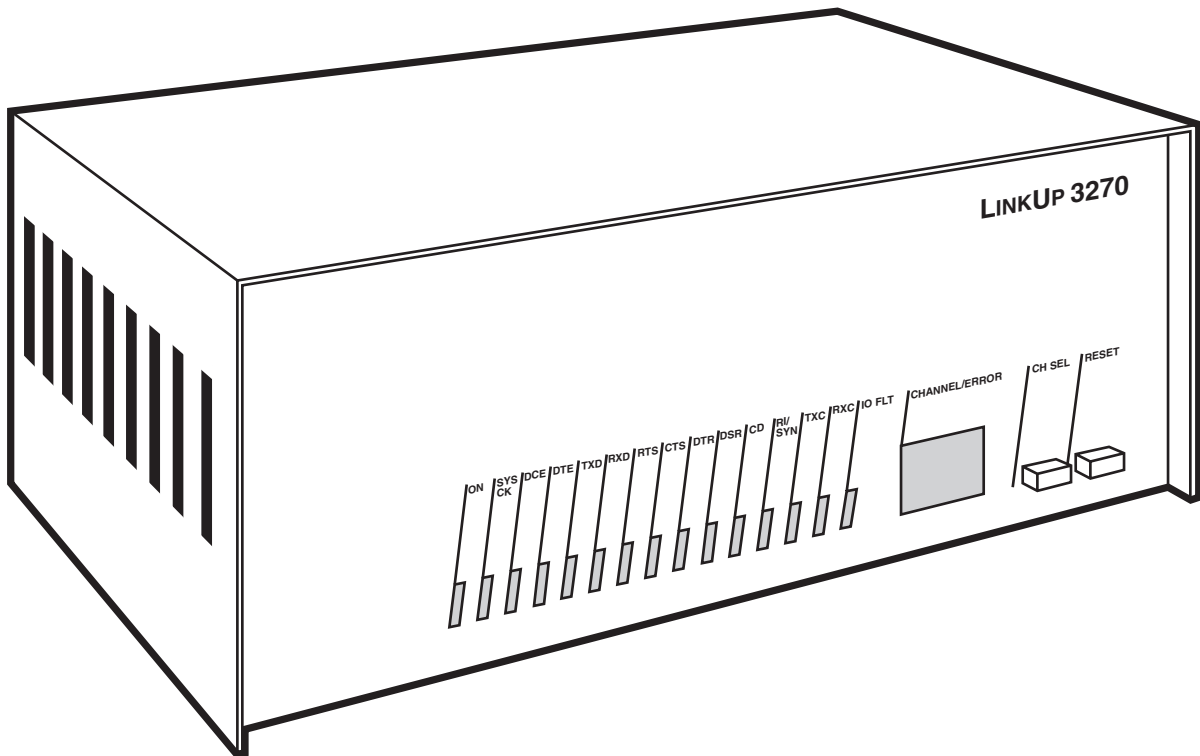




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1. Specifications

Memory —	256-768K RAM
Ports —	Up to 34 total (32 async, 2 sync) (serial)
Channels —	Base Unit: 2 synchronous channels; bit rates up to 19.2 Kbps on RS-232C/V.24 interfaces Async Expansion Board: Four async channels (RS-232C/V.24 or RS-422/V.11), or eight async channels (RS-232C) with DB9 connectors; bit rates 110 bps to 19.2 Kbps.
Indicators —	(13) Channel Status LEDs: DCE, DTE, TXD, RXD, RTS, CTS, DTR, DSR, CD, RI/SYN, TxC, RxC, I/O FAULT; (1) System OK LED
Power —	115 VAC \pm 15% 230 VAC \pm 15% 50 or 60Hz \pm 2Hz 50 Watts
Size —	6"H x 16.8"W x 11"D (15.5 x 42. x 27.5 cm)
Weight —	17 lb. (7.7 kg)

2. Introduction

The LinkUp 3174 allows connection of asynchronous terminals and printers to IBM® or compatible host computers (for example, Model 360, 370, 43XX and 30XX mainframes). Emulation of standard 3270 keyboard functions is defined for each supported terminal type, providing full IBM capability. An Async Passthrough feature also enables the same asynchronous terminals to communicate with asynchronous host computers.

A single LinkUp 3174 can support up to 32 directly connected devices concurrently. Use of asynchronous dial-up lines will allow many more operators to access the host computer, providing they do not need to access the system at the same time. In addition to a variety of asynchronous terminals, the LinkUp 3174 also supports attachment of many personal computers running terminal-emulation software. This allows the LinkUp 5294 to be used in a variety of system environments.

The LinkUp 3174 can be connected to an IBM host through a 3705, 3725, or 3745 front end processor or Integrated Communications Adapter. The LinkUp 3174 includes a built-in synchronous

modem eliminator and in general takes the place of a remote IBM 3174 Control Unit.

The LinkUp 3174 has two synchronous ports providing simultaneous connectivity to two synchronous hosts. The available LUs may be distributed in any manner between the two hosts, as long as each LU is associated with only one host. This allows a single terminal to switch from one host to the other without changing cables or redialing the LinkUp 3174. All the operator has to do is terminate one session, return to Connect Mode, and select another LU associated with the second host.

In addition, the LinkUp 3174 can be connected to ASCII hosts through the asynchronous ports. Up to 16 asynchronous ports may be designated as passthrough ports, providing async terminals with access to the ASCII host as if they were directly connected. This enables operators to access IBM mainframes and ASCII minicomputers from the same terminal with a single dial-up. Figure 2-1 shows a typical system arrangement using the LinkUp 3174.

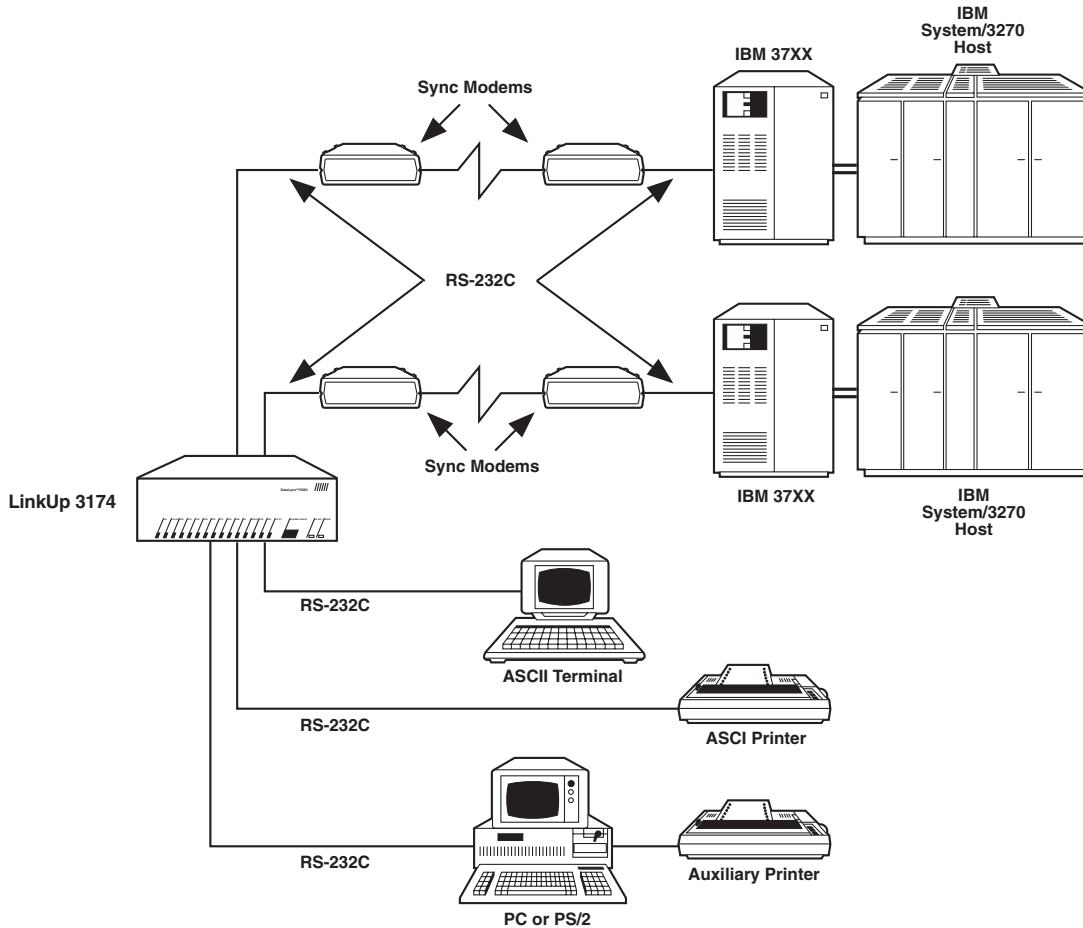


Figure 2-1. Typical LinkUp 3174 Installation.

2.1 Using the Manual

This manual describes installation, configuration, and operation of the LinkUp 3174 protocol converter. Because the LinkUp 3174 interacts with IBM host computers and a variety of asynchronous terminals and printers, discussion of these is also included in a limited sense. A working knowledge of the host computer and the available application programs is assumed throughout this manual. If you are unfamiliar with use of the host computer, please refer to the documentation provided by the computer's manufacturer.

To help you quickly find the specific information you need, a brief description of the contents of each chapter is given below.

- **CHAPTER ONE** — Specifications. Physical dimensions, electrical characteristics, available RAM and EEPROM, and other technical data.

- **CHAPTER TWO** — Introduction. Summarizes the features of the LinkUp 3174 and explains terminology used in the manual that may be unfamiliar to the operator. It also contains an explanation of the concept of virtual logical unit operation.
- **CHAPTER THREE** — Installation. Gives detailed instructions on how to install the LinkUp 3174, the configuration terminal, additional local and remote terminals and printers. It shows how to connect the LinkUp 3174 to the host computer and establish communication.
- **CHAPTER FOUR** — Hardware Description. Describes the front-panel controls, channel status indicators, and back-panel layout of the LinkUp 3174.

- **CHAPTER FIVE** —Port Test and System Management Modes. Explains each of the options of Port Test Mode and System Management Mode. Screen displays for these modes are also shown.
- **CHAPTER SIX** — Configurator Mode. Describes configuration methods and parameter values for synchronous and asynchronous parts, logical units, passthrough units, access groups, character translations, and banner messages.
- **CHAPTER SEVEN** — Configuring a Terminal Module. Describes the Terminal Configurator, which allows the system manager to either customize or completely define a terminal driver. Display-terminal information parameters, function sequences, and key sequences with recommended keystrokes for both displays and hardcopy terminals are included.
- **CHAPTER EIGHT** — Support for Hardcopy Terminals-PAPER/3278. Describes the keyboard functions and data presentation of the PAPER/3278 feature, which permits the use of hardcopy terminals with the LinkUp 3174.
- **CHAPTER NINE** — Support for Special Output Devices. Explains how the LinkUp 3174 supports specialized devices not normally found in a 3270 environment, such as graphic displays and plotters, printers with downloadable forms control, and micro-, mini- or instrumentation computers used in a mode other than terminal emulation. Pseudo-transparency and SAS transparency are explained.
- **CHAPTER TEN** — Generate/View Attributes. Describes the Generate Attribute and View Attribute keyboard functions. These are extensions to the 3278 keyboard functions which are provided by the LinkUp 3174 so that you can view information regarding screen layout design or experiment with screen layout design and testing.
- **CHAPTER ELEVEN** — Packet Network Access (PNA) Applications. Explains how to use the LinkUp 5294 in X.25 and other packet data network environments.
- **CHAPTER TWELVE** — Block Mode Operation. Describes Block Mode operation, a method of transmitting data from a personal computer to the LinkUp 3174 in blocks rather than character by character.
- **CHAPTER THIRTEEN** — REQMS/RECFMS Support & Maintenance Statistics (SNA Only). Explains the LinkUp 3174's support for host-generated requests for maintenance statistics. These are used by the host software for network management functions.
- **CHAPTER FOURTEEN** — Netview Alert Support (SNA Only). Describes how the LinkUp 3174 generates and/or transmits Netview Alert messages to a host computer in support of BM's Netview facility.
- **CHAPTER FIFTEEN** — Dial Back Security (SNA Only). Explains the characteristics, configuration procedures, and operation of the LinkUp 3174 Dial Back Security feature.
- **APPENDIX A** — Translation Tables. Contains the character translate tables used by the LinkUp 3174.
- **APPENDIX B** — International Character Set Support. Contains the most common translate table changes necessary for use with ISO 7-bit ASCII codes in various countries.
- **APPENDIX C** — Configuring the IBM Host Computer. Contains IBM system-generation information to help the system manager in configuring the host computer.
- **APPENDIX D** — Fault Isolation/Problem Reporting. This is a separate document containing troubleshooting information for common installation and configuration problems and problems encountered during normal operation. It also contains a list of error messages and instructions for reporting a problem to Black Box.
- **APPENDIX E** — List of Supported Terminals. This lists all the terminals supported by the LinkUp 3174.

2.2 Summary of Features

This section describes the device support capabilities of the LinkUp 3174 and the emulation techniques which it employs. The LinkUp 3174 is shown in Figure 2-2.

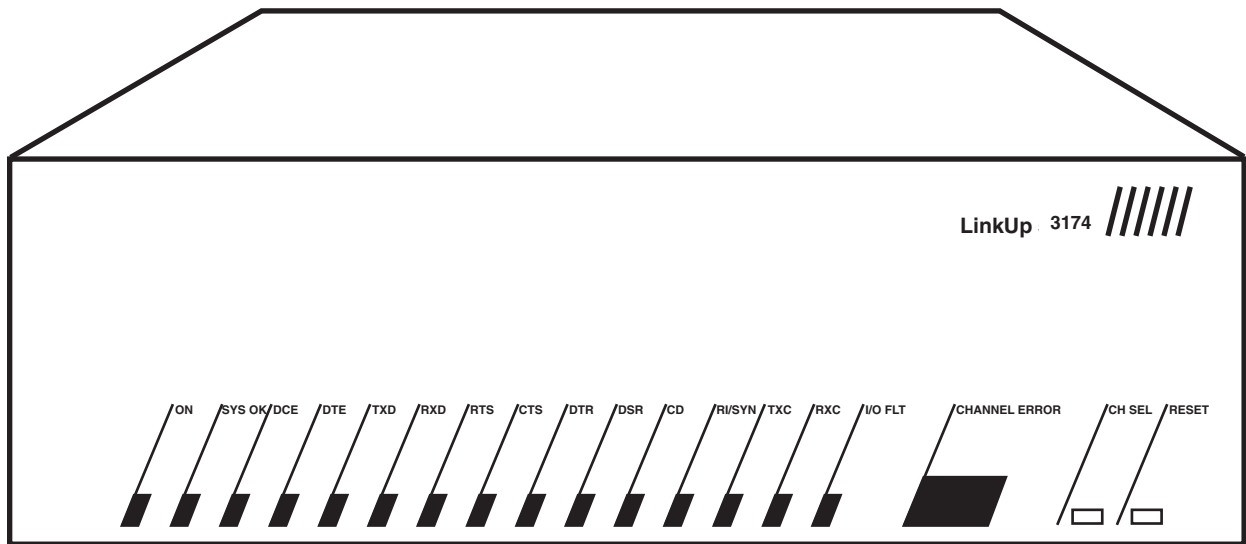


Figure 2-2. LinkUp 3174.

2.2.1 HARDWARE OPTIONS

All LinkUp 3174 base units have two synchronous ports and one async board containing four asynchronous ports. Upgrade kits allow the operator to add 4-port and/or 8-port async boards in any combination up to a maximum of four boards and 32 ports. The 4-port async boards may be ordered as RS-232C or RS-422 and may be installed in any combination or sequence. The 8-port async boards are available only in RS-232C and are fitted with DB-9 connectors. The LinkUp 3174 automatically recognizes that a new board has been installed and determines whether it is RS-232C or RS-422.

Async RS-232C boards are designed with automatic DTE/DCE recognition capability. When an attached device is powered on, the LinkUp 3174 determines whether the device is DTE (terminal) or DCE (modem) and sets its default parameters accordingly. No special cable is required, and configuration is

not necessary unless a printer is directly attached or the dial back feature is to be used. Each time the device is powered off, the LinkUp 3174 will return to auto-recognition, allowing the user to change attached devices without having to reconfigure. If it is necessary to set a port for a specific device type, however, this may be accomplished through a simple configurator change. All configurator parameters are stored in non-volatile EEPROM.

The front panel displays signals on all available channels. When the channel number is incremented beyond the last installed channel, an LED test is performed by turning on all lights. Incrementing the channel number one more time returns to the normal channel display.

2.2.2 ASCII DEVICES SUPPORTED

The LinkUp 3174 provides support for many commonly used ASCII terminals as well as the IBM Personal Computer and full compatibles. The type of terminal to be used may be selected each time a connection to the LinkUp 3174 is established.

The LinkUp 3174 will also perform emulation of IBM 3287 Model 1 and 2 printers. This allows a variety of ASCII printers such as dot-matrix, letter-quality, or non-impact to be used for output from the IBM host computer.

2.2.3 TERMINAL EMULATION

Supported terminal types include most popular terminals. Any terminal which conforms to ANSI Standard X3.64 may be used by selecting the ANSI terminal type.

The LinkUp 3174 also provides a Terminal Configurator which allows customization of up to six terminal modules. This feature can be used to modify the emulation characteristics of any built-in terminal driver. This allows bidirectional customizations: commands both to and from the terminal can be redefined.

2.2.4 PRINTER EMULATION

The LinkUp 3174 emulates IBM 3287 printers in both DSC and SCS modes by converting host-originated printer data and commands to standard ASCII characters and carriage-control commands. The PRINT driver is designed for use with almost any ASCII printer.

Customized printing commands are supported by use of one of the techniques provided for special output devices. Specifically, pseudo-transparency and SAS-type graphics support are well suited for sending special command sequences to printers as well as other output devices. The sequences could include printer initialization strings, commands for special print fonts, etc.

2.2.5 PERSONAL COMPUTER SUPPORT

Programs for popular desktop computers are available which allow emulation of ASCII terminals. By using an appropriate software emulation program, the microcomputer can attach to the LinkUp 3174 and function as a terminal either directly or remotely. The micro-computer can then access the IBM mainframe as if it were an IBM display station, in many cases allowing optimal use of existing equipment.

2.2.6 EMULATION AND PROCESSING

Each LinkUp 3174 can provide emulation for 128 sessions. The number of devices is specified during configuration of the host computer. During emulation, each ASCII device will appear to an IBM host computer as an IBM 3178, 3179, 3278, or 3279 model 1-5 Display Station or 3287 SCS or DSC printer.

During emulation, the LinkUp 3174 translates the key sequence generated on the terminal keyboard into appropriate codes which are then sent to the IBM host. To the extent that the attached terminal permits, standard display station attributes (protected, unprotected, dual intensity, and nondisplay) are supported. IBM's Extended Attributes and Programmed Symbols are not currently supported.

2.2.7 OPTIMIZED DISPLAY OUTPUT AND TERMINAL SUPPORT

Through the use of separate modules for each supported terminal type, particular features of any terminal are used to optimize performance. These separate drivers also allow 3270 function emulation to be implemented in a manner most suited to the individual keyboard layout.

Through carefully chosen keyboard-mapping assignments, the number of keystrokes made by the operator is minimized. Each individual module is identified by a Terminal ID (Device Type) which is entered during the connect sequence. A list of currently supported terminals and the associated Terminal IDs can be found in Appendix E.

As an alternative to the custom keyboard map for each terminal, the ADM3A keyboard layout can be selected. This is beneficial for operators who must operate a variety of different terminals, since only one keyboard layout has to be learned. This can be selected for any terminal by preceding the Device Type with a colon (:) during the connect sequence. (For example, type :TV925 in response to the Enter Device Type: prompt.) The screen handling is optimized for the TV925 terminal, but the keyboard commands are the same as those for the ADM3A.

The LinkUp uses various processing techniques during data transmission to minimize the asynchronous line load. Strings of characters and blanks on a screen that are unchanged are not unnecessarily redisplayed when the screen is updated. This allows the amount of screen repainting to be kept to a minimum. This is

especially advantageous when remote terminals with low baud rates are employed.

2.2.8 STATUS LINE EMULATION

During Emulation Mode the LinkUp 3174 displays status indicators on the last line of the display screen. This is line 24 on most terminals. Line 25 is used if the terminal provides a 25th display line. This is an emulation of the status line on an actual 3278 display station.

This provides the terminal operator with current information on the status of the session and other host-controlled functions. The status line information is overwritten whenever the host writes to Line 24 or when the operator inputs data to a position in Line 24, as long as no error condition exists and the keyboard is not locked.

2.2.9 CUSTOMIZED CHARACTER TRANSLATIONS

This allows the operator to modify the translate tables to support special needs. In particular, International users may need to customize output characters for their specific country.

2.2.10 ASYNC PASSTHROUGH

Async Passthrough is a facility that enables an asynchronous terminal to communicate with an asynchronous host. Other applications such as PC printer sharing are also possible.

Async Passthrough employs data-buffering to allow the use of different baud rates on either side of the passthrough session. Flow control can also be independently configured on each side of the passthrough session as either logical flow control (X-ON/X-OFF) or hardware flow control. If Device Ready signals are configured, the loss of Device Ready on the async host side of the passthrough session will put the session into a reconnect state with no timeout limit. The message **Passthrough Port line is down** will be displayed on the operator's terminal. The operator may then exit the passthrough session by using the LinkUp 3174 Attention Code or take action to restore the line to the async host. If the line is restored, the message **Passthrough Port Line Restored.** will be displayed on the operator's terminal. The loss of device ready on the async terminal side of the passthrough session will cause an immediate end to the session and will free the host port for other passthrough sessions.

Up to 16 passthrough sessions are available, and each may be password-protected if desired. It is recommended, however, that no more than ten passthrough sessions be run concurrently (eight if an IBM host session is also in progress).

2.3 Terminology Used in this Manual

The following paragraphs define some of the terms and concepts used in this manual to describe the operation of the LinkUp 3174. Pay particular attention to the terms **Port** and **Logical Unit**, as a proper understanding of their definitions is necessary in order to successfully configure the protocol converter.

- **Physical Port** — This is the physical LinkUp 3174 connector used for attachment of an ASCII device (terminal, printer, modem, etc.). Depending on the number of optional boards, as many as 32 asynchronous ports may be present. These ports are numbered 2 through 33. Ports 0 and 1 are reserved for synchronous operation. The number of a specific port is not necessarily related to the Logical Unit Address associated with that port. Although it may be more convenient to configure the LinkUp 3174 so that each Logical Unit Address corresponds to the same physical port number, this is not a requirement.

It is possible for two devices, a terminal and a printer, to share one physical port. The printer is attached directly to the auxiliary port of the terminal. Both devices must have unique Logical Unit addresses, and the printer must be defined as an auxiliary printer (AUX Logical Unit type).

- **Logical Unit** — In contrast to a port, a Logical Unit is not necessarily a specific physical entity; rather, it can be any device that is addressable by the IBM host computer. Each LinkUp 3174, regardless of the number of physical ports installed, can provide up to 196 separate Logical Unit addresses, numbered 2 through 129 and 1002 through 1065. These are addressed independently by the host computer. The host computer sends outbound data to a particular Logical Unit; the LinkUp 3174 reads the address and routes the data to the appropriate port. Of the 196 available Logical Unit addresses, a maximum of 128 may be configured at any given time, and no more than 64 may be assigned to Sync Port 1. (With 32 async ports available, a maximum of 64 Logical Units can be

active at one time: 32 displays and 32 auxiliary printers.)

A terminal attached to one physical port may select and use any available Logical Unit for communication with the host computer. The coupling between a Logical Unit and a physical port is established during Connect Mode. Alternatively, the associated LU could be set as non-overridable during configuration, and the port would be effectively dedicated to a single LU. The Logical Unit to be used is not necessarily dictated by the physical port number. The port and LU are decoupled after intentional or accidental disconnection of the terminal. This allows later use of the same Logical Unit address by a terminal attached to another port.

Logical Units are defined during Configurator Mode to accommodate different types of devices and provide various emulation options. There are three Logical unit types: DSPLY (display devices, such as terminals), PRT (for printers), and AUX (for auxiliary printers). A configuration menu is associated with each of the three types.

- **Passthrough (Dedicated Host) Ports** — When operating in Async Passthrough Mode, at least one of the asynchronous ports must be designated as a passthrough port or a dedicated host port. These terms refer to the asynchronous port or ports that are connected

to the asynchronous host. Passthrough ports are assigned while in Configurator Mode using the async port configuration menus.

- **Passthrough Units** — A Passthrough Unit (PTU) is, for passthrough sessions, the equivalent of the Logical Unit. It enables a terminal user to connect to another asynchronous port on the LinkUp rather than to one of the synchronous ports. In a typical application, this second async port is connected to a minicomputer such as a DEC™ VAX™. The terminal operator may then communicate through the LinkUp 3174 to the VAX by selecting the appropriate PTU number. The same operator may also select a Logical Unit (LU) and communicate with an IBM mainframe. Figure 2-3 shows a typical example of this application.
- **Access Groups** — Access groups are groups of like-configured display LUs or PTUs to which identifying names have been assigned. They are designed to simplify host access for the operator. For example, during the connect sequence, the user is prompted to enter an LU or PTU

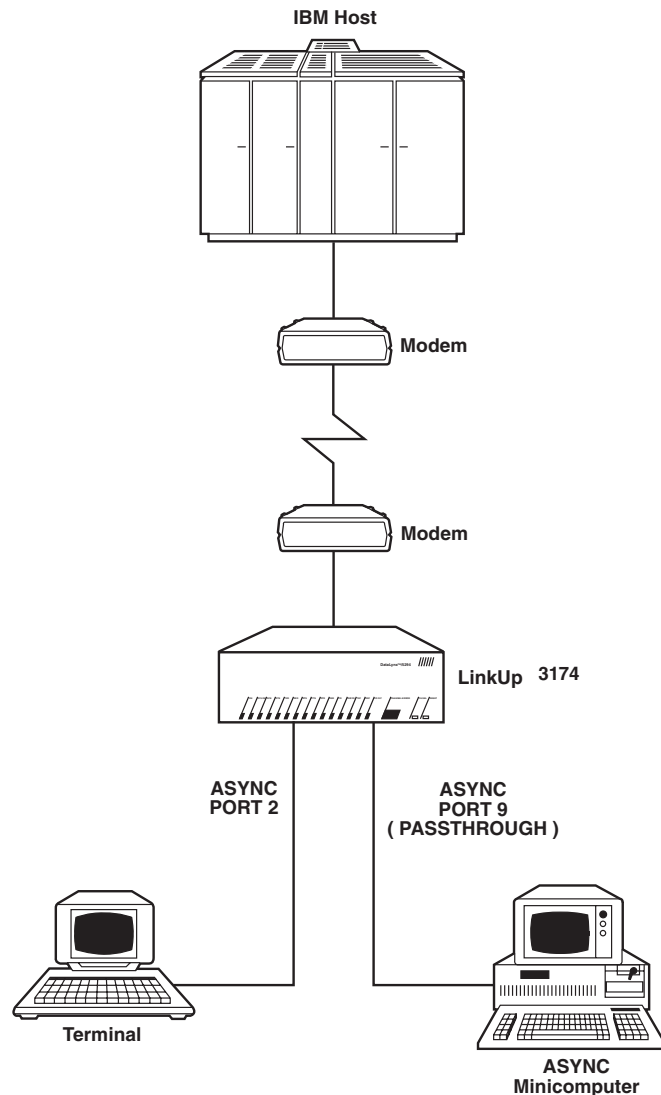


Figure 2-3. Typical LinkUp 3174 Passthrough Application.

number or the name of a previously defined Access Group. If an Access group name is entered, the LinkUp 3174 will search for the first available LU or PTU in that Access Group as assign it to the operator. If all the LUs or PTUs belonging to the group are in use, then the message **No LU Available** or **No PTU Available** is displayed. Up to 156 LU groups and 16 PTU groups may be defined using a unique identifier of up to six alphanumeric characters for each.

- **Printers and Auxiliary Printers** — The LinkUp 3174 recognizes two general categories of printers. The major distinction is the manner in which they are physically attached to the LinkUp 3174.

Printers (LU type PRT) are directly attached to the LinkUp 3174 using an RS-232C serial connector. Each PRT device requires one port address and one Logical Unit address. The type of emulation performed is set during configuration.

Auxiliary printers (LU type AUX) are not attached directly to the LinkUp 3174; rather, they are connected to a terminal which is attached to the LinkUp 3174. This allows two devices to share one port. Although the auxiliary printer shares the port number with the terminal, it must have a unique LU address.

As far as the host computer is concerned, both printer types are identical. The host identifies and addresses the attached devices by the LU number, not the port number. Consequently, both printer types appear to be independent devices.

- **Local and Remote Terminals** — As mentioned previously, terminals may be connected either directly to the LinkUp 3174 using an RS-232C cable, or remotely through the use of asynchronous modems. Emulation functions are identical for terminals connected locally and remotely. The major operational differences between the two concern the use of the modem more than the use of the LinkUp 3174. For this reason, an operator of a remote terminal must also be familiar with the modem being used.

2.4 Virtual Logical Unit Operation

Since the LinkUp 3174 design separates the logical unit (LU) from the physical port, a means of controlling access to the LU must be provided. To do so, four interrelated LU states have been created. They are:

1. In-Use State
2. Reconnect State
3. Pending Disconnect State
4. Disconnect State

Figure 2-4 illustrates these four states and the possible transition paths between them. Each of the possible conditions and transitions is described in Section 2.4.1.

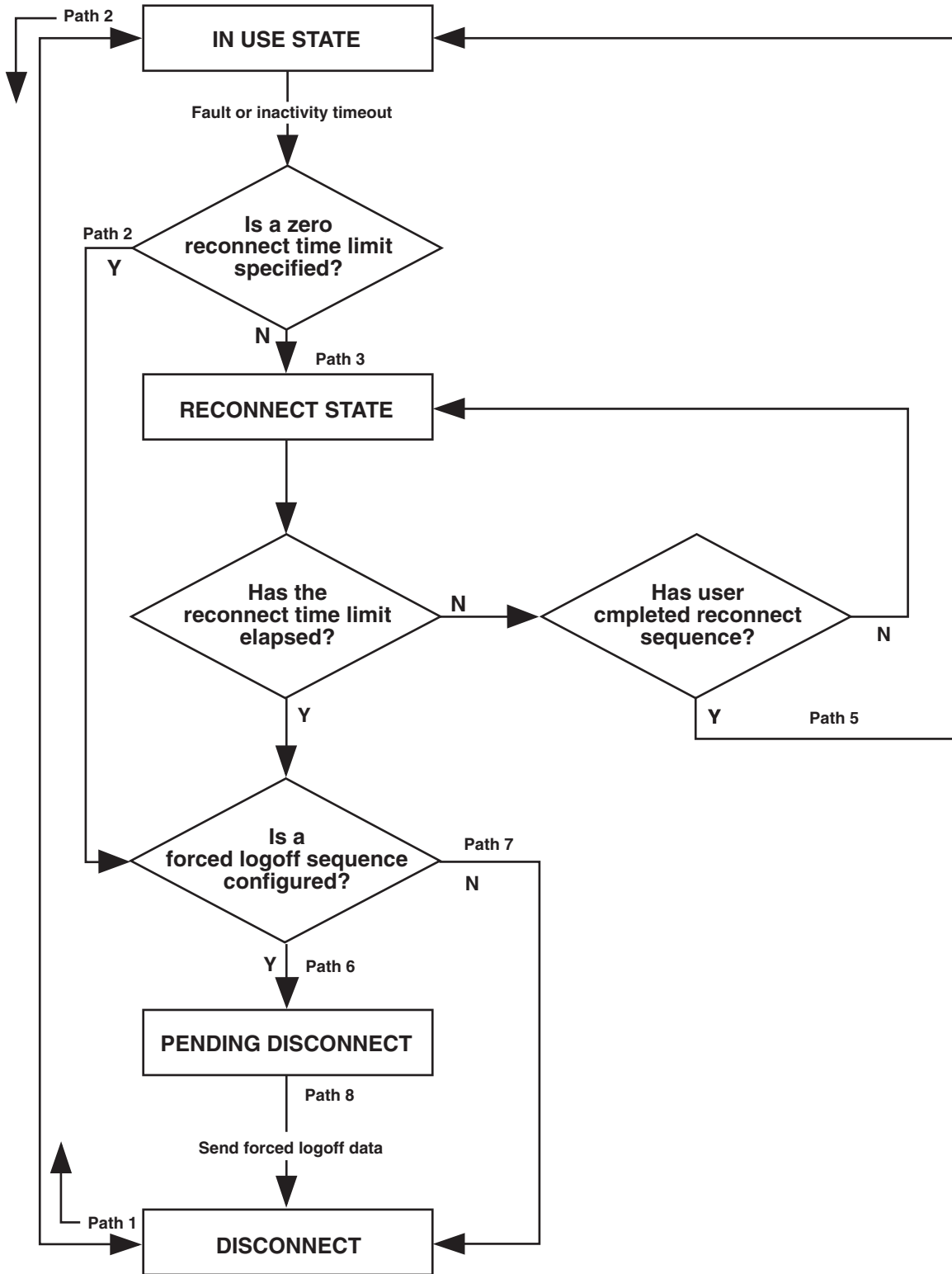


Figure 2-4. Logical Unit State Transitions.

2.4.1 LOGICAL UNIT STATES

For simplicity in the following discussions, the term "terminal" is used to mean any device capable of connecting to an async port on the LinkUp 3174. Therefore, "terminal" could also imply a personal computer, printer, or other device.

Each Logical Unit state is defined as follows:

- **In-Use State** — This is the normal operational state. In-Use State means that the terminal has selected an LU and is in Emulation Mode connected to the LinkUp 3174.
 - **Reconnect State** — While in this state, the LinkUp 3174 maintains the host-LU session even though the terminal is no longer in Emulation Mode. Emulation Mode may have been terminated by an inactivity time limit expiring or a dial-up line being dropped.
- The LU will remain in Reconnect State until the Reconnect Time Limit specified in the Configurator has expired. During this state, the operator can reconnect to the LU and resume the session without repeating the entire connect sequence. If a Reconnect Password has been established, it will have to be entered before the LU is reclaimed.
- **Pending Disconnect State** — This state is entered after the Reconnect Time Limit has expired, or after the Deact/Act Async Port command has been issued. The LinkUp 3174 transmits the Forced Logoff data while the LU is in Pending Disconnect State. In addition, this state occurs only if a Forced Logoff data message has been defined for the LU.
 - **Disconnect State** — This state occurs when the LU is not in session with the host or a terminal.

A terminal operator can enter Disconnect State by entering either the [INITIALIZE TERMINAL] command (when only one session is configured for the port) or the [REQUEST DISCONNECT] command. Both commands will cause a proper logoff from the host, but the latter will reset the port as well.

2.4.2 LOGICAL UNIT STATE TRANSITIONS

- **Path 1: Disconnect to In-Use Transition** — This transition path occurs when the proper Connect Mode procedure is completed by the operator.
- **Path 2: In-Use to Disconnect Transition** — This transition path occurs when the operator performs a proper logoff on the terminal. This may be done by entering either the [REQUEST DISCONNECT] or [INITIALIZE TERMINAL] commands at the terminal.
- **Path 3: In-Use to Reconnect Transition** — This transition path occurs for one of the following reasons:
 1. In modem-connected lines, this transition occurs if the Device Ready signal is dropped in the communication line. This can result from interference on the phone line or from accidental disconnection or power-off of one of the modems. The DTR signal cannot be dropped accidentally in dedicated connect-mode situations.
 2. This transition can also be the result of an inactivity timeout. This timeout period is defined during configuration of the Logical Unit. If terminal inactivity exists beyond this time limit, the transition to Reconnect State occurs. This may occur in either modem-connected or dedicated-connect lines.
- **Path 4: In-Use to Pending Disconnect Transition** — This path is taken if the Reconnect Time Limit was set to 0 during configuration of the Logical Unit and conditions identical to those described for Path 3 have occurred.
- **Path 5: Reconnect to In-Use Transition** — This transition path occurs when the user performs the proper reconnect sequence from the terminal.
- **Path 6: Reconnect to Pending Disconnect Transition** — This transition occurs after the Reconnect Time Limit has expired. While in the Pending Disconnect State, the Forced Logoff Message is sent from the LinkUp 3174 to the host. Once the message is sent, the transition from Pending Disconnect to Disconnect (Path 8) occurs.

- **Path 7: Reconnect to Disconnect Transition** — This transition is also due to a reconnect timeout but differs from the conditions described in Path 6 in that a Forced Logoff Message has not been defined, so no message is sent. The Logical Unit never enters Pending Disconnect state.
- **Path 8: Pending Disconnect to Disconnect Transition** — This transition occurs after a Forced Logoff is complete. The LU is now available and requires a complete Connect Mode procedure to reestablish a session.

2.4.3 CONFIGURATION CONSIDERATIONS

The LinkUp 3174 has been designed to allow configuration parameters to be changed without affecting LUs that are currently active, that is, without powering off the LinkUp 3174. However, an LU must make the transition to Disconnect State before its configuration changes will take effect. This transition is normally accomplished by powering off the device or by using the [INITIALIZE TERMINAL] or [REQUEST DISCONNECT] command.

None of these methods work, however, if the device is a printer and the Device Ready Signal (port parameter) is set to NONE. This is because there is no keyboard for entering a command, and because powering off the printer is not recognized when there is no Device Ready signal configured. The LinkUp 3174 assumes that the LU is always in use.

Therefore, to effect printer port or printer LU changes under these conditions, one of the following methods must be used:

- Deactivate and then activate the printer port from System Management Mode by issuing the Deact/Act Async Port command twice.
- Issue the Remote Reset command from System Management Mode.
- Power off the LinkUp 3174.

NOTE

If the Printer LU is set for SHR a LOC Operational Mode when configuration changes are made, any In-Use display LU wishing to use the printer for Local Copy Print must first exit to Connect Mode and then reenter the session.

2.4.4 SESSION OUTAGE CONSIDERATIONS

The LinkUp 3174 has been designed to take advantage of several SNA commands that inform the host of the status of attached devices. Notification of session outage is generally sent when an attached device drops its Device Ready signal; however, if this signal is set to NONE in the port configuration menu, the LinkUp 3174 assumes that the device is always attached and powered on. This setting will circumvent the notification capability for the port so configured.

If Device Ready is not set to NONE, loss of this signal from an attached device causes the LinkUp 3174 to exit from In-Use State. If the Reconnect Time Limit has been set to ZERO, the LinkUp checks to see if forced logoff data has been configured, then transitions either to Pending Disconnect State a Disconnect State, as appropriate (see Figure 2-5). If the Reconnect Time Limit is other than zero, the LinkUp 3174 enters Reconnect State and remains there until the time limit expires or a successful reconnect is accomplished. A Reconnect Time Limit of NONE leaves the LinkUp 3174 in Reconnect State indefinitely.

When the LinkUp 3174 transitions to Disconnect State, it sends an LUSTAT OFF and /or NOTIFY OFF to the host.

3. Installation

This section describes installation of the LinkUp 3174. A typical local installation to a single host is described. Attachment of local and remote (to the LinkUp 3174) terminals and printers is also included in Sections 3.3, 3.4, and 3.5. Special considerations for dual-host and remote-host environments are described in Section 3.6.

System Generation (SYSGEN) and configuration of the IBM host computer will vary considerably from one installation to another. In general, however, the host system should be configured as if the LinkUp 3174 were a 3174 or 3274 Control Unit. Each of the LU numbers configured on the LinkUp 3174 corresponds to one of the LU addresses on a Control Unit.

3.1 Installing the LinkUp 3174 and the Configuration Terminal

Configuration and installation of the LinkUp 3174 requires attachment of an asynchronous terminal to one of the asynchronous ports. The terminal is then used in conjunction with the Configurator menus to set the logical configuration parameters. The terminal used for this purpose is referred to as the Configuration Terminal throughout this section.

It is recommended that a local terminal be used for initial installation and configuration. This will simplify problem isolation during the installation process. Therefore, the following sections assume that the configuration terminal will be locally attached to the LinkUp 3174. If a remote terminal must be used, refer to Section 3.4.

3.1.1 UNPACK THE LINKUP 3174

The LinkUp 3174 is carefully packed in a box. A label on the outside of the box lists the model of the unit, serial number, firmware version number, date of manufacture, voltage setting of the power switch (115 or 230 VAC), and other electrical information. Inside you will find a large envelope containing a warranty card and a release notice for the latest firmware version, a power cord, and the LinkUp 3174. A DB9-to-DB25 converter cable is also enclosed with each 8-port async board ordered.

Carefully remove the contents of the box and check to see that the above items are present. If an item is missing or defective, call Black Box.

NOTE

The power cord that is shipped with units set for 230-volt operation does not include an AC plug. The appropriate plug must be supplied by the operator.

3.1.2 INSTALL THE LINKUP 3174

The only additional equipment needed to install the LinkUp 3174 is an asynchronous terminal, or personal computer with terminal-emulation software installed, and an appropriate length of RS-232 cable. A small screwdriver may also be desired for tightening the cable connection.

The LinkUp 3174 is shipped with all asynchronous RS-232C ports configured as follows:

- Autobaud
- 8 bits/character
- No parity
- 1 stop bit

Each port is configured for automatic DTE/DCE detection. Once a device is attached and powered on, the LinkUp 3174 determines whether the device is DTE or DCE, and configures its own port accordingly.

The location of the LinkUp 3174 is not critical as long as the maximum recommended cable lengths are not exceeded. Temperature and humidity are considerations; however, the LinkUp 3174 is no more sensitive than other computer or data-processing equipment. During initial installation and testing, it may be helpful to position the LinkUp 3174 so that the front-panel indicators are easily visible.

3.1.3 SET UP THE CONFIGURATION TERMINAL

Ensure that the configuration terminal is set for initial operation with the following values:

- No parity
- 8 data bits
- 1 stop bit

(Seven data bits and even parity is also allowed.) This configuration allows use of virtually any asynchronous display terminal for configuration. These values are the initial default values for parameters that may be changed later to suit specific requirements.

3.1.4 CONNECT THE CONFIGURATION TERMINAL

Connect the terminal to Port 2 of the LinkUp 3174 using a standard RS-232C cable. Figure 3-1 below shows the location and numbering scheme of both synchronous and asynchronous ports. Refer to Section 2.7 for required cable pinouts. No other data-cable connections are required at this time.

NOTE

If Port 2 is located on an 8-port board, use a standard DB9-to-DB25 converter cable. Standard IBM AT® cables may be used to attach devices to other 9-pin connectors.

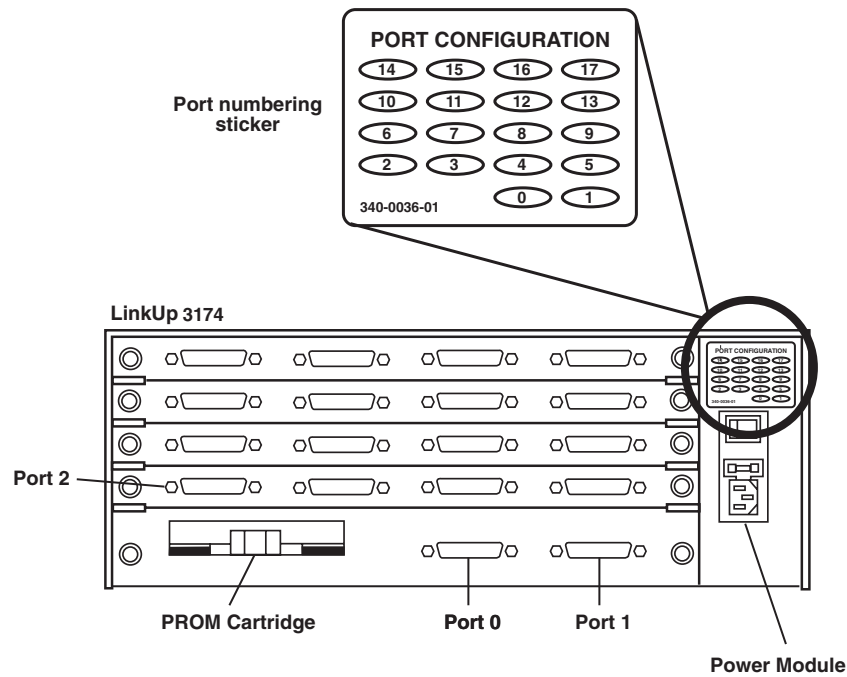


Figure 3-1. Typical Back Panel of a LinkUp 3174.

3.1.5 ESTABLISH COMMUNICATION

Power on both the LinkUp 3174 and the terminal. When the LinkUp 3174 is powered on, all the LEDs on the front panel will illuminate briefly, and “88” will appear in the CHANNEL/ERROR display window. After less than one second, all the LEDs will go off except for the ON indicator, and “dr” will appear in the CHANNEL/ERROR display. Allow another 2 or 3 seconds for the LinkUp 3174 to recognize that the terminal is connected and to set the port for proper operation (DTE or DCE). During this time the LinkUp 3174 performs a series of internal self tests. Once the self tests are completed and all systems are functioning normally, the SYS OK LED on the front panel will begin blinking slowly and 02 will appear in the CHANNEL/ERROR display. If this does not occur, refer Appendix D.

NOTE

When you upgrade the PROM cartridge to SNA version 5.30 or above or BSC version 4.30 or above, the LinkUp 3174 is upgraded from an 18-port unit (one that supports 16 asynchronous ports) to a 34-port unit (supporting 32 async ports). When this occurs, the Electrically Erasable Programmable Read Only Memory (EEPROM) parameters for ports 18 through 34 are initialized. The LU names for an 32 LUs are also initialized. This process can take up to 30 seconds. During this time the CHANNEL/ERROR display will show "dr." The initialization will most likely be followed by an <SP 00> error, since the main system parameters have been changed. Press the RESET button to clear this error code from the front panel display; then begin normal operation.

When you power on a LinkUp 3174 that is configured to run from the secondary microcode bank, the boot process begins initially from the primary microcode bank. When the LinkUp processes the command to boot from the secondary bank, it begins the boot process again, displaying “88” followed by “dr” in the CHANNEL/ERROR display window. Do not be alarmed when this occurs; it is a normal part of a secondary bank power-up. The entire boot-up process takes approximately 45 seconds.

Press <Enter>. This allows the LinkUp 3174 to detect the bit rate at which the terminal is operating, and to establish the connection. A banner message similar to the following will be displayed on the screen:

```
***3174 CONTROL UNIT EMULATOR - V6.XXU3***
```

```
(For Help, Type '?' after any Prompt. To Abort Connect Sequence, Type '!')  
(To Delete Response Characters, use 'Rubout'. To Cancel Response, 'ctrl/x'.)
```

```
Enter Device Type (ADM3A):
```

The connection is complete when the following prompt appears on the terminal screen:

Enter Device Type (ADM3A):

3.1.6 SELECT A DEVICE TYPE

Determine the appropriate Terminal ID for your terminal and enter it in response to the Enter Device Type prompt.

Type a question mark for a list of valid terminal types. If you are using a terminal that is not listed directly but which emulates one of the supported terminals, use the Terminal ID for the emulated terminal.

NOTE

A question mark <?> followed by <Enter> is a valid response at any time during Connect and Configuration Modes. It will display a brief description of the response expected by the LinkUp 3174.

3.2 Accessing the LinkUp 3174 Configurator

The following section describes access to the Configurator Mode of the LinkUp 3174. Since logical configuration will be unique for each installation, all system information pertinent to this control unit and its attached devices must be readily available and understood before proceeding.

Enter System Management Mode as follows:

1. Establish the connection and enter the appropriate Device Type as described in Section 3.1 above. The prompt **Enter Logical Unit Id (LU 2):** will be displayed.
2. Enter Port Test Mode by typing <Enter> in response to the above prompt. The Port Test Mode Menu will appear.
3. Select 1 from the Port Test Mode Menu to enter System Management Mode. The first entry into System Management Mode requires no password, but the prompt **Specify New System Password:** will appear. Enter a new password to protect against unauthorized access to System Management Mode.

NOTE

If the LinkUp 3174 has been previously configured, you may be prompted to enter a password before entry into System Management Mode is allowed. Obtain the correct password from the system manager. (If the password is not known, see Appendix D).

After entry of a password (if required) and/or a new password (or <Enter>), the System Management Mode menu will be displayed.

4. Select Option 1, Configurator Mode, from the System Management Mode menu. The prompt Enter Item(s) to be Configured: will appear, indicating that you are in Configurator Mode. Refer to CHAPTER FIVE for complete details on use of the Configurator.

Configure the synchronous and asynchronous ports, LU and PTU parameters, and Access Groups as required for your installation. Save the changes by typing END at the **Enter Change(s):** prompt. Exit Configurator and System Management Modes using the same command.

3.3 Connecting Additional Local Terminals

Having specified port characteristics to the LinkUp 3174 with the Configurator, ensure that additional terminals you connect are configured correctly.

Connect each terminal to the appropriate asynchronous port of the LinkUp 3174 using a standard RS-232C cable. The LinkUp 3174 provides an automatic DTE/DCE detection feature which determines whether the attached device is a modem or a terminal. No DTE/DCE configuration changes are required if the defaults listed in CHAPTER FIVE can be used.

NOTE

When attaching devices to those ports having DB9 connectors, DB9-to-DB25 converter cables may be required. Standard IBM AT cables, available from your local PC dealer, may be used.

3.4 Connecting Remote Terminals

For remote terminals, full duplex asynchronous modems are required. The modems attached to the LinkUp 3174 ports should be configured properly for switched or dedicated lines.

3.4.1 LINE CONFIGURATION

Modems on the LinkUp end of switched lines should permit the following:

- Auto-answer mode.
- Loss-of-Carrier disconnect (causes modem to drop DSR and return to auto-answer state if phone line becomes disconnected).
- External DTR control (causes modem to disconnect from phone line if the LinkUp 3174 drops DTR).

3.4.2 MODEM CONSIDERATIONS

Auto-answer modems must be optioned to pass Ring Indicator (Pin 22) to the LinkUp 3174 and for DTE (LinkUp) control of DTR (Pin 20). In auto-answer mode, the LinkUp 3174 raises DTR in response to a positive going signal on Ring Indicator. The Ring Indicator signal must be set to be held low or negative except when ringing occurs. Refer to the appropriate literature provided with the modem.

User-friendly messages generated by some modems (such as "Connect," etc.) must be disabled. Such messages will interfere with the LinkUp 3174's autobaud detection, causing errors during connection.

Connect the modem to the switched or dedicated communication line as appropriate. Connect the modem to an asynchronous port on the LinkUp 3174 using an RS-232C cable. With the automatic DTE/DCE detection feature in effect, the LinkUp 3174 will recognize the modem and configure the port for DTE operation.

It is suggested that the LinkUp 3174 port remain configured for automatic DTE/DCE detection in dial-up applications. The LinkUp 3174 will automatically set the proper flow control and Device Ready signaling.

Connect the terminal to the other modem with an RS-232C cable. Then connect the modem to an appropriate communications line.

3.5 Connecting Printers

Printers may be connected to the LinkUp 3174 in one of two ways. Printers using a serial interface (RS-232C cable) may be connected directly to the LinkUp 3174 using one of the asynchronous ports. The attachment may be either local, using only a cable, or remote, using a pair of modems. The other way is to attach the printer through the auxiliary port of a terminal which is in turn attached to the LinkUp.

3.5.1 LOCAL PRINTERS

The following information applies if a directly attached printer is used:

1. The port used must be configured with no overridable parameters, since the printer cannot be used to answer Connect Mode prompts.
2. Configure the LU associated with the port as a PRT (printer) LU.
3. Connect the printer to one of the async ports on the rear of the LinkUp 3174. Make sure that the port interface parameters agree. The autobaud option cannot be used for printers.

Once the printer is turned on and put on-line, it should be recognized by the LinkUp 3174. If the host is properly configured, there is no further action required.

3.5.2 REMOTE PRINTERS

In addition to the considerations listed for local printers, the following applies to remote printers:

1. Connect the printer to the modem as instructed by the modem manufacturer's literature. A telephone is required to dial the number unless the printer or modem provides an alternate dialing method.
2. The LinkUp 3174 modem should be optioned for Auto Answer if the printer operator will be dialing into the port. Set the communications parameters of the printer, modems, and the LinkUp 3174 port to match. A fixed rate must be used.

At the LinkUp 3174 site, the operator can monitor the port and observe the Ring Indicator flashing during the dial-up. Once the LinkUp 3174 answers the call, the DTR and DSR lights will remain on. If this does not happen, refer to Appendix D.

3.5.3 AUXILIARY PRINTERS

The following considerations apply to auxiliary printers attached to directly or remotely connected terminals.

1. Verify that the auxiliary port of the chosen terminal is supported by the LinkUp 3174.
2. Connect the printer to the auxiliary or printer port of the terminal. Set the auxiliary port parameters to agree with the printer requirements.
3. The LU associated with the terminal must be configured to support an auxiliary printer LU. The printer itself is defined through configuration of its own LU.

3.6 Connecting the LinkUp 3174 to the Host Computer

The LinkUp 3174 can be attached to the host front end in one of three ways, as shown in Figure 3-2.

As shown in Figure 3-2, the DTE/DCE setting of the port depends on the type of connection used.

Method 1:

If the LinkUp 3174 is attached using a pair of synchronous modems, the sync port must be configured as DTE. The two modems are connected through a dialup or dedicated line. In such an installation, clocking is typically provided by the

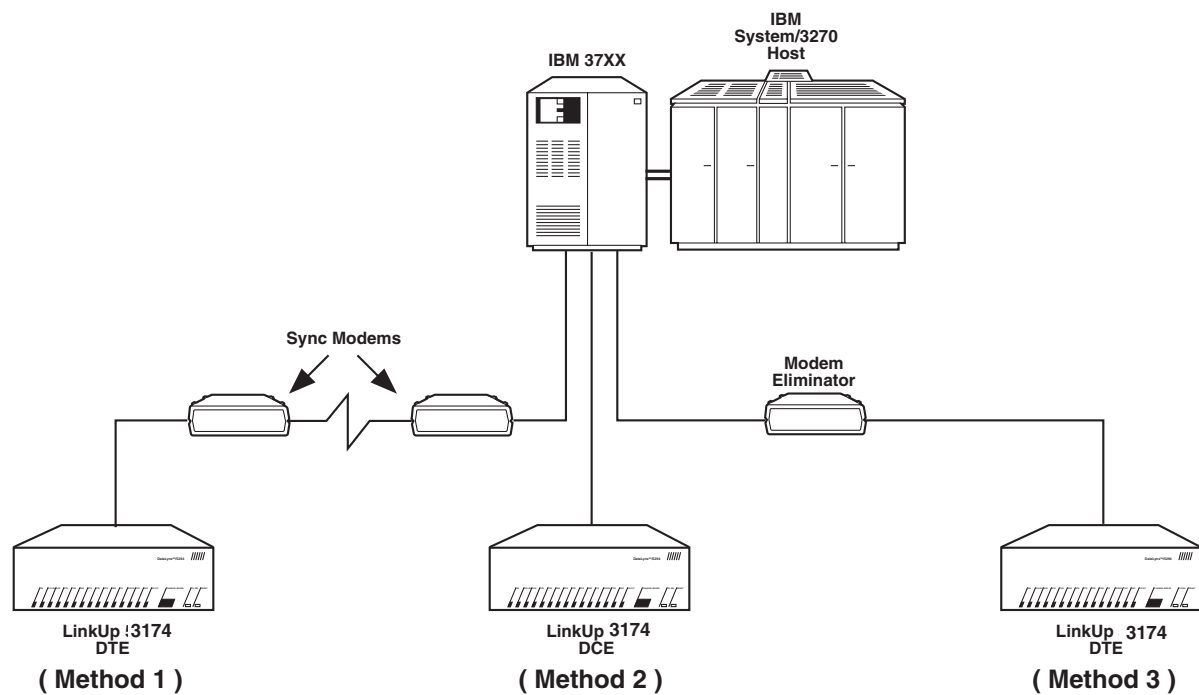


Figure 3-2. Attachment of the LinkUp 3174 to the Host.

modem; thus, the LinkUp 3174 bit rate must be set for EXTERNAL Clocking. Refer to the modem manufacturer's literature for setting the modem for Internal Clocking and Carrier Controlled by Request to Send.

When a dialup line is used, the LinkUp PU ID (Physical Unit ID) must be configured correctly; otherwise, the connection cannot be made. Obtain the proper ID from the host computer's network manager.

Method 2:

This method is used when the LinkUp 3174 is installed in close proximity to the front end. The connection consists of a single cable with no other communications equipment. In this case, the LinkUp 3174 sync port must be configured as DCE. The bit rate is controlled by the LinkUp 3174 and set during configuration of the sync port. The LinkUp 3174 uses an internal modem eliminator to provide the necessary clocking signals.

Method 3:

This method is similar to Method 1 except that a modem eliminator is used in place of the pair of modems and the intervening line. The LinkUp 3174 port is set as DTE and the bit rate is controlled externally.

A special case of such an installation is an X.25 network environment. The Modem Eliminator depicted in Figure 3-2 could in actuality be a very complex network connecting a variety of devices in addition to the LinkUp 3174 and the host.

3.6.1 REQUIREMENTS

Before connecting to the host, obtain the following information so that you can configure the synchronous ports correctly.

1. Control Unit address. (If both ports 0 and 1 are used, they may have the same Control Unit number.)
2. Bit Rate. Use external clocking if the LinkUp 3174 is set for DTE, or specify a bit rate if the LinkUp 3174 is DCE.
3. Whether NRZI (Non-Return to Zero Inverted) encoding is used (SNA only).
4. Physical Unit Address (PU ID). This is critical for dial-up applications (SNA only).
5. Line configuration (half or full duplex). If a half-duplex line is used, the LinkUp 3174 will wait for CTS from the modem before sending data.

3.6.2 DUAL HOST INSTALLATIONS

If the dual host option is used, make sure that the LUs you configure for use on Sync Port 0 have addresses between 2 and 129 inclusive, and that LUs configured for Sync Port I are numbered from 1002 to 1065, inclusive. No more than 128 LUs may be configured at any one time.

3.6.3 ESTABLISH COMMUNICATION WITH THE HOST

If the LinkUp 3174 is configured as DTE:

The DTE and DTR indicators should come on when all of the equipment is connected and powered on. After the modem is powered on, the TXC and RXC lights will indicate the clocking signals. After the host connection is completed, CTS, RTS, CD, TXD, and RXD should also be present.

If the LinkUp 3174 is configured as DCE:

When all of the equipment is connected and powered on, the DCE, CTS (if full duplex), DSR, TXC, and RXC lights should come on. After the host connection is completed, RTS, CD, TXD, and RXD should also be present.

If the correct front-panel signals are not present, refer to Appendix D. If neither the TXD nor RXD lights are flashing, there is no synchronous line between the LinkUp 3174 and the host computer. Contact the host operator and make sure that the line has been activated.

3.7 Connecting the LinkUp 3174 to an Asynchronous Host Computer

Asynchronous terminals may be connected through the LinkUp 3174 in one of two ways as depicted in Figure 3-3. No special host software is required.

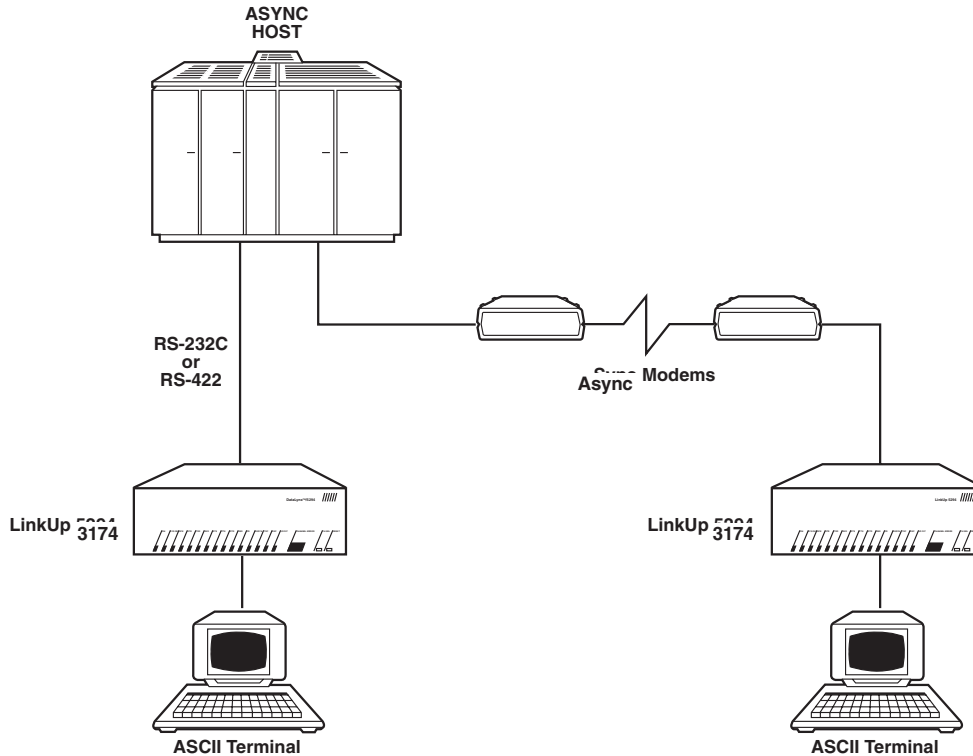


Figure 3-3. Attachment of Asynchronous Terminals to an Asynchronous Host.

The asynchronous host is attached to the LinkUp 3174 through its async communication ports, which would otherwise be directly connected to the terminal or modem. No changes should be required on the async host.

When directly connected, the operator requests use of the specific LinkUp 3174 port and is switched through to the async host. For the modem connection, the operator requests use of the LinkUp 3174 port to which the modem is connected. After the LinkUp 3174 switches through to the modem, the operator can issue modem commands to dial the corresponding modem on the async host.

The async host must support some form of flow control (RTS/CTS or X-ON/X-OFF) in order to prevent buffer overruns in the LinkUp 3174. the data rates on the terminal and host sides may be different, and each side may use a different form of flow control. The LinkUp 3174 will buffer and execute the flow control for both sides so that there is no data loss.

3.8 Data Cable Pin Specifications

Cable requirements for both asynchronous and synchronous interfaces are given in the following sections.

3.8.1 ASYNCHRONOUS RS-232C CABLES WITH DB25 CONNECTORS

The minimum requirements for an asynchronous RS-232C cable for use with dedicated terminals are that it provide Pins 1 through 8 and 20. The minimum requirements for use with auto-answer modems are Pins 1 through 8, 20, and 22.

For directly-connected printers, certain printer types may use pin 11 to supply a Not Busy signal.

Pin 1	Frame Ground
Pin 2	Transmit Data (TxD)
Pin 3	Receive Data (RxD)
Pin 4	Request To Send (RTS)
Pin 5	Clear To Send (CTS)
Pin 6	Data Set Ready (DSR)
Pin 7	Signal Ground
Pin 8	Data Carrier Detected (DCD)
Pin 11	Busy
Pin 20	Data Terminal Ready (DTR)
Pin 22	Ring Indicator (RI)

3.8.2 ASYNCHRONOUS RS-422 CABLES WITH DB25 CONNECTORS

The minimum requirements of an asynchronous RS-422 cable are pins 15, 17, 19, and 25. Pin 1 is also commonly provided. The LinkUp 3174 can operate as a DCE device only when using the RS-422 standard.

Pin 1	Protective Ground
Pin 15	Receive +
Pin 17	Receive -
Pin 19	Transmit +
Pin 25	Transmit -

3.8.3 ASYNCHRONOUS RS-232C CABLES WITH DB9 CONNECTORS

Cable pinouts for the RS-232C DB9 connector are shown below:

Pin 1	Data Carrier Detect (DCD)
Pin 2	Receive Data (RxD)
Pin 3	Transmit Data (TxD)
Pin 4	Data Terminal Ready (DTR)
Pin 5	Signal Ground
Pin 6	Data Set Ready (DSR)
Pin 7	Request to Send (RTS)
Pin 8	Clear to Send (CTS)
Pin 9	Ring Indicator (RI)

3.8.4 SYNCHRONOUS MODEM CABLES

A minimum-conductor synchronous cable that will work with all compatible sync modems and the LinkUp 3174 in Modem Eliminator mode requires the following pins: 1 through 8, 15, 17, and 20. If the LinkUp is to be dialed from the host, Pin 22 must also be supported.

RS232-C/DB25:

Pin 1	Frame Ground
Pin 2	Transmit Data (TxD)
Pin 3	Receive Data (RxD)
Pin 4	Request to Send (RTS)
Pin 5	Clear To Send (CTS)
Pin 6	Data Set Ready (DSR)
Pin 7	Signal Ground
Pin 8	Data Carrier Detected (DCD)
Pin 15	Transmit Clock (TxCl)
Pin 17	Receive Clock (RxCl)
Pin 20	Data Terminal Ready (DTR)

4. Hardware Description

The front panel of the LinkUp 3174 is shown in Figure 4-1. Status indicators monitor power and the selected channel used for display of RS-232C line signals. To simplify operation, only two operator controls are provided. Use of the front panel buttons is discussed in Section 4.1. The LinkUp 3174's displays and indicators are discussed in Sections 4.2 and 4.3.

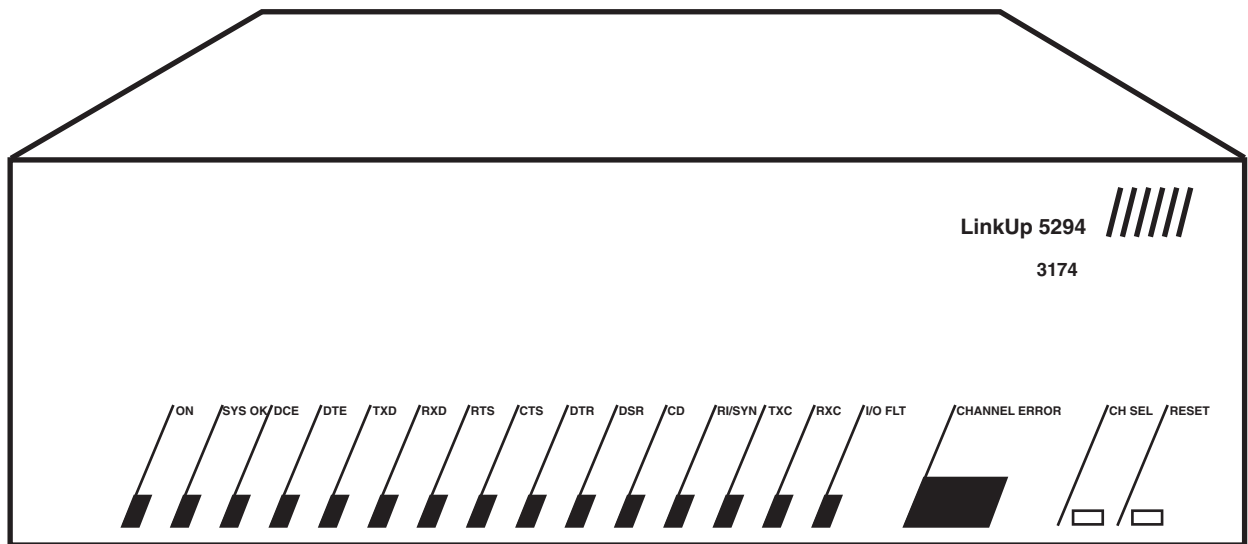


Figure 4-1. LinkUp 3174 Front Panel.

4.1 Front-Panel Controls

Two front-panel controls are provided on the LinkUp 3174: the CH SEL button and the RESET button. The use of these controls is discussed below.

- **The CH SEL (Channel Select) Button** — The CH SEL button is used to select the channel to be monitored. When the button is pressed, the channel number increases. When held for a longer time, the channel number is incremented at a faster rate. The channel currently being monitored is indicated by the two-digit LED display.

If the display is incremented past the highest channel available, "88" appears in the display and an LED integrity test is performed. All of the front-panel lights are turned on to ensure proper operation. Pressing the CH SEL button again terminates the LED test.

- **The RESET Button** — The RESET button is used to clear error codes from the front panel display. Error codes are listed in Appendix D. When the first error occurs, pressing RESET will clear the error and channel-status display will resume. If there is more than one error, the RESET button will clear the most recent error and display the previous one. When all of the accumulated errors have been displayed and cleared, the status lights resume their normal function. Once cleared, errors cannot be redisplayed using the front panel. We recommend that write down any error codes displayed before you press RESET.

4.2 Channel-Status Indicators

The LinkUp 3174 is equipped with a full RS-232C status display capable of monitoring the status of any selected port. Each of the indicators is briefly described below. ON indicates that the LinkUp 3174 is either transmitting or receiving the signal, as appropriate.

- **DCE/DTE (Data Communications Equipment/Data Terminal Equipment)** — An LED lit for one of these indicates that the port selected has been software-optioned to communicate with either a modem (DTE) or directly with a terminal or printer (DCE). If both of these LEDs are lit, the LinkUp 3174 is configured for Auto-Detect, and either no device has been attached, the attached device is powered off, or the Auto-Detect has not been completed.

NOTE

Auto-Detect is available on async ports only.

- **TXD/RXD (Transmit Data/Receive Data)** — These are data signals that indicate transmission of data either to or from the LinkUp 3174.
- **RTS (Request To Send)** — The LinkUp 3174 provides this signal when optioned DTE or expects to receive the signal when optioned as DCE.
- **CTS (Clear To Send)** — The LinkUp 3174 provides this signal when optioned DCE and expects it from the modem when optioned DTE.
- **DTR (Data Terminal Ready)** — The LinkUp 3174 provides this signal when optioned DTE or expects to receive the signal when optioned DCE. When the LinkUp 3174 is configured as DTE auto-answer, this signal will only be provided after receipt of the RI (Ring Indicator) signal from the modem.
- **DSR (Data Set Ready)** — The LinkUp 3174 provides this signal when optioned DCE or expects to receive it from the modem when optioned DTE.

- **CD (Carrier Detect)** — This LED is lit when the LinkUp 3174 has detected a carrier signal from a remote modem. If no detectable carrier signal is present, or if the remote modem hangs up, this LED will be turned off.
- **RI/SYN (Ring Indicator/Data Sync)** — This is a dual-function LED. It displays Ring Indicator when DTE/auto-answer in synchronous or asynchronous operation. On the sync port, this LED is always off.
- **TXC/RXC (Transmit Clock/Receive Clock)** — When on, this LED indicates the presence of synchronous clock signals which are required for the sync port. These must always be present for Port 0 and Port 1.
- **I/O FAULT** — On SYNC ports, this LED flashes if a framing error occurs. On asynchronous ports, this LED indicates parity errors.

During normal operation in async DTE mode, the following should be on: DTE, RTS, CTS, DSR and CD.

RI will be on during ringing and DTR will come on after RI is detected. During normal operation in async DCE mode, the following should be on: DCE, RTS, CTS, DTR, DSR and CD.

In both DTE and DCE modes, the TXD and RXD lights will blink during data transfer.

4.3 System-Status Indicators

The following system-status indicators are provided on the front panel.

- **SYS OK** — This LED blinks to indicate that the system is functioning properly. The LED acts as a “heartbeat” indicator, and is never turned off unless there is an unrecoverable error.
- **PWR** — This LED indicates, when on, that the power supply is functioning properly.

4.4 Error-Code Display

When a program-detectable error occurs, all channel-status indicators are turned off and a two- or three-level error code is displayed using the two-digit channel display. The error codes are flashed alternately.

For further information on diagnostics and troubleshooting, refer to Appendix D.

4.5 The Back Panel

On the back panel of the LinkUp 3174 are two synchronous ports and from four to 32 asynchronous ports. Construction is modular for ease in upgrading, switching between RS-232C and RS-422 interfaces, or swapping out malfunctioning ports. The main board and up to four async boards each can be removed easily by loosening the two knurled knobs at either end of each board's backplate, then pulling gently to unseat the board and slide it out of the chassis.

On the LinkUp 3174 BSC and SNA models, female DB25 connectors are used for the RS-232C synchronous port interfaces. On the HV model, Port 0 is a CCITT V.35 interface; Port 1 is RS-232C. On all models, sync ports are numbered 0 and 1; async ports are numbered from 2 to 32, inclusive.

There are two types of async RS-232C boards available: a 4-port board containing female DB25 connectors, and an 8-port board containing male DB9 connectors. RS-422 boards are available in only one style, with 4 female DB25 connectors.

5. Port Test and System Management

This section describes Port Test and System Management Modes. General information, such as accessing the different modes, is provided in Section 5.1. Port Test Mode is further described in Section 5.2. Section 5.3 provides information on each of the functions available from System Management Mode.

To access Port Test Mode, establish the connection to the LinkUp 3174 either by direct connection or by a dial-up line. Answer the Enter Device Type prompt with the appropriate response for your terminal type.

When the LinkUp 3174 prompts for entry of a Logical Unit number, type <1> followed by <Enter>. The Port Test Mode menu will appear on the terminal screen.

NOTE

If a port is configured for PNA Option 3, Port Test Mode is not available.

Option 1 of the Port Test Mode menu provides access to System Management Mode, which is described in Section 5.3. In Figure 5-1 below, the LinkUp 3174 prompts are in bold and typed responses are underlined.

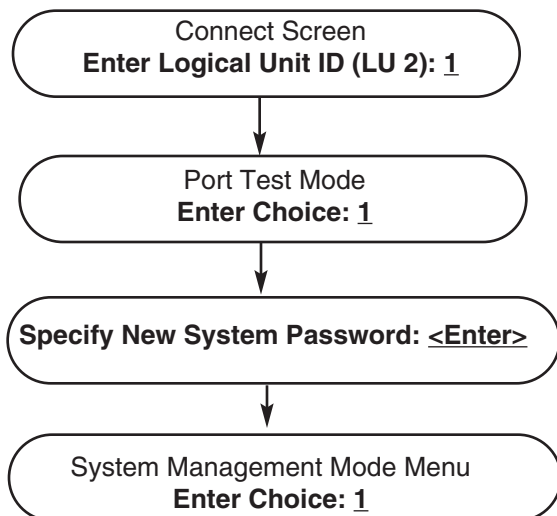


Figure 5-1. Overview of Menus.

5.1 General Information

Port Test Mode and System Management Mode contain various port tests and traces which have similar characteristics.

The following conventions are used:

- Data from the LinkUp 3174 to the terminal or host is enclosed in square brackets ([]).
- Data from the terminal or host to the LinkUp 3174 is displayed without brackets.
- Complete messages, which may consist of only a single character, are separated by a space.
- Data is displayed on the first 23 lines of the screen, with line 24 reserved for messages. If the terminal supports dual intensity, the first set of 23 data lines are displayed in low intensity. When 23 lines have been displayed, the second set of 23 lines overwrites the first data in high intensity. By alternating between high and low intensity, the most recent data is easily located. If the terminal being used does not support dual intensity, all wrapped data is displayed in the same intensity.
- The <SPACE> bar is a toggle which freezes and restarts the display. When the display is frozen, data is buffered by the LinkUp 3174. If this buffer overflows, a string of asterisks (*) will appear in the trace data.
- The <Enter> key ends the trace and returns to the Options menu.
- To clear stored trace data, type <*>.

5.2 Port Test Mode Menu and Functions

The Port Test Mode menu is shown below. Type the number corresponding to the function to be performed. Other accepted responses are ?, END, and QUIT. All of the above responses must be followed by <Enter>.

PORT TEST MODE

Options:

1. System Management Mode
2. Interface Signal Display
3. Character Display Test
4. Character Echo Test

Enter Choice:

Port Test functions can only be performed on the operator's own port. This allows any number of users to access the Port Test functions at the same time. Each option is described below.

1. System Management Mode (Option 1). This provides access to System Management Mode functions described in Section 5.3.
2. Interface Signal Display (Option 2). The Interface Signal Display is a remote representation of the front panel RS-232C status indicators. When selected from the Port Test Mode menu, this feature is used to monitor the operator's own asynchronous port. A typical display is shown below.

INTERFACE SIGNALS PORT 2

```
T R R C D D D R T R
X X T T T S C / X X
D D S S R R D S C C

0 0 1 1 1 1 1 0 0 0
```

CR - Options Menu; SPACE- Freeze/start Display

A one (1) indicates that the signal is logically true or ON. A zero (0) indicates that the signal is not present. This display provides eight refreshes per second on a 2400-baud terminal. See Section 4.2 for an explanation of the individual signals.

3. Character Display Test (Option 3). This function is used to test the terminal screen for proper display of the alphanumeric characters. PAPER/3278 operators may find this option useful for testing the condition of the print head.

```
+/0123456789;=<=>?@ABCDEFGHIJKLMN...
mnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
Z{\^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
OPQRSTUVWXYZ{\^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
CDEFGHIJKLMN...
6789;=<=>?@ABCDEFGHIJKLMN...
uvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
efghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
KLMNOPQRSTUVWXYZ{\^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
VWXYZ{\^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
pqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
STUVWXYZ{\^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN...
HIJKLMN...
=>?@ABCDEFGHIJKLMN...
abcdefghijklmnopqrstuvwxyz
```

4. Character Echo Test (Option 4). The Character Echo Test causes the LinkUp 3174 to echo each key typed from the keyboard. This includes Attention Keys and Escape (ESC) sequences. Care should be taken in using this test. Typing other than the display table ASCII character set (20H through 7EH) may cause unpredictable results. Type two <CR>s to return to the options menu.

TWO CONSECUTIVE CRs - Options Menu

5.3 System Management Mode Menu and Functions

System Management Mode may be accessed by only one user (port) at a time. If Option 1 of Port Test Mode is selected when System Management Mode is already in use, the following message is displayed and the operator is returned to Connect Mode.

System Management Mode already in use.

Unlike Port Test Mode, System Management Mode can be password-protected. When System Management Mode is selected, the LinkUp 3174 will prompt for entry of the system password if one is required. A new password may then be specified

after successful entry of the old one. After the correct password has been entered, the System Management Mode option menu is displayed. The menu shown below represents firmware versions 6.21 and above. Earlier versions of firmware display the menu options in a single column.

SYSTEM MANAGEMENT MODE

Options:

- | | |
|-------------------------------------|-------------------------------|
| 1. Configurator Mode | 2. Interface Signal Display |
| 3. Sync Port Address Trace | 4. Async Port Trace |
| 5. Product Configuration and Levels | 6. Reset Sync Port |
| 7. Deact/Act Async Port | |
| 20. Sync Port Trace | 21. Character Display |
| 22. Character Echo Test | 23. LU and Async Port Summary |
| 24. Remote Reset | 25. SNA/SDLC Counters |
| 26. System Transfer Utilities | 27. Set Date/Time |

Enter Choice:

NOTE

The LinkUp 3174 is shipped from the factory with no password defined. Therefore, when you select System Management Mode for the first time, you are prompted to enter a new System password. You may specify a password at this time or you may default to the no-password condition by pressing <Enter>. As long as the system remains without a password, you will be prompted only for a new one.

If you wish to clear a System password and return to the no-password condition, enter the current password at the Enter System Password prompt. Then enter NONE at the Specify New System Password prompt.

To avoid unauthorized access, use of a password is highly recommended.

If the System password is forgotten, the default condition of no password may be restored by executing a SETUP procedure. Refer to Appendix D.

Some System Management Mode options are not applicable to BSC operation. Unless otherwise stated, if an SNA or HV only option is selected while under BSC protocol, the message **Not Supported in this Release** will be displayed, followed by the **Enter Choice:** prompt.

Option 26, System Transfer Utilities, is available only on the HV model running firmware Version 6.08 or above. If this option is selected on an SNA model, it will be ignored and the options menu will be redisplayed. Option 27, Set Date/Time, appears only on SNA and HV models with firmware 6.21 or above.

All of the menu options are explained in the following paragraphs. To exit System Management Mode, and return to Connect Mode, type either END or QUIT, followed by <Enter>, in response to the **Enter Choice:** prompt. Exit from each of the function screens is discussed in the following sections.

Configurator Mode (Option 1, All Models)

When item 1 is selected from the menu, the LinkUp 3174 enters Configurator mode, and the prompt **Enter Item(s) to be Configured:** is displayed. This allows configuration of Port and LU parameters, translate tables, custom terminals, and the Banner Message. Configurator Mode is discussed in depth in Chapter 6. To exit Configurator Mode and return to System Management Mode, type END or QUIT followed by <Enter>.

Interface Signal Display (Option 2, All Models)

This option is also available from Port Test Mode and is described in Section 5.2. The Interface Signal Display is a remote representation of the front panel RS-232C signal indicators. When selected from System Management Mode, this test can be used to monitor any other installed port on the LinkUp 3174. To monitor your own port, select this option from Port Test Mode.

When the option is selected, the LinkUp 3174 prompts for entry of the port to be monitored. After the port number is entered, the interface signal information is displayed. A typical display is shown below. Refer to Section 4.2 for an explanation of the individual signals.

```

INTERFACE SIGNALS
PORT 2

T R R C D D D R T R
X X T T T S C / X X
D D S S R R D S C C
0 0 1 1 1 1 1 0 0 0

CR-Options Menu; SPACE- Freeze/Start Display
```

Sync Port Address Trace (Option 3, All Models)

This option displays each control unit address as it appears in the synchronous data stream. Each address is displayed as a two-character hex value followed by two blanks. This can be used on a multipoint line to display all active Control Unit addresses.

When the option is selected, the LinkUp 3174 prompts for entry of the port to be monitored. After the port number is entered, the sync port address trace is displayed, as shown below.

```

**** 03 03 03 03 03 03 03 03 03 03
03   03 03 03 03 03 03 03 03 03
03   03 03 03 03 03 03 03 03 03

CR - Options Menu; SPACE - Freeze/Start Display
```

Async Port Trace (Option 4, All Models)

This function monitors both the input and output data stream for the selected async port. When the option is selected, the LinkUp 3174 prompts for entry of the port to be monitored. After the port number is entered, the async port trace is displayed, as shown below.

```

**0D[110D0A2020202A2A03331373420434F4E54524F4C20554E495420454D554C41544F
52202D205632E3037000055003300000000000000202A2A0D0A0D0A0A28466F722048656C70
2C205479706520273F272061667465722061E792050726F6D742E20546F2041626F72742043
6F6E6E6563742053657175656E63652C2054797065202721272E2029D0A28546F204456C6574
6520526573706F6E736520436861726163746572732C2075736520275275626F7574272E20546F
6576696365205479706520280041444D334100293A20] 77[57] 79[59] 35[35] 30[30] 70
[50] 0D [0D0A456E746572204C55204C55204E756D62657220283900293A29]

CR- Options Menu; SPACE - Freeze/Start Display; * - Reset Trace
```

Product Configuration and Levels (Option 5, All Models)

This option displays the total number of ports, amount of RAM and EEPROM, firmware version number, calculated CRC, and, for firmware versions 6.20 and above, maximum CPU power consumption, front-panel error codes, and the currently configured date and time. The Product Configuration and Levels screen is shown below.

Product Configuration

Available EEPROM 32K bytes
 Available RAM 768K bytes
 Available PORTS 34 Total
 FirmwareVersion 6.24U3 (Primary)
 Calculated CRC 8D0FH
 Maximum CPU Power Consumption 6 percent
 Front panel Errors ... None ...
 DATE: 0000/00/00
 TIME: 00:00:00

CR - Options Menu; R - Reset front panel errors

Possible values for the above hardware components are as follows:

- Available EEPROM: 32K
- Available RAM: 768K
- Available Ports: 6, 10, 14, 18, 22, 26, 30, 34 (including the 2 sync ports)

The firmware version and calculated CRC are used by Black Box when diagnosing problems. For HV models running firmware 6.01 or above, the firmware version display line indicate whether the LinkUp 3174 is currently running from the primary or the secondary microcode bank. The maximum CPU power consumption is shown as a percent and indicates the highest percentage of CPU resources that has been utilized since the last time option 5 was selected, or since the LinkUp 3174 was powered on. On both HV and SNA models, any front panel error codes that have appeared in the CHANNEL/ERROR window since the LinkUp's last power-up will also be displayed. Pressing R deletes them from the screen and erases them from memory. Record all the values shown on this screen for Black Box if a problem must be reported.

Reset Sync Port (Option 6, All Models)

This option allows the system manager to reset either of the synchronous ports in order to allow configuration changes to take effect. When this option is selected, the operator is prompted to enter the sync port to be reset. The screen shown below, with the selected sync port number displayed, will appear.

CAUTION

The Reset Sync Port Breaks All LU Activity For That Port In a Non-Recoverable Way.

Are You CERTAIN that you want to Reset Sync Port 0 (YES or NO)?

CR - Options Menu

An answer of YES will cause the selected sync port to be reset, and the message ****RESET IN PROGRESS**** will be momentarily displayed. An answer of N, NO or <Enter> will abort the request and the port will not be affected. In either case, the operator will be returned to the System Management Mode menu. Any other response will elicit an Invalid error message, and the cautionary message will be repeated.

NOTE

It is highly recommended that the sync line be deactivated before resetting the sync port. Failure to do so may cause the loss of one or more LUs (until the LinkUp 3174 is completely reset) or loss of data buffers.

This function will not reset the configuration of Option 10 of the Sync Port Menu, Maximum number of LUs. To effect a change in this parameter, a Remote Reset (System Management Mode Option 24) or a physical power-off/power-on reset of the LinkUp is required.

Deact/Act Async Port (Option 7, All Models)

This option is provided to allow the system manager to deactivate or activate an asynchronous port without affecting the others.

When this option is selected, the LinkUp 3174 prompts for a port selection. The port which is being used for System Management Mode cannot be selected.

If the selected port is currently active, the screen shown below, with the selected async port number displayed, appears.

****CAUTION****

The Selected Async Port is Currently Active.

Are you CERTAIN that you want to Deactivate Async Port 2 (YES or NO)?

CR - Options Menu

An answer of YES will cause the command to be executed. An answer of N, NO, or <Enter> will abort the command and the port will not be affected. In either case the operator will be returned to the System Management Mode menu. Any other response will elicit an Invalid error message, and the cautionary message prompt will be redisplayed.

NOTE

When deactivating a port having an associated LU in session with the host, Forced Logoff, if configured, will be performed immediately, regardless of any reconnect time limit. See Section 1.4 for further information.

Sync Port Trace (Option 20, All Models)

This function monitors both the input and output data stream for the selected sync port. Data is displayed as hexadecimal data using the display formats and conventions of Section 5.1, as well as the following:

- For SNA data streams, a dash is introduced after the first two and after the first eight hex values of a message in order to mark the end of the link and transmission headers.

- The two-byte CRC is included in inbound messages to the LinkUp 3174. A sync port trace is shown below.

```
****] Cl(# - 27E [C173 -] C100 - 2 D000000001-6B8001.....[
```

CR - Options Menu; SPACE - Freeze/Start Display; *-Reset Trace

Character Display Test (Option 21, All Models)

Option 21, the Character Display Test, generates a continuous output of the alphabet test message on the operator's async port. The character display test is illustrated below. This option is also available in Port Test Mode.

```
+/0123456789;=<=>?@ABCDEFGHIJKLMNopqrstuvwxyz{\}^ abcdefghijkl  
mnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMNopqrstuvwxyz  
Z{\}^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMN  
OPQRSTUVWXYZ{\}^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@AB  
CDEFGHIJKLMNopqrstuvwxyz{\}^ abcdefghijklmnopqrstuvwxyz+/012345  
6789;=<=>?@ABCDEFGHIJKLMNopqrstuvwxyz{\}^ abcdefghijklmnopqrst  
uvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMNopqrstuvwxyz{\}^ abcd  
efghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMNopQRSTU  
VWXYZ{\}^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEF  
GHIJKLMNopqrstuvwxyz{\}^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>  
@ABCDEFGHIJKLMNopqrstuvwxyz{\}^ abcdefghijklmnopqrstuvwxyz+/01  
23456789;=<=>?@ABCDEFGHIJKLMNopqrstuvwxyz{\}^ abcdefghijklmno  
pqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMNopqrstuvwxyz{\}^  
abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEFGHIJKLMNopQR  
STUVWXYZ{\}^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<=>?@ABCDEF  
GHIJKLMNopqrstuvwxyz{\}^ abcdefghijklmnopqrstuvwxyz+/0123456789;=<  
=>?@ABCDEFGHIJKLMNopqrstuvwxyz{\}^ abcdefghijklmnopqrstuvwxyz
```

Character Echo Test (Option 22, All Models)

The Character Echo Test causes the LinkUp 3174 to echo each key typed from the keyboard. This includes Attention Keys and Escape (ESC) sequences. Care should be taken in using this test. Typing other than the displayable ASCII character set (20H through 7EH) may cause unpredictable results. This option is also available in Port Test Mode. The screen displayed when this option is selected is shown below.

TWO CONSECUTIVE CR's - Options Menu

LU and Async Port Summary (Option 23, All Models)

This function displays certain configuration parameters for each Logical Unit, along with information about the state of the LU and the keyboard. Async port configuration parameters and passthrough port information are also displayed. This display requires up to eight pages for the LU Summary, depending on the number of LUs configured, and from one to four pages for the Async Port Summary, depending on the number of async ports installed.

Four keys are active during this test, as follows:

- <N> (for NEXT) displays the next page of data
- <P> displays the previous page
- <R> redisplay the current page
- <Enter> is used to return to the options menu

The LU Summary is shown below.

LU Number	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Device type	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp	Dsp
LU State	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis	Dis
Keyboard Locked	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Echo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Insert Mode	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Printer Pacing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
File Xfer Mode	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Display Owner	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sync Port	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Async Port	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The Async Port Summary is shown below:

Port Number	2	3	4	5	6	7	8	9
Device Type	ADM3A	ADM3A	ADM3A	ADM3A	ADM3A	ADM3A	ADM3A	ADM3A
DTE/DCE	DCE	DCE	DCE	DCE	DCE	DCE	DCE	DCE
Bit Rate	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto
No. of Bits	8	8	8	8	8	8	8	8
Parity	None	None	None	None	None	None	None	None
Stop Bits	1	1	1	1	1	1	1	1
Connect Mode	DED	DED	DED	DED	DED	DED	DED	DED
N B Pin	None	None	None	None	None	None	None	None
Logical PC	XON	XON	XON	XON	XON	XON	XON	XON
D R Pin	20	20	20	20	20	20	20	20
Act/Deact	Act	Act	Act	Act	Act	Act	Act	Act
PTU #	None	None	None	None	None	None	None	None
Host Port	None	None	None	None	None	None	None	None

CR - Options Menu N- Next Display Page P - Previous Page R- Redisplay Current Page

Any ports configured as host ports for async passthrough will show device type as HOST, PTU # as N/A, and Host Port as N/A. The terminal operator's port, in passthrough use, will show the PTU # as the Passthrough Logical Unit number in use and the Host Port as the number of the port connected to the async host.

Remote Reset (Option 24, All Models)

This function is equivalent to a hardware reset (power off/power on). This causes sync port changes, printer port changes, auxiliary translate table changes and microcode download changes to take effect. When the reset screen is displayed, the user must enter YES before the reset takes places. An answer of N, NO, or <Enter> aborts the command and the reset does not occur. Any other response illicit an error message, and the Remote

Reset caution message is redisplayed. If a Remote Reset is aborted, the operator is returned to the System Management Mode menu. If the reset is executed, the operator must begin again at the Connect Mode screen. The Remote Reset warning screen is shown below.

****CAUTION****

The Remote Reset Breaks All LU Activity in a Non-Recoverable Way.

Are CERTAIN that you want to Reset the Controller (YES or NO)?

CR-Options Menu

CAUTION

This will unconditionally reset the LinkUp 3174. Any operator connected when this function is invoked is not warned and will have to reconnect. It is strongly recommended that the sync line(s) be deactivated before performing this function.

SNA/SDLC Counters (Option 25, SNA and HV Only)

This function displays statistical information for the selected synchronous port. Entry of the port number in response to the LinkUp 3174 prompt causes the following screen to be displayed:

SNA/SDLC Counters for Port 0		
	SEND	RECEIVE
CRC Errors	N/A	1
Retransmissions	0	N/A
SNRMs	N/A	1
Frame Counters		
I Frames	666	1667
U Frames	2	2
Total	668	1669

CR - Options Menu; D-Update Display; R-Reset Counters

- 1.CRC (Cyclic Redundancy Check) Errors.** This is the total number of blocks with errors that have been received from the host.
- 2.Retransmissions.** This is the total number of blocks resent to the host.
- 3.SNRM (Set Normal Response Mode) command.** This is the number of SNRMs received by the LinkUp 3174.
- 4.I-Frames (Information Frames).** This is the number of data frames sent and received.
- 5.U-Frames (Unnumbered Frames).** This is the number of unnumbered frames, such as SNRM, XID, and DISC commands, sent and received.
- 6.Total.** The total number of I-Frames and U-Frames.

Values for items 1 through 5 are displayed as decimal numbers between 0 and 65535. Item 6 is counted to 131070. If these maximum displayable values are reached, the counters are not automatically reset.

All counts are reset to zero when the LinkUp 3174 is powered off or when Reset Sync Port or Remote Reset is issued. These counts are not affected by a host-generated REQMS with Reset request.

The following keys are active during this operation:

- <R> resets the counters. (This does not reset RECFMS totals).
- <D> is used to refresh the display.
- <Enter> is used to return to System Management Mode menu.

The option is not applicable to BSC and does not appear on the BSC System Management Mode menu.

System Transfer Utilities (Option 26, HV Only)

This function is available only on the LinkUp 3174 HV model. It enables the system manager to download firmware upgrades directly from a personal computer to LinkUp’s secondary microcode bank. It also allows configuration parameters to be transferred from LinkUp 3174 to a personal computer, or vice versa. An additional utility transfers an image of LinkUp’s RAM to a PC floppy disk or hard drive.

System Transfer Utilities

1. Transfer Configuration Parameters TO PC.
2. Load Configuration Parameters FROM PC.
3. Transfer Random Access Memory Image TO PC.
4. Load Microcode into Secondary Bank FROM PC.
5. Load Microcode into Secondary Bank from Primary Bank.
6. Switch Microcode to Secondary Bank on Next Power-Up.

Enter Choice:

Performing System Transfer Utilities

Before executing a system transfer utility for the first time, perform the following procedures:

1. Load the following programs onto a personal computer hard drive from the TruLynx or TermLynx diskette:

```
READCNFGEXE
LOADCNFGEXE
READRAM.EXE
LOADCODE.EXE
```

NOTE

These programs may be run directly from the TruLynx or TermLynx diskette if desired.

2. Connect a personal computer to one of LinkUp 3174's asynchronous ports.

NOTE

The connection to LinkUp 3174 may be local or remote; however, if it is a dialup connection via async modems, it is recommended that error-correcting modems be used.

3. Install the TermLynx and TruLynx programs on the personal computer, if they are not already installed.

NOTE

If the TermLynx/TruLynx programs have been installed on the personal computer previously, it may be necessary to upgrade to a later version in order to execute a system transfer utility. Version 2.58 or higher is required.

4. Run TermLynx by typing TLINIT <Enter> at the appropriate DOS prompt.

NOTE

If TLINIT has been added to the personal computer's AUTOEXEC.BAT file, then it automatically runs each time the personal computer is powered on. In this case, omit step 4 above.

5. At the DOS prompt, press <Alt/Caps Lock> or <Shift/Shift> simultaneously to Hotkey into Terminal Emulation Mode.
6. Press <Enter> once or twice to obtain the LinkUp 3174 banner message. Log onto LinkUp 3174 in the normal fashion, enter System Management Mode, then select Option 26, System Transfer Utilities.

The functions and features of each of the transfer options are described in the following paragraphs.

Transfer Configuration Parameters TO PC.

This utility is provided to create a backup of configuration parameters. The system manager is able to transfer configuration parameter data to a personal computer hard disk or floppy disk. This option can be used to refer to a previous configuration at a later time using Option 2.

To use the Transfer Configuration Parameters TO PC option, enter <l> at the Enter Choice: prompt from the System Transfer Utilities menu. Hotkey to DOS by pressing both shift keys simultaneously or <Alt/Caps Lock>. The standard DOS commands will apply.

Create a new filename for the current configuration and execute the program by entering **READCNFG (drive):filename**. To display an example of the syntax needed, type **READCNFG <Enter>**. Use the DOS directory command to view existing filenames.

The screen will display the message **READCNFG (drive):(filename) (date) (time)** when the LinkUp 3174 receives the command to execute the **Transfer Configuration Parameters TO PC program**. A bar graph will then appear indicating that the current configuration is being copied from the LinkUp 3174 to the drive and filename specified. The time at which the configuration was saved will be stored only in the DOS directory list. The original time reference will be replaced with a new time reference when the file is opened. When the LinkUp 3174 has copied the configuration parameters, the following message will appear:

Operation Was Successfully Completed. Please Hotkey to Emulation Mode.

Press <Alt/Caps Lock> or <Shift/Shift>. LinkUp 3174 will display the following message:

Operation Completed Successfully. Press ENTER to Continue.

When <Enter> is pressed, the System Transfer Utilities menu will be redisplayed. Type [END] followed by <Enter> to reach the System Management Mode menu. In order to guard against unauthorized access to System Management Mode, if the LinkUp 3174 is left idle for several minutes after the transfer utility operation is completed, an inactivity timeout will occur. The personal computer will be disconnected from the LinkUp 3174 if it is a remote dial-up connection; it will be returned to Connect Mode if it is a local or dedicated connection. See Section 2.4 for further information.

If any problems occur while attempting to transfer configuration parameters, the LinkUp 3174 will automatically abort the operation. If an error message appears on the personal computer screen, hotkey back to Emulation Mode, select Option 1, and attempt another transfer.

2. Load Configuration Parameters FROM PC.

This option retrieves a backup configuration data file from the personal computer and loads it directly into EEPROM. This saves the system manager's time by eliminating the need to reconfigure the LinkUp 3174 item by item.

To use the Load Configuration Parameters FROM PC option, enter <2> at the **Enter Choice:** prompt on the System Transfer Utilities menu. The following message will appear:

**Ready to Load Configuration from PC ...
Please Hotkey to DOS and Run LOADCNFG**

Hotkey to DOS by pressing both shift keys simultaneously or <Alt/Caps Lock>. The standard DOS commands will apply. Use the DOS directory command to view existing filenames and determine which configuration to load. Enter **LOADCNFG (drive):filename** to execute the program. While the utility is running, a bar graph will appear showing the percentage of the data copied into EEPROM. After the utility has loaded all of the configuration parameters into the LinkUp 3174, the following message will appear

**Operation Was Successfully Completed.
Please Hotkey to Emulation Mode.**

Press <Alt/Caps Lock> or <Shift/Shift>. LinkUp 3174 will display the following message:

**Operation Completed Successfully.
Press ENTER to Continue.**

When <Enter> is pressed, the System Transfer Utilities menu will be redisplayed. Type [END] followed by <Enter> to reach the System Management Mode menu. In order to guard against unauthorized access to System Management Mode, if the LinkUp 3174 is left idle for several minutes after the transfer utility operation is completed, an inactivity timeout will occur. The personal computer will be disconnected from the LinkUp 3174 if it is a remote dial-up connection; it will be returned to Connect Mode if it is a local or dedicated connection. See Section 1.4 for further information.

If any problems occur while the LinkUp 3174 is attempting to receive the configuration parameters, the operation will be aborted automatically. If an error message appears on the personal computer screen, Hotkey back to Emulation Mode, select Option 2, and attempt another transfer.

3. Transfer Random Access Memory Image TO PC.

Use this option to copy the entire contents of the LinkUp 3174's RAM onto a personal computer disk. This utility takes an image of the 768K working memory at a particular point in time.

To use the Transfer Random Access Memory Image TO PC option, enter <3> at the Enter Choice: prompt on the System Transfer Utilities menu. Hotkey to DOS by pressing both shift keys simultaneously or <Alt/Caps Lock>. The standard DOS commands will apply. Choose a new filename for the current contents of RAM and execute the program by entering READRAM (drive):filename at the DOS prompt.

When the LinkUp 3174 has received the command to execute the Transfer RAM Image TO PC program, a bar graph will appear indicating that the contents of RAM are being copied from the LinkUp 3174 to the drive and filename specified. The time at which the configuration was saved will be stored only in the DOS directory list. The original time reference will be replaced with a new time reference when the file is opened. When the LinkUp 3174 has copied the entire contents of RAM, the following message will appear

**Operation Was Successfully Completed.
Please Hotkey to Emulation Mode.**

Press <Alt/Caps Lock> or <Shift/Shift>. LinkUp 3174 will display the following message:

**Operation Completed Successfully
Press ENTER to Continue.**

When <Enter> is pressed, the System Transfer Utilities menu will be redisplayed. Type [END] followed by <Enter> to reach the System Management Mode menu. In order to guard against unauthorized access to System Management Mode, if the LinkUp 3174 is left idle for several minutes after the transfer utility operation is completed, an inactivity timeout will occur. The personal computer will be disconnected from the LinkUp 3174 if it is a remote dial-up connection; it will be returned to Connect Mode if it is a local or dedicated connection.

If any problems occur during the RAM transfer, the operation is automatically aborted. If an error message appears on the personal computer screen, hotkey back to Emulation Mode, select Option 3 and attempt another transfer.

4. Load Microcode into Secondary Bank FROM PC.

Perform firmware upgrades quickly and easily with this option. A new version of firmware sent from Black Box on diskette can be loaded directly from your personal computer into LinkUp 3174's secondary microcode bank. The original factory-installed microcode in the primary bank remains in permanent memory storage and is always accessible as a backup.

To use the Load Microcode FROM PC option, enter <4> at the **Enter Choice:** prompt from the System Transfer Utilities menu. Hotkey to DOS by pressing both shift keys simultaneously. The standard DOS commands will apply.

Upgrade to the current version of firmware by entering LOADCODE and the filename of the new version as noted in the README file accompanying the diskette. Or identify a previous version of firmware to load by using the DOS directory command. Enter **LOADCODE (drive):filename** at the DOS prompt to execute the program.

A bar graph appears on the screen indicating that the download is taking place and displaying the percentage of the code that has been transferred. Upon completion of the download, the following message will appear:

**Operation Was Successfully Completed.
Please Hotkey to Emulation Mode.**

Press <Alt/Caps Lock> or <Shift/Shift>. LinkUp 3174 will display the following message:

**Operation Completed Successfully.
Press ENTER to Continue.**

When <Enter> is pressed, the System Transfer Utilities menu will be redisplayed. Type [END] followed by <Enter> to reach the System Management Mode menu. In order to guard against unauthorized access to System Management Mode, if the LinkUp 3174 is left idle for several minutes after the transfer utility operation is completed, an inactivity timeout will occur. The personal computer will be disconnected from the LinkUp 3174 if it is a remote dial-up connection; it will be returned to Connect Mode if it is a local or dedicated connection.

If any problems occur during the microcode download, the operation is automatically aborted and an error message appears on the personal computer screen. If this occurs, hotkey back to Emulation Mode, select Option 4 and attempt another download.

NOTE

To activate the newly-installed microcode, the LinkUp 3174 must be currently running from the primary bank, and Option 6 of the System Transfer Utilities menu must be set to Switch Microcode to Secondary Bank on Next Power Up.

5. Load Microcode into Secondary Bank from Primary Bank

This option exists for the purpose of running tests on the secondary microcode bank during the manufacturing process. It is not used during normal operation.

6. Switch Microcode to Secondary Bank on Next Power-Up

This option is a toggle switch that indicates which microcode bank the LinkUp 3174 will run from the next time it is powered on.

Refer to System Management Mode, Option 5, Product Configuration and Levels, to determine from which memory bank the LinkUp 3174 last booted. This is the memory bank from which it is currently running. The following paragraphs will describe how the toggle switch works.

To change the memory bank that the LinkUp 3174 is running from, enter <6> at the **Enter Choice:** prompt from the System Transfer Utilities menu. The screen will be redisplayed and the appropriate word Primary or Secondary will have changed. However, the LinkUp 3174 is not yet running from the chosen memory bank.

Effectively, what the Switch Microcode option has done is inserted (or removed) a command somewhere in the path of the initial program bootstrap code that tells the LinkUp to switch to the secondary bank to complete the boot-up.

Therefore, in order to effect an option 6 utility change, the system manager must either Power the LinkUp 3174 off and on, or perform a Remote Reset.

NOTE

For this utility to take effect immediately, type [END], and press <Enter> at the "Enter Choice:" prompt on the System Transfer Utilities menu. The System Management Mode menu will be redisplayed. Select Option 24, Remote Reset.

When the LinkUp 3174 is reset, the boot-up begins at the primary bank where the initial program bootstrap code is resident. If there is an error in the microcode in the secondary bank, the Linkup 3174 will automatically switch back to the primary bank and complete the boot-up and self-test from the primary bank. SY02 will flash on and off in the LED window on the front panel of the LinkUp 3174.

Power-Up Error Messages

When the LinkUp 3174 is reset after downloading microcode, you may encounter one of the following Error Messages.

- **SY01** — Error in primary bank. This error is displayed if LinkUp 3174 is running from the primary bank and an error is detected. Call Black Box.
- **SY02** — Error in secondary bank. If this error is displayed after trying to download microcode onto the secondary bank, the problem could range from memory scrambled in transmission to a defective memory chip. First, reset the LinkUp 3174, then try to perform the download operation again. If an error occurs, hotkey back to Emulation Mode. If this procedure is being performed locally and this message repeatedly displays upon each subsequent power-up, call Black Box. It would be helpful to get the CRC numbers from the Option 5, Product Configuration and Levels screen, in System Management Mode.
- **SY03** — Error associated with hardware in secondary bank. Call Black Box.

NOTE

If the system manager is performing this procedure remotely, via network or via modem, then the LED window cannot be seen. In this case, the errors may be overlooked.

Set Date/Time (Option 27, SNA and HV Only)

SET REAL TIME CLOCK

Current Date: 0000/00/00

Current Time: 00:00:00

Enter Date: (yyyy/mm/dd)

This option is used in conjunction with the Dialback Security function to provide a date/time stamp for each audit record that is created by the LinkUp 3174 and sent to the audit port. When this option is selected, the following screen is displayed:

6. Configurator Mode

Configurator Mode is used to change the parameter values for:

- Synchronous ports
- Asynchronous ports
- Logical Units
- Passthrough Units
- Access Groups
- Character translations
- Banner Message

Configurator Mode is accessed from System Management Mode, which is an option in the Port Test Mode menu. The procedure for entering Configurator Mode is as follows:

1. After entering your Device Type, select use of LU 1 from the Connect Screen. The Port Test Mode menu will appear.
2. Select Option 1, System Management Mode, from the Port Test Mode menu. Specify a new system password, or press <Enter>, or enter the current system password if required. The System Management Mode menu will be displayed:
3. Select Option 1, Configurator Mode, from the System Management Mode menu. Configurator Mode is entered and the following prompt is displayed

Enter Item(s) to be Configured:

In Figure 6-1, the LinkUp 3174 prompts are in bold, and typed responses are underlined.

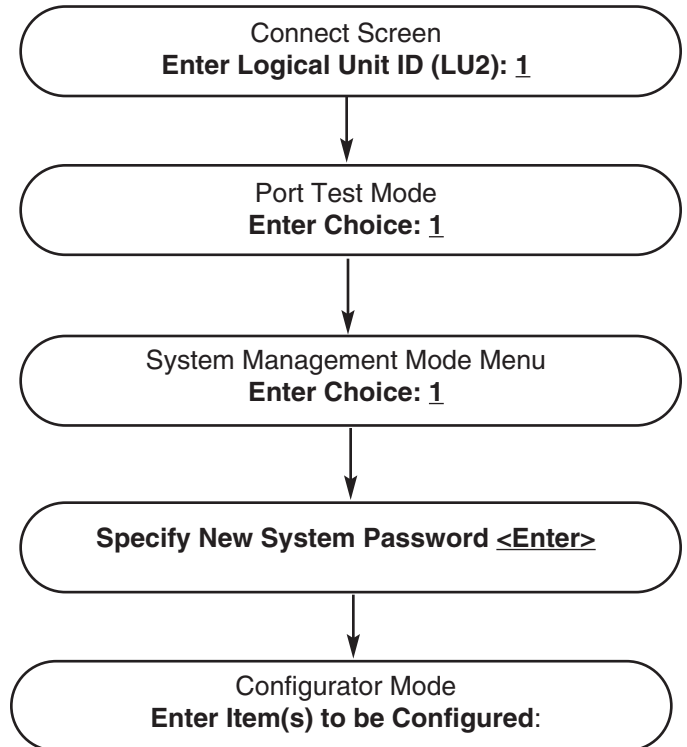


Figure 6-1. Accessing Configurator Mode.

6.1 General Information

The following sections provide information which is pertinent to all configuration functions.

6.1.1 HELP MESSAGES DURING CONFIGURATION

Help messages are available at any time during configuration. These messages are displayed on the terminal screen and provide information on valid responses and available options. If you need a brief reminder of acceptable responses during the configuration process, type a question mark <?> followed by <Enter>, and an appropriate Help message is displayed on the screen.

The Help Screen for the Enter Item(s) to be Configured: prompt is shown below.

Enter one of the following items:

PORT	-To configure the first/next physical port.
PORT n	-To configure physical port n.
PORT n,n-n	-To configure multiple ports.
LU	-To configure the first/next Logical Unit.
LU n	-To configure Logical Unit n.
LU n,n-n	-To configure multiple Logical Units.
LU GROUP	-To configure an LU Access Group.
PTU	-To configure the first/next Passthrough Unit.
PTU n	-To configure Passthrough Unit n.
PTU n,n-n	-To configure multiple Passthrough Units.
PTU GROUP	-To configure a Passthrough Unit Access Group.
TRANS-	To configure the ASCII-ASCII Translate Table.
BANNER	-To configure a Custom Terminal Module.
T1, T2, T3...T6	-To configure a Custom Terminal Module.
END or QUIT	-To exit the Configurator.
<RETURN>	-To configure the next item in the standard configuration sequence.
DBSYS	-To configure GLOBAL Dial Back System parameters.
DBPS	-To ADD, DELETE, or LIST Dial Back Personalities.
M1, M2 ...M5	-To work with user configurable Modem Personalities.

To Continue Press <CR>, Key:

The above configuration options are discussed in Section 6.2 and following.

6.1.2 CONSISTENCY CHECKING

The Configurator validates individual parameter values as they are entered. This includes checking for parameter interdependencies. In some cases the Configurator changes multiple parameter values as the result of a single change by the operator. For example, when an async port Communications Interface is changed from AUTO to DTE, the Flow Control From Device and Device Ready pin numbers are forced to Pins 5 and 6 (CTS and DSR), respectively.

If a new parameter value is entered which is not compatible with another existing parameter, the message **Incompatible with Parameter (n)** is displayed, where (n) is the number of the existing parameter. The user is then prompted again to enter parameter changes.

Most configuration parameters are frozen when a Logical Unit or Passthrough Unit is assigned to an Access Group. This prevents configuration changes from being made until the LU or PTU is removed from the group. If configuration is attempted, the message **Item CANNOT Be Changed Because LU/PTU is a Member of an Access Group** is displayed. Refer to Sections 6.2 and 6.9 for further information.

6.1.3 OVERRIDABLE PARAMETERS

Certain parameter values in the asynchronous port and LU menus are followed by a plus (+) or minus (-) sign. The plus (+) sign allows the parameter to be changed at connect time, while the minus (-) sign does not allow change. If no sign is present, the parameter is not overridable at connect time. These flags may be entered independently of the actual parameter value. Thus:

1 = ADM3A 1 = ADM3A +

are an valid change entries for the Device Type parameter (Asynchronous Port Menu). At connect time, the value for a non-overridable parameter will be the default value specified by the Configurator. However, for an overridable parameter, the Connect processor will display a prompt followed by the default to allow entry of a different value, if necessary.

For example, if an installation uses only Televideo 925 terminals, all directly coupled to the LinkUp 3174, the default Device Type (TV925) should be set through the Configurator as non-overridable. A user performing a normal connect to the LinkUp 3174 would not be asked to enter the Device Type.

Parameters for Printer and Auxiliary Printer LUs cannot be set as overridable. Since these LUs are controlled by the host, their parameters cannot be changed at connect time.

If a port and its associated default LU are configured with with overridable parameters, a connecting terminal immediately enters Emulation Mode with no prompts displayed. If configuration is necessary, execute the [INITIALIZE TERMINAL] sequence (usually [ESC <]) to exit Emulation Mode and enter Connect Mode. Configurator Mode may then be accessed using the procedure given in Figure 6-1.

6.1.4 CONFIGURATOR MODE COMMANDS

Configuration commands are entered from the terminal keyboard. The LinkUp 3174 always provides a prompt whenever a response is required. The general format of a configuration menu is:

[Param. #] [Parameter Name] [current setting]
[overridable]

[Param. #] [Parameter Name] [current setting]

Enter Change(s):

The response format is: [Param. #] = [New Value]

where: [Param. #] is the number shown on the menu, and [New Value] is a valid setting

As an example, a typical configuration menu is shown below:

Current Values for Port 0 (SYNC):

1. Link Protocol	SDLC
2. Character Set	EBCDIC
3. Control Unit Number	01
4. Communications Interface	DTE
5. Bit Rate	EXT
6. Connect Mode	DED
7. Half/Full Duplex Line	FULL
8. NRZI Encoding	N
9. Physical Unit ID	0000000000
10. Maximum Number of LUs	128
11. Enable NetView Alerts	N

Enter Change(s):

More than one parameter may be changed on a single line; however, parameters must be entered in ascending sequence. For example:

Enter Change(s): 3 = 7, 4 = DCE, 5 = 9600, 7 = FULL <CR>

Spaces between configuration entries and characters are optional and are ignored. For multiple changes on a single line, use a comma to separate entries.

Unless otherwise stated, all commands are followed by the <Enter> key.

The <?> (Help) Command

During configuration, help messages are available at two levels. To illustrate this, assume you type **PORT 2** <Enter> in response to the Enter Item(s) to be Configured: prompt. The following screen appears:

Current Values for Port 2 (RS232 ASYNC):

1. Device Type	ADM3A +
2. Associated LU/PTU/Group Id	LU 2 +
3. Communications Interface	AUTO
4. Bit Rate	AUTO
5. Number of Bits/Char(Excluding Parity)	8
6. Parity	NONE
7. Number of Stop Bits	
8. Connect Mode	DED
9. Flow Control from Device	XON
10. Flow Control from Emulator	XON
11. Device Ready Signal (Pin No.)	AUTO
12. Packet Network Access	N
13. Auto-Skip Enable	Y
14. Dial Back Modem Type	NONE
15. Enable Operator Generated Alert	N

Enter Changes:

At this point, typing <?Enter> displays a list of acceptable responses, valid format, editing keys, etc. The general format for a response is also shown.

A second level of help exists for each specific parameter. For instance, to see the available responses for parameter #1, **type: 1 = ?** <Enter>. This shows all the available settings for parameter #1 on the current menu.

The <Enter> (Redisplay) Command

After a valid change line has been entered, the menu is not automatically redisplated. Press <Enter> at the next Enter Change(s): prompt to redisplated the menu with the new values included.

<BACKSPACE> or <RUBOUT>

The Backspace or Rubout key can be used during configuration to correct typing mistakes. The command deletes the last character of the current entry.

The <CTRL/X> (Delete Entry) Command

This command deletes the current entry. This may be more convenient than the single-character backspace or rubout key for correcting typing errors. This command does not require <Enter>.

The <!> (Restore Previous Values) Command

During a configuration session, it is sometimes desirable to reset all of the changes to the previously held values. This can be done by typing an exclamation point <!> followed by <Enter> in response to the Enter Change(s) prompt. This command resets only the parameters changed since the last END command. In other words, the parameters changed on other menus or previous edits to the current menu are not reset.

NOTE

If it becomes desirable to reset all configuration parameters to their factory-default values, the SETUP procedure may be used. Refer to Appendix D for this procedure.

The QUIT Command

This command is used to exit a menu without saving the changes. The settings which were in effect when the menu was entered are retained. This does not necessarily restore the default values. The message:

Abandon Changes (Y/N)?

is displayed after the QUIT command is executed. Type <Y> to abandon the new configuration values. A response of <N> has the same effect as the END command.

The END Command

To exit from a configuration menu, type END followed by <Enter> in response to the Enter Change(s): prompt. This stores the new parameter settings and in most cases returns you to the Enter Item(s) to be Configured: prompt. An exception to this rule occurs when you are configuring the asynchronous port to which your terminal is connected.

When this particular menu is exited with the END command, the LinkUp 3174 takes you out of Configurator Mode and displays the following message on your screen:

****Connect/Port Test Cancelled - Port Reconfigured.****

When this occurs, press <Enter> to return to Connect Mode. If you are connected to the LinkUp 3174 by modems, you will have to redial.

The END command is also used in response to the Enter Item(s) to be Configured: prompt to exit from Configurator Mode and return to the System Management Mode menu. Note that changes made while in Configurator Mode are saved when END is typed in response to the **Enter Change(s):** prompt.

On exit from a specific menu level in Configurator Mode, all modified parameters are saved in EEPROM. If not currently in use, the item is immediately reinitialized with its new parameters. Otherwise, reinitialization occurs when the item becomes idle, that is, when a terminal operator disconnects from the LU. In some cases, it may be necessary to use the Deactivate/Activate Async Port command from System Management Mode to reinitialize the port. This is required for printer ports because they may never go idle.

NOTE

Synchronous port reconfiguration does not take effect until the LinkUp 3174 is either powered off or the Reset Sync Port or Remote Reset command is issued.

The <Enter> (Next Item) Command

Configurable items may be automatically configured in the following sequence:

- Synchronous Ports (0,1)
- Asynchronous Ports (2 through 33, depending on the number and type of async boards installed)
- Logical Units (2 through 129, or 1002 through 1065)
- Passthrough Units (2 through 17)

When the **Enter Item(s) To Be Configured:** prompt is displayed, the <Enter> key alone increments to the next item in the above sequence. This is particularly useful the first time the LinkUp 3174 must be configured, as it eliminates the need to type in each item separately.

6.2 Configuration Procedures

To configure the LinkUp 3174 for use in an IBM or other synchronous host environment, it is recommended that the following steps be completed in the order listed:

1. Configure the synchronous port(s).
2. Configure all asynchronous ports that will be used except for the port to which your terminal is connected.
3. Configure all Logical Units that will be used.
4. Set up LU Access Groups (if applicable).
5. Modify Translate Tables (if applicable).
6. Set up a Banner Message (if desired).
7. Perform the Reset Sync Port command in order to effect sync port configuration changes. (If the maximum number of LUs for either sync port has been changed, perform the Remote Reset command instead of the Reset Sync Port command, or power the LinkUp 3174 off, then on.)
8. Configure the async port to which your terminal is connected (if necessary).

To configure the LinkUp 3174 for async passthrough operation, the following steps must be accomplished:

1. Configure those async ports which will be passthrough (dedicated host) ports. Dedicated host ports are those async ports that are connected to the async host.
2. Configure all other async ports which will be used for display terminals, except for the async port to which your terminal is attached.
3. Configure the Passthrough Units that will be used.
4. Set up PTU Access Groups (if applicable).
5. Set up a Banner Message (if desired).

6. Configure the async port to which your terminal is attached (if necessary).

Sections 6.4 through 6.9 describe the configuration parameters and options for synchronous and asynchronous ports, logical units, passthrough units, and access groups.

6.3 Global Configuration

Global Configuration simplifies the configuration process by allowing the system manager to configure a set of LUs, PTUs, or Asynchronous Ports in a single operation, assigning identical configuration parameters, where applicable, to each member of the set.

To use Global Configuration, respond to the **Enter Item(s) to be Configured:** prompt by entering either LU, PTU, or PORT followed by a string of numbers in place of the single number response used for single item configuration. A hyphen may be used to indicate a span of numbers, or a comma can be used to separate individual numbers. Thus, the response **LU 2-5, 7** is equivalent to **LU 2, 3, 4, 5, 7**. There are no restriction on the order of the numbers. For example, the responses **LU 2-5, 7**, **LU 2, 7, 3-5**, **LU 2-4, 7, 5**, and **LU 2, 4-5, 7, 3** all result in the same global configuration. A single configuration menu is displayed that represents the entire group. In the case of LU global configuration, the LU type (DSPLY, PRT, a AUX) must be selected before the configuration menu appears.

In using Global Configuration, the first number entered serves as the base for the configuration; that is, it supplies the parameter values which appear when the configuration menu is initially displayed. For example, entering **PORT 2-8** in response to the Enter Item(s) to be Configured: prompt causes the current parameter values for Port 2 to display. When Port 2 is configured and the menu is exited with the END command, Ports 3 through 8 attain the same parameter values as Port 2.

As another example, suppose you have already configured LU 6 for a particular use and you now want to configure LUs 2 through 5 in the same way. In response to the **Enter Item(s) to be Configured:** prompt, enter **LU 6, 2-5**. The parameter values for LU 6 appear when the configuration menu is initially displayed. Type **END** to configure LUs 2-5 with the same parameter values.

6.3.1 EXCLUSIONS AND EXEMPTIONS

On the display LU configuration menu there is one parameter excluded from global configuration—**Logical Unit Number of Auxiliary Printer**—and two parameters which may be exempted from global configuration—**Logical Unit Number of Local Copier Printer** and **LU Name**. Two other parameters may also be exempted from global configuration, Associated Async Port on the PTU configuration menu, and Associated LU/PTU/Group Name on the Async Port menu. If a new value is not entered for an exempted parameter during global configuration, the value of the parameters remains unchanged in each included LU, PTU, or port (whereas the values of all other parameters are globally copied from the base as described). Conversely, if the value of an exempted item is explicitly changed on the base LU, PTU, or port, then all of the included LUs, PTUs, or ports attain that same new value.

As described in Section 6.9, display LUs and PTUs may be assigned to LU and PTU Access Groups. Global configuration is not allowed for any LU or PTU currently beginning to an Access Group. If any of the numbers entered for Global Configuration are included in an Access Group, the configuration menu is not displayed and the following message appears:

ERROR: Attempt to Modify an LU/PTU Belonging to an Existing Access Group.

6.4 Synchronous Port Parameters

The Synchronous Port configuration menu with default values for SNA is shown in below. To access this menu, enter **PORT 0** or **PORT 1** at the **Enter Item(s) to be Configured:** prompt or, if Configurator Mode has just been entered, type **<Enter>**. Configuration menu items and options are discussed in the following sections. Parameters 8 and 9 are not applicable to BSC. The Synchronous Port configuration menu for BSC shows N/A for parameters 8 and 9. Parameter 10 is not listed on the BSC configuration menu.

Current Values for Port 0 (SYNC):

1. Link Protocol	SDLC
2. Character Set	EBCDIC
3. Control Unit Number	01
4. Communications Interface	DTE
5. Bit Rate	EXT
6. Connect Mode	DED
7. Half/Full Duplex Line	FULL
8. NRZI Encoding	N
9. Physical Unit ID	0000000~0
10. Maximum number of LUs	128
11. Enable NetView Alerts	N

Enter Change(s):

1. Link Protocol

Firmware versions 5.XX and 6.XX support Synchronous Data Link Control (SDLC), while Version 4.XX supports Binary Synchronous Communications (BSC) between the LinkUp 3174 and the host computer. This parameter is for information only and cannot be changed by the operator.

2. Character Set

Either Extended Binary Coded Decimal Interchange Code (EBCDIC) or the American Standard Code for Information Interchange (ASCII) may be specified. IBM host software may be set up to support either code, though EBCDIC is the more commonly used. For SNA, the setting of this parameter may be overridden by the Bind command, which specifies the character set for each LU.

The default setting for this parameter is EBCDIC.

3. Control Unit Number

For SNA, the Control Unit Number is specified in hex format as a value in the range 1 to 0FF. (Hex 0 is reserved and hex 0FF is the SDLC Broadcast address.) For BSC protocol, the Control Unit number is specified in hex format as one of the 32 valid BSC polling addresses contained in Table 6-1. (The CU Number is entered in EBCDIC regardless of the character set specified.) A leading zero is

required whenever the first hex digit is in the range A to F for both SNA and BSC.

If both Ports 0 and 1 are used, they may have the same CU Number. See Dual Host Installation, Section 3.6.

In SNA, the default setting for this parameter is 01 for both ports. In BSC, the default setting is 40 for both ports.

Table 6-1. BSC Control Unit Poll/Select Address.

POLLING ADDRESS				SELECTION ADDRESS			
Char Set =EBCDIC		Char Set = ASCII		Char Set = EBCDIC		Char Set = ASCII	
CU Number (Hex)	I/O Char	CU Number (Hex)	I/O Char	CU Number (Hex)	I/O Char	CU Number (Hex)	I/O Char
40	SP	20	SP	60	-	2D	-
C1	A	41	A	61	/	2F	/
C2	B	42	B	E2	S	53	S
C3	C	43	C	E3	T	54	T
C4	D	44	D	E4	U	55	U
C5	E	45	E	E5	V	56	V
C6	F	46	F	E6	W	57	W
C7	G	47	G	E7	X	58	X
C8	H	48	H	E8	Y	59	Y
C9	I	49	I	E9	Z	5A	Z
4A	¢	5B	[	6A	|	7C	|
4B	.	2E	.	6B	,	2C	,
4C	<	3C	<	6C	%	25	%
4D	(	28	(	6D	_	3E	_
4E	+	2B	+	6E	>	3E	>
4F	| or !	21	!	6F	?	3F	?
50	&	26	&	F0	0	30	0
D1	J	4A	J	F1	1	31	1
D2	K	D2	K	4B	2	32	2
D3	L	4C	L	F3	3	33	3
D4	M	4D	M	F4	4	34	4
D5	N	4E	N	F5	5	35	5
D6	O	4F	O	F6	6	36	6
D7	P	50	P	F7	7	37	7
D8	Q	51	Q	F8	8	38	8
D9	R	52	R	F9	9	39	9
5A	!	5D	]	7A	:	3A	:
5B	\$	24	\$	7B	#	23	#
5C	*	2A	*	7C	@	40	@
5D	)	29	'	7D	'	27	'
5E	;	3B	;	7E	=	3D	=
5F	-or ^	5E	^	7F	"	22	"

4. Communications Interface

If the LinkUp 3174 is connected to the host computer by modems or line drivers (modem eliminators) on either a point-to-point communications line or on a multipoint line (Figure 6-2), its Communications Interface must be specified as Data Terminal Equipment (DTE).

However, if the LinkUp 3174 is located adjacent to the host computer and is connected directly to a host port, it has its own built-in modem eliminator. In this case, its Communications Interface must be specified as Data Communications Equipment (DCE).

The default setting for this parameter is DTE.

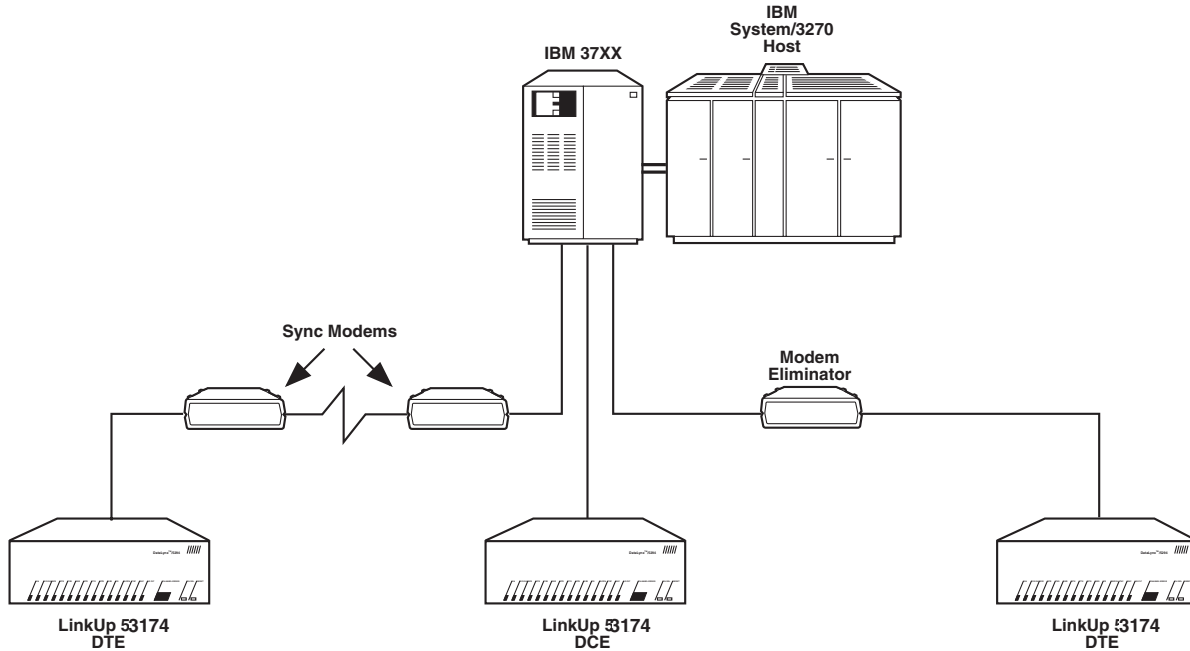


Figure 6-2. LinkUp 3174 Communications Interface Setting.

5. Bit Rate

The value to be specified here depends on whether or not the LinkUp 3174 is supplying the synchronous clock signals. For direct connection to a host port (Communications Interface = DCE), the LinkUp 3174 typically provides the clocking. In this case, the Bit Rate may be specified as 1200, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 38400, 56000, or 64000. Firmware version 6.XX is required for speeds above 19200.

For operation by modems a line drivers (Communications Interface = DTE), the modem typically provides the clock signals, in which case

EXT (External) must be specified. Unpredictable results occur if both the modem and the LinkUp 3174 attempt to supply the clocking signals. The default setting for this parameter is EXT.

6. Connect Mode

Both dedicated (DED) and auto-answer (AUTO) are valid values for this parameter. The AUTO setting should be used if the host will be calling the LinkUp 3174. For BSC, the DED setting must be specified since the Binary Synchronous Communications protocol does not support dial-out from the host computer.

The default setting for this parameter is DED.

7. Half/Full Duplex Line

A half-duplex line is one that can transmit data in one direction at a time, while a full-duplex line transmits data in both directions at the same time. The effect of this parameter depends on whether the LinkUp 3174 port is operating in DCE or DTE mode and is as follows:

When operating in full-duplex, the LinkUp 3174 raises and lowers Request-To-Send (DTE mode) or Carrier Detect (DCE mode). This is essential for multi-point configurations, because if a Control Unit does not lower its RTS or CD signal upon completing transmission, it prevents any other Control Unit from using the line.

The host communications controller, on the other hand, should be set to maintain permanent RTS when operating in full duplex.

The above information is summarized below. The default setting for this parameter is FULL (Full Duplex operation).

- **HALF DUPLEX DTE** — Following data reception from the host, LinkUp 3174 waits for Carrier Detect signal to go low before raising Request-To-Send.
- **HALF DUPLEX DCE** — Following data reception from host, LinkUp 3174 waits for Request-To-Send signal to go low before raising Carrier Detect and starting transmission.
- **FULL DUPLEX DTE** — Following data reception from host, LinkUp 3174 immediately raises Request-To-Send Signal.
- **FULL DUPLEX DCE** — Following data reception from host, LinkUp 3174 immediately raises Carrier Detect signal and starts transmission.

8. NRZI Encoding (SNA Only)

Either NRZI or non-NRZI encoding is supported by the LinkUp 3174. Specify Y or N as required by the modem.

The default setting for this parameter is N.

9. Physical Unit ID (SNA Only)

The physical unit ID is a unique 10-digit hex identification that is included in the response to an SDLC XID command from the host. This is typically necessary only in a dial-up environment. It contains three elements.

- **Digits 1-2** — length of Terminal ID field: reserved for future use since XID for the LinkUp 3174 is a fixed length. Hex value is 00.
- **Digits 3-5** — block number: fixed for LinkUp 3174. Hex value is 017.
- **Digits 6-10** — Terminal ID number: must be a value recognized as valid by the host system.

This value must also be configured at the host computer. Contact the network manager for the required value.

The default setting for this parameter is all zeros.

10. Maximum Number of LUs (SNA Only)

A maximum of 128 LUs may be specified between the two sync ports. Also, while Port 0 can have up to 128 LUs, Port 1 can have no more than 64 LUs assigned. LUs associated with Port 0 are numbered 2 through 129, inclusive. LUs associated with Port 1 are numbered from 1002 through 1065, inclusive, to correspond to host LU addresses 2 through 65.

NOTE

Whenever the value of this parameter is changed for either sync port, a total is summed. If the total exceeds 128, the new value just entered is not accepted and the following error message is displayed:

Request Rejected, Total LUs Exceeds 128

The System Manager should also be aware that when a new value for this parameter takes effect, some of the previous LU configurations may have their corresponding LU numbers changed. Such LUs need to be reconfigured.

11. Enable NetView Alerts (SNA Only)

Specify Y to enable the LinkUp 3174 generation of unsolicited alerts. Specify N to disable this feature.

The default setting for this parameter is N.

NOTE

Changes in synchronous port parameters do not take effect unless a power-on reset is performed, or the Reset Sync Port command is executed from System Management Mode. EXCEPTION: Changes to Option 10 take effect ONLY when a power-on reset is performed. The Reset Sync Port command does not alter the previously configured value of this parameter.

6.5 Asynchronous Port Parameters

A typical Asynchronous Port configuration menu with R5-232C default values for SNA is shown below. Default values for RS-422 ports are the same except for Communications Interface, Flow Control from Device, and Device Ready Signal. These defaults are described in the following paragraphs.

Current Values for Port 2 (RS232 ASYNC):

1. Device Type	ADM3A +
2. Associated LU/PTU/Group ID	LU 2 +
3. Communications Interface	AUTO
4. Bit Rate	AUTO
5. Number of Bits/Char (Excluding Parity)	8
6. Parity	NONE
7. Number of Stop Bits	1
8. Connect Mode	DED
9. Flow Control from Device	XON
10. Flow Control from Emulator	XON
11. Device Ready Signal (Pin No.)	AUTO
12. Packet Network Access	N
13. Auto-Skip Enable	Y
14. Dial Back Modem Type	NONE
15. Enable Operator-generated Alert	N

Enter Change(s):

1. Device Type

The range of device types supported by the LinkUp 3174 is constantly being expanded. The list of those currently supported may be displayed through the Help Facility by typing I=? followed by <Enter>.

If this port is to be an async passthrough port (that is, connected to the async host), the device type must be specified as HOST. The parameter automatically becomes non-overridable when this change is made.

If a printer is to be attached to this port, the Device Type may be specified as PRINT (for general-purpose ASCII printer support) or as one of the listed printer types. In this case the LinkUp 3174 forces the first two menu parameters to be non-overridable.

Certain special device types are defined to support specific LinkUp 3174 features. These include:

- PAPER for hardcopy terminals (see Chapter 8).
- IBMPC for personal computer (see Section 2.2).
- COMPU for interfacing micro, mini, and instrumentation computers to the LinkUp 3174 (See Section 9.3).
- TABLE for Block Mode operation (see Chapter 11).

The default value for this parameter is ADM3A+.

2. Associated LU/PTU/Group ID

This parameter associates a Logical Unit, Passthrough Unit, or Access Group Name with this asynchronous port.

For SNA Logical Units, this is a value in the range 2 through 129 (corresponding to SNA LU addresses 02 through 129 on Sync Port 0), or 1002 through 1065 (corresponding to SNA LU addresses 02 through 65 on Sync Port 1). Logical Units 0 and 1 are reserved in SNA.

In BSC operation the total number of LUs is also 32. Table 6-2 gives the corresponding BSC device addresses. Note that the address of any device connected to the LinkUp 3174 is determined by the LU number that is specified at connect time, and the port number to which the device is connected.

If the device attached to this port is a Passthrough Unit, this parameter may be specified as PTU 2 through PTU 17, where the PTU configuration defines the async passthrough port (that is, Device Type = Host).

An Access Group may be specified for this parameter. The Access Group must have been previously defined or the error message **Unrecognized Response**, or **Invalid Parameter**

Table 6-2. BSC Control With Poll/Select Addresses

DEVICE ADDRESS					DEVICE ADDRESS				
EBCDIC		ASCII			EBCDIC			ASCII	
LU Number	Hex	I/O Char	Hex	I/O Char	LU Number	Hex	I/O Char	Hex	I/O Char
2	40	SP	20	SP	18	50	&	26	&
3	C1	A	41	A	19	D1	J	4A	J
4	C2	B	42	B	20	D2	K	4B	K
5	C3	C	43	C	21	D3	L	4C	L
6	C4	D	44	D	22	D4	M	4D	M
7	C5	E	45	E	23	D5	N	4E	N
8	C6	F	46	F	24	D6	O	4F	O
9	C7	G	47	G	25	D7	P	50	P
10	C8	H	48	H	26	D8	Q	51	Q
11	C9	I	49	I	27	D9	R	52	R
12	4A	¢	5B	[	28	5A	!	5D]
13	4B	.	2E	.	29	5B	\$	24	\$
14	4C	<	3C	<	30	5C	*	2A	*
15	4D	(	28	(	31	5D	)	29)
16	4E	+	2B	+	32	5E	;	3B	;
17	4F	| or !	21	!	33	5F	¬ or ^	5E	^
					Gen Poll	7F	"	22	"

Number, is displayed. Refer to Section 6.9 for information on configuration of Access Groups. When using global configuration, only an Access Group name may be specified.

3. Communications Interface

Three RS-232C options for this parameter are AUTO, DTE, and DCE. The AUTO setting enables automatic interface detection and configuration. The LinkUp 3174 senses which type of device is attached to the port and set its interface to DTE or DCE, as appropriate. The device must be powered on before automatic detection occurs.

If the LinkUp 3174 is connected to asynchronous devices by modems or line drivers, the interface may be set to DTE or AUTO. If the LinkUp 3174 is connected directly, the interface may be set to DCE or AUTO.

If DTE is selected or detected, the LinkUp 3174 automatically sets **Flow Control from Device** to Pin 5 and **Device Ready Signal** to Pin 6. If DCE is selected or detected, these two options are set to X-ON and Pin 20, respectively.

For RS-232C ports, the default value for this parameter is AUTO. For RS-422 ports, the only allowed value for this parameter is DCE.

4. Bit Rate

The supported asynchronous bit rates are 75, 110, 134, 150, 300, 600, 1200, 2000, 2400, 4800, 7200, 9600, 14400, 19200, and AUTO (Autobaud).

If Autobaud is specified, only the following bit rates can be determined: 9600, 4800, 2400, 1200, and 300 bps. Any value below 1200 bps is detected and treated as being 300 bps.

The default value for this parameter is AUTO.

5. Number of Bits/Char (Excluding Parity)

The number of character code bits supported by the LinkUp 3174 may be specified as 7 or 8. This parameter, as well as the next two, must be set to match the character structure supported by the terminal to be connected to the part being configured.

The structure of asynchronous transmitted data is:

Start Bit • Char. Code Bits • Parity Bit • Stop Bit

where the start bit is transmitted first. The Parity bit is optional. The default value for this parameter is 8.

6. Parity

This parameter may be set to ODD, EVEN, MARK, SPACE, or NONE. If true parity checking is required, either ODD or EVEN should be specified. MARK and SPACE correspond to a fixed bit (1 or 0, respectively) in the parity bit position, while NONE indicates absence of a parity bit.

The default value for this parameter is NONE (no parity).

7. Number of Stop Bits

Either 1, 1.5, or 2 stop bits may be specified. Typically, 2 stop bits are required only for operation at 110 bps, 1.5 stop bits only at 134 bps, while 1 stop bit is used for all other speeds.

The default value for this parameter is 1.

8. Connect Mode

For a terminal or printer connected directly to the LinkUp 3174 or by a fixed point-to-point line using modems or a line driver, the Connect Mode is normally specified as DED (Dedicated).

For dial-up support through an auto-answer modem, the Connect Mode is AUTO. In this latter mode, and with the Communications Interface set to DTE, the LinkUp 3174 awaits the Ring Indicator signal from the modem (Pin 22) before raising its Data Terminal Ready (DTR) signal (Pin 20). When the auto-answer modem sees DTR go high it accepts the dial-up connect and only then raises Data Set Ready (DSR) to the LinkUp 3174. Modems must always be set to auto-answer when connected to the LinkUp 3174.

The default value for this parameter is DED.

9. Flow Control from Device

This parameter identifies the pin number on which the LinkUp 3174 expects to see a Not Busy signal, enabling it to transmit data to the connected device. In DTE mode this generally corresponds to the Clear-To-Send (CTS) signal supplied by the modem or line driver. In DCE mode, it depends on the device type; typically, display terminals do not supply such a signal, and NONE should be specified.

NOTE

For RS-232C ports having DB9 connectors, Pin 11 is not supported.

Note also that the LinkUp 3174 supports logical as well as physical flow control from the attached device.

The default value for this parameter is X-ON. For RS-422 ports, the only allowed values for this parameter are X-ON and NONE.

10. Flow Control From Emulator

This identifies the control codes or EIA pin signals that the LinkUp 3174 transmits as its data input buffer approaches full (busy) and empty (not busy). Generally, flow control of inbound data is relevant only when the terminal device is a computer or other device (such as a dedicated host printer)

which can generate data at a rate faster than the receiving device is capable of processing it. After the LinkUp 3174 transmits an X-OFF, it can accept 16 more characters of data. If the terminal does not stop in time, data loss may result.

The default for this parameter is X-ON.

For RS-422 ports, the only allowed values are X-ON and NONE.

11. Device Ready Signal

This is the pin number on which the LinkUp 3174 expects to see a Device Ready signal. In DTE mode, this generally corresponds to the Data Set Ready (DSR) signal supplied by the modem or line driver. In DCE mode, it depends on the device type. For display terminals it is typically Pin 20 (Data Terminal Ready), while printers use either Pin 4 or Pin 20.

The action taken by the LinkUp 3174 if the Device Ready signal goes low depends on whether the communications interface is DCE or DTE. For DTE, the loss of Device Ready always causes the LinkUp 3174 to terminate In-Use State. The port is decoupled from its associated LU and is physically reset.

For DCE interface with dedicated connect mode (DED) specified, the LinkUp 3174 maintains the In-Use State, but suspends output to the device until Device Ready is restored. This is appropriate for a directly connected printer whose Device Ready signal is usually equivalent to an online indication. That is, the signal is raised/lowered by an operator pressing an Online/Offline select button. Note, however, that the port and LU cannot be disconnected other than by a power-off, remote reset, or the Deact/Act Async Port command when Device Ready is used in this way.

If Device Ready signals are defined for an async passthrough session, the loss of Device Ready on the async host side puts the passthrough session into Reconnect State with no timeout limit. The message **Passthrough Port line is down** is displayed on the operator's terminal. The passthrough session may then be exited using the LinkUp 3174 Attention Code, or action may be taken to restore the line to the async host. If the line to the host is restored, the message **Passthrough Port Line Restored** is displayed. The loss of Device Ready on the end-user side of the passthrough session causes the LinkUp

3174 to terminate In-Use State, ending the passthrough session and freeing the host port for other passthrough sessions.

For RS-232C ports, the default for this parameter is AUTO. For RS-422 ports, the only allowed value for this parameter is NONE.

NOTE

Whenever the Device Ready signal is defined, the LinkUp 3174 informs the host of an off-line condition. Depending on how the host responds to this notification, you may or may not be able to reconnect to your session. To prevent the LinkUp 3174 from informing the host of the loss of Device Ready, set the Device Ready Signal to NONE.

The overall system defaults are in bold print and are as follows:

3 = AUTO; 9 = XON; 10 = XON; 11 = AUTO

On changing the Communications Interface, Items 9, 10, and 11 are forced to default values. These defaults are listed below.

	DCE	DTE
9 = AUTO	NONE	5
10 = AUTO	5	20
11 = AUTO	20	6

The pin choices corresponding to AUTO are assigned automatically when the COMM interface is determined to be either DTE or DCE.

Pin numbers cannot be duplicated on items 9 and 11. If you enter a pin number for item 9 that is already assigned as Device Ready, then the Device Ready Signal is forced to NONE. If you try to enter for Item 11 a pin number that is already assigned to Item 9, the message Incompatible with Parameter 9 will be displayed.

The allowed choices for RS-422 operation are as follows:

- 3 = DCE
- 9 = X-ON, NONE
- 10 = X-ON, NONE
- 11 = NONE

12. Packet Network Access

This is for use with Packet Data Networks (PDNs) to specify the type of data handling which is to be employed. Chapter 11 gives a detailed discussion of how the LinkUp 3174 can be used with PDNs.

Options for this parameter are N (for no PNA support), or one of the following:

- 1 = Generic support with cursor movement functions (up, down, left, right arrows) converted to specific cursor addresses.
- 2 = Support specifically designed for use with the CompuServe network. Not recommended for use with other PNA networks.
- 3 = Support specifically designed for use with the Telnet (GTE) network. Not recommended for use with the PNA networks.
- 4 = Generic support with PAD echo and control of cursor movement functions (up, down, left, right arrows).

If Option 1, 3, or 4 is selected, then parameter 13 (Auto-Skip Enable) should be set to N.

If Option 3 is selected, the LinkUp 3174 does not allow data to be written to the last screen position under any circumstances.

For ports defined with Device Type = HOST, this parameter is not used.

The default for this parameter is N.

13. Auto-Skip Enable

This is for use with Parameter 12 (Packet Network Access) only. If this option is disabled, the operator is required to use the <TAB> key to move to the next field even if the host application has defined the field as Auto Skip. This parameter may not be set to N if Parameter 12 has been set to N or 2. See Chapter 11 for further details.

For ports defined with Device Type = HOST, this parameter is not used.

The default for this parameter is Y.

14. Dialback Modem Type

This parameter is for use with the Dialback Security feature, which is documented in detail in Chapter 16. Valid values are M1, M2, M3, M4, M5, Hayes®, and NONE.

An asynchronous port is configured for dial back operation by setting this parameter to a value other than NONE. If an attempt is made to change this parameter before the port is properly configured, an error message will be displayed.

To configure a port for dialback operation, set the following parameters as indicated:

- 3. Communications Interface = DTE
- 4. Bit Rate = a fixed rate (not AUTO)
- 8. Connect Mode = DED or AUTO
- 11. Device Ready Signal = 8

If Dial Back Modem Type is set to NONE, dial back is disabled on that port. Refer to Section 16.3 for further information.

The default setting for this parameter is NONE.

15. Enable Operator-Generated Alert

This parameter allows the System Manager to specify which asynchronous ports can send operator-generated alert messages to the host. Specify Y to allow unsolicited operator-generated NetView Alerts from the async port being configured. Note that the associated synchronous port must also be configured so that NetView Alerts are enabled. Specify N to disable this feature. The default value for this parameter is N.

6.6 Logical Unit Parameters for a Display

A typical configuration menu with default values for a Display Logical Unit is shown below.

Current Values for Logical Unit 2 (DSPLY):

1. Buffer Size	1920
2. Password	NONE
3. Inactivity Time Limit	NONE -
4. Reconnect Time Limit	30 -
5. Forced Logoff Attention Code	NONE -
6. Forced Logoff Data	NONE-
7. Echoplex Enable	Y-
8. Echoplex Toggle Enable	N
9. Ancillary Translation Enable	N -
10. Display Status Line Initially	Y
11. Alternate Translate Table	N
12. Logical Unit Number of Local Copy Printer	NONE -
13. Logical Unit Number of Auxiliary Printer	NONE -
14. LU Name	NONE
15. Typeahead Enable	N -
16. Numeric Field Check Enable	Y

Enter Change(s):

Associated Sync Port (BSC Only)

This parameter applies to BSC operation only and does not appear on this menu when naming SNA firmware. Valid values for this parameter are 0 and 1. If only one synchronous port is to be used, all Logical Units must be associated with that port. However, if Port 1 is also in use, the 32 BSC LUs may be divided between Ports 0 and 1 in any manner. For example, they may be assigned alternately:

LUs 2, 4, 6, 8, etc. to Port 0.

LUs 3, 5, 7, 9, etc. to Port 1.

The only restriction is that a single LU cannot be associated with more than one sync port. Ensure that the host is SYSGENed to match. The LinkUp 3174 will respond to an ACTLU with a "not available" status if the LU is associated with the wrong sync port.

The default sync port for all logical units is Port 0.

1. Buffer Size

This parameter provides emulation of the various models of the 3278 display terminal. The valid buffer sizes and associated screen formats are shown in Table 6-3. The buffer size specified must be large enough to handle the largest screen buffer that is requested by the host in the Bind. This is directly related to the display-station model which is being emulated.

A screen size larger than 24 x 80 (1920 bytes) is accommodated by the following:

1. Dynamic selection of 80- or 132-column mode on terminals which can accommodate wider screen formats.
2. Vertical paging which allows a small screen to act as a window on the larger buffer of data sent to the LU. This feature only works vertically, not horizontally. Terminals which support only 80 columns of data cannot be used for emulation of a Model 5 display station.

Consider, for example, a terminal being used in emulation of a 3278 Model 5. While operating in normal mode (24-row x 80-column format), 80-column format is used. If the host sends an Erase/Write Alternate (to select 27-row x 132-column format), the LinkUp 3174 switches the terminal to 132-column format and begins operating in paged mode.

When in paged mode, the LinkUp 3174 divides the 27 rows of buffer data into two pages that overlap one another by five lines. Page 1 contains Rows 1-24; Page 2 contains Rows 20-27. The page displayed at any given time is the one containing the cursor. Thus, if Page 1 is currently displayed and the cursor is moved off the bottom of the screen by the user, the LinkUp 3174 displays Page 2.

The default setting for this parameter is 1920.

Table 6-3. Alternate Screen Format Buffer Sizes

3278 Model	Alternate Format		
	Buffer Size	# rows	#cols.
1	960	12	80
2	1920	24	80
3	2560	32	80
4	3440	43	80
5	3564	27	80

2. Password

Specification of a password for an LU effectively provides dual-level session protection. A terminal user who correctly enters an LU password at the start of a session is required to define a Reconnect Password for the session. The Reconnect Password is one that only the user knows. If no LU password is configured, the user is not prompted for entry of a Reconnect Password.

Passwords may be up to 6 alpha or numeric characters or a combination of alphanumerics. The word NONE should not be used, as it is reserved for use when no password is required.

The default for this parameter is NONE.

NOTE

For LUs belonging to LU Access Groups, a password is recommended; otherwise, reconnect is not possible.

3. Inactivity Time Limit

Options for this parameter are integer values from 1 to 99 minutes, and NONE. This specifies the length of time that the LinkUp maintains a session between an inactive terminal and the host. A terminal is considered inactive when no operator or host activity is taking place. If NONE is specified, activity is not monitored.

When an inactivity timeout occurs, the terminal, if connected locally or by a dedicated link, is returned to Connect Mode. A remote dial-up terminal is disconnected.

In an environment with multiple concurrent LU sessions, the inactivity timer of the current active session is the only active timer for all the LU sessions associated with the using port. When this timer expires, all LU sessions activated under the port will exit In-Use State.

The default for this parameter is NONE.

4. Reconnect Time Limit

Options for this parameter are integer values from 0 to 99 minutes, and NONE. This specifies the length of time that the LinkUp 3174 maintains a session between a disconnected terminal and the host. If an LU in In-Use State is decoupled from its terminal because of an inactivity timeout or remote disconnect, the LU enters Reconnect State for the length of time specified by this parameter.

NOTE

For LUs belonging to LU Access Groups, reconnect is not possible unless a connect password has been specified.

The value 0 means that the LU skips Reconnect State and goes almost immediately to Disconnect State, terminating the session. The value NONE, on the other hand, means that the LU remains in Reconnect State indefinitely; that is, until a terminal reconnects to it.

The default for this parameter is 30 minutes.

5. Forced Logoff Attention Code

This parameter and the next one together allow definition of a Forced Logoff message to be sent by an LU to the host in the event of an improper transition to Disconnect State (see Section 2.4). For SNA/SDLC protocol, the message is formatted as if the user typed **<SYS REQ>** followed by the Forced Logoff Data and **<Enter>**.

Valid options for SNA are ENT, TERMF, TERMC, and NONE. Selecting TERMF or TERMC causes a specially formatted message, sometimes referred to as TermSelf, to be sent to the host. Forced TermSelf generates 01 06 83 44 F3 00, which unbinds the LU-LU session while keeping the SSCP-LU session intact. Cleanup TermSelf generates 01 06 83 4C F3 00, which terminates both the LU-LU and SSCP-LU sessions. (For further information on this command, consult the IBM System Programmer's Guide, Advanced Communications Function for VTAM (ACF/VTAM).) If either TERMF or TERMC is selected, any Forced Logoff Data is ignored. If Forced Logoff Data is desired, specify ENT.

If neither TermSelf nor Forced Logoff Data is desired, specify NONE.

For BSC protocol, if the attention code is specified as a PA key or the <CLR>key, then data need not be specified, since it will not be sent to the host. If, however, the specified attention code is ENT or a PF key, then the data will be sent as if it were the contents of a single modified field located at the start of the buffer.

The default value for this parameter is NONE.

6. Forced Logoff Data

The data may contain up to 12 alphanumeric characters enclosed in single quotes (apostrophes). The following are exceptions:

- a) Two consecutive single quotes are required to represent a single one. That is, "represents".
- b) Semi-colon (;) generates a Field Mark code in the transmitted data.
- c) Asterisk (*) generates a Duplicate code in the transmitted data.

If no Forced Logoff Attention code is specified, no Forced Logoff data is sent regardless of the setting of this parameter. Refer to Section 2.4 for more information on Forced Logoff.

The default value for this parameter is NONE.

NOTE

Forced Logoff data is sent to the host on the SSCP-LU session. Thus, regardless of where the cursor was last positioned on the LU-LU session, the cursor location that appears in the Forced Logoff data stream is the home position (40H 40H).

7. Echoplex Enabled

This parameter may be set to Y or N. If set to N, echoplex is disabled, which prevents the LinkUp 3174 from echoing input characters to the terminal device. This means that characters and cursor movement initiated at the user's keyboard is not displayed on the terminal. Also, the Status Line is not displayed. Thus, only outbound data (from the host) is sent to the terminal.

Disabling echoplex is primarily intended for computer-to-computer applications (see Section 9.3) and file transfer.

The default for this parameter is Y.

8. Echoplex Toggle Enable

This parameter may be set to Y or N. If it is enabled, the [ESC ;] sequence is recognized and echo of characters ceases until the sequence is received again.

The default for this parameter is N.

9. Ancillary Translation Enable

This parameter controls use of the ancillary translate tables. Refer to Section 6.10 for configuration details. Accepted values for this parameter are Y and N. When N is selected, the translation table is ignored. When Y is selected, both incoming and outgoing data is translated as defined by the table.

The default for this parameter is N.

10. Display/Status Line Initially

This controls whether or not the Status Line is displayed after initial connection to the host. Valid options are Y or N.

The default for this parameter is Y.

11. Alternate Translate Table

This controls whether or not a separate, special EBCDIC-to-ASCII translate table is used. This is primarily for use in non-English-speaking countries where a special character set is patched into the firmware. Valid options are Y or N.

The default for this parameter is N.

12. Logical Unit Number or Local Copy Printer

This parameter allows assignment of a Local Copy Printer LU to the Display LU being configured. It may be specified as any value in the Range 2 through 129 or 1002 through 1065. Take care to ensure that the LU number specified is configured as a printer type. If a Local Copy Printer is not required, NONE may be specified.

The default for this parameter is NONE.

NOTE

This parameter may be changed even if the LU is a member of an Access Group. If during global configuration a new value is not entered for this parameter, the existing value of the parameter held by each included LU remains the same rather than changing to the value contained in the base LU.

13. Logical Unit Number of Auxiliary Printer

While the Local Copy print function is an emulation of an actual 3278 feature, the Auxiliary Printer function is not. It is a special feature which allows shared use of a single port by a terminal and a printer attached to the auxiliary port of the terminal. See Section 2.3 for a more complete description.

As in the previous parameter, the range of valid LU numbers is 2 through 129, 1002 through 1065, or NONE. Ensure that the specified LU is configured as an auxiliary printer type.

The default for this parameter is NONE.

NOTE

This parameter can be changed even if the LU belongs to an Access Group.

This parameter is excluded from global configuration. If during global configuration an attempt is made to change it, the following message is displayed:

Parameter not permitted in multiple LU/PTU configuration.

14. LU Name

This is an identification name which appears on the far right of the terminal's status line when this logical unit is selected. The string may be from 1 to 8 alpha or numeric characters in any combination. The word NONE is reserved for use when no LU name is required.

The default for this parameter is NONE.

NOTE

This parameter may be changed even if the LU belongs to an Access Group. Also, if during global configuration a new value is not entered for this parameter, the existing LU names of all the included LUs remain the same. They are not given the same name as the base LU.

Certain terminals having IBM style graphic status lines may not support the entire allowable character set for LU Name.

15. Typeahead Enable

This parameter only exists in SNA versions 5.31 or higher and in BSC versions 4.30 or higher. This controls how the LinkUp 3174 handles data that it receives from the terminal when the keyboard is located. Valid options are Y or N. If N is specified, all data sent by the terminal while the keyboard is locked is discarded. The <RESET> key may, however, be used to unlock the keyboard.

If Y is selected, data input to the asynchronous port is buffered while input is inhibited. Up to 64 characters may be input after the keyboard locked condition occurs. If X-ON/X-OFF flow control is specified for the port, an X-OFF is sent to the terminal after 48 characters have been reached by the buffer. When the host system subsequently unlocks the keyboard, the LinkUp 3174 processes the buffered characters. As the input buffer contents fall below 8 characters, an X-ON is sent to the asynchronous terminal.

The default for this parameter is N.

CAUTION

If Y is selected, the normal RESET key or key sequence may not unlock the keyboard, since this data is also buffered while input is inhibited.

NOTE

It is recommended that the Typeahead feature not be used with an auxiliary printer that employs a form of flow control other than X-ON/X-OFF.

16. Numeric Field Check Enable

While in Emulation Mode, the LinkUp 3174 normally checks each input field, and will not allow alpha characters to be entered into numeric-only fields unless the numeric-override key sequence is used. If this parameter is set to N, numeric field checking is disabled, allowing alpha characters to be entered into numeric-only fields without using the numeric-override sequence.

The default setting for this parameter is Y.

Typeahead Reset (BSC Only)

This parameter exists only in BSC models running firmware version 4.30 or above. This parameter indicates a single hex byte which the LinkUp 3174 interprets as a [RESET] command when Typeahead Enable is set to Y and the keyboard is locked. If Typeahead Enable is set to N, this parameter is not applicable. Valid values for this parameter are NONE or any two-digit hex code in the range 00 to 1F.

For display terminals that use a single hex byte in the range 00 to 1F for their [RESET] sequence, that same hex byte may be entered as the Typeahead Reset character. For terminals that use <CTRL/R> as their [RESET] sequence, the Typeahead Reset character does not need to be changed from its default setting.

For computer-to-computer applications in which Typeahead Enable must be set to Y, but incoming control codes must not be recognized and acted upon, set this parameter to NONE.

CAUTION

When specifying NONE for this parameter, be extremely careful as there is no remedy for a keyboard-locked condition other than powering off the terminal or deactivating the sync port.

The default for this parameter is 12H for new units containing the proper firmware. For units that have been upgraded from an earlier version of firmware, the default for this parameter is 00H until the SETUP procedure is performed. When SETUP is accomplished on upgraded units, the default setting becomes 12H.

6.7 Logical Unit Parameters for a Printer or Auxiliary Printer

The Logical Unit configuration menus for Printers and Auxiliary Printers are shown below. The default values are also shown.

To access these menus, type PRT or AUX at the prompt **Enter Logical Unit Type (DSPLY):**.

Current Values for Logical Unit 7 (PRT):

1. Buffer Size	1920
2. Operational Mode	SHR
3. Line Length (Columns)	132
4. Page Length (Inches)	11.00
5. Lines Per Inch	6
6. Single/Dual Case	D
7. Single/Double Spacing	S
8. Suppress Blank Lines	Y
9. Ancillary Translation Enable	N
10. Form Feed after Local Copy	N
11. Alternate Translate Table	N

Enter Change(s):

Current Values for Logical Unit 20 (AUX):

1. Buffer Size	1920
2. Operational Mode	SHR
3. Line Length (Columns)	132
4. Page Length (Inches)	11.00-
5. Lines Per Inch	6-
6. Single/Dual Case	D-
7. Single/Double Spacing	S-
8. Suppress Blank Lines	Y-
9. Ancillary Translation Enable	N-
10. Form Feed after Local Copy	N
11. Auxiliary Printer Device Type	PRINT-
12. Alternate Translate Table	N

Enter Change(s):

1. Buffer Size

See corresponding parameter in Section 6.6, Item 1.

2. Operational Mode

The printer LU may be specified for Local Copy (LOC) use only, Host System (SYS) use only, or shared (SHR) use. If the host attempts to activate a printer LU specified for Local Copy use only, the LinkUp 3174 posts an error message. If the printer LU is configured for shared use, Local Copy requests are handled as follows:

1. Under SNA operation, Local Copy Requests are honored when the LU is in a Between Brackets state.
2. Under BSC protocol, Local Copy requests are honored between output from consecutive host states.

NOTE

Under BSC protocol, if a user requests a Local Copy operation while host-initiated printing is in progress, interference may occur.

The default value for this parameter is SHR.

3. Line Length (Columns)

The print line length may be specified as any value between 40 and 254 columns. The specified value represents the maximum length permitted. Actual line lengths depend on the format controls sent by the host. Thus, the specified value should correspond to the carriage width of the actual printer(s) used with the LinkUp 3174.

The default value for this parameter is 132.

4. Page Length (Inches)

Page length may be any value between 1.00 and 22.00 inches and may be specified to two decimal places. This parameter is specified in inches rather than as a line count, since the line density (next parameter) is variable. The actual line count is calculated by the LinkUp 3174 as the product of page length times lines per inch. The result must be an integer value.

The default for this parameter is 11.00 inches.

5. Lines Per Inch

Either 6 or 8 lines per inch may be specified to match the actual line density of the printer(s) used. The default for this parameter is 6.

6. Single/Dual Case

Specify D (Dual Case) if both upper and lower case printing is required, or S (Single Case) if upper case only is required. The LinkUp 3174 automatically converts lower case to upper.

The default for this parameter is D.

7. Single/Double Spacing

This parameter may be specified as either S (Single Spacing) or D (Double Spacing). The default for this parameter is S.

8. Suppress Blank Lines

This parameter enables or disables printing of blank lines during both host-initiated printing and Local Copy printing. Valid options are Y (suppress printing of blank lines) and N (include blank lines in the print). The default for this parameter is Y.

9. Ancillary Translation Enable

This parameter controls use of the ancillary translate tables. Refer to Section 6.10 for configuration of the tables. Accepted values for this parameter are Y and N. When N is selected, the translation table is completely ignored. When Y is selected, printer data is translated as defined by the translate table. The default for this parameter is N.

10. Form Feed After Local Copy

This parameter is available in SNA versions 5.32 or higher and in BSC versions 4.30 or higher. When the parameter is set to Y (Yes), a Form Feed is sent to the printer following a local copy print instead of the standard Carriage Return Line Feed. The default for this parameter is N.

11. Auxiliary Printer Device Type (AUX menu only)

Valid options for this parameter are found by using the Help Facility (type 11 = ?). If your printer is not specifically supported, the PRINT device type is recommended. PRINT provides support for basic ASCII printers, using a minimum of carriage control functions (Carriage Return, Line Feed, and Form Feed). The default for this parameter is PRINT.

12. Alternate Translate Table (Parameter 11 on PRT menu)

Valid options for this parameter are Y and N. If set to Y, a special EBCDIC-to-ASCII translate table is used. This is primarily for use in non-English-speaking countries where a special character set is patched into the protocol converter firmware.

The default for this parameter is N.

6.8 Passthrough Unit Parameters

A typical configuration menu with default values for a Passthrough Logical Unit (PTU) is shown below. Note that none of the parameters is overridable by the operator at connect time.

Current Values for PTU 2:	
1. Associated Async Passthru Port	2
2. LinkUp Attention Code	1B 3C
3. Password	NONE
Enter Change(s):	

This parameter assigns an async port to the PTU for the purpose of communicating with an async host. Valid values for this parameter are 2 through 33. This async port must be configured for Device Type = HOST, as specified in Section 6.5.

The default setting for this parameter is the PTU number.

NOTE

This parameter may be changed even if the PTU belongs to an Access Group. Also, if during global configuration a new value for this parameter is not entered, the previously held values of this parameter are retained by each of the included PTUs.

2. LinkUp 3174 Attention Code

This parameter defines the attention code by which a terminal operator may break a passthrough session and return to the initial connect screen. This sequence is configurable up to seven hex bytes.

For complete 8-bit transparency in async passthrough operation, the attention code should be set to NONE. To end the passthrough session, the directly connected operator should then power the terminal off and back on. This requires a device ready signal from the terminal. Dial-up operators should hang up the modem.

The default setting for this parameter is 1B 3C ([ESC <]).

3. Password

Specification of a password for a Passthrough Unit provides connection security. If a password is configured, the operator must supply that same password when attempting to connect to the passthrough (dedicated host) port.

Passwords may be up to 6 alpha or numeric characters or a combination of alphanumerics. The word NONE should not be used, as it is reserved for use when no password is required.

The default for this parameter is NONE.

6.9 Access Groups

An Access Group allows a number of similarly-configured LUs or PTUs to be defined or referenced by name. The name can be from one to six alphanumeric characters long, and up to 16 PTU groups and 16 LU groups can be defined.

No two Access Groups may share the same name, even if one is an LU Access Group and the other is a PTU Access Group. If the system manager attempts to use the same name for both types of Access Groups, the message **ERROR: Access Group Name already in use** will be displayed.

Access Groups simplify host access for the operator. For example, during the connect sequence, the name of an LU Access Group may be entered in response to the prompt for Logical Unit ID. The LinkUp 3174 will search for the first available LU in that Access Group and assign it to the operator.

6.9.1 ACCESSING THE ACCESS GROUP MENU

From Configurator Mode, enter LU Group or PTU Group at the Enter Item(s) to be Configured: prompt. This will allow viewing and modifying of the groups. A typical Access Group menu is shown on the top of the next page.

LOGICAL UNIT ACCESS GROUP MENU

Access Group ==	Logical Unit Members
IBM ==	2-5, 7

Enter Change(s): _____

In the above example, one LU Access Group is defined, called IBM, which consists of Logical Units 2, 3, 4, 5, and 7.

6.9.2 USING THE ACCESS GROUP MENU

From the Access Group Menu, the operator may perform any of the following functions:

1. Create an Access Group
2. Modify an Access Group
3. Delete an Access Group
4. Delete all Access Groups

Create an Access Group

Access Groups may be created using the following format

Enter change(s): [Name] = [PTU or LU Numbers]

where:

[Name] is up to 6 alphanumeric characters.

[PTU or LU Numbers] are valid LU or PTU numbers entered as:

n 1, n2, n3... - for individual numbers n1-n3

For LU Access Groups, members may consist of LUs in the range 2 through 33. For Port Access Groups, members may be numbered from 2 through 17 only.

For example, to create a new Access Group named JACK containing LUs 10 through 13, 15, and 17 through 20, type **JACK = 10-13,15,17-20**.

The Access Group facility changes the configuration of the LUs or PTUs included in the Access Group in a manner similar to Global Configuration. When an Access Group is defined, the first included LU or PTU serves as the configuration base, as described

in Section 6.3. In the above example, after entering **JACK = 10-13,15,17-20**, the following message appears:

THIS MAY RECONFIGURE LU/PTUs WITH LU/PTU 10 AS BASE. PROCEED? (Y/N)

A response of Y or YES will result in LUs 11-13, 15, and 17-20 being reconfigured the same as LU 10, except for the three special items for AUX printer, Local Copy printer, and LU name. This reconfiguration takes effect immediately, prior to exiting the Access Group menu, and remains in effect even if the menu is exited with the [QUIT] command. Exiting with [QUIT] will cause only the new definitions of Access Groups to be ignored; that is, JACK will not be an Access Group containing LUs 10-13, 15, and 17-20. The LUs will have the same parameter values as LU 10.

The first LU listed in the definition of an Access Group must be a display LU. If it is not, the following message will be displayed:

ERROR: Base LU is NOT a Display LU. Access Group NOT Allowed.

If the base LU or PTU is not password protected, the following message is also displayed at the time the Access Group is defined:

WARNING: No Connect Password in Base LU. Session Reconnect NOT Possible.

It is therefore recommended that any LU or PTU used as a configuration base for an Access Group be given a password before the Access Group is defined.

Modify an Access Group

To modify the Access Group IBM so it contains only LUs 2, 4, and 5, type **IBM = 2,4,5**.

Delete an Access Group

To delete an Access Group named BOB, for example, enter **BOB =** without specifying any LU or PTU numbers.

Delete all Access Groups

To delete all LU or PTU Access Groups, enter the word **RESET** at the **Enter Change(s):** prompt.

To get help while in the Access Group Menu, type **<?Enter>** at the **Enter Change(s):** prompt. This will

display a list of valid formats.

As with all other Configurator Menus, an **<Enter>** will redisplay the table showing all current settings.

To cancel changes to the table, type **QUIT** in response to the **Enter Change(s):** prompt. This command produces the **Abandon Changes (Y/N):** prompt as it does in the other configurator menus; however, if the changes are abandoned, only changed table entries are cancelled. The LUs that were defined as a new Access Group have already been reconfigured and they retain their new parameter values.

To exit from the Configurator and save the changes made, type **END** in response to the **Enter Change(s):** and **Enter Item(s) to be Configured:** prompts.

Once an Access Group has been defined and all the members share the same configuration, individual LUs or PTUs within the group may not be reconfigured either singly or as part of a global configuration. Only three LU parameters and one PTU parameter, regarded as individual in nature, may be changed subsequent to Access Group definition. For example, if in response to the **Enter Item(s) to be Configured:** prompt the system manager enters **LU 4**, which is included in the Access Group **IBM**, the Configurator will not allow any parameters to be changed other than Logical Unit Number of Local Copy Printer, Logical Unit Number of Auxiliary Printer, and LU Name. These items may have values that differ from those of the base LU. If an attempt is made to change any other parameters, the following message is displayed:

Item CANNOT Be Changed Because LU/PTU is a Member of an Access Group

Similarly, suppose that PTU 6 is included in the PTU Access Group **VAX**. If PTU 6 is entered at the **Enter Item(s) to be Configured:** prompt, the Configurator allows only the item **Associated Async Passthru Port** to be changed.

A given LU or PTU may belong to two or more Access Groups provided it shares the same configuration as the base LU/PTU of the other Access Group(s). For example, if the system manager attempts to include LU 10 of Access Group **JACK** in the definition of another Access Group **JIM**, the Configurator will first ensure that the base LU specified for **JIM** shares the same

configuration as LU 10. If so, LU 10 may be included in **JIM**. Otherwise, the following message will be displayed:

Base LU/PTU in conflict with Group LU/PTU(s) belonging to another Access Group

Access Groups are a convenience for the terminal user. If an Access Group Name is entered in response to the **Enter Logical Unit Id: connect** prompt, the LinkUp 3174 will assign the operator the first available LU or PTU belonging to that group. If all the LU/PTUs belonging to that Access Group are in use, the message **No LU Available** or **No PTU Available** will be displayed.

6.10 Translate Tables

A modifiable translation table is included to accommodate the following applications:

- ISO Foreign Language Codes
- IBM PC 8-bit codes
- HP 8-bit codes

From the Configurator, the operator may access a 14-entry, user-modifiable translation menu. This will allow 8-bit data from the keyboard to translate into any 7-bit ASCII character, and similarly 7-bit data en route to the terminal or printer to be changed to their preassigned 8-bit values.

Note that asynchronous port parameters (Parity, 7/8 bit, etc.) still affect the 8-bit terminal I/O data.

Modified translations will not take effect if any of the following conditions are true for an LU:

- In a state other than In-Use
- In SAS graphics mode
- While enforcing pseudo-transparency
- If the LU has not been configured to use the translate tables
- **Inbound (From Terminal):** 8-Bit ASCII characters (00-FA) are passed through the table after being preprocessed for keyboard sequences. These characters are then translated to ASCII characters (21H through 7EH).
- **Outbound (To terminal/printer):** Text characters (20H through 7EH) are passed

through the ASCII translation table and are exchanged with their 8-bit counterparts (00H through 0FAH).

NOTE

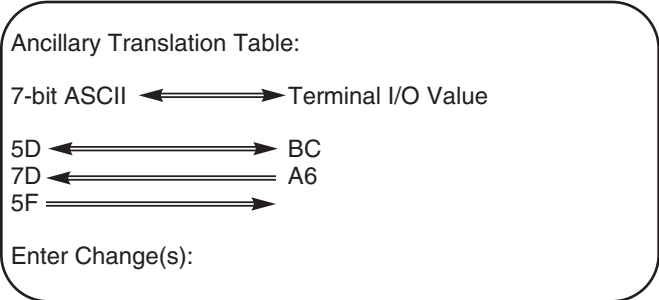
If the table cannot be read successfully from non-volatile memory (this most frequently occurs during power-up of the LinkUp 3174) an SP 03 error is displayed on the front panel and the number of entries in the table is initialized to zero.

6.10.1 ACCESSING THE TRANSLATE TABLE

From Configurator Mode, enter TRANS in response to the **Enter Item(s) to be Configured:** prompt. This allows viewing and modification of entries in the ASCII translation table. The menu looks similar to the one shown below.

The entries in the sample menu are interpreted as follows:

1. a) The 7-bit ASCII character 5D destined for a terminal or printer is converted to BC.
 b) The terminal I/O value BC is converted to 5D as it enters the LinkUp 3174.



2. a) The 7-bit ASCII character 7D destined for a terminal or printer is NOT converted.
 b) The terminal I/O value A6 is converted to 7D.
3. a) The 7-bit ASCII character 5F destined for a terminal or printer is converted to 5B.
 b) The terminal I/O value 5B is NOT converted.

6.10.2 USING THE TRANSLATE TABLE MENU

From the Translate Table menu, the operator may perform any of the following functions:

1. Make any required changes.
2. Ask for help.
3. Display the new table if step 1 had previously been taken.
4. Quit the session without change.
5. Exit from Configurator and save changes.

Each option is described in subsequent paragraphs.

Make Required Changes

Much like any other configurator menu, the user may change one or more entries at a time in the following format:

Enter Change(s): [ASCII CHAR] OPERAND [HEX VALUE]

Where [ASCII CHAR] is any displayable character (20 thru 7E) and [HEX VALUE] is within the range 00-FA (00-7E with parity), or [HEX VALUE] may be blank(s) or null which causes all rows associated with [ASCII CHAR] to be deleted.

OPERAND is one of the following operators:

- <=> or = to configure a bidirectional translation
- => or <= to configure a unidirectional translation

NOTE

Unlike other configurator menus, row numbers are not specified. Thus the entry appears in the next available row, or the row corresponding to [ASCII CHAR] is changed.

Should the user attempt to exceed maximum menu size, only those which do not cause the menu to grow beyond maximum are honored. For example, if there are 10 entries in the menu and the user types in 6 new entries, only the first 4 take effect. An error message is issued.

Changed table entries do not take effect immediately. The new values take effect only when a Remote Reset is executed (refer to Section 5.3 for details) or when the LinkUp 3174 is powered off and back on. This prevents the Translate Table from being changed while a device that is using the Table is in session.

An overridable parameter is added in the LU configurator menu to enable or disable ancillary translation table for each LU.

Error messages which may result from an invalid entry are described below.

- **Ask for Help** — As with other Configurator Mode menus, Help is available by typing `<?><Enter>` at the **Enter Change(s):** prompt. This displays a list of valid response formats.
- **Redisplay** — As with other configurator menus, `<Enter>` redisplay the table showing all current settings.
- **Cancel Changes To The Table** — To do so, type **QUIT** or `<!>` at the **Enter Change(s):** prompt. These commands also function the same here as they do with other Configurator menus. The **[QUIT]** command produces the **Abandon Changes? (Y/N):** prompt, while the `<!>` command erases any changes made and redisplay the previous table values.
- **Exit From Configurator and Save All Changes** — To do so, type **END** in response to the **Enter Change(s):** and **Enter Item(s) to be Configured:** prompts.

6.10.3 TRANSLATE TABLE ERROR MESSAGES

The Configurator validates individual entries as they are entered. Invalid entries are not accepted and one of the following error messages is issued.

- **SYNTAX ERROR:** Indicates an invalid operator or incorrect format. For example:

`4F> = 2D`

- **ASCII VALUE OUT OF RANGE:** Indicates that the ASCII value is not in the range 21-7E. For example:

`A2<=>9C`

- **TERMINAL I/O VALUE OUT OF RANGE:** Indicates that the terminal I/O value is not in the range 00-FA. For example:

`5F=>FF`

- **MAXIMUM TABLE LENGTH EXCEEDED:** Indicates that the Ancillary Translate Table already has 14 entries and no more entries may be added unless some are deleted first.
- **TRAILING CHARACTERS IGNORED:** Indicates that an unrecognizable character string follows a correct response. For example:

`2F=>8F, 4A=A4, +8..`

All valid responses prior to the erroneous segment are still honored.

6.11 Banner Messages

From the Configurator the user may establish a Banner Message of up to 79 alphanumeric characters (including required beginning and ending single quotation marks). The message is stored in EEPROM and displayed on a single line at the top of the Connect Mode Screen.

To create a Banner Message, enter **Configurator Mode**. At the prompt **Enter Item(s) to be configured:**, enter **BANNER**.

The following screen is displayed:

Any displayable ASCII characters may be included in a Banner Message, but the message must be preceded and followed by a single quote character or the message will not be stored in EEPROM. Type `<Enter>` to store a Banner Message and return to the Configurator Mode prompt.

6.12 Configurator Mode Error Messages

Specify Banner Message

Currently:
(NONE)
:-

While you are entering configuration changes, a number of syntax or semantic errors may be detected by the LinkUp 3174. These will result in the display of an error message in the following format:

nn:<message>

where **nn** is the number of the parameter in error. The messages are identical to Connect Mode errors and are listed in Appendix D.

7. Configuring A Terminal Module

This chapter describes the Terminal Configurator, an extended function of Configurator Mode which allows the system manager to customize or completely define a terminal module. This is necessary when the asynchronous terminal used with the LinkUp 3174 is not specifically supported. This feature can also be used to modify one of the built-in modules to accommodate specific operator preferences.

As illustrated in Figure 7-1, the Terminal Configurator is accessed through Configurator Mode. The procedure is listed below.

1. Select use of LU1 from the Connect Screen. The Port Test Mode menu will appear.
2. Select Option 1 (System Management Mode) from the Port Test Mode menu. The System Management Mode Menu will be displayed.
3. Specify the [CLEAR SCREEN] sequence, if required. Enter the password, if required, or type <Enter>.
4. Select Option 1 (Configurator Mode) from the System Management Mode menu. Configurator Mode is entered when the prompt **Enter Item(s) to be Configured:** appears on the screen.
5. To configure a terminal module, respond to the prompt with one of the following:

T1, T2, T3, T4, T5, or T6

Use the appropriate symbol for the terminal module configured. Note that a new terminal ID may be defined as part of the configuration. After that, either the new ID or T(n) may be used.

The first Terminal Information Menu will appear on the screen. Enter changes and data as described in Section 7.4.

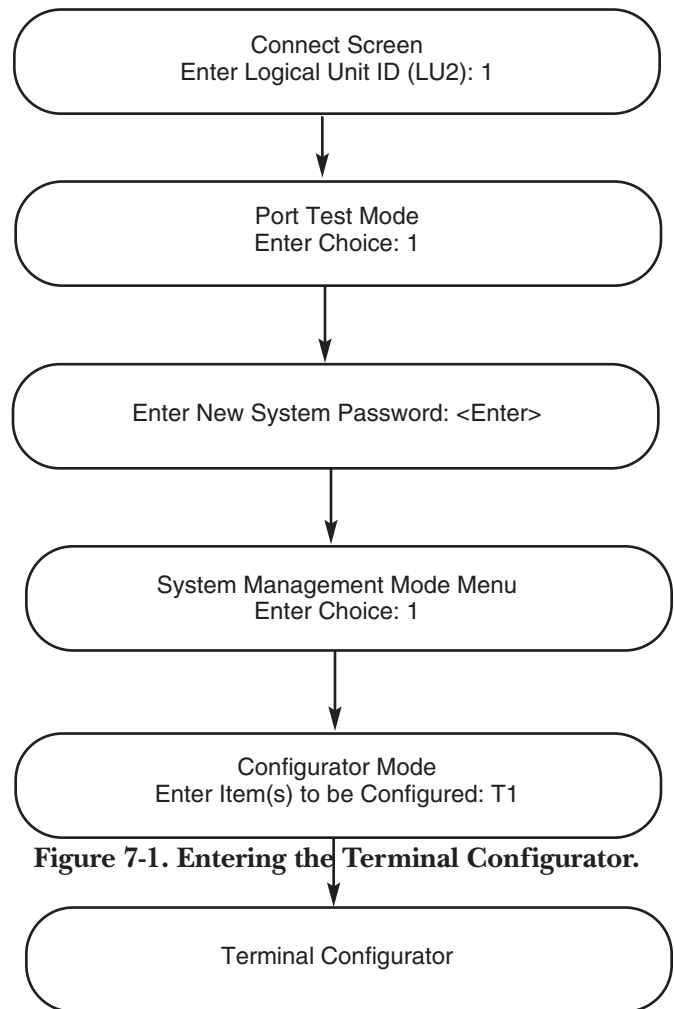


Figure 7-1. Entering the Terminal Configurator.

7.1 General Information

Terminal Configurator menus are similar to those used for other configuration functions. The command formats are identical in most cases to the formats used during port and LU configuration. Help messages are also provided and are accessed by typing a question mark <?> followed by <Enter>.

There are two sets of menus. One set is for Display terminals and the other set is specifically for hardcopy terminals which do not provide a CRT, but rather display information on paper output. Printer modules are not configurable. Both sets of menus are further divided as follows:

1. Information Menus (2 menus). These specify the general characteristics of the terminal, such as screen size and whether attributes are supported. Information menu parameters are described in Section 7.7.
2. Function Sequence Menus (2 menus for displays, 1 menu for hardcopy terminals). These specify the commands the LinkUp 3174 sends that cause the terminal to perform specific functions. Thus, the user specifies the sequence which the terminal expects to receive. These include sequences to clear the screen, position the cursor, and set certain attributes. Function Sequence menus are described in Section 7.8.
3. Key Sequence Menus (5 menus). These specify the sequences generated from the terminal keyboard which cause the LinkUp 3174 to emulate 3278 keyboard functions. The user specifies which key or key sequence is used to generate the function. Example key sequences are <TAB>, <DELETE CHARACTER>, and <NUMERIC OVERRIDE>. Key Sequence Menus are described in Section 7.9.

7.2 Terminology and Definitions

To use the Terminal Configurator, it is necessary to understand the following definitions:

- **Base Terminal Module:** The terminal module that is used initially to provide the starting values for terminal module configuration.
- **Built-In Terminal:** One of the terminal modules provided by the LinkUp 3174 firmware.
- **Device Type:** The 1- to 6-character string that specifies the terminal module to use. The first character must be a letter.
- **Terminal ID:** Same as Device Type.
- **Terminal Module:** The data and tables used by the LinkUp 3174 to interface to a particular

terminal. This consists of general terminal information and allows translation of key sequences and function sequences.

- **Terminal being used:** The actual terminal from which configuration data is being entered to the LinkUp 3174.
- **Terminal being configured:** The terminal for which a terminal module is being configured.
- **T(n):** The symbol used in subsequent sections to mean T1, T2, T3, T4, T5, or T6. This is the default Terminal ID for a Terminal Module and the one used whenever the module has not yet been defined.

7.3 Special Considerations

We recommend that you do research ahead of time to find a built-in terminal module which is as close as possible to the one you want. This can be done by specifying one of the built-in modules (for example, ADM3A) as the base device type for your custom terminal module. Compare the key sequences of the base device type with the key sequences you desire. Have the programmer's guide for the device type you choose nearby.

Keep a printed record of your custom configuration in case you have to alter it later, or in case you have to call Black Box for assistance.

Before going online to the host, test the module by using the Character Echo Test and/or the Async Port Trace facility.

7.3.1 SPECIFIC LIMITATIONS

Up to six modules may be defined. These terminal modules are stored in non-volatile (EEPROM) memory, and are therefore not erased when the LinkUp 3174 is powered off. Each terminal module requires 1020 bytes.

The following general constraints also exist:

1. The maximum length of a function sequence entered from the keyboard is 240 key strokes or 450 bytes.
2. Alternate key sequences cannot be specified.
3. Only the standard status line are allowed. Graphics characters are not allowed in new terminal modules.

4. The LinkUp 3174 needs to know the [CLEAR SCREEN] sequence for the terminal used. If a non-standard terminal is used for configuration, a message appears after the **Enter Logical Unit Id** prompt which instructs the operator to define it. This information must be provided before the user is allowed to continue. NONE is a valid entry, but if it is used, the menus that follow may not be readable.

7.4 Data Entry Formats and Commands

The most common commands and formats which are used during Terminal Configuration are listed below. Note that most are identical to the commands listed in Chapter 6 for standard configuration functions. Any of these may be entered in response to the Enter Change(s): prompt from the Configurator.

Valid formats are as follows:

- **# = value (, # = value)** — To modify specified menu parameter(s).
- **<RETURN>** — To redisplay menu with modified value(s).
- **# = >** — To display a long function string.
- **# = ?** — To obtain a list of valid parameter values.
- **!** — To restore previous values and ignore changes.
- **&** — To continue entering input on the next line.
- **<CTRL/X>** — To delete all input.
- **<BACKSPACE>** or **<RUBOUT>** — To delete one character on the current line.
- **END** — To exit terminal configurator, saving changes.
- **QUIT** — To exit without saving changes.
- **NEXT** — To go to the next terminal menu.
- **PREV** — To go to the previous terminal menu.
- **INFO n** — To go to the nth information menu.
- **FUNC n** — To go to the nth function sequence menu.

- **KEYS n** — To go to the nth key sequence menu.
- **HEX** — To switch to hexadecimal key entry mode.
- **LIT** — To switch to literal key entry mode.

where “#” is 17, and “n” is the optional sub-menu number.

7.4.1 COMMAND FORMATS AND CONVENTIONS

Configuration commands are entered from the terminal keyboard. The LinkUp 3174 always provides a prompt whenever a response is required. The general format of a configuration menu is:

1. Device Type T5

[Param. #] [Parameter Name] [current setting]

[Param. #] [Parameter Name] [current setting]
Enter Change (s):

The response format is:

[Param. #] = [New Value]

where: [Param. #] is the number shown on the menu, and [New Value] is a valid setting

More than one parameter may be changed on a single line; however, parameters must be entered in ascending sequence. For example:

Enter Change(s): 1 = MYTERM, 3=27, 4=132, 9=N
<CR>

Spaces between configuration entries and characters are optional and are ignored. For multiple changes on a single line, use a comma to separate entries.

Other available configurator commands are described in the next section.

7.4.2 SPECIAL COMMANDS

Unless otherwise stated, all commands are followed by <Enter>.

The ? (Help) Command

During configuration, help messages are available at two levels. A typical menu lists all of the items which can be configured using a general format:

1. Device Type T5

[Param. #] [Parameter Name] [current setting]

[Param. #] [Parameter Name] [current setting]

Enter Change(s):

At this point, typing <?><Enter> displays a list of acceptable responses, valid formats, editing keys, etc.

A second level of help exists for each specific parameter. For instance, to see the available responses for parameter #1, type:

Enter Change(s): 1 = ?

This shows all of the available settings for parameter #1 on the current menu.

The <RETURN> Command

After a valid change line is entered, the menu is not automatically redisplayed. Press <Enter> at the next **Enter Change(s):** prompt to redisplay the menu with the new values included.

The [# = >] Command

When a menu with a function sequence too long to fit on one menu line, only the first 10 characters of the function sequence are displayed in the menu, followed by a > symbol. To display the entire function sequence, type the number of the function, an equal sign, and the > symbol at the **Enter Change(s):** prompt. For instance: Enter Change(s): 13 = > displays the entire function sequence for Item 13 in the menu.

When entering long function sequences, use an ampersand <&> at the end of each line to wrap to the next line. <Enter> terminates the sequence. An error message is displayed if too many bytes are entered on one line.

<BACKSPACE> or <RUBOUT>

These keys can be used during configuration to correct typing mistakes. The command deletes the last character of the current entry.

The <CTRL/> (Delete Entry) Command

This command deletes the current entry. This may be more convenient than the single character <BACKSPACE> or <RUBOUT> key for correcting typing errors. This command does not require <Enter>.

The <!> (Restore Previous Values) Command

During a configuration session, it is sometimes desirable to reset all of the changes to the previously held values. This can be done by typing an <!><Enter> in response to the **Enter Change(s):** prompt. This command only resets the parameters changed since the last END command. In other words, the parameters changed on other menus or previous edits to the current menu are not reset.

The [QUIT] Command

This command is used to exit a menu without saving the changes. The settings which were in effect when the menu was entered are retained. This does not restore the default values. The message:

Abandon Changes? (Y/N)

is displayed after the [QUIT] command. Type <Y> to abandon the new configuration values. A response of <N> has the same effect as an [END] command.

The [END] Command

To save terminal module changes, type END and press <Enter>. The following message appears on your screen: **Terminal Module Storage in Progress.** followed by: **Enter Item(s) to be Configured:.**

The END command is also used in response to the **Enter Item(s) to be Configured:** prompt to exit from Configurator Mode and return to the System Management Mode menu. Note that changes made while in Configurator Mode are saved when END is typed in response to the **Enter Change(s):** prompt.

The [NEXT] Command

This command displays the next menu.

The [PREV] Command

This displays the previous menu.

The [INFO n] Command

This command displays the nth Information Menu.

The [FUNC n] Command

This displays the nth Function Sequence Menu.

The [KEYS n] Command

This displays the nth Key Sequence Menu.

The [HEX] Command

This command is used in conjunction with Key Sequence Menus to switch from literal key entry mode to hexadecimal key entry mode. This is the default setting.

The [LIT] Command

This command is used in conjunction with Key Sequence Menus to switch from hexadecimal key entry mode to literal key entry mode.

7.5 Data Presentation Formats

Key sequences are displayed either as the hex bytes entered, NONE, or UNDEFINED. NONE means that no key sequence is defined for this key. UNDEFINED means that the key sequence has never been specified.

All other data is displayed as decimal or hexadecimal values, strings, or keywords.

7.6 General Procedure for Terminal Configuration

Refer to Section 7.1 for instructions on how to enter and access the Terminal Configurator functions. The general procedure for editing a terminal module is described below.

1. Select a Base Device Type

This is the Terminal ID of an existing terminal module that is used as the base for the new terminal module. It can be either a built-in module or it can be another user-defined terminal which has been previously configured. NONE is also a valid entry for the Base Terminal Module. In this case, all key sequence and function sequence entries in menus are initially shown as UNDEFINED. To create a

hardcopy device terminal module, HCOPY should be specified.

NOTE

Some existing terminal drivers are too large to be safely used as Base Terminal Modules. If one of these is selected as the Base Device Type (for example, the Wyse 100 terminal driver Terminal ID = WY100), the message "Storage Limit Exceeded" is displayed on your screen followed by the prompt Proceed with Partial Base Terminal Driver? (Y/N). Due to the possibility of problems occurring when attempting host access, it is recommended that these terminal drivers not be used as Base Device Types.

If it is necessary to proceed with a partial base terminal driver, ensure that all undefined parameters in the module are either defined or set to NONE. If this is not done, host access is denied and the error message Terminal Module Incomplete is displayed.

2. Select a New Terminal ID

If this is the first time that a specific terminal module is configured, select a new Terminal ID (that is, a name for the customized module). If the module needs to be modified again, it can be accessed through either the new Terminal ID or "T(n)." The new Terminal ID is entered on the first configuration menu as Item 1.

Note that this new name need not refer to the base terminal module. In fact, it may be advantageous to select a name which is easily recognizable as a customized module (for example, MYTERM, TEST, etc.).

On the other hand, the new Terminal ID may be the same as one of the built-in Terminal IDs. When selected from Connect Mode, the customized module takes precedence over the built-in module of the same name. The same user-specified terminal ID is not allowed for two or more user-defined terminal modules.

3. Specific Information Parameters

These menus are used to specify general terminal information. The values shown differ depending on the base terminal module used. The base driver used in the example is ADM3A.

4. Specific Function Sequences

The menus in Section 7.8 are for entering function sequences. Note that the user-specified Terminal ID is shown on the first line of the menu.

5. Specify Key Sequences

The menus in Section 6.9 are the five Key Sequence Menus. At the bottom of each menu, the present setting of the key specification format is shown. Two modes are provided for entry of Key Sequences only: HEX and LIT. To change the current mode, type either LIT or HEX in response to the Enter Change(s): prompt. These two modes are described below:

HEX Mode

If HEX mode is used, the actual hex values for the key sequences are entered from the keyboard of the terminal. Each byte is delimited from the next by one or more spaces, and leading zeros in a byte are optional. This mode is useful when configuring a module for a terminal different from the terminal being used for the configuration. This is the default mode.

LIT Mode

If LIT (literal) mode is used, the actual keystroke used is entered. This method can only be used if the terminal used for configuration corresponds to the terminal module configured. The beginning of the key sequence is signaled by an equals sign (=) and delimited by an automatic timeout. To enter key sequences in LIT mode, type:

[parameter #] = [key sequence]

and wait for the timeout.

The hex equivalent appears on the terminal screen after the =. The timer starts when the = is entered and is reset after each keystroke. A timeout occurs when the **Enter Change(s):** prompt is displayed on the next line.

If no sequence is specified in LIT mode before the timeout elapses, no change is made to the existing

sequence. If no sequence is desired, use HEX mode to enter NONE.

7.7 Display Terminal Information Parameters

The parameters in the following menus define general terminal operating information. The possible values that can be specified for each Terminal Information parameter menu are discussed in the following paragraphs.

1. Device Type

Either the user-specified Device Type or the default types T(n) may be used. A Device Type can be 1 to 6 letters and/or digits starting with a letter. The following restrictions also apply:

Current Values for Terminal Info (T5 = T5):

1. Device Type	T5
2. Device Class	DSPLY
3. Number of Rows	24
4. Number of Columns	80
5. Physical Flow Control (Pin No.)	NONE
6. Device Ready Signal (Pin No.)	20
7. Logical Flow Control	X-ON
8. Fold Lower Case In Key Sequences	Y
9. Write In Last Screen Position	Y

Enter Change(s):

1. The same Device Type may not be specified for two or more user-specified terminal modules.
2. The Device Type for any user-specified terminal module may not be an abbreviation for another.
3. The Device Type may not be NONE or HCOPI.
4. The Device Type chosen may be the same as a built-in module. The user-specified terminal type takes precedence. Also, if the new Device Type is an abbreviation of a built-in module it takes precedence.

The operator-specified Device Type can be used anywhere that a built-in Device Type can be used, such as in response to prompts or in configuration menus. If a Device Type for a built-in terminal is specified in a Port Configuration menu and a new module is configured with the same Device Type, the user-specified version is the default at the next connect.

2. Device Class

At the present time the only device classes are DSPLY and HCOPIY. The device class cannot be changed.

3. Number Of Rows

Display Terminals: Any value from 12 to 43 may be entered. The recommended value is 24, even if your terminal has a 25th line.

Hardcopy Terminals: This value should be 27.

4. Number of Columns

Any integer value between 40 and 132 may be entered. The recommended values are 80 or 132.

5. Physical Flow Control (PIN NO.)

Valid values are 4 and NONE. NONE is recommended.

6. Device Ready Signal (PIN NO.)

Valid values are 20 and NONE. 20 is recommended.

7. Logical Flow Control

Valid values are X-ON and NONE. If your terminal support X-ON/X-OFF flow control, then X-ON is recommended. Otherwise, specify NONE.

8. Fold Lower Case In Key Sequence

If any key sequence controls a lower-case letter, specify N. If you want key sequences with lower- case letters to be interpreted as upper case in key sequences, specify Y. This is useful if PF keys are emulated by an ESC character followed by a letter, because it is not necessary to shift case. If your terminal has extra function keys that are being used for PF keys, specify N.

9. Write In Last Screen Position

Display Terminals: If you cannot turn off scrolling on your terminal, specify N. The lower right-hand character position on your screen is never written into by the LinkUp 3174. If you can turn off scrolling, do so and specify Y.

Hardcopy Terminals: Has no effect.

10. Intensified Fields

Display Terminals: If your terminal supports dual intensity or colon, specify Y. Otherwise, specify N.

Hardcopy Terminals: Has no effect.

11. Field Oriented Attributes

Display Terminals: Specify Y if, when the intensity

Current Values for Terminal Info (T5 . TS):

10. Intensified Fields	N
11. Field Oriented Attributes	N
12. Support Non-Display Fields	N
13. Status Line	N
14. Auxiliary Printer Port	Y
15. Aux. Printer Port Is Transparent	Y
16. Pass Carriage Control	N
17. Space Compression	Y
18. Maximum Key Sequence Length	2

Enter Change(s):

sequence is received, your terminal is designed to change the intensity of all characters in a field without rewriting the characters in that field, and if an attribute takes up one position on the screen.

If your terminal does not use one screen position for an attribute, or your terminal is character-oriented, specify N. If N is specified, the LinkUp 3174 occasionally rewrites part of a screen after a host write in order to correct the intensity attribute.

If you are in doubt, try Y first. If fields are not in the correct columns change to N. Refer also to Section 7.8.

Hardcopy Terminals: Specify N.

12. Support Non-Display Fields

Display Terminals: Specify Y if the terminal used is field-oriented, such as the WYSE or Viewpoint/60. These terminals recognize non-display sequences.

Hardcopy Terminals: Specify N.

13. Status Line

Display Terminals: Specify Y if your terminal has a separate status line. N causes the status line to show on the last line of the display. For more information, refer to the description of the Status Line in Appendix D.

Hardcopy Terminals: Specify N.

14. Auxiliary Printer Port

Display Terminals: If your terminal has a printer port that can be used to support an auxiliary printer, specify Y. Be sure to specify [SELECT AUX. PRINTER] and [DESELECT AUX. PRINTER] function sequences. Otherwise, specify N.

Hardcopy Terminals: Specify N.

15. AUX Printer Port Is Transparent

Display Terminals: Specify N if Auxiliary Printer Port is optioned N. Otherwise, if data written to the printer port does not affect the screen, specify Y. Otherwise, specify N and the LinkUp 3174 refreshes the screen after writing to an Aux Printer. Some terminals support both transparent and non-transparent printer ports depending on the [INITIALIZE TERMINAL] sequence or the [SELECT AUX PRINTER] sequence. This parameter and these sequences must all be set correctly to achieve the desired results. It may be necessary to try several combinations.

Read the terminal manual carefully. The word Transparent might not be used to refer to the printer port or might be used for an unrelated function.

Hardcopy Terminals: Specify N.

16. Pass Carriage Control

This feature allows carriage-control characters to be used as record delimiters in computer-to-computer transfers.

Display Terminals: If Y is specified, the following translation of carriage-control characters is performed for data sent by the host to a Display Logical Unit.

EBCDIC	Hex	ASCII	Hex
New Line	15	Line Feed	0A
Form Feed	0C	Form Feed	0C
Carriage Return	0D	Carriage Return	0D

If N is specified, the EBCDIC characters are translated to spaces.

Hardcopy Terminals: Specify N.

17. Space Compression

Display Terminals: If Y is specified, the LinkUp 3174 converts more than three contiguous spaces to a cursor movement sequence when in session with the host. This minimizes the number of characters that must be sent to a terminal. This is particularly useful when using a low baud rate. In most cases, specify Y. Terminal modules for computer-to-computer data transfer may require all space characters. In this case, specify N.

Hardcopy Terminals: Specify N.

18. Maximum Key Sequence Length

This parameter is necessary to delete all alternate key sequences in the base terminal module. Set this parameter to 7. This parameter is set by the software if necessary before storing the terminal module. Most operators need not set this parameter. Valid values are 2 through 7.

7.8 Function Sequence Menus

These menus are used to define the sequences that the LinkUp 3174 sends to the terminal.

Refer also to Section 7.3 of this manual for further information on entry of function sequences.

The following restrictions apply to function sequences:

1. A function sequence may consist of up to 240 keystrokes or 450 bytes.
2. The first byte of a function sequence may not be a displayable character or a null character. Therefore, the first byte of a function sequence must have a hex value between 01 and IF or 7F, or be one of the Special Commands listed below. NONE is also a valid value.

Special commands used in Function Sequences are listed below:

- **NO** — No Operation. Can be used as the first value in a function sequence if the sequence would otherwise start with a printing character of a null.
- **EM** — Empty. Causes a wait until the output buffer is empty. This function sequence command should be used before WT in order to make WT effective.
- **WT (n)** — Wait. Causes a wait of between [(n-1)*10] and (n*10) ms, where "n" is less than or equal to 7F. For longer waits use more than one WT (n) function sequence command. The first WT must be used after EM to have the desired result.
- **ST** — Status Line. Causes the status line to be sent to the terminal.
- **SQS** — Sequence Start. Used to indicate the start of an uninterruptible sequence.
- **SQE** — Sequence End. Used to indicate the end of an uninterruptible sequence.
- **IGE** — Ignore Echoplex. All values in a function sequence after this command is sent out independently of the setting for Echoplex Enable.

Current Values for Function Sequences 1 -12 (T5 = T5):

1. Startof Screen	1E
2. Forward One Position	0C
3. Back One Position	08
4. Up One Line	0B
5. Down One Line	0A
6. Clear Screen	1A
7. Cursor Positioning	1B 3D RS CS
8. Set Unprotected Standard Intensity	NONE
9. Set Unprotected High Intensity	NONE
10. Set Protected Standalone Intensity	NONE
11. Set Protected High Intensity	NONE
12. Set Non-Display	NONE

Enter Change(s):

1. Start Of Screen

This sequence puts the cursor in the home position (upper left-hand corner).

2. Forward One Position

This sequence moves the cursor to the right one position without destroying any characters.

3. Back One Position

This sequence moves the cursor to the left one position without destroying any characters.

4. Up One Line

This sequence moves the cursor up one row without changing columns and without destroying any characters.

5. Down One Line

This sequence moves the cursor down one row without changing columns and without destroying any characters.

6. Clear Screen

Display Terminals: This sequence clears the screen and leaves the cursor in the home position. Some terminals do not have a separate clear screen sequence. It is necessary to use the terminal's [HOME] sequence followed by the terminal's [ERASE TO END OF SCREEN] key sequence.

Hardcopy Terminals: We use <CR><LF> for PAPER. The operator may specify form feed (if supported by the terminal) or multiple line feeds.

7. Cursor Positioning

This sequence moves the cursor to a specific row and column on the screen. Many terminals use a sequence that consists of lead-in characters followed by a value for row and then a value for column. Some terminals send column before row and some have characters between column and row and/or trailing characters. There are also different row and column numbering schemes. The LinkUp 3174 supports nine types of numbering schemes. The numbering scheme is specified in the cursor-positioning sequence by using the following function-sequence commands as part of the cursor-positioning sequence:

- **R0** — Rows numbered from 0 in hex.
- **R1** — Rows numbered from 1 in hex.
- **RS** — Rows numbered starting with the space character (20 hex).
- **RD0** — Rows numbered from 0 in decimal.
- **RD1** — Rows numbered from 1 in decimal.
- **RN0** — Two bytes are sent for row. The bytes are calculated by taking each nibble of the hex value of row number (starting from 0) and adding 30H to it.
- **RA1** — Represents the row number by a two-byte sequence (each byte starting at 40H).
Example: Row 2-40 42; Row 24-41 48
- **XTK** — The row number is converted to a positioning sequence appropriate for a Tektronix 4014.
- **C0** — Columns numbered from 0 in hex.
- **C1** — Columns numbered from 1 in hex.
- **CS** — Columns numbered starting with the space character (20 hex).
- **CD0** — Columns numbered from 0 in decimal.
- **CD1** — Columns numbered from 1 in decimal.
- **CN0** — Two bytes are sent for column. The bytes are calculated by taking each nibble of the hex value of column number (starting from 0) and adding 30H to it.

- **CAI** — Represents the column number by a two-byte sequence (each byte starting at 40H).
Example: COL 1-40 41; COL 80-45 50.
- **YTK** — The column number is converted to a positioning sequence appropriate for a Tektronix 4014.
- **MV51** — Extended IBM 3151 cursor positioning. The bytes are calculated by taking the first 3 bits of row (starting from 0) and adding 20H to it; taking the last 5 bits of row and adding 20H to it; taking the first 3 bits of column and adding 20H to it; taking the last 5 bits of column and adding 40H to it.

A terminal may have several numbering schemes. The numbering scheme you use must be one of the nine provided. It may be necessary to select the numbering scheme in the [INITIALIZE TERMINAL] sequence. The following examples are given to help clarify the explanation of cursor-positioning sequences.

Example 1: Lear Siegler® ADM3A Cursor Positioning Sequence — 1B 3D RS CS

Example 2: Microterm ACT-5A Cursor Positioning Sequence — 14 R0 C0

Example 3: Hazeltine® 1500 Curosr Positioning Sequence — 7E 11 C0 R0

Example 4: Soroc™ Challenger 530 Curosr Positioning Sequence — 1B 3D R1 C1

Example 5: DEC VT100™ Cursor Positioning Sequence — 1B 5B RD1 3B CD1 48

Example 6: Hewlett-Packard® HP®-125 Cursor Positioning Sequence — 1B 26 61 CD0 63 RD0 52

Example 7: Data General 450 Cursor Positioning Sequence — 1E 46 50 CA0 RA0

Example 8: Tektronix® 4014 Cursor Positioning Sequence — 1D YTK XTK 1F

8. Set Unprotected Standard Intensity

This sets the intensity for an unprotected normal-intensity field. If you specified N for Intensified Fields, specify NONE for this parameter. For a color terminal, the sequence that makes the terminal switch to GREEN is suggested. Otherwise, for a dual-intensity terminal, specify the sequence that switches the display to low intensity.

9. Set Unprotected High Intensity

This sequence sets intensity for an unprotected, intensified field. If you specified N for Intensified Fields, specify NONE for this parameter. For a color terminal, the sequence that makes the terminal switch to RED is suggested. Otherwise, for a dual-intensity terminal, specify the sequence that switches the display to high intensity.

10. Set Protected Standard Intensity

This sequence is used to set intensity for a protected, normal-intensity field. If you specified N for Intensified Fields, specify NONE for this parameter. For a color terminal, the sequence that makes the terminal switch to BLUE is suggested. Otherwise, specify the same sequence as specified for **Set Unprotected Standard Intensity**.

11. Set Protected High Intensity

This sequence sets intensity for a protected, high-intensity field. If you specified N for Intensified Fields, specify NONE for this parameter. For a color terminal, the sequence that makes the terminal switch to WHITE is suggested. Otherwise, specify the same sequence as specified for **Set Unprotected High Intensity**.

12. Set Non-Display

This sequence identifies data which should not be displayed. This works in conjunction with the support Non-Display Fields Option (Terminal Information Parameter 12). Refer to Section 7.7 for additional information.

Current Values for Function Sequences 13 - 24 (T5 = T5):

13. De-Initialize Terminal	0E EM WT 03
14. Initialize Terminal	0E 1A EM WT 03
15. Select Large Screen	NONE
16. Select Small Screen	NONE
17. Sound Bell	07
18. Keyboard Lock	NONE
19. Keyboard Unlock	NONE
20. Select Auxiliary Printer	NONE
21. Deselect Auxiliary Printer	NONE
22. Local Device Print	NONE
23. Attribute Position Display	20
24. Status Line Display	1B 3D 37 20 ST

Enter Change(s):

13. Deinitialize Terminal

This sequence is sent to the terminal when leaving a session and going back to Connect. This can be used to reset options set by the [INITIALIZE TERMINAL] sequence.

It may be necessary to generate a delay at the end of this sequence, especially if the terminal does a power-on/reset as a result of the deinitialization sequence. To generate a delay, specify EM WT (n) where “n” is the wait time in 10-ms increments and is a value between 1 and 7F hex. The wait generated may be as much as 10 ms less than specified, so always use 10 ms more than absolutely required. If larger delays are required, repeat WT (n) in the sequence until the required delay is achieved. The EM function sequence command is necessary to ensure that the output buffer is empty before starting the timed wait.

14. Initialize Terminal

The terminal-initialization sequence is usually the longest and most involved function sequence. Because of the large variety of features provided in terminals, it is impractical to give a step-by-step procedure for specifying an initialization sequence.

The following list contains some of the features that may be controlled by the initialization sequence. Some of these features may be switch-controlled on your terminal, some may be the defaults when power is turned on, and some may not exist on your terminal.

- **Online** — See Notes 1, 5
- **Full Duplex** — See Notes 1, 4
- **Keyboard Unlock** — See Notes 3, 5
- **Monitor Mode Off** — See Note 3
- **Cursor Selection** — See Note 4
- **Absolute Cursor Addressing** — See Notes 1, 3
- **Scrolling Off** — See Note 4
- **Auto-Wrap Off** — See Note 4
- **Set Number of Columns** — See Note 4
- **Status Line Initially On or Off** — See Note 3
- **Reset Graphics Mode** — See Note 3
- **Character Set** — See Note 4
- **Video Enable** — See Notes 3, 5
- **Clear Screen or Home + Erase to End of Screen** — See Note 1
- **Set Reduced Intensity** — See Note 2
- **Set Programmable Function Keys** — See Note 4
- **Soft Key Legends** — See Note 4
- **Enter ANSI Mode** — See Note 4
- **Enter Alt. Keypad Mode** — See Note 4
- **Enter Numeric Keypad Mode** — See Note 4
- **Reset Extension Port** — See Note 3
- **Enable Transparent Extension Port** — See Note 4

NOTES:

1. Required
2. Suggested
3. May be the default when power is turned on
4. May be switch selectable a part of the terminal's Setup Mode if it has one
5. Feature which, if not set properly, may make it appear as if the terminal is not working

15. Select Large Screen

This is the sequence sent by the LinkUp 3174 to the terminal to select 132-column mode. This also requires that you specify 132 for Number of Columns in the Terminal Information Menu. See Section 7.7. Most users specify NONE, because most terminals do not have an alternate size capability.

16. Select Small Screen

If you specified NONE for Select Large Screen, specify NONE for this parameter. Otherwise, specify the sequence that switches your terminal to 80-column mode.

17. Sound Bell

This function sequence causes the terminal to beep when the host indicates sound alarm in the write-control code.

18. Keyboard Lock

This sequence physically locks the keyboard. Most users specify NONE for this parameter. If you are modifying the IBM PC terminal module and intend to use the file-transfer program, do not change this sequence.

19. Keyboard Unlock

This sequence unlocks the keyboard. If you specified NONE for Keyboard Lock, specify NONE for this parameter. If you are modifying the IBM PC terminal module and intend to use the file-transfer program, do not change this sequence.

20. Select Auxiliary Printer

This sequence causes a terminal to send subsequent characters to the auxiliary port until it receives the [DESELECT AUX PRINTER] sequence. If you specified N for Auxiliary Printer Port, specify NONE here. Otherwise, find the sequence that enables the port by referring to your terminal's manual. If there is more than one sequence, the one that causes the display to be unaffected (transparent) is preferred.

Some terminals require a delay after this sequence. It is advisable to add EM WT 03 at the end of this sequence if characters are missing on your auxiliary printer after testing.

On some terminals, the auxiliary port select/deselect sequence is incorrectly sent to the auxiliary port. If you have extra characters at the

beginning of each line on your printer and the characters are the same as the characters in the select or deselect sequence, the problem may be in the design of the terminal. Contact the terminal manufacturer in this case.

21. Deselect Auxiliary Printer

This sequence causes a terminal to send subsequent output to the display only. If you specified NONE for Select Auxiliary Printer, specify NONE for this parameter also. Otherwise, find the disable aux port sequence in your terminal's manual. There may be more than one disable sequence. If so, choose the one that corresponds to the enable aux port sequence used.

Some terminals require a delay after this sequence. It is advisable to add EM WT 03 at the end of this sequence if characters are missing on your auxiliary printer after testing.

On some terminals, the auxiliary port select/deselect sequence is incorrectly sent to the auxiliary port. If you have extra characters at the beginning of each line on your printer and the characters are the same as the characters in the select or deselect sequence, the problem may be in the design of the terminal. Contact the terminal manufacturer in this case.

22. Local Device Print

This sequence causes the terminal to copy its screen directly to its auxiliary port. The LinkUp 3174 will ignore this sequence if received.

23 Attribute Position Display

This is the sequence sent by the LinkUp 3174 to take up a display position on the screen for an attribute. If you specified Y for Field Oriented Attributes (Section 7.7), specify NONE here. If your terminal is character-oriented, the LinkUp 3174 generates a space character for an attribute. To specify this, enter NO 20 for this parameter. The space character by itself cannot be entered because a function sequence is not allowed to start with a displayable character.

If you find the field intensities are correct but fields are not in the correct column, either your specification for Field Oriented Attributes or Attribute Position Display is incorrect.

24. Status Line

This sequence is sent to the terminal to address the Status Line. The ST command must be included in this sequence.

25. Start New Line (Hardcopy Only)

This sequence is used to move the print head to the beginning of the next line.

26. Print Cursor (Hardcopy Only)

This sequence is used to display the cursor for a hardcopy terminal module.

7.9 Key Sequence Menus

The menus in this section define the terminal key sequences used to perform specific functions.

The 3278 functions are listed in the menus, with the corresponding key sequences displayed to the right.

Refer also to Section 7.6 for information on the two different methods of key sequence entry, HEX and LIT.

The following restrictions apply to entry of Key Sequences:

1. A key sequence may consist of up to 7 bytes.
2. The first byte of a key sequence may not be a displayable character or a null character. Therefore, the first byte of a key sequence must have a hex value between 01 and 1F or the value 7F.
3. NONE is a valid key sequence value.
4. A key sequence should not be given to more than one function. If, however, two or more functions are assigned an identical key sequence, the first function that is listed in the five menus is the only one performed by either sequence.
5. A key sequence should not be an abbreviation for another key sequence. For example, if Reset is specified as <CTRL/A> and Backspace Cursor is specified as <CTRL/A><CTRL/B>, entering the Backspace Cursor key sequence causes the Reset key function to execute and to take the <CTRL/B> as the first byte of the next key sequence.

When using literal key-sequence entry mode with X-ON/X-OFF flow control enabled, be careful not to generate an X-OFF (<CTRL/S>). If you should do this, send an X-ON (<CTRL/Q>) from your keyboard.

When you have specified all key sequences, check each key sequence against the rest of the key sequences for duplicates or abbreviations. If you want to keep your alternate keys from a base terminal module then also compare the alternates against every other key. You will eliminate all alternate key sequences if you have at least one key sequence which has a length of 7. If you want to eliminate all alternate keys, set Terminal Information Parameter #18, Maximum Key Sequence Length, to 7.

1. Reset

This key unlocks a disabled keyboard.

Recommended Keys: <RESET>; <CTRL/R>

2. Backspace Cursor

This key moves the cursor to the left one position without destroying the contents of the new or old

Current Values for Keys 1 -13 (T5 = T5):

1. Reset	12
2. Backspace Cursor	08
3. Down Cursor	0A
4. Up Cursor	0B
5. Forward Space Cursor	0C
6. Home	1E
7. Tab	14
8. Backtab	02
9. Delete	7F
10. NewLine	0E
11. Duplicate	04
12. Field Mark	06
13. Insert Mode	15

Key Specification Format - HEX

Enter Change(s):

cursor position. If the old cursor position is at the beginning of the line, the cursor displays at the end of the previous line.

Recommended Keys: < left arrow>; <CTRL/H>

Hardcopy Terminals: Specify NONE

3. Down Cursor

This key moves the cursor down one position without destroying the contents of the new or old cursor position. If the old cursor position is on the bottom line, the new cursor position will be on the top line. In any case, the cursor stays in the same column.

Recommended Keys: <down arrow>; <LINE FEED>

Hardcopy Terminals: Specify NONE.

4. Up Cursor

This key moves the cursor up one position without destroying the contents of the new or old cursor position. If the old cursor position is on the top line, the new cursor position will be on the bottom line. In any case, the cursor stays in the same column.

Recommended Keys: <up arrow>; <CTRL/K>

Hardcopy Terminals: Specify NONE.

5. Forward Space Cursor

Display Terminals: This key moves the cursor to the right one position without destroying the contents of the new or old cursor position. If the old cursor position is at the end of the title, the cursor will be displayed at the beginning of the next line.

Recommended Keys: <right arrow>; <CTRL/L>

Terminals: Specify NONE.

6.Home

This key moves the cursor to the upper leftmost unprotected character position.

Recommended Keys: <HOME>; <CTRL^>

7. Tab

This key moves the cursor to the first character location of the next unprotected field. Beware of terminals with a <TAB> key that generates a local tab. Using this key does not give the desired result.

Recommended Keys: <TAB>;<CTRL/T>

8. Backtab

This key moves the cursor to the first character in the previous unprotected field if the cursor is on the attribute or in a protected field. If the cursor is in an unprotected field, the cursor is moved to the first character in the field. In a display with no unprotected fields, the cursor moves to the home position.

9. Delete

This key deletes the character in an unprotected field at the cursor position and shifts one character position to the left, all remaining characters to the right of the cursor and on the same line.

Recommended Keys: <DELETE>; ; <DEL CHAR>; <RUBOUT>

10. New Line

This key moves the cursor to the first unprotected location on the next line. Ensure that this key is not also used as the <Enter> key.

Recommended Keys: <Return>; <NEWLINE>; <NL>; <LINE FEED>; <LF>; <CTRL/N>

11. Duplicate

This key provides a means of informing a host application program that a duplicate operation is indicated for the current field.

Recommended Keys: <CTRL/D>; <DUP>

12. Field Mark

This key is used to inform a host application program of the end of a field in an unformatted buffer or subfield in a formatted buffer.

Recommended Keys: <CTRL/F>; [FIELD MARK]

13. Insert Mode

This key places the keyboard in the insert mode of operation.

Recommended Keys: <a>; <INSERT>; <INSERT CHAR>; <CTRL/U>

14 Erase To End of Field

This key clears the character location occupied by the cursor and all remaining character locations to the right in the field if the cursor is within an unprotected field.

Recommended Keys: <ERASE EOF>; <CTRL/E>

15. Erase Input

This key clears all unprotected character locations to nulls.

Recommended Keys: <ERASE INPUT>; <CTRL/F>

Current Values for Keys 14 - 26 (T5 = T5):

14. Erase to End Of Field	05
15. Erase Input	18
16. Enter	0D
17. Clear	1B 5E
18. System Request	1B 3F
19. PF1	1B 31
20. PF2	1B 32
21. PF3	1B 33
22. PF4	1B 34
23. PF5	1B 35
24. PF6	1B 36
25. PF7	1B 37
26. PF8	1B 38

Key Specification Format = HEX

Enter Change(s):

16. Enter

This key generates an attention request to the host to allow transmission of data. You might have both an <Enter> key and a <Return> key. If both generate the same key sequence make sure that you do not use either one for any other key sequence.

Recommended Keys: <Enter>; <Return>

17. Clear

This key generates an attention request to the host, causes the entire display buffer to be cleared and moves the cursor to the home position.

Recommended Keys: <CLEAR>; [ESC ^]

18. Sys Request

This key switches between SSCP-LU session and LU-LU session.

Recommended Keys: <SYS REQ>; [ESC ?]

PF1 through PF24

These keys generate unique host attention requests accompanied by data transfer. If your terminal has keys labeled <PFn>, then use these keys. Otherwise, if your terminal has function keys labeled <Fn>, you might want to use these. It may be necessary to use a <SHIFT> key along with the keys to generate enough unique key sequences.

If your terminal has a very limited number of keys, it is recommended that you use ESCAPE sequences based on the first two-and-one-half rows of alphanumeric keys as follows as used for ADM3A:

row 1	(I-O)	PF1- PF10
row 2	(Q-P)	PF11 - PF20
row 3	(A-F)	PF21-PF24

You must make sure that any sequence used for a PF key is not used for any other key sequence. If you do not want to use all the PF keys, specify NONE for each one that is not required.

Recommended Keys: <PFn>; <Fn>; [ESC SEQ] **43.-45. PA1, PA2 and PA3**

These keys generate host attention requests with no data transfer. If you have a limited number of keys, you can use ESCAPE sequences. Make sure that you are not using a key sequence more than once.

Recommended Keys: <PAn>; [ESC SEQ]

46. Print

This key is used by the LinkUp 3174 to initiate a local copy print. Be sure not to use a key that also happens to be a local function key for the terminal. Recommended Keys: <PRINT>; <CTRL/P>

47. Cursor Select

Display Terminals: This key allows the selector-light-pn function to be performed from the keyboard.

Current Values for Keys 27-39

27. PF9	1B 39
28. PF10	1B 30
29. PF11	1B 51
30. PF12	1B 57
31. PF13	1B 45
32. PF14	1B 52
33. PF15	1B 54
34. PF16	1B 59
35. PF17	1B 55
36. PF18	1B 49
37. PF19	1B 4F
38. PF20	1B 50
39. PF21	1B 41

Key Specification Format = HEX

Enter Change(s):

This is not currently supported in BSC.

Current Values for Keys 40-52 (T5 = T5):

40. PF22	1B 53
41. PF23	1B 44
42. PF24	1B 46
43. PA1	1B 5A
44. PA2	1B 58
45. PA3	1B 43
46. Print	10
47. Cursor Select	03
48. Attention	1B 5C
49. Device Cancel	1B 5D
50. Ident	1B 3A
51. Test	1B 3B
52. Fast Forward Space	NONE

Key Specification Format = HEX

Enter Change(s):

Recommended Keys: <CURS SEL>; <CTRL/C>

Hardcopy Terminals: Specify NONE

48. Attention

This key sends a Signal command to the host.

Recommended Keys: <ATTN>; [ESC \]

49. Device Cancel

This key cancels a LinkUp 3174 local copy print.

Recommended Keys: <DEV CNCL>; [ESC]]
(ESC key followed by right square bracket.)

50. Ident

This key is not supported by the LinkUp 3174.

Specify NONE.

51. Test

This key initiates an operator-generated Netview Alert.

Recommended Key [ESC N]

52. Fast Forwardspace

Display Terminals: This key moves the cursor to the right two columns along with any necessary line or screen wrap.

Recommended keys <—>>>

Hardcopy Terminals: Specify NONE.

53. Fast Backspace

Display Terminals: This key moves the cursor to the left two columns along with any necessary line or screen wrap.

Recommended Keys <<<—>

Hardcopy Terminals: Specify NONE.

54. Numeric Override Key

This is a special LinkUp 3174 function that allows a terminal operator to key any alphanumeric or special character into a field whose attribute is numeric only.

Recommended Key: [ESC [] (ESC key followed by left square bracket)

55. Refresh Screen

This is a special LinkUp 3174 function that allows the operator to redisplay the contents of the LinkUp 3174 screen buffer.

Hardcopy Terminals: This key causes the LinkUp 3174 screen buffer to be printed regardless of the state of the Screen Print Switch.

Recommended Key: <CTRL/W>

Current Values for Keys 53 - 64(T5 = T5):

53. Fast Backspace	NONE
54. Numeric Override	1B SB
55. Refresh Screen	17
56. Initialize Terminal	1B 3C
57. Display Status Line	1B 5F
58. Screen Dump	NONE
59. Local Copy Form Feed	1B 7C
60. Request Disconnect	1B 7E
61. Generate Attribute	07
62. View Attribute	16
63. Page Up/Down Toggle	1B 3B
64. Echoplex Toggle Enable	1B 3B

Key Specification Format - HEX

Enter Change(s):

56. Initialize Terminal

This is a special LinkUp 3174 function which causes the terminal to exit from 3270 emulation mode and reinitialize. This is the only way of performing a proper logoff from the LinkUp 3174. The LinkUp 3174 may or may not send a Forced Logoff message, depending on the state of the session. Refer to Section 2.4 for further information on Forced Logoff.

Recommended Key: [ESC <]

57. Display Status Line

This key toggles display of the Status Line.
Recommended Key: [ESC_]

58. Screen Dump

This key causes the Local Device Print function sequence to be sent to this display.

Recommended Key: NONE. Consult your terminal operator's manual to see if this function is available on your terminal.

59. Local Printer Form Feed

This is a special LinkUp 3174 function that allows a terminal operator to send a Form Feed to the local copy printer, if one is assigned.

Recommended Key: [ESC |]

60. Request Disconnect

This is a special function that causes the LinkUp 3174 to send a [DEINITIALIZE TERMINAL] sequence to the terminal and then to drop Data Terminal Ready (DTR) if in DTE mode or Data Set Ready (DSR) if in DCE mode.

Recommended Key: [ESC ~]

61. Generate Attribute

This is a special LinkUp 3174 function that may be used to insert an attribute at any position on the screen in order to experiment with screen-layout design and testing. For more information see Chapter 10.

Recommended Key: <CTRL/G>; [NONE]

62. View Attributes

This is a special LinkUp 3174 function that causes all attribute characters to be displayed on the screen at any time in order to allow the operator to view information regarding screen layout. This requires a <RESET> key sequence to exit. For more information see Chapter 10.

Recommended Key: <CTRL/V>

63. Page Up/Down Toggle

This key sequence is used to page between the upper and lower portions of Model 3, 4, and 5 screens. Recommended Key: [ESC >]

64. Echoplex Toggle Enable

This key is used to control character echo by the LinkUp 3174.

Recommended Key: [ESC ;]

NOTE

The following functions are for hardcopy terminals only. See Chapter 8 for further information on hardcopy support.

Suppress Blank Lines Switch

Hardcopy Terminals: This key provides a special toggle function that prevents paper waste during screen printing or field refresh by eliminating all lines that contain no printable data.

Recommended Key: <CTRL/J>

Clear Buffer After TX Switch

Hardcopy Terminals: This key provides a special toggle function that is useful in interactive environments because it prevents repetitive printing of previously received data by clearing the LU device buffer immediately after data has been transmitted to the host.

Recommended Key: <CTRL/K>

CAUTION

The above option should never be used with FORMATTED screens, it could erase data required by the host.

Rubout

Hardcopy Terminals: This key deletes the character preceding the current print-head position. Typically, this is the last character typed in.

Recommended Keys: <RUBOUT>; ; [ESC]

Screen Print Switch

Hardcopy Terminals: This key is a special toggle function that causes the contents of the LinkUp 3174 screen buffer not to be printed or to be printed after completion of a write command that contains the keyboard restore flag set.

Recommended Key: <CTRL/U>

Erase Field

Hardcopy Terminals: If the cursor is located in an unprotected field⁴ this key deletes the entire field contents.

Recommended Key: <CTRL/E>

Local Device Print

Hardcopy Terminals: This key performs no function at this time. Specify NONE.

Field ID Switch

Hardcopy Terminals: This key is a special toggle function that determines if field ID numbers are to be printed.

Recommended Key: <CTRL/G>

Refresh “Paper” Field

Hardcopy Terminals: This key is a special function that causes the field in which the cursor is presently located to be printed.

Recommended Key: <CTRL/V>

8. Support For Hardcopy Terminals

The PAPER/3278 Feature permits the use of hardcopy terminals with the LinkUp 3174. Supported hardcopy terminals include the Texas Instruments® 700 and 800, the Teletype Model 33, and the DECwriter™.

The PAPER/3278 Feature provides a limited emulation of the IBM 3278 Display Station. It is well suited for simple interactive inquiry/response or list display applications. By using special keyboard functions, formatted data applications may also be displayed.

8.1 Keyboard Functions

Because the PAPER/3278 Feature is a limited emulation, some keyboard functions of the 3278 Display Station are not supported. Those functions which require a CRT Screen, such as cursor-movement keys or the Insert Mode, are not supported.

Other keyboard functions must be implemented differently for the PAPER/3278 terminal than for display terminals. For example, the <DELETE> key on a display terminal causes the character at the cursor to be deleted and the remaining characters on the rest of the line to shift one character to the left to fill the deleted position. This operation is not possible on hardcopy terminals. In contrast, the PAPER/3278 <RUBOUT> key effectively causes deletion of the character preceding the print head position.

The following keyboard functions are not supported in PAPER/3278:

- Cursor Movement Keys (right, left, up, and down)
- Insert Mode Key
- Cursor Select
- Generate and View Attributes

The remaining keyboard functions are grouped into three categories:

- **Standard Functions** - functions that closely resemble CRT terminal operation.
- **Non-Standard Functions** - functions that must be implemented differently than CRT display terminals.
- **Special Functions** - functions that allow the user to control the data presentation formats.

8.1.1 STANDARD FUNCTIONS

The following are standard PAPER/3278 keyboard functions:

Tab	Backtab
Erase Input	Print
Enter	Field Mark
Clear	Device Cancel
Screen Refresh	Numeric Override
Reset	System Request
Home	PA1 through PA3
New Line	PFI through PF24
Duplicate	Initialize Terminal
Request Disconnect	Form Feed

Not all of these functions are detailed in this section. The following descriptions apply to the PAPER/3278 implementations specifically.

- **TAB** — The tabbing function on a CRT screen results in the cursor moving from one field to the next on a formatted screen. When using PAPER/3278, tabbing causes the next field ID (and up to 12 characters of data, if present) to be printed, as indicated in the sample printout below.


```

3: This is new text <TAB>
4: <TAB>
1: Existing text...
```

- **ERASE INPUT** — <ERASE INPUT> results in all unprotected fields being erased and the cursor being logically moved to the Home position of the screen. This action is indicated by a printed LinkUp 3174 message.

3: Old Data <ERASE INPUT>
 INPUT ERASED

- **RESET** — The <RESET> function unlocks the keyboard and repositions the print head to the beginning of the next line. For example, if an alpha character is entered where only a numeric character is allowed, the keyboard will lock and a LinkUp 3174 message will be printed to indicate the condition. To recover from this condition use the <RESET> function.

4: 123[A] The [A] is not printed but causes the keyboard to lock.
 KEYBOARD LOCKED <RESET>

8.1.2 NON-STANDARD FUNCTIONS

Certain keyboard functions available on CRT display terminals cannot be implemented in the same fashion using PAPER/3278. The two keyboard functions that have alternate implementations are listed below:

For CRT Display	For Paper/3278
Delete	Rubout
Erase to End of Field	Erase Field

- **RUBOUT** — If the <RUBOUT> key is pressed once, the preceding character is deleted from the screen buffer. This is indicated by the print head executing a Line Feed and backspace as indicated below:

4: This is a finq<RUBOUT>

Additional <RUBOUT> commands delete characters one at a time moving to the left.

4: This is a line feed<RUBOUT> is pressed four times.

- **ERASE FIELD** — If the cursor is in an unprotected field, the <ERASE FIELD> function deletes the entire field contents.

4: This is a line feed<ERASE FIELD>

8.1.3 SPECIAL FUNCTIONS

Five special keyboard functions are provided with PAPER/3278 to allow the user to control the data-presentation format. They are:

- Screen Print Switch
- Field ID Switch
- Suppress Blank Lines Switch
- Clear Buffer after TX Switch
- Field Refresh

These functions are interactive to each other and produce different results depending on whether formatted or unformatted data is being sent from the host. Formatted and unformatted data presentations are described in Section 8.2.

The key sequences associated with the first four of these functions are toggles. Depressing the key once turns a feature on, a second time turns the feature off. The defaults are not configurable. Field Refresh is unique to hardcopy devices.

- **SCREEN PRINT SWITCH** — Generally, for formatted output applications, it is useful to view an entire screen at one time. This is a familiar situation on CRT terminals. The operator can advance from one input field to the next using the <TAB> key. On hardcopy terminals, viewing this kind of screen information requires an alternate implementation. The Screen Print Switch governs whether or not the contents of a complete screen are printed on the hardcopy terminal. With this switch set ON a complete display screen is printed before the user is permitted to make entries. Examples of this feature are illustrated in Figures 8-1 and 8-2.

The default setting for this function is ON.

The key sequence for this function is <CTRL/U>.

- **FIELD ID SWITCH** — The Field ID Switch is provided to assist in the identification of unprotected field locations in formatted data applications. If this feature is OFF, formatted screen printout appears much like it does on actual CRT terminals. Compare Figure 8-2, Field ID ON, to Figure 8-1, Field ID OFF, to decide which is more useful.

The default setting for this function is OFF.

The key sequence for this function is <CTRL/G>.

- **SUPPRESS BLANK LINES SWITCH** — Suppress Blank Lines is a paper-saving feature. When it is turned ON, blank lines do not print during screen printing and screen refresh.

The default for this function is ON.

The key sequence for this function is <CTRL/J>.

- **CLEAR BUFFER AFTER TX SWITCH** — This feature is useful in interactive environments because it prevents repetitive printing of previously received screen data. This is done by clearing the device buffer immediately after data has been transmitted to the host. Because this operation removes all data and attributes, this function should be used with caution. It should be turned OFF for normal 3270 applications that require field definitions to remain intact during interactions with the host. Otherwise, application errors can occur.

The default for this function is OFF.

The key sequence for this function is <CTRL/K>.

- **FIELD REFRESH** — The Field Refresh function provides a method of reprinting only the field containing the cursor. This allows for a quick collection if the field has been confused by RUBOUTs.

The key sequence for this function is <CTRL/V>.

8.2 Data Presentation

Input Data

During keyboard input, the print head will wrap to the next line automatically after it reaches the end of the defined line length (either 80 or 132 characters). In formatted-buffer situations the print head also indents four spaces at the beginning of each new line.

Output Data

The manner in which output data is displayed using PAPER/3278 depends on whether the host sends formatted or unformatted data. If the host sends formatted data, it includes attribute characters in the data stream defining which fields are protected and which are unprotected. Protected fields are fields which cannot be changed. Alternately, unprotected fields are open to the operator for entries or changes.

Formatted Data

The printout of formatted data may appear in one of two ways, as illustrated in Figures 8-1 and 8-2. With the Field ID Switch turned ON, the LinkUp 3174 provides numeric IDs for unprotected input fields on alternate lines of the output (Figure 8-1). If Field ID is disabled, the same display screen will appear like the one illustrated in Figure 8-2.

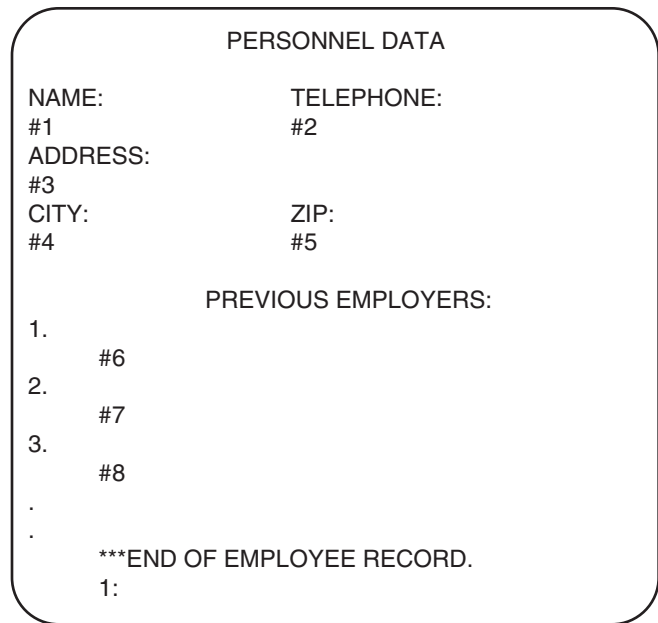


Figure 8-1. Formatted Screen Printout — With Field Identifiers.

```

                PERSONNEL DATA
NAME:           TELEPHONE:
ADDRESS:
CITY:           ZIP:

                PREVIOUS EMPLOYERS:
1.
2.
3.
.
.
***END OF EMPLOYEE RECORD.
1:

```

Figure 8-2. Formatted Screen Printout—With No Field Identifiers.

Unformatted Output

Unformatted output is typically used for simple interactive inquiry/response or list-display applications. In this case, the Field ID Switch has no function. The printout at completion of a host write command does not include trailing blank lines.

If the cursor is located following the last printable character in the screen buffer (on CRT display), the print head will also be positioned at this location on hardcopy printout. For example:

```
ENTER PART NUMBER:_
```

However, if more data follows the cursor position, the print head is located on the line following the end of the data. For example:

```
ENTER PART NUMBER:_ (NOT TO EXCEED 10
DIGITS)
```

```
—
```

9. Support for Special Output Devices

The LinkUp 3174 is designed to support specialized devices which are not normally found in a 3270 environment. For example:

- Micro, mini, and instrumentation computers used in any mode other than terminal emulation
- Printers with downloadable fonts control
- Graphic displays and plotters
- Paper tape punches
- PROM burners, etc.

These devices must receive ASCII control codes in order to perform correctly. The standard EBCDIC character set, however, does not include any means of passing these control codes to an asynchronous device.

The LinkUp 3174 supports two methods of transparent transfer of all ASCII codes, in the form of unformatted ASCII data, to and from the host computer. These two methods are described in Sections 9.1 and 9.2. The data is wrapped or enveloped in SNA protocol and transmitted without disturbing the existing host software support. For instance, many printers require an escape (ESC) character which is in the control code range. The techniques described in the following sections can be used to transmit the ESC code and other ASCII characters to the printer.

For users who wish to provide communications between IBM host computers and either micro, mini or instrumentation computers, the LinkUp 3174 offers a special terminal driver called COMPU. Computer-to-Computer applications using the COMPU driver are described in Section 9.3.

9.1 Pseudo-Transparency

Pseudo-transparency is used for output from the host to a peripheral device, usually a printer or plotter, of all 128 ASCII characters, allowing greater control of the device. During pseudo-transparency mode, a pair of EBCDIC characters is converted to one ASCII character.

NOTE

LinkUp 3174 pseudo-transparency should not be confused with IBM SCS code 35 (35h) transparent data transfer, which is the IBM technique for sending binary data to an SCS/LU Type 1 printer.

CAUTION

LinkUp 3174 does not support pseudo-transparency for SCS printers. If these sequences are sent to an SCS printer attached to the LinkUp 3174, they will print as displayable data. SCS code 35 transparency should be used in this case.

Each ASCII character sent to the printer is converted in the application program to its hexadecimal equivalent. This allows the ASCII characters (between 00H and 7EH) to be represented in the IBM host program using the Characters 0 through 9 and A through F, which are legal EBCDIC characters. When the LinkUp 3174 receives the command to begin pseudo-transparency, each subsequent pair of characters is assumed to be a single hexadecimal value. This ASCII value is then sent by the LinkUp 3174 to the printer or other device requiring ASCII commands.

While the LinkUp 3174 is operating in pseudo-transparency mode, only the Characters 0 through 9, A through F, and EM are accepted from the host. Any other characters (except for the mode deselect character) are ignored. If an odd number of characters is received, the last character is also ignored.

Once pseudo-transparency is deselected, the LinkUp 3174 resumes normal operation and translates the EBCDIC data as before.

9.1.1 MODE SELECT AND DESELECT COMMANDS

The trigger command for selection of pseudo-transparency mode is the two-character sequence: [| -].

That is, the EBCDIC vertical bar (4F) followed by the logical not character (5F). The mode-deselect character is an EBCDIC dollar sign (5B).

The following example shows use of pseudo-transparency to output CR, LF, and X-ON (represented in hex as 0DH, 0AH, 11H). If the default trigger characters are used, the IBM program contains the text string:

```
ASCII Hex:   | - 0 D      0 A   11 $
EBCDIC Pairs: 4F 5F F0 C4 F0 C1 F1 F1 5B
```

NOTE

Spaces are shown for clarity only.

The LinkUp 3174 interprets the nine characters in the above example to be the select sequence, three hex codes, and the deselect character, respectively.

9.1.2 SPECIAL CONSIDERATIONS AND LIMITATIONS

The following special notes and considerations apply when using pseudo-transparency:

- The data transmitted between the mode select and deselect character cannot span buffers. If this occurs, LinkUp 3174 will exit pseudo transparency at the buffer boundary and print the rest of the string as data.
- The mode select characters cannot be the last two characters in a buffer sent to the printer.
- During pseudo-transparency all IBM 3270 data stream rules are bypassed. All order codes (such as NL, CR, FF, SBA, and SF) are ignored except EM. In addition, the printer column counter is not updated.

For the above reasons, UNFORMATTED printing is recommended whenever pseudo-transparency is used. The Local Copy print function acts much like a formatted print; consequently, the column alignments of the printed data do not match the column alignment on the CRT screen if pseudo-transparent strings are used in the data stream.

9.1.3 SPECIAL APPLICATIONS EXAMPLES

1. Specialty printer-control sequences are readily output by the LinkUp 3174 using the transparent data approach. Fonts (character design) for printers such as the Xerox® 2700 laser printer can be output this way.
2. Mainframe/micro link applications can use the LinkUp 3174 as a vehicle to implement the communications path.
3. A post-application processing program can be written to receive application data and expand certain character codes to include the pseudo-transparent strings appropriate for a particular printer or plotter. SAS graphics users can output plotter data to the LinkUp 3174 using JES spool facilities.
4. A sophisticated security system for dial-up terminals equipped with answerback can be implemented. First, prompt the user to enter name and password. Then output a screen with the following pseudo-transparent sequence:

```
4F SF F0 FS SB
```

This sends an ASCII 05 to the terminal. If the terminal supports answerback, it completes a nondisplay field with a unique identification code followed by the code for the Enter key. This permits positive physical identification of the terminal.

9.2 SAS Graphic Transparency

The LinkUp 3174 also supports the graphics pass-through system used by host packages such as SAS or ISSCO TELL-A-GRAF. Customers using PLOT-10 software can change the ADEIN and ADEOUT routines of PLOT-10 to use this method as well, although details of this type of modification are beyond the scope of this manual. In contrast to pseudo-transparency, SAS graphics support provides a two-way interactive method of transparent data transmission.

In this method, the host initiates the protocol by writing to the display with an EBCDIC 70H following the write control code (WCC). All data which follows is transparent and no longer follows IBM 3270 datastream rules. This provides the path for a variety of data transfers.

Host data is translated to ASCII in the host and then converted by adding 80H to all ASCII values between 00H and 7EH. Note that 7FH is not converted. This transmits data with values from 7FH to FEH down the line without interfering with SNA protocols. Carriage-return and control codes may be freely included in the data.

Once initiated, this mode remains in effect until the host issues another WRITE command without an EBCDIC 70H following the WCC.

NOTE

The LinkUp 3174 does not support SAS transparency for auxiliary printers.

9.2.1 SPECIAL CONSIDERATIONS

The following special considerations apply to use of SAS-compatible graphics support:

1. Multiple writes to the display terminal can occur. The host application program, however, should be designed either to allow time for each write to complete or to wait for an input message before starting the next write.
2. Input from the display device is assumed to be in the same format if the last write from the host used the 70H introducer code. ASCII data from 20 to 7E is transformed to EBCDIC by addition of 80H by the LinkUp 3174 prior to transmission. The ASCII device ends the block by sending a Carriage Return (ODH) to the LinkUp 3174.
3. SAS users should ensure that Byte 7 of the OPTIONS PROMPTCHARS= string (on the host) is set to 01 to indicate use of a LinkUp 3174 protocol converter. TEK4105 terminals should be specified as DEVICE=TEK410SB for earlier releases of SAS if the terminal does not properly return to ANSI mode following a graphics operation.

9.3 Computer-to-Computer Applications (COMPU)

For operators who wish to provide communications between IBM host computers and either micro, mini, or instrumentation computers, the LinkUp 3174 offers a special terminal driver called COMPU. Unlike the IBMPC driver, COMPU is not intended to support the terminal emulator package. The COMPU driver suppresses cursor addressing and all other terminal-control sequences generated by the LinkUp 3174. COMPU sends only actual outbound data from the host. If, however, the outbound data includes the EBCDIC characters Carriage Return (Hex 0D), New Line (Hex 15), or Form Feed (Hex 0C), they will be translated to ASCII and sent to the terminal:

EBCDIC	ASCII
Carriage Ret (0D)	Carriage Ret (0D)
New Line (15)	Line Feed (OA)
Form Feed (0C)	Form Feed (OC)

This differs from display terminal drivers, for which the above three codes are translated to spaces (hex 20).

The COMPU user typically configures the LinkUp 3174 port and LU parameters as not overridable in order to allow immediate entry to 3278 Emulation Mode. Other LinkUp 3174 features that are likely to be used in COMPU applications include:

- Echoplex Enable, set to N in the LU configuration. This eliminates unnecessary echoing of data.
- X-ON/X-OFF flow control, in the port configuration, to prevent either the LinkUp 3174 overrunning the computer or the computer overrunning the LinkUp 3174.
- Pseudo-transparency, to allow the operator to include application-dependent control functions in the outbound data. (See Section 9.1.)

Data sent to the IBM host should be formatted as if it was coming from a keyboard. For example, if the contents of the device buffer in the LinkUp 3174 represent an unformatted screen for a 3278 Model 2, a block of up to 1920 characters can be sent to the host. Note that the last character of an inbound block must correspond to an attention-type key function such as <Enter> or a <PF> key. This is required to cause the LinkUp 3174 to transmit the data to the host.

COMPU differs from other drivers in that it does not discard input data while in a keyboard-locked state. Instead, COMPU allows data to accumulate in an input buffer until the host unlocks the keyboard. This means that the device can send data immediately after it has sent a <CR> or <Enter>. If the LinkUp 3174 buffer fills while in this state, flow control takes effect and X-OFF is sent to the device.

Since input characters are not examined during keyboard-locked state, care should be taken to ensure that inbound data, such as an alpha character in a numeric field, does not result in a keyboard-lock condition. If this should occur, the <RESET> key sequence may not unlock the keyboard, since this data is also buffered. To prevent an irreversible keyboard-lock condition from occurring, be sure to set the Typeahead Enable option on the LU parameter menu to Y (YES) and specify a single hex byte as the Typeahead Reset character. Refer to Section 6.6 for further information.

10. Generate/View Attributes

The LinkUp 3174 provides two extensions to the 3278 keyboard functions:

- View attribute characters
- Generate and insert attribute characters

10.1 View Attribute Characters

All the attribute characters may be displayed on the screen at any time to allow the operator to view information regarding screen-layout design and testing. Attribute characters are displayed in encoded form, as shown in Table 10-1, by use of the [VIEW ATTRIBUTES] key sequence.

To restore the screen to normal display, press the <RESET> key equivalent for the specific terminal.

10.2 Generate Attribute Characters

Attribute characters may be inserted at any position on the screen in order to experiment with screen layout design and testing. From the keyboard, an operator may perform offline entry of attributes into the LinkUp 3174 screen buffer (in hex format) at the current cursor location. A single attribute character specifies the following information about the field on the screen, starting at the attribute character's location:

- Whether the field is protected or unprotected.
- Whether the field is alphanumeric or numeric.
- Whether the display intensity of the field is:
 - Standard intensity
 - High intensity
 - Non-display
- Whether or not the field is detectable.
- Whether the field has a Modified Data Tag set.

To generate and insert an attribute character at the location where the cursor is presently positioned, refer to the specific section in this manual for the desired terminal. Following the [GENERATE ATTRIBUTE] key sequence, enter the two hex digits from Table 10-1 which specify the desired attribute.

Table 10-1. Encoding to Generate and Display Field Attributes

Hex value (Generate Attribute Function)	Display-code character for View Attribute Function	Protect/ Unprotected	Alpha/ Numeric	Intensity	Detectable	Modified Data Tag Set
00	@	U	A	S	N	N
01	A	U	A	S	N	Y
04	B	U	A	S	Y	N
05	C	U	A	S	Y	Y
08	D	U	A	H	Y	N
09	E	U	A	H	Y	Y
0C	F	U	A	ND	N	N
0D	G	U	A	ND	N	Y
10	H	U	#	S	N	N
11	I	U	#	S	N	Y
14	J	U	#	S	Y	N
15	K	U	#	S	Y	Y
18	L	U	#	H	Y	N
19	M	U	#	H	Y	Y
1C	N	U	#	ND	N	N
1D	O	U	#	ND	N	Y
20	P	P	A	S	N	N
21	Q	P	A	S	N	Y
24	R	P	A	S	Y	N
25	S	P	A	S	Y	Y
28	T	P	A	H	Y	N
29	U	P	A	H	Y	Y
2C	V	P	A	ND	N	N
2D	W	P	A	ND	N	Y
30	X	P	#	S	N	N
31	Y	P	#	S	N	Y
34	Z	P	#	S	Y	N
35	[	P	#	S	Y	Y
38	\	P	#	H	Y	N
39	]	P	#	H	Y	Y
3C	^	P	#	ND	N	N
3D	_	P	#	ND	N	Y
KEY:	U=Unprotected A=Alphanumeric S=Standard ND=Non-display Y=Yes	P=Protected	#—Numeric	H=High N=No		

11. Packet Network Access Applications

Packet Network Access support allows the LinkUp 3174 to be used in X.25 and other network environments facilitating transmission of asynchronous data. The LinkUp 3174 is located between the IBM host computer and the host PAD (Packet Assembler-Disassembler) as shown in Figure 11-1. The host PAD provides the interface between the LinkUp 3174 and the X.25 network. The terminal is connected to the Packet Data Network (PDN) through the terminal PAD. The terminal can be directly cabled to the PAD or can dial into a public PAD port.

The LinkUp 3174 converts the host synchronous data into an asynchronous data stream. The host PAD bundles the asynchronous data into a packet and transmits it over the X.25 network to the terminal PAD. The terminal PAD unbundles the asynchronous packet and sends the data stream to the terminal. Conversely, the terminal's asynchronous data stream is assembled into a packet and transmitted by the terminal PAD. The host PAD receives the packet, unbundles it, and passes the asynchronous data stream to the LinkUp 3174. The LinkUp 3174 will convert the asynchronous data into a synchronous data stream and send it to the host.

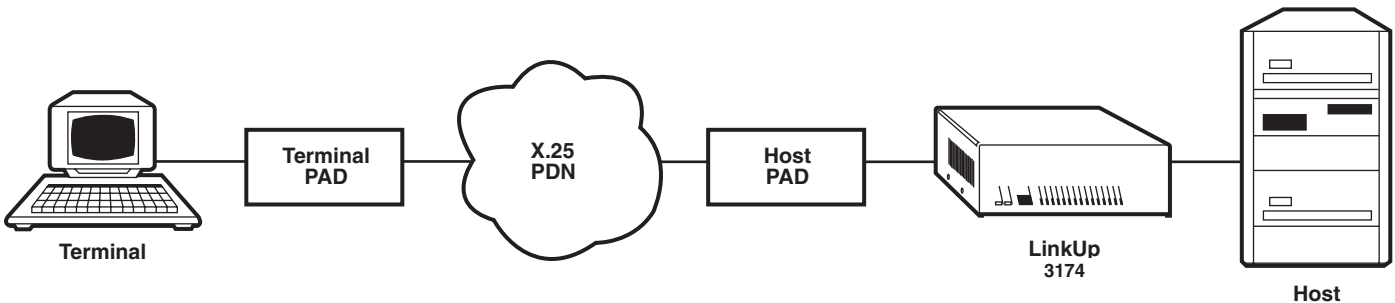


Figure 11-1. Packet Data Network Environment.

11.1 Terminology

The following abbreviations are used throughout this section:

- **AID Keys:** Attention Identifiers. These are keys that require host processing. They are: <CLEAR>, <Enter>, PF keys, and PA keys. When these keys are pressed, the LinkUp 3174 normally locks the terminal's keyboard and sends the information to the host. The host

generally returns data from the display and signals the LinkUp 3174 to unlock the keyboard.

- **Autoskip Field:** This is a type of field defined by the input field attributes of the IBM host application. After the operator has entered the last character of the field, the cursor is positioned in the next input field automatically without requiring the operator to press <TAB>.

- **Character Echo:** This causes a character to appear on a terminal's display after a key on the keyboard is pressed.
- **Cursor Movement Keys:** These are the Up Arrow, Down Arrow, Left Arrow, and Right Arrow keys. They are generally handled by the LinkUp 3174 without requiring any information to go to the host.
- **Host PAD:** The PAD located at the host end of the network. In an X.25 network with minicomputers and asynchronous terminals, this is the PAD located at the minicomputer end of the network. In the LinkUp 3174 implementation where IBM hosts are used, this is the PAD located at the LinkUp 3174.
- **PAD: Packet Assembler-Disassembler.** This is a physical interface node with an asynchronous (RS-232C) port on one side and an X.25 protocol interface on the other side. A PAD is somewhat analogous to an asynchronous modem in that both provide an interface to specialized communications lines.
- **PNA: Packet Network Access.** The LinkUp 3174 feature which allows connection of asynchronous terminals through an X.25 network.

- **PDN: Packet Data Network.** A network of private or public communications lines which use X.25 protocol.
- **Packet:** A collection of asynchronous data of varying length addressed for a specific destination.
- **Terminal PAD:** The PAD located at the asynchronous terminal end of the X.25 network.

11.2 Using LinkUp 3174 with PDNs

In order to explain the way the LinkUp 3174 handles keystroke echo and cursor positioning with PDNs, it is necessary to explain how the LinkUp 3174 handles these with a directly connected terminal.

Figure 11-2 depicts the flow of information between the keyboard, display, and the LinkUp 3174 when alphanumeric or cursor-movement keys are depressed.

A: User presses the Up Arrow key. Up Arrow keycode goes to the LinkUp 3174.

B: The LinkUp 3174 echoes the Up Arrow to the display (or in some cases sends a cursor address) and the cursor is repositioned.

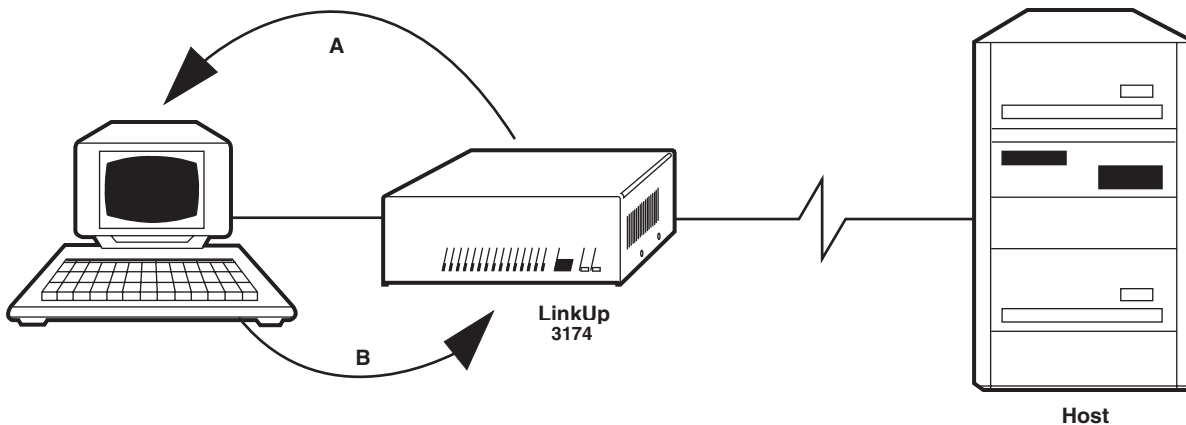


Figure 11-2. Cursor Movement Echo.

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PADs are capable of echoing keycodes back to the terminal. If the PAD echoes the keycode and the LinkUp 3174 also echoes the keycode, the result is duplicate characters. Figure 11-3 illustrates this. Because of this phenomenon, it is important to properly configure the PAD and the LinkUp 3174.

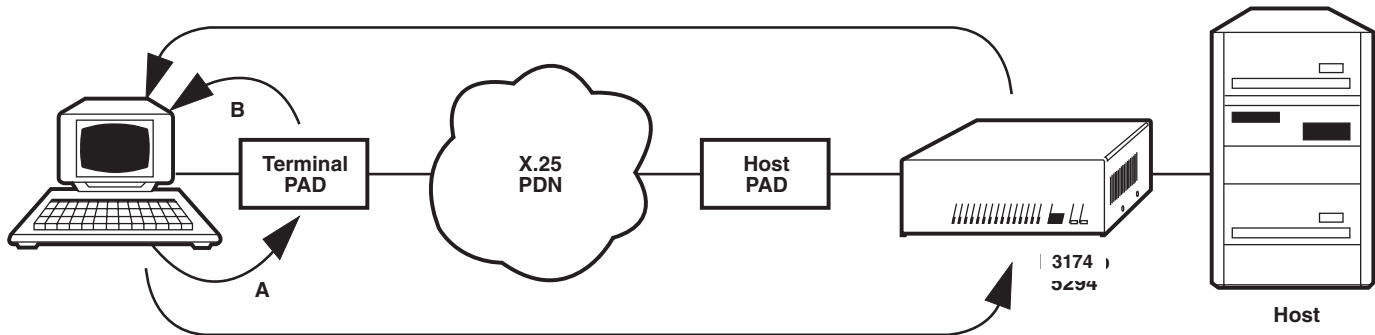


Figure 11-3. Double Echo With PAD.

Figure 11-4 shows the flow of information between the keyboard, display, and the LinkUp 3174 when AID keys are depressed.

- A: The operator presses the <CLEAR> key. The CLEAR keycode goes to the LinkUp 3174.
- B: Recognizing the AID key, the LinkUp 3174 locks the keyboard.

- C: The CLEAR code is sent to the host.
- D: The host processes the command. Then appropriate data and an unlock keyboard command is sent to the LinkUp.
- E: The LinkUp 3174 sends the data and a cursor positioning command to the display, and then unlocks the keyboard.

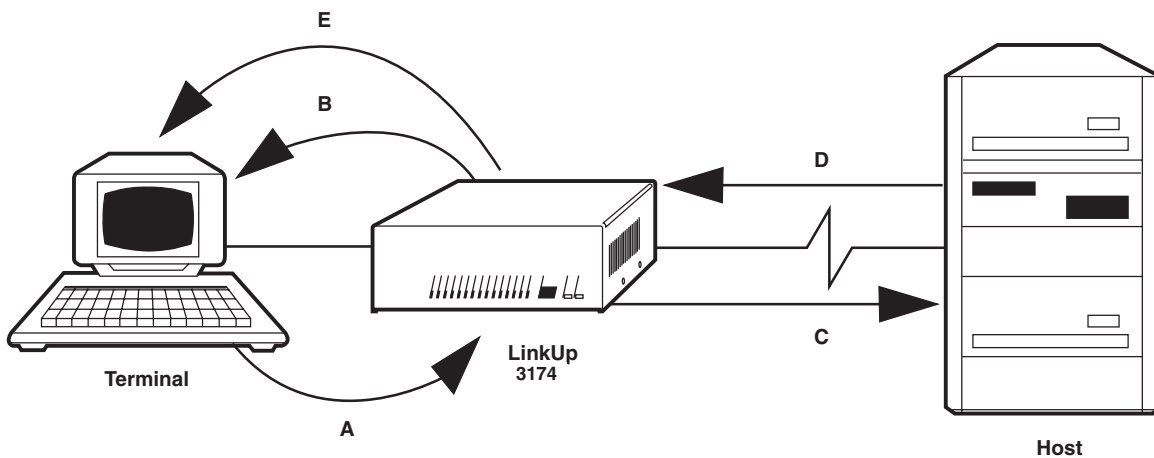


Figure 11-4. AID Key Echo.

When using PADs, a transmission delay can occur between the terminal and the LinkUp 3174. If there is a delay between the time you press the <CLEAR> key and when the LinkUp 3174 locks the keyboard, it is possible for you to continue typing. You have now gotten ahead of the host computer, which is going to send cursor positioning information. The cursor positioning information goes to the terminal and moves the cursor to a location which is different from where you left it. It is your responsibility to avoid this situation.

11.3 Installation Considerations

Packet Data Network support can be configured for any asynchronous port of the LinkUp 3174. To enable PDN support, set the value for Async Port parameter 12 to one of the following values as determined by the network type and function required.

- **12=1** — Local PAD echo of characters with explicit cursor-positioning sequences. This is generic PDN support. This ensures cursor synchronization at the expense of the user's having to wait for the LinkUp 3174 response after each press of the cursor key. Otherwise, data may be garbled.
- **12=2** — Local echo with local cursor echo. This is the same generic support as Option 1, but without the LinkUp 3174 echo of cursor-movement keys. The PAD itself will echo the cursor movement keys.
- **12=3** — Local echo with local cursor echo. This is for use with Telenet 3000 series networks, because proprietary PAD control sequences are used. Non-display fields will not be displayed. Telenet® 4000 series networks are not supported.
- **12=4** — Local echo with local cursor echo. This is the same generic support as Option 1, but without the LinkUp 3174 echo of cursor-movement keys. The PAD itself echoes the cursor movement keys.

The Async Port menu Option 13, Auto-Skip Enable, should be disabled (set to N), except when Option 12 has a value of 2. This avoids cursor-positioning problems that may occur when typing beyond the end of a field.

call and raises DTR on Pin 20 in response. The PAD should drop Pin 6 (DSR) to indicate the end of a connection so that the LinkUp 3174 will initiate session termination as configured. Ensure that the host PAD provides these modem simulation functions.

When the LinkUp 3174 is used with X.25 networks, some screen-display problems may result. If the initial port configuration is done while connected to the network, you first encounter locally echoed passwords and duplication of characters. However, once the port is configured and you have exited to Connect Mode, local character echo ceases. Double echo does not occur during subsequent configurations since the LinkUp 3174 turns off its own echoplex during reconfiguration.

11.3.1 PAD PARAMETERS

The X.25 host PAD should be optioned for no character echo, editing not used, and data forwarding after 20 milliseconds of inactivity.

Option codes and their descriptions are as follows:

1:0	No escape to PAD mode
2:0	No local echo
3:0	No character forwarding
4:2	Packet forwarding after 20 ms
5:1	LinkUp accepts X-ON/X-OFF from PAD
6:0	Suppress PAD messages
7:0	Ignore break from LinkUp 3174
8:0	Normal data delivery
9:0	No padding after CR
10:0	No line folding
11:x	Baud rate (x is the LinkUp port)
12:1	PAD accepts X-ON/X-OFF from LinkUp
13:0	No LF insertion
14:0	No padding after LF
15:0	No editing
16-22:0	No editing

Setup options for the remote terminal PAD include local echo, no line editing, data forward on <Enter>, and data forwarding after 20 milliseconds of keyboard inactivity.

For a dedicated PAD these options are normally filed at the time of installation. If a public network is used, a subscriber profile is generally created by the network to set the remote PAD options at the

The host PAD should be optioned for DCE and the LinkUp 3174 as DTE. The LinkUp 3174 expects to see ring indicate on Pin 22 for an incoming PDN

time the user requests connection. These options should then be communicated to the PDN carrier at the time of subscription. Option codes and their descriptions are as follows:

- 1:1 Terminal can escape to PAD mode
- 2:1 Echo input
- 3:2 Forward on CR
- 4:2 Packet forwarding after 20 ms
- 5:1 Accept X-ON/X-OFF from PAD
- 6:1 Send PAD messages to terminal
- 7:0 Ignore break from terminal
- 8:0 Normal data delivery
- 9:0 No padding after CR
- 10:0 No line folding
- 12:1 PAD accepts X-ON/X-OFF from terminal
- 13:0 No LF insertion
- 14:0 No padding after LF
- 15-24:0 No editing

11.4 Special Operational Considerations

During operation of a terminal through a PDN to the host computer, some characters and commands are echoed locally and reflected on the terminal screen quickly. Others must be sent through the network to the host, processed, and sent back through the network before they are observed. In general, alphanumeric characters echo immediately. The following functions must be processed by the host or the LinkUp 3174 and take 1 to 3 seconds.

- Field Advance using <TAB> or <BACKTAB> Keys
- Cursor HOME
- <CLEAR>
- Reset (usually <CTRL/R>)
- <Enter>
- PF and PA key sequences

Also note the following changes from normal terminal keyboard usage with the LinkUp 3174:

1. When a field is completed, use <TAB> to move ahead to the next field and <BACKTAB> to

move to the previous field. Allow a few seconds for the cursor to be repositioned to the new field.

2. <SCREEN REFRESH> is useful if you suspect that the screen data may have been corrupted.
3. When using Insert Mode, data previously entered in the field does not appear to be correct. When a <RESET> command is sent, the LinkUp corrects the field.
4. When using one of the generic PNA options (1 or 4), non-display fields such as passwords display because of local echo by the PAD. <SCREEN REFRESH> should be entered immediately after keying data in a non-display field, causing the LinkUp 3174 to remove it from the display. Other fields may then be completed as needed.

11.5 Other Special Considerations

11.5.1 SCREEN DISPLAY ERRORS

Because of local PAD echo, the terminal display may become garbled at times. To correct this condition should it occur, use the <SCREEN REFRESH> sequence for your terminal. For most terminal types, this is accomplished by a <CTRL/W>.

If the initial LinkUp 3174 port configuration is done while connected to the network, you will encounter locally echoed passwords and duplication of characters since the LinkUp 3174 default for PNA access is N (None). Once the port is configured, exit to Connect Mode, complete the connect sequence, and screen data should appear normally thereafter.

You should not observe double echo during subsequent configurations, since the LinkUp 3174 will turn off its own echoplex during reconfiguration.

11.5.2 DATA FORWARDING TO THE PAD

Operators using PADs at remote locations to connect terminals to the PDN should check to see if the PAD supports escape forwarding. This capability recognizes an escape sequence from a terminal, does not echo it, and forwards the packet to the LinkUp 3174 after a specified time period. If possible, this method of data forwarding should be used to lessen the conflict of PAD echo and the LinkUp 3174 echo of control sequences.

11.5.3 USING AUXILIARY PRINTERS

Printer flow control with auxiliary printers can be a problem, since the network can deliver data to the terminal faster than the printer can handle it. For terminals, it may be necessary to use the Terminal Configurator to add the following sequence to the auxiliary printer select sequence:

EM WT 05

This adds 50 milliseconds of wait time to each print line to pace the printer output. The exact value may be modified after testing.

12. Block Mode Operation

Block Mode operation is available with the LinkUp 3174 when using a personal computer and version 2.22 or higher of TermLynx II software. No host software changes are required.

Block Mode operation enables you to transmit data from a personal computer to the LinkUp 3174 in blocks rather than character by character. This allows network communication lines to be used more efficiently, often resulting in significant cost savings.

In normal (Character Mode) operation, each time a key is pressed on your keyboard, a character is sent through the terminal's I/O port to the LinkUp 3174, where it is recorded at the proper location in the LinkUp 3174 screen buffer. The character is then echoed back across the communication line to the end user's terminal where it appears on the display. Cursor positioning and screen attributes are controlled by the LinkUp 3174.

In Block Mode operation, the LinkUp 3174 transfers the 3270 screen buffer, including all attributes and cursor addressing, to the terminal. The TermLynx program then locally controls all screen handling and editing. No characters are transmitted to the LinkUp 3174 until the operator enters an AID key. This action causes the input to be transmitted all at once. Character echo from the LinkUp 3174 to the terminal is eliminated, resulting in a significant reduction in line usage per logical unit.

12.1 Accessing Block Mode

The LinkUp 3174 contains a terminal driver (TLBLK) designed for use with an LU which is in Block Mode. This driver is only available in SNA version 5.30 or above, or BSC version 4.30 or above.

If Block Mode is desired, first install TermLynx II on a personal computer that is connected to the LinkUp 3174. At the DOS prompt press ALT/CAPS LOCK to toggle into Emulation Mode. Enter TLBLK at the Enter Device Type: prompt. This terminal driver functions exactly like the IBMPC driver when the LU is not in Block Mode. No special LinkUp 3174 configuration is required. An configuration parameters dealing with Echo (PNA

Access, Echoplex Enable, and Echoplex Toggle Enable) should be set for the factory default values.

Block Mode is entered when the LinkUp 3174 receives a <CTRL/A><4> or [ESC :] <4>. This is accomplished at the keyboard by toggling <ALT/BACKSPACE>. The Block Mode symbol (—) will appear on the righthand side of the status line. Block Mode is exited when the LinkUp 3174 receives <CTRL/A> or [ESC :] <5>. This is accomplished by again toggling <ALT/BACKSPACE>. The [REQUEST DISCONNECT] and [INITIALIZE TERMINAL] key sequences also cause the LinkUp to exit Block Mode. If the Device Type is not TLBLK, these sequences are ignored.

12.2 Block Mode Processing by LinkUp 3174

When Block Mode is entered, the following takes place:

- Echoplex is disabled. Note that it is not necessary to configure the LU with the Echoplex Toggle option enabled or the Echoplex option disabled.
- The previous state of echoplex is saved so that it can be restored upon exiting Block Mode.
- The Auto-Skip option is disabled.

While in Block Mode, screen processing is altered in the following manner:

- Associated with the Block Mode Device Driver (TLBLK), there is a special Attribute Table which can handle any possible permutation of high/low intensity, display/invisible, alpha/numeric, and protected/unprotected fields. After receiving an attribute from the host, this special Attribute Table is used to provide the Block Mode Device (TermLynx) with a description of the field. Table 12-1 shows all possible attributes and the resulting sequences sent to the TermLynx. Note that not all the entries in the Attribute Table are used. The extra entries are reserved for future use.
- The screen-optimization mechanism is disabled to provide the LinkUp 3174 with all the screen attributes.

- The LinkUp 3174 translates nulls into spaces, as most ASCII terminals simply ignore nulls. Distinction between nulls and spaces is necessary for Block Mode operation; therefore, the LinkUp 3174 will send nulls to the TermLynx if nulls are detected in the data stream from the host.
- Repeat-to-address of spaces to a full screen is handled by a special function sequence. The TermLynx recognizes this function sequence and initializes its buffer to spaces. The current Clear Screen causes the TermLynx to find the buffer with nulls.

After exiting Block Mode, the following takes place:

- Echoplex is restored to its previous state before Block Mode was entered.
- Auto-Skip is enabled.
- Normal screen processing resumes as if the regular IBM PC driver is being used. Moreover, screen optimization mechanisms are enabled and the IBM PC's intensity sequences are sent instead of those obtained from the special table.
- Nulls and spaces in the host data stream will revert to being indistinguishable and the LinkUp 3174 will no longer send nulls.

Table 12-1. Screen Attributes and Block Mode Output Sequences.

Field Description	Output Sequence	
ADSU	ESC)	0
ADSP	ESC'	0
ADHU	ESC(	0
ADHP	ESC &	0
ANSU Not used	ESC)	1
ANSP Not Used	ESC '	1
ANHU	ESC(	1
ANHP	ESC &	1
NDSU	ESC)	2
NDSP	ESC '	2
NDHU	ESC (	2
NDHP	ESC &	2
NNSU Not Used	ESC)	3
NNSP Not Used	ESC '	3
NNHU	ESC (	3
NNHP	ESC &	3

12.3 Block Mode Processing by TermLynx

When Block Mode is invoked with <ALT/BACKSPACE> on the PC keyboard, TermLynx sends <CTRL/A> <4> to the LinkUp 3174 followed by <CTRL/W>. This causes both the LinkUp 3174 and TermLynx to be in sync with each other. The Block Mode symbol (—) is displayed on the bottom right of the PC screen, indicating that the terminal is in Block Mode. When Block Mode is exited, TermLynx sends <CTRL/A> <S> to the LinkUp 3174 followed by <CTRL/W>. The <CTRL/W> sequence causes the LinkUp 3174 to send the 3270 screen buffer to TermLynx with either Block Mode attributes or non-Block Mode attributes, as appropriate.

While in Block Mode, TermLynx processes all input keys locally except for those listed below. Functional handling of 3270 keyboard operations is the same in Block Mode as in Character Mode. The special functions are implemented, with the exception of Generate and View Attributes.

- **PF1 through PF24, PA1 through PA3, ENTER, CLEAR** — All characters that have been changed are sent to the LinkUp 3174 followed by an AID key. The keyboard is locked.
- **DEVICE CANCEL, STATUS LINE, RESET** — Control codes are sent to the Linkup 3174 3174 with no data, even if changes have been made, and regardless of the LinkUp 3174's keyboard lock status. No keyboard lock is performed.
- **ATTN, REFRESH, SYS REQ** — The keyboard is locked and a control code is sent to the LinkUp 3174 with no data, even if changes have been made.
- **INITIALIZE TERMINAL, REQUEST DISCONNECT** — Block Mode is exited. No data is sent to the LinkUp 3174. No keyboard lock is performed.
- **PRINT** — Characters that have been changed are sent to the LinkUp 3174 followed by the [PRINT] key sequence. The keyboard is locked.

NOTE

Keyboard lock caused by an AID or command key is unlocked by a LinkUp 3174 sequence.

TermLynx checks all input characters for validity. Actions that cause the keyboard to locally lock in certain conditions are listed below. The <RESET> key may be used to clear this condition so that processing may continue.

- **Insert Mode** — Pressing a data character while the cursor is in a protected field, or attempting text entry in an unprotected field which is full (no nulls in the field).
- **Destructive Backspace** — Pressing the Destructive Backspace key while the cursor is on an attribute or one position to the right of an attribute, or in a protected field.
- **Delete** — Pressing the Delete key while the cursor is in a protected field.
- **Numeric Field** — Entering an alpha character in a field defined as numeric.
- **Data Entry** — Entering data in a protected field.

12.4 Operating Features and Restrictions

The following features and restrictions apply to Block Mode operation using the LinkUp 3174 and TermLynx II software:

- If a file transfer is initiated while in Block Mode, TermLynx automatically toggles the LU out of Block Mode and back in again when the file transfer is completed.
- In order for Block Mode to be used in X.25 packet data network environments, echo from the terminal PAD must be disabled. Unpredictable results occur if this is not done. The CCITT option code is 2:0. (See Chapter 11 for other required X.25 parameter values.)
- In X.25 applications, the inactivity timer setting should allow for the fact that a PC user does not send any data over the network while editing is performed on the screen. At least three (3) minutes is recommended.

- If PACING OFF is specified for printer flow control, ensure that X.25 PADs allow the use of X-ON/X-OFF flow control to regulate the auxiliary printer data streams. Overflow of the PC printer buffer is avoided by using the Custom Terminal Configurator (see Chapter 6) to increase the EM WT 03 sequence to EM WT 40 (or 50) in the aux print select sequence. This delays the sending of print data by the LinkUp 3174 to match the printer speed. The exact delay factor depends on the printer and network speeds.
- Applications written for light pens are not supported in Block Mode.
- The Cursor Select key is not supported in Block Mode.
- The Block Mode option in the TLCONFIG program must be set to TOGGLE.

12.5 User Configuration

User configurability is provided for the Base Device Type TLBLK. All function and key sequences may be manipulated by the user except the following:

- Block Mode On and Block Mode Off sequences
- All sequences listed in Table 12-1.

Note that the above sequences are agreed-upon conventions between the LinkUp 3174 and TermLynx. Therefore, there is no advantage in providing operator configurability. Ensure that any changes made are reflected in the LinkUp 3174 and/or TermLynx if required.

13. REQMS/RECFMS Support and Maintenance Statistics

The LinkUp 3174 provides support for host-generated requests for maintenance statistics. These statistics are used by the host software for network management functions. REQMS (for REQuest Maintenance Statistics) is the command generated by the host software, and RECFMS (for RECFormatted Maintenance Statistics) is the response sent by the controller which, in this case, is the LinkUp 3174. Some IBM publications also use the term CNM for Communications Network Management statistics. This feature requires no direct intervention by the operator or system manager. When a request is received by the LinkUp 3174, the appropriate response is sent automatically.

There is an important distinction between the RECFMS totals which are accumulated by the LinkUp 3174 and the various Maintenance Statistics displayed from System Management Mode. These distinctions are as follows:

REQMS/RECFMS Tools are accumulated within the LinkUp 3174 for transmission to the host when a REQMS command is received. These values cannot be directly reset or displayed by the operator.

Displayable Counters are accumulated by the LinkUp 3174 for use during troubleshooting procedures. They are included to provide the system manager with information on system performance. The counters can be reset by the system manager, if desired.

Some of the statistics included in the RECFMS response are similar to the counters which can be displayed from System Management Mode; however, the two sets of data are collected and reset independently.

13.1 LinkUp 3174 Responses and Formats

This section describes how the LinkUp 3174 supports REQMS/RECFMS functions. For information on how the host interprets the response data, refer to the appropriate IBM literature.

The LinkUp 3174 responds to all required REQMS requests. A zero count is returned for those fields which are not accumulated or supported within the LinkUp 3174. This ensures compatibility with all host packages by sending a properly formatted response even though particular counts are zero.

The following RECFMS statistics are reported:

- Non-productive timeouts
- Write retries (retransmission errors)
- Overrun errors
- Underrun errors
- Connection problems/errors (SNRMs)
- FCS (Frame Checking Sequence) errors (CRC errors)
- Primary Station Abort
- Idle timeouts
- SDLC Command Rejects
- DCE errors
- Write timeouts

The internal values do not reset when the maximum is reached, but are maintained until a reset occurs. A reset is accomplished in either of two ways:

- From a host-generated REQMS with RESET request. This initializes the internal maintenance totals.
- By powering off the LinkUp 3174 or by issuing Reset Sync Port or Remote Reset.

14. NetView Alert Support

IBM's NetView facility is a network-management tool designed to aid in controlling and monitoring the network, detecting and isolating hardware and software problems, and automating network operation and recovery. It integrates several diagnostic programs (including existing NCCF, NPDA, and NLDM functions) into a single package that can be monitored from a single terminal on the network.

Support for Netview Alert messages is SNA-specific and can be enabled or disabled by the system manager using a configuration option for each synchronous port.

When the option is turned on, an SNA alert message of a specific NMVT (Network Management Vector Transport) format is generated as a result of any Network classified error condition or operator-entered alert request. All alert messages for the 3174 controller and the attached terminals are transmitted over the SSCP-PU session. If the SSCP-PU session is broken at the time of an alert generation, the message is queued until the next SSCP-PU session is successfully established.

There should be only one alert message queued for each attached device and one for each controller at any given time. As soon as an alert for a specific device is transmitted to the host, an additional alert for that device may be queued, with the exception of temporary errors. Temporary errors (for example, the 4nn error displayed on the status line) require operator intervention to turn off the Input-Inhibited condition by pressing the <RESET> key. Once this is done, the next alert message can be generated. Multiple alerts either replace previous alerts of a lower priority or are ignored if the previous alert was of equal or higher priority. Table 15-1 contains a tabulation of alert parameters.

14.1 Alert Message Conditions

There are seven conditions under which an SNA alert message may be generated and sent to the host NetView Program by an IBM 3174 controller. Three of these are supported by the LinkUp 3174.

1. Control Unit error
2. Application Program Check error
3. Operator-Generated Alert

14.1.1 CONTROL UNIT ERROR

This type of alert message is generated whenever a 5nn error condition is detected. Normally, the transmission of this type of alert message is delayed until the communication link is established or recovered.

Refer to Table 15-1 for the specific NMVT format for control unit error messages. There can be only one control unit error queued for transmission for a controller at any given time.

14.1.2 APPLICATION PROGRAM CHECK ERROR

This type of alert message is generated and sent to the host whenever a 4nn error condition is detected. Refer to Table 15-1 for the specific NMVT format for application program check error messages. There can be only one application program check error message queued for transmission for attached device at any given time.

14.1.3 OPERATOR-GENERATED ALERT MESSAGES

This type of alert message is controlled on a port by port basis through configuration. Only those ports authorized by the system manager can send operator-generated alert messages to the host.

For those who are authorized to send operator-generated alerts, the <TEST> key places the display in Local Test Mode where the operator can type /A followed by <Enter> or <PAI> to bring up the alert panel.

After pressing the <TEST> key, the display screen is cleared and a TEST symbol indicating Test Mode appears on the status line from locations 3 to 6 for those LUs having the status line update option enabled. Use of the <TEST> key results in no response when a Printer Busy or Printer Not Functional condition exists.

When properly filled in, the information provided on the alert panel can be initiated for transmission by pressing the <Enter> or <PA1> key. Before this message is queued for transmission, a check is performed to ensure that the user-action code is between decimal 1 and 20, inclusive. If the number is within this range, it is translated into the Alert user-action code and transmitted as part of an alert NMVT inbound request to the host.

If the number is invalid, the Input Inhibited and symbols (X?+) are displayed. To reenter correct information the operator must clear the Input Inhibited condition by pressing the <RESET> key, clear the screen by pressing the <CLEAR> key, and request the operator-generated alert panel again by typing /A and pressing <Enter> or <PA1>. The operator may also press the <TEST> key to terminate Local Test Mode. For terminals not having a <TEST> key, <ESC> on most terminal modules, or any user-defined sequence from a custom terminal module, can be set up to invoke this function.

Several users may request and fill in the alert panel simultaneously; however, there can be only one outstanding transmission of an operator-generated alert message per controller at any given time. Any attempt to send a second message before the first message has been transmitted to the host and responded to by the host is denied. The X-f symbols are displayed on the status line to indicate Input Inhibited and Minus Function error conditions. Your alert panel should not be cleared at this time; instead, the <RESET> key should be used to clear the error conditions, after which another attempt to send the message should be made.

For those who are not authorized to send operator-generated alerts, typing /A followed by <Enter> or <PA1> while in Test Mode causes **X-f F X** to display on the status line (assuming status-line update is permitted). This indicates Input Inhibited, Minus Function, and Operator Unauthorized error conditions. Pressing the <RESET> key restores the status line and the keyboard.

14.1.4 DEVICE HARDWARE ERROR

This type of alert message is generated whenever a 2nn error condition for device failure is found. Since the LinkUp 3174 has no way of telling that a display is not working properly, this type of error is not reported.

14.1.5 FRONT PANEL ERRORS AS PART OF ALERT ERROR REPORT

The LinkUp reports a variety of error conditions through a front-panel display. Causes of these errors can be categorized into the following classes:

- Hardware deficiency (HA)
- System error (SY)
- EEPROM chip error (EE)
- System parameter error in EEPROM (SP)
- Port parameter error in EEPROM (PO)
- Logical Unit parameter error in EEPROM (LU)
- Passthrough unit parameter error in EEPROM (PU)
- User configurable device driver parameter error in EEPROM (UC)
- Stack overflow (LS)

To report LinkUp-specific front-panel errors, the NMVT format for control unit error is used. Details of this format are shown on the next page. The assigned priority and operator parameters required for converting each front panel error into the NMVT format for alert messages are shown in Table 15-1. For all EE, SP, PO, LU, UC, and LS errors, type and location in Qualifier 2 (Q2) are used to reference the first error code and the second error code, respectively.

Table 14-1 (continued). Netview Program Alert Parameters Supported by the LinkUp.

DESCRIPTION/USER-ACTION CODE

X'FE26'	Operator-generated alert screen 07
X'FE27'	Operator-generated alert screen 08
X'FE28'	Operator-generated alert screen 09
X'FE29'	Operator-generated alert screen 10
X'FE;2A'	Operator-generated alert screen 11
X'FE2B'	Operator-generated alert screen 12
X'FE2C'	Operator-generated alert screen 13
X'FE2D'	Operator-generated alert screen 14
X'FE2E'	Operator-generated alert screen 15
X'FE2F'	Operator-generated alert screen 16
X'FE30'	Operator-generated alert screen 17
X'FE31'	Operator-generated alert screen 18
X'FE32'	Operator-generated alert screen 19
X'FE33'	Operator-generated alert screen 20
X'FE3A'	Delayed alert 5nn (non-channel-attached)
X'FE40'	Permanent control unit hardware failure (1 FRU)
X'FE42'	Delayed control unit hardware failure (1 FRU)
X'FE44'	Temporary control unit hardware failure (1 FRU)
X'FE48'	Control unit error, threshold exceeded (1 FRU)

DETAIL TEXT REFERENCE CODE

X'FE01'	Q1:SC,QAHG	Q2:not used	Q3:not used
X'FE03'	Q1:SC,QAHG	Q2:LU number	Q3:not used
X'FE0F'	Q1:SC,QAHG	Q2:Error detail	Q3:not used
X'FE20'-FE33'	Q1:Customer-defined	Q2:Customer-defined	Q3:Customer-defined

Q1, Q2, Q3 = Alert code qualifier
SC, QAHG

SC = Status (error) code
QA = Status code qualifier
HG = Hardware group. For a list of HGs, see the 3174 Help Desk Reference.

Port number = Control unit port number in hex (00-1F)

LU number = Secondary logical unit ID in hex (local address).

TYPE, LOC = xxx, yyy where xxx is the type of failing. FRU and yyy is the location of the failing FRU.

Error detail = Additional information about the error. For a description of this information, see the status codes in the 3174 Help Desk Reference where this error detail appears in the Extended Data column.

Terminal ID = Terminal identification code (e.g., 3290).

15. Dialback Security

The LinkUp 3174 Dialback Security feature is designed to prevent unauthorized access to host resources in dialup environments. It is not intended to be a substitute for sound security practices such as periodic changing of user passwords, use of passwords of size characters or more in length, and the instilling of a sense of confidentiality within the user group.

Dialback Security provides an additional level of security not available through a simple dialup access facility. First, the user must correctly enter a user ID and password that is independent of the host level ID and password in order to receive a call back from the LinkUp to a corresponding preconfigured telephone number. Only then will the LinkUp allow host access.

In addition, an audit trail which gives a complete record of an successful and unsuccessful connection attempts is compiled for output to a printer or personal computer disk file.

The LinkUp Dialback Security feature is currently available only on SNA models.

15.1 Features Overview

15.1.1 DIALBACK USER PERSONALITIES

Up to 128 dialback user personalities can be configured. Each personality consists of a:

- user ID
- Password
- calling sequence (Dialback phone number)
- modem type/personality

15.1.2 MODEM PERSONALITIES

This feature allows the system manager to:

- Assign one of six different modem personalities to each of the dialback user personalities. Each user can then receive a call back on a modem that is configured to match his or her modem type.

- Customize the Auto Answer and Auto Dial command strings to match the requirements of the modem being used.
- Cause DTR to toggle between answering and dialing.
- Set a dialup port as RECEIVE ONLY, so that the call back will always occur on a different port.

There are 6 modem personalities available. They are:

- **Hayes** - this personality is contained in ROM and cannot be changed. It can be used as a base or starting point for one or more of the configurable modem personalities.
- **MI - M5** - these personalities are configurable and can be based on the Hayes personality or created from scratch to support virtually any type of modem.

15.1.3 DIALBACK MODES

The Dialback System consists of three operational modes, each of which contains a set of configuration variables that control dial back operations across all ports dedicated to dial back. These modes are described below.

- **Dialback Same Port (DBSP) Mode** — When operating in DBSP Mode, the port that receives a call will always be the port that performs the call back. This is the standard mode of operation.
- **Dialback Other Port (DBOP) Mode** — The DBOP Mode is a facility that directs the call back to take place on a port other than the one dialed in on. When DBOP Mode is in operation, an additional measure of security is gained through an internal queueing mechanism that ensures that the port receiving a call will never be the port that returns that particular call. Instead, the LinkUp will force the answering modem to hang up while returning the call on another port.

Dialback on another port eliminates the possibility of an unauthorized user's holding the LinkUp 3174 modem off hook, thereby defeating the dialback operation. If this occurs with DBOP, security will not be compromised as the LinkUp 3174 will drop the connection by forcing the modem on hook. DBOP mode is intended for use with carriers that do not provide an "Either End" call termination scheme, or to facilitate modem pooling. (See Figures 16-1 and 16-2 for additional information regarding the advantages of this feature.)

- **DBOP/SELECT Mode** — The Modem Select feature forces the LinkUp 3174 to compare the modem type of a dialback personality and the modem types of the async ports available for dialback. If the modem types match, a call back is placed. If there is no match, the dial back personality remains in a queue until a port with a matching modem type becomes available.

This enables the system manager to optimize the use of expensive equipment (such as high speed modems) by reserving the modems with high-speed capability for the high speed call backs. A personality that needs only standard equipment for the call back can be left on the queue for the standard modems to complete the return call.

15.1.4 DIALBACK MODEM TYPE

Each asynchronous port that is used for dialback operation can be matched to one of the five system manager-defined modem personalities, or the Hayes personality. Dialback is enabled on a specific async port by first configuring Option 14 on the Async Port Configuration menu for a dialback modem type other than NONE (the default setting).

15.1.5 THE AUDIT TRAIL

The audit trail feature allows the system manager to monitor dialback access to all ports dedicated to the dialback system. Both successful and unsuccessful attempts to connect to the host through dialback ports are tracked by sending Audit Records to a data-collection device attached to the asynchronous port configured as the Audit Port.

Each audit record includes the date and time of the connection attempt, the port number and the operation performed. Each record is terminated with a carriage return line feed, and no single record exceeds 80 characters in length. For more

detailed information, see Section 16.5. Either a personal computer running user-provided data collection software or an async printer may be attached to the audit port as the data collection device.

15.1.6 THE REAL TIME CLOCK

After configuration, the real time clock provides a date/time stamp for each audit record. The clock continues to run as set until it is changed by the system manager or until the LinkUp 3174 is power cycled.

15.2 Operational Overview

After configuration, the dialback system is used as follows:

- The user dials into the async modem attached to the LinkUp and enters his or her user ID and password.
- The user is allowed three tries to correctly enter the user ID and three tries to enter the matching password.
- If the user fails to correctly enter either the ID or password, the LinkUp terminates the connection by forcing the modem to hang up. The LinkUp then waits for the next call.
- If the user correctly enters the ID and password, the LinkUp retrieves the stored telephone number associated with that user ID and terminates the received call.
- The LinkUp places a call back to the user either on the same port or a different port than the user originally called in on, depending on the configuration of the DBOP option.
- The LinkUp finds out what type of modem the caller is using and places a call back from an appropriate modem if the Modem Select option is enabled.
- After the user's modem—which must be in auto answer mode—answers the call, the user reenters his or her password and connection to the host session proceeds as in a normal dialup, allowing the user into the standard LinkUp 3174 connect path.
- During this process, selected activity can be recorded for the audit trail and output to a dedicated printer or PC disk file.

The LinkUp 3174 will not allow a user to bypass dialback through the use of a privileged account password number or dialback override feature. Also, the LinkUp will not allow a user to override the phone number which has been preconfigured to receive the dialback.

Figures 15-1 and 15-2 on the following pages illustrate a typical step-by-step scenario of attempts by an unauthorized user to gain host access in both

DBSP and DBOP Modes. These diagrams together explain the need for the Dial Back Other Port option.

Figure 15-1 illustrates the need for the DBOP option. The scenario of an unauthorized user trying to break into a host that is in the standard Dial Back Same Port Mode (without DBOP enabled) is outlined below. The reference numbers correspond to the figure.

When an unauthorized user, Caller H from Outlaw City, calls into the LinkUp:

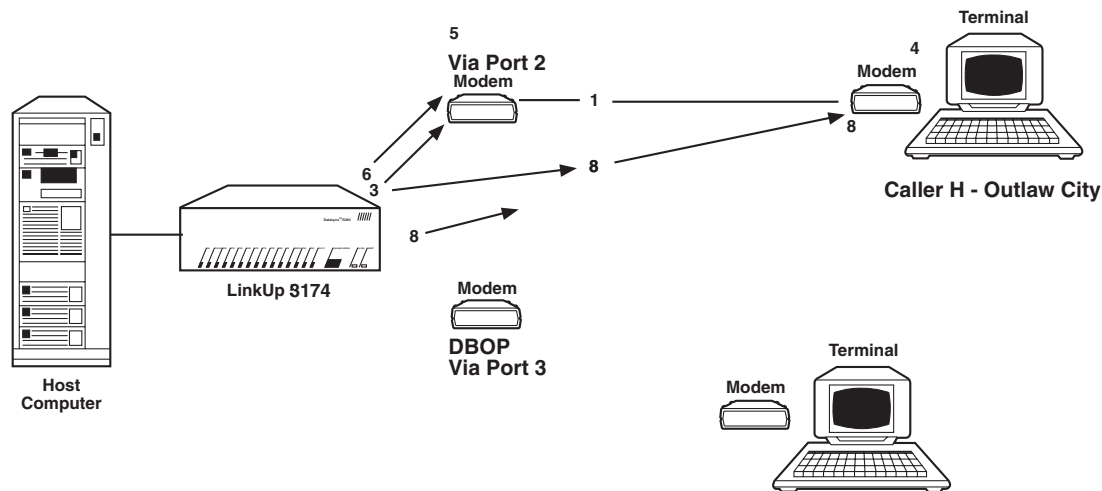
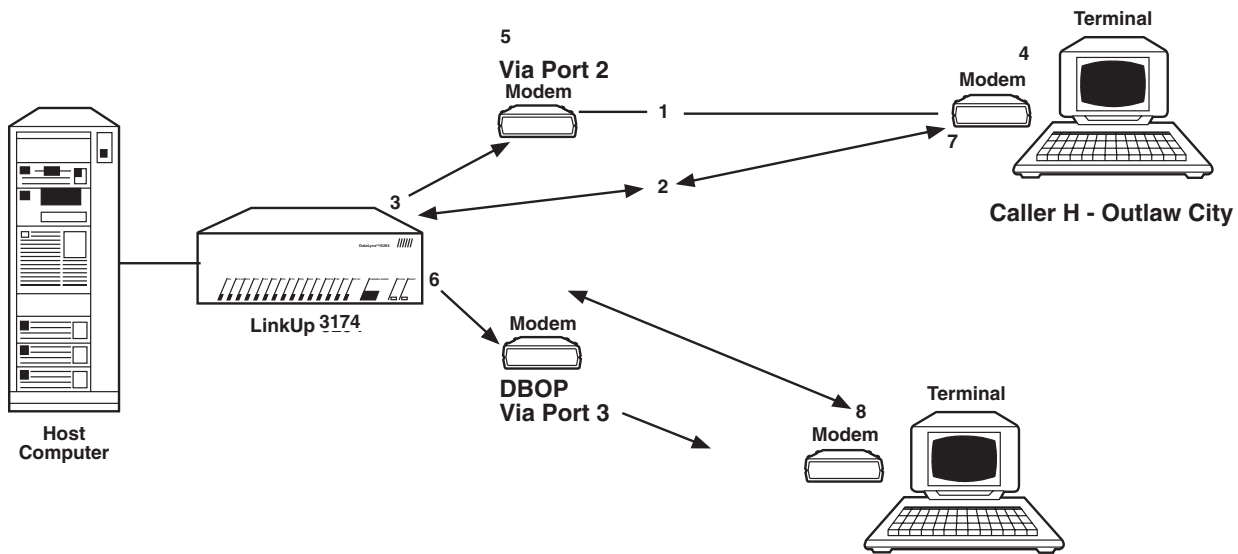


Figure 15-1. Unauthorized User Scenario — Dial In/Dial Back on Same Port.

- The call is established via port 2 (reference 1).
- The ID and Password are requested by the LinkUp. If Caller H, the unauthorized user, is able to guess the correct password and ID, the LinkUp will search for the preconfigured dial back user personality phone number (reference 2).
- The LinkUp will cause the receiving modem (at port 2) to hang up/go on hook (reference 3).
- Caller H from Outlaw City does not hang up/go on hook (reference 4).
- If the phone system does not have "Either End" termination, the circuit between the caller and the LinkUp modem is still live (reference 5). (This situation occurs most commonly in phone systems outside the U.S.A.)
- If the unauthorized user is successful in getting the modem at the LinkUp end to act as though a legitimate connection has been established (reference 6), and as though a call back has been placed (reference 7), the LinkUp will prompt for the reentry of the password (reference 8).
- The LinkUp without DBOP mode enabled establishes connection to the host after the unauthorized user correctly reenters the password. Unauthorized access to the host has been successful.

The DBOP mode enabled feature is illustrated above.

- Call in is made (reference 1).
- ID and Password are requested and correct responses are provided by the unauthorized user (reference 2).



AUTHORIZED RECEIVER - DIAL BACK PERSONALITY - LOS ANGELES

Figure 15-2. Unauthorized user Scenario - DBOP Enabled - Security Of Host.

- LinkUp causes receiving modem at Port 2 to go on hook (reference 3).
- An unauthorized user holds his or her modem off hook and attempts to retain the connection with the LinkUp and gain access to the host (reference 4).
- The LinkUp with DBOP mode enabled disconnects from the call in port (reference 5) and makes the call back on another port (reference 6).
- The unauthorized user can still be off hook, tying up port access on the original call in port (port 2), but he or she has no possibility of gaining host access (reference 7).

- The call back via the other port is successful and host access is made available only to the authorized user at the specific location as configured in the dialback user personality (reference 8).

The LinkUp has recorded this connection attempt in the audit trail and the system manager can compare the request for host access at that particular time and date (which was initiated by the unauthorized caller) to the records of the authorized user.

15.3 Configuration

Before configuring the LinkUp 3174 for dialback operation, the system manager should determine which async ports will be used for dial back calls coming in and for return calls going out. Also, if the audit trail feature will be used, an async port should be selected to receive the audit trail output.

The type of modem to be connected to each dial back port must be determined. Also, a list of dial back users that includes IDs, passwords, and phone

numbers should be compiled. It should be decided which dialback ports, if any, are to be configured as receive only.

An example of a typical layout for planning possible applications for the receive-only and modem-select DBOP features is illustrated below. The \$ symbols represent expensive equipment (high speed modems) or services (800 telephone service).

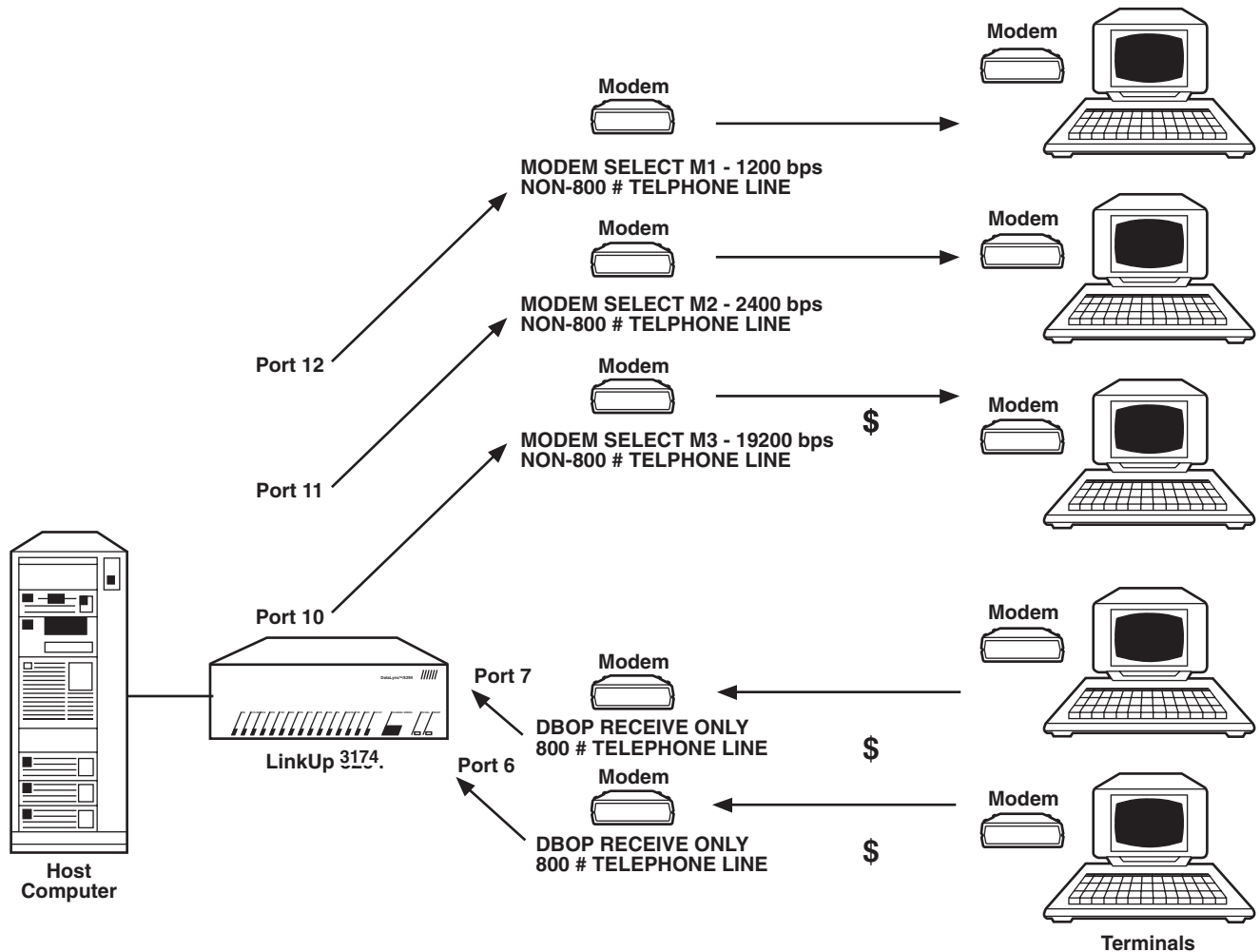
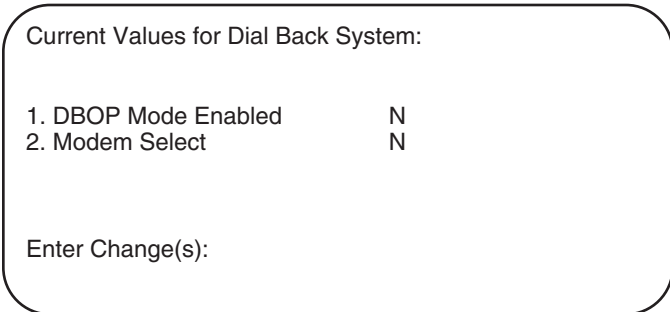


Figure 15-3. Layout Application Example for a Typical LinkUp Modem Environment.

15.3.1 DIAL BACK SYSTEM (DBSYS) CONFIGURATION

The Dial Back System menu is used to select either the DBOP or DBSP mode of operation. To get to the Dial Back System menu, select Configurator Mode from the System Management Mode main menu and enter **DBSYS** at the **Enter Item(s) to be Conhured:** prompt

The following Dial Back System menu will be displayed.



1. DBOP Mode Enabled

Setting DBOP Mode Enabled to Y allows all ports configured with a Modem Type other than NONE to use the DBOP call back method. To enable the DBOP feature, type [1 = Y] <Enter> at the Enter Change(s) prompt.

Setting DBOP Mode Enabled to N forces the call back to be made on the same port that received the call. The default setting is N. This is the DBSP (Dial Back Same Port) Mode.

2. Modem Select

The Modem Select option allows the system manager to determine which modem type will be used to execute a call back. When this option is set to Y and a dialback user personality is queued to be called back, the LinkUp 3174 searches the available call back ports and finds a port configured for the same modem type as the type configured for the dialback personality in the queue. As soon as a modem-type match is found, the call back is placed on that port. This enables the sytem manager to optimize the use of expensive equipment such as high speed modems by reserving the modems with high speed capability for the high speed call backs. A modem personality that needs only standard equipment for the call back can be left on the queue for the standard modems to complete the return call.

The Modem Select option can be set to Y only when DBOP Mode Enabled is set to Y. If DBOP Mode Enabled = N, the Modem Select setting is ignored.

If the dialback personality specifies NONE as the modem type, the personality is compatible with any modem, and the call back will be made from the first available dialback port.

To enable Modem Select, type [2 = Y] <Enter> at the Enter Change(s) prompt. Press <Enter> again to view the changes, <!><Enter> to abort the changes, or type [END] <Enter> to save the changes. To exit the menu without saving any changes, type [QUIT] <Enter>.

The list below summarizes the various settings of the dial back system parameters.

- **DBOP Mode Enabled =Y** — For Modem Select = Y, the dial back initiated on the first available port configured for the modem type specified in the dial back user personality. For Modem Select = N, the dial back initiated on the first available dial back port regardless of modem type specified in the dial back user personality.
- **DBOP Mode Enabled = N** — For Modem Select = Y, the modem select setting is ignored. Dialback is initiated on the same port that received the call. For Modem Select = N, Dial back is initiated on the same port that received the call.

NOTE

Changes made to the Dialback System menu do not take effect until a Remote Reset is performed, or until the LinkUp 3174 is power-cycled.

15.3.2 DIALBACK PORT CONFIGURATION

To configure an asynchronous port for dial back operation, enter the configuration options menu of the desired async port

Before Option 14, Dialback Modem Type, can be set to a value other than NONE (the default) the following parameters must be set as shown below:

- 3. Communications Interface = DTE
- 4. Bit Rate parameter = a fixed rate (not AUTO)
- 8. Connect Mode = DED or AUTO (If set for AUTO, modem must pass RI before the LinkUp will raise DTR)
- 11. Device Ready Signal = 8

The flow control parameters (options 9 and 10) can be set for either logical (X-ON/X-OFF) or hardware (CTS/RTS) flow control.

Valid Bit Rate values for Dial Back are 75, 110, 134, 150, 300, 600, 1200, 2000, 2400, 4800, 7200, 9600, 14400, and 19200.

Valid values for Dial Back Modem Type are M1, M2, M3, M4, M5, HAYES and NONE. If set to NONE, dialback is disabled on that port.

If an attempt is made to change the Dial Back Modem Type before the port is properly configured, an error message is displayed. Use the [END] command to save changes, the <!> command to abort changes, or the [QUIT] command to exit the menu without saving changes.

15.3.3 AUDIT TRAIL CONFIGURATION

A port is configured for audit trail by specifying AUDIT as the Device Type on the async port configuration menu.

To ensure proper audit trail operation, other async port parameters must be set as indicated below:

3. Communications Interface. This must be set to the appropriate interface for the collection device. This will typically be DCE if the collection device is a PC or printer. AUTO is not allowed for the audit port and will result in non-operation.

4. Bit Rate. This must be set to agree with the corresponding parameter on the attached device. AUTO will result in non-operation.

5-9. Parameters 5 through 9. These should be set to agree with the corresponding parameters on the attached device.

11. Device Ready Signal (Pin No.). This must be set to the pin number of the signal that the attached device will hold high constantly while it is in the ready state. If this signal goes low on the audit port, the device is considered NOT READY and audit functions will NOT be performed.

NOTE

This means that if a printer, for example, attached to an audit port is power cycled, audit records may be lost or sent to another port configured as audit if a device is attached and in the ready state. This could be important if the system manager wants to guarantee a backup of audit records and if for security reasons the system manager needs to be assured that any data sent to ports configured as audit is not available to unauthorized personnel.

12. Packet Network Access. This parameter must be set to N. Any other value may result in improper operation.

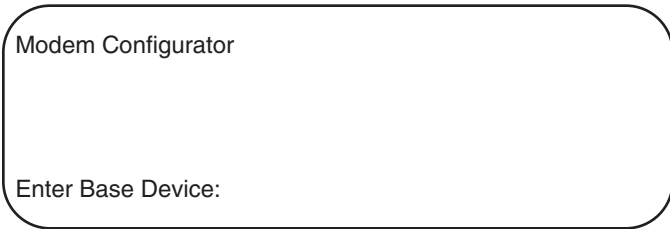
13. Auto-Skip Enable. This parameter must be set to Y. Any other value may result in improper operation.

14. Dial Back Modem Type. This parameter must be set to NONE. Any other value may result in improper operation.

15.3.4 CONFIGURING MODEM PERSONALITIES

Modem Personalities allow each LinkUp to support various modem types during dial back operation. Six modem personalities are available, five of which are user programmable. The sixth is permanently configured as a Hayes and can be used as a base for any of the other five.

To configure a modem personality, enter M1, M2, M3, M4, or M5 at the Enter Item(s) to be Configured: prompt. The following screen will appear:



Valid values for Base Device are as follows:

HAYES — Loads the resident Hayes modem personality (MP) for modification.

NONE — Loads the default values for a modem personality. (strings = NONE, DTR option = Y)

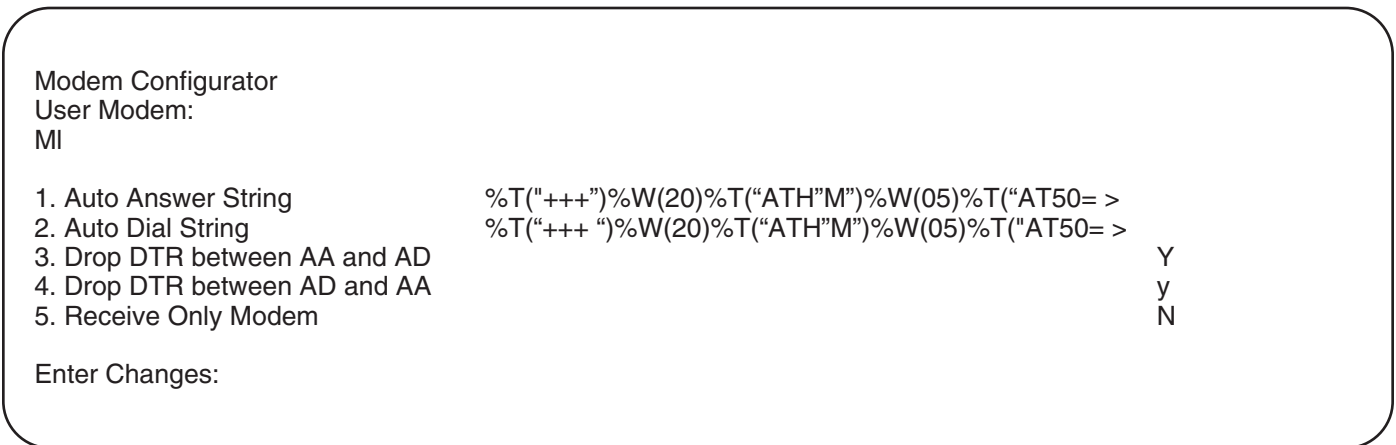
M1 — Loads the selected user-programmed modem personality.

- M2
- M3
- M4
- M5

NOTE

Values for Base Device must be entered in all capital letters (eg., HAYES).

When a valid base modem type is entered (using all caps), a Modem Personalities Configuration menu appears. The parameters on this menu define how LinkUp will interact with a particular modem attached to a dial back port. The default settings for a base modem type of HAYES are shown below.



NOTE

The > symbol at the end of the Auto Answer and Auto Dial String display lines indicates that the string is longer than the display space. Enter [# = >] <CR> to view the rest of each string.

Options 1 and 2. Auto Answer and Auto Dial strings configure the modems with the operational modes necessary for dialback.

The Auto Answer string is sent by a dialback port to initialize an attached modem to Auto Answer Mode. The string is sent whenever one of the following conditions exists:

- When the LinkUp is powered up and a modem is powered on and attached to a properly configured dialback port.
- When a user fails to provide valid responses to the ID a Password prompts.
- After a user breaks the modem connection to a dial back port (assuming DSR is in the high state).
- Whenever DSR goes from low to high for any reason.

The Auto Dial string is sent by the dialback port after the LinkUp 3174 has checked the ID and password of an operator and determined that a call back is authorized.

Options 3 and 4. Drop DTR between AA and AD/between AD and AA

These options indicate whether or not the LinkUp will drop DTR on the transition between the auto answer and autodial command strings, and vice versa. They should be set to provide optimum operation with the modems chosen.

Option 5. Receive Only Modem

Set this option to Y if the modem is to be used to receive incoming calls only (DBOP Mode must be enabled). Set this option to N if the modem will be used both for receiving calls and for placing call backs.

NOTE

The modems attached to the LinkUp 3174 are required to act as follows:

- Raise DCD (Pin 8) only if carrier is present. If carrier is lost, DCD must drop.
- DSR (Pin 6) must be high at all times. If constant DSR is not present, the LinkUp 3174 will not raise DTR and will not communicate with the modem.
- If the expected result is not returned within the time allowed, the LinkUp will abort and initialize modem to Auto Answer Mode.
- Modems should be optioned to wait for the dialtone before dialing; they should not blind dial.

Modems that are not capable of performing as above may not work with the LinkUp Dialback Security option.

Valid entries on the modem personalities configuration menu are as follows:

- END — saves the current modem personality configuration and exits the menu.
- QUIT — exits the current menu without saving changes.

NOTE

On this menu, the QUIT command assumes that you have decided not to make the entered changes and does not prompt with ABANDON CHANGES? (Y/N).

- CLEAR — clears the current modem personality parameters and returns them to their default settings.
- # = modem command string — valid on items 1 and 2 to configure modem strings using the command language specified in Syntax of Modem Command Strings later in this document.
- # = > — used on items 1 and 2 to display the entire string when it exceeds the space available on a single line. This entry also displays smaller strings on this menu to help the user isolate a string that needs to be modified.

- **# = NONE** — used to send nothing for an initialization or dial string or to initialize either one prior to entering a string.
- **# = Y or N** — used on items 3, 4, and 5 to specify whether the LinkUp will drop DTR (Y) or not (N) on the transitions between the INIT and DIAL strings and vice versa; also to specify whether the modem being configured will be permitted to make call backs (N) or not (Y).
- **<Ctl><N>** — This control sequence is used in place of the & character in normal LinkUp 3174 configuration. It provides the user a way of moving to the next line to input long modem command strings. This means that the & is treated as any other character when configuring a modem personality.

NOTE

Once a <Ctl><N> sequence is used, the portion of the command string already entered cannot be modified. Always check for proper syntax before using <Ctl><N>. If a mistake is discovered after entering <Ctl><N>, the string must be cleared and reentered.

The following are key characters which perform special functions for the LinkUp 3174 processor:

- **! or ?** — These are considered key characters (Abort and Help respectively).

If a key character is entered somewhere on the command string line, only one of the following characters can be used to proceed:

- **<ENTER> or <CR>** to perform the Help or Abort function.
- **<Backspace>** — to clear the ! or ? and accept new input.
- **! or ?** — to input ! or ? into the modem string.

15.3.5 SYNTAX OF MODEM COMMAND STRINGS

The modem command strings are comprised of macro commands and data to be sent to the modem (including control codes). Both Auto Answer and Dialback command strings use the same syntax and the commands are executed in sequence. Valid values for the multiplier $n = 1$ to 25 in the macro commands.

Macro Commands

Macro commands allow interaction between the modem strings and external entities such as the modem itself and user IDs. Macro commands are of a generic syntax and are defined for dialback as follows:

1. **%W(n)** Wait $n * 100$ msec
Example `%W (03) = Wait 300 ms`
2. **%P** Output calling sequence/phone number for the current dial back personality
3. **%T("Data")** Transmit data (as defined below)
Example `%T("+++")` puts Hayes type modem in command mode
4. **%I(n,"Data","Data")**
An interactive command that allows the LinkUp to check for a result before proceeding with the next macro command. For the next $n \times 5$ seconds, compare the input received to one or more data strings contained within the command. Up to 3 conditional data fields are allowed in one %I macro command.
Example `%I(3,"connect")` causes LinkUp to wait 15 seconds for connect to be returned by the modem before proceeding to the next macro command.
5. **%B(n)** Send a break to the async device (that is, hold the line at logical 0) for $*50$ ms
Example `%B(7) = send a break of 350 ms`

Data Fields

This portion of the dial back string holds the ASCII data that the modem will interpret as command strings. Any value from 01H to 7EH may be entered into this segment of the dial back string. Displayable characters are entered as literal characters and control characters are entered using the standard control mnemonics. For example, `%T("ATH^M")` would send ATH followed by <CR>.

Most ASCII characters (20H to 7EH) are entered as is. The exceptions are the key characters <?> (help) and <!> (abort), each of which must be typed twice for the entry to be valid.

Control code mnemonics are shown in the list below.

ASCII CODE	ASCII CHARACTER
01H	(SOH) ^A
02H	(STX) ^B
03H	(ETX) ^C
04H	(EOT) ^D
05H	(ENQ) ^E
06H	(ACK) ^F
07H	(BELL) ^G
08H	(BS) ^H
09H	(TAB) ^I
0AH	(LF) ^J
0BH	(VTAB) ^K
0CH	(FF) ^L
0DH	(CR) ^M
0EH	(SO) ^N
0FH	(SI) ^O
10H	(DLE) ^P
11H	(DC1) ^Q
12H	(DC2) ^R
13H	(DC3) ^S
14H	(DC4) ^T
15H	(NAK) ^U
16H	(SYN) ^V
17H	(ETB) ^W
18H	(CAN) ^X
19H	(EM) ^Y
1AH	(SUB) ^Z
1BH	(ESC) ^[
1CH	(FS) ^\
1DH	(GS) ^]
1EH	(RS) ^_
1FH	(US) ^_

Command String Entry

Strings are stored, in a translated format, in a 100-byte field associated with the modem personality. If errors are encountered while attempting to translate operator input into modem personality string output, the LinkUp outputs an error message with the command string number in which the first error was encountered.

15.3.6 MODEM COMMAND STRINGS AND RAM USAGE

There is a finite amount of RAM, 99 bytes, allocated for each modem command string.

The commands use RAM as follows:

%P — 1 Byte

%B — 2 Bytes

%W — 2 Bytes

%T — Length of Message + 2 bytes

%I — (Combined Length of Messages) + (1 Extra Byte Per Message) + 3 bytes

15.3.7 CONFIGURING DIALBACK USER PERSONALITIES

The system manager must identify authorized dial back users by creating a dial back user personality for each. Up to 128 dial back personalities may be created. Each one consists of a User ID, a password, a calling sequence (telephone number), and a modem type.

To configure a dial back personality, enter DBPS at the Enter Item(s) to be Configured: prompt.

The following screen will be displayed:

Dial Back Configuration Options:

1. ADD a Dial back Personality
2. DELETE a Dial back Personality
3. LIST Dial Back Personalities

Enter Choice: _

Option 1- ADD a Dial Back Personality

If this option is selected, the following appears on the screen:

ADD Dial Back Personality

Specify ID : _

Valid values are all 7-bit ASCII characters between 20H (space) and 7E (-), inclusive. Up to six characters may be used to identify a dialback user. This field must be completed.

NOTE

To enter the key characters <!> and <?> into the ID field, they must be typed twice, followed by <Enter>. Although these two keys must be pressed twice, the character will only appear once in the ID field.

The provision to enter <!> and <?> characters into user-defined strings has been made so that these characters may be used in calling sequences if necessary. Since these characters normally perform the abort and help functions, respectively, it is recommended they not be used for other purposes unless absolutely necessary.

Once a valid ID is entered, the prompt:

Specify Password : _

is displayed. Up to eight characters may be entered into this field to protect against unauthorized access. This field must be completed. Valid values are all 7-bit ASCII characters between 20H (space) and 7E (), inclusive. For optimal security, it is recommended that passwords be a minimum of 6 characters in length.

When a valid password has been entered, the prompt

Specify Calling Sequence

is displayed. Up to 25 characters (including spaces) may be entered into this field to specify a dial back telephone number. This field must be completed.

Valid values are all 7-bit ASCII characters between 20H (space) and 7E, inclusive.

When a valid calling sequence has been entered, the prompt

Specify Modem Type:

is displayed. Valid values are HAYES, M1 through M5, and NONE. (Modem type must be entered in capital letters.)

When a valid modem type is entered, the following screen appears.

ADD Dial Back Personality

```
Specify ID           : abcdef
Specify Password    : abcdef
Specify Calling Sequence: 1234567890123456789012345
Specify ModemType   : NONE

ID                  : abcdef
PASSWORD           : abcdef
CALLING SEQUENCE   : 1234567890123456789012345
MODEM TYPE         : NONE
Save Personality ? (y/n) : _
```

Type Y and press <Enter> to save the dialback personality, or N followed by <Enter> to change the personality before saving. After configuring all the necessary dial back personalities, enter <N> at the **Add Another Personality? (Y/N):** prompt to return to the Dial Back Configuration Options menu. Use the [END] or [QUIT] command to exit the menu.

Option 2 - DELETE a Dial Back Personality

If this option is selected,

DELETE Dial Back Personality

Search ID:

is displayed. Enter the ID you wish to delete. If it is valid, the following screen is displayed:

DELETE Dial Back Personality

```
Search ID           : abcdef
ID                  : abcdef
PASSWORD           : abcdef
CALLING SEQUENCE   : 1234567890123456789012345
MODEM TYPE         : NONE
Delete Record ? (Y/N) : _
```

If Y is entered, the indicated dial back personality is deleted and the following prompt appears:

Delete Another (Y/N): _

If N is entered, the Dial Back Configuration Options menu is redisplayed.

Option 3 LIST Dial Back Personalities

If this option is selected,

LIST Dial Back Personalities

Hit Any key ...

is displayed. When a key is pressed, the LinkUp 3174 displays the list of Dial Back Personalities.

Record ID	Pass	Calling Sequence	Modem Type	
01	VIP	Andrew	213-320-7126	M1
02	MIKE	Cyclist	707-323-4444	HAYES
03	DENISE	Manager	213-835-1212	M2

<space> to Quit.

Pressing the space bar return you to the Dial Back Configuration Options menu. Use the [END] command to exit from the menu.

NOTE

This completes the configuration requirements for the dialback option, with the exception of setting the time clock. Before continuing, perform a Remote Reset from System Management Mode, or power cycle the LinkUp to ensure that all configuration changes take effect.

15.3.8 REAL TIME CLOCK CONFIGURATION

To properly implement the Audit Trail function, a clock capable of keeping track of the date and time is necessary. The clock provided by the LinkUp displays the time in military format and keeps time to the second. To set the time clock, select Item 27 in the System Management Mode menu. The following display will appear:

SET REAL TIME CLOCK

Current Date : 0000/00/00

Current Time : 00:00:00

Enter Date (yyyy/mm/dd):_

If you wish to change the date only or the time only, press <Enter> at the prompt you wish to skip. For example, to bypass the date, press <Enter> at the Enter Date prompt. The following message will be displayed:

Date Not Changed.

Enter Time (hh:mm:ss):_

If an invalid date is entered, an error message will appear and you will be prompted to enter another date. Valid values for date and time are the numbers 0 through 9 and the characters </> or <:>.

NOTE

Assuming that a valid time is entered, the check will automatically start as soon as you press <Enter>, and will keep running until reset by the system manager or until the LinkUp is power cycled.

Once a valid date and/or time is entered, the following display will appear.

CLOCK ENTERED:

Current Date : 1990/11/22

Current Time : 10:40:22

CLOCK Correct?(Y/N) -

If Y is selected, the System Management Mode menu is relayed.

NOTE

Configuration for dialback operation is now complete. A Remote Reset or power cycle should have been completed before setting the time clock in order to ensure that all configuration changes took effect. If either of these operations is executed now, the time clock will be deactivated and will have to be reset.

15.4 Operation

This section describes how LinkUp establishes a connection with a host LU when dialback operation is in effect. Two scenarios are discussed: dial back on the same port and Dial Back Other Port (DBOP Mode).

In both dial back modes, if the dialback port receiving a call is configured for DTE/DED CONNECT, the LinkUp will provide DTR and RTS constantly except when it recycles the port. If the dialback port is configured DTE/AUTO CONNECT, the DCE device will store Ring Indicate and wait for the LinkUp to raise DTR before answering the call.

15.4.1 DIAL BACK ON SAME PORT

Once the connection is established, the prompt ID?: is displayed. Type the ID string and press <Enter>. The LinkUp will echo the ID string and check its ID table for a match. Three chances are given to provide the correct ID string. If all three fail, the LinkUp hangs up and recycles the port to Auto Answer. The LinkUp also generates an Invalid Access Attempt record for the audit trail, if enabled.

If the ID prompt is not answered for longer than five minutes, the LinkUp hangs up and recycles the port to Auto Answer. An ID - Timeout record is generated from the audit trail, if enabled.

If the ID is valid, the LinkUp prompts for the password. Type the password string and press <Enter>. The password will not be echoed by the LinkUp. The LinkUp will compare the entered password with the one configured for the ID chosen. Three chances are given to enter the correct password string. If all three fail, the LinkUp hangs up and recycles the port to Auto Answer. The LinkUp also generates an Invalid PW Timeout record for the audit trail, if enabled.

If the password prompt is not answered for longer than five minutes, a Password - Timeout record for the audit trail is generated, if enabled.

NOTE

If more than 20 characters are entered at either the ID or Password prompt, the LinkUp assumes that it is an attempt to compromise security and immediately hangs up.

After a valid ID/Password pair has been entered, the LinkUp hangs up, sets the modem for Auto Dial and immediately initiates a call back on the same port. The screen will display

**Call Back In progress.
Disconnecting...**

When the new connection is established, the user reenters the password and access to the LinkUp and the host is gained in the normal manner, depending on the other configuration settings of the LinkUp.

15.4.2 DIAL BACK ON OTHER PORT- DBOP

After a valid ID/Password pair is received, the LinkUp checks to see if DBOP is enabled. If so, and a call back request for the given ID/password is already in the queue, the following message is displayed:

**Call Back already queued
Disconnecting...**

If DBOP is enabled and the call back request has not already been queued,

**Dial back request queued.
Disconnecting...**

is displayed. The LinkUp generates a Dial on Queue record for the audit trail, if enabled. If the element is picked up by a port, the audit trail is updated with a Call back in Progress record. After 15 minutes, the queued ID is removed from the queue and a Queued Call Removed record is generated for the audit trail.

When a properly configured port becomes available for a call back, the nominal time delay before the call back is initiated is five seconds. Once the connection is established, the user reenters the password and access to the LinkUp and the host is gained in the usual manner, depending on the other configuration settings of the LinkUp.

15.4.3 AUDIT TRAIL RECORD FORMAT

Each audit record has the following format:

aaa bb yy/mm/dd hh:mm:ss cccccc dddddddd P xx d

where:

aaa is the OP code. This tells what part of the dial back operation is executing.

bb is the SUB code. This further isolates the area of operation.

ccccc holds the ID or password on Alert record types. Holds the ID for all others.

ddddddd shows the invalid password

d is an asterisk used on Alert record types.

Fields not mentioned are self-explanatory. An example of an audit record is shown below:

IIF 01 1991/12/25 05:05:05 DANIEL SONG P04 *

15.5 Op/Sub Code Description

Table 15-2 shows the different OP and SUB codes available.

Table 15-2. OP/SUB Code Descriptions.

OP CODE	SUB CODE	ID/PASS	ALERT	DESCRIPTION
COR	01			System could not place call due to comm problem with port.
DBP	01	N/A	N	Modem attached to port has gone off hook.
DBP	02	ID specified	N	Both ID and PASSWORD prompts answered correctly. Port is dialing back. ID included.
DBP	03	ID specified	N	The dialback operation has been successfully completed.
DBP	04	ID specified	Y	An error occurred while attempting a call back.
DQK	01			System pulled call back of queue (timeout).
DQP	01			Call back placed on queue.
DQR	01			User requested call back not be placed on queue.
IID	01	ID specified	N	Invalid ID submitted. ID is not known to Dial Back data base.
IID	02	ID specified	Y	Invalid ID - Invalid Access Attempt. User has entered invalid ID three times. Either valid user has incorrect ID or there was an attempt to compromise security.

Table 15-2 (continued). OP/SUB Code Descriptions.

OP CODE	SUB CODE	ID/PASS	ALERT	DESCRIPTION
IID	03	N/A	N	Invalid ID - Timeout. User has let more than five minutes pass while sitting at ID prompt.
IIF	01	N/A	Y	Attempt to send modem initialization string has failed.
IPW	01	ID and Password specified	N	Invalid Password submitted. Password does not match current Dial back record.
IPW	02	ID and Password specified	Y	Invalid Password - Invalid Access Attempt. User has entered invalid password three times. Either valid user has incorrect Password or there was an attempt to compromise security.
IPW	03	N/A	N	Invalid Password - Timeout. User has let more than five minutes pass while sitting at Password prompt.
IP2	01	ID		Second Password rejected or bad phone connection.
LBK	01	N/A	Y	If issued during Dial Back question and answer session (i.e., between DBP 01 and DBP 02), CD (Carrier Detect Pin 8) has gone low. If issued at any other time, this message indicates that the modem has been powered off or disconnected (i.e., Data Set Ready Pin 6 has gone low).

Appendix A: Translation Tables

The basic purpose of a protocol converter is to allow asynchronous terminals that use the ASCII interface code to communicate with IBM devices that, generally, use the EBCDIC interface code. The LinkUp automatically translates ASCII characters to EBCDIC for all communications data received from a terminal, and also translates EBCDIC characters to ASCII, for all output to a display or printer.

For keyboard input, all code values below hexadecimal w0, as well as the single value 7F, are valid only as keyboard function codes. That is, these values are tested by the LinkUp to determine whether they are the first or only character of a string used to emulate a 3278 keyboard function (for example, ENTER, PAn, PFn, etc). Function code strings are terminal dependent.

In the following charts, ASCII to EBCDIC translations and vice-versa are based as much as possible on hcharacter equivalence. However, there are certain characters in ASCII that have no EBCDIC equivalents, and similarly some EBCDIC characters that lack ASCII equivalents. For these, the following translations apply:

ASCII	EBCDIC
[(5B)←→¢	(4A)
] (5D)←→!	(5A)
^ (5E)←→¬	(5F)
! (21)←→|	(4F)

For outbound (EBCDIC) data, several codes in the control code range (below hex 40) constitute a part of the 3270 (buffer orders, printer order, SCS codes, etc.), and are not directly translated for ASCII output. For example, the EBCDIC code hex 11 is a Set Buffer Address; it, and the two characters that follow, have the effect of changing the location on the display screen on which data is being written. Carriage control characters are handled in a special manner. Other values in the control code range as well as those in the character code range (hex 40 through FF) that have no ASCII equivalents are translated to the ASCII question-mark (hex 3F).

The one special feature of the LinkUp that is data-dependent, pseudo-transparency, provides the

means for a host to transmit all possible 7-bit codes. This allows ASCII control coes to be ouput to devices that support special control functions. The technique used requiries an encoded string whose start is defined by the contiguous pair of EBCDIC characters vertical bar (4F hex) and logical not (5F hex), and is terminated by a dollar-sign character (5B hex).

U.S. EBCDIC to ASCII Data Translation Table

EBCDIC		ASCII	
40	SP	20	SP
41		3F	?
42		3F	?
43		3F	?
44		3F	?
45		3F	?
46		3F	?
47		3F	?
48		3F	?
49		3F	?
4A	¢	5B	[
4B	.	2E	.
4C	<	3C	<
4D	(	28	(
4E	+	2B	+
4F	|	7C	|
50	&	26	&
51		3F	?
52		3F	?
53		3F	?
54		3F	?
55		3F	?
56		3F	?
57		3F	?
58		3F	?
59		3F	?
5A	!	21	!
5B	\$	24	\$
5C	*	2A	*
5D	)	29)
5E	;	3B	;
5F	¬	5E	^
60	-	2D	—
61	/	2F	/
62		3F	?

U.S. EBCDIC to ASCII Data Translation Table (Continued)			
EBCDIC		ASCII	
63		3F	?
64		3F	?
65		3F	?
66		3F	?
67		3F	?
68		3F	?
69		3F	?
6A	|	5D]
6B	,	2C	,
6C	%	25	%
6D	-	5F	-
6E	>	3E	>
6F	?	3F	?
70		3F	?
71		3F	?
72		3F	?
73		3F	?
74		3F	?
75		3F	?
76		3F	?
77		3F	?
78		3F	?
79	'	60	'
7A	:	3A	:
7B	#	23	#
7C	@	40	@
7D	,	27	,
7E	=	3D	=
7F	"	22	"
80		3F	?
81	a	61	a
82	b	62	b
83	c	63	c
84	d	64	d
85	e	65	e
86	f	66	f
87	g	67	g
88	h	68	h
89	i	69	i
8A		3F	?
8B		3F	?
8C		3F	?
8D		3F	?
8E		3F	?
8F		3F	?
90		3F	?
91	j	6A	j
92	k	6B	k
93	l	6C	l

U.S. EBCDIC to ASCII Data Translation Table (Continued)			
EBCDIC		ASCII	
94	m	6D	m
95	n	6E	n
96	o	6F	o
97	p	70	p
98	q	71	q
99	r	72	r
9A		3F	?
9B		3F	?
9C		3F	?
9D		3F	?
9E		3F	?
9F		3F	?
A0		3F	?
A1	~	7E	~
A2	s	73	s
A3	t	74	t
A4	u	75	u
A5	v	76	v
A6	w	77	w
A7	x	78	x
A8	y	79	y
A9	z	7A	z
AA		3F	?
AB		3F	?
AC		3F	?
AD		3F	?
AE		3F	?
AF		3F	?
B0		3F	?
B1		3F	?
B2		3F	?
B3		3F	?
B4		3F	?
B5		3F	?
B6		3F	?
B7		3F	?
B8		3F	?
B9		3F	?
BA		3F	?
BB		1B	?
BC		3F	?
BD		3F	?
BE		3F	?
BF		3F	?
C0	{	7B	{
C1	A	41	A
C2	B	42	B
C3	C	43	C
C4	D	44	D

**U.S. EBCDIC to ASCII Data Translation Table
(Continued)**

EBCDIC		ASCII	
C5	E	45	E
C6	F	46	F
C7	G	47	G
C8	H	48	H
C9	I	49	I
CA		3F	?
CB		3F	?
CC		3F	?
CD		3F	?
CE		3F	?
CF		3F	?
D0	}	7D	}
D1	J	4A	J
D2	K	4B	K
D3	L	4C	L
D4	M	4D	M
D5	N	4E	N
D6	O	4F	O
D7	P	50	P
D8	Q	51	Q
D9	R	52	R
DA		3F	?
DB		3F	?
DC		3F	?
DD		3F	?
DE		3F	?
DF		3F	?
E0	\	5C	\
E1		3F	?
E2	S	53	S
E3	T	54	T
E4	U	55	U
E5	V	56	V
E6	W	57	W
E7	X	58	X
E8	Y	59	Y
E9	Z	5A	Z
EA		3F	?
EB		3F	?
EC		3F	?
ED		3F	?
EE		3F	?
EF		3F	?
F0	0	30	0
F1	1	31	1
F2	2	32	2
F3	3	33	3
F4	4	34	4
F5	5	35	5

**U.S. EBCDIC to ASCII Data Translation Table
(Continued)**

EBCDIC		ASCII	
F6	6	36	6
F7	7	37	7
F8	8	38	8
F9	9	39	9
FA		3F	?
FB		3F	?
FC		3F	?
FD		3F	?
FE		3F	?
FF		3F	?

U.S. ASCII to EBCDIC Data Translation Table

ASCII		EBCDIC	
20	SP	40	SP
21	!	5A	!
22	"	7B	"
23	#	7B	#
24	\$	5B	\$
25	%	6C	%
26	&	50	%
27	'	7D	'
28	(	4D	(
29	)	5D)
2A	*	5C	*
2B	+	4E	+
2C	,	6B	,
2D	-	60	-
2E	.	4B	.
2F	/	61	/
30	0	F0	0
31	1	F1	1
32	2	F2	2
33	3	F3	3
34	4	F4	4
35	5	F5	5
36	6	F6	6
37	7	F7	7
38	8	F8	8
39	9	F9	9
3A	:	7A	:
3B	;	5E	;
3C	<	4C	<
3D	=	7E	=
3E	>	6E	>
3F	?	6F	?
40	@	7C	@
41	A	C1	A
42	B	C2	B
43	C	C3	C
44	D	C4	D
45	E	C5	E
46	F	C6	F
47	G	C7	G
48	H	C8	H
49	I	C9	I
4A	J	D1	J
4B	K	D2	K
4C	L	D3	L
4D	M	D4	M
4E	N	D5	N
4F	O	D6	O
50	P	D7	P
51	Q	D8	Q

**U.S ASCII to EBCDIC Translation Table
(Continued)**

ASCII		EBCDIC	
52	R	D9	R
53	S	E2	S
54	T	E3	T
55	U	E4	U
56	V	E5	V
57	W	E6	W
58	X	E7	X
59	Y	E8	Y
5A	Z	E9	Z
5B	[	4A	¢
5C	\	E0	\
5D	]	6A	|
5E	^	5F	¬
5F	_	6D	-
60	.	79	.
61	a	81	a
62	b	82	b
63	c	83	c
64	d	84	d
65	e	85	e
66	f	86	f
67	g	87	g
68	h	88	h
69	i	89	i
6A	j	91	j
6B	k	92	k
6C	l	93	l
6D	m	94	m
6E	n	95	n
6F	o	96	o
70	p	97	p
71	q	98	q
72	r	99	r
73	s	A2	s
74	t	A3	t
75	u	A4	u
76	v	A5	v
77	w	A6	w
78	x	A7	x
79	y	A8	y
7A	z	A9	z
7B	{	C0	{
7C	|	4F	|
7D	}	D0	}
7E	~	A1	~
7F	DEL	00	

Displayable ASCII Characters

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1																
2	SP	!	"	#	\$	%	&	'	()	*	+	,	=	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
6	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	DEL

Displayable EBCDIC Characters

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1																
2																
3																
4	SP										¢	,	<	(	+	|
5	&										!	\$	*	)	;	|
6	-	/									|	#	%	_	>	?
7										\	:		@	"	=	"
8		a	b	c	d	e	f	g	h	i						
9		j	k	l	m	n	o	p	q	r						
A		~	a	t	u	v	w	x	y	z						
B																
C	[	A	B	C	D	E	F	G	H	I						
D	]	J	K	L	M	N	O	P	Q	R						
E	\	S	T	U	V	W	X	Y	Z							
F	0	1	2	3	4	5	6	7	8	9						

Appendix B: International Character Sets

This document contains the most common translation table changes necessary for use with ISO 7-bit ASCII codes. Changes are shown for each country, with the EBCDIC codes listed first as a reference. In the LinkUp 3174 Entry column, the default ASCII codes are listed first, followed by the national codes to be used. These LinkUp 3174 entries should be made using the TRANS facility of the LinkUp 3174 Configurator.

Table B-1. Translation Table Changes For International Characters.

COUNTRY	IBM EBCDIC	LINKUP 5294 ENTRY
Denmark/Norway	4A	5B=23
	5A	5D=24
	5B	24=5D
	7B	23=5B
	7C	50=5C
	E0	5C=40
England (UK)	4A	5B=24
	5B	24=23
	7B	23=5D
	4F	21=5B
Finland/Sweden	4A	5B=23
	5A	5D=24
	5B	24=5D
	7B	23=5B
	7C	4D=40
	E0	5C=40
Portugal	4A	5B=23
	6A	7C=7D
	7B	23=5B
	7C	40=5D
	A1	7E=7C
	D0	7D=40
	4F	21=7E
Spain	5A	5D=23
	7B	23=5C
	E0	5C=5D

IBM uses special or "RPQ" character sets for Turkey. If you need 5B as a transfer character, call Black Box. ASCII codes 23 and 22 are not defined in the table, because no equivalent IBM characters are in use.

Table B-2. Turkish Character Sets.

IBM EBCDIC	LINKUP 5294 ENTRY
4A	5B=40
5A	5D=5F
5B	24=5B
5F	5E will be output
6A	7C=7D
6D	5F will be output
79	60=69
7B	23=5C
7C	40=5D
7F	22=5E
89	69=7B
A1	7E=7C
C0	7B=60
D0	7D=7F
E0	5C=7E

Appendix C: Configuring the IBM Host Computer

The following IBM system generation information will help you configure the host computer. It is written mainly for the system manager and includes three sample configurations:

1. ACF/VTAME TC Monitor, IBM4331 W/ICA
2. CICS/VS System with ACF/VTAM
3. BTAM TC Monitor under DBDCCICS

1. ACF/VTAME TC Monitor, IBM 4331 with ICA

This dynamic configuration is read and put into effect by VTAME when initialized. It resides in a system source library or a partitioned data set. The ACF/VTAME TC monitor is used with an integrated communication adapter (ICA) on the IBM 4331 mainframes. It is similar to the ACF/VTAM monitor used with an external communication controller instead of an ICA.

Type the following to indicate that an ICA is being used:

```
ICA  VBUILD  TYPE=CA
```

Type the following to show that a group of similar lines are handled together. In this example, there is only one line in the group.

```
GROUP  GRUP  LNCTL=BSC
```

Type the following to specify the line being used. Address 30 (Hex) is the first line of eight available on the fully optioned ICA.

```
LINE  LINE  ADDRESS=030
```

Type the following to attach one cluster controller to the line. You would define more in a multi-drop environment. You must activate the controller and its associated terminals because they are not brought online at initialization.

```
CONTRLLR  CONTRLLR  GPOLL=40,  
CUTYPE=3174, ISTATUS=INACTIVE
```

Type the following to attach the terminals to the cluster controller. These are general definitions which work in most cases. The terminals are attached to an IBM monitor (DBDCCICS) when activated and must be defined to CICS as shown below. Use the DLOGMOD entry to activate terminals by selected groups.

```
PORT 2 TERMINAL ADDR=40,  
TERM=3278, FEATUR2=MODEL2,  
LOGAPPL=DBDCCICS, DLOGMOD=3270
```

```
PORT 3 TERMINAL ADDR=C1,  
TERM=3278, FEATUR2=MODEL2,  
LOGAPPL=DBDCCICS, DLOGMOD=S3270
```

```
PORT 4 TERMINAL ADDR=C2,  
TERM=3278, FEATUR2=MODEL2,  
LOGAPPL=DBDCCICS, DLOGMOD=S3270
```

```
PORT S TERMINAL ADDR=C3,  
TERM=3278, FEATUR2=MODEL2,  
LOGAPPL=DBDCCICS, DLOGMOD=S3270
```

Type the following to attach a receive only printer to the terminal on Port 8. The specification of 3286 is used for all printer types. Model 2 indicates that the full 1920 buffer is available.

```
PRNT8 TERMINAL ADDR=C7,  
TERM=3286, FEATUR2=MODEL2,  
LOGAPPL=DBDCCICS, DLOGMOD=S3270
```

Type the following to attach a transparent print option printer to the terminal on part 2.

```
TRAN9 TERMINAL ADDR=C8,  
TERM=3286, FEATUR2=MODEL2,  
LOGAPPL=DBDCCICS, DLOGMOD=S3270
```

The following is a sample IBM ICA configuration screen:

```

***CA CONFIGURATION DATA***

PF1-ADVANCE LINE POINTER   PF4 SELECT NEXT CA UNE ADR
PF2-SELECT NEXT OPTION     ENTER-UPDATE AND EXIT
PF3-EXIT WITHOUT UPDATE

LINE ADDRESS 30 BSC MOD CLOCK EIA I/F

SWITCHED NETWORK           YES      NO
PERM REOUEST TO SEND      YES      NO
WRAP TEST SELECTION       MODEM   CA I/F
SELECT STANDBY            YES      NO
MODEM ANSWER TONE (HZ)    2025    2100
NEW SYNC                   YES      NO
EIB MODE                   YES      NO
DATA SIGNAL RATE SEL      LOW      HIGH
HIGH SPEED OPERATION       YES      NO
MODEM PROCEDURE           CDSTL   DTR
DATA CODE                  ASCII   EBCDIC
    
```

2. CICS/VS System with ACF/VTAM

This configuration is part of the CICS terminal control table (TCT). It is a series of macro calls assembled to create a core image phase. This phase is loaded at initialization and indicates that the specified terminals are under the control of ACF/VTAM. This configuration is similar to other systems where the processing and communications tasks are handled separately.

Type the following to define the terminals accessed with the ACF/VTAM TC monitor. These macros assume that you have configured ACF/VTAM with the precoding examples.

```

PORT2      DFHTCT TYPE=TERMINAL,
           ACCMETH=VTAM,
           TRMIDNT=PORT2,
           TRMTYPE=3278, TRMMODL=2
           TRMSTAT=TRANSCEIVE,
           RELREQ=(YES,YES)
    
```

```

PORT3      DFHTCT TYPE=TERMINAL,
           ACCMETH=VTAM
           TRMIDNT=PORT3,
           TRMTYPE=3278, TRMMODL=2
           TRMSTAT=TRANSCEIVE,
           RELREQ=(YES,YES)
    
```

```

PORT4      DFHTCT TYPE=TERMINAL,
           ACCMETH=VTAM,
           TRMIDNT=PORT4,
           TRMTYPE=3278,TRMMODL=2
           TRMSTAT=TRANSCEIVE,
           RELREQ=(YES,YES)
    
```

```

PORT5      DFHTCT TYPE=TERMINAL,
           ACCMETH=VTAM,
           TRMIDNT=PORTS,
           TRMTYPE=3278,TRMMODL=2
           TRMSTAT=TRANSCEIVE,
           RELREQ=(YES,YES)
    
```

Type the following to attach a receive only printer to the terminal on port 8. The specification of 3284 is used for all printer types. TRMMODL=2 indicates that the full 1920 buffer is available.

```

PORT8      OFFTCT TYPE=TERMINAL,
           ACCMETH=VTAM,
           TRMIDNT=LU18,
           TRMTYPE=3284,TRMMODL=2,
           RUSIZE=256
           TRMSTAT=RECEIVE,
           RELREQ=(YES,YES)
    
```

Type the following to attach a transparent print option printer to the terminal on port 2.

```

TRAN9      OFFTCT TYPE=TERMINAL,
           ACCMETH=VTAM,
           TRMIDNT=LU12,
           TRMTYPE=3284,TRMMODL=2,
           RUSIZE=256
           TRMSTAT=RECEIVE,
           RELREQ=(YES,YES)
    
```

3. BTAM TC Monitor under DBDCCICS

This configuration is part of the CICS terminal control table (ICI). It is a series of macro calls assembled to create a core image phase. This phase is loaded at initialization and determines the configuration of the communications network. It is the simplest way to define a network under CICS. Please note that these are samples and may vary among operating systems.

Type the following to define polling address sequences for the controller and terminals to be accessed.

```

PCLUSTER  OFTRMLST AUTOWLST, 3732,
            (40407F7F2D)

PPORT1    DFTRMLST OPENLST,
            (606040402D)

PPORT2    DFTRMLST OPENLST,
            (6060C1C12D)

PPORT3    DFTRMLST OPENLST,
            (6060C2C22D)

PPORT4    DFTRMLST OPENLST,
            (6060C3C32D)

PPORT5    DFTRMLST OPENLST,
            (6060C4C42D)

PPORT6    DFTRMLST OPENLST,
            (6060C5C52D)

PPORT7    DFTRMLST OPENLST,
            (6060C6C62D)

PPORT8    DFTRMLST OPENLST,
            (6060C7C72D)

PPORT9    DFTRMLST OPENLST,
            (6060C8C82D)

```

Type the following to create a data set control block for a communication line and to define a point-to-point, non-switched environment. Modify these parameters to suit specific installations.

```

GROUP TYPE=SDSCI, DSCNAME=LASER,
        SWITCH=NO,
        DEVICE=BSCMDPPT, CONFIG=PPT,
        FEATURE=(BSC), BSCCODE=EBCDIC,
        CU=2703,
        LINELST=(030), MODELST=(0),
        ERROPT=E, RETRY=7

```

Type the following to attach a single line to a cluster controller.

```

LINE DFHTCT TYPE=LINE,
      ACCMETH=BTAM, DSCNAME=LASER,
      LISTADDR=(PCLUSTER, WRAP),
      IRMTYPE=3270, TRMMODL=2,
      BTAMRLN=1, FEATURE=AUTOPOLL,
      INREAL=256

```

Type the following to attach the terminals to the the cluster controller. These are general definitions which work in most cases.

```

PORT2 DFHTCT TYPE=TERMINAL,
      TRMIDNT=LU2, TRMADDR=PPORT2,
      CLASS=BISYNC,
      TRMTYPE=3278, PGESIZE=(24,80),
      TRMMODL=2
      POLLPOS=1, TRMSTAT=TRANSCIVE,
      COMPAT=NO, FEATURE=(AUDALARM)

```

```

PORT3 DFHTCT TYPE=TERMINAL,
      TRMIDNT=LU3,
      TRMADDR=PPORT3, CLASS=BISYNC,
      TRMTYPE=3278,
      PGESIZE=(24,80), TRMMODL=2
      POLLPOS=1, TRMSTAT=TRANSCIVE,
      COMPAT=NO, FEATURE=(AUDALARM)

```

```

PORT4 DFHTCT TYPE=TERMINAL,
      TRMIDNT=LU4,
      TRMADDR=PPORT4, CLASS=BISYNC,
      TRMTYPE=3278,
      PGESIZE=(24,80), TRMMODL=2
      POLLPOS=1, TRMSTAT=TRANSCIVE,
      COMPAT=NO, FEATURE=(AUDALARM)

```

```

PORT5 DFHTCT TYPE=TERMINAL,
      TRMIDNT=LUS,
      TRMADDR=PPORT5, CLASS=BISYNC,
      TRMTYPE=3278,
      PGESIZE(24,80), TRMMODL=2
      POLLPOS=1, TRMSTAT=TRANSCIVE,
      COMPAT=NO, FEATURE=(AUDALARM)

```

Type the following to attach a receive only printer to port 8. The specification of 3284 is used for all printer types. TRMMOD1=2 indicates that the full 1920 buffer is available.

```
PRNT8 DFHTCT TYPE=TERMINAL  
  TRMIDNT=LU18,  
  TRMADDR=PPORT8,CLASS=BISYNC,  
  TRMTYPE=3284,  
  PGESIZE=(24,80),TRMMODL=2  
  COMPAT=NO,FEATURE=(PRINT)
```

Type the following to attach a transparent print option printer to the terminal on port 2.

```
TRAN9 DFHTCT TYPE=TERMINAL,  
  TRMIDNT=LU22,  
  TRMADDR=PPORT9,CLASS=BISYNC,  
  TRMTYPW284,  
  PGESIZE=(24,80),TRMMODL=2  
  TRMSTAT=RECEIVE,  
  COMPAT=NO,FEATURE=(PRINT)
```

Appendix D: Troubleshooting

D.1 Installation and Configuration Problems

The LinkUp is designed for ease of use and maintenance-free operation. When properly installed and configured, it usually provides continuous trouble-free service. Should a problem arise with your terminal device or the port to which you are attached, a number of diagnostic tests can be performed using Port Test Mode or System Management Mode which may help isolate the trouble.

Most problems encountered by the LinkUp users occur during the installation and configuration phases of operation. These problems are discussed in this section. Problems which may arise during normal operation, and front panel error handling, are covered in Section D.2.

D.1.1 POWER PROBLEMS

- **Unit does not power up** — Check the power cord; make sure the power strip is on (if used).

Remove power cord from the LinkUp 3174. Slip a screwdriver under the lip of the fuse retainer and remove fuse. Check condition and replace if necessary.

- **All front panel LEDs ON. Channel/Error display shows "88" or "SY" error code** — Firmware not properly seated. Power off the LinkUp; remove and reseat the prom cartridge. Also reseat the async the expansion board(s).

Clean contacts on firmware cartridge and expansion boards using a pencil eraser.

- **Channel/Error display shows "dr". SYS OK light on but not blinking** — Hardware power-on test failure. See Note.

NOTE

During power-on self testing (which usually takes 2 or 3 seconds), the Channel/Error display shows "dr". All front panel LEDs except ON and SYS OK are initially off. As the various self tests are completed, the corresponding LEDs are lit. If a self-test does not pass, the corresponding LED remains OFF, "dr" remains in the Channel/Error display, and the SYS OK LED is on steady. The list below shows the hardware errors indicated by an LED remaining off.

- **DCE LED off** — Watch Dog Timer Failure. Replace PROM Cartridge.
- **DTE LED off** — ROM Test Failure. Replace PROM Cartridge.
- **TXD LED off** — Data Bus Failure. Replace microprocessor or main board.
- **RXD LED off** — Address Bus Failure. Replace microprocessor or main board.
- **RTS LED off** — RAM Test Failure. Replace RAM chips.
- **CTS LED off** — Insufficient Working RAM. Increase RAM to 768K, or replace defective RAM chips.
- **DTR LED off** — Sync 8530 Failure. Replace sync 8530 or main board.
- **DSR LED off** — Async 8530 Failure. Replace async 8530 or async board.
- **DCD LED off** — Insufficient EEPROM. Increase EEPROM to 32K, or replace defective EEPROM chips.

D.1.2 ASYNCHRONOUS PORT CONFIGURATION PROBLEMS

- **Port appears to be inoperative. Cannot obtain LinkUp connect screen** — Press <Enter> to autobaud the LinkUp.

Make sure the async expansion board is properly seated.

Check cable. It must support the required pins for the intended application.

Check the configuration of the terminal. Set it for 8 data bits, no parity, 1 stop bit.

Try connecting the terminal to a different async port on the LinkUp.

Try setting the terminal for a different baud rate.

- **Directly attached printer does not work** — Configure the port and the LU associated with the port for printer operation.

Configure the port for a fixed bit rate (do not use AUTO).

NOTE

If the printer port is configured for Device Ready Signal = NONE and the configuration of the printer is then changed, the Deact/Act Async Port function (System Management Mode, Option 7) must be used to cause the configuration changes to take effect.

If the Device Ready Signal is defined, printer configuration changes may be activated by using the Port Deact/Act function or by powering the printer off and back on again.

If a terminal requiring the printer for local copy in In-Use state, it must exit to Connect Mode and re-enter to be able to access the printer.

- **Aux printer does not work** — Make sure the LinkUp supports the auxiliary (or printer) port of the terminal being used.

Make sure the auxiliary port parameters on your terminal are set to agree with the requirements of your printer.

Make sure the LU associated with your terminal is configured to support an aux printer LU (Option 14 on Display LU menu).

Make sure the LU is configured as AUX.

- **Garbled printer output (AUX or PRT)** — Check for proper flow control, baud rate, parity, data bits.

D.1.3 SYNCHRONOUS PORT CONFIGURATION PROBLEMS

- **Cannot establish connection with the host** — Make sure the LU you are using is associated with the proper synchronous port.

Check for proper Control Unit number. (If you do not know the CU number, you may be able to obtain it by running a sync port address trace.)

Check for correct physical unit ID number.

Check for incorrect bit rate. If the LinkUp is connected to the host via synchronous modems, the bit rate must be set to EXT; Communications Interface = DTE. If the LinkUp is directly connected to the host, the bit rate must be a specific number; Communications Interface = DCE.

Make sure that the host line is active.

NOTE

When a connection is established between the LinkUp and a host computer, the TXD and RXD front panel indicators flash continuously when monitoring the sync port, indicating host polling and LinkUp responses. If only one of these LEDs is flashing, the LinkUp is receiving polls but is not responding. Check the Sync Port configuration for proper CU Address, proper Duplex, and proper NRZI. If neither LED is flashing, the sync line is not active.

If the synchronous port must be reconfigured, the reconfiguration does not take effect until the LinkUp is powered off and back on, or a Sync Port Reset or Remote Reset is accomplished.

D.1.4 MODEM PROBLEMS

The variety of modem problems which can arise in a dial-up environment is beyond the scope of this manual. We assume that the system manager is familiar with the modems in use and knows their specific requirements. This section contains general guidelines only. However, it should prove helpful in troubleshooting the more common problems associated with modem use.

If a modem connection is unsuccessful, check the RS-232C cables. Be sure Pin 22 (Ring Indicator) is present. For synchronous modems, Pins 15 and 17 must also be present to provide the necessary clocking signals. Recheck the configuration of both modems, making sure all the necessary signals are being transmitted and/or received. Also check for proper configuration of the LinkUp 3174 port to which the modem is connected. If you are dialing into the LinkUp, both DTR and DSR should remain ON after the call is answered. If this is not the case, the port is incorrectly configured.

If a modem connection is successful but data transfer is garbled or nonexistent, make sure the baud rates of the modems and the terminal devices are matched. Be sure the answering modem is set for auto answer and that result codes are disabled. If you are dialing into the LinkUp, set the Connect Mode to AUTO.

NOTE

If one modem is autobaud and the other is not, it is advisable to put the autobaud modem at the answering end and the fixed baud rate modem at the calling end.

D.2 Problems During Normal Operation

D.2.1 CONNECT MODE PROBLEMS

Problems may arise during normal Connect Mode operation if erroneous or unacceptable responses are made to connect-mode prompts. Connect Mode error messages and appropriate actions for these messages are listed below:

- **SYNTAX ERROR** — Reenter command using proper syntax.
- **UNRECOGNIZED RESPONSE** — Correct response to prompt and reissue command.

- **NONEXISTENT ACCESS GROUP** — An Access Group Name has been entered which has not been previously defined. Enter Configurator Mode and define the Access Group Name.
- **ILLEGAL CHARACTER** — Illegal character has been used. Correct response and reissue command.
- **MAXIMUM STRING LENGTH EXCEEDED** — Value entered exceeded maximum number of allowable characters. Correct response and reissue command.
- **MAXIMUM LINE LENGTH EXCEEDED** — Line entered has exceeded the maximum length. Reenter the line.
- **VALUE OUT OF RANGE** — Enter appropriate value.
- **INVALID** — An invalid response has been made.
- **TRAILING CHARACTERS IGNORED** — More characters have been entered than required for the requested response. Not a destructive error. Continue with operation.
- **NOT SUPPORTED IN THIS RELEASE** — You have selected an option which is not supported in this release of the LinkUp. Select another option and proceed.
- **LU <#> NOT AVAILABLE** — Select another LU number for the session.
- **LU<#> NOT COMPATIBLE WITH DEVICE TYPE** — Check for proper LU number for the device type you are using.
- **LU<#> INADEQUATE BUFFER SIZE** — Change LU selection or reconfigure buffer size.
- **LU<#> NOT PRINTER TYPE** — Check for proper LU number.
- **LU<#> NOT AUX PRINTER TYPE** — Check for proper LU number.
- **DISPLAY DOES NOT SUPPORT AUXILIARY PRINTER** — You have attempted to use the Auxiliary Printer feature with a Device Type that does not support this feature.

- **REQUESTED PASSTHRU PORT NOT A HOST PORT** — The async passthrough port associated with the selected PTU has not been configured as a dedicated host port. Reconfigure either the PTU or the associated async passthrough port, or select another port.
- **NO LU (PTU) AVAILABLE** — All LUs or PTUs in the selected Access Group are already in use.
- ****CAUTION** (PAGE LENGTH x LINES PER INCH) HAS NON-INTEGERS RESULT; LINE COUNT PER PAGE NOT UPDATED** — Warning message only.
- **INACTIVITY TIME LIMIT EXCEEDED** — Your terminal has remained inactive in Emulation Mode for longer than allowed. This time limit is defined by your system manager. Attempt to reconnect to the same Logical Unit.
- **CONNECT REQUEST FAILED** — Perform connect sequence again.
- **UNABLE TO READ EEPROM. DEFAULT CHARACTERISTICS ASSUMED** — Report error to Black Box.
- ****CONNECT ATTEMPT CANCELLED. PORT RECONFIGURED**** — Perform connect sequence again and proceed. Port has been reconfigured while in use.
- **PASSTHROUGH PORT LINE IS DOWN** — Device Ready signal on the async host side of a passthrough session has been lost. Passthrough session is in Reconnect State. Exit the passthrough session using the LinkUp Attention Code, or take action to restore the line to the async host.
- **RECONNECT NOT POSSIBLE** — Broken session cannot be restored due to incorrect reconnect password or because there are not reconnectable LUs or PTUs in the Access Group.

- **CONNECT PENDING PLEASE WAIT...(OR HIT <RETURN> KEY TO ABORT)** — Warning message only. Wait as requested or abort connect request with an <Enter>.

NOTE

When upgrading the PROM cartridge to SNA version 5.30 or above, or BSC version 4.30 or above, the <SP 00> error code will be displayed because the main system parameters are being changed. Clear this error code by pressing RESET on the front panel and continue normal operation.

D.2.2 CONFIGURATOR MODE PROBLEMS

Problems may arise during configuration if erroneous or unacceptable responses are made to configurator-mode prompts. The Configurator Mode error messages and their meanings are listed below:

- **ERROR: ACCESS GROUP NAME ALREADY IN USE** — You are attempting to configure an LU Group or PTU Group which has already been defined. Choose another Access Group Name.
- **ERROR: ATTEMPT TO MODIFY AN LU/PTU BELONGING TO AN EXISTING ACCESS GROUP** — You have attempted global configuration for an LU/PTU currently belonging to an Access Group. If configuration is necessary, delete the Access group, perform the configuration; then recreate the Access Group.
- **ERROR: BASE LU IS NOT A DISPLAY LU. ACCESS GROUP NOT ALLOWED** — Redefine the Access Group so that the first LU listed in the group is a display LU.
- **ITEM CANNOT BE CHANGED BECAUSE LU/PTU IS A MEMBER OF AN ACCESS GROUP** — You have attempted to change a configuration parameter on an LU/PTU that has been previously assigned to an Access Group. If configuration is necessary, delete the Access Group, perform the configuration; then recreate the Access Group.

- **ERROR: BASE LU/PTU IN CONFLICT WITH GROUP LU/PTU(S) BELONGING TO ANOTHER ACCESS GROUP** — You have attempted to place an LU/PTU belonging to an existing Access Group into another Access Group having a different base configuration.

D.2.3 PORT INOPERATIVE

If an async port becomes inoperative, try using a different port on the same async board. If none of the ports on a single async board are operative, exchange the board for a new one or swap the board with the one above it.

NOTE

If an async board fails, those located above it on the LinkUp are inoperative. It is necessary to move the failed board to the uppermost position (or remove it completely and shift the other boards down) in order to use the remaining good ports. Be sure to power off the LinkUp before removing and repositioning the async boards.

D.2.4 FRONT PANEL ERROR HANDLING

If a program-detectable error occurs, all channel status indicators on the front panel are turned off and a two-level or three-level error code is displayed by the two-digit channel display. The error codes are flashed alternately.

When an error is displayed, pressing the RESET button clears the error and causes channel status display to resume. However, if more than one error has occurred, pressing RESET clears the most recent error and displays the previous one. Preceding error codes can then be viewed by pressing RESET repeatedly until the channel status indicators resume their normal operation. This marks the end of accumulated errors. Once errors are cleared, they cannot be redisplayed on the front panel.

The error code assignments are listed in Table D-1.

Table D-1. Front Panel Error Codes.

CLASS	FIRST CODE	SECOND CODE	DEFINITION
Hardware Deficiency	HA	00	Insufficient EEPROM for this configuration.
	HA	01	Insufficient RAM for this configuration.
System Errors	Sy	00	CPU failure: "watch dog" timer timeout. ROM Failure: Bad ROM cartridge. Contents of flash EEPROM corrupted. Attempt another microcode download. Flash EEPROM is defective. Call your supplier.
	Sy	01	
	Sy	02	
	Sy	03	
EEPROM Chip Error	EE	01 through 04	EPROM chip defective. Chip number is identified by the second code.
System Parameter Error in EEPROM	SP	00	EEPROM Header Error. As many as all parameters stored in EEPROM may be restored to default values. This error occurs when unformatted EEPROM chip(s) are encountered when the LinkUp is powered up. EEPROM failure in System section. Default values are loaded. EEPROM failure in Banner Message area. Default values are loaded. EEPROM failure in Ancillary Translate tables. Default values are loaded.
	SP	01	
	SP	02	
	SP	03	
Port Parameter Error in EEPROM	Po	00 through 33	EEPROM failure in Port Parameters. Second code indicates port number. Default values are loaded for the defective port.
*Logical Unit Parameter Error in EEPROM	LU	02 through 33	EEPROM failure in LU parameters. Second code indicates LU number. Default values are loaded for the defective item.
User-Configurable Device Driver Parameter Error in EEPROM	UC	01 through 06	EEPROM failure in User-Configurable Device Driver parameters. Second code indicates the defective driver number. Defaults are loaded for the defective item.
*Stack Overflow	LS	02 through 33	Logical Unit Stack overflow. Second code indicates the LU number.
*Passthrough Unit Parameter	PU	02 through 17	EEPROM failure in passthrough unit.
*These error codes may be either two-level or three-level codes. All other error codes are two-level codes.			

D.2.5 STATUS LINE ERROR MESSAGES

In 3278 Emulation Mode, the LinkUp supports a Status Line consisting of an error code area and an operator information area. These are formatted in a similar manner to the Status Line presented on an IBM 3278 Display Station screen. The error messages displayed on the Status line may be used to help isolate problems which may occur during a host session.

The Status Line is a subset of the IBM 3174 Status Line. Special graphics characters used on the IBM 3278 Display Station are available on some ASCII terminals.

If the Status Line is not displayed and the keyboard is locked, perform the [DISPLAY STATUS LINE] sequence if you wish to view the status line message(s). Perform the <RESET> sequence to restore keyboard operation.

NOTE

If a display in Emulation Mode has been assigned a local copy printer and the printer LU either:

a) has not been associated with an async port during configuration, or

b) is powered off or disconnected, then a Status Line message of OCO is displayed instead of the normal OCO_{nn} (where nn=the LU number of the local copy printer). If a local copy print operation is attempted, the error message X F X (Operator Unauthorized) is displayed. The <RESET> key should be used to clear this error message.

If the OCO message is caused by a configuration error, the error must be corrected and the display must exit to Connect Mode and return to Emulation Mode before the printer can be used.

If OCO is caused by the printer's not being in use, powering on or connecting the printer is all that is required; however, the Status Line is not corrected until the display exits to Connect Mode and returns.

Status Line Program Error Codes are listed below:

- **401** — Invalid command received.
- **402** — Invalid (out of range) address was received as the operand of a data stream order.
- **403** — Data was received following a Read, Read Modified or Erase All Unprotected command.
- **404** — Data stream ended before required bytes were received.
- **410** — RU greater than 1,536 bytes received.
- **413** — Attempted function is not supported.
- **420** — Last-In-Chain carried exception response when bind specified definite response.
- **421** — Last-In-Chain carried definite response when bind specified exception response.
- **422** — No response is not allowed.
- **423** — Format Indicator (FI) bit is not allowed.
- **430** — Sequence number error.
- **431** — Chaining error.
- **432** — Bracket error.
- **433** — Data Traffic Reset.
- **434** — Direction error.
- **441** — Bracket Reject.
- **443** — Change Direction required.
- **444** — Session already bound.
- **445** — ACTLU not equal to COLD or ERP.
- **450** — Profile error.
- **451** — Primary Protocol error.
- **452** — Secondary Protocol error.
- **453** — Common Protocol error.
- **454** — Screen size specification error.
- **455** — LU Profile error.
- **498** — Negative Response received.
- **499** — Exception Request.

The following is a list of Status Line Communication Error Codes:

- **501** — DSR signal from modem has dropped. Check modem. Press RESET key. Retry operation.
- **502** — CTS signal from modem is missing. Check modem. Press RESET key. Retry operation.
- **504** — DISC received from network. A new connection is required.
- **505** — Initial state of system. Host Recovery. An SNRM is required.
- **510** — The PU is not active. Host Recovery. An ACTPU is required.
- **520** — Non-productive timeout caused by a valid frame not received in the past 20-25 seconds, or the communications line is hung a space or a valid character. Verify the operational status of the comms network. Reset by receipt of a valid frame or a frame containing a poll.
- **521** — No flag characters on the line in 20-25 seconds. Verify the operational status of the comms network. Reset by receipt of a valid frame or a frame containing a poll.
- **528** — Common Reject caused by detection of an NR sequence error, receipt of a command that has no data field defined, or receipt of an invalid command. Host recover. SNRM required.
- **530** — Write timeout caused by modem clocking missing; CTS has dropped. Check modem. Host recovery. SNRM required.

NOTE

In BSC operation, error code 532 is equivalent to error 520 above.

D.2.6 EEPROM PROBLEMS

If any section of EEPROM is corrupted, it is automatically reinitialized at power-on time. A front panel error code informs the system manager that this has occurred. Reinitialization of EEPROM may result in loss of user-defined terminal modules.

If an ancillary translate table has been configured but cannot be read successfully from non-volatile memory, and <SP 03> error is displayed on the front panel and the table is reinitialized.

D.2.7 SETUP PROCEDURE

The LinkUp allows four attempts to enter a password-protected system's Management Mode. After the fourth unsuccessful attempt to enter the correct password, the message System Management Request Failed appears, after which the screen is cleared. Keying <Enter> then causes the Connect Mode screen to be redisplayed.

If the System Management Mode password is forgotten, the default condition of no password may be restored by executing a SETUP procedure. This procedure can only be implemented from Port 2 of the LinkUp. Follow these steps:

1. Power off the LinkUp.
2. Loosen the thumbscrews on either side of the main circuit board and slide it partway out. Move the two-position switch located near the PROM cartridge to the SETUP position. Carefully slide the main board back into position, making sure that the CHANNEL SELECT and RESET buttons do not bind on the front panel.
3. Power the unit back on.
4. Press <Enter> and wait for the Connect Screen to appear.
5. Enter your Device Type and request LU1. The following display appears:

```

***SETUP MODE***
Options:   ALL           -To initialize all Parameters
           PASSWORD      -To Reset System Password
           !             -To Abort this Request

Enter Option:
    
```

6. Type in the desired response and press <Enter>.

NOTE

The **SETUP** procedure may also be used to restore all configuration parameters to their default values.

7. Power the LinkUp off again, slide the main circuit board out, and return the two-position switch to the RUN mode. Carefully reseat the main board and tighten the thumbscrews.
8. Power on the LinkUp and continue normal operation.

CAUTION

Use extreme care whenever removing and reseating the main circuit board on the LinkUp. The **CHANNEL SELECT** and **RESET** buttons are delicate and may be permanently damaged if they are not properly aligned when sliding the main board back into position.

D.3 Reporting Problems

Should you encounter a problem not covered in this document, or one that persists after following the appropriate troubleshooting steps given, call Black Box.

Before you call, please complete the steps below so that you will have the necessary information ready.

Step 1: Read this manual thoroughly. It contains the information necessary for correcting most problems.

Step 2: Have the following information ready for Black Box:

1. Model name and number and number of asynchronous ports.
2. Hardware Revision Level. Obtain from the product table located on the bottom or rear of the unit.
3. Firmware Version Number. Obtain from menu item 5 of System Management Mode.
4. System Configuration: type of host, local vs. remote connection, application program, terminal type and configuration, type of modems used, etc.

Step 3: Describe the symptoms of the problem. To say that the unit is dead or that it is operating incorrectly is of little help in isolating a problem.

1. Are all the cables and wires connected properly?
2. Is the power on?
3. Are any lights or indicators on?
4. Did the unit make any unusual noises?
5. Are the connected units working, such as the host computer, other terminals or printers, modems, or network nodes?
6. Have you made any recent changes in configuration, cabling, peripheral attachments, etc.?

Appendix E: List Of Supported Terminals

This Appendix lists all the terminals supported by the LinkUp 3174.

E.1 ACT5A Terminal Module—Microterm ACT-5A

How to Set Up the Terminal

To set up the ACT-5A terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows.

1. Set the Full/Half Duplex switch at the rear of the cabinet to Full Duplex operation.
2. To set the terminal and printer baud rates, set the switch corresponding to the desired baud rate. It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected. If a baud rate of 110 is selected, be sure the number of Stop bits specified is two (2). The baud rate switches are found on the main logic board.

I/O	Printer	Baud Rate
1	8	1920
2	7	960
3	6	480
4	5	240
5	4	120
6	3	60
7	2	30
8	1	110

3. There are six (6) switches located on the logic board at the rear of the cabinet which control the terminal's parity, word length and number of stop bits. Set these switches to the following values:

Switch/Option	Value	Comments
5/8th bit transmit	as desired	OFF = Mark, ON = Space to be transmitted
6 and 7/Word Length	Length = 8 = 7 = 6 = 5	6 = OFF 7 = OFF 6 = OFF 7 = ON 6 = ON 7 = OFF 6 = ON 7 = ON
8/Odd or Even Parity	as desired	OFF = Even, ON = Odd
9/Number of Stop Bits	ON	Sets the number of stop bits at one. If a baud rate less than or equal to 110 is being used, set this bit to OFF = two stop bits.
10/Parity	as desired by Switch #8.	OFF = No parity, ON = parity selected

Keyboard Emulation

The following is a table showing how the Microterm ACT-5A keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the ACT-5A Auto-Scroll capability.
4. The auxiliary port on the ACT-5A is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	08H
Down Cursor	↓	0BH
Up Cursor	↑	1AH
Forward Space Cursor	→	18H
Home	CTRL/^	1EH
Tab	TAB	09H
Backtab	CTRL/B	02H
Delete	DELETE	7FH
New Line	LINE FEED	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/Y	19H
Enter	RETURN or ENTER	0DH
Clear	ESC^	1B 5EH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH

3278 Function	Key Sequence	Hex Value Generated
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.2 ADM2D Terminal Module—Lear Siegler ADM-21 Order Entry

How to Set Up the Terminal

To set up the ADM-21 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. There are ten (10) toggle-type switches on the terminal's back panel labeled as S1 switches. These switches are used to specify terminal operating characteristics. Set these switches in the following manner:

Switch	Set to:	Comments
EDIT-FUNC	FUNC	Sets Alternate mode with edit keys
CURSOR BLINK- CURSOR STEADY	?	Set as desired
CARRIAGE RETURN-	CARR.RETURN	Disables automatic New Line function
PARITY (Sw. 4 and 5)	ODD	Sw4 = Down, Sw5 = Down
	EVEN	Sw4 = Down, Sw5 = Up
	MARK	Sw4 = Up, Sw5 = Down
	SPACE	Sw4 = Up, Sw5 = Up

Switch	Set to:	Comments
HALF DUPLEX- FULL DUPLEX	FULL DUPLEX	Full Duplex operation enabled
60HZ - 50 HZ	As required	To match input power frequency
AT4	Switch UP	AT4 not used
CGS1	Switch UP	CGS1 not used
CGS2	Switch DOWN	CGS2 char. select option enabled

2. There are 10 toggle-type switches on the terminal back panel labeled as S2 switches. These switches set the baud rate and specify functional terminal operating characteristics. Set these switches in the following manner.

SW Switch	Set to:	Comments
BAUD RATE (SW. 1-7)		See #3 below for Switch settings
BUSY DIS-BUSY EN	Busy DIS	Disable BUSY control function
REV VIDEO ON- REV VIDEO OFF	as desired	Set Reverse Video function as desired

3. The remaining switches on the back panel are used to set the baud rate for communication with the LinkUp 3174. To set the baud rate, set the switch next to the desired baud rate to the UP position as specified on the ADM-21 back panel (S2) switch group. All other switches must be set to the DOWN position. Note that only one switch is enabled for the desired baud rate unless 110 is to be selected. To set a baud rate of 110, set the following switches to the UP position (Sw. 1, 3, 5, 6, 7, 8) and Switches 2 and 4 to the DOWN Position.

It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected. If a baud rate of 110 is selected, be sure to specify 2 stop bits.

4. Connect the terminal to the converter port (modem or direct cable) as appropriate.

Keyboard Emulation

The following is a table shown how the ADM-21 Order Entry keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments are based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix, thus:
 - Row 1 (1-0) = PF1 - PF10
 - Row 2 (Q - P) = PF11 - PF20
 - Row 3 (A - F) = PF21 - PF24
4. The last character on the screen (the Line-24, Column-80 character position) cannot be displayed. This feature is designed to defeat the ADM-21 Auto-Scroll capability.
5. The terminal requires a special keytop set.
6. The auxiliary port on the ADM-21 is used by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R or RESET	12H 01 41 0DH
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	CTRL/^	1EH
Tab	TAB	09H
Backtab	BACKTAB	01 47 0DH
Delete	CHAR DELETE or DEL	01 45 0DH 7FH
New Line	NEW LINE	5CH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CHAR INSERT	01 44 0DH
Erase to End of Field	ERASE EOF	01 46 0DH
Erase Input	CTRL/X	18H
Enter	RETURN/ENTER	0DH
Clear	CLEAR	01 40 0DH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q or ESC -	1B 51H 1B 5FH
PF12	ESC W or ESC =	1B 57H 1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	PA1	01 60 0DH
PA2	PA2	01 61 0DH
PA3	PA3	01 62 0DH
Print	PRINT SCREEN	01 43 0DH
Cursor Select	CTRL/C	03H

3278 Function	Key Sequence	Hex Value Generated
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	SCREEN REFRESH	01 42 0DH
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.3 ADM3A Terminal Module—Lear Siegler ADM-3A

How to Set Up the Terminal

To set up the ADM-3A terminal for connection to the LinkUp 3174 in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before opening the ADM-3A case.
2. There are 13 toggle-type switches on the terminal’s circuit board. These switches are used to specify operating characteristics. Set these switches in the following manner:

Switch	Set to:	Comments
SPACE-ADV	SPACE	Destructive Cursor
UC DISP-U/L DISP	U/L DISP	Allows display of upper and lower case characters (if terminal has this option)
DISABLE-KB LOCK	KB LOCK	Allows keyboard lock
DISABLE-CLR SCRN	CLR SCRN	Clear Screen position
50 HZ - 60 HZ	?	To match input power freq.
12 LINE-24 LINE	24 LINE	24 line display
CUR CTL-OFF	CUR CTL	Specify cursor control
LOCAL-OFF	?	Set as is appropriate
103-OFF	?	Set as is appropriate
202-OFF	OFF	Half-duplex I/O not allowed
CODE-SEC		Active only if 202 is on
ETX-OFF	OFF	Off since 202 is off
EOT-OFF	OFF	Off since 202 is off

3. There are 20 toggle-type switches on the ADM-3A Front Panel. These switches are used to specify the terminal’s primary operating characteristics and may be accessed by removing (unscrewing) the identification plate on the keyboard. Set these switches in the following manner:

Switch	Set to:	Comments
BIT8-0/1	0	Forces bit 8 to zero. Set this switch only if parity is not set; i.e., this switch and a Parity switch are mutually exclusive
PARITY-INH	?	If parity is to be set, set Parity; otherwise, set to INH. Parity is set to match parity for the LinkUp 3174 port. If no parity, set Bit 8 (see above).
STOP 1-2	?	Set as appropriate. The LinkUp 3174 assumes 1, except at baud rate of 110, when 2 is assumed.
DATA 7-8	8	8-bit data word length.
PAR-ODD-EVEN	?	This switch has effect only with the PARITY-INH switch in the PARITY position. If Parity is on, select parity to match the parity on the LinkUp 3174 port for this CRT.
LC EN-UC	EN	Allows lower and upper case.
AUTO NL-OFF	OFF	Disables auto NEW LINE.
RS232-CL	RS232	Selects RS-232C communications at the Modem connector on the rear panel.
HDX-FDX	FDX	Full-duplex operation.

4. The remaining switches on the front panel are used to set the baud rate for communication with the converter. To set the baud rate, set the switch next to the desired baud rate to the left-hand position. All other baud switches must be set on the right-hand side; i.e., set one switch only. The baud rate specified here must match the baud rate specified for the converter port to which this terminal is connected. It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected. If a baud rate of 110 is selected, be sure to specify 2 stop bits.

5. Replace the cover, reconnect the AC power cord and connect the terminal to the converter port (or modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the ADM-3A keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:

Row 1 (1-0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

4. The auxiliary port on the ADM-3A is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	CTRL/H	08H
Down Cursor	LINE FEED	0AH
Up Cursor	CTRL/K	0BH
Forward Space Cursor	CTRL/L	0CH
Home	CTRL/^	1EH
Tab	CTRL/T	14H
	or CTRL/I	09H
Backtab	CTRL/B	02H
Delete	RUB	7FH
	or ESC +	1B 2BH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC^	1B 5EH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
	or ESC -	1B 2DH
PF12	ESC W	1B 57H
	or ESC =	1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H

3278 Function	Key Sequence	Hex Value Generated
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	SCREEN REFRESH	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.4 ADM3P Terminal Module—Lear Siegler ADM-3P

How to Set Up the Terminal

To set up the ADM-3P terminal for connection to the LinkUp 3174, proceed as follows:

1. Disconnect the AC power cord from the outlet before opening the case.
2. There are 13 toggle-type switches on the terminal's circuit board. These switches are used to specify terminal operating characteristics. Set these switches in the following manner:

Switch	Set to:	Comments
SPACE-ADV	SPACE	Destructive Cursor
UC DISP-U/L DISP	U/L DISP	Allows display of upper and lower case characters (if terminal has this option)
DISABLE-KB LOCK	KB LOCK	Allows keyboard lock
DISABLE-CLR SCRN	CLR SCRN	Clear Screen position
50 HZ - 60 HZ	as required	To match input power freq.
12 LINE-24 LINE	24 LINE	24-line display
CUR CTL-OFF	CUR CTL	Specify cursor control
LOCAL-OFF	as desired	Set as is appropriate
103-OFF	as desired	Set as is appropriate
202-OFF	OFF	Half-duplex I/O not allowed
CODE-SEC		Active only if 202 is on
ETX-OFF	OFF	Off since 202 is off
EOT-OFF	OFF	Off since 202 is off

3. There are 20 toggle-type switches on the front panel. These switches are used to specify the terminal's primary operating characteristics and may be accessed by removing (unscrewing) the identification plate on the keyboard. Set these switches in the following manner:

Switch	Set to:	Comments
BIT8-0/1	0	Forces bit 8 to zero. Set this switch only if parity is not set; i.e., this switch and a parity switch are mutually exclusive.
PARITY-INH	as required	If parity is to be set, set Parity; otherwise, set to INH. Parity is set to match parity for the LinkUp 3174 port. If no parity,
STOP 1-2	set Bit 8 (see above). as desired	Set as appropriate. The LinkUp 3174 assumes 1, except at baud of 110, when 2 is assumed.
DATA 7-8 .PAR-ODD-EVEN	8 as desired	8-bit data word length This switch has effect only with the PARITY-INH switch in the PARITY position. If parity is on, select parity to match the parity on the LinkUp 3174 port for this CRT.
LC EN-UC AUTO NL-OFF RS232-CL	EN OFF RS232	Allows lower and upper case. Disables auto NEW LINE. Selects RS-232C communications at the Modem connector on the rear panel.
HDX-FDX	FDX	Full duplex operation.

4. The remaining switches on the Front Panel are used to set the baud rate for communication with the converter. To set the baud rate, set the switch next to the desired baud rate to the left-hand position. All other baud switches must be set on the right-hand side; i.e., set one switch only. The baud rate specified here must match the baud rate specified for the converter port to which this terminal is connected. It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected. If a baud rate of 110 is selected, be sure to specify 2 stop bits.

5. Replace the cover, reconnect the AC power cord and connect the terminal to the converter port (or modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the ADM-3P keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix, thus:

Row 1 (1-0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

4. The auxiliary port on the ADM-3A is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature. For a description of this feature, see the LinkUp 3174 Terminal User's Guide.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	CTRL/H	08H
Down Cursor	LINE FEED	0AH
Up Cursor	CTRL/K	0BH
Forward Space Cursor	CTRL/L	0CH
Home	CTRL/^	1EH
Tab	CTRL/T	14H
	or CTRL/I	09H
Backtab	CTRL/B	02H
Delete	RUB	7FH
	or ESC +	1B 2BH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC^	1B 5EH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
	or ESC -	1B 2DH
PF12	ESC W	1B 57H
	or ESC =	1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H

3278 Function	Key Sequence	Hex Value Generated
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	SCREEN REFRESH	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.5 ADM11 Terminal Module—Lear Siegler ADM-11

How to Set Up the Terminal

Information on the Lear Siegler ADM-11 terminal switch settings was not available at the time of publication. Please refer to the ADM-11 User's Manual and the "General Notes on Terminal Switch Settings" section of the Introduction to this document for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the Lear Siegler ADM-11 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Lear Siegler Auto-Scroll capability.

4. The auxiliary port on the ADM-11 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature. For a description of this feature, see the LinkUp 3174 Terminal User's Guide.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	SHIFT/TAB	1B 49H
Delete	DEL	7FH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	ERASE LINE	1B 54H
Erase Input	ERASE PAGE	1B 59H
Enter	RETURN or ENTER	0DH
Clear	ESC Z	1B 5AH
Sys Request	ESC?	1B 3FH
PF1	ESC 1 or F1	1B 31H 01 40 0DH
PF2	ESC 2 or F2	1B 32H 01 41 0DH
PF3	ESC 3 or F3	1B 33H 01 42 0DH
PF4	ESC 4 or F4	1B 34H 01 43 0DH
PF5	ESC 5 or F5	1B 35H 01 44 0DH
PF6	ESC 6 or F6	1B 36H 01 45 0DH
PF7	ESC 7 or F7	1B 37H 01 46 0DH
PF8	ESC 8 or F8	1B 38H 01 47 0DH
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC -	1B 2DH
PF12	ESC =	1B 3DH
PF13	ESC !	1B 21H
PF14	ESC @	1B 40H
PF15	ESC #	1B 23H
PF16	ESC \$	1B 24H
PF17	ESC %	1B 25H
PF18	ESC ^	1B 5EH
PF19	ESC &	1B 26H
PF20	ESC *	1B 2AH
PF21	ESC (	1B 28H
PF22	ESC)	1B 29H
PF23	ESC _(underline)	1B 5FH

3278 Function	Key Sequence	Hex Value Generated
PF24	ESC +	1B 2BH
PA1	ESC ,	1B 2CH
PA2	ESC .	1B 2EH
PA3	ESC /	1B 2FH
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC L	1B 4CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.6 ADM12 Terminal Module—Lear Siegler ADM-12

How to Set Up the Terminal

To set up the ADM-12 terminal for connection to the converter in order to emulate the 3278, proceed as follows:

All operator-selectable variables are input from the keyboard into the Status Line within the ADM-12 Set-up Mode; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. For details on how to enter and exit the ADM-12 Set-up modes, and how to select the various options, please refer to the ADM-12 User's Reference Manual. Set the options as follows:

Option	Set to:	Comments
Keyclick	as desired	Audible keyclick
Status Line Attributes	as desired	
Cursor Blink	as desired	Cursor blink or steady
Cursor Shape	as desired	Block or Underline
Screen Saver	as desired	Autoshut off of display
Smooth Scroll	as desired	Smooth or Jump scroll
Horizontal Scroll	as desired	By line or page
On Line/Local	ONLN	On Line
Page Configuration	as desired	Two- or one-page
Wrap at Right Margin	NO	No end-of-line wrap

Option	Set to:	Comments
Return key config.	CR	Return key generates CR character
Block/Conversation Duplex Option	CNV FDX	Conversation Mode Full Duplex
Handshake protocol	Set to: as desired	Comments Set to match logical flow control selection configured for the LinkUp 3174 port.
Baud Rate	as desired	Terminal Baud Rate
Parity Select	as desired	Enable or Disable
Parity Type	as desired	Even or Odd
Bit 8	as desired	Bit 8 = 0 or = 1

Keyboard Emulation

The following is a table showing how the ADM-12 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the Line-24, Column-80 character position) cannot be displayed. This feature is designed to defeat the ADM-12 Auto-Scroll capability.
4. The auxiliary port on the ADM-12 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	SHIFT/TAB	1B 49H
Delete	DEL or DELETE CHAR	7FH 1B 57H
New Line	NEW LINE	1FH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CHAR INS	1B 51H
Erase to End of Field	ERASE LINE	1B 54H
Erase Input	ERASE PAGE	1B 59H
Enter	RETURN or ENTER	0DH
Clear	F28	01 5B 0DH
Sys Request	F29	01 5C 0DH
PF1	F1	01 40 0DH
PF2	F2	01 41 0DH
PF3	F3	01 42 0DH
PF4	F4	01 43 0DH

3278 Function	Key Sequence	Hex Value Generated
PF5	F5	01 44 0DH
PF6	F6	01 45 0DH
PF7	F7	01 46 0DH
PF8	F8	01 47 0DH
PF9	F 9	11 48 0DH
PF10	F10	01 49 0DH
PF11	F11	01 4A 0DH
PF12	F12	01 4B 0DH
PF13	F13	01 4C 0DH
PF14	F14	01 4D 0DH
PF15	F15	01 4E 0DH
PF16	F16	01 4F 0DH
PF17	F17	01 50 0DH
PF18	F18	01 51 0DH
PF19	F19	01 52 0DH
PF20	F20	01 53 0DH
PF21	F21	01 54 0DH
PF22	F22	01 55 0DH
PF23	F23	01 56 0DH
PF24	F24	01 57 0DH
PA1	F25	01 58 0DH
PA2	F26	01 59 0DH
PA3	F27	01 5A 0DH
Print	ESC P	1B 50H
Cursor Select	CTRL/C	03H
Attention	F30	01 5D 0DH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.7 ADM21 Terminal Module—Lear Siegler ADM-21

How to Set Up the Terminal

To set up the ADM-21 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. There are 10 toggle-type switches on the terminal's back panel labeled as S1 switches. These switches are used to specify terminal operating characteristics. Set these switches in the following manner:

Switch	Set to:	Comments
EDIT-FUNC	FUNC keys	Sets Alternate mode with edit
CURSOR BLINK-CURSOR STEADY	?	Set as desired
CARRIAGE RETURN-NEW LINE	CARR.RETURN	Disables automatic New Line function
PARITY (Sw. 4 and 5)	ODD	Sw4 = Down, Sw5 = Down
	EVEN	Sw4 = Down, Sw5 = Up
	MARK	Sw4 = Up, Sw5 = Down
	SPACE	Sw4 = Up, Sw5 = Up
HALF DUPLEX-DUPLEX	FULL DUPLEX	Full Duplex operation FULL enabled
60HZ - 50 HZ	As required	To match input power frequency
AT4	Switch UP	AT4 not used
CGS1	Switch UP	CGS1 not used
CGS2	Switch DOWN	CGS2 char. select option enabled

2. There are 10 toggle-type switches on the terminal Back Panel labeled as S2 switches. These switches set the baud rate and specify functional terminal operating characteristics. Set these switches in the following manner:

S2 Switch	Set to:	Comments
BAUD RATE (S2. 1-7)		See #3 below for Switches settings
BUSY DIS-BUSY EN	Busy DIS function	Disable BUSY control
REV VIDEO ON-VIDEO OFF	as desired	Set Reverse Video function REV as desired

3. The remaining switches on the back panel are used to set the baud rate for communication with the protocol converter. To set the baud rate, set the switch next to the desired baud rate to the UP position as specified on the ADM-21 back panel (S2) switch group. All other switches must be set to the DOWN position. Note that only one switch is enabled for the desired baud rate unless 110 is to be selected. To set a baud rate of 110, set the following switches to the UP position (Sw. 1, 3, 5, 6, 7, 8) and Switches 2 and 4 to the DOWN position.

It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected. If a baud rate of 110 is selected, be sure to specify 2 stop bits.

4. Connect the terminal to the converter port (modem or direct cable) as appropriate.

Keyboard Emulation

The following is a table showing how the ADM-21 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix, thus:

Row 1 (1-0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

4. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the ADM-21 Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	SEND PAGE	01 47 0DH
Delete	DELETE CHAR	01 45 0DH
New Line	DEL	7FH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CHAR INSERT or LINE INSERT	01 44 0DH 01 42 0DH
Erase to End of Field	LINE DELETE	01 43 0DH
Erase Input	LINE ERASE	01 40 0DH
Enter	RETURN or RETURN key at right of keypad	0DH 1FH
Clear	PAGE ERASE	01 41 0DH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H

3278 Function	Key Sequence	Hex Value Generated
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	SEND LINE	01 46 0DH
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.8 ADM24E Terminal Module—Lear Siegler ADM-24E

How to Set Up the Terminal

To set up the ADM-24 E terminal for connection to the LinkUp 3270 in order to emulate the 3278, proceed as follows:

All operator-selectable variables are input from the keyboard into the Status Line within the ADM-24E Set-Up Mode; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. For details on how to enter and exit the ADM-24E Set-Up mode, and how to select the various options, please refer to the ADM-24E User's Reference Manual. Set the options as follows:

Option	Set to:	Comments
Scroll Method	as desired	Jump or Smooth Scroll
ScreenBackground	as desired	Normal, Reverse or High-Light
Keyclick	as desired	Audible Keyclick
Return Key Configuration	CR CR character	Return key generates
Scroll Mode	Non-Scroll	Terminal Scroll disabled
Auto New Line	OFF	Auto New Line disabled
Keyboard Configuration	as desired	QY-Type, QWERTY, AZERTY or QY-TTY
Primary Language Group	USASCII	Terminal uses USASCII characters
Line 25 Definition	as desired	Status, F1-F8, F9-F16 or Blank
Line 25 Display	as desired	Normal or Reverse
Audible Bell	as desired	ON or OFF
Number of Lines, Page 1	24	24-line page defined
Number of Lines, Page 2	n.a.	0-24, unused by LinkUp 3174
Function Key Legend No.	as desired	
Typewriter Tabs	as desired	
Tabbing Mode	as desired	Typewriter or Protected Field
Internation Language	as desired	Alternate character generation mode
Attributes	Non-embedded	
Send/Print Attributes	Non-embedded	
Edit Key Sequence	ON	Edit keys transmit to Transmission host
Null Suppression	ON	
DEL Suppression	OFF	DEL character transmitted to host
Fill Character #1	Space fills screen with spaces	Clear screen function
Fill Character #2-#8	as desired	
Duplex	Full	Full Duplex mode
Parity (Host)	as desired	Odd, Even, Mark Space, or None

3278 Function	Key Sequence	Hex Value Generated
Busy/Ready Indicator	as desired	Set to match logical flow-control selection configured for the LinkUp 3174 port
Baud Rate (Host)	as desired	Main port baud rate
X-ON Character (Host)	DC1	
X-OFF Character (Host)	DC3	
Parity (Printer)	as desired	Odd, Even, Mark, Space or None
Busy/Ready Indicator	as desired	Set to match logical flow (Printer) control selection configured for printer device
Printer Busy	as desired	Low or High
Baud Rate (Printer)	as desired	Printer port baud rate
Printer Buffer Size	0	
X-ON Character (Printer)	DC1	
X-OFF Character (Printer)	DC3	
User Program Present	as desired	To run customer firmware (P1 and P2)
Line frequency	as required	50Hz or 60Hz
Data Transmission Mode	Conversation	Conversation Mode
Answerback	as desired	ON or OFF
Answerback Message	as desired	
ScreenSave	as desired	Auto Shut-off of display
Fill 5 Placement	as desired	Before or After

Keyboard Emulation

The following is a table showing how the ADM-24E keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the ADM-24E is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓ or LINEFEED	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	SHIFT/TAB	1B 49H
Delete	DEL	7FH
	or DELETE CHAR	1B 57H
New Line	NEW LINE	1FH

3278 Function	Key Sequence	Hex Value Generated
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CHAR INS	1B 51H
Erase to End of Field	ERASE LINE	1B 54H
Erase Input	ERASE PAGE	1B 59H
Enter	RETURN or ENTER	0DH
Clear	F28	01 6B 0DH
Sys Request	F29	01 6C 0DH
PF1	F1	01 40 0DH
PF2	F2	01 41 0DH
PF3	F3	01 42 0DH
PF4	F4	01 43 0DH
PF5	F5	01 44 0DH
PF6	F6	01 45 0DH
PF7	F7	01 46 0DH
PF8	F8	01 47 0DH
PF9	F9	01 48 0DH
PF10	F10	01 49 0DH
PF11	F11	01 4A 0DH
PF12	F12	01 4B 0DH
PF13	F13	01 4C 0DH
PF14	F14	01 4D 0DH
PF15	F15	01 4E 0DH
PF16	F16	01 4F 0DH
PF17	F17	01 60 0DH
PF18	F18	01 61 0DH
PF19	F19	01 62 0DH
PF20	F20	01 63 0DH
PF21	F21	01 64 0DH
PF22	F22	01 65 0DH
PF23	F23	01 66 0DH
PF24	F24	01 67 0DH
PA1	F25	01 68 0DH
PA2	F26	01 69 0DH
PA3	F27	01 6A 0DH
Print	SEND LINE or ESC P	1B 34H 1B 50H
Cursor Select	CTRL/C	03H
Attention	F30	01 6D 0DH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH

Special Function	Key Sequence	Hex Value Generated
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.9 ADM178 Terminal Module—Lear Siegler ADM-1178

How to Set Up the Terminal

To set up the ADM-1178 terminal for connection to the LinkUp 3174 in order to emulate the 3278, proceed as follows:

All operator-selectable variables are input from the keyboard into the status line within the ADM-1178 Set-Up Mode; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. Set the options as follows:

Option	Set to:	Comments
Click Online	as desired Y the host computer	Audible keyclick Terminal is on-line to
Cursor Blink	as desired	Cursor steady or blinking
Status	as desired	Status line is normal or reverse video
Wrap BPS	N as desired	Autowrap disabled BPS=300, 600, 1200, 2400, 4800, 9600, 19200
Bits Bit 8	as desired as desired	Seven or eight data bits Eighth data bit set to 0 or 1
PTY ?	as desired	Parity enabled or disabled
PTY Option	as desired Set to:	Even or Odd Parity Comments
Duplex	as desired	Half of Full Duplex
HZ	as desired	Vertical Refresh Rate equal to 60 or 50 Hz
Handshake	as desired	Set to match logical flow control selection configured for the LinkUp 3174 port
XON/XOFF	DC1/DC3	If X-ON/X-OFF flow control selected, DC1/DC3 characters used as X-ON/X-OFF
Busy	as desired	Set to match logical flow control selection configured for LinkUp 3174 port
Ansbk	N	Disables the terminal's answer-back option

Option	Set to:	Comments
Numeric	Keypad	Numeric keypad generates numerals and, by use of the ALT key, PF functions
Screen Save Attributes	as desired PAGE	Selected attributes will affect all characters on page to the right of cursor
Lock	as desired	Lock will be Alpha Lock Mode or Shift Lock Mode
Indicate Shift	80	Shift indicator appears in Col. 80 of the Status Line
Lock	Local	Keyboard Lock will be local function
Lock Release	as desired Shift key	Keyboard Lock will be released by either the Lock key or the

Keyboard Emulation

The following is a table showing how the Lear Siegler ADM-1178 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the Lear Siegler ADM-1178 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.
4. The IBM 3278 keyboard, because it is an EBCDIC terminal, does not provide an ESC key. The Lear Siegler ADM-1178 provides as an ESC key the key immediately below the ATTN key at the left side of the keyboard.
5. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Lear Siegler ADM-1178 Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 5FH
Backspace Cursor	← or ←	08H 1B 4AH
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME SYMBOL	1EH
Tab	→I	09H
Backtab	I←	1B 49H
Delete	DELETE CHAR	7FH
New Line	NEW LINE SYMBOL	1B 5BH
Duplicate	DUP	1B 43H
Field Mark	FIELD MARK	1B 44H

3278 Function	Key Sequence	Hex Value Generated
Insert Mode	INSERT SYMBOL	1B 4CH
Erase to End of Field	ERASE EOF	1B 50H
Erase Input	ERASE INPUT	1B 46H
Enter	ENTER	0DH
Clear	CLEAR	1B 53H
Sys Request	SYS REQ	1B 41H
PF1	PF1	1B 60H
PF2	PF2	1B 61H
PF3	PF3	1B 62H
PF4	PF4	1B 63H
PF5	PF5	1B 64H
PF6	PF6	1B 65H
PF7	PF7	1B 66H
PF8	PF8	1B 67H
PF9	PF9	1B 68H
PF10	PF10	1B 69H
PF11	PF11	1B 6AH
PF12	PF12	1B 6BH
PF13	PF13	1B 6CH
PF14	PF14	1B 6DH
PF15	PF15	1B 6EH
PF16	PF16	1B 6FH
PF17	PF17	1B 70H
PF18	PF18	1B 71H
PF19	PF19	1B 72H
PF20	PF20	1B 73H
PF21	PF21	1B 74H
PF22	PF22	1B 75H
PF23	PF23	1B 76H
PF24	PF24	1B 77H
PA1	PA1	1B 78H
PA2	PA21	1B 79H
PA3	ALT/INSERT SYMBOL	1B 4DH
Print	DISPLAY-PRINT SYM.	1B 57H
Cursor Select	CURSOR SEL	1B 42H
Attention	ATTENTION	1B 40H
Device Cancel	DEVICE CANCEL	1B 55H
Ident	IDENT	1B 58H
Test	TEST	1B 59H
Fast Fowardspace	ALT →	1B 5EH
Fast Backspace	ALT ←	1B 60H
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC Q	1B 51H
Refresh Screen	ALT/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC E	1B 45H
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	ALT/G	07H

Special Function	Key Sequence	Hex Value Generated
View Attribute	ALT/V	16H
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.10 ANSI Terminal Module—ANSI Standard 3.64

How to Set Up the Terminal

Information on the setup of any terminal complying to ANSI Standard 3.64 will depend on the particular terminal being used. Please refer to the manufacturer's user's manual and the 'General Notes on Terminal Switch Settings' section of the Introduction to this document for the proper settings, or contact your Local Data representative.

Keyboard Emulation

The following is a table showing how an ANSI Standard 3.64 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 5B 44H
Down Cursor	↓	1B 5B 42H
Up Cursor	↑	1B 5B 41H
Forward Space Cursor	→	1B 5B 43H
Home	CTRL/^	1EH
Tab	TAB	09H
Backtab	BACKSPACE	08H
Delete	DELETE	7FH
New Line	LINE FEED	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	CTRL/Z	1AH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
	or PF1	1B 4F 50H
PF2	ESC 2	1B 32H
	or PF2	1B 4F 51H
PF3	ESC 3	1B 33H
	or PF3	1B 4F 52H
PF4	ESC 4	1B 34H
	or PF4	1B 4F 53H
PF5	ESC 5	1B 35H

3278 Function	Key Sequence	Hex Value Generated
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC !	1B 21H
	or ESC-	1B 2DH
PF12	ESC @	1B 40H
	or ESC =	1B 3DH
PF13	ESC #	1B 23H
PF14	ESC \$	1B 24H
PF15	ESC %	1B 25H
PF16	ESC ^	1B 5EH
PF17	ESC &	1B 26H
PF18	ESC *	1B 2AH
PF19	ESC (	1B 28H
PF20	ESC)	1B 29H
PF21	ESC ESC 1	1B 1B 31H
PF22	ESC ESC 2	1B 1B 32H
PF23	ESC ESC 3	1B 1B 33H
PF24	ESC ESC 4	1B 1B 34H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3E
Toggle Echoplex	ESC ;	1B 3BH

E.11 C108 Terminal Module—HDS Concept 108/APL8

How to Set Up the Terminal

To set up the Human Designed Systems Concept 108/APL8 terminal for connection to LinkUp 3174 in order to emulate the 3278, proceed as follows:

All operator selectable options are input either from the host or the terminal's keyboard into the Programmer Mode Status Lines; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. There are numerous Status Lines available on the Concept 108/APL8. We will be concerned with the Keyboard Line (abbreviated KB), and Line 1 (L1). The terminal must be configured so that the Line 1 input/output port is used for connection to the LinkUp 3174. Status Lines are viewed by depressing the STAT key, and are scrolled (i.e. change display from KB line to L1 line) by entering from the keyboard the sequence MULT CODE, SPACE, d (scroll forward) or D (scroll backward).
3. Enter Programmer Mode by entering the sequence MULT CODE, U. Enter Full Duplex Mode by entering the sequence MULT CODE, 8. To set the baud rate, parity, and number of stop bits for KB and L1, refer to the charts below. Note that all changes to KB also change L1, and vice versa.

Option/Port [/KB/L1]		Sequence	
Baud		MULT CODE O	baud character
Parity		MULT CODE P	parity character
Stop bits		MULT CODE SPACE	stop character

Baud Character	Baud Rate	Parity Character	Parity
SPACE	50	SPACE	NONE
!	75	!	EVEN
"	110	"	ODD
#	134.5	#	MARK
\$	150	\$	SPACE
%	300		
&	600	Stop Char.	Stop Bits
	1200	!	1
(	1800	"	2
)	2000		
*	2400		
+	3600		
,	4800		
-	7200		
.	9600		

4. All other relevant selectable options are set by the LinkUp 3174 terminal-initialization sequence. These include Full Duplex, Auto LineFeed Off, Remote Mode, Transmit Mode, Character Mode, reassignment of Edit Key generation, etc. Any further option selection by the user may have an adverse effect on terminal/LinkUp 3174 operation.

Keyboard Emulation

The following is a table showing how the HDS Concept 108/APL8 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press Control key concurrently with indicated alpha key.
2. Press ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based upon the first two- and-one-half rows of alphanumeric keys being treated as a matrix; thus:

Row 1 (1 - 0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three characters on the fourth row of alpha keys (Z, X, C). Either lower or upper case (shifted) alpha characters are valid.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 2CH
Backspace Cursor	← or BACKSPACE	1B 3EH 08H
Down Cursor	↓	1B 3CH
Up Cursor	↑	1B 3BH
Forward Space Cursor	→	1B 3DH
Home	HOME	1B 3FH
Tab	TAB	09H
Backtab	BACKTAB	1B 60H
Delete	RUBOUT or DEL CHAR	7FH 1B 48H
New Line	LINE FEED	0AH
Duplicate	F1	1C 35H
Field Mark	F2	1C 36H
Insert Mode	INSRT	1B 47H
Erase to End of Field	CLEAR EOP/EOL	1B 4BH
Erase Input	LINE DEL/INS	1B 4AH
Enter	RETURN	0DH
Clear	F3	1C 37H
Sys Request	STAT	1B 2BH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H
PF13	ESC E	1B 45H

3278 Function	Key Sequence	Hex Value Generated
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	PRINT	1B 7BH
Cursor Select	SEND	1B 4CH
Attention	ESC V	1B 56H
Device Cancel	TAB SET/CLR	1B 5DH
Indent	ESC B	1B 42H
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	SCROLL	1B 5BH
Refresh Screen	TAPE	1B 27H
Initialize Terminal	SHIFT/SCROLL	1B 5CH
Display Status Line	ESC M	1B 4DH
Local Copy Form Feed	SHIFT/PRINT	1B 7CH
Request Disconnect	SHIFT/TAB SET/CLR	1B 5FH
Generate Attribute	MULT CODE	1B 3AH
View Attributes	PAGE	1B 2DH
Toggle Session	SHIFT/PAGE	1B 2EH
Toggle Echoplex	ESC ;	1B 3BH

E.12 C530 Terminal Module—SOROC Challenger 530

How to Set Up the Terminal

To set up the SOROC Challenger 530 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows.

All operator-selectable options are input from the keyboard through the C530 Intelligent Flexibility feature; there are no external switches.

1. Connect the terminal to the converter (modem or direct cable) as appropriate.
2. For details on how to access Intelligent Flexibility, to view current settings, or to change those settings, please refer to the Challenger 530 Operator's Guide. Set the terminal's characteristics as follows:

NOTE:

Some of the terminal's characteristics are set/reset by the LinkUp 3174 terminal initialization sequence, and user definitions are therefore irrelevant.

Item Number	Value (in decimal)	Comments
00	27	ESC as lead-in character
01, 02	as desired	SEND LINE/PAGE/MSG end indication character(s)
03, 04	as desired	"End of Line" indication character(s)
05, 06	as desired	"Skip Protected Field" indication character(s)
07, 08	as desired	"Start Protected Field" indication character(s)
09, 10	as desired	"End Protected Field" indication character(s)
11	as desired	"Start of Message" character
12	as desired	"End of Message" character
13	as desired	"Block Mode Pad" character
14, 15	as desired	"Formatted Print" delimiter characters
16	as desired	Number of Null characters after print delimiter
17	as desired	Printer Internal Delay time
18	as desired	Keyboard Repeat Rate
19	as desired	Break key time duration
20	as desired	RTS Trailing Edge delay
21, 22	19, 20	Transparent Aux. Port "ON" and "OFF" character codes: set by the LinkUp 3174
23	14	SO (=CTRL/N) as Intelligent Flexibility and Programmable key termination character
24		not used
25	as required	00 = 60 Hz/01 = 50 Hz
26	as desired	00 = Power on in Conversation Mode 01 = Power on in Block Mode
27	00	Full Duplex when in Conversation Mode: set by the LinkUp 3174
28	01	Programmable Function mode for numeric keypad: set by the LinkUp 3174
29	as desired	00 = Keyclick disable 01 = Keyclick enable
30	as desired	00 = Audible Alarm disable 01 = Audible alarm enable
31	as desired	00 = Break key disable 01 = Break key enable
32	as desired	00 = Status Line disable 01 = Status Line enable

Item Number	Value (in decimal)	Comments
33	as desired	00 = Internal Printer Delay disable 01 = Internal Printer Delay enable
34	01	Transparent Aux. Port enable: set by LinkUp 3174
35	as desired controlled	00 = Request-To-Send 01 = Request-To-Send no controlled
36	as desired	00 = Block Mode Pad chars. enable 01 = Block Mode Pad chars. disable
37	as desired	00 = Power on with Aux. Port disabled 01 = Power on with Aux. Port enabled
38	as desired	00 = Protected data skipped 01 = Protected data printed during a 'Formatted Print'
39	as desired	Set to match logical flow control selection configured for the LinkUp 3174
40	00	Any code interpreted as X-ON
41	01	CTRL/Z interpreted as "Clear Screen" command
42	as desired	00 = Full Duplex Keyboard disable 01 = Full Duplex keyboard enable
43	as desired	00 = Function Key Message Delay disable 01 = Function Key Message Delay enable
44	00	RS-232C Communication not used
45-58		
49 - Computer Port Word Configuration		
51 - Printer Port Word Configuration		

Value	Parity	Data/stop bits
00	No	7/1
01	No	7/2
02	Odd	7/1
03	Odd	7/2
04	Even	7/1
05	Even	7/2
06	Zero	7/1
07	Zero	7/2
08	One	7/1
09	One	7/2

Value	Parity	Data/stop bits
50 - Computer Port Baud Rate		
52 - Printer Port Baud Rate		

Value	Baud	Value	Baud
00	45.5	08	1200
01	50	09	1800
02	75	10	2000
03	110	11	2400
04	134.5	12	4800
05	150	13	9600
06	300	14	19200
07	600	15	38400

Keyboard Emulation

The following is a table showing how the SOROC Challenger 530 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments are based on the first two- and-one-half rows of alphanumeric keys being treated as a matrix; thus:

Row 1 (1 - 0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three characters on the fourth row of alpha keys (Z, X, C).

4. NK denotes that the indicated key is found in the Numeric Keypad at the right of the keyboard.
5. The auxiliary port on the SOROC Challenger 530 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	NK 0	01 49 0DH
Delete	DELETE SYMBOL	7FH
New Line	NK RET. or CTRL/DELETE SYMB.	01 4B 0DH 1FH
Duplicate	NK 6	01 45 0DH
Field Mark	NK ,	01 4C 0DH
Insert Mode	NK .	01 4A 0DH

3278 Function	Key Sequence	Hex Value Generated
Erase to End of Field	NK 4	01 43 0DH
Erase Input	NK 7	01 46 0DH
Enter	RETURN	0DH
Clear	NK -	01 4D 0DH
Sys Request	NK 9	01 48 0DH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
	or ESC -	1B 2DH
PF12	ESC W	1B 57H
	or ESC =	1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	NK 1	01 40 0DH
	or ESC Z	1B 5AH
PA2	NK 2	01 41 0DH
	or ESC X	1B 58H
PA3	NK 3	01 42 0DH
	or ESC C	1B 43H
Print	NK 8	01 47 0DH
Cursor Select	NK 5	01 44 0DH
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH

Special Function	Key Sequence	Hex Value Generated
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3E
Toggle Echoplex	ESC ;	1B 3BH

E.13 C71035 Terminal Module—C. Itoh 7103

How to Set Up the Terminal

To set up the C. Itoh® 7103 terminal for connection to the protocol converter in order to emulate the IBM 3278 model 5, proceed as follows. To emulate the 3278 models 1 through 4, refer to the CI7103 terminal module.

1. Press SHIFT and SETUP simultaneously to enter SETUP mode.
2. Press SHIFT and D simultaneously to set default conditions.
3. Press the TAB key 8 times to enter DISPLAY STATUS LINE mode.
4. Press the SPACE BAR until STATUS LINE OFF is displayed.
5. Press the TAB key once.
6. Press the SPACE BAR until DATA LINES 27 is displayed.
7. Press the TAB key once.
8. Press the SPACE BAR until the desired BAUD RATE is displayed. Note: Baud rates above 9600 are not recommended if an auxiliary printer will be used with the terminal.
9. Press the TAB key once.
10. Press the RIGHT ARROW key once.
11. Press the SPACE BAR until TX RATE LIMITED OFF is displayed.
12. If an auxiliary printer will be used with the terminal, press the TAB key twice, and press the SPACE BAR until the desired BAUD rate for the printer is displayed.
13. Press the SHIFT and S keys simultaneously to save the SETUP.
14. Press the SHIFT and SETUP keys simultaneously to exit SETUP mode.

Keyboard Emulation

The CIE 7103 terminal with the 3180-1 keyboard is designed identically to the IBM 3180 keyboard. All functions supported by the protocol converter use the same key sequences as the IBM 3180.

NOTES:

1. Press the ALT and Shift keys concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 71H
Backspace Cursor	←	1B 5B 44H
Down Cursor	↓	1B 5B 42H
Up Cursor	↑	1B 5B 41H
Forward Space Cursor	→	1B 5B 43H
Home	HOME	18 5B 48H
Tab	→I	09H
Backtab	I←	1B 69H
Delete	DELETE	1B 36H
New Line	RETURN	0DH
Duplicate	Shift/DUP	1C 31H
Field Mark	Shift/Field Mark	1C 32H
Insert Mode	a	1B 35H
Erase to End of Field	ERASE EOF	1B 66H
Erase Input	ALT/ERINP	18 1B 76H
Enter	ENTER	0AH
Clear	CLEAR	1B 74H
Sys Request	ALT/SYS RQ	18 1B 73H
PF1	PF1	1B 19 31H
PF2	PF2	1B 19 32H
PF3	PF3	1B 19 33H
PF4	PF4	1B 19 34H
PF5	PF5	1B 19 35H
PF6	PF6	1B 19 36H
PF7	PF7	1B 19 37H
PF8	PF8	1B 19 38H
PF9	PF9	1B 19 39H
PF10	PF10	1B 19 30H
PF11	PF11	1B 19 2DH
PF12	PF12	1B 19 3DH
PF13	PF13	1B 19 5DH
PF14	PF14	1B 19 40H
PF15	PF15	1B 19 23H
PF16	PF16	1B 19 24H
PF17	PF17	1B 19 25H
PF18	PF18	1B 19 5EH
PF19	PF19	1B 19 26H
PF20	PF20	1B 19 42H
PF21	PF21	1B 19 28H
PF22	PF22	1B 19 29H
PF23	PF23	1B 19 5FH
PF24	PF24	1B 19 2BH
PA1	PA1	1B 31H
PA2	PA2	1B 32H
PA3	Blank key next to PA2	1B 33H
Print	PRINT	1B 67H
Cursor Select	CURSOR SEL	1B 75
Attention	ATTN	1B 73H
Device Cancel	ALT/CANCEL	18 1B 71H
Ident	ALT/IDENT	18 1B 67H
Test	TEST	18 08H

3278 Function	Key Sequence	Hex Value Generated
Fast Fowardspace	ALT →→	18 1B 43H
Fast Backspace	ALT ←←	18 1B 44H
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7B
Refresh Screen	ALT/w	18 77
Initialize Terminal	ESC <	1B 3C
Local Copy Form Feed	ESC |	1B 7C
Request Disconnect	ESC ~	1B 7E
Generate Attribute	ALT/g	18 67
View Attribute	ALT/v	18 76
Display Status Line	ESC _(underline)	1B 5F
Toggle Session	ESC >	1B 3E
Toggle Echoplex	ALT/E	05H

E.14 CI7103 Terminal Module—C. Itoh 7103

How to Set Up the Terminal

To set up the C. Itoh 7103 terminal for connection to the protocol converter in order to emulate the 3278 models 1 through 4, proceed as follows. To emulate the 3278 model 5, refer to the C71035 terminal module.

1. Press SHIFT and SETUP simultaneously to enter SETUP mode.
2. Press SHIFT and D simultaneously to set default conditions.
3. Press the TAB key 8 times to enter DISPLAY STATUS LINE mode.
4. Press the SPACE BAR until STATUS LINE OFF is displayed.
5. Press the TAB key once.
6. Press the SPACE BAR until DATA LINES 27 is displayed.
7. Press the TAB key once.
8. Press the SPACE BAR until the desired BAUD RATE is displayed. Note: Baud rates above 9600 are not recommended if an auxiliary printer will be used with the terminal.
9. Press the TAB key once.
10. Press the RIGHT ARROW key once.
11. Press the SPACE BAR until TX RATE LIMITED OFF is displayed.
12. If an auxiliary printer will be used with the terminal, press the TAB key twice, and press the SPACE BAR until the desired Baud rate for the printer is displayed.
13. Press the SHIFT and S keys simultaneously to save the SETUP.
14. Press the SHIFT and SETUP keys simultaneously to exit SETUP mode.

Keyboard Emulation

The CIE 7103 terminal with the 3180-1 keyboard is designed identically to the IBM 3180 keyboard. All functions supported by the protocol converter use the same key sequences as the IBM 3180.

NOTES:

1. Press the ALT and Shift keys concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 71H
Backspace Cursor	←	1B 5B 44H
Down Cursor	↓	1B 5B 42H
Up Cursor	↑	1B 5B 41H
Forward Space Cursor	→	1B 5B 43H
Home	HOME	18 5B 48H
Tab	→I	09H
Backtab	I←	1B 69H
Delete	DELETE	1B 36H
New Line	RETURN	0DH
Duplicate	Shift/DUP	1C 31H
Field Mark	Shift/Field Mark	1C 32H
Insert Mode	a	1B 35H
Erase to End of Field	ERASE EOF	1B 66H
Erase Input	ALT/ERINP	18 1B 76H
Enter	ENTER	0AH
Clear	CLEAR	1B 74H
Sys Request	ALT/SYS RQ	18 1B 73H
PF1	PF1	1B 19 31H
PF2	PF2	1B 19 32H
PF3	PF3	1B 19 33H
PF4	PF4	1B 19 34H
PF5	PF5	1B 19 35H
PF6	PF6	1B 19 36H
PF7	PF7	1B 19 37H
PF8	PF8	1B 19 38H
PF9	PF9	1B 19 39H
PF10	PF10	1B 19 30H
PF11	PF11	1B 19 2DH
PF12	PF12	1B 19 3DH
PF13	PF13	1B 19 5DH
PF14	PF14	1B 19 40H
PF15	PF15	1B 19 23H
PF16	PF16	1B 19 24H
PF17	PF17	1B 19 25H
PF18	PF18	1B 19 5EH
PF19	PF19	1B 19 26H
PF20	PF20	1B 19 42H
PF21	PF21	1B 19 28H
PF22	PF22	1B 19 29H
PF23	PF23	1B 19 5FH
PF24	PF24	1B 19 2BH

3278 Function	Key Sequence	Hex Value Generated
PA1	PA1	1B 31H
PA2	PA2	1B 32H
PA3	Blank key next to PA2	1B 33H
Print	PRINT	1B 67H
Cursor Select	CURSOR SEL	1B 75
Attention	ATTN	1B 73H
Device Cancel	ALT/CANCEL	18 1B 71H
Ident	ALT/IDENT	18 1B 67H
Test	TEST	18 08H
Fast Fowardspace	ALT→→→	18 1B 43H
Fast Backspace	ALT←←←	18 1B 44H
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7B
Refresh Screen	ALT/w	18 77
Initialize Terminal	ESC <	1B 3C
Local Copy Form Feed	ESC |	1B 7C
Request Disconnect	ESC ~	1B 7E
Generate Attribute	ALT/g	18 67
View Attribute	ALT/v	18 76
Display Status Line	ESC -(underline)	1B 5F
Toggle Session	ESC >	1B 3E
Toggle Echoplex	ALT/E	05H

E.15 COMPU Terminal Module—Computer-to-Computer Applications

How to Set Up the Terminal

Information on the setup of the micro-, mini-, or instrumentation computer used in the Computer-to-Computer interface will depend upon the particular computer being used. Please refer to the manufacturer's user's manual for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the computer's keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press Control key concurrently with indicated alpha key.
2. Press ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based upon the first two- and-one-half rows of alphanumeric keys being treated as a matrix; thus:

Row 1 (1 - 0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three characters on the fourth row of alpha keys (Z, X, C). Either lower- or upper-case (shifted) alpha characters are valid.

4. The auxiliary port on the Computer-to-Computer interface is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	CTRL/H	08H
Down Cursor	LINE FEED	0AH
Up Cursor	CTRL/K	0BH
Forward Space Cursor	CTRL/L	0CH
Home	CTRL/^	1EH
Tab	CTRL/T	14H
	or CTRL/I	09H
Backtab	CTRL/B	02H
Delete	RUB	7FH
	or ESC +	1B 2BH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC^	1B 5EH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
	or ESC -	1B 2DH
PF12	ESC W	1B 57H
	or ESC =	1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H

3278 Function	Key Sequence	Hex Value Generated
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CRTL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.16 COMPX Terminal Module—Computer-to-Computer Applications (with Keyboard Lock/Unlock)

How to Set Up the Terminal

Information on the setup of the micro-, mini-, or instrumentation computer used in the Computer-to-Computer interface will depend upon the particular computer being used. Please refer to the manufacturer's user's manual for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the computer's keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press Control key concurrently with indicated alpha key.
2. Press ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based upon the first two- and-one-half rows of alphanumeric keys being treated as a matrix; thus:

Row 1 (1 - 0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three characters on the fourth row of alpha keys (Z, X, C). Either lower- or upper-case (shifted) alpha characters are valid.

4. The auxiliary port on the Computer-to-Computer interface is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	CTRL/H	08H
Down Cursor	LINE FEED	0AH
Up Cursor	CTRL/K	0BH
Forward Space Cursor	CTRL/L	0CH
Home	CTRL/^	1EH
Tab	CTRL/T or CTRL/I	14H 09H
Backtab	CTRL/B	02H
Delete	RUB or ESC +	7FH 1B 2BH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC^	1B 5EH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q or ESC -	1B 51H 1B 2DH
PF12	ESC W or ESC =	1B 57H 1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H

3278 Function	Key Sequence	Hex Value Generated
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CRTL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.17 D200 Terminal Module—Data General DASHER D200

How to Set Up the Terminal

To set up the DASHER® D200 terminal for connection to LinkUp 3174 in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before opening the DASHER D200 case.
2. There are 8 toggle-type switches on the back of the terminal. These switches are used to set the terminal's parity and baud rate.

Baud Rate	Switches			
	1	2	3	4
19200	1	1	1	1
9600	1	1	1	0
7200	1	1	0	1
4800	1	1	0	0
3600	1	0	1	1
2400	1	0	1	0
1800	1	0	0	1
1200	1	0	0	0
600	0	1	1	1
300	0	1	1	0
150	0	1	0	1
134.5	0	1	0	0
110	0	0	1	1
75	0	0	1	0
50	0	0	0	1
50	0	0	0	0

Parity	Switches	
	5	6
Even	1	1
Mark	1	0
Odd	0	1
None	0	0

NOTE: Switches 7 and 8 are not used.

3. There are four (4) switches inside the terminal case which control the printer interface characteristics. As the LinkUp 3174 does not currently support as auxiliary printer connected to the Dasher D200, the setting of these switches is irrelevant.

4. Replace the cover, reconnect the AC power cord and connect the terminal to the converter port (or Modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the Dasher D200 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The keys referred to below are as shown on the DG/3278 Dasher D200 terminal keyboard template (part number 093-000298-00), or Dasher D2 terminal keyboard template (part number 093-000297-00).

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	19H
Down Cursor	↓	1AH
Up Cursor	↑	17H
Forward Space Cursor	→	18H
Home	HOME	08H
Tab	TAB	09H
Backtab	CTRL/B	02H
Delete	DEL	7FH
New Line	NEW LINE	0AH
Duplicate	DUP	1E 71H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	ERASE EOL	0BH
Erase Input	ERASE INPUT	1E 72H
Enter	CR	0DH
Clear	ERASE PAGE	0CH
Sys Request	SYS REQUEST	1E 79H
PF1	PF1	1E 61H
PF2	PF2	1E 62H
PF3	PF3	1E 63H
PF4	PF4	1E 64H

3278 Function	Key Sequence	Hex Value Generated
PF5	PF5	1E 65H
PF6	PF6	1E 66H
PF7	PF7	1E 67H
PF8	PF8	1E 68H
PF9	PF9	1E 31H
PF10	PF10	1E 32H
PF11	PF11	1E 33H
PF12	PF12	1E 34H
PF13	PF13	1E 21H
PF14	PF14	1E 22H
PF15	PF15	1E 23H
PF16	PF16	1E 24H
PF17	PF17	1E 25H
PF18	PF18	1E 26H
PF19	PF19	1E 27H
PF20	PF20	1E 28H
PF21	PF21	1E 29H
PF22	PF22	1E 2AH
PF23	PF23	1E 39H
PF24	PF24	1E 3AH
PA1	PA1	1E 74H
PA2	PA2	1E 75H
PA3	PA3	1E 76H
Print	PRINT	01H
Cursor Select	CURSOR SELECT	1E 73H
Attention	ATTN	1E 7AH
Device Cancel	ESC]	1E 7AH
Ident	ESC:	1B 3AH
Test	ESC N	1B 4EH
Fast Fowardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESCAPE NUMERIC	1E 36H
Refresh Screen	REPAINT SCREEN	1E 35H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	ALT/G	07H
View Attribute	ALT/V	16H
Display Status Line	ESC E	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.18 D450 Terminal Module—Data General Dasher D400/D450

How to Set Up the Terminal

1. There are two (2) sets of DIP switches on the back of the terminal with eight (8) switches per set. Set these switches as follows.

Left Bank	Set to:	Comments
1	as desired	Reserved
2-4	as desired	Printer Interface and/or Transmit Baud Rate (Split Baud). See Table A below.
5,6	as desired	Reserved
7,8	as desired	Split Baud enabled = 0 disabled = 1

Right Bank	Set to:	Comments
1-4	see below	EIA Port Baud Rate. See Table B below.
5,6	as desired	0, 0 = No parity 0, 1 = Odd parity 1, 0 = Mark parity 1, 1 = Even parity
7	as required	1 = 50Hz, 0 = 60Hz
8	n.a.	Reserved

Table A

Baud	Switches		
	2	3	4
4800	1	1	1
3600	1	1	0
2400	1	0	1
1800	1	0	0
1200	0	1	1
600	0	1	0
300	0	0	1
110	0	0	0

Table B

Baud	Switches			
	1	2	3	4
19200		1	1	1
9600	1	1	1	0
7200	1	1	0	1
4800	1	1	0	0
3600	1	0	1	1
2400	1	0	1	0
1800	1	0	0	1
1200	1	0	0	0
600	0	1	1	1
300	0	1	1	0
150	0	1	0	1
134.5	0	1	0	0
110	0	0	1	1
75	0	0	1	0
50	0	0	0	1
50	0	0	0	0

2. Connect the terminal to the converter port (modem or direct cable) as appropriate.

Keyboard Emulation

The following is a table showing how the Dasher D400/D450 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the Dasher D400/D450 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	19H
Down Cursor	↓	1AH
Up Cursor	↑	17H
Forward Space Cursor	→	18H
Home	HOME	08H
Tab	TAB	09H
Backtab	CTRL/B	02H
Delete	DEL	7FH
New Line	NEW LINE	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	ERASE EOL	0BH
Erase Input	C4	1E 5FH

3278 Function	Key Sequence	Hex Value Generated
Enter	CR	0DH
Clear	ERASE PAGE	0CH
Sys Request	ESC ?	1E 3FH
PF1	PF1	1E 71H
PF2	PF2	1E 72H
PF3	PF3	1E 73H
PF4	PF4	1E 74H
PF5	PF5	1E 75H
PF6	PF6	1E 76H
PF7	PF7	1E 77H
PF8	PF8	1E 78H
PF9	PF9	1E 79H
PF10	PF10	1E 7AH
PF11	PF11	1E 7BH
PF12	PF12	1E 7CH
PF13	SHIFT/PF1 or PF13	1E 61H 1E 7DH
PF14	SHIFT/PF2 or PF14	1E 62H 1E 7EH
PF15	SHIFT/PF3 or PF15	1E 63H 1E 70H
PF16	SHIFT/PF4	1E 64H
PF17	SHIFT/PF5	1E 65H
PF18	SHIFT/PF6	1E 66H
PF19	SHIFT/PF7	1E 67H
PF20	SHIFT/PF8	1E 68H
PF21	SHIFT/PF9	1E 69H
PF22	SHIFT/PF10	1E 6AH
PF23	SHIFT/PF11	1E 6BH
PF24	SHIFT/PF12	1E 6CH
PA1	C1	1E 5CH
PA2	C2	1E 5DH
PA3	C3	1E 5EH
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Ident	ESC :	1B 3AH
Test	ESC N	7F 4EH
Fast Fowardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/A	01H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attribute	CTRL/V	16H
Display Status Line	ESC _(underline)	1B 5FH

Special Function	Key Sequence	Hex Value Generated
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.19 DISPH Terminal Module—Nortel Displayphone

The DISPH terminal module has been deleted from the LinkUp 3174. This module can be recreated using a base module of DISPI and the Terminal Configurator of the LinkUp 3174.

Specific instructions for creation of the DISPH terminal module are provided below. When this terminal modul has been created according to these instructions, use the keyboard mapping chart on subsequent pages to operate the terminal in conjunction with the LinkUp 3174.

BASE (STARTING) TERMINAL TYPE: Northern Telecom Displayphone (ID = DISPI)

Using the User-Defined Terminal Configuration option, make the following changes to the Base Terminal:

1. DISPI Menu #1

1.Device Type T1
Change: 1 = DISPH

2.DISPI Menu #2

10. Intensified Fields Y
11. Field Oriented Attributes Y

Change: 10 = N
 11 = N

3. DISPI Func Menu #1

8. Set Unprotected Standard Intensity 1B 5B 30 6D 1B 5B 43 1B 5B 44
9. Set Unprotected High Intensity1B 5B 31 6D 1B 5B 43 1B 5B 44
10. Set Protected Standard Intensity 1B 5B 30 6D 1B 5B 43 1B 5B 44
11. Set Protected High Intensity 1B 5B 31 6D 1B 5B 43 1B 5B 44

Change: 8 = NONE, 9 = NONE, 10 = NONE, 11 = NONE

4. DISPI Func Menu #2

22. Attribute Position Display NONE

Change: 22 = 00 20

How to Set Up the Terminal

To set up the Displayphone terminal for connection to the protocol converter in emulation of the 3278, proceed as follows.

The Displayphone does not use DIP switches for options. Instead, options are selected through the keyboard. Perform the following:

Instructions for Dialup Connection:

- 1.A telephone jack must be plugged into Line 2 (on the back of the Displayphone).
- 2.Turn terminal on.

3. Press "Services" key.
4. Select "4" (DISPLAYPHONE UTILITIES).
5. Select "2" (MANUAL DATA CALL PROFILE).

WIDTH	MODE	DUPLEX	PARITY
80	P	F	(set to match the converter)
6. Press "Exit" to store data.
7. Press "Services" again.
8. Press "Line 2" and manually dial telephone number.
9. Press "Data Soft" key for connection.
10. To hang up, press "Line 2" and then press "Release."

NOTES:

1. Use Line 2 for data calls.
2. The maximum baud rate for dial-up is 1200 baud.

Instructions for Direct Connection:

1. Connect the RS-232C cable to the back of the Displayphone at the port marked "RS-232."
2. Turn terminal on.
3. Press "Services".
4. Select "3" - Local Data Port

Local RS-232C Data Port should be ON
Set baud rates
Press "Exit"

WIDTH	MODE	DUPLEX	PARITY
80	P	F	(set to match the converter)

Press "Exit" to store data.

5. Press "Screen" key

NOTE: The maximum baud rate for the Displayphone when directly connected is 9600 baud.

Keyboard Emulation

The following is a table showing how the Displayphone keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the DEL key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	DEL V or CTRL/R	7F 56H 12H
Backspace Cursor	←	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	09H
Home	DEL |^	7F 0BH
Tab	DEL →	7F 09H
Backtab	DEL ←	7F 08H
Delete	DEL B	7F 42H
New Line	DEL lv	7F 0AH
Duplicate	DEL D	7F 44H
Field Mark	DEL F	7F 46H
Insert Mode	DEL N	7F 4EH
Erase to End of Field	DEL M	7F 4DH
Erase Input	DEL K	7F 4BH
Enter	RETURN	0DH
Clear	DEL L	7F 4CH
Sys Request	DEL J	7F 4AH
PF1	DEL 1 or ESC 1	7F 31H 1B 31H
PF2	DEL 2 or ESC 2	7F 32H 1B 32H
PF3	DEL 3 or ESC 3	7F 33H 1B 33H
PF4	DEL 4 or ESC 4	7F 34H 1B 34H
PF5	DEL 5 or ESC 5	7F 35H 1B 35H
PF6	DEL 6 or ESC 6	7F 36H 1B 36H
PF7	DEL 7 or ESC 7	7F 37H 1B 37H
PF8	DEL 8 or ESC 8	7F 38H 1B 38H
PF9	DEL 9 or ESC 9	7F 39H 1B 39H
PF10	DEL 0 or ESC 0	7F 30H 1B 30H
PF11	DEL - or ESC -	7F 2DH 1B 2DH

3278 Function	Key Sequence	Hex Value Generated
PF12	DEL = or ESC =	7F 3D 1B 3DH
PF13	DEL Q or ESC Q	7F 51H 1B 51H
PF14	DEL W or ESC W	7F 57H 1B 57H
PF15	DEL E or ESC E	7F 45H 1B 45H
PF16	DEL R or ESC R	7F 52H 1B 52H
PF17	DEL T or ESC T	7F 54H 1B 54H
PF18	DEL Y or ESC Y	7F 59H 1B 59H
PF19	DEL U	7F 55H
PF20	DEL I	7F 49H
PF21	DEL 0	7F 4FH
PF22	DEL P	7F 50H
PF23	DEL A	7F 41H
PF24	DEL S	7F 53H
PA1	DEL Z	7F 5AH
PA2	DEL X	7F 58H
PA3	DEL C	7F 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	DEL .	7F 2EH
Device Cancel	DEL H	7F 48H
Indent	DEL ,	7F 2CH
Test	DEL N	7F 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	DEL [	7F 5BH
Refresh Screen	CTRL/W or DEL G	17H 7F 47H
Initialize Terminal	DEL <	7F 3CH
Local Copy Form Feed	DEL |	7F 7CH
Request Disconnect	DEL ~	7F 7CH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	DEL _ (underline)	F 5FH
Toggle Session	DEL >	7F 3EH
Toggle Echoplex	DEL ;	7F 3BH

E.20 DISPI Terminal Module—Nortel Displayphone

How to Set Up the Terminal

To set up the Displayphone terminal for connection to the protocol converter in emulation of the 3278, proceed as follows.

The Displayphone does not use DIP switches for options. Instead, options are selected through the keyboard.

Perform the following:

Instructions for Dial-Up Connection:

1. A telephone jack must be plugged into Line 2 (on the back of the Displayphone).
2. Turn terminal on.
3. Press Services key.
4. Select 4 (DISPLAYPHONE UTILITIES).
5. Select 2 (MANUAL DATA CALL PROFILE).

WIDTH	MODE	DUPLEX	PARITY
80	P	F	(set to match the LinkUp 3174)

6. Press Exit to store data.
7. Press Services key again.
8. Press Line 2 and manually dial telephone number.
9. Press Data Soft key for connection.
10. To hang up, press Line 2 and then press Release.

NOTES:

1. Use Line 2 for data calls.
2. The maximum baud rate for dial-up is 1200 baud.

Instructions for Direct Connection:

1. Connect the RS-232C cable to the back of the Displayphone at the port marked RS-232.
2. Turn terminal on.
3. Press Services.
4. Select 3 - Local Data Port
Local RS-232C Data Port should be on
Set baud rates
Press Exit

WIDTH	MODE	DUPLEX	PARITY
80	P	F	(set to match LinkUp 3174)

Press Exit to store data

5. Press the Screen key

NOTE:

The maximum baud rate for the Displayphone when directly connected is 9600 baud.

Keyboard Emulation

The following is a table showing how the Displayphone keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the <Ctrl> key concurrently with the indicated alpha key.
2. Press the key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	DEL V or CTRL/R	7F 56H 12H
Backspace Cursor	←	08H
Down Cursor	down arrow	0AH
Up Cursor	up arrow	0BH
Forward Space Cursor	→	09H
Home	DEL|^	7F 0BH
Tab	DEL →	7F 09H
Backtab	DEL ←	7F 08H
Delete	DEL B	7F 42H
New Line	DEL lv	7F 0AH
Duplicate	DEL D	7F 44H
Field Marlc	DEL F	7F 46H
Insert Mode	DEL N	7F 4EH
Erase to End of Field	DEL M	7F 4DH
Erase Input	DEL K	7F 4BH
Enter	RETURN	0DH
Clear	DEL L	7F 4CH
Sys Request	DEL J	7F 4AH
PF1	DEL I or ESC 1	7F31H 1B 31H
PF2	DEL 2 or ESC 2	7F 32H 1B 32H
PF3	DEL 3 orESC 3	7F 33H 1B 33H
PF4	DEL 4 or ESC 4	7F 34H 1B 34H
PF5	DEL 5 or ESC 5	7F 35H 1B 35H
PF6	DEL 6 or ESC 6	7F 36H 1B 36H
PF7	DEL 7 or ESC 7	7F 37H 1B 37H
PF8	DEL 8 or ESC 8	7F 38H 1B 38H

3278 Function	Key Sequence	Hex Value Generated
PF9	DEL 9 or ESC 9	7F 39H 1B 39H
PF10	DEL O or ESC O	7F 30H 1B 30H
PF11	DEL - or ESC -	7F 2DH 1B2DH
PF12	DEL = or ESC =	7F 3DH 1B 3DH
PF13	DEL Q or ESC Q	7F 51H 1B 51H
PF14	DEL W orESC W	7F 57H 1B 57H
PF15	DEL E or ESC E	7F 45H 1B 45H
PF16	DEL R or ESC R	7F 52H 1B 52H
PF17	DEL T or ESC T	7F 54H 1B 54H
PF18	DEL Y orESC Y	7F 59H 1B59H
PF19	DEL U	7F 55H
PF20	DEL I	7F 49H
PF21	DEL O	7F4FH
PF22	DEL P	7F 50H
PF23	DEL A	7F41H
PF24	DEL S	7F 53H
PA1	DEL Z	7F 5AH
PA2	DEL X	7F 58H
PA3	DEL C	7F 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	DEL .	7F 2EH
Device Cancel	DEL H	7F 48H
Ident	DEL ,	7F 2CH
Test	DEL N	7F 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	DEL [	7F 5BH
Refresh Screen	CTRL/W or DEL G	17H 7F 47H
Initialize Tenninal	DEL <	7F 3CH
Local Copy Forrn Feed	DEL |	7F 7CH
Request Disconnect	DEL ~	7F 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	DEL (underline)	F 5FH
Page Up/Down Toggle	ESC >	1B 3EH
Toggle Echoplex	DEL ;	7F 3BH

E.21 DM5 Terminal Module—Beehive DM-5

How to Set Up the Terminal

To set up the Beehive® DM-5/Basic terminals for connection to the LinkUp 3174 in order to emulate the 3278, proceed as follows.

1. Disconnect the AC power cord from the outlet before opening the terminal case.
2. There are three (3) groups of switches on the DM-5/BASIC with eight (8) switches in each group. Switch groups S1 and S2 are found on the back panel of the terminal; switch group S3 is found on the printed circuit board inside the terminal. Set the switches to the following values;

S1	Value	Comments
1	n.a.	LinkUp 3174 cursor-positioning characteristics render this switch moot
2	DOWN	Auto Line Feed disabled
3	UP	Full Duplex
4, 5	as desired	Parity 4 5 MARK UP UP SPACE DOWN UP ODD UP DOWN EVEN DOWN DOWN
6, 7, 8	as desired	Main Port Baud Rate
S2	Value	Comments
1, 2	UP	Termination character CR selected
3-8	unused	
S3	Value	Comments
1	unused	
2	as desired	CLOSED - Normal Video OPEN - Reverse Video
3	OPEN	Normal/Half Intensity normal (i.e. not reversed) denotation
4	as desired	Main Port X-ON/X-OFF. CLOSED = enabled. Set to match logical flow control selection configured for LinkUp
5	3174 port. OPEN	Transmission of Keyboard keys enabled
6	as required	OPEN = 60 Hz CLOSED = 50 Hz
7	n.a.	Applicable only in Block mode
8	OPEN	Character echo from LinkUp 3174 only

Keyboard Emulation

The following is a table showing how the Beehive DM-5 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line 24, column 80 character position) cannot be displayed. This feature is designed to defeat the Beehive Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 56H
Backspace Cursor	← or BACKSPACE	1B 44H 08H [~]
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 48H
Tab	→|	09H
Backtab	|←	1B 3EH
Delete	DELETE CHAR or DEL	7FH 1B 48H
New Line	ALT/J or INSERT LINE 1B	0AH 4CH
Duplicate	ALT/D	04H
Field Mark	ALT/F	06H
Insert Mode	INSERT CHAR	1B 51H
Erase to End of Field	CLEAR EOL	1B 4BH
Erase Input	DELETE LINE or CLEAR EOP	1B 4DH 1B 4AH
Enter	RETURN or ENTER	0DH
Clear	CLEAR	1C 45H
Sys Request	STATUS LINE	1B 54H
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC -	1B 2DH
PF12	ESC =	1B 3DH
PF13	ESC !	1B 21H
PF14	ESC @	1B 40H
PF15	ESC #	1B 23H
PF16	ESC \$	1B 24H
PF17	ESC %	1B 25H

3278 Function	Key Sequence	Hex Value Generated
PF18	ESC ^	1B 5EH
PF19	ESC &	1B 26H
PF20	ESC *	1B 2AH
PF21	ESC (	1B 28H
PF22	ESC S	1B 29H
PF23	ESC _(underline)	1B 5FH
PF24	ESC +	1B 2BH
PA1	ESC ,	1B 2CH
PA2	ESC .	1B 2EH
PA3	ESC /	1B 2FH
Print	PAGE SEND	1B 49H
Cursor Select	ALT/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	ALT/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC '	1B 27H
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	ALT/G	07H
View Attributes	ALT/V	16H
Toggle Session	ESC S	1B 53H
Toggle Echoplex	ESC ;	1B 3BH

Keyboard Emulation

The following is a table showing how the Beehive BASIC keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Beehive Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	ESC V	1B 56H
Backspace Cursor	ESC D or BACKSPACE	1B 44H 08H
Down Cursor	ESC B	1B 42H
Up Cursor	ESC A	1B 41H
Forward Space Cursor	ESC C	1B 43H
Home	ESC H	1B 48H
Tab	CTRL/I	09H
Backtab	ESC	1B 3EH
Delete	ESC P or DEL	1B 50H 7FH
New Line	LF or ESC L	0AH 1B 4CH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	ESC Q	1B 51H
Erase to End of Field	ESC K	1B 4BH
Erase Input	ESC M or ESC J	1B 4DH 1B 4AH
Enter	RETURN or ENTER	0DH
Clear	CLEAR	1B 45H
Sys Request	ESC T	1B 54H
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC -	1B 2DH
PF12	ESC =	1B 3DH
PF13	ESC !	1B 21H
PF14	ESC @	1B 40H
PF15	ESC #	1B 23H
PF16	ESC \$	1B 24H
PF17	ESC %	1B 25H
PF18	ESC ^	1B 5EH
PF19	ESC &	1B 26H
PF20	ESC *	1B 2AH
PF21	ESC (	1B 28H
PF22	ESC)	1B 29H
PF23	ESC _(underline)	1B 5FH
PF24	ESC +	1B 2BH
PA1	ESC ,	1B 2CH
PA2	ESC . (period)	1B 2EH
PA3	ESC /	1B 2FH
Print	ESC I	1B 49H
Cursor Select	CTRL/C	03H

3278 Function	Key Sequence	Hex Value Generated
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC '	1B 27H
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.22 DM5AB Terminal Module—Beehive DM-5A/B

How to Set Up the Terminal

To set up the Beehive DM5A/5B terminals for connection to the protocol converter in order to emulate the 3278, proceed as follows.

1. Disconnect the AC power cord before opening the terminal case.
2. There are three (3) groups of switches on the DM5A, and four (4) on the DM5B, with eight (8) switches in each group. Switch groups S1 and S2 are found on the back panel of the terminal; switch group S3 and S4 are found on the printed circuit board inside the terminal. Set the switches to the following values:

S1	Value	Comments
1	n.a.	LinkUp 3174 cursor-positioning characteristics render this switch moot
2	DOWN	Auto Line Feed disabled
3	UP	Full Duplex
4, 5	as desired	Parity 4 5 MARK UP UP SPACE DOWN UP ODD UP DOWN EVEN DOWN DOWN
6, 7, 8	as desired	Main Port Baud Rate

S2	Value	Comments
1, 2	UP	Termination char. CR selected
3, 4, 5	as desired	Aux. port flow control: set to match logical flow-control selection configured for printer being used
	Protocol	3 4 5
	DTR (Pin 20)	UP UP UP
	Pins 11 and 19 Ready	DOWN UP UP
	Pins 11 and 19 Busy	UP DOWN UP
	ETX/ACK	DOWN DOWN UP
	XON/XOFF	UP UP DOWN
	ACK/NAK	DOWN UP DOWN
	TTY	UP DOWN DOWN
6, 7, 8	as desired	Aux. Port Baud Rate (see below)
S3	Value	Comments
1	OPEN	DM5B - Standard Character Set DM5A - RS232C selected
2	as desired	Main Port X-ON/X-OFF CLOSED - enabled Set to match logical flow control selection configured for LinkUp 3174 port
3	OPEN	Normal/Half Intensity retains normal (i.e. not reversed) denotation
4	as desired	Main Port X-ON/X-OFF. CLOSED: enabled. Set to match logical flow control selection configured for the LinkUp 3174 port
5	OPEN	Transmission of keyboard keys enabled
6	as desired	OPEN = 60 Hz/CLOSED = 50 Hz
7	n.a.	Applicable only in Block mode
8	OPEN	Character echo from LinkUp 3174 only
DM5B only S4	Value	Comments
1	as desired	OPEN - Upper-case only CLOSED - Upper/Lower-case
	characters generated	
2	unused	
3	n.a.	Applicable only in Forms mode
4	unused	
5	CLOSED	Main Port RS-232C enabled
6, 7, 8	6 = OPEN 7, 8 = CLOSED	Aux. Port RS-232C enabled

3. Replace the cover, reconnect the AC power cord, and connect the terminal to the converter port (or modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the Beehive DM-5A/B keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Beehive Auto-Scroll capability.
4. The auxiliary port on the Beehive DM-5A/B is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 56H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	18 48H
Tab	TAB	09H
Backtab	BACKTAB	1B 3EH
Delete	DELETE CHAR	1B 50H
New Line	INSERT LINE	1B 4CH
Duplicate	ALT/D	04H
Field Mark	ALT/F	06H
Insert Mode	INSERT CHAR.	1B 51H
Erase to End of Field	CLEAR EOL	1B 4BH
Erase Input	CLEAR EOP	1B 4AH
Enter	RETURN	0DH
Clear	CLEAR	1B 45H
Sys Request	ESC ?	1B 3FH
PF1	PF1	02 1B 70 0DH
PF2	PF2	02 1B 71 0DH
PF3	PF3	02 1B 72 0DH
PF4	PF4	02 1B 73 0DH
PF5	PF5	02 1B 74 0DH
PF6	PF6	02 1B 75 0DH
PF7	PF7	02 1B 76 0DH
PF8	PF8	02 1B 77 0DH
PF9	PF9	02 1B 78 0DH
PF10	PF10	02 1B 79 0DH
PF11	PF11	02 1B 7A 0DH
PF12	PF12	02 1B 7B 0DH
PF13	PF13	02 1B 7C 0DH
PF14	PF14	02 1B 7D 0DH
PF15	PF15	02 1B 7E 0DH
PF16	PF16	02 1B 7F 0DH
PF17	PF17	1B 37H
PF18	PF18	1B 38 H

3278 Function	Key Sequence	Hex Value Generated
PF19	PF19	1B 39H
PF20	PF20	1B 30H
PF21	PF21	1B 31H
PF22	PF22	1B 32H
PF23	PF23	1B 33H
PF24	PF24	1B 34H
PA1	ESC ,	1B 2CH
PA2	ESC .	1B 2EH
PA3	ESC /	1B 2FH
Print	PAGE SEND	1B 49H
Cursor Select	ALT/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Ident	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Fowardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/w	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	A-SET	1B 64H
View Attribute	A-DEL	1B 65H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC S	1B 53H
Toggle Echoplex	ESC ;	1B 3BH

E.23 DM20 Terminal Module—Beehive DM-20/Standard/Plus

How to Set Up the Terminal

To set up the Beehive DM-20/Standard/Plus terminals for connection to the protocol converter in order to emulate the 3278, proceed as follows.

1. Disconnect the AC power cord from the outlet before opening the terminal case.
2. There are three (3) groups of switches on the DM-20/Standard/Plus with eight (8) switches in each group. Switch groups S1 and S2 are found on the back panel of the terminal; switch group S3 is found on the printed circuit board inside the terminal. There is also a fourth group of switches, located on the printed circuit board, for the PLUS terminal.

The settings for the DM-20 will be described first, followed by those for the Standard/Plus terminals. Set the switches to the following values:

LINKUP 3174

DM-20 S1	Value	Comments
1	as desired	UP enables receiver parity error detection
2	n.a.	LinkUp 3174 cursor-positioning characteristics render this switch moot.
3	DOWN	Auto Linefeed disabled
4	DOWN	Keyboard generates lower- and upper-case characters
5, 6	UP	Termination character CR selected
7, 8	as desired	Parity 7 8 MARK UP UP SPACE DOWN UP ODD UP DOWN EVEN DOWN DOWN
DM-20 S2	Value	Comments
1, 2, 3	as desired	Main Port Baud Rate
4	UP	Full Duplex selected
5, 6, 7	as desired	Auxiliary Port Baud Rate
8	DOWN	Auto Echo disabled
DM-20 S3	Value	Comments
1	as desired	Go-On-Line switch
2	OFF	Transmit escape codes
3	as required	ON = 50Hz, OFF = 60Hz
4	OFF	X-ON/X-OFF enabled
5	unused	
6	OFF	Normal (vs. Reversed) intensities selected
7	as desired	OFF = White characters on black screen, ON = Black characters on white screen
8	OFF	Disable current loop
STANDARD/ PLUS S1	Value	Comments
1	n.a.	LinkUp 3174 cursor-positioning characteristics render this switch moot
2	DOWN	Auto Line Feed disabled
3	UP	Full Duplex
4, 5	as desired	Parity 4 5 MARK UP UP SPACE DOWN UP ODD UP DOWN EVEN DOWN DOWN
6, 7, 8	as desired	Main Port Baud Rate (see table below)

**STANDARD/
PLUS S2**

	Value	Comments
1, 2	UP	Termination character selected
3, 4, 5	as desired	Aux. port flow control: set to match logical flow-control selection configured for the printer being used.
	Protocol	3 4 5
	DTR (Pin 20)	UP UP UP
	Pins 11 and 19 Ready	DOWN UP UP
	Pins 11 and 19 Busy	UP DOWN UP
	ETX/ACK	DOWN DOWN UP
	XON/XOFF	UP UP DOWN
	ACK/NAK	DOWN UP DOWN
	TTY	UP DOWN DOWN
6, 7, 8	as desired	Aux. Port Baud Rate (see chart below)

**STANDARD/
PLUS S3**

	Value	Comments
1	OPEN	PLUS - Standard Character Set STANDARD - RS-232C selected
2	as desired	CLOSED - Normal Video OPEN - Reverse Video
3	OPEN	Normal/Half Intensity retains normal (i.e. not reversed) denotation
4	as desired	Main Port X-ON/X-OFF CLOSED: enabled Set to match logical flow control selection configured for LinkUp 3174 port
5	OPEN	Transmission of Keyboard keys enabled
6	as required	OPEN = 60 Hz CLOSED = 50 Hz
7	n.a.	Applicable only in Block mode
8	OPEN	Character echo from LinkUp 3174 only

**PLUS
ONLY S4**

	Value	Comments
1	as desired	OPEN - Upper-case only CLOSED - Upper/Lower-case characters generated
2	unused	
3	n.a.	Applicable only if in Forms mode
4	unused	
5	CLOSED	Main Port RS-232C enabled
6, 7, 8	6 = OPEN 7,8 = CLOSED	Aux. Port RS-232C enabled

Baud Rate	Switches		
	1/5/6	2/6/7	3/7/8
110	UP	UP	UP
300	DOWN	UP	UP
1200	UP	DOWN	UP
1800	DOWN	DOWN	UP
2400	UP	UP	DOWN
4800	DOWN	UP	DOWN
9600	UP	DOWN	DOWN
19200	DOWN	DOWN	DOWN

3. Replace the cover, reconnect the AC power cord and connect the terminal to the converter port (or modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the Beehive DM-20/PLUS keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Beehive Auto-Scroll capability.
4. The auxiliary port on the Beehive DM-20/Standard/Plus is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 56H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	18 48H
Tab	TAB	09H
Backtab	BTAB	1B 3EH
Delete	DCHAR	1B 50H
New Line	LF	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRLF	F06H
Insert Mode	ICHAR.	1B 51HH
Erase to End of Field	CLEAR EOF	1B 4BH
Erase Input	DLINE	1B 4DH
Enter	RETURN	0DH
Clear	CTRL/ALL CLEAR	1B 45H
Sys Request	TEST	1B 66H
PF1	F1	02 1B 70 0DH
PF2	F2	02 1B 71 0DH
PF3	F3	02 1B 72 0DH

3278 Function	Key Sequence	Hex Value Generated
PF4	F4	02 1B 73 0DH
PF5	F5	02 1B 74 0DH
PF6	F6	02 1B 75 0DH
PF7	F7	02 1B 76 0DH
PF8	F8	02 1B 77 0DH
PF9	F9	02 1B 78 0DH
PF10	F10	02 1B 79 0DH
PF11	F11	02 1B 7A 0DH
PF12	F12	02 1B 7B 0DH
PF13	F13	02 1B 7C 0DH
PF14	F14	02 1B 7D 0DH
PF15	F15	02 1B 7E 0DH
PF16	F16	02 1B 7F 0DH
PF17	ESC 17	1B 31 37H
PF18	ESC 18	1B 31 38H
PF19	ESC 19	1B 31 39H
PF20	ESC 20	1B 31 30H
PF21	ESC 21	1B 31 31H
PF22	ESC 22	1B 31 32H
PF23	ESC 23	1B 31 33H
PF24	ESC 24	1B 31 34H
PA1	ESC @	1B 40H
PA2	ESC -	1B 2DH
PA3	ESC ^	1B 5EH
Print	CTRL/P	10H
Cursor Select	ESC \$	1B 24H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Ident	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Fowardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/w	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC_(underline)	1B 5FH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attribute	CTRL/V	16H
Toggle Session	ESC S	1B 53H
Toggle Echoplex	ESC ;	1B 3BH

Keyboard Emulation

The following is a table showing how the Beehive STANDARD keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Beehive Auto-Scroll capability.
4. The auxiliary port on the Beehive DM-20/Standard/Plus is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	ESC V	1B 56H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	18 48H
Tab	CTRL/I	09H
Backtab	ESC	1B 3EH
Delete	ESC P	1B 50H
New Line	LF	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	ESC Q	1B 51H
Erase to End of Field	ESC K	1B 4BH
Erase Input	ESC M	1B 4DH
Enter	RETURN	0DH
Clear	CTRL/ALL CLEAR	1B 45H
Sys Request	ESC F	1B 66H
PF1	F1	02 1B 70 0DH
PF2	F2	02 1B 71 0DH
PF3	F3	02 1B 72 0DH
PF4	F4	02 1B 73 0DH
PF5	F5	02 1B 74 0DH
PF6	F6	02 1B 75 0DH
PF7	F7	02 1B 76 0DH
PF8	F8	02 1B 77 0DH
PF9	F9	02 1B 78 0DH
PF10	F10	02 1B 79 0DH
PF11	F11	02 1B 7A 0DH
PF12	F12	02 1B 7B 0DH
PF13	CTRL/B,ESC,!,CR	02 1B 7C 0DH
PF14	CTRL/B,ESC,},CR	02 1B 7D 0DH
PF15	CTRL/B,ESC,~,CR	02 1B 7E 0DH
PF16	CTRL/B,ESC,DEL,CR	02 1B 7F 0DH
PF17	ESC 17	1B 31 37H
PF18	ESC 18	1B 31 38H

3278 Function	Key Sequence	Hex Value Generated
PF19	ESC 19	1B 31 39H
PF20	ESC 20	1B 31 30H
PF21	ESC 21	1B 31 31H
PF22	ESC 22	1B 31 32H
PF23	ESC 23	1B 31 33H
PF24	ESC 24	1B 31 34H
PA1	ESC @	1B 40H
PA2	ESC -	1B 2DH
PA3	ESC ^	1B 5EH
Print	CTRL/P	10H
Cursor Select	ESC \$	1B 24H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Ident	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Fowardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/w	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attribute	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC S	1B 53H
Toggle Echoplex	ESC ;	1B 3BH

E.24 DM78 Terminal Module—Beehive DM-78

How to Set Up the Terminal

To set up the Beehive DM-78 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows.

1. Disconnect the power cord from the outlet before opening the DM-78 case.
2. There are four (4) groups of switches on the DM-78 with eight (8) switches in each group. Switch groups S1 and S2 are found on the back panel of the terminal; switch groups S3 and S4 are found on the printed circuit board inside the terminal. Set the switches to the following values:

LINKUP 3174

S1	Value	Comments		
1	unused			
2	DOWN	Auto Linefeed Disabled		
3	unused			
4, 5	as desired	Parity 4 5 MARK UP UP SPACE DOWN UP ODD UP DOWN EVEN DOWN DOWN		
6, 7, 8	as desired	Main Port Baud Rate (see chart below)		
S2	Value	Comments		
1, 2	UP	Termination character CR selected		
3, 4, 5	as desired	Auxiliary Port Protocol - dependent upon auxiliary device type; see manufacturer's manual for settings		
6, 7, 8	as desired	Auxiliary Port Baud Rate (see chart below)		
	Baud Rate	6	7	8
	110	UP	UP	UP
	300	DOWN	UP	UP
	1200	UP	DOWN	UP
	1800	DOWN	DOWN	UP
	2400	UP	UP	DOWN
	4800	DOWN	UP	DOWN
	9600	UP	DOWN	DOWN
	19200	DOWN	DOWN	DOWN
S3	Value	Comments		
1	CLOSED	Current loop disabled		
2	CLOSED	Normal video selected		
3	unused			
4	as desired	Set to match logical flow-control selection configured for the LinkUp 3174 port		
5	unused			
6	as required	CLOSED = 50Hz, OPEN = 60Hz		
7, 8	unused			

S4	Value	Comments
1	CLOSED	Keyboard generates lower- and upper-case characters
2	unused	
3	OPEN	Data is transmitted out of the auxiliary port, but not processed locally
4	unused	
5	CLOSED	RS-232C communication enabled
6,7,8	as required	Auxiliary Port RS-422/RS-232C - dependent upon the auxiliary device type; see manufacturer's manual for settings

3. Replace the cover, reconnect the AC power cord and connect the terminal to the converter port (or modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the Beehive DM-78 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the DM-78 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.
4. The IBM 3278 keyboard, because it is an EBCDIC terminal, does not provide an ESC key. The DM-78 provides an ESC key immediately below the ATTN key at the left side of the keyboard.

3278 Function	Key Sequence	Hex Value Generated
Reset	ALT/R or RESET	12H 1B 56H
Backspace Cursor	← or ALT/H	1B 44H 08H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME SYMBOL	18 48H
Tab	→I	09H
Backtab	I←	1B 3EH
Delete	DELETE SYMBOL	1B 50H
New Line	NEW LINE SYMBOL	0DH
Duplicate	DUP	1B 25H
Field Mark	FIELD MARK	1B 27H
Insert Mode	INSERT SYMBOL	19H
Erase to End of Field	ERASE EOF	1B 4AH
Erase Input	ERASE INPUT	1B 28H
Enter	ENTER	17H
Clear	CLEAR	1B 45H
Sys Request	SYS REQ	1B 2BH
PF1	PF1	1B 70 0H

3278 Function	Key Sequence	Hex Value Generated
PF2	PF2	1B 71 0H
PF3	PF3	1B 72 0H
PF4	PF4	1B 73 0H
PF5	PF5	1B 74 0H
PF6	PF6	1B 75 0H
PF7	PF7	1B 76 0H
PF8	PF8	1B 77 0H
PF9	PF9	1B 78 0H
PF10	PF10	1B 79 0H
PF11	PF11	1B 7A 0H
PF12	PF12	1B 7B 0H
PF13	PF13	1B 7C 0H
PF14	PF14	1B 7D 0H
PF15	PF15	1B 7E 0H
PF16	PF16	1B 7F 0H
PF17	PF17	1B 67H
PF18	PF18	1B 3DH
PF19	PF19	1B 34H
PF20	PF20	1B 35H
PF21	PF21	1B 36H
PF22	PF22	1B 37H
PF23	PF23	1B 26H
PF24	PF24	1B 30H
PA1	PA1	1B 20H
PA2	PA2	1B 21H
PA3	PA3	1B 22H
Print	ESC 3	1B 33H
Cursor Select	CURSOR SEL	1B 24H
Attention	ESC \	1B 5CH
Device Cancel	DEV CNCL	1B 29H
Ident	IDENT	1B 2FH
Test	TEST	1B 66H
Fast Fowardspace	→→	1B 68H
Fast Backspace	←←	1B 69H
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC #	1B 23H
Refresh Screen	ALT/Z	1AH
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC :	1B 3AH
Request Disconnect	ESC `	1B 60H
Generate Attribute	ALT/G	07H
View Attribute	ALT/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ALT/E	05H

E.25 FORTU Terminal Module—Fortune Videotex 32:16

How to Set Up the Terminal

Information on the Fortune Videotex 32:16 terminal switch settings was not available at the time of publication. Please refer to the manufacturer's user's manual and the "General Notes on Terminal Switch Settings" section of this document for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the Fortune Videotex 32:16 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control Key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Fortune Auto-Scroll capability.
4. The auxiliary port on the Fortune Terminal is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	01 77 0DH 08H
Down Cursor	↓	01 79 0DH
Up Cursor	↑	01 78 0DH
Forward Space Cursor	→	01 7A 0DH
Home	CTRL^	1EH
Tab	TAB	09H
Backtab	CTRL/B	02H
Delete	DELETE	01 74 0DH
New Line	LF/GL	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	INSERT	01 72 0DH
Erase to End of Field	CANCEL	7FH
Erase Input	CTRL/X	18H
Enter	RETURN or ENTER	0DH 01 0DH
Clear	CTRL/L	0CH
Sys Request	ESC ?	1B 3FH
PF1	F1	01 61 0DH
PF2	F2	01 62 0DH
PF3	F3	01 63 0DH
PF4	F4	01 64 0DH
PF5	F5	01 65 0DH
PF6	F6	01 66 0DH
PF7	F7	01 67 0DH
PF8	F8	01 68 0DH
PF9	F9	01 69 0DH

3278 Function	Key Sequence	Hex Value Generated
PF10	F10	01 6A 0DH
PF11	F11	01 6B 0DH
PF12	F12	01 6C 0DH
PF13	F13	01 41 0DH
PF14	F14	01 42 0DH
PF15	F15	01 43 0DH
PF16	F16	01 44 0DH
PF17	F17	01 45 0DH
PF18	F18	01 46 0DH
PF19	F19	01 47 0DH
PF20	F20	01 48 0DH
PF21	F21	01 49 0DH
PF22	F22	01 4A 0DH
PF23	F23	01 4B 0DH
PF24	F24	01 4C 0DH
PA1	F25	01 4D 0DH
PA2	F26	01 4E 0DH
PA3	F27	01 4F 0DH
Print	SEND LINE	01 50 0DH
	or ESC P	10H
Cursor Select	CTRL/C	03H
Attention	F30	1B 5CHH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.26 HP21 Terminal Module—Hewlett-Packard HP-2621B

How to Set Up the Terminal

To set up the HP-2621B terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before setting up the configuration switches.
2. There are eight (8) toggle-type switches on the terminal's RIGHT-HAND group of switches on the rear panel. These switches are used to specify the physical strapping configuration of the HP-2621B terminal. Set these switches in the following manner:

Right-hand Switches	Set to:	Comments
R0 (RET/ENT KEY STRING) R1	R0 = DOWN R1 = DOWN	Transmit CR when Return or Enter key pressed
X (DATA SPEED SEL)	DOWN	X - Data Speed Select option strap disabled
H (LONG TRANS)	UP	H - Long Transfer Warning Handshake strap disabled
G (SHORT TRANS)	UP	G - Short Transfer Trigger Handshake strap disabled
C (WRAP, EOL)	UP	C - Wraparound, EOL strap disabled
A (ESC SEQ)	UP	A - Escape Sequence Transmission enabled

3. There are eight (8) toggle-type switches on the terminal's CENTER group of switches on the rear panel. These switches are used to specify terminal operating characteristics. Set these switches in the following manner:

Center Switches	Set to:	Comments	
P0, P1, and P2	P0 = DOWN	(Sets no parity - 8th bit always 1)	
	P1 = DOWN		
	P2 = DOWN		
	P0 = UP	(Sets no parity - 8th bit always 0)	
	P1 = DOWN		
	P2 = DOWN		
	P0 = DOWN	(Sets EVEN parity in 8th bit)	
	P1 = DOWN		
P2 = UP			
X (X-ON/X-OFF)	P0 = UP	(Sets ODD parity in 8th bit)	
	P1 = DOWN		
	P2 = DOWN		
	P0 = DOWN	(Sets No parity - data full 8 bits)	
	P1 = UP		
	P2 = DOWN		
		as desired	Set to match logical flow control selection configured for the LinkUp 3174 port

NOTE:

The fifth switch is not used.

E (ENQ/ACK)	DOWN	ENQ/ACK handshake disabled
LF (AUTO LF)	DOWN	Auto LF disabled
LM (LINE CHAR MODE)	DOWN	Selects character mode

4. There are eight (8) toggle-type switches on the terminal's LEFT-HAND group of switches on the rear panel. These switches are used to specify terminal operating characteristics. Set these switches in the following manner:

Left-hand Switches	Set to:	Comments
B0 (BAUD RATE)	100 bps	B0 = DOWN B1 = DOWN B2 = DOWN
	150 bps	B0 = UP B1 = DOWN B2 = DOWN
	300 bps	B0 = DOWN B1 = UP B2 = DOWN
	600 bps	B0 = UP B1 = UP B2 = DOWN
	1200 bps	B0 = DOWN B1 = DOWN B2 = UP
	2400 bps	B0 = UP B1 = DOWN B2 = UP
	4800 bps	B0 = DOWN B1 = UP B2 = UP
	9600 bps	B0 = UP B1 = UP B2 = UP
EC (ECHO)	DOWN	Set ECHO to remote
IV (INVERSE VIDEO/	UP	Set Inverse Video as the UNDERLINE)
L0	DOWN	Set English as National language configuration
L1	UP	
L2	UP	

5. Reconnect the AC power cord and connect the terminal to the converter port (direct connect or modem) as appropriate.

Keyboard Emulation

The following is a table showing how the HP-2621B keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The LinkUp 3174 has been programmed to take advantage of the HP-125 type intelligent terminal characteristics. For example, the LinkUp 3174 downloads and sets HP-125 type function keys to implement the following IBM functions:

A1	ERASE INPUT
PA2	ERASE EOF
PA3	INSERT
CLEARDELETE	

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	1B 44H 08H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 48H
Tab	TAB	09H
Backtab	SHIFT TAB	1B 49H
Delete	F8 or DEL	1B 50H 7FH
New Line	ESC F or CTRL/N	1B 46H 0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	F7	1B 51H
Erase to End of Field	F6	1B 4BH
Erase Input	F5	1B 4DH
Enter	RETURN	0DH
Clear	F4	1B 4AH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC -	1B 5FH
PF12	ESC =	1B 3DH
PF13	ESC !	1B 21H
PF14	ESC @	1B 40H
PF15	ESC #	1B 23H
PF16	ESC \$	1B 24H
PF17	ESC %	1B 25H
PF18	ESC ^	1B 5EH
PF19	ESC &	1B 26H
PF20	ESC *	1B 2AH
PF21	ESC (	1B 28H
PF22	ESC)	1B 29H
PF23	ESC _(underline)	1B 1FH
PF24	ESC +	1B 2BH
PA1	F1	1B 2CH
PA2	F2	1B 2EH
PA3	F3	1B 2FH
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH

3278 Function	Key Sequence	Hex Value Generated
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC L	1B 4CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.27 HP45 Terminal Module—Hewlett-Packard HP-2645

How to Set Up the Terminal

To set up the HP-2645 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before setting up the configuration switches.
2. There are three (3) switches located at the upper left of the keyboard. These control the duplex, parity and baud rate data communications options. Set the Duplex switch to FULL, and set the parity and baud as desired.
3. There are three (3) groups of switches, with eight (8) switches in each group, found on the 13260A Standard Asynchronous Communications PCA board within the terminal. Set these switches to the following values:

Switch	Set to:	Comments
A	OPEN	Transmit ESCAPE codes
B	CLOSED	Typed spaces will overwrite existing characters
C	OPEN	Auto wraparound disabled
D	n.a.	Applicable only in Block Mode
E	n.a.	Applicable only with paper tape read in
F	CLOSED	Terminal Baud is determined by the switch on the keyboard
G,H,J,K	n.a.	Applicable only in Block Mode
L	CLOSED	No effect on Self-Test
M	CLOSED	INSERT CHAR and DELETE CHAR keys operate in normal sense
N	CLOSED	No effect on printer ESCAPE code transfer

Switch	Set to:	Comments
P,Q R	as desired OPEN	APL printing pairing codes Transition from receive state to transmit occurs after CB (Clear to Send) goes on
S,T U,V	CLOSED OPEN	Non-main channel protocol Terminal ignores all transitions of SB (Secondary Receive Data) and CF (Carrier Detect)
W X	as desired as desired	Disable/Enable Data Comm. Self Test Data Speed signal low or high (CH = 0 or 1)
Y	as desired	Transmit LED lit for CB (Send to Clear) or for CC (Data Set Ready)
Z	as desired	If Parity switch is set to NoParity, this switch forces bit 8 to zero (CLOSED) or one (OPEN). If Parity switch is set to Even or Odd, this
switch chooses (CLOSED) or (OPEN).		"Check for parity error" "No check for parity error"

4. Replace the terminal cover, reconnect the AC power cord, and connect the terminal to the converter port (modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the HP-2645 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	1B 44H 08H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 68H
Tab	TAB	09H
Backtab	CTRL/TAB or CTRL/BACKSPACE	1B 69H
Delete	DELETE HAR or DELETE	1B 50H 7FH
New Line	NEW LINE	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	INSERT CHAR or INSERT LINE	1B 51H 1B 4CH
Erase to End of Field	DELETE LINE or CTRL/E	1B 4DH 05H

3278 Function	Key Sequence	Hex Value Generated
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	CLEAR DISPLAY	1B 4AH
Sys Request	ESC ?	1B 3FH
PF1	PF1	1B 70H
PF2	PF2	1B 71H
PF3	PF3	1B 72H
PF4	PF4	1B 73H
PF5	PF5	1B 74H
PF6	PF6	1B 75H
PF7	PF7	1B 76H
PF8	PF8	1B 77H
PF9	ESC 09	1B 30 39H
PF10	ESC 10	1B 31 30H
PF11	ESC 11	1B 31 31H
PF12	ESC 12	1B 31 32H
PF13	ESC 13	1B 31 33H
PF14	ESC 14	1B 31 34H
PF15	ESC 15	1B 31 35H
PF16	ESC 16	1B 31 36H
PF17	ESC 17	1B 31 38H
PF18	ESC 18	1B 31 39H
PF19	ESC 19	1B 32 30H
PF20	ESC 20	1B 32 31H
PF21	ESC 21	1B 32 32H
PF22	ESC 22	1B 32 33H
PF23	ESC 23	1B 32 34H
PF24	ESC 24	1B 2CH
PA1	ESC ,	1B 2EH
PA2	ESC .	1B 2FH
PA3	ESC /	10H
Print	CTRL/P	03H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC L	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.28 HP125 Terminal Module—Hewlett-Packard HP-125

How to Set Up the Terminal

1. To set up the HP-125 type terminal for connection to the LinkUp 3174, it is not necessary to set any external terminal switches. Connect the terminal to the converter port (modem or direct cable) as appropriate. All terminal straps and HP function keys will be either set up by remote commands transmitted from the LinkUp 3174 to the terminal, or input directly by the user from the keyboard into the terminal itself. The following table gives a summary of this initialization procedure.

HP-125 Mode	HP-125 Strap Setting	Comments
TERMINAL MODE	AbCGH1	The LinkUp 3174 automatically initializes these strap settings when the user initializes the terminal type in response to the User Signon Message response "Hndsk" strap must be set by user to enable X-ON/X-OFF
	X	
	E	
LOCAL MODE	RETURN straps to	The following sample Normal Settings program on the HP-125 can be written to perform this task 10 PRINT CHR\$(27"&K0a0c1d0j010m0n 0p0q2\$": 20 PRINT CHR\$(27 "&s0a0b0c1g1h0L: 30 END (Refer to Section 3 of the HP-125 System Reference Manual for the definition of these strap settings)

2. It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected. If a baud rate of 110 is selected, be sure to specify 2 stop bits.
3. The protocol converter uses an HP-125 in terminal mode only; it does not allow host system interactions with CP/M programs on the HP-125 or use of HP-125 devices (such as plotters) other than display and keyboard.
4. The protocol conversion tables in the LinkUp 3174 cause all display fields in the HP-125 to use HP normal intensity. Therefore, the IBM 3270 screens on the HP-125 type terminal appear slightly different than they appear on genuine IBM 3278-2 terminals, but the differences are minor. Functionality is not impaired.

Keyboard Emulation

The following is a table showing how the HP-125 terminal type keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3. The protocol converter has been programmed to take advantage of the HP-125 type intelligent terminal characteristics. For example, the LinkUp 3174 downloads and sets HP-125 type function keys to implement the following IBM functions:

PA1 ERASE INPUT
 PA2 ERASE EOF
 PA3 INSERT
 CLEARDELETE

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	1B 44H 08H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 48H
Tab	TAB	09H
Backtab	SHIFT TAB	1B 49H
Delete	F8 or DEL	1B 50H 7FH
New Line	ESC F or CTRL/N	1B 46H 0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	F7	1B 51H
Erase to End of Field	F6	1B 4BH
Erase Input	F5	1B 4DH
Enter	RETURN	0DH
Clear	F4	1B 4AH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC -	1B 2DH
PF12	ESC =	1B 3DH
PF13	ESC !	1B 21H
PF14	ESC @	1B 40H
PF15	ESC #	1B 23H
PF16	ESC \$	1B 24H
PF17	ESC %	1B 25H
PF18	ESC ^	1B 5EH
PF19	ESC &	1B 26H
PF20	ESC *	1B 2AH

3278 Function	Key Sequence	Hex Value Generated
PF21	ESC (	1B 28H
PF22	ESC)	1B 29H
PF23	ESC _(underline)	1B 5FH
PF24	ESC +	1B 2BH
PA1	F1	1B 2CH
PA2	F2	1B 2EH
PA3	F3	1B 2FH
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC L	1B 4CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.29 HZ14 Terminal Module—Hazeltine 1400

How to Set Up the Terminal

To set up the Hazeltine 1400 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before setting the switches.
2. There are eight (8) control switches located under the terminal's access plate. These switches are used to specify terminal operating characteristics. Lift (or remove) the access plate to set the switches. The switches are numbered 1 through 8 (from the left) and should be set as follows:

Switch	Set to:	Comment
1, 2	DOWN	Not applicable
3, 4	As appropriate	Set to match parity of the LinkUp 3174 port for the terminal as described above
5	DOWN	Specifies full-duplex mode

3. The remaining control switches are used to set the baud rate for communications to the converter. The baud rate specified here must match the baud rate specified for the port to which this terminal is to be connected. It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected. If a baud rate of 110 is selected, be sure to specify 2 stop bits.

Set the baud rate as follows:

Baud Rate	Switches		
	6	7	8
110	UP	UP	UP
300	DOWN	UP	UP
600	UP	DOWN	UP
1200	DOWN	DOWN	UP
1800	UP	UP	DOWN
2400	DOWN	UP	DOWN
4800	UP	DOWN	DOWN
9600	DOWN	DOWN	DOWN

4. Replace the access plate, reconnect the AC power cord, and connect the terminal to the converter port (or modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the Hazeltine 1400 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	CTRL/H	08H
Down Cursor	CTRL/J or LINEFEED	0AH
Up Cursor	CTRL/K	0BH
Forward Space Cursor	CTRL/L	0CH
Home	CTRL/I	1B 12H
Tab	ESC CTRL/R	09H
Backtab	CTRL/B	02H
Delete	RUB	7FH
	or ESC +	1B 2BH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H

3278 Function	Key Sequence	Hex Value Generated
Enter	RETURN	0DH
Clear	ESC CTRL/\	1B 1CH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
	or ESC -	1B 2DH
PF12	ESC W	1B 57H
	or ESC =	1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	PA1	1B 5AH
PA2	PA2	1B 58H
PA3	PA3	1B 43H
Print	PRINT SCREEN	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH

Special Function	Key Sequence	Hex Value Generated
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.30 HZ78 Terminal Module—Hazeltine 10-78

How to Set Up the Terminal

To set up the Hazeltine 10-78 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

All operator-selectable options are input from the keyboard into the Setup Mode Status Line; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. Call up the Status Line by depressing the ALT and ESC keys simultaneously. Set the option values as follows:

Option	Value/Comments
0	3278 Keyboard
1	PF option on Alternate Keypad
2	ESC as lead-in character
3	Full Duplex
4	Character-oriented attributes
5	NO/Disable Auto Scroll
6	NO/Disable Auto New Line
7	?/Diagnostic Test
8	?/Cursor Block or Underline
9	?/50Hz or 60Hz
A	?/Main Port Baud Rate
B	?/Auxiliary Port Baud Rate
C	?/Main Parity - EVEN, ODD, MARK, SPACE
D	?/Auxiliary Parity - EVEN, ODD, MARK, SPACE

? = Set as desired or as required by other factors (converter configuration, etc.).

Keyboard Emulation

The following is a table showing how the Hazeltine 10-78 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The IBM 3278 keyboard, because it is an EBCDIC terminal, does not provide an ESC key. The Hazeltine 10-78 provides as an ESC key the key immediately below the ATTN key at the left side of the keyboard.
4. The auxiliary port on the Hazeltine 10-78 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 01H
Backspace Cursor	←	08H
Down Cursor	↓	1B 0BH
Up Cursor	↑	1B 0CH
Forward Space Cursor	→	10H
Home	HOME	1B 12H
Tab	TAB	09H
Backtab	BACKTAB	07H
Delete	DEL	7FH
New Line	NEW LINE	0AH
Duplicate	DUP	0EH
Field Mark	FIELD MARK	17H
Insert Mode	INSERT	19H
Erase to End of Field	ERASE EOF	18H
Erase Input	ERASE INPUT	12H
Enter	ENTER	0DH
Clear	CLEAR	1B 4DH
Sys Request	SYS REQ	1B 3BH
PF1	PF1	1B 31 H
PF2	PF2	1B 32 H
PF3	PF3	1B 33 H
PF4	PF4	1B 34 H
PF5	PF5	1B 35 H
PF6	PF6	1B 36 H
PF7	PF7	1B 37 H
PF8	PF8	1B 38 H
PF9	PF9	1B 39 H
PF10	PF10	1B 30 H
PF11	PF11	1B 2D H
PF12	PF12	1B 3D H
PF13	PF13	1B 51 H
PF14	PF14	1B 57 H
PF15	PF15	1B 45 H
PF16	PF16	1B 52 H
PF17	PF17	1B 54H
PF18	PF18	1B 59H
PF19	PF19	1B 55H
PF20	PF20	1B 49H
PF21	PF21	1B 4FH
PF22	PF22	1B 50H
PF23	PF23	1B 46H
PF24	PF24	1B 47H
PA1	PA1	1B 5AH
PA2	PA2	1B 58H
PA3	ESC C	1B 43H
Print	PRINT	1B 56H
Cursor Select	SELECT	1B 2FH
Attention	ESC \	1B 5CH
Device Cancel	ESC }	1B 7DH
Ident	IDENT	1B 53H
Test	TEST	1B 16H

3278 Function	Key Sequence	Hex Value Generated
Fast Fowardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC #	1B 7BH
Refresh Screen	ALT/Z	1AH
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC:	1B 7CH
Request Disconnect	ESC `	1B 7EH
Generate Attribute	ALT/G	07H
View Attribute	ALT/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ALT/E	05H

E.31 HZ150 Terminal Module - Hazeltine 1500

How to Set Up the Terminal

To set up the Hazeltine 1500 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before setting the switches.
2. There are 24 switches located under the terminal's access plate above the keyboard. They are made up of three (3) DIP switch groups, each with eight (8) individual switches.

Set the right-most group of switches as follows:

Switch # (left to right)	Set to:	Comments
1, 2	DOWN	RS-232
3-8	not used	

Set the middle group of switches as follows:

Switch # (right to left)	Set to:	Comments
1	STD VIDEO	Standard video
2	U/L case characters	Upper and lower case
3	CR	No Auto Linefeed
4	FULL	Full duplex

For switches 5-8, set one switch down (toward the keyboard) for the desired parity and all 3 others up (away from the keyboard).

5	parity = 0
6	1
7	ODD
8	EVEN

3. The eight (8) left most switches are used to set the baud rate. To set a particular baud rate, set the proper switch down (toward the keyboard) and all seven (7) others up (away from it).

Switch# (right to left)	Baud Rate
1	19,200
2	9,600
3	4,800
4	2,400
5	1,800
6	1,200
7	300
8	110

4. Replace the access plate, reconnect the AC power cord and connect the terminal to the converter port (or modem) as appropriate.

Keyboard Emulation

The following is a table showing how the Hazeltine 1500 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:

row 1 (1 - 0) = PF1 - PF10
 row 2 (Q - P) = PF11 - PF20
 row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

4. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Hazeltine 1500 Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	BACKSPACE	08H
Down Cursor	CTRL/J or LINEFEED	0AH
Up Cursor	CTRL/K	0BH
Forward Space Cursor	CTRL/L	0CH
Home	CTRL/^	1EH
Tab	CTRL/T	14H
	or CTRL/I	09H
Backtab	CTRL/B	02H
Delete	DEL	7FH
	or ESC +	1B 2BH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H

3278 Function	Key Sequence	Hex Value Generated
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC ^	1B 5EH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q or ESC -	1B 51H 1B 2DH
PF12	ESC W or ESC =	1B 57H 1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H

Special Function	Key Sequence	Hex Value Generated
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.32 HZ151 Terminal Module—Hazeltine 1510

How to Set Up the Terminal

To set up the Hazeltine 1510 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before setting the switches.
2. There are 24 switches located under the terminal's access plate above the keyboard. They are made up of three (3) DIP switch groups, each with eight (8) individual switches.

Switch # (left to right)	Set to:	Comments
1,2	UP	RS-232
3	-	N/A
4	DOWN	ESC as lead-in
5	UP	Sets character mode
6,7	DOWN	Sets EOM to CR
8	DOWN	No wrap on column 80

Set the middle group of switches as follows:

Switch # (right to left)	Set to:	Comments
1	STD VIDEO	Standard video
2	U/Lcase	Upper and Lower case characters
3	CR	No Auto Linefeed
4	FULL	Full duplex

For switches 5-8, set one switch down (toward the keyboard) for the desired parity and all 3 others up (away from the keyboard).

5	parity = 0
6	1
7	ODD
8	EVEN

3. The eight (8) leftmost switches are used to set the baud rate. To set a particular baud rate, set the proper switch down (toward the keyboard) and all seven (7) others up (away from it).

Switch # (right to left)	Baud Rate
1	19,200
2	9,600
3	4,800
4	2,400
5	1,800
6	1,200
7	300
8	110

4. Replace the access plate, reconnect the AC power cord, and connect the terminal to the converter port (or modem).

Keyboard Emulation

The following is a table showing how the Hazeltine 1510 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix. Thus:

Row 1 (1 - 0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the PA key assignments have, as their second key, the first three (3) characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

4. The last character on the screen (the line 24, column 80 character position) cannot be displayed. This feature is designed to defeat the Hazeltine 1510 Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	BACKSPACE	08H
Down Cursor	CTRL/J or LINEFEED	0AH
Up Cursor	CTRL/K	0BH
Forward Space Cursor	CTRL/L	0CH
Home	HOME	1B 12H
Tab	TAB	09H
Backtab	CTRL/B	02H
Delete	DEL	7FH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH

3278 Function	Key Sequence	Hex Value Generated
Clear	CLEAR	1B 1CH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.33 I3101 Terminal Module—IBM 3101

How To Set Up the Terminal

To set up the IBM 3101 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC Power cord from the outlet before starting the setup process.
2. There are eight (8) toggle-type switches located on the keyboard element as Group 1 switches. These switches describe the communication connect options and are set to the following values:

Group 1 Switches	Set to:	Comments
CHAR-BLOCK	CHAR	The converter supports only TTY-compatible character interfaces
DX-HDX	FDX	Full-duplex operations enabled
CL422-232C	232C	Sets EIA RS-232 option
CRTS-PRTS	PRTS	RTS held continuously high
REV CHAN ON-OFF	REV CHAN OFF	Operations enabled without reverse channel
LINE TURN AROUND CHARS (Sw 6-7)	CR	Set Sw 6 = 0, Sw 7 = 1
MONO-DUAL	DUAL	Sets dual-case character set

3. There are eight (8) toggle switches located on the keyboard element as GROUP 2 switches. These switches describe the terminal operating characteristics and are set to the following values:

Group 2 Switches	Set to:	Comments
STOP1-STOP2	STOP 1	Set to 1 stop bit unless 110-baud rate is desired. In this case use STOP2.
PARITY	SPACE MARK ODD EVEN	Sw2 = 0, Sw3 = 0 Sw2 = 0, Sw3 = 1 Sw2 = 1, Sw3 = 0 Sw2 = 1, Sw3 = 1
SEND LINE OPTION	OFF	Set switches to desired parity
NULL SUPPRESSION	OFF	Sets normal send function
TIME FILL CHARS	0	All nulls are not suppressed No time fill characters (Sw7-8) -set: Sw7 = 0, Sw8 = 0

4. There are eight (8) toggle switches located on the keyboard element as GROUP 3 switches. These switches describe the functional terminal operating characteristics and are set to the following values:

Group 3 Switches	Set to:	Comments
AUTO NL ON-OFF	OFF	Automatic generation of New Line disabled
AUTOLF ON-OFF	OFF	Automatic generation of line feed disabled
CR/CR-LF	CR	Disable automatic generation of a line-feed character every time a carriage return is keyed
SCROLL ON-OFF	OFF	Scrolling disabled
REVERSE VIDEO ON-OFF	as desired	Video capability
BLINK CURSOR ON-OFF	as desired	Cursor characteristic

5. There are eight (8) toggle-type switches located on the keyboard element as GROUP 4 switches. These switches describe the baud rates needed for both primary and auxiliary communication interfaces. The following table describes how to set the baud rate for the terminal to interface with the converter.

I/O Baud Rate (BPS)	Main Port Switch Settings				Auxiliary Port Switch Settings			
	1	2	3	4	5	6	7	8
110	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
150	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
200	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
300	OFF	OFF	ON	ON	OFF	OFF	ON	ON
600	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
1200	OFF	ON	OFF	ON	OFF	ON	OFF	ON
1800	OFF	ON	ON	OFF	OFF	ON	ON	OFF
2400	OFF	ON	ON	ON	OFF	ON	ON	ON
4800	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
9600	ON	OFF	OFF	ON	ON	OFF	OFF	ON

The baud rate set into the above switches must match the baud rate specified for the converter port to which this terminal is to be connected. It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected. If a baud rate of 110 is selected, be sure the number of stop bits is two (2). (See STOP 2 switch specified in the GROUP 2 Switches.)

6. Reconnect the AC power cord and connect the terminal to the converter port (modem or direct cable) as appropriate.

Keyboard Emulation

The following is a table showing how the IBM 3101 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the IBM I3101 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	ALT/R	12H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME symbol	1B 48H
Tab	→I	09H
Backtab	←(backspace)	1B 49H
Delete	DEL	7FH
New Line	ALT/N	0EH
Duplicate	ALT/D	04H
Field Mark	ALT/F	06H
Insert Mode	ALT/U	1B 51H
Erase to End of Field	ERASE EOL/EOF	1B 4BH
Erase Input	ERASE INPUT	1B 4DH
Enter	←I (new line)	0DH
Clear	CLEAR	1B 4AH
Sys Request	ESC ?	1B 3FH
PF1	PF1	1B 61 0DH
	ESC 1	1B 31H
PF2	PF2	1B 62 0DH
	ESC 2	1B 32H
PF3	PF3	1B 63 0DH
	ESC 3	1B 33H
PF4	PF4	1B 64 0DH
	ESC 4	1B 34H
PF5	PF5	1B 65 0DH
	ESC 5	1B 35H
PF6	PF6	1B 66 0DH
	ESC 6	1B 36H
PF7	PF7	1B 67 0DH
	ESC 7	1B 37H
PF8	PF8	1B 68 0DH
	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC !	1B 21H
PF12	ESC @	1B 40H
PF13	ESC #	1B 23H
PF14	ESC \$	1B 24H
PF15	ESC %	1B 25H
PF16	ESC ^	1B 5EH
PF17	ESC &	1B 26H
PF18	ESC *	1B 2AH
PF19	ESC (	1B 28H
PF20	ESC)	1B 29H
PF21	ESC ESC 1	1B 4B 31H
PF22	ESC ESC 2	1B 4B 32H
PF23	ESC ESC 3	1B 4B 33H
PF24	ESC ESC 4	1B 4B 34H
PA1	ERASE EOS 1	1B 4A 31H

3278 Function	Key Sequence	Hex Value Generated
PA2	ERASE EOS 2	1B 4A 32H
PA3	ERASE EOS 3	1B 4A 33H
Print	ALT/P	10H
Cursor Select	ALT/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ALT/A	01H
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	ALT/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Device Print	PRINT	1B 57H
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	ALT/G	07H
View Attributes	ALT/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.34 I3150 Terminal Module—IBM 3151

How to Set Up the Terminal

The DataLynx/3174 supports the IBM 3151 models 31 and 41. The model 11 is not supported. To set up the model 31 and 41 terminals for connection to the protocol converter in order to emulate the 3278, proceed as follows:

All operator-selectable options are input from the keyboard into the setup menus; there are no external switches.

1. Enter the setup menu by pressing the “SETUP” key <CTRL/SETUP>. Set the options as follows:

Parameter Menu	Set to:	Comments
General		
Machine Mode	IBM 3151	For 3151 operation
Screen	as desired	Normal or Reverse Video
Row and Column	24 x 80	132-Column mode is also supported
Scroll	NO	Set by the LinkUp 3174
Auto LF	OFF	Set by the LinkUp 3174
CRT Saver	ON	Set by the LinkUp 3174
Line Wrap	NO	Set by the LinkUp 3174
Forcing Insert	OFF	Set by the LinkUp 3174
Tab	FIELD	Set by the LinkUp 3174
Term. ID	as desired	Not Used

LINKUP 3174

Parameter Menu	Set to:	Comments
Communication		
Operating Mode	ECHO with the LinkUp 3174 handling	ECHO, or conversational mode, the echo
of the keyboard input		
Line Speed	as desired	Main port baud rate (50-19200)
Word Length	as desired	
Parity	as desired	
Stop Bit	as desired	
Turnaround Character	CR	
Line Control	PRTS	Permanent Request to Send
Break Signal	as desired	Not Used
Send Null Suppress	OFF	
Keyboard/Printer		
Enter	RETURN	Enter key functions as Return key. Set by the LinkUp 3174.
Return	NEW LINE key. Set by the LinkUp 3174.	Enter key function as Return
New Line	CR	Set by the LinkUp 3174
Send	PAGE	
Insert Character	MODE	Set by the LinkUp 3174
Line Speed (bps)	as desired	Aux Printer line speed
Word Length	as desired	Aux Printer word length
Parity	as desired	Aux Printer parity
Stop bit	as desired	Aux Printer stop bit(s)
Characters	as desired	Aux Printer character set

Keyboard Emulation

The following is a table showing how the IBM 3151 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the IBM 3151 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 48H
Tab	TAB→	09H
Backtab	←TAB	1B 32H
Delete	DELETE	1B 51H
New Line	LF	0AH
Duplicate	CTRL/D	04H

3278 Function	Key Sequence	Hex Value Generated
Field Mark	CTRL/F	06H
Insert Mode	INS LN	1B 4EH
Erase to End of Field	ERASE EOF	1B 49H
Erase Input	ER INP	1B 4BH
Enter	←RETURN or ENTER	0DH
Clear	CLEAR	1B 4C 0DH
Sys Request	ESC ?	1B 3FH
PF1	F1	1B 61 0DH
PF2	F2	1B 62 0DH
PF3	F3	1B 63 0DH
PF4	F4	1B 64 0DH
PF5	F5	1B 65 0DH
PF6	F6	1B 66 0DH
PF7	F7	1B 67 0DH
PF8	F8	1B 68 0DH
PF9	F9	1B 69 0DH
PF10	F10	1B 6A 0DH
PF11	F11	1B 6B 0DH
PF12	F12	1B 6C 0DH
PF13	SHIFT/F1	1B 21 61 0DH
PF14	SHIFT/F2	1B 21 62 0DH
PF15	SHIFT/F3	1B 21 63 0DH
PF16	SHIFT/F4	1B 21 64 0DH
PF17	SHIFT/F5	1B 21 65 0DH
PF18	SHIFT/F6	1B 21 66 0DH
PF19	SHIFT/F7	1B 21 67 0DH
PF20	SHIFT/F8	1B 21 68 0DH
PF21	SHIFT/F9	1B 21 69 0DH
PF22	SHIFT/F10	1B 21 6A 0DH
PF23	SHIFT/F11	1B 21 6B 0DH
PF24	SHIFT/F12	1B 21 6C 0DH
PA1	PA1	1B 21 6D 0DH
PA2	PA2	1B 21 6E 0DH
PA3	PA3	1B 21 6F 0DH
Print	PRINT	1B 57 0DH
Cursor Select	CTRL/C	03H
Attention	ESC\	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ALT/N	0EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Device Print	SEND LINE	1B 21 38 0DH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H

Special Function	Key Sequence	Hex Value Generated
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.35 I3161 Terminal Module—IBM 3161/3163

How to Set Up the Terminal

To set up the IBM 3161/3163 terminal for connection to the converter in order to emulate the 3278, proceed as follows:

All operator-selectable options are input from the keyboard into the Setup and Select menus; there are no external switches.

1. Enter the Setup Menu by depressing the “Setup” key <CTRL/SELECT>. Set the options as follows:

Parameter Menu	Set to:	Comments
Machine Mode Operating Mode	IBM 3161/3163 ECHO	For 3161/3163 operation ECHO, or conversational mode, with the LinkUp handling the echo of the keyboard input
Interface	RS-232C	EIA RS-232 communication interface
Line Control	as desired	PRTS-permanent RTS CRTS-controlled RTS IPRTS-induced permanent RTS
Line Speed	as desired	Main and Aux. Port baud rate. (50 - 19.2K bps)
Parity	as desired	Main and Aux. Port. (Space, Mark, Odd, Even, or No)
Turnaround Character	Not Applic.	Line-turnaround character to be sent at the end of a read-type command
Stop Bit	as desired	Main and Aux port. 1 or 2 bits.
Word Length	as desired	Main and Aux. port. 7 or 8 bits
Response Delay	as desired	0 or 100 msec.
Break Signal	as desired	170 or 500 msec.
Enter	RETURN	Enter key works as a “Return” key
Return	NEW LINE	New Line option functions when the Return key is pressed
New Line	CR	Return (and Enter) key generates a CR character
Tab	as desired by the LinkUp 3174	Field or Column. Overridden
Line Wrap	OFF	Auto Line Wrap is disabled
Auto LF	OFF	Upon receipt of a CR character, only a carriage return (and not a carriage return, line feed) is performed by the terminal

Parameter Menu	Set to:	Comments
Send	Not Applic.	Not applicable in Echo Mode
Send Null	Not Applic.	Not applicable in Echo Mode
Insert	Not Applic.	Not applicable as the "Insert" key is not used by the LinkUp 3174
emulation		
Trace	Not Applic.	Not applicable as it does not affect communication to the LinkUp 3174
CRT Saver	Not Applic.	Overridden by the LinkUp 3174
Scroll	OFF	Auto scroll is disabled
Print	Not Applic.	Not applicable as the "Print" key is not used by the LinkUp 3174 emulation
Print EOL	OFF	No end-of-line character sent to the printer by the terminal
Line End	Not Applic.	Not applicable as the "Print EOL" option is disabled

Keyboard Emulation

The following is a table showing how the IBM 3161/3163 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the IBM I3161/3163 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 48H
Tab	TAB→	09H
Backtab	←TAB	1B 32H
Delete	DELETE	1B 51H
New Line	LF	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	INS LN	1B 4EH
Erase to End of Field	ERASE EOF	1B 49H
Erase Input	ER INP	1B 4BH
Enter	←RETURN or ENTER	0DH
Clear	CLEAR	1B 4C 0DH
Sys Request	ESC ?	1B 3FH
PF1	F1	1B 61 0DH

3278 Function	Key Sequence	Hex Value Generated
PF2	F2	1B 62 0DH
PF3	F3	1B 63 0DH
PF4	F4	1B 64 0DH
PF5	F5	1B 65 0DH
PF6	F6	1B 66 0DH
PF7	F7	1B 67 0DH
PF8	F8	1B 68 0DH
PF9	F9	1B 69 0DH
PF10	F10	1B 6A 0DH
PF11	F11	1B 6B 0DH
PF12	F12	1B 6C 0DH
PF13	SHIFT/F1	1B 21 61 0DH
PF14	SHIFT/F2	1B 21 62 0DH
PF15	SHIFT/F3	1B 21 63 0DH
PF16	SHIFT/F4	1B 21 64 0DH
PF17	SHIFT/F5	1B 21 65 0DH
PF18	SHIFT/F6	1B 21 66 0DH
PF19	SHIFT/F7	1B 21 67 0DH
PF20	SHIFT/F8	1B 21 68 0DH
PF21	SHIFT/F9	1B 21 69 0DH
PF22	SHIFT/F10	1B 21 6A 0DH
PF23	SHIFT/F11	1B 21 6B 0DH
PF24	SHIFT/F12	1B 21 6C 0DH
PA1	PA1	1B 21 6D 0DH
PA2	PA2	1B 21 6E 0DH
PA3	PA3	1B 21 6F 0DH
Print	PRINT	1B 38 0DH
Cursor Select	CTRL/C	03H
Attention	ESC\	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ALT/N	0EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Device Print	SEND LINE	1B 21 38 0DH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.36 I3162 Terminal Module—IBM 3162

How to Set Up the Terminal

The LinkUp 3174 supports the IBM 3162 models 11 and 12. Models 31 and 32 are not supported. To set up the model 11 and 12 terminals for connection to the protocol converter in order to emulate the 3278, proceed as follows:

All operator-selectable options are input from the keyboard into the Setup menus; there are no external switches.

1. Enter the Setup Menu by pressing the “SETUP” key <CTRL/SETUP>. Set the options as follows:

Parameter Menu	Set to:	Comments
General		
Machine Mode	IBM 3162	For 3162 operation
Screen	as desired	Normal or Reverse Video
Row and Column	24 x 80	132 Column mode is also supported
Scroll	NO	Set by the LinkUp 3174
Auto LF	OFF	Set by the LinkUp 3174
CRT Saver	OFF	Set by the LinkUp 3174
Line Wrap	NO	Set by the LinkUp 3174
Forcing Insert	OFF	Set by the LinkUp 3174
Tab	COLUMN	Set by the LinkUp 3174
Term. ID	as desired	Not Used
Communication		
Operating Mode	ECHO	ECHO, or conversational mode,
the keyboard input	with the DataLynx handling the	echo of
Line Speed	as desired	Main port baud rate (50-19200)
Parameter Menu	Set to:	Comments
Word Length	as desired	
Parity	as desired	
Stop Bit	as desired	
Turnaround Character	CR	
Interface	as required	RS-232 usually used
Line Control	PRTS	Permanent Request to Send
Break Signal	as desired	Not Used
Send Null Suppress	ON	
Keyboard/Printer		
Enter	RETURN	Enter key functions as Return key. Set by the LinkUp 3174
Return	NEW LINE	Set by the LinkUp 3174
New Line	CR	Set by the LinkUp 3174
Send	PAGE	
Insert Character	MODE	Set by the LinkUp 3174
Line Speed (bps)	as desired	Aux Printer line speed
Word Length	as desired	Aux Printer word length
Parity	as desired	Aux Printer parity

Parameter Menu	Set to:	Comments
Stop bit	as desired	Aux Printer stop bit(s)
Characters	as desired	Aux Printer character set

Keyboard Emulation

The following is a table showing how the IBM 3162 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the IBM 3162 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 48H
Tab	TAB→	09H
Backtab	←TAB	1B 32H
Delete	DELETE	1B 51H
New Line	LF	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	INS LN	1B 4EH
Erase to End of Field	ERASE EOF	1B 49H
Erase Input	ER INP	1B 4BH
Enter	←RETURN or ENTER	0DH
Clear	CLEAR	1B 4C 0DH
Sys Request	ESC ?	1B 3FH
PF1	F1	1B 61 0DH
PF2	F2	1B 62 0DH
PF3	F3	1B 63 0DH
PF4	F4	1B 64 0DH
PF5	F5	1B 65 0DH
PF6	F6	1B 66 0DH
PF7	F7	1B 67 0DH
PF8	F8	1B 68 0DH
PF9	F9	1B 69 0DH
PF10	F10	1B 6A 0DH
PF11	F11	1B 6B 0DH
PF12	F12	1B 6C 0DH
PF13	SHIFT/F1	1B 21 61 0DH
PF14	SHIFT/F2	1B 21 62 0DH
PF15	SHIFT/F3	1B 21 63 0DH
PF16	SHIFT/F4	1B 21 64 0DH
PF17	SHIFT/F5	1B 21 65 0DH
PF18	SHIFT/F6	1B 21 66 0DH
PF19	SHIFT/F7	1B 21 67 0DH

3278 Function	Key Sequence	Hex Value Generated
PF20	SHIFT/F8	1B 21 68 0DH
PF21	SHIFT/F9	1B 21 69 0DH
PF22	SHIFT/F10	1B 21 6A 0DH
PF23	SHIFT/F11	1B 21 6B 0DH
PF24	SHIFT/F12	1B 21 6C 0DH
PA1	PA1	1B 21 6D 0DH
PA2	PA2	1B 21 6E 0DH
PA3	PA3	1B 21 6F 0DH
Print	PRINT	1B 57 0DH
Cursor Select	CTRL/C	03H
Attention	ESC\	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ALT/N	0EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Device Print	SEND LINE	1B 21 38 0DH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.37 IBMPC Terminal Module—IBM Personal Computer

The software packages TermLynx-II and TruLync/3270-PC allow the emulation of the IBM 3278-2 using the IBM Personal Computer.

Refer to the appropriate documentation for information on the software package, keyboard emulation, and other operationsl details.

E.38 INF205 Terminal Module—Informer 205/207

How to Set Up the Terminal

Information on the Informer 205 terminal switch settings was not available at the time of publication. Please refer to the Informer 205 User's Manual and the "General Notes on Terminal Switch Settings" section of the Introduction to this document for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the Informer 205 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The Informer 207 Portable Terminal keyboard has no ESC key. To generate an ASCII ESC = 1BH, one must hit the ALT and "c/" keys concurrently.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 01H
Backspace Cursor	←	1B 5B 44H
	or ←	08H
Down Cursor	↓	1B 5B 42H
Up Cursor	↑	1B 5B 41H
Forward Space Cursor	→	1B 5B 43H
Home	HOME	01H
Tab	TAB	09H
Backtab	BACKTAB	07H
Delete	DEL	7FH
New Line	NEW LINE	0AH
Duplicate	DUP	0EH
Field Mark	FIELD MARK	17H
Insert Mode	INSERT	19H
Erase to End of Field	ERASE EOF	18H
Erase Input	ERASE INPUT	12H
Enter	ENTER	0DH
Clear	CLEAR	1B 4DH
Sys Request	SYS REQ	1B 3BH
PF1	PF1	1B 31 H
PF2	PF2	1B 32 H
PF3	PF3	1B 33 H
PF4	PF4	1B 34 H
PF5	PF5	1B 35 H
PF6	PF6	1B 36 H
PF7	PF7	1B 37 H
PF8	PF8	1B 38 H
PF9	PF9	1B 39 H
PF10	PF10	1B 30 H
PF11	PF11	1B 2D H
PF12	PF12	1B 3D H
PF13	PF13	1B 51 H
PF14	PF14	1B 57 H
PF15	PF15	1B 45 H
PF16	PF16	1B 52 H
PF17	PF17	1B 54H
PF18	PF18	1B 59H
PF19	PF19	1B 55H
PF20	PF20	1B 49H

3278 Function	Key Sequence	Hex Value Generated
PF21	PF21	1B 4FH
PF22	PF22	1B 50H
PF23	PF23	1B 46H
PF24	PF24	1B 47H
PA1	PA1	1B 5AH
PA2	PA2	1B 58H
PA3	PA3	1B 4EH
Print	or ESC C PRINT	1B 43H 1B 56H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Ident	IDENT or ESC :	1B 53H 1B 3AH
Test	CTRL/P	10H
Fast Fowardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh Screen	ALT/Z	1AH
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	ALT/G	07H
View Attribute	ALT/V	16H
Display Status Line	ESC _ (underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC +	1B 2BH

E.39 N8009 Terminal Module - Newbury 8009

How to Set Up the Terminal

To set up the Newbury 8009 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

All operator-selectable variables are input form the keyboard into the STATUS LINE and OPTION PAGE of the Newbury 8009; there are no external terminal switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. Call up the STATUS LINE by depressing the CONTROL and TAB keys simultaneously. Set the option values as follows:

Option	Value	Comments
1	TX = ?	Transmit speed and parity. It is recommended that the highest valid baud rate (matching for both the converter and the terminal) be selected.
2	RX = ?	Receive speed and parity.
3	FULL DUPLEX	Full-duplex operation.
4	4 WIRE	Terminal operates on a 4-wire interface.
5	BELL = ?	Character position at which the insertion of a character will cause the bell to sound (the "Bell Position").
6	DELETE = N	Rubouts will not produce a symbol on the display.
7	NL = IGNORE	NEW LINE is to be ignored.
8	PAGES = 1	One displayable page available.

3. Call up the OPTION PAGE by depressing the CONTROL and HOME keys simultaneously. Set the option values as follows:

Option	Value	Comments
Clear	CLEAR FROM HOME	Causes data to be cleared from home to the end of the screen
Cursor skip	CURSOR SKIP OFF	Cursor may be moved to a protected position
Soft code	SOFT CODES OFF	Numeric keyboard used to generate numbers
Underline	UNDERLINE OFF	Disables the underlining of data subsequent to the control character 12H
Protect	PROTECT = OFF	Disables the display of protected fields

"Transmit from Screen Options" are irrelevant to the LinkUp 3174. "Printer Port Options" will depend upon the printer used, so these settings are therefore left to the user. There should be no Control Codes set.

Keyboard Emulation

The following is a table showing how the Newbury 8009 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:

Row 1 (1 - 0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the alternate PA key assignments have, as their second key, the first three (3) characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	08H
Down Cursor	↓ or LINEFEED	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	18H
Home	HOME	1DH
Tab	TAB	09H
Backtab	DEL LINE	02H
Delete	RUBOUT or DEL CHAR	7FH 0EH
New Line	INS LINE	01H
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	INSERT CHAR	0FH
Erase to End of Field	DEOL	19H
Erase Input	CTRL/U	15H
Enter	RETURN or SEND LINE or SEND PAGE	0DH 1AH 0CH
Clear	CLEAR	1FH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H

3278 Function	Key Sequence	Hex Value Generated
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.40 PAPER Terminal Module—Hardcopy

How to Set Up the Terminal

Information on the setup of a hardcopy terminal will depend on the particular terminal being used. Please refer to the manufacturer's user's manual and the "General Notes on Terminal Switch Settings" section of the Introduction to this document for the proper settings, or contact your Local Data representative.

Keyboard Emulation for Paper

The following is a table showing how the Paper/3278 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:

row 1 (1 - 0) = PF1 - PF10
row 2 (Q - P) = PF11 - PF20
row 3 (A - F) = PF21 - PF24

Similarly, the alternate PA key assignments have, as their second key, the first three (3) characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Home Cursor	CTRL/^	1EH
Tab	CTRL/T	14H
Backtab	CTRL/B	02H
Rubout	RUB	7FH
	or ESC +	1B 2BH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Erase Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC ^	1B 5EH
Sys Request	ESC?	1B 3FH
Print	CTRL/P	10H
Device Cancel	ESC]	1B 5DH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H

3278 Function	Key Sequence	Hex Value Generated
PA3	ESC C	1B 43H
Attention	ESC \	1B 5CH
Indent	ESC :	1B 3AH
Test	n.a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Display Status Line	ESC_(Underline)	1B 5FH
Switch/Suspend Session	ESC >	1B 3EH
Refresh PAPER Field	CTRL/V	16H
Screen Print Switch	CTRL/U	15H
Field Id Switch	CTRL/G	07H
Suppress Blank Lines Switch	CTRL/J	0AH
Clear Buffer after Tx Switch	CTRL/K	0BH
Toggle Echoplex	ESC ;	1B 3BH

E.41 SCANS Terminal Module - Scanset

How to Set Up the Terminal

To set up the SCANSET terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows.

All parameters of the SCANSET terminal are set from the keyboard while in "Status Mode". For details as to how to access "Status Mode" and enter values, please refer to the manufacturer's "SCANSET User's Manual". Set the parameters to the following values:

Parameter	Value	Comments
Baud TX	as desired	Transmission Baud Rate
Baud RX	as desired	Reception Baud Rate
Baud Print	as desired	Printer Baud Rate
Dial - Pulse/Tone	as required	Set to Pulse if terminal is connected to a rotary-dial phone line. Set to Tone if connected to
Bit TX/RX	a touch-tone line. as desired	Number of data bits transmitted
PAR Print	to the connected printer as desired	Type of parity - ODD, EVEN, or NONE
Brightness	as desired	Brightness of display: 0 = minimum, 3 = maximum
Beep Col	as desired	YES causes a beep at the 72 character entered in a line. NO disables the beep.

Parameter	Value	Comments
Beep Tone	as desired	Volume of the beep: 0 = minimum, 3 = maximum
Cursor	ESC	Causes an ESC sequence to be transmitted when a cursor key is pressed
Return Key	CR	Transmits a CR upon depression of the RETURN Key
Screen Size	80	80-column screen
Duplex	FULL	Full Duplex Transmission
Scroll	NO	Disables Scrolling
XON/XOFF	as desired	Set to match logical flow-control selection configured for the converter port

Keyboard Emulation

The following is a table showing how the SCANSET keyboard is used in emulation of the 3278-2 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the SCANSET Auto-Scroll capability.
4. The auxiliary port on the SCANSET is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R or PF LOAD	12H 1B 24 ODH
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME (F5)	1EH
Tab	TAB (F6)	09H
Backtab	BACKSPACE	08H
Delete	DELETE	7FH
New Line	LINE FEED	0A
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	CLEAR (F4)	1B 4AH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H

Parameter	Value	Comments
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC !	1B 21H
PF12	ESC @	1B 40H
PF13	ESC #	1B 23H
PF14	ESC F	1B 46H
PF15	ESC %	1B 25H
PF16	ESC ^	1B 5EH
PF17	ESC &	1B 26H
PF18	ESC *	1B 2AH
PF19	ESC (	1B 28H
PF20	ESC)	1B 29H
PF21	ESC Q	1B 51H
PF22	ESC W	1B 57H
PF23	ESC E	1B 45H
PF24	ESC R	1B 52H
PA1	F1	1B 5AH
PA2	F2	1B 58H
PA3	F3	1B 56H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH

Toggle Echoplex

ESC ;

1B 3BH

E.42 T4420 Terminal Module—Teletype 4420/4424

How to Set Up the Terminal

The Teletype 4420 has no option switches; rather, its options are selected through the keyboard.

Refer to manufacturer's manual for information on how to access and modify the Option Selection Table. Set the option values to the following:

Option Number	Value	Comments
201	as desired	Sets the terminal baud rate
202	a	Asynchronous transmission
203	as desired	Disconnect on Loss of Carrier
204	as desired	Printer on Auto Answer
205	as desired	Substitute Character on Parity Error
206	a	Send Cursor and Edit Controls from the Keyboard
207	as desired SPACE	Parity - EVEN, ODD, MARK,
208	k	No end character for Message Send to On-line Data Preparation
209	k	No end character for Message Send to Interactive
210	k to Message Send	No end character for Interactive
211	k to On-line Data Preparation	No end character for Interactive
212	c	No disconnect character
213	b	CR/LF Line ending sequence
214	b	No display of data sent from keyboard
215	b	DC3 stop, DC1 start Display Send Control
216	b	DC3 stop, DC1 start Buffer Full Response
217-220	not used	
221	as desired	Position of NI and RETURN keys (choose either a or b)
222	a	Row, then column Cursor Addressing
223-228	b	No codes stored
229	c	ESC sequences performed but not stored
230	a	Data unprotected as displayed, protected without delimiters
231	b	No auto transmission of NL at 80th column
232	b	Send protected controls unprotected

Option Number	Value	Comments
233	a	Send highlights delimiters
234	b	No answerback on Auto Answer
235	a	Message Send from Cursor
236	b	Printer not affected by DC2 and
237	DC4 characters as desired	Auto Select of Speed and Options Group with 212L1A
238	b	Keyboard send in Interactive
239-241	not used	
300-302	as desired	Printer Option settings will depend on the type of printer being used

Keyboard Emulation

The following is a table showing how the Teletype 4420/4424 keyboards are used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R or ESC R	12H 1B 52H
Backspace Cursor	← or ESC D	08H 1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 48H
Tab	TAB	09H
Backtab	CTRL/TAB	1B 4FH
Delete	DELETE or DELETE CHAR	7FH
New Line	or ESC P NEW LINE	1B 50H 0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CHAR INS	1B 5EH
Erase to End of Field	LINE DELETE	1B 4DH
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	CLEAR	1B 4AH
Sys Request	ESC ?	1B 3FH
PF1	ESC 01	1B 30 31H
PF2	ESC 02	1B 30 32H
PF3	ESC 03	1B 30 33H
PF4	ESC 04	1B 30 34H

PF5	ESC 05	1B 30 35H
3278 Function	Key Sequence	Hex Value Generated
PF6	ESC 06	1B 30 36H
PF7	ESC 07	1B 30 37H
PF8	ESC 08	1B 30 38H
PF9	ESC 09	1B 30 39H
PF10	ESC 10	1B 31 30H
PF11	ESC 11	1B 31 31H
PF12	ESC 12	1B 31 32H
PF13	ESC 13	1B 31 33H
PF14	ESC 14	1B 31 34H
PF15	ESC 15	1B 31 35H
PF16	ESC 16	1B 31 36H
PF17	ESC 17	1B 31 37H
PF18	ESC 18	1B 31 38H
PF19	ESC 19	1B 31 39H
PF20	ESC 20	1B 32 30H
PF21	ESC 21	1B 32 31H
PF22	ESC 22	1B 32 32H
PF23	ESC 23	1B 32 33H
PF24	ESC 24	1B 32 34H
PA1	ESC P1	1B 50 31H
PA2	ESC P2	1B 50 32H
PA3	ESC P3	1B 50 33H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC _ (underline)	1B 5FH
Toggle Session	ESC >	1B 3EH

Toggle Echoplex

ESC ;

1B 3BH

E.43 TDV22 Terminal Module—Tandberg TDV2215

How to Set Up the Terminal

Information on the Tandberg TDV2215 terminal switch settings was not available at the time of publication. Please refer to the manufacturer's user's manual and the "General Notes on Terminal Switch Settings" section of this document for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the Tandberg TDV2215 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:

row 1 (1 - 0) = PF1 - PF10
 row 2 (Q - P) = PF11 - PF20
 row 3 (A - F) = PF21 - PF24

Similarly, the alternate PA key assignments have, as their second key, the first three (3) characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

4. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Tandberg Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1B 12H
Tab	TAB	09H
Backtab	BACKTAB	02H
Delete	DEL CHAR	7FH
New Line	LINE FEED	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	INS CHAR	15H
Erase to End of Field	ERASE LINE	05H
Erase Input	DEL LINE	18H
Enter	RETURN	0DH
Clear	ERASE PAGE	1B 1CH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H

3278 Function	Key Sequence	Hex Value Generated
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	PRINT	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC #	1B 23H
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	n.a.	n.a.
Request Disconnect	n.a.	n.a.
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H

E.44 TEK40 Terminal Module—Tektronix 4000

How to Set Up the Terminal

Information on the Tektronix 4000 Series terminals' switch settings was not available at the time of publication. Please refer to the Tektronix User's Manual and the "General Notes on Terminal Switch Settings" section of this document for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the Tektronix 4000 series keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:

Row 1 (1 - 0) = PF1 - PF10
 Row 2 (Q - P) = PF11 - PF20
 Row 3 (A - F) = PF21 - PF24

Similarly, the alternate PA key assignments have, as their second key, the first three (3) characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	BACKSPACE	08H
Down Cursor	LINE FEED	0AH
Up Cursor	CTRL/K	0BH
Forward Space Cursor	CTRL/L	0CH
Home	CTRL/^	1EH
Tab	CTRL/T	14H
	or CTRL/I	09H
Backtab	CTRL/B	02H
Delete	DEL	7FH
	or ESC +	1B 2BH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC ^	1B 5EH
Sys Request	ESC?	1B 3FH
PF1	ESC 1	1B 31H
PF2	ESC 2	1B 32H
PF3	ESC 3	1B 33H
PF4	ESC 4	1B 34H

3278 Function	Key Sequence	Hex Value Generated
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
	or ESC -	1B 2DH
PF12	ESC W	1B 57H
	or ESC =	1B 3DH
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.45 TLBLK Terminal Module—Block-Mode Applications

This terminal driver is specially designed for use with a logical unit operating in Block Mode. It causes screen processing to be altered and performs other functions necessary for block transfer of data. When not in Block Mode this terminal driver functions exactly like the IBM PC driver.

E.46 TRAY10 Terminal Module—TELERAY 10 Terminal

How to Set Up the Terminal

To set up the TELERAY® 10 terminal for connection to the converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before setting the switches.
2. There are two (2) sets of switches, eight (8) switches per set, located at the rear panel of the terminal. Set these as follows:

NOTE:

Relative switch locations and Up/Down notation are shown for packaging configuration M, R, L and E; for configurations S and T, refer to the Manufacturer's Instruction Manual or the rear panel decal.

Right Switches	Set to:	Comments
1	as desired	UP = Display Delimiters DOWN = Normal
2	as desired	UP = Xmit to Cursor DOWN = Xmit to End
3	as desired	UP = ETX on Xmit DOWN = Normal
4	UP	Full Duplex
5	DOWN	Auto-Wrap disabled
6	DOWN	New Line Mode disabled
7	DOWN	New Line on LF character
8	DOWN	RS-232 communication
Left Switches	Set to:	Comments
1-4	as desired	Baud Rate (main and peripheral ports). See chart.
5	as desired	UP = Even Parity DOWN = Odd Parity
6	as desired	UP = Parity enabled DOWN = Parity disabled
7	as desired	UP = 1 stop bit DOWN = 2 stop bits
8	as desired	UP = 7 bit character DOWN = 8 bit character

BAUD	SWITCH			
	1	2	3	4
50	UP	UP	UP	UP
75	DOWN	UP	UP	UP
110	UP	DOWN	UP	UP
135.5	DOWN	DOWN	UP	UP
150	UP	UP	DOWN	UP
300	DOWN	UP	DOWN	UP
600	UP	DOWN	DOWN	UP
1200	DOWN	DOWN	DOWN	UP
1800	UP	UP	UP	DOWN
2000	DOWN	UP	UP	DOWN
2400	UP	DOWN	UP	DOWN
3600	DOWN	DOWN	UP	DOWN
4800	UP	UP	DOWN	DOWN
7200	DOWN	UP	DOWN	DOWN
9600	UP	DOWN	DOWN	DOWN
Reserved	DOWN	DOWN	DOWN	DOWN

3. There are four (4) toggle-type key switches on the keyboard. Set them as follows:

Key	Position	Comments
LOCAL	UP	Terminal is in Remote Mode
BLOCK	UP	Character Mode selected
PAGE	as desired	UP = Scroll mode DOWN = Page mode
MONITOR	UP	Monitor mode disabled (control characters are transmitted)

4. Reconnect the AC power cord and connect the terminal to the converter port (or modem).

Keyboard Emulation

The following is a table showing how the TELERAY 10 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port of the TELERAY 10 Terminal is utilized by the LinkUp for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME SYMBOL	1B 48H
Tab	TAB	09H
Backtab	BACKTAB	1B 64H

3278 Function	Key Sequence	Hex Value Generated
Delete	DEL CHAR	1B 51H
New Line	LINE FEED	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	INSERT CHAR	1B 50H
Erase to End of Field	CLEAR EOL	1B 4BH
Erase Input	CLEAR EOP	1B 5B 4DH
Enter	RETURN	0AH
Clear	CLEAR PAGE	1B 5EH
Sys Request	ESC ?	1B 3FH
PF1	F1	1B 31 H
PF2	F2	1B 32 H
PF3	F3	1B 33 H
PF4	F4	1B 34 H
PF5	F5	1B 35 H
PF6	F6	1B 36 H
PF7	F7	1B 37 H
PF8	F8	1B 38 H
PF9	ESC 9	1B 39 H
PF10	ESC 0	1B 30 H
PF11	ESC !	1B 21H
PF12	ESC @	1B 40H
PF13	ESC #	1B 23H
PF14	ESC \$	1B 24H
PF15	ESC %	1B 25H
PF16	ESC ^	1B 5EH
PF17	ESC &	1B 26H
PF18	ESC *	1B 2AH
PF19	ESC (	1B 28H
PF20	ESC)	1B 29H
PF21	ESC -	1B 2DH
PF22	ESC =	1B 3DH
PF23	ESC _(underline)	1B 5FH
PF24	ESC +	1B 2BH
PA1	CTRL/T	14H
PA2	CTRL/Y	19H
PA3	CTRL/U	15H
Print	PRINT	1B 4FH
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Ident	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Fowardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 7BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC S	1B 53H

Special Function	Key Sequence	Hex Value Generated
Local Copy Form Feed	ESC|	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attribute	CTRL/V	16H
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.47 TV910 Terminal Module—Televideo 910

How to Set Up the Terminal

To set up the Televideo 910 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before opening the TeleVideo terminal case.
2. There are two (2) sets of 10 switches on the TeleVideo 910, labeled S1 and S2. Set these switches in the following manner:

S1 (right rear)	Set to:	Comments
1-4		Baud rate - see chart
5	DOWN	8 data bits
6	as desired	Send parity - UP No parity - DOWN (set to match the converter)
7	as desired	EVEN parity - UP ODD parity - DOWN (set to match the converter)
8	DOWN 2 stop bits)	1 stop bit (if baud rate is 110, set UP for
9	DOWN	Autot wrap off
10	DOWN	Auto Linefeed off

Baud Rate	1	2	3	4
9600	DOWN	DOWN	DOWN	DOWN
50	DOWN	DOWN	DOWN	UP
75	DOWN	DOWN	UP	DOWN
110	DOWN	DOWN	UP	UP
135	DOWN	UP	DOWN	DOWN
150	DOWN	UP	DOWN	UP
300	DOWN	UP	UP	DOWN
600	DOWN	UP	UP	UP
1200	UP	DOWN	DOWN	DOWN
1800	UP	DOWN	DOWN	UP
2400	UP	DOWN	UP	DOWN
3600	UP	DOWN	UP	UP
4800	UP	UP	DOWN	DOWN
7200	UP	UP	DOWN	UP
9600	UP	UP	UP	DOWN
19200	UP	UP	UP	UP

S2 (left rear)	Set to:	Comments
1	DOWN	1 and 2 - Sets standard 910 emulation
2	DOWN	
3	as desired	50 Hz - DOWN (foreign) 60 Hz - UP (U.S.)
4	as desired	UP = Steady cursor DOWN = Blinking cursor
5	as desired	UP = Underline cursor DOWN = Block cursor
6	UP	Full Duplex
7	as desired	UP = White on black DOWN = Black on white
8	UP	No DSR
9	DOWN	DCD connected
10	DOWN	DTR on with terminal

3. Replace the cover, reconnect the AC power cord and connect the terminal to the converter port (or modem, etc.), as appropriate.

Keyboard Emulation

The following is a table showing how the Televideo 910 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:

row 1 (1 - 0) = PF1 - PF10

row 2 (Q - P) = PF11 - PF20

row 3 (A - F) = PF21 - PF24

Similarly, the alternate PA key assignments have, as their second key, the first three (3) characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

4. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the TeleVideo 910 Auto-Scroll capability.
5. The auxiliary port on the TeleVideo 910 is utilized by the DataLynx for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓ or LINE FEED	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	CTRL/B	02H
Delete	DEL	7FH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN or ENTER	0DH
Clear	CLEAR/SPACE	1AH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1 or FUNCT/1	1B 31H 01 31 0DH
PF2	ESC 2 or FUNCT/2	1B 32H 01 32 0DH
PF3	ESC 3 or FUNCT/3	1B 33H 01 33 0DH
PF4	ESC 4 or FUNCT/4	1B 34H 01 34 0DH
PF5	ESC 5 or FUNCT/5	1B 35H 01 35 0DH
PF6	ESC 6 or FUNCT/6	1B 36H 01 36 0DH
PF7	ESC 7 or FUNCT/7	1B 37H 01 37 0DH
PF8	ESC 8 or FUNCT/8	1B 38H 01 38 0DH
PF9	ESC 9 or FUNCT/9	1B 39H 01 39 0DH
PF10	ESC 0 or FUNCT/0	1B 30H 01 30 0DH
PF11	ESC/Q	1B 51H
PF12	ESC/W	1B 57H
PF13	ESC/E	1B 45H
PF14	ESC/R	1B 52H
PF15	ESC/T	1B 54H
PF16	ESC/Y	1B 59H
PF17	ESC/U	1B 55H
PF18	ESC/I	1B 49H
PF19	ESC/O	1B 4FH
PF20	ESC/P	1B 50H
PF21	ESC/A	1B 41H
PF22	ESC/S	1B 53H
PF23	ESC/D	1B 44H

3278 Function	Key Sequence	Hex Value Generated
PF24	ESC/F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.48 TV910P Terminal Module—Televideo 910 + /912

How to Set Up the Terminal

To set up the TeleVideo 910+ or 912 terminal for connection to the proctol converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before opening the TeleVideo terminal case.
2. This section describes how to set the terminal switches on the TeleVideo 910+/912 terminal. Although these two terminals use the same software driver, their switch settings vary. Therefore, the 910+ switch settings will be covered first, followed by the settings of the 912.

910+ S1 (right rear)	Set to:	Comments
1-4	—	Baud rate - see chart.
5	DOWN	8 data bits
6	as desired	Send parity - UP (no parity) DOWN (set to match the converter)
7	as desired	EVEN parity - UP ODD parity - DOWN (set to match the converter)
8	DOWN	1 stop bit (if baud rate is 110, set for 2 stop bits)
9	DOWN	Auto wrap off
10	DOWN	Auto Linefeed off

910+ Baud Rate	1	2	3	4
9600	DOWN	DOWN	DOWN	DOWN
50	DOWN	DOWN	DOWN	UP
75	DOWN	DOWN	UP	DOWN
110	DOWN	DOWN	UP	UP
135	DOWN	UP	DOWN	DOWN
150	DOWN	UP	DOWN	UP
300	DOWN	UP	UP	DOWN
600	DOWN	UP	UP	UP
1200	UP	DOWN	DOWN	DOWN
1800	UP	DOWN	DOWN	UP
2400	UP	DOWN	UP	DOWN
3600	UP	DOWN	UP	UP
4800	UP	UP	DOWN	DOWN
7200	UP	UP	DOWN	UP
9600	UP	UP	UP	DOWN
19200	UP	UP	UP	UP

910+ S2 (left rear)	Set to:	Comments
1	DOWN	Sets Conversational Mode
2	DOWN	Sets Full Duplex
3	as desired	50 Hz - DOWN (foreign) 60 Hz - UP (U.S.)
4	DOWN	Sets Edit Mode to Duplex
5	as desired	UP = Underline cursor DOWN = Block cursor
6	UP	Sets 912/920 compatible
7	as desired	UP = Green on black DOWN = Black on green
8	UP	No DSR
9	DOWN	DCD connected
10	DOWN	DTR on with terminal

The S1 switches on the Back Panel switches are used to set the baud rate for communication with the converter. The S3 switches are used to set the Printer Port baud rate. Set one of the following S1 and S3 group switches DOWN for the desired terminal baud rate:

912 S1/S3 Switches	Desired Baud Rate
2	9600
3	4800
4	2400
5	1200
6	600
7	300
8	150
9	75
10	110

LINKUP 3174

912 S2 (left rear)	Set to:	Comments
1	UP	Not used
2	DOWN	Set Standard Character Set
3	UP	Full Duplex
4	as desired	50 Hz - UP (foreign) 60 Hz - DOWN (U.S.)
5	as desired	Set if parity is to be enabled UP = No Parity DOWN = Send Parity
6	DOWN	Sets 1 Stop Bit. Note that the terminal will automatically set 2 Stop Bits if the baud rate is set to 110 bps.
7	UP	8 Data bits are defined
8	UP	Only necessary for Rev. E and lower
9	as desired	Set to desired parity UP = EVEN DOWN = ODD
10	as desired	UP = Steady cursor DOWN = Blinking cursor (Rev E and lower uses jumper W25)

NOTE:

To set the S5 switches, you must remove the terminal cover. The S5 group is near the back edge of the circuit board and is labeled as S.

912 S5	Set to:	Comments
1	UP	DSR disconnected
2	DOWN	DCD connected
3	OPEN	Used in conjunction with Switch 4
4	DOWN	DTR connected
5	NOT USED	No auxiliary printer support
6-7	DOWN	RS-232

NOTE:

The Jumper (S4/W33) must be installed on the main circuit board to DISABLE the Auto-New Line at column 80.

3. Replace the cover, reconnect the AC power cord and connect the terminal to the converter port (or modem, etc.), as appropriate.

Keyboard Emulation

The following is a table showing how the TeleVideo 910+ keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the FUNCT/char PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:
 - row 1 (1 - 0) = PF1 - PF10
 - row 2 (Q - P) = PF11 - PF20
 - row 3 (A - F) = PF21 - PF24
 Either lower-case or upper-case (shifted) alpha characters are valid.
4. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the TeleVideo 910+/912 Auto-Scroll capability.
5. The auxiliary port on the TeleVideo 910+/912 is utilized by the LinkUp for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓ or LINE FEED or CTRL/V	0AH 16H
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	BACK TAB	1B 49H
Delete	DEL	7FH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN or ENTER	0DH
Clear	CLEAR SPACE	1AH
Sys Request	ESC ?	1B 3FH
PF1	FUNCT/1	01 31 0DH
PF2	FUNCT/2	01 32 0DH
PF3	FUNCT/3	01 33 0DH
PF4	FUNCT/4	01 34 0DH
PF5	FUNCT/5	01 35 0DH
PF6	FUNCT/6	01 36 0DH
PF7	FUNCT/7	01 37 0DH
PF8	FUNCT/8	01 38 0DH

3278 Function	Key Sequence	Hex Value Generated
PF9	FUNCT/9	01 39 0DH
PF10	FUNCT/0	01 30 0DH
PF11	FUNCT/Q	01 51 0DH
PF12	FUNCT/W	01 57 0DH
PF13	FUNCT/E	01 45 0DH
PF14	FUNCT/R	01 52 0DH
PF15	FUNCT/T	01 54 0DH
PF16	FUNCT/Y	01 59 0DH
PF17	FUNCT/U	01 55 0DH
PF18	FUNCT/I	01 49 0DH
PF19	FUNCT/O	01 4F 0DH
PF20	FUNCT/P	01 50 0DH
PF21	FUNCT/A	01 41 0DH
PF22	FUNCT/S	01 53 0DH
PF23	FUNCT/D	01 44 0DH
PF24	FUNCT/F	01 46 0DH
PA1	ESC 1	1B 31H
PA2	ESC 2	1B 32H
PA3	ESC 3	1B 33H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.49 TV925 Terminal Module—TeleVideo 920/925/950

How to Set Up the Terminal

To set up the TeleVideo 920/925/950 terminal for connection to the DataLynx in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before opening the TeleVideo 920 case.
2. This section describes how to set the terminal switches on the TeleVideo 920/925/950 terminals. Although these three terminals use the software driver, their switch settings vary. Therefore, the 920 settings will be covered first, followed by the 925/950 settings.

Switches on the TeleVideo 920 are identical to those of the TeleVideo 912. Refer to the previous section for the settings of the TeleVideo 920 option switches.

NOTE:

Both the 925 and 950 have a "Setup Mode" available to the user for the setting of some of the terminals' options. All of these options are set either by the terminals' switches or by the LinkUp 3174 initialization procedure. The user should be very careful because the use of "Setup Mode" may be detrimental to the terminal/LinkUp 3174 operation.

S1 (Right rear)	Set to:	Comments
1-4	-	Sets the baud rate of the main port (see the baud rates table).
5	DOWN	Sets 8-bit word.
6	DOWN	Sets 1 stop bit. For all baud rates less than or equal to 110 bps, two (2) stop bits are recommended.
7-10		This sets the baud rate of the printer port. See the following table on setting baud rates.

SWITCHES

925 Baud Rates	1/7	2/8	3/9	4/10	950 Baud Rates
9600	DOWN	DOWN	DOWN	DOWN	9600
50	DOWN	DOWN	DOWN	UP	1200
75	DOWN	DOWN	UP	DOWN	135
110	DOWN	DOWN	UP	UP	4800
135	DOWN	UP	DOWN	DOWN	75
150	DOWN	UP	DOWN	UP	2400
300	DOWN	UP	UP	DOWN	300
600	DOWN	UP	UP	UP	9600
1200	UP	DOWN	DOWN	DOWN	50
1800	UP	DOWN	DOWN	UP	1800
2400	UP	DOWN	UP	DOWN	150
3600	UP	DOWN	UP	UP	7200
4800	UP	UP	DOWN	DOWN	110
7200	UP	UP	DOWN	UP	3600
9600	UP	UP	UP	DOWN	600
19200	UP	UP	UP	UP	19200

S2 (Left Rear)	Set to:	Comments
1	925 - DOWN 950 - UP	Set to Duplex edit mode
2	DOWN	925 - Non-912/920 emulation
3, 4, 5	No Parity Odd Parity Even Parity Mark Parity Space Parity	3=DOWN, 4=DOWN,5=DOWN 3=DOWN, 4=DOWN, 5=UP 3=DOWN, 4=UP, 5=UP 3=UP, 4=DOWN, 5=UP 3=UP, 4=UP 5=UP
6	UP	Set normal block characters on a black screen
7, 8	925-UP, DOWN	
9	?	DOWN = 50Hz, UP = 60Hz
10	925-DOWN 950 - ?	No auto linefeed UP = Key Click OFF DOWN = Key Click ON

On the 925 only there are 10 toggle-type switches that are only accessible by removing the terminal cover. They are labeled as S3 switches and should be set to the following values:

925 S3 Switches	Set to:	Comments
1	?	UP = Key click OFF DOWN = Key click ON
2	DOWN	Set the language to ENGLISH
3	DOWN	
4	?	DOWN = Blinking cursor UP = Steady cursor
5	?	DOWN = Block cursor UP = Underline cursor
6	DOWN	Timeout blank option disabled
7	UP	Page Attributes function enabled; line attributes function disabled
8	DOWN	DCD Connected
9	UP	DSR Disconnected
10	DOWN	DTR Connected

3. Replace the cover, reconnect the AC power cord, connect the terminal to the LinkUp 3174 port (or modem, etc.), as appropriate.

Keyboard Emulation

The following is a table showing how the TeleVideo 920/925/950 keyboards are used in emulation of the 3278 keyboard.

NOTES:

- 1.Hit the CONTROL, SHIFT, or FUNCT key concurrently with the indicated key (alpha characters may be lower or upper case).
- 2.Hit the ESC key followed by the indicated character.
- 3.The "Cursor Down" key for the TeleVideo 920 is slightly different from that of the TeleVideo 925/950. On the TeleVideo 920, the "Cursor Down" key sequence is CTRL/V.
- 4.The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Televideo Auto-Scroll capability.
- 5.The auxiliary port on the TeleVideo 920/925/950 is used by the LinkUp 3174 for its "Auxiliary Printer" feature. The user should be aware that the TeleVideo 925 will pass to the printer the character sequence which deselects the auxiliary port. If the printer will be affected by receiving these characters, we recommend that the user discontinue use of the "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓	16H
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	BACKTAB	1B 49H
Delete	CHAR DELETE or DEL	1B 57H 7FH
New Line	LINE FEED	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CHAR INSERT or LINE INSERT	1B 51H 1B 45H
Erase to End of Field	LINE DELETE	1B 52H
Erase Input	LINE ERASE	1B 54H
Enter	RETURN or ENTER	0DH
Clear	PAGE ERASE or CLEAR SPACE	1B 59H 1AH
Sys Request	ESC ?	1B 3FH
PF1	F1	01 40 0DH
PF2	F2	01 41 0DH
PF3	F3	01 42 0DH
PF4	F4	01 43 0DH
PF5	F5	01 44 0DH
PF6	F6	01 45 0DH
PF7	F7	01 46 0DH
PF8	F8	01 47 0DH
PF9	F9	01 48 0DH
PF10	F10	01 49 0DH

3278 Function	Key Sequence	Hex Value Generated
PF11	SHIFT/F1 or F11	01 60 0DH 01 4A 0DH
PF12	SHIFT/F2	01 61 0DH
PF13	SHIFT/F3	01 62 0DH
PF14	SHIFT/F4	01 63 0DH
PF15	SHIFT/F5	01 64 0DH
PF16	SHIFT/F6	01 65 0DH
PF17	SHIFT/F7	01 66 0DH
PF18	SHIFT/F8	01 67 0DH
PF19	SHIFT/F9	01 68 0DH
PF20	SHIFT/F10	01 69 0DH
PF21	FUNCT/1	01 31 0DH
PF22	FUNCT/2	01 32 0DH
PF23	FUNCT/3	01 33 0DH
PF24	FUNCT/4	01 34 0DH
PA1	ESC 1	1B 31H
PA2	ESC 2	1B 32H
PA3	ESC 3	1B 33H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC_(underline)	1B 5FH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/Y	16H
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.50 TV970 Terminal Module— TeleVideo TV-970

How to Set Up the Terminal

To set up the TeleVideo TV-970 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows.

All operator-selectable parameters are input from the keyboard through the TV-970 set up mode; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. To enter Set Up mode, press the SET UP key. A Set Up Menu will appear on the terminals screen. To exit Set Up mode, press the SET UP key a second time. To permanently save the reset parameter values (as opposed to allowing them to revert to previous values following the current session), enter a CTRL/S before exiting the Set Up mode. Set the terminal's parameters as follows:

Identifier	Value	Comments
COMM	CNV	Conversational mode
DUPLX	FDX	Full Duplex communication
SEND/RCV	NO ECHO	Local terminal echo turned off
BAUD (MAIN)	as desired	Main port baud rate
PARITY (MAIN)	as desired	Main port parity
DATA BITS (MAIN)	as desired	Main port word size
STOP BIT (MAIN)	as desired	Main port stop bit(s)
RCV CTRL	as desired	Set to match logical flow control selection configured for the LinkUp 3174 port
XMIT CTRL (MAIN)	as desired	Set to match logical flow-control selection configured for the LinkUp 3174 port
BAUD (PRINT)	as desired	Printer port baud rate
PARITY (PRINT)	as desired	Printer port parity
DATA BITS (PRINTER)	as desired	Printer port word size
STOP BIT (PRINTER)	as desired	Printer port stop bit(s)
XMIT CTRL (PRINT)	as desired	Set to match logical flow-control selection configured for the printer being used
PRINT STAT	BUF/XPT	Buffered transparent print selected
INSH CHAR	n.a.	The character that replaces erased data on the screen (three-character decimal value)
INS/RPL	n.a.	Insert overwrites/moves current data
CTRL REP	PROC	Terminal processes commands received from the host.
AUTOPG	n.a.	Screen pages/scrolls when cursor goes beyond the 24th line
AUTOWRAP	NO WRAP	Autowrap disable
EDIT BOUND	n.a.	Screen/page editing capability
EDITING EXT	DSPL	Permits insert/delete to affect full screen

Identifier	Value	Comments
HORZ EDIT	n.a.	Insert/delete commands affect data to right/left of cursor
VERT EDIT	n.a.	Insert/delete commands affect data above/below cursor line
AUTOTAB	n.a.	Cursor moves/does not move into a 'guarded area'
GUARDED XFER	ALL	All areas are transmitted and printed as they are displayed
MULTI-AREA XFER	ALL	Allows all unguarded fields to be transmitted
XFER TERM	FULL	Defines the data to be transferred as an entire page of memory
LN XFER	PG	Transmits through cursor or end-of-page
XFER EXEC	DEFER	SEND key transmit sequence
PG XFER	PG	Allows the entire page to be transmitted
CHAR/LN	132	Allows the terminal to display lines 132 characters in length
LN/PG	24	Defines terminal page length as 24 lines
SCRN BACK	as desired	Display of light on dark or dark on light
SCRN SAVER	as desired	Screen turns off after n minutes if idle
SCROLL	as desired	Rate of terminal data display
25TH LINE	as desired	Use of 25th line; blank, status, or message
1ST CHAR SET	U.S.	U.S. ASCII (only setting)
2ND CHAR SET	U.K.	U.K. ASCII (only setting)
LF/NEW LN	LN FEED	LINE FEED key generates only LF (= 0AH); RETURN generates only CR (= 0DH)
CURSOR STYLE	as desired	Manner of cursor display
NORMAL ATTR	HIGH	Normal intensity is defined to be the higher of the two intensities
LN ATTR	NOR	Single-height, single-width character display
POWER/HZ	as desired	50 Hz or 60 Hz
KEYCLICK	as desired	Audible or Inaudible
BREAK KEY	IGNORE	BREAK key is ignored when pressed

Keyboard Emulation

The following is a table showing how the TeleVideo TV-970 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 5B 44H
Down Cursor	↓	1B 5B 42H
Up Cursor	↑	1B 5B 41H
Forward Space Cursor	→	1B 5B 43H
Home	HOME	1B 5B 48H
Tab	TAB	09H
Backtab	BACKTAB	1B 5B 5AH
Delete	DEL	7FH
	or CHAR DELETE	1B 5B 50H
New Line	LINE INSERT	1B 5B 4CH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CHAR INSERT	1B 5B 40H
Erase to End of Field	LINE ERASE	1B 5B 4BH
Erase Input	PAGE ERASE	1B 5B 4AH
Enter	RETURN	0DH
Clear	LINE DELETE	1B 5B 4DH
Sys Request	ESC S	1B 53H
PF1	F1	1B 3F 61H
PF2	F2	1B 3F 62H
PF3	F3	1B 3F 63H
PF4	F4	1B 3F 64H
PF5	F5	1B 3F 65H
PF6	F6	1B 3F 66H
PF7	F7	1B 3F 67H
PF8	F8	1B 3F 68H
PF9	F9	1B 3F 69H
PF10	F10	1B 3F 6AH
PF11	F11	1B 3F 6BH
PF12	F12	1B 3F 6CH
PF13	F13	1B 3F 6DH
PF14	F14	1B 3F 6EH
PF15	F15	1B 3F 6FH
PF16	F16	1B 3F 70H
PF17	SHIFT F7	1B 3F 47H
PF18	SHIFT F8	1B 3F 48H
PF19	SHIFT F9	1B 3F 49H
PF20	SHIFT F10	1B 3F 4AH
PF21	SHIFT F11	1B 3F 4BH
PF22	SHIFT F12	1B 3F 4CH

3278 Function	Key Sequence	Hex Value Generated
PF23	SHIFT F13	1B 3F 4DH
PF24	SHIFT 14	1B 3F 4EH
PA1	SHIFT F1	1B 3F 41H
PA2	SHIFT F2	1B 3F 42H
PA3	SHIFT F3	1B 3F 43H
Print	PRINT	1B 5B 69H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Ident	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh screen	CTRL W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H\
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.51 VIEWC Terminal Module—ADDS Viewpoint Color

How to Set Up the Terminal

To set up the ADDS® Viewpoint Color terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

All operator-selectable variables are input from the keyboard into the Status Line within the Viewpoint Color Set-Up Mode; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. For details on how to enter and exit the Viewpoint Color Set-Up mode, and how to select the various options, please refer to the Viewpoint Color User's Manual. There are four (4) banks of logical switches with eight (8) bits per bank. Set the switches as follows:

Bank #1	Set to:	Comments	Switch #				Baud Rate
			1,5	2,6	3,7	4,8	
1-4	as desired	EIA Port Baud See table	0	0	0	0	110
			0	0	0	1	150
			0	0	1	0	300
5-8	as desired	Aux. Port Baud See Table	0	0	1	1	1200
			0	1	0	0	1800
			0	1	0	1	2400
			0	1	1	0	4800
			0	1	1	1	9600
			1	0	0	0	19200
Bank #2							
	Set to:	Comments					
1	1	Full Duplex					
2	as desired	X-ON/X-OFF Set to match the logical flow control selection configured for the LinkUp 3174 port					
3	0	Disable second page option					
4	0	Auto Scroll disable					
5	0	Auto Line Feed disable					
6	as desired	Display Parity Error					
7, 8	as desired	Parity 0,0 = Odd 1,0 = Mark 0,1 = Even 1,1 = Space					
Bank #3							
	Set to:	Comments					
1	as desired	Screen Refresh Rate 0 = 60 Hz, 1 = 50 Hz					
2	as desired	0 = Cursor Visible 1 = Cursor Suppressed					
3	Reserved						
4	as desired	0 = Flashing Cursor 1 = Steady Cursor					
5, 6	0,0	Upper/Lower case characters					
7, 8	0,0	CR as line terminator					
Bank #4							
	Set to:	Comments					
1	as desired	Extended Color Palette					
2	1	Cursor home position at upper left					
3	as desired	Audible keyclick					
4-6	as desired	Foreign Language character setting					
7	0	Regent 40 mode disabled					
8	as desired	CRT Auto Off					

Keyboard Emulation

The following is a table showing how the Viewpoint Color keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be display. This feature is designed to defeat the ADDS Auto-Scroll capability.
4. The auxiliary port on the Viewpoint/Color is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.
5. Because the ENTER key on the numeric keypad generates varying sequences (depending on the presence or absence of field attributes), it is our recommendation that this key not be used.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	15H 08H
Down Cursor	↓	0AH
Up Cursor	↑	1AH
Forward Space Cursor	→	06H
Home	HOME	01H
Tab	TAB	09H
Backtab	SHIFT/TAB	1B 4FH
Delete	DEL	7FH
New Line	INS L	1B 4DH
Duplicate	CTRL/D	04H
Field Mark	CTRL/O	0FH
Insert Mode	INS C	1B 46H
Erase to End of Field	CTRL/EOF	1B 4BH
Erase Input	CTRL/E ALL	1B 47H
Enter	RETURN	0DH
Clear	DEL L or CTRL/L	1B 6CH 0CH
Sys Request	ESC S	1B 3FH
PF1	F1	02 31 0DH
PF2	F2	02 32 0DH
PF3	F3	02 33 0DH
PF4	F4	02 34 0DH
PF5	F5	02 35 0DH
PF6	F6	02 36 0DH
PF7	F7	02 37 0DH
PF8	F8	02 38 0DH
PF9	SHIFT/F1	02 21 0DH
PF10	SHIFT/F2	02 22 0DH
PF11	SHIFT/F3	02 23 0DH
PF12	SHIFT/F4	02 24 0DH
PF13	SHIFT/F5	02 25 0DH

3278 Function	Key Sequence	Hex Value Generated
PF14	SHIFT/F6	02 26 0DH
PF15	SHIFT/F7	02 27 0DH
PF16	SHIFT/F8	02 28 0DH
PF17	ESC 7	1B 37H
PF18	ESC 8	1B 38H
PF19	ESC 9	1B 39H
PF20	ESC 0	1B 30H
PF21	ESC 1	1B 31H
PF22	ESC 2	1B 32H
PF23	ESC 3	1B 33H
PF24	ESC 4	1B 34H
PA1	ESC ,	1B 2CH
PA2	ESC .	1B 2EH
PA3	ESC /	1B 2FH
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Ident	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n.a.	n.a.
Fast Backspace	n.a.	n.a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh screen	CTRL W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form		
Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.52 VIEWP Terminal Module—ADDS Viewpoint Regent

How to Set Up Terminal

Information on the ADDS Regent® terminals switch settings was not available at the time of publication. Please refer to the manufacturer's user's manual and the "General Notes on Terminal Switch Settings" section of the Introduction to this document for the proper settings, or contact Black Box.

To set up the ADDS Viewpoint terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows.

1. Disconnect the AC power cord before removing the cover of the terminal.
2. There are eight (8) option switches on the right rear of the terminal. Set them as follows:

S1 (right rear)	Set to:	Comments
1-3	?	See baud rate table
4	0	Auto scroll disabled
5	0	Auto line feed disabled
6	1	Full duplex
7, 8	?	Parity 7 8
		ODD 0 0
		EVEN 0 1
		MARK 1 0
		SPACE 1 1

Baud Rate	S1-1	S1-2	S1-3
110	0	0	0
150	0	0	1
300	0	1	0
1200	0	1	1
2400	1	0	0
4800	1	0	1
9600	1	1	0
19200	1	1	1

3. There are eight (8) option switches located inside the Viewpoint on the main printed circuit board. The cover must be removed to set them. The switch group is labeled as S2 and is a few inches up from and to the right of the RS-232C connectors.

S2 (internal)	Set to:	Comments
1	?	0 = White on black 1 = Black on white
2	0	Disable parity error display
3	?	0 = 60 Hz, 1 = 50 Hz
4, 5, 6	0	U.S. character set
7	?	0 = Steady cursor 1 = Blinking cursor
8	?	0 = Block cursor 1 = Underline cursor

4. Replace the cover, reconnect the AC power cord and connect the terminal to the converter port (or modem, etc.) as appropriate.

Keyboard Emulation

The following is a table showing how the ADDS Viewpoint keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Currently, the function keys available on some Regent terminals are not supported. This is so that one terminal driver may support both the Viewpoint and the Regent series. These function keys can be accommodated by using the Terminal Configurator. (See the System Manager.)
2. Press the Control key concurrently with the indicated alpha key.

3. Press the ESC key prior to pressing the indicated alpha key.
4. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:
 - Row 1 (1 - 0) = PF1 - PF10
 - Row 2 (Q - P) = PF11 - PF20
 - Row 3 (A - F) = PF 21 - PF24

Similarly, the PA key assignments have, as their second key, the first three (3) characters on the fourth row of alpha keys (Z, X, C). Either lower case or upper case (shifted) alpha characters are valid.
5. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the ADDS Viewpoint Auto-Scroll capability.
6. The auxiliary port on the ADDS Viewpoint is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←← or BACKSPACE	15H 08H
Down Cursor	↓	0AH
Up Cursor	↑	1AH
Forward Space Cursor	→	06H
Home	HOME	01H
Tab	TAB	09H
Backtab	CTRL/K	0BH
Delete	DEL	7FH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/O	0FH
Insert Mode	CTRL/Y	19H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC ^ or CTRL/L	1B 1EH 0CH
Sys Request	ESC?	1B 3FH
PF1	ESC 1 or F1	1B 31H 02 31H
PF2	ESC 2 or F2	1B 32H 02 32H
PF3	ESC 3 or F3	1B 33H 02 33H
PF4	ESC 4	1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H

3278 Function	Key Sequence	Hex Value Generated
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	PRINT	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 23H
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	n.a.
Request Disconnect	ESC ~	n.a.
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.53 VIP731 Terminal Module—Honeywell VIP7301

How to Set Up the Terminal

To set up the Honeywell® VIP7301 terminal for connection to the converter in order to emulate the 3278, proceed as follows:

1. Disconnect the AC power cord from the outlet before setting the switches.
2. There is one group of ten (10) switches located on the back panel of the terminal. Set the switches as follows:

S1 Switches	Set to:	Comments
1	DOWN	Normal Mode
2	(as required)	UP = Echo Mode DOWN = Non-Echo Mode Set by LinkUp 3174
3	(as required)	UP = Roll Mode DOWN = Non-Roll Mode Set by LinkUp 3174
4	n.a.	Applicable only when the LOCAL key is depressed
5	as desired	UP = Even parity DOWN = Mark parity
6-8	as desired	Baud Rate. See chart below
9	DOWN	VIP7200 Attribute commands accepted
10	as desired	UP = J1 Pin 11 disabled DOWN = J1 Pin 11 enable

Baud Rate	6	7	8
300	DOWN	DOWN	DOWN
600	DOWN	DOWN	UP
1200	DOWN	UP	DOWN
1800	DOWN	UP	UP
2400	UP	DOWN	DOWN
4800	UP	DOWN	UP
9600	UP	UP	DOWN
19200	UP	UP	UP

3. There are two key switches on the keyboard which affect terminal operation; the LOCAL key must be UP to enable communication with the LinkUp, and the AUTO LF key must be UP so that the RETURN key generates only the CR character.

4. Reconnect the AC power cord and connect the terminal to the converter port (or modem), as appropriate.

Keyboard Emulation

The following is a table showing how the Honeywell VIP7301 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 65H
Backspace Cursor	← or BACKSPACE	1B 44H 08H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	HOME	1B 48H
Tab	TAB	09H
Backtab	CTRL/TAB	1B 5B 5AH
Delete	DELETE	7FH
New Line	LF	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	ERASE EOF	1B 4BH
Erase Input	ERASE EOP	1B 4AH
Enter	RETURN	0DH
Clear	CLEAR	1B 60H
Sys Request	CTRL/INIT	1B 63H
PF1	F1	1B 30H
PF2	F2	1B 32H
PF3	F3	1B 36H
PF4	F4	1B 38H
PF5	F5	1B 3AH
PF6	F6	1B 3CH
PF7	F7	1B 3EH
PF8	F8	1B 50H
PF9	F9	1B 52H
PF10	F10	1B 54H
PF11	F11	1B 5CH
PF12	F12	1B 5EH
PF13	F13 (SHIFT F1)	1B 31H
PF14	F14 (SHIFT F2)	1B 35H
PF15	F15 (SHIFT F3)	1B 37H
PF16	F16 (SHIFT F4)	1B 39H
PF17	F17 (SHIFT F5)	1B 3BH
PF18	F18 (SHIFT F6)	1B 3DH
PF19	F19 (SHIFT F7)	1B 3FH
PF20	F20 (SHIFT F8)	1B 51H
PF21	F21 (SHIFT F9)	1B 53H
PF22	F22 (SHIFT F10)	1B 56H
PF23	F23 (SHIFT F11)	1B 5DH
PF24	F24 (SHIFT F12)	1B 5FH
PA1	ESC F1	1B 1B 30H
PA2	ESC F2	1B 1B 32H
PA3	ESC F3	1B 1B 36H
Print	TRANSMIT	1B 69H
Cursor Select	CTRL/C	03H
Attention	ESC X	1B 58H
Device Cancel	ESC {	1B 7BH
Indent	ESC Y	1B 59H

3278 Function	Key Sequence	Hex Value Generated
Test	CTRL/N	0EH
Fast Forwardspace	CTRL/R	12H
Fast Backspace	CTRL/L	0CH

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC #	1B 23H
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Display Status Line	ESC 3	1B 33H
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Toggle Session	ESC .	1B 2EH
Toggle Echoplex	ESC Z	1B 5A

E.54 VP60 Terminal Module—ADDS Viewpoint/60

How to Set Up the Terminal

To set up the ADDS Viewpoint/60 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

All operator-selectable options are input from the keyboard into the Setup Mode Status Line; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. Call up the Status Line by depressing the SHIFT and HOME keys simultaneously. A line containing four (4) option banks of eight (8) bits each will appear on the screen. Set the option values as follows:

Option Bank 1	Value	Comments
1-4	as desired	Main Port Baud Rate (see table below)
5-8	as desired	Auxiliary Port Baud Rate (see table below)

Bit Settings

Baud Rate	1/5	2/6	3/7	4/8
110	0	0	0	0
150	0	0	0	1
300	0	0	1	0
1200	0	0	1	1
1800	0	1	0	0
2400	0	1	0	1
4800	0	1	1	0
9600	0	1	1	1
19200	1	0	0	0

Option Bank 2	Value	Comments
1	1	Full Duplex
2	as desired	0 = Dark Char. on Light screen 1 = Light Char on Dark screen
3	1	Video highlight at full intensity
4	0	Auto Scroll disabled
5	0	Auto Linefeed disabled
6	0	Disable Parity Error Display
7, 8	as desired	Parity 7 8 ODD 0 0 EVEN 0 1 MARK 1 0 SPACE 1 1

Option Bank 3	Value	Comments
1	as desired	0 = 60Hz, 1 = 50Hz
2	0	Cursor visible
3	as desired	0 = Block, 1 = Underline Cursor
4	as desired	0 = Blink, 1 = Steady Cursor
5, 6	0,0	Upper/Lower case characters
7, 8	0,0	Line terminator character CR selected

Option Bank 4	Value	Comments
1	Reserved	
2	1	Cursor home at upper left enabled
3	as desired	0 = Keyclick disabled 1 = enabled
4-6	Reserved	
7	0	Regent 40 mode disabled
8	Reserved	

Keyboard Emulation

The following is a table showing how the ADDS Viewpoint/60 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The second character of the ESC sequence PF key assignments is based on the first two-and-one-half rows of alphanumeric keys being treated as a matrix; thus:
Row 1 (1 - 0) = PF1 - PF10
Row 2 (Q - P) = PF11 - PF20
Row 3 (A - F) = PF 21 - PF24

Similarly, the PA key assignments have, as their second key, the first three (3) characters on the fourth row of alpha keys (Z, X, C). Either lower-case or upper-case (shifted) alpha characters are valid.

4. The auxiliary port on the ADDS Viewpoint/60 is utilized by the LinkUp for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	← or BACKSPACE	15H 08 H
Down Cursor	↓	0AH
Up Cursor	↑	1AH
Forward Space Cursor	→	06H
Home	HOME	01H
Tab	TAB	09H
Backtab	CTRL/K	0BH
Delete	DEL	7FH
New Line	CTRL/N	0EH
Duplicate	CTRL/D	04H
Field Mark	CTRL/O	0FH
Insert Mode	CTRL/Y	19H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	ESC ^ or CTRL/L	1B 1EH 0CH
Sys Request	ESC?	1B 3FH
PF1	ESC 1 or F1	1B 31H 02 31H
PF2	ESC 2 or F2	1B 32H 02 32H
PF3	ESC 3 or F3	1B 33H 02 33H
PF4	ESC 4 or F4	1B 34H 02 34H
PF5	ESC 5 or F5	1B 35H 02 35H
PF6	ESC 6 or F6	1B 36H 02 36H
PF7	ESC 7 or F7	1B 37H 02 37H
PF8	ESC 8 or F8	1B 38H 02 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC Q	1B 51H
PF12	ESC W	1B 57H
PF13	ESC E	1B 45H
PF14	ESC R	1B 52H
PF15	ESC T	1B 54H
PF16	ESC Y	1B 59H
PF17	ESC U	1B 55H
PF18	ESC I	1B 49H
PF19	ESC O	1B 4FH
PF20	ESC P	1B 50H
PF21	ESC A	1B 41H

3278 Function	Key Sequence	Hex Value Generated
PF22	ESC S	1B 53H
PF23	ESC D	1B 44H
PF24	ESC F	1B 46H
PA1	ESC Z	1B 5AH
PA2	ESC X	1B 58H
PA3	ESC C	1B 43H
Print	CTRL/P	10H
Cursor Select	CTRL/C	03H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC [	1B 5BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(Underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.55 VP78 Terminal Module—ADDS Viewpoint/78

How to Set Up the Terminal

To set up the ADDS Viewpoint/78 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

All operator-selectable options are input from the keyboard into the Setup Mode Status Line; there are no external switches.

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. Call up the Status Line by depressing the ALT, SHIFT, and BACKTAB keys simultaneously. A line containing four (4) option banks of eight (8) bits each will appear on the screen. Set the option values as follows:

Option Bank 1	Value	Comments
1-4	as desired	Main Port Baud Rate (see table)
5-8	as desired	Auxiliary Port Baud Rate (see table)

Bit Settings					
Baud Rate	1/5	2/6	3/7	4/8	
110	0	0	0	0	
150	0	0	0	1	
300	0	0	1	0	
1200	0	0	1	1	
1800	0	1	0	0	
2400	0	1	0	1	
4800	0	1	1	0	
9600	0	1	1	1	
19200	1	0	0	0	

Option Bank 2	Value	Comments
1	Reserved	
2	as desired	0 = Dark Char. on Light screen 1 = Light Char. on Dark screen
3	1	Video highlight at full intensity
4	0	Auto Scroll disabled
5	0	Auto Linefeed disabled
6	0	Disable Parity Error Display
7, 8	as desired	Parity 7 8 ODD 0 0 EVEN 0 1 MARK 1 0 SPACE 1 1

Option Bank 3	Value	Comments
1	as desired	0 = 60Hz, 1 = 50Hz
2	0	Cursor visible
3	as desired	0 = Block, 1 = Underline Cursor
4	as desired	0 = Blink, 1 = Steady Cursor
5, 6	0,0	Upper/Lower-case characters
7, 8	0,0	Line terminator character CR selected

Option Bank 4	Value	Comments
1	Reserved	
2	1	Cursor home at upper left enabled
3	as desired	0 = Keyclick disabled 1 = enabled
4-8	Reserved	

Keyboard Emulation

The following is a table showing how the ADDS Viewpoint/78 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the ADDS Viewpoint/78 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.
4. The IBM 3278 keyboard, because it is an EBCDIC terminal, does not provide an ESC key. The ADDS Viewpoint/78 provides as an ESC key the key immediately below the ATTN key at the left side of the keyboard.

3278 Function	Key Sequence	Hex Value Generated
Reset	ALT/R or RESET	12H 1B 40H
Backspace Cursor	← or ←	1B 38H 1B 60H
Down Cursor	↓	1B 5EH
Up Cursor	↑	1B 5CH
Forward Space Cursor	→	1B 62H
Home	HOME SYMBOL	1B 3DH
Tab	→I	1B 3AH
Backtab	I←	1B 3CH
Delete	DELETE CHAR SYMBOL	1B 5AH
New Line	NEW LINE SYMBOL	1B 3EH
Duplicate	DUP	1B 54H
Field Mark	FIELD MARK	1B 56H
Insert Mode	INSERT SYMBOL	1B 58H
Erase to End of Field	ERASE EOF	1B 4EH
Erase Input	ERASE INPUT	1B 4BH
Enter	ENTER	0DH
Clear	ALT/CURSOR SEL	1B 47H
Sys Request	SYS REQ	1B 45H
PF1	PF1	1B 20H
PF2	PF2	1B 21H
PF3	PF3	1B 22H
PF4	PF4	1B 23H
PF5	PF5	1B 24H
PF6	PF6	1B 25H
PF7	PF7	1B 26H
PF8	PF8	1B 27H
PF9	PF9	1B 28H
PF10	PF10	1B 29H
PF11	PF11	1B 2AH
PF12	PF12	1B 2BH
PF13	PF13	1B 2CH
PF14	PF14	1B 2DH
PF15	PF15	1B 2EH

3278 Function	Key Sequence	Hex Value Generated
PF16	PF16	1B 2FH
PF17	PF17	1B 30H
PF18	PF18	1B 31H
PF19	PF19	1B 32H
PF20	PF20	1B 33H
PF21	PF21	1B 34H
PF22	PF22	1B 35H
PF23	PF23	1B 36H
PF24	PF24	1B 37H
PA1	PA1	1B 55H
PA2	PA2	1B 57H
PA3	ALT/INSERT SYMBOL	1B 59H
Print	DISPLAY->PRINT SYMBOL	1B 50H
Cursor Select	CURSOR SEL	1B 46H
Attention	ATTENTION	1B 44H
Device Cancel	DEVICE CANCEL	1B 41H
Ident	IDENT	1B 51H
Test	TEST	1B 53H
Fast Fowardspace	ALT→	1B 63H
Fast Backspace	ALT←	1B 61H
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh Screen	ALT/W	17H
Initialize Terminal	ESC }	1B 7DH
Local Copy Form Feed	ESC|	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	ALT/G	07H
View Attribute	ALT/V	16H
Display Status Line	ESC -(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ALT/E	05H

E.56 VP78C Terminal Module—ADDS Viewpoint/78 Color

How to Set Up the Terminal

All operator-selectable options are input from the keyboard into the Set-Up Mode Menus; there are no external switches. To set up the terminal for use with the LinkUp 3174, proceed as follows:

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. Call up the Master Help Menu by depressing the ALT, SHIFT, and BACKTAB keys simultaneously. Enter either the Parameter Menu or the Color Palette Menu by depressing Key #1 or #2, respectively.

Parameter Menu	Set to:	Comments
Main Baud Rate	as desired	0 = 100 1 = 150 2 = 300 3 = 1200 4 = 1800 5 = 2400 6 = 4800 7 = 9600 8 = 19200
Parity Type	as desired	0 = ODD 1 = EVEN 2 = Mark 3 = Space
Parity Check Enable	Y/N	
Case Map Language	as desired	0 = USA/UK/France 1 = Germany/Switzerland 2 = Spain/Portugal 3 = Sweden/Finland
Upper Case Default	as desired	Y/N
Key to Upper Case Only	as desired	Y/N
Key Click Enable	as desired	Y/N
Cursor Blink Enable	as desired	Y/N
Block Cursor	as desired	Y/N
Cursor Display	as desired	Y/N
Screen Saver	as desired	Y/N
Home to Top Left	Y	
Auto Scroll Enable	N	No Auto Scroll
Auto Line Feed Enable	N	No Auto Line Feed
Color Palette Menu		
	Set to:	Comments
@ Palette	G	@ Palette set to Green on Black
A Palette	R	A Palette set to Red on Black
P Palette	C	P Palette set to Cyan on Black
Q Palette	W	Q Palette set to White on Black

NOTE:

The palette colors defined above correspond to the IBM 3278 default colors. Other colors may be defined without adversely affecting the operation of the protocol converter.

Keyboard Emulation

The following is a table showing how the ADDS Viewpoint/78 Color keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the ADDS Viewpoint/78 Color is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.
4. The IBM 3278 keyboard, because it is an EBCDIC terminal, does not provide an ESC key. The ADDS Viewpoint/78 provides as an ESC key the key immediately below the ATTN key at the left side of the keyboard.

3278 Function	Key Sequence	Hex Value Generated
Reset	ALT/R or RESET	12H 1B 40H
Backspace Cursor	← or ←	1B 38H 1B 60H
Down Cursor	↓	1B 5EH
Up Cursor	↑	1B 5CH
Forward Space Cursor	→	1B 62H
Home	HOME SYMBOL	1B 3DH
Tab	→I	1B 3AH
Backtab	I←	1B 3CH
Delete	DELETE CHAR SYMBOL	1B 5AH
New Line	NEW LINE SYMBOL	1B 3EH
Duplicate	DUP	1B 54H
Field Mark	FIELD MARK	1B 56H
Insert Mode	INSERT SYMBOL	1B 58H
Erase to End of Field	ERASE EOF	1B 4EH
Erase Input	ERASE INPUT	1B 4BH
Enter	ENTER	0DH
Clear	ALT/CURSOR SEL	1B 47H
Sys Request	SYS REQ	1B 45H
PF1	PF1	1B 20H
PF2	PF2	1B 21H
PF3	PF3	1B 22H
PF4	PF4	1B 23H
PF5	PF5	1B 24H
PF6	PF6	1B 25H
PF7	PF7	1B 26H
PF8	PF8	1B 27H
PF9	PF9	1B 28H
PF10	PF10	1B 29H
PF11	PF11	1B 2AH
PF12	PF12	1B 2BH
PF13	PF13	1B 2CH
PF14	PF14	1B 2DH
PF15	PF15	1B 2EH
PF16	PF16	1B 2FH
PF17	PF17	1B 30H
PF18	PF18	1B 31H
PF19	PF19	1B 32H
PF20	PF20	1B 33H
PF21	PF21	1B 34H
PF22	PF22	1B 35H
PF23	PF23	1B 36H
PF24	PF24	1B 37H
PA1	PA1	1B 55H
PA2	PA2	1B 57H

3278 Function	Key Sequence	Hex Value Generated
PA3 Print	ALT/INSERT SYMBOL DISPLAY→PRINT SYMBOL	1B 59H 1B 50H
Cursor Select	CURSOR SEL	1B 46H
Attention	ATTENTION	1B 44H
Device Cancel	DEVICE CANCEL	1B 41H
Ident	IDENT	1B 51H
Test	TEST	1B 53H
Fast Forwardspace	ALT →	1B 63H
Fast Backspace	ALT ←	1B 61H

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh Screen	ALT/W	17H
Initialize Terminal	ESC }	1B 7DH
Local Copy Form Feed	ESC|	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	ALT/G	07H
View Attribute	ALT/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ALT/E	05H

E.57 VP2025 Terminal Module—ADDS Viewpoint/2025

How to Set Up the Terminal

To set up the ADDS Viewpoint/2025 terminal with the 319X keyboard for connection to the protocol converter in order to emulate the 3278, proceed as follows.

All operator-selectable options are input from the keyboard into the Setup menus; there are no external switches.

1. Enter the Setup Mode by pressing the “SETUP” key (Shift/Setup). Set the options as follows:

Parameter Menu	Set to:	Comments
<u>Global</u>		
Screen Timeout	Yes	
Fore/Back	as desired	
Scroll	Jump	
44 Row Refresh	60 Hz	
Lines/Sessions	26/1	
Printer Use	as desired	

Parameter Menu	Set to:	Comments
<u>Communication</u>		
Mode	FDS/Line	
Baud Rate	as desired (50-19200)	
Parity	as desired	
Parity Check	as desired	
Data Bits	as desired	
Stop Bits	as desired	
X-ON/X-OFF	as desired	
Pace	00	
Terminator	US/CR	
XPC	Off	
<u>AUX</u>		
Mode	FDX/Line	
Baud Rate	as desired	
Parity	as desired	
Parity Check	as desired	
Stop Bits	as desired	
X-ON/X-OFF	as desired	
Auto Echo	No	
Pace	as required	
Terminator	US/CR	
<u>Keyboard1</u>		
Case Select	as desired	
Space Char	Destructive	
Keyclick	as desired	
Keyboard	U.S.	
Enhanced Keys	Separate	
<u>Screen1</u>		
Auto Wrap	No	
Auto Scroll	No	
Margin Bell	No	
Column Change	Save Screen	
Columns	80	132-Column is also supported
Cursor Home	Upper Left	
<u>Visual1</u>		
Cursor	as desired	
Cursor Blink	as desired	
Protect	not applicable	
Alt Prot	not applicable	
Status LLine	On	

Model 1

Terminal	3270
Mode	Enhanced
Prgm keys/Tab	Terminal Dependent
Keyboard Type	319X

NOTES:

1. Although the parallel printer connector to the ADDS 2025 terminal resembles that of the PC, it does NOT have the same pinouts. Use of a PC-to-Printer cable may cause the terminal to behave erratically. Refer to your ADDS 2025 manual for information on the proper cable to use.
2. When using a serial auxiliary printer with the ADDS Viewpoint/2025, X-ON/X-OFF is not a reliable method of flow control. The terminal starts sending data to the printer after approximately 2 seconds whether it has received XON or not.

Keyboard Emulation

The following is a table showing how the ADDS Viewpoint/2025 keyboard is used in emulation of the 3278-2 keyboard.

NOTES:

1. Press the ALT key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The auxiliary port on the ADDS Viewpoint/2025 is utilized by the LinkUp 3174 for its "Auxiliary Printer" feature.

3278 Function	Key Sequence	Hex Value Generated
Reset	RESET	1B 3EH
Backspace Cursor	←	1B 64H
Down Cursor	↓	1B 66H
Up Cursor	↑	1B 62H
Forward Space Cursor	→	1B 68H
Home	HOME	1B 56H
Tab	TAB	1B 3AH
Backtab	ALT/TAB	1B 3BH
Delete	DELETE CHAR	1B 5CH
New Line	NEW LINE	1B 3CH
Duplicate	DUP	1B 6CH
Field Mark	FIELD MARK	1B 6EH
Insert Mode	INSERT	1B 54H
Erase to End of Field	ERASE EOF	1B 5EH
Erase Input	ERASE INPUT	1B 5FH
Enter	ENTER	0DH
Clear	CLEAR	1B 52H
Sys Request	SYS REQ	1B 4FH
PF1	PF1	1B 20H
PF2	PF2	1B 21H
PF3	PF3	1B 22H
PF4	PF4	1B 23H
PF5	PF5	1B 24H
PF6	PF6	1B 25H

3278 Function	Key Sequence	Hex Value Generated
PF7	PF7	1B 26H
PF8	PF8	1B 27H
PF9	PF9	1B 28H
PF10	PF10	1B 29H
PF11	PF11	1B 2AH
PF12	PF12	1B 2BH
PF13	PF13	1B 2CH
PF14	PF14	1B 2DH
PF15	PF15	1B 2EH
PF16	PF16	1B 2FH
PF17	PF17	1B 20H
PF18	PF18	1B 31H
PF19	PF19	1B 32H
PF20	PF20	1B 33H
PF21	PF21	1B 34H
PF22	PF22	1B 35H
PF23	PF23	1B 36H
PF24	PF24	1B 37H
PA1	PA1	1B 58H
PA2	PA2	1B 60H
PA3	PA3	1B 50H
Print	PRINT	1B 4EH
Cursor Select	CURSOR SEL	1B 48H
Attention	ATTN	1B 42H
Device Cancel	ALT/RESET	1B 3FH
Ident	IDENT	1B 6AH
Test	TEST	1B 71H
Fast Fowardspace	ALT →	1B 69H
Fast Backspace	ALT ←	1B 65H
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ALT/N	0EH
Refresh Screen	ALT/Z	17H
Initialize Terminal	ESC {	1B 7BH
Local Copy Form Feed	ESC|	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	ALT/G	07H
View Attribute	ALT/V	16H
Display Status Line	ALT/_(underline)	1FH
Toggle Session	ESC }	1B 7DH
Toggle Echoplex	ALT/E	05H

E.58 VT52 Terminal Module—DEC VT52

How to Set Up the Terminal

Information on the DEC VT52 terminal switch settings was not available at the time of publication. Please refer to the VT52 User's Manual and the "General Notes on Terminal Switch Settings" section of the Introduction to this document for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the DEC VT52 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press Control key concurrently with the indicated alpha key.
2. Press ESC key prior to pressing the indicated alpha key.
3. NK indicates that the indicated key is found in the Numeric Keypad at the lower right of the keyboard (LinkUp sets the keypad to "Alternate keypad" mode). For VT52 terminals having no numeric keypad, a terminal driver (terminal ID = VT52X) is provided.
4. The last character on the screen (the line 24, column 80 character position) cannot be displayed. This feature is designed to defeat the DEC Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	NK 0	1B 3F 70H
Tab	TAB	09H
Backtab	BACKSPACE	08H
Delete	DELETE	7FH
New Line	LINE FEED	0AH
Duplicate	NK 6	1B 3F 76H
Field Mark	NK , or CTRL/F	1B 3F 6CH 06H
Insert Mode	NK .	1B 3F 6EH
Erase to End of Field	NK 4	1B 3F 74H
Erase Input	NK 7	1B 3F 77H
Enter	RETURN or ENTER	0DH 1B 3F 4DH
Clear	NK - or CTRL/Z	1B 3F 6DH 1AH
Sys Request	NK 9	1B 3F 79H
PF1	ESC 1 or PF1	1B 31H 1B 50H
PF2	ESC 2 or PF2	1B 32H 1B 51H

3278 Function	Key Sequence	Hex Value Generated
PF3	ESC 3 or PF3	1B 33H 1B 52H
PF4	ESC 4 or PF4	1B 34H 1B 53H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC ! or ESC -	1B 21H 1B 2DH
PF12	ESC @ or ESC =	1B 40H 1B 3DH
PF13	ESC #	1B 23H
PF14	ESC \$	1B 24H
PF15	ESC %	1B 25H
PF16	ESC ^	1B 5EH
PF17	ESC &	1B 26H
PF18	ESC *	1B 2AH
PF19	ESC (	1B 28H
PF20	ESC)	1B 29H
PF21	ESC ESC 1	1B 1B 31H
PF22	ESC ESC 2	1B 1B 32H
PF23	ESC ESC 3	1B 1B 33H
PF24	ESC ESC 4	1B 1B 34H
PA1	NK 1	1B 3F 71H
PA2	NK 2	1B 3F 72H
PA3	NK 3	1B 3F 73H
Print	NK 8	1B 3F 78H
Cursor Select	NK 5	1B 3F 75H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.59 VT52X Terminal Module—DEC VT52 without Numeric Keypad

How to Set Up the Terminal

Information on the DEC VT52 terminal switch settings was not available at the time of publication. Please refer to the VT52 User's Manual and the "General Notes on Terminal Switch Settings" section of the Introduction to this document for the proper settings, or contact Black Box.

Keyboard Emulation

The following is a table showing how the DEC VT52 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the DEC Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 44H
Down Cursor	↓	1B 42H
Up Cursor	↑	1B 41H
Forward Space Cursor	→	1B 43H
Home	CTRL/^	1EH
Tab	TAB	09H
Backtab	BACKSPACE	08H
Delete	DELETE	7FH
New Line	LINE FEED	0AH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	CTRL/U	15H
Erase to End of Field	CTRL/E	05H
Erase Input	CTRL/X	18H
Enter	RETURN	0DH
Clear	CTRL/Z	1AH
Sys Request	ESC ?	1B 3FH
PF1	ESC 1	1B 31H
	or PF1	1B 50H
PF2	ESC 2	1B 32H
	or PF2	1B 51H
PF3	ESC 3	1B 33H
	or PF3	1B 52H
PF4	ESC 4	1B 34H
	or PF4	1B 53H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H

3278 Function	Key Sequence	Hex Value Generated
PF10	ESC 0	1B 30H
PF11	ESC ! or ESC -	1B 21H 1B 2DH
PF12	ESC @ or ESC =	1B 40H 1B 3DH
PF13	ESC #	1B 23H
PF14	ESC \$	1B 24H
PF15	ESC %	1B 25H
PF16	ESC ^	1B 5EH
PF17	ESC &	1B 26H
PF18	ESC *	1B 2AH
PF19	ESC (	1B 28H
PF20	ESC)	1B 29H
PF21	ESC ESC 1	1B 1B 31H
PF22	ESC ESC 2	1B 1B 32H
PF23	ESC ESC 3	1B 1B 33H
PF24	ESC ESC 4	1B 1B 34H
PA1	ESC Z	1B 3F 71H
PA2	ESC X	1B 3F 72H
PA3	ESC C	1B 3F 73H
Print	CTRL/P	1B 3F 78H
Cursor Select	CTRL/C	1B 3F 75H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form		
Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.60 VT100 Terminal Module—DEC VT100

How to Set Up the Terminal

To set up the DEC VT100™ terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. Turn on the Power Switch and enable the Software option switches using the keyboard (SETUP B procedure). SETUP B mode may only be entered from SETUP A mode by pressing the SETUP key, then the "5" key of the main keyboard. This mode contains a series of software keys that tailor the terminal to the operating environment of the user. The following values are recommended for the interfaces with the LinkUp 3174.

BYTE 1 SWITCHES

(Bit def. from
left to right)

	Set to:	Comments
1 (SCROLL)	as desired	Jump or Smooth Scroll
2 (AUTO REPEAT)	1	Set auto repeat function enabled
3 (SCREEN)	as desired	0 = Dark background 1 = Light background
4 (CURSOR)	as desired	0 = Underline cursor 1 = Block cursor

BYTE 2 SWITCHES

(Bit def. from
left to right)

	Set to:	Comments
1 (MARGIN BELL)	-	Enable this option, if desired (OFF = 0, ON = 1)
2 (KEYCLICK)	-	Enable this option, if desired (OFF = 0, ON = 1)\
3 (ANSI/VT52)	1	Disable VT52 compatible mode, Enable ANSI compatible mode
4 (AUTO XON/XOFF)	as desired	Set to match logical flow-control selection configured for LinkUp port

BYTE 3 SWITCHES

(Bit def. from
left to right)

	Set to:	Comments
1 (# SWITCH)	0	Set to # character
2 (WRAP AROUND)	0	Disable the automatic wraparound feature
3 (NEW LINE)	0	Disable the New Line function
4 (INTERFACE)	0	Should disable unless Interface option is installed

BYTE 4 SWITCHES
(Bit def. from left to right)

	Set to:	Comments
1 (PARITY SENSE)	-	This switch is only appropriate if Bit 2 (PARITY) is set. If so, ODD PARITY = 0 and EVEN PARITY = 1.
2 (PARITY)	-	Set as desired (OFF = 0, ON = 1). If ON = 1 is set, then the PARITY SENSE switch (Bit 1) must also be set to ODD or EVEN parity.
3 (BITS PER CHAR)	as desired	Set to match number of bits selected in the LinkUp 3174 configuration
4 (POWER)	as desired	0 = 60Hz 1 = 50Hz

The SETUP B mode screen gives the facility for setting the appropriate terminal baud rate. Available baud rates are: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600 and 19.2 Kbps. Both the transmit baud rate (T SPEED) and receive baud rate (R SPEED) must be set to the same value. The baud rate specified here must match the baud rate for the port to which this terminal is connected. For all baud rates lower than 150 bps (i.e. 50, 75, 110, 134.5), the number of Stop bits must be 2.

Keyboard Emulation

The following is a table showing how the DEC VT100 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. NK denotes that the indicated key is found in the numeric keypad at the lower right of the keyboard (the LinkUp sets the keypad to "Alternate keypad" mode). For VT100 terminals (and all look-alike terminals which comply with ANSI Standard 3.64) having no numeric keypad, a terminal driver (Terminal ID = ANSI) is provided.

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←←	1B 5B 44H
Down Cursor	↓	1B 5B 42H
Up Cursor	↑	1B 5B 41H
Forward Space Cursor	→	1B 5B 43H
Home	NK 0	1B 4F 70H
Tab	TAB	09H
Backtab	BACKSPACE	08H
Delete	DELETE	7FH
New Line	LINE FEED	0AH
Duplicate	NK 6	1B 4F 76H
Field Mark	NK ,	1B 4F 6CH
Insert Mode	NK .	1B 4F 6EH

LINKUP 3174

Erase to End of Field	NK 4	1B 4F 74H
Erase Input	NK 7	1B 4F 77H
Enter	RETURN or ENTER	0DH 1B 4F 4DH
Clear	NK -	1B 4F 6DH
Sys Request	NK 9	1B 4F 79H
PF1	PF1 or ESC 1	1B 4F 50H 1B 31H
PF2	PF2 or ESC 2	1B 4F 51H 1B 32H
PF3	PF3 or ESC 3	1B 4F 52H 1B 33H
PF4	PF4 or ESC 4	1B 4F 53H 1B 34H
PF5	ESC 5	1B 35H
PF6	ESC 6	1B 36H
PF7	ESC 7	1B 37H
PF8	ESC 8	1B 38H
PF9	ESC 9	1B 39H
PF10	ESC 0	1B 30H
PF11	ESC ! or ESC -	1B 21H 1B 2DH
PF12	ESC @ or ESC =	1B 40H 1B 3DH
PF13	ESC #	1B 23H
PF14	ESC \$	1B 24H
PF15	ESC %	1B 25H
PF16	ESC ^	1B 5EH
PF17	ESC &	1B 26H
PF18	ESC *	1B 2AH
PF19	ESC (	1B 28H
PF20	ESC)	1B 29H
PF21	ESC ESC 1	1B 1B 31H
PF22	ESC ESC 2	1B 1B 32H
PF23	ESC ESC 3	1B 1B 33H
PF24	ESC ESC 4	1B 1B 34H
PA1	NK 1	1B 3F 71H
PA2	NK 2	1B 3F 72H
PA3	NK 3	1B 3F 73H
Print	NK 8	1B 3F 78H
Cursor Select	NK 5	1B 3F 75H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form		
Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.61 VT102 Terminal Module—DEC VT102

How to Set Up the Terminal

To set up the DEC VT102™ terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Connect the terminal to the converter port (modem or direct cable) as appropriate.
2. Turn on the Power Switch and enable the Software option switches using the keyboard (SETUP B procedure). SETUP B mode may only be entered from SETUP A mode by pressing the SETUP key, then "5" key of the main keyboard. This mode contains a series of software keys that tailor the terminal to the operating environment of the user. The following values are recommended for the interface with the LinkUp 3174.

BYTE 1 SWITCHES (Bit def. from left to right)

	Set to:	Comments
1 (SCROLL)	as desired	Jump or Smooth Scroll
2 (AUTO REPEAT)	1	Set auto repeat function enabled
3 (SCREEN)	as desired	0 = Dark background 1 = Light background
4 (CURSOR)	as desired	0 = Underline cursor 1 = Block cursor

BYTE 2 SWITCHES (Bit def. from left to right)

	Set to:	Comments
1 (MARGIN BELL)	-	Enable this option, if desired (OFF = 0, ON = 1)
2 (KEYCLICK)	-	Enable this option, if desired (OFF = 0, ON = 1)
3 (ANSI/VT52)	1	Disable VT-52 compatible mode, Enable ANSI compatible mode
4 (AUTO XON/XOFF)	as desired	Set to match logical flow control selection configured for LinkUp port

BYTE 3 SWITCHES

(Bit def. from left to right)

	Set to:	Comments
1 (# SWITCH)	0	Set to # character
2 (WRAP AROUND)	0	Disable the automatic wrap-around feature
3 (NEW LINE)	0	Disable the New Line function
4 (INTERFACE)	0	Should disable unless Interface option is installed

BYTE 4 SWITCHES

(Bit def. from left to right)

	Set to:	Comments
1 (PARITY SENSE)	-	This switch is only appropriate if Bit 2 (PARITY) is set. If so, ODD PARITY = 0 and EVEN PARITY = 1.
2 (PARITY)	-	Set as desired (OFF = 0, ON = 1). If ON = 1 is set, then the PARITY SENSE switch (Bit 1) must also be set to ODD or EVEN parity.
3 (BITS PER CHAR)	as desired	Set to match number of bits selected in the LinkUp 3174 configuration
4 (POWER)	as desired	0 = 60Hz 1 = 50Hz

The SETUP B mode screen gives the facility for setting the appropriate terminal baud rate. Available baud rates are: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 200, 2400, 3600, 4800, 9600 and 19.2 Kbps. Both the transmit baud rate (T SPEED) and receive baud rate (R SPEED) must be set to the same value. The baud rate specified here must match the baud rate for the port to which this terminal is connected. For all baud rates lower than 150 bps (i.e. 50, 75, 110, 134.5), the number of Stop bits must be 2.

Keyboard Emulation

The following is a table showing how the DEC VT102 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. NK denotes that the indicated key is found in the numeric keypad at the lower right of the keyboard (the LinkUp 3174 sets the keypad to "Alternate keypad" mode).
4. The auxiliary port on the DEC VT102 is utilized by the LinkUp for its "Auxiliary Printer" feature.

3278 Function

Key Sequence

Hex Value Generated

Reset	CTRL/R	12H
Backspace Cursor	←	1B 5B 44H
Down Cursor	↓	1B 5B 42H
Up Cursor	↑	1B 5B 41H
Forward Space Cursor	→	1B 5B 43H
Home	NK 0	1B 4F 70H
Tab	TAB	09H
Backtab	BACKSPACE	08H
Delete	DELETE	7FH
New Line	LINE FEED	0AH
Duplicate	NK 6	1B 4F 76H
Field Mark	NK ,	1B 4F 6CH
Insert Mode	NK .	1B 4F 6EH
Erase to End of Field	NK 4	1B 4F 74H
Erase Input	NK 7	1B 4F 77H
Enter	RETURN or ENTER	0DH 1B 4F 4DH
Clear	NK -	1B 4F 6DH
Sys Request	NK 9	1B 4F 79H
PF1	PF1 or ESC 1	1B 4F 50H 1B 31H
PF2	PF2 or ESC 2	1B 4F 51H 1B 32H
PF3	PF3 or ESC 3	1B 4F 52H 1B 33H
PF5	PF4 or ESC 4	1B 4F 53H 1B 34H
PF6	ESC 5	1B 35H
PF7	ESC 6	1B 36H
PF8	ESC 7	1B 37H
PF9	ESC 8	1B 38H
PF10	ESC 9	1B 39H
PF11	ESC 0	1B 30H
PF12	ESC ! or ESC- ESC @ or ESC =	1B 21H 1B 2DH 1B 40H 1B 3DH
PF13	ESC #	1B 23H
PF14	ESC \$	1B 24H
PF15	ESC %	1B 25H
PF16	ESC ^	1B 5EH
PF17	ESC &	1B 26H
PF18	ESC *	1B 2AH
PF19	ESC (	1B 28H
PF20	ESC)	1B 29H
PF21	ESC ESC 1	1B 1B 31H
PF22	ESC ESC 2	1B 1B 32H
PF23	ESC ESC 3	1B 1B 33H
PF24	ESC ESC 4	1B 1B 34H
3278 Function	Key Sequence	Hex Value Generated

PA1	NK 1	1B 3F 71H
PA2	NK 2	1B 3F 72H
PA3	NK 3	1B 3F 73H
Print	NK 8	1B 3F 78H
Cursor Select	NK 5	1B 3F 75H
Attention	ESC \	1B 5CH
Device Cancel	ESC]	1B 5DH
Indent	ESC :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC {	1B 7BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC _(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.62 VT220 Terminal Module—DEC VT220

How to Set Up the Terminal

To set up the VT220™ terminal, proceed as follows.

1. Press F3 (SETUP) to enter the SETUP mode.
2. Use the Arrow keys to enter the Comm Setup mode.
3. Use the Arrow keys and the ENTER key to select the desired Baud Rate, 8 data bits, no parity, and 1 stop bit. If the selected Baud Rate is 110 or less, use 2 stop bits.
4. If an Auxiliary Printer will be used with the terminal, use the Arrow keys to get back to the main directory and enter the printer Setup Mode, and repeat step 3 for the printer.
5. Use the Arrow key to get back to the main menu, then go to General Setup. The following three (3) parameters must be set:
 - VT200, 7-bit control
 - NO New Line
 - User-Defined unlocked
6. Use the Arrow keys once more to get back to the main directory.
7. Press the Right Arrow key to select SAVE.
8. Press F3 (SETUP) to exit Setup mode.

Keyboard Emulation

The following is a table showing how the DEC VT220 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control key concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. NK denotes that the indicated key is found in the numeric keypad at the lower right of the keyboard (LinkUp 3174 sets the keypad to "Alternate keypad" mode).

3278 Function	Key Sequence	Hex Value Generated
Reset	CTRL/R	12H
Backspace Cursor	←	1B 5B 44H
Down Cursor	↓	1B 5B 42H
Up Cursor	↑	1B 5B 41H
Forward Space Cursor	→	1B 5B 43H
Home	NK 0	1B 4F 70H
Tab	TAB	09H
Backtab	CTRL/H	08H
Delete	DELETE	7FH
New Line	LINE FEED	0AH
Duplicate	NK 6	1B 4F 76H
Field Mark	NK ,	1B 4F 6CH
Insert Mode	NK .	1B 4F 6EH
Erase to End of Field	NK 4	1B 4F 74H
Erase Input	NK 7	1B 4F 77H
Enter	RETURN or ENTER	0DH 1B 4F 4DH
Clear	NK -	1B 4F 6DH
Sys Request	NK 9	1B 4F 79H
PF1	PF1 or CTRL/3 1	1B 4F 50H 1B 31H
PF2	PF2 or CTRL/3 2	1B 4F 51H 1B 32H
PF3	PF3 or CTRL/33	1B 4F 52H 1B 33H
PF4	PF4 or CTRL/3 4	1B 4F 53H 1B 34H
PF5	CTRL/3 5	1B 35H
PF6	F6	1B 36H
PF7	F7	1B 37H
PF8	F8	1B 38H
PF9	F9	1B 39H
PF10	F10	1B 30H
PF11	F11 or CTRL/3 -	1B 21H 1B 2DH
PF12	F12 or CTRL/3 =	1B 40H 1B 3DH

3278 Function	Key Sequence	Hex Value Generated
PF13	F13	1B 23H
PF14	F14	1B 24H
PF15	F15	1B 25H
PF16	F16	1B 5EH
PF17	F17	1B 26H
PF18	F18	1B 2AH
PF19	F19	1B 28H
PF20	F20	1B 29H
PF21	CTRL/3 CTRL/3 1	1B 1B 31H
PF22	CTRL/3 CTRL/3 2	1B 1B 32H
PF23	CTRL/3 CTRL/3 3	1B 1B 33H
PF24	CTRL/3 CTRL/3 4	1B 1B 34H
PA1	NK 1	1B 3F 71H
PA2	NK 2	1B 3F 72H
PA3	NK 3	1B 3F 73H
Print	NK 8	1B 3F 78H
Cursor Select	NK 5	1B 3F 75H
Attention	CTRL/3 \	1B 5CH
Device Cancel	CTRL/3]	1B 5DH
Indent	CTRL/3 :	1B 3AH
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	CTRL/3 {	1B 7BH
Refresh Screen	CTRL/W	17H
Initialize Terminal	CTRL/3	1B 3CH
Local Copy Form		
Feed	CTRL/3 |	1B 7CH
Request Disconnect	CTRL/3 ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	CTRL/3 _(underline)	1B 5FH
Toggle Session	CTRL/3	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.63 WY50P Terminal Module—Wyse WY-50P

How to Set Up the Terminal

To set up the Wyse WY-60 terminal in Wyse WY-50 PLUS emulation mode for connection to the protocol converter in order to emulate the 3278, proceed as follows.

1. Press CNTRL and SETUP simultaneously to enter the SETUP mode.
2. Press F4 to enter the Modem Setup mode.
3. Use the ARROW keys and the Space Bar to select the desired Baud Rate, 8 data bits, no parity, and 1 stop bit. If the selected Baud Rate is 110 or less, use 2 stop bits.

- 4.If an Auxiliary Printer will be used with the terminal, press F5 to enter Aux. Setup Mode, and repeat step 3 for the printer.
- 5.Press F10 to return to the main Setup menu.
- 6.Press the Right Arrow key to select SAVE MODES.
- 7 Press F10 to exit the Setup mode.

Keyboard Emulation

The following is a table showing how the Wyse WY-60 with an IBM RT/316X-style keyboard is used in emulation of the 3278 keyboard.

NOTES:

- 1.Press the Control and Shift keys concurrently with the indicated alpha key.
- 2.Press the ESC key prior to pressing the indicated alpha key.
- 3.The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the WYSE WY-50 + Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	BACKSPACE	12H
Backspace Cursor	←	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB→	09H
Backtab	←TAB	1B 49H
Delete	DELETE	1B 57H
New Line	RETURN	1FH
Duplicate	CTRL/D	04H
Field Mark	CTRL/F	06H
Insert Mode	INSERT	1B 71H
Erase to End of Field	ERASE EOF	1B 54H
Erase Input	DEL LN	1B 52H
Enter	SEND or ENTER	0DH
Clear	CLEAR or ErEOP	1B 59H
Sys Request	SHIFT/F16	01 6F 0DH
PF1	F1	01 40 0DH
PF2	F2	01 41 0DH
PF3	F3	01 42 0DH
PF4	F4	01 43 0DH
PF5	F5	01 44 0DH
PF6	F6	01 45 0DH
PF7	F7	01 46 0DH
PF8	F8	01 47 0DH
PF9	F9	01 48 0DH
PF10	F10	01 49 0DH
PF11	F11	01 4A 0DH
PF12	F12	01 4B 0DH
PF13	SHIFT/F1	01 60 0DH

3278 Function	Key Sequence	Hex Value Generated
PF14	SHIFT/F2	01 61 0DH
PF15	SHIFT/F3	01 62 0DH
PF16	SHIFT/F4	01 63 0DH
PF17	SHIFT/F5	01 64 0DH
PF18	SHIFT/F6	01 65 0DH
PF19	SHIFT/F7	01 66 0DH
PF20	SHIFT/F8	01 67 0DH
PF21	SHIFT/F9	01 68 0DH
PF22	SHIFT/F10	01 69 0DH
PF23	SHIFT/F11	01 6A 0DH
PF24	SHIFT/F12	01 6B 0DH
PA1	F13	01 4C 0DH
PA2	F14	01 4D 0DH
PA3	F15	01 4E 0DH
Print	PRINT	1B 50H
Cursor Select	CTRL/C	03H
Attention	F16	01 4F 0DH
Device Cancel	CTRL/X	18H
Indent	CTRL/I	09H
Test	CTRL/N	0EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.
Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC w	1B 77H
Refresh Screen	CTRL/W	17
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.64 Y100 Terminal Module—Wyse WY-100

How to Set Up the Terminal

To set up the Wyse WY-100 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows.

1. Disconnect the AC power cord from the outlet before setting the option switches.
2. There are three (3) banks of toggle-type switches, each with eight (8) switches located on the keyboard. These switches should be set to the following values:

SW1	Set to:	Comments
1	ON	Edit keys are set up as duplex keys (host-controllable)
2	OFF	End of Line = US
3	ON	End of Transmission = CR
4	ON	Disable auto-new-line
5-8	see below	Sets the Printer Port baud rate

SW2	Set to:	Comments
1	ON	8-bit data
2	as desired	ON = Even parity OFF = Odd parity
3	OFF	1 stop bit. If a baud rate of 110 or less is selected, set to ON = 2 stop bits.
4	OFF	Parity disabled
5-8	see below	Sets the modem port baud rate

Baud Rate	5	6	7	8
9600	OFF	OFF	OFF	ON
7200	OFF	OFF	ON	OFF
4800	OFF	OFF	ON	ON
3600	OFF	ON	OFF	OFF
2400	OFF	ON	OFF	ON
2000	OFF	ON	ON	OFF
1800	OFF	ON	ON	ON
1200	ON	OFF	OFF	OFF
600	ON	OFF	OFF	ON
300	ON	OFF	ON	OFF
150	ON	OFF	ON	ON
134.5	ON	ON	OFF	OFF
110	ON	ON	OFF	ON
75	ON	ON	ON	OFF
50	ON	ON	ON	ON

SW3	Set to:	Comments
1	OFF	1 page (1920 character) memory
2	as required	OFF = 60Hz power source ON = 50Hz power source
3 and 4	OFF	Normal Display mode
5	as desired	OFF = Black screen ON = White screen
6	as desired	OFF = Blinking cursor ON = Non-blinking cursor
7	OFF	Full Duplex
8	OFF	Conversation Mode

3. Reconnect the AC power cord and connect the terminal to the converter port (or modem, etc.), as appropriate.

Keyboard Emulation

The following is a table showing how the Wyse WY-100 keyboard is used in emulation of the 3278 keyboard.

NOTES:

1. Press the Control and Shift keys concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.
3. The last character on the screen (the line-24, column-80 character position) cannot be displayed. This feature is designed to defeat the Wyse WY-100 Auto-Scroll capability.

3278 Function	Key Sequence	Hex Value Generated
Reset	SEND PAGE	1B 35H
Backspace Cursor	← or BACKSPACE	08H
Down Cursor	↓ or LINEFEED	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	SHIFT/TAB	1B 49H
Delete	RUBOUT	7FH
New Line	NEW LINE	1FH
Duplicate	DEL/INS CHAR	1B 51H
Field Mark	SOM/EOM	1B 39H
Insert Mode	LINE INSERT	1B 45H
Erase to End of Field	LINE DELETE	1B 52H
Erase Input	LINE ERASE	1B 54H
Enter	RETURN or ENTER	0DH
Clear	PAGE ERASE	1B 59H
Sys Request	SEND MSG	1B 53H
PF1	F1	02 30H
PF2	F2	02 31H
PF3	F3	02 32H
PF4	F4	02 33H
PF5	F5	02 34H
PF6	F6	02 35H
PF7	F7	02 36H
PF8	F8	02 37H
PF9	SHIFT/F1	02 38H
PF10	SHIFT/F2	02 39H
PF11	SHIFT/F3	02 3AH
PF12	SHIFT/F4	02 3BH
PF13	SHIFT/F5	02 3CH
PF14	SHIFT/F6	02 3DH
PF15	SHIFT/F7	02 3EH
PF16	SHIFT/F8	02 3FH
PF17	ESC F1	1B 02 30H
PF18	ESC F2	1B 02 31H
PF19	ESC F3	1B 02 32H
PF20	ESC F4	1B 02 33H
PF21	ESC F5	1B 02 34H

3278 Function	Key Sequence	Hex Value Generated
PF22	ESC F6	1B 02 35H
PF23	ESC F7	1B 02 36H
PF24	ESC F8	1B 02 37H
PA1	SCRN EDIT	1B 4EH
PA2	SET TAB	1B 31H
PA3	PAGE	1B 68H
Print	PRINT	1B 40H
Cursor Select	SEND LINE	1B 34H
Attention	ESC \	1B 5CH
Device Cancel	SHIFT/PRINT	1B 50H
Indent	ESC :	1B 3AH
Test	CTRL/N	1B 4EH
Fast Forwardspace	SCRL DOWN	1B 76H
Fast Backspace	INS/REP	1B 72H

Special Function	Key Sequence	Hex Value Generated
Numeric Override	SCRL UP	1B 77H
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH

E.65 WY350 Terminal Module - Wyse WY-350

How to Set Up the Terminal

To set up the Wyse WY-350 terminal for connection to the protocol converter in order to emulate the 3278, proceed as follows:

1. Press SHIFT and SETUP simultaneously to enter SETUP mode.
2. Set the options as follows:

Parameter	Set to:	Comments
HANDSHAKE	as desired	X-ON/X-OFF is preferred
SCREEN	80	132 is not supported
CURSOR	as desired	
BLINK?	as desired	
MODE	FDX	Full Duplex Communications
DATA BIT	as desired	
STOP BIT	as desired	
PARITY BIT	as desired	
MODEM PORT BAUD RATE	50-19200	
BLK END	US/CR	
AUTO NL	OFF	
CR	CR	

Parameter	Set to:	Comments
AUTO SCRL	OFF	
AUX BAUD R	as desired	
SCRL	as desired	Not used by the LinkUp 3174
S.SAVER	as desired	
PROT	as desired	Not used by the LinkUp 3174
RET/ENTER	CR/CR	
COMPAT MODE	WY50	
ENHANCE	ON	
STATUS	ON	
TEST	OFF	

Keyboard Emulation

The following is a table showing how the Wyse WY-350 is used in emulation of the 3278 terminal.

NOTES:

1. Press the Control and Shift keys concurrently with the indicated alpha key.
2. Press the ESC key prior to pressing the indicated alpha key.

3278 Function	Key Sequence	Hex Value Generated
Reset	PAGE NEXT	1B 4BH
Backspace Cursor	←←	08H
Down Cursor	↓	0AH
Up Cursor	↑	0BH
Forward Space Cursor	→	0CH
Home	HOME	1EH
Tab	TAB	09H
Backtab	SHIFT/TAB	1B 49H
Delete	DEL	7FH
New Line	INS CHAR	1B 51H
Duplicate	F16	01 4F 0DH
Field Mark	SHIFT/F16	01 6F 0DH
Insert Mode	REPL	1B 72H
Erase to End of Field	CLR LINE	1B 54H
Erase Input	n.a.	n.a.
Enter	RETURN or ENTER	0DH
Clear	CLR SCRN	1B 59H
Sys Request	F14	01 4D 0DH
PF1	F1	01 40 0DH
PF2	F2	01 41 0DH
PF3	F3	01 42 0DH
PF4	F4	01 43 0DH
PF5	F5	01 44 0DH
PF6	F6	01 45 0DH
PF7	F7	01 46 0DH
PF8	F8	01 47 0DH
PF9	F9	01 48 0DH
PF10	F10	01 49 0DH
PF11	F11	01 4A 0DH
PF12	F12	01 4B 0DH

3278 Function	Key Sequence	Hex Value Generated
PF13	SHIFT/F1	01 60 0DH
PF14	SHIFT/F2	01 61 0DH
PF15	SHIFT/F3	01 62 0DH
PF16	SHIFT/F4	01 63 0DH
PF17	SHIFT/F5	01 64 0DH
PF18	SHIFT/F6	01 65 0DH
PF19	SHIFT/F7	01 66 0DH
PF20	SHIFT/F8	01 67 0DH
PF21	SHIFT/F9	01 68 0DH
PF22	SHIFT/F10	01 69 0DH
PF23	SHIFT/F11	01 6A 0DH
PF24	SHIFT/F12	01 6B 0DH
PA1	F13	01 4C 0DH
PA2	SHIFT/F13	01 6C 0DH
PA3	n.a.	n.a.
Print	PRINT	1B 50H
Cursor Select	CTRL/C	03H
Attention	SHIFT/F14	01 6D 0DH
Device Cancel	INS	1B 71H
Indent	SEND	1B 37H
Test	ESC N	1B 4EH
Fast Forwardspace	n. a.	n. a.
Fast Backspace	n. a.	n. a.

Special Function	Key Sequence	Hex Value Generated
Numeric Override	ESC w	1B 77H
Refresh Screen	CTRL/W	17H
Initialize Terminal	ESC <	1B 3CH
Local Copy Form Feed	ESC |	1B 7CH
Request Disconnect	ESC ~	1B 7EH
Generate Attribute	CTRL/G	07H
View Attributes	CTRL/V	16H
Display Status Line	ESC_(underline)	1B 5FH
Toggle Session	ESC >	1B 3EH
Toggle Echoplex	ESC ;	1B 3BH



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