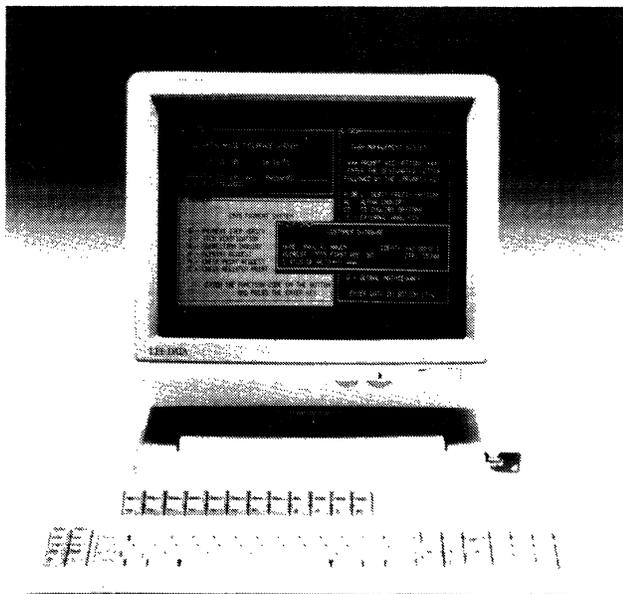


# Lee Data Series 300 and Series 400 Display Systems



*Lee Data's Model 1222 Open Window Display provides users with a choice of four screen capacities, plus windowing capabilities. Up to four windows can be displayed on the screen simultaneously, in any combination of 3270 mode and/or Async mode sessions.*

## MANAGEMENT SUMMARY

**UPDATE:** Lee Data has introduced a number of new products since the last version of this report. These include the Model 307 controller; Models 313 and 413 tri-host controllers; Models 314 and 414 quad-host controllers; Model 1222 Open Window Display; Model 2131 Color Open Window Display; Series 610 Associate Processor; Model 1310 Color Graphics Printer; Model 1317 Station Printer; Models 1361 (monochrome) and 1362 (color) printers; and the QuickLink Adapter. The company has also withdrawn from marketing a number of products, including the Models 1214A, 1214B, 1214D, 1216, 1218, 1220, 1221, 1230, and 1231 displays; Series 700 Personal Workstation; Series 25 voice/data workstation; and Models 1316, 1350, 1360, and 1370 printers.

Since its formation in 1979, Lee Data has risen to become a major contender in the IBM 3270-compatible market. Its first product offering, the Series 300 Display System, was introduced later that year; a second line, the Series 400, was unveiled in 1982. With these introductions, which have been followed by a steady stream of new products and enhancements, Lee Data has emerged as one of the most innovative companies in this market. It was the first of the independent vendors to add personal computing capabili-

Lee Data's Series 300 and Series 400 are IBM 3270-compatible terminal systems. The Series 300 provides components which are compatible with the IBM 3274 controllers and 3178/3180 displays. The Series 400 combines IBM 3270 compatibility with asynchronous operation. Significant features of both systems include dual-, tri-, and quad-host capability, monochrome and color displays, windowing displays, IBM 3270-PC emulation, a coax eliminator feature, and a twisted-pair wire adapter. Another new product provides Series 400 users with multiuser local processing capabilities.

**MODELS:** Series 300 Controllers (Models 307, 308, 310, 311, 313, 314, 320, and 321); Series 400 Controllers (Models 408, 410, 411, 413, 414, 420, and 421); Series 610 Associate Processor; Model 1214 Display Station; Model 1222 Open Window Display; Model 2131 Open Window Color Display Station; Series 70 Personal Workstation; Model 1310 Color Graphics Printer; Model 1317 Station Printer; Model 1361 Universal Printer; Model 1362 Universal Color Printer; 1380 Line Printer.

**DISPLAY:** Models 1214 and 2131 feature a 14-inch display screen; Model 1222 contains a 15-inch screen. Model 1214 features a 1,920-character display capacity; Model 1222 features selectable capacities from 1,920 to 3,564 characters, while Model 2131 features selectable capacities of 1,920 or 2,560 characters. Models 1214 and 1222 are monochrome displays; Model 2131 features four- or eight-color display capability. All models have a tilt/swivel monitor. Windowing capability is standard on the Models 1222 and 2131. A color display is also standard on the Series 70 Personal Workstation.

**KEYBOARD:** A variety of keyboard layout styles is available for use with all Lee Data display stations, including typewriter and data entry styles. All keyboards are detachable.

**COMPETITION:** IBM, AT&T, ITT Courier, Telex, Memorex, and several others.

**PRICE:** Single-quantity purchase prices for the display terminals range from \$1,262 for the Model 1214 to \$2,965 for the Model 2131 with windowing and graphics capabilities.

## Lee Data Series 300 and Series 400 Display Systems

ties to its 3270 product line; its Coax Eliminator feature was also a first. It was also the first vendor to offer selectable 3270/Async capabilities on the same terminal system, as well as the first vendor to offer windowing capabilities on its display stations. Other significant new additions to the product line are the Series 610 Associate Processor, which provides multiuser local processing without the use of a PC, and the QuickLink Adapter, which allows Lee Data devices to be attached to Series 300 and Series 400 controllers via standard telephone wire.

The Series 300 provides IBM 3270 compatibility in both BSC and SNA/SDLC protocols. A variety of IBM 3274-equivalent local and remote controllers provides the basis for the Series 300; these controllers support device clusters ranging from 8 to 32 devices. Lee Data provides a wide variety of devices which can attach to the controllers, including monochrome and color display terminals, printers, and personal workstations providing personal computing capabilities. Included in the Series 300 controller family are the Model 311 and Model 321 dual-host controllers. These units provide interfaces for two separate host computers, doubling the number of applications that the user can access. Lee Data has since expanded its Series 300 controller line with the introduction of tri-host (Model 313) and quad-host (Model 314) units.

The Series 400 provides the same IBM 3270 compatibility found with the Series 300; in addition, the Series 400 controllers provide up to 32 additional ports for communications access to 32 asynchronous devices. The Lee Data Model 1222 and Model 2131 Open Window displays can be used to switch between 3270 mode and Async mode applications, allowing a user to perform synchronous and asynchronous functions from the same terminal without using a protocol converter. In 3270 mode, the Series 400 controllers provide for the attachment of 16 to 32 devices; in Async mode, up to 32 devices may be used for asynchronous communications. All Lee Data peripheral devices that can be attached to the Series 300 controllers may also be attached to the Series 400 controllers; however, only the Model 1222 and 2131 displays can be used for both 3270 and Async applications. The Series 400 also provides dual- (Models 411 and 421), tri- (Model 413), and quad-host (Model 414) controllers. As with the Series 300 multiple-host controllers, these models provide interfaces for two, three, or four (respectively) IBM or IBM-compatible hosts, as well as asynchronous interfaces.

In May 1984, Lee Data introduced the Model 1221 Open Window Display. This unit provided all of the display capabilities of the company's All-In-One displays (including selectable display formats), while adding windowing capabilities. The Model 1221 has since been replaced by the newer Model 1222. Up to four windows can be configured on the Model 1222's screen, in any combination of 3270 (BSC or SNA/SDLC) or Async applications. Lee Data has also announced a color display with windowing capability, the Model 2131 Open Window Display.

As we have said, Lee Data has continually enhanced the Series 300/Series 400 product lines; the company has un-

## CHARACTERISTICS

**VENDOR:** Lee Data Corporation, 7075 Flying Cloud Drive, Minneapolis, MN 55344. Telephone (612) 828-0300.

**DATE OF ANNOUNCEMENT:** Series 300—August 1979; Series 400—April 1982.

**DATE OF FIRST DELIVERY:** Series 300—October 1979; Series 400—April 1982.

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** Lee Data Corporation.

## CONFIGURATION

The *Series 300* is an IBM 3270-compatible display system. The Series 300 supports up to 32 devices (displays and/or printers) in remote or local clusters. Both BSC and SNA/SDLC protocols are supported. The Series 300 contains eight separate controller models:

- **Model 307 Remote Controller**—an IBM 3274-51C and 3276-compatible remote control unit. The 307 provides support for up to eight devices. The 307 replaces the older 306 Remote Controller; the new model supports windowing features.
- **Model 308 Remote Controller**—an IBM 3274-61C-compatible remote control unit. The 308 provides support for up to 16 devices.
- **Model 310 Remote Controller**—an IBM 3274-1C/-21C/-31C/-41C-compatible remote control unit. The 310 provides support for up to 32 devices.
- **Model 311 Remote Controller**—a dual-host remote control unit. The 311 provides support for up to 32 devices, and interfaces with two hosts; it can operate concurrently in both BSC and SNA/SDLC environments. Users can switch from one host to the other via a keyboard command, or by jumping to a different window.
- **Model 313 Remote Controller**—a tri-host remote control unit. The 313 provides support for up to 32 devices, and interfaces with three hosts; it can operate concurrently in both BSC and SNA/SDLC environments. Users can switch from one host to the other via a keyboard command, or by jumping to a different window.
- **Model 314 Remote Controller**—a quad-host remote control unit. The 314 provides support for up to 32 devices, and interfaces with four hosts; it can operate concurrently in both BSC and SNA/SDLC environments. Users can switch from one host to the other via a keyboard command, or by jumping to a different window.
- **Model 320 Local Controller**—a local control unit that is compatible with the following IBM 3274 control unit models: -1A, -1B, -1D, -21A, and -31A. The 320 provides support for up to 32 devices.
- **Model 321 Local/Remote Controller**—a dual-host control unit that provides both a local and remote interface. The 321 provides support for up to 32 devices, and interfaces with two hosts; it can operate concurrently in both BSC and SNA/SDLC environments. Users can switch from one host to the other via a keyboard command, or by jumping to a different window.

The Lee Data Series 300 controllers can communicate with the IBM System/360, System/370, 30XX, and 4300 processors, or with IBM-compatible systems. Remote controllers

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► veiled a number of new products within the past year, including new printers, displays, and controllers. Another significant addition to the product family is the Series 610 Associate Processor. The Series 610 is a multiuser, multi-tasking microcomputer that provides Series 400 users with local processing capabilities, while eliminating the need for PCs. The Series 610 is available in two configurations, with memory up to 3MB and hard disk storage up to 144MB. Up to 32 displays (up to 12 simultaneously) can access the Series 610.

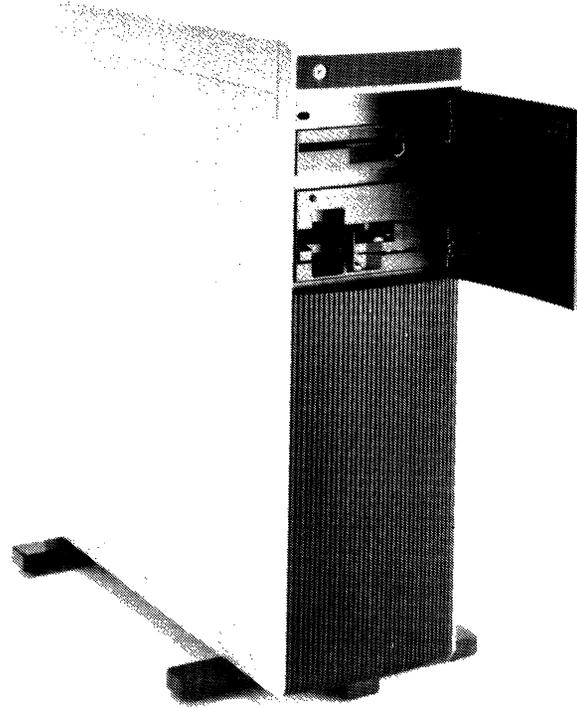
Lee Data also provides its Coax Eliminator for users wishing to reduce their dependence on coaxial cable. Up to 8 displays or printers can be connected to a single coax cable (or twisted-wire circuit) from any Lee Data controller. Also offered is the QuickLink Adapter, which allows Lee Data terminals, workstations, and printers to attach to Series 300 and Series 400 controllers via twisted-pair telephone wire.

Lee Data has also been active in the acquisition side of the industry. An attempt to purchase terminal maker Visual Technology in late 1984 fell through. However, in December 1985, the company completed a pair of acquisitions. Arizona-based Phaze Information Machines, a maker of IBM 3270-compatible terminals and workstations, became a wholly owned subsidiary of Lee Data. Likewise, California-based Datastream Communications, a maker of protocol converters, terminal controllers, and micro-to-mainframe communications software, also became a wholly owned subsidiary. Phaze is now known as the Phaze Terminal Division of Lee Data, continuing its operations in Scottsdale. Datastream is now known as the Datastream Networking Division of Lee Data, operating out of its Santa Clara facilities.

In addition to its terminal systems, Lee Data also markets the System 2000 and System 2500 Multiuser Computer Systems. The company has also entered the local area network (LAN) market via an OEM agreement with Banyan Systems of Westboro, MA. The Lee Data LAN product is called the Series 820 LANMASTER; it is a network server for the interconnection of personal computers.

### COMPETITIVE POSITION

Although it stands as a relative newcomer to the IBM 3270-compatible terminal market (compared to the likes of Telex, AT&T, and ITT Courier), Lee Data has carved out a significant market share and a high degree of user acceptance. Almost from the start, the company's innovation has placed it among the top vendors in this market. In the past two years, IBM has changed the face of this market with a wave of new product introductions and price cuts. The competitors who have remained in this market have responded with new generations of 3270-compatible equipment. The key features of these product lines have been lower prices, multifunctionality, and plug-compatibility. All of the vendors have incorporated the first feature into their products. Most have chosen between the second and third. For instance, Telex and Memorex market displays, controllers, and printers that are completely interchangeable (plug-compatible) with the corresponding IBM com- ►



*The Series 610 Associate Processor is designed for use in conjunction with the Series 400 controllers. The Series 610 allows a number of Series 400 terminal users to access local processing functions, without the use of personal computers.*

► communicate with the host over a telecommunications facility via a modem. The maximum cable length between the controller and the modem is 50 feet. The Lee Data Coax Eliminator feature allows up to eight devices to be attached to the Coax Eliminator via a single-cable or twisted-pair wire circuit. The Lee Data QuickLink Adapter enables terminals and workstations to interconnect with the controllers using standard twisted-pair telephone wire in wall outlets. Installation distances can be extended indefinitely in multiples of 5,000 feet when daisy-chained together. Local controllers attach directly to the host via a byte multiplexer, selector, or block multiplexer channel.

*The Series 400 operates as both an IBM 3270-compatible and asynchronous display system. In 3270 mode, the Series 400 supports up to 32 devices (displays and/or printers) in remote or local clusters; both BSC and SNA/SDLC protocols are supported. In Async mode, the Series 400 supports up to 32 concurrent asynchronous sessions. Seven controller models are available:*

- **Model 408 Remote Controller**—compatible with the IBM 3274-61C; provides support for 16 remotely connected devices in 3270 mode, and eight asynchronous ports.
- **Model 410 Remote Controller**—compatible with IBM 3274 Models -1C, -21C, -31C, and -41C; provides support for 32 remotely connected devices, which can operate in both 3270 and Async modes.
- **Model 411 Remote Controller**—a dual-host remote controller; in 3270 mode, the 411 provides support for up to 32 remotely connected devices and interfaces with two hosts. Concurrent operation in BSC and SNA/SDLC environments is possible; users can switch from one host to another via a keyboard command. In Async mode, the 411 can support up to 32 concurrent asynchronous sessions. ►

## Lee Data Series 300 and Series 400 Display Systems

ponents. Lee Data and AT&T (with its 6500 Multifunction Communication System), meanwhile, have opted for multifunctionality within their 3270 lines, providing high-end displays and multihost controllers. ITT Courier has done a little of both, providing local processing via its 993X Application Processor, and plug-compatibility with its 1778 display. Recently, Lee Data's Phaze Terminal Division introduced the Model 1178, a plug-compatible replacement for the IBM 3178; the 1178 carries a list price of \$995. These vendors stand as the heavyweights among the independent 3270-compatible competitors. IBM, however, still maintains a healthy margin of leadership in this market.

Lee Data's innovation has led the company into other markets, like the LAN market. The company is moving toward a time when it can provide a number of solutions to a user's communications problems.

### ADVANTAGES AND RESTRICTIONS

The IBM 3270 terminal market, for a long time, was a lucrative but relatively stable arena. IBM claimed a 50 percent share, but the sheer size of the market dictated that even a relatively small share translated into big profits. The blueprint for success for the independents largely consisted of offering 3270-emulating controllers, displays, and printers at a lower price than IBM. This scenario changed forever in 1983 when IBM added new models, cut prices, and integrated the IBM Personal Computer into the 3270 family. Prices had to be lowered; vendors who had been strictly involved in marketing terminals and controllers found that they now needed to add personal computing to their product line. Most have done so as of this writing; some that did not have disappeared.

Since its entry into the 3270 market in 1979, Lee Data has not been a typical 3270-compatible independent vendor. Almost from its first product offerings, Lee Data has been an innovator, integrating multifunctional capabilities into its terminal systems. As was mentioned previously in this report, it was the first vendor to add personal computing capabilities to a standard 3270 terminal cluster. Other innovations followed, including the Coax Eliminator, All-In-One and Open Window displays, Series 400 with 3270 and Async communications, dual-host capability on a single control unit, and an IBM 3270-PC emulator. Now, the company has added multiuser local processing, tri- and quad-host controllers, and a twisted-pair wiring option. These products give Lee Data the most complete and multifunctional product line in the 3270 world; of the independents, only AT&T (with its 6500 Multifunction Communication System) provides some (but not all) of this multifunctionality. ITT Courier offers multiuser local processing via its 993X Application Processor, but lacks the multifunctional displays offered by Lee Data and AT&T.

### USER REACTION

In the 1986 Datapro Terminal Users Survey, conducted in conjunction with *Data Communications* magazine, a total of four responses were received from users of Lee Data

- ▶ **Model 413 Remote Controller**—a tri-host remote controller; in 3270 mode, the 413 provides support for up to 32 remotely connected devices and interfaces with three hosts. Concurrent operation in BSC and SNA/SDLC environments is possible; users can switch from one host to another via a keyboard command. In Async mode, the 413 can support up to 32 concurrent asynchronous sessions.
- **Model 414 Remote Controller**—a quad-host remote controller; in 3270 mode, the 414 provides support for up to 32 remotely connected devices and interfaces with four hosts. Concurrent operation in BSC and SNA/SDLC environments is possible; users can switch from one host to another via a keyboard command. In Async mode, the 414 can support up to 32 concurrent asynchronous sessions.
- **Model 420 Local Controller**—compatible with IBM 3274 Models -1A, -1B, -1D, -21A, -31A, -41A, and -41D; provides support for up to 32 locally connected devices in 3270 mode, and 32 concurrent asynchronous sessions in Async mode.
- **Model 421 Local/Remote Controller**—a dual-host control unit that provides both local and remote interfaces; in 3270 mode, the 421 provides support for up to 32 locally or remotely connected devices, and interfaces with two hosts. Concurrent operation in BSC and SNA/SDLC environments is possible; users can switch from one host to another via a keyboard command. In Async mode, the 421 can support up to 32 concurrent asynchronous sessions.

In 3270 mode, the Series 400 controllers can communicate with the IBM System/360, System/370, 30XX, and 4300 processors, or with IBM-compatible systems. In Async mode, up to 32 separate ports are available for communication with asynchronous hosts. Communications with Digital Equipment Corporation, Hewlett-Packard, and Sperry hosts are supported; optional emulations available include Digital VT52/VT100/VT132, Data General Dasher D210, TeleVideo 950, Hazeltine 1510, Hewlett-Packard HP 2624B, and AT&T (Datspeed) 40/1 and 40/2. Remote controllers communicate with the host over a telecommunications facility via a modem. The maximum cable length between the controller and the modem is 50 feet. The Lee Data Coax Eliminator feature allows up to eight devices to be attached to the Coax Eliminator via a single cable or twisted-pair wire circuit. The Lee Data QuickLink Adapter enables terminals and workstations to interconnect with the controllers using standard twisted-pair telephone wire in wall outlets. Installation distances can be extended indefinitely in multiples of 5,000 feet when daisy-chained together. Local controllers attach directly to the host via a byte multiplexer, selector, or block multiplexer channel.

As part of the Series 400, Lee Data has introduced the Series 610 Associate Processor. The Series 610 is used in conjunction with the Series 400 controllers to provide shared local processing functions in addition to 3270 host applications. Functions provided via the Series 610 include application development, software development, local data base management, word processing, electronic spreadsheet, and electronic mail. The Series 610 Associate Processor can be accessed by up to 32 displays, any 12 of which can access it simultaneously.

Personal computing capabilities can also be added to both the Series 300 and Series 400. The Series 70 Personal Workstation is an IBM 3270-PC-compatible unit that can be used with both series. Lee Data's PC Adapter is an expansion board that plugs into an IBM PC and enables it to communicate with the Series 300 and Series 400 controllers.

### TRANSMISSION SPECIFICATIONS

The Lee Data Series 300 and Series 400 (in 3270 mode) Remote Controllers perform transmission over common car-

## Lee Data Series 300 and Series 400 Display Systems

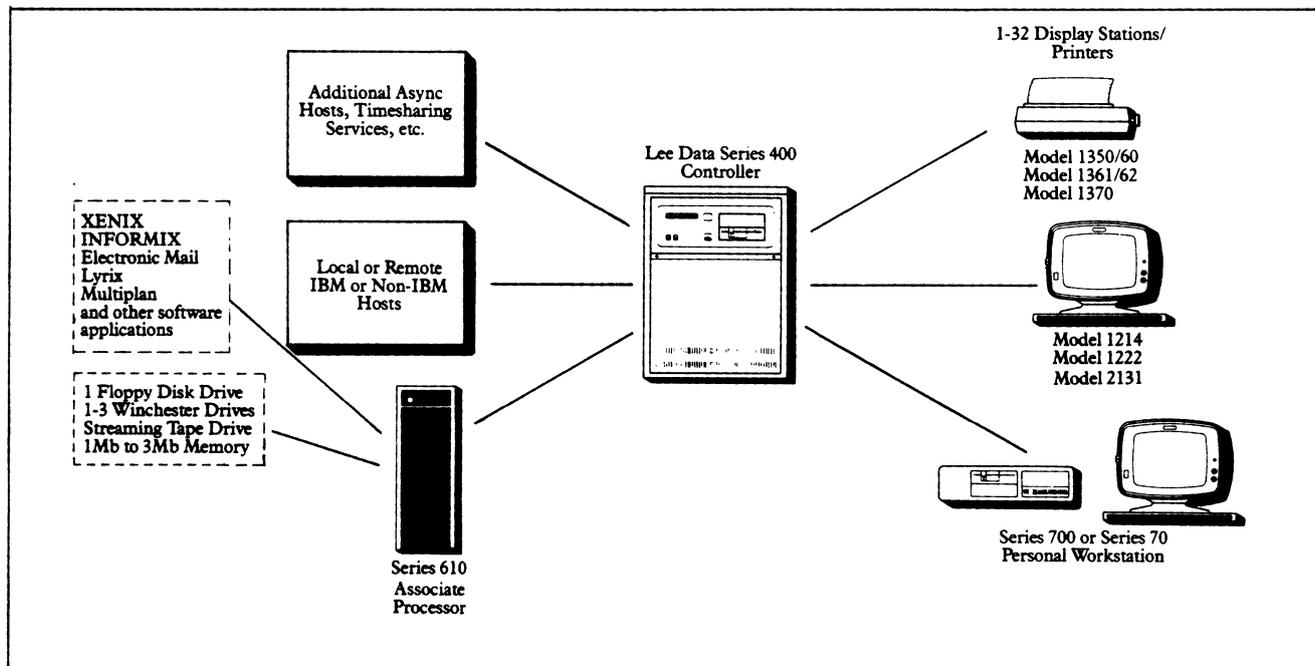


Figure 1. The Series 610 Associate Processor provides local processing for up to 32 Lee Data terminal, printer, or workstation users. Older Lee Data equipment, like the Series 700 Personal Workstation, is also supported.

► display systems. The users represented an installed base of 605 display terminals. The ratings given to these display systems are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	2	0	0	3.5
Display clarity	2	2	0	0	3.5
Keyboard feel & usability	4	0	0	0	4.0
Ergonomics	2	2	0	0	3.5
Hardware reliability	3	1	0	0	3.8
Maintenance service/technical support	3	1	0	0	3.8
Overall performance	2	2	0	0	3.5

\*Weighted Average based on a scale of 4.0 for Excellent.

When asked whether or not they would recommend Lee Data equipment to other users, all four users indicated that they would. The users were also asked to name the factors which had the most influence on their decision to purchase the Lee Data terminal systems. Three of the users cited the features and/or functionality of the systems, while one user named price as the main purchase consideration. □

► rier nonswitched, point-to-point or multipoint networks. Transmission rates range from 2400 to 19,200 bps in both BSC and SNA/SDLC environments. An RS-232-C modem interface is provided. The Series 300 and Series 400 Local Controllers attach to IBM System/360, System/370, and 30XX processors through a byte multiplexer, selector or block multiplexer, or to any 4300 processor through a byte multiplexer or block multiplexer channel. In the Series 400 Async mode, the asynchronous ports connect to dial-up or dedicated modems, or attach directly to the computer, mini-computer, or time-sharing service. The ports provide RS-232-C interfaces. Automatic dialing is supported. The communication link may be over common carrier non-

switched or dial-up point-to-point networks. Transmission rates from 300 to 9600 bps are operator-selectable

### DEVICE CONTROL

The Series 300 and Series 400 begin operation after the Initial Program Load. Programs are entered from a diskette into the system controller. Three modes of operation are available: On-line, Local Command, and Utility modes.

**On-line Mode** provides for 3270 mode operation in Series 300 systems, and for either 3270 mode or Async mode operation in Series 400 systems. In a dual-host system, it also provides for primary or secondary mode operation. In On-line mode, a display station or printer communicates directly with either a 3270 host system and resident application, or with one of several asynchronous hosts, minicomputers, or time-sharing services. On-line functions that can be performed include data processing, data entry, program development, viewing, and editing.

**In Local Command mode**, the system controller controls the display stations and printers. The following operations are permitted: transferring data from the display screen to the printer; sending local information messages from one station to another, or to all stations; testing display stations and printers; reassigning printers to display stations for local printing functions; redefining display station or printer addresses to allow their use at other host-recognized addresses; monitoring communications between the host and a controller from a display connected to the controller; displaying system performance statistics such as the number of blocks transmitted and received; and switching between hosts in a dual-host system. Local Command mode also allows for the display of the system's Configuration Table, which reports the current Logical Unit (LU) number and cable assignments for each display station and printer.

**In Utility mode**, the user can perform tasks necessary for normal system operation and can record problems with system operation. The following functions can be performed in Utility mode: preparation of new diskettes to receive data; creation of backup copies of the system diskette; configura-

## Lee Data Series 300 and Series 400 Display Systems

tion of the system hardware and software to meet specific requirements; and recording of the contents of system controller memory to aid Lee Data service representatives in diagnosing problems.

### COMPONENTS

**SERIES 300 CONTROLLERS:** Eight models are available: Model 307 Remote Controller, Model 308 Remote Controller, Model 310 Remote Controller, Model 311 Remote Controller, Model 313 Remote Controller, Model 314 Remote Controller, Model 320 Local Controller, and Model 321 Local/Remote Controller. All controller models support both BSC and SNA/SDLC protocols. Model 307 replaces the older Model 306, and supports attachment of up to eight devices; Model 308 supports attachment of up to 16 devices. All other controller models support the attachment of up to 32 devices. Models 311 and 321 are dual-host controllers; they can interface with two separate host computers. Model 311 provides two remote interfaces; Model 321 provides one local and one remote interface. Model 313 is a tri-host controller, able to interface with three host computers. Model 314 is a quad-host controller, capable of interfacing with four hosts. Both Model 313 and Model 414 provide remote interfaces only. All of the multiple-host controllers allow for concurrent BSC and SNA/SDLC operation. Any Lee Data display station or printer may be attached to any Series 300 controller; the Series 70 Personal Workstation and PC Adapter feature are also supported by the Series 300 controllers. All controller models include an integrated diskette drive and control panel. See the preceding Configuration section for additional information on the Series 300 controllers.

**SERIES 400 CONTROLLERS:** Seven models are available: Model 408 Remote Controller, Model 410 Remote Controller, Model 411 Remote Controller, Model 413 Remote Controller, Model 414 Remote Controller, Model 420 Local Controller, and Model 421 Local/Remote Controller. All controller models provide two modes of operation: 3270 mode and Async mode. In 3270 mode, both BSC and SNA/SDLC protocols are supported. Model 408 supports the attachment of up to 16 devices for 3270 mode operation; in Async mode, eight devices may be active at one time. All other models support attachment of 32 devices for 3270 mode operation, or 32 devices in Async mode. Models 411 and 421 are dual-host controllers, and can interface with two separate host computers, in addition to eight (Model 408) or 32 (all other models) asynchronous ports. Model 411 provides two remote interfaces; Model 421 provides one local and one remote interface. Model 413 is a tri-host controller, and can interface to three remote host computers, in addition to its 32 asynchronous ports. The Model 414 is a quad-host controller, able to interface with four separate remote host computers, in addition to 32 asynchronous ports. All multiple-host controllers allow for concurrent BSC and SNA/SDLC operation. Any Lee Data display station or printer may be attached to any Series 400 controller for 3270 mode operation; the Series 400 controllers also provide support for the Series 70 Personal Workstation and the PC Adapter feature. For Async mode operation, only the Lee Data Model 1222 and Model 2131 displays can operate as asynchronous display stations; all printer models may be used. All controller models include an integrated diskette drive and control panel. See the preceding Configuration section for more information on the Series 400 controllers.

**SERIES 610 ASSOCIATE PROCESSOR:** A multiuser, multiprocessing microcomputer designed for use in conjunction with the Series 400 controllers. The Series 610 Associate Processor allows users to share personal computing functions without having a personal computer. The Series 610 is available in two configurations. The minimum configuration includes one 800KB diskette drive and one 40MB hard disk drive. The standard configuration includes one

800KB diskette drive, three 40MB or two 72MB hard disk drives, and one 45MB streaming tape drive. The Series 610 can be configured with up to 3MB of memory. It runs under the Xenix operating system, and will run the Informix relational database. Local processing functions, such as application development, software development, local data base management, word processing, electronic spreadsheet, and electronic mail is available to Lee Data Series 400 users on a multiuser basis. The Series 610 Associate Processor provides support for up to 32 display stations, 12 of which can access the Series 610 simultaneously. The Series 610 also provides for the sharing of resources such as printers, disk drives, and software. It supports the Model 1222 and Model 2131 Open Window displays.

**COAX ELIMINATOR:** Allows up to eight displays or printers to be connected to a single coaxial cable or twisted-pair wire circuit from any Series 300 or Series 400 controller.

**QUICKLINK ADAPTER:** Enables Lee Data display terminals, workstations, and printers to interconnect to Series 300 and Series 400 controllers using standard twisted-pair telephone wire in standard wall outlets.

**MODEL 1214 DISPLAY TERMINAL:** An entry-level display terminal that features a 14-inch tilt/swivel display screen and green phosphor characters. The 1214 provides a 1,920-character (24 lines by 80 columns) display format and attaches to the Series 300 and Series 400 (3270 mode operation only) controllers.

**MODEL 1222 OPEN WINDOW (ALL-IN-ONE) DISPLAY TERMINAL:** Combines All-In-One features (four selectable screen sizes) with windowing capabilities. The Model 1221 includes a 15-inch tilt/swivel display screen with green phosphor characters, and provides emulation of the IBM 3180. Selectable screen formats of 1,920 characters (24 lines by 80 columns), 2,560 characters (32 lines by 80 columns), 3,440 characters (43 lines by 80 columns), and 3,564 characters (27 lines by 132 columns) are available. Up to four windows can be displayed on the screen simultaneously, representing four interactive sessions. These sessions can be in any combination (3270 mode in BSC or SNA/SDLC, Async mode, remote or local). Each window set is a user-definable custom windowing format. Variables include the number of windows to be displayed, window location, and window size. Individual windows can zoom to a full screen, and data may be copied from window to window. An operator information status line is included, aiding in identification of the active window. In addition, a help menu can be accessed via a single keystroke.

**MODEL 2131 OPEN WINDOW COLOR DISPLAY TERMINAL:** Emulates the IBM 3279 Model S3G and is compatible with the IBM 3179. The Model 2131 includes a 14-inch tilt/swivel display screen with eight-color (red, blue, green, white, pink, turquoise, yellow, and black) display capability. The Model 2131 features selectable display formats of 1,920 (24 lines by 80 columns) or 2,560 (32 lines by 80 columns) characters. Up to four windows can be displayed on the screen simultaneously, representing four interactive sessions. These sessions can be in any combination (3270 mode in BSC or SNA/SDLC, Async mode, remote or local). Each window set is a user-definable custom windowing format. Variables include the number of windows to be displayed, window location, and window size. Individual windows can zoom to a full screen, and data may be copied from window to window. An operator information status line is included, aiding in identification of the active window. In addition, a help menu can be accessed via a single keystroke. The Model 2131 also supports host color graphics, and contains a built-in QuickLink Adapter.

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► **1214 KEYBOARDS:** Two detachable keyboard styles are available for use with the 1214 display terminals, with 87 or 124 keys. Both models include a low-profile design and typewriter-style key layout.

**1222/2131 KEYBOARD:** A detachable keyboard with 122 keys and a low-profile design is available for use with the Model 1222 and Model 2131 Open Window displays. The keyboard includes a single keystroke record/playback of 96-character strings capability for each window. Color-coded keys are also included.

**SERIES 70 PERSONAL WORKSTATION:** Emulates the IBM 3270-PC. The Series 70 is a color graphics workstation for PC graphics as well as IBM 3279-S3G graphics applications. The unit attaches to Series 300 and Series 400 controllers; file transfer utilities are available to enable the transfer of files between the host computer and the Series 70. In PC Graphics mode, the Series 70 can display up to 16 colors for the creation of high-resolution business graphics. With the IBM 3279-S3G emulation feature, the Series 70 can access and display host graphics, support programmed symbol sets, and display up to eight colors. Windowing is also supported; up to seven windows can be displayed simultaneously (four interactive sessions, a personal computer session, and two note pads). Both 3270 mode and Async mode sessions can be run simultaneously, and data can be transferred from window to window. A minimum configuration of the Series 70 includes a color monitor, 122-key low-profile keyboard (same as for the Model 1222 and Model 2131), 128K RAM, one disk drive, and support for PC graphics and windowing. A keyboard modification capability is standard.

**PC ADAPTER:** An add-on board that plugs into an expansion slot of the IBM Personal Computer, enabling the PC to connect to a Series 300 or Series 400 controller. The PC Adapter feature can also be used with the IBM PC, PC XT, AT&T Personal Computer Model 6300, or any IBM PC-compatible microcomputer.

**MODEL 1310 COLOR GRAPHICS PRINTER:** A color graphics printer for attachment to the Series 70 Personal Workstation. Print speeds for the Model 1310 are 200 cps in draft mode, 110 cps in correspondence mode, and 35 cps in letter-quality mode. The Model 1310 prints up to 132 columns, and accepts paper from 5 to 14 inches wide. Vertical spacing is six or eight lpi. Both monochrome and eight-color (yellow, cyan, magenta, red, green, purple, brown, and black) printing is available. Color and graphics capabilities are programmable using Basic commands; text can be mixed with graphics.

**MODEL 1317 STATION PRINTER:** Emulates the IBM Personal Computer Printer. A replacement for the older Model 1316 Station Printer, the Model 1317 attaches directly to a Lee Data Model 1214, Model 1222, or Model 2131 display station or Series 70 Personal Workstation. Maximum print speed is 160 cps, and line length is 80 columns (132 columns in condensed mode). The 1317 uses from 4- to 10-inch wide paper, and prints up to three copies. Vertical spacing is six or eight lpi. The 1317 operates in the SNA Character String (SCS) and the Data Stream Compatibility (DSC) modes.

**MODEL 1361 UNIVERSAL PRINTER:** Compatible with the IBM 3268 and 3287 printers. The Model 1361 is a monochrome graphics printer for attachment to the Series 300 and Series 400 controllers. Print rates for the Model 1361 are 400 cps in draft quality, and 100 cps in letter quality. The printer permits the use of host graphics, including programmed symbols. Programmed symbol graphics can be used with 3270 graphics applications as well; charts and graphs can be designed using host graphics software. The Model 1361 is upgradable to a Model 1362 Universal Color Printer.

**MODEL 1362 UNIVERSAL COLOR PRINTER:** Compatible with the IBM 3268 and 3287 printers. The Model 1362 is a color graphics printer for attachment to the Series 300 and Series 400 controllers. Print rates for the Model 1362 are 400 cps in draft quality, and 100 cps in letter quality. The printer permits the use of host graphics, including programmed symbols. Programmed symbol graphics can be used with 3270 graphics applications as well; charts and graphs can be designed using host graphics software. The Model 1362 provides four-color (red, green, blue, and black) print capability as standard; seven-color (red, green, blue, black, pink, yellow, and turquoise) printing is an operator-selectable option.

**MODEL 1380 LINE PRINTER:** Compatible with the IBM 3287. The 1380 features a maximum print speed of 300 lpi, and prints 132-character lines. Up to six copies may be generated on fanfold paper. Horizontal spacing of 10, 12, or 15 cpi can be selected, and vertical spacing of 6 or 8 lpi is likewise selectable. The 1380 operates in both SCS and DSC modes, and connects to any Series 300 or Series 400 controller. A Printer Controller is required to provide an interface between the 1380 and the system controller.

### PRICING

Lee Data Series 300 and Series 400 Display Systems are available for purchase, or on a lease basis. Maintenance service is provided through Lee Data's Customer Service organization, with locations in 80 cities in the United States. A variety of maintenance plans are available.

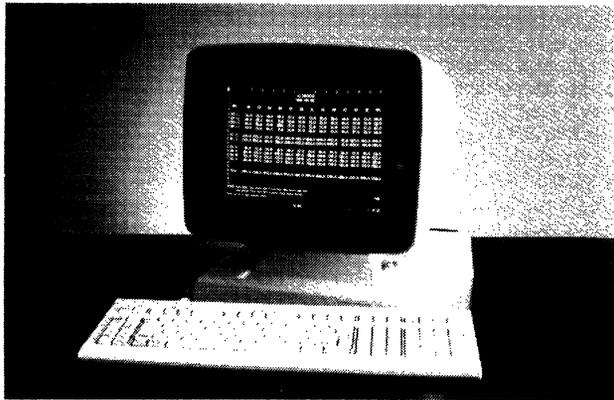
Lee Data does not provide detailed pricing information for publication, but did provide the following single-quantity purchase prices for some of their newer components. For more detailed pricing information, contact Lee Data or your local Lee Data sales office.

### EQUIPMENT PRICES

	Purchase Price (\$)
Model 307 Remote Controller (8 ports)	3,720
Model 308 Remote Controller (16 ports)	6,960
Model 310 Remote Controller (32 ports)	11,764
Model 311 Remote Controller (32 ports)	14,542
Model 321 Local/Remote Controller (32 ports)	16,556
Model 408 Remote Controller (16 3270 ports, 8 asynchronous ports)	8,775
Model 411 Remote Controller (32 3270 ports, 32 asynchronous ports)	17,435
Model 421 Local/Remote Controller (32 3270 ports, 32 asynchronous ports)	17,571
Series 610 Associate Processor; minimum configuration (includes 1MB RAM, 40MB Winchester hard disk storage, Xenix operating system)	10,095
Model 1214 Display Terminal	1,262
Model 1222 Open Window Display Terminal (async, windows)	2,395
Model 2131 Open Window Color Display Terminal (windows)	2,795
Model 2131 Open Window Color Display Terminal (windows, graphics)	2,965
Series 70 Personal Workstation (includes color monitor, keyboard, 256K RAM, diskette drive, and support for host graphics)	4,925
Series 70 Personal Workstation (includes color monitor, keyboard, 256K RAM, diskette drive, 3270 communications, and support for host graphics)	5,225
Model 1310 Color Graphics Printer	1,960
Model 1361 Universal Printer	5,995
Model 1362 Universal Color Printer	7,190
PC Adapter	1,150 ■



# Lee Data Series 300 and Series 400 Display Systems



*Lee Data's new Model 1214 Display Terminal is available in four models, including All-In-One versions which provide four selectable display formats. The terminals include a 14-inch screen, low-profile keyboard, and a compact enclosure with a reduced footprint.*

## MANAGEMENT SUMMARY

Since its formation in 1979, Lee Data has risen to become a major contender in the IBM 3270-compatible market. Its first product offering, the Series 300 Display System, was introduced later that year; a second line, the Series 400, was unveiled in 1982. With these introductions, Lee Data has emerged as one of the most innovative companies in this market. It was the first of the independent vendors to add personal computing capabilities to its 3270 product line; its Coax Eliminator feature was also a first. It is currently the only vendor to offer selectable 3270/Async capabilities on the same terminal system. Lee Data has also announced the availability of windowing capabilities on its Model 1221 All-In-One Display Station, becoming the first 3270 vendor to offer windowing without a personal computer or PC attachment.

The Series 300 provides IBM 3270 compatibility in both BSC and SNA/SDLC protocols. A variety of IBM 3274 equivalent local and remote controllers provide the basis for the Series 300; these controllers support device clusters ranging from 8 to 32 devices. Lee Data provides a wide variety of devices which can attach to the controllers, including monochrome and color display terminals, printers, and personal workstations providing personal computing capabilities. Included in the Series 300 controller family are the Model 311 and Model 321 dual host controllers. These units provide interfaces for two separate host computers, doubling the number of applications that the user can access.

The Series 400 provides the same IBM 3270 compatibility found with the Series 300; in addition, the Series 400 controllers provide up to 16 additional ports for the attachment of asynchronous devices. The Lee Data All-In-One displays can be used to switch between 3270 mode and Async mode applications, making them unique in that a

Lee Data's Series 300 and Series 400 are IBM 3270-compatible terminal systems. The Series 300 provides components which are compatible with the IBM 3274 controllers and 3178/3278 displays. The Series 400 combines IBM 3270 compatibility with asynchronous operation. Significant features of both systems include dual host capability, a variety of personal computing capabilities (IBM PC and 3270-PC emulation), Coax Eliminator feature, and new Model 1221 Open Window Display (windowing capability on a display terminal).

**MODELS:** 306, 308, 310, 408, and 410 Remote Controllers; 320 and 420 Local Controllers; 311 Remote/Remote Controller; 321 Local/Remote Controller; 411 Asynchronous Remote/Remote Controller; 421 Asynchronous Local/Remote Controller; 1214, 1216, 1218, and 1220 Display Stations; 1221 Open Window Display; 1230 and 1231 Color Display Stations; Series 70 and Series 700 Personal Workstations; PC Adapter feature; HP 2624B Emulation Option; 1316 Station Printer; 1350 and 1360 Matrix Printers; 1370 Letter Quality Printer; 1380 Line Printer.

**DISPLAY:** Models 1214 and 1216 feature a 14-inch display screen; all other display models contain a 15-inch screen. Models 1214, 1214A, 1216, 1218, and 1230 feature a 1920-character display capacity; Models 1214B/D, 1220, and 1221 feature selectable capacities from 1920 to 3564 characters; Model 1231 features selectable capacities of 1920 or 2560 characters. Models 1216, 1218, and 1220 are monochrome displays; Models 1230 and 1231 feature two- or four-color display capability. All models have a tilt/swivel monitor.

**KEYBOARD:** A variety of keyboard layout styles are available for use with all Lee Data display stations, including typewriter and data entry styles. All keyboards are detachable.

**COMPETITION:** IBM, ITT Courier, Telex, Harris, Teletype, Memorex, and several others.

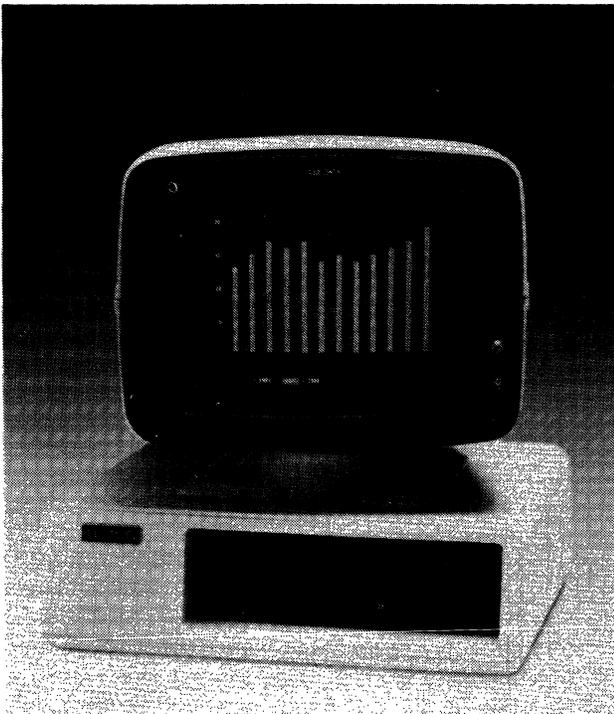
**PRICE:** The Series 300 and Series 400 components are available for purchase or lease. Single quantity purchase prices for the new Model 1214 Display Terminals range from \$1,462 to \$2,162. The new entry-level Model 408 Remote Controller is priced at \$8,075. The Series 70 Personal Workstation sells for \$5,711 in a minimum configuration supporting PC graphics and windowing.

## Lee Data Series 300 and Series 400 Display Systems

user can perform synchronous and asynchronous functions from the same terminal without using a protocol converter. In 3270 mode, the Series 400 controllers provide for the attachment of from 16 to 32 devices; in Async mode, from 8 to 16 devices may be used for asynchronous communications. All Lee Data peripheral devices that can be attached to the Series 300 controllers may also be attached to the Series 400 controllers; however, only the All-In-One display models can be used for both 3270 and Async applications. The Series 400 also provides dual host controllers, Models 411 and 421. These controllers provide interfaces for two IBM or IBM-compatible hosts, as well as asynchronous interfaces.

In May 1984, Lee Data introduced the Model 1221 Open Window Display. This unit provides all of the display capabilities of the company's All-In-One displays (including selectable display formats), while adding windowing capabilities. Up to four windows can be configured on the Model 1221's screen, in any combination of 3270 (BSC or SNA/SDLC) or Async applications.

In July 1984, Lee Data unveiled a variety of new products, including a new display terminal family, controller, personal workstation, PC attachment option, and Hewlett-Packard terminal emulation option. The new display family is the Model 1214, which includes four models. The 1214 contains a more compact enclosure design, a low-profile keyboard, and comes in separate versions for the



*The Series 70 Personal Workstation emulates the IBM 3270-PC. Like the 3270-PC, the Series 70 provides windowing capabilities, enabling the user to run seven concurrent sessions (four interactive host sessions, a personal computer session, and two note pads). The unit can display up to 16 colors in PC graphics mode, or up to 8 colors in host graphics mode.*

## CHARACTERISTICS

**VENDOR:** Lee Data Corporation, 7075 Flying Cloud Drive, Minneapolis, MN 55344. Telephone (612) 828-0300.

**DATE OF ANNOUNCEMENT:** Series 300—August 1979; Series 400—April 1982.

**DATE OF FIRST DELIVERY:** Series 300—October 1979; Series 400—April 1982.

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** Lee Data Corporation.

## CONFIGURATION

*The Series 300 is an IBM 3270-compatible display system. The Series 300 supports up to 32 devices (displays and/or printers) in remote or local clusters. Both BSC and SNA/SDLC protocols are supported. The Series 300 contains six separate controller models:*

- **Model 306 Remote Controller**—an IBM 3274-51C and 3276-compatible remote control unit. The 306 provides support for up to eight devices.
- **Model 308 Remote Controller**—an IBM 3274-61C-compatible remote control unit. The 308 provides support for up to 16 devices.
- **Model 310 Remote Controller**—an IBM 3274-1C/-21C/-31C/-41C-compatible remote control unit. The 310 provides support for up to 32 devices.
- **Model 311 Remote/Remote Controller**—a dual host remote control unit. The 311 provides support for up to 32 devices, and interfaces with two hosts; it can operate concurrently in both BSC and SNA/SDLC environments. Users can switch from one host to the other via a keyboard command.
- **Model 320 Local Controller**—a local control unit that is compatible with the following IBM 3274 control unit models: -1A, -1B, -1D, -21A, and -31A. The 320 provides support for up to 32 devices.
- **Model 321 Local/Remote Controller**—a dual host control unit that provides both a local and remote interface. The 321 provides support for up to 32 devices, and interfaces with two hosts; it can operate concurrently in both BSC and SNA/SDLC environments. Users can switch from one host to the other via a keyboard command.

The Lee Data Series 300 controllers can communicate with the IBM System/360, System/370, 30XX, and 4300 processors, or with IBM-compatible systems. Remote controllers communicate with the host over a telecommunications facility via a modem. The maximum cable length between the controller and the modem is 50 feet. The Lee Data Coax Eliminator feature allows up to eight devices to be attached to the Coax Eliminator via a single cable or twisted wire circuit. Installation distances can be extended indefinitely in multiples of 2500 feet when daisy chained together. Local controllers attach directly to the host via a byte multiplexer, selector, or block multiplexer channel.

*The Series 400 operates as both an IBM 3270-compatible and asynchronous display system. In 3270 mode, the Series 400 supports up to 32 devices (displays and/or printers) in remote or local clusters; both BSC and SNA/SDLC protocols are supported. In Async mode, the Series 400 supports up to 16 devices. Five controller models are available:*

## Lee Data Series 300 and Series 400 Display Systems

Series 300 and Series 400 (including All-In-One versions). The 1214 is designed to eventually replace the older Lee Data monochrome display models, including the Models 1216, 1218, and 1220 All-In-One. The new controller is the Model 408, an entry-level version of the existing Model 410.

Lee Data's personal computing capabilities were enhanced with the addition of the Series 70 Personal Workstation and the PC Adapter option. The Series 70 joins the Series 700 Personal Workstation in Lee Data's line of PC products. The Series 70 emulates the IBM 3270-PC, with color graphics capability and windowing; it includes a color monitor and diskette drive. The Series 700 emulates the IBM PC and PC XT, and is an add-on to an existing Lee Data monochrome display. The PC Adapter feature is an add-on board which plugs into the IBM PC, PC XT, AT&T Personal Computer, or other IBM-compatible microcomputers; it allows the PC to attach to a Series 300 or Series 400 controller.

In addition to Lee Data's wide range of display and personal computing products, a variety of printers are available for use as part of a Series 300 or Series 400 cluster. Lee Data also provides its Coax Eliminator for users wishing to reduce their dependence on coaxial cable. Up to 8 displays or printers can be connected to a single coax cable (or twisted wire circuit) from any Lee Data controller.

### COMPETITIVE POSITION

Although it is a relative newcomer to the IBM 3270-compatible terminal market (compared to the likes of Telex, Teletype, and ITT Courier), Lee Data has carved out a significant market share. Almost from the start, the company's innovation has placed it among the top vendors in this market. In the past several months, IBM has severely shaken up this market with a wave of new product introductions and price cuts. A small shake-out has resulted, with Raytheon and MDS Trivex leaving the market. On the other end of the spectrum, Lee Data and ITT Courier have reacted with strong new product introductions of their own. Lee Data's new products should provide the impetus to put it in the top three of the independent vendors, along with ITT Courier and Telex.

### ADVANTAGES AND RESTRICTIONS

The IBM 3270 terminal market, for a long time, was a lucrative but relatively stable arena. IBM claimed a 50 percent share, but the sheer size of the market dictated that even a relatively small share translated into big profits. The blueprint for success for the independents largely consisted of offering 3270-emulating controllers, displays, and printers at a lower price than IBM. This scenario changed forever in 1983 when IBM added new models, cut prices, and integrated the IBM Personal Computer into the 3270 family. Prices had to be lowered; vendors who had been strictly involved in marketing terminals and controllers found that they now needed to add personal computing to their product line. Most have done so as of this writing; some that did not have disappeared.

- **Model 408 Remote Controller**—compatible with the IBM 3274-61C; provides support for 16 remotely-connected devices in 3270 mode, and eight devices in Async mode.
- **Model 410 Remote Controller**—compatible with IBM 3274 Models -1C, -21C, -31C, and -41C; provides support for 32 remotely-connected devices in 3270 mode, and 16 devices in Async mode.
- **Model 411 Remote/Remote Controller**—a dual host remote controller; in 3270 mode, the 411 provides support for up to 32 remotely-connected devices and interfaces with two hosts. Concurrent operation in BSC and SNA/SDLC environments is possible; users can switch from one host to another via a keyboard command. In Async mode, the 411 can support up to 16 devices.
- **Model 420 Local Controller**—compatible with IBM 3274 Models -1A, -1B, -1D, -21A, -31A, -41A, and -41D; provides support for up to 32 locally-connected devices in 3270 mode, and 16 devices in Async mode.
- **Model 421 Local/Remote Controller**—a dual host control unit that provides both local and remote interfaces; in 3270 mode, the 421 provides support for up to 32 locally- or remotely-connected devices, and interfaces with two hosts. Concurrent operation in BSC and SNA/SDLC environments is possible; users can switch from one host to another via a keyboard command. In Async mode, the 421 can support up to 16 devices.

In 3270 mode, the Series 400 controllers can communicate with the IBM System/360, System/370, 30XX, and 4300 processors, or with IBM-compatible systems. In Async mode, up to 16 separate ports are available for the connection of asynchronous devices. Communications with DEC, Hewlett-Packard, and Sperry hosts are supported. Remote controllers communicate with the host over a telecommunications facility via a modem. The maximum cable length between the controller and the modem is 50 feet. The Lee Data Coax Eliminator feature allows up to eight devices to be attached to the Coax Eliminator via a single cable or twisted wire circuit. Installation distances can be extended indefinitely in multiples of 2500 feet when daisy chained together. Local controllers attach directly to the host via a byte multiplexer, selector, or block multiplexer channel.

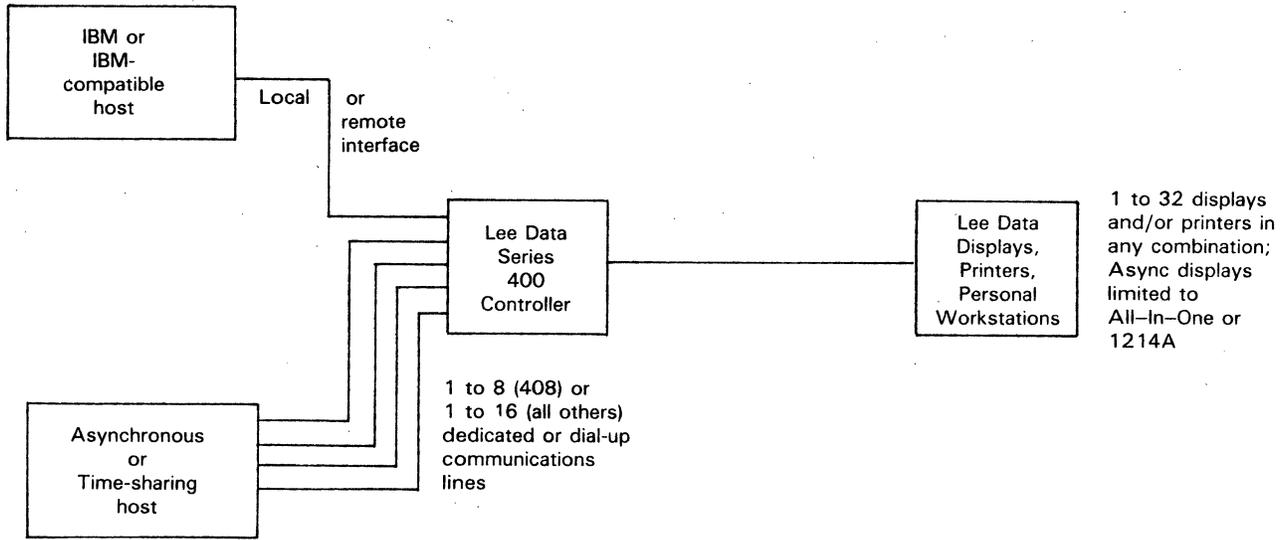
Personal computing capabilities can be added to both the Series 300 and Series 400. The Series 700 Personal Workstation is an attachment that can be added to a Lee Data display, providing IBM Personal Computer and PC XT compatibility. The Series 70 Personal Workstation is an IBM 3270-PC-compatible unit. Lee Data's PC Adapter is an expansion board that plugs into the IBM PC and enables it to communicate with the Series 300 and Series 400 controllers.

### TRANSMISSION SPECIFICATIONS

The Lee Data Series 300 and Series 400 (in 3270 mode) Remote Controllers perform transmission over common carrier nonswitched, point-to-point or multipoint networks. Transmission rates range from 2400 to 19,200 bps in both BSC and SNA/SDLC environments. An RS-232-C modem interface is provided. The Series 300 and Series 400 Local Controllers attach to IBM System/360, System/370, and 30XX processors through a byte multiplexer, selector or block multiplexer, or to any 4300 processor through a byte multiplexer or block multiplexer channel. In the Series 400 Async mode, the asynchronous ports connect to dial-up or dedicated modems, or attach directly to the computer, mini-computer, or time-sharing service. The ports provide RS-232-C interfaces. Automatic dialing is supported. The communication link may be over common carrier non-switched or dial-up point-to-point networks. Transmission rates from 300 to 9600 bps are operator-selectable.

## Lee Data Series 300 and Series 400 Display Systems

Series 400 Configuration Diagram



Since its entry into the 3270 market in 1979, Lee Data has *not* been a typical 3270-compatible independent vendor. Almost from its first product offerings, Lee Data has been an innovator, integrating multifunctional capabilities into its terminal systems. As was mentioned previously in this report, it was the first vendor to add personal computing capabilities to a standard 3270 terminal cluster. Other innovations followed, including the Coax Eliminator, All-In-One Display, Series 400 with 3270 and Async communications, and dual host capability on a single control unit. Now, the company has added a display terminal with windowing capabilities (Model 1221 Open Window Display) and an IBM 3270-PC emulator (Series 70 Personal Workstation), as well as allowing for the attachment of the IBM PC to a Lee Data controller. These products give Lee Data the most complete and multifunctional product line in the 3270 world; of the independents, only ITT Courier even comes close. Lee Data has paved the way for what should be many years of success in this market.

### USER REACTION

In the 1983 Datapro Terminal Users' Survey, conducted in conjunction with *Data Communications* magazine, a total of four responses were received from users of Lee Data display systems; all of these users reported on the Series 300. The user represented an installed base of 118 display terminals, including the 1216, 1218, and 1220 models. The ratings given to these display systems are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	1	1	0	3.3
Ease of operation	2	2	0	0	3.5
Display clarity	2	1	1	0	3.3
Keyboard feel & usability	2	1	1	0	3.3
Ergonomics	2	1	1	0	3.3
Hardware reliability	2	2	0	0	3.5
Maintenance service/technical support	1	2	1	0	3.0

\*Weighted Average based on a scale of 4.0 for Excellent.

### DEVICE CONTROL

The Series 300 and Series 400 begin operation after the Initial Program Load (Initial Machine Load for the Model 306 Remote Controller). Programs are entered from a diskette into the system controller. Three modes of operation are available: On-line, Local Command, and Utility modes.

**On-line Mode** provides for 3270 mode operation in Series 300 systems, and for either 3270 mode or Async mode operation in Series 400 systems. In a dual host system, it also provides for primary or secondary mode operation. In On-line mode, a display station or printer communicates directly with either a 3270 host system and resident application, or with one of several asynchronous hosts, minicomputers, or time-sharing services. On-line functions that can be performed include data processing, data entry, program development, viewing, and editing.

**In Local Command mode**, the system controller controls the display stations and printers. The following operations are permitted: transferring data from the display screen to the printer; sending local information messages from one station to another, or to all stations; testing display stations and printers; reassigning printers to display stations for local printing functions; redefining display station or printer addresses to allow their use at other host-recognized addresses; monitoring communications between the host and a controller from a display connected to the controller; displaying system performance statistics such as the number of blocks transmitted and received; and switching between hosts in a dual host system. Local Command mode also allows for the display of the system's Configuration Table, which reports the current Logical Unit (LU) number and cable assignments for each display station and printer.

**In Utility mode**, the user can perform tasks necessary for normal system operation and can record problems with system operation. The following functions can be performed in Utility mode: preparation of new diskettes to receive data; creation of back-up copies of the system diskette; configuration of the system hardware and software to meet specific requirements; and recording of the contents of system controller memory to aid Lee Data service representatives in diagnosing problems.

### COMPONENTS

**SERIES 300 CONTROLLERS:** Six models are available: Model 306 Remote Controller, Model 308 Remote Control-

## Lee Data Series 300 and Series 400 Display Systems

The users also provided ratings for their terminal controllers. A total of eight controllers were in use, either Model 310 or Model 320. The ratings given to the controllers are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	1	3	0	0	3.3
Ease of installation	3	1	0	0	3.8
Ease of operation	2	2	0	0	3.5
Ease of expansion	2	1	1	0	3.3
Reliability of controller	1	3	0	0	3.3
Reliability of peripherals	1	1	1	0	3.0
Maintenance service/ technical support	1	3	0	0	3.3

\*Weighted Average based on a scale of 4.0 for Excellent.

When asked whether or not they would recommend Lee Data equipment to other users, all four users indicated that they would. □

ler, Model 310 Remote Controller, Model 320 Local Controller, Model 311 Remote/Remote Controller, and Model 321 Local/Remote Controller. All controller models support both BSC and SNA/SDLC protocols. Model 306 supports attachment of up to eight devices, and Model 308 supports attachment of up to 16 devices. All other controller models support the attachment of up to 32 devices. Models 311 and 321 are dual host controllers; they can interface with two separate host computers. Model 311 provides two remote interfaces; Model 321 provides one local and one remote interface. Both the Models 311 and 321 allow for concurrent BSC and SNA/SDLC operation. Any Lee Data display station or printer may be attached to any Series 300 controller; the Series 70 Personal Workstation, Series 700 Personal Workstation, and PC Adapter feature are also supported by the Series 300 controllers. All controller models include an integrated diskette drive and control panel. See the preceding Configuration section for additional information on the Series 300 controllers.

**SERIES 400 CONTROLLERS:** Five models are available: Model 408 Remote Controller, Model 410 Remote Controller, Model 411 Remote/Remote Controller, Model 420 Local Controller, and Model 421 Local/Remote Controller. All controller models provide two modes of operation: 3270 mode and Async mode. In 3270 mode, both BSC and SNA/SDLC protocols are supported. Model 408 supports the attachment of up to 16 devices for 3270 mode operation; in Async mode, eight devices may be active at one time. All other models support attachment of 32 devices for 3270 mode operation, or 16 devices in Async mode. Models 411 and 421 are dual host controllers, and can interface with two separate host computers, in addition to eight (Model 408) or 16 (all other models) asynchronous ports. Model 411 provides two remote interfaces; Model 421 provides one local and one remote interface. Models 411 and 421 allow for concurrent BSC and SNA/SDLC operation. Any Lee Data display station or printer may be attached to any Series 400 controller for 3270 mode operation; the Series 400 controllers also provide support for the Series 70 Personal Workstation, Series 700 Personal Workstation, and the PC Adapter feature. For Async mode operation, only the Lee Data All-In-One displays (except the 1214D) can operate as asynchronous display stations; all printer models may be used. All controller models include an integrated diskette drive and control panel. See the preceding Configuration section for more information on the Series 400 controllers.

**COAX ELIMINATOR:** Allows up to eight displays or printers to be connected to a single coaxial cable or twisted wire circuit from any Series 300 or Series 400 controller.

**MODEL 1214 DISPLAY TERMINAL:** Available in four models: 1214, 1214A, 1214B, and 1214D. All models feature a 14-inch tilt/swivel display screen and green phosphor characters. The 1214 provides a 1920-character (24 lines by 80 columns) display format and attaches to the Series 300 and Series 400 (3270 mode operation only) controllers. The 1214A provides a 1920-character display format and can attach to Series 300 and Series 400 controllers for 3270 mode and Async mode operation. The 1214B All-In-One display provides four selectable display formats: 1920-character (24 lines by 80 columns), 2560-character (32 lines by 80 columns), 3440-character (43 lines by 80 columns), and 3564-character (27 lines by 132 columns). The 1214B can attach to the Series 300 and Series 400 controllers for both 3270 mode and Async mode operation. The 1214D All-In-One display provides the four selectable display formats, and attaches to Series 300 and Series 400 (3270 mode only) controllers. The 1214 displays contain a smaller footprint size than the older Lee Data displays.

**MODEL 1216 DISPLAY TERMINAL:** An IBM 3178-compatible display that includes a 14-inch tilt/swivel display screen with green phosphor characters. The 1216 provides a 1920-character (24 lines by 80 columns) display format; an operator information line is available.

**MODEL 1218 DISPLAY TERMINAL:** An IBM 3278 Model 2-compatible display that includes a 15-inch tilt/swivel display screen with green phosphor characters. The 1218 provides a 1920-character (24 lines by 80 columns) display format; it can be optionally upgraded to an All-In-One display (with multiple selectable display formats) for use with a Series 400 controller in Async mode.

**MODEL 1220 ALL-IN-ONE DISPLAY TERMINAL:** Emulates the IBM 3278 Models 2, 3, 4, and 5. The 1220 includes a 15-inch tilt/swivel display screen with selectable formats of 1920 characters (24 lines by 80 columns), 2560 characters (32 lines by 80 columns), 3440 characters (43 lines by 80 columns), and 3564 characters (27 lines by 132 columns). An operator information line is standard. Characters are displayed in green phosphor. The 1220 can be used with both the Series 300 and Series 400 (3270 and Async mode) controllers.

**MODEL 1221 OPEN WINDOW (ALL-IN-ONE) DISPLAY TERMINAL:** Combines the All-In-One features of the Model 1220 (four selectable screen sizes) with windowing capabilities. The Model 1221 includes a 15-inch tilt/swivel display screen with green phosphor characters. Up to four windows can be displayed on the screen simultaneously, representing four interactive sessions. These sessions can be in any combination (3270 mode in BSC or SNA/SDLC, Async mode, remote or local). Each window set is a user-definable custom windowing format. Variables include the number of windows to be displayed, window location, and window size. Individual windows can zoom to a full screen, and data may be copied from window to window. An operator information status line is included, aiding in identification of the active window. In addition, a help menu can be accessed via a single keystroke.

**MODEL 1230 COLOR DISPLAY TERMINAL:** Emulates the IBM 3279 Model 2A. The Model 1230 includes a 15-inch tilt/swivel display screen, and features selectable two- (green and white) or four- (green, blue, red, and white) color display capability. A 1920-character (24 lines by 80 columns) display format is standard. The Model 1230 cannot be used with a Series 400 controller in Async mode.

**MODEL 1231 COLOR DISPLAY TERMINAL:** Emulates the IBM 3279 Model 3A. Like the Model 1230, the Model 1231 includes a 15-inch tilt/swivel display screen with two- or four-color display capability. Unlike the Model 1230, the Model 1231 features selectable display formats of 1920 (24

## Lee Data Series 300 and Series 400 Display Systems

lines by 80 columns) or 2560 (32 lines by 80 columns) characters. The Model 1231 cannot be used with a Series 400 controller in Async mode.

**1214 KEYBOARDS:** Two detachable keyboard styles are available for use with the 1214 display terminals, with 87 or 124 keys. Both models include a low-profile design and typewriter-style key layout.

**1216/1218/1220/1230/1231 KEYBOARDS:** Eleven keyboard styles are available. These include: 75-key EBCDIC Data Entry; 75-key EBCDIC Data Entry/Keypunch; 87-key EBCDIC Typewriter (IBM 3278-style); 87-key EBCDIC Typewriter (IBM 3277 Modified); 87-key EBCDIC Typewriter with Numeric Pad; 87-key EBCDIC Typewriter with APL; 87-key Console/Typewriter; 87-key Programmer's Typewriter; 87-key VT100-style; 87-key VT100/VT132-style; 87-key Personal Workstation/Asynchronous (for use with the Series 700 Personal Workstation feature). All keyboards are detachable.

**1221 KEYBOARD:** A detachable keyboard with 122 keys and a low-profile design is available for use with the Model 1221 Open Window display. The 1221 keyboard includes a single keystroke record/playback of 96-character strings capability for each window.

**SERIES 70 PERSONAL WORKSTATION:** Emulates the IBM 3270-PC. The Series 70 is a color graphics workstation for PC graphics as well as IBM 3279-S3G graphics applications. The unit attaches to Series 300 and Series 400 controllers; file transfer utilities are available to enable the transfer of files between the host computer and the Series 70. In PC Graphics mode, the Series 70 can display up to 16 colors for the creation of high resolution business graphics. With the IBM 3279-S3G emulation feature, the Series 70 can access and display host graphics, support programmed symbol sets, and display up to eight colors. Windowing is also supported; up to seven windows can be displayed simultaneously (four interactive sessions, a personal computer session, and two note pads). Both 3270 mode and Async mode sessions can be run simultaneously, and data can be transferred from window to window. A minimum configuration of the Series 70 includes a color monitor, 122-key low-profile keyboard (same as the Model 1221), 128K RAM, one disk drive, and support for PC graphics and windowing.

**SERIES 700 PERSONAL WORKSTATION:** Compatible with the IBM Personal Computer and the PC XT. The Series 700 feature consists of a base unit, which includes an 8088 CPU, 8088-based system adapter, and a 5/4-inch double-sided, double-density diskette drive. A second diskette drive is optionally available. The Series 700 feature attaches to any Lee Data monochrome display, including the All-In-One displays. Two Lee Data utility programs permit transfer of data between the Series 700 and the host computer. The Screen Save utility permits writing of a screenful of data from a 3270 or Async system to a diskette. The File Transfer utility transfers a data file between a 3270 system and the Series 700 diskette. The Series 700 can switch from personal computer functions to terminal functions via a single keystroke.

**PC ADAPTER:** An add-on board that plugs into an expansion slot of the IBM Personal Computer, enabling the PC to connect to a Series 300 or Series 400 controller. The PC Adapter feature can also be used with the IBM PC, PC XT, AT&T Personal Computer, or any IBM PC-compatible microcomputer.

**HEWLETT-PACKARD 2624B EMULATION OPTION:** An option that allows a 1221 display to emulate a Hewlett-Packard 2624B display station.

**MODEL 1316 STATION PRINTER:** Emulates the IBM Personal Computer Printer. The Model 1316 attaches directly to a Lee Data display station or personal workstation. Maximum print speed is 80 cps, and line length is 80 characters. The 1316 uses 8½-inch wide fanfold paper, and prints up to three copies. Vertical spacing is six or eight lpi. The 1316 operates in the SNA Character String (SCS) and the Data Stream Compatibility (DSC) modes.

**MODEL 1350/1360 MATRIX PRINTERS:** Compatible with the IBM 3287. Maximum print speed is 180 cps for the 1350, and 340 cps for the 1360. Line length is 132 characters. Up to six copies may be printed on fanfold paper. Vertical spacing is six or eight lpi. The 1350 and 1360 operate in both SCS and DSC modes, and connect to any Series 300 or Series 400 controller.

**MODEL 1370 LETTER QUALITY PRINTER:** Compatible with the IBM 3287. The 1370 provides letter quality output at 50 cps, and accepts a variety of 10- and 12-pitch fonts. Bond paper or fanfold forms are automatically fed, and up to six copies can be generated. Horizontal spacing is selectable at 10, 12, or 15 cpi, and vertical spacing is selectable at 6 or 8 lpi. The 1370 operates in both SCS and DSC modes, and connects to any Series 300 or Series 400 controller.

**MODEL 1380 LINE PRINTER:** Compatible with the IBM 3287. The 1380 features a maximum print speed of 300 lpi, and prints 132-character lines. Up to six copies may be generated on fanfold paper. Horizontal spacing of 10, 12, or 15 cpi can be selected, and vertical spacing of 6 or 8 lpi is likewise selectable. The 1380 operates in both SCS and DSC modes, and connects to any Series 300 or Series 400 controller. A Printer Controller is required to provide an interface between the 1380 and the system controller.

### PRICING

Lee Data Series 300 and Series 400 Display Systems are available for purchase, or on a lease basis. Maintenance service is provided through Lee Data's Customer Service organization, with locations in 80 cities in the United States. A variety of maintenance plans are available.

Lee Data does not provide detailed pricing information for publication, but did provide the following single quantity purchase prices for some of their newer components. For more detailed pricing information, contact Lee Data or your local Lee Data sales office.

Models	Purchase Price (\$)
Model 408 Remote Controller	8,075
Model 1214 Display Terminal	1,462
Model 1214A Display Terminal	1,762
Model 1214B All-In-One Display Terminal	1,862
Model 1214D All-In-One Display Terminal	2,162
Series 70 Personal Workstation (including color monitor, keyboard, 128K RAM, diskette drive, and support for host graphics)	5,646
Series 70 Personal Workstation (including color monitor, keyboard, 128K RAM, diskette drive, and support for windowing and PC graphics)	5,711
PC Adapter	1,150 ■

# Lee Data Corporation Series 300 Display Systems

## MANAGEMENT SUMMARY

The Lee Data Corporation (LDC) Series 300 interactive display systems are designed for compatibility with the IBM 3270 Information Display System. The series consists of two separate systems: the Model 310 Remote Display System and the Model 320 Local Display System. Both systems feature the operating characteristics and features of an IBM 3274 Control Unit and IBM 3278 Display Stations.

The Model 310 Control Unit with the operating characteristics of the 3274-1C or 51C, allows for remote clusters of devices supported by telecommunications using a communications facility via a modem. The second control unit, the Model 320, is a locally controlled system with the operating characteristics of the 3274 Models 1A, 1B, and 1D.

The terminals used on the Lee Data systems are the company's All-In-One SOFTPRINT Displays. The display can emulate four formats, compatible with the 3278 Models 2, 3, 4, and 5. The SOFTPRINT Display offers the standard 24-line by 80-column format, for a total of 1920 displayable characters. Also offered are expansion to a 32-line by 80-column format; a 43-line by 80-column format; and a 27-line by 132-column format. Characters are displayed in green on a dark background, and formed through the use of a 7-by-9 dot matrix (7-by-8 dot matrix for the Model 4). Five keyboard styles are provided, all of which are detachable from the display station via a 6-foot cable. Three styles are compatible with the 3278 keyboards; an 87-key EBCDIC typewriter layout, a 75-key EBCDIC data entry layout, and a 75-key EBCDIC data entry keypunch layout. The fourth style keyboard available is similar to the IBM 3277 keyboard layout, which reduces awkward keyboard shifting. The fifth style is the Numeric Pad keyboard on the 87-key EBCDIC layout, which facilitates easier numerical entries for accounting applications.

A family of IBM 3270-compatible clustered terminal systems.

The Series 300 is available as a remote or local display system and features a 3274-compatible control unit and a display which can be configured from the keyboard in one of four IBM 3278-compatible formats. Depending on the display station chosen, as many as 3564 characters can be displayed. Line capacity varies from 24 to 43, and 80 and 132-column formats are available. Five keyboard styles are provided. Up to 32 devices can be attached to the controller, in any mix of display stations and printers.

A typical configuration, including a Model 310 remote control unit and seven display stations, is available for a monthly rental of \$883.

## CHARACTERISTICS

**VENDOR:** Lee Data Corporation, 10206 Crosstown Circle, Minneapolis, MN 55344. Telephone (612) 932-0300.

**DATE OF ANNOUNCEMENT:** Model 310—August 1979; Model 320—May 1980.

**DATE OF FIRST DELIVERY:** Model 310—October 1979; Model 320—June 1980.

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** Lee Data Corporation.

## CONFIGURATION

Two separate systems are available in the Series 300: the Model 310 Remote Display System and the Model 320 Local Display System. The Model 310 Control Unit allows for remote clusters of devices supported by telecommunications using a communications facility via a modem. The maximum cable length between the controller and the



Lee Data Corporation's Model 310 Remote Control Unit is shown here flanked by two of the company's All-In-One SOFTPRINT Display Stations. The Model 310 Remote Display System allows for remote clusters of devices (up to 32, including any mix of display stations and printers). The system emulates the operating characteristics and features of the IBM 3270 Information Display System.

## Lee Data Corporation Series 300 Display Systems

▷ LDC's Coax Eliminator can be added to either Series 300 system to reduce the user's dependence on coax cable for connecting displays to the control unit. Up to eight SOFTPRINT displays (or printers) can be connected to one coax cable or one twisted wire circuit from any LDC 3274-compatible controller.

Lee Data also provides an optional matrix printer for connection to the Series 300 systems. Standard features on the printer are: print speeds of 120 characters per second (45 to 225 lines per minute depending on length of print lines) or 180 characters per second (75 to 370 lines per minute); full 132-character line width; 6/8 lines per inch; 94 EBCDIC character set; 7-by-7 dot matrix characters, and bidirectional printing.

All of the LDC components are under microprocessor control. Lee Data was formed in April 1979, and introduced its first product in the 3270-compatible marketplace, the Model 310 Remote Display System, in October 1979. Service is provided by LDC through the company's Field Service System (FSS).□

▶ modem is 50 feet. The Model 320 Control Unit is a locally controlled system with the operating characteristics of the IBM 3274 Control Units Models 1A, 1B, or 1D. The Model 320 attaches to the IBM 370/115 through 370/168, and 30XX processors via a byte multiplexer, selector, or block multiplexer channel, or any IBM 4300 processor via a byte multiplexer or block multiplexer channel. Each system can support up to 32 devices including any mix of display stations and printers. LDC's All-In-One SOFTPRINT Displays support four display formats, and a choice of five keyboards. The optional matrix printer offers a choice of two print speeds.

### TRANSMISSION SPECIFICATIONS

The Model 310 Remote Display System supports compatible IBM data communications using a BSC or SNA/SDLC protocol at line speeds from 2,000 to 19,200 bits per second. Modem connection is via an RS-232-C interface. The unit emulates the IBM 3270 operating mode. Transmission is point-to-point or multi-point over dedicated facilities. The Model 320 Local Display System locally attaches to an IBM 370/303X channel via a byte multiplexer, selector, or block multiplexer channel. The unit can also be attached to an IBM 4300 processor via a byte multiplexer or block multiplexer channel.

### DEVICE CONTROL

A 16-bit microprocessor with 32K RAM memory performs the central control functions of the Series 300. Eight-bit microprocessors are designed into the display station, printer, and functional areas of the system controller.

The Series 300 operates under the control of programs stored in the host computer and provides complete compatibility with the addressing sequence, command code structure, and line discipline employed by the IBM 3270 Information Display System. The system responds to and executes the full repertoire of 3270 commands via its control unit.

Cursor control is functionally the same as the IBM 3278. The microprocessor in the display station positions the cursor up, down, left, right, either step by step or repetitive with a slow speed and a high speed movement. Cursor addressability is standard.

Program function and program attention keys, standard on the 3278, are also standard on the LDC systems. Each of these keys generates a unique code that is recognized by the controlling software as a specific program request or identifier. The program function code accompanies the display data as it is transmitted to the computer, or is transmitted separately.

The system controller, display stations, and printers, have embedded diagnostics which operate each time the controller or display unit is powered on. This is accomplished by utilizing the microprocessor structure of the system. If a problem is detected, an error describing the problem will be reported to the operator.

### COMPONENTS

**CONTROL UNITS:** Two control units are available: the Model 310 Remote Control Unit, and the Model 320 Local Control Unit. A 16-bit microprocessor performs the central functions for both models. The Model 310 allows for communications with remote clusters of devices over a communications facility through the use of a modem. The Model 320 attaches to the IBM 370/115 through 370/168, 3031, 3032, and 3033 processors via a byte multiplexer channel, selector channel, or block multiplexer channel, or any IBM 4300 processor via a byte multiplexer or block multiplexer channel. A single diskette drive unit is housed in the system controller for program loading and storage. Up to 32 devices, including any mix of display stations and printers, can be attached to either control unit.

**DISPLAY STATIONS:** A choice of four screen formats are available, compatible with IBM 3278 Models 2, 3, 4, and 5. All models are available with an anti-glare screen which displays characters in green on a dark background. A 94-character EBCDIC set is displayed, including upper and lower case, numerics, and special symbols. Standard features on the LDC SOFTPRINT Displays include local print, local message transfer, local commands, and embedded diagnostics. The following chart shows the selectable screen sizes and their corresponding screen formats:

	Model 2	Model 3	Model 4	Model 5
Total Displayable Characters	1920	2560	3440	3564
Lines per Display	24	32	43	27
Characters per Line	80	80	80	132
Dot Matrix	7 x 9	7 x 9	7 x 8	7 x 9

LDC provides, as an option, their Coax Eliminator, to reduce user dependence on coax cable. Up to eight displays (or printers) can be connected to one coax cable or one twisted wire circuit from any LDC controller.

**KEYBOARDS:** Five keyboard styles are available. Three styles are compatible with the 3278: an 87-key EBCDIC typewriter layout, a 75-key EBCDIC data entry, and a 75-key EBCDIC data entry keypunch layout. The fourth style available is an IBM 3277 display station compatible layout, which helps to reduce keyboard shifting. The fifth style is an 87-key EBCDIC layout with a 12-key numeric pad, for accounting applications. All keyboards are detachable from the console via a 6 foot cable. Features include cursor selection and audible key clicks.

**PRINTER:** Standard features for the optional matrix printer include print speeds of 120 cps (45 to 225 lines per minute depending on length of print lines) or 180 cps (75 to ▶

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▶ 370 lines per minute); full 132-character line width; 6/8 lines per inch; 94-character EBCDIC set; microprocessor electronics; 7-by-7 dot matrix characters; and bidirectional printing, which eliminates carriage returns. The printer is connected to the system via industry standard coaxial cable.

### PRICING

Lee Data systems are available for lease or purchase. The company declined to provide detailed pricing, but did provide the following monthly rental figures for a typical system on a one year lease. Prices include installation and prime shift maintenance. Maintenance is provided by LDC through their Field Service System.

<u>Configuration</u>	<u>Monthly Rental</u>
Model 310 Control Unit with 7 All-In-One Display Stations	\$ 883
Model 320 Control Unit with 7 All-In-One Display Stations	\$1,124
Model 310 Control Unit with 4 All-In-One Displays and one 120 cps Printer	\$ 790■

