AST Research Communications Cards

All of the AST communications products include an adapter card that fits into a single IBM PC expansion slot, software diskette, and documentation. The AST-5251, above, allows an IBM PC to emulate an IBM 5251 display terminal, for interactive communications with an IBM System/34, System/36 or System/38 computer system.

In this report, we cover a series of emulation products for the IBM Personal Computer.

MODELS: AST's communications card line comprises three emulation products, the AST-3780, the AST-5251, and the AST-SNA; AST's version of PCnet, for local area networking; and the AST-PCOX.
CONVERSION: AST-3780 allows IBM PC to emulate an IBM 2780, 3780, 2770, or 3741; AST-5251 allows IBM PC to appear as an IBM 5251 Model 12; AST-PCnet is CSMA/CD-based local area networking product for linking IBM PCs; AST-SNA permits IBM PC to act as IBM 3270 Information Display System; AST-PCOX allows IBM-PC to function as a 3278/3279 terminal.
TRANSMISSION RATES: AST-3780—up to 19.2K bps; AST-5251—from 1200 to 9600 bps; AST-PCnet—up to 1M bps; AST-SNA—up to 4800 bps; AST-PCOX—up to 2.36M bps.
COMPETITION: General-purpose expansion card area—Microsoft, Quadram; communications card area—IBM, Tecmar, Techland.
PRICE: AST's hardware/software communications products are available for purchase only. Purchase prices range from $695 to $1,195, which includes the plug-in card, software diskette, and manuals.

MANAGEMENT SUMMARY

AST Research, Inc. was originally founded in April 1980 as AST Associates, an electronic design consultancy. After the introduction of the IBM PC in August 1981, the company decided to alter its charter and direct its efforts toward capturing a share of the PC aftermarket. The decision turned out to be pivotal: AST's revenues rose from $2,000 in December 1981 to over $100,000 in June 1982. In three to five years, the company projects $200 million in annual revenues.

AST's original PC products included memory expansion and interface cards. The company entered the communications products business in late 1982 with the announcement of the AST-3780 and the AST-SNA. Although both models were announced concurrently, only the AST-3780 was subsequently delivered. At the time of this writing, the AST-SNA is still in beta test, at 30 locations. Just four months after delivering the AST-3780, AST began shipments of its next two communications products, the AST-5251 and the AST-PCnet. The company's most recent offering is the AST-PCOX 3278/3279 Terminal Emulator.

CHARACTERISTICS

VENDOR: AST Research, Inc., 2121 Alton Avenue, Irvine, CA 92714. Telephone (714) 863-1333. In Canada: Digitrol Computers, Inc., 440 Philips Street, Waterloo, Ontario N2L 5R9. Telephone (519) 884-4541.

DATE OF FIRST ANNOUNCEMENT: AST-3780—December 1982; AST-5251—April 1983; AST-PCnet—April 1983; AST-SNA—December 1982; AST-PCOX—third quarter 1983.

DATE OF FIRST DELIVERY: AST-3780—May 1982; AST-5251—May 1983; AST-PCnet—May 1983; AST-SNA—in beta test; AST-COX—third quarter 1983.

NUMBER INSTALLED TO DATE: AST-3780—1000; AST-5251—650; AST-PCnet—3300; AST-SNA—30 beta test sites; AST-PCOX—information not available.

MODELS

The AST Research, Inc. communications products are a series of add-on cards for the IBM Personal Computer. These cards plug directly into the computer expansion chassis, and come equipped with software on diskette.

Currently, AST Research offers five communications products:

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The AST-3780 enables the PC to emulate a remote job entry (RJE) terminal in a Binary Synchronous Communications (BSC) environment. The AST-5251 provides emulation of an IBM 5251 Model 12 for connection to an IBM System/34, System/36 or System/38. The AST-PCnet is a local area networking product made available from AST through a licensing agreement with the product's originator, Orchid Technology. The AST-SNA provides emulation of an IBM 3270 Information System, for operation in a IBM Systems Network Architecture (SNA) network. AST-PCOX interfaces the IBM PC to an IBM 3274/3276 cluster controller via the Coax-A keyboard/display.

All of the units covered in this report have various minimum hardware requirements for system operation. The AST-3780 requires a PC with at least 64K of RAM, one diskette drive, a CC-432 synchronous communications (included with the AST-3780), and either a color/graphics or monochrome monitor. The system can also accommodate a printer. The AST-5251 also requires a PC with 64K of RAM, as well as a CC-432 synchronous communications card (included with AST-5251), a diskette adapter card, at least one diskette drive, and either a monochrome or color/graphics adapter card and an 80-character by 25-line display. If printer support is desired, the AST 5251 requires a parallel printer port and an IBM-compatible printer.

The AST-PCnet minimum requirements are similar to the AST-5251 requirements, except that the AST-PCnet package also includes a special PCnet adapter card.

The AST-SNA, as well as the Professional Workstation Program on AST-PCOX, needs an IBM PC with 128K bytes of memory. Other AST-SNA requirements include a diskette adapter card; at least one diskette drive; a monochrome adapter card and an 80-character by 25-line display; a synchronous communication board with RS-232-C interface connector; a mass-terminated DB25 cable; and an IBM or IBM-compatible host system that supports remote SNA 3270 attachments. AST-SNA supports several parallel printers: IBM and Epson 80-cps matrix models, as well as the NEC Spinwriter Model 3550.

The AST-PCOX requires an IBM PC or PC XT with a minimum of 64K bytes of memory, one disk drive, PC-DOS Version 1.1 or 2.0, and a monochrome or color display with adapter. PCOX will run on some, but not all, IBM-PC compatible computers.

COMPETITIVE POSITION

AST Research ranks among the leaders in the microcomputer expansion card business, by our assessment and substantiated by the results compiled during Datapro's 1983 Microcomputer User Survey. The company was quick to realize the impact IBM's PC would have on the microcomputer market, and has since engineered a full line of PC and XT compatible products. AST garnered over 20 percent of the responses received for plug-in expansion cards, placing it second behind Microsoft. Other leaders in the general-purpose expansion card market are numerous;

- **AST-3780—an emulation product that permits the IBM PC to communicate in Binary Synchronous Communications (BSC) protocol. Using the AST-3780, the PC can emulate all common BSC RJE workstations: the IBM 2780, the IBM 3780, the IBM 2770, and the IBM 3741.**
- **AST-5251—an emulation product that permits an IBM PC to appear as an IBM 5251 Model 12, for communications with an IBM System/34, System/36, or System/38 computing system.**
- **AST-PCnet—a baseband CSMA/CD-based local area networking product for linking IBM PCs. Using PCnet, resources such as hard disk units, printers, and databases can be shared among linked PCs. Communications on the network is at rates up to 1M bps.**
- **AST-SNA—an emulation product that permits an IBM PC to act as an IBM 3270 Information Display System functioning in an SNA environment. The AST-SNA supports the SDLC protocols used by the IBM 3274 and 3276 Control Units.**
- **AST-PCOX—an IBM PC to 3274/3276 Coax-A interface that allows the PC to function as a 3278/3279 terminal. Using AST-PCOX, the IBM PC emulates IBM 3278 Models 2, 3, or 4 attached to a 3274/3276 cluster controller.**

TRANSMISSION SPECIFICATIONS

AST-3780. **The AST-3780 can communicate with the following systems, among others: IBM System/34, System/36, System 38, and Series/1; IBM System 360, System 370, and 4300; IBM 2780 and 3780 RJE terminals; the IBM Personal Computer; Digital Equipment Corporation (DEC) System 20, PDP-10, PDP-11, or VAX systems; and Honeywell and Wang computer systems.**

Communications with the host system can be local or remote. All transmit and receive clocking signals are provided by modems. For local communications, the CC-432 card can be configured for operation with a null modem, or modem eliminator, for distances less than 50 feet. If the distance between the terminal and the host is more on the line of several thousand feet, a pair of limited distance modems (line drivers) are required. If the AST-3780 is communicating with the host computer from a remote site using telephone company facilities, any synchronous modem may be used; however, AST recommends the Bell 201 or Universal Data Systems (UDS) 201B/C for 2400 bps communications, or the Bell 208 or UDS 208A/B for 4800 bps communications.

Communication is synchronous, in half-duplex mode. Switched or nonswitched, half- or full-duplex lines may be used. Using the AST-3780 package, line speeds of up to 19.2K bps can be attained. ASCII/EBCDIC conversion is automatic.

AST-5251. **The AST-5251 can communicate with the IBM System/34, System/36, or System/38 host computers.**

Communications is under the IBM-supplied remote workstation support for the IBM 5251 Model 12 display. In addition, an optional interface is available for bidirectional file transfers between the PC and the host computer.

Communication with the host system is through synchronous modems, limited distance modems, or the modem eliminator configuration of the CC-432 card. The CC-432 card includes a low power null modem, for RS-232-C communications with a local computer over distances of 50 feet or less.

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these include Quadram, Mountain Computer, and Seattle Computer. However, AST faces less competition in the communications expansion card area; IBM, Tecmar, and Techland are AST's main competitors in this undeveloped marketplace.

AST was wise to recognize the microcomputer communications area as being an unexplored, potentially huge market. The types of communications products AST subsequently provided are geared for a specific, very important application: the gradual integration of PCs into large-scale, IBM-oriented communications networks. The desire and need for local processing within specific corporate departments is obvious; the ability to supplement this local computing power with access to the corporate mainframe provides users with the best of both worlds.

AST has done well to penetrate this lucrative market so quickly. The company has displayed an aggressive advertising policy and a reputation for delivering high-quality products. The company's memory-oriented expansion cards received these ratings from the 199 users who responded to Datapro's survey, on a scale of 4.0 for Excellent: Ease of Use, 3.7; Ease of Installation, 3.6; Documentation, 2.8; Vendor Support, 3.0; and Overall Performance, 3.5. Using this user reaction as a barometer, we predict that AST should not have any problem maintaining its market position.

ADVANTAGES AND RESTRICTIONS

AST's communications boards provide users with key types of IBM emulation. There are still more BSC-based IBM networks in existence than any other. The AST-3780 enables the PC to emulate the most popular IBM's RJE workstations: the 2780, the 3780, the 2770, and the 3741.

Eventually, IBM's currently marketed architectural scheme, SNA, will dominate the networking world. AST's SNA product enables a PC to emulate several types of SNA communications; the product is also multifunctional, enabling many types of emulations to be performed from a single PC. With AST-SNA, a PC is able to act as an IBM

Communication with the AST-5251 is synchronous at line speeds from 1200 to 9600 bps. Operation is over switched or nonswitched, point-to-point or multipoint facilities.

AST-PCnet. **The AST-PCnet permits communications among linked IBM PCs over a distributed bus network, using the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) local networking technique. Transmission is up to 1M bps. The network has the ability to address up to 64,000 PCs.**

PCnet utilizes standard 75-ohm coaxial cable as the medium. Cable types may be mixed within the network. For direct connection to the PCs, light, flexible RG 59B/U cable is used, which can extend up to 3000 feet. For long, fixed runs, the heavier RG 11/U cable is used, and can be extended up to 7000 feet.

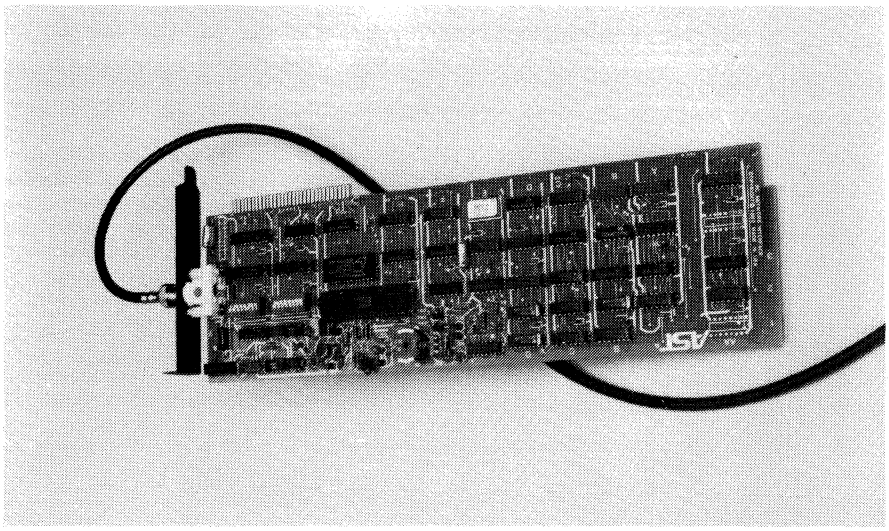
AST-SNA. **AST-SNA can communicate with any host system that supports remote IBM 3270 SNA attachment. Using AST-SNA, the PC is provided with the standard capabilities of the following terminals: the IBM 3274 Model 51C, Configuration B; the IBM 3278 Model 2 or 3279 Model 2A Display Station with 87-key EBCDIC keyboard; and, optionally, the IBM 3287 Model 2 Printer.**

Communication with AST-SNA is synchronous, in half- or full-duplex. As with all SNA communications, the SDLC protocol is used. Transmission speed is up to 4800 bps, using compatible synchronous modems at each end. Operation may be over switched or nonswitched facilities.

AST-PCOX. **The AST-PCOX connects with a channel-attached IBM 3274 cluster controller or remote BSC or SDLC 3274/3276 cluster controller through IBM Category A, 93-ohm coaxial cable. The 3278/3279 emulation is accomplished through an AST-PCOX processor board running in conjunction with software on the IBM PC. The processor can handle up to 2.36M bps transmission rates.**

PCOX uses Direct Memory Access (DMA) to transmit data from the AST-PCOX board directly into the PC memory. The DMA interface is a standard IBM bus interface. The AST-PCOX board has two sets of configuration jumpers: 2E/X or 3E/X sets input/output port addresses for the AST-PCOX; DRQ1/DACK 1 or DRQ3/DACK 3 jumpers set DMA on channels one or three.

The PCOX interface has its own processor, which operates independently of the PC; therefore, the emulated terminal can remain on line with the host while the PC performs local functions.



The AST-PCnet is a CSMA/CD-based local area networking product. Over 64,000 PCs can be addressed. Transmission is up to 1M bps, over 75 ohm coaxial cable. The network cable can be up to 7000 feet in length. Network features include disk sharing, file locking, and datagram message service.

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3270 Information Display System, which has the largest installed base of any other terminal on the market. The AST-SNA also can be configured with the following, valuable options: the ability to emulate an IBM 3770 Communications Terminal for batch data transfer operation; the ability to support multiple PCs; and the ability to support multiple ASCII terminals.

AST also recognized the large installed base of System/34 and System/38 computer systems and the future of the System/36. Its AST-5251 enables a PC to act as a remotely attached IBM 5251 display terminal, supporting all key functions. The AST-5251 may coexist with 5251 terminal clusters.

The local area networking (LAN) market is one of the fastest growing in data communications. AST made a key move by licensing PCnet software, a developed LAN scheme for PCs, from Orchid Technology. PCnet is one of the best PC LAN products available. It not only enables users to share files, but also often-expensive, common peripherals such as printers and communications lines. PCnet's maximum transmission rate of 1M bps is satisfactory for most corporate applications. □

DEVICE CONTROL

AST-3780. The AST-3780's CC-432 card occupies 16 contiguous locations in the PC's I/O address space. The card uses interrupt line IRQ-2; if this line is in use, the card must be configured for an unused IRQ line. The CC-432 card requires an RS-232 cable with at least 10 connectors.

After the CC-432 card is in place, the AST-3780 system must be tailored to match certain host system characteristics. The following parameters must be set: Emulation Mode (2780, 3780, 3741, or 3780); Space Compression (On/Off); Records per Block (80 to 512 bytes); Transparent Operation (0 through 3); Device Codes (numeric, e.g., DC2/DC1); Printer Initialize (character string); Command File Name (DOS file name); and Interrupt Request Line (2 through 7). All commands are entered in uppercase only; keyboard data or file contents may be transmitted in upper/lower case.

All files that may be stored on a PC-DOS diskette can be transferred to and from the host system. The AST-3780 may be operated in interactive or batch mode.

AST-3780 INTERACTIVE OPERATION: The interactive (keyboard-driven) subprogram is entered by typing "IP" in response to the DOS prompt. The operator is then presented with a main menu of selections, including Transmit, Receive, and Return To PC-DOS. The emulator is incapable of simultaneous transmission and reception. The emulator provides information on the status of communications, displaying one of the following: Idle, Line Request, Remote Ready, Transmitting, Finishing—Wait, Receiving, Remote Delay, Waiting/Complete, or Remote Disconnect.

The AST-3780 has the ability to transmit directly from the keyboard, for entering short job streams or sending commands to the system spooler. In addition, the sending of files longer than one diskette or disk volume is facilitated. During transmission, the AST-3780 may be forced to interrupt or terminate transmission by the host. The AST-3780 will automatically terminate transmission upon receipt of the Reverse Interrupt command from the host, and display a message in the status field. Also, if a contention situation exists, i.e., both the host and the AST-3780 attempt to transmit at the same time, a Remote Contending message will appear on the PC screen.

In Receive Mode, the AST-3780 may configure the PC to receive at the display, to storage, or to the printer. The AST-3780 may also be configured to automatically receive files, numbering them sequentially as they are received.

AST-3780 BATCH OPERATION: The file-driven (batch) subprogram is initiated by typing "CP" in response to the DOS prompt. To operate in batch mode, the operator creates a program file called the Command Processor (CP), which contains a series of operating instructions. The CP provides automatic, unattended operation of the emulator, performing the keystroke functions of the interactive version. A total of 13 commands (e.g., Transmit, Set Transmission Mode) can be configured.

AST-5251. The AST-5251's CC-432 card occupies 16 contiguous locations in the PC's I/O address space and, like the AST-3780's CC-432 card, is initially configured to use interrupt line IRQ-2. When shipped, the CC-432 is configured as a Data Terminal Equipment (DTE) device, to receive transmit and receive timing from a Data Circuit-terminating Device (DCE). The CC-432 may also be configured as a DCE device using a set of pin pairs located at the top of the card. This is to eliminate the need for a modem or null modem when it is connected to another DTE device. When configured as a DCE, the CC-432 provides the transmit and receive clocks to the connected DTE.

A batch file must be created before AST-5251 operations. Included within the batch file are the following parameters: the SDLC station address, by which the host system recognizes the remote device; the line speed, between 1200 and 9600 bps; whether a parallel printer is to be used; whether NRZI encoding is to be used; and whether trace information (i.e., line trace and SNA buffer trace) should appear on the display's 25th line.

After these parameters are set, the emulator program is loaded, and the communications link between the PC and the host is initiated, the host recognizes the AST-5251 as an IBM 5251 Model 12 Display Station. Keyboard functions of the PC are nearly identical to the IBM 5251. A keyboard template is provided with the AST-5251, to aid in locating 5251 functions. After it is determined that the AST-5251 is operating properly, the PC must be configured for System 34/36/38 connection, in exactly the same manner as an ordinary IBM 5251 Model 12.

The AST-5251 supports nearly all IBM 5251 Model 12 functions, with the following exceptions: Cluster Feature #2550 and Dual Cluster feature #2551 are not supported beyond the attachment of a printer; Expanded Functions feature #3600, which includes support for a magnetic stripe reader (MSR), selector light pen, copy to printer, and Modulus 10/11 self-check numbers; and Keylock feature #4655. Printable characters on the AST-5251 are limited to the 96-character ASCII set; an error condition is not returned for unprintable characters. Also, some special characters are unable to be displayed on the PC, and are replaced by a different set of symbols. If a monochrome display is used, some 5251 display attributes are not supported.

However, the AST-5251 provides some features not found on the IBM 5251. These include an audible keystroke error indication, a typamatic Delete key, and an optional interface for bidirectional file transfers between the PC and the host system. An Emulator Transfer Utility (ETU) is available, that provides a disk access subsystem for the user during host sessions.

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AST-PCnet. The AST-PCnet adapter is a single board that occupies any expansion slot in the PCs to be linked. Each PCnet adapter has a series of switches that must be set to define each PC's network address; this Network Identification number consists of four hex digits. After the PCnet adapters are in place, the PCs must be interconnected with coaxial cables.

Up to 65,535 unique PC addresses can be configured with PCnet. However, since only one cable per network can be supported, the maximum number of PCs linked to the network is dependent on application bandwidth needs.

PCnet software requires that linked PCs be split into two types, shared PCs and user PCs. Both types can contain floppy, hard, and RAM disk storage units. *Shared PCs (sPCs)* can contain disk storage units shared among PCs on the network. *User PCs (uPCs)* are individual workstations whose disk units cannot be shared by other PCs on the network.

Two levels of software support are provided with PCnet, PC-DOS interface support and CSMA/CD interface support.

The PC-DOS software support provides the following functions:

- File sharing. The PC-DOS interface allows uPCs to share PC-DOS volumes on hard, floppy, or RAM disks connected to an sPC. The sPC program allows the setting up of uPC access permission for each disk volume. These volumes appear to the uPCs on the network as locally attached. Disk volume sharing functions include file transfer, file creation, and on-line reconfiguration of shared files. Data transfer between sPCs must occur via a uPC that has access to both.

- The sharing of common peripherals such as printers and communications lines. These can be attached either to sPCs or uPCs and operate in the background, so that the sPCs and the uPCs don't have to be dedicated PCs. All peripherals appear to be locally attached.

- Multiaccess Resource Locking. This ensures data integrity, by preventing common data files and certain common devices from being accessed by more than one user at a time. This name-lock function locks out other users from any defined file, device, or record name.

- Multitasking. This enables users to send remote commands to a PC, using shared resources such as printers and communications lines to run background programs.

The AST-PCnet CSMA/CD interface support provides a low-level datagram interface to users not wishing to use the PC-DOS interface. Datagram service is a general purpose PC-to-PC message system. These messages may be up to 128 bytes in length, and can be either sent to a specific PC on the network or broadcast to all connected PCs. With datagram service, no form of acknowledgement is provided. Using Carrier Sense Multiple Access/Collision Detection (CSMA/CD) techniques, however, collisions are detected, and several attempts at retransmission are made in the case of a collision. The PCnet CSMA/CD interface is interrupt-driven, and has separate receive and transmit buffers. An independent timer is provided for interrupt-driven timeouts and retransmission.

PCnet includes two diagnostic tests. The PCnet Board Adapter Test ensures the basic system operability. The PCnet Communications Test can be either point-to-point or multipoint, and verifies the communications link between two or more PCs.

AST-SNA. All basic 3270 keyboard functions, e.g, edit keys and function keys, are supported with AST-SNA. With AST-SNA, the PC display is identical to that of the IBM 3274. For example, information can be displayed in one or more formatted fields, as defined by the host application. Other functions include protected/unprotected fields and local print.

AST-SNA. The following five AST-SNA configuration products are available: SNA3270 Single Display Station Support with attached printer (LU2 & 3), which includes software and synchronous communications card; SNA3270P Cluster Option for SNA3270, allowing attachment of up to three additional PCs as 3278 devices, which includes software and Cluster Communications card; AST3270C cluster option for SNA3270, allowing attachment of up to three additional ASCII display terminals as 3278 Model 2 devices, which includes software and Cluster Communications card; SNA3270 Batch RJE option for SNA3270, which is a software diskette and the SNA3270X enhanced version option of the SNA3270, allowing for expansion, which includes software and Intelligent Communications card.

After the AST-SNA card is in place, both the PC and the host system must be configured. The PC is configured using the configuration program with the AST-SNA package. The host is configured by changing the parameters in the host system, subsystem and access methods. The AST-SNA supports interaction with CICS/VS, IMS/VS, JES2 & 3, POWER/VS, RES, TCAM, VTAM, NCCF, TSO, NCCF, VSPC, 8100 PX, and others. Network Control Program configuration parameters include: clocking; Physical Unit (PU) address; Logical Unit (LU) address; and communications parameters such as line speed, external/internal clocking, polled/non-polled operation, and NRZI.

AST-SNA provides the standard capabilities of the IBM 3274 Model 51C Control Unit, the IBM 3278 Model 2 Display Station with 87-key EBCDIC keyboard, and the IBM 3287 Model 2 printer (optional). The following features are supported: 1920-character display; status indicators; local print capability; audible alarm; basic 3270 attribute support; EBCDIC line transmission; and printer support including parallel interface, 3270 data stream capability, upper- and lower-case characters, local printer capability, and host-initiated screen print.

Two versions of AST-SNA software are provided, one for the IBM 3278 program (for use with the IBM Monochrome Adapter or equivalent), and the other for the IBM 3279 program (for use with the IBM Color Graphics Adapter or equivalent).

Configuration procedures are identical for both program versions. These are established using the configuration program, CFG, to modify the configuration values stored in the configuration file, CS3270. Logon and logoff procedures to the host are identical to those used by 3270 terminals.

AST-PCOX. The AST-PCOX interface board and software work together to provide IBM 3278/3279 emulation and file transfers. To get these capabilities, users must install the AST-PCOX board and customize the accompanying software. The AST-PCOX board, which plugs into any slot in the IBM PC or PC XT motherboard, provides terminal emulation functions that applications programs can use to send data to the host computer; receive and store data from the host; reformat or modify display data; and provide canned key sequences, such as automatic log on and log off. These functions are available to the program in the same way that PC-DOS functions are available: a function identifier and a parameter are placed in registers, an interrupt instruction is executed to call the AST-PCOX module

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interface, and a result is returned from the AST-PCOX register. The program's language can be any that communicates with assembly-language routines.

To install the AST-PCOX software, users must load DOS, wait for a prompt, place the AST-PCOX diskette into Drive A, enter the Install command, and press the Return key. The screen then displays the menu, a customized file called PX.COM that has seven options: Direct Memory Access channel number, Input/Output port address, 3278/3279 emulation selection, video display type selection, type of status line display, and the interrupt vector number. Option seven allows users to directly install the AST-PCOX. To emulate more than one type of display terminal, users must create additional PX.COM files for each, which must be uniquely identified through the DOS Rename command.

The AST-PCOX can operate as a transient program or as a resident module that can be entered at any time with a single keystroke. As a transient program, PX.COM occupies memory only while it is actually operating. A PX T DOS command loads the PX.COM transient module from disk to provide 3278 terminal emulation. Pressing Ctrl-Scroll Lock (Break) suspends emulation.

If there is enough memory, running PCOX as a resident program is more convenient, because users can re-enter emulator mode at any time with a single keystroke. DOS command, PX R, loads the resident program. To enter terminal emulation, users must press Alt-Scroll Lock; to exit emulation, Ctrl-Scroll Lock is pressed. The PCOX resident program remains in memory until the system is rebooted.

The Professional Workstation Program, an applications program, allows the IBM PC or PC XT to emulate a 3278/3279 terminal; transfer files to and from TSO or a VM/CMS host system; perform AST-PCOX diagnostics and memory dumps; and switch between these functions. Workstation Program operation depends upon the AST-PCOX resident module. The program also requires a PC with at least 128K bytes of memory.

When using the Workstation Program, selecting a function other than terminal emulation will result in a panel display, on which there are requests for information or action from users. For example, if users want to transfer files, the panel will ask for the name of the files selected for transfer.

There are several limitations on transferring files: the PC file must consist of only text characters; all lower-case alphabet characters are translated into upper case; and host dataset must conform to TSO standards.

PCOX emulation provides a 24-line text window, a status line, as well as line, column and window counters. Users can view more than 24 lines of text by scrolling. A status line on the bottom of the screen shows session state, keyboard state, communication link status, and associated printer state. AST-PCOX displays equivalent composite symbols on the 3278 status line, or optionally, an English interpretation of the symbols. There is additional status information on the right-hand side of the status line in columns 65 through 80.

Error messages appear in the upper right-hand corner of the screen, and a more complete message appears on line three. Abbreviated error messages include: invalid option, invalid response, bad local file name, bad TSO dataset name, and host message.

The AST-PCOX can use either a monochrome or color adapter board. By designating one module for monochrome operation and another for color, users can invoke one or the other, depending upon the chosen application. Through the AST-PCOX, the PC can provide basic four-color support for Models 2, 3, 4 and their compatible counterparts.

Enclosed with the PCOX manual is a plastic keyboard template that shows a condensed form of the PC key combinations, which correspond to special functions on the 3278 keyboard. There are some differences between the keyboards. For example, the left bracket produces a cents sign when running under PCOX; the right bracket produces the vertical-bar symbol. Also, the 3278 and 3279 have a number of characters that are part of foreign-language character sets or used in specific applications. The PC cannot display several of these character sets, but replaces them with English equivalents.

In cases where pressing certain keys produces error conditions, the End key resets the keyboard.

PRICING

The AST Research, Inc. communications products are available from stock for purchase only. Users are automatically contacted when software is updated. A one-year warranty applies to all AST hardware products.

Purchase prices are as follows: AST—3780, $945; AST—5251, $895; AST—SNA, $695 (contact vendor for options pricing); AST—PCnet, $695; AST-PCOX—$1,195. Quantity discounts are available. ■