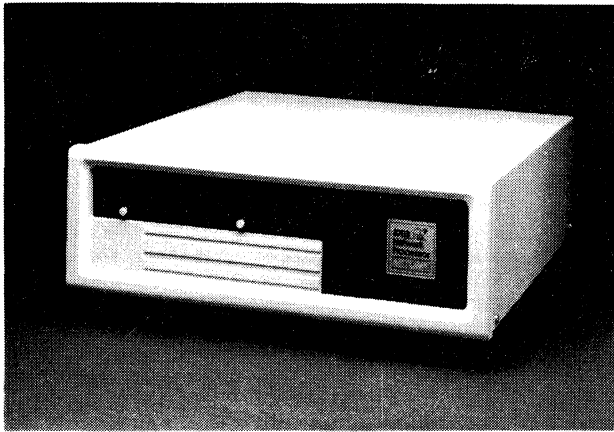


Netlink, Inc. 3703 Network Processor



Netlink's 3703 Network Processor is a multifunctional protocol processor with its own microprocessor and memory.

MANAGEMENT SUMMARY

Netlink, Inc. was originally established as an Australian firm, Systems Technology Pty. Ltd., by an ex-IBM employee, who designed the 3703 Network Processor in 1982. The product achieved initial success in the Australian marketplace, and licensing contracts were established with European and Japanese manufacturers. In the United States, both Amdahl and Codex signed agreements to market 3703 technology. (Codex sells and services the 3703 under the name 4250 Gateway.) In 1984, Netlink, Inc. was established to develop 3703 technology in the United States. The product is now manufactured in Singapore, England, Australia, and Raleigh, North Carolina.

The 3703 operates as an IBM Physical Unit Type 2 (PU.T2) cluster controller, providing a gateway to the IBM environment for a variety of equipment operating under asynchronous ASCII and bisynchronous (BSC) protocols. The unit is a multifunction protocol processor with its own microprocessor and memory. It is a software-based system that allows users to accommodate a number of different protocols in the SNA network. The 3703A, announced as we were going to press with this report, is an asynchronous-only version of the product. Readers interested in the details of this new product should contact the vendor for more information.

One of the major differences between the 3703 and other protocol converters on the market is its ability to handle a number of protocols at once. Most conversion products handle one type of protocol conversion, ASCII to SDLC for example, at one time. Users needing more than one type of conversion in a network must purchase separate units for each type desired. The 3703, in contrast, offers all of the following conversions in one product: asynchronous ASCII to EBCDIC Logical Unit (LU) Type 1 and LU Type 2, BSC 3271 and 3275 to LU Type 2 and LU Type 3, and BSC RJE to LU Type 0 and LU Type 1. ▶

The Netlink, Inc. 3703 Network Processor offers multiple protocol conversions and line concentration. The unit emulates an IBM Physical Unit Type 2 cluster controller, providing a gateway to the IBM SNA/SDLC environment.

MODELS: 3703; 3703A (asynchronous-only version).

CONVERSION: ASCII to EBCDIC LU1 and LU2; BSC 3271 and 3275 to LU1 and LU2; BSC RJE to LU0 and LU1.

TRANSMISSION RATES: 19.2K bps on host link; 300 to 9600 bps on terminal links.

COMPETITION: IBM 3708, 3710.

PRICE: 3703 from \$8,500 to \$12,500; 3703A from \$4,000 to \$5,800; quantity discounts available.

CHARACTERISTICS

VENDOR: Netlink, Inc., 3214 Springforest Road, Raleigh, NC 27604. Telephone (919) 878-8612.

DATE OF FIRST ANNOUNCEMENT: 1982 (In Australia).

DATE OF FIRST DELIVERY: July 1982.

NUMBER INSTALLED TO DATE: Over 900.

SERVICED BY: Netlink, Inc.

MODELS

The 3703 houses all of the hardware needed to support up to 12 ASCII and/or BSC devices in any combination. The unit acts as a multifunction IBM Physical Unit Type 2 (PU.T2) cluster controller that concurrently maps multiple protocols from attached devices to IBM Logical Unit (LU) 0, 1, and 2 types. The 3703 offers the following conversions: ASCII to EBCDIC LU1 and LU2; BSC 3271 and 3275 to LU1, LU2, and LU3; and BSC RJE to LU0 and LU1. It connects to an SNA host either directly or remotely via modem through an IBM 37X5 or compatible communications controller running any version of IBM's Network Control Program (NCP). A host-resident VTAM application, called the Network Support Program (NSP), is responsible for sending the 3703 its operating program, receiving the 3703's memory dump, and controlling terminal access to the 3703's Network Processor Control Point. This control point, the first or second logical unit on the 3703, is used to control downline loading and upline dumping. The 3703 does not support a direct channel attachment to the host, but may interface with the host through an Integrated Control Adapter (ICA) or Integrated Communications Processor (ICP).

The NSP also provides downline load and upline dumping capabilities for network control information and status displays, and macros in NSP provide the means to configure 3703 ports for ASCII or BSC operation. All 3703 NSP work under MVS, DOS, or VM/VCNA operating systems. The 3703 will interface with all IBM host database subsystems, ▶

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➤ The product can be used in various applications. For example, the unit provides a local interface for ASCII terminals. In this configuration, the 3703 connects to a 3705 communications controller and acts as a local concentrator in the network. Terminals may attach directly or via modem on a dial-up or leased line to the 3703 processor. The 3703 may also provide remote protocol conversion. In this application, the 3703 attaches to the communications controller via a modem, and through a daisy-chain port, other SNA devices or 3703s may share the line to the host. The 3703 may also be used as a remote concentrator in which up to 12 devices, including dial-up terminals, may attach, through the 3703, to an SNA host. By using the 3703 to concentrate lines, users can conserve port space on a communications controller or front end processor and eliminate the need to multiplex and demultiplex data streams at the local site. In addition, several 3703s can be multidropped on the same line, and users may be able to save a scanner or frame on the control unit as a result.

The 3703 connects to the host through an IBM 37X5 or compatible control unit running any version of IBM's Network Control Program (NCP), a host-resident VTAM application. Connection to the control unit is either direct or through a modem. The NCP is responsible for controlling the 3703 while it is operating in the network. The Network Support Program (NSP) provides downline load and upline dumping capabilities for network control information and status displays. Macros in NSP provide the means to configure 3703 operating parameters. All 3703 NSP work under MVS, DOS, or VM/VCNA operating systems. The 3703 also supports IMS, CICS, TSO, and RJE (JES2, JES3, and POWER), and operates under IBM's network management products.

Installing a 3703 requires that the 3703 be accurately identified to VTAM, NCP, and host subsystems, and devices attached to the 3703 must be defined through configuration macros. Supermacros that define the characteristics of commonly used terminals are provided with the system, and users may extend supermacros as required. Configurations and executable code are stored in a host-resident library. The 3703 provides a series of internal switches, external push buttons, LEDs, and a display for monitoring and controlling the system. Error indications are shown on a seven-segment display, and LEDs monitor system status and line activity. Users set SDLC line characteristics via switches inside the 3703; ASCII and BSC port parameters are configured via a host-resident Network Support Program and downline loaded to the 3703.

When the 3703 is powered on or reset, it will run a series of diagnostics to test ROM and RAM, power supplies, and the SDLC line. Users monitor and control NSP activity through a Network Support Console, which may be any configuration authorized as an LU Type 1 or Type 2 device. While logged on, the console receives messages about NSP activities, and these reports may be directed to a printer for hardcopy output. Through the support console, a system operator can use predefined commands to perform a variety of functions, such as reloading the 3703 to the host or starting or stopping a log of NSP activity.

➤ including IMS, CICS, TSO, and RJE (JES2, JES3, and POWER). In addition, the 3703 responds to commands from IBM's network management products.

A newly announced asynchronous-only processor, the 3703A, is available in 8- and 12-port versions. The unit is functionally similar to the 3703.

CONFIGURATION

The basic 3703 contains an Intel 8086, 16-bit microprocessor running at 3MHz; 24K bytes of ROM for diagnostics and loading the 3703 program from the host; 284K bytes of read/write RAM, some of which is reserved for the downline-loaded programs and the rest for data buffers; one SDLC communications port using Direct Memory Access (DMA); one SDLC daisy-chain port; four synchronous or asynchronous ports for attached terminals; and three spare slots. The 3703 supports up to two additional communications cards, each with four asynchronous or synchronous ports for a maximum of 12 ports. The unit incorporates an industry-standard Multibus backplane, which allows the insertion of additional circuit cards.

The CPU board contains four on-board serial ports and a one-megabyte system memory, which controls 3703 diagnostics and loader/dump code. The serial ports, under the control of an Intel 82451A USART, obtain transmit and receive clocks from the RS-232-C line for synchronous operation. For asynchronous operation, a special cable is used to wrap clock outputs for the baud rate generator to the clock inputs of the USART, which can also generate transmit and receive interrupts to optimize software response time.

TRANSMISSION SPECIFICATIONS

The 3703 supports a 19.2K bps, SDLC data link on the host side and 300 to 9600 bps links to data devices on the terminal side. The 3703 connects to the host through dial-up or leased lines. Also, through an integral modem-sharing facility, the 3703 can be daisy-chained so that other SNA devices can share the same line. In this application, the 3703 appears as a multidropped PU.12 in the network.

The 3703's SDLC port provides the link to the host. It supports an RS-232-C connector, internal or external clocking, synchronous or asynchronous transmission, a 110 to 19.2K bps transmission speed, half- or full-duplex operation, and NRZI or non-NRZI coding. Users can configure the SDLC port for any eight-bit SDLC polling address.

A digital splitter on the SDLC port drives the daisy-chain port, which appears as a multidrop on the SDLC link. This port has an RS-232-C interface and can take or supply clocking. It has passthrough signals on pins 2 through 8, 15, 17, 20, 22, and 24. This port will not support NRZI if old revisions of SDLC are being used in the application; however, NRZI is supported under SDLC/256K, a new revision of the protocol, if the 3703 has been configured for switched RTS.

Devices attach to the 3703 through terminal ports, which support the RS-232-C interface, internal or external clocking, full EIA pinout, DTE or DCE operation, synchronous or asynchronous transmission, full-duplex operation, and a 300 to 9600 bps transmission speed.

DEVICE CONTROL

Users monitor and control the 3703 through a series of internal switches, external push buttons, LEDs, and a display. The 3703 contains a seven-segment display for error indications; eight LEDs for monitoring RUN status, POLL activity, power, and SDLC line activity; a watchdog timer to

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➤ The 3703 supports five basic software modules for various types of emulation. The SNA Physical Unit Type 2 module provides a modular software structure that conforms to that of SNA. The asynchronous communications module allows ASCII devices to work as LU Type 0, Type 1, or Type 2 equipment in an SNA network. Access to RJE packages, TSO, CICS, and IMS are also supported through this module, and a "swap-on-bind" command allows a user to log on to a Type 2 device and then switch to a Type 1 device, and vice versa. A 3274 module allows asynchronous ASCII VDUs to be functionally compatible with IBM 3278 VDUs or 3274 Model 51C control units. An RJE Station Facility module allows the 3703 to act as either a single logic unit (SLU) or multiple logic unit (MLU) RJE station. With this module, up to eight LUs can log onto JES2 or JES3 automatically when the 3703 is loaded, or from any device attached to the 3703. A bisynchronous communications module maps BSC protocols to SNA and allows IBM 2770, 2780, 3275, 3780, 3741, polled 3780 and 3270 devices, as well as RJE and data-entry systems to access an SNA host. An optional Burroughs Poll Select module allows Burroughs TD 830 terminals to emulate LU Type 2 devices and TC 4000 printers to emulate LU Type 1 units. Also available through this module is a Burroughs terminal-to-host upstream passthrough capability that allows the user to log on to either an IBM or Burroughs host. Netlink has also recently announced the availability of an optional module for videotext support.

COMPETITIVE POSITION

Netlink's two major classes of customers include end users in need of gateway service to the SNA network and manufacturers seeking to incorporate their products into the SNA marketplace. The only direct competition Netlink faces is from IBM's 3710, which provides a similar capability.

The 3703 has apparently been a successful product abroad, but may face stiffer competition in the United States, where IBM has a much stronger market presence. On the other hand, the 3703 does offer unique capabilities that even IBM's 3710 cannot provide, and end users with a mixed bag of protocols in their operating environments will be quick to see the advantages of the product.

➤ detect program or hardware malfunctions; a reset push button; a "PGM" push button that causes the display of internal switch settings and prevents a dump of 3703 memory when the reset button is depressed; and one eight-way switchpack, used for setting up "exchange id" numbers for dial-up applications.

A display driver chip under software control manages the seven-segment display; one LED, driven by hardware, indicates that the unit is powered on and the CPU has not been reset. The switches mounted on the 3703's circuit board, as well as the program push button, are read by system software, but the reset button is directly connected to the CPU reset circuit.

Installing a 3703 is similar to installing any other SNA-type controller. The 3703 must be accurately identified to VTAM, NCP, and host subsystems, and all devices attached to the 3703 must be defined through 3703 configuration macros. To generate a 3703 configuration, users must assemble macros defining the characteristics of each 3703 attachment and execute a configuration generator program to format internal tables for devices attached to the 3703. Supermacros defining the characteristics of commonly used terminals are provided with the system. A user may extend supermacros if necessary. The configurations and any executable code are stored in a host-resident library. Users set the characteristics of SDLC lines via switches inside the 3703, while ASCII and BSC port parameters are configured via the host-resident Network Support Program and downloaded to the 3703. (The NSP controls the 3703 while it is attached to the network.)

The 3703's operating program includes commands that are used to communicate with the host itself and the NSP that resides within it. These commands are used to send a message from the 3703 to the host, establish a local session between the 3703 and another attached device, establish a session with the 3703's Network Processor Control Point, display 3703 status, send an SNA command, send a message on behalf of another attached device, or end a local session. A user may enter the 3703 commands from any attached device that supports a keyboard.

When the 3703 is powered on or reset, it first runs a series of diagnostics, including ROM checksum, RAM nondestructive and destructive tests, a RAM Galpat test, an SDLC line test, a timer test, and a test of power supplies. If the diagnostic tests are completed successfully, a bootstrap program logs onto the host-resident NSP and identifies itself by sending a logon from the Network Processor Control Point, which provides network services, such as loading, dumping, and status. Logon requests are repeated automatically every two minutes until a session is bound with NSP.

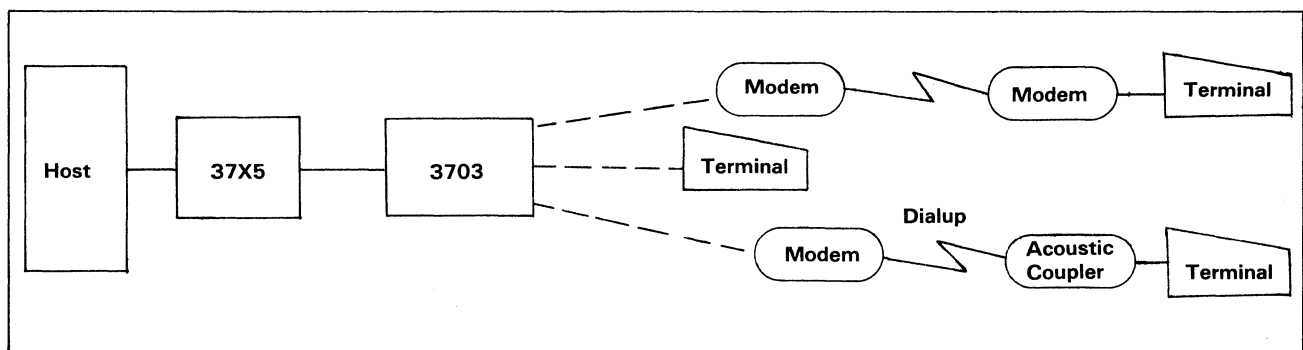


Figure 1. In this configuration, the 3703 serves as a local interface for ASCII terminals. The 3703 also acts as a local concentrator, using modem ports to connect to the 37X5.

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➤ Netlink's associations with Codex and Amdahl, both well known and successful data communications equipment marketers, further strengthen the company's overall position.

ADVANTAGES AND RESTRICTIONS

The 3703 offers several important advantages in SNA network environments. Its software-based operation permits adaptation to both asynchronous protocols and a variety of BSC implementations, particularly older ones for which there are few conversion products available. (Many BSC devices operate differently from the IBM standard and, therefore, do not implement all functions. Because the 3703 is software-driven, it is possible to overcome idiosyncrasies in the BSC protocol that may affect operation in the SNA network.)

The 3703 is centrally controlled and loaded and operates under IBM's network management programs. Also, the unit accommodates multiple protocols downstream and allows the user of the product to achieve a pure SNA backbone in the network. A unique 3703 characteristic is its ability to allow a user to log on to an application through the 3703 as an LU Type 2 device and switch to an LU Type 1 device. This feature allows simultaneous operation in both interactive and batch modes.

The 3703 offers several advantages to the user in a typical IBM environment. By moving BSC processing to a 3703, a significant number of 37X5 cycles will be free for SNA processing, and this might delay the need for the purchase of another 37X5 or an upgrade to a 3705. In applications where incompatible terminals, such as an interactive 3270-type device and a remote RJE, are used for input and high-speed output functions, the 3703 eliminates the need to have the incompatible datastreams from these devices share a band splitting or channelized modem. By converting both streams to SNA, the 3703 eliminates the need for an Emulator Program and a byte multiplex channel, and reduces the number of ports needed on the control unit. The 3703 also allows personal computers to dial into a 3703 port and perform interactive and batch applications concurrently through a "swap-on-bind" command that allows switching back and forth from LU Type 2 to LU Type 1 operation. By allowing MLUs through a single port, the 3703 allows the personal computer to be in session with TSO while JES is transmitting output data to a printer or disk file. In this application, the personal computer user logs onto TSO, CICS, or IMS as a 3270 display screen and then logs onto JES to emulate an IBM 3777/3/4 terminal with Multiple Logical Units (MLUs).

There are a number of operating constraints associated with the 3703. An ASCII VDU being used for 3274 emulation must have cursor positioning string in order to operate with the 3703. In addition, keys which do not send a character sequence to the 3703 cannot be used for 3274 emulation because although these keys have a local effect, the 3703 will not note any changes.

➤ Once a session is bound, the 3703 either dumps or loads its memory. After the operating program, configuration, and any patches are loaded into the 3703, the NSP is unbound, and there is no further communication between the 3703 and the NSP until another downline load or upline dump is required, or an operator sends a command, through NSP, to the 3703 Network Processor Control Point.

Users may monitor and control the activity of the NSP through a Network Support Console, which is any configuration-authorized LU Type 1 or Type 2 device anywhere in the network. While logged on, the console receives messages about NSP activities. Users wishing to access these messages may do so by entering a predefined terminal logon sequence and entering a valid password. Once logged on through a Network Support Console, an operator may issue a command to initiate a printer to act as a logging device for all NSP message traffic. Through a series of NSP commands entered through the console, operators may perform a variety of functions, e.g., start or stop a log of NSP activity, add a 3703 definition to those defined in the startup procedure, reload the 3703 from the host, communicate with the Network Processor Control Point regarding 3703 control, and so forth.

The 3703 supports five basic software modules through which the various types of emulation are implemented. These modules include an SNA PU.T2 module, an asynchronous communications module, a 3274 emulation module, an RJE station facility module, and a bisynchronous communications module. The modules provide the following basic functions:

- SNA PU.T2 module—provides a modular software structure with well-defined interfaces between layers that conforms to the structure of SNA. Discrete layered support includes Data Link Control, Path Control, Transmission Control, Data Flow Control, Network Addressable Unit Services, up to 32 Logical Units, SNA Capabilities, and Communications Network Management.
- Asynchronous communications module—allows asynchronous ASCII devices (TTY-compatible) to work as LU Type 0, Type 1, or Type 2 devices in an SNA network. Additional support is provided to allow an ASCII device to look like the datastream from an IBM 3767 or 3776 with an extension supporting outbound Function Management Headers. This allows access to RJE packages, TSO, CICS, and IMS. ASCII devices that will operate with the 3703 include keyboard printers, terminals, visual display units (VDUs), microcomputers, minicomputers, output-only devices, letter-quality printers, plotters, and optical character readers. The asynchronous module supports screens in line-by-line or full-screen emulation of IBM 3278 Model 2, 3, 4, 5, and 3279 four-color devices. An ASCII module "swap-on-bind" command allows a user to log on to the 3703 as an LU Type 2 device and then switch to an LU Type 1 device, and vice versa. Another command permits multiple logical units on a single ASCII port.
- 3274 module—allows asynchronous ASCII VDUs to be functionally compatible with IBM 3278 VDUs or IBM 3274 Model 51C control units using configuration support A. This module provides code and configuration parameters that take advantage of functions similar to an IBM 3278, commonly available on ASCII screens.
- RJE Station Facility module—allows the 3703 to act as either a single logic unit (SLU) or multiple logical unit (MLU) RJE station. The RJE Station Facility is a series of up to eight LUs that can log onto JES2 or JES3 automatically when the 3703 is loaded, or from any device attached to the 3703. To achieve this capability, the user must define additional LUs, end of sessions that run on the

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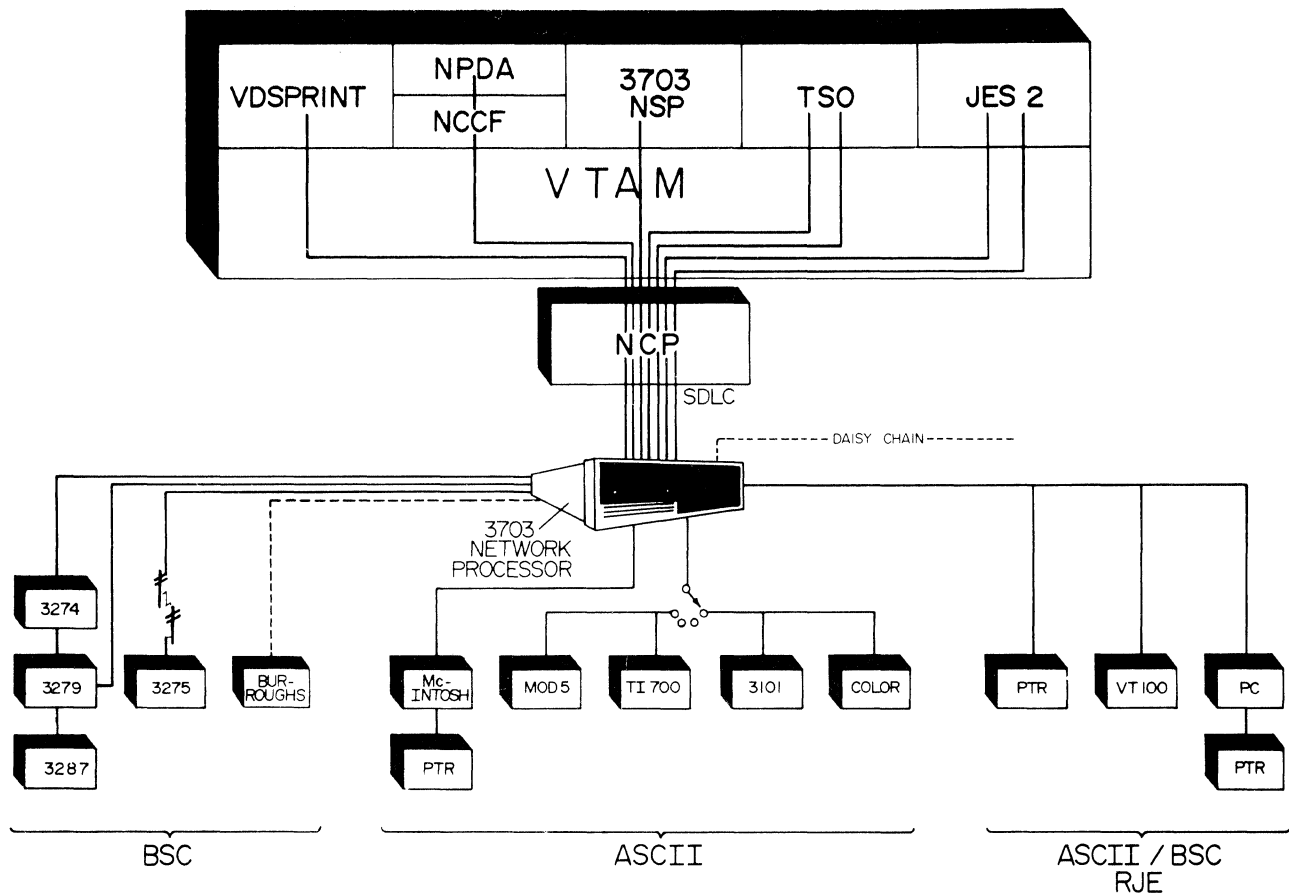


Figure 2. The 3703 operating as a PU.2 cluster controller provides a gateway to the IBM environment for a variety of devices using asynchronous ASCII and BSC protocols. A daisy-chain port allows direct connection of devices that appear to be multidropped to a 37X5 control unit.

➤ Operating restrictions, specific to certain terminals, also exist. A VT100, for example, defines attribute sequences for intensity, underscore, blink, and reverse video; however, without an Advanced Video Option, only underscore and reverse video will have any effect. Additionally, the VT100 status line will consist of only four LEDs.

USER REACTION

We spoke with three 3703 users, whose names were provided by Netlink. Each of the users had responsibility for systems management in IBM environments of large companies. We asked these individuals to rate the product in five categories. Their responses are shown in the following chart.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	1	0	0	3.6
Hardware reliability	0	3	0	0	3.0
Maintenance service/ technical support	2	1	0	0	3.6
Ease of installation	1	0	2	0	2.6
Overall satisfaction	1	2	0	0	3.3

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

➤ logical line defined in JES2 rather than physical devices in the 3703. LU Type 1 devices that establish local sessions with the RJE Station Facility identify themselves as readers, printers, punches, exchange disks, or consoles.

- Bisynchronous communications module—maps BSC protocols to SNA. This capability allows IBM 2770, 2780, 3780, 3741, polled 3780 or 3270 devices, as well as RJE and data-entry terminals, minicomputers, microcomputers, or mainframes using the BSC protocol to access a host operating under SNA. The mapping performed for BSC preserves the end-to-end nature of SNA.

As an option, the 3703 may be equipped with a Burroughs Poll Select emulator module, which allows Burroughs TD 830 terminals to emulate LU Type 2 devices and TC 4000 printers to emulate LU Type 1 units. Also available through this module is upstream passthrough capability for Burroughs terminals to a Burroughs 6700, 6800 CPU; the ability to log on to either an IBM or Burroughs host and switch between the two on a session basis; support, through configuration macros, for configuring Burroughs terminals; and LU Type 0 emulation.

➤ Netlink has recently announced the availability of videotext support, also available as an option.

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▷ The users supplied us with some valuable information regarding 3703 operation. In one user's application, customers with many different types of terminals were accessing a host at the main computer center. When a terminal operator is using an ASCII terminal to access an SNA host, different keystrokes are required to operate the terminal, and the user was concerned that this process would cause complications because the customers, located away from the main site, would be unable to confer with the systems manager regarding problems during a communications sequence. He found, however, that the 3703's keyboard mapping capabilities were excellent for customers using different types of terminals, and there was only a short learning curve before transmission sequences went rather smoothly. The user commented, "It was easy to customize a simple arrangement of keys at the customer's location, and we had very few problems once the system was installed."

This same user noted that the 3703 was the most feasible and inexpensive solution to a particular problem he faced. His company stipulated that customers accessing the central host could not be put on the same multidrop line, and there could be no dial-up access to the host. The remote concentration capabilities of the 3703 helped him solve this problem.

The next user found that the ability to control the 3703 from a central location was the product's chief advantage. Protocol converters are often located at the terminal site, and, if these devices are remotely located, the systems manager must go out to these sites if there is trouble with the equipment. "This," according to the user, "can be a real pain. Now I can take care of everything right here." Another advantage concerned the 3703's ability to save line capacity on the 3725 control unit.

All of the users we contacted told us that the 3703 was difficult to install, and in two cases, required the services of a Netlink technician. (Before the 3703 is operational, the

▶ PHYSICAL SPECIFICATIONS

The 3703 is 5.78 inches high, 17.44 inches wide, 17.91 inches deep, and weighs approximately 22 pounds.

PRICING

A 4-port 3703 sells for \$8,500; an 8-port unit is \$10,500; and a 12-port unit costs \$12,500. An 8-port 3703A is \$4,000; a 12-port 3703A costs \$5,800. Quantity discounts are available. ■

user must set a large number of parameters.) Once the initial installation was complete, however, the unit ran well and with minimal complications. Only one user had to replace a bad card on his 3703. He received a board replacement within 24 hours.

Netlink's service and support were highly rated by everyone. One user told us, "The company will walk customers through problems via the telephone, and if that doesn't work, they'll send someone out. I did have some problems during installation, and Netlink was very helpful."

Another user commented, "It takes a while to get the 3703 running, but Netlink sent someone out to help us, and once we got things straightened out, we had no problems whatsoever. Netlink impresses me as being a 'family-like' company in which everyone is very friendly and helpful."

In summing up his comments regarding the 3703, one user noted that error messages on the unit were explicit and complete, making problem diagnosis a fairly simple matter. Another user recommended that the 3703 be plugged into a dedicated power source; otherwise, if there are power fluctuations, the system might go down.

All of the users we contacted recommended the 3703 to others. "If you're using a mixed bag of protocols, this thing is perfect." This comment accurately summarizes the chief selling point of the 3703. □