

IBM 7171 Protocol Converter

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Product Summary

Editor's Note

Asynchronous-to-synchronous protocol conversion supports communications across IBM and non-IBM environments and allows an organization to make use of existing, incompatible communications equipment. Since asynchronous peripherals are generally less expensive than IBM synchronous products, protocol converters offer the most economical solution for large display environments.

Description

The 7171 Protocol Converter attaches locally to an IBM System/370, 43XX, 308X, or 9370 host computer, allowing up to 64 asynchronous displays, printers, plotters, and PCs to emulate IBM synchronous displays and IBM printers.

Strengths

The 7171 accommodates up to 64 local or remote devices. It supports a wide range of display terminals through customizable terminal definition tables.

Limitations

The 7171 does not support a pass-through session for access to an asynchronous host. Thus, the product is at a disadvantage to several other protocol converters on the market today, including the IBM 3708 Network Conversion Unit.

Competition

Andrew Corp., Andrew/KMW, Micom Communications Corp., Netlink Inc., Telematics International Inc., Wall Data, and others.

Vendor

International Business Machines Corp. (IBM)
 Old Orchard Road
 Armonk, NY 10504
 Contact your local IBM representative.

Price

The base model, which supports up to 16 devices, sells for \$14,100. An eight-line addition costs \$1,495.

Analysis

Product Strategy

Before the introduction of its own protocol converters in 1982, IBM customers wanting to use IBM host computers had to purchase IBM's 3270 terminals or buy protocol converters from other vendors that allow less expensive asynchronous ASCII devices to emulate IBM-compatible equipment. An entire industry of protocol converter manufacturers emerged to meet the need for conversion from asynchronous to IBM 3270 systems. By 1982, this industry was one of the fastest-growing segments of the data communications market. After considering the potential profit in selling converters to interface asynchronous equipment to the SNA network, IBM began offering its own units. The 7171 made its debut in September 1984 as a host-site unit, providing asynchronous-to-synchronous protocol conversion capability.

The 7171 converter supports communications between 16 and 64 local or remote asynchro-

nous display terminals, printers, and plotters and an IBM System/370, 43XX, 308X, or 9370 host computer. Asynchronous devices appear as IBM 3270-type terminals, printers, and plotters. The 7171 Protocol Converter supports full-duplex asynchronous transmission from 50 to 19.2K bps and auto baud detection on a per-line basis from 300 to 19.2K bps.

Main functional components of the 7171 include a CPU board; a channel adapter board for interfacing to the host processor; a channel controller board; and up to eight terminal controller boards, each of which supports eight ASCII terminals.

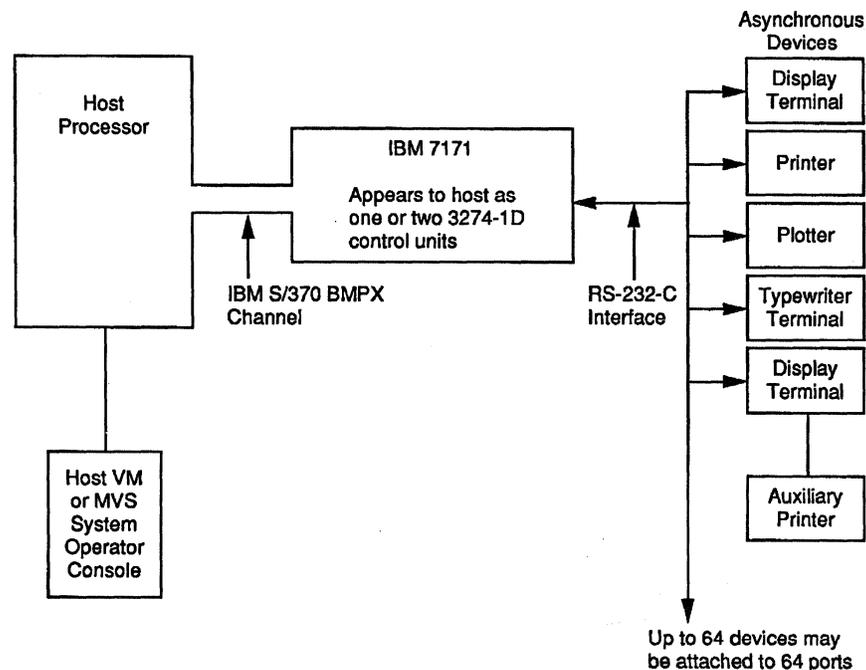
A Special Maintenance Facility allows the use of a display terminal to examine and store data in 7171 CPU memory and to monitor and debug error messages. Also included with the 7171 is a Support Utility Diskette, which provides a means to define, modify, and save ASCII device definition tables.

Competitive Position

When IBM introduced the Model 7426 protocol converter in October 1982, the company joined a growing number of vendors whose products support communications between ASCII devices and IBM 3270 applications programs. When IBM entered the conversion market, other protocol con-

Figure 1.
A System Configuration for
IBM's 7171 Protocol
Converter

The 7171 attaches to an IBM host processor through a block multiplexer channel (BMPX) and supports from 16 to 64 ASCII devices through an RS-232-C interface. The 7171 emulates an IBM 3274-1D control unit; asynchronous devices attached to the system appear as 3270 terminals and printers.



Company Profile IBM Corp.

Corporate Headquarters
Old Orchard Road
Armonk, NY 10504

In Canada
IBM Canada Ltd.,
Markham
3500 Steeles Avenue E.
Markham, ON L3R 2Z1
(416) 474-2111

Offices located in other cities throughout Canada.

Officers
Chairman/CEO: John Akers
Vice Chairman: Jack D. Kuehler
Sr. VP/Gen. Mgr.: Terry Lautenbach

Company Background
Year Founded: 1914
No. Employees: 400,000 worldwide

IBM is one of the oldest manufacturers of computing equipment in the world. It started out in Poughkeepsie, NY as a small company manufacturing clocks for industrial use and later introduced punched card equipment for business accounting functions. According to

Business Week and *Fortune*, IBM is among the top five industrial corporations by sales volume. It has dominated the mainframe market for over 30 years and has a strong hold on other industry sectors.

Business Overview
IBM designs, manufactures, markets, and services mainframe computer systems and associated peripherals; minicomputer systems and peripherals, microcomputer/personal computer systems; computer system software; data communications controllers and terminals; other communications products such as modems, voice response systems, and voice messaging systems; local area network communications products; and office typewriters. In addition, IBM provides specialized products and services such as communications carrier and limited time-sharing services; the IBM

Information Network, a communications facility with remote storage and computing services; OEM manufacturing of terminals, disk drives, and other products; maintenance service and system supplies; and financial services through its IBM Credit Corp. subsidiary.

Since it introduced its PC line of microcomputers, IBM has had several earning periods where the growth of the company was much less than anticipated. Such a fluctuating growth rate reflects the competitive nature of this small system market. To compete more effectively in this market, IBM has greatly expanded its software, as well as hardware, efforts and has entered into agreements with several independent software suppliers to provide tools for its entire line of computer products.

For the second time in its history, IBM confirmed a reduction in its work force last year. Approximately 10,000 people are either to take early retirement or accept termination incentives. IBM took a fourth-quarter write-off of \$2.3 billion as a restructuring charge.

Financial Profile
Operations results for 1989 showed that net profits fell 35 percent to \$3.76 billion, or \$6.47 per share. Revenues, however, increased 5.1 percent to \$62.7 billion over 1988. Fourth-quarter earnings fell 75 percent to \$591 million, or \$1.04 per share, due to the \$2.3 billion restructuring charge.

Management Statement
Moving more resources close to customers is a cornerstone of IBM's transformation in the computer industry. To that end, in 1988 IBM undertook the most significant restructuring of its business in more than 30 years, establishing seven lines of business and a new organization—IBM United States. This restructuring continued through 1989 and will dynamically continue in order to consistently meet IBM customer needs.

IBM notes that it is managing for the long term and, with the steps it has taken and continues to take, it remains confident about the future of its business.

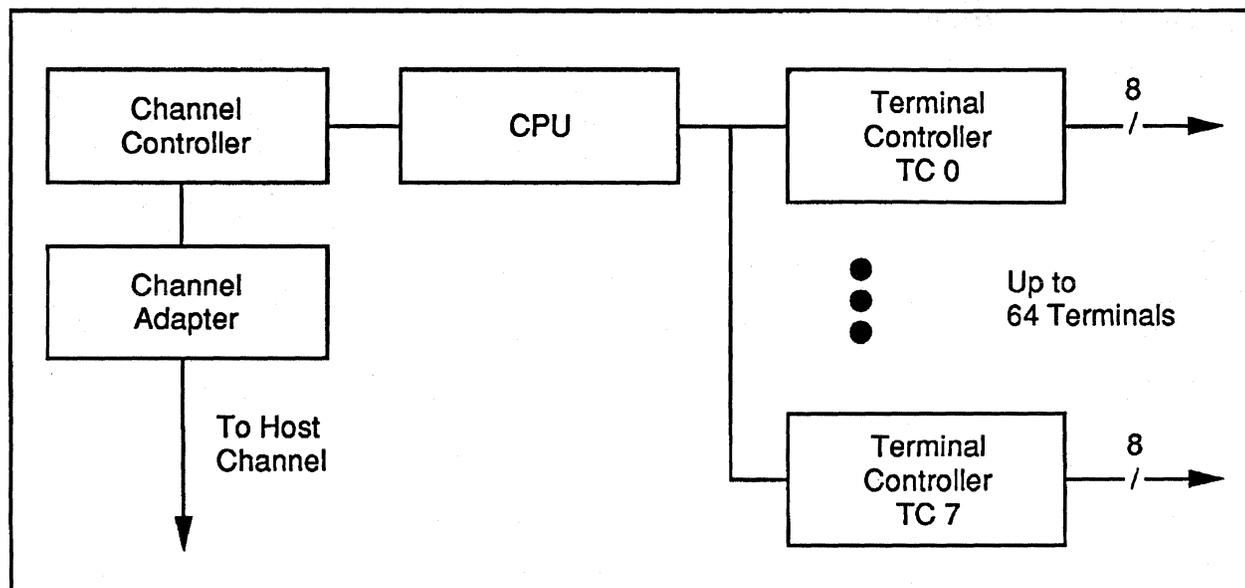
verter vendors reaped the rewards of having IBM educate its huge installed base to the benefits of protocol conversion.

Although IBM dominates the protocol conversion market, several other companies offer ASCII-to-3270 conversion products, including Andrew Corp., Andrew/KMW (formerly KMW Sys-

tems, which was acquired by Andrew Corp.), Micom Communications Corp., Netlink Inc., Telematics International Inc., and Wall Data.

Today, protocol conversion is not the same business it was back in the late 1970s and early '80s; personal computers and diskless workstations, which can emulate displays using internal

Figure 2.
A Functional Diagram of IBM 7171 Hardware Components



The CPU houses the unit's main memory; each terminal controller board supports up to eight ASCII devices.

adapter cards, have largely replaced displays. Nevertheless, PC networking products have opened up another avenue into which protocol conversion vendors can market products.

IBM's 3174 Establishment Controller and 37XX communications controller family support the direct attachment of asynchronous equipment for synchronous host access, which further reduces the need for standalone converters. Traditional vendors of IBM-compatible communications controllers, including IDEA Courier, Memorex/Telex, and Intelligent Information Systems, market controllers that support communications across both synchronous and asynchronous environments with additional capabilities such as multiple sessions with windowing.

Decision Points

By allowing users to generate custom terminal definition tables, the IBM 7171 provides the flexibility to handle a wide range of devices and to redefine terminal keyboard keys as needed. The protocol converter accommodates both remote and locally attached devices and can be upgraded, as the user's needs require, to support up to 64 devices.

One limitation of the 7171 is a lack of support for an asynchronous pass-through session through which an asynchronous display terminal can access a non-IBM host. Several protocol converters on the market, including IBM's 3708 Network Conversion Unit, provide this capability. Users who require access to both IBM and non-IBM systems from a single asynchronous display, therefore, should choose the IBM 3708 Network Conversion Unit or another product.

Because there are many differences between ASCII and IBM 3270 terminals, users will experience certain restrictions when using an ASCII device with the 7171. For example, the character in the lower right-hand corner is normally not displayed, and any attempt to write a character in this position causes the screen to scroll up one line. Screen display appears one line higher than indicated in the 7171's internal buffer; therefore, the results of input are difficult to predict.

The 7171 supports only those terminals operating in full-duplex mode. In addition, the unit supports 3270 features as described in IBM programming and hardware manuals, but it will not emulate accidental hardware characteristics when a 3270 is sent an incorrect datastream. Also, the

7171 attaches to a block multiplexer channel, which may support more than one device simultaneously. Operation of the 7171 may be affected when certain types of devices are connected to the channel along with it. For example, a 7171 should not be attached to the same channel as are the tape drives.

Characteristics

Model: IBM 7171 Protocol Converter, Model 1.

Date of Announcement: September 1984.

Date of First Delivery: Fourth quarter of 1984.

Serviced by: IBM Corp.

Overview

The IBM 7171 Protocol Converter is an ASCII-to-3270 protocol converter that allows local and remote ASCII display terminals, printers, and personal computers emulating asynchronous displays to communicate with an IBM System/370, 43XX, 308X, or 9370 host processor. The base unit supports 16 devices and is expandable to a maximum of 64 devices.

Attaching to the host via a block multiplexer channel, the 7171 emulates an IBM 3274 Model 1D control unit with attached IBM 3278 display terminals and 328X printers. When more than 32 ASCII devices are attached, the 7171 appears as two 3274s. This arrangement allows ASCII terminals to communicate with the IBM host interactive packages and editors operating under VM/SP or MVS.

IBM 7171 Components

Main functional components of the 7171 include the following:

- A CPU board
- A channel adapter board for interfacing to the host processor
- A channel controller board
- Up to eight terminal controller boards, each of which supports eight ASCII terminals

Table 1. Transmission Specifications for the IBM 7171

Host Attachment:	The IBM 7171 attaches to the IBM host through a block multiplexer channel
Device Attachment:	Devices connect to the 7171 via an RS-232-C/V.24 interface; devices can be attached using specially wired null modem cables, asynchronous line drivers, modems, or acoustic couplers over leased or switched lines; the recommended maximum distance between a locally attached device and the IBM 7171 is 50 feet
Transmission Mode:	Full-duplex transmission
Data Format:	Terminals must be set to seven data bits, one stop bit, and even parity
Transmission Speeds:	50 to 19.2K; auto baud detection is available on a per-line basis for 300, 600, 1200, 1800, 2400, 3600, 4800, 9600, and 19.2K bps transmission speeds

CPU main memory stores a control program; a diagnostic program; EBCDIC/ASCII translation tables, which handle basic conversion operations; and terminal definition tables, each of which contains a list of control character sequences that determines how a specific ASCII display terminal functions. CPU memory (RAM) holds screen images for up to 64 active terminals, host and terminal input/output buffers, and a work area for the control program.

Included with the 7171 are tables for IBM 3101, DataMedia 1520/15421/3045, Digital Equipment VT100, LSI ADM 3A/31, TeleVideo 912/920/950, and compatible display terminals, as well as for IBM-compatible PCs emulating any of these displays. With the support utility, users can customize tables for other types of displays and store these tables in nonvolatile RAM.

Device Control

Model 7171 manages attached devices through a series of buffers that holds information passing between terminals and the host. A keyboard input routine interprets characters received from a display terminal according to its corresponding terminal definition table, which contains a list of control character sequences that determines how the display functions. The routine separates characters into text, local editing functions, and "attention" functions: text characters go directly into the 7171's screen buffer unless they would alter a protected field (in which case they are ignored); local editing functions alter the screen buffer and/or cursor position as required; and "attention" functions go directly to the host without altering the 7171 screen buffer. When changes are made to a terminal's screen

image in the 7171 main memory, either by keyboard input or output from a host application, the terminal screen is updated to match the screen image stored in the 7171 unit.

During an automatic recovery sequence, which may occur as a result of data transmission errors or a buffer overflow, the terminal is marked in an input-error state, and every received character is ignored; an ASCII BEL character sent to the terminal causes a beep sound, which alerts the user to the error. If connection is lost due to modem or phone line errors, the line to the 7171 is automatically disabled and reenabled to permit the user to dial back and log on.

Users attach ASCII devices to the 7171 through RS-232-C cable connections to ports located at the rear of the unit. Each port will function according to one of the terminal definitions. Terminals must be set to 7 bits, 1 stop bit, even parity, and to a 300 to 19.2K bps rate.

Activating the 7171 power switch to the "On" position, setting the On Line/Off Line switch to "On Line," and turning on terminal power will generate an "Enter Terminal Type" message on the connected terminal screen. Users then enter terminal type, such as IBM 3101 or Digital VT100, and press "Enter" to bring up the logo of the host operating system. Logon to the host proceeds from this point in the normal way.

When the 7171 is powered on, the unit runs a diagnostics routine, which checks for errors in the CPU

and channel controller and terminal controller boards. Error conditions are indicated via lights on the CPU and controller boards, which are visible when the rear door of the 7171 unit is opened. If an error condition exists, users can proceed to isolate the failure through a set of Problem Determination Procedures specified in the IBM 7171 installation manual.

For added control of the 7171, users can attach a terminal to port 0 of terminal controller 0 to create a Special Maintenance Facility. After this procedure, an operator can examine and store data in memory and monitor and debug error messages through the console. The operator can maintain a host session and a console session concurrently and toggle back and forth between the two.

A support utility diskette provides a menu-driven method to define, modify, and save ASCII device definition tables using an IBM-compatible PC. If a personal computer is not available, users can define device tables at the machine level.

Pricing

The base model, which supports up to 16 devices, sells for \$14,100. An eight-line addition costs \$1,495, and a spare parts kit is available for \$6,740. ■

IBM 7171 Protocol Converter

datapro ANALYSIS

UPDATE: IBM has withdrawn the 7426 protocol converter, which had been included in our last report.

Before the introduction of its own protocol converters in 1982, IBM customers wanting to use IBM host computers had to purchase IBM's expensive, compatible 3270 terminals or buy protocol converters to allow less expensive asynchronous ASCII devices to emulate IBM-compatible equipment. An entire industry of protocol converter manufacturers emerged to meet the need for conversion from asynchronous ASCII to IBM 3270. By 1982, the industry was one of the fastest-growing segments of the data communications market. After considering the potential profit in selling converters to interface asynchronous equipment to the SNA network, IBM began offering its own units. The 7171 made its debut in September 1984 as a host-site unit that directly attaches to a block multiplexer channel on an IBM 4331, 4341, 3081, 3083, or 3084.

VENDOR: International Business Machines Corp. (IBM), Old Orchard Road, Armonk, New York 10504. Contact your local IBM representative.
CANADIAN DISTRIBUTION: IBM Canada, 3500 Steeles Avenue, East Markham, Ontario L3R 2Z1. Telephone (416) 474-2111.
MODELS: IBM 7171, Model 1.
COMPETITION: KMW, Local Data, Netlink, and Renex.
PRICE: 7171 ASCII Device Attachment Control Unit—\$12,420.

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PRODUCT EVALUATION

The 7171 converter, designed for local attachment of from 16 to 64 asynchronous ASCII devices via EIA RS-232-C/CCITT V.24 interface to the block multiplexer channel of an IBM host, emulates an IBM 3274-1D control unit.

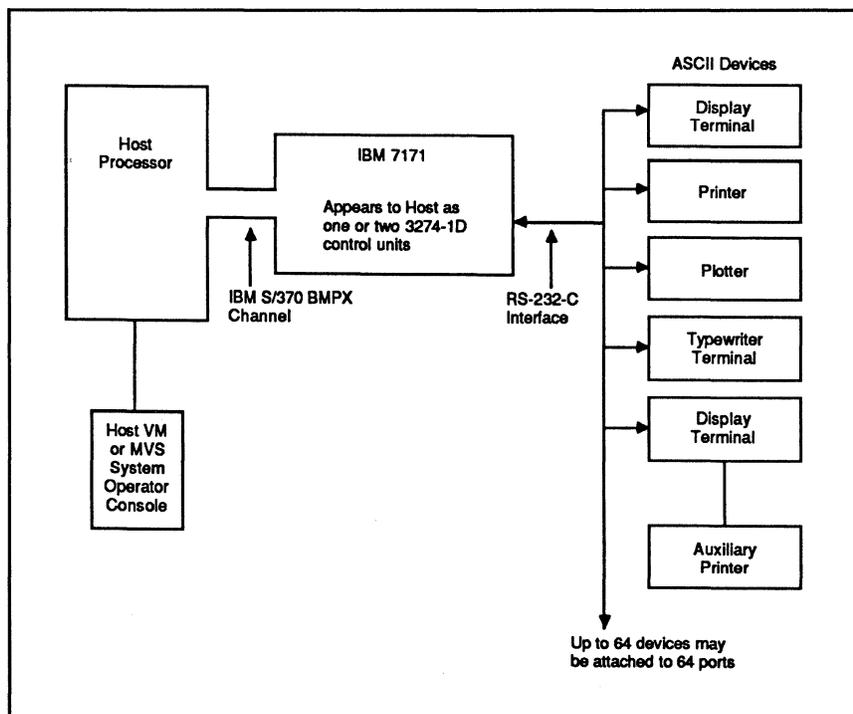


Figure 1. Shown here is a system configuration for IBM's 7171 protocol converter. The unit attaches to an IBM host processor through a block multiplexer channel (BMPX) and supports from 16 to 64 ASCII devices through an RS-232-C interface. The 7171 emulates an IBM 3274-1D control unit; ASCII devices attached to the system appear as 3270 terminals.

IBM 7171 Protocol Converter

Devices attached to the protocol converter appear as IBM 3270-type terminals, printers, or plotters. The unit supports full-duplex asynchronous transmission from 50 to 19.2K bps, and auto baud detection is available on a per-line basis from 300 to 19.2K bps.

Main functional components of the 7171 include a CPU board; a channel adapter board for interfacing to the host processor; a channel controller board; and up to eight terminal controller boards, each of which supports eight ASCII terminals. CPU main memory contains the control program, Terminal Definition Tables, and EBCDIC/ASCII translation tables that handle basic conversion operations. RAM holds screen images for up to 64 active terminals, host and terminal input/output buffers, and a work area for the control program.

Model 7171 manages attached devices through a series of buffers that holds information passing between terminals and the host. A keyboard input routine interprets characters received from a terminal according to its Terminal Definition Table, which contains a list of control character sequences that determines how the unit functions. The 7171 comes with a number of predefined tables for major ASCII terminals, and users can define tables for other types of equipment. The routine separates characters into text, local editing functions, and "attention" functions: text characters go directly into the 7171's screen buffer unless they would alter a protected field (in which case they are ignored); local editing functions alter the screen buffer and/or cursor position as required; and "attention" functions go directly to the host and do not alter the 7171 screen buffer.

A Special Maintenance Facility allows users to attach a terminal to one 7171 port to achieve additional control of the unit. Through the attached control terminal, users can examine and store data in memory and monitor and debug error messages. Also included with the 7171 is a support utility diskette that provides a means to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128K bytes of memory and a 160K-byte diskette drive.

MARKET POSITION

When IBM introduced the Model 7426 protocol converter in October 1982, the company joined a growing number of vendors whose products support communications between ASCII devices and IBM 3270 applications programs. When IBM entered the conversion market, other protocol converter vendors reaped the rewards of having IBM educate its huge installed base to the benefits of protocol conversion.

Today, protocol conversion is not the booming business it was back in the late 1970s and early '80s. IBM now includes protocol conversion on its newer controllers and processors, eliminating the need for separate products. The market for these products has declined, and vendors that made their mark in the communications industry selling these products have revamped their product lines.

Many other companies offer ASCII-to-3270 conversion products. Among them are KMW Systems, Local Data, Netlink, and Renex. The 7171 unit will support up to 64 ASCII devices, which is a considerably greater number than most vendors offer on other units.

Because there are many differences between ASCII and IBM 3270 terminals, users will experience certain restrictions when using an ASCII device with the 7171. For example, the character in the lower right-hand corner is normally not displayed, and any attempt to write a character in this position causes the screen to scroll up one line. Screen display appears one line higher than indicated in the 7171's internal buffer; therefore, the results of input are difficult to predict.

The 7171 supports only those terminals operating in full-duplex mode. In addition, the unit supports 3270 features as described in IBM programming and hardware manuals, but it will not emulate accidental hardware characteristics when a 3270 is sent an incorrect datastream. Also, the 7171 attaches to a block multiplexer channel, which may support more than one device at once. Operation of the 7171 may be affected when certain types of devices are connected to the channel along with it. For example, a 7171 should not be attached to the same channel as tape drives.

SPECIFICATIONS

MODEL: 7171, Model 1.

DATE OF ANNOUNCEMENT: Model 7171—September 1984.

DATE OF FIRST DELIVERY: Fourth-quarter 1984.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines.

IBM 7171 Protocol Converter

MODEL

The Model 7171 is an ASCII-to-3270 protocol converter for locally attaching up to 64 ASCII devices to IBM 43XX or 308X host processors via a block multiplexer channel. The 7171 emulates an IBM 3274 Model 1D control unit. When more than 32 ASCII devices are attached, the 7171 appears as two 3274s. The arrangement allows ASCII terminals to communicate with the IBM host interactive packages and editors operating under VM/SP or MVS.

TRANSMISSION SPECIFICATIONS

The 7171 attaches to the IBM host through a block multiplexer channel and to ASCII devices through an RS-232-C interface. When installed outside of the United States, the 7171 conforms to CCITT V.24 and V.28 standards. Full-duplex transmission rates from 50 to 19.2K bps are supported. Auto baud detection is available on a per-line basis for 300, 600, 1200, 1800, 2400, 3600, 4800, 9600, and 19.2K bps speeds. The IBM 7171 is configured as Data Terminal Equipment (DTE). Devices can attach directly to the 7171 through a specially wired null modem cable or through asynchronous line drivers, modems, or acoustic couplers over leased or switched lines. For a direct connection, the required cable configuration is generally unique to a specific terminal. Though the RS-232-C standard specifies that the maximum distance between the terminal and the 7171 should not exceed 50 feet, users running applications at low transmission rates may be able to extend the distance to several hundred feet without severe signal degradation.

DEVICE CONTROL

The IBM 7171, emulating a 3274-1D control unit, supports a variety of ASCII terminals, printers, and plotters. Main functional components of the unit include a CPU board, a channel controller board, the channel adapter board, and up to eight terminal controller boards. CPU main memory contains the control program, a diagnostic program, EBCDIC/ASCII translation tables, and Terminal Definition Tables in ROM. Terminal Definition Tables contain a list of control character sequences that determines how ASCII terminals are to function. Tables for the IBM 3101, IBM PC, Datamedia 1520/1521/3045, Digital Equipment Corporation VT100, LSI ADM 3A/31, and Televideo 912/920/950 are included; users must customize tables for other types of terminals and store these tables in nonvolatile RAM. RAM holds screen images for up to 64 active terminals, host and terminal input/output buffers, and a work area for the 7171 control program. The channel adapter board provides the interface with the host processor channel. Each terminal controller card supports up to eight ASCII terminals.

Within the 7171, terminal management is handled by the full-screen image buffer, ring buffer for keyboard input, a buffer for output to the terminal, and the Terminal Definition Tables that reside in the 7171's main memory for each ASCII terminal attached. The keyboard input routine interprets characters received from the ASCII terminal according to its associated Terminal Definition Table, separating those characters into text, local editing functions, and "attention" functions. Text characters from the terminal go directly into the 7171's screen buffer unless they would alter a protected field, in which case an audible alarm sounds and the character is ignored. Local editing functions will alter the screen buffer and/or cursor position buffer as required. Since "Attention" functions go directly to the host, they do not alter the 7171 screen buffer. When changes are made to a terminal's screen image in the 7171 main memory, either by keyboard input or output from a host application, the terminal screen is updated to match the screen image stored in the 7171 unit.

Automatic recovery sequences will occur during transmission or data errors, or when the 7171 ring buffer is full. When an error occurs, the terminal is marked in an input-error state, and every received character is ignored; an ASCII BEL character sent to the terminal causes a beep sound which alerts the user to the error. If connection is lost due to modem or phone line errors, the line to the 7171 is automatically disabled and reenabled to permit the user to dial back and log on.

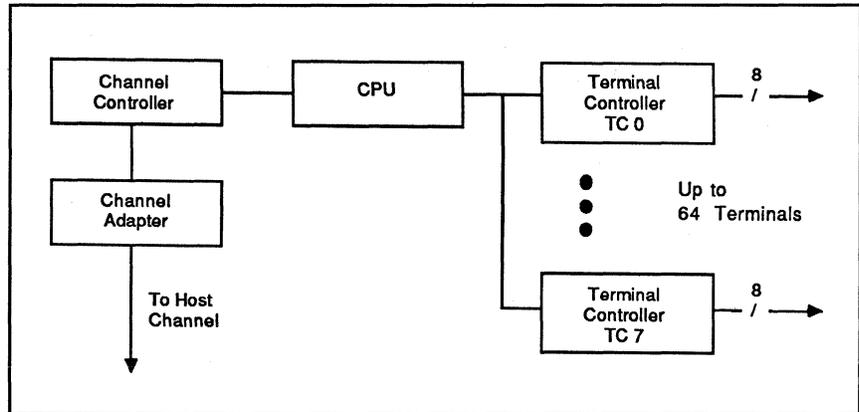
Users attach ASCII devices to the 7171 through RS-232-C cable connections to ports located at the rear of the unit. Each port will function according to one of the Terminal Definitions set in ROM or a user-programmed definition held in the 7171 nonvolatile RAM. Terminals must be set to 7 bits, 1 stop bit, even parity, and to a 300 to 19.2K bps rate. Activating the 7171 power switch to the "on" position, the On Line/Off Line switch to "On Line," and turning on terminal power will generate an "Enter Terminal Type" message on the connected terminal screen. Users then enter terminal type, such as IBM 3101 or Digital VT100, and press "Enter" to bring up the logo of the host operating system. Logon to the host proceeds from this point in the normal way.

When the 7171 is powered on, the unit runs a diagnostics routine, which checks for errors in the CPU and channel controller and terminal controller boards. Error conditions are indicated via lights on the CPU and controller boards, which are visible when the rear door of the 7171 unit is opened. If an error condition exists, users can proceed to isolate the failure through a set of Problem Determination Procedures specified in the IBM 7171 installation manual.

For added control of the 7171, users can attach a terminal to port 0 of terminal controller 0 to create a Special Maintenance Facility. After this procedure, an operator can

IBM 7171 Protocol Converter

Figure 2. Functional diagram of IBM 7171 hardware components. The CPU houses the unit's main memory; each terminal controller board supports up to eight ASCII devices.



examine and store data in memory and monitor and debug error messages through the console. The operator can maintain a host session and a console session concurrently and toggle back and forth between the host session and operator console screen.

A support utility diskette provides a menu-driven method to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128K bytes

of memory and a 160K-byte diskette drive. If a personal computer is not available, users can define device tables at the machine level.

PRICING

The basic Model 7171 with support for up to 16 devices sells for \$12,420. An eight-line addition costs \$1,325, and a spare parts kit is available for \$5,705. □

IBM 7426 and 7171 Protocol Converters

MANAGEMENT SUMMARY

UPDATE: IBM has reviewed this report and informed us that it requires no changes at the present time.

With the announcement of the 7426 and 7171 protocol converters, IBM has embraced a new philosophy concerning protocol conversion. Until 1982, when the 7426 converter was announced, IBM did not include protocol converters in its product line, and customers who wanted to use IBM host computers had to purchase IBM's compatible (and expensive) 3270 terminals or buy protocol converters to allow less expensive asynchronous ASCII devices to emulate IBM-compatible equipment. An entire industry of protocol converter manufacturers emerged to meet the need for conversion from asynchronous ASCII to IBM 3270. By 1982, the industry was one of the fastest growing segments of the data communications market. Realizing that selling converters to interface asynchronous equipment to the SNA network is good business, IBM began offering its own units. The introduction of the 7426 for remote connection to the SNA network was followed by the 7171, introduced in September 1984. The 7171 is a host-site unit that directly attaches to a block multiplexer channel on an IBM 43XX or 308X computer.

In 1979 IBM announced the 3101 ASCII display terminal, which differs from other IBM products in that it uses ASCII communications instead of BSC or SDLC protocols. IBM first announced the Model 7426 protocol converter to allow its ASCII 3101 display terminal and associated 3102

This report describes IBM's Model 7426 and 7171 protocol converters. The 7426 unit is designed for remote attachment of devices, while the 7171 is used at the host site. The 7426 emulates an IBM 3276-12 controller and allows up to four IBM 3101 or other TTY-compatible terminals to appear as 3270-type terminals to an IBM 8100, 4300, S/370, or 30XX system. The 7171 accommodates the direct channel attachment to IBM 43XX and 308X hosts of 16 to 64 asynchronous devices emulating IBM 3270 equipment.

MODELS: 7426 Model 1, 7426 Model 2; 7171 (expandable in eight line increments).

CONVERSION: ASCII to 3270 SDLC.

TRANSMISSION RATES: 7426 Model 1—up to 38.4K bps through directly attached loop; up to 9600 bps through data-link attached loop; 7426 Model 2—up to 9600 bps, either through direct connection or a remote communications link; Model 7171—300 to 19.2K bps (autobaud per line).

COMPETITION: Protocol Computers, Inc., Micom Systems.

PRICE: 7426 Model 1—\$4,210; Model 2—\$3,830; Model 7171—\$12,420 (base unit).

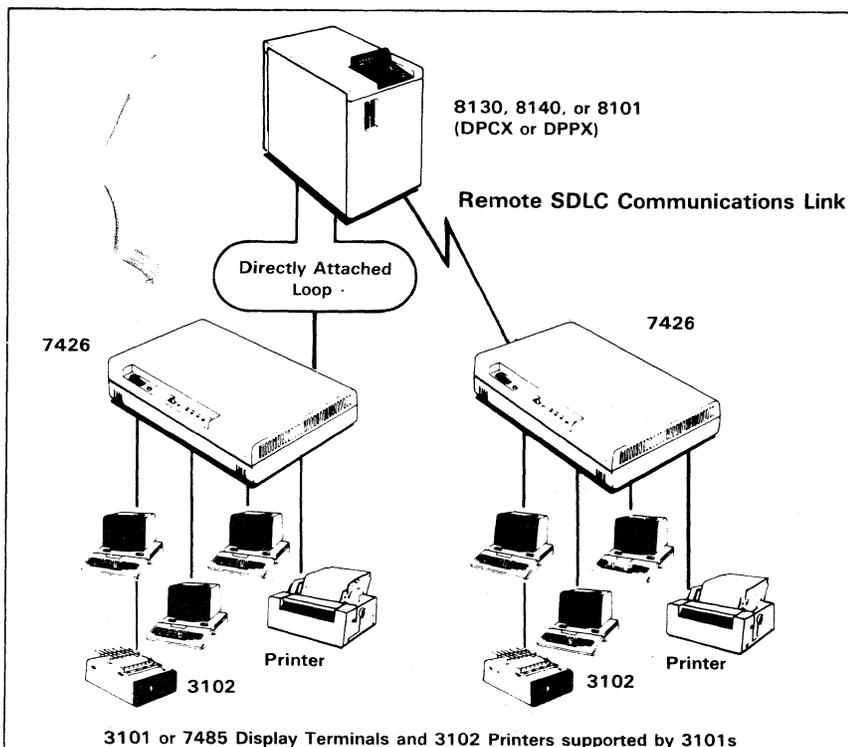


Figure 1. Shown here is a configuration of 7426 device attachments to an IBM 8100 System. The 7426 is designed to support IBM 3101 displays with or without attached 3102 printers. Other TTY-compatible ASCII display terminals and printers can also be attached. The 7426 also provides conversion between ASCII devices and a 4300 host computer.

IBM 7426 and 7171 Protocol Converters

► unit to communicate with 8100 and 4300 computers, with which they were previously incompatible. Although the 7426 was designed with the 3101 in mind, it also supports other ASCII terminal devices, such as an IBM Personal Computer running under the 3101 emulation program, the IBM 7485-531 RPQ display terminal, the IBM 4975-01A RPQ printer terminal, and, on an RPQ basis, certain non-IBM TTY-compatible ASCII displays and printers. The 7426 now operates with S/370 and 30XX hosts, as well as the 8100 and 4300.

The 7426 is a desktop, four-port unit that comes in two models: Model 1, designed for loop attachment, connects to the host via directly attached loop at a data rate of up to 38.4K bps, or to a data-link attached loop at up to 9600 bps; Model 2 is designed for communications via an SDLC data link operating at up to 9600 bps. Remote attachment of either the Model 1 or Model 2 requires the use of an external synchronous modem. The 7426 supports an RS-232-C or RS-422-A interface.

To the host computer, the 7426 appears as an IBM 3276-12 controller. ASCII terminals attached to the unit act as IBM 3278 display stations or 3287 printers. The 7426 transforms the field-formatted 3270 datastream produced by the host into an ASCII-TTY datastream for the attached devices and vice versa. The 7426 provides a 1,920-character transmit buffer for each of its four devices. Data entered at a display keyboard goes into the buffer, where it can be edited before the 7426 performs the ASCII-to-3270/SDLC conversion and sends it to the host. IBM's protocol converter also provides a 4800-byte block of storage that attached devices can share. This area is used to hold preformatted display screens used in fill-in-the-blank applications and other archived data.

Operation of the 7426 depends upon downstream loading of control code from the host. This loading occurs automatically when the 7426 receives power. Several factors restrict 7426 operation; we discuss those in the Advantages and Restrictions section of this report.

The 7171 converter, designed for local attachment of from 16 to 64 asynchronous ASCII devices to the block multiplexer channel of an IBM 43XX or 308X host, emulates an IBM 3274 1D control unit. Devices attached to the protocol converter appear as IBM 3270-type terminals, printers, or plotters. The unit supports full-duplex asynchronous transmission from 50 to 19.2K bps, and autobaud detection is available on a per-line basis from 300 to 19.2K bps.

Main functional components of the 7171 include a CPU board, a channel adapter board for interfacing to the host processor, a channel controller board and up to eight terminal controller boards, each of which supports eight ASCII terminals. The main memory of the CPU contains the control program, Terminal Definition Tables, and EBCDIC/ASCII translation tables that handle basic conversion operations. RAM holds screen images for up to 64 active terminals, host and terminal input/output buffers, and a work area for the control program. ►

► CHARACTERISTICS

VENDOR: International Business Machines Corporation, One Orchard Place, Armonk NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: Model 7426—October 1982; Model 7171—September 1984.

DATE OF FIRST DELIVERY: Model 7426—Fourth Quarter 1983; Model 7171—Fourth Quarter 1984.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines.

MODELS

The 7426 is an ASCII-to-3270/SDLC protocol converter for remotely attaching up to four 3101 display terminals or other TTY-compatible terminals to IBM 4300, 8100, S/370, 30XX, and 8100 hosts. The unit emulates an IBM 3276-12 control unit. There are two models:

- Model 1—connects to the host system through a direct-attached or data-link-attached loop; supports up to 38.4K bps transmission for direct-attached loops and 1200, 2400, 4800, and 9600 bps transmission for data-link-attached loops.
- Model 2—connects the host through an SDLC communications link; supports transmission up to 9600 bps.

The Model 7171 is an ASCII-to-3270 protocol converter for locally attaching up to 64 ASCII devices to IBM 43XX or 308X host processors via a block multiplexer channel. The 7171 emulates an IBM 3274 model 1D control unit. (When more than 32 ASCII devices are attached, the 7171 appears as two 3274s.) It allows ASCII terminals to communicate with the IBM host interactive packages and editors operating under VM/SP or MVS.

TRANSMISSION SPECIFICATIONS

Terminals can attach to the 7426 locally, or remotely through an SDLC communications link. A choice of RS-232-C or RS-422-A interfaces is provided. In either case, the maximum data rate supported per terminal is 9600 bps for remote attachments. If communications lines are used, they may be either switched or nonswitched facilities, and asynchronous external modems are required. The 7426 provides auto-answer for its remotely connected terminals.

When connected locally, the maximum distance between the 7426 and the terminal is determined by the type of interface used. With an RS-232-C interface, a terminal can be located up to 40 feet from the 7426. When the RS-422-A interface is used, the terminal can be located up to 4,000 feet from the 7426. Maximum data transmission speed between the 7426 and an attached terminal is 9600 bps.

The 7426 Model 1 communicates with its IBM host through directly attached loops at up to 38.4K bps or remotely attached loops at 9600 bps. The 7426 Model 2 communicates with the host through an SDLC communications link at up to 9600 bps. The SDLC link operates in half-duplex, point-to-point, or multipoint mode over half- or full-duplex leased line facilities; a synchronous external modem is required.

The 7171 attaches to the IBM host through a block multiplexer channel and to ASCII devices through an RS-232-C interface. (See Figure 2.) When installed outside of the United States, the 7171 conforms to CCITT V.24 and V.28 ►

IBM 7426 and 7171 Protocol Converters

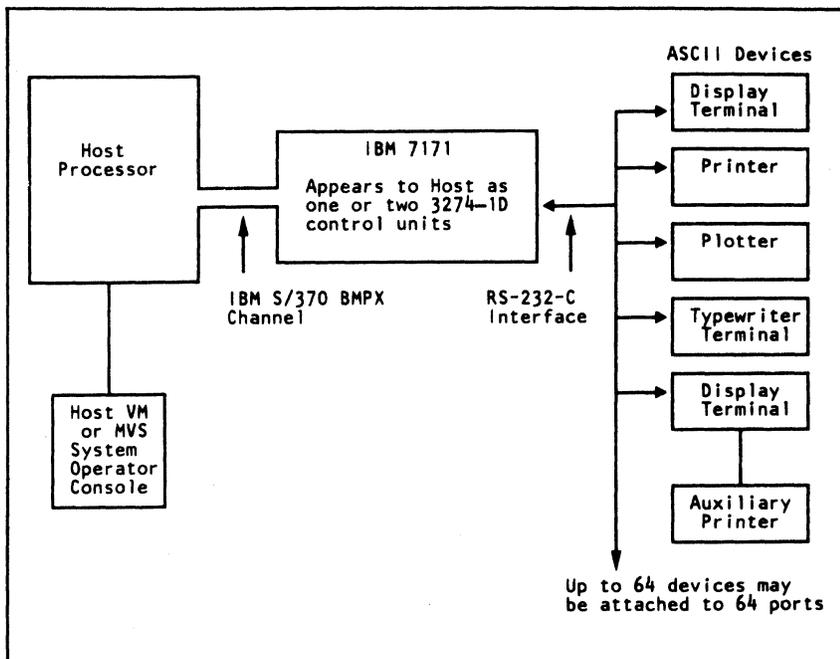


Figure 2. Shown here is a system configuration for IBM's 7171 protocol converter. The unit attaches to an IBM host processor through a block multiplexer channel (BMPX) and supports from 16 to 64 ASCII devices through an RS-232-C interface. The 7171 emulates an IBM 3274-1D control unit; ASCII devices attached to the system appear as 3270 terminals.

➤ Model 7171 manages attached devices through a series of buffers that hold information passing between terminals and the host. A keyboard input routine interprets characters received from a terminal according to its Terminal Definition Table, which contains a list of control character sequences that determine how the unit functions. (The 7171 comes with a number of predefined tables for major ASCII terminals, and users can define tables for other types of equipment.) The routine separates characters into text, local editing functions, and "attention" functions: text characters go directly into the 7171's screen buffer unless they would alter a protected field in which case they are ignored; local editing functions alter the screen buffer and/or cursor position as required; and "attention" functions go directly to the host and do not alter the 7171 screen buffer.

A Special Maintenance Facility allows users to attach a terminal to one 7171 port to achieve additional control of the unit. Through the attached control terminal, users can examine and store data in memory and monitor and debug error messages. Also included with the 7171 is a support utility diskette that provides a means to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128KB of memory and a 160KB diskette drive.

COMPETITIVE POSITION

When IBM introduced the Model 7426 protocol converter in October 1982, the company joined a growing number of vendors whose products allow communications between ASCII devices and IBM 3270 applications programs. When IBM entered the conversion market, other protocol converter vendors hoped to reap the rewards of having IBM educate its huge installed base to the benefits that protocol

➤ standards. Full-duplex transmission rates from 50 to 19.2K bps are supported. Autobaud detection is available on a per-line basis for 300, 600, 1200, 1800, 2400, 3600, 4800, 9600, and 19.2K bps speeds. The IBM 7171 is configured as Data Terminal Equipment (DTE). Devices may attach directly to the 7171 through a specially wired null modem cable or through asynchronous line drivers, modems, or acoustic couplers over leased or switched lines. For a direct connection, the required cable configuration is generally unique to a specific terminal. Although the RS-232-C standard specifies that the maximum distance between the terminal and the 7171 should not exceed 50 feet, users running applications at low transmission rates may be able to extend the distance to several hundred feet without severe signal degradation.

DEVICE CONTROL

Model 7426. To the IBM host, the 7426 appears logically as a 3276-12 Control Unit with attached 3278 display stations and/or 3287 printers. The 3276 emulation capability allows 3101 and other TTY-compatible terminals to use existing 3270 programming support. The 7426 contains a 1920-character buffer for each of the attached devices. Data entered at the terminal keyboard first enters the corresponding 7426 buffer before presentation at the display. Editing, updating, data entry, and correcting typing errors are done between the terminal and the 7426 before the information is sent in final form to the host. In addition to the 1920-character buffers, the 7426 contains a 4800-byte block of storage that is shared by attached devices. This storage, called the format storage area, holds preformatted display screens that are typically used in form fill-in applications. Having the forms stored in the protocol converter reduces the volume of data traffic that must occur between the 7426 and the host each time a particular application is run. The screens are formatted and distributed to the 7426 through user-written application code stored at the host system.

For the 7426 to operate, the host system must downline load microcoded control logic into RAM storage in the converter. IBM provides this control logic on magnetic media (diskette or tape) shipped to the host site upon installation of the

IBM 7426 and 7171 Protocol Converters

conversion provides. The current boom in protocol converter sales, from \$5 million a year in 1980 to over \$100 million in 1983, indicates that data communications equipment users have indeed accepted this concept. Realizing that protocol converters are now a vital element in a comprehensive data communications product line, IBM has embraced the concept thoroughly. In addition to the 7426 and 7171, the company also offers the 3710 Network Controller, which includes protocol conversion, and the 3708 Network Conversion units. Full product reports on each system immediately follow this report.

In a June 1985 announcement, IBM and Rolm announced that both the 7426 and 7171 converters had been certified for use with Rolm's CBX II switch. Several configurations using the converters were documented in an installation guide published by IBM. The tests were conducted at IBM's Telecommunications Development Laboratories. IBM and Rolm are presently committed to developing a worldwide telecommunications strategy that includes products from both companies, and IBM's protocol converters are an important part of the overall plan to provide numerous bridges, gateways, and interfaces between the SNA network and products from other vendors.

IBM's competitive position in this market is unique. While several vendors sell far more conversion devices than IBM, the company greatly influences user acceptance of the products because the majority of protocol conversions and emulations involve IBM equipment.

Many companies offer ASCII-to-3270 conversions. Two prominent contenders are Protocol Computers, Inc. and Micom. Protocol Computers manufactures the 1076 protocol converter, which provides ASCII-to-3270 conversion and 3276-12 emulation. Micom's Micro7400 also offers support for 3278 emulation by ASCII terminals. Other companies contending in the ASCII-to-IBM-3270 conversion market include Local Data, Datastream, Icot, KMW Systems, and Renex.

ADVANTAGES AND RESTRICTIONS

IBM's 7426 protocol converter is specifically designed for use with IBM 3101 terminals, and users who have this particular model may wish to stay with IBM for their conversion products.

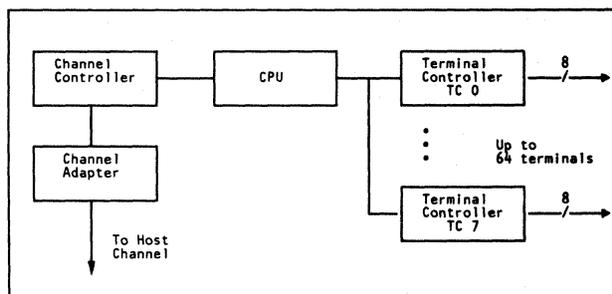


Figure 3. Functional diagram of IBM 7171 hardware components. The CPU houses the unit's main memory; each terminal controller board supports up to eight ASCII devices.

7426. For the 8100 processor, the control code is stored on an IBM Diskette 2D; for the 4321 and 4331, the medium is an IBM Distribution Tape Reel (DTR). Upon 7426 power-up, the host operator loads the diskette or tape into the host system and transmits the code to the 7426, whereupon it is ready to perform its functions automatically.

Users can customize the 7426 for a specific operating environment during installation (and whenever necessary later on) by locally attaching a 3101 (or IBM PC with a 3101 emulator) to the designated port (Port 0) on the 7426 and pressing the Initialization switch on the front panel. Users can specify the following operating parameters: loop carrier, data rates, parity selection, and number of transmit bits.

The Model 7426 front panel contains a power switch, a power lamp, an Initialization/Test switch, and five indicator lamps that show Test Mode, Unit Ready, Line Ready, Communications Check, and Machine Check.

Diagnostic tests built into the 7426 monitor functional operation of the unit. When the 7426 receives power, it automatically performs a self test.

Terminal users access 3278 terminal functions through keystroke sequences. For example, by pressing the ALT key and the "d" key, users access the Enter function.

Model 7171. The IBM 7171, emulating a 3274-1D control unit, supports a variety of ASCII terminals, printers, and plotters. Main functional components of the unit include a CPU board, a channel controller board, the channel adapter board and up to eight terminal controller boards. (See Figure 3 for a functional hardware components diagram of the 7171.) The main memory of the CPU contains the control program, a diagnostic program, EBCDIC/ASCII translation tables, and Terminal Definition Tables in ROM. (Terminal Definition Tables contain a list of control character sequences that determine how ASCII terminals are to function. Tables for the IBM 3101, IBM PC, Datamedia 1520/1521/3045, DEC VT100, LSI ADM 3A/31, and Televideo 912/920/950 are included; users must customize tables for other types of terminals, and store these tables in nonvolatile RAM.) RAM holds screen images for up to 64 active terminals, host and terminal input/output buffers, and a work area for the 7171 control program. The channel adapter board provides the interface with the host processor channel. Each terminal controller card supports up to eight ASCII terminals.

Within the 7171, terminal management is handled by the full-screen image buffer, ring buffer for keyboard input, a buffer for output to the terminal, and the Terminal Definition Tables that reside in the 7171's main memory for each ASCII terminal attached. The keyboard input routine interprets characters received from the ASCII terminal according to its associated Terminal Definition Table, separating those characters into text, local editing functions, and "attention" functions. Text characters from the terminal go directly into the 7171's screen buffer unless they would alter a protected field, in which case an audible alarm sounds, and the character is ignored. Local editing functions will alter the screen buffer and/or cursor position buffer as required. "Attention" functions go directly to the host; therefore, they do not alter the 7171 screen buffer. When changes are made to a terminal's screen image in the 7171 main memory, either by keyboard input or output from a host application, the terminal screen is updated to match the screen image stored in the 7171 unit.

Automatic recovery sequences will occur during transmission or data errors, or when the 7171 ring buffer is full. When an error occurs, the terminal is marked in an input-error state, and every received character is ignored; an ASCII BEL character sent to the terminal causes a beeping

IBM 7426 and 7171 Protocol Converters

There are several operational restrictions on the 7426. The unit only supports terminals operating in character mode; transparent mode is not supported. In addition, the 7426 does not support the following special 3276 Model 12 Control Unit features: address lock, APL/text control, APL/text, extended function base, color display attachment, audible alarm, an extended character set adapter, encrypt/decrypt, the magnetic reader control, SDLC/BSC switch, security keylock, or a selector light pen.

The 7171 unit will support up to 64 ASCII devices, which is a considerably greater number than most vendors offer on other units. The maximum number of ports on a PCI unit, for example, is only seven, and Micom's 7400 product accommodates up to 16. With a starting price of \$12,420 for a base unit supporting 16 devices, IBM's 7171 is more expensive than competing products, which presently sell in the \$5,000 price range. However, for large network users there may be a cost advantage in being able to expand the IBM 7171 in eight-line additions that will cost \$1,325 rather than buying additional units from another manufacturer to accommodate a larger number of ASCII devices. In general, a converter that supports eight devices will cost about \$3,500.

Because there are many differences between ASCII and IBM 3270 terminals, users will experience certain restrictions when using an ASCII device with the 7171. For example, the character in the lower right-hand corner is normally not displayed, and any attempt to write a character in this position causes the screen to roll up one line. Everything on the screen appears one line higher than indicated in the 7171's internal buffer; therefore, the results of input are difficult to predict.

The 7171 supports only those terminals operating in full-duplex mode. In addition, the unit supports 3270 features as described in IBM programming and hardware manuals, but it will not emulate accidental hardware characteristics when a 3270 is sent an incorrect datastream. Also, the 7171 attaches to a block multiplexer channel, which may support more than one device at once. Operation of the 7171 may be affected when certain types of devices are connected to the channel along with it. For example, a 7171 should not be attached to the same channel as tape drives.

USER REACTION

IBM did not supply us with a list of current users of its protocol converters; therefore, we were unable to conduct a user reaction for the products. □

sound that informs the terminal user of the error condition. If connection is lost due to modem or phone-line errors, the line to the 7171 is automatically disabled and reenabled to permit the user to dial back in and logon.

Users attach ASCII devices to the 7171 through RS-232-C cable connections to ports located at the rear of the unit. Each port will function according to one of the Terminal Definitions set in ROM or a user-programmed definition held in the 7171 nonvolatile RAM. Terminals must be set to seven bits, one stop bit, even parity, and to a 300 to 19.2K bps rate. Activating the 7171 power switch to the "on" condition, the On Line/Off Line switch to "On Line" and turning on terminal power will generate an "Enter Terminal Type" message on the connected terminal screen. Users then enter terminal type, such as IBM 3101 or DEC VT100, and press "Enter" to bring up the logo of the host operating system. Logon to the host proceeds from this point in the normal way.

When the 7171 is powered on, the unit runs a diagnostics routine, which checks for errors in the CPU and channel controller and terminal controller boards. Error conditions are indicated via lights on the CPU and controller boards, which are visible when the rear door of the 7171 unit is opened. If an error condition exists, users can proceed to isolate the failure through a set of Problem Determination Procedures specified in the IBM 7171 installation manual.

For added control of the 7171, users can attach a terminal to port 0 of terminal controller 0 to create a Special Maintenance Facility. When this is done, an operator can examine and store data in memory and monitor and debug error messages through the console. The operator can maintain a host session and a console session concurrently and toggle back and forth between the host-session and operator console screen.

Included with the 7171 is a support utility diskette that provides a menu-driven method to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128KB of memory and a 160KB diskette drive. If a personal computer is not available, users can define device tables at the machine level.

PRICING

The Model 7426 protocol converter is available for purchase only. IBM offers the following quantity discounts: 6 percent for 25 to 99 units; 9 percent for 100 to 199 units; and 15 percent for 200 or more units. The 7426 has been designed for customer installation. The Model 1 7426 sells for \$4,210; the Model 2 sells for \$3,830. There is a \$20 charge for repair-center maintenance.

The basic Model 7171 with support for up to 16 devices sells for \$12,420. An eight-line addition costs \$1,325, and a spare parts kit is available for \$5,705. The following quantity discounts are available: 6 percent for 10 to 19 units; 9 percent for 20 to 29 units, 12 percent for 30 to 39 units, 15 percent for 40 to 49 units, and 20 percent for 50 or more units. IBM specifies a \$229 monthly maintenance charge for the basic 7171; a \$13 fee is added for each eight-line increment. ■

IBM 7426 and 7171 Protocol Converters

MANAGEMENT SUMMARY

UPDATE: *This report has been updated to reflect changes in IBM's protocol converter product line. Since we last published the report, IBM introduced the 7171 unit and made "statements of direction" regarding protocol conversion on other IBM equipment.*

With the announcement of the 7426 and 7171 protocol converters, IBM has embraced a new philosophy concerning protocol conversion. Until 1982, when the 7426 converter was announced, IBM did not include protocol converters in its product line, and customers who wanted to use IBM host computers had to purchase IBM's compatible (and expensive) 3270 terminals or buy protocol converters to allow less expensive asynchronous ASCII devices to emulate IBM-compatible equipment. An entire industry of protocol converter manufacturers emerged to meet the need for conversion from asynchronous ASCII to IBM 3270. By 1982, the industry was one of the fastest growing segments of the data communications market. Realizing that selling converters to interface asynchronous equipment to the SNA network is good business, IBM began offering its own units. The introduction of the 7426 for remote connection to the SNA network was followed by the 7171, introduced in September 1984. The 7171 is a host-site unit that directly attaches to a block multiplexer channel on an IBM 43XX or 308X computer.

In 1979 IBM announced the 3101 ASCII display terminal, which differs from other IBM products in that it uses ASCII ▶

This report describes IBM's Model 7426 and 7171 protocol converters. The 7426 unit is designed for remote attachment of devices, while the 7171 is used at the host site. The 7426 emulates an IBM 3276-12 controller and allows up to four IBM 3101 or other TTY-compatible terminals to appear as 3270-type terminals to an IBM 8100, 4300, S/370, or 30XX system. The 7171 accommodates the direct channel attachment to IBM 43XX and 308X hosts of 16 to 64 asynchronous devices emulating IBM 3270 equipment.

MODELS: 7426 Model 1, 7426 Model 2; 7171 (expandable in eight line increments).

CONVERSION: ASCII to 3270 SDLC.

TRANSMISSION RATES: 7426 Model 1—up to 38.4K bps through directly attached loop; up to 9600 bps through data-link attached loop; 7426 Model 2—up to 9600 bps, either through direct connection or a remote communications link; Model 7171—300 to 19.2K bps (autobaud per line).

COMPETITION: Protocol Computers, Inc., Micom Systems.

PRICE: 7426 Model 1—\$4,210; Model 2—\$3,830; Model 7171—\$12,420 (base unit).

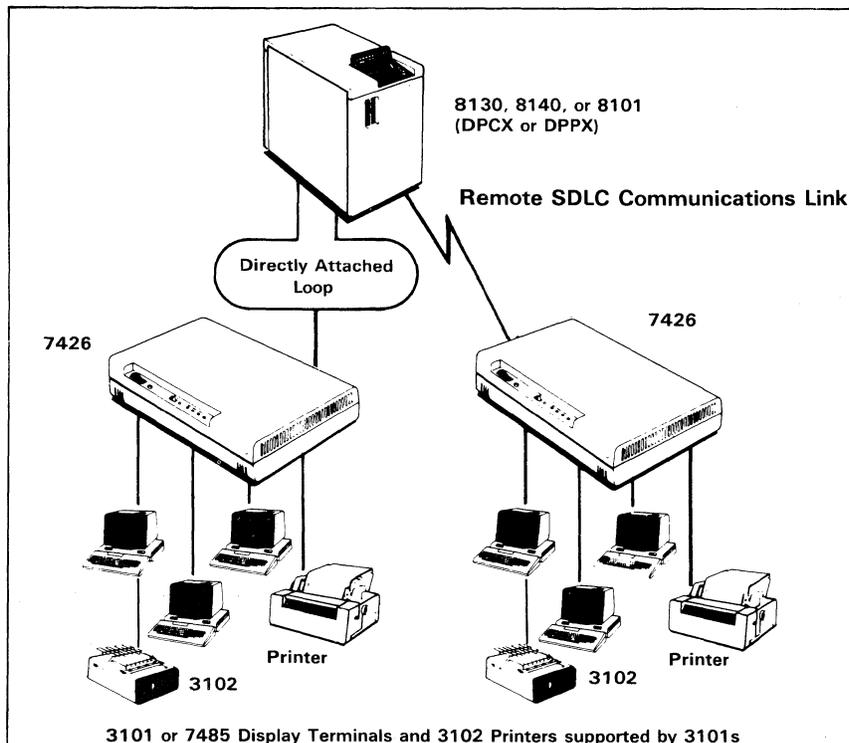


Figure 1. Shown here is a configuration of 7426 device attachments to an IBM 8100 System. The 7426 is designed to support IBM 3101 displays with or without attached 3102 printers. Other TTY-compatible ASCII display terminals and printers can also be attached. The 7426 also provides conversion between ASCII devices and a 4300 host computer.

IBM 7426 and 7171 Protocol Converters

► communications instead of BSC or SDLC protocols. IBM first announced the Model 7426 protocol converter to allow its ASCII 3101 display terminal and associated 3102 unit to communicate with 8100 and 4300 computers, with which they were previously incompatible. Although the 7426 was designed with the 3101 in mind, it also supports other ASCII terminal devices, such as an IBM Personal Computer running under the 3101 emulation program, the IBM 7485-531 RPQ display terminal, the IBM 4975-01A RPQ printer terminal, and, on an RPQ basis, certain non-IBM TTY-compatible ASCII displays and printers. The 7426 now operates with S/370 and 30XX hosts, as well as the 8100 and 4300.

The 7426 is a desktop, four-port unit that comes in two models: Model 1, designed for loop attachment, connects to the host via directly attached loop at a data rate of up to 38.4K bps, or to a data-link attached loop at up to 9600 bps; Model 2 is designed for communications via an SDLC data link operating at up to 9600 bps. Remote attachment of either the Model 1 or Model 2 requires the use of an external synchronous modem. The 7426 supports an RS-232-C or RS-422-A interface.

To the host computer, the 7426 appears as an IBM 3276-12 controller. ASCII terminals attached to the unit act as IBM 3278 display stations or 3287 printers. The 7426 transforms the field-formatted 3270 datastream produced by the host into an ASCII-TTY datastream for the attached devices and vice versa. The 7426 provides a 1,920-character transmit buffer for each of its four devices. Data entered at a display keyboard goes into the buffer, where it can be edited before the 7426 performs the ASCII-to-3270/SDLC conversion and sends it to the host. IBM's protocol converter also provides a 4800-byte block of storage that attached devices can share. This area is used to hold preformatted display screens used in fill-in-the-blank applications and other archived data.

Operation of the 7426 depends upon downstream loading of control code from the host. This loading occurs automatically when the 7426 receives power. Several factors restrict 7426 operation; we discuss those in the Advantages and Restrictions section of this report.

The 7171 converter, designed for local attachment of from 16 to 64 asynchronous ASCII devices to the block multiplexer channel of an IBM 43XX or 308X host, emulates an IBM 3274 1D control unit. Devices attached to the protocol converter appear as IBM 3270-type terminals, printers, or plotters. The unit supports full-duplex asynchronous transmission from 50 to 19.2K bps, and autobaud detection is available on a per-line basis from 300 to 19.2K bps.

Main functional components of the 7171 include a CPU board, a channel adapter board for interfacing to the host processor, a channel controller board and up to eight terminal controller boards, each of which supports eight ASCII terminals. The main memory of the CPU contains the control program, Terminal Definition Tables, and EBCDIC/ASCII translation tables that handle basic conversion operations. RAM holds screen images for up to 64

► CHARACTERISTICS

VENDOR: International Business Machines Corporation, One Orchard Place, Armonk NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: Model 7426—October 1982; Model 7171—September 1984.

DATE OF FIRST DELIVERY: Model 7426—Fourth Quarter 1983; Model 7171—Fourth Quarter 1984.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines.

MODELS

The 7426 is an ASCII-to-3270/SDLC protocol converter for remotely attaching up to four 3101 display terminals or other TTY-compatible terminals to IBM 4300, 8100, S/370, 30XX, and 8100 hosts. The unit emulates an IBM 3276-12 control unit. There are two models:

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- Model 2—connects the host through an SDLC communications link; supports transmission up to 9600 bps.

The Model 7171 is an ASCII-to-3270 protocol converter for locally attaching up to 64 ASCII devices to IBM 43XX or 308X host processors via a block multiplexer channel. The 7171 emulates an IBM 3274 model 1D control unit. (When more than 32 ASCII devices are attached, the 7171 appears as two 3274s.) It allows ASCII terminals to communicate with the IBM host interactive packages and editors operating under VM/SP or MVS.

TRANSMISSION SPECIFICATIONS

Terminals can attach to the 7426 locally, or remotely through an SDLC communications link. A choice of RS-232-C or RS-422-A interfaces is provided. In either case, the maximum data rate supported per terminal is 9600 bps for remote attachments. If communications lines are used, they may be either switched or nonswitched facilities, and asynchronous external modems are required. The 7426 provides auto-answer for its remotely connected terminals.

When connected locally, the maximum distance between the 7426 and the terminal is determined by the type of interface used. With an RS-232-C interface, a terminal can be located up to 40 feet from the 7426. When the RS-422-A interface is used, the terminal can be located up to 4,000 feet from the 7426. Maximum data transmission speed between the 7426 and an attached terminal is 9600 bps.

The 7426 Model 1 communicates with its IBM host through directly attached loops at up to 38.4K bps or remotely attached loops at 9600 bps. The 7426 Model 2 communicates with the host through an SDLC communications link at up to 9600 bps. The SDLC link operates in half-duplex, point-to-point, or multipoint mode over half- or full-duplex leased line facilities; a synchronous external modem is required.

The 7171 attaches directly to the IBM host through a block multiplexer channel supporting an RS-232-C interface. (See Figure 2 for Model 7171 system configuration.) When in-

IBM 7426 and 7171 Protocol Converters

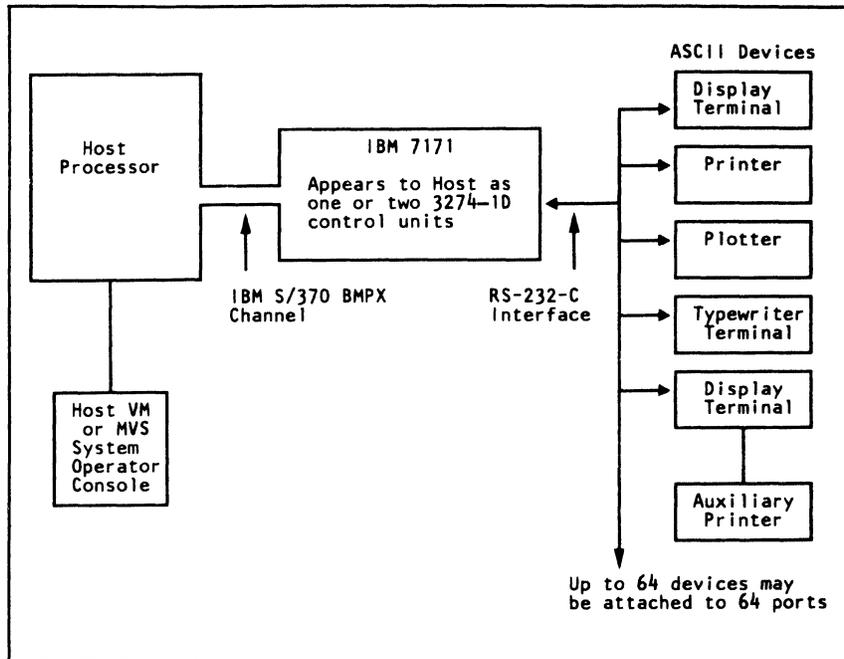


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► active terminals, host and terminal input/output buffers, and a work area for the control program.

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A Special Maintenance Facility allows users to attach a terminal to one 7171 port to achieve additional control of the unit. Through the attached control terminal, users can examine and store data in memory and monitor and debug error messages. Also included with the 7171 is a support utility diskette that provides a means to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128KB of memory and a 160KB diskette drive.

COMPETITIVE POSITION

When IBM introduced the Model 7426 protocol converter in October 1982, the company joined a growing number of vendors whose products allow communications between ASCII devices and IBM 3270 applications programs. When IBM entered the conversion market, other protocol converter vendors hoped to reap the rewards of having IBM educate its huge installed base to the benefits that protocol

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DEVICE CONTROL

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For the 7426 to operate, the host system must downline load microcoded control logic into RAM storage in the converter. IBM provides this control logic on magnetic media (diskette or tape) shipped to the host site upon installation of the 7426. For the 8100 processor, the control code is stored on an IBM Diskette 2D; for the 4321 and 4331, the medium is

IBM 7426 and 7171 Protocol Converters

▷ conversion provides. The current boom in protocol converter sales, from \$5 million a year in 1980 to over \$100 million in 1983, indicates that data communications equipment users have indeed accepted this concept. Realizing that protocol converters are now a vital element in a comprehensive data communications product line, IBM has embraced the concept thoroughly, and in addition to introducing the 7171 in 1984, IBM has made two important "statements of direction" concerning other protocol conversion products.

One statement concerns IBM's 3710 remote concentrator, which presently concentrates, but does not convert, asynchronous, SDLC, and BSC traffic. In the near future, IBM plans to offer protocol conversion in this unit, thus supplying the terminal conversion to SNA farther out in the network and extending the range of network management facilities available to the terminals. IBM has also discussed the possibility of providing "reverse" protocol conversion that will allow 3270 terminals to access the asynchronous environment.

In a June 1985 announcement, IBM and Rolm announced that both the 7426 and 7171 converters had been certified for use with Rolm's CBX II switch. Rolm, purchased by IBM late last year, is now part of IBM's Telecommunications Products Division. Several configurations using the converters were documented in an installation guide published by IBM. The tests were conducted at IBM's Telecommunications Development Laboratories. IBM and Rolm are presently committed to developing a worldwide telecommunications strategy that will include products from both companies, and IBM's protocol converters are an important part of the overall plan to provide numerous bridges, gateways, and interfaces between the SNA network and products from other vendors.

IBM's competitive position in this market is unique. While several vendors sell far more conversion devices than IBM, the company greatly influences user acceptance of the products because the majority of protocol conversions and emulations involve IBM equipment.

Many companies, both large and small, offer ASCII-to-3270 conversions. Two prominent contenders are Protocol Computers, Inc. and Micom. Protocol Computers manufactures the 1076 protocol converter, which provides

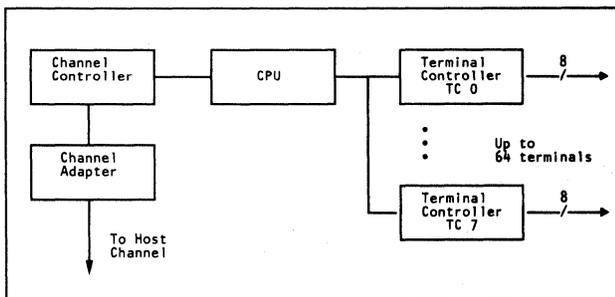


Figure 3. Functional diagram of IBM 7171 hardware components. The CPU houses the unit's main memory; each terminal controller board supports up to eight ASCII devices.

▶ an IBM Distribution Tape Reel (DTR). Upon 7426 power-up, the host operator loads the diskette or tape into the host system and transmits the code to the 7426, whereupon it is ready to perform its functions automatically.

Users can customize the 7426 for a specific operating environment during installation (and whenever necessary later on) by locally attaching a 3101 (or IBM PC with a 3101 emulator) to the designated port (Port 0) on the 7426 and pressing the Initialization switch on the front panel. Users can specify the following operating parameters: loop carrier, data rates, parity selection, and number of transmit bits.

The Model 7426 front panel contains a power switch, a power lamp, an Initialization/Test switch, and five indicator lamps that show Test Mode, Unit Ready, Line Ready, Communications Check, and Machine Check.

Diagnostic tests built into the 7426 monitor functional operation of the unit. When the 7426 receives power, it automatically performs a self test.

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Model 7171. The IBM 7171, emulating a 3274-1D control unit, supports a variety of ASCII terminals, printers, and plotters. Main functional components of the unit include a CPU board, a channel controller board, the channel adapter board and up to eight terminal controller boards. (See Figure 3 for a functional hardware components diagram of the 7171.) The main memory of the CPU contains the control program, a diagnostic program, EBCDIC/ASCII translation tables, and Terminal Definition Tables in ROM. (Terminal Definition Tables contain a list of control character sequences that determine how ASCII terminals are to function. Tables for the IBM 3101, IBM PC, Datamedia 1520/1521/3045, DEC VT100, LSI ADM 3A/31, and Televideo 912/920/950 are included; users must customize tables for other types of terminals, and store these tables in nonvolatile RAM.) RAM holds screen images for up to 64 active terminals, host and terminal input/output buffers, and a work area for the 7171 control program. The channel adapter board provides the interface with the host processor channel. Each terminal controller card supports up to eight ASCII terminals.

Within the 7171, terminal management is handled by the full-screen image buffer, ring buffer for keyboard input, a buffer for output to the terminal, and the Terminal Definition Tables that reside in the 7171's main memory for each ASCII terminal attached. The keyboard input routine interprets characters received from the ASCII terminal according to its associated Terminal Definition Table, separating those characters into text, local editing functions, and "attention" functions. Text characters from the terminal go directly into the 7171's screen buffer unless they would alter a protected field, in which case an audible alarm sounds, and the character is ignored. Local editing functions will alter the screen buffer and/or cursor position buffer as required. "Attention" functions go directly to the host; therefore, they do not alter the 7171 screen buffer. When changes are made to a terminal's screen image in the 7171 main memory, either by keyboard input or output from a host application, the terminal screen is updated to match the screen image stored in the 7171 unit.

Automatic recovery sequences will occur during transmission or data errors, or when the 7171 ring buffer is full. When an error occurs, the terminal is marked in an input-error state, and every received character is ignored; an ASCII BEL character sent to the terminal causes a beeping sound that informs the terminal user of the error condition. If connection is lost due to modem or phone-line errors, the

IBM 7426 and 7171 Protocol Converters

▶ ASCII-to-3270 conversion and 3276-12 emulation. Micom's Micro7400 also offers support for 3278 emulation by ASCII terminals. Other companies contending in the ASCII-to-IBM-3270 conversion market include Local Data, Icot, KMW Systems, and Modemsplus.

ADVANTAGES AND RESTRICTIONS

IBM's 7426 protocol converter is specifically designed for use with IBM 3101 terminals, and users who have this particular model may wish to stay with IBM for their conversion products.

There are several operation restrictions on the 7426. The unit only supports terminals operating in character mode; transparent mode is not supported. In addition, the 7426 does not support the following special 3276 Model 12 Control Unit features: address lock, APL/text control, APL/text, extended function base, color display attachment, audible alarm, an extended character set adapter, encrypt/decrypt, the magnetic reader control, SDLC/BSC switch, security keylock, or a selector light pen.

The 7171 unit will support up to 64 ASCII devices, which is a considerably greater number than most vendors offer on other units. The maximum number of ports on a PCI unit, for example, is only seven, and Micom's 7400 product accommodates up to 16. With a starting price of \$12,420 for a base unit supporting 16 devices, IBM's 7171 is more expensive than competing products, which presently sell in the \$5,000 price range. However, for large network users there may be a cost advantage in being able to expand the IBM 7171 in eight-line additions that will cost \$1,325 rather than buying additional units from another manufacturer to accommodate a larger number of ASCII devices. In general, a converter that supports eight devices will cost about \$3,500.

Because there are many differences between ASCII and IBM 3270 terminals, users will experience certain restrictions when using an ASCII device with the 7171. For example, the character in the lower right-hand corner is normally not displayed, and any attempt to write a character in this position causes the screen to roll up one line. Everything on the screen appears one line higher than indicated in the 7171's internal buffer; therefore, the results of input are difficult to predict.

The 7171 supports only those terminals operating in full-duplex mode. In addition, the unit supports 3270 features as described in IBM programming and hardware manuals, but it will not emulate accidental hardware characteristics when a 3270 is sent an incorrect datastream. Also, the 7171 attaches to a block multiplexer channel, which may support more than one device at once. Operation of the 7171 may be affected when certain types of devices are connected to the channel along with it. For example, a 7171 should not be attached to the same channel as tape drives.

▶ line to the 7171 is automatically disabled and reenabled to permit the user to dial back in and logon.

Users attach ASCII devices to the 7171 through RS-232-C cable connections to ports located at the rear of the unit. Each port will function according to one of the Terminal Definitions set in ROM or a user-programmed definition held in the 7171 nonvolatile RAM. Terminals must be set to seven bits, one stop bit, even parity, and to a 300 to 19.2K bps rate. Activating the 7171 power switch to the "on" condition, the On Line/Off Line switch to "On Line" and turning on terminal power will generate an "Enter Terminal Type" message on the connected terminal screen. Users then enter terminal type, such as IBM 3101 or DEC VT100, and press "Enter" to bring up the logo of the host operating system. Logon to the host proceeds from this point in the normal way.

When the 7171 is powered on, the unit runs a diagnostics routine, which checks for errors in the CPU and channel controller and terminal controller boards. Error conditions are indicated via lights on the CPU and controller boards, which are visible when the rear door of the 7171 unit is opened. If an error condition exists, users can proceed to isolate the failure through a set of Problem Determination Procedures specified in the IBM 7171 installation manual.

For added control of the 7171, users can attach a terminal to port 0 of terminal controller 0 to create a Special Maintenance Facility. When this is done, an operator can examine and store data in memory and monitor and debug error messages through the console. The operator can maintain a host session and a console session concurrently and toggle back and forth between the host-session and operator console screen.

Included with the 7171 is a support utility diskette that provides a menu-driven method to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128KB of memory and a 160KB diskette drive. If a personal computer is not available, users can define device tables at the machine level.

PRICING

The Model 7426 protocol converter is available for purchase only. IBM offers the following quantity discounts: 6 percent for 25 to 99 units; 9 percent for 100 to 199 units; and 15 percent for 200 or more units. The 7426 has been designed for customer installation. The Model 1 7426 sells for \$4,210; the Model 2 sells for \$3,830. There is a \$20 charge for repair-center maintenance.

The basic Model 7171 with support for up to 16 devices sells for \$12,420. An eight-line addition costs \$1,325, and a spare parts kit is available for \$5,705. The following quantity discounts are available: 6 percent for 10 to 19 units; 9 percent for 20 to 29 units, 12 percent for 30 to 39 units, 15 percent for 40 to 49 units, and 20 percent for 50 or more units. IBM specifies a \$229 monthly maintenance charge for the basic 7171; a \$13 fee is added for each eight-line increment. ■

USER REACTION

IBM did not supply us with a list of current users of its protocol converters; therefore, we were unable to conduct a user reaction for the products. □

IBM 7426 and 7171 Protocol Converters

MANAGEMENT SUMMARY

UPDATE: *This report has been updated to reflect changes in IBM's protocol converter product line. Since we last published the report, IBM introduced the 7171 unit and made "statements of direction" regarding protocol conversion on other IBM equipment.*

With the announcement of the 7426 and 7171 protocol converters, IBM has embraced a new philosophy concerning protocol conversion. Until 1982, when the 7426 converter was announced, IBM did not include protocol converters in its product line, and customers who wanted to use IBM host computers had to purchase IBM's compatible (and expensive) 3270 terminals or buy protocol converters to allow less expensive asynchronous ASCII devices to emulate IBM-compatible equipment. An entire industry of protocol converter manufacturers emerged to meet the need for conversion from asynchronous ASCII to IBM 3270. By 1982, the industry was one of the fastest growing segments of the data communications market. Realizing that selling converters to interface asynchronous equipment to the SNA network is good business, IBM began offering its own units. The introduction of the 7426 for remote connection to the SNA network was followed by the 7171, introduced in September 1984. The 7171 is a host-site unit that directly attaches to a block multiplexer channel on an IBM 43XX or 308X computer.

In 1979 IBM announced the 3101 ASCII display terminal, which differs from other IBM products in that it uses ASCII

This report describes IBM's Model 7426 and 7171 protocol converters. The 7426 unit is designed for remote attachment of devices, while the 7171 is used at the host site. The 7426 emulates an IBM 3276-12 controller and allows up to four IBM 3101 or other TTY-compatible terminals to appear as 3270-type terminals to an IBM 8100, 4300, S/370, or 30XX system. The 7171 accommodates the direct channel attachment to IBM 43XX and 308X hosts of 16 to 64 asynchronous devices emulating IBM 3270 equipment.

MODELS: 7426 Model 1, 7426 Model 2; 7171 (expandable in eight line increments).
CONVERSION: ASCII to 3270 SDLC.
TRANSMISSION RATES: 7426 Model 1—up to 38.4K bps through directly attached loop; up to 9600 bps through data-link attached loop; 7426 Model 2—up to 9600 bps, either through direct connection or a remote communications link; Model 7171—300 to 19.2K bps (autobaud per line).
COMPETITION: Protocol Computers, Inc., Micom Systems.
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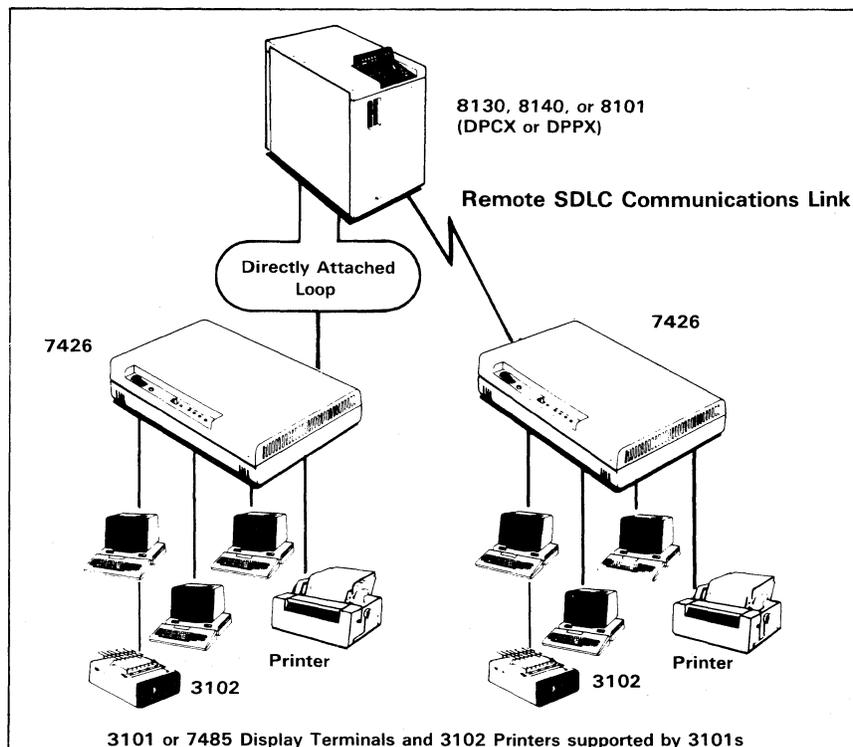


Figure 1. Shown here is a configuration of 7426 device attachments to an IBM 8100 System. The 7426 is designed to support IBM 3101 displays with or without attached 3102 printers. Other TTY-compatible ASCII display terminals and printers can also be attached. The 7426 also provides conversion between ASCII devices and a 4300 host computer.

IBM 7426 and 7171 Protocol Converters

► communications instead of BSC or SDLC protocols. IBM first announced the Model 7426 protocol converter to allow its ASCII 3101 display terminal and associated 3102 unit to communicate with 8100 and 4300 computers, with which they were previously incompatible. Although the 7426 was designed with the 3101 in mind, it also supports other ASCII terminal devices, such as an IBM Personal Computer running under the 3101 emulation program, the IBM 7485-531 RPQ display terminal, the IBM 4975-01A RPQ printer terminal, and, on an RPQ basis, certain non-IBM TTY-compatible ASCII displays and printers. The 7426 now operates with S/370 and 30XX hosts, as well as the 8100 and 4300.

The 7426 is a desktop, four-port unit that comes in two models: Model 1, designed for loop attachment, connects to the host via directly attached loop at a data rate of up to 38.4K bps, or to a data-link attached loop at up to 9600 bps; Model 2 is designed for communications via an SDLC data link operating at up to 9600 bps. Remote attachment of either the Model 1 or Model 2 requires the use of an external synchronous modem. The 7426 supports an RS-232-C or RS-422-A interface.

To the host computer, the 7426 appears as an IBM 3276-12 controller. ASCII terminals attached to the unit act as IBM 3278 display stations or 3287 printers. The 7426 transforms the field-formatted 3270 datastream produced by the host into an ASCII-TTY datastream for the attached devices and vice versa. The 7426 provides a 1,920-character transmit buffer for each of its four devices. Data entered at a display keyboard goes into the buffer, where it can be edited before the 7426 performs the ASCII-to-3270/SDLC conversion and sends it to the host. IBM's protocol converter also provides a 4800-byte block of storage that attached devices can share. This area is used to hold preformatted display screens used in fill-in-the-blank applications and other archived data.

Operation of the 7426 depends upon downstream loading of control code from the host. This loading occurs automatically when the 7426 receives power. Several factors restrict 7426 operation; we discuss those in the Advantages and Restrictions section of this report.

The 7171 converter, designed for local attachment of from 16 to 64 asynchronous ASCII devices to the block multiplexer channel of an IBM 43XX or 308X host, emulates an IBM 3274 1D control unit. Devices attached to the protocol converter appear as IBM 3270-type terminals, printers, or plotters. The unit supports full-duplex asynchronous transmission from 50 to 19.2K bps, and autobaud detection is available on a per-line basis from 300 to 19.2K bps.

Main functional components of the 7171 include a CPU board, a channel adapter board for interfacing to the host processor, a channel controller board and up to eight terminal controller boards, each of which supports eight ASCII terminals. The main memory of the CPU contains the control program, Terminal Definition Tables, and EBCDIC/ASCII translation tables that handle basic conversion operations. RAM holds screen images for up to 64

► CHARACTERISTICS

VENDOR: International Business Machines Corporation, One Orchard Place, Armonk NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: Model 7426—October 1982; Model 7171—September 1984.

DATE OF FIRST DELIVERY: Model 7426—Fourth Quarter 1983; Model 7171—Fourth Quarter 1984.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines.

MODELS

The 7426 is an ASCII-to-3270/SDLC protocol converter for remotely attaching up to four 3101 display terminals or other TTY-compatible terminals to IBM 4300, 8100, S/370, 30XX, and 8100 hosts. The unit emulates an IBM 3276-12 control unit. There are two models:

- Model 1—connects to the host system through a direct-attached or data-link-attached loop; supports up to 38.4K bps transmission for direct-attached loops and 1200, 2400, 4800, and 9600 bps transmission for data-link-attached loops.
- Model 2—connects the host through an SDLC communications link; supports transmission up to 9600 bps.

The Model 7171 is an ASCII-to-3270 protocol converter for locally attaching up to 64 ASCII devices to IBM 43XX or 308X host processors via a block multiplexer channel. The 7171 emulates an IBM 3274 model 1D control unit. (When more than 32 ASCII devices are attached, the 7171 appears as two 3274s.) It allows ASCII terminals to communicate with the IBM host interactive packages and editors operating under VM/SP or MVS.

TRANSMISSION SPECIFICATIONS

Terminals can attach to the 7426 locally, or remotely through an SDLC communications link. A choice of RS-232-C or RS-422-A interfaces is provided. In either case, the maximum data rate supported per terminal is 9600 bps for remote attachments. If communications lines are used, they may be either switched or nonswitched facilities, and asynchronous external modems are required. The 7426 provides auto-answer for its remotely connected terminals.

When connected locally, the maximum distance between the 7426 and the terminal is determined by the type of interface used. With an RS-232-C interface, a terminal can be located up to 40 feet from the 7426. When the RS-422-A interface is used, the terminal can be located up to 4,000 feet from the 7426. Maximum data transmission speed between the 7426 and an attached terminal is 9600 bps.

The 7426 Model 1 communicates with its IBM host through directly attached loops at up to 38.4K bps or remotely attached loops at 9600 bps. The 7426 Model 2 communicates with the host through an SDLC communications link at up to 9600 bps. The SDLC link operates in half-duplex, point-to-point, or multipoint mode over half- or full-duplex leased line facilities; a synchronous external modem is required.

The 7171 attaches to the IBM host through a block multiplexer channel and to ASCII devices through an RS-232-C interface. (See Figure 2.) When installed outside of the

IBM 7426 and 7171 Protocol Converters

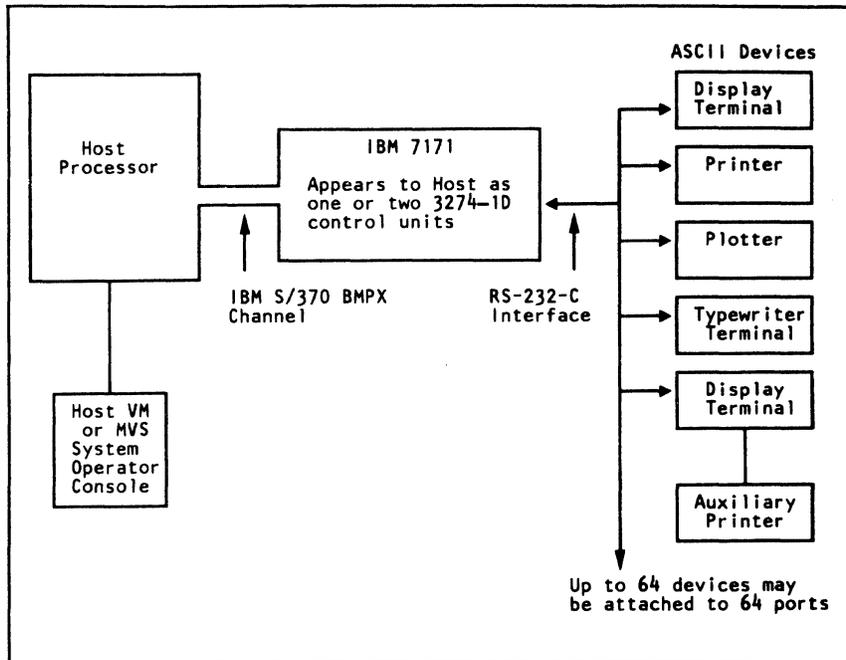


Figure 2. Shown here is a system configuration for IBM's 7171 protocol converter. The unit attaches to an IBM host processor through a block multiplexer channel (BMPX) and supports from 16 to 64 ASCII devices through an RS-232-C interface. The 7171 emulates an IBM 3274-1D control unit; ASCII devices attached to the system appear as 3270 terminals.

► active terminals, host and terminal input/output buffers, and a work area for the control program.

Model 7171 manages attached devices through a series of buffers that hold information passing between terminals and the host. A keyboard input routine interprets characters received from a terminal according to its Terminal Definition Table, which contains a list of control character sequences that determine how the unit functions. (The 7171 comes with a number of predefined tables for major ASCII terminals, and users can define tables for other types of equipment.) The routine separates characters into text, local editing functions, and "attention" functions: text characters go directly into the 7171's screen buffer unless they would alter a protected field in which case they are ignored; local editing functions alter the screen buffer and/or cursor position as required; and "attention" functions go directly to the host and do not alter the 7171 screen buffer.

A Special Maintenance Facility allows users to attach a terminal to one 7171 port to achieve additional control of the unit. Through the attached control terminal, users can examine and store data in memory and monitor and debug error messages. Also included with the 7171 is a support utility diskette that provides a means to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128KB of memory and a 160KB diskette drive.

COMPETITIVE POSITION

When IBM introduced the Model 7426 protocol converter in October 1982, the company joined a growing number of vendors whose products allow communications between ASCII devices and IBM 3270 applications programs. When IBM entered the conversion market, other protocol converter vendors hoped to reap the rewards of having IBM educate its huge installed base to the benefits that protocol

► United States, the 7171 conforms to CCITT V.24 and V.28 standards. Full-duplex transmission rates from 50 to 19.2K bps are supported. Autobaud detection is available on a per-line basis for 300, 600, 1200, 1800, 2400, 3600, 4800, 9600, and 19.2K bps speeds. The IBM 7171 is configured as Data Terminal Equipment (DTE). Devices may attach directly to the 7171 through a specially wired null modem cable or through asynchronous line drivers, modems, or acoustic couplers over leased or switched lines. For a direct connection, the required cable configuration is generally unique to a specific terminal. Although the RS-232-C standard specifies that the maximum distance between the terminal and the 7171 should not exceed 50 feet, users running applications at low transmission rates may be able to extend the distance to several hundred feet without severe signal degradation.

DEVICE CONTROL

Model 7426. To the IBM host, the 7426 appears logically as a 3276-12 Control Unit with attached 3278 display stations and/or 3287 printers. The 3276 emulation capability allows 3101 and other TTY-compatible terminals to use existing 3270 programming support. The 7426 contains a 1920-character buffer for each of the attached devices. Data entered at the terminal keyboard first enters the corresponding 7426 buffer before presentation at the display. Editing, updating, data entry, and correcting typing errors are done between the terminal and the 7426 before the information is sent in final form to the host. In addition to the 1920-character buffers, the 7426 contains a 4800-byte block of storage that is shared by attached devices. This storage, called the format storage area, holds preformatted display screens that are typically used in form fill-in applications. Having the forms stored in the protocol converter reduces the volume of data traffic that must occur between the 7426 and the host each time a particular application is run. The screens are formatted and distributed to the 7426 through user-written application code stored at the host system.

For the 7426 to operate, the host system must downline load microcoded control logic into RAM storage in the converter. IBM provides this control logic on magnetic media (diskette or tape) shipped to the host site upon installation of the 7426. For the 8100 processor, the control code is stored on an IBM Diskette 2D; for the 4321 and 4331, the medium is

IBM 7426 and 7171 Protocol Converters

conversion provides. The current boom in protocol converter sales, from \$5 million a year in 1980 to over \$100 million in 1983, indicates that data communications equipment users have indeed accepted this concept. Realizing that protocol converters are now a vital element in a comprehensive data communications product line, IBM has embraced the concept thoroughly, and in addition to introducing the 7171 in 1984, IBM has made two important "statements of direction" concerning other protocol conversion products.

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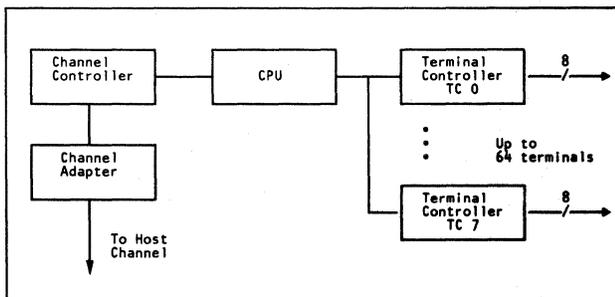


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CONVERSION: ASCII to 3270 SDLC.

TRANSMISSION RATES: 7426 Model 1—up to 38.4K bps through directly attached loop; up to 9600 bps through data-link attached loop; 7426 Model 2—up to 9600 bps, either through direct connection or a remote communications link; Model 7171—300 to 19.2K bps (autobaud per line).

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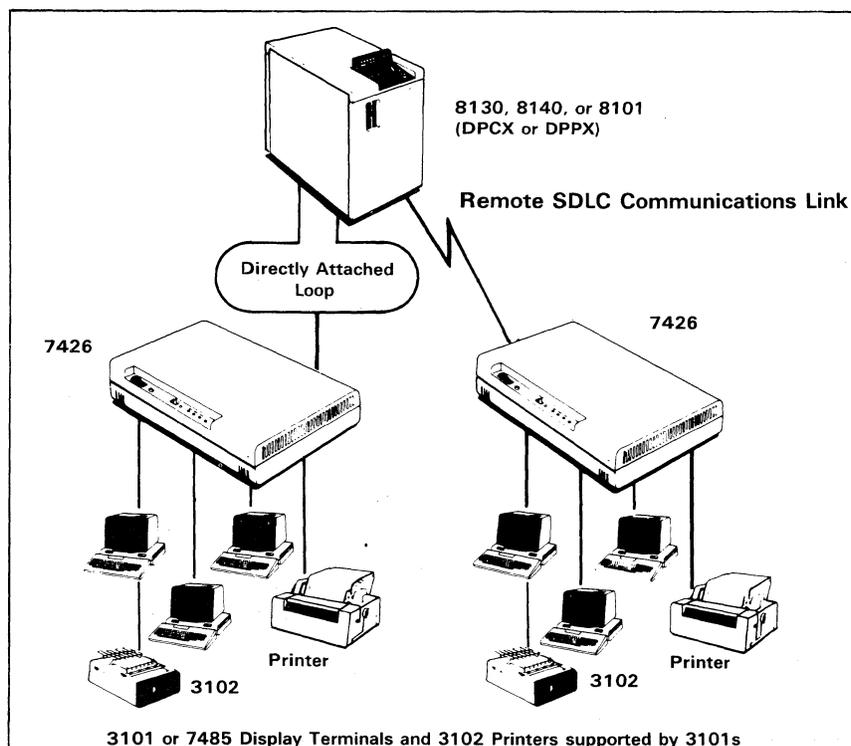


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IBM 7426 and 7171 Protocol Converters

► communications instead of BSC or SDLC protocols. IBM first announced the Model 7426 protocol converter to allow its ASCII 3101 display terminal and associated 3102 unit to communicate with 8100 and 4300 computers, with which they were previously incompatible. Although the 7426 was designed with the 3101 in mind, it also supports other ASCII terminal devices, such as an IBM Personal Computer running under the 3101 emulation program, the IBM 7485-531 RPQ display terminal, the IBM 4975-01A RPQ printer terminal, and, on an RPQ basis, certain non-IBM TTY-compatible ASCII displays and printers. The 7426 now operates with S/370 and 30XX hosts, as well as the 8100 and 4300.

The 7426 is a desktop, four-port unit that comes in two models: Model 1, designed for loop attachment, connects to the host via directly attached loop at a data rate of up to 38.4K bps, or to a data-link attached loop at up to 9600 bps; Model 2 is designed for communications via an SDLC data link operating at up to 9600 bps. Remote attachment of either the Model 1 or Model 2 requires the use of an external synchronous modem. The 7426 supports an RS-232-C or RS-422-A interface.

To the host computer, the 7426 appears as an IBM 3276-12 controller. ASCII terminals attached to the unit act as IBM 3278 display stations or 3287 printers. The 7426 transforms the field-formatted 3270 datastream produced by the host into an ASCII-TTY datastream for the attached devices and vice versa. The 7426 provides a 1,920-character transmit buffer for each of its four devices. Data entered at a display keyboard goes into the buffer, where it can be edited before the 7426 performs the ASCII-to-3270/SDLC conversion and sends it to the host. IBM's protocol converter also provides a 4800-byte block of storage that attached devices can share. This area is used to hold preformatted display screens used in fill-in-the-blank applications and other archived data.

Operation of the 7426 depends upon downstream loading of control code from the host. This loading occurs automatically when the 7426 receives power. Several factors restrict 7426 operation; we discuss those in the Advantages and Restrictions section of this report.

The 7171 converter, designed for local attachment of from 16 to 64 asynchronous ASCII devices to the block multiplexer channel of an IBM 43XX or 308X host, emulates an IBM 3274 1D control unit. Devices attached to the protocol converter appear as IBM 3270-type terminals, printers, or plotters. The unit supports full-duplex asynchronous transmission from 50 to 19.2K bps, and autobaud detection is available on a per-line basis from 300 to 19.2K bps.

Main functional components of the 7171 include a CPU board, a channel adapter board for interfacing to the host processor, a channel controller board and up to eight terminal controller boards, each of which supports eight ASCII terminals. The main memory of the CPU contains the control program, Terminal Definition Tables, and EBCDIC/ASCII translation tables that handle basic conversion operations. RAM holds screen images for up to 64

► CHARACTERISTICS

VENDOR: International Business Machines Corporation, One Orchard Place, Armonk NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: Model 7426—October 1982; Model 7171—September 1984.

DATE OF FIRST DELIVERY: Model 7426—Fourth Quarter 1983; Model 7171—Fourth Quarter 1984.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines.

MODELS

The 7426 is an ASCII-to-3270/SDLC protocol converter for remotely attaching up to four 3101 display terminals or other TTY-compatible terminals to IBM 4300, 8100, S/370, 30XX, and 8100 hosts. The unit emulates an IBM 3276-12 control unit. There are two models:

- Model 1—connects to the host system through a direct-attached or data-link-attached loop; supports up to 38.4K bps transmission for direct-attached loops and 1200, 2400, 4800, and 9600 bps transmission for data-link-attached loops.
- Model 2—connects the host through an SDLC communications link; supports transmission up to 9600 bps.

The Model 7171 is an ASCII-to-3270 protocol converter for locally attaching up to 64 ASCII devices to IBM 43XX or 308X host processors via a block multiplexer channel. The 7171 emulates an IBM 3274 model 1D control unit. (When more than 32 ASCII devices are attached, the 7171 appears as two 3274s.) It allows ASCII terminals to communicate with the IBM host interactive packages and editors operating under VM/SP or MVS.

TRANSMISSION SPECIFICATIONS

Terminals can attach to the 7426 locally, or remotely through an SDLC communications link. A choice of RS-232-C or RS-422-A interfaces is provided. In either case, the maximum data rate supported per terminal is 9600 bps for remote attachments. If communications lines are used, they may be either switched or nonswitched facilities, and asynchronous external modems are required. The 7426 provides auto-answer for its remotely connected terminals.

When connected locally, the maximum distance between the 7426 and the terminal is determined by the type of interface used. With an RS-232-C interface, a terminal can be located up to 40 feet from the 7426. When the RS-422-A interface is used, the terminal can be located up to 4,000 feet from the 7426. Maximum data transmission speed between the 7426 and an attached terminal is 9600 bps.

The 7426 Model 1 communicates with its IBM host through directly attached loops at up to 38.4K bps or remotely attached loops at 9600 bps. The 7426 Model 2 communicates with the host through an SDLC communications link at up to 9600 bps. The SDLC link operates in half-duplex, point-to-point, or multipoint mode over half- or full-duplex leased line facilities; a synchronous external modem is required.

The 7171 attaches directly to the IBM host through a block multiplexer channel supporting an RS-232-C interface. (See Figure 2 for Model 7171 system configuration.) When in-

IBM 7426 and 7171 Protocol Converters

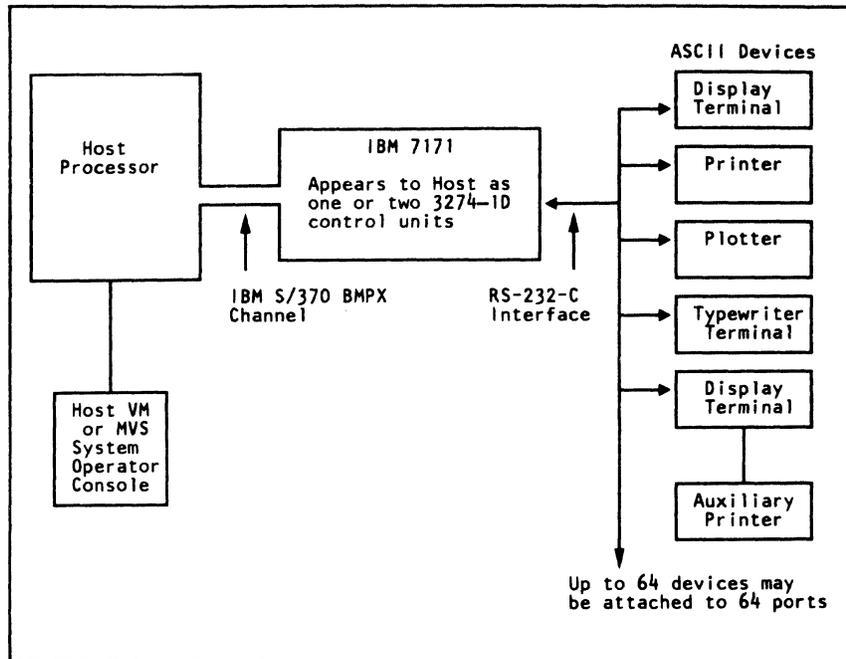


Figure 2. Shown here is a system configuration for IBM's 7171 protocol converter. The unit attaches to an IBM host processor through a block multiplexer channel (BMPX) and supports from 16 to 64 ASCII devices through an RS-232-C interface. The 7171 emulates an IBM 3274-1D control unit; ASCII devices attached to the system appear as 3270 terminals.

▶ active terminals, host and terminal input/output buffers, and a work area for the control program.

Model 7171 manages attached devices through a series of buffers that hold information passing between terminals and the host. A keyboard input routine interprets characters received from a terminal according to its Terminal Definition Table, which contains a list of control character sequences that determine how the unit functions. (The 7171 comes with a number of predefined tables for major ASCII terminals, and users can define tables for other types of equipment.) The routine separates characters into text, local editing functions, and "attention" functions: text characters go directly into the 7171's screen buffer unless they would alter a protected field in which case they are ignored; local editing functions alter the screen buffer and/or cursor position as required; and "attention" functions go directly to the host and do not alter the 7171 screen buffer.

A Special Maintenance Facility allows users to attach a terminal to one 7171 port to achieve additional control of the unit. Through the attached control terminal, users can examine and store data in memory and monitor and debug error messages. Also included with the 7171 is a support utility diskette that provides a means to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128KB of memory and a 160KB diskette drive.

COMPETITIVE POSITION

When IBM introduced the Model 7426 protocol converter in October 1982, the company joined a growing number of vendors whose products allow communications between ASCII devices and IBM 3270 applications programs. When IBM entered the conversion market, other protocol converter vendors hoped to reap the rewards of having IBM educate its huge installed base to the benefits that protocol

▶ stalled outside of the United States, the 7171 conforms to CCITT V.24 and V.28 standards. Full-duplex transmission rates from 50 to 19.2K bps are supported. Autobaud detection is available on a per-line basis for 300, 600, 1200, 1800, 2400, 3600, 4800, 9600, and 19.2K bps speeds. The IBM 7171 is configured as Data Terminal Equipment (DTE). Devices may attach directly to the 7171 through a specially wired null modem cable or through asynchronous line drivers, modems, or acoustic couplers over leased or switched lines. For a direct connection, the required cable configuration is generally unique to a specific terminal. Although the RS-232-C standard specifies that the maximum distance between the terminal and the 7171 should not exceed 50 feet, users running applications at low transmission rates may be able to extend the distance to several hundred feet without severe signal degradation.

DEVICE CONTROL

Model 7426. To the IBM host, the 7426 appears logically as a 3276-12 Control Unit with attached 3278 display stations and/or 3287 printers. The 3276 emulation capability allows 3101 and other TTY-compatible terminals to use existing 3270 programming support. The 7426 contains a 1920-character buffer for each of the attached devices. Data entered at the terminal keyboard first enters the corresponding 7426 buffer before presentation at the display. Editing, updating, data entry, and correcting typing errors are done between the terminal and the 7426 before the information is sent in final form to the host. In addition to the 1920-character buffers, the 7426 contains a 4800-byte block of storage that is shared by attached devices. This storage, called the format storage area, holds preformatted display screens that are typically used in form fill-in applications. Having the forms stored in the protocol converter reduces the volume of data traffic that must occur between the 7426 and the host each time a particular application is run. The screens are formatted and distributed to the 7426 through user-written application code stored at the host system.

For the 7426 to operate, the host system must downline load microcoded control logic into RAM storage in the converter. IBM provides this control logic on magnetic media (diskette or tape) shipped to the host site upon installation of the 7426. For the 8100 processor, the control code is stored on an IBM Diskette 2D; for the 4321 and 4331, the medium is

IBM 7426 and 7171 Protocol Converters

conversion provides. The current boom in protocol converter sales, from \$5 million a year in 1980 to over \$100 million in 1983, indicates that data communications equipment users have indeed accepted this concept. Realizing that protocol converters are now a vital element in a comprehensive data communications product line, IBM has embraced the concept thoroughly, and in addition to introducing the 7171 in 1984, IBM has made two important "statements of direction" concerning other protocol conversion products.

One statement concerns IBM's 3710 remote concentrator, which presently concentrates, but does not convert, asynchronous, SDLC, and BSC traffic. In the near future, IBM plans to offer protocol conversion in this unit, thus supplying the terminal conversion to SNA farther out in the network and extending the range of network management facilities available to the terminals. IBM has also discussed the possibility of providing "reverse" protocol conversion that will allow 3270 terminals to access the asynchronous environment.

In a June 1985 announcement, IBM and Rolm announced that both the 7426 and 7171 converters had been certified for use with Rolm's CBX II switch. Rolm, purchased by IBM late last year, is now part of IBM's Telecommunications Products Division. Several configurations using the converters were documented in an installation guide published by IBM. The tests were conducted at IBM's Telecommunications Development Laboratories. IBM and Rolm are presently committed to developing a worldwide telecommunications strategy that will include products from both companies, and IBM's protocol converters are an important part of the overall plan to provide numerous bridges, gateways, and interfaces between the SNA network and products from other vendors.

IBM's competitive position in this market is unique. While several vendors sell far more conversion devices than IBM, the company greatly influences user acceptance of the products because the majority of protocol conversions and emulations involve IBM equipment.

Many companies, both large and small, offer ASCII-to-3270 conversions. Two prominent contenders are Protocol Computers, Inc. and Micom. Protocol Computers manufactures the 1076 protocol converter, which provides

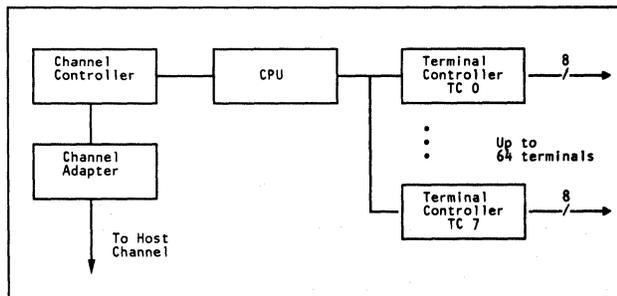


Figure 3. Functional diagram of IBM 7171 hardware components. The CPU houses the unit's main memory; each terminal controller board supports up to eight ASCII devices.

an IBM Distribution Tape Reel (DTR). Upon 7426 power-up, the host operator loads the diskette or tape into the host system and transmits the code to the 7426, whereupon it is ready to perform its functions automatically.

Users can customize the 7426 for a specific operating environment during installation (and whenever necessary later on) by locally attaching a 3101 (or IBM PC with a 3101 emulator) to the designated port (Port 0) on the 7426 and pressing the Initialization switch on the front panel. Users can specify the following operating parameters: loop carrier, data rates, parity selection, and number of transmit bits.

The Model 7426 front panel contains a power switch, a power lamp, an Initialization/Test switch, and five indicator lamps that show Test Mode, Unit Ready, Line Ready, Communications Check, and Machine Check.

Diagnostic tests built into the 7426 monitor functional operation of the unit. When the 7426 receives power, it automatically performs a self test.

Terminal users access 3278 terminal functions through keystroke sequences. For example, by pressing the ALT key and the "d" key, users access the Enter function.

Model 7171. The IBM 7171, emulating a 3274-1D control unit, supports a variety of ASCII terminals, printers, and plotters. Main functional components of the unit include a CPU board, a channel controller board, the channel adapter board and up to eight terminal controller boards. (See Figure 3 for a functional hardware components diagram of the 7171.) The main memory of the CPU contains the control program, a diagnostic program, EBCDIC/ASCII translation tables, and Terminal Definition Tables in ROM. (Terminal Definition Tables contain a list of control character sequences that determine how ASCII terminals are to function. Tables for the IBM 3101, IBM PC, Datamedia 1520/1521/3045, DEC VT100, LSI ADM 3A/31, and Televideo 912/920/950 are included; users must customize tables for other types of terminals, and store these tables in nonvolatile RAM.) RAM holds screen images for up to 64 active terminals, host and terminal input/output buffers, and a work area for the 7171 control program. The channel adapter board provides the interface with the host processor channel. Each terminal controller card supports up to eight ASCII terminals.

Within the 7171, terminal management is handled by the full-screen image buffer, ring buffer for keyboard input, a buffer for output to the terminal, and the Terminal Definition Tables that reside in the 7171's main memory for each ASCII terminal attached. The keyboard input routine interprets characters received from the ASCII terminal according to its associated Terminal Definition Table, separating those characters into text, local editing functions, and "attention" functions. Text characters from the terminal go directly into the 7171's screen buffer unless they would alter a protected field, in which case an audible alarm sounds, and the character is ignored. Local editing functions will alter the screen buffer and/or cursor position buffer as required. "Attention" functions go directly to the host; therefore, they do not alter the 7171 screen buffer. When changes are made to a terminal's screen image in the 7171 main memory, either by keyboard input or output from a host application, the terminal screen is updated to match the screen image stored in the 7171 unit.

Automatic recovery sequences will occur during transmission or data errors, or when the 7171 ring buffer is full. When an error occurs, the terminal is marked in an input-error state, and every received character is ignored; an ASCII BEL character sent to the terminal causes a beeping sound that informs the terminal user of the error condition. If connection is lost due to modem or phone-line errors, the

IBM 7426 and 7171 Protocol Converters

▶ ASCII-to-3270 conversion and 3276-12 emulation. Micom's Micro7400 also offers support for 3278 emulation by ASCII terminals. Other companies contending in the ASCII-to-IBM-3270 conversion market include Local Data, Icot, KMW Systems, and Modemsplus.

ADVANTAGES AND RESTRICTIONS

IBM's 7426 protocol converter is specifically designed for use with IBM 3101 terminals, and users who have this particular model may wish to stay with IBM for their conversion products.

There are several operation restrictions on the 7426. The unit only supports terminals operating in character mode; transparent mode is not supported. In addition, the 7426 does not support the following special 3276 Model 12 Control Unit features: address lock, APL/text control, APL/text, extended function base, color display attachment, audible alarm, an extended character set adapter, encrypt/decrypt, the magnetic reader control, SDLC/BSC switch, security keylock, or a selector light pen.

The 7171 unit will support up to 64 ASCII devices, which is a considerably greater number than most vendors offer on other units. The maximum number of ports on a PCI unit, for example, is only seven, and Micom's 7400 product accommodates up to 16. With a starting price of \$12,420 for a base unit supporting 16 devices, IBM's 7171 is more expensive than competing products, which presently sell in the \$5,000 price range. However, for large network users there may be a cost advantage in being able to expand the IBM 7171 in eight-line additions that will cost \$1,325 rather than buying additional units from another manufacturer to accommodate a larger number of ASCII devices. In general, a converter that supports eight devices will cost about \$3,500.

Because there are many differences between ASCII and IBM 3270 terminals, users will experience certain restrictions when using an ASCII device with the 7171. For example, the character in the lower right-hand corner is normally not displayed, and any attempt to write a character in this position causes the screen to roll up one line. Everything on the screen appears one line higher than indicated in the 7171's internal buffer; therefore, the results of input are difficult to predict.

The 7171 supports only those terminals operating in full-duplex mode. In addition, the unit supports 3270 features as described in IBM programming and hardware manuals, but it will not emulate accidental hardware characteristics when a 3270 is sent an incorrect datastream. Also, the 7171 attaches to a block multiplexer channel, which may support more than one device at once. Operation of the 7171 may be affected when certain types of devices are connected to the channel along with it. For example, a 7171 should not be attached to the same channel as tape drives.

▶ line to the 7171 is automatically disabled and reenabled to permit the user to dial back in and logon.

Users attach ASCII devices to the 7171 through RS-232-C cable connections to ports located at the rear of the unit. Each port will function according to one of the Terminal Definitions set in ROM or a user-programmed definition held in the 7171 nonvolatile RAM. Terminals must be set to seven bits, one stop bit, even parity, and to a 300 to 19.2K bps rate. Activating the 7171 power switch to the "on" condition, the On Line/Off Line switch to "On Line" and turning on terminal power will generate an "Enter Terminal Type" message on the connected terminal screen. Users then enter terminal type, such as IBM 3101 or DEC VT100, and press "Enter" to bring up the logo of the host operating system. Logon to the host proceeds from this point in the normal way.

When the 7171 is powered on, the unit runs a diagnostics routine, which checks for errors in the CPU and channel controller and terminal controller boards. Error conditions are indicated via lights on the CPU and controller boards, which are visible when the rear door of the 7171 unit is opened. If an error condition exists, users can proceed to isolate the failure through a set of Problem Determination Procedures specified in the IBM 7171 installation manual.

For added control of the 7171, users can attach a terminal to port 0 of terminal controller 0 to create a Special Maintenance Facility. When this is done, an operator can examine and store data in memory and monitor and debug error messages through the console. The operator can maintain a host session and a console session concurrently and toggle back and forth between the host-session and operator console screen.

Included with the 7171 is a support utility diskette that provides a menu-driven method to define, modify, and save ASCII device definition tables. This utility operates on an IBM PC with 128KB of memory and a 160KB diskette drive. If a personal computer is not available, users can define device tables at the machine level.

PRICING

The Model 7426 protocol converter is available for purchase only. IBM offers the following quantity discounts: 6 percent for 25 to 99 units; 9 percent for 100 to 199 units; and 15 percent for 200 or more units. The 7426 has been designed for customer installation. The Model 1 7426 sells for \$4,210; the Model 2 sells for \$3,830. There is a \$20 charge for repair-center maintenance.

The basic Model 7171 with support for up to 16 devices sells for \$12,420. An eight-line addition costs \$1,325, and a spare parts kit is available for \$5,705. The following quantity discounts are available: 6 percent for 10 to 19 units; 9 percent for 20 to 29 units, 12 percent for 30 to 39 units, 15 percent for 40 to 49 units, and 20 percent for 50 or more units. IBM specifies a \$229 monthly maintenance charge for the basic 7171; a \$13 fee is added for each eight-line increment. ■

USER REACTION

IBM did not supply us with a list of current users of its protocol converters; therefore, we were unable to conduct a user reaction for the products. □

1. *Chrysolina* *serripes* (L.)
2. *Chrysolina* *serripes* (L.)

1. *Chrysolina* *serripes* (L.)
2. *Chrysolina* *serripes* (L.)

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IBM 7426 Protocol Converter

MANAGEMENT SUMMARY

Responding to the trend toward asynchronous distributed communications in the data communications network, in 1979 IBM announced the 3101 ASCII display terminal, which differs from other IBM products in that it uses ASCII communications instead of BSC or SDLC protocols to access IBM mainframes. In October 1982, IBM announced the Model 7426 protocol converter, enabling the 3101, along with its associated 3102, to be attached to IBM 8100 and 4300 computers, with which they were previously incompatible.

Although the 7426 was designed with the 3101 in mind, it also supports other ASCII terminal devices, such as an IBM Personal Computer running under the 3101 emulation program, the IBM 7485-531 RPQ display terminal, the IBM 4975-01A RPQ printer terminal, and, on an RPQ basis, certain non-IBM TTY-compatible ASCII displays and printers.

Display terminals connected through a 7426 appear as IBM 3278 display units. Printers appear as IBM 3287 printers. With the introduction of the 7426, IBM legitimized protocol conversion as an acceptable way to handle problems of incompatibility in both its BSC and SNA environments.

The 7426 is a desk-top, four-port unit that comes in two models: Model 1 is designed for loop attachment and connects to a 4331 or 8100 directly attached loop at a data rate of up to 38.4K bps, or to a data-link attached loop at up to 9600 bps; Model 2 is designed for communications via

This report describes IBM's Model 7426 protocol converter, which emulates an IBM 3276-12 controller and allows IBM 3101 or other TTY-compatible terminals to appear as 3270-type terminals to 8100 and 4300 computers. The report also provides a brief discussion of the Yale ASCII Communications System and its associated Model 4944 ASCII Device Control Unit.

MODELS: 7426 Model 1, 7426 Model 2.
CONVERSION: ASCII to 3270 SDLC.
TRANSMISSION RATES: Model 1—up to 38.4K bps through directly-attached loop; up to 9600 bps through data-link attached loop; Model 2—up to 9600 bps, either through direct connection or a remote communications link.
COMPETITION: Protocol Computers, Inc., Micom Systems.
PRICE: Model 1—\$4,210; Model 2—\$3,830.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Old Orchard Place, Armonk NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: October 1982.

DATE OF FIRST DELIVERY: Fourth quarter, 1982.

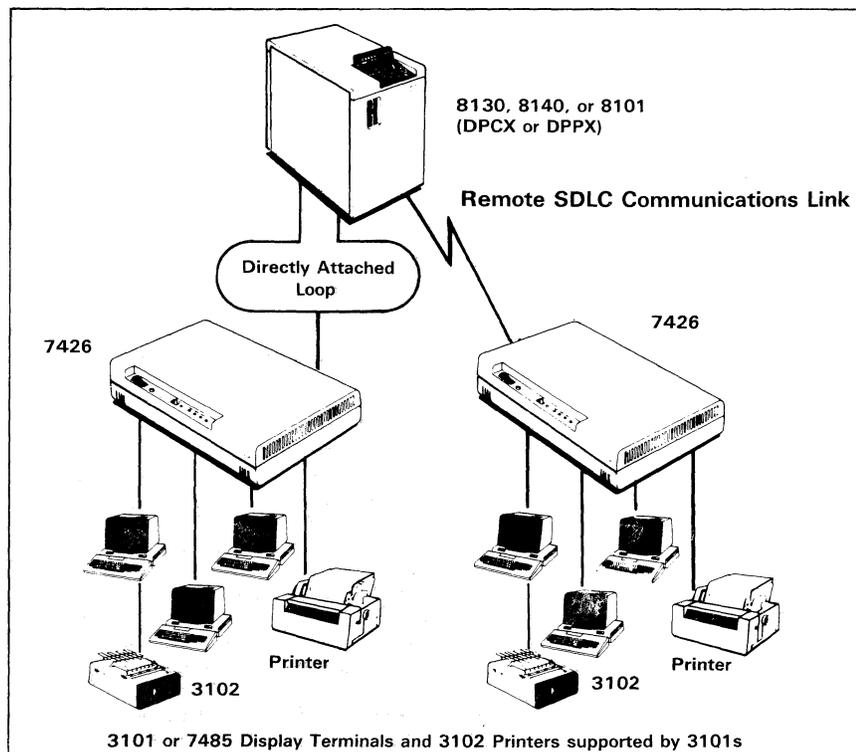


Figure 1. Shown here is a configuration of 7426 device attachments to an IBM 8100 System. The 7426 is designed to support IBM 3101 displays with or without attached 3102 printers. Other TTY-compatible ASCII display terminals and printers can also be attached. The 7426 also provides conversion between ASCII devices and a 4300 host computer.

IBM 7426 Protocol Converter

▷ an SDLC data link operating at up to 9600 bps. Remote attachment of either the Model 1 or Model 2 requires the use of an external synchronous modem.

The 7426 provides a choice of RS-422-A or RS-232-C interfaces, and supports up to four IBM 3101 display terminals with or without associated 3102 printers, which can be connected to the 7426 locally or via communications lines. When connected locally, the maximum distance between the 7426 and the terminal is determined by the type of interface used. When the RS-232-C interface is used, a terminal can be located up to 40 feet from the 7426. When the RS-422-A interface is used, the terminal can be located up to 4000 feet from the 7426. Maximum data transmission speed between the 7426 and an attached terminal is 9600 bps.

To the host computer, the 7426 appears as an IBM 3276-12 controller. The 7426 transforms the field-formatted 3270 data stream produced by the host into an ASCII-TTY data stream for the attached devices and vice versa. The 7426 provides a 1920-character transmit buffer for each of its four devices. Data entered at a display keyboard goes into the buffer, where it can be edited before the 7426 performs the ASCII-to-3270/SDLC conversion and sends it to the host.

IBM's protocol converter also provides a 4800-byte block of storage that attached devices can share. This area is used to hold preformatted display screens used in fill-in-the-blank applications and other archived data.

Operation of the 7426 depends upon downstream loading of control code from the host. This loading occurs automatically when the 7426 receives power. Several factors restrict 7426 operation; we discuss those in the Advantages and Restrictions section of this report.

In September 1983, IBM announced another emulation product, the Host Loaded Yale ASCII Terminal Communications System, a software package that permits ASCII display terminals to access IBM interactive systems, e.g., TSO and VM/CMS, and appear as 3277-type terminals. Announced with the new program was a 4994 ASCII Device Control Unit that works with the Yale ASCII program to interface terminals with the host. Both of these products will be available in March 1984.

The Yale ASCII Communications System supports up to 48 full-duplex ASCII devices connected through the 4994 unit. There are three 4994 models: Model A supports 16 lines, Model B supports 32 lines, and Model C supports 48 lines. The 4994 executes the terminal control portion of the program, which is downloaded from an IBM 4300 host VM system. The Yale System permits 3277-terminal emulation on most ASCII terminal units, including the 3101. The connection to the IBM host appears as a locally attached IBM 3272 controller. ▷

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

SERVICED BY: International Business Machines.

MODELS

The 7426 protocol converter is an ASCII-to-3270/SDLC protocol converter for attaching up to four 3101 display terminals or other TTY-compatible terminals to IBM 4300 processors and 8100 Information Systems. There are two models:

- **Model 1**—connects to a 4331 or 8100 system through a direct-attached or data-link-attached loop; supports up to 38.4K bps transmission for direct-attached loops and 1200, 2400, 4800, and 9600 bps transmission for data-link-attached loops.
- **Model 2**—connects a 4321, 4331, or 8100 system through an SDLC communications link; supports transmission up to 9600 bps.

TRANSMISSION SPECIFICATIONS

Terminals can attach to the 7426 locally or through communications lines. A choice of RS-232-C or RS-422-A interfaces is provided. In either case, the maximum data rate supported per terminal is 9600 bps. If communications lines are used, they may be either switched or nonswitched facilities, and asynchronous external modems are required. The 7426 provides auto-answer for its remotely connected terminals.

The 7426 Model 1 communicates with its 8100 and 4331 host through directly attached loops at up to 38.4K bps or remotely attached loops at 9600 bps. The 7426 Model 2 communicates with its 8100, 4321, or 4331 host through an SDLC communications link at up to 9600 bps. The SDLC link operates in half-duplex, point-to-point, or multipoint mode over half- or full-duplex leased line facilities; a synchronous external modem is required.

DEVICE CONTROL

To the IBM 8100, 4331, or 4321 systems, the 7426 appears logically as a 3276-12 Control Unit with attached 3278 display stations and 3287 printers. The 3276 emulation capability allows 3101 and other TTY-compatible terminals to use existing 3270 programming support.

The Model 7426 front panel contains a power switch, a power lamp, an Initialization/Test switch, and five indicator lamps that show Test Mode, Unit Ready, Line Ready, Communications Check, and Machine Check.

For the 7426 to operate, the host system must downline load microcoded control logic into RAM storage in the converter. IBM provides this control logic on magnetic media (diskette or tape) shipped to the host site upon installation of the 7426. For the 8100 processor, the control code is stored on an IBM Diskette 2D; for the 4321 and 4331, the medium is an IBM Distribution Tape Reel (DTR). Upon 7426 power-up, the host operator loads the diskette or tape into the host system and transmits the code to the 7426, whereupon it is ready to perform its functions automatically.

Users can customize the 7426 for a specific operating environment during installation (and whenever necessary later) ▶

IBM 7426 Protocol Converter

- The Yale program supports a maximum data rate up to 19.2K bps between the 4994 and a locally attached device; however, aggregate data rates of connected hardware can limit this speed.

COMPETITIVE POSITION

When IBM introduced the Model 7426 protocol converter in October 1982, the company joined a growing number of vendors whose products allow communications between ASCII devices and IBM 3270 applications programs. When IBM entered the conversion market, other protocol converter vendors hoped to reap the rewards of having IBM educate its huge installed base to the benefits that protocol conversion provides. The current boom in protocol converter sales, from \$5 million a year in 1980 to over \$100 in 1983, indicates that data communications equipment users have indeed accepted this concept.

IBM's competitive position in this market is unique. While several vendors sell far more conversion devices than IBM, the company greatly influences user acceptance of the products because the majority of protocol conversions and emulations involve IBM equipment.

Many companies, both large and small, offer ASCII-to-3270 conversions. Two prominent contenders are Protocol Computers, Inc. and Micom. Protocol Computers manufactures the 1076 protocol converter, which provides ASCII-to-3270 conversion and 3276-12 emulation. Micom's new Micro7400, which replaces Industrial Computers Control's CA20 unit, also offers support for 3278 emulation by ASCII terminals.

ADVANTAGES AND RESTRICTIONS

IBM's 7426 protocol converter is specifically designed for use with IBM 3101 terminals, and users who have this particular model may wish to stay with IBM for their conversion products.

There are several operation restrictions on the 7426. The unit only supports terminals operating in character mode; transparent mode is not supported. In addition, the 7426 does not support the following special 3276 Model 12 Control Unit features: address lock, APL/text control, APL/text, extended function base, color display attachment, audible alarm, an extended character set adapter, encrypt/decrypt, the magnetic reader control, SDLC/BSC switch, security keylock, or a selector light pen.

USER REACTION

IBM did not supply us with a list of current users; therefore, we did not conduct a user reaction for the product. □

- on) by locally attaching a 3101 (or IBM PC with a 3101 emulator) to the designated port (Port 0) on the 7426 and pressing the Initialization switch on the front panel. Users can specify the following operating parameters: loop carrier, data rates, parity selection, and number of transmit bits.

Diagnostic tests built into the 7426 monitor functional operation of the unit. When the 7426 receives power, it automatically performs a self test.

Terminal users access 3278 terminal functions through keystroke sequences. For example, by pressing the ALT key and the "d" key, users access the Enter function.

PRICING

The Model 7426 protocol converter is available for purchase only. IBM offers the following quantity discounts: 6 percent for 25-99 units; 9 percent for 100-199 units; and 15 percent for 200 or more units. The 7426 has been designed for customer installation. The Model 1 7426 sells for \$4,210; the Model 2 sells for \$3,830. There is a \$20 charge for repair-center maintenance.

The 4994 ASCII Device Control Unit, mentioned in the Management Summary of this report, sells for \$16,735 (Model A), \$25,850 (Model B), and \$32,300 (Model C). Users must pay a basic license one-time charge of \$3,700 for the Yale ASCII Terminal Communications System program. ■

IBM 3708 Network Conversion Unit

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Product Summary**Editor's Note**

The protocol conversion market evolved to provide a means of communication between inexpensive asynchronous peripheral devices and IBM synchronous hosts. Communications controllers marketed today by IBM and other vendors allow direct attachment of both synchronous and asynchronous devices, which has greatly reduced the need for stand-alone protocol converters. Nevertheless, products such as the IBM 3708 are still in demand because they offer the most economical connectivity solution.

Description

The IBM 3708 provides line concentration, protocol conversion, and protocol enveloping for asynchronous devices such as displays, printers, plotters, and personal computers. From 8 to 18 devices can be accommodated, depending on the configuration.

Strengths

The 3708 provides access to dual IBM hosts and an asynchronous host from any attached display terminal. The unit supports a variety of devices through customer-configured keyboard maps.

Limitations

Most protocol converters, including the 3708, do not support the full range of IBM 3270 functions.

Competition

Andrew Corp., Andrew/KMW, Micom Communications Corp., Netlink Inc., Telematics International Inc., Wall Data, and others.

Vendor

International Business Machines Corporation (IBM)
Old Orchard Road
Armonk, NY 10504
Contact your local IBM representative.

Price

The 3708 sells for \$4,375. A plug-in cartridge containing system micro-code costs an additional \$875.

Analysis

Product Strategy

IBM introduced the 3708 Network Conversion Unit at the 1985 TCA show in San Diego, and competitors were quick to recognize the threat this product posed. For a number of years, IBM had no protocol converters in its product line, and many manufacturers were reaping the rewards of a strong market for devices that allow asynchronous equipment to communicate with IBM hosts. Of course, a large part of this market included IBM mainframe customers. After IBM developed converters of its own to sell to its huge installed base and included support for ASCII systems on its newer controllers, the market share of those competitors declined significantly.

The IBM 3708 provides line concentration, protocol conversion, protocol enveloping, and

ASCII pass-through support for asynchronous devices. The 10-port unit, designed for customer installation and maintenance, supports the attachment of one or two IBM hosts and multiple asynchronous devices and/or hosts. Devices attached to the unit emulate IBM 3270 equipment.

The 3708 supports connections to IBM System/370, 30XX, 43XX, and 9370 hosts; IBM AS/400 and System/3X computers; IBM 4701 Model 003 Finance Communications Controllers and 4702 Branch Automation Processors; and ROLM CBX II 8000 and 9000 systems.

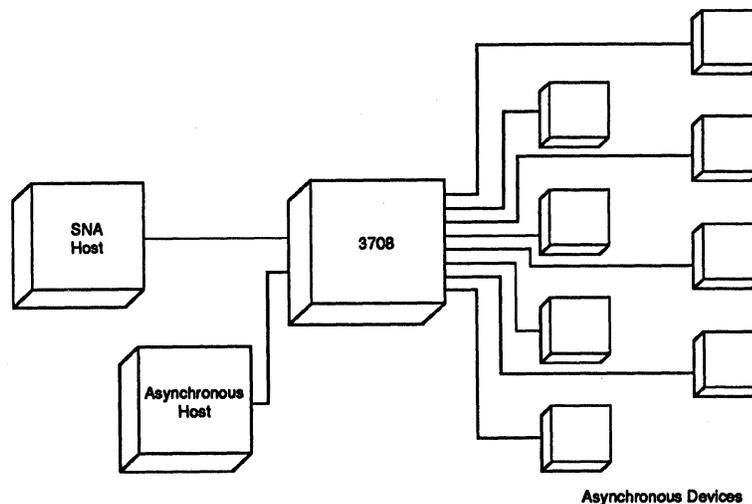
When operating in protocol conversion mode, the 3708 converts a 3270 datastream to and from ASCII code, allowing asynchronous display terminals and personal computers emulating displays to appear to an IBM SNA host as IBM 3178, 3179, 3278, and 3278 displays. Asynchronous printers and plotters appear as IBM 3287 printers.

Asynchronous devices supported include IBM 3101-, 3151-, and 316X-compatible displays; IBM ProPrinter ASCII printer models; and equipment from Applied Digital Data Systems (ADDS), Data General, Digital Equipment, Falco Data Products, Hewlett-Packard, TeleVideo Systems, and Wyse Technology. Users can create custom keyboard maps for other types of equipment.

In protocol conversion mode, a display and printer can share a 3708 port while appearing to

Figure 1.
Host Access through the
3708 Network Conversion
Unit

The 3708 allows any attached display terminal to access dual IBM SNA hosts and an asynchronous host.



Company Profile IBM Corporation

Corporate Headquarters

Old Orchard Road
Armonk, NY 10504

In Canada

IBM Canada Ltd.,
Markham
3500 Steeles Avenue E.
Markham, ON L3R 2Z1
(416) 474-2111

Offices located in other
cities throughout Canada.

Officers

Chairman/CEO: John Akers

Vice Chairman: Jack D. Kuehler

Sr. VP/Gen. Mgr.: Terry Lautenbach

Company Background

Year Founded: 1914

No. Employees: 400,000
worldwide

IBM is one of the oldest manufacturers of computing equipment in the world. It started out in Poughkeepsie, NY as a small company manufacturing clocks for industrial use and later introduced punched card equipment for business accounting functions. According to *Business Week* and *Fortune*, IBM is among the top five industrial corporations by sales volume. It has dominated the mainframe market for over 30 years and has a strong hold on other industry sectors.

Business Overview

IBM designs, manufactures, markets, and services mainframe computer systems and associated peripherals,

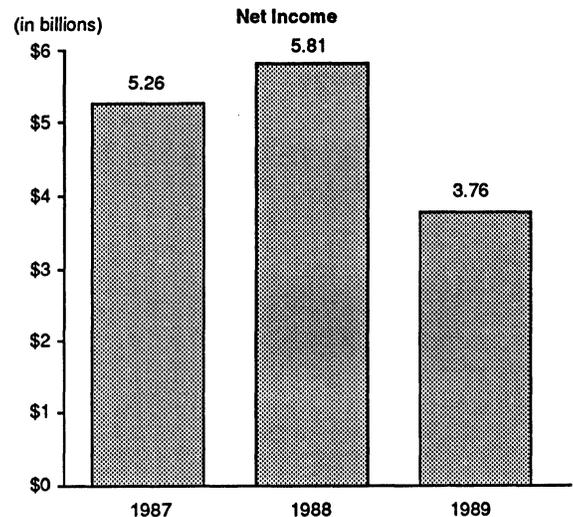
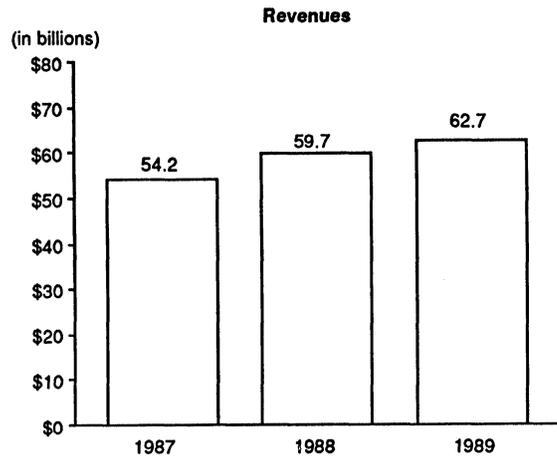
minicomputer systems and peripherals; microcomputer/personal computer systems; computer system software; data communications controllers and terminals; other communications products such as modems, voice response systems, and voice messaging systems; and local area network communications products. In addition, IBM provides specialized products and services such as communications carrier and limited timesharing services; the IBM Information Network, a communications facility with remote storage and computing services; OEM manufacturing of terminals, disk drives, and other products; maintenance service and system supplies; and financial services through its IBM Credit Corp. subsidiary.

Since it introduced its PC line of microcomputers, IBM has had several earning periods where the growth of the company was much less than anticipated. To compete more effectively in this market, IBM has greatly expanded its software, as well as hardware, efforts and has entered into agreements with several independent software suppliers to provide tools for its entire line of computer products.

Financial Profile

Net profits fell 35 percent in 1989 to \$3.76 billion, or

Financial Results 1987-1989



\$6.47 per share. Revenues, however, increased 5.1 percent to \$62.7 billion over 1988. Fourth-quarter earnings fell 75 percent to \$591 million, or \$1.04 per share, due to a \$2.3 billion restructuring charge.

Management Statement

Moving more resources close to customers is a cornerstone of IBM's transformation in the computer industry. To that end, in 1988 IBM undertook the most significant restructuring of its business in more than 30 years, establishing seven

lines of business and a new organization—IBM United States. This restructuring continued through 1989 and will continue to be dynamic in order to consistently meet the needs of IBM's customers.

IBM notes that it is managing for the long term and, with the steps it has taken and continues to take, it remains confident about the future of its business.

► *(Analysis continued)*

the host as two logical units. This capability increases the maximum number of supportable devices to 18.

In protocol enveloping mode, the 3708 allows TWX 33/35 and compatible displays and keyboard/printers to communicate with an SNA host through an IBM 37XX communications controller. This mode also can be used to allow plotters and other asynchronous ASCII devices to transmit and receive 8-bit transparent data.

In ASCII pass-through mode, the 3708 allows an attached device to communicate with an asynchronous host. In this application, the converter is transparent at both ends of the connection.

Users can control and configure the 3708 via a display terminal attached directly or remotely to the protocol converter. Data is entered into menus, and a copy of this information can be printed. The control terminal can also be used to monitor system alerts and diagnose problems.

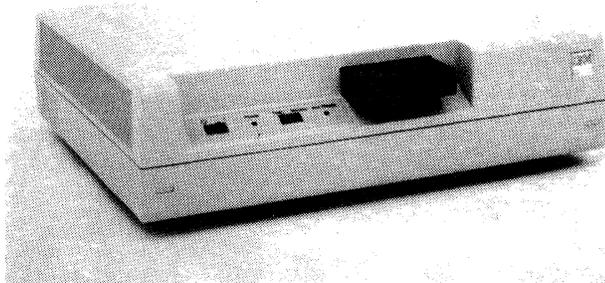
Competitive Position

When first introduced in 1985, the 3708 was attractively priced, and it offered many features not found on competing products. Manufactured and marketed by IBM, it soon became a leading product in the protocol conversion marketplace. With the 3708, the company "legitimized" the use of asynchronous hosts along with IBM hosts in a network. This approach marked a striking turnabout for IBM, which had previously downplayed the existence of asynchronous equipment.

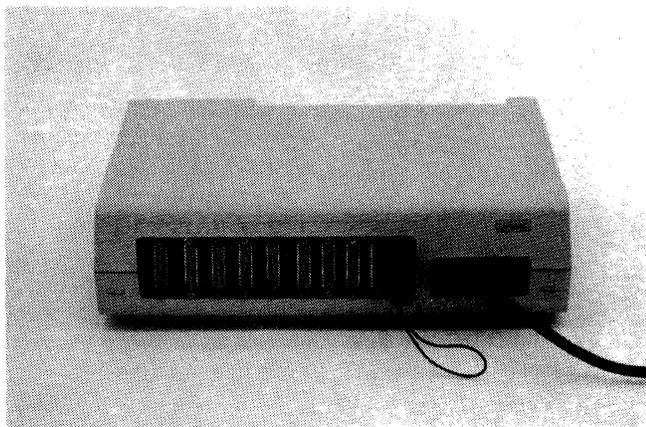
The 3708 posed the first major threat to IBM's protocol conversion competitors, which afterwards lost significant market shares to IBM. Vendors still competing with IBM include Andrew Corp., Andrew/KMW Systems (formerly KMW Systems, which was acquired by Andrew Corp.), Micom Communications Corp., Netlink Inc., Telematics International Inc., and Wall Data.

The protocol conversion market has changed since the early 1980s. As personal computers continue to replace display terminals, vendors are introducing more board-level hardware solutions for PCs and local area networks.

Today, IBM supports the direct attachment of asynchronous equipment to its 3174 Establishment Controller and 37XX communications controllers, which further reduces the need for standalone converters. Vendors of IBM-compatible communications controllers, including IDEA Courier, Memorex/Telex, and Intelligent Information Systems, market units that support communications across both synchronous and asynchronous environments with additional capabilities, such as multiple sessions with windowing.



a) *The 3708 Network Conversion Unit consists of a base unit and a plug-in cartridge for system code.*



b) *On the back of the 3708 are 10 ports, 2 of which support IBM host connections.*

Decision Points

The two principal advantages in using the 3708 are flexibility and economy. The unit supports the attachment of less expensive asynchronous devices to IBM hosts. The 3708 supports dual SNA host connections: two lines can connect to one host, or each line can be attached to a separate host. ASCII pass-through capability enables attached display terminals to communicate with asynchronous hosts as well. Through the port-sharing capability, users can connect nine displays and 9 auxiliary devices (e.g., printers) to the 3708, expanding the total number of supportable devices to 18.

Users gain cost savings on communications facilities through the 3708's line concentration feature. The 3708 combines data from attached display terminals and transmits it to an SNA host on one leased line, which can be shared with other SNA terminal controllers.

Users realize additional savings through the 3708's capability to reduce hardware and software costs. Because the 3708 converts data from attached ASCII devices into EBCDIC code before it reaches the host, it eliminates the need to install Network Terminal Option (NTO) host conversion software or BTAM/TCAM host access software, which is normally required for asynchronous display terminal-to-IBM host communications. In addition, without a 3708, each display terminal requires a port on an IBM 37XX controller. Since the 3708 concentrates data from multiple ASCII display terminals onto one line, it reduces the number of communications controller ports needed for display terminal attachment.

IBM has designed the 3708 for easy installation. It consists of a base unit, a plug-in cartridge for microcode, a 14-foot power cord, and an RS-232-C wrap plug. Ports for interfacing with hosts and peripherals, located on the back of the unit, support either the RS-232-C or RS-422-A interface.

Unlike other protocol converters, the 3708 supports IBM's SNA network management features through NetView and its predecessors NPDA and NLDM, making the device a true part of the SNA network.

Most protocol converters, unfortunately, do not support the full range of IBM 3270 functions, and the 3708 is no exception to this rule. The 3708 does not support the following 3270 features: ALT CURSOR, APL/TEXT, ASCII option, attribute

select keys, clicker on/off, compression of symbol definition bit strings, encrypt/decrypt, extended datastreams, host load of printer authorization matrix, IBM 3274 log/test facility, light pen, magnetic readers, mono/dual case control of IBM 3287 printers, more than four display colors, programmed symbols, screen sizes exceeding 1,920 characters, SFAP options, SI print order, test request read, and user-defined alerts.

Characteristics

Date of Announcement: September 1985.

Date of First Delivery: October 1985.

Serviced by: International Business Machines.

Components

The 3708 consists of two basic components, a base and a cartridge, which are designed for easy installation and replacement. All the microcode for 3708 operation resides on the cartridge, which plugs into the front of the base unit.

On the back of the base are 10 ports. One or two ports can be used for IBM synchronous host access; the two SNA lines can run to either one host or individually to separate hosts. (The 3708 is defined as a separate physical unit [PU] to each SNA host.) The remaining ports (eight or nine) support asynchronous devices and/or hosts. The 3708 allows a display with an attached printer to share a 3708 port, but appear to the host as two logical units. This feature raises the maximum number of devices that can be accommodated to 18.

An asynchronous display terminal, for which the protocol converter provides mapping, acts as a control terminal for the 3708. Users can attach a printer for hard copy printouts of any information displayed on the control terminal screen.

Operation

The 3708 supports connections to IBM System/370, 30XX, 43XX, and 9370 hosts via 37XX communications controllers; to IBM AS/400 computers; to IBM System/

3X processors via the Communication Attachment, using the 3274 Remote Attach Support; to IBM 4701 Model 003 Finance Communications Controllers or 4702 Branch Automation Processors using the Alternate Line Attachment Adapter, SNA Primary; and to ROLM CBX II 8000 and 9000 systems.

The 3708 provides concurrent support for line concentration, ASCII-to-SNA/SDLC protocol conversion, protocol enveloping for TWX 33/35-compatible devices communicating with SNA hosts, and ASCII pass-through operation. Users can define any 3708 port to operate in either protocol conversion or protocol enveloping mode, or both, and all ports can be configured to support ASCII pass-through. Support for switched access among asynchronous ASCII devices occurs through the ROLM CBX II.

In protocol conversion mode, the 3708 converts a 3270 datastream to and from ASCII code to allow asynchronous display terminals, printers, plotters, and personal computers emulating displays to appear as IBM 3270 displays and printers to an SNA host. Asynchronous displays appear as 3278 Model 2s, 3178s, 3279s, or 3179s with monochrome or four-color support. Buffered or unbuffered asynchronous printers appear as 3287 Model 1 or 2 printers supported as LU1 (SNA character string mode) and/or LU3 (3270 datastream mode) devices. Personal computers operating in asynchronous device emulation mode can access the 3708, as long as the emulation program is compatible with the 3708's keyboard mappings. IBM offers terminal emulation capability for personal computers through the PC/Host File Transfer and Terminal Emulator (FTTERM) product.

Printers attached to the 3708 can operate in one of three modes: system mode, in which the printer is dedicated to output from the host; local mode, in which the printer is dedicated to local copy from one or more displays attached to the 3708; or shared mode, in which the printer is used by both the host and attached displays.

The 3708 provides key mapping for a variety of devices, including the following:

- IBM 3101-, 3151-, and 316X-compatible displays
- IBM ProPrinter model printers
- Equipment from Applied Digital Data Systems, Data General, Digital Equipment (including the VT220 in native mode), Falco Data Products, Hazeltine, Hewlett-Packard, Lear Siegler, Northern Telecom, Teletype, TeleVideo Systems, and Wyse Technology
- Rolm's Cypress, Cedar, and Juniper products (through the CBX II)

Other asynchronous displays and printers can be accommodated through user-defined keyboard maps.

When operating in protocol conversion mode, the 3708 provides a number of important features. A type-ahead key queuing feature allows a terminal operator to

enter keystroke sequences without waiting for a complete screen write. An enhanced null/blank feature allows the use of either a spacebar or cursor movement key to edit and separate fields. When the user depresses the *Enter* key, the 3708 converts imbedded nulls to blanks, and the data sent to the host contains blanks wherever a blank or null appeared on the screen. Highlighting and four-color support are provided on the 3270 datastream. Users can simulate light-pen capability through the *Cursor Select* key. The 3708 also emulates the status line of the IBM 3178 display on the twenty-fifth line of the asynchronous display terminal screen. If the unit has no twenty-fifth line, the terminal operator can enable this feature on the twenty-fourth screen line through a keystroke sequence.

In protocol enveloping mode, SNA headers surround ASCII code to permit communications between ASCII devices and an SNA host running start/stop applications. In this mode, ASCII units appear as LU1, TWX 33/35 devices. Data transmission occurs line by line, and data can be 8-bit transparent (i.e., in 256-character codes or binary). The terminal's appearance to the host is the same as that of a TWX 33/35 device connected through a Network Terminal Option (NTO) program, which resides in the 3708 rather than in the 37XX controller.

When the 3708 is operating in the protocol enveloping mode, it does not control the keyboard; thus a prompt (character string) can be defined for each port so that terminal operators will know when they can and cannot enter data. In the protocol enveloping mode, the 3708 can support printers and plotters, as long as a port is configured to suppress logon screens and operate with data flow transparency.

An asynchronous device can also communicate through the 3708 to a remote asynchronous host using the 3708 protocol enveloping capability and the Network Routing Facility (NRF)—a program product residing in the 37XX communications controller. This capability provides the advantage of using the SNA network to communicate with an asynchronous host at a central-site location.

In ASCII pass-through mode, the 3708 transparently transmits unmodified data between an asynchronous display terminal and an asynchronous host. The asynchronous host and attached asynchronous devices take care of data and protocol error checking. Output-only devices cannot operate in this mode.

Device Control

Users configure, control, and monitor the 3708 through a display terminal that initially must be one of the asynchronous displays for which the converter provides mapping. Once another terminal has been defined, however, it can be used for control. Users can attach the control terminal locally, or remotely via a dial-up modem, to the 3708.

An operator enters configuration data via screen menus on the control terminal, and a local printer provides hard copy of any displayed screens. All configuration data resides in nonvolatile storage and is retained in a power failure. Control terminal functions include defining host ports, host access, device ports, two optional translate tables, printer access, and up to six additional keyboard mappings; setting control terminal and port passwords; and setting suppression of 3708 logon screens for plotter attachment. Users can monitor 3708 operation by checking its port status and viewing data in transmission on lines attached to the converter. The control terminal also allows viewing of response time statistics, configuration data, an alert log, and additional error information.

Any properly defined display terminal in the network can serve as a control terminal, although only one control session can be established at any given time. Setting up a control session involves a simple procedure in which the operator first types in a password and a terminal identification number. Ending a session involves depressing a "4" and an *Enter* key. Users invoke all subsequent control functions in a similar manner. Access to the control terminal functions can be configured on a per-port basis.

Access to the 3708 is protected by password, assignable to each port via the control terminal. (In applications where only IBM host application passwords are necessary for logging on, however, the user can eliminate the port password.) SNA sessions are also protected, eliminating the possibility of an illegal entry into a session that was previously defined but not terminated.

Software

The 3708 operates with MVS, VM, and VSE host programs that support the 3274 control unit Model 51C or 61C with Configuration Support A. The unit also can perform functions of the Network Terminal Option (NTO) licensed program; it is further supported by the Network Problem Determination Application (NPDA) and Network Logical Data Manager (NLDM) SNA communications network management products, as well as NetView. Through NetView, the 3708 can alert connected SNA hosts about possible errors in the network and log these reports at the IBM host or on the 3708's control terminal; NLDM monitors response time for all devices in the network when the 3708 is operating in protocol conversion mode.

Users can effect file transfers between a personal computer and an IBM or ASCII host by adding complementary programs, one in the PC and one in the host, that support this function. Users who want to complete this task through the 3708 can also write their own programs or acquire them from an outside source.

The PC/Host File Transfer and Terminal Emulator (FTTERM), which supports both 5.25- and 3.5-inch media, provides IBM 3101 display terminal emulation and file transfer capability in conjunction with the same IBM host programs that provide file transfer support to PCs attached to a 3270 or local area network. FTTERM also provides support for 3101 emulation through the 3708 in protocol enveloping and ASCII pass-through mode. In addition, FTTERM provides 3101 emulation to network information services directly from the PC's communications port.

Transmission Specifications

The 3708 attaches to an IBM host through a direct connection or through a nonswitched, point-to-point, or multipoint communications link. The unit can be multiplexed with other SNA controllers on an SNA/SDLC line, and will operate with one or two IBM host processors. Attachment to an asynchronous host occurs via a nonswitched, point-to-point communications link through an RS-232-C interface. Each SNA host line supports multiple device-to-host communications simultaneously, but an asynchronous host line supports only one device-to-host communication at a time. The 3708 supports data rates ranging from 110 to 19.2K bps on each upstream link to the IBM or asynchronous host. Data transmission takes place in half- or full-duplex mode on the IBM host links, and in full-duplex mode on each asynchronous host link.

Attachment of asynchronous devices is either direct or point-to-point on switched or nonswitched facilities. The 3708 supports auto baud recognition and auto answer up to 9,600 bps. Transmission rates between the 3708 and attached devices can range between 110 and 19.2K bps. Devices attach up to 50 feet via an RS-232-C interface and up to 4,000 feet through an RS-422-A interface.

Rolm's Cypress, Cedar, and Juniper workstations attach to the 3708 via a ROLM CBX II DataCom Module or Data Terminal Interface.

Pricing

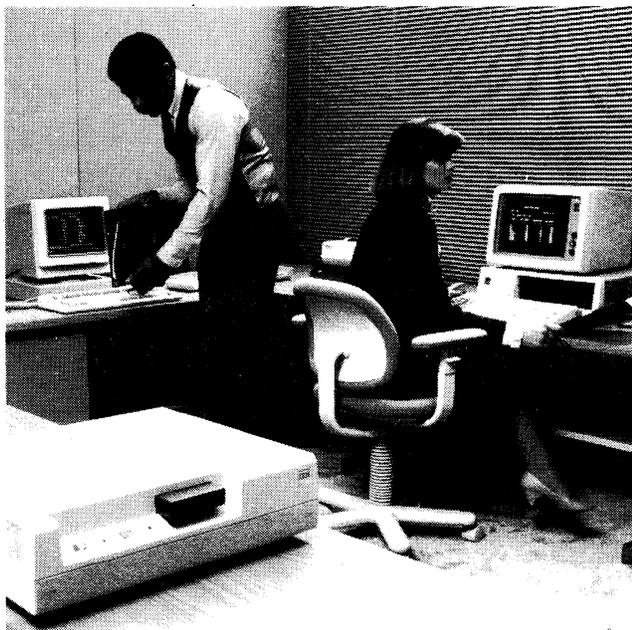
The 3708 sells for \$4,375; the plug-in cartridge containing system microcode is \$875. Quantity discounts are available. IBM offers the 3708 in standalone and rack-mount versions of the unit. ■

IBM 3708 Network Conversion Unit

datapro ANALYSIS

UPDATE: Since our last report, we have expanded the list of IBM 3708-supported equipment and added a table of the 3708-supported IBM modems.

IBM introduced the 3708 Network Conversion Unit at the 1985 TCA show in San Diego, and competitors were quick to recognize the threat this new product posed. For a number of years, IBM had no protocol converters in its product line, and many manufacturers reaped the rewards of a strong market for devices that allowed asynchronous equipment to communicate with IBM hosts. Of course, a large part of this market included IBM mainframe customers. Since IBM has developed converters of its own to sell to its huge installed base and included support for ASCII systems on its newer controllers, the market for protocol converters has declined significantly.



IBM's 3708 Network Conversion Unit, pictured in the foreground, consists of a base unit and a plug-in cartridge for system microcode.

VENDOR: International Business Machines Corp. (IBM), Old Orchard Road, Armonk, New York 10504. Contact your local IBM representative.
CANADIAN DISTRIBUTION: IBM Canada, 3500 Steeles Avenue, East Markham, Ontario L3R 2Z1. Telephone (416) 474-2111.
MODELS: IBM 3708, Model 1.
CONVERSION: Asynchronous ASCII to IBM SNA/SDLC.
TRANSMISSION RATES: 110 to 19.2K on host and terminal lines.
COMPETITION: Datastream, Protocol Computers, Inc., Micom.

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PRODUCT EVALUATION

The 3708 provides line concentration, protocol conversion, protocol enveloping, and ASCII pass-through support for asynchronous devices. The 10-port unit, designed for customer installation and maintenance, supports the attachment of one or two IBM hosts, asynchronous hosts, and asynchronous ASCII devices, which, when attached to the unit, emulate IBM 3270 equipment. The 3708 operates with the following: IBM's System/370, 43XX, 30XX, and 9370 operating with a 3705, 3725, or 3720 communications controller; a 4361, 4331, or 4321 through the Communication Adapter (CA); a 9370 via the Telecommunications Subsystem Controller; an 8100 via Data Link or Direct Attach; a System/36 or System/38 through the Communication Attachment, using the 3274 Remote Attach Support; and a 4701 Model 003 Finance Communication Controller or 4702 Branch Automation Processor, using the Alternate Line Attachment Adapter, SNA Primary. The 3709 can also attach to an IBM 3710 Network Controller and to ROLM CBX II 8000 or 9000 systems.

When operating in protocol conversion mode, the 3708 converts a 3270 datastream to and from ASCII code to allow asynchronous display terminals, printers, keyboard/printers, plotters, and personal computers to appear to an IBM SNA host as 3270 displays and printers. A display and printer can share a 3708 port but appear to the host as two logical units. If one port is used for attachment to an

IBM 3708 Network Conversion Unit

TABLE 1. IBM MODEMS FOR THE 3708

Modem Model	Speed (bps)	Lines
3833-1	2400	Nonswitched, voice grade
3834-1	4800	Nonswitched, voice grade
3863-1	2400/1200	Nonswitched, voice grade
3864-1	4800/2400	Nonswitched, voice grade
3865-1/2	9600/4800	Nonswitched, voice grade
3868-1	2400/1200	Nonswitched, voice grade
3868-2	4800/2400	Nonswitched, voice grade
3868-3/4	9600/4800	Nonswitched, voice grade
5811-10	2400/4800/9600	Limited distance modem
5811-18	—	Rack-mount version of 5811-10
5811-20	2400/4800/7200/9600	Nonswitched baseband
5811-28	—	Rack-mount version of 5811-20
5812-10	2400/4800/7200/9600	Nonswitched baseband
5812-18	—	Rack-mount version of 5812-10
5821-10	2400 up to 19200 2400 up to 56000	Nonswitched baseband Dataphone Digital Service
5842	2400	Switched
5865-2/3	9600/7200/4800	Nonswitched voice grade
5866-2/3	14400/9600	Nonswitched voice grade
5868-51/52	—	Rack-mount version of 5865-2
5868-062	—	Rack-mount version of 5866-1/2

SNA host, nine ports can be used for ASCII/asynchronous terminal or ASCII host attachment. If two ports are used for SNA host attachment and two ASCII hosts are attached, six ports can be used for ASCII/asynchronous terminal attachments.

In conversion mode, the 3708 provides key mapping for many devices, including an IBM 3101; an IBM PC running a terminal emulator, such as the PC/Host File Transfer and Terminal Emulator or an IBM 316X; ROLM's Cypress, Cedar, and Juniper products (through the

CBX II); as well as equipment from ADDS Viewpoint, Beehive, Data General, Digital Equipment Corporation (including the VT220 in native mode), FALCO, Hazeltine, Hewlett-Packard, Lear Siegler, Northern Telecom, Teletype, TeleVideo, and Wyse. Through a user-defined keyboard mapping feature, other types of ASCII displays and printers can operate with the 3708 if they support certain characteristics.

In protocol enveloping mode, the 3708 allows TWX 33/35 and compatible displays and keyboard/printers to communicate over an SNA/SDLC link attached to an SNA host through a 3705, 3720, or 3725 controller. This mode also can be used to allow plotters and other asynchronous ASCII devices to transmit and receive eight-bit transparent data.

In pass-through mode, the 3708 allows an asynchronous device to communicate with an asynchronous host. In this application, the converter is transparent to both ends of the connection. An asynchronous device can also communicate through the 3708 to a remote asynchronous host using the 3708 protocol enveloping capability and the Network Routing Facility (NRF), a program product residing in the 3725 communications controller. This capability supplies the advantage of using the SNA network to communicate with an asynchronous host at a central-site location.

The 3708 operates with IBM's MVS, VM, and VSE host programs supporting the IBM 3274 Control Unit model 51C or 61C with Configuration Support A. The 3708 protocol enveloping mode allows the attachment of TWX 33/35 devices and eliminates the need to have the Network Terminal Option (NTO) installed in the communications controller. The 3708 is supported by NetView, IBM's network management program, as well as NCCF-V2R1,-V2R2; NPDA-V3; NLDM-R2,-R3; CICS-R1.6; IMS-R1.3; TSO-R1.1; PROFS-R2.2; and NRF with ACT/NCP V4.

Users control and configure the 3708 via a terminal attached either directly or remotely to the unit. Configuration data is entered into menus, and a copy of this information is available through a local print capability. The control terminal is also used for problem determination, whereby the 3708 logs recent alerts along with an indication of the suspected cause of the problem, recommended action, and a failure code. Through the control terminal, an IBM service specialist can diagnose system problems from a remote location and install temporary "fixes" in microcode.

Access to the 3708 is protected by password, assignable to each port via the control terminal, but in applications where only IBM host application passwords are necessary for logging on, the user can eliminate the port password.

IBM 3708 Network Conversion Unit

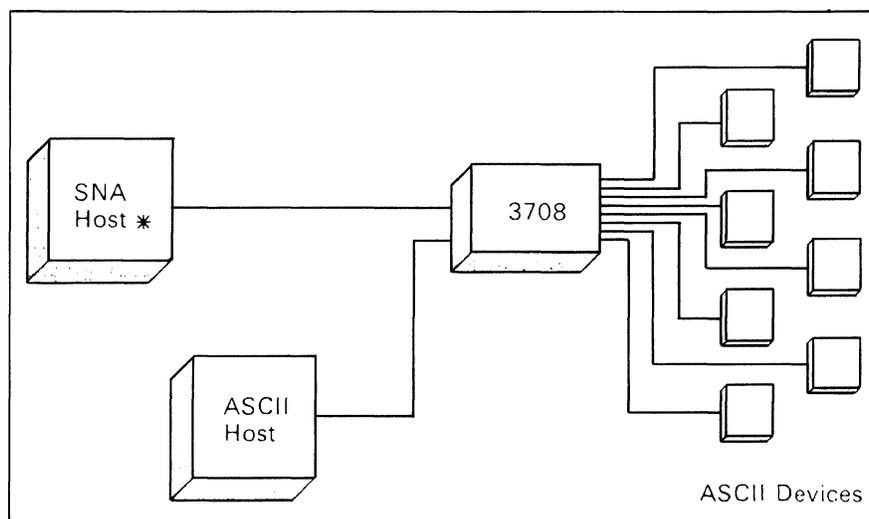


Figure 1. The 3708 supports attachment to both SNA and asynchronous ASCII hosts. Devices connected to the converter can access either resource.

SNA sessions are also protected, eliminating the possibility of an illegal entry into a session that was previously defined but not terminated.

IBM has designed the 3708 for easy installation. It consists of a base unit, a plug-in cartridge for microcode, a 14-foot power cord, and an RS-232-C wrap plug. Ports for interfacing with hosts and peripherals are on the back of the unit. They support either the RS-232-C or RS-422-A interface.

In addition to the 3708, IBM sells the 7171 protocol converter, which allows direct attachment at the host site. In contrast to these units, the 3708 extends protocol conversion capability further into the network, offers network management control under NetView or NPDA and NLDM, and allows asynchronous equipment to communicate with both SNA and asynchronous hosts.

The two principal advantages in using the 3708 are flexibility and economy. The unit supports the attachment of various devices—including SNA and asynchronous hosts and ASCII terminals, printers, and plotters—in different combinations. Due to the availability of 3708 protocol conversion and ASCII pass-through capabilities, asynchronous terminal equipment can communicate with both an SNA host and an asynchronous host. In addition, the 3708 supports dual SNA host connections: two lines can connect to one host, or each line can be attached to a separate host. Through the port-sharing capability, users can connect nine displays and nine auxiliary devices to the 3708, expanding total support to 18 units.

Users gain cost savings on communications facilities through the 3708's line concentration feature. The 3708 combines data from attached terminals and transmits it to an SNA host on one leased line, which can be shared with other SNA terminal controllers. Users realize additional savings through the 3708's capability to reduce hardware and software costs. Because the 3708 converts data from

attached ASCII devices into EBCDIC code before it reaches the host, it eliminates the need to install NTO host conversion software or BTAM/TCAM host access software normally required for asynchronous terminal-to-IBM host communications. In addition, without a 3708, each terminal requires a port on an IBM 37X5 controller. Since the 3708 concentrates data from multiple ASCII terminals onto one line, it reduces the number of communications controller ports needed for terminal attachment.

Unlike other protocol converters, the 3708 supports IBM's SNA network management features through NetView and its predecessors NPDA and NLDM, making the device a true part of the SNA network.

Most protocol converters do not support the full range of IBM 3270 functions, and the 3708 is no exception to this rule. The 3708 does not support the following 3270 features: ALT CURSOR, APL/TEXT, ASCII option, attribute select keys, clicker on/off, compressing of symbol definition bit strings, encrypt/decrypt, extended datastreams, host load of printer authorization matrix, IBM 3274 log/test facility, Katakana, light pen, magnetic readers, mono/dual case control of IBM 3278 printers, more than four colors, programmed symbols, screen sizes exceeding 1,920 characters, SFAP options, SI print order, test request read, and user-defined alerts.

MARKET POSITION

When first introduced, the 3708 was competitively priced, offering many features not found on competing products. Manufactured and marketed by IBM, it soon became a leading product in the protocol conversion marketplace. With the 3708, the company "legitimized" the use of asynchronous hosts along with IBM hosts in a network.

IBM 3708 Network Conversion Unit

This approach marked a striking turnabout for IBM, which had previously downplayed the existence of asynchronous equipment.

The 3708 posed the first major threat to IBM's protocol conversion competitors. After its introduction, the market for protocol converters began to soften. Today, IBM supports the attachment of asynchronous equipment on its newer processors and controllers, virtually eliminating the need for standalone converters.

SPECIFICATIONS

DATE OF ANNOUNCEMENT: September 17, 1985.
DATE OF FIRST DELIVERY: October 1985.
NUMBER DELIVERED TO DATE: Information not available.
SERVICED BY: IBM.

CONFIGURATION

The 3708 consists of two basic components, a base and a cartridge, designed for easy installation and replacement. All of the microcode for 3708 operation resides on the cartridge, which plugs into the front of the base unit. On the back of the base are 10 ports. One or two ports can be used to connect the 3708 to an IBM host; the two SNA lines can run to either one host or individually to separate hosts. (The 3708 is defined as a separate physical unit [PU] to each SNA host.) The remaining ports (eight or nine) support asynchronous devices and/or hosts. The 3708 comes with one 14-foot power cord and an RS-232-C wrap plug. IBM offers the 3708 in standalone and rack-mount versions.

An asynchronous display for which the converter provides mapping controls the 3708. Users can attach a printer for hard copy printouts of any information displayed on the terminal screen.

Attachment between the 3708 and an SNA host occurs through any of the following devices: an IBM 37X5 or 3720 communications controller, 3710 Network Controller, 43XX Integrated Communication Adapter, 9370, System 36, 4700, 8100 System Data Link or Direct Attach, or System/38 Communications Attachment. The 3708 will also attach to ROLM CBX II 8000 or 9000 systems.

TRANSMISSION SPECIFICATIONS

The 3708 attaches to an IBM host through direct connection or a nonswitched, point-to-point, or multipoint communications link. The unit can be multidropped with other SNA controllers on an SNA/SDLC line and will operate with one or two IBM host processors. Attachment to an ASCII host occurs via a nonswitched, point-to-point communications link through an RS-232-C interface.

Each SNA host line supports multiple device-to-host communications simultaneously, but an ASCII host line supports only one device-to-host communication at a time. The 3708 supports data rates ranging from 110 to 19.2K bps on each upstream link to the IBM or asynchronous host. Communication on the IBM host link takes place in half- or full-duplex mode and in full-duplex mode to asynchronous hosts. The 3708 supports attachment to IBM modems. See Table 1.

Attachment of asynchronous ASCII devices is either direct or point to point on switched or nonswitched facilities. The device supports auto baud recognition (to 9600 bps) and auto answer. Transmission rates between the 3708 and attached devices can range between 110 and 19.2K bps. Devices attach up to 50 feet via an RS-232-C interface and up to 4,000 feet through an RS-422-A interface.

ROLM's Cypress, Cedar, and Juniper workstations attach to the 3708 via a ROLM CBX II DataCom Module or Data Terminal Interface.

OPERATION

The 3708 provides concurrent support for line concentration, ASCII to SNA/SDLC protocol conversion, protocol enveloping for TWX 33/35 devices communicating with SNA hosts, and ASCII pass-through operation. Users can define any 3708 port to operate in either protocol conversion or protocol enveloping mode, or both, and all ports can be configured to support ASCII pass-through. Support for switched access among asynchronous ASCII devices occurs through the ROLM CBX II.

In conversion mode, the 3708 converts a 3270 datastream to and from ASCII code to allow ASCII display terminals, printers, plotters, keyboard/printers, and personal computers to appear as IBM 3270 displays and printers to an SNA host. ASCII displays appear as 3278 Model 2s, 3178s, 3279s, or 3179s with monochrome or four-color support. Buffered or unbuffered ASCII printers appear as 3287 Models 1 or 2 supported as LU1 (SNA character string mode) and/or LU3 (3270 datastream mode) devices. Printers attached to the 3708 can operate in one of

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three modes: system mode, in which the printer is dedicated to output from the host; local mode, in which the printer is dedicated to local copy from one or more displays attached to the 3708; or shared mode, in which the printer is used by both the host and attached displays. The 3708 also allows a display with an attached printer to share a 3708 port, but appear to the host as two logical units. Personal computers operating in asynchronous device emulation mode can access the 3708 as long as the emulation program is compatible with the 3708's keyboard mappings.

When operating in conversion mode, the 3708 provides a number of features. A type-ahead key queuing feature allows a terminal operator to enter keystroke sequences without waiting for a complete screen write. An enhanced null/blank feature allows the use of either a spacebar or cursor movement key to edit and separate fields. When the user depresses the Enter key, the 3708 converts imbedded nulls to blanks, and the data sent to the host contains blanks wherever a blank or null appeared on the screen. Highlighting and four-color support are provided on the 3270 datastream. Users can simulate lightpen capability through the Cursor Select key. The 3708 also emulates the status line of the 3178's display on the twenty-fifth line of the ASCII display. If the unit has no twenty-fifth line, the terminal operator can enable this feature on the twenty-fourth screen line through a keystroke sequence.

In protocol enveloping mode, SNA headers surround ASCII code to permit communication between ASCII devices and an SNA host running start/stop applications. In this mode, ASCII units appear as LU1, TWX 33/35 devices. Communication occurs line by line, and data can be eight-bit transparent, i.e., in 256 character codes or binary. The terminal's appearance to the host is the same as that of a TWX 33/35 connected through an NTO program, which resides in the 3708 rather than in the 37X5 controller. When the 3708 is operating in enveloping mode, it does not control the keyboard, thus a prompt (character string) can be defined for each port so that terminal operators will know when they can and cannot enter data. In protocol enveloping mode, the 3708 can support printers and plotters as long as a port is configured to suppress logon screens and operate with data flow transparency.

In ASCII pass-through mode, the 3708 transmits unmodified data between an ASCII display and an asynchronous host. The 3708 serves as a wire connection between an ASCII device and an ASCII host. The ASCII host and attached ASCII devices take care of data and protocol error checking. Output-only devices cannot operate in this mode.

DEVICE CONTROL

Users configure, control, and monitor a 3708 through a terminal that initially must be one of the asynchronous

displays for which the converter provides mapping. Once another terminal has been defined, however, it can be used for control. Users can attach the terminal locally or remotely, via a dial-up modem, to the 3708.

An operator enters configuration data via screen menus on the control terminal, and a local printer provides hard copy of any displayed screens. All configuration data resides in nonvolatile storage and is retained in the event of power failure. Terminal functions include defining host ports, host access, device ports, two optional translate tables, printer access, and up to six additional keyboard mappings; setting control terminal and port passwords; and setting suppression of 3708 logon screens for plotter attachment. Users can monitor 3708 operation by checking its port status and viewing data in transmission on lines attached to the converter. This terminal also features response time statistics, configuration data, an alert log, and additional error information.

Any properly defined terminal in the network can serve as a control terminal, although only one control session can be established at any given time. Setting up a control session involves a simple procedure in which the operator first types in a password and terminal identification number. Ending a session involves depressing a "4" and an Enter key. Users invoke all subsequent control functions in a similar manner. Access to the control terminal functions can be configured on a per-port basis.

SOFTWARE

The 3708 operates with MVS, VM, and VSE host programs that support the 3274 control unit Model 51C or 61C with Configuration Support A. The unit also can perform functions of the Network Terminal Option (NTO) licensed program; it is further supported by the Network Problem Determination Application (NPDA) and Network Logical Data Manager (NLDM) SNA communications network management products, as well as NetView. Through NetView, the 3708 can alert connected SNA hosts about possible errors in the network and log these reports at the IBM host or on the 3708's control terminal; NLDM monitors response time for all devices in the network when the 3708 is operating in protocol conversion mode.

Users can effect file transfers between a personal computer and an IBM or ASCII host by adding complementary programs, one in the PC and one in the host, that support this function. Users who want to complete this task through the 3708 can also write their own programs or acquire them from an outside source.

The PC/Host File Transfer and Terminal Emulator (FT-TERM), which supports both 5¼- and 3½-inch media, provides 3101 terminal emulation and file transfer in conjunction with the same IBM host programs that provide

IBM 3708 Network Conversion Unit

file transfer support to PCs attached to a 3270 or local area network. FTTERM also provides support for 3101 emulation through the 3708 in protocol enveloping and ASCII pass-through mode. In addition, FTTERM provides 3101 emulation to network services, such as Dow Jones, directly from the PC's communications port.

PRICING

The 3708 sells for \$3,750; the plug-in cartridge containing system microcode is \$750. Quantity discounts are available. □

IBM 3708 Network Conversion Unit



IBM's 3708 Network Conversion Unit, pictured in the foreground in the photo to the above, consists of a base unit and a plug-in cartridge for system microcode.

MANAGEMENT SUMMARY

UPDATE: IBM has reviewed this report and added a number of technical points concerning 3708 connections.

IBM introduced the 3708 Network Conversion Unit at the 1985 TCA show in San Diego, and competitors were quick to recognize the threat this new product posed. For a number of years, IBM had no protocol converters in its product line, and many manufacturers reaped the rewards of a strong market for devices that allowed asynchronous equipment to communicate with IBM hosts. Of course, a large part of this market included IBM mainframe customers. Now IBM has converters of its own to sell to its huge installed base, and the competition is forced to react to this formidable challenger.

The 3708 provides line concentration, protocol conversion, protocol enveloping, and ASCII passthrough support for asynchronous devices. The ten-port unit, designed for customer installation and maintenance, allows the attachment of one or two IBM hosts, asynchronous hosts, and asynchronous ASCII devices, which when attached to the unit emulate IBM 3270 equipment. The 3708 operates with IBM's System/370, 303X, 308X, 3090, and 43XX processors; 8100 Systems; System/38 units; System 36; 4700 systems; 9370 systems; the 3710 controller; and Rolm's CBX II voice/data PABX.

When operating in protocol conversion mode, the 3708 converts a 3270 datastream to and from ASCII code to ▶

IBM's ten-port 3708 Network Conversion Unit allows asynchronous ASCII devices to emulate IBM 3270 full-screen displays and printers. It provides concurrent support for line concentration, protocol conversion, protocol enveloping, and ASCII passthrough capability.

Communication between ASCII hosts and devices is supported through the ASCII passthrough feature. Protocol enveloping allows connection between TWX 33/35 devices and an SNA host.

MODELS: 3708 Network Conversion Unit.
CONVERSION: Asynchronous ASCII to IBM SNA/SDLC.
TRANSMISSION RATES: 110 to 19.2K on host and terminal lines.
COMPETITION: Datastream, Protocol Computers, Inc., Micom.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, One Orchard Place, Armonk, New York 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: September 17, 1985.

DATE OF FIRST DELIVERY: October 1985.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.

CONFIGURATION

The 3708 is made up of two basic components, a base and a cartridge, designed for easy installation and replacement. All of the microcode for 3708 operation resides on the cartridge, which plugs into the front of the base unit. On the back of the base are ten ports. One or two ports may be used to connect the 3708 to an IBM host; the two SNA lines may run to either one host or individually to separate hosts. (The 3708 is defined as a separate physical unit (PU) to each SNA host.) The remaining ports (eight or nine) support asynchronous devices and/or hosts. The 3708 comes with one 14-foot power cord and an RS-232-C wrap plug. It is available in standalone and rackmount versions.

The 3708 is controlled through an asynchronous display (any for which the converter provides mapping). A printer may be attached for hardcopy printouts of any information displayed on the terminal screen.

Attachment between the 3708 and an SNA host can be through any of the following: an IBM 37X5 or 3720 communications controller, 3710 Network Controller, 43XX Integrated Communication Adapter, 9370, System 36, 4700, 8100 System Data Link or Direct Attach, or System/38 Communications Attachment. The 3708 will also attach to a Rolm CBX II. ▶

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► allow asynchronous display terminals, printers, keyboard/printers, plotters, and personal computers to appear to an IBM SNA host as 3270 displays and printers. A display and printer may share a 3708 port, but appear to the host as two logical units.

In conversion mode, the 3708 provides key mapping for many devices, including an IBM 3101; an IBM PC running a terminal emulator, such as the PC/Host File Transfer and Terminal Emulator or an IBM 316X; Rolm's Cypress, Cedar, and Juniper products (through the CBX II); as well as equipment from ADDS Viewpoint, Beehive, Data General, Digital Equipment Corporation (including the VT220 in native mode), Hazeltine, Hewlett-Packard, Lear Siegler, Northern Telecom, Teletype, and TeleVideo. Through a user-defined keyboard mapping feature, other types of ASCII displays and printers may operate with the 3708 if they support certain characteristics.

In protocol enveloping mode, the 3708 allows TWX 33/35 and compatible displays and keyboard/printers to communicate over an SNA/SDLC link attached to an SNA host through a 3705, 3720, or 3725 controller. This mode also can be used to allow plotters and other asynchronous ASCII devices to transmit and receive eight-bit transparent data.

In passthrough mode, the 3708 allows an asynchronous device to communicate with an asynchronous host. In this application, the converter is transparent to both ends of the connection. An asynchronous device can also communicate through the 3708 to a remote asynchronous host using the 3708 protocol enveloping capability and the Network Routing Facility (NRF), a program product residing in the 3725 communications controller. This capability provides the advantage of using the SNA network to communicate with an asynchronous host at a central-site location.

The 3708 operates with IBM's MVS, VM, and VSE host programs supporting the IBM 3274 Control Unit model 51C or 61C with Configuration Support A. The 3708 protocol enveloping mode allows the attachment of TWX 33/35 devices and eliminates the need to have the Network Terminal Option (NTO) installed in the communications controller. The 3708 is supported by Netview, IBM's network management program.

Users control and configure the 3708 via a terminal attached either directly or remotely to the unit. Configuration data is entered into menus, and a copy of this information is available through a local print capability. The control terminal is also used for problem determination, whereby the 3708 logs recent alerts along with an indication of the suspected cause of the problem, recommended action, and a failure code. Through the control terminal, an IBM service specialist can diagnose system problems from a remote location and install temporary "fixes" in microcode.

Access to the 3708 is protected by password, assignable to each port via the control terminal, but in applications ►

► TRANSMISSION SPECIFICATIONS

The 3708 attaches to an IBM host through direct connection or a nonswitched, point-to-point, or multipoint communications link. The unit can be multidropped with other SNA controllers on an SNA/SDLC line and will operate with one or two IBM host processors. Attachment to an ASCII host is via a nonswitched, point-to-point communications link through an RS-232-C interface. Each SNA host line will support multiple device-to-host communications simultaneously, but an ASCII host line supports only one device-to-host communication at a time. The 3708 supports data rates ranging from 110 to 19.2K bps on each upstream link to the IBM or asynchronous host. Communication on the IBM host link is in half- or full-duplex mode and in full-duplex mode to asynchronous hosts. The 3708 supports attachment to IBM modems.

Attachment of asynchronous ASCII devices is either direct or point-to-point on switched or nonswitched facilities. Auto baud recognition (to 9600 bps) and auto answer are supported. Transmission rates between the 3708 and attached devices can range between 110 and 19.2K bps. Devices attach up to 50 feet via an RS-232-C interface and up to 4,000 feet through an RS-422A interface.

Rolm's Cypress, Cedar, and Juniper workstations attach to the 3708 via a Rolm CBX II DataCom Module or Data Terminal Interface.

OPERATION

The 3708 provides concurrent support for line concentration, ASCII to SNA/SDLC protocol conversion, protocol enveloping for TWX 33/35 devices communicating with SNA hosts, and ASCII passthrough operation. Users can define any 3708 port to operate in either protocol conversion or protocol enveloping mode, or both, and all ports may be configured to support ASCII passthrough. Support for switched access among asynchronous ASCII devices is through the Rolm CBX II.

When in conversion mode, the 3708 converts a 3270 datastream to and from ASCII code to allow ASCII display terminals, printers, plotters, keyboard/printers, and personal computers to appear as IBM 3270 displays and printers to an SNA host. ASCII displays appear as 3278 Model 2s, 3178s, 3279s, or 3179s with monochrome or four-color support. Buffered or unbuffered ASCII printers appear as 3287 Models 1 or 2 supported as LU1 (SNA character string mode) and/or LU3 (3270 datastream mode) devices. Printers attached to the 3708 may operate in one of three modes: system mode, in which the printer is dedicated to output from the host; local mode, in which the printer is dedicated to local copy from one or more displays attached to the 3708; or shared mode, in which the printer is used by both the host and attached displays. The 3708 also allows a display with an attached printer to share a 3708 port, but appear to the host as two logical units. Personal computers operating in asynchronous device emulation mode can access the 3708 as long as the emulation program is compatible with the 3708's keyboard mappings.

When operating in conversion mode, the 3708 provides a number of features. A type-ahead key queuing feature allows a terminal operator to enter keystroke sequences without waiting for a complete screen write. An enhanced null/blank feature allows the use of either a space bar or cursor movement key to edit and separate fields. When the user depresses the Enter key, the 3708 converts imbedded nulls to blanks, and the data sent to the host contains blanks wherever there was either a blank or null on the screen. Highlighting and four-color support are provided on the 3270 datastream. Light-pen capability can be simulated ►

IBM 3708 Network Conversion Unit

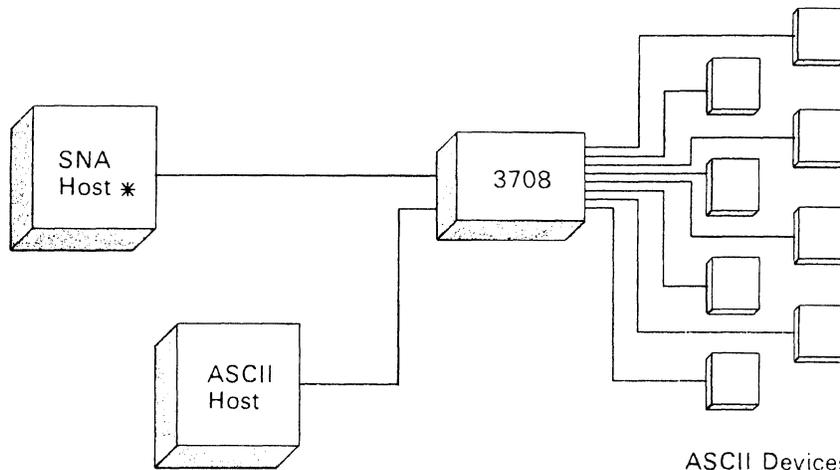


Figure 1. The 3708 supports attachment to both SNA and asynchronous ASCII hosts. Devices connected to the converter may access either resource.

where only IBM host application passwords are necessary for logging on, the user can eliminate the port password. SNA sessions are also protected, eliminating the possibility of an illegal entry into a session that was previously defined but not terminated.

IBM has designed the 3708 for easy installation. It consists of a base unit, a plug-in cartridge for microcode, a 14-foot power cord, and an RS-232-C wrap plug. Ports for interfacing with hosts and peripherals are on the back of the unit. They support either the RS-232-C or RS-422A interface.

In addition to the 3708, IBM sells the 7426 and 7171 protocol converters. The 7426 is designed for remote device attachment, while the 7171 allows direct attachment at the host site. In contrast to these units, the 3708 extends protocol conversion capability further into the network, offers network management control under Netview or NPDA and NLDM, and allows asynchronous equipment to communicate with both SNA and asynchronous hosts.

COMPETITIVE POSITION

Because the 3708 is competitively priced, offering many features not found on competing products, and manufactured and marketed by IBM, it will probably assume almost immediate prominence in the protocol conversion marketplace. Most conversion products offer asynchronous ASCII-to-SNA/SDLC capability, allowing customers to use inexpensive terminals within an IBM network. Until recently, IBM did not offer its own protocol converters, but, with the 3708, the company has "legitimized" the use of asynchronous hosts along with IBM hosts in a network. This marks a striking turnabout for IBM, which had previously downplayed the existence of asynchronous equipment.

There is no question that the 3708 will be a real threat to IBM's protocol conversion competitors, which are mostly small firms with limited capital for research, development, and marketing efforts. IBM will have no problem selling any of its protocol conversion products to its huge installed

through the Cursor Select key. The 3708 also emulates the status line of the 3178's display on the twenty-fifth line of the ASCII display. If the unit has no twenty-fifth line, the terminal operator may enable this feature on the twenty-fourth screen line through a keystroke sequence.

In protocol enveloping mode, ASCII code is surrounded by SNA headers to permit communication between ASCII devices and an SNA host running start/stop applications. In this mode, ASCII units appear as LU1, TWX 33/35 devices. Communication is line by line, and data can be eight-bit transparent, i.e., in 256 character codes or binary. The terminal's appearance to the host is the same as that of a TWX 33/35 connected through an NTO program, which resides in the 3708 rather than the 37X5 controller. Because the 3708 operating in enveloping mode does not control the keyboard, a prompt (character string) can be defined for each port so that terminal operators will know when they can and cannot enter data. In protocol enveloping mode, the 3708 can support printers and plotters as long as a port is configured to suppress logon screens and operate with data flow transparency.

In ASCII passthrough mode, the 3708 transmits unmodified data between an ASCII display and an asynchronous host. The 3708 serves as a wire connection between an ASCII device and an ASCII host. Data and protocol error checking is the responsibility of the ASCII host and attached ASCII devices. Output-only devices are not supported in this mode.

DEVICE CONTROL

Users configure, control, and monitor a 3708 through a terminal that initially must be one of the asynchronous displays for which the converter provides mapping. However, once another terminal has been defined, it may be used for control. The terminal may be attached locally or remotely, via a dial-up modem, to the 3708.

Through the control terminal, an operator enters configuration data via screen menus, and a local printer provides hard copy of any displayed screens. All configuration data resides in nonvolatile storage and is retained in the event of power failure. Functions available through the terminal include defining host ports, host access, device ports, two optional translate tables, printer access, and up to six additional keyboard mappings; setting control terminal and port passwords; and setting suppression of 3708 logon screens for plotter attachment. Users can monitor 3708 operation by checking its port status and viewing data in transmission on lines attached to the converter. Response time statistics,

IBM 3708 Network Conversion Unit

► customer base, and other companies in this segment will have to work extremely hard to offset the negative aspects of selling against such a formidable competitor. On the other hand, now that IBM has fully-embraced protocol conversion as a viable means to integrate equipment into the SNA environment, competitors could find that the market for protocol conversion has grown significantly enough to allow other manufacturers to reap the benefits of IBM's sanctioning the concept.

ADVANTAGES AND RESTRICTIONS

We could describe the 3708's chief advantages in two words: "flexibility" and "economy." The unit supports the attachment of various devices—including SNA and asynchronous hosts and ASCII terminals, printers, and plotters—in different combinations. Due to the availability of 3708 protocol conversion and ASCII passthrough capabilities, asynchronous terminal equipment may communicate with both an SNA host and an asynchronous host. Additionally, the 3708 will support dual SNA host connections; two lines may connect to one host, or each line may be attached to a separate host. Finally, through port sharing capability, it is actually possible to connect nine displays and nine auxiliary devices to the 3708, expanding total support to 18 units.

Cost savings on communications facilities are achieved through the 3708's line concentration feature. The 3708 combines data from attached terminals and transmits it to an SNA host on one leased line, which may be shared with other SNA terminal controllers. Additional savings are realized through the 3708's ability to reduce hardware and software costs. Because the 3708 converts data from attached ASCII devices into EBCDIC code before it reaches the host, it eliminates the need to install NTO host conversion software or BTAM/TCAM host access software that normally would be needed for asynchronous terminal-to-IBM host communications. In addition, without a 3708, each terminal requires a port on an IBM 37X5 controller. Since the 3708 concentrates data from multiple ASCII terminals onto one line, it reduces the number of communications controller ports needed for terminal attachment.

Unlike other protocol converters, the 3708 supports IBM's SNA network management features through Netview and its predecessors NPDA and NLDM, making the device a true part of the SNA network.

Most protocol converters do not support the full range of IBM 3270 functions, and the 3708 is no exception to this rule. The following 3270 features are not supported: ALT CURSOR, APL/TEXT, ASCII option, attribute select keys, clicker on/off, compressing of symbol definition bit strings, encrypt/decrypt, extended datastreams, host load of printer authorization matrix, IBM 3274 log/test facility, Katakana, light pen, magnetic readers, mono/dual case

control of IBM 3287 printers, more than four colors, programmed symbols, screen sizes larger than 1,920 characters, SFAP options, SI print order, test request read, and user-defined alerts.

USER REACTION

IBM did not provide us with a list of 3708 users; therefore, we were unable to conduct a user reaction interview regarding the product's operation at an actual installation. □

► configuration data, an alert log, and other error information are available through the terminal.

Any properly defined terminal in the network may be used as a control terminal, although only one control session can be established at any given time. Setting up a control session involves a simple procedure in which the operator first types in a password and terminal identification number. Ending a session involves depressing a "4" and an Enter key. All subsequent control functions are invoked in a similar manner. Access to the control terminal functions can be configured on a per-port basis.

SOFTWARE

The 3708 operates with MVS, VM, and VSE host programs that support the 3274 control unit model 51C or 61C with Configuration Support A. The unit also can perform functions of the NTO (Network Terminal Option) licensed program; it is further supported by the NPDA (Network Problem Determination Application) and NLDM (Network Logical Data Manager) SNA communications network management products, as well as Netview. Through Netview, the 3708 can alert connected SNA hosts regarding possible errors in the network and log these reports at the IBM host or on the 3708's control terminal; NLDM monitors response time for all devices in the network when the 3708 is operating in protocol conversion mode.

File transfers between a personal computer and an IBM or ASCII host are possible through the addition of complementary programs, one in the PC and one in the host, that support this function. Users who wish to complete this task through the 3708 can also write their own programs or acquire them from an outside source.

The PC/Host File Transfer and Terminal Emulator (FTTERM) is a \$200 PC product that supports both 5¼- and 3½-inch media. It provides 3101 terminal emulation and file transfer in conjunction with the same IBM host programs that provide file transfer support to PCs attached to a 3270 or local area network. FTTERM also provides support for 3101 emulation through the 3708 in protocol enveloping and ASCII passthrough mode. FTTERM also provides 3101 emulation to network services, such as Dow Jones, directly from the PC's communications port.

PRICING

The 3708 sells for \$3,750; the plug-in cartridge containing system microcode is \$750. Quantity discounts are available.

IBM provides a one-year warranty on the unit; Customer On-Site Exchange service is provided during the warranty period, and other service options are available for a fee. The 3708 is designed for customer installation, and all cables external to the system must be ordered separately. ■

IBM 3708 Network Conversion Unit

MANAGEMENT SUMMARY

After months of "statements of direction" concerning its plans regarding protocol conversion products, IBM introduced the 3708 Network Conversion Unit at the 1985 TCA show in San Diego. Competitors were quick to recognize the threat this new product posed. For a number of years, IBM had no protocol converters in its product line, and many manufacturers reaped the rewards of a strong market for devices that allowed asynchronous equipment to communicate with IBM hosts. Of course, a large part of this market included IBM mainframe customers. Now IBM has converters of its own to sell to its huge installed base, and the competition is forced to react to this formidable challenger.

The 3708 provides line concentration, protocol conversion, protocol enveloping, and ASCII passthrough support for asynchronous devices. The ten-port unit, designed for customer installation and maintenance, allows the attachment of one or two IBM hosts, asynchronous hosts, and asynchronous ASCII devices, which when attached to the unit emulate IBM 3270 equipment. The 3708 operates with IBM's System/370, 303X, 308X, 3090, and 43XX processors; 8100 Systems; System/38 units; the 3710 controller; and Rolm's CBX II voice/data PABX.

When operating in protocol conversion mode, the 3708 converts a 3270 datastream to and from ASCII code to allow asynchronous display terminals, printers, keyboard/printers, plotters, and personal computers to appear to an IBM SNA host as 3270 displays and printers. A display and printer may share a 3708 port, but appear to the host as two logical units.

IBM's 3708 Network Conversion Unit is a ten-port device that provides concurrent support for line concentration, protocol conversion, protocol enveloping, and ASCII passthrough capability. The unit allows asynchronous ASCII devices to emulate IBM 3270 full-screen displays and printers. Communication between ASCII hosts and devices is supported through the ASCII passthrough feature. Protocol enveloping allows connection between TWX 33/35 devices and an SNA host.

MODELS: 3708 Network Conversion Unit.
CONVERSION: Asynchronous ASCII to IBM SNA/SDLC.
TRANSMISSION RATES: 110 to 19.2K on host and terminal lines.
COMPETITION: Datastream, Protocol Computers, Inc., Micom.

CHARACTERISTICS

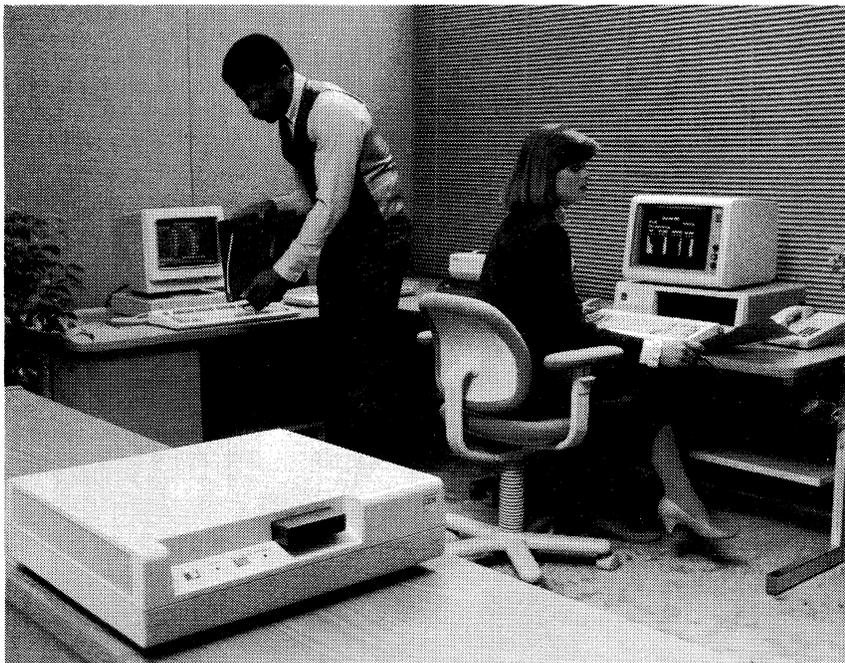
VENDOR: International Business Machines Corporation, One Orchard Place, Armonk, NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: September 17, 1985.

DATE OF FIRST DELIVERY: October 1985.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: IBM.



IBM's 3708 Network Conversion Unit, pictured in the foreground in the photo to the left, consists of a base unit and a plug-in cartridge for system microcode.

IBM 3708 Network Conversion Unit

▷ In conversion mode, the 3708 provides key mapping for many devices, including an IBM 3101, an IBM PC running 3101 emulation, a 3161 in native mode, and a 3163; Rolm's Cypress, Cedar, and Juniper products (through the CBX II); as well as equipment from ADDS Viewpoint, Beehive, Data General, Digital Equipment Corporation, Hazeltine, Hewlett-Packard, Lear Siegler, Northern Telecom, Teletype, and TeleVideo. Through a user-defined keyboard mapping feature, other types of ASCII displays and printers may operate with the 3708 if they support certain characteristics.

In protocol enveloping mode, the 3708 allow TWX 33/35 and compatible displays and keyboard/printers to communicate over an SNA/SDLC link attached to an SNA host through a 3705 or 3725 controller. This mode also can be used to allow plotters and other asynchronous ASCII devices to transmit and receive eight-bit transparent data.

In passthrough mode, the 3708 allows an asynchronous device to communicate with an asynchronous host. In this application, the converter is transparent to both ends of the connection.

The 3708 operates with IBM's MVS, VM, and VSE host programs supporting the IBM 3274 Control Unit model 51C or 61C with Configuration Support A. The 3708 also supports the Network Terminal Option (NTO) program, and is supported by IBM's Network Problem Determination Application (NPDA) and Network Logical Data Management (DLDM) network management products.

Users control and configure the 3708 via a terminal attached either directly or remotely to the unit. Configuration data is entered into menus, and a copy of this information is available through a local print capability. The control terminal is also used for problem determination, whereby the 3708 logs recent alerts along with an indication of the suspected cause of the problem, recommended action, and a failure code. Through the control terminal, an IBM service specialist can diagnose system problems from a remote location.

Access to the 3708 is protected by password, assignable to each port via the control terminal, but in applications where only IBM host application passwords are necessary for logging on, the user can eliminate the port password. SNA sessions are also protected, eliminating the possibility of an illegal entry into a session that was previously defined but not terminated.

IBM has designed the 3708 for easy installation. It consists of a base unit, a plug-in cartridge for microcode, a 14-foot power cord, and an RS-232-C wrap plug. Ports for interfacing with hosts and peripherals are on the back of the unit. Standalone and rackmount versions are available.

In addition to the 3708, IBM sells the 7426 and 7171 protocol converters. The 7426 is designed for remote device attachment, while the 7171 allows direct attachment at the host site. In contrast to these units, the 3708 extends

► CONFIGURATION

The 3708 is made up of two basic components, a base and a cartridge, designed for easy installation and replacement. All of the microcode for 3708 operation resides on the cartridge, which plugs into the front of the base unit. On the back of the base are ten ports. One or two ports may be used to connect the 3708 to an IBM host; the two SNA lines may run to either one host or individually to separate hosts. (The 3708 is defined as a separate physical unit (PU) to each SNA host.) The remaining ports (eight or nine) support asynchronous devices and/or hosts. The 3708 comes with one 14-foot power cord and an RS-232-C wrap plug. It is available in standalone and rackmount versions.

The 3708 is controlled through an asynchronous display (any for which the converter provides mapping). A printer may be attached for hardcopy printouts of any information displayed on the terminal screen.

Attachment between the 3708 and an SNA host can be through any of the following: an IBM 37X5 communications controller, 3710 Network Controller, 43XX Integrated Communication Adapter, 8100 System Data Link or Direct Attach, or System/38 Communications Attachment. The 3708 will also attach downstream of a Rolm CBX II.

TRANSMISSION SPECIFICATIONS

The 3708 attaches to an IBM host through direct connection or a nonswitched, point-to-point, or multipoint communications link. The unit can be multidropped with other SNA controllers on an SNA/SDLC line and will operate with one or two IBM host processors. Attachment to an ASCII host is via a nonswitched, point-to-point communications link through an RS-232-C interface. Each SNA host line will support multiple device-to-host communications simultaneously, but an ASCII host line supports only one device-to-host communication at a time. The 3708 supports data rates ranging from 110 to 19.2K bps on each upstream link to the IBM or asynchronous host. Communication on the IBM host link is in half- or full-duplex mode and in full-duplex mode to asynchronous hosts. The 3708 supports attachment to IBM modems.

Attachment of asynchronous ASCII devices is either direct or point-to-point on switched or nonswitched facilities. Auto baud recognition (to 4800 bps) and auto answer/disconnect are supported. Transmission rates between the 3708 and attached devices can range between 110 and 19.2K bps. Devices attach up to 50 feet via an RS-232-C interface and up to 4,000 feet through an RS-422A interface.

Rolm's Cypress, Cedar, and Juniper workstations attach to the 3708 via a Rolm CBX II DataCom Module or Data Terminal Interface.

OPERATION

The 3708 provides concurrent support for line concentration, ASCII to SNA/SDLC protocol conversion, protocol enveloping for TWX 33/35 devices communicating with SNA hosts, and ASCII passthrough operation. Users can define any 3708 port to operate in either protocol conversion or protocol enveloping mode, or both, and all ports may be configured to support ASCII passthrough. Support for switched access among asynchronous ASCII devices is through the Rolm CBX II.

When in conversion mode, the 3708 converts a 3270 datastream to and from ASCII code to allow ASCII display terminals, printers, plotters, keyboard/printers, and personal computers to appear as IBM 3270 displays and printers to an SNA host. ASCII displays appear as 3278 Model 2s,

IBM 3708 Network Conversion Unit

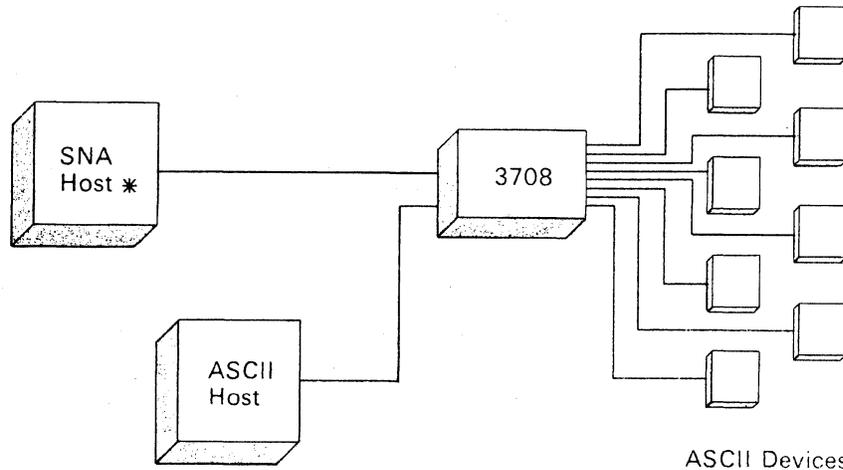


Figure 1. The 3708 supports attachment to both SNA and asynchronous ASCII hosts. Devices connected to the converter may access either resource.

▷ protocol conversion capability further into the network, offers network management control under NPDA and NLDM, and allows asynchronous equipment to communicate with both SNA and asynchronous hosts.

COMPETITIVE POSITION

Because the 3708 is competitively priced, offering many features not found on competing products, and manufactured and marketed by IBM, it will probably assume almost immediate prominence in the protocol conversion marketplace. Most conversion products offer asynchronous ASCII-to-SNA/SDLC capability, allowing customers to use inexpensive terminals within an IBM network. Until recently, IBM did not offer its own protocol converters, but, with the 3708, the company has "legitimized" the use of asynchronous hosts along with IBM hosts in a network. This marks a striking turnabout for IBM, which had previously downplayed the existence of asynchronous equipment.

There is no question that the 3708 will be a real threat to IBM's protocol conversion competitors, which are mostly small firms with limited capital for research, development, and marketing efforts. IBM will have no problem selling any of its protocol conversion products to its huge installed customer base, and other companies in this segment will have to work extremely hard to offset the negative aspects of selling against such a formidable competitor. On the other hand, now that IBM has full-embraced protocol conversion as a viable means to integrate equipment into the SNA environment, competitors could find that the market for protocol conversion has grown significantly enough to allow other manufacturers to reap the benefits of IBM's sanctioning the concept.

ADVANTAGES AND RESTRICTIONS

We could describe the 3708's chief advantages in two words: "flexibility" and "economy." The unit supports the attachment of various devices—including SNA and asynchronous hosts and ASCII terminals, printers, and plotters—in different combinations. Due to the availability of 3708 protocol conversion and ASCII passthrough capabili-

▷ 3178s, 3279s, or 3179s with monochrome or four-color support. Buffered or unbuffered ASCII printers appear as 3287 Models 1 or 2 supported as LU1 (SNA character string mode) and/or LU3 (3270 datastream mode) devices. Printers attached to the 3708 may operate in one of three modes: system mode, in which the printer is dedicated to output from the host; local mode, in which the printer is dedicated to local copy from one or more displays attached to the 3708; or shared mode, in which the printer is used by both the host and attached displays. The 3708 also allows a display with an attached printer to share a 3708 port, but appear to the host as two logical units. Personal computers operating in asynchronous device emulation mode can access the 3708 as long as the emulation program is compatible with the 3708's keyboard mappings.

When operating in conversion mode, the 3708 provides a number of features. A type-ahead key queuing feature allows a terminal operator to enter keystroke sequences without waiting for a complete screen write. An enhanced null/blank feature allows the use of either a space bar or cursor movement key to edit and separate fields. When the user depresses the Enter key, the 3708 converts imbedded nulls to blanks, and the data sent to the host contains blanks wherever there was either a blank or null on the screen. Highlighting and four-color support are provided on the 3270 datastream. Light-pen capability can be simulated through the Cursor Select key. The 3708 also emulates the status line of the 3178's display on the twenty-fifth line of the ASCII display. If the unit has no twenty-fifth line, the terminal operator may enable this feature on the twenty-fourth screen line through a keystroke sequence.

In protocol enveloping mode, ASCII code is surrounded by SNA headers to permit communication between ASCII devices and an SNA host running start/stop applications. In this mode, ASCII units appear as LU1, TWX 33/35 devices. Communication is line by line, and data is eight-bit transparent, i.e., in 256 character codes or binary. The terminal's appearance to the host is the same as that of a TWX 33/35 connected through an NTO program, which resides in the 3708 rather than the 37X5 controller. Because the 3708 operating in enveloping mode does not control the keyboard, a prompt (character string) is defined for each port so that terminal operators will know when they can and cannot enter data. In protocol enveloping mode, the 3708 can support printers and plotters as long as a port is configured to suppress logon screens and operate with data flow transparency.

In ASCII passthrough mode, the 3708 transmits unmodified data between an ASCII display and an asynchronous host. The 3708 serves as a wire connection between an ASCII

IBM 3708 Network Conversion Unit

ties, asynchronous terminal equipment may communicate with both an SNA host and an asynchronous host. Additionally, the 3708 will support dual SNA host connections; two lines may connect to one host, or each line may be attached to a separate host. Finally, through port sharing capability, it is actually possible to connect nine displays and nine auxiliary devices to the 3708, expanding total support to 18 units.

Cost savings on communications facilities are achieved through the 3708's line concentration feature. The 3708 combines data from attached terminals and transmits it to an SNA host on one leased line, which may be shared with other SNA terminal controllers. Additional savings are realized through the 3708's ability to reduce hardware and software costs. Because the 3708 converts data from attached ASCII devices into EBCDIC code before it reaches the host, it eliminates the need to install NTO host conversion software or BTAM/TCAM host access software that normally would be needed for asynchronous terminal-to-IBM host communications. In addition, without a 3708, each terminal requires a port on an IBM 37X5 controller. Since the 3708 concentrates data from multiple ASCII terminals onto one line, it reduces the number of communications controller ports needed for terminal attachment.

Unlike other protocol converters, the 3708 supports IBM's SNA network management features through NPDA and NLDM, making the device a true part of the SNA network.

Most protocol converters do not support the full range of IBM 3270 functions, and the 3708 is no exception to this rule. The following 3270 features are not supported: ALT CURSOR, APL/TEXT, ASCII option, attribute select keys, clicker on/off, compressing of symbol definition bit strings, encrypt/decrypt, extended datastreams, host load of printer authorization matrix, IBM 3274 log/test facility, Katakana, light pen, magnetic readers, mono/dual case control of IBM 3287 printers, more than four colors, programmed symbols, screen sizes larger than 1,920 characters, SFAP options, shift override of numeric lock, SI print order, test request read, and user-defined alerts.

USER REACTION

IBM did not provide us with a list of 3708 users; therefore, we were unable to conduct a user reaction interview regarding the product's operation at an actual installation. □

► device and an ASCII host. Data and protocol error checking is the responsibility of the ASCII host and attached ASCII devices. Output-only devices are not supported in this mode.

DEVICE CONTROL

Users configure, control, and monitor a 3708 through a terminal that initially must be one of the asynchronous displays for which the converter provides mapping. However, once another terminal has been defined, it may be used for control. The terminal may be attached locally or remotely, via a dial-up modem, to the 3708.

Through the control terminal, an operator enters configuration data via screen menus, and a local printer provides hard copy of any displayed screens. All configuration data resides in nonvolatile storage and is retained in the event of power failure. Functions available through the terminal include defining host ports, host access, device ports, a translate table, printer access, and up to six additional keyboard mappings; setting control terminal and port passwords; and setting suppression of 3708 logon screens for plotter attachment. Users can monitor 3708 operation by checking its port status and viewing data in transmission on lines attached to the converter. Response time statistics, configuration data, an alert log, and other error information are available through the terminal.

Any properly defined terminal in the network may be used as a control terminal, although only one control session can be established at any given time. Setting up a control session involves a simple procedure in which the operator first types in a password or terminal identification number and then a period. Ending a session involves depressing a "4" and an Enter key. All subsequent control functions are invoked in a similar manner.

SOFTWARE

The 3708 operates with MVS, VM, and VSE host programs that support the 3274 control unit model 51C or 61C with Configuration Support A. The unit also can perform functions of the NTO (Network Terminal Option) licensed program; it is further supported by the NPDA (Network Problem Determination Application) and NLDM (Network Logical Data Manager) SNA communications network management products. Through NPDA, the 3708 can alert connected SNA hosts regarding possible errors in the network and log these reports on the 3708's control terminal; NLDM monitors response time for all devices in the network when the 3708 is operating in protocol conversion mode.

File transfers between a personal computer and an IBM or ASCII host are possible through the addition of complementary programs, one in the PC and one in the host, that support this function. Users who wish to complete this task through the 3708 must write their own programs or acquire them from an outside source.

PRICING

The 3708 sells for \$3,750; the plug-in cartridge containing system microcode is \$750. Quantity discounts are available.

IBM provides a one-year warranty on the unit; Customer On-Site Exchange service is provided during the warranty period, and other service options are available for a fee. The 3708 is designed for customer installation, and all cables external to the system must be ordered separately. ■

IBM 3708 Network Conversion Unit

PRODUCT DESCRIPTION

IBM's recent addition to its protocol conversion product line, the 3708 Network Conversion Unit, provides line concentration, protocol conversion, protocol enveloping, and ASCII passthrough support for asynchronous devices. This ten-port unit allows the attachment of one or two IBM hosts, asynchronous hosts, and asynchronous ASCII devices, which when attached to the unit will emulate IBM 3270 equipment. The unit operates with IBM's System/370, 303X, 308X, 3090, and 43XX processors; 8100 Systems; System/38 units; 3710 Controllers, and the Rolm CBXII voice/data PABX.

When operating in protocol conversion mode, the 3708 converts a 3270 datastream to and from ASCII to allow asynchronous display terminals, printers, keyboard/printers, plotters, and personal computers to appear to an IBM SNA host as 3270 displays and printers. In this mode, a display and printer may share a 3708 port, but appear to the host as two logical units.

In protocol enveloping mode, the 3708 allows TWX 33/35 and compatible displays and keyboard/printers to communicate over an SNA/SDLC link attached to an SNA host through a 3705 or 3725 controller. This mode also can be used to allow plotters and other asynchronous ASCII devices to transmit and receive eight-bit transparent data.

In passthrough mode, the 3708 will allow an asynchronous device to communicate with an asynchronous host. In this application, the converter is transparent to both ends of the connection.

The 3708 operates with IBM's MVS, VM, and VSE host programs supporting the IBM 3274 Control Unit model 51C or 61C with Configuration Support A. The 3708 also supports the Network Terminal Option (NTO) program, and is supported by IBM's Network Problem Determination Application (NPDA) and Network Logical Data Management (NLDM) network management products.

Users control and configure the 3708 via a terminal attached either directly or remotely to the unit. Configuration data is entered into menus, and a copy of this information is available through a local print capability. The control terminal is also used for problem determination, whereby the 3708 logs recent alerts along with an indication of the probable cause of the problem, recommended action, and a failure code. Through the control terminal, an IBM service specialist can diagnose system problems from a remote location.

Access to the 3708 is protected by password, assignable to each port via the control terminal, but in applications where only IBM host application passwords are necessary for logging on, the user can eliminate the port password. SNA sessions are also protected, eliminating the possibility

PRODUCT ANNOUNCEMENT: The IBM 3708 Network Conversion Unit is a ten-port device that provides concurrent support for line concentration, protocol conversion, protocol enveloping, and ASCII passthrough capability. The IBM 3708 allows asynchronous ASCII devices to emulate IBM 3270 full-screen displays and printers. Communication between ASCII hosts and devices is supported through ASCII passthrough support capability. Protocol enveloping capability allows connection between TWX 33/35 and SNA host.

ANNOUNCEMENT DATE: September 17, 1985.

SCHEDULED DELIVERY: October 1985.

PRICE: \$3,750 for basic unit; quantity discounts available.

BASIC SPECIFICATIONS

MANUFACTURER: International Business Machines Corporation, One Orchard Place, Armonk, NY 10504. Contact your local IBM representative.

MODELS: 3708 Network Conversion Unit.

TRANSMISSION SPECIFICATIONS: The 3708 attaches to an IBM host through direct connection or a nonswitched, point-to-point, or multipoint communications link. The unit can be multiplexed with other SNA controllers on an SNA/SDLC line and will operate with one or two IBM host processors, each connection being supported as a separate physical unit. Attachment to an ASCII host is via a nonswitched, point-to-point communications link through an RS-232-C interface. The 3708 supports data rates ranging from 110 to 19.2K bps on each upstream link to the IBM or asynchronous host. Communication on the IBM host link is in half- or full-duplex mode and in full-duplex mode to asynchronous hosts. The 3708 supports attachment to IBM modems.

Attachment of asynchronous ASCII devices is either direct or point-to-point on switched or nonswitched facilities. Auto baud recognition (to 4800 bps) and auto answer/disconnect are supported. Transmission rates between the 3708 and attached devices can range between 110 and 19.2K bps. Devices attach up to 50 feet via an RS-232-C interface and through an RS-422A interface for attachments up to 4,000 feet.

Rolm's Cypress, Cedar, and Juniper workstations attach to the 3708 via a Rolm CBXII DataCom Module or Data Terminal Interface.

CONFIGURATION: The 3708 is a ten-port unit that will support one or two IBM hosts; the remaining ports support asynchronous devices and/or ASCII hosts. The basic 3708 configuration includes the base unit, one 14-foot power cord, and an RS-232-C wrap plug. All of the microcode for 3708 operation resides on a plug-in cartridge. The 3708 is available in standalone or rackmount versions.

IBM's new conversion attaches upstream of a number of IBM hosts, including System/370, 303X, 308X, 3090, and 43XX processors; 8100 systems; System/38; and 3710 Network Controllers. The 3708 also attaches downstream from a Rolm CBXII. Through

IBM 3708 Network Conversion Unit

➤ of gaining access to a session that was previously defined but not terminated.

The 3708 is available in standalone or rackmount versions. The product is designed for customer installation, and all cables external to the system must be ordered separately. IBM provides a one-year warranty on the unit; IBM's Customer On-site Exchange service is provided during the warranty period, and customers may select other service options for a fee.

RELATIONSHIP TO CURRENT PRODUCT LINE: In addition to the 3708, IBM sells the 7426 and 7171 protocol converters. The 7426 is designed for remote device attachment, while the 7171 allows direct attachment at the host site. The 3708 extends protocol conversion capability further into the network and allows devices connected to the SNA network to communicate not only with IBM SNA hosts, but also asynchronous hosts through a passthrough feature. The unit also allows devices attached to the system to come under the control of IBM's network management products. In addition to protocol conversion, the 3708 provides line concentration and a protocol enveloping feature, which are not available on the 7426 and 7171.

MARKETING POSITION: Because the 3708 is competitively priced, offering many features not found on competing products, and manufactured and marketed by IBM, it will probably assume almost immediate prominence in the protocol conversion marketplace. Most conversion products offer asynchronous ASCII-to-SNA/SDLC capability, allowing customers to use inexpensive terminals within an IBM network. Until recently, IBM did not offer its own protocol converters, but the company is now committed to the concept, and, with the 3708, IBM has "legitimized" the use of asynchronous hosts along with IBM hosts in a network. This marks a striking turnabout for IBM, which had previously downplayed the existence of asynchronous equipment.

There is no question that the 3708 will be a real threat to IBM's protocol conversion competitors, which are mostly small firms with limited capital for research, development, and marketing efforts. IBM will have no problem selling any of its protocol conversion products to its huge installed customer base, and other companies in this segment will have to work extremely hard to offset the negative aspects of selling against such a formidable competitor. On the other hand, now that IBM has fully embraced protocol conversion as a viable means to integrate equipment into the SNA environment, competitors could find that the market for protocol conversion has grown significantly enough to allow other manufacturers to reap the benefits of IBM's sanctioning the concept. □

➤ a 3708 operating in passthrough mode, ASCII devices may be connected in a point-to-point communication with an asynchronous host; in this configuration, the 3708 is transparent to both ends.

Users configure, control, and monitor a 3708 through a terminal, which initially must be one of the asynchronous displays for which the converter provides mapping. Once another terminal is defined

through the UDT, that terminal may be used for control. An operator enters configuration data via screen menus, and a local printer capability provides hardcopy of any displayed screens. All configuration data resides in nonvolatile storage and is retained in the event of power failure. Entry to the control terminal can be protected by password on a per-port basis, and SNA session security is also supported.

SOFTWARE: The 3708 operates with MVS, VM, and VSE host programs that support the 3274 control unit model 51C or 61C with Configuration Support A. The unit also can perform functions of the NTO (Network Terminal Option) licensed program; it is further supported by the NPDA and NLDM SNA communication network management products. Through NPDA, the 3708 can alert connected SNA hosts regarding possible errors in the network and log these reports on the 3708 control terminal; NLDM monitors response time for all devices in the network when the 3708 is operating in protocol conversion mode.

SYSTEM FEATURES: The 3708 provides concurrent support for line concentration, ASCII to SNA/SDLC protocol conversion, protocol enveloping for TWX 33/35 operation with SNA host, and ASCII passthrough operation. Support for switched access among asynchronous ASCII devices is through the Rolm CBXII.

When in conversion mode, the 3708 converts a 3270 datastream to and from ASCII code to allow asynchronous ASCII display terminals, printers, plotters, keyboard/printers, and personal computers to appear as IBM 3270 displays and printers to an SNA host. ASCII displays appear as 3278 Model 2s, 3178s, 3279s, or 3179s with monochrome or four-color support. Buffered or unbuffered ASCII printers appear as 3287 Models 1 or 2, supported as LU1 (SCS mode) and/or LU3 (DSC mode) devices. Printers attached to the 3708 may operate in one of three modes: system mode, in which the printer is dedicated to output from the host; local model, in which the printer is dedicated to local copy from one or more displays attached to the 3708; or shared mode, in which the printer is used by both the host and attached displays. The 3708 also allows a display with an attached printer to share a 3708 port, but appear to the host as two logical units. Personal computers operating in asynchronous device emulation mode can access the 3708 as long as the emulation program is compatible with the 3708's keyboard mappings.

The 3708 supports predefined keyboard mappings for the following units: IBM 3101 Models 10, 12, 13, 20, 22, and 23; IBM PC in 3101 mode and IBM 3161 and 3163 display stations; Rolm's Cypress, Cedar, and Juniper via the CBXII; DEC VT52, VT100, and VT220, Hewlett-Packard 2621B; Data General D210, Hazeltine Model 1500, Esprit I and II; TeleVideo 910 and 950; Lear Siegler ADM3A; Beehive ATL-078; ADDS Viewpoint; Teletype 5410 and 5420; and Northern Telecom's Displayphone. Character-mode ASCII displays not listed above can be configured through a User Defined Terminal (UDT) feature, also used for redefining keyboard mappings already resident on the 3708.

Additional features provided through the 3708 enhance productivity. A type-ahead key queuing feature allows the user to enter keystroke sequences without waiting for a complete screen write. An enhanced null/blank feature lets a terminal operator use either the space bar or cursor movement key to edit and separate fields. When the user depresses the enter key, the 3708 converts imbedded nulls to blanks, and the data sent to the host contains blanks wherever there was either a blank or a null on the screen.

The 3708 supports highlighting and four-color support on the 3270 datastream. Light pen capability can be simulated through the Cursor Select key. The 3708 emulates the status line of the 3178 display unit on the twenty-fifth line of the ASCII display. If the unit has no twenty-fifth line, the terminal operator may enable this feature on the twenty-fourth screen line through a keystroke sequence.

IBM 3270 keys and functions *not* supported by the 3708 include ALT CURSOR, APL/TEXT, ASCII option, attribute select keys, ➤

IBM 3708 Network Conversion Unit

clicker on/off, compressing of symbol definition bit strings, encrypt/decrypt, extended datastreams, host load of printer authorization matrix, IBM 3274 log/test facility, Katakana, light pen, magnetic readers, mono/dual case control of IBM 3287 printer, more than four-color support, programmed symbols, screen sizes larger than 1,920 characters, SFAP options, shift override of numeric lock, SI print order, test request read, and user-defined alerts.

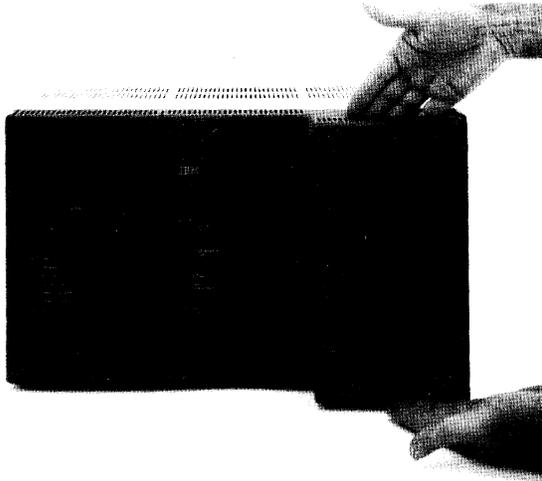
In protocol enveloping mode, ASCII displays communicate as LU1, TWX 33/35 devices. Communication is line by line, and data is eight-bit transparent, i.e., in 256 character codes, or binary. In this mode, the terminal's appearance to the host is the same as that

of a TWX 33/35 connected through an NTO program, which resides in the 3708 rather than the 37X5 controller. In protocol enveloping mode, the 3708 can support printers and plotters as long as a port can be configured to suppress logon screens and operate with data flow transparency.

File transfers between a personal computer and an IBM or ASCII host is possible through the addition of complementary programs, one in the PC and one in the host, that support this function. Users who wish to complete this task through the 3708 must write their own programs or acquire them from an outside source.

PRICING: The 3708 sells for \$3,750; the plug-in cartridge containing system microcode is \$750. ■

IBM 3710 Network Controller



IBM's 3710 Network Controller consists of three basic modular machine elements: a power unit, control unit, and diskette unit. These units slide into the front of the 3710 frame. The back of the unit houses communications adapters and a service modem.

MANAGEMENT SUMMARY

UPDATE: *IBM has recently reviewed this report and informed us that there are no technical changes at the present time.*

A few years ago, IBM introduced several products with important implications in the protocol conversion marketplace. The subject of this report is the 3710 Network Controller; other IBM conversion products are covered in reports which precede this one. A brief summary of the historical development of IBM's conversion product line over the past few years shows that the company has thoroughly embraced the concept of protocol conversion to allow non-SNA equipment to operate in the SNA network.

IBM's first protocol converter, the 7426, introduced in October 1982, allowed the company's ASCII 3101 terminal to communicate with 8100 and 43XX computers. Although it was designed primarily for the 3101, the unit also enabled other asynchronous ASCII devices to connect to an SNA host. At the time the 7426 was introduced, interest in and sales of protocol conversion products had begun to increase dramatically, and several companies announced new converters that would allow asynchronous ASCII devices to emulate IBM 3270 equipment. From 1982 to 1984, revenues from protocol converter sales were strong, and IBM began making statements of direction concerning its intention to introduce more conversion products of its own.

In September 1984, IBM announced the 7171 protocol converter and the 3710 Network Controller. The 7171 allows the direct attachment of from 16 to 64 asynchronous ▶

Offering management of multiple protocols, line concentration, and multiplexing, IBM's 3710 Network Controller is supported in the SNA network as a Physical Unit Type 2 cluster controller. It operates on point-to-point or multidropped SDLC links. The 3710 also supports an eight-port Communications Adapter that appears to an IBM SNA host as a 3274 control unit.

In the SNA network, the 3710 attaches to a 37X5 communications controller. Devices attach to the 3710 through communications adapters that support RS-232-C, V.35, and X.21 interfaces.

MODELS: IBM 3710.

CONVERSION: Concentrates lines using start/stop, BSC, and SDLC protocols onto single or multiple SDLC or X.25 links. Supports full-screen IBM 3270 protocol conversion through an 8PCA communications adapter, which allows attachment of asynchronous ASCII devices communicating with an SNA/SDLC host.

TRANSMISSION: From 110 to 19.2K bps with RS-232-C communications adapter; from 110 to 64K bps with a V.35 or X.21 communications adapter.

COMPETITION: Netlink, Inc. 3703 Network Processor; NCR Comten 5620.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, One Orchard Place, Armonk, New York 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: September 10, 1984.

DATE OF FIRST DELIVERY: Information not available.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines.

CONFIGURATION

The 3710 can be installed as a tabletop or rack-mounted unit. It is made up of modular hardware components called machine elements. A basic 3710 configuration consists of the following elements:

- A frame—houses the elements that make up the controller.
- One power unit—controls voltage used by the controller.
- One control unit—manages protocols and line interfaces. ▶

IBM 3710 Network Controller

➤ ASCII devices to the block multiplexer channel of a 43XX or 308X host. Devices attached to the converter appear to the IBM host as 3270-type equipment. (For more detailed information on both the 7426 and 7171, refer to Report C23-491-101 in this tab.) The 3710 offers the ability to manage mixed protocols (start/stop, BSC, and SDLC) in the network, as well multiplex and concentrate lines from attached devices to a 37X5 communications controller. One of the chief advantages of the 3710 is its ability to off-load a variety of SNA network management functions from the communications controller, thus freeing that device for other tasks. The 3710's line concentration function also allows users to save port space on the controller.

While the 7171 and 3710 were important additions to IBM's conversion products line, announcements made in September 1985 at the TCA show in San Diego offer the most serious challenge to the company's competitors. At this time, IBM introduced the 3708 Network Conversion Unit and an eight-port Communications Adapter (8PCA) for the 3710. The 3708 offers line concentration, protocol conversion, and protocol enveloping, allowing asynchronous ASCII devices attached to the unit to support full-screen 3270 displays and printers. An ASCII passthrough support capability allows asynchronous devices to communicate with asynchronous hosts, as well. Significantly, a ten-port 3708 cost only \$4,500, a price that is lower than other converters offering far less functionality. (For more complete coverage of the 3708, refer to Report C23-491-301, which immediately precedes this report.)

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From a technical perspective, both the 3710 and the 3708 are important products as they offer not only the ability to manage multiple protocols, but also line concentration and, on the 3710, multiplexing. The units also support IBM SNA network management functions, offering the user greater flexibility in diagnosing and recovering from failures.

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A 3710 configuration consists of a frame that houses three modular elements—a power unit, diskette unit, and control ➤

- • One diskette unit—reads information from and writes information to the controller's system diskette.
- One 5¼-inch system diskette unit—contains 3710 operational microcode, which has been recently enhanced to allow tracing of data on an upstream (host side) X.25 link, to provide network management data to flow to more than one host, and to allow the continuation of sessions with downstream (terminal side) non-SNA resources when resource ownership is taken over by a back-up host.
- One communication adapter—provides the interface between the 3710 and attached devices. Three types of adapters are available. An RS-232-C line interface handles one or two lines at speeds up to 19.2K bps. A V.35 or X.21 adapter handles one line at speeds up to 64K bps. Each 3710 supports up to 16 communications adapters and up to 31 lines using an RS-232-C interface, 14 lines using either a V.35 or X.21 interface, and 30 lines using more than one of these interfaces.
- Adapter blanks—maintain proper airflow wherever there is no communications adapter.
- One service modem—used to connect a remotely attached control terminal; also allows IBM service personnel to communicate with the 3710; operates at 1200 bps in half-duplex mode.
- Device cables—connect modems and other devices to communications adapters.
- Common-carrier cable—connects the service modem to a telephone jack; used for remote assistance.
- Power cord—connects the 3710 to an electrical outlet.

The power unit, control unit, and diskette unit slide into the front of the 3710 frame; the service modem and the 16 communications adapters slide into the back of the frame. All lines from attached devices connect to the controller through the communications adapters.

The 3710 can be equipped with options that increase its ability to store information and accommodate a larger number of devices. An expansion unit, which slides into the top of the 3710, provides 128K bytes of additional storage. An eight-port communications adapter (8PCA) provides connection for eight asynchronous ASCII devices, including a mix of hosts or terminals. (For example, if one asynchronous host is attached to the 8PCA, seven ports are available for other devices.) The 3710 will support up to seven 8PCAs for a total connection of up to 56 downstream asynchronous lines. Each 8PCA appears to an SNA host as an IBM 3274 Control Unit, Model 51C or 61C. A 3710 with 8PCAs can be multidropped on an SNA/SDLC link with other controllers or attached to an X.25 network. The 8PCAs provide for attachment to up to five IBM SNA hosts.

A host-independent control terminal, which may be any start/stop device compatible with an IBM 3101, provides the interface between the 3710 and a network manager/operator. This terminal may be attached directly to the 3710 or remotely through the service modem or an external modem.

TRANSMISSION SPECIFICATIONS

The 3710 provides communications adapters for RS-232-C, V.35, or CCITT X.21 interfaces. The controller concentrates lines interfaced through these adapters into a single SNA/SDLC or X.25 upstream link to a 37X5 communications controller. (X.25 support is provided for the 3725 only.) These lines may be switched or leased, half or full duplex, and use asynchronous or synchronous protocols. The ➤

IBM 3710 Network Controller

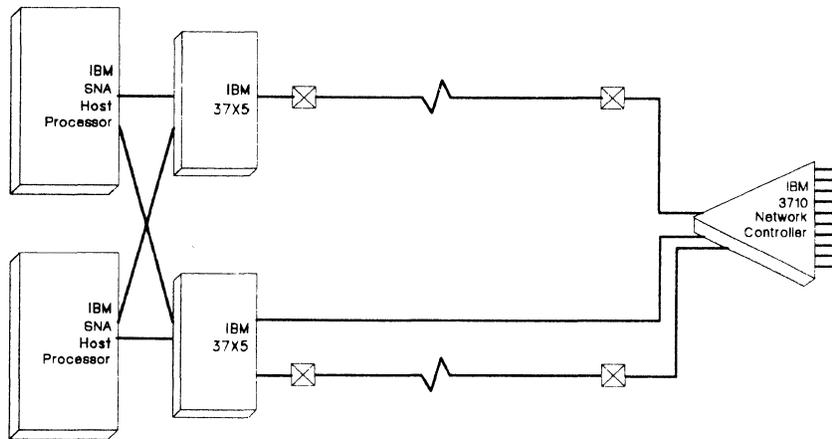


Figure 1. The 3710 supports multiple upstream attachments to communications controllers and hosts. It supports up to 30 lines to 37X5 controllers. These lines may be attached remotely, directly, or both.

unit—that slide into the front of the enclosure, and up to 16 communications adapters and one service modem that slide into the back of the unit. Three types of communications adapters provide the interface to devices connected to the 3710. An RS-232-C adapter handles one or two lines at speeds ranging from 110 to 19.2K bps; a V.35 or X.21 adapter handles one line at speeds up to 64K bps. The number of lines supported by the 3710 depends upon the type of adapter used in the configuration. A unit configured entirely with RS-232-C adapters will support 31 lines; units with either V.35 or X.21 adapters support up to 14 lines, and if the adapters are mixed, the unit can support up to 30 lines.

In the SNA network, the 3710 is supported as a Physical Unit Type 2 cluster controller sharing lines with other 3710s and SNA devices. The unit can be placed in various network configurations. When downstream of a host, the 3710 will concentrate lines in a point-to-point or multidrop network. In a multidrop network, multiple 3710s concentrate lines to an IBM communications controller, and the unit can also be cascaded in successive levels for greater line concentration. In addition, the 3710 supports multiple upstream attachments to more than one host, as well as satellite services on upstream and SDLC device links that use a modulo-128 transmission check and on lines to BSC 3270 and asynchronous start/stop devices.

The 3710 controller will operate with the following IBM software: Advanced Communications Function for the Virtual Telecommunications Access Method (ACF/VTAM) Version 2, Releases 1 and 2; ACF/Network Control Program (NCP) Version 3; Network Communications Control Facility (NCCF) Version 2, Release 1; Network Problem Determination Access (NPDA) Version 3, Release 1; and Non-SNA Interconnection (NSI) (BSC RJE support operating with the IBM 3725 and NCP Version 3). New software releases provided enhanced functional support. These include ACF/VTAM Version 3, required for a trace function that allows the 3710 to copy data and the control information it sends or receives; System Support Program (SSP) for ACF/NCP/VS Version 3, which provides a Configuration Control Program through which operators configure and redefine the 3710; NCCF Version

RS-232-C adapter supports speeds from 110 to 19.2K bps; the V.35 and X.21 adapters support speeds ranging from 110 to 64K bps.

The 3710 can be used in various network configurations. When the unit is placed downstream of the host, it will concentrate lines in a point-to-point or multidrop network. Multiple 3710s can be used in a multidrop network to concentrate lines to a communications controller. The 3710s also can be cascaded in successive levels for greater concentration. Additionally, the unit will support satellite services on upstream lines and SDLC device lines that use a modulo-128 transmission check and on lines to BSC 3270 and asynchronous start/stop devices. The 3710 supports multiple upstream attachments to more than one host and communications controller, each handling a different type of data. In this type of application, any device attached through a 3710 can communicate with any host; however, communication occurs with only one host at a time. In addition, only one host actually "owns" the 3710 itself, although another host can be designated a backup without any configuration changes.

DEVICE CONTROL

In the SNA network, the 3710 is supported as a Physical Unit Type 2 cluster controller sharing lines with IBM 3710s and other SNA devices. The primary functions of the 3710 are to concentrate and multiplex SDLC and selected BSC and asynchronous start/stop protocols over SNA/SDLC or X.25 links and manage a variety of data transmission protocols, allowing both SNA and non-SNA devices to communicate with an SNA host. An eight-port communications adapter allows the attachment of asynchronous ASCII devices that will emulate IBM 3270 displays and printers.

The 3710 manages line protocols in three modes: passthrough, protocol enveloping, and protocol conversion. In the passthrough mode, SDLC protocol is recognized and passed through the unit without any changes. In enveloping mode, the unit surrounds specific non-SNA protocols (asynchronous start/stop, BSC RJE, or BSC for multileaving) so that they appear to be SDLC. In conversion mode, the 3710 actually changes other non-SNA protocols to SDLC so that asynchronous ASCII and BSC 3270 devices appear to the host as IBM SNA 3270 devices.

IBM has designed the 3710 for customer installation. Operation of the unit requires ACF/VTAM (Advanced Communication Function for the Virtual Telecommunications Access Method), Version 2 or later, and the ACF/NCP (Advanced Communication Function for the Network Control Program), Version 3 or later. The unit operates with the

IBM 3710 Network Controller

➤ 2, Release 2, which offers an interface to the 3710 from the host console, allowing a network operator to remotely control the unit; NPDA Version 3, Release 2, required to run problem determination information programs in the network; NCP Packet Switching Interface, Release 4.2 operating with ACF/NCP Version 4 in a 3725 communications controller for X.25 support; and NSI, Release 1.3 operating under ACF/NCP in the 3725 controller for remote job entry capability.

Network operators control, manage, and configure the 3710 through a console, which can be an IBM 3101 or compatible terminal. This terminal may be attached directly to the 3710 or remotely attached through the controller's service modem or a customer-supplied external modem. It is protected from unauthorized access by a password. When not used for control purposes, the 3101 may be used for other applications.

COMPETITIVE POSITION

IBM's announcement of the 3708 Network Conversion Unit and the 8PCA for the 3710 in September sounded the death knell for many protocol converter manufacturers without fairly strong market shares. Most major competitors, such as Micom and PCI, have redirected their efforts into X.25 conversion products, which should prove more lucrative. ASCII-to-SNA conversion products, although still part of the equipment line, have been downplayed by many companies competing in this market.

IBM is in a unique position in this market because most conversion products are designed to allow customers to use inexpensive asynchronous terminals rather than 3270 equipment in an IBM network. If we assume that major customers of protocol conversion equipment already own a great deal of IBM products, we can also assume that these customers will be likely targets for sales of IBM conversion products. This poses a large threat to the existing competition, which gained market share before IBM went into the protocol conversion business.

ADVANTAGES AND RESTRICTIONS

The 3710 can concentrate data from up to 31 leased or switched lines onto a single line to a communications controller. Therefore, it reduces the number of lines and modems needed in a network, significantly cutting the costs for data communications equipment. The unit is designed for customer setup, and installation, operation, and maintenance of the 3710 do not require any additions to existing hosts, controllers, or other network devices. In fact, the only modification required is a change in the network definition to reflect the 3710's presence in systems operating under ACF/VTAM Version 2 and ACF/NCP Version 3.

Another advantage of the 3710 is its ability to manage multiple protocols. Typically, protocol converters handle only one type of conversion at once, and users with a mixed-protocol network must purchase several different types of converters to handle specific jobs. With the 3710, ➤

➤ IBM System/370, 30XX, and 43XX processors and 3705 or 3725 communications controllers. It supports a wide range of asynchronous ASCII start/stop devices; BSC RJE, BSC Multileaving Interface, and BSC 3270 devices; and IBM SDLC devices, including the Series 1, System/32/34/36/38, the 8100 DPCX and DPPX, and so forth.

Users can configure the 3710 either from the host using NCCF and the CCP function of the ACF Systems Support Program Version 3, or through a control terminal, which can be any 3101 or compatible terminal. Specific functions available through the terminal include running and verifying the completion of 3710 setup tests, loading microcode from the system diskette to the 3710's storage, copying the system diskette onto a backup diskette, copying new or changed 3710 configuration information from the system diskette onto a backup diskette, displaying information regarding the controller's machine elements and attached lines, defining networks to the 3710 and displaying or changing previously defined configurations on the system diskette, diagnosing and recovering from online and offline problems, changing line status, assigning new lines to a communications controller, and changing passwords.

The terminal may be attached directly to the 3710 or remotely attached through the controller's service modem or a customer-supplied external modem. It is also possible to attach one control terminal to multiple 3710s through asynchronous switched lines. When not being used for control purposes, the terminal may be used for other applications. A sign-on password prevents the use of the control terminal by unauthorized personnel.

The 3710 continuously monitors itself and its attached lines and devices, and when a problem is detected, the network operator is notified. The 3710 can be programmed to send to the control terminal a problem alert, which lists what failed, the probable cause, and how to correct the problem. The network operator can also use diagnostic tests to locate and diagnose problems on communications adapters, attached cables, or the service modem. Offline tests of the 3710 itself, individual machine elements, and cables can be run through the control terminal when the 3710 is disconnected from the network. Self-explanatory messages of the results of offline tests are sent to the operator via the control terminal. In the event that users cannot resolve problems with the 3710, IBM provides a remote assistance through a switched telephone line attached to the service modem on the unit. Access to remote assistance is password-protected.

On the front of the 3710 are LEDs and power switches through which users can monitor general device status. Switches for turning power on and off, starting the control terminal, writing storage on diskette, and conducting a lamp test are available. LEDs monitor power, voltage, and the operational status of the control and diskette units.

SOFTWARE

IBM software operating with MVS or MVS/XA systems supports the 3710. The unit will operate with software announced before the 3710. This includes ACF/VTAM Version 2, Releases 1 and 2; ACF/NCP Version 3; NCCF Version 2, Release 1; NPDA Version 3, Release 1; Non-SNA Interconnection (BSC RJE support operating with the IBM 3725 and NCP Version 3). In this environment, a control terminal is necessary for configuring the 3710.

Under new releases of software, the IBM 3710 receives enhanced functional support. These programs include the following:

- ACF/VTAM Version 3 is required for the trace function, which enables the 3710 to copy the data and control information it sends or receives. ACF/VTAM collects ➤

IBM 3710 Network Controller

➤ this requirement is eliminated. Also, the 3710 can off-load a number of SNA Communications Network Management functions from the 37X5 communications controller, thus freeing that unit for other tasks. It is possible that users may be able to postpone the purchase of an additional controller when the 3710 is available to take up some of the network management load.

A 3710 fully equipped with seven 8PCAs allows a user to attach up to 56 asynchronous ASCII devices communicating with an SNA or asynchronous host. The price of a 3710 is \$20,300, and each 8PCA, supporting eight ports, is \$3,300. Therefore, a system equipped to handle 56 ASCII devices costs about \$43,400, minus cabling costs and any additional software. At first, this appears to be a lot of money to pay for protocol conversion, but the per-port charge for a 3710 supporting 56 ASCII devices is only \$775, which is well below the per-port costs of other protocol converters. Additionally, the 3710 equipped with 8PCAs provides attachment to up to five IBM host processors along with line concentration and multiplexing functions.

The IBM 3710 has some limitations. It depends on a 37X5 communications controller for connection to an upstream host system and cannot connect to downstream SNA PU Type 4 devices that are 37X5s. When compared with an NCR Comten 5620, the 3710 is limited in that it cannot run network control software and operates only as a node on an SNA network. The 5620 can do both. Also, the 3710 provides only 512K of memory (384K plus 128K optional) and does not support hard disk; the 5620, on the other hand, supports up to 2M bytes of memory and 10M bytes of hard disk.

Users intending to install a 3710 should carefully note the cabling requirements of the unit, as it is the customer's responsibility to purchase the correct cable, either from IBM or an outside vendor. Customers are also responsible for arranging the installation of common carrier equipment and determining the correct number of spares for the 3710.

USER REACTION

IBM did not supply us with a list of users for the product; therefore, we were unable to conduct a user reaction interview for the product. □

➤ trace data and formats it into records, which are then formatted and printed through a Trace Analysis Program (TAP).

- System Support Programs (SSP) for ACF/NCP/VS Version 3 provide a number of utilities and small programs, including Configuration Control Program (CCP) and TAP. SSP, required for the operation of ACF/NCP, operates with ACF/NCP in a 37X5 communications controller. CCP is an interactive program that guides operators through defining, displaying, and changing a 3710 config-

uration. Definitions can be stored for later use. CCP allows complete definition loads and nondisruptive updates, keeps track of all 3710 configurations defined in the network, copies configurations, defines up to five lines to communications controllers, and supports two levels of cascading.

- Network Communications Control Facility (NCCF) Version 2, Release 2, installed at the host, provides a network operator interface to the 3710 from the host console, as well as online diagnostic tests, a CCP interface and transport facility, and additional operator commands. This software permits an operator to control the 3710 remotely, without disrupting current operations.
- Network Problem Determination Application (NPDA) Version 3, Release 2, installed at the host, provides LPDA information and an automatic display of alerts. NPDA operates as an NCCF application to provide summary and detailed information for determining causes of network errors. LPDA is a set of error-determination tests run by IBM 386X modems. For testing IBM 386X modems and direct SDLC or BSC lines to devices, users need NPDA Version 3, Release 2. To run LPDA tests on one or more multidrop upstream lines, users need NPDA, Version 3, Release 2 or later, and ACF/NCP, Version 4 or later, in a 3725 communications controller. If NPDA is installed, the 3710's alerts are sent to NPDA and are also available for display at the control terminal. In a multidrop or cascaded network, all of the devices attached to the 3710, as well as the controller itself, must share the same NPDA.

For upstream (host side) X.25 support on leased and switched virtual circuits, the 3710 requires the X.25 NCP Packet Switching Interface, Release 4.2, operating with ACF/NCP, Version 4 in a 3725 communications controller. This X.25 interface allows SNA users to connect to public packet switched networks, such as Tymnet, Telenet, and Uninet.

Remote job entry, which allows jobs to be submitted for processing by non-SNA program products in a remote host, requires Non-SNA Interconnection (NSI), Release 1.3, operating under ACF/NCP in the 3725 communications controller. NSI allows non-SNA BSC RJE data to be transported on an SNA network and provides terminal functions for devices that use BSC RJE.

PRICING

The 3710 is available under Plan D for purchase or 30-day rental. IBM allows up to 65 percent of the first six-month rental charges to be accrued towards the purchase of the product. All external cables for the 3710 and the 8PCA must be ordered separately, either from IBM or another vendor. All cables must be shielded. Users may order spare machine elements and other accessories for the 3710. For specific information regarding such purchases, users should contact their local IBM representative.

IBM provides several types of maintenance options, including IBM On-Site Exchange (IOE), Customer On-Site Exchange (COE), and Customer Carry-in Exchange or Repair (CCE/CCR). In the table below, we have listed 3710 purchase and rental prices and annual maintenance charges for IOE, COE, and CCE/CCR maintenance plans. ➤

IBM 3710 Network Controller

EQUIPMENT PRICES

		Pur- chase Price (\$)	Monthly Rental (\$)	Annual Mainte- nance (IOE) (\$)	Annual Mainte- nance (COE) (\$)	Annual Maint. (CCE/ CCR) (\$)
#001	IBM 3710 Network Controller	20,300	110	1,160	802	753
#7001	V.24 Communication Adapter	2,000	113	160	138	135
#7005	V.35 Communication Adapter	2,000	114	166	141	138
#7010	X.21 Communication Adapter	2,200	130	234	205	191
#7020	128K Storage Expansion	1,500	78	30	25	23
#7015	Eight-port Communication Adapter for asynchronous ASCII devices	3,300	189	289	247	240

		Initial Charge* (\$)	Monthly License* (\$)	Monthly Service Charge* (\$)
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SOFTWARE PRICES

5665-289	Software for MVS/XA environment	6,255/4,695	2,085/1,565	302/483
5665-313	Software for MVS/370 environment	5,130/3,840	1,710/1,280	275/440
5668-854	ACF/NCP 4.0 for 3725 communications controller	2,085/1,875	695/625	148/237
5668-947	NCCF Version 2, Release 2.2 for MVS/370 and MVS/XA in 24-bit Addressing Mode	2,250/2,010	375/335	55/88
5665-316	NCCF Version 2, Release 2 (2.2) for MVS/XA in 31-bit Addressing Mode	2,730/2,460	455/410	66/106
5668-920	NPDA Version 3, Release 2 (3.2) for MVS/370 and MVS/XA in 24-bit Addressing Mode	1,650/1,237	264/198	22/35
5665-321	NPDA Version 3, Release 2 (3.2) for MVS/XA in 31-bit Addressing Mode	1,920/1,440	320/240	28/45
5668-981	NCP Packet Switching Interface (NPSI) 4.2	770/577	269/202	40/64
5665-338	ACF/SSP Version 3 (3.0) for IBM 3705 and 3725 communications controllers	1,605/1,200	535/400	71/114

*The first figure shown in the pricing column is the charge for a primary system; the second figure is for a distributed system (DSLO). ■

IBM 3710 Network Controller

MANAGEMENT SUMMARY

In just a little over one year, IBM has introduced several products with important implications in the protocol conversion marketplace. The subject of this report is the 3710 Network Controller; other IBM conversion products are covered in reports which precede this one. A brief summary of the historical development of IBM's conversion product line over the past few years shows that the company has thoroughly embraced the concept of protocol conversion to allow non-SNA equipment to operate in the SNA network.

IBM's first protocol converter, the 7426, introduced in October 1982, allowed the company's ASCII 3101 terminal to communicate with 8100 and 43XX computers. Although it was designed primarily for the 3101, the unit also enabled other asynchronous ASCII devices to connect to an SNA host. At the time the 7426 was introduced, interest in and sales of protocol conversion products had begun to increase dramatically, and several companies announced new converters that would allow asynchronous ASCII devices to emulate IBM 3270 equipment. From 1982 to 1984, revenues from protocol converter sales were strong, and IBM began making statements of direction concerning its intention to introduce more conversion products of its own.

In September 1984, IBM announced the 7171 protocol converter and the 3710 Network Controller. The 7171 allows the direct attachment of from 16 to 64 asynchronous ASCII devices to the block multiplexer channel of a 43XX

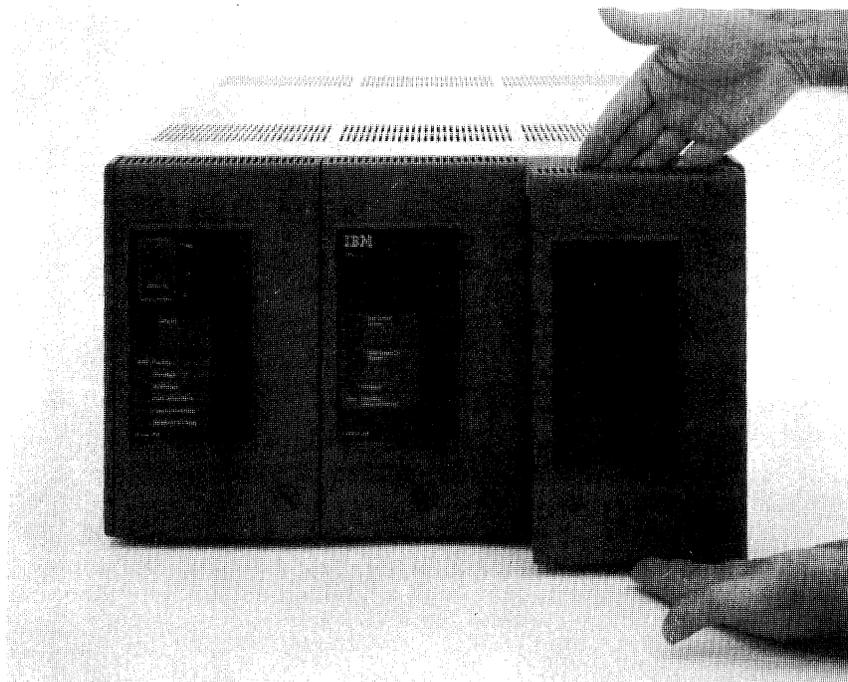
IBM's 3710 Network Controller is supported in the SNA network as a Physical Unit Type 2 cluster controller on point-to-point or multidropped SDLC links. The 3710 also supports an eight-port Communications Adapter that appears to an IBM SNA host as a 3274 control unit. In addition to the management of multiple protocols, the unit offers line concentration and multiplexing. In the SNA network, the 3710 attaches to a 37X5 communications controller. Devices attach to the 3710 through communications adapters that support RS-232-C, V.35, and X.21 interfaces.

MODELS: IBM 3710.

CONVERSION: Concentrates lines using start/stop, BSC, and SDLC protocols onto single or multiple SDLC or X.25 links. Supports full-screen IBM 3270 protocol conversion through an 8PCA communications adapter, which allows attachment of asynchronous ASCII devices communicating with an SNA/SDLC host.

TRANSMISSION: From 110 to 19.2K bps with RS-232-C communications adapter; from 110 to 64K bps with a V.35 or X.21 communications adapter.

COMPETITION: Netlink, Inc. 3703 Network Processor; NCR Comten 5620.



IBM's 3710 Network Controller consists of three basic modular machine elements: a power unit, control unit, and diskette unit. These units slide into the front of the 3710 frame. The back of the unit houses communications adapters and a service modem.

IBM 3710 Network Controller

or 308X host. Devices attached to the converter appear to the IBM host as 3270-type equipment. (For more detailed information on both the 7426 and 7171, refer to Report C23-491-101 in this tab.) The 3710 offers the ability to manage mixed protocols (start/stop, BSC, and SDLC) in the network, as well multiplex and concentrate lines from attached devices to a 37X5 communications controller. One of the chief advantages of the 3710 is its ability to off-load a variety of SNA network management functions from the communications controller, thus freeing that device for other tasks. The 3710's line concentration function also allows users to save port space on the controller.

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A 3710 configuration consists of a frame that houses three modular elements—a power unit, diskette unit, and control unit—that slide into the front of the enclosure, and up to 16

CHARACTERISTICS

VENDOR: International Business Machines Corporation, One Orchard Place, Armonk, NY 10504. Contact your local IBM representative.

DATE OF ANNOUNCEMENT: September 10, 1984.

DATE OF FIRST DELIVERY: Information not available.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: International Business Machines.

CONFIGURATION

The 3710 can be installed as a tabletop or rack-mounted unit. It is made up of modular hardware components called machine elements. A basic 3710 configuration consists of the following elements:

- A frame—houses the elements that make up the controller.
- One power unit—controls voltage used by the controller.
- One control unit—manages protocols and line interfaces.
- One diskette unit—reads information from and writes information to the controller's system diskette.
- One 5/4-inch system diskette unit—contains 3710 operational microcode, which has been recently enhanced to allow tracing of data on an upstream (host side) X.25 link, to provide network management data to flow to more than one host, and to allow the continuation of sessions with downstream (terminal side) non-SNA resources when resource ownership is taken over by a back-up host.
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IBM 3710 Network Controller

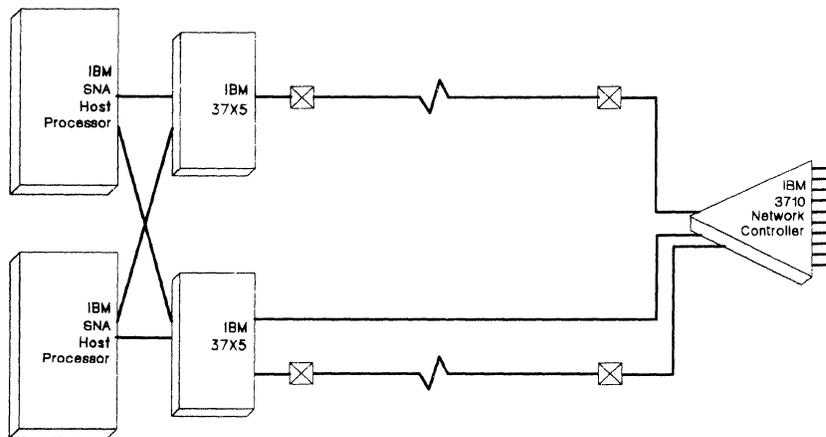


Figure 1. The 3710 supports multiple upstream attachments to communications controllers and hosts. It supports up to 30 lines to 37X5 controllers. These lines may be attached remotely, directly, or both.

communications adapters and one service modem that slide into the back of the unit. Three types of communications adapters provide the interface to devices connected to the 3710. An RS-232-C adapter handles one or two lines at speeds ranging from 110 to 19.2K bps; a V.35 or X.21 adapter handles one line at speeds up to 64K bps. The number of lines supported by the 3710 depends upon the type of adapter used in the configuration. A unit configured entirely with RS-232-C adapters will support 31 lines; units with either V.35 or X.21 adapters support up to 14 lines, and if the adapters are mixed, the unit can support up to 30 lines.

In the SNA network, the 3710 is supported as a Physical Unit Type 2 cluster controller sharing lines with other 3710s and SNA devices. The unit can be placed in various network configurations. When downstream of a host, the 3710 will concentrate lines in a point-to-point or multidrop network. In a multidrop network, multiple 3710s concentrate lines to an IBM communications controller, and the unit can also be cascaded in successive levels for greater line concentration. In addition, the 3710 supports multiple upstream attachments to more than one host, as well as satellite services on upstream and SDLC device links that use a modulo-128 transmission check and on lines to BSC 3270 and asynchronous start/stop devices.

The 3710 controller will operate with the following IBM software: Advanced Communications Function for the Virtual Telecommunications Access Method (ACF/VTAM) Version 2, Releases 1 and 2; ACF/Network Control Program (NCP) Version 3; Network Communications Control Facility (NCCF) Version 2, Release 1; Network Problem Determination Access (NPDA) Version 3, Release 1; and Non-SNA Interconnection (NSI) (BSC RJE support operating with the IBM 3725 and NCP Version 3). New software releases provided enhanced functional support. These include ACF/VTAM Version 3, required for a trace function that allows the 3710 to copy data and the control information it sends or receives; System Support Program (SSP) for ACF/NCP/VS Version 3, which provides a Configuration Control Program through which operators configure and redefine the 3710; NCCF Version

number of devices. An expansion unit, which slides into the top of the 3710, provides 128K bytes of additional storage. An eight-port communications adapter (8PCA) provides connection for eight asynchronous ASCII devices, including a mix of hosts or terminals. (For example, if one asynchronous host is attached to the 8PCA, seven ports are available for other devices.) The 3710 will support up to seven 8PCAs for a total connection of up to 56 downstream asynchronous lines. Each 8PCA appears to an SNA host as an IBM 3274 Control Unit, Model 51C or 61C. A 3710 with 8PCAs can be multidropped on an SNA/SDLC link with other controllers or attached to an X.25 network. The 8PCAs provide for attachment to up to five IBM SNA hosts.

A host-independent control terminal, which may be any start/stop device compatible with an IBM 3101, provides the interface between the 3710 and a network manager/operator. This terminal may be attached directly to the 3710 or remotely through the service modem or an external modem.

TRANSMISSION SPECIFICATIONS

The 3710 provides communications adapters for RS-232-C, V.35, or CCITT X.21 interfaces. The controller concentrates lines interfaced through these adapters into a single SNA/SDLC or X.25 upstream link to a 37X5 communications controller. (X.25 support is provided for the 3725 only.) These lines may be switched or leased, half or full duplex, and use asynchronous or synchronous protocols. The RS-232-C adapter supports speeds from 110 to 19.2K bps; the V.35 and X.21 adapters support speeds ranging from 110 to 64K bps.

The 3710 can be used in various network configurations. When the unit is placed downstream of the host, it will concentrate lines in a point-to-point or multipoint network. Multiple 3710s can be used in a multidrop network to concentrate lines to a communications controller. The 3710s also can be cascaded in successive levels for greater concentration. Additionally, the unit will support satellite services on upstream lines and SDLC device lines that use a modulo-128 transmission check and on lines to BSC 3270 and asynchronous start/stop devices. The 3710 supports multiple upstream attachments to more than one host and communications controller, each handling a different type of data. In this type of application, any device attached through a 3710 can communicate with any host; however, communication occurs with only one host at a time. In addition, only one host actually "owns" the 3710 itself, although another host can be designated a backup without any configuration changes.

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- ▷ 2, Release 2, which offers an interface to the 3710 from the host console, allowing a network operator to remotely control the unit; NPDA Version 3, Release 2, required to run problem determination information programs in the network; NCP Packet Switching Interface, Release 4.2 operating with ACF/NCP Version 4 in a 3725 communications controller for X.25 support; and NSI, Release 1.3 operating under ACF/NCP in the 3725 controller for remote job entry capability.

Network operators control, manage, and configure the 3710 through a console, which can be an IBM 3101 or compatible terminal. This terminal may be attached directly to the 3710 or remotely attached through the controller's service modem or a customer-supplied external modem. It is protected from unauthorized access by a password. When not used for control purposes, the 3101 may be used for other applications.

COMPETITIVE POSITION

IBM's announcement of the 3708 Network Conversion Unit and the 8PCA for the 3710 in September may have sounded the death knell for many protocol converter manufacturers without fairly strong market shares. Certainly, all of the major converter vendors are now in the position of having to react to IBM's offerings, and whether lowering prices on units, enhancing them to be more directly competitive with IBM's conversion products, and expanding product lines with new offerings will preserve the position of stronger competitors, such as Micom, Protocol Computers, and Datastream, is hard to predict.

IBM is in a unique position in this market because most conversion products are designed to allow customers to use inexpensive asynchronous terminals rather than 3270 equipment in an IBM network. If we assume that major customers of protocol conversion equipment already own a great deal of IBM products, we can also assume that these customers will be likely targets for sales of IBM conversion products. This poses a large threat to the existing competition, which gained market share before IBM went into the protocol conversion business.

ADVANTAGES AND RESTRICTIONS

The 3710 can concentrate data from up to 31 leased or switched lines onto a single line to a communications controller. Therefore, it reduces the number of lines and modems needed in a network, significantly cutting the costs for data communications equipment. The unit is designed for customer setup, and installation, operation, and maintenance of the 3710 do not require any additions to existing hosts, controllers, or other network devices. In fact, the only modification required is a change in the network definition to reflect the 3710's presence in systems operating under ACF/VTAM Version 2 and ACF/NCP Version 3.

Another advantage of the 3710 is its ability to manage multiple protocols. Typically, protocol converters handle

▷ DEVICE CONTROL

In the SNA network, the 3710 is supported as a Physical Unit Type 2 cluster controller sharing lines with IBM 3710s and other SNA devices. The primary functions of the 3710 are to concentrate and multiplex SDLC and selected BSC and asynchronous start/stop protocols over SNA/SDLC or X.25 links and manage a variety of data transmission protocols, allowing both SNA and non-SNA devices to communicate with an SNA host. An eight-port communications adapter allows the attachment of asynchronous ASCII devices that will emulate IBM 3270 displays and printers.

The 3710 manages line protocols in three modes: passthrough, protocol enveloping, and protocol conversion. In the passthrough mode, SDLC protocol is recognized and passed through the unit without any changes. In enveloping mode, the unit surrounds specific non-SNA protocols (asynchronous start/stop, BSC RJE, or BSC for multileaving) so that they appear to be SDLC. In conversion mode, the 3710 actually changes other non-SNA protocols to SDLC so that asynchronous ASCII and BSC 3270 devices appear to the host as IBM SNA 3270 devices.

IBM has designed the 3710 for customer installation. Operation of the unit requires ACF/VTAM (Advanced Communication Function for the Virtual Telecommunications Access Method), Version 2 or later, and the ACF/NCP (Advanced Communication Function for the Network Control Program), Version 3 or later. The unit operates with the IBM System/370, 30XX, and 43XX processors and 3705 or 3725 communications controllers. It supports a wide range of asynchronous ASCII start/stop devices; BSC RJE, BSC Multileaving Interface, and BSC 3270 devices; and IBM SDLC devices, including the Series 1, System/32/34/36/38, the 8100 DPCX and DPPX, and so forth.

Users can configure the 3710 either from the host using NCCF and the CCP function of the ACF Systems Support Program Version 3, or through a control terminal, which can be any 3101 or compatible terminal. Specific functions available through the terminal include running and verifying the completion of 3710 setup tests, loading microcode from the system diskette to the 3710's storage, copying the system diskette onto a backup diskette, copying new or changed 3710 configuration information from the system diskette onto a backup diskette, displaying information regarding the controller's machine elements and attached lines, defining networks to the 3710 and displaying or changing previously defined configurations on the system diskette, diagnosing and recovering from online and offline problems, changing line status, assigning new lines to a communications controller, and changing passwords.

The terminal may be attached directly to the 3710 or remotely attached through the controller's service modem or a customer-supplied external modem. It is also possible to attach one control terminal to multiple 3710s through asynchronous switched lines. When not being used for control purposes, the terminal may be used for other applications. A sign-on password prevents the use of the control terminal by unauthorized personnel.

The 3710 continuously monitors itself and its attached lines and devices, and when a problem is detected, the network operator is notified. The 3710 can be programmed to send to the control terminal a problem alert, which lists what failed, the probable cause, and how to correct the problem. The network operator can also use diagnostic tests to locate and diagnose problems on communications adapters, attached cables, or the service modem. Offline tests of the 3710 itself, individual machine elements, and cables can be run through the control terminal when the 3710 is disconnected from the network. Self-explanatory messages of the results of offline

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only one type of conversion at once, and users with a mixed-protocol network must purchase several different types of converters to handle specific jobs. With the 3710, this requirement is eliminated. Also, the 3710 can off-load a number of SNA Communications Network Management functions from the 37X5 communications controller, thus freeing that unit for other tasks. It is possible that users may be able to postpone the purchase of an additional controller when the 3710 is available to take up some of the network management load.

A 3710 fully equipped with seven 8PCAs allows a user to attach up to 56 asynchronous ASCII devices communicating with an SNA or asynchronous host. The price of a 3710 is \$20,300, and each 8PCA, supporting eight ports, is \$3,300. Therefore, a system equipped to handle 56 ASCII devices costs about \$43,400, minus cabling costs and any additional software. At first, this appears to be a lot of money to pay for protocol conversion, but the per-port charge for a 3710 supporting 56 ASCII devices is only \$775, which is well below the per-port costs of other protocol converters. Additionally, the 3710 equipped with 8PCAs provides attachment to up to five IBM host processors along with line concentration and multiplexing functions.

The IBM 3710 has some limitations. It depends on a 37X5 communications controller for connection to an upstream host system and cannot connect to downstream SNA PU Type 4 devices that are 37X5s. When compared with an NCR Comten 5620, the 3710 is limited in that it cannot run network control software and operates only as a node on an SNA network. The 5620 can do both. Also, the 3710 provides only 512K of memory (384K plus 128K optional) and does not support hard disk; the 5620, on the other hand, supports up to 2M bytes of memory and 10M bytes of hard disk.

Users intending to install a 3710 should carefully note the cabling requirements of the unit, as it is the customer's responsibility to purchase the correct cable, either from IBM or an outside vendor. Customers are also responsible for arranging the installation of common carrier equipment and determining the correct number of spares for the 3710.

USER REACTION

IBM did not supply us with a list of users for the product; therefore, we were unable to conduct a user reaction interview for the product. □

► tests are sent to the operator via the control terminal. In the event that users cannot resolve problems with the 3710, IBM provides a remote assistance through a switched telephone line attached to the service modem on the unit. Access to remote assistance is password-protected.

On the front of the 3710 are LEDs and power switches through which users can monitor general device status. Switches for turning power on and off, starting the control terminal, writing storage on diskette, and conducting a lamp test are available. LEDs monitor power, voltage, and the operational status of the control and diskette units.

SOFTWARE

IBM software operating with MVS or MVS/XA systems supports the 3710. The unit will operate with software announced before the 3710. This includes ACF/VTAM Version 2, Releases 1 and 2; ACF/NCP Version 3; NCCF Version 2, Release 1; NPDA Version 3, Release 1; Non-SNA Interconnection (BSC RJE support operating with the IBM 3725 and NCP Version 3). In this environment, a control terminal is necessary for configuring the 3710.

Under new releases of software, the IBM 3710 receives enhanced functional support. These programs include the following:

- ACF/VTAM Version 3 is required for the trace function, which enables the 3710 to copy the data and control information it sends or receives. ACF/VTAM collects trace data and formats it into records, which are then formatted and printed through a Trace Analysis Program (TAP).
- System Support Programs (SSP) for ACF/NCP/VS Version 3 provide a number of utilities and small programs, including Configuration Control Program (CCP) and TAP. SSP, required for the operation of ACF/NCP, operates with ACF/NCP in a 37X5 communications controller. CCP is an interactive program that guides operators through defining, displaying, and changing a 3710 configuration. Definitions can be stored for later use. CCP allows complete definition loads and nondisruptive updates, keeps track of all 3710 configurations defined in the network, copies configurations, defines up to five lines to communications controllers, and supports two levels of cascading.
- Network Communications Control Facility (NCCF) Version 2, Release 2, installed at the host, provides a network operator interface to the 3710 from the host console, as well as online diagnostic tests, a CCP interface and transport facility, and additional operator commands. This software permits an operator to control the 3710 remotely, without disrupting current operations.
- Network Problem Determination Application (NPDA) Version 3, Release 2, installed at the host, provides LPDA information and an automatic display of alerts. NPDA operates as an NCCF application to provide summary and detailed information for determining causes of network errors. LPDA is a set of error-determination tests run by IBM 386X modems. For testing IBM 386X modems and direct SDLC or BSC lines to devices, users need NPDA Version 3, Release 2. To run LPDA tests on one or more multidrop upstream lines, users need NPDA, Version 3, Release 2 or later, and ACF/NCP, Version 4 or later, in a 3725 communications controller. If NPDA is installed, the 3710's alerts are sent to NPDA and are also available for display at the control terminal. In a multidrop or cascaded network, all of the devices attached to the 3710, as well as the controller itself, must share the same NPDA.

For upstream (host side) X.25 support on leased and switched virtual circuits, the 3710 requires the X.25 NCP Packet Switching Interface, Release 4.2, operating with ACF/NCP, Version 4 in a 3725 communications controller. This X.25 interface allows SNA users to connect to public packet switched networks, such as Tymnet, Telenet, and Uninet.

Remote job entry, which allows jobs to be submitted for processing by non-SNA program products in a remote host, requires Non-SNA Interconnection (NSI), Release 1.3, operating under ACF/NCP in the 3725 communications controller. NSI allows non-SNA BSC RJE data to be transported on an SNA network and provides terminal functions for devices that use BSC RJE.

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PRICING

The 3710 is available under Plan D for purchase or 30-day rental. IBM allows up to 65 percent of the first six months rental charges to be accrued towards the purchase of the product. All external cables for the 3710 and the 8PCA must be ordered separately, either from IBM or another vendor. All cables must be shielded. Users may order spare machine elements and other accessories for the 3710. For specific

information regarding such purchases, users should contact their local IBM representative.

IBM provides several types of maintenance options, including IBM On-Site Exchange (IOE), Customer On-Site Exchange (COE), and Customer Carry-in Exchange or Repair (CCE/CCR). In the table below, we have listed 3710 purchase and rental prices and annual maintenance charges for IOE, COE, and CCE/CCR maintenance plans.

EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Rental (\$)	Annual Maintenance (IOE) (\$)	Annual Maintenance (COE) (\$)	Annual Maint. (CCE/CCR) (\$)
#001	IBM 3710 Network Controller	20,300	110	1,160	802	753
#7001	V.24 Communication Adapter	2,000	113	160	138	135
#7005	V.35 Communication Adapter	2,000	114	166	141	138
#7010	X.21 Communication Adapter	2,200	130	234	205	191
#7020	128K Storage Expansion	1,500	78	30	25	23
#7015	Eight-port Communication Adapter for asynchronous ASCII devices	3,300	189	289	247	240

			Initial Charge* (\$)	Monthly License* (\$)	Monthly Service Charge* (\$)
5665-289	Software for MVS/XA environment	6,255/4,695	2,085/1,565		302/483
5665-313	Software for MVS/370 environment	5,130/3,840	1,710/1,280		275/440
5668-854	ACF/NCP 4.0 for 3725 communications controller	2,085/1,875	695/625		148/237
5668-947	NCCF Version 2, Release 2.2 for MVS/370 and MVS/XA in 24-bit Addressing Mode	2,250/2,010	375/335		55/88
5665-316	NCCF Version 2, Release 2 (2.2) for MVS/XA in 31-bit Addressing Mode	2,730/2,460	455/410		66/106
5668-920	NPDA Version 3, Release 2 (3.2) for MVS/370 and MVS/XA in 24-bit Addressing Mode	1,650/1,237	264/198		22/35
5665-321	NPDA Version 3, Release 2 (3.2) for MVS/XA in 31-bit Addressing Mode	1,920/1,440	320/240		28/45
5668-981	NCP Packet Switching Interface (NPSI) 4.2	770/577	269/202		40/64
5665-338	ACF/SSP Version 3 (3.0) for IBM 3705 and 3725 communications controllers	1,605/1,200	535/400		71/114

*The first figure shown in the pricing column is the charge for a primary system; the second figure is for a distributed system (DSLO). ■