

IBM 3725 Communication Controller

Product Enhancement

Part of IBM's major telecommunications product announcements on May 20, 1986 concerned enhancements to the 3725 Communication Controller. These included the following:

- An increase in main storage capacity from 2M bytes to 3M bytes in 256K-byte increments. Programming support for the 3M-byte capability will be available under ACF/NCP, Version 4, Release 1 and ACF/SSP, Version 3, Release 1 software. Other NCP products will be compatible with this capability.
- Support for LPDA-2 commands that allow extended line problem determination and modem configuration changes on IBM 586X modems. Programming support for LPDA-2 will be available with ACF/NCP, Version 4, Release 2 and ACF/SSP, Version 3, Release 2 software.
- Ability to provide additional lines to 3725 scanners through the reduction of line interface coupler (LIC) weights. High-speed communications lines attached to an LIC 2, 3, and 4B supporting BSC ASCII or SDLC DX at a data rate ranging between 32K and 64K bps now have a weight of 25, reduced from a weight of 42. Weights on communication lines attached to an LIC supporting SDLC at data rates up to 128K bps have been reduced from 100 to 50. The LIC weight reduction for 14.4K bps communications lines supporting BSC ASCII or SDLC now have an LIC weight of 37 and 42, respectively, down from a weight of 50. (The former LIC weights are still available, however.)
- Remote-console access to 3725 maintenance and operator subsystem (MOSS) over a switched line through the IBM Information Network. This feature allows an IBM Personal Computer to operate as a remote 3725 MOSS console through the public switched network.

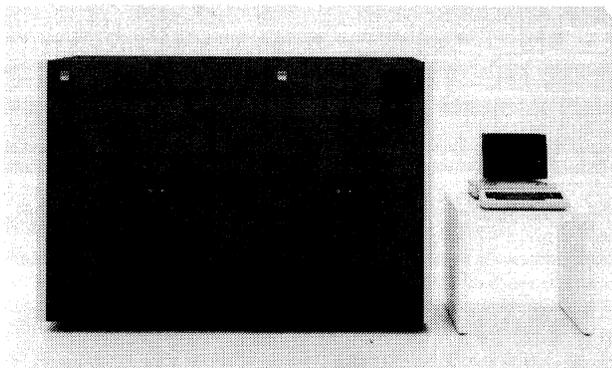
In an earlier announcement (April 16), IBM unveiled a 3725 attachment to the IBM Token-Ring Network. This includes a LAB Type C attachment base consisting of a Token-Ring multiplexer, a physical base for up to four Token-Ring couplers, a communication scanner, and a physical base for up to 16 line attachments. A Token-Ring Interface Coupler (TIC) with a microprocessor operating under control of resident microcode provides 3725 attachment to one network. Each TIC transmits and receives at 4M bps, and under control of ACF/NCP, provides logical link control functions that conform to IEEE 802.2 standards.

In addition to the enhancements outlined above, IBM also introduced several software programming upgrades and additions. The X.25 Network Control Program Packet Switching Interface (NPSI), Release 4.3 allows attachment of the 3725, as well as the new 3720 controller, to X.25 networking services. This package supports data transmission from 1200 to 64K bps. It requires either ACF/NCP, Version 4, Release 2 or ACF/NCP, Version 4 Subset (MVS or VM) software, and ACF/System Support Program ACF/SSP, Version 3, Release 2.

An enhanced Version 3 of Release 1.1, Advanced Communications Function/VTAM allows the IBM VM operating system to have the same SNA communication capabilities as MVS. Changes in the ACF/Network Control Program (ACF/NCP), Version 4, Release 2 allow it to work with the 3725 controller.

The 3725 performance enhancements, available in July 1986, will be installed at no charge, with the exception of the 3M-byte storage upgrade, available in October 1986, which costs \$2,700. Token-Ring Attachment prices are as follows: purchase price of LAB Type C is \$23,760, and the monthly rental charge is \$1,275; the TIC 1 sells for \$3,000, and its monthly rental charge is \$161. The Attachment will be available in January 1987. The initial basic license fee for the X.25 NPSI, Release 4.3—scheduled for December 1986 delivery for MVS and March 1987 delivery for VM/SP—is \$770; the DSLO initial fee is \$557. The monthly basic license fee is \$269, while the monthly DSLO fee is \$202. □

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The IBM 3725 Communication Controller, shown here with the 3726 Expansion and a 3727 Operator Console, supports up to 8 hosts, 256 lines, and 1024K bytes of storage.

MANAGEMENT SUMMARY

The IBM 3725 Communication Controller was first introduced in March 1983 after a year of speculation that it would be replacing the IBM 3705. Although the 3725 does replace the 3705-II at the high end of the IBM communication controllers, it does not yet obsolete the 3705, which still offers some models. In April of last year, IBM announced that Models A, B, C, and D of the 3705-I would no longer be available. In keeping with IBM's commitments to its customer base, the 3725 is fully compatible with its predecessors. It can be intermixed with the 3705-II and 3705-80 in the same single-domain or multi-domain network.

After the introduction of the 3725 in March 1983, enhancements to the system were offered in November of that year. The new features for the 3725 included the following: new releases of ACF/NCP (Version 3 for the IBM 3725), EP (Release 2 for the IBM 3725), and ACF/SSP (Version 2 Release 2) with the new versions supporting all the features of their predecessors, as well as an upgrade largely to support SNA Network Interconnection; a doubling of the maximum main memory size for the 3725 Model 1 to 2M bytes; support for data rates up to 256K bps through the V.35 attachment; a port-swapping feature that allows the operator to reassign a line from a malfunctioning 3725 port to another port through the 3727 console without involving the host; a line description file containing the symbolic name, physical address, protocol, and speed of each attached communications line as configured by the user; and a new flexibility in the arrangement of LICs and ICCs inside the 3725 cabinet.

IBM also doubled the main memory and provided new software for the system. IBM expanded the 3725's maximum storage mainly to accommodate two new features of its Systems Network Architecture (SNA): SNA Network Interconnection, and the Modulo 128 feature of SDLC, SNA's link protocol. SNA Network Interconnection adds network-to-network communications, a new level of scale

The 3725 is IBM's top-of-the-line communications processor, and by definition the pacesetter for the IBM plug-compatible market. A modular, programmable controller, it comes in two models. Model 1 supports up to 8 host computers, 256 communications lines, and 2M bytes of main storage. Model 2 supports up to 4 hosts, 80 communications lines, and 2048K bytes of storage.

FUNCTION: Front-end or remote full-service communications processor.

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA; pre-SNA IBM communications optional.

OPERATING SOFTWARE: ACF/NCP Version 2 or 3 for the 3725; EP Release 1 or 2 for the 3725.

COMPETITION: NCR Comten 3790; Amdahl 4705 Model E; CCI CC80 and CC85.

PRICE: A 3725 Model 1 configured with 1M bytes of storage, one channel attachment, one Line Attachment Base (Type A), eight Line Interface Couplers (Type 1), and an operator's console costs \$149,990.

CHARACTERISTICS

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

DATE OF ANNOUNCEMENT: March 1983.

DATE OF FIRST DELIVERY: Fourth quarter, 1983.

SERVICED BY: International Business Machines Corporation.

CONFIGURATION

The 3725 Model 1 base frame accommodates up to 96 lines. With the 3726 Communication Controller Expansion, which is offered only with Model 1, an additional 160 lines can be attached for a total of 256 lines, full-duplex or half-duplex. The 3725 Model 2 accommodates up to 80 full-duplex or half-duplex lines.

The number of operable lines, however, may be fewer than the number physically attachable. The maximum number of lines that operate concurrently depends on line speed, line protocols, message length, control program, and application work load.

The 3725 base machine (for Model 1 or 2) contains:

- Central Control Unit (CCU) that executes instructions to control the communication scanners and channel adapters. It runs under ACF/NCP V2, V3, or V4, EP/3725, or both in PEP mode.

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TABLE 1. LINE ATTACHMENT BASE CAPABILITIES

Line Attachment Base Type	Configuration	No. of Scanners	Type of Line Interface Coupler	Max. No. of LICs per 3725
Type A	Optional, 3725 or 3726	1	1 or 4A	8
Type B	Optional, 3725 or 3726	2	1, 2, 3, 4A, or 4B	8
CLAB	Standard, 3725 only	1	1 or 4A	8

➤ for the architecture. The Modulo 128 SDLC feature allows up to 127 SDLC frames to be transmitted before an acknowledgement is required from the receiving node. The previous maximum was seven unacknowledged frames. Before the 1983 announcement, IBM provided no facility for a system or terminal on one network to communicate with a system or terminal residing on another network. With the 1983 announcements, two networks could be connected through a gateway node, an IBM host with attached 3705 or 3725 and running the appropriate software. Each network maintains its own address structures, security provisions, and local classes of service; the gateway node provides translation for internetwork sessions.

In November 1984, IBM announced yet more enhancements to the 3725, Models 1 and 2. The new features included the following:

- High speed adapter RPQs for the Model 1 that support line speeds from 512K bps to 1.544M bps;
- New Internal Clock feature for both the Model 1 and the Model 2 that supports internally clocked asynchronous terminals for operation with or without communications equipment at speeds ranging from 75 bps to 19,200 bps, and direct attachment of synchronous devices at 245,760 bps;
- Supports externally clocked asynchronous terminals at speeds up to 19,200 bps;
- Line attachment features placed in the 3725 Model 1 and 3726 Communication Controller Expansion can be specified at the time of manufacture; and
- The LIC weight of half-duplex lines operating at speeds above 9600 bps on LIC Type 1 was reduced.

New features announced for the IBM 3725 Model 2 exclusively included:

- A Channel and Line Attachment Base (CLAB) with a microprocessor-based communication scanner and a physical base for up to 24 additional line attachments, up to two additional channel adapters, and one internal clock feature;

- Main storage of 512K bytes, expandable in both models by four additional 256K increments. Main storage houses a 3725 Network Control Program (i.e., NCP, EP, or PEP) and other programs loaded from the host, and provides buffers for data exchanged with the channel adapters and lines.
- Maintenance and Operator Subsystem (MOSS), which provides IPL and utility procedures for the 3725 operator. An independent processor with microcode, a diskette drive, and an attachment for an IBM 3727 operator console are included. The MOSS, with the attached 3727 console, offers network management functions, error logging, machine status display, CCU services, scanner services, line services, and diagnostics.
- Transmission SubSystem (TSS), which physically connects the 3725 to communication facilities. It consists of Line Attachment Bases (LABs) with microprocessor-based scanners, Line Interface Couplers (LICs), and Internal Clock Controls (ICCs). The communication scanners serialize and deserialize the characters, support various line protocols, and offer character buffering and cycle-steal transfer in the main storage of the 3725. Integrated modems are not available for the 3725 or 3726.

In Model 1, two Type C LABs are standard; a third LAB (Type A or B) can be added optionally. Each CLAB has one communications scanner and can attach up to 32 full- or half-duplex communication lines by means of optional (separately priced) LICs. The ICCs are also optional for Model 1.

For further expansion, the 3726 Communication Controller Expansion can be added. The 3726 Expansion supports up to an additional 160 communications lines. The 3726 attaches only to a 3725 Model 1 and is not supported by the 3725 Model 2.

Model 2 includes one Type CLAB as standard, which can support up to 80 full- or half-duplex lines. Two additional LABs may be added. Model 2 also includes one ICC as standard, but can support two more ICC features. Model 2 is field-upgradable to a Model 1.

Channel adapters, providing physical attachment to host channels, are optional for both models. For Model 1, an optional Two-Processor Switch (TPS) is available that allows a channel adapter to connect two processor channels for nonsimultaneous communication. A basic Model 1 has a physical base for two channel adapters and two TPSs, enabling a total of four hosts to be attached, and two to operate concurrently.

With the optional 3726 Communication Controller Expansion, an additional four Channel Adapters (CAs) without

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TABLE 2. COMMUNICATIONS SUPPORTED BY 3725 LINE INTERFACE COUPLERS

Line Interface Coupler (LIC)	Number of Lines per LIC	Type of Interfaces Supported	Transmission Speeds and Modes Supported
LIC1	4	RS-232-C/V.24, RS-366/V.25 (auto-call), X.21 bis, X.20 bis	Synchronous (SDLC or BSC) transmission at 2400, 4800, 9600, or 19.2K bps via external modem or direct connection; asynchronous (start/stop) transmission at up to 1200 bps via direct connections.
LIC2	1	Wideband type for 8751, 8801, or 8803 service	Synchronous BSC transmission at up to 64K bps; synchronous (SDLC) transmission at up to 230.4K bps.
LIC3	1	CCITT V.35	Synchronous (SDLC or BSC) transmission at up to 256K bps via V.35 modem; synchronous transmission at up to 56K bps via direct connection.
LIC4A	4	CCITT X.21	For connection to switched or nonswitched packet networks. Synchronous (SDLC only) transmission at 2400, 4800, or 9600 via external modem or direct connection.
LIC4B	1	CCITT X.21	For switched packet networks, synchronous transmission via external modem at up to 48K bps; for nonswitched packet networks, synchronous transmission via external modem at up to 64K bps; for direct connection, synchronous transmission at up to 56K bps. SDLC only. (Not available in the USA)

- ▶ • One Line Attachment Base (LAB) Type A or B with one or two microprocessor-based communication scanners and a physical base for up to 32 additional line attachments and one internal clock control;
- Up to 14 additional line interface couplers (LICs) to install in the optional CLAB or LAB;
- Up to two internal clock controls (ICC-2s) to install in the optional CLAB or LAB; and
- Up to six storage increments of 256K bytes to provide up to two megabytes of main storage.

The enhancements are expected to be available in the third quarter of this year. Machines already installed and maintained by IBM will have engineering changes done to them, in the third quarter of this year, in order to support the new enhancements.

The 3725 controls data communications between terminals and one or more System/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 host processors or between two or more host processors. Terminal devices can be attached to the 3725 directly or through modems; host processors can be attached locally or remotely. Remote connection may be established by common carrier or customer-owned communication facilities.

The two 3725 models serve large or small networks. Model 1, which accommodates the 3726 Communication Controller Expansion unit, supports a maximum of eight hosts, 256 lines, and 2048K bytes of storage. Model 2 supports up to four hosts, 80 lines, and 2048K bytes of storage.

The Central Control Unit (CCU) performs the control program which is kept in main storage. This unit regulates ▶

- ▶ • Two-Processor Switches, or two CAs each with TPSs, can be added. Thus a total of eight hosts can be attached, six operating concurrently. If channel-attached, the 3725 requires a control unit position on the system channel.

A basic Model 2 provides a physical base for four channel adapters and no TPS. Model 2 attaches to a maximum of four hosts.

The 3725 can be used as a remote communication controller, without channel connection to a host processor. In this configuration, called "link-attached," the 3725 is connected by one or more communication links to channel-attached 3705s or 3725s. The controller can perform the same networking functions whether link-attached or channel-attached.

The 3725, Model 1 or 2, requires a primary 3727 Operator Console for installation, operation, and maintenance. A second 3727 may be used as an alternate. Only one console is active at a time. The active console is selected by a switch on the 3725 control panel. The console can be located a maximum distance of 25 feet (7.5 meters) from the 3725, and there should not be a wall or door between the console and attached 3725. With the addition of a 7427 Console Switching Unit, up to four 3725s can share a single primary operator console. An alternate console can also be configured and switched among any six controllers.

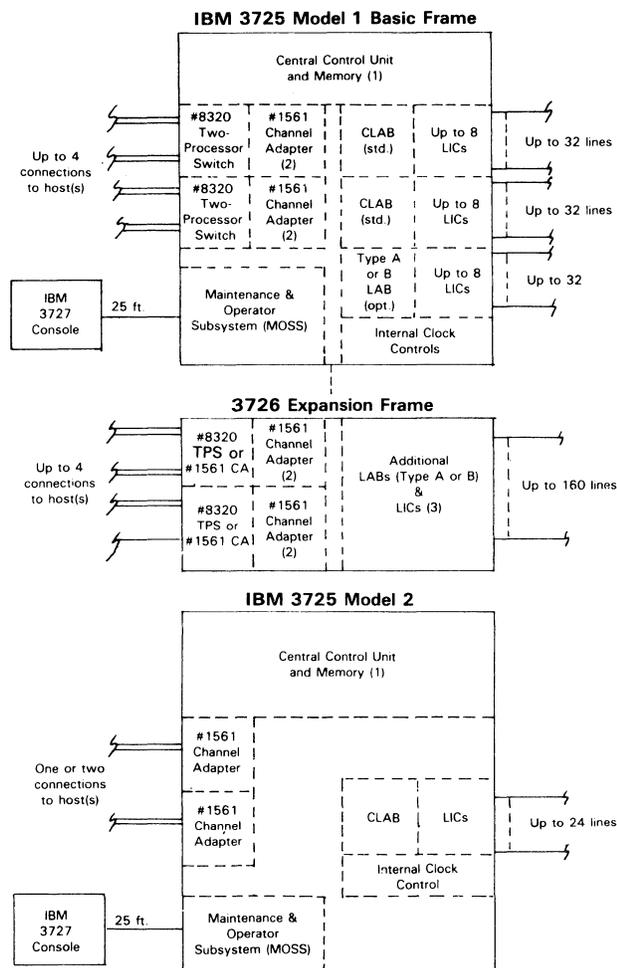
The configuration diagram on Page 104 of this report shows the relationships among the 3725 components and depicts the 3726 expansion capabilities.

CONNECTION TO HOST COMPUTER: The same type of channel adapter (1561) attaches either the 3725 Model 1 or Model 2 to a host channel of an IBM S/370 (except models 115 and 125), 303X, 308X, 4331, or 4341 processors. A channel adapter provides the logical and physical interface between the communication controller and host processor. It attaches to a byte multiplexer, block multiplexer, or selector channel. The 3725 Model 1 supports physical attachment of up to eight host channels; Model 2 supports up to four.

In Model 1 only, each Channel Adapter (CA) may be equipped with a Two-Processor Switch (TPS), which allows ▶

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CONFIGURATION



Notes:

(1) Memory capacity is 512K bytes. On 3725 Model 1 only, memory capacity may be expanded in 256K-byte increments to a maximum of 2M bytes.

(2) 3725 Model 1 supports up to two Channel Adapters and two Two-Processor Switches; four additional Channel Adapters, or two Channel Adapters and two Two-Processor Switches, may be added via the 3726 Expansion. Thus, the maximum number of channels physically attachable is eight, and the maximum number of channels concurrently active is six.

3725 Model 2 supports one or two Channel Adapters; no support is provided for the Two-Channel Switch.

(3) 3725 Model 1 provides two Type C Line Attachment Bases (CLABs) as standard components, and supports one additional LAB (Type A or B) as an option; up to five additional Type A or B LABs can be added via the 3726 Expansion. 3725 Model 2 provides one CLAB as a standard component, and is not expandable.

On the 3725 Model 1, all LABs are optional; each LAB supports up to 32 communications lines via single- and multiline Line Interface Couplers (LICs), for a maximum line capacity of 256 lines. The Line Increase Feature (#3602) is required to support more than six LABs and is contained in the 3726 Expansion frame. On the 3725 Model 2, the LAB supports a maximum of 24 lines, via single- and multiline LICs.

▶ the channel adapters, the communication scanner, and any data that is transferred between them. The main storage, besides housing the control program, provides the data space for the attached telecommunications lines. The telecommunications lines are connected via cables to line interface couplers (LICs) in the 3725.

Software for the 3725 includes the Advanced Communications Function for Network Control Program (ACF/NCP) and the Emulation Program (EP/3725), which are designed only for the 3725 and cannot run on the 3705. Users must install ACF/System Support Programs (ACF/SSP), Version 2 or 3, on the host to generate the ACF/NCP, which must be downloaded to the 3725. ACF/SSP has a configuration control program that provides support for IBM's new 3710 Network Controller. ACF/NCP for the 3725 can communicate with ACF/NCP for the IBM 3705. EP/3725 allows coexistence of 270X, 370X, and 3725 communications processors in a common host environment.

COMPETITIVE POSITION

In terms of the marketplace, we see the 3725 as a system designed to address the 3705's current competitors, and not as a revolutionary breakthrough in communications processing. The IBM 3725 competitors include the Amdahl ▶

▶ the CA to be connected to two processor channels instead of only one. The channels may belong to the same or different processors. Data cannot be transmitted simultaneously on more than one channel. Manual switches on the 3725 control panel allow a user to enable each of the active channel interfaces. If all interfaces are enabled, the processors are responsible for resolving any contention, because only one interface can transfer data at a time.

The channel adapters must occupy contiguous positions beginning with Position 1. CA Positions 1 and 2 are in the 3725 basic frame; CA Positions 3 through 6 are in the 3726 Expansion frame. Both CAs must therefore be installed in the 3725 before one may be installed in the 3726. When TPS is installed, it is placed in the first available position. The same channel attachment cable groups (3290 and 1178) serve Model 1 or 2.

TRANSMISSION SPECIFICATIONS

Three types of Line Attachment Bases (LABs) are available—LAB Type A, LAB Type B, and CLAB. In the 3725 Model 1, the base machine includes two CLABs as standard components; each has one communication scanner. One additional LAB, Type A or B, may be installed. Type A provides one scanner; Type B provides two. If further expansion is needed, up to five additional LABs (Type A or B) may be installed in the 3726 Expansion.

▶ The 3725 Model 2 supports one CLAB, which is a standard component, but two additional LABs may be added. ▶

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▷ 4705 and NCR Comten 3690. The IBM 3725 Model 1 outdoes the Amdahl 4705 Model E in number of hosts attachable (eight versus six), number of hosts supported concurrently (six versus four), number of full-duplex lines attachable (256 versus 176), and maximum main memory capacity (2M bytes versus 1M bytes). The Amdahl 4705 takes less floor space than the IBM 3725, even though the 3725 is not as bulky as the 3705. The 3725 is exceeded by the NCR Comten 3690 Models A5 to E5 in number of lines attachable (512 half- or full-duplex), number of hosts supported concurrently (eight) and maximum main memory (4M bytes). The Comten 3690 also supports disk-based mass storage, a capability not offered with the 3725.

ADVANTAGES AND RESTRICTIONS

A chief advantage of the 3725 is its simplified machine structure that can handle larger networks and provide more main storage than the 3705 models. The 3725 involves only one scanner type, one channel adapter type, and five line interface coupler types. The simplified design includes features that serve multiple uses, and facilitate configuration upgrades without changing already-installed machine features. For example, a single type of line attachment supports SDLC or BSC protocols at line speeds up to 19.2K bps plus asynchronous protocols at speeds up to 1200 bps.

An added advantage of the structure is that it requires up to 50 percent less floor space, and less power, than the 3705-II, depending on configuration.

The 3725 supports throughput equal to 1.8 to 1.9 times that of a 3705-II equipped with a Scanner Type 3, or 3.2 to 3.5 times that of a 3705-II with a Scanner Type 2.

Another advantage of the 3725 is its improved network management facility. A functionally separate Maintenance and Operator Subsystem (MOSS) that uses an integral diskette drive, an attached IBM 3727 Operator Console, and software functions built into the 3725 versions of ACF/NCP and EP facilitates operation, maintenance, and problem determination. Two mechanisms, called Alert and Alarm, are used to aid in problem determination. For instance, MOSS displays alert messages when a problem occurs in the 3725 that affects normal operations and might require operator action. The alert messages identify the cause of the error, give additional information on the resources affected by the error, and suggest possible actions to be taken by the operator. The Alarm gives an automatic first level of problem determination, informs the operator console of failure, and provides an entry point into the maintenance documentation so as to follow through and solve the problem. Sixteen levels of alarm, that correspond to the sixteen levels of alert, are available. □

▶ The microprocessor-based scanner serializes and deserializes the characters, supports various line protocols, and provides character buffering and cycle steal transfer into the 3725 main storage. The scanner microcode is loaded from the MOSS diskette. Any scanner can support intermix protocols, asynchronous or synchronous communications, and half- or full-duplex transmission. BSC (EBCDIC or ASCII) and SDLC protocols are supported in normal mode,

an operating mode similar to that of the 3705 Scanner Type 3. Asynchronous protocols with five to eight data bits and one or two stop bits are supported in character mode, similar to that of the 3705 Scanner Type 2. In character mode, BSC is also supported. Character mode is required for tributary addressing under EP or PEP. The scanner, in addition, supports procedures for automatic calling units and X.21 native, X.21 bis, X.20 bis, and X.25 protocols. The number of lines handled by the scanner depends on protocol and transmission speed.

Table 1 lists the line attachment base capabilities.

Line Interface Couplers (LICs) attach the communications facilities and terminals to the 3725. Five types of LICs are offered. The decision of which one to use depends on the physical interface required, the transmission speed to be supported, and number of lines to be connected. An LIC can attach from one to four full-duplex or half-duplex lines. Up to eight LICs can be installed per LAB, allowing up to 32 lines per LAB.

Terminals can be attached to the 3725 either directly or via modems. Direct (modemless) attachment of terminals can be accomplished with LIC-1, LIC-3, LIC-4A, or LIC-4B and the corresponding direct attachment cable.

Table 2 shows the modem attachment and direct connection capabilities of the LICs.

The ICC provides bit clocking when the attached external modem does not provide the clocking, as well as when direct attachment of the data terminal equipment is required. The ICC provides clocking for eight LICs (up to 32 lines) at 50, 110, 134.5, 200, 300, 600, and 1200 bps for synchronous operation with or without a modem. For asynchronous operation, the same speeds are used plus 75, 100, 2400, 4800, 9600, and 19.2K bps. For direct attachment only (without a modem), the ICC provides clocking for eight LICs at speeds of 2400, 4800, 9600, 19.2K, and 56K bps in synchronous operation. Asynchronous operation is at 2400, 4800, 9600, and 19.2K bps.

Speeds up to 1200 bps are set at the time of control program generation and must match the speed of the terminal's internal clock. For speeds above 1200 bps, the terminal uses external clocking provided by the 3725; the speed is preset at 9600 bps at the factory but can be changed at installation to 2400, 4800, 19.2K, or 56K bps.

SOFTWARE

ADVANCED COMMUNICATIONS FUNCTION FOR NETWORK CONTROL PROGRAM (ACF/NCP) VERSION 2, 3, OR 4 FOR THE IBM 3725: ACF/NCP for the 3725 is the basic operating system for either 3725 model, whether channel-attached or connected via communications link. ACF/NCP for the 3725 is supported by hosts operating under OS/VS1, OS/VS2 MVS, and DOS/VSE, and is designed to support the enhanced operating features of the 3725, including its problem determination, error recording, and system generation capabilities, storage for up to 2M bytes, and support for continued operation and controlled shutdown in failure situations. ACF/NCP for the 3725 also supports Release 4 of the X.25 NCP Packet-Switching Interface licensed program.

ACF/NCP for the 3725 supports and communicates with the following host-resident programs: ACF/SSP Version 2 and 3, ACF/TCAM Version 2 Release 4, ACF/VTAM Version 1 Release 3 (MVS only, with appropriate PTF), ACF/VTAM Version 2 (MVS, VS1, and VSE), EREP 1.5 (MVS/VS1, VSE/VM), and NPA-Host FDP Number 5798-CZR, NPDA Version 2, NCCF Version 2, and NLDM Release 2.

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► ACF/NCP for the 3725 also supports and communicates with these controller-resident programs: ACF/NCP for the IBM 3725, EP for the IBM 3725, PEP, NTO Release 2 for the IBM 3725, X.25 NPSI Release 4, and ACF/NCP for the IBM 3705.

ACF/NCP Version 3 for the 3725 supports all the features of Version 2, and additionally supports SNA Network Interconnection (network-to-network SNA sessions), and Modulo 128 SDLC (128 frames before acknowledgement). ACF/NCP Version 3 is supported only on controllers attached to hosts running MVS/370 or MVS/XA.

ACF/NCP Version 3 will support the VHSA RPQs (8J5080, 8J5081, 8J5082) and the IBM 3725 Model 2 storage expansion up to two megabytes after upgrading the existing machines.

EMULATION PROGRAM FOR THE IBM 3725 (EP/3725): EP/3725 supports 3725 operation in 270X Emulation Mode. EP/3725 provides the same problem determination aids, error recording functions, and other features as ACF/NCP on the 3725. It provides support for up to six channel adapters, and can run concurrently with ACF/NCP Version 2 in PEP operation mode. EP/3725 Release 2 supports the new 256K BSC data rate, and is necessary for PEP operations alongside ACF/NCP Version 3. It incorporates the S.W.I.F.T. PRPQ (5799-AQT), which assists users of EP or PEP to link directly to the network of the Society for Worldwide Interbank Financial Telecommunications.

EP/3725 is designed for users of VSE/AF Release 3, OS/VS1 Release 7, VM/SP 2.1, MVS/370, and MVS/XA. EP/3725 supports the following access methods: BTAM, BTAM-ES, BTAM-SP, ACF/TCAM, and RTAM.

ACF/NCP for the 3725 and EP/3725 are generated using the ACF/System Support Programs (ACF/SSP) Version 2 Release 1.1 or 2 licensed program (5735-XXA), which was announced with the 3725. Designed to operate only in the IBM 3725, neither will operate in the IBM 3704 or 3705. Coexistence of 270X, 370X, and 3725 in a common host environment, however, is supported.

ACF/SYSTEM SUPPORT PROGRAMS (ACF/SSP) VERSION 2 AND 3: ACF/SSP provides system generation and utility functions for users of ACF/NCP for the 3705, ACF/NCP for the IBM 3725, and EP on the IBM 3705 and EP/3725. ACF/SSP Version 2 Release 1.1 or 2 requires at least one locally attached IBM 3705-II or 3705-80 meeting the storage requirements of ACF/NCP or EP for the 3705 or one locally attached 3725 meeting the storage requirements of ACF/NCP or EP/3725 for the 3725. It is supported under

VSE/AF Release 3, OS/VS1 Release 7, MVS/370, and MVS/XA with the appropriate VTAM or TCAM release.

ACF/SSP Version 3 and ACF/NCP Version 3 or ACF/NCP Version 4 and/or EP/3725 Release 2 are required to support the additional start/stop data rates provided by Internal Clock Control 2. Existing machines need to be upgraded in order to support this capability. ACF/NCP Version 4 or ACF/NCP Version 3 with appropriate PTFs and/or EP/3725 Release 2 with appropriate PTFs is needed to support more than two channel adapters in the IBM 3725 Model 2.

ACF/SSP Version 2 Release 2 supports all the features of Version 2 Release 1.1, along with SNA Network Interconnection and Modulo 128 SDLC. ACF/SSP Version 2 Release 2 is necessary only to support ACF/NCP Version 3. This version may run only on hosts running MVS/370 and MVS/XA.

X.25 NCP PACKET SWITCHING INTERFACE PROGRAM: X.25 NPSI provides users of ACF/NCP/VS with the facility to use the 3725 Communication Controller to access public data networks complying with CCITT X.25 standards. The package is Telenet-certified. This program supports packet sequence numbering of up to 128, with a packet length section of up to 4,096 characters. It supports SNA network node interconnection and protocol conversion for non-SNA equipment. Within the program is a subset of X.29 allowing communications with asynchronous X.28 devices (TTY). It also supports the X.21 LICs.

NETWORK TERMINAL OPTION (NTO): NTO is a software product which is loaded in the 3725 and extends the SNA environment to include support for several common asynchronous terminals. These include the IBM 2740 and 2741 terminals on either switched or leased lines, and Teletype models 33/35 on switched lines only.

PRICING

All 3725 components can be acquired by purchase or month-to-month rental. The 3725 is offered under Plan D of IBM's Lease and Rental Agreement (LRA). This plan calls for an initial period of three months, during which IBM provides maintenance service 24 hours per day, 7 days per week at no additional charge. After the initial period, maintenance service is available for an Annual Maintenance charge, which specifies a maximum number of hours of service per month. If the maximum is exceeded, an Additional Monthly Maintenance Charge Rate (AMMCR) is applied.

Purchase credit for rental payments made under LRA can be accrued up to a maximum of 65 percent of the total purchase price.

EQUIPMENT PRICES

	Monthly Rental (\$)	Purchase (\$)	Annual Maint. (\$)	AMMCR (\$)
3725 Communication Controller				
Model 1 (512K bytes, up to 96 lines)	3,260	75,000	2,556	213
Model 2 (512K bytes, up to 24 lines)	2,630	60,500	2,280	190
3726 Communication Controller Expansion (up to 160 lines; attaches to Model 1 only)	1,390	32,000	480	40
#1561 Channel Adapter	295	6,750	96	8
#4666 Internal Clock Control	65	1,500	24	2

IBM 3725 Communication Controller

		Monthly Rental (\$)	Purchase (\$)	Annual Maint. (\$)	AMMCR (\$)
#4667	Internal Clock Control-2 Line Attachment Bases—	69	1,500	24	2
#4771	Type A	825	19,000	192	16
#4772	Type B	1,150	26,400	324	27
#4773	CLAB	929	16,000	300	25
	Line Interface Couplers—				
#4911	Type 1	115	2,600	24	2
#4921	Type 2	130	3,000	24	2
#4931	Type 3	130	3,000	24	2
#4941	Type 4A	115	2,600	24	2
#4942	Type 4B	130	3,000	24	2
#7100	Storage Increment (256K bytes)	190	4,375	228	19
#8320	Two-Processor Switch	175	4,000	36	3
#3602	Line Increase Feature on 3726	370	8,500	168	14
	3727 Operator Console Model 70—				
	Logic Unit	160	2,390	324	27
#3255	Display	130	3,000	0	0
#4655	Keyboard	175	4,000	0	0

SOFTWARE PRICES

		Initial Charge		Monthly Charges			
		Basic License (\$)	DSLO License (\$)	Basic License (\$)	DSLO License (\$)	Licensed Program Support (\$)	Additional Licensed Program Support (\$)
5735-XX9	ACF/NCP Version 2 for IBM 3725	1,080	810	216	162	59	94
5667-124	ACF/NCP Version 3 for IBM 3725	2,400	2,160	400	360	135	216
5735-XXB	EP/3725 Release 2	1,200	900	225	169	35	56
5735-XXA	ACF/SSP Version 2 Release 2	462	347	84	63	22	35
5668-981	X.25 NPSI Release 4	700	525	223	166	36	58
5735-XX7	NTO for IBM 3725	600	450	171	127	11	18

IBM 372X Communications Controllers

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Product Summary**Editor's Note**

The 3725 communications controller is no longer actively marketed. This report serves as a reference edition for the 3725 as well as providing coverage of the 3720.

Description

IBM's 372X Communications Controllers are front-end or remote full-service communications processors, supporting IBM and plug-compatible mainframe host computers.

Strengths

IBM's 372X Communications Controllers have a simplified design. In addition, the product line features the X.25 Network Control Program Packet Switching Interface (NPSI) Release 4.3, which allows attachment of the 3720 and 3725 to X.25 networking services.

Limitations

The IBM 372X Communications Controllers can only be used in conjunction with other IBM-compatible products.

Competition

NCR Comten; Amdahl.

Vendor

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

Price

Pricing varies according to model. See Equipment Prices for details. These prices will be in effect as of July 1, 1990.

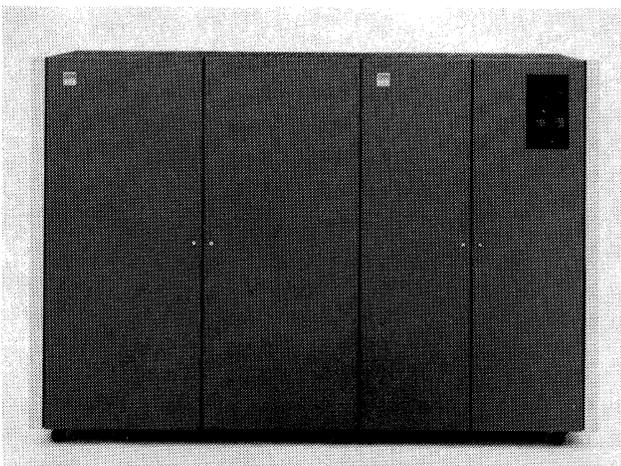
GSA Schedule

Yes.

Analysis

IBM introduced the 3725 Communication Controller in March 1983 after a year of speculation that new equipment would replace the IBM 3705. Though the 3725 never fully replaced the 3705-II, it did become the high-end model of the IBM communication controllers. In the third quarter of 1986, IBM stopped marketing the 3705-II and 3705-80 models. In December 1988, IBM withdrew the 3725. Due to the number currently installed, however, we continue to present the following information detailing the 3725's characteristics.

The demise of the 3705 and the 3725 does not represent the end of IBM's participation in the low-end communication controller market. In May 1986, the company introduced the 3720 Communication Controller, designed for small-to-medium sized organizations or for use in remote locations. The 3720 provides about one third of the 3725's performance and operates under control of software programs used on the 3725. A 3721 Expansion Unit extends the capability of the basic system.



The IBM 3725 Communication Controller is available in two models. Model 1 can support up to eight hosts, 256 lines, and 3M bytes of main storage. Model 2 can support up to four hosts, 80 lines, and 2048K bytes of storage.

Product Strategy

IBM offers the 3720 in four models: Models 1 and 11, which concentrate up to 28 lines and directly attach to the host computer; and Models 2 and 12, which concentrate up to 16 lines and two IBM Token-Ring Networks, are used at remote locations and connect to the host via telephone lines. Unattended operation procedures and a remote-switched console enable 3720 operations to be controlled from a remote location. A 3721 expansion unit allows Models 1 and 2 to attach up to 60 lines, and Models 11 and 12 to attach up to 48 lines and three IBM Token-Ring Networks. Models 1 and 2 are field upgradable to Models 11 and 12, respectively.

The 3720 comes with a standard 1M byte of storage, expandable to 2M bytes. A 10M-byte hard disk provides additional storage for support files used by Maintenance and Operator Subsystem (MOSS) facilities. IBM has upgraded MOSS to include automatic restarting of the scanner in case of failure and automatic analysis of Box Event Records (BERs). Speed of all internal clocks for synchronous terminals is now set in software through the MOSS operator console; previously, this action required hardware strap settings.

The 3720 offers some advantages over the 3725. Its controller supports four 56K bps or 64K bps full-duplex communications lines or five 48K bps lines. Only two lines are supported by 3725 scanners. IBM derived more efficient use of scanners by assigning 3720 Line Interface Coupler (LIC) weights to individual lines rather than to LICs. Total weight amounts to the sum of the weights of connected lines; scanner capacity is more efficiently allocated when there are mixes of different line types on the same scanner.

The 3725 controls data communications between terminals and one or more System/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 host processors or between two or more host processors. Terminal devices can be attached to the 3725 directly or through modems; host processors can be attached locally or remotely. Users can establish remote connection via common carrier or customer-owned communication facilities.

The two 3725 models serve large or small networks. Model 1, which accommodates the 3726 Communication Controller Expansion unit, supports a maximum of eight hosts, 256 lines, and

Company Profile IBM Corporation

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Armonk, NY 10504

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Offices located in other
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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

COPICS Installed Base:
1,500 worldwide COPICS
customers, 450 U.S. cus-
tomers (estimated).

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 communication controllers and terminals; other communication 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. This 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 has confirmed a reduction in its work force. According to a recent announcement, approximately 10,000 people will either take early retirement or accept termination incentives. It was also announced that IBM will take 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 continue to be dynamic in order to consistently meet the needs of its 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.

To help its customers stay competitive, IBM announced its Computer-Integrated Manufacturing (CIM) Architecture. IBM claims its CIM Architecture gives customers a comprehensive strategy to help them integrate information in a consistent manner across the entire enterprise. It addresses the integration challenge in an environment characterized by a variety of computer system technologies, operating systems, and applications. The CIM Architecture focuses on the storage of shared information, its delivery throughout networks, and its presentation to a variety of devices and users. IBM says CIM functions will be implemented for its Systems Application Architecture operating environments and its Advanced Interactive Executive operating environments.

Table 1. Line Attachment Base Capabilities

Line Attachment Base Type	Configuration	No. of Scanners	Type of Line Interface Coupler	Max. No. of LICs per 3725
Type A	Optional, 3725 or 3726	1	1 or 4A	8
Type B	Optional, 3725 or 3726	2	1, 2, 3, 4A, or 4B	8
Type C	Optional, 3725	1, 1 TRM, 1 ICC	1, 2, 3, 4A, or 4B	4 (4 Token-Ring Interface Couplers)
CLAB	Standard, 3725 only	1	1 or 4A	8

► *(Analysis continued)*

2048K bytes of storage. Model 2 supports up to four hosts, 80 lines, and 2048K bytes of storage.

The Central Control Unit (CCU) performs the control program that stays in main storage. This unit regulates the channel adapters, the communication scanner, and any data that is transferred between them. Besides housing the control program, the main storage provides the data space for the attached telecommunications lines, which are connected via cables to line interface couplers (LICs) in the 3725.

Software for the 3725 includes the Advanced Communications Function for Network Control Program (ACF/NCP) and the Emulation Program (EP/3725), which are designed only for the 3725 and cannot run on the 3705. Users must install ACF/System Support Programs (ACF/SSPs), Version 2 or 3, on the host to generate the ACF/NCP, which must be downloaded to the 3725. ACF/SSP has a configuration control program that provides support for IBM's 3710 Network Controller. ACF/NCP for the 3725 can communicate with ACF/NCP for the IBM 3705. EP/3725 allows coexistence of 270X, 370X, and 3725 communications processors in a common host environment.

In April 1986, IBM released a 3725 attachment to the IBM Token-Ring Network, which includes a LAB Type C attachment base consisting of a token-ring multiplexer, a physical base for up to four token-ring couplers, a communication scanner, and a physical base for up to 16 line attachments. A Token-Ring Interface Coupler (TIC) with a microprocessor operating under control of resident microcode provides 3725 attachment to one network. Each TIC transmits and receives at 4M bps, and under control of ACF/NCP, provides logical link control functions that conform to IEEE 802.2 standards.

IBM also introduced several software programming upgrades and additions. The X.25 Network Control Program Packet Switching Interface (NPSI), Release 4.3 allows attachment of the 3725, as well as the 3720 controller, to X.25 networking services. This package supports data transmission from 1200 to 64K bps. It requires either ACF/NCP, Version 4, Release 2 or ACF/NCP, Version 4 Subset (MVS or VM) software, and ACF/System Support Program ACF/SSP, Version 3, Release 2.

An enhanced Version 3 of Release 1.1, Advanced Communications Function/VTAM allows the IBM VM operating system to have the same SNA communication capabilities as MVS. Changes in the ACF/Network Control Program (ACF/NCP), Version 4, Release 2 allow it to work with the 3725 controller.

Decision Points

The major advantage of the 372X Communication Controllers is that they are IBM machines and, therefore, are compatible with IBM hosts and peripherals. The 3725 also offers users the benefit of a simplified machine structure, which consists of one scanner type, one channel adapter type, and five line interface coupler types. The simplified design includes features that serve multiple uses and facilitate configuration upgrades without necessitating the change of already installed machine features. For example, a single type of line attachment supports SDLC or BSC protocols at line speeds up to 19.2K bps plus asynchronous protocols at speeds up to 1200 bps.

The Network Management facility furnishes another advantage. The functionally separate Maintenance and Operator Subsystem (MOSS) uses an integral diskette drive and an attached IBM 3727 Operator Console. Software functions built

Table 2. Communications Supported by 372X Line Interface Couplers

Line Interface Coupler (LIC)	Number of Lines per LIC	Type of Interfaces Supported	Transmission Speeds and Modes Supported
LIC1	4	RS-232-C/V.24, RS-366/V.25 (auto call), X.21 bis, X.20 bis	Synchronous (SDLC or BSC) transmission at 2400, 4800, 9600, or 19.2K bps via external modem or direct connection; asynchronous (start/stop) transmission at up to 1200 bps via direct connections.
LIC2	1	Wideband type for 8751, 8801, or 8803 service	Synchronous BSC transmission at up to 64K bps; synchronous (SDLC) transmission at up to 230.4K bps.
LIC3	1	CCITT V.35	Synchronous (SDLC or BSC) transmission at up to 256K bps via V.35 modem; synchronous transmission at up to 56K bps via direct connection.
LIC4A	4	CCITT X.21	For connection to switched or nonswitched packet networks. Synchronous (SDLC only) transmission at 2400, 4800, or 9600 bps via external modem or direct connection.
LIC4B	1	CCITT X.21	For switched packet networks, synchronous transmission via external modem at up to 48K bps; for nonswitched packet networks, synchronous transmission via external modem at up to 64K bps; for direct connection, synchronous transmission at up to 256K bps. SDLC only. (Not available in the USA.)

into the 3725 versions of ACF/NCP and EP facilitate operation, maintenance, and problem determination. Two mechanisms, called Alert and Alarm, assist in problem determination. MOSS displays Alert messages when a problem occurs that affects normal operations and might require operator action. The Alert messages identify the cause of the error, give additional information on the resources affected by the error, and suggest possible actions to be taken by the operator. The Alarm gives an automatic first level of problem determination, informs the operator console of failure, and provides an entry point into the maintenance documentation for problem solution.

Competitive Position

In the marketplace, the 3725 did not represent a revolutionary breakthrough in communications processing, but served to challenge the competitors of the 3705. The IBM 3725 competitors included the Amdahl 4705E, 4705T, and 4725 and NCR Comten 3695 and 5660 communications processors. The IBM 3725 Model 1 competed against the Amdahl 4725, which had the same number of attachable hosts as the Model 1 (eight), the same number of attachable full-duplex lines (256), and the same maximum memory capacity of 3M bytes.

The NCR Comten 3695 surpassed the 3725 in the number of lines attachable (512 half or full duplex) and maximum main memory (4M bytes). The Comten 3690 and 3695 also support disk-based mass storage, a capability not offered with

the 3725. The Comten 5660 provides 16M bytes of main memory and can support up to 1,024 lines. The Comten 5660 is a high-end processor that will support up to eight IBM or compatible mainframes and up to 1,024 communication lines. This product competed with the 3725, while the 3720 is more directly competitive with NCR Comten's 5620 product. Thus far, IBM has given no indication that it plans to offer a processor with the capabilities of the Comten 5660.

The 3720 is the low-end product in IBM's communication controller family, which includes the older 3705 and the 3725. It is designed for small-to-medium sized organizations that do not need the power of the 3725, or it can be used at remote locations.

Traditionally, IBM has focused its major marketing efforts on large organizations with far-ranging data processing requirements. The 3720 represents a step in a different direction, however, as in performance and price the product is clearly aimed at the smaller organization. It seems likely that with the smaller and less expensive 3720, IBM is making a bid for more business in markets now dominated by Digital Equipment Corporation.

The company continues to expand its communications offerings to include far more flexible network management and control features, which are critical in today's networks. In the past, IBM's SNA network has been criticized as being cumbersome to manage, and other plug-compatible processor vendors have capitalized on this weakness

by selling systems that offered far greater configuration and planning tools. The network control and diagnostic enhancements will be extremely attractive to IBM's huge installed base of customers.

Characteristics

Models: 3720—Models 1, 2, 11, and 12; 3725—Models 1 and 2.

Date of Announcement: IBM 3725—March 1983, IBM 3720—1986.

Date of First Delivery: IBM 3725—1983, IBM 3720—1986.

Serviced by: International Business Machines Corporation.

Models

The 3720 is the low-end model in the 372X line of communication controllers. It provides about one third the performance capability of the 3725 and operates under control of software programs used on the 3725. It comes in four models: Model 1, Model 2, Model 11, and Model 12. Models 1 and 11 attach directly to the host, while Models 2 and 12 operate in a remote environment. They attach to the host through telephone lines. Control of these models from remote control centers occurs through the use of a remote switched console, unattended operation facilities, and a Remote Support Facility.

IBM offered two models of the 3725: Model 1 and Model 2. Users can field upgrade Model 2 to a Model 1. The 3725 controls data communications between directly attached, modem-attached, or IBM Token-Ring Network-attached terminal devices and one or more directly or remotely connected IBM host processors, including System/370 (except Models 115 and 125), 303X, 308X, 3090, 43XX, or 9370. The 3725 can also control communications between two host processors. Users can achieve remote connections through common carrier-provided or customer-owned communication facilities.

Configuration

Model 3720

The 3720 concentrates communication lines and provides networking functions, such as monitoring errors and detecting system problems. The basic 3720 includes a central control unit, 1M byte of main storage, a 10M-byte disk, a diskette drive, the Maintenance and Operator Subsystem (MOSS), and one communication scanner including internal clock controls. MOSS allows the automatic analysis of Box Event Records (BERs), thus facilitating problem determination functions. Through MOSS, a console operator can perform local and remote controller diagnostics from a central site. In 1988, IBM enhanced MOSS facilities with the following functions:

- transfer of NCP load modules to the 3270 and their loading from disk,
- automatic load and dump of NCP,
- online retrieval and transmission of dump data to the host, and
- status display.

All 3720 units can also be equipped with an IBM Remote Support Facility (RSF) and configured for unattended operation. The 3720's management console is password protected, and the controller can use the security and audit features resident on host hardware or software.

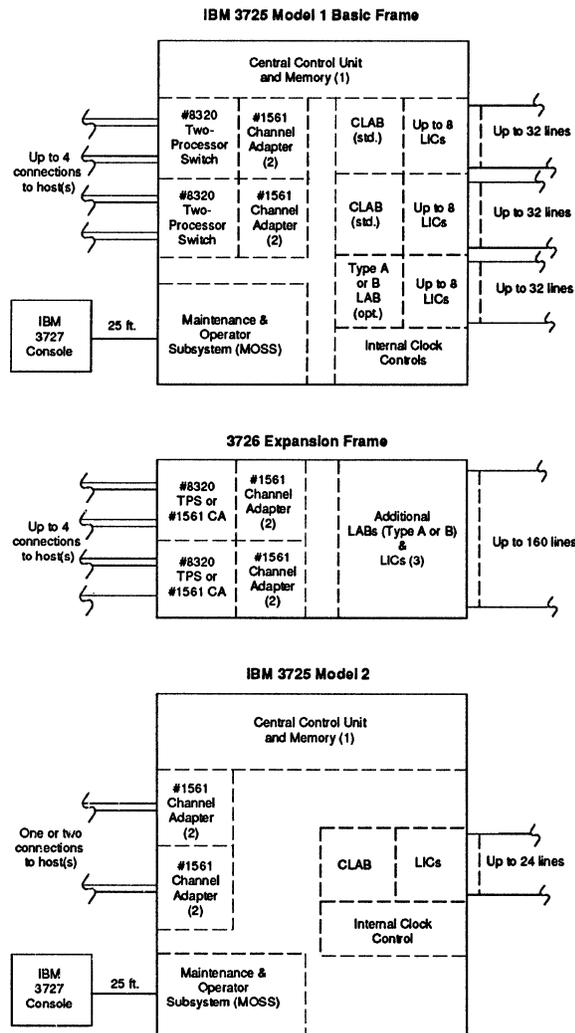
Options on the 3720 Model 1 or 2 include an additional 1M byte of storage and up to seven line interface couplers (LICs). Models 11 or 12 can contain an additional 1M byte of storage, up to four LICs, and up to two Type 1 Token-Ring Interface Couplers (TICs). Models 1 and 2 are field upgradable to Models 11 and 12, respectively.

The two-processor switch provides a second channel interface that can connect the first or the second channel adapter to a Multiprocessor System (MP) or to two channels of the same or different processors with nonsimultaneous communications. Models 1 and 11 can each support two of the switches. This option is not available on Models 2 and 12.

A 3721 Expansion Unit, installed on the top of a 3720, allows attachment of up to 32 additional lines. The 3721 Model 1 has one scanner that controls up to eight LICs, and the 3721 Model 2 has two scanners, each controlling up to four LICs. One model of the 3721 cannot be converted to another. The 3721 can operate over common carrier-provided or equivalent customer-owned communication facilities. It attaches the same DCEs as the 3720. The 3721 does not support attachment to the Token-Ring Network. Users can upgrade the base 3721 by adding Line Interface Couplers, Types 1, 2, 3, 4A, and 4B.

Any IBM 3101 Model 23 or compatible terminal can serve as a 3720 system console, including an IBM PC running the IBM 3101 Emulation Program. One remote operator console can manage multiple 3720s via

Figure 1.
IBM 3725 Basic Configuration



Notes:

(1) Memory capacity is 512K bytes. On 3725 Model 1 only, memory capacity may be expanded in 256K-byte increments to a maximum of 2M bytes.

(2) 3725 Model 1 supports up to two Channel Adapters and 2 Two-Processor Switches; four additional Channel Adapters, or two Channel Adapters and 2 Two-Processor Switches, may be added via the 3726 Expansion. Thus, the maximum number of channels physically attachable is eight, and the maximum number of channels concurrently active is six.

3725 Model 2 supports one or two Channel Adapters; no support is provided for the Two-Processor Switch.

(3) 3725 Model 1 provides two Type C Line Attachment Bases (CLABs) as standard components, and supports one additional LAB (Type A or B) as an option; up to five additional Type A or B LABs can be added via the 3726 Expansion. 3725 Model 2 provides one CLAB as a standard component, and is not expandable.

On the 3725 Model 1, all LABs are optional; each LAB supports up to 32 communications lines via single- and multiline Line Interface Couplers (LICs), for a maximum line capacity of 256 lines. The Line Increase Feature (#3602) is required to support more than six LABs and is contained in the 3726 Expansion frame. On the 3725 Model 2, the LAB supports a maximum of 24 lines, via single- and multiline LICs.

attachment to a switched communications line and 1200 bps, full-duplex modems that conform to CCITT V.22 Recommendations. Customers running EP, but not NCP/PEP, must provide a local console to receive error alarms normally sent through the VTAM operator console. Customers using the IBM Remote Support Facility (RSF) must have an IBM 5841 synchronous modem at the RSF port.

Connection to Host Computer

The same type of channel adapter (# 1561) attaches either the 3720 Model 1 or 3720 Model 11 to a host channel of an IBM 4341, 4361, 4381, 303X, 308X, or 3090 processor. It attaches to a byte or block multiplexer or selector channels. With the exception of the 303X, the adapters also attach to the IBM 3044 Fiber Optic Channel Extender Link that allows placement of a

3720 Model 1 or 11 up to 6,666 feet (2 kilometers) from a host running NCP. Models 1 and 11 also come with one or two optional Two-Processor Switches (TPSS) that allow a channel adapter to attach to two processor channels with nonsimultaneous communication.

Model 3725

The 3725 Model 1 base frame accommodates up to 96 lines. With the 3726 Communication Controller Expansion, which is offered only with Model 1, an additional 160 lines can be attached for a total of 256 lines, full duplex or half duplex. The 3725 Model 2 accommodates up to 80 full-duplex or half-duplex lines.

The number of operable lines, however, can be fewer than the number physically attachable. The maximum number of lines that operate concurrently depends

on line speed, line protocols, message length, control program, and application work load.

The 3725 base machine (for Model 1 or 2) contains:

- Central Control Unit (CCU), that executes instructions to control the communication scanners and channel adapters. It runs under ACF/NCP V2, V3, or V4, EP/3725, or both in PEP mode.
- Main storage of 512K bytes, expandable in both models by four additional 256K increments. Main storage houses a 3725 Network Control Program (i.e., NCP, EP, or PEP) and other programs loaded from the host processor and provides buffers for data exchanged with the channel adapters and lines.
- Maintenance and Operator Subsystem (MOSS), which provides IPL and utility procedures for the 3725 (Model 1) operator. An independent processor with microcode, a diskette drive, and an attachment for an IBM 3727 operator console are included. The MOSS, with the attached 3727 console, offers network management functions, error logging, machine status display, CCU services, scanner services, line services, and diagnostics.
- Transmission SubSystem (TSS), which physically connects the 3725 to communications facilities. It consists of Line Attachment Bases (LABs) with microprocessor-based scanners, Channel and Line Attachment Bases, Line Interface Couplers (LICs), and optional Internal Clock Controls, Type 2 (ICC-2s). The communication scanners serialize and deserialize the characters, support various line protocols, and offer character buffering and cycle-steal transfer in the main storage of the 3725. Integrated modems are not available for the 3725 or 3726.

In the 3725 Model 1, two Type C LABs are standard, and a third LAB (Type A or B) is an option. Each CLAB has one communications scanner and can attach up to 32 full- or half-duplex communications lines by means of optional (separately priced) LICs. The ICC-2s are also optional for Model 1.

The 3725 Model 2 is field upgradable to a Model 1. It includes one CLAB as standard, which can support up to 80 full- or half-duplex lines. An additional CLAB and one LAB Type A, B, or C can be added for installation in LAB positions 2 and 3, respectively. Model 2 also includes one ICC-2 as standard, but can support two more ICC features.

- Token-Ring Subsystem (TRSS), which supplies the physical connection to an IBM Token-Ring Network. Line and Token-Ring Attachment Bases (LABs) with Token-Ring multiplexer and Token-Ring Interface Couplers (TICs) make up this subsystem.
- Channel Adapters (CAs), providing physical attachment to host channels, are optional for both models. For Model 1, an optional Two-Processor Switch

(TPS) allows a channel adapter to connect two processor channels for nonsimultaneous communication. A basic Model 1 has a physical base for two channel adapters and two TPSs, enabling a total of four hosts to be attached, and two to operate concurrently.

For further expansion, users can add the 3726 Communication Controller Expansion. The 3726 Expansion supports up to an additional 160 communications lines. The 3726 attaches only to a 3725 Model 1 and is not supported by the 3725 Model 2. With the optional 3726 Communication Controller Expansion, four additional Channel Adapters (CAs) without Two-Processor Switches, or two CAs each with TPSs, can be added, making a total of eight hosts to be attached, six operating concurrently. If channel attached, the 3725 requires a control unit position on the system channel.

A basic Model 2 provides a physical base for four channel adapters and no TPS. Model 2 attaches to a maximum of four hosts.

The 3725 can function as a remote communication controller without channel connection to a host processor. In this configuration, called "link attached," the 3725 is connected by one or more communication links to channel-attached 3705s or 3725s. The controller can perform the same networking functions whether link attached or channel attached.

The 3725, Model 1 or 2, requires a primary 3727 Operator Console for installation, operation, and maintenance. A second 3727 can act as an alternate. Only one console is active at a time. The user selects the active console by a switch on the 3725 control panel. The console can be located a maximum distance of 25 feet (7.5 meters) from the 3725, and there should not be a wall or door between the console and the attached 3725. With the addition of a 7427 Console Switching Unit, up to four 3725s can share a single primary operator console. An alternate console can also be configured and switched among any six controllers.

Connection to Host Computer

A channel adapter (1561) provides the physical and logical interface for either the 3725 Model 1 or Model 2 to a host channel of an IBM S/370 (except Models 115 and 125), 303X, 308X, 3090, 43XX, 9370 host processors, or between two host processors. The channel adapter attaches to a byte multiplexer, block multiplexer, or selector channel. The 3725 Model 1 supports physical attachment of up to eight host channels; Model 2 supports up to four.

In Model 1 only, each Channel Adapter (CA) can be equipped with a Two-Processor Switch (TPS), which allows the CA to be connected to two processor channels instead of only one. The channels can belong to the same or different processors. Data cannot be transmitted simultaneously on more than one channel. Manual

switches on the 3725 control panel allow a user to enable each of the active channel interfaces. If all interfaces are enabled, the processors are responsible for resolving any contention because only one interface can transfer data at a time.

The channel adapters must occupy contiguous positions beginning with Position 1. CA Positions 1 and 2 are in the 3725 basic frame; CA Positions 3 through 6 are in the 3726 Expansion frame. Both CAs must, therefore, be installed in the 3725 before one can be installed in the 3726. When TPS is installed, it is placed in the first available position. The same channel attachment cable groups (3290 and 1178) serve Model 1 or 2.

Transmission Specifications

Model 3720

The internal clock supports both "Category 1" and "Category 2" transmission rates. Software from the MOSS operator console sets the internal clocks. Speeds are set by line, not by LIC as in the 3725. The SSP program product determines speeds for other types of attachments.

Category 1 rates, set by NCP or EP, are 50, 110, 134.5, 200, 300, 600, and 1200 bps for start/stop or synchronous operation and 75, 100, 2400, 4800, 9600, and 19.2K bps for start/stop operation only. Category 2 rates, set via the operator console, are 2400, 4800, 9600, 19.2K, 38.4K, 55,885, and 245,760 bps for directly attached synchronous terminals. Directly attached and modem-attached terminals operate in half- or full-duplex modes.

The 3720 supports seven LICs per Model 1 or 2 and will support up to four LICs on a Model 11 or 12. Please refer to Table 2 for modem attachment and direct connection capabilities of the LICs. The Token-Ring Interface Coupler (TIC) Type 1 operates under the control of a resident microcode that controls the Token-Ring Network under standard protocols. The TIC operates only under the control of ACF/NCP. The 3720 Models 11 and 12 can each support two TICs, which are not available on Models 1 and 2.

IBM modems that can be used with the 3720 include the following: 3833 Model 1 (2400 bps), 3834 Model 1 (4800 bps), 3863 Models 1/2 (2400 bps), 3864 Models 1/2 (4800 bps), 3865 Models 1/2 (9600 bps), 3868 Model 1 (2400 bps), 3868 Model 2 (4800 bps), 3868 Models 3/4 (9600 bps), 5811 Models 10/18 (2400—19.2K bps), 5841 (1200 bps), 5865 (9600 bps), 5866 (14.4K bps), 5868 Model 51 (9600 bps), and 5868 Model 61 (14.4K bps).

Model 3725

IBM offers four types of Line Attachment Bases (LABs)—LAB Type A, LAB Type B, LAB Type C, and Communication and Line Attachment Base (CLAB). LABs Type A and CLABs offer a single communication scanner, while LABs Type B provide two communication scanners. LABs Type C have one communication

scanner and interface clock control, as well as one Token-Ring multiplexer. In the 3725 Model 1, the base machine includes two CLABs as standard components; each has one communication scanner. Users can install one additional LAB, Type A, B, or C. If further expansion is needed, up to five additional LABs (Type A, B, or C) can be installed in the 3726 Expansion.

The 3725 Model 2 supports one CLAB, which is a standard component, but two additional LABs can be added.

The microprocessor-based scanner serializes and deserializes the characters, supports various line protocols, and provides character buffering and cycle-steal transfer into the 3725 main storage. The scanner microcode is loaded from the MOSS diskette. Any scanner can support intermix protocols, asynchronous or synchronous communications, and half- or full-duplex transmission. The device supports BSC, EBCDIC, ASCII, and SDLC protocols in normal or block mode, an operating mode similar to that of the 3705 Scanner Type 3. Asynchronous protocols with five to eight data bits and one or two stop bits are supported in "character mode" with EP/3725 R1 and ACF/NCP V2, similar to that of the 3705 Scanner Type 2. BSC is also supported in character mode. They can also be supported in "enhanced mode" with EP/3725 R2 and ACF/NCP V3 or V4. Protocols are also supported in normal mode at speeds up to 64K bps with EP/3725 R2. The scanner also supports procedures for automatic calling units and X.21 native, X.21 bis, X.20 bis, and X.25 protocols. The number of lines handled by the scanner depends on protocol and transmission speed.

Table 1 lists the Line Attachment Base (LAB) capabilities.

Line Interface Couplers (LICs) furnish the necessary functions to attach the external communications facilities and Data Terminal Equipment (DTE). The DTEs are attached directly to the 3725 or through DCEs. IBM offers five types of LICs, and the decision on which one to use depends on the physical interface required, the transmission speed to be supported, and number of lines to be connected. Up to four LICs can be attached on a line and Token-Ring Attachment Base (LAB Type C) for a maximum of 16 lines per LAB Type C. Up to eight LICs can be installed on LABs Type A or B and CLABs up to a maximum of 32 lines per LAB.

Terminals can be attached to the 3725 either directly or via modems. Direct (modemless) attachment of terminals can be accomplished with LIC-1, LIC-3, LIC-4A, or LIC-4B and the corresponding direct attachment cable.

Table 2 shows the modem attachment and direct connection capabilities of the LICs.

The Token-Ring Subsystem permits the 372X Controllers to attach to IBM Token-Ring Networks. The subsystem consists of Line and Token-Ring Attachment Bases (LABs) and Token-Ring Interface Couplers (TICs). Only LAB Type C is available, which offers one Token-Ring Multiplexer (TRM) and up to four Token-Ring Interface Couplers (TICs). LAB Type C also furnishes a communications scanner, internal clock

control, and up to four LICs. The TRM provides the adaptation between the 3725 and the TICs. The Token-Ring Interface Coupler Type 1 consists of a set of components and a microprocessor that runs under the control of a resident microcode, which controls the IBM Token-Ring Network via standard protocols. The TIC operates only under the control of the Network Control Program (NCP).

The Internal Clock Control, Type 2 (ICC-2) provides bit clocking when the attached external modem does not provide the clocking, as well as when direct attachment of the data terminal equipment is required. The ICC-2 provides clocking for eight LICs (up to 32 lines) at 50, 110, 134.5, 200, 300, 600, and 1200 bps for synchronous or asynchronous operation with or without a DCE direct attachment, and at speeds of 2400, 4800, 9600, 19K, and 56K bps for operation without a DCE direct attachment. Up to 1200 bps, the speed is set at the time of control program generation and has to match that of the internal clock or the attached DTE. Above 1200 bps, the DTE has to use external clocking that is provided by the 3725, and the speed is set by hardware in the 3725. Business machine clocking to the 3725 occurs at data rates of 50, 110, 134.5, 200, 300, 600, and 1200 bps for asynchronous or synchronous operation with or without a DCE direct attachment.

For externally clocked DTEs, bit clocking is provided to directly attached DTEs at data rates of 2400, 4800, 9600, 19.2K, 56K, and 245K bps for synchronous operation without a DCE; data rates of 2400, 4800, 9600, and 19.2K bps are provided for start/stop operation without a DCE. The speed is set to 9600 bps at the factory, and when installed, it can be changed by the CE on a per-LIC basis.

IBM modems that can be used with the 3725 include the following: 3833 Model 1 (2400 bps), 3834 Model 1 (4800 bps), 3863 Models 1/2 (2400 bps), 3864 Models 1/2 (4800 bps), 3865 Models 1/2 (9600 bps), 3868 Model 1 (2400 bps), 3868 Model 2 (4800 bps), 3868 Models 3/4 (9600 bps), 3872 (2400 bps), 5811 Models 10/18 (2400—19.2K bps), 5841 (1200 bps), 5865 (9600 bps), 5866 (14.4K bps), 5868 Model 51 (9600 bps), and 5868 Model 61 (14.4K bps).

Software

Advanced Communications Function for Network Control Program (ACF/NCP) Version 3 or 4 Release 2 for the IBM 372X Controllers

ACF/NCP for the 372X Controllers is the basic operating system for the 3725 and the 3720, whether channel attached or connected via communications links. ACF/NCP is supported by hosts operating under OS/VS1, OS/VS2, MVS, and DOS/VSE, and is designed to support the enhanced operating features of the 3725, including its problem determination, error recording, and system generation capabilities; storage for up to 3M bytes (3725 model); and to support continued operation and controlled shutdown in failure situations. ACF/NCP

Version 4 Release 2 also offers improved modem support and the ability to attach an IBM 3725 to IBM's Token-Ring Network via the IBM Token-Ring Subsystem. ACF/NCP for the 3725 also supports Release 4 of the X.25 NCP Packet-Switching Interface licensed program.

ACF/NCP for the 3725 supports and communicates with the following host-resident programs: ACF/SSP Version 2 and Version 3, Release 2; ACF/TCAM Version 2, Release 4; ACF/VTAM Version 1, Release 3 (MVS only, with appropriate PTF); ACF/VTAM Version 2 (MVS, VS1, and VSE); EREP 1.5 (MVS/VS1, VSE/VM); and NPA-Host FDP Number 5798-CZR, NPDA Version 2, NCCF Version 2, and NLDL Release 2.

ACF/NCP for the 3725 also supports and communicates with these controller-resident programs: ACF/NCP for the IBM 372X Controllers, EP for the IBM 372X Controllers, PEP, NTO Release 2 for the IBM 3725, X.25 NPSI Release 4, and ACF/NCP for the IBM 3705.

ACF/NCP Version 3 for the 3725 supports all the features of Version 2, and also supports SNA Network Interconnection (network-to-network SNA sessions) and Modulo 128 SDLC (128 frames before acknowledgment). ACF/NCP Version 3 is supported only on controllers attached to hosts running MVS/370 or MVS/XA.

ACF/NCP Version 3 will support the VHSA RPQs (8J5080, 8J5081, 8J5082) and the IBM 3725 Model 2 storage expansion up to two megabytes after upgrading the existing machines.

ACF/NCP Version 4 Subset functions under MVS/370 and MVS/Extended Architecture (XA) operating on the 3720 Controller. It provides the same functions and facilities of ACF/NCP Version 4, except the SNA Network Interconnection. The ACF/NCP Version 4 Subset offers support for up to 28 communication lines on one communication scanner, as well as support of up to two channel adapters. ACF/NCP Version 4 Subset also supports these programs: Network Routing Facility (NRF) Release 3 operating on the 3720 with ACF/NCP Version 4 Subset with MVS; and X.25 Network Packet Switching Interface (NPSI) Release 4.3 with ACF/NCP Version 4 Subset with MVS.

ACF/NCP Version 4 Subset accommodates VSE users operating the 3720 Communications Controller. It offers the functions and facilities of ACF/NCP Version 4, except SNA Network Interconnection. It can support up to 28 communication lines on one communication scanner and offers support of up to two channel adapters.

The 3720 supports the ACF/TCAM, Version 2, Release 4; BTAM/SP, BTAM/ES, RTAM; and ACF/VTAM Access Methods. TCAM, with the MSNF feature, supports 3720 terminal-to-terminal sessions in an NCP environment, but all SNA logical units attached to the controller must be activated via a host processor running VTAM. TCAM does not support load, dump, or SNA resource ownership of the 3720. When the 3720 is channel attached to a TCAM host, a TCAM Version 2, Release 4 channel contact facility establishes the necessary communications path.

In addition to the aforementioned programs, the 3720 will operate with the ACF/SSP, Version 3, Release 2 (MVS, VM, VSE) support products.

Emulation Program for the IBM 372X Controllers (EP Release 2)

EP Release 4 supports 372X operation in 270X Emulation Mode. EP Release 4 provides the same problem determination aids, error recording functions, and other features as ACF/NCP on the 372X. It can support up to six channel adapters and can run concurrently with ACF/NCP Version 2 in PEP operation mode. EP/3725 Release 2 supports the new 256K BSC data rate, and is necessary for PEP operations alongside ACF/NCP Version 3. It incorporates the S.W.I.F.T. PRPQ (5799-AQT), which assists users of EP or PEP to link directly to the network of the Society for Worldwide Interbank Financial Telecommunications.

EP is designed for users of VSE/AF Release 3, OS/VS1 Release 7, VM/SP 2.1, MVS/370, and MVS/XA. It supports the following access methods: BTAM, BTAM-ES, BTAM-SP, ACF/TCAM, and RTAM.

ACF/NCP for the 3725 and EP/3725 are generated using the ACF/System Support Programs (ACF/SSP) Version 2, Release 1.1 or 2 licensed program (5735-XXA), which was announced with the 3725. Because both are designed to operate only in the IBM 372X, neither will operate in the IBM 3704 or 3705. Co-existence of 270X, 370X, and 372X in a common host environment, however, is supported.

ACF/System Support Programs (ACF/SSP) Version 2 and Version 3, Release 2

ACF/SSP provides system generation and utility functions for users of ACF/NCP for the 3705; ACF/NCP for the IBM 3720; ACF/NCP for the IBM 3725; and EP on the IBM 3705, EP/3720, and EP/3725. ACF/SSP Version 2, Release 1.1 or 2 requires at least one locally attached IBM 3705-II or 3705-80 meeting the storage requirements of ACF/NCP or EP for the 3705 or one locally attached 3725 meeting the storage requirements of ACF/NCP or EP/3725 for the 3725. It is supported under VSE/AF Release 3, OS/VS1 Release 7, MVS/370, and MVS/XA with the appropriate VTAM or TCAM release.

ACF/SSP Version 3 and ACF/NCP Version 3 or ACF/NCP Version 4 and/or EP/3725 Release 2 are required to support the additional start/stop data rates provided by Internal Clock Control Type 2. Users must upgrade existing machines to support this capability. ACF/NCP Version 4 or ACF/NCP Version 3 with appropriate PTFs and/or EP/3725 Release 2 with appropriate PTFs is needed to support more than two channel adapters in the IBM 3725 Model 2.

ACF/SSP Version 2 Release 2 supports all the features of Version 2, Release 1.1, along with SNA Network Interconnection and Modulo 128 SDLC. ACF/SSP Version 2 Release 2 is necessary only to support ACF/NCP Version 3. This version can run only on hosts running MVS/370 and MVS/XA.

X.25 NCP Packet-Switching Interface Program

X.25 NPSI provides users of ACF/NCP/VS with the capability to attach the 372X Communication Controller to data transmission services that support interfaces complying with CCITT X.25 standards. The package is Teletype certified. This program supports packet sequence numbering of up to 128, with a packet length section of up to 4,096 characters. It supports SNA network node interconnection and protocol conversion for non-SNA equipment. Within the program, a subset of X.29 allows communications with asynchronous X.28 devices (TTY). It also supports the X.21 LICs. X.25 NPSI Release 4.1 for VM/SP will support ACF/NCP Version 3 for the IBM 3725.

Non-SNA Interconnection Release 4 (VSE, MVS)

This program permits BSC communications (RJE terminals and host-to-host) to travel on the SDLC lines of the SNA network, which reduces the communication line costs. The 3725 is supported by Non-SNA Interconnection Release 4 with ACF/NCP V4R1 (MVS/370, MVS/XA, VSE) and by ACF/NCP V4R2 in an MVS/370 or MVS/XA environment. The 3720 is also supported in these environments, as well as in an ACF/NCP V4 subset (VSE) environment.

Network Terminal Option (NTO)

NTO is a software product that extends the capabilities of ACF/NCP in the 372X Communications Controllers to permit SNA support for a chosen group of non-SNA devices, which include the IBM 2740 and 2741 terminals on either switched or leased lines, and Teletype Models 33/35 on switched lines only. This option is needed when the user chooses the NTO licensed program to operate in conjunction with ACF/NCP Version 4, Release 2. As well as the other functions contained in earlier releases, the NTO Release 4 program provides generation under NCP/Emulation Program Definition Facility, dial-out capability, performance enhancements, and Network Management Vector Transport (NMVT) processing.

Network Extension Facility (NEF) Version 2

NEF Version 2 is a programming RPQ that extends the ACF/NCP Version 3 capabilities in an IBM 3725 Controller to Airline Line Control networks communicating with Transaction Processing Facility (TPF) Version 2, Release 3 applications. By offering enhanced attachment capability for Airline Line Control devices to an SNA network and transport of TPF Version 2 transactions through the network, NEF Version 2 facilitates the integration of the Airline Line Control network into the overall SNA network environment.

Software products operating only on 3720 Model 1 include the following:

- Emulation Program, Release 3 for MVS and VSE (10/86).
- Emulation Program, Release 4 for MVS and VSE (10/86).

On 3720 Models 11 and 12, ACF/NCP for MVS and VM will be provided through a current level of ACF/NCP, Version 4 and the ACF/NCP, Version 4 Subset.

The 3720 controllers support the following Communication Management software:

- NetView, Release 1 (MVS, MVS/XA, VM)
- NCCF, Version 2, Release 2 (VSE)
- NPDA, Version 3, Release 2 for VSE with 3720 PTF (3720 PTF—10/86)
- NPDA, Version 3 (except NPDA, Version 3, Release 2 for VSE with 3720 PTF)
- NRF, Release 2 (MVS) (10/86)
- NRF, Release 3 (MVS) (10/86)
- NPSI Release 4.3 (MVS supporting ACF/NCP, Version 4, Release 2—12/86; supporting ACF/NCP Version 4 Subset—6/87)
- NPSI Release 4.3 (VM supporting ACF/NCP, Version 4, Release 2—3/87; supporting ACF/NCP Version 4 Subset—6/87)
- X.25 SNA Interconnection, Release 2 PRPQ 7L1000 (4/87)

Pricing

Users can acquire all 372X components by purchase or month-to-month rental.

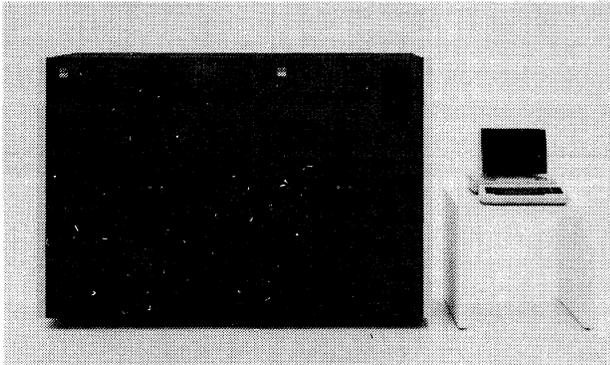
Equipment Prices

	Rental (\$)	Purchase (\$)
3720 Communications Controller		
Model 1	3,475	41,430
Model 2	2,465	29,510
Model 11	4,040	48,250
Model 12	3,040	36,330
1561 Second Channel Adapter	642	7,655
4911, 4921, 4931, 4941, and 4942 LIC* Types 1, 2, 3, 4A, and 4B	235	2,835
4991 Token-Ring Int. CPLR** Type 1	213	3,400
7100 Storage Increment 1MB	570	6,810
8320 Two-Processor Switch	379	4,540

*Line Interface Coupler (LIC).

**Interface Coupler. ■

IBM 3725 Communication Controller



The IBM 3725 Communication Controller, shown here with the 3726 Expansion and a 3727 Operator Console, supports up to 8 hosts, 256 lines, and 1024K bytes of storage.

MANAGEMENT SUMMARY

The IBM 3725 Communication Controller was introduced on March 8, 1983 after rumors that it would replace the IBM 3705 had circulated for more than a year. Although the 3725 does replace the 3705-II at the high end of the IBM communication controllers, it does not yet obsolete the 3705, which is still available. In keeping with IBM's commitments to its customer base, the 3725 is fully compatible with its predecessors. It can be intermixed with the 3705-II and 3705-80 in the same single-domain or multi-domain network.

In November 1983, IBM announced a number of new features for the 3725, including:

- New releases of ACF/NCP (Version 3 for the IBM 3725), EP (Release 2 for the IBM 3725), and ACF/SSP (Version 2 Release 2). The new versions support all the features of their predecessors, and have been upgraded largely to support SNA Network Interconnection;
- A doubling of the maximum main memory size for the 3725 Model 1 to 2M bytes;
- Support for data rates up to 256K bps through the V.35 attachment;
- A port-swapping feature that allows the operator to reassign a line from a malfunctioning 3725 port to another port through the 3727 console without involving the host;
- A line description file containing the symbolic name, physical address, protocol, and speed of each attached communications line as configured by the user; and
- A new flexibility in the arrangement of LICs and ICCs inside the 3725 cabinet.

The most important of these announcements are the new software releases and the doubling of main memory. IBM ➤

The 3725 is IBM's top-of-the-line communications processor, and by definition the pacesetter for the IBM plug-compatible market. A modular, programmable controller, it comes in two models. Model 1 supports up to 8 host computers, 256 communications lines, and 2M bytes of main storage. Model 2 supports up to 2 hosts, 25 communications lines, and 512K bytes of storage.

FUNCTION: Front-end or remote full-service communications processor.

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA; pre-SNA IBM communications optional.

OPERATING SOFTWARE: ACF/NCP Version 2 or 3 for the 3725; EP Release 1 or 2 for the 3725.

COMPETITION: NCR Comten 3790; Amdahl 4705 Model E; CCI CC80 and CC85.

PRICE: A 3725 Model 1 configured with 1M bytes of storage, one channel attachment, one Line Attachment Base (Type A), eight Line Interface Couplers (Type 1), and an operator's console costs \$149,990.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Information Systems Group, National Accounts Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: March 8, 1983.

DATE OF FIRST DELIVERY: Fourth quarter, 1983.

SERVICED BY: International Business Machines Corporation.

CONFIGURATION

The 3725 Model 1 base frame accommodates up to 96 lines. With the 3726 Communication Controller Expansion, which is offered only with Model 1, an additional 160 lines can be attached, for a total of 256 lines, full-duplex or half-duplex. The 3725 Model 2 accommodates up to 24 full-duplex or half-duplex lines.

The number of operable lines, however, may be fewer than the number physically attachable. The maximum number of lines that operate concurrently depends on line speed, line protocols, message length, control program, and application work load.

The 3725 base machine (for Model 1 or 2) contains:

- Central control unit that executes instructions to control the communication scanners and channel adapters. It runs ➤

IBM 3725 Communication Controller

TABLE 1. LINE ATTACHMENT BASE CAPABILITIES

Line Attachment Base Type	Configuration	No. of Scanners	Type of Line Interface Coupler	Max. No. of LICs per 3725
Type A	Optional, 3725 or 3726	1	1 or 4A	8
Type B	Optional, 3725 or 3726	2	1, 2, 3, 4A or 4B	8
CLAB	Standard, 3725 only	1	1 or 4A	8

➤ has expanded the 3725's maximum storage mainly to accommodate two new features of its Systems Network Architecture (SNA): SNA Network Interconnection, and the Modulo 128 feature of SDLC, SNA's link protocol. SNA Network Interconnection adds network-to-network communications, a new level of scale for the architecture. Before the current announcement, IBM provided no facility for a system or terminal on one network to communicate with a system or terminal residing on another network. Now, two networks can be connected through a gateway node, an IBM host with attached 3705 or 3725 and running the appropriate software. Each network maintains its own address structures, security provisions, and local classes of service; the gateway node provides translation for internetwork sessions.

The Modulo 128 SDLC feature allows up to 127 SDLC frames to be transmitted before an acknowledgement is required from the receiving node. The previous maximum was seven unacknowledged frames.

The 3725 controls data communications between terminals and one or more System/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 host processors or between two or more host processors. Terminal devices can be attached to the 3725 directly or through modems; host processors can be attached locally or remotely. Remote connection may be established by common carrier or customer-owned communication facilities.

The two 3725 models serve large or small networks. Model 1, which accommodates the 3726 Communication Controller Expansion unit, supports a maximum of eight hosts, 256 lines, and 2048K bytes of storage. Model 2 supports up to two hosts, 24 lines, and 512K bytes of storage.

Software for the 3725 includes the Advanced Communications Function for Network Control Program (ACF/NCP) Version 2 or 3 for the 3725 and Emulation Program for the 3725 (EP/3725) Release 1 or 2, which are designed only for the 3725 and cannot run on the 3705. Users must install ACF/System Support Programs (ACF/SSP) Version 2 Release 1.1 or 2, on the host to generate the ACF/NCP, which must be downloaded to the 3725. ACF/NCP for the 3725 can communicate with ACF/NCP for the IBM 3705. EP/3725 allows coexistence of 270X, 370X, and 3725 communications processors in a common host environment. ➤

➤ under ACF/NCP V2 or V3, EP/3725 R1 or R2, or both in PEP mode.

- Main storage of 512K bytes, expandable in Model 1 by four additional 256K increments. Main storage houses a 3725 network control program (i.e., NCP, EP, or PEP) and other programs loaded from the host, and provides buffers for data exchanged with the channel adapters and lines.
- Maintenance and operator subsystem (MOSS), which provides IPL and utility procedures for the 3725 operator. An independent processor with microcode, a diskette drive, and an attachment for an IBM 3727 operator console are included.
- Transmission subsystem (TSS), which physically connects the 3725 to communication facilities. It consists of line attachment bases (LABs) with microprocessor-based scanners, line interface couplers (LICs), and internal clock controls (ICCs). Integrated modems are not available for the 3725 or 3726.

In Model 1 two Type C LABs are standard; a third LAB (Type A or B) can be added optionally. Each CLAB has one communications scanner and can attach up to 32 full- or half-duplex communication lines by means of optional (separately priced) LICs. The ICCs are also optional for Model 1.

For further expansion, the 3726 Communication Controller Expansion can be added. The 3726 Expansion supports up to an additional 160 communications lines. The 3726 attaches only to a 3725 Model 1 and is not supported by the 3725 Model 2.

Model 2 includes one Type C LAB as standard, which can support up to 24 full- or half-duplex lines. No additional LABs may be added. Model 2 also includes one ICC as standard. Model 2 is field-upgradable to a Model 1.

Channel adapters, providing physical attachment to host channels, are optional for both models. For Model 1, an optional two-processor switch (TPS) is available that allows a channel adapter to connect two processor channels for nonsimultaneous communication. A basic Model 1 has a physical base for two channel adapters and two TPSs, enabling a total of four hosts to be attached, and two to operate concurrently.

With the optional 3726 Communication Controller Expansion, an additional four channel adapters (CAs) without Two-Processor Switches, or two CAs each with TPSs, can be added. Thus a total of eight hosts can be attached, six operating concurrently. If channel-attached, the 3725 requires a control unit position on the system channel. ➤

IBM 3725 Communication Controller

TABLE 2. COMMUNICATIONS SUPPORTED BY 3725 LINE INTERFACE COUPLERS

Line Interface Coupler (LIC)	Number of Lines per LIC	Type of Interfaces Supported	Transmission Speeds and Modes Supported
LIC1	4	RS-232-C/V.24, RS-366/V.25 (auto-call), X.21 bis, X.20 bis	Synchronous (SDLC or BSC) transmission at 2400, 4800, 9600, or 19.2K bps via external modem or direct connection; asynchronous (start/stop) transmission at up to 1200 bps via direct connections.
LIC2	1	Wideband type for 8751, 8801, or 8803 service	Synchronous BSC transmission at up to 64K bps; synchronous (SDLC) transmission at up to 230.4K bps.
LIC3	1	CCITT V.35	Synchronous (SDLC or BSC) transmission at up to 256K bps via V.35 modem; synchronous transmission at up to 56K bps via direct connection.
LIC4A	4	CCITT X.21	For connection to switched or nonswitched packet networks. Synchronous (SDLC only) transmission at 2400, 4800, or 9600 via external modem or direct connection.
LIC4B	1	CCITT X.21	For switched packet networks, synchronous transmission via external modem at up to 48K bps; for non-switched packet networks, synchronous transmission via external modem at up to 64K bps; for direct connection, synchronous transmission at up to 56K bps. SDLC only.

➤ COMPETITIVE POSITION

In terms of the marketplace, we see the 3725 as a system designed to address the 3705's current competitors, and not as a revolutionary breakthrough in communications processing. The IBM 3725 competitors include the Amdahl 4705 and NCR Comten 3690. The IBM 3725 Model 1 outdoes the Amdahl 4705 Model E in number of hosts attachable (eight versus six), number of hosts supported concurrently (six versus four), number of full-duplex lines attachable (256 versus 176), and maximum main memory capacity (2M bytes versus 1M bytes). The Amdahl 4705 takes less floor space than the IBM 3725, even though the 3725 is not as bulky as the 3705. The 3725 is exceeded by the NCR Comten 3690 Models A5 to E5 in number of lines attachable (512 half- or full-duplex), number of hosts supported concurrently (eight) and maximum main memory (4M bytes). The Comten 3690 also supports disk-based mass storage, a capability not offered with the 3725.

ADVANTAGES AND RESTRICTIONS

A chief advantage of the 3725 is its simplified machine structure that can handle larger networks and provide more main storage than the 3705 models. The 3725 involves only one scanner type, one channel adapter type, and five line interface coupler types. The simplified design includes features that serve multiple uses, and facilitate configuration upgrades without changing already-installed machine features. For example, a single type of line attachment supports SDLC or BSC protocols at line speeds up to 19.2K bps plus asynchronous protocols at speeds up to 1200 bps.

An added advantage of the new structure is that it requires up to 50 percent less floor space, and less power, than the 3705-II, depending on configuration. ➤

➤ A basic Model 2 provides a physical base for only two channel adapters and no TPS. Model 2 attaches to a maximum of two hosts, and communications cannot be simultaneous.

The 3725 can be used as a remote communication controller, without channel connection to a host processor. In this configuration, called "link-attached," the 3725 is connected by one or more communication links to channel-attached 3705s or 3725s. The controller can perform the same networking functions whether link-attached or channel-attached.

The 3725, Model 1 or 2, requires a primary 3727 Operator Console for installation, operation, and maintenance. A second 3727 may be used as an alternate. Only one console is active at a time. The active console is selected by a switch on the 3725 control panel. The console can be located a maximum distance of 25 feet (7.5 meters) from the 3725, and there should not be a wall or door between the console and attached 3725. With the addition of a 7427 Console Switching Unit, up to four 3725s can share a single primary operator console. An alternate console can also be configured, and switched among any six controllers.

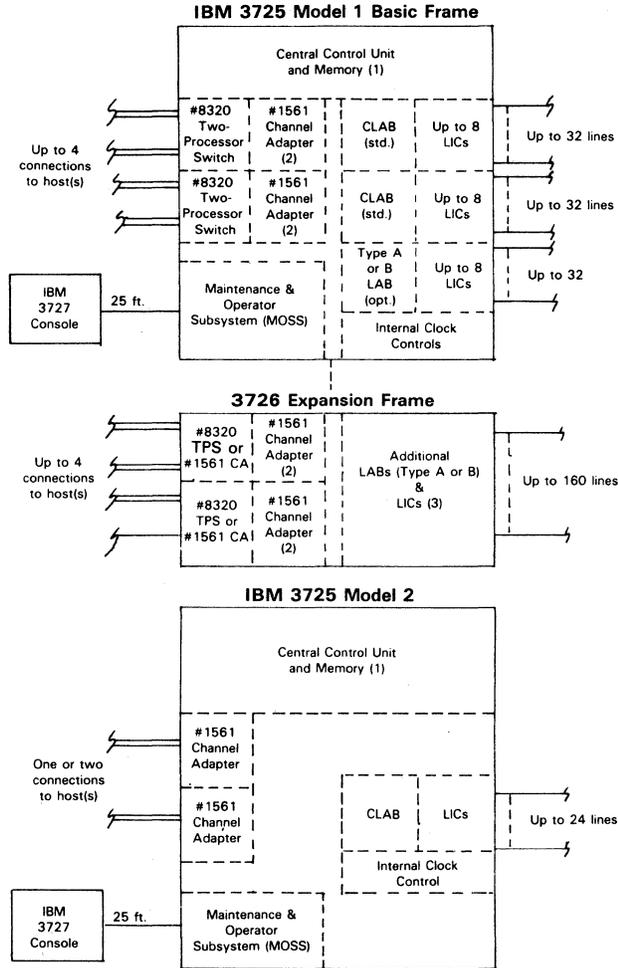
The configuration diagram on page 104 of this report shows the relationships among the 3725 components and depicts the 3726 expansion capabilities.

CONNECTION TO HOST COMPUTER: The same type of channel adapter (1561) attaches either the 3725 Model 1 or Model 2 to a host channel of an IBM S/370 (except models 115 and 125), 303X, 308X, 4331, or 4341 processors. A channel adapter provides the logical and physical interface between the communication controller and host processor. It attaches to a byte multiplexer, block multiplexer, or selector channel. The 3725 Model 1 supports physical attachment of up to eight host channels; Model 2 supports up to two.

In Model 1 only, each channel adapter (CA) may be equipped with a two-processor switch (TPS), which allows the CA to be connected to two processor channels instead of ➤

IBM 3725 Communication Controller

CONFIGURATION



Notes:

(1) Memory capacity is 512K bytes. On 3725 Model 1 only, memory capacity may be expanded in 256K-byte increments to a maximum of 2M bytes.

(2) 3725 Model 1 supports up to two Channel Adapters and two Two-Processor Switches; four additional Channel Adapters, or two Channel Adapters and two Two-Processor Switches, may be added via the 3726 Expansion. Thus, the maximum number of channels physically attachable is eight, and the maximum number of channels concurrently active is six.

3725 Model 2 supports one or two Channel Adapters; no support is provided for the Two-Channel Switch.

(3) 3725 Model 1 provides two Type C Line Attachment Bases (CLABs) as standard components, and supports one additional LAB (Type A or B) as an option; up to five additional Type A or B LABs can be added via the 3726 Expansion. 3725 Model 2 provides one CLAB as a standard component, and is not expandable.

On the 3725 Model 1, all LABs are optional; each LAB supports up to 32 communications lines via single- and multi-line Line Interface Couplers (LICs), for a maximum line capacity of 256 lines. The Line Increase Feature (#3602) is required to support more than six LABs and is contained in the 3726 Expansion frame. On the 3725 Model 2, the LAB supports a maximum of 24 lines, via single- and multi-line LICs.

▷ The 3725 supports throughput equal to 1.8 to 1.9 times that of a 3705-II equipped with a Scanner Type 3, or 3.2 to 3.5 times that of a 3705-II with a Scanner Type 2.

Another advantage of the 3725 is its improved network management facility. A functionally separate Maintenance and Operator Subsystem (MOSS) that uses an integral diskette drive, an attached IBM 3727 Operator Console, and software functions built into the 3725 versions of ACF/NCP and EP facilitates operation, maintenance, and problem determination. For instance, MOSS displays awareness messages when a problem occurs in the 3725 that affects normal operations and might require operator action. The awareness messages identify the cause of the error, give additional information on the resources affected by the error, and suggest possible actions to be taken by the operator. □

▶ only one. The channels may belong to the same or different processors. Data cannot be transmitted simultaneously on more than one channel. Manual switches on the 3725 control panel allow a user to enable each of the active channel interfaces. If all interfaces are enabled, the processors are responsible for resolving any contention, because only one interface can transfer data at a time.

The channel adapters must occupy contiguous positions beginning with Position 1. CA Positions 1 and 2 are in the

3725 basic frame; CA Positions 3 through 6 are in the 3726 Expansion frame. Both CAs must therefore be installed in the 3725 before one may be installed in the 3726. When TPS is installed, it is placed in the first available position. The same channel attachment cable groups (3290 and 1178) serve Model 1 or 2.

TRANSMISSION SPECIFICATIONS

Three types of line attachment bases (LABs) are available—LAB Type A, LAB Type B, and CLAB. In the 3725 Model 1, the base machine includes two CLABs as standard components; each has one communication scanner. One additional LAB, Type A or B, may be installed. Type A provides one scanner; Type B provides two. If further expansion is needed, up to five additional LABs (Type A or B) may be installed in the 3726 Expansion.

The 3725 Model 2 supports only one CLAB, which is a standard component.

The microprocessor-based scanner serializes and deserializes the characters, supports various line protocols and provides character buffering and cycle steal transfer into the 3725 main storage. The scanner microcode is loaded from the MOSS diskette. Any scanner can support intermix protocols, asynchronous or synchronous communications, and half- or full-duplex transmission. BSC (EBCDIC or ASCII) and SDLC protocols are supported in normal mode, an operating mode similar to that of the 3705 Scanner Type 3. Asynchronous protocols with five to eight data bits and ▶

IBM 3725 Communication Controller

one or two stop bits are supported in character mode, similar to that of the 3705 Scanner Type 2. In character mode, BSC is also supported. Character mode is required for tributary addressing under EP or PEP. The scanner, in addition, supports procedures for automatic calling units and X.21 native, X.21 bis, X.20 bis, and X.25 protocols. The number of lines handled by the scanner depends on protocol and transmission speed.

Table 1 lists the line attachment base capabilities.

Line interface couplers (LICs) attach the communications facilities and terminals to the 3725. Five types of LICs are offered. The decision of which one to use depends on the physical interface required, the transmission speed to be supported, and number of lines to be connected. An LIC can attach from one to four full-duplex or half-duplex lines. Up to eight LICs can be installed per LAB, allowing up to 32 lines per LAB.

Terminals can be attached to the 3725 either directly or via modems. Direct (modemless) attachment of terminals can be accomplished with LIC-1, LIC-3, LIC-4A, or LIC-4B and the corresponding direct attachment cable.

Table 2 shows the modem attachment and direct connection capabilities of the LICs.

The ICC provides bit clocking when the attached external modem does not provide the clocking, as well as when direct attachment of the data terminal equipment is required. The ICC provides clocking for eight LICs (up to 32 lines) at 50, 110, 134.5, 200, 300, 600, and 1200 bps for operation with or without a modem. For direct attachment only (without a modem), the ICC provides clocking at speeds of 2400, 4800, 9600, 19.2K, and 56K bps for eight LICs.

Speeds up to 1200 bps are set at the time of control program generation and must match the speed of the terminal's internal clock. For speeds above 1200 bps, the terminal uses external clocking provided by the 3725; the speed is preset at 9600 bps at the factory but can be changed at installation to 2400, 4800, 19.2K, or 56K bps.

SOFTWARE

ADVANCED COMMUNICATIONS FUNCTION FOR NETWORK CONTROL PROGRAM (ACF/NCP) VERSION 2 OR 3 FOR THE IBM 3725: ACF/NCP for the 3725 is the basic operating system for either 3725 model, whether channel-attached or connected via communications link. ACF/NCP for the 3725 is supported by hosts operating under OS/VS1, OS/VS2 MVS, and DOS/VSE, and is designed to support the enhanced operating features of the 3725, including its problem determination, error recording, and system generation capabilities, storage for up to 2M bytes, and support for continued operation and controlled shutdown in failure situations. ACF/NCP for the 3725 also supports Release 4 of the X.25 NCP Packet-Switching Interface licensed program.

ACF/NCP for the 3725 supports and communicates with the following host-resident programs: ACF/SSP Version 2, Release 1.1 or 2, ACF/TCAM Version 2 Release 4, ACF/VTAM Version 1 Release 3 (MVS only, with appropriate PTF), ACF/VTAM Version 2 (MVS, VS1, and VSE), EREP 1.5 (MVS/VS1), VSE/VM, and NPA-Host FDP Number 5798-CZR, NPDA Version 2, NCCF Version 2, and NLDM Release 2.

ACF/NCP for the 3725 also supports and communicates with these controller-resident programs: ACF/NCP for the IBM 3725, EP for the IBM 3725, PEP, NTO Release 2 for the IBM 3725, X.25 NPSI Release 4, and ACF/NCP for the IBM 3705.

ACF/NCP Version 3 for the 3725 supports all the features of Version 2, and additionally supports SNA Network Interconnection (network-to-network SNA sessions), and Modulo 128 SDLC (128 frames before acknowledgement). ACF/NCP Version 3 is supported only on controllers attached to hosts running MVS/370 or MVS/XA.

EMULATION PROGRAM FOR THE IBM 3725 (EP/3725) Releases 1 and 2: EP/3725 supports 3725 operation in 270X Emulation Mode. EP/3725 provides the same problem determination aids, error recording functions, and other features as ACF/NCP on the 3725. It provides support for up to six channel adapters, and can run concurrently with ACF/NCP Version 2 in PEP operation mode. EP/3725 Release 2 supports the new 256K BSC data rate, and is necessary for PEP operations alongside ACF/NCP Version 3. It incorporates the S.W.I.F.T. PRPQ (5799-AQT), which assists users of EP or PEP to link directly to the network of the Society for Worldwide Interbank Financial Telecommunication.

EP/3725 is designed for users of VSE/AF Release 3, OS/VS1 Release 7, VM/SP 2.1, MVS/370, and MVS/XA. EP/3725 supports the following access methods: BTAM, BTAM-ES, BTAM-SP, ACF/TCAM, and RTAM.

ACF/NCP for the 3725 and EP/3725 are generated using the ACF/System Support Programs (ACF/SSP) Version 2 Release 1.1 or 2 licensed program (5735-XXA), which was announced with the 3725. Designed to operate only in the IBM 3725, neither will operate in the IBM 3704 or 3705. Coexistence of 270X, 370X, and 3725 in a common host environment, however, is supported.

ACF/SYSTEM SUPPORT PROGRAMS (ACF/SSP) VERSION 2 RELEASE 1.1 OR 2: ACF/SSP provides system generation and utility functions for users of ACF/NCP for the 3705, ACF/NCP for the IBM 3725, and EP on the IBM 3705 and EP/3725. ACF/SSP Version 2, Release 1.1 or 2 requires at least one locally attached IBM 3705-II or 3705-80 meeting the storage requirements of ACF/NCP or EP for the 3705 or one locally attached 3725 meeting the storage requirements of ACF/NCP or EP/3725 for the 3725. It is supported under VSE/AF Release 3, OS/VS1 Release 7, MVS/370, and MVS/XA with the appropriate VTAM or TCAM release.

ACF/SSP Version 2 Release 2 supports all the features of Version 2 Release 1.1, along with SNA Network Interconnection and Modulo 128 SDLC. ACF/SSP Version 2 Release 2 is necessary only to support ACF/NCP Version 3. This version may run only on hosts running MVS/370 and MVS/XA.

X.25 NCP PACKET SWITCHING INTERFACE PROGRAM: X.25 NPSI provides users of ACF/NCP/VS the facility to use the 3725 Communication Controller to access public data networks complying with CCITT X.25 standards. The package is Telenet-certified. This program supports packet sequence numbering of up to 128, with packet length section of up to 4096 characters. It supports SNA network node interconnection and protocol conversion for non-SNA equipment. Within the program is a subset of X.29 allowing communications with asynchronous X.28 devices (TTY). It also supports the X.21 LICs.

NETWORK TERMINAL OPTION (NTO): NTO is a software product which is loaded in the 3725 and extends the SNA environment to include support for several common asynchronous terminals. These include the IBM 2740 and 2741 terminals on either switched or leased lines, and Teletype models 33/35 on switched lines only.

IBM 3725 Communication Controller

PRICING

All 3725 components can be acquired by purchase or month-to-month rental. The 3725 is offered under Plan D of IBM's Lease and Rental Agreement (LRA). This plan calls for an initial period of three months, during which IBM provides maintenance service 24 hours per day, 7 days per week at no additional charge. After the initial period, maintenance

service is available for an Annual Maintenance charge, which specifies a maximum number of hours of service per month. If the maximum is exceeded, an Additional Monthly Maintenance Charge Rate (AMMCR) is applied.

Purchase credit for rental payments made under LRA can be accrued up to a maximum of 65 percent of the total purchase price.

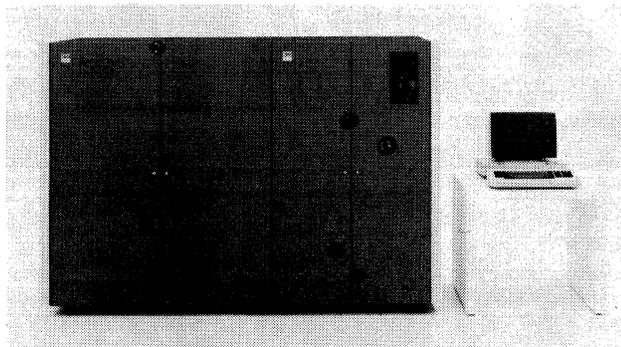
EQUIPMENT PRICES

		Monthly Rental	Purchase	Annual Maint.	AMMCR
3725 Communication Controller					
	Model 1 (512K bytes, up to 96 lines)	\$3,260	\$75,000	\$2,556	\$213
	Model 2 (512K bytes, up to 24 lines)	2,630	60,500	2,280	190
	3726 Communication Controller Expansion (up to 160 lines; attaches to Model 1 only)	1,390	32,000	480	40
#1561	Channel Adapter	295	6,750	96	8
#4666	Internal Clock Control	65	1,500	24	2
	Line Attachment Bases—				
#4771	Type A	825	19,000	192	16
#4772	Type B	1,150	26,400	324	27
	Line Interface Couplers—				
#4911	Type 1	115	2,600	24	2
#4921	Type 2	130	3,000	24	2
#4931	Type 3	130	3,000	24	2
#4941	Type 4A	115	2,600	24	2
#4942	Type 4B	130	3,000	24	2
#7100	Storage Increment (256K bytes)	190	4,375	228	19
#8320	Two-Processor Switch	175	4,000	36	3
#3602	Line Increase Feature on 3726	370	8,500	168	14
3727 Operator Console Model 70—					
	Logic Unit	160	2,390	324	27
#3255	Display	130	3,000	0	0
#4655	Keyboard	175	4,000	0	0

SOFTWARE PRICES

		Initial Charge		Monthly Charges			
		Basic License	DSLO License	Basic License	DSLO License	Licensed Program Support	Additional Licensed Program Support
5735-XX9	ACF/NCP Version 2 for IBM 3725	\$1,080	\$ 810	\$216	\$162	\$ 59	\$ 94
5667-124	ACF/NCP Version 3 for IBM 3725	2,400	2,160	400	360	135	216
5735-XXB	EP/3725 Release 2	1,200	900	225	169	35	56
5735-XXA	ACF/SSP Version 2 Release 2	462	347	84	63	22	35
5668-981	X.25 NPSI Release 4	700	525	223	166	36	58
5735-XX7	NTO for IBM 3725	600	450	171	127	11	18 ■

IBM 3725 Communication Controller



The IBM 3725 Communications Controller, shown here with the 3726 Expansion and a 3727 Operator Console, supports up to 8 hosts, 256 lines, and 1,024K bytes of storage.

MANAGEMENT SUMMARY

The new IBM 3725 Communication Controller was finally introduced on March 8 after rumors that it would soon replace the IBM 3705 had been circulating for more than a year. We see the new controller as an evolutionary modernization of the 3705. Although the 3725 does replace the 3705-II at the high end of the IBM communication controllers, the 3725 does not obsolete the 3705, which is still available. In keeping with IBM's commitments to its customer base, the 3725 is fully compatible with its predecessors. It can be intermixed with the 3705-II and 3705-80 in the same single-domain or multi-domain network.

The 3725 controls data communications between terminals and one or more System/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 host processors or between two host processors. Terminal devices can be attached directly or with modems to the 3725; host processors can be attached locally or remotely. Remote connection may be established by common carrier or customer-owned communication facilities.

The two 3725 models serve large or small networks. Model 1, which accommodates the 3726 Communication Controller Expansion unit, supports a maximum of eight hosts, 256 lines, and 1,024K bytes of storage. Model 2 supports up to two hosts, 24 lines, and 512K bytes of storage.

Software for the 3725 includes ACF/System Support Programs (ACF/SSP) Version 2 Release 1.1, which can be used on the 3705 Communication Controllers, as well as on the 3725. The Advanced Communications Function for Network Control Program (ACF/NCP) Version 2 for the 3725 and Emulation Program for the 3725 (EP/3725) are designed only for the 3725 and cannot be run on the 3705. Programs that ACF/NCP Version 2 for the 3725 can communicate with, however, include ACF/NCP for the IBM >

A new, modular, programmable communication controller offered in two models. Model 1 supports up to 8 hosts, 256 lines, and 1,024K bytes of storage. Model 2 supports up to 2 hosts, 24 lines, and 512K bytes of storage.

The 3725 runs under control of ACF/NCP Version 2 for the 3725 or EP for the 3725. It can be locally or remotely attached to the IBM S/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 host processors.

The 3725 supports throughput equal to 1.8 or 1.9 times that of a 3705-II equipped with a Scanner Type 3, or 3.2 to 3.5 times that of a 3705-II with a Scanner Type 2. Line speeds from 50 bps to 230.4K bps are accommodated.

Minimum configuration of the 3725 requires the base frame, one Line Interface Coupler (LIC), one channel adapter (if the controller is to be channel-attached), and an IBM 3727 operator console. These components of Model 1 total \$86,740; of Model 2, \$71,740.

CHARACTERISTICS

VENDOR: International Business Machines Corporation, Information Systems Group, National Accounts Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

DATE OF ANNOUNCEMENT: March 8, 1983.

DATE OF FIRST DELIVERY: Fourth quarter of 1983.

SERVICED BY: International Business Machines Corporation.

CONFIGURATION

The 3725 Model 1 base frame accommodates up to 96 lines. With the 3726 Communication Controller Expansion, which is offered only with Model 1, an additional 160 lines can be attached, for a total of 256 lines, full-duplex or half-duplex. The 3725 Model 2 accommodates up to 24 full-duplex or half-duplex lines.

The number of operable lines, however, may be fewer than the number physically attachable. The maximum number of lines that operate concurrently depends on line speed, line protocols, message length, control program, and application work load.

The 3725 base machine (for Model 1 or 2) contains: >

IBM 3725 Communication Controller

TABLE 1. LINE ATTACHMENT BASE CAPABILITIES

Line Attachment Base Type	Configuration	No. of Scanners	Type of Line Interface Coupler	Max. No. of LICs per 3725
Type A	Optional, 3725 or 3726	1	1 or 4A	8
Type B	Optional, 3725 or 3726	2	1, 2, 3, 4A or 4B	8
CLAB	Standard, 3725 only	1	1 or 4A	8

▷ 3705. EP/3725 allows coexistence of 270X, 370X, and 3725 in a common host environment.

COMPETITIVE POSITION

In terms of the marketplace, we see the 3725 as a system designed to address the 3705's current competitors, and not as a revolutionary breakthrough in communications processing. The IBM 3725 competitors include the Amdahl 4705 and NCR Comten 3690. The IBM 3725 Model 1 outdoes the Amdahl 4705 Model E in number of hosts attachable (eight versus six), number of hosts supported concurrently (six versus four), and number of full duplex lines attachable (256 versus 176). Maximum main memory capacity is 1M bytes for both. But the Amdahl 4705 takes less floor space than the IBM 3725, even though the 3725 is not as bulky as the 3705. The 3725 is exceeded by the NCR Comten 3690 Models A5 to E5 in number of lines attachable (512 half- or full-duplex), number of hosts supported concurrently (eight) and maximum main memory (4M bytes). The Comten 3690 also supports disk-based mass storage, a capability not offered with the 3725.

ADVANTAGES AND RESTRICTIONS

A chief advantage of the 3725 is its simplified machine structure, which can handle larger networks and provides more main storage than the 3705 models. The 3725 involves only one scanner type, one channel adapter type, and five line interface coupler types. The simplified design facilitates configuration upgrades without changing already-installed machine features, and it includes features that serve multiple uses. For example, a single type of line attachment supports SDLC or BSC protocols at line speeds up to 19.2K bps and asynchronous protocols at speeds up to 1,200 bps.

An added advantage of the new structure is that it requires up to 50 percent less floor space, and less power, than the 3705-II, depending on configuration.

The 3725 supports throughput equal to 1.8 to 1.9 times that of a 3705-II equipped with a Scanner Type 3, or 3.2 to 3.5 times that of a 3705-II with a Scanner Type 2.

▶ • Central control unit that executes instructions to control the communication scanners and channel adapters. It runs under ACF/NCP V2, EP/3725, or both in PEP mode.

▶ • Main storage of 512K bytes, expandable in Model 1 by two additional 256K increments. Main storage houses a 3725 network control program (i.e., NCP, EP, or PEP) and other programs loaded from the host, and provides buffers for data exchanged with the channel adapters and lines.

▶ • Maintenance and operator subsystem (MOSS), which provides IPL and utility procedures for the 3725 operator. An independent processor with microcode, a diskette drive, and an attachment for an IBM 3727 operator console are included.

▶ • Transmission subsystem (TSS), which physically connects the 3725 to communication facilities. It consists of line attachment bases (LABs) with microprocessor-based scanners, line interface couplers (LICs), and internal clock controls (ICCs). Integrated modems are not available for the 3725 or 3726.

In Model 1 two Type C LABs are standard; a third LAB (Type A or B) can be added optionally. Each CLAB has one communication scanner and can attach up to 32 full- or half-duplex communication lines by means of optional (separately priced) LICs. The ICCs are also optional for Model 1.

For further expansion, the 3726 Communications Controller Expansion can be added. The 3726 Expansion supports up to an additional 160 communications lines. The 3726 attaches only to a 3725 Model 1 and is not supported by the 3725 Model 2.

Model 2 includes one Type C LAB as standard, which can support up to 24 full- or half-duplex lines. No additional LABs may be added. Model 2 also includes one ICC as standard. Model 2 is field-upgradable to a Model 1.

Channel adapters, providing physical attachment to host channels, are optional for both models. For Model 1, an optional two-processor switch (TPS) is available that allows a channel adapter to connect two processor channels for nonsimultaneous communication. A basic Model 1 has a physical base for two channel adapters and two TPSs, enabling a total of four hosts to be attached, and two to operate concurrently.

With the optional 3726 Communication Controller Expansion, an additional four channel adapters (CAs) without Two-Processor Switches, or two CAs each with TPSs, can

IBM 3725 Communication Controller

TABLE 2. COMMUNICATIONS SUPPORTED BY 3725 LINE INTERFACE COUPLERS

Line Interface Coupler (LIC)	Number of Lines per LIC	Type of Interfaces Supported	Transmission Speeds and Modes Supported
LIC1	4	RS-232-C/V.24, RS-366/V.25 (auto-call), X.21 bis, X.20 bis	Synchronous (SDLC or BSC) transmission at 2400, 4800, 9600, or 19.2K bps via external modem or direct connection; asynchronous (start/stop) transmission at up to 1200 bps via direct connections.
LIC2	1	Wideband type for 8751, 8801, or 8803 service	Synchronous BSC transmission at up to 64K bps; synchronous (SDLC) transmission at up to 230.4K bps.
LIC3	1	CCITT V.35	Synchronous (SDLC or BSC) transmission at up to 64K bps via V.35 modem; synchronous transmission at up to 56K bps via direct connection.
LIC4A	4	CCITT X.21	For connection to switched or non-switched packet networks. Synchronous (SDLC only) transmission at 2400, 4800, or 9600 via external modem or direct connection.
LIC4B	1	CCITT X.21	For switched packet networks, synchronous transmission via external modem at up to 48K bps; for non-switched packet networks, synchronous transmission via external modem at up to 64K bps; for direct connection, synchronous transmission at up to 56K bps. SDLC only.

➤ Another advantage is the improved network management facilities of the 3725. A functionally separate Maintenance and Operator Subsystem (MOSS) that uses an integral diskette drive, an attached IBM 3727 Operator Console, and software functions built into ACF/NCP Version 2 and EP facilitates operation, maintenance, and problem determination. For instance, MOSS displays awareness messages when a problem occurs in the 3725 which affects normal operations, and which might require operator action. The awareness messages identify the cause of the error, give additional information on the resources affected by the error, and suggest possible actions to be taken by the operator.

In regard to restrictions, if the transmission speed of any of the lines connected to a communication scanner exceeds 9600 bps, the maximum number of line interface couplers for that scanner is four, and the number of LICs may have to be reduced further because of the sum of LIC weights. Each LIC is assigned a scanner weight, which is the percentage of scanner capacity consumed by the lines attached to that LIC. This weight depends on the speeds and protocols of the lines. The total load put on a scanner must not exceed 100 percent. LICs with weights above 18 are installed on LAB Type B; under certain conditions they may be plugged on the CLABs, but not on LAB Type A. The scanner weights can be obtained from the IBM Configuration Guide.□

➤ be added. Thus a total of eight hosts can be attached, six operating concurrently. If channel-attached, the 3725 requires a control unit position on the system channel.

A basic Model 2 provides a physical base for only two channel adapters and no TPS. Model 2 attaches to a maximum of two hosts, and communications cannot be simultaneous.

The 3725 can be used as a remote communication controller, without channel connection to a host processor. In this configuration, called "link-attached", the 3725 is connected by one or more communication links to channel-attached 3705s or 3725s. The controller can perform the same networking functions whether link-attached or channel-attached.

The 3725, Model 1 or 2, requires a primary 3727 Operator Console for installation, operation, and maintenance. A second 3727 may be used as an alternate. Only one console is active at a time. The active console is selected by a switch on the 3725 control panel. The console can be located a maximum distance of 25 feet (7.5 meters) from the #3725, and there should not be a wall or door between the console and attached 3725. With the addition of a 7427 Console Switching Unit, up to four 3725s can share a single primary operator console. An alternate console can also be configured, and switched among any six controllers.

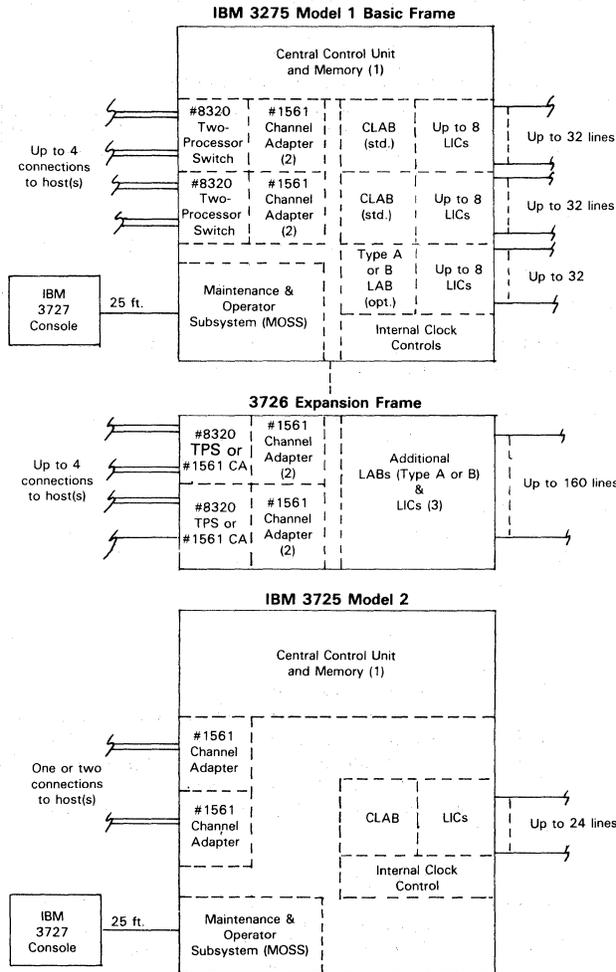
The configuration diagram on page 104 of this report shows the relationships among the 3725 components and depicts the 3726 expansion capabilities.

CONNECTION TO HOST COMPUTER: The same type of channel adapter (#1561) attaches either the 3725 Model 1 or Model 2 to a host channel of an IBM S/370 (except models 115 and 125), 303X, 308X, 4331, or 4341 processors. A channel adapter provides the logical and physical interface between the communication controller and host processor. It attaches to a byte multiplexer, block multiplexer, or selector channel. The 3725 Model 1 supports physical attachment of up to eight host channels; Model 2 supports up to two.

In Model 1 only, each channel adapter (CA) may be equipped with a two-processor switch (TPS), which allows the CA to be connected to two processor channels instead of only one. The channels may belong to the same or different processors. Data is not transmitted simultaneously on more than one channel. Manual switches on the 3725 control panel allow a user to enable each of the active channel interfaces. If all interfaces are enabled, the processors are

IBM 3725 Communication Controller

CONFIGURATION



Notes:

(1) Memory capacity is 512K bytes. On 3725 Model 1 only, memory capacity may be expanded in one or two 256K-byte increments to a maximum of 1M bytes.

(2) 3725 Model 1 supports up to two Channel Adapters and two Two-Processor Switches; four additional Channel Adapters, or two Channel Adapters and two Two-Processor Switches, may be added via the 3726 Expansion. Thus, the maximum number of channels physically attachable is eight, and the maximum number of channels concurrently active is six.

3725 Model 2 supports one or two Channel Adapters; no support is provided for the Two-Channel Switch.

(3) 3725 Model 1 provides two Type C Line Attachment Bases (CLABs) as standard components, and supports one additional LAB (Type A or B) as an option; up to five additional Type A or B LABs can be added via the 3726 Expansion. 3725 Model 2 provides one CLAB as a standard component, and is not expandable.

On the 3725 Model 1, all LABs are optional; each LAB supports up to 32 communications lines via single- and multi-line Line Interface Couplers (LICs), for a maximum line capacity of 256 lines. The Line Increase Feature (#3602) is required to support more than six LABs and is contained in the 3726 Expansion frame. On the 3725 Model 2, the LAB supports a maximum of 24 lines, via single- and multi-line LICs.

► responsible for resolving any contention, because only one interface can transfer data at a time.

The channel adapters must occupy contiguous positions beginning with Position 1. CA Positions 1 and 2 are in the 3725 basic frame; CA Positions 3 through 6 are in the 3726 Expansion frame. Both CAs must therefore be installed in the 3725 before one may be installed in the 3726. When TPS is installed, it is placed in the first available position. The same channel attachment cable groups (#3290 and #1178) serve Model 1 or 2.

TRANSMISSION SPECIFICATIONS

Three types of line attachment bases (LABs) are available—LAB Type A, LAB Type B, and CLAB. In the 3725 Model 1, the base machine includes two CLABs as standard components; each has one communication scanner. One additional LAB, Type A or B, may be installed. Type A provides one scanner; Type B provides two. If further expansion is needed, up to five additional LABs (Type A or B) may be installed in the 3726 Expansion.

The 3725 Model 2 supports only one CLAB, which is a standard component.

The microprocessor-based scanner serializes and deserializes the characters, supports various line protocols and provides character buffering and cycle steal transfer into the 3725 main storage. The scanner microcode is loaded from the MOSS diskette. Any scanner can support intermix protocols, asynchronous or synchronous communications, and half- or full-duplex transmission. BSC (EBCDIC or ASCII) and SDLC protocols are supported in normal mode, an operating mode similar to that of the 3705 Scanner Type 3. Asynchronous protocols with five to eight data bits and one or two stop bits are supported in character mode, similar to that of the 3705 Scanner Type 2. In character mode, BSC is also supported. Character mode is required for tributary addressing under EP or PEP. The scanner, in addition, supports procedures for automatic calling units and X.21 native, X.21 bis, X.20 bis, and X.25 protocols. The number of lines handled by the scanner depends on protocol and transmission speed.

Table 1 lists the line attachment base capabilities.

Line interface couplers (LICs) attach the communications facilities and terminals to the 3725. Five types of LICs are offered. The decision of which one to use depends on the physical interface required, the transmission speed to be supported, and number of lines to be connected. An LIC can attach from one to four full-duplex or half-duplex lines. Up to eight LICs can be installed per LAB, allowing up to 32 lines per LAB.

IBM 3725 Communication Controller

- Terminals can be attached to the 3725 either directly or via modems. Direct (modemless) attachment of terminals can be accomplished with LIC-1, LIC-3, LIC-4A, or LIC-4B and the corresponding direct attachment cable.

Table 2 shows the modem attachment and direct connection capabilities of the LICs.

The ICC also provides bit clocking when the attached external modem does not provide the clocking, as well as when direct attachment of the data terminal equipment is required. The ICC provides clocking for eight LICs (up to 32 lines) at 50, 110, 134.5, 200, 300, 600, and 1200 bps for operation with or without a modem. For direct attachment only (without a modem), the ICC provides clocking at speeds of 2400, 4800, 9600, 19.2K, and 56K bps for eight LICs.

Speeds up to 1200 bps are set at the time of control program generation and must match the speed of the terminal's internal clock. For speeds above 1200 bps, the terminal uses external clocking provided by the 3725; the speed is preset at 9600 bps at the factory but can be changed at installation to 2400, 4800, 19.2K, or 56K bps.

SOFTWARE

ADVANCED COMMUNICATIONS FUNCTION FOR NETWORK CONTROL PROGRAM (ACF/NCP) VERSION 2 FOR THE IBM 3725: ACF/NCP Version 2 is the basic operating system for the 3725 (either model, whether channel-attached or connected via communications link), and is supported by hosts operating under OS/VS1, OS/VS2 MVS, and DOS/VSE. The package is designed to support the enhanced operating features of the 3725, including new problem determination and error recording functions, improved system generation capabilities, storage for up to 1M bytes, and support for continued operation and controlled shutdown in failure situations. ACF/NCP Version 2 for the 3725 also supports Release 4 of the X.25 NCP Packet-Switching Interface licensed program. The planned availability of this software is the fourth quarter of 1983.

ACF/NCP Version 2 for the 3725 supports and communicates with the following host-resident programs: ACF/SSP Version 2 Release 1.1, ACF/TCAM Version 2 Release 4, ACF/VTAM Version 1 Release 3 (MVS only, with appropriate PTF), ACF/VTAM Version 2 (MVS, VS1, and VSE), EREP 1.5 (MVS/VS1), VSE/VM), and NPA-Host FDP Number 5798-CZR, NPDA Version 2, NCCF Release 2, and NLDM.

ACF/NCP Version 2 for the 3725 also supports and communicates with these controller-resident programs: ACF/NCP Version 2 for the IBM 3725, EP for the IBM 3725 PEP, NTO Release 2 for the IBM 3725, X.25 NPSI Release 4, and ACF/NCP for the IBM 3705.

EMULATION PROGRAM FOR THE IBM 3725 (EP/3725): EP/3725 supports 3725 operation in 270X Emulation Mode. EP/3725 provides the same problem determination aids, error recording functions, and other features as ACF/NCP on the 3725. It provides support for up to six channel adapters, and can run concurrently with ACF/NCP Version 2 in PEP operation mode. It incorporates the S.W.I.F.T. PRPQ (5799-AQT), which assists users of EP or PEP to link directly to the network of the Society for Worldwide

Interbank Financial Telecommunication. EP/3725 will be available in the fourth quarter of 1983.

EP/3725 is designed for users of VSE/AF Release 3, OS/VS1 Release 7, VM/SP 2.1, MVS/370, and MVS/XA. EP/3725 supports the following access methods: BTAM, BTAM-ES, BTAM-SP, ACF/TCAM, and RTAM.

ACF/NCP Version 2 for the 3725 and EP/3725 are generated using the ACF/System Support Programs (ACF/SSP) Version 2 Release 1.1 licensed program (5735-XXA), which was announced with the 3725. Designed to operate only in the IBM 3725, neither will operate in the IBM 3704 or 3705. Coexistence of 270X, 370X, and 3725 in a common host environment, however, is supported.

ACF/SYSTEM SUPPORT PROGRAMS (ACF/SSP) VERSION 2 RELEASE 1.1: ACF/SSP provides system generation and utility functions for users of ACF/NCP Version 2 for the 3705, ACF/NCP Version 2 on the IBM 3725, and EP on the IBM 3705 and EP/3725. ACF/SSP Version 2 Release 1.1 requires at least one locally attached IBM 3705-II or 3705-80 meeting the storage requirements of ACF/NCP Version 2 or EP for the 3705 or one locally attached 3725 meeting the storage requirements of ACF/NCP Version 2 or EP/3725 for the 3725. It is supported under VSE/AF Release 3, OS/VS1 Release 7, MVS/370, and MVS/XA with the appropriate VTAM or TCAM release.

X.25 NCP PACKET SWITCHING INTERFACE PROGRAM: X.25 NPSI provides users of ACF/NCP/VS the facility to use 3705-II or 3705-80 Communications Controllers to access public data networks complying with CCITT X.25 standards. The package is Telenet-certified. This program supports packet sequence numbering of up to 128, with packet length section of up to 4096 characters. It supports SNA network node interconnection and protocol conversion for non-SNA equipment. Within the program is a subset of X.29 allowing communications with asynchronous X.28 devices (TTY). It also supports the X.21 LICs.

NETWORK TERMINAL OPTION (NTO): NTO is a software product which is loaded in the 3705 and extends the SNA environment to include support for several common asynchronous terminals. These include the IBM 2740 and 2741 terminals on either switched or leased lines, and Teletype models 33/35 on switched lines only.

PRICING

All 3725 components can be acquired by purchase or month-to-month rental. The 3725 is offered under Plan D of IBM's Lease and Rental Agreement (LRA). This plan calls for an initial period of three months, during which IBM provides maintenance service 24 hours per day 7 days per week at no additional charge. After the initial period, maintenance service is available for an Annual Maintenance charge, which specifies a maximum number of hours of service per month. If the maximum is exceeded, an Additional Monthly Maintenance Charge Rate (AMMCR) is applied.

Purchase credit for rental payments made under LRA can be accrued up to a maximum of 65 percent of the total purchase price. ►

IBM 3725 Communication Controller

		<u>Monthly Rental</u>	<u>Purchase</u>	<u>Annual Maint.</u>	<u>AMMCR</u>
3725 Communication Controller					
	Model 1 (512K bytes, up to 96 lines)	\$3,260	\$75,000	\$2,556	\$213
	Model 2 (512K bytes, up to 24 lines)	2,630	60,500	2,280	190
	3726 Communication Controller Expansion (up to 160 lines; attaches to Model 1 only)	1,390	32,000	480	40
#1561	Channel Adapter	295	6,750	96	8
#4666	Internal Clock Control	65	1,500	24	2
	Line Attachment Bases—				
#4771	Type A	825	19,000	192	16
#4772	Type B	1,150	26,400	324	27
	Line Interface Couplers—				
#4911	Type 1	115	2,600	24	2
#4921	Type 2	130	3,000	24	2
#4931	Type 3	130	3,000	24	2
#4941	Type 4A	115	2,600	24	2
#4942	Type 4B	130	3,000	24	2
#7100	Storage Increment (256K bytes)	190	4,375	228	19
#8320	Two-Processor Switch	175	4,000	36	3
#3602	Line Increase Feature on 3726	370	8,500	168	14
3727 Operator Console Model 70—					
	Logic Unit	160	2,390	324	27
#3255	Display	130	3,000	0	0
#4655	Keyboard	175	4,000	0	0

Software

		<u>Initial Charge</u>		<u>Monthly Charges</u>			
		<u>Basic License</u>	<u>DSLO License</u>	<u>Basic License</u>	<u>DSLO License</u>	<u>Licensed Program Support</u>	<u>Additional Licensed Program Support</u>
5735-XX9	ACF/NCP Version 2 for IBM 3725	\$1,080	\$810	\$216	\$162	\$59	\$94
5735-XXB	EP/3725	1,200	900	225	169	35	56
5735-XXA	ACF/SSP Version 2 Release 1.1	420	315	76	57	22	35
5668-981	X.25 NPSI Release 4	700	525	223	166	36	58
5735-XX7	NTO for IBM 3725	600	450	171	127	11	18 ■

IBM 3725 Communication Controller

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IBM 3725 Communication Controller

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#3602	Line Increase Feature on 3726	370	8,500	168	14
	3727 Operator Console Model 70—				
	Logic Unit	160	2,390	324	27
#3255	Display	0	352	0	0
#4655	Keyboard	0	420	0	0

		<u>Initial Charge</u>		<u>Monthly Charges</u>			
<u>Software</u>		<u>Basic License</u>	<u>DSLO License</u>	<u>Basic License</u>	<u>DSLO License</u>	<u>Licensed Program Support</u>	<u>Additional Licensed Program Support</u>
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5735-XXA	ACF/SSP Version 2 Release 1.1	420	315	76	57	22	35
5688-981	X.25 NPSI Release 4	Contact vendor		207	154	33	53
5735-XX7	NTO for IBM 3725	Contact vendor for pricing					■

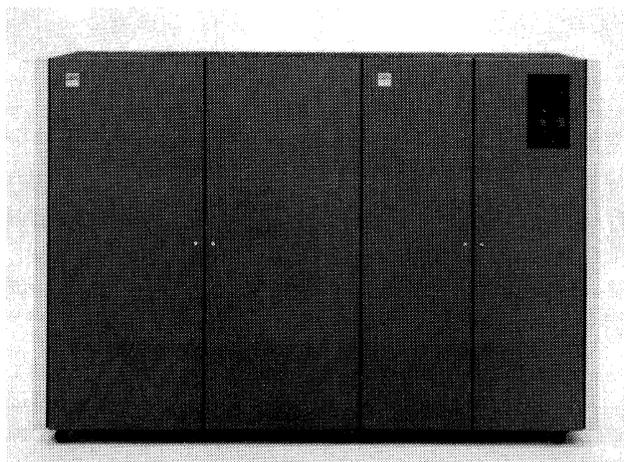
IBM 372X Communications Controllers

datapro **ANALYSIS**

UPDATE: *Since our last report on this product, IBM has enhanced the Maintenance and Operator Subsystem (MOSS) by endowing it with additional capabilities.*

IBM introduced the 3725 Communication Controller in March 1983 after a year of speculation that the new equipment would replace the IBM 3705. Though the 3725 never fully replaced the 3705-II, it did become the high-end model of the IBM communication controllers. In the third quarter of 1986, IBM stopped marketing the 3705-II and 3705-80 models.

The demise of the 3705 did not, however, represent the end of IBM's participation in the low-end communication controller market. In May 1986, the company introduced the 3720 Communication Controller, designed for small-to-medium sized organizations or for use in remote locations. The 3720 provides about one third of the 3725's performance and operates under control of software programs used on the 3725. A 3721 Expansion Unit extends the capability of the basic system.



The IBM 3725 Communication Controller is available in two models. Model 1 can support up to eight hosts, 256 lines, and 3M bytes of main storage. Model 2 can support up to four hosts, 80 lines, and 2048K bytes of storage.

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

CANADIAN ADDRESS: IBM Canada, 3500 Steeles Avenue, East Markham, Ontario L3R 2Z1. Telephone (416) 474-2111.

MODELS: 3720—Models 1, 2, 11, and 12; 3725—Models 1 and 2.

FUNCTION: Front-end or remote full-service communications processor.

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA; pre-SNA IBM communications optional.

OPERATING SOFTWARE: ACF/NCP Version 4; EP Release 3 or 4; PEP.

COMPETITION: NCR Comten; Amdahl; CCI.

PRICE: From \$26,000 to \$75,000.

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PRODUCT EVALUATION

IBM offers the 3720 in four models: Models 1 and 11, which concentrate up to 28 lines and directly attach to the host computer; and Models 2 and 12, which concentrate up to 16 lines and two IBM Token-Ring Networks, are used at remote locations and connect to the host via telephone lines. Unattended operation procedures and a remote-switched console enable 3270 operations to be controlled from a remote location. A 3721 expansion unit allows Models 1 and 2 to attach up to 60 lines, and Models 11 and 12 to attach up to 48 lines and three Token-Ring Networks. Models 1 and 2 are field upgradable to Models 11 and 12, respectively.

The 3720 comes with a standard 1M byte of storage, expandable to 2M bytes. A 10M-byte hard disk provides additional storage for support files used by Maintenance and Operator Subsystem (MOSS) facilities. IBM has upgraded MOSS to include automatic restarting of the scanner in case of failure and automatic analysis of Box Event Records (BERs). Speed of all internal clocks for synchronous terminals is now set in software through the MOSS operator console; previously, this action required hardware strap settings.

IBM 372X Communications Controllers

TABLE 1. LINE ATTACHMENT BASE CAPABILITIES

Line Attachment Base Type	Configuration	No. of Scanners	Type of Line Interface Coupler	Max. No. of LICs per 3725
Type A	Optional, 3725 or 3726	1	1 or 4A	8
Type B	Optional, 3725 or 3726	2	1, 2, 3, 4A, or 4B	8
Type C	Optional, 3725	1, 1 TRM, 1 ICC	1, 2, 3, 4A, or 4B	4 (4 Token-Ring Interface Couplers)
CLAB	Standard, 3725 only	1	1 or 4A	8

The 3720 offers some advantages over the 3725. Its controller supports four 56K bps or 64K bps full-duplex communications lines or five 48K bps lines. Only two lines are supported by 3725 scanners. IBM derived more efficient use of scanners by assigning 3720 Line Interface Coupler (LIC) weights to individual lines rather than to LICs. Total weight amounts to the sum of the weights of connected lines; scanner capacity is more efficiently allocated when there are mixes of different line types on the same scanner.

The 3725 controls data communications between terminals and one or more System/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 host processors or between two or more host processors. Terminal devices can be attached to the 3725 directly or through modems; host processors can be attached locally or remotely. Users can establish remote connection via common carrier or customer-owned communication facilities.

The two 3725 models serve large or small networks. Model 1, which accommodates the 3726 Communication Controller Expansion unit, supports a maximum of eight hosts, 256 lines, and 2048K bytes of storage. Model 2 supports up to four hosts, 80 lines, and 2048K bytes of storage.

The Central Control Unit (CCU) performs the control program that stays in main storage. This unit regulates the channel adapters, the communication scanner, and any data that is transferred between them. Besides housing the control program, the main storage provides the data space for the attached telecommunications lines, which are connected via cables to line interface couplers (LICs) in the 3725.

Software for the 3725 includes the Advanced Communications Function for Network Control Program (ACF/NCP) and the Emulation Program (EP/3725), which are designed only for the 3725 and cannot run on the 3705.

Users must install ACF/System Support Programs (ACF/SSPs), Version 2 or 3, on the host to generate the ACF/NCP, which must be downloaded to the 3725. ACF/SSP has a configuration control program that provides support for IBM's 3710 Network Controller. ACF/NCP for the 3725 can communicate with ACF/NCP for the IBM 3705. EP/3725 allows coexistence of 270X, 370X, and 3725 communications processors in a common host environment.

In April 1986, IBM released a 3725 attachment to the IBM Token-Ring Network, which includes a LAB Type C attachment base consisting of a Token-Ring multiplexer, a physical base for up to four Token-Ring couplers, a communication scanner, and a physical base for up to 16 line attachments. A Token-Ring Interface Coupler (TIC) with a microprocessor operating under control of resident microcode provides 3725 attachment to one network. Each TIC transmits and receives at 4M bps, and under control of ACF/NCP, provides logical link control functions that conform to IEEE 802.2 standards.

IBM also introduced several software programming upgrades and additions. The X.25 Network Control Program Packet Switching Interface (NPSI), Release 4.3 allows attachment of the 3725, as well as the 3720 controller, to X.25 networking services. This package supports data transmission from 1200 to 64K bps. It requires either ACF/NCP, Version 4, Release 2 or ACF/NCP, Version 4 Subset (MVS or VM) software, and ACF/System Support Program ACF/SSP, Version 3, Release 2.

An enhanced Version 3 of Release 1.1, Advanced Communications Function/VTAM allows the IBM VM operating system to have the same SNA communication capabilities as MVS. Changes in the ACF/Network Control Program (ACF/NCP), Version 4, Release 2 allow it to work with the 3725 controller.

IBM 372X Communications Controllers

TABLE 2. COMMUNICATIONS SUPPORTED BY 372X LINE INTERFACE COUPLERS

Line Interface Coupler (LIC)	Number of Lines per LIC	Type of Interfaces Supported	Transmission Speeds and Modes Supported
LIC1	4	RS-232-C/V.24, RS-366/V.25 (auto call), X.21 bis, X.20 bis	Synchronous (SDLC or BSC) transmission at 2400, 4800, 9600, or 19.2K bps via external modem or direct connection; asynchronous (start/stop) transmission at up to 1200 bps via direct connections.
LIC2	1	Wideband type for 8751, 8801, or 8803 service	Synchronous BSC transmission at up to 64K bps; synchronous (SDLC) transmission at up to 230.4K bps.
LIC3	1	CCITT V.35	Synchronous (SDLC or BSC) transmission at up to 256K bps via V.35 modem; synchronous transmission at up to 56K bps via direct connection.
LIC4A	4	CCITT X.21	For connection to switched or nonswitched packet networks. Synchronous (SDLC only) transmission at 2400, 4800, or 9600 bps via external modem or direct connection.
LIC4B	1	CCITT X.21	For switched packet networks, synchronous transmission via external modem at up to 48K bps; for nonswitched packet networks, synchronous transmission via external modem at up to 64K bps; for direct connection, synchronous transmission at up to 256K bps. SDLC only. (Not available in the USA.)

The major advantage of the 372X Communication Controllers is that they are IBM machines and, therefore, are compatible with IBM hosts and peripherals. The 3725 also offers users the benefit of a simplified machine structure, which consists of one scanner type, one channel adapter type, and five line interface coupler types. The simplified design includes features that serve multiple uses and facilitate configuration upgrades without necessitating the change of already installed machine features. For example, a single type of line attachment supports SDLC or BSC protocols at line speeds up to 19.2K bps plus asynchronous protocols at speeds up to 1200 bps.

The Network Management facility furnishes another advantage. The functionally separate Maintenance and Operator Subsystem (MOSS) uses an integral diskette drive and an attached IBM 3727 Operator Console. Software functions built into the 3725 versions of ACF/NCP and EP facilitate operation, maintenance, and problem determination. Two mechanisms, called Alert and Alarm, assist in problem determination. MOSS displays Alert messages when a problem occurs that affects normal operations and might require operator action. The Alert messages identify the cause of the error, give additional information on the resources affected by the error, and suggest possible actions to be taken by the operator. The Alarm gives an automatic first level of problem determination, informs the operator console of failure, and provides an entry point into the maintenance documentation for problem solution.

MARKET POSITION

In the marketplace, the 3725 did not represent a revolutionary breakthrough in communications processing, but served to challenge the competitors of the 3705. The IBM 3725 competitors include the Amdahl 4705E, 4705T, and 4725 and NCR Comten 3695 and 5660 communications processors. The IBM 3725 Model 1 competes against the Amdahl 4725, which can support the same number of attachable hosts as the Model 1 (eight), can support the same number of attachable full-duplex lines (256), and has the same maximum memory capacity of 3M bytes.

The NCR Comten 3695 surpasses the 3725 in the number of lines attachable (512 half or full duplex) and maximum main memory (4M bytes). The Comten 3690 and 3695 also support disk-based mass storage, a capability not offered with the 3725. The Comten 5660 provides 16M bytes of main memory and can support up to 1,024 lines. The Comten 5660 is a high-end processor that will support up to eight IBM or compatible mainframes and up to 1,024 communication lines. This product competes with the 3725, while the 3720 is more directly competitive with NCR Comten's 5620 product. Thus far, IBM, while enhancing its 3725, has given no indication that it plans to offer a processor with the capabilities of the Comten 5660.

The 3720 is the low-end product in IBM's communication controller family, which includes the older 3705 and the 3725. It is designed for small-to-medium sized organizations that do not need the power of the 3725, or it can be used at remote locations.

IBM 372X Communications Controllers

Traditionally, IBM has focused its major marketing efforts on large organizations with far-ranging data processing requirements. The 3720 represents a step in a different direction, however, as in performance and price the product is clearly aimed at the smaller organization. It seems likely that with the smaller and less expensive 3720, IBM is making a bid for more business in markets now dominated by Digital Equipment Corporation.

The company continues to expand its communications offerings to include far more flexible network management and control features, which are critical in today's networks. In the past, IBM's SNA network has been criticized as being cumbersome to manage, and other plug-compatible processor vendors have capitalized on this weakness by selling systems that offered far greater configuration and planning tools. The new network control and diagnostic enhancements will be extremely attractive to IBM's huge installed base of customers.

SPECIFICATIONS

MODELS: 3720—Models 1, 2, 11, and 12; 3725—Models 1 and 2.

DATE OF ANNOUNCEMENT: IBM 3725—March 1983, IBM 3720—1986.

DATE OF FIRST DELIVERY: IBM 3725—1983, IBM 3720—1986.

SERVICED BY: International Business Machines Corporation.

MODELS

The 3720 is the low-end model in the 372X line of communication controllers. It provides about one third the performance capability of the 3725 and operates under control of software programs used on the 3725. It comes in four models: Model 1, Model 2, Model 11, and Model 12. Models 1 and 11 attach directly to the host, while Models 2 and 12 operate in a remote environment. They attach to the host through telephone lines. Control of these models from remote control centers occurs through the use of a remote switched console, unattended operation facilities, and a Remote Support Facility.

IBM offers two models of the 3725: Model 1 and Model 2. Users can field upgrade Model 2 to a Model 1. The 3725 controls data communications between directly attached, modem-attached, or IBM Token-Ring Network-attached terminal devices and one or more directly or remotely connected IBM host processors, including System/370 (except Models 115 and 125), 303X, 308X, 3090, 43XX, or 9370. The 3725 can also control communications between two host processors. Users can achieve remote connections through common carrier-provided or customer-owned communication facilities.

Configuration

Model 3720: The 3720 concentrates communication lines and provides networking functions, such as monitoring

errors and detecting system problems. The basic 3720 includes a central control unit, 1M byte of main storage, a 10M-byte disk, a diskette drive, the Maintenance and Operator Subsystem (MOSS), and one communication scanner including internal clock controls. MOSS allows the automatic analysis of Box Event Records (BERs), thus facilitating problem determination functions. Through MOSS, a console operator can perform local and remote controller diagnostics from a central site. In 1988, IBM enhanced MOSS facilities with the following functions:

- transfer of NCP load modules to the 3720 and their loading from disk,
- automatic load and dump of NCP,
- online retrieval and transmission of dump data to the host, and
- status display.

All 3720 units can also be equipped with an IBM Remote Support Facility (RSF) and configured for unattended operation. The 3720's management console is password protected, and the controller can use the security and audit features resident on host hardware or software.

Options on the 3720 Model 1 or 2 include an additional 1M byte of storage and up to seven line interface couplers (LICs). Models 11 or 12 can contain an additional 1M byte of storage, up to four LICs, and up to two Type 1 Token-Ring Interface Couplers (TICs). Models 1 and 2 are field upgradable to Models 11 and 12, respectively.

The two-processor switch provides a second channel interface that can connect the first or the second channel adapter to a Multiprocessor System (MP) or to two channels of the same or different processors with nonsimultaneous communications. Models 1 and 11 can each support two of the switches. This option is not available on Models 2 and 12.

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A 3721 Expansion Unit, installed on the top of a 3720, allows attachment of up to 32 additional lines. The 3721 Model 1 has one scanner that controls up to eight LICs, and the 3721 Model 2 has two scanners, each controlling up to four LICs. One model of the 3721 cannot be converted to another. The 3721 can operate over common carrier-provided or equivalent customer-owned communication facilities. It attaches the same DCEs as the 3720. The 3721 does not support attachment to the Token-Ring Network. Users can upgrade the base 3721 by adding Line Interface Couplers, Types 1, 2, 3, 4A, and 4B.

Any IBM 3101 Model 23 or compatible terminal can serve as a 3720 system console, including an IBM PC running the IBM 3101 Emulation Program. One remote operator console can manage multiple 3720s via attachment to a switched communications line and 1200 bps, full-duplex modems that conform to CCITT V.22 Recommendations. Customers running EP, but not NCP/PEP, must provide a local console to receive error alarms normally sent through the VTAM operator console. Customers using the IBM Remote Support Facility (RSF) must have an IBM 5841 synchronous modem at the RSF port.

CONNECTION TO HOST COMPUTER: The same type of channel adapter (#1561) attaches either the 3720 Model 1 or 3720 Model 11 to a host channel of an IBM 4341, 4361, 4381, 303X, 308X, or 3090 processor. It attaches to a byte or block multiplexer or selector channels. With the exception of the 303X, the adapters also attach to the IBM 3044 Fiber Optic Channel Extender Link that allows placement of a 3720 Model 1 or 11 up to 6,666 feet (2 kilometers) from a host running NCP. Models 1 and 11 also come with one or two optional Two-Processor Switches (TPSs) that allow a channel adapter to attach to two processor channels with nonsimultaneous communication.

Model 3725: The 3725 Model 1 base frame accommodates up to 96 lines. With the 3726 Communication Controller Expansion, which is offered only with Model 1, an additional 160 lines can be attached for a total of 256 lines, full duplex or half duplex. The 3725 Model 2 accommodates up to 80 full-duplex or half-duplex lines.

The number of operable lines, however, can be fewer than the number physically attachable. The maximum number of lines that operate concurrently depends on line speed, line protocols, message length, control program, and application work load.

The 3725 base machine (for Model 1 or 2) contains:

- Central Control Unit (CCU), that executes instructions to control the communication scanners and channel adapters. It runs under ACF/NCP V2, V3, or V4, EP/3725, or both in PEP mode.

- Main storage of 512K bytes, expandable in both models by four additional 256K increments. Main storage houses a 3725 Network Control Program (i.e., NCP, EP, or PEP) and other programs loaded from the host processor and provides buffers for data exchanged with the channel adapters and lines.
- Maintenance and Operator Subsystem (MOSS), which provides IPL and utility procedures for the 3725 (Model 1) operator. An independent processor with microcode, a diskette drive, and an attachment for an IBM 3727 operator console are included. The MOSS, with the attached 3727 console, offers network management functions, error logging, machine status display, CCU services, scanner services, line services, and diagnostics.
- Transmission SubSystem (TSS), which physically connects the 3725 to communications facilities. It consists of Line Attachment Bases (LABs) with microprocessor-based scanners, Channel and Line Attachment Bases, Line Interface Couplers (LICs), and optional Internal Clock Controls, Type 2 (ICC-2s). The communication scanners serialize and deserialize the characters, support various line protocols, and offer character buffering and cycle-steal transfer in the main storage of the 3725. Integrated modems are not available for the 3725 or 3726.

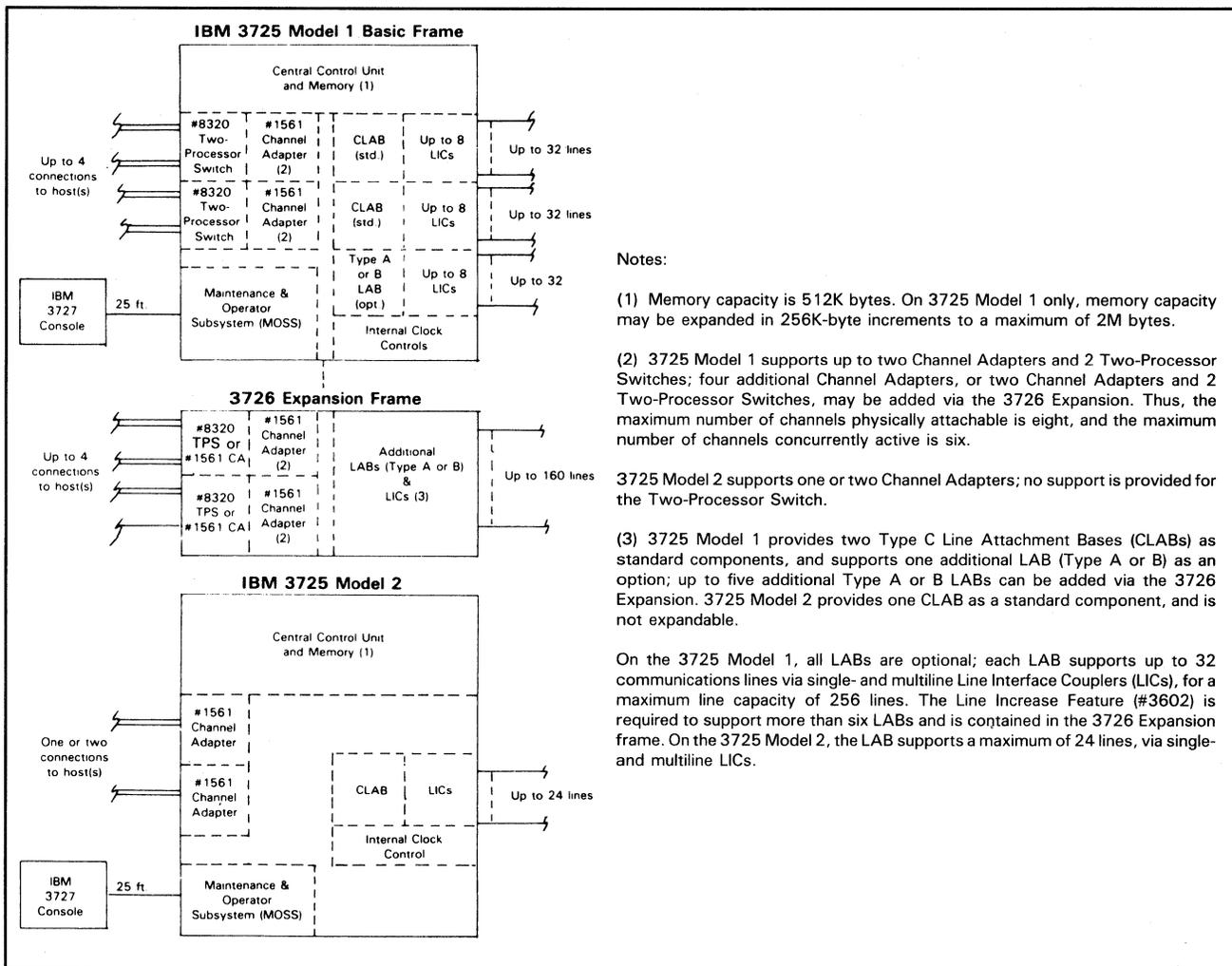
In the 3725 Model 1, two Type C LABs are standard, and a third LAB (Type A or B) is an option. Each CLAB has one communications scanner and can attach up to 32 full- or half-duplex communications lines by means of optional (separately priced) LICs. The ICC-2s are also optional for Model 1.

The 3725 Model 2 is field upgradable to a Model 1. It includes one CLAB as standard, which can support up to 80 full- or half-duplex lines. An additional CLAB and one LAB Type A, B, or C can be added for installation in LAB positions 2 and 3, respectively. Model 2 also includes one ICC-2 as standard, but can support two more ICC features.

- Token-Ring Subsystem (TRSS), which supplies the physical connection to an IBM Token-Ring Network. Line and Token-Ring Attachment Bases (LABs) with Token-Ring multiplexer and Token-Ring Interface Couplers (TICs) make up this subsystem.
- Channel Adapters (CAs), providing physical attachment to host channels, are optional for both Model 1, an optional Two-Processor Channel Adapter allows a channel adapter to connect to two channels for nonsimultaneous communication. Model 1 has a physical channel adapter and two TPSs, enabling attachment, and two to operate.

For further expansion, users can attach a Communication Controller Expansion.

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Notes:

(1) Memory capacity is 512K bytes. On 3725 Model 1 only, memory capacity may be expanded in 256K-byte increments to a maximum of 2M bytes.

(2) 3725 Model 1 supports up to two Channel Adapters and 2 Two-Processor Switches; four additional Channel Adapters, or two Channel Adapters and 2 Two-Processor Switches, may be added via the 3726 Expansion. Thus, the maximum number of channels physically attachable is eight, and the maximum number of channels concurrently active is six.

3725 Model 2 supports one or two Channel Adapters; no support is provided for the Two-Processor Switch.

(3) 3725 Model 1 provides two Type C Line Attachment Bases (CLABs) as standard components, and supports one additional LAB (Type A or B) as an option; up to five additional Type A or B LABs can be added via the 3726 Expansion. 3725 Model 2 provides one CLAB as a standard component, and is not expandable.

On the 3725 Model 1, all LABs are optional; each LAB supports up to 32 communications lines via single- and multiline Line Interface Couplers (LICs), for a maximum line capacity of 256 lines. The Line Increase Feature (#3602) is required to support more than six LABs and is contained in the 3726 Expansion frame. On the 3725 Model 2, the LAB supports a maximum of 24 lines, via single- and multiline LICs.

Figure 1. IBM 3725 basic configuration.

supports up to an additional 160 communications lines. The 3726 attaches only to a 3725 Model 1 and is not supported by the 3725 Model 2. With the optional 3726 Communication Controller Expansion, four additional Channel Adapters (CAs) without Two-Processor Switches, or two CAs each with TPSs, can be added, making a total of eight hosts to be attached, six operating concurrently. If channel attached, the 3725 requires a control unit position on the system channel.

A basic Model 2 provides a physical base for four channel adapters and no TPS. Model 2 attaches to a maximum of four hosts.

The 3725 can function as a remote communication controller without channel connection to a host processor. In this configuration, called "link attached," the 3725 is connected by one or more communication links to channel-attached 3705s or 3725s. The controller can perform the networking functions whether link attached or channel-attached.

The 3725, Model 1 or 2, requires a primary 3727 Operator Console for installation, operation, and maintenance. A second 3727 can act as an alternate. Only one console is active at a time. The user selects the active console by a switch on the 3725 control panel. The console can be located a maximum distance of 25 feet (7.5 meters) from the 3725, and there should not be a wall or door between the console and the attached 3725. With the addition of a 7427 Console Switching Unit, up to four 3725s can share a single primary operator console. An alternate console can also be configured and switched among any six controllers.

The configuration diagram on Page C13-491-304 of this report shows the relationships among the 3725 components and depicts the 3726 expansion capabilities.

CONNECTION TO HOST COMPUTER: A channel adapter (1561) provides the physical and logical interface for either the 3725 Model 1 or Model 2 to a host channel of an IBM S/370 (except Models 115 and 125), 303X,

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308X, 3090, 43XX, 9370 host processors, or between two host processors. The channel adapter attaches to a byte multiplexer, block multiplexer, or selector channel. The 3725 Model 1 supports physical attachment of up to eight host channels; Model 2 supports up to four.

In Model 1 only, each Channel Adapter (CA) can be equipped with a Two-Processor Switch (TPS), which allows the CA to be connected to two processor channels instead of only one. The channels can belong to the same or different processors. Data cannot be transmitted simultaneously on more than one channel. Manual switches on the 3725 control panel allow a user to enable each of the active channel interfaces. If all interfaces are enabled, the processors are responsible for resolving any contention because only one interface can transfer data at a time.

The channel adapters must occupy contiguous positions beginning with Position 1. CA Positions 1 and 2 are in the 3725 basic frame; CA Positions 3 through 6 are in the 3726 Expansion frame. Both CAs must, therefore, be installed in the 3725 before one can be installed in the 3726. When TPS is installed, it is placed in the first available position. The same channel attachment cable groups (3290 and 1178) serve Model 1 or 2.

TRANSMISSION SPECIFICATIONS

Model 3720: The internal clock supports both "Category 1" and "Category 2" transmission rates. Software from the MOSS operator console sets the internal clocks. Speeds are set by line, not by LIC as in the 3725. The SSP program product determines speeds for other types of attachments.

Category 1 rates, set by NCP or EP, are 50, 110, 134.5, 200, 300, 600, and 1200 bps for start/stop or synchronous operation and 75, 100, 2400, 4800, 9600, and 19.2K bps for start/stop operation only. Category 2 rates, set via the operator console, are 2400, 4800, 9600, 19.2K, 38.4K, 55,885, and 245,760 bps for directly attached synchronous terminals. Directly attached and modem-attached terminals operate in half- or full-duplex modes.

The 3720 supports seven LICs per Model 1 or 2 and will support up to four LICs on a Model 11 or 12. Please refer to Table 2 for modem attachment and direct connection capabilities of the LICs. The Token-Ring Interface Coupler (TIC) Type 1 operates under the control of a resident microcode that controls the Token-Ring Network under standard protocols. The TIC operates only under the control of ACF/NCP. The 3720 Models 11 and 12 can each support two TICs, which are not available on Models 1 and 2.

IBM modems that can be used with the 3720 include the following: 3833 Model 1 (2400 bps), 3834 Model 1 (4800 bps), 3863 Models 1/2 (2400 bps), 3864 Models 1/2 (4800

bps), 3865 Models 1/2 (9600 bps), 3868 Model 1 (2400 bps), 3868 Model 2 (4800 bps), 3868 Models 3/4 (9600 bps), 5811 Models 10/18 (2400—19.2K bps), 5841 (1200 bps), 5865 (9600 bps), 5866 (14.4K bps), 5868 Model 51 (9600 bps), and 5868 Model 61 (14.4K bps).

Model 3725: IBM offers four types of Line Attachment Bases (LABs)—LAB Type A, LAB Type B, LAB Type C, and Communication and Line Attachment Base (CLAB). LABs Type A and CLABs offer a single communication scanner, while LABs Type B provide two communication scanners. LABs Type C have one communication scanner and interface clock control, as well as one Token-Ring multiplexer. In the 3725 Model 1, the base machine includes two CLABs as standard components; each has one communication scanner. Users can install one additional LAB, Type A, B, or C. If further expansion is needed, up to five additional LABs (Type A, B, or C) can be installed in the 3726 Expansion.

The 3725 Model 2 supports one CLAB, which is a standard component, but two additional LABs can be added.

The microprocessor-based scanner serializes and deserializes the characters, supports various line protocols, and provides character buffering and cycle-steal transfer into the 3725 main storage. The scanner microcode is loaded from the MOSS diskette. Any scanner can support intermix protocols, asynchronous or synchronous communications, and half- or full-duplex transmission. The device supports BSC, EBCDIC, ASCII, and SDLC protocols in normal or block mode, an operating mode similar to that of the 3705 Scanner Type 3. Asynchronous protocols with five to eight data bits and one or two stop bits are supported in "character mode" with EP/3725 R1 and ACF/NCP V2, similar to that of the 3705 Scanner Type 2. BSC is also supported in character mode. They can also be supported in "enhanced mode" with EP/3725 R2 and ACF/NCP V3 or V4. Protocols are also supported in normal mode at speeds up to 64K bps with EP/3725 R2. The scanner also supports procedures for automatic calling units and X.21 native, X.21 bis, X.20 bis, and X.25 protocols. The number of lines handled by the scanner depends on protocol and transmission speed.

Table 1 lists the Line Attachment Base (LAB) capabilities.

Line Interface Couplers (LICs) furnish the necessary functions to attach the external communications facilities and Data Terminal Equipment (DTE). The DTEs are attached directly to the 3725 or through DCEs. IBM offers five types of LICs, and the decision on which one to use depends on the physical interface required, the transmission speed to be supported, and number of lines to be connected. Up to four LICs can be attached on a line and Token-Ring Attachment Base (LAB Type C) for a maximum of 16 lines per LAB Type C. Up to eight LICs can be installed on LABs Type A or B and CLABs up to a maximum of 32 lines per LAB.

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Terminals can be attached to the 3725 either directly or via modems. Direct (modemless) attachment of terminals can be accomplished with LIC-1, LIC-3, LIC-4A, or LIC-4B and the corresponding direct attachment cable.

Table 2 shows the modem attachment and direct connection capabilities of the LICs.

The Token-Ring Subsystem permits the 372X Controllers to attach to IBM Token-Ring Networks. The subsystem consists of Line and Token-Ring Attachment Bases (LABs) and Token-Ring Interface Couplers (TICs). Only LAB Type C is available, which offers one Token-Ring Multiplexer (TRM) and up to four Token-Ring Interface Couplers (TICs). LAB Type C also furnishes a communications scanner, internal clock control, and up to four LICs. The TRM provides the adaptation between the 3725 and the TICs. The Token-Ring Interface Coupler Type 1 consists of a set of components and a microprocessor that runs under the control of a resident microcode, which controls the IBM Token-Ring Network via standard protocols. The TIC operates only under the control of the Network Control Program (NCP).

The Internal Clock Control, Type 2 (ICC-2) provides bit clocking when the attached external modem does not provide the clocking, as well as when direct attachment of the data terminal equipment is required. The ICC-2 provides clocking for eight LICs (up to 32 lines) at 50, 110, 134.5, 200, 300, 600, and 1200 bps for synchronous or asynchronous operation with or without a DCE direct attachment, and at speeds of 2400, 4800, 9600, 19K, and 56K bps for operation without a DCE direct attachment. Up to 1200 bps, the speed is set at the time of control program generation and has to match that of the internal clock or the attached DTE. Above 1200 bps, the DTE has to use external clocking that is provided by the 3725, and the speed is set by hardware in the 3725. Business machine clocking to the 3725 occurs at data rates of 50, 110, 134.5, 200, 300, 600, and 1200 bps for asynchronous or synchronous operation with or without a DCE direct attachment.

For externally clocked DTEs, bit clocking is provided to directly attached DTEs at data rates of 2400, 4800, 9600, 19.2K, 56K, and 245K bps for synchronous operation without a DCE; data rates of 2400, 4800, 9600, and 19.2K bps are provided for start/stop operation without a DCE. The speed is set to 9600 bps at the factory, and when installed, it can be changed by the CE on a per-LIC basis.

IBM modems that can be used with the 3725 include the following: 3833 Model 1 (2400 bps), 3834 Model 1 (4800 bps), 3863 Models 1/2 (2400 bps), 3864 Models 1/2 (4800 bps), 3865 Models 1/2 (9600 bps), 3868 Model 1 (2400 bps), 3868 Model 2 (4800 bps), 3868 Models 3/4 (9600 bps), 3872 (2400 bps), 5811 Models 10/18 (2400—19.2K bps), 5841 (1200 bps), 5865 (9600 bps), 5866 (14.4K bps), 5868 Model 51 (9600 bps), and 5868 Model 61 (14.4K bps).

SOFTWARE

ADVANCED COMMUNICATIONS FUNCTION FOR NETWORK CONTROL PROGRAM (ACF/NCP) VERSION 3 OR 4 RELEASE 2 FOR THE IBM 372X CONTROLLERS: ACF/NCP for the 372X Controllers is the basic operating system for either the 3725 model and the 3720 model, whether channel attached or connected via communications links. ACF/NCP is supported by hosts operating under OS/VS1, OS/VS2, MVS, and DOS/VSE, and is designed to support the enhanced operating features of the 3725, including its problem determination, error recording, and system generation capabilities; storage for up to 3M bytes (3725 model); and to support continued operation and controlled shutdown in failure situations. ACF/NCP Version 4 Release 2 also offers improved modem support and the ability to attach an IBM 3725 to IBM's Token-Ring Network via the IBM Token-Ring Subsystem. ACF/NCP for the 3725 also supports Release 4 of the X.25 NCP Packet-Switching Interface licensed program.

ACF/NCP for the 3725 supports and communicates with the following host-resident programs: ACF/SSP Version 2 and Version 3 Release 2; ACF/TCAM Version 2 Release 4; ACF/VTAM Version 1 Release 3 (MVS only, with appropriate PTF); ACF/VTAM Version 2 (MVS, VS1, and VSE); EREP 1.5 (MVS/VS1, VSE/VM); and NPA-Host FDP Number 5798-CZR, NPDA Version 2, NCCF Version 2, and NLDM Release 2.

ACF/NCP for the 3725 also supports and communicates with these controller-resident programs: ACF/NCP for the IBM 372X Controllers, EP for the IBM 372X Controllers, PEP, NTO Release 2 for the IBM 3725, X.25 NPSI Release 4, and ACF/NCP for the IBM 3705.

ACF/NCP Version 3 for the 3725 supports all the features of Version 2, and also supports SNA Network Interconnection (network-to-network SNA sessions) and Modulo 128 SDLC (128 frames before acknowledgment). ACF/NCP Version 3 is supported only on controllers attached to hosts running MVS/370 or MVS/XA.

ACF/NCP Version 3 will support the VHSA RPQs (8J5080, 8J5081, 8J5082) and the IBM 3725 Model 2 storage expansion up to two megabytes after upgrading the existing machines.

ACF/NCP Version 4 Subset functions under MVS/370 and MVS/Extended Architecture (XA) operating on the 3720 Controller. It provides the same functions and facilities of ACF/NCP Version 4, except the SNA Network Interconnection. The ACF/NCP Version 4 Subset offers support for up to 28 communication lines on one communication scanner, as well as support of up to two channel adapters. ACF/NCP Version 4 Subset also supports these programs: Network Routing Facility (NRF) Release 3 operating on the 3720 with ACF/NCP Version 4 Subset with

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MVS; and X.25 Network Packet Switching Interface (NPSI) Release 4.3 with ACF/NCP Version 4 Subset with MVS.

ACF/NCP Version 4 Subset accommodates VSE users operating the 3720 Communications Controller. It offers the functions and facilities of ACF/NCP Version 4, except SNA Network Interconnection. It can support up to 28 communication lines on one communication scanner and offers support of up to two channel adapters.

The 3720 supports the ACF/TCAM, Version 2, Release 4; BTAM/SP, BTAM/ES, RTAM; and ACF/VTAM Access Methods. TCAM, with the MSNF feature, supports 3720 terminal-to-terminal sessions in an NCP environment, but all SNA logical units attached to the controller must be activated via a host processor running VTAM. TCAM does not support load, dump, or SNA resource ownership of the 3720. When the 3720 is channel attached to a TCAM host, a TCAM Version 2, Release 4 channel contact facility establishes the necessary communications path.

In addition to the aforementioned programs, the 3720 will operate with the ACF/SSP, Version 3, Release 2 (MVS, VM, VSE) support products.

EMULATION PROGRAM FOR THE IBM 372X CONTROLLERS (EP RELEASE 4): EP Release 4 supports 372X operation in 270X Emulation Mode. EP Release 4 provides the same problem determination aids, error recording functions, and other features as ACF/NCP on the 372X. It can support up to six channel adapters and can run concurrently with ACF/NCP Version 2 in PEP operation mode. EP/3725 Release 2 supports the new 256K BSC data rate, and is necessary for PEP operations alongside ACF/NCP Version 3. It incorporates the S.W.I.F.T. PRPQ (5799-AQT), which assists users of EP or PEP to link directly to the network of the Society for Worldwide Interbank Financial Telecommunications.

EP is designed for users of VSE/AF Release 3, OS/VS1 Release 7, VM/SP 2.1, MVS/370, and MVS/XA. It supports the following access methods: BTAM, BTAM-ES, BTAM-SP, ACF/TCAM, and RTAM.

ACF/NCP for the 3725 and EP/3725 are generated using the ACF/System Support Programs (ACF/SSP) Version 2 Release 1.1 or 2 licensed program (5735-XXA), which was announced with the 3725. Because both are designed to operate only in the IBM 372X, neither will operate in the IBM 3704 or 3705. Coexistence of 270X, 370X, and 372X in a common host environment, however, is supported.

ACF/SYSTEM SUPPORT PROGRAMS (ACF/SSP) VERSION 2 AND VERSION 3 RELEASE 2: ACF/SSP provides system generation and utility functions for users of ACF/NCP for the 3705; ACF/NCP for the IBM 3720; ACF/NCP for the IBM 3725; and EP on the IBM 3705,

EP/3720, and EP/3725. ACF/SSP Version 2 Release 1.1 or 2 requires at least one locally attached IBM 3705-II or 3705-80 meeting the storage requirements of ACF/NCP or EP for the 3705 or one locally attached 3725 meeting the storage requirements of ACF/NCP or EP/3725 for the 3725. It is supported under VSE/AF Release 3, OS/VS1 Release 7, MVS/370, and MVS/XA with the appropriate VTAM or TCAM release.

ACF/SSP Version 3 and ACF/NCP Version 3 or ACF/NCP Version 4 and/or EP/3725 Release 2 are required to support the additional start/stop data rates provided by Internal Clock Control Type 2. Users must upgrade existing machines to support this capability. ACF/NCP Version 4 or ACF/NCP Version 3 with appropriate PTFs and/or EP/3725 Release 2 with appropriate PTFs is needed to support more than two channel adapters in the IBM 3725 Model 2.

ACF/SSP Version 2 Release 2 supports all the features of Version 2 Release 1.1, along with SNA Network Interconnection and Modulo 128 SDLC. ACF/SSP Version 2 Release 2 is necessary only to support ACF/NCP Version 3. This version can run only on hosts running MVS/370 and MVS/XA.

X.25 NCP PACKET-SWITCHING INTERFACE PROGRAM: X.25 NPSI provides users of ACF/NCP/VS with the capability to attach the 372X Communication Controller to data transmission services that support interfaces complying with CCITT X.25 standards. The package is Telenet certified. This program supports packet sequence numbering of up to 128, with a packet length section of up to 4,096 characters. It supports SNA network node interconnection and protocol conversion for non-SNA equipment. Within the program, a subset of X.29 allows communications with asynchronous X.28 devices (TTY). It also supports the X.21 LICs. X.25 NPSI Release 4.1 for VM/SP will support ACF/NCP Version 3 for the IBM 3725.

NON-SNA INTERCONNECTION RELEASE 4 (VSE, MVS): This program permits BSC communications (RJE terminals and host-to-host) to travel on the SDLC lines of the SNA network, which reduces the communication line costs. The 3725 is supported by Non-SNA Interconnection Release 4 with ACF/NCP V4R1 (MVS/370, MVS/XA, VSE) and by ACF/NCP V4R2 in an MVS/370 or MVS/XA environment. The 3720 is also supported in these environments, as well as in an ACF/NCP V4 subset (VSE) environment.

NETWORK TERMINAL OPTION (NTO): NTO is a software product that extends the capabilities of ACF/NCP in the 372X Communications Controllers to permit SNA support for a chosen group of non-SNA devices, which include the IBM 2740 and 2741 terminals on either switched or leased lines, and Teletype Models 33/35 on switched lines only. This option is needed when the user

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chooses the NTO licensed program to operate in conjunction with ACF/NCP Version 4 Release 2. As well as the other functions contained in earlier releases, the NTO Release 4 program provides generation under NCP/Emulation Program Definition Facility, dial-out capability, performance enhancements, and Network Management Vector Transport (NMVT) processing.

NETWORK EXTENSION FACILITY (NEF) VERSION 2: NEF Version 2 is a programming RPQ that extends the ACF/NCP Version 3 capabilities in an IBM 3725 Controller to Airline Line Control networks communicating with Transaction Processing Facility (TPF) Version 2 Release 3 applications. By offering enhanced attachment capability for Airline Line Control devices to an SNA network and transport of TPF Version 2 transactions through the network, NEF Version 2 facilitates the integration of the Airline Line Control network into the overall SNA network environment.

Software products operating only on 3720 Model 1 include the following:

- Emulation Program, Release 3 for MVS and VSE (10/86).
- Emulation Program, Release 4 for MVS and VSE (10/86).

On 3720 Models 11 and 12, ACF/NCP for MVS and VM will be provided through a current level of ACF/NCP, Version 4 and the ACF/NCP, Version 4 Subset.

The 3720 controllers support the following Communication Management software:

- NetView, Release 1 (MVS, MVS/XA, VM)
- NCCF, Version 2, Release 2 (VSE)
- NPDA, Version 3, Release 2 for VSE with 3720 PTF (3720 PTF—10/86)
- NPDA, Version 3 (except NPDA, Version 3, Release 2 for VSE with 3720 PTF)
- NRF, Release 2 (MVS) (10/86)
- NRF, Release 3 (MVS) (10/86)
- NPSI Release 4.3 (MVS supporting ACF/NCP, Version 4, Release 2—12/86; supporting ACF/NCP Version 4 Subset—6/87)
- NPSI Release 4.3 (VM supporting ACF/NCP, Version 4, Release 2—3/87; supporting ACF/NCP Version 4 Subset—6/87)
- X.25 SNA Interconnection, Release 2 PRPQ 7L1000 (4/87)

PRICING

Users can acquire all 372X components by purchase or month-to-month rental.

EQUIPMENT PRICES

	Rental (\$)	Purchase (\$)
3720 Communication Controller		
Model 1	2,865	36,500
Model 2 (Communication Controller, remote attach., up to 16 lines)	2,040	26,000
Model 11 (Comm. controller, direct attach., up to 28 lines)	3,335	42,500
Model 12 (Comm. controller, remote attach., up to 16 lines)	2,510	32,000
1561 Second Channel Adapter	530	6,750
4911, 4921, 4931, 4941, and 4942 LIC Types 1, 2, 3, 4A, and 4B	196	2,500
4991 Token Ring Int. CPLR Type 1	177	3,000
7100 Storage Increment 1MB	471	6,000
8320 Two-Processor Switch	314	4,000
3725 Communication Controller		
Model 1	4,420	75,000
Model 2 (Communication Controller, remote attach., up to 16 lines)	3,330	60,500
1561 Channel Adapter	399	6,750
4666 Internal Clock Control	85	1,500
4667 ICC-2	85	1,500
4771 LAB Type A	1,115	19,000
4772 LAB Type B	1,560	26,400

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	<u>Rental</u> <u>(\$)</u>	<u>Purchase</u> <u>(\$)</u>
4773 CLAB LAB Type A	1,175	16,000
4774 LAB Type C	1,400	23,760
4911 LIC Type 1	155	2,600
4921 LIC Type 2	174	3,000
4931 LIC Type 3	174	3,000
4941 LIC Type 4A	155	2,600
4942 LIC Type 4B	174	3,000
4991 TIC 1	177	3,000
4992 TIC 1	161	3,000
7100 256K Storage Increment	257	4,375
7101 3MB Storage Capacity	159	2,700
8320 2-Processor Switch	237	4,000
3726 Communication Controller Extension	1,800	32,000 <input type="checkbox"/>

IBM 3745 Communication Controller

Product Enhancement

Analysis

As part of its announcement blitz on September 5, 1990, IBM included enhancements to the 3745 controller.

Buffer Chaining Channel Adapter (BCCA)

This new feature for all 3745 channel-attached models offers users a 25 percent improvement in interactive processing and up to 100 percent improvement in batch processing. The performance improvements delivered by BCCA enable the 3745 to support a considerable improvement in data throughput, which translates into support for more stations and applications.

Support of NCP Load Modules

All 3745 modules can now support up to 6 megabytes of Network Control Program (NCP) Load Modules. These larger NCP load modules support the attachment of more stations per node, particularly in X.25 and LAN environments. The support of

larger network configurations reduces the number of controllers required in a network, thereby simplifying network management and operations.

Memory Increase

Models 130, 150, and 170 support 8 megabytes of memory, which enables customers to use the larger NCP load modules and to run additional networking programs. The 3745 Model 150 can now support thirty-two 9600 bps lines, using the full scanner capacity.

ESCON Support

IBM offers integrated support for the new Enterprise Systems Connection Architecture (ESCON) I/O channel as part of the 3745 extensions. When users require ESCON I/O channel connectivity, they can use the IBM ESCON Converter Model 1 in conjunction with the 3745 parallel channel. ■

—By Barbara Callahan
Associate Editor

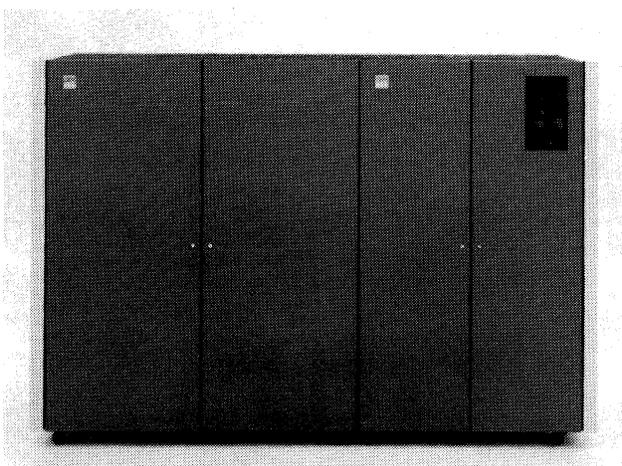
IBM 372X Communication Controllers

MANAGEMENT SUMMARY

UPDATE: This report is being updated to reflect any changes that have occurred since the last update. IBM added the 3720 to its 372X communication controller product line. Enhancements have been added to both the 3720 and 3725 and these are discussed in this report. Pricing changes and the 1986 Network Users Survey ratings for the IBM 3725 Communications Processors are also included in this report.

The IBM 3725 Communication Controller was first introduced in March 1983 after a year of speculation that it would be replacing the IBM 3705. Although it never fully replaced the 3705-II, it did become the high end model of the IBM communication controllers. Third quarter 1986, saw the end of the 3705, as the company stopped marketing the 3705-II or 3705-80 models. Although the IBM 3705 is no longer being marketed, IBM has not deserted the low-end of its communication controller line. In May 1986, the company introduced the 3720 Communication Controller. It is designed for small- to medium-sized organizations that do not need a large communication controller, or for use in remote locations. The 3720 provides about one third of the 3725's performance and operates under control of software programs used on the 3725. A new 3721 Expansion Unit extends the capability of the basic system.

The new controller is available in four models: Models 1 and 11, which concentrate up to 28 lines, directly attach to the host computer; Models 2 and 12, which concentrate up to 16 lines and 2 IBM Token-Ring Networks, are used at remote locations and connect to the host via telephone lines. Models 1 and 2 are now available and Models 11 and 12 will be available in June 1987. New unattended operation procedures and a remote switched console provide the ability to control 3720 operations from a remote location. A 3721 expansion unit allows Models 1 and 2 to attach up ▶



The IBM 3725 Communication Controller is available in two models. Model 1 can support up to eight hosts, 256 lines, and 3MB of main storage. Model 2 can support up to four hosts, 80 lines, and 2048K bytes of storage.

IBM offers the 372X line of communication controllers, which includes the entry level 3720 and the top-of-the-line 3725. The 3725 comes in two models, Model 1 and Model 2. Model 1 supports up to 8 host computers, 256 communications lines, and 2M bytes of main storage. Model 2 supports up to 4 hosts, 80 communications lines, and 2048K bytes of storage. The 3720, IBM's low-end communication controller, has been designed for use in remote locations or by organizations that do not require the capacity of the larger 3725. Equipped with an enhanced IBM Maintenance Operator Subsystem, the 3720 allows host console operators to perform controller diagnostics on directly attached or remote units. It is available in four models: Model 1, 2, 11, and 12.

FUNCTION: Front-end or remote full-service communications processor.

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA; pre-SNA IBM communications optional.

OPERATING SOFTWARE: ACF/NCP Version 4; EP Release 3 or 4; PEP.

COMPETITION: NCR Comten; Amdahl; CCI.
PRICE: A 3725 Model 1 configured with 1M bytes of storage, one channel attachment, one Line Attachment Base (Type A), eight Line Interface Couplers (Type 1), and an operator's console costs \$149,990; a 3720 Model 1—\$26,000; Model 2—\$26,000; Model 11—\$42,500; Model 12—\$32,000.

CHARACTERISTICS

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

DATE OF ANNOUNCEMENT: IBM 3725—March 1983, IBM 3720—1986.

DATE OF FIRST DELIVERY: IBM 3725—1983, IBM 3720—1986.

SERVICED BY: International Business Machines Corporation.

MODELS

Two models of the 3725 are available, Model 1 and Model 2, with Model 2 being field upgradable to a Model 1. The 3725 is used to control data communications between directly attached, modem attached, or IBM Token-Ring Network attached terminal devices and one or more directly- or remotely-connected IBM host processors (S/370 except ▶

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TABLE 1. LINE ATTACHMENT BASE CAPABILITIES

Line Attachment Base Type	Configuration	No. of Scanners	Type of Line Interface Coupler	Max. No. of LICs per 3725
Type A	Optional, 3725 or 3726	1	1 or 4A	8
Type B	Optional, 3725 or 3726	2	1, 2, 3, 4A, or 4B	8
Type C	Optional, 3725	1, 1 TRM, 1 ICC	1, 2, 3, 4A, or 4B	4 (4 Token-ring Interface couplers)
CLAB	Standard, 3725 only	1	1 or 4A	8

▷ to 60 lines, and Models 11 and 12 to attach up to 48 lines and 3 Token-Ring Networks. Models 1 and 2 are field upgradable to Models 11 and 12, respectively.

The 3720 comes with a standard 1M byte of storage, expandable to 2M bytes. A 10M-byte hard disk provides additional storage for support files used by MOSS (Maintenance and Operator Subsystem) facilities. MOSS has been upgraded to include automatic rebooting of the scanner in case of failure and automatic analysis of Box Event Records (BERs). Speed of all internal clocks for synchronous terminals are now set in software through the MOSS operator console; previously, this action required hardware strap settings.

The 3720 offers some advantages over the 3725. The new controller supports four 56K bps or 64K bps full-duplex communications lines or five 48K bps lines. Only two lines are supported by 3725 scanners. More efficient use of scanners is derived by assigning 3720 LIC (Line Interface Coupler) weights to individual lines rather than to LICs. Total weight is the sum of the weights of connected lines; scanner capacity is more efficiently allocated when there are mixes of different line types on the same scanner.

The 3725 controls data communications between terminals and one or more System/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 host processors or between two or more host processors. Terminal devices can be attached to the 3725 directly or through modems; host processors can be attached locally or remotely. Remote connection may be established by common carrier or customer-owned communication facilities.

The two 3725 models serve large or small networks. Model 1, which accommodates the 3726 Communication Controller Expansion unit, supports a maximum of eight hosts, 256 lines, and 2048K bytes of storage. Model 2 supports up to four hosts, 80 lines, and 2048K bytes of storage.

The Central Control Unit (CCU) performs the control program which is kept in main storage. This unit regulates ▷

▶ Models 115 and 125, 303X, 308X, 3090, 43XX, or 9370). The 3725 can also control communications between two host processors. Remote connections can be done through common carrier-provided or customer-owned communication facilities.

The 3720 is the low-end model in the 372X line of communication controllers. It provides about one third the performance capability of the 3725 and operates under control of software programs used on the 3725. It is available in four models; Model 1, Model 2, Model 11, and Model 12. Models 1 and 11 attach directly to the host, while Models 2 and 12 have been designed specifically for use in a remote environment. They attach to the host through telephone lines. Through use of a remote switched console, unattended operation facilities, and a Remote Support Facility, these models can be controlled from remote control centers.

CONFIGURATION

Model 3725

The 3725 Model 1 base frame accommodates up to 96 lines. With the 3726 Communication Controller Expansion, which is offered only with Model 1, an additional 160 lines can be attached for a total of 256 lines, full-duplex or half-duplex. The 3725 Model 2 accommodates up to 80 full-duplex or half-duplex lines.

The number of operable lines, however, may be fewer than the number physically attachable. The maximum number of lines that operate concurrently depends on line speed, line protocols, message length, control program, and application work load.

The 3725 base machine (for Model 1 or 2) contains:

- Central Control Unit (CCU), that executes instructions to control the communication scanners and channel adapters. It runs under ACF/NCP V2, V3, or V4, EP/3725, or both in PEP mode.
- Main storage of 512K bytes, expandable in both models by four additional 256K increments. Main storage houses a 3725 Network Control Program (i.e., NCP, EP, or PEP) and other programs loaded from the host processor, and provides buffers for data exchanged with the channel adapters and lines.
- Maintenance and Operator Subsystem (MOSS), which provides IPL and utility procedures for the 3725 (Model 1) ▶

IBM 372X Communication Controllers

TABLE 2. COMMUNICATIONS SUPPORTED BY 372X LINE INTERFACE COUPLERS

Line Interface Coupler (LIC)	Number of Lines per LIC	Type of Interfaces Supported	Transmission Speeds and Modes Supported
LIC1	4	RS-232-C/V.24, RS-366/V.25 (auto-call), X.21 bis, X.20 bis	Synchronous (SDLC or BSC) transmission at 2400, 4800, 9600, or 19.2K bps via external modem or direct connection; asynchronous (start/stop) transmission at up to 1200 bps via direct connections.
LIC2	1	Wideband type for 8751, 8801, or 8803 service	Synchronous BSC transmission at up to 64K bps; synchronous (SDLC) transmission at up to 230.4K bps.
LIC3	1	CCITT V.35	Synchronous (SDLC or BSC) transmission at up to 256K bps via V.35 modem; synchronous transmission at up to 56K bps via direct connection.
LIC4A	4	CCITT X.21	For connection to switched or nonswitched packet networks. Synchronous (SDLC only) transmission at 2400, 4800, or 9600 bps via external modem or direct connection.
LIC4B	1	CCITT X.21	For switched packet networks, synchronous transmission via external modem at up to 48K bps; for nonswitched packet networks, synchronous transmission via external modem at up to 64K bps; for direct connection, synchronous transmission at up to 256K bps. SDLC only. (Not available in the USA.)

► the channel adapters, the communication scanner, and any data that is transferred between them. The main storage, besides housing the control program, provides the data space for the attached telecommunications lines. The telecommunications lines are connected via cables to line interface couplers (LICs) in the 3725.

Software for the 3725 includes the Advanced Communications Function for Network Control Program (ACF/NCP) and the Emulation Program (EP/3725), which are designed only for the 3725 and cannot run on the 3705. Users must install ACF/System Support Programs (ACF/SSP), Version 2 or 3, on the host to generate the ACF/NCP, which must be downloaded to the 3725. ACF/SSP has a configuration control program that provides support for IBM's new 3710 Network Controller. ACF/NCP for the 3725 can communicate with ACF/NCP for the IBM 3705. EP/3725 allows coexistence of 270X, 370X, and 3725 communications processors in a common host environment.

Part of IBM's major telecommunications product announcements on May 20, 1986 concerned enhancements to the 3725 Communication Controller. These included the following:

- An increase in main storage capacity from 2M bytes to 3M bytes in 256K-byte increments. Programming support for the 3M-byte capability will be available under ACF/NCP, Version 4, Release 1 and ACF/SSP, Version 3, Release 1 software. Other NCP products will be compatible with this capability.
- Support for LPDA-2 commands that allow extended line problem determination and modem configuration changes on IBM 586X modems. Programming support ►

► operator. An independent processor with microcode, a diskette drive, and an attachment for an IBM 3727 operator console are included. The MOSS, with the attached 3727 console, offers network management functions, error logging, machine status display, CCU services, scanner services, line services, and diagnostics.

- **Transmission SubSystem (TSS)**, which physically connects the 3725 to communications facilities. It consists of **Line Attachment Bases (LABs)** with microprocessor-based scanners, **Channel and Line Attachment Bases, Line Interface Couplers (LICs)**, and optional **Internal Clock Controls, Type 2 (ICC-2s)**. The communication scanners serialize and deserialize the characters, support various line protocols, and offer character buffering and cycle-steal transfer in the main storage of the 3725. Integrated modems are not available for the 3725 or 3726.

In the 3725 Model 1, two Type C LABs are standard; a third LAB (Type A or B) can be added optionally. Each CLAB has one communications scanner and can attach up to 32 full- or half-duplex communications lines by means of optional (separately priced) LICs. The ICC-2s are also optional for Model 1.

The 3725 Model 2 includes one CLAB as standard, which can support up to 80 full- or half-duplex lines. An additional CLAB and one LAB Type A, B, or C can be added for installation in LAB position 2 and 3 respectively. Model 2 also includes one ICC-2 as standard, but can support two more ICC features. Model 2 is field-upgradable to a Model 1.

- **Token Ring Subsystem (TRSS)**, which supplies the physical connection to an IBM Token-Ring Network. Line and Token-Ring Attachment Bases (LABs) with Token-Ring multiplexer and Token-Ring Interface Couplers (TICs) make up this subsystem.
- **Channel Adapters (CAs)**, providing physical attachment to host channels, are optional for both models. For Model 1, an optional Two-Processor Switch (TPS) is available ►

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▷ for LPDA-2 will be available with ACF/NCP, Version 4, Release 2 and ACF/SSP, Version 3, Release 2 software.

- Ability to provide additional lines to 3725 scanners through the reduction of line interface coupler (LIC) weights. High-speed communications lines attached to an LIC 2, 3, and 4B supporting BSC, ASCII, or SDLC DX at a data rate ranging between 32K and 64K bps now have a weight of 25, reduced from a weight of 42. Weights on communication lines attached to an LIC supporting SDLC at data rates up to 128K bps have been reduced from 100 to 50. The LIC weight reduction for 14.4K bps communications lines supporting BSC, ASCII, or SDLC now have an LIC weight of 37 and 42, respectively, down from a weight of 50. (The former LIC weights are still available, however.)
- Remote-console access to 3725 maintenance and operator subsystem (MOSS) over a switched line through the IBM Information Network. This feature allows an IBM Personal Computer to operate as a remote 3725 MOSS console through the public switched network.

In an earlier announcement (April 16 1986), IBM unveiled a 3725 attachment to the IBM Token-Ring Network. This includes a LAB Type C attachment base consisting of a Token-Ring multiplexer, a physical base for up to four Token-Ring couplers, a communication scanner, and a physical base for up to 16 line attachments. A Token-Ring Interface Coupler (TIC) with a microprocessor operating under control of resident microcode provides 3725 attachment to one network. Each TIC transmits and receives at 4M bps, and under control of ACF/NCP, provides logical link control functions that conform to IEEE 802.2 standards.

In addition to the enhancements outlined above, IBM also introduced several software programming upgrades and additions. The X.25 Network Control Program Packet Switching Interface (NPSI), Release 4.3 allows attachment of the 3725, as well as the new 3720 controller, to X.25 networking services. This package supports data transmission from 1200 to 64K bps. It requires either ACF/NCP, Version 4, Release 2 or ACF/NCP, Version 4 Subset (MVS or VM) software, and ACF/System Support Program ACF/SSP, Version 3, Release 2.

An enhanced Version 3 of Release 1.1, Advanced Communications Function/VTAM allows the IBM VM operating system to have the same SNA communication capabilities as MVS. Changes in the ACF/Network Control Program (ACF/NCP), Version 4, Release 2 allow it to work with the 3725 controller.

The 3725 performance enhancements, announced in July 1986, will be installed at no charge, with the exception of the 3M-byte storage upgrade, which costs \$2,700. Token-Ring Attachment prices are as follows: purchase price of LAB Type C is \$23,760, and the monthly rental charge is \$1,275; the TIC 1 sells for \$3,000, and its monthly rental charge is \$161. The Attachment became available in Janu-

▷ that allows a channel adapter to connect two processor channels for nonsimultaneous communication. A basic Model 1 has a physical base for two channel adapters and two TPSs, enabling a total of four hosts to be attached, and two to operate concurrently.

For further expansion, the 3726 Communication Controller Expansion can be added. The 3726 Expansion supports up to an additional 160 communications lines. The 3726 attaches only to a 3725 Model 1 and is not supported by the 3725 Model 2. With the optional 3726 Communication Controller Expansion, four additional Channel Adapters (CAs) without Two-Processor Switches, or two CAs each with TPSs, can be added. Thus a total of eight hosts can be attached, six operating concurrently. If channel-attached, the 3725 requires a control unit position on the system channel.

A basic Model 2 provides a physical base for four channel adapters and no TPS. Model 2 attaches to a maximum of four hosts.

The 3725 can be used as a remote communication controller, without channel connection to a host processor. In this configuration, called "link-attached," the 3725 is connected by one or more communication links to channel-attached 3705s or 3725s. The controller can perform the same networking functions whether link-attached or channel-attached.

The 3725, Model 1 or 2, requires a primary 3727 Operator Console for installation, operation, and maintenance. A second 3727 may be used as an alternate. Only one console is active at a time. The active console is selected by a switch on the 3725 control panel. The console can be located a maximum distance of 25 feet (7.5 meters) from the 3725, and there should not be a wall or door between the console and the attached 3725. With the addition of a 7427 Console Switching Unit, up to four 3725s can share a single primary operator console. An alternate console can also be configured and switched among any six controllers.

The configuration diagram on Page -104 of this report shows the relationships among the 3725 components and depicts the 3726 expansion capabilities.

CONNECTION TO HOST COMPUTER: A channel adapter (1561) provides the physical and logical interface for either the 3725 Model 1 or Model 2 to a host channel of an IBM S/370 (except Models 115 and 125), 303X, 308X, 3090, 43XX, 9370 host processors, or between two host processors. The channel adapter attaches to a byte multiplexer, block multiplexer, or selector channel. The 3725 Model 1 supports physical attachment of up to eight host channels; Model 2 supports up to four.

In Model 1 only, each Channel Adapter (CA) may be equipped with a Two-Processor Switch (TPS), which allows the CA to be connected to two processor channels instead of only one. The channels may belong to the same or different processors. Data cannot be transmitted simultaneously on more than one channel. Manual switches on the 3725 control panel allow a user to enable each of the active channel interfaces. If all interfaces are enabled, the processors are responsible for resolving any contention, because only one interface can transfer data at a time.

The channel adapters must occupy contiguous positions beginning with Position 1. CA Positions 1 and 2 are in the 3725 basic frame; CA Positions 3 through 6 are in the 3726 Expansion frame. Both CAs must therefore be installed in the 3725 before one may be installed in the 3726. When TPS is installed, it is placed in the first available position. The same channel attachment cable groups (3290 and 1178) serve Model 1 or 2.

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► ary 1987. The initial basic license fee for the X.25 NPSI, Release 4.3—scheduled for December 1986 delivery for MVS and March 1987 delivery for VM/SP—is \$770; the DSLO initial fee is \$557. The monthly basic license fee is \$269, while the monthly DSLO fee is \$202.

In March of this year, IBM announced several new no-charge enhancements to both the 3725 and the 3720 communication controllers. Enhancements are as follows:

- Reduced Line Interface Coupler (LIC) weights for lines operating in BSC, EBCDIC, or SDLC half-duplex at 14.4K bps, and for lines operating at 128K bps with a nonswitched X.24/V.11 interface (3725)
- Up to 3MB of main storage for the 3725 is now supported by ACF/NCP Version 3 (3725)
- Non-SNA Interconnection Release 4 will support the 372X with ACF/NCP Version 4 Release 2 for 3725 and 3720 in the MVS environment
- Link Interface Coupler Type 4B is now available at 256K bps (3725)

New options for 3720 operations include the following:

- Loading of a single ACF/NCP V4R2 or ACF/NCP Version 4 Subset load module from the host onto the 3720 disk; automatic loading of the NCP load module stored on the 3720 disk, at power-on or after failure; loading of the NCP stored on the 3720 disk at operator request either from the network console, or from the 3720 local/remote console, or from the 3720 operator panel; automatic saving of a single NCP storage dump on the 3720 disk in case of failure; and at network operator request, full or partial retrieval of the NCP dump saved on the 3720 disk for on-line transmission to the host
- Support for extended cable length on LIC Type 3, especially at high speeds
- 3720 support by VM/XA Systems Facility (SF) Release 1 and VM/XA SF Release 2 in compatibility mode as a 3705
- Native support of the 3720 by TCAM V2R4 with NCP V4R2
- IBM 5842 modem support for access to the remote console and to the remote support facility functions
- 3720 Models 11 and 12, which support attachment of IBM Token-Ring Networks, will be available June 30, 1987

COMPETITIVE POSITION

In terms of the marketplace, we see the 3725 as a system designed to address the 3705's current competitors, and not as a revolutionary breakthrough in communications processing. The IBM 3725 competitors include the Am-►

► Model 3720

The 3720 concentrates communication lines and provides networking functions, such as monitoring errors and detecting system problems. The basic 3720 includes a central control unit, 1M byte of main storage, a 10M-byte disk, a diskette drive, the Maintenance and Operator Subsystem (MOSS), and one communication scanner including internal clock controls. The Maintenance Operator Subsystem (MOSS) allows the automatic analysis of Box Event Records (BERs), thus facilitating problem determination functions. Through MOSS, a console operator can perform local and remote controller diagnostics from a central site. All 3720 units can also be equipped with an IBM Remote Support Facility (RSF) and configured for unattended operation. The 3720's management console is password protected, and the controller can use the security and audit features resident on host hardware or software.

Options on the 3720 Model 1 or 2 include an additional 1M byte of storage and up to seven line interface couplers (LICs). Models 11 or 12 may contain an additional 1M byte of storage, up to four LICs, and up to two Type 1 Token-Ring Interface Couplers (TICs). Models 1 and 2 are field-upgradable to Models 11 and 12, respectively.

The two processor switch provides a second channel interface that can connect the first or the second channel adapter to a Multiprocessor System (MP) or to two channels of the same or different processors with non-simultaneous communications. Models 1 and 11 can each support two of the switches. This option is not available on Models 2 and 12.

A 3721 Expansion Unit, installed on the top of a 3720, allows attachment of up to 32 additional lines. The 3721 Model 1 has one scanner that controls up to 8 LICs, and the 3721 Model 2 has two scanners, each controlling up to 4 LICs. One model of the 3721 cannot be converted to another. The 3721 can operate over common carrier-provided or equivalent customer owned-communication facilities. It attaches the same DCEs as the 3720. The 3721 does not support attachment to the Token-Ring Network.

Any IBM 3101 Model 23 or compatible terminal may be used as a 3720 system console, including an IBM PC running the IBM 3101 Emulation Program. One remote operator console can manage multiple 3720s via attachment to a switched communications line and 1200 bps, full-duplex modems that conform to CCITT V.22 Recommendations. Customers running EP, but not NCP/PEP, must provide a local console to receive error alarms that are normally available through the VTAM operator console. Customers using the IBM Remote Support Facility (RSF) must have an IBM 5841 synchronous modem at the RSF port.

CONNECTION TO HOST COMPUTER: The same type of channel adapter (#1561) attaches either the 3720 Model 1 or 3720 Model 11 to a host channel of an IBM 4341, 4361, 4381, 303X, 308X, or 3090 processors. It attaches to a byte or block multiplexer or selector channels. With the exception of the 303X, the adapters also attach to the IBM 3044 Fiber Optic Channel Extender Link that allows placement of a 3720 Model 1 or 11 up to 6,666 feet (2 kilometers) from a host running NCP. Models 1 and 11 also come with one or two optional Two-Processor Switches (TPSs) that allow a channel adapter to attach to two processor channels with nonsimultaneous communication.

TRANSMISSION SPECIFICATIONS

Model 3725

Four types of Line Attachment Bases (LABs) are available—LAB Type A, LAB Type B, LAB Type C, and CLAB (Communication and Line Attachment Base). LABs Type A ►

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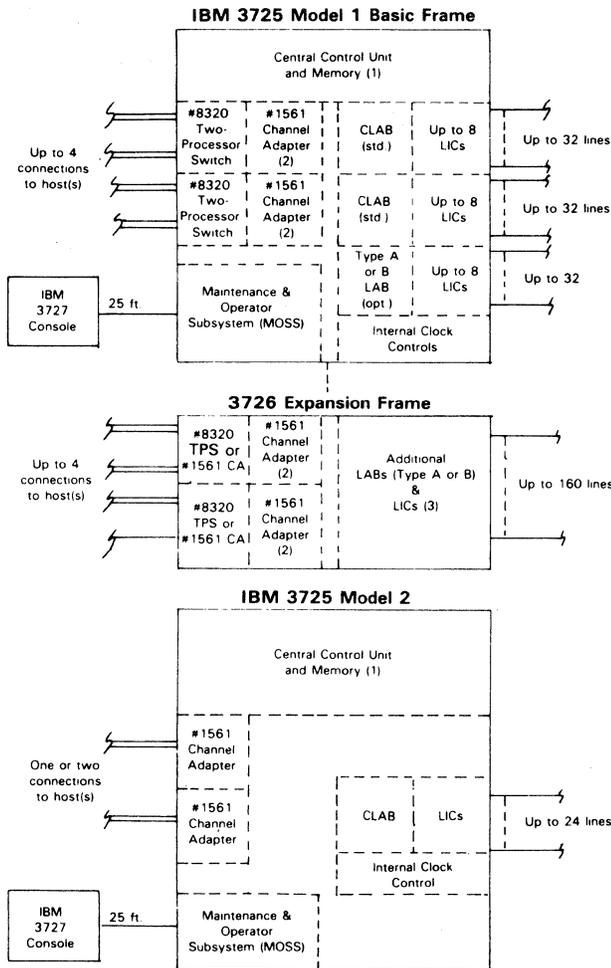


Figure 1. IBM 3725 basic configuration.

➤ dahl 4705E and 4705T, and NCR Comten 3695 and 5660 communications processors. The IBM 3725 Model 1 outdoes the Amdahl 4705 Model E in number of hosts attachable (eight versus six), number of hosts supported concurrently (six versus four), number of full-duplex lines attachable (256 versus 176), and maximum main memory capacity (3M bytes versus 1M bytes). The Amdahl 4705 takes less floor space than the IBM 3725, even though the 3725 is not as bulky as the 3705. The 3725 is exceeded by the NCR Comten 3695 in number of lines attachable (512 half- or full-duplex) and maximum main memory (4M bytes). The Comten 3690 and 3695 also support disk-based mass storage, a capability not offered with the 3725. The Comten 5660 provides 16MB of main memory and can support up to 1,024 lines.

The new 3720 is the low-end product in IBM's communication controller family, which includes the older 3705 and the 3725. It is designed for small- to medium-sized organizations that do not need the power of the 3725 or for use at remote locations.

In the world of communications processors, IBM continues to hold on to the lion's share of the market. In a recent survey from International Data Corporation, IBM was ➤

Notes:

(1) Memory capacity is 512K bytes. On 3725 Model 1 only, memory capacity may be expanded in 256K-byte increments to a maximum of 2M bytes.

(2) 3725 Model 1 supports up to two Channel Adapters and 2 Two-Processor Switches; four additional Channel Adapters, or two Channel Adapters and 2 Two-Processor Switches, may be added via the 3726 Expansion. Thus, the maximum number of channels physically attachable is eight, and the maximum number of channels concurrently active is six.

3725 Model 2 supports one or two Channel Adapters; no support is provided for the Two-Processor Switch.

(3) 3725 Model 1 provides two Type C Line Attachment Bases (CLABs) as standard components, and supports one additional LAB (Type A or B) as an option; up to five additional Type A or B LABs can be added via the 3726 Expansion. 3725 Model 2 provides one CLAB as a standard component, and is not expandable.

On the 3725 Model 1, all LABs are optional; each LAB supports up to 32 communications lines via single- and multiline Line Interface Couplers (LICs), for a maximum line capacity of 256 lines. The Line Increase Feature (#3602) is required to support more than six LABs and is contained in the 3726 Expansion frame. On the 3725 Model 2, the LAB supports a maximum of 24 lines, via single- and multiline LICs.

➤ and CLABs offer a single communication scanner, while LABs Type B provide two communications scanners. LABs Type C have one communication scanner and interface clock control, as well as one Token-Ring multiplexer. In the 3725 Model 1, the base machine includes two CLABs as standard components; each has one communication scanner. One additional LAB, Type A, B, or C may be installed. If further expansion is needed, up to five additional LABs (Type A, B, or C) may be installed in the 3726 Expansion.

The 3725 Model 2 supports one CLAB, which is a standard component, but two additional LABs may be added.

The microprocessor-based scanner serializes and deserializes the characters, supports various line protocols, and provides character buffering and cycle-steal transfer into the 3725 main storage. The scanner microcode is loaded from the MOSS diskette. Any scanner can support intermix protocols, asynchronous or synchronous communications, and half- or full-duplex transmission. BSC, EBCDIC, ASCII, and SDLC protocols are supported in normal or block mode, an operating mode similar to that of the 3705 Scanner Type 3. Asynchronous protocols with five to eight data bits and one or two stop bits are supported in "character mode" with EP/3725 R1 and ACF/NCP V2, similar to that of the 3705 Scanner Type 2. BSC is also supported in character mode. They can also be supported in "enhanced mode" with EP/3725 R2 and ACF/NCP V3 or V4. Protocols are also supported in normal mode at speeds up to 64K bps with EP/3725 R2. The scanner also supports procedures for automa- ➤

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➤ seen as having 84 percent of the market. Only NCR Comten and Amdahl provide any competition. NCR's announcement of the 5660 last year, and its upgrading and introduction of new 3600 models reinforced its offerings to the communications processor user. The Comten 5660 is a high-end processor that will support up to 8 IBM or compatible mainframes and up to 1,024 communication lines. This product competes with the 3725, while the 3720 is more directly competitive with NCR Comten's 5620 product. Thus far, IBM, while enhancing its 3725, has given no indication that it plans to offer a processor with the capabilities of the Comten 5660.

How the Comten 5660 will effect the 3725 in terms of sales and marketability has yet to be determined. The 5660 is faster, offers more storage, and has three times the processing power of any other processor currently on the market. Whether these qualities will lure current 3725 users away remains to be seen.

Traditionally, IBM has focused its major marketing efforts on large organizations with far-ranging data processing requirements. The 3720 represents a step in a different direction, however, as in performance and price the product is clearly aimed at the smaller organization. It seems likely that with the smaller and less expensive 3720, IBM is making a bid for more business in markets now dominated by Digital Equipment Corporation.

The company continues to expand its communications offerings to include far more flexible network management and control features, which are critical in today's networks. In the past, IBM's SNA network has been criticized as being cumbersome to manage, and other plug-compatible processor vendors have capitalized on this weakness by selling systems that offered far greater configuration and planning tools. The new network control and diagnostic enhancements will be extremely attractive to IBM's huge installed base of customers.

ADVANTAGES AND RESTRICTIONS

The major advantage of the 372X communication controllers is that they are IBM machines, and are therefore compatible with IBM hosts, terminals, etc. That these communications processors hold an 84 percent market share in the communications market is but another indication that users with IBM hosts want IBM communications processors.

Another advantage of the 3725 is its simplified machine structure, which consists of one scanner type, one channel adapter type, and five line interface coupler types. The simplified design includes features that serve multiple uses and facilitates configuration upgrades without changing already installed machine features. For example, a single type of line attachment supports SDLC or BSC protocols at line speeds up to 19.2K bps plus asynchronous protocols at speeds up to 1200 bps.

Another advantage of the 3725 is its network management facility. The functionally separate Maintenance and Opera-

➤ ic calling units and X.21 native, X.21 bis, X.20 bis, and X.25 protocols. The number of lines handled by the scanner depends on protocol and transmission speed.

Table 1 lists the Line Attachment Base (LAB) capabilities.

Line Interface Couplers (LICs) furnish the necessary functions to attach the external communications facilities and Data Terminal Equipment (DTE). The DTEs are attached directly to the 3725 or through DCEs. Five types of LICs are offered. The decision of which one to use depends on the physical interface required, the transmission speed to be supported, and number of lines to be connected. Up to four LICs can be attached on a line and Token-Ring Attachment Base (LAB Type C) for a maximum of 16 lines per LAB Type C. Up to eight LICs can be installed on LABs Type A or B and CLABs up to a maximum of 32 lines per LAB.

Terminals can be attached to the 3725 either directly or via modems. Direct (modemless) attachment of terminals can be accomplished with LIC-1, LIC-3, LIC-4A, or LIC-4B and the corresponding direct attachment cable.

Table 2 shows the modem attachment and direct connection capabilities of the LICs.

The Token-Ring Subsystem permits the 372X controllers to attach to IBM Token-Ring networks. It is made up of Line and Token-Ring Attachment Bases (LABs) and Token-Ring Interface Couplers (TICs). Only LAB Type C is available and it offers one Token-Ring Multiplexer (TRM) and up to four Token-Ring Interface Couplers (TICs). LAB Type C also furnishes a communications scanner, internal clock control, and up to four LICs. The TRM provides the adaptation between the 3725 and the TICs. The Token-Ring Interface Coupler Type 1 consists of a set of components and a microprocessor that runs under the control of a resident microcode, which controls the IBM Token-Ring Network using standard protocols. The TIC operates only under the control of the Network Control Program (NCP).

The Internal Clock Control, Type 2 (ICC-2) provides bit clocking when the attached external modem does not provide the clocking, as well as when direct attachment of the data terminal equipment is required. The ICC-2 provides clocking for eight LICs (up to 32 lines) at 50, 110, 134.5, 200, 300, 600, and 1200 bps for synchronous or asynchronous operation with or without a DCE direct attachment, and at speeds of 2400, 4800, 9600, 19K, and 56K bps for operation without a DCE direct attachment. Up to 1200 bps, the speed is set at the time of control program generation and has to match that of the internal clock or the attached DTE. Above 1200 bps, the DTE has to use external clocking that is provided by the 3725, and the speed is set by hardware in the 3725. Business machine clocking to the 3725 is provided at data rates of 50, 110, 134.5, 200, 300, 600, and 1200 bps for asynchronous or synchronous operation with or without a DCE direct attachment.

For externally clocked DTEs, bit clocking is provided to directly attached DTEs at data rates of 2400, 4800, 9600, 19.2K, 56K, and 245K bps for synchronous operation without a DCE; data rates of 2400, 4800, 9600, and 19.2K bps are provided for start/stop operation without a DCE. The speed is set to 9600 bps at the factory, and when installed it may be changed by the CE on a per-LIC basis.

IBM modems that can be used with the 3725 include the following: 3833 Model 1 (2400 bps), 3834 Model 1 (4800 bps), 3863 Models 1/2 (2400 bps), 3864 Models 1/2 (4800 bps), 3865 Models 1/2 (9600 bps), 3868 Model 1 (2400 bps), 3868 Model 2 (4800 bps), 3868 Models 3/4 (9600 bps), 3872 (2400 bps), 5811 Models 10/18 (2400—19.2K bps), 5841 (1200 bps), 5865 (9600 bps), 5866 (14.4K bps), 5868 Model 51 (9600 bps), and 5868 Model 61 (14.4K bps).

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▶ tor Subsystem (MOSS) uses an integral diskette drive, an attached IBM 3727 Operator Console, and software functions built into the 3725 versions of ACF/NCP and EP facilitates operation, maintenance, and problem determination. Two mechanisms, called Alert and Alarm, are used to aid in problem determination. For instance, MOSS displays Alert messages when a problem occurs that affects normal operations and might require operator action. The Alert messages identify the cause of the error, give additional information on the resources affected by the error, and suggest possible actions to be taken by the operator. The Alarm gives an automatic first level of problem determination, informs the operator console of failure, and provides an entry point into the maintenance documentation so as to follow through and solve the problem. Sixteen levels of Alarm, that correspond to the sixteen levels of Alert, are available.

USER REACTION

In Datapro's 1986 Data Communications Users Survey, 98 users of the IBM 3725 Communications Processor responded with an installed base of 274 units. The ratings for the IBM 3725 are

	Excellent	Good	Fair	Poor	WA*
Overall performance	35	59	1	1	3.3
Ease of installation	26	65	5	1	3.2
Ease of operation	30	56	8	3	3.2
Ease of expansion	24	47	23	2	3.0
Hardware reliability	66	27	3	1	3.6
Quality of manufacturer's software/firmware	36	56	3	1	3.3
Ease of programming	10	47	21	3	2.8
Quality of manufacturer's maint. svc./tech. support	37	47	11	1	3.3

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

We were unable to contact any of these users for additional comments. □

▶ Model 3720

The internal clock supports both "Category 1" and "Category 2" transmission rates. The internal clocks are all set by software from the MOSS operator console. Speeds are set by line, not by LIC as done in the 3725. Speeds for other types of attachments are determined through the SSP program product.

Category 1 rates, set by NCP or EP, are 50, 110, 134.5, 200, 300, 600, and 1200 bps for start/stop or synchronous operation and 75, 100, 2400, 4800, 9600, and 19.2K bps for start/stop operation only. Category 2 rates, set via the operator console, are 2400, 4800, 9600, 19.2K, 38.4K, 55,885, and 245,760 bps for directly attached synchronous terminals. Transmission mode for both directly attached and modem-attached terminals is half- or full-duplex.

The 3720 supports seven LICs per Model 1 or 2 and will support up to four LICs on a Model 11 or 12. Refer to Table 2 for modem attachment and direct connection capabilities of the LICs. The Token-Ring Interface Coupler (TIC) Type 1 operates under the control of a resident microcode that controls the Token-Ring network using standard protocols. The TIC operates only under the control of ACF/NCP. The

3720 Models 11 and 12 can each support two TICs, which are not available on Models 1 and 2.

IBM modems that can be used with the 3720 include the following: 3833 Model 1 (2400 bps), 3834 Model 1 (4800 bps), 3863 Models 1/2 (2400 bps), 3864 Models 1/2 (4800 bps), 3865 Models 1/2 (9600 bps), 3868 Model 1 (2400 bps), 3868 Model 2 (4800 bps), 3868 Models 3/4 (9600 bps), 5811 Models 10/18 (2400—19.2K bps), 5841 (1200 bps), 5865 (9600 bps), 5866 (14.4K bps), 5868 Model 51 (9600 bps), and 5868 Model 61 (14.4K bps).

SOFTWARE

ADVANCED COMMUNICATIONS FUNCTION FOR NETWORK CONTROL PROGRAM (ACF/NCP) VERSION 3 OR 4 RELEASE 2 FOR THE IBM 372X CONTROLLERS: ACF/NCP for the 372X Controllers is the basic operating system for either 3725 model and the 3720 model, whether channel-attached or connected via communications links. ACF/NCP is supported by hosts operating under OS/VS1, OS/VS2, MVS, and DOS/VSE, and is designed to support the enhanced operating features of the 3725, including its problem determination, error recording, and system generation capabilities, storage for up to 3M bytes (3725 model), and support for continued operation and controlled shutdown in failure situations. ACF/NCP Version 4 Release 2 also offers improved modem support and the capability to attach an IBM 3725 to IBM's Token-Ring Network using the IBM Token-Ring Subsystem. ACF/NCP for the 3725 also supports Release 4 of the X.25 NCP Packet-Switching Interface licensed program.

ACF/NCP for the 3725 supports and communicates with the following host-resident programs: ACF/SSP Version 2 and Version 3 Release 2, ACF/TCAM Version 2 Release 4, ACF/VTAM Version 1 Release 3 (MVS only, with appropriate PTF), ACF/VTAM Version 2 (MVS, VS1, and VSE), EREP 1.5 (MVS/VS1, VSE/VM), and NPA-Host FDP Number 5798-CZR, NPDA Version 2, NCCF Version 2, and NLDM Release 2.

ACF/NCP for the 3725 also supports and communicates with these controller-resident programs: ACF/NCP for the IBM 372X Controllers, EP for the IBM 372X Controllers, PEP, NTO Release 2 for the IBM 3725, X.25 NPSI Release 4, and ACF/NCP for the IBM 3705.

ACF/NCP Version 3 for the 3725 supports all the features of Version 2, and additionally supports SNA Network Interconnection (network-to-network SNA sessions), and Modulo 128 SDLC (128 frames before acknowledgement). ACF/NCP Version 3 is supported only on controllers attached to hosts running MVS/370 or MVS/XA.

ACF/NCP Version 3 will support the VHSA RPOs (8J5080, 8J5081, 8J5082) and the IBM 3725 Model 2 storage expansion up to two megabytes after upgrading the existing machines.

ACF/NCP Version 4 Subset is for MVS/370 and MVS/Extended Architecture (XA) users that operates on the 3720 Controller. It provides the same functions and facilities of ACF/NCP Version 4, except for the SNA Network Interconnection. The ACF/NCP Version 4 Subset offers support for up to 28 communication lines on one communication scanner, as well as support of up to two channel adapters. ACF/NCP Version 4 Subset also supports these programs: Network Routing Facility (NRF) Release 3 operates on the 3720 with ACF/NCP Version 4 Subset with MVS, and X.25 Network Packet Switching Interface (NPSI) Release 4.3 with ACF/NCP Version 4 Subset with MVS.

ACF/NCP Version 4 Subset is available for VSE users operating on the 3720 Communications Controller. It offers

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► the functions and facilities of ACF/NCP Version 4, except for SNA Network Interconnection. It can support up to 28 communication lines on one communication scanner plus support of up to two channel adapters.

The 3720 supports the ACF/TCAM, Version 2, Release 4; BTAM/SP, BTAM/ES, RTAM; and ACF/VTAM Access Methods. TCAM, with the MSNF feature, supports 3720 terminal-to-terminal sessions in an NCP environment, but all SNA logical units attached to the controller must be activated via a host processor running VTAM. TCAM does not support load, dump, or SNA resource ownership of the 3720. When the 3720 is channel-attached to a TCAM host, a TCAM Version 2, Release 4 channel contact facility establishes the necessary communications path.

In addition to the above, the 3720 will operate with the ACF/SSP, Version 3, Release 2 (MVS, VM, VSE) support products.

EMULATION PROGRAM FOR THE IBM 372X CONTROLLERS (EP RELEASE 4): EP Release 4 supports 372X operation in 270X Emulation Mode. EP Release 4 provides the same problem determination aids, error recording functions, and other features as ACF/NCP on the 372X. It provides support for up to six channel adapters, and can run concurrently with ACF/NCP Version 2 in PEP operation mode. EP/3725 Release 2 supports the new 256K BSC data rate, and is necessary for PEP operations alongside ACF/NCP Version 3. It incorporates the S.W.I.F.T. PRPQ (5799-AQT), which assists users of EP or PEP to link directly to the network of the Society for Worldwide Interbank Financial Telecommunications.

EP is designed for users of VSE/AF Release 3, OS/VS1 Release 7, VM/SP 2.1, MVS/370, and MVS/XA. It supports the following access methods: BTAM, BTAM-ES, BTAM-SP, ACF/TCAM, and RTAM.

ACF/NCP for the 3725 and EP/3725 are generated using the ACF/System Support Programs (ACF/SSP) Version 2 Release 1.1 or 2 licensed program (5735-XXA), which was announced with the 3725. Designed to operate only in the IBM 372X, neither will operate in the IBM 3704 or 3705. Coexistence of 270X, 370X, and 372X in a common host environment, however, is supported.

ACF/SYSTEM SUPPORT PROGRAMS (ACF/SSP) VERSION 2 AND VERSION 3 RELEASE 2: ACF/SSP provides system generation and utility functions for users of ACF/NCP for the 3705, ACF/NCP for the IBM 3720, ACF/NCP for the IBM 3725, and EP on the IBM 3705, EP/3720, and EP/3725. ACF/SSP Version 2 Release 1.1 or 2 requires at least one locally attached IBM 3705-II or 3705-80 meeting the storage requirements of ACF/NCP or EP for the 3705 or one locally attached 3725 meeting the storage requirements of ACF/NCP or EP/3725 for the 3725. It is supported under VSE/AF Release 3, OS/VS1 Release 7, MVS/370, and MVS/XA with the appropriate VTAM or TCAM release.

ACF/SSP Version 3 and ACF/NCP Version 3 or ACF/NCP Version 4 and/or EP/3725 Release 2 are required to support the additional start/stop data rates provided by Internal Clock Control Type 2. Existing machines need to be upgraded in order to support this capability. ACF/NCP Version 4 or ACF/NCP Version 3 with appropriate PTFs and/or EP/3725 Release 2 with appropriate PTFs is needed to support more than two channel adapters in the IBM 3725 Model 2.

ACF/SSP Version 2 Release 2 supports all the features of Version 2 Release 1.1, along with SNA Network Interconnection and Modulo 128 SDLC. ACF/SSP Version 2 Release 2 is necessary only to support ACF/NCP Version 3.

This version may run only on hosts running MVS/370 and MVS/XA.

X.25 NCP PACKET-SWITCHING INTERFACE PROGRAM: X.25 NPSI provides users of ACF/NCP/VS with the capability to attach the 372X Communication Controller to data transmission services that support interfaces complying with CCITT X.25 standards. The package is Telenet-certified. This program supports packet sequence numbering of up to 128, with a packet length section of up to 4,096 characters. It supports SNA network node interconnection and protocol conversion for non-SNA equipment. Within the program is a subset of X.29 allowing communications with asynchronous X.28 devices (TTY). It also supports the X.21 LICs. A planned future release is X.25 NPSI Release 4.1 for VM/SP that will support ACF/NCP Version 3 for the IBM 3725.

NON-SNA INTERCONNECTION RELEASE 4 (VSE, MVS): This program permits BSC communications (RJE terminals and host-to-host) to travel on the SDLC lines of the SNA network, which reduces the communication line costs. The 3725 is supported by Non-SNA Interconnection Release 4 with ACF/NCP V4R1 (MVS/370, MVS/XA, VSE) and by ACF/NCP V4R2 in an MVS/370 or MVS/XA environment. The 3720 is also supported in these environments, as well as in an ACF/NCP V4 subset (VSE) environment.

NETWORK TERMINAL OPTION (NTO): NTO is a software product, which extends the capabilities of ACF/NCP in the 372X Communications Controllers to permit SNA support for a chosen group of non-SNA devices. These include the IBM 2740 and 2741 terminals on either switched or leased lines, and Teletype models 33/35 on switched lines only. This option is needed when the NTO licensed program is chosen to operate in conjunction with ACF/NCP Version 4 Release 2. As well as the other functions contained in earlier releases, the NTO Release 4 program provides generation under NCP/Emulation Program Definition Facility, dial-out capability, performance enhancements, and Network Management Vector Transport (NMVT) processing.

NETWORK EXTENSION FACILITY (NEF) VERSION 2: NEF Version 2 is a programming RPQ that is used to extend the ACF/NCP Version 3 capabilities in an IBM 3725 controller to Airline Line Control networks communicating with Transaction Processing Facility (TPF) Version 2 Release 3 applications. By offering enhanced attachability for Airline Line Control devices to an SNA network and transport of TPF Version 2 transactions through the network, NEF Version 2 aids the integration of the Airline Line Control network into the overall SNA network environment.

Software products operating only on 3720 Model 1 include the following:

- Emulation Program, Release 3 for MVS and VSE (10/86).
- Emulation Program, Release 4 for MVS and VSE (10/86).

On 3720 Models 11 and 12, ACF/NCP for MVS and VM will be provided through a then-current level of ACF/NCP, Version 4 and the ACF/NCP, Version 4 Subset.

The 3720 controllers will support the following Communication Management software:

- NetView, Release 1 (MVS, MVS/XA, VM).
- NCCF, Version 2, Release 2 (VSE).
- NPDA, Version 3, Release 2 for VSE with 3720 PTF (3720 PTF—10/86).

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- NPDA, Version 3 (except NPDA, Version 3, Release 2 for VSE with 3720 PTF).
- NRF, Release 2 (MVS) (10/86).
- NRF, Release 3 (MVS) (10/86).
- NPSI Release 4.3 (MVS supporting ACF/NCP, Version 4, Release 2— 12/86; supporting ACF/NCP Version 4 Subset—6/87).
- NPSI Release 4.3 (VM supporting ACF/NCP, Version 4, Release 2—3/87; supporting ACF/NCP Version 4 Subset—6/87).
- X.25 SNA Interconnection, Release 2 PRPQ 7L1000 (4/87).

PRICING

All 372X components can be acquired by purchase or month-to-month rental. The 3725 is offered under Plan D of IBM's Lease and Rental Agreement (LRA). This plan calls for an initial period of three months, during which IBM provides maintenance service 24 hours per day, 7 days per week at no additional charge. After the initial period, maintenance service is available for an Annual Maintenance charge, which specifies a maximum number of hours of service per month. If the maximum is exceeded, an Additional Monthly Maintenance Charge Rate (AMMCR) is applied.

Purchase credit for rental payments made under LRA can be accrued up to a maximum of 65 percent of the total purchase price.

EQUIPMENT PRICES

		Purchase Price (\$)	Annual Maint. (\$)	Monthly Rental (\$)	AMMCR (\$)
3720 Communication Controller					
	Model 1 (Communication Controller, direct attach. to host, up to 28 lines)	36,500	2,090	2,605	175
	Model 2 (Communication Controller, remote attach., up to 16 lines)	26,000	1705	1,855	142
	Model 11 (Comm. controller, direct attach., up to 28 lines)	42,500	2,135	3,035	178
	Model 12 (Comm. controller, remote attach., up to 16 lines)	6,700	96	482	8
	3721 Expansion Unit-one scanner	16,000	—	1,145	—
	3721 Expansion Unit-two scanner	22,500	—	1,605	—
#4991	T-R Interface Coupler Type 1	3,000	180	161	15
#7100	1MB Storage Increment	6,000	48	429	4
3725 Communication Controller					
	Model 1 (512K bytes, up to 96 lines)	75,000	2,688	4,020	224
	Model 2 (512K bytes, up to 24 lines)	60,500	2,400	3,030	200
	3726 Communication Controller Expansion (up to 160 lines; attaches to Model 1 only)	32,000	504	1,710	42
#1561	Channel Adapter—provides physical connection to host I/O channels from 3725-1, 3725-2, and 3726	6,750	102	363	8
#4666	Internal Clock Control—provides bit clocking when the external DCE does not provide clocking or when DTE is directly attached	1,500	24	78	2
#4667	Internal Clock Control-2—second clock for both 3725 models; supports internally clocked asynchronous terminals for operation with/without modems for operation at 75/100/2400/4800/9600/19.2K bps in addition to currently supported speed	1,500	24	78	2
	Line Attachment Bases—				
#4771	Type A	19,000	204	1,015	17
#4772	Type B	26,400	348	1,420	29
#4773	CLAB	16,000	312	1,070	26
#4774	Type C	23,760	17	1,275	NA
	Line Interface Couplers—				
#4911	Type 1—provides 4 EIA RS-232-C/CCITT V.24 interface ports for half- and full-duplex communication lines at up to 19.2K bps	2,600	24	141	2
#4921	Type 2—accommodates a single half- or full-duplex communication line at transmission rates up to 230.4K bps	3,000	24	159	2
#4931	Type 3—accommodates a single half- or full-duplex dedicated communication line through a V.35 interface at data rates to 256K bps	3,000	24	159	2
#4941	Type 4A—provides 4 CCITT X.21 interface ports as defined in IBM SRL GA27-3287 for half- or full-duplex, switched or dedicated communication lines at data rates up to 9600 bps	2,600	24	141	2
#4942	Type 4B—single CCITT X.21 interface port as defined in IBM SRL GA27-3287 for a half- or full-duplex switched or dedicated line; supports data rates up to 48K bps on switched line and 64K bps on dedicated line	3,000	24	159	2
	Token-Ring Interface Coupler	—	—	—	—
#4992	TIC 1—provides one attachment to IBM Token-Ring Network	3,000	15	161	NA
#7100	Storage Increment (256K bytes)—6 maximum per 3725	4,375	240	234	20
#7101	3MB Storage Capability	2,700	—	145	—
#8320	Two-Processor Switch	4,000	36	216	3
#3602	Line Increase Feature on 3726	8,500	174	455	14
3727 Operator Console Model 70—					
	Logic Unit	2,390	324	196	27
#3255	Display	352	—	—	—
#4655	Keyboard	420	—	—	—

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SOFTWARE PRICES

		Initial Charge		Monthly Charges			
		Basic License (\$)	DSLO License (\$)	Basic License (\$)	DSLO License (\$)	Licensed Program Support (\$)	Additional Licensed Program Support (\$)
5735-XX9	ACF/NCP Version 2 for IBM 3725	1,305	979	261	196	96	154
5667-124	ACF/NCP Version 3 for IBM 3725	2,550	2,310	425	385	148	237
5735-XXB	EP/3725 Release 2	1,365	1,025	256	192	40	64
5735-XXA	ACF/SSP Version 2 Release 2	508	381	92	69	24	38
5668-981	X.25 NPSI Release 4	770	577	269	202	40	64
5735-XX7	NTO for IBM 3725	660	495	206	155	12	19 ■

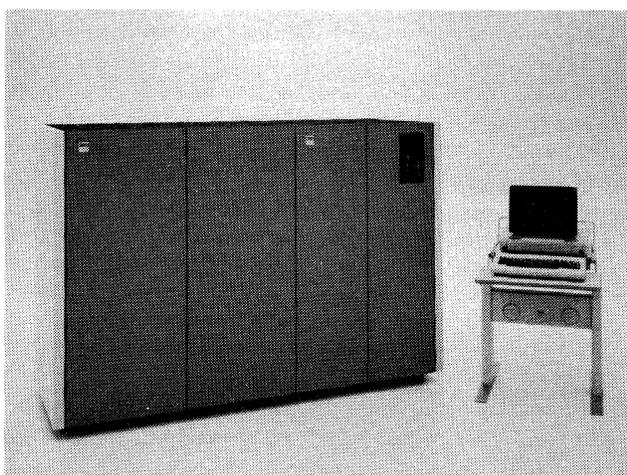
IBM 3725 Communication Controller

MANAGEMENT SUMMARY

UPDATE: *This report is being updated to show changes that have occurred since the last update. IBM enhanced the Internal Clock Control feature for the 3725, Models 1 and 2, and changed the pricing on certain features and software. The 1985 Network Users Survey ratings for the IBM 3725 Communications Processors are also shown in this report.*

The IBM 3725 Communication Controller was first introduced in March 1983 after a year of speculation that it would be replacing the IBM 3705. Although the 3725 does replace the 3705-II at the high end of the IBM communication controllers, it does not yet obsolete the 3705, which still offers some models. In April of last year, IBM announced that Models A, B, C, and D of the 3705-I would no longer be available. In keeping with IBM's commitments to its customer base, the 3725 is fully compatible with its predecessors. It can be intermixed with the 3705-II and 3705-80 in the same single-domain or multidomain network.

After the introduction of the 3725 in March 1983, enhancements to the system were offered in November of that year. The new features for the 3725 included the following: new releases of ACF/NCP (Version 3 for the IBM 3725), EP (Release 2 for the IBM 3725), and ACF/SSP (Version 2, Release 2) with the new versions supporting all the features of their predecessors, as well as an upgrade largely to support SNA Network Interconnection; a doubling of the maximum main memory size for the 3725 Model 1 to 2M bytes; support for data rates up to 256K bps through the V.35 attachment; a port-swapping feature that allows the operator to reassign a line from a malfunctioning 3725 port to another port through the 3727 console without involving the host; a line description file containing the symbolic



The IBM 3725 is a modular, programmable controller. Two models are offered. Model 1, shown here, supports up to eight host computers, 256 communications lines, and 2M bytes of main storage. Model 2 supports up to four hosts, 80 communications lines, and 2048K bytes of storage.

The 3725 is IBM's top-of-the-line communications processor, and by definition the pacesetter for the IBM plug-compatible market. A modular, programmable controller, it comes in two models. Model 1 supports up to 8 host computers, 256 communications lines, and 2M bytes of main storage. Model 2 supports up to 4 hosts, 80 communications lines, and 2048K bytes of storage.

FUNCTION: Front-end or remote full-service communications processor.

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA; pre-SNA IBM communications optional.

OPERATING SOFTWARE: ACF/NCP Version 2 or 3 for the 3725; EP Release 1 or 2 for the 3725.

COMPETITION: NCR Comten 3790; Amdahl 4705 Model E; CCI CC80 and CC85.

PRICE: A 3725 Model 1 configured with 1M bytes of storage, one channel attachment, one Line Attachment Base (Type A), eight Line Interface Couplers (Type 1), and an operator's console costs \$149,990.

CHARACTERISTICS

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

DATE OF ANNOUNCEMENT: March 1983.

DATE OF FIRST DELIVERY: 1983.

SERVICED BY: International Business Machines Corporation.

CONFIGURATION

The 3725 Model 1 base frame accommodates up to 96 lines. With the 3726 Communication Controller Expansion, which is offered only with Model 1, an additional 160 lines can be attached for a total of 256 lines, full-duplex or half-duplex. The 3725 Model 2 accommodates up to 80 full-duplex or half-duplex lines.

The number of operable lines, however, may be fewer than the number physically attachable. The maximum number of lines that operate concurrently depends on line speed, line protocols, message length, control program, and application work load.

The 3725 base machine (for Model 1 or 2) contains:

- Central Control Unit (CCU), that executes instructions to control the communication scanners and channel adapters. It runs under ACF/NCP V2, V3, or V4, EP/3725, or both in PEP mode.

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TABLE 1. LINE ATTACHMENT BASE CAPABILITIES

Line Attachment Base Type	Configuration	No. of Scanners	Type of Line Interface Coupler	Max. No. of LICs per 3725
Type A	Optional, 3725 or 3726	1	1 or 4A	8
Type B	Optional, 3725 or 3726	2	1, 2, 3, 4A, or 4B	8
CLAB	Standard, 3725 only	1	1 or 4A	8

▷ name, physical address, protocol, and speed of each attached communications line as configured by the user; and a new flexibility in the arrangement of LICs and ICCs inside the 3725 cabinet.

IBM also doubled the main memory and provided new software for the system. IBM expanded the 3725's maximum storage mainly to accommodate two new features of its Systems Network Architecture (SNA): SNA Network Interconnection, and the Modulo 128 feature of SDLC, SNA's link protocol. SNA Network Interconnection adds network-to-network communications, a new level of scale for the architecture. The Modulo 128 SDLC feature allows up to 127 SDLC frames to be transmitted before an acknowledgement is required from the receiving node. The previous maximum was seven unacknowledged frames. Before the 1983 announcement, IBM provided no facility for a system or terminal on one network to communicate with a system or terminal residing on another network. With the 1983 announcements, two networks could be connected through a gateway node, an IBM host with attached 3705 or 3725 and running the appropriate software. Each network maintains its own address structures, security provisions, and local classes of service; the gateway node provides translation for internetwork sessions.

In November 1984, IBM announced yet more enhancements to the 3725, Models 1 and 2. The new features included the following:

- High-speed adapter RPQs for the Model 1 that support line speeds from 512K bps to 1.544M bps;
- New Internal Clock feature for both the Model 1 and the Model 2 that supports internally clocked asynchronous terminals for operation with or without communications equipment at speeds ranging from 75 bps to 19,200 bps, and direct attachment of synchronous devices at 245,760 bps;
- Supports externally clocked asynchronous terminals at speeds up to 19,200 bps;
- Line attachment features placed in the 3725 Model 1 and 3726 Communication Controller Expansion can be specified at the time of manufacture; and

▶ • Main storage of 512K bytes, expandable in both models by four additional 256K increments. Main storage houses a 3725 Network Control Program (i.e., NCP, EP, or PEP) and other programs loaded from the host, and provides buffers for data exchanged with the channel adapters and lines.

• Maintenance and Operator Subsystem (MOSS), which provides IPL and utility procedures for the 3725 operator. An independent processor with microcode, a diskette drive, and an attachment for an IBM 3727 operator console are included. The MOSS, with the attached 3727 console, offers network management functions, error logging, machine status display, CCU services, scanner services, line services, and diagnostics.

• Transmission SubSystem (TSS), which physically connects the 3725 to communications facilities. It consists of Line Attachment Bases (LABs) with microprocessor-based scanners, Line Interface Couplers (LICs), and Internal Clock Controls, Type 2 (ICC-2s). The communication scanners serialize and deserialize the characters, support various line protocols, and offer character buffering and cycle-steal transfer in the main storage of the 3725. Integrated modems are not available for the 3725 or 3726.

In Model 1, two Type C LABs are standard; a third LAB (Type A or B) can be added optionally. Each CLAB has one communications scanner and can attach up to 32 full- or half-duplex communications lines by means of optional (separately priced) LICs. The ICC-2s are also optional for Model 1.

For further expansion, the 3726 Communication Controller Expansion can be added. The 3726 Expansion supports up to an additional 160 communications lines. The 3726 attaches only to a 3725 Model 1 and is not supported by the 3725 Model 2.

Model 2 includes one Type CLAB as standard, which can support up to 80 full- or half-duplex lines. Two additional LABs may be added. Model 2 also includes one ICC as standard, but can support two more ICC features. Model 2 is field-upgradable to a Model 1.

Channel adapters, providing physical attachment to host channels, are optional for both models. For Model 1, an optional Two-Processor Switch (TPS) is available that allows a channel adapter to connect two processor channels for nonsimultaneous communication. A basic Model 1 has a physical base for two channel adapters and two TPSs, enabling a total of four hosts to be attached, and two to operate concurrently.

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TABLE 2. COMMUNICATIONS SUPPORTED BY 3725 LINE INTERFACE COUPLERS

Line Interface Coupler (LIC)	Number of Lines per LIC	Type of Interfaces Supported	Transmission Speeds and Modes Supported
LIC1	4	RS-232-C/V.24, RS-366/V.25 (auto-call), X.21 bis, X.20 bis	Synchronous (SDLC or BSC) transmission at 2400, 4800, 9600, or 19.2K bps via external modem or direct connection; asynchronous (start/stop) transmission at up to 1200 bps via direct connections.
LIC2	1	Wideband type for 8751, 8801, or 8803 service	Synchronous BSC transmission at up to 64K bps; synchronous (SDLC) transmission at up to 230.4K bps.
LIC3	1	CCITT V.35	Synchronous (SDLC or BSC) transmission at up to 256K bps via V.35 modem; synchronous transmission at up to 56K bps via direct connection.
LIC4A	4	CCITT X.21	For connection to switched or nonswitched packet networks. Synchronous (SDLC only) transmission at 2400, 4800, or 9600 bps via external modem or direct connection.
LIC4B	1	CCITT X.21	For switched packet networks, synchronous transmission via external modem at up to 48K bps; for nonswitched packet networks, synchronous transmission via external modem at up to 64K bps; for direct connection, synchronous transmission at up to 56K bps. SDLC only. (Not available in the USA.)

- ▶ The LIC weight of half-duplex lines operating at speeds above 9600 bps on LIC Type 1 was reduced.

New features announced for the IBM 3725 Model 2 exclusively included:

- A Channel and Line Attachment Base (CLAB) with a microprocessor-based communication scanner and a physical base for up to 24 additional line attachments, up to two additional channel adapters, and one internal clock feature;
- One Line Attachment Base (LAB) Type A or B with one or two microprocessor-based communication scanners and a physical base for up to 32 additional line attachments and one internal clock control;
- Up to 14 additional line interface couplers (LICs) to install in the optional CLAB or LAB;
- Up to two internal clock controls (ICC-2s) to install in the optional CLAB or LAB; and
- Up to six storage increments of 256K bytes to provide up to two megabytes of main storage.

The 3725 controls data communications between terminals and one or more System/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 host processors or between two or more host processors. Terminal devices can be attached to the 3725 directly or through modems; host processors can be attached locally or remotely. Remote connection may be established by common carrier or customer-owned communication facilities.

- ▶ With the optional 3726 Communication Controller Expansion, four additional Channel Adapters (CAs) without Two-Processor Switches, or two CAs each with TPSs, can be added. Thus a total of eight hosts can be attached, six operating concurrently. If channel-attached, the 3725 requires a control unit position on the system channel.

A basic Model 2 provides a physical base for four channel adapters and no TPS. Model 2 attaches to a maximum of four hosts.

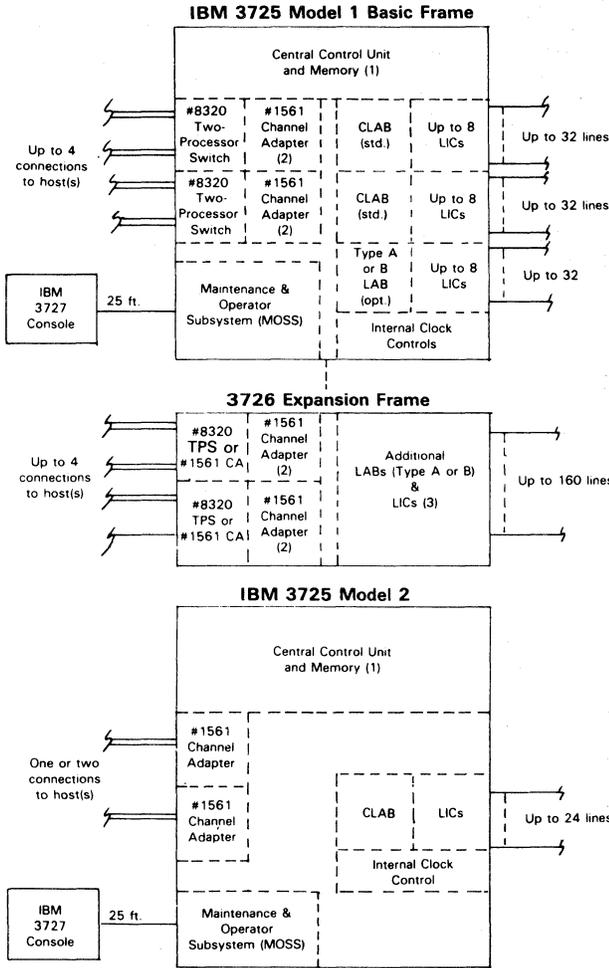
The 3725 can be used as a remote communication controller, without channel connection to a host processor. In this configuration, called "link-attached," the 3725 is connected by one or more communication links to channel-attached 3705s or 3725s. The controller can perform the same networking functions whether link-attached or channel-attached.

The 3725, Model 1 or 2, requires a primary 3727 Operator Console for installation, operation, and maintenance. A second 3727 may be used as an alternate. Only one console is active at a time. The active console is selected by a switch on the 3725 control panel. The console can be located a maximum distance of 25 feet (7.5 meters) from the 3725, and there should not be a wall or door between the console and attached 3725. With the addition of a 7427 Console Switching Unit, up to four 3725s can share a single primary operator console. An alternate console can also be configured and switched among any six controllers.

The configuration diagram on Page -104 of this report shows the relationships among the 3725 components and depicts the 3726 expansion capabilities.

CONNECTION TO HOST COMPUTER: The same type of channel adapter (1561) attaches either the 3725 Model 1 or Model 2 to a host channel of an IBM S/370 (except Models 115 and 125), 303X, 308X, 4331, or 4341 processors. A channel adapter provides the logical and physical interface between the communication controller and host processor. It attaches to a byte multiplexer, block multiplexer, or selector channel. The 3725 Model 1 supports physical

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Notes:

(1) Memory capacity is 512K bytes. On 3725 Model 1 only, memory capacity may be expanded in 256K-byte increments to a maximum of 2M bytes.

(2) 3725 Model 1 supports up to two Channel Adapters and 2 Two-Processor Switches; four additional Channel Adapters, or two Channel Adapters and 2 Two-Processor Switches, may be added via the 3726 Expansion. Thus, the maximum number of channels physically attachable is eight, and the maximum number of channels concurrently active is six.

3725 Model 2 supports one or two Channel Adapters; no support is provided for the Two-Processor Switch.

(3) 3725 Model 1 provides two Type C Line Attachment Bases (CLABs) as standard components, and supports one additional LAB (Type A or B) as an option; up to five additional Type A or B LABs can be added via the 3726 Expansion. 3725 Model 2 provides one CLAB as a standard component, and is not expandable.

On the 3725 Model 1, all LABs are optional; each LAB supports up to 32 communications lines via single- and multiline Line Interface Couplers (LICs), for a maximum line capacity of 256 lines. The Line Increase Feature (#3602) is required to support more than six LABs and is contained in the 3726 Expansion frame. On the 3725 Model 2, the LAB supports a maximum of 24 lines, via single- and multiline LICs.

➤ The two 3725 models serve large or small networks. Model 1, which accommodates the 3726 Communication Controller Expansion unit, supports a maximum of eight hosts, 256 lines, and 2048K bytes of storage. Model 2 supports up to four hosts, 80 lines, and 2048K bytes of storage.

The Central Control Unit (CCU) performs the control program which is kept in main storage. This unit regulates the channel adapters, the communication scanner, and any data that is transferred between them. The main storage, besides housing the control program, provides the data space for the attached telecommunications lines. The telecommunications lines are connected via cables to line interface couplers (LICs) in the 3725.

Software for the 3725 includes the Advanced Communications Function for Network Control Program (ACF/NCP) and the Emulation Program (EP/3725), which are designed only for the 3725 and cannot run on the 3705. Users must install ACF/System Support Programs (ACF/SSP), Version 2 or 3, on the host to generate the ACF/NCP, which must be downloaded to the 3725. ACF/SSP has a configuration control program that provides support for IBM's new 3710 Network Controller. ACF/NCP for the 3725 can communicate with ACF/NCP for the IBM 3705. EP/3725

➤ attachment of up to eight host channels; Model 2 supports up to four.

In Model 1 only, each Channel Adapter (CA) may be equipped with a Two-Processor Switch (TPS), which allows the CA to be connected to two processor channels instead of only one. The channels may belong to the same or different processors. Data cannot be transmitted simultaneously on more than one channel. Manual switches on the 3725 control panel allow a user to enable each of the active channel interfaces. If all interfaces are enabled, the processors are responsible for resolving any contention, because only one interface can transfer data at a time.

The channel adapters must occupy contiguous positions beginning with Position 1. CA Positions 1 and 2 are in the 3725 basic frame; CA Positions 3 through 6 are in the 3726 Expansion frame. Both CAs must therefore be installed in the 3725 before one may be installed in the 3726. When TPS is installed, it is placed in the first available position. The same channel attachment cable groups (3290 and 1178) serve Model 1 or 2.

TRANSMISSION SPECIFICATIONS

Three types of Line Attachment Bases (LABs) are available—LAB Type A, LAB Type B, and CLAB. In the 3725 Model 1, the base machine includes two CLABs as standard components; each has one communication scanner. One additional LAB, Type A or B, may be installed. Type A provides one scanner; Type B provides two. If further expansion

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- allows coexistence of 270X, 370X, and 3725 communications processors in a common host environment.

COMPETITIVE POSITION

In terms of the marketplace, we see the 3725 as a system designed to address the 3705's current competitors, and not as a revolutionary breakthrough in communications processing. The IBM 3725 competitors include the Amdahl 4705 and NCR Comten 3690. The IBM 3725 Model 1 outdoes the Amdahl 4705 Model E in number of hosts attachable (eight versus six), number of hosts supported concurrently (six versus four), number of full-duplex lines attachable (256 versus 176), and maximum main memory capacity (2M bytes versus 1M bytes). The Amdahl 4705 takes less floor space than the IBM 3725, even though the 3725 is not as bulky as the 3705. The 3725 is exceeded by the NCR Comten 3690 Models A5 to E5 in number of lines attachable (512 half- or full-duplex), number of hosts supported concurrently (eight) and maximum main memory (4M bytes). The Comten 3690 also supports disk-based mass storage, a capability not offered with the 3725.

ADVANTAGES AND RESTRICTIONS

A chief advantage of the 3725 is its simplified machine structure that can handle larger networks and provide more main storage than the 3705 models. The 3725 involves only one scanner type, one channel adapter type, and five line interface coupler types. The simplified design includes features that serve multiple uses, and facilitate configuration upgrades without changing already installed machine features. For example, a single type of line attachment supports SDLC or BSC protocols at line speeds up to 19.2K bps plus asynchronous protocols at speeds up to 1200 bps.

An added advantage of the structure is that it requires up to 50 percent less floor space, and less power, than the 3705-II, depending on configuration.

The 3725 supports throughput equal to 1.8 to 1.9 times that of a 3705-II equipped with a Scanner Type 3, or 3.2 to 3.5 times that of a 3705-II with a Scanner Type 2.

Another advantage of the 3725 is its improved network management facility. A functionally separate Maintenance and Operator Subsystem (MOSS) that uses an integral diskette drive, an attached IBM 3727 Operator Console, and software functions built into the 3725 versions of ACF/NCP and EP facilitates operation, maintenance, and problem determination. Two mechanisms, called Alert and Alarm, are used to aid in problem determination. For instance, MOSS displays Alert messages when a problem occurs in the 3725 that affects normal operations and might require operator action. The Alert messages identify the cause of the error, give additional information on the resources affected by the error, and suggest possible actions to be taken by the operator. The Alarm gives an automatic first level of problem determination, informs the operator console of failure, and provides an entry point into the maintenance documentation so as to follow through and

- tion is needed, up to five additional LABs (Type A or B) may be installed in the 3726 Expansion.

The 3725 Model 2 supports one CLAB, which is a standard component, but two additional LABs may be added.

The microprocessor-based scanner serializes and deserializes the characters, supports various line protocols, and provides character buffering and cycle-steal transfer into the 3725 main storage. The scanner microcode is loaded from the MOSS diskette. Any scanner can support intermix protocols, asynchronous or synchronous communications, and half- or full-duplex transmission. BSC (EBCDIC or ASCII) and SDLC protocols are supported in normal mode, an operating mode similar to that of the 3705 Scanner Type 3. Asynchronous protocols with five to eight data bits and one or two stop bits are supported in character mode, similar to that of the 3705 Scanner Type 2. In character mode, BSC is also supported. Character mode is required for tributary addressing under EP or PEP. The scanner, in addition, supports procedures for automatic calling units and X.21 native, X.21 bis, X.20 bis, and X.25 protocols. The number of lines handled by the scanner depends on protocol and transmission speed.

Table 1 lists the line attachment base capabilities.

Line Interface Couplers (LICs) attach the communications facilities and terminals to the 3725. Five types of LICs are offered. The decision of which one to use depends on the physical interface required, the transmission speed to be supported, and number of lines to be connected. An LIC can attach from one to four full-duplex or half-duplex lines. Up to eight LICs can be installed per LAB, allowing up to 32 lines per LAB.

Terminals can be attached to the 3725 either directly or via modems. Direct (modemless) attachment of terminals can be accomplished with LIC-1, LIC-3, LIC-4A, or LIC-4B and the corresponding direct attachment cable.

Table 2 shows the modem attachment and direct connection capabilities of the LICs.

The Internal Clock Control, Type 2 (ICC-2) provides bit clocking when the attached external modem does not provide the clocking, as well as when direct attachment of the data terminal equipment is required. The ICC-2 provides clocking for eight LICs (up to 32 lines) at 50, 110, 134.5, 200, 300, 600, and 1200 bps for synchronous or asynchronous operation with or without a DCE direct attachment. Business machine clocking to the 3725 is also provided at data rates of 75, 100, 2400, 4800, 9600, and 19.2K bps for asynchronous operation with or without a DCE direct attachment.

For externally clocked DTEs, bit clocking to directly attached DTE at data rates of 2400, 4800, 9600, 19.2K, 56K, and 245K bps for synchronous operation without a DCE is provided, while data rates of 2400, 4800, 9600, and 19.2K bps are provided for start/stop operation without a DCE. The speed is set to 9600 bps at the factory, and when installed it may be changed by the CE on a per-LIC basis.

SOFTWARE

ADVANCED COMMUNICATIONS FUNCTION FOR NETWORK CONTROL PROGRAM (ACF/NCP) VERSION 2, 3, OR 4 FOR THE IBM 3725: ACF/NCP for the 3725 is the basic operating system for either 3725 model, whether channel-attached or connected via communications link. ACF/NCP for the 3725 is supported by hosts operating under OS/VS1, OS/VS2, MVS, and DOS/VSE, and is designed to support the enhanced operating features of the 3725, including its problem determination, error recording,

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► solve the problem. Sixteen levels of Alarm, that correspond to the sixteen levels of Alert, are available.

USER REACTION

In Datapro's 1985 Network Users Survey, 125 users of the IBM 3725 Communications Processor responded with an installed base of 500 units. The ratings for the IBM 3725 are given below:

	Excellent	Good	Fair	Poor	WA*
Overall performance	53	65	6	1	3.4
Ease of installation	33	69	20	2	3.1
Ease of operation	32	73	17	2	3.1
Ease of expansion	25	72	20	4	3.0
Hardware reliability	70	47	7	1	3.5
Quality of manufacturer's software/firmware	28	82	15	0	3.1
Ease of programming	12	55	18	5	2.8
Quality of manufacturer's maint. svc./tech. support	38	69	15	3	3.1

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

We were unable to contact any of these users for additional comments. □

► and system generation capabilities, storage for up to 2M bytes, and support for continued operation and controlled shutdown in failure situations. ACF/NCP for the 3725 also supports Release 4 of the X.25 NCP Packet-Switching Interface licensed program.

ACF/NCP for the 3725 supports and communicates with the following host-resident programs: ACF/SSP Versions 2 and 3, ACF/TCAM Version 2 Release 4, ACF/VTAM Version 1 Release 3 (MVS only, with appropriate PTF), ACF/VTAM Version 2 (MVS, VS1, and VSE), EREP 1.5 (MVS/VS1, VSE/VM), and NPA-Host FDP Number 5798-CZR, NPDA Version 2, NCCF Version 2, and NLDM Release 2.

ACF/NCP for the 3725 also supports and communicates with these controller-resident programs: ACF/NCP for the IBM 3725, EP for the IBM 3725, PEP, NTO Release 2 for the IBM 3725, X.25 NPSI Release 4, and ACF/NCP for the IBM 3705.

ACF/NCP Version 3 for the 3725 supports all the features of Version 2, and additionally supports SNA Network Interconnection (network-to-network SNA sessions), and Modulo 128 SDLC (128 frames before acknowledgement). ACF/NCP Version 3 is supported only on controllers attached to hosts running MVS/370 or MVS/XA.

ACF/NCP Version 3 will support the VHSA RPOs (8J5080, 8J5081, 8J5082) and the IBM 3725 Model 2 storage expansion up to two megabytes after upgrading the existing machines.

EMULATION PROGRAM FOR THE IBM 3725 (EP/3725): EP/3725 supports 3725 operation in 270X Emulation Mode. EP/3725 provides the same problem determination aids, error recording functions, and other features as ACF/NCP on the 3725. It provides support for up to six channel adapters, and can run concurrently with ACF/NCP Version 2 in PEP operation mode. EP/3725 Release 2 supports the new 256K BSC data rate, and is necessary for

PEP operations alongside ACF/NCP Version 3. It incorporates the S.W.I.F.T. PRPQ (5799-AQT), which assists users of EP or PEP to link directly to the network of the Society for Worldwide Interbank Financial Telecommunications.

EP/3725 is designed for users of VSE/AF Release 3, OS/VS1 Release 7, VM/SP 2.1, MVS/370, and MVS/XA. EP/3725 supports the following access methods: BTAM, BTAM-ES, BTAM-SP, ACF/TCAM, and RTAM.

ACF/NCP for the 3725 and EP/3725 are generated using the ACF/System Support Programs (ACF/SSP) Version 2 Release 1.1 or 2 licensed program (5735-XXA), which was announced with the 3725. Designed to operate only in the IBM 3725, neither will operate in the IBM 3704 or 3705. Coexistence of 270X, 370X, and 3725 in a common host environment, however, is supported.

ACF/SYSTEM SUPPORT PROGRAMS (ACF/SSP) VERSION 2 AND 3: ACF/SSP provides system generation and utility functions for users of ACF/NCP for the 3705, ACF/NCP for the IBM 3725, and EP on the IBM 3705 and EP/3725. ACF/SSP Version 2 Release 1.1 or 2 requires at least one locally attached IBM 3705-II or 3705-80 meeting the storage requirements of ACF/NCP or EP for the 3705 or one locally attached 3725 meeting the storage requirements of ACF/NCP or EP/3725 for the 3725. It is supported under VSE/AF Release 3, OS/VS1 Release 7, MVS/370, and MVS/XA with the appropriate VTAM or TCAM release.

ACF/SSP Version 3 and ACF/NCP Version 3 or ACF/NCP Version 4 and/or EP/3725 Release 2 are required to support the additional start/stop data rates provided by Internal Clock Control Type 2. Existing machines need to be upgraded in order to support this capability. ACF/NCP Version 4 or ACF/NCP Version 3 with appropriate PTFs and/or EP/3725 Release 2 with appropriate PTFs is needed to support more than two channel adapters in the IBM 3725 Model 2.

ACF/SSP Version 2 Release 2 supports all the features of Version 2 Release 1.1, along with SNA Network Interconnection and Modulo 128 SDLC. ACF/SSP Version 2 Release 2 is necessary only to support ACF/NCP Version 3. This version may run only on hosts running MVS/370 and MVS/XA.

X.25 NCP PACKET-SWITCHING INTERFACE PROGRAM: X.25 NPSI provides users of ACF/NCP/VS with the facility to use the 3725 Communication Controller to access public data networks complying with CCITT X.25 standards. The package is Telenet-certified. This program supports packet sequence numbering of up to 128, with a packet length section of up to 4,096 characters. It supports SNA network node interconnection and protocol conversion for non-SNA equipment. Within the program is a subset of X.29 allowing communications with asynchronous X.28 devices (TTY). It also supports the X.21 LICs.

NETWORK TERMINAL OPTION (NTO): NTO is a software product which is loaded in the 3725 and extends the SNA environment to include support for several common asynchronous terminals. These include the IBM 2740 and 2741 terminals on either switched or leased lines, and Teletype models 33/35 on switched lines only.

PRICING

All 3725 components can be acquired by purchase or month-to-month rental. The 3725 is offered under Plan D of IBM's Lease and Rental Agreement (LRA). This plan calls for an initial period of three months, during which IBM provides maintenance service 24 hours per day, 7 days per week at no additional charge. After the initial period, maintenance

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▶ service is available for an Annual Maintenance charge, which specifies a maximum number of hours of service per month. If the maximum is exceeded, an Additional Monthly Maintenance Charge Rate (AMMCR) is applied.

Purchase credit for rental payments made under LRA can be accrued up to a maximum of 65 percent of the total purchase price.

EQUIPMENT PRICES

		Purchase Price (\$)	Annual Maint. (\$)	Monthly Rental (\$)	AMMCR (\$)
3725 Communication Controller					
	Model 1 (512K bytes, up to 96 lines)	75,000	2,556	3,485	213
	Model 2 (512K bytes, up to 24 lines)	60,500	2,280	2,630	190
	3726 Communication Controller Expansion (up to 160 lines; attaches to Model 1 only)	32,000	480	1,485	40
#1561	Channel Adapter—provides physical connection to host I/O channels from 3725-1, 3725-2, and 3726	6,750	96	315	8
#4666	Internal Clock Control—provides bit clocking when the external DCE does not provide clocking or when DTE is directly attached	1,500	24	69	2
#4667	Internal Clock Control-2—second clock for both 3725 models; supports internally clocked asynchronous terminals for operation with/without modems for operation at 75/100/2400/4800/9600/19.2K bps in addition to currently supported speed	1,500	24	69	2
	Line Attachment Bases—				
#4771	Type A	19,000	192	882	16
#4772	Type B	26,400	324	1,230	27
#4773	CLAB	16,000	300	929	25
	Line Interface Couplers—				
#4911	Type 1—provides 4 EIA RS-232-C/CCITT V.24 interface ports for half- and full-duplex communication lines at up to 19.2K bps	2,600	24	123	2
#4921	Type 2—accommodates a single half- or full-duplex communication line at transmission rates up to 230.4K bps	3,000	24	139	2
#4931	Type 3—accommodates a single half- or full-duplex dedicated communication line through a V.35 interface at data rates to 256K bps	3,000	24	139	2
#4941	Type 4A—provides 4 CCITT X.21 interface ports as defined in IBM SRL GA27-3287 for half- or full-duplex, switched or dedicated communication lines at data rates up to 9600 bps	2,600	24	124	2
#4942	Type 4B—single CCITT X.21 interface port as defined in IBM SRL GA27-3287 for a half- or full-duplex switched or dedicated line; supports data rates up to 48K bps on switched line and 64K bps on dedicated line	3,000	24	139	2
#7100	Storage Increment (256K bytes)—6 maximum per 3725	4,375	228	203	19
#8320	Two-Processor Switch	4,000	36	187	3
#3602	Line Increase Feature on 3726	8,500	168	395	14
	3727 Operator Console Model 70—				
	Logic Unit	2,390	324	171	27
#3255	Display	325	—	—	—
#4655	Keyboard	420	—	—	—

SOFTWARE PRICES

		Initial Charge		Monthly Charges			
		Basic License (\$)	DSLO License (\$)	Basic License (\$)	DSLO License (\$)	Licensed Program Support (\$)	Additional Licensed Program Support (\$)
5735-XX9	ACF/NCP Version 2 for IBM 3725	1,280	963	240	180	37	59
5667-124	ACF/NCP Version 3 for IBM 3725	2,400	2,160	400	360	135	216
5735-XXB	EP/3725 Release 2	1,280	963	240	180	37	59
5735-XXA	ACF/SSP Version 2 Release 2	508	381	92	69	24	38
5668-981	X.25 NPSI Release 4	700	525	223	166	40	64
5735-XX7	NTO for IBM 3725	660	495	206	155	12	19 ■

