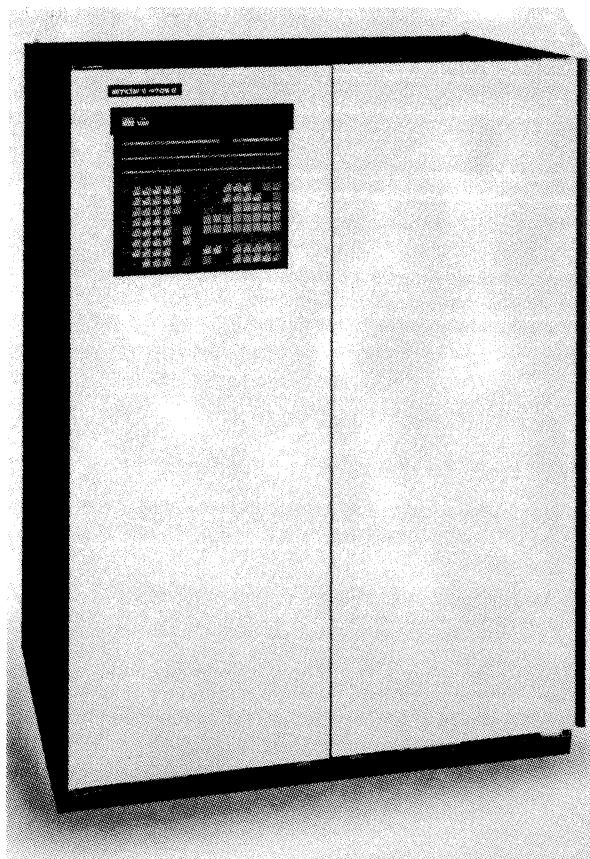


Amdahl 4705 Series Communications Processors



Amdahl's 4705E Communications Processor offers a unique backup feature, the Integrated Line Switch. This feature allows for software-initiated switching of line interface units from the main 4705E to a backup 4705E.

MANAGEMENT SUMMARY

UPDATE: *This report is being updated to include a component price list, several minor changes, and a user ratings section. The Amdahl 4705 is no longer actively marketed, but is still supported by the company. An existing 4705 can be field-upgraded to a 4705E or 4705T machine.*

Amdahl Corporation, founded in 1970, is a leading supplier of large, general-purpose computers. The Communications Systems Division, formerly known as Tran Communications Ltd., became a wholly owned subsidiary of Amdahl in 1980. This division designs, manufactures, and markets private and public digital communications equipment and networks. Some of its products include multiplexers, packet switching systems, limited distance data sets, and Customer Service Units/Data Service Units (CSU/DSU).

The 4705 Communications Processor was Amdahl's first alternative offering to the IBM 3705-II Communications

The Amdahl 4705 Communications Processor, Amdahl's first plug-compatible, software-compatible replacement for the IBM 3705 Communications Controller, is no longer being actively marketed, but is still being supported by the company. Amdahl is concentrating its efforts on the 4705E, a plug-compatible replacement for the IBM 3725 Communication Controller, and the 4705T, an upgrade of the 4705E. In many applications, these Amdahl processors offer price/performance advantages over their IBM equivalents.

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

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA and emulation environments.

OPERATING SOFTWARE: IBM's ACF/NCP, NCP, PEP, and EP.

COMPETITION: IBM 3705; IBM 3725; NCR Comten 3650 and 3690; CCI CC80 and CC85.

PRICE: Depends upon configuration.

CHARACTERISTICS

VENDOR: Amdahl Corporation, 1250 East Arques Avenue, P.O. Box 470, Sunnyvale, CA 94088-3470. Telephone (408) 746-6000.

DATE OF ANNOUNCEMENT: 4705E—April 1983; 4705T—February 1985.

DATE OF FIRST DELIVERY: 4705E—April 1983; 4705T—February 1985.

NUMBER DELIVERED TO DATE: 4705E—800; 4705T—Information not available.

SERVICED BY: Amdahl Corporation.

CONFIGURATION

The Amdahl 4705 Series of Communications Processors are designed to compete with IBM's 3725 Communications Controller. The 4705E provides memory from 256K bytes to 1024K bytes in 256K-byte increments; can support up to six CPU attachments to block or byte multiplexer channels in the base frame; supports up to 352 half-duplex communication lines has two channel switches that permit a channel adapter to be switched between two hosts; supports up to four communications scanners and a Line Interface Base (LIB) that supports up to four line sets.

The 4705T, while offering the same basic configuration as the 4705E, also offers some additional capabilities through the High-Speed attachment feature. These features include: additional data channels that operate at speeds from 4800

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▷ Controller. The 4705 was announced in October 1980; U.S. deliveries began in December 1980, and European deliveries began in October 1981. The 4705E was announced in April 1983, with U.S. delivery also beginning in April 1983. Between the 4705 and the 4705E, over 1,000 units have been installed in the U.S., Canada, Europe, and Australia. The 4705T was announced in February 1985 and is currently available for delivery. The 4705E can be upgraded to the 4705T, and current 4705s can be upgraded to either a 4705E or 4705T.

The 4705E, an enhanced version of the 4705, is designed to compete with IBM's high-end 3725 Communication Controller. Like the 3725, Amdahl's 4705E offers greater maximum main storage, faster throughput, and simpler configuration than the 4705 or the IBM 3705. In addition, the 4705E runs the established IBM 3705 operating software, rather than the newer IBM versions for the 3725. The 4705E can support from 256K to 1M bytes of main memory, expandable in 256K increments, and from 64 to 352 communications lines operating synchronously or asynchronously, in half- or full-duplex mode, at rates from 1200 to 64K bps. In extended connectivity, the 4705E can support 64 asynchronous and synchronous lines on a single scanner at speeds up to 4800 bps (asynchronously) or 9600 bps (synchronously).

The 4705T is a high-performance version of the 4705E, which adds to the basic 4705E capabilities. It provides communications for up to 44 data and/or voice lines multiplexed over a high-speed facility at speeds up to 2048K bps. The 4705T allows simultaneous two-way communications over the voice and/or data lines. The voice lines link local and distant automatic telephone switchboards so that the need for dedicated trunk lines is eliminated. Like the 4705E, the 4705T can operate industry-standard 3705 communications software, and is compatible with processing systems that are based on System/370 and 370 extended architecture (370-XA).

COMPETITIVE POSITION

The Amdahl processors compete in the market for full-scale, IBM-compatible communications processors against NCR Comten's 3600 Series and CCI's CC80 and CC85, as well as with IBM itself. IBM has the lion's share of the processor market—roughly a 90 percent market share. Each of the plug-compatible vendors uses a different product strategy to gain its share of the remaining 10 percent: NCR Comten combines performance advantages with its own networking software; CCI gears its product to special applications, such as airline reservation systems, and offers a variety of field-upgradable, low-end models. Amdahl, the original vendor of IBM-plug-compatible mainframes, is the only vendor in the market to offer full software compatibility with IBM's communications processors, in addition to significant advantages in price, performance, and configuration.

In pricing several models from Amdahl and IBM, Datapro found that the Amdahl prices are lower when comparing ▷

▶ bps to 768K bps; trunk interface to conventional high-speed links from 56K bps to 2048K bps; voice links between telephone switchboards that offer high quality, low cost alternatives to more expensive dedicated tie lines or long distance charges; and additional line sets.

The high-speed line attachments are housed in a new, smaller expansion cabinet that is 21 inches wide, 29.5 inches deep, and 62.6 inches high. This cabinet attaches to the side of the 4705E main or expansion cabinet. These high-speed line attachments are powered separately from the base and expansion 4705E cabinets. This provides a high-degree of isolation in case of faults on a high-speed line. Each high-speed line is controlled by a separate microprocessor that offers isolation and independence from the main 4705E CPU. The processing necessary to maintain the high-speed lines produces no degradation in either the throughput or the connectivity of the 4705E portion of the box.

Physically, the 4705 Series Communication Processors are housed in one to three frames, or cabinets. The Basic Frame is a double-width cabinet that includes the CCU, main storage, operator control panel, lamp unit, and loader unit; all Channel Adapters and Scanners; and mountings for up to 10 LIBs and Line Sets for up to 160 lines. Each of two smaller Expansion Frames accommodates up to an additional six LIBs and Line Sets for up to 96 lines. The 4705T also features a High-Speed Expansion Frame that can hold up to 96 communications lines that support both voice and data communications.

The High-Speed Expansion cabinet also houses a Voice I/O module that provides a way of supplying voice communications over an existing trunk. This module eliminates the need for expensive dedicated tie lines. The Voice I/O module has two channels, plugs into the chassis in the High-Speed Expansion cabinet, and provides a standard four-wire E&M, type 1 voice interface. Voice traffic is accommodated using an Amdahl exclusive, enhanced CVSD technique that digitizes voice at 16K, 32K, 48K, or 64K bps on a per line basis. This Amdahl-Enhanced Continuously Variable Slope Delta modulation technique (AECVSD), which is patent pending, produces toll quality voice at 32K bps and can support modems at up to 9600 bps. By adding voice interface equipment, the Voice I/O module capabilities can be further extended to cover other voice applications such as facsimile transmission, business machine intercommunication, or automatic hot-line operation. The module has built-in diagnostics for end-to-end channel testing from a central Network Console; built-in fault detection and alarm reporting; and manual channel disable for quick error recovery and diagnostics. The module can accommodate up to 46 voice channels, or a combination of voice and data channels, over a single link.

The Synchronous and Asynchronous I/O Modules are also housed in the High-Speed Expansion cabinet. These modules provide the channel logic needed to interface either two low-speed synchronous or asynchronous data channels with the 4705T. Each module can be supplied to support one of these interfaces: RS-232-C/V.24, V.35, AT&T 301/303, or MIL STD-188/114. Each module occupies one slot in the chassis of the expansion cabinet. The modules can be configured in the field to interface with either Data Terminal Equipment (DTE) or Data Communications Equipment (DCE). They operate in full- or half-duplex mode, and can transmit up to four interface controls in either direction. The Synchronous I/O Module supports channel data rates of 300 bps to 512K bps, depending on the interface chosen, while the Asynchronous I/O Module supports channel data rates from 110 to 19.2K bps. The Asynchronous Module accepts either ASCII or EBCDIC data formats and is parity transparent. The channel characteristics of either module are software configured by the 4705T Network Console. From the console, data rates, full- or half-duplex mode, ▶

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IBM configurations with equivalent memory, channel adapters, communications scanners and line sets. The 4705T offers significant benefits when compared to the IBM 3725 RPQ VHSA. It supports more high-speed lines (four versus one), allows the inclusion of data sources outside the FEP, supports both voice and video, and offers a dramatic cost savings. The IBM RPQ, to support a single T1 line, is approximately \$140,000 above the cost of the basic 3725; the 4705T's high-speed attachment is around \$20,000 higher than the basic 4705E. Since a pair of 3725's or 4705T's are required, the cost of implementing a T1 link with 4705Ts is approximately \$240,000 less than a 3725 implementation.

IBM has recently upgraded its 3725 controller to include up to 3 megabytes of storage (up from a maximum of 2 megabytes). Performance improvements allow customers to configure more high-speed lines on new and existing 3725s, and remote 3725s can now be diagnosed from the central site. IBM has also introduced a low-cost controller, the 3720, designed for small- to medium-sized organizations that do not need the performance and capacity of the larger 3725. In May 1986, NCR Comten introduced the 5660 processor, a high-end product that offers more power and line connectivity than any other SNA-compatible machine. It concurrently supports up to 1,024 communications lines, executes approximately 3.5 million instructions per second, and provides centralized or distributed network control via a system console.

ADVANTAGES AND RESTRICTIONS

Amdahl's biggest advantage against the other plug-compatible vendors is its 100 percent software compatibility with IBM systems. Users can swap an Amdahl communications processor for its IBM counterpart with few, if any, software rewrites.

The 4705 Series processors' advantages over the IBM 3705 include:

- *Improved throughput capacity*—Amdahl conducted benchmark tests that show the aggregate data rate capacity of the 4705E and 4705T to be approximately 2.4 times the capacity of a similarly configured IBM 3705-II, and approximately 1.3 times that of the 3725. (The 4705E and 4705T units have about 1.8 times the capacity of the older 4705.)

One explanation for Amdahl's improved throughput is the instruction look-ahead function, which allows the processor's fetch cycle to retrieve another instruction from memory while execution of the current instruction occurs. This overlap of fetch time with execution time does not occur with IBM 3705-II's processor. Another reason for improved throughput is that the internal cycle speed for the 4705 Series' processor is 145 nanoseconds (0.145 microseconds) compared to 1.0 microseconds for 3705-II Models E, F, G, and H, and 0.9 microseconds for Models J, K, and L.

control signals, and scrambler enable can be configured. The physical interface between either module and its channel device is supplied by a Channel Connector Assembly, which is ordered separately.

The Integrated Limited-Distance Data Set Module, which occupies one I/O slot in the chassis of the High-Speed Expansion Cabinet of the 4705T, contains an integrated limited-distance data set to provide low cost synchronous communications with remote channel devices. The module can support the following range of data rates: 1200 to 9600 bps, 2400 to 19.2K bps, and 19.2K to 64K bps. An Amdahl 982 Synchronous Data Set terminates the four-wire loop at the remote end. With the Integrated Limited-Distance Data set in the 4705T, the 982 Data Set can be located up to 32 miles away. The physical interface between the module and the channel cable from the remote 982 Data Set is furnished by a four-wire connector mounted on the backplane of the chassis. The module operates in either full- or half-duplex mode. When operating in half-duplex mode, the module can transmit three DTE to DCE controls and four DCE to DTE controls. Most of the channel characteristics are soft configured by the 4705T Network Console, including data rate, full- or half-duplex operation, control signals, and scrambler enable. The Integrated Limited-Distance Data Set module offers automatic onboard storage of channel parameters for channel integrity, built-in fault detection and alarm reporting, and automatic equalization and automatic line build-out for distortion-free transmissions.

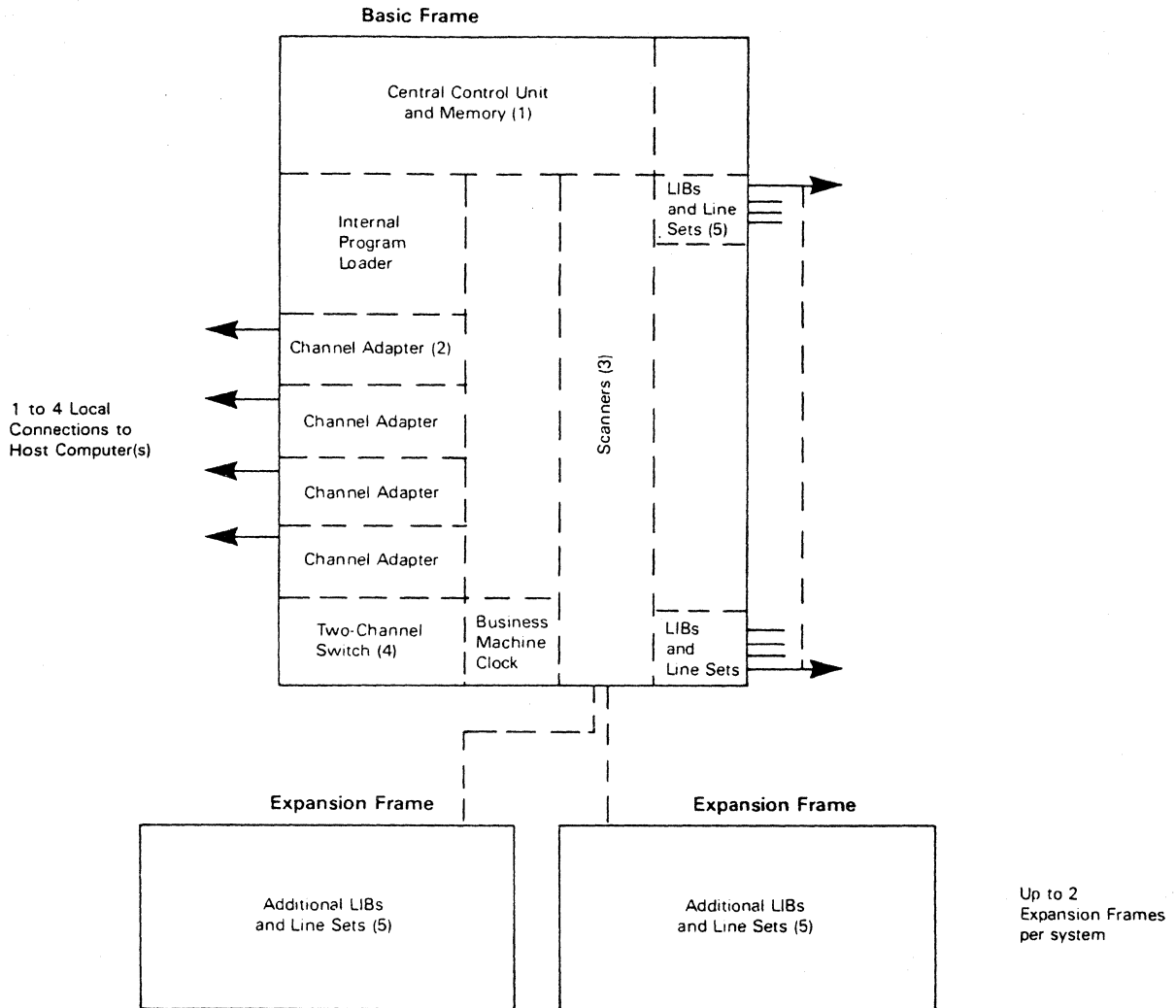
The Integrated Multiport Limited-Distance Data Set furnishes the logic to interface up to four channels, on one four-wire loop, within the 4705T High-Speed expansion Cabinet. Synchronous data rates from 600 bps to 9600 bps are supported by the module, with no overhead bandwidth. Two, three, or four channels from a four-wire loop are combined by the module and are terminated by an Amdahl 984 Multiport Synchronous Data Set that can be located up to 28 miles away. The module operates in full-duplex mode, with the 4705T Network Console soft configuring communications characteristics, such as data rate and channel split. The module is housed in two adjacent slots in the chassis with the High-Speed Expansion Cabinet of the 4705T. The physical interface from the module to the remote 984 Data Set is provided by a four-wire connector that is mounted on the backplane of the chassis. The Integrated Multiport Limited-Distance Data Set provides automatic onboard storage of channel parameters for channel integrity, built-in fault detection and alarm reporting, manual or remote dis-

Module	Function	Speeds (up to kbps)	Duplex Mode	No. Lines per Line Set	Electrical Standard
HS20	Synchronous I/O	64 768 64	Both	2	RS-232-C, V.35 Bell 301/303 MIL-STD-188-14
HS40	Asynchronous I/O	19.2 19.2	Both	1	RS-232-C, V.24 MIL-STD-188-14
HS45	Voice I/O	16-64 kHz	—	2	4 Wire, Type I E&M Signalling Amdahl Enhanced CVSD
HS30	Integrated Limited Distance Data Set	1.2-64	Both	1	4 Wire, AT&T 43401
HS34	Integrated Multiport Limited Distance Data Set	.6-9.6	Both	4	4 Wire, AT&T 43401

Table 1. 4705T high-speed attachment interface modules

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Configuration



(1) Memory size is 64K to 512K bytes, expandable in 64K-byte increments, for the 4705 and 64K to 1M bytes for the 4705E.

(2) One to four Channel Adapters can be installed.

(3) One to four Communications Scanners can be installed. If Type 2 is used, first Scanner can handle up to 64 lines; additional three Scanners can handle up to 96 lines each. If Type 3 is used, first Scanner can handle up to 48 lines; additional three Scanners can handle 64 lines each. Maximum number of lines per system is 352.

(4) One Two-Channel Switch may be configured for each Channel Adapter.

(5) Basic Frame accommodates up to 10 LIBs and Line Sets for up to 160 lines. Each Expansion Frame accommodates up to 6 LIBs and Line Sets for up to 96 lines. Each LIB handles up to 16 lines. Each Line Set provides interfacing for one to four lines, depending on type of Line Set selected.

➤ • *Simpler, more accurate operator controls*—Amdahl's system provides a newly designed console panel that contains touch-sensitive switches and hexadecimal LED read-outs in place of IBM's control panel lamps and rotation-type mechanical switches.

• *Reduced space requirements*—Amdahl's cabinetry is physically smaller and requires less service clearance than IBM's. For Amdahl models that are configured with the same number of frames as the equivalent IBM model (counting Amdahl's double-width Basic Frame as two frames), the space savings can be substantial. The one

➤ **able of individual channels, and automatic equalization and automatic line buildout that provides distortion free transmissions.**

A Maintenance Subsystem, which includes a diskette-based diagnostic reader and a display unit, is also part of the 4705 Series. The subsystem can perform diagnostics on an operating 4705E or 4705T.

Two optional features available with the 4705E and the 4705T are the Integrated Line Switch, which allows a 4705E or 4705T to switch communications lines from malfunctioning line sets in its main cabinet to hot standbys in an expansion cabinet; and the High-Speed Asynchronous

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exception is when an Amdahl model contains one more frame than its IBM equivalent. When service clearance is considered, all of Amdahl's models take up less space than IBM's.

- *Simplified installation and improved reliability and serviceability*—The inherent modularity of the Amdahl system's design reduces downtime when the system is expanded or a component fails. The system provides a standalone self-diagnostic and maintenance routine that allows internal system functions to be self-tested without dependence on a host computer or other outside connection. In addition, the 4705 Series' architecture provides several functions designed to increase the system's operational reliability, such as automatic instruction retry when an instruction fails to execute correctly, line unit loop diagnostics, and a channel loopback capability.

Certain IBM configurations and features are slightly different as implemented by Amdahl. For instance, the Amdahl 4705 Series system's main memory is expanded in 256K-byte increments, whereas the IBM 3705 and 3725 memories are expandable in 32K-byte steps. (IBM's new 3720 controller accepts increments in 256K-byte segments.) This results in Amdahl's having fewer memory-plus-line-capacity combinations than IBM. In addition, Amdahl has chosen not to support the lower-performance IBM Type 1 Channel Adapter and Type 1 Communications Scanner, which are essentially replaced by the high-performance Type 4 Channel Adapter.

Amdahl also does not support IBM's Line Interface Base Types 2 through 12, which support Telegraph interfaces and integral modems and adapters. Certain IBM Line Sets that utilize Line Interface Base 1, including Line Sets 1J, 1GA, 1TA, 1W, and 1Z, are also not supported. Although IBM has merged its Line Sets 1A and 1B into its 1D Line Set, Amdahl has decided to keep them separate, which may result in a cost savings to the customer.

Most of Amdahl's 4705 Series Line Sets are equivalent to two of their respective IBM versions but are priced substantially less than twice the cost of the IBM versions. Also, Amdahl's Line Set NC1E, which is priced as an equivalent to IBM's Line Set E1 (a dual RS-366-compatible automatic dial interface), includes two RS-232-C interfaces for attachment of regular communications lines in addition to the two auto-dial unit interfaces offered on the IBM version.

When compared to the IBM 3725, the 4705E and 4705T offer the following advantages in addition to lower price and faster throughput:

- Support for up to 1M bytes of memory using 3705 software. The 4705E and 4705T can support larger configurations and higher throughput without the need to convert to the newer IBM 3725 software versions.
- Support for asynchronous devices at data rates up to 9600 bps, compared to 1200 bps for the 3725. High-speed

Clock, which allows asynchronous communications at speeds up to 9600 bps. The 4705T also offers additional features such as touch-actuated operator panel, online and standalone diagnostics, instruction lookahead, automatic fault isolation, instruction retry, and software configurability of communications capability via operator's console.

PROCESSING COMPONENTS

The Amdahl 4705E and 4705T are composed of the following major components:

- The *Central Control Unit (CCU)*, which contains the circuits and data flow paths to execute the instruction set, address storage, control the communications scanners and channel adapters, and perform arithmetic and logical processing of data, all under the direction of the system's control program.
- *Main Storage*, which (for any model) can contain 256K to 1024K bytes of NMOS FET semiconductor memory, expandable in 256K-byte increments.
- One to six *Channel Adapters*, which provide data paths between the 4705E or 4705T and channel-attached host computers. See "Connection To The Host" in this report for details.
- One to four *Communication Scanners*, which connect the Line Interface Bases (LIBs) and Line Sets to the CCU. Scanner functions include: monitoring LIBs for service requests, assembling/disassembling characters, performing various line controls, servicing interrupts to the CCU to send or receive characters, and executing certain other procedures, such as control character recognition, code translation, and user recovery functions, under the direction of the system's control program.

Two types of scanners are available and may be added to the system in any combination: CS Type 2 supports up to six LIBs, accommodates asynchronous or synchronous lines, and transfers one byte to/from the CCU per interrupt; CS Type 3 supports up to four LIBs, accommodates synchronous lines only, and transfers one block of up to 255 bytes to/from the CCU per interrupt using a "cycle steal" methodology that halts the control program for a complete machine cycle during each data transfer. The first scanner per system is limited in line capacity to 64 lines (CS2) or 48 lines (CS3) per scanner; the second, third, and fourth scanners each have a line capacity of 96 lines (CS2) or 64 lines (CS3) per scanner. The Amdahl CS2 and CS3 are functionally equivalent to IBM's CS2 and CS3 scanners; Amdahl does not provide an equivalent for IBM's CS1 scanner, since the CS2 performs equivalent functions with higher performance.

- *Line Interface Bases (LIBs)*, which provide certain control functions for particular types of lines and transmission techniques. In general, each LIB can accommodate up to 16 lines. See "Transmission Specifications" in this report for details.
- *Line Sets*, which provide physical interfaces to one to four modems and communications lines. See "Transmission Specifications" for more details.

Other basic components include the operator control panel, a lamp unit, and an internal diagnostic routine loader unit. The control panel provides LED displays and touch-sensitive switches that allow the operator to perform various debugging and testing functions and other operations that require human intervention. The lamp unit is a type of logic probe with an attached light indicator that can be used to troubleshoot various hardware circuits.

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asynchronous support on the 4705E requires the addition of an optional High-Speed Asynchronous Clock.

Amdahl's optional Integrated Line Switch for hot standby lines was originally a significant advantage, but in November 1983, IBM announced a similar feature for the 3725.

Amdahl has instigated several changes to the 4705 Series Communications Processors that have rendered former restrictions obsolete and made the new features equal to or improved over the 3725. One of the restrictions had been that the 4705 did not support satellite communications links. This is no longer the case as the 4705T does support satellite communication links with a special buffer to compensate for variations in satellite propagation delay. Another restriction dealt with the number of host processors that could be supported. Previously, Amdahl supported four to IBM's six. Amdahl's 4705 Series processors now also supports six processors.

The 4705 Series' restriction against the 3725 deals with its slightly more complex configuration. The 3725 uses a single type of scanner, integrated into the Type C Line Attachment Base; Amdahl supports one or two separate scanners that connect the Line Interface Bases and Line Sets to the CCU. The 3725's Line Interface Couplers (line sets) support either full- or half-duplex communications; the 4705E and 4705T require different types of line sets for each transmission mode. Even with this restriction, the 4705E remains a good buy when compared to IBM's top-of-the-line communications processor.

USER REACTION

In Datapro's 1985 Network User's Survey, five users rated a total of 17 4705E units. In this survey, by far the greatest number of responses were received for IBM 3705 and 3725 units, followed by ratings for NCR Comten's equipment. Although Amdahl received a lower number of responses, reflecting its smaller market share in the industry, ratings for its 4705E unit were consistently high, with no rating falling below 3.4 on a scale of 4.0 for excellent. All five respondents rated the 4705E excellent (4.0 rating) in hardware reliability. No other unit represented in the survey received such a high score in this category.

The ratings from the 4705E users are summarized in the following table. Note that in some categories, all five users did not provide a rating.

	Excellent	Good	Fair	Poor	WA*
Ease of installation	2	3	0	0	3.4
Ease of operation	2	3	0	0	3.4
Ease of expansion	3	2	0	0	3.6
Hardware reliability	5	0	0	0	4.0
Quality of manufacturer's software/firmware	2	2	0	0	3.5
Ease of programming	2	1	0	0	3.7
Quality of manufacturer's maintenance/support	3	1	1	0	3.4
Overall performance	3	2	0	0	3.6

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

▶ The loader unit consists of a diskette controller and drive, an internal diskette, a register for storing the type of program load and stimulus, and read-only storage bootstrap. It is used to load and perform internal self-diagnostic and maintenance routines when the 4705 Series processors are in a disabled or off-line state, without dependence on the host or outside connections.

Figure 1 on Page -104 shows a typical configuration of a 4705 Series Communications Processor and demonstrates the relationships among these components.

CONNECTION TO THE HOST

The Amdahl 4705 Series Communications Processors can be channel-attached or remotely connected to any Amdahl or equivalent host computer, including an IBM 370, 303X, 3081, or 4300. They are generally compatible with MVS, SVS, and VS1 operating systems and with BTAM, QTAM, TCAM, and VTAM host access methods, including ACF and MSNF capabilities. Exceptions are: 1) host software that requires hardware features is not supported; and 2) some host software used for testing the IBM 3705-II may be incompatible with the Amdahl units (however, Amdahl provides equivalent test routines that operate without host involvement).

Amdahl provides one Channel Adapter for direct attachment of the 4705E or 4705T to the byte multiplexer, block multiplexer, or selector channel of a local host computer. Amdahl's CA4 operates under EP, PEP, or NCP program control. Up to four CA4s may be configured per 4705 Series processor. A Two-Channel Switch can be used with the CA4 to allow the adapter to connect two host channels. Only one of the channels is active at a time; the active channel is selected manually. The Amdahl CA4 is functionally equivalent to IBM's CA4 Channel Adapter. Amdahl does not provide an equivalent to the IBM CA1, since the CA4 performs equivalent functions with higher performance.

The physical connectors required to attach the 4705E or 4705T to an IBM host are functionally equivalent but physically somewhat different than IBM's. Therefore Amdahl provides its own connector cables.

A Remote Program Load option (functionally equivalent to IBM's RPL option) is provided to load the operating software over high-speed data communications lines from a remote host computer. The RPL option can be used when the 4705E or 4705T is utilized as a remote network concentrator with no local host channel attachment, when network software management is controlled from a central (remote) computer rather than the local computer to which the 4705 or 4705E is channel-attached, and in other circumstances that require a remote IPL. The RPL feature occupies one channel adapter slot, so that only three CA4s may be configured.

CONNECTION TO THE NETWORK

Amdahl provides two types of Line Interface Bases: LIB1, which handles up to 16 lines of various speeds and protocols; and LIB2, which is required to support high-speed asynchronous lines operating up to 9600 bps. The LIB relays signals between the Communications Scanner and the Line Sets and provides a send/receive bit timing signal to the Line Set for each transmission speed.

Line Sets detect receive bits from the communications lines, transmit send bits to the line, and transmit modem control signals. They accommodate one to four lines, depending on the type of Line Set selected. Line Sets for the 4705 Series Communications Processors are provided to accommodate a wide range of communications requirements. ▶

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► The 4705E line sets include the following:

- *HD1E*, a four-line set that supports analog, half-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps,
- *FD1E*, a two-line, full-duplex version of HD1E,
- *HD2E*, a two-line set that supports analog, wideband, half-duplex connections over the V.35 interface, at rates up to 64K bps,
- *FD2E*, a one-line, full-duplex version of HD2E,
- *FD4E*, a two-line set that supports digital, full-duplex communications over the X.21 interface, at rates up to 19.2K bps,
- *FD5E*, a one-line set that supports digital, full-duplex communications over the X.21 or V.36 interface, at rates up to 64K bps,
- *HD1LE*, a four-line set that supports analog, half-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps. Supports LPDA,
- *FD1LE*, a two-line set that supports analog, full-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps. Supports LPDA,
- *NC1E*, a two-line set that supports analog, half-duplex connections over the RS-336 autodial interface, at rates up to 19.2K bps,
- *HD1GE*, a two-line set that supports analog, wideband, half-duplex AT&T 303-compatible communications, at rates up to 50K bps,
- *FD1TE*, a one-line, full-duplex version of HD1GE, and
- *LA1CE*, a two-line set that supports half-duplex connections over the RS-232-C and V.24 interfaces, at rates up to 1200 bps.

The 4705T offers the same line sets as the 4705E, plus five additional ones. They are as follows:

- HS20, a synchronous I/O module for two lines,
- HS30, an integrated limited-distance data set operating from 1200 to 64K bps (users must specify speed before order),
- HS34, an integrated limited-distance data set operating at 600 to 9600 bps; combines up to four synchronous channels,
- HS40, an asynchronous I/O module for one line, and
- HS45, a voice I/O module for two lines.

TRANSMISSION SPECIFICATIONS

The 4705E and 4705T currently support transmissions of up to 64K bps in half- or full-duplex mode, using start/stop, BSC, X.25, or SDLC line protocols, over switched, leased, or private communications lines. EIA RS-232-C, X.21, CCITT V.24, and V.35 interfaces are available. With the High-Speed attachment feature, the 4705T can support additional data channels operating at speeds from 4800 bps to 768K bps, and synchronous trunk speeds up to 2048K bps. The High-Speed attachment feature also supports, in addition to the above interfaces, AT&T 301/303, MIL STD-188/114 unbalanced, and T1 bipolar (DS1).

The high-speed lines support an Amdahl proprietary, bit-interleaved, time division multiplexing protocol that is compatible with most tariffed offerings (e.g., the T1 service offered by AT&T Communications and by most regional Bell Operating Companies), and can also be used with private, high-speed links over fiber optic, microwave, or copper wire. An optional (no extra cost) center weighted buffer supports satellite transmission at rates up to 2.048M bps.

A wide variety of inputs may be multiplexed over each high-speed link, including data passed through the co-resident 4705E, data from external terminal and host devices (both IBM-compatible and non-IBM), voice transmission, and digital video. Depending on the mix of inputs and speed of the output line, a high-speed line can support up to 96 tail circuit channels. Asynchronous data can be supported at rates of 110 bps to 19.2K bps via V.24/RS-232-C or MIL STD-188/114 interfaces. Twenty-four synchronous data rates from 300 bps to 512K bps are supported via V.24/RS-232-C, V.35, AT&T 301/303, and MIL STD-188/114 interfaces. The higher speed synchronous rates support video transmission.

OPERATOR INTERFACE

The Network Console, a standard feature of the 4705T, is used to configure, monitor, and manage the High-Speed Voice and Data Attachments. The console is controlled by a program in the High-Speed Attachment, and can operate in two modes, the Multimaster Mode and the Session Mode. In Multimaster Mode, every 4705T that is connected to the terminal reports on its operating status and any alarm conditions. Session Mode allows the operator to use the console to configure, monitor, or diagnose any remote or local channels linked to the console. The operator uses a typewriter-style electronic keyboard, and display is through a video screen. English format is used for commands and responses. The console supports data rates from 300 bps to 4800 bps so that one network site can control local or remote 4705T communications processors. The console can be located up to 4,000 feet from the 4705T.

SOFTWARE

The Amdahl 4705 Series Communications Processors operate under the control of the following licensed and public-domain control programs available from IBM: EP3, PEP, NCP5, and ACF/NCP 3.0, 2.0, and 2.1. The 4705E and 4705T also support ACF/NCP 3.2 and 3.1. Amdahl customers generally acquire public-domain software, such as EP, PEP, and NCP, directly through Amdahl, which also provides software support services for these programs. It is Amdahl's intent to support users of current public-domain IBM software by continuing to provide new releases of that software to Amdahl users. Customers acquire licensed IBM software products, such as ACF/NCP, directly from IBM, which also provides software support services for those programs.

Amdahl also provides standalone diagnostic and maintenance programs that permit a disabled or off-line 4705 to perform self-test routines without host assistance. The 4705E's maintenance subsystem allows testing of active, on-line processors.

PRICING

The Amdahl 4705E and 4705T systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases may be renewed for 12-month periods. Lease payments, made monthly in advance, include the lessee charge, property taxes, and insurance, but not maintenance

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► charges. Feature and model upgrades follow the existing lease, except that the minimum lease term for a model upgrade is 12 months. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price on a two-year lease and 60 percent on a four-year lease. The purchase credit applies either to the original lessee or the current lessee. Amdahl will pass on two-thirds of the available Investment Tax Credit to qualified customers.

Monthly maintenance charges are not included in lease charges or purchase prices. The standard maintenance agreement provides for 24 hours per day and 7 days per week. Prime-shift-only (up to 9 hours per day and 5 days per week) contracts and other arrangements are optionally available.

Purchase prices, monthly prices for two- and four-year leases, and 24-hour, 7 days-per-week maintenance charges are shown in the following table.

EQUIPMENT PRICES

		Purchase Price (\$)	Two-year Lease* (\$)	Four-year Lease* (\$)	Monthly Maint. (\$)
Basic System					
4705E	Base unit with 256K bytes memory	27,000	1,225	730	330
4705T	Base unit with 256K bytes memory and high-speed voice/data attachment	42,000	1,905	1,135	430
Line Interface Boards					
LIB1E	Handles up to 16 lines of various speeds	1,000	45	25	—
LIB2E	Required to support high-speed (9600 bps) asynchronous lines	2,000	90	50	—
Line Sets for 4705E/4705T					
HD1E	Analog, half-duplex with V.24 interface; four lines	2,400	110	65	—
FD1E	Analog, full-duplex with V.24 interface; two lines	1,200	45	30	—
HD2E	Digital, half-duplex with V.35 interface; two lines	5,000	225	135	—
FD2E	Digital, full-duplex with V.35 interface; one line	3,000	135	80	—
FD4E	Analog, full-duplex with X.21 interface; two lines	**	**	**	—
FD5E	Digital, full-duplex with X.21 or V.36 interface; one line	**	**	**	—
HD1LE	Analog, half-duplex with V.24 interface; four lines; supports LPDA	2,500	115	70	—
FD1LE	Analog, full-duplex with V.24 interface; two lines; supports LPDA	1,300	50	35	—
NC1E	Analog, auto-dial, half-duplex with RS-366 interface; two lines	1,200	55	30	—
HD1GE	Analog, wideband, full-duplex with AT&T 303 interface; two lines	4,000	180	105	—
FD1TE	Analog, wideband, full-duplex with AT&T 303 interface; one line	2,000	90	50	—
LA1CE	Half-duplex with RS-232-C and V.24 interfaces; two lines	**	**	**	—
Line Sets for 4705T					
H20	Synchronous I/O module; two lines	1,000	50	25	—
HS30	Integrated limited distance data set; 1200 to 64K bps	880	40	25	—
HS34	Integrated limited distance data set; 600 to 9600 bps; combines up to 4 synchronous channels	1,300	65	35	—
HS40	Asynchronous I/O module, one line	680	30	15	—
HS45	Voice I/O module; two lines	1,430	70	50	—
Features for 4705E and 4705T					
EXPE	Expansion unit	12,000	545	320	50
ILSE	Integrated line switch	4,000	180	105	—
MS3E	256K-byte memory module	6,000	270	160	30
CA4E	Channel adapter	4,000	180	105	15
RIPLE	Remote IPL	2,000	90	50	—
TCSE	Two-channel switch	1,750	80	45	15
CS2E	Communications scanner, Type 2	6,000	270	160	30
CS3E	Communications scanner, Type 3	16,000	725	430	70
SS2E	Single scanner attachment, base Type 2	5,000	225	135	—
SS3E	Single scanner attachment, base Type 3	8,000	360	215	—

*Monthly charge.

**Contact vendor regarding pricing. ■

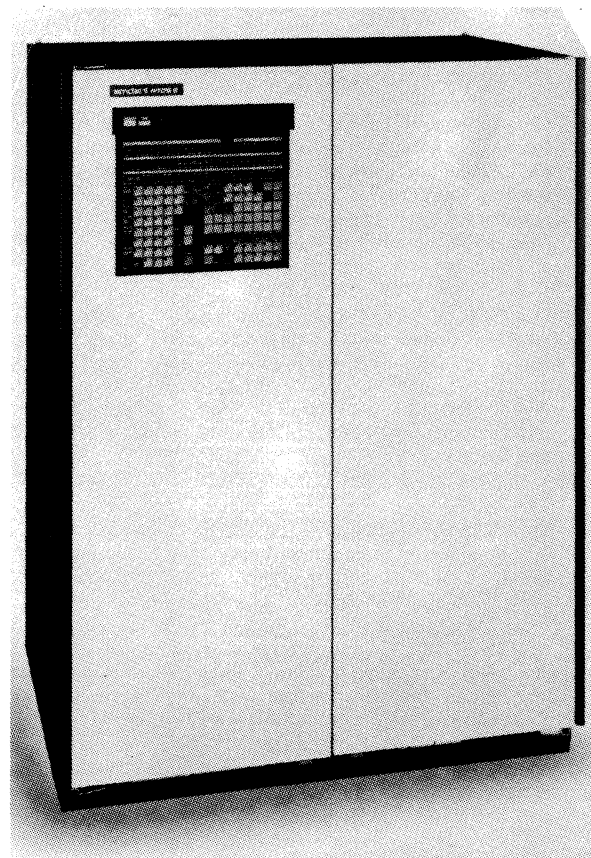
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MANAGEMENT SUMMARY

UPDATE: *This report is being updated to show the changes that have occurred in the Amdahl 4705 Series of Communications Processors since this report was last done. The Amdahl 4705 is no longer actively marketed, and a new processor, the 4705T has been introduced. New features and new line sets have been added to the 4705E. These and other changes are discussed in the following report.*

Amdahl Corporation was founded in 1970. They are a leading supplier of large general-purpose computers. The Communications Systems Division, formerly known as Tran Communications Ltd., became a wholly owned subsidiary of Amdahl in 1980. The Communications System Division designs, manufactures, and markets private and public digital communications equipment and networks. Some of their products include multiplexers, packet switching systems, limited distance data sets, and Customer Service Units/Data Service Units (CSU/DSU).

The 4705 Communications Processor was Amdahl's first alternative offering to the IBM 3705-II Communications Controller. The 4705 was announced in October 1980; U.S. ➤



Amdahl's 4705E Communications Processor offers a unique backup feature, the Integrated Line Switch. This feature allows for software-initiated switching of line interface units from the main 4705E to a backup 4705E.

The Amdahl 4705 Communications Processor, Amdahl's first offering as a plug-compatible, software-compatible replacement for the IBM 3705 Communications Controller, is no longer being actively marketed. While Amdahl still supports the 4705, it is no longer selling new ones. Amdahl is concentrating its efforts on the 4705E, a plug-compatible replacement for the IBM 3725 Communication Controller, and the 4705T, an upgrade of the 4705E. In most applications, these Amdahl processors offer price/performance advantages over their IBM equivalents.

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

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA and emulation environments.

OPERATING SOFTWARE: IBM's ACF/NCP, NCP, PEP, and EP.

COMPETITION: IBM 3705; IBM 3725; NCR Comten 3650 and 3690; CCI CC80 and CC85.

PRICE: Depends upon configuration.

CHARACTERISTICS

VENDOR: Amdahl Corporation, 1250 East Arques Avenue, P.O. Box 470, Sunnyvale, CA 94088-3470. Telephone (408) 746-6000.

DATE OF ANNOUNCEMENT: 4705E—April 1983; 4705T—February 1985.

DATE OF FIRST DELIVERY: 4705E—April 1983; 4705T—February 1985.

NUMBER DELIVERED TO DATE: 4705E—400; 4705T—Information not available.

SERVICED BY: Amdahl Corporation.

CONFIGURATION

The Amdahl 4705 Series of Communications Processors are designed to compete with IBM's 3725 Communications Controller. The 4705E provides memory from 256K bytes to 1024K bytes in 256K-byte increments; can support up to six CPU attachments to block or byte multiplexer channels in the base frame; supports up to 352 half-duplex communication lines has two channel switches, that permit a channel adapter to be switched between two hosts; supports up to four communications scanners, and a Line Interface Base (LIB) that supports up to four line sets.

The 4705T, while offering the same basic configuration as the 4705E, also offers some additional capabilities through the High-Speed attachment feature. These features include: additional data channels that operate at speeds from 4800 ➤

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▷ deliveries began in December 1980, and European deliveries began in October 1981. The 4705E was announced in April 1983, with U.S. delivery also beginning in April 1983. Between the 4705 and the 4705E, over 800 units have been installed in the U.S., Canada, Europe, and Australia. The 4705T was announced in February 1985 and is currently available for delivery. The 4705E can be upgraded to the 4705T.

The 4705E is an enhanced version of the 4705, designed to compete with IBM's high-end 3725 Communication Controller. Like the 3725, Amdahl's 4705E offers greater maximum main storage, faster throughput, and simpler configuration than the 4705 or the IBM 3705. In addition, the 4705E runs the established IBM 3705 operating software, rather than the newer IBM versions for the 3725. The 4705E can support from 256K to 1M bytes of main memory, expandable in 256K increments, and from 64 to 352 communications lines operating synchronously or asynchronously, in half- or full-duplex mode, at rates from 1200 to 64K bps. In extended connectivity, the 4705E can support 64 asynchronous and synchronous lines on a single scanner up to speeds of 9600 bps.

The 4705T is a high-performance version of the 4705E, that can provide communications for up to 44 data and/or voice lines multiplexed over a high-speed facility at speeds up to 2048K bps. The 4705T allows simultaneous two-way communications over the voice and/or data lines. The voice lines link local and distant automatic telephone switchboards so that the need for dedicated trunk lines is eliminated. Like the 4705E, the 4705T can operate industry-standard 3705 communications software, and is compatible with processing systems that are based on System/370 and 370 extended architecture (370-XA).

COMPETITIVE POSITION

The Amdahl processors compete in the market for full-scale, IBM-compatible communications processors against NCR Comten's 3600 Series and CCI's CC80 and CC85, as well as with IBM itself. IBM enjoys roughly a 90 percent share of the market. Each of the plug-compatible vendors uses a different product strategy to gain its share of the remaining 10 percent: NCR Comten combines performance advantages with its own networking software; CCI gears its product to special applications, such as airline reservation systems, and offers a variety of field-upgradable low-end models. Amdahl, the original vendor of IBM-plug-compatible mainframes, is the only vendor in the market to offer full software compatibility with IBM's communications processors, in addition to significant advantages in price, performance, and configuration.

In pricing several models from Amdahl and IBM, Datapro found that the Amdahl prices are lower when comparing IBM configurations with equivalent memory, channel adapters, communications scanners and line sets. The 4705T offers significant benefits when compared to the IBM 3725 RPQ VHSA. It supports more high-speed lines (four versus one), it allows the inclusion of data sources outside the FEP, it supports both voice and video, and ▷

▷ bps to 768K bps; trunk interface to conventional high-speed links from 56K bps to 2048K bps; voice links between telephone switchboards that offer high quality, low cost alternatives to more expensive dedicated tie lines or long distance charges; and additional line sets.

The high-speed line attachments are housed in a new, smaller expansion cabinet that is 21 inches wide, 29.5 inches deep, and 62.6 inches high. This cabinet attaches to the side of the 4705E main or expansion cabinet. These high-speed line attachments are powered separately from the base and expansion 4705E cabinets. This provides a high-degree of isolation in case of faults on a high-speed line. Each high-speed line is controlled by a separate microprocessor that offers isolation and independence from the main 4705E CPU. The processing necessary to maintain the high-speed lines produces no degradation in either the throughput or the connectivity of the 4705E portion of the box.

Physically, the 4705 Series Communication Processors are housed in one to three frames, or cabinets. The Basic Frame is a double-width cabinet that includes the CCU, main storage, operator control panel, lamp unit, and loader unit; all Channel Adapters and Scanners; and mountings for up to 10 LIBs and Line Sets for up to 160 lines. Each of two smaller Expansion Frames accommodates up to an additional six LIBs and Line Sets for up to 96 lines. The 4705T also features a High-Speed Expansion Frame that can hold up to 96 communications lines that support voice communications.

The High-Speed Expansion cabinet also houses a Voice I/O module that provides a way of supplying voice communications over an existing trunk. This module eliminates the need for expensive dedicated tie lines. The Voice I/O module has two channels, plugs into the chassis in the High-Speed Expansion cabinet, and provides a standard four-wire type 1 voice interface. Voice traffic is accommodated using an Amdahl exclusive, enhanced CVSD technique that digitizes voice at 16K bps, 48K bps, or 64K bps on a per line basis. This Amdahl-Enhanced Continuously Variable Slope Delta modulation technique (AECVSD), which is patent pending, produces toll quality voice at 32K bps and can support modems at up to 9600 bps. By adding voice interface equipment, the Voice I/O module capabilities can be further extended to cover other voice applications such as facsimile transmission, business machine intercommunication, or automatic hot-line operation. The module has built-in diagnostics for end-to-end channel testing from a central Network Console; built-in fault detection and alarm reporting; and manual channel disable for quick error recovery and diagnostics. The module can accommodate up to 46 voice channels, or a combination of voice and data channels, over a single link.

The Synchronous and Asynchronous I/O Modules are also housed in the High-Speed Expansion cabinet. These modules provide the channel logic needed to interface either two low-speed synchronous or asynchronous data channels with the 4705T. Each module can be supplied to support one of these interfaces: RS-232-C/V.24, V.35, AT&T 301/303, or MIL STD-188/114. Each module occupies one slot in the chassis of the expansion cabinet. The modules can be configured in the field to interface with either Data Terminal Equipment (DTE) or Data Communications Equipment (DCE). They operate in full- or half-duplex mode, and can transmit up to four interface controls in either direction. The Synchronous I/O Module supports channel data rates of 300 bps to 512K bps, depending on the interface chosen, while the Asynchronous I/O Module supports channel data rates from 110 to 19,200 bps. The Asynchronous module accepts either ASCII or EBCDIC data formats and is parity transparent. The channel characteristics of either module are software configured by the 4705T Network Console. From the console, data rates, full- or half-duplex mode, ▷

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offers a dramatic cost savings. The IBM RPQ, to support a single T1 line, is approximately \$140,000 above the cost of the basic 3725; the 4705T's high-speed attachment is around \$20,000 higher than the basic 4705E. Since a pair of 3725's or 4705T's are required, the cost of implementing a T1 link with 4705Ts is approximately \$240,000 less than a 3725 implementation.

ADVANTAGES AND RESTRICTIONS

Amdahl's biggest advantage against the other plug-compatible vendors is its 100 percent software compatibility with IBM systems. Users can swap an Amdahl communications processor for its IBM counterpart with few, if any, software rewrites.

The 4705 Series processors' advantages over the IBM 3705 include:

- *Improved throughput capacity*—Amdahl conducted benchmark tests that show the aggregate data rate capacity of the 4705E and 4705T to be approximately 2.4 times the capacity of a similarly configured IBM 3705-II, and approximately 1.3 times that of the 4705.

One explanation for Amdahl's improved throughput is the instruction look-ahead function, which allows the processor's fetch cycle to retrieve another instruction from memory while execution of the current instruction occurs. This overlap of fetch time with execution time does not occur with IBM 3705-II's processor. Another reason for improved throughput is that the internal cycle speed for the 4705 Series' processor is 145 nanoseconds (0.145 microseconds) compared to 1.0 microseconds for 3705-II Models E, F, G, and H, and 0.9 microseconds for Models J, K, and L.

- *Simpler, more accurate operator controls*—Amdahl's system provides a newly designed console panel that contains touch-sensitive switches and hexadecimal LED read-outs in place of IBM's control panel lamps and rotation-type mechanical switches.
- *Reduced space requirements*—Amdahl's cabinetry is physically smaller and requires less service clearance than IBM's. For Amdahl models that are configured with the same number of frames as the equivalent IBM model (counting Amdahl's double-width Basic Frame as two frames), the space savings can be substantial. The one exception is when an Amdahl model contains one more frame than its IBM equivalent. When service clearance is considered, all of Amdahl's models take up less space than IBM's.
- *Simplified installation and improved reliability and serviceability*—The inherent modularity of the Amdahl system's design reduces downtime when the system is expanded or a component fails. The system provides a standalone self-diagnostic and maintenance routine that allows internal system functions to be self-tested without dependence on a host computer or other outside connection. In addition, the 4705 Series' architecture provides

control signals, and scrambler enable can be configured. The physical interface between either module and its channel device is supplied by a Channel Connector Assembly, which is ordered separately.

The Integrated Limited-Distance Data Set module, which occupies one I/O slot in the chassis of the High-Speed Expansion Cabinet of the 4705T, contains an integrated limited-distance data set to provide low cost synchronous communications with remote channel devices. The module can support the following range of data rates: 1.2K to 9.6K bps, 2.4 to 19.2K bps, and 19.2K to 64.0K bps. An Amdahl 982 Synchronous Data Set terminates the four-wire loop at the remote end. With the Integrated Limited-Distance Data set in the 4705T, the 982 Data Set can be located up to 32 miles away. The physical interface between the module and the channel cable from the remote 982 Data Set is furnished by a four-wire connector mounted on the backplane of the chassis. The module operates in either full- or half-duplex mode. When operating in half-duplex mode, the module can transmit three DTE to DCE controls and four DCE to DTE controls. Most of the channel characteristics are soft configured by the 4705T Network Console, including data rate, full- or half-duplex operation, control signals, and scrambler enable. The Integrated Limited-Distance Data Set module offers automatic onboard storage of channel parameters for channel integrity, built-in fault detection and alarm reporting, and automatic equalization and automatic line build-out for distortion-free transmissions.

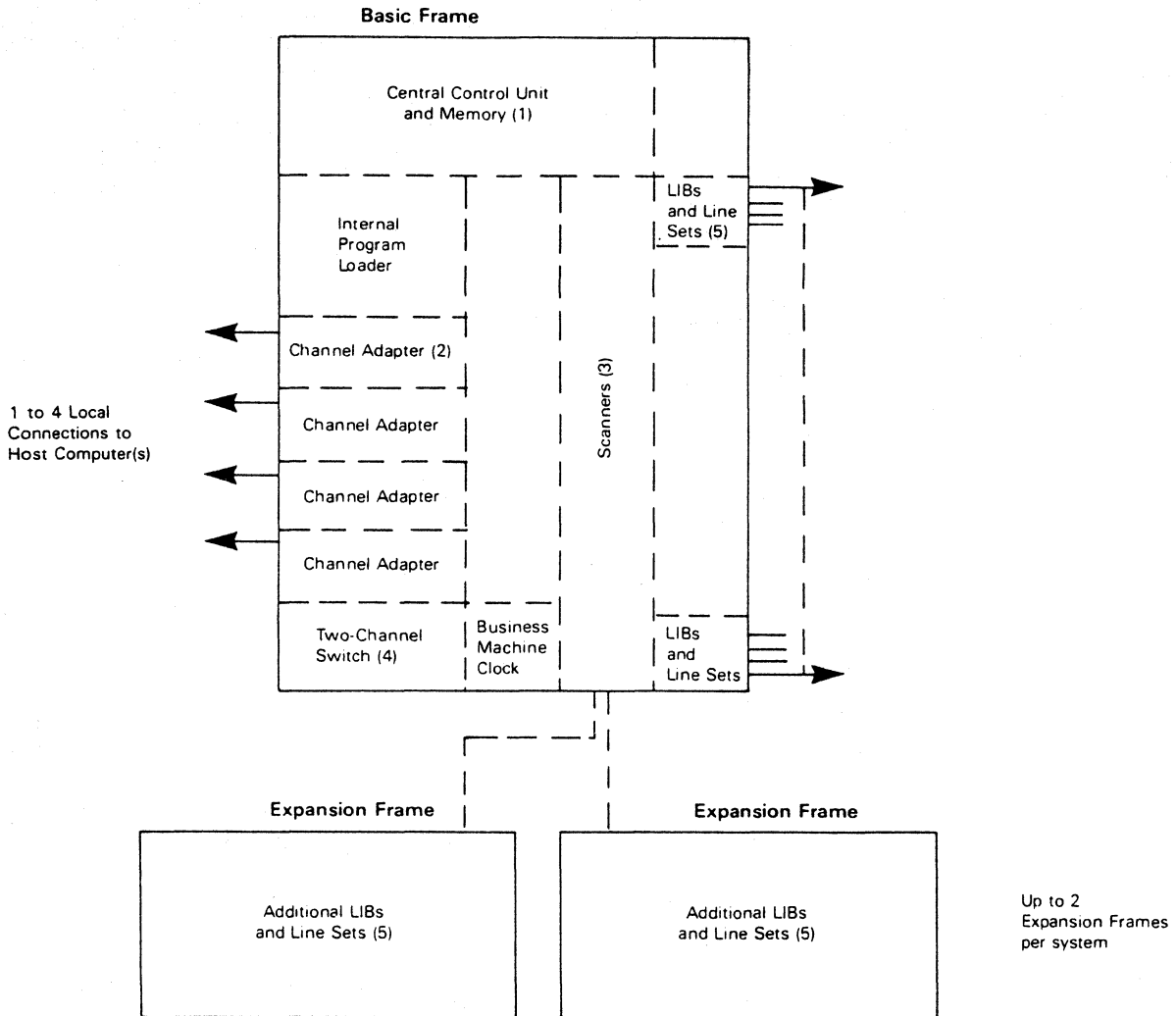
The Integrated Multipoint Limited-Distance Data Set furnishes the logic to interface up to four channels, on one four-wire loop, within the 4705T High-Speed expansion Cabinet. Synchronous data rates from 600 bps to 9600 bps are supported by the module, with no overhead bandwidth. Two, three, or four channels from a four-wire loop are combined by the module and are terminated by an Amdahl 984 Multipoint Synchronous Data Set that can be located up to 28 miles away. The module operates in full-duplex mode, with the 4705T Network Console soft configuring communications characteristics, such as data rate and channel split. The module is housed in two adjacent slots in the chassis with the High-Speed Expansion Cabinet of the 4705T. The physical interface from the module to the remote 984 Data Set is provided by a four-wire connector that is mounted on the backplane of the chassis. The Integrated Multipoint Limited-Distance Data Set provides automatic onboard storage of channel parameters for channel integrity, built-in fault detection and alarm reporting, manual or remote dis-

Module	Function	Speeds (up to kbps)	Duplex Mode	No. Lines per Line Set	Electrical Standard
HS20	Synchronous I/O	64 768 64	Both	2	RS-232-C, V.35 Bell 301/303 MIL-STD-188-14
HS40	Asynchronous I/O	19.2 19.2	Both	1	RS-232-C, V.24 MIL-STD-188-14
HS45	Voice I/O	16-64 kHz	—	2	4 Wire, Type 1, E&M Signalling, Amdahl Enhanced CVSD
HS30	Integrated Limited Distance Data Set	1.2-64	Both	1	4 Wire, AT&T 43401
HS34	Integrated Multipoint Limited Distance Data Set	.6-9.6	Both	4	4 Wire, AT&T 43401

Table 1. 4705T high-speed attachment interface modules

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Configuration



- (1) Memory size is 64K to 512K bytes, expandable in 64K-byte increments, for the 4705 and 64K to 1M bytes for the 4705E.
- (2) One to four Channel Adapters can be installed.
- (3) One to four Communications Scanners can be installed. If Type 2 is used, first Scanner can handle up to 64 lines; additional three Scanners can handle up to 96 lines each. If Type 3 is used, first Scanner can handle up to 48 lines; additional three Scanners can handle 64 lines each. Maximum number of lines per system is 352.
- (4) One Two-Channel Switch may be configured for each Channel Adapter.
- (5) Basic Frame accommodates up to 10 LIBs and Line Sets for up to 160 lines. Each Expansion Frame accommodates up to 6 LIBs and Line Sets for up to 96 lines. Each LIB handles up to 16 lines. Each Line Set provides interfacing for one to four lines, depending on type of Line Set selected.

➤ several functions designed to increase the system's operational reliability, such as automatic instruction retry when an instruction fails to execute correctly, line unit loop diagnostics, and a channel loopback capability.

Certain IBM configurations and features are slightly different as implemented by Amdahl. For instance, the Amdahl 4705 Series system's main memory is expanded by 256K-byte increments, whereas the IBM memories are expandable in 32K-byte steps. This results in Amdahl's having fewer memory-plus-line-capacity combinations than IBM. In addition, Amdahl has chosen not to support ➤

➤ able of individual channels, and automatic equalization and automatic line buildout that provides distortion free transmissions.

A Maintenance Subsystem, which includes a diskette-based diagnostic reader and a display unit, is also part of the 4705 Series. The subsystem can perform diagnostics on an operating 4705E or 4705T.

Two optional features available with the 4705E and the 4705T are the Integrated Line Switch, which allows a 4705E or 4705T to switch communications lines from malfunctioning line sets in its main cabinet to hot standbys in an expansion cabinet; and the High-Speed Asynchronous Clock, which allows asynchronous communications at ➤

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the lower-performance IBM Type 1 Channel Adapter and Type 1 Communications Scanner, which are essentially replaced by the high-performance Type 4 Channel Adapter.

Amdahl also does not support IBM's Line Interface Base Types 2 through 12, which support Telegraph interfaces and integral modems and adapters. Certain IBM Line Sets that utilize Line Interface Base 1, including Line Sets 1J, 1GA, 1TA, 1W, and 1Z, are also not supported. Although IBM has merged its Line Sets 1A and 1B into its 1D Line Set, Amdahl has decided to keep them separate, which may result in a cost savings to the customer.

Most of Amdahl's 4705 Series Line Sets are equivalent to two of their respective IBM versions but are priced substantially less than twice the cost of the IBM versions. Also, Amdahl's Line Set NCI, which is priced as an equivalent to IBM's Line Set E1 (a dual RS-366-compatible automatic dial interface), includes two RS-232-C interfaces for attachment of regular communications lines in addition to the two auto-dial unit interfaces offered on the IBM version.

When compared to the IBM 3725, the 4705E and 4705T offer the following advantages in addition to lower price and faster throughput:

- Support for up to 1M bytes of memory using 3705 software. Users can upgrade from a 4705 or an IBM 3705 to a 3725-compatible processor without converting to the newer IBM 3725 versions of the IBM software.
- Support for asynchronous devices at data rates up to 9600 bps, compared to 1200 bps for the 3725. High-speed asynchronous support on the 4705E requires the addition of an optional High-Speed Asynchronous Clock.

Amdahl's optional Integrated Line Switch for hot standby lines was originally a significant advantage, but in November 1983, IBM announced a similar feature for the 3725.

Amdahl has instigated several changes to the 4705 Series Communications Processors that have rendered former restrictions obsolete and made the new features equal to or improved over the 3725. One of the restrictions had been that the 4705 did not support satellite communications links. This is no longer the case as the 4705T does support satellite communication links with a special buffer to compensate for variations in satellite propagation delay. Another restriction dealt with the number of host processors that could be supported. Previously, Amdahl supported four to IBM's six. Amdahl's 4705 Series processors now also supports six processors.

The 4705 Series' restriction against the 3725 deals with its slightly more complex configuration. The 3725 uses a single type of scanner, integrated into the Type C Line Attachment Base; Amdahl supports up to four separate scanners that connect the Line Interface Bases and Line

speeds up to 9600 bps. The 4705T also offers additional features such as touch-actuated operator panel, online and standalone diagnostics, instruction lookahead, automatic fault isolation, instruction retry, and software configurability of communications capability via operator's console.

PROCESSING COMPONENTS

The Amdahl 4705E and 4705T are composed of the following major components:

- The *Central Control Unit (CCU)*, which contains the circuits and data flow paths to execute the instruction set, address storage, control the communications scanners and channel adapters, and perform arithmetic and logical processing of data, all under the direction of the system's control program.
- *Main Storage*, which (for any model) can contain 256K to 1024K bytes of NMOS FET semiconductor memory, expandable in 256K-byte increments.
- One to six *Channel Adapters*, which provide data paths between the 4705E or 4705T and channel-attached host computers. See "Connection To The Host" in this report for details.
- One to four *Communication Scanners*, which connect the Line Interface Bases (LIBs) and Line Sets to the CCU. Scanner functions include: monitoring LIBs for service requests, assembling/disassembling characters, performing various line controls, servicing interrupts to the CCU to send or receive characters, and executing certain other procedures, such as control character recognition, code translation, and user recovery functions, under the direction of the system's control program.

Two types of scanners are available and may be added to the system in any combination: CS Type 2 supports up to six LIBs, accommodates asynchronous or synchronous lines, and transfers one byte to/from the CCU per interrupt; CS Type 3 supports up to four LIBs, accommodates synchronous lines only, and transfers one block of up to 255 bytes to/from the CCU per interrupt using a "cycle steal" methodology that halts the control program for a complete machine cycle during each data transfer. The first scanner per system is limited in line capacity to 64 lines (CS2) or 48 lines (CS3) per scanner; the second, third, and fourth scanners each have a line capacity of 96 lines (CS2) or 64 lines (CS3) per scanner. The Amdahl CS2 and CS3 are functionally equivalent to IBM's CS2 and CS3 scanners; Amdahl does not provide an equivalent for IBM's CS1 scanner, since the CS2 performs equivalent functions with higher performance.

- *Line Interface Bases (LIBs)*, which provide certain control functions for particular types of lines and transmission techniques. In general, each LIB can accommodate up to 16 lines. See "Transmission Specifications" in this report for details.
- *Line Sets*, which provide physical interfaces to one to four modems and communications lines. See "Transmission Specifications" for more details.

Other basic components include the operator control panel, a lamp unit, and an internal diagnostic routine loader unit. The control panel provides LED displays and touch-sensitive switches that allow the operator to perform various debugging and testing functions and other operations that require human intervention. The lamp unit is a type of logic probe with an attached light indicator that can be used to troubleshoot various hardware circuits.

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- Sets to the CCU. The 3725's Line Interface Couplers (line sets) support either full- or half-duplex communications; the 4705E and 4705T require different types of line sets for each transmission mode.

Even with this restriction, the 4705E remains a good buy when compared to IBM's top-of-the-line communications processor. □

- The loader unit consists of a diskette controller and drive, an internal diskette, a register for storing the type of program load and stimulus, and read-only storage bootstrap. It is used to load and perform internal self-diagnostic and maintenance routines when the 4705 Series processors are in a disabled or off-line state, without dependence on the host or outside connections.

Figure 1 on Page -104 shows a typical configuration of a 4705 Series Communications Processor and demonstrates the relationships among these components.

CONNECTION TO THE HOST

The Amdahl 4705 Series Communications Processors can be channel-attached or remotely connected to any Amdahl or equivalent host computer, including an IBM 370, 303X, 3081, or 4300. They are generally compatible with MVS, SVS, and VS1 operating systems and with BTAM, QTAM, TCAM, and VTAM host access methods, including ACF and MSNF capabilities. Exceptions are: 1) host software that requires hardware features is not supported; and 2) some host software used for testing the IBM 3705-II may be incompatible with the Amdahl units (however, Amdahl provides equivalent test routines that operate without host involvement).

Amdahl provides one Channel Adapter for direct attachment of the 4705E or 4705T to the byte multiplexer, block multiplexer, or selector channel of a local host computer. Amdahl's CA4 operates under EP, PEP, or NCP program control. Up to four CA4s may be configured per 4705 Series processor. A Two-Channel Switch can be used with the CA4 to allow the adapter to connect two host channels. Only one of the channels is active at a time; the active channel is selected manually. The Amdahl CA4 is functionally equivalent to IBM's CA4 Channel Adapter. Amdahl does not provide an equivalent to the IBM CA1, since the CA4 performs equivalent functions with higher performance.

The physical connectors required to attach the 4705E or 4705T to an IBM host are functionally equivalent but physically somewhat different than IBM's. Therefore Amdahl provides its own connector cables.

A Remote Program Load option (functionally equivalent to IBM's RPL option) is provided to load the operating software over high-speed data communications lines from a remote host computer. The RPL option can be used when the 4705E or 4705T is utilized as a remote network concentrator with no local host channel attachment, when network software management is controlled from a central (remote) computer rather than the local computer to which the 4705 or 4705E is channel-attached, and in other circumstances that require a remote IPL. The RPL feature occupies one channel adapter slot, so that only three CA4s may be configured.

CONNECTION TO THE NETWORK

Amdahl provides only one type of Line Interface Base, LIB1, which handles up to 16 lines of various speeds and protocols. The LIB relays signals between the Communications Scanner and the Line Sets and provides a send/receive bit timing signal to the Line Set for each transmission speed.

The Line Set detects receive bits from the communications lines, transmits send bits to the line, and transmits modem control signals. A Line Set can accommodate one to four lines, depending on the type of Line Set selected. Line Sets for the 4705 Series Communications Processors are provided to accommodate a wide range of communications requirements.

The 4705E line sets are:

- *HD1E*, a four-line set that supports analog, half-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps,
- *FD1E*, a two-line, full-duplex version of HD1E,
- *HD2E*, a two-line set that supports analog, wideband, half-duplex connections over the V.35 interface, at rates up to 64K bps,
- *FD2E*, a one-line, full-duplex version of HD2E,
- *FD4E*, a two-line set that supports digital, full-duplex communications over the X.21 interface, at rates up to 19.2K bps,
- *FD5E*, a one-line set that supports digital, full-duplex communications over the X.21 interface, at rates up to 64K bps,
- *HD1LE*, a four-line set that supports analog, half-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps. Supports LPDA,
- *FD1LE*, a two line set that supports analog, full-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps. Supports LPDA,

The 4705T offers the same line sets as the 4705E, plus four additional ones. They are:

- *NC1E*, a two line set that supports analog, half-duplex connections over the RS-336 autodial interface, at rates up to 19.2K bps,
- *HD1GE*, a two line set that supports analog, wideband, half-duplex AT&T 303-compatible communications, at rates up to 50K bps,
- *FD1TE*, a one line, full-duplex version of HD1GE,
- *LA1CE*, a two line set that supports half-duplex connections over the RS-232-C and V.24 interfaces, at rates up to 1.2K bps.

TRANSMISSION SPECIFICATIONS

The 4705E and 4705T currently support transmissions of up to 64K bps in half- or full-duplex mode, using start/stop, BSC, X.25, or SDLC line protocols, over switched, leased, or private communications lines. EIA RS-232-C, X.21, CCITT V.24, and V.35 interfaces are available. With the High-Speed attachment feature, the 4705T can support additional data channels operating at speeds from 4800 bps to 768K bps, and synchronous trunk speeds up to 2048K bps. The High-Speed attachment feature also supports, in addition to the above interfaces, AT&T 301/303, MIL STD-188/114 unbalanced, and T1 bipolar (DS1).

The high-speed lines support an Amdahl proprietary, bit-interleaved, time division multiplexing protocol that is compatible with most tariffed offerings (e.g., the T1 service offered by AT&T Comm and by most regional Bell operation companies), and can also be used with private, high-speed

Amdahl 4705 Series Communications Processors

links over fiber optic, microwave, or copper wire. An optional (no extra cost) center weighted buffer supports satellite transmission at rates up to 2.048M bps.

A wide variety of inputs may be multiplexed over each high-speed link, including data passed through the co-resident 4705E, data from external terminal and host devices (both IBM-compatible and non-IBM), voice transmission, and digital video. Depending on the mix of inputs and speed of the output line, a high-speed line can support up to 96 tail circuit channels. Asynchronous data can be supported at rates of 110 bps to 19.2K bps via V.24/RS-232-C or MIL STD-188/114 interfaces. Twenty-four synchronous data rates from 300 bps to 512K bps are supported via V.24/RS-232-C, V.35, AT&T 301/303, and MIL STD-188/114 interfaces. The higher speed synchronous rates support video transmission.

OPERATOR INTERFACE

The Network Console, a standard feature of the 4705T, is used to configure, monitor, and manage the High-Speed Voice and Data Attachments. The console is controlled by a program in the High-Speed Attachment, and can operate in two modes, the Multimaster Mode and the Session Mode. In Multimaster Mode, every 4705T that is connected to the terminal reports on its operating status and any alarm conditions. Session Mode allows the operator to use the console to configure, monitor, or diagnose any remote or local channels linked to the console. The operator uses a typewriter-style electronic keyboard and display is thru a video screen. English format is used for commands and responses. The console supports data rates from 300 bps to 4800 bps so that one network site can control local or remote 4705T communications processors. The console can be located up to 4,000 feet from the 4705T.

SOFTWARE

The Amdahl 4705 Series Communications Processors operate under the control of the following licensed and public-domain control programs available from IBM: EP3, PEP,

NCP5, and ACF/NCP 3.0, 2.0, and 2.1. The 4705E and 4705T also support ACF/NCP 3.2 and 3.1. Amdahl customers generally acquire public-domain software, such as EP, PEP, and NCP, directly through Amdahl, which also provides software support services for these programs. It is Amdahl's intent to support users of current public-domain IBM software by continuing to provide new releases of that software to Amdahl users. Customers acquire licensed IBM software products, such as ACF/NCP, directly from IBM, which also provides software support services for those programs.

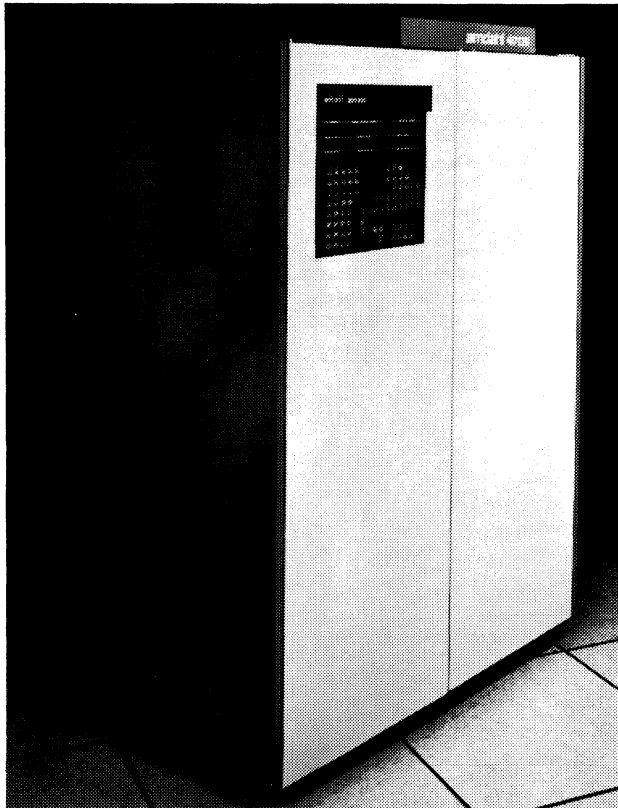
Amdahl also provides standalone diagnostic and maintenance programs that permit a disabled or off-line 4705 to perform self-test routines without host assistance. The 4705E's maintenance subsystem allows testing of active, on-line processors.

PRICING

The Amdahl 4705E and 4705T systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases may be renewed for 12-month periods. Lease payments must be made monthly in advance. Lease payments include the lessee charge, property taxes, and insurance, but not maintenance charges. Feature and model; upgrades follow the existing lease, except that the minimum lease term for a model upgrade is 12 months. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price on a two-year lease and 60 percent on a four-year lease. The purchase credit applies either to the original lessee or the current lessee. Amdahl will pass on two-thirds of the available Investment Tax Credit to qualified customers.

Monthly maintenance charges are not included in lease charges or purchase prices. The standard maintenance agreement provides for 24 hours per day and 7 days per week. Prime-shift-only (up to 9 hours per day and 5 days per week) contracts and other arrangements are optionally available. ■

Amdahl 4705 Communications Processor



MANAGEMENT SUMMARY

The Model 4705 Communications Processor is Amdahl's answer to the IBM 3705-II Communications Controller. The 4705 was announced in October 1980; U.S. deliveries began in December 1980, and European deliveries are scheduled to begin in third quarter 1981.

Amdahl offers the 4705 as an IBM 3705-II functional-equivalent and software-compatible system. The 4705 utilizes IBM public-domain software, such as EP, PEP, and NCP, and licensed program products, such as ACF/NCP, as its operating software. Amdahl supplies the public-domain software to its 4705 customers and provides support services for that software, including updates as IBM introduces new releases. Licensed software is acquired by the customer directly from IBM, which also provides support services for that software.

Amdahl offers the 4705 with benefits over IBM in price and performance. Datapro priced several models from each vendor and found that the Amdahl prices were substantially lower. Take, for example, the two configurations that appear in the box on page 1 of this report. IBM's equivalent to the Amdahl Model 5 configuration shown is a 3705-II Model E2, priced at \$59,603 (purchase) or \$2,192 per month (two-year lease including 24-hour, 7-days-per-week maintenance); their equivalent to the Amdahl Model 8 configuration shown is a 3705-II Model L4, priced at \$264,643 (purchase) or

A communications processor system functionally equivalent to and software-compatible with the IBM 3705-II. Amdahl offers faster throughput, more reliability, design improvements and lower prices than the 3705.

A smaller 4705 Model 5 configuration with 64K bytes of memory, one Type 4 Channel Adapter, one Type 2 Communications Scanner, two Line Interface Bases, and eight HD1A Line Sets that together accommodate 32 communications lines is priced at \$54,305. Two-year and four-year lease prices are \$1,885 and \$1,729 per month, respectively, including 24-hour, 7-days-per-week maintenance.

A larger 4705 Model 8 configuration with 512K bytes of memory, two Type 2 Channel Adapters, four Type 2 Scanners, 22 Line Interface Bases, and 88 HD1A Line Sets that accommodate 352 lines is priced at \$228,910. Two-year and four-year lease prices are \$8,868 and \$8,007 per month, respectively, including 24-hour, 7-days-per-week maintenance.

CHARACTERISTICS

VENDOR: Amdahl Corporation, 1250 East Arques Avenue, P. O. Box 470, Sunnyvale, CA 94086. Telephone (408) 746-6000.

DATE OF ANNOUNCEMENT: October 1980.

DATE OF FIRST DELIVERY: December 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Amdahl Corporation.

CONFIGURATION

The Amdahl 4705 Communications Processor is a functional equivalent of IBM's 3705-II Communications Controller as specified in Release 5 (sixth edition) of *IBM 3705 Principles of Operation* (IBM publication #GC30-3004-4), for the following currently released IBM 3705-II features:

- 352-line capacity (half-duplex)
- CA2, CA3, and CA4 Channel Adapters
- Up to 512K bytes of main memory
- Type 1, 2, and dual read-only storage
- CS2 and CS3 Communications Scanners
- LIB1 Line Interface Base
- 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H, 1S, and 1U Line Sets
- Business Machine Clock
- Two-Channel Switch
- Remote Initial Program Load
- One to four simultaneous Channel Adapters

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▷ \$10,493 per month (two-year lease including maintenance). Our figures are based on the latest prices currently available: October 1980 prices for Amdahl; and December 1980 prices for IBM, which included increases in 3705-II lease prices of approximately 6%.

In these instances, purchase prices are 9 percent and 14 percent lower for the Amdahl 4705 Model 5 and 8 configurations, respectively, than their IBM equivalents; Amdahl's two-year lease prices are 14 and 15 percent lower and their four-year lease prices are 21 and 24 percent lower, respectively, than IBM's two-year leases (IBM offers no 4-year leasing). Even though Amdahl has stated its intent to increase its lease pricing within the next month or so to reflect IBM's December increases, presumably prices will remain well below IBM's.

Amdahl has also implemented a number of hardware features designed as improvements over the 3705-II, which result in:

- **Improved throughput capacity**—Amdahl conducted benchmark tests that show the aggregate data rate capacity of the 4705 to be approximately 1.8 times the capacity of a similarly configured IBM 3705-II Model F8. (Note that the newer, faster IBM Models J, K, and L were not benchmarked.) The test simulated a configuration in which 144 IBM 3270 BSC-type users were accessing the system under TPNS Release 5 software using 9600 bps full-duplex lines. MVS/SE Release 3.8 was used as the host operating system, the host access method was ACF/VTAM, and the communications processors each operated in native mode under ACF/NCP. Type 2 Communications Scanners and Type 4 Channel Adapters were used.

In another Amdahl-conducted benchmark test, an Amdahl 4705 with Type 2 scanners was matched against a similarly configured IBM 3705-II with Type 3 scanners. Performance was found to be nearly equivalent for the two systems, even though the Type 2 scanner uses significantly more 4705 processor overhead than Type 3. The implication is that under certain circumstances, since Amdahl's processor can make up for the lower performance of the Type 2 scanner because its processor is more powerful than IBM's, equivalent performance to the 3705-II with Type 3 scanners can be achieved by using a 4705 with Amdahl Type 2 scanners, which each cost about \$13,000 less than IBM's Type 3's. ▷

Model	Line Capacity	Number of Scanners Required	Cabinets Required	IBM 3705-II Model Equivalent
5	Up to 64 lines	1	Basic only	E
6	65 to 160 lines	2	Basic only	F, J
7	161 to 256 lines	3	Basic + 1 Expansion	G, K
8	257 to 352 lines	4	Basic + 2 Expansions	H, L

TABLE 1. Characteristics of 4705 Models

▶ The Amdahl 4705 comes in four models, which differ only in line capacity and related hardware requirements. Each model is field-upgradable to the next higher model. The configurational differences between the models are detailed in Table 1.

The Amdahl 4705 is composed of the following major components:

- The **Central Control Unit (CCU)**, which contains the circuits and data flow paths to execute the instruction set, address storage, control the communications scanners and channel adapters, and perform arithmetic and logical processing of data, all under the direction of the system's control program.
- **Main Storage**, which (for any model) can contain 64K to 512K bytes of NMOS FET semiconductor memory, expandable in 64K-byte increments.
- **One to four Channel Adapters**, which provide data paths between the 4705 and channel-attached host computers. See "Connection To Host Computer" for details.

- **One to four Communication Scanners**, which connect the Line Interface Bases (LIBs) and Line Sets to the CCU. Scanner functions include: monitoring LIBs for service requests, assembling/disassembling characters, performing various line controls, servicing interrupts to the CCU to send or receive characters, and executing certain other procedures, such as control character recognition, code translation, and user recovery functions, under the direction of the system's control program.

Two types of scanners are available and may be added to the system in any combination: CS Type 2 supports up to six LIBs, accommodates asynchronous or synchronous lines, and transfers one byte to/from the CCU per interrupt; CS Type 3 supports up to four LIBs, accommodates synchronous lines only, and transfers one block of up to 255 bytes to/from the CCU per interrupt using a "cycle steal" methodology that halts the control program for a complete machine cycle during each data transfer. The first scanner per system is limited in line capacity to 64 lines (CS2) or 48 lines (CS3) per scanner; the second, third, and fourth scanners each have a line capacity of 96 lines (CS2) or 64 lines (CS3) per scanner. The Amdahl CS2 and CS3 are functionally equivalent to IBM's CS2 and CS3 scanners; Amdahl does not provide an equivalent for IBM's CS1 scanner, since the CS2 performs equivalent functions with higher performance.

- **Line Interface Bases (LIBs)**, which provide certain control functions for particular types of lines and transmission techniques. In general, each LIB can accommodate up to 16 lines. See "Transmission Specifications" for details.
- **Line Sets**, which provide physical interfaces to one to four modems and communications lines. See "Transmission Specifications" and Table 2 for details.

Other basic components include the operator control panel, a lamp unit, and an internal diagnostic routine loader unit. The control panel provides LED displays and touch-sensitive switches that allow the operator to perform various debugging and testing functions and other operations that require human intervention. The lamp unit is a type of logic probe with an attached light indicator that can be used to troubleshoot various hardware circuits.

The loader unit consists of a diskette controller and drive, an internal diskette, a register for storing the type of program load and stimulus, and read-only storage bootstrap. It is used to load and perform internal self-diagnostic and maintenance ▶

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➤ One explanation for this improved throughput is Amdahl's instruction look-ahead function, which allows the processor's fetch cycle to retrieve another instruction from memory while execution of the current instruction occurs. This overlap of fetch time with execution time does not occur with IBM 3705-II's processor. Another reason is that the internal cycle speed for the 4705's processor is 0.0145 microseconds, compared to 1.0 microseconds for 3705-II Models E, F, G, and H, and 0.9 microseconds for Models J, K, and L.

Although Amdahl is justifiably proud of the results of their benchmark testing, they have noted that the results are highly dependent upon configuration, application, and operating characteristics. Both Amdahl and Datapro recommend that prospective customers carefully evaluate their own environments to determine what throughput differences result between the Amdahl and IBM systems within that environment.

- *Simpler, more accurate operator controls*—Amdahl's system provides a newly designed console panel that contains touch-sensitive switches and hexadecimal LED read-outs in place of IBM's control panel lamps and rotation-type mechanical switches.

- *Reduced space requirements*—Amdahl's cabinetry is physically smaller and requires less service clearance than IBM's. For Amdahl models that are configured with the same number of frames as the equivalent IBM model (counting Amdahl's double-width Basic Frame as two frames), the space savings can be substantial. For example, a fully-loaded Amdahl 4705 Model 8 occupies as much as 30 percent less space than its IBM equivalent. The one exception is when an Amdahl model contains one more frame than its IBM equivalent (i.e., the Amdahl). In this ➤

➤ routines when the 4705 is in a disabled or off-line state, without dependence on the host or outside connections.

Physically, the 4705 is housed in one to three frames, or cabinets. The Basic Frame is a double-width cabinet that includes the CCU, main storage, operator control panel, lamp unit, and loader unit; all Channel Adapters and Scanners; and mountings for up to 10 LIBs and Line Sets for up to 160 lines. Each of two smaller Expansion Frames accommodates up to an additional six LIBs and Line Sets for up to 96 lines.

The configuration diagram at the end of this report illustrates the relationships among these components.

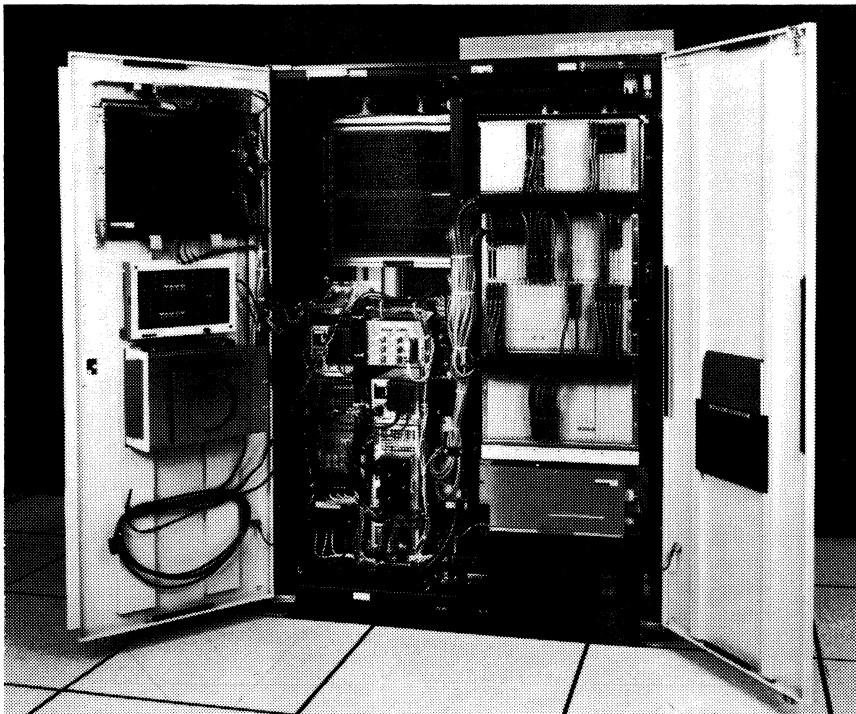
TRANSMISSION SPECIFICATIONS

In general, Amdahl currently supports transmissions of up to 56K bps in half- or full-duplex mode, using start/stop, BSC, or SDLC line protocols, over switched, leased, or private communications lines. EIA RS-232-C and CCITT V.24 and V.35 interfaces are available.

Amdahl provides only one type of Line Interface Base, LIB1, which handles up to 16 lines of various speeds and protocols. The LIB relays signals between the Communications Scanner and the Line Sets and provides a send/receive bit timing signal to the Line Set for each transmission speed.

The Line Set detects receive bits from the communications lines, transmits send bits to the line, and transmits modem control signals. A Line Set can accommodate one to four lines, depending on the type of Line Set selected. Line Sets are provided to accommodate a wide range of communications requirements and are detailed in Table 2.

CONNECTION TO THE HOST: The Amdahl 4705 can be channel-attached or remotely connected to any Amdahl or equivalent host computer, including an IBM 360, 370, 303X, 3081, or 4300. The 4705 is generally compatible with MVS, SVS, and VS1 operating systems and with BTAM, QTAM, TCAM, and VTAM host access methods, including ACF and MSNF capabilities. Exceptions are: (1) host software that requires hardware features is not supported; and (2) some host software used for testing the IBM 3705-II may be ➤



When the 4705 Basic Frame's doors are opened, its internal workings are revealed. On the inside of the left door are mounted the operator panel, flexible disk drive, and diagnostic lamp unit. The upper left side of the cabinet holds the central control unit and main storage; the lower left, the power supply. A swing gate of the right side of the cabinet accommodates Communications Scanners and Channel Adapters. Behind the gate (not visible in photo) are Line Interface Bases and Line Sets for up to 160 lines. Additional Line Interface Bases and Line Sets may be housed in one or two Expansion Frames (not shown in photo).

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TABLE 2. Communications Handled By Amdahl and IBM Functional Equivalents

Type of Line Interface	Transmission					Line Sets		Lines Per Line Set		Comments
	Amdahl Speed (bps)	IBM Speed (bps)*	Timing	Mode	Line	Amdahl	IBM Equivalent*	Amdahl	IBM*	
External RS-232-C Modem	2400	1200	Asynchronous	Half-duplex	Leased or Switched	HD1A	1A	4	2	Cannot use CS3 Scanner.
	2400	1200	Asynchronous	Full-duplex	Leased	FD1A	1B	2	1	
	2400	1200	Asynchronous	Half-duplex	Leased or Switched	HD1	1D	4	2	
	19,200	9600	Synchronous	Half-duplex	Leased or Switched					
	19,200	9600	Synchronous	Full-duplex	Leased	FD1	1H	2	1	
Wideband	50,000	50,000	Synchronous	Half-duplex	Leased	HD1G	1G	2	2	
External CCITT V.35	56,000	56,000	Synchronous	Half-duplex	Leased	HD2	1S	2	1	
	56,000	56,000	Synchronous	Full-duplex	Leased	FD2	1U	1	1	
Local Attachment	2400	1200	Asynchronous	Half-duplex	Cables	LA1C	1C	4	2	Maximum cable length is 200 feet; cannot use CS3 Scanner.
	19,200	9600	Synchronous	Half-duplex	Cables	LA1F	1F	4	2	
Automatic Dial RS-366	2400	1200	Asynchronous	Half-duplex	Switched	NC1	1E	2 RS-366 plus	2	For attachment of external dialing units and data communications lines.
	19,200	9600	Synchronous	Half-duplex	Switched			2 RS-232-C		

*For comparison only.

**HD1 and NC1 each accommodate asynchronous transmissions at up to 2400 bps plus synchronous transmissions at up to 19,200 bps.

➤ case, the Amdahl configuration requires more floor space than IBM. However, when service clearance is considered, all of Amdahl's models take up less space than IBM's.

- *Simplified installation and improved reliability and serviceability*—The inherent modularity of the Amdahl system's design reduces downtime when the system is expanded or a component fails. The system provides a stand-alone self-diagnostic and maintenance routine that allows internal system functions to be self-tested without dependence on a host computer or other outside connection. In addition, the 4705's architecture provides several functions designed to increase the system's operational reliability, such as automatic instruction retry when an instruction fails to execute correctly, line unit loop diagnostics, a channel loopback capability, etc.

Certain IBM configurations and features are slightly different as implemented by Amdahl. For instance, the Amdahl system's main memory is expanded by 64K-byte increments, whereas the IBM memories are expandable in 32K-byte steps. This results in Amdahl's having fewer memory-plus-line-capacity combinations than IBM. In addition, Amdahl has chosen not to support the lower-performance IBM Type 1 Channel Adapter and Type 1 Communications Scanner, which are essentially replaced by the high performance Type 4 Channel Adapter and Type 2 Scanner, respectively.

Amdahl also does not support IBM's Line Interface Base Types 2 through 12, which support Telegraph interfaces and integral modems and adapters. Certain IBM Line Sets that utilize Line Interface Base 1, including Line Sets 1T, 1J, 1GA, 1TA, 1W and 1Z, are also not supported. Although IBM recently merged its Line Sets 1A and 1B into its 1D Line Set, Amdahl has decided to keep them separate, which may result in a cost savings to the customer.

➤ incompatible with the Amdahl 4705 (however, Amdahl provides equivalent test routines that operate without host involvement).

Amdahl provides three Channel Adapters for direct attachment of the 4705 to the byte multiplexer, block multiplexer, or selector channel of a local host computer:

- CA2—operates under NCP program control only. When the CA2 is used, only two Channel Adapters may be configured per 4705 (the second adapter may be a CA3, a CA4, or another CA2).
- CA4—operates under EP, PEP, or NCP program control. Up to four CA4s may be configured per 4705 when no CA2s or CA3s are configured; one CA4 may be configured when a CA2 or CA3 is also used.

A Two-Channel Switch can be used with either the CA2 or CA4 to allow the adapter to connect two host channels. Only one of the channels is active at a time; the active channel is selected manually.

- CA3—provides the combined capabilities of a CA2 and Two-Channel Switch, plus a cross-call feature. The CA3 is used to attach the 4705 to the channels of a pair of tightly-coupled multiprocessing systems and allows the 4705 to operate as a shared symmetrical I/O unit with an alternate path capability between the two systems. Switching between the two CPUs is automatic on a first-come, first-serve basis, and only one channel is active at a time. As with the CA2, only two Channel Adapters may be configured per 4705 when the CA3 is used (the second adapter may be a CA2, a CA4 or another CA3).

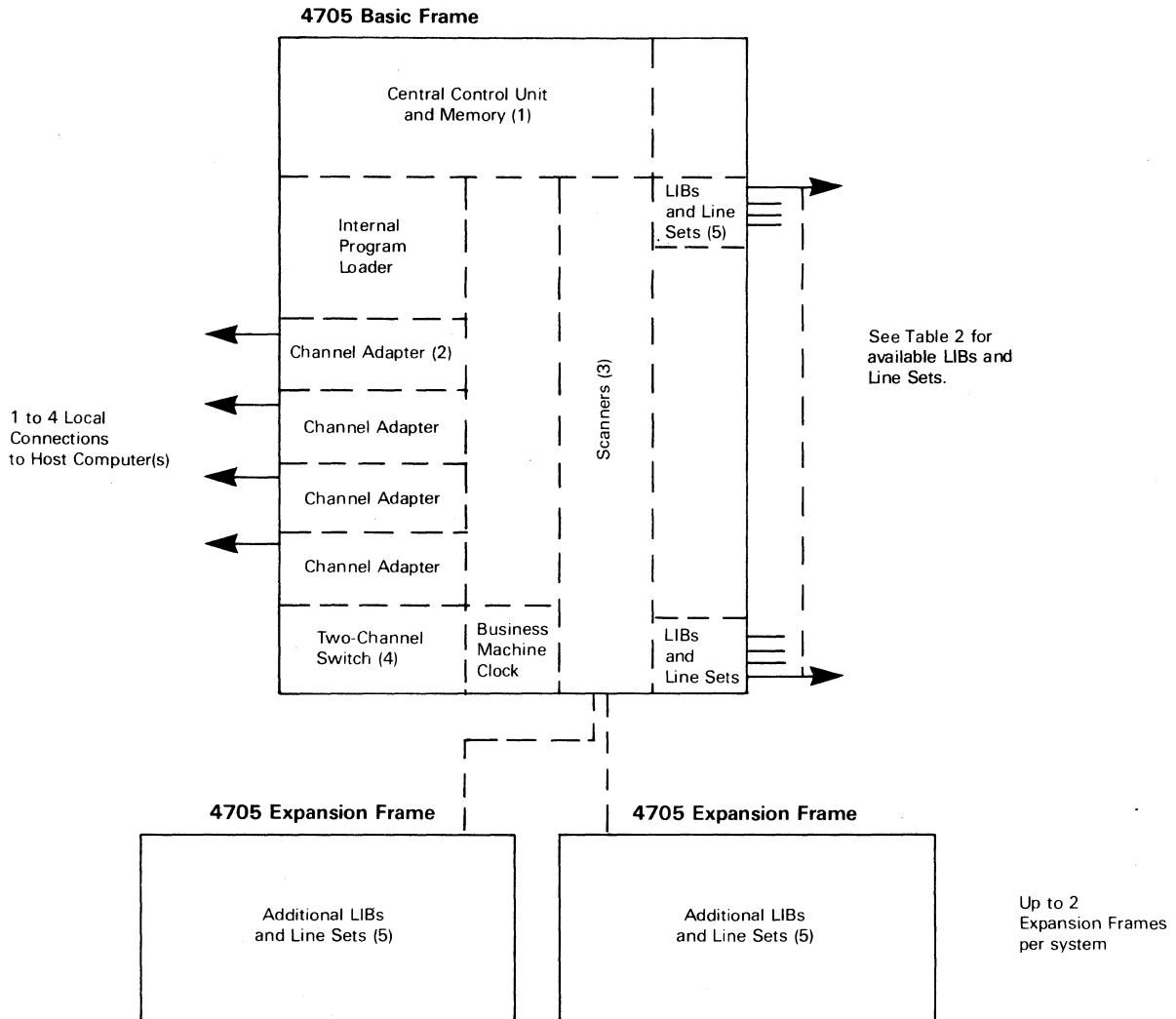
The Amdahl CA2, CA3, and CA4 are functionally equivalent to IBM's CA2, CA3, and CA4 Channel Adapters. Amdahl does not provide an equivalent to the IBM CA1, since the CA4 performs equivalent functions with higher performance.

The physical connectors required to attach the 4705 to an IBM host are functionally equivalent but physically somewhat different than IBM's. Therefore Amdahl provides its own connector cables.

➤ A Remote Program Load option (functionally equivalent to IBM's RPL option) is provided to load the 4705's operating

Amdahl 4705 Communications Processor

Configuration



(1) Memory size is 64K to 512K bytes, expandable in 64K-byte increments.

(2) One to four Channel Adapters can be installed.

(3) One to four Communications Scanners Type 2 or 3 can be installed. If Type 2 is used, first Scanner can handle up to 64 lines; additional three Scanners can handle up to 96 lines each. If Type 3 is used, first Scanner can handle up to 48 lines; additional three Scanners can handle 64 lines each. Maximum number of lines per system is 352.

(4) One Two-Channel Switch may be configured for each Channel Adapter Type 2 or 4.

(5) Basic Frame accommodates up to 10 LIBs and Line Sets for up to 160 lines. Each Expansion Frame accommodates up to 6 LIBs and Line Sets for up to 96 lines. Each LIB handles up to 16 lines. Each Line Set provides interfacing for one to four lines, depending on type of Line Set selected.

➤ Most of Amdahl's Line Sets are equivalent to two of their respective IBM versions, but are priced substantially less than twice the cost of the IBM versions. Also Amdahl's Line Set NC1, which is priced as an equivalent to IBM's Line Set E1 (a dual RS-366 compatible automatic dial interface), includes 2 RS-232-C interfaces for attachment of regular communications lines in addition to the two auto-dial unit interfaces offered on the IBM version.

➤ software over high-speed data communications lines from a remote host computer. The RPL option can be used when the 4705 is utilized as a remote network concentrator with no local host channel attachment, when network software management is controlled from a central (remote) computer rather than the local computer to which the 4705 is channel-attached, and in other circumstances that require a remote IPL. The RPL feature occupies one channel adapter slot, so that only three CA4s may be configured (systems with CA2s and CA3s are not affected).

SOFTWARE

The Amdahl 4705 operates under the control of the following licensed and public-domain control programs available from ➤

Since its inception, Amdahl Corporation has continued to announce new products that keep abreast or ahead of ➤

Amdahl 4705 Communications Processor

▷ IBM. The introduction of the 4705 has been interpreted as Amdahl's effort to position itself to respond to expected IBM H-Series communications capabilities, as well as to provide a front-end communications link between Amdahl's mainframes and the private telecommunications networks sold by Tran Telecommunications, a recent Amdahl acquisition. Certainly in the existing communications processor market, which includes not only IBM, but NCR Comten, Memorex, and other well-established vendors, Amdahl's entry is significant. □

▶ IBM: EP3, PEP, NCP5, and ACF/NCP 2.0 and 2.1. Amdahl customers generally acquire public-domain software, such as EP, PEP, and NCP, directly through Amdahl, which also provides software support services for these programs. It is Amdahl's intent to support users of current public-domain IBM software by continuing to provide new releases of that software to Amdahl users. Customers acquire licensed IBM software products, such as ACF/NCP, directly from IBM, which also provides software support services for those programs.

Amdahl also provides stand-alone diagnostic and maintenance programs that permit a disabled or off-line 4705 to perform self-test routines without host assistance.

PRICING

The Amdahl 4705 systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases may be renewed for 12-month periods. Lease payments must be made monthly in advance. Lease payments include the lessee charge, property taxes, and insurance, but not maintenance charges. Feature and model; upgrades are coterminous with the existing lease, except that the minimum lease term for a model upgrade is 12 months. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price on a two-year lease and 60 percent on a four-year lease. The purchase credit applies either to the original lessee or the current lessee. Amdahl will pass on two-thirds of the available Investment Tax Credit to qualified customers.

Monthly maintenance charges are not included in lease charges. The standard maintenance agreement provides for 24 hours per day and 7 days per week. Prime-shift-only (up to 9 hours per day and 5 days per week) contracts and other arrangements are optionally available.

		Monthly Charges*			Monthly Maint.	
		2-Year Lease	4-Year Lease	Purchase	Prime Shift	24-Hour 7 Days/Wk.
4705 Communications Processor						
	Model 5; max. 64 lines	\$ 850	\$ 760	\$38,000	\$276	\$384
	Model 6; max. 160 lines	1,165	1,040	49,300	297	412
	Model 7; max. 256 lines	1,480	1,325	60,600	318	442
	Model 8; max. 352 lines	1,830	1,600	71,900	339	471
MS1	Storage Increment; 64K bytes	145	125	2,650	52	72
MS2	Storage Increment; 128K bytes	290	250	5,300	104	145
MEO	Memory Expansion Option; 256K to 512K bytes	410	365	17,600	30	41
CA2	Channel Adapter	160	138	5,500	16	22
CA3	Channel Adapter	340	300	10,975	19	26
CA4	Channel Adapter	138	120	3,750	14	19
TCS	Two-Channel Switch	47	42	1,775	4	6
RPL	Remote Program Load Option	179	153	7,935	41	57
CS2	Communications Scanner	150	132	4,035	16	22
CS3	Communications Scanner	550	480	14,630	52	72
LIB1	Line Interface Base	30	27	940	5	7
Line Sets:						
HD1A	RS-232-C; supports up to 4 half-duplex 2400 bps lines	25	22	830	4	6
HD1	RS-232-C; supports up to 4 half-duplex lines	55	50	1,750	9	13
FD1A	RS-232-C; supports up to 2 full-duplex 2400 bps lines	26	23	1,150	4	6
FD1	RS-232-C; supports up to 2 full-duplex 19,200 bps lines	55	50	1,750	9	13
HD2	CCITT/V.35; supports up to 2 half-duplex 56K bps lines	130	116	5,140	19	27
FD2	CCITT/V.35; supports 1 full-duplex 56K bps line	120	106	4,625	17	24
LA1C	Local; supports up to 4 half-duplex 2400 bps lines	24	22	1,090	4	6
LA1F	Local; supports up to 4 half-duplex 19,200 bps lines	55	50	1,750	9	13
HD1G	Wideband; supports up to 2 half-duplex 50K bps lines	124	110	3,485	19	26
NC1	Auto Dialing; supports up to 2 RS-232-C compatible half-duplex lines plus up to 2 RS-399 compatible auto-call units	22	20	875	3	4

*EXCLUDES maintenance charges. ■

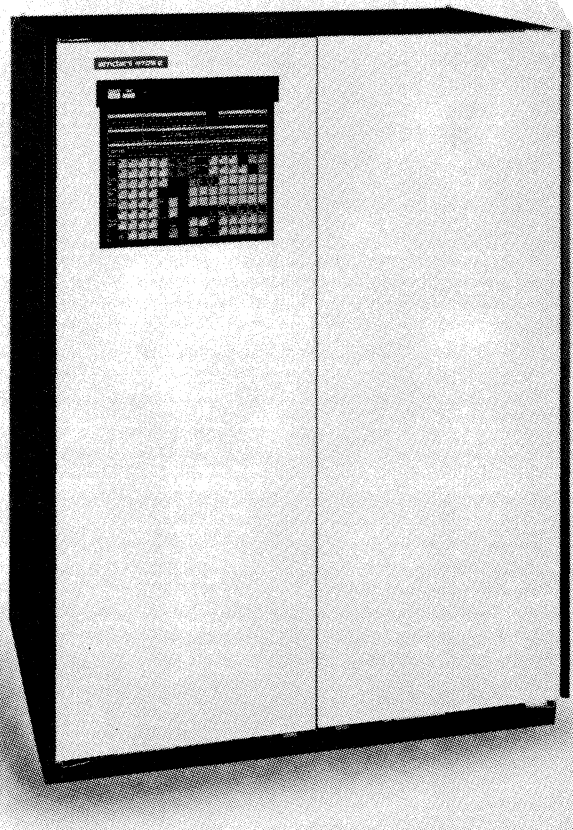
Amdahl 4705 Series Communications Processors

MANAGEMENT SUMMARY

UPDATE: *This report is being updated to show the changes that have occurred in the Amdahl 4705 Series of Communications Processors since this report was last done. The Amdahl 4705 is no longer actively marketed, and a new processor, the 4705T has been introduced. New features and new line sets have been added to the 4705E. These and other changes are discussed in the following report.*

Amdahl Corporation was founded in 1970. They are a leading supplier of large general-purpose computers. The Communications Systems Division, formerly known as Tran Communications Ltd., became a wholly owned subsidiary of Amdahl in 1980. The Communications System Division designs, manufactures, and markets private and public digital communications equipment and networks. Some of their products include multiplexers, packet switching systems, limited distance data sets, and Customer Service Units/Data Service Units (CSU/DSU).

The 4705 Communications Processor was Amdahl's first alternative offering to the IBM 3705-II Communications Controller. The 4705 was announced in October 1980; U.S. ➤



Amdahl's 4705E Communications Processor offers a unique backup feature, the Integrated Line Switch. This feature allows for software-initiated switching of line interface units from the main 4705E to a backup 4705E.

The Amdahl 4705 Communications Processor, Amdahl's first offering as a plug-compatible, software-compatible replacement for the IBM 3705 Communications Controller, is no longer being actively marketed. While Amdahl still supports the 4705, it is no longer selling new ones. Amdahl is concentrating its efforts on the 4705E, a plug-compatible replacement for the IBM 3725 Communication Controller, and the 4705T, an upgrade of the 4705E. In most applications, these Amdahl processors offer price/performance advantages over their IBM equivalents.

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

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA and emulation environments.

OPERATING SOFTWARE: IBM's ACF/NCP, NCP, PEP, and EP.

COMPETITION: IBM 3705; IBM 3725; NCR Comten 3650 and 3690; CCI CC80 and CC85.

PRICE: Depends upon configuration.

CHARACTERISTICS

VENDOR: Amdahl Corporation, 1250 East Arques Avenue, P.O. Box 470, Sunnyvale, CA 94088-3470. Telephone (408) 746-6000.

DATE OF ANNOUNCEMENT: 4705E—April 1983; 4705T—February 1985.

DATE OF FIRST DELIVERY: 4705E—April 1983; 4705T—February 1985.

NUMBER DELIVERED TO DATE: 4705E—400; 4705T—Information not available.

SERVICED BY: Amdahl Corporation.

CONFIGURATION

The Amdahl 4705 Series of Communications Processors are designed to compete with IBM's 3725 Communications Controller. The 4705E provides memory from 256K bytes to 1024K bytes in 256K-byte increments; can support up to six CPU attachments to block or byte multiplexer channels in the base frame; supports up to 352 half-duplex communication lines has two channel switches, that permit a channel adapter to be switched between two hosts; supports up to four communications scanners, and a Line Interface Base (LIB) that supports up to four line sets.

The 4705T, while offering the same basic configuration as the 4705E, also offers some additional capabilities through the High-Speed attachment feature. These features include: additional data channels that operate at speeds from 4800 ➤

Amdahl 4705 Series Communications Processors

▷ deliveries began in December 1980, and European deliveries began in October 1981. The 4705E was announced in April 1983, with U.S. delivery also beginning in April 1983. Between the 4705 and the 4705E, over 800 units have been installed in the U.S., Canada, Europe, and Australia. The 4705T was announced in February 1985 and is currently available for delivery. The 4705E can be upgraded to the 4705T.

The 4705E is an enhanced version of the 4705, designed to compete with IBM's high-end 3725 Communication Controller. Like the 3725, Amdahl's 4705E offers greater maximum main storage, faster throughput, and simpler configuration than the 4705 or the IBM 3705. In addition, the 4705E runs the established IBM 3705 operating software, rather than the newer IBM versions for the 3725. The 4705E can support from 256K to 1M bytes of main memory, expandable in 256K increments, and from 64 to 352 communications lines operating synchronously or asynchronously, in half- or full-duplex mode, at rates from 1200 to 64K bps. In extended connectivity, the 4705E can support 64 asynchronous and synchronous lines on a single scanner up to speeds of 9600 bps.

The 4705T is a high-performance version of the 4705E, that can provide communications for up to 44 data and/or voice lines multiplexed over a high-speed facility at speeds up to 2048K bps. The 4705T allows simultaneous two-way communications over the voice and/or data lines. The voice lines link local and distant automatic telephone switchboards so that the need for dedicated trunk lines is eliminated. Like the 4705E, the 4705T can operate industry-standard 3705 communications software, and is compatible with processing systems that are based on System/370 and 370 extended architecture (370-XA).

COMPETITIVE POSITION

The Amdahl processors compete in the market for full-scale, IBM-compatible communications processors against NCR Comten's 3600 Series and CCI's CC80 and CC85, as well as with IBM itself. IBM enjoys roughly a 90 percent share of the market. Each of the plug-compatible vendors uses a different product strategy to gain its share of the remaining 10 percent: NCR Comten combines performance advantages with its own networking software; CCI gears its product to special applications, such as airline reservation systems, and offers a variety of field-upgradable low-end models. Amdahl, the original vendor of IBM-plug-compatible mainframes, is the only vendor in the market to offer full software compatibility with IBM's communications processors, in addition to significant advantages in price, performance, and configuration.

In pricing several models from Amdahl and IBM, Datapro found that the Amdahl prices are lower when comparing IBM configurations with equivalent memory, channel adapters, communications scanners and line sets. The 4705T offers significant benefits when compared to the IBM 3725 RPQ VHSA. It supports more high-speed lines (four versus one), it allows the inclusion of data sources outside the FEP, it supports both voice and video, and ▷

▷ bps to 768K bps; trunk interface to conventional high-speed links from 56K bps to 2048K bps; voice links between telephone switchboards that offer high quality, low cost alternatives to more expensive dedicated tie lines or long distance charges; and additional line sets.

The high-speed line attachments are housed in a new, smaller expansion cabinet that is 21 inches wide, 29.5 inches deep, and 62.6 inches high. This cabinet attaches to the side of the 4705E main or expansion cabinet. These high-speed line attachments are powered separately from the base and expansion 4705E cabinets. This provides a high-degree of isolation in case of faults on a high-speed line. Each high-speed line is controlled by a separate microprocessor that offers isolation and independence from the main 4705E CPU. The processing necessary to maintain the high-speed lines produces no degradation in either the throughput or the connectivity of the 4705E portion of the box.

Physically, the 4705 Series Communication Processors are housed in one to three frames, or cabinets. The Basic Frame is a double-width cabinet that includes the CCU, main storage, operator control panel, lamp unit, and loader unit; all Channel Adapters and Scanners; and mountings for up to 10 LIBs and Line Sets for up to 160 lines. Each of two smaller Expansion Frames accommodates up to an additional six LIBs and Line Sets for up to 96 lines. The 4705T also features a High-Speed Expansion Frame that can hold up to 96 communications lines that support voice communications.

The High-Speed Expansion cabinet also houses a Voice I/O module that provides a way of supplying voice communications over an existing trunk. This module eliminates the need for expensive dedicated tie lines. The Voice I/O module has two channels, plugs into the chassis in the High-Speed Expansion cabinet, and provides a standard four-wire type 1 voice interface. Voice traffic is accommodated using an Amdahl exclusive, enhanced CVSD technique that digitizes voice at 16K bps, 48K bps, or 64K bps on a per line basis. This Amdahl-Enhanced Continuously Variable Slope Delta modulation technique (AECVSD), which is patent pending, produces toll quality voice at 32K bps and can support modems at up to 9600 bps. By adding voice interface equipment, the Voice I/O module capabilities can be further extended to cover other voice applications such as facsimile transmission, business machine intercommunication, or automatic hot-line operation. The module has built-in diagnostics for end-to-end channel testing from a central Network Console; built-in fault detection and alarm reporting; and manual channel disable for quick error recovery and diagnostics. The module can accommodate up to 46 voice channels, or a combination of voice and data channels, over a single link.

The Synchronous and Asynchronous I/O Modules are also housed in the High-Speed Expansion cabinet. These modules provide the channel logic needed to interface either two low-speed synchronous or asynchronous data channels with the 4705T. Each module can be supplied to support one of these interfaces: RS-232-C/V.24, V.35, AT&T 301/303, or MIL STD-188/114. Each module occupies one slot in the chassis of the expansion cabinet. The modules can be configured in the field to interface with either Data Terminal Equipment (DTE) or Data Communications Equipment (DCE). They operate in full- or half-duplex mode, and can transmit up to four interface controls in either direction. The Synchronous I/O Module supports channel data rates of 300 bps to 512K bps, depending on the interface chosen, while the Asynchronous I/O Module supports channel data rates from 110 to 19,200 bps. The Asynchronous module accepts either ASCII or EBCDIC data formats and is parity transparent. The channel characteristics of either module are software configured by the 4705T Network Console. From the console, data rates, full- or half-duplex mode, ▷

Amdahl 4705 Series Communications Processors

offers a dramatic cost savings. The IBM RPQ, to support a single T1 line, is approximately \$140,000 above the cost of the basic 3725; the 4705T's high-speed attachment is around \$20,000 higher than the basic 4705E. Since a pair of 3725's or 4705T's are required, the cost of implementing a T1 link with 4705T's is approximately \$240,000 less than a 3725 implementation.

ADVANTAGES AND RESTRICTIONS

Amdahl's biggest advantage against the other plug-compatible vendors is its 100 percent software compatibility with IBM systems. Users can swap an Amdahl communications processor for its IBM counterpart with few, if any, software rewrites.

The 4705 Series processors' advantages over the IBM 3705 include:

- *Improved throughput capacity*—Amdahl conducted benchmark tests that show the aggregate data rate capacity of the 4705E and 4705T to be approximately 2.4 times the capacity of a similarly configured IBM 3705-II, and approximately 1.3 times that of the 4705.

One explanation for Amdahl's improved throughput is the instruction look-ahead function, which allows the processor's fetch cycle to retrieve another instruction from memory while execution of the current instruction occurs. This overlap of fetch time with execution time does not occur with IBM 3705-II's processor. Another reason for improved throughput is that the internal cycle speed for the 4705 Series' processor is 145 nanoseconds (0.145 microseconds) compared to 1.0 microseconds for 3705-II Models E, F, G, and H, and 0.9 microseconds for Models J, K, and L.

- *Simpler, more accurate operator controls*—Amdahl's system provides a newly designed console panel that contains touch-sensitive switches and hexadecimal LED read-outs in place of IBM's control panel lamps and rotation-type mechanical switches.
- *Reduced space requirements*—Amdahl's cabinetry is physically smaller and requires less service clearance than IBM's. For Amdahl models that are configured with the same number of frames as the equivalent IBM model (counting Amdahl's double-width Basic Frame as two frames), the space savings can be substantial. The one exception is when an Amdahl model contains one more frame than its IBM equivalent. When service clearance is considered, all of Amdahl's models take up less space than IBM's.
- *Simplified installation and improved reliability and serviceability*—The inherent modularity of the Amdahl system's design reduces downtime when the system is expanded or a component fails. The system provides a standalone self-diagnostic and maintenance routine that allows internal system functions to be self-tested without dependence on a host computer or other outside connection. In addition, the 4705 Series' architecture provides

control signals, and scrambler enable can be configured. The physical interface between either module and its channel device is supplied by a Channel Connector Assembly, which is ordered separately.

The Integrated Limited-Distance Data Set module, which occupies one I/O slot in the chassis of the High-Speed Expansion Cabinet of the 4705T, contains an integrated limited-distance data set to provide low cost synchronous communications with remote channel devices. The module can support the following range of data rates: 1.2K to 9.6K bps, 2.4 to 19.2K bps, and 19.2K to 64.0K bps. An Amdahl 982 Synchronous Data Set terminates the four-wire loop at the remote end. With the Integrated Limited-Distance Data set in the 4705T, the 982 Data Set can be located up to 32 miles away. The physical interface between the module and the channel cable from the remote 982 Data Set is furnished by a four-wire connector mounted on the backplane of the chassis. The module operates in either full- or half-duplex mode. When operating in half-duplex mode, the module can transmit three DTE to DCE controls and four DCE to DTE controls. Most of the channel characteristics are soft configured by the 4705T Network Console, including data rate, full- or half-duplex operation, control signals, and scrambler enable. The Integrated Limited-Distance Data Set module offers automatic onboard storage of channel parameters for channel integrity, built-in fault detection and alarm reporting, and automatic equalization and automatic line build-out for distortion-free transmissions.

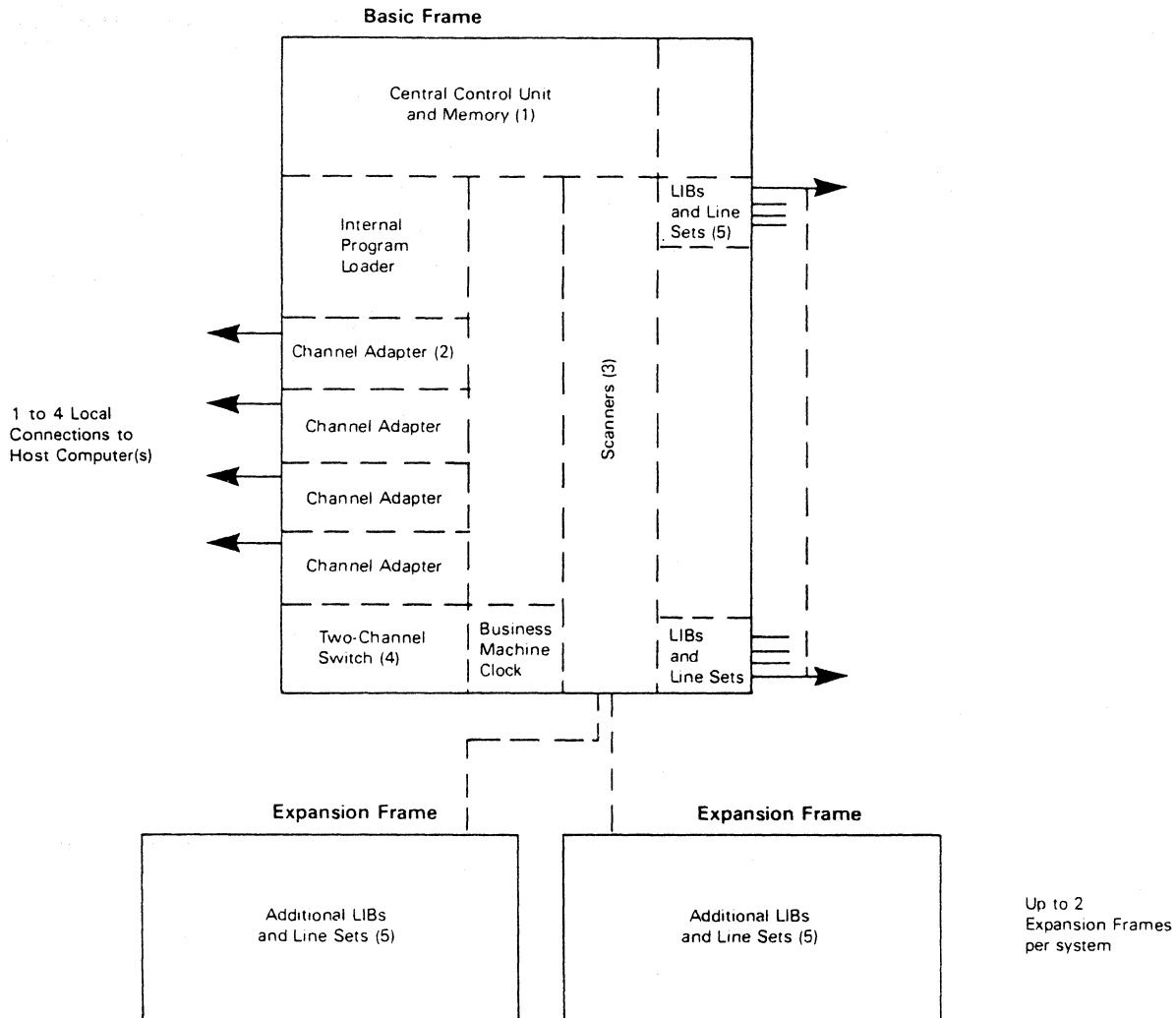
The Integrated Multiport Limited-Distance Data Set furnishes the logic to interface up to four channels, on one four-wire loop, within the 4705T High-Speed expansion Cabinet. Synchronous data rates from 600 bps to 9600 bps are supported by the module, with no overhead bandwidth. Two, three, or four channels from a four-wire loop are combined by the module and are terminated by an Amdahl 984 Multiport Synchronous Data Set that can be located up to 28 miles away. The module operates in full-duplex mode, with the 4705T Network Console soft configuring communications characteristics, such as data rate and channel split. The module is housed in two adjacent slots in the chassis with the High-Speed Expansion Cabinet of the 4705T. The physical interface from the module to the remote 984 Data Set is provided by a four-wire connector that is mounted on the backplane of the chassis. The Integrated Multiport Limited-Distance Data Set provides automatic onboard storage of channel parameters for channel integrity, built-in fault detection and alarm reporting, manual or remote dis-

Module	Function	Speeds (up to kbps)	Duplex Mode	No. Lines per Line Set	Electrical Standard
HS20	Synchronous I/O	64 768 64	Both	2	RS-232-C, V.35 Bell 301/303 MIL-STD-188-14
HS40	Asynchronous I/O	19.2 19.2	Both	1	RS-232-C, V.24 MIL-STD-188-14
HS45	Voice I/O	16-64 kHz	—	2	4 Wire, Type I, E&M Signalling, Amdahl Enhanced CVSD
HS30	Integrated Limited Distance Data Set	1.2-64	Both	1	4 Wire, AT&T 43401
HS34	Integrated Multiport Limited Distance Data Set	.6-9.6	Both	4	4 Wire, AT&T 43401

Table 1. 4705T high-speed attachment interface modules

Amdahl 4705 Series Communications Processors

Configuration



(1) Memory size is 64K to 512K bytes, expandable in 64K-byte increments, for the 4705 and 64K to 1M bytes for the 4705E.

(2) One to four Channel Adapters can be installed.

(3) One to four Communications Scanners can be installed. If Type 2 is used, first Scanner can handle up to 64 lines; additional three Scanners can handle up to 96 lines each. If Type 3 is used, first Scanner can handle up to 48 lines; additional three Scanners can handle 64 lines each. Maximum number of lines per system is 352.

(4) One Two-Channel Switch may be configured for each Channel Adapter.

(5) Basic Frame accommodates up to 10 LIBs and Line Sets for up to 160 lines. Each Expansion Frame accommodates up to 6 LIBs and Line Sets for up to 96 lines. Each LIB handles up to 16 lines. Each Line Set provides interfacing for one to four lines, depending on type of Line Set selected.

➤ several functions designed to increase the system's operational reliability, such as automatic instruction retry when an instruction fails to execute correctly, line unit loop diagnostics, and a channel loopback capability.

Certain IBM configurations and features are slightly different as implemented by Amdahl. For instance, the Amdahl 4705 Series system's main memory is expanded by 256K-byte increments, whereas the IBM memories are expandable in 32K-byte steps. This results in Amdahl's having fewer memory-plus-line-capacity combinations than IBM. In addition, Amdahl has chosen not to support

➤ able of individual channels, and automatic equalization and automatic line buildout that provides distortion free transmissions.

A Maintenance Subsystem, which includes a diskette-based diagnostic reader and a display unit, is also part of the 4705 Series. The subsystem can perform diagnostics on an operating 4705E or 4705T.

Two optional features available with the 4705E and the 4705T are the Integrated Line Switch, which allows a 4705E or 4705T to switch communications lines from malfunctioning line sets in its main cabinet to hot standbys in an expansion cabinet; and the High-Speed Asynchronous Clock, which allows asynchronous communications at

Amdahl 4705 Series Communications Processors

the lower-performance IBM Type 1 Channel Adapter and Type 1 Communications Scanner, which are essentially replaced by the high-performance Type 4 Channel Adapter.

Amdahl also does not support IBM's Line Interface Base Types 2 through 12, which support Telegraph interfaces and integral modems and adapters. Certain IBM Line Sets that utilize Line Interface Base 1, including Line Sets 1J, 1GA, 1TA, 1W, and 1Z, are also not supported. Although IBM has merged its Line Sets 1A and 1B into its 1D Line Set, Amdahl has decided to keep them separate, which may result in a cost savings to the customer.

Most of Amdahl's 4705 Series Line Sets are equivalent to two of their respective IBM versions but are priced substantially less than twice the cost of the IBM versions. Also, Amdahl's Line Set NCI, which is priced as an equivalent to IBM's Line Set E1 (a dual RS-366-compatible automatic dial interface), includes two RS-232-C interfaces for attachment of regular communications lines in addition to the two auto-dial unit interfaces offered on the IBM version.

When compared to the IBM 3725, the 4705E and 4705T offer the following advantages in addition to lower price and faster throughput:

- Support for up to 1M bytes of memory using 3705 software. Users can upgrade from a 4705 or an IBM 3705 to a 3725-compatible processor without converting to the newer IBM 3725 versions of the IBM software.
- Support for asynchronous devices at data rates up to 9600 bps, compared to 1200 bps for the 3725. High-speed asynchronous support on the 4705E requires the addition of an optional High-Speed Asynchronous Clock.

Amdahl's optional Integrated Line Switch for hot standby lines was originally a significant advantage, but in November 1983, IBM announced a similar feature for the 3725.

Amdahl has instigated several changes to the 4705 Series Communications Processors that have rendered former restrictions obsolete and made the new features equal to or improved over the 3725. One of the restrictions had been that the 4705 did not support satellite communications links. This is no longer the case as the 4705T does support satellite communication links with a special buffer to compensate for variations in satellite propagation delay. Another restriction dealt with the number of host processors that could be supported. Previously, Amdahl supported four to IBM's six. Amdahl's 4705 Series processors now also supports six processors.

The 4705 Series' restriction against the 3725 deals with its slightly more complex configuration. The 3725 uses a single type of scanner, integrated into the Type C Line Attachment Base; Amdahl supports up to four separate scanners that connect the Line Interface Bases and Line

speeds up to 9600 bps. The 4705T also offers additional features such as touch-actuated operator panel, online and standalone diagnostics, instruction lookahead, automatic fault isolation, instruction retry, and software configurability of communications capability via operator's console.

PROCESSING COMPONENTS

The Amdahl 4705E and 4705T are composed of the following major components:

- The *Central Control Unit (CCU)*, which contains the circuits and data flow paths to execute the instruction set, address storage, control the communications scanners and channel adapters, and perform arithmetic and logical processing of data, all under the direction of the system's control program.
- *Main Storage*, which (for any model) can contain 256K to 1024K bytes of NMOS FET semiconductor memory, expandable in 256K-byte increments.
- One to six *Channel Adapters*, which provide data paths between the 4705E or 4705T and channel-attached host computers. See "Connection To The Host" in this report for details.
- One to four *Communication Scanners*, which connect the Line Interface Bases (LIBs) and Line Sets to the CCU. Scanner functions include: monitoring LIBs for service requests, assembling/disassembling characters, performing various line controls, servicing interrupts to the CCU to send or receive characters, and executing certain other procedures, such as control character recognition, code translation, and user recovery functions, under the direction of the system's control program.

Two types of scanners are available and may be added to the system in any combination: CS Type 2 supports up to six LIBs, accommodates asynchronous or synchronous lines, and transfers one byte to/from the CCU per interrupt; CS Type 3 supports up to four LIBs, accommodates synchronous lines only, and transfers one block of up to 255 bytes to/from the CCU per interrupt using a "cycle steal" methodology that halts the control program for a complete machine cycle during each data transfer. The first scanner per system is limited in line capacity to 64 lines (CS2) or 48 lines (CS3) per scanner; the second, third, and fourth scanners each have a line capacity of 96 lines (CS2) or 64 lines (CS3) per scanner. The Amdahl CS2 and CS3 are functionally equivalent to IBM's CS2 and CS3 scanners; Amdahl does not provide an equivalent for IBM's CS1 scanner, since the CS2 performs equivalent functions with higher performance.

- *Line Interface Bases (LIBs)*, which provide certain control functions for particular types of lines and transmission techniques. In general, each LIB can accommodate up to 16 lines. See "Transmission Specifications" in this report for details.
- *Line Sets*, which provide physical interfaces to one to four modems and communications lines. See "Transmission Specifications" for more details.

Other basic components include the operator control panel, a lamp unit, and an internal diagnostic routine loader unit. The control panel provides LED displays and touch-sensitive switches that allow the operator to perform various debugging and testing functions and other operations that require human intervention. The lamp unit is a type of logic probe with an attached light indicator that can be used to troubleshoot various hardware circuits.

Amdahl 4705 Series Communications Processors

- Sets to the CCU. The 3725's Line Interface Couplers (line sets) support either full- or half-duplex communications; the 4705E and 4705T require different types of line sets for each transmission mode.

Even with this restriction, the 4705E remains a good buy when compared to IBM's top-of-the-line communications processor. □

- The loader unit consists of a diskette controller and drive, an internal diskette, a register for storing the type of program load and stimulus, and read-only storage bootstrap. It is used to load and perform internal self-diagnostic and maintenance routines when the 4705 Series processors are in a disabled or off-line state, without dependence on the host or outside connections.

Figure 1 on Page -104 shows a typical configuration of a 4705 Series Communications Processor and demonstrates the relationships among these components.

CONNECTION TO THE HOST

The Amdahl 4705 Series Communications Processors can be channel-attached or remotely connected to any Amdahl or equivalent host computer, including an IBM 370, 303X, 3081, or 4300. They are generally compatible with MVS, SVS, and VS1 operating systems and with BTAM, QTAM, TCAM, and VTAM host access methods, including ACF and MSNF capabilities. Exceptions are: 1) host software that requires hardware features is not supported; and 2) some host software used for testing the IBM 3705-II may be incompatible with the Amdahl units (however, Amdahl provides equivalent test routines that operate without host involvement).

Amdahl provides one Channel Adapter for direct attachment of the 4705E or 4705T to the byte multiplexer, block multiplexer, or selector channel of a local host computer. Amdahl's CA4 operates under EP, PEP, or NCP program control. Up to four CA4s may be configured per 4705 Series processor. A Two-Channel Switch can be used with the CA4 to allow the adapter to connect two host channels. Only one of the channels is active at a time; the active channel is selected manually. The Amdahl CA4 is functionally equivalent to IBM's CA4 Channel Adapter. Amdahl does not provide an equivalent to the IBM CA1, since the CA4 performs equivalent functions with higher performance.

The physical connectors required to attach the 4705E or 4705T to an IBM host are functionally equivalent but physically somewhat different than IBM's. Therefore Amdahl provides its own connector cables.

A Remote Program Load option (functionally equivalent to IBM's RPL option) is provided to load the operating software over high-speed data communications lines from a remote host computer. The RPL option can be used when the 4705E or 4705T is utilized as a remote network concentrator with no local host channel attachment, when network software management is controlled from a central (remote) computer rather than the local computer to which the 4705 or 4705E is channel-attached, and in other circumstances that require a remote IPL. The RPL feature occupies one channel adapter slot, so that only three CA4s may be configured.

CONNECTION TO THE NETWORK

Amdahl provides only one type of Line Interface Base, LIB1, which handles up to 16 lines of various speeds and protocols. The LIB relays signals between the Communications Scanner and the Line Sets and provides a send/receive bit timing signal to the Line Set for each transmission speed.

The Line Set detects receive bits from the communications lines, transmits send bits to the line, and transmits modem control signals. A Line Set can accommodate one to four lines, depending on the type of Line Set selected. Line Sets for the 4705 Series Communications Processors are provided to accommodate a wide range of communications requirements.

The 4705E line sets are:

- *HD1E*, a four-line set that supports analog, half-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps,
- *FD1E*, a two-line, full-duplex version of HD1E,
- *HD2E*, a two-line set that supports analog, wideband, half-duplex connections over the V.35 interface, at rates up to 64K bps,
- *FD2E*, a one-line, full-duplex version of HD2E,
- *FD4E*, a two-line set that supports digital, full-duplex communications over the X.21 interface, at rates up to 19.2K bps,
- *FD5E*, a one-line set that supports digital, full-duplex communications over the X.21 interface, at rates up to 64K bps,
- *HD1LE*, a four-line set that supports analog, half-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps. Supports LPDA,
- *FD1LE*, a two line set that supports analog, full-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps. Supports LPDA,

The 4705T offers the same line sets as the 4705E, plus four additional ones. They are:

- *NC1E*, a two line set that supports analog, half-duplex connections over the RS-336 autodial interface, at rates up to 19.2K bps,
- *HD1GE*, a two line set that supports analog, wideband, half-duplex AT&T 303-compatible communications, at rates up to 50K bps,
- *FD1TE*, a one line, full-duplex version of HD1GE,
- *LA1CE*, a two line set that supports half-duplex connections over the RS-232-C and V.24 interfaces, at rates up to 1.2K bps.

TRANSMISSION SPECIFICATIONS

The 4705E and 4705T currently support transmissions of up to 64K bps in half- or full-duplex mode, using start/stop, BSC, X.25, or SDLC line protocols, over switched, leased, or private communications lines. EIA RS-232-C, X.21, CCITT V.24, and V.35 interfaces are available. With the High-Speed attachment feature, the 4705T can support additional data channels operating at speeds from 4800 bps to 768K bps, and synchronous trunk speeds up to 2048K bps. The High-Speed attachment feature also supports, in addition to the above interfaces, AT&T 301/303, MIL STD-188/114 unbalanced, and T1 bipolar (DS1).

The high-speed lines support an Amdahl proprietary, bit-interleaved, time division multiplexing protocol that is compatible with most tariffed offerings (e.g., the T1 service offered by AT&T Comm and by most regional Bell operation companies), and can also be used with private, high-speed

Amdahl 4705 Series Communications Processors

links over fiber optic, microwave, or copper wire. An optional (no extra cost) center weighted buffer supports satellite transmission at rates up to 2.048M bps.

A wide variety of inputs may be multiplexed over each high-speed link, including data passed through the co-resident 4705E, data from external terminal and host devices (both IBM-compatible and non-IBM), voice transmission, and digital video. Depending on the mix of inputs and speed of the output line, a high-speed line can support up to 96 tail circuit channels. Asynchronous data can be supported at rates of 110 bps to 19.2K bps via V.24/RS-232-C or MIL STD-188/114 interfaces. Twenty-four synchronous data rates from 300 bps to 512K bps are supported via V.24/RS-232-C, V.35, AT&T 301/303, and MIL STD-188/114 interfaces. The higher speed synchronous rates support video transmission.

OPERATOR INTERFACE

The Network Console, a standard feature of the 4705T, is used to configure, monitor, and manage the High-Speed Voice and Data Attachments. The console is controlled by a program in the High-Speed Attachment, and can operate in two modes, the Multimaster Mode and the Session Mode. In Multimaster Mode, every 4705T that is connected to the terminal reports on its operating status and any alarm conditions. Session Mode allows the operator to use the console to configure, monitor, or diagnose any remote or local channels linked to the console. The operator uses a typewriter-style electronic keyboard and display is thru a video screen. English format is used for commands and responses. The console supports data rates from 300 bps to 4800 bps so that one network site can control local or remote 4705T communications processors. The console can be located up to 4,000 feet from the 4705T.

SOFTWARE

The Amdahl 4705 Series Communications Processors operate under the control of the following licensed and public-domain control programs available from IBM: EP3, PEP,

NCP5, and ACF/NCP 3.0, 2.0, and 2.1. The 4705E and 4705T also support ACF/NCP 3.2 and 3.1. Amdahl customers generally acquire public-domain software, such as EP, PEP, and NCP, directly through Amdahl, which also provides software support services for these programs. It is Amdahl's intent to support users of current public-domain IBM software by continuing to provide new releases of that software to Amdahl users. Customers acquire licensed IBM software products, such as ACF/NCP, directly from IBM, which also provides software support services for those programs.

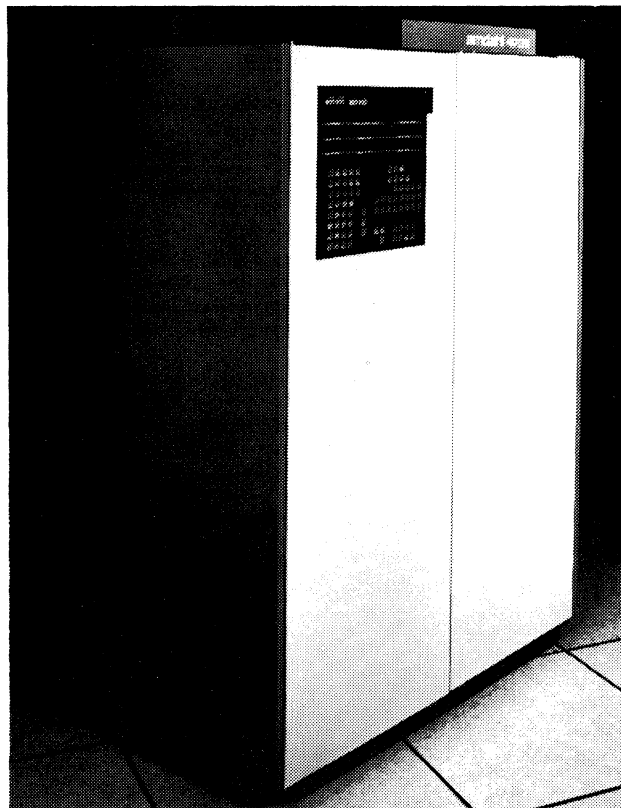
Amdahl also provides standalone diagnostic and maintenance programs that permit a disabled or off-line 4705 to perform self-test routines without host assistance. The 4705E's maintenance subsystem allows testing of active, on-line processors.

PRICING

The Amdahl 4705E and 4705T systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases may be renewed for 12-month periods. Lease payments must be made monthly in advance. Lease payments include the lessee charge, property taxes, and insurance, but not maintenance charges. Feature and model upgrades follow the existing lease, except that the minimum lease term for a model upgrade is 12 months. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price on a two-year lease and 60 percent on a four-year lease. The purchase credit applies either to the original lessee or the current lessee. Amdahl will pass on two-thirds of the available Investment Tax Credit to qualified customers.

Monthly maintenance charges are not included in lease charges or purchase prices. The standard maintenance agreement provides for 24 hours per day and 7 days per week. Prime-shift-only (up to 9 hours per day and 5 days per week) contracts and other arrangements are optionally available. ■

Amdahl 4705 and 4705E Communications Processors



MANAGEMENT SUMMARY

The 4705 Communications Processor is Amdahl's alternative to the IBM 3705-II Communications Controller. The 4705 was announced in October 1980; U.S. deliveries began in December 1980, and European deliveries began in October 1981. Approximately 400 units have been installed in the U.S., Canada, Europe, and Australia.

The Amdahl 4705 provides functional equivalency and software compatibility with the IBM 3705-II. As operating software, the 4705 uses IBM public-domain software, such as EP, PEP, and NCP, and licensed program products, such as ACF/NCP. Amdahl supplies the public-domain software to its 4705 customers and provides support services for that software, including updates as IBM introduces new releases. Licensed software is acquired by the customer directly from IBM, which provides support services for that software.

The 4705E is an enhanced version of the 4705, designed to compete with IBM's high-end 3725 Communication Controller. Like the 3725, Amdahl's 4705E offers greater maximum main storage, faster throughput, and simpler configuration than the 4705 or the IBM 3705. In addition, the 4705E runs the established IBM 3705 operating software, rather than the newer IBM versions for the 3725. The 4705E can support from 256K to 1M bytes of main memory, expandable in 256K increments, and from 64 to

The Amdahl 4705 Communications Processor is a plug-compatible, software-compatible replacement for the IBM 3705 Communications Controller. The Amdahl 4705E is a plug-compatible replacement for the IBM 3725 Communication Controller; the 4705E runs IBM 3705 software. A 4705 can be field upgraded to a 4705E. In most applications, both Amdahl processors offer price/performance advantages over their IBM equivalents.

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

HOST COMPUTERS SUPPORTED: IBM and plug-compatible mainframes.

ARCHITECTURE SUPPORTED: SNA and emulation environments.

OPERATING SOFTWARE: IBM's ACF/NCP, NCP, PEP, and EP.

COMPETITION: IBM 3705; IBM 3725; NCR COMTEN 3650 and 3690; CCI CC80 and CC85.

PRICE: A 4705 Model 5 processor with single Type 4 Channel Adapter, one Type 3 Communications Scanner, three Line Interface Bases, and 12 HD1 Line Sets, that accommodates 48 communications lines costs \$82,850, and leases for \$2,898 per month on a two-year lease. A 4705E processor with 512K bytes of memory, two Type 2 scanners, six Line Interface Bases, 24 Type HD1E Line Sets, Switch, two Channel Adapters, and able to support 96 BSC communications lines at 9600 bps costs \$145,600, and leases for \$6,484 per month on a two-year lease.

CHARACTERISTICS

VENDOR: Amdahl Corporation, 1250 East Arques Avenue, P.O. Box 470, Sunnyvale, CA 94086. Telephone (408) 746-6000.

DATE OF ANNOUNCEMENT: 4705—October 1980; 4705E—April 1983.

DATE OF FIRST DELIVERY: 4705—December 1980; 4705E—April 1983.

NUMBER DELIVERED TO DATE: 4705—over 400; 4705E—over 100.

SERVICED BY: Amdahl Corporation.

CONFIGURATION

The Amdahl 4705 Communications Processor is a functional equivalent of IBM's 3705-II Communications Controller as specified in Release 5 (sixth edition) of *IBM*

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➤ 352 communications lines operating synchronously or asynchronously, in half- or full-duplex mode, at rates from 1200 to 64K bps.

In pricing several models from Amdahl and IBM, Datapro found that the Amdahl prices are lower when comparing IBM configurations with equivalent memory, channel adapters, communications scanners and line sets. Consider one of the two examples that appear in the box on page 1 of this report. IBM's equivalent to the Amdahl Model 5 in a typical emulation configuration is a 3705-II Model E4, priced at \$92,595 (purchase). An IBM 3725 Model 1 equipped similarly to the 4705E in our example costs \$179,290. These prices are based on the latest figures currently available—April 1983 prices for Amdahl, and June 1983 for IBM. IBM's and Amdahl's leasing plans are dissimilar enough that a comparison would not be informative.

COMPETITIVE POSITION

The Amdahl processors compete in the market for full-scale, IBM-compatible communications processors against NCR Comten's 3600 Series and CCI's CC80 and CC85, as well as with IBM itself. IBM enjoys roughly a 90 percent share of the market. Each of the plug-compatible vendors uses a different product strategy to gain its share of the remaining 10 percent: NCR Comten combines performance advantages with its own networking software; CCI gears its product to special applications, such as airline reservation systems, and offers a variety of field-upgradable low-end models. Amdahl, the original vendor of IBM-plug-compatible mainframes, is the only vendor in the market to offer full software compatibility with IBM's communications processors, in addition to significant advantages in price, performance, and configuration.

ADVANTAGES AND RESTRICTIONS

Amdahl's biggest advantage against the other plug-compatible vendors is its 100 percent software compatibility with IBM systems. Users can swap an Amdahl communications processor for its IBM counterpart with few, if any, software rewrites.

TABLE 1. MODEL CHARACTERISTICS

Model	Line Capacity	Number of Scanners Required	Cabinets Required	IBM 3705-II Model Equivalent
5	Up to 64 lines	1	Basic only	E
6	65 to 160 lines	2	Basic only	F, J
7	161 to 256 lines	3	Basic + 1 Expansion	G, K
8	257 to 352 lines	4	Basic + 2 Expansions	H, L
4705E	64 to 352 lines	1 to 4	Basic (2 expansions optional)	3725 Model 1

➤ *3705 Principles of Operation* (IBM publication #GC30-3004-4), for the following currently released IBM 3705-II features:

- 352-line capacity (half-duplex)
- CA2, CA3, and CA4 Channel Adapters
- Up to 512K bytes of main memory
- Type 1, 2, and dual read-only storage
- CS2 and CS3 Communications Scanners
- LIB1 Line Interface Base
- 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H, 1S, 1T, and 1U Line Sets
(Note: Line Set Types 1A, 1B, 1C, 1F, and 1H are no longer available from IBM, but their equivalents are supplied by Amdahl.)
- Business Machine Clock
- Two-Channel Switch
- Remote Initial Program Load
- One to four simultaneous Channel Adapters

The Amdahl 4705 comes in four models, which differ only in line capacity and related hardware requirements. Each model is field-upgradable to the next higher model. The 4705E comes in a single model, upgradable from a basic 256K bytes main memory, single scanner, and support for 64 communications lines to a maximum configuration of 1M bytes main memory, four scanners, and support for 352 communications lines. The configurational differences between the models are detailed in Table 1.

The Amdahl 4705 is composed of the following major components:

- The *Central Control Unit (CCU)*, which contains the circuits and data flow paths to execute the instruction set, address storage, control the communications scanners and channel adapters, and perform arithmetic and logical processing of data, all under the direction of the system's control program.
- *Main Storage*, which (for any model) can contain 64K to 512K bytes of NMOS FET semiconductor memory, expandable in 64K-byte increments.
- One to four *Channel Adapters*, which provide data paths between the 4705 and channel-attached host computers. See "Connection To The Host" in this report for details.
- One to four *Communication Scanners*, which connect the Line Interface Bases (LIBs) and Line Sets to the CCU. Scanner functions include: monitoring LIBs for service requests, assembling/disassembling characters, performing various line controls, servicing interrupts to the CCU to send or receive characters, and executing certain other procedures, such as control character recognition, code translation, and user recovery functions, under the direction of the system's control program.

➤ Two types of scanners are available and may be added to the system in any combination: CS Type 2 supports up to six LIBs, accommodates asynchronous or synchronous lines, and transfers one byte to/from the CCU per interrupt; CS Type 3 supports up to four LIBs, accommodates synchronous lines only, and transfers one block of up to 255 bytes to/from the CCU per interrupt using a "cycle steal" methodology that halts the control program for a complete machine cycle during each data transfer. The first scanner per system is limited in line capacity to 64 lines (CS2) or 48 lines (CS3) per scanner; the second, third, and fourth scanners each have a line capacity of 96 lines (CS2) or 64 lines (CS3) per scanner. The Amdahl CS2 and CS3 are functionally equivalent to IBM's CS2 and CS3 scanners; Amdahl does not provide an equivalent for IBM's CS1 scanner, since the CS2 performs equivalent functions with higher performance.

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➤ The 4705's advantages over the IBM 3705 include:

- *Improved throughput capacity*—Amdahl conducted benchmark tests that show the aggregate data rate capacity of the 4705 to be approximately 1.8 times the capacity of a similarly configured IBM 3705-II Model F8. (Note that the faster IBM Models J, K, and L were not benchmarked.) The test simulated a configuration in which 144 IBM 3270 BSC-type users were accessing the system under TPNS Release 5 software using 9600 bps full-duplex lines. MVS/SE Release 3.8 was used as the host operating system, the host access method was ACF/VTAM, and the communications processors each operated in native mode under ACF/NCP. Type 2 Communications Scanners and Type 4 Channel Adapters were used.

In another Amdahl-conducted benchmark test, an Amdahl 4705 with Type 2 scanners was matched against a similarly configured IBM 3705-II with Type 3 scanners. Performance was found to be nearly equivalent for the two systems, even though the Type 2 scanner uses significantly more 4705 processor overhead than Type 3. The implication is that in certain circumstances, Amdahl's processor can make up for the lower performance of the Type 2 scanner because its processor is more powerful than IBM's; performance equivalent to the 3705-II with Type 3 scanners can be achieved by using a 4705 with Amdahl Type 2 scanners, which each cost about \$13,000 less than IBM's Type 3s.

While Amdahl has yet to publish the results of benchmarks pitting the 4705E directly against the IBM 3725, Amdahl-conducted benchmarks using the equivalent of 100 BSC lines at 9600 bps rate the 4705E at 2.4 times the throughput of a corresponding IBM 3705-II. IBM rates the 3725 at 1.8 to 1.9 times the throughput of the 3705-II.

- • *Line Interface Bases (LIBs)*, which provide certain control functions for particular types of lines and transmission techniques. In general, each LIB can accommodate up to 16 lines. See "Transmission Specifications" in this report for details.
- *Line Sets*, which provide physical interfaces to one to four modems and communications lines. "Transmission Specifications" and Table 2 give details.

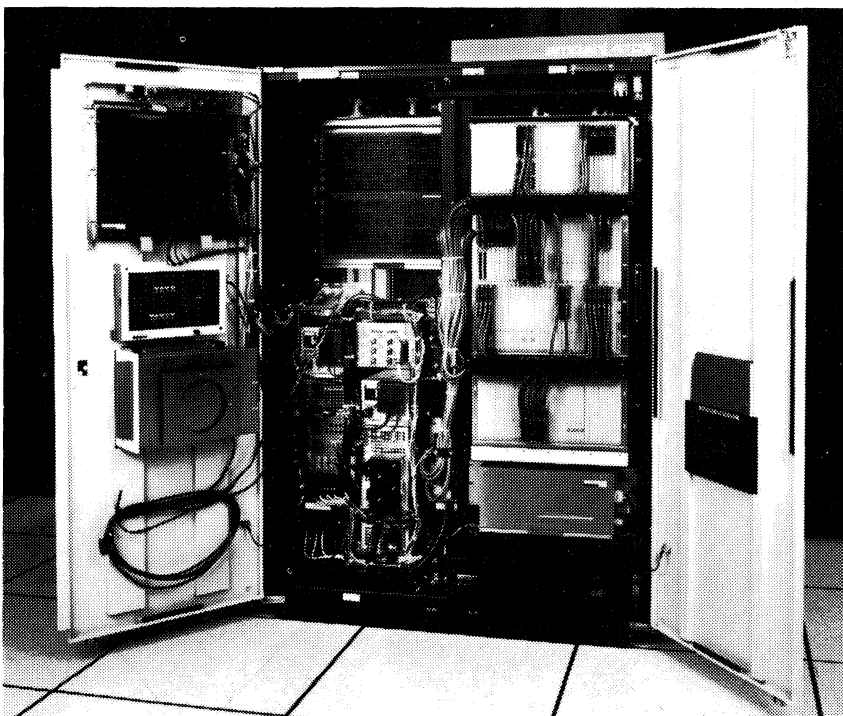
Other basic components include the operator control panel, a lamp unit, and an internal diagnostic routine loader unit. The control panel provides LED displays and touch-sensitive switches that allow the operator to perform various debugging and testing functions and other operations that require human intervention. The lamp unit is a type of logic probe with an attached light indicator that can be used to troubleshoot various hardware circuits.

The loader unit consists of a diskette controller and drive, an internal diskette, a register for storing the type of program load and stimulus, and read-only storage bootstrap. It is used to load and perform internal self-diagnostic and maintenance routines when the 4705 is in a disabled or off-line state, without dependence on the host or outside connections.

Physically, the 4705 is housed in one to three frames, or cabinets. The Basic Frame is a double-width cabinet that includes the CCU, main storage, operator control panel, lamp unit, and loader unit; all Channel Adapters and Scanners; and mountings for up to 10 LIBs and Line Sets for up to 160 lines. Each of two smaller Expansion Frames accommodates up to an additional six LIBs and Line Sets for up to 96 lines.

The 4705E features the same basic configuration as the 4705, but uses a faster processor. One standard feature unique to the 4705E is the Maintenance Subsystem, which includes a diskette-based diagnostic reader and a display unit. The subsystem can perform diagnostics on an operating 4705E.

➤ Two optional features are available with the 4705E and not with the 4705: the Integrated Line Switch, which allows a ➤



When the 4705 Basic Frame's doors are opened, its internal workings are revealed. On the inside of the left door are mounted the operator panel, flexible disk drive, and diagnostic lamp unit. The upper left side of the cabinet holds the central control unit and main storage; the lower left, the power supply. A swing gate of the right side of the cabinet accommodates Communications Scanners and Channel Adapters. Behind the gate (not visible in photo) are Line Interface Bases and Line Sets for up to 160 lines. Additional Line Interface Bases and Line Sets may be housed in one or two Expansion Frames (not shown in photo).

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TABLE 2. COMMUNICATIONS HANDLED BY AMDAHL 4705 AND IBM FUNCTIONAL EQUIVALENTS

Type of Line Interface	Transmission					Line Sets		Lines Per Line Set		Comments	
	Amdahl Speed (bps)	IBM Speed (bps)*	Timing	Mode	Line	Amdahl	IBM Equivalent*	Amdahl	IBM*		
External RS-232-C Modem	2400	1200	Asynchronous	Half-duplex	Leased or Switched	HD1A	1A***	4	2	Cannot use CS3 Scanner.	
	2400	1200	Asynchronous	Full-duplex	Leased	FD1A	1B***	2	1		Cannot use CS3 Scanner. Cannot use CS3 Scanner.
	2400	1200	Asynchronous	Half-duplex	Leased or Switched	HD1	1D	4	2		
	19,200	9600	Synchronous	Half-duplex	Leased or Switched						
	19,200	9600	Synchronous	Full-duplex	Leased	FD1	1H***	2	1		
Wideband	50,000	50,000	Synchronous	Half-duplex	Leased	HD1G	1G	2	2		
	50,000	50,000	Synchronous	Full-duplex	Leased	FD1T	1T	1	1		
External CCITT V.35	56,000	56,000	Synchronous	Half-duplex	Leased	HD2	1S	2	1		
	56,000	56,000	Synchronous	Full-duplex	Leased	FD2	1U	1	1		
Local Attachment	2400	1200	Asynchronous	Half-duplex	Cables	LA1C	1C***	4	2	Maximum cable length is 200 feet; cannot use CS3 Scanner.	
	19,200	9600	Synchronous	Half-duplex	Cables	LA1F	1F***	4	2	Maximum cable length is 100 feet.	
Automatic Dial RS-366	2400	1200	Asynchronous	Half-duplex	Switched	NC1	1E	2 RS-366 plus 2 RS-232-C	2	For attachment of external dialing units and data communications lines.	
	19,200	9600	Synchronous	Half-duplex	Switched						

*For comparison only.

**HD1 and NC1 each accommodate asynchronous transmissions at up to 2400 bps plus synchronous transmissions at up to 19,200 bps.

***IBM has withdrawn these line sets from its 3705 product line.

➤ One explanation for Amdahl's improved throughput is the instruction look-ahead function, which allows the processor's fetch cycle to retrieve another instruction from memory while execution of the current instruction occurs. This overlap of fetch time with execution time does not occur with IBM 3705-II's processor. Another reason for improved throughput is that the internal cycle speed for the 4705's processor is 145 nanoseconds (.145 microseconds) compared to 1.0 microseconds for 3705-II Models E, F, G, and H, and 0.9 microseconds for Models J, K, and L.

- *Simpler, more accurate operator controls*—Amdahl's system provides a newly designed console panel that contains touch-sensitive switches and hexadecimal LED read-outs in place of IBM's control panel lamps and rotation-type mechanical switches.
- *Reduced space requirements*—Amdahl's cabinetry is physically smaller and requires less service clearance than IBM's. For Amdahl models that are configured with the same number of frames as the equivalent IBM model (counting Amdahl's double-width Basic Frame as two frames), the space savings can be substantial. For example, a fully-loaded Amdahl 4705 Model 8 occupies as much as 30 percent less space than its IBM equivalent. The one exception is when an Amdahl model contains one more frame than its IBM equivalent (i.e., the Amdahl 4705 Model 5, which requires the double-width Basic Cabinet, versus the single-frame IBM 3705-II Model E). In this case, the Amdahl configuration requires more ➤

➤ 4705E to switch communications lines from malfunctioning line sets in its main cabinet to hot standbys in an expansion cabinet, and the High-Speed Asynchronous Clock, which allows asynchronous communications at speeds up to 9600 bps.

The configuration diagram at the end of this report illustrates the relationships among these components.

TRANSMISSION SPECIFICATIONS

The 4705 currently supports transmissions of up to 56K bps in half- or full-duplex mode, using start/stop, BSC, or SDLC line protocols, over switched, leased, or private communications lines. EIA RS-232-C and CCITT V.24 and V.35 interfaces are available. The 4705E supports transmissions up to 64K bps.

Amdahl provides only one type of Line Interface Base, LIB1, which handles up to 16 lines of various speeds and protocols. The LIB relays signals between the Communications Scanner and the Line Sets and provides a send/receive bit timing signal to the Line Set for each transmission speed.

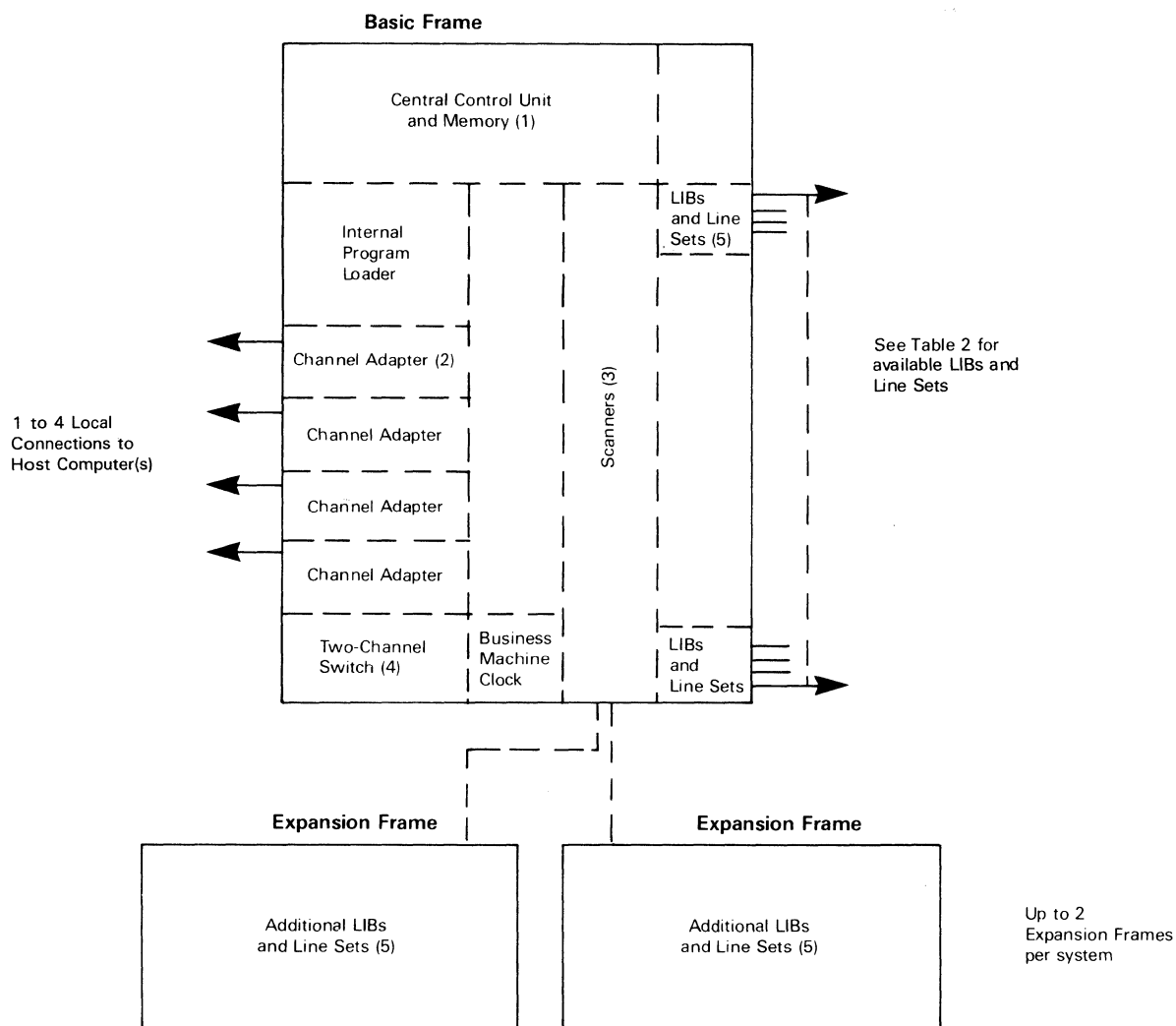
The Line Set detects receive bits from the communications lines, transmits send bits to the line, and transmits modem control signals. A Line Set can accommodate one to four lines, depending on the type of Line Set selected. Line Sets for the 4705 are provided to accommodate a wide range of communications requirements and are detailed in Table 2.

The 4705E supports its own complement of line sets, which do not correspond readily enough to their counterparts on the IBM 3705 and 3725 to allow comparison on a table. The 4705E line sets are:

- *HD1E*, a four-line set that supports analog, half-duplex connections over the RS-232-C or V.24 interface, at rates up to 19.2K bps, ➤

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Configuration



(1) Memory size is 64K to 512K bytes, expandable in 64K-byte increments, for the 4705 and 64K to 1M bytes for the 4705E.

(2) One to four Channel Adapters can be installed.

(3) One to four Communications Scanners Type 2 or 3 can be installed. If Type 2 is used, first Scanner can handle up to 64 lines; additional three Scanners can handle up to 96 lines each. If Type 3 is used, first Scanner can handle up to 48 lines; additional three Scanners can handle 64 lines each. Maximum number of lines per system is 352.

(4) One Two-Channel Switch may be configured for each Channel Adapter Type 2 or 4.

(5) Basic Frame accommodates up to 10 LIBs and Line Sets for up to 160 lines. Each Expansion Frame accommodates up to 6 LIBs and Line Sets for up to 96 lines. Each LIB handles up to 16 lines. Each Line Set provides interfacing for one to four lines, depending on type of Line Set selected.

➤ floor space than the IBM configuration. However, when service clearance is considered, all of Amdahl's models take up less space than IBM's.

- *Simplified installation and improved reliability and serviceability*—The inherent modularity of the Amdahl system's design reduces downtime when the system is expanded or a component fails. The system provides a standalone self-diagnostic and maintenance routine that allows internal system functions to be self-tested without dependence on a host computer or other outside connection. In addition, the 4705's architecture provides several functions designed to increase the system's operational

- • **FD1E**, a two-line, full-duplex version of HD1E,
- **HD1GE**, a two-line set that supports analog, wideband, half-duplex AT&T 303-compatible communications at rates up to 50K bps,
- **FD1TE**, a one-line, full-duplex version of HD1GE,
- **HD2E**, a two-line set that supports digital, half-duplex communications over the CCITT V.35 interface at rates up to 64K bps,
- **FD2E**, a one-line, full-duplex version of HD2E,
- **NC1E**, a two-line set that supports analog, half-duplex communications over the RS-366 auto-dial interface at rates up to 19.2K bps, and

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- ▷ reliability, such as automatic instruction retry when an instruction fails to execute correctly, line unit loop diagnostics, and a channel loopback capability.

Certain IBM configurations and features are slightly different as implemented by Amdahl. For instance, the Amdahl 4705 system's main memory is expanded by 64K-byte increments, whereas the IBM memories are expandable in 32K-byte steps. This results in Amdahl's having fewer memory-plus-line-capacity combinations than IBM. In addition, Amdahl has chosen not to support the lower-performance IBM Type 1 Channel Adapter and Type 1 Communications Scanner, which are essentially replaced by the high performance Type 4 Channel Adapter and Type 2 Scanner, respectively.

Amdahl also does not support IBM's Line Interface Base Types 2 through 12, which support Telegraph interfaces and integral modems and adapters. Certain IBM Line Sets that utilize Line Interface Base 1, including Line Sets 1J, 1GA, 1TA, 1W, and 1Z, are also not supported. Although IBM has merged its Line Sets 1A and 1B into its 1D Line Set, Amdahl has decided to keep them separate, which may result in a cost savings to the customer.

Most of Amdahl's 4705 Line Sets are equivalent to two of their respective IBM versions but are priced substantially less than twice the cost of the IBM versions. Also, Amdahl's Line Set NCI, which is priced as an equivalent to IBM's Line Set E1 (a dual RS-366 compatible automatic dial interface), includes two RS-232-C interfaces for attachment of regular communications lines in addition to the two auto-dial unit interfaces offered on the IBM version.

When compared to the IBM 3725, the 4705E offers the following advantages in addition to lower price and faster throughput:

- Support for up to 1M bytes of memory using 3705 software. Users can upgrade from a 4705 or an IBM 3705 to a 3725-compatible processor without converting to the newer IBM 3725 versions of the IBM software.
- Support for asynchronous devices at data rates up to 9600 bps, compared to 1200 bps for the 3725. High-speed asynchronous support on the 4705E requires the addition of an optional High-Speed Asynchronous Clock.

Amdahl's optional Integrated Line Switch for hot standby lines was originally a significant advantage, but in November 1983, IBM announced a similar feature for the 3725.

The 4705E's restrictions against the 3725 include:

- A slightly more complex configuration. The 3725 uses a single type of scanner, integrated into the Type C Line Attachment Base; Amdahl uses two separate types of scanner. The 3725's Line Interface Couplers (line sets) ▷

- ▷ • *LAIC*, a four-line set that supports analog, half-duplex communications with locally attached RS-232-C or V.24 devices not more than 200 feet from the 4705E.

CONNECTION TO THE HOST: The Amdahl 4705 or 4705E can be channel-attached or remotely connected to any Amdahl or equivalent host computer, including an IBM 360, 370, 303X, 3081, or 4300. They are generally compatible with MVS, SVS, and VS1 operating systems and with BTAM, QTAM, TCAM, and VTAM host access methods, including ACF and MSNF capabilities. Exceptions are: 1) host software that requires hardware features is not supported; and 2) some host software used for testing the IBM 3705-II may be incompatible with the Amdahl units (however, Amdahl provides equivalent test routines that operate without host involvement).

Amdahl provides three Channel Adapters for direct attachment of the 4705 to the byte multiplexer, block multiplexer, or selector channel of a local host computer:

- CA2—operates under NCP program control only. When the CA2 is used, only two Channel Adapters may be configured per 4705 (the second adapter may be a CA3, a CA4, or another CA2).
- CA4—operates under EP, PEP, or NCP program control. Up to four CA4s may be configured per 4705 when no CA2s or CA3s are configured; one CA4 may be configured when a CA2 or CA3 is also used.

A Two-Channel Switch can be used with either the CA2 or CA4 to allow the adapter to connect two host channels. Only one of the channels is active at a time; the active channel is selected manually.

- CA3—provides the combined capabilities of a CA2 and Two-Channel Switch, plus a cross-call feature. The CA3 is used to attach the 4705 to the channels of a pair of tightly-coupled multiprocessing systems and allows the 4705 to operate as a shared symmetrical I/O unit with an alternate path capability between the two systems. Switching between the two CPUs is automatic on a first-come, first-serve basis, and only one channel is active at a time. As with the CA2, only two Channel Adapters may be configured per 4705 when the CA3 is used (the second adapter may be a CA2, a CA4, or another CA3).

The Amdahl CA2, CA3, and CA4 are functionally equivalent to IBM's CA2, CA3, and CA4 Channel Adapters. Amdahl does not provide an equivalent to the IBM CA1, since the CA4 performs equivalent functions with higher performance.

The 4705E uses a single type of channel adapter equivalent to the CA4.

The physical connectors required to attach the 4705 or 4705E to an IBM host are functionally equivalent but physically somewhat different than IBM's. Therefore Amdahl provides its own connector cables.

A Remote Program Load option (functionally equivalent to IBM's RPL option) is provided to load the operating software over high-speed data communications lines from a remote host computer. The RPL option can be used when the 4705 or 4705E is utilized as a remote network concentrator with no local host channel attachment, when network software management is controlled from a central (remote) computer rather than the local computer to which the 4705 or 4705E is channel-attached, and in other circumstances that require a remote IPL. The RPL feature occupies one channel adapter slot, so that only three CA4s may be configured (systems with CA2s and CA3s are not affected). ▷

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support either full- or half-duplex communications; the 4705E requires different types of line sets for each transmission mode.

- Insufficient main memory to support high-speed, high-delay applications such as satellite communications. The 3725 can support up to 2M bytes of main storage, while the 4705E supports up to half as much. The memory increment is most useful only for satellite, and Amdahl has explicitly chosen not to support satellite transmission.
- Support for two fewer host processors; the 4705E can support up to four concurrently active hosts; the 3725 can support six.

Even with these restrictions, the 4705E remains a good buy when compared to IBM's top-of-the-line communications processor.

USER REACTION

In Datapro's 1983 Network Users' Survey, 14 Amdahl 4705 users responded with ratings of 24 processors. The survey was completed before the announcement of the 4705E, so it includes no ratings on that model. The users' ratings of the 4705 were as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	9	4	1	0	3.6
Ease of installation	5	8	1	0	3.3
Ease of operation	7	6	1	0	3.4
Ease of expansion	6	6	2	0	3.3
Hardware reliability	9	5	0	0	3.6
Quality of vendor's maintenance service	8	3	11	2	3.2
Quality of vendor's technical support	6	3	3	1	3.1

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

Since the 4705 uses IBM-supplied software, we have not included ratings in any categories that apply to software quality or ease of programming. □

SOFTWARE

The Amdahl 4705 and 4705E operate under the control of the following licensed and public-domain control programs available from IBM: EP3, PEP, NCP5, and ACF/NCP 2.0 and 2.1 Amdahl customers generally acquire public-domain software, such as EP, PEP, and NCP, directly through Amdahl, which also provides software support services for these programs. It is Amdahl's intent to support users of current public-domain IBM software by continuing to provide new releases of that software to Amdahl users. Customers acquire licensed IBM software products, such as ACF/NCP, directly from IBM, which also provides software support services for those programs.

Amdahl also provides standalone diagnostic and maintenance programs that permit a disabled or off-line 4705 to perform self-test routines without host assistance. The 4705E's maintenance subsystem allows testing of active, on-line processors.

PRICING

The Amdahl 4705 and 4705E systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases may be renewed for 12-month periods. Lease payments must be made monthly in advance. Lease payments include the lessee charge, property taxes, and insurance, but not maintenance charges. Feature and model upgrades are coterminous with the existing lease, except that the minimum lease term for a model upgrade is 12 months. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price on a two-year lease and 60 percent on a four-year lease. The purchase credit applies either to the original lessee or the current lessee. Amdahl will pass on two-thirds of the available Investment Tax Credit to qualified customers.

Monthly maintenance charges are not included in lease charges or purchase prices. The standard maintenance agreement provides for 24 hours per day and 7 days per week. Prime-shift-only (up to 9 hours per day and 5 days per week) contracts and other arrangements are optionally available.

EQUIPMENT PRICES

		Monthly Charges*			Monthly Maint.
		2-Year Lease	4-Year Lease	Purchase	24-Hour 7 Days/Week
4705 Communications Processor					
	Model 5; max. 64 lines	\$ 810	\$ 675	\$35,350	\$312
	Model 6; max. 160 lines	1,200	1,000	46,650	340
	Model 7; max. 256 lines	1,600	1,330	57,950	370
	Model 8; max. 352 lines	2,010	1,670	69,250	399
MS1	Storage Increment; 64K bytes	162	134	2,650	72
MS2	Storage Increment; 128K bytes	324	268	5,300	145
ME0	Memory Expansion Option; 256K to 512K bytes	654	543	10,000	41
CA2	Channel Adapter	186	154	5,500	22
CA3	Channel Adapter	443	368	10,975	26
CA4	Channel Adapter	160	133	3,750	19
TCS	Two-Channel Switch	59	49	1,775	6
RPL	Remote Program Load Option	300	270	9,300	40
CS2	Communications Scanner	178	147	4,035	22
CS3	Communications Scanner	650	540	14,630	72

Amdahl 4705 and 4705E Communications Processors

EQUIPMENT PRICES

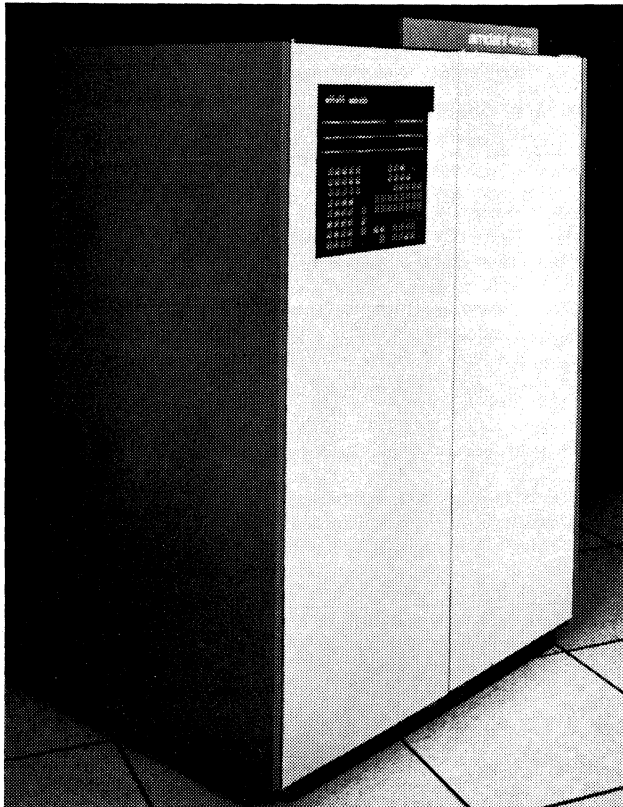
		Monthly Charges*			Monthly Maint.
		2-Year Lease	4-Year Lease	Purchase	24-Hour 7 Days/Week
LIB1	Line Interface Base	\$ 38	\$ 31	\$ 940	\$ 7
	Line Sets:				
HD1A	RS-232-C; supports up to 4 half-duplex 2400 bps lines	30	25	830	6
HD1	RS-232-C; supports up to 4 half-duplex lines, 2400 bps async or 19.2K bps sync	70	58	1,750	13
FD1B	RS-232-C; supports up to 2 full-duplex 2400 bps lines	34	28	1,150	6
FD1	RS-232-C; supports up to 2 full-duplex 19,200 bps lines	70	58	1,750	13
HD2	CCITT/V.35; supports up to 2 half-duplex 56K bps lines	168	140	5,140	27
FD2	CCITT/V.35; supports 1 full-duplex 56K bps line	156	130	4,625	24
LA1C	Local; supports up to 4 half-duplex 2400 bps lines	30	25	1,090	6
LA1F	Local; supports up to 4 half-duplex 19,200 bps lines	70	58	1,750	13
HD1G	Wideband; supports up to 2 half-duplex 50K bps lines	152	126	3,485	26
NC1	Auto Dialing; supports up to 2 RS-232-C compatible half-duplex lines plus up to 2 RS-399 compatible auto-call units	65	54	875	4

4705E Communications Processor

4705E	Basic processor with 256K memory	1,500	900	36,000	330
EXPE	Expansion Unit	1,040	625	25,000	50
MS3E	256K-byte memory module	250	150	6,000	30
CA4E	Channel adapter	165	100	4,000	15
TCSE	Two-channel switch	170	100	4,000	15
CS2E	Communications scanner, Type 2	250	150	6,000	30
CS3E	Communications scanner, Type 3	670	400	16,000	70
SS2E	Single scanner attachment base Type 2	210	125	5,000	—
SS3E	Single scanner attachment base Type 3	330	200	8,000	—
LIB1E	Line interface base	40	25	1,000	—
	Line Sets:				
HD1A	RS-232-C/V.24; supports up to 4 half-duplex analog lines up to 19.2K bps	100	60	2,400	—
FD1A	RS-232-C/V.24; supports up to 2 full-duplex analog lines up to 19.2K bps	100	60	2,400	—
HD1GE	Wideband; supports up to 2 half-duplex analog lines up to 50K bps	170	100	4,000	—
FD1TE	Wideband; supports 1 full-duplex analog line up to 50K bps	170	100	4,000	—
HD2E	V.35; supports up to 2 digital, half-duplex lines up to 64K bps	210	125	5,000	—
FD2E	V.35; supports 1 digital, full-duplex line up to 64K bps	210	125	5,000	—
NC1E	Auto-dial; supports up to 2 analog, half-duplex RS-366 lines up to 19.2K bps	100	60	2,400	—
LA1C	RS-232/V.24; supports up to 4 locally attached, asynchronous, half-duplex lines up to 2400 bps	100	60	2,400	—
LIB1AE	High-speed asynchronous clock	210	125	5,000	—
ILSE	Integrated line switch unit	670	400	16,000	—
RIPLE	Remote IPL feature	85	50	2,000	—

*Excludes maintenance charges. ■

Amdahl 4705 Communications Processor



MANAGEMENT SUMMARY

The 4705 Communications Processor is Amdahl's alternative to the IBM 3705-II Communications Controller. The 4705 was announced in October 1980; U.S. deliveries began in December 1980, and European deliveries began in October 1981. Approximately 300 units have been installed in the U.S., Canada, Europe, and Australia.

The Amdahl 4705 provides functional equivalency and software compatibility with the IBM 3705-II. As operating software, the 4705 uses IBM public-domain software, such as EP, PEP, and NCP, and licensed program products, such as ACF/NCP. Amdahl supplies the public-domain software to its 4705 customers and provides support services for that software, including updates as IBM introduces new releases. Licensed software is acquired by the customer directly from IBM, which provides support services for that software.

In pricing several models from Amdahl and IBM, Datapro found that the Amdahl prices are lower when comparing IBM configurations with equivalent memory, channel adaptors, communications scanners and line sets. Consider the two examples that appear in the box on page 1 of this report. IBM's equivalent to the Amdahl Model 5 in a typical emulation configuration is a 3705-II, Model E4, priced at \$92,595 (purchase) or \$3,970 per ▶

A communications processor system functionally equivalent to and software-compatible with the IBM 3705-II. Amdahl offers faster throughput, more reliability, design improvements, and lower prices than the 3705.

A 4705 Model 5 typical Emulation configuration with 128K bytes of memory, one Type 4 Channel Adapter, one Type 3 Communications Scanner, three Line Interface Bases, and 12 HD1 Line Sets that together accommodate 48 communications lines is priced at \$82,850. Two-year and four-year lease prices are \$3,623 and \$3,130 per month respectively, including 24-hour, 7-days-per-week maintenance.

A 4705 Model 6 typical NCP configuration with 512 bytes of memory, two Type 4 Channel Adaptors, one Type 2 and one Type 3 Communications Scanner, seven Line Interface Bases, and 28 HD1 Line Sets that accommodate 128 lines is priced at \$159,595. Two-year and four-year lease prices are \$8,030 and \$6,915 per month respectively, including 24-hour, 7-days-per-week maintenance.

CHARACTERISTICS

VENDOR: Amdahl Corporation, 1250 East Arques Avenue, P. O. Box 470, Sunnyvale, CA 94086. Telephone (408) 746-6000.

DATE OF ANNOUNCEMENT: October 1980.

DATE OF FIRST DELIVERY: December 1980.

NUMBER DELIVERED TO DATE: Over 300.

SERVICED BY: Amdahl Corporation.

CONFIGURATION

The Amdahl 4705 Communications Processor is a functional equivalent of IBM's 3705-II Communications Controller as specified in Release 5 (sixth edition) of *IBM 3705 Principles of Operation* (IBM publication #GC30-3004-4), for the following currently released IBM 3705-II features:

- 352-line capacity (half-duplex)
- CA2, CA3, and CA4 Channel Adapters
- Up to 512K bytes of main memory
- Type 1, 2, and dual read-only storage
- CS2 and CS3 Communications Scanners
- LIB1 Line Interface Base
- 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H, 1S, 1T and 1U Line Sets
(Note: Line Set Types 1A, 1B, 1C, 1F, and 1H are no longer available from IBM, but their equivalents are supplied by Amdahl.)
- Business Machine Clock
- Two-Channel Switch
- Remote Initial Program Load
- One to four simultaneous Channel Adapters ▶

Amdahl 4705 Communications Processor

➤ month (two-year lease including 24-hour, daily maintenance). These prices are based on the latest figures currently available—February 1982 prices for Amdahl, and December 1981 for IBM.

The purchase prices are 10 percent and 11 percent lower for the Amdahl Model 5 and 6 configurations respectively than for their IBM equivalents. Amdahl's two-year lease prices are 9 and 8 percent lower and their four-year lease prices are 21 and 20 percent lower than IBM's two-year leases. IBM does not offer four-year leasing.

Amdahl has also implemented a number of hardware features designed as improvements over the 3705-II, which result in:

- *Improved throughput capacity*—Amdahl conducted benchmark tests that show the aggregate data rate capacity of the 4705 to be approximately 1.8 times the capacity of a similarly configured IBM 3705-II Model F8. (Note that the newer, faster IBM Models J, K, and L were not benchmarked.) The test simulated a configuration in which 144 IBM 3270 BSC-type users were accessing the system under TPNS Release 5 software using 9600 bps full-duplex lines. MVS/SE Release 3.8 was used as the host operating system, the host access method was ACF/VTAM, and the communications processors each operated in native mode under ACF/NCP. Type 2 Communications Scanners and Type 4 Channel Adapters were used.

In another Amdahl-conducted benchmark test, an Amdahl 4705 with Type 2 scanners was matched against a similarly configured IBM 3705-II with Type 3 scanners. Performance was found to be nearly equivalent for the two systems, even though the Type 2 scanner uses significantly more 4705 processor overhead than Type 3. The implication is that in certain circumstances, Amdahl's processor can make up for the lower performance of the Type 2 scanner because its processor is more powerful than IBM's; performance equivalent to the 3705-II with Type 3 scanners can be achieved by using a 4705 with Amdahl Type 2 scanners, which each cost about \$13,000 less than IBM's Type 3s.

One explanation for Amdahl's improved throughput is the instruction look-ahead function, which allows the ➤

➤ The Amdahl 4705 comes in four models, which differ only in line capacity and related hardware requirements. Each model is field-upgradable to the next higher model. The configurational differences between the models are detailed in Table 1.

The Amdahl 4705 is composed of the following major components:

- The *Central Control Unit (CCU)*, which contains the circuits and data flow paths to execute the instruction set, address storage, control the communications scanners and channel adapters, and perform arithmetic and logical processing of data, all under the direction of the system's control program.
- *Main Storage*, which (for any model) can contain 64K to 512K bytes of NMOS FET semiconductor memory, expandable in 64K-byte increments.
- One to four *Channel Adapters*, which provide data paths between the 4705 and channel-attached host computers. See "Connection To The Host" in this report for details.
- One to four *Communication Scanners*, which connect the Line Interface Bases (LIBs) and Line Sets to the CCU. Scanner functions include: monitoring LIBs for service requests, assembling/disassembling characters, performing various line controls, servicing interrupts to the CCU to send or receive characters, and executing certain other procedures, such as control character recognition, code translation, and user recovery functions, under the direction of the system's control program.

Two types of scanners are available and may be added to the system in any combination: CS Type 2 supports up to six LIBs, accommodates asynchronous or synchronous lines, and transfers one byte to/from the CCU per interrupt; CS Type 3 supports up to four LIBs, accommodates synchronous lines only, and transfers one block of up to 255 bytes to/from the CCU per interrupt using a "cycle steal" methodology that halts the control program for a complete machine cycle during each data transfer. The first scanner per system is limited in line capacity to 64 lines (CS2) or 48 lines (CS3) per scanner; the second, third, and fourth scanners each have a line capacity of 96 lines (CS2) or 64 lines (CS3) per scanner. The Amdahl CS2 and CS3 are functionally equivalent to IBM's CS2 and CS3 scanners; Amdahl does not provide an equivalent for IBM's CS1 scanner, since the CS2 performs equivalent functions with higher performance.

- *Line Interface Bases (LIBs)*, which provide certain control functions for particular types of lines and transmission techniques. In general, each LIB can accommodate up to 16 lines. See "Transmission Specifications" in this report for details.
- *Line Sets*, which provide physical interfaces to one to four modems and communications lines. "Transmission Specifications" and Table 2 give details.

Other basic components include the operator control panel, a lamp unit, and an internal diagnostic routine loader unit. The control panel provides LED displays and touch-sensitive switches that allow the operator to perform various debugging and testing functions and other operations that require human intervention. The lamp unit is a type of logic probe with an attached light indicator that can be used to troubleshoot various hardware circuits.

The loader unit consists of a diskette controller and drive, an internal diskette, a register for storing the type of program load and stimulus, and read-only storage bootstrap. It is used to load and perform internal self-diagnostic and maintenance ➤

TABLE 1. CHARACTERISTICS OF 4705 MODELS

Model	Line Capacity	Number of Scanners Required	Cabinets Required	IBM 3705-II Model Equivalent
5	Up to 64 lines	1	Basic only	E
6	65 to 160 lines	2	Basic only	F, J
7	161 to 256 lines	3	Basic + 1 Expansion	G, K
8	257 to 352 lines	4	Basic + 2 Expansions	H, L

Amdahl 4705 Communications Processor

processor's fetch cycle to retrieve another instruction from memory while execution of the current instruction occurs. This overlap of fetch time with execution time does not occur with IBM 3705-II's processor. Another reason for improved throughput is that the internal cycle speed for the 4705's processor is 145 nanoseconds (.145 microseconds) compared to 1.0 microseconds for 3705-II Models E, F, G, and H, and 0.9 microseconds for Models J, K, and L.

Although Amdahl is justifiably proud of the results of their benchmark testing, they have noted that the results are highly dependent upon configuration, application, and operating characteristics. Both Amdahl and Datapro recommend that prospective customers carefully evaluate their own environments to determine what throughput differences result between the Amdahl and IBM systems within that environment.

- *Simpler, more accurate operator controls*—Amdahl's system provides a newly designed console panel that contains touch-sensitive switches and hexadecimal LED read-outs in place of IBM's control panel lamps and rotation-type mechanical switches.

- *Reduced space requirements*—Amdahl's cabinetry is physically smaller and requires less service clearance than IBM's. For Amdahl models that are configured with the same number of frames as the equivalent IBM model (counting Amdahl's double-width Basic Frame as two frames), the space savings can be substantial. For example, a fully-loaded Amdahl 4705 Model 8 occupies as much as 30 percent less space than its IBM equivalent. The one exception is when an Amdahl model contains one more frame than its IBM equivalent (i.e., the Amdahl 4705 Model 5, which requires the double-width Basic Cabinet, ➤

➤ routines when the 4705 is in a disabled or off-line state, without dependence on the host or outside connections.

Physically, the 4705 is housed in one to three frames, or cabinets. The Basic Frame is a double-width cabinet that includes the CCU, main storage, operator control panel, lamp unit, and loader unit; all Channel Adapters and Scanners; and mountings for up to 10 LIBs and Line Sets for up to 160 lines. Each of two smaller Expansion Frames accommodates up to an additional six LIBs and Line Sets for up to 96 lines.

The configuration diagram at the end of this report illustrates the relationships among these components.

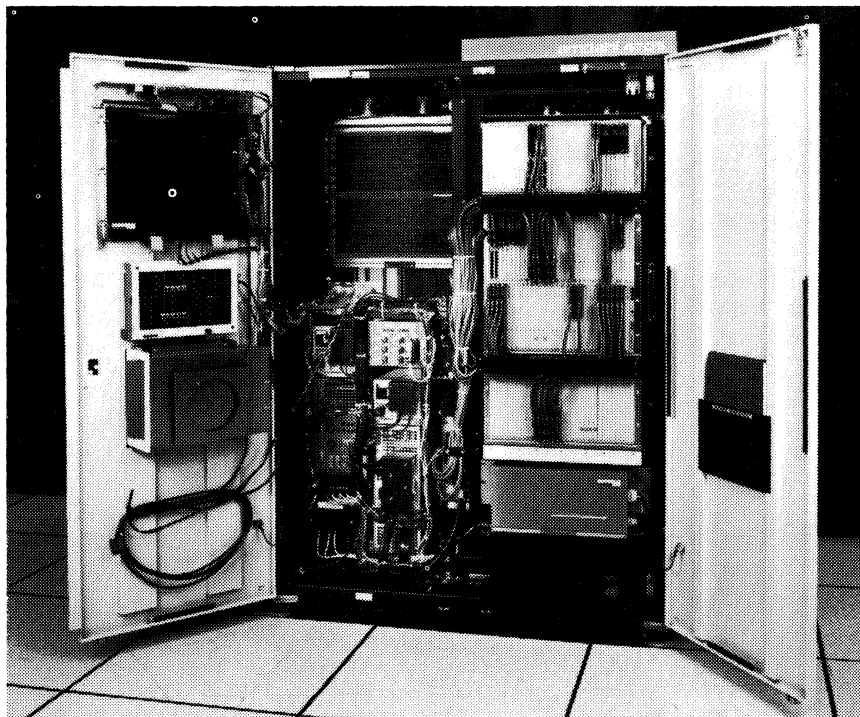
TRANSMISSION SPECIFICATIONS

In general, Amdahl currently supports transmissions of up to 56K bps in half- or full-duplex mode, using start/stop, BSC, or SDLC line protocols, over switched, leased, or private communications lines. EIA RS-232-C and CCITT V.24 and V.35 interfaces are available.

Amdahl provides only one type of Line Interface Base, LIB1, which handles up to 16 lines of various speeds and protocols. The LIB relays signals between the Communications Scanner and the Line Sets and provides a send/receive bit timing signal to the Line Set for each transmission speed.

The Line Set detects receive bits from the communications lines, transmits send bits to the line, and transmits modem control signals. A Line Set can accommodate one to four lines, depending on the type of Line Set selected. Line Sets are provided to accommodate a wide range of communications requirements and are detailed in Table 2.

CONNECTION TO THE HOST: The Amdahl 4705 can be channel-attached or remotely connected to any Amdahl or equivalent host computer, including an IBM 360, 370, 303X, 3081, or 4300. The 4705 is generally compatible with MVS, SVS, and VS1 operating systems and with BTAM, QTAM, TCAM, and VTAM host access methods, including ACF and MSNF capabilities. Exceptions are: (1) host software that requires hardware features is not supported; and (2) some host software used for testing the IBM 3705-II may be ➤



When the 4705 Basic Frame's doors are opened, its internal workings are revealed. On the inside of the left door are mounted the operator panel, flexible disk drive, and diagnostic lamp unit. The upper left side of the cabinet holds the central control unit and main storage; the lower left, the power supply. A swing gate of the right side of the cabinet accommodates Communications Scanners and Channel Adapters. Behind the gate (not visible in photo) are Line Interface Bases and Line Sets for up to 160 lines. Additional Line Interface Bases and Line Sets may be housed in one or two Expansion Frames (not shown in photo).

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TABLE 2. COMMUNICATIONS HANDLED BY AMDAHL AND IBM FUNCTIONAL EQUIVALENTS

Type of Line Interface	Transmission					Line Sets		Lines Per Line Set		Comments
	Amdahl Speed (bps)	IBM Speed (bps)*	Timing	Mode	Line	Amdahl	IBM Equivalent*	Amdahl	IBM*	
External RS-232-C Modem	2400	1200	Asynchronous	Half-duplex	Leased or Switched	HD1A	1A***	4	2	Cannot use CS3 Scanner.
	2400	1200	Asynchronous	Full-duplex	Leased	FD1A	1B***	2	1	
	2400	1200	Asynchronous	Half-duplex	Leased or Switched	HD1	1D	4	2	
	19,200	9600	Synchronous	Half-duplex	Leased or Switched					
Wideband	19,200	9600	Synchronous	Full-duplex	Leased	FD1	1H***	2	1	
	50,000	50,000	Synchronous	Half-duplex	Leased	HD1G	1G	2	2	
External CCITT V.35	50,000	50,000	Synchronous	Full-duplex	Leased	FD1T	1T	1	1	
	56,000	56,000	Synchronous	Half-duplex	Leased	HD2	1S	2	1	
Local Attachment	56,000	56,000	Synchronous	Full-duplex	Leased	FD2	1U	1	1	
	2400	1200	Asynchronous	Half-duplex	Cables	LA1C	1C***	4	2	Maximum cable length is 200 feet; cannot use CS3 Scanner.
19,200	9600	Synchronous	Half-duplex	Cables	LA1F	1F***	4	2	Maximum cable length is 100 feet.	
Automatic Dial RS-366	2400	1200	Asynchronous	Half-duplex	Switched	NC1	1E	2 RS-366 plus	2	For attachment of external dialing units and data communications lines.
	19,200	9600	Synchronous	Half-duplex	Switched			2 RS-232-C		

*For comparison only.

**HD1 and NC1 each accommodate asynchronous transmissions at up to 2400 bps plus synchronous transmissions at up to 19,200 bps.

***IBM has withdrawn these line sets from its 3705 product line.

➤ versus the single-frame IBM 3705-II Model E). In this case, the Amdahl configuration requires more floor space than the IBM configuration. However, when service clearance is considered, all of Amdahl's models take up less space than IBM's.

- *Simplified installation and improved reliability and serviceability*—The inherent modularity of the Amdahl system's design reduces downtime when the system is expanded or a component fails. The system provides a stand-alone self-diagnostic and maintenance routine that allows internal system functions to be self-tested without dependence on a host computer or other outside connection. In addition, the 4705's architecture provides several functions designed to increase the system's operational reliability, such as automatic instruction retry when an instruction fails to execute correctly, line unit loop diagnostics, and a channel loopback capability.

Certain IBM configurations and features are slightly different as implemented by Amdahl. For instance, the Amdahl system's main memory is expanded by 64K-byte increments, whereas the IBM memories are expandable in 32K-byte steps. This results in Amdahl's having fewer memory-plus-line-capacity combinations than IBM. In addition, Amdahl has chosen not to support the lower-performance IBM Type 1 Channel Adapter and Type 1 Communications Scanner, which are essentially replaced by the high performance Type 4 Channel Adapter and Type 2 Scanner, respectively.

Amdahl also does not support IBM's Line Interface Base Types 2 through 12, which support Telegraph interfaces and integral modems and adapters. Certain IBM Line Sets that utilize Line Interface Base 1, including Line Sets 1J, 1GA, 1TA, 1W and 1Z, are also not supported. Although IBM recently merged its Line Sets 1A and 1B into its 1D Line Set, Amdahl has decided to keep them ➤

➤ incompatible with the Amdahl 4705 (however, Amdahl provides equivalent test routines that operate without host involvement).

Amdahl provides three Channel Adapters for direct attachment of the 4705 to the byte multiplexer, block multiplexer, or selector channel of a local host computer:

- CA2—operates under NCP program control only. When the CA2 is used, only two Channel Adapters may be configured per 4705 (the second adapter may be a CA3, a CA4, or another CA2).
- CA4—operates under EP, PEP, or NCP program control. Up to four CA4s may be configured per 4705 when no CA2s or CA3s are configured; one CA4 may be configured when a CA2 or CA3 is also used.

A Two-Channel Switch can be used with either the CA2 or CA4 to allow the adapter to connect two host channels. Only one of the channels is active at a time; the active channel is selected manually.

- CA3—provides the combined capabilities of a CA2 and Two-Channel Switch, plus a cross-call feature. The CA3 is used to attach the 4705 to the channels of a pair of tightly-coupled multiprocessing systems and allows the 4705 to operate as a shared symmetrical I/O unit with an alternate path capability between the two systems. Switching between the two CPUs is automatic on a first-come, first-serve basis, and only one channel is active at a time. As with the CA2, only two Channel Adapters may be configured per 4705 when the CA3 is used (the second adapter may be a CA2, a CA4 or another CA3).

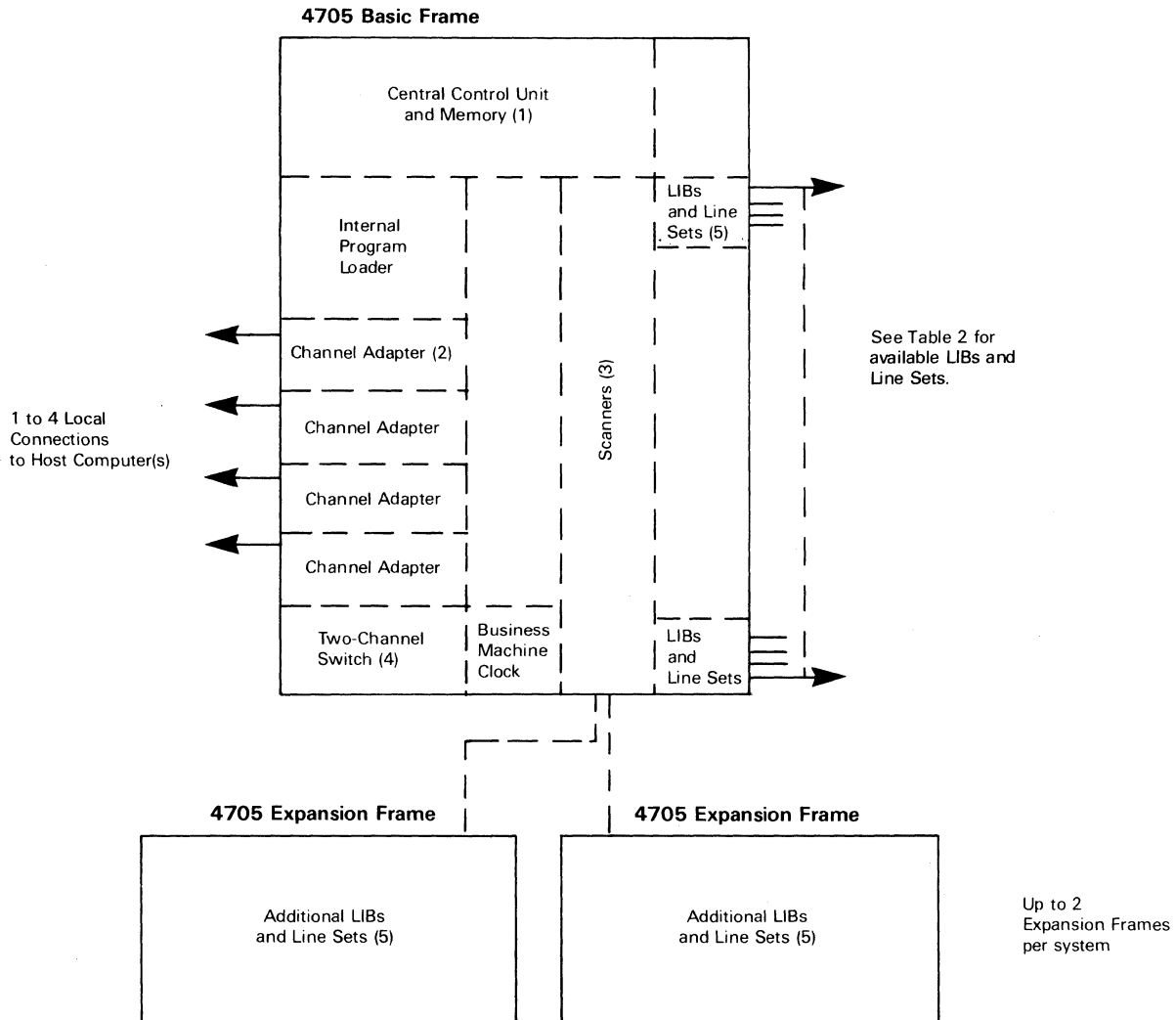
The Amdahl CA2, CA3, and CA4 are functionally equivalent to IBM's CA2, CA3, and CA4 Channel Adapters. Amdahl does not provide an equivalent to the IBM CA1, since the CA4 performs equivalent functions with higher performance.

The physical connectors required to attach the 4705 to an IBM host are functionally equivalent but physically somewhat different than IBM's. Therefore Amdahl provides its own connector cables.

A Remote Program Load option (functionally equivalent to IBM's RPL option) is provided to load the 4705's operating ➤

Amdahl 4705 Communications Processor

Configuration



(1) Memory size is 64K to 512K bytes, expandable in 64K-byte increments.

(2) One to four Channel Adapters can be installed.

(3) One to four Communications Scanners Type 2 or 3 can be installed. If Type 2 is used, first Scanner can handle up to 64 lines; additional three Scanners can handle up to 96 lines each. If Type 3 is used, first Scanner can handle up to 48 lines; additional three Scanners can handle 64 lines each. Maximum number of lines per system is 352.

(4) One Two-Channel Switch may be configured for each Channel Adapter Type 2 or 4.

(5) Basic Frame accommodates up to 10 LIBs and Line Sets for up to 160 lines. Each Expansion Frame accommodates up to 6 LIBs and Line Sets for up to 96 lines. Each LIB handles up to 16 lines. Each Line Set provides interfacing for one to four lines, depending on type of Line Set selected.

➤ separate, which may result in a cost savings to the customer.

Most of Amdahl's Line Sets are equivalent to two of their respective IBM versions but are priced substantially less than twice the cost of the IBM versions. Also Amdahl's Line Set NCI, which is priced as an equivalent to IBM's Line Set E1 (a dual RS-366 compatible automatic dial interface), includes 2 RS-232-C interfaces for attachment of regular communications lines in addition to the two auto-dial unit interfaces offered on the IBM version.

➤ software over high-speed data communications lines from a remote host computer. The RPL option can be used when the 4705 is utilized as a remote network concentrator with no local host channel attachment, when network software management is controlled from a central (remote) computer rather than the local computer to which the 4705 is channel-attached, and in other circumstances that require a remote IPL. The RPL feature occupies one channel adapter slot, so that only three CA4s may be configured (systems with CA2s and CA3s are not affected).

SOFTWARE

➤ The Amdahl 4705 operates under the control of the following licensed and public-domain control programs available from ➤

Amdahl 4705 Communications Processor

▷ Since its inception in 1970, Amdahl Corporation has been a pioneer in the IBM plug-compatible mainframe and front-end processor markets. The Amdahl Communications Systems Division provides a variety of packet-switching support products. They include the 4410 Network Processor, a high-capacity digital data switch that performs packet-switching and conforms to the CCITT X.25 interface standard. The 4410 Network Processor attaches to the 4705; the 4410 can also be used with other vendors' equipment that has a compatible interface. Amdahl is considered a major competitor of such communications processor vendors as IBM, Memorex, and NCR Comten.

USER REACTION

In December 1982, Datapro interviewed three users of the Amdahl 4705.

A data processing service for the health care industry gave excellent ratings on all points to the two Amdahl 4705 Model 5 Communications Processors that they have been using for more than a year as front-ends to an Amdahl 470V7 computer. The IBM 3705 Communications Controllers they replaced were fine too, a spokesman said, but they selected the Amdahl 4705 for "more performance and to save a little." He cited price/performance as the major advantage of the Amdahl 4705. "It has never been down in over a year," he noted.

A southern data processing institution for banks also gave consistently excellent ratings to the Amdahl 4705, which they have been using as an on-line controller since the summer of 1980. After considering the IBM 3705, the company president chose the Amdahl 4705 because of its price and Amdahl's service philosophy. "If you have a problem, it's an Amdahl problem until it's solved," he commented, indicating that IBM's service is not as satisfactory.

A bank in the Midwest has been using two Amdahl 4705 Model 6 Communications Processors as front-ends for a year and a half. A spokesman said potential buyers would be surprised at how easy it is to change from an IBM to an Amdahl communications processor. Adding line sets goes a lot easier than it did with the IBM 3705 that the bank used formerly, he said. With the IBM 3705, it took four hours to add a line set; with the Amdahl 4705, adding a line set doesn't take more than an hour. Ease of upgrading the equipment was also given as an advantage of the Amdahl 4705. He mentioned that the diagnostic capability doesn't run very well, but otherwise they have no problems and have not needed to make a service call.

▶ IBM: EP3, PEP, NCP5, and ACF/NCP 2.0 and 2.1. Amdahl customers generally acquire public-domain software, such as EP, PEP, and NCP, directly through Amdahl, which also provides software support services for these programs. It is Amdahl's intent to support users of current public-domain IBM software by continuing to provide new releases of that software to Amdahl users. Customers acquire licensed IBM software products, such as ACF/NCP, directly from IBM, which also provides software support services for those programs.

Amdahl also provides stand-alone diagnostic and maintenance programs that permit a disabled or off-line 4705 to perform self-test routines without host assistance.

PRICING

The Amdahl 4705 systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases may be renewed for 12-month periods. Lease payments must be made monthly in advance. Lease payments include the lessee charge, property taxes, and insurance, but not maintenance charges. Feature and model; upgrades are coterminous with the existing lease, except that the minimum lease term for a model upgrade is 12 months. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price on a two-year lease and 60 percent on a four-year lease. The purchase credit applies either to the original lessee or the current lessee. Amdahl will pass on two-thirds of the available Investment Tax Credit to qualified customers.

Monthly maintenance charges are not included in lease charges or purchase prices. The standard maintenance agreement provides for 24 hours per day and 7 days per week. Prime-shift-only (up to 9 hours per day and 5 days per week) contracts and other arrangements are optionally available. ▶

The ratings provided by these users are summarized as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	3	0	0	0	4.0
Ease of installation	3	0	0	0	4.0
Ease of operation	2	1	0	0	3.6
Ease of expansion	2	1	0	0	3.6
Hardware reliability	3	0	0	0	4.0
Quality of manufacturer's maintenance service	3	0	0	0	4.0
Quality of manufacturer's technical support	2	1	0	0	3.6

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

Because Amdahl 4705 users employ IBM software, the software ratings (which were excellent or good) are not applicable to Amdahl. □

Amdahl 4705 Communications Processor

		Monthly Charges*			Monthly Maint.
		2-Year Lease	4-Year Lease	Purchase	24-Hour 7 Days/Wk.
4705 Communications Processor					
	Model 5; max. 64 lines	\$ 810	\$ 675	\$35,350	\$312
	Model 6; max. 160 lines	1,200	1,000	46,650	340
	Model 7; max. 256 lines	1,600	1,330	57,950	370
	Model 8; max. 352 lines	2,010	1,670	69,250	399
MS1	Storage Increment; 64K bytes	162	134	2,650	72
MS2	Storage Increment; 128K bytes	324	268	5,300	145
ME0	Memory Expansion Option; 256K to 512K bytes	654	543	10,000	41
CA2	Channel Adapter	186	154	5,500	22
CA3	Channel Adapter	443	368	10,975	26
CA4	Channel Adapter	160	133	3,750	19
TCS	Two-Channel Switch	59	49	1,775	6
RPL	Remote Program Load Option	300	270	9,300	40
CS2	Communications Scanner	178	147	4,035	22
CS3	Communications Scanner	650	540	14,630	72
LIB1	Line Interface Base	38	31	940	7
Line Sets:					
HD1A	RS-232-C; supports up to 4 half-duplex 2400 bps lines	30	25	830	6
HD1	RS-232-C; supports up to 4 half-duplex lines, 2400 bps async or 19.2K bps sync	70	58	1,750	13
FD1B	RS-232-C; supports up to 2 full-duplex 2400 bps lines	34	28	1,150	6
FD1	RS-232-C; supports up to 2 full-duplex 19,200 bps lines	70	58	1,750	13
HD2	CCITT/V.35; supports up to 2 half-duplex 56K bps lines	168	140	5,140	27
FD2	CCITT/V.35; supports 1 full-duplex 56K bps line	156	130	4,625	24
LA1C	Local; supports up to 4 half-duplex 2400 bps lines	30	25	1,090	6
LA1F	Local; supports up to 4 half-duplex 19,200 bps lines	70	58	1,750	13
HD1G	Wideband; supports up to 2 half-duplex 50K bps lines	152	126	3,485	26
NC1	Auto Dialing; supports up to 2 RS-232-C compatible half-duplex lines plus up to 2 RS-399 compatible auto-call units	65	54	875	4

*Excludes maintenance charges.■

Amdahl 4705 Communications Processor

Product Enhancement

On April 18, 1983, Amdahl Corporation announced an enhanced version of the 4705 Communications Processor, the 4705E. The Amdahl 4705E represents a direct response to IBM's Model 3725, which was announced in March 1983. The 4705E, which is field upgradeable from the 4705, improves Amdahl's competitive position in relation to the IBM 3725.

The 4705E uses standard 3705 software, including ACF/NCP Version 2 and ACF/NCP Version 1 Releases 2.1 and 3.0. Like the 4705, the 4705E supports up to four active host CPU connections simultaneously and supports up to 352 half-duplex communications lines over switched or private line facilities. Asynchronous, BSC, SDLC, and X.25 protocols are supported. The basic 4705E frame supports up to 160 lines. Up to two expansion frames can be configured, each adding up to 96 lines. Line capacity is halved for full-duplex operation. By comparison, the IBM 3725 supports a maximum of 256 communications lines; however, the 3725's line capacity is not affected by full-duplex operation.

In addition, the 4705E adds the following new features:

- Support for full- or half-duplex communications over switched or private lines.
- Improved throughput. Throughput capacity for the 4705E is 1.3 times that of the 4705, and 2.4 times the throughput of the IBM 3705-II. IBM claims its 3725 has 1.85 times the throughput of the 3705-II. Amdahl has scheduled benchmark tests on the IBM 3725 to determine actual throughput comparisons.
- Storage capacity of 256K to 1M bytes, expandable in 256K increments. The 1M maximum is double the maximum storage capacity of the 4705 (512K bytes), and equal to the maximum storage offered on the IBM 3725. The extended memory size of the 4705E is accomplished using standard 3705 NCP/EP software.
- Line speeds up to 64K bps. The IBM 3725 supports a maximum line speed of 230.4K bps.
- Support for asynchronous terminal devices at speeds up to 9600 bps, compared to 1200 bps for the IBM 3725.
- An Integrated Line Switch (ILS) communications backup system. The ILS enables groups of communications lines to be switched between Amdahl systems under software control without modification to NCP or EP. By avoiding duplicate line sets, this feature is cost saving and operationally efficient.

Purchase price for the basic 4705E, with 256K bytes of memory and support for up to 160 communications lines, is \$36,000. A 4705E configured with 1M bytes of memory, four channel adapters, and support for 121 line interfaces, sells for \$229,600. Amdahl began delivery of the 4705E in the second quarter of 1983. □

