

# Amdahl 4745 Communications Processor

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**Product Summary****Editor's Note**

In April 1990, Amdahl enhanced Models 4745-110 and 4745-210 with 4M bps token- ring adapters, extended the memory capacity to a total of 8M bytes, extended the channel connectivity of both models to support up to four active channel adapters in the base frame, and extended the Integrated Switching Architecture (ISA) with operation of automatic backup capabilities. The base prices have not changed since November 1989.

**Description**

The 4745 line of communications controllers consists of Models 110 and 210. The controllers are primarily designed for use in large networks as remote concentrators or front ends for remote hosts. The Model 4745-110 can support up to 64 lines and four channel adapters. The Model 210 handles the traffic volume in medium-to-large SNA networks, and can handle up to 256 lines and six channel adapters. Both models run ACF/NCP Versions 3, 4, and 5.

**Strengths**

Amdahl's Integrated Switching Architecture (ISA) provides a multi-level component backup and multiprocessor backup for high network availability.

**Limitations**

At this time, the 4745 does not support T1.

**Competition**

NCR and IBM.

**Vendor**

Amdahl Corp.  
1250 East Arques Avenue  
P.O. Box 3470  
Sunnyvale, CA 94088-3470  
(408) 746-6000

**Price**

Base unit price is \$100,650 for the Model 110, and \$132,000 for the Model 210.

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—By *Barbara Rinehart*  
*Associate Editor/Analyst*

# Analysis

In May 1988, Amdahl introduced the 4745 front-end communications processors, which consist of two models: the 4745-110 and 4745-210. Initially, the two models ran IBM's ACF/NCP Version 2, 3, or 4 software, but in April 1989, Amdahl incorporated the capability of running NCP Version 5 into the models. The 4745 replaced Amdahl's earlier communications processor, the 4725. Both the 4745-110 and 4745-210, can be field upgraded to run ACF/NCP Version 5.

The 4745-210 is designed to meet the traffic needs of SNA networks. The 4745-110 is suited for smaller, high-speed requirements, serving as a remote concentrator, a network node, or an application controller for security or other reasons.

The 4745s can run ACF/NCP Version 2, 3, 4, or 5 on the same hardware, without modification. To make the transition from one version to another, the operator need only to type simple commands on the 4745's console and to load the appropriate ACF/NCP module across the channel or from the 4745's disk drive, a process that takes about five minutes.

In 1990, Amdahl made the following enhancements:

- Introduced the Token-Ring Adapter that allows the 4745 to connect to as many as four 4M bps token-ring LANs, and to manage data transfer between the token-ring LANs and host applications.
- Expanded the memory capacity of the communications processors to 8M bytes.
- Expanded the processors' channel connectivity to support up to four active channel adapters in the base frame.
- Extended the 4745's Integrated Switching Architecture (ISA) to provide the option of automatic backup operations.

The Amdahl systems are IBM compatible. As such, the IBM installed base is a target market.

## Competitive Position

Communications processors are a commodity product. IBM, NCR, and Amdahl dominate the market. In terms of market share in the communications processor field, Amdahl still ranks third behind IBM and NCR.

When we compared Amdahl's revenue from 1988 and 1989, we found that the communications product line's revenue contribution dropped from 5 percent in 1988 to 3 percent in 1989.

## Decision Points

Even though communications processors are commodity items, the Amdahl 4745 processors offer the following benefits: fit into the mainstream of SNA networks, are compatible with the IBM 3745, and are easily upgraded from the NCP v4 to NCP v5. According to Amdahl, the 4745's throughput is up to 1.4 times that of the IBM 3745-210.

In April 1990, Amdahl made an announcement that it planned to support the T1/CEPT. As of this writing, this feature is still not available.

# Characteristics

**Models:** Model 4745-110; Model 4745-210.

**Date of Announcement:** Models 110 and 210—May 1988.

**Date of First Delivery:** Models 110 and 210—June 1988.

**Number Installed:** Information not available.

## Overview

The 4745 Communications Processor consists of the 4745 base unit and the 4747 console. Amdahl offers an optional expansion frame, the 5203, for the Model 210. The 4745 base unit contains the Communications Control Unit (CCU), Maintenance and Operator Subsystem (MOSS), and main storage.

## Company Profile Amdahl Corporation

### Corporate Headquarters

1250 East Arques Avenue  
Sunnyvale, CA 94088-  
3470  
(408) 746-6000

### In Canada

Amdahl Canada Limited  
One First Canadian Place  
P.O. Box 123  
Toronto, ON M5X 1A4  
(416) 862-7479

### Officers

*Chairman of the Board/  
CEO:* John C. Lewis  
*Vice Chairman of the  
Board:* Eugene R. White  
*President/Chief Operating  
Officer:* E. Joseph Zemke

### Company Background

Amdahl Corp. was formed  
in October 1970 by Dr.

Gene Amdahl, and immediately attracted a group of engineers familiar with large-scale systems. Five years later, with \$47 million invested on research and development, the company installed its first product, the Amdahl 470V/6 computer.

On October 1980, the 4705 front-end communications processor was announced, and in September 1987, the 4725 Series of front-end processors was introduced offering up to 80 percent more throughput than the 4705 models.

Amdahl designs, develops, manufactures, markets, and services large-scale, high-performance data processing systems. The company's product line includes large, general-purpose main-frame computers, data storage subsystems, data communications products, and software. Amdahl also provides educational and consulting services.

As of 1990, Amdahl had customers in more than 25 countries with approximately 120 sales offices and 8,200 employees. Manufacturing activities are centered in northern California, Dublin, Ireland, and the Canadian province of Ontario. In 1990, Amdahl ranked 201 on *Fortune* magazine's list of the 500 largest U.S. companies.

### Financial Profile

Net income for the year ended December 28, 1990 amounted to \$183,954,000 or \$1.66 per share, up from \$152,972,000 or \$1.39 a share in 1989. Revenue totaled \$2,159 billion in 1990, compared to \$2,101 billion in 1989.

In the fourth quarter of 1990, net income was \$61,314,000 or 55 cents per share on revenues that increased to \$625,847,000.

### Sources of Revenues

Amdahl's revenue sources for 1989 were broken down into the following areas: processors—70 percent; maintenance—13 percent; software/educational services—2 percent; communications products—3 percent; and storage products—12 percent.

The base unit of the 4745-110 has two scanners with up to 64 lines. The base unit of the 4745-210 can support up to four scanners with up to 128 lines. The base unit for either model can support up to two channel adapters.

The 4745 resides between the host processor(s) and the network terminals. Under the control of an NCP program in main storage, it can connect and disconnect terminals; transmit and receive data between the terminals and host processor(s); and operate and monitor modems, automatic calling units (ACUs), and other communication units.

Attachment to the network can take place locally or remotely. Local attachment occurs via a selector, byte multiplexer, or block multiplexer channel. Remote attachment occurs via a telecommunications link with another, Amdahl (4745, 4725, 4705) or IBM (3705, 3720, 3725, 3745) communications controller. Channel adapters control the data transfer between the host and the 4745, and line interface couplers support the attachment between the 4745 and the network.

### Configurations

The minimum configuration for a 4745-110 consists of one base unit; two communications scanners; one console; and one line interface coupler (LIC). This configuration is suitable for a link-attached system. If the user requires channel attachment, the system must have at least one channel adapter.

The minimum configuration for a 4745-210 consists of one base unit; two communications scanners; eight LICs; and one console.

The maximum configuration for the 4745-110 includes of one base unit; two communications scanners; 16 LICs; one console; and four channel adapters.

The maximum configuration for the 4745-210 includes one base unit; one expansion unit; eight communications scanners; 64 LICs; six channel adapters with 2 two-processor switches, or five channel adapters with 3 two-processor switches, or four channel adapters with 4 two-processor switches; and one console with an alternate console.

**Table 1. Specifications Summary****Configurations**

	4745 Base Unit	Expansion Unit	Maximum Configuration
<b>Main Storage</b>			
4745-110	3MB with NCP 4	NA	3MB with NCP 4
4745-210	4 or 8MB with NCP 5	Yes	8MB with NCP 5
	3MB with NCP 4		3MB with NCP 4
	4 or 8MB with NCP 5		8MB with NCP 5
<b>Active Channel Connections (Byte, Block, or Selector)</b>			
4745-110	0-4	NA	4
4745-210	0-4*	0-4*	6
<b>Total Channel Connections</b>			
4745-110	0-4	NA	4
4745-210	0-4 (with TPS)	0-4	8
<b>Two-Processor Switches (TPS)</b>			
4745-110	0-2	NA	2
4745-210	0-2	0-2	4
<b>Token-Ring Adapters (4M bps)</b>			
4745-110	0-1	NA	1
4745-210	0-2	NA	2
<b>Token-Ring Attachments</b>			
4745-110	0-2	NA	2
4745-210	0-4	NA	4
<b>HDX and FDX Lines</b>			
4745-110	1-64	NA	64
4745-210	1-128	0-128	256
<b>Scanners</b>			
4745-110	2	NA	2
4745-210	2-4	0-4	8
<b>Consoles†</b>	NA	NA	2

NA—Not available.

\*The maximum total number of active channel connections in the base and expansion frames, taken together, is six.

†One console, including keyboard and display station, is required and is housed separately. Electronic interfaces for both local and remote consoles are contained in the 4745 base unit.

**Components****Communications Control Unit (CCU)**

The heart of the 4745, the CCU, based on emitter-coupled logic (ECL) technology, offers a cycle time of 30 nanoseconds. The CCU performs the following:

- Collects instructions from main storage and decodes them for execution.
- Executes I/O instructions to the channel adapters and communications scanners.
- Processes interrupts.
- Manages main storage shared by all 4745 components.
- Interfaces with maintenance and operator subsystem (MOSS) and the control panels on the base unit and expansion unit.

To facilitate future upgrades, some components are based on extensive microcoding.

**Main Storage**

The main storage for the 4745 supplies memory space for the control program, software configuration tables, and data buffers. Shared by all major 4745 components, it enables them to communicate with each other. The main storage resides entirely in the base unit.

**Maintenance and Operator Subsystem (MOSS)**

The 4745 MOSS, an independent microprocessor-based subsystem, maintains separate connections to all major system components. It furnishes the 4745 with a flexible system for isolating problems and implementing diagnostic procedures. MOSS also gives operation and

maintenance personnel an interface to the system via the console or the control panels located on the base and expansion units.

Additional MOSS features are:

- Independent paths to all major system components.
- Support of 4745 operations.
- Monitoring and diagnosing of subsystem problems.
- Communication with the 4745 control program.
- Provision of maintenance support, as required.

### **System Extension Feature (SEF)**

SEF refers to an extension of the basic 4745 system. The SEF includes a larger hard disk (67M bytes); an enhanced set of printed circuit boards for the maintenance and operator subsystem (MOSS); a new back panel; and other, related modifications. The SEF can be applied to existing 4745s as a field upgrade.

The 67M-byte hard disk contains programs that control configurations and enhance diagnostic tests. The hard disk frees the host processor from performing certain operational functions, accelerates program loading, and sends fast prompts to the console. The hard disk can also store two operational NCP load modules and one dump module when the 4745 serves as a remote concentrator. The 4745 is also equipped with a 5.25-inch, 1M-byte diskette drive that loads start-up diagnostics, microcode, system configurations, and the bootstrap program.

### **The Expanded Channel Connectivity**

This extends the channel connectivity of the 4745-110 and 4745-210 to support up to four active channel adapters in the base frame. This provides increased host connectivity. The previous maximum for both models was two channel adapters in the base frame.

### **Channel Adapters**

The channel adapters (CAs) furnish the physical connections and control the data transfer between the host processors and the 4745. Each channel is a CMOS VLSI device that uses microcode to manage data over IBM-compatible block multiplexer channels, selector channels, or byte multiplexer channels. When equipped with the two-processor switch option, a channel adapter can supply a second channel connection to the same host processor or to a different processor.

### **Token-Ring Adapter**

The Token-Ring Adapter (TRA) allows the 4745-210 to connect to as many as four independent token-ring LANs, running at 4M bps. Each Amdahl TRA can connect two independent token-ring networks; there can be as many as two TRAs (four token-ring LAN connections) installed in the 4725-210, or one TRA (two token-ring LAN connections) installed in the 4745-110. The 4745 uses standard NCP Token-Ring Interconnection (NTRI)

**Table 2. LIC Specifications**

Type	Lines per LIC	Interfaces	Maximum Speeds (K bps)
LIC1	4	RS-232-C/V.24, RS-366/V.25	19.2
LIC2	1	Bell 303	230.4
LIC3	1	V.35	256.0
LIC4A	4	X.21	19.2
LIC4B	1	X.21	256.0

software within NCP to manage data transfer. The Amdahl 4745 TRA feature is compatible with industry-standard hardware and software, and conforms to the IEEE 802.5 LAN standard.

### **Two-Processor Switch**

In case of a host system failure, the optional two-processor switch is used to connect the processor to a backup host. It works with a channel adapter to provide a second channel interface for that adapter. This second channel interface can be connected to a different channel on the same host or to a second host. Users engage the interfaces by a switch on the control panel of the base unit. The operator can engage either interface or both simultaneously. The switch does not provide hardware or software multiplexing of data from the channel(s). Usually, only one channel is enabled at a time.

### **Integrated Switching Architecture**

Functions of the Integrated Switching Architecture (ISA) are:

- Allows backup of the central control unit/main storage (CCU/MS).
- Allows backup of the line interface couplers (LICs), communications scanners, channel adapters, the maintenance and operator subsystem (MOSS), buses, and power supplies.
- Enables one system to back up as many as four systems.
- Operates in four modes of backup: twin-in-dual, twin-in-standby, twin-in-backup, and multiple backup.
- Provides limited online maintenance and maintenance scheduling.

### **Communications Scanners**

These devices control data transfer between the 4745 and the terminal equipment in the network. Since the 4745 uses only one type of scanner, users can easily configure and reconfigure the system. The scanner is a high-performance device that contains a VLSI microprocessor with integrated RAM and a VLSI front-end scanner. The communications scanner controls the line interface couplers that form the actual connections to

**Table 3. Specifications Summary**

**Physical Characteristics**

	<b>4745 Base Unit</b>	<b>Expansion Unit</b>	<b>Console</b>
Weight (lb.)	858	299 660	11 24
Width (in.)	35.4	85 33.5	45 17.7
Depth (in.)	31.5	80 31.5	56 22.0
Height (in.)	55.1	140 55.1	37 14.6
Heat Dissipation (Btu/h.)	5794	940 3730	85 337
Airflow (f <sup>3</sup> /min.)	525	12 420	NA NA
Operating Temperature (° F)	41-100*	5-38* 41-100*	0-40 32-104
Operating Humidity (%)	20-80	20-80	20-80
Power Consumption (Hz)	50/60	50/60	50/60
(kVA)	1.7	1.1	0.1
(V)	208-240	208-240	120 (U.S.), 240 (Intl.)
Phase	1	1	1

NA—Not applicable.

\*Reduced to 26° C/78° F at 10,000 feet (3.048 meters).

the communications lines. One scanner can attach up to 32 lines through a maximum arrangement of eight line interface couplers.

The communications scanner manages line protocol by executing link control functions, serializes and deserializes data characters, provides character buffering, and controls data circuit-terminating equipment (DCEs). It also performs error detection and correction.

**Line Interface Couplers (LIC)**

The LICs supply ports for connecting communications lines to the 4745. They receive data coming from the lines and transmit it to the scanner, and send information from the scanner back to the lines. For details on the five types of LICs for the 4745, please refer to Table 2.

Line interface couplers can attach half- or full-duplex lines. Each port on a LIC1 can handle a unique protocol, interface type, duplex type, and line speed. Each port on a LIC4 can support a unique duplex type and line speed. In addition, each port on a LIC1, LIC3, LIC4A, or LIC4B can support either direct-attached or DCE-attached devices.

**Operator Interface**

**4747 Console**

The 4745 supports up to two 4747 consoles: a primary console (required) and an alternate console (optional).

The console consists of a 14-inch, 25-line, 2,000-character monochrome display with attached keyboard. The operator can perform a wide range of operations and diagnostic functions with the help of a series of selectable full-page screens.

Users must place the primary console within approximately 13.5 meters (44 feet) of the base unit. The alternate console can be located approximately 150 meters (492 feet) from the base unit if it is connected directly, or placed at a remote site and attached via modems. The alternate console port can be optionally switched to a modem to give Amdahl Diagnostic Assistance Center (AMDAC) access to the 4745 for remote diagnostics and maintenance activities. The user can switch between an alternate console and an AMDAC connection via a switch in the base control panel. Primary and alternate consoles can operate concurrently.

**Control Panel**

The 4745 base unit is equipped with front-mounted control panels that allow access to critical system functions. These panels also contain backup controls for use in case the 4747 console does not operate. Each control panel consists of system status control switches and indicators. The controls enable the operator or maintenance person to power the unit on or off, reset the system, and enable or disable channel interfaces. The base unit control panel has a key for use by the operator to place MOSS in customer mode for normal operation or in customer engineer (CE) mode for maintenance.

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## **Software**

Both models of the Amdahl 4745 Communications Processor can run IBM Advanced Communications Function/Network Control Program (ACF/NCP) software. The ACP/NCP allows Node Type (NT) 2.1 devices to use the LU 6.2 protocol for peer-to-peer sessions over SNA networks with minimal host intervention.

The Amdahl 4745 can also run PEP, EP, as well as program products written for the IBM 3745.

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## **Pricing and Support**

Remote diagnostic service is available through the Amdahl Diagnostic Assistance Center (AMDAC).

Amdahl Customer Services offers installation services, as well as on going local and regional product services. Several support plans are available for the 4745.

The pricing is for the base system only. The 4745-110 costs \$100,650 and the 4745-210 costs \$132,000. ■



# Amdahl 4745 Communications Processor

## **datapro** **ANALYSIS**

In May 1988, Amdahl introduced the 4745 front-end communications processors, which consist of two models: the 4745-110 and 4745-210. Initially, the two models ran IBM's ACF/NCP Version 2, 3, or 4 software, but in April 1989, Amdahl incorporated the capability of running NCP Version 5 into the models. In effect, the 4745 replaces Amdahl's earlier communications processor, the 4725. Both the 4745-110 and 4745-210, as well as the 4725, can be field upgraded to run ACF/NCP Version 5.

The 4745s are the only front-end processors on the market today that can run ACF/NCP Version 2, 3, 4, or 5 on the same hardware without modification. To make the transition from one version to another, the operator need only type simple commands on the 4745's console and load the appropriate ACF/NCP module across the channel or from the 4745's hard disk, a process that takes about five minutes.

### PRODUCT EVALUATION

Amdahl assesses the throughput for the two models in the 4745 Series to be 20 percent greater than the earlier 4725. According to the company, performance tests have demonstrated that the throughput of the 4745 processors is up to 2.2 times greater than competitive units that run ACF/NCP Version 4. Since the products operate under industry-standard software, the processors can be intermixed in networks featuring Amdahl's earlier 4725 and 4705 models, as well as those consisting of IBM 3745, 3725, 3720, and 3705 communications controllers. This intermixing enables customers to enlarge their networks without replacing existing hardware or interrupting operations.

Primarily designed for use in large networks as a remote concentrator or front-end for remote hosts, the Model 4745-110 can support up to 64 lines and two channel adapters. The Model 4745-210, which handles traffic volume in medium-to-large SNA networks, can accommodate up to 256 half- or full-duplex lines and six channel adapters.

Amdahl has paid a great deal of attention to the packaging of these products in order to deliver cost and convenience benefits to users. The company includes integrated inter-

**VENDOR:** Amdahl Corp., 1250 E. Arques Avenue, Sunnyvale, California 94088-3470. Telephone (408) 746-6000.

**CANADIAN DISTRIBUTION:** One First Canadian Place, Fifth Floor, P.O. Box 123, Toronto, Ontario, M5X 1A4. Telephone (416) 862-7479.

**MODELS:** 4745-110; 4745-210.

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

**HOST COMPUTERS SUPPORTED:** Amdahl and IBM plug-compatible mainframes.

**ARCHITECTURE SUPPORTED:** SNA.

**OPERATING SOFTWARE:** ACF/NCP Versions 2, 3, 4, and 5.

**COMPETITION:** NCR Comten, IBM.

**PRICE:** 4745-110—\$100,650; 4745-210—\$132,000.

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nal clock control within the units at no extra cost. To increase reliability and facilitate maintenance, the product design relies heavily on a high level of integration, manifested by the combination of entire functions on a single circuit board. Amdahl also points out that users can physically attach up to 30 percent more lines in the base unit than they could attach in the IBM 3725, an asset that reduces cost and eases the way for upgrading.

Improvements over Amdahl's 4705E communications processor include larger memory, faster scanners, increased power, and higher throughput. These enhancements provide greater line use and more effective connectivity capabilities. The 4745 units also require less floor space than the 4705E, as well as lower cooling and power requirements.

As connectivity needs grow, customers can take advantage of the large-scale network configuration possibilities offered by the 4745. The large storage capacity and the full-duplex transmission modes enable users to connect more devices to their networks. The 4745-110 can support up to 16 direct physical line attachments at a rate of 64K bps, and the 4745-210 can support up to 64 physical line attachments, also at 64K bps, depending upon line use.

## Amdahl 4745 Communications Processor

### MARKET POSITION

Primarily known as a large-systems vendor, Amdahl has prospered since the launch of its 5890 Series mainframe computers in 1986. Strong 5890 sales over the last few years and the introduction of the more powerful 5990 Series mainframes in 1988 have produced record Amdahl earnings and helped to turn this IBM plug-compatible manufacturer into a \$2 billion company. This momentum carried through 1988, allowing Amdahl to achieve three successively strong quarters, including the best first- and second-quarter results in its history.

While Amdahl has tried to diversify its product line by adding storage products, communications hardware, and software and support services, mainframe sales still accounted for an estimated 68 percent of revenues in 1988. Disk products accounted for 12 percent of revenues; com-

munications equipment for 5 percent; maintenance and support for 13 percent; and software and educational services for 2 percent.

In terms of market share in the communications processor field, Amdahl ranks third behind IBM and NCR Comten. The arrival of IBM's 3745 has heightened competition, but Amdahl's response with ACF/NCP Version 5 software for the 4745 should alleviate some of the pressure.

NCR Comten's announcement of the 5655, 5665, and 5675 communications processors in March 1989 has stirred up more competition. These products are also SNA compatible and, according to NCR, offer 2½ times the performance level of the IBM 3745-210 or 1.25 times the performance of a 3745-410 in Twin-in-Dual mode of operation.

### SPECIFICATIONS

**MODELS:** 4745-110; 4745-210.

**DATE OF ANNOUNCEMENT:** May 1988.

**DATE OF FIRST DELIVERY:** June 1988.

**SERVICED BY:** Amdahl Corporation.

#### MODELS

The Amdahl 4745 Communications Processor Series consists of two high-performance models: the 4745-110 and 4745-210. Both models can run either IBM ACF/NCP software for the 3725 or IBM ACF/NCP software for the 3745. Model-210 handles the traffic loads of medium-to-large SNA networks. Model-110 accommodates smaller, high-speed tasks such as remote concentration or applications isolation for security or control reasons. The 4745 can support the following protocols: Binary Synchronous Communication (BSC), asynchronous, SDLC, HDLC, X.25, and X.21.

#### CONFIGURATION

The 4745 Communications Processor consists of the 4745 base unit and the 4747 console. Amdahl offers an optional 4746 expansion unit for the Model-210. The 4745 base unit contains the Communications Control Unit (CCU), Maintenance and Operator Subsystem (MOSS), and main storage.

The base unit of the 4745-110 has two scanners with up to 64 lines. The base unit of the 4745-210 can support up to four scanners with up to 128 lines. The base unit for either model can support up to two channel adapters.

The 4745-110 is configured with 2M bytes of main storage for NCP Version 4 and 4M bytes for NCP Version 5. The 4745-210 is configured with 3M bytes of main storage for NCP Version 4 and 4M bytes for NCP Version 5.

The optional 4746 expansion unit for the 4745-210 allows the user to add up to four scanners, up to 128 lines, and up to four channel adapters. For greater flexibility, users can equip up to two of these four channel adapters with two-processor switches.

The 4745 resides between the host processor(s) and the network terminals. Under the control of an NCP program in main storage, it can connect and disconnect terminals; transmit and receive data between the terminals and host processor(s); and operate and monitor modems, automatic calling units (ACUs), and other communication units.

Attachment to the network takes place locally or remotely. Local attachment occurs via a selector, byte multiplexer, or block multiplexer channel. Remote attachment occurs via a telecommunications link with another communications controller (another 4745, or 4725, 4705, 3705, 3720, 3725, or 3745). Channel adapters control the data transfer between the host and the 4745, and line interface couplers support the attachment between the 4745 and the network.

The minimum configuration for a 4745-110 consists of one base unit with 2M bytes of main storage for NCP 4 and 3M bytes for NCP 5; two communications scanners; one AMDAC modem; one console; and one LIC. This configuration is suitable for a link-attached system. If the user requires channel attachment, the system must have at least one channel adapter.

## Amdahl 4745 Communications Processor

TABLE 1. LIC SPECIFICATIONS

Type	Lines per LIC	Interfaces	Maximum Speeds (K bps)
LIC1	4	RS-232-C/V.24, RS-366/V.25	19.2
LIC2	1	Bell 303	230.4
LIC3	1	V.35	256.0
LIC4A	4	X.21	19.2
LIC4B	1	X.21	256.0

The minimum configuration for a 4745-210 consists of one base unit with 3M bytes of storage for NCP 4 and 4M bytes for NCP 5; two communications scanners; eight LICs; one AMDAC modem; and one console.

The maximum configuration for the 4745-110 consists of one base unit with 2M bytes of storage for NCP 4 and 4M bytes for NCP 5; two communications scanners; 16 LICs; one console; one AMDAC modem; and two channel adapters.

The maximum configuration for the 4745-210 consists of one base unit with 3M bytes of main storage for NCP 4 and 4M bytes for NCP 5; one expansion unit; eight communications scanners; 64 LICs; six channel adapters with 2 two-processor switches, or five channel adapters with 3 two-processor switches, or four channel adapters with 4 two-processor switches; one console and alternate console; and one ADMAC modem.

## PROCESSING COMPONENTS

**Communications Control Unit (CCU).** The heart of the 4745, the CCU, based on emitter coupled logic (ECL) technology, offers a cycle time of 30 nanoseconds. The CCU performs the following:

- fetching instructions from main storage and decoding them for execution;
- executing I/O instructions to the channel adapters and communications scanners;
- processing interrupts;
- managing main storage shared by all 4745 components; and
- interfacing with MOSS and the control panels on the base unit and expansion unit.

To facilitate future upgrades, some components are based on extensive microcoding.

**Main Storage.** The main storage for the 4745 supplies memory space for the control program, software configu-

ration tables, and data buffers. Shared by all major 4745 components, it enables them to communicate with each other. The main storage resides entirely in the base unit.

**Maintenance and Operator Subsystem (MOSS).** The 4745 MOSS, an independent microprocessor-based subsystem, maintains separate connections to all major system components. It furnishes the 4745 with a flexible system for rapidly isolating problems and implementing diagnostic procedures. MOSS also gives operation and maintenance personnel an interface to the system via the console or the control panels located on the base and expansion units.

Additional MOSS features are:

- independent paths to all major system components;
- support of the operation of the 4745;
- monitoring and diagnosing of subsystem problems;
- communication with the 4745 control program; and
- provision of maintenance support, as required.

**Amdahl Diagnostic Assistance Center (AMDAC) Modem.** AMDAC provides the means for the 4745 to be supported remotely from a central site. The customer can authorize AMDAC personnel to access the 4747 console functions to view error messages and system states and to send new microcode online to the 4745. In addition, scanner and channel adapter dumps can be transmitted from the 4745 to AMDAC for analysis. The AMDAC modem is an error-correcting, asynchronous, full-duplex (V.22 BSC) device that operates at rates of 1200 bps or 2400 bps.

**Disk Devices.** A 20M-byte hard disk contains programs that control configurations and enhance diagnostic tests. The hard disk frees the host processor from performing certain operational functions, accelerates program loading, and sends fast prompts to the console. The hard disk can also store two operational NCP load modules and one dump module when the 4745 serves as a remote concentrator. The 4745 is also equipped with a 5/4-inch, 1M-byte diskette that loads start-up diagnostics, microcode, system configurations, and the bootstrap program.

**Channel Adapters.** The channel adapters (CAs) furnish the physical connections and control the data transfer between the host processors and the 4745. Each channel is a CMOS VLSI device that uses microcode to manage data over IBM-compatible block multiplexer channels, selector channels, or byte multiplexer channels. When equipped with the two-processor switch option, a channel adapter can supply a second channel connection to the same host processor or a different processor.

**Two-Processor Switch.** The optional two-processor switch is generally used to switch manually to a backup host in

## Amdahl 4745 Communications Processor

TABLE 2. 4745 SPECIFICATIONS

	Model 4745-110	Model 4745-210
No. of instructions	53	53
Storage capacity	2MB with NCP 4; 4MB with NCP 5	3MB with NCP 4; 4MB with NCP 5
No. of connectable channels	4	8
No. of concurrent hosts	2	6
Maximum number of channel adapters	2	6
Maximum number of communications scanners	2	8
Maximum no. of connectable lines (HDX/FDX)	64	256
Transmission mode	HDX/FDX	HDX/FDX
Synchronization mode	Start stop/ SYN/frame	Start stop/ SYN/frame
No. of character elements	5, 6, 7, 8 bits	5, 6, 7, 8 bits
Monitoring processor	MOSS	MOSS

case of a host system failure. It works with a channel adapter to provide a second channel interface for that adapter. This second channel interface can be connected to a different channel on the same host or to a second host. Users enable the interfaces by a switch on the control panel of the base unit. The operator can enable either interface or both together. The switch does not provide hardware or software multiplexing of data from the channel(s). Usually, only one channel is enabled at a time.

**Communications Scanners.** These devices control data transfer between the 4745 and the terminal equipment in the network. Since the 4745 uses only one type of scanner, users can more easily configure and reconfigure the system. The scanner is a high-performance device that contains a VLSI microprocessor with integrated RAM and a VLSI front-end scanner. The communications scanner controls the line interface couplers that form the actual connections to the communications lines. One scanner can attach up to 32 lines through a maximum arrangement of eight line interface couplers.

The communications scanner manages line protocol by executing link control functions, serializes and deserializes data characters, provides character buffering, and controls data circuit-terminating equipment (DCEs). It also performs error detection and correction.

**Line Interface Couplers (LICs).** The LICs supply ports for connecting communications lines to the 4745. They re-

ceive data coming from the lines and transmit it to the scanner, and send information from the scanner back to the lines. For details on the five types of LICs for the 4745, please refer to Table 1.

Line interface couplers can attach half- or full-duplex lines. Each port on a LIC1 can handle a unique protocol, interface type, duplex type, and line speed. Each port on a LIC4 can support a unique duplex type and line speed. In addition, each port on a LIC1, LIC3, LIC4A, or LIC4B can support either direct-attached or DCE-attached devices.

### OPERATOR INTERFACE

**4747 Console.** The 4745 supports up to two 4747 consoles: a primary console (required) and an alternate console (optional). The console consists of a 14-inch, 25-line, 2,000-character monochrome display with attached keyboard. The operator can perform a wide range of operations and diagnostic functions with the help of a series of selectable full-page screens.

Users must place the primary console within approximately 13.5 meters (44 feet) of the base unit. The alternate console can be approximately 150 meters (492 feet) from the base unit if it is connected directly, or placed at a remote site and attached with modems. The alternate console port can be optionally switched to a modem to give Amdahl Diagnostic Assistance Center (AMDAC) access to the 4745 for remote diagnostics and maintenance activities. The user can switch between an alternate console and an AMDAC connection via a switch in the base control panel. Primary and alternate consoles can operate concurrently.

**Control Panel.** The 4745 base unit and the 4746 expansion unit are equipped with front-mounted control panels that allow access to critical system functions. These panels also contain backup controls for use in case the 4747 console does not operate. Each control panel consists of system status control switches and indicators. The controls enable the operator or maintenance person to power the unit on or off, reset the system, and enable or disable channel interfaces. The base unit control panel has a key for use by the operator to place MOSS in customer mode for normal operation or in customer engineer (CE) mode for maintenance.

### PRICING AND SUPPORT

Amdahl Customer Services offers installation services, as well as ongoing local and regional product services. Several support plans are available for the 4745, including local and remote maintenance options.

The 4745-110 costs \$100,650; the 4745-210 costs \$132,000. □