amdahl®

AMDAHL 4705E
Communications Processor
Overview Manual

amdahl®

AMDAHL 4705E
Communications Processor
Overview Manual

Publication Number: G1056.0–01A
Part Number: BK–119281–001

August 1983

REVISION NOTICE
This is the first edition.

ABSTRACT
This publication provides prospective customers with general information about the AMDAHL 4705E Communications Processor. The manual contains a general discussion of the Amdahl 4705E hardware features, compatibility, technology, and maintenance.

FEDERAL COMMUNICATIONS COMMISSION (FCC) STATEMENT
This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. This equipment has been tested and found to comply with the requirements of Subpart J of Part 15 of FCC Rules for a Class A computing device. Operation of this equipment in a residential area is likely to cause interference in which case the user at its own expense will be required to take whatever measures may be required to correct the interference.

FOR FURTHER INFORMATION
If you wish to obtain further information about the AMDAHL 4705E Communications Processor, contact your Amdahl marketing representative, or write:

Amdahl Corporation
Marketing Communications
M/S 215
P.O. Box 3470
1250 East Arques Avenue
Sunnyvale, CA 94088–3470

READER COMMENT FORM
A reader comment form is provided at the end of this publication. If this form is not available, comments and suggestions may be sent to Amdahl Corporation, Technical Publications Department, Mail Stop 323, P.O. Box 3470, Sunnyvale, CA 94086–3470. All comments and suggestions become the property of Amdahl Corporation.

CONTENTS

FIGURES

TABLES

PREFACE

This publication provides a functional overview of the AMDAHL 4705E Communications Processor. Advanced technology and innovative design techniques, including increased memory size and greater processor speed, demonstrate Amdahl's advanced approach to user's communications requirements.

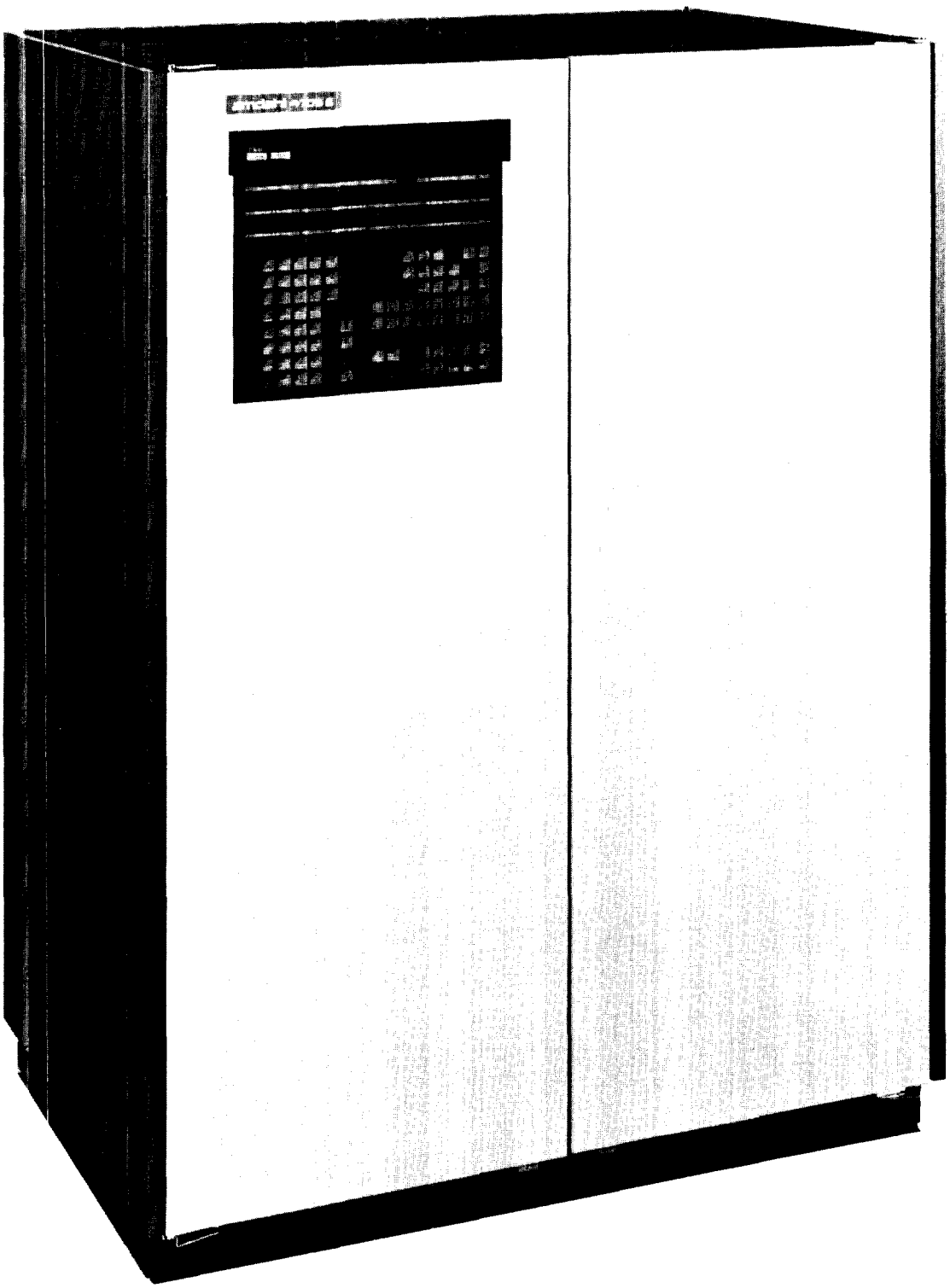
There are four main sections in this publication. In each section it is assumed that a reader is familiar with basic communications processor concepts.

Introduction provides an overview of the major features of the Amdahl 4705E, including a physical description and characteristics.

Compatibility defines the Amdahl 4705E features that provide compatibility with a user's existing and projected future software.

Hardware Description defines the main sections of the Amdahl 4705E.

Maintenance provides an introduction to the Amdahl 4705E's maintenance philosophy.



A05607

INTRODUCTION

The AMDAHL 4705E Communications Processor (hereafter referred to as the Amdahl 4705E) is a compatible programmed transmission control unit that complies with the *IBM 3705–II Principles of Operation*. It is designed to assume many of the line–control and processing functions for a data communication subsystem. In many installations, primary control of the communication network is concentrated in the host processor, with an access method controlling the flow of data to and from the stations (terminals) in the network. Sending and receiving data over the communication lines is a function of the transmission control unit. It operates in response to commands from the access method. In addition to performing the usual functions of transmission control units, the Amdahl 4705E takes over many of the functions of an access method. In this way, the Amdahl 4705E removes much of the control of the data communication subsystem from the host processor. Figure 1 illustrates this centralization of function.

The Amdahl 4705E is a higher performance version of the 4705 (refer to the *AMDAHL 4705 Communications Processor Machine Reference Manual*, G1020.0). The internal performance of the Amdahl 4705E has been measured under controlled conditions (at Amdahl's Benchmark Center) at up to 1.3 times the performance of the 4705 and 2.4 times that of the IBM 3705–II. The improved performance of the Amdahl 4705E can provide a user with the ability to support a larger number of communication terminals on a single Amdahl 4705E system and handle increased traffic due to its higher throughput.

The Amdahl 4705E's performance enhancement, improved reliability, serviceability, and compatibility with IBM architecture are discussed in this manual.

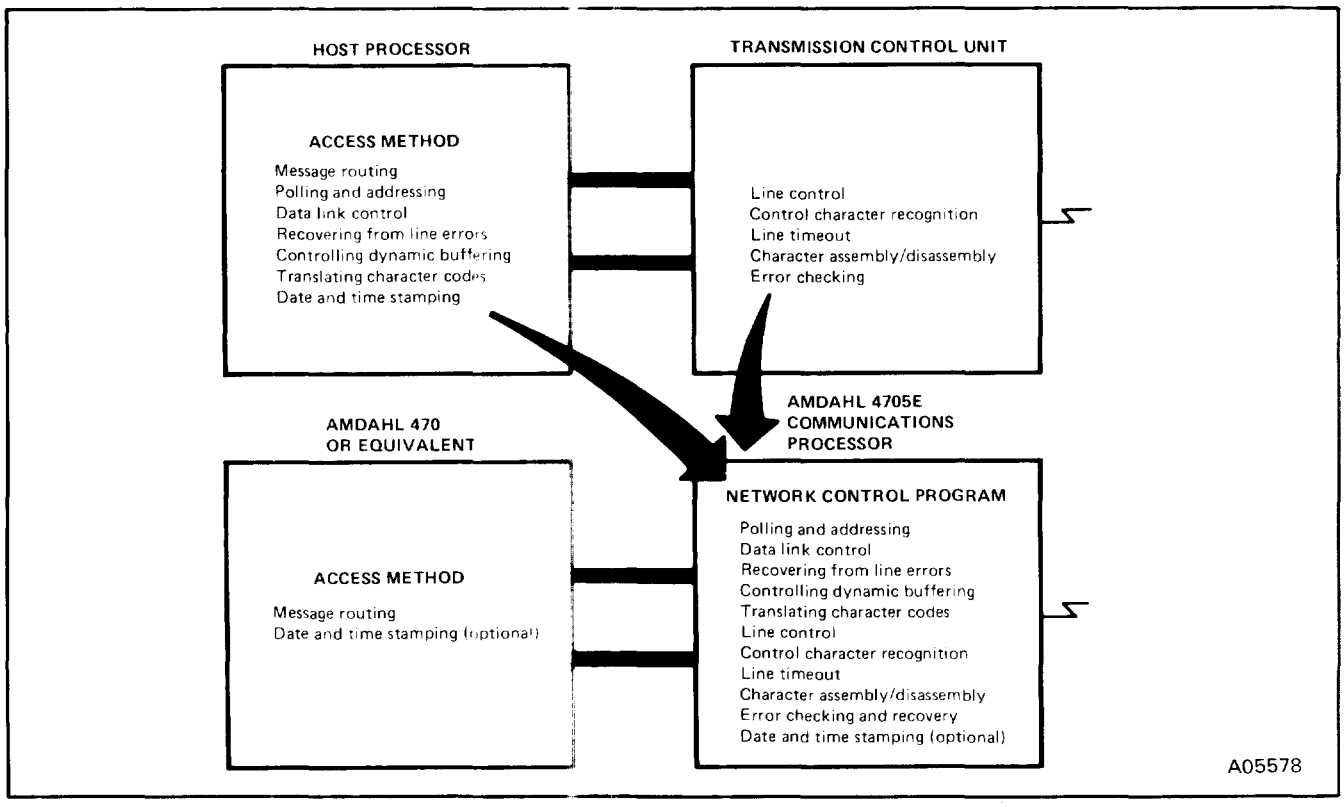


Figure 1. Centralization of Function in the AMDAHL 4705E

AMDAHL 4705E PHYSICAL DESCRIPTION

The Amdahl 4705E consists of a basic frame and up to two expansion frames.

Basic Frame

The basic frame contains the central control unit, channel adapters, control panel, main storage, diagnostic panel, communication scanners, loader, and provisions for mounting line interface bases and line sets, in most cases.

Expansion Frame

An Amdahl 4705E unit can have a maximum of two expansion frames attached. Each expansion frame has provisions for mounting additional line interface bases and line sets.

AMDAHL 4705E PHYSICAL PLANNING REQUIREMENTS

Physical planning requirements for the basic frame and expansion frame (figure 2) are:

- Floor Space (includes service clearance)

Basic frame	2.8 sq. m (30 sq. ft.)
Expansion frame	1.5 sq. m (17 sq. ft.)

- Input Power

Basic frame	3.87 kVA at 50/60 Hz
Expansion frame	1.15 kVA at 50/60 Hz

- Cooling

Basic frame	4.8 kW (16270 Btu/hr)
Expansion frame	1.1 kW (3650 Btu/hr)

For more information about the Amdahl 4705E environmental requirements, as well as specifications for site facilities and input power, see the *AMDAHL 4705/4705E Communications Processor Physical Planning Manual* (G1022.0).

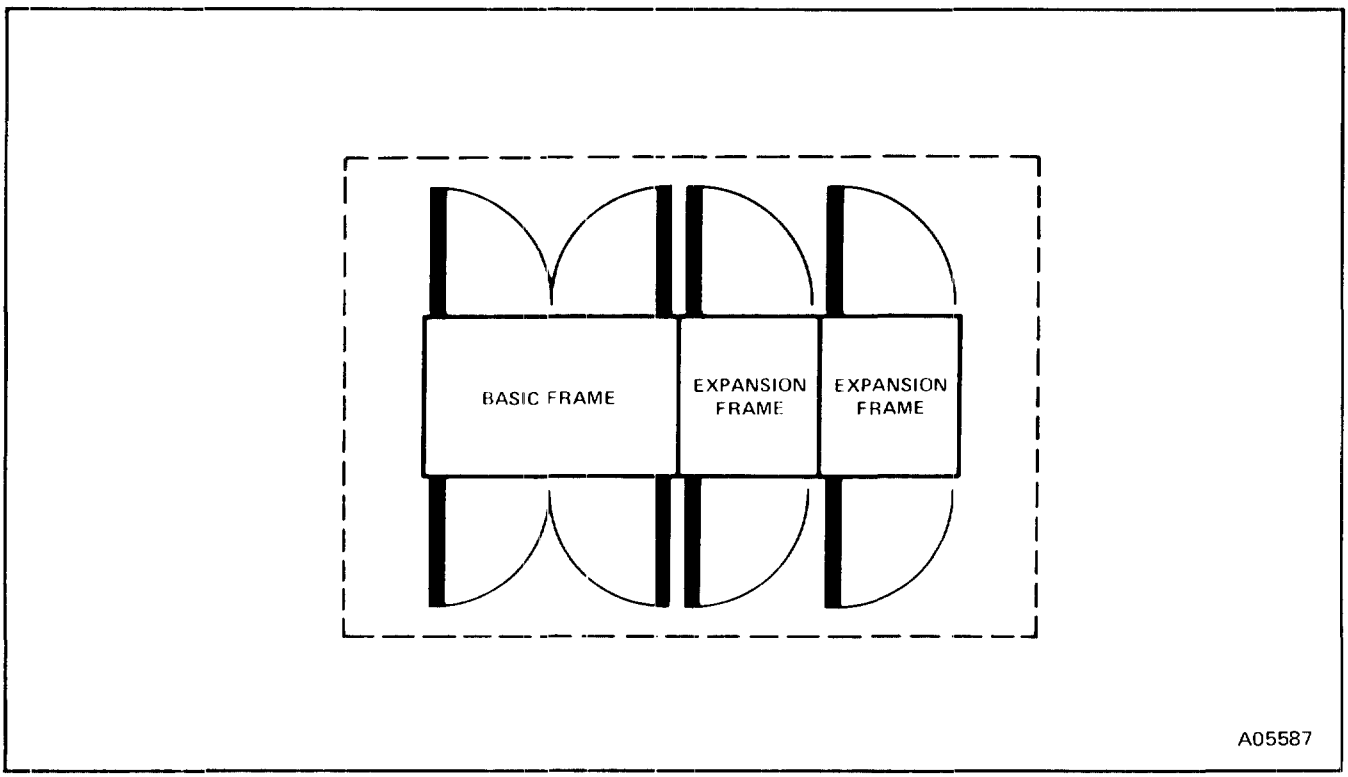


Figure 2. AMDAHL 4705E Configuration

HIGHLIGHTS

The Amdahl 4705E provides the following advantages:

- Advanced technology with proven reliability, availability, and serviceability.
- Reduced space requirements to decrease facilities constraints.
- Touch–operated console panel for simple, accurate use.
- Flexible components to simplify the configuration process.
- Support for ACF/NCP Version 2 (3705) and Version 1, Releases 2.1 and 3.0.

Features

Consider the following features of the Amdahl 4705E:

- Fully programmable.
- Functionally and operationally equivalent to IBM communications controllers.
- Compatible with Amdahl or Amdahl–compatible computer systems.
- Compatible with IBM's 370 computer systems.
- Memory greater than 512 kilobytes (kb), offering from 256 kb to 1024 kb in 256 kb increments.
- Up to four CPU attachments to block or byte multiplexer channels.
- Easy–to–read and efficiently designed control panel as shown in figure 3.
- Maintenance performed by the use of diagnostics, which are on floppy disks.

In addition to the previously mentioned features, the Amdahl 4705E supports currently announced releases of:

- Host access methods VTAM, BTAM, TCAM, and QTAM.
- Communications Processor Software EP, NCP, PEP; including ACF/NCP.
- Systems Network Architecture (SNA).
- Start/Stop, SDLC, BSC, and X.25 line protocols.
- Half– or full–duplex communications with private, leased, or switched, EIA RS232C, Bell 303, CCITT V.24, and V.35 interfaces.
- Line speeds up to 64,000 bits per second.
- Up to 352 half–duplex communication lines.
- Up to 176 full–duplex communication lines.
- Autocall RS366A, CCITT V.25

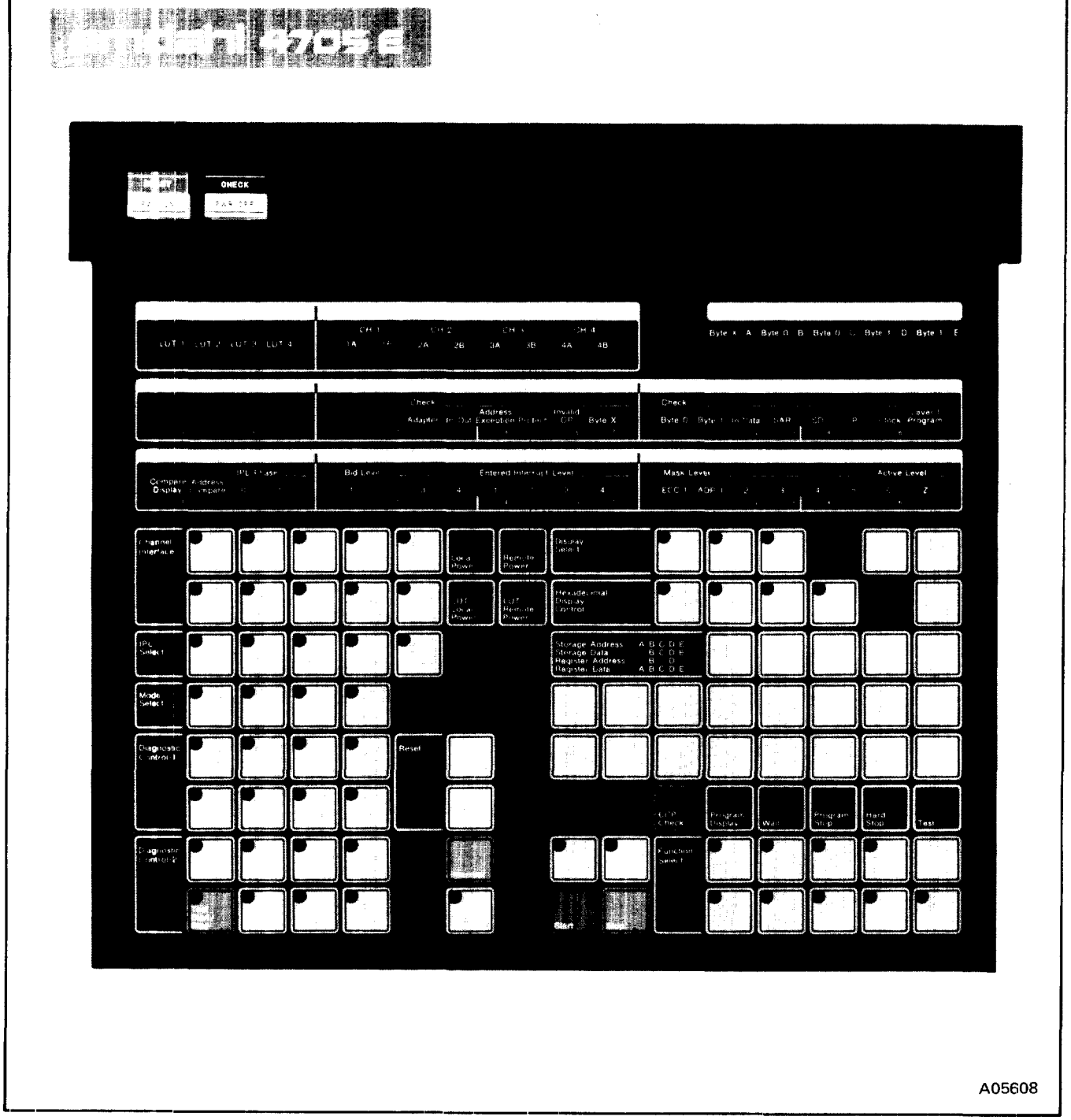


Figure 3. AMDAHL 4705E Control Panel

COMPATIBILITY

The AMDAHL 4705E Communications Processor is a programmable transmission control unit designed to support host systems operating with IBM 360/370 software. The hardware architecture is compatible with Revision 6 of the *IBM 3705–II Principles of Operation*. This compatibility allows IBM 3705–II software to operate in the Amdahl 4705E without modification.

SYSTEM SUPPORT PROGRAMS

The Amdahl 4705E is priority–interrupt driven. This allows the control program to handle service requests at five different priority levels. Control and system support programs are compatible with programs used on the IBM 3705–II. IBM software compatibility allows the following operating programs to be run on the Amdahl 4705E:

1. Emulation Program (EP)
2. Network Control Program (NCP)
3. Partitioned Emulation Program (PEP)
4. Advanced Communications Function for the Network Control Program (ACF/NCP)

The instruction set is composed of the same 51 instructions used on the IBM 3705–II. This IBM instruction set compatibility makes it possible to receive the benefit of IBM software enhancements.

SOFTWARE/HARDWARE RELATIONSHIPS

The central control unit (CCU), directed by the control program, interacts with communication scanners and the channel adapters to control the flow of data through the Communications Processor (CP).

Interaction between the Amdahl 4705E channel adapters and the communication scanners is through interrupts and input/output instructions.

Figure 4 illustrates the data flow to and from the terminal and the host processor through the various parts of the Amdahl 4705E.

Data entered at a terminal is received by the line set (LS) and line interface base (LIB). The communication scanner (CS) recognizes that service is required and receives data from the LIB. The program places the data in storage, making it available to the channel adapter (CA) to be sent to the host processor channel.

When data is to be transmitted from the host processor to a terminal, the process is reversed. The host channel sends the data to the Amdahl 4705E's channel adapter, which places the data in storage. An interrupt request to send the data to the LIB and finally to the terminal is then signaled to the control program.

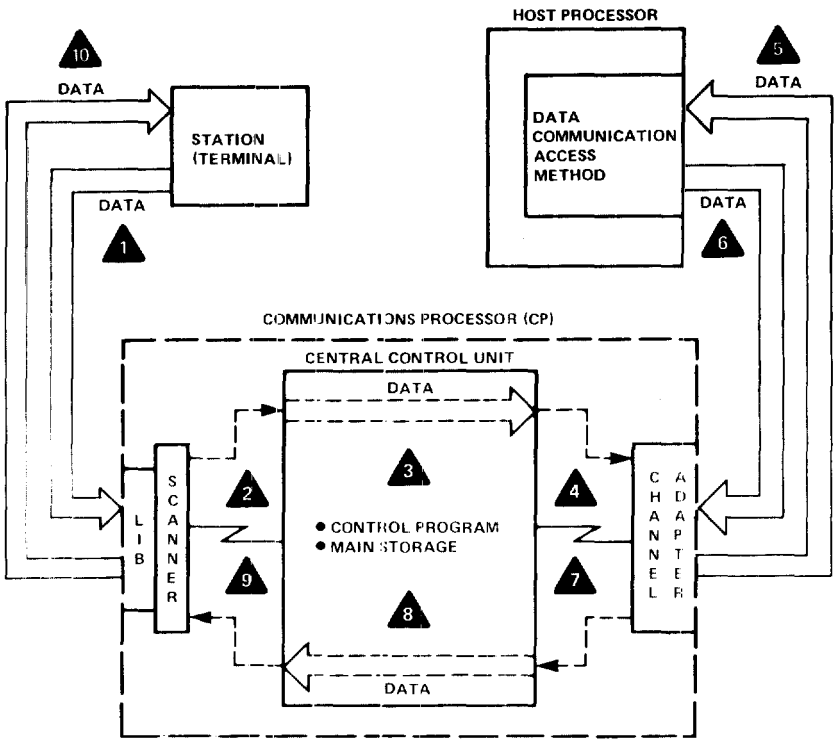
Program Support

Control programs, some of which are licensed programs, are available from IBM for scheduling and controlling the Amdahl 4705E. The control program that resides in the Amdahl 4705E storage controls the transfer of data as it passes through the Amdahl 4705E between the stations in the teleprocessing network and the host processor.

The primary functions of the control program are related to transmitting and receiving data.

Network Control Program

The Network Control Program, which is loaded into the Amdahl 4705E (via the host processor), provides the Amdahl 4705E with the flexibility to meet the demands of an expanding data communications network. The NCP could also be loaded through a link to a host connected Amdahl 4705E, when using the Remote Initial Program Load (RIPL). The Amdahl 4705E executes the NCP, under control of an access method stored in the host processor, and relieves the host processor of much of the responsibility for network management.



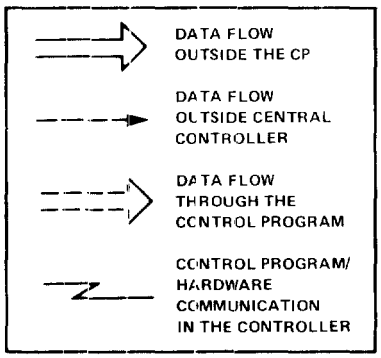
STATION TO HOST PROCESSOR

1. STATION SENDS DATA TO THE CP.
2. COMMUNICATION SCANNER NOTIFIES CONTROL PROGRAM AS DATA ARRIVES.
3. CONTROL PROGRAM PROCESSES DATA, PREPARES IT FOR HOST PROCESSOR.
4. CONTROL PROGRAM ACTIVATES CHANNEL ADAPTER WHEN DATA IS READY TO BE SENT TO HOST PROCESSOR.
5. CHANNEL TRANSFERS DATA TO HOST PROCESSOR.

HOST PROCESSOR TO STATION

6. HOST PROCESSOR SENDS DATA TO THE CP.
7. CHANNEL ADAPTER NOTIFIES CONTROL PROGRAM AS DATA ARRIVES.
8. CONTROL PROGRAM PROCESSES DATA, PREPARES IT FOR STATION.
9. CONTROL PROGRAM ACTIVATES COMMUNICATION SCANNER WHEN DATA IS READY TO BE SENT TO STATION.
10. DATA IS TRANSMITTED ACROSS COMMUNICATION LINE TO STATION.

KEY



A02313

Figure 4. System Data Flow

The network control program performs a wide range of functions for the data communications subsystem. Certain functions are standard for any network control program; others are optional, selected as part of the program generation procedure.

Advanced Communications Function for the Network Control Program

The Advanced Communication Function for the Network Control Program is a licensed IBM version of the NCP that can be run on the Amdahl 4705E. This IBM product works with an access method in the host processor to provide advanced communication function networking, in accordance with the concepts of Systems Network Architecture (SNA).

The networking capabilities of ACF/NCP are particularly appropriate for users who wish to interconnect several locations to share resources and reduce communication costs. Formerly, a network included only a single host computer and a variety of communications processor, cluster, and terminal nodes. Combining the ACF NCP program product with the Amdahl 4705E and access methods, such as the ACF/TCAM or ACF/VTAM, provides a flexible approach to the design of single–system and multi–system data communications networks.

Emulation Program

The Emulation Program allows an Amdahl 4705E to emulate an IBM 270X transmission control unit. The EP allows many application programs written for support of the IBM 270X to operate with the Amdahl 4705E with no modification.

Partitioned Emulation Program

The Partitioned Emulation Program extension of the Network Control Program (either NCP or ACF/NCP) allows the Amdahl 4705E to emulate an IBM 270X transmission control unit for certain lines, while performing network control functions for others.

The principal advantage of the PEP extension is that it allows concurrent operation of existing application or access method programs designed to communicate with an IBM 270X transmission control unit and new (or converted) application programs designed to communicate with NCP or ACF/NCP. Concurrent operation can be valuable during the transition from EP to NCP.

HARDWARE DESCRIPTION

The Amdahl 4705E is composed of modular hardware units. The various hardware units function as follows.

CENTRAL CONTROL UNIT

The central control unit (CCU) contains the circuits and data flow paths needed to execute the instruction set, to address storage, to control the attached adapters, and perform arithmetic and logical processing of data to and from the attached adapters. Operation of the CCU is under control of the programs in storage.

Clock Control

The clock control circuit provides clock pulses and timing signals for all CCU circuits. It also performs clock stop/start control as instructed from the operator control panel. The clock control circuit contains two oscillators (14.28571 MHz and 16 MHz) and waveform shaping logic to ensure proper timing distribution.

Initial Program Load

The initial program load (IPL) control provides various controls for IPL. Its function is to load the bootstrap program (BSP) stored in read-only storage (ROS) into main storage and transfer control to the loaded BSP. The BSP then controls the channel adapters for loading of the control program (i.e. NCP) from the host processor. In systems that require loading (or down line loading) the specialized BSP monitors up to eight different SDLC links over which the Amdahl 4705E can be loaded remotely. That is, with no direct host channel connection required. IPL occurs when any of the following listed conditions occur. Refer to figure 3 for control panel indicator and switch references.

1. Power is switched ON.
2. Reset switch on the panel is ON.
3. WRITE IPL command is received by a channel adapter.
4. Machine check source is detected, except during IPL phase.

Panel Control Circuit

The panel control circuit provides control required for the following functions of the operator control panel:

1. CP and CCU status display and control.
2. Host processor connection switching.
3. Main storage and diagnostic program tests.
4. Operator to control program conversation.
5. Storage Dump Utility for NCP.

Instruction Look-Ahead Circuit

The CCU has an instruction look-ahead function to decrease instruction execution time and increase control program throughput. It consists of an instruction look-ahead circuit and buffer registers to store up to three advance-fetched instructions.

General Register Control Circuit

The CCU has 32 General Registers (GR), each having 20 bits. The registers are in four groups of eight registers.

CCU Control Circuit

The CCU control circuit provides all the controls for instruction execution, cycle steal, and IPL phases 1 and 2.

Registers and Arithmetic Logic Unit

This circuit component consists of a work register and an arithmetic logic unit (R–ALU) to provide various operations for execution of CCU instructions. The R–ALU processes the data input from main storage and various work registers and stores the results of data processing back into main storage.

Interrupt Control

The Amdahl 4705E has five program levels implemented via four interrupt levels and a fifth background level program. The differences in the five program levels are as follows:

1. Interrupt program level one: Hardware and software error handling and initial program loading (IPL).

2. Interrupt program level two: Communication scanner processing.

3. Interrupt program level three: Channel adapter and time supervisory processing.

4. Interrupt program level four: Buffer control management; tasking and queue management supervisor.

5. Background program level: Data and message processing and command management.

Except for levels one and two, which share registers, each interrupt level has its own set of registers to speed processing.

Storage Interface Control

The storage control interface receives storage access requests from various CCU component circuits and controls the storage so that the various components can access the storage. It also corrects single–bit errors and detects all double–bit data errors. Storage protection is provided and is compatible with that of the 3705–II.

MAIN STORAGE

The Amdahl 4705E main storage (MS) uses NMOS FET technology and can accommodate up to 1024 kb of memory in 256 kb increments. Memory access time is 260 ns.

NOTE

NCP was designed to work with up to 512 kb of memory. Amdahl provides a macro change that allows users to take full advantage of the Amdahl 4705E 1024 kb memory size. No changes are made to NCP code, tables, or buffers. Amdahl also supplies modified dump and print routines to accomodate the larger memory size. The Amdahl 4705E does not support RIPL systems with memory sizes that exceed 512 kb.

CHANNEL ADAPTERS

The Amdahl 4705E may be attached, via the proper channel adapter, to Amdahl or compatible processors (such as IBM System/370, 303X, 3081 or 4300 processors). The Amdahl 4705E may be connected to a byte multiplexer, block multiplexer, or selector channel. Type 4 channel adapter (CA4E) is functionally equivalent to the CA4 of the IBM 3705–II. The Amdahl 4705E channel adapter (CA4E) is designed for both the Emulation Program and Network Control Program (NCP) operations.

Two–Channel Switch Feature

The two–channel switch (TCS) provides a means of manually switching the path between the Amdahl 4705E and the host processor. It is connected to a CA4E. The use of this facility permits a CA4E to be connected to two channels. Only one of the channels can be enabled for operation at a time. The enabled channel is selected by means of a manual switch on the control panel.

Remote Initial Program Loader

The remote initial program loader (RIPL) provides the means of remotely loading the NCP through a communication link with or without a channel adapter on the Amdahl 4705E. The use of the RIPL limits the maximum Amdahl 4705E configuration to three CA4Es. A floppy diskette, which contains the programs necessary to initiate loading, is provided (see Loader Unit).

COMMUNICATION SCANNERS

The communication scanners (CS) provide the connection between the CCU and the communication line attachment hardware (line interface bases and line sets). The primary function of the CS is to periodically scan the hardware associated with each communication line for service requests. Two types of communication scanners are available for the Amdahl 4705E. Note that IBM's Type 1 Communications Scanner equivalent is not supplied, since the AMDAHL 4705E Type 2 Communications Scanner replaces it while providing higher throughput performance.

Type 2 Scanner

The type 2 communication scanner (CS2E) executes the I/O instructions from the control program, assembles or disassembles characters, performs various line controls, and requests interrupts from the CCU on a send or receive character basis. This scanner transfers a full byte to or from the CCU. The CS2E supports up to six line interface bases (LIBs) with a maximum capability of 96 lines. This CS2E is functionally equivalent to the IBM 3705–II CS2.

Type 3 Scanner

The type 3 communication scanner (CS3E) in an Amdahl 4705E supports up to four LIBs with a maximum capability of 64 lines and transfers up to 255 bytes of data to or from the control memory store before interrupting the control program for more tasks. The CS3E is very useful for higher performance communication links. This CS3E is functionally equivalent to the IBM 3705–II CS3.

LINE UNIT

The line unit (LUT) is made up of line control unit, line interface bases, and line sets.

Line Control Unit

The line control unit (LC) connects a scanner to the line interface base and line sets. The LC generates all internal clocks used by the line interface base and the line sets. Its basic oscillator is set at 12.288 MHz and is divided for generation of lower speed.

Line Interface Base

The line interface base (LIB) performs the following functions:

1. Relays control signals to and from the LC and line sets.
2. Supplies a send/receive bit timing signal to the line set for each transmission speed.

The Amdahl 4705E offers two types of LIB's (LIB1E and LIB1AE). LIB1E allows a maximum of 16 attachable communication lines (via various types of line sets). The LIB1E is capable of handling various communication line types and speed rates. LIB1AE is capable of handling high speed asynchronous lines at speeds of 4800 bps and 9600 bps along with all of the LIB1E capabilities. These speeds are two and four times the speeds available on the IBM 3705–II. One LIB is required for each four line sets.

Line Sets

The line set (LS) transmits and receives necessary signals to and from a scanner under LIB control. Its major functions are:

1. Detect receive bits from modems.
2. Transmit send bits to modems.
3. Transmit/receive modem control signals.

Many Amdahl 4705E LSs support four lines, unlike the two-line capacity of the IBM 3705-II (table 1). Also, IBM's link problem determination aids (LPDA) capability is supported by HD1LE and FD1LE.

LOADER UNIT

The loader unit is used to load the maintenance program into the Amdahl 4705E when it is in the disabled state. The loader provides the Amdahl 4705E with an independent maintenance IPL capability and source diagnostics from a diskette. The loader adds to the standalone maintenance capability of the Amdahl 4705E by making it possible to run diagnostic tests at any time the Amdahl 4705E is not being used in a network and does not require any host processor involvement. The following functions and hardware are provided with the loader unit:

1. A diskette storage drive and diskette controller that provide a source for the remote load control programs and diagnostic programs.

2. A register for storing the type of program load.

3. A read-only storage (ROS) bootstrap program for initiating IPL from the diskette.

DIAGNOSTIC PANEL

A device called a diagnostic panel is incorporated in the Amdahl 4705E as an aid for troubleshooting. The unit uses an integrated logic probe with an attached readout panel, which may be used as a maintenance tool for determining the logic states of the various hardware circuits. The diagnostic panel enables the field engineer (FE) to troubleshoot the system while the Amdahl 4705E is on-line with the system in full operation. The Amdahl field engineer, with the aid of the diagnostic panel, can diagnose problems and reduce system down time due to Amdahl 4705E failure.

CONTROL PANEL

The Amdahl 4705E control panel is a simple, efficiently designed array of touch-sensitive switches and light-emitting diode (LED) displays that allow operator/program conversation and various debugging and testing techniques. The Amdahl 4705E control panel is shown in figure 3. The major hardware improvements are hexadecimal coded LED read-outs and touch-sensitive switches that take the place of traditional binary control-panel lamps and rotation-type mechanical switches.

SYSTEM CONFIGURATIONS

The base cabinet of the Amdahl 4705E supports up to 160 lines. Two additional cabinets can be connected, increasing the line capacity by up to 96 per cabinet. The base cabinet contains the central control unit, control panel, main storage, loader, diagnostic panel, channel adapters, communication scanners, and provisions for mounting line interface bases and line sets.

Each expansion cabinet has provisions for mounting additional line interface bases and line sets. A maximum of two expansion cabinets may be attached. Since all main storage, channel adapters, and communication scanners are mounted in the first cabinet, the expansion process is simplified.

INTEGRATED LINE SWITCH UNIT

The Integrated Line Switch (ILS) provides an integrated approach to switching communication lines and/or redistributing line loads. With the ILS the need for external line switches and a duplicate set of line interface bases and lines sets in a backup processor can be avoided. Instead, the ILS feature provides the logic, cabinet, and cables necessary to attach and switch a group of line interface units to two different communication scanners. By placing the switchable line sets and LIBs in their own cabinet, power independence and configuration flexibility are retained. One ILS cabinet can support up to two scanner groups of LIBs and line sets (figure 5) depending upon scanner type and number of LIB's required for each scanner.

Table 1. AMDAHL 4705E Communication Line Capabilities

TYPE OF LINE INTERFACE	TRANSMISSION					LINE SETS		LINES PER LINE SET	
	AMDAHL MAX SPEED (BPS)	IBM MAX SPEED (BPS)	TIMING	MODE	LINE	AMDAHL	IBM APPROXIMATE EQUIVALENT	AMDAHL	IBM
External RS232C Modem	2,400§	2,400*	Asychro-nous	Half Duplex	Leased or Switched	HD1E or HD1LE†	1D	4	2
	19,200	9,600	Synchro-nous	Half Duplex	Leased or Switched				
	19,200	9,600	Synchro-nous	Full Duplex	Leased or Switched	FD1E or FD1LE†	1H	2	1
	2,400§	2,400*	Asychro-nous	Full Duplex	Leased or Switched				
Wideband (Bell 303)	64,000	50,000	Synchro-nous	Half Duplex	Leased	HD1GE	1G	2	1
	64,000	50,000	Synchro-nous	Full Duplex	Leased	HD1TE	1T	1	1
External CCITT V35	64,000	56,000	Synchro-nous	Half Duplex	Leased	HD2E	1S	2	1
	64,000	56,000	Synchro-nous	Full Duplex	Leased	FD2E	1U	1	1
Local Attach-ment	2,400§	2,400	Asynchro-nous	Half Duplex	Cables	LA1CE	1C	4	2
	2,400‡	2,400	Synchro-nous	Half Duplex	Cables	LA1FE	1F	4	2
Automatic Dialing (RS366)					ACU	NC1E	1E	2	2
	2,400§	1,200	Asynchro-nous	Half Duplex	Switched	NC1E	1E	2	0
	19,200	9,600	Synchro-nous	Half Duplex	Switched			2	0

* Max speed for IBM 3725 is 1,200 bps.
† Provides support for IBM LPDA facility.
‡ RPQ only.
§ Max speed is 9,600 bps when using LIB1AE.

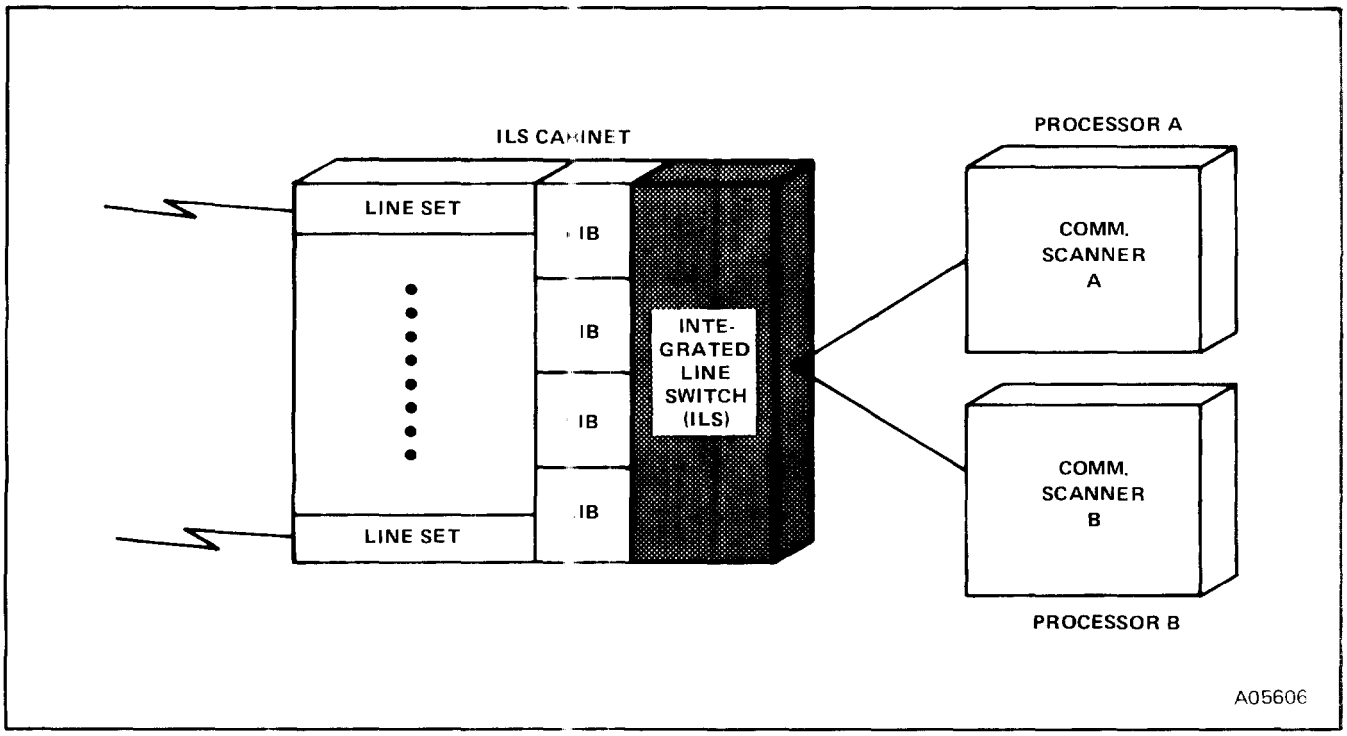


Figure 5 Integrated Line Switch

HIGH SPEED ASYNCHRONOUS SUPPORT

The Amdahl 4705E encourages use of asynchronous devices at speeds greater than 2400 bps. The LIB1AE supports internally clocked async devices such as graphic terminals or personal computers at 4800, 7200, and 9600 bps. The LIB1AE can support async lines running at up to four rates as well as supporting synchronous lines running at their normal rates. The LIB1AE provides a rate multiplier factor so that a user can set a line at normal rate (i.e. 2400 bps) in his system generation process and actually run the line at four times that rate (i.e. 9600 bps).

RPQ ITEMS (REQUEST FOR PRICE QUOTATION)

Several components have RPQ status on the Amdahl 4705E. Their availability and price must be obtained from headquarters marketing as the need arises.

The following items are presently defined as RPQ for the Amdahl 4705E:

- CA2E – Channel Adapter
- CA3E – Channel Adapter
- FD1BE – FDX, asynchronous, slow speed
- LA1FE – local attach, medium speed

Items on the RPQ status are available in limited quantities and may be discontinued without notice.

MAINTENANCE

Much of the improved reliability and serviceability of the Amdahl 4705E comes from the modular design of the hardware. The modular design not only allows the Amdahl 4705E to grow easily to meet the needs of an expanding data communications system, but also decreases the mean-time-to-repair.

MAINTENANCE PHILOSOPHY

Online network systems are composed of a variety of units, including host central processor units and terminals. As a result, failures in such systems may include a wide range of possible causes. In order to trace the source of a failure, it is first necessary to grasp the nature of the failure and programs to determine the cause of the error as quickly as possible.

The Amdahl 4705E uses maintenance programs and various maintenance test devices to help determine the location of failures, diagnose signs of trouble, and, finally, test and confirm the repairs performed. It should be noted, however, that in troubleshooting a system failure during online processing, it is important to minimize the repair time without affecting the network system as it operates.

The Amdahl 4705E hardware is designed with loopback functions for various sections. These functions can verify hardware integrity by having comparisons made between data leaving a certain unit and the data received. These loopback functions may be utilized by maintenance programs and maintenance analysis procedures to isolate errors. A useful feature is the internal line unit loopback function. The diagnostics make use of the Amdahl 4705E's ability to loop the channel interface (problems here are infrequent, but are difficult to diagnose in traditional communications processors).

Extended Maintenance Operating System

The Extended Maintenance Operating System (EMOS) test system is the Amdahl 4705E stand-alone maintenance program that is run independently from the general purpose operating system. Consequently, it can only be executed during host system routine maintenance and system shutdown. The EMOS test system was developed to be an aid to the FE during maintenance. EMOS test system aids the FE as follows:

- Execution of tests which are otherwise impossible to perform with a maintenance program operated under a general purpose operating system.
- Overall testing of the hardware system.
- Simplification of operation and ease of maintenance work.
- To cope with flexibility for system expansion. That is, when the system configuration has been changed, the system configuration can be temporarily altered without lengthy system regeneration.

Internal Functional Test

The Internal Functional Test (IFT) is a set of programs with which the Amdahl 4705E tests itself internally without dependence on the CPU and outside connections. The IFTs can be loaded into the Amdahl 4705E by an internal diskette and have the capability to test the Amdahl 4705E independently. The host processor is not required to execute the tests. It is possible to execute the IFTs at any time the Amdahl 4705E is not being used. The IFTs:

1. Test the CP.
2. Interact with the operator through the control panel.
3. Test each unit individually: the CCU, the CSs, the CAs, and the MS.
4. Are stored in the main storage of the Amdahl 4705E by IPL from an internal diskette (internal loader unit) or from the host processor channel after being read from an EMOS tape.

Diagnostic Panel

The field engineer can use a self contained hardware monitor to view the latch-settings within the various Amdahl 4705E units. This display can assist greatly in problem isolation.

Ease of maintenance and efficient installation packaging results in the improved reliability and serviceability of the Amdahl 4705E.

GLOSSARY

Advanced Communication Function (ACF). An IBM program product.

Attachment Base (AB). A communications processor hardware feature that provides the controls to the central control unit for the attached adapters.

Basic Telecommunications Access Method (BTAM). A primitive access that permits host application programs to communicate with remote devices via the EP in the Amdahl 4705E.

Binary Synchronous Communication (BSC). IBM's version of character-oriented synchronous transmission in which data is transferred in blocks with synchronization characters on the front end and error control on the rear.

Bits Per Second (bps). In serial transmission, the speed with which a device or channel transmits data.

Byte Multiplexer Channel (BMX). A multiplexer channel that interleaves bytes of data. A BMX can be used to connect the Amdahl 4705E to a host CPU.

CA4E. Channel adapter, type four.

CCITT V.24. International version of EIA RS232C (see EIA RS232C).

CCITT V.25. NC1 Autocall, RS366A.

CCITT V.35. A standard data transmission interface for sending and receiving stations using digital type communications.

Central Control Unit (CCU). A communications processor hardware unit that contains the circuits and data flow paths needed to execute the instruction set and to control controller storage and the attached adapters.

Central Processing Unit (CPU). A unit of a computer that includes circuits controlling the interpretation and execution of instructions. It is used in this manual to refer to the host attached to the Amdahl 4705 communications processor.

Channel Adapter (CA). A communications processor hardware unit that provides attachment of the controller to an Amdahl 470 or 580 or equivalent host processor channel.

Communications Processor (CP). A type of transmission control unit whose operations are controlled by a program stored and executed in the unit. Examples are the AMDAHL 4705, 4705E and IBM 3705 Communication Processors.

Communication Scanner (CS). A communication scanner provides the connection between CCU and the communication line attachment hardware.

CS2E. Communication scanner, type 2.

CS3E. Communication scanner, type 3.

Diagnostic Panel. A device incorporated in the AMDAHL 4705E Communications Processor as an aid for troubleshooting (sometimes called Lamp Unit).

EIA RS232C. The USA standard defining the interface between the modem and the "business machine" (Amdahl 4705E line set or a terminal).

Emulation Program (EP). The program in the Amdahl 4705E that allows it to simulate a hardwired 270X. It also allows connection to BTAM, QTAM, or TCAM in a host.

Extended Maintenance Operating System (EMOS) test system. A stand alone maintenance program run independently from the general purpose operating system.

Integrated Line Switch Unit (ILS). The unit allows communications processor backup and can help to balance the load between them.

Internal Functional Test (IFT). A set of programs with which the AMDAHL 4705E Communications Processor tests itself internally without dependence on outside connections.

Initial Program Load (IPL). The initiation procedure that causes an operating system to commence operation.

kilo (k). A 1,000 unit in decimal notation. The small k is also the notation for 1,024 used in computer abbreviations.

Line Interface Base (LIB). An Amdahl 4705E hardware unit that provides for the interface of line sets to the line control unit.

Line Set (LS). An AMDAHL 4705E Communications Processor hardware unit through which communication lines and line units are attached to a line interface base.

Line Unit Control (LUT). The Amdahl 4705E line unit is composed of line interface bases and line sets with a line control unit section for scanner connection.

Maintenance Analysis Procedures (MAP). Directions outlining any activity, such as tests, measurements, replacements, adjustments, and repairs, intended to eliminate faults or to keep a functional unit in a specified state. For use by FE.

Main Storage (MS). The primary semiconductor memory using NMOS technology in the AMDAHL 4705E Communications Processor.

Multiplex (MUX). To interleave two or more messages on a single channel. Also a type of channel used to connect the Amdahl 4705E to the host CPU.

Network Control Program (NCP). A program, generated by the user from a library of IBM-supplied modules, that controls the operation of a communication processor used in conjunction with VTAM or TCAM.

NC1. Automatic Dialing type line set. Also has two standard RS232 interfaces.

N-Channel-Metal-Oxide-Semiconductor Field Effect Transistor (NMOS FET). The technology used to manufacture memory for the Amdahl 4705E.

Partitioned Emulation Programming (PEP). A feature of the Network Control Program that allows the Amdahl 4705E to emulate a IBM 270X transmission control unit for certain lines, while performing network control functions for others.

Protocol. Rules establishing standards for communication sequences between users.

Queued Telecommunications Access Method (QTAM). Host interface program which allows host programs to communicate with remote devices via EP in the Amdahl 4705E.

Read-Only-Storage (ROS). The Amdahl 4705E ROS holds the bootstrap programs used during IPL.

Remote Initial Program Loader (RIPL). A hardware feature of the AMDAHL 4705E Communications Processor that provides the means of remotely loading the NCP, via an SDLC link, with or without a channel adapter on the Amdahl 4705E.

Synchronous Data Link Control (SDLC). IBM's version of a bit-oriented communications protocol used in SNA.

System Network Architecture (SNA). IBM's method for implementing networks.

Telecommunications Access Method (TCAM). Allows host application programs to communicate with remote devices via EP or NCP in the Amdahl 4705E.

Two-Channel Switch (TCS). A hardware feature of the AMDAHL 4705E Communications Processor that allows the Amdahl 4705E to be attached to two channels through a single, type four channel adapter. Only one path is active at a time.

Virtual Telecommunications Access Method (VTAM). A set of programs in the host that controls communication between terminals and application programs running under DOS/VS, OS/VS1, OS/VS2 using PEP or NCP in the Amdahl 4705E.

amdahl

AMDAHL CORPORATION
1250 EAST ARQUES AVENUE
P.O. BOX 3470
SUNNYVALE, CALIFORNIA 94088-3470

READER COMMENT FORM

WE WOULD APPRECIATE YOUR COMMENTS AND SUGGESTIONS FOR IMPROVING THIS PUBLICATION.

Publication No.	Title	Current Date

How did you use this publication?
☐ Study ☐ Installation ☐ Sales
☐ Reference ☐ Maintenance ☐ Operations

What is your occupation?

What is your overall rating of this publication?
☐ Very Good ☐ Fair ☐ Very Poor
☐ Good ☐ Poor

Is the material presented effectively?
☐ Well organized ☐ Fully covered ☐ Clear
☐ Correct ☐ Well illustrated

Please enter your other comments below. If you were in any way dissatisfied with this publication, we would like to know why. Be specific, if possible; give page, column, and line number references where applicable.

All comments and suggestions become the property of Amdahl Corporation.

Your name & return address (include ZIP code):

AM 2283 1/84

Thank you for your interest. Fold and fasten as shown on back. No postage necessary if mailed in U.S.A.

FOLD AND TAPE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 741 SUNNYVALE, CA

POSTAGE WILL BE PAID BY ADDRESSEE

ATTENTION: TECHNICAL PUBLICATIONS
M/S 323

amdahl®

AMDAHL CORPORATION
1250 EAST ARQUES AVENUE
P.O. BOX 3470
SUNNYVALE, CALIFORNIA 94088-3470

FOLD AND TAPE