MARK 2E

System Installation/ Maintenance Manual

POINT DATA CORPORATION

POINT 4 DATA CORPORATION

MARK 2E

SYSTEM INSTALLATION/ MAINTENANCE MANUAL

Revision A

NOTICE

Every attempt has been made to make this manual complete, accurate and up-to-date. However, all information herein is subject to change due to updates. All inquiries concerning this manual should be directed to POINT 4 Data Corporation.

WARNING!

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference. Only shielded cables with the shield terminated to the metal hood of the connector should be used. Use of non-POINT 4 cables may violate FCC rules.

POINT 4 Data Corporation
15442 Del Amo Avenue
Tustin, CA 92680
(714) 259-0777

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PREFACE

The POINT 4 MARK 2E System Installation and Maintenance Manual is designed for value added resellers, installers, maintenance and service persons of the MARK 2E minicomputer system. Its purpose is to provide instructions for installing, upgrading, and maintaining the system. The manual contains the following sections: overview, specifications, installing the system, starting up, upgrading the system, troubleshooting, removing and replacing components, and powerfail instructions.

The overview describes the MARK 2E components, the options available, and the peripherals supported. The specifications section provides physical, power, and environmental information and requirements for the system and its optimum setting. Installing the system consists of a checkout procedure to help ensure correct installation. The section on starting up describes the controls and indicators and the self-tests of the system; procedures for powering up are also provided. The section on upgrading provides instructions for extending the basic system by increasing memory or the number of ports, and for adding options such as an expansion memory board, floppy diskette drive, or a bisynchronous board. If a problem occurs, a troubleshooting section suggests a routine to help locate the problem or malfunction by using MANIP, checking out the system, and using diagnostics. If it is necessary to remove and replace a part, instructions for doing so are in the section on removing and replacing components. The last section gives instructions for what to do in a powerfail situation.

A glossary is included to define the terms associated with the MARK 2E, POINT 4 products, and computer systems.

Standard Writing Conventions

< >	Angle bracket symbols around any character or word refer to a specific key on the keyboard.
<RETURN>	Indicates a carriage return. It is required to activate a command input. Procedures normally do not state press <RETURN> unless the procedure repeats what is displayed on the terminal.
<CTRL-a>	Indicates a control character where "a" is an alpha key. It is entered by holding down the CTRL key and pressing the alpha key indicated. Both keys are then released.

enter — "Enter" means that the user is to type the specified information and then press <RETURN>.

default — A parameter value established by the system. For example, the system default for the Manager password is X. This and other defaults may be changed.

Related Manuals

Related Manuals include:

Title	Pub. Number
MARK 2/4 DISCUTILITY (DU.WDI) Technical Memorandum	STP-0026
MARK 2/2E/3/4 System Diagnostic Document	HTP-0046
MARK 2/2E/3/4 Mux Diagnostic Document	HTP-0042
MARK 2/2E/4 Disk/Diskette/Tape Diagnostic	HTP-0043
MARK 2E/4 Map and Memory Diagnostic Document	HTP-0045
HITS.19 - RS232 Serial Interfaces and New (MARK 2E) Modular Connectors	
IRIS R9 System Configuration Manual	SM-030-0029
IRIS R9 Peripherals Handbook	SM-030-0032
IRIS R9 User Reference Manual	SM-030-0034
IRIS R8 Installation and Configuration Manual	SM-030-0009
IRIS R8 Peripherals Handbook	SM-030-0018
IRIS R8 User Manual	SM-030-0011

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Section 1
OVERVIEW

The POINT 4 MARK 2E is a multi-user, business minicomputer that is designed for desk or table top use (see Figure 1-1). It can support 17 users, performs 3.6 million instructions per second (MIPS) and has up to 1MB mapped main memory. The MARK 2E is shipped fully assembled and is ready for use after minimal installation.

The MARK 2E utilizes the POINT 4 IRIS (Interactive Real-Time Information System) Operating System, R9.0* and subsequent revisions and can run existing application software written in IRIS Business BASIC and SMbasic.

This Overview contains descriptions of the MARK 2E components, options and peripherals.

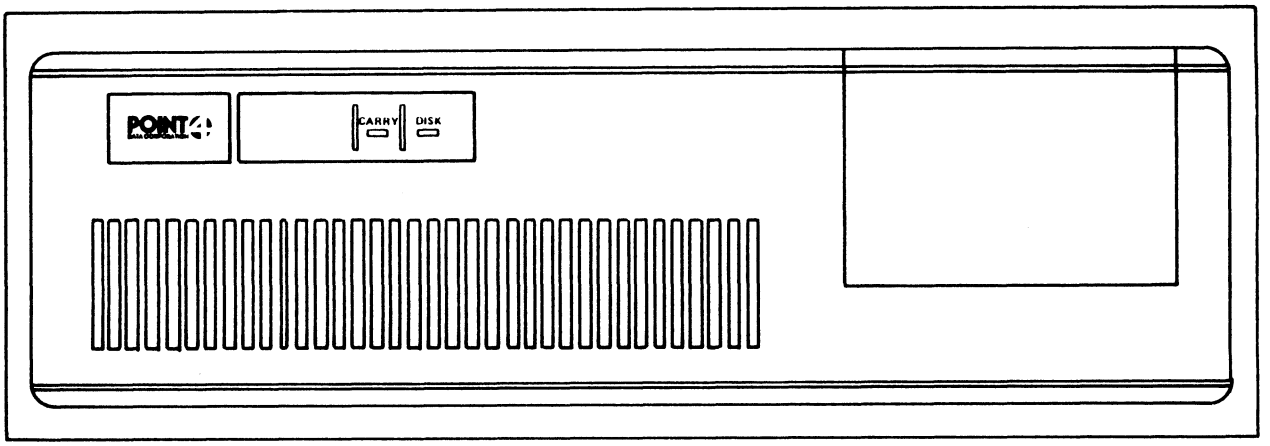


Figure 1-1. POINT 4 MARK 2E Minicomputer System

*With a special patch, the MARK 2E can be used with IRIS R8.3E.

1.1 GENERAL DESCRIPTION OF MARK 2E

The MARK 2E is housed in a cabinet designed for desk or table top use. The basic system consists of the MARK 2E chassis, power supply, 256KB memory, four ports, 27MB disk drive, 60MB streaming cartridge tape drive, and mapped IRIS license. The capabilities of the basic system can be extended by adding memory, ports, or any of the options listed in Section 1.2. The following subsections describe the MARK 2E components and their major characteristics.

1.1.1 Cabinet

The MARK 2E cabinet is a compact unit that contains the chassis, the power supply and the system peripherals. Indicators on the front panel show system activity; switches on the right side and the rear control system operations. The cover removes easily to provide easy access to all internal components.

1.1.2 Power Supply

A 200-watt power supply provides power for the central processing unit (CPU), controllers and system peripherals. It is contained in a closed-frame package located in the rear, right side of the chassis. Power controls are on the right side and the rear. For information on power specifications, see Section 2.2.

1.1.3 Central Processing Unit (CPU)

The 16-bit central processing unit (CPU) operates on a 280-nanosecond cycle time and executes instructions at a rate of 3.6 million instructions per second (MIPS). It uses 5-volt TTL circuitry on a single 4-layer board, and it has a real-time clock set to a standard 10 Hertz.

The basic system has a mapped main memory capacity of 256KB. This capacity can be extended to 512KB by changing a programmable array logic (PAL*) integrated circuit and adding memory integrated circuits to the CPU board, or to 1MB by adding an optional expansion memory board.

Throughout this manual, the CPU is referred to as the CPU/mother board. This designation is applied because the CPU board performs backplane functions in addition to the usual computational operations. It accomplishes this by using a single micro-engine to perform CPU operations and to drive the peripherals interface board (PIB) and the asynchronous boards. These boards and the expansion memory board, if present, plug into connectors on the CPU/mother board.

*PAL is a registered trademark of Monolithic Memories, Inc.

1.1.4 Peripherals Interface Board (PIB)

The peripherals interface board (PIB) links the peripherals (i.e., the disk drive, the streaming cartridge tape drive, and, if present, the floppy disk drive) to the CPU. Its function is to provide control information and to direct data transfer between the CPU and the peripherals. This is accomplished by two I/O channels, provided by the PIB and driven by the CPU, that communicate between the micro-engine and the disk/floppy controller board and the streaming cartridge tape drive.

1.1.5 Asynchronous Board(s)

The basic MARK 2E contains one asynchronous board with four ports. The system can support a maximum of four boards, each with four ports, for a total of 16 asynchronous ports. Each port provides a communication link between the processor and an external peripheral such as a workstation or a printer. Each board plugs into connectors on the CPU/mother board and is driven by the micro-engine.

Each port has individually software programmable characteristics. This allows the selection of the number of bits per character; the number of stop bits; and odd, even, or no parity.

The connector at each port is an eight-pin, RJ-45 modular phone-type connector with RS-232C standard voltage levels for connection to external devices. It is compatible with a four, six, or eight-pin modular phone-type connector.

Baud rates are switch selectable.

1.1.6 Disk/Floppy Controller Board

The disk/floppy controller board controls the Winchester disk drive and, if present, the floppy disk drive. It sits on top of the Winchester disk drive and is controlled by the micro-engine via the PIB board.

1.1.7 Winchester Disk Drive

The Mark 2E uses a 5-1/4-inch Winchester disk drive (ST506/412 interface). Although the basic system is furnished with a 27MB drive, 55, 86, and 143MB drives are also available. Only a single drive can be used in the MARK 2E system.

1.1.8 Streaming Cartridge Tape Drive

A 1/4-inch (QIC-02) streaming cartridge tape drive is standard on MARK 2E systems. Its storage capacity is 45MB, or with the addition of an appropriate cartridge, 60MB.

1.1.9 Mapped IRIS License

The MARK 2E is supported by IRIS (Interactive Real-time Information System) R9.0 or subsequent revisions. It can also use IRIS R8.3E providing a patch is applied specifically for that purpose. The patch is available upon request.

The mapped IRIS software license includes Business BASIC, ABASIC, Utilities and the mapped IRIS feature for the MARK 2E. The SMbasic Interpreter and Utilities are available at no extra cost.

1.1.10 Pico-N

The Pico-N is a security device that must be installed on POINT 4 computers before the IRIS Operating System can be run. It protects against unauthorized use of software.

The MARK 2E can use a standard Pico-N or a miniature Pico-N designed just for the MARK 2E. When available, the miniature Pico-N will be shipped with all systems using the IRIS Operating System.

1.2 OPTIONS

Three options can be added to the MARK 2E to expand its capabilities: an expansion memory board, a bisynchronous board, and a floppy disk drive. These options are described in the following subsections.

1.2.1 Expansion Memory Board

A 512KB expansion memory board can be added to a MARK 2E that has already been expanded to 512KB to bring the total memory capacity to 1MB. The expansion memory board plugs into a connector on the CPU/mother board.

1.2.2 Bisynchronous Board

A bisynchronous board can be added to the MARK 2E to provide more efficient communication of large volumes of data. It is mounted on a board support bracket on the chassis and is connected to the first asynchronous board in the system. It can be added as the 5th, 9th, 13th, or 17th port.

1.2.3 Floppy Disk Drive

A 5-1/4-inch floppy disk drive with a 1MB capacity can be added to a MARK 2E. The floppy drive is mounted above the streaming cartridge tape drive.

Double-density (MFM), double-sided floppy disks are required.

1.3 PERIPHERALS

A complete range of peripherals compatible with the MARK 2E is available from various manufacturers. Peripherals that can interface with the MARK 2E are: video display and printing terminals, line and character printers, plotters, and modems.

Section 2
SPECIFICATIONS

To ensure optimum performance, it is important that a system be placed in the proper environment. The physical, power, and environmental specifications in this section provide information about the best setting for the MARK 2E to ensure optimum performance.

2.1 PHYSICAL

1. Cabinet

Height:	6.50 inches (16.5 cm)
Width:	21 inches (53.3 cm)
Depth:	16 inches (40.6 cm)
Weight:	45 pounds (20 kgs)

2. Boards

MARK 2E boards are not interchangeable with any other POINT 4 computer boards except for the disk/floppy controller board.

Table 2-1 lists the MARK 2E boards, part numbers, and references the sections that contain the board illustrations.

TABLE 2-1. MARK 2E SYSTEM BOARDS

Board	Part Number	Illustrated in Section
Central Processing Unit (CPU) 256KB 512KB	053029-02 053029-01	7.3.3 7.3.3
Peripherals Interface Board (PIB)	053032	7.3.1
Disk/Floppy Controller	901800 WD1002-05	7.3.2
Asynchronous	053030	5.1.2
Bisynchronous	053031	5.2.2
Expansion Memory	053033	5.2.1

2.2 POWER REQUIREMENTS

The power requirements for the MARK 2E are:

1. AC Wiring

   POINT 4 recommends a three-wired line (AC high, AC low and AC earth ground) free of excessive noise. Sharing a line with equipment that draws high energy such as a motor, or turns on and off repeatedly can adversely affect system performance.

2. Power Supply

   a. AC Input Power

      The required AC inputs for the MARK 2E power supply are:

      Voltages: 90-130 volts, switch selectable
      180-260 volts, switch selectable

      Frequency: 47-63 Hz

      Fuse: 5 amps internal to power supply (U.S.)
      2.5 amps (international)

   b. DC Output Power

      The MARK 2E power supply is 200 watts. It provides power for all logic and peripherals. Table 2-2 lists the voltages and their tolerances.

   c. Heat Dissipation: 682 British Thermal Units

TABLE 2-2. MARK 2E VOLTAGES AND TOLERANCES

Voltage	Tolerance
+5V	5%
-5V	5%
+12V	5%
-12V	5%

2.3 ENVIRONMENTAL

1. Placement

   The MARK 2E should be placed out of direct sunlight and with at least six inches of space around its sides for free air circulation.

2. Temperature

Operating:	+41 to +95°F	+5 to +35°C
Non-Operating:	-4 to +185°F	-20 to +85°C

3. Humidity: 5 to 95% noncondensing

Section 3
INSTALLING THE SYSTEM

Because the MARK 2E system is delivered fully assembled and housed in a compact cabinet, its installation is quick and easy to accomplish. The installation procedure consists of a system checkout to ensure that internal system components are intact and in place. Once the checkout is completed, the cables connecting the external peripherals may be installed. Appendix A provides signal lists; wiring diagrams for CRT, printer and modem cables; and related information.

3.1 SYSTEM CHECKOUT

Complete the system checkout according to the instructions that follow:

1. After unpacking the MARK 2E, place it on the desk or table on which it is to be used. Be sure there is access to the rear of the computer.

2. Make certain that the power switch on the right side is turned OFF.

3. Remove the chassis cover as follows:

   a. Remove the four corner screws located on the rear of the chassis (see Figure 3-1). Set the screws aside.

   b. Slide the cover forward, off the front of the chassis. Set it aside.

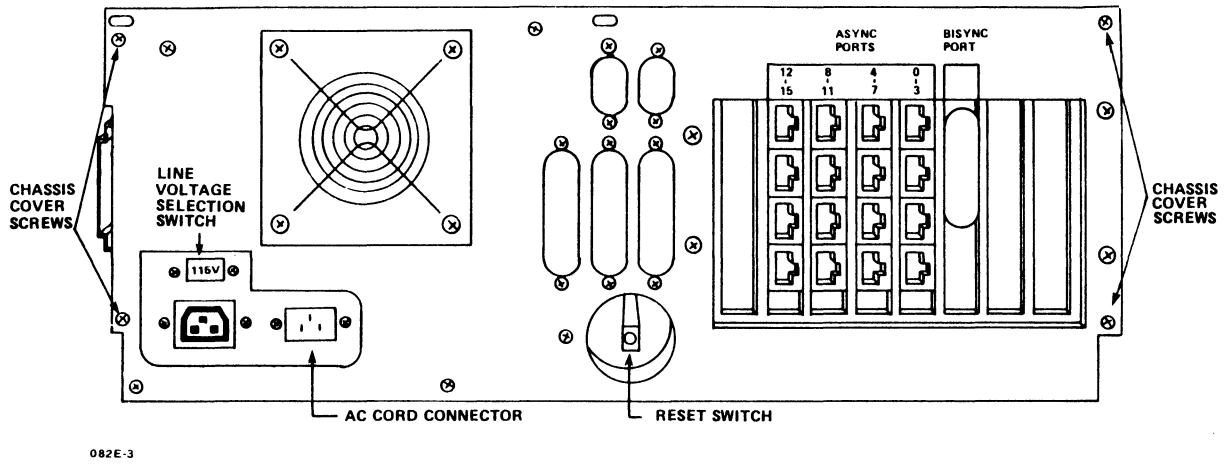


Figure 3-1. Rear View, MARK 2E System

4. If IRIS is the operating system, install a Pico-N. To install, carefully push the Pico-N's connector onto the designated pins at location J10 on the CPU/mother board (see Figure 3-2). If an early style Pico-N is used, install it at location J1. **The characters A1 on the Pico-N connector must align with Pin 1 on the CPU/mother board.**

5. Ensure that all ribbon and power cables are firmly connected. A list of these connections is provided in Section 6, Table 6-2.

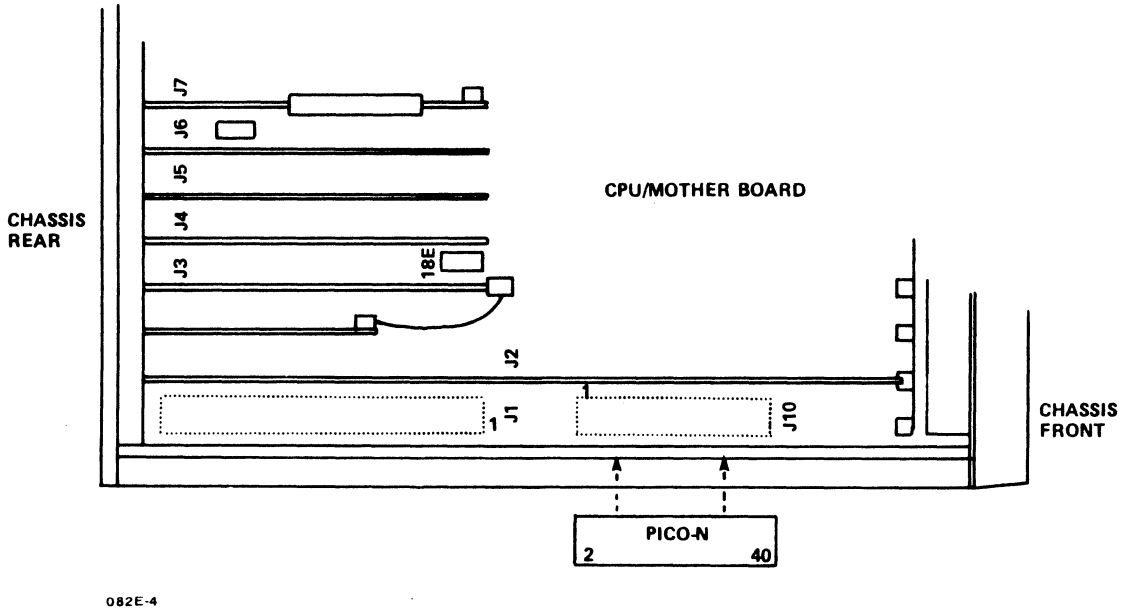


Figure 3-2. Installing the Pico-N

6. On the asynchronous board(s), check that the baud rate setting is appropriate for this system. Tables 3-1 and 3-2 indicate baud rate switch locations and settings, respectively. Figure 3-3 illustrates the direction of the open/closed settings for baud rate switches.

TABLE 3-1. BAUD RATE SWITCH LOCATIONS

Switch	Modular Connection Async Boards	Port
SW1	J2	0, 4, 8, 12
SW2	J3	1, 5, 9, 13
SW3	J4	2, 6, 10, 14
SW4	J5	3, 7, 11, 15

TABLE 3-2. BAUD RATE SWITCH SETTINGS

Baud Rate	Select Switch							
	1	2	3	4	5	6	7	8
19.2K	Closed	Open	Open	Open	Open	Open	Open	Open
9600*	Open	Closed	Open	Open	Open	Open	Open	Open
4800	Open	Open	Closed	Open	Open	Open	Open	Open
2400	Open	Open	Open	Closed	Open	Open	Open	Open
1200	Open	Open	Open	Open	Closed	Open	Open	Open
300	Open	Open	Open	Open	Open	Closed	Open	Open
150	Open	Open	Open	Open	Open	Open	Closed	Open
110	Open	Open	Open	Open	Open	Open	Open	Closed

*Standard POINT 4 baud rate setting

Figure 3-3. Open/Closed Setting for Baud Rate Switches

7. Replace the cover chassis and four corner screws.

8. Install the AC cord on the rear of the chassis (see Figure 3-1).

9. Install the cables to connect the MARK 2E to the peripheral devices (see Appendix A for instructions).

When these instructions have been completed, proceed to Section 4, Starting Up.

Section 4
STARTING UP

This section describes the controls and indicators of the MARK 2E system including MANIP, a program that allows the operator to control some computer functions from the terminal keyboard. The section also provides instructions for powering up, and it describes the self-tests associated with MANIP and power up.

Once the system has been powered up initially, DISCUTILITY can be loaded. Directions for loading DISCUTILITY are in the MARK 2/4 DISCUTILITY (DU.WDI) Technical Memorandum, and that document should be at hand when the program is to be loaded.

4.1 CONTROLS AND INDICATORS

This section explains the controls and indicators that are a part of the MARK 2E system including the MANIP program.

4.1.1 Front Panel and Drive Indicators

The front panel (Figure 4-1) has two indicators which show system activity: CARRY and DISK. A door on the front panel opens to display the indicators for the streaming tape cartridge drive and floppy disk drive, if present. These indicators show drive activity. Table 4-1 lists the indicators and their functions.

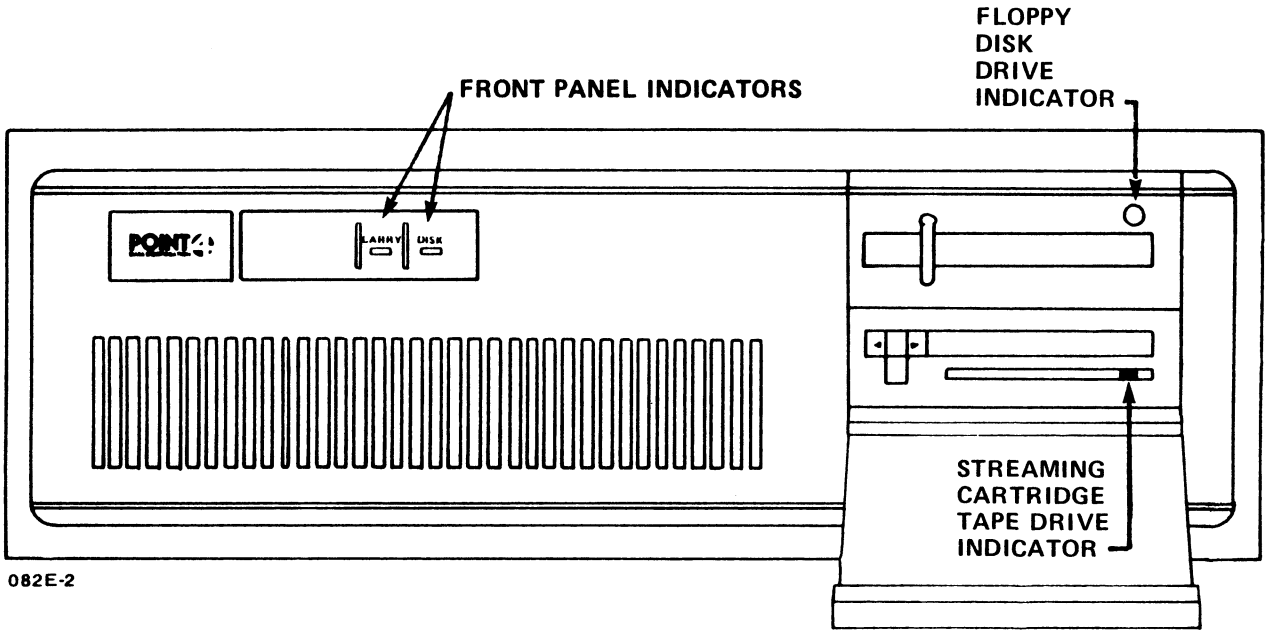


Figure 4-1. Front Panel and Drive Indicators

TABLE 4-1. FRONT PANEL INDICATORS

Indicator	Function
Panel Cover	
CARRY (green)	Flashing indicates the state of the CPU CARRY bit. When IRIS is running, the indicator normally blinks. With other programs, e.g., DISCUTILITY or diagnostics, the state of CARRY varies with the program.
DISK (red)	Shows hard disk activity. The indicator lights when the disk is spinning up to speed and stays on while the disk is in use (exception: when using the 55 or 86MB disk, the indicator goes out briefly when the disk is selected).
Drives	
Streaming Tape Drive (red)	Indicates that this drive is selected and in use.
Floppy Disk Drive (red)	Indicates that this drive is selected and in use.

4.1.2 Power Controls

The power controls are located on the right side and rear of the system. They include the AC power switch and the AC line voltage selection switch (see Figure 3-1).

4.1.2.1 AC POWER SWITCH

The AC power switch is located on the right side of the chassis. It has two positions, ON and OFF. After the operating system has been installed on the hard disk drive, and the power switch is turned to ON, the operating system is loaded automatically and the system is ready for use.

4.1.2.2 AC LINE VOLTAGE SELECTION SWITCH

This switch is located above the AC cord connector on the rear of the chassis. It is used to switch the voltage to either 90-130 or 180-260 volts. The voltages are marked on the switch.

4.1.3 Reset Switch

The reset switch is located in a recess on the rear of the chassis. When pressed, the reset switch loads MANIP starting at location 77000. MANIP is described in Section 4.1.4.

4.1.4 MANIP

MANIP is a stand-alone program that is loaded automatically into memory when powered on, when the reset switch is pressed, or when a HALT occurs. It performs the following functions:

- Enables the user to load programs
- Initiates an automatic IPL when the power is turned ON (once the operating system is on the disk)
- Enables the user to display and examine memory contents on the master terminal
- Initiates the hardware verify test
- Enables a qualified programmer to debug the system if necessary

MANIP functions are controlled by the operator through commands entered on the master terminal. One function of MANIP, the hardware verify test, is described below because it is normally run after the installation and before the operating system is loaded.

The MANIP Menu is displayed in Section 4.2.1. For additional information on the use of MANIP functions, see Section 6.1 and Appendix B.

4.1.4.1 HARDWARE VERIFY TEST

The hardware verify test verifies the operation of the MARK 2E system as a whole. It tests the central processing unit (CPU), all system memory, the tape interface, and all available serial ports. It also invokes the disk/floppy controller self-test and checks for its successful completion.

The hardware verify test is accessed through the V command of MANIP. POINT 4 suggests that this test be run continuously overnight once the system is installed and periodically thereafter to test overall system operation. It can also be run to help diagnose system trouble (see Section 6.3).

To access the hardware verify test, make certain the power is ON and then:

1. Press the reset switch located in a recess in the rear of the chassis.

   The program counter, four accumulators, carry flip flop and -> are displayed.

2. Press V <RETURN> on the master terminal keyboard to load and run the hardware verify test.

This test will run in a continuous loop until a HALT occurs (see Section 6.3.1.2) or until the operator presses <ESC> or the reset switch.

4.2 POWERING UP

There are two power up procedures: the initial one that occurs at installation time, and a routine one that occurs thereafter, whenever the power is turned ON. Whenever a power up occurs, an automatic firmware self-test runs automatically. For additional information on the firmware self-test, see Section 4.2.3.

4.2.1 Initial Power Up

To power up the system for the first time, make certain that the power switch is OFF and then:

1. Plug the AC power cable into the wall AC outlet.

2. Turn the power switch of the master terminal (port 0) to ON.

3. Turn the AC power switch on the right side of the cabinet to ON.

   The MARK 2E firmware self-test executes. Upon successful completion of this self-test, the MANIP Menu is displayed as follows:

```
                                                  444     4
POINT 4 Data Corporation                        4444      444
MARK 2E                                        444   4    4444
                                               4   444    4444


ENTER COMMAND LETTER                        44444444     4444
(PLUS OPERAND(S) WHERE APPROPRIATE)           444444     444
FOLLOWED BY A CARRIAGE RETURN                   4444     4


A = DISPLAY CONTENTS OF ACCUMULATORS
C = CHANGE ACCUMULATOR CONTENTS
D = DISPLAY CONTENTS OF MEMORY
F = BOOT FROM FLOPPY DISK
H = LOAD PROGRAM FROM STREAMER TAPE
J = JUMP WITH ACCUMULATORS AND CARRY RESTORED
K = STORE CONSTANT IN BLOCK OF MEMORY
M = MOVE A BLOCK OF MEMORY
P = PROGRAM LOAD (BOOT) FROM HARD DISK
V = LOAD (@ 20000) AND RUN HARDWARE VERIFY TEST
: = OPEN SPECIFIC LOCATION TO EXAMINE OR STORE
@ = LOAD DBUG AT 73000
? = DISPLAY THIS MENU
-> P
```

4. Press the reset switch located on the rear of the chassis.

5. Insert the DISCUTILITY tape into the tape drive (or, if appropriate, the floppy disk containing DISCUTILITY into the floppy disk drive).

6. To load the DISCUTILITY program from streamer tape, enter H on the master terminal keyboard and press <RETURN>.

   If the program is to be loaded from a floppy disk, enter F.

7. From this point, refer to the MARK 2/4 DISCUTILITY (DU.WDI) Technical Memorandum. The general steps are as follows:

   - Format the disk
   - Load the software (Restore)
   - Configure the system
   - Run MAPACTIVATE

4.2.2 Routine Power Up

Once the software is loaded, a routine power up takes place when the power is turned ON. To perform a routine power up:

Turn the AC power switch on the right side of the cabinet to ON.

The MARK 2E firmware self-test executes. Upon successful completion of this self-test, MANIP is loaded and an automatic IPL occurs. After the MANIP menu is displayed, a message similar to the following is displayed:

```
->P
PRESS RETURN

                        IRIS 9.n

A LICENSED, UNPUBLISHED, RESTRICTED AND CONFIDENTIAL WORK.  IF AND
WHEN THIS WORK IS PUBLISHED, THE FOLLOWING COPYRIGHT NOTICE APPLIES:

COPYRIGHT (C) 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982,
1983, 1984, 1985, 1986, 1987, POINT 4 DATA CORPORATION.

ENTER YEAR, MONTH, DAY, HOUR, MINUTE !

#IRIS.START.IPL

#BYE  GROUP 0 USER 1     mmm dd, yyyy   nn:nn:nn

NET ACCRUED CHARGES      $nn.nn

CPU TIME USED        nn:nn:nn
CONNECT TIME USED    nn:nn:nn

nnnn BLOCKS IN USE, nnnn AVAILABLE ON UNIT #n
```

The system is now ready to use.

4.2.3 Firmware Self-Test

This initial test executes whenever the power is turned ON. It verifies that the CPU/mother board hardware is functioning enough to communicate with a terminal. If an error is detected, the firmware stops at a fixed address; this address is displayed on the green LED indicators on the back edge of the CPU/mother board and should be reported to POINT 4 Hardware Technical Support.

The normal sequence at power up is: one pass of the firmware test, the loading of MANIP, and an automatic IPL (once the operating system has been installed on the hard disk).

Section 5
UPGRADING THE SYSTEM

The POINT 4 MARK 2E basic system can be expanded by extending the basic system or by adding options. The basic system can be extended by increasing memory from 256KB to 512KB or by increasing the number of serial ports to a total of 16 ports (four asynchronous boards). Options that can be added include an expansion memory board, a bisynchronous board, and a floppy disk drive.

Installing the components that expand the MARK 2E's capabilities can be accomplished easily by a technician using the instructions contained in this section.

5.1 EXTENDING THE BASIC SYSTEM

The basic system can be extended by increasing memory from 256 to 512KB or by adding more serial ports. These methods of extending the system are described in the following subsections.

5.1.1 Increasing Memory from 256KB to 512KB

To increase memory from 256 to 512KB, it is necessary to order a memory upgrade kit (82046) from POINT 4. The kit contains a 512KB programmable array logic (PAL) integrated circuit (92014-18E) and eight memory integrated circuits (204464). These parts are installed on the CPU/mother board as follows (see Figure 5-1).

1. Install the eight memory integrated circuits in sockets at locations 14K through 21K on the CPU/mother board. Make certain that pin 1 of each integrated circuit aligns with pin 1 of each socket.

2. Remove existing PAL 16L8 (92013-18E) at location 18E on the CPU/mother board and replace it with PAL 16L8 (92014-18E).

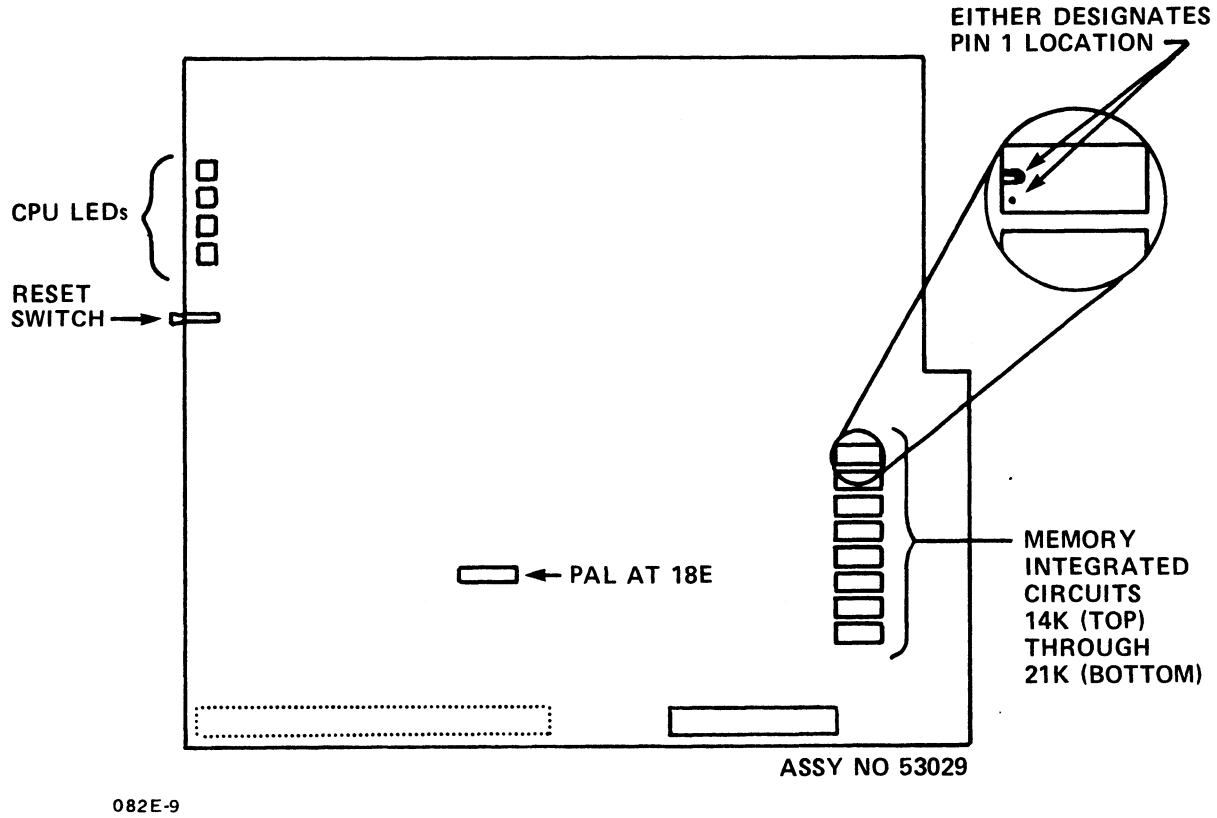


Figure 5-1. Increasing Memory from 256 to 512KB

5.1.2 Adding Ports to the System

The MARK 2E basic system contains one asynchronous board with four serial ports. The system can be extended to a maximum of four asynchronous boards with four ports each for a total of 16 ports. To add ports, it is necessary to order the asynchronous board(s) (053030) and the appropriate programmable array logic (PAL) integrated circuit(s) from POINT 4. When ordering, use these port upgrade kit order numbers: 4 through 7 ports (082040-01), 8 through 11 ports (082040-04), and 12 through 15 ports (082040-06).

Cables (88075) to connect the ports to external peripherals can be ordered from POINT 4 or constructed according to the instructions in Appendix A.

POINT 4 sets the baud rate on the asynchronous boards to a standard 9600. Individual system requirements may require another setting. Make certain the setting is appropriate for the particular peripherals connected to the system. Baud rate switch locations and settings are described in Section 3.1.

After adding ports, the software configuration must also be modified to include the new ports. For IRIS R9.0 and later revisions, change the Port Definition Table using SETUP (see IRIS R9 System Configuration Manual; for IRIS R8.3E, change the Port Definition Table using DSP (see IRIS R8 Installation/ Configuration Manual).

To install an asynchronous board, use the following instructions (see Figures 5-2 and 5-3):

1. Install the appropriate programmable array logic (PAL) integrated circuit at location 13B on the CPU/mother board.

2. Remove the screw from the appropriate board support bracket on the chassis rear, and set the screw aside:

Asynchronous Board Ports	Bracket Screw Adjacent to CPU/ Mother Board Expansion Slot
0, 1, 2, 3	J3
4, 5, 6, 7	J4
8, 8, 10, 11	J5
12, 13, 14, 15	J6

3. Insert the asynchronous board(s) into the board support bracket so that:

   a. the edge connector at location P1 on the asynchronous board is carefully inserted into the appropriate pin connector on the CPU/mother board (pin 1 of the edge connector must align with pin 1 on the CPU/mother board); and

   b. the bottom of the bracket mount on the asynchronous board is inserted into the slot at the bottom of the board support bracket.

4. Replace the screw into the board support bracket. This connects chassis ground and supports the board.

To remove an asynchronous board for repair or replacement, reverse the installation instructions.

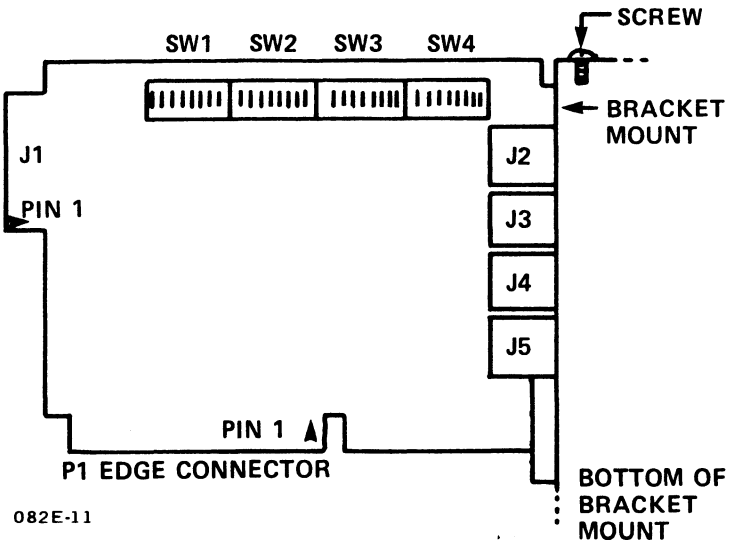


Figure 5-2. Asynchronous Board

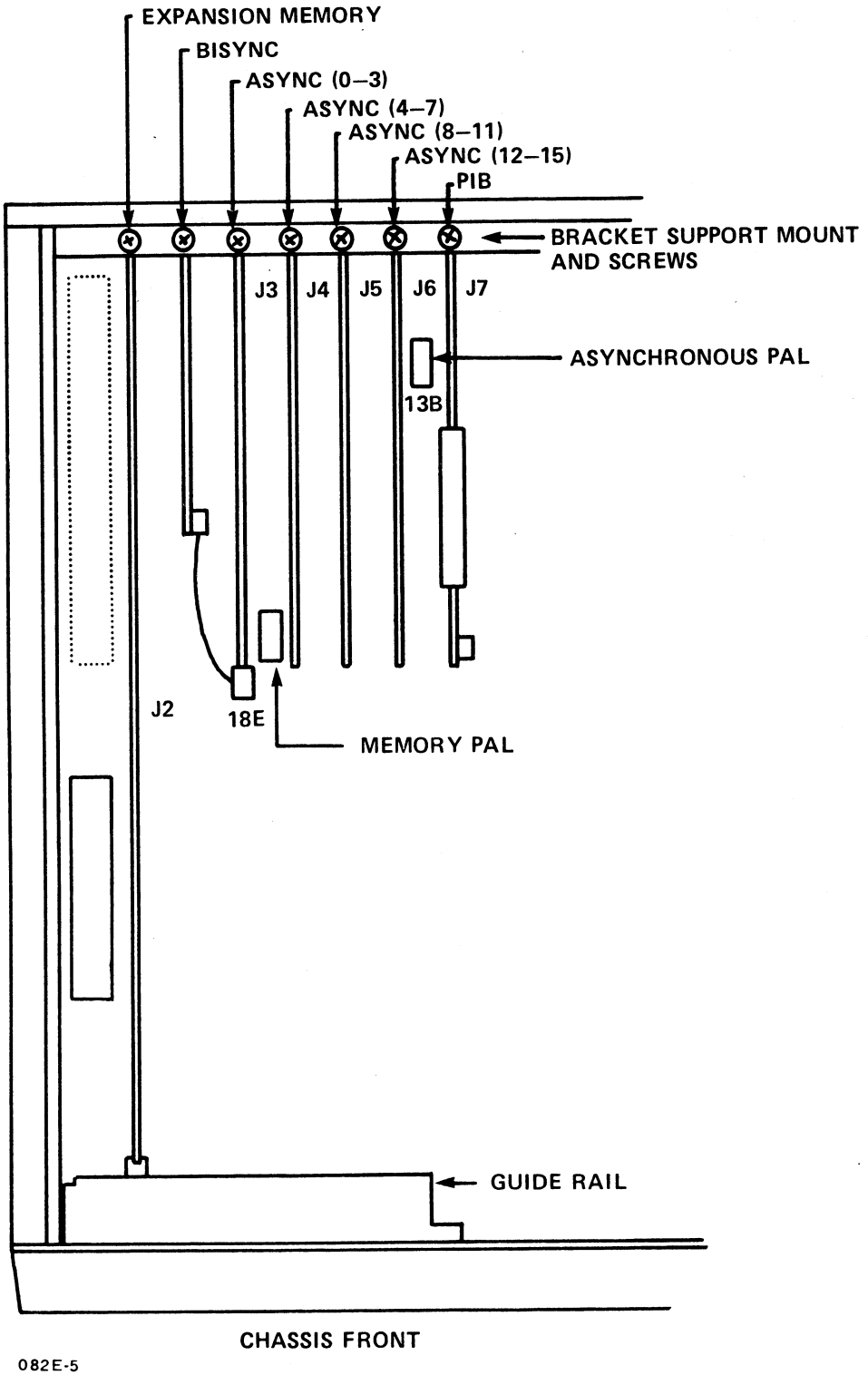


Figure 5-3. Installing Asynchronous, Bisynchronous, and Expansion Memory Boards

5.2 ADDING OPTIONS

The three options which can be added to the MARK 2E basic system to expand its capabilities are the expansion memory board, bisynchronous board, and floppy disk drive.

5.2.1 Expansion Memory Board

Once the MARK 2E basic system has been extended to 512KB, an expansion memory board (53033) can be added to provide an additional 512KB of memory for a total of 1MB of memory (see Figure 5-4). If the system has been extended from 256 to 512KB previously, a programmable array logic (PAL) integrated circuit (92014-18E) is installed, and no other PAL change is required.

To install an expansion memory board, follow these instructions:

1. If the system has 256KB memory, increase the memory to 512KB. See Section 5.1.1 for instructions on increasing memory from 256 to 512KB.

2. Remove the appropriate screw from the board support bracket on the chassis rear. Set the screw aside.

3. Insert the expansion memory board into the support bracket and guide rail (opposite) so that:

   a. the edge connector on the expansion memory board at location P1 is carefully inserted into the pin connector on the' CPU/mother board at location J2 (pin 1 of edge connector must align with pin 1 at location J2); and

   b. the bottom of the bracket mount is inserted into the slot at the bottom of the board support bracket.

4. Replace the screw into the board support bracket. This connects chassis ground and supports the board.

To remove the expansion memory board for repair or replacement, reverse the installation instructions.

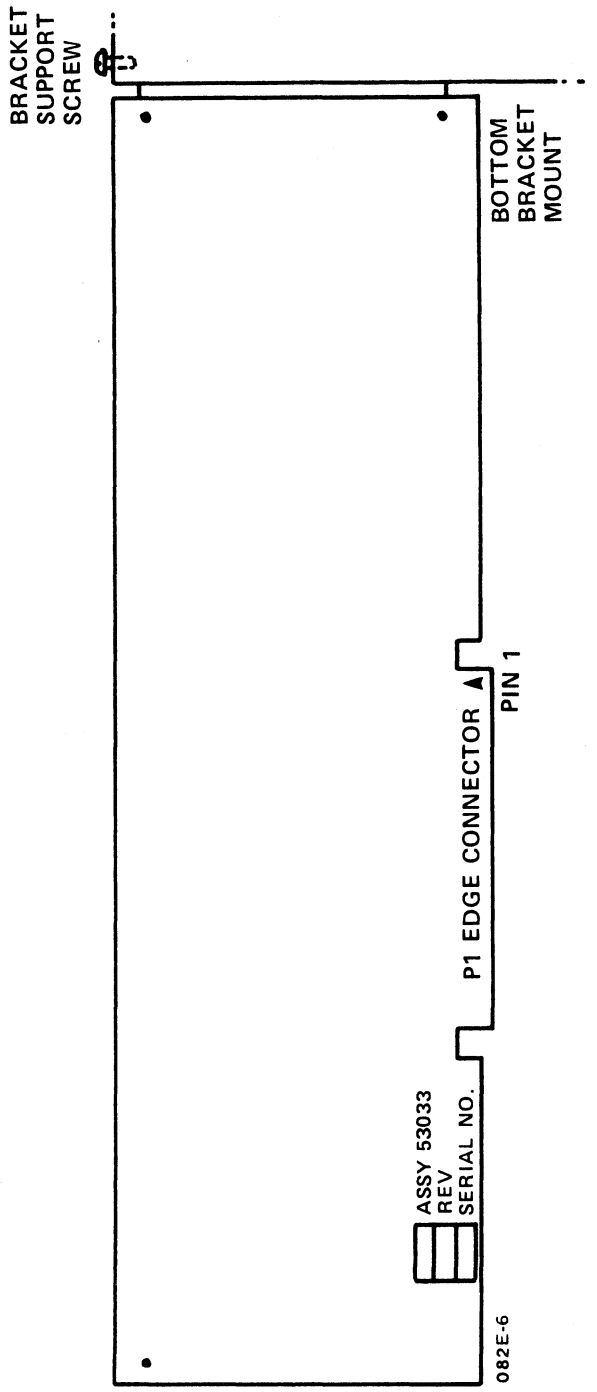


Figure 5-4. Expansion Memory Board

5.2.2 Bisynchronous Board

To add a bisynchronous board (053031) to the MARK 2E basic system, follow these instructions:

1. Remove the appropriate screw from the board support bracket on the chassis rear (see Figure 5-3). Set the screw aside.

2. Insert the bisynchronous board (see Figure 5-5) into the support bracket between CPU/mother board locations J2 and J3. Replace the screw to connect chassis ground and support the board.

3. Connect the cable connector on the bisynchronous board at location P1 to the pins on the adjacent asynchronous board (ports 0-3) at location J1.

4. To configure the I/O cable for the bisynchronous ports, refer to Appendix A.

To remove the bisynchronous board for repair or replacement, reverse the installation procedure.

NOTE

Software for the bisynchronous port is the "BISYNC" package which is licensed from and supported by Starburst Data Systems, Inc., P.O. Box 4582, Laguna Beach, CA 92652.

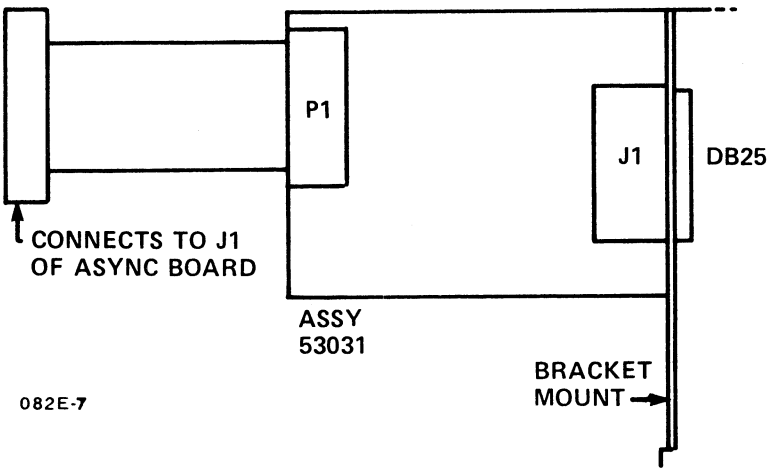


Figure 5-5. Bisynchronous Board

5.2.3 Floppy Disk Drive

If a floppy disk drive (kit 82043) is added to a MARK 2E basic system, it must occupy the upper part of the housing designated for the streaming cartridge tape drive and the floppy disk drive. Since the basic MARK 2E system normally has the streaming cartridge tape drive installed in the upper part of the housing, it must be removed and inserted into the housing on the lower set of slide guides before the floppy disk drive can be installed.

To remove the streaming cartridge tape drive, see Section 7, Removing and Replacing Components, for instructions on removing the drive. Install the tape drive on the lower set of slide guides in the housing, then proceed with the installation of the floppy disk drive according the following instructions (see Figure 5-6):

1. Attach the slide guides (721042) to the sides of the floppy disk drive with screws (707DGP).

2. Insert the drive into the top front opening of the housing and slide it in on the top slide guides.

3. Plug cable P12 from the power supply into connector J2 on the floppy disk drive.

4. Connect the ribbon cable (088068) from the floppy disk drive at location J1 to the hard disk/floppy controller board at location J8.

5. Secure the drive to the front of the housing with single edge retainer clips (721037) and screws (707DPP).

After installing the floppy disk drive, the software configuration must be modified to acknowledge its addition. For IRIS R9.0 and later revisions, change the Disk Driver Table using SETUP (see the IRIS R9 System Configuration Manual); for IRIS R8.3E, change the Disk Driver Table using DSP (see the IRIS R8 Installation/ Configuration Manual).

To remove the floppy disk drive for repair or replacement, reverse the installation instructions.

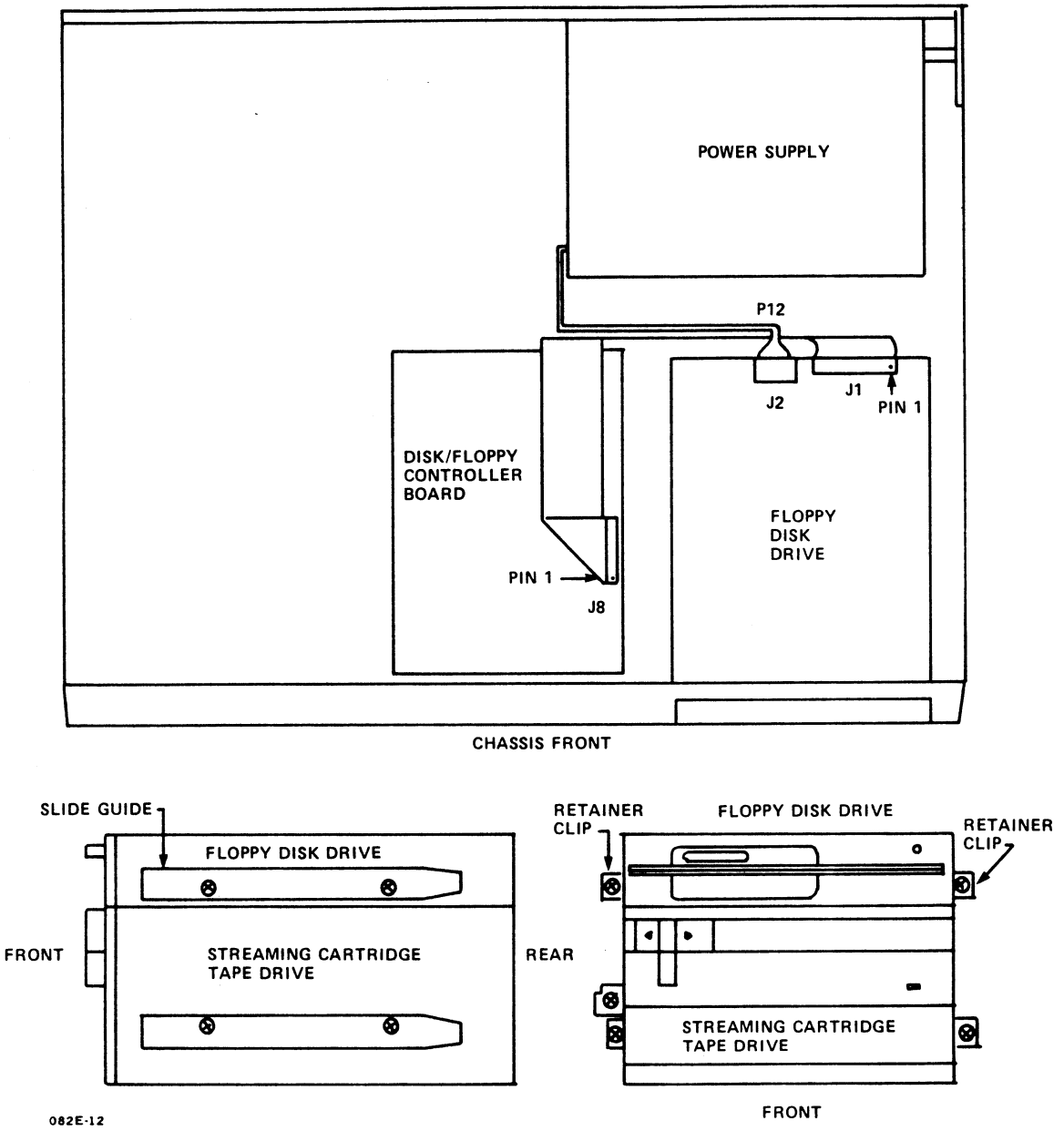


Figure 5-6. Installing the Floppy Disk Drive

Section 6
TROUBLESHOOTING

The MARK 2E system requires little preventive or ongoing maintenance. Systems that are correctly installed and managed with reasonable care, perform well over a long period of time. Occasionally, however, a problem or a malfunction does occur. If it does, the troubleshooting routine described in this section will help identify the problem or malfunction. In some cases, qualified technicians can easily accomplish corrective action; in others a faulty component may need to be removed and sent to POINT 4 for repair or replacement.

If a problem or a malfunction relates to the operating system, refer to the IRIS or other appropriate software documentation for help.

If you are unable to identify a problem, locate a malfunction or take corrective action, call Hardware Technical Support, POINT 4 Data Corporation, (714) 259-0777.

Before undertaking the troubleshooting routine that follows, check these common causes of difficulty:

- The AC power cord is not properly plugged into the chassis or wall outlet.
- The cables between the ports and the peripherals are not properly plugged in or the cables may be miswired.

6.1 MANIPULATE THE SYSTEM

The first step in troubleshooting is to MANIP(ulate) the system, that is, to use MANIP to help locate a problem or a malfunction.

MANIP is a program that allows the user to perform several system functions from the master terminal keyboard (see Section 4.1.4 and Appendix B). MANIP functions used in troubleshooting are those which allow the user to display and examine the contents of memory on the master terminal, and the hardware verify test.

6.1.1 Using MANIP

MANIP is used if the system HALTs, or if the system is running but trouble is suspected.

A HALT is a condition that brings the entire system to a standstill. It can be caused by a power failure, or a hardware or software problem. When a HALT occurs, it is indicated by a halt code contained in memory.

Any of the following conditions may indicate a problem: the program will not load from tape or floppy disk, the system will not IPL, the user is waiting for some action but none occurs, or the action that occurs is not the one expected.

When any of these conditions occur, it is necessary to display and examine memory contents on the master terminal to gather data useful in locating a problem or malfunction. To access MANIP, use the following instructions.

6.1.2 Accessing MANIP

With the AC power turned ON:

1. To load MANIP, press the reset switch located in a recess on the rear of the chassis.

   The program counter, four accumulators, carry flip-flop and -> are displayed.

2. Enter ? on the master terminal keyboard and press <RETURN>.

   The MANIP Menu is displayed on the master terminal (see Section 4.2.1).

3. To use any of the functions listed in the MANIP Menu, enter the command and parameters where required.

   See Appendix B for instructions on using MANIP and a description of the commands and parameters.

6.2 CHECK OUT THE SYSTEM

If MANIP(ulating) the system does not locate a problem or malfunction, methodically check out the system as described in the following subsections. Perform these preliminary steps first:

1. Disconnect the AC power.
2. Remove the chassis cover (see Section 3.1).

6.2.1 Check the Baud Rate Setting

POINT 4 sets the baud rate on the asynchronous boards to 9600. Individual system requirements may require another setting. If so, make certain that the setting is appropriate for the particular peripherals connected to the system (see Section 3.1).

6.2.2 Measure Power Supply Voltages

Measure power supply voltages from the P8 and P9 connectors, which originate at the power supply, and plug into locations J8 and J9, respectively, on the CPU/mother board. Use a digital volt meter, and when testing, make certain that J8 and J9 are connected to P8 and P9. A tolerance of five percent is acceptable. Table 6-1 lists the correct voltages for each pin of the P8 and P9 connectors. If the five percent tolerance level is exceeded, contact POINT 4 Hardware Technical Support.

TABLE 6-1. POWER SUPPLY VOLTAGES - P8 AND P9 CONNECTORS

P8 Connector		P9 Connector	
Pin 1	Power OK signal sensing DC output and AC input	Pins 1, 2	ground
Pin 2	+5V		
Pin 3	+12V	Pin 3	-5V
Pin 4	-12V	Pins 4, 5, 6	+5V
Pins 5, 6	ground		

WARNING!

Do not try to enter the power supply frame or adjust voltages, or warranty will be invalid.

6.2.3 Check the Connections

Occasionally through shipping or handling, connections between components become loose. If this occurs, the system will not operate properly. To ensure that connections are in good order, check all cable and board connections according to the following instructions.

6.2.3.1 CABLE CONNECTIONS

Four types of cable connections should be checked: power, ribbon, LED indicator and push-on lug. See Table 6-2 for a list of the cable connections. To ensure that these cables are properly connected, perform the following steps:

1. Ensure that all cables are firmly connected (see Figure 6-1).

2. Check that pin 1 of each ribbon cable is aligned with the pin 1 designation on the component to which it is connected. (The pin 1 location of each ribbon is identified by a colored trace line on the edge of the ribbon and a triangular mark on the connector.)

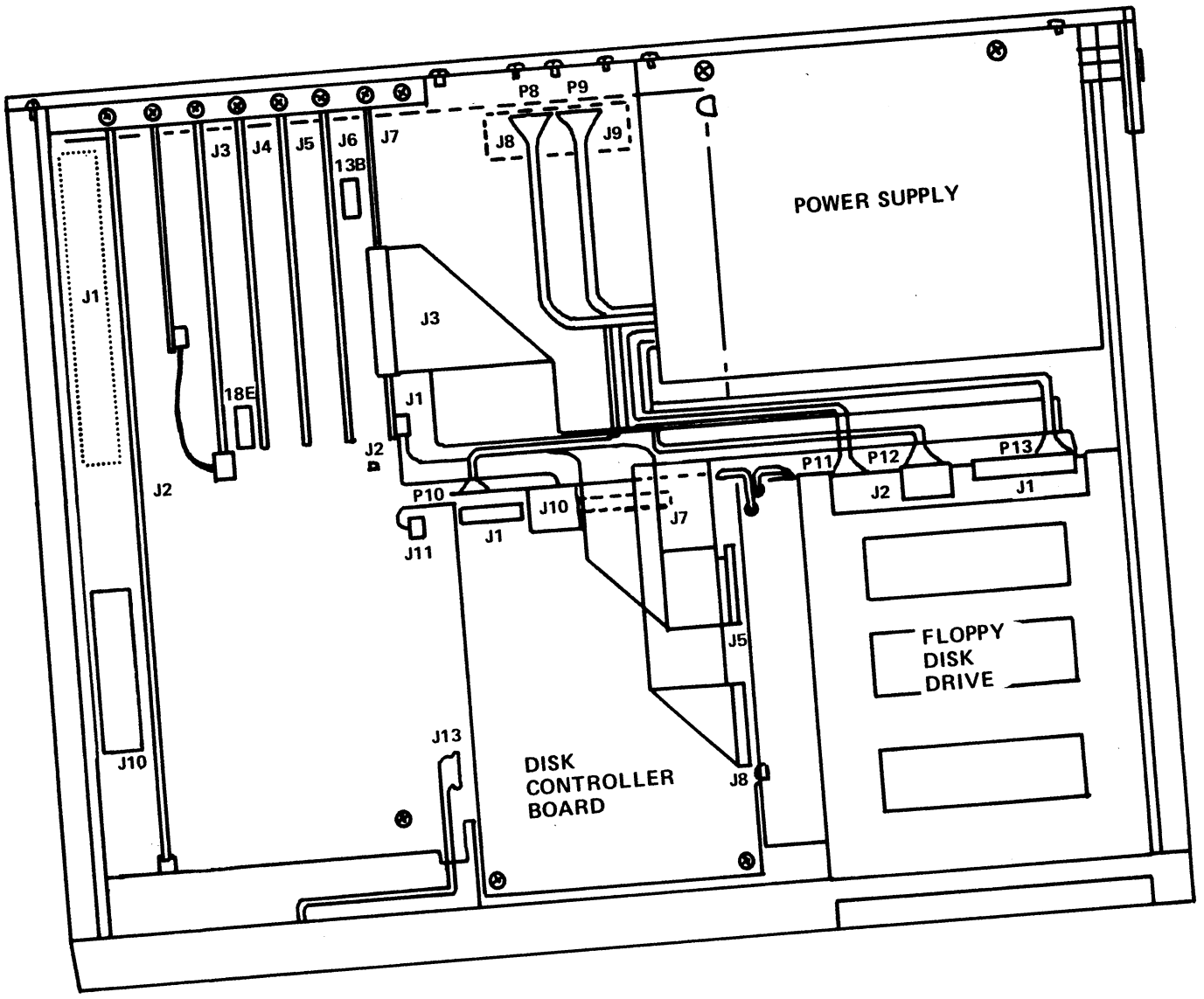
   Power cable connections are keyed, or latched, so that they can only be connected in a way that aligns pin 1 of the cable with pin 1 on the designated component.

3. On the CPU/mother board at location J11, check that the brown wire of the brown/red-LED connector is aligned with the pin 1 designation on the CPU/mother board.

4. On the CPU/mother board at location J13, check that the red wire of the LED connector is aligned with the pin 1 designation on the CPU/mother board.

TABLE 6-2. CABLE CONNECTIONS

Cable Origin	Connects to Location
Power Supply P8 and P9	J8 and J9 CPU/mother board
P10	Lower right rear, Winchester disk drive (viewed from rear)
P11 and P12	Lower right, upper left rear, streaming tape cartridge drive (viewed from rear)
P12	J2 floppy disk drive
PIB J2	J10 disk/floppy controller board
Push-on Lugs Chassis Ground	Right side, streaming tape cartridge drive (viewed from rear)
Chassis Ground	Lower left rear, Winchester disk drive (viewed from rear)
Chassis Ground	J6 disk/floppy controller board
LEDs Disk drive brown/red	J11 CPU/mother board
Front panel indicators	J13 CPU/mother board
Ribbon Cables J1 asynchronous board (at J3 of PU/mother board)	P1 bisynchronous board (if present)
J1 floppy disk drive	J8 disk/floppy controller board
Cables A and B, Disk drive	J7 and J1 disk/floppy controller board
J1 PIB	J5 disk/floppy controller board
J3 PIB	Bottom, streaming tape cartridge drive (viewed from rear)



082E-8

Figure 6-1. Cable and Board Connections

6.2.3.2 BOARD CONNECTIONS

Five types of board connections should be checked (see Figure 6-1):

- Cable connections between boards or between boards and system peripherals
- Socketed components on the CPU/mother board
- Pico-N connection on the CPU/mother board
- P1 edge connections between the peripherals interface board (PIB), asynchronous board, and expansion memory board (if present) and the CPU/mother board
- Board bracket mounts and board support bracket

Cable connections are discussed in Section 6.2.3.1. Instructions for ensuring the remaining board connections are as follows:

1. Push down on all socketed components on the CPU/mother board to ensure they are firmly seated. Table 6-3 provides a list of socketed components and their locations.

   This step may necessitate removing some of the boards connected to the CPU/mother board in order to gain access to the components (see Sections 5 and 7).

2. Ensure that the Pico-N is firmly seated and that pin 1 on the Pico-N is aligned with pin 1 on the CPU/mother board connector.

3. Ensure that the P1 edge connectors of the PIB, asynchronous, and the expansion memory board (if present) are firmly seated into their connectors on the CPU/mother board. Pin 1 of each P1 edge connector should align with pin 1 on the CPU/mother board connector.

4. Ensure that the screws of the bracket mounts for the PIB, asynchronous, expansion memory (if present) and bisynchronous (if present) boards are firmly fixed.

TABLE 6-3. SOCKETED COMPONENTS AND THEIR LOCATIONS

Component	Location	Description
IC Sockets	Y1* and Y2	Crystals
	14K through 21K	Memory chips
	5E and 3D through 11D	CPU firmware
	6E and 8E	Vector and Exception
	20D and 22D	MANIP PROMs
PALS	13B	Number of ports
	18E	Size of memory

*To check Y1, either the CPU/mother board or the power supply must be removed.

Not all systems have all components.

6.3 DIAGNOSTICS

Diagnostics for the MARK 2E system are of two types: internal, consisting of the firmware self-test and the hardware verify test; and external, consisting of a number of diagnostic programs. These types of diagnostics are described in the following subsections.

6.3.1 Self-Tests

The firmware self-test completes one pass automatically any time that the system is powered up. It verifies that the CPU/mother board hardware is functioning enough to communicate with a terminal. If the firmware self-test does not complete, the CPU firmware address indicators will freeze (see Sections 4.2.3 and 6.3.1.1).

The hardware verify test can be accessed through MANIP at the operator's discretion. It is normally run for an extended period after the system is installed, and before the operating system is IPLed, to verify the operation of the system as a whole. It should also be run periodically to check system operation and when troubleshooting. Once accessed, the hardware verify test will run in a continuous loop until an error causes it to HALT, or the operator stops the test by pressing <ESC> or the reset switch (see Sections 4.1.4.1 and 6.3.1.2).

When troubleshooting, it is important to remember that when MANIP is loaded, it replaces the contents of memory between addresses 77000 and 77777. For this reason, running the hardware verify test is postponed until other options for locating a problem of malfunction have been tried.

To access and run the hardware verify test for troubleshooting use the procedure in Section 6.1.2, and enter the V command from the MANIP Menu.

6.3.1.1 CPU FIRMWARE ADDRESS INDICATORS

Sixteen firmware LED indicators are located on the rear edge of the CPU/mother board (see Table 6-4 and Figure 6-2). Ten indicators, A0 through A9, relate to the mocro-engine firmware; the remaining six indicate status conditions internal to the CPU/mother board.

A0 through A9 are useful only to POINT 4 or other authorized repair technicians. If a system does not successfully complete the firmware self-test, these indicators will freeze at a particular address, and no self-test message will be displayed on the terminal. If this occurs, report the status of these indicators to POINT 4 Hardware Technical Support.

The remaining six indicators provide information that can be used in locating a problem or malfunction.

TABLE 6-4. CPU FIRMWARE ADDRESS INDICATORS

Indicator	Description
A0 through A9	Relates to micro-engine firmware. Used only by POINT 4 or authorized repair technician.
ION	Indicates that interrupts are enabled.
MAP	Indicates that mapping is enabled.
DSK	Indicates that the CPU micro-engine is being interrupted by the disk/floppy controller. Disk interrupts must be enabled for this indicator to light.
TAP	Indicates that the CPU micro-engine is being interrupted by the streaming cartridge tape controller. Tape interrupts must be enabled for this indicator to light.
MUX	Indicates that the CPU is being interrupted by one of 17 serial ports. Serial port interrupts must be enabled for this indicator to light.
EIS	Not used.

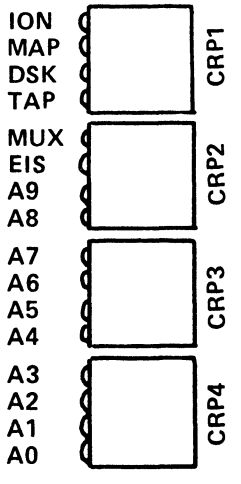


Figure 6-2. CPU Firmware Address Indicators

6.3.1.2 SYSTEM HALTS

When a HALT occurs, control of the system returns to MANIP.

Before corrective action can be taken, it is necessary to identify the type of HALT that has occurred. Use the following steps to identify the HALT:

1. Enter A on the master terminal keyboard.

   The program counter, four accumulators and the carry flip-flop are displayed.

2. Record these for future reference.

3. Subtract one from the program counter.

4. Enter D followed by the octal number from step 3 and press <ESC> immediately.

   The contents of the memory location containing the HALT are displayed. The HALT code is the word that follows the colon (:). The following example illustrates this procedure:

```
Program  A0     A1    A2  A3   Carry
Counter

2462:  76742  76742  0 2454  0
D2461
2461:  73377  16024  <ESC>
```

   The halt code contained at address 2461 is 73377.

5. Refer to the IRIS R9 System Manager Manual for an explanation of the HALT code.

   If POINT 4 help is required, the Software Support staff may also need the first 20 words of memory starting at location 0.

NOTE

A recurring HALT may indicate a problem that requires future action. The HALT information will be useful to support persons at POINT 4 if assistance is required.

6.3.2 Diagnostic Programs

Diagnostic programs are available from a stand-alone tape, or by shutting down from IRIS to a program stored on logical unit 5. POINT 4 recommends that the diagnostic tape be ordered so that diagnostics are available in the event that IRIS cannot be loaded.

The diagnostic programs available for the MARK 2E include the following:

- MARK 2/2E/3/4 System Diagnostics (1.8 or later)*
- MARK 2/2E/4 Standard Disk/Diskette/Tape Diagnostic (1.11 or later)
- MARK 2/2E/3/4 Standard MUX Diagnostic (1.5 or later)
- MARK 2E/4 Standard Map and Memory Diagnostic (1.5 or later)

*Not included on IRIS logical unit 5

6.3.2.1 DIAGNOSTIC TAPES

All of the diagnostic programs for the MARK 2E are available on a single stand-alone 1/4-inch tape (in either QIC-11 or QIC-24 format). This tape consists of a stand-alone system executive program and six additional tests that are loaded and controlled by the executive program. These programs and tests are referred to as the System Diagnostics. The tape also includes the standard MARK 2/2E/3/4 diagnostics. The standard diagnostics may be loaded by the executive program but do not run under system diagnostic executive control.

The System Diagnostics may be used to verify that the MARK 2E and all peripherals are operational. It can also be used to detect failing devices. Once detected, the appropriate standard diagnostic program can be loaded and used to isolate and investigate problems.

The Tape test of the System Diagnostics requires operator intervention; the other tests do not. The tests do not stop if an error is encountered; instead they keep a running error count. The System Executive will display an error count for any device at the end of all testing.

For more information on these diagnostic programs and instructions on how to use them, refer to the appropriate diagnostic manual.

6.3.2.2 DIAGNOSTICS ON IRIS LOGICAL UNIT 5

Once the IRIS Operating System is installed, the standard MARK 2E diagnostics can be accessed from IRIS logical unit 5. Note that logical unit 5 does not include the System Diagnostics; and if IRIS cannot be IPLed, the standard diagnostics are not available for use.

The names and filenames of the diagnostics shipped with the IRIS Operating System on logical unit 5 are as follows:

- MARK 2/2E/4 Standard Disk/Diskette/Tape Diagnostic, DI.M24TDK.1.11 or later
- MARK 2/2E/3/4 Standard MUX Diagnostic, DI.M234MX.1.5 or later
- MARK 2E/4 Standard Map and Memory Diagnostic, DI.M4MM.1.5 or later

To shut down from IRIS to a diagnostic program, use the following instructions:

1. At the IRIS prompt (#), enter the SHUTDOWN command followed by a logical unit/diagnostic name as illustrated in the example below. The word "key" represents the manager password; the default is X.

   ```
   SHUTDOWN <CTRL-E>key<CTRL-E>5/DI.M4MM.1.5
   ```

   The diagnostic program begins to run.

2. If the CPU halts, press the reset switch located in a recess on the rear of the chassis to load MANIP.

   The program counter, first four accumulators and the carry flip flop are displayed on the terminal.

3. Enter J2 on the master terminal keyboard.

   The diagnostic program begins to run.

Section 7
REMOVING AND REPLACING COMPONENTS

This section is for technicians who need to remove and replace a faulty component. Instructions are provided for removing the following components: the power supply; the Winchester disk; streaming cartridge tape drive; and the peripherals interface board (PIB), disk/floppy controller board, and the central processing unit (CPU/mother board).

To remove the memory expansion, asynchronous, or bisynchronous boards or the floppy disk drive (where they are present), see Section 5, Upgrading the System. Simply reverse the installation instructions given there for these components.

These general instructions should be followed before removing any component from a MARK 2E system:

1. Make certain that all users are logged off the system.
2. Shut down and back up the system.
3. Disconnect the AC power.
4. Remove the chassis cover (see Section 3.1).

7.1 POWER SUPPLY

After following the general instructions for removing components, remove the power supply as follows (see Figure 7-1):

1. Unplug the following power supply cables that connect the power supply to other components:

   a. Cables P8 and P9 that connect to the CPU/mother board at locations J8 and J9

   b. Cable P10 that connects to the Winchester disk drive on the rear righthand side

   c. Cables P11 and P13 that connect to the streaming cartridge tape drive at the upper left and lower right corners (as viewed from the rear)

   d. Cable P12 that connects to the floppy disk drive at location J2

2. Remove the four corner screws on the chassis rear that secure the power supply to the chassis. Set the screws aside.

3. To release the power supply from the notches that secure it to the floor of the chassis, push it slightly toward the front of the chassis and then lift it up and out of the chassis.

To replace the power supply, reverse the instructions for removal. Be careful not to catch the cables of other components under the power supply as it is being inserted into the chassis and locked into place.

WARNING!

Do not attempt to open the enclosed frame of the power supply or the warranty will be invalid.

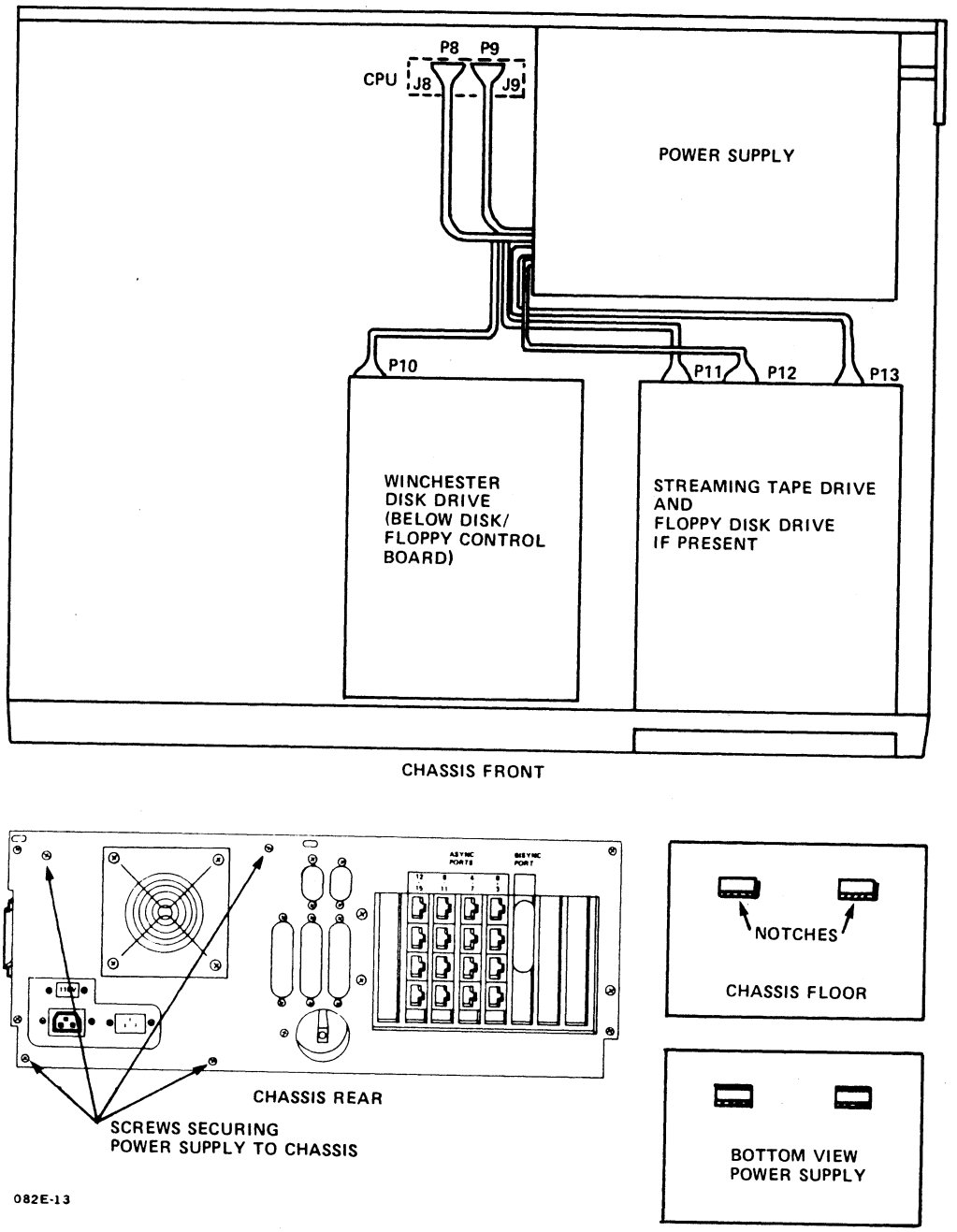


Figure 7-1. Removing the Power Supply

7.2 DRIVES

The POINT 4 MARK 2E system includes a Winchester disk drive, a streaming cartridge tape drive and, if selected, a floppy disk drive. The following subsections describe the removal and replacement of the Winchester disk and streaming cartridge tape drives. To remove the floppy disk drive (if present), see Section 5.2.3 and reverse the installation instructions provided for this component.

7.2.1 Winchester Disk Drive

After following the general instructions for removing components, remove the disk drive as follows (see Figure 7-2):

1. Remove the two screws from the retainer clips that secure the disk drive to the chassis front. Set the screws and the retainer clips aside.

2. Disconnect the disk drive ribbon cables A and B from the disk/floppy controller board at locations J7 and J1 respectively.

3. Pull off the push-on lug of the ground wire (88010) located on the rear lower left of the disk drive (as viewed from the rear).

4. Disconnect the brown/red LED wire connector (88023) from the CPU/mother board at location J11.

5. Unplug the power supply cable at location P10 on the disk drive rear.

6. Slide the disk drive out of the chassis by pushing it gently from the back and then pulling it out of the front. Be careful not to catch any cables.

To replace the disk drive, reverse the instructions for removal. When sliding the disk drive into the chassis, insert the cables into the front opening and then slide the drive back carefully. When connecting the brown/red LED wire connector, align the brown wire with pin 1 on the CPU/mother board.

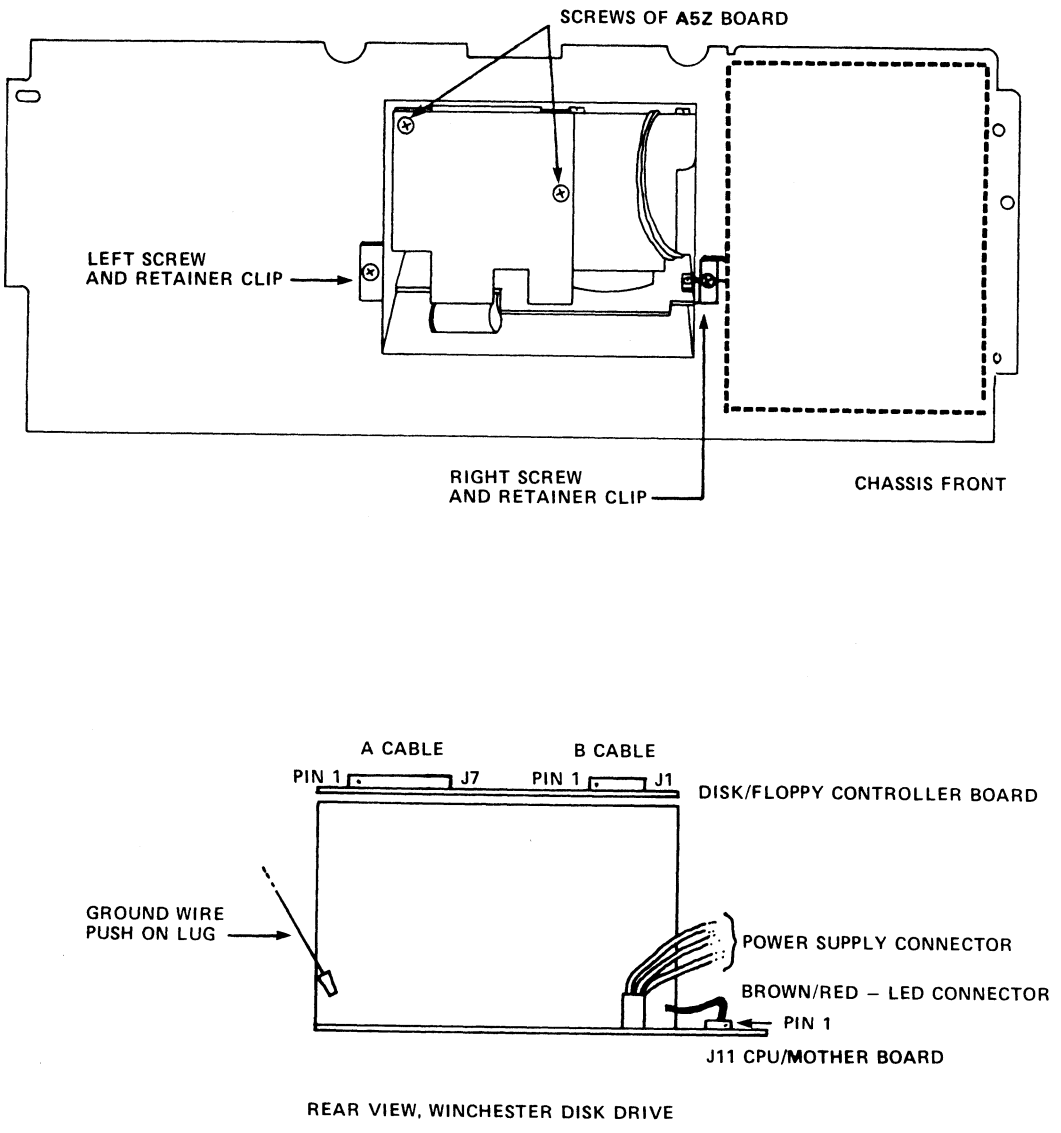


Figure 7-2. Removing the Winchester Disk Drive

NOTE

If the disk drive is being removed and replaced by another drive, use steps 7, 8, and 9 to remove the slide rails, A and B cables, and the brown/red LED wire (see Figure 7-3). These components must be installed on the replacement disk drive.

7. Remove the screws that attach the slide rails to the sides of the disk drive.

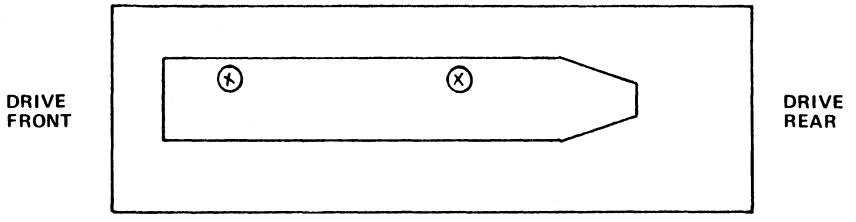
8. Disconnect the A and B cables from the disk/floppy controller drive.

9. Remove the brown/red LED wire from on the disk drive as follows:

   a. Remove the two screws from board A5Z located on the drive front. Set the screws aside.

   b. Gently lift board A5Z and pull the wire out.

To replace the disk drive, reverse the instructions for removal. When sliding the disk drive into the chassis, insert the cables into the front opening and then slide the drive back carefully.



SIDE VIEW, WINCHESTER DISK DRIVE

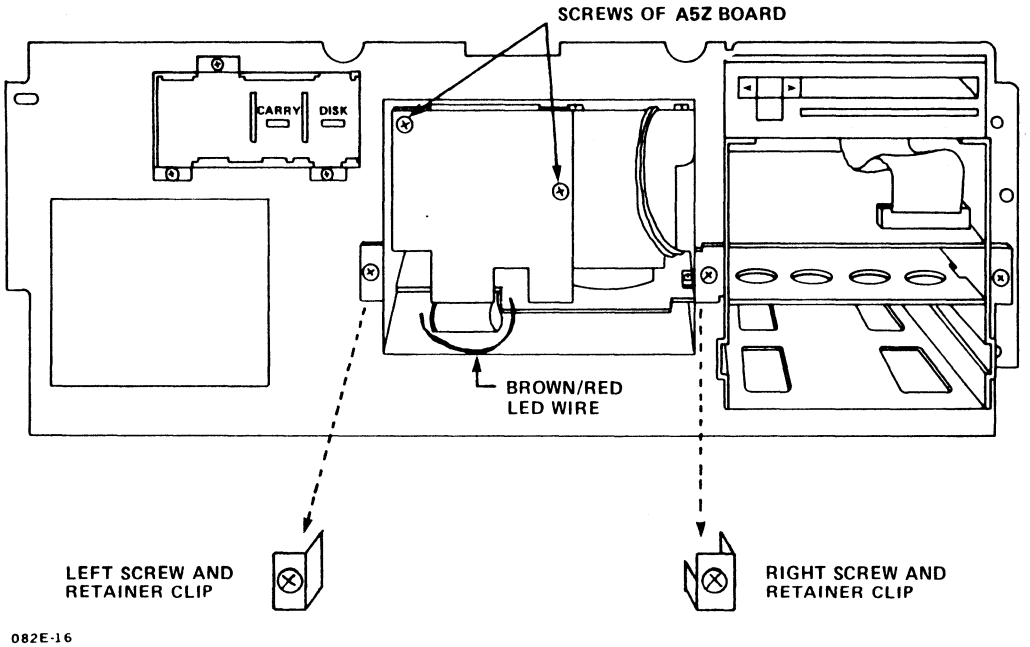


Figure 7-3. Removing Disk Drive Slide Rails, A and B Cables and Brown/Red LED Wire

7.2.2 Streaming Cartridge Tape Drive

After following the general instructions for removing components, remove the streaming cartridge tape drive as follows (see Figure 7-4):

1. Remove the two screws from the retainer clips that secure the streaming cartridge tape drive to the chassis front. Set the screws and retainer clips aside.

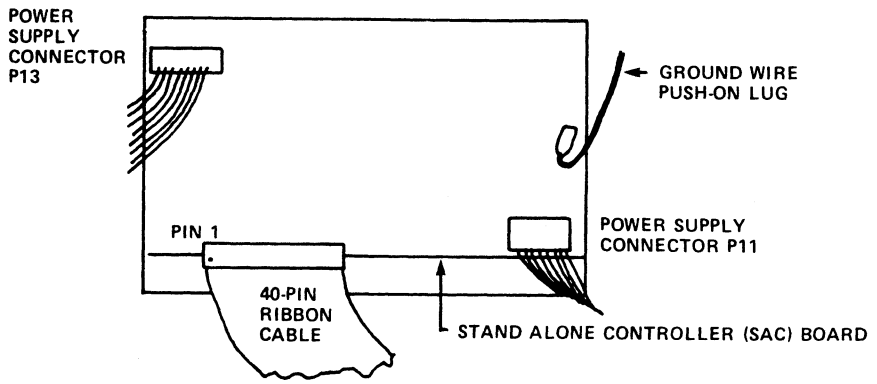
2. Unplug power supply cables P11 and P13 from the streaming cartridge tape drive. They are located in the upper left and lower right corners (as viewed from the rear).

3. Pull off the push-on lug of the ground wire (88018-6A) located at the right side of the tape drive.

4. Disconnect the 40-pin ribbon cable located near the bottom rear of the streaming cartridge tape drive.

5. Slide the streaming cartridge tape drive out of the chassis by pushing it gently from the back and then pulling it out from the front.

To install or replace the streaming cartridge tape drive, reverse the instructions for removal. To gain more hand room, connect the push-on lug of the ground wire to the drive before sliding it completely into the chassis.



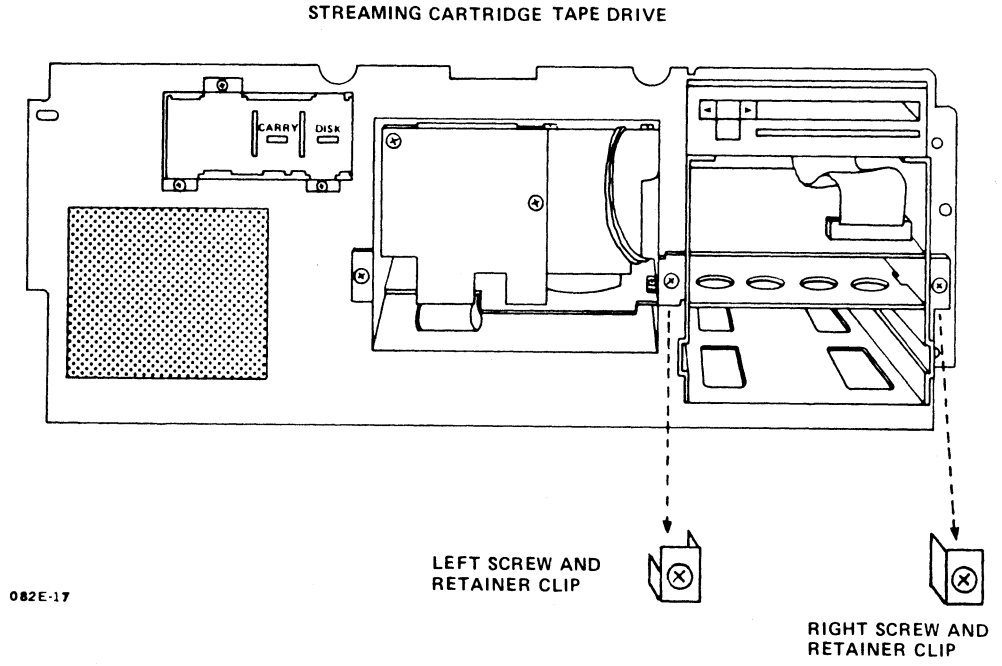


Figure 7-4. Removing the Streaming Cartridge Tape Drive

7.3 BOARDS

This section provides instructions for the removal of the following MARK 2E system boards: peripherals interface board (PIB), disk/floppy controller board and the central processing unit (CPU/mother board). To install these boards, simply reverse the removal instructions. To remove the expansion memory, asynchronous or bisynchronous boards, see Section 5, Upgrading the System, and reverse the installation instructions.

7.3.1 Peripherals Interface Board

After following the general instructions for removing components, remove the peripherals interface board (PIB) as follows. The PIB plugs into location J7 on the CPU/mother board (see Figure 7-5).

1. Unplug the cable on the PIB at location J2 that connects to the disk/floppy controller board at location J10.

2. Disconnect the ribbon cable on the PIB at location J1 that connects to the disk/floppy controller board at location J5.

3. Disconnect the ribbon cable on the PIB at location J3 that connects to the bottom of the streaming cartridge tape drive.

4. Remove the screw that secures the PIB to the board support bracket on the chassis rear. Set the screw aside.

5. Carefully pull up on the PIB to disconnect the P1 edge connector from the CPU/mother board and to remove the bracket mount from the board support bracket.

To replace the peripherals interface board (PIB), reverse the removal instructions.

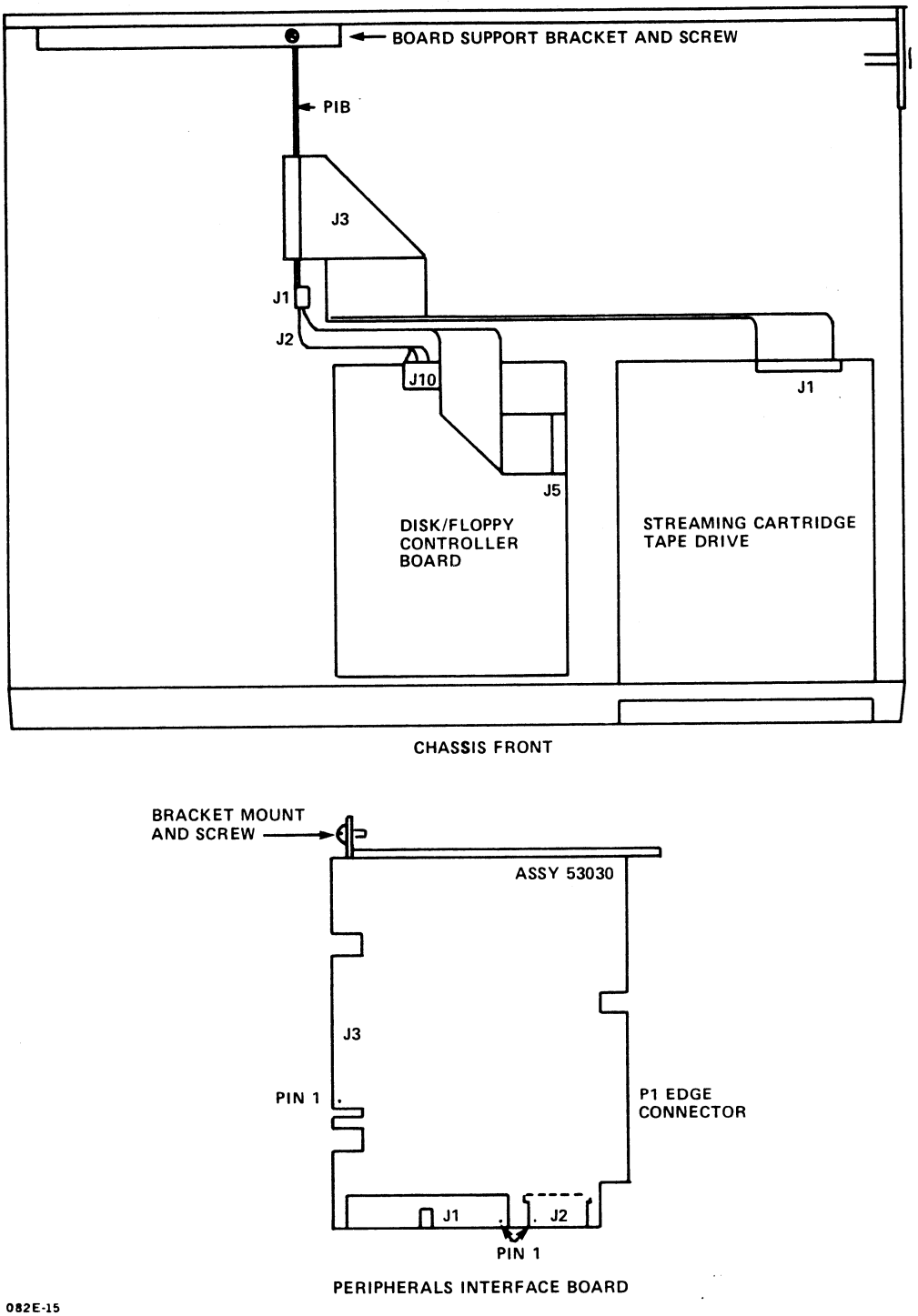


Figure 7-5. Removing the Peripherals Interface Board (PIB)

7.3.2 Disk/Floppy Controller Board

After following the general instructions for removing components, remove the disk/floppy controller board as follows (see Figure 7-6):

1. Disconnect the following ribbon cables that connect the disk/floppy controller board to other system peripherals:

   a. Cable at location J5 that connects to the PIB at location J1

   b. Cable at location J8 that connects to the floppy disk drive at location J1 (if a floppy disk drive is present)

   c. Cables A and B at locations J7 and J1 respectively that connect to the disk drive

2. Unplug the cable on the disk/floppy controller board at location J10 that connects to the peripherals interface board (PIB) at location J2.

3. Remove the four corner screws that attach the disk/floppy controller board to the disk drive. Set the screws aside.

4. Lift the board up and off the disk drive.

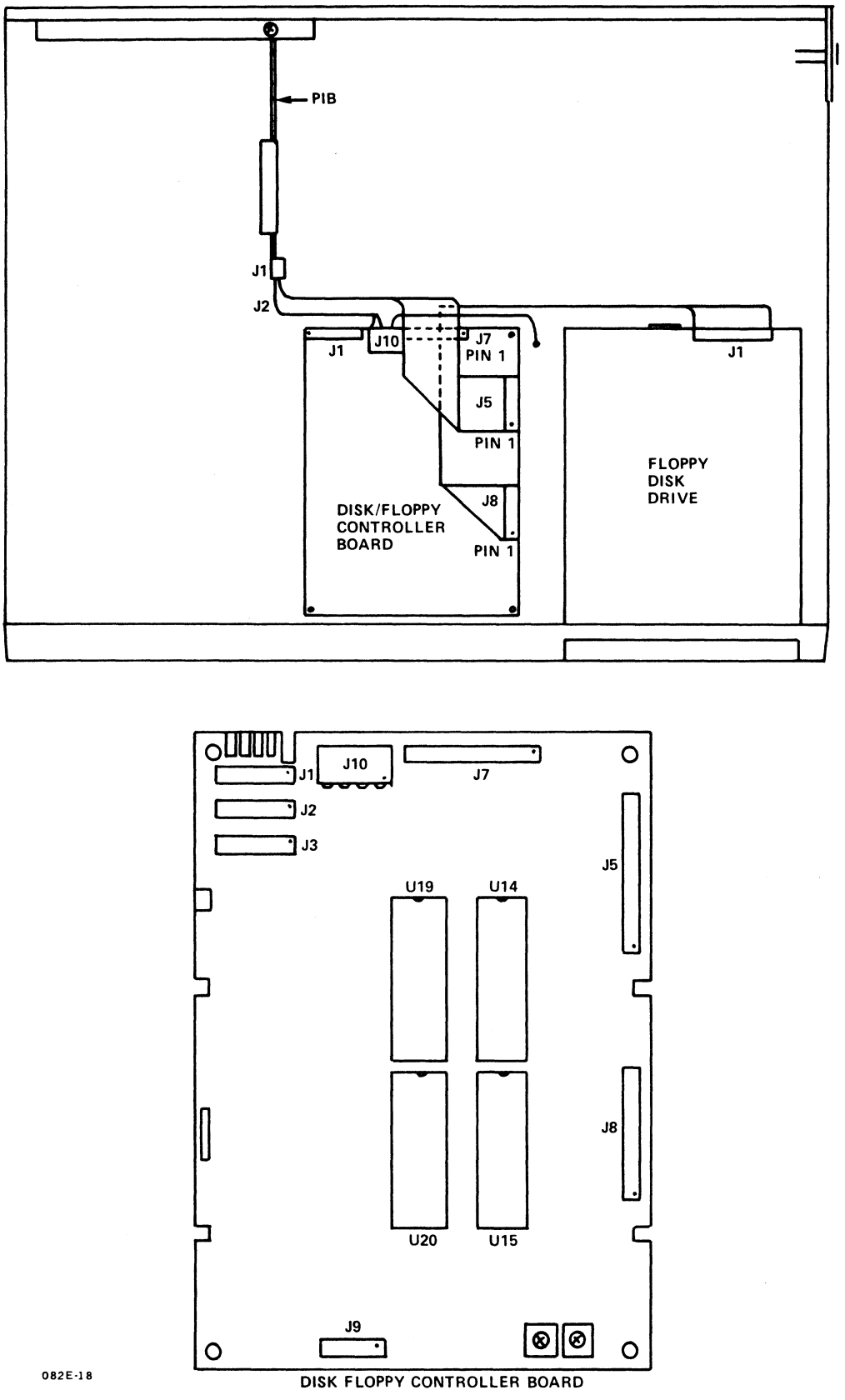


Figure 7-6. Removing the Disk/Floppy Controller Board

7.3.3 Central Processing Board/Mother Board (CPU)

After following the general instructions for removing components, remove the CPU/mother board as follows (see Figure 7-7):

1. Disconnect the peripherals interface board (PIB), asynchronous, bisynchronous (if present), and expansion memory (if present) boards according to the instructions provided for installing or removing these boards in Sections 5 and 7, Upgrading the System, and Removing and Replacing Components, respectively.

2. Carefully remove the Pico-N from the CPU/mother board at location J10 by pulling it up and off its pins (an early style Pico-N may be located at J1).

3. Disconnect connectors from the CPU/mother board at the following locations: J8, J9, J11, and J13.

4. Remove the two screws that secure the CPU/mother board to the chassis. Set the screws aside.

5. Carefully remove the CPU/mother board from the left side of the chassis as follows:

   a. Pull the CPU/mother board out of the edge spaces at the board rear and out of the slots that secure the plastic stand-offs. Be careful not to catch the reset switch as the board is being removed.

   b. Pinch the plastic stand-offs to remove them from the CPU/mother board. Keep the stand-offs to use with the replacement board.

To replace the CPU/mother board, reverse the removal instructions.

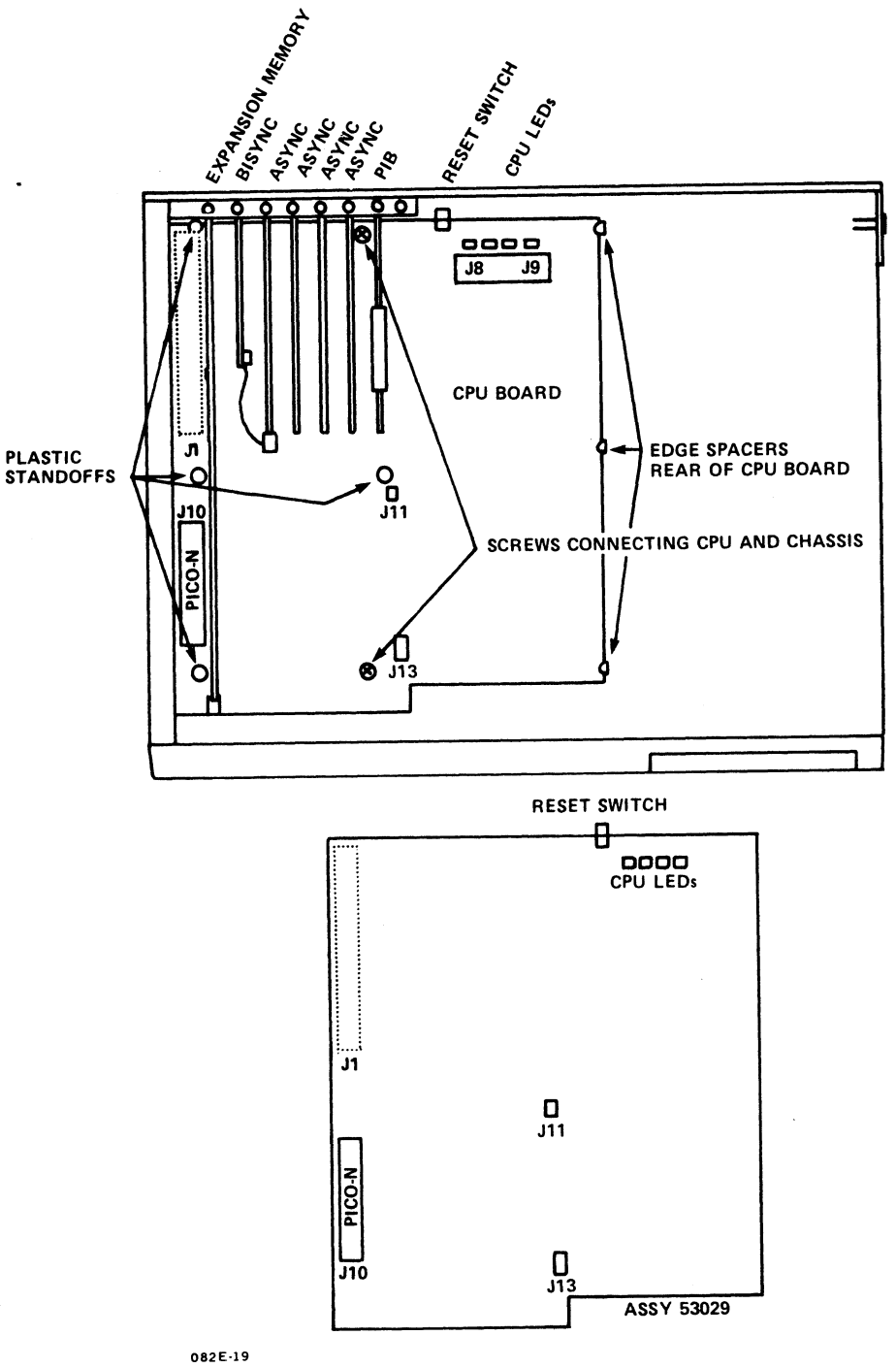


Figure 7-7. Removing the CPU/Mother Board

Section 8
POWER FAIL INSTRUCTIONS

This section explains what happens during a power failure, and it provides procedures to follow to determine what, if any, information has been lost as a result of a power failure.

When a power failure occurs, the MARK 2E power supply generates a warning signal, and the IRIS Operating System terminates operation.

When the power returns, the firmware self-test is initiated. Upon successful completion of one pass of the self-test, MANIP is loaded, an automatic IPL occurs, and the system is ready to use. The system should be checked to determine whether any information was lost at the time of the power failure. Use the more appropriate of the following procedures:

Procedure 1

1. Insert the most recent backup tape(s) into the tape drive and perform a Restore.
2. IPL (Initial Program Load) the system.
3. Reenter all data from the time of the backup to the power failure.

Procedure 2

1. IPL (Initial Program Load) the system.
2. Check the information entered on the system just prior to the power failure and check backward to determine if and what information was lost.
3. If it is determined that information has been lost, reenter the lost information.

APPENDICES

Appendix A
CABLING DIAGRAMS

This appendix provides cable wiring diagrams for terminal, printer, and modem cables. It also provides information on crimping tools used to crimp plugs onto the ends of cables.

Please note that 8-pin connectors are required for FCC compliance. The readily available 6-pin connectors have only the inner six pins (2-7) of the 8-pin connectors shown in the diagrams. The 6-pin connectors do not provide the connection for the shield and thus would not meet FCC requirements.

A.1 CRIMPING TOOLS FOR MODULAR PLUGS

Standard modular plugs are crimped onto the end of cables. They require a good crimping tool to avoid incorrect crimping, missing some of the pins, and damage to the jacks into which the plugs are connected.

To make your own cables, POINT 4 suggests that a quality crimping tool be used. Such crimping tools are available from distributors of telephone wiring equipment and connectors. Although more expensive (about $150.00), a good crimping tool will make good crimps every time and will outlast many others.

A.2 MODULAR-TO-DB25 SIGNAL LIST

Async Board Jack	SYSTEM END Modular Plug				DEVICE END
10-Pos #	8-* Pos #	6-Pos #	Signal Name		DB25 Pin #
1			CHASGND		
2 -----	1		CHASGND (SHIELD)	---	1
3 -----	2 -----	1	CONTROL OUT	-->	8
4 -----	3 -----	2	DATA OUT	-->	3
5 -----	4 -----	3	STATUS IN	<--	20
6 -----	5 -----	4	DATA IN	<--	2
7 -----	6 -----	5	SIGNAL GND	---	7
8 -----	7 -----	6	SIGNAL GND		
9 -----	8		SPARE		
10			SPARE		

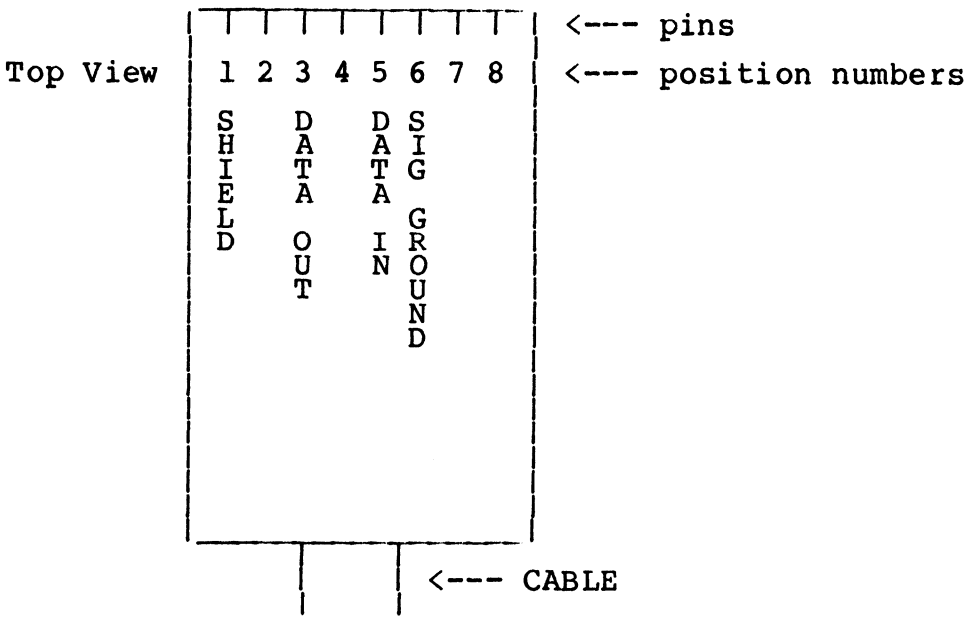
*The 8-pin connector allows for the use of shielded cables. Shielded cables must be used to meet FCC requirements.

A.3 RECOMMENDED WIRING DIAGRAM FOR CRT CABLES

The CRT cable should have all the signals required for a CRT. Unused wires should not be connected at either end of the cable.

This cable should also work with printers that use X-ON/X-OFF instead of a busy line.

SYSTEM END Position # in 8-position Modular Plug	EIA Signal Name	POINT 4 Signal Description	DEVICE END DB25 Pin #
1	PROT GND	SHIELD ---	1
2			
3	TXD	DATA OUT -->	3
4			
5	RXD	DATA IN <--	2
6	SIGNAL GROUND	---	7
7			
8			



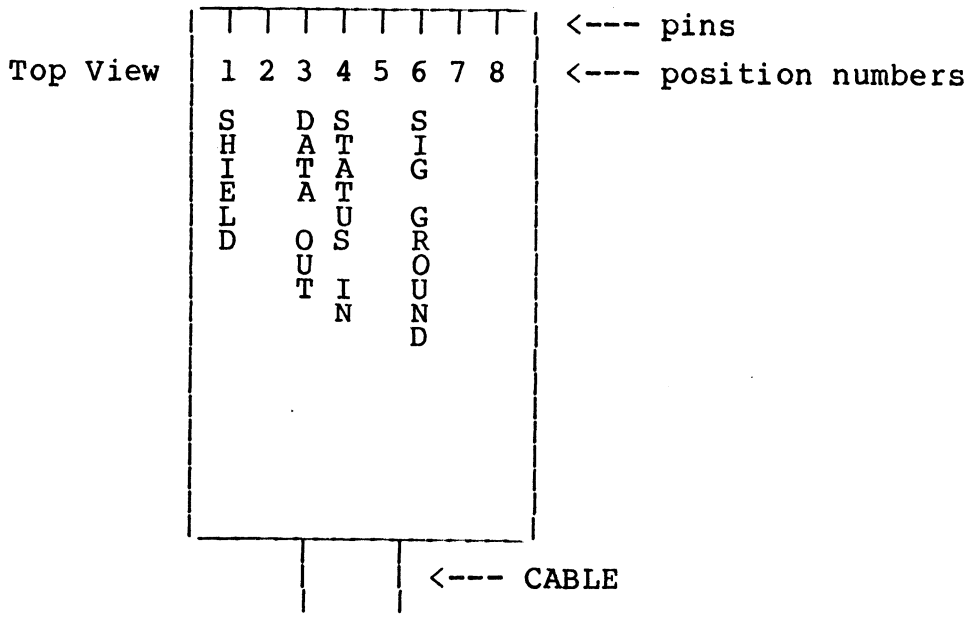
8-Pin CRT Connector, with Locking Tab Down

A.4 RECOMMENDED WIRING DIAGRAM FOR PRINTER CABLES

The printer cable should have all of the signals required for a typical printer that uses a busy line and not X-ON/X-OFF. The status-in line may have to be moved at the printer end of the cable (some printer use other pins for the busy signal).

Unused wires should not be connected at either end of the cable.

SYSTEM END Position # in 8-position Modular Plug	EIA Signal Name	POINT 4 Signal Description		DEVICE END DB25 Pin #
1	PROT GND	SHIELD	---	1
2				
3	TXD	DATA OUT	-->	3
4	DSR	STATUS IN	<--	20
5				
6	SIGNAL GROUND		---	7
7				
8				



8-Pin Printer Connector, with Locking Tab Down

A.5 RECOMMENDED WIRING DIAGRAM FOR MODEM CABLES - ASYNCHRONOUS PORT

SYSTEM END Position # in 8-position Modular Plug	EIA Signal Name	POINT 4 Signal Description		DEVICE END DB25 Pin #
1	PROT GND	SHIELD	---	1
2	DTR/RTS	CONTROL OUT	-->	20
3	TXD	DATA OUT	-->	2
4	DSR/CTS	STATUS IN	<--	8
5	RXD	DATA IN	<--	3
6		SIGNAL GND	---	7
7		NOT USED		
8		NOT USED		

A.6 BISYNCHRONOUS INTERFACE SIGNALS

SYSTEM END Pin # in DB25 Connector	Signal Name	Description	
1	CHASGND		
2	TX-OT	DATA OUT	-->
3	RX-IN	DATA IN	<--
4	RTS-OT	REQUEST TO SEND	-->
5	CTS-IN	CLEAR TO SEND	<--
6	DSR-IN	DATA SET READY	<--
7	GND		---
8	CAR-IN	CARRIER	<--
15	TX-CLK	TRANSMIT CLOCK	<--
17	RX-CLK	RECEIVE CLOCK	<--
20	DTR-OT	DATA TERMINAL READY	-->

Appendix B
MANIP

MANIP is a program that allows the user to display and examine the contents of memory on the master terminal for the purpose of locating problems. This appendix provides information on how to use MANIP; Table B-1 lists the MANIP commands and descriptions. For more information on MANIP, see Section 6.1. To access MANIP, see Section 6.1.2.

To use MANIP, a command and command parameters (where required) must be entered on the master terminal keyboard. A command consists of a single letter (the command identifier) and parameters that specify addressing modes, memory addresses and data input. All parameters must be entered in octal. The letters x, y and z are used to represent octal parameters.

If an error is made while entering a command, correct it by using one of the following:

1. Press <ESC> or any other control character except <RETURN> to delete the entry and then enter the command again.

2. If an error is made when entering an octal value, enter several zeros and then the correct octal number. Only the last six octal digits will be used.

TABLE B-1. MANIP COMMANDS (1 of 3)

Command & Parameters	Definition
A	Causes the program counter, the contents of accumulators A0, A1, A2, A3, and the carry flip-flop to be displayed on the master terminal as they were at the time MANIP was entered.
Cx,y	Change accumulator or carry flip-flop: • If x is 0, 1, 2, or 3, then y is stored as saved value for accumulator x (A0, A1, A2, A3, respectively). • If x is 4, then saved value of the carry flip-flop is set equal to the LSB of y • Parameter description x - 1 octal digit 0-4 y - 1 word octal
Dx	Dump memory in octal, beginning at location x. Eight words are displayed per line, with the address of the first word at the beginning of each line. • Parameter Description x - octal number representing a 16-bit memory address
F	Reads block 0 from floppy disk and idles at 377 waiting to be overwritten by DMA from floppy disk.
H	Reads block 0 of a 45MB (QIC-24) tape and idles at 377 waiting to be overwritten by DMA from tape.
H46	Reads block 0 of a 20MB (QIC-11) tape. Following an H46 command, the drive cannot read 45MB (QIC-24) tapes until a tape RESET command is issued or the MARK 2E power has been turned OFF and ON.
Jx	Jump to location x after restoring accumulator and carry values. • Parameter Description x - octal number representing 16-bit memory address

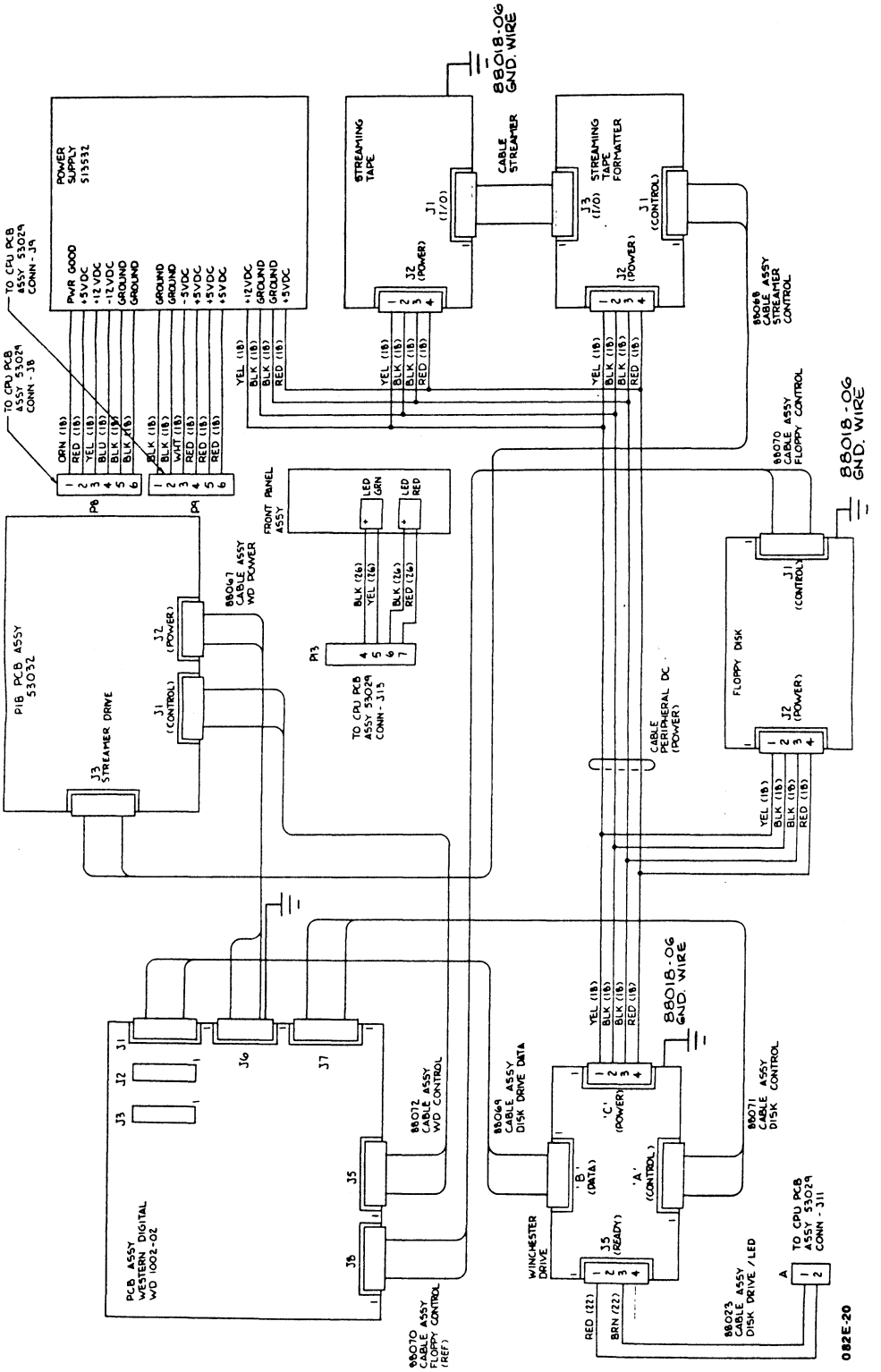
TABLE B-1. MANIP COMMANDS (2 of 3)

Command & Parameters	Definition
Kx,y,z	Store the octal constant z in locations x through y, inclusive. • Parameter Description x - octal number representing 16-bit beginning memory address y - octal number representing 16-bit ending memory address z - octal number representing constant
Mx,y,z	Move block in memory. Locations x through y, inclusive, are moved to area starting at location z. • Source and destination areas may overlap in either direction without bad effects. • May be used to move MANIP itself as long as destination area does not overlap source area. • Parameter Description x - octal number representing 16-bit beginning memory address y - octal number representing 16-bit ending memory address z - octal number representing 16-bit beginning memory address of new location
P	Initial Program Load from disk (Sector 0, Surface 0, Cylinder 0). Performs standard bootstrap APL function (i.e., starts DMA action and then idles at location 377 waiting for the disk to overwrite that location).
V	Loads self-test at location 20000 and runs hardware verify test. Upon successful completion, the following is displayed on the master terminal: MARK 2E CPU SELFTEST REV nn CPU OK, MAP OK, nnMB MEMORY OK, DISK LOGIC OK, TAPE LOGIC OK, nPorts OK Self-test then moves itself to another memory location and repeats the above. Main memory will be overwritten.

TABLE B-1. MANIP COMMANDS (3 of 3)

Command & Parameters	Definition
x:y	Octal value y is stored at location x, and next cell is opened. ● Parameter Description x - octal number representing 16-bit memory address y - 1 to 6 digits representing an octal value If y is omitted, the current content of location x is displayed. A new y may then be entered, or the next cell opened without change.
@	Loads DBUG at location 73000; main memory will be overwritten.

Appendix C
SYSTEM WIRING DIAGRAMS



PIB/STREAMER DRIVE INTERFACE

J3 (PIB)	
PIN NO.	SIGNAL
1	GND
2	RESERVED
3	GND
4	RESERVED
5	GND
6	RESERVED
7	GND
8	RESERVED
9	GND
10	RESERVED
11	GND
12	HOST BUS BIT 7
13	GND
14	HOST BUS BIT 6
15	GND
16	HOST BUS BIT 5
17	GND
18	HOST BUS BIT 4
19	GND
20	HOST BUS BIT 3
21	GND
22	HOST BUS BIT 2
23	GND
24	HOST BUS BIT 1
25	GND
26	HOST BUS BIT Ø
27	GND
28	ONLINE
29	GND
30	REQUEST
31	GND
32	RESET
33	GND
34	TRANSFER
35	GND
36	ACKNOWLEDGE
37	GND
38	READY
39	GND
40	EXCEPTION
41	GND
42	DIRECTION
43	GND
44	RESERVED
45	GND
46	RESERVED
47	GND
48	RESERVED
49	GND
50	RESERVED

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DISK/FLOPPY CONTROLLER BOARD

J1 (DATA) "B"	
PIN NO.	SIGNAL
1	NC
2	GND
3	NC
4	GND
5	NC
6	GND
7	NC
8	GND
9	NC
10	NC
11	GND
12	GND
13	MFM WRITE DATA
14	MFM WRITE DATA
15	GND
16	GND
17	MFM READ DATA
18	MFM READ DATA
19	GND
20	GND

PIB DISK/FLOPPY BOARD INTERFACE

J5 (WD CONTROL)	
PIN NO	SIGNAL
1	DAL Ø
2	GND
3	DAL 1
4	GND
5	DAL 2
6	GND
7	DAL 3
8	GND
9	DAL 4
10	GND
11	DAL 5
12	GND
13	DAL 6
14	GND
15	DAL 7
16	GND
17	AØ
18	GND
19	A1
20	GND
21	A2
22	GND
23	$\overline{CS}$
24	GND
25	$\overline{WE}$
26	GND
27	$\overline{RE}$
28	GND
29	PULL-UP
30	GND
31	NC
32	GND
33	NC
34	GND
35	INTRQ
36	GND
37	DRQ
38	GND
39	$\overline{MR}$
40	GND

DISK/FLOPPY BOARD

J6 (WD POWER)	
PIN NO	SIGNAL
1	NC
2	GND
3	GND
4	+5VDC

DISK/FLOPPY BOARD DISK DRIVE INTERFACE

J7 (DRIVE CONTROL "A"	
PIN NO.	SIGNAL
1	GND
2	$\overline{RWC}$
3	GND
4	$\overline{HEAD\ SELECT\ 2}$
5	GND
6	$\overline{WRITE\ GATE}$
7	GND
8	$\overline{SEEK\ COMPLETE}$
9	GND
10	$\overline{TK\ ØØØ}$
11	GND
12	$\overline{WRITE\ FAULT}$
13	GND
14	$\overline{HEAD\ SELECT\ Ø}$
15	GND
16	NC
17	GND
18	$\overline{HEAD\ SELECT\ 1}$
19	GND
20	$\overline{INDEX}$
21	GND
22	$\overline{READY}$
23	GND
24	$\overline{STEP}$
25	GND
26	$\overline{DRIVE\ SELECT\ 1}$
27	GND
28	$\overline{DRIVE\ SELECT\ 2}$
29	GND
30	$\overline{DRIVE\ SELECT\ 3}$
31	GND
32	NC
33	GND
34	$\overline{DIRECTION\ IN}$

DISK/FLOPPY BOARD FLOPPY DRIVE INTERFACE

J8 (FLOPPY CONTROL)	
PIN NO	SIGNAL
1	GND
2	NC
3	GND
4	NC
5	GND
6	$\overline{DRIVE\ SELECT\ Ø}$
7	GND
8	$\overline{INDEX}$
9	GND
10	$\overline{DRIVE\ SELECT\ 1}$
11	GND
12	$\overline{DRIVE\ SELECT\ 2}$
13	GND
14	$\overline{DRIVE\ SELECT\ 3}$
15	GND
16	$\overline{MOTOR\ ON}$
17	GND
18	$\overline{DIRECTION\ IN}$
19	GND
20	$\overline{STEP}$
21	GND
22	$\overline{WRITE\ DATA}$
23	GND
24	$\overline{WRITE\ GATE}$
25	GND
26	$\overline{TRACK\ ØØØ}$
27	GND
28	$\overline{WRITE\ PROTECT}$
29	GND
30	$\overline{READ\ DATA}$
31	GND
32	$\overline{SIDE\ SELECT}$
33	GND
34	NC

Appendix D
GLOSSARY

Accumulator - a part of the logical-arithmetic unit of a computer.

Address - a number identifying a location where information is stored.

APL (Automatic Program Load) - the loading of the program that occurs whenever the AC power switch is turned to ON once the software is loaded.

Asynchronous - A mode of communications that transmits a single character with additional bits, stop and start, to provide the timing. Each character is individually timed.

Bisynchronous - A communications protocol that includes control characters and procedures for controlling the establishment of a valid connection and transfer of data. Usually one block of characters is transmitted at a time.

CPU (Central Processing Unit) - also referred to as the CPU/ mother board because, in addition to the usual computational operations, it performs backplane functions and it connects the peripherals interface, asynchronous, bisynchronous, and expansion memory boards to the CPU board.

DBUG - a debugging program to locate and correct errors in a computer program. It is independent of the IRIS Operating System and is controlled from the master terminal.

Diagnostic - a hardware program or routine used to help locate a malfunction or problem in system hardware. POINT 4 diagnostics are available on stand-alone tapes; they are also supplied with the IRIS Operating System on logical unit 5.

DISCUTILITY - a program that is used to format a disk and save and restore information from disk and/or streamer tape. It is available on the IRIS Operating System logical unit 0 or as a stand-alone program.

Disk Driver Table - a table on the IRIS Operating System that contains information about the disk controller, disk drive and disk partitioning.

DSP - Disk Service Processor, an IRIS on-line debugging utility.

Expansion memory board - an optional 512KB memory board that can be added to the MARK 2E system to bring its total memory capacity to 1MB.

Firmware test - a test that verifies the CPU/mother board hardware is functioning enough to communicate with a terminal. It is run each time the power is turned ON.

HALT - a ceasing of computer operations because of a hardware or software problem or a power failure.

Hardware verify test - a test that verifies the operation of the MARK 2E system as a whole: CPU, all system memory, tape interface and serial ports. It also invokes the disk/floppy controller self-test and checks for its successful completion. It can be accessed through MANIP.

IPL (Initial Program Load) - a procedure that reads the IRIS Operating System from disk to memory.

IRIS (Interactive Real-Time Information System) - POINT 4's operating system that supports multi-user business software.

MANIP - a stand-alone program that is automatically loaded into memory by system firmware when the system is powered up, a HALT occurs, or a user pushes the reset switch. It initiates the hardware verify test and, when the operating system is on the disk, an automatic program load. It also enables the user to load programs or display and examine the contents of memory on a master terminal; and it enables programmers to debug the system.

MAPACTIVATE - utility on the IRIS Operating System that activates the memory map driver.

Mapped memory - hardware architecture used to increase the memory available to the system by redirecting the CPU to different areas of physical memory.

Master terminal - the terminal connected to port zero and used to perform certain system operations.

Octal - the base eight numbering system used by IRIS.

Operating system - a collection of programs which direct and supervise the computer's operation. POINT 4's operating system is IRIS.

PAL - programmable array logic, an integrated circuit and trademark of Monolithic Memories, Inc.

PIB - peripherals interface board that links the peripherals to the CPU.

Pico-N - a 40- or 100-pin connector with encapsulated circuitry that prevents unauthorized use of IRIS, POINT 4 application packages, or specified OEM packages. It is supplied under a non-transferrable license with each paid IRIS license and remains the property of POINT 4.

Port Definition Table - contains the information needed by the multiplexer driver to access the devices on the multiplexer.

Port 0 - the first port on the first asynchronous board.

Program counter - the register that contains the address of the current instruction being executed.

Self-tests - refers to the firmware test and the hardware verify test.

SETUP - an interactive utility used to configure the IRIS R9 Operating System.

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