MARK 6E/12E

System Installation/ Maintenance Manual

POINT 4 DATA CORPORATION

MARK 6E/12E

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.

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01	Preliminary release	03/28/87
02	Complete revision incorporating AC distribution tray and BBU assembly covers, disk and tape housing, and bezel changes	06/27/88
A	Complete revision incorporating a -5V DC regulator board, card cage brace, 765MB hard disk drive, 8mm helical scan tape drive, LOTUS 750 Controller, and appendices on the care and handling of tapes/ cartridges, and cabling to external peripherals	11/23/88

LIST OF EFFECTIVE PAGES

Changes, additions, and deletions to information in this manual are indicated by vertical bars in the margins or by a dot near the page number if the entire page is affected. A vertical bar by the page number indicates pagination rather than content has changed. The effective revision for each page is shown below.

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PREFACE

The MARK 6E/12E System Installation and Maintenance Manual is designed for value added resellers, installers, maintenance and service persons of the MARK 6E/12E minicomputer system. Its purpose is to provide information about the system and its components; information and instructions for installing and starting up the system, installing and replacing individual components, for troubleshooting, and power-fail situations. The sections of the manual contain the following:

Section 1 - Overview: A brief description of the MARK 6E/12E computer and the software that can be utilized.

Section 2 - Components: Information about the function, location, features, and capabilities of the major system components.

Section 3 - Controls and Indicators: Information about the location, operation, and function of the control panel; power monitor board and power switch; MANIP (a stand-alone program that enables the operator to perform several system functions from the master terminal keyboard); and tape drive indicators.

Section 4 - Installing Integrated Systems: A suggested procedure for installing the system hardware.

Section 5 - Getting Started: Routine procedures for starting up the system including initial power-up, self-test, and initial program load. Loading software is referenced.

Section 6 - Installing and Removing Components: Instructions for the installation and replacement of essential system components.

Section 7 - Troubleshooting: A suggested routine for locating problems and malfunctions including how to determine system HALTS, MANIP(ulate) and check out the system, and run diagnostics.

Section 8 - Power-Fail Instructions: An explanation of what occurs during a power failure where battery backup is present, and procedures for recovering information.

The manual also includes the following appendices: System Specifications, Battery Backup, Caring for Tapes/Cartridges, MANIP Commands, Cabling to External Peripherals, System Wiring Diagrams, Backplane Pin Assignments, and a Glossary.

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.

Related Documents

Related documentation includes:

Title	Document Order No.
IRIS R9 System Configuration Manual	ITP0029
IRIS R9 System Manager Manual	ITP0030
LOTUS DISCUTILITY Manual	ITP0018
LOTUS 725/740/745/750 Disk/Tape Controller Diagnostics Manual	HTP0059
LOTUS 800 Controller Manual	HTP0070
LOTUS 800 Disk/Tape Controller Diagnostics Manual	HTP0073
Mag Tape Controller, Model TC200, Technical Manual (for LOTUS 725)	
MARK 5 thru 12 CPU/Memory Diagnostics Manual	HTP0074
MARK 6/12 System I&M Manual	HTP0072
MARK 6/12 DCH Map/Extended Memory Diagnostic Manual	HTP0054
MARK 6/12 Self-Test/MANIP Manual	HTP0064
MIGHTY MUX Diagnostic Manual	HTP0067
MIGHTY MUX User Manual	HTP0015
Hardware Information Technical Support Bulletins: HITS.20 - Installing/Configuring 2/4MB Ext Memory HITS.21 - MARK 12 CPU and Firmware	

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Section 1
OVERVIEW

The POINT 4 MARK 6E/12E is a multi-user minicomputer system that combines state-of-the-art technology and advanced architectural concepts; supports up to 64 users; performs simultaneous, multiple tasks; and provides up to 16MB of extended memory.

The MARK 6E/12E fully utilizes the POINT 4 IRIS (Interactive Real-Time Information System) Operating System. It can also run existing application software written in IRIS Business BASIC and SMbasic.

The MARK 6E/12E is available as an integrated system or as separate components. An integrated system is housed in a tower-style chassis and includes the following:

- A MARK 6 or a MARK 12 central processing unit with optional extended memory
- An 8-slot card cage and backplane assembly
- A main power supply, -5V DC regulator board, optional battery backup, and auxiliary power supply (if required)
- Up to four 5-1/4-inch ESDI hard disk drives
- Up to 64 ports with RJ45 connectors
- A 150MB 1/4-inch streaming tape drive with an optional 8mm helical scan tape drive
- Up to three 50-pin 1/2-inch tape drive connectors
- IRIS and the Pico-N

Specific components and options are described in Section 2.

In addition, a complete range of compatible peripherals is available from various manufacturers. Peripherals that can interface with the MARK 6E/12E include: video display and printing terminals, line and character printers, plotters, and modems.

Section 2
COMPONENTS

This section describes each of the major components and options of the MARK 6E/12E system. It provides information about the function, location, features, and capabilities of the following:

- Tower-style chassis
- Power supplies including battery backup
- Card cage and backplane assembly
- Computer boards
- Hard disk drive(s)
- Tape drive(s)
- IRIS and the Pico-N

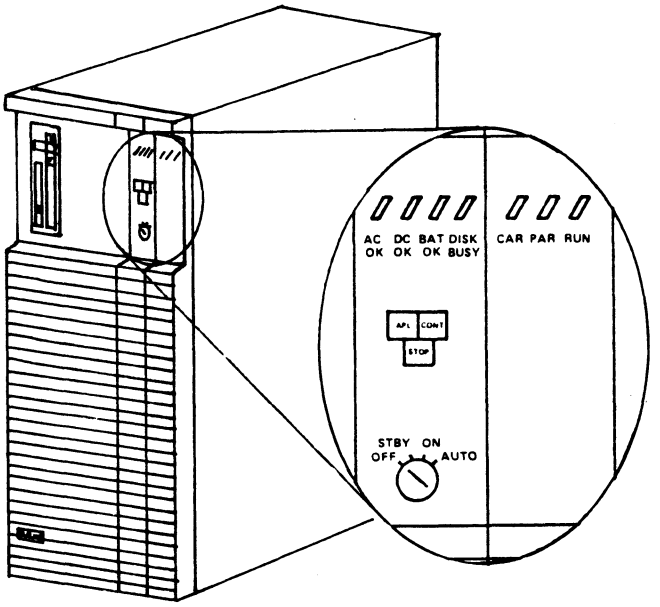
2.1 CHASSIS

The MARK 6E/12E is housed in a tower-style chassis. The chassis, which measures 29 inches high x 12 inches wide x 29 inches deep, is no longer or higher than the average desk. It is easy to move by means of a front panel handle and two sets of wheels. Front, rear, top, and side panels are easily removed to provide access to the interior. Figure 2-1 illustrates the MARK 6E/12E.

The system control panel, which is located on the front, contains the power control and program execution switches, and the power, central processing unit (CPU), and disk activity indicators. The chassis rear contains connectors for external peripheral devices, the main power switch, AC outlet, fuses, and voltage indicators.

Internal construction consists of a rack and frame structure that complies with RETMA* and EIA* specifications. The rack and frame structure includes the following: a vertically-mounted 8-slot card cage and backplane assembly, power supplies, disk and tape drives.

*RETMA (Radio Electronics and Television Manufacturer's Association) and EIA (Electronic Industries Association) represent an industry standard.



FRONT

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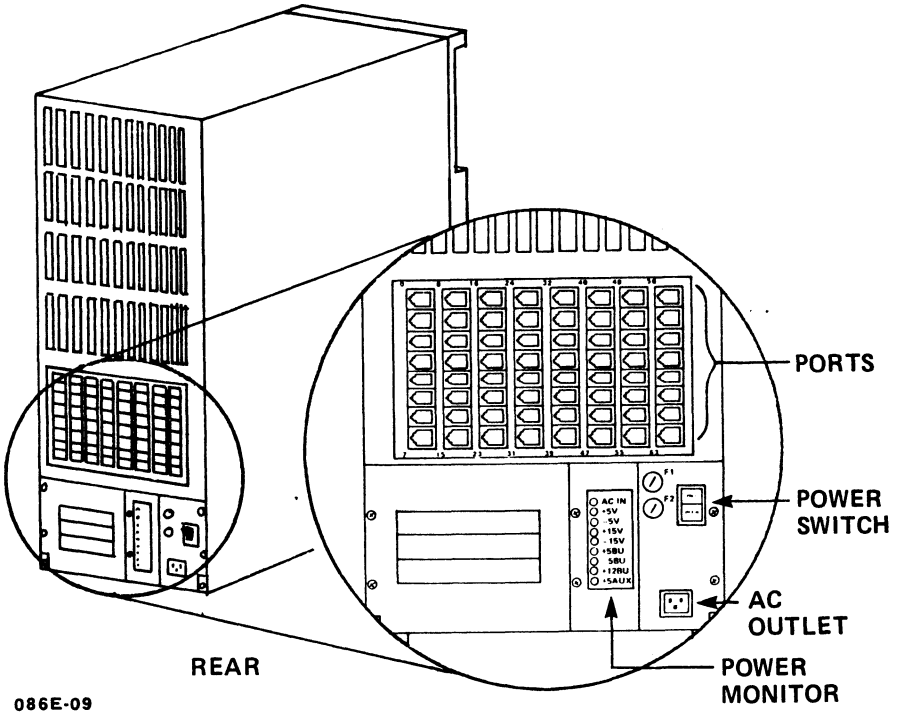

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Figure 2-1. MARK 6E/12E

2.2 POWER SUPPLIES

The MARK 6E/12E has a main power supply and a -5V DC regulator board. An auxiliary power supply is required if more than two ESDI hard disk drives are included in the system. Battery backup (BBU) is available as an option. Figure 2-2 shows the location of the power supplies.

The following subsections describe the power supplies. For additional information, see Sections 6 and 7, and Appendix A.

2.2.1 Main Power Supply

A 500-watt power supply provides power for the central processing unit (CPU), controllers, first and second ESDI hard disk drives, 1/4-inch streaming tape drive, and 8mm helical scan tape drive (if present). The main power supply is enclosed in a box at the bottom front of the chassis.

2.2.2 -5V DC Regulator Board

A -5V DC regulator board is available to support controllers that require -5V DC. It is located on the chassis floor adjacent to the main power supply.

2.2.3 Auxiliary Power Supply

If a system has more than two 5-1/4-inch ESDI hard drives, a 144-watt auxiliary power supply is required. It is located near the bottom front of the chassis.

2.2.4 Battery Backup Unit

If the system has a battery backup unit (BBU), uninterrupted +5BBU power is supplied to extended memory if the power fails. Because main memory is transferred to extended memory during a power-fail, it also is saved. The BBU is located in the chassis front below the disk drives. It requires IRIS R9 or later revision.

The BBU is charged any time that AC power is on and the keyswitch is in the STBY, ON, or AUTO position. The actual hold time varies with the amount of load, the size of the battery, and the amount of charge. For additional information, see Appendix B.

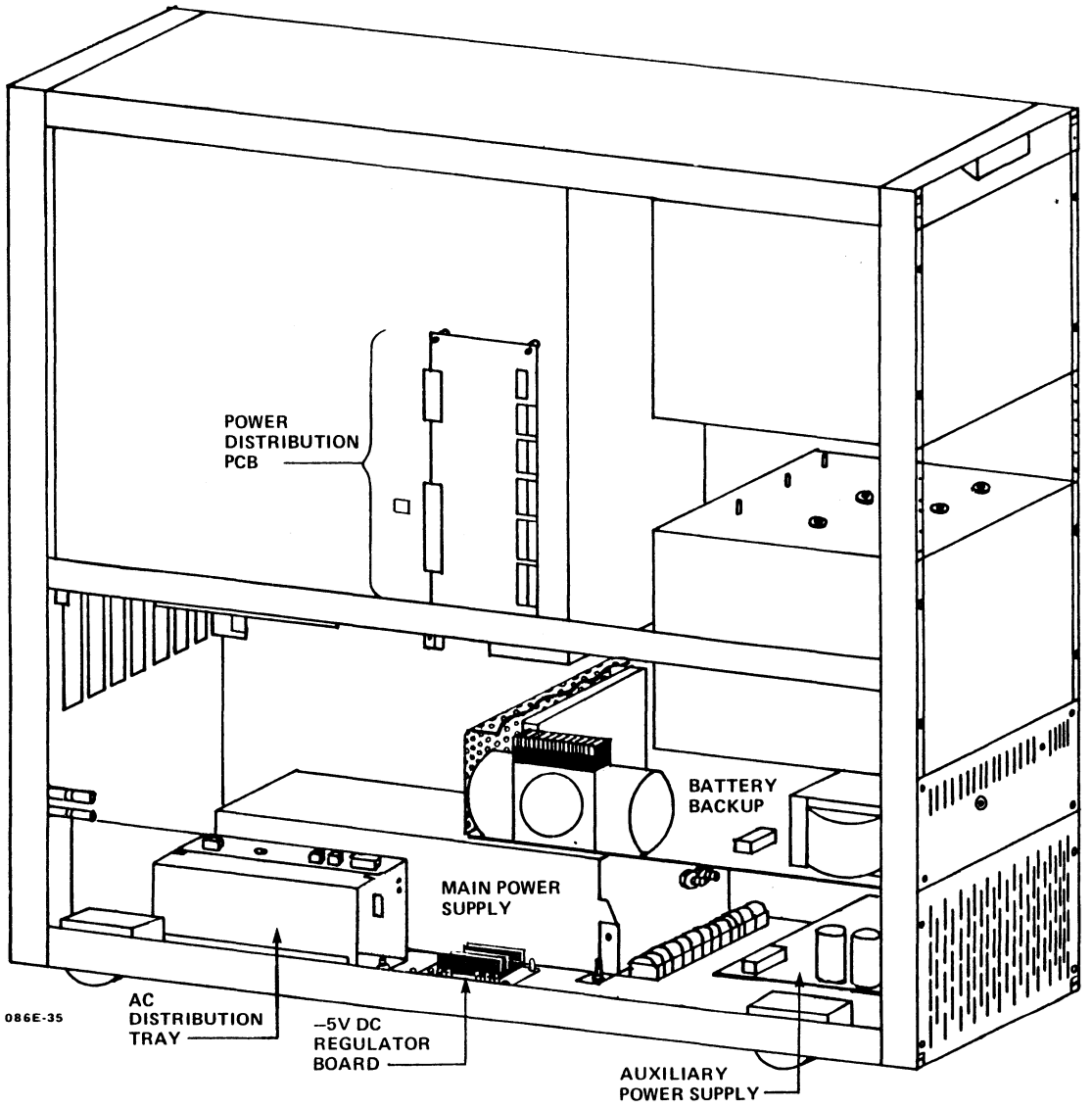


Figure 2-2. Location of the Power Supplies

2.3 COMPUTER BOARDS

The MARK 6E/12E supports a maximum of eight computer boards. The boards are housed in the vertically-mounted card cage at the top of the chassis.

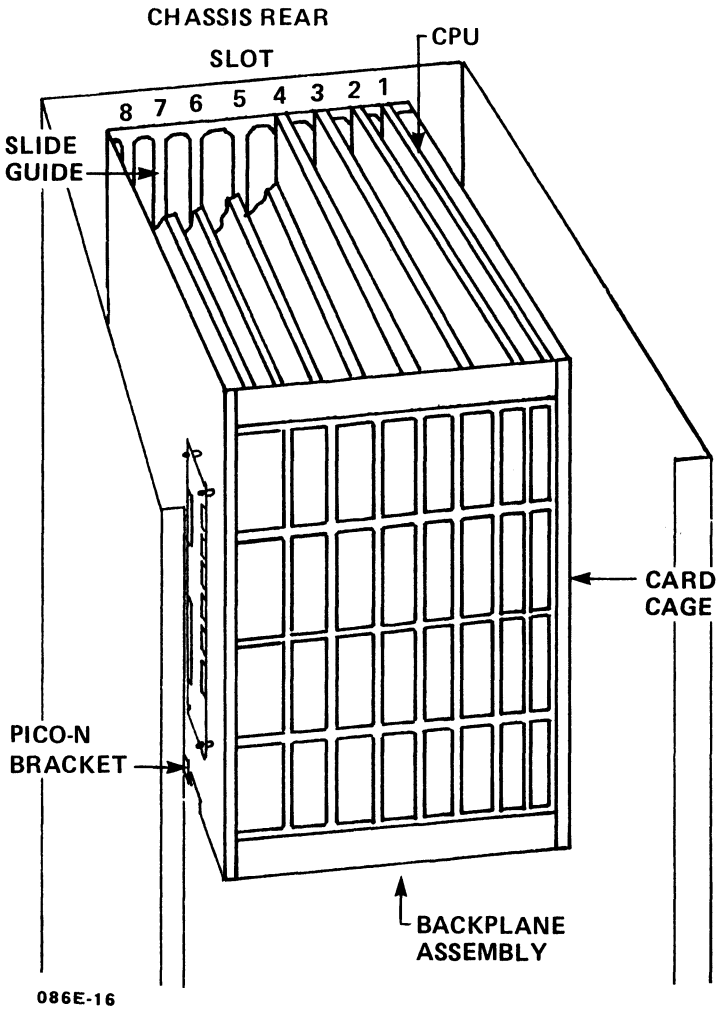
The card cage has a backplane assembly that supplies power to the computer boards and enables communications to be transferred from one board to another. The backplane is located on the underside of the card cage. Figure 2-3 illustrates the card cage and backplane assembly.

The computer boards fit into slots of the card cage from right side to left side (as viewed from the front) in the following order:

Board	Slot
Mark 6 or 12 CPU	1 (right side)
Extended Memory	2, 3, 4, 5 as needed
Disk/Tape Controller	The first slot to the left of the extended memory boards
310 Multiplexer	The slot to the left of the disk/ tape controller
301 Expansion	The remaining slots to a maximum of three boards

NOTE

If a 1/2-inch tape controller is used, place it to the right of the disk controller.



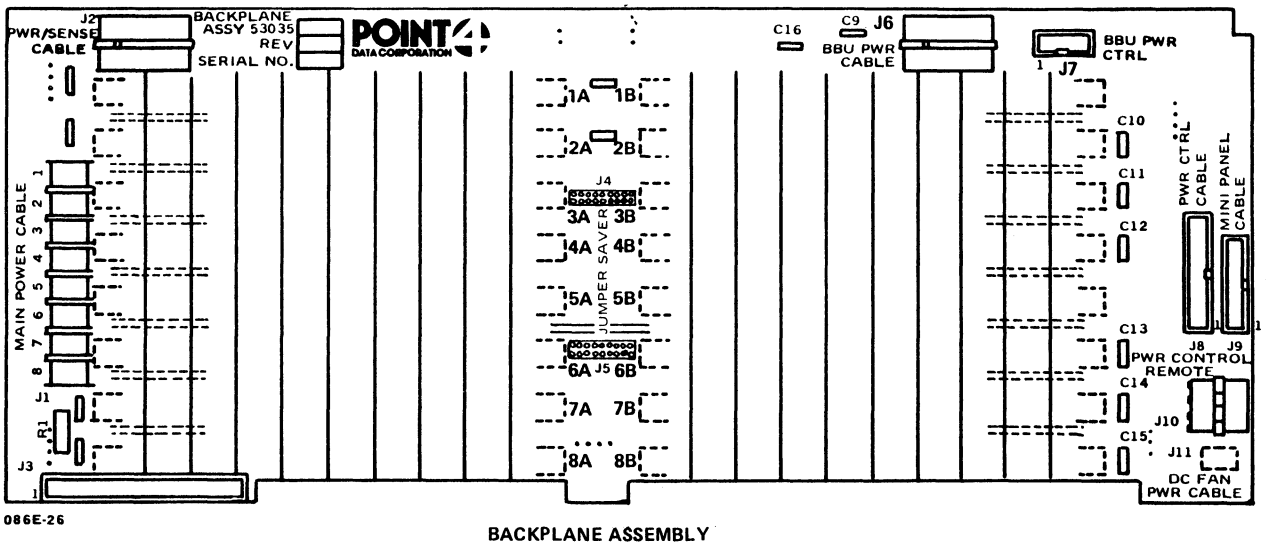


Figure 2-3. Card Cage and Backplane Assembly

2.3.1 Central Processing Unit

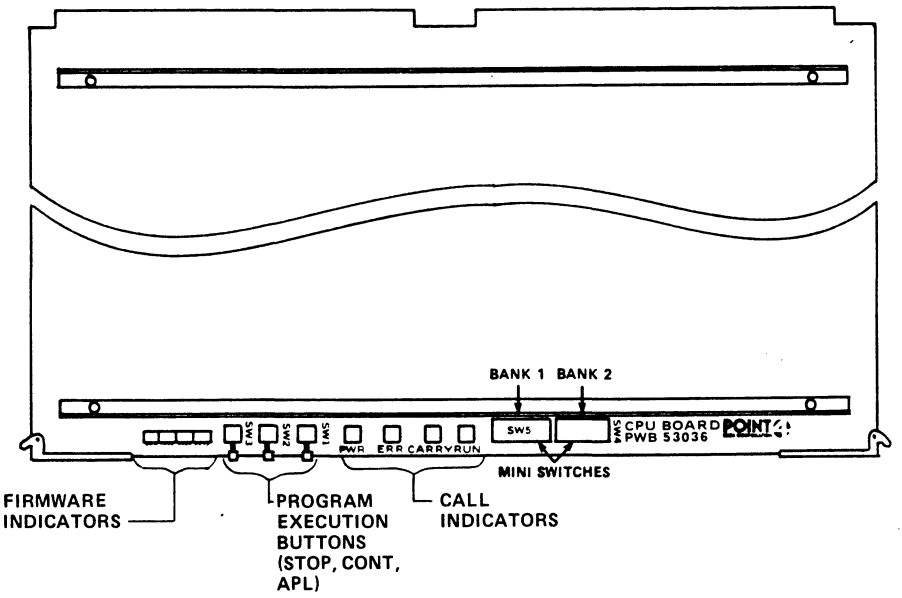
The MARK 6E/12E includes either the MARK 6 or the MARK 12 central processing unit (CPU). The CPU controls and performs the execution of instructions; and it contains the main storage, arithmetic unit, and special registers of the computer. The CPU occupies slot 1 of the card cage. Figure 2-4 illustrates the MARK 6 and MARK 12 CPUs.

2.3.1.1 FEATURES

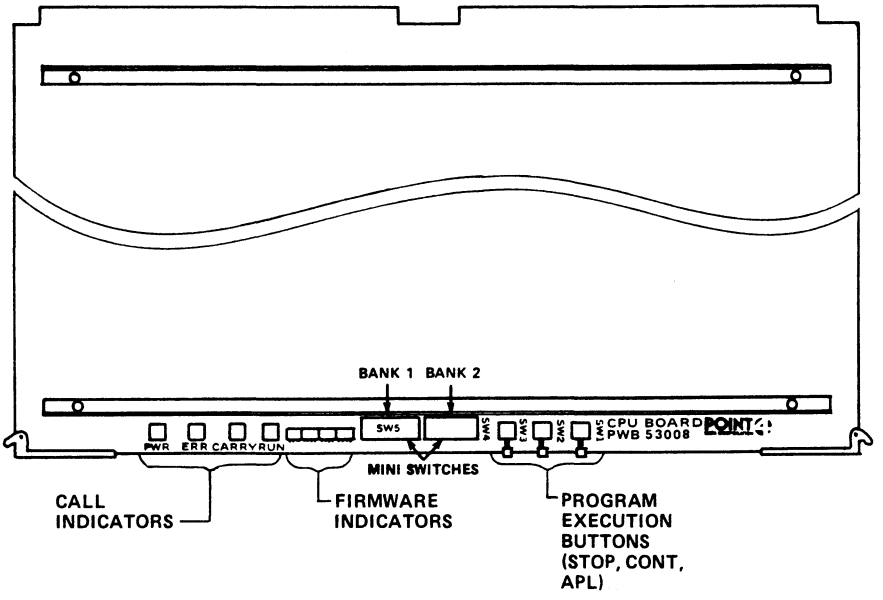
The main features of the 16-bit CPU are listed below. Where the information pertaining to the MARK 12 CPU differs from that of the MARK 6 CPU, it is indicated in parentheses.

- Uses a 4-stage pipeline architecture to fetch and queue four instructions simultaneously
- Executes instructions at 6.25 (15) MIPS - millions of instructions per second
- Operates on a 160 (64) nanosecond effective execution cycle time
- Employs 128KB of high speed main memory and can access an additional 16MB of extended memory
- Uses 5-volt TTL circuitry on a single 4-layer (6-layer), 15-inch board

In addition, the MARK 12 CPU has three software addressing modes: 32K-word, 64K-word, and MARK 12.



MARK 6 CPU



MARK 12 CPU

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Figure 2-4. MARK 6 and MARK 12 Central Processing Units

2.3.1.2 INDICATORS AND CONTROLS

The central processing unit (CPU) has LED indicators and controls along the top edge that distinguish it from other boards in the computer. Figure 2-4 illustrates the LED indicators and controls.

Sixteen firmware indicators, grouped in fours, are used by POINT 4 or authorized repair technicians for troubleshooting. The leftmost five indicators show status conditions internal to the CPU; the rightmost 11 indicate the firmware address. The firmware indicators are described in Table 2-1.

Four call indicators (POWER, ERROR, CARRY, and RUN) describe the status of the CPU. The call indicators are described in Table 2-2.

STOP, CONTinue, and APL (automatic program load), are buttons that control program execution. They are enabled when the keyswitch on the control panel is set to ON and disabled when set to AUTO. These buttons provide the same functions as those on the control panel. The control buttons are described in Table 2-3.

The mini-switches determine the manner in which an initial program load (IPL) is performed and/or the manner of access to the CPU software self-test. The switches can also be manipulated by technicians to read any location in main memory when troubleshooting. Table 2-4 describes the three options for setting the mini-switches and the results of each option.

TABLE 2-1. FIRMWARE INDICATORS

Indicator	Description
ION	Interrupts are enabled
DME	Data channel mapping is enabled
EIS	CPU is in extended instruction set mode (disabled in MARK 12)
64K	CPU is in 64K-word addressing mode
DCR	Data channel request is active; not available in CPU status word
Remaining	Indicate the firmware address

TABLE 2-2. CALL INDICATORS

Indicator	Description
PWR	+5V DC is applied to the CPU
ERR	Indicates a memory parity error
CARRY	Indicates the current state of the CPU carry flag; lights when carry flag is set to 1
RUN	Indicates CPU is operating; does not light when the CPU is halted

TABLE 2-3. PROGRAM EXECUTION CONTROLS

Button	Description
STOP	Stops CPU operation. The CPU finishes the current instruction, fetches the next one, then stops. The program counter points to the next instruction to be executed.
CONT	Causes program execution to resume, starting at the address in the program counter.
APL	Depending on how the mini-switches are set, loads MANIP into the top 1000 octal words of memory, loads the CPU software self-test, or does an automatic initial program load from another designated device.

TABLE 2-4. CPU MINI-SWITCH SETTINGS

Switch Value	Switch Setting* Bank 1	Switch Setting* Bank 2	To IPL	Access Self-Test
Standard PT 4 Configuration Octal 0	▲▲▲▲▲▲▲▲	▲▲▲▲▲▲▲▲	From Disk: Turn keyswitch ON Wait for MANIP ->* Enter Pnn Press <RETURN>	Through MANIP
Octal 200+mm	▲▲▲▲▲▲▲▲	▼▲xxxxxx	Turn keyswitch ON Press APL	Through MANIP
Octal 100200**	▼▲▲▲▲▲▲▲	▼▲▲▲▲▲▲▲	WILL NOT IPL	Directly. Runs self-test forever.

nn - device code to boot from. If P <RETURN> is entered, it defaults to 27; this is valid for a LOTUS disk controller board.

mm - device code to boot from.

*Switch setting:
▼ - on or closed **(down)**
▲ - off or open **(up)**
xxxxxx - binary form of mm

**This setting is used when running self-test overnight at initial installation or when troubleshooting.

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2.3.1.3 SELF-TESTS

Two self-tests are associated with the central processing unit (CPU) that check the functioning of the MARK 6E/12E:

- Firmware self-test - At the firmware level, this initial test verifies that 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 indicators on the top edge of the CPU. Pressing STOP and CONT together, then releasing CONT first, advances to the next test. Report any errors to POINT 4 Hardware Technical Support.

- CPU software self-test **(this does not refer to program software)** - This test verifies that the CPU software is functioning. The test is contained in the MANIP PROM. It can be accessed in three ways: at the initial power-on, through MANIP (a stand-alone program), and by setting the mini-switches located on the top edge of the CPU to octal 100200.

2.3.2 Extended Memory

The MARK 6E/12E supports a maximum of four memory boards, which provide up to 16MB in 2 or 4MB capacities. Extended memory transfers data to the central processing unit (CPU) over a 32-bit, VME-like bus at a rate of 33.3MB per second. It also detects and corrects single-bit errors automatically and reports double-bit errors.

Extended memory boards fit into slots 2, 3, 4, and 5 of the card cage as required. Battery backup (if present) provides battery power to extended memory in the event of a power failure. Figure 2-5 illustrates the extended memory board.

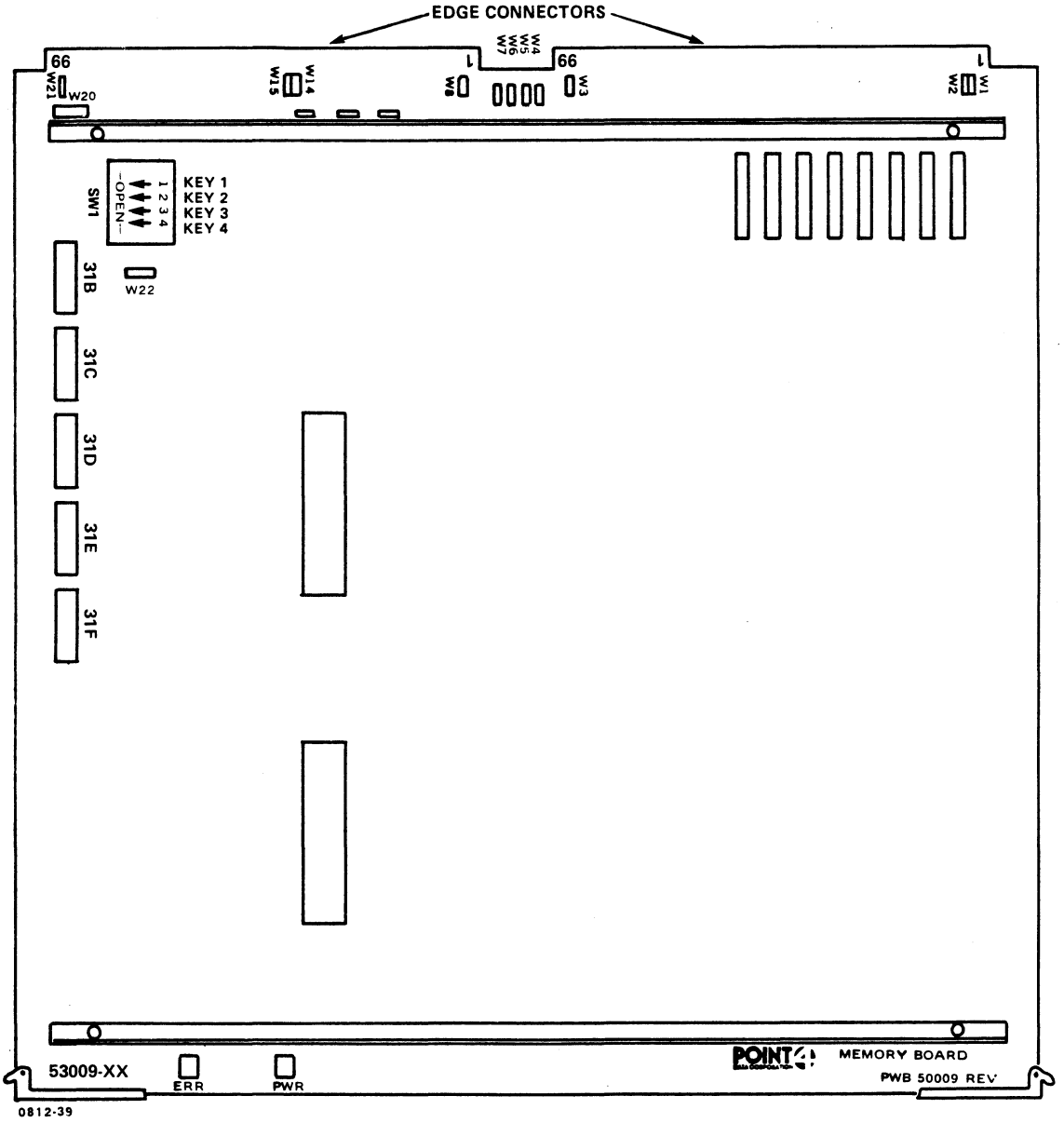


Figure 2-5. Extended Memory

2.3.3 LOTUS Controller

In a MARK 6E/12E system, a LOTUS 800 Controller is used to control the ESDI hard disk drives and the 1/4-inch tape drive. It occupies the slot to the left of the extended memory board(s).* Figure 2-6 illustrates the LOTUS 800 Controller.

If the system has a half-inch tape drive, a LOTUS 725 Controller is required; if it has an 8mm helical scan tape drive, a LOTUS 750 Controller is required.

Table 2-5 lists the controllers by type and interface, and specifies the number of drives supported.

TABLE 2-5. LOTUS CONTROLLERS

Controller	Type	Interface	Drives Supported
LOTUS 725*	1/2-inch Tape	Pertec	1
LOTUS 750	8mm Tape	SCSI	1
LOTUS 800	5-1/4-inch Disk 1/4-inch Tape	ESDI QIC-02	1 to 4 1

*If a 1/2-inch tape controller is used, it occupies the slot to the right of the disk controller.

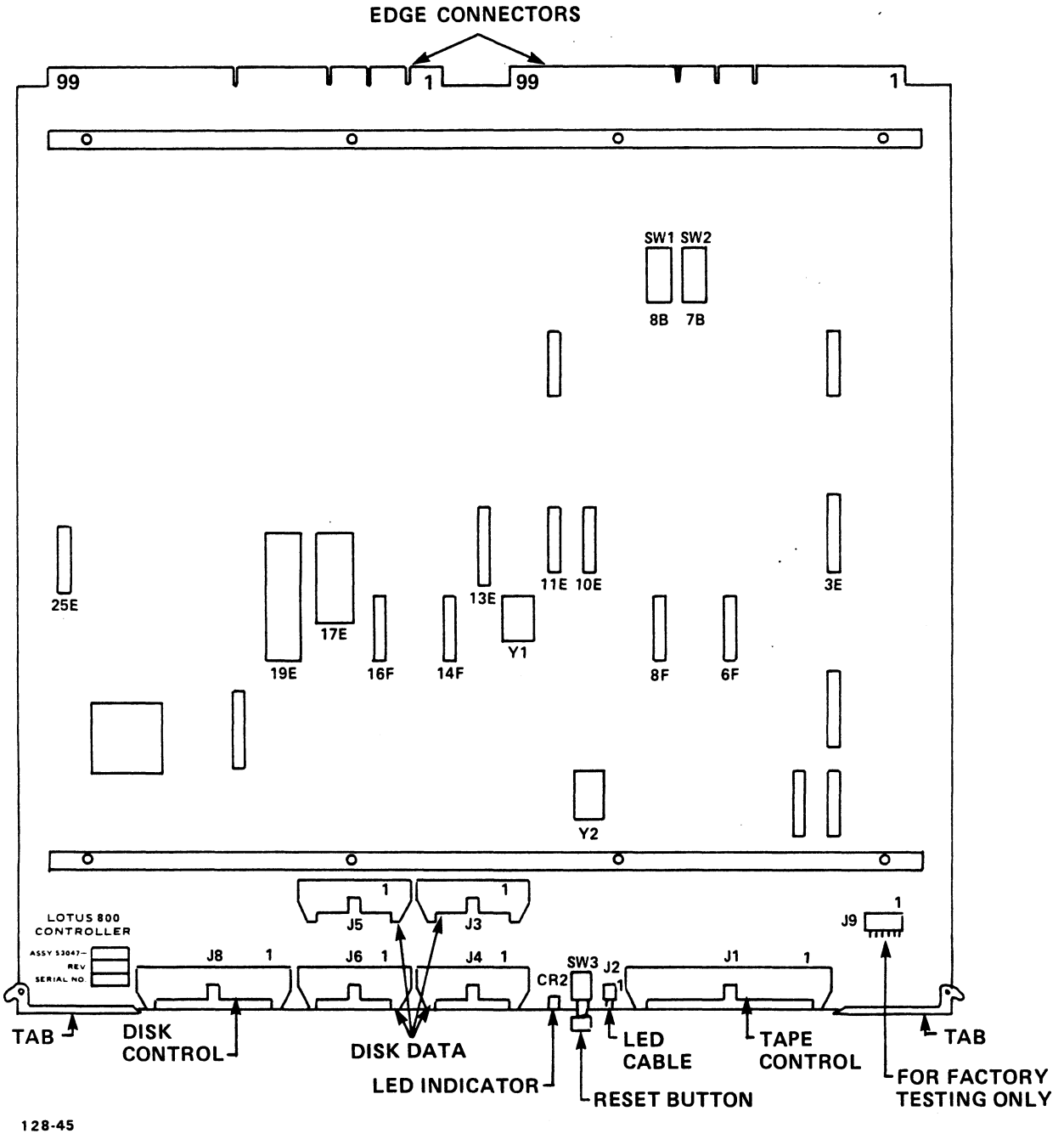


Figure 2-6. LOTUS 800 Controller

2.3.4 310 Multiplexer and 301 Expansion Boards

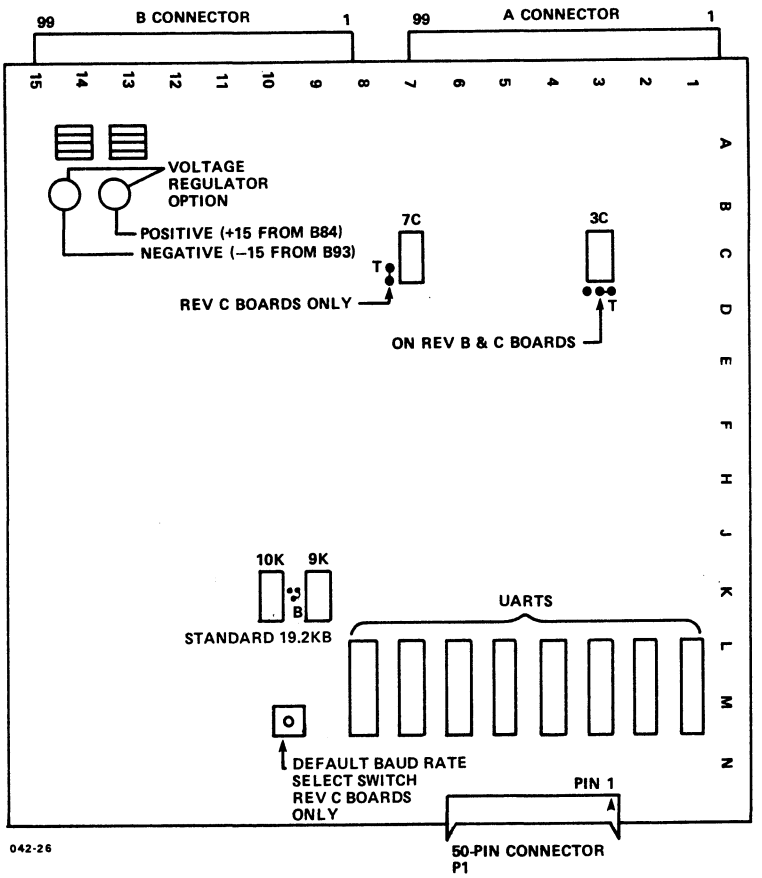
The 310 multiplexer and the 301 expansion boards provide communications between the central processing unit (CPU) and up to 64 external RS232 peripheral devices. The multiplexer provides eight ports for external peripherals; an expansion board provides 8, 16, or 24 ports. A MARK 6E/12E has one multiplexer and a maximum of three expansion boards. Figure 2-7 illustrates the multiplexer and expansion boards.

The multiplexer occupies the first slot to the left of the disk/tape controller in the card cage; the expansion boards occupy the slots to the left of the multiplexer.

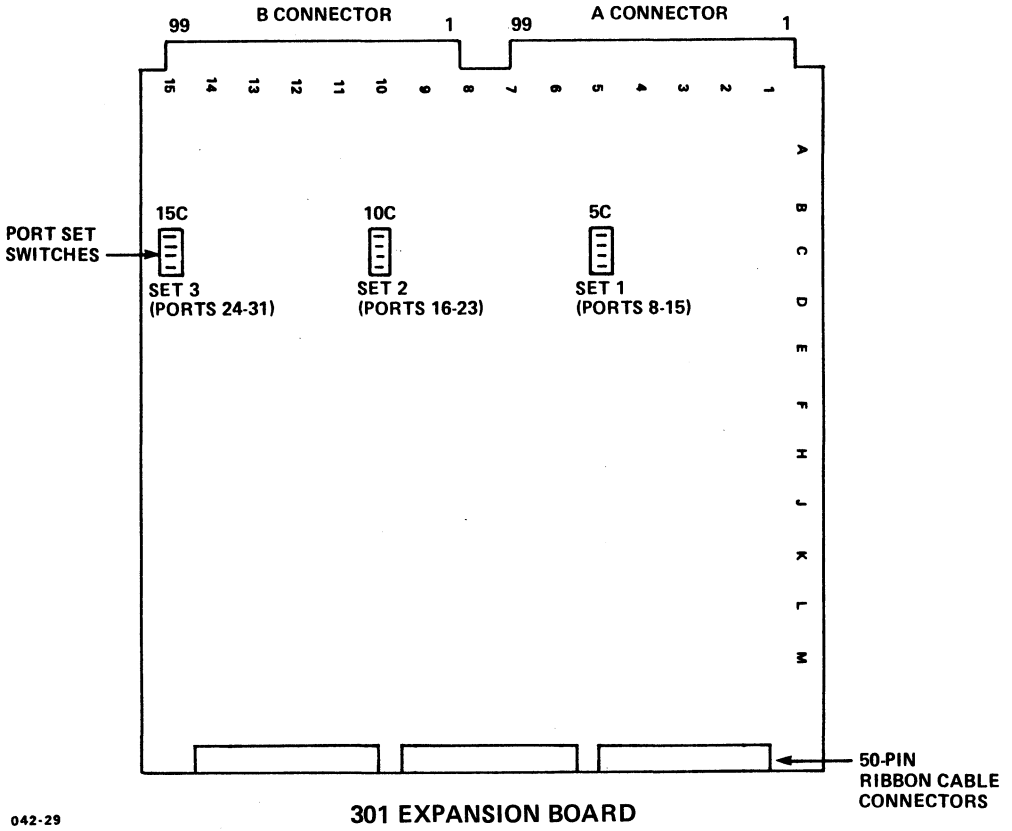
Table 2-6 is a configuration guide for the multiplexer and the expansion boards.

TABLE 2-6. MULTIPLEXER AND EXPANSION BOARD CONFIGURATION GUIDE

Number of Ports	Mux 310	301 Expansion			Interboard (Z) Cable	Chassis Slots Needed
		8	16	24		
8	1					1
16	1	1			324-1	2
24	1		1		324-1	2
32	1			1	324-1	2
40	1	1		1	324-2	3
48	1		1	1	324-2	3
56	1			2	324-2	3
64	1	1		2	324-3	4



310 MULTIPLEXER



301 EXPANSION BOARD

Figure 2-7. 310 Multiplexer and 301 Expansion Boards

2.4 DISK DRIVES

Hard disk drives are main storage devices that record and store large volumes of information. The MARK 6E/12E supports up to four* 5-1/4-inch ESDI hard disk drives in 170, 382, and 765MB capacities. The disk drives, which are located in the chassis front, require the LOTUS 800 Controller. If more than two disk drives are used, an auxiliary power supply is also required. Figure 2-8 illustrates the location of the disk drives.

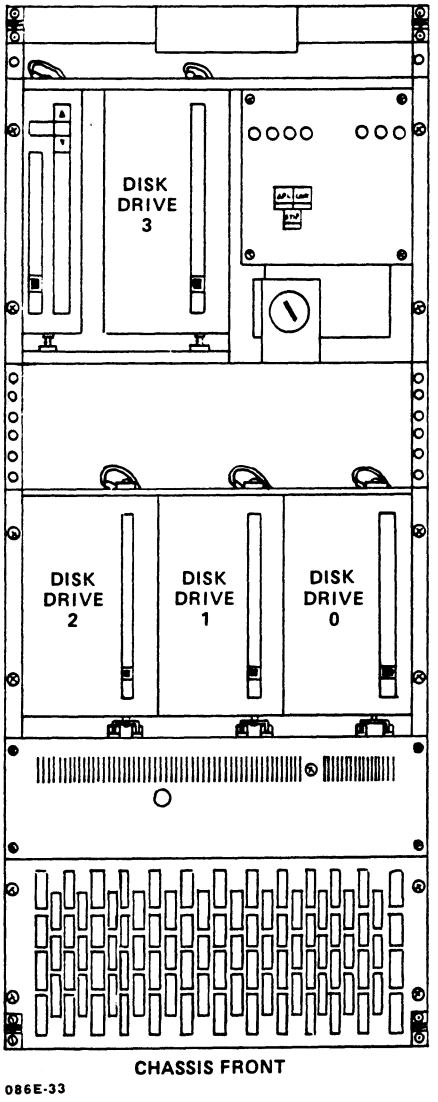


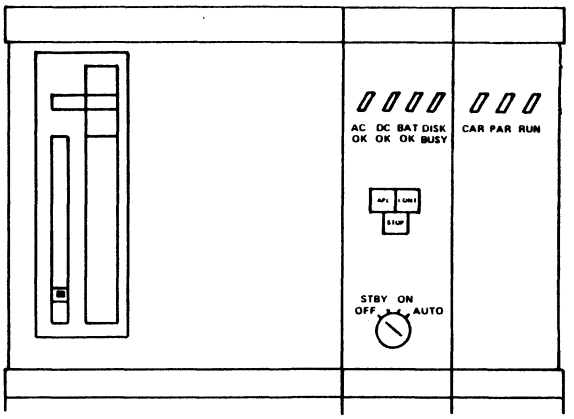
Figure 2-8. Location of the ESDI Disk Drives

*If an 8mm helical scan tape drive is present, only three ESDI hard disk drives can be supported.

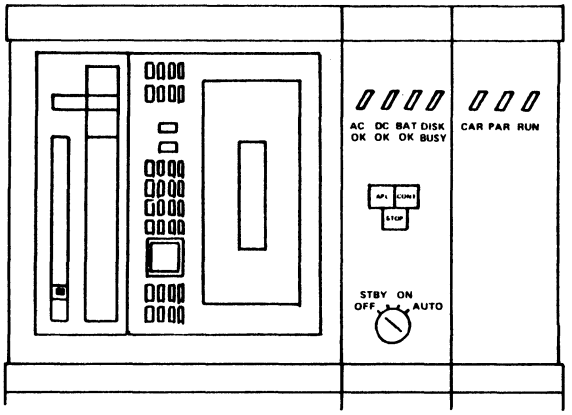
2.5 TAPE DRIVES

Tape drives are storage devices, which are used to load programs and applications, or to back up information for archival storage. The MARK 6E/12E supports one 1/4-inch streaming tape drive; one 1/4-inch streaming tape drive and one 8mm helical scan tape drive; or a single 8mm helical scan tape drive. The 1/4-inch streaming tape drive and the 8mm helical scan tape drive are located in the chassis front to the left of the control panel. Figure 2-9 illustrates the possible locations of the tape drives.

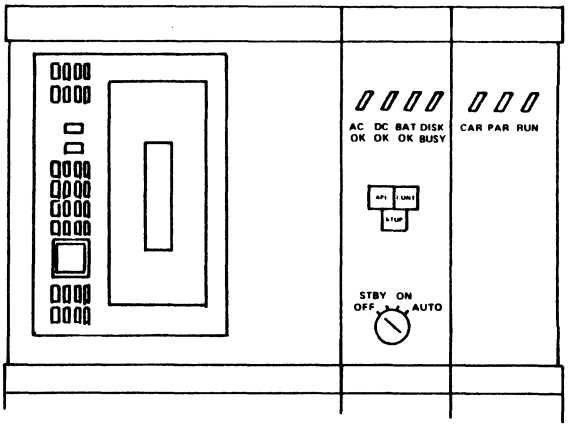
A 1/2-inch magnetic tape subsystem in an independent table-top unit is also available.



ONE 1/4-INCH TAPE DRIVE



ONE 1/4-INCH TAPE DRIVE
AND AN 8mm HELICAL SCAN TAPE DRIVE



8mm HELICAL SCAN TAPE DRIVE

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Figure 2-9. Possible Locations of the Tape Drives

Table 2-7 lists the available tape drives and provides the type, interface, capacity, and media of each.

For information on care and handling of tapes, see Appendix C.

TABLE 2-7. TAPE DRIVES

Drive	Type	Interface	Capacity	Media	Controller
Viper* 150L	1/4-inch	QIC-02	150MB	DC600XTD** DC600A** DC300XLP**	LOTUS 800
Cipher 880^ Magnetic Tape Subsystem	1/2-inch	Pertec-Compatible	92MB	7.0 to 10.5-inch reel	LOTUS 725
EXABYTE# Cartridge Tape Subsystem	8mm	SCSI	2.3GB	Standard 8mm 3.7 x 2.5 x 0.6 inches	LOTUS 750

*Viper is a trademark of Archive Corporation.
**For information on functions supported by the media, see Appendix C.
^The Cipher 880 is an independent table-top unit.
#EXABYTE is a registered trademark of EXABYTE Corporation.

2.6 EXTENDED IRIS LICENSE

The extended IRIS license includes Business BASIC, ABASIC, utilities and the extended IRIS feature for extended memory. On a MARK 6E/12E integrated system, the SMbasic Interpreter and Utilities are available at no extra cost.

The revision of IRIS required depends partly on the components included in the system. All 5-1/4-inch ESDI disk drives require 9.1.3 or later. The 150MB tape drive requires IRIS 9.2 or later and DISCUTILITY 5.7C or later; the 8mm helical scan tape drive requires IRIS 9.3 and DISCUTILITY 5.8 or later.

2.6.1 Pico-N

The Pico-N is a hardware security device that must be installed on the MARK 6E/12E before the IRIS Operating System can be run. It protects against the unauthorized use of POINT 4 software, and if desired, against the unauthorized use of customer-provided software. The Pico-N is provided at no charge with each IRIS license. It remains the property of POINT 4.

Section 3
CONTROLS AND INDICATORS

This section describes the controls that regulate the MARK 6E/12E and the indicators that monitor its activities. The controls and indicators are located on the front panel and chassis rear. Information is provided about the location, operation and function of the following:

- Power control keyswitch
- Program execution controls
- Control panel indicators
- Power monitor board indicators
- Main power switch
- Tape drive indicators

This section also describes MANIP, a stand-alone program that allows the user to perform several system functions from the master terminal keyboard.

3.1 CONTROL PANEL

The control panel, located on the right side of the front panel, contains the controls and indicators that regulate and monitor the MARK 6E/12E. It has four functions: controlling and monitoring power, controlling program execution, monitoring the central processing unit (CPU), and monitoring the ESDI disk drive(s). Figure 3-1 illustrates the control panel. Tables 3-1, 3-2, and 3-3 describe the power control keyswitch, the program execution controls, and control panel indicators, respectively.

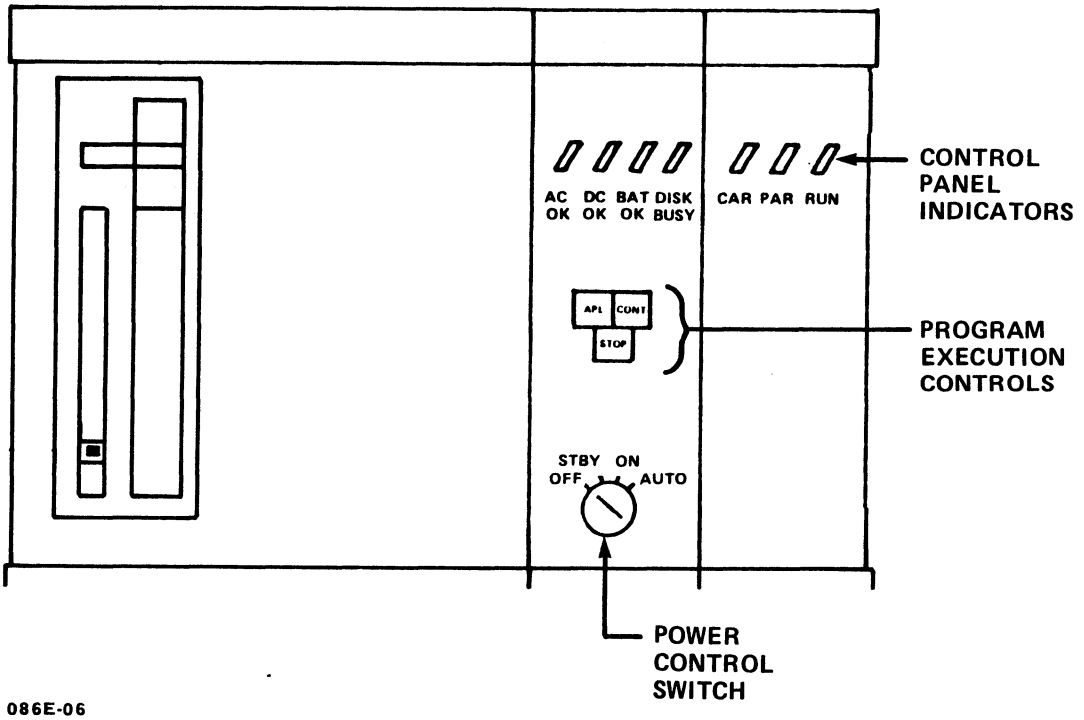

Figure 3-1. Control Panel

TABLE 3-1. POWER CONTROL KEYSWITCH

Key-switch	Function
OFF	This position is used when the power is OFF for extended periods or when specified operations require the power to be off, for example, when installing or replacing components. OFF disables the battery backup unit (BBU) and all other DC voltages.
STBY	Main power supply voltages to the computer are disabled, but the BBU voltages are maintained for extended memory, slots 2 through 5 (if the BBU is installed).
ON	Turns power ON and enables all controls and indicators on the control panel. The power-fail, auto-restart feature available with the BBU is disabled. In this position, the CPU must be started manually after a power failure.
AUTO	Maintains power to the CPU and indicators, and disables all front panel controls. This prevents interference with the CPU. If the BBU is installed, the power-fail, auto-restart feature enables the computer to resume operations automatically after a power failure.

STOP, CONTinue, and APL (automatic program load) are the buttons that control program execution. They are enabled when the power control keyswitch is set to ON and disabled when it is set to AUTO.

TABLE 3-2. PROGRAM EXECUTION CONTROLS

Button	Function
STOP	Stops central processing unit (CPU) operation. The CPU finishes the current instruction, fetches the next one and then stops. The program counter points to the next instruction to be executed.
CONT	Causes program execution to resume, starting at the address in the program counter.
APL	Loads the MANIP program into the top 1000 octal words of memory to enable the use of MANIP. **If the CPU is already running, press STOP before APL.** If the CPU mini-switches are set to octal 100200, pressing APL causes the CPU software self-test to be loaded. If the CPU mini-switches are set to octal 200 + mm, the CPU does an automatic initial program load from device mm when APL is pressed.

Indicators, located across the top of the control panel, monitor power, central processing unit (CPU) operations, and ESDI disk activity. When lighted, an indicator shows an active state.

TABLE 3-3. CONTROL PANEL INDICATORS

Indicator	Description
AC OK	AC power is on.
DC OK	DC voltages are on and in tolerance.
BAT OK	If AC OK is on, the battery backup unit (BBU) is fully charged. If AC OK is off and the keyswitch is set to ON, AUTO, or STBY, the BBU is supplying +5V to extended memory to maintain memory contents.
DISK BUSY	Indicates the selected ESDI disk drive is operating.
CAR	Indicates the current state of the CPU carry flag. When the carry flag is set to 1, the indicator lights.
PAR	Indicates a parity error was detected when accessing memory.
RUN	Indicates CPU is operating. If the CPU halts, the indicator does not light.

3.2 POWER MONITOR BOARD AND MAIN POWER SWITCH

The power monitor board and the main power switch are located on the AC panel on the chassis rear.

The power monitor board contains a set of indicators that monitor the power supply and battery backup (BBU) voltages. It also generates the power-fail and power-gone signals for the system. Figure 3-2 illustrates the power monitor board; Table 3-4 describes each indicator.

The main power switch controls the availability of AC current to the MARK 6E/12E.

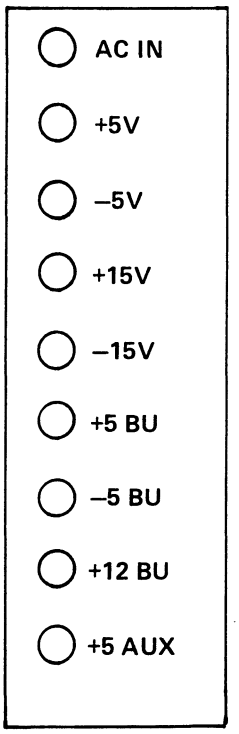

Figure 3-2. Power Monitor Board

TABLE 3-4. POWER MONITOR BOARD INDICATORS

Indicator	Description
AC IN	AC power is on.
+5V	+5V output voltage is in tolerance and ready for user application.
-5V	-5V output voltage is in tolerance and ready for user application.
+15V	+15V output voltage is in tolerance and ready for user application.
-15V	-15V output voltage is in tolerance and ready for user application.
+5 BU*	+5 battery backup supply is in tolerance. This output voltage is used by extended memory, slots 2-5.
-5 BU	Not used.
+12 BU	Not used.
+5 AUX	Not used.
*If battery backup is not installed, the +5 BU is connected to its non-BU counterpart +5V.	

3.3 MANIP

MANIP is a stand-alone program that enables the operator to perform several system functions from the master terminal keyboard. These functions include the following:

- Loading the program
- Running the CPU software self-test
- Manipulating the computer's registers and memory so that memory contents can be displayed, modified, searched, moved, checksummed, etc.

The MANIP program is automatically loaded into memory at initial power-up and when APL is pressed. It can also be loaded if the system halts by pressing <ESC> on the master terminal keyboard. When loaded, MANIP replaces the top 1000 octal words of memory.

For more information about MANIP, see Sections 5.2, 7, and Appendix D.

3.4 TAPE DRIVE INDICATORS

The following tape drives can be housed to the left of the control panel: one or two 1/4-inch streaming tape drives, a 1/4-inch streaming tape drive and an 8mm helical scan tape drive, or one 8mm helical scan tape drive. Table 3-5 describes the indicators on the tape drives.

TABLE 3-5. TAPE DRIVE INDICATORS

Drive	Indicator	Function
1/4-inch Tape Drive	Red	At power ON, indicates running of self-test diagnostics. Goes out when test completes. Remaining on indicates test failed. Thereafter, indicates tape drive is selected.
8mm Helical Scan Tape Drive	Amber	At power ON, indicates running of self-test diagnostics. Goes out when test completes. Flashing indicates test failed. Variable blinking indicates activity on SCSI interface.
	Green	At power ON, indicates running of self-test diagnostics. Goes out when test completes. Flashing indicates test failed. Thereafter, indicates that cartridge is loaded.

Section 4
INSTALLING INTEGRATED SYSTEMS

Once unpacked, the MARK 6E/12E can be moved to its designated location and installed. The installation procedure is easy because integrated systems are delivered fully assembled.*

The suggested procedure for installing the hardware is provided in this section. The procedure consists of the following:

- Checking out the computer
- Installing the Pico-N
- Connecting the external peripherals

Installing the software does not normally take place until after the computer has been powered up for the first time, and extended self-testing has taken place. Powering up and self-testing are described in Section 5; installing software is referenced.

*For information on installing individual components, see Section 6.

Before beginning, have at hand a Phillips screwdriver. **Do not attempt to plug in or turn on the system until instructed to do so.**

1. Make certain that the keyswitch on the control panel and the main power switch on the chassis rear are turned OFF.

2. Remove the front, rear, top, and side panels of the chassis as instructed below. Figure 4-1 illustrates the removal of the panels.

   a. Snap off the front panel and set it aside.

   b. Unscrew the four corner screws that secure the rear panel to the chassis. Set the screws and washers aside.

   c. Unscrew the two rear corner screws that secure the top panel to the frame and set the screws and washers aside. Slide the panel toward the rear, then remove it.

   d. Unscrew the six screws that secure each of the side panels to the frame. Remove and set aside the panels, screws and washers.

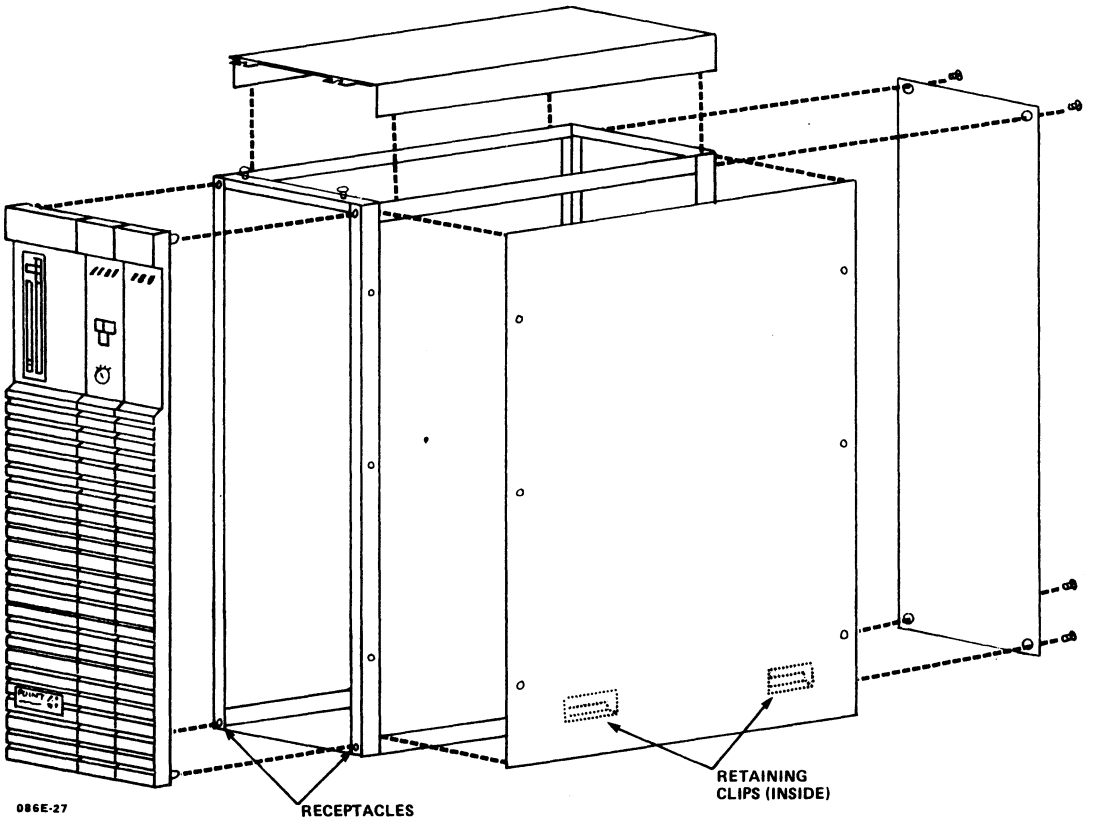

Figure 4-1. Removing the Panels from the MARK 6E/12E

3. Visually inspect the system components for obvious damage. If any damage is evident, report it to the shipping company.

4. Remove the computer boards, one at a time, from the card cage and check to ensure that all components on them are intact and firmly seated. Figure 4-2 illustrates removing the computer boards. For each board:

   a. If present, disconnect ribbon cables that prohibit the removal of the board from the card cage. Be sure to note where each ribbon cable is connected so that it can be reconnected.

   b. Pull up the tabs that are located on the outside edges of each board; pull on them to release the board from the backplane; and slide the board out of the guide rails.

   c. Place the board, component side up, on a flat surface. Visually inspect the board to ensure that all components are intact. Press down on the socketed components to make certain they are firmly seated.

   d. Slide the board back into the guide rails of the card cage; push it down until the edge connectors of the board snap into the backplane connectors; and close the tabs.

   e. If present, reconnect the ribbon cables.

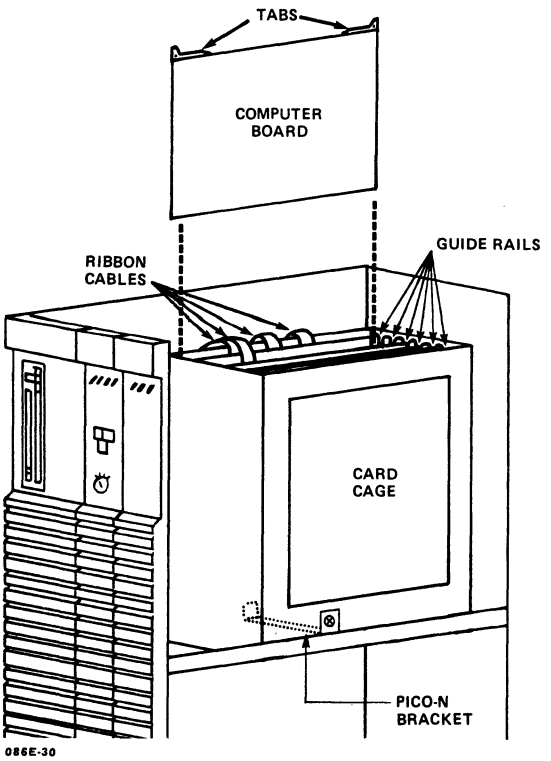

Figure 4-2. Removing Computer Boards from the Card Cage

5. Make certain that all easily accessible cables and connectors are firmly attached. (A complete list of cables and connectors is provided in Section 7).

6. Make certain that the fuses on the chassis rear are intact.

7. If IRIS is the operating system, make certain that the Pico-N is held securely in place by the accompanying retaining bracket.

   To install a Pico-N that has been shipped separately, unscrew the Pico-N retainer bracket and set it aside. Push the Pico-N's connector carefully onto the pins on the back- plane at the front left (as viewed from the front). It should be placed so that it does not interfere with the multiplexer or any other backplane connectors. Replace the Pico-N retainer bracket and screws.

8. Replace the front, rear, top, and side panels by reversing the instructions in Step 2.

9. Connect the external RS232 peripherals into the I/O panel on the rear of the chassis. The master terminal port is Port 0 on the first port board at the extreme left (as viewed from the rear). For more information on cabling to external peripherals, see Appendix E.

10. Move the MARK 6E/12E to its permanent place.

11. Proceed to Section 5.

Section 5
GETTING STARTED

Once the hardware installation has been completed, the start-up routine can be initiated. This section describes the procedures that are associated with the start-up routine except for the loading of software.* The other routines are as follows:

- Initial power-up
- Self-testing
- Initial program loading

*The loading of software normally takes place after self-testing and prior to the initial program loading. For information on loading IRIS R9, refer to the IRIS R9 System Configuration Manual.

5.1 INITIAL POWER-UP

A power-up is initiated when the power is turned ON. This action also initiates the CPU Self-Test. For the initial power-up, use the following procedure:

1. Make certain the keyswitch on the control panel is turned to OFF.

2. Make certain the main power switch on the rear of the CPU chassis is OFF.

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

4. Turn ON the main power switch.

   The AC OK indicators, which are located on the control panel and the power monitor board, should light. If the AC indicators do not light, check that:

   a. AC power is connected at the wall and on the chassis rear

   b. Power control cable is connected to the backplane at location J2

   c. Fuses on the chassis rear are good

5. Turn the keyswitch to STBY.

   If battery backup (BBU) is included, the +5 BU should light.

6. Turn the keyswitch to ON.

   The DC OK indicator on the control panel and the following indicators on the power monitor board should light: AC IN, +5V, -5V; +15V, -15V, and +5 BU (if the BBU is installed or a jumper plug is installed on the backplane at location J6).

   If a designated indicator does not light, check its voltage (see Section 7).

5.2 SELF-TESTS

The power-up procedure initiates the CPU Self-Test. The CPU Self-Test includes a firmware self-test that verifies hardware is functioning enough to communicate with a terminal, and a CPU software self-test that verifies the central processing unit (CPU) software is functioning. The firmware self-test runs once, and the software self-test repeats four times. The sequence is as follows:

- Firmware self-test
- Loading of MANIP, a software program that controls the operation of the CPU from the master terminal
- CPU software self-test

If the CPU Self-Test completes successfully, the RUN indicator lights, and the CAR indicator blinks on the control panel and also on the top edge of the CPU board. Control is turned back to the MANIP program. The following message is displayed on the master terminal:

```
POINT 4 MARK 6 (12) SELF TEST
CPU LOGIC OK, ON-BOARD MEMORY OK
000001:VVVV
PRESS ? FOR HELP MENU
->
```

POINT 4 recommends that testing be continued by running diagnostics, then the CPU software self-test for an extended period. If any part of the CPU Self-Test sequence fails, refer to Section 7.

Diagnostics are available as stand-alone programs or on the IRIS Operating System. To use the diagnostic programs on the IRIS Operating System, it is necessary to load the operating system first. If IRIS cannot be accessed, or if another operating system is used, stand-alone diagnostics should be run. These diagnostics can be ordered from POINT 4. Instructions for running diagnostics are provided in Section 7.

To access the CPU software self-test (whether or not IRIS is loaded), press STOP, then APL on the control panel. To instruct MANIP to run the CPU software self-test, enter T on the master terminal. The self-test will run in a continuous loop until stopped. Typically, it is allowed to run overnight at the time of installation. To stop the self-test, press <ESC> twice.

After the CPU software self-test has been run for an extended period, the software can be loaded. To load software, refer to the appropriate IRIS documentation.

5.3 INITIAL PROGRAM LOAD (IPL)

Loading the software places the IRIS Operating System on the disk. To transfer IRIS from disk to memory each time the computer is turned on, it is necessary to perform an initial program load (IPL). Use the following procedure to perform an IPL:

1. Make certain the control panel keyswitch is turned to ON.

2. Press the STOP, then the APL buttons. The following is displayed:

   ```
   ->
   ```

3. Turn the keyswitch to AUTO.

   This prevents the system from halting if STOP is accidentally pressed. In the event of a power fail, operation will resume once the power comes on, if the keyswitch is set to AUTO.

4. At the master terminal, enter P. The following is displayed:

   ```
   PRESS RETURN
   ```

5. Press <RETURN>. The following is displayed:

   ```
                        IRIS n.n

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   IF AND WHEN THIS WORK IS PUBLISHED, THE FOLLOWING COPYRIGHT NOTICE APPLIES:

   COPYRIGHT (C), 19nn POINT 4, DATA CORPORATION

   ENTER YEAR,MONTH,DAY,HOUR,TIME
   ```

6. Enter the date and time in the YY,MM,DD,HH,MI format.

   Time is based on the 24-hour clock. For example, the date and time format for entering 7:30 A.M., April 25, 1989 is: 89,04,25,07,30. Do not space after commas.

   To default to the date and time that the system was last shut down, press <DELETE>.

7. Press <ESC>. The following is displayed:

   ```
   ACCOUNT ID?
   ```

At this point, the initial program load (IPL) is completed. To continue, refer to the IRIS or other appropriate software documentation.

Section 6
INSTALLING AND REPLACING COMPONENTS

This section is for technicians who are upgrading a system or who need to remove and replace a faulty component. It provides instructions for the installation and replacement of the major MARK 6E/12E components: the power supplies and power monitor board, computer boards, hard disk and tape drives, and fans.

In most cases, the instructions provided assume that the system is being upgraded; for example, by extending memory or adding ports. Where this is true, an installation procedure is provided. To remove the component, reverse the installation procedure.

In several cases, the instructions provided assume that a faulty component is being removed and replaced; for example, a main power supply. Where this is true, a removal procedure is provided. To install a replacement, reverse the removal procedure.

Before installing or removing and replacing any component, perform the following preliminary steps:

1. If the system has been in use, shut down and back up (refer to the IRIS R9 User Reference Manual).

2. Turn OFF the computer.

3. Disconnect the AC power cord from the rear of the computer.

4. Grasp the front panel handle and pull the computer to an open space. This provides access to the rear and sides of the computer.

5. Remove the front, rear, and/or side panels as required to install or replace the appropriate component (see Section 4).

6.1 POWER SUPPLIES

This section describes the installation or removal of the main power supply, -5V DC regulator board, power monitor board, auxiliary power supply, and battery backup unit (BBU). For more information on power supplies, see Section 7 and Appendix A.

6.1.1 Main Power Supply

The main power supply is enclosed in a black box at the bottom of the chassis. It is illustrated in Figure 6-1. To remove the main power supply, perform the preliminary steps provided at the beginning of this section, then:

1. If present, remove the BBU (see Section 6.1.5).

2. Carefully cut the tie wraps that:

   a. Hold DC power distribution cables to the side of the card cage

   b. Attach cables to the top of the main power supply box

3. Disconnect the following cable connectors **only** at the locations specified:

   a. DC power distribution cable connectors located on the backplane at J2 and on the power distribution board at J19

   b. I/O power cable connector located on the bottom of the first 8-port I/O board (Ports 0-7) at J11

   c. AC power cable connector located on the AC distribution tray at J15

4. Unscrew the two nuts that secure the DC power distribution cables to the 1/4-inch studs on the power supply. Remove the cables from the studs and set the nuts aside.

5. Unscrew the three nuts from the brackets that secure the power supply to the chassis floor. Set the brackets and nuts aside.

6. Remove the power supply with the remaining cables attached by lifting and pulling it out of the right side of the chassis (as viewed from the front).

7. After noting where each remaining cable terminates within the chassis, disconnect its push-on, ring lug, or connector from the power supply.

To install a main power supply, reverse the removal procedure.

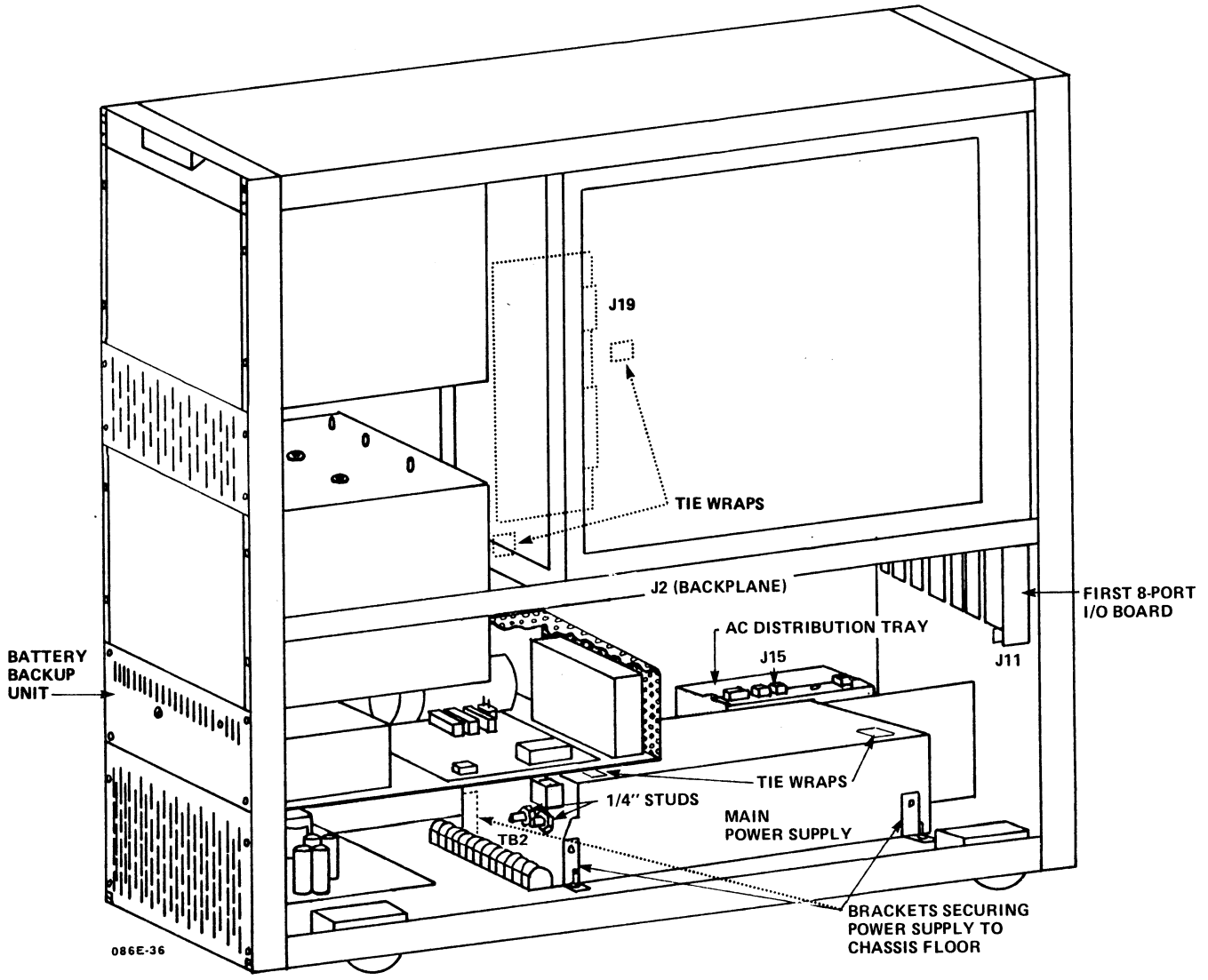


Figure 6-1. Removing the Main Power Supply

6.1.2 -5V DC Regulator Board

The -5V DC regulator board is located on the floor of the chassis adjacent to the power supply. It is illustrated in Figure 6-2. To remove the regulator board, perform the preliminary steps provided at the beginning of this section, then:

1. Disconnect the following cables from the regulator board:

   a. -5V cable at location 3

   b. Ground cable at location 5

   c. -12V cable at location 4

2. Carefully pinch the plastic standoffs at each corner of the regulator board and lift the board off the standoffs.

To install a -5V regulator board, reverse the removal procedure.

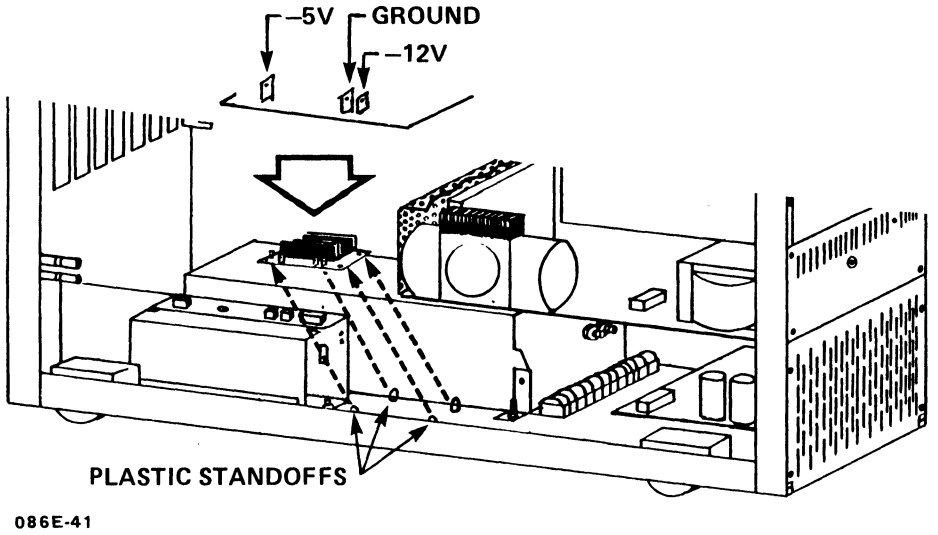


Figure 6-2. Removing the -5V DC Regulator Board

6.1.3 Removing the Power Monitor Board

The power monitor board is located at the bottom rear of the chassis. It is illustrated in Figure 6-3. To remove the power monitor board, perform the preliminary steps provided at the beginning of this section, then:

1. Remove the two screws that are located on the left side of the board. Set the screws and washers aside.

2. Pull the board out of the chassis just far enough to disconnect the cable connected to the board at J27; disconnect the cable.

3. Remove the board from the chassis.

To install a power monitor board, reverse the removal instructions. When installing the board, slide it into the slide guide on the floor of the chassis and snap the pin edge connector into the connector slot.

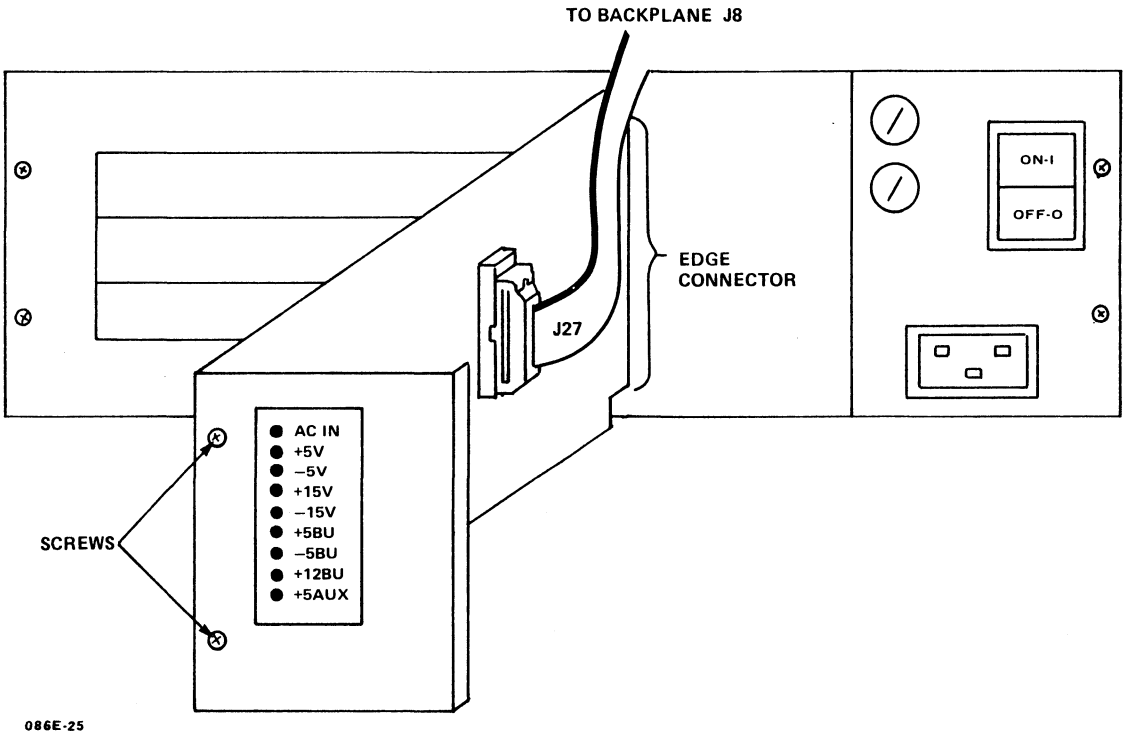


Figure 6-3. Removing the Power Monitor Board

6.1.4 Auxiliary Power Supply

An auxiliary power supply is required if more than two ESDI disk drives are included in the system. The auxiliary power supply is installed near the bottom front of the chassis. It is illustrated in Figure 6-4. To install an auxiliary power supply, perform the preliminary steps provided at the beginning of this section, then:

1. Remove the four screws securing the metal blank to the chassis front at the location designated for the auxiliary power supply. Set the screws and washers aside.

2. Insert the auxiliary power supply into the chassis front and use the screws and washers from Step 1 to secure it to the frame.

3. Connect the following auxiliary power supply cable connectors:

   a. DC power cable to the power distribution printed circuit board at J18

   b. AC power cable connector to the AC distribution tray at location J17

To remove the auxiliary power supply, reverse the installation procedure.

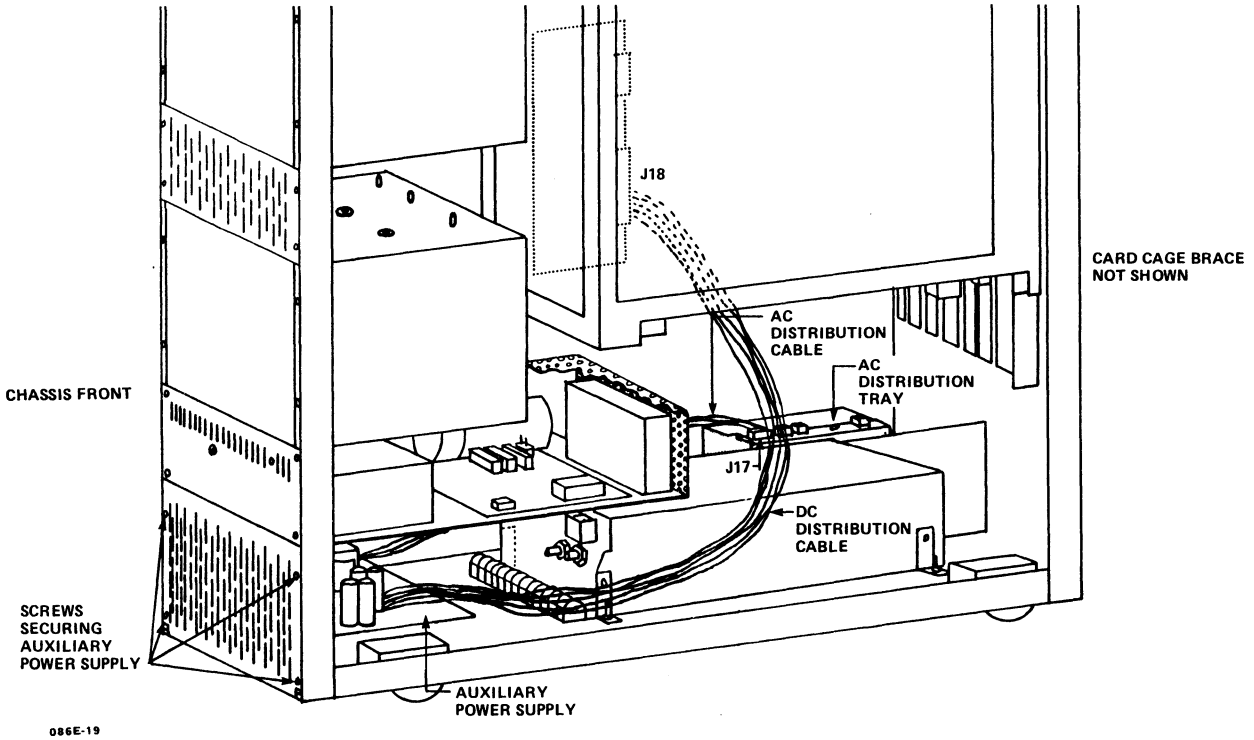


Figure 6-4. Installing an Auxiliary Power Supply

6.1.5 Battery Backup Unit

If present, the battery backup unit (BBU) is located below the ESDI disk drive(s). It is illustrated in Figure 6-5. To remove the BBU, perform the preliminary steps provided at the beginning of this section, then:

1. Disconnect the following BBU cable connectors **only** at the locations specified:

   a. AC power cable connector located on the AC distribution tray at J16

   b. DC power cable connector located on the BBU printed circuit board at J2

   c. Power control ribbon cable connector located on the BBU printed circuit board at J1

2. Cut the tie wraps necessary to free the BBU AC power cable.

3. Remove the four screws that secure the BBU tray to the chassis front. Set the screws and washers aside.

4. Carefully pull the BBU tray out of the chassis making certain not to catch the cables still attached to the tray.

To install a BBU, reverse the removal procedure. In addition, connect the cable that originates from the battery to the BBU printed circuit board at location J5.

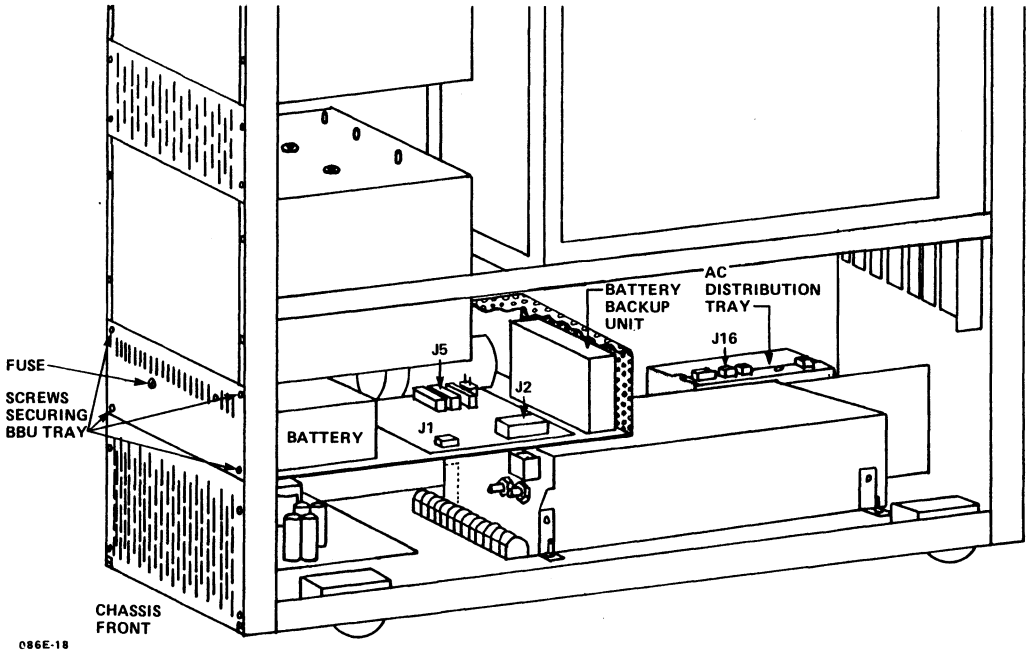


Figure 6-5. Removing the Battery Backup Unit

6.2 COMPUTER BOARDS

Computer boards are installed either to expand the capacity of the system or to replace suspect or faulty boards.

If additional boards are being installed to expand the capacity of the system, it may be necessary to relocate some boards before adding others to ensure a correct configuration. See Section 2.3 for information on the required placement of boards within the card cage.

General instructions, which apply to the installation and removal of all computer boards, are provided below. The general instructions are followed by specific instructions that relate to individual boards: central processing unit (CPU), extended memory, disk/tape controller, 310 multiplexer and 301 expansion boards.

6.2.1 General Instructions

To install any board, follow the instructions below. At Step 3, turn to the subsection relevant to the particular board being installed and implement the individual instructions provided there. Return to the general instructions and continue implementing Steps 4 through 6.

1. Visually inspect the computer board to be installed for obvious damage. If any damage is evident, report it to the POINT 4 Data Corporation representative.

2. Place the board, component side up, on a flat surface and press down on all socketed components.

3. Implement individual instructions, such as setting switches or positioning jumpers, according to information provided in the subsection that applies to the particular board.

4. Holding the board by the tabs on the top edge, slide it into the guide rails of the designated slot; push down until it snaps into the backplane connectors; and close the tabs. The components should face right (as viewed from the front).

5. If present, attach the cable(s) associated with the board and route the cable(s) to the designated destination according to the instructions provided in the subsection that applies to the particular board.

6. Use the appropriate diagnostics to test the board once it is installed (see Section 7).

To remove any board, reverse the installation process.

6.2.2 Central Processing Unit

The central processing unit (CPU) occupies the far right slot of the card cage (as viewed from the front). To install the CPU, follow the preliminary steps provided at the beginning of this section and the general instructions for installing computer boards.

At Step 3 of the general instructions, make certain that the mini-switches, located along the top edge of the board, are set as desired. Figure 6-6 illustrates the standard POINT 4 configuration. For more information on alternate settings, see Section 2.3.1.2.

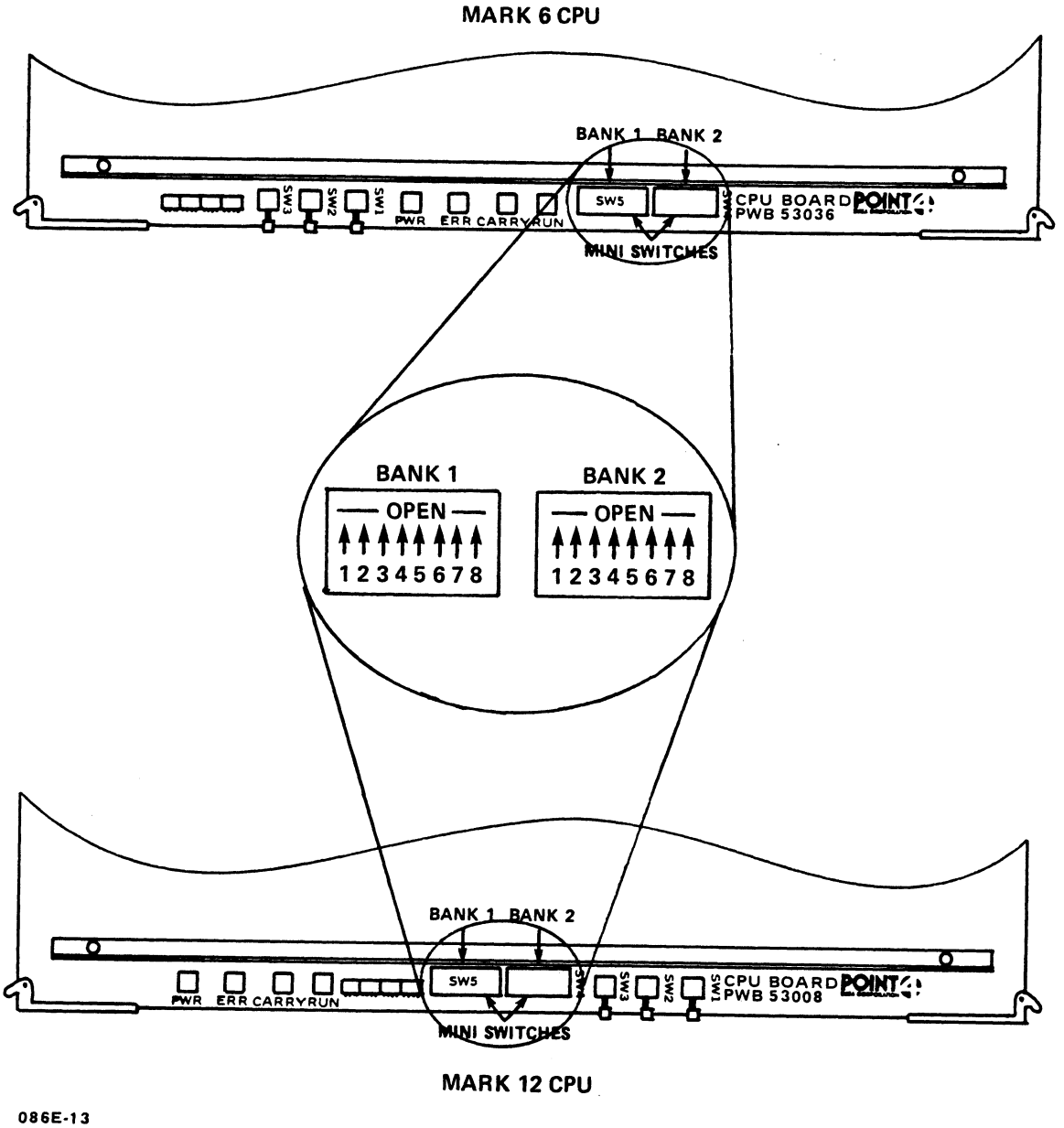


Figure 6-6. CPU Mini-Switches

6.2.3 Extended Memory

The MARK 6E/12E supports a maximum of four extended memory boards providing up to 16MB in 2 or 4MB capacities. The boards occupy slots 2, 3, 4, and 5 of the card cage as required. The different capacity boards are identified by part numbers in the front left corner: a 2MB board is 053009-01; a 4MB board is 053009-02.

Use Rev A3 or later revision of extended memory. For Rev A3, the firmware at locations 31B through 31F should be part number 91010-xx (xx refers to the chip location). If the board does not fit these parameters, refer to HITS Bulletins 20 and 21. Figure 6-7 illustrates the firmware locations, jumpers, and SW1.

To install extended memory boards, follow the preliminary steps provided at the beginning of this section and the general instructions for installing computer boards. At Step 3 of the general instructions:

1. Make certain that the power jumpers are set as follows:

   a. If battery backup (BBU) power source is present:

      Jumpers in at W1, W3, W8, W21, W2, W14, W15, W20
      Jumpers out at W4, W5, W6, W7

      The BBU jumper configuration can be used without a BBU power source if the jumper plug is installed on the backplane at location J6. This is standard.

   b. If BBU power source is **not** present:

      Jumpers in at W1, W3, W8, W21, W4, W5, W6, W7
      Jumpers out at W2, W14, W15, W20

2. Set switch (SW1) to the **beginning** block address as follows:

   For each extended memory board, set the 4-position switch to indicate the total number of megabytes of extended memory already defined. Address the 4MB board(s) first; then proceed to the 2MB board(s) regardless of their order in the card cage. Use the following guide to set the switches:

Total MB of Extended Memory Already Defined	SW1 Switch/Setting* Key1	Key2	Key3	Key4
0 (First Board - any size)	0	0	0	NU
2	0	0	1	NU
4	0	1	0	NU
6	0	1	1	NU
8	1	0	0	NU
10	1	0	1	NU
12	1	1	0	NU

*1 - on or closed
0 - off or open
NU - not used

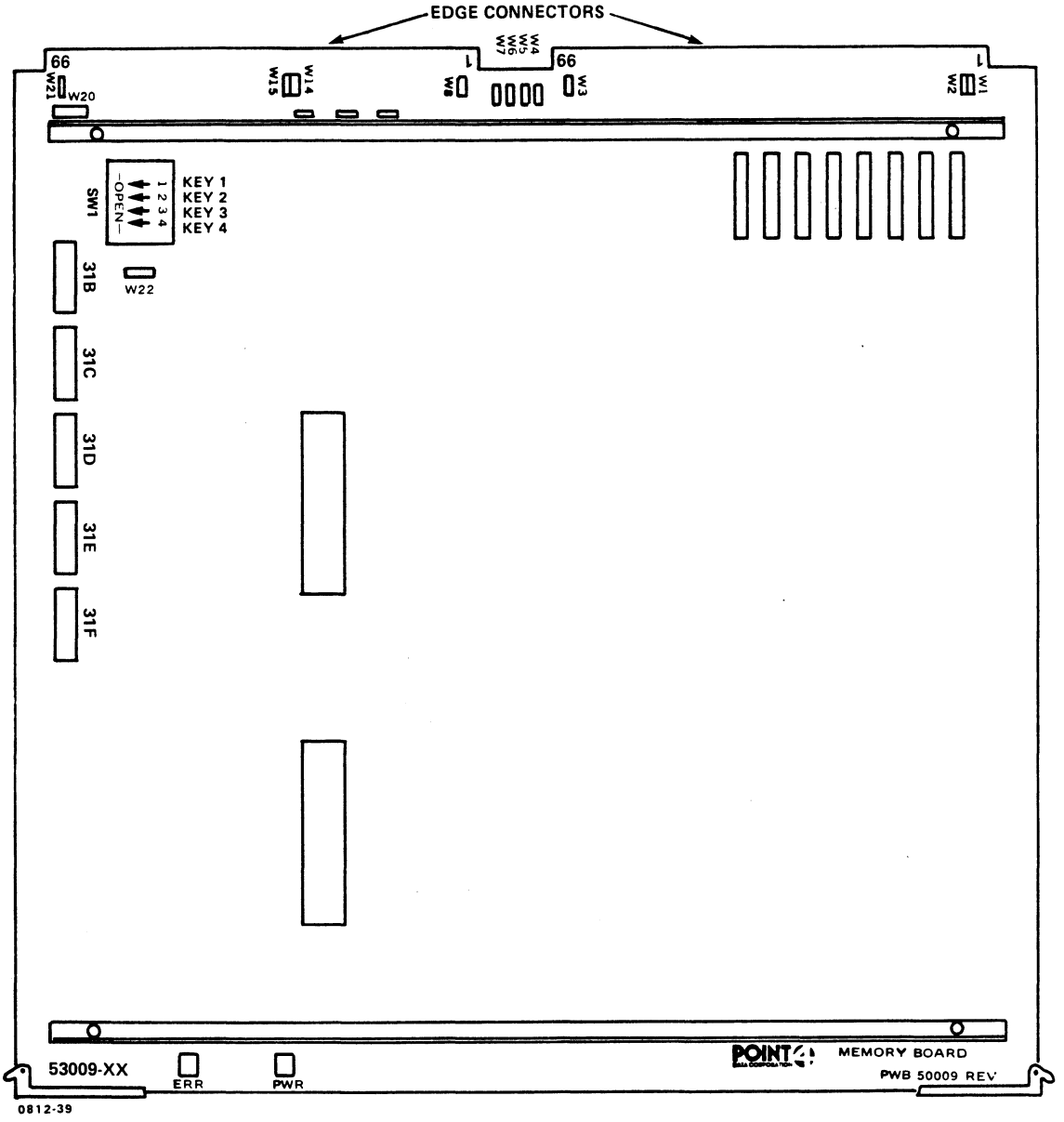


Figure 6-7. Installing Extended Memory

6.2.4 Disk/Tape Controller

The disk/tape controller normally occupies the slot to the left of the extended memory boards (as viewed from the front). The instructions provided in this section apply to the LOTUS 800 Controller that supports 5-1/4-inch ESDI disk drives and the 1/4-inch tape drive.* Figure 6-8 illustrates the LOTUS 800 Controller. For more information on the LOTUS 800, refer to the LOTUS 800 Controller Manual.

To install the LOTUS 800 Controller, perform the preliminary steps provided at the beginning of this section and the general instructions for the installation of computer boards. At Step 3 of the general instructions:

1. Make certain that switches 1 (SW1) and 2 (SW2) are set as illustrated in Figure 6-8, then install the board.

2. Once the board is installed, connect the following cables to the controller, then route them to the ESDI disk drive(s) or the tape drive as indicated below. Make certain that pin 1 of each cable connector aligns with pin 1 of the matching connector.

Cable	Connector Locations	
Tape Control, 50-pin	Controller J1	Tape drive rear
Disk Busy LED	Controller J2	Control panel J1
Data, 20-pin		
Drive 0	Controller J4	Disk drive J2
Drive 1	Controller J6	Disk drive J2
Drive 2	Controller J3	Disk drive J2
Drive 3	Controller J5	Disk drive J2
Disk Control, 34-pin (daisy chain)	Controller J8	Disk drive J1**
Power, 4-pin		
Drive 0 or 1	Power PCB, Card Cage, J20	Disk drive J3
Drive 2 or 3	Power PCB, Card Cage, J20	Disk drive J3

*For information on the LOTUS 725 or 750, refer to the appropriate controller documentation.

**The last physical connector on the disk control cable is connected to drive 0, the second last connector to drive 1 and so on.

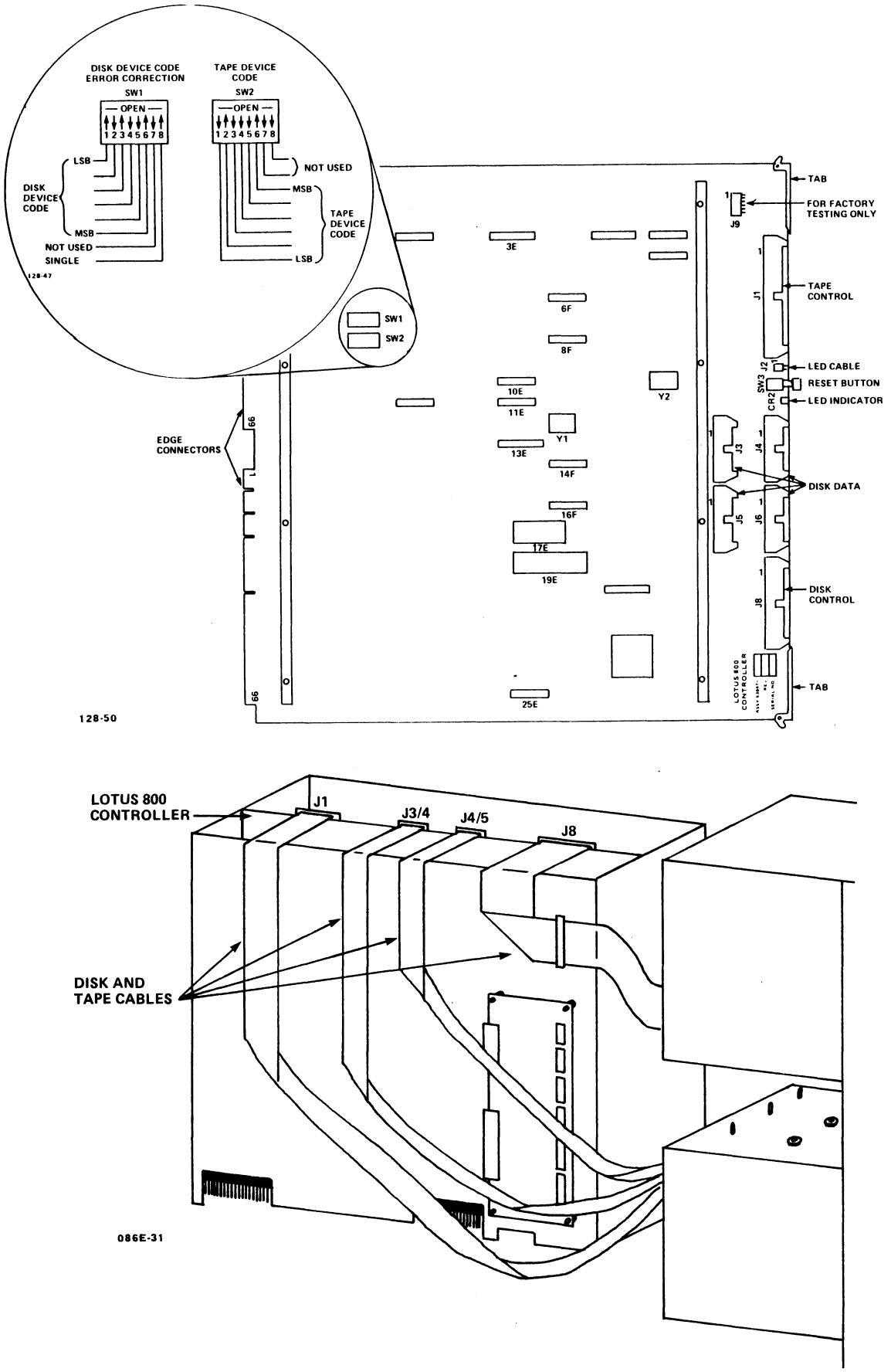


Figure 6-8. Installing the LOTUS 800 Controller

6.2.5 310 Multiplexer and 301 Expansion Boards

The 310 multiplexer supports the first eight ports for external RS232 peripherals. The 301 expansion boards support up to 56 additional ports in groups of 8, 16, or 24 per board.

To install additional ports (beyond the base eight supported by the multiplexer), the following components are required: a ribbon cable, an 8-port I/O board, and a jumper cable for each eight ports; and one 301 expansion board per 8, 16, or 24 ports. Because a maximum of 64 ports is supported by the MARK 6E/12E, the usual complement of 301 expansion boards includes two boards that support 24 ports each and one that supports eight ports.

Separate installation instructions are provided for each of the following components: multiplexer, expansion board(s), 8-port I/O board(s), and multiplexer and expansion board cables. Because of the complexity of installing additional boards and routing multiple cables at different times, the instructions assume that all existing multiplexer and expansion board cables will be disconnected before additional ones are added. Once additional boards are installed, all cables can be connected and routed at the same time.

6.2.5.1 310 MULTIPLEXER

The multiplexer provides communication between the central processing unit (CPU) and the external RS232 peripheral devices connected to Ports 0-7. The multiplexer is installed to the left of the controller (as viewed from the front). To install the multiplexer, follow the preliminary steps provided at the beginning of this section and the general instructions for installing computer boards. At Step 3 of the general instructions:

1. Set the baud rate rotary switch located at 10M (Rev C only) to the appropriate Port 0 default baud rate. See Figure 2-7. Use one of the settings below:

Setting	Baud rate
0	110
1	150
2	300
3	19.2KB
4	1200
5	2400
6	4800
7	9600 Standard POINT 4 setting
8, 9	Not used

2. Once the multiplexer has been installed, and if no expansion boards are to be installed, connect the multiplexer cables as indicated below. (To install one or more expansion boards, do not connect the multiplexer cables at this time, but proceed directly to Section 6.2.5.2.)

   a. Connect one end of the 50-pin cable to the connector on the top edge of the multiplexer and the other end to the first 8-port I/O board (Ports 0-7) at location J10. Figure 6-9 illustrates the routing of the cable.

      Make certain that pin 1 of the ribbon cable connector aligns with pin 1 on the board connector of the multiplexer, and that it is at the top of the first 8-port I/O board. If the cable is reversed, it will reverse the port numbers of the eight connectors on that board.

   b. Make certain that the multiplexer power cable, which originates on the main power supply at TB2, is connected to the first 8-port I/O board (Ports 0-7) at location J11. The brown wire should be on the bottom.

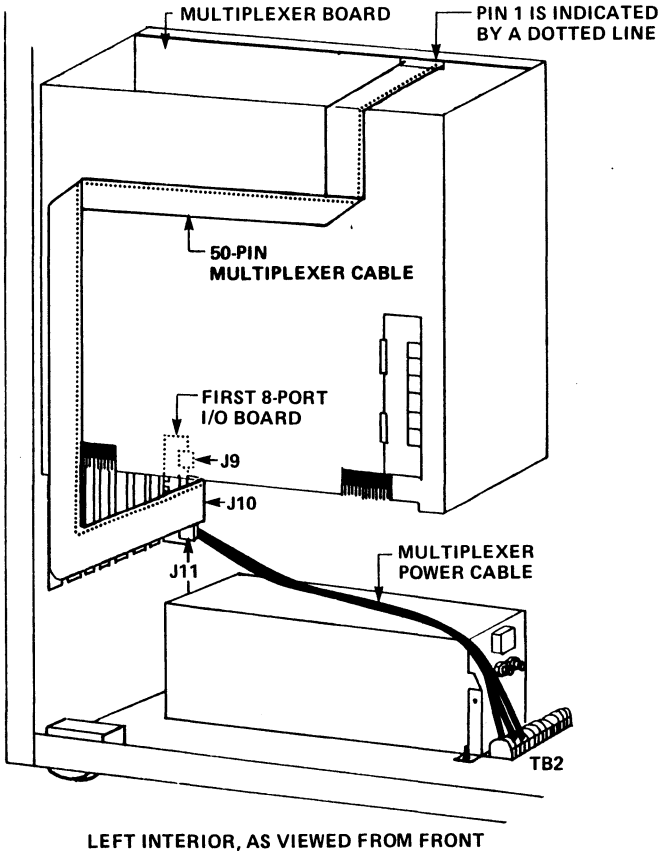


Figure 6-9. Installing the 310 Multiplexer

6.2.5.2 301 EXPANSION BOARD(S)

The expansion boards provide communication between the central processing unit (CPU) and up to 56 external RS232 peripheral devices connected to Ports 8-64. One, two, or three expansion boards are installed to the left of the multiplexer (as viewed from the front). In a 64-port system, the first two expansion boards commonly support 24 ports each, and the third supports eight. To install an expansion board, follow the preliminary steps provided at the beginning of this section and the general instructions for installing computer boards. At Step 3 of the general instructions:

1. Set each 4-position port set switch on the 301 expansion board. See Figure 6-10.

   A 301-A8 board supports eight ports and has a 4-position switch at location 5C; a 301-A16 board support 16 ports and has 4-position switches at locations 5C and 10C; a 301-A24 board supports 24 ports and has 4-position switches at locations 5C, 10C, and 15C.

   Set the 4-position port set switches sequentially, starting with set 1 on the first 301 board at location 5C, and continuing until all port switches on the expansion boards are set.

2. Once the expansion board is installed, connect the Z cables A and B (Model 324) to the backplane as follows:

   a. Place the top connector of the A cable on the backplane where the 310 multiplexer is located and the bottom connector of the A cable on the backplane where the 301 expansion board is located. See Figure 6-10.

   b. Repeat this procedure with the B cable.

3. Do not connect the expansion board ribbon cables at this time, but proceed to Section 6.2.5.3.

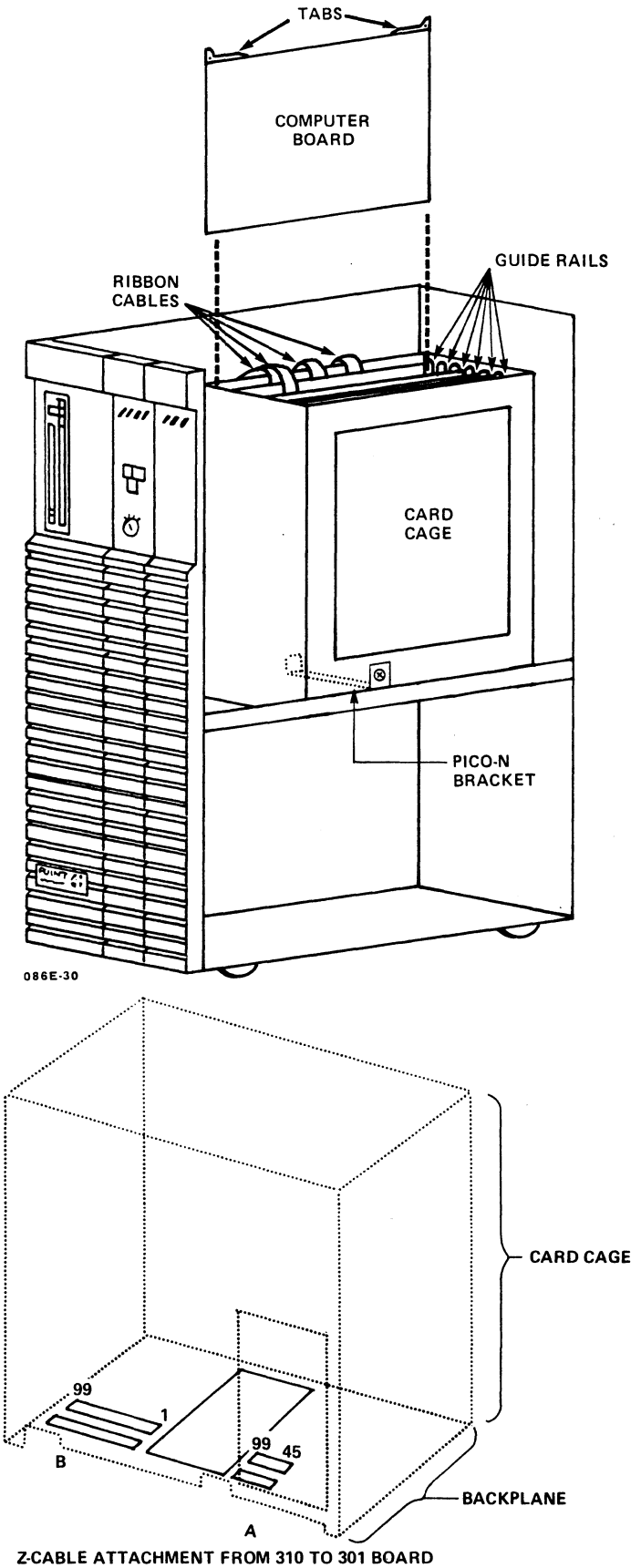


Figure 6-10. Installing 301 Expansion Boards

6.2.5.3 8-PORT I/O BOARDS

Once the 301 expansion boards have been installed, it is necessary to install one 8-port I/O board into the I/O panel for each additional eight ports. Figure 6-11 illustrates the installation of 8-port I/O boards. The following instructions assume that a total of eight 8-port I/O boards (64 ports) are going to be installed. To install 8-port I/O board(s), perform the preliminary steps provided at the beginning of this section, then:

1. Unscrew the four screws that secure the I/O panel to the back of the chassis. Set the screws and washers aside.

2. Pull the I/O panel off far enough to gain access to the backside (it may be necessary to disconnect the multiplexer power cable from the first 8-port I/O board, Ports 0-7).

3. From the outside, remove the screws that secure the metal blanks to the slots for the individual 8-port I/O boards. Remove the blanks and set the screws and washers aside.

4. Place each 8-port I/O board against the inside opening of a slot in the I/O panel so that the modular jacks face outward, and the notch of the locking tab is on the left.

5. Connect each 8-port I/O board to the I/O panel with the screws and washers from Step 3.

6. To provide power for the second and subsequent 8-port I/O boards, install a power jumper cable between the 8-port I/O boards as follows:

   a. Plug one end of the first power jumper cable to the top connector of the first 8-port I/O board (Ports 0-7).

      Insert each jumper connector so that its ridged edge locks into the connector on the board.

   b. Plug the other end of the first power jumper cable into the top connector of the second 8-port I/O board.

   c. Plug one end of the second power jumper cable into the bottom connector of the second 8-port I/O board.

   d. Plug the other end of the second power jumper cable into the bottom connector of the third 8-port I/O board.

   e. Continue this alternating pattern until the last board is connected.

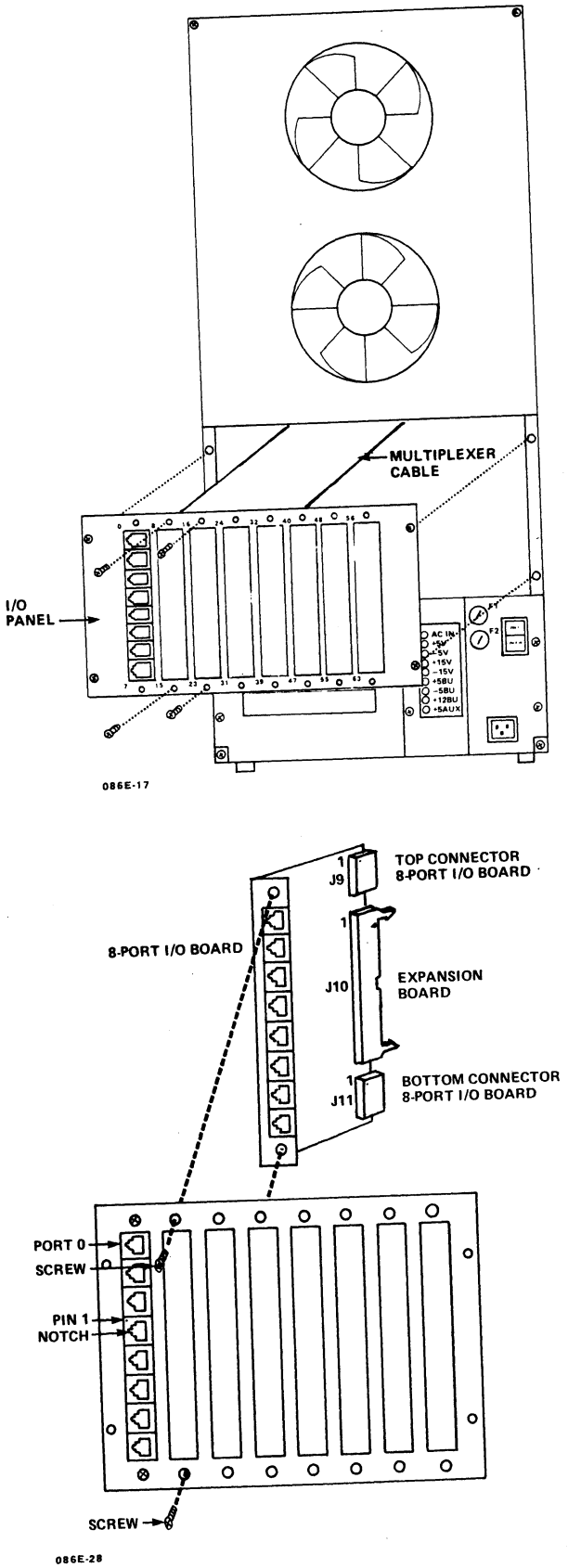


Figure 6-11. Installing 8-Port I/O Boards

6.2.5.4 MULTIPLEXER AND EXPANSION BOARD CABLES

These instructions are for the routing and connecting of the multiplexer and expansion board cables. Eight ribbon cables are required for 64 ports. The instructions assume that the cables are connected first to the 8-port I/O boards in the I/O panel, then are routed upward to their designated boards.

1. Beginning with the multiplexer ribbon cable, label each ribbon cable at both ends.

   The multiplexer cable should be labeled 0. The expansion board cables are labeled consecutively 1 through 7.

2. Connect the ribbon cables to the 8-port I/O boards at location J10 as follows:

   a. The multiplexer cable to the first 8-port I/O board (Ports 0-7)

   b. Expansion cable 1 to the second 8-port I/O board (Ports 8-15)

   c. Expansion cable 2 to the third 8-port I/O board (Ports 16-23)

   d. Continue until all eight cables are connected

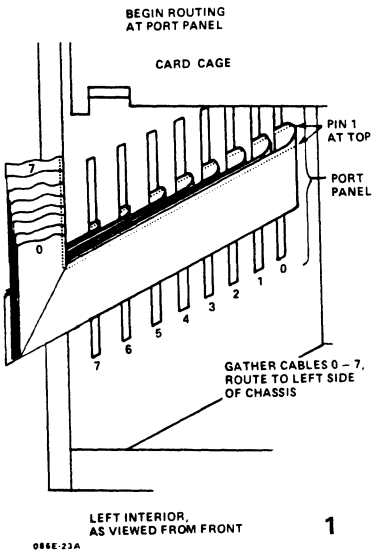
3. Replace and secure the I/O panel with the screws that were removed in Section 6.2.5.3.

4. Route, clamp, and connect the cables as illustrated in Figure 6-12.

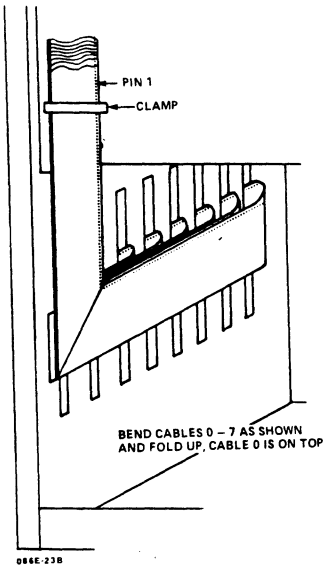
   Pin 1 of each cable should be at the top of the I/O panel and to the right side of each cable when it is connected to the multiplexer or expansion boards. If the cable is reversed, it will reverse the numbers of the eight connectors on the 8-port I/O board to which it is designated.

5. Make certain that the multiplexer power cable, which originates on the main power supply at TB2, is connected to the first 8-port I/O board (Ports 0-7) at location J11. The brown wire should be on the bottom.

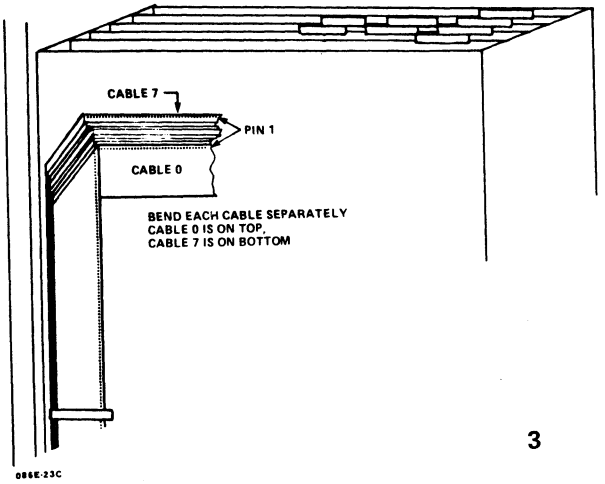
6. To provide multiplexer power to the second and subsequent 8-port I/O boards, make certain that power jumper cables are connected between the first and second 8-port I/O boards at their J9 locations, between the second and third 8-port I/O boards at their J11 locations, between the third and fourth 8-port I/O boards at their J9 locations, and so on through the last 8-port I/O board.



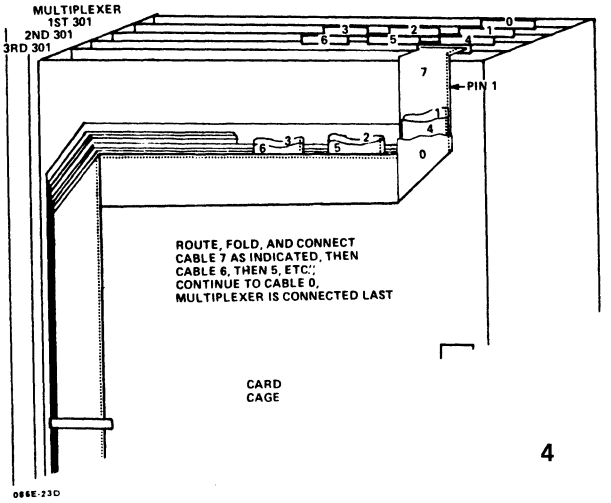
1



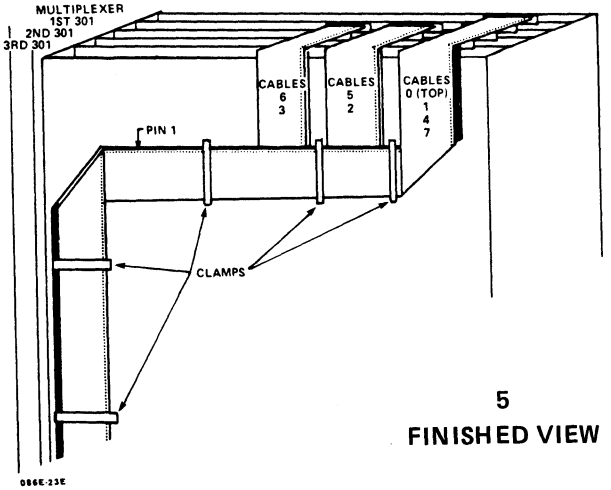
2



3



4



5
FINISHED VIEW

Figure 6-12. Routing and Connecting Multiplexer and Expansion Cables

6.3 ESDI HARD DISK DRIVES

The MARK 6E/12E system supports a maximum of four 5-1/4-inch ESDI hard disk drives in 170, 382, or 765MB capacities. The 5-1/4-inch disk drives are housed in the chassis front.

The first two disk drives (drives 0 and 1) are powered by the main power supply. When three or four disk drives (drives 2 and 3) are present, an auxiliary power supply must be added (see Sections 2 and 6.1). ESDI disk drives also require the LOTUS 800 Controller (see Sections 2 and 6.2).

The following convention should be applied when installing or adding disk drives. The first drive installed (drive 0) will be the only drive terminated. It will be connected to the daisy-chained control cable at the **last** physical connector, also designated 0. The second drive (drive 1) will be connected to the daisy-chained control cable at the second last physical connector, designated 1, and so on.

To install an ESDI disk drive, perform the preliminary steps at the beginning of this section, then:

1. On the ESDI disk drive(s), modify the component side of the printed circuit board as follows and as illustrated in Figure 6-13:

   a. Remove the terminator from all drives **except** disk drive 0.

   b. On the 170 and 382MB drives **only,** position a jumper at W5 (remote spindle control).

   c. On every drive, position the jumper(s) for the drive select option using one of the following as appropriate:

Drive	170 and 382MB Jumper Location			765MB Jumper Location
	DA3	DA2	DA1	
0	-	-	X	DS1
1	-	X	-	DS2
2	-	X	X	DS3
3	X	-	-	DS4

X = Jumper installed

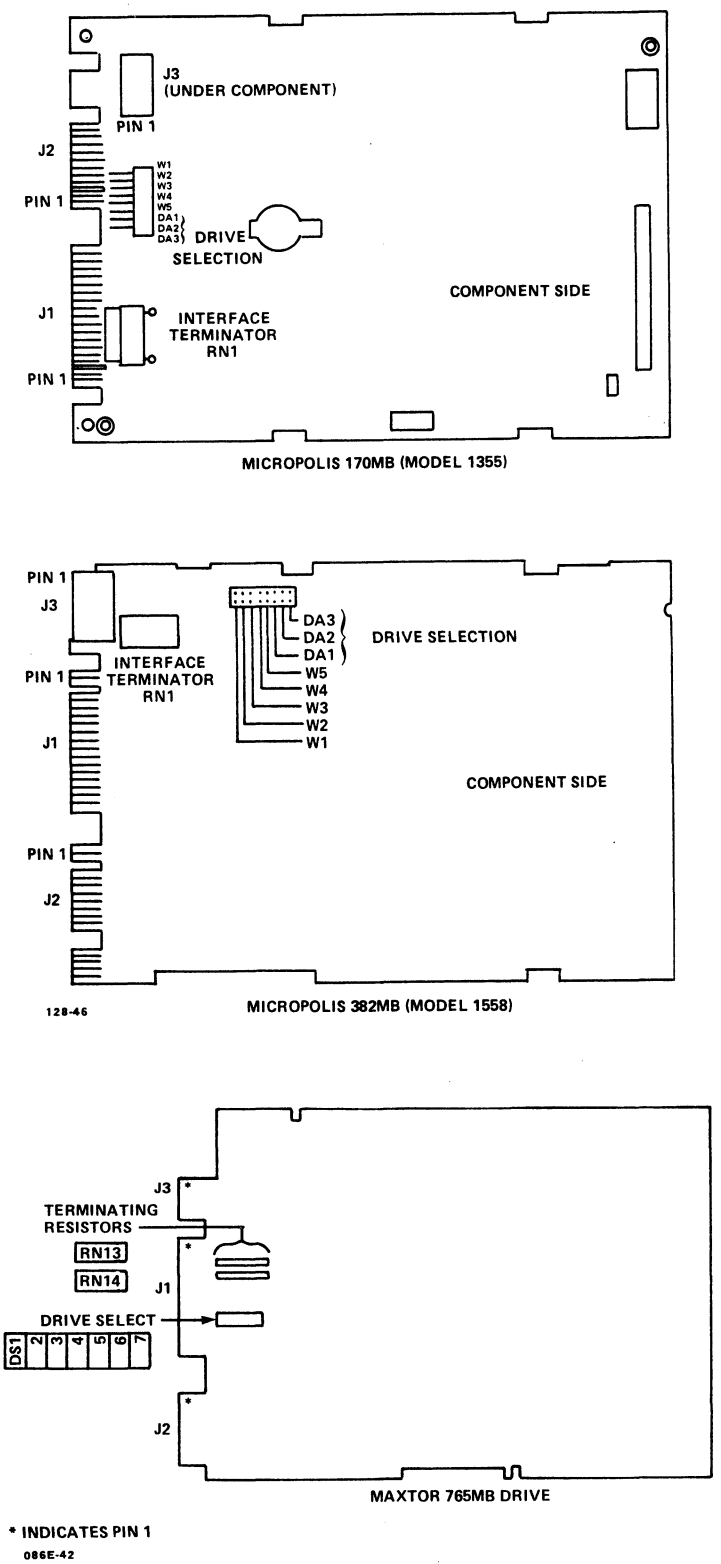


Figure 6-13. Modifying the Disk Drive

2. Unscrew the four screws from the filler panel that is located below the control panel. Remove and store the filler panel. Set the screws and washers aside. Figures 6-14 and 6-15 illustrate the installation of the disk drives.

3. To install the first, second, and/or third disk drive(s), (0, 1, and/or 2), implement the following instructions:

   a. With the attached slide guide facing down, insert drive 0, 1, and/or 2 into the designated slide guides. Align the screw holes on the drive top with the holes of the shock mounts located on top of the housing slot.

   b. Using a stubby Phillips screwdriver, secure the screws and washers, which accompany the drive, into the shock mounts on top of the housing.

4. To install a fourth disk drive (drive 3), proceed to Step 5; otherwise replace the filler panel and screws removed in Step 2.

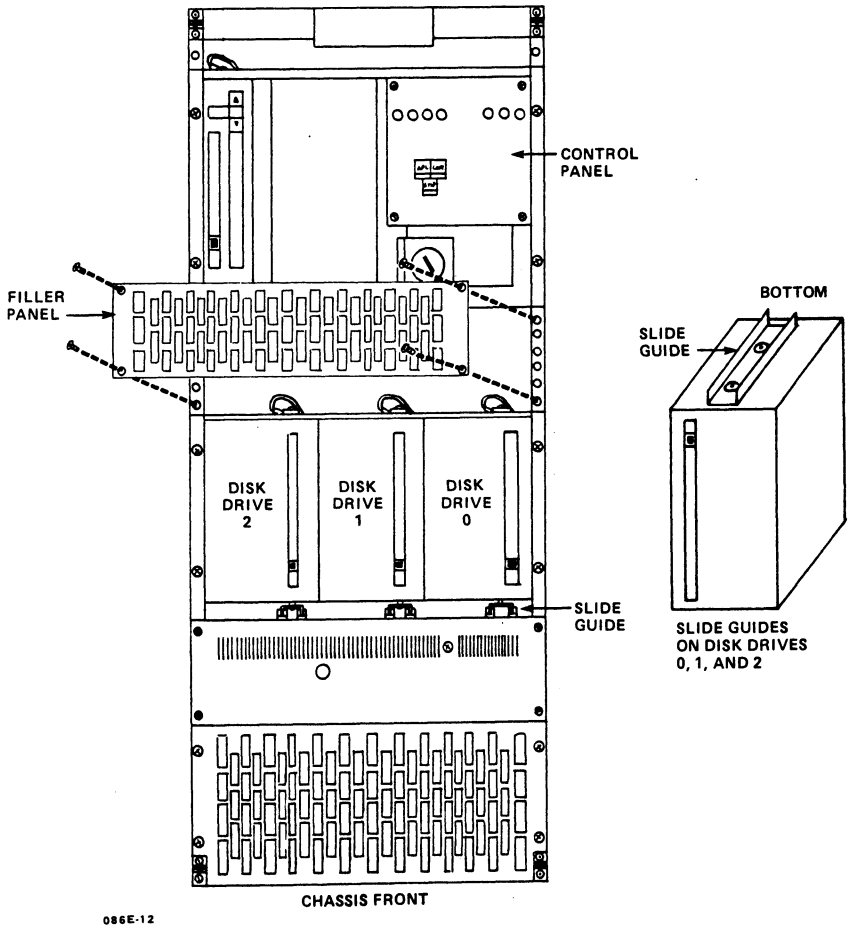


Figure 6-14. Installing the First, Second, and/or Third ESDI Drive(s)

5. To install the fourth disk drive (drive 3), refer to Figure 6-15 and implement the following instructions:

   a. Remove the shock-mounted slide from the disk drive.

   b. Insert the drive into the housing slot immediately to the left of the control panel.* Align the screw holes on the drive top and bottom with the holes of the shock mounts located on the top and bottom of the housing slot.

   c. With a stubby Phillips screwdriver, secure the screws that accompany the drive into the top and bottom of the shock mounts.

6. Replace the filler panel and screws removed in Step 2.

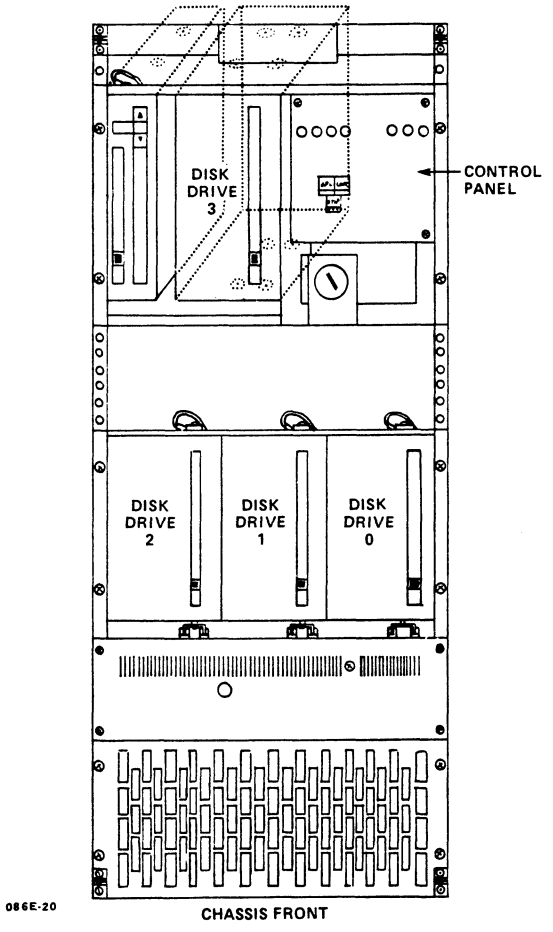


Figure 6-15. Installing the Fourth ESDI Disk Drive

*If the system includes an 8mm helical scan tape drive, it occupies the space to the left of the control panel; thus, the space is not available for the fourth disk drive.

7. Connect and route the following cables making certain that pin 1 of each cable connector aligns with pin 1 of the matching edge or power connector. Figure 6-17 illustrates the routing of the cables.

Cable	Connector Locations	
Control, 34-pin (daisy chain)	Disk Drive J1	Controller J8
Data, 20-pin		
Drive 0	Disk drive J2	Controller J4
Drive 1	Disk Drive J2	Controller J6
Drive 2	Disk Drive J2	Controller J3
Drive 3	Disk Drive J2	Controller J5
Power, 4-pin		
Drive 0 or 1	Disk drive J3	Power PCB, Card Cage J20
Drive 2 or 3	Disk drive J3	Power PCB, Card Cage J20

8. Attach the ground wires on the rear of the disk drives to the ground studs on the top of the disk drive housing.

To remove a disk drive, reverse the installation procedure.

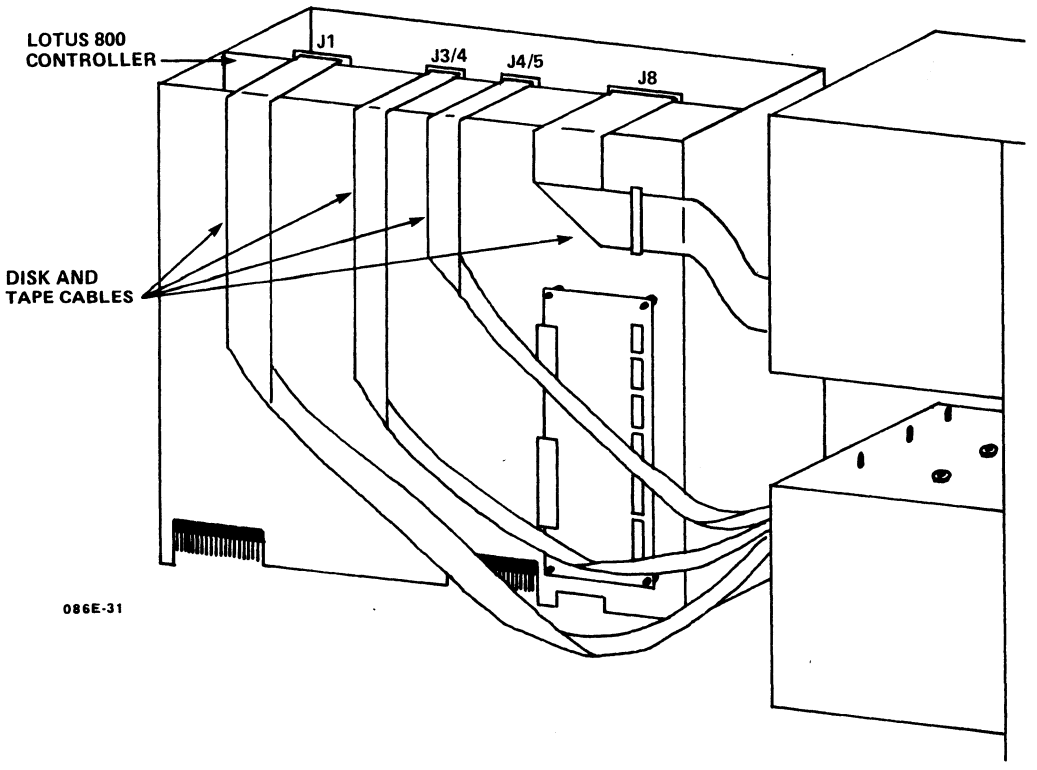


Figure 6-16. Routing the Disk Drive and Tape Drive Cables

6.4 TAPE DRIVE

This section describes the removal and replacement of the standard 1/4-inch tape drive, and the installation of the 8mm helical scan tape drive. The tape drive(s) are located in the chassis front to the left of the control panel.

6.4.1 1/4-Inch Tape Drive

One 1/4-inch streaming tape drive is supported by the system. Figure 6-17 illustrates its location. The 1/4-inch tape drive requires a LOTUS 800 Controller. To remove a 1/4-inch tape drive, perform the preliminary steps at the beginning of this section, then:

1. Using a stubby Phillips screwdriver, remove the four screws (two each top and bottom) that secure the tape drive to the tape drive housing. Set the screws and washers aside.

2. Unplug the following cables from the rear of the tape drive:
   a. Power cable
   b. 50-pin ribbon cable

3. Disconnect the ground wire from the top of the tape drive housing.

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

To install a tape drive, reverse the removal procedure.

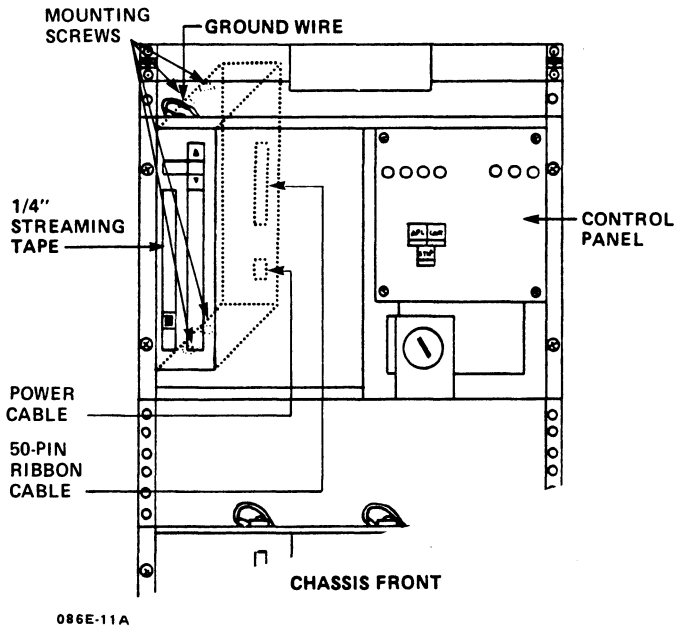


Figure 6-17. Removing the Tape Drive

6.4.2 8mm Helical Scan Tape Drive

If present, the 8mm helical scan tape drive is located to the left of the control panel either at the far left or to the right of the 1/4-inch tape drive (if present). It requires a LOTUS 750 Controller. To install an 8mm helical scan tape drive, perform the preliminary steps at the beginning of the section, then:

1. Install four 1/4-inch metal standoffs onto the 8mm tape drive, two each into the top and bottom. See Figure 6-18.

2. Slide the 8mm tape drive into the housing slot and secure the standoffs to the chassis with four screws.

3. Connect the following cables:

Cable	Connector Locations	
Power cable	Tape drive, rear	Power PCB at J22
50-pin ribbon	Tape drive, rear	Controller at J1

4. Attach the ground wire on the rear chassis frame of the tape drive to the ground stud on top of the tape drive housing.

To remove a tape drive, reverse the installation procedure.

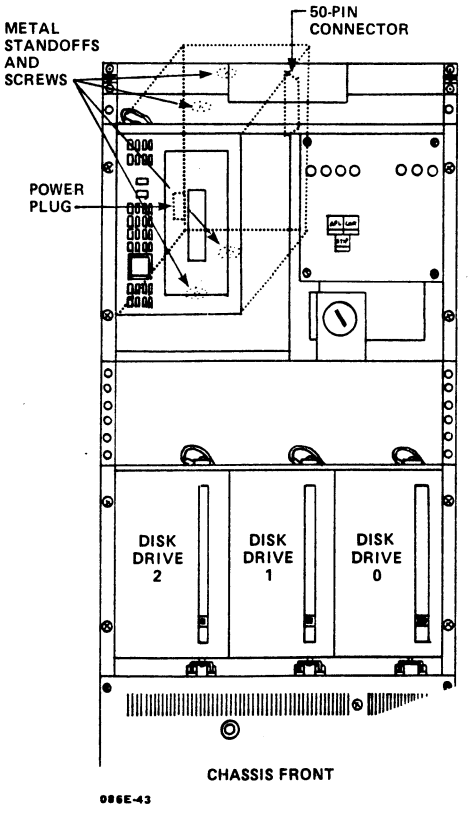


Figure 6-18. Installing an 8mm Helical Scan Tape Drive

6.5 FANS

Fans are located on the chassis rear. The fans are illustrated in Figure 6-19. To remove them, perform the preliminary steps provided at the beginning of this section, then:

1. Unplug the fan cable that connects to the AC distribution tray at location J14.

2. Remove the eight screws on the chassis rear that secure the fans and the attached metal sheet to the chassis. Set the screws and washers aside.

To install the fans, reverse the removal process.

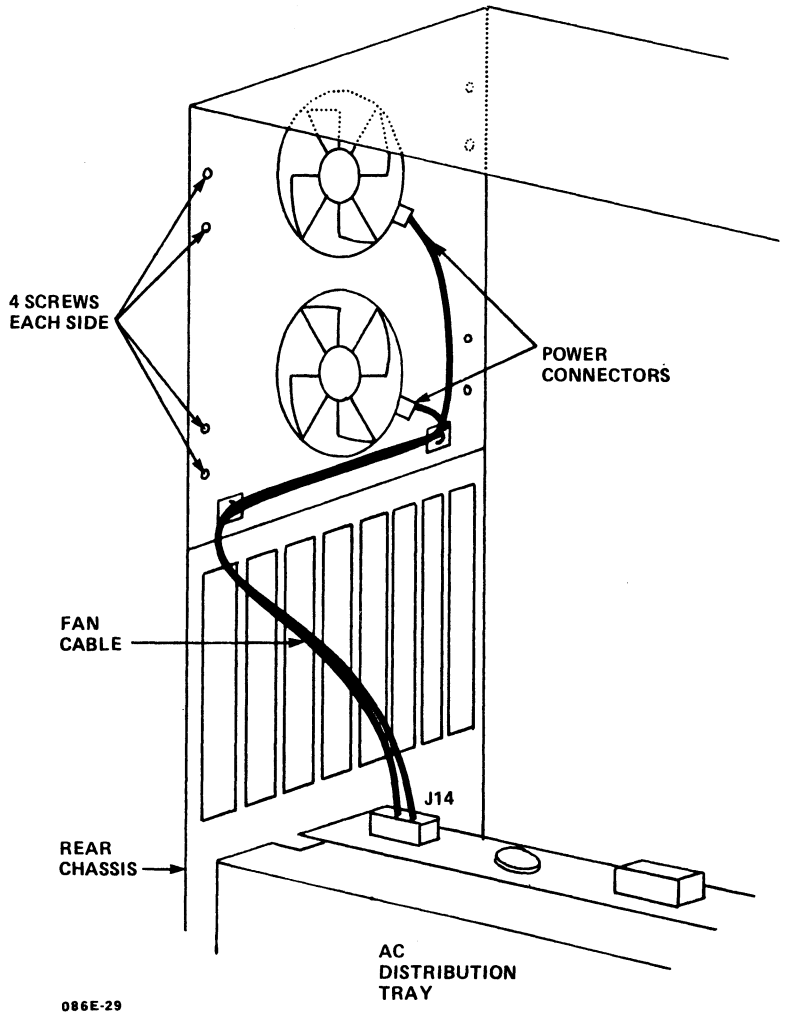


Figure 6-19. Removing the Fans

Section 7
TROUBLESHOOTING

The MARK 6E/12E 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 does occur. If it does, the troubleshooting routine described in this section will help to 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.

If a problem 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.

7.1 DETERMINING SYSTEM HALTS

A system 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. The type of problem is indicated by a HALT code contained in memory.

If a HALT occurs, a firmware program activated by the halt transfers control to the master terminal. Two lines of information are displayed on the screen. The first contains the address of the HALT instruction +1 (the program counter), the four accumulators, and the CPU status word; the second contains the value coded in the mini-switches on the front edge of the central processing unit (CPU) followed by the contents of eight words in main memory beginning at the address.

To determine the type of HALT, use the following procedure:

1. Set the mini-switches to one less than the address in the program counter and press any key on the master terminal **except** <ESC>.*

   The two lines of information described in the paragraph above are displayed. The word following the colon in the second line is the halt code.

2. Check the IRIS R9 System Manager Manual for an explanation of the HALT.

3. If the explanation of the HALT indicates that a further examination of memory is advised, set the mini-switches on the top edge of the CPU to the starting address of the next eight words to be examined.

   By operating the mini-switches in this way, the user can read any location in memory.

*If <ESC> is pressed, the MANIP program is loaded from the APL PROM into the top 1000 octal words of memory and runs. The operator can use any of the MANIP functions, but the top 1000 octal words of main memory are lost.

7.2 MANIPULATING THE SYSTEM

Even if the system is running, trouble may be indicated by one of the following conditions: the program will not load from tape, the system will not perform an Initial Program Load (IPL), the user is waiting for some action but none occurs, or the action that occurs is not the one expected.

If any of these conditions occur, the first step in troubleshooting is to MANIP(ulate) the system, that is, to use MANIP to locate a problem or malfunction. The MANIP functions that are relevant to troubleshooting are those that allow the user to display and examine the contents of memory on the master terminal, and the CPU software self-test.

7.2.1 Locating a Problem

To gather data useful in locating a problem, a MANIP command is entered on the master terminal keyboard. The command allows the user to display and examine memory contents on the terminal. A command consists of a single letter to identify the command and an octal number (if required) to specify address modes, memory addresses, and data input. For more information on MANIP functions, commands, and parameters, see Appendix D.

To enter MANIP, proceed as follows:

1. Make certain all the mini-switches on the CPU board are in the UP position.

   UP is the standard position. If different, note the position of the switches so that they can be returned to their original positions once the MANIP function is complete.

2. Press STOP and APL on the card chassis mini-panel.

   The CAR indicator flashes while MANIP waits for a command to be entered. The following is displayed:

   ```
   ->
   ```

3. Enter ?. A MANIP Menu similar to the following is displayed:

```
POINT 4 DATA CORP.          MARK 6 (12) VIRTUAL CONSOLE          CPU/FW Rev. nnnn
COPYRIGHT (C) 1986                  d mmm, yy                    MANIP rev.  n.n
================================================================================
_FORMAT__ ____________DESCRIPTION (all parameters octal)_____________________
A          Display ADRS: AC0 AC1 AC2 AC3 CPU-STAT (msb = Carry)
Cx,y       CHANGE ACx or CRY/CPU-STAT to y; Cx (x>4): change real adrs to virtual
Dx*        DISPLAY memory contents in octal, starting at adrs x
Ex* or x:  EXAMINE/ENTER into location x. ^ opens prev. adrs. ESC to end
Fx,y       Establish OFFSET for virtual adrss, x=real, y=virtual adrs
Jx*        JUMP to adrs x and execute; default = continue from last HALT
Kx,y,z     Store CONSTANT z in locations x through y
Mx,y,z     MOVE memory block x through y to location z
Nx,y,z,m   SEARCH memory x through y for NOT-EQUAL z, with optional mask m
Ox*        OUTPUT memory in ASCII, starting at
Px         PROGRAM LOAD (IPL) from device code x; default=(mini-switches), or 27
Sx,,y,z,m  SEARCH memory x through y for the value z, with optional mask m
T          Run Mark 6/12 SELF-TEST.  After HALT, press CONT, or type <ESC>J<RETURN>
Ux,y,z,a   UNLOAD PROM:x=PROM adrs.,y=#wds,z=mem.adrs,a=opt.exec.adrs; dflt=DBUG
Xx,y       Calc, and print CHECKSUM over mem. block x through y
Yx         Set up CRT new-line DELAY; 0=max. delay, 177777=none
  * Opt.  adrss mode: 0=word,real; 1=byte,virt; 2=byte,lower 64KB; 3=byte,upper
<CTRL-X>  etc.  CTU (Cassette Tape Unit) access commands
?          Shows this Help menu
->
```

NOTE

If you need to request help from POINT 4 Hardware Technical Support, make a note of the revision levels for CPU firmware and MANIP, which are displayed in the upper right corner of the menu. The support staff will need to know these revision levels in order to help you.

This menu lists the MANIP command formats and briefly describes their functions. For a more complete description of the MANIP functions, refer to Appendix D.

7.2.2 Performing the Self-Tests

Two self-tests are associated with the central processing unit (CPU) that check the functioning of the MARK 6E/12E: the firmware self-test and the CPU software self-test. The tests run automatically at the initial power up. The normal sequence of the self-tests is: firmware self-test, loading of MANIP, and CPU software self-test. The tests are described below.

- Firmware self-test - At the firmware level, this initial test verifies that 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 indicators on the top edge of the CPU. Pressing STOP and CONT together, then releasing CONT first, advances to the next test. Report any errors to POINT 4 Hardware Technical Support.

- The CPU software self-test **(this does not refer to program software)** - This test verifies that the CPU software is functioning. The test is contained in the MANIP PROM. It can be accessed in three ways: at the initial power-on, through MANIP, and by setting the mini-switches located on the top edge of the CPU to octal 100200.

7.2.2.1 ACCESSING CPU SOFTWARE SELF-TEST THROUGH MANIP

To access the CPU software self-test through MANIP, follow the procedure below. The procedure assumes that all the mini-switches are in the standard UP position.

1. If in IRIS, enter SHUTDOWN <CTRL-E>key<CTRL-E>. A message similar to the following is displayed:

```
SYSTEM IS QUIESCENT

#BYE   GROUP n USER n  mmm,dd,yyyy  hh:mm:ss

NET ACCRUED CHARGES      $nn.nn

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

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

2. Turn the disk drive OFF.

   If the disk drive remains ON and generates an interrupt request signal, the test halts. (The interrupt device code is in accumulator 0).

3. Press STOP, then APL on the mini-panel.

   The RUN indicator is ON and the CAR indicator blinks on the top edge of the CPU board. The following is displayed:

   ```
   ->
   ```

4. To instruct MANIP to run the CPU software self-test, enter T. The following is displayed:

   ```
   pppppp: aaaaaa bbbbbb cccccc dddddd ssssss
   vvvvvv wwwwww wwwwww wwwwww wwwwww wwwwww wwwwww wwwwww
   ```

   pppppp - value of program counter when halt was encountered
   aaaaaa - value of accumulator 0
   bbbbbb - value of accumulator 1
   cccccc - value of accumulator 2
   dddddd - value of accumulator 3
   ssssss - saved CPU status word
   vvvvvv - value in mini-switches on front edge of CPU
   wwwwww - content of eight words of main memory starting at address vvvvvv

   The processor halts, and the RUN indicator goes out.

5. Press <CONT> or press <ESC> and enter J. The following is displayed:

   ```
   POINT 4 MARK 6/12 SELF-TEST
   CPU LOGIC OK, ON-BOARD MEMORY OK.
   000001:VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
   000002:VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
   000003:VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
   000004:VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
   000005:VVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVV
   ```

6. To halt the CPU software self-test, press <ESC>.

7.2.2.2 ACCESSING CPU SOFTWARE SELF-TEST THROUGH MINI-SWITCHES

The third way to access the CPU Self-Test is by setting the mini-switches on the top edge of the CPU to octal 100200. This setting is used to run the self-test in a continuous loop. Set the switches as follows:

1. Set the leftmost switch on each of the two banks of mini-switches to the DOWN position.

2. Set all remaining switches on each bank to the UP position.

3. Press APL, then CONT on the mini-panel.

7.3 CHECKING OUT THE SYSTEM

The checkout procedure described in the following subsections can also be used to help locate problems. Before beginning, turn OFF the power; move the computer to an open space; and remove the front, rear, top, and side panels (see Section 4).

7.3.1 Measuring the Voltages

The power monitor board on the chassis rear houses the voltage indicators. If an indicator (other than -5 BU, +12 BU, and +5 AUX) is not lighted when the power is ON, the voltage tolerance or the power supply designated by that indicator may be faulty. Even if the indicators are lighted, it is possible that voltages may be out of tolerance. To check suspected voltages:

1. Turn the power ON.

2. With a digital voltage meter, check the voltages. The power supplies, locations, and voltages are as follows:

Main P/S Power PCB Card Cage J19		Aux P/S Power PCB Card Cage J18		Multiplexer First 8-Pt Board J11		-5V DC Regulator Board	
Pin	Signal	Pin	Signal	Pin	Signal	Lug	Signal
1	+12V	1	Sense	4	+12V	3	-5V
2	+12V	2	GND	5	-12V	4	-12V
3	GND	3	GND	6	GND	5	GND
4	GND	4	Not used				
5	+5V	5	Not used				
6	+5V	6	+12V AUX				
		7	+12V AUX				
		8	+12V sense				

   If BBU is present, check the +5 BU on the BBU printed circuit board at location J2, pin 1.

3. If a voltage is out of tolerance, remove the appropriate power supply and return it to POINT 4. See Section 6, Installing and Replacing Components.

WARNING!

Do not attempt to adjust any voltages or the warranty may be invalid.

7.3.2 Checking 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 firmly secured, check all board and cable connections according to the following instructions.

1. Follow the preliminary instructions provided at the beginning of Section 6.

2. Remove the central processing unit (CPU), extended memory, and the LOTUS Controller from the card cage; press down on all socketed components; and return the boards to the card cage.

   To remove the boards, reverse the installation procedures provided in Section 6.

3. Check that all cables and/or connectors are properly connected. The cables and connectors are listed in Table 7-1.

TABLE 7-1. CABLES AND CONNECTORS (1 of 2)

Cable	Connector Locations	
	Origin	Destination
Main P/S		
AC power	P/S TB1	AC tray J15
DC power "A"	P/S TB1, J6	Backplane J2
DC power "B"	P/S E1, E2	Backplane J1
Peripheral	P/S TB2	Power PCB J19
I/O power	P/S TB2	1st 8-pt I/O Bd J11
	1st 8-pt I/O Bd J9	2nd 8-pt I/O Bd J9
	2nd 8-pt I/O Bd J11	3rd 8-pt I/O Bd J11
-5V DC Regulator Bd		
-5V	Reg Bd lug 3	Backplane J6
-12V	Reg Bd lug 4	P/S TB2
GND	Reg Bd lug 5	P/S TB2
Power Monitor Bd		
26-pin power control	Pwr Mntr Bd J27	Backplane J8
Auxiliary P/S		
AC power	Aux PCB	AC tray J17
DC power	Aux PCB	Power PCB J18

TABLE 7-1. CABLES AND CONNECTORS (2 of 2)

Cable	Connector Locations	
	Origin	Destination
Battery Backup Unit AC power DC power Power control	 BBU TB1 BBU J2 BBU J1 BBU J4, J5, J6	 AC tray J16 Backplane J6 Backplane J7 BBU PCB
LOTUS 800 Controller 50-pin tape cntrl Disk Busy LED 20-pin disk data 34-pin disk cntrl	 Controller J1 Controller J2 Controller J3, J4, J5, J6 Controller J8	 1/4" tape drive, rear Control panel J1 ESDI disk drive J2 ESDI disk drive J1
LOTUS 750 Controller 50-pin	 Controller J1	 8mm tape drive, rear
310 Multiplexer 50-pin	 Multiplexer Bd	 1st 8-port I/O Bd J10
301 Expansion Bd 50-pin	 Expansion Bd	 8-port I/O boards J10
ESDI Disk Drive(s) Power	 Disk drive J3	 Power PCB J20-0, 1, 2, 3
1/4" Tape Drive Power	 Tape drive, rear	 Power PCB J21 (1st) J22 (2nd)
8mm Tape Drive Power	 Tape drive, rear	 Power PCB J22

4. Make certain that all ground wires, ring lugs, and push-on connectors are secure.

   Ground lugs are present on each ESDI disk drive, the tape drive, and the AC distribution tray.

   Ring lugs and/or push-ons are present on all power supplies.

5. Make certain that the Pico-N is secured to the backplane.

7.4 RUNNING DIAGNOSTIC PROGRAMS

In addition to the troubleshooting procedures already outlined, a number of diagnostic programs are available to help locate problems. These programs are available with the IRIS Operating System or on 1/4-inch or 1/2-inch streamer tapes.

This section summarizes how to access a diagnostic from IRIS, how to load from streamer tape, and it describes the required cabling connections. For comprehensive information about the diagnostic programs, refer to the following diagnostic manuals:

- MARK 5 thru 12 CPU/On-board Memory Diagnostic Manual
- MARK 6/12 Map/Memory Diagnostic Manual
- LOTUS 725/740/745/750 Disk/Tape Controller Diagnostic Manual
- LOTUS 800 Disk/Tape Controller Diagnostic Manual
- MIGHTY MUX Diagnostic Manual

7.4.1 Accessing a Diagnostic from IRIS

The program names (under IRIS) and version numbers of diagnostics that pertain to MARK 6E/12E System components are as follows:

Component	Name/Version Number
MARK 5 thru 12 CPU/On-board Memory	DI.CPUMEM.1.0 or later
MARK 6/12 DCH Map/Extended Memory	DI.M6/12.1.5 or later
LOTUS 725/740/745/750	DI.740.1.12 or later
LOTUS 800	DI.800.1.0 or later
MIGHTY MUX	DI.310MX.2.0 or later

When IRIS is active, access and run a diagnostic as follows:

1. At the IRIS prompt (#), enter SHUTDOWN <CTRL-E>key<CTRL-E> followed by logical unit/diagnostic program name. The word "key" represents the password.

   For example, to access the MIGHTY MUX diagnostic that is located on the standard logical unit 5, the entry is

   ```
   SHUTDOWN <CTRL-E>key<CTRL-E> 5/DI.310MX.2.0
   ```

   The diagnostic program begins to run.

2. If the central processing unit (CPU) halts, press APL on the mini-panel or <ESC> on the keyboard to load MANIP.

   The program counter and first four accumulators are displayed on the terminal.

3. Enter J2.

   The diagnostic program begins to run.

7.4.2 Loading a Diagnostic from Streamer Tape

Load the diagnostic program from a 1/4-inch (QIC-02) streamer tape as follows:

1. Insert the tape cartridge into the tape drive.

2. Press STOP, then APL on the mini-panel.

3. To load the program, enter P42 on the master terminal.

4. Enter 0.

   The diagnostic program loads and begins to run. For example, if the MARK 6/12 diagnostic is loaded, a message similar to the following is displayed:

```
*** POINT 4 DATA CORPORATION ***
15442 DEL AMO AVE., TUSTIN, CA.
PHONE NO. (714)-259-0777

*** MARK 6/12 DATA CHANNEL MAP & MEMORY DIAGNOSITCS - VERSION n.n ***

ALL NUMERIC INPUT AND OUTPUT IS OCTAL

*** CHECKSUM COMPLETE ***

*** CHECKSUMS AGREE ***

CPU FIRMWARE REVISION LEVEL = nnnn
```

   The program checks to ensure that the standard hamming option is installed. The following is displayed:

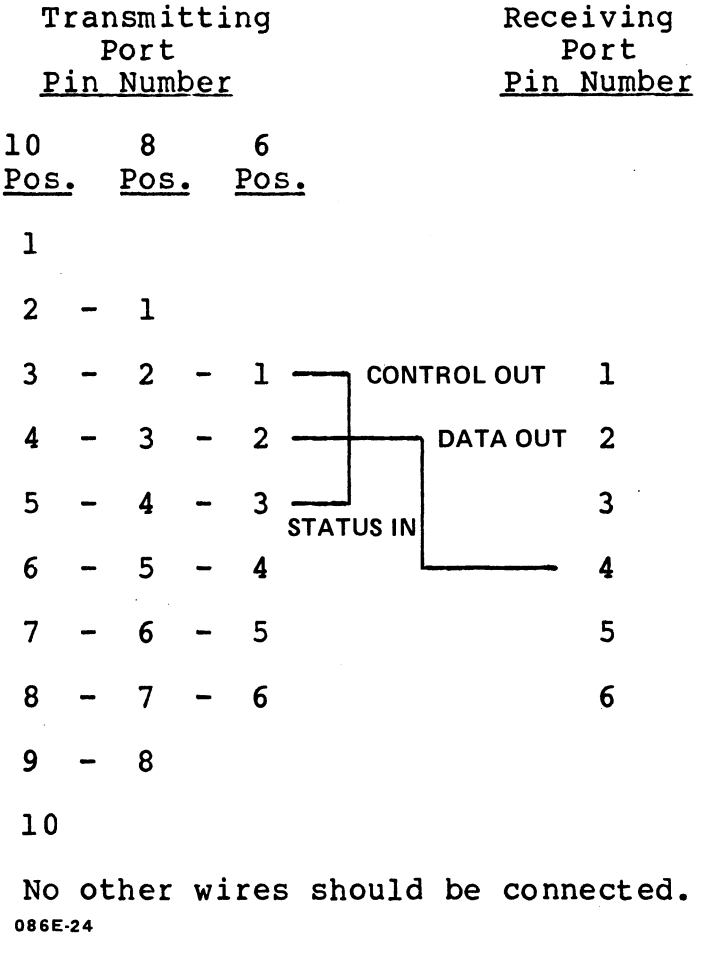
```
HAMMING IS INSTALLED
BOARD SIZES (LEGITIMATE SIZES ARE 20000/10000 BLOCKS, IN DESCENDING ORDER:)
BOARD 1  BOARD 2  BOARD 3  BOARD 4  BOARD 5  BOARD 6  BOARD 7  BOARD 10
  20000    20000    10000
TOTAL NUMBER OF BLOCKS = nnnnnn
PRESS RETURN TO CONTINUE >
```

5. Remove the streamer tape and keep it in a safe place.

7.4.3 Cable Connections for MARK 6/12 Data Channel Map and Extended Memory Diagnostic

The MIGHTY MUX diagnostic cable connections are required to run both the MIGHTY MUX and MARK 6/12 Map/Memory diagnostics. On the latter, these cable connections permit the diagnostic to check the ability of the data channel to transmit and receive information and to run the Simultaneous Expansion Memory Access through Mux and On-board (Main) Memory Test.

The cable should be set up to transfer data from port 1 (the transmitting port) to port 2 (the receiving port) on the 310 multiplexer board by making the following connections:



Note: The master port is 0.

7.5 USING SOFTWARE DIAGNOSTICS

EXERCISER and SWAPTEST are two software diagnostics that can be used to help locate hardware problems (refer to the IRIS R9 User Reference Manual).

If a system HALT or a TRAP is encountered when using EXERCISER or SWAPTEST, refer to the IRIS R9 System Manager Manual for help.

Section 8
POWER-FAIL INSTRUCTIONS

This section explains what occurs during a power failure on a MARK 6E/12E system that has the battery backup option, and it provides procedures to follow in the event a power failure lasts longer than the battery backup holding capability. The battery backup option is available on systems using IRIS R9.

If a MARK 6E/12E with extended memory and battery backup detects that a power-fail is about to occur, the power supply system alerts the IRIS Operating System. IRIS immediately transfers the contents of main memory into extended memory where it is saved during a power failure.

When the power returns after a failure, hardware and software self-tests run automatically. If both tests complete successfully, the MARK 6E/12E transfers back to main memory the contents which it earlier transferred to extended memory. Operations can resume without any action or input from the user if the keyswitch is set to AUTO.

NOTE

If the keyswitch is set to ON, the system comes up and enters MANIP; to IPL, press P.

The length of time that battery backup can hold information varies with the load, and the size and charge of the battery. For example, a six-ampere-hour battery with a load current of six amperes saves information for about 30 minutes (see Appendix B for additional information about hold times and conditions).

If the power failure lasts longer than the holding capability of the battery backup, memory is lost. If that is the case, perform the more appropriate of the procedures that follow.

Procedure 1

1. Insert the most recent backup tape 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
SYSTEM SPECIFICATIONS

A.1 PHYSICAL DIMENSIONS

Height:	29.00 inches (73.66 cm)
Width:	12.00 inches (30.48 cm)
Depth:	29.00 inches (73.66 cm)
Weight:	158 pounds (71 kgs)

A.2 POWER REQUIREMENTS

The MARK 6E/12E has a main power supply and a -5V DC regulator board. It may also have an auxiliary power supply and a battery backup unit (BBU). This section provides information about the power requirements for these supplies and for the MARK 6/12 central processing unit (CPU) and controllers. Table A-1 lists the voltages, amperes, rated capacity, and tolerances for the main power supply; Tables A-2, A-3, and A-4 list the voltages, amperes, and tolerances for the remaining power supplies; and Table A-5 provides the power requirements for the CPU and controllers.

A.2.1 AC Wiring

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

A.2.2 Main Power Supply

The main power supply provides power for the central processing unit (CPU), controllers, first and second ESDI disk drives, and the tape drive(s).

1. AC Input

Fuse Rating:	6 amps (U.S.), 3 amps (International)
Voltages:	90-132 volts 180-264 volts
Cycles:	47-63 Hz

2. DC Output: 500 watts

3. Heat Dissipation: 1790 British thermal units

TABLE A-1. MAIN POWER SUPPLY VOLTAGES, AMPERES, RATED CAPACITY, AND TOLERANCES

Voltage	Maximum Amperes	Rated Capacity	Tolerance
+5V	65.00A	325.00W	5%
+15V	0.50A	7.50W	5%
+12V	12.00A	144.00W	5%
-15V	0.50A	7.50W	5%
-12V	2.00A	24.00W	5%

A.2.3 -5V DC Regulator Board

The -5V DC regulator board is available to support controllers that require -5V DC.

TABLE A-2. -5V DC REGULATOR BOARD VOLTAGE, AMPERES, AND TOLERANCE

Voltage	Maximum Amperes	Tolerance
-5V	1.50	+/- 5%

A.2.4 Auxiliary Power Supply

The auxiliary power supply is used whenever more than two 5-1/4-inch ESDI hard disk drives are present.

1. AC Input

   Fuse Rating: 6 amps (U.S.), 3 amps (International)

   Voltages: 90-132 volts
   180-264 volts

   Cycles: 47-63 Hz

2. DC Output: 144 watts

3. Heat Dissipation: 491 British thermal units

TABLE A-3. AUXILIARY POWER SUPPLY VOLTAGE, AMPERES, AND TOLERANCE

Voltage	Maximum Amperes	Tolerance
+12V	12.00A	5%

A.2.5 Battery Backup

1. AC Input

Fuse Rating:	3 amps (U.S.), 1.5 amps (International)
Voltages:	90-132 volts 180-264 volts
Cycles:	47-63 Hz

2. DC output for the BBU is shown in Table A-4.

TABLE A-4. BATTERY BACKUP VOLTAGE, AMPERES, AND TOLERANCE

Voltage	Maximum Amperes	Tolerance
+5V	11.00A	1%

A.2.6 CPU and Controllers

The power requirements of the CPU and controllers are provided in Table A-5.

TABLE A-5. CPU AND CONTROLLER POWER REQUIREMENTS

Component	+5V	(1) +5VBBU	-5V	+15V	-15V	+12V	-12V
MARK 6 CPU	10.00						
MARK 12 CPU	14.00						
EXM, 2MB w/o BBU (2)	6.30						
EXM, 2MB w/BBU (2)	2.30	4.00					
EXM, 4MB w/o BBU (2)	6.30						
EXM, 4MB w/BBU (2)	2.30	4.00					
L725 1/2" Tape Ctlr	4.00						
L750 8mm Tape Ctlr	1.60						
L800 1/4" Disk/Tape Ctlr	8.00						
MUX, 310-A8 w/Reg	5.00			0.25	0.25		
MUX, 310-A8 w/o Reg	5.00					0.25	0.25
MUX, 301-A8	1.00					0.10	0.10
MUX, 301-A16	2.00					0.20	0.20
MUX, 301-A24	3.00					0.30	0.30

(1) +5V BBU is provided by the BBU supply for the 500 watt power supply.

(2) The currents shown for 2MB and 4MB EXM are for a board in operating mode. If more than one board is included, only the first board is in operating mode. All other boards are in standby mode. Standby currents for 2MB and 4MB EXM boards are:

w/o BBU	+5V = 4.2 amps	
w/BBU	+5V = 2.3 amps	+5V BBU = 1.9 amps

A.3 ENVIRONMENTAL REQUIREMENTS

1. Placement

   Place the MARK 6E/12E so that it is out of direct sunlight and has free air circulation at the front and rear. Avoid plugging other electrical devices into the same power line as the system.

2. Temperature

Operating:	50 to 95°F +10 to 35°C
Storage:	-40 to 140°F -40 to 60°C

3. Humidity

Operating:	20 to 80% non-condensing
Storage:	5 to 95% non-condensing

Appendix B
BATTERY BACKUP

Battery backup (BBU) is an optional feature of the MARK 6E/12E. Its purpose is to ensure that information will not be lost in the event of a power failure.

During a power failure, the BBU provides uninterrupted +5BBU power to slots 1 through 5. The actual hold time varies with the amount of the load, the size of the battery, and the amount of charge. Table B-1 shows the various hold times for the BBU.

The battery charges with sufficient AC voltage when the keyswitch is in the STBY, ON or AUTO position. When depleted, a six-ampere-hour battery recharges in less than 20 hours.

TABLE B-1. BATTERY BACKUP HOLD TIMES*

Load Current (Amps)	Minutes for 6.0 Ahr Battery
10	13
9	17
8	20
7	25
6	30
5	40
4	50
3	80
2	235

*These times are for a fully charged battery and are approximate. Times vary slightly with temperature, battery conditions and loads due to usage.

Table B-2 describes the pin assignments for the interface connectors on the BBU printed circuit board.

TABLE B-2. INTERFACE CONNECTORS

Pin	Signal	Description
J1 BBU CONTROL		
1	BTYOK	Battery OK signal to card chassis mini-panel indicator
2-6		Not used
7	BTROFF	Off signal from keyswitch
8		Not used
9	+S	+5BBU sense line
10	-S	+5BBU sense return
J2 BBU POWER		
1	+5BU	+5 BBU voltage
2	+5BU	+5 BBU voltage
3	GND	+5 BBU common
4	GND	+5 BBU common
5	-5BU	Not used
6	+12BU	Not used
7	+12/-5RTN	Not used
8	+12/-5RTN	Not used
9	SPARE	Not used
P16 BBU AC POWER		
1	ACH	Switch AC line high
2	ACN	Switch AC line neutral
3	GND	Chassis Ground

Appendix C
CARING FOR TAPES AND CARTRIDGES

Tapes are media on which computer programs and information are stored. Tapes, and the cartridges in which they are housed, are sensitive and need to be handled carefully to ensure that the tape drive can read and write reliably. This appendix contains information and instructions about the proper care and handling of 1/4-inch streaming tape and 8mm tape and their cartridges.

C.1 1/4-INCH TAPE CARTRIDGE

With proper care, the typical life of a tape cartridge is up to 5000 track passes. The following information and instructions will help to ensure reliable operation and long life.

C.1.1 Specifications

The 1/4-inch streaming tape (QIC-02) drive has either 45/60MB or 125/150MB capacity. Table C-1 lists order numbers, cartridge types, and the functions supported for these tape capacities.

TABLE C-1. CARTRIDGE TYPES AND FUNCTIONS

Drive Capacity	POINT 4 Order No.	Cartridge Type	Functions Supported
45/60MB	QCT0200	DC300XLP	Read/Write QIC-24 Read only QIC-11
	QCT0250	DC600A	Read/Write QIC-24 Read only QIC-11
125/150MB	QCT0270	DC600XTD	Read/Write QIC-150 Read only QIC-120 Read only QIC-24 Read only QIC-11
	QCT0250	DC600A	Read/Write QIC-120 Read only QIC-24 Read only QIC-11
	QCT0200	DC300XLP	Read only QIC-24 Read only QIC-11

C.1.2 Labeling

Each tape cartridge should be labeled with the date of creation, a description of the tape contents, and any other relevant information. The label should be placed on the plastic top of the cartridge and not on the metal bottom plate.

C.1.3 Storage

When not in use, the 1/4-inch tape cartridge should always be returned to its protective case and stored in a cool, dry place.

Before using, allow the tape cartridge to acclimate to the operating environment for 24 hours or for the amount of time it has been exposed to a dissimilar environment, whichever is less.

C.1.4 Handling a 1/4-Inch Tape Cartridge

Incorrect handling can adversely affect tape performance.

Avoid the following: touching the recording media, having the cartridge close to magnetic fields or magnetic materials, dust, sunlight, and moisture.

Faulty tape tension can cause reading problems. To help ensure correct tape tension, retension the tape before each use. To retension a tape, use the RETENSION command of DISCUTILITY (Rev 2.3 or later).

C.1.5 Write-Protecting a 1/4-Inch Tape Cartridge

The 1/4-inch tape cartridge has a write-protect plug, which can be rotated before the cartridge is inserted into the drive to either permit or prohibit writing to the tape. If the user is allowed to read from and write to the tape, use a screwdriver to rotate the plug so that the arrow points away from SAFE. If the user is allowed only to read from the tape, make certain the arrow of the write protect plug points to SAFE (see Figure C-1).

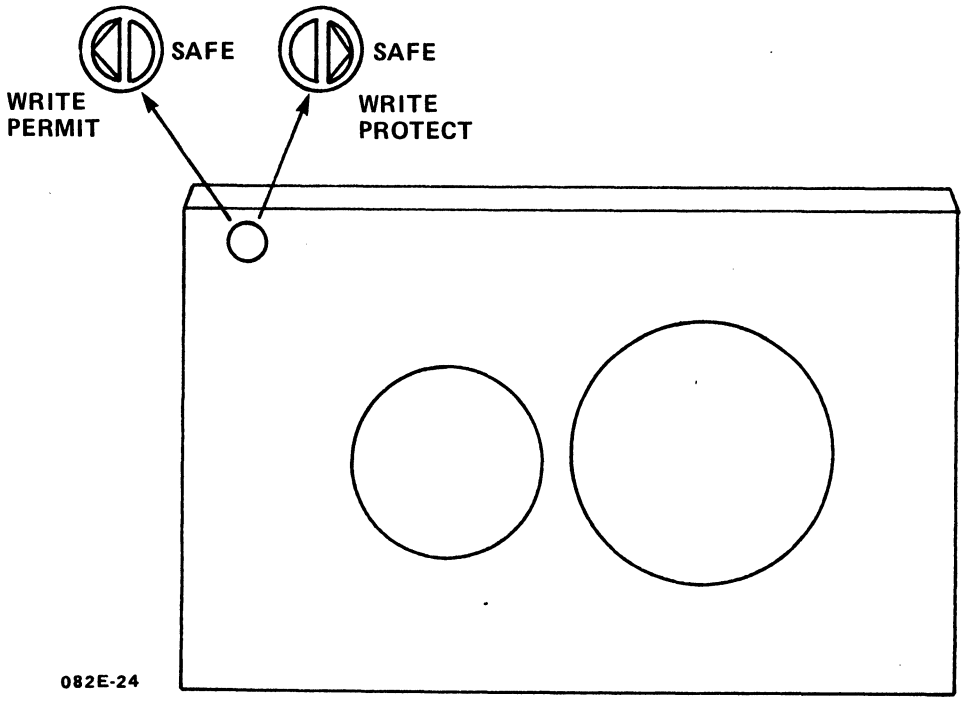


Figure C-1. Write-Protecting a 1/4-Inch Tape Cartridge

C.1.6 Inserting and Removing a 1/4-Inch Tape Cartridge

Once the tape cartridge has been removed from its protective case and the write-protect plug set as appropriate, the tape cartridge can be inserted in the drive as follows (see Figure C-2):

1. Insert the cartridge into the tape drive opening and push it in until it stops.

   The drive is designed so that the tape cartridge can be inserted only in the correct way.

2. Move the loading lever toward the cartridge to lock the cartridge into operating position.

To remove the tape cartridge from the tape drive:

1. Push the loading lever away from the cartridge.

2. When the tape cartridge ejects, remove it from the tape drive.

3. Return the tape cartridge to its protective case.

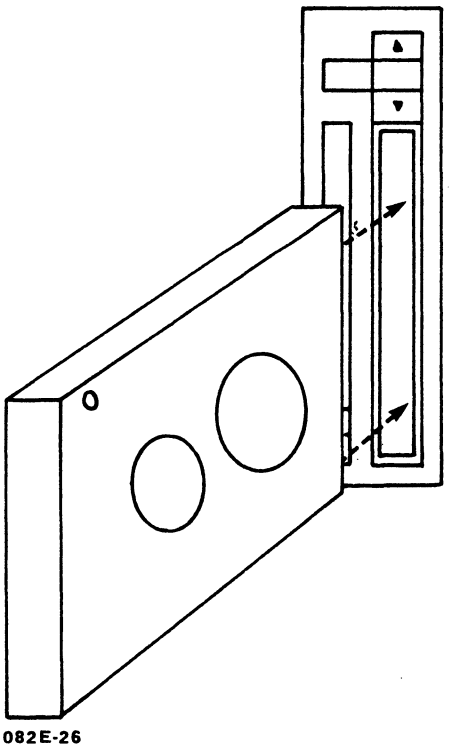


Figure C-2. Inserting a 1/4-Inch Tape Cartridge

C.1.7 Cleaning a Tape Drive

To prevent tape problems from occurring, establish a regular cleaning routine. The read/write/erase heads of the tape drive should be cleaned after each initial pass of a new tape cartridge and after every eight hours of normal use. The sensor openings and cartridge cavity should be cleaned whenever dust or dirt are visible. **Before doing any cleaning, turn off power to the tape drive.**

Clean heads with a lint free swab and Freon TF. Do not use solutions that contain alcohol or water. Cartridge cleaning kits can be ordered from POINT 4.

Clean the sensor heads and cartridge cavity by carefully blowing out dust or dirt with low pressure air from an aerosol can of dry air.

C.2 8mm TAPE CARTRIDGE

C.2.1 Specifications

The 8mm helical scan tape drive uses standard 8mm tape cartridges (3.7 x 2.5 x 0.6 inches).

C.2.2 Labeling

Each tape cartridge should be labeled with the date of creation, a description of the tape contents, and any other relevant information. The label should be placed on the plastic top of the cartridge.

C.2.3 Storage

When not in use the 8mm tape cartridge should be returned to its protective case and stored vertically in a cool, dry place.

Before using, allow the tape cartridge to acclimate to the operating environment for 24 hours or for the amount of time it has been exposed to a dissimilar environment, whichever is less.

C.2.4 Handling an 8mm Tape Cartridge

Incorrect handling can adversely affect tape performance.

Avoid the following: touching the recording media, having the cartridge close to magnetic fields and magnetic materials, dust, sunlight, and moisture.

C.2.5 Write-Protecting an 8mm Tape Cartridge

The tape cartridge has a write-protect tab, which can be set before the cartridge is inserted into the drive to either permit or prohibit writing to tape. If the user is allowed to read from and write to the tape, make certain the tab is moved to the right so that the red portion of the tab is not visible. If the user is allowed only to read from the tape, use a ball-point pen or other similar instrument to move the tab to the left so that the red portion of the tab is visible (see Figure C-3).

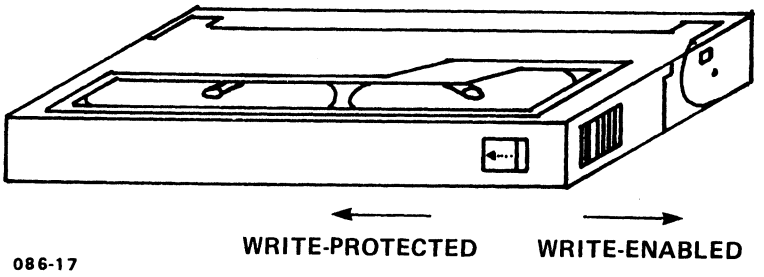


Figure C-3. Write-Protecting an 8mm Tape Cartridge

C.2.6 Inserting and Removing an 8mm Tape Cartridge

Once the tape cartridge has been removed from its protective case and the write-protect tab set as appropriate, the tape cartridge can be inserted in the drive as follows (see Figure C-4):

1. If the tape drive door is closed, press the UNLOAD button to open the drive door.

2. Insert the tape cartridge with the label side facing up and the cartridge lid facing the drive.

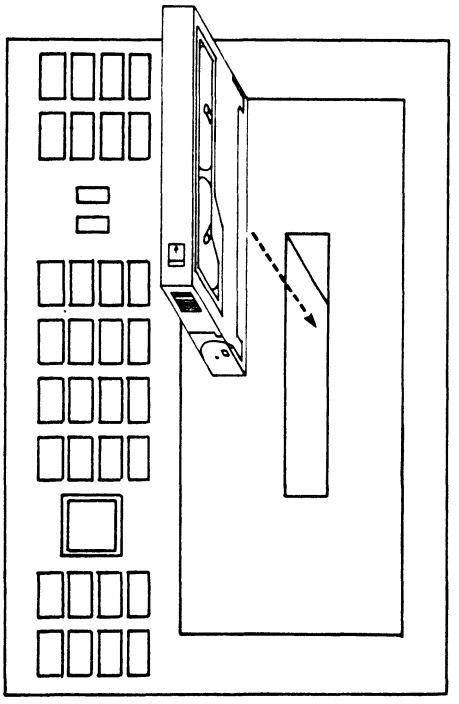
3. Gently close the drive door; the tape cartridge automatically loads.

To remove the tape cartridge from the tape drive:

1. Press the UNLOAD button on the drive.*

2. When the tape cartridge ejects, remove it from the tape drive.

3. Return the tape cartridge to its protective case.



086E-40

Figure C-4. Inserting the 8mm Tape Cartridge

*If power is lost, the tape cartridge will not eject.

Appendix D
MANIP COMMANDS

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 lists the MANIP commands and descriptions as well as the MANIP program listing. More information on MANIP is available in Section 7.

A MANIP command consists of a single letter, which is 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, z, a, m, and n are used to represent octal parameters.

For some commands, MANIP allows either word or byte addressing using either real memory addresses or offset memory addresses (see the F command). These optional addressing modes are invoked by the parameter "a". They can be used with the commands D, E, J and O. The "a" parameter definitions are as follows:

a Parameter	Definition
omitted	Word address, including "F" offset, if any
0	Word address, absolute
1	Byte address, using offset, if any
2	Byte address, lower 64KB
3	Byte address, upper 64KB

NOTE

The J command does not permit byte addresses.

If no "a" parameter is given, the addressing mode is "word address, including offset, if any". If there is no "a" parameter, the preceding comma is optional.

Table D-1 shows the MANIP commands, parameters, and definitions. Table D-2 lists the MANIP commands used to control a cassette tape unit (CTU).

TABLE D-1. MANIP COMMAND DESCRIPTIONS (1 of 7)

Command & Parameters	Definition
A	Displays initial value of program counter (PC) saved in first location of MANIP, contents of accumulators A0, A1, A2, A3, and CPU status word as they were at the time MANIP was entered. The MSB of the CPU status word represents the carry flip-flop.
Cx,y	Changes accumulator or CPU status word, or address representation. • 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 the CPU status word (MSB = carry) is set equal to y. • If x is greater than 4 and an address offset has been established (see F command), x is interpreted as a real address and converted to a virtual address using the offset previously established, and displayed on the master terminal. In this case, the y parameter is not used. • Parameter Description x - 1 octal digit 0-7 or one word octal y - 1 word octal
Dx,a	Dumps memory in octal, beginning at location x, using address mode a. Eight words (or bytes if using a byte address mode) are displayed per line, with the address of the first word (byte) at the beginning of each line. To temporarily pause output, press <CTRL-S> (XOFF); to start, press <CTRL-Q> (XON); to terminate output, press <ESC> or any other key. • Parameter Description x - octal number representing a 16-bit memory address a - optional one digit (0-3) representing an address mode

TABLE D-1. MANIP COMMAND DESCRIPTIONS (2 OF 7)

Command & Parameters	Definition
Ex,a	Enables entry at address x, using address mode a. The address (changed to a word address if it was a byte address) is printed, followed by a colon. An octal value can then be entered into the memory location, followed by <RETURN>. The next address (x+1) is then printed and opened for entry. Entry can be continued into sequential address locations until terminated by pressing <RETURN> and then <ESC>. • If there is no entry before <RETURN>, the present content of the opened location is displayed in octal to allow examination of a value before entering a new one. If <RETURN> is pressed again without an entry, the current value is saved; and the next address is printed and opened for entry. • If a caret (^) is entered instead of <RETURN>, the previous address is printed and opened. This feature is convenient for confirming an entry just made. • Parameter Description x - octal number representing a 16-bit memory address a - optional one digit (0-3) representing an address mode
Fx,y	Establishes an address offset (a fixed difference between real memory addresses and virtual addresses as entered and listed in MANIP). The difference x-y is added to an address entered and subtracted from a memory address before listing. If y is not entered, it is assumed to be zero. Whenever a nonzero offset is established, an F is printed at the beginning of each line. To revert to real memory addressing, enter F0. • Parameter Description x - octal number representing a real memory address y - octal number representing listing address equivalent to address specified in x

TABLE D-1. MANIP COMMAND DESCRIPTIONS (3 of 7)

Command & Parameters	Definition
F	Saves current offset value, and reinstates previous offset. Displays offset being reinstated. Provides a convenient way to toggle back and forth between two offsets (or one offset and real memory addressing).
Jx,a	Jumps to location x (using address mode a) with accumulators and carry restored. • Parameter Description x - octal number representing a 16-bit memory address a - optional one digit (0) representing absolute word address mode (byte address modes not available for J command)
J	Jumps to address where last halt occurred (does a CONTinue function).
Kx,y,z	Stores 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 main memory. Locations x through y, inclusive, are moved to the area starting at location z. • Source and destination areas can overlap in either direction without bad effects. • Can move MANIP as long as destination area does not overlap source area. • Parameter Description x - octal number representing a 16-bit beginning memory address y - octal number representing a 16-bit ending memory address z - octal number representing a 16-bit beginning memory address of a new location

TABLE D-1. MANIP COMMAND DESCRIPTIONS (4 of 7)

Command & Parameters	Definition
Nx,y,z,m	Searches locations x through y, inclusive, for values not equal to constant z. Each word is ANDed with mask m before comparison with z. • If m is omitted, 177777 is assumed. • Parameter Description x - octal number representing a 16-bit beginning memory address y - octal number representing a 16-bit ending memory address z - octal number representing constant m - octal number representing mask; if omitted defaults to 177777 **Example of the use of mask:** The command Nx,y,0,170000 searches locations x through y for any value whose four MSBs are nonzero, i.e., for any value greater than 7777. If such a value is found, its address and contents are displayed in octal.
Ox,a	Outputs ASCII. Contents of memory starting at location x (using address mode a) are displayed as text. If a zero byte is found, the output is terminated. • Parameter Description x - octal number representing a 16-bit memory address a - optional one digit (0-3) representing an address mode

TABLE D-1. MANIP COMMAND DESCRIPTIONS (5 of 7)

Command & Parameters	Definition
Px	Program loads from disk or other DMA device. Performs standard bootstrap APL (gives a NIOS instruction with device code x, then idles at location 377 waiting for the disk to overwrite that location). If x is omitted, P reads the CPU mini-switches and uses their contents as the device code; if mini-switches are not set to a valid device code, P uses device code 27. **If the switch representing the 200 bit is set in addition to the device code switches, MANIP cannot be accessed. Pressing APL causes MANIP to try to boot from the disk.** ● Parameter Description x - One or two-digit octal number (1 through 76) representing the device code from which the program is to be loaded
Sx,y,z,m	Searches locations x through y, inclusive, for constant z. Each word is ANDed with mask m before comparison with z. ● If m is omitted, 177777 is assumed. ● Parameter Description x - octal number representing a 16-bit beginning memory address y - octal number representing a 16-bit ending memory address z - octal number representing a constant m - octal number representing a mask; if omitted defaults to the value 177777 **Example of the use of mask:** The command Sx,y,60025,160077 searches location x through y for any I/O instruction for device 25. If a comparison is found, its address and contents are displayed in octal.
T	Runs software self-test. CPU halts. Press <CONT> or press <ESC> J <RETURN>. See Sections 2.3.1.3 and 7.2.2 for more on Self-Test.

TABLE D-1. MANIP COMMAND DESCRIPTION (6 of 7)

Command & Parameters	Definition
Ux,y,z,a	Loads from APL PROM beginning at PROM location x, and reading y words into main memory starting at location z, then jumps to starting address a. ● Parameter Description x - octal number representing a beginning PROM location y - octal number representing the number of words to be loaded z - octal number representing a beginning memory address a - optional octal number representing a starting address
U	Loads DBUG from APL PROM into main memory starting at location 73000 and jumps into it.
Xx,y	Calculates and prints checksum over memory locations x through y. Uses a revolving checksum (using a SUBL 0,1 instruction with A0 = each word from x through y, and A1 = accumulating checksum; initially 0). This ensures that if two words in memory are swapped, the swap is detected by the checksum. Useful for determining if any word in memory has changed. ● Parameter Description x - octal number representing a 16-bit beginning memory address y - octal number representing a 16-bit ending memory address
Yx	Sets up a <RETURN> delay. Required on some terminals for proper scrolling. After each carriage return/line feed, MANIP counts up an accumulator from x to 0 before proceeding. For maximum delay set x=0, for no delay set x=177777. ● Parameter Description x - octal number representing <RETURN> delay value

TABLE D-1. MANIP COMMAND DESCRIPTIONS (7 of 7)

Command & Parameters	Definition
x:y	Octal value y is stored at location x, and the next cell is opened (see E command). ● Parameter Description x - octal number representing a 16-bit memory address y - 1 to 6 digits representing an octal value
<CTRL-X> or other control character	Any control character is interpreted as a cassette tape unit (CTU) command. MANIP passes the command to the CTU and displays responses from the CTU, if any. CTU commands in MANIP are described in Table B-2. For more information, refer to the IRIS R9 System Manager Manual.

TABLE D-2. MANIP CTU COMMAND DESCRIPTIONS

Command & Parameters	Definition
<CTRL-D>	Lists directory (index) from tape, if tape is so formatted.
<CTRL-E>	Enquires (error status).
<CTRL-K>file	Kills the named file.
<CTRL-O>file	Opens the named file if it is in the directory.
<CTRL-O>file,x,y	Creates a directory entry for named file starting at block x and containing y+1 blocks of 128 words each.
<CTRL-R>	Reads the open file from tape into memory.
<CTRL-R>x,y	Reads from tape into memory; reads y+1 blocks starting at block x.
<CTRL-S>x	Seeks to block x on tape. <CTRL-S>999 winds tape all the way forward.
<CTRL-T>n	Selects track n (0 or 1).
<CTRL-X>	Cancels partially entered command.
<CTRL-Z>	Rewinds tape to starting position.
<ESC>	Exits CTU mode and reverts to MANIP.

Appendix E
CABLING TO EXTERNAL PERIPHERALS

This appendix provides information and recommendations about the cables and connectors used to connect POINT 4 computer systems to external peripherals such as terminals, printers, or modems. Implementing the recommendations can help protect systems from crosstalk that may result in interrupts, errors, system halts, or slowdowns; and from static discharge and lightning.

E.1 CABLES

POINT 4 recommends using shielded RS232 cables.* Shielded cables are required for FCC compliance. The shield portion of a cable should have a good electrical connection to earth ground at both ends of the cable, and it should be tied to earth ground at the point of exit from the building.

Cable wires that are not used by external peripheral devices should be disconnected at both ends. To disconnect an unused wire in a DB25-to-DB25 cable, cut the wire at each connector. To achieve a similar effect with a cable ending in a RJ45 connector, ground unused signals at the DB25 end of the cable.

*Shielded RS232 cables are available from POINT 4, outside vendors, or they can be assembled as required.

E.2 GROUNDING CONNECTORS

POINT 4 uses two types of connectors to attach cables to external peripherals: a modular telephone type 8-pin RJ45 connector and a 25-pin DB25 connector. Connectors at the computer end may be either RJ45s or DB25s; connectors at the external peripheral device end are DB25s. To ground DB25 connectors, see Section E.2.1; for RJ45 connectors, see Section E.2.2.

E.2.1 Grounding DB25 Connectors

When used at the computer end, DB25 connectors attach to a model 322 connector panel. On older revisions, pin 1 of all ports are connected together, but they are not connected to chassis ground. To ground the connectors, do one of the following (see Figure E-1):

- Order a cable (88082) and two quick disconnect lugs (725034). Solder the quick disconnect lugs to the grounding points on the 322 connector panel. Screw the ring lug to the chassis frame and push the quick disconnect of the cable onto the nearest grounding point.

- Create a cable from minimum 16-gauge wire. Solder it onto the grounding point nearest to the chassis frame. Run the cable to frame ground, and attach it by means of a lug and screw.

On newer revisions, a ground wire is included. Push on the cable (see Figure E-1) and screw it to frame ground.

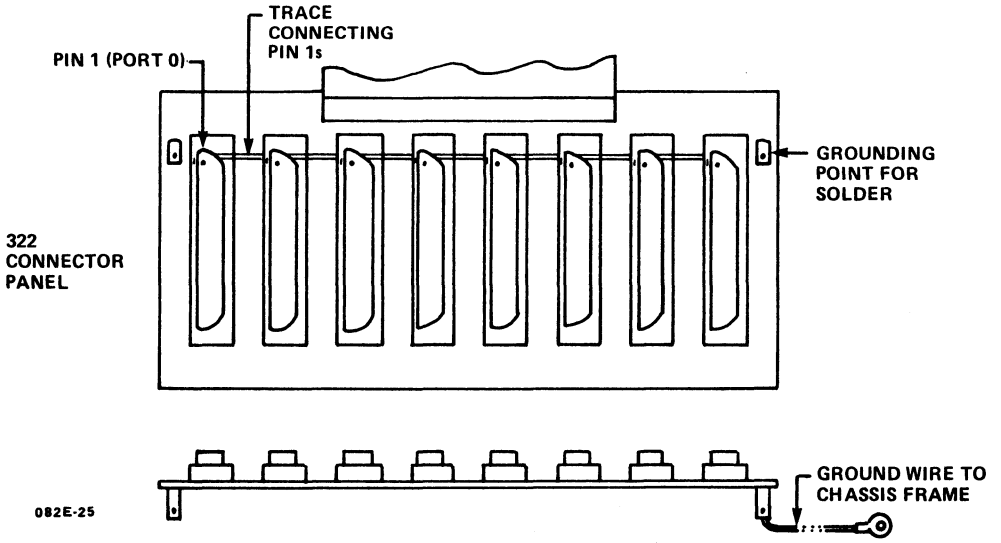


Figure E-1. Chassis Ground Points on a 322 Connector Panel

On a MARK 4, fasten the ground wire to the inside of the chassis rear by fastening the end with the push-on connector to the lug on the 8-port panel, and the end with a ring lug to the threaded stud above the port panel.

E.2.2 Grounding RJ45 Connectors

To ground RJ45 connectors, make certain that the following connections are made:

- On a MARK 2E, secure the screw that connects each computer board support bracket to the metal frame of the chassis.
- On a MARK 4E, secure the screws in the metal standoffs that connect the port panel to the chassis rear.
- On a MARK 5/5E/6/6E/8/9/12/12E secure the screws that fasten each 8-port I/O board to the I/O panel.

E.3 CABLE WIRING DIAGRAMS

POINT 4 recommends that cables be wired according to the diagrams provided in this appendix. Diagrams are provided for the following:

- Modular-to-DB25 signal list

  - Wiring diagram for modular-to-DB25 CRT cable
  - Wiring diagram for modular-to DB25 printer cable
  - Wiring diagram for modular-to-DB25 modem cable - asynchronous port

- Signal list for POINT 4 computers with DB25 connectors

  - Wiring diagram for DB25-to-DB25 CRT cable
  - Wiring diagram for DB25-to-DB25 printer cable
  - Wiring diagram for DB25-to-DB25 modem cable - asynchronous port

- Bisynchronous interface signals

If assembling cables and connectors, first see Section E.4.

E.3.1 Modular-to-DB25 Signal List

Async Board Jack	SYSTEM END Modular Plug			DEVICE END
10-Pos #	8-* Pos #	6-Pos #	Signal Name	DB25 Pin No.
1			CHASGND (SHIELD)	
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 (see Figure E-2).

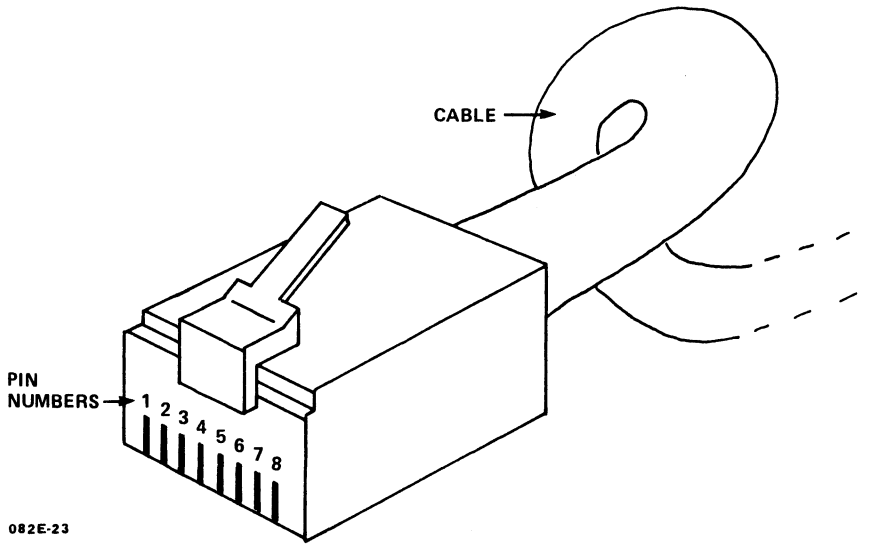


Figure E-2. 8-Pin Modular Connector

E.3.1.1 WIRING DIAGRAM FOR MODULAR-TO-DB25 CRT CABLE

The CRT cable should have all the signals required for a CRT. It should also work with printers that use XON/XOFF instead of a busy line.

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

SYSTEM END Position No. in 8-position Modular Plug	POINT 4 Signal Description		DEVICE END DB25 Pin No.
1	SHIELD	---	1
2			
3	DATA OUT	-->	3
4		---	20---+*
5	DATA IN	<--	2
6	SIGNAL GROUND	---	7---+
7			
8			

*Since this signal is not required by most CRTs, it is recommended that this signal be cut at both ends. If that is not possible, then ground the signal at the device end of the cable.

E.3.1.2 WIRING DIAGRAM FOR MODULAR-TO-DB25 PRINTER CABLE

This cable should work with printers that use a busy signal instead of XON/XOFF.

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

SYSTEM END Position No. in 8-position Modular Plug	POINT 4 Signal Description		DEVICE END DB25 Pin No.
1	SHIELD	---	1
2			
3	DATA OUT	-->	3
4	STATUS IN	<--	20*
5			
6	SIGNAL GROUND	---	7
7			
8			

*This signal is the printer busy signal commonly called "DTR". Some printers provide this signal on other pins, such as pins 11 or 19. The MARK 2E/4/4E requires that this signal be high=ready, low=busy (-3 volts).

Although the 310 multiplexer can be programmed to accept either high or low as busy, POINT 4 recommends setting it as high=ready, low=busy.

E.3.1.3 WIRING DIAGRAM MODULAR-TO-DB25 MODEM CABLE - ASYNCHRONOUS PORT

SYSTEM END Position No. in 8-position Modular Plug	POINT 4 Signal Description		DEVICE END DB25 Pin No.
1	SHIELD	---	1
2	CONTROL OUT	-->	20*
3	DATA OUT	-->	2
4	STATUS IN	<--	8**
5	DATA IN	<--	3
6	SIGNAL GROUND	---	7
7			
8			

*Some modems require this signal, which is commonly called "DTR", to operate. If the modem does not use this signal, POINT 4 recommends cutting this wire.

**On the 310 multiplexer, this signal, which is commonly called "carrier detect", is used to initiate an auto log-off. POINT 4 recommends this feature for modem ports.

On the MARK 2E and 4E, this signal must be ground, open or high enable system data exchange. A low (-3 volts) to the system inhibits data exchange.

E.3.2 Signal List for POINT 4 Computers with DB25 Connectors - Asynchronous Port

SYSTEM END Pin No. in DB25 Connector	Signal Name/Description	
1	CHASSIS GROUND	---
2	DATA IN	<--
3	DATA OUT	-->
7	SIGNAL GROUND	---
8	CONTROL OUT (DTR)	-->
20	STATUS IN (BUSY)	<--

E.3.2.1 WIRING DIAGRAM FOR DB25-TO-DB25 CRT CABLE

This cable should work with CRTs and printers that use XON/XOFF instead of a busy signal.

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

SYSTEM END DB25 Pin No.	POINT 4 Signal Description		DEVICE END DB25 Pin No.
1	SHIELD	---	1
2	DATA IN	<--	2
3	DATA OUT	-->	3
7	SIGNAL GROUND	---	7

E.3.2.2 WIRING DIAGRAM FOR DB25-TO-DB25 PRINTER CABLE

This cable should work with printers that use a busy signal instead of XON/XOFF. For printers that use XON/XOFF, see Section E.3.2.1.

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

SYSTEM END DB25 Pin No.	POINT 4 Signal Description		DEVICE END DB25 Pin No.
1	SHIELD	---	1
3	DATA OUT	-->	3
7	SIGNAL GROUND	---	7
20	STATUS IN	<--	20*

*This signal is the printer busy signal commonly called "DTR". Some printers provide this signal on other pins, such as pins 11 or 19. The MARK 4 requires that this signal be high=ready, low=busy (-3 volts).

Although the 310 multiplexer can be programmed to accept either high or low as busy, POINT 4 recommends setting it as high=ready, low=busy.

E.3.2.3 WIRING DIAGRAM FOR DB25-TO-DB25 MODEM CABLE - ASYNCHRONOUS PORT

Unused wires should be cut at both ends.

SYSTEM END DB25 Pin No.	POINT 4 Signal Description		DEVICE END DB25 Pin No.
1	SHIELD	---	1
2	DATA IN	<--	3
3	DATA OUT	-->	2
7	SIGNAL GROUND	---	7
8	CONTROL OUT	-->	20*
20	STATUS IN	<--	8**

*Some modems require this signal, which is commonly called" DTR", to operate. If your modem does not use this signal, POINT 4 recommends cutting this wire.

**On the 310 multiplexer, this signal, which is commonly called "carrier detect", is used to initiate an auto log-off. POINT 4 recommends this feature for modem ports.

On the MARK 4, this signal must be ground, open, or high to enable system data exchange. A low (-3 volts) to the system will inhibit data exchange.

E.3.3 Bisynchronous Interface Signals

Bisynchronous interface signals are relevant only for POINT 4 computers that support a bisynchronous port.

SYSTEM END Pin No. in DB25 Connector	Signal Name/Description	
1	SHIELD	---
2	DATA OUT	-->
3	DATA IN	<--
4	REQUEST TO SEND	-->
5	CLEAR TO SEND	<--
6	DATA SET READY	<--
7	SIGNAL GROUND	---
8	CARRIER	<--
15	TRANSMIT CLOCK	<--
17	RECEIVE CLOCK	<--
20	DATA TERMINAL READY	-->

All signals are straight through to modem.

E.4 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.

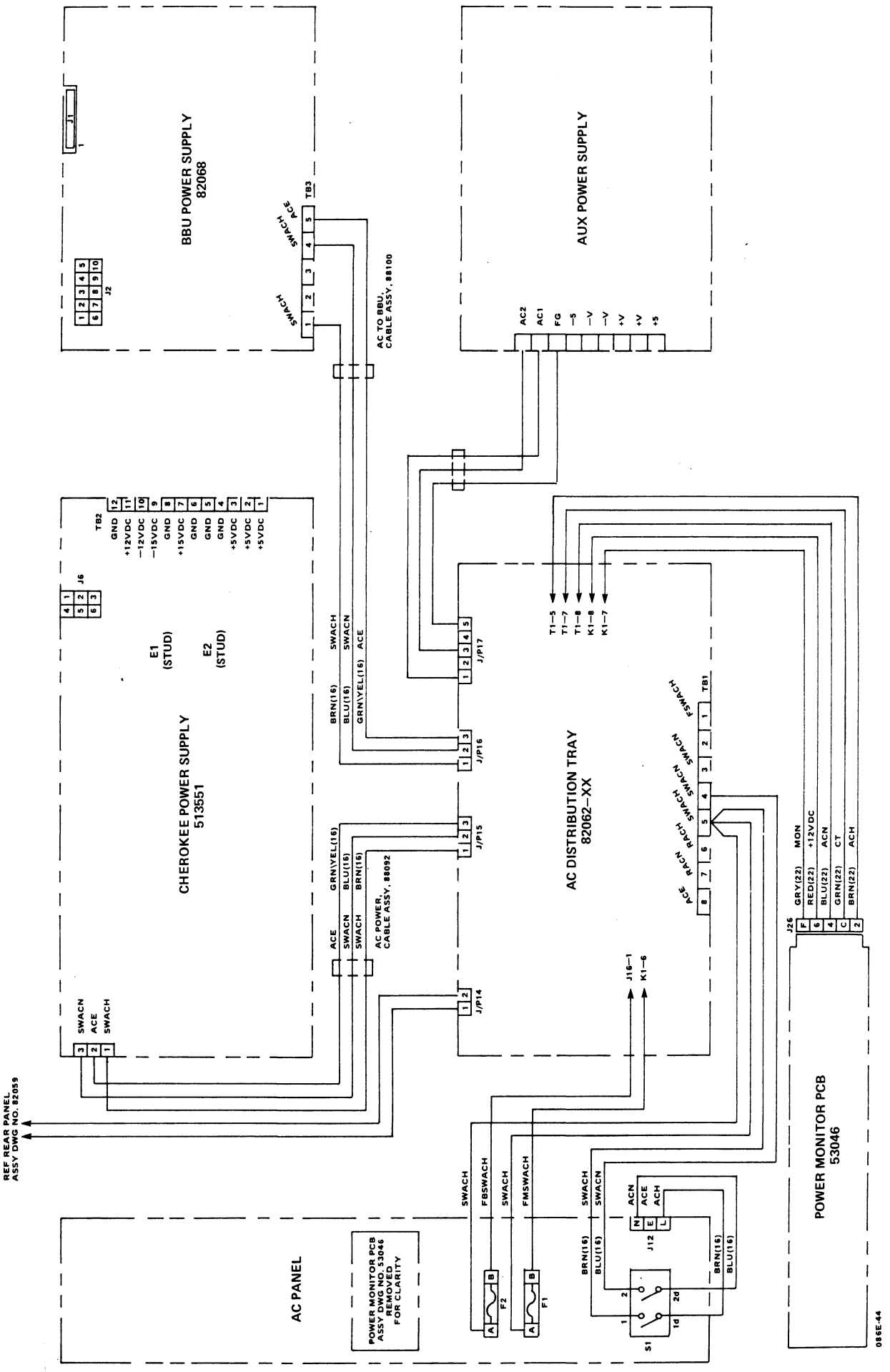
To make cables, POINT 4 suggests that a quality crimping tool be used. Such crimping tools are available from distributors of telephone wiring equipment and connectors. Although more expensive (about $150.00), a good crimping tool will make good crimps every time and will outlast many others.

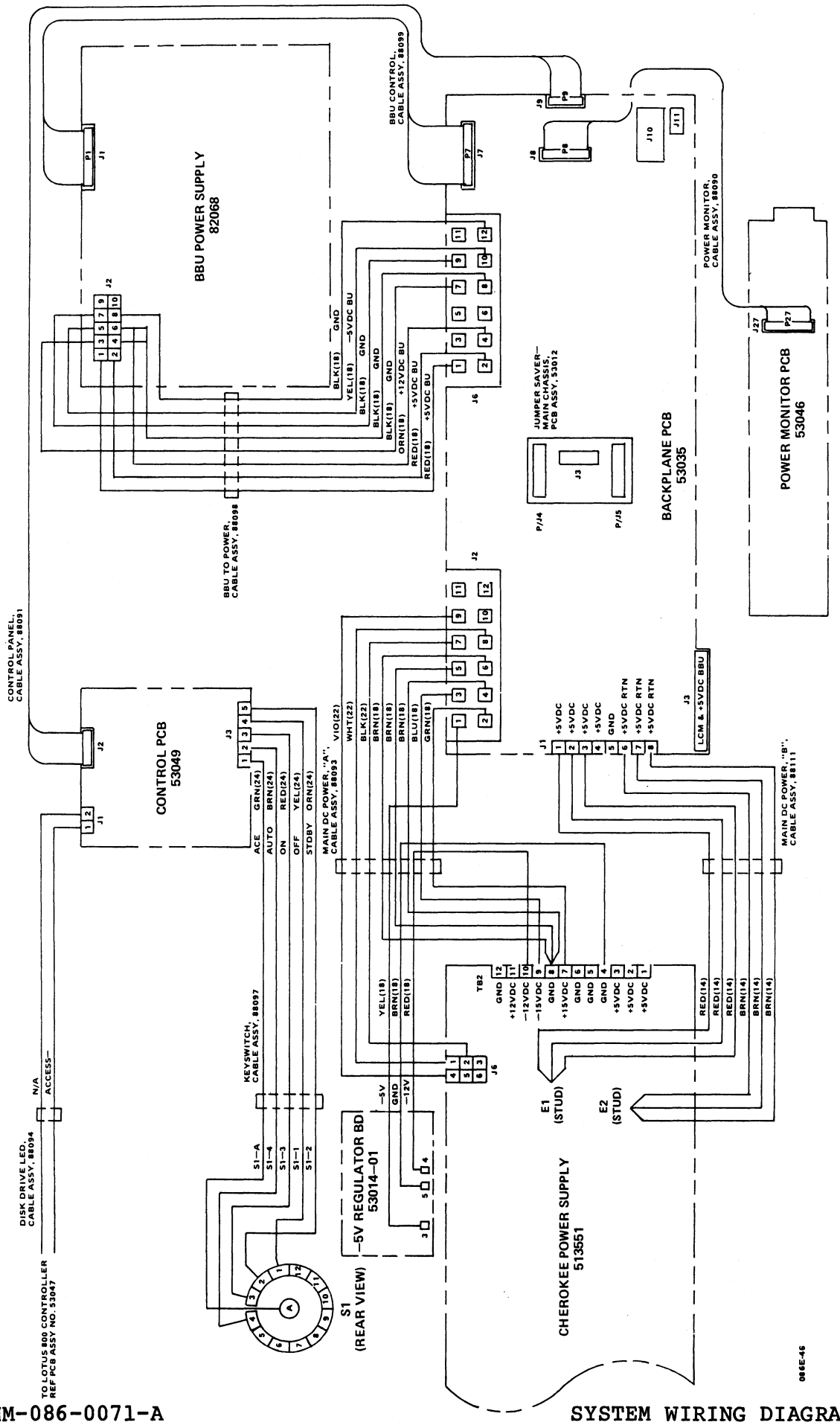
Appendix F
SYSTEM WIRING DIAGRAMS

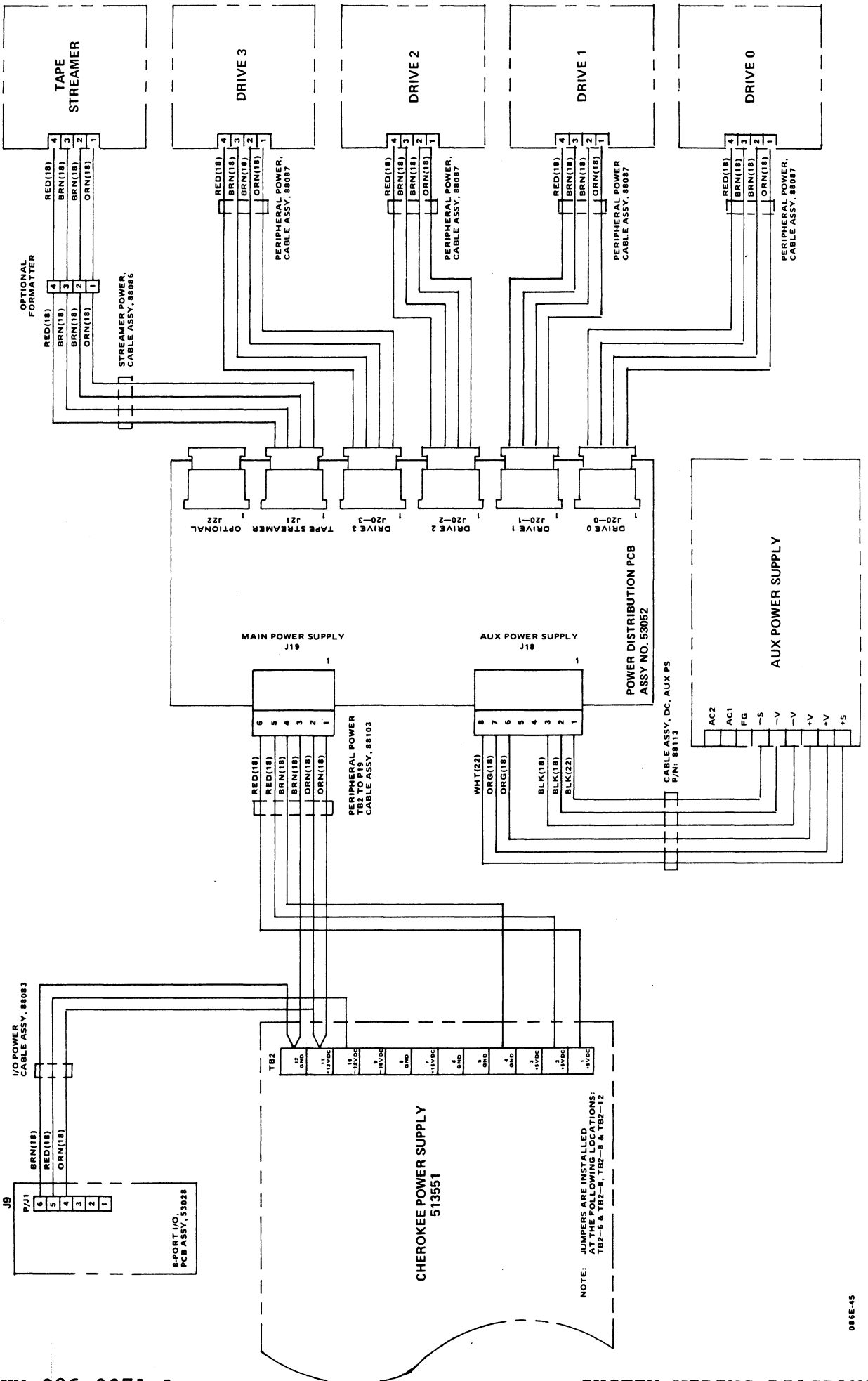
This appendix contains the following system wiring diagrams for the MARK 6E/12E:

AC Wiring

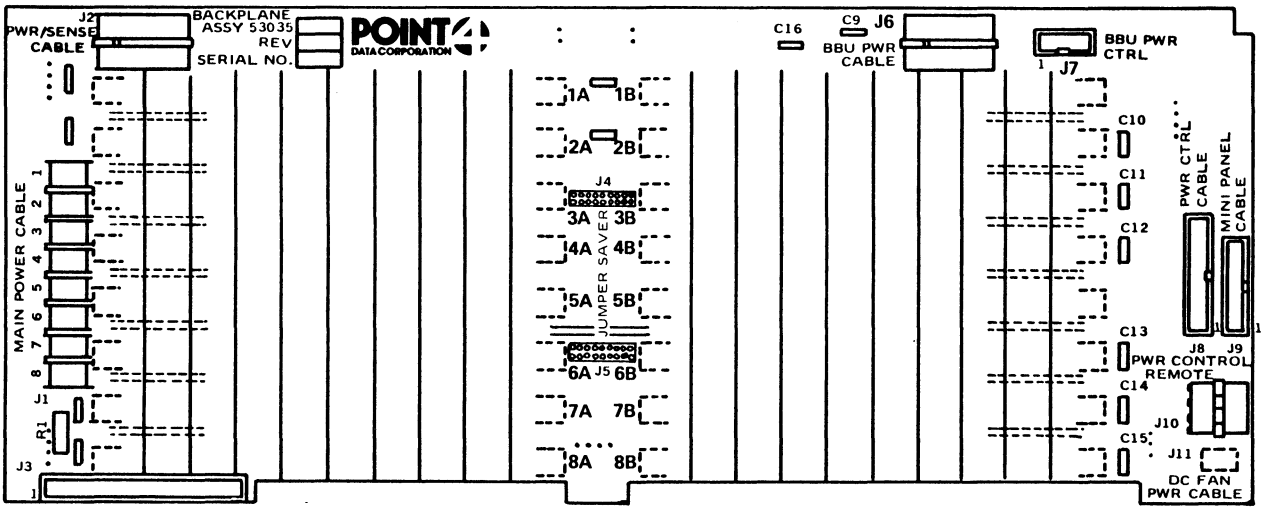
DC Wiring


BBU POWER SUPPLY
82068
AUX POWER SUPPLY
CHEROKEE POWER SUPPLY
513551
AC DISTRIBUTION TRAY
82062–XX
AC PANEL
POWER MONITOR PCB
53046
AC TO BBU CABLE ASSY, 88100
AC POWER CABLE ASSY, 88092
REF REAR PANEL ASSY DWG NO. 82059
POWER MONITOR PCB ASSY DWG NO 53046 REMOVED FOR CLARITY
E1 (STUD)
E2 (STUD)
SWACN
ACE
SWACH
FBSWACH
FMSWACH
ACN
ACH
086E-44


BBU POWER SUPPLY
82068
BBU CONTROL CABLE ASSY, 88099
POWER MONITOR CABLE ASSY, 88090
POWER MONITOR PCB
53046
JUMPER SAVER— MAIN CHASSIS PCB ASSY, 53012
BACKPLANE PCB
53035
BBU TO POWER CABLE ASSY, 88098
CONTROL PANEL CABLE ASSY, 88091
CONTROL PCB
53049
MAIN DC POWER, "A" CABLE ASSY, 88093
MAIN DC POWER, "B" CABLE ASSY, 88111
KEYSWITCH CABLE ASSY, 88097
DISK DRIVE LED CABLE ASSY, 88094
TO LOTUS 800 CONTROLLER REF PCB ASSY NO. 53047
-5V REGULATOR BD
53014-01
CHEROKEE POWER SUPPLY
513551
S1
(REAR VIEW)
E1
(STUD)
E2
(STUD)
LCM & +5VDC BBU
ACCESS—
N/A
ACE
AUTO
ON
OFF
STDBY
GRN(24)
BRN(24)
RED(24)
YEL(24)
ORN(24)
WHT(22)
VIO(22)
BLK(22)
BRN(18)
BLU(18)
GRN(18)
YEL(18)
ORN(18)
RED(18)
BLK(18)
GND
-5VDC BU
+12VDC BU
+5VDC BU
+5VDC
+5VDC RTN
-5V
-12V
+15VDC
-15VDC
+12VDC
-12VDC
RED(14)
BRN(14)
086E-46


TAPE STREAMER
DRIVE 3
DRIVE 2
DRIVE 1
DRIVE 0
OPTIONAL FORMATTER
STREAMER POWER, CABLE ASSY, 88086
PERIPHERAL POWER, CABLE ASSY, 88087
PERIPHERAL POWER CABLE ASSY, 88087
RED(18)
BRN(18)
ORN(18)
OPTIONAL J22
TAPE STREAMER J21
DRIVE 3 J20-3
DRIVE 2 J20-2
DRIVE 1 J20-1
DRIVE 0 J20-0
POWER DISTRIBUTION PCB ASSY NO. 53052
MAIN POWER SUPPLY J19
AUX POWER SUPPLY J18
AUX POWER SUPPLY
AC2
AC1
FG
-S
-V
-V
+V
+V
+S
PERIPHERAL POWER TB2 TO P19 CABLE ASSY, 88103
CABLE ASSY, DC, AUX PS P/N: 88113
WHT(22)
ORG(18)
BLK(18)
BLK(22)
I/O POWER CABLE ASSY, 88083
J9
P/J1
8-PORT I/O PCB ASSY, 53028
TB2
CHEROKEE POWER SUPPLY 513551
NOTE: JUMPERS ARE INSTALLED AT THE FOLLOWING LOCATIONS: TB2-6 & TB2-8, TB2-8 & TB2-12
086E-45

Appendix G
BACKPLANE PIN ASSIGNMENTS



BACKPLANE ASSEMBLY

CPU ONLY

1A				1B			
TOP		BOTTOM		TOP		BOTTOM	
PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
1	GND	2	GND	1	GND	2	GND
3	+5V	4	+5V	3	+5V	4	+5V
5	+5BU	6	-5V	5	V31-	6	
7	PWRGON-	8	V0-	7	VB1-	8	WRITE-
9	-5BU	10	+15V	9	LWORD-	10	VB2-
11	PWRF-	12		11		12	AS-
13	V2-	14	V3-	13		14	DS-
15	V4-	16	V5-	15		16	VB3-
17	V6-	18	V7-	17	DCHM0-	18	SYSCLK-
19	V8-	20	V9-	19		20	VB4-
21	V10-	22	V11-	21		22	VB5-
23	V12-	24	V13-	23		24	VB6-
25	V14-	26	V15-	25		26	BBUSY-
27	V16-	28	V17-	27		28	BERR-
29	V18-	30	V19-	29	INTR-	30	BERC-
31	V20-	32	V1-	31		32	DTACK-
33	GND	34	GND	33	DCH0+	34	
35	V21-	36	V22-	35	DCHR-	36	
37	V23-	38	MSK0-	37	DCHI+	38	
39	V24-	40	INTA+	39		40	
41	V25-	42	DATIB+	41	RQENB-	42	BACKUP+
43	V26-	44	DATIA+	43	+5BU	44	+5BU
45	V27-	46	DS3-	45		46	+15V
47		48	DATOC+	47		48	
49		50	CLR+	49		50	GND
51	V28-	52	STRT+	51		52	
53	V29-	54	DATIC+	53		54	
55	V30-	56	DATOB+	55	DATA7-	56	DATA14-
57		58	DATOA+	57	DATA5-	58	DATA11-
59		60	DCHA-	59	DATA12-	60	DATA8-
61		62	DS4-	61	DATA4-	62	DATA0-
63		64	DS5-	63	DATA9-	64	DATA13-
65		66	DS2-	65	DATA1-	66	DATA15-
67		68	DS1-	67		68	
69		70	IORST+	69		70	
71		72	DS0-	71		72	
73		74	IOPLS+	73	DATA3-	74	
75		76		75	DATA10-	76	
77		78		77		78	
79		80	SELD-	79		80	
81		82	SELB-	81	-5V	82	DATA2-
83		84	PEL-	83		84	+15V
85		86	RUNL-	85		86	
87		88	CL-	87		88	
89		90	CNT-	89		90	
91		92	STP-	91	-15V	92	GND
93		94		93	-15V	94	+12BU
95		96		95	DATA6-	96	+5BU
97	+5V	98	+5V	97	+5V	98	+5V
99	GND	100	GND	99	GND	100	GND

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MEMORY / I/O

2A				2B			
TOP		BOTTOM		TOP		BOTTOM	
PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
1	GND	2	GND	1	GND	2	GND
3	+5V	4	+5V	3	+5V	4	+5V
5	+5BU	6	-5V	5	V31-	6	
7	PWRGON-	8	V0-	7	VB1-	8	WRITE-
9		10	+15V	9	LWORD-	10	VB2-
11	PWRF-	12		11		12	AS-
13	V2-	14	V3-	13		14	DS-
15	V4-	16	V5-	15		16	VB3-
17	V6-	18	V7-	17	DCHM0-	18	SYSCLK-
19	V8-	20	V9-	19		20	VB4-
21	V10-	22	V11-	21		22	VB5-
23	V12-	24	V13-	23		24	VB6-
25	V14-	26	V15-	25		26	BBUSY-
27	V16-	28	V17-	27		28	BERR-
29	V18-	30	V19-	29	INTR2-	30	BERC-
31	V20-	32	V1-	31		32	DTACK-
33	GND	34	GND	33	DCH0+	34	
35	V21-	36	V22-	35	DCHR2-	36	
37	V23-	38	MSK0-	37	DCHI+	38	
39	V24-	40	INTA+	39		40	
41	V25-	42	DATIB+	41	RQENB-	42	BACKUP+
43	V26-	44	DATIA+	43	+5BU	44	+5BU
45	V27-	46	DS3-	45		46	+15V
47		48	DATOC+	47		48	
49		50	CLR+	49		50	GND
51	V28-	52	STRT+	51		52	
53	V29-	54	DATIC+	53		54	
55	V30-	56	DATOB+	55	DATA7-	56	DATA14-
57		58	DATOA+	57	DATA5-	58	DATA11-
59		60	DCHA-	59	DATA12-	60	DATA8-
61		62	DS4-	61	DATA4-	62	DATA0-
63		64	DS5-	63	DATA9-	64	DATA13-
65		66	DS2-	65	DATA1-	66	DATA15-
67		68	DS1-	67		68	
69		70	IORST+	69		70	
71		72	DS0-	71		72	
73		74	IOPLS+	73	DATA3-	74	
75		76		75	DATA10-	76	
77		78		77		78	
79		80	SELD-	79		80	
81		82	SELB-	81	-5V	82	DATA2-
83		84		83		84	+15V
85		86		85		86	
87		88		87		88	
89		90		89		90	
91		92		91	-15V	92	GND
93		94	DCHPIN2-	93	-15V	94	
95		96	INTPIN2-	95	DATA6-	96	+5BU
97	+5V	98	+5V	97	+5V	98	+5V
99	GND	100	GND	99	GND	100	GND

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I/O ONLY

6A				6B			
TOP		BOTTOM		TOP		BOTTOM	
PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
1	GND	2	GND	1	GND	2	GND
3	+5V	4	+5V	3	+5V	4	+5V
5		6	-5V	5		6	
7		8		7		8	
9		10	+15V	9		10	
11		12		11		12	
13		14		13		14	
15		16		15		16	
17		18		17	DCHM0-	18	
19		20		19		20	
21		22		21		22	
23		24		23		24	
25		26		25		26	
27		28		27		28	
29		30		29	INTR6-	30	
31		32		31		32	
33	GND	34	GND	33	DCH0+	34	
35		36		35	DCHR6-	36	
37		38	MSK0-	37	DCHI+	38	
39		40	INTA+	39		40	
41		42	DATIB+	41	RQENB-	42	
43		44	DATIA+	43		44	
45		46	DS3-	45		46	+15V
47		48	DATOC+	47		48	
49		50	CLR+	49		50	GND
51		52	STRT+	51		52	
53		54	DATIC+	53		54	
55		56	DATOB+	55	DATA7-	56	DATA14-
57		58	DATOA+	57	DATA5-	58	DATA11-
59		60	DCHA-	59	DATA12-	60	DATA8-
61		62	DS4-	61	DATA4-	62	DATA0-
63		64	DS5-	63	DATA9-	64	DATA13-
65		66	DS2-	65	DATA1-	66	DATA15-
67		68	DS1-	67		68	
69		70	IORST+	69		70	
71		72	DS0-	71		72	
73		74	IOPLS+	73	DATA3-	74	
75		76		75	DATA10-	76	
77		78		77		78	
79		80	SELD-	79		80	
81		82	SELB-	81	-5V	82	DATA2-
83		84		83		84	+15V
85		86		85		86	
87		88		87		88	
89		90		89		90	
91		92		91	-15V	92	GND
93		94	DCHPIN6-	93	-15V	94	
95		96	INTPIN6-	95	DATA6-	96	
97	+5V	98	+5V	97	+5V	98	+5V
99	GND	100	GND	99	GND	100	GND

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MAIN POWER CABLE

J1	
PIN	SIGNAL
1	+5V
2	+5V
3	+5V
4	+5V
5	GND
6	GND
7	GND
8	GND

PWR/SENSE CABLE

J2	
PIN	SIGNAL
1	-5V
2	+15V
3	-15V
4	GND
5	GND
6	GND
7	GND
8	+5V
9	PFAIL-
10	
11	PWREN+
12	+12V

LCM +5BU PWR CABLE

J3	
PIN	SIGNAL
1	GND
2	GND
3	+5BU
4	+5BU
5	GND
6	GND
7	+5BU
8	+5BU
9	GND
10	GND
11	+5BU
12	+5BU
13	GND
14	GND
15	+5BU
16	+5BU
17	GND
18	GND
19	+5BU
20	+5BU
21	GND
22	GND
23	
24	
25	
26	
27	
28	
29	GND
30	GND
31	+5BU
32	+5BU
33	GND
34	GND
35	+5BU
36	+5BU
37	GND
38	GND
39	+5BU
40	+5BU
41	GND
42	GND
43	+5BU
44	+5BU
45	GND
46	GND
47	+5BU
48	+5BU
49	GND
50	GND

NORMALLY NOT USED WITH MARK 6/12 CPU

JUMPER SAVER

J4	
PIN	SIGNAL
1	DCHR-
2	DCHR5-
3	DCHR4-
4	DCHR3-
5	DCHR2-
6	DCHR6-
7	DCHR7-
8	DCHR8-
9	+5V
10	GND
11	
12	DCHPIN6-
13	DCHPIN7-
14	DCHPIN8-
15	DCHPIN2-
16	DCHPIN3-
17	DCHPIN4-
18	DCHPIN5-

JUMPER SAVER

J5	
PIN	SIGNAL
1	INTR-
2	INTR5-
3	INTR4-
4	INTR3-
5	INTR2-
6	INTR6-
7	INTR7-
8	INTR8-
9	+5V
10	GND
11	
12	INTPIN6-
13	INTPIN7-
14	INTPIN8-
15	INTPIN2-
16	INTPIN3-
17	INTPIN4-
18	INTPIN5-

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BBU POWER CABLE

J6	
PIN	SIGNAL
1	+5BU
2	+5BU
3	+5V
4	+12BU
5	+12V
6	BACKUP+
7	GND
8	GND
9	GND
10	-5BU
11	-5V
12	GND

BBU POWER CONTROL

J7	
PIN	SIGNAL
1	BTRYOK-
2	PFBBU-
3	
4	PWREN+
5	GND
6	GND
7	BTROFF-
8	SPARE1
9	+5BU
10	GND

PWR CONTROL CABLE

J8	
PIN	SIGNAL
1	GND
2	GND
3	+5BU
4	+12BU
5	PWREN+
6	+15V
7	+5AUX
8	-5V
9	PFAUX-
10	-15V
11	GND
12	BACKUP+
13	GND
14	PWRF-
15	PWRGON-
16	-5BU
17	+5V
18	ACON+
19	PWRL-
20	PFBBU-
21	+5V
22	PFAIL-
23	+5MPL
24	+5MPL
25	GND
26	GND

MINI PANEL CABLE

J9	
PIN	SIGNAL
1	+5MPL
2	RUNL-
3	PWREN+
4	PEL-
5	+5MPL
6	CNT-
7	+5BU
8	CL-
9	+5BU
10	STP-
11	GND
12	BTRYOK-
13	GND
14	PWRGON-
15	GND
16	SPARE1
17	GND
18	PWRL-
19	ACON+
20	BTROFF-

PWR CONTROL REMOTE

J10	
PIN	SIGNAL
1	PWREN+
2	SPARE1
3	GND
4	BTROFF-
5	+5AUX
6	PFAUX-

FAN CABLE

J11	
PIN	SIGNAL
1	GND
2	+15V

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Appendix H
GLOSSARY

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

Address - a label, name or number identifying a register, unit or location where information is stored.

APL (Automatic Program Load) - a button on the mini-panel of the card chassis that when pressed loads the MANIP program into the top 1000 (octal) words of memory.

Backplane assembly - the underside of the card cage where signals are connected from board to board.

Backup - the process of copying part or all the information on a disk onto another disk or tape. The information copied can include the operating system, configuration, application programs and all data that has been entered on the system.

Battery backup - a MARK 6E/12E option that backs up power to the extended memory in the event of a power failure.

Baud rate - the rate at which one device communicates with another device.

Bit - a binary digit.

Board - a printed circuit board that holds capacitors, diodes, resistors, transistors and other elements of electrical circuits.

Byte - a unit of eight binary digits; eight bits.

Card cage - the eight-slot section of the chassis that holds the printed circuit boards of the system. It also includes a backplane assembly on the underside.

CPU (Central Processing Unit) - the principal unit of the computer that controls the processing routines, performs arithmetic functions and stores directly-accessible memory.

CPU Self-Test - consists of two tests that check the functioning of the MARK 6E/12E: the firmware self-test routine and the CPU software self-test.

CPU software self-test - the part of the CPU Self-Test that verifies that CPU software is functioning.

CPU status word - a 16-bit word whose individual bits indicate status or control various functions. Some are manipulated by software, all by hardware.

Data channel - a 16-bit bi-directional information path between the CPU memory and input/output devices.

Default - a parameter to which the system reverts if another customized parameter is not substituted in its place, e.g., the default password for SHUTDOWN is X.

Device code - a code used to select individual controllers.

Diagnostic - a program or routine used to help locate a malfunction or problem in system hardware.

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

Disk - a storage device on which information is recorded on the magnetized surface of a rotating disk.

Disk controller - a printed circuit board that controls access and enables the exchange of information between disk and the computer's memory.

ESDI (Enhanced Small Disk Interface) - refers to the interface between a 5-1/4-inch hard disk drive and a controller.

EXERCISER - a software test that tests the ability of the disk controller or cache memory to do single-block transfers from formatted files and the ability of the memory buffer pool to maintain that information.

Expansion board - a printed circuit board associated with the multiplexer that increases the number of terminals and printers that can be connected to the system.

Extended memory - a printed circuit board that provides 2 or 4MB of expanded memory in addition to the 128KB on the CPU board.

Firmware self-test - a routine that verifies that hardware is functioning enough to communicate with a terminal. It is one part of the CPU Self-Test.

Formatting - a procedure that writes the headers of all sectors to disk, analyzes the headers and surfaces for errors, and records and chains hard errors to alternate sectors.

GB (gigabyte) - equal to 1000 megabytes.

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

Hardware - the physical components that make up the computer and its peripheral equipment.

Helical Scan Tape Subsystem - a digital data storage device that provides high density and large storage capacity by writing very narrow tracks at an acute angle on 8mm tape.

Hz (Hertz) - a unit of frequency equal to one cycle per second.

Integrated system - a fully assembled MARK 6E/12E system housed in a cabinet and including an extended IRIS license.

In tolerance - within an acceptable limit of a required value.

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

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

KB (kilobyte) - equal to 1024 bytes.

LEDs (Light-emitting diodes) - light indicators on the power monitor board, the mini-panel and several printed circuit boards that monitor computer operations.

Logical Unit (LU) - designation used to refer to software on a disk or memory-based partition.

MANIP - a stand-alone program that enables the user to "manipulate" the computer's registers and memory; that is, memory contents can be displayed, modified, searched, moved, checksummed, etc. MANIP is also used to run the CPU software self-test, and to load and run a program from disk.

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

MB (megabyte) - equal to 1,048,576 bytes.

Mini-switches - the two groups of red and white switches on the top edge of the CPU board. Their setting determines the manner in which an IPL is performed and/or the manner of access to the CPU software self-test. In troubleshooting, they can also be used to read any location in memory.

Multiplexer, MIGHTY MUX - a printed circuit board that manages information transfer between the computer memory and video display and printer terminals.

Onboard memory - also known as main memory. Refers to the 128KB memory stored on the CPU board, which is directly accessible.

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

Pico-N - a 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 nontransferrable license with each paid IRIS license and remains the property of POINT 4.

Port - interactive input/output channel on the IRIS system.

Port 0 - the first port on a MUX 310 board.

Power monitor board - a board, located on the left side of the power supply, that contains eight light indicators (LEDs) that monitor power supply and battery backup voltages.

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

RETMA (Radio Electronics-Television Manufacturer's Association) - now the EIA (Electronics Industries Association). Represents an industry-accepted standard.

SCSI (Small Computer Systems Interface) - refers to the interface between the 8mm helical scan tape drive and the tape controller.

SHUTDOWN - a system command used to shut down the system.

SMD (Storage Module Drive) - a type of hard disk.

Streamer tape drive - a tape drive that inputs/outputs a large quantity of information faster than other tape drives because it does not stop while transferring information.

SWAPTEST - an IRIS program that tests the interaction and the reliability of the IRIS Operating System.

Tape cartridge - a cartridge containing magnetic tape used to store programs and information.

TTL - transistor-transistor logic.

Voltage regulator - a circuit that holds an output voltage at a predetermined value or causes it to vary according to a predetermined plan, regardless of normal input-voltage changes.

Word - 16 bits or two bytes.

Write-protect - a mechanism on a tape cartridge that can be set to prevent the tape from being written on.

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COMMENT SHEET

MANUAL TITLE: MARK 6E/12E System Installation and Maintenance Manual

PUBLICATION NO. HM-086-0071 REVISION A

FROM: NAME/COMPANY: _____

BUSINESS ADDRESS: _____

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