PLEXUS

# P/90 Maintenance Manual

98-40287.1 Ver C February, 1988

# P/90 Maintenance Manual

98-40287.1 Ver C February, 1988

PLEXUS COMPUTERS, INC.

3833 North First Street

San Jose, CA 95134

408/943-9433

Printed in the United States of America

# PREFACE

## Introduction

This P/90 Maintenance Manual (98-40287.1) describes the Plexus® P/90 computer system, a 32 bit supermicrocomputer system employing the UNIX † operating system. This manual is designed and written for system administrators, system integrators, and technicians who work on the P/90 computer system. As such, it provides both general and specific who work on the system.

Within this manual the following conventions apply:

1. Bold text (i.e. **A23** must be LOW), indicates a signal name, or user input (i.e. **<cr>**).
2. Signal names with an asterisk (i.e. **SELPROM*** must be LOW) indicates an active LOW signal line.
3. **<cr>** indicates a carriage return.
4. Component locations are in all capitals (i.e. U10A, U21B).

## Manual Layout

Your *Plexus P/90 Maintenance Manual* is divided into five chapters.

*Chapter One, Introduction*, introduces the P/90 . Topics covered are general description, specifications (U.S. and overseas), environmental specifications, functional configuration, and physical configuration.

*Chapter Two, Preventive Maintenance*, details procedures to properly maintain your system and keep it at peak performance.

*Chapter Three, Assembly/Disassembly Procedures*, describes the correct procedures to dismantle and reassemble the major components in your system.

*Chapter Four, Reference Information*, lists cable connections, switch setting, power supply adjustments, etc.

*Chapter Five, Board Descriptions*, lists the individual boards that make-up the P/90. The board descriptions include card cage slot locations, switch and jumper settings, and safety procedures for board removal.

---

® Plexus is a registered trademark of Plexus Computers, Inc.

† UNIX is a trademark of ATT.

## References

[1] Sys5 Administrator's Handbook (98-05133.x)

The telephone number that Plexus customers should use for all related software and/or hardware problems is: 1-800-553-PLEX.

## Revision Record

| | |
|---|---|
| 98-40287.1 Ver. A | The initial release of this document. |
| 98-40287.1 Ver. B | Power ratings and input current values are updated. Memory board error decode information is included. 300 Megabyte disk drive jumper settings are also included. |
| 98-40287.1 Ver. C | Maintenance information for the expansion cabinet is integrated into the manual. |

## TABLE OF CONTENTS

## List of Figures

## List of Tables

# INTRODUCTION

This chapter describes your P/90 computer system. A system overview introduces the major components of your computer. The remaining sections describe the power, space, and environmental considerations required for your system.

## System Overview

The P/90 is a powerful super-microcomputer system that can support up to 32 users with as much as 16 Megabytes of memory. Up to two expansion cabinets (each containing up to ten 5.25-inch media storage peripherals) can be supported by the main cabinet. Figures 1-1 and 1-2 illustrate the front and rear views, respectively, of your P/90 computer system (as it would appear with one expansion cabinet).

The equipment options of your P/90 Main Cabinet include:

- a Motorola† 68020 microprocessor based job processor board,
- up to 16 Megabytes of DRAM main memory,
- intelligent I/O processor boards,
- an eight slot industry-standard VMEbus backplane,
- SCSI host adapter boards, and
- up to four 5.25-inch peripherals including:
  - — ¼-inch 60 Megabyte cartridge tape drive,
  - — 135 Megabyte disk drive,
  - — 300 Megabyte disk drive,

† Motorola is a trademark of Motorola.

Your P/90 Expansion Cabinet can contain up to ten 5.25-inch drives (eight of the ten drives must be Winchester disk drives). Peripheral options for your expansion cabinet include:

- ¼-inch 60 Megabyte cartridge tape drive,
- 135 Megabyte disk drive,
- 300 Megabyte disk drive,
- 1.2 Megabyte floppy disk drive,
- SCSI peripheral controller(s), and
- disk drive power supply(s).

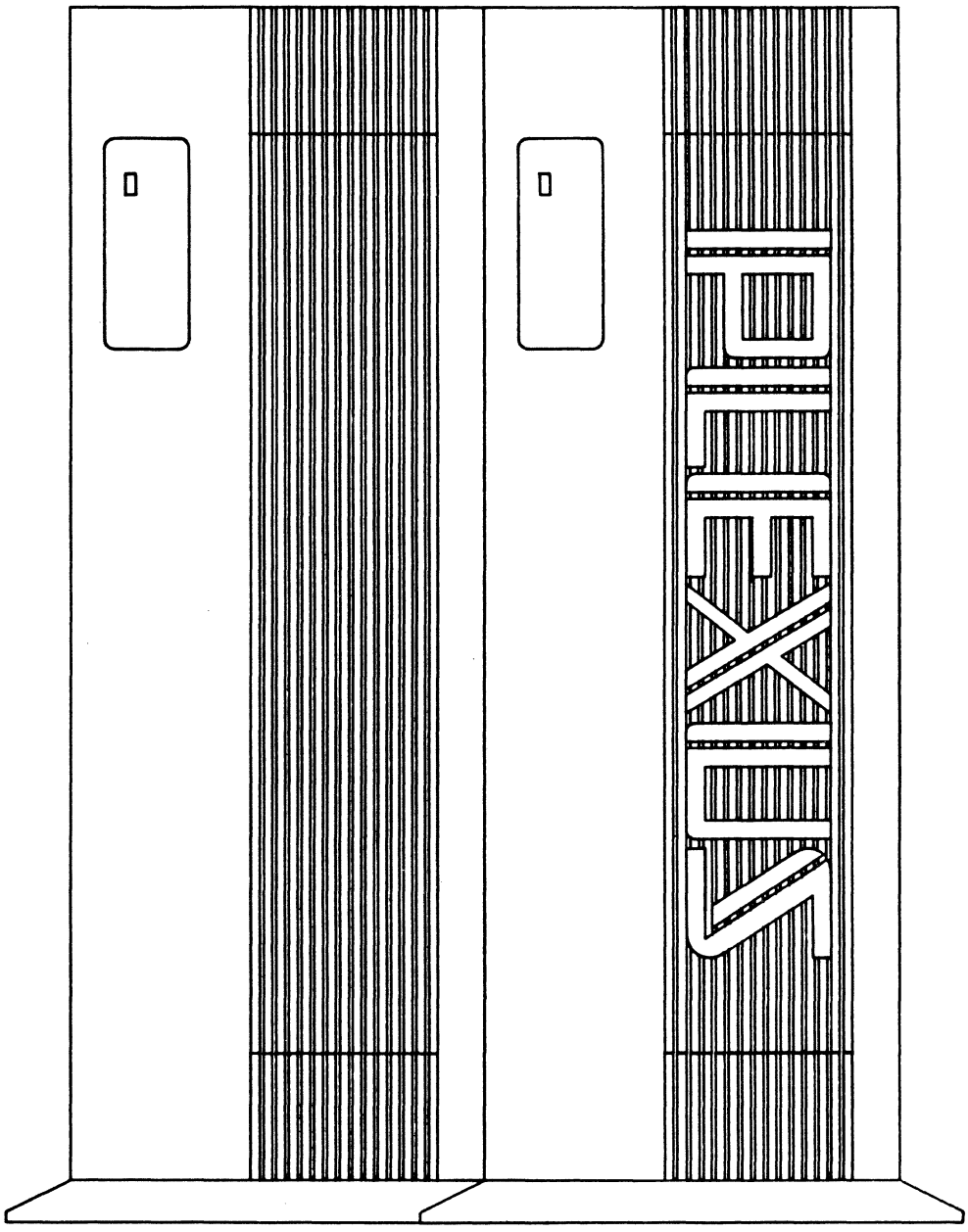


**Figure 1-1.** P/90 System, Front View

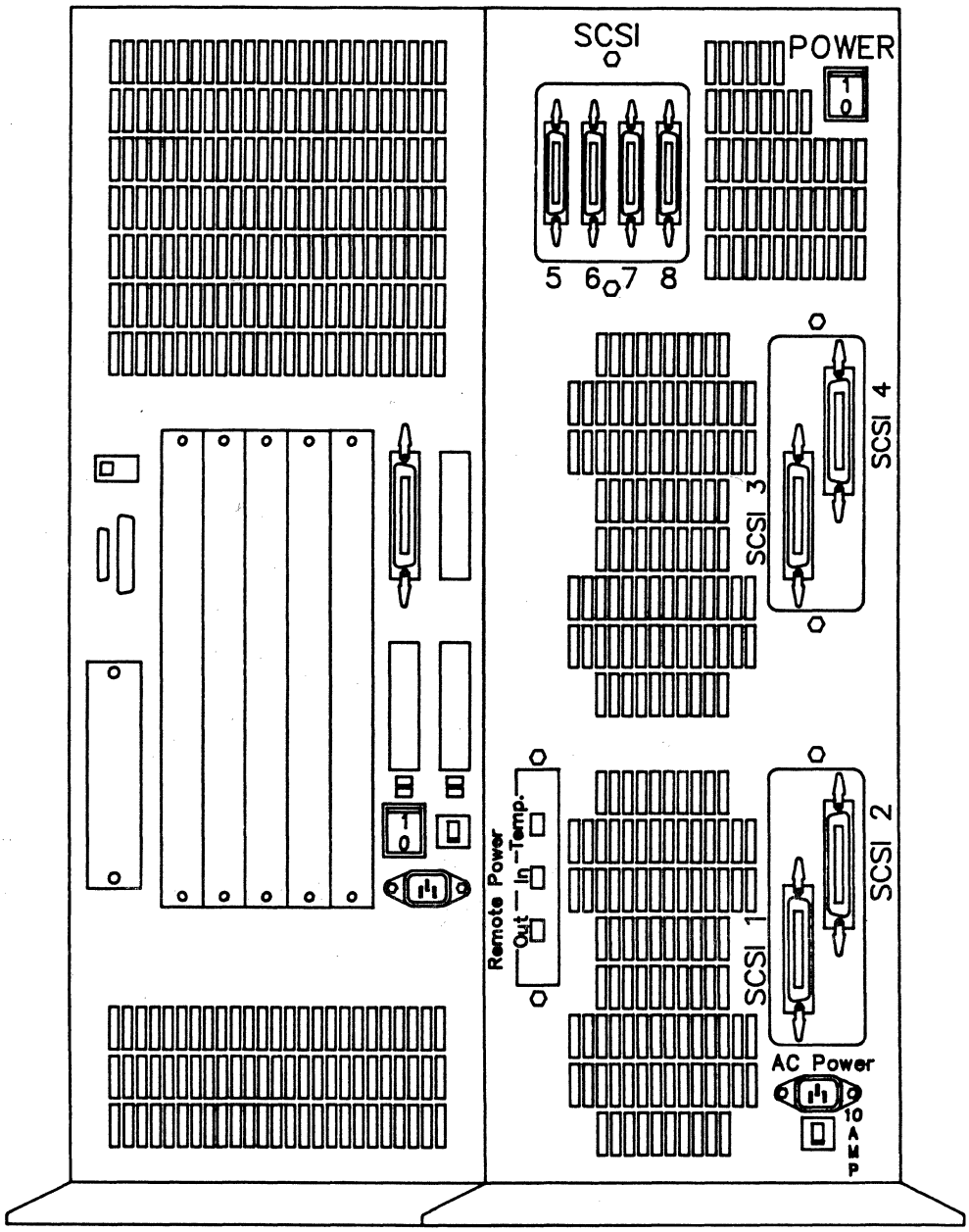



**Figure 1-2.** P/90 System, Rear View

## Backplane Configuration

The memory board, job processor board, and bus arbiter board occupy the first three slots of the card cage (see Table 1-1). A single VMEbus communication processor board (VCP) fills slot four or five depending on whether a modem is installed on the bus arbiter board. Slots five through eight are reserved for the Ethernet †, DDN/SNA, and/or host adapter boards, with host adapter board 0 in slot eight, host adapter board 1 in slot seven, host adapter board 2 in slot six, etc. The remaining slot(s) five and/or six can be filled with either the fourth host adapter board (3), the Ethernet board, or a network protocol board (DDN/SNA).

**[ WARNING ]** Board placement in the P/90 is very important. Slots four through eight require the installation of either a board or a jumper module.

**Table 1-1.** P/90 Card Cage Slot Assignments

| Slot # | Board |
|---|---|
| 8 | Host Adapter 0 |
| 7 | Host Adapter 1 |
| 6 | Host Adapter 2, Ethernet, or DDN/SNA |
| 5 | VCP, Host Adapter 3, Ethernet, or DDN/SNA |
| 4 | no board or VCP (see NOTE below) |
| 3 | Arbiter |
| 2 | 68020 CPU |
| 1 | Memory |

**[ NOTE ]** Systems without modems installed on the arbiter board can have the VCP installed in slot four.

## The Host Adapter Board

The host adapter board is the system interface to your system's peripherals (hard disk drives, tape drives, etc.). Each host adapter can support two hard disk drives, and one each of the tape drives, optical disk drives, and floppy drives. Figure 1-3 illustrates the P/90 system internal interface.

† Ethernet is a registered trademark of Xerox Corporation

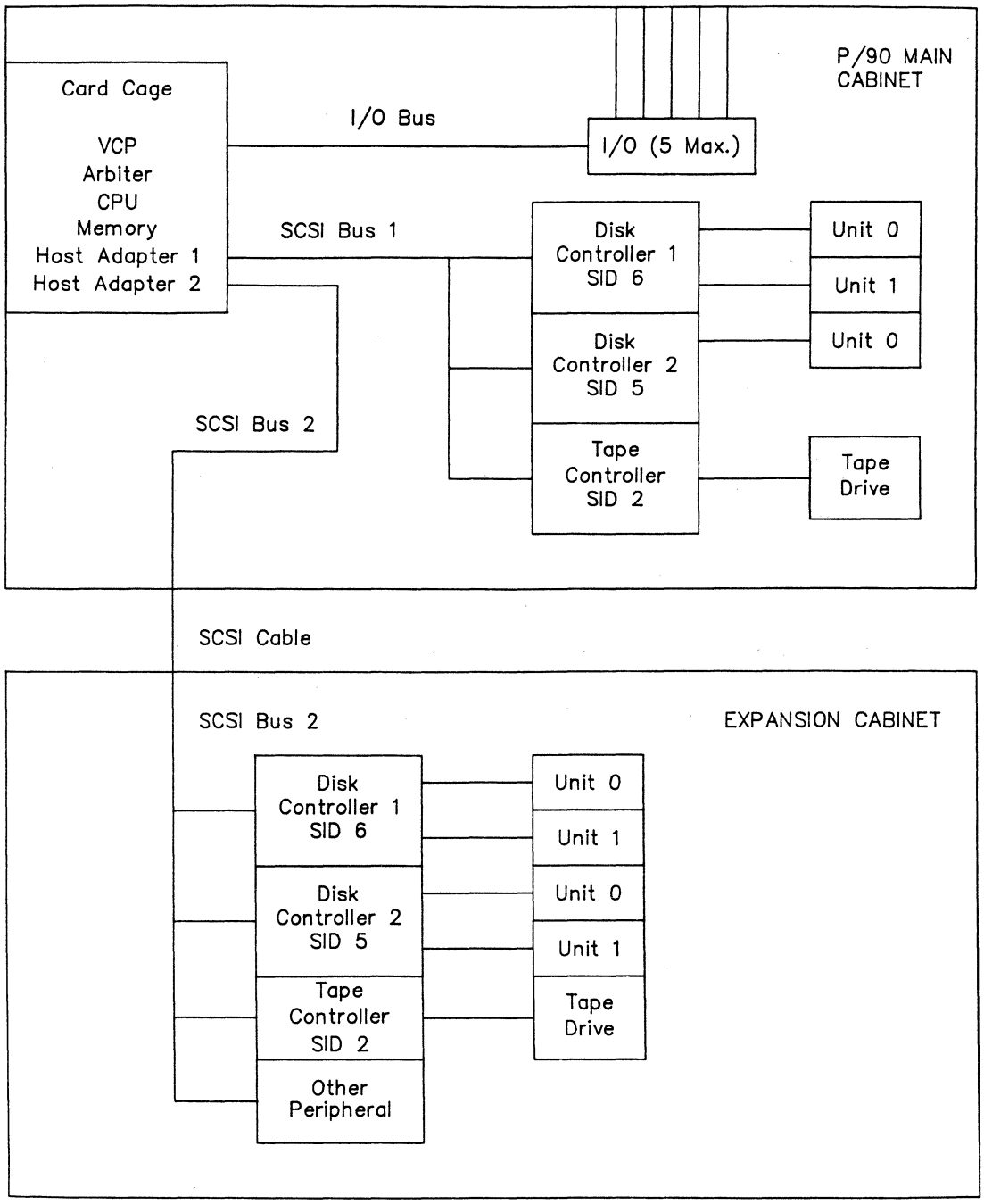



**Figure 1-3.** P/90 System Internal Interface

## Space Requirements

This section describes the overall dimensions of your system cabinet, the minimum floor area required to install and service your system and the area required to unpack it. The main cabinet and expansion cabinet have identical outside measurements and footprint.

### System Cabinet Dimensions and Weight

The outside measurements of your P/90 computer are given in Table 1-2.

**Table 1-2.** Dimensions and Weight

| Dimensions and Weight | | |
|---|---|---|
| Height | 29 in. | (73.6 cm) |
| Width | 9.95 in. | (25.3 cm) |
| Depth | 26.9 in. | (68.3 cm) |
| Weight-Main Cab. | 54 to 175 lb | (24.5 to 79 kg) |
| Weight-Exp. Cab.† | 85 to 175 lb | (38.6 to 79 kg) |

† one media tray with two disk drives

### Floor Area Requirements

From the dimensions in Table 1-2, the basic footprint of your P/90 cabinet (main or expansion) is 10 inches wide and 27 inches deep. Additional space around the cabinet(s) is required at the back, front, sides, and top of the cabinet(s) for servicing. Table 1-3 lists the service area requirements.

**Table 1-3.** Service Clearance

| Service Clearance | | |
|---|---|---|
| Front | 60 in. | (152 cm) |
| Back | 30 in. | (76 cm) |
| Sides | 24 in. | (61 cm) |
| Top | 24in. | (61 cm) |

Combining the dimensions from Table 1-2 and 1-3, we can compute the minimum area required to service and install your P/90 main cabinet. For each expansion cabinet, you must allow an additional 24 inches (61 cm) to the minimum width dimension.

**Table 1-4.** Minimum Area

| Minimum Required Area | | |
|---|---|---|
| Height | 53 in. | (135 cm) |
| Depth | 118 in. | (229 cm) |
| Width | 58 in. | (83 cm) |

# Power Requirements

This section describes the characteristics of the P/90 power requirements, the grounding of the unit, noise suppression, and types of power connectors required for proper installation and running.

## Voltage Characteristics

Your computer is equipped with one of six power options which are set at the factory. When you ordered your system, you or your salesman ordered the correct power option. The voltage options are listed in Table 1-5.

**Table 1-5.** Plexus Power Options

| | | |
|---|---|---|
| 115V | 49 — 61 hz | (± 15%) † |
| 230V | 49 — 61 hz | (± 15%) |

† Plexus default.

### Input Current Characteristics

The input current specifications for each P/90 cabinet is:

| | |
|---|---|
| Steady State | 9A @ 115V |
| | 4.5 @ 230V |
| Surge | 30A avg. |

**[ NOTE ]** Amperage figures are for the system only. All main and expansion cabinets require a separate 20-amp circuit breaker with a 20-amp grounded outlet.

## Grounding

Your P/90 is provided with a three-conductor power cord terminated in a three-conductor plug with the green safety ground wire connected to the metal frame of the system. This safety ground protects you and your personnel against malfunctions such as short circuits and also helps to protect the equipment against natural events, such as lightning strikes. For this protection to work properly, the power cord must be plugged into an outlet which employs a ground connection, which in turn, must be connected to the distribution panel where your system's circuit breaker is installed.

Grounding wires for the outlets used by the P/90 and its peripheral equipment must be connected to the same ground wire (separate from the neutral) at the distribution panel. The grounding wire should go from the distribution panel to an earth ground. The earth ground could be the structural steel of the building, a ground rod, a building entrance earth ground connection or the earth ground of an existing computer system.

**[ CAUTION ]** All grounding wires used for your P/90 must be insulated; conduit must not be used for grounding wires.

## Lightning Arrestors

If protection of power and communication lines are needed against lightning, it is recommended that an external line (suppressor) arrestor/filter be installed that is able to suppress a strike of 6KV to 440V on an average of 50usec., and that both common and transceiver suppressor absorption capability of 80 joules — 6500 Amp dissipation.

## Noise Suppression

Office equipment, janitorial equipment, electric motors, etc. can create electromagnetic interference (noise) sufficient to cause computer malfunctions. To eliminate the noise, or reduce it to an acceptable level, your computer and its peripherals must be provided with circuit breakers and grounding systems separate from those used by other electrical equipment. Grounding of the equipment and of the power distribution circuit must be as described in the section *Grounding*.

**[ NOTE ]** For severe line noise conditions, Plexus recommends the use of a line conditioner/filter or a UPS.

## Power Cords and Connectors

Many different types of power and power distribution systems are used throughout the world. Use one that is applicable to your local power system. The connector mounted on the rear panel of your computer is a standard 3-conductor connector.

**[ NOTE ]** Plexus only ships the standard U.S.A. power cord connector. All others must be installed by the user.

# Environmental Requirements

This section details the environmental requirements of your computer. Table 1-6 lists the temperature, humidity, and heat dissipation required for the proper operation of your system.

**Table 1-6.** Environmental Requirements

| Environmental Consideration | Environmental Requirement |
|---|---|
| Temperature (Operating) | 40 - 85F (4 - 30C) |
| Temperature (Non-Operating) | −40 - 140F (−40 - 40C) |
| Temperature (Gradient) | ±27 deg/hr max; ±15deg C/hr max. |
| Humidity (Operating) | 20 - 80% RH |
| Humidity (Non-Operating) | 5 - 89% RH (noncondensing) |
| Heat Dissipation | 930 watts (per cabinet) |
| Altitude (Operating) | 0 - 10,000 feet |
| Altitude (Non-Operating) | 0 - 40,000 feet |

## Temperature and Humidity Ranges

The acceptable, recommended, and unacceptable temperature and humidity ranges for the operation of your computer are shown in Figures 1-4 and 1-5, respectively.

If your system is moved from one environment to another (from one room to another), Plexus recommends that the equipment not be powered up until the system has had time to acclimate to the new environment. You should wait one hour for each 10° C (18° F) temperature difference before powering up your system.

Excessively high humidity levels can cause improper operation of disk units and of paper-handling peripherals such as printers, while excessively low humidity levels can increase static electricity problems.

## Electrostatic Discharges

In the course of walking, it is possible to accumulate large amounts of static electricity. If you discharge the static electricity around your computer, it can damage the equipment, cause errors in system operation, and damage the contents of software media such as floppy disks and magnetic tape. To prevent damage caused by static electricity, ground mats or wrist straps connected to earth ground must be used while working around your computer. These mats and straps are designed to dissipate a static charge.

**[ WARNING ]** Do not handle computer component or printed circuit boards unless you are properly grounded. Even the small electrostatic discharges which you cannot feel can damage components.

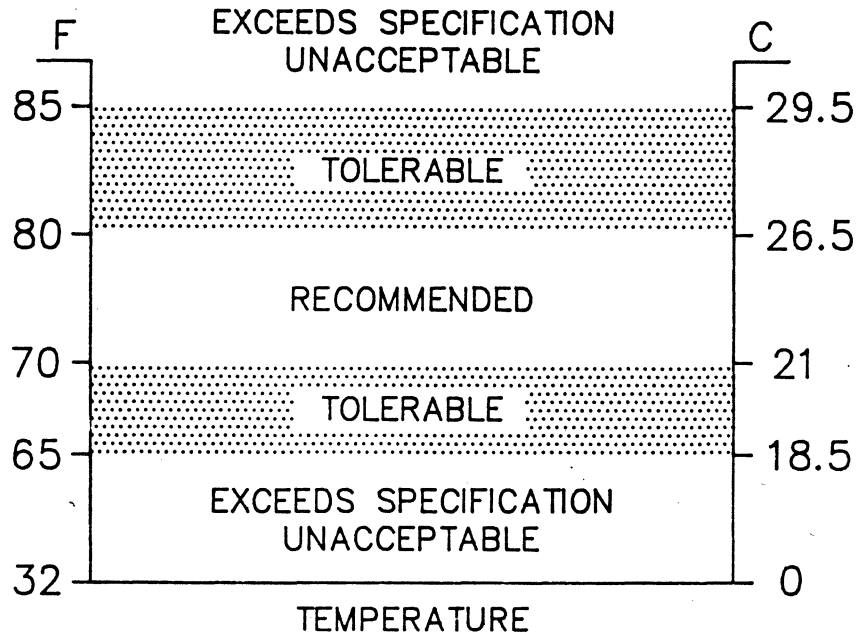



**Figure 1-4.** Temperature Range

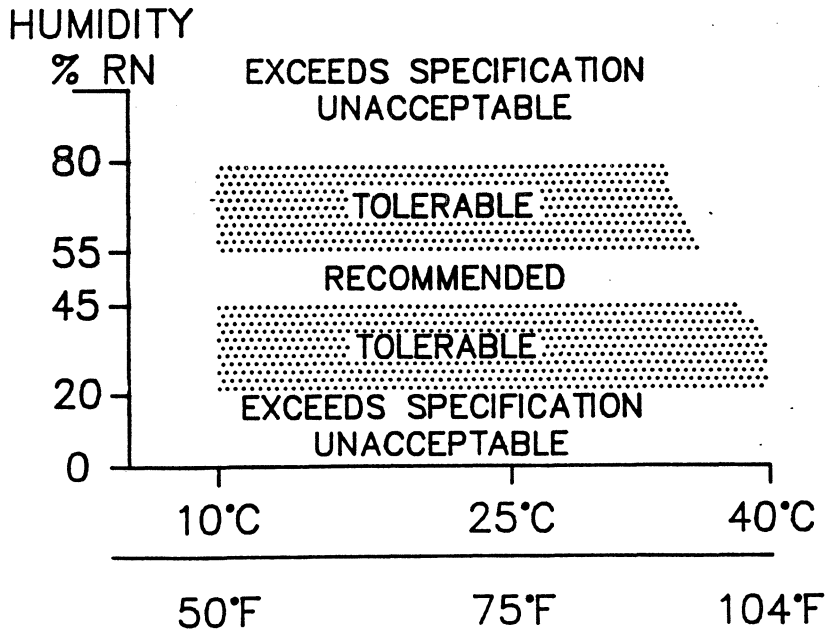



**Figure 1-5.** Humidity Range

## Cooling Requirements

Your computer system is equipped with cooling fans to circulate environmental (room air) air through the cabinet. The following equations are used to calculate the ability of an environment to maintain the proper operating temperatures.

Heat output in watts X *xxx* = Temperature rise

where the heat output in watts is the wattage of your system and *xxx* is a fixed value determined by the size of the room. Table 1-7 lists several sample values.

**Table 1-7.** Sample Fixed Values for Temperature Rises

| | **Fahrenheit** | **Celsius** |
|---|---|---|
| 10'x10'(3m x 3m) Room | 0.02 | 0.0112 |
| Large Room | $\simeq$ 0.00 | $\simeq$ 0.00 |

To determine the temperature of the room when the computer is running, add the temperature rise to the current room temperature.

For an example, consider the installation site of a computer to be a room ten foot by ten foot in size. The room is air conditioned to 76 degrees F (24 C) and is windowless. The formula used to calculate the rise in temperature caused by the installation of your computer is:

930 watts X 0.0112 = 10.4C + 24C = 34.4C (93.9F)

In this example, additional cooling is not required, but additional cooling might be desirable.

If your system is operated continuously, you must determine if the air conditioning is turned off or down during weekends or during off-work hours. If the operation of the air conditioning is varied, measurements must be taken during the down or off periods to ensure that the temperature range of the system is not exceeded. In order to prevent damage to the system when its operating range is exceeded, additional air conditioning must be provided or the system must be powered down during these down periods.

# Cabling

This section details the information and techniques needed to connect external equipment (cables) to your P/90 computer system.

## Cable Lengths

The RS-232C technical standard recommends cables no longer than 50 foot, however, Plexus has found that cables up to 200 feet in length are acceptable if a low-capacitance, shielded cable is used. Longer runs are possible but have a greater probability of noise on the line.

Two types of add-on equipment are available for use in extending cable runs: current loop adapters and short-haul modems. When using a current loop adapter at the terminal end of a cable, lengths up to 1000 feet are allowed. Most terminals have a current loop interface available on unused pins of the RS-232C connector.

If your terminals lack current loop capability, or if the run required is longer than 1000 feet, short-haul modems must be used. This configuration requires two modems to be used: one at the terminal and one at the computer. The use of short-haul modems allows cable runs of up to several miles with the only limiting factor being the capability of the modems themselves.

## General Considerations

To protect other equipment from noise radiation, an overall shield for the cable is required. If a shielded cable is used, the shield should be connected via a metallic connector hood to the I/O panel connector jackscrews, for maximum shielding effect. For terminal use, the shield should not be connected to any other pins on the RS-232C connector.

It is also recommended that cables not be run through electrically noisy areas, such as those areas containing large electric motors, welding apparatus, X-ray machines etc. Any wiring running outside of a building should be buried in conduit, not strung above ground. This provides protection against natural occurrences, such as lightning strikes that would damage the computer's communication board(s). Please note that such damage is not covered by the Plexus warranty. If lightning is a possibility at your installation site, it is highly recommended that fiber optic lines and modems be installed.

## Cable Termination

Peripheral equipment connected to your system must remain connected, even when the peripherals are not in use. If you disconnect a cable from a peripheral, you must also disconnect the cable from the the system's I/O panel. Any cable connected to the system I/O panel, and not connected to anything else, can pick up noise, and cause system malfunctions. Cables not properly terminated at the peripheral end can also pick up noise, severely affecting system operation.

## Cable Wiring

The number of wires (or pins) used in building cables depend on the application of the port being used (i.e. modem, terminal, DB-9, etc.). Tables 1-8 through 1-14 list the pinouts of the ports available for your P/90.

**Table 1-8.** Terminal/Serial Printer Cable Pinouts

| LINC Card (DB-9) | To I/O Device (DB-25) | Signal Name |
|---|---|---|
| 1 | 3 | RXD |
| 6 | 2 | TXD |
| 8 | 7 | GND |

**Table 1-9.** Synchronous Modem Cable Pinouts (DB-9)

| LINC Card (DB-9) | Modem (DB-25) | Signal Name |
|---|---|---|
| 1 | 2 | TXD |
| 2 | 4 | RTS |
| 3 | 17 | RXC |
| 4 | 20 | DTR |
| 5 | 15 | TXC |
| 6 | 3 | RXD |
| 7 | 5 | CTS |
| 8 | 7 | GND |
| 9 | 8 | DCD |

**Table 1-10.** Asynchronous Modem Cable Pinouts (DB-9)

| LINC Card (DB-9) | Modem (DB-25) | Signal Name |
|---|---|---|
| 1 | 2 | TXD |
| 2 | 4 | RTS |
| 4 | 20 | DTR |
| 6 | 3 | RXD |
| 7 | 5 | CTS |
| 8 | 7 | GND |
| 9 | 8 | DCD |

**Table 1-11.** Terminal/Serial Printer Cable Pinouts (DB-25 [with DTR Flow Control])

| LINC Card DB-25 | I/O Device DB-25 | Signal Name |
|---|---|---|
| 2 | 2 | TXD |
| 3 | 3 | RXD |
| 7 | 7 | GND |
| 20 | 20 | DTR |

**Table 1-12.** Asynchronous Modem Cable Pinouts (DB-25)

| LINC Card DB-25 | Modem DB-25 | Signal Name |
|---|---|---|
| 2 | 3 | RXD |
| 3 | 2 | TXD |
| 4 | 5 | CTS |
| 5 | 4 | RTS |
| 6 | 20 | DTR |
| 7 | 7 | GND |
| 8 | 8 | DCD |
| 20 | 6 | DSR |

**[ WARNING ]** Hardware damage will occur if you cross plug DB-25 connectors (both serial and parallel) with connector gender change devices.

**Table 1-13.** Synchronous Modem Cable Pinouts (DB-25)

| LINC Card DB-25 | Modem DB-25 | Signal Name |
|---|---|---|
| 2 | 3 | RXD |
| 3 | 2 | TXD |
| 4 | 5 | CTS |
| 5 | 4 | RTS |
| 6 | 20 | DTR |
| 7 | 7 | GND |
| 8 | 8 | DCD |
| 20 | 6 | DSR |
| 15 | 15 | TXC |
| 17 | 17 | RXC |

**Table 1-14.** Parallel I/O Port Pinouts (P4)

| Pin # | Description | Direction |
|---|---|---|
| 1 | Strobe* | To Printer |
| 2 | Data Bit 0 | To Printer |
| 3 | Data Bit 1 | To Printer |
| 4 | Data Bit 2 | To Printer |
| 5 | Data Bit 3 | To Printer |
| 6 | Data Bit 4 | To Printer |
| 7 | Data Bit 5 | To Printer |
| 8 | Data Bit 6 | To Printer |
| 9 | Data Bit 7 | To Printer |
| 10 | Acknowledge* | To LINC |
| 11 | Busy | To LINC |
| 12 | Paper Empty | To LINC |
| 13 | Select | To LINC |
| 14 | not used, reserved | |
| 15 | Error* | To LINC |
| 16 | Initialize Printer* | To Printer |
| 17 | Select Input* | To Printer |
| 18-25 | Ground | To LINC |

* = Active low signal

## VMEbus Backplane

The VMEbus employs a four level bus request — bus grant scheme for allowing boards access to the VMEbus. Those slots not occupied by a board require a jumper plug installed in the upper connector bus of the unused slot (on the back of the backplane). This requirement assures the bus grant signal is passed to all board slots.

**[ WARNING ]** If an empty slot does not have a jumper plug installed, CPU selftest will fail.

Bus requests are initiated by controller board(s), and the job processor board to gain access to the VMEbus. When the bus is required, the board issues a bus request signal (**BR0–** through **BR3–**). The signal is processed by the bus arbiter chip on the VMEbus arbiter board and a bus grant signal is sent (**BG0** through **BG3**).

The bus grant signal is daisy-chained through the VMEbus to the board requesting the bus (starting at slot 8). For this scheme to work, each bus grant signal is actually two signals: bus grant in and bus grant out (see Figure 1-6).

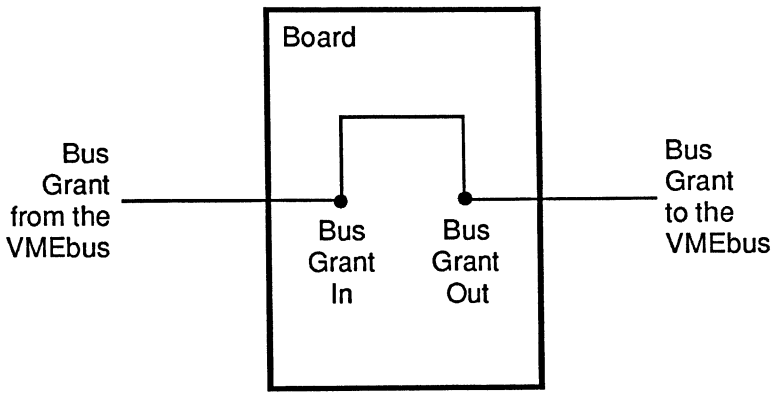



**Figure 1-6.** Bus Grant Block Diagram

There are also four levels of bus requests and bus grants (**BS0** through **BS3**). Each board is hard-wired to a bus request level, with the highest level being the first level (**BS0**) and the lowest being the fourth level (**BS3**).

The VMEbus supports seven interrupt lines, **IRQ1*** through **IRQ7***. Interrupts are processed by the job processor to determine priority.

The VMEbus is capable of supporting 32 data and 32 address lines each. Table 1-15 lists the bits the address and data bus can support per cycle.

**Table 1-15.** Address and Data Path Bits

| Bus | Bits |
|---|---|
| Address | 32-, 24-, or 16-bits |
| Data | 32-,16-, or 8-bits |

## VMEbus Electrical Specifications

The VMEbus requires a 96-pin connector for each each backplane card slot. The 96-pin connector used by the VMEbus must provide: a voltage rating greater than or equal to 100 volts DC, isolation pin to pin; a contact resistance less than or equal to 50 milliohms, at rated current; and insulation resistance greater than or equal to 100 Megohms, pin to pin. The VMEbus signal levels thresholds are shown in Figure 1-7.

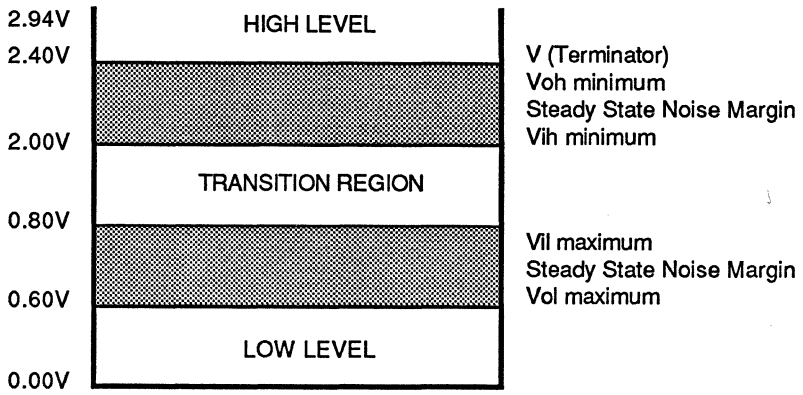



**Figure 1-7.** VMEbus Signal Levels

## Uninterruptable Power Supply (UPS)

Your P/90 is designed to accept an optional uninterruptable power supply (see the UPS connector on the back of your system). Two UPS signals sense the power source of your system: **UPSINT1–** and **UPSINT2–**. When UPS signals are HIGH, power is being received from the standard AC power source (standard operation). When UPS signals are LOW the uninterruptable power supply is active and a graceful shutdown of your system is initiated (**/etc/shutdown**).

**[ WARNING ]** UPS systems not approved by Plexus Computers are used at your risk.

# PREVENTIVE MAINTENANCE

This chapter describes the preventive maintenance of your P/90 computer. Please remember, preventive maintenance is important. Failure to perform routine maintenance can have a detrimental effect on your system's operation.

## Equipment

Listed below is the equipment you need to service your new system. Table 2-1 lists the PM time schedule.

- Head Cleaning Applicators (NOT Cotton Swabs),
- 95% isopropyl alcohol,
- Formula 409† (or comparable) cleaning solution,
- one small whisk broom,
- several cloths,
- cutting pliers,
- 3" tie-wraps (or longer), and
- a vacuum.

**Table 2-1.** Preventive Maintenance Time Schedule

| Scheduled Maintenance | Time Frame |
|---|---|
| Clean Tape Head & Capstan | After a new tape or eight hours of use. |
| Clean Fan Filter | Every Two Weeks |
| Clean Exterior | Every Month |
| Battery Replacement | Every Two Years |

† Formula 409 is a trademark of Proctor and Gamble.

## Cleaning Your System's Fan Filters

Every two weeks you should clean the fan filter in each cabinet. This is an easy task requiring no special equipment. The following procedure details the fan filter removal and cleaning. Refer to Figure 2-1.

1. Open the front access door.
2. Slide the fan filter grille to the side of the opening.
3. Gently pull the fan filter grille from the opening.
4. Remove the fan filter.
5. Gently wash the fan filter in warm water using a mild soap.
6. Thoroughly rinse the fan filter to remove any soap residue.
7. Thoroughly dry the fan filter before it's re-installation.

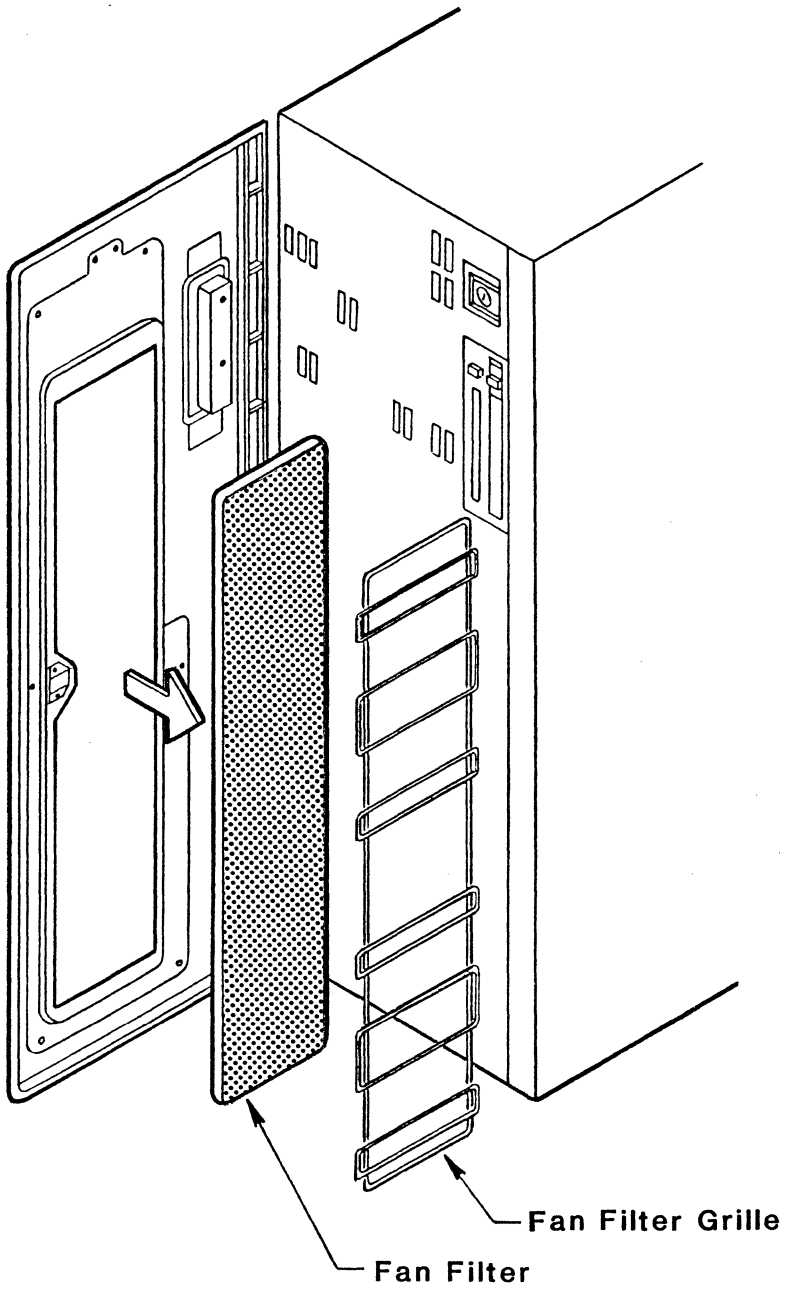



**Figure 2-1.** P/90 Fan Filter Removal

## Maintaining Your 1/4-inch Tape Drive

Your new cartridge tape drive should be cleaned after: using a new tape, or eight hours of use. To properly service the tape drive, you must clean the cartridge read/write head and the tape hole sensor. The equipment needed to clean the cartridge tape drive components are:

- 6-inch or longer head cleaning applicators
- 95% isopropyl alcohol

The following procedure details the recommended cleaning sequence for the cartridge tape drive components. Refer to Figure 2-2. You can remove the side cover from the cabinet, for increased accessibility.

1. Make sure the power is OFF to the tape drive.
2. Slide the lever to extend the head assembly into the cartridge area.
3. Moisten the head cleaning applicator with the alcohol solution.
4. Thoroughly wipe the cartridge tape head, capstan, and the tape hole sensor.
5. Examine the roller guides and wipe any accumulated debris away.
6. Discard the used head cleaning applicator.
7. Buff the tape head, capstan, sensor, and the associated tape path dry with a clean and dry head cleaning applicator.

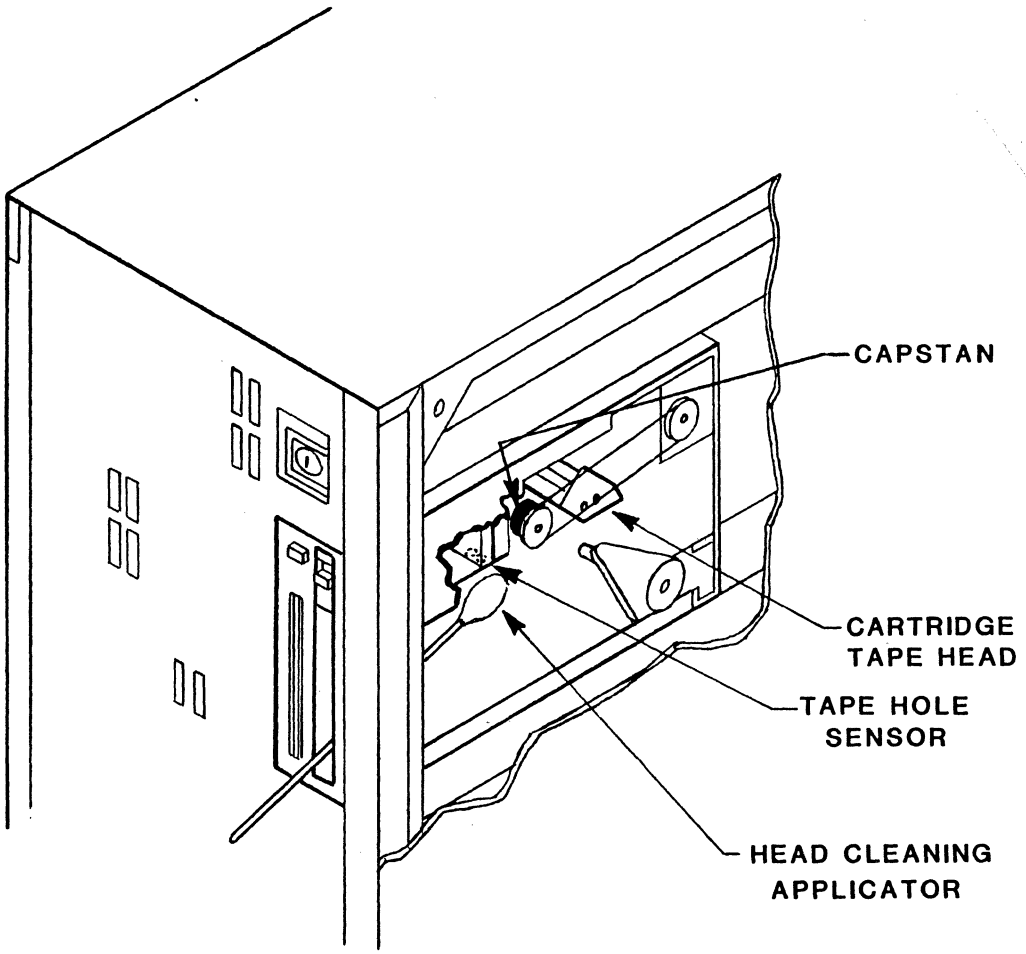



**Figure 2-2.** Cleaning the 1/4-inch Tape Drive

## Replacing Your System Battery

The system clock is maintained by a Nickel-Cadium (NiCad), PC Mount, 3.6V battery. The battery is mounted to the bus arbiter board, and should be replaced every two years.

Three pieces of equipment are needed to replace the system's battery: a replacement battery, a pair of cutting pliers, and a 3" tie-wrap (or longer).

**[ NOTE ]** To keep the processor battery charged, you should run your system for at least 48 hours once every 60 days. Should the processor battery lose its charge due to extended system shutdown, it will be recharged the next time system is powered-up. Remember to reset the system clock before performing operations to the system.

1. Power down your system. See the *Sys5 Administrator's Handbook* for the correct procedure.
2. Turn the keyswitch OFF.
3. Disconnect the power cord.
4. Remove your system's top cover and store it in a safe location (see *Removing Your System's Exteriors* in *Chapter Three*).
5. Turn the card cage until it is parallel with the floor.
6. Remove the bus arbiter board from the card cage (slot three).
7. Cut the tie-wrap securing the battery.
8. Pull the battery straight out.
9. Discard the old battery.
10. Install the new battery.
11. Use a new tie-wrap to secure the battery.
12. Cut any excess tie-wrap.
13. Replace the bus arbiter board in the card cage.
14. Return the card cage to it's upright position.
15. Replace the exterior cover.

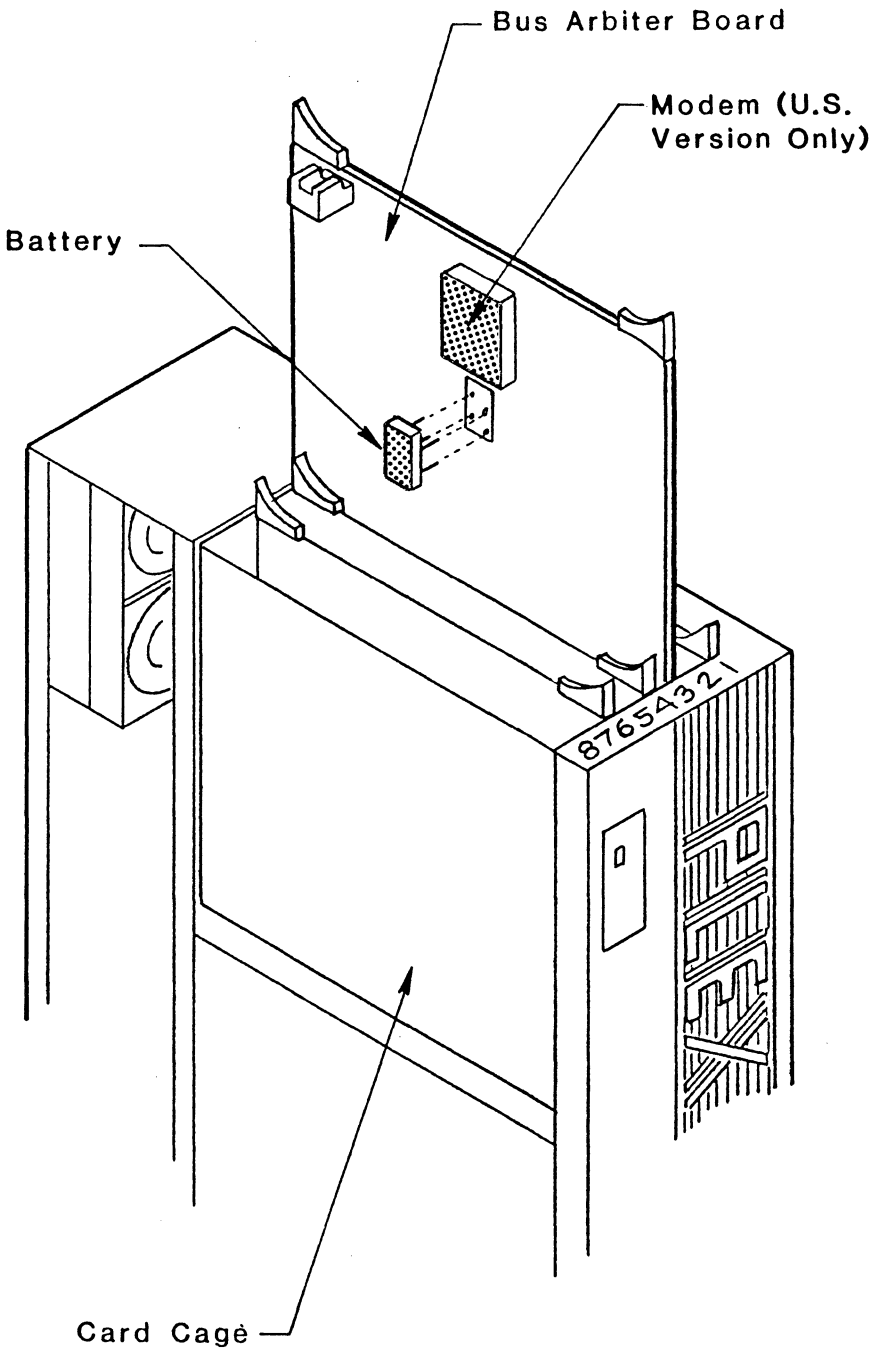



**Figure 2-3.** System Battery Replacement

## Cleaning Your System's Exterior

Once a month, the system's exterior should be cleaned. The only equipment needed to clean the exteriors are: a small cloth, Formula 409 (or equivalent), and a small whisk broom.

To clean your system's exteriors:

1. Use whisk broom to clean the vents at the front and back of your system.
2. Spray the Formula 409 solution onto the small cloth and wipe the exterior sides.

**[ WARNING ]** DO NOT spray liquid into the exterior vents, fan filters, tape, or floppy disk drive openings.

## Maintaining Your Hard Disk Drives

The disk drives do not require preventive maintenance.

# ASSEMBLY/DISASSEMBLY

This chapter details the disassembly of your P/90 computer. It is divided into two major sections, the main cabinet, and the expansion cabinet. The components comprising the P/90 main cabinet are:

| | |
|---|---|
| Disk Drive Unit 0 | Disk Drive Unit 1 |
| Disk Drive Unit 2 | Keyswitch |
| Tape Drive | Tape Drive Controller |
| Card Cage | Circuit Breaker |
| Power Cord | System I/O Panels |
| Power Supply | SCSI Interface Connectors |
| Fans | Fan Filters |

Figures 3-1 and 3-2 illustrate the P/90 main cabinet components.

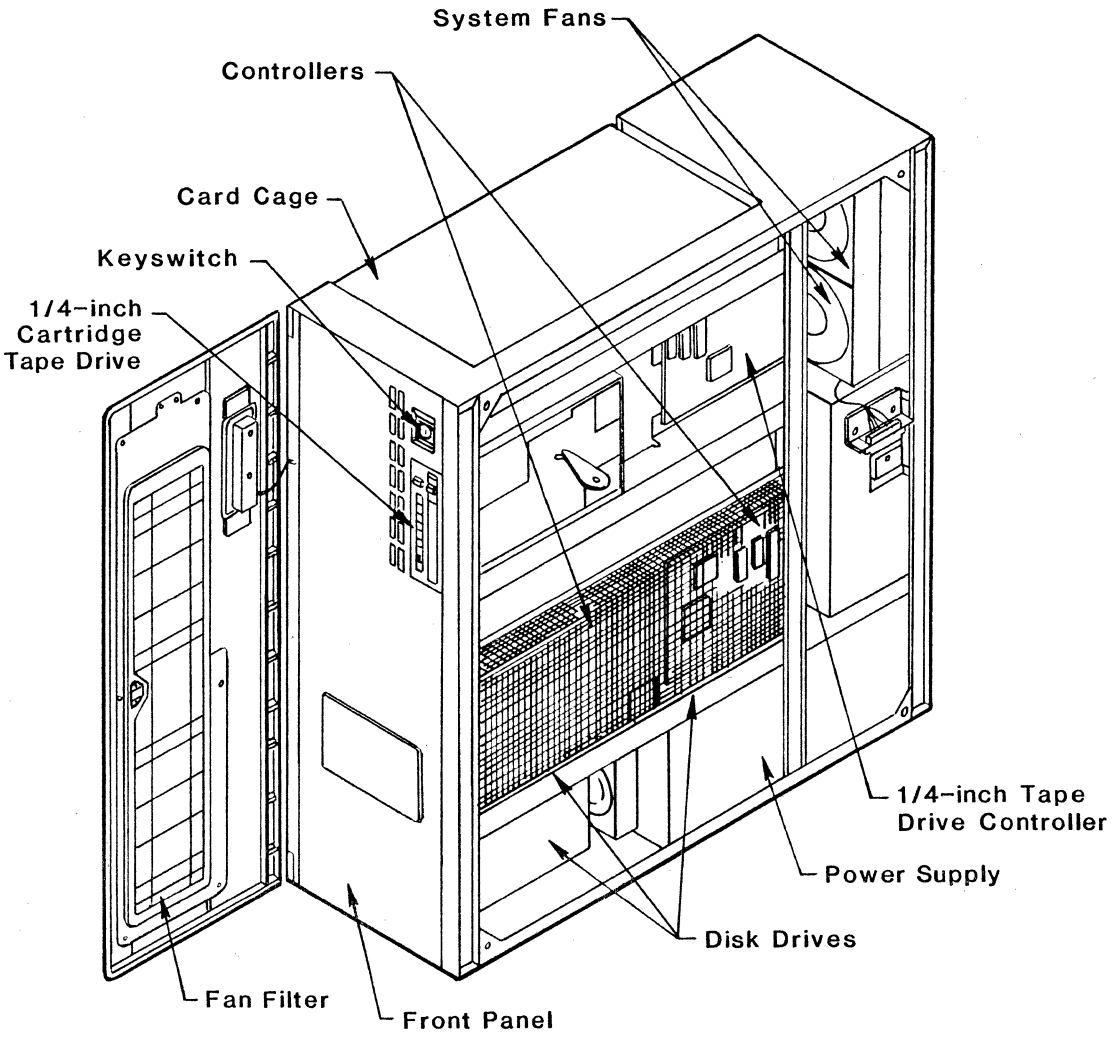



**Figure 3-1.** P/90 Main Cabinet Front View with Access Door Open

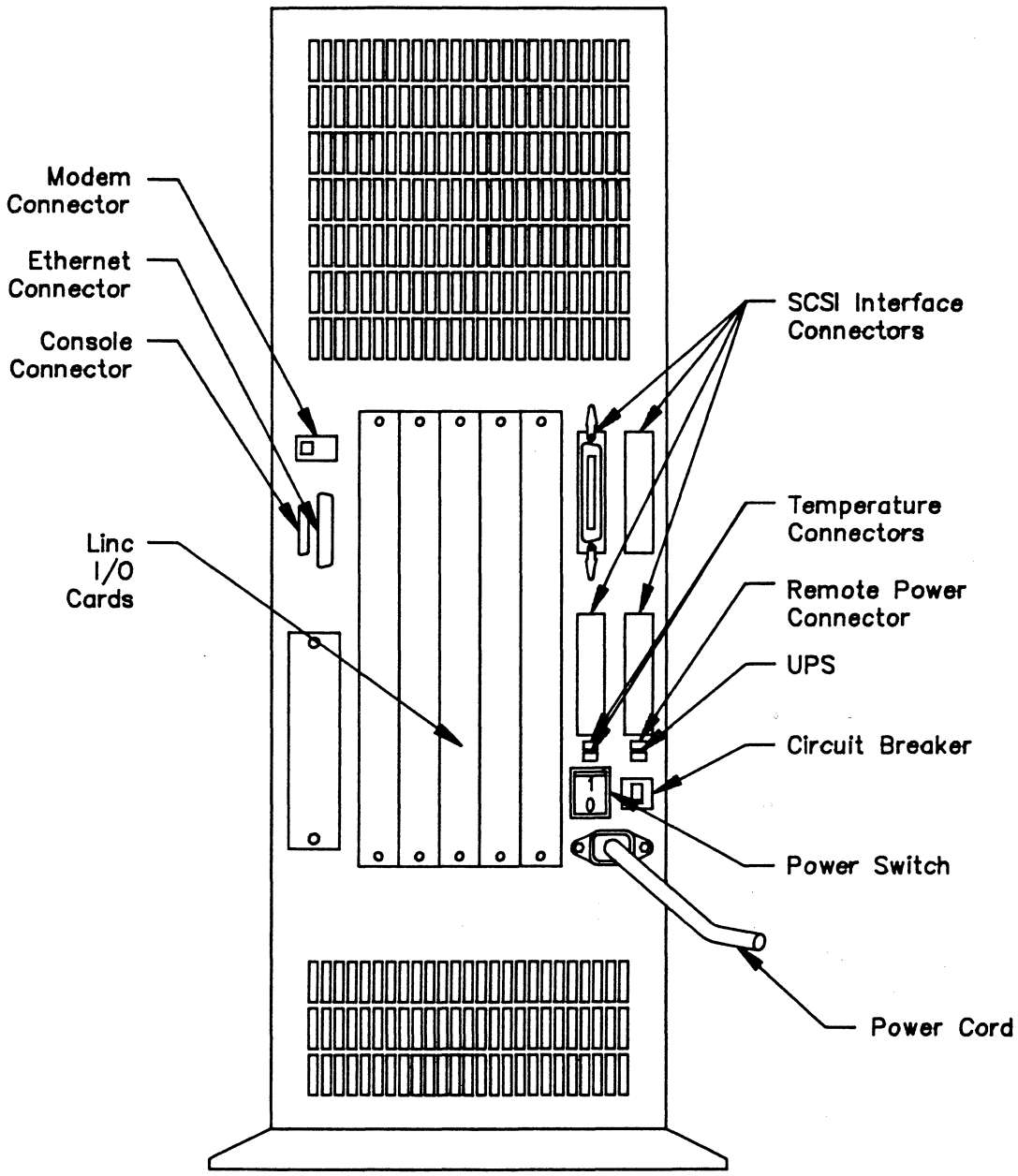



**Figure 3-2.** P/90 Main Cabinet Rear View

## Removing Your System's Exteriors

Most assembly and disassembly procedures require the removal of the top and side covers. To remove your system's exteriors requires two steps: remove the top and pull away the sides.

To remove the exterior covers from your system:

1. Power down your system. See your *Sys5 Administrator's Handbook.*
2. Turn the keyswitch switch OFF.
3. Disconnect the system's power cable.
4. Remove the two (2) screws (A) in the back of your system near the top. See NOTE below.
5. Open the front door.
6. Remove the two (2) screws (B) in the front of your system near the top. See NOTE below.
7. Lift the top cover from the system.
8. Store the top cover in a safe place.
9. Slide each of the side covers up to disengage them from the system.
10. Store the sides is a safe place.

**[ NOTE ]** You must re-install the two front screws (B) and two rear screws (A) with the lock washers (as originally installed) before restoring power to your system.

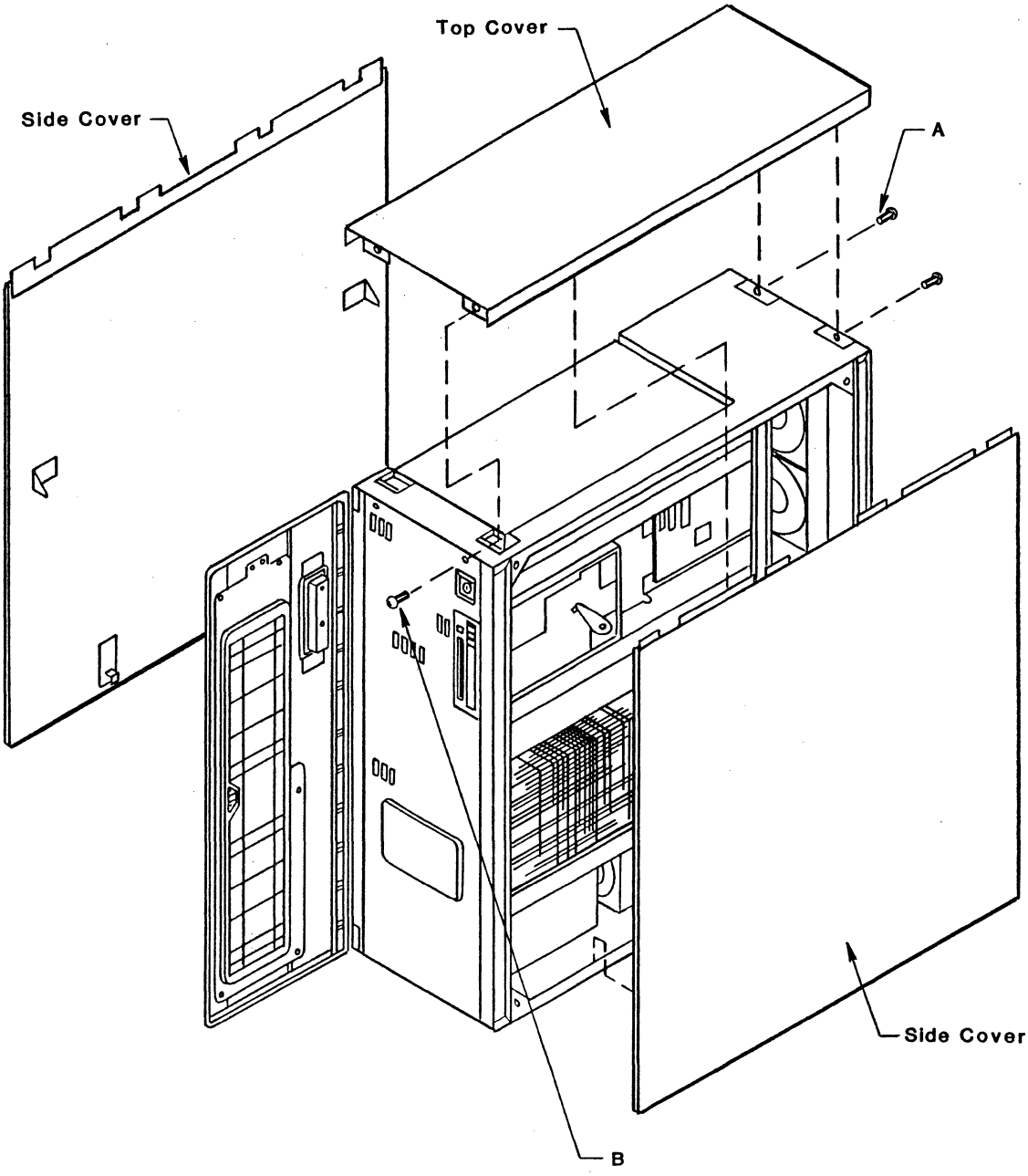



**Figure 3-3.** Removing Your System's Exteriors

## Removing Your System's Front Panel

Some of the assembly and disassembly procedures require the removal of the system's front panel. The only equipment required the front panel is a small flat-head screwdriver.

To remove the front panel:

1. Power down your system. See your *Sys5 Administrator's Handbook*.
2. Turn the keyswitch switch OFF.
3. Disconnect the system's power cable.
4. Remove the two (2) screws (A) at the top of the front panel (top cover screws).
5. Remove the six (6) screws (B) along each side of the front panel.
6. Gently pull the front panel from the system.

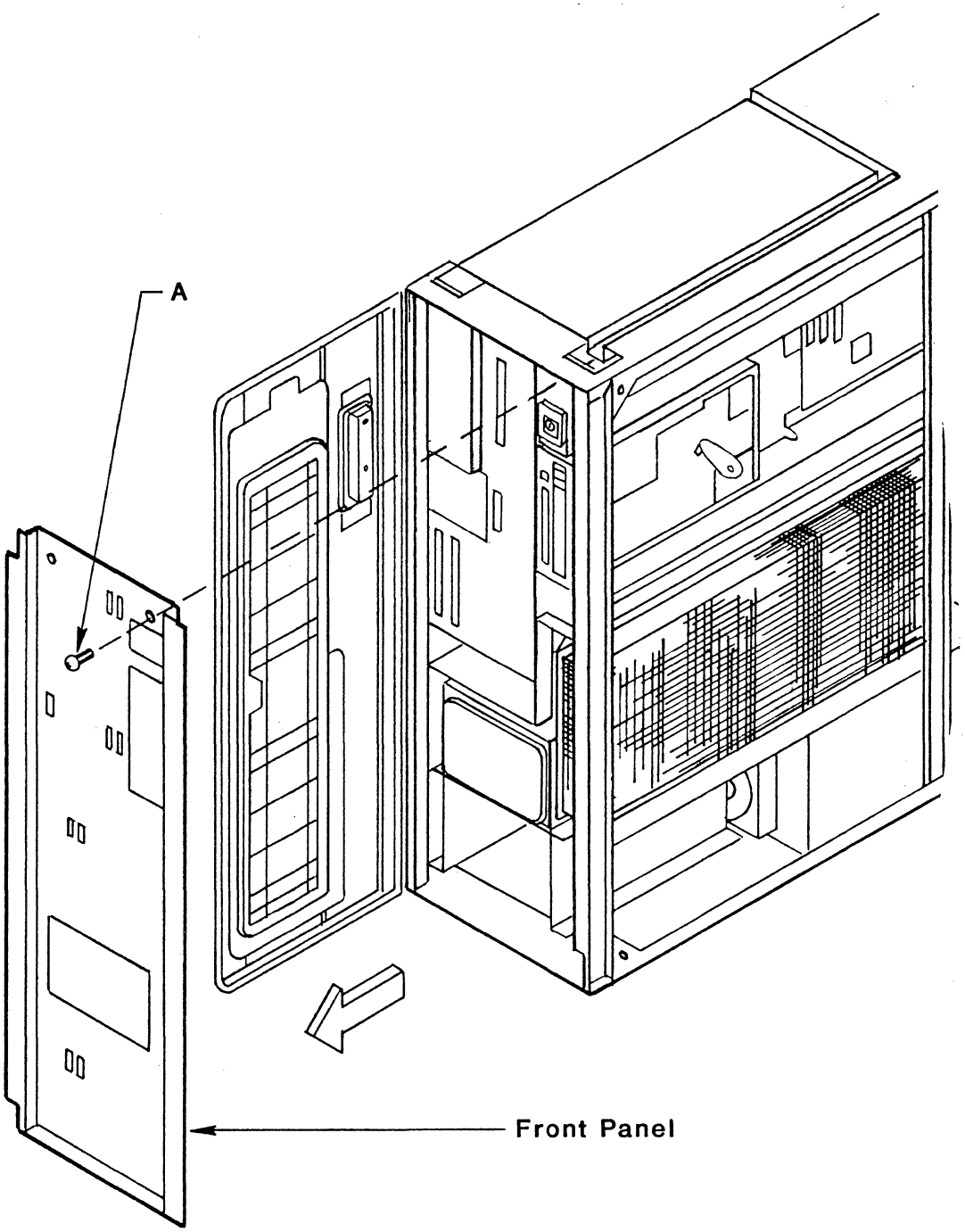



**Figure 3-4.** Removal of the System's Front Panel

## Removing a LINC I/O Card

Your system can employ five LINC I/O cards, located at the back of your system. The removal of each is the same. The only equipment needed is a small flat-head screwdriver.

To remove a LINC I/O card:

1. Power down your system. See your *Sys5 Administrator's Handbook.*
2. Turn the keyswitch switch OFF.
3. Disconnect the system's power cable.
4. Unscrew the top and bottom captive screws (A) from the I/O card.
5. Gently pull the I/O card straight out from the back of the system (to remove the I/O card from the VCP backplane).

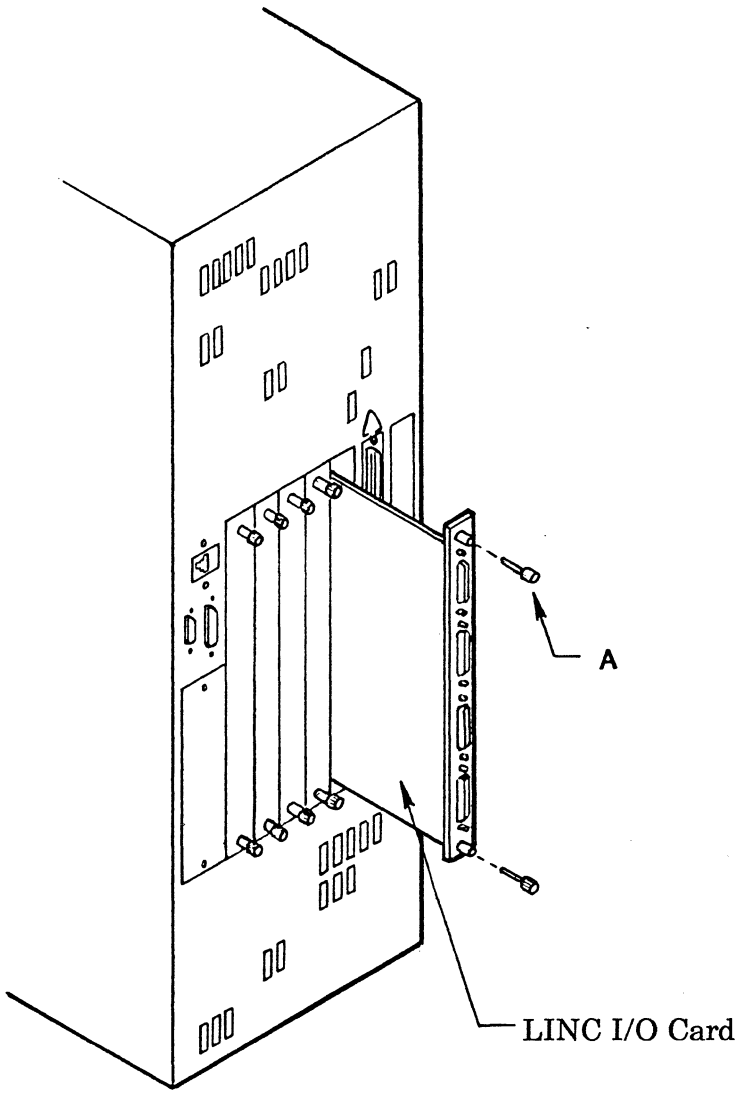



**Figure 3-5.** Removing a LINC I/O Card

## Removing Your 1/4-inch Tape Drive

To remove the 1/4-inch tape drive requires the removal of the top and side covers, as well as the removal of the front panel.

To remove the 1/4-inch tape drive:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the keyswitch OFF.
3. Disconnect the power cord.
4. Remove the exterior covers (see the section *Removing Your System's Exteriors* in this chapter).
5. Open the front door.
6. Remove the front panel (*Removing Your System's Front Panel* in this chapter).
7. Disconnect the attaching cables from the 1/4-inch tape drive controller board.
8. Slide the tape drive out of the system.
9. Remove the two (top and bottom) non-skid slides.
10. To install the tape drive, reverse the above procedure.

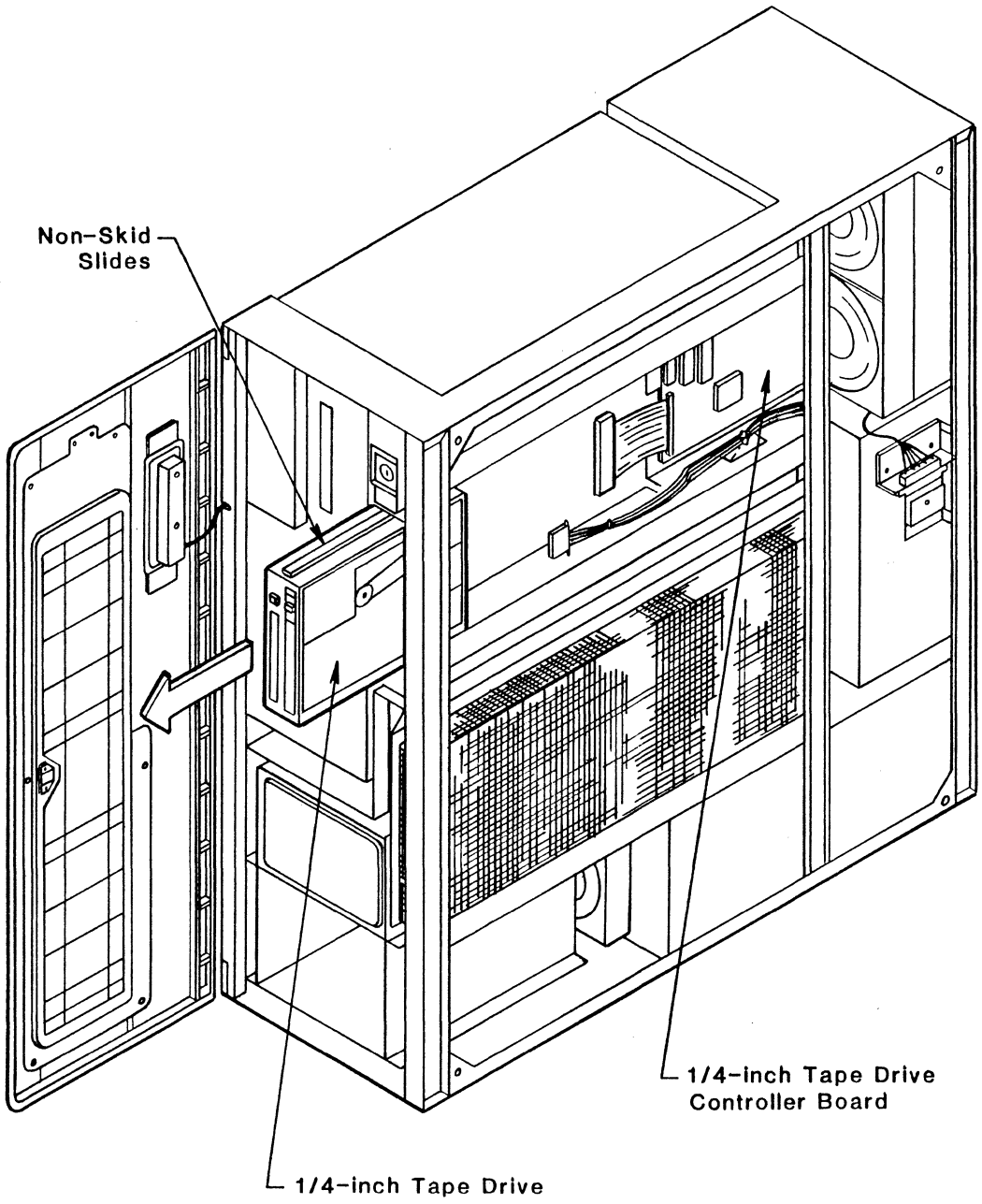



**Figure 3-6.** Removing Your 1/4-inch Tape Drive

## Removing Your Hard Disk Drive

Your main cabinet can have as many as three different hard disk drives in three different locations. The remove of a disk drive requires the top and side covers be removed first, as well as the front panel.

To remove a disk drive:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the keyswitch OFF.
3. Disconnect the power cord.
4. Remove the exterior cover. (see the section *Removing Your System's Exteriors* in this chapter).
5. Open the front door.
6. Remove the front panel.
7. Mark and disconnect any cables attached to the disk drive(s).
8. Slide the disk drive drawer out of your system and place it on a flat surface.
9. Depress the two clips at the front sides of the disk drive to be removed and gently pull the drive from the disk drive drawer. See NOTE below.
10. Remove the two non-skid slides from the sides of the disk drive.
11. Reverse these steps to install the disk drive.

**[ NOTE ]** The main cabinet of the P/90 can contain as many as three hard disk drives. Figure 3-7 illustrates the location of the three disk drives and the correct direction to employ in removing each.

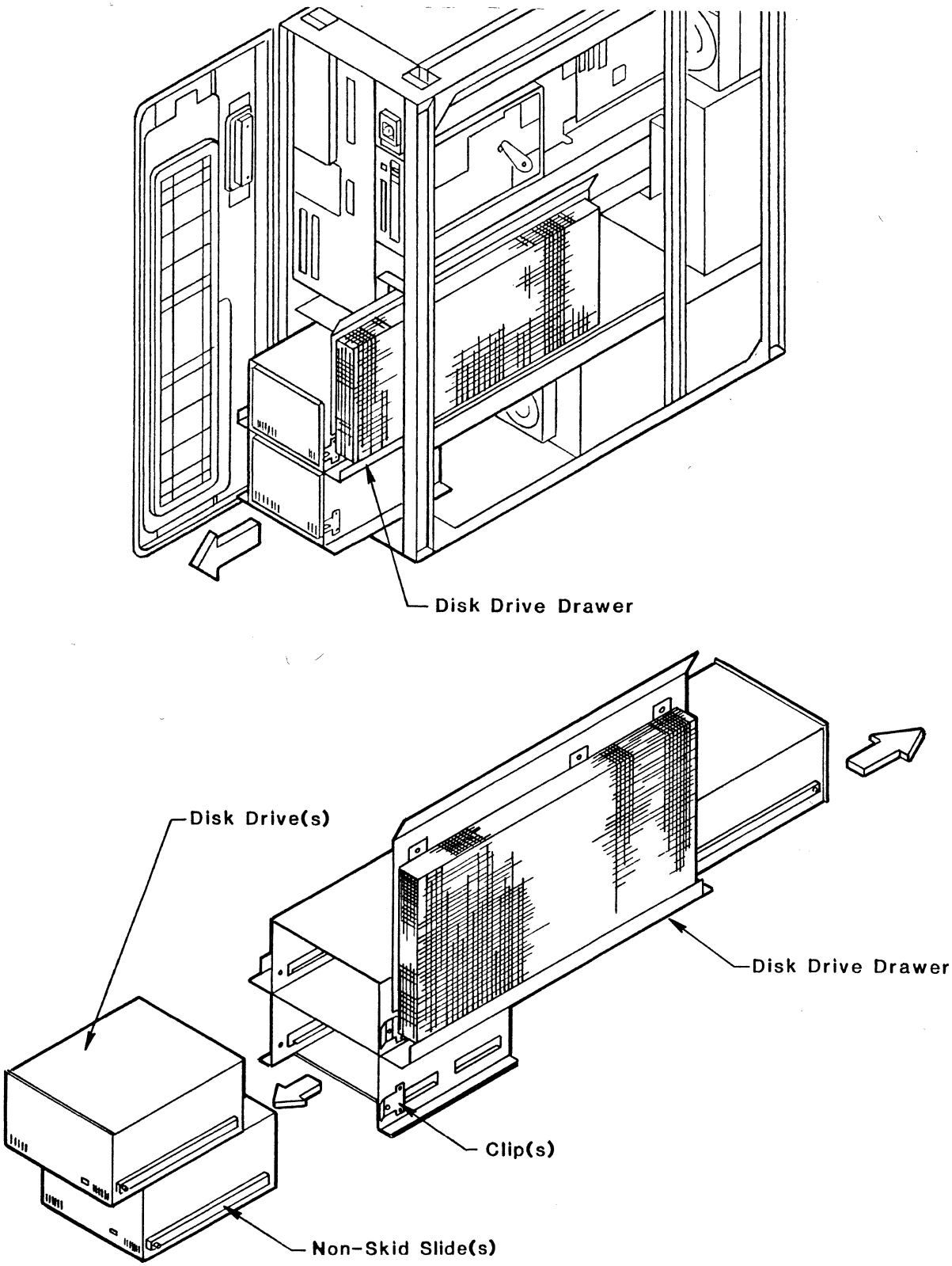



**Figure 3-7.** Removing Your Hard Disk Drive

## Removing Your Power Supply

Removing the power supply requires your first remove: the top cover, side covers, front panel, and the disk drive drawer.

To remove the power supply:

1. Power down your system. See your *Sys5 Administrator's Handbook*.
2. Turn the keyswitch switch OFF.
3. Disconnect the system's power cable.
4. Remove the top and side covers (see the section *Removing Your System's Exteriors* in this chapter).
5. Remove the front panel (see the section *Removing Your System's Front Panel* in this chapter).
6. Remove the disk drive drawer (see *Removing Your Hard Disk Drive* in this chapter).
7. Remove the nuts (A) from the two flanges at the front of the system cabinet.
8. Remove the two screws (B) from the power supply chassis.
9. Slide the power supply out the front of the system.

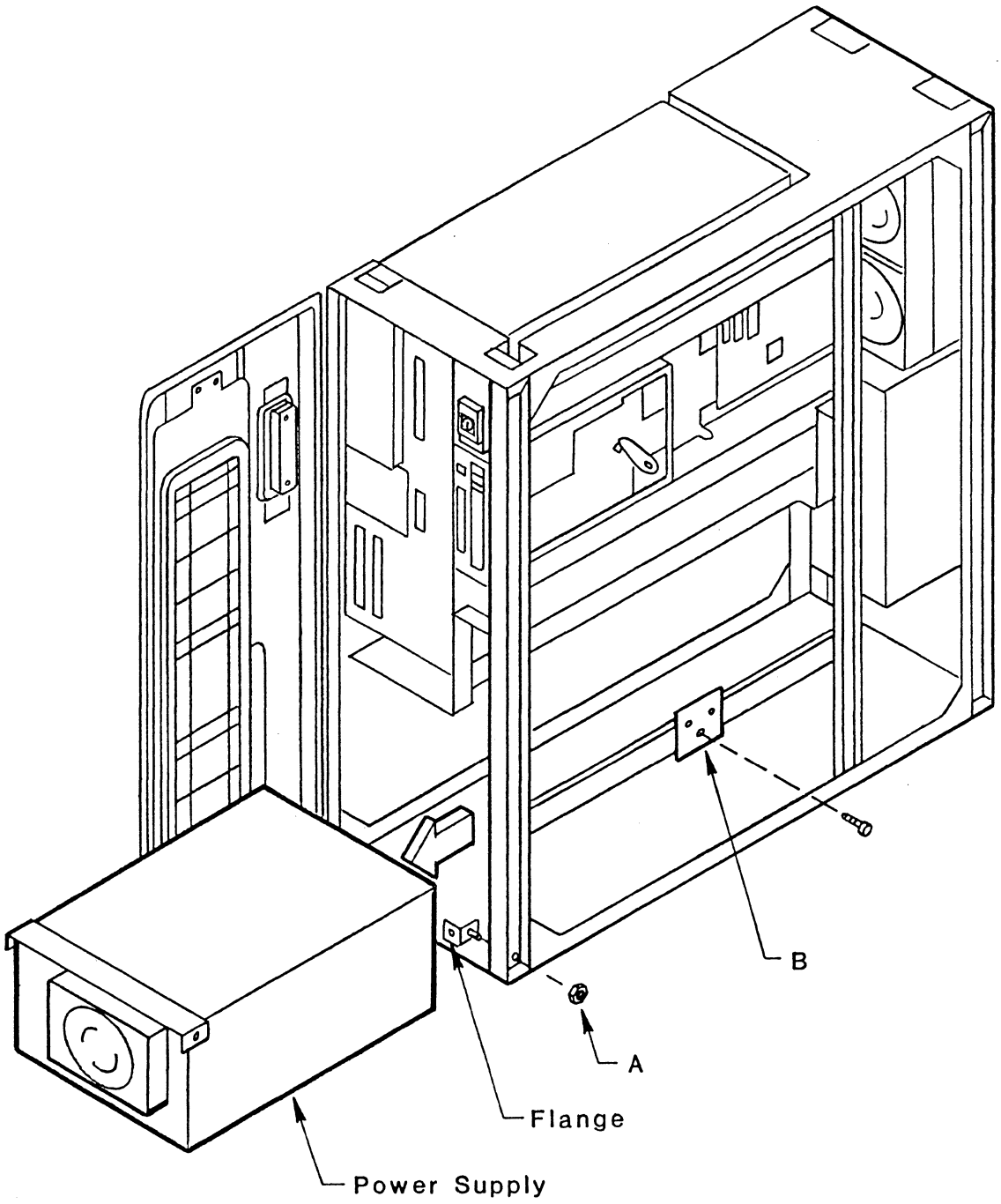



**Figure 3-8.** Removing Your Power Supply

## Removing Your VCP Backplane Card

Removing the VCP backplane requires your first remove: the top cover, side covers, and all I/O panels.

To remove the VCP backplane:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the keyswitch OFF.
3. Disconnect the power cord.
4. Remove the exterior covers (see the section *Removing Your System's Exteriors* in this chapter).
5. Remove all of the I/O panels (see the section *Removing an I/O Panel* in this chapter.
6. Disconnect the VCP backplane cable.
7. Remove the four nuts (A) holding the VCP backplane.
8. Gently pull the VCP backplane from the four mounting studs.
9. Slide the VCP backplane away from the chassis.

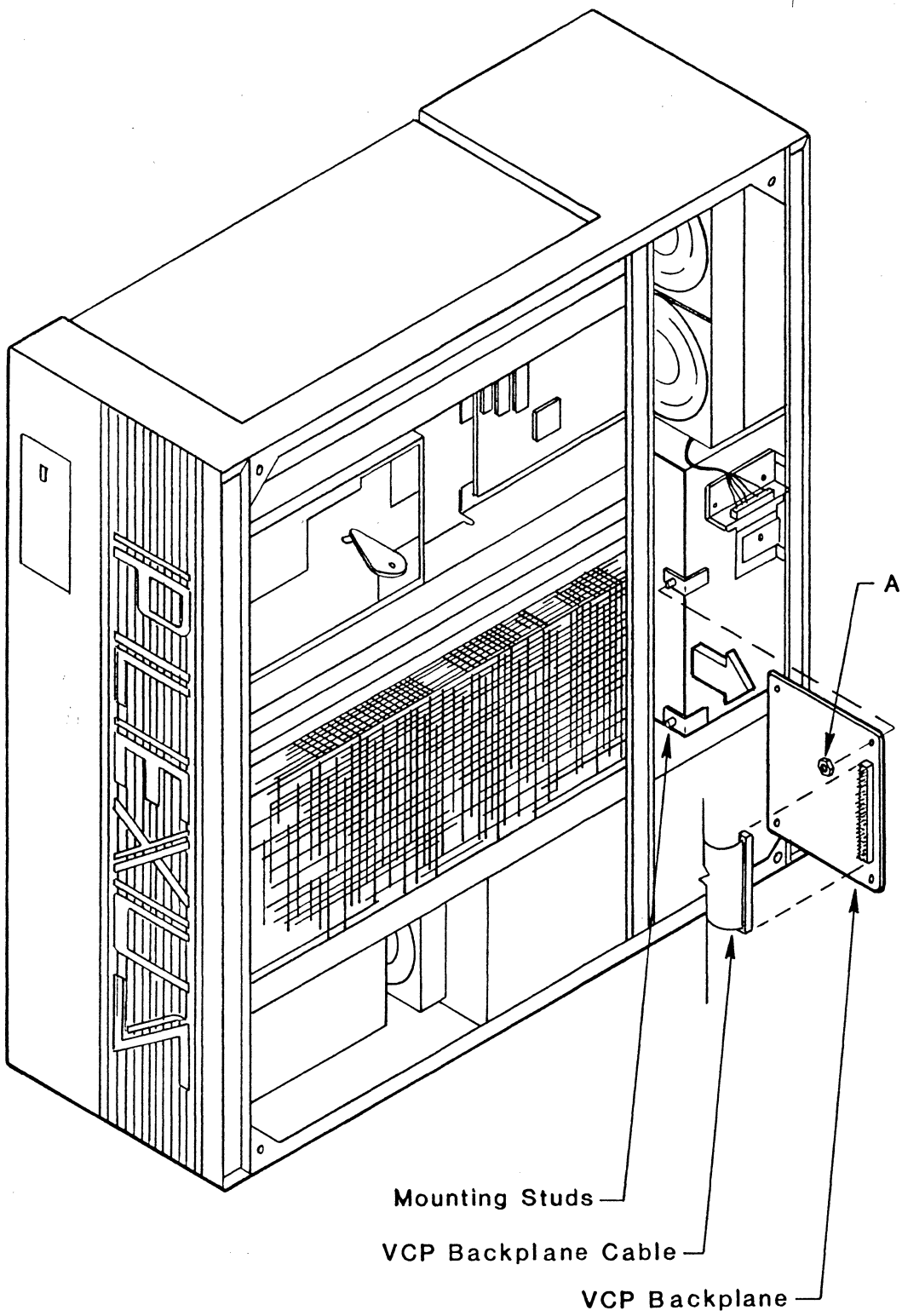



**Figure 3-9.** VCP Backplane Removal

## Removing Your Tape Controller

Removing the 1/4-inch cartridge tape controller requires your first remove: the top cover and the side covers.

To remove the 1/4-inch cartridge tape drive controller:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the keyswitch OFF.
3. Disconnect the power cord.
4. Remove the exterior covers (see the section *Removing Your System's Exteriors* in this chapter).
5. Locate the 1/4-inch cartridge tape controller (see Figure 3-10).
6. Remove any attaching cables by carefully grasping the cable connector and gently removing it from the controller connector.
7. Gently pull 1/4-inch cartridge tape controller from the four (4) board clips.

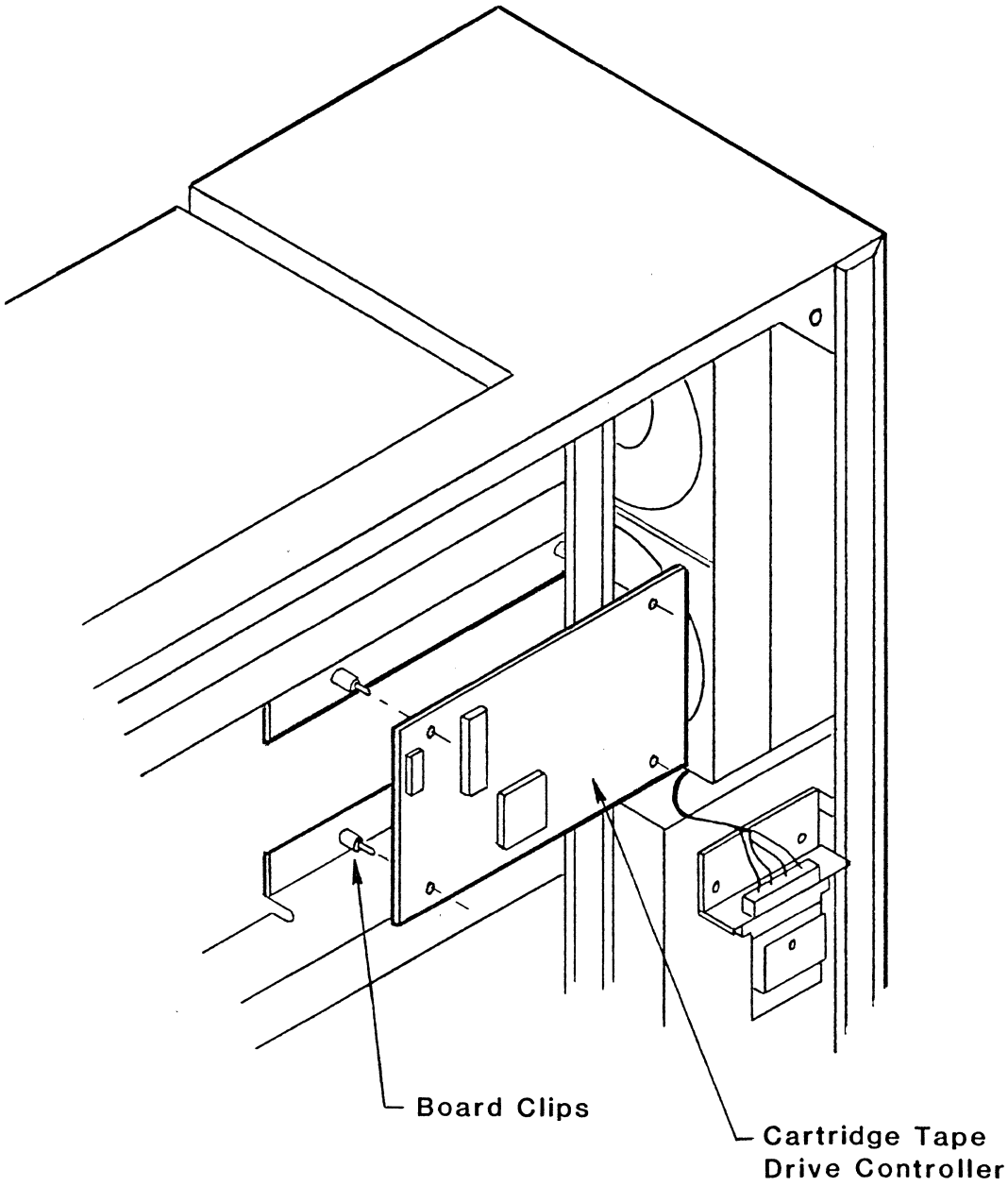



**Figure 3-10.** Removing the 1/4-inch Cartridge Tape Controller

## Removing Your Disk Drive Controller

Removing the disk drive controller requires your first remove the top cover and side covers.

To remove the controller board:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the keyswitch OFF.
3. Disconnect the power cord.
4. Remove the exterior covers (see the section *Removing Your System's Exteriors* in this chapter).
5. Disconnect the cables at the back of the controller panel. To remove the cables, firmly grasp one side of the cable connector and gently pull the two connectors apart.
6. Remove the six (A) screws holding the protective screen in place. Store the screen in a safe location.
7. Carefully remove the cable connectors from the controller board by firmly holding the controller board and gently pulling the cable free.
8. Using a small flathead screwdriver, remove the four (B) attaching screws.
9. The board is now free.

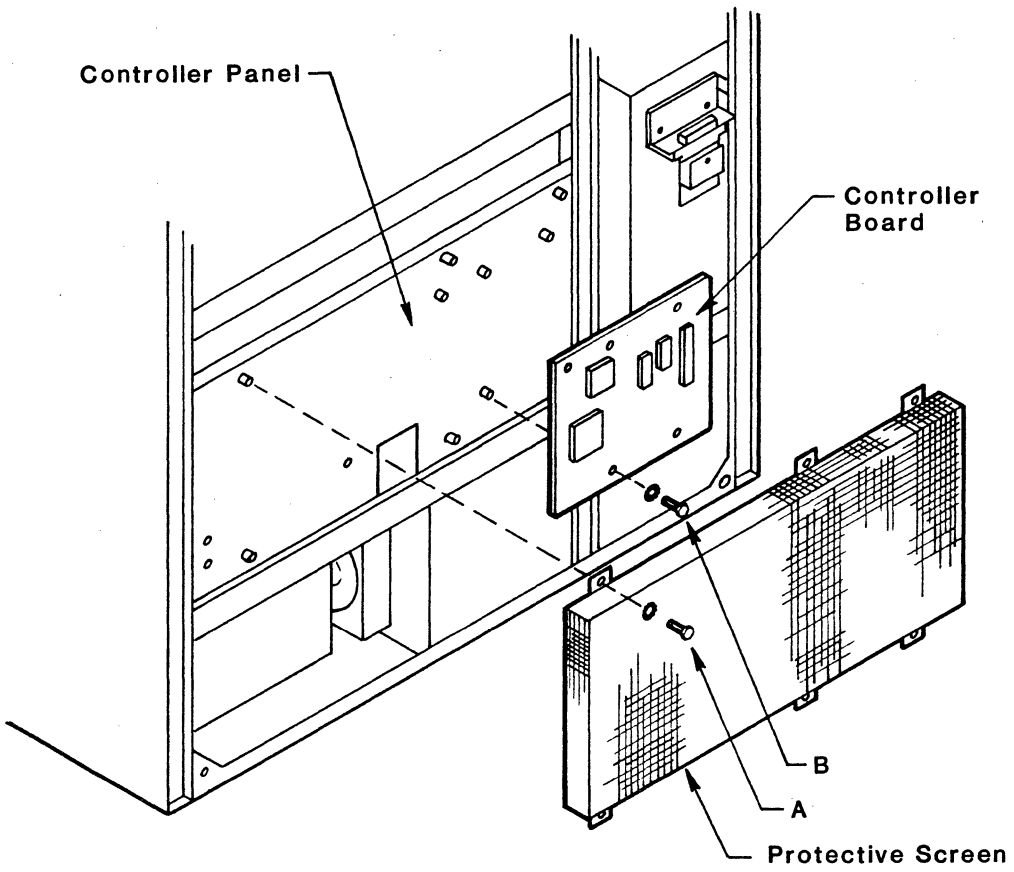



**Figure 3-11.** Removing a Disk Drive Controller

## Removing a Backplane Jumper Block

Whenever you change the configuration of your card cage, your must determine if a backplane jumper block must be moved, added, or deleted. If in doubt, read *VMEbus Backplane* in Chapter One of this manual. Moving a backplane jumper block requires your first remove the top cover and side covers.

To remove a backplane jumper block:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the keyswitch OFF.
3. Disconnect the power cord.
4. Remove the exterior covers (see the section *Removing Your System's Exteriors* in this chapter).
5. Disengage the three captive screws at the top of the card cage.
6. Rotate the card cage into the service position (see Figure 3-13).
7. At the back of the card cage, gently pull the jumper block straight out from the backplane (see Figure 3-12).

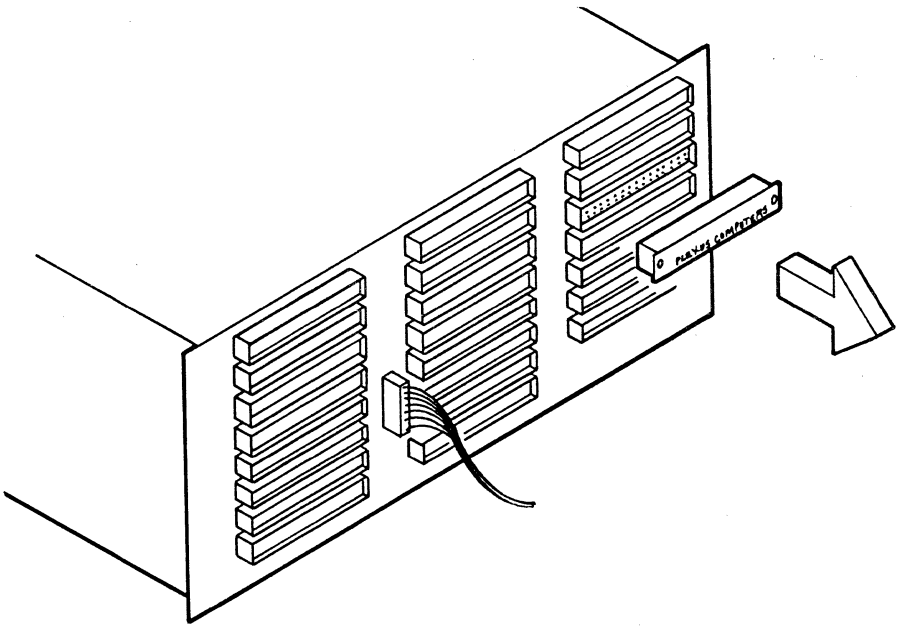


**Figure 3-12.** Removing a Backplane Jumper Block

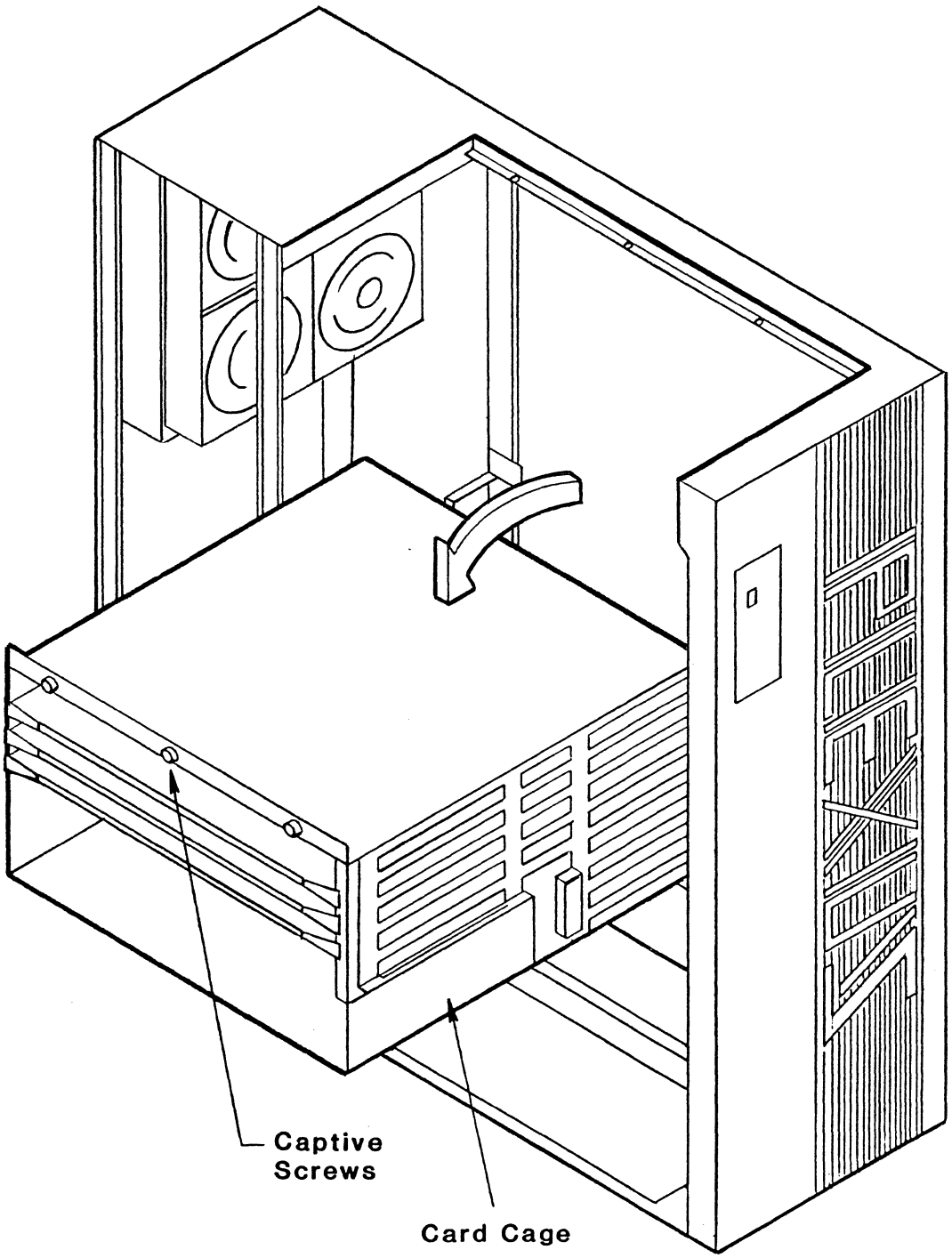



**Figure 3-13.** Rotating the Card Cage

## Adding Another Controller Board

Adding another controller board requires you first remove the top cover and side covers.

To add a controller board:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the keyswitch OFF.
3. Disconnect the power cord.
4. Remove the exterior covers (see the section *Removing Your System's Exteriors* in this chapter).
5. Remove the six (A) screws holding the protective screen in place. Store the screen in a safe location.
6. Using a small flathead screwdriver, remove the three (B) screws at the front of the controller panel.
7. Attach the correct controller board adapter plate to the controller panel.
8. Attach the new controller board to the adapter plate.
9. Attach the SCSI cable connector to the board connector.
10. Replace the protective screen.
11. Re-install the top and side covers.

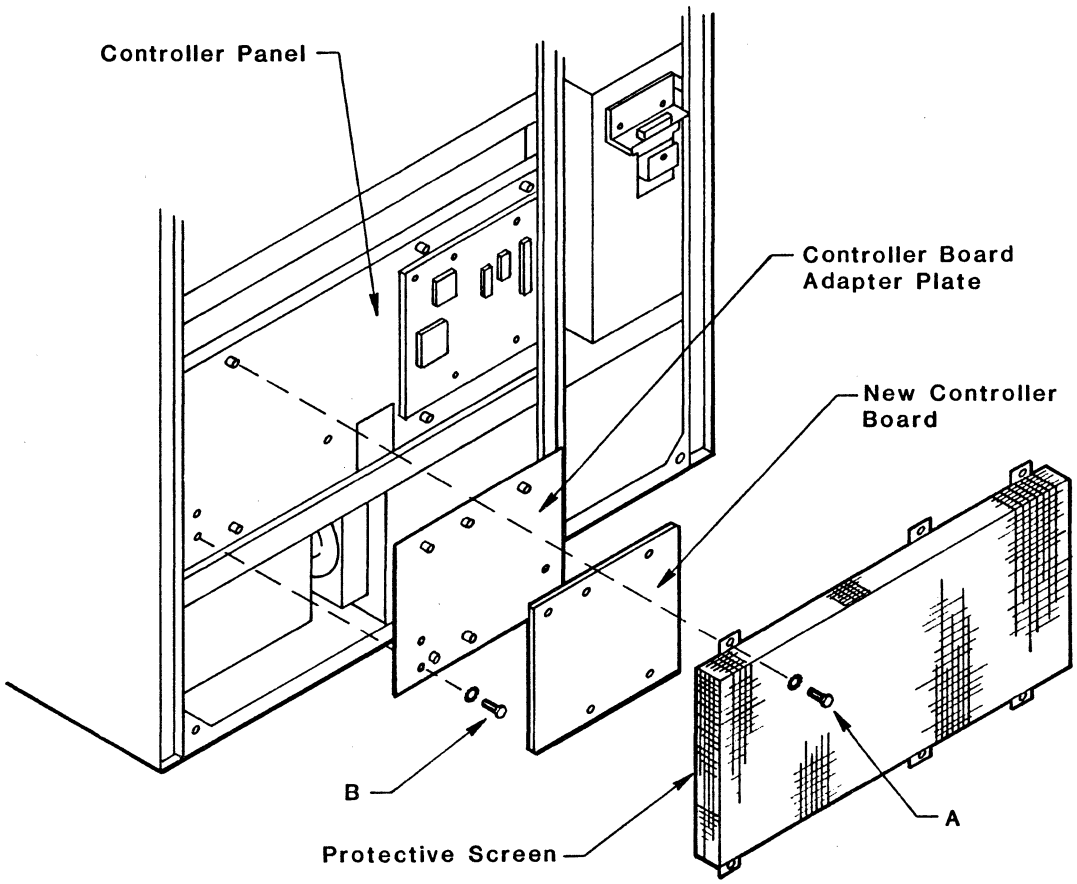



**Figure 3-14.** Adding Another Controller Board

## Expansion Cabinet Assembly/Disassembly

This section describes the assembly and disassembly of your P/90 expansion cabinet. The main components of your P/90 expansion cabinet are:

| | |
|---|---|
| Disk Drive Unit 0 | Disk Drive Unit 1 |
| Tape Drive | Tape Drive Controller |
| Media Tray | Circuit Breaker |
| Power Cord | Power Supply(s) |
| SCSI Controller | SCSI Interface Connectors |
| Fans | Fan Filters |

Figures 3-15 and 3-16 illustrate the P/90 expansion cabinet components.

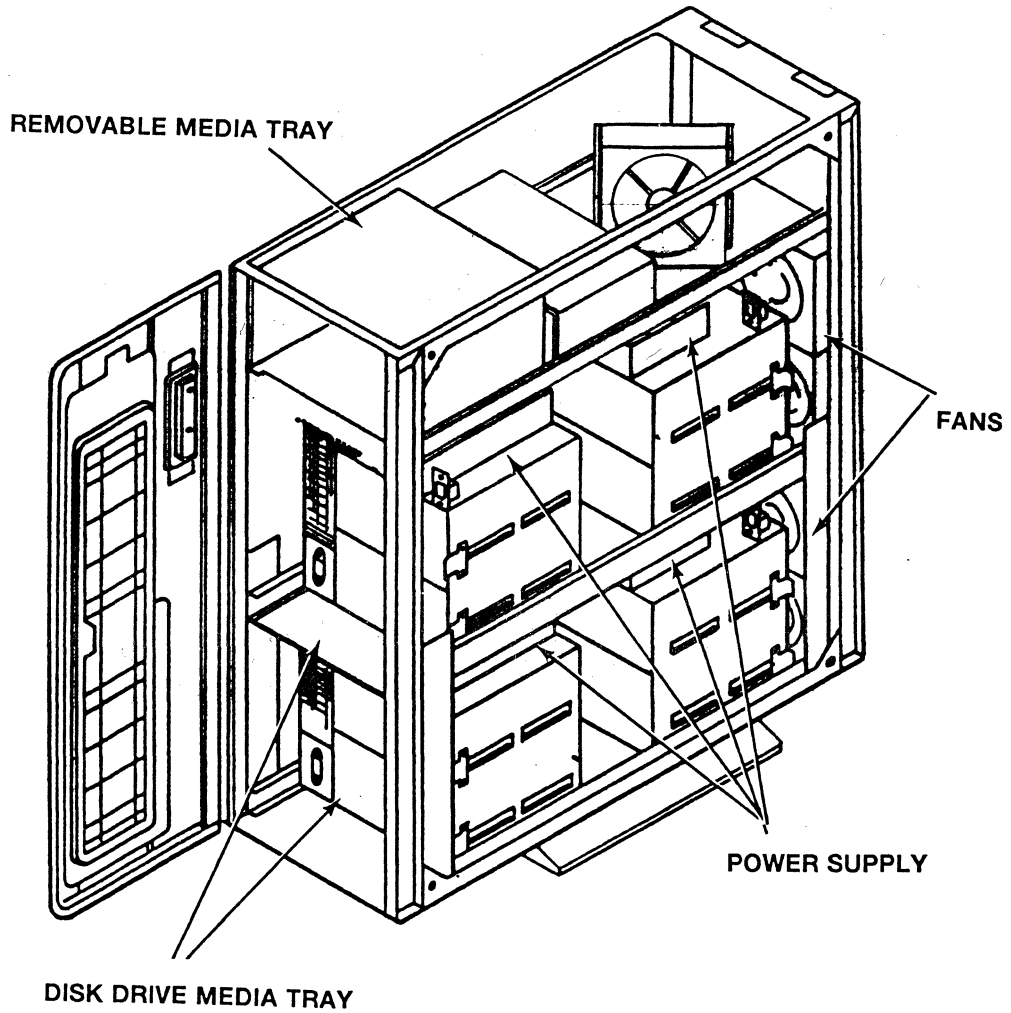



**Figure 3-15.** P/90 Expansion Cabinet Components

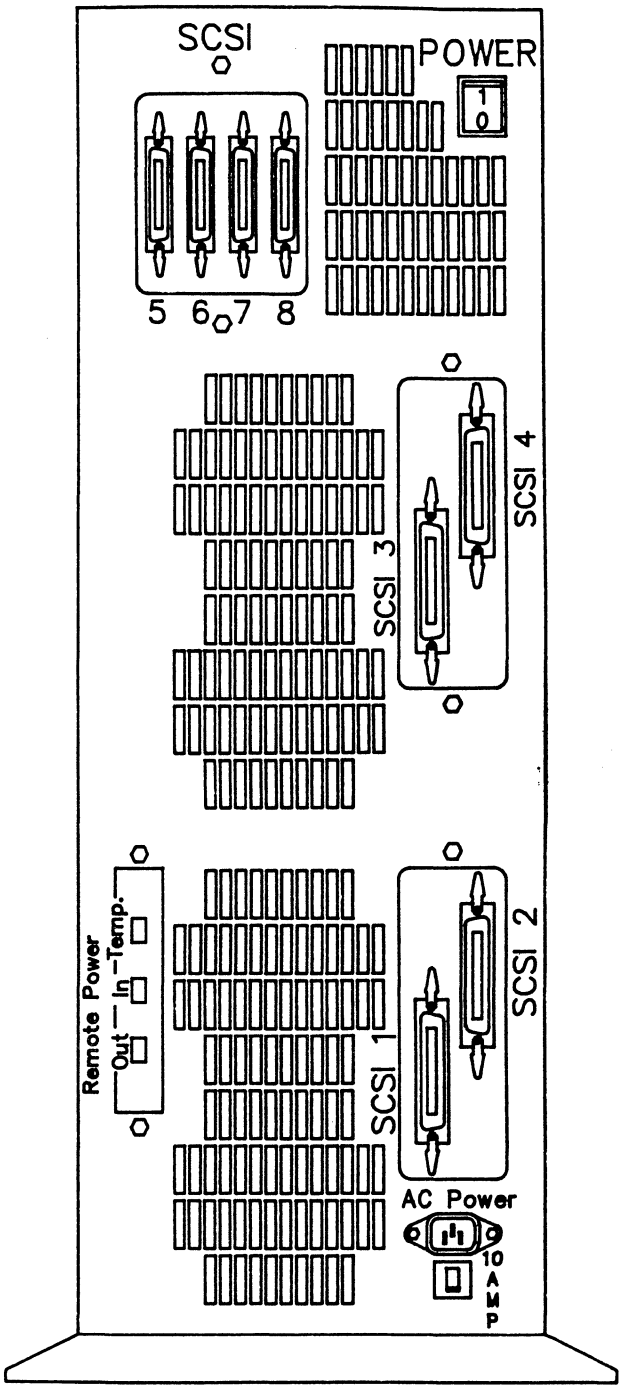



**Figure 3-16.** P/90 Expansion Cabinet Rear View

## Removing Your System's Exteriors

Most of the assembly and disassembly procedures do not require the removal of the expansion cabinet exterior sides. However, you must remove the top cover from your expansion cabinet to access and remove the top ("removable") media tray. Removing your system's exteriors requires two steps: remove the top cover and pull away the sides. Refer to Figure 3-17.

To remove the exterior covers from your system:

1. Power down your system. See your *Sys5 Administrator's Handbook*.
2. Turn the P/90 main cabinet keyswitch to the OFF position.
3. Turn off the power switch on the expansion cabinet.
4. Disconnect the systems' power cables.
5. Remove the two upper screws on the rear panel of your system.
6. Lift the rear of the top cover from the cabinet and pull.
7. Store the top cover in a safe place.
8. Slide each of the side covers up to disengage them from the cabinet.
9. Store the sides is a safe place.

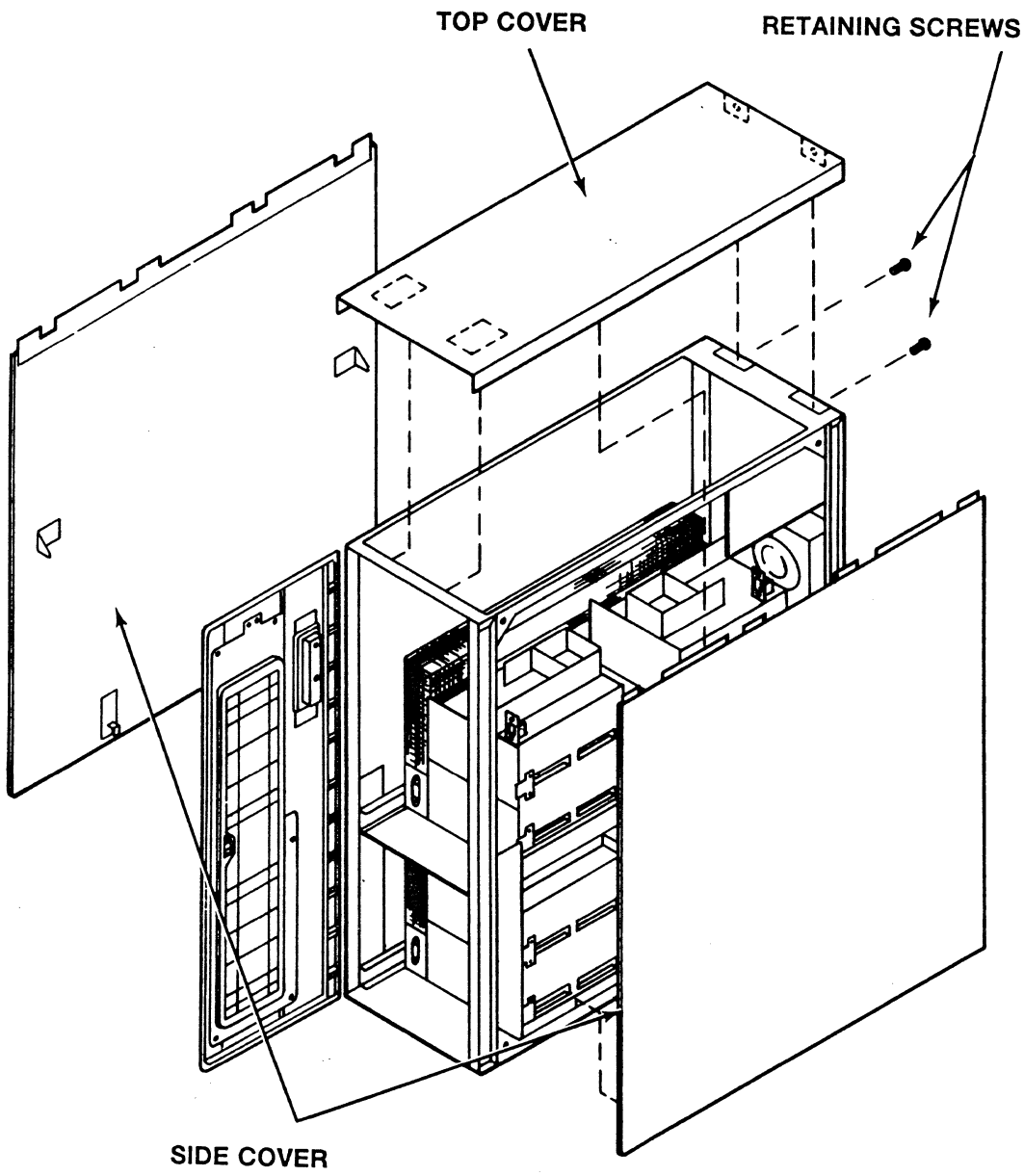



**Figure 3-17.** Removing Your System's Exteriors

## Removing Your System's Front Panel

Your P/90 expansion cabinet is designed such that the hard disk drive media trays can be removed through the front access panel. The only equipment required to remove this panel is a small phillips screwdriver. Refer to Figure 3-18.

To remove the front panel:

1. Power down your system. See your *Sys5 Administrator's Handbook.*
2. Turn the P/90 main cabinet keyswitch to the OFF position.
3. Turn off the power switch on your expansion cabinet.
4. Disconnect the systems' power cables.
5. Remove the two screws from the bottom of the front access panel.
6. Remove the three screws along each side of the front access panel.
7. Gently pull the front panel from the system.

**[ NOTE ]** The +5V power indicator cable is routed through a cutout on the left side of the access panel. Be very careful not to snag the cable on the sharp edges of this cutout as you remove the access panel.

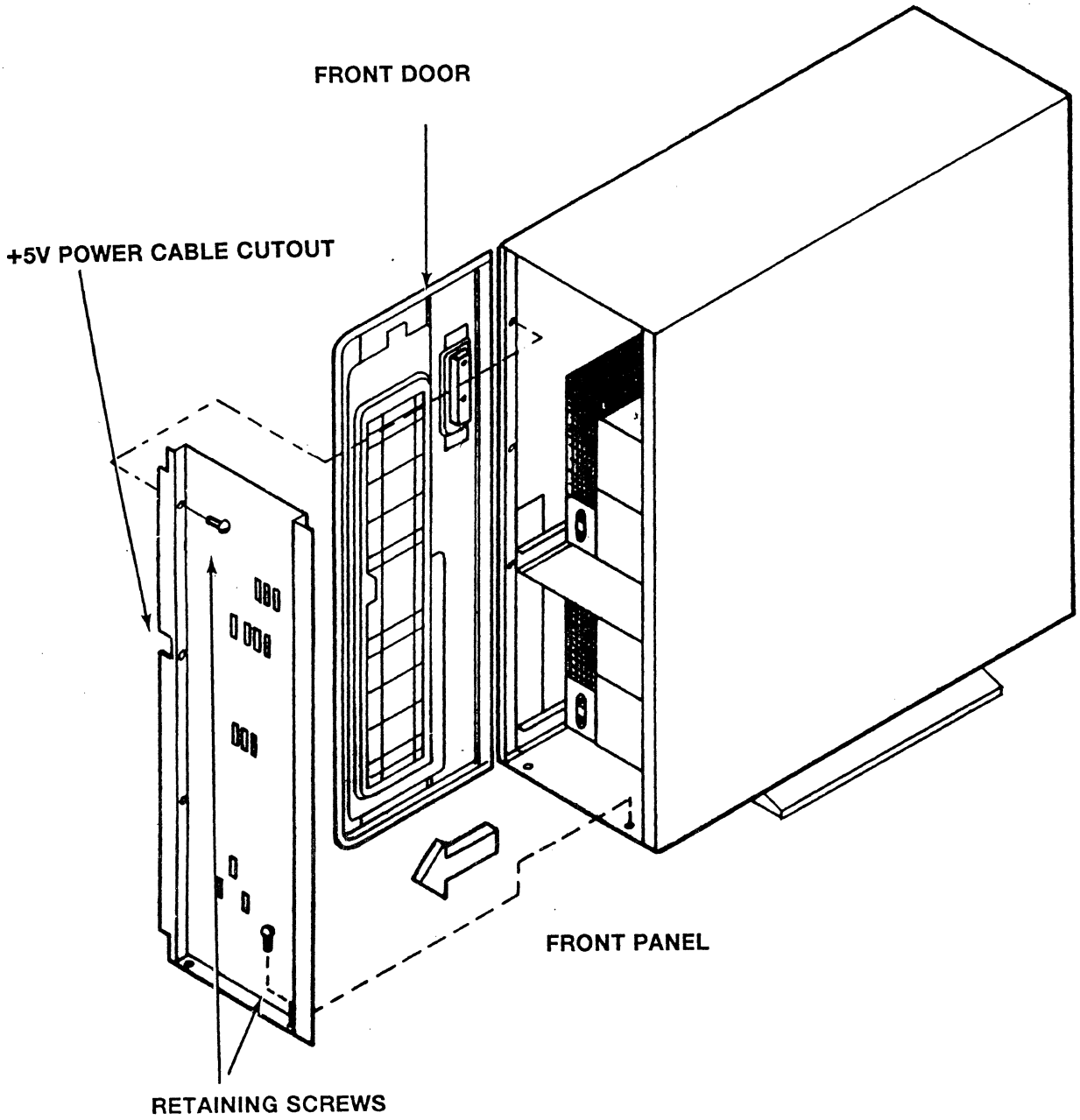



**Figure 3-18.** Removal of the System's Front Panel

## Removing Your Expansion Cabinet's Media Tray

You must first remove the media tray from the expansion cabinet in order to access the drives, controllers, and power supplies for removal/replacement. The media trays are removed from the expansion cabinet with all of the drives, controllers, power supplies attached. This section contains two separate procedures: (1) removing a disk drive media tray; (2) removing the upper "removable" media tray.

To remove a hard disk media tray, you must first open the front door, remove the front access panel, remove the media tray retaining screws from the rear panel, and remove the front retaining brackets for the tray. The only equipment required is a small phillips screwdriver. Refer to Figure 3-19.

To remove a hard disk media tray from the expansion cabinet:

1. Power down your system. See your *Sys5 Administrator's Handbook*.
2. Turn the P/90 main cabinet keyswitch to the OFF position.
3. Turn off the power switch on your expansion cabinet.
4. Disconnect the systems' power cables.
5. Remove the front access panel.
6. Remove the two media tray retaining brackets.
7. Remove the two retaining screws (located above and below the tray's recessed SCSI port) from the rear panel.
8. Unplug the AC power plug from the front of the media tray.
9. Pull the tray out of the expansion cabinet.
10. Gently place the tray on a flat surface.

**[ NOTE ]** The weight of a media tray with two drives is 30 pounds. The weight of a media tray with four drives is 50 pounds. Be careful when you pull a tray out of the cabinet.

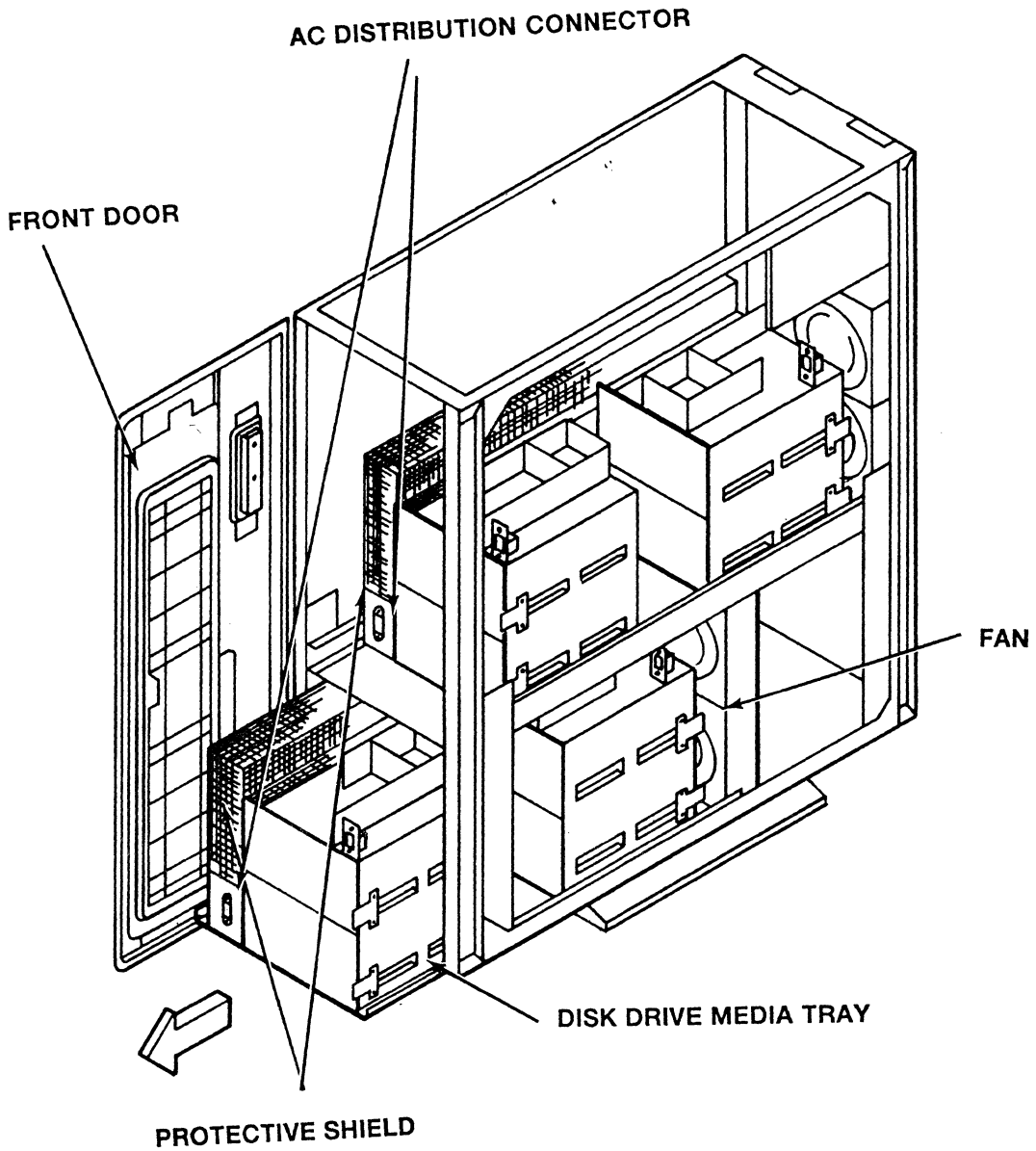



**Figure 3-19.** Removal of an Expansion Cabinet Tray

To remove the upper "removable media" tray, you must open the front door, remove the front access panel, remove the expansion cabinet top cover, remove the rear panel retaining screws, and remove the front retaining brackets for the tray. The only equipment required is a small phillips screwdriver.

To remove the upper media tray from the expansion cabinet:

1. Power down your system. See your *Sys5 Administrator's Handbook*.
2. Turn the P/90 main cabinet keyswitch to the OFF position.
3. Turn off the power switch on your expansion cabinet.
4. Disconnect the systems' power cables.
5. Remove the expansion cabinet front panel (see the section *Removing Your System's Front Panel*).
6. Remove the top cover.
7. Unplug the molex connector supplying power from the AC distribution panel (located at lower left of tray).
8. Remove the two media tray retaining bracket screws.
9. Remove the two retaining screws (located above and below the upper recessed SCSI port) from the rear panel.
10. Pull the tray out of the expansion cabinet.
11. Gently place the tray on a flat surface.

**[ NOTE ]** The weight of the removable media can be as much as 34 pounds. Take care when pulling the tray out of the expansion cabinet.

## Removing Your Hard Disk Drive

Each media tray (excluding the top removable media tray) can have four hard disk drives installed. The two disk drive media trays are identical with respect to removing the drives. To remove a hard disk drive you must remove the media tray.

To remove a disk drive:

1. Remove the expansion cabinet media tray (see the section *Removing Your System's Expansion Cabinet Media Tray* and follow the 10 steps).
2. Disconnect all cables (power, data, signal) attached to the disk drive.
3. If you are removing one of the rear drives, you must remove the fan assembly from the media tray. Remove the two retaining screws from the bottom of the tray.

**[ CAUTION ]** The fans are loose in this assembly. They can be dropped and damaged if care is not exercised at this time.

4. Depress the two clips at the front sides of the disk drive to be removed and gently pull the drive from the media tray. See NOTE below.
5. Remove the two non-skid slides from the sides of the disk drive. Note, the slides are loose and will fall free when the drive is removed.
6. Reverse these steps to install the disk drive.

**[ NOTE ]** Figure 3-20 illustrates the positions and direction in removing a disk drive from an expansion cabinet tray.

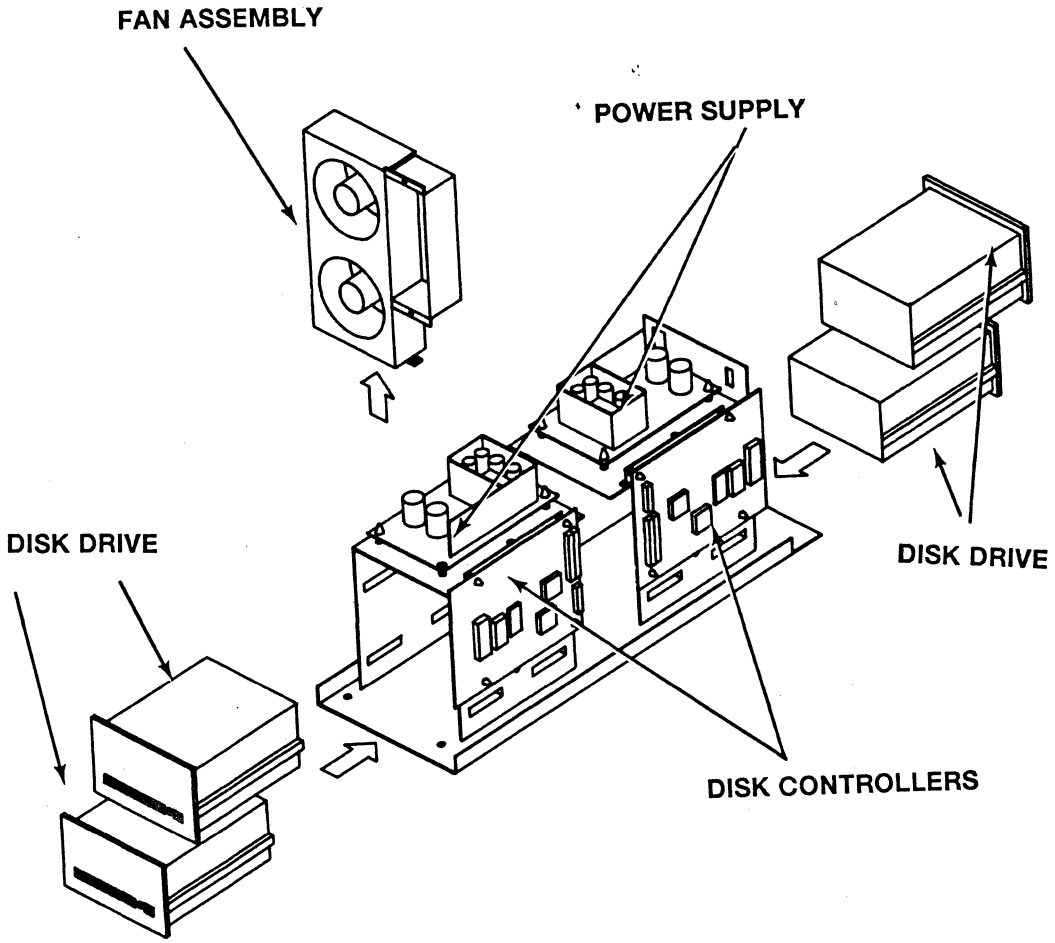



**Figure 3-20.** Removing Your Hard Disk Drive

## Disk Drive Controller Removal

As many as four disk drive controllers can be installed in a P/90 expansion cabinet, two each on a disk drive media tray (excluding the top removable media tray).

To remove a disk drive controller, you must first remove the media tray from the expansion cabinet, and the protective shield on the media tray. Refer to Figure 3-21.

To remove a disk drive controller:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the P/90 main cabinet keyswitch to the OFF position.
3. Turn off the power switch on your expansion cabinet.
4. Disconnect the systems' power cords.
5. Remove the media tray from the expansion cabinet (see the section *Removing Your Expansion Cabinet's Media Tray* in this chapter).
6. Remove the four retaining screws securing the protective shield to the tray. Remove the shield from the tray.
7. Locate the disk drive controller(s).
8. Disconnect all attached cables.
9. Gently depress the plastic standoffs and remove the board.

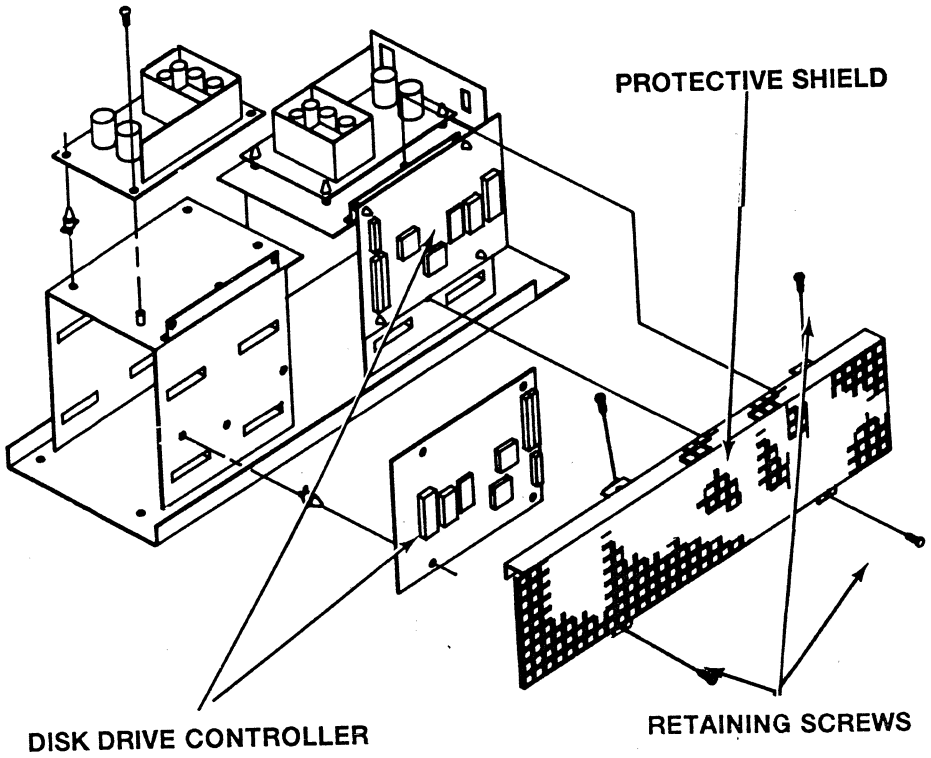



**Figure 3-21.** Removing a Disk Drive Controller

## Power Supply Removal

The power supply(s) for the disk drive media tray is located on top of the drive enclosure. To remove a power supply, you must first remove the media tray. Refer to Figure 3-22.

To remove a power supply:

1. Power down your system (see your *Sys5 Administrator's Handbook*).
2. Turn the P/90 main cabinet keyswitch to the OFF position.
3. Turn off the power switch on your expansion cabinet.
4. Disconnect the systems' power cords.
5. Remove the media tray (see the section *Removing Your Expansion Cabinet's Media Tray* in this chapter).
6. Locate the power supply.
7. Remove any attaching cables.
8. Remove the grounding screw from the remaining standoff.
9. Gently depress the three plastic standoffs securing the power supply board to the metallic plate.
10. The power supply is now free.

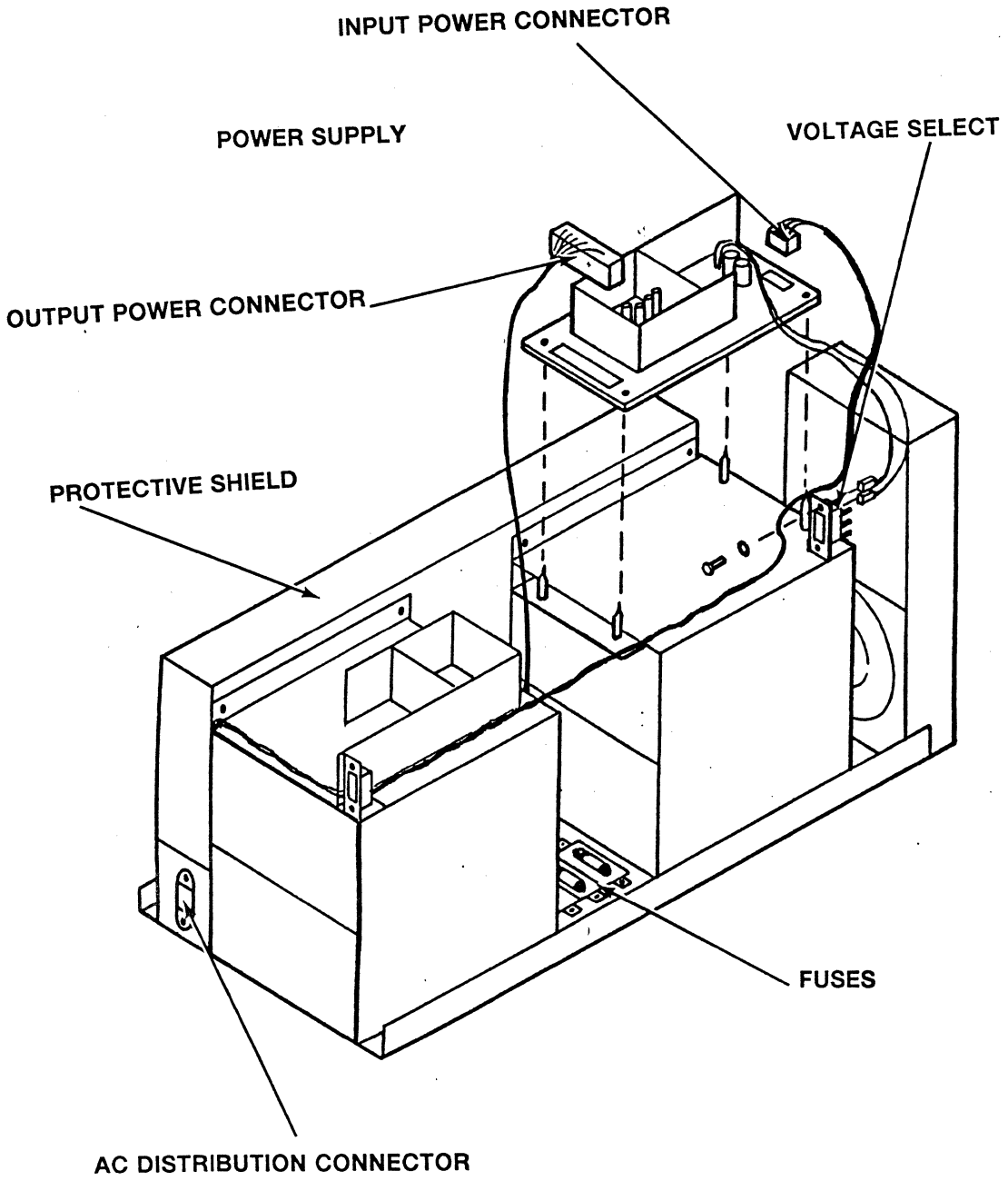



**Figure 3-22.** Removing the Power Supply

# REFERENCE INFORMATION

This chapter lists general information regarding your P/90 such as connector pinouts, VMEbus signal references, reference information for the Fujitsu† and Maxtor‡ disk drives, SCSI controller configuration, and power supply voltage adjustments. Specific information about individual boards is located in *Chapter 5, Board Descriptions*.

## Indicators

The P/90 cabinets have an exterior power indicator light located at the upper left corner (see Figure 4-1). The main cabinet LED lights to indicate +5V is being received from the arbiter. The expansion cabinet LED lights to indicate +5V is being received from the main cabinet.

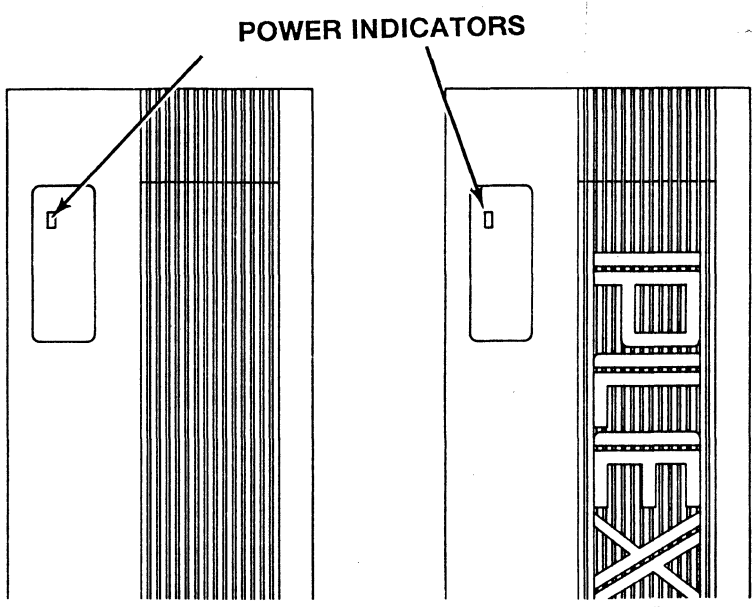



**Figure 4-1.** P/90 Cabinet Power Indicators

† Fujitsu is a register trademark of Fujitsu Limited

‡ Maxtor is a register trademark of Maxtor Corporation

## Backplane

This sections deals with the connectors of the VCP, the function of each, and their pinouts. Table 4-1 lists the connectors and function.

**Table 4-1.** P/90 Connectors

| Connector | Function | Table |
|---|---|---|
| J1.(A,B,C) Connector | VMEbus Interface | 4-2 |
| J2.(A,B,C) Connector | VMEbus Interface | 4-3 |
| J3.(A,B,C) Connector | Plexus Proprietary Bus | 4-4 |

**Table 4-2.** J1.(A,B,C) VMEbus Interface

| Pin Number | Signal Name | Pin Number | Signal Name |
|---|---|---|---|
| J1A.01 | D00 | J1A.02 | D01 |
| J1A.03 | D02 | J1A.04 | D03 |
| J1A.05 | D04 | J1A.06 | D05 |
| J1A.07 | D06 | J1A.08 | D07 |
| J1A.09 | GND | J1A.10 | SYSCLK |
| J1A.11 | GND | J1A.12 | DS1* |
| J1A.13 | DS0* | J1A.14 | WRITE* |
| J1A.15 | GND | J1A.16 | DTACK* |
| J1A.17 | GND | J1A.18 | AS* |
| J1A.19 | GND | J1A.20 | IACK* |
| J1A.21 | IACKIN* | J1A.22 | IACKOUT* |
| J1A.23 | AM4 | J1A.24 | A07 |
| J1A.25 | A06 | J1A.26 | A05 |
| J1A.27 | A04 | J1A.28 | A03 |
| J1A.29 | A02 | J1A.30 | A01 |
| J1A.31 | -12V | J1A.32 | +5V |
| J1B.01 | BBSY* | J1B.02 | BCLR* |
| J1B.03 | ACFAIL* | J1B.04 | BG0IN* |
| J1B.05 | BG0OUT* | J1B.06 | BG1IN* |
| J1B.07 | BG1OUT* | J1B.08 | BG2IN* |
| J1B.09 | BG2OUT* | J1B.10 | BG3IN* |
| J1B.11 | BG3OUT* | J1B.12 | BR0* |
| J1B.13 | BR1* | J1B.14 | BR2* |
| J1B.15 | BR3* | J1B.16 | AM0 |
| J1B.17 | AM1 | J1B.18 | AM2 |
| J1B.19 | AM3 | J1B.20 | GND |
| J1B.21 | SERCLK(1) | J1B.22 | SERDAT*(1) |
| J1B.23 | GND | J1B.24 | IRQ7* |
| J1B.25 | IRQ6* | J1B.26 | IRQ5* |
| J1B.27 | IRQ4* | J1B.28 | IRQ3* |
| J1B.29 | IRQ2* | J1B.30 | IRQ1* |
| J1B.30 | +5VSTDBY | J1B.32 | +5V |

| Pin Number | Signal Name | Pin Number | Signal Name |
|---|---|---|---|
| J1C.01 | D08 | J1C.02 | D09 |
| J1C.03 | D10 | J1C.04 | D11 |
| J1C.05 | D12 | J1C.06 | D13 |
| J1C.07 | D14 | J1C.08 | D15 |
| J1C.09 | GND | J1C.10 | SYSFAIL* |
| J1C.11 | BERR* | J1C.12 | SYSRESET* |
| J1C.13 | LWORD* | J1C.14 | AM5 |
| J1C.15 | A23 | J1C.16 | A22 |
| J1C.17 | A21 | J1C.18 | A20 |
| J1C.19 | A19 | J1C.20 | A18 |
| J1C.21 | A17 | J1C.22 | A16 |
| J1C.23 | A15 | J1C.24 | A14 |
| J1C.25 | A13 | J1C.26 | A12 |
| J1C.27 | A11 | J1C.28 | A10 |
| J1C.29 | A09 | J1C.20 | A08 |
| J1C.31 | +12V | J1C.32 | +5V |

**Table 4-3.** J2.(A.B.C) VMEbus Interface

| Pin Number | Signal Name | Pin Number | Signal Name |
|---|---|---|---|
| J2A.01 | (NOT BUSSED) | J2A.02 | (NOT BUSSED) |
| J2A.03 | (NOT BUSSED) | J2A.04 | (NOT BUSSED) |
| J2A.05 | (NOT BUSSED) | J2A.06 | (NOT BUSSED) |
| J2A.07 | (NOT BUSSED) | J2A.08 | (NOT BUSSED) |
| J2A.09 | (NOT BUSSED) | J2A.10 | (NOT BUSSED) |
| J2A.11 | (NOT BUSSED) | J2A.12 | (NOT BUSSED) |
| J2A.13 | (NOT BUSSED) | J2A.14 | (NOT BUSSED) |
| J2A.15 | (NOT BUSSED) | J2A.16 | (NOT BUSSED) |
| J2A.17 | (NOT BUSSED) | J2A.18 | (NOT BUSSED) |
| J2A.19 | (NOT BUSSED) | J2A.20 | (NOT BUSSED) |
| J2A.21 | (NOT BUSSED) | J2A.22 | (NOT BUSSED) |
| J2A.23 | (NOT BUSSED) | J2A.24 | (NOT BUSSED) |
| J2A.25 | (NOT BUSSED) | J2A.26 | (NOT BUSSED) |
| J2A.27 | (NOT BUSSED) | J2A.28 | (NOT BUSSED) |
| J2A.29 | (NOT BUSSED) | J2A.31 | (NOT BUSSED) |
| J2A.32 | (NOT BUSSED) | | |
| J2B.01 | +5V | J2B.02 | GND |
| J2B.03 | RESERVED | J2B.04 | A24 |
| J2B.05 | A25 | J2B.06 | A26 |
| J2B.07 | A27 | J2B.08 | A28 |
| J2B.09 | A29 | J2B.10 | A30 |
| J2B.11 | A31 | J2B.12 | GND |
| J2B.13 | +5V | J2B.14 | D16 |
| J2B.15 | D17 | J2B.16 | D18 |
| J2B.17 | D19 | J2B.18 | D20 |
| J2B.19 | D21 | J2B.20 | D22 |
| J2B.21 | D23 | J2B.22 | GND |
| J2B.23 | D24 | J2B.24 | D25 |
| J2B.25 | D26 | J2B.26 | D27 |
| J2B.27 | D28 | J2B.28 | D29 |
| J2B.29 | D20 | J2B.20 | D31 |
| J2B.31 | GND | J2B.32 | +5V |

| Pin Number | Signal Name | Pin Number | Signal Name |
|---|---|---|---|
| J2C.01 | (NOT BUSSED) | J2C.02 | (NOT BUSSED) |
| J2C.03 | (NOT BUSSED) | J2C.04 | (NOT BUSSED) |
| J2C.05 | (NOT BUSSED) | J2C.06 | (NOT BUSSED) |
| J2C.07 | (NOT BUSSED) | J2C.08 | (NOT BUSSED) |
| J2C.09 | (NOT BUSSED) | J2C.10 | (NOT BUSSED) |
| J2C.11 | (NOT BUSSED) | J2C.12 | (NOT BUSSED) |
| J2C.13 | (NOT BUSSED) | J2C.14 | (NOT BUSSED) |
| J2C.15 | (NOT BUSSED) | J2C.16 | (NOT BUSSED) |
| J2C.17 | (NOT BUSSED) | J2C.18 | (NOT BUSSED) |
| J2C.19 | (NOT BUSSED) | J2C.20 | (NOT BUSSED) |
| J2C.21 | (NOT BUSSED) | J2C.22 | (NOT BUSSED) |
| J2C.23 | (NOT BUSSED) | J2C.24 | (NOT BUSSED) |
| J2C.25 | (NOT BUSSED) | J2C.26 | (NOT BUSSED) |
| J2C.27 | (NOT BUSSED) | J2C.28 | (NOT BUSSED) |
| J2C.29 | (NOT BUSSED) | J2C.20 | (NOT BUSSED) |
| J2C.31 | (NOT BUSSED) | J2C.32 | (NOT BUSSED) |

**Table 4-4.** J3.(A,B,C) Plexus Proprietary Interface

| Pin Number | Signal Name | Pin Number | Signal Name |
|---|---|---|---|
| J3A.01 | Not | Defined J3-A.02 | Not Defined |
| J3A.03 | CPD03 | J3-A.04 | CPD06 |
| J3A.05 | CPD08 | J3-A.06 | CPD11 |
| J3A.07 | CPD14 | J3-A.08 | CPD16 |
| J3A.09 | GND | J3-A.10 | CPD20 |
| J3A.11 | GND | J3-A.12 | CPD24 |
| J3A.13 | CPD27 | J3-A.14 | CPD30 |
| J3A.15 | GND | J3-A.16 | CPADD02 |
| J3A.17 | GND | J3-A.18 | CPADD07 |
| J3A.19 | GND | J3-A.20 | CPADD11 |
| J3A.21 | CPADD13 | J3-A.22 | GND |
| J3A.23 | CPADD18 | J3-A.24 | CPADD20 |
| J3A.25 | CPADD23 | J3-A.26 | CPADD25 |
| J3A.27 | GND | J3-A.28 | CREQ– |
| J3A.29 | MREAD– | J3-A.30 | MSBE– |
| J3A.31 | +5V | J3-A.32 | +5V |
| J3B.01 | Not | Connected | J3B.02 |
| J3B.03 | CPD04 | J3B.04 | CPD07 |
| J3B.05 | CPD09 | J3B.06 | CPD12 |
| J3B.07 | CPD15 | J3B.08 | CPD17 |
| J3B.09 | CPD19 | J3B.10 | CPD21 |
| J3B.11 | CPD23 | J3B.12 | CPD25 |
| J3B.13 | CPD28 | J3B.14 | CPD31 |
| J3B.15 | MEMCLK | J3B.16 | CPADD02 |
| J3B.17 | CPADD05 | J3B.18 | GND |
| J3B.19 | CPADD09 | J3B.20 | GND |
| J3B.21 | CPADD14 | J3B.22 | CPADD16 |
| J3B.23 | GND | J3B.24 | CPADD21 |
| J3B.25 | GND | J3B.26 | CPADD26 |
| J3B.27 | MSTRB– | J3B.28 | DREQ– |
| J3B.29 | MCMPLT– | J3B.30 | MMBE– |
| J3B.31 | +5V | J3B.32 | +5V |

| Pin Number | Signal Name | Pin Number | Signal Name |
|---|---|---|---|
| J3C.01 | CPD00 | J3C.02 | CPD02 |
| J3C.03 | CPD05 | J3C.04 | GND |
| J3C.05 | CPD10 | J3C.06 | CPD13 |
| J3C.07 | GND | J3C.08 | CPD18 |
| J3C.09 | GND | J3C.10 | CPD22 |
| J3C.11 | GND | J3C.12 | CPD26 |
| J3C.13 | CPD29 | J3C.14 | GND |
| J3C.15 | GND | J3C.16 | CPADD04 |
| J3C.17 | CPADD06 | J3C.18 | CPADD08 |
| J3C.19 | CPADD10 | J3C.20 | CPADD12 |
| J3C.21 | CPADD15 | J3C.22 | CPADD17 |
| J3C.23 | CPADD18 | J3C.24 | CPADD22 |
| J3C.25 | CPADD24 | J3C.26 | CPADD27 |
| J3C.27 | GND | J3C.28 | GND |
| J3C.29 | GND | J3C.30 | GND |
| J3C.31 | +5V | J3C.32 | +5V |

## Test Points

Test Points for the P/90 are located on the bus arbiter board (slot 0). See Figure 4-2 for the locations of the test points on the bus arbiter board. For more information regarding the test points, see *Chapter Five, Board Descriptions*.

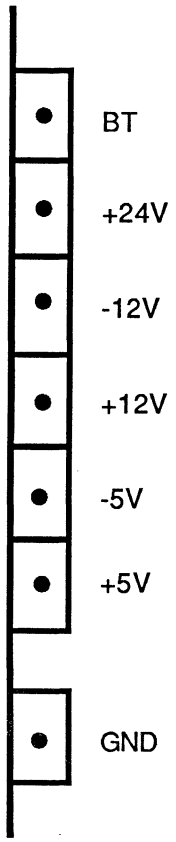



**Figure 4-2.** P/90 Test Point Locations (Arbiter Board)

## Hard Disk Controller Board

Tables 4-5 and 4-6 list the switch setting of the hard disk controller boards in both cabinets. Controller 0 is set to SCSI ID 5; Controller 1 is set to SCSI ID 6. In the expansion cabinet, each hard disk media tray can have two controllers. The forward controller is set to SCSI ID 6; the rear controller is set to SCSI ID 5. Figure 4-3 illustrates the hard disk controller.

**Table 4-5.** Disk Controller Switch Setting (F2)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | SCSI ID |
|---|---|---|---|---|---|---|---|---|
| OFF | OFF | ON | ON | OFF | ON | ON | OFF | 5 |
| OFF | OFF | ON | ON | OFF | ON | OFF | ON | 6 |

**Table 4-6.** Disk Controller Switch Setting (E9)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| ON | ON | ON | OFF | ON | OFF | OFF | OFF |

## Cartridge Tape Controller Board

Tables 4-7 and 4-8 list the switch settings of the 1/4-inch cartridge tape controller board. Figure 4-4 illustrates the tape controller board.

**Table 4-7.** Tape Controller Switch Settings (U53)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| CLOSED | CLOSED | OPEN | CLOSED | OPEN | OPEN | CLOSED | OPEN |
| OPEN = UP, CLOSE = DOWN | | | | | | | |

**Table 4-8.** Tape Controller Switch Settings (U20)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| OPEN | CLOSED | CLOSED | CLOSED | CLOSED | CLOSED | OPEN | OPEN |
| OPEN = UP, CLOSE = DOWN | | | | | | | |

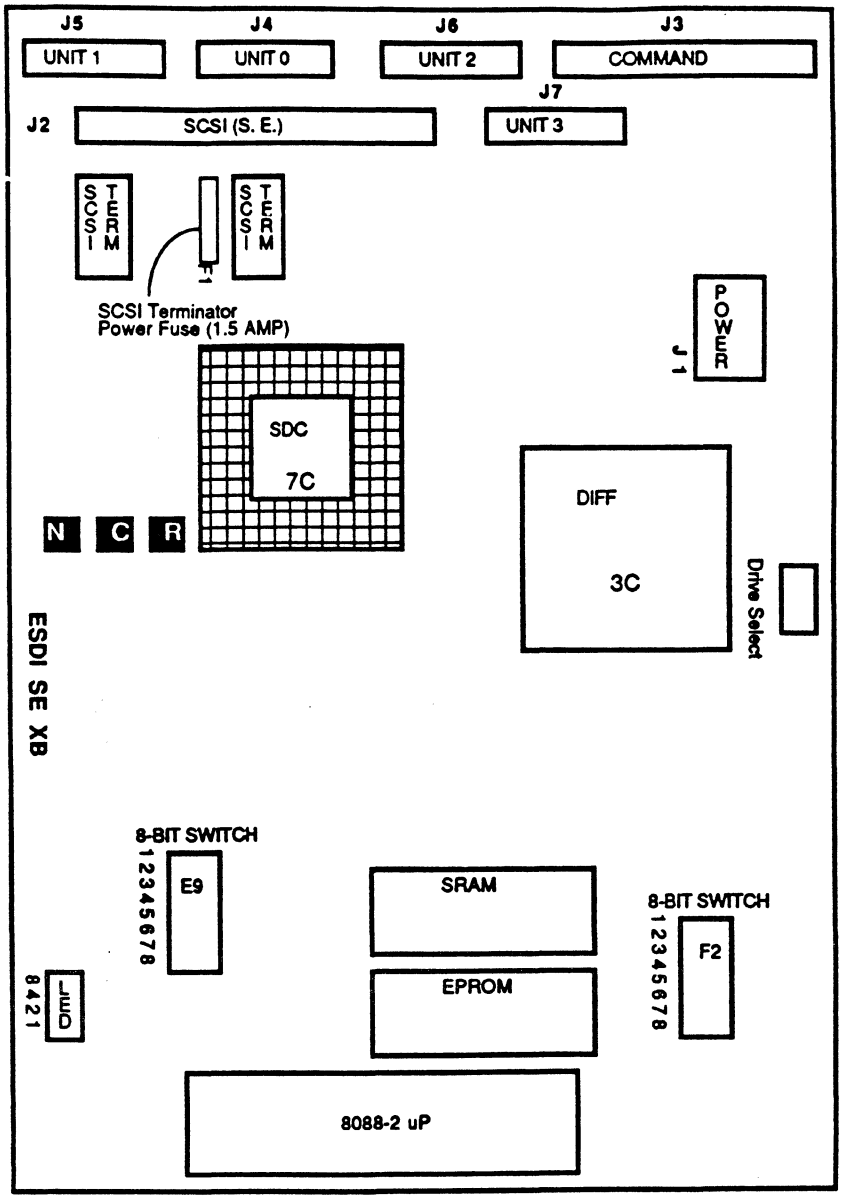



**Figure 4-3.** Hard Disk Controller

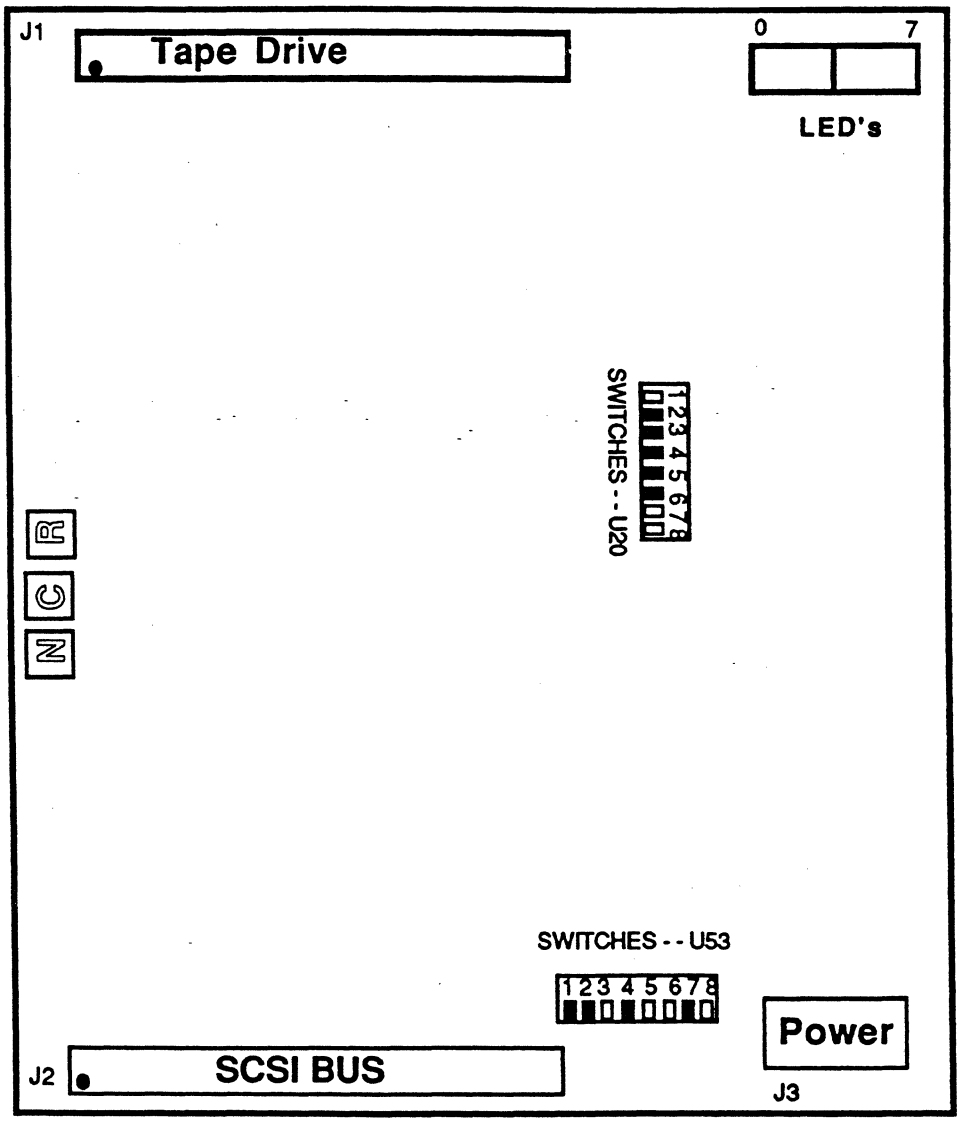



**Figure 4-4.** Tape Controller Board

## 135 Megabyte Fujitsu Disk Drive

Tables 4-9 through 4-11 list the jumper settings of the 135 Megabyte disk drive.

**Table 4-9.** 135 Megabyte Disk Drive Jumper CNH5

| Jumper | Settings |
|---|---|
| 11-12 | OPEN |
| 13-14 | SHORT |
| 15-16 | SHORT |

**Table 4-10.** 135 Megabyte Disk Drive Jumper CNH7

| Jumper | Setting |
|---|---|
| 1-2 | SHORT |
| 3-4 | SHORT |
| 5-6 | OPEN |
| 7-8 | SHORT |
| 9-10 | OPEN |
| 11-12 | SHORT |
| 13-14 | OPEN |
| 15-16 | OPEN |

**Table 4-11.** 135 Megabyte Disk Drive Jumper CNH6

| Jumper | Unit 0 | Unit 1 |
|---|---|---|
| 1-2 | SHORT | OPEN |
| 3-4 | OPEN | SHORT |
| 5-6 | OPEN | OPEN |
| 7-8 | OPEN | OPEN |
| 9-10 | OPEN | OPEN |
| 11-12 | OPEN | OPEN |
| 13-14 | OPEN | OPEN |
| 15-16 | OPEN | OPEN |

## Disk Drive Fault Lamps (LEDs)

Two types of LEDs are used on the disk drive:

Ready — The ready LED is ON when the drive is accepting commands and is selected. It is OFF during initial seeks and when commands are being executed.

Fault — Creates a binary four-bit fault code. See Table 4-12.

**Table 4-12.** Disk Drive Fault Codes

| 3 | 2 | 1 | 0 | State |
|---|---|---|---|---|
| X | X | X | O | Spindle motor revolutions fewer than 90% of standard |
| X | X | O | X | VCM over current |
| X | X | O | O | Initial seek time out |
| X | O | X | X | Write command during seek operation |
| X | O | X | O | +12V/+5V, less than 80% of standard |
| X | O | O | X | Offtrack command during write operation |
| X | O | O | O | Write echo check |
| O | X | X | X | Two or more head ICs selected during write operation |
| O | X | X | O | Seek time out |
| O | X | O | X | Guard band detection during normal seek operation |
| O | X | O | O | Guard band detection in linear mode |
| O | O | X | X | Overshoot check |
| O | O | X | O | Seek fault with seek command |
| O | O | O | X | Head load signal command |
| O | O | O | O | Read and write simultaneously issued or other miscellaneous faults |
| F | F | F | O | Invalid or unimplemented command fault |
| F | F | O | F | Interface fault |
| F | F | O | O | Command data parity fault |

O = ON
X = OFF
F = Flashing

## 300 Megabyte Fujitsu Disk Drive

Tables 4-13 through 4-15 list the jumper settings for the 300 Megabyte disk drive.

**Table 4-13.** 300 Megabyte Disk Drive Jumper CNH5

| Jumper | Settings |
|---|---|
| 11-12 | OPEN |
| 13-14 | SHORT |
| 15-16 | SHORT |

**Table 4-14.** 300 Megabyte Disk Drive Jumper CNH7

| Jumper | Setting |
|---|---|
| 1-2 | SHORT |
| 3-4 | SHORT |
| 5-6 | OPEN |
| 7-8 | SHORT |
| 9-10 | OPEN |
| 11-12 | SHORT |
| 13-14 | OPEN |
| 15-16 | SHORT |

**Table 4-15.** 300 Megabyte Disk Drive Jumper CNH6

| Jumper | Unit 0 | Unit 1 |
|---|---|---|
| 1-2 | SHORT | OPEN |
| 3-4 | OPEN | SHORT |
| 5-6 | OPEN | OPEN |
| 7-8 | OPEN | OPEN |
| 9-10 | OPEN | OPEN |
| 11-12 | OPEN | OPEN |
| 13-14 | OPEN | OPEN |
| 15-16 | OPEN | OPEN |

## Disk Drive Fault Lamps (LEDs)

Two types of LEDs are used on the disk drive:

Ready — The ready LED is ON when the drive is accepting commands and is selected. It is OFF during initial seeks and when commands are being executed.

Fault — Creates a binary four-bit fault code. See Table 4-16.

**Table 4-16.** Disk Drive Fault Codes

| 3 | 2 | 1 | 0 | State |
|---|---|---|---|---|
| X | X | X | O | Spindle motor revolutions fewer than 90% of standard |
| X | X | O | X | VCM over current |
| X | X | O | O | Initial seek time out |
| X | O | X | X | Write command during seek operation |
| X | O | X | O | +12V/+5V, less than 80% of standard |
| X | O | O | X | Offtrack command during write operation |
| X | O | O | O | Write echo check |
| O | X | X | X | Two or more head ICs selected during write operation |
| O | X | X | O | Seek time out |
| O | X | O | X | Guard band detection during normal seek operation |
| O | X | O | O | Guard band detection in linear mode |
| O | O | X | X | Overshoot check |
| O | O | X | O | Seek fault with seek command |
| O | O | O | X | Head load signal command |
| O | O | O | O | Read and write simultaneously issued or other miscellaneous faults |
| F | F | F | O | Invalid or unimplemented command fault |
| F | F | O | F | Interface fault |
| F | F | O | O | Command data parity fault |

O = ON
X = OFF
F = Flashing

## 300 Megabyte Maxtor Disk Drive

Tables 4-17 and 4-18 list the jumper settings for the 300 Megabyte disk drive.

**Table 4-17.** 300 Megabyte Disk Drive Jumpers JP16 - JP31

| Jumper | Setting |
|---|---|
| JP16 | SHORT |
| JP17 | SHORT |
| JP18 | SHORT |
| JP19 | OPEN |
| JP20 | OPEN |
| JP21 | SHORT |
| JP22 | SHORT |
| JP23 | OPEN |
| JP24 | OPEN |
| JP25 | SHORT |
| JP26 | OPEN |
| JP27 | OPEN |
| JP28 | OPEN |
| JP29 | OPEN |
| JP30 | SHORT |
| JP31 | OPEN |

**Table 4-18.** 300 Megabyte Disk Drive Jumpers DS1 - DS7

| Jumper | Unit 0 | Unit 1 |
|---|---|---|
| DS1 | SHORT | OPEN |
| DS2 | OPEN | SHORT |
| DS3 | OPEN | OPEN |
| DS4 | OPEN | OPEN |
| DS5 | OPEN | OPEN |
| DS6 | OPEN | OPEN |
| DS7 | OPEN | OPEN |

## Power Supply

Your power supply provides ground and four output DC voltages for your system's use: +5V, −12V, +12V, and +24V.

## Power Supply Strapping

Your power supply can be strapped for the single phase input voltages (see Table 4-19).

**Table 4-19.** Power Supply Strapping

| Voltage | 100-120VAC | 220-240VAC |
|---|---|---|
| Input Voltage Jumper | W1 to 110V Post | W1 to 220V Post |
| Apply DC | Line and Neutral Connectors | Line and Neutral Connectors |
| Fuse | 3A | 2A |

## Main Cabinet Power Supply Adjustments

Your power supply can only be adjusted for the +5V and −5V output voltages. To check and adjust the power supply voltages:

1. Connect a D.C. voltmeter negative (common) lead to the GND test point.
2. Connect the voltmeter positive lead to the D.C. voltage test point you are checking.
3. Verify the processor D.C. voltage is within specification. Refer to Table 4-20.
4. Locate the voltage adjustment screw on the power supply. Refer to Figure 4-5.
5. Adjust the voltage with a flathead insulated screwdriver until your voltmeter reads with specifications.

**Table 4-20.** DC Voltage Checks and Adjustments

| Voltage | Suggested | Minimum | Maximum | Ripple |
|---|---|---|---|---|
| +5V | +5.05V | +5.00V | +5.25V | .05V P/P |
| −5V | −5.25V | −5.00V | −5.50V | xxxV P/P |
| +12V | +12.00V | +11.90V | +12.30V | .24V P/P |
| −12V | −12.00V | −12.30V | −11.90V | .24V P/P |
| +24V | +24.00V | +23.80V | +24.40V | .48V P/P |

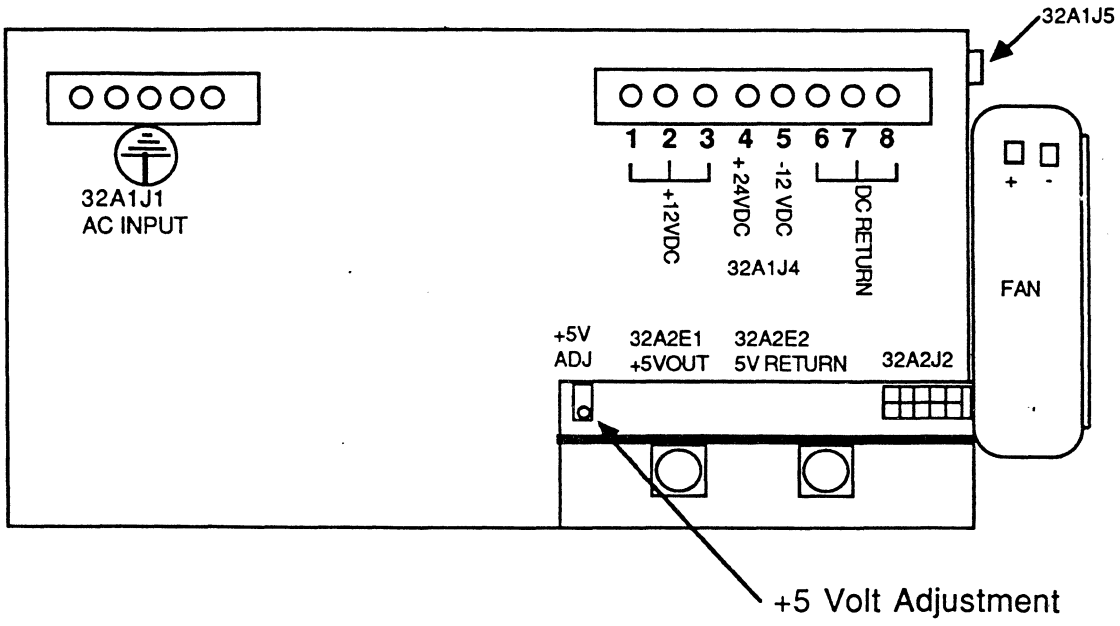



**Figure 4-5.** Main Cabinet Power Supply Adjustments

## Expansion Cabinet Power Supply Adjustments

This power supply has a single adjustment pot for +5V and +12V. Figure 4-6 illustrates the location of the adjustment pot, as well as the grounding lug, and input and output connectors. Access to the power supply in the upper media tray is through the cutout in the controller platform.

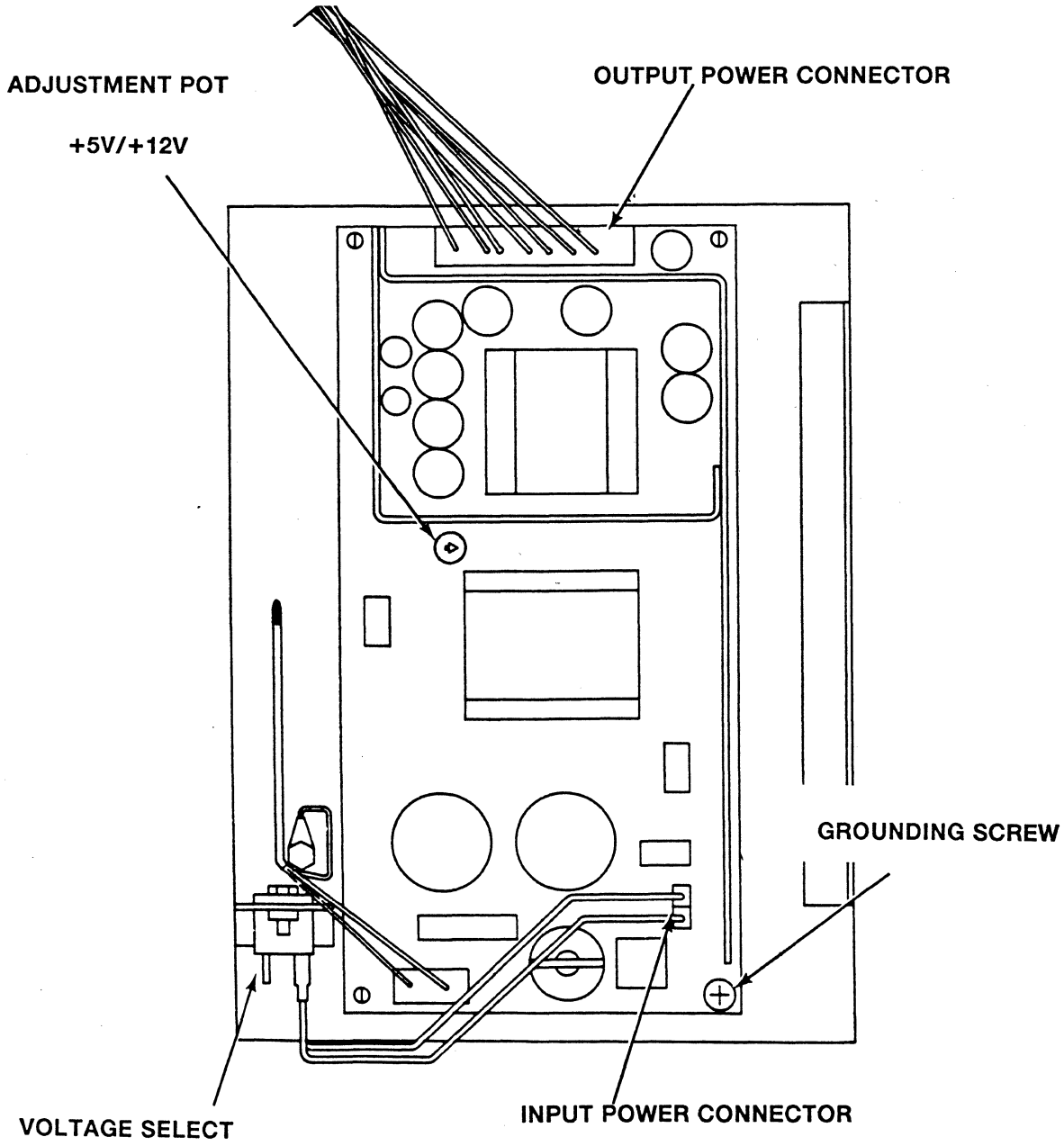



**Figure 4-6.** Power Supply Component Location

# BOARD DESCRIPTIONS

This section details reference information concerning the circuit boards of the P/90 computer system. The boards discussed are:

- The Job Processor Board
- The Memory Board
- The VMEbus Arbiter Board
- The VMEbus Communication Board (VCP)
- The VCP Backplane Card
- The LINC I/O Boards
- The Multibus* Adapter Board
- The Ethernet Board, and
- The SCSI Host Adapter Board

The card cage slot assignments for P/90 are shown in Table 5-1.

**Table 5-1.** P/90 Card Cage Slot Assignments

| Slot # | Board |
|---|---|
| 8 | Host Adapter 0 |
| 7 | Host Adapter 1 |
| 6 | Host Adapter 2, Ethernet, or DDN/SNA |
| 5 | VCP, Ethernet, DDN/SNA, or Host Adapter 3 |
| 4 | no board or VCP (see NOTE below) |
| 3 | Arbiter |
| 2 | 68020 CPU |
| 1 | Memory |

**[ NOTE ]** Systems without modems installed on the arbiter board can have the VCP installed in slot four.

* Multibus is a trademark of Intel.

**[ WARNING ]** If there is an empty slot in your card cage, a jumper module must be inserted into the rear side of the backplane.

**[ NOTE ]** To allow space for the memory bus, the Plexus card cage is larger than the standard VMEbus card cage. Plexus designed circuit boards are 9Ux400mm while standard VMEbus circuit boards are 6Ux150mm. As a result, slots containing standard VMEbus boards must have a sizing bracket installed.

## Electrostatic Discharges

It is possible for personnel to accumulate large amounts of static electricity. The discharge of static electricity can damage equipment, cause errors in system operation and can damage the contents of software media such as floppy disks and magnetic tape. To prevent damage from static electricity, ground mats and/or wrist straps connected to earth ground must be used around the computer. These mats/straps will dissipate any accumulated static charge.

**[ WARNING ]** Do not handle computer component or printed circuit boards unless you are properly grounded. Even the small electrostatic discharges which you cannot feel can damage components.

## The Job Processor Board

The job processor board consists of a 68020 based microprocessor, memory map and interface, cache, DMA, VMEbus, interrupt handling, select logic, clock/calendar, scratch RAM, console and download ports, and various control and timing signals. In the P/90 card cage, the job processor is assigned slot number two (2) in all configurations. Figure 5-1 illustrates the component locations.

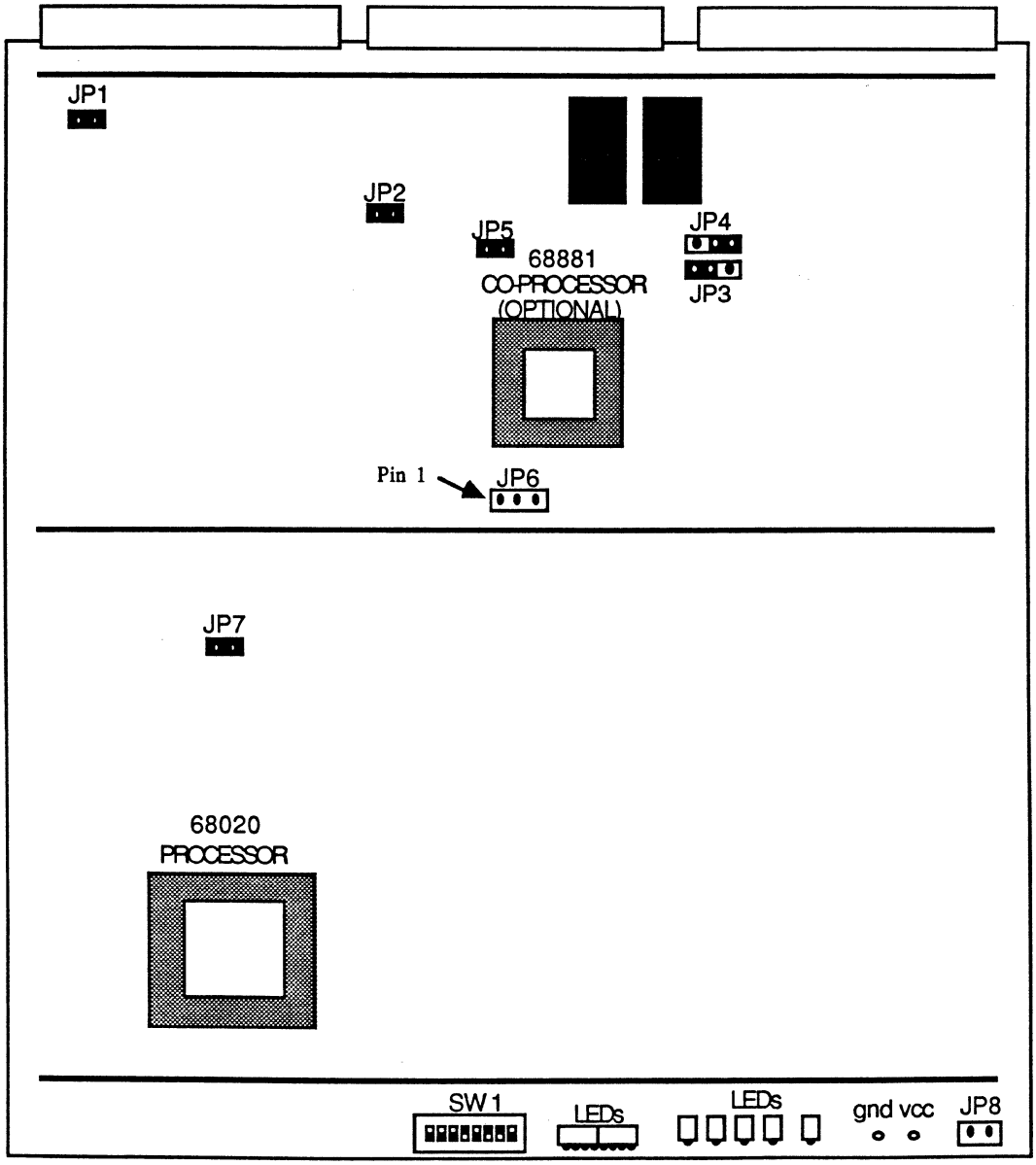



**Figure 5-1.** Job Processor Component Locations

## Job Processor Switch Settings

Switches are used to set the system default baud rate, select console terminal port, enable the autoboot mode, and enable/disable the diagnostic mode. Table 5-2 lists the function of each switch.

**Table 5-2.** Job Processor Switch S1 Configuration

| Switch # | Default | Enable | Disable | Function |
|---|---|---|---|---|
| SW0 | OFF | Table 5-3 | Table 5-3 | Baud Rate |
| SW1 | ON | Table 5-3 | Table 5-3 | Baud Rate |
| SW2 | ON | Table 5-3 | Table 5-3 | Baud Rate |
| SW3 | OFF | ON | OFF | Auto Boot Mode |
| SW4 | ON | ON | OFF | Console Port A |
| SW5 | OFF | ON | OFF | Console Port B |
| SW6 | OFF | OFF | OFF | Unused |
| SW7 | OFF | ON | OFF | Diag. Monitor |

Switch 7 enables the diagnostic mode after the completion of selftest, and should be turned on for use only by trained Plexus personnel. Switch 6 is not used. Switches 5 and 4 enable console ports B and A respectively. Turning switch 3 ON enables Autoboot mode. The Plexus default is 9600 baud. Table 5-3 lists the switch settings for the baud rates, as well as the console port enables.

**Table 5-3.** Job Processor Switch Setting Options for Switchpak S1

| SW2 | SW1 | SW0 | Baud Rate |
|---|---|---|---|
| OFF | OFF | OFF | 110 |
| OFF | OFF | ON | 300 |
| OFF | ON | OFF | 600 |
| OFF | ON | ON | 1200 |
| ON | OFF | OFF | 2400 |
| ON | OFF | ON | 4800 |
| ON | ON | OFF | 9600 |
| ON | ON | ON | 19200 |

| SW3 | SW4 | Port Enabled |
|---|---|---|
| OFF | OFF | Port A |
| OFF | ON | Port A (P3) |
| ON | OFF | Port B (P4) |
| ON | ON | Port A and B |

## Job Processor Jumper Settings

The VMEbus job processor employs eight jumper settings, JP1 through JP8. Table 5-4 lists the settings and functions of the job processor jumpers.

**Table 5-4.** Job Processor Jumper Settings

| Jumper | Pins | Setting | Function |
|---|---|---|---|
| JP1 | 1-2 | Closed | Test jumper to enable a clock signal. |
| JP2 | 1-2 | Closed | Test jumper to enable a clock signal. |
| JP3 | 1-2 | Closed | Enables the 16-Kbyte PROM setting. |
| JP4 | 2-3 | Closed | Disables the 32-Kbyte PROM setting. |
| JP5 | 1-2 | Closed | Test jumper to enable a clock signal. |
| JP6 | 2-3 | Closed | VMEbus clock cache select. |
| JP7 | 1-2 | Closed | Test jumper to enable a clock signal. |
| JP8 | 1-2 | Open | System debug interrupt select. |

## Job Processor LEDs

The LEDs are divided into two groups: **L7** through **L0** display a register content, while LEDs **RUN**, **DMA**, **HALT**, **BERR**, and **VME** display system and board status. Table 5-5 lists the functions of the LEDs, while Figure 5-2 illustrate the LED locations.

**Table 5-5.** Job Processor LEDs

| LED | Function |
|---|---|
| L0 - L7 | Register Status |
| RUN | System is up and running |
| DMA | Direct memory access is active |
| HALT | Job processor board not running or memory operation is occurring |
| BERR | CPU Bus error or DMA bus error |
| VME | Job processor is accessing the VMEbus |

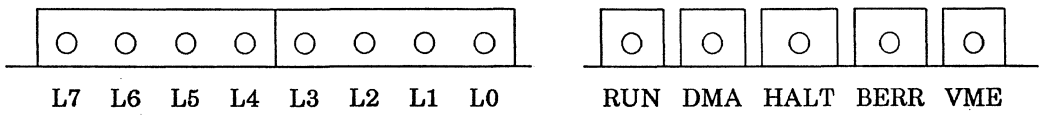



**Figure 5-2.** Job Processor LEDs

## Job Processor Test Points

The VMEbus job processor employs two test points: TP1 for ground and TP2 for +5V.

## The Memory Board

A single memory board capable of containing up to 64 Megabytes of DRAM is available in your P/90 and is located in slot one (1). Figure 5-3 illustrates the component location for the memory board.

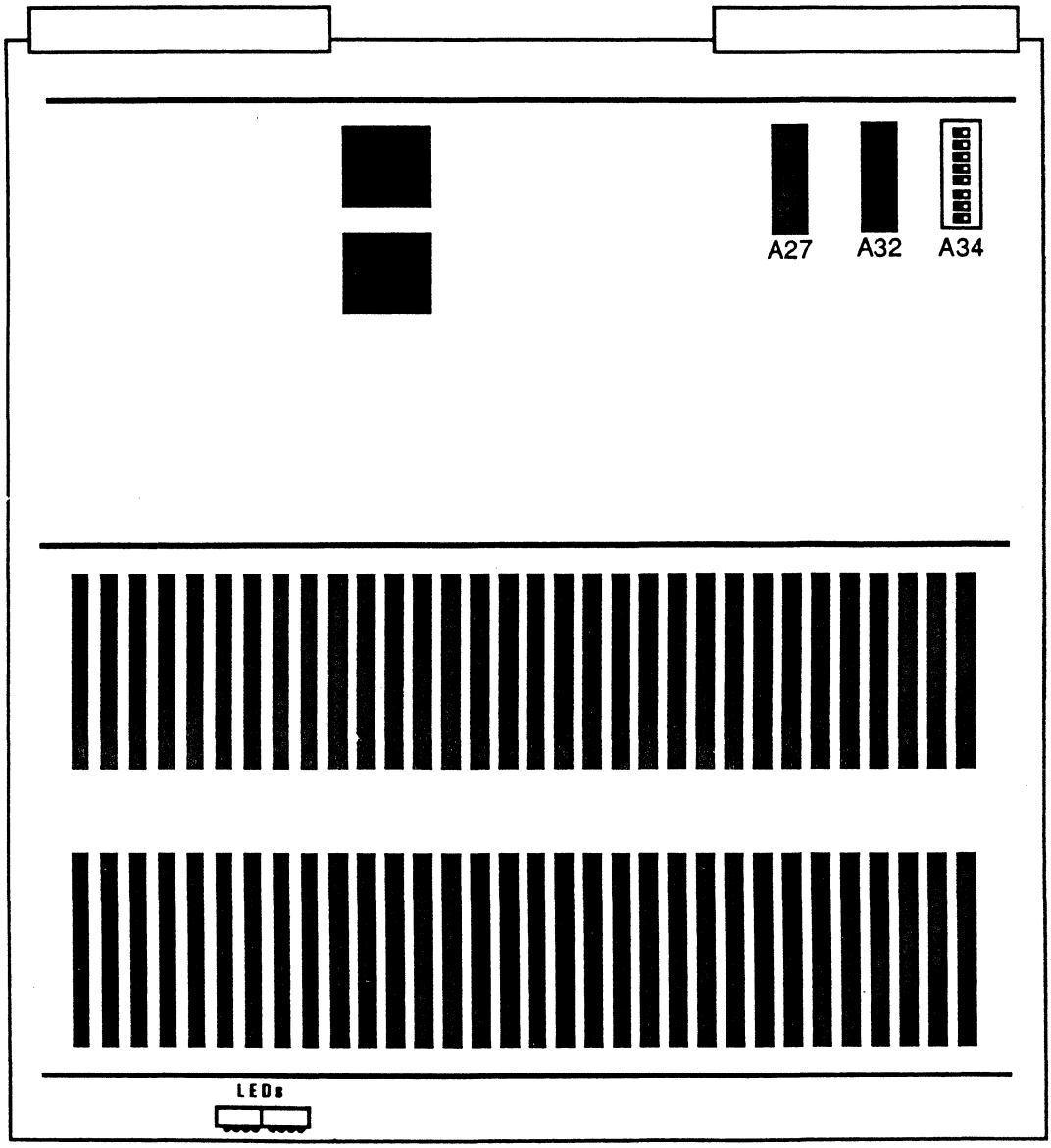



**Figure 5-3.** Memory Board Component Location

## Memory Board Switch Settings

When the memory board is installed, switch SW1 at board location U32A must be set to the value of the beginning address of the board. The memory board accessed **must** be set to: **0000 0000**, where 1=ON and 0=OFF. Figure 5-4 illustrates the switch position for the first memory board.

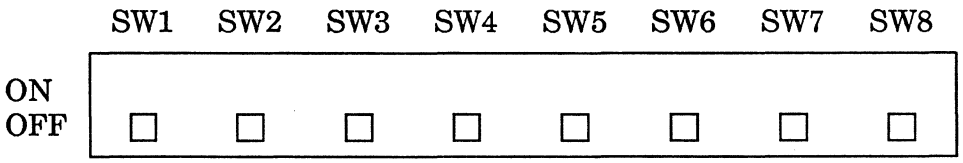



**Figure 5-4.** Base Address of the First Memory Board

## Memory Board Error Decoding

The Read Latch register is latched when a single bit or multiple bit error occurs and is reset to a transparent mode by the reset error register (Reset Error). The bit assignment for the Read Latch register is listed in Tables 5-6, 5-7, 5-8. Table 5-9 lists the syndrome error code.

**Table 5-6.** Memory Board Error Decoding

| Bit(s) | Function |
|---|---|
| 0 – 7 | Check bits 0 through 10 |
| 8 – 10 | Number of the selected bank (See Table 5-7) |
| 11 – 13 | Number of empty banks (See Table 5-8) |
| 14 | Not Used |
| 15 | Chip size loaded<br>1 = 1 Meg memory chips<br>0 = 256k memory chips |
| 16 | Zero (used in sizing memory) |
| 17 | Multiple bit error (**MBE-**)<br>0 = Multiple bit error |
| 18 | Single bit error (**SBE-**)<br>0 = single bit error |
| 19 – 31 | not implemented |

**Table 5-7.** Memory Board Bank Select Decode

| Bank # | 10 | 9 | 8 |
|---|---|---|---|
| Bank 0 | OFF | OFF | OFF |
| Bank 1 | OFF | OFF | ON |
| Bank 2 | OFF | ON | OFF |
| Bank 3 | OFF | ON | ON |
| Bank 4 | ON | OFF | OFF |
| Bank 5 | ON | OFF | ON |
| Bank 6 | ON | ON | OFF |
| Bank 7 | ON | ON | ON |

**Table 5-8.** Memory Board Bank Empty Decode

| Bank # | 13 | 12 | 11 |
|---|---|---|---|
| Bank 0 | ON | ON | ON |
| Bank 1 | ON | ON | OFF |
| Bank 2 | ON | OFF | ON |
| Bank 3 | ON | OFF | OFF |
| Bank 4 | OFF | ON | ON |
| Bank 5 | OFF | ON | OFF |
| Bank 6 | OFF | OFF | ON |
| Bank 7 | OFF | OFF | OFF |

**Table 5-9.** Syndrome Error Code

| Code | Error Bit | Code | Error Bit | Code | Error Bit | Code | Error Bit |
|---|---|---|---|---|---|---|---|
| 0b | bit 17 | 0e | bit 16 | 13 | bit 18 | 15 | bit 19 |
| 19 | bit 21 | 1a | bit 22 | 1c | bit 23 | 23 | bit 8 |
| 26 | bit 10 | 29 | bit 11 | 2a | bit 12 | 2c | bit 13 |
| 34 | bit 15 | 4a | bit 33 | 4f | bit 32 | 52 | bit 34 |
| 57 | bit 36 | 58 | bit 37 | 5b | bit 38 | 5d | bit 39 |
| 64 | bit 57 | 67 | bit 58 | 68 | bit 59 | 6b | bit 60 |
| 70 | bit 62 | 75 | bit 63 | 8a | bit 49 | 8f | bit 48 |
| 94 | bit 51 | 97 | bit 52 | 98 | bit 53 | 9b | bit 54 |
| a2 | bit 40 | a4 | bit 41 | a7 | bit 42 | a8 | bit 43 |
| ad | bit 45 | b0 | bit 46 | b5 | bit 47 | cb | bit 1 |
| d3 | bit 2 | d5 | bit 3 | d6 | bit 4 | d9 | bit 5 |
| dc | bit 7 | e3 | bit 24 | e5 | bit 25 | e6 | bit 26 |
| ea | bit 28 | ec | bit 29 | f1 | bit 30 | f4 | bit 31 |

Table 5-10 lists the diagnostic latch for the least significant 49C460 bit assignments.

**Table 5-10.** Memory Board Least Significant Bit (Diagnostic Latch)

| Bit | Function | Bit | Function |
|---|---|---|---|
| Bit 0 | Diag Check Bit 0 | Bit 1 | Diag Check Bit 1 |
| Bit 2 | Diag Check Bit 2 | Bit 3 | Diag Check Bit 3 |
| Bit 4 | Diag Check Bit 4 | Bit 5 | Diag Check Bit 5 |
| Bit 6 | Diag Check Bit 6 | Bit 7 | Diag Check Bit 7 |
| Bit 8 | ID Code 0 | Bit 9 | ID Code 1 |
| Bit 10 | Diag Mode 0 | Bit 11 | Diag Mode 1 |
| Bit 12 | Correct | | |
| Bit 13 - 31 | Don't care | | |

Table 5-11 lists the diagnostic latch for the most significant 49C460 bit assignments.

**Table 5-11.** Memory Board Most Significant Bit (Diagnostic Latch)

| Bit | Function | Bit | Function |
|---|---|---|---|
| Bits 32 - 39 | Don't care | | |
| Bit 40 | ID Code 0 | Bit 41 | ID Code 1 |
| Bit 42 | Diag Mode 0 | Bit 43 | Diag Mode 1 |
| Bit 44 | Correct | | |
| Bit 45 - 63 | don't care | | |

## Memory Board Jumper Settings

Figure 5-5 illustrates the positioning of the two memory board jumpers.

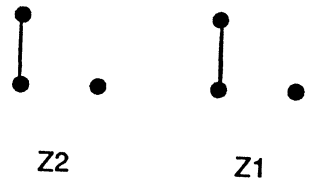



**Figure 5-5.** Memory Board Jumpers

## Memory Board LEDs

Each memory board employs eight LEDs (Light Emitting Diodes), located at the right front corner of your memory board. These LEDs indicate the memory bank (7 through 0) currently being accessed. Figure 5-6 illustrates the sequence of the memory board LEDs.

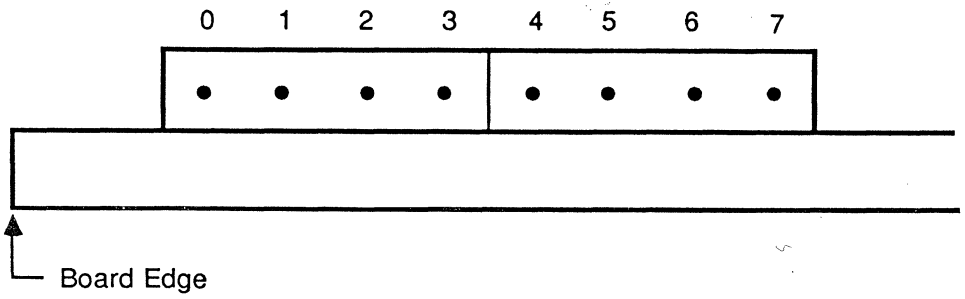



**Figure 5-6.** Memory Board's LEDs

## Memory Board Test Points

The memory board does not have test points.

## The VMEbus Arbiter Board

The VMEbus arbiter board is installed in slot three (3) of the card cage and is responsible for system control, system monitoring, and bus arbitration. Figure 5-7 illustrates the component locations of the bus arbiter board.

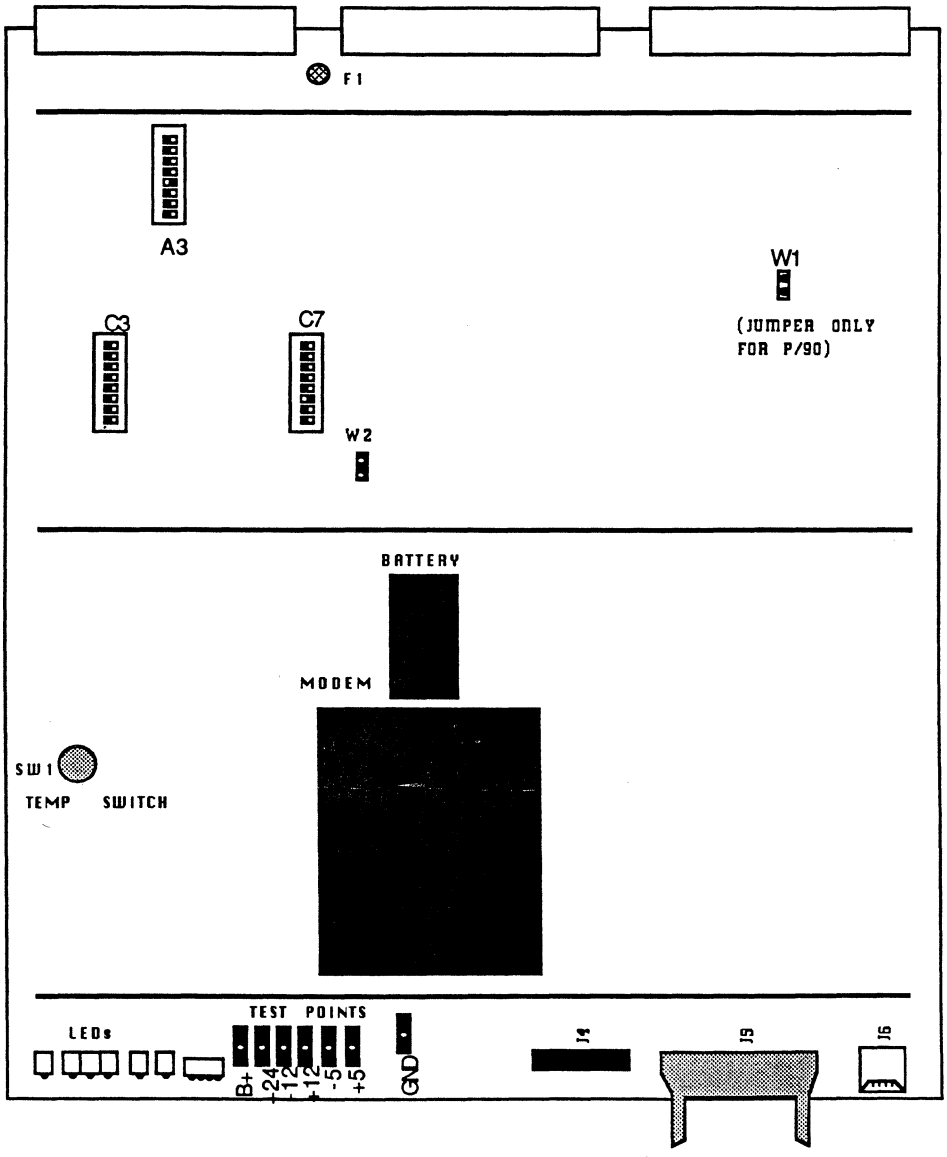



**Figure 5-7.** VMEbus Arbiter Component Location

## Bus Arbiter Board Switches

This section details the switch settings of the VMEbus arbiter board. The bus arbiter board employs three switch-paks controlling: the base number used in register, the base number used in the port configuration, and the shutdown delay time circuits. SW1 enables the shutdown function and therefore is always ON (closed). Each progressively higher switch double the shutdown time. Table 5-12 lists the time delay switch-pak U7C (U8C). The time delay can vary from 110 seconds to 7.8 hours (approximately).

The Plexus default setting is approximately four hours (SW1, SW7, and SW8 = ON).

**Table 5-12.** Arbiter Board Time Delay Switch Settings

| Switch Setting | Plexus Default | Time Delay |
|---|---|---|
| SW8 | ON | 1:50 † |
| SW7 | ON | 3:40 |
| SW6 | OFF | 7:20 |
| SW5 | OFF | 14:40 |
| SW4 | OFF | 29:20 |
| SW3 | OFF | 58:40 |
| SW2 | OFF | 1:57:20 |
| SW1 | ON | 3:54:40 |

† Enables shutdown.

**[ NOTE ]** Times are approximate.

**Table 5-13.** Arbiter Board Switch Settings for U3C (U3C)

| Switch # | State | Function |
|---|---|---|
| SW8 | ON | Enable Port B |
| | OFF† | Disables Port B |
| SW7 | ON | Modem Specific |
| | OFF† | Modem Specific |
| SW6 | ON† | Modem Specific |
| | OFF | Modem Specific |
| SW5 | ON† | Enables the Default Diagnostic Port |
| | OFF | Disables the Default Diagnostic Port |
| SW4 | ON | Enables Power Supply Fail Warning |
| | OFF† | Disables Power Supply Fail Warning |
| SW3 | ON | Power Supply Switch Settings |
| | OFF | Power Supply Switch Settings |
| SW2 | ON | Power Supply Switch Settings |
| | OFF | Power Supply Switch Settings |
| SW1 | ON | Power Supply Switch Settings |
| | OFF | Power Supply Switch Settings |

† Denotes default.

**[ NOTE ]** Baud rate of the modem is set by software.

**Table 5-14.** Arbiter Board Interrupt Switch Settings U3A (U4A)

| Switch # | State | Function |
|---|---|---|
| SW8 | ON | Not Connected |
| | OFF | Not Connected |
| SW7 | ON† | Interrupt 7 Enabled |
| | OFF | Interrupt 7 Disabled |
| SW6 | ON | Interrupt 6 Enabled |
| | OFF | Interrupt 6 Disabled |
| SW5 | ON | Interrupt 5 Enabled |
| | OFF | Interrupt 5 Disabled |
| SW4 | ON | Interrupt 4 Enabled |
| | OFF | Interrupt 4 Disabled |
| SW3 | ON | Interrupt 2 Enabled |
| | OFF | Interrupt 2 Disabled |
| SW2 | ON | Interrupt 1 Enabled |
| | OFF | Interrupt 1 Disabled |
| SW1 | ON | Interrupt 0 Enabled |
| | OFF† | Interrupt 0 Disabled |

† Denotes default.

**Table 5-15.** Arbiter Board Power Supply Default Switch Settings

| Switch # | State |
|---|---|
| U3C.1 | OFF |
| U3C.2 | ON |
| U3C.3 | OFF |

## Bus Arbiter Board LEDs

The VMEbus arbiter board has eight LEDs, a four-pack LED to determine which priority level has access to the VMEbus, and four discrete LEDs used to indicate the status of the temperature and voltage sensing circuits/devices. Table 5-16 lists the arbiters LEDs and their function. Figure 5-8 illustrates the configuration of the arbiters LEDs.

**Table 5-16.** Arbiter LED Functions

| LED | Function |
|---|---|
| **OVRTMP** | Air temperature indicator for all of the cabinets. When the temperature in any of the cabinets exceeds 70° C ±5° the LED = ON. |
| **PWROK** | Voltage indicator for all five of the D.C. voltages. LED = ON when all voltages are within tolerance. |
| **OVRV** | Voltage indicator for all five of the D.C. voltages. LED = ON when any one of the five D.C. voltages exceeds it's tolerance on the high end. |
| **UNDRV** | Voltage indicator for all five of the D.C. voltages. LED = ON when any one of the five D.C. voltages exceeds it's tolerance on the low end. |
| **BUSY** | Indicates the VMEbus is busy. |
| **PORT B** | Indicates port B is functional. |
| **BG1 - BG4** | Indicates the level of bus request. |

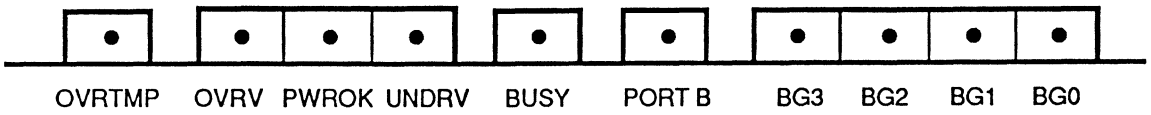



**Figure 5-8.** Arbiter LED Configuration

## Bus Arbiter Board Test Points

This section details the test points of the bus arbiter board (also the system test points). There are seven test points on the bus arbiter board (TP1 through TP7).

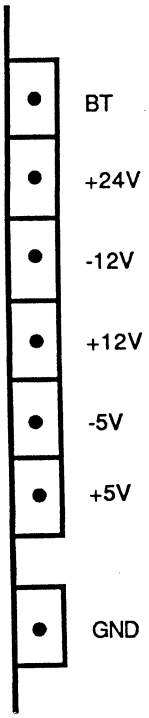



**Figure 5-9.** Arbiter Test Point Locations

Test points are listed on the arbiter board by test point reference voltage (ex. -5V), not their test point designation (ex. TP3). Table 5-17 lists the board reference, and function.

**Table 5-17.** Arbiter Board Test Points and Functions

| Board Desig. | Function |
|---|---|
| BT | This test point is used to verify the voltage at the rechargeable 3.6V battery. It should be checked with the power OFF as well as ON. |
| +24V | This test point is used to verify the system +24V used to drive the disk and cartridge tape drives installed in the main cabinet. |
| −12V | This test point is used to verify the system −12V used by the RS232 drivers on the boards, as well as the disk drives installed in the main cabinet. |
| +12V | This test point is used to verify the +12V used by the RS232 drivers on the boards, as well as the disk and cartridge tape drives installed in the main cabinet. |
| −5V | This test point is the system −5V used by all boards and peripherals in the main cabinet. |
| +5V | This test point is the system +5V used by all boards and peripherals in the main cabinet. |
| GND | This test point is ground referencing for all other voltages. |

Table 5-18 lists the test points and the minimum/maximum values that should be found.

**Table 5-18.** Arbiter Board Test Points

| Nominal | Suggested | Minimum | Maximum |
|---|---|---|---|
| GND | 0.00V | -0.70V | +0.70V |
| +5.00V | +5.05V | +5.00V | +5.10V |
| -5.00V | -5.00V | -5.25V | -4.75V |
| +12.00V | +12.00V | +11.40V | 12.60V |
| -12.00V | -12.00V | -12.60V | -11.40V |
| +24.00V | +24.00V | +21.60V | +26.40V |
| +3.20V (BATT)† | +3.20V | +3.00V | +4.00V |

†Battery test voltage with system power OFF.

## Bus Arbiter Board Jumpers

The VMEbus arbiter board employs two jumpers: to enable/disable the xtal clock and to enable/disable a −5V (in some applications). Table 5-19 lists the jumpers, the settings, defaults, and meanings.

**Table 5-19.** Arbiter Board Jumper Settings

| Jumper | Setting | Meaning |
|---|---|---|
| W1 | Open | Disable −5V (for P/95) |
| | Closed | Enable −5V (for P/90) |
| W2 | Open | Disable xtal clock |
| | Closed† | Enable xtal clock |

† Plexus default

## The VMEbus Communication Processor (VCP)

The VCP controls I/O between the system and the outside world. Your VCP is installed in slot 4 (if a modem chip is not installed on the bus arbiter board) or slot 5 (if a modem chip is installed on the bus arbiter board). Two versions of the VCP exist. Figure 5-10 illustrates the component locations of Type 1 VCP; Figure 5-11 illustrates the component locations of Type 2 VCP.

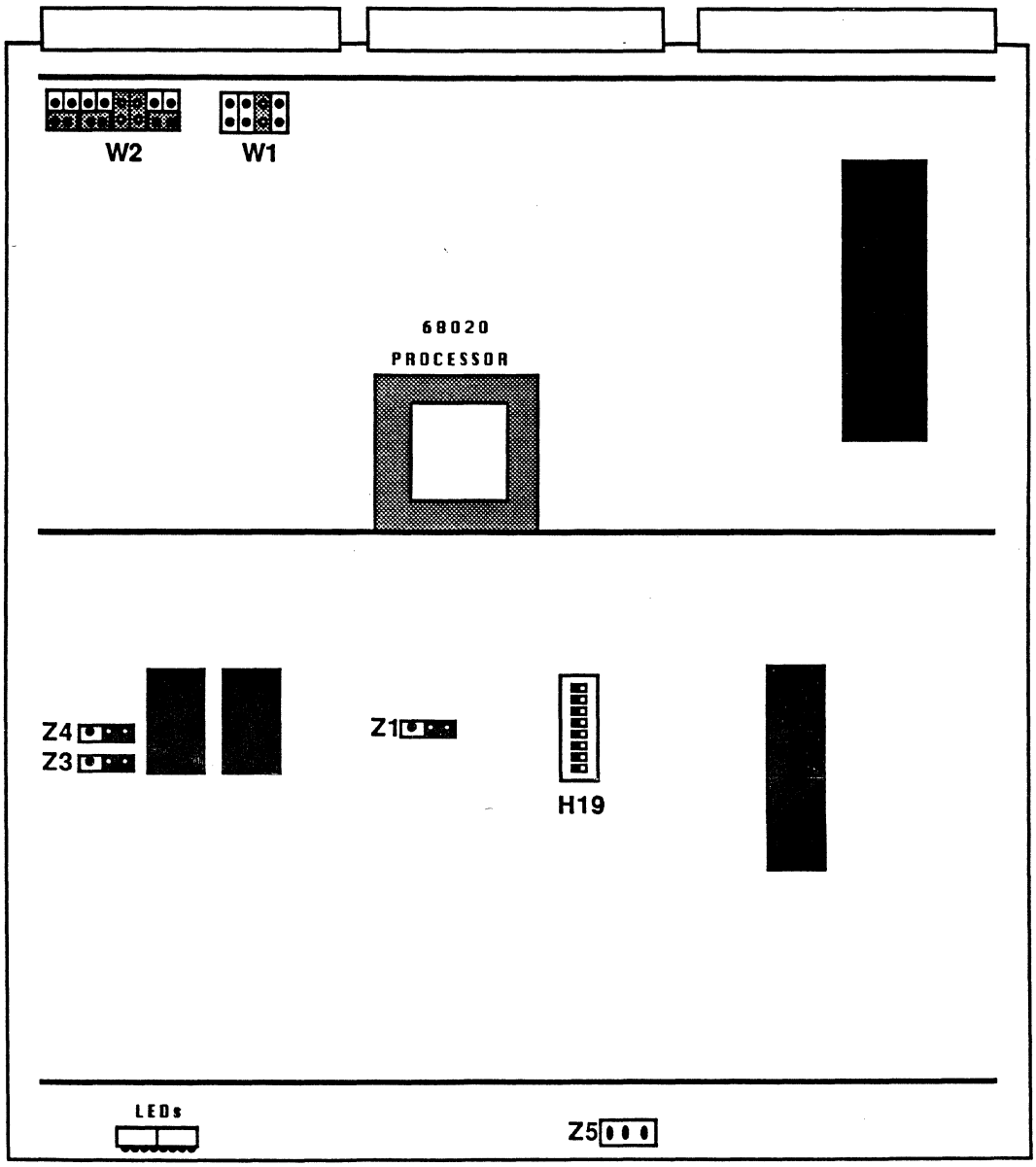



**Figure 5-10.** VCP (Type 1) Component Location

VCP Type 2 uses the following wire-wraps:

**W1** - pin 4 - pin 8 **W2** - pin 2 - pin 10; pin 7 - pin 15

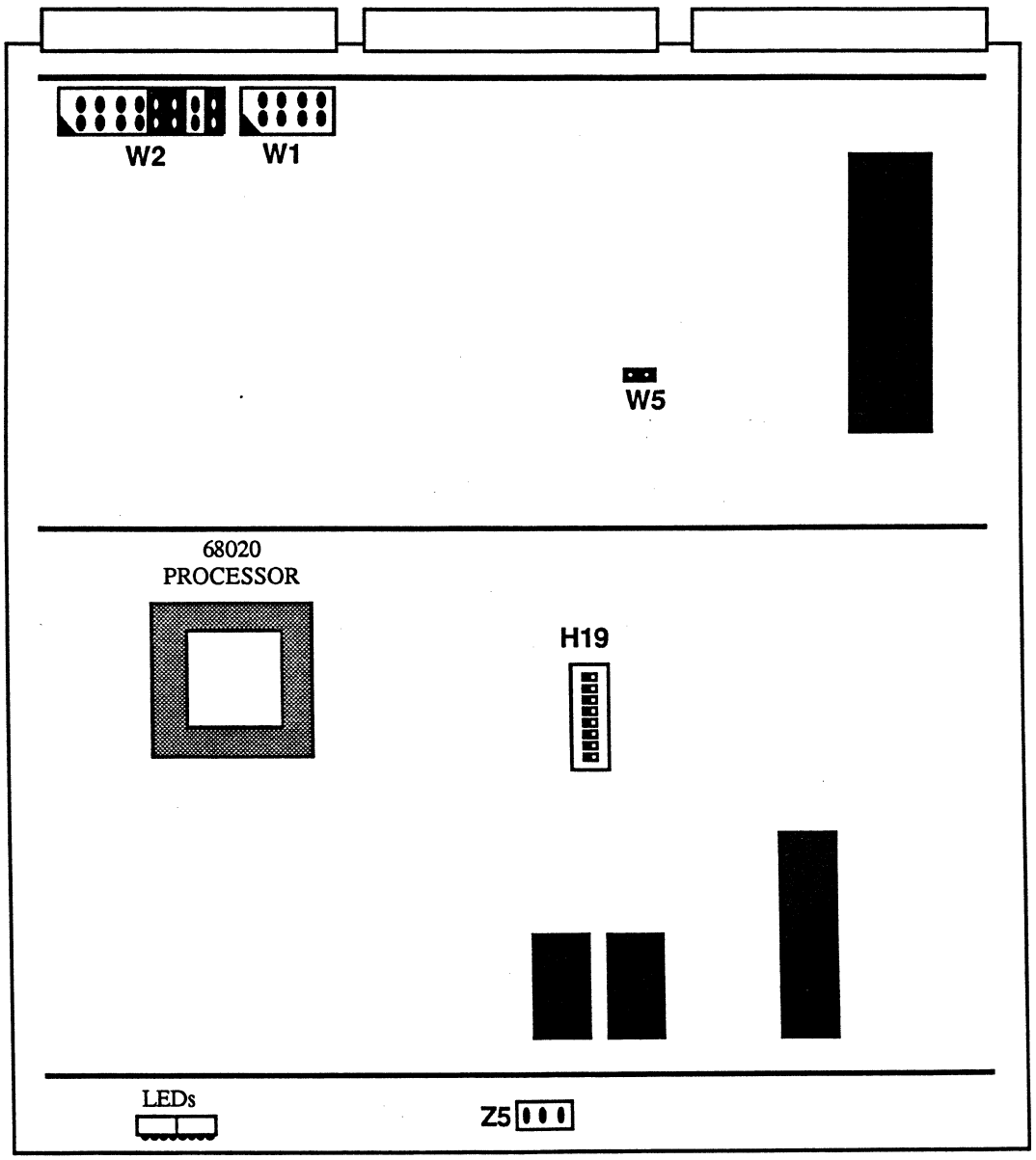



**Figure 5-11.** VCP (Type 2) Component Location

## VCP Switch Settings

The VCP employs one switch pak at location (see Figure 5-10). Table 5-20 lists the switches and their functional description.

**Table 5-20.** VCP Switch Settings

| Switch Number | Functional Description |
|---|---|
| SW1 | Sets the Boot-up/Diagnostic boot mode.<br>OFF = Normal Boot-up (Plexus default).<br>ON = Diagnostic Boot. |
| SW2 | Spare (OFF Default) |
| SW3 | Spare (OFF Default) |
| SW4 | Spare (OFF Default) |
| SW5 | Sets the VCP board address 0 through 4. See Table 5-21. |
| SW6 | Sets the VCP board address 0 through 4. See Table 5-21. |
| SW7 | Sets the VCP board address 0 through 4. See Table 5-21. |
| SW8 | Sets the VCP board address 0 through 4. See Table 5-21. |

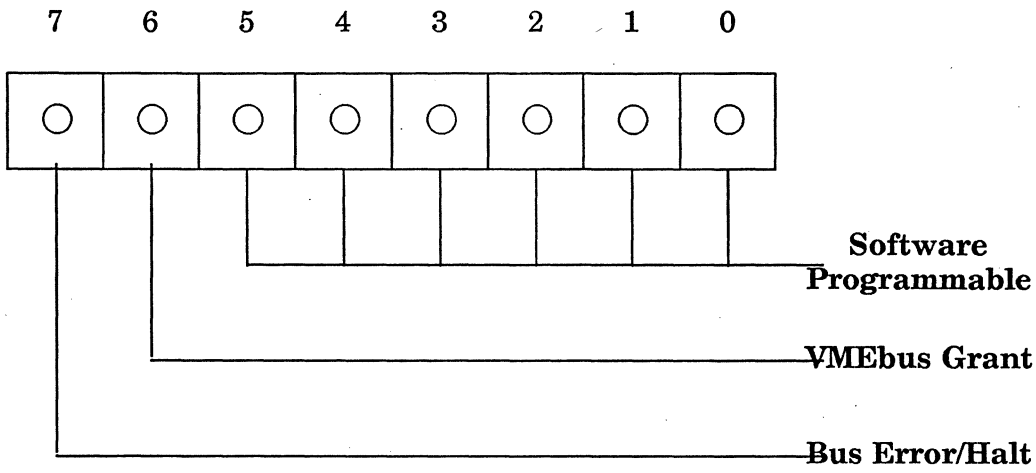
**Table 5-21.** VCP Switch Setting Addresses

| VCP Board # | | | | | Switch |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | Number |
| 0 | 0 | 0 | 0 | 0 | SW5 |
| 0 | 0 | 0 | 0 | 1 | SW6 |
| 0 | 0 | 1 | 1 | 0 | SW7 |
| 0 | 1 | 0 | 1 | 0 | SW8 |

where 1 = ON and 0 = OFF.

## VCP LEDs

The VCP's LEDs employs eight LEDs, located at the edge of the board (see Figure 5-12).




**Specific states:**

| LED # | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | F | 0 | 0 | F | Waiting for the download. |
| | 0 | 0 | 0 | F | F | 0 | 0 | 0 | VCP kernel up and running |
| | 1 | 0 | 0 | F | F | 0 | 0 | 0 | DMA bus error. |
| | 1 | 0 | 0 | X | X | 0 | 0 | 0 | 68020 bus error. |

**where:**

F = Flashing
X = Indeterminate
1 = On
0 = Off

**Figure 5-12.** VCP LED Configuration

## VCP Jumper Settings

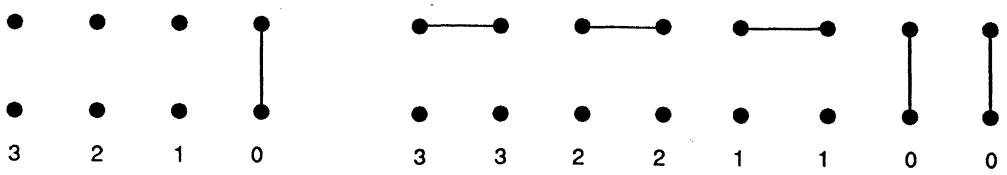
The VCP employs three jumpers and two jumper-paks. Table 5-22 lists the three jumper configurations and functions.

**Table 5-22.** VCP Jumper Settings

| Location | Setting | Function |
|---|---|---|
| F22 | Closed | Test jumper to enable/disable clock. |
| F18 | Closed | Test jumper to enable/disable clock. |
| H3 | Open | When Closed, enables a write to the EEPROM. |

The two jumper-paks work together to set the bus request level setting for the board. The small 8-prong jumper-pak sets the bus request level while the 16-prong jumper-pak sets the bus grant in and out for the selected level. Figure 5-13 illustrates two examples of switch settings.

**Bus Request Level 0:**




**Bus Request Level 3:**

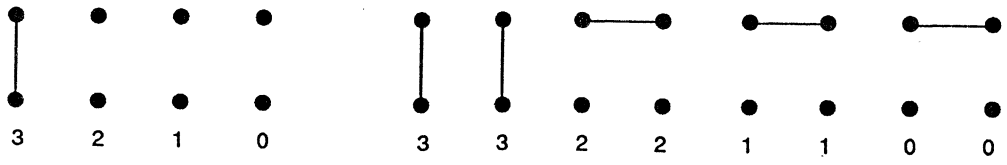



**Figure 5-13.** VCP Jumper-Pak Examples

## The VCP Backplane Card

The VCP backplane cards interface between a VCP board in the card cage and up to five LINC cards mounted at the rear of the system.

LINC cards must be installed in a particular order, with the lowest tty ports servicing serial I/Os (LINC V4, LINC V8, and LINC V16) and the highest port numbers servicing the parallel ports (LINC P4).

**[ CAUTION ]** Do not skip LINC card slots. LINC cards must be installed sequentially. LINC P4 cards must be installed consecutively.

## The LINC I/O Cards

The VCP's data bus is connected to the VCP backplane card, then to the I/O cards (LINC), forming the I/O ports of your system. Currently, four versions of the LINC cards exist: LINC V4 (DB-9), LINC V8 (DB-25), LINC V16 (Telco) and the LINC P4 (Parallel). Table 5-23 lists the LINC board numbers and their descriptions.

**Table 5-23.** LINC I/O Cards

| Board | Description |
|---|---|
| LINC V4 | A four port serial I/O linc card using a DB-25 pin connector. |
| LINC V8 | An eight port serial I/O linc card using a DB-9 pin connector. |
| LINC V16 | A 16 port serial I/O linc card using two Telco connectors. |
| LINC P4 | A four port parallel I/O linc card using a Centronics interface. |

Figures 5-14, 5-15, and 5-16 illustrate the LINC V8, LINC V16, and LINC P4 cards.

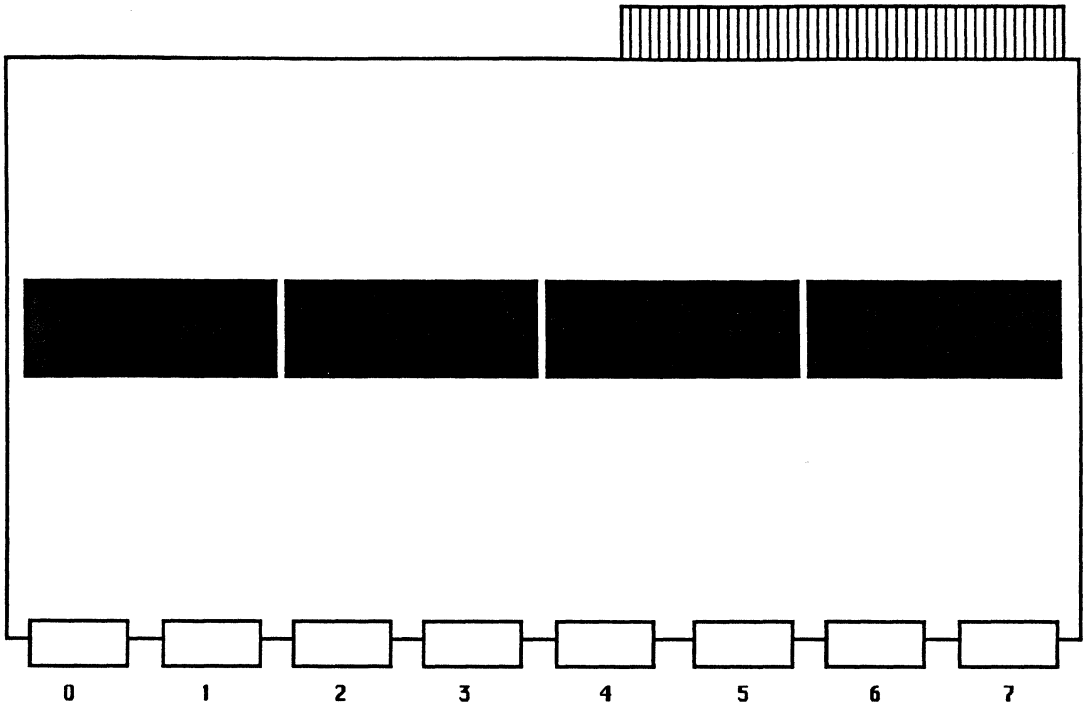



**Figure 5-14.** LINC V8 Card

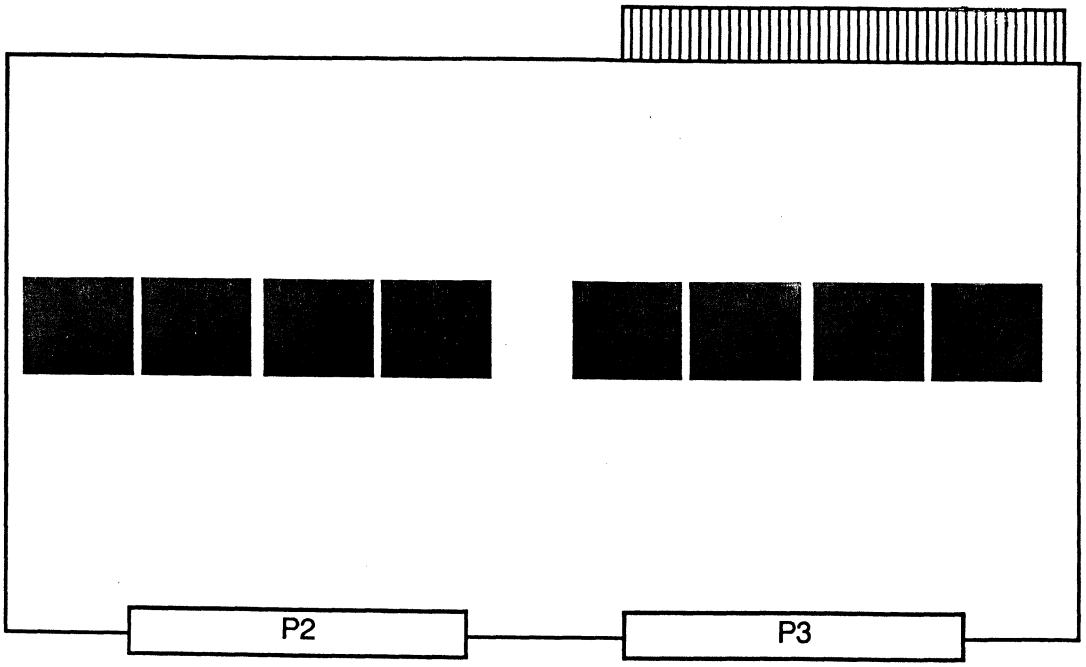



**Figure 5-15.** LINC V16 Card

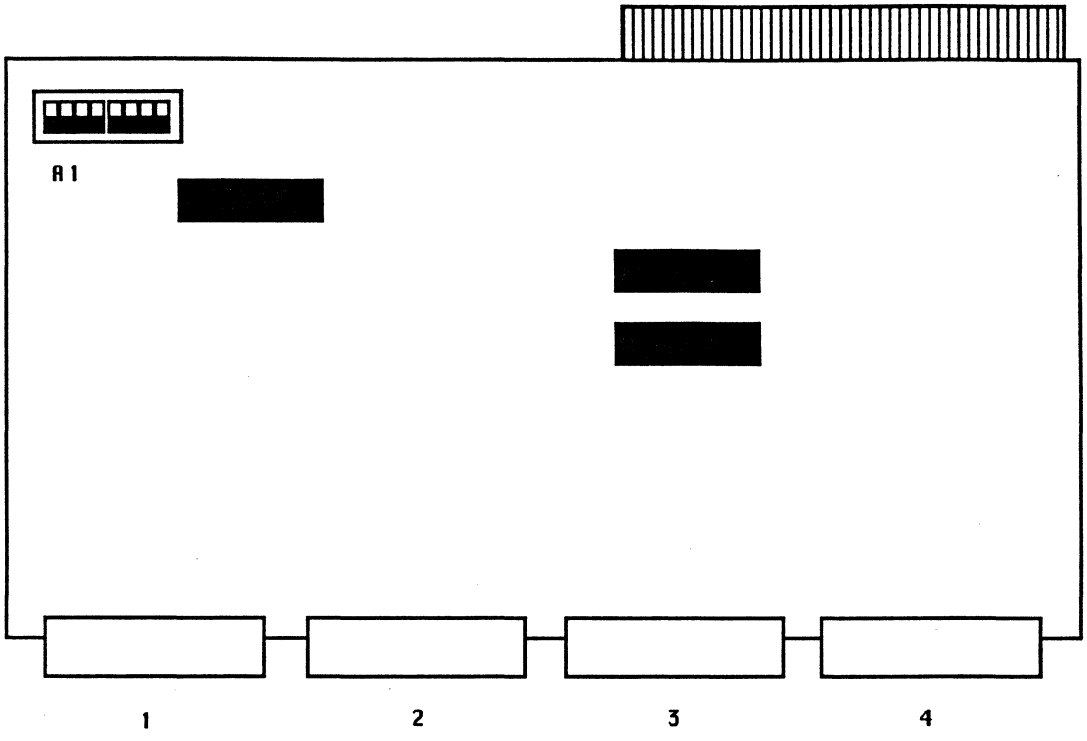



**Figure 5-16.** LINC P4 Card

## The Multibus Adapter Board

The Multibus adapter board is a Plexus designed VMEbus board designed to accept Multibus controller boards without resetting switches or jumpers. Two boards require installation in a Multibus adapter board before installation in a P/90: the DDN and the SNA controller boards.

## DDN Interface Communication Board

Plexus provides the hardware and software to support a Defense Data Network (DDN) interface. The DDN interface board usually is installed in slot eleven (11) and must be installed in a Multibus adapter board before installation in a P/90. Two cables are required to support the interface board: an RS-232 (63-00199) and an RS-449 (63-00192).

### DDN Switch Settings

Table 5-24 lists the Plexus default switch setting for the DDN interface controller board.

**Table 5-24.** DDN Default Switch Settings

| Switch | Function | Position |
|---|---|---|
| SW3-1 | ADR17* | OFF |
| SW3-2 | ADR16* | OFF |
| SW3-3 | ADR15* | OFF |
| SW3-4 | ADR14* | OFF |
| SW3-5 | ADR13* | OFF |
| SW3-6 | ADR12* | OFF |
| SW3-7 | ADR11* | OFF |
| SW3-8 | ADR10* | ON |
| | | |
| SW2-1 | ADRF* | OFF |
| SW2-2 | ADRE* | OFF |
| SW2-3 | ADRD* | OFF |
| SW2-4 | ADRC* | OFF |
| SW2-5 | ADRB* | OFF |
| SW2-6 | ADRA* | OFF |
| SW2-7 | ADR9* | OFF |
| SW2-8 | ADR8* | OFF |
| | | |
| SW1-1 | ADR7* | ON |
| SW1-2 | ADR6* | ON |
| SW1-3 | ADR5* | OFF |
| SW1-4 | ADR4* | ON |

## DDN Jumper Settings

Table 5-25 lists the Plexus default jumper settings for the DDN controller board while Table 5-26 lists the jumper settings for a serial I/O.

**Table 5-25.** DDN Default Jumper Settings

| Jumper | Default | Function |
|---|---|---|
| JP1 | In | EPROM Setup |
| JP2 | Open | |
| JP3 | A to B | |
| JP4 | A to B | |
| JP5 | B to C | |
| JP10 | A to B | Host access to 64k of shared RAM |
| JP11 | A to B | Host access to 64k of shared RAM |
| JP12 | Open | Disables maintenance diagnostics |
| JP13 | A to B | Host uses 16-bit I/O addressing |
| JP14 | A to B | Host inverts sense of ADR0* |
| JP15 | A to B | Enables Host NMI interrupt for debug support |
| JP16 | H to J | INT0* |
| JP17 | H to J | INT0* |
| JP20 | E to J | XACK* delay (312 nS) |

**Table 5-26.** DDN Serial Interface Settings

| Serial Port | Settings |
|---|---|
| RS-232 | Install U11, U12<br>Remove U6<br>Jumper JP6 A-B<br>JP7 A-G, JP7 B-G<br>JP7 C-G, JP7 D-G<br>JP7 E-G, JP7 F-G |

### DDN I/O Connector Plate

Table 5-27 lists the options available on the connector plate.

**Table 5-27.** DDN Comm Ports I/O Connector Plate

| Opening | Connector |
|---|---|
| A | DB-9 |
| B | DB-15 (Ethernet) |
| C,D,E | DB-25 (RS-232) |
| F,G | DB-37 (RS-449) |

## SNA Interface Communication Board

Plexus provides the hardware and software necessary to support an SNA interface. The SNA controller board is usually installed in slot eleven (11) and must be installed in a Multibus adapter board before installation in a P/90. An RS-232 (26-conductor) controller interface cable (63-00196) is required to connect the SNA controller board and the I/O panel.

## SNA Jumper Settings

Table 5-28 lists the Plexus jumper settings for the SNA interface controller board.

**Table 5-28.** SNA Jumper Settings

| Jumper | In/Open | Function |
|---|---|---|
| W1 | Open | Serial I/F ground, channel A |
| W2 | Open | Serial I/F multifunction, channel A |
| W3 | In | Serial I/F RS-232C ground, channel A |
| W4 | Open | Serial I/F RS-449 ground, channel A |
| W5 | In | EPROM size select |
| W6 | Open | EPROM size select |
| W7 | In | 64k or 256k RAM size select |
| W8 | In | Bus Time Out enable |
| W9 | In | No Byte Swap |
| W10 | Open | Dual-port memory not mapped in Multibus memory space |
| W11 | Open | ADRF bit compare |
| W12 | Open | ADRE bit compare |
| W13 | Open | Byte Swap |
| W14 | Open | Enable BPRO out |
| W15 | Open | Byte Swap |
| W16 | In | Serial I/F RS-232C ground, channel B |
| W17 | In | Enable BPRN in |
| W18 | Open | Disable BPRN in |
| W19 | Open | 8289 arbiter, Any request |
| W20 | Open | Serial I/F RS-449 ground, channel B |
| W21 | Open | Serial I/F RS-232C ground, channel C |
| W22 | In | 256k & 512k EPROM select |
| W23 | Open | 64k & 128k EPROM select |
| W24 | In | 8289 arbiter, ground CBRQ |
| W25 | Open | enable CBRQ out |
| W42 | Open | I/O A-7 addr compare |
| W43 | Open | I/O A-6 addr compare |
| W44 | In | I/O A-5 addr compare |
| W45 | Open | I/O A-4 addr compare |
| W46 | In | Serial I/F ground, channel C |
| W47 | In | Serial I/F RS-232C ground, channel D |
| W48 | Open | Serial I/F ground, channel D |
| W49 | Open | Serial I/F ground, channel C |
| W50 | Open | Serial I/F ground, channel D |

| Jumper | In/Open | Function |
|---|---|---|
| W51 | Open | Serial I/F ground, channel B |
| W52 | Open | Serial I/F ground, channel B |
| W62 | In | Enable I/O space Flag Byte |
| W63 | Open | Enable Tri-state RS-449, channel C |
| W64 | Open | Enable Tri-state RS-449, channel D |
| W65 | Open | Enable Tri-state RS-449, channel A |
| W66 | Open | Enable Tri-state RS-449, channel B |
| W67 | In | TXC from DCE device, channel A |
| W68 | Open | TXC from DCE device, channel B |
| W69 | Open | TXC from DCE device, channel D |
| W70 | Open | TXC from DCE device, channel C |
| W71 | In | DMA address window select |
| W72 | Open | DMA address window select |
| W73 | Open | DMA address window select |
| W74 | In | DMA address window select |
| W75 | Open | DMA address window select |
| W76 | In | DMA address window select |
| ADR-10 | Open | Address compare bit 10 |
| ADR-11 | In | Address compare bit 11 |
| ADR-12 | Open | Address compare bit 12 |
| ADR-13 | Open | Address compare bit 13 |
| ADR-14 | Open | Address compare bit 14 |
| ADR-15 | Open | Address compare bit 15 |
| ADR-16 | Open | Address compare bit 16 |
| ADR-17 | Open | Address compare bit 17 |
| I/O A-8 | Open | I/O address compare bit 8 |
| I/O A-9 | Open | I/O address compare bit 9 |
| I/O A-A | Open | I/O address compare bit A |
| I/O A-B | Open | I/O address compare bit B |
| I/O A-C | Open | I/O address compare bit C |
| I/O A-D | Open | I/O address compare bit D |
| I/O A-E | Open | I/O address compare bit E |
| I/O A-F | Open | I/O address compare bit F |
| INT-0 | In | Interrupt bit 0 |
| INT-1 | Open | Interrupt bit 1 |
| INT-2 | Open | Interrupt bit 2 |
| INT-3 | Open | Interrupt bit 3 |
| INT-4 | Open | Interrupt bit 4 |
| INT-5 | Open | Interrupt bit 5 |
| INT-6 | Open | Interrupt bit 6 |

| Jumper | In/Open | Function |
|---|---|---|
| INT-7 | Open | Interrupt bit 7 |
| OPT-0 | Open | Optional jumper bit 0 (short self-test) |
| OPT-1 | Open | Optional jumper bit 1 |
| OPT-2 | Open | Optional jumper bit 2 |
| OPT-3 | Open | Optional jumper bit 3 |

## Comm Ports I/O Connector Plate

Table 5-29 lists the connector sizes supported by the comm ports connector plate.

**Table 5-29.** SNA Comm Ports I/O Connector Plate

| Opening | Connector |
|---|---|
| A | DB-9 |
| B | DB-15 (Ethernet) |
| C,D,E | DB-25 (RS-232) |
| F,G | DB-37 (RS-449) |

## The Ethernet Board

The Ethernet board is designed to run TCP/IP. Depending on your configuration, the Ethernet board can be installed in slot five (5) or six (6). he Ethernet board employs 47 jumpers to configure the board, J1 through J47. Figure 5-17 illustrates the Ethernet board. Table 5-30 lists the installed jumpers.

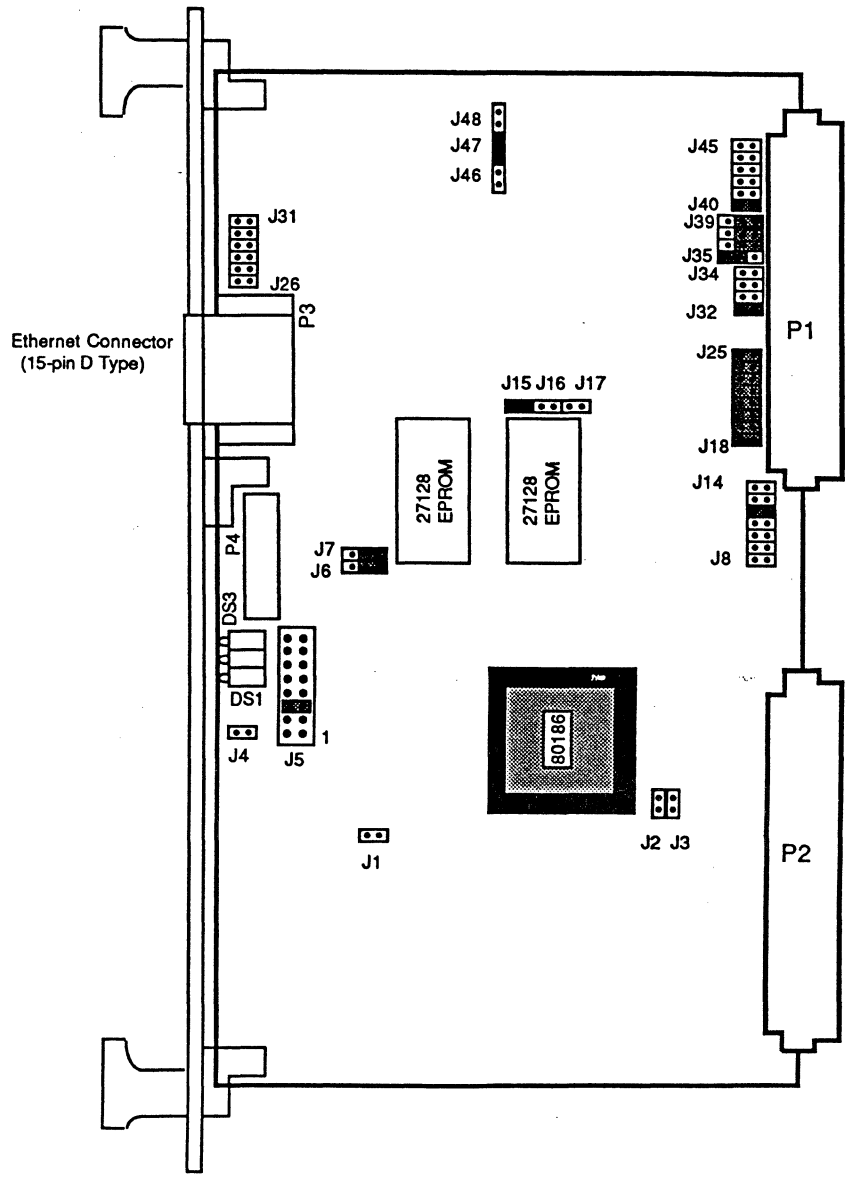



**Figure 5-17.** Ethernet Board Components

**Table 5-30.** Ethernet Board Jumper Settings

| Jumper | Setting | Jumper | Setting |
|---|---|---|---|
| J1 | Absent | J21 | Absent |
| J2 | Installed | J22 | Absent |
| J3 | Absent (see Table 5-31) | J23 | Absent |
| J4 | Boot from | J24 | Installed |
| J5 | Absent | J25 | Absent |
| J6 | Absent (Table 5-31) | J26 | Absent |
| J7 | Absent | J27-J34 | Installed (All) |
| J8 | Installed | J35 | Installed |
| J9 | Absent | J36 | Absent |
| J10 | Absent | J37 | Absent |
| J11 | Absent | J38 | Absent |
| J12 | Installed | J39 | 1 to 2 |
| J13 | Installed | J40 | 2 to 3 |
| J14 | Installed | J41 | 2 to 3 |
| J15 | Installed | J42 | 2 to 3 |
| J16 | Installed | J43 | Installed |
| J17 | Installed | J44 | Absent |
| J18 | Installed | J45 | Absent |
| J19A | Installed | J46 | Absent |
| J20 | Absent | J47 | Absent |

**Table 5-31.** Ethernet Board J3 — J6 Jumper Settings

| J3 | J6 | RAM |
|---|---|---|
| Absent | Absent | 128K (factory setting) |
| Installed | Absent | Reserved |
| Absent | Installed | 512K |
| Installed | Installed | Reserved |

## The SCSI Host Adapter Board

As many as four SCSI host adapter boards can be installed in your P/90. Figure 5-18 illustrates the SCSI Host Adapter board. Table 5-32 lists the jumper settings of the SCSI host adapter board while Table 5-33 lists the five rotary switch positions.

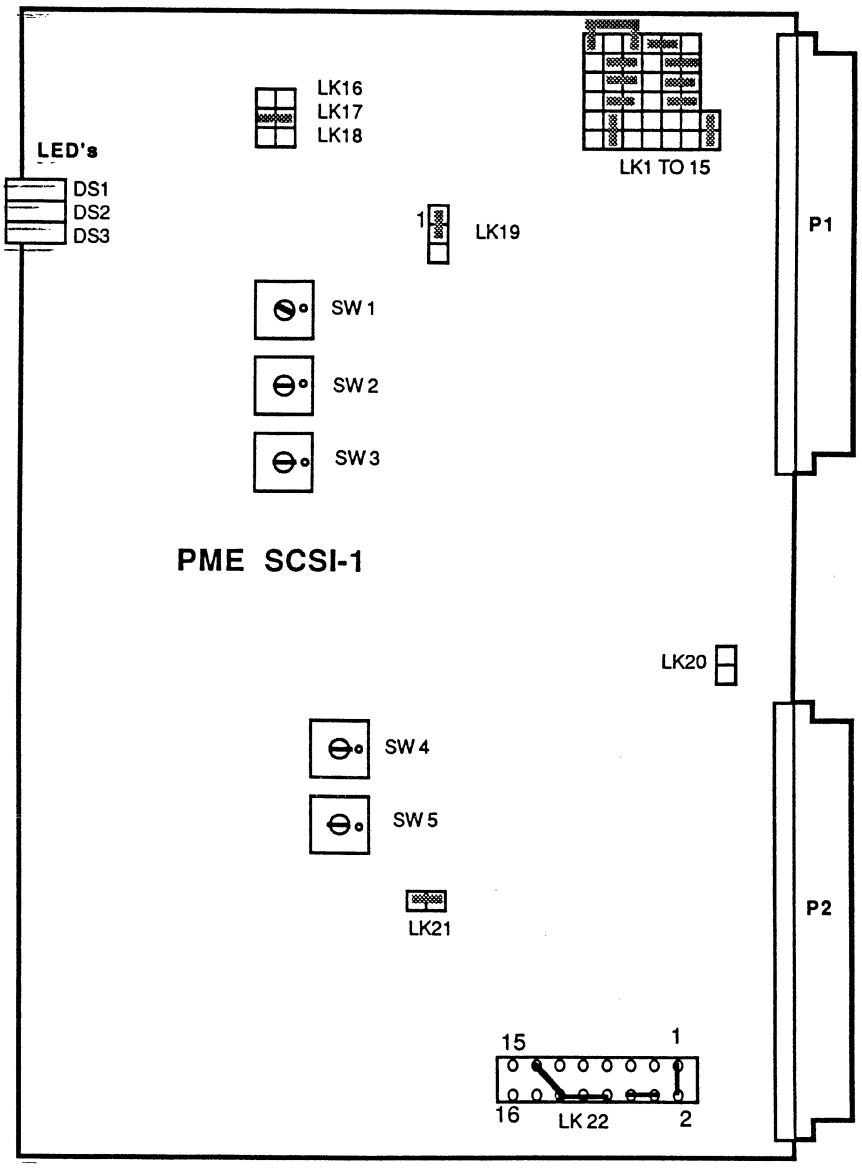



**Figure 5-18.** SCSI Host Adapter Board

**Table 5-32.** SCSI Host Adapter Jumper Settings

| Jumper | Settings | Definition |
|---|---|---|
| LK1 | SHORT between 2-3 | Bus Arbitration |
| LK3 | SHORT between 1-2 | Bus Arbitration |
| LK5 | SHORT between 1-2 | Bus Arbitration |
| LK7 | SHORT between 1-2 | Bus Arbitration |
| LK2 | SHORT between 1-3 | Bus Arbitration |
| LK4 | SHORT between 1-2 | Bus Arbitration |
| LK6 | SHORT between 1-2 | Bus Arbitration |
| LK8 | SHORT between 1-2 | Bus Arbitration |
| LK9 | OPEN | Address Modifiers |
| LK10 | spare | Address Modifiers |
| LK11 | OPEN | Address Modifiers |
| LK12 | OPEN | Bus Request Level |
| LK13 | OPEN | Bus Request Level |
| LK14 | OPEN | Bus Request Level |
| LK15 | SHORT | Bus Request Level |
| LK16 | OPEN | Bus Hold Limit |
| LK17 | SHORT | Bus Hold Limit |
| LK18 | OPEN | Bus Hold Limit |
| LK19 | SHORT between 1-2 | Address Bus Width |
| LK20 | OPEN | Terminator |
| LK21 | SHORT between 1-2 | Test Link |
| LK22 | SHORT between 1-2, 4-6, 8-10, 12-13 | SCSI ID and PROM size |

**Table 5-33.** SCSI Host Adapter Switch Settings

| Switch | Board 0 | Board 1 | Board 2 | Board 3 |
|---|---|---|---|---|
| SW1 | 2 | 2 | 2 | 2 |
| SW2 | 0 | 0 | 0 | 0 |
| SW3 | 0 | 1 | 2 | 3 |
| SW4 | 0 | 0 | 0 | 0 |
| SW5 | 0 | 0 | 0 | 0 |

# INDEX

**G, H, I**



**J, K, L**



**M, N, O**