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System

Hardware Maintenance Manual

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Paragon™ System Hardware Maintenance Manual

Intel® Corporation

WARNING

Some of the circuitry inside this system operates at hazardous energy and electric shock voltage levels. To avoid the risk of personal injury due to contact with an energy hazard, or risk of electric shock, do not enter any portion of this system unless it is intended to be accessible without the use of a tool. The areas that are considered accessible are the outer enclosure and the area just inside the front door when all of the front panels are installed, and the front of the diagnostic station. There are no user serviceable areas inside the system. Refer any need for such access only to technical personnel that have been qualified by Intel Corporation.

CAUTION

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Preface

Introduction

This manual presents the information an Intel Customer Support engineer or other qualified service person needs to perform maintenance on the Paragon™ XP/S system.

This manual provides information on troubleshooting and repairing Paragon XP/S systems contained in one or more cabinets. This manual also serves as a hardware reference for your site system administrator.

The manual assumes that you have been through the customer engineer training class, and so are familiar with the Paragon XP/S system hardware and software.

Organization

Chapter 1	This chapter provides a brief description of the Paragon XP/S system, its evolution, and the maintenance philosophy pursued in this document.
Chapter 2	This chapter provides an operational description of the Paragon XP/S system at a level adequate to support the maintenance philosophy of the manual. In addition to the system-level functional description, it describes each field replaceable unit (FRU).
Chapter 3	This chapter describes all the routine and periodic maintenance procedures associated with the Paragon XP/S system.
Chapter 4	This chapter describes troubleshooting procedures for the Paragon XP/S system. Standard troubleshooting techniques are used in conjunction with the Paragon XP/S system node confidence test (NCT) and diagnostic utilities to support fault diagnosis to the FRU level.

Chapter 5	This chapter provides detailed procedures for connecting all internal and external cables for each standard Paragon XP/S system. Instructions describe cabling for the basic cabinet, cardcage interconnect cabling, I/O system cabling, LED subsystem cabling, and cabinet-to-cabinet cabling.
Chapter 6	This chapter provides full disassembly and assembly procedures that support FRU replacement for the Paragon XP/S system. Detailed illustrations are provided when necessary to support the disassembly procedures.
Appendix A	This appendix contains an illustrated parts list of all replaceable items in the Paragon XP/S system. Illustrations are provided when necessary to identify FRUs. Intel part numbers are provided for all parts unique to the Paragon XP/S system.
Index	The Index provides a two-level topic index on the sections, illustrations, tables, hardware, descriptions, and procedures covered in this manual.

Notational Conventions

This manual uses the following notational conventions:

Bold — Identifies command names and switches, system call names, reserved words, and other items that must be used exactly as shown.

Italic — Identifies variables, filenames, directories, processes, user names, and writer annotations in examples. Italic type style is also occasionally used to emphasize a word or phrase.

`Plain-Monospace` — Identifies computer output (prompts and messages), examples, and values of variables. Some examples contain annotations that describe specific parts of the example. These annotations (which are not part of the example code or session) appear in *italic* type style and flush with the right margin.

`Bold-Italic-Monospace` — Identifies user input (what you enter in response to some prompt).

`Bold-Monospace` — Identifies the names of keyboard keys (which are also enclosed in angle brackets). A dash indicates that the key preceding the dash is to be held down *while* the key following the dash is pressed. For example:

`<Break>` **`<s>`** **`<Ctrl-Alt-Del>`**

[ ] — (Brackets) Surround optional items.

... — (Ellipsis dots) Indicate that the preceding item may be repeated.

| — (Bar) Separates two or more items of which you may select only one.

{ } — (Braces) Surround two or more items of which you must select one.

Applicable Documents

For more information, refer to the *Paragon™ System Technical Documentation Guide*.

Comments and Assistance

Intel Scalable Systems Division is eager to hear of your experiences with our products. Please call us if you need assistance, have questions, or otherwise want to comment on your Paragon system.

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Overview 1

Introduction

The Paragon™ XP/S system is a family of Intel parallel supercomputers that are housed in one or more cabinets depending on the size and performance of the system. The smallest standard Paragon XP/S system can house all compute and I/O resources in a single Paragon XP/S system cabinet. As the size of the Paragon XP/S system increases, additional cabinets (as well as additional compute nodes and I/O devices) are added to house the resources required by the larger system.

The Paragon XP/S system uses a Multiple Instruction, Multiple Data (MIMD) approach to parallel processing. In a MIMD parallel computer, each processing element (referred to as a *node*) has its own CPU, memory, and communications interface to other computational nodes (compute nodes).

In a MIMD parallel computer, each compute node acts independently on its own data, and receives instructions or shares data using node-to-node communications. In the Single Instruction, Multiple Data (SIMD) architecture, all compute nodes simultaneously operate on the same task, though each node still maintains its own data.

The Paragon XP/S system uses a mesh interconnect topology between the computational nodes for node-to-node communications. The I/O environment of the Paragon XP/S system provides I/O bandwidth and mass storage that closely matches the computational and internode communication performance of the Paragon XP/S system.

Maintenance and Repair Philosophy

The maintenance and repair philosophy supported in this manual is based on the field replaceable units (FRUs) of the Paragon XP/S system. All descriptions, testing, repair, and replacement of parts in the Paragon XP/S system is done to the FRU level, so a more detailed examination of a problem is not necessary.

For example, each assembled node board is a FRU, but individual board modules or components are not FRUs. If your testing and troubleshooting isolates a fault to a certain node board, you replace the entire board (the FRU) even though the real problem might be with a module or component installed on the node board. When returned to the repair depot, the actual fault with the node board will be repaired. In most cases, the field service personnel do not have the tools, parts, support equipment, and/or experience to repair/replace Paragon XP/S system components below the FRU level.

The following sections describe the FRUs associated with each of the major parts of the Paragon XP/S system.

Diagnostic Station

The Paragon XP/S system Diagnostic Station (DS) is separate, fully contained computer that is mounted in the first cabinet (cabinet 00) of each Paragon XP/S system. The entire diagnostic station is a FRU.

Cabinet Modules

The Paragon XP/S system cabinets have the following modules and assemblies as FRUs:

- Cardcage module assembly (the backplane and any installed node boards are FRUs).
- Fanpack module (individual fans are FRUs).
- Front door assembly (the LED display boards and cables are FRUs).
- Peripheral module assembly (individual disk/tape drives, SCSI/DIN adapters, RAID controller boards, and associated cables are FRUs).
- Each power supply and the DC-DC convertor assemblies are FRUs.
- Power channel assembly, line filter, main breaker, and main power cord are FRUs.

Boards and Repairable/Replaceable Components

The Paragon XP/S system replaceable components might also be included as part of a module or assembly. The Paragon XP/S system replaceable components are as follows:

- GP node board. The base board can have either 16M-bytes or 32M-bytes of installed memory, and with a memory daughterboard installed, there can be up to 160M-bytes of total node memory.

- MP node board. The base board can have from 16M-bytes to 128M-bytes of installed memory, and with a memory daughterboard installed, there can be up to 256M-bytes of total node memory.

- Memory daughter board. The memory daughter board mounts on either a GP or an MP node base board. An installed memory daughter board adds 16M-bytes, 32M-bytes, 64M-bytes, or 128M-bytes of memory to that of the base board depending on the selected memory option.

- MIO node. The GP node base board can have either 16M-bytes or 32M-bytes of installed memory. The MP node base board can have either 64M-bytes or 128M-bytes of installed memory. The MIO node board provides a serial port (9-pin), Ethernet port (15-pin), and SCSI port (50-pin) at its front panel.

- HIPPI node. The HIPPI node board mounts on a GP node base board with either 16M-bytes or 32M-bytes of installed memory, or on an MP node base board with either 64M-bytes or 128M-bytes of installed memory. The HIPPI node board has both a source and destination channel on board, and occupies two slots in a Paragon XP/S system cardcage.

- SCSI-16 node. The MP node base board can have either 64M-bytes or 128M-bytes of installed memory. The SCSI-16 node board provides a serial port (6-pin RJ45), Ethernet port (8-pin RJ45), and two 16-bit SCSI ports (68-pin) at its front panel.

- The power controller board.

- The LED controller board and the LED display boards.

- The RAID controller boards, and 1.2G-byte, 1.0G-byte, or 4.0G-byte SCSI disk drives (five drives in each RAID array).

- The 4mm DAT SCSI tape drive.

Cabling

The Paragon XP/S system replaceable cables are as follows:

- The basic cabinet cables that apply to all cabinets, regardless of configuration. These cables include the front door power cables, the fan power cables, the thermostat cables, the LED controller power/signal cable, the LED signal cables, and the main power cable.

- The DC power subsystem cables. These cables include the DC power cables (+5V and +12V), the DC auxiliary power cable, the power controller board power cable, the power controller board wiring harness, the disk power cable harnesses, the power supply AC power cords, and the supply power/cooling cables.

- The I/O system cables. These cables include the internal Ethernet cables, the internal HIPPI cables, the internal SCSI and RAID cables, the individual disk and RAID power cables, and the peripheral module DC power cable.

- The cabinet-to-cabinet cables. These cables include the mesh interconnect cables, the power controller board power chain cable, the power controller board scan chain cable, LED controller East/West cable, and the backplane scan string expansion cable.

Hardware Description 2

Introduction

This chapter gives a functional-level description of each of the major hardware elements of the Paragon™ XP/S system. This hardware description supports maintenance, troubleshooting, installation, and replacement for the Paragon XP/S system and its field replaceable units (FRUs).

Diagnostic Station

The Paragon XP/S system diagnostic station (DS) is a separate computer (based in the Intel486™ processor) that controls Paragon XP/S system boot and diagnostic functions, and stores the operating system and utility software required for DS operations. There is normally a single diagnostic station in each Paragon XP/S system, and that DS is installed in cabinet 0. Figure 2-1 is a block diagram of the Paragon XP/S system diagnostic station that indicates the major components included in the DS.

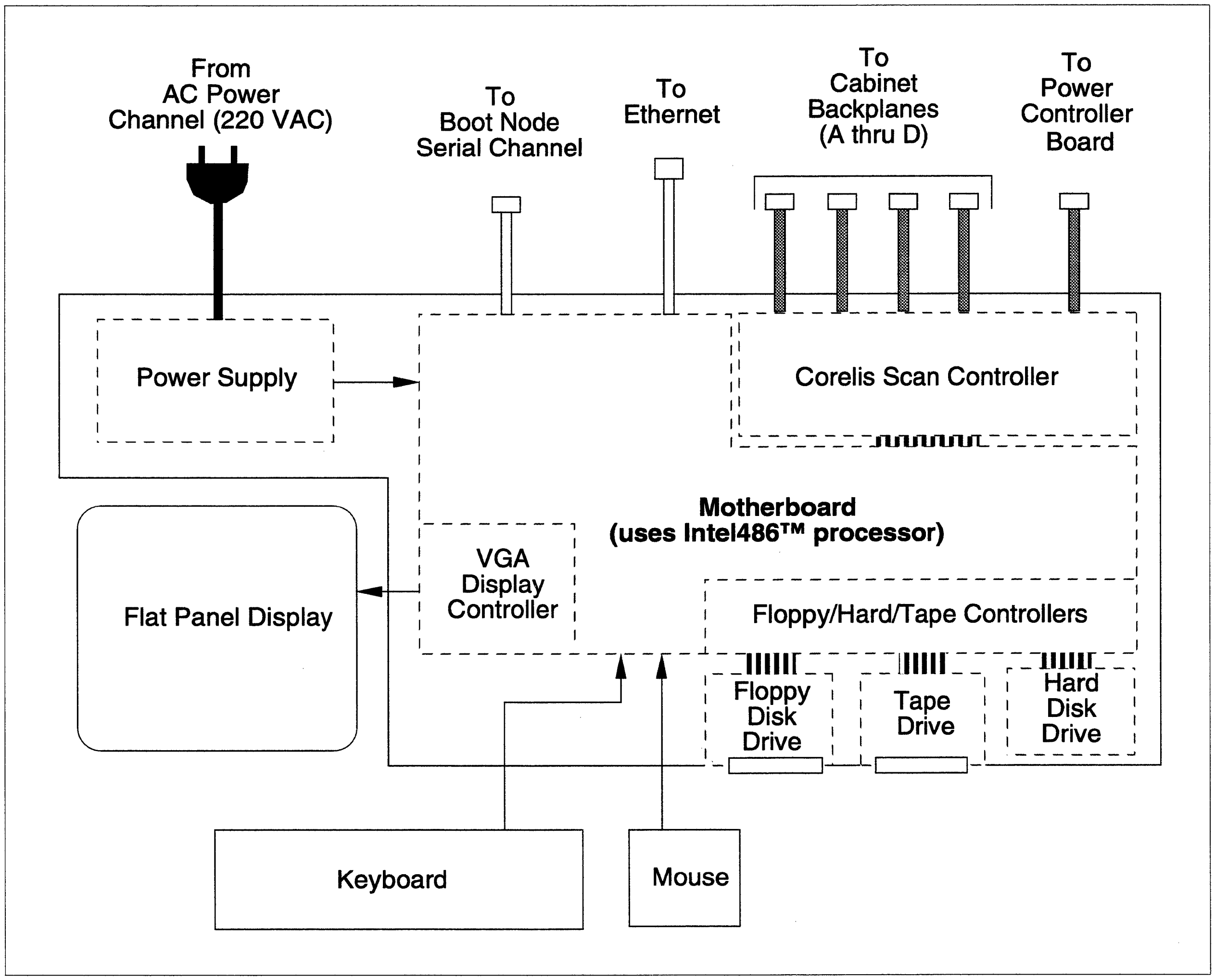


Figure 2-1. Diagnostic Station Block Diagram

The diagnostic station contains its own power supply and uses 220 VAC power that it obtains from the cabinet AC power channel. All components of the diagnostic station are powered by the diagnostic station power supply.

The flat panel VGA display is driven by a controller connected to the Intel486-based motherboard of the diagnostic station. Other controllers connected to the Intel486-based motherboard control the floppy drive, the cartridge tape drive, and the SCSI hard disk drive of the diagnostic station. The DS keyboard and mouse are also connected to the Intel486-based motherboard.

The diagnostic station's cartridge tape drive and (occasionally) its floppy disk drive are used to load updates of the Paragon XP/S system software, including the operating system, system utilities, compilers, diagnostics, and applications. The 540-MByte hard disk of the diagnostic station stores the diagnostic software and the operating system, compiler, and utility software of the Paragon XP/S system.

The Corelis scan board controls the JTAG scan string accesses to the power controller boards and backplanes of each cabinet in the Paragon XP/S system.

The diagnostic station controls Paragon XP/S system initialization and runs the Paragon System Diagnostic (PSD) software to help isolate system failures to the Field Replaceable Unit (FRU) level. In general, the diagnostic station in its entirety is considered a single FRU. Any faults to diagnostic station components can be corrected by replacing the entire diagnostic station.

Cabinet Hardware

The Paragon XP/S system houses all of its main compute hardware in one or more cabinets. Each cabinet uses industry standard 19-inch racks and other hardware. The cardcages, peripheral modules and other Paragon XP/S system hardware are also designed to work with these industry standard 19-inch racks. The modularity and interchangeability of the Paragon XP/S system hardware makes it quite straight-forward to customize the configuration of a system to match a customer's needs.

General Information

Detailed listings (with part numbers) of field replaceable units (FRUs) are presented in Table A-1, Table A-2, Table A-3, Table A-4, and Table A-5 starting on page A-1. In general, the cabinet FRUs include the basic cabinet hardware, associated power supplies, peripheral modules, and any installed boards or drives. Refer to Chapter 6 for detailed removal, replacement, and/or installation procedures for the cabinet FRUs. Refer to Chapter 5 for detailed cabling procedures that might be necessary when replacing a FRU.

Figure 2-2 is a block diagram of a cabinet showing the major hardware components that might be installed in each Paragon XP/S system cabinet. The drawing also indicates the major signal paths between the hardware components.

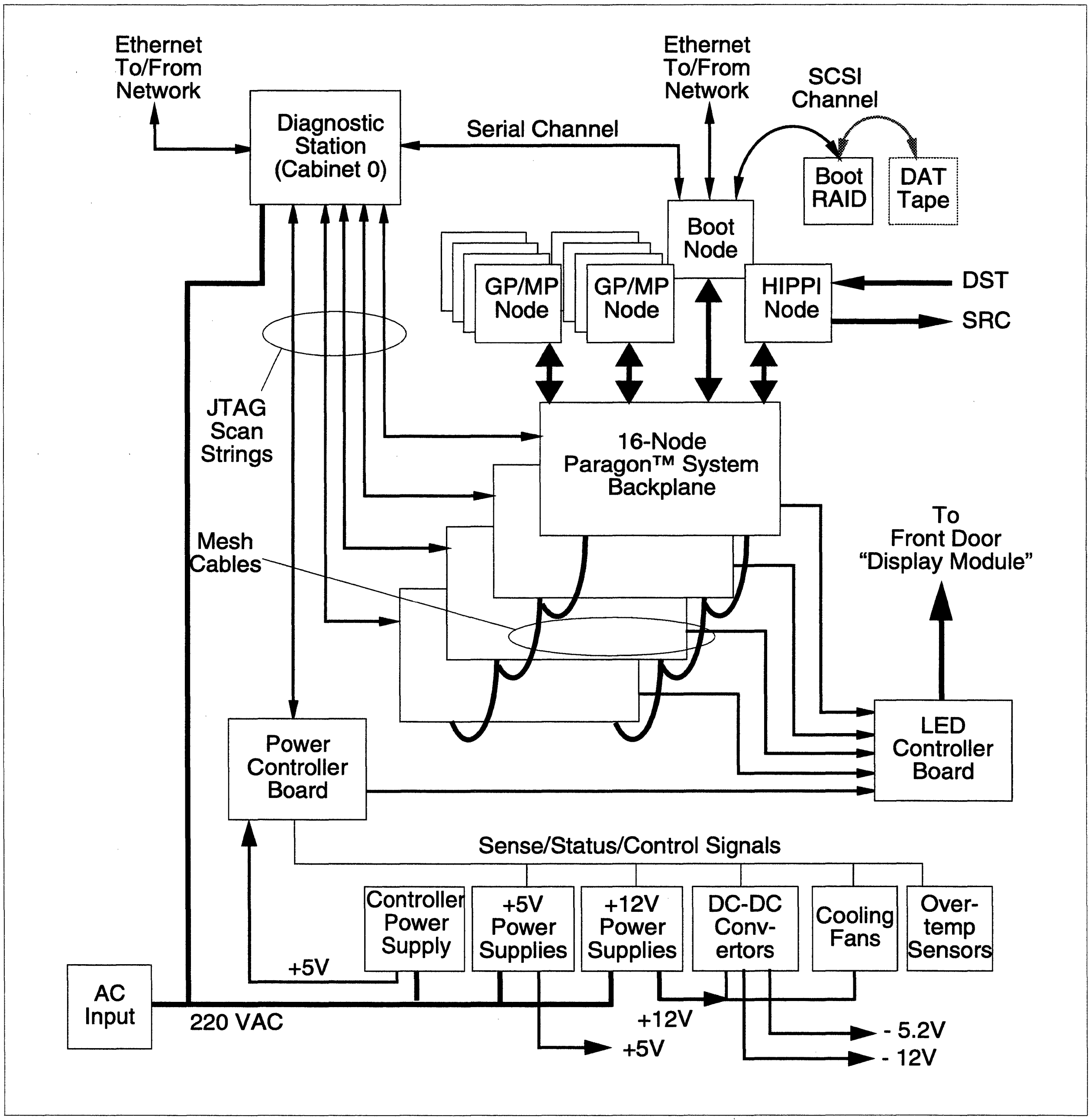


Figure 2-2. Cabinet Block Diagram

Although the cabinet block diagram is somewhat crowded, it is not really very complex. Two or three elements of the block diagram only exist in cabinet 0 of a multi-cabinet Paragon XP/S system, as follows:

- The diagnostic station is normally only installed in cabinet 0.
- The controller power supply is normally only installed in cabinet 0.
- MIO nodes can be installed in any cabinet, but the arrangement shown (i.e., serial channel connected to the diagnostic station and Ethernet channel connected to the local network) is only valid for the Paragon XP/S system boot node. Most other MIO nodes are connected only to RAID arrays.

Every cabinet uses the same AC/DC power distribution arrangement. AC power enters through the main power cord, passes through a line filter, the main breaker, and a terminal block, and on to the AC power channel. The AC power channel provides 220VAC to the power supplies and diagnostic station (if installed) of the cabinet.

If this is cabinet 0, it will have a diagnostic station installed. The diagnostic station originates and controls the JTAG scan string signals that are used throughout the Paragon XP/S system for diagnostics, monitoring, and control. The five scan string cables are daisy-chained from the first cabinet to the last cabinet in the Paragon XP/S system.

The power controller board monitors and controls the operation of each of the power supplies in the cabinet. Each cabinet in the Paragon XP/S system has a power controller board that controls the DC power systems, and also monitors the temperature and fan operation for that cabinet. Onboard LEDs indicate the status of all monitored elements. Various jumpers control the response when an overtemperature or out-of-tolerance condition is detected. ON/OFF switches allow any power controller board in the Paragon XP/S system to control the DC power for the entire system. Refer to "Interpreting Power Controller Board LEDs" on page 4-10 for more information on the power controller board. In addition to the status shown on the power controller board LEDs, status information is also sent from the power controller board to the LED controller board for eventual display on the cabinet front door.

The control power supply is installed only in cabinet 0. The +5V output of this supply powers all power controller boards in the Paragon XP/S system, so the loss of power in one cabinet does not necessarily mean the loss of power to that cabinet's power controller board.

The remaining power supplies in the cabinet (except for the controller power supply) provide the reliability of an N+1 system. An N+1 system has enough reserve capacity to allow the loss of any single power supply without any subsequent loss of the Paragon XP/S system. The standard Paragon XP/S system uses four +5V, two +12V power supplies, and two each -5.2V and -12V DC-DC convertors in each cabinet to achieve N+1 system reliability. The +5V and +12V supplies are powered by 220VAC from the power channel, and the DC-DC convertors derive their power from the +12V supply. The outputs of the +5V and +12V supplies are connected, in parallel, to a set of main bus bars that are mounted in the rear area of each cabinet. The main bus bars provide a high capacity, low loss connection point for all components in the cabinet that use +5V or +12V power.

The fifteen cooling fans in the Paragon XP/S system cabinet provide signals to the power controller board that will flag an error condition. In addition, the three major areas of the cabinet (peripheral bay, node bay, and rear area) are monitored for two levels of overtemperature condition. Cooling fan faults and overtemperature conditions will cause LED activation on the power controller board and might also result in system shutdown.

The LED controller board accepts status information from the power controller board and from each of the backplanes in the Paragon XP/S system cabinet. The status information is used to develop fault summary signals, node activity signals, and message traffic signals that result in LED indications on the cabinet front door LED displays. Refer to the *Paragon™ System User's Guide* for a detailed description of the cabinet front door LED display that relates the LEDs to Paragon XP/S system operation.

There are four 16-node backplanes and associated cardcages in each Paragon XP/S system cabinet. There are actually seventeen slots in each cardcage, but the center slot is vacant and normally covered. Each backplane holds the circuitry and performs the routing required to implement a 4x4 (16-node) mesh interconnect network on that backplane. The mesh interconnect cables extend the mesh network to the backplane immediately above and/or below itself. When all backplanes in a cabinet are interconnected together, the cabinet has a 4x16 mesh network (64 nodes). The logical mesh network is mirrored in the front door LED display. Each backplane sends status and activity information to the LED controller board so the LED display will accurately reflect the state of nodes installed in each cardcage.

Several different types of nodes can be installed in a Paragon XP/S system cardcage, but the fundamental operation performed by any node is either computation or I/O, as follows:

- Every Paragon XP/S system must have a boot node, and the boot node is normally installed in slot 3 of the top cardcage in cabinet 0 (slot 00D03 in CBS notation). Because of the required mass storage and communication links for the boot node, an MIO node is used in this application.

- The MIO node supports an Ethernet hookup between the Paragon XP/S system and the local network. It also supports a direct serial link between the Paragon XP/S system and another serial port. Finally, the MIO node can be connected to (and control) a SCSI-based RAID array and/or a DAT tape drive. The baseboard used for an MIO node can be either a GP node or an MP node.

- The SCSI-16 node provides two 16-bit SCSI channels that connect to a SCSI-based RAID array and/or a DAT tape drive. The SCSI-16 node can be configured to use either single-ended or differential SCSI for either channel. The SCSI-16 node supports an Ethernet hookup between the Paragon XP/S system and the local network. It also supports a direct serial link between the Paragon XP/S system and another serial port. The baseboard used for a SCSI-16 node is an MP node.

- Service nodes can be GP nodes, MP nodes, MIO nodes, or SCSI-16 nodes.

- Compute nodes can be either GP nodes or MP nodes. These nodes can also have additional memory (above that on the baseboard) if a memory daughterboard is installed.

- The HIPPI node is used to support high-speed communication between the Paragon XP/S system and some other device that also supports the HIPPI protocol. The baseboard used for a HIPPI node can be either a GP node or an MP node.

Basic Cabinet Hardware

Every cabinet contains the same basic cabinet hardware:

- The casters, support legs, cover plates, and cosmetic trim panels. Most of these components are preinstalled and cannot be replaced.

- The main power cable (with connector), main breaker, AC line filter, and the AC power channel that provides main AC power (220 VAC) to the cabinet.

- The front and rear cabinet doors. The front door also contains the LED display board, the DC power bus bars, and the signal cables for the LED display boards. There is also an LED controller board mounted one the side of the cabinet in the rear area.

- The cooling fan assemblies. There are six large cooling fans at the base of the cardcages and six more at the top of the cardcages. In addition, there are three cooling fans at the top of the cabinet peripheral bay.

- The cabinet mounting racks (industry standard 19-inch) and four 17-slot cardcages (for 16 node boards and a vacant center slot). Installed on the back of each cardcage is a Paragon system backplane.

- The DC power supplies for each cabinet. Each cabinet has four (or optionally six) +5V power supplies, two +12V power supplies, and two DC-DC convertor assemblies that supply -5.2V/-12V to installed components.

- The basic cabinet cabling. In addition to the hardware components installed in a basic cabinet, numerous power and signal cables/wires are installed in the basic cabinet to support interconnect and power distribution requirements.

The replaceable parts of the basic cabinet hardware are listed in Table A-1 starting on page A-1. Refer to Chapter 6 for instructions on replacing parts of the basic cabinet hardware.

The AC power components include the main power cable, the main breaker, the AC line filter, and the AC power channel. Differences in the line power available in various countries are resolved through the use of different main power cords and different wiring options at the terminal block. Refer to "Cabinet AC Power Wiring" on page 5-2, if necessary, for the proper procedures to adapt the cabinet for different line power. The AC power channel provides 220VAC to the power supplies and diagnostic station (if installed) of the cabinet.

The LED components of the cabinet must connect to at least one cardcage backplane in order to be active. When active, the front door LED display panel mirrors the front panel LEDs of any boards installed in the cabinet.

Modules

Many of the components installed in a Paragon XP/S system cabinet are also part of a module. For example, the node boards and the backplane are part of the cardcage module. In addition, even though each power supply is treated as a FRU, it is described in this section. The following sections provide a functional-level description of the modules in the Paragon XP/S system cabinet.

Cardcage Module

There are four cardcage modules in each Paragon XP/S system cabinet. The cardcage module consists of the cardcage, an attached backplane, any installed node boards, any installed air baffle cards, and any installed front filler panels.

The cardcage itself is an off-the-shelf standard assembly that uses replaceable rails and I-beams. The side plates, the backplane, the front filler panels, and the node front panels of each cardcage module form the side walls of the cabinet cooling air plenum. For proper cooling airflow, the node front panels and front filler panels should completely enclose the front of the cardcage. In addition, if a cardcage has a large number of vacant slots, air baffle cards should be installed to ensure that cooling air is distributed evenly across the plenum.

The only active component in a cardcage module (aside from the installed node boards) is the backplane. Node boards mate with backplane connectors mounted on the cardcage-side of the backplane. All active components in the backplane are mounted on the rear side (opposite the cardcage-side) of the board. Note that when referring to connectors on the rear side of the backplane, relative directions (i.e., right or left) are as viewed from the rear of the cabinet. Connectors mounted on the rear side of the backplane perform the following functions:

- Mesh connectors allow the backplane to link with backplanes immediately above (North), below (South), to the right (East), and to the left (West). Two mesh connectors are used for each backplane-to-backplane link, so there are sixteen (16) mesh connectors on each backplane.

- A scan string input connector (left edge of the backplane) links each backplane to the diagnostic station. If there are additional cabinets in the Paragon XP/S system, a scan string output connector (right edge of the backplane) links this backplane with one to the immediate right.

- An LED connector near the upper right corner of the backplane sends status and activity information to the LED controller board. After appropriate processing, this information results in LED activity in the section of the front door corresponding to this backplane.

- Bus bar links between the backplane bus bars and the main bus bars provide +5V power to the backplane and any installed node boards.

- A 9-pin connector near the lower right corner of the backplane provides +12V, -5.2V, and -12V power to any components on the backplane or on any installed node boards that require these voltages.

Peripheral Module

The Paragon XP/S system peripheral module mounts in front of the cardcages on hinge pins. There can be up to three peripheral modules installed in each cabinet. The Paragon XP/S system peripheral module can contain individual disk drives, individual tape drives, or RAID (Redundant Array of Inexpensive Disks) arrays with their associated controller.

Each peripheral module can mount up to fifteen individual disk/tape drives, three RAID arrays (with five SCSI disk drives per array), or other appropriate combinations that total no more than fifteen drives. Other than the frame, hardware, and cover plates, the only components included in a basic peripheral module are a cooling fan and the terminal block. The peripheral module power cable connects to the terminal block, and the cooling fan also connects to the same terminal block.

A RAID array consists of the following elements:

- Five SCSI disks installed in drive carriers (carrier frame, SCSI/DIN adapter, and the hard disk).
- The RAID controller board.
- The RAID board power cable (connects to terminal block and RAID board).
- The SCSI RAID cable (connects to the MIO/SCSI-16 node and the RAID board).

The RAID utilities and PSD can be used to identify faulty drives, cables, or the RAID controller board. Refer to "Peripheral Numbering" on page 2-20 for the convention that is used in reporting peripherals. Each RAID array is treated as a single SCSI device by the SCSI controller (on the MIO node).

NOTE

There can be one of two types of DAT tape drives installed in the Paragon XP/S system. The older type (HP Model 35470) accepts only the original, lower capacity tape cartridge (Intel part number 316963-001) and will fail if the newer, 120 meter by 4mm DAT tape cartridge is installed. If you have one of the newer DAT tape drives (HP Model C1533) installed, you can use the 120 meter by 4mm DAT tape (Intel part number 350831-001) to achieve the full 4G-byte capacity of the drive.

When individual drives (usually DAT tape drives) are installed in a peripheral module, they are first installed in a drive skid. The drive skid occupies an entire array row in the peripheral module. Individual drives use separate power and SCSI signal cables, not the SCSI/DIN adapter that RAID drives use. The power cable for individual drives connects to the peripheral module terminal block, and has five connectors to power up to five drives. The SCSI RAID cable has a second connector on the end that can be used by an individual drive. There are also SCSI cables available that support connections to only individual drives.

Display Module

The display module is really the front door of a Paragon XP/S system cabinet. The front door is actually a rather complex structure that incorporates a translucent plastic outer cover, a metal frame, numerous plastic spacers and cover panels, the LED display boards, the LED controller board, and the associated cabling. In addition to its major function of showing the activity and status of the nodes and other components within the cabinet, the "display module" must also perform a reasonably good imitation of being a door.

All display activity of the front door LEDs is controlled by the LED controller board, a board that is mounted on the lower right side (viewed from the rear) of the rear area of the cabinet. Refer to Figure 2-2 on page 2-4 for more information on the signals that are used by the LED controller board in controlling the LED display.

A signal cable from the LED controller board is combined with power cables and routed to the lower hinge area of the front door. The signal cable is connected first to the top LED display board. Short display-to-display signal cables pass the LED controller signals to each lower LED display board until the bottom one is reached.

The "display module" power cables connect directly between the main bus bars for the cabinet and the bus bars connecting the LED display boards in the front door. The high amount of current used by the front door LEDs dictates the use of heavy cables and bus bars.

If you want more information, refer to the *Paragon™ System User's Guide* for a detailed description of the cabinet front door LED display that relates the LEDs to Paragon XP/S system operation.

Power Supply Modules

There are five different types of power supply used within the Paragon XP/S system cabinet. There are actually six types because of the diagnostic station power supply, but the entire diagnostic station is normally treated as a FRU. The following power supply types are FRUs in the Paragon XP/S system:

- 2000 watt, 400 amp, +5VDC power supply. There are either four (standard) or six (optional) of these supplies installed in each Paragon XP/S system cabinet. The output of all of these supplies is applied, in parallel, to the main bus bars of the cabinet.

- 800 watt, 67 amp, +12VDC power supply. There are two of these supplies installed in each Paragon XP/S system cabinet. The output of all of these supplies is applied, in parallel, to the main bus bars of the cabinet.

- 60 watt, 5 amp, -12V DC-DC convertors. There are two of these convertors mounted in an assembly, and one assembly installed in each Paragon XP/S system cabinet.
- 52 watt,10 amp, -5.2V DC-DC convertors. There are two of these convertors mounted in an assembly, and one assembly installed in each Paragon XP/S system cabinet.
- 130 watt, 26 amp, +5VDC power supply. There is normally only one of these supplies in the entire Paragon XP/S system. The output of this supply is cabled first to the power controller board in cabinet 00. A "daisy chain" power cable relays this power to each successive cabinet in the Paragon XP/S system.

Each of the above power supplies is a separately replaceable FRU. The DC-DC convertor assemblies (not the individual convertors) are also FRUs. The installation method used in the Paragon XP/S system allows each cabinet to provide the reliability of an N+1 redundant power system. The loss of a single power supply will not result in a system failure. The remaining supplies have enough capacity to make up for the loss until the faulty supply is replaced.

The +5V and +12V power supply outputs can be inhibited remotely using the OFF button of any power controller board in the Paragon XP/S system. Because the DC-DC convertors use +12V power, inhibiting the outputs of the main power supplies shuts down all DC power in the Paragon XP/S system (with the exception of the power controller board power).

The power controller board monitors the status of each main power supply as well as the voltages on each of the buses. When a a fault is detected, the power controller board latches the appropriate onboard LED (to indicate fault location), and optionally can shut down the system if one of the power buses goes out of tolerance. Because of the separate control power supply, a system shutdown will not result in loss of the latched status LED on the power controller board. The LED indicators remain lit until the RESET button on the power controller board is pressed, or until AC power to cabinet 0 is turned off.

Fan Modules

The Paragon XP/S system uses a cooling air plenum that encloses all four cardcages of the cabinet. There are six cooling fans in the base of the plenum, and an additional six cooling fans at the top of the plenum. Each of these fans is a FRU. Although the fans are assembled into modules, the modules are not FRUs, only the fans. The cables powering the fans also return a signal to indicate a fault with any fan. This fault status is latched into the power controller board LEDs. The power controller board also tracks overtemperature status which might indirectly point to a fan problem. All twelve fans in the plenum are required to maintain cooling airflow, but the loss of one or more fans might not result in an overtemperature fault in a lightly loaded system.

In addition to the twelve fans in the cabinet plenum, there are three smaller fans at the top of the peripheral bay. Each of these fans is a FRU. Although the fans are assembled into a three-pack module, the module is not a FRU, only the fans. The purpose of this three-pack module is to exhaust air from only the peripheral bay. Both the diagnostic station and the peripheral modules have cooling fans, so the three-pack module doesn't do any direct cooling.

Node Boards

The boards discussed in this section are only the node boards that install in a Paragon XP/S system cardcage. Other boards (e.g., the LED display board or the power controller board) are discussed in other sections of this chapter. The following sections provide brief functional descriptions of the node boards that can be installed in the Paragon XP/S system.

GP Node Board

The GP node board is the original compute node for the Paragon XP/S system, and it can also be used as the base board for both the MIO node board and the HIPPI node board. The GP node board holds either 16M-bytes or 32M-bytes of onboard memory, two i860 processors (one dedicated to compute functions and one for message operations), diagnostic scan channel support, a NIC (Network Interface Chip) controller, two DP ASICs (Data Path Application Specific Integrated Circuits), a daughterboard expansion connector, and the mesh interface connector.

A memory daughterboard can be installed on the GP node baseboard to add 16M-bytes, 32M-bytes, 64M-bytes, or 128M-bytes of memory to the 16M-bytes or 32M-bytes of onboard memory included on the baseboard. This makes it possible for a GP node to have total onboard memory from a minimum of 16M-bytes (without memory daughterboard) to a maximum of 160M-bytes (with the highest capacity memory daughterboard).

Operating at a clock frequency of 50 MHz, each GP node is able to exhibit performance of up to 75 MFLOPS (Million FLoating-point Operations Per Second) in double precision (64-bit words) or 100 MFLOPS in single precision (32-bit words) operation. Board-to-board communications take place over the mesh interconnect.

Each GP node board (with or without memory daughterboard) occupies one 1-inch wide slot in the Paragon XP/S system cardcage. There can be sixteen GP nodes installed in each cardcage or as many as 64 nodes in a Paragon XP/S system cabinet.

MP Node Board

The MP node board is the second-generation compute node for the Paragon XP/S system. The MP node board holds 16M-bytes, 32M-bytes, 64M-bytes, or 128M-bytes of onboard memory, three i860 processors (two dedicated to compute functions and one to message operations), diagnostic scan channel support, a NIC (Network Interface Chip) controller, two DP ASICs (Data Path Application Specific Integrated Circuits), a daughterboard expansion connector, and the mesh interface connector.

A memory daughterboard can be installed on the MP node baseboard to add 16M-bytes, 32M-bytes, 64M-bytes, or 128M-bytes of memory to the 16M-bytes through 128M-bytes of onboard memory included on the baseboard. This makes it possible for an MP node to have total onboard memory from a minimum of 16M-bytes (without memory daughterboard) to a maximum of 256M-bytes (with the highest capacity memory daughterboard).

Operating at a clock frequency of 50 MHz, each MP node is capable of performance of up to 150 MFLOPS (Million FLoating-point Operations Per Second) in double precision (64-bit words) or 200 MFLOPS in single precision (32-bit words) operation. Board-to-board communications take place over the mesh interconnect.

Each board occupies one 1-inch wide slot in the Paragon XP/S system cardcage. There can be sixteen MP nodes installed in each cardcage or as many as 64 nodes in a Paragon XP/S system cabinet.

MIO Node

The MIO node is a combination of a GP or MP node base board, and the MIO daughterboard. The MIO node provides serial, Ethernet, and 8-bit SCSI channel interfaces to the Paragon XP/S system. These interfaces are used to satisfy Paragon XP/S system external communication, diagnostics, and I/O requirements.

The Paragon XP/S system boot node is always an MIO node and is normally installed in slot 3 of the top cardcage in cabinet 0 (slot 00D03 in CBS notation). The serial channel of the boot node connects directly to the serial channel of the diagnostic station. The Ethernet port of the boot node is the main connection between the Paragon XP/S system and the local network. The boot node SCSI interface connects with both a RAID controller and a DAT tape device.

The serial channel uses a 9-pin connector and supports an RS232 interface at rates from 110 baud up to 288Kbps. The serial channel is normally only used by the boot node at boot time, or for diagnostic purposes during debug.

The Ethernet port uses a 15-pin connector and supports the IEEE802.3 Ethernet specification.

The SCSI channel uses a high-density 50-pin connector and supports 8-bit SCSI operations at rates up to 7M-bytes/sec. The SCSI channel normally communicates with a single RAID controller and (optionally) with a DAT tape drive.

The connectors for all three MIO node I/O interfaces are available on the node front panel. The MIO node occupies one 1-inch wide slot in the Paragon XP/S system cardcage. There is no physical limit (other than 16 nodes per cardcage and 64 nodes per cabinet) to the number of MIO node boards that can be installed in a cardcage or cabinet, but the cabling and I/O device requirements to utilize the installed nodes results in an upper limit of MIO nodes in a single cabinet. Most practical systems use less than sixteen MIO nodes in a cabinet.

SCSI-16 Node

The SCSI-16 node is a combination of an MP node base board, and the SCSI-16 daughterboard. The SCSI-16 node provides serial, Ethernet, and SCSI channel interfaces to the Paragon XP/S system. These interfaces are used to satisfy Paragon XP/S system external communication, diagnostics, and I/O requirements.

The serial channel uses an RJ-11 connector and the hardware supports an RS232 interface at rates up to 288 Kbps. The serial channel is normally only used by a boot node at boot time, or for diagnostic purposes during debug.

The Ethernet port uses an RJ-45 connector and supports the IEEE802.3 Ethernet specification. This interface supports the industry-standard IEEE 10BaseT protocol, which is a 10MHz twisted pair media standard.

The two SCSI channels use high-density 68-pin connectors, and the hardware supports 8-bit or 16-bit SCSI operations at rates up to 20 M-bytes/sec. Each SCSI channel normally communicates with a single RAID controller and (optionally) with a DAT tape drive. Each SCSI channel can be factory configured to support either single-ended or differential communications with the attached SCSI device(s) or RAID controller.

The connectors for all I/O interfaces are available on the node front panel. The SCSI-16 node occupies one 1-inch wide slot in the Paragon XP/S system cardcage. There is no physical limit (other than 16 nodes per cardcage and 64 nodes per cabinet) on the number of SCSI-16 node boards that can be installed in a cardcage or cabinet, but the cabling and I/O device requirements to utilize the installed nodes results in an upper limit of SCSI-16 nodes in a single cabinet. Most practical systems use less than eight SCSI-16 nodes in a cabinet.

HIPPI Node

The HIPPI node board is a combination of a GP or MP node base board, and the HIPPI daughterboard. The HIPPI node board supports high-speed, point-to-point communications between the Paragon XP/S system and another device with a HIPPI interface. The HIPPI node complies with the six ANSI standards that comprise the HIPPI standard.

The HIPPI node supports two simplex channels; one "Source" channel, and one "Destination" channel. Both channels can operate simultaneously at the full 100Mbps burst rate. Communication overhead reduces the practical transmission rate to about 90Mbps or less. The Paragon XP/S system implementation of the HIPPI node uses 32-bit words and 48-bit source and destination addresses.

The connectors for HIPPI node channels are available on the node front panel. The HIPPI node occupies two slots (2-inch wide front panel) when installed in a Paragon XP/S system cardcage. Each HIPPI connector is a high-density 100-pin connector that interfaces directly with the supplied HIPPI cables.

Interconnections

The Paragon XP/S system uses cables to interconnect the major modules within each cabinet, and it also uses cables to interconnect cabinets to form the full system. There are actually four subsystems within the Paragon XP/S system that can be associated with interconnections. These subsystems are linked directly to the cables that are used to effect the interconnects, as follows:

- The basic cabinet interconnect cables are installed in every cabinet. These cables include the fan cables, the thermostat cables, the LED power and signal cables, and the main power cable.
- The DC power subsystem cables distribute power to the various areas within the cabinet that require it. These cables include the cables between the main bus bars and power supplies, the straps between the main bus bars and backplanes, the DC auxiliary power cable, the power controller power cable (cabinet 0 only), the power controller board wire harness, the disk module power cable, the power supply power/cooling cable, and the power supply AC power cords.
- The I/O system cables link I/O resources (both within and outside of a cabinet) together and also to Paragon XP/S system MIO nodes. These cables include internal and stub Ethernet cables, Individual drive power cables, HIPPI cables, SCSI/RAID cables, RAID array power cables, peripheral module fan cables, and peripheral module power cables.
- The mesh interconnect cables and cabinet-to-cabinet cables perform the important cardcage and cabinet interconnect functions that are necessary if the parts of a Paragon XP/S system cabinet are to become a Paragon XP/S system. These cables include the mesh interconnect cables, the power controller board power chain cables, the backplane-to-backplane scan chain cables, the power controller board scan chain cables, and the LED controller East/West cables.

A cardcage with its associated backplane and installed node boards is the base module used in making a Paragon XP/S system. The basic cabinet interconnect cables and the DC power subsystem cables apply to most cabinets, but these cables really play a support role in the operation of the system. The I/O system cables, the mesh interconnect cables, and the cabinet-to-cabinet cables play critical roles in turning the Paragon XP/S system into a supercomputer.

The I/O system links the Paragon XP/S system to the outside world and support computing functions with mass storage and archiving functions. The cables associated with the I/O system provide the interconnections necessary for I/O operations.

The mesh interconnect cables are actually controlled impedance signal paths that link the cardcages together. Without the technology that is embodied in the mesh interconnect cables, it would not be possible for the nodes in different cardcages to communicate at the speed they do now.

The cabinet-to-cabinet cables also include mesh interconnect cables. In addition to the mesh interconnect cables, signals that are not as sensitive to timing (i.e., scan cables and power cables) perform the remaining link functions that are necessary when connecting multiple cabinets together.

Numbering Conventions

The Paragon XP/S system uses both a physical numbering convention and two forms of logical numbering to identify the cabinets, cardcage modules, disk modules, nodes, and disks that are installed in the system. Depending on the task being performed, it might be necessary to translate from a logical numbering convention (used by the operating system or the system diagnostics) to physical node/disk numbering in order to locate a field replaceable unit. The correspondence between the front door LEDs and the installed nodes is also not immediately obvious, and therefore requires some translation.

LED-to-Slot Mapping

When the nodes are viewed from the front of the cabinet, the slot numbering starts at the right of the card cage and moves left. To find the LED associated with a slot, you begin counting at the lower-right corner of the backplane's block of LEDs, count up the right column, and then over to the next column to the left, and then back down in a serpentine fashion; in other words, Slot 0 is the lower-right LED, and Slot 15 is the lower-left LED. Figure 2-3 illustrates how the slots in a single backplane map to the corresponding LEDs in the cabinet door. There is a separate set of LEDs for each cardcage/backplane in the cabinet.

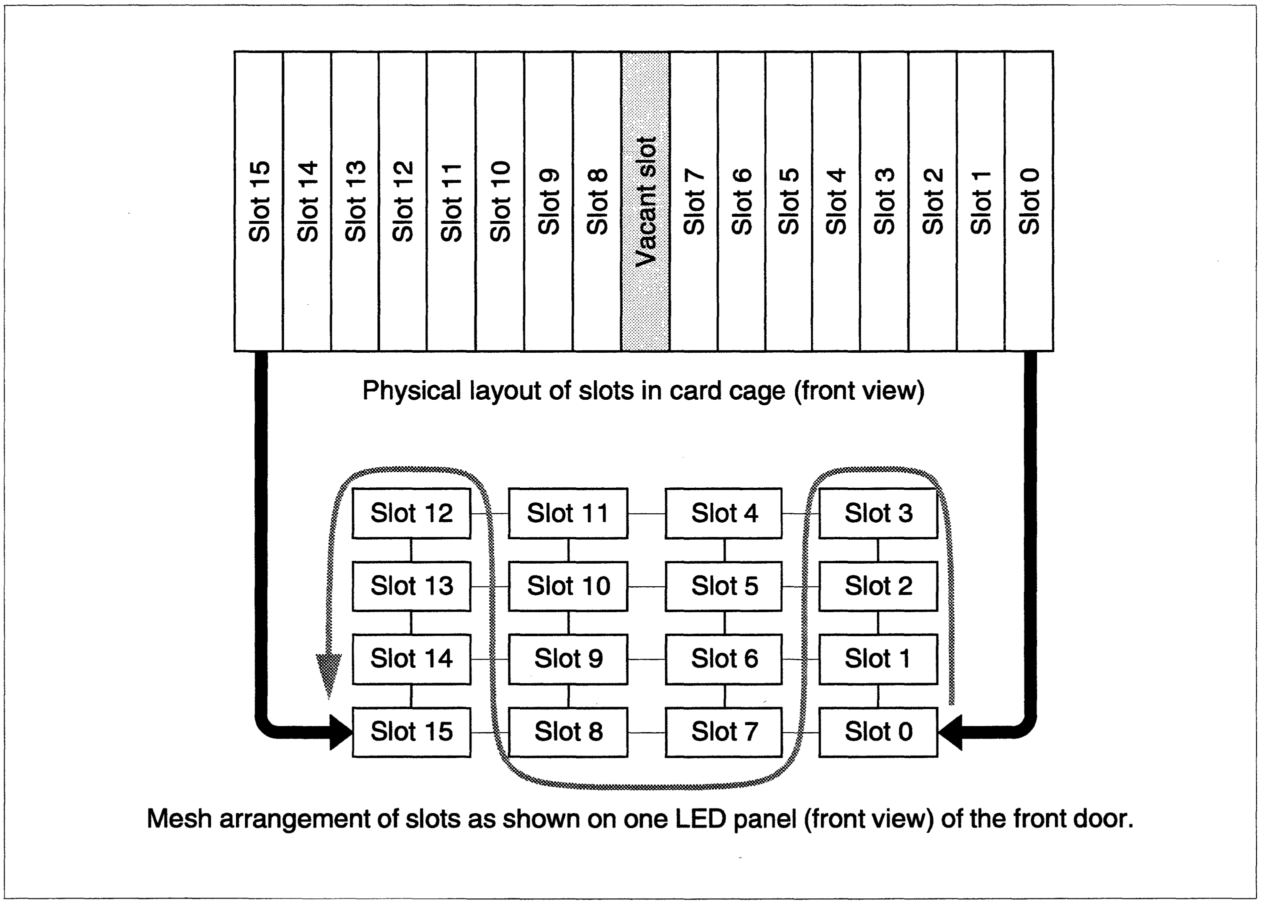


Figure 2-3. LED-to-Slot Mapping

Physical Locations

The logical location of a failing node/disk (indicated by a front door LED location or a diagnostic message) must be translated to reveal its physical location. A device's physical location is described using the CBS (Cabinet:Backplane:Slot) numbering scheme. The CBS numbering scheme uses an outward-inward approach to FRU identification by identifying first the cabinet, then the module (backplane or peripheral module), and finally the specific slot or drive. For example, a failing node identified as being "01B10" would be physically located in cabinet 01, cardcage B, and slot 10. In another example, a faulty disk drive identified as being "01ZB3" would be physically located in cabinet 01, peripheral module Z (the top module), row B (center row), and drive 3 (third from the right).

A cabinet might, or might not have cardcages, peripheral modules, nodes, or drives located in all its possible internal locations, but the CBS number of a FRU is based solely on its physical location. As long as a node/disk retains the same physical position, its CBS number will not change even if the number of installed nodes/disks in the cabinet changes.

Cabinet Numbering

The Paragon XP/S system is housed in one or more cabinets. When facing the front of the cabinets, the rightmost cabinet is numbered "cabinet 00". Additional cabinets to the left are numbered in sequence up to the last cabinet in the system. Figure 2-4 shows the Paragon XP/S system cabinet numbering scheme.

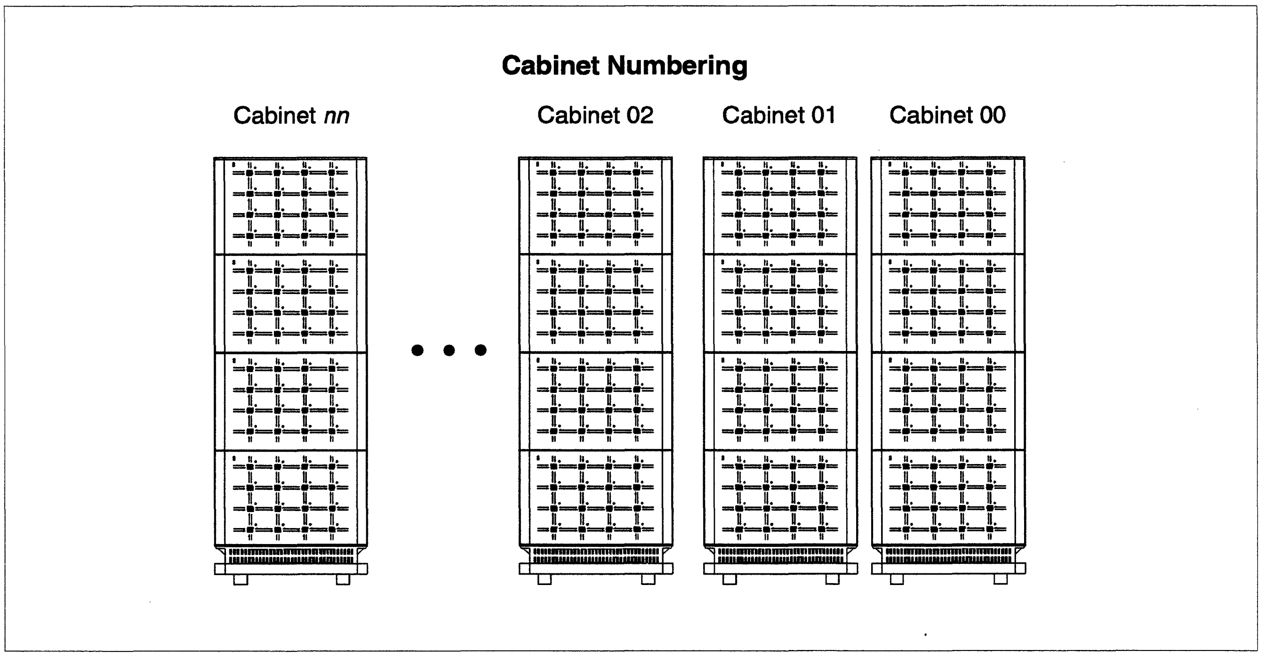


Figure 2-4. Cabinet Physical Numbering

NOTE

The CBS numbering scheme only applies to cardcage-mounted boards in the node bay, and drives/controllers mounted in the peripheral bay. Other FRUs are identified using the cabinet number and the appropriate FRU description. By convention, capital letters (instead of lower case) are used exclusively in the CBS numbering scheme.

Node Numbering

To identify a node with CBS numbering, you specify its cabinet, backplane, and slot. Figure 2-5 illustrates the CBS node numbering scheme, and shows how an example CBS number relates to a physical slot in the node bay of the Paragon XP/S system.

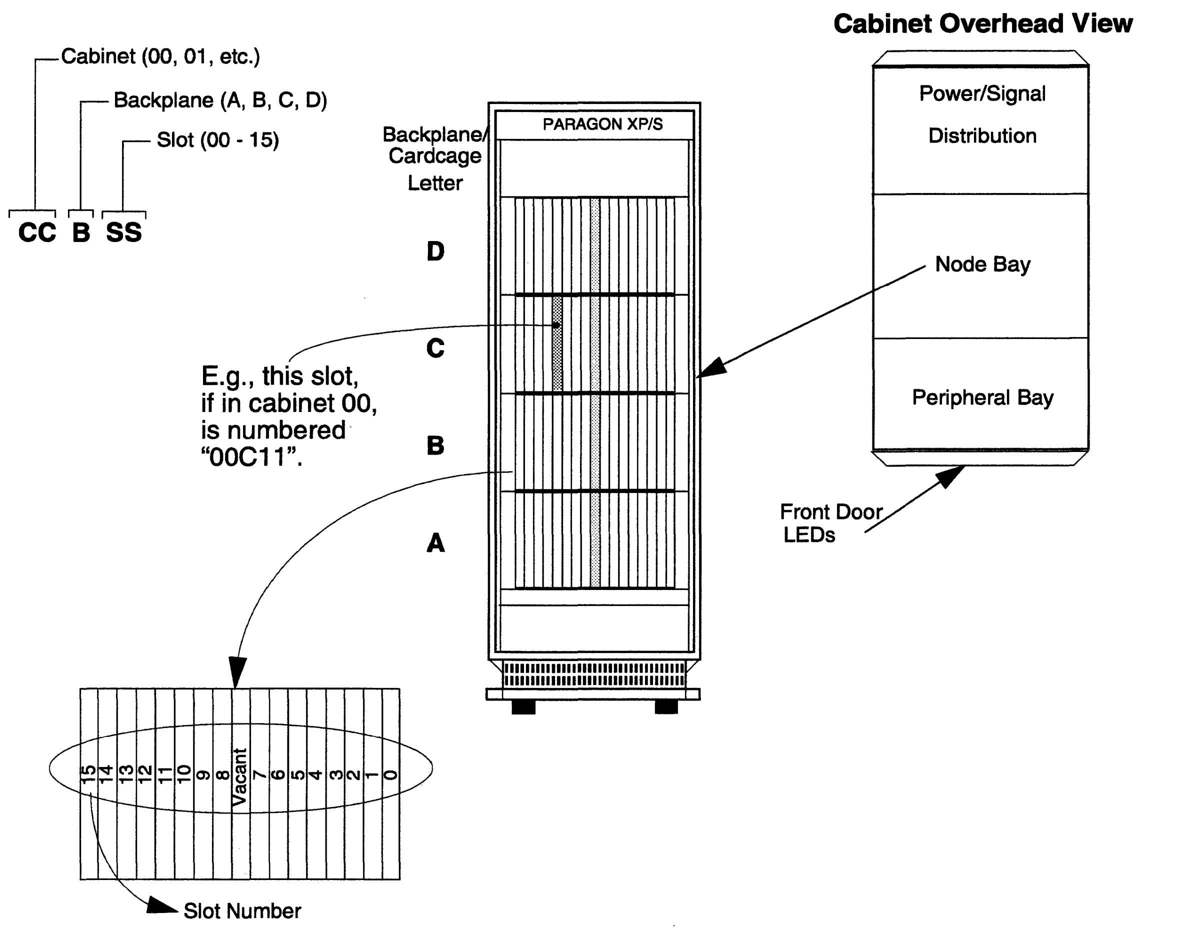


Figure 2-5. Node Numbering

Peripheral Numbering

The Paragon XP/S system peripherals are located in the peripheral bay in the front of each Paragon XP/S system cabinet. In cabinet number 00, the top peripheral module position (position "Z") is occupied by the Diagnostic Station (DS). If the peripheral device being identified is a RAID controller (instead of one of the drives) the letter "R" is used where the drive number would otherwise appear. Figure 2-6 shows how the CBS numbering for peripheral devices is derived, and shows how an example CBS number relates to a physical location in the peripheral bay of the Paragon XP/S system.

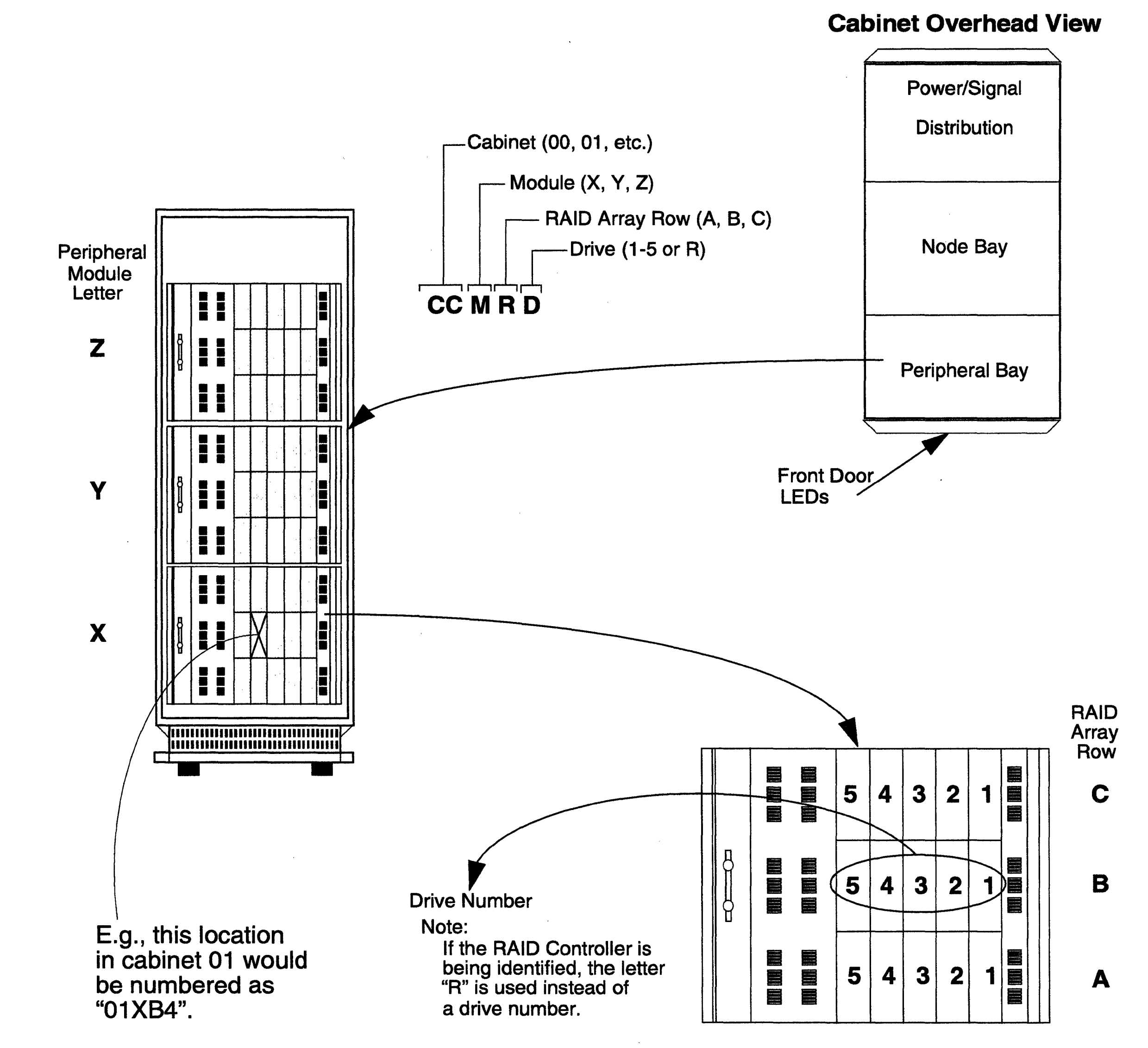


Figure 2-6. Peripheral Numbering (RAID/Disks/Tapes)

Power Supply Numbering

The Paragon XP/S system power supplies are located in the rear section of each cabinet on one of three hinge brackets. After the rear door is open, each hinge bracket can be opened separately to provide access to any of the power supplies. The power supply fault LEDs (on the power controller board that is mounted on the top hinge bracket, opposite the power supplies) indicate a faulty supply by number. Figure 2-7 shows the rear portion of the Paragon XP/S system cabinet and identifies (by number) the power supplies that are mounted on the hinge brackets. If an LED lights, the power supply number corresponds to those shown in this figure. Note that the control power supply is normally only installed in the first cabinet (cabinet 00) in the Paragon XP/S system. Note also that +5V power supplies #3 and #6 are only used when there are three supplies mounted on a hinge bracket, as shown in the view on the left side of Figure 2-7.

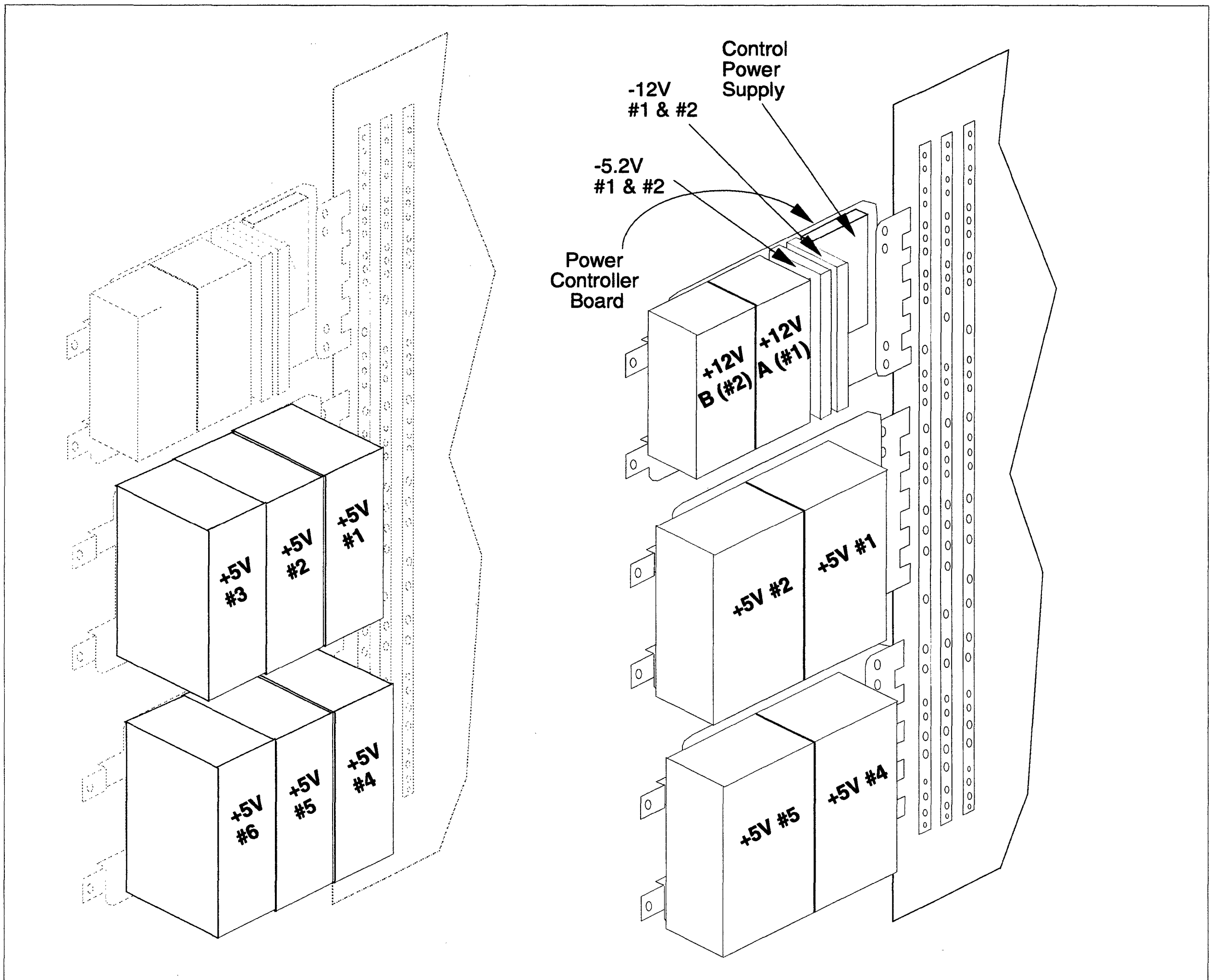


Figure 2-7. Power Supply Numbering

Diagnostic Node Numbering

The diagnostic node numbering is based on the CBS numbering scheme for nodes. As with the CBS numbering scheme, the physical location of every node (whether occupied or not) has a corresponding node/slot number. Unlike the CBS scheme, node/slot numbers continue in sequence instead of restarting at zero for each new cardcage. Figure 2-8 shows the diagnostic node numbering for a representative 3-cabinet Paragon XP/S system.

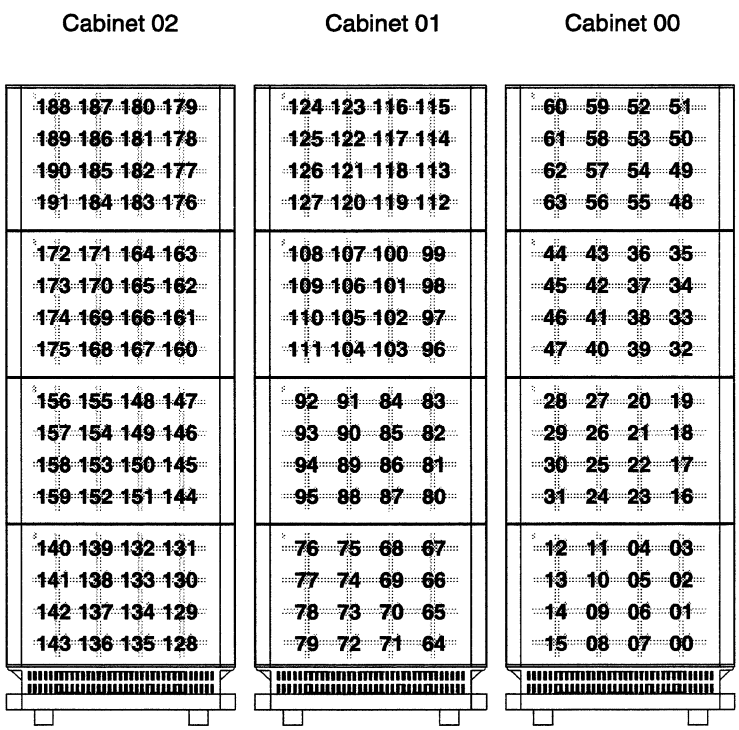


Figure 2-8. Diagnostic System Node Numbering

Logical Numbering

The numbering system used by the operating system software starts at the top left of the left-most cabinet, and spans all of the cabinets in the Paragon XP/S system. When you reach the end of the right-most cabinet, return to the leftmost-cabinet, drop down a row, and continue counting. OS node numbering is also called root partition node numbering. Note that the logical numbering scheme results in a new set of node numbers whenever the system size (i.e., the number of cabinets) changes. Figure 2-9 shows the logical node numbering for a representative 3-cabinet Paragon XP/S system.

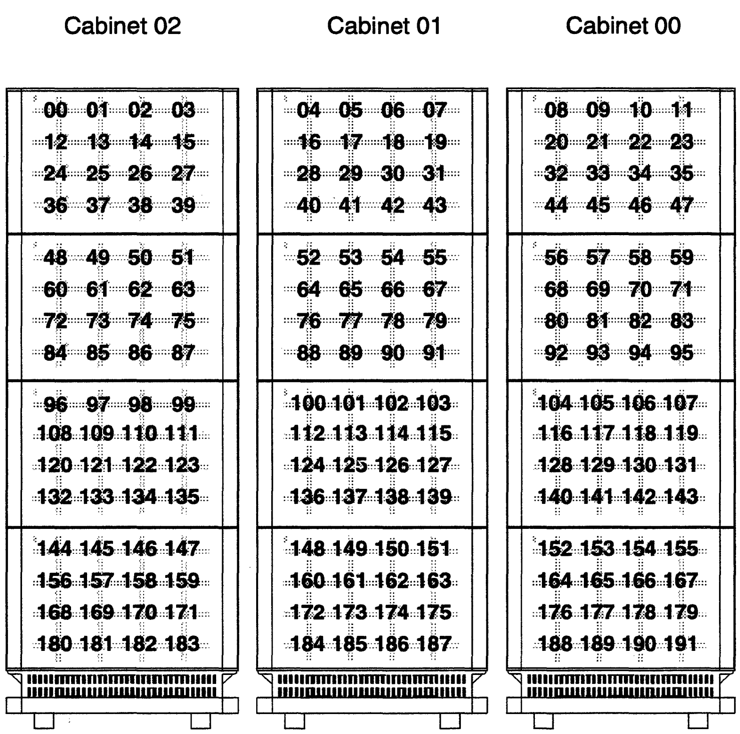


Figure 2-9. Logical Node Numbering

Maintenance Guide 3

Introduction

The Paragon™ XP/S system requires very little special handling or maintenance. In most cases, you only need to supply the proper power and cooling air to the Paragon XP/S system. The procedures in this chapter describe the steps to be followed when maintaining the Paragon XP/S system.

ESD Protection Practices

Everyday maintenance procedures can subject Paragon XP/S system components to damage from electrostatic discharge (ESD) if adequate ESD protective practices are not followed. You don't even need to touch a component in order to cause ESD damage, because a charge can be induced over a distance of several feet. Proper ESD protective practices will minimize the chances of damage to Paragon XP/S system components.

ESD behaves like a miniature lightning bolt, and causes damage to components in much the same manner as a lightning strike. ESD vaporizes or burns integrated circuit features at a microscopic level in the same way that a lightning strike causes damage to man-sized or building-sized objects. Unfortunately, ESD-caused damage is not always fatal to the devices. Most of the time a device is only weakened so the failure will happen later, or worse, intermittently. If the damage was always immediate and catastrophic, people would more readily link the device failure with the actual cause — inadequate ESD protective practices.

System components can be damaged by undetectable static voltages as well as by static charges that you are able to see, feel, or hear. A human being is normally able to detect an ESD buildup only when it reaches a level of 3500 volts or more. Many of the components used in the Paragon XP/S system, however, can be damaged by ESD levels as low as $\pm$200 volts. Quite obviously, if you only use adequate ESD protective practices when you become aware of a static charge, a lot of damage will occur even though you cannot sense the ESD. The only safe way to minimize ESD damage is to ALWAYS follow adequate ESD protective practices. The following sections describe the recommended work practices to minimize equipment exposure to ESD, the recommended ESD protective equipment, and requirements for an ESD safe workspace.

Minimizing Equipment ESD Exposure

There are two major areas that must be considered when you try to minimize your equipment ESD exposure:

- **Site Preparation:** The environmental conditions and the floor material at the site should minimize the potential for static charge build-up and ESD damage.

- **Operating/Maintenance Practices:** The practices followed by operation and maintenance personnel must minimize equipment ESD exposure and damage.

Site Preparation

The recommended environmental conditions and the floor material for the site are called out in the *Paragon™ System Site Preparation Guide*. In general, there is not much that can easily be done to change these conditions once the Paragon XP/S system is installed. Most post-installation options cost money, take a significant amount of time, and additionally can be high maintenance items. The changes should be made, however, in order to minimize the chances for ESD damage to the Paragon XP/S system.

Humidifiers or de-humidifiers can be added at a site to bring the humidity closer to the recommended 50% relative humidity. The relative humidity at the site is the single condition that has the greatest affect on static charge build-up. For example, simply walking across an unprotected, carpeted floor will cause a person to pick up a charge. In a room with 10% relative humidity, the charge will be 35,000 volts. In a room with 40% relative humidity, the charge will be 15,000 volts. In a room with 55% relative humidity, the charge will be down to 7,500 volts. The higher the relative humidity, the less the charge build-up. The major precaution to follow when changing the site humidity is to not exceed the maximum 85% relative humidity (non-condensing) called out in the *Paragon™ System Site Preparation Guide.*

In order to be considered ESD-safe, the floor material at the Paragon XP/S system site should have a charge decay time of less than 0.5 second, and it should not generate a charge of more than 200 volts. The floor materials recommended in the *Paragon™ System Site Preparation Guide* (tile or sealed concrete) are either ESD-safe or can easily be treated to be ESD-safe. The following treatments can be added to a floor to make it ESD-safe:

Dissipative floor wax

The least expensive option, dissipative floor wax, is also called butchers wax or discharge wax. The wax is relatively durable, but it typically needs to be reapplied every 3-6 months. Check floor conductivity with a megohmmeter to determine when to reapply wax. The major disadvantage is that wax can only be applied on hard floors (no carpets).

Static suppression spray

This is a more expensive and less durable option than dissipative floor wax. Typically sold in spray cans or as a liquid, this treatment should only be considered a temporary measure. The duration that the treatment is effective can be as little as a few minutes, or as long as a few weeks. One positive feature of this treatment is that it can easily be applied to carpets. If necessary, (due to availability or price) liquid or spray fabric softener can be used instead of the commercially available static suppression spray products. Be sure to apply a more permanent treatment (wax or anti-static mats) at the earliest opportunity.

Anti-static mats

An anti-static mat is a more expensive option than dissipative floor wax or static suppressive spray, but it does have the virtue of also being more durable. When cared for properly, anti-static floor mats should last for years. Check the mat conductivity with a megohmmeter periodically to determine if the mat needs to be replaced. The mat must be connected to an earth ground in order to be effective.

Operating/Maintenance Practices

In order to be effective, ESD protective practices must be followed at all times. It only takes one ESD exposure to damage or destroy a Paragon XP/S system component. The following general guidelines are recommended for all personnel who have maintenance or operating responsibilities with the Paragon XP/S system:

- Although an operating Paragon XP/S system has good ESD protection properties, it is good practice to wear an ESD protective smock and dissipative heel straps when working in the vicinity of the system.

- Use an ESD dissipative wrist strap (with cord connected to the cabinet ground) in addition to an ESD protective smock and heel straps whenever you open the front or rear door of a Paragon XP/S system cabinet. The smock must be buttoned in order to form an adequate ESD shield. Also wear the wrist strap, smock, and heel straps whenever handling components or boards within the Paragon XP/S system cabinet.

- Keep the area around the Paragon XP/S system and the on-site work area clean. If the floor is dirty, its ESD dissipative properties are impaired.

- Keep the area around the Paragon XP/S system free of all unnecessary plastic products. With the exception of specially treated plastics (e.g., antistatic bags and ESD safe foam), all plastic products (binders, bags, boxes, cups, packing foam, etc.) should be considered as static charge generators. Get rid of these plastic products! Any plastic products that must remain should be treated with a static suppressive spray or replaced with ESD-safe alternatives.

- The plastic front door of the Paragon XP/S system cabinet is not ESD safe. Keep these doors cleaned with static suppression spray cleaner, but always assume the door is charged. Do not hold boards or other components close to the front door of the Paragon XP/S system cabinet.

- Place boards or other ESD-sensitive components entirely within shielded anti-static bags before transporting them. Follow this practice even if you are only moving the component to a nearby work area.

- If components are being transported in a tote or on a cart, make sure the tote/cart has adequate ESD protective properties. The tote/cart must not be insulated, and carts should also have conductive wheels or a grounding chain that contacts the floor.

- If a Paragon XP/S system board/component is being repaired on-site, make sure the work area includes a grounded ESD dissipative mat and that you use an ESD dissipative wrist strap (with cord connected to ground) in addition to the smock and heel straps. All equipment and furnishings in the work area should be either ESD safe or adequately grounded. A continuously monitored work station is recommended.

- Whenever removing boards or other components from the Paragon XP/S system, always place the board or component in a shielded bag and seal the bag. The board/component is not ESD-safe unless it is in a sealed, shielded bag.

- When shipping boards or components, pack them first in a shielded bag and seal the bag. The padding around the board/component should be conductive or ESD-safe (pink foam or bubble pack).

ESD-Protected Work Areas

The *Paragon™ System Site Preparation Guide* states the minimum requirements for a Paragon XP/S system on-site work area. The minimum requirements for the on-site work area are as follows:

- There must be a work surface with ESD dissipative properties and a surface area of at least 4 sq.ft. A small table covered by a grounded ESD mat will satisfy this requirement.

- The work area must have a readily accessible ground connection to which ESD mats and ESD wrist straps can be connected.

- The floor of the work area must have an ESD dissipative surface. Alternatively, the floor around the work surface can be covered by a grounded ESD floor mat.

Note that the minimum requirements for a Paragon XP/S system on-site work area are adequate to support little more than preparing a board for shipment. If more complex tasks are to be performed (e.g., connector pin replacement or work on subassemblies), a larger, more capable work area is recommended. The following additional features are recommended for the work area:

- A continuous monitored work station that includes a monitored wrist strap, an ESD dissipative table top, and an ESD floor mat. The monitored work station provides a positive indication that ESD protective measures are working.

- A larger work surface than the 4 sq.ft. minimum is recommended. A 10-15 sq.ft. area should be adequate for most tasks.
- An ESD-safe chair will be necessary if you will be at the work area for an extended length of time.
- An ESD-safe cart is recommended if any quantity of boards/components are to be regularly moved between the Paragon XP/S system and the work area. The cart must have all shelves connected together (mechanically and electrically) and have a ground drag chain. Conductive wheels on carts are effective only while both the wheels and the floor are clean.

Recommended ESD Protective Equipment

Table 3-1 lists the ESD protective equipment that SSD Customer Support recommends for field personnel. These items are not available through Intel, but should be available locally or directly from the supplier. Contact SSD Customer Support for approval of substitute equipment or supplies.

Table 3-1. ESD Protective Equipment (1 of 2)

Item	Description	Identification
ESD floor tile	Tile for raised computer room floors that possesses a resistance of 1 to 10 megohms to ground.	Order by description.
ESD dissipative floor wax	Liquid floor wax that exhibits a resistance of 1 to 100 megohms per square after application. Also referred to as “butchers” or “discharge” wax.	Order by description.
ESD floor mat	Floor mat (with ground connection) that exhibits a resistance of 10,000 ohms to 1 megohm per square when properly installed.	Numerous suppliers.
Wrist strap and cord	Wrist strap with elastic, snap, or velcro closure that exhibits a resistance of 1 to 10 megohms to ground.	Numerous suppliers.
Anti-static smock with ESD cuff	Blue or white smock that exhibits 1 to 10 megohms of cuff-to-cuff resistance. The smock must be grounded in order to provide ESD protection.	Tech Ware SOC-25-SPL-(*size*) BLUE SOC-15-SPL-(*size*) WHITE
ESD heel straps (two required)	The fabric heel straps exhibit a resistance of 1 to 10 megohms to ground when properly installed.	Desco #7560
Continuous monitored work station	Monitor wrist strap, table top, and floor mat. The wrist strap is monitored to provide positive indication of ESD protection.	Numerous suppliers.
ESD protected chair	Charge generation less than ±200 volts and a resistance of 1 to 100 megohms to ground.	Lissner CAM10/3DB/7BS/TLC/FC

Table 3-1. ESD Protective Equipment (2 of 2)

Item	Description	Identification
Carts	All shelves connected (mechanically and electrically), and cart has a ground drag chain and (optionally) conductive wheels.	Order by description.
Field service ESD kit	Static dissipative work surface (includes carry pockets, attached ground cord, banana jack for wrist strap, and velcro closure straps) and ESD wrist strap with banana plug.	Desco #7710 (mat plus wrist strap) #7720 (mat alone)
Static suppressive spray cleaner	A cleaner that leaves a conductive residue when it dries. Chemically similar to liquid or spray fabric softeners.	Numerous suppliers.
Shielded bags	Conductive grey (preferred) or pink plastic bags in which boards and other electronic products are typically shipped. Do not use old or torn bags.	Numerous suppliers.

Preventive Maintenance Schedules

A set of monthly and weekly tasks have been identified as preventive maintenance procedures for the Paragon XP/S system. Table 3-2 lists the monthly site preventive maintenance tasks for the Paragon XP/S system. Table 3-3 lists the weekly site preventive maintenance tasks for the Paragon XP/S system.

Table 3-2. Monthly Site Preventive Maintenance Tasks (1 of 2)

Task Description	Action
Check to make sure all fans (6 ea. lower, 6 ea. upper, and 3 ea. front) in each cabinet are operating. Check power controller board fan fault LEDs and observe fan blades to determine failure.	Replace any faulty fans (see "Removing/Replacing Cabinet Mechanical Components" on page 6-2 for the appropriate replacement procedures.
Confirm that the airflow through each cabinet is adequate for proper cooling and that the ambient air in the computer room does not exceed 20°C (68°F).	Clear any obstructions and clean pathways in each cabinet to restore cooling airflow. Correct any temperature/airflow problems in the computer room.
Open the rear door of each cabinet and check for any abnormally hot power supplies (case very hot to the touch or too hot to touch).	Replace the hot power supply. Refer to "Removing/Replacing Power Subsystem Components" on page 6-25 for instructions.
Confirm that all cables are firmly seated on their mating connectors. Check each mesh interconnect cable, scan cable, SCSI/Ethernet/serial cable, LED cables, and the power/signal cables attached to the power supplies.	Reseat and/or secure any cables that have become loose. Refer to the cabling procedures in Chapter 5, if necessary, for cable replacement and routing instructions.

Table 3-2. Monthly Site Preventive Maintenance Tasks (2 of 2)

Task Description	Action
Check the site interrupt log.	Correct any problems reported in the log if the problems can be fixed.
Check the Paragon XP/S system disk logs.	Replace any RAID drives with a reported "Failed", or "Warning" status.
Install all spare node boards in vacant slots in the system, or (if there aren't enough vacant slots) swap the spare node boards with "known good" node boards for the duration of the remaining testing.	Tests are also run on spares to make sure that the spare node boards are "known good" when the time comes to use them.
Run **hwcfg**, **mergecfg**, and **cfgpar** in order to update the Paragon XP/S system configuration files for the duration of the remaining testing.	Adding the spare node boards to the system will change the system configuration.
Invoke **psd**, then run two passes of all tests at low voltage margin. Use the **margin** utility to margin the supplies in all cabinets. You can alternatively rejumper the power controller board (FAB 3 only) to change power supply margin in a single cabinet.	Note or replace any nodes that are indicated faulty.
With **psd** invoked, run two passes of all tests at high voltage margin.	Note or replace any nodes that are indicated faulty.
With the Paragon XP/S system at high voltage margin, run two passes of the Parallel SAT's.	Note or replace any nodes that are indicated faulty.
With the Paragon XP/S system at low voltage margin, run two passes of the Parallel SAT's.	Note or replace any nodes that are indicated faulty.
Restore the Paragon XP/S system to its operating configuration, disable margining (return the supplies to nominal voltage), then return it to service.	If any indicated faulty nodes have not already been replaced, replace them now with "known good" nodes. If necessary, run **hwcfg**, **mergecfg**, and **cfgpar** in order to rebuild the Paragon XP/S system configuration files so the system can resume normal operation.

Table 3-3. Weekly Site Preventive Maintenance Tasks (1 of 2)

Task Description	Action
Check the Paragon XP/S system **autoddb** log.	Check the log and correct any problems that can be fixed. If necessary, save a copy of the log for SSD Customer Support.
Check the Paragon XP/S system disk logs.	Replace any RAID drives with a reported "Failed", or "Warning" status.

Table 3-3. Weekly Site Preventive Maintenance Tasks (2 of 2)

Task Description	Action
Invoke **psd**, then run two passes of all tests on the Paragon XP/S system.	Note or replace any nodes that are indicated faulty.
Run two passes of the Parallel SAT's on the Paragon XP/S system.	Note or replace any nodes that are indicated faulty.
Restore the Paragon XP/S system to its operating configuration, then return it to service.	If any indicated faulty nodes have not already been replaced, replace them now with "known good" nodes. If necessary, run **hwcfg**, **mergecfg**, and **cfgpar** in order to rebuild the Paragon XP/S system configuration files so the system can resume normal operation.

Cleaning Procedures

The major components of the Paragon XP/S system should be cleaned occasionally to restore full cooling airflow, improve the static dissipative properties of Paragon XP/S system components, and to maintain the appearance of the system.

CAUTION

If it is necessary to open the cabinet rear door to clean parts of the Paragon XP/S system, first remove power from the appropriate unit. Use non-conducting cleaning tools whenever cleaning parts within the Paragon XP/S system cabinet.

Never apply a liquid cleaning agent directly to an Paragon XP/S system component. If it is necessary to use a liquid cleaning agent, apply it to a cleaning cloth instead of directly to the part being cleaned. Clean the component with the cloth, then wipe the component dry.

The recommended cleaning equipment for the Paragon XP/S system consists of the following:

- Clean, lint-free cleaning rags.
- Cotton swabs.
- Cleaning solution. Either use a commercially available static suppressive spray cleaner, or a blend composed of 75% mild, water-soluble cleaning detergent and 25% liquid fabric softener. The cleaning solution must both clean the surface and reduce its ESD properties.

- Small vacuum cleaner with ESD-safe hose and cleaning tools.

Restoring Cooling Airflow

Your main reason for cleaning the Paragon XP/S system cabinets will be to restore full cooling airflow to the system. If you observe dust and lint collecting around air passages of the cabinet components, it is time to clean. It will not be necessary to shut down the Paragon XP/S system unless you need to remove node boards or other components in a Paragon XP/S system cabinet. Perform the following steps to clean the Paragon XP/S system air passages:

1. Using the vacuum cleaner and appropriate attachments, clean any dust or lint from the base castings and exhaust grills of the cabinet(s).

2. If you must clean inside an Paragon XP/S system cabinet, observe proper ESD protective procedures and perform the following steps:

   A. Shut down the Paragon XP/S system using a normal shutdown procedure. Refer to the *Paragon™ System Administrator's Guide* for an appropriate shutdown procedure.

   B. Open the front door of the cabinet (lever at bottom right-side of the door), and (if necessary) unscrew and swing out the diagnostic station and RAID array modules. Clean the dust and lint from all exposed surfaces using the vacuum cleaner and appropriate attachments.

   C. If necessary, remove the installed boards using the procedures described in "Removing/Replacing Node Boards" on page 3-25. Clean the dust/lint from the boards using the vacuum cleaner and appropriate attachments, then replace the boards in the appropriate slots.

   D. Open the rear door of the cabinet and clean the dust/lint from all exposed surfaces using the vacuum cleaner and appropriate attachments.

3. Restore power to all Paragon XP/S system units using an appropriate start-up procedure. Refer to the *Paragon™ System Administrator's Guide* for an appropriate start-up procedure.

Cosmetic Cleaning

You should clean visible surfaces of Paragon XP/S system units when necessary to restore the appearance. The diagnostic station (with display screen, keyboard, and trackball mouse), and the front doors of each cabinet might require occasional cleaning. Perform the following steps to clean these objects:

1. For the diagnostic station screen, brush away any dust or lint using a dry cleaning rag. Apply the cleaning solution and/or water to a cleaning rag, then clean the screen of any accumulated foreign matter. Wipe the screen dry with a dry cleaning rag.

2. For the diagnostic station keyboard and trackball mouse, use the following steps:

   A. Brush away any accumulated dust or lint using a dry cleaning rag.

CAUTION

> Be careful to not let any cleaning liquid fall through the keys to the board on which the keys are mounted. Also do not let any cleaning liquid fall into the trackball mouse housing. Cleaning fluid will short out the printed circuit contacts.

   B. Apply cleaning solution and/or water to a cleaning rag or cotton swab, then clean the keyboard, keys, and trackball of any accumulated foreign matter. Wipe the keyboard, keys, and trackball dry using a dry cleaning rag or cotton swab.

   C. Using cotton swabs wetted with cleaning solution and/or water, clean between the keys and in any inaccessible areas of the keyboard and trackball housing. Dry these areas using a dry cotton swab.

   D. You can reduce the need for keyboard cleaning in the future by using one of the commercially-available flexible keyboard covers. If available, try to use an ESD-safe keyboard cover.

3. For the front doors of Paragon XP/S system cabinets, brush away any dust or lint using a dry cleaning rag. Apply cleaning solution and/or water to a cleaning rag, then clean the front door of any accumulated foreign matter. Wipe the door and display surfaces dry with a dry cleaning rag.

Cleaning/Aligning Tape Drives

The cartridge tape drive in the diagnostic station should be cleaned periodically, at least after every 24 hours of use. You can obtain a cleaning cartridge from the drive manufacturer or from a local distributor. Follow the instructions that come with the cleaning cartridge in order to clean the cartridge tape drive.

The 4mm SCSI DAT tape drive should be cleaned periodically, at least after every 24 hours of use. You can obtain a cleaning cartridge either from your media supplier or from Hewlett-Packard. Use the HP DAT Cleaning Cassette, HP 92283K (or equivalent) as follows:

Insert the cleaning cassette into the drive. The drive will automatically load the cassette and clean the heads. At the end of the cleaning cycle, the drive will automatically eject the cleaning cassette.

Please note the date of the cleaning on the cleaning cassette label. The cleaning cassette can be used up to 25 times, after which it should be discarded.

Adjusting Power Supply Output Voltages

The output voltage of each of the power supply types used in the Paragon XP/S system can be adjusted to set the voltage to nominal. Any time a power supply or convertor is replaced, you should follow the procedures in this section to make sure the replacement power supply is adjusted to the proper voltage. Use the procedures in the following sections to check and adjust the output voltages of each power supply type.

WARNING

The personnel performing these procedures can be exposed to hazardous voltages while power is applied to the cabinet.

400 Amp, +5VDC Power Supply Adjustment

The +5 volt and +12 volt systems in Paragon XP/S systems use multiple power supplies tied in parallel with active current sharing as a means of increasing power system reliability. This requires that a special adjustment procedure be used whenever it is necessary to install a new supply that might not have been previously adjusted, or to change the operating DC voltage of the system. Figure 3-1 shows the two qualified 400 amp, +5VDC supply types, and indicates the measurement points, and voltage adjustment screws for each supply.

WARNING

The output voltage for this supply, +5VDC, is not normally hazardous to humans, but the available current, 400 amps per supply, is more than enough to weld metal. Be careful to not allow any conductive objects near the outputs of a powered-up supply.

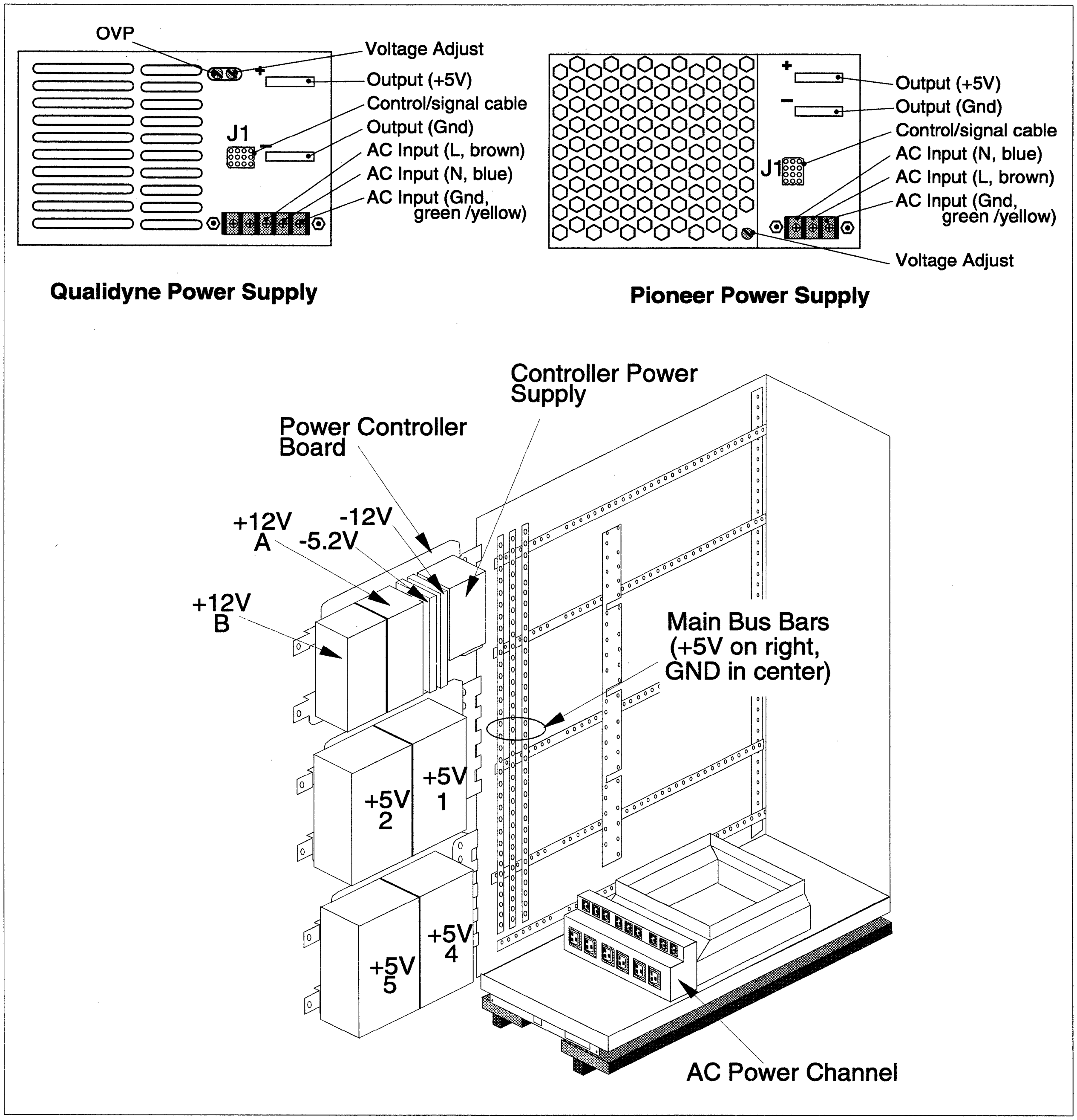


Figure 3-1. 400 Amp, +5VDC Power Supplies Measurement/Adjustment Points

Perform the following steps to measure and adjust the output voltage of the +5VDC power supply:

1. Make sure the power (main breaker) has been turned OFF at the cabinet holding the supply that is to be adjusted. Refer to the *Paragon™ System Administrator's Guide* or an appropriate power-down procedure.

2. Open the rear door of the cabinet and (if necessary) loosen the captive thumb screws and swing open the hinge bracket for the supply being adjusted.

3. Remove one or more of the short +5 volt bus bars (red insulation) that go from the main vertical bus bars to the back planes until the number of node boards that still have +5VDC power is between 12 and 24. Refer to "Replacing a Cardcage Backplane" on page 6-50 for more information on removing these parts.

4. Unplug the AC power cords for all +5 volt supplies except the one to be adjusted. Refer to Figure 5-3 on page 5-7 for the locations of the AC plugs corresponding to each power supply.

5. Turn on the cabinet circuit breaker. Next, turn on system power by pushing the ON switch on the power controller board.

6. Measure the voltage at the center of the vertical bus bars (GND and +5VDC). Refer to Figure 3-1 for the recommended measurement locations.

7. If necessary, adjust the "Voltage Adjust" screw on the operating power supply to a measured value of +5.14 $\pm$0.01 volts. Refer to Figure 3-1 for the "Voltage Adjust" screw locations.

8. Turn off the cabinet circuit breaker before setting up to adjust another supply. Repeat steps 4 through 7 for any additional supplies that have been replaced. If a supply is being replaced and the bus voltage was correct before the new supply was put in, it is not necessary to adjust the other supplies.

9. With the cabinet circuit breaker OFF, reconnect all short +5VDC bus bars (red insulation) between the main +5VDC bus bar and the backplanes.

10. Reconnect all power supplies to their proper outlets in the power channel (refer to Figure 5-3 on page 5-7 for the correct locations).

67 Amp, +12VDC Power Supply Adjustment

The +5 volt and +12 volt systems in Paragon XP/S systems use multiple power supplies tied in parallel with active current sharing as a means of increasing power system reliability. This requires that a special adjustment procedure be used whenever it is necessary to install a new supply that might not have been previously adjusted or to change the operating DC voltage of the system.

WARNING

The output voltage for this supply, +12VDC, is not normally hazardous to humans, but the available current, 67 amps per supply, is more than enough to weld metal. Be careful to not allow any conductive objects near the outputs of a powered-up supply.

Figure 3-2 shows the +12VDC power supply, and indicates the measurement points, AC plug locations, and voltage adjustment screw location for the supply.

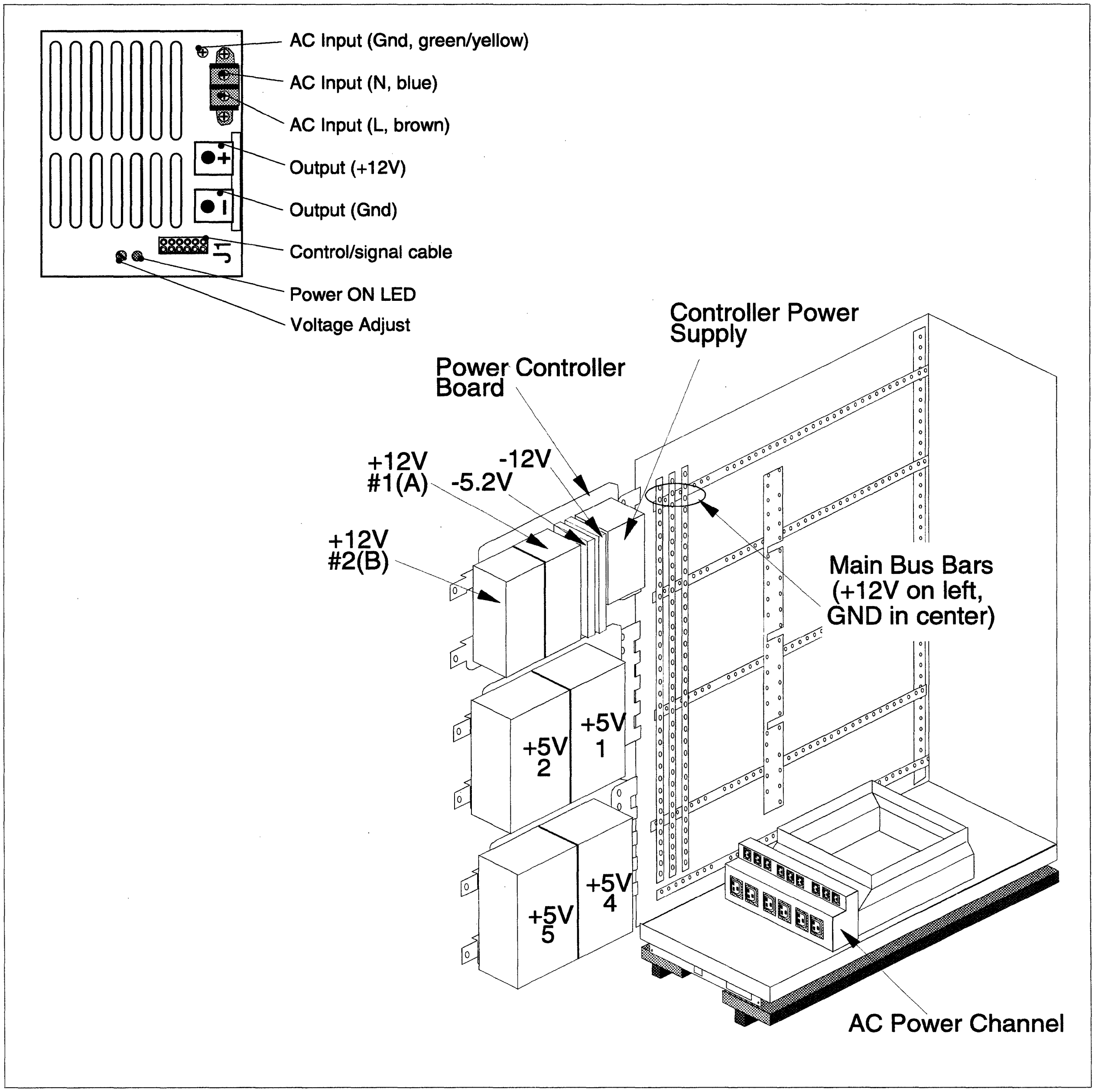


Figure 3-2. 67 Amp, +12VDC Power Supply Measurement/Adjustment Points

Perform the following steps to measure and adjust the output voltage of the +12VDC power supply:

1. Make sure the power (main breaker) has been turned OFF at the cabinet holding the supply that is to be adjusted. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure.

2. Open the rear door of the cabinet and (if necessary) loosen the captive thumb screws and swing open the top hinge bracket.

3. Unplug the AC power cord for the +12 volt supply that is not being adjusted. Refer to Figure 5-3 on page 5-7 for the locations of the AC plugs corresponding to each power supply.

4. Turn on the cabinet circuit breaker. Next, turn on system power by pushing the ON switch on the power controller board.

5. Measure the voltage at the top of the vertical bus bars (GND and +12VDC). Refer to Figure 3-2 for the recommended measurement locations.

6. If necessary, adjust the "Voltage Adjust" screw on the operating power supply to a measured value of +12.1 $\pm$0.02 volts. Refer to Figure 3-2 for the "Voltage Adjust" screw locations.

7. Turn off the cabinet circuit breaker before setting up to adjust the other supply. Repeat steps 3 through 6 for the other supply if it has been replaced. If a supply is being replaced and the bus voltage was correct before the new supply was put in, it is not necessary to adjust the other supply.

8. With the cabinet circuit breaker OFF, reconnect the power supplies to their proper outlets in the power channel (refer to Figure 5-3 on page 5-7 for the correct locations).

-5.2V DC-DC Convertor Output Voltage Adjustment

The -5.2 volt bus in the Paragon XP/S system uses two DC-DC convertors connected in parallel. Either DC-DC convertor can supply adequate power to satisfy the entire needs of the cabinet, and their parallel operation provides added reliability to the system. A special adjustment procedure must be used whenever it is necessary to install a new DC-DC convertor that may not have been previously adjusted or to change the operating DC voltage of the system. Figure 3-3 shows the DC-DC convertors, and indicates the measurement points and voltage adjustment screw locations for each voltage and DC-DC convertor.

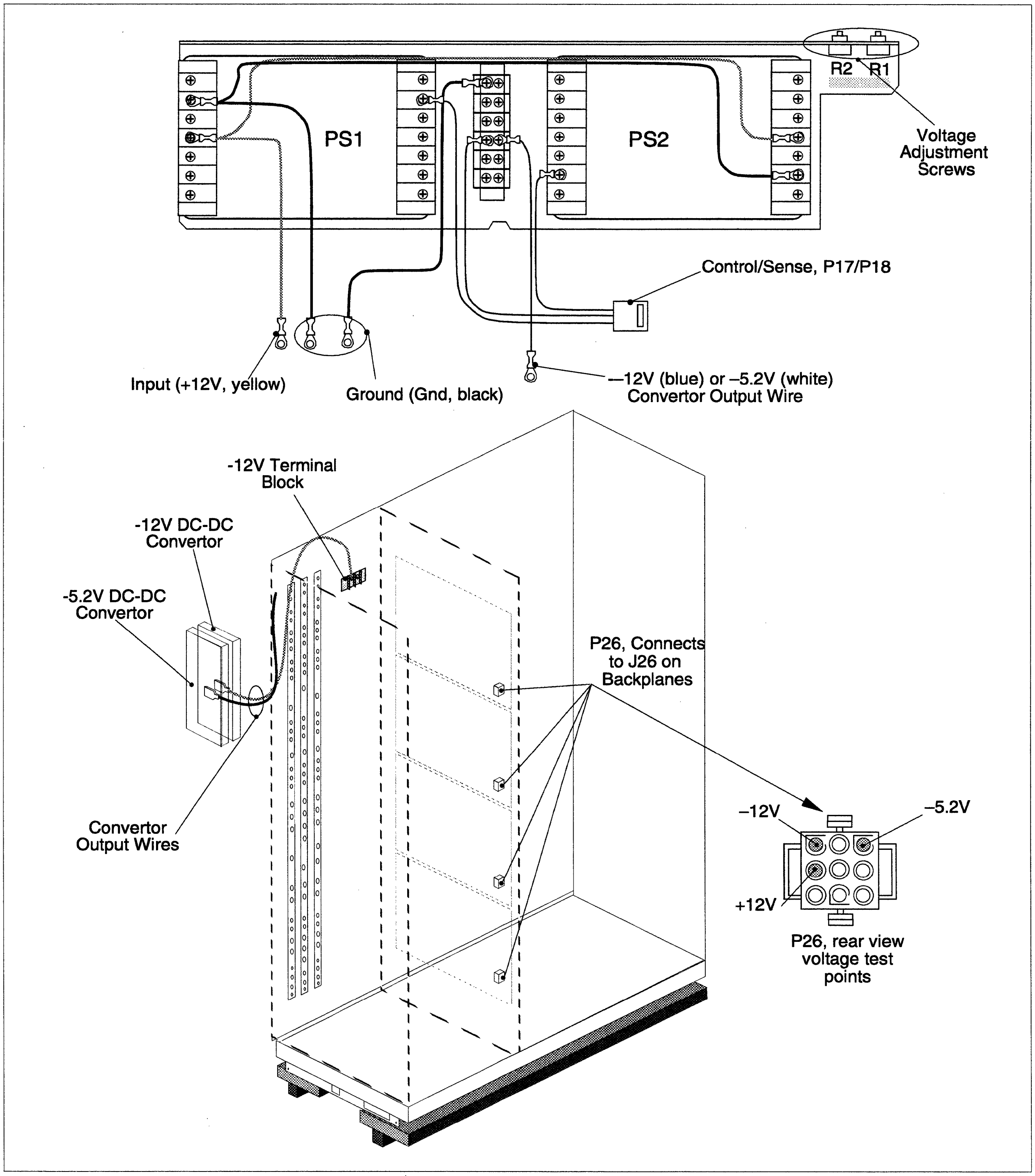


Figure 3-3. DC-DC Convertor Measurement/Adjustment Points

Perform the following steps to measure and adjust the output voltage of the –5.2 volt DC-DC convertor:

1. Make sure the power (main breaker) has been turned OFF at the cabinet holding the supply that is to be adjusted. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure.

2. Open the rear door of the cabinet and (if necessary) loosen the captive thumb screws and swing open the top hinge bracket.

3. Loosen the lock nuts for the voltage adjustment screws (R1 and R2) for the -5.2 VDC DC-DC convertors. Refer to Figure 3-3 if necessary for the adjustment screw locations.

4. On the power controller board for this cabinet, remove the –5.2V power bus fault jumper (jumper E210 on a FAB2 power controller board, or jumper E111 on a FAB3 power controller board). If this jumper is not removed, the system power will shut down before the convertor output can be adjusted. Refer to Figure 4-2 on page 4-6 or Figure 4-3 on page 4-7 if necessary for the jumper locations.

5. Turn on the cabinet circuit breaker. Next, turn on system power by pushing the ON switch on the power controller board.

6. Rotate the R1 and R2 voltage adjustment screws for the convertor fully counter clockwise.

7. Measure the voltage between the GND bus bar and P26 pin 1. Refer to Figure 3-3 for the recommended measurement locations. Note that the voltage can be measured at pin 1 of any of the four P26 connectors (one to each backplane) in the cabinet.

8. Adjust the R1 "Voltage Adjust" screw of the -5.2 VDC convertor to a measured value of -5.2 ±0.01 volts. Refer to Figure 3-3 for the "Voltage Adjust" screw locations.

9. Adjust the R2 "Voltage Adjust" screw of the -5.2 VDC convertor until the voltage starts to go more negative, then back it off to a measured value of -5.2 ±0.01 volts.

10. While continuing to monitor the output voltage, retighten the "Voltage Adjust" screw lock nuts (refer to Figure 3-3 for the correct locations). If necessary, readjust the appropriate convertor to a measured value of -5.2 ±0.01 volts with the "Voltage Adjust" screw lock nuts tightened.

11. If a power bus fault shutdown is to be enabled for the –5.2V power bus, reinstall jumper E210 on a FAB2 power controller board, or jumper E111 on a FAB3 power controller board. Refer to Figure 4-2 on page 4-6 or Figure 4-3 on page 4-7 if necessary for the jumper locations.

-12V DC-DC Convertor Output Voltage Adjustment

The -12 volt bus in the Paragon XP/S system uses two DC-DC convertors connected in parallel. Either DC-DC convertor can supply adequate power to satisfy the entire needs of the cabinet, and their parallel operation provides added reliability to the system. A special adjustment procedure must be used whenever it is necessary to install a new DC-DC convertor that may not have been previously adjusted or to change the operating DC voltage of the system. Refer to Figure 3-3 for a view of the DC-DC convertors, and the locations of the measurement points and voltage adjustment screw locations for each voltage and DC-DC convertor.

Perform the following steps to measure and adjust the output voltage of the –12 volt DC-DC convertor:

1. Make sure the power (main breaker) has been turned OFF at the cabinet holding the supply that is to be adjusted. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure.

2. Open the rear door of the cabinet and (if necessary) loosen the captive thumb screws and swing open the top hinge bracket.

3. Loosen the lock nuts for the voltage adjustment screws (R1 and R2) for the -12 VDC DC-DC convertor. Refer to Figure 3-3 if necessary for the adjustment screw locations.

4. On the power controller board for this cabinet, remove the –12V power bus fault jumper (jumper E211 on a FAB2 power controller board, or jumper E112 on a FAB3 power controller board). If this jumper is not removed, the system power will shut down before the convertor output can be adjusted. Refer to Figure 4-2 on page 4-6 or Figure 4-3 on page 4-7 if necessary for the jumper locations.

5. Turn on the cabinet circuit breaker. Next, turn on system power by pushing the ON switch on the power controller board.

6. Rotate the R1 and R2 voltage adjustment screws for the convertor fully counter clockwise.

7. Measure the voltage between the GND bus bar and P26 pin 3. Refer to Figure 3-3 for the recommended measurement locations.

8. Adjust the R1 "Voltage Adjust" screw of the -12 VDC convertor to a measured value of -12.0 $\pm$0.02 volts. Refer to Figure 3-3 for the "Voltage Adjust" screw locations.

9. Adjust the R2 "Voltage Adjust" screw of the -12 VDC convertor until the voltage starts to go more negative, then back it off to a measured value of -12.0 $\pm$0.02 volts.

10. While continuing to monitor the output voltage, retighten the "Voltage Adjust" screw lock nuts (refer to Figure 3-3 for the correct locations). If necessary, readjust the appropriate convertor to a measured value of -12 $\pm$0.02 volts with the "Voltage Adjust" screw lock nuts tightened.

11. If a power bus fault shutdown is to be enabled for the –12V power bus, reinstall jumper E211 on a FAB2 power controller board, or jumper E112 on a FAB3 power controller board. Refer to Figure 4-2 on page 4-6 or Figure 4-3 on page 4-7 if necessary for the jumper locations.

Power Controller +5VDC Power Supply Adjustment

The power controller +5VDC power supply is normally only installed in cabinet 0 of multi-cabinet Paragon XP/S systems. The power controller boards of any additional cabinets in this Paragon XP/S system derive their power from this supply.

In very large Paragon XP/S systems (typically with more than 10 cabinets) more than one cabinet can have a power controller +5VDC power supply. Consult with the system administrator to determine whether there is more than one power controller +5VDC power supply in this Paragon XP/S system.

Figure 3-4 shows the power controller +5VDC power supply and indicates the test points and voltage adjustment screw for the supply.

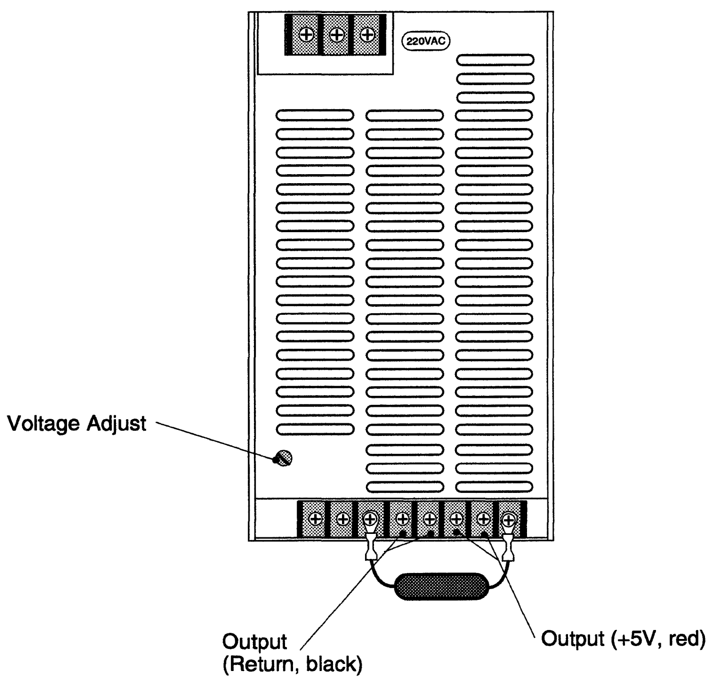


Figure 3-4. Power Controller +5VDC Power Supply Measurement/Adjustment Points

Perform the following steps to measure and adjust the output voltage of the power controller +5VDC power supply:

1. Make sure the power (main breaker) has been turned OFF at cabinet 0. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure.

2. Open the rear door of the cabinet and (if necessary) loosen the captive thumb screws and swing the top hinge bracket open.

3. Connect a DC voltmeter to the cabinet 0 power controller board at J480 pin 1 (+, positive) and J480 pin 4 (–, negative/ground). Refer to Figure A-13 or Figure A-14 in Appendix A, if necessary, for more information.

4. Switch the main breaker at the rear base of cabinet 0 to ON. It is not necessary for the system power to be on for this procedure.

5. Refer to Figure 3-4 for the location of the "Voltage Adjust" screw, then adjust the measured output of the power controller +5 volt power supply to +5.00 $\pm$0.01 volts.

6. Disconnect the DC voltmeter and close the hinge bracket.

Checking/Configuring the SCSI RAID Controller Board

CAUTION

The SCSI RAID controller board for each RAID in the Paragon XP/S system must have Version 3.06 (or newer) of FLASH memory loaded. Attempting to operate the Paragon XP/S system with an older FLASH memory version will result in lower I/O performance, and can result in the loss of contents for all disks connected to that SCSI RAID controller.

Once DC power is applied to the Paragon XP/S system, run the procedures in this section to completion. If Paragon XP/S system power is cycled before the FLASH memory is checked or reprogrammed, data loss in the RAID array is possible.

When replacing a SCSI RAID controller board, or adding a RAID array (with its SCSI RAID controller board) to the Paragon XP/S system, you should make sure that the SCSI RAID controller board is using the latest on-board software. The procedures in the following sections describe how to check the version of FLASH memory installed on the replacement/new SCSI RAID controller board, update the FLASH memory to the current version, and use **psd** diagnostics to verify that the SCSI RAID controller board is operating properly.

Checking the FLASH Memory Version

Perform the following procedures to check and/or reprogram the FLASH memory installed in the SCSI RAID controller board:

1. Make sure all cabinets in the system are powered up and the main system DC power has been turned ON. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-up procedure.

2. Log in as *root* on the diagnostic station, then invoke **psd** as follows:

```
DS# cd /u/paragon/diag
DS# ./psd

PSD Version XX.XX.X
Copyright (c) 1994 Intel Corporation
```

3. From the **psd** `Root Menu`, select the `SCSI Device Tests/ option.`

4. From the `SCSI Device Tests` menu, select the `Operator Functions/` menu.

5. Select the `Test Unit Ready` function from the `Operator Functions/` menu as follows:

```
1. SCSI Bus Reset
2. Read Capacity
3. Test Unit Ready          <<<=============== pick this function ====
4. Request Sense
5. Send Diagnostic
6. Set Pass Thru Cmd
7. Inquiry
8. Mode Sense
9. Mode Select
10. Format
11. Download RAID Microcode
12. Tape Log Sense
13. Dump Memory
14. MFG Set Up RAID
15. Change RAID Levels
16. Reconstruct a RAID Device

> 3 <cr>
Initializing Paragon. Please Wait...
Loading /u/paragon/diag/scsi.node......

Enter node to run Operator Functions on:
```

6. Enter the node number of the I/O node (MIO or SCSI-16 node) that is driving the SCSI RAID controller board. This node number must use the diagnostic node numbering convention. Refer to "Diagnostic Node Numbering" on page 2-22 if you do not know how to find the I/O node number.

7. Assuming an I/O node number of 51 (a CBS node number of 00D03), and a SCSI device number of 0 (the RAID controller is always device 0), the `Operator Functions/` menu returns after you make the following selections:

```
Enter node to run Operator Functions on: 51 <cr>
Enter target on node 51 to run Operator Functions on: 0 <cr>

  Trial 1: Test Unit Ready

1. SCSI Bus Reset
2. Read Capacity
3. Test Unit Ready
4. Request Sense
5. Send Diagnostic
6. Set Pass Thru Cmd            <<<============== pick this function ====
7. Inquiry
8. Mode Sense
9. Mode Select
10. Format
11. Download RAID Microcode
12. Tape Log Sense
13. Dump Memory
14. MFG Set Up RAID
15. Change RAID Levels
16. Reconstruct a RAID Device

Node 51 Device 0> 6 <cr>
```

8. When `Set Pass Thru Cmd` is selected, information on the RAID controller board will be returned, as follows:

```
dev type len qual rmb vers fmt B5 B6 B7  Identification
  0   00  1f  00   0   02   2  00 00 12  NCR  ADP-92/01  0304
                                FLASH memory version ---->> ^^^^
```

9. If the FLASH memory version reported for the RAID controller board is 3.06 (0306) or higher, proceed to "Running Diagnostics on the RAID Controller Board" on page 3-24. If the FLASH memory version reported for the RAID controller board is a lower number than 3.06 (0306), proceed to "Updating FLASH Memory" on page 3-23. In either case, remain in **psd** until it is time to reboot the Paragon XP/S system.

Updating FLASH Memory

Perform the following steps to update the FLASH memory on the SCSI RAID controller board to the current version:

CAUTION

When downloading the FLASH memory (RAID microcode), be sure you only use the mode 4 option (RAID only). If mode 5 (RAID and disks) is selected, all user data on the RAID disks might be destroyed.

1. While still in the `Operator Functions/` menu, select the `Download RAID Microcode` function, as follows:

```
1. SCSI Bus Reset
2. Read Capacity
3. Test Unit Ready
4. Request Sense
5. Send Diagnostic
6. Set Pass Thru Cmd
7. Inquiry
8. Mode Sense
9. Mode Select
10. Format
11. Download RAID Microcode     <<<========== pick this function ====
12. Tape Log Sense
13. Dump Memory
14. MFG Set Up RAID
15. Change RAID Levels
16. Reconstruct a RAID Device

Node 51 Device 0> 11<cr>
Are you sure you want to download RAID microcode? y <cr>
Which mode? [RAID only = 4, RAID and disks = 5, 'q'uit] 4 <cr>
Starting RAID microcode download, version 306 ... complete
```

2. After the `Operator Functions/` menu is again displayed, select the `Set Pass Thru Cmd to view` the updated information on the RAID controller board, as follows:

```
dev type len qual rmb vers fmt B5 B6 B7  Identification
  0   00  1f  00   0   02   2  00 00 12  NCR  ADP-92/01  0306
                                FLASH memory version ---->>  ^^^^
```

3. The actual FLASH memory version number displayed might be higher than that shown in the prior step. The downloaded microcode will be the latest version available when the current version of **psd** was shipped. If the latest FLASH memory version does not download, contact SSD Customer Support for assistance.

4. If the FLASH memory version now reported for the RAID controller board is 3.06 (0306) or higher, proceed to "Running Diagnostics on the RAID Controller Board" on page 3-24. Do not exit **psd** until the procedures in the next section are complete.

Running Diagnostics on the RAID Controller Board

Perform the following steps to verify that the RAID controller board is now functioning properly:

1. Now exit the `Operator Functions/` menu, as follows:

```
1. SCSI Bus Reset
2. Read Capacity
3. Test Unit Ready
4. Request Sense
5. Send Diagnostic
6. Set Pass Thru Cmd
7. Inquiry
8. Mode Sense
9. Mode Select
10. Format
11. Download RAID Microcode
12. Tape Log Sense
13. Dump Memory
14. MFG Set Up RAID
15. Change RAID Levels
16. Reconstruct a RAID Device

Node 51 Device 0> q <cr>       <<<============ pick the quit option ====
> <cr>                        <<<============ a <cr> exits this menu ====
```

2. The next higher menu, the `SCSI Device Tests/` menu, will now be displayed. Run all SCSI tests as follows:

```
SCSI Device Tests Menu

1. SCSI Bus Reset Test
2. Device ID Test
3. Array Controller Tests/
4. Array Controller Disk Tests/
5. Disk Tests/
6. Tape Tests/
7. Operator Functions/

> 0 <cr>          <<<=============== zero (0) runs all tests in the suite ====
```

3. If any tests fail, troubleshoot and correct the problem. If all tests successfully run to completion, quit **psd**, then reboot the Paragon XP/S system.

Removing/Replacing Node Boards

NOTE

Contact SSD Customer Support before exchanging a node board. You should only exchange node boards if so directed by SSD Customer Support. Board exchanging should *never* occur without the knowledge and consent of the system administrator. Contact SSD Customer Support at one of the locations listed in the Preface of this manual.

You might need to replace a node board in the following situations:

- If diagnostics identifies a node as bad, you can move the bad node to a different location and determine if the error follows the node.
- If you are certain that a node board is bad and you have a spare, you can install the spare and send the defective node board to SSD Customer Support for repair.

To exchange a node board, observe proper ESD protective procedures and perform the following steps:

1. Open the rear door of any cabinet. To open the door, insert a 3/16 inch allen wrench in the allen screw on the right-hand top of the rear door. Turn the allen screw counterclockwise approximately 90 degrees to release the latch. You can then pull the door open.

2. Turn off the DC power to the mesh using the OFF button located the power control panel. The power control panel is located inside the rear door of the cabinet, near the upper-rear of the cabinet (see Figure 3-5).

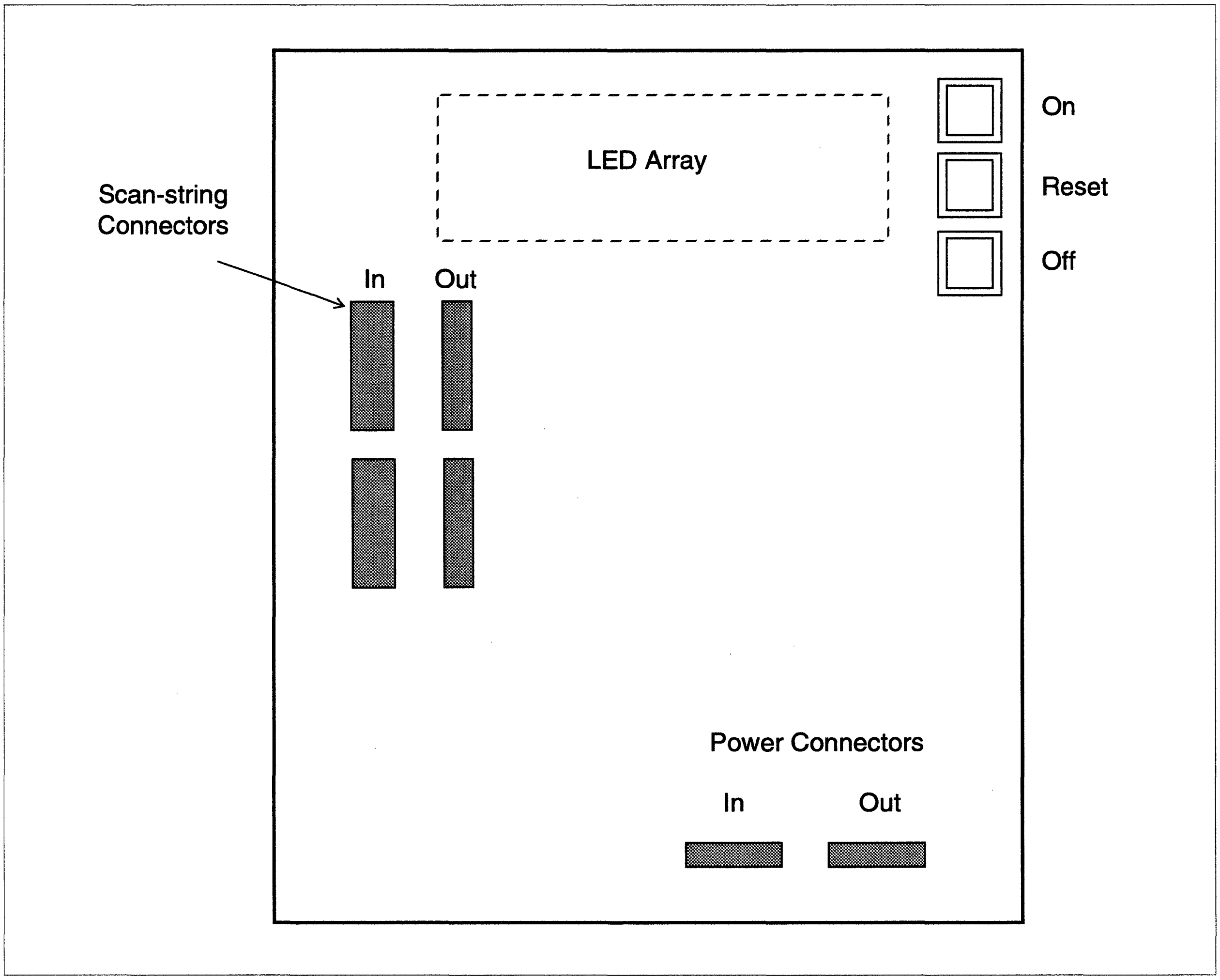


Figure 3-5. Turning off the Supercomputer

CAUTION

Guard against static when replacing or exchanging nodes. Use a proper grounding strap.

3. To open the front door of a cabinet, move the lever (located at the bottom right of the door) counterclockwise 90 degrees.

4. With a small screwdriver, loosen the screws at both ends of the malfunctioning board's front panel (see Figure 3-6). The front panel screws are captive and cannot be completely removed from the panel.

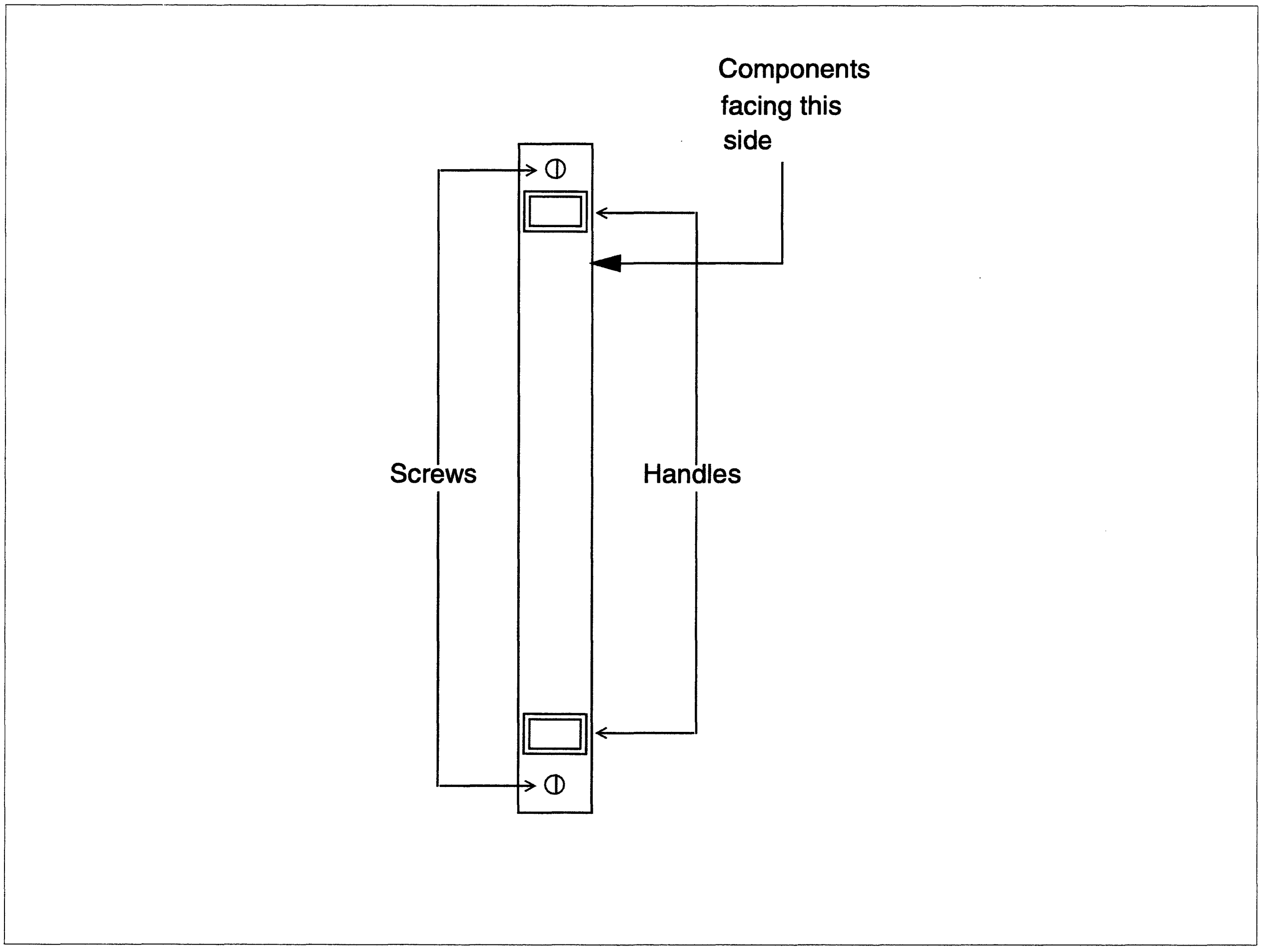


Figure 3-6. Node Board's Front Panel

5. Grasp both handles and push them apart. The board pops free of the backplane.

6. Seal the defective board in an antistatic bag so it can be packaged and returned to SSD Customer Support for repair.

CAUTION

Be certain that the node board connector is properly aligned with the backplane connector and that the pins are all engaging before trying to seat a node board. If backplane pins are damaged, the backplane will need to be replaced. Contact SSD Customer Support if any backplane pins are bent, broken, or damaged in any other way.

7. Insert a spare board into the tracks of the empty slot. Push the ejector handles to the center. Carefully align the connectors, then firmly seat the board with the palm of your hand.

8. With a small screwdriver tighten the screws in place. **DO NOT OVERTIGHTEN**.

9. If you cannot tighten the screws, the board is not properly seated. Remove the board, and visually inspect both the board and the backplane connector for bent pins. If there are no bent pins, repeat Step 7, keeping the board straight while sliding it down the tracks of the empty slot.

CAUTION

If you discover any bent pins in the previous step, call SSD Customer Support for further instructions. Do not apply power to the mesh without first calling SSD Customer Support.

10. Apply power to the mesh using the ON button on the power control panel (see Figure 3-5).

11. Refer to the next section for information about returning a malfunctioning board to SSD Customer Support for repair.

Returning FRUs for Repair

When you call SSD Customer Support, have the following information available:

- Serial number of the computational unit. You can find the serial number inside the back door of the first cabinet (the cabinet with the diagnostic station) on the swing-out power supply gate.
- Your shipping and billing addresses.
- Purchase order number (for billing purposes) if your warranty has expired.
- The serial number of the FRU that is to be returned.
- The cause of failure (if known), or the fault symptoms that were observed.

Always contact SSD Customer Support *before* returning a board for replacement. You will be given a Return Materials Authorization (RMA) number, shipping instructions, and other important information. It is possible that you will be given a Clarify case number series instead of an RMA number. The RMA number is the same as the Clarify number. Contact SSD Customer Support at one of the locations listed in the front of this manual.

Before shipping a board, make sure it is adequately protected as follows:

- The board should be placed in an antistatic bag within a padded shipping bag.
- Allow sufficient room in the shipping carton for protective padding such as flow pack, foam, and so on.
- Write, "Attn: Return Material Authorization (RMA) *number*" on the *outside* of the shipping carton. *number* is the RMA number given to you by SSD Customer Support.
- Label the shipping carton FRAGILE.

Address and ship the carton to the address given to you by your SSD Customer Support Representative.

Troubleshooting Guide 4

Introduction

The Paragon™ XP/S system must be maintained to the field replaceable unit (FRU) level, so troubleshooting tools and techniques are only required to support this level of maintenance. The testing and troubleshooting tools available to you are:

- **Observation and test**. Using close observation of the Paragon XP/S system in operation, you can often detect problems and deduce their cause. This technique is most useful for mechanical and display problems. In addition, power-related problems can be quickly diagnosed by looking at the power controller board LEDs and checking a few points with a multimeter or test light. The next section presents a detailed description of the start-up sequence that is observable each time the Paragon XP/S system goes through its boot procedure. Any variation from a normal boot sequence will often help indicate the cause of a problem.

- **NCT**. The Paragon XP/S system Node Confidence Test (NCT) runs each time the Paragon XP/S system is powered up. The NCT checks the basic functionality of the compute nodes and peripheral components of the Paragon XP/S system. The NCT test results usually indicate basic faults in the Paragon XP/S system, and the more detailed tests in PSD are used to isolate faults to the correct FRU.

- **PSD**. The Paragon System Diagnostics are a suite of tests and utilities that check the detailed functionality of the Paragon XP/S system. The PSD tests verify Paragon XP/S system communication links and any optional capabilities of the Paragon XP/S system.

Troubleshooting Mechanical Problems

Mechanical problems usually are caused by broken, missing, or damaged parts of the Paragon XP/S system. While a mechanical problem might result in degraded Paragon XP/S system operation or even system failure, it is more likely that a mechanical problem will affect operator safety or Paragon XP/S system appearance. If you observe a mechanical problem, correct it by replacing any damaged or missing mechanical parts.

The common connecting hardware parts (screws, nuts, etc.) are the only field replaceable portions (purely mechanical) of the Paragon XP/S system. Replace the common connecting hardware used with the Paragon XP/S system with equivalent parts. These parts can be obtained locally or from Intel.

There are some FRUs, such as the front door or cardcage module, that have a significant mechanical portion, but these FRUs also include electronic parts. If the mechanical portion of a FRU has failed, but the electrical/electronic portion still functions, you must still replace the entire FRU. For example, a damaged cardcage rail means you must replace the entire cardcage (including the backplane), because the rails are not FRUs.

Troubleshooting Power Problems

If you experience a complete loss of power or the intermittent loss of power to a cabinet, or one or more modules, use the procedures in this section to isolate the power problem to the proper FRU. The Paragon XP/S system uses dedicated 200-250 VAC power for each cabinet. The power problems in this section apply to the AC input power of the cabinet, the DC output of the power supplies, the cooling fans and airflow of the cabinet, and the FRUs along these paths. If the Paragon XP/S system power is adequate to allow the NCT, SATs, or PSD diagnostics to run, perform the procedures in the remaining sections of this chapter to isolate any faults.

To isolate power problems, you will need the following tools:

- A 3/16-inch Allen wrench (to open the rear door of the cabinet).
- Phillips-head and slotted screwdrivers (to remove various covers and access panels).
- A digital or analog multimeter (to measure AC/DC voltage and continuity).

In general, these cabinet power problems can be caused by any of the following factors:

1. Faulty line power,
2. Improper system setup,
3. Faulty AC components,

4. Faulty power supply module,

5. Faulty fan or blocked airflow, or

6. Other module faults that are related directly to the power and cabinet cooling.

Figure 4-1 illustrates the power problem isolation procedures for the cabinet.

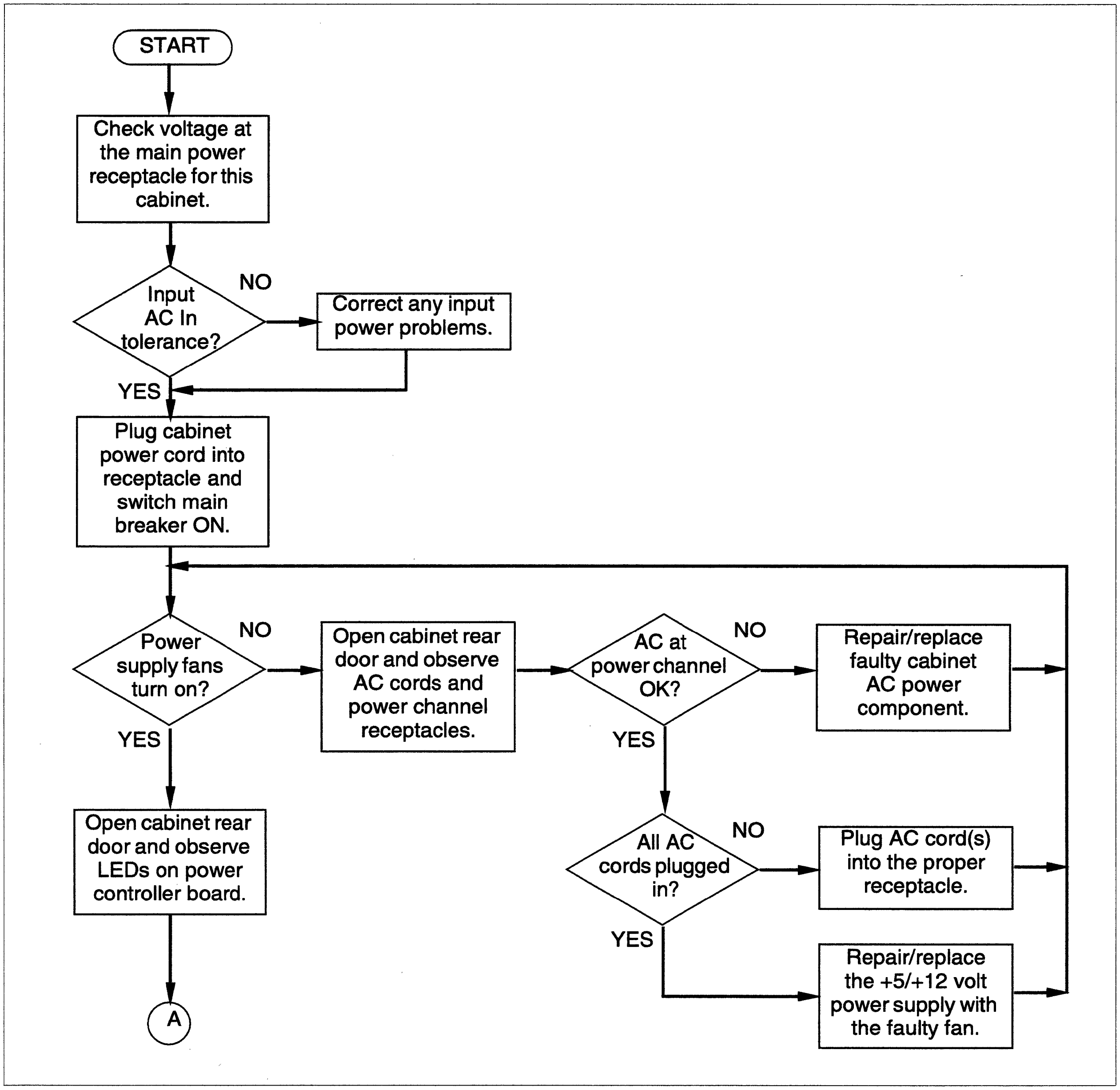


Figure 4-1. Isolating Cabinet Power Problems (1 of 2)

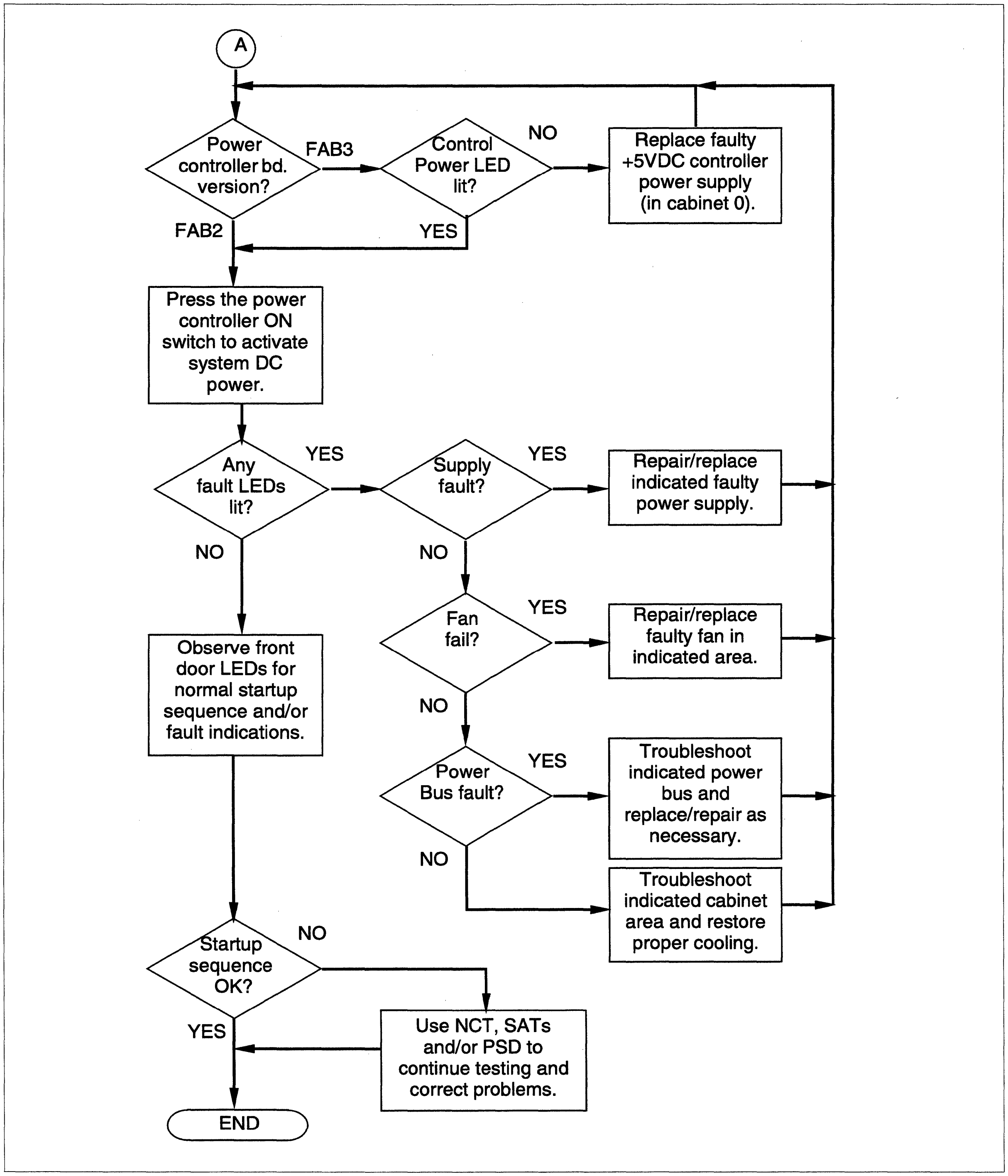


Figure 4-1. Isolating Cabinet Power Problems (2 of 2)

As shown in Figure 4-1, the front door LED's can be used as a simple fault indicator. If there are no front door LED's lit when power is applied, some sort of power problem is likely.

You will need to use a multimeter to isolate AC component faults (power channel, line filter, main breaker, or power cord). The multimeter is also necessary to check the output of the cardcage power supply, but simple observation is usually adequate to identify faults with fans or airflow paths. If the diagnostics can run, use them for any further fault isolation. For example, running the PSD tests at high and low voltage margins can point to power problems in the full system as well as margin problems with individual nodes.

LED Fault Indicators

There are four general sections of each cabinet that contain LED indicators, and most of these areas can also indicate a hardware fault with the LEDs. The following sections of the cabinet have LED indicators:

- The front door of each Paragon XP/S system cabinet contains LEDs. Most of these LEDs show message traffic or node activity, but there is also a single red LED for each node to indicate a node fault and a single red LED for the cabinet that indicates a cabinet power/temperature fault. If the red cabinet LED is lit, refer to the LEDs on the power controller module for more detailed fault information.
- Each RAID and tape drive in the cabinet has one or two LEDs that light based on drive activity. These LEDs are not latching (i.e., do not remain lit to indicate a fault), and are not generally useful for fault isolation.
- Each board installed in one of the cardcages has two or more LEDs. In the case of a GP node board, the green LED indicates node activity and the red LED indicates a node fault. A lit red LED on the front panel of a node board will be mirrored by a red LED on the front door in the position corresponding to the node's slot.
- The rear area of the cabinet holds two boards with LEDs. The LED controller board has a green power-on indicator LED and an LED that lights when the board self-test passes. The power controller board has two green power-on indicator LEDs (FAB3 and newer) and a full matrix of red LEDs that identify individual cabinet power/temperature faults.

Power Controller Board Setup

There are two versions of the Paragon XP/S system power controller board; FAB2 and FAB3. The FAB2 version of the power controller board only provides the red LED indicators for fault indication. The FAB3 version of the power controller board has significant additional features on the board to support testing and troubleshooting. Where the FAB2 power controller board provides capabilities similar to the FAB3 version, the setup procedures described in this section apply equally to both board versions.

Figure 4-2 shows the FAB 2 power controller board and indicates the jumpers and connectors that apply when setting the board up for test. Figure 4-3 shows the FAB 3 power controller board and indicates the jumpers and connectors that apply when setting the board up for test. The FAB2 version of the power controller board is functionally equivalent to the FAB 3 version, but it does not support manual voltage margining and doesn't have the green LED power-on indicators.

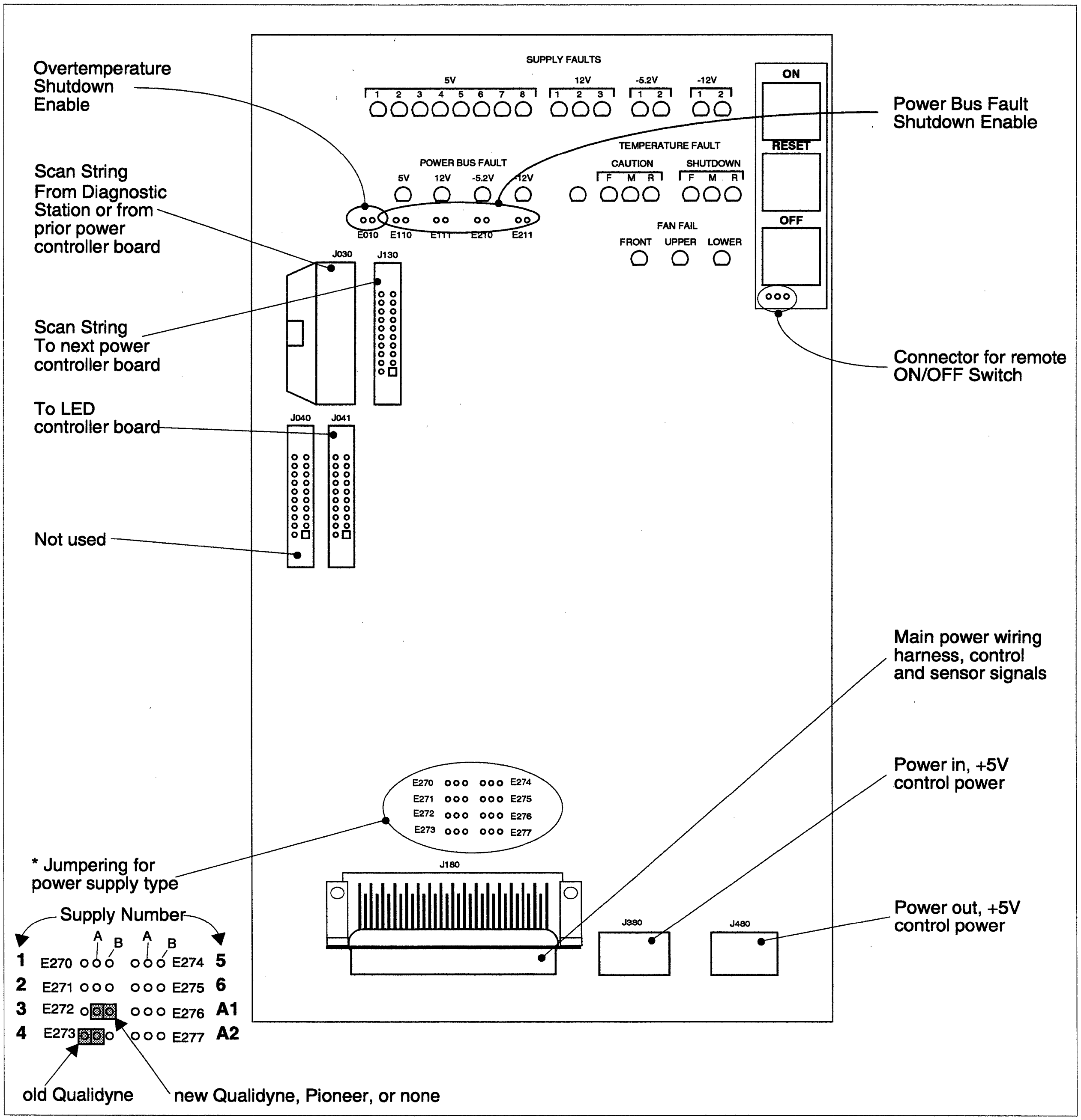


Figure 4-2. Power Controller Board Setup (FAB 2)

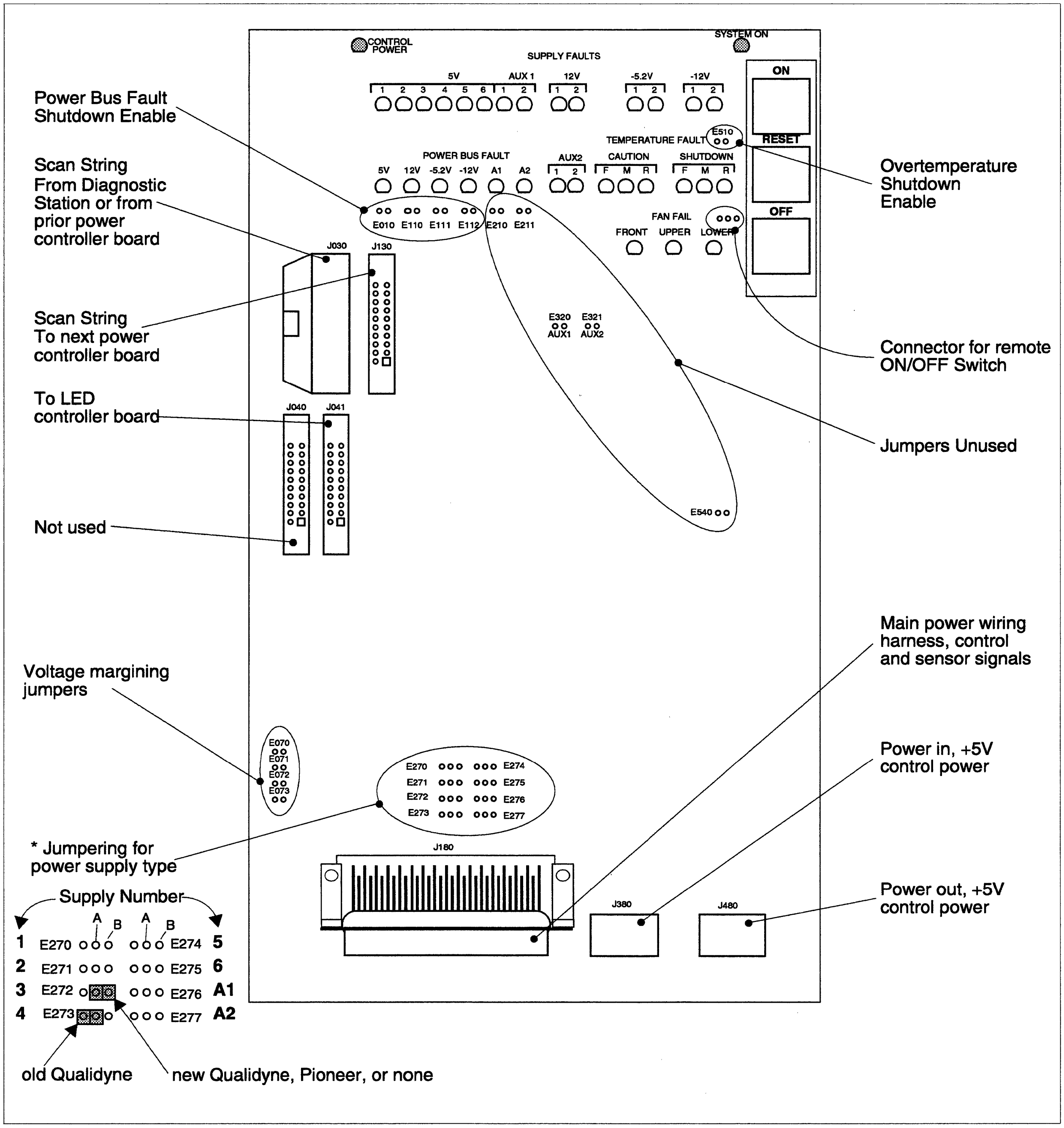


Figure 4-3. Power Controller Board Setup (FAB 3)

There are jumpers on both board versions (FAB2 and FAB3) to enable/disable Paragon XP/S system shutdown when the following monitored parameters go out of tolerance:

- When the jumper at E510 (E010 on FAB2) is installed, the entire Paragon XP/S system will be shut down if an overtemperature condition (more than 53 degrees C or 125 degrees F) is detected in this cabinet of the system. One or more of the SHUTDOWN LEDs will light and latch to indicate the area of the cabinet (front, middle, or rear) that overheated. If the overtemperature shutdown is enabled in this cabinet, it should be enabled in all cabinets of the Paragon XP/S system.

- When the jumper at E010 (E110 on FAB2) is installed, the entire Paragon XP/S system will be shut down if the +5V bus goes more negative than +4.5V in this cabinet of the system. The +5V Power Bus Fault LED will light and latch if the Paragon XP/S system is shut down due to a fault in this area. If this power bus fault shutdown is enabled in this cabinet, it should be enabled in all cabinets of the Paragon XP/S system.

- When the jumper at E110 (E111 on FAB2) is installed, the entire Paragon XP/S system will be shut down if the +12V bus goes more negative than +10.8V in this cabinet of the system. The +12V Power Bus Fault LED will light and latch if the Paragon XP/S system is shut down due to a fault in this area. If this power bus fault shutdown is enabled in this cabinet, it should be enabled in all cabinets of the Paragon XP/S system.

- When the jumper at E111 (E210 on FAB2) is installed, the entire Paragon XP/S system will be shut down if the -5.2V output of the DC-DC convertor goes more positive than -4.68V in this cabinet of the system. The -5.2V Power Bus Fault LED will light and latch if the Paragon XP/S system is shut down due to a fault in this area. If this power bus fault shutdown is enabled in this cabinet, it should be enabled in all cabinets of the Paragon XP/S system.

- When the jumper at E112 (E211 on FAB2) is installed, the entire Paragon XP/S system will be shut down if the -12V output of the DC-DC convertor goes more positive than -10.8V in any cabinet of the system. The -12V Power Bus Fault LED will light and latch if the Paragon XP/S system is shut down due to a fault in this area. If this power bus fault shutdown is enabled in this cabinet, it should be enabled in all cabinets of the Paragon XP/S system.

Jumper blocks E270 through E277 (on both the FAB2 and FAB3 versions) allow selection of the power supply types used in this cabinet. Refer to the notes for Figure A-13 on page A-16 or Figure A-14 on page A-17 for the jumpers required in these blocks. Note that the supply types can be intermixed (Qualidyne, Pioneer, or none) as long as the jumper corresponding to that position is set properly. If the jumper corresponding to a position is set improperly, the fault indicator for that position will be continuously lit.

Jumper blocks E070 through E073 provide a means to manually margin the cabinet +5V power supplies from the power controller board. Power supply margining is otherwise accomplished remotely, under control of the diagnostic station. Jumpers at E070 and E071 force the output of the supplies toward their lower margin: a jumper at E071 causes 3% down margin and jumpers at both E071 and E070 cause 5% down margin. Jumpers at E072 and E073 force the output of the supplies toward their upper margin: a jumper at E072 causes 3% up margin and jumpers at both E072 and E073 cause 5% up margin.

A number of jumper blocks and LEDs have been provided on the FAB 3 power controller board that have no current use, but can be used to support future capabilities. Six LEDs (identified as AUX1, AUX2, A1, and A2) provide spare monitoring and fault reporting capabilities. Six sets of jumper blocks (E210, E211, E320, E321, E276, and E277) provide spare jumper control similar to that used by the other functions monitored on this board.

The three large push buttons in the upper right corner of the power controller board serve the following two main functions:

Power Control. The ON and OFF switches control DC power in the entire Paragon XP/S system. Pushing the OFF button causes a logic level signal to be sent to each +5V and +12V power supply in the Paragon XP/S system (except for the control +5V supply). This logic level signal inhibits the outputs of the supplies and thus shuts down power to the Paragon XP/S system. Inhibiting the output instead of shutting down the supply prevents excessive current surges on the AC supply line.

Each power controller board (both the FAB2 and the FAB3 board) has provision for a remotely mounted ON/OFF switch. If necessary, the remote ON/OFF switch would allow operator or maintenance personnel to power the system up or down without opening a cabinet rear door. Any power controller board ON/OFF switch in the system (including any remote ON/OFF switch) controls power to the entire Paragon XP/S system.

Fault Indicator RESET. The large RESET switch momentarily resets each of the latches to the power controller board LED fault indicators. For any fault indicators where the fault condition no longer exists, the LED will turn off and stay off. For those fault indicators where the fault condition still exists, the LED will turn off, and then turn back on when the RESET switch is released.

There are seven connectors on the power controller board (refer to Figure 4-3 for locations). Connector J180 links the power controller board, through the main power wiring harness, to each supply and area in the cabinet that is either monitored or controlled by this board. Connector J040 is not used, but connector J041 sends the power system fault signal through the LED controller board and on to the front door power fault indicator.

Connector J030 receives the scan string signals either from the diagnostic station (usually for cabinet 0), or from the next lower-numbered adjacent cabinet. If there are more cabinets in this Paragon XP/S system, a scan string cable connects from J130 to the next power controller board.

The control power supply is an open frame 26 amp, +5V supply that is only installed in cabinet 0. The control power supply powers all of the power controller boards (and only those boards) in the Paragon XP/S system. The control power supply uses a different AC and DC power path from the other Paragon XP/S system supplies, so the power controller boards are still powered up when the other parts of the Paragon XP/S system have been powered down, unless the main breaker for cabinet 0 is turned OFF.

Power for the power controller board is separately provided by the control +5V supply (in cabinet 0). Connector J380 receives power either from the control +5V supply (in cabinet 0), or from the next lower-numbered adjacent cabinet. If there are more cabinets in this Paragon XP/S system, a power cable connects from J480 to the next power controller board.

Interpreting Power Controller Board LEDs

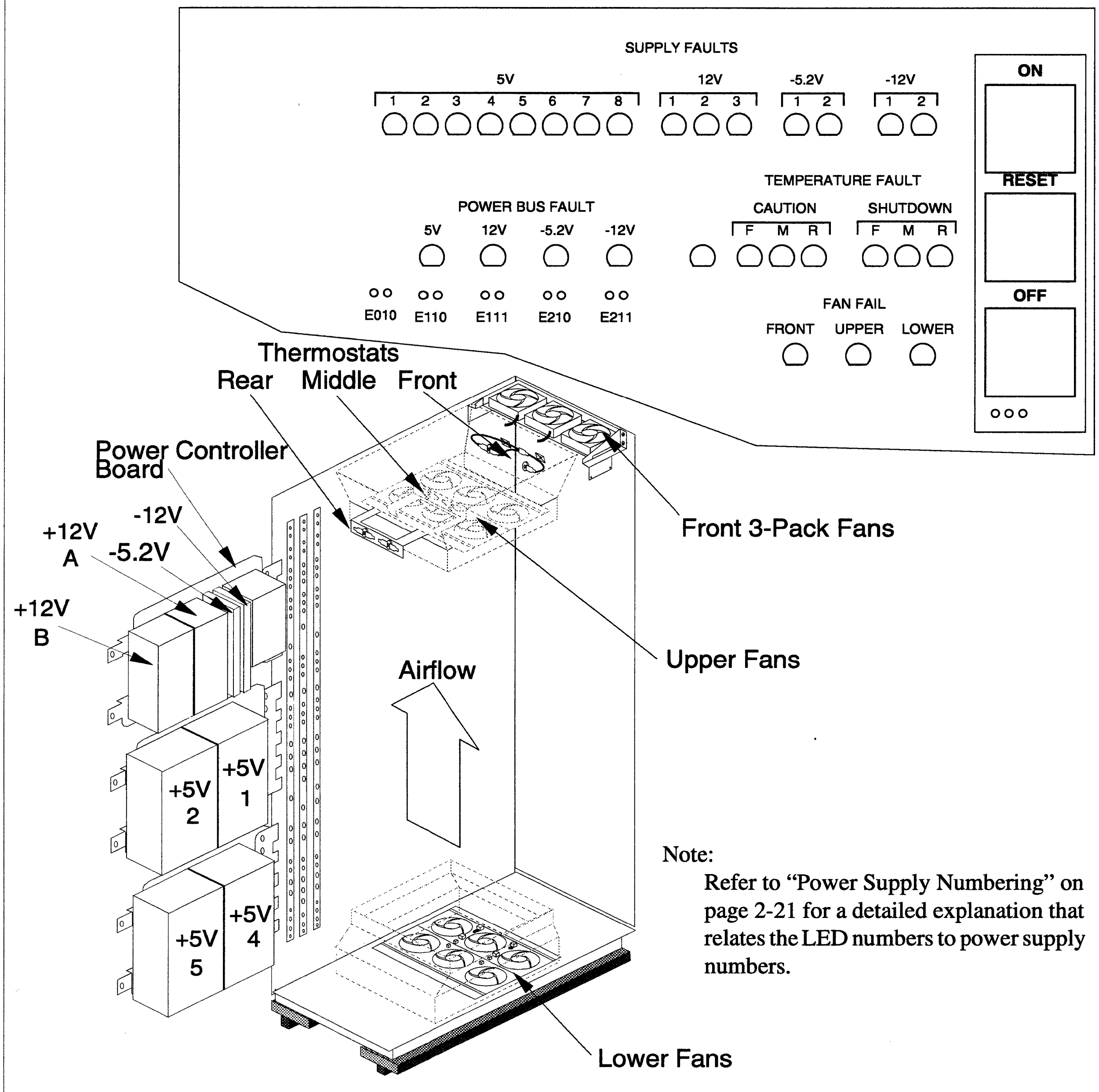
The power controller board LEDs summarize the state of the power supplies, power buses, and airflow paths within each cabinet. The power controller board is powered by a separate +5V supply in cabinet 0, so the latched state of the power controller board LEDs is unaffected if the Paragon XP/S system power is turned off.

If any of the fault LEDs on the power controller board light, the red fault LED in the upper left corner of the front door also lights. This LED warns the system administrator or maintenance person that there is a power/temperature problem with the cabinet. In addition to the detailed fault information presented by the power controller board LEDs, fault information is also transmitted over the scan strings to the diagnostic station.

There are two versions of the power controller board; FAB 2 and FAB 3. There are significant layout differences between these two board versions, so a separate section is provided for each version.

FAB 2 Power Controller Board

Figure 4-4 shows the upper portion of the FAB 2 power controller board and indicates the relationship between an indicator LED and the hardware causing the fault. Refer to Figure 4-4 while reading the description in this section.



Note:

Refer to "Power Supply Numbering" on page 2-21 for a detailed explanation that relates the LED numbers to power supply numbers.

Figure 4-4. Power Controller Board LEDs (FAB 2)

The top row of LEDs indicates a fault in any of the standard cabinet power supplies. As indicated in Figure 4-4, the normal cabinet has #1, #2, #4, and #5 +5V power supplies installed. In a higher density configuration, the +5V power supplies can be mounted narrow-side out to allow three +5V power supplies (e.g., #1, #2, and #3 on the middle bracket) on each bracket. Refer to "Power Supply Numbering" on page 2-21 for a detailed explanation that relates the LED numbers to power supply numbers. The LEDs for #7 and #8 +5V power supplies, and for #3 +12V power supply are not used in any Paragon XP/S system configuration. The "Supply Fault" LEDs light if a fault is detected in the monitored supply. The "N+1" redundancy designed into the Paragon XP/S system ensures that the loss of a single power supply does not require system shutdown.

The "Power Bus Fault" LEDs light to indicate an out-of-tolerance condition on one of the DC buses. For the +5V and +12V buses, the voltage is monitored at the center of the cabinet vertical busbars. For the -5.2V and -12V supplies, the voltage is monitored at the outputs of the DC-DC convertors. For all of the buses, a deviation of more than 10% from the nominal voltage will cause the corresponding LED to light, and also cause the entire Paragon XP/S system to shut down, unless that voltage shutdown jumper (E110, E111, E210, or E211) is removed.

The "Temperature Fault" LEDs light in response to several overtemperature conditions. Three areas of the cabinet (indicated in Figure 4-4) are monitored; the rear area ("R" for power supplies and cabling), the middle area ("M" for cardcages and nodes), and the front area ("F" for I/O devices and diagnostic station). Two levels of overtemperature are reported; a "CAUTION" range (over approximately 40 degrees C), and a "SHUTDOWN" range (over approximately 50 degrees C). If any LED in the "SHUTDOWN" range activates, the entire Paragon XP/S system will also shut down, unless the overtemperature shutdown jumper (E010) is removed.

The "Fan Fail" LEDs light if any of the cooling fans in the cabinet fail. The cooling fans used in the Paragon XP/S system can indicate a failure to the power controller board. The loss of a single fan might not result in an overtemperature condition, so these LEDs can help prevent later, more serious failures. Three sets of fans, as indicated in Figure 4-4, are monitored. This fault information (along with internal power supply status) is also reported through the scan strings to the diagnostic station.

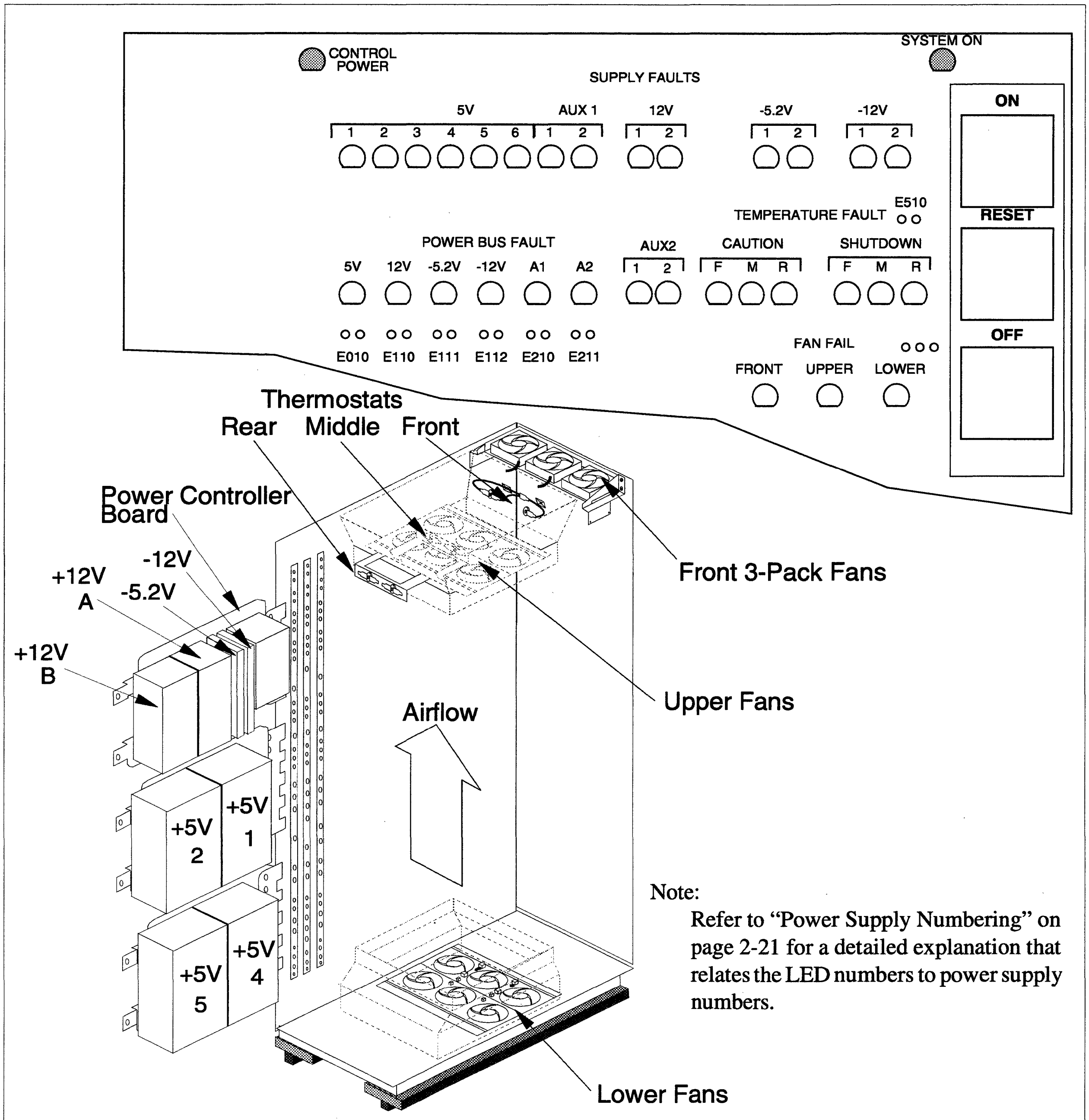
Jumper blocks E270 through E277 determine the routing of power supply fault signals. The notes for Figure A-13 on page A-16 describe the jumpering required for the supported power supply options. In general, a jumper is required in each position, either A-to-B or blank-to-A. Improper jumper settings will cause improper supply fault LED indications for the +5V supplies.

FAB 3 Power Controller Board

Figure 4-5 shows the upper portion of the FAB 3 power controller board and indicates the relationship between an indicator LED and the hardware causing the fault. Refer to Figure 4-5 while reading the description in this section.

The two green LEDs at the top of the power controller board provide useful fault information as well as power-on indications. The left LED (CONTROL POWER) is lit whenever this power controller board is receiving +5V power. The only valid reason for this LED to be off is that cabinet 0 is not receiving AC power (e.g., main breaker OFF or power cord disconnected). The right LED is lit when DC power to the Paragon XP/S system is ON. Paragon XP/S system DC power is controlled by the

ON/OFF push-button switches at the right side of this power controller board or any other power controller board in this Paragon XP/S system. When the Paragon XP/S system is on and functioning properly, both of the green LEDs should be lit



Note:

Refer to "Power Supply Numbering" on page 2-21 for a detailed explanation that relates the LED numbers to power supply numbers.

Figure 4-5. Power Controller Board LEDs (FAB 3)

The top row of LEDs indicates a fault in any of the standard cabinet power supplies. The "Supply Fault" LEDs light if a fault is detected in the monitored supply. As indicated in Figure 4-5, the normal cabinet has #1, #2, #4, and #5 +5V power supplies installed. In a higher density configuration, the +5V power supplies can be mounted narrow-side out to allow three +5V power supplies (e.g., #1, #2, and #3 on the middle bracket) on each bracket. Refer to "Power Supply Numbering" on page 2-21 for a detailed explanation that relates the LED numbers to power supply numbers. The "N+1" redundancy designed into the Paragon XP/S system ensures that the loss of a single power supply does not require system shutdown.

The "Power Bus Fault" LEDs light to indicate an out-of-tolerance condition on one of the DC buses. For the +5V and +12V buses, the voltage is monitored at the center of the cabinet vertical busbars. For the -5.2V and -12V supplies, the voltage is monitored at the outputs of the DC-DC convertors. For all of the buses, a deviation of more than 10% from the nominal voltage will cause the corresponding LED to light, and also cause the entire Paragon XP/S system to shut down, unless that voltage shutdown jumper (E010, E110, E111, or E112) is removed.

The "Temperature Fault" LEDs light in response to several overtemperature conditions. Three areas of the cabinet (indicated in Figure 4-5) are monitored; the rear area ("R" for power supplies and cabling), the middle area ("M" for cardcages and nodes), and the front area ("F" for I/O devices and the diagnostic station). Two levels of overtemperature are reported; a "CAUTION" range (over approximately 40 degrees C), and a "SHUTDOWN" range (over approximately 50 degrees C). If any LED in the "SHUTDOWN" range activates, the entire Paragon XP/S system will also shut down, unless the overtemperature shutdown jumper (E510) is removed.

The "Fan Fail" LEDs light if any of the cooling fans in the cabinet fail. The cooling fans used in the Paragon XP/S system can indicate a failure to the power controller board. The loss of a single fan might not result in an overtemperature condition, so these LEDs can help prevent later, more serious failures. Three sets of fans (indicated in Figure 4-5) are monitored. This fault information (along with internal power supply status) is also reported through the scan strings to the diagnostic station.

Jumper blocks E270 through E277 determine the routing of power supply fault signals. The notes for Figure A-14 on page A-17 describe the jumpering required for the supported power supply options. In general, a jumper is required in each position, either A-to-B or blank-to-A. Improper jumper settings will cause improper supply fault LED indications for the +5V supplies.

There are three pairs of auxilliary LEDs on the FAB3 power controller board. The AUX1 LEDs in the "Supply Faults" area, the AUX2 LEDs in the "Temperature Fault" area, and the A1 and A2 LEDs in the "Power Bus Fault" area are unused in current versions of the Paragon XP/S system. These LEDs (along with jumpers E210, E211, E320 and E321) are available to support future power supply options in the Paragon XP/S system.

Troubleshooting Operating Problems

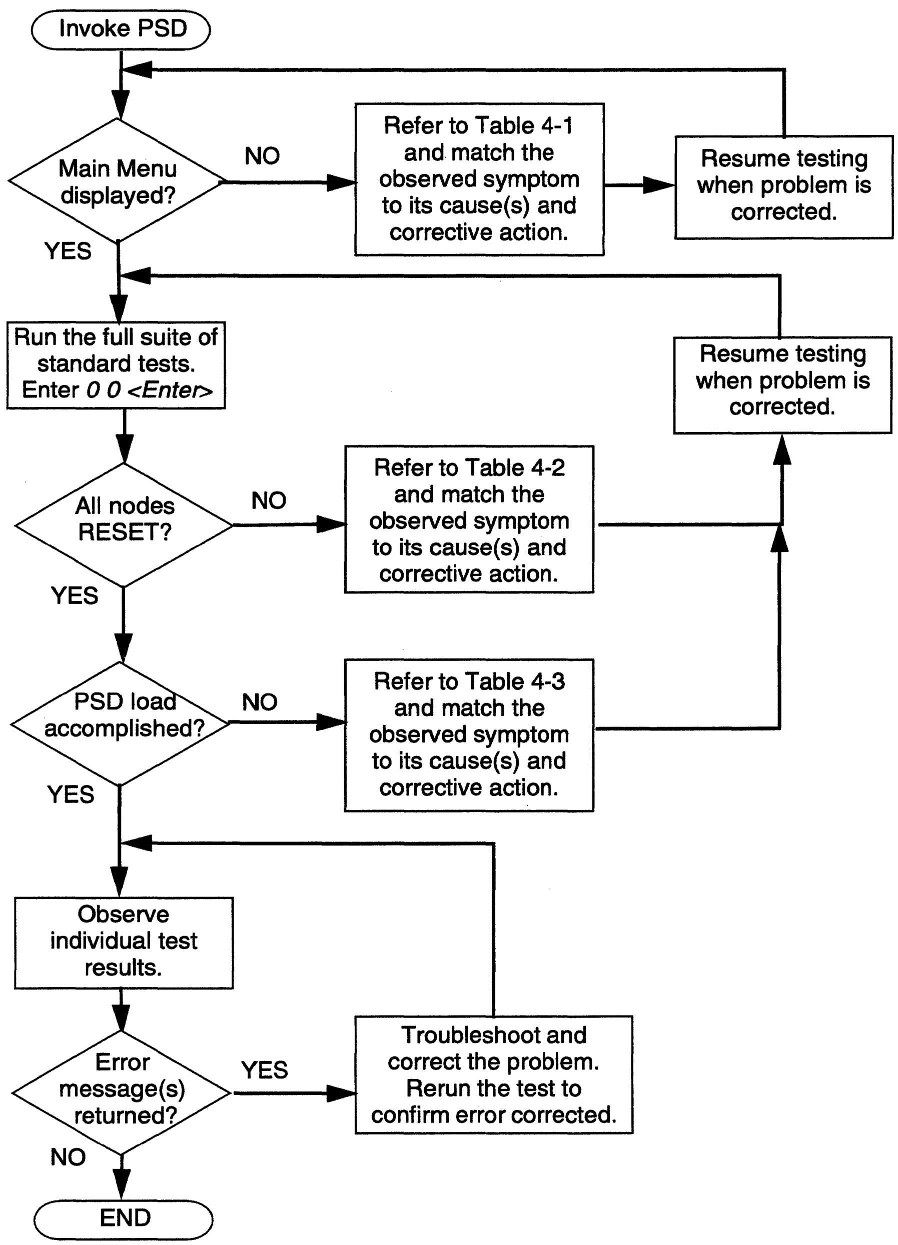


Figure 4-6. PSD Diagnostic Troubleshooting Test Flow

To aid in the troubleshooting process, each step of Figure 4-6 is explained in detail.

- **Invoke PSD** - enter the following command on the diagnostic station console to invoke the Paragon System Diagnostics:

  psd [**-l** *logfile*] [**-m** *macfile*] [**-d** *default_file*] [**-e** *env_file*]

  where:

  logfile is a user specified error log file name. The default error log file name is *psd.log*.

  macfile is a user specified macro command file name. The default macro command file name is *psd.mac*.

  default_file is a user-specified error and information log file. The default log file is *psd.def.*

  env_file is the environment file. The default is *psdenv*.

  If errors are encountered upon entering the **psd** command, refer to Table 4-1. For a complete explanation of starting a PSD session, refer to Chapter 2 of the *Paragon™ System Diagnostic Reference Manual.*

- **Run the full suite of standard tests** - enter the following command on the diagnostic station console to run all standard tests on a continual basis:

  `0 0 <Enter>`

  By entering the above command, you execute all standard tests continually or until an error is found. If the tests run continually and you want to halt execution of those tests, press the <Delete> key.

  If you want to run through the full suite of standard tests only once, enter the following command:

  `0 <Enter>`

- **All Nodes Reset?** - you will be able to tell if all the nodes are reset by observing the nodes' LED lights. When the standard tests are run, all node LED's will go from green to red and back to green, if the node is operational. You can see what errors (if any) were generated by running the standard test by examining the *psd.log* file. This file contains all errors generated while the standard tests were run. Refer to Table 4-2 on page 4-18 for possible error conditions and their associated corrective action.

- **PSD Load Accomplished?** - Once all nodes are reset and all node LED lights are green, you can load any diagnostic test you choose. Refer to Table 4-3 on page 4-19 if any error conditions are generated when you attempt to execute a diagnostic test.

- **Observe Individual Test Results** - At this point, you have successfully loaded PSD, executed the full suite of standard tests and loaded and executed the requested individual diagnostic test.

- **Error Messages Returned?** - If any error messages are returned from the individual diagnostic test, refer to Chapter 3 of the *Paragon™ System Diagnostic Troubleshooting Guide* for an explanation of all possible errors generated in each diagnostic test and the proper corrective action.

Troubleshooting Start-up Errors

You can encounter errors when you attempt to start up the Paragon system diagnostics. Table 4-1 contains the common errors that can be encountered on start-up, their cause and the applicable corrective action(s) for that error.

Table 4-1. Start-up Error Troubleshooting Table

Symptom	Cause	Corrective Action
File not found, file permission problem or daemon not installed	Installation problem	Re-install software
RPC connection refused	Diagnostic daemon **dsd** dead	Start **dsd** using **dsdc** *start*. Refer to the **dsdc** manual page in Appendix B of the *Paragon™ System Diagnostic Reference Manual*
Can not save the binary configuration file */u/paragon/diag/SYS CONFIG.BIN*	PSD session currently in progress or a previous session did not clean up properly.	Make sure there is no **psd** currently running, remove the *SYSBIN.ORIG* file and re-invoke **psd**.
No space on device	The file system is full	Make some space available on the device
psd aborted: Paragon system is busy	PSD session currently in progress or a previous session did not clean up the lock file.	Make sure there is no **psd** currently running, remove the file */usr/spool/locks/PSD.lock* and restart **psd**.
Permission denied when invoked.	*psd* file does not have execute permission.	Provide execute permission for **psd**.
System margining failed	Margining	Check scan string cable E on the system. Refer to the *Paragon™ System Hardware Maintenance Manual*, Chapter 5 for instructions on cables.

Troubleshooting System Initialization

You can encounter errors when you attempt to initialize the Paragon system. Table 4-2 contains the common errors that can be encountered on system initialization, their cause and the applicable corrective action(s) for that error.

Table 4-2. System Initialization Error Troubleshooting Table

Symptom	Cause	Corrective Action
Error message from **rstutil**	**rstutil**	See **rstutil** error messages in Chapter 3 of the *Paragon™ System Diagnostic Reference Manual.*
Error message form **mrcutil**	**mrcutil**	See **mrcutil** error messages in Chapter 3 of the *Paragon™ System Diagnostic Reference Manual.*
ping (level 1 mesh test) error, **initutil** failed or a read/write failed on the scanbus	Configuration	Verify the *SYSCONFIG.TXT* file matches the hardware configuration. Refer to the *Paragon™ System Diagnostic Reference Manual* for configuration file information
Sync failure	Scanbus failure	Check backplane and cables. Refer to the *Paragon™ System Hardware Maintenance Manual* for help in checking the backplane and cables.
ping (level 1 mesh test)	Node board failure, iMRC failure or backplane failure	Replace backplane or iMRC if applicable. Refer to the *Paragon™ System Hardware Maintenance Manual* for help in replacing the backplane or iMRC.
Some nodes show solid green LED, while others (left of the solid green LEDs) are blinking	Sync error on backplane	Diagnostics sync with each backplane sequentially, starting from backplane A in cabinet 00 to backplane D in the last cabinet. The place at which the LED lights transition from solid to blinking indicates a bad backplane at that location.
NCTs fail	Bad GP node board	Replace the bad GP node board. Refer to the *Paragon™ System Hardware Maintenance Manual* for help in replacing the GP node board.

Troubleshooting Loading PSD

To check that loading to the boot node is working correctly, log in to a window on the diagnostic station as root and direct the output of the boot node to this window by entering the following command:

```
cu -l tty1a
```

In the window where **psd** is running, try to run a test. The boot string containing file names and IP addresses of the boot node and the diagnostic station, plus other information put out by the loader such as the size of the files downloaded to the boot node appear in the window running the **cu** command. This allows you to check whether the loader detected any errors, that the IP addresses used by the loader are correct, and the downloaded files are the correct ones (compare the file size to the size of the files in */u/paragon/diag*).

Table 4-3. Troubleshooting PSD Loading Error Table (1 of 2)

Symptom	Cause	Corrective Action
Messages such as "No Response from." or "Response Timed out"	Problem communicating with node(s) via scan	Check node communication using **diagscanio**. Refer to the *Paragon™ System Diagnostic Reference Manual* for the **diagscanio** manual page.
Loading hangs forever	The boot node value may be wrong or */u/paragon/diag/psdenv* may have incorrect IP addresses of boot node and DS.	Check the *MAGIC.MASTER* file for correct bootnode value and recreate the *SYSCONFIG.BIN* file using **cfgpar** after fixing it. Refer to the *Paragon™ System Diagnostic Reference Manual* for the **cfgpar** manual page. Check */u/paragon/diag/psdenv* for correct IP address
Loader is not able to load tests.	Installation (loader read permissions, node executables readable)	Change file permissions so the loader and node executables are readable by user, group and world
"NIC transmit time out."	mesh	Check LEDs are flashing green. Nodes that do not flash green are probably hung. Use **statusutl** to check for mis-routes or parity errors. Refer to the *Paragon™ System Diagnostic Reference Manual* for the **statusutl** manual page. Try restarting test.

Table 4-3. Troubleshooting PSD Loading Error Table (2 of 2)

Symptom	Cause	Corrective Action
Test does not run correctly (sizes of downloaded files in **cu** window do not match those in */u/paragon/diag)* file.	tftp loaded wrong file	rerun test
Load of node code never completes (loader displays "Kernel Load Failed" message in **cu** window)	incorrect permissions on */u/paragon/diag* directory	add read permissions for world to the */u/paragon/diag* directory.

Cabling Guide 5

Introduction

The Paragon™ XP/S system can be comprised of only one cabinet or multiple cabinets. The cabling strategy used in the Paragon XP/S system makes it possible to go from a single-cabinet system to a multi-cabinet system by just adding the cables required between the existing system and the new cabinets. The Paragon XP/S system is modular and scalable, and cabling is used to interconnect the Paragon system modules to form a supercomputer.

The sections in this chapter address the following cable areas in the Paragon XP/S system:

- **Basic Cabinet Cabling**. Power and signal cabling that applies to each Paragon XP/S system cabinet. Cardcage-to-cardcage mesh cabling and the cabling that goes to and from the diagnostic station is also included in this section.

- **DC Power Subsystem Cabling**. The cabling that goes to and from each of the DC power supplies in the Paragon XP/S system.

- **I/O System Cabling**. The cabling that goes to and from the I/O panel, I/O nodes, and peripheral modules in each cabinet of the Paragon XP/S system.

- **Cabinet-to-Cabinet Cabling**. The cabling that goes between the cabinets of a multi-cabinet system. This section provides inter-cabinet cabling procedures for both standard systems and for Paragon XP/S systems that use corner units.

Basic Cabinet Cabling

Each Paragon XP/S system cabinet has the same basic cabling. The following subsections describe how to remove, install, or change the following wiring for the Paragon XP/S system cabinet:

- The AC power wiring in the cabinet.
- The cables going to each of the cabinet fan assemblies.
- The cabling associated with the cabinet front door LED assembly.
- The cabling associated with the diagnostic station.

Cabinet AC Power Wiring

The AC power wiring of the cabinet includes the main power cord and the individual wires connected to the AC power components (line filter, main breaker, terminal block, and the power channel). The diagnostic station and each power supply also have AC power cords, but this wiring is discussed in the power supply and diagnostic sections of this chapter.

The following three portions of the AC power wiring can be replaced without also replacing one of the cabinet AC power components:

- The cabinet main power cord is replaceable. The main power cord might need to be replaced if a cabinet is being changed to use International/European power wiring (instead of North America/Japan) or visa versa, and the power plug needs to be converted to match up with the site power receptacles. It is also possible that a damaged cord or plug needs to be replaced.
- The wires going between the line filter and the main breaker, and the wires going between the main breaker and the terminal block are replaceable. This wiring, and the associated terminals, are treated as bulk material. Any replacement wiring should be constructed on site.
- The AC power cords that run between each power supply and the power channel are replaceable. Replacement of these power cords is described in the sections on power supply cabling.

Replacing the Main Power Cord

Figure 5-1 shows the base area of a cabinet and indicates the cabinet AC power components.

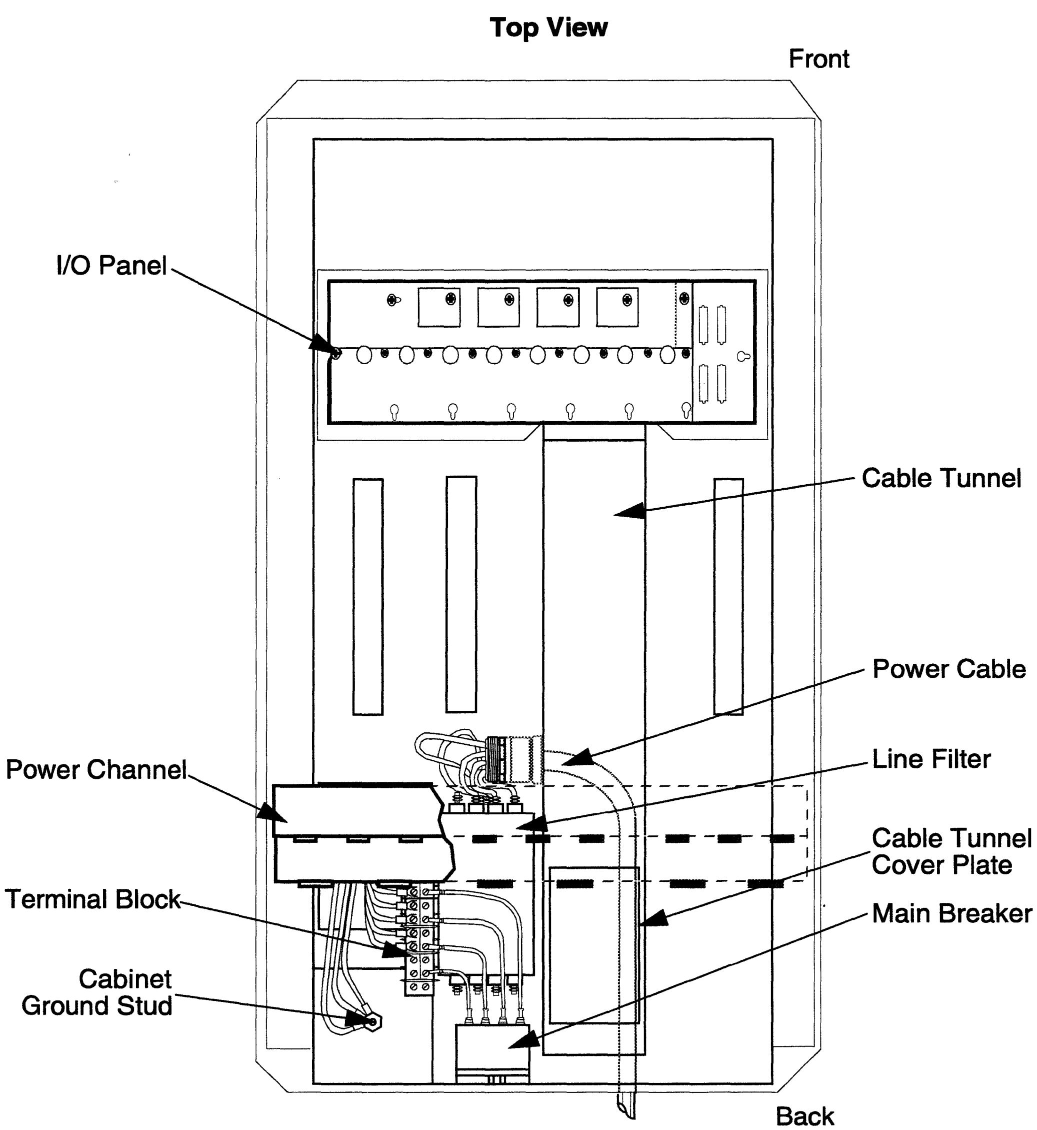


Figure 5-1. Cabinet AC Power Components

Figure 5-2 is a wiring diagram showing the power wiring connections (North America/Japan or International/European) for a Paragon XP/S system cabinet.

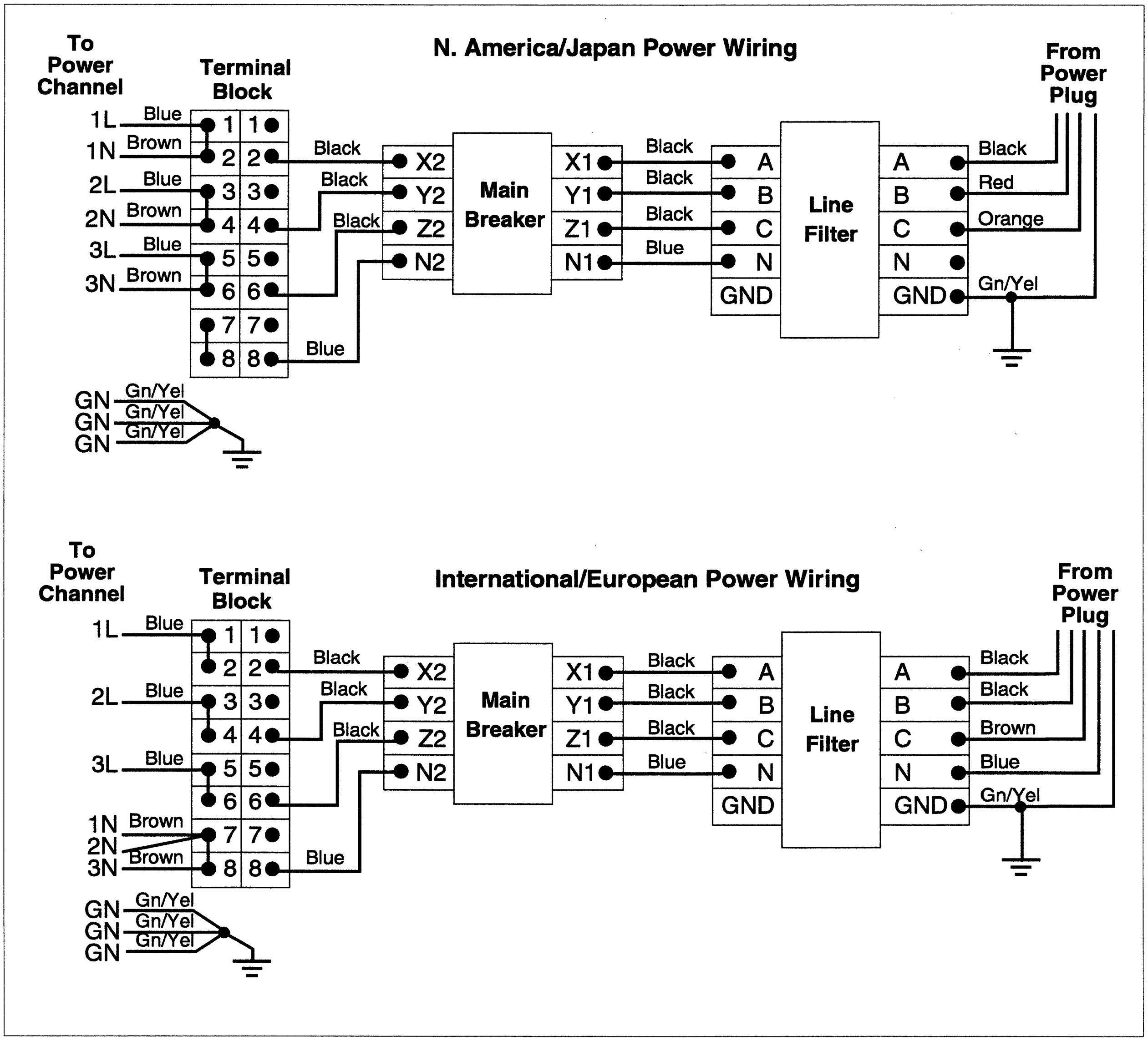


Figure 5-2. AC Power Wiring Diagram

Perform the following steps to replace the main power cord:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing open the bottom two power supply hinge brackets so you have access to the base area of the cabinet.

3. Remove six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff securing the clear AC service cover to the rear base of the cabinet. Remove the clear AC service cover and set it aside.

4. Remove the two bolts and washers securing the legs of the power channel assembly to the base of the cabinet.

5. Remove the four button head screws and washers securing the top brace of the power channel assembly to the side stiffeners of the cabinet. Move the power channel assembly out of the way.

6. Loosen and remove the nut securing the power cord ground wire to the cabinet base. Remove the power cord ground wire and set it out of the way.

7. Remove the nuts securing the power cord wires to the "LINE" terminals of the line filter. Remove the power cord wires and move them out of the way. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

8. Remove 14 flat head Phillips screws, then remove the cover plate over the cabinet base cable tunnel.

9. Reach down into the cable tunnel, and cut the two cable ties securing the main power cord to the cabinet.

10. Loosen and remove the large nut securing the power cord end to the cabinet base, then pull the cord, wires, and nut out of the cabinet base and set them aside.

11. Route the main power cord through the cabinet base cable tunnel, then thread the wires through the power entrance on the side of the channel.

12. Put the large nut over the end of the wires (coming through the power entrance), then tighten the nut to secure the main power cord to the cabinet base.

13. Use two wire ties to secure the main power cord to the inside of the cabinet base cable tunnel, then secure the cover plate over the cabinet base cable tunnel using 14 flat head Phillips screws.

14. Secure the power cord wires to the "LINE" terminals of the line filter using the line filter nuts. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

15. Secure the power cord ground wire to the cabinet base ground stud using the supplied nut.

16. Position the power channel assembly in the cabinet base, then secure the power channel assembly legs to the cabinet base using two bolts and washers.

17. Secure the upper flanges of the power channel assembly to the side stiffeners of the cabinet using four button head screws and washers.

18. Secure the clear AC service cover to the rear base of the cabinet using six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff.

Replacing AC Power Component Wiring

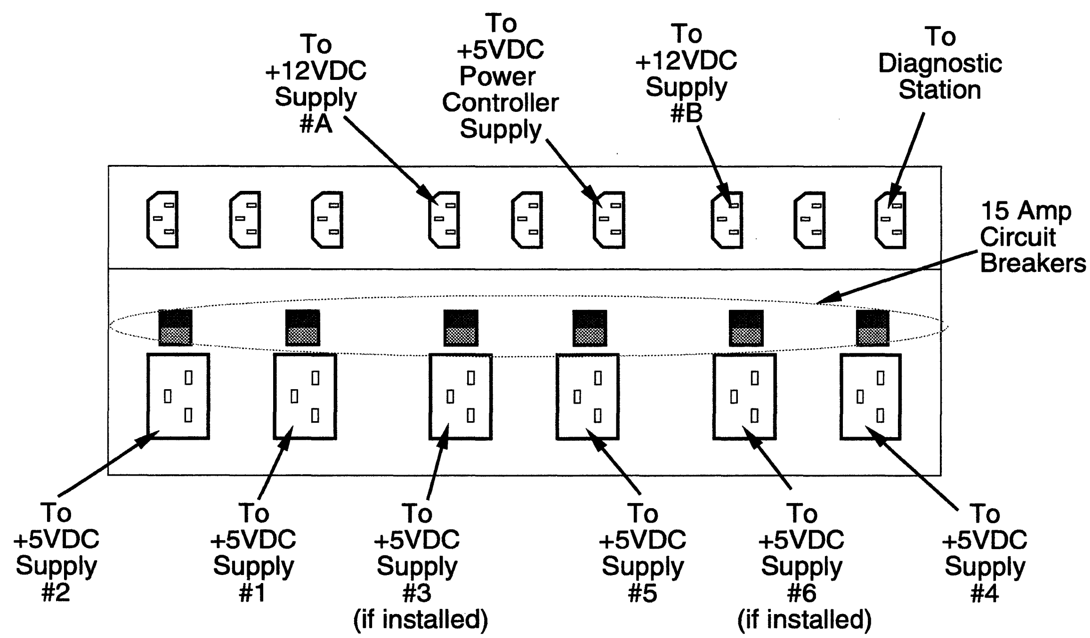
The wires going between the line filter and the main breaker, and the wires going between the main breaker and the terminal block can be replaced if necessary. These are 08 AWG multi-strand wires, blue or black insulation, with ring terminals on each end. Refer to Figure 5-2 on page 5-4 for the connection points and wire insulation colors when replacing any of these wires. The wire length is determined by the distance between connections and wire dress requirements. This wiring, and the associated terminals, are treated as bulk material. Any replacement wiring should be constructed on site.

The individual wires in the main power cable connect directly to the line filter input terminals. If any of these wires are damaged, replace the main power cord as described in "Replacing the Main Power Cord" on page 5-3.

The individual wires going from the terminal block to the power channel are part of the power channel assembly. If any of these wires are damaged, replace the power channel assembly as described in "Removing/Replacing the Power Channel Assembly" on page 6-27.

AC Power Channel Plug Allocations

In order to maintain uniform loading across all three phases of the input AC power, the power plugs installed in the AC power channel are arranged so no single phase has an excessive load. Figure 5-3 shows the Paragon XP/S system AC power channel and indicates the plug allocations that should be used for the outlets.



Note:

All outlets supply 220/240 VAC. Confirm the component power requirements of any non-standard parts before trying to use any of the power channel outlets.

Figure 5-3. AC Power Channel Plug Allocations

Main Bus Bar Cabling

Each Paragon XP/S system cabinet uses a set of main bus bars to distribute +5VDC and +12VDC power throughout the cabinet. These bus bars are mounted along the left side (viewed from the rear) of the back of the cabinet. The bus bars themselves should never need to be replaced, but it is important to note the attachment points of other cables, wires, and bus bars.

The cabling procedures in other portions of this chapter will reference this section and Figure 5-4 in order to indicate the attachment point(s) used on the bus bar(s).

Figure 5-4 shows the cabinet main bus bar, and indicates the cables that are attached to the bus bars and the points at which they are attached.

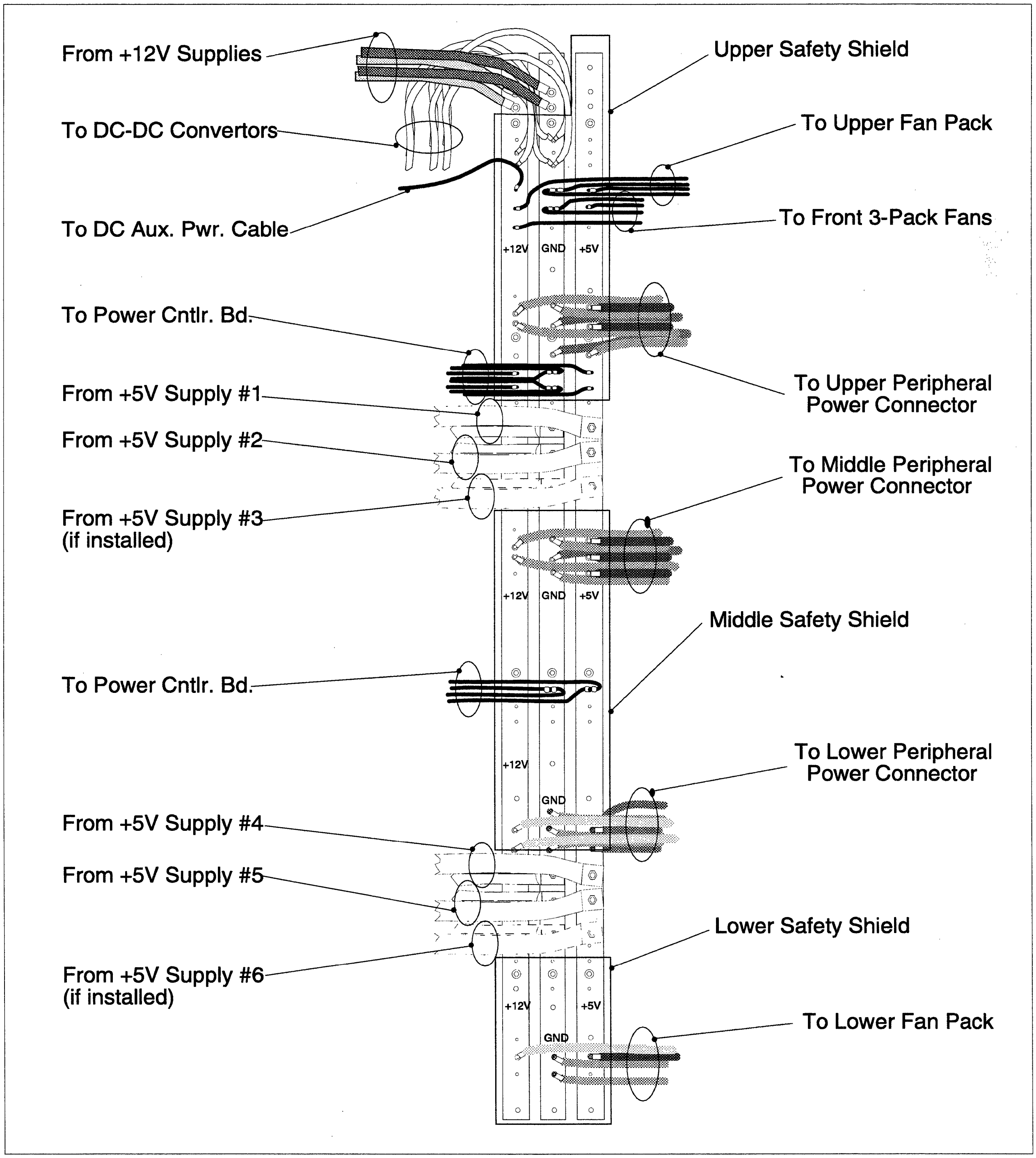


Figure 5-4. Main Bus Bar Cabling

Cabinet Fan Cabling

There are three fan assemblies in each Paragon XP/S system cabinet. Each set of fans has its own power/control cable. Use the procedures in this section to remove and/or replace the fan cables. Figure 5-5 shows a portion of the Paragon XP/S system cabinet and indicates the connections and routing for each of the fan cables.

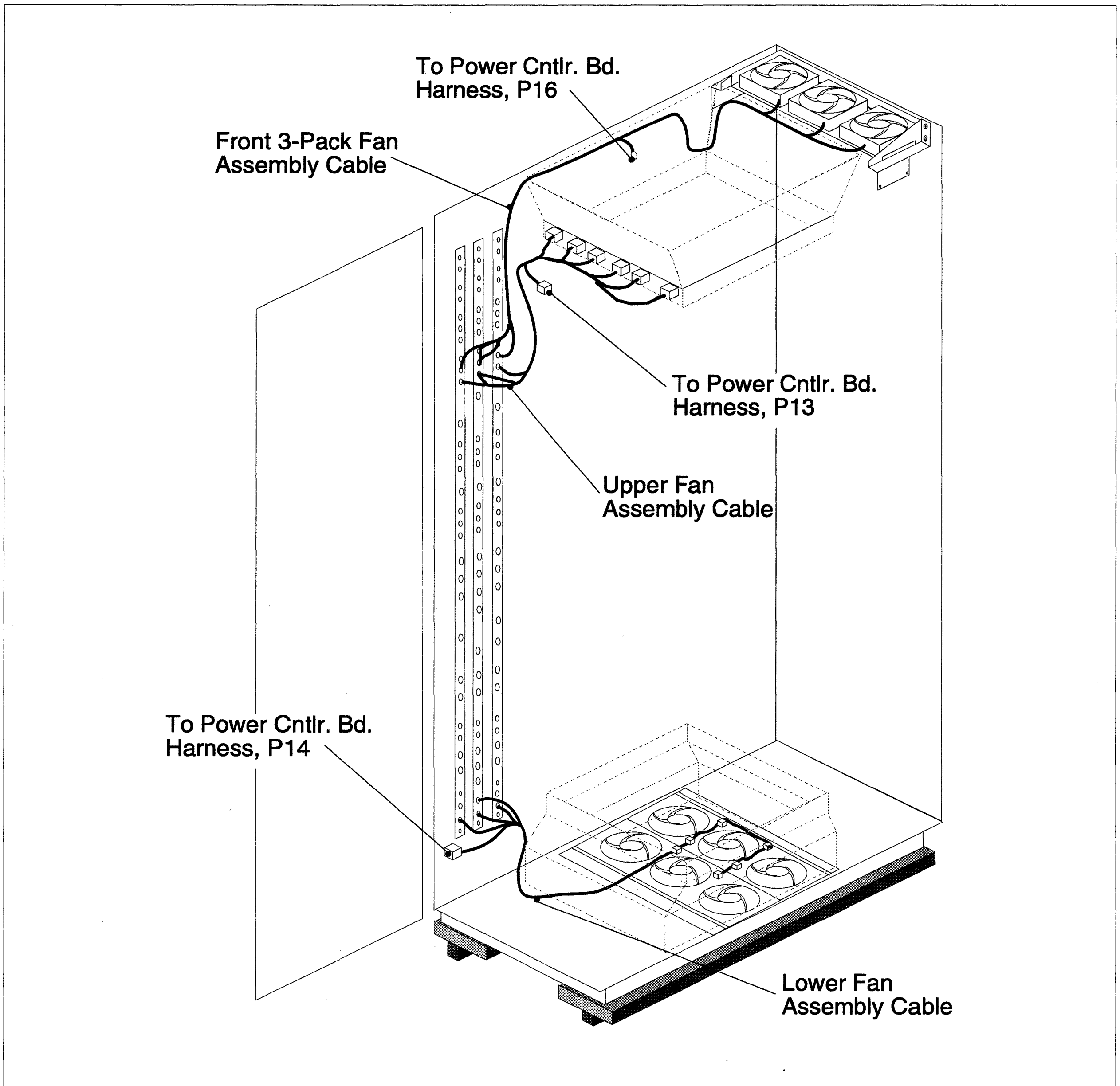


Figure 5-5. Fan Power Cable Routing

Lower Fan Assembly Cabling

The lower fan assembly cable is connected to each of the lower fan connectors (behind the lower plenum shroud), to the main bus bars, and to the power controller cable harness. Figure 5-5 shows the lower fan assembly cable routing, and Figure 5-4 shows the attachment points of the lower fan assembly cable on the main bus bar.

Getting Access

Perform the following steps to gain access to the lower fan assembly cable:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet, then loosen the latching hardware and swing the bottom peripheral module (if installed) fully open so you have access to the area below the bottom cardcage.

3. Remove the two screws holding the cosmetic panel over the lower front plenum panel, then remove the cosmetic panel and set it aside.

4. Remove the eight Phillips screws securing the lower front plenum panel to the brackets, then remove the lower front plenum panel and set it aside.

5. Loosen the two captive screws securing the center front fan to the fan tray, then move the center front fan out of the way.

Removing the Cable

Perform the following steps to remove the lower fan assembly cable:

WARNING

The internal plenum sheets, fan trays, and brackets of the cabinet might have sharp edges. Use care and wear protective clothing (if necessary) to avoid being scratched by any sharp edges.

NOTE

A small mirror might be necessary for the next several steps. It will be difficult to see the cable, connectors, or cable ties otherwise.

1. Carefully reach through the fan opening, then disconnect the lower fan assembly cable from each of the six fan connectors.

2. Use care to avoid damaging the lower fan assembly cable, and cut the four cable ties securing the cable to the mounting pads on the under side of the fan trays. Position the lower fan assembly cable so it will not catch on any obstructions while being removed through the rear of the cabinet.

3. Temporarily close any peripheral modules and the front door, then move to the rear area of the cabinet.

4. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the bottom two power supply hinge brackets open so you have access to the base area of the cabinet.

5. Disconnect the spade lug connector of the lower fan assembly cable from the mating connector (P16) of the power controller cable harness. Refer to Figure 5-5 on page 5-9 for more information.

6. Remove the securing screws, then remove the clear shield from the lower portion of the bus bars and set it aside. Refer to Figure 5-4 on page 5-8 if necessary for details.

7. As indicated in Figure 5-4, remove four screws securing the lower fan assembly cable to the bus bars, then set the cable aside.

Installing the Replacement Cable

WARNING

The internal plenum sheets, fan trays, and brackets of the cabinet might have sharp edges. Use care and wear protective clothing (if necessary) to avoid being scratched by any sharp edges.

NOTE

A small mirror might be necessary for the next several steps. It will be difficult to see the cable, connectors, or cable ties otherwise.

Perform the following steps to install the replacement lower fan assembly cable:

1. Thread the six fan connectors of the replacement lower fan assembly cable under the power channel assembly and into the base area of the plenum (under the fans).

2. Connect the spade lug connector of the lower fan assembly cable to the mating connector (P16) of the power controller cable harness. Refer to Figure 5-5 on page 5-9 for more information if necessary.

3. Secure the ring terminals of the lower fan assembly cable to the appropriate points on the bus bars using four screws. Each terminal is labeled and the wire insulation is color coded (i.e., black = GND, red = +5V, yellow = +12V). Refer to Figure 5-4 on page 5-8 if necessary for details.

4. Secure the clear, lower bus bar shield over the bus bars using the previously removed screws.

5. Dress the lower fan assembly cable if necessary, and tie it to appropriate points in the cabinet using cable ties.

6. Close the power supply hinge brackets and the rear door, then move to the front of the cabinet.

7. Open the front door and any peripheral modules that are obstructing the cabinet base.

8. Carefully reach through the center front fan opening and connect each of the cable connectors to the appropriate fan connector. Refer to Figure 5-5 on page 5-9 for more information on cable routing if necessary.

9. Using cable ties, secure the lower fan assembly cable to the four mounting pads on the fan tray.

10. Remove any excess cable tie material, and clean any debris from the area below the plenum.

Reinstalling Fans and Covers

Perform the following steps to reinstall fans and covers after replacing the lower fan assembly cable:

1. Position the previously removed fan over its fan opening, then secure it to the fan tray using the two captive Allen screws.

2. Position the lower front plenum panel at the front of the lower plenum, then secure it to the plenum using eight Phillips screws. It might be necessary to move the plenum sides some to align the screw holes.

3. Secure the cosmetic panel over the lower front plenum panel using two screws.

4. Close any open peripheral modules and secure them using the captive thumb screws.

5. Close the cabinet front door.

Upper Fan Assembly Cabling

The upper fan assembly cable is connected to each of the upper fan connectors, to the main bus bars, and to the power controller cable harness. Figure 5-5 on page 5-9 shows the upper fan assembly cable routing, and Figure 5-4 on page 5-8 shows the attachment points of the upper fan assembly cable on the main bus bar.

Removing the Cable

Perform the following steps to remove the upper fan assembly cable:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the top power supply hinge open so you have access to the upper area of the cabinet.

3. Disconnect the spade lug connector of the upper fan assembly cable from the mating connector (P13) of the power controller cable harness. Refer to Figure 5-5 on page 5-9 for more information.

4. Disconnect the upper fan assembly cable connectors from each of the upper fan connectors. Refer to Figure 5-5 on page 5-9 for the connector locations.

5. Remove the securing screws, then remove the clear shield from the upper portion of the bus bars and set it aside. Refer to Figure 5-4 on page 5-8 if necessary for details.

6. As indicated in Figure 5-4, remove four screws securing the upper fan assembly cable to the bus bars, cut any securing cable ties, then remove the cable and set it aside.

Installing the Cable

Perform the following steps to install the replacement upper fan assembly cable:

1. Connect the upper fan assembly cable connectors to each of the upper fan connectors (P6 is on the right side, as viewed from the rear). Refer to Figure 5-5 on page 5-9 for the connector locations.

2. Connect the spade lug connector of the upper fan assembly cable to the mating connector (P13) of the power controller cable harness. Refer to Figure 5-5 on page 5-9 for more information.

3. Secure the ring terminals of the upper fan assembly cable to the appropriate points on the bus bars using four screws. Each terminal is labeled and the wire insulation is color coded (i.e., black = GND, red = +5V, yellow = +12V). Refer to Figure 5-4 on page 5-8 if necessary for details.

4. Secure the clear, upper bus bar shield over the bus bars using the previously removed screws.

5. Dress the upper fan assembly cable if necessary, and tie it to appropriate points in the cabinet using cable ties.

6. Close the power supply hinge brackets and the rear door of the cabinet.

Front Fan Assembly Cabling

The front fan assembly is a pack of three fans whose main purpose is to exhaust heated air from the peripheral bay of the cabinet. Each module installed in the peripheral bay (e.g., peripheral modules and the diagnostic station) also has its own cooling fan(s).

The front fan assembly cable is connected to each of the three front fan connectors, to the main bus bars, and to the power controller cable harness. Figure 5-5 on page 5-9 shows the front fan assembly cable routing, and Figure 5-4 on page 5-8 shows the attachment points of the front fan assembly cable on the main bus bar.

Removing the Cable

Perform the following steps to remove the front fan assembly cable:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the top power supply hinge open so you have access to the upper area of the cabinet.

3. Disconnect the spade lug connector of the front fan assembly cable from the mating connector (P16) of the power controller cable harness. Refer to Figure 5-5 on page 5-9 for more information.

4. Remove the securing screws, then remove the clear shield from the upper portion of the bus bars and set it aside. Refer to Figure 5-4 on page 5-8 if necessary for details.

5. As indicated in Figure 5-4, remove four screws securing the front fan assembly cable to the bus bars, cut any securing cable ties, then position the cable so it can be removed through the front of the cabinet.

6. Close the power supply hinge brackets and the rear door, then move to the front of the cabinet.

7. Open the front door and any peripheral module or diagnostic station that is obstructing the upper area of the cabinet.

8. Carefully pull the front fan assembly cable through the gap between the top cardcage and the cabinet side.

9. Cut any restraining cable ties, disconnect the front fan assembly cable connectors from the fan connectors, then set the front fan assembly cable aside.

Installing the Cable

Perform the following steps to install the replacement front fan assembly cable:

1. Open the front door and any peripheral module or diagnostic station that is obstructing the upper area of the cabinet.

2. Connect the replacement front fan assembly cable connectors to the appropriate front fan connectors. Refer to Figure 5-5 on page 5-9 for the connector locations.

3. Dress any excess wire and connectors, then tie the excess to the front fan assembly bracket using cable ties.

4. Thread the ends of the front fan assembly cable along the right side (as viewed from the front) of the top cardcage, and into the rear area of the cabinet.

5. Close any open peripheral modules or the diagnostic station, and then close the front door.

6. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the top power supply hinge open so you have access to the upper area of the cabinet.

7. Connect the spade lug connector of the front fan assembly cable to the mating connector (P16) of the power controller cable harness. Refer to Figure 5-5 on page 5-9 for more information.

8. Secure the ring terminals of the front fan assembly cable to the appropriate points on the bus bars using four screws. Each terminal is labeled and the wire insulation is color coded (i.e., black = GND, red = +5V, yellow = +12V). Refer to Figure 5-4 on page 5-8 if necessary for details.

9. Secure the clear, upper bus bar shield over the bus bars using the previously removed screws.

10. Dress the front fan assembly cable if necessary, and tie it to appropriate points in the cabinet using cable ties.

11. Close the power supply hinge brackets and the rear door of the cabinet.

Cardcage Interconnect Cabling

Only the mesh expansion cables provide cardcage interconnect cabling between backplanes in a single Paragon XP/S system cabinet. The same mesh expansion cables are also used to connect backplanes in multi-cabinet Paragon XP/S systems. Refer to "Cabinet-to-Cabinet Cabling" on page 5-82 for cable interconnect procedures between cabinets. Figure 5-6 shows one of the mesh expansion cables installed between two backplanes in a cabinet.

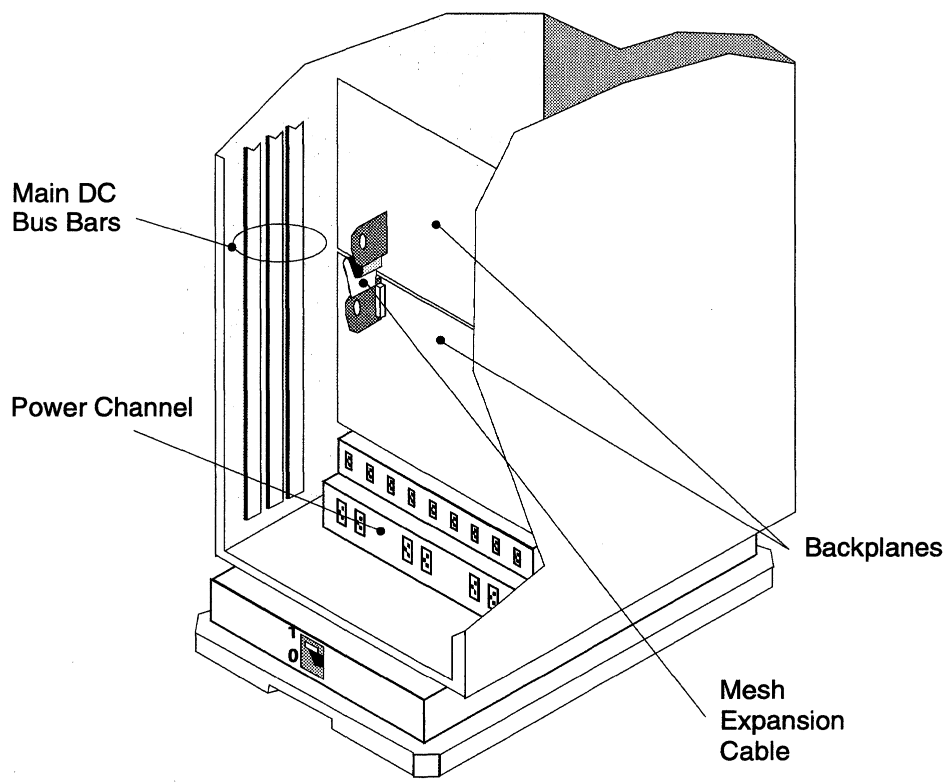


Figure 5-6. Mesh Expansion Cable

CAUTION

Use care when connecting mesh expansion cables to the backplane connectors. The cables are stiff, the connectors have high pin density, and the pins can be easily damaged. If you feel undue resistance while connecting a mesh expansion cable, IMMEDIATELY HALT the procedure and examine the connectors for bent pins. Straighten any bent pins, if possible, before proceeding. Contact SSD Customer Support for assistance if any of the connector pins must be replaced.

Note the mesh expansion cable bends and connector placement in the hookup shown in Figure 5-6. All interconnect cabling between backplanes must use the same cable bends and connector placement. The backplane connector pairs J19 (top) to J24 (bottom) are connected by one mesh expansion cable, and the connector pairs J20 (top) to J23 (bottom) are connected by the second mesh expansion cable. There are three sets of mesh expansion cables (total of six cables) interconnecting the four backplanes in each cabinet.

LED Subsystem Wiring

The LED subsystem wiring consists of the following parts:

Front Door Assembly Cabling. The wiring, busbars, and cables within the front door assembly.

LED Signal/Power Cable. The power and signal cable going to the cabinet front door.

LED Controller Board Cabling. The cabling attached to the LED controller board.

If you also need to replace one of the LED display boards or the LED controller board, refer to "Removing/Replacing Cabinet LED Components" on page 6-15 as well as the procedures in this section. Figure 5-7 shows the LED components that are in each cabinet and the LED subsystem cables.

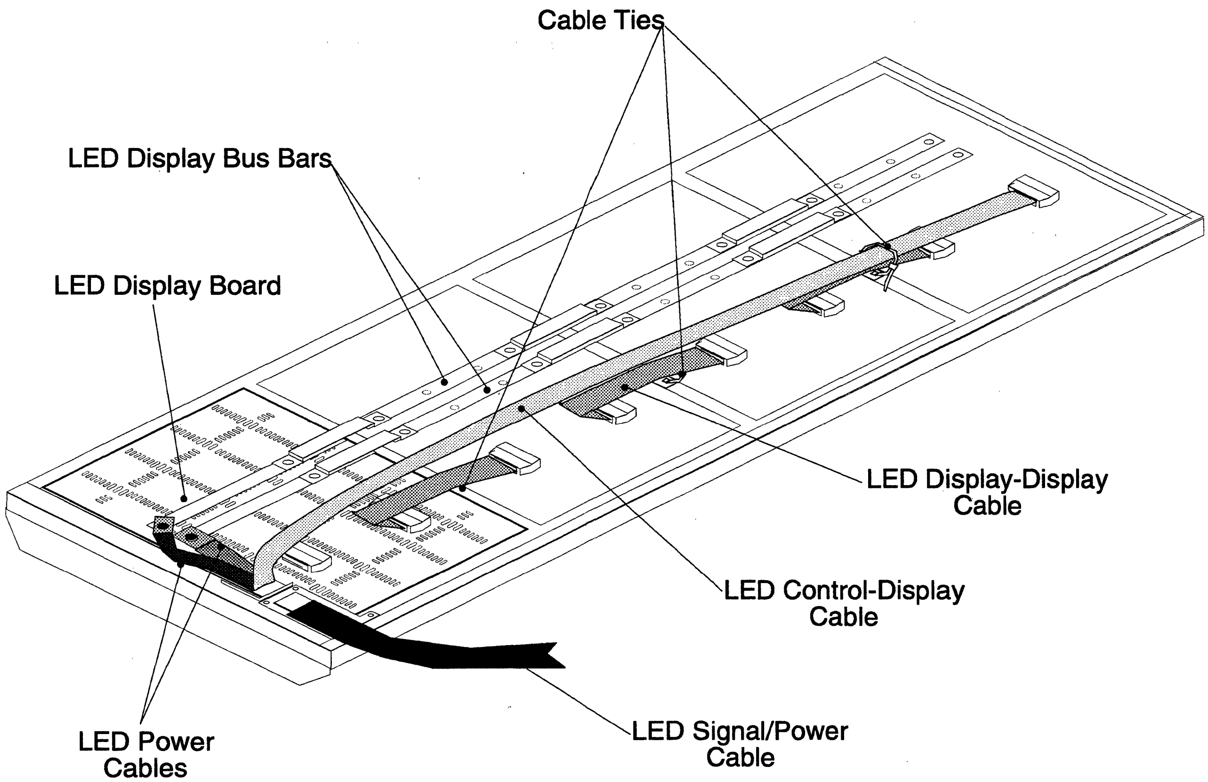


Figure 5-7. LED Subsystem Wiring

Front Door Assembly Cabling

The Paragon XP/S system front door assembly uses bus bars to supply DC power to each of the LED display boards, and a single type of board-to-board ribbon cable to pass LED signals among the LED display boards. The procedures in this section only address replacement of the board-to-board ribbon cables. If one of the LED display boards is also being replaced, follow the procedures in "Removing/Replacing Cabinet LED Components" on page 6-15 along with the procedures in this section.

Perform the following steps to replace the front door assembly cabling:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and identify the LED display board(s) having problems.

3. Remove eight (ten on bottom cover) flat-head, black screws securing the inside cover panels over the LED display board(s) having problems, then set the cover panels aside. If necessary remove all of the inside cover panels.

4. Cut the cable tie(s) securing the LED control/display and LED display/display cables to the door frame (between the LED display boards having problems). Refer to Figure 5-7 on page 5-18 for details if necessary.

5. Disconnect the LED display/display cable between the LED display boards having problems, then set the cable aside.

6. Connect the replacement LED display/display cable to the same connectors, and in the same orientation as the removed cable. Push on each connector until the connector locks snap into place.

7. Dress and secure the replacement LED display/display cable and the LED control/display cable to the door frame using cable ties.

8. Position the inside cover panels over the LED display boards, then secure them to the door assembly using flat-head, black screws.

LED Signal/Power Cable Replacement

The LED signal/power cable assembly includes the LED control/display cable and two LED power cables enclosed (over much of their length) in a zipper tube sheath. The two LED power cables attach to the bottom of the bus bars that supply power to the LED display boards. The LED control/display cable connects to the top LED display board.

Removing the Cable

Perform the following steps to remove the LED signal/power cable assembly:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and remove eight (ten on bottom cover) flat-head, black screws securing each of the inside cover panels over the LED display boards, then set the cover panels aside.

3. Cut the cable tie(s) securing the LED control/display and LED display/display cables to the door frame. Refer to Figure 5-7 on page 5-18 for details if necessary.

4. Disconnect the LED control/display cable from the P1 connector on the top LED display board.

5. Remove two flathead screws securing the LED power cables to the busbars, then disconnect the LED power cables.

6. Thread the LED signal/power cable assembly out through the support bracket (lower inside corner of the front door) until it is free of the door. If necessary first remove the screws holding the bracket to make it easier to remove the LED signal/power cable assembly.

7. Temporarily close any peripheral modules and the front door, then move to the rear area of the cabinet.

8. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the bottom two power supply hinges open so you have access to the base area of the cabinet.

9. Disconnect the LED control/display cable from connector J800 of the LED controller board.

10. Remove the securing screws, then remove the clear shield from the lower portion of the bus bars and set it aside. Refer to Figure 5-4 on page 5-8 if necessary for details.

11. Remove two pan head screws securing the LED power cables to the bottoms of the main bus bars.

12. Draw the LED signal/power cable assembly under the air plenum and into the rear area of the cabinet, then cut any cable ties securing this cable to the cabinet. Set the LED signal/power cable assembly aside.

Installing the Cable

Perform the following steps to install the LED signal/power cable assembly:

1. If the replacement LED signal/power cable assembly is not enclosed in zipper tube, perform the following steps cut 42 inches of zipper tube and place it around the LED control/display cable and the two LED power cables. Approximately 10 inches of the LED power cable and 48 inches of the LED control/display cable must be exposed on the door-end of the LED signal/power cable assembly. Seal the zipper tube with 42 inches of 1-inch wide Z-tape.

2. Open the front door of the cabinet, and make sure that the four cover panels for the door LED display boards are off of the door.

3. Connect the replacement LED control/display cable to the P1 connector of the top LED display board. Push on the connector until the lock snaps into place.

4. Dress and secure the replacement LED control/display cable and the LED display/display cables to the door frame using cable ties.

5. Connect the +5V (red insulation) and GND (black insulation) cables to the LED bus bars as shown in Figure 5-7, then secure them using flat head screws.

6. Thread the LED signal/power cable assembly through the support bracket (lower inside corner of the front door). If necessary first remove the screws holding the bracket to make it easier to run the LED signal/power cable assembly through the bracket.

7. Make sure the power and signal cables are dressed and secure them to tie points on the door as indicated in Figure 5-7.

8. Replace the cover panels and secure each of them to the door using eight (ten on the bottom panel) black flat head screws.

9. Route the LED signal/power cable assembly under the plenum and power channel assembly, and on into the rear area of the cabinet. Refer to Figure 5-7 for routing information.

10. Close any peripheral modules and the cabinet front door, then open the rear door and the bottom two power supply hinge brackets.

11. Connect the LED control/display cable to connector J800 of the LED controller board.

12. Secure the LED power cables to the bottoms of the main bus bars using two pan head screws. Refer to Figure 5-4 on page 5-8 if necessary for details.

13. Secure the clear shield to the lower portion of the bus bars using flat head screws.

14. Close the bottom two power supply hinge brackets and the rear door.

LED Controller Board Cabling

All signals going to the LED display boards in the cabinet front door must first pass through the LED controller board. The LED controller board accepts signal inputs from the power controller board, from each backplane in the cabinet, and (if applicable) from the adjacent, next lower numbered cabinet in the Paragon XP/S system. The LED controller board send signal outputs to the LED display boards in the cabinet front door, and (if applicable) to the adjacent, next higher numbered cabinet in the Paragon XP/S system.

The replacement procedures for the LED signal/power cable assembly are described in "LED Signal/Power Cable Replacement" on page 5-19. Each of the following subsections describes replacement procedures for one of the remaining cable types that connects to the LED controller board.

Replacing the LED Power/Controller Cable Assembly

The LED power/controller cable assembly carries signals between the power controller board and the LED controller board, and DC power from the main bus bars to the LED controller board. Perform the following steps to replace the LED power/controller cable assembly:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the top two power supply hinges open so you have access to the LED controller board area of the cabinet.

3. Disconnect the power connector from J100 and the signal connector from J200 at the LED controller board. If necessary, refer to Figure A-11 for the connector locations and Figure 5-7 for routing information.

4. Remove the securing screws, then remove the clear shield from the upper portion of the bus bars and set it aside. Refer to Figure 5-4 on page 5-8 if necessary for details.

5. Remove four screws securing the cable power wiring to the bus bars. Each terminal is labeled and the wire insulation is color coded (i.e., black = GND, red = +5V, yellow = +12V). Refer to Figure 5-4 on page 5-8 if necessary for details.

6. Disconnect the signal cable at J041 of the power controller board.

7. Cut any cable ties securing the LED power/controller cable assembly to the sides and top of the cabinet, then remove the cable assembly and set it aside.

8. Dress the replacement LED power/controller cable assembly following the same path as the cable assembly that was just removed, then loosely secure it to the cabinet tie points using cable ties. The ties will be tightened when all connections are complete. Refer to Figure 5-7, if necessary for routing information.

9. Connect the LED power/controller cable assembly signal cable to J041 of the power controller board.

10. Secure the cable power wiring to the bus bars using screws, as indicated in Figure 5-4 on page 5-8. Each terminal is labeled and the wire insulation is color coded (i.e., black = GND, red = +5V, yellow = +12V).

11. Secure the clear, upper bus bar shield over the bus bars using the previously removed screws.

12. At the LED controller end of the cable assembly, connect the power connector to J100 and the signal connector to J200 of the LED controller board.

13. Adjust the LED power/controller cable assembly to remove excess slack, then tighten all the cable ties.

Replacing the Backplane-to-LED Controller Cables

Each backplane in the cabinet uses a backplane-to-LED controller cable to carry signals to the LED controller board. Perform the following steps to replace a backplane-to-LED controller cable:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the top two power supply hinges open so you have access to the LED controller board area of the cabinet.

3. Identify the backplane-to-LED controller cable(s) being replaced, as follows:

Backplane End	LED Controller End
Backplane A (bottom), J57	Connector J730
Backplane B (second from bottom), J57	Connector J310
Backplane C (second from top), J57	Connector J311
Backplane D (top), J57	Connector J210

4. Cut any securing cable ties, then disconnect the backplane-to-LED controller cable(s) from the LED controller connector and then from the J57 connector of the appropriate backplane(s). Remove the backplane-to-LED controller cable(s) and set them aside.

NOTE

Each of the backplane-to-LED controller cables has a different length and part number based on the backplane to which it connects. Make sure the replacement backplane-to-LED controller cable is the same length as the cable being replaced.

5. Connect the replacement backplane-to-LED controller cable(s) to the J57 connector of the appropriate backplane(s), and to the appropriate connector of the LED controller board. Refer to Figure 5-7, if necessary for routing information.

6. Dress the replacement backplane-to-LED controller cable(s) and secure to appropriate cabinet tie points using cable ties.

Replacing Cabinet-to-Cabinet LED Signal Cables

In multi-cabinet Paragon XP/S systems, the LED signals are shared between adjacent cabinets using cabinet-to-cabinet LED signal cables. Perform the following steps to replace a cabinet-to-cabinet LED signal cable:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch and open the rear doors of the adjacent cabinets associated with the cabinet-to-cabinet LED signal cable that is being replaced. Swing the bottom two power supply hinges open so you have access to the LED controller board areas of each cabinet.

3. At the left-hand cabinet (viewed from the rear), disconnect the cabinet-to-cabinet LED signal cable at connector J900 (bottom connector) of the LED controller board.

4. At the right-hand cabinet (viewed from the rear), disconnect the cabinet-to-cabinet LED signal cable at connector J801 (third from bottom connector) of the LED controller board.

5. Cut any cable ties securing the cabinet-to-cabinet LED signal cable to either cabinet, then remove the cable and set it aside.

6. Connect the replacement cabinet-to-cabinet LED signal cable to connector J900 (bottom connector) of the LED controller board in the left-hand cabinet (viewed from the rear).

7. Run the replacement cabinet-to-cabinet LED signal cable down the right side of the cabinet, then through the rear slot between the cabinets, and into the rear base area of the right-hand cabinet.

8. Connect the other end of the replacement cabinet-to-cabinet LED signal cable to connector J801 (third from bottom connector) of the LED controller board.

9. If necessary, dress the cable and secure it to the cabinet sides using cable ties.

Diagnostic Station Cabling

The Paragon XP/S system diagnostic station is, by itself, a field replaceable unit (FRU), so cabling procedures mainly deal with connecting and routing the cables that are attached directly to the diagnostic station. Figure 5-8 shows the cabling associated with the diagnostic station, and indicates the routing that should be used when installing or replacing a diagnostic station.

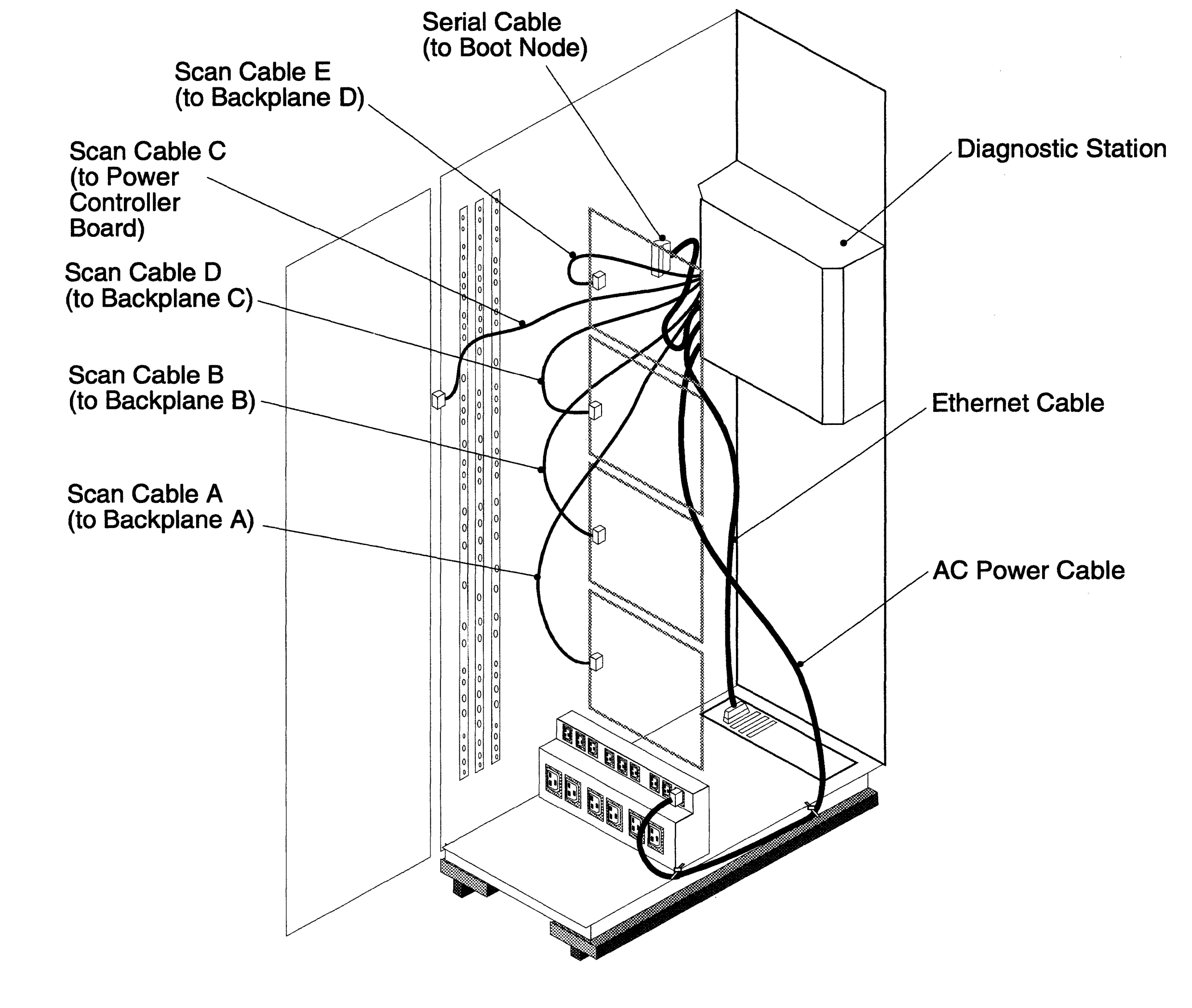


Figure 5-8. Diagnostic Station Cabling

Power Wiring

The diagnostic station uses 220/240 VAC power from the cabinet power channel.

Removing the Cable

Use the following steps to remove the diagnostic station AC power cord:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing open the bottom power supply hinge bracket so you have access to the base area of the cabinet.

3. Unplug the diagnostic station AC power plug from the AC power channel (top, right outlet when viewed from the rear).

4. Cut the cable tie securing the diagnostic station AC power cord to the lower right leg of the power channel, then place the cord so it can be drawn through to the front without catching on anything.

5. Close the power supply hinge and the back door, then open the front door of the cabinet. Swing open the diagnostic station and any peripheral modules.

6. Loosen any attaching screws, then move the cosmetic panel covering the base of the peripheral bay out of the way (so you can reach the cabinet base).

7. Cut the cable tie securing the diagnostic station AC power cord to the lower left base of the peripheral bay, then draw the cord and plug under the plenum and into the peripheral bay.

8. Loosen any attaching screws then remove the cosmetic panels covering the right side (viewed from the front) of the peripheral bay.

9. Cut any cable ties securing the diagnostic station AC power cord to the cabinet side. Note that these cable ties should also be securing the Ethernet cable to the side.

Routing the Cable

If a diagnostic station is being added to this cabinet (not just an existing one being replaced), the top peripheral module DC power connector should first be removed. Refer to "Peripheral Bay DC Power Cabling" on page 5-56 for procedures on removing this connector, if that is necessary. Use the following steps to route the diagnostic station AC power cord:

1. Open the front door of the cabinet, and swing open the diagnostic station and any peripheral modules.

2. If necessary, loosen any attaching screws then remove the cosmetic panels covering the right side (viewed from the front) of the peripheral bay.

3. Dress both the AC power cord and the diagnostic station Ethernet cable along the side of the cabinet, then secure it at appropriate points using cable ties.

4. Route the AC power cord through the opening in the cosmetic lower panel, along the left base area (under the plenum), then into the rear area of the cabinet. Secure the AC power cord to a tie mount on the base in the left rear of the peripheral bay (see Figure 5-8 for location).

5. Secure the side cosmetic panels and the lower cosmetic panel in the correct positions using the screws that were removed earlier.

6. Close any peripheral modules and the cabinet front door, then open the rear door and the bottom power supply hinge bracket.

7. Pull the AC power cord taut (so there is no slack that can be drawn into the plenum), then secure it to the lower right leg of the power channel using a cable tie.

8. Plug the AC power cord into the top right outlet of the AC power channel. Refer to Figure 5-3 on page 5-7 if necessary to locate the correct AC power outlet.

Ethernet Cabling

Each diagnostic station must be connected to an Ethernet channel. Figure 5-9 shows the slot types in the Paragon XP/S system I/O panel (original FAB), and indicates the proper slot to use for the diagnostic station Ethernet channel. Figure 5-10 shows the slot types in the Paragon XP/S system I/O panel (current FAB). Note that normally only cabinet 0 has an I/O panel with connector slots. Cabinets other than cabinet 0 should have a blank panel. Note also that all unused slots in the I/O panel should be covered.

Removing the Cable

Perform the following steps to disconnect the diagnostic station Ethernet cable:

1. Make sure the DC power has been turned OFF to the Paragon XP/S system. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet, and swing open the diagnostic station and any peripheral modules.

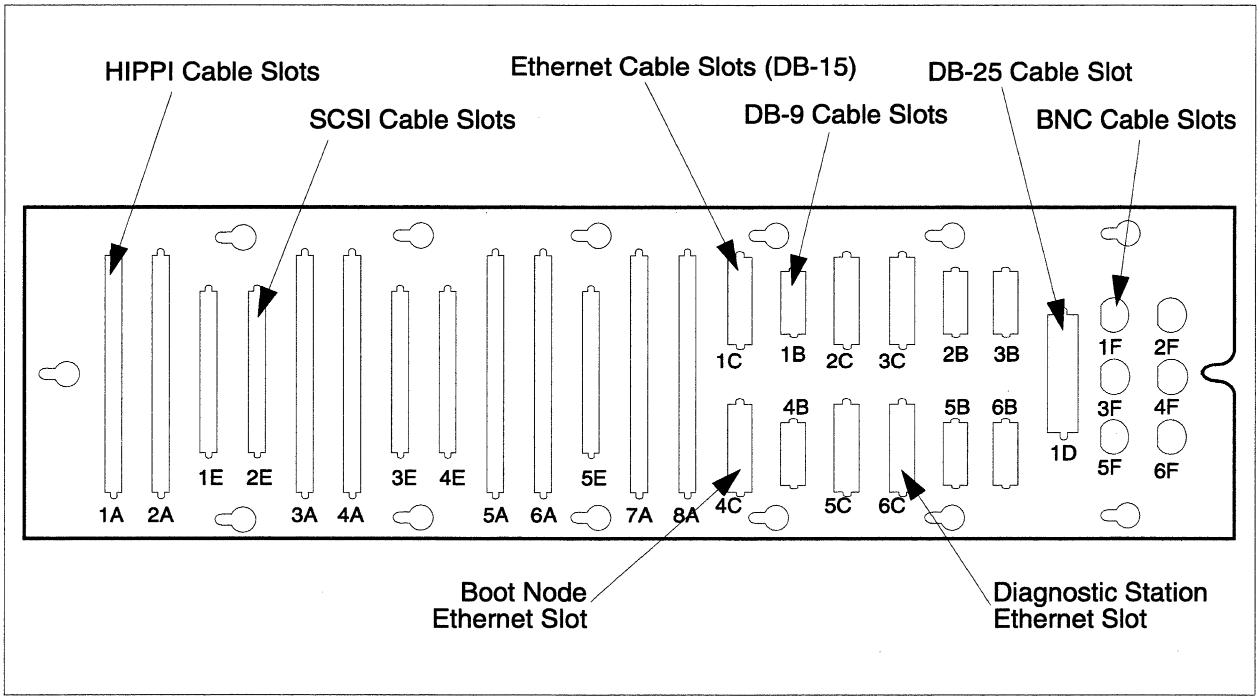


Figure 5-9. I/O Panel Slot Assignments (Original FAB)

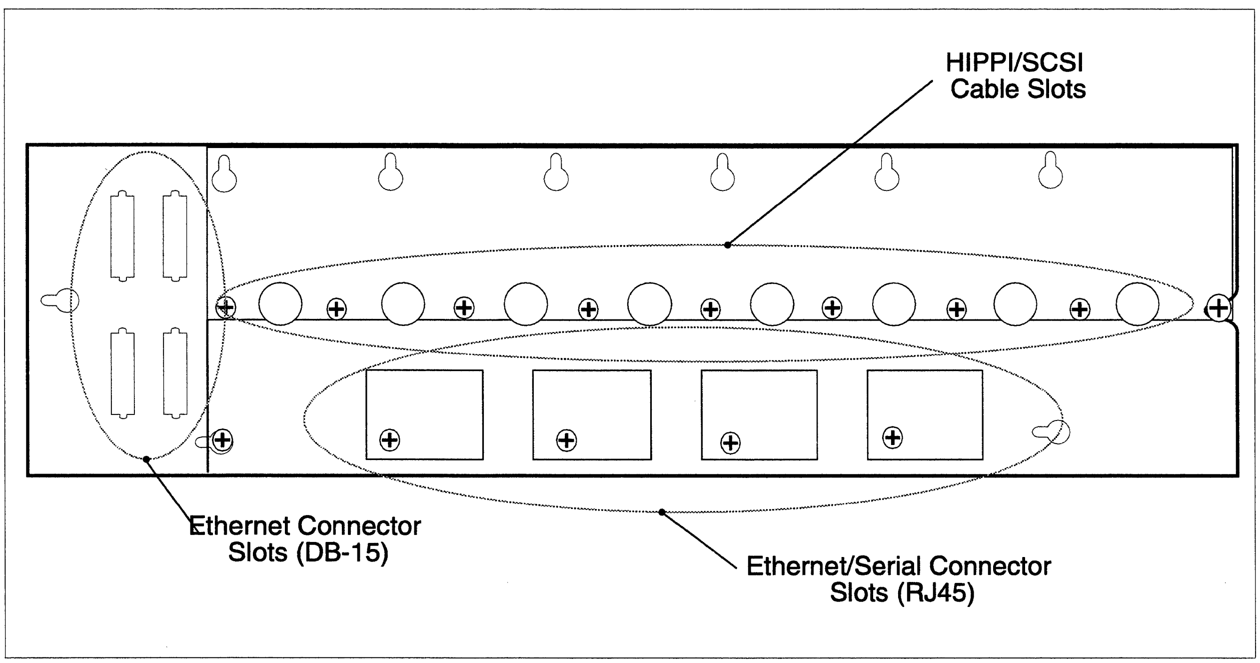


Figure 5-10. I/O Panel Slot Assignments (Current FAB)

3. If necessary, loosen any attaching screws then remove the cosmetic panels covering the right

side (viewed from the front) of the peripheral bay.

4. Cut any cable ties securing the diagnostic station Ethernet cable to the side of the cabinet.

5. If only the diagnostic station (with attached Ethernet cable) is being replaced, loosen two captive screws then disconnect the diagnostic station Ethernet connector at the I/O panel.

6. If the entire Ethernet cable (from the diagnostic station to the customer cable) is being removed/replaced, perform the following steps:

   A. Loosen any attaching screws, then move the cosmetic panel covering the base of the peripheral bay out of the way (so you can reach the cabinet base).

   B. Loosen the 14 screws securing the I/O panel to the cabinet base, then tilt the I/O panel out so you can reach the customer cable.

   C. Loosen any captive screws, then disconnect the connector of the stub Ethernet cable from the customer cable.

   D. Remove two hex standoffs, then remove the stub Ethernet cable from the bottom of the I/O panel.

Routing the Cable

If a diagnostic station is being added to this cabinet (not just an existing one being replaced), the top peripheral module DC power connector should first be removed. Refer to "Peripheral Bay DC Power Cabling" on page 5-56 for procedures on removing this connector, if that is necessary. Use the following steps to route the diagnostic station Ethernet cable:

1. Open the front door of the cabinet, and swing open the diagnostic station and any peripheral modules.

2. If necessary, loosen any attaching screws then remove the cosmetic panels covering the right side (viewed from the front) of the peripheral bay.

3. Dress both the AC power cord and the diagnostic station Ethernet cable along the side of the cabinet, then secure it at appropriate points using cable ties.

4. If the diagnostic station (and its attached cables) is being replaced, connect the Ethernet cable to the stub Ethernet cable mounted in slot 6C of the I/O panel. Refer to Figure 5-9 or Figure 5-10 on page 5-28 for the connector slot location.

5. If a new diagnostic station (and its attached cables) is being installed in this cabinet, perform the following steps to route the remaining portions of the Ethernet cable:

   A. Loosen any attaching screws, then move the cosmetic panel covering the base of the peripheral bay out of the way (so you can reach the cabinet base).

B. Loosen the 14 screws securing the I/O panel to the cabinet base, then tilt the I/O panel out so you can reach the customer cable.

C. Using the captive screws, connect the connector of the stub Ethernet cable to the customer cable and secure the connectors together.

D. Attach the stub Ethernet cable to the bottom of the I/O panel at slot 6C using hex standoffs. Refer to Figure 5-9 or Figure 5-10 on page 5-28 for the connector slot location.

E. Reinstall the I/O panel in the cabinet base, and secure it by tightening the 14 screws.

F. Connect the diagnostic station Ethernet cable to the end of the stub Ethernet cable that is mounted at slot 6C of the I/O panel, and secure the connectors together using the captive screws.

G. Position the cosmetic panel over the I/O panel in the base of the peripheral bay, then secure it using the previously removed screws.

6. Secure the side cosmetic panels and the lower cosmetic panel in the correct positions using the screws that were removed earlier.

7. Close any peripheral modules and the cabinet front door.

Scan String and Serial Channel Cabling

The remaining cabling for the diagnostic station consists of five scan string cables and a single serial cable. Refer to Figure 5-8 on page 5-25 for cable identification and routing information. Perform the following steps to remove and/or route the scan string and serial cables:

1. Make sure the DC power has been turned OFF to the Paragon XP/S system. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet, and swing open the diagnostic station.

3. If removing a diagnostic station, disconnect the serial and scan string cables from their mating connectors and pull the cables into the peripheral bay section of the cabinet. Refer to Figure 5-8 on page 5-25 for cable identification and routing information.

4. If replacing a diagnostic station and routing the serial and scan string cables, perform the following steps:

   A. Connect the serial cable (DB-9 female connector) of the diagnostic station to the serial connector of the boot node, and secure it using the captive screws.

   B. Route the five scan cables along the right side of the top cardcage and into the rear portion of the cabinet.

   C. Close the diagnostic station and the cabinet front door, then open the rear door and the top two power supply hinge brackets.

   D. Route the scan string cable labelled "C" to the front of the power controller board, then plug it into connector J030.

   E. Route the remaining scan string cables down the left edge of the backplanes, then plug each cable into connector J58 of their respective backplanes as follows:

      - Scan string cable "A" to backplane A (bottom backplane), connector J58.
      - Scan string cable "B" to backplane B (second from bottom backplane), connector J58.
      - Scan string cable "D" to backplane C (second from top backplane), connector J58.
      - Scan string cable "E" to backplane D (top backplane), connector J58.

DC Power Subsystem Cabling

The DC power subsystem cabling consists of the following cables:

The power controller board cable harness. The cable harness that collects all sense, monitor, and control signals for the DC power subsystem, and connects them to the power controller board.

The 400 amp +5VDC power supply cabling. The AC input, control/sense, and main power output cables that are connected to each of the 400 amp +5VDC power supplies in each cabinet.

The 67 amp +12VDC power supply cabling. The AC input, control/sense, and main power output cables that are connected to each of the 67 amp +12VDC power supplies in each cabinet.

The DC-DC convertor cabling. The DC input, control/sense, and output cables that are connected to each of the DC-DC convertors in each cabinet.

The power controller +5VDC power supply cabling. The AC input, control/sense, and power output cables and the bleed resistor assembly that are connected to the power controller +5VDC power supply (installed only in cabinet 0).

The peripheral bay DC power cabling. The DC power cables, connectors, and brackets that are installed to provide power to peripheral modules that can be installed in the peripheral bay of each cabinet.

If cabling is being replaced or installed along with the installation/replacement of a DC power subsystem component, refer to the appropriate section under "Removing/Replacing Power Subsystem Components" on page 6-25 along with the appropriate procedure in this section. Refer to Figure 5-3 on page 5-7 if necessary to determine AC input power hookup points on the AC power channel. Refer to Figure 5-4 on page 5-8 if necessary to determine DC output power hookup points on the main bus bars.

Power Controller Board Cable Harness

The power controller board cable harness allows the board to control and/or monitor each power supply, the fans, and the temperature major regions of the Paragon XP/S system cabinet. Figure 5-11 shows the routing and connection points of the power controller board cable harness.

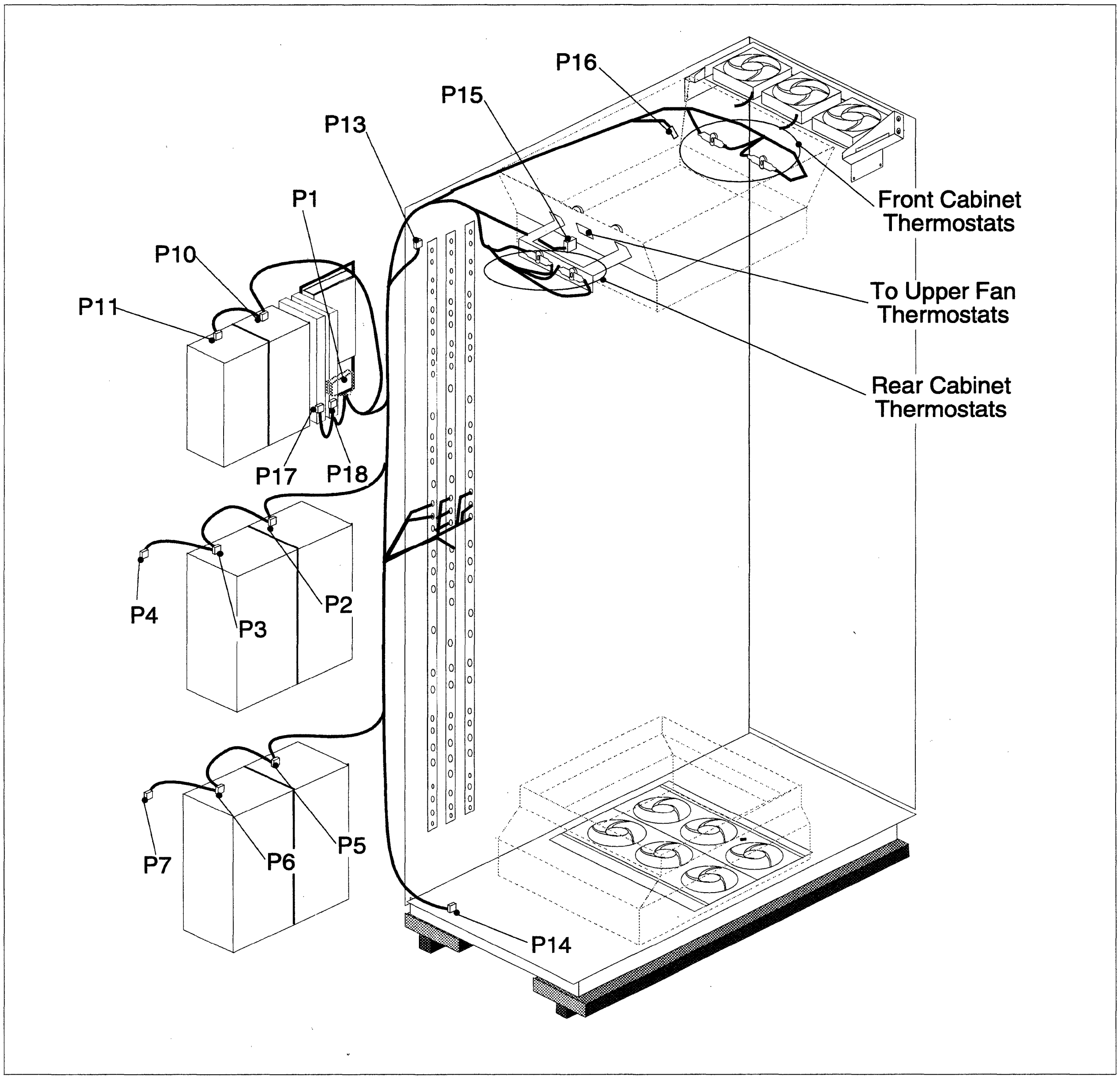


Figure 5-11. Power Controller Board Cable Harness Routing

The power controller board cable harness is a complex assembly that extends throughout the Paragon XP/S system cabinet. If necessary, refer to the portion of Figure A-26 (starting on page A-28) that shows the power controller board cable harness for more detailed information on the connectors and layout of the harness.

Removing the Power Controller Board Cable Harness

Perform the following procedures to remove a power controller board cable harness:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door, then (if applicable) swing open the diagnostic station or top peripheral module so you have access to the top front area of the cabinet.

3. Disconnect the four spade terminals (labelled TS1A, TS1B, TS2A, and TS2B) connected to the front pair of thermostats, then cut any cable ties securing this portion of the power controller board cable harness to the top and sides of the cabinet.

NOTE

The power controller board cable harness is also tied to the front fan assembly cable harness. It might be necessary to either cut those ties, or disconnect and remove the front fan assembly cable harness along with the power controller board cable harness.

4. Close any open diagnostic station or peripheral module(s), then close the front door.

5. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top two power supply hinge brackets.

6. Withdraw the portion of the power controller board cable harness from the front area of the cabinet (with four spade lugs), past the side of the cardcage, and into the rear area of the cabinet.

7. Cut any securing cable ties, then disconnect the four spade terminals (labelled TS3A, TS3B, TS4A, and TS4B) connected to the rear pair of thermostats.

8. Disconnect plug P15 from the connector (in front of the rear thermostats) going to the center thermostats.

9. Cut the cable tie at the upper left corner (viewed from the rear) of the cabinet, then disconnect the spade terminals labelled P13 and P16 from the top and front fan cables.

10. Remove the securing screws, then remove the clear shield from the upper portion of the bus bars and set it aside.

11. Loosen and remove the screws securing seven power controller board cable harness terminals (labelled GND, 5V, and 12V) to the main bus bars, then move them out of the way. Refer to Figure 5-4 on page 5-8 if necessary for details on the terminal connections.

12. Remove the securing screws, then remove the clear shield from the middle portion of the bus bars and set it aside.

13. Loosen and remove the screws securing two power controller board cable harness terminals (labelled GND and 5V) to the main bus bars, then move them out of the way. Refer to Figure 5-4 on page 5-8 if necessary for details on the terminal connections.

14. Disconnect the spade terminal labelled P14 from the bottom fan cable.

15. Working from the bottom of the cabinet, cut any securing cable ties then disconnect plugs P5 and P6 (and P7 if applicable) from the stub cables connected to the power supplies mounted on the bottom hinge bracket.

16. Cut any securing cable ties then disconnect plugs P2 and P3 (and P4 if applicable) from the stub cables connected to the power supplies mounted on the middle hinge bracket.

17. Cut any securing cable ties then disconnect plugs P10 and P11 from the +12 volt power supplies mounted on the top hinge bracket.

18. Disconnect plugs P17 and P18 from the stub cables connected to the DC-DC convertors mounted on the top hinge bracket.

19. Reach around to the front of the top hinge bracket, loosen any screws holding the plug to the connector, and disconnect plug P1 from connector J180 on the power controller board.

20. At this point, the power controller board cable harness should be free of any restraining cable ties, but there might be cable clamps holding the cable to the cabinet. If necessary, cut any remaining cable ties, remove any cable clamps, then remove the power controller board cable harness and set it aside.

Installing the Power Controller Board Cable Harness

Perform the following procedures to install a replacement power controller board cable harness:

1. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top two power supply hinge brackets.

2. Connect plug P1 of the replacement power controller board cable harness to connector J180 on the power controller board.

3. Refer to Figure 5-11 on page 5-33 for harness layout and routing information, then use cable clamps (those removed in the prior section) to drape the cable harness in its approximate final layout.

4. Working from the bottom of the cabinet, dress the cable harness along the hinge edge and secure it using cable ties, then connect the spade terminal labelled P14 to the bottom fan cable.

5. Connect plugs P5 and P6 (and P7 if applicable) to the stub cables connected to the power supplies mounted on the bottom hinge bracket. Dress the cable harness along the hinge edge and back of the hinge bracket, and secure it using cable ties.

6. Secure the two bottom power controller board cable harness terminals (labelled GND and 5V) to the main bus bars as shown in Figure 5-4 on page 5-8 using the previously removed screws. Dress the cable harness along the hinge edge, and secure it using cable ties.

7. Secure the clear, middle bus bar shield over the bus bars using the previously removed screws.

8. Connect plugs P2 and P3 (and P4 if applicable) to the stub cables connected to the power supplies mounted on the middle hinge bracket. Dress the cable harness along the hinge edge and back of the hinge bracket, and secure it using cable ties.

9. Secure the seven middle power controller board cable harness terminals (labelled GND, 5V, and 12V)to the main bus bars as shown in Figure 5-4 on page 5-8 using the previously removed screws. Dress the cable harness along the hinge edge, and secure it using cable ties.

10. Secure the clear, top bus bar shield over the bus bars using the previously removed screws.

11. Connect plugs P10 and P11 to the +12 volt power supplies mounted on the top hinge bracket as shown in Figure 5-11 on page 5-33.

12. Connect plugs P17 and P18 to the stub cables connected to the DC-DC convertors mounted on the top hinge bracket as shown in Figure 5-11 on page 5-33. Dress the cable harness along the hinge edge, and secure it using cable ties.

13. Connect the spade terminals labelled P13 and P16 to the top and front fan cables as shown in Figure 5-11 on page 5-33.

14. Connect plug P15 to the connector (in front of the rear thermostats) going to the center thermostats.

15. Connect the four spade terminals (labelled TS3A, TS3B, TS4A, and TS4B) to the rear pair of thermostats with TS4A and TS4B going to the left thermostat, and TS3A and TS3B going to the right thermostat. References are as viewed from the rear.

16. Dress the cable harness and secure it to upper left side of the cabinet using cable ties. At this time, there should be a remaining 2-3 foot long section (four wires) of the power controller board cable harness.

17. Feed the remaining portion of the cable along the left side of the cabinet, past the top cardcage, and into the peripheral bay area of the cabinet.

18. Close the power supply hinge brackets and the rear door, then move to the front of the cabinet.

19. Open the front door and any peripheral module or diagnostic station that is obstructing the upper area of the cabinet.

20. Connect the four spade terminals (labelled TS1A, TS1B, TS2A, and TS2B) to the front pair of thermostats with TS1A and TS1B going to the left thermostat (as viewed from the front), and TS2A and TS2B going to the right thermostat.

21. Dress the cable harness and secure it to the upper right side of the cabinet using cable ties. If applicable, also use cable ties to secure the power controller board cable harness to the front fan cable.

400 Amp, +5VDC Power Supply Cabling

The 400 amp, +5VDC power supply is the main power source used within the Paragon XP/S system cabinet. Each cabinet has either four (standard) or six (optional) of these power supplies installed on reinforced hinge brackets in the rear area of the cabinet. The hinge brackets swing out to allow access to the power supplies and to the cables and other FRUs in the rear area of the cabinet. Two types of power supplies have been qualified for use in the Paragon XP/S system. Figure 5-12 shows the top of each power supply type and indicates the AC input, DC output, and control/sense cable locations on the supply.

WARNING

The personnel performing these procedures can be exposed to hazardous voltages if power is applied to the cabinet. While performing the procedures in this section the AC power to the cabinet must be turned OFF. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the AC power to the cabinet before performing any replacement procedures.

Note that the output voltage for this supply, +5VDC, is not normally hazardous to humans, but the available current, 400 amps per supply, is more than enough to weld metal. Be careful to not allow any conductive objects near the outputs of a powered-up supply.

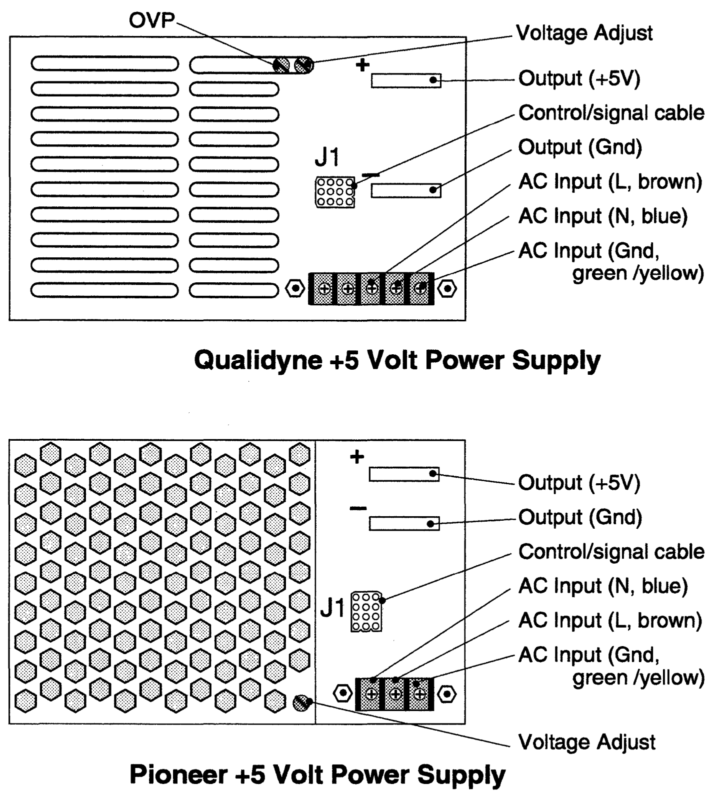


Figure 5-12. 400 Amp, +5VDC Power Supply Cabling

Removing the +5VDC Supply Cabling

It might be necessary to remove the +5VDC supply cabling if one or more cables has been damaged, or if the power supply arrangement (either two or three supplies on a hinge bracket) is being changed. Perform the following procedures to remove the +5VDC supply cabling:

1. Make sure the AC power has been turned OFF and the main power cord has been unplugged. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the power supply hinge bracket for the +5VDC power supply of interest.

3. Disconnect the short power/cooling cable from connector J1 of the power supply, and from the appropriate mating connector (P2–P7) of the power controller board cable harness.

4. Cut any restraining cable ties, then remove the short power/cooling cable and set it aside.

Removing the AC Power Cord

The AC power cord is routed from the power supply, down the hinge line of the cabinet, and over to the AC power channel. Perform the following steps to remove the power supply AC power cord:

1. Unplug the power supply AC cable from the AC power channel. Refer to Figure 5-3 on page 5-7 if necessary to determine the outlet to which the supply is connected.

2. Loosen two screws then remove the safety shield covering the AC input terminals of the supply.

3. Remove the terminal screws, then disconnect and remove the wires labelled G (green or green/yellow), L (brown or black), and N (blue or white).

4. Cut any restraining cable ties, then remove the power supply AC cable from the cabinet.

Removing the DC Output Cabling

The DC output cabling for this supply consists of the two heavy braided cables that connect the supply output bars to the cabinet main bus bars. Because of the cable size and stiffness, and the relative routing locations of these cables, there can be no substitution of cables (i.e., using a shorter or longer cable than is specified). Refer to Figure 5-4 on page 5-8 for cable part number specifications.

1. Cut any restraining cable ties that tie either of the supply DC output cables to other cables or to the cabinet structure.

2. Cut the cable ties securing the safety shield over the +5VDC output bar, then remove the safety shield and set it aside.

3. Remove the brass nut, washers, and bolt securing the +5VDC output cable to the supply output bus bar, then set the hardware aside.

4. Remove the large flat head screw securing the +5VDC output cable to the cabinet main bus bar, then set the cable and hardware aside.

5. Remove the brass nut, washers, and bolt securing the GND output cable to the supply output bus bar, then set the hardware aside.

6. Remove the large flat head screw securing the GND output cable to the cabinet main bus bar, then set the cable and hardware aside.

Installing the +5VDC Supply Cabling

It might be necessary to install new +5VDC supply cabling if one or more cables is being replaced, or if the power supply arrangement (either two or three supplies on a hinge bracket) is being changed. The power supply associated with this cabling should have already been installed before the cabling can be installed. Refer to "Removing/Replacing the 400 Amp +5VDC Power Supplies" on page 6-34, if necessary, to replace/install the power supply.

Perform the following procedures to install the +5VDC supply cabling:

1. Make sure the AC power has been turned OFF and the main power cord has been unplugged. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the power supply hinge bracket for the +5VDC power supply of interest.

3. Connect the short power/cooling cable to connector J1 of the power supply, and to the appropriate mating connector (P2-P7) of the power controller board cable harness. The appropriate mating connectors for the power supplies are as follow:

Power Controller Board Cable Harness Connector	400 Amp, +5VDC Power Supply
Connector P2	Power supply 1
Connector P3	Power supply 2
Connector P4 (optional)	Power supply 3 (if installed)
Connector P5	Power supply 4
Connector P6	Power supply 5
Connector P7 (optional)	Power supply 6 (if installed)

Refer to Figure 2-7 on page 2-21 or to Figure 6-10 on page 6-35, if necessary, to relate a power supply number to its physical location in the cabinet.

4. Dress the short power/cooling cable with the power controller board cable harness, then secure them (as necessary) to the hinge bracket using cable ties.

Installing the AC Power Cord

The AC power cord is routed from the power supply, down the hinge line of the cabinet, and over to the AC power channel.

Perform the following steps to install a new or replacement AC power cord:

1. Make sure the AC power has been turned OFF and the main power cord has been unplugged.
2. Plug the power supply AC cable into the appropriate outlet of the AC power channel. Refer to Figure 5-3 on page 5-7 if necessary to determine the outlet to which the supply is connected.
3. Route the end of the AC cable (with exposed wires) up the left edge of the cabinet, behind the cabinet side braces, then out along the top edge of the hinge bracket. If necessary, secure the AC cable to the cabinet side using cable ties.
4. Loosen two screws then remove the safety shield covering the AC input terminals of the supply.
5. Connect the wires labelled G (green or green/yellow), L (brown or black), and N (blue or white) to the appropriate AC input terminals of the power supply and secure them with the terminal screws. Refer to Figure 5-12 on page 5-38 for the terminal locations.
6. Secure the AC terminal safety shield over the terminals using the previously removed screws.

Installing the DC Output Cabling

The DC output cabling for each supply consists of a pair of heavy, braided cables that go directly from the supply output bus bars to the main bus bars on the left side of the cabinet. These DC output cables might need to be replaced if they are damaged for some reason, or if the supply arrangement is being changed (e.g., from two supplies on a hinge bracket to three supplies on the hinge bracket).

Perform the following steps to install the DC output cables:

1. Make sure the AC power has been turned OFF and the main power cord has been unplugged.

2. Confirm that you have the correct cable part number (and length) for the installed supply. The proper cables are as follow:

	Cable Part Number and Length	Power Supply
Standard	316403-001, 14-inch GND 316404-002, 16-inch +5V	Power supply 1 and 4 (two supplies per hinge bracket)
Standard	316403-003, 22-inch GND 316404-005, 24-inch +5V	Power supply 2 and 5 (two supplies per hinge bracket)
Optional	316403-004, 13-inch GND 316404-001, 13-inch +5V	Power supply 1 and 4 (three supplies per hinge bracket)
Optional	316403-002, 17.3-inch GND 316404-004, 15-inch +5V	Power supply 2 and 5 (three supplies per hinge bracket)
Optional	316403-005, 21-inch GND 316404-003, 21-inch +5V	Power supply 3 and 6 (three supplies per hinge bracket)

Because of the cable size and stiffness, and the relative routing locations of these cables, there can be no substitution of cables (i.e., using a shorter or longer cable than is specified). Refer also to Figure 5-4 on page 5-8 for cable attachment locations.

3. Make sure the power supply output bus bars have the correct extension bus bars attached. The supply nearest the hinge line should have 4-inch extension bus bars attached. The second supply out from the hinge line should have 2.5-inch extension bus bars attached. The third supply out from the hinge line (if installed) should have no extension bus bars attached.

4. Secure the correct GND cable to top hole of the "–" output bus bar (or extension bus bar) using a brass nut, washers, and bolt.

5. Secure the correct +5V cable to top hole of the "+" output bus bar (or extension bus bar) using a brass nut, washers, and bolt.

6. Secure the GND cable to the "GND" main bus bar using the large flat head screw that was removed earlier. Refer to Figure 5-4 on page 5-8 for the proper attachment points. Note that the supply nearest the hinge line uses the top mounting hole, second supply to the middle hole, and third supply (if installed) to the bottom hole.

7. Secure the +5V cable to the "+5V" main bus bar using the large flat head screw that was removed earlier. Refer to Figure 5-4 on page 5-8 for the proper attachment points. Note that the supply nearest the hinge line uses the top mounting hole, second supply to the middle hole, and third supply (if installed) to the bottom hole.

8. Position the previously removed safety shield over the "+" output bus bar (or extension bus bar) and cable of the supply, then secure it using two cable ties.

9. Dress the GND cable and +5V cable of this supply together, and secure them together using cable ties.

67 Amp, +12VDC Power Supply Cabling

There are two +12VDC power supplies installed in each Paragon XP/S system cabinet. These supplies are mounted on the top hinge bracket, and their outputs are fed directly to the main busbars along the left side of the cabinet. Figure 5-13 shows the top of the +12VDC power supply that is qualified for use in the Paragon XP/S system, and indicates the AC input, DC output, and control/sense cable locations on the supply.

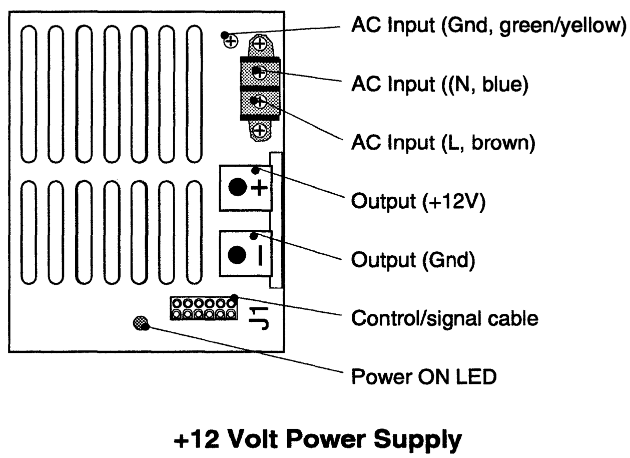


Figure 5-13. 67 Amp, +12VDC Power Supply Cabling

WARNING

The personnel performing these procedures can be exposed to hazardous voltages if power is applied to the cabinet. While performing the procedures in this section, the AC power to the cabinet must be turned OFF. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the AC power to the cabinet before performing any replacement procedures.

Note that the output voltage for this supply, +12VDC, is not normally hazardous to humans, but the available current, 67 amps per supply, is more than enough to power an automobile starter motor. Be careful to not allow any conductive objects near the outputs of a powered-up supply.

Removing the +12VDC Supply Cabling

It might be necessary to remove the +12VDC supply cabling if one or more cables has been damaged. In most cases where a +12VDC supply is being replaced, however, it is acceptable to leave the original cabling in place and replace only the supply.

Removing the AC Power and Signal Cabling

Perform the following procedures to remove the +12VDC power and signal cabling:

1. Make sure the AC power has been turned OFF and the main power cord has been unplugged. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top power supply hinge bracket.

3. Disconnect connector P10 or P11 of the power controller board cable harness from connector J1 of the power supply.

4. The AC power cord is routed from the power supply, down the hinge line of the cabinet, and over to the AC power channel. Unplug the power supply AC cable from the AC power channel. Refer to Figure 5-3 on page 5-7 if necessary to determine the outlet to which the supply is connected.

5. Loosen two screws then remove the safety shield covering the AC input and DC output terminals of the supply.

6. Remove two screws securing the shield over the terminal block, the set the shield aside.

7. Remove the two terminal screws, then disconnect and remove the wires labelled L (brown or black) and N (blue or white).

8. Remove the screw securing the AC ground wire (green or green/yellow) to the supply case, then move the ground wire out of the way.

9. Cut any restraining cable ties, then remove the power supply AC cable from the cabinet.

Removing the DC Output Cabling

The DC output cabling for this supply consists of the two heavy, multi-strand cables that connect the supply output terminals to the cabinet main bus bars. Because of the cable size and the relative routing locations of these cables, there can be no substitution of cables (i.e., using a shorter or longer cable than is specified). Refer to Figure 5-4 on page 5-8 for cable part number specifications.

1. Make sure the AC power has been turned OFF and the main power cord has been unplugged.
2. Cut any restraining cable ties that tie the supply DC output cables to other cables or to the cabinet structure.
3. Make sure the clear safety shield covering the output terminals has been removed.
4. Remove the nuts and lockwashers securing the +12VDC and GND output cables to the supply output terminals, then set the hardware aside.
5. Remove the large pan head screws securing the +12VDC and GND output cables to the cabinet main bus bar, then set the cables and hardware aside.

Installing the +12VDC Supply Cabling

It might be necessary to install new +12VDC supply cabling if one or more cables has been damaged. The power supply associated with this cabling should have already been installed before the cabling can be installed. Refer to "Removing/Replacing the 67 Amp +12VDC Power Supplies" on page 6-38, if necessary, to replace/install the power supply.

Installing the AC Power and Signal Cabling

Perform the following procedures to install the +12VDC power and signal cabling:

1. Make sure the AC power has been turned OFF and the main power cord has been unplugged. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.
2. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top power supply hinge bracket.
3. Refer Figure 6-10 on page 6-35, if necessary, to relate a power supply number to its physical location in the cabinet.
4. Plug connector P10 or P11 of the power controller board cable harness into connector J1 of the appropriate power supply. Plug P10 connects with +12VDC supply "A" (nearer to the hinge line). Plug P11 connects with +12VDC supply "B" (farther from the hinge line).

5. The AC power cord is routed from the power supply, down the hinge line of the cabinet, and over to the AC power channel. Plug the power supply AC cable into the appropriate outlet of the AC power channel. Refer to Figure 5-3 on page 5-7 if necessary to determine the outlet to which the supply is connected.

6. Route the end of the AC cable (with exposed wires) up the left edge of the cabinet, behind the cabinet side braces, then out along the inner and then top edge of the hinge bracket. If necessary, secure the AC cable to the cabinet side using cable ties.

7. Loosen two screws then remove the safety shield covering the AC input terminals of the supply.

8. Connect the wires labelled L (brown or black insulation) and N (blue or white insulation) to the appropriate AC input terminals of the power supply and secure them with the terminal screws. Refer to Figure 5-12 on page 5-38 for the terminal locations.

9. Connect the AC ground wire (green or green/yellow insulation) to the supply case using the previously removed screw. Refer to Figure 5-12 on page 5-38 for the terminal locations.

10. Secure the AC terminal safety shield over the terminals using the previously removed screws.

Installing the DC Output Cabling

The DC output cabling for this supply consists of the two heavy, multi-strand cables that connect the supply output terminals to the cabinet main bus bars. Because of the cable size and the relative routing locations of these cables, there can be no substitution of cables (i.e., using a shorter or longer cable than is specified). Refer to Figure 5-4 on page 5-8 for cable part number specifications.

1. Confirm that you have the correct cable part number (and length) for the installed supply. The proper cables are described in Figure 5-4 on page 5-8. The longer cable pair is for the "B" supply and the shorter pair is for the "A" supply. Because of the cable size and stiffness, and the relative routing locations of these cables, there can be no substitution of cables (i.e., using a shorter or longer cable than is specified).

2. Secure the correct GND cable (black insulation) to the "–" output terminal of the supply using a nut and lockwasher.

3. Secure the correct +12V cable (red insulation) to the "+" output terminal of the supply using a nut and lockwasher.

4. Secure the GND cable to the "GND" main bus bar and the +12V cable to the "+12V" main bus bar using the large pan head screws and lockwashers that were removed earlier. Refer to Figure 5-4 on page 5-8 for the proper attachment points. Note that the "B" supply (farther from the hinge line) uses the top mounting holes, and the "A" supply uses the next lower mounting holes.

5. Dress the supply output cables together and secure them, as necessary, using cable ties.

DC-DC Convertor Cabling

There are two DC-DC convertor assemblies (one for -5.2VDC and one for -12VDC) installed in each Paragon XP/S system cabinet. These convertor assemblies are mounted on the top hinge bracket, and their outputs are fed to a separate terminal block mounted on the left side of the cabinet. The procedure described in "Removing/Replacing the DC-DC Convertors" on page 6-43 leaves the DC-DC convertor cabling in place, even though replacement cables are included with the replacement DC-DC convertor. Use the procedures in this section if it is necessary to replace the DC-DC convertor cabling in addition to or in place of the DC-DC convertor.

Figure 5-14 shows the DC-DC convertor assembly that is used in the Paragon XP/S system, and indicates the DC input, DC output, and control/sense cable locations on the supply.

DC-DC Convertors (-5.2VDC or -12VDC)

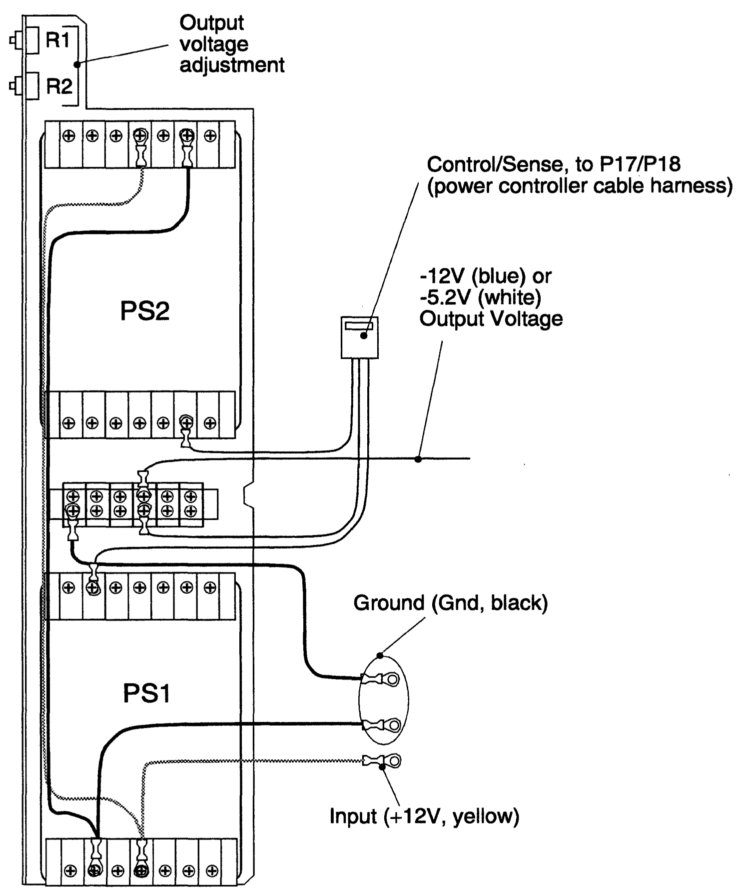


Figure 5-14. DC-DC Convertor Cabling

Figure 5-15 on page 5-51 shows the cable routing associated with the outputs of each of the DC-DC convertors as well as the routing for the backplane auxiliary DC power cable.

Removing the DC-DC Convertor Cabling

Both the -5.2VDC and the -12VDC DC-DC convertor assemblies use similar cabling, so the procedures in this section apply to both convertor types. The procedures indicate any differences between the two supply types. Refer to Figure 5-14 on page 5-47, if necessary, for details on the DC-DC convertor cabling. Refer to Figure 5-15 on page 5-51, if necessary, for convertor output routing information.

Perform the following procedures to remove the DC-DC convertor cabling:

1. Make sure the AC power for this cabinet has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.
2. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top power supply hinge bracket.
3. Remove the securing screws, then remove the clear shield from the top portion of the bus bars and set it aside.
4. Remove the securing screw then disconnect the yellow wire labelled +12V from the +12V main bus bar on the left side of the cabinet.
5. Remove the securing screw then disconnect the two black wires labelled GND from the GND main bus bar on the left side of the cabinet.
6. Disconnect the control/sense cable connector from its mating connector on the power controller board cable harness (P17 for the -5.2V DC-DC convertor or P18 for the -12V DC-DC convertor).
7. If this cabling is for the -5.2V DC-DC convertor, you must disconnect the white DC output cable at the convertor. Perform the procedures in "Removing/Replacing the DC-DC Convertors" on page 6-43 in order to get access to the output terminal of the convertor.
8. If this cabling is for the -12V DC-DC convertor, perform the following steps:

   A. Trace the blue output wire to its end at the cabinet-mounted terminal block (on the upper left inside of the cabinet, to the right of the main bus bars).

   B. Remove the terminal screw,

   C. Disconnect the output wire,

   D. Cut any restraining cable ties, then

E. Pull the blue output wire free (so it is only connected to the -12V DC-DC convertor).

9. At this point, all of the wiring for the DC-DC convertor should be free and ready for removal. If you are only replacing the wiring, you must partially remove the DC-DC convertor in order to gain access to the terminal blocks to which the wires are connected. Perform the procedures in "Removing/Replacing the DC-DC Convertors" on page 6-43 in order to get access to the output terminals. Once you disconnect the wiring (as shown in Figure 5-14 on page 5-47), you can install the new wiring.

10. If you are removing this wiring and also replacing the DC-DC convertor, there is no need to disconnect the wires from the DC-DC convertor terminal blocks (other than the -5.2V output wire). Perform the procedures in "Removing/Replacing the DC-DC Convertors" on page 6-43, and once the convertor is removed, set it and the attached wires aside. New wiring is provided with the replacement DC-DC convertor.

Installing the DC-DC Convertor Cabling

Both the -5.2VDC and the -12VDC DC-DC convertor assemblies use similar cabling, so the procedures in this section apply to both convertor types. The procedures indicate any differences between the two supply types. Refer to Figure 5-14 on page 5-47, if necessary, for details on the DC-DC convertor cabling.

Perform the following procedures to install the DC-DC convertor cabling:

1. Make sure the replacement (or existing) DC-DC convertor has been properly installed on the hinge bracket and that the convertor terminal block wiring has been installed before proceeding. If this cabling is for the -5.2V DC-DC convertor, you must connect the white DC output cable at the convertor before installing the convertor. Refer to Figure 5-14 on page 5-47 for the wiring details, and refer to the procedures in"Removing/Replacing the DC-DC Convertors" on page 6-43 for the proper installation procedures.

2. Using an ohmmeter, check the resistance of the output wire-to-ground in both directions. There should be at least 10,000 ohms resistance between the output wire and ground in one direction, and less than 10 ohms resistance in the other direction.

3. Connect the yellow wire labelled +12V to the +12V main bus bar on the left side of the cabinet, then secure it using the previously removed screw and lockwasher. Refer to Figure 5-4 on page 5-8, if necessary, for details on the bus bar connections.

4. Connect the two black wires labelled GND to the GND main bus bar on the left side of the cabinet, then secure them using the previously removed screws and lockwashers. The -12V convertor wires should be connected in the upper set of main bus bar holes.

5. Secure the clear safety shield to the top portion of the bus bars using the previously removed screws.

6. Dress the convertor input power wires together and tie them using cable ties.

7. Connect the control/sense cable connector to its mating connector on the power controller board cable harness (P17 for the -5.2V DC-DC convertor or P18 for the -12V DC-DC convertor).

8. If this cabling is for the -5.2V DC-DC convertor, the -5.2V output cable should already be connected, and the cabling should now be complete.

9. If this cabling is for the -12V DC-DC convertor, route the blue -12V output wire to the left side of the cabinet, over and behind the main bus bars, and then secure it (using the previously removed terminal screw) to the cabinet-mounted terminal block (on the upper left inside of the cabinet, to the right of the main bus bars). Refer to Figure 5-15 on page 5-51, if necessary, for -12V output wire routing information.

Backplane Auxiliary DC Power Cabling

The backplane auxiliary DC power cable taps into each of the auxiliary DC voltages (+12VDC, -5.2VDC, and -12VDC), and then distributes these voltages to the auxiliary power connector on each backplane in the cabinet. Figure 5-15 shows the cable routing associated with the backplane auxiliary DC power cable and the routing for the outputs of each of the DC-DC convertors.

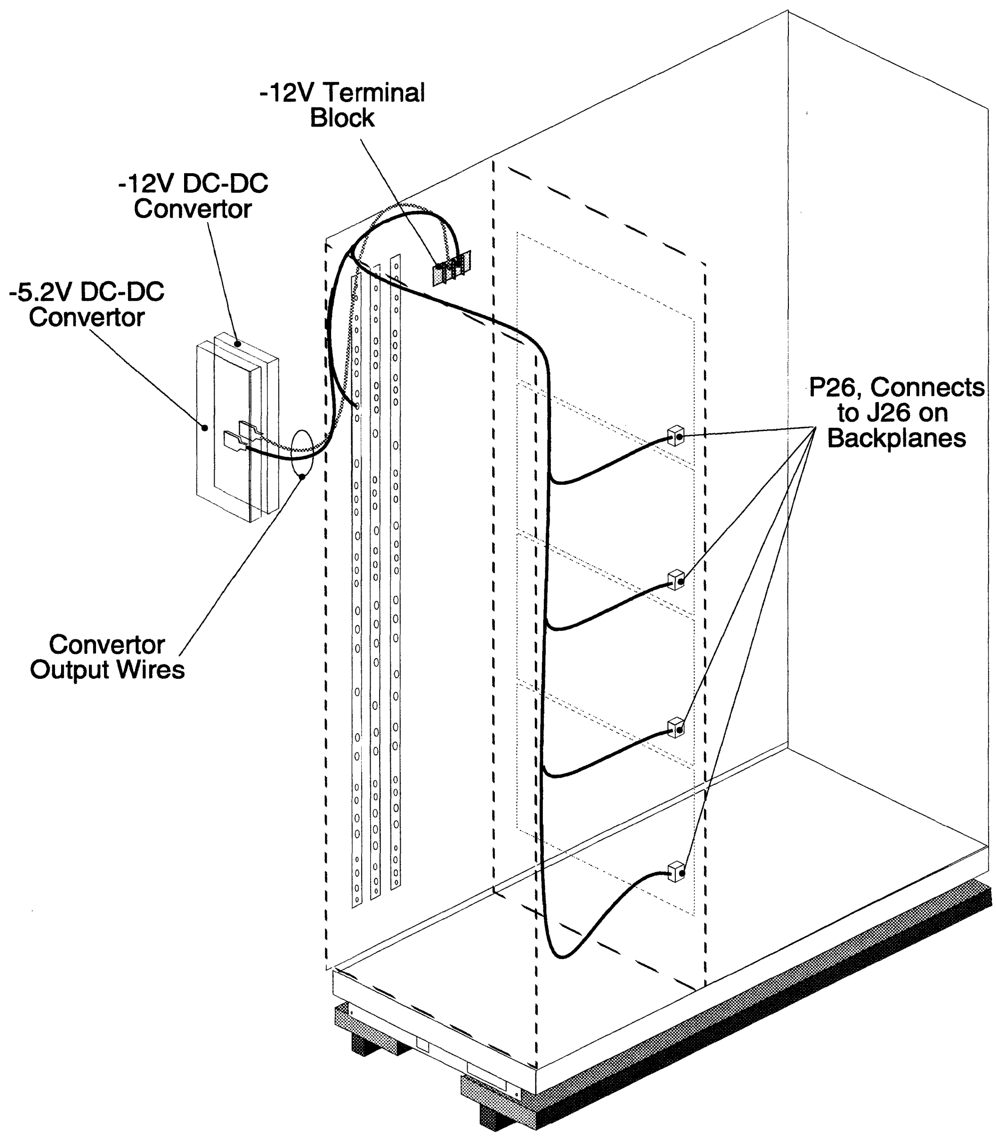


Figure 5-15. Backplane Auxiliary DC Power Cable Routing

Removing the Auxiliary Power Cabling

Perform the following procedures to remove the auxiliary power cabling:

1. Make sure the AC power for this cabinet has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top power supply hinge bracket.

3. Remove the securing screws, then remove the clear shield from the top portion of the bus bars and set it aside.

4. Remove the securing screw, then disconnect the white wire labelled "+12V" from the +12V main bus bar. This is the +12VDC tap for the auxiliary power cable.

5. Remove the securing screw, then disconnect the white wire labelled "-12V" from the terminal block to the right of the main bus bars. This is the -12VDC tap for the auxiliary power cable.

6. Refer to the procedures in "Removing/Replacing the DC-DC Convertors" on page 6-43 if necessary, then remove the securing screw, then disconnect the white wire labelled "-5.2V" from the output terminal block of the -5.2V DC-DC convertor. Refer to Figure 5-14 on page 5-47, if necessary, for the terminal location. This is the -5.2VDC tap for the auxiliary power cable.

7. Disconnect each of the auxiliary power cable connectors from the four backplane connectors (J26) in the cabinet. It will be necessary to swing open the lower hinge brackets in order to disconnect all of the cable connectors.

8. Cut any restraining cable ties, then remove the auxiliary power cable from the cabinet and set it aside. Refer to Figure 5-15 on page 5-51, if necessary, for cable routing path information.

Installing the Auxiliary Power Cabling

Refer to Figure 5-15 on page 5-51, if necessary, for auxiliary power cable routing path information. Perform the following procedures to route and install the auxiliary power cabling:

1. Connect the white wire and terminal (of the auxiliary power cable) labelled "+12V" to the +12V main bus bar. This is the +12VDC tap for the auxiliary power cable. Refer to Figure 5-4 on page 5-8, if necessary, for the attachment point of the wire on the +12V bus bar.

2. Secure the clear shield (removed previously) to the top portion of the bus bars using the screws that were removed earlier.

3. Refer to the procedures in "Removing/Replacing the DC-DC Convertors" on page 6-43 if necessary, then connect the white wire labelled "-5.2V" to the output terminal block of the -5.2V DC-DC convertor. Refer to Figure 5-14 on page 5-47, if necessary, for the terminal location. This is the -5.2VDC tap for the auxiliary power cable. Reinstall the -5.2V DC-DC convertor after the output wire has been connected.

4. Route the white wire labelled "-12V" to the left side of the cabinet, over and behind the main bus bars, and then secure it (using the previously removed terminal screw) to the cabinet-mounted terminal block (on the upper left inside of the cabinet, to the right of the main bus bars). Refer to Figure 5-15, if necessary, for wire routing information.

5. Refer to Figure 5-15, if necessary, then route the auxiliary power cable to the rear edge of the cabinet, along the top edge, then down the right side of the cabinet. Secure the cable to the cabinet as necessary using cable ties.

6. Connect the auxiliary power cable connectors to their mating connectors (J26) on each of the backplanes. The connector labelled "CC3 P26" connects to J26 of the top backplane in the cabinet. The remaining connector follow the sequence until the connector labelled "CC0 P26" connects to J26 of the bottom backplane in the cabinet.

7. Dress the remaining auxiliary power cable portions, then secure it to the cabinet using cable ties.

8. Close any open hinge brackets in the cabinet, then close the cabinet rear door.

Power Controller +5VDC Power Supply Cabling

There is normally only one power controller board +5VDC power supply used in the Paragon XP/S system. It is connected directly to the AC power channel and is powered on as long as AC power is applied to cabinet 0. All other power controller boards in the Paragon XP/S system are powered by this power supply. Figure 5-16 shows the top of the power controller board +5VDC power supply, and indicates the AC input and DC output cable locations on the supply.

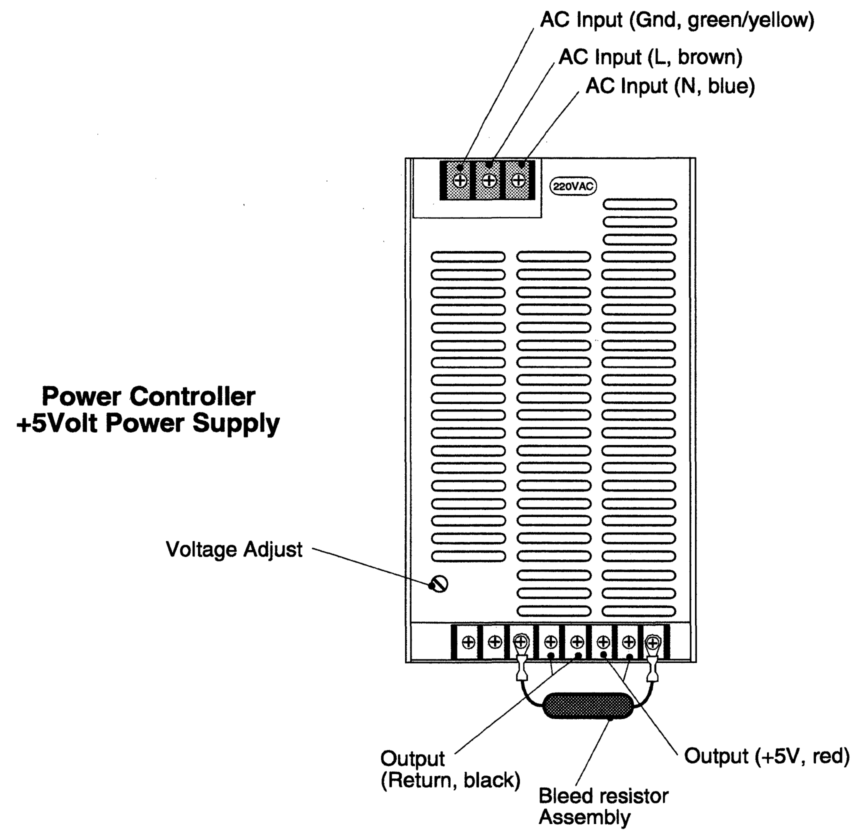


Figure 5-16. Power Controller +5VDC Power Supply Cabling

Removing the Controller Supply Cabling

Perform the following steps to remove the power controller +5VDC power supply cabling:

1. Make sure the AC power for this cabinet has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top power supply hinge bracket.

3. The AC power cord is routed from the power supply, down the hinge line of the cabinet, and over to the AC power channel. Unplug the power supply AC cable from the AC power channel. Refer to Figure 5-3 on page 5-7 if necessary to determine the outlet to which the supply is connected.

4. Loosen the three terminal screws, then disconnect the AC power cable from the top terminal block of the power supply. Refer to Figure 5-16 on page 5-54, if necessary, to identify the AC input terminal block.

5. Cut any restraining cable ties, then remove the AC power cable and set it aside.

6. Loosen four terminal screws, then disconnect the DC power cable from the bottom terminal block of the power supply. Refer to Figure 5-16 on page 5-54, if necessary, to identify the DC output terminal block.

7. Disconnect the other end of the DC power cable from connector J380 of the power controller board (on the opposite side of the hinge bracket). Remove the DC power cable and set it aside.

8. Loosen two terminal screws, then remove the bleed resistor assembly and set it aside. Refer to Figure 5-16 on page 5-54, if necessary, to identify the terminals to which the bleed resistor assembly is connected.

Installing the Controller Supply Cabling

Perform the following steps to install the power controller +5VDC power supply cabling:

1. Secure the bleed resistor assembly to the appropriate terminals of the DC output terminal block, then bend the resistor back so it will not interfere with other wiring attached to the terminal block. Refer to Figure 5-16 on page 5-54, if necessary, to identify the terminals to which the bleed resistor assembly is connected.

2. Connect the DC power cable wire to the bottom terminal block of the power supply using the previously removed screws. Refer to Figure 5-16 on page 5-54, if necessary, to identify the appropriate terminals on the DC output terminal block.

3. Attach the connector at other end of the DC power cable to connector J380 of the power controller board (on the opposite side of the hinge bracket).

4. Connect the AC power cable to the top terminal block of the power supply using the previously removed screws. Refer to Figure 5-16 on page 5-54, if necessary, to identify the AC input terminals.

5. Route the AC power cord from the power supply, down the hinge line of the cabinet, and over to the AC power channel. Plug the power supply AC cable into the proper outlet of the AC power channel. Refer to Figure 5-3 on page 5-7 if necessary to determine the outlet to which the supply connects.

6. Dress the AC power cord along the cabinet hinge line, then secure it as necessary using cable ties.

7. Close any open hinge brackets, then close the cabinet rear door.

Peripheral Bay DC Power Cabling

Any peripheral modules installed in the cabinet are powered by DC voltages taken directly from the cabinet main bus bars. The peripheral bay DC power cable connects to the main bus bars using screws, and routes to the peripheral bay (front of the cabinet) and terminates in a connector that is mounted in a bracket on the side of the cabinet. In cabinets other than cabinet 0, there are three peripheral bay DC power cables routed to the front of the cabinet.

When a diagnostic station is installed in cabinet 0, it uses AC power taken from the AC power channel (not DC voltages). In cabinet 0 (or any cabinet with an installed diagnostic station), the top peripheral bay DC power cable must be removed to provide clearance for the diagnostic station.

Figure 5-17 shows the mounting bracket positions and routing paths for the peripheral bay DC power cables. Refer to Figure 5-4 on page 5-8 for detailed information on connecting the peripheral bay DC power cables to the main bus bars.

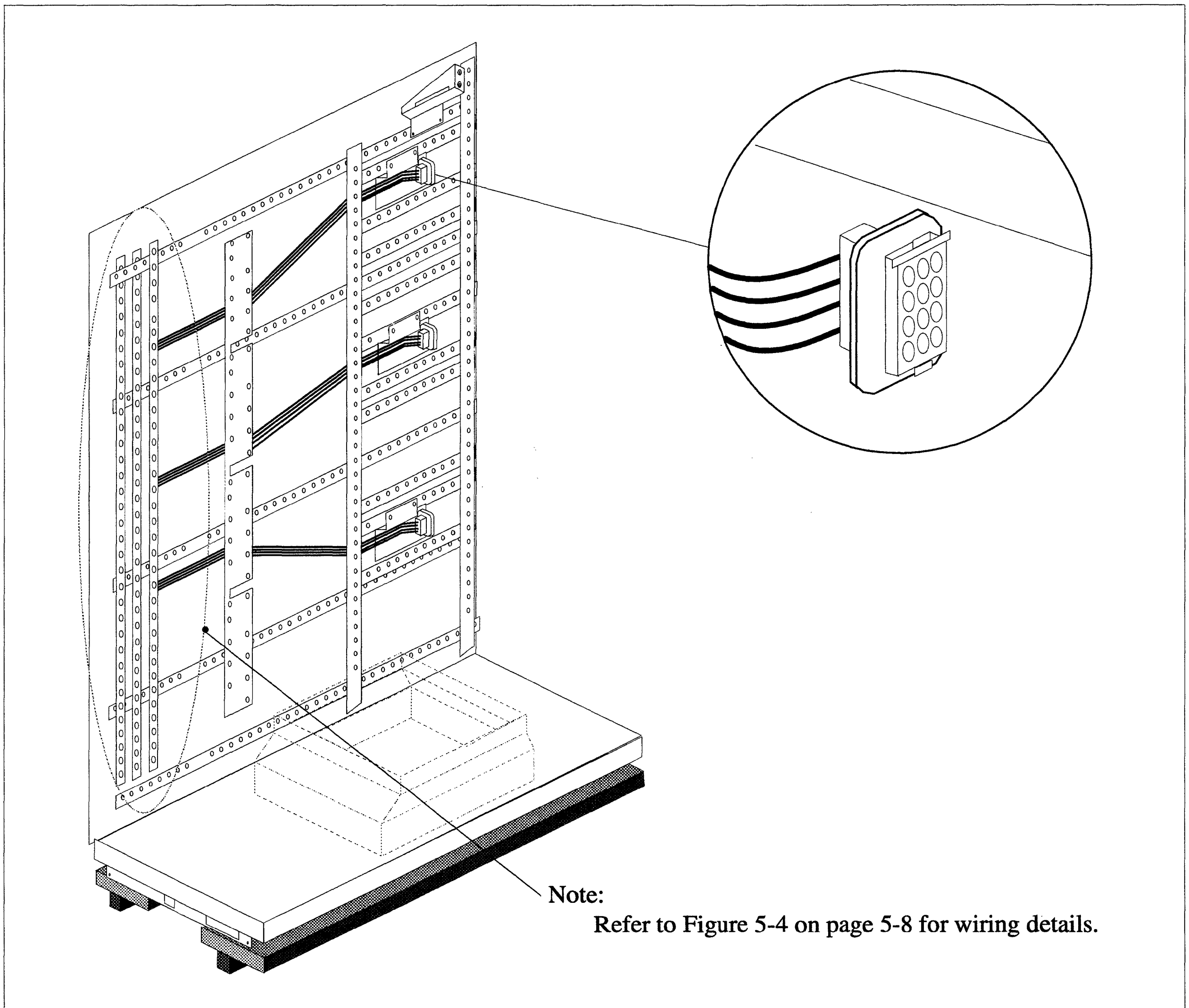


Figure 5-17. Peripheral Bay DC Power Cabling

Removing the Peripheral Bay DC Power Cabling

Perform the following steps to remove the peripheral bay DC power cabling:

1. Make sure the AC power for this cabinet has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top two power supply hinge brackets.

3. Depending on the cabling being removed, remove the securing screws and the clear shield covering the top or middle sections of the main bus bar, then set the shield(s) aside. The top shield covers the wires to the top peripheral bay DC power cable and the middle shield covers the wires to the middle and bottom peripheral bay DC power cables.

4. Refer to Figure 5-4 on page 5-8, if necessary, then remove the screws and washers securing the peripheral bay DC power cable (that is being removed) to the +5V, +12V, and GND main bus bars. There will be one terminal to the +5V bar (yellow wires), two terminals to the +12V bar (red wires), and three terminals to the GND bar (black wires).

5. Trace the remaining light blue wire (-12V) back to the cabinet-mounted terminal block (on the upper left inside of the cabinet, to the right of the main bus bars). Loosen the proper terminal screw, then pull the wire through any restraining cable clamps.

6. Replace the clear shield and the securing screws that were removed earlier.

7. Close the hinge brackets and the rear door, then go to the front of the cabinet and open the front door. If necessary, open any peripheral module that blocks access to the right side (viewed from the front) of the cabinet.

8. If the peripheral bay DC power cable is being replaced (not removed completely), compress the connector tabs and remove the peripheral bay DC power cable connector from the bracket. Withdraw the peripheral bay DC power cable wires from the side of the cabinet and set the cable aside.

9. If the peripheral bay DC power cable is being removed completely, remove the two screws and washers securing the cable bracket to the cabinet side, then withdraw the peripheral bay DC power cable wires from the side of the cabinet and set the cable assembly (with bracket) aside.

Installing the Peripheral Bay DC Power Cabling

Perform the following steps to replace/install the peripheral bay DC power cabling:

1. Open the front door of the cabinet. If necessary, open any peripheral module that blocks access to the right side (viewed from the front) of the cabinet.

2. If installing a new peripheral bay DC power cable, secure the mounting bracket for the peripheral bay DC power cable connector to the right side of the cabinet using two screws and lockwashers. Refer to Figure 5-17 on page 5-57, if necessary, to identify the bracket mounting location.

3. From behind the mounting bracket, push the peripheral bay DC power cable connector in until the mounting tabs snap into place.

4. Route the terminal ends of the peripheral bay DC power cable to the right of the cardcage and into the rear area of the cabinet.

5. Close any peripheral modules and the cabinet front door.

6. Using a 3/16-inch Allen wrench, unlatch and open the rear door of the cabinet, then swing open the top two power supply hinge brackets.

7. Depending on the cabling being installed, remove the securing screws and the clear shield covering the top or middle sections of the main bus bar, then set the shield(s) aside. The top shield covers the wires to the top peripheral bay DC power cable and the middle shield covers the wires to the middle and bottom peripheral bay DC power cables.

8. Refer to Figure 5-4 on page 5-8, if necessary, then secure the peripheral bay DC power cable (that is being replaced) to the +5V, +12V, and GND main bus bars using the previously removed screws. There will be one terminal to the +5V bar (yellow wires), two terminals to the +12V bar (red wires), and three terminals to the GND bar (black wires).

9. Replace the clear shield and the securing screws that were removed earlier.

10. Route the remaining light blue wire (-12V) to the cabinet-mounted terminal block (on the upper left inside of the cabinet, to the right of the main bus bars). Secure the wire to the proper terminal using a terminal screw.

11. Dress the peripheral bay DC power cable, then secure it as necessary using cable ties.

12. Close any open hinge brackets, then close the cabinet rear door.

I/O System Cabling

The procedures in this section describe the removal, replacement, and/or installation of cabling associated with the I/O system. The following hardware is associated with the Paragon XP/S I/O system:

- The MIO node.
- The peripheral module.
- The HIPPI node.
- The SCSI-16 node.

MIO Node Cabling

There will always be at least one I/O node in each Paragon XP/S system to act as the system boot node. That I/O node must provide an Ethernet and serial port as a minimum, and any practical system must also support some level of mass storage (i.e., SCSI-based hard disks). In many Paragon XP/S systems, an MIO node is used as the boot node. The MIO node provides serial, Ethernet, and SCSI interfaces by adding an I/O daughterboard to a standard GP or MP node base board.

CAUTION

If the Paragon system is to be connected to other equipment through non-isolated interfaces (e.g., SCSI, RS-232, or HIPPI signal cables) insure that no differences of potential (caused by noise on the safety ground) exist between the Paragon system cabinet and the other equipment cabinet. Before connecting the signal cables, apply power to both units and monitor the voltage between the Paragon system I/O panel and the chassis of the other equipment. Any DC voltage, power line frequency voltage, or noise spikes of short duration which exceed approximately 500 millivolts peak can cause data errors or even system faults which require operator intervention. Problems of this type can be avoided by using the same type of safety ground connection to power receptacles for the other equipment as is described for the Paragon system cabinets.

CAUTION

Use conductive or static-suppressive foam blocks to protect the exposed connectors of long, under-floor, external cables while the cables are being routed and prior to connection with the I/O node or external equipment. The conductive or static-suppressive foam prevents damage to cable connector pins, and dissipates any static charge that might otherwise be transmitted to the external equipment or to the I/O node.

The Paragon XP/S system uses MIO nodes to perform most I/O operations. The MIO node uses its serial channel to communicate directly with the diagnostic station. It uses its Ethernet port to connect between the Paragon XP/S system and the customer's local network. The MIO node SCSI port normally connects to a RAID array and (optionally) a DAT tape drive. The procedures in this section describe how to remove, replace, and install the cabling associated with the Paragon XP/S system MIO node. Figure 5-18 shows the front panel of the MIO node and indicates the I/O connectors associated with this node.

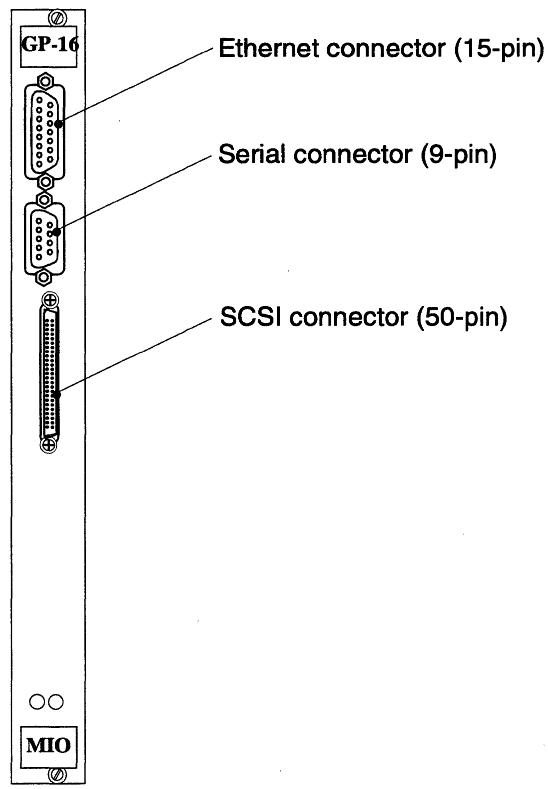


Figure 5-18. MIO Node Connectors

Figure 5-9 and Figure 5-10 on page 5-28 show the I/O panels (original FAB and current FAB) that might be installed in the front base of cabinet 0. Other cabinets might also have an I/O panel such as this (with connector cutouts), but blank panels are installed in other cabinets by default.

SCSI Cabling

The SCSI device being controlled by an MIO node is usually in the same cabinet or in an adjacent cabinet. It is also possible that a SCSI device external to the Paragon XP/S system is being controlled, but this would be a special (i.e., non-standard) installation. Perform the following procedures to remove, replace, or install the SCSI cabling of an MIO node:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the MIO node.

3. If removing the SCSI cable, unplug the connectors at either end, cut any restraining cable ties, then remove the cable and set it aside.

4. In order to replace or install a SCSI cable, mate the controller end of the SCSI cable with the SCSI connector at the MIO node front panel. Push the connector on until the spring locks of the connector engage.

5. Based on the location of the SCSI device, perform one of the following procedures:

In-Cabinet SCSI Devices

A. If the device is located in a peripheral module within this cabinet, route the cable to the peripheral module.

B. Mate the first SCSI connector of the cable (not the end connector) with the connector for the RAID controller. A RAID controller is considered to be one SCSI device.

C. If a DAT tape is also to be controlled by this MIO node, mate the end connector of the cable with the connector for the DAT tape device.

D. Dress the cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

Adjacent-Cabinet SCSI Devices

A. If the device is located in a peripheral module adjacent to this cabinet, route the cable through the side slot between the cabinets, then to the peripheral module.

B. Mate the first connector of the cable (not the end connector) with the connector for the RAID controller in the remote peripheral module.

C. If a DAT tape is also to be controlled by this MIO node, mate the end connector of the cable with the connector for the DAT tape device.

D. Dress the cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

External SCSI Devices (Original FAB I/O Panel)

A. If the SCSI device is located outside of the cabinet, route the cable to the I/O panel. Note that this procedure applies only to cabinets with the original FAB I/O panel.

B. Loosen the fourteen screws in the I/O bulkhead panel (Figure 5-9 on page 5-28).

C. Slide the cutout panel with its connectors to the left until you see that it can be removed. Lift it gently.

D. Connect the external SCSI cable to one of the SCSI cutouts in the cutout panel (Figure 5-9 on page 5-28).

E. Mate the internal SCSI cable to the connector for the external SCSI cable, and secure them together using captive hardware.

F. Reinstall the I/O bulkhead panel and secure it using the fourteen screws.

G. Dress the internal portion of the cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

External SCSI Devices (Current FAB I/O Panel)

A. Note that this procedure applies only to cabinets with the current FAB I/O panel. Loosen the fifteen screws holding the upper I/O bulkhead panel. Slide bulkhead panel back until you see that it can be removed, then lift it and move it to the side (refer to Figure 5-10 on page 5-28).

B. Mate the internal SCSI cable to the connector for the corresponding external SCSI cable, and secure them together using captive hardware.

C. Position the copper/brass ferrules for the internal SCSI cable(s) in the appropriate slots (refer to Figure 5-10 on page 5-28), then reinstall the upper I/O bulkhead panel and secure it using the fifteen screws. Be sure to make a solid mechanical contact between the edges of the cable slots and the copper/brass ferrules for the internal SCSI cable(s).

D. Dress the cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

Ethernet Cabling

The MIO node has an Ethernet connector mounted on the front panel. The boot node must have its Ethernet port connected to the customer's local network. Any additional MIO nodes in the Paragon XP/S system can be connected through their Ethernet ports to external networks, but the boot node connection and the diagnostic station connection are the only required links between the Paragon XP/S system and external networks.

All Paragon XP/S system Ethernet connections are ultimately to a network external to the Paragon XP/S system. The following sections describe the Ethernet cabling procedures first within the cabinet, and then between the cabinet and the customer's local network.

Ethernet Connections Within the Cabinet

Perform the following procedures to cable between the MIO Ethernet connector and the Paragon XP/S system I/O panel:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the MIO node.

3. Connect the node-end of the internal Ethernet cable to the Ethernet connector of the MIO node, then secure it using the captive hardware for the connector.

4. Loosen the fourteen screws in the I/O bulkhead panel (Figure 5-9 or Figure 5-10 on page 5-28).

5. Slide the cutout panel to the left until you see that it can be removed, then lift it and move it to the side.

6. Connect a stub Ethernet cable to one of the Ethernet cutouts in the cutout panel (Figure 5-9 or Figure 5-10 on page 5-28).

7. Mate the internal Ethernet cable to the connector for the stub Ethernet cable, and secure them together using captive hardware.

8. Reinstall the I/O bulkhead panel and secure it using the fourteen screws.

9. Dress the internal Ethernet cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

External Ethernet Connections

Generally, all the Ethernet connections go to one cabinet, but in large installations they might go to several. When installed at the factory, each Ethernet node has an internal Ethernet cable connecting the node to the I/O bulkhead panel, and a stub Ethernet cable that goes from the I/O bulkhead panel to the cavity under the cabinet. All unused cutouts of the I/O bulkhead panel should be covered.

To connect the external Ethernet cables, perform these steps:

1. Feed the external Ethernet cables under the cabinet so that they reach the stub cable connectors or the connectors in the cutout panel at the bottom front inside the cabinet.

2. Loosen the fourteen screws of the I/O panel (Figure 5-9 or Figure 5-10 on page 5-28).

3. Slide the cutout panel with its connectors to the left until you see that it can be removed. Lift it gently.

4. Connect the external cables to the connectors mounted in the cutout panel (Figure 5-9 or Figure 5-10 on page 5-28), or the connector on the end of the stub cable.

5. Replace the cutout panel and make sure that the connections remain intact.

NOTE

All unused connector cutouts in the I/O panel must be covered. If necessary, obtain the correct cutout covers and install them over the unused slots in the I/O panel.

Serial Channel Cabling

The serial channel of the MIO node board is normally only used as the serial link between the diagnostic station and the boot node. This channel might also be used for serial communications between an MIO node (not the boot node) and an external device. If you are connecting the boot node serial channel to the diagnostic station, refer to "Scan String and Serial Channel Cabling" on page 5-31 for the appropriate procedures. Perform the following steps to connect the serial channel of another MIO node (not the boot node) and an external device:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the MIO node.

3. Connect the node-end of the internal serial cable to the serial connector of the MIO node, then secure it using the captive hardware for the connector.

4. Loosen the fourteen screws in the I/O bulkhead panel (Figure 5-9 on page 5-28).

5. Slide the cutout panel to the left until you see that it can be removed, then lift it and move it to the side.

6. Mate the internal serial cable to the connector for the external serial cable, and secure them together using captive hardware.

7. Reinstall the I/O bulkhead panel and secure it using the fourteen screws.

8. Dress the internal serial cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

Peripheral Module Cabling

The Paragon XP/S system peripheral module contains RAID arrays and individual drives. It has an integral cooling fan and uses cabinet-supplied DC power (+5V, +12V, and -12V) to power the cooling fan, the RAID controller(s), and any installed drives. The SCSI control cables are connected to either the RAID controller or directly to separate drives (normally one or more DAT tape drives). Figure 5-19 shows the back panel of a peripheral module, and indicates the proper routing and terminals for the peripheral module cables.

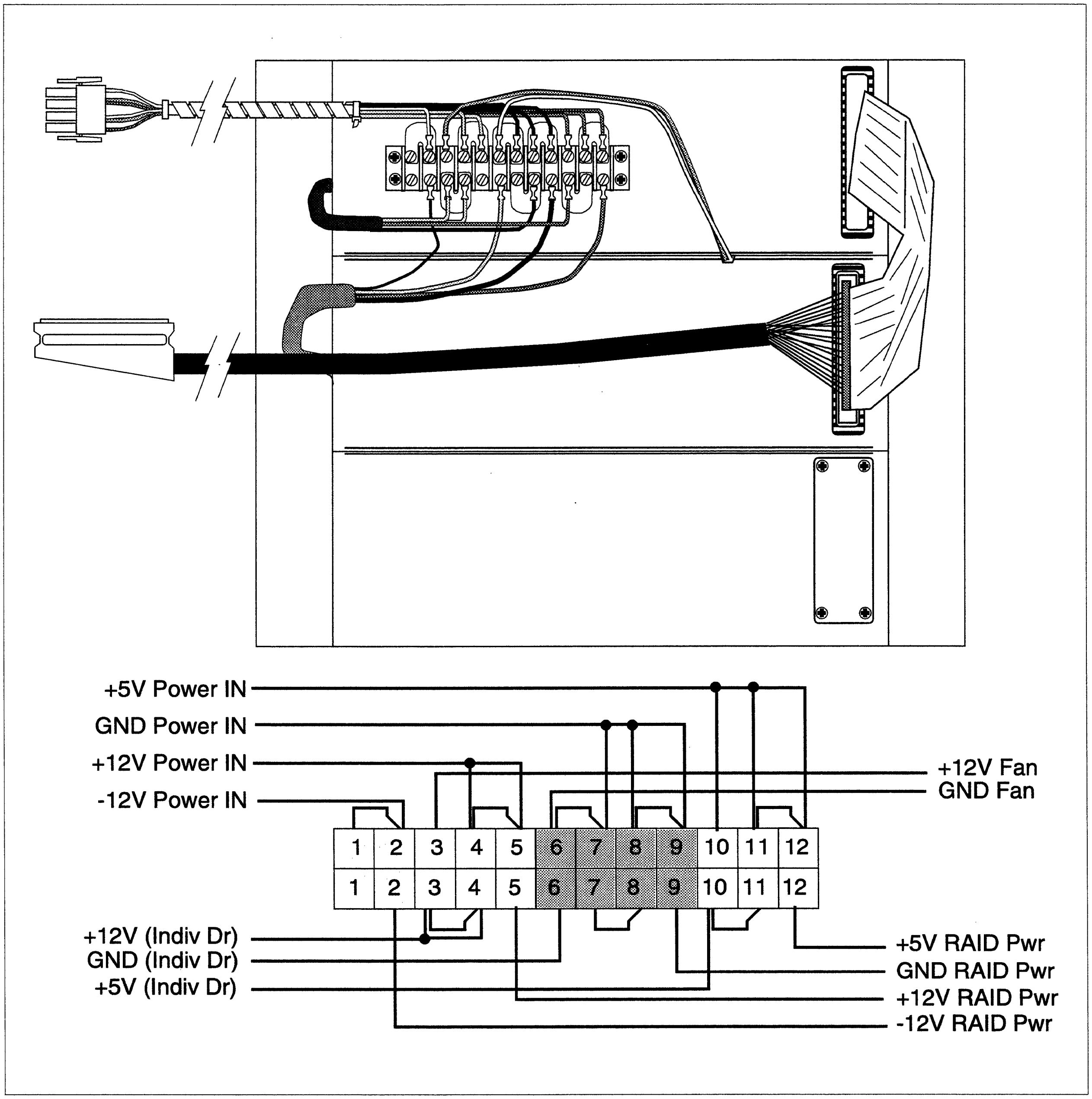


Figure 5-19. Peripheral Module Cabling

Power Wiring

The peripheral module derives its power from the peripheral bay DC power cable (refer to "Peripheral Bay DC Power Cabling" on page 5-56 for more information). The voltages from the peripheral bay DC power cable are first brought to a terminal block on the back panel of the peripheral module, and then distributed to RAID controllers or to individual drives. Perform the procedures in this section to remove, replace, or install power cables in the peripheral module.

Peripheral Module Input Power Cabling

The voltages from the peripheral bay DC power cable are brought to the peripheral module by the peripheral module input power cable. Refer to Figure 5-19, if necessary, while removing or installing the peripheral module input power cable. Perform the following steps:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open the peripheral module attached to the peripheral module input power cable that is being removed/replaced.

3. Disconnect the peripheral module input power cable from the peripheral bay DC power cable.

4. Refer to Figure 5-19, if necessary, to identify the proper terminals, then remove the terminal screws securing the peripheral module input power cable to the terminal block.

5. Cut any restraining cable ties, then remove the peripheral module input power cable, and set it aside.

6. Secure the wires of the replacement peripheral module input power cable to the proper positions of the block using the previously removed terminal screws. Refer to Figure 5-19 on page 5-66, if necessary, to identify the proper terminals.

7. Plug the connector of the peripheral module input power cable into the peripheral bay DC power cable.

8. Secure the peripheral module input power cable to appropriate tie points using cable ties.

RAID Controller Power Cabling

The voltages from the peripheral module terminal block are brought to each RAID controller by a separate RAID controller power cable. Refer to Figure 5-19, if necessary, while removing or installing the RAID controller power cable. Perform the following steps:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open the peripheral module using the RAID controller power cable that is being removed/replaced.

3. Disconnect the RAID controller power cable from the appropriate RAID controller.

4. Refer to Figure 5-19, if necessary, to identify the proper terminals, then remove the terminal screws securing the RAID controller power cable to the terminal block.

5. Cut any restraining cable ties, then remove the RAID controller power cable, and set it aside.

6. If you are adding a RAID controller power cable to this peripheral module, this is your starting point. Secure the wires of the replacement RAID controller power cable to the proper positions of the block using the previously removed terminal screws. Refer to Figure 5-19 on page 5-66, if necessary, to identify the proper terminals.

7. Plug the connector of the RAID controller power cable into the appropriate RAID controller.

8. Secure the RAID controller power cable to appropriate tie points using cable ties.

Drive Power Cabling

The voltages from the peripheral module terminal block are brought to individual tape drives by a tape drive DC power cable. Refer to Figure 5-19, if necessary, while removing or installing the tape drive DC power cable. Perform the following steps:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open the peripheral module using the tape drive DC power cable that is being removed/replaced.

3. Use the procedures described in "Replacing the SCSI DAT Tape Drive" on page 6-66 to disconnect the tape drive DC power cable from the drive, then pull the cable out from within the peripheral module.

4. Refer to Figure 5-19, if necessary, to identify the proper terminals, then remove the terminal screws securing the tape drive DC power cable to the terminal block.

5. Cut any restraining cable ties, then remove the tape drive DC power cable, and set it aside.

6. If you are adding a tape drive DC power cable to this peripheral module, this is your starting point. Secure the wires of the replacement tape drive DC power cable to the proper positions of the block using the previously removed terminal screws. Refer to Figure 5-19 on page 5-66, if necessary, to identify the proper terminals.

7. Plug the connector of the tape drive DC power cable into the appropriate tape drive(s). Use the procedures described in "Replacing the SCSI DAT Tape Drive" on page 6-66 to install the tape drive in the peripheral module.

8. Secure the tape drive DC power cable to appropriate tie points using cable ties.

Peripheral Module SCSI Cabling

The SCSI cables going to the peripheral module connect to either a RAID controller or an individual disk/tape drive. Perform the procedures described in "SCSI Cabling" on page 5-61 to remove, replace, or install the SCSI cabling going to a peripheral module.

HIPPI Node Cabling

The HIPPI node provides high-speed point-to-point data communications between the Paragon XP/S system and an external device, computer system, or network. The procedures in this section describe how to remove, replace, or install the HIPPI cabling in a Paragon XP/S system cabinet. Refer to the *Paragon™ System High Performance Parallel Interface Manual* for more detailed information on using the HIPPI node.

CAUTION

If the Paragon system is to be connected to other equipment through non-isolated interfaces (e.g., SCSI, RS-232, or HIPPI signal cables) insure that no differences of potential (caused by noise on the safety ground) exist between the Paragon system cabinet and the other equipment cabinet. Before connecting the signal cables, apply power to both units and monitor the voltage between the Paragon system I/O panel and the chassis of the other equipment. Any DC voltage, power line frequency voltage, or noise spikes of short duration which exceed approximately 500 millivolts peak can cause data errors or even system faults which require operator intervention. Problems of this type can be avoided by using the same type of safety ground connection to power receptacles for the other equipment as is described for the Paragon system cabinets.

CAUTION

Use conductive or static-suppressive foam blocks to protect the exposed connectors of long, under-floor eternal cables while the cables are being routed and prior to connection with the I/O node or external equipment. The conductive or static-suppressive foam prevents damage to cable connector pins, and dissipates any static charge that might otherwise be transmitted to the external equipment or to the I/O node.

There are two internal cables that are used to connect the HIPPI controller to the system I/O panel and two external cables that are used to connect the I/O panel to an external device. Because HIPPI channels are simplex (one source and one destination), two cables are required for full duplex operation. Figure 5-20 shows the front panel of the HIPPI node, and indicates the two HIPPI channels.

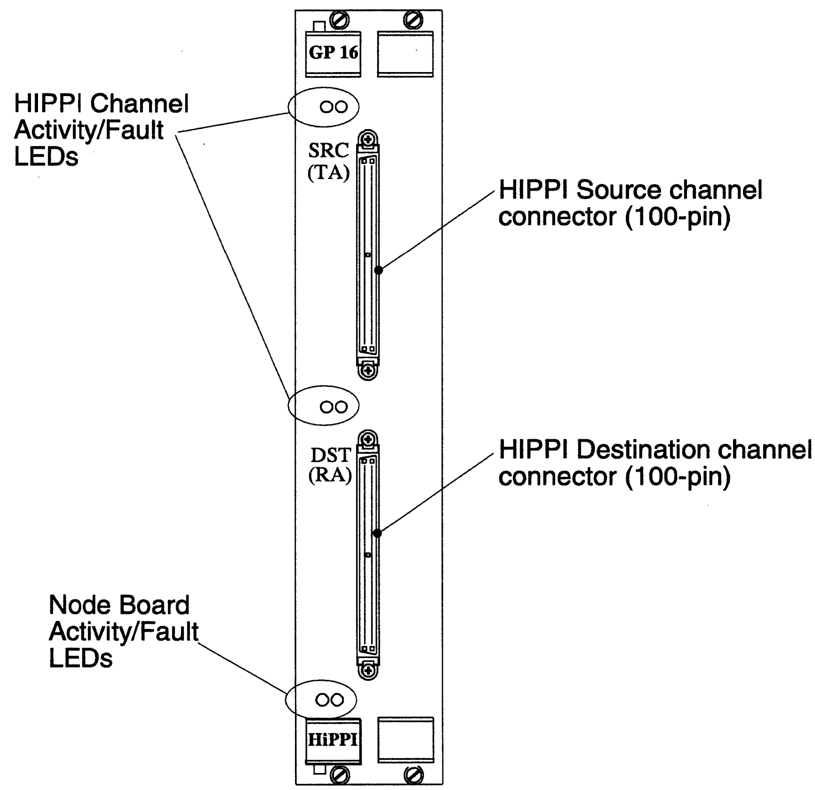


Figure 5-20. HIPPI Node Front Panel

The following sections tell how to install the internal and external cables. Refer to Figure 5-9 on page 5-28 for a detailed view of the I/O panel slot assignments (original FAB of the I/O panel). Figure 5-21 shows a typical HIPPI node installation (original FAB) and indicates the cabling (within the Paragon XP/S system cabinet) that would be used for a typical installation.

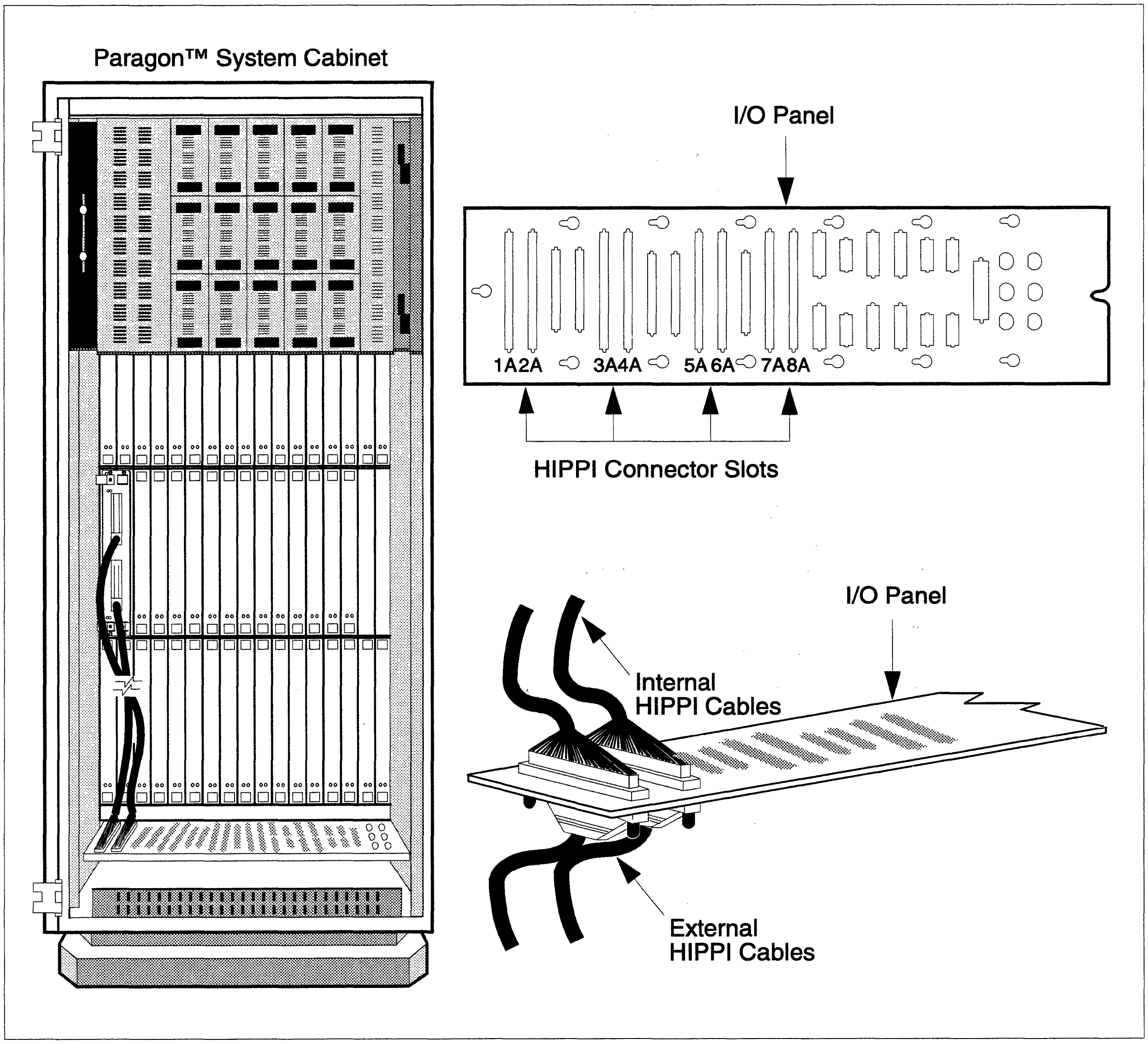


Figure 5-21. HIPPI Node Cabling (Original FAB)

Removing HIPPI Cables (Original FAB)

Refer to Figure 5-21 on page 5-71, if necessary, while performing the removal/installation procedures for the HIPPI cables in a cabinet using the original FAB of the I/O panel. Perform the following steps to remove the HIPPI cables:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the HIPPI node.

3. Disconnect the node-end of the internal HIPPI cable connected to the source connector (SRC) of the HIPPI node.

4. Disconnect the node-end of the internal HIPPI cable connected to the destination connector (DST) of the HIPPI node.

5. Loosen the fourteen screws in the I/O bulkhead panel (refer to Figure 5-21).

6. Slide the cutout panel to the left until you see that it can be removed, then lift it and move it to the side.

7. Disconnect the internal HIPPI cable (source channel) from the connector for the corresponding external HIPPI cable.

8. Disconnect the internal HIPPI cable (destination channel) from the connector for the corresponding external HIPPI cable.

9. Reinstall the I/O bulkhead panel and secure it using the fourteen screws.

10. Cut any cable ties restraining the internal HIPPI cables, then remove the cables and set them aside.

Installing HIPPI Cables (Original FAB)

Perform the following steps to replace or install the HIPPI cables:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the HIPPI node.

3. Connect the node-end of an internal HIPPI cable to the source connector (SRC) of the HIPPI node, then secure it using the captive hardware for the connector.

4. Connect the node-end of the other internal HIPPI cable to the destination connector (DST) of the HIPPI node, then secure it using the captive hardware for the connector.

5. Loosen the fourteen screws in the I/O bulkhead panel (refer to Figure 5-21).

6. Slide the cutout panel to the left until you see that it can be removed, then lift it and move it to the side.

7. Mate the internal HIPPI cable (source channel) to the connector for the corresponding external HIPPI cable, and secure them together using captive hardware. You can use any of the following pairs of slots in the bulkhead: (1A, 2A), (3A, 4A), (5A, 6A), or (7A, 8A).

8. Mate the internal HIPPI cable (destination channel) to the connector for the corresponding external HIPPI cable, and secure them together using captive hardware. Use the I/O panel HIPPI slot adjacent to the one you used for the destination channel.

9. Reinstall the I/O bulkhead panel and secure it using the fourteen screws.

10. Dress the internal HIPPI cables so there are no loose ends and so the peripheral modules and diagnostic station can open fully, then secure them to appropriate mount locations using cable ties.

Removing HIPPI Cables (Current FAB)

Each HIPPI controller for the current FAB of the I/O panel comes with two 100-pin "internal" cables that are used to connect the controller to the "external" cables. One cable attaches to the source channel connector and the other attaches to the destination channel connector. There are many possible lengths of these internal cables, but in all cases the installed length outside of the cabinet should be approximately three feet. The "internal" cable length that is outside of the cabinet makes the process of connecting the "internal" and "external" HIPPI cables together much less complex than it was with the original FAB of the I/O panel. In the "current FAB" version, 3-inch long copper/brass ferrules are crimped on to a portion of the cable shield in place of the insulation, and the internal/external connection is made outside of the cabinet. Figure 5-22 shows a typical HIPPI node installation (current FAB) and indicates the cabling (within the Paragon XP/S system cabinet) that would be used for a typical installation.

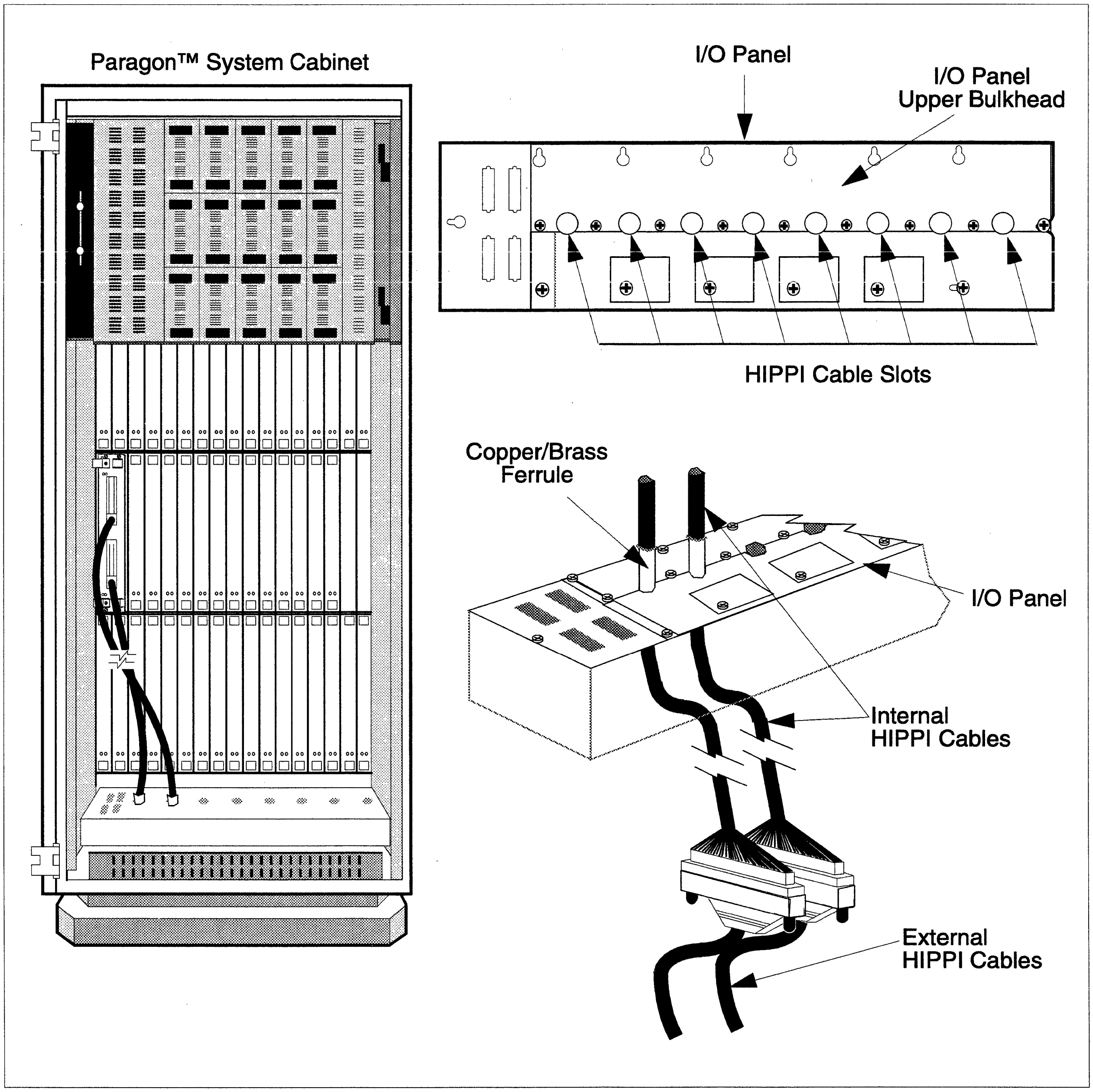


Figure 5-22. HIPPI Node Cabling (Current FAB)

Refer to Figure 5-22 on page 5-74, if necessary, while performing the removal and installation procedures for the HIPPI cables in a cabinet using the current FAB of the I/O panel. Perform the following steps to remove the HIPPI cables:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the HIPPI node.

3. Disconnect the node-end of the internal HIPPI cable connected to the source connector (SRC) of the HIPPI node.

4. Disconnect the node-end of the internal HIPPI cable connected to the destination connector (DST) of the HIPPI node.

5. Loosen any captive hardware holding the internal and external connectors together, then disconnect the internal and external HIPPI cables.

6. Loosen the fifteen screws holding the upper I/O bulkhead panel against the HIPPI cables (refer to Figure 5-22).

7. Slide the upper I/O bulkhead panel back until you see that it can be removed, then lift it and move it to the side.

8. Remove the internal HIPPI cables (source and destination channels) from the under the cabinet, then set the ends aside.

9. Temporarily reinstall the upper I/O bulkhead panel and secure it using the fifteen screws.

10. Cut any cable ties restraining the internal HIPPI cables, then remove the cables and set them aside.

Installing HIPPI Cables (Current FAB)

Perform the following steps to replace or install the HIPPI cables:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the HIPPI node.

3. Connect the node-end of the selected internal HIPPI cable to the source connector (SRC) of the HIPPI node, then secure it using the captive hardware for the connector. Refer to Appendix A if necessary to determine the appropriate length and part number of the HIPPI cable.

4. Connect the node-end of the other internal HIPPI cable to the destination connector (DST) of the HIPPI node, then secure it using the captive hardware for the connector.

5. Loosen the fifteen screws holding the upper I/O bulkhead panel. then slide it back until you see that it can be removed, then lift it and move it to the side (refer to Figure 5-22).

6. Mate the internal HIPPI cable (source channel) to the connector for the corresponding external HIPPI cable, and mate the destination channel cable to the connector for the corresponding external HIPPI cable, and secure them together using captive hardware.

7. Position the copper/brass ferrules for the internal cables in the appropriate slots (refer to Figure 5-22), then reinstall the upper I/O bulkhead panel and secure it using the fifteen screws. Be sure to make a solid mechanical contact between the edges of the cable slots and the copper/brass ferrules for the internal cables.

8. Dress the internal HIPPI cables so there are no loose ends and so the peripheral modules and diagnostic station can open fully, then secure them to appropriate mount locations using cable ties.

SCSI-16 Node Cabling

The SCSI-16 node is a second generation I/O node for the Paragon XP/S system that provides higher performance and additional SCSI capability over that available with the MIO node. The SCSI-16 node provides standard serial and Ethernet interfaces like the MIO node. In addition, the SCSI-16 node provides two 16-bit SCSI interfaces that can be factory configured for either single-ended or differential operation. The SCSI-16 node consists of a SCSI-16 daughterboard mated to a standard MP node base board.

CAUTION

If the Paragon system is to be connected to other equipment through non-isolated interfaces (e.g., SCSI, RS-232, or HIPPI signal cables) insure that no differences of potential (caused by noise on the safety ground) exist between the Paragon system cabinet and the other equipment cabinet. Before connecting the signal cables, apply power to both units and monitor the voltage between the Paragon system I/O panel and the chassis of the other equipment. Any DC voltage, power line frequency voltage, or noise spikes of short duration which exceed approximately 500 millivolts peak can cause data errors or even system faults which require operator intervention. Problems of this type can be avoided by using the same type of safety ground connection to power receptacles for the other equipment as is described for the Paragon system cabinets.

CAUTION

Use conductive or static-suppressive foam blocks to protect the exposed connectors of long, under-floor external cables while the cables are being routed and prior to connection with the I/O node or external equipment. The conductive or static-suppressive foam prevents damage to cable connector pins, and dissipates any static charge that might otherwise be transmitted to the external equipment or to the I/O node.

The Paragon XP/S system can use SCSI-16 nodes to perform most I/O operations. Each SCSI-16 node SCSI port is normally connect to a RAID array and (optionally) a DAT tape drive. The procedures in this section describe how to remove, replace, and install the cabling associated with the Paragon XP/S system SCSI-16 node. Figure 5-23 shows the front panel of the SCSI-16 node and indicates the I/O connectors associated with this node.

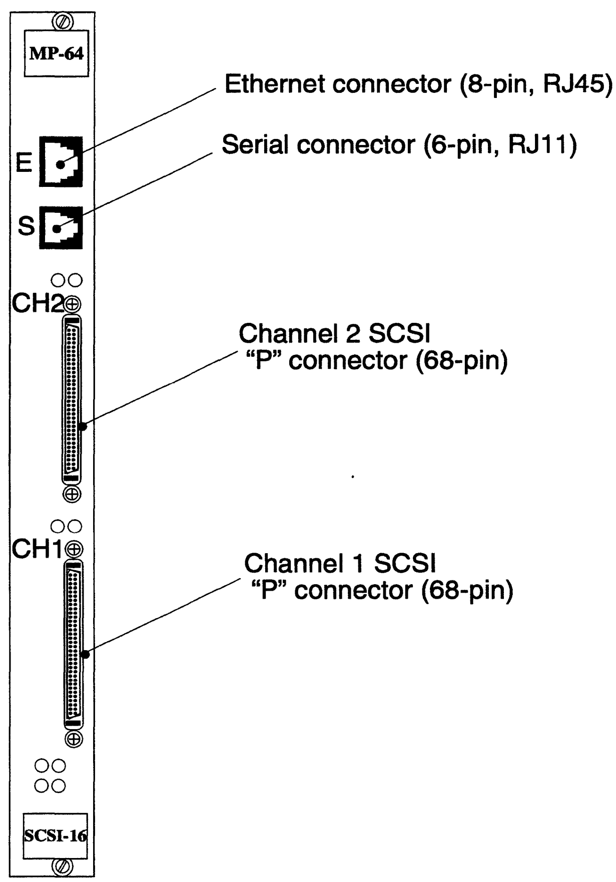


Figure 5-23. SCSI-16 Node Connectors

Figure 5-9 and Figure 5-10 on page 5-28 show the I/O panels (original FAB and current FAB) that might be installed in the front base of cabinet 0. Other cabinets might also have an I/O panel such as this (with connector cutouts), but blank panels are installed in other cabinets by default.

SCSI Cabling

The SCSI device being controlled by a SCSI-16 node is usually in the same cabinet or in an adjacent cabinet. It is also possible that a SCSI device external to the Paragon XP/S system is being controlled, but this would be a special (i.e., non-standard) installation. Perform the following procedures to remove, replace, or install the SCSI cabling of a SCSI-16 node:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the SCSI-16 node.

3. If removing the SCSI cable, unplug the connectors at either end, cut any restraining cable ties, then remove the cable and set it aside.

4. In order to replace or install a SCSI cable, mate the controller end of the SCSI cable with the appropriate SCSI connector (HC1 or CH2) at the SCSI-16 node front panel. Push the connector on until the spring locks of the connector engage.

5. Based on the location of the SCSI device, perform one of the following procedures:

In-Cabinet SCSI Devices

A. If the SCSI device is located in a peripheral module within this cabinet, route the cable to the peripheral module.

B. Mate the first SCSI connector of the cable (not the end connector) with the connector for the RAID controller. A RAID controller is considered to be one SCSI device.

C. If a DAT tape is also to be controlled by this SCSI-16 node, mate the end connector of the cable with the connector for the DAT tape device.

D. Dress the cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

Adjacent-Cabinet SCSI Devices

A. If the device is located in a peripheral module in an adjacent cabinet, route the cable through the side slot between the cabinets, then to the peripheral module.

B. Mate the first connector of the cable (not the end connector) with the connector for the RAID controller in the adjacent cabinet's peripheral module.

C. If a DAT tape is also to be controlled by this MIO node, mate the end connector of the cable with the connector for the DAT tape device.

D. Dress the cable so there are no loose ends and so the adjacent cabinet's peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

External SCSI Devices (Original FAB I/O Panel)

A. If the SCSI device is located outside of the cabinet, route the cable to the I/O panel. Note that this procedure applies only to cabinets with the original FAB I/O panel.

B. Loosen the fourteen screws in the I/O bulkhead panel (Figure 5-9 on page 5-28).

C. Slide the cutout panel with its connectors to the left until you see that it can be removed. Lift it gently.

D. Connect the external SCSI cable to one of the SCSI cutouts in the cutout panel (Figure 5-9 on page 5-28).

E. Mate the internal SCSI cable to the connector for the external SCSI cable, and secure them together using captive hardware.

F. Reinstall the I/O bulkhead panel and secure it using the fourteen screws.

G. Dress the internal portion of the cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

External SCSI Devices (Current FAB I/O Panel)

A. Note that this procedure applies only to cabinets with the current FAB I/O panel.

B. Loosen the fifteen screws holding the upper I/O bulkhead panel.

C. Slide bulkhead panel back until you see that it can be removed, then lift it and move it to the side (refer to Figure 5-10 on page 5-28).

D. Mate the internal SCSI cable to the connector for the corresponding external SCSI cable, and secure them together using captive hardware.

E. Position the copper/brass ferrules for the internal SCSI cable(s) in the appropriate slots (refer to Figure 5-10 on page 5-28), then reinstall the upper I/O bulkhead panel and secure it using the fifteen screws. Be sure to make a solid mechanical contact between the edges of the cable slots and the copper/brass ferrules for the internal SCSI cable(s).

F. Dress the cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

Ethernet Cabling

The SCSI-16 node has an 8-pin RJ45 Ethernet connector mounted on the front panel. Any SCSI-16 nodes in the Paragon XP/S system can be connected through their Ethernet ports to external networks, but the boot node connection and the diagnostic station connection are the only required links between the Paragon XP/S system and external networks. All Paragon XP/S system Ethernet connections are ultimately to a network external to the Paragon XP/S system. The following sections describe the Ethernet cabling procedures.

NOTE

In order to cable to/from the Ethernet channel of the SCSI-16 node, this cabinet must have the current FAB of the I/O panel, as is shown in Figure 5-10 on page 5-28. If this cabinet has a blank I/O panel or an original FAB I/O panel, contact SSD Customer Support to get the proper panel.

Note also that the external Ethernet cable must have an 8-pin RJ45 connector that will mate with the panel-end connector of the internal Ethernet cable. If the external Ethernet connector does not have the proper connector, either change the connector on the cable, or run a new cable with the proper connector.

Perform the following procedures to cable between the SCSI-16 Ethernet connector and the Paragon XP/S system I/O panel:

1. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the SCSI-16 node.

2. Push the node-end of the internal Ethernet cable into the 8-pin RJ45 Ethernet connector of the SCSI-16 node until the snap lock engages.

3. Loosen the screw holding the cover plate over the slot in the I/O bulkhead panel that will be used for this cable (refer Figure 5-10 on page 5-28). Remove the cover plate and set it aside.

4. Route the external Ethernet cable under the cabinet, up through the open slot in the I/O panel, and then mate it to the panel-end of the internal Ethernet cable. The connector locks will snap when the cables are fully engaged.

5. Push the panel-end of the internal Ethernet cable into the I/O panel slot until the snap lock engages.

6. Dress the internal Ethernet cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

Serial Channel Cabling

The serial channel of the SCSI-16 node might be used for serial communications between a SCSI-16 node (not the boot node) and an external device. Perform the following steps to connect the serial channel of a SCSI-16 node (not the boot node) and an external device:

NOTE

In order to cable to/from the serial channel of the SCSI-16 node, this cabinet must have the current FAB of the I/O panel, as is shown in Figure 5-10 on page 5-28. If this cabinet has a blank I/O panel or an original FAB I/O panel, contact SSD Customer Support to get the proper panel.

Note also that the external serial channel cable must have a 4-pin RJ11 connector that will mate with the panel-end connector of the internal serial channel cable. If the external serial channel connector does not have the proper connector, either change the connector on the cable, or run a new cable with the proper connector.

Perform the following procedures to cable between the SCSI-16 serial channel connector and the Paragon XP/S system I/O panel:

1. Open the front door of the cabinet and swing open any peripheral modules or diagnostic station that blocks access to the SCSI-16 node.

2. Push the node-end of the internal serial channel cable into the 6-pin RJ45 serial channel connector of the SCSI-16 node until the snap lock engages.

3. Loosen the screw holding the cover plate over the slot in the I/O bulkhead panel that will be used for this cable (refer Figure 5-10 on page 5-28). Remove the cover plate and set it aside.

4. Route the external serial channel cable under the cabinet, up through the open slot in the I/O panel, and then mate it to the panel-end of the internal serial channel cable. The connector locks will snap when the cables are fully engaged.

5. Push the panel-end of the internal serial channel cable into the I/O panel slot until the snap lock engages.

6. Dress the internal serial channel cable so there are no loose ends and so the peripheral module can open fully, then secure it to appropriate mount locations using cable ties.

NOTE

All unused connector cutouts in the I/O panel must be covered. If necessary, obtain the correct cutout covers and install them over the unused slots in the I/O panel.

Cabinet-to-Cabinet Cabling

With the exception of the smallest Paragon XP/S systems, all Paragon XP/S systems occupy two or more cabinets. The cabinet-to-cabinet cabling must be installed when the system is first installed and any time the system is moved. You should also use the procedures in this section if it is necessary to replace a cabinet-to-cabinet cable that has been damaged.

Standard Cabinet-to-Cabinet Cabling

There are three procedures for installing the external cables between connected cabinets:

- Connect the backplanes.
- Connect the LED controller boards.
- Connect the power supply controller boards.

Connect the Backplanes

In multiple-cabinet systems, there are two types of cables that need to be run between the backplanes of each cabinet: a scan string ribbon cable and a heavy, mesh expansion cable. Work top-to-bottom and left-to-right from the back of the cabinets.

Figure 5-24 shows the scan-string and mesh expansion cable connections between two cabinets.

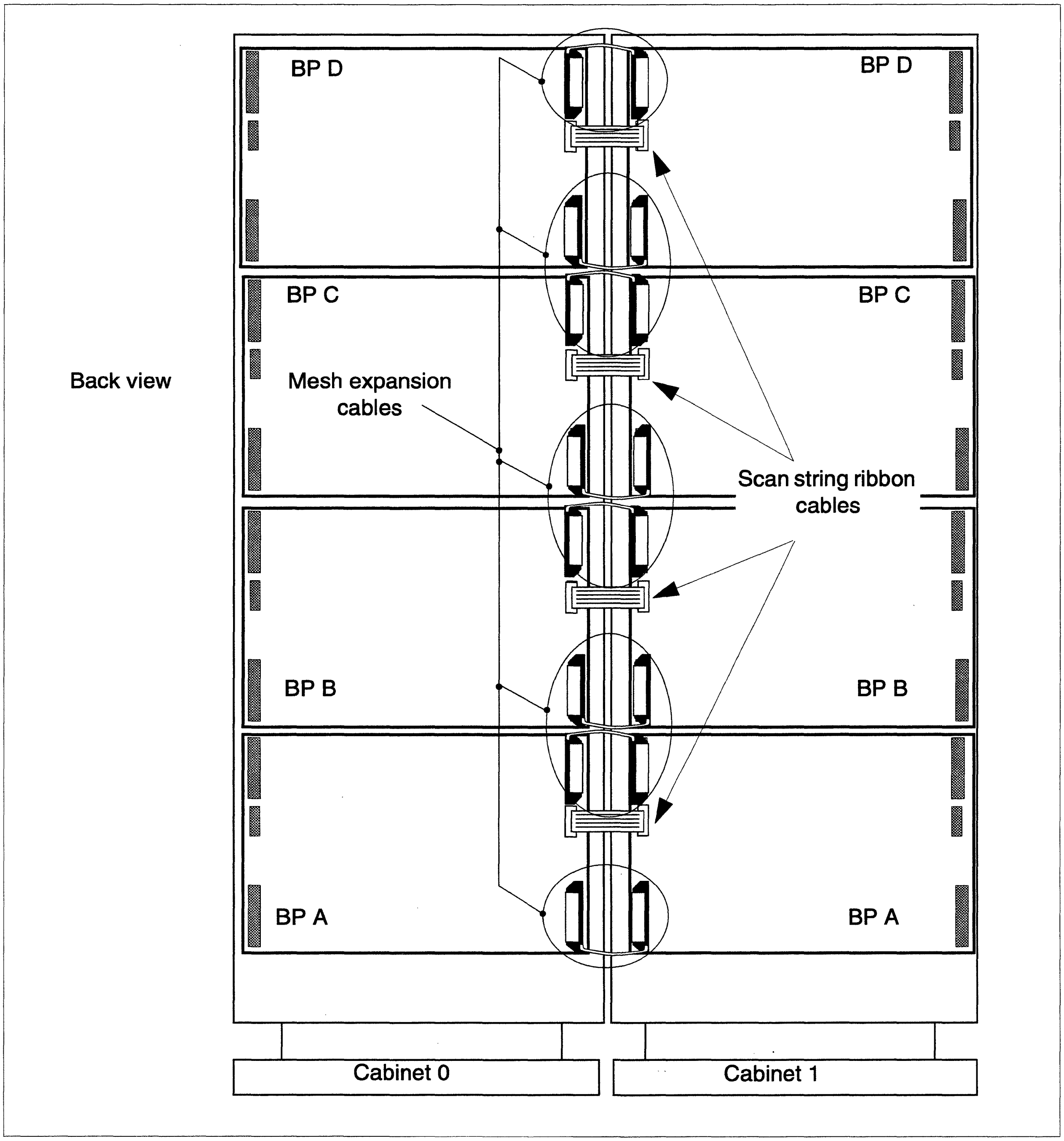


Figure 5-24. Scan-String and Mesh Expansion Cable Connections Between Two Cabinets

Figure 5-25 shows the location of backplane connectors.

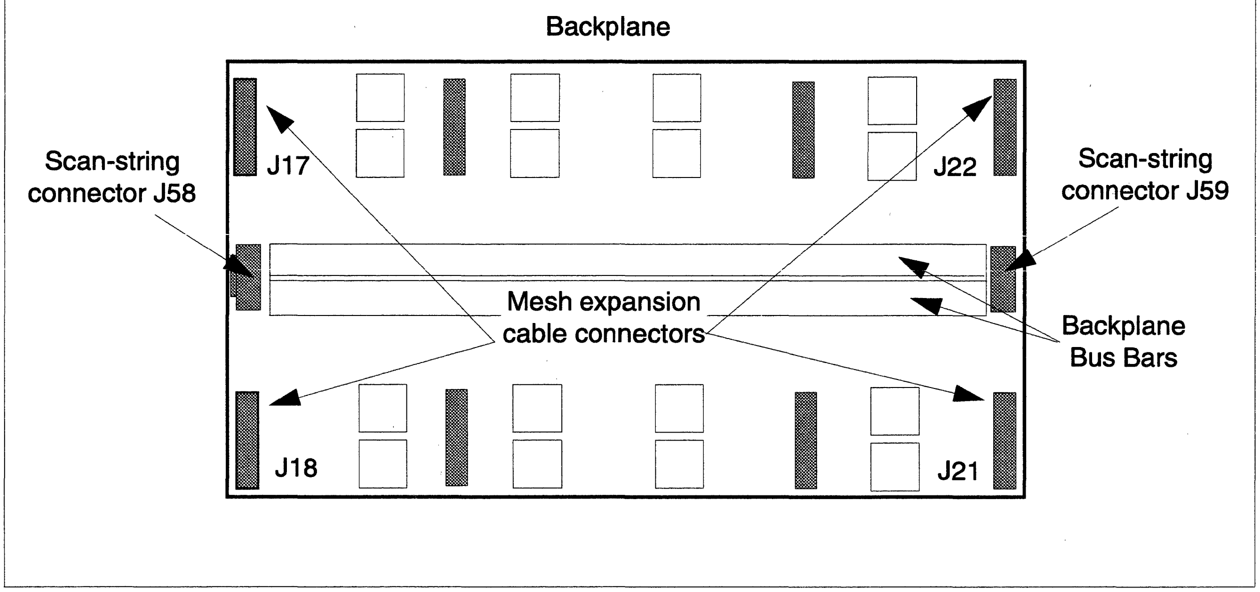


Figure 5-25. Backplane Connections

To connect the backplanes, do the following:

1. One end of the short scan-string cable is factory-installed on backplane connector J59 in cabinet 1. Connect the other end of that scan-string cable to backplane connector J58 in cabinet 0.

2. Connect one of the mesh expansion cables to backplane connector J22 in cabinet 1.

3. Connect the other end of the mesh expansion cable to backplane connector J17 in cabinet 0.

4. Connect a second mesh expansion cable between connector J21 in cabinet 1 and J18 in cabinet 0.

5. Repeat the above procedure to connect the backplanes between additional cabinets.

CAUTION

The closely mounted mesh expansion cables must not touch each other. Be very careful not to bend any pins.

Connect the LED Controller Boards

A multicolored twisted-pair cable carries signal information between cabinets for the front panel LED displays. The cable runs between the LED controller boards that are located on the bulkhead at the bottom right of each cabinet when viewed from the rear of the cabinet. To connect the LED controller boards, do the following:

1. Feed the cable through the opening at the bottom where the cabinets join.
2. Working left-to-right, connect the colored twisted-pair cable from J900 on the LED controller board in Cabinet 0 to J801 on the LED controller board in Cabinet 1 (Figure 5-26).
3. Continue the J900 to J801 daisy-chain connection for each cabinet in the system.

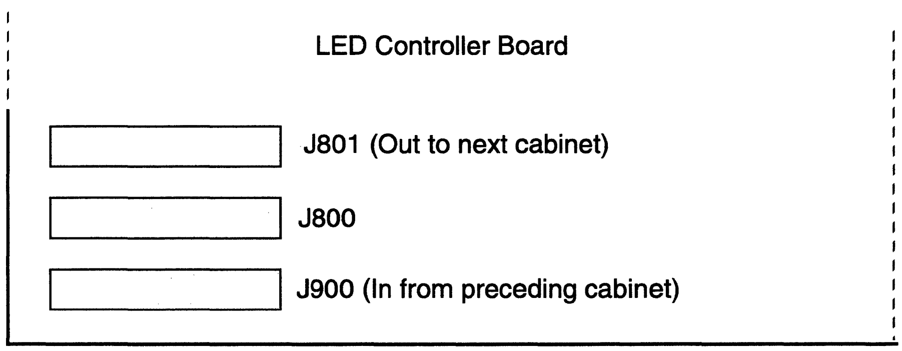


Figure 5-26. LED Controller Board Showing Daisy-Chain Connectors

Connect the Power Supply Controller Boards

The power supply controller boards are located at the back of the system cabinet, in the top left corner. There are two cables that form a daisy-chain connection between all cabinets in the system: a four-conductor power cable and a scan-string ribbon cable. To connect the power supply controller boards, do the following (Figure 5-27 on page 5-86):

1. Clip the tie-wrap that holds the cable bundle together.
2. Feed the cables through the space at the top where the cabinets join. Notice that the four-conductor power cable (two red and two black) is already plugged into the power connector labeled "Out" on the controller board in Cabinet 0.
3. Plug the other end of the four-conductor power cable into the power connector labeled "In" on the controller board in Cabinet 1. The power connectors are keyed, so the red wires should be on the left at both "Power Connector In" and "Power Connector Out."

4. Repeat Steps 2 and 3 until all of the power supply controller boards in the system are daisy-chained.

5. The long scan-string ribbon cable is already connected to the scan-string connector labeled "Out" on the controller board in Cabinet 0 (Figure 5-27).

6. Connect the other end of the scan-string cable to the right-angle connector on the controller board in Cabinet 1 (labeled as scan-string "In" in Figure 5-27).

7. Using the cables supplied with the system, continue connecting the scan-string cables until all the power supply controller boards in the system are daisy-chained.

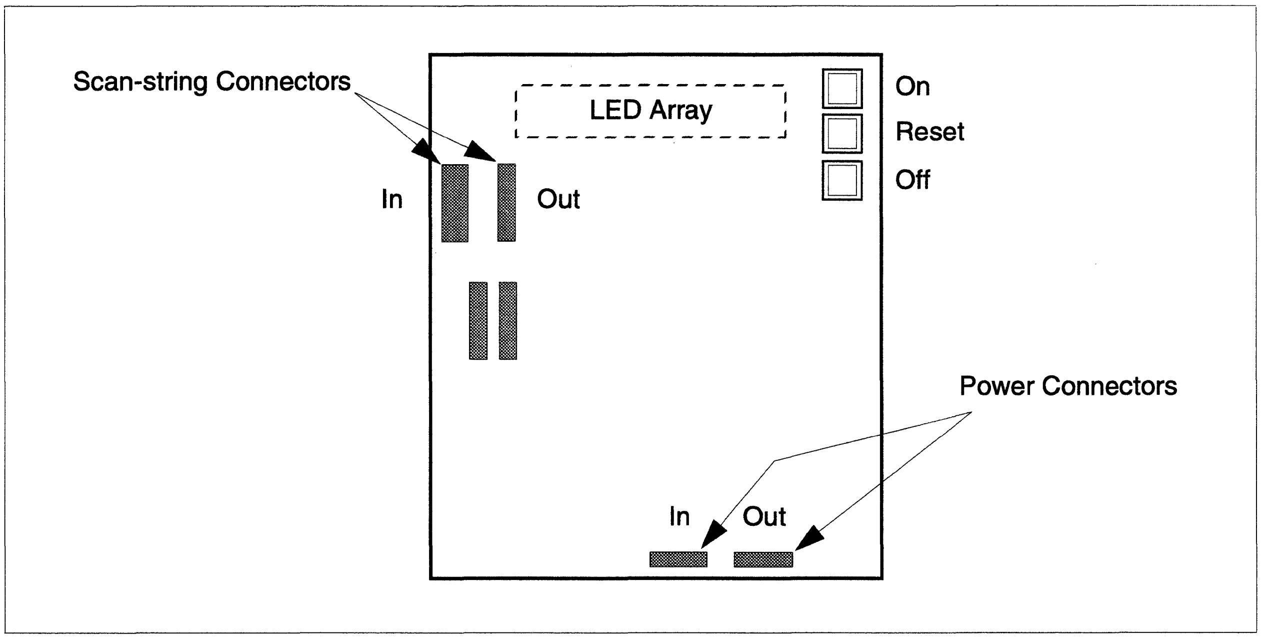


Figure 5-27. Power Supply Controller Board Connectors

NOTE

The Reset button shown in Figure 5-27 does NOT reset the system. It resets the condition of the LED array for the cabinet in which the power supply controller board resides. The On and Off buttons are explained in Chapter 4.

This completes the installation procedures at the back of the cabinet. Close all of the power supply modules. Fasten the modules. The module screws only need to be finger tight. If you are installing multiple cabinets, close the back doors of the other cabinets. You should feel the spring lock engage, and the doors should fit snugly.

Cabling Through Paragon™ XP/S System Corner Units

Figure 5-28 shows the routing of cabinet-to-cabinet cables that are associated with the corner unit installation.

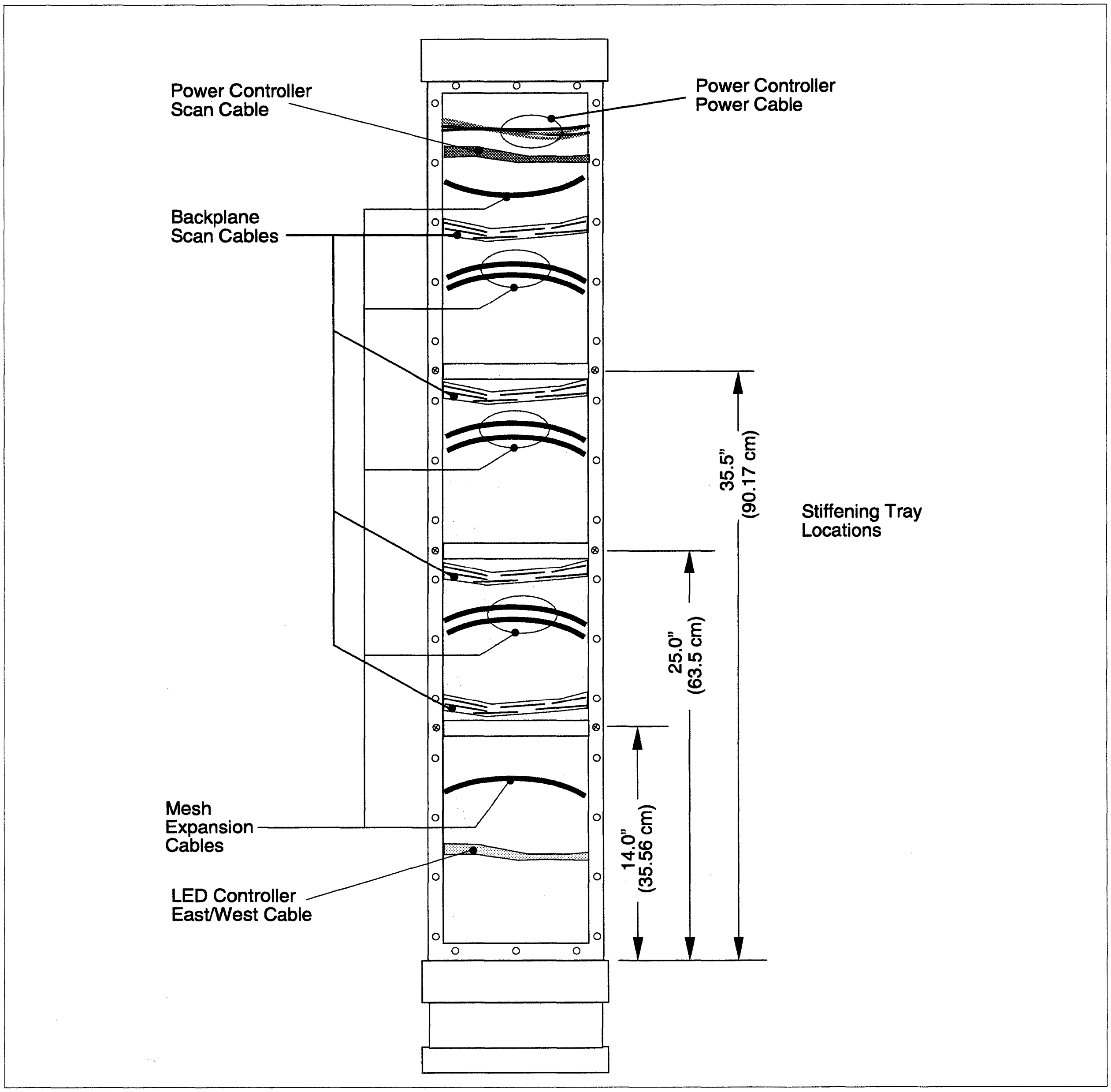


Figure 5-28. Corner Unit Cable Routing

Perform the following steps to install the cabinet-to-cabinet cables associated with each corner unit installation:

1. As shipped, the corner unit internal stiffening trays might interfere with routing of the cabinet-to-cabinet cables. If necessary, remove and reinstall the internal stiffening trays. As measured from the corner unit base, there should be one internal stiffening tray at 14 inches (35.56 cm), one at 25 inches (63.5 cm), and one at 35.5 inches (90.17 cm). Refer to Figure 5-28 for the stiffening tray locations.

CAUTION

Cable routing should be performed by two people; one at the rear of the cabinets, and one at the front of the open corner unit. While it is not impossible for a single person to route cables through the corner unit, doing so increases the chance of damaging the mesh expansion cables or connector pins.

2. Open the rear doors of the cabinet on either side of the corner unit, then swing open the power supplies on their hinges so you have access to the cardcage backplanes.

3. Refer to Figure 5-28 for cable routing information. Route the backplane scan cables as follows:

   A. Starting with the top cable, connect the backplane scan cable to backplane connector J58 of the right-hand (viewed from the rear) cabinet.

   B. Have your helper (in front of the corner unit) continue routing the backplane scan cable through the corresponding slot on the opposite side of the corner unit, then into the other cabinet.

   C. Connect the other end of the backplane scan cable into backplane connector J59 of the left-hand (viewed from the rear) cabinet.

   D. Repeat steps A through C for the remaining backplane scan cables (four cables total through each corner unit).

4. Refer to Figure 5-28 for cable routing information. Route the corner unit mesh expansion cables as follows:

   A. Starting with the top mesh expansion cable, pre-bend the cable at the edge of each connector, then route the cable from the cabinet slot next to the backplane connector, then into the corner unit.

   B. Have your helper (in front of the corner unit) continue routing the mesh expansion cable through the corresponding slot on the opposite side of the corner unit, then into the other cabinet.

C. Once the mesh expansion cable is routed, carefully plug the connector into the backplane of the cabinet from which you started. The other end of the mesh expansion cable will be plugged in later.

D. Repeat steps A through C for the remaining mesh expansion cables (eight mesh expansion cables total between cabinets). For paired mesh expansion cables (indicated in Figure 5-28), carefully plug in the lower connector first, then the upper connector.

E. Open the back door of the other cabinet, then swing the power supplies out to gain access to the backplanes.

F. Starting with the top mesh expansion cable, carefully plug the mesh expansion cables into the proper backplane connectors (J17/J18 or J21/J22). For paired mesh expansion cables (indicated in Figure 5-28), carefully plug in the lower connector first, then the upper connector.

G. Continue plugging in the mesh expansion connectors until all eight have been connected.

H. After all mesh expansion cables have been connected, make sure the mesh expansion cables are bent as indicated in Figure 5-28. The top mesh expansion cable should be bent down, and all remaining cables should be bent up.

5. Plug the power controller power chain cable into connector J480 of the power controller board in the left-hand cabinet (viewed from the rear).

6. Route the power controller power chain cable up, then through the corner unit (as indicated in Figure 5-28), into the right-hand cabinet, then connect it to connector J380 of the right-hand cabinet power controller board.

7. Plug the power controller scan-string cable into connector J130 of the power controller board in the left-hand cabinet (viewed from the rear).

8. Route the power controller scan-string cable up, then through the corner unit (as indicated in Figure 5-28), into the right-hand cabinet, then connect it to connector J030 of the right-hand cabinet power controller board.

9. Plug the LED controller East/West cable into connector J801 of the LED controller board on the lower right wall of the left-hand cabinet (viewed from the rear).

10. Route the LED controller East/West cable through the corner unit (as indicated in Figure 5-28), into the right-hand cabinet, then connect it to connector J900 of the right-hand cabinet LED controller board.

11. Using cable ties, secure the LED controller East/West cable, power controller power cable, and power controller scan-string cable to appropriate tie points within each cabinet.

Disassembly/Assembly Procedures 6

Introduction

The Paragon™ XP/S system is made up of cabinets, modules, cables, and individual field replaceable units (FRUs). These pieces are mechanically and electrically interconnected to form the Paragon XP/S system. The procedures in this chapter describe how to disassemble the Paragon XP/S system to the level needed to access the FRUs, and how to reassemble the system after replacing a FRU. The disassembly/assembly procedures address the following major sections of the Paragon system:

- Cabinet mechanical components (doors and trim pieces, cabinet joining, and cabinet fan assemblies).
- Cabinet LED components (front door LEDs and the controller).
- Power subsystem components (AC components and the power supplies).
- Diagnostic station and associated components.
- Node bay components (node boards and the backplane).
- Peripheral bay components (hard disk/tape drives and the SCSI RAID controller).
- The Paragon XP/S system corner unit (site preparation and installation procedures).

Removing/Replacing Cabinet Mechanical Components

The Paragon XP/S system mechanical components might be replaceable elements (FRUs) or might need to be removed in order to gain access to a FRU. The removal and replacement procedures in this section cover the following mechanical components:

- Rear door assembly
- Cabinet joining components
- ~~External cabinet cosmetic trim components~~
- Plenum, trim, and baffle components
- Front fan assembly
- Upper fan assembly
- Lower fan assembly

CAUTION

While performing the procedures in this section the DC power (at a minimum) to the cabinet must be turned OFF. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the DC or AC power to the cabinet before performing any replacement procedures.

Removing/Replacing the Rear Door

It might be necessary to remove a cabinet rear door in order to gain better access to FRUs in the rear portion of the cabinet. Perform the following procedures to remove or replace the rear door of the cabinet.

1. Using a 3/16-inch Allen wrench, unlatch the rear door and open it.
2. Provide adequate support to prevent it from falling, then remove the six flat head Phillips screws securing the door to the upper and lower hinges. Carefully set the door aside.

Perform the following procedures to install the rear door:

1. Provide adequate support to position and prevent the rear door from falling, then install six flat head Phillips screws to secure the door to the upper and lower hinges.

2. Make sure the door alignment is correct (door opens and closes, and the latches fully engage), then tighten the hinge screws.

Separating or Joining Cabinets

WARNING

The personnel performing these procedures can be exposed to hazardous voltages if power is applied to the cabinet. While performing the procedures in this section the AC power to the cabinet must be turned OFF and the main power cable disconnected from the cabinet. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the AC power and disconnect the main power cable from the cabinet before performing any replacement procedures.

When reconfiguring from a Paragon XP/S system of one size to one (or more) of another size, it will usually be necessary to either join the additional cabinets or separate cabinets that were once joined. Full cabinet joining procedures (including cabling procedures) are provided in the *Paragon™ System Hardware Installation Manual.* The procedures in this section deal only with the mechanical aspects of separating or joining Paragon XP/S system cabinets. Cabinet-to-cabinet cabling procedures are presented in Chapter 5 as well as in the *Paragon™ System Hardware Installation Manual.*

WARNING

Each Paragon XP/S system cabinet weighs over 1000 lbs. (454.5 kg). Exercise caution when moving the cabinets to protect yourself (especially your hands and fingers) and others from possible injury. It is best to have at least one helper whenever a Paragon XP/S system cabinet needs to be moved.

It might be necessary to separate a pair of joined cabinets in order to move the cabinets (e.g., the entire Paragon XP/S system might be moving to another area or building). Another reason for separating a pair of cabinets might be that a large Paragon XP/S system is being split into two or more smaller systems.

Separating Two Cabinets

The following procedure describes how to separate a pair of joined cabinets:

1. Power down both cabinets and turn OFF the main breaker of each cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

CAUTION

Follow recommended procedures when disconnecting, removing, or reconnecting Paragon XP/S system cables. It is quite easy to bend or break connector pins if proper procedures are not followed.

2. Open the rear doors of both cabinets and disconnect the cabinet-to-cabinet cables that pass between the cabinets. Refer to "Cabinet-to-Cabinet Cabling" on page 5-82 if necessary for procedures on removing these cables.
3. Screw the foot stops (part of the wedge adapter castings that join the base castings) up until they no longer contact the floor.
4. Remove the cover plates over the front and rear wedge adapter castings, then remove the four black Phillips screws holding the front and rear cover plates to the cabinet base castings.
5. Remove the two button head screws securing each wedge adapter casting to the cabinets. Set the wedge adapter castings aside.
6. Loosen and then remove the four front and four rear sets of screws, nuts, and washers that go through the stiffeners in each cabinet and through the EMI flanges. Refer to Figure 6-3 for the screw locations.
7. Move the two cabinets apart. The EMI flanges should remain attached to the right-hand (viewed from the front) cabinet.

If you are only temporarily separating these cabinets, this is your stopping point. Proceed to "Joining Two Cabinets" on page 6-6 when you are ready to re-join the cabinets.

If these cabinets are to be permanently separated, proceed to "Installing/Removing Cabinet Trim Pieces" on page 6-4 for the procedure to convert these cabinets to "end" cabinets.

Installing/Removing Cabinet Trim Pieces

Perform the following steps to convert one or more "separated" cabinets into an "end" cabinet:

1. If the left side (viewed from the front) of this cabinet is to be the "end" of the system, remove the two screws (see Figure 6-1) securing each of the EMI flanges to the left side of the cabinet. Set the EMI flanges aside. If the right side (viewed from the front) of this cabinet is to be an "end" of the system, it should need no further preparation.

2. Secure the silver grill to the front slot of the cabinet (either right or left side) using 44 flat head Phillips screws. Make sure the flat, milled section of the grill is at the top. You will need a #1 Phillips screwdriver with a 3/16-inch diameter or smaller head in order to reach and drive the screws securing the grill to the cabinet slots.

3. Secure the black grill to the rear slot of the cabinet (either right or left side) using 44 black flat head Phillips screws.

CAUTION

Once the decorative Paragon XP/S system side plaque is placed on the side grill, it cannot be removed or repositioned without damaging either the grill or the plaque. Do not place the Paragon XP/S system side plaque until you are satisfied with its alignment and orientation.

4. After tightening all grill screws, carefully remove the protective cover from the back of a Paragon XP/S system side plaque, orient and align the plaque, then press it into position at the top of the silver (front) grill.

If you need to remove side grills that are already installed on a Paragon XP/S system cabinet, perform the following steps:

1. Loosen and remove the 44 black flat head Phillips screws securing the black grill to the rear slot of the cabinet (either right or left side). You will need a #1 Phillips screwdriver with a 3/16-inch diameter or smaller head in order to reach and remove the screws securing the grill to the cabinet slots. Remove the black grill from the rear slot, and set it aside.

2. Loosen and remove the lower 39 flat head Phillips screws securing the silver grill to the front slot of the cabinet (either right or left side).

3. Open the front door of the cabinet, then remove any panel, plenum, or cover obstructing the top, inside portion of the front slot.

4. Using a punch or screwdriver and a hammer, rap on the back side of the Paragon XP/S system side plaque until it either breaks or can be removed. It will usually be necessary to break the Paragon XP/S system side plaque because it is permanently attached and covers the front of the screw heads.

5. Once the remaining silver grill screw heads are accessible, remove the remaining five flat head Phillips screws securing the silver grill to the front slot of the cabinet, and remove the grill.

Joining Two Cabinets

Before a pair of Paragon XP/S system cabinets can be joined, the EMI flanges that fit between the long vertical cabinet slots must be prepared. Figure 6-1 indicates the EMI flanges and the EMI gasket clips that must be on the flanges before installation.

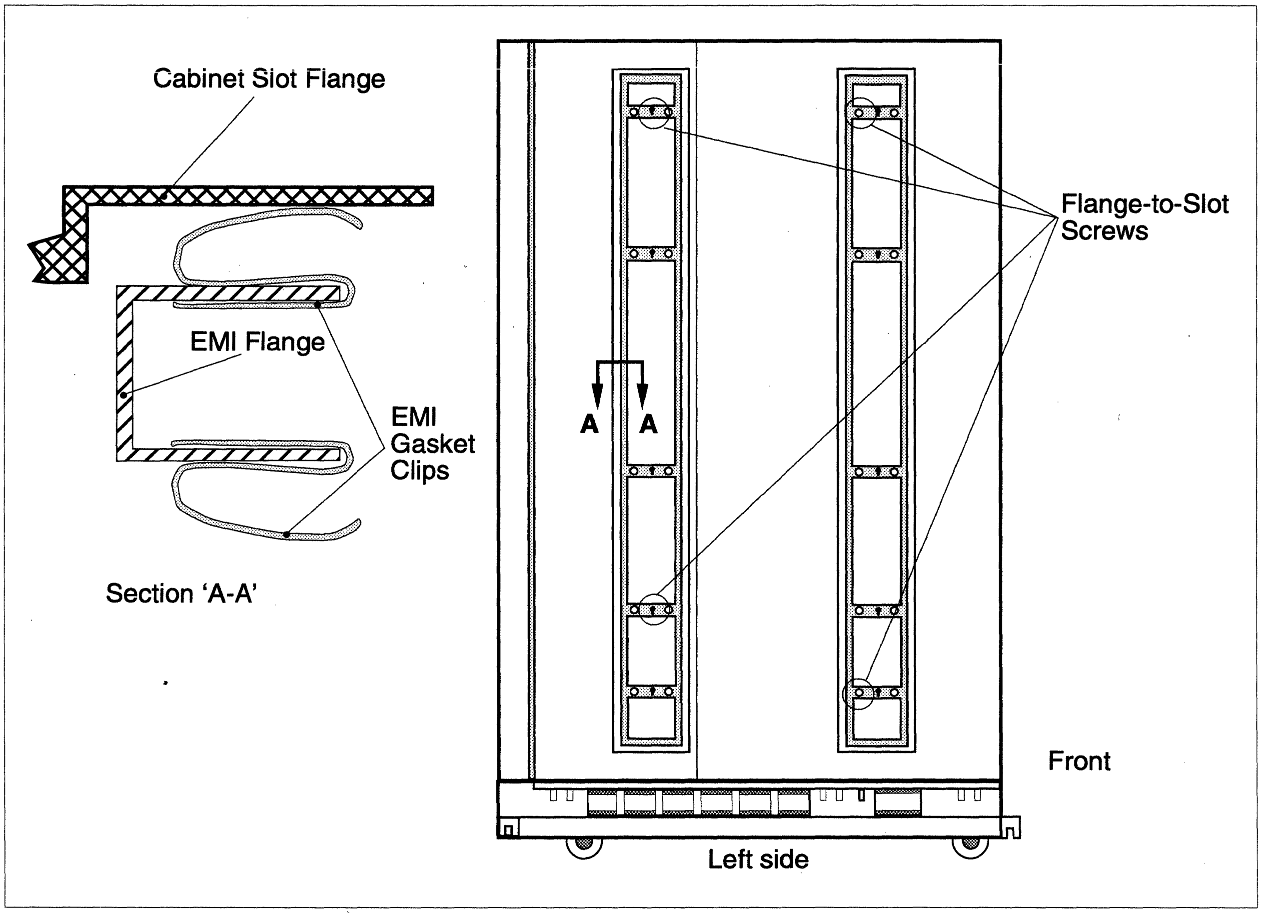


Figure 6-1. Preparing EMI Flanges for Installation

Perform the following steps to prepare the Paragon XP/S system cabinets and EMI flanges for joining:

1. Examine the long slots of the cabinets that are to be joined. The slot flanges must have exposed metal for their full length. If the grills are still installed, perform the procedures in "Installing/Removing Cabinet Trim Pieces" on page 6-4 before performing the procedures in this section.

CAUTION

Make sure the full length of the cabinet slots has exposed, bare metal. If any segment of this length is covered with paint or other non-conductive material, use conductive metal tape to restore an adequate ground path. Poor conduction paths will defeat the Paragon system cabinet EMI shielding.

2. Install copper EMI gasket clips around the full periphery of the front and back of each EMI flange. The EMI gasket material can be cut to fit if necessary.

3. Use two pan head Phillips screws to secure each prepared EMI flange to the slots on the left-hand side of the right cabinet. Refer to Figure 6-1 for the required screw locations. These screws only hold the EMI flanges in position while the cabinets are being joined.

To join the cabinets, do the following:

1. Position the right-hand cabinet exactly where you want it.

2. Roll the left-hand cabinet next to the right-hand cabinet, and align the cabinets so that the EMI flange on the right-hand cabinet lines up with the long slot in the left-hand cabinet. Figure 6-2 shows a top view of how the cabinets should be aligned.

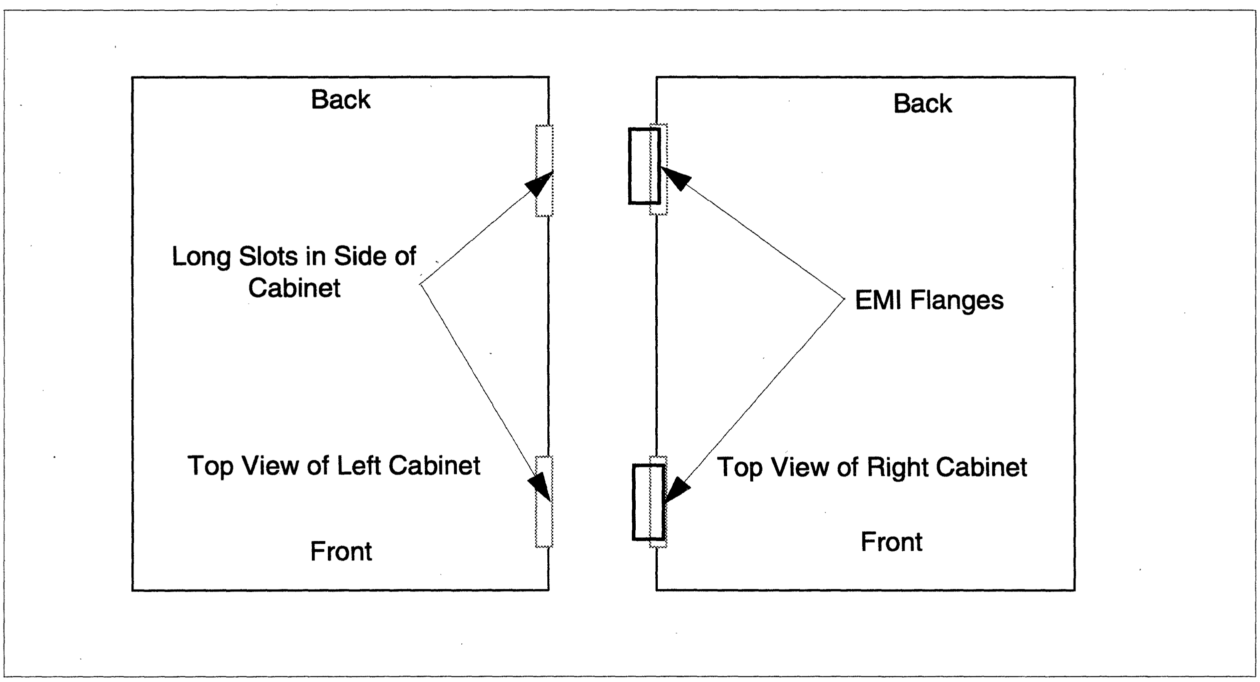


Figure 6-2. Align the System Cabinets

3. Move the cabinets together, fitting the EMI flanges into the long slots of the adjacent cabinet so that the holes in the slots line up with their respective screw holes in each cabinet. When properly positioned, the cabinets should be flush against one another.

4. Secure the cabinets to each other using Phillips head screws (plus washers and nuts) at each of eight locations shown in Figure 6-3. The screw goes through the indicated hole in the stiffening flange, then through the corresponding holes in the EMI flange and the stiffening flange of the other cabinet. Once the eight screws, washers, and nuts are started, you can gradually draw the cabinets together.

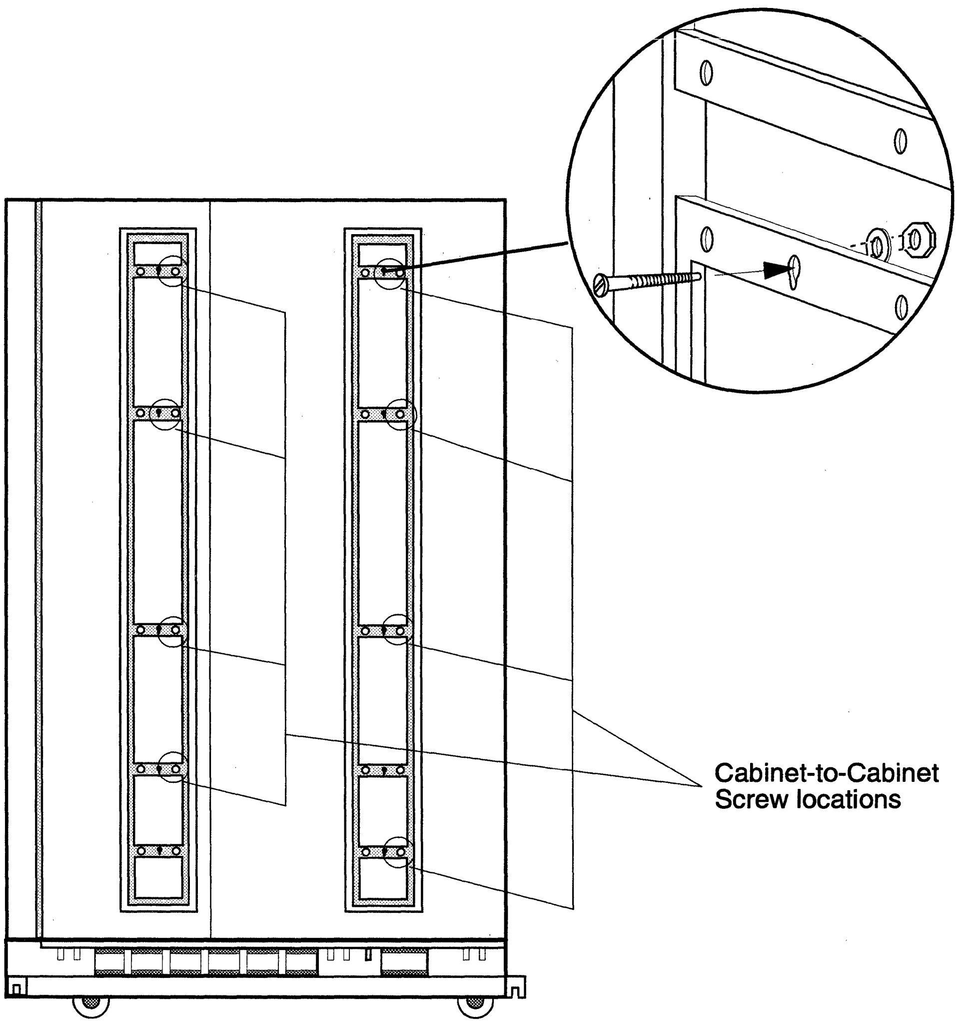


Figure 6-3. Joining the Cabinets

5. Work back and forth between the eight locations, tightening each screw a little at a time until all screws are tight. To maintain the alignment of the screw holes while installing the screws, you may have to move the cabinets slightly.

6. Secure wedge adapter castings between the cabinet bases (front and rear) using two button head screws.

7. Adjust the foot stops in both the wedge adapter castings and the legs so that they fit snugly against the floor.

8. Place the wedge adapter cover over the wedge adapter casting, matching the self-stick seals to secure it.

9. Place the foot covers over the legs, matching the self-stick seals to secure them.

10. As shown in Figure 6-4, secure external cover plates between the cabinet bases. One plate is attached at the front of the cabinets and the other plate is attached at the rear. To attach the cover plates, insert and tighten the four screws provided with each plate.

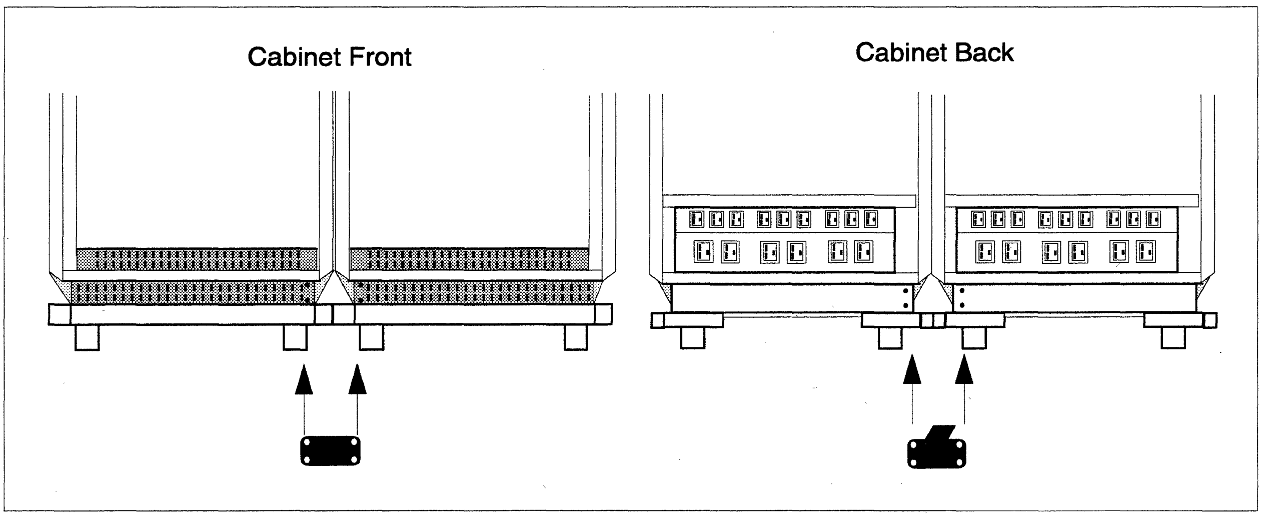


Figure 6-4. Attaching External Cosmetic Cover Plates

Removing/Replacing the Plenum, Trim, and Baffle Components

Each Paragon XP/S system cabinet uses numerous components to make sure that cooling air is routed to all critical areas. If some of these components are damaged or not installed, cabinet cooling will be impaired, and without proper cooling airflow, system reliability will be affected.

There are no procedures in this section. The text and figures in this section only identify the plenum, trim, and baffle components that should be in place to ensure proper cooling airflow. If any components are missing or damaged, replace them. If the number of nodes, power supplies, or I/O devices in a cabinet changes, make sure the correct trim and baffle pieces are in place to maintain proper cooling airflow. Figure 6-5 shows a transparent version of the Paragon XP/S system cabinet, and indicates the plenum, trim, and baffle components that are described in this section.

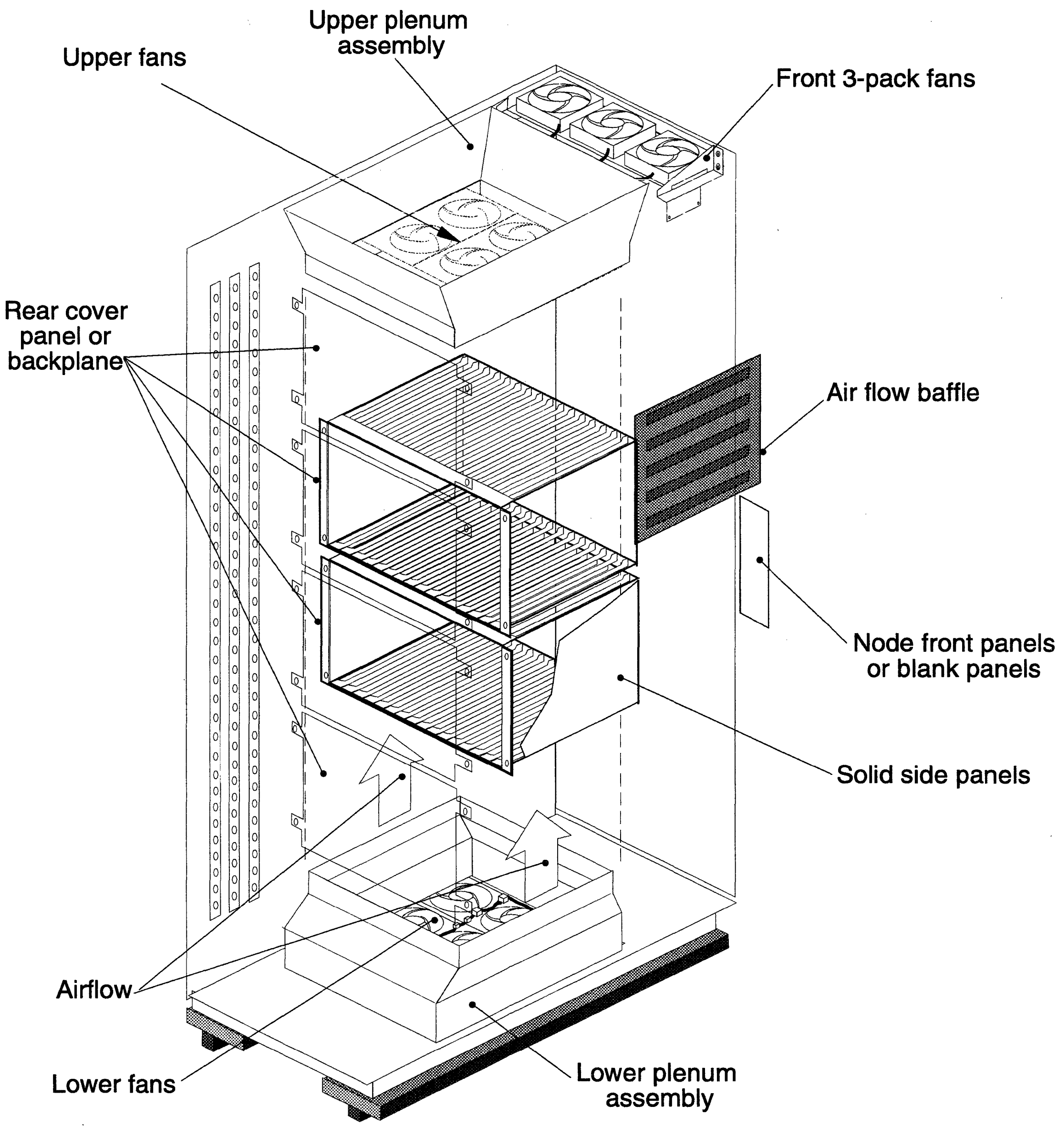


Figure 6-5. Plenum, Trim, and Baffle Components

Table 6-1 lists the part numbers and describes each of the possible plenum, trim, and baffle components of the Paragon XP/S system cabinet. Refer to Figure 6-5 for item placement and related information.

Table 6-1. Plenum, Trim, and Baffle Components

Part Reference	Intel Part Number	Description
MFCBFL	316480-001	Air flow baffle
MFCCARDSUP	317287-001	Cardcage support panel
MFCDSK1.8	317477-001	Filler panel, disk, 1.87-inch
MFCDSK1.9	317476-001	Filler panel, disk, 1.93-inch
MFCDSK2	317153-001	Filler, disk, two-panel
MFCDSK5	317001-001	Filler, disk, five-panel
MFCDSKPNL	313828-002	Panel, filler, stiff, I/O, 3.495
MFCPNLPM	317049-009	Panel, filler, cardcage, 1 slot, PM
MFCPNL1	317049-007	Panel, filler, cardcage, 1 slot
MFCPNL2	317049-001	Panel, filler, cardcage, 2 slot
MFCPNL3	317049-008	Panel, filler, cardcage, 3 slot
MFCPNL4	317049-002	Panel, filler, cardcage, 4 slot
MFCPNL8	317049-003	Panel, filler, cardcage, 8 slot
MFCPNL9	317049-004	Panel, filler, cardcage, 9 slot
MFCPNL13	317049-005	Panel, filler, cardcage, 13 slot
MFCPNL17	317049-006	Panel, filler, cardcage, 17 slot
MFCPNLL	317186-002	Assembly, panel, 18-inch, lower
MFCPNLM	317186-001	Assembly, panel, 15.5-inch, middle
MFCPNLU	317187-001	Assembly, panel, 19-inch, upper
	317363-001	Panel, rear cardcage support
	317618-001	Assembly, interior panel, air plenum

Removing/Replacing Front Fan Assembly FRUs

There is a three-fan assembly mounted at the top front of each Paragon XP/S system cabinet. This fan assembly draws heated air from the peripheral bay and exhausts it through the top grills. The diagnostic station and the peripheral modules have their own cooling fans, so the main function performed by the front fan assembly is to exhaust the air that has been drawn through these modules.

Although there is a thermostat that monitors peripheral bay (FRONT) temperatures, failure of a single front fan is unlikely to result in an overtemperature CAUTION or SHUTDOWN indication. It is more likely that the front FAN FAIL indicator on the power controller board will be lit or that you will see that one of the fans in the front fan assembly is not functioning.

Perform the following procedures to remove and replace the front fan assembly:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet, then loosen the latching hardware and swing the diagnostic station or top peripheral module fully open so you have access to the front fan assembly. Identify the location of the failed fan(s) in the front fan assembly.

3. Remove the two pan head Phillips screws securing each side of the front fan assembly mounting bracket to the standoffs on the sides of the cabinet, then carefully lower the fan assembly so you can reach the fan cable connectors.

4. Disconnect each of the fan cable connectors from the fan connectors, then move the fan assembly to a work surface.

5. Disassemble and remove the failed fan(s), then assemble the replacement fan(s) in the front fan assembly. Reuse existing hardware when installing the replacement fan(s).

6. Move the front fan assembly back to the cabinet, then reconnect each of the fan cable connectors to the proper fan connectors.

7. Position the front fan assembly over the standoffs at the top front of the cabinet, then secure the front fan assembly brackets to the standoffs using two pan head Phillips screws on each side.

8. Swing the diagnostic station or peripheral module closed and secure it using the captive hardware.

Removing/Replacing an Upper Fan Assembly Fan

The upper fan assembly is part of the upper portion of the node bay cooling plenum. This area holds six 200 CFM cooling fans that are grouped as two fans each in a left, right, and center fanpack.

There are two thermostats monitoring node bay (MIDDLE) temperatures, but failure of a single fan might not result in an overtemperature CAUTION or SHUTDOWN indication. It is more likely that the UPPER FAN FAIL indicator on the power controller board will be lit or that you will notice that one of the fans in the upper fan assembly is not functioning. Be sure you identify the faulty fan before starting the replacement procedures.

Perform the following procedures to remove and replace a fan from the upper fan assembly:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the back door of the cabinet, then loosen the latching hardware and swing the top hinge bracket fully open so you have access to the area above the top cardcage.

3. Disconnect each of the six fan power cable connectors from the corresponding connectors of the upper fan assembly, then move the fan power cable out of the way.

CAUTION

When repositioning cables and panels, be careful not to overstress connectors or change the relative positions of the thermostats. If it is necessary to cut cable ties, be sure you resecure the cables with ties after replacing the fan(s).

4. Loosen and remove the fourteen pan head Phillips screws securing the back panel of the upper plenum to the brackets, then carefully move the back panel out of the way. It might be necessary to cut cable ties and reposition cables in order to move the back panel.

5. Remove first the center section fanpack and then (if necessary) either the right or left fanpack in order to remove the fan or fans that have failed. Place the appropriate fanpack in a work area so you can replace the failed fan(s).

6. Cut the cable ties securing the fan power cables, then remove the connector of the failed fan from the fanpack bracket.

7. Loosen and remove four Phillips head screws and nuts securing the faulty fan to the bracket, then remove the fan and set it aside.

8. Position the replacement fan in the place of the one just removed, then secure it to the fanpack bracket using four Phillips screws and nuts.

9. Snap the fan power cable connector into its proper slot in the fanpack bracket.

10. Route the fan power cables as they were originally, then secure them to the fan frames using cable ties.

11. Reinsert the right and/or left fanpack (if they were removed), and then reinsert the center fanpack in the upper fan assembly.

12. Position the back panel of the upper plenum over the plenum brackets, then secure it using fourteen Phillips screws. If necessary, restore the cable routing and secure cables using cable ties.

13. Reconnect the six fan power connectors to the connectors projecting from the upper fan assembly brackets.

Removing/Replacing a Lower Fan Assembly Fan

The lower fan assembly is part of the lower portion of the node bay cooling plenum. This area holds six 200 CFM cooling fans that are grouped as three fans each in a front and back fanpack.

There are two thermostats monitoring node bay (MIDDLE) temperatures, but failure of a single fan might not result in an overtemperature CAUTION or SHUTDOWN indication. It is more likely that the LOWER FAN FAIL indicator on the power controller board will be lit or that you might even notice that one of the fans in the lower fan assembly is not functioning. Be sure you identify the faulty fan before starting the replacement procedures.

Perform the following procedures to remove and replace a fan from the lower fan assembly:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet, then loosen the latching hardware and swing the bottom peripheral module (if installed) fully open so you have access to the area below the bottom cardcage.

3. Remove the two screws holding the cosmetic panel over the lower front plenum panel, then remove the cosmetic panel and set it aside.

4. Remove the eight Phillips screws securing the lower front plenum panel to the brackets, then remove the lower front plenum panel and set it aside.

5. Identify the faulty fan(s) and disconnect its power connector from the mating connector that is mounted in the fan tray slot.

6. Each fan is secured to the fan tray by two captive Allen-drive cap screws. Loosen the two cap screws holding the faulty fan, then remove the fan and set it aside.

7. Transfer the captive screw hardware from the faulty fan to the replacement fan, and secure the fan power wires to the fan body using cable ties (in the same positions as the faulty fan).

8. Position the replacement fan(s) on the fan tray, then secure them using the captive Allen-drive cap screws.

9. Connect the fan power connector to the mating connector that is mounted in the fan tray slot.

10. Secure the lower front plenum panel to the plenum brackets using eight Phillips screws.

11. Position the cosmetic panel over the lower front plenum panel, then secure it using two Phillips screws.

Removing/Replacing Cabinet LED Components

The Paragon XP/S system LED components include following replaceable components:

- The LED controller board (mounted in the rear of the cabinet).
- The LED display boards (mounted in the cabinet front door).
- The cabinet front door itself.
- The power and signal cables associated with the LED components (see Chapter 5).

The procedures in this section describe how to replace the LED components. Refer to Chapter 5 for procedures on how to replace the LED cables.

CAUTION

While performing the procedures in this section the DC power (at a minimum) to the cabinet must be turned OFF. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the DC or AC power to the cabinet before performing any replacement procedures.

Removing the LED Controller Board

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Figure 6-6 shows the location of the LED controller board in the cabinet and indicates the cables and hardware that must be removed/disconnected when replacing the LED controller board.

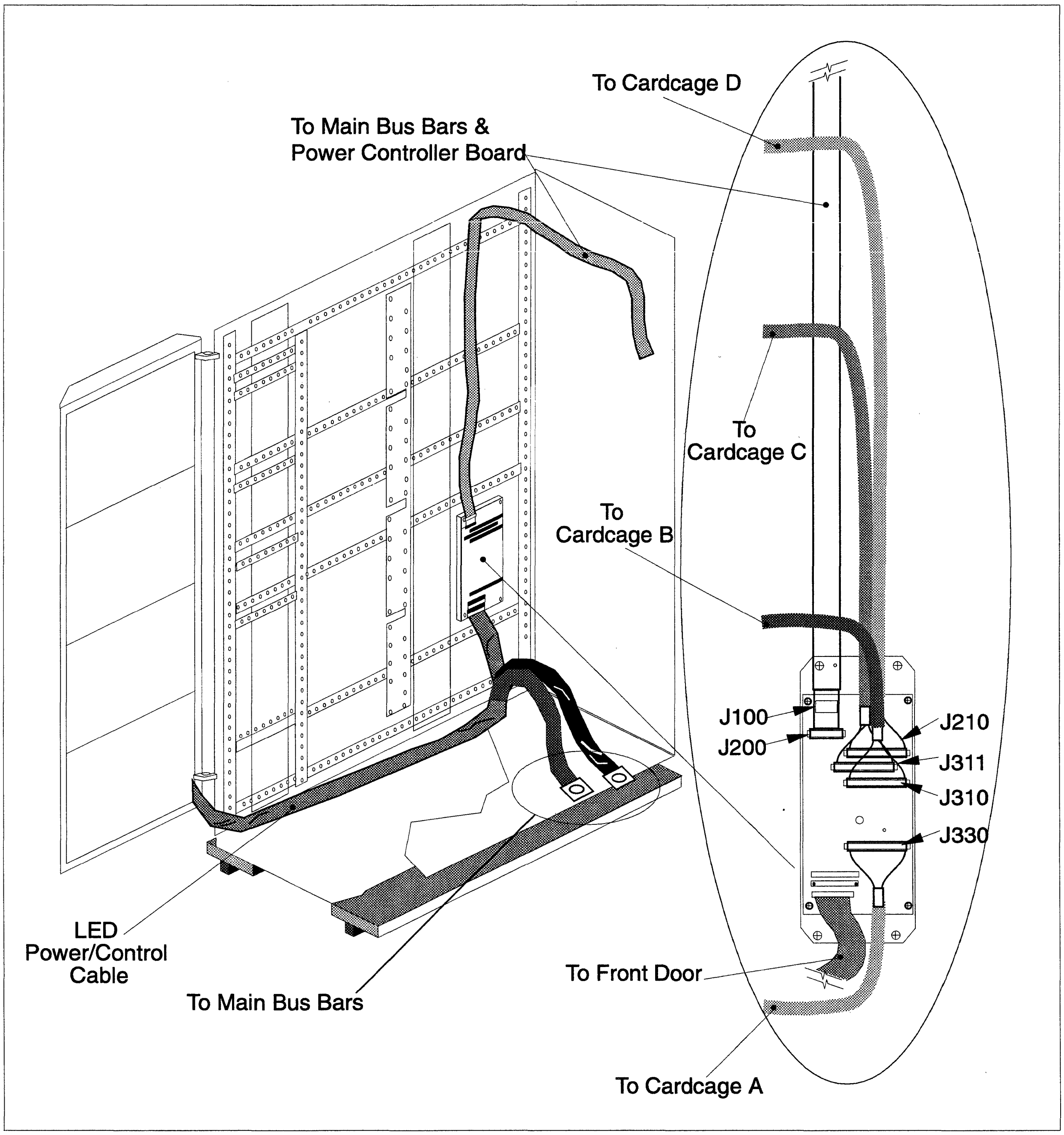


Figure 6-6. Replacing the LED Controller Board

Perform the following procedures to replace the LED controller board:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the rear door of the cabinet and swing the bottom two power supply hinges open so you have access to the LED controller board.

3. Disconnect cables from the LED controller board as follows:

   A. Disconnect the LED power and control cable (part number 316817-001) from connectors J100 and J200.

   B. Disconnect the backplane-to-LED controller cables (part numbers 316827-00X) from connectors J210 (backplane D), J311 (backplane C), J310 (backplane B), and J730 (backplane A).

   C. If present, disconnect the LED controller East/West cables (part number 316818-001) from connector J801 (from next lower numbered cabinet) and J900 (to next higher numbered cabinet). These cables are present only if this cabinet has adjacent cabinets (on one or both sides).

   D. Disconnect the LED controller-to-display cable (part number 316829-001) from connector J800.

4. Remove the five Phillips-head screws and washers securing the LED controller board to the mounting bracket, then remove the LED controller board and set it aside.

Installing the LED Controller Board

This procedure assumes all cables going to the LED controller board are routed and the board mounting bracket is in place on the lower right wall of the rear area of the cabinet. Refer to Figure 6-6 and perform the following steps to install the LED controller board:

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

1. Position the LED controller board on the mounting bracket standoffs, then secure it using five Phillips-head screws and washers. The board indicator LEDs should be pointed up.

2. Connect cables to the LED controller board as follows:

A. Connect the LED power and control cable (part number 316817-001) to connectors J100 and J200.

B. Connect the backplane-to-LED controller cables (part numbers 316827-00X) to connectors J210 (backplane D), J311 (backplane C), J310 (backplane B), and J730 (backplane A). Make sure the cables from each backplane are going to the proper connectors.

C. If this cabinet has adjacent cabinets (on one or both sides), connect the LED controller East/West cables (part number 316818-001) to connector J801 (from next lower numbered cabinet) and J900 (to next higher numbered cabinet).

D. Connect the LED controller-to-display cable (part number 316829-001) to connector J800.

Removing the Front Door Assembly

It might be necessary to remove the entire front door assembly if the door has been damaged (and must be replaced), or in order to make it easier to replace an LED display board or cable. Figure 6-7 shows the front door assembly and indicates the components associated with removing the door assembly, any of the LED display boards, or the associated cables.

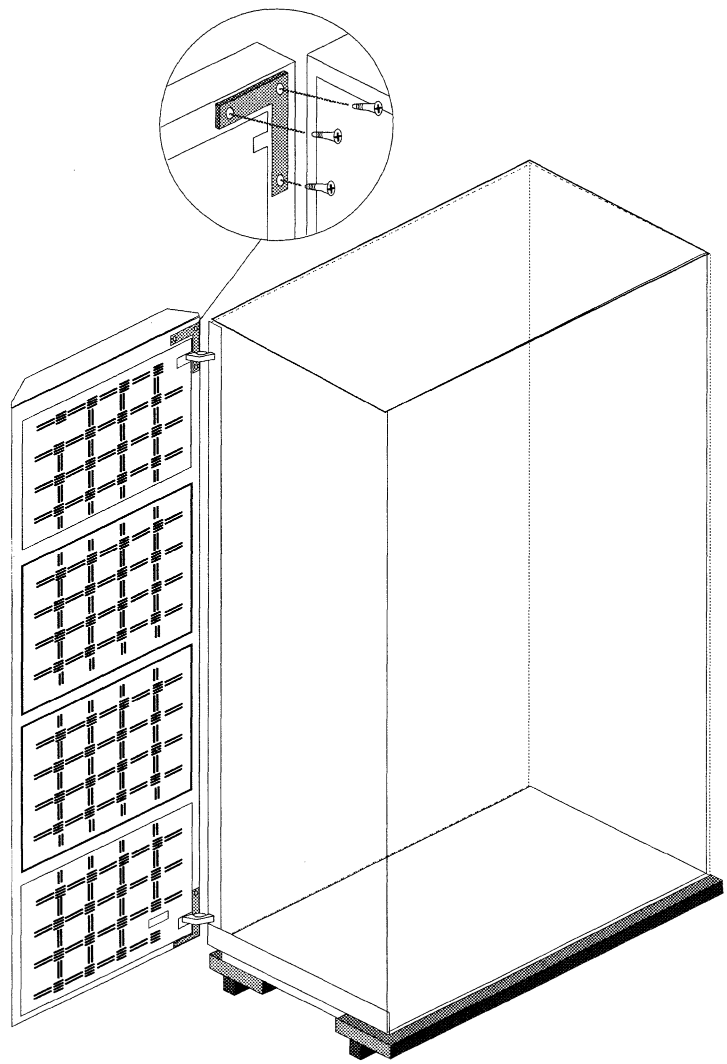


Figure 6-7. Replacing the Cabinet Front Door

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Refer to Figure 6-7 if necessary, and perform the following steps to remove the front door assembly from a Paragon XP/S system cabinet:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet, then open the front door of the cabinet.
2. Open the rear cabinet door, then open the bottom two power supply hinges.
3. Identify the power and signal cables (routed along the cabinet base) that go to the front door assembly. Disconnect the LED controller-to-display cable from connector J800 of the LED controller board.
4. Remove the pan head Phillips screw securing the door GND (black insulation) power cable to the bottom of the cabinet GND busbar. Fold the cable out of the way.
5. Remove the pan head Phillips screw securing the door +5V (red insulation) power cable to the bottom of the cabinet +5V busbar. Fold the cable out of the way.
6. Cut any cable ties holding the cables, then pull the GND and +5V power cables, and the LED controller-to-display cable through to the front of the cabinet.
7. Provide support to prevent the door from falling, then remove three flat head Phillips securing the lower hinge and three flat head Phillips securing the upper hinge to the front door.
8. Carefully remove the front door assembly and set it aside.

Removing an LED Display Board

It is possible to replace an LED display board or one of the associated cables without removing the front door, but component positioning and alignment is much easier when the door assembly is flat. Refer to "Removing the Front Door Assembly" on page 6-19 for the front door removal procedure. Figure 6-8 shows the details that apply to the removal of the LED display board.

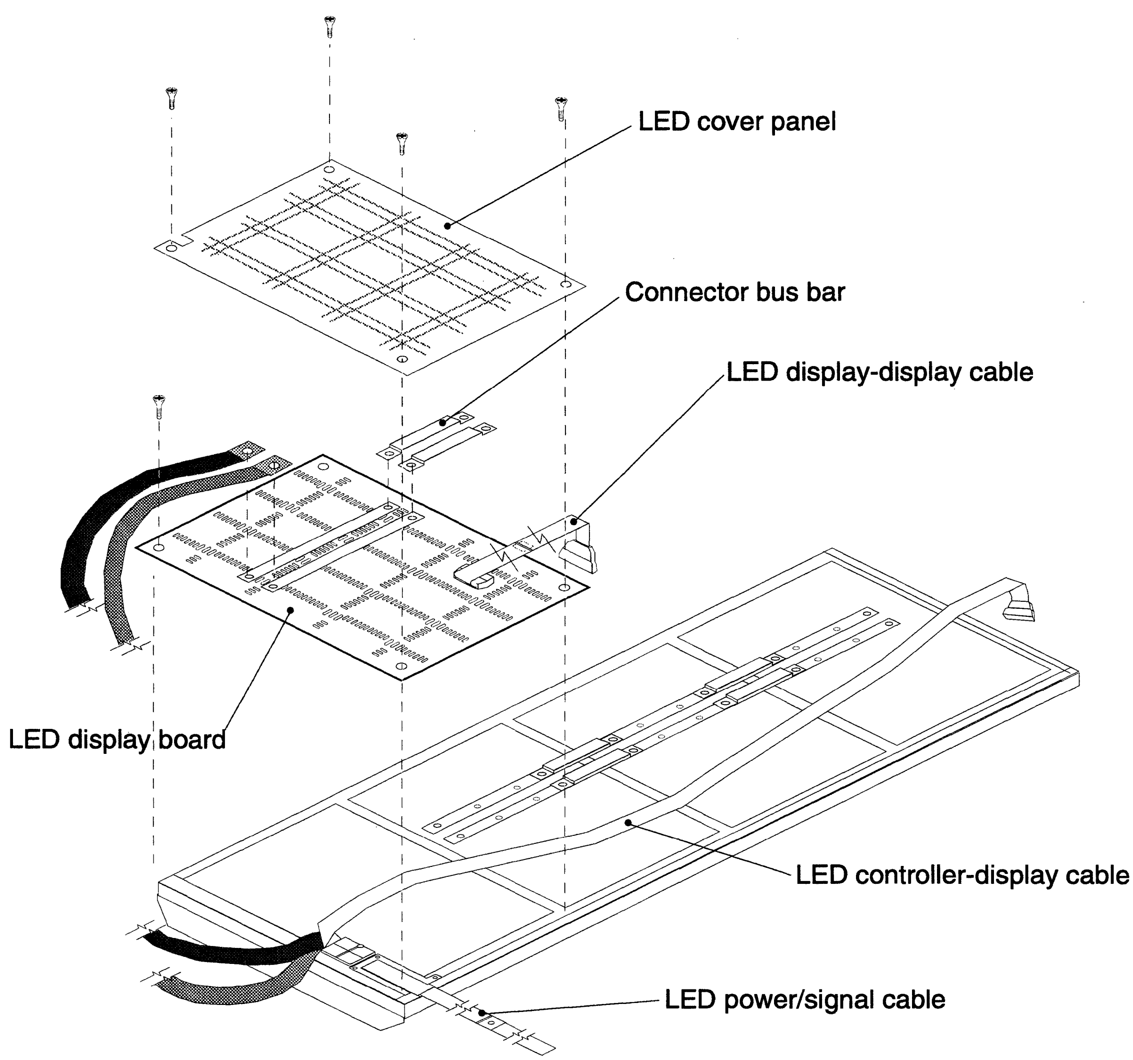


Figure 6-8. Front Door Assembly Details

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Refer to Figure 6-8 if necessary, and perform the following steps to remove an LED display board from the Paragon XP/S system cabinet front door:

1. If removing the LED display board while the door is still installed on the cabinet, make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet, then open the front door of the cabinet.
2. Remove the four black pan head and six black flat head Phillips screws securing the bottom cover panel over the bottom LED display board. Remove the bottom cover panel and set it aside.
3. Remove the eight black flat head Phillips screws securing each of the remaining cover panels over their respective LED display boards. Remove these cover panels and set them aside.
4. Disconnect the LED controller-to-display signal cable from the topmost connector of the top LED display board, then cut the cable ties securing the LED controller-to-display signal cable to the door.
5. If removing the bottom LED display board:

   A. Remove the flat head Phillips screw securing the +5VDC cable to the front door bus bar

   B. Remove the flat head Phillips screw securing the GND cable to the front door bus bar.

   C. Remove two Phillips head screws securing the cable support bracket to the base of the front door.

   D. Disconnect the LED display-to-display cable at connector J1 of the bottom LED display board, then fold the cable out of the way.

   E. Fold the power, ground, and signal cables and the cable support bracket out of the way.

   F. Remove the four flat head Phillips screws securing the two connector busbars between the bottom LED display board (position A in CBS numbering terminology) and the next higher LED display board (position B). Set the two connector busbars aside.

   G. Remove seven hex standoffs securing the LED display board to the graphics frame of the door. Remove the pan head Phillips screw securing the lower left corner of the LED display board to the graphics frame of the door.

   H. Remove the LED display board and place it on an ESD-safe work surface.

6. If removing the top LED display board:

   A. Disconnect the LED display-to-display cable at connector J2 of the top LED display board, then fold the cable out of the way.

   B. Remove the four flat head Phillips screws securing the two connector busbars between the top LED display board (position D in CBS numbering terminology) and the next lower LED display board (position C). Set the two connector busbars aside.

   C. Remove eight hex standoffs securing the LED display board to the graphics frame of the door.

   D. Remove the LED display board and place it on an ESD-safe work surface.

7. If removing either of the inner LED display boards:

   A. Disconnect the LED display-to-display cables at connectors J1 and J2 of the LED display board being replaced, then fold the cables out of the way.

   B. Remove the eight flat head Phillips screws securing the four connector busbars between the LED display board being replaced and the LED display boards on either side. Set the four connector busbars aside.

   C. Remove eight hex standoffs securing the LED display board to the graphics frame of the door.

   D. Remove the LED display board and place it on an ESD-safe work surface.

8. Remove the six pan head Phillips screws securing the two LED board busbars to the spacers on the LED display board being replaced. Set the two LED board busbars aside.

9. Remove the eight standoffs on the component-side (the busbars were attached to the standoffs) and eight kep nuts from the LED display board and set them aside.

10. Place the LED display board in an ESD-safe bag so it can be transported.

Installing an LED Display Board

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

It is possible to replace an LED display board or one of the associated cables with the front door still installed, but component positioning and alignment is easier when the door assembly is flat. Refer to "Removing the Front Door Assembly" on page 6-19 for the front door removal procedure. Refer to Figure 6-8 if necessary, and perform the following steps to install an LED display board in the Paragon XP/S system cabinet front door:

1. If installing the LED display board while the door is still installed on the cabinet, make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet, then open the front door of the cabinet.

2. Attach eight spacers (for the busbars) to the component-side of the replacement LED display board using kep nuts. Center the spacers over their holes as much as possible, then tighten the nuts.

3. Position the replacement LED display board in its graphic frame, then secure it using eight hex standoffs. If this is the bottom LED display board, use seven hex standoffs along with a pan head Phillips screw in the lower left corner to secure it.

4. Secure each of the main busbar segments (over the replacement LED display board) to their spacers using three pan head Phillips screws.

5. Secure each connector busbar between the replacement LED display board and the adjacent board(s) using two flat head Phillips screws. Tighten the screws. The top and bottom LED display boards are each secured to two connector busbars while the inner LED display boards are each secured to four connector busbars.

6. Connect the LED display-to-display cable(s) between connector J2 (of the upper LED display board) and connector J1 of the next-lower LED display board. There must be a display-to-display cable between adjacent LED display boards.

7. Connect the LED controller-to-display cable to connector J1 of the top LED display board then route it down the door assembly and over the three LED display-to-display cables.

8. Use cable ties to secure the LED controller-to-display cable and LED display-to-display cables to the cable tie mounts between the LED display boards. Refer to Figure 6-8 for routing and position information.

9. Attach the GND power cable to the hinge-side door busbar (GND busbar) and the +5V power cable to the latch-side door busbar (+5V busbar) using flat head Phillips screws.

10. Make sure the power cables and LED controller-to-display cable are secured to the door by a cable tie and that the cable support bracket is attached to the door by two Phillips screws. Make sure the power cables and LED controller-to-display cable are covered by zipper tube and "Z" tape starting at the cable tie point. Refer to Figure 6-8 for cable tie, zipper tube, and attachment position information.

11. Attach the top and two inner LED display board cover panels to the door using eight black flat head Phillips screws for each cover panel.

12. Attach the bottom LED display board cover panel to the door using seven black flat head Phillips screws and four black pan head Phillips screws.

Installing the Front Door Assembly

Refer to Figure 6-7 if necessary, and perform the following steps to install the front door assembly on the Paragon XP/S system cabinet:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.
2. Open the hinges then, using appropriate support, position the front door and secure it to the hinges using six flat head Phillips screws. After verifying proper alignment, tighten the screws.
3. Open the rear door and swing the bottom two power supply brackets out so you have access.
4. Route the zipper tube (containing the power cables and LED controller-to-display cable) from the front door, under the bottom fan assembly, and up to the rear of the cabinet (through the opening between the power channel and the base assembly).
5. Connect the LED controller-to-display cable to J800 on the LED controller board.
6. Route the LED power cables along the base of the cabinet to the cabinet busbars on the left wall (viewed from the rear) of the cabinet.
7. Secure the LED power cables to the proper busbars (red to +5V and black to GND) using pan head Phillips screws.
8. If necessary, secure the LED power cables and signal cable to appropriate tie points in the base of the cabinet.

Removing/Replacing Power Subsystem Components

The replaceable Paragon XP/S system power subsystem components are as follow:

- Components in a cabinet that are connected to the AC line power source (the AC power cord, the line filter, the main breaker, and the AC power channel assembly).
- The power supply controller board.
- Each of the system power supplies (the 400 amp +5V supplies, the 67 amp +12V supplies, the 26 amp +5V control supply, and the -12V and -5.2V DC-DC convertors).

The following sections provide removal/replacement procedures for the power subsystem components. Removal/replacement procedures for the power cabling are described in "Basic Cabinet Cabling" on page 5-2.

Removing/Replacing AC Input Components

The AC input components include the main power cord (with either US or European style plug attached), the main breaker, the line filter, and the power channel assembly. Perform the procedures in the following sections to remove the indicated FRU.

WARNING

The personnel performing these procedures can be exposed to hazardous voltages if power is applied to the cabinet. While performing the procedures in this section the AC power to the cabinet must be turned OFF and the main power cable disconnected from the cabinet. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the AC power and disconnect the main power cable from the cabinet before performing any replacement procedures.

Figure 6-9 shows the rear base area of a Paragon XP/S system cabinet, and indicates the power channel assembly, main power cord, line filter, and main breaker of the Paragon XP/S system cabinet. Refer to Figure 6-9 while performing the procedures in the following sections.

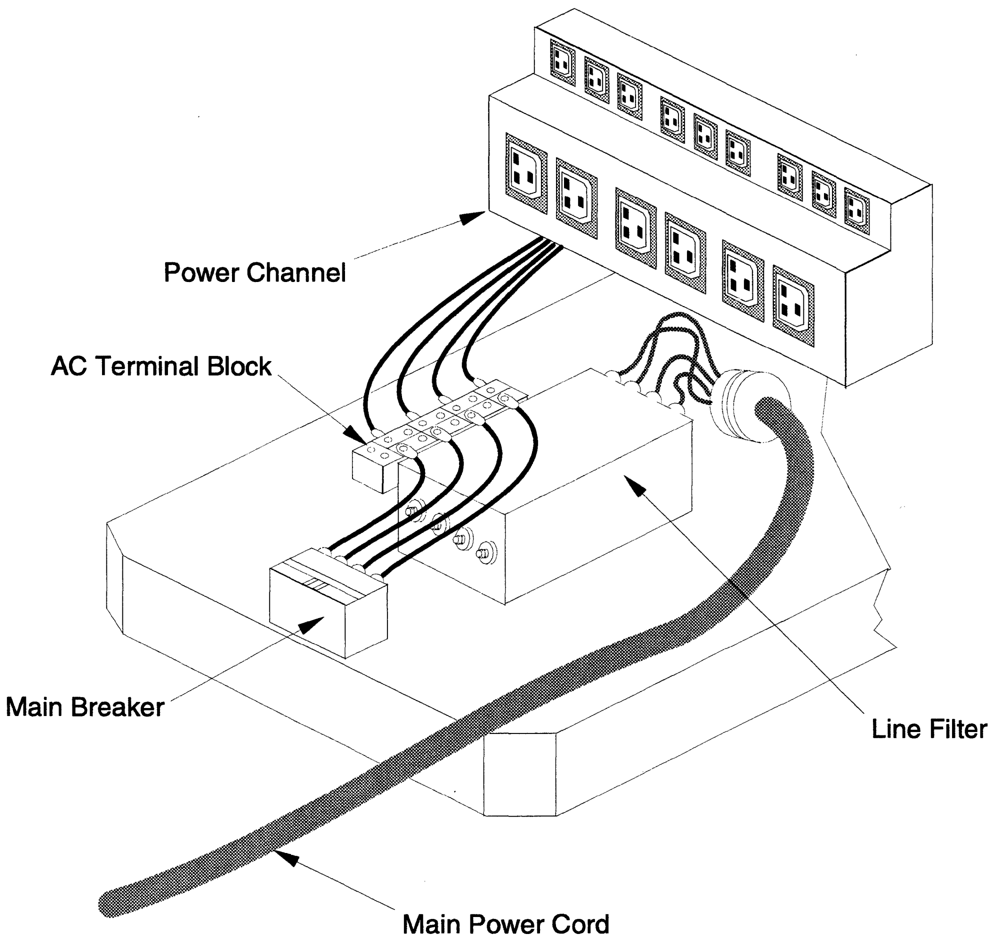


Figure 6-9. AC Power Components

Removing/Replacing the Power Channel Assembly

It will be necessary to remove the power channel assembly in order to get better access to the main power cord or the line filter. The power channel assembly might also need to be replaced if one or more of the AC outlets is not active. Perform the following steps to remove or replace the AC power channel assembly:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the bottom two power supply hinges open so you have access to the base area of the cabinet.

Removing (Power Channel Assembly)

1. Remove six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff securing the clear AC service cover to the rear base of the cabinet. Remove the clear AC service cover and set it aside.

2. Remove the brass nut and bronze washer securing the three power channel ground wires (green with yellow stripe) to the grounding stud on the left side of the terminal block. Lift the wires off of the ground stud, and set them to the side.

3. Disconnect the remaining power channel assembly wires that are connected to the left-side terminals of the terminal block. Move the wires to the side. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

4. Remove the two bolts and washers securing the legs of the power channel assembly to the base of the cabinet.

5. Remove the four button head screws and washers securing the top brace of the power channel assembly to the side stiffeners of the cabinet.

6. Remove the power channel assembly and set it aside.

Installing (Power Channel Assembly)

1. Make sure that the power channel assembly legs are positioned with the flanges facing away from the power plugs, then position the power channel assembly in the rear of the cabinet as indicated in Figure 6-9.

2. Secure the power channel assembly legs to the cabinet base using two bolts and washers.

3. Secure the upper flanges of the power channel assembly to the side stiffeners of the cabinet using four button head screws and washers.

4. Refer to Figure 5-2 on page 5-4 for wiring information, then connect the wires from the power channel wiring harness to the left side of the terminal block.

5. Secure the three ground wires (green insulation with a yellow stripe) from the power channel wiring harness to the cabinet base ground stud using a bronze washer and brass nut.

6. Secure the clear AC service cover to the rear base of the cabinet using six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff.

Removing/Replacing the Main Power Cord

The main power cord might need to be replaced if a cabinet is being changed to use European power wiring (instead of U.S./Japan) or visa versa, and the power plug needs to be converted to match up with the site power receptacles. It is also possible that a damaged cord or plug needs to be replaced.

Use the following procedures to remove and/or replace the main power cord:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the bottom two power supply hinges open so you have access to the base area of the cabinet.

Removing (Main Power Cord)

1. Remove six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff securing the clear AC service cover to the rear base of the cabinet. Remove the clear AC service cover and set it aside.

2. Remove the two bolts and washers securing the legs of the power channel assembly to the base of the cabinet.

3. Remove the four button head screws and washers securing the top brace of the power channel assembly to the side stiffeners of the cabinet. Move the power channel assembly out of the way.

4. Loosen and remove the nut securing the power cord ground wire to the cabinet base. Remove the power cord ground wire and set it out of the way.

5. Remove the nuts securing the power cord wires to the "LINE" terminals of the line filter. Remove the power cord wires and move them out of the way. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

6. Remove 14 flat head Phillips screws, then remove the cover plate over the cabinet base wiring channel.

7. Reach down into the wiring channel, and cut the two wire ties securing the main power cord to the cabinet.

8. Loosen and remove the large nut securing the power cord end to the cabinet base, then pull the cord and nut out of the cabinet base and set them aside.

Installing (Main Power Cord)

1. Route the main power cord through the cabinet base wiring channel, then thread the wires through the power entrance on the side of the channel.

2. Put the large nut over the end of the wires (coming through the power entrance), then tighten the nut to secure the main power cord to the cabinet base.

3. Use two wire ties to secure the main power cord to the inside of the cabinet base wiring channel, then secure the cover plate over the cabinet base wiring channel using 14 flat head Phillips screws.

4. Secure the power cord wires to the "LINE" terminals of the line filter using the line filter nuts. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

5. Secure the power cord ground wire to the cabinet base ground stud using the supplied nut.

6. Position the power channel assembly in the cabinet base, then secure the power channel assembly legs to the cabinet base using two bolts and washers.

7. Secure the upper flanges of the power channel assembly to the side stiffeners of the cabinet using four button head screws and washers.

8. Secure the clear AC service cover to the rear base of the cabinet using six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff.

Removing/Replacing the Line Filter

The line filter should only need to be replaced if it has been damaged. Perform the following procedures to remove or replace the line filter:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the bottom two power supply hinges open so you have access to the base area of the cabinet.

Removing (Line Filter)

1. Remove six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff securing the clear AC service cover to the rear base of the cabinet. Remove the clear AC service cover and set it aside.

2. Remove the two bolts and washers securing the legs of the power channel assembly to the base of the cabinet.

3. Remove the four button head screws and washers securing the top brace of the power channel assembly to the side stiffeners of the cabinet. Move the power channel assembly as necessary to gain access to the line filter and related hardware.

4. Remove the nuts securing the power cord wires to the "LINE" terminals of the line filter. Remove the power cord wires and move them out of the way. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

5. Remove the nuts securing the wires to the "LOAD" terminals of the line filter. Cut any securing cable ties, then move any remaining wires on the line filter out of the way. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

6. Remove the four Phillips screws securing the line filter to the cabinet base, then remove the line filter and set it aside.

Installing (Line Filter)

1. Position the line filter in the cabinet base, and secure it using four Phillips screws.

2. Secure the main breaker wires to the "LOAD" terminals of the line filter using the line filter nuts. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

3. Secure the power cord and ground wires to the "LINE" terminals of the line filter using the line filter nuts. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

4. Use cable ties and mounts to secure the wires going to/from the main breaker to positions on the "LOAD" side and the top of the line filter. Refer to Figure 6-9 if necessary for installation information.

5. Position the power channel assembly in the cabinet base, then secure the power channel assembly legs to the cabinet base using two bolts and washers.

6. Secure the upper flanges of the power channel assembly to the side stiffeners of the cabinet using four button head screws and washers.

7. Secure the clear AC service cover to the rear base of the cabinet using six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff.

Removing/Replacing the Main Breaker

The main breaker should only need to be replaced if it has been damaged. Perform the following procedures to remove or replace the main breaker:

1. Make sure the AC breaker has been turned OFF, then disconnect the power plug from line power. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Using a 3/16-inch Allen wrench, unlatch the rear door and open it. Swing the bottom two power supply hinges open so you have access to the base area of the cabinet.

Removing (Main Breaker)

1. Remove six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff securing the clear AC service cover to the rear base of the cabinet. Remove the clear AC service cover and set it aside.

2. Remove the nuts securing the wires to the "LOAD" terminals of the line filter. Cut any securing cable ties, then move any remaining wires on the line filter out of the way. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

3. Loosen and remove the terminal screws for the four "LINE" wires on the top of the main breaker. Cut any securing cable ties, then move any remaining wires out of the way. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

4. Loosen and remove the four black flat head Phillips screws securing the main breaker to the rear of the cabinet base. Remove the main breaker.

5. With the main breaker out of the cabinet, perform the following steps:

   A. Loosen and remove the terminal screws for the four "LOAD" wires on the bottom of the main breaker.

   B. Disconnect and remove the bar connecting the two toggle switches of the main breaker together.

   C. Loosen and remove the screws securing the mounting bracket to the face of the main breaker. Remove the mounting bracket and set it aside.

Installing (Main Breaker)

1. Perform the following steps to prepare the replacement main breaker for mounting in the cabinet:

   A. Disconnect and remove the bar connecting the two toggle switches of the main breaker together.

   B. Position the mounting bracket over the face of the main breaker, then secure it using the screws from the old breaker.

C. Reconnect the bar holding the two toggle switches of the main breaker together.

D. Reconnect the wires and tighten the terminal screws for the four "LOAD" wires on the bottom of the main breaker. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

2. Position the assembled main breaker in the rear of the cabinet base with the four "LOAD" wires on the bottom of the main breaker. When OFF, the main breaker toggle switches must be down.

3. Secure the main breaker to the rear of the cabinet base using four black flat head Phillips screws.

4. Secure the bottom four main breaker wires to the "LOAD" terminals of the line filter using the line filter nuts. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

5. Secure the terminal block wires to the top four "LINE" terminals the main breaker using the provided screws. Refer to Figure 5-2 on page 5-4 for wiring information, if necessary.

6. Use cable ties and mounts to secure the wires going to/from the main breaker to positions on the "LOAD" side and the top of the line filter. Refer to Figure 6-9 if necessary for installation information.

7. Secure the clear AC service cover to the rear base of the cabinet using six 1/4-20 x 3/8 pan head Phillips screws, a #6-32 x 1/2 pan head Phillips screw, and a 5/16-inch standoff.

Removing/Replacing the DC Power Components

WARNING

The personnel performing these procedures can be exposed to hazardous voltages if power is applied to the cabinet. While performing the procedures in this section the AC power to the cabinet must be turned OFF and the main power cable disconnected from the cabinet. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the AC power and disconnect the main power cable from the cabinet before performing any replacement procedures.

Each Paragon XP/S system cabinet contains the following DC power components:

- Four 400 amp +5VDC power supplies.
- Two 67 amp +12VDC power supplies.

- Two DC-DC convertor modules of each size (-5.2VDC and -12VDC).
- A power controller board.
- In addition, cabinet 0 contains the 26 amp +5VDC controller power supply that provides DC power to all power controller boards in the Paragon XP/S system.

The following sections provide removal and replacement procedures for these DC power components.

Removing/Replacing the 400 Amp +5VDC Power Supplies

WARNING

The output voltage for this supply, +5VDC, is not normally hazardous to humans, but the available current, 400 amps per supply, is more than enough to weld metal. Be careful to not allow any conductive objects near the outputs of a powered-up supply.

Figure 6-10 shows the rear of a Paragon XP/S system cabinet and indicates how each type of DC power component is mounted.

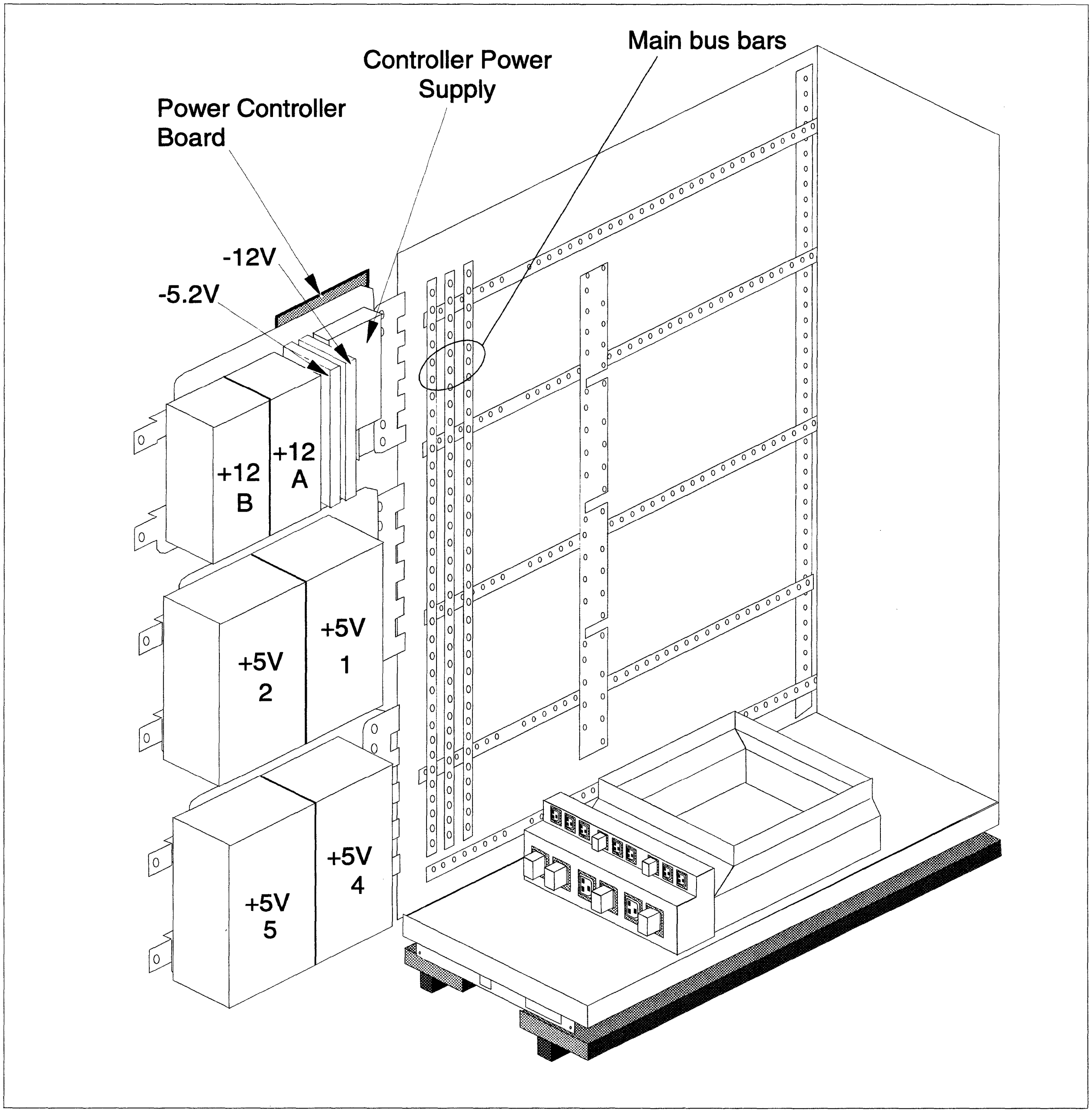


Figure 6-10. DC Power Components

There are four 400 amp +5VDC power supplies installed in a standard Paragon XP/S system cabinet. Two power supplies (numbers 4 and 5) are mounted on the bottom swing-out hinge bracket and two supplies (numbers 1 and 2) are mounted on the middle swing-out hinge. Refer to Figure 6-10 if necessary while performing the removal/replacement procedures in this section. Perform the following steps:

1. Make sure the AC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Identify the power supply that is to be replaced. If replacing a failed power supply, the indicator LEDs on the power controller board should indicate the faulty supply. Refer to "Interpreting Power Controller Board LEDs" on page 4-10 for information on how to interpret the power controller board LEDs.

Removing (400 Amp, +5V Supply)

Perform the following steps to remove the supply:

1. At the power channel, disconnect the power cord for this power supply. Refer to Figure 6-10 for the plug location.

2. Loosen the thumb screws, then swing open the hinge bracket of the power supply that is to be replaced.

3. Remove the two screws and the protective cover over the AC power terminals of the power supply.

4. Refer to Figure 5-12 on page 5-38 if necessary while disconnecting the following wires and cables from the power supply:

   A. Loosen the screws and disconnect the three wires from the AC power terminals of the power supply.

   B. Disconnect the power/cooling signal cable from connector J1 of the power supply.

   C. Loosen and remove the brass nut, lockwasher, and washer, then disconnect the braided ground cable from the bracket connected to the negative (-) output of the power supply.

   D. Cut the two cable ties holding the plastic cover over the +5V output of the power supply.

   E. Loosen and remove the brass nut, lockwasher, and washer, then disconnect the braided ground cable from the bracket connected to the +5V (+) output of the power supply.

5. Loosen (but do not remove) the four screws securing the power supply to the hinge bracket.

6. Lift the power supply up enough to disengage it from the slots in the hinge bracket, then remove the power supply and set it aside.

Installing (400 Amp, +5V Supply)

If you are adding a +5V power supply to this cabinet, this is your starting point. Perform the following steps to remove the supply:

1. Ensure that the new/replacement power supply has four mounting screws loosely engaged on the side that will be mounted on the hinge bracket.

NOTE

> Either two or three +5V power supplies can be mounted on a hinge bracket depending on the side of the supply mounted to the bracket. If three supplies are to be mounted on a hinge bracket, the narrow sides (5-inches wide) of all three supplies must be mounted on the hinge bracket. If two supplies are to be mounted on a hinge bracket, the wide sides (8-inches wide) of both supplies must be mounted on the hinge bracket.

2. Position the supply on the hinge bracket so the mounting screws engage in the slots, then tighten the four mounting screws.

3. It might be necessary to transfer the power supply busbars from the removed power supply to the replacement supply before wiring the power supply. Refer to Figure 5-12 on page 5-38 if necessary while connecting the following wires and cables to the power supply:

   A. Connect the braided ground cable to the busbar stud connected to the negative (-) output of the power supply, then secure it using a brass nut, lockwasher, and washer.

   B. Connect the braided +5V cable to the busbar stud connected to the positive (+) output of the power supply, then secure it using a brass nut, lockwasher, and washer.

   C. Place the plastic cover over the +5V busbar of the power supply, then secure it using two cable ties.

   D. Connect the power/cooling signal cable to connector J1 of the power supply.

   E. Secure the three power cord wires to the AC power terminals of the power supply using the terminal screws.

   F. Secure the plastic shield to the standoffs of the AC terminals using two screws.

4. If this is a new (instead of replacement) power supply, perform the wiring routing procedures described in "DC Power Subsystem Cabling" on page 5-32 before continuing. Plug the power supply AC power cord into the proper outlet of the AC power channel assembly as indicated in Figure 6-10 on page 6-35.

5. Use the procedures described in "400 Amp, +5VDC Power Supply Adjustment" on page 3-11 to adjust the output of the replaced/new power supply.

6. Close the power supply hinge bracket and secure it using the captive thumb screws.

Removing/Replacing the 67 Amp +12VDC Power Supplies

WARNING

The output voltage for this supply, +12VDC, is not normally hazardous to humans, but the available current, 67 amps per supply, is more than enough to weld metal. Be careful to not allow any conductive objects near the outputs of a powered-up supply.

There are two 67 amp +12VDC power supplies installed in a standard Paragon XP/S system cabinet. The power supplies (numbers "A" and "B") are mounted on the top swing-out hinge of each cabinet. Refer to Figure 6-10 if necessary while performing the removal/replacement procedures in this section.

1. Make sure the AC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Identify the power supply that is to be replaced. If replacing a failed power supply, the indicator LEDs on the power controller board should indicate the faulty supply. Refer to "Interpreting Power Controller Board LEDs" on page 4-10 for information on how to interpret the power controller board LEDs.

3. At the power channel, disconnect the power cord for this power supply. Refer to Figure 5-3 on page 5-7 for the plug location.

4. Loosen the thumb screws, then swing open the top hinge bracket.

5. Remove the two screws and the protective cover over the AC power terminals of the power supply.

6. Refer to Figure 5-13 on page 5-43 if necessary while disconnecting the following wires and cables from the power supply:

   A. Loosen the screws and disconnect the two wires from the AC power terminals of the power supply and the screw connecting the ground terminal to the power supply chassis.

   B. Disconnect the signal cable from connector J1 of the power supply.

C. Loosen and remove the brass nut, lockwasher, and washer, then disconnect the ground cable from the negative (-) output stud of the power supply.

D. Loosen and remove the brass nut, lockwasher, and washer, then disconnect the power cable from the bracket connected to the positive (+) output stud of the power supply.

7. Loosen (but do not remove) the four screws securing the power supply to the hinge bracket.

8. Lift the power supply up enough to disengage it from the slots in the hinge bracket, then remove the power supply and set it aside.

9. Ensure that the new/replacement power supply has four mounting screws loosely engaged on the side that will be mounted on the hinge bracket. Transfer the mounting screws from the replaced supply if necessary.

10. Position the supply on the hinge bracket so the mounting screws engage in the slots, then tighten the four mounting screws.

11. Refer to Figure 5-13 on page 5-43 if necessary while connecting the following wires and cables to the power supply:

    A. Connect the ground cable to the negative (-) output stud of the power supply, then secure it using a brass nut, lockwasher, and washer.

    B. Connect the +12V cable to the positive (+) output stud of the power supply, then secure it using a brass nut, lockwasher, and washer.

    C. Connect the signal cable to connector J1 of the power supply.

    D. Secure the two power cord wires to the AC power terminals of the power supply using the terminal screws.

    E. Secure the ground wire of the power cord to the supply chassis using the supplied screw.

    F. Secure the protective cover over the AC power terminals using two screws.

12. If new wiring is required for this power supply, perform the wiring routing procedures described in "DC Power Subsystem Cabling" on page 5-32 before continuing. Plug the power supply AC power cord into the proper outlet of the AC power channel assembly as indicated in Figure 6-10 on page 6-35.

13. Use the procedures described in "67 Amp, +12VDC Power Supply Adjustment" on page 3-13 to adjust the output of the replaced/new power supply.

14. Close the power supply hinge bracket and secure it using the captive thumb screws.

Removing/Replacing the Power Controller Board

The power controller board is installed in each Paragon XP/S system cabinet. Refer to Figure 6-10 if necessary while performing the removal/replacement procedures in this section. Perform the following steps:

CAUTION

> Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure.

2. Open the rear door of the cabinet and (if necessary) loosen the captive thumb screws and swing the top hinge bracket open.

3. Refer to Figure 4-3 on page 4-7 to identify the power controller board cable locations, if necessary, then disconnect the following cables from the power controller board:

   A. Disconnect the power in, control power cable from connector J380.

   B. If connected, disconnect the power out, control power cable from connector J480.

   C. Disconnect the main power wiring harness cable from connector J180.

   D. Disconnect the LED control cable from connector J041.

   E. Disconnect the input scan string cable from connector J030.

   F. If connected, disconnect the output scan string cable from connector J130.

4. Remove the six pan head Phillips screws securing the power controller board to standoffs, then set the power controller board aside.

5. Make sure the replacement power controller board has been properly set up (refer to "Power Controller Board Setup" on page 4-5), then position it in front of the standoffs, and secure it using six pan head Phillips screws. Proper setup implies setting the board jumpers to enable system shutdown based on certain fault indications. Jumpers must also be set to match the power supplies used in each cabinet.

6. Refer to Figure 4-3 on page 4-7 to identify then connect the following cables to the power controller board:

A. Connect the input scan string cable to connector J030.

B. If there are additional cabinets beyond this one, connect the output scan string cable to connector J130.

C. Connect the main power wiring harness cable to connector J180.

D. Connect the LED control cable to connector J041.

E. If there are additional cabinets beyond this one, connect the "Power Out" control power cable to connector J480.

F. Connect the "Power In" control power cable to connector J380.

7. Close the hinge bracket and secure it using the captive thumb screws. Close the rear door of the cabinet.

Removing/Replacing the Control Power Supply

The control power supply is an open frame 26 amp, +5V supply that is only installed in cabinet 0 of most multicabinet Paragon XP/S systems. In special cases (usually very large systems) a Paragon XP/S system might have more than one control power supply. Check with the system administrator or on-site PSE to determine if there is more than one control power supply in this system.

The control power supply powers all of the power controller boards (and only those boards) in the Paragon XP/S system. The control power supply uses a different AC and DC power path from the other Paragon XP/S system supplies, so the power controller boards are still powered up when the other parts of the Paragon XP/S system have been powered down.

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Refer to Figure 6-10 if necessary while performing the removal/replacement procedures in this section. Perform the following steps:

1. Make sure the DC power has been turned OFF. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure.

2. Open the rear door for cabinet 0, then loosen the captive thumb screws and swing the top and bottom hinge brackets open.

3. Identify the control power supply AC power cord (see Figure 6-10 on page 6-35), then disconnect the cord plug from the AC power channel. The control power supply should be plugged into the sixth outlet from the left on the top row of the AC power channel.

4. Refer to Figure 5-16 on page 5-54 for terminal locations, then disconnect the AC input wires and DC output cable from the control power supply terminals. It is not necessary to remove the bleed resistor assembly from the control power supply until it is transferred to the replacement supply.

5. Remove the power controller board as described in "Removing/Replacing the Power Controller Board" on page 6-40. If adequate support can be provided for the board, it is not necessary to disconnect the cables from the power controller board.

6. Loosen the four pan head Phillips screws securing the control power supply to the hinge bracket, then lift the supply out of its mounting slots, remove it, and set it aside.

7. Remove the four flat head Phillips screws securing the cover to the replacement control power supply, then remove the cover.

CAUTION

Make sure the control power supply is set up to operate with 220 VAC power. If the control power supply is set up to use the wrong input voltage, it will be damaged when powered up.

8. Make sure that the power supply jumper is set to 220 VAC input voltage and the "220V" label is in place on the cover, then replace the cover and secure it using four flat head Phillips screws.

9. Transfer the bleed resistor assembly from the removed control power supply to the replacement one. Be sure to use the same terminals as indicated in Figure 5-16 on page 5-54.

10. Loosely install four pan head Phillips mounting screws on the back of the control power supply, then mount it to the slots of the hinge bracket. Tighten the mounting screws.

11. Position the power controller board over the mounting standoffs of the hinge bracket, then secure it using six pan head Phillips screws. If you did not disconnect any power controller board cables, proceed to the next step. If you did disconnect the cables, follow the procedures described in "Removing/Replacing the Power Controller Board" on page 6-40 to connect the cables to the power controller board.

12. Refer to Figure 5-16 on page 5-54 for terminal locations, then connect the AC input wires and DC output cable to the control power supply terminals.

CAUTION

Once the AC power cord is plugged in, power will be applied through the control power supply to every power controller board in the Paragon XP/S system. If you do not want to distribute this power at this time, turn OFF the main breaker of cabinet 0.

13. Identify the control power supply AC power cord (see Figure 6-10 on page 6-35), then plug the cord into the AC power channel. The existing cord should still be routed, tied, and waiting in the cabinet. The control power supply should be plugged into the sixth outlet from the left on the top row of the AC power channel.

14. Use the procedures described in "Power Controller +5VDC Power Supply Adjustment" on page 3-19 if necessary to adjust the output of the replaced power supply.

15. Close the power supply hinge brackets and secure them using the captive thumb screws. Close the rear door of cabinet 0.

Removing/Replacing the DC-DC Convertors

A DC-DC convertor assembly contains two DC-DC convertor modules, two voltage adjustment potentiometers, terminal blocks, diodes, and interconnect wiring. An out-of-tolerance condition or other monitored fault will cause one or both of the corresponding indicator LEDs (on the power controller board) to light. The entire DC-DC convertor assembly must be replaced if either of the DC-DC convertors fails.

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

The removal/replacement of both the -12V and -5.2 DC-DC convertor assemblies is described in this section. Both assemblies are the same except for the module type and some wiring. Perform the following steps:

1. Make sure the DC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the rear door of the cabinet and (if necessary) loosen the captive thumb screws and swing the top hinge bracket open.

3. Identify the DC-DC convertor assembly that is to be replaced. When facing the power controller board, the -12V DC-DC convertor assembly is on the left (hinge-side) and the -5.2V DC-DC convertor assembly is immediately to its right.

4. Remove the power controller board as described in "Removing/Replacing the Power Controller Board" on page 6-40. If adequate support can be provided for the board, it is not necessary to disconnect the cables from the power controller board.

5. Loosen (but do not remove) the four screws securing the DC-DC convertor assembly to the hinge bracket, then lift and remove the DC-DC convertor assembly as much as the attached wiring allows.

NOTE

The following steps transfer the DC-DC convertor assembly wiring from the existing assembly to the replacement assembly. This might make it necessary to remove some wires that are included with the replacement assembly. If you must replace the wiring along with the DC-DC convertor assembly, you will need to route and dress the replacement wires. Refer to "DC-DC Convertor Cabling" on page 5-47 for the appropriate procedures.

6. Refer to Figure 5-14 on page 5-47 for terminal/wire locations if necessary, then transfer the following wires to the replacement DC-DC convertor assembly:

   A. Disconnect plug P17 (-5.2V assembly) or P18 (-12V assembly) from the main power wiring harness.

   B. Transfer the single black ground wire from the terminal block 1B terminal to the corresponding terminal of the replacement assembly.

   C. Transfer the convertor black ground wires to the corresponding terminals of the replacement assembly.

   D. Transfer the convertor yellow +12V wires to the corresponding terminals of the replacement assembly.

   E. Transfer the output wire (white for -5.2V or blue for -12V) from the terminal block 4A terminal to the corresponding terminal of the replacement assembly.

   F. Make sure all terminal screws are tight, then connect plug P17 (-5.2V assembly) or P18 (-12V assembly) to the main power wiring harness.

7. Make sure four mounting screws are loosely secured to the back of the DC-DC convertor assembly, then position it on the hinge bracket slots and tighten the screws.

8. Position the power controller board over the mounting standoffs of the hinge bracket, then secure it using six pan head Phillips screws. If you did not disconnect any power controller board cables, proceed to the next step. If you did disconnect the cables, follow the procedures described in "Removing/Replacing the Power Controller Board" on page 6-40 to connect the cables to the power controller board.

9. Use the procedures described in "-5.2V DC-DC Convertor Output Voltage Adjustment" on page 3-15 or "-12V DC-DC Convertor Output Voltage Adjustment" on page 3-18 if necessary to adjust the output of the replaced convertor(s).

10. Close the power supply hinge bracket and secure it using the captive thumb screws. Close the rear door of the cabinet.

Removing/Replacing Diagnostic Station Components

The Paragon XP/S system diagnostic station is a FRU by itself and is normally replaced as a unit. A failure of any part of the diagnostic station makes it necessary to replace the entire unit.

CAUTION

While performing the procedures in this section the DC power (at a minimum) to the cabinet must be turned OFF. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the DC or AC power to the cabinet before performing any replacement procedures.

Replacing the Entire Diagnostic Station

The entire diagnostic station (with attached cables, keyboard, and trackball mouse) is a field replaceable unit (FRU). The following procedures describe how to remove and replace the diagnostic station.

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Removing (Diagnostic Station Assembly)

Perform the following steps to remove the diagnostic station:

1. Make sure the DC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet (the diagnostic station is normally installed only in cabinet 0), then unlatch the Diagnostic station and swing it fully open. Switch the Diagnostic station power switch to the OFF (0) position

3. Disconnect the door stop arm from the side of the cabinet so the diagnostic station assembly can swing fully open.

4. Loosen and remove four black Phillips screws, then remove the cosmetic plate over the top front of the cabinet. This plate prevents the diagnostic station from being lifted off its hinge pins.

5. Cut any securing cable ties holding the diagnostic station AC power, serial, ethernet, and scan cables to the cabinet.

6. Open the cabinet rear door, then disconnect the diagnostic station AC power cable from its AC power channel outlet (upper right outlet). Feed the power cable under the base of the node bay plenum and through to the front of the cabinet.

NOTE

It will be necessary to swing one or more of the power supply hinge brackets open in order to gain access to most of the connectors to which the diagnostic station cables are connected.

7. Disconnect each of the scan cables from the J58 connectors (left-hand center) of the backplanes. Feed these scan cables around the side of the node bay plenum and through to the front of the cabinet.

8. Disconnect the scan cable from connector J030 of the power controller board. Feed this scan cable around the side of the node bay plenum and through to the front of the cabinet.

9. Loosen the captive hardware, then disconnect the diagnostic station serial cable from the serial connector of the MIO node at the default location of 00D03.

10. Loosen the securing screws, remove the I/O panel, disconnect the ethernet cable from the diagnostic station ethernet cable at location 6B, then disconnect the diagnostic station ethernet cable from the I/O panel.

11. Lift the diagnostic station assembly until the hinge pins disengage, then remove the diagnostic station and set it aside.

Installing (Diagnostic Station Assembly)

The following procedure assumes that a diagnostic station has just been removed from the cabinet and required parts have already been removed. If you are adding a diagnostic station to a cabinet that previously did not contain one, some additional preparation might be necessary. Review the removal procedures to determine any additional parts that might need to be removed. Perform the following steps to install a diagnostic station in the cabinet.

1. With a helper (if necessary), lift the replacement diagnostic station into position and onto the cabinet hinge pins.

2. Connect the serial cable to the 9-pin serial connector of the MIO node in slot 00D03 (default location), and secure it using the captive hardware.

3. Connect the diagnostic station to the Ethernet LAN as follows:

   A. Loosen the securing screws and remove the I/O panel.

   B. Connect the Ethernet cable of the diagnostic station to location 6B of the I/O panel.

   C. Connect the external Ethernet cable to the diagnostic station Ethernet cable and secure it using the captive hardware.

   D. Reinstall the I/O panel in the base of the cabinet and secure it using four Phillips screws.

4. Connect the diagnostic station AC power cable as follows:

   A. Route the AC power cord to the base of the cabinet and tie it to the tie mount at the left base of the cabinet.

   B. Ensure the diagnostic station power switch is turned OFF (0), and that the cabinet DC power is OFF.

   C. Route the AC power cord under the left side of the node bay plenum, and up to the AC power channel.

   D. Open the rear door of the cabinet, then plug the diagnostic station AC power cord into the top right outlet of the AC power channel.

5. Connect the diagnostic station scan string cables as follows:

   A. Route the scan string cables along the side of the cabinet (between the cardcage and cabinet sides) to the rear area of the cabinet.

   B. Open the cabinet rear door and connect the scan string cables as follows:

      1) Connect the cable labelled "C" to connector J030 of the power controller board.

2) Connect the cable labelled "A" to connector J58 of the bottom backplane.

3) Connect the cable labelled "B" to connector J58 of the backplane second from the bottom.

4) Connect the cable labelled "D" to connector J58 of the backplane second from the top.

5) Connect the cable labelled "E" to connector J58 of the top backplane.

C. Dress the scan string cables and secure them as necessary using cable ties.

6. Dress the remaining diagnostic station cables along the right side of the cabinet peripheral bay, and secure them to the cabinet side rails using cable ties.

7. Connect the door stop arm to the side of the cabinet to restrict opening ability of the diagnostic station assembly.

8. Secure the cosmetic plate over the top front of the cabinet using four black Phillips screws.

9. Turn the diagnostic station power switch (on the back of the assembly) to ON (1).

Removing/Replacing Node Bay Components

The replaceable node bay components include any boards installed in a cardcage and the backplane of the cardcage. Other node bay components (such as cardcage rails) are also replaceable, but they are not defined as field replaceable units (FRUs) in the Paragon system.

Replacing Node Boards

It is necessary to replace a node board (i.e., one of the boards installed in the Paragon system cardcage) when the board is reported as faulty by the operating system, by the door or front panel LEDs, or by the Paragon system diagnostics (PSD). You might also replace a node board in response to a field change order, as part of a field upgrade, or as part of your normal fault isolation procedures.

CAUTION

Use care when removing and inserting boards in the Paragon system cardcage. The connector pins of the board connector, of the backplane, or both can be damaged if the board is not properly aligned during insertion. The only authorized remedy to this problem (assuming the bent pins cannot be straightened) is to replace the board or the backplane).

Perform the following steps to remove and replace any boards installed in a Paragon system cardcage:

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

1. Make sure the DC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet, then unlatch and swing open (if necessary) any diagnostic station or peripheral module that is blocking access to the board(s) being replaced.

3. Identify the board that is to be replaced. Refer to "Numbering Conventions" on page 2-16 for information on converting a node identification (from the LEDs, the operating system, or the diagnostics) to a physical location.

4. If this board has any cables attached to its front panel, loosen any securing hardware, disconnect each cable, and move it out of the way.

5. Loosen the captive screws at the top and bottom of the node board front panel.

6. Push the card ejectors (at the top and bottom of the node board front panel) apart, then remove the node board. After removal, place the board in an antistatic bag to minimize chances of ESD damage.

7. Remove the replacement node board from its antistatic bag and carefully position it in the card guides for the slot.

8. Push the node board back in its slot until the pins begin to engage, then press on the front panel until the board is fully seated. The board is properly seated when its front panel is even with other front panels in this cardcage, and the card ejectors have returned to their upright position.

9. Secure the board in its slot by tightening the two captive screws on the front panel.

10. If there are any cables associated with this board, connect each cable to the appropriate front panel connector, and secure it using the captive hardware.

11. Close and secure the diagnostic station and/or peripheral module, and then the cabinet front door prior to powering up the Paragon system.

Replacing a Cardcage Backplane

The cardcage backplane might need to be removed if it is necessary to straighten a bent flex cable connector pin. The backplane might need replacement when it is reported as faulty by the operating system or by the Paragon system diagnostics (PSD). You might also replace a backplane in response to a field change order, as part of a field upgrade, or as part of your normal fault isolation procedures.

CAUTION

While performing the procedures in this section the DC power (at a minimum) to the cabinet must be turned OFF. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the DC or AC power to the cabinet before performing any replacement procedures.

Removing (Backplane)

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Perform the following steps to remove the Paragon system cardcage backplane:

1. Make sure the DC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet, then unlatch and swing open (if necessary) any diagnostic station or peripheral module that is blocking access to the cardcage of the backplane being replaced.

3. Loosen the captive front panel screws of all node boards in the cardcage, then push apart the card ejectors of each node board in the cardcage. All node boards must be disengaged from their backplane connectors, but it is not necessary to remove the boards from their slots.

4. Open the rear door of the cabinet, then loosen the captive thumbscrews and swing open the hinge brackets of any power supplies that obstruct access to the backplane being replaced.

5. Perform the following steps to disconnect any cables connected to the backplane:

   A. Disconnect the input scan string cable (from the diagnostic station or the next lower-numbered cabinet) at connector J58 and position it out of the way.

   B. If applicable, disconnect the output scan string cable from connector J59 and position it out of the way.

CAUTION

Due to the stiffness of flex cables and the fragility of the connector pins, use extra care when disconnecting and reconnecting these cables. The flex cables should be completely disconnected (at both ends) while the backplane is being replaced. If the flex cables remain connected at one end during backplane replacement, the cable/connector is more likely to be damaged.

C. If applicable, disconnect the flex cables connected to the "north" connectors (J23/J24) and the "south" connectors (J19/J20) and set them aside. One of these flex cable pairs will not be installed if this is the top or bottom cardcage in the cabinet.

D. If applicable, disconnect the flex cables connected to the "east" connectors (J21/J22) and the "west" connectors (J17/J18) and position them out of the way. One or both of these flex cable pairs will not be installed if this is the only or the end cabinet in the Paragon system.

E. Disconnect the LED signal cable from connector J57 and position it out of the way.

F. Disconnect the power and control cable from connector J26 and position it out of the way.

6. Remove the protective shield over the cabinet busbars, then remove the Phillips machine screws and lockwashers securing the Vbar-to-cardcage busbars to the cabinet busbars.

7. Remove six Phillips screws on the top and six Phillips screws on the bottom securing the backplane to the cardcage, then remove the backplane and set it aside.

Installing (Backplane)

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Perform the following steps to install the Paragon system cardcage backplane:

1. If you are replacing the backplane, transfer the Vbar-to-cardcage busbars from the faulty backplane to the replacement backplane. If necessary, also transfer the busbar shields and associated hardware to the replacement backplane.

2. Position the replacement backplane over the back of the cardcage, then loosely secure it using six Phillips screws and washers on the top, and six Phillips screws and washers on the bottom of the backplane.

CAUTION

The alignment of the backplane slot connectors with the card guides is critical. Improper alignment can result in undue mechanical stress on node boards, failure of node boards to seat, or connector pin damage during board insertion.

3. Using an approved alignment tool or a scrap node board (if available) as an alignment tool, insert the alignment node board into the third slot from the left (viewed from the front).

CAUTION

Do not insert the alignment node board completely until the backplane is properly aligned with the cardcage.

4. Move the backplane until the alignment node board inserts freely without the backplane connector being moved by the alignment node board alignment pin. After checking the corresponding alignment at the other end of the cardcage (third slot from the right), tighten the twelve screws securing the backplane to the cardcage.

5. Secure the Vbar-to-cardcage busbars to the cabinet busbars using two Phillips machine screws and lockwashers, then reinstall the protective shield over this section of the cabinet busbars.

6. Connect cables to the backplane as follows:

   A. Connect the input scan string cable (from the diagnostic station or the next lower-numbered cabinet) to connector J58.

   B. If applicable, connect the output scan string cable (to the next cabinet in the system) to connector J59. This cable will not be installed if this is the only or the end cabinet in the Paragon system.

   C. If applicable, connect the flex cables between the "north" connectors (J23/J24) and next higher cardcage or between the "south" connectors (J19/J20) and next lower cardcage. One of these flex cable pairs will not be installed if this is the top or bottom cardcage in the cabinet.

   D. If applicable, connect the flex cables between the "east" connectors (J21/J22) and the next lower-numbered cabinet, or between the "west" connectors (J17/J18) and the next higher-numbered cabinet. One or both of these flex cable pairs will not be installed if this is the only or the end cabinet in the Paragon system.

   E. Connect the LED signal cable to connector J57.

   F. Connect the power and control cable to connector J26.

7. Swing any open power supply hinge brackets closed and secure them with the captive thumb screws.

8. Open the cabinet front door and reinstall all the node boards that were originally removed from this cardcage.

Removing/Replacing Peripheral Bay Components

The replaceable peripheral bay components include the SCSI hard disk drives, the DAT tape drive(s), the RAID controller/SCSI backplane(s), SCSI/DIN adapters, and an entire peripheral module assembly. The SCSI/DIN adapter (either original or flex assembly) is removed when the hard disk or tape drive is replaced. Use the procedures of "Replacing a RAID SCSI Hard Disk Drive" on page 6-62 or "Replacing the SCSI DAT Tape Drive" on page 6-66 if necessary in order to replace a SCSI/DIN adapter.

CAUTION

While performing the procedures in this section the DC power (at a minimum) to the cabinet must be turned OFF. Follow an appropriate shutdown procedure as described in the *Paragon™ System Administrator's Guide*, then turn OFF the DC or AC power to the cabinet before performing any replacement procedures. Before replacing a hard disk, back up the data and have the back-up media ready so that you can copy the data back to the logical unit.

Replacing the Peripheral Module Assembly

An entire peripheral module assembly might need to be removed from or added to the Paragon system if the I/O facilities of the system are being changed. Other than a mechanical failure, there is little possibility that a reported fault would merit replacement of an entire peripheral module assembly. The peripheral module assembly itself is not identified as a field replaceable unit (FRU) for the Paragon system.

Removal (Peripheral Module Assembly)

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Perform the following steps to remove an entire peripheral module assembly:

1. Make sure the DC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Open the front door of the cabinet, then unlatch and swing open the peripheral module that is being replaced.

3. Reach behind the peripheral module and disconnect the module power cable from the mating connector that is mounted on the side of the cabinet.

4. Disconnect the SCSI signal cable(s) from each MIO node controlling drives in this peripheral module.

5. Cut any cable ties (other than those on the peripheral module) that hold the SCSI signal cable to points on the cabinet.

6. Reach around the peripheral module and disconnect the door stop arm from the side of the cabinet so the peripheral module assembly can swing fully open.

7. Get assistance if necessary, then carefully lift the peripheral module assembly off of its hinge pins and move it to a flat work surface.

Installation (Peripheral Module Assembly)

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Perform the following steps to install an entire peripheral module assembly in a Paragon system cabinet:

1. Get assistance if necessary, then carefully position the peripheral module hinges over the cabinet hinge pins, and lower it until it engages and can swing freely.

2. Reach around the peripheral module and connect the door stop arm to the side of the cabinet.

3. Reach behind the peripheral module and connect the module power cable to the mating connector that is mounted on the side of the cabinet.

4. Connect the SCSI signal cable(s) to each MIO node that controls drives in this peripheral module.

5. Swing the peripheral module assembly closed and secure it using the captive latching hardware.

Configuring SCSI Disk and Tape Drives

Before installing a SCSI hard disk drive or a SCSI DAT tape drive in a Paragon system peripheral module, the drive configuration must be changed and/or verified to make sure it will operate properly in the system. Perform the procedures in this section to configure the RAID hard disk drives and DAT tape drives prior to installation in the Paragon system peripheral module.There are currently two DAT tape drive models and three SCSI hard disk drive models that are qualified for installation in a Paragon XP/S system peripheral module. The configuration process for these drives involves the following processes:

- Verify proper jumper selections on either the SCSI hard disk drive or the DAT tape drive.
- Verify proper option switch selections on the DAT tape drive.
- Verify the presence or absence of termination resistors on the drive, as necessary.

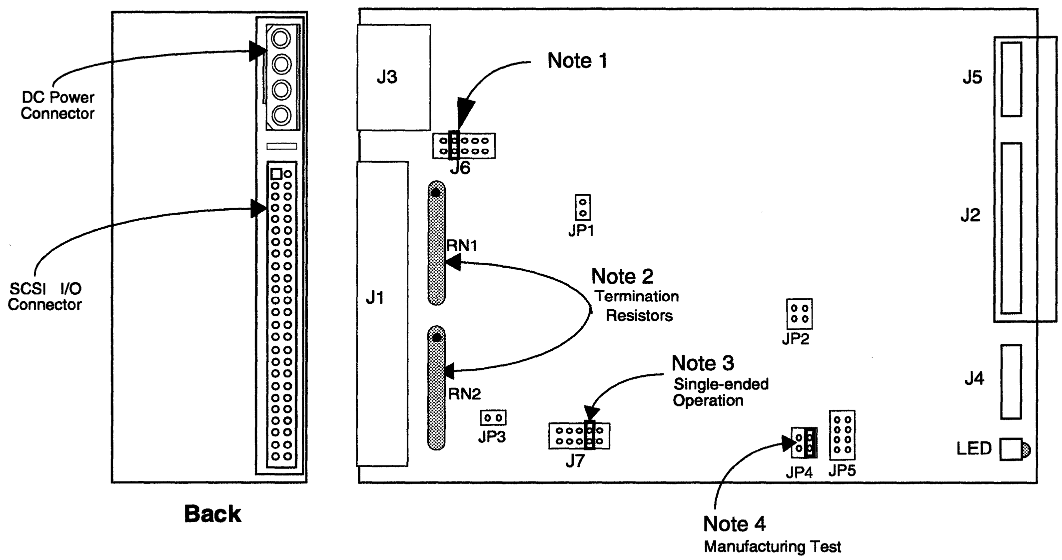
CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

The following subsections apply to each of the qualified drives for the Paragon XP/S system peripheral modules. Refer to the subsection that applies to the drive being installed, then configure the drive as described.

Configuring 1.2G-Byte Maxtor Hard Disk Drives

The 1.2G-byte Maxtor hard disk drive is the drive used in the RAID arrays of earlier Paragon XP/S systems. This is a 3.5-inch disk drive that is installed as one of five drives in a RAID array. All drives in a given five-drive array must be of the same capacity, and should also be the same model (i.e., all 1.2G-byte Maxtor drives in an array). Each drive must be set up with a SCSI ID of "0", parity enabled, and with single ended operation enabled. In addition, each installed RAID drive must have termination resistors installed. Refer to Figure 6-11 for detailed configuration information on the Maxtor 1.2G-byte hard disk drive.



Notes:

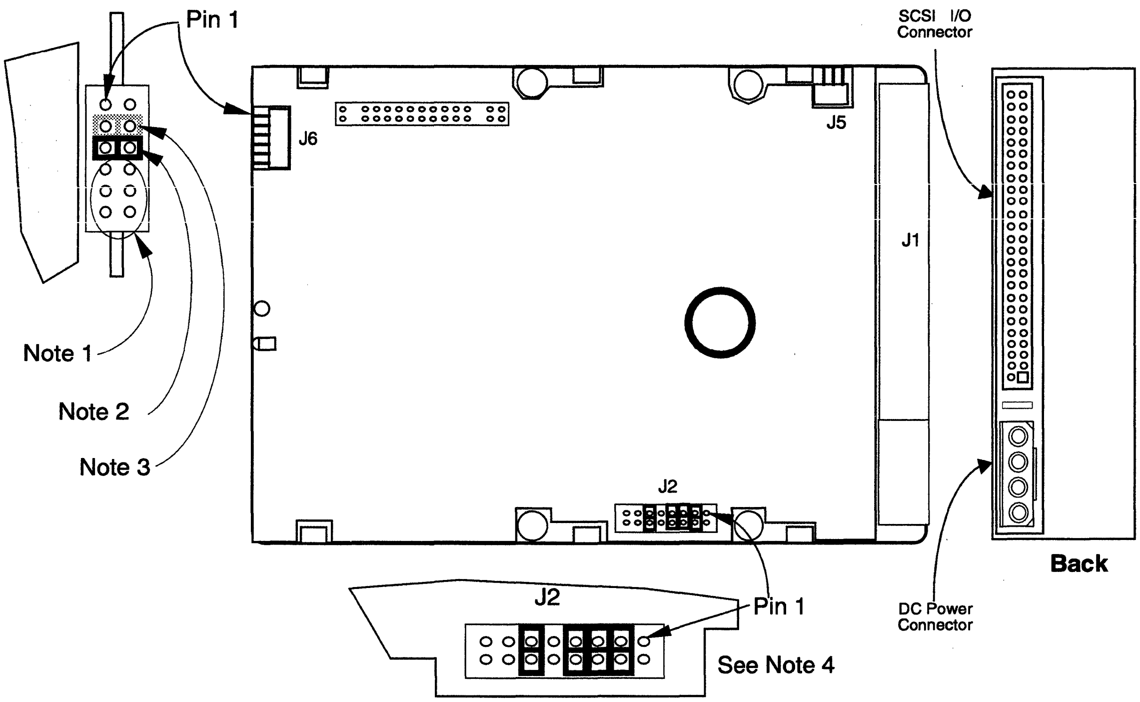
1. Jumpers are installed to set the default SCSI ID of this drive. In RAID applications for the Paragon XP/S system, no SCSI ID jumpers (SCSI ID of "0") are installed. A jumper is installed at J6 7-8 to enable parity.
2. Termination resistors must installed in the location and orientation shown.
3. The jumper installed at J7 3-4 sets the drive up for single-ended (instead of differential) SCSI I/O signals.
4. Jumper blocks JP1, JP2, JP4, and JP5 are for manufacturing only. There should be only one jumper installed in any of these blocks, at JP4 2-4.

Figure 6-11. Configuring 1.2G-Byte Maxtor Hard Disk Drives

Configuring 1.0G-Byte Seagate Hard Disk Drives

The 1.0G-byte Seagate hard disk drive is the drive used in the RAID arrays of newer Paragon XP/S systems. The 1.0G-byte drive was adopted to allow the Paragon XP/S system to use the cardinal-sized drives that have become industry standards. This is a 3.5-inch disk drive that is installed as one of five drives in a RAID array. All drives in a given five-drive array must be of the same capacity, and should also be the same model (i.e., all 1.0G-byte Seagate drives in an array).

Each drive must be set up with a SCSI ID of "0", the "Sync Spindle" jumper installed, motor start on command enabled, and with terminators enabled. Refer to Figure 6-12 for detailed configuration information on the Seagate 1.0G-byte hard disk drive.



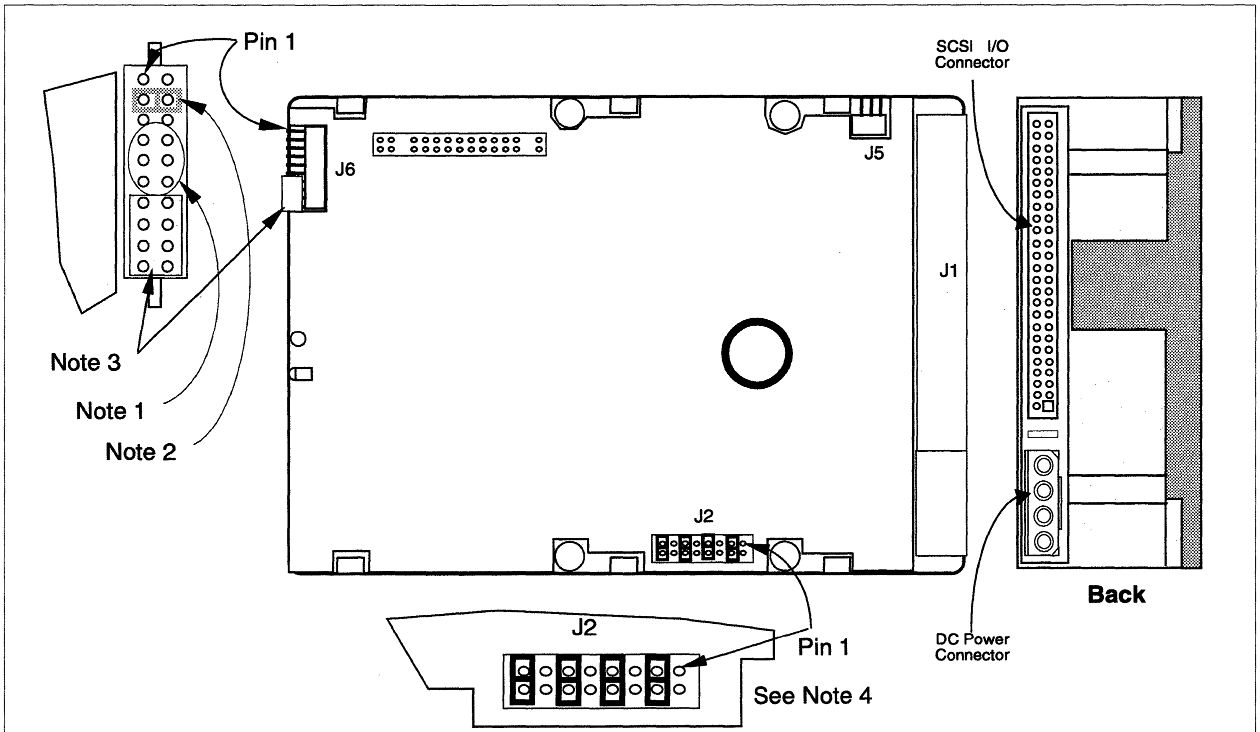
Notes:

1. Jumpers are installed to set the default SCSI ID of this drive. In RAID applications for the Paragon XP/S system, no SCSI ID jumpers (SCSI ID of "0") are installed.
2. The "Sync Spindle" jumper installed at J6 5-6 is required.
3. A header can be attached at J6 3-4 to connect a remote LED indicator. The LED cathode connects to J6, pin 4.
4. The drive option jumper block, J2, must be jumpered as shown for RAID applications in the Paragon XP/S system. The jumpers enable the following options:
   - J2, 3-4 Terminator power from drive.
   - J2, 5-6 Enable terminators.
   - J2, 7-8 Enable parity option.
   - J2, 11-12 Enable motor start on command.

Figure 6-12. Configuring 1.0G-Byte Seagate Hard Disk Drives

Configuring 4.0G-Byte Seagate Hard Disk Drives

The 4.0G-byte Seagate hard disk drive is used in the RAID arrays of newer Paragon XP/S systems. This is a 3.5-inch disk drive that is installed as one of five drives in a RAID array. All drives in a given array must be of the same capacity, and should also be the same model (i.e., all 4.0G-byte Seagate drives in an array). Each drive must be set up with a SCSI ID of "0", terminators enabled, motor start on command enabled, parity enabled, and with terminator power from the drive selected. Refer to Figure 6-13 for detailed configuration information on the Seagate 4.0G-byte hard disk drive.



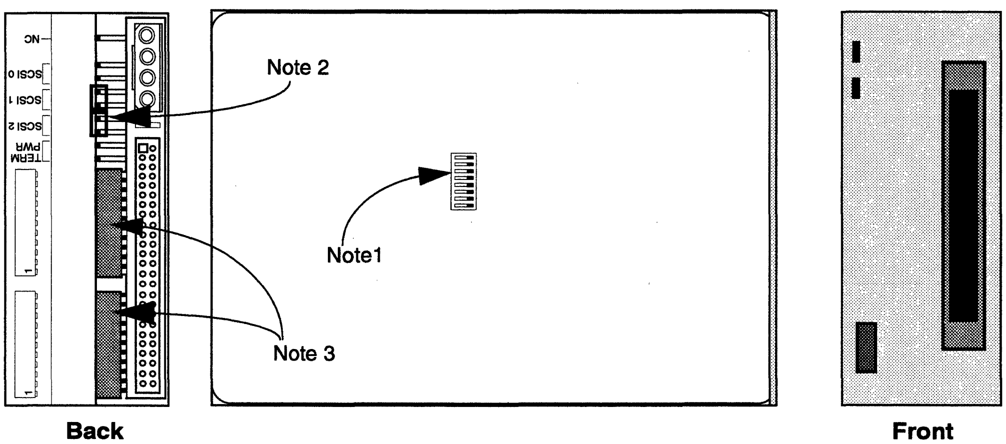
Notes:

1. Jumpers are installed to set the default SCSI ID of this drive. In RAID applications for the Paragon XP/S system, no SCSI ID jumpers (SCSI ID of "0") are installed.
2. A header can be attached at J6 3-4 to a remote LED indicator. The LED cathode connects to J6, pin 4.
3. Shipped with cover installed. These jumper pairs, plus J6 1-2 and J6 5-6, are reserved.
4. The drive option jumper block, J2, must be jumpered as shown for RAID applications in the Paragon XP/S system. The jumpers enable the following options:
   - J2, 3-4 Terminator power from drive.
   - J2, 7-8 Enable parity option.
   - J2, 11-12 Enable motor start on command.
   - J2, 15-16 Enable terminators.

Figure 6-13. Configuring 4.0G-Byte Seagate Hard Disk Drives

Configuring HP Model 35470 DAT Tape Drives

The HP Model 35470 DAT tape drive is the drive used in earlier Paragon XP/S systems. This drive is normally installed above a RAID array in the peripheral module. The first DAT drive in the peripheral module is normally set up with a SCSI ID of "6" and with all option switches set to "ON". If installed, a second DAT drive will have a SCSI ID of "5", and any subsequent drives will have successively lower SCSI ID numbers (and, therefore, lower arbitration priority). In addition, the final installed DAT tape drive on each SCSI bus must have termination resistors installed. Refer to Figure 6-14 for detailed configuration information on the HP Model 35470 DAT tape drive.



Notes:

1. Option switches 1 through 8 are all set to "ON", as indicated, for Paragon XP/S system applications.
2. Jumpers are installed, as indicated, to set the default SCSI ID of this drive to "6". Possible SCSI ID settings (0 = no jumper, 1 = jumper installed) are as follow:

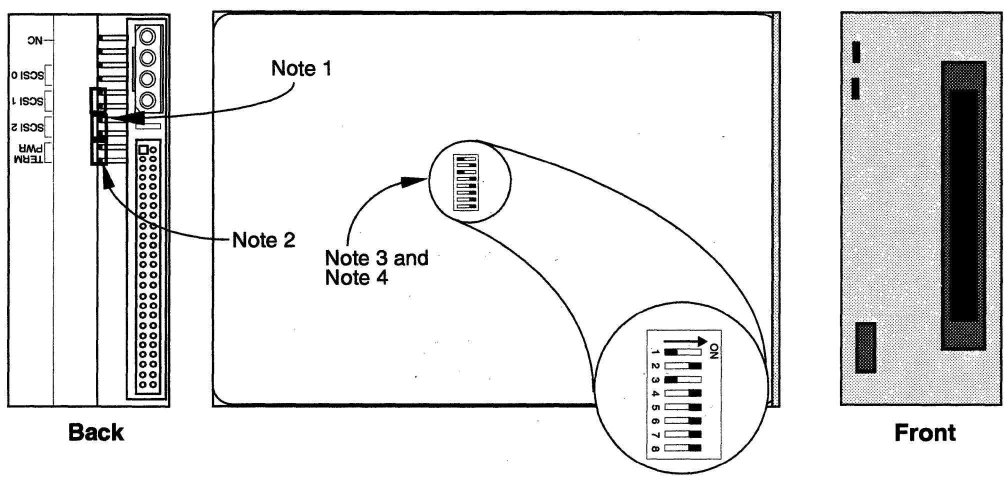
SCSI ID	Bit 2	Bit 1	Bit 0	SCSI ID	Bit 2	Bit 1	Bit 0
0	0	0	0	**4**	1	0	0
1	0	0	1	**5**	1	0	1
2	0	1	0	**6**	1	1	0
3	0	1	1	**7**	1	1	1

3. Termination resistor SIP's must be installed in the indicated locations when the drive is the end device on a SCSI bus. Ensure SIP pin 1 is oriented as indicated on the drive back panel.

Figure 6-14. Configuring HP Model 35470 DAT Tape Drives

Configuring HP Model C1533 DAT Tape Drives

The HP Model C1533 DAT tape drive is a faster drive than the Model 35470 drive used in earlier Paragon XP/S systems. This drive is normally installed above a RAID array in the peripheral module. The first DAT drive in the peripheral module is normally set up with a SCSI ID of "6". If installed, a second DAT drive will have a SCSI ID of "5", and any subsequent drives will have successively lower SCSI ID numbers (and, therefore, lower arbitration priority). An in-line terminator must be installed on the SCSI connector of the end tape drive on the SCSI bus. Refer to Figure 6-15 for detailed configuration information on the HP Model C1533 DAT tape drive.



Notes:

1. Jumpers are installed as indicated to set the default SCSI ID of this drive to "6". Possible SCSI ID settings (0 = no jumper, 1 = jumper installed) are as follow:

SCSI ID	Bit 2	Bit 1	Bit 0	SCSI ID	Bit 2	Bit 1	Bit 0
0	0	0	0	**4**	1	0	0
1	0	0	1	**5**	1	0	1
2	0	1	0	**6**	1	1	0
3	0	1	1	**7**	1	1	1

2. Terminator power is enabled using the indicated jumper. External terminators must be used.
3. With Option switch 1 OFF and switch 2 ON as indicated, compression is disabled at power-on and the host is allowed to control compression.
4. With Option switch 3 OFF as indicated, the Media Recognition System is active. Non-Media Recognition System tapes are treated as if they are write-protected.

Figure 6-15. Configuring HP Model C1533 DAT Tape Drives

Replacing a RAID SCSI Hard Disk Drive

The Paragon system uses hard disks in two different areas; in the diagnostic station and in Redundant Array of Inexpensive Disks (RAID) arrays.

The diagnostic station uses either a 535M-byte or a 540M-byte SCSI hard disk drive. The diagnostic station hard disk drive is not a FRU (i.e., you must replace the entire diagnostic station if a hard disk fails).

The RAID arrays contain 1.2G-byte, 1.0G-byte, or 4.0G-byte SCSI hard disk drives that are FRUs and can be replaced. The Paragon system peripheral module can contain SCSI hard disk drives (in a RAID array) and DAT tape drives. The SCSI hard disk drives are first installed in a drive carrier before being mounted in the peripheral module. One or more DAT tape drives are first installed in a drive skid, and the skid is then mounted in the peripheral module. The following sections provide detailed procedures for installing or replacing drives in the Paragon system peripheral module.

The SCSI hard disk drives in a RAID array operate as fault tolerant units, so disk replacement is usually not performed in response to some catastrophic failure, but rather after the number of detected errors exceeds allowable limits. One of the SCSI hard disks in a RAID array might need replacement when it is reported as faulty by the operating system, by the RAID utilities, or by the Paragon system diagnostics (PSD). You might also replace a SCSI hard disk drive in response to a field change order, as part of a field upgrade, or as part of your normal fault isolation procedures.

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Refer to Figure 6-16 on page 6-63 and Figure 6-18 on page 6-67 while performing the procedures in this section. Perform the following steps to remove and/or install a SCSI hard disk drive from the Paragon system peripheral module:

1. Make sure the DC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

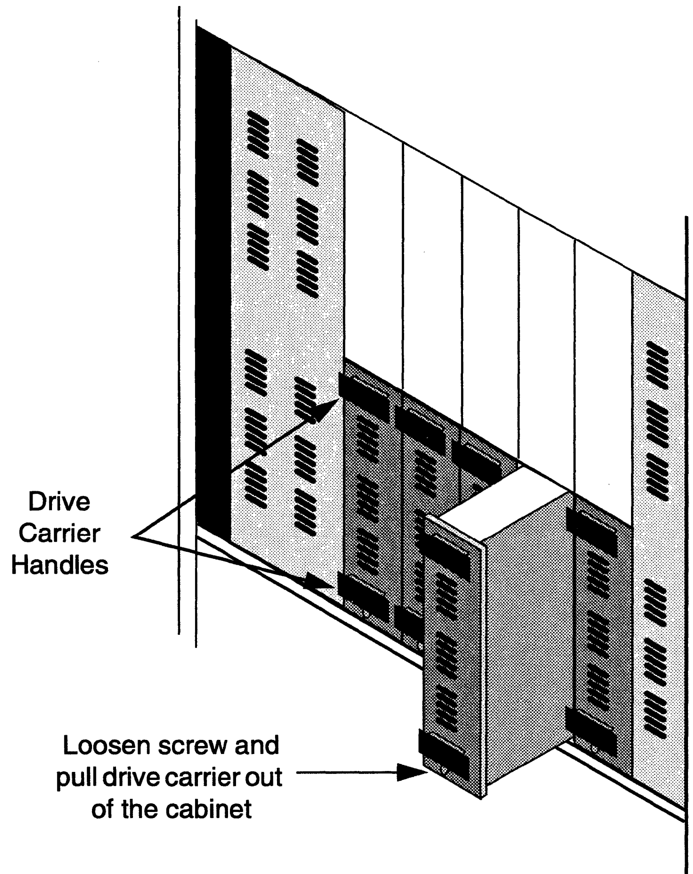


Figure 6-16. Removing a Drive from the Peripheral Module

2. Loosen the screw at the base of the drive carrier, and pull the drive carrier out of the cabinet using the drive carrier's handles (see Figure 6-16). Place the carrier assembly on a stable, flat, ESD-protected surface.

3. Unscrew the two screws holding the SCSI/DIN adapter board or the SCSI/DIN flex adapter to the drive carrier (see Figure 6-17).

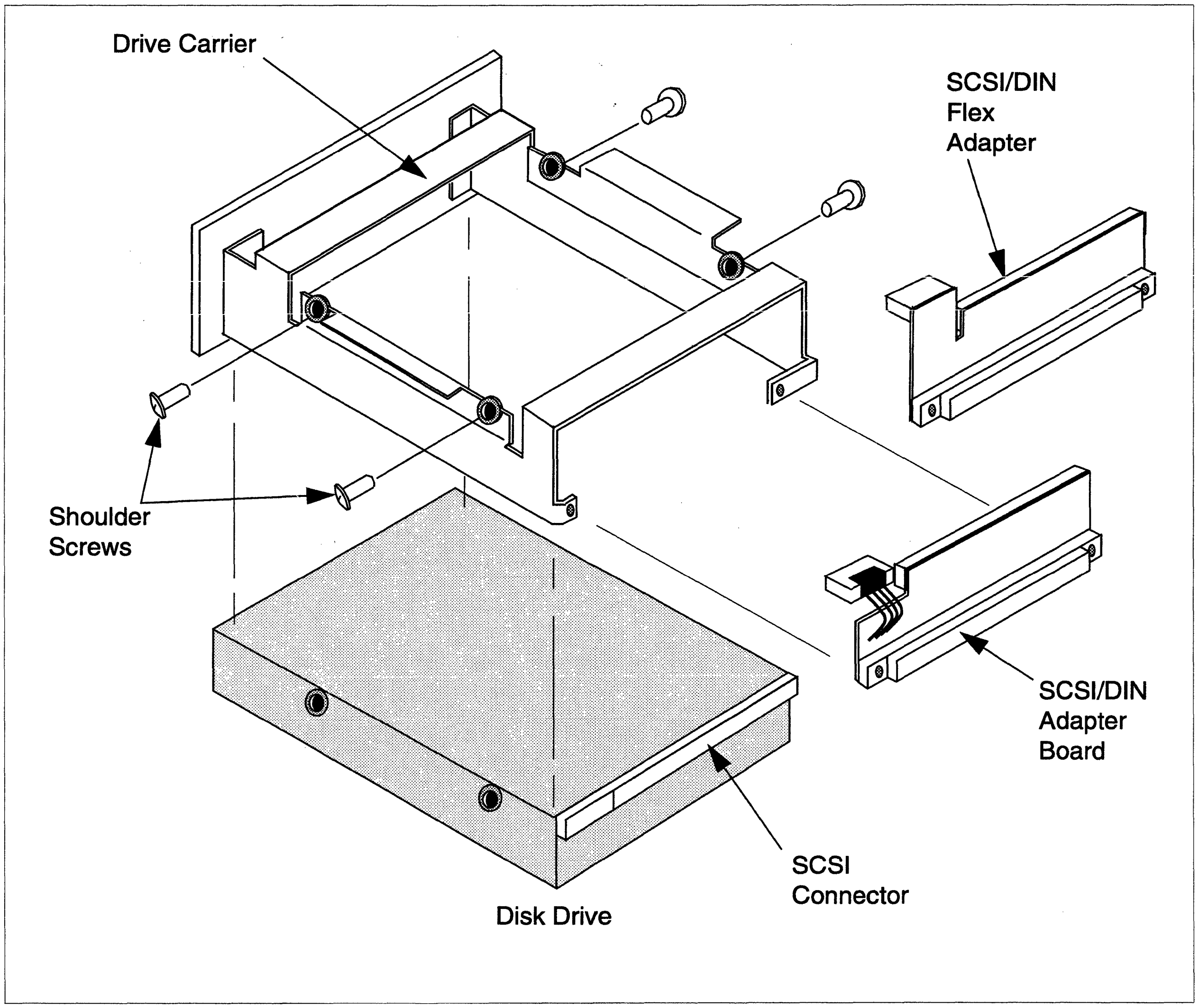


Figure 6-17. Removing a Drive from a Drive Carrier

NOTE

Earlier versions of the Paragon XP/S system used the SCSI/DIN adapter board, while newer and upgraded systems use the SCSI/DIN flex adapter. The functionality of both adapters is the same, but the SCSI/DIN flex adapter is the preferred component. If a Seagate 1.0G-byte drive or a Seagate 4.0G-byte drive is being installed, the SCSI/DIN flex adapter MUST be used.

4. Unplug the SCSI/DIN adapter board (or the SCSI/DIN flex adapter) from the drive, and remove the adapter from the drive. Set the adapter aside (see Figure 6-17).

5. Remove the four shoulder screws holding the drive to the carrier (see Figure 6-17). Lift the drive carrier off of the drive.

6. Verify that the new drive is properly configured. Refer to "Configuring 1.2G-Byte Maxtor Hard Disk Drives" on page 6-57, to "Configuring 1.0G-Byte Seagate Hard Disk Drives" on page 6-58, or to "Configuring 4.0G-Byte Seagate Hard Disk Drives" on page 6-59 for configuration information on the SCSI hard disk drive, if necessary.

7. Place the drive carrier over the new drive and reattach it with the four shoulder screws.

8. Reattach the SCSI/DIN adapter board (or the SCSI/DIN flex adapter), using the two screw holes to align the adapter with the drive. Plug the SCSI/DIN adapter board (or the SCSI/DIN flex adapter) into the new drive. Note that a SCSI/DIN flex adapter must be used with the Seagate 1.0G-byte drive or with the Seagate 4.0G-byte drive.

9. Slide the drive carrier back into the peripheral module assembly, and tighten the screw at the bottom of the drive carrier.

Replacing the SCSI DAT Tape Drive

The SCSI DAT tape drive provides high-capacity archiving capabilities for the Paragon system. In a default installation, the SCSI DAT tape drive is installed in the top array row of the first peripheral module assembly (CBS number 00YC4). The SCSI DAT tape drive is jumpered as SCSI device "6" and is connected to the end of the SCSI signal cable feeding the RAID controller for the next lower array (CBS number 00YBR) in the module. Refer to "Peripheral Numbering" on page 2-20 if necessary for more information on the CBS numbering scheme for Paragon peripheral devices.

The SCSI DAT tape drive might need replacement when it is reported as faulty by the operating system or by the Paragon system diagnostics (PSD). You might also replace the SCSI DAT tape drive in response to a field change order, as part of a field upgrade, or as part of your normal fault isolation procedures.

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Refer to Figure 6-18 on page 6-67 and Figure 6-19 on page 6-68 while performing the procedures in this section. Perform the following steps to replace and/or install a DAT tape drive in the Paragon system peripheral module:

1. Make sure the DC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Remove the six screws securing the drive skid to the peripheral module.

3. Pull the drive skid out of the cabinet using the drive skid's handles (see Figure 6-18).

4. While supporting the skid with one hand, reach behind the drive skid with the other hand, and disconnect the power and SCSI connectors from any drives installed in the skid (see Figure 6-19).

5. Place the skid assembly on a stable, flat surface.

6. Remove the four securing screws holding the drive to the skid (see Figure 6-19). Slide the drive out of the drive skid (either through the front or through the rear of the skid.

7. Verify that the new drive is properly configured. Refer to "Configuring HP Model 35470 DAT Tape Drives" on page 6-60 or to "Configuring HP Model C1533 DAT Tape Drives" on page 6-61 for configuration information on the DAT tape drive, if necessary.

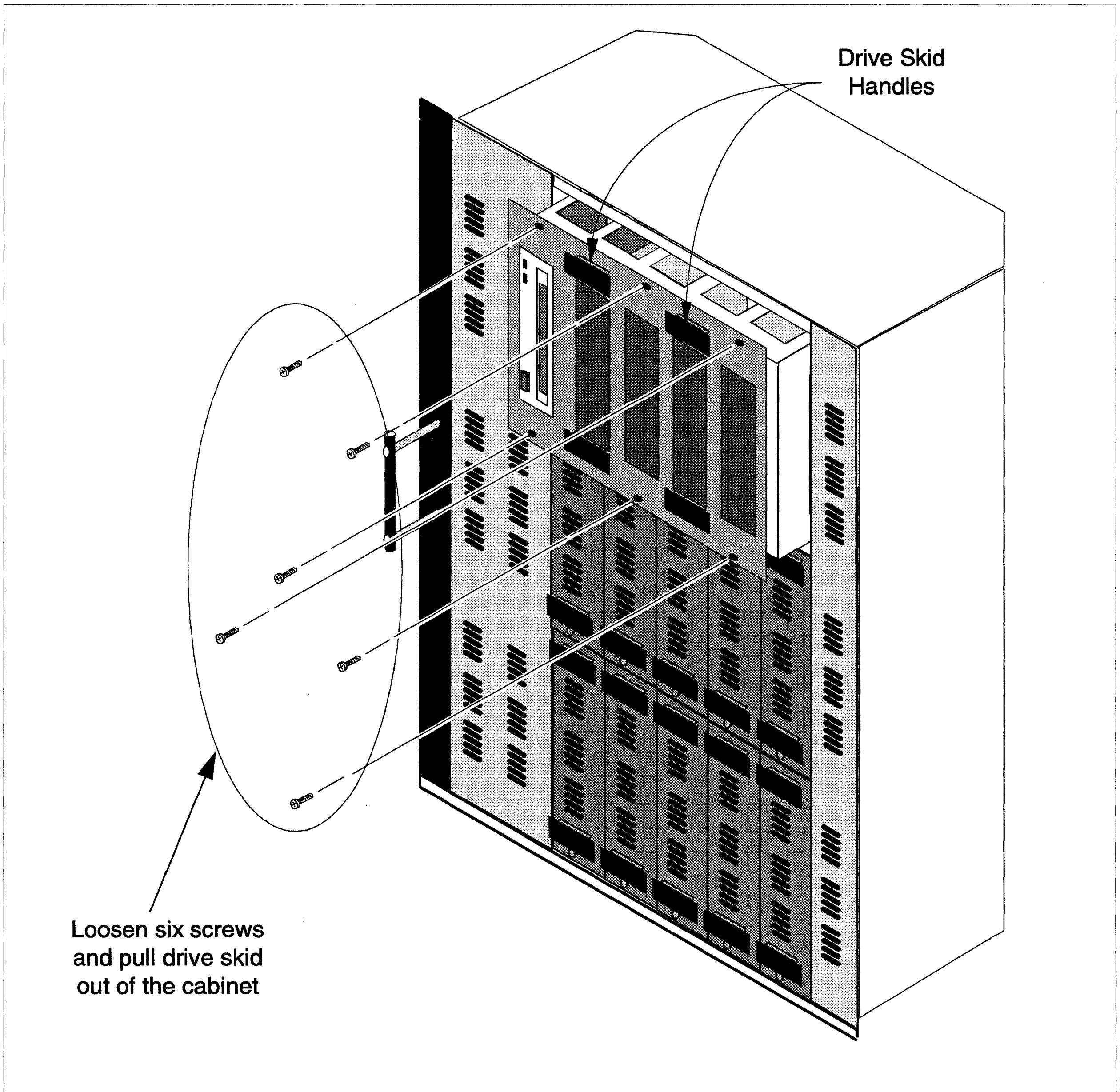


Figure 6-18. Removing the Drive Skid from the Peripheral Module

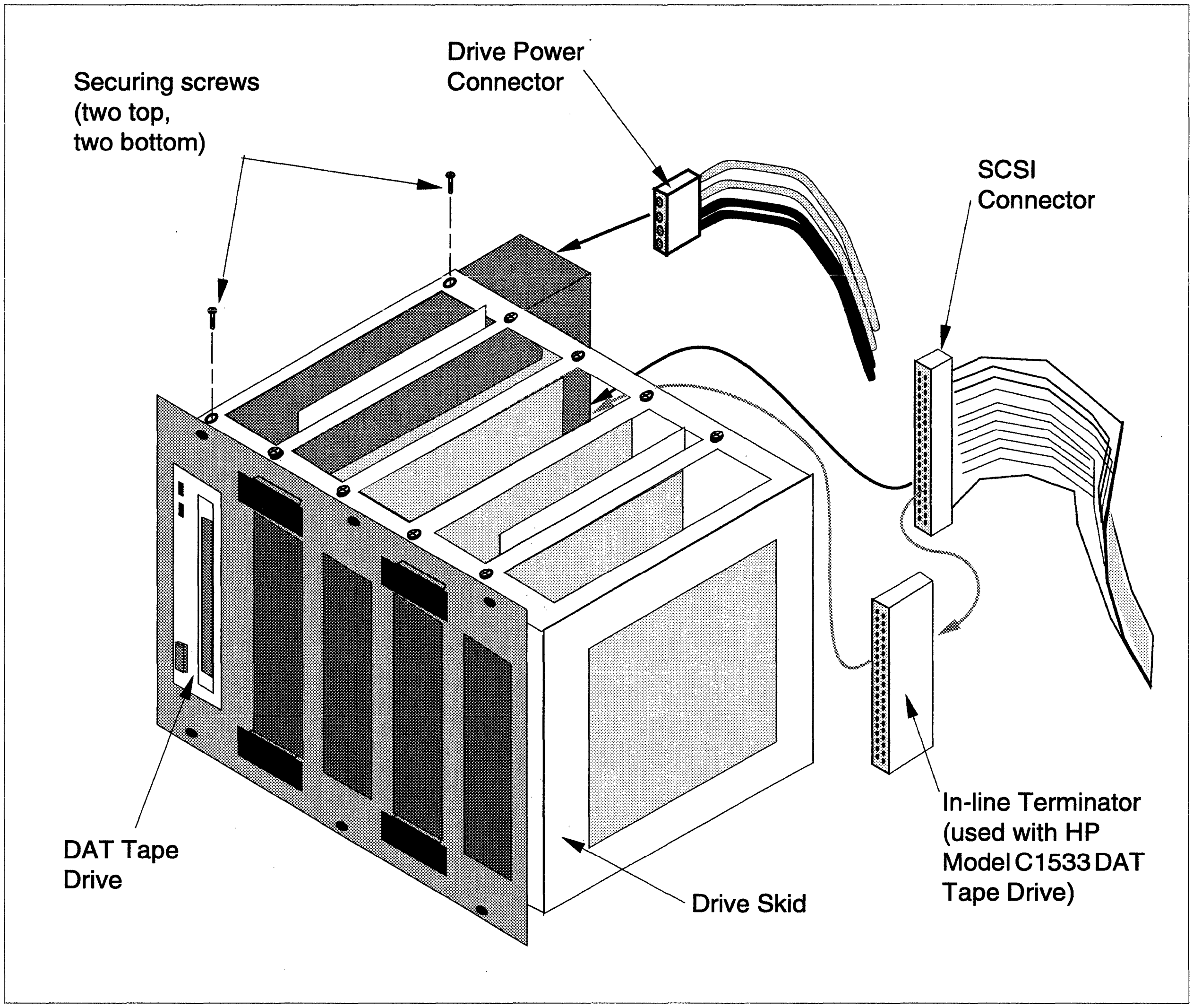


Figure 6-19. Replacing the Tape Drive in a Drive Skid

8. Slide the new tape drive into its slot in the drive skid, align the drive holes with those in the skid, and reattach it with the four securing screws.

9. Reattach the SCSI connector and the drive power connector to the mating connectors of the drive(s) in the skid.

10. Slide the drive skid back into the peripheral module assembly, and secure it using six screws as shown in Figure 6-18.

Replacing/Installing the SCSI RAID Controller

The SCSI RAID controller board is mounted at the back of the peripheral module assembly in either the "A", "B", or "C" position as defined for the CBS numbering scheme (refer to "Peripheral Numbering" on page 2-20 for more information). The RAID hard disks plug directly into one of the connectors of this board and receive both control signals and power from these controller board connectors.

The SCSI RAID controller board might need replacement when it is reported as faulty by the operating system or by the Paragon system diagnostics (PSD). You might also replace the SCSI RAID controller board in response to a field change order, as part of a field upgrade, or as part of your normal fault isolation procedures. Use the procedures in "Installation (SCSI RAID Controller Board)" on page 6-71 if you are adding a SCSI RAID controller to a peripheral module in the Paragon XP/S system.

Removal (SCSI RAID Controller Board)

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Perform the following steps to remove a SCSI RAID controller board from one of the Paragon system peripheral modules:

1. Make sure the DC power has been turned OFF for this cabinet. Refer to the *Paragon™ System Administrator's Guide* for an appropriate power-down procedure for the cabinet.

2. Loosen the captive screws securing the each of the five drive carriers of the RAID array to the modules (see Figure 6-16 on page 6-63). It is only necessary to remove the drive carriers connected to the SCSI RAID controller board that is being replaced.

CAUTION

Be sure to note the array position of each drive that you remove. The drives must be reinstalled in the same position, or else data loss is likely.

3. Pull each of the drive carriers (with attached drive and SCSI/DIN adapter board) out of the cabinet using the drive carrier's handles and set them out of the way. Note the array position of each drive that you remove.

4. Unlatch and swing open the peripheral module holding the SCSI RAID controller board that is being replaced. Figure 6-20 shows the peripheral module assembly and indicates how to remove/replace the SCSI RAID controller board.

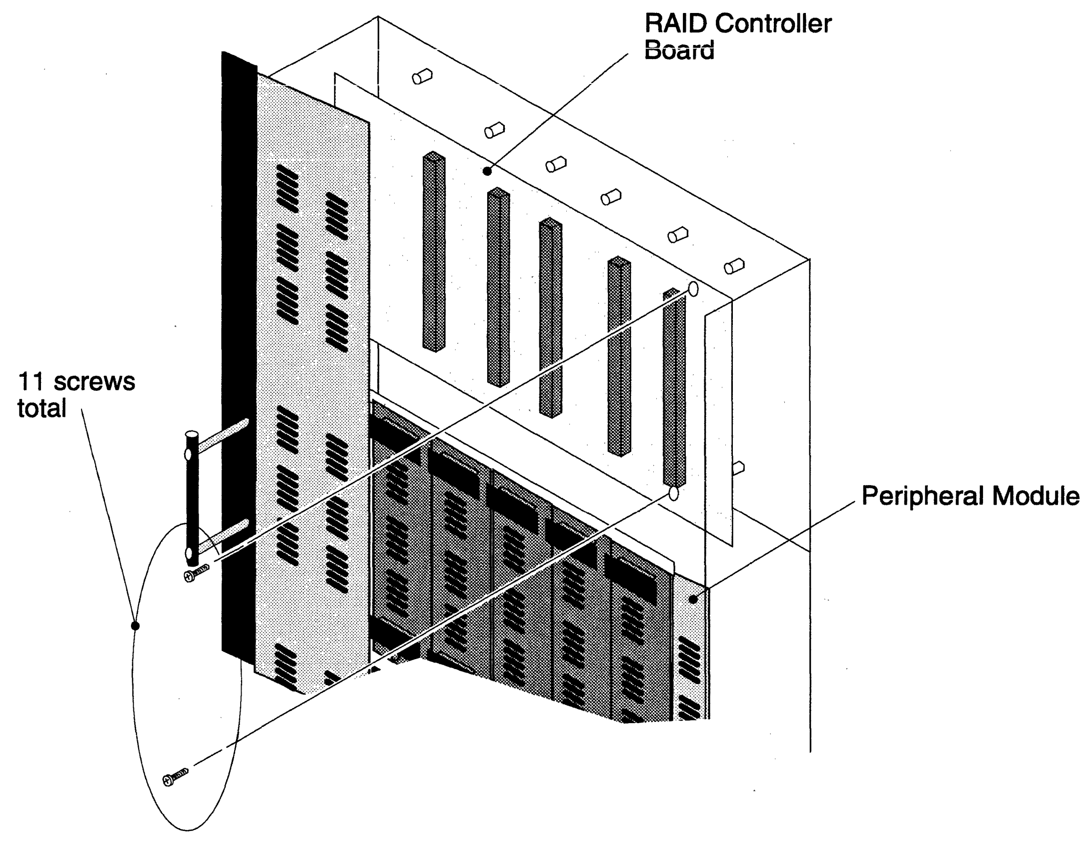


Figure 6-20. Removing/Replacing the SCSI RAID Controller Board

5. Disconnect the SCSI signal cable from connector J13 (at the back of the SCSI RAID controller board that is being replaced).

6. Disconnect the power cable from connector J19 (right-hand side of the SCSI RAID controller board that is being replaced).

7. Loosen and remove the eleven (11) Phillips head screws securing the SCSI RAID controller board to the standoffs.

8. If this SCSI RAID controller board is installed in the top or bottom array position of the peripheral module assembly, remove four flat-head Phillips screws and the top or bottom plate (see Figure 6-20) so the SCSI RAID controller board can be removed.

9. If this SCSI RAID controller board is installed in the middle array position of the peripheral module assembly, remove four flat-head Phillips screws and the back plate (see Figure 6-20) so the SCSI RAID controller board can be removed.

10. Remove the SCSI RAID controller board and place it in an anti-static bag until its disposition is determined.

Installation (SCSI RAID Controller Board)

CAUTION

Make sure you comply with the ESD protection procedures described in "ESD Protection Practices" on page 3-1 before removing/replacing/installing any ESD-sensitive components.

Perform the following steps to install a SCSI RAID controller board into one of the Paragon system peripheral modules:

1. Compare the jumpers and switch setting on the replacement SCSI RAID controller board with those on the board being replaced. The jumpers and switch settings should match. Refer to Figure A-17 on page A-19 for the locations and meanings of the jumpers and switch setting on the SCSI RAID controller board.

2. Position the SCSI RAID controller board in the appropriate array (top, middle, or bottom) of the peripheral module and secure it to the proper standoffs using eleven (11) Phillips head screws.

3. If this SCSI RAID controller board is installed in the top or bottom array position of the peripheral module assembly, secure the top or bottom plate to the peripheral module frame (see Figure 6-20) using four flat-head Phillips screws.

4. If this SCSI RAID controller board is installed in the middle array position of the peripheral module assembly, secure the back plate to the peripheral module frame (see Figure 6-20) using four flat-head Phillips screws.

5. Connect the power cable to connector J19 (right-hand side of the SCSI RAID controller board that is being replaced).

6. Connect the SCSI signal cable to connector J13 (at the back of the SCSI RAID controller board that is being added/replaced).

7. Reinstall each of the drive carriers in their original array position. Secure the drives using the captive front panel screws.

8. Swing the peripheral module assembly closed and secure it using the captive latching hardware.

9. Before putting the RAID controller back into operation, you will need to check and program the FLASH memory on the controller using PSD. Use procedures in "Checking/Configuring the SCSI RAID Controller Board" on page 3-20 to check and (if necessary) program the FLASH memory on the RAID controller board.

Installing a Paragon™ XP/S System Corner Unit

The cabinet footprint of large Paragon XP/S systems might be physically too long to fit within the computer room floor space of some sites. One option that can be used to fit a large (long) Paragon XP/S system into a limited space is to install Paragon XP/S system corner units. The corner unit option changes the footprint from a long, straight line of cabinets to an "L" or a "U" shaped configuration. The corner units have no affect on system operation (other than a minor increase to mesh communication latency), but their installation might make it difficult or even impossible to watch all of the front door LEDs at the same time.

This section includes the site preparation steps as well as the installation steps associated with a corner unit installation.

Site Preparation

Each Paragon XP/S system corner unit uses a cabinet-height wedge that allows the adjacent cabinet to turn by 45 degrees from the alignment of the previous cabinet. Two Paragon XP/S system corner units are required to align the Paragon XP/S system cabinets in an "L" configuration. Four Paragon XP/S system corner units are required to align the Paragon XP/S system cabinets in a "U" configuration. Figure 6-21 shows a portion of a Paragon XP/S system layout and indicates the dimensions and clearances associated with the "L" layout. Figure 6-22 shows a portion of a Paragon XP/S system layout and indicates the dimensions and clearances associated with the "U" layout.

Other than the changed cabinet alignment, there is no difference in site preparation requirements between a Paragon XP/S system with the normal straight alignment and one using an "L" or a "U" shaped layout. The power and air conditioning requirements are identical. Refer to Figure 6-21 or Figure 6-22 for the cabinet layout so you can make sure the required vented floor tiles, power receptacles, and cable cutouts are ready prior to hardware installation.

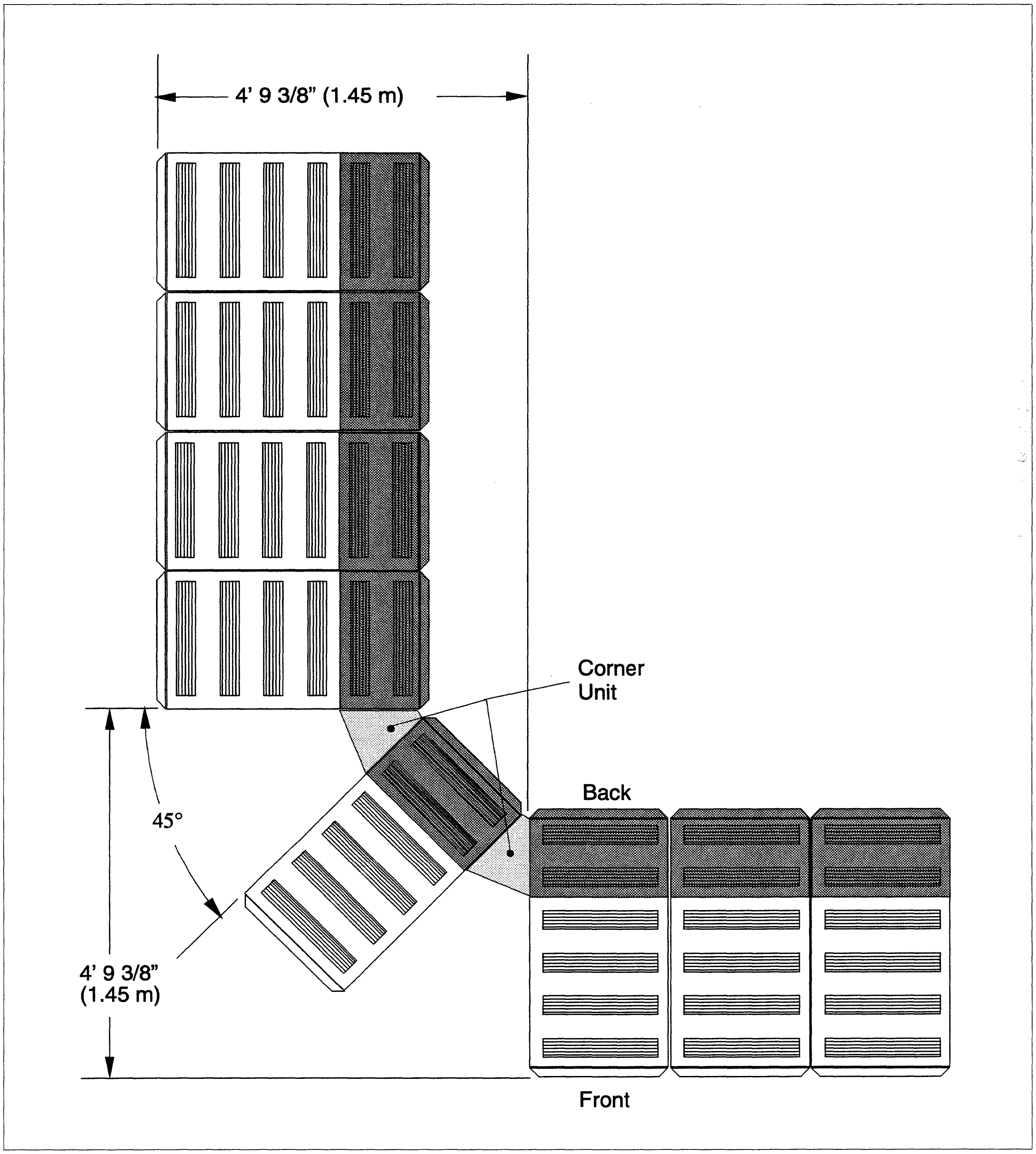


Figure 6-21. Paragon™ XP/S System Corner Unit "L" Layout

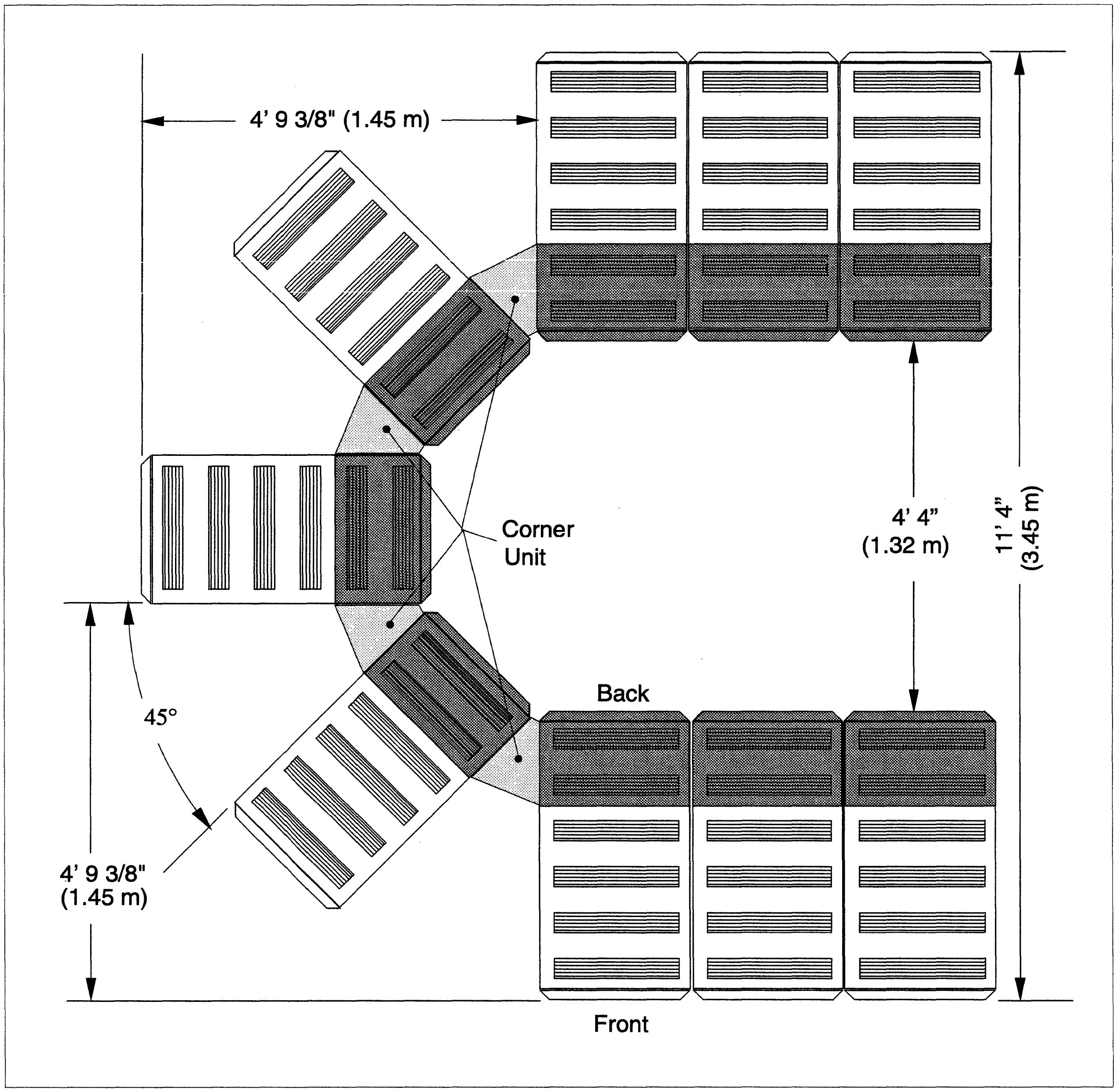


Figure 6-22. Paragon™ XP/S System Corner Unit "U" Layout

Hardware Installation

The Paragon XP/S system corner unit uses a cabinet-height wedge that allows the adjacent cabinet to turn by 45 degrees from the alignment of the previous cabinet. Two Paragon XP/S system corner units are required to change the cabinet alignment by 90 degrees, and four Paragon XP/S system corner units are required to change the cabinet alignment by 180 degrees.

The procedures in this section describe how to install a single Paragon XP/S system corner unit. Repeat the procedures in this section as often as necessary based on the number of corner units that are to be installed.

Kit Contents

Each corner unit kit is shipped with the following major items:

- The corner wedge assembly (including the main wedge, a base unit, and three or four stiffener trays).
- A metal cover plate and the decorative black grill assembly for the corner wedge.
- Two decorative silver grills for the forward slots of the Paragon system cabinet and two Paragon system side plaques.
- A cabinet-to-cabinet cable set for the corner unit consisting of:
  - A power controller power chain cable (part number 316517-001),
  - A power controller scan-string signal cable (part number 316520-001),
  - An LED controller East/West cable (part number 316818-001),
  - Four backplane scan-string expansion cables (part number 317624-001), and
  - Eight corner flex (mesh routing) cables (part number 317506-001).
- A quantity of copper EMI gasket clips (part number 317563-001).
- Additional screws, leveler legs, and ties to allow final installation of the corner unit.

WARNING

Make sure the cabinet main breakers are OFF and the main power cable to each cabinet is disconnected before installing the Paragon XP/S system corner unit. Installation personnel can be exposed to hazardous voltages if a cabinet is connected to line power while the corner unit is being installed.

Mechanical Installation

The following steps describe how to perform the initial mechanical installation of the Paragon XP/S system corner unit:

1. Position the cabinets in the approximate position and alignment that they will be after the corner unit is installed, then remove any existing grills, EMI flanges, or cabinet joining hardware from the facing vertical slots of the cabinets.

CAUTION

Make sure the full length of the cabinet rear slots has exposed, bare metal. If any segment of this length is covered with paint or other non-conductive material, use conductive metal tape to restore an adequate ground path. Poor conduction paths will defeat the Paragon system cabinet EMI shielding.

2. Install copper EMI gasket clips around the full periphery of each of the EMI flanges of the corner unit. The EMI gasket material can be cut to fit if necessary. Figure 6-23 shows a top portion of the corner unit EMI flange and indicates how the clips are to be installed.

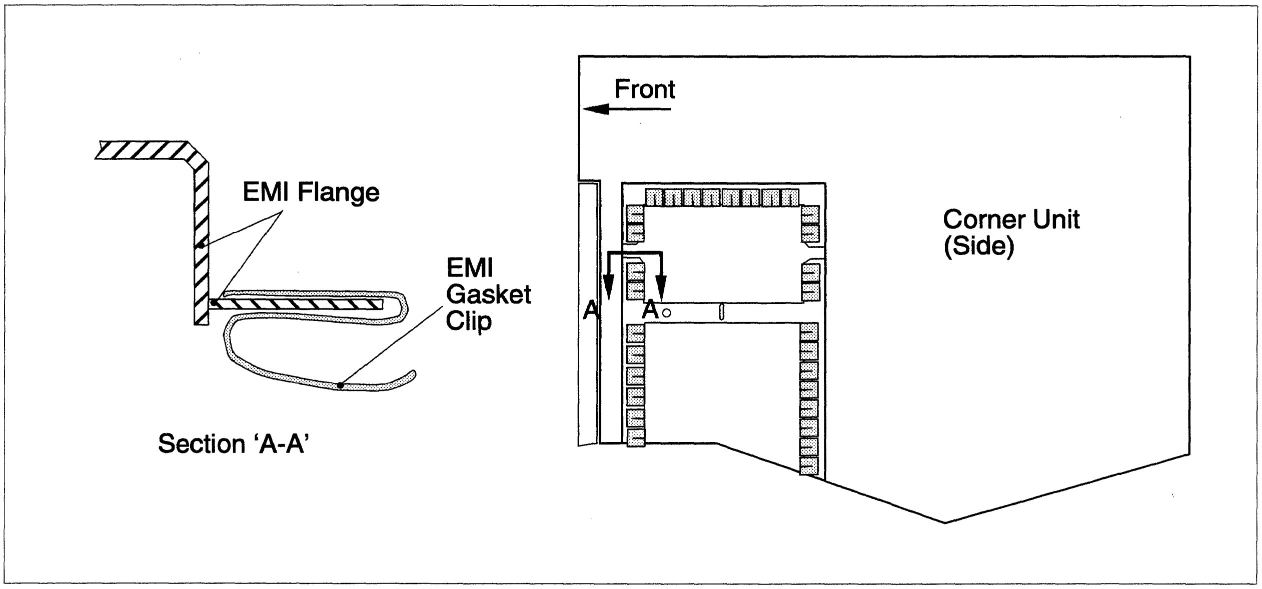


Figure 6-23. Installing EMI Gasket Clips

3. With the front panel and grill removed from the corner unit, carefully mate the corner unit EMI flange with the rear slot of the first cabinet. Secure the corner unit loosely to the cabinet using five Phillips-head machine screws, washers, and (if necessary) nuts. Figure 6-24 shows the corner unit and cabinet, and indicates how to join the corner unit EMI flange to the cabinet slot.

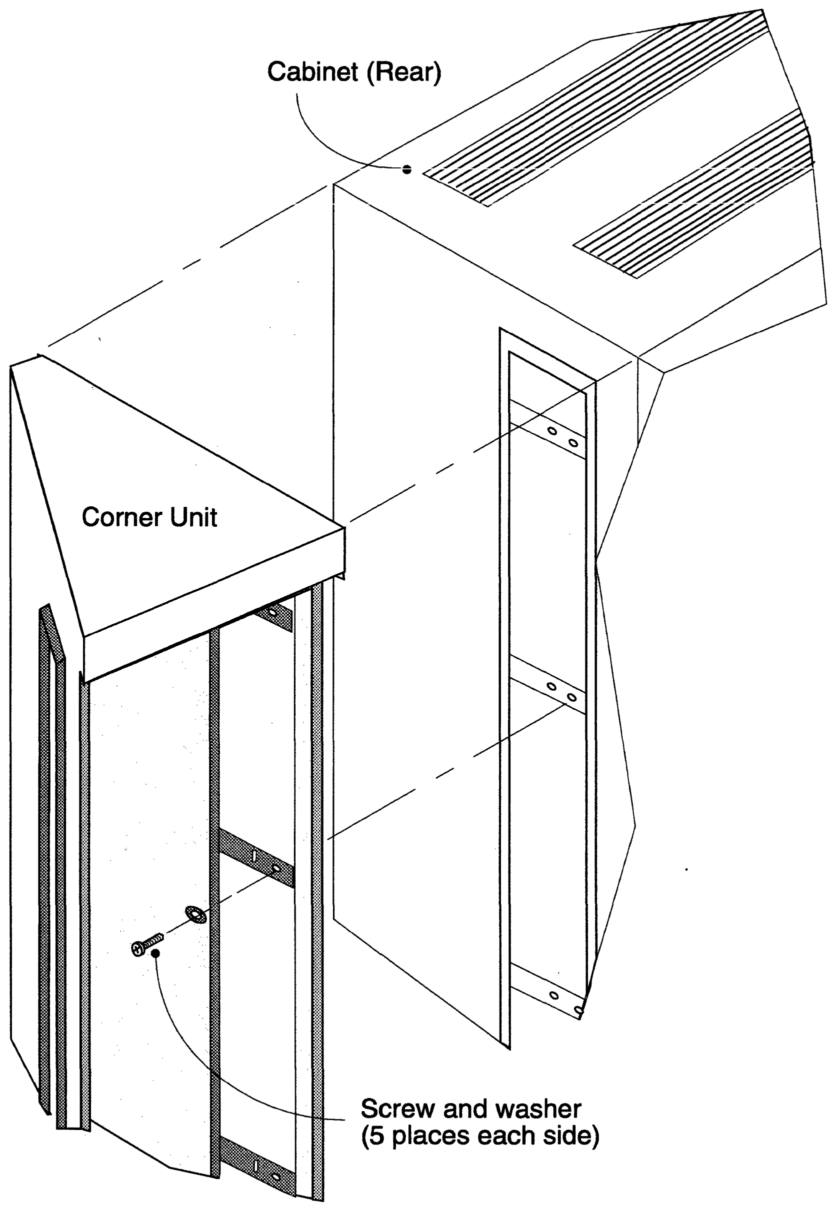


Figure 6-24. Mating the Corner Unit to the Cabinet

4. Carefully align the next cabinet with the other side of the corner unit, then roll it in until the EMI flange mates with the rear slot of the cabinet. Secure the corner unit loosely to this cabinet using five Phillips-head machine screws, washers, and (if necessary) nuts.

5. At the lower rear of the corner unit, loosely attach the angle bracket to the corner unit and two cabinets using three socket-head screws.

6. Repeat steps 3 through 6 for each corner unit that is to be installed with this Paragon XP/S system.

7. After all corner units are initially installed, adjust the alignment and position of the cabinets (see Figure 6-21 or Figure 6-21 for correct alignment), then tighten all screws (five with each EMI slot and three with each angle bracket).

Cable Installation

Figure 6-25 shows the routing of cabinet-to-cabinet cables that are associated with the corner unit installation. Perform the following steps to install the cabinet-to-cabinet cables associated with each corner unit installation:

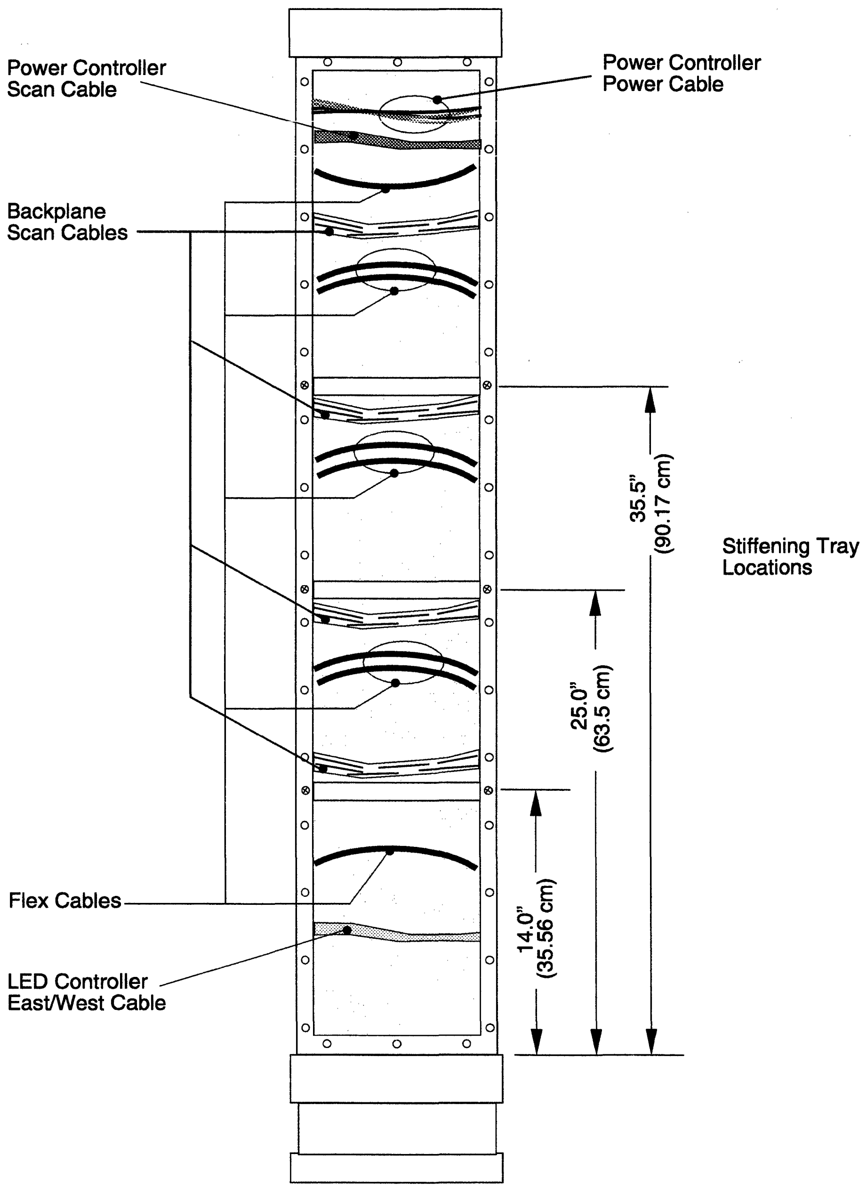


Figure 6-25. Corner Unit Cable Routing

1. As shipped, the internal stiffening trays might interfere with routing of the cabinet-to-cabinet cables. If necessary, remove and reinstall the internal stiffening trays. As measured from the corner unit base, there should be one internal stiffening tray at 14 inches (35.56 cm), one at 25 inches (63.5 cm), and one at 35.5 inches (90.17 cm). Refer to Figure 6-25 for the stiffening tray locations.

CAUTION

Cable routing should be performed by two people; one at the rear of the cabinets, and one at the front of the open corner unit. While it is not impossible for a single person to route cables through the corner unit, doing so increases the chance of damaging the flex cables or connector pins.

2. Open the rear doors of the cabinet on either side of the corner unit, then swing open the power supplies on their hinges so you have access to the cardcage backplanes.

3. Refer to Figure 6-25 for cable routing information. Route the backplane scan cables (part number 317624-001) as follows:

   A. Starting with the top cable, connect the backplane scan cable to backplane connector J58 of the right-hand (viewed from the rear) cabinet.

   B. Have your helper (in front of the corner unit) continue routing the backplane scan cable through the corresponding slot on the opposite side of the corner unit, then into the other cabinet.

   C. Connect the other end of the backplane scan cable into backplane connector J59 of the left-hand (viewed from the rear) cabinet.

   D. Repeat steps A through C for the remaining backplane scan cables (four cables total through each corner unit).

4. Refer to Figure 6-25 for cable routing information. Route the corner unit flex cables (part number 317506-001) as follows:

   A. Starting with the top flex cable, pre-bend the cable at the edge of each connector, then route the cable from the cabinet slot next to the backplane connector, then into the corner unit.

   B. Have your helper (in front of the corner unit) continue routing the flex cable through the corresponding slot on the opposite side of the corner unit, then into the other cabinet.

   C. Once the flex cable is routed, carefully plug the connector into the backplane of the cabinet from which you started. The other end of the flex cable will be plugged in later.

D. Repeat steps A through C for the remaining flex cables (eight flex cables total between cabinets). For paired flex cables (indicated in Figure 6-25), carefully plug in the lower connector first, then the upper connector.

E. Open the back door of the other cabinet, then swing the power supplies out to gain access to the backplanes.

F. Starting with the top flex cable, carefully plug the flex cables into the proper backplane connectors (J17/J18 or J21/J22). For paired flex cables (indicated in Figure 6-25), carefully plug in the lower connector first, then the upper connector.

G. Continue plugging in the flex connectors until all eight have been connected.

H. After all flex cables have been connected, make sure the flex cables are bent as indicated in Figure 6-25. The top flex cable should be bent down, and all remaining cables should be bent up.

5. Plug the power controller power chain cable (part number 316517-001) into connector J480 of the power controller board in the left-hand cabinet (viewed from the rear).

6. Route the power controller power chain cable up, then through the corner unit (as indicated in Figure 6-25), into the right-hand cabinet, then connect it to connector J380 of the right-hand cabinet power controller board.

7. Plug the power controller scan-string cable (part number 316520-001) into connector J130 of the power controller board in the left-hand cabinet (viewed from the rear).

8. Route the power controller scan-string cable up, then through the corner unit (as indicated in Figure 6-25), into the right-hand cabinet, then connect it to connector J030 of the right-hand cabinet power controller board.

9. Plug the LED controller East/West cable (part number 316818-001) into connector J801 of the LED controller board on the lower right wall of the left-hand cabinet (viewed from the rear).

10. Route the LED controller East/West cable through the corner unit (as indicated in Figure 6-25), into the right-hand cabinet, then connect it to connector J900 of the right-hand cabinet LED controller board.

11. Using cable ties, secure the LED controller East/West cable, power controller power cable, and power controller scan-string cable to appropriate tie points within each cabinet.

Final Installation

At this point, the cabinets and corner unit(s) should be properly aligned and secured (as described in "Mechanical Installation" on page 6-76), and the cabinet-to-cabinet cables should be installed (as described in "Cable Installation" on page 6-80). Perform the following steps to complete the Paragon XP/S system corner unit installation:

1. Align the corner unit cover plate so the slots are at the top, then secure it to the corner unit using 36 flat Phillips-head screws. Tighten the screws.

2. Insert the tabs of the corner unit grill into the cover plate slots, then align the grill and press on the front until the velcro strips make full contact. The grill can be pulled back and repositioned if necessary.

3. Position a silver-colored grill over the exposed front slot of one of the cabinets attached to the corner unit, then secure it to the cabinet using 44 #3-48 x 1/4 Phillips-head screws. Repeat this step for the other cabinet attached to this corner unit.

CAUTION

Once the decorative Paragon XP/S system side plaque is placed on the side grill, it cannot be removed or repositioned without damaging either the grill or the plaque. Do not place the Paragon XP/S system side plaque until you are satisfied with its alignment and orientation.

4. After tightening all grill screws, carefully remove the protective cover from the back of a Paragon XP/S system side plaque, orient and align the plaque, then press it into position at the top of the side grill. Follow the same precautions while placing the Paragon XP/S system side plaque for the other cabinet.

5. Attach cabinet foot stops to the exposed front corners of the two cabinets attached to the corner unit. Screw out the legs of these foot stops and the leg in the rear angle bracket until they contact the floor. Put the protective covers over the foot stop and angle bracket assemblies, and press to make sure the velcro tabs make contact.

6. Repeat steps 1 through 5 for any additional corner units for this Paragon XP/S system.

Illustrated Parts List A

Introduction

This appendix contains parts lists of all of the field replaceable units (FRUs) that have been identified for the Paragon™ XP/S system. Following each of the parts list tables are keyed drawings to aid in locating the FRUs. The key number in the parts list corresponds to the key numbers in bubbles that appear in the drawings.

Modules, Boards, and Mechanical Parts

Table A-1 lists the modules, assemblies, boards and mechanical parts that are FRUs for theParagon XP/S system. Figure A-1 through Figure A-25 shows each of the parts identified in Table A-1.

Table A-1. Field Replaceable Modules (1 of 3)

Key	Paragon Part Reference	Intel Part Number	Description
1		316149-001	Line filter, EMI 45 amp
2		316150-001	Circuit Breaker, 45 amp, 50/60 Hz
3		316158-001	Fan, 200 CFM, +12 VDC 1.8 amp, lower
4		316804-001	Assembly, fan, 200 CFM, +12VDC, 1.8 amp, upper
5		316212-002	Power supply, +12 VDC, 67 amp
6		316253-001	Power supply, +5VDC, 26 amp
7		316384-001	Power supply, +5VDC, 400 amp
8		316442-001	Assembly, DC-DC Convertor, +12VDC –5.2VDC, 10 amp
9		316443-001	Assembly, DC-DC Convertor, +12VDC –12VDC, 5 amp

Table A-1. Field Replaceable Modules (2 of 3)

Key	Paragon Part Reference	Intel Part Number	Description
10		316980-003	Board assembly, power controller, FAB 2
11		317397-001	Board assembly, power controller, FAB 3
12		316518-001	Assembly, bleed resistor
13		316581-0XX	Board assembly, routing backplane, FAB 3.0
37		317641-0XX	Board assembly, routing backplane, FAB 3.5, Slow streaming MRC, with 3 capacitors
		317897-0XX	Board assembly, routing backplane, FAB 3.5, Medium streaming MRC, with 3 capacitors
		340609-0XX	Board assembly, routing backplane, FAB 5, Slow streaming MRC, with 3 capacitors
		340622-0XX	Board assembly, routing backplane, FAB 5, Medium streaming MRC, with 3 capacitors
14	MFCDAT	316897-001	Tape drive, DAT, HP model 35470
15		340744-001	Tape drive, DAT, HP model C1533
16		317961-0XX	Hard disk drive, SCSI, 1.2G-byte, 3.5-inch, 1.6-inch high
17		340573-001	Hard disk drive, SCSI, 1.0G-byte, 3.5-inch, 1.0-inch high
38		341404-001	Hard disk drive, SCSI, 4.0G-byte, 3.5-inch, 1.6-inch high
18		514135-002	Hard disk drive, SCSI, 540M-byte, 3.5-inch, 1.0-inch high
19		316383-0XX	Board assembly, RAID controller, ADP92-01
20		316760-001	Board assembly, SCSI/DIN adapter (replaced by 317040-001)
21		317040-001	Board assembly, SCSI/DIN adapter, flex
22		317230-001	Board assembly, SCSI backplane
23		317311-001	Board assembly, LED controller
24		317315-001	Board assembly, LED display, Paragon
		316313-001	Board assembly, LED, front panel display
25	PSCGP167	317437-0XX	CBA, GP node, 16MB, FAB 7
	PSCGP168	317420-0XX	CBA, GP node, 16MB, FAB 8
	PSCGP328	317421-0XX	CBA, GP node, 32MB, FAB 8

Table A-1. Field Replaceable Modules (3 of 3)

Key	Paragon Part Reference	Intel Part Number	Description
34	PSCMP364	340727-0XX	PBA, MP Node, 64MB, FAB 2.1
	PSCMP3128	340728-0XX	PBA, MP Node, 128MB, FAB 2.1
	PSCMP316	340871-0XX	PBA, MP Node, 16MB, FAB 3
	PSCMP332	340872-0XX	PBA, MP Node, 32MB, FAB 3
26	PSCMIO	317436-0XX	CBA, MIO, SCSI/ENET, Node, 16MB, FAB 3
	PSCMIO32	340130-0XX	CBA, MIO, SCSI/ENET, Node, 32MB, FAB 3
	PSCMIOMP128	341156-0XX	CBA, MIO, SCSI/ENET, MP Node, 128MB
	PSCMIOMP64	341299-0XX	CBA, MIO, SCSI/ENET, MP Node, 64MB
27	PSCHIPPI	340377-0XX	CBA, HIPPI, FAB 2, 16MB
	PSCHIPPI	340132-0XX	CBA, HIPPI, 32MB
	PSCHIPPI128	341300-0XX	CBA, HIPPI, MP Node, 128MB
		341401-0XX	CBA, HIPPI, MP Node, 64MB
35		340527-0XX	CBA, MP node with Memory Daughter Card
		341084-0XX	CBA, GP-16 FAB 8 with 16MB Memory Daughter Card
		341085-0XX	CBA, GP-32 FAB 8 with 128MB Memory Daughter Card
		341086-0XX	CBA, GP-16 FAB 7 with 16MB Memory Daughter Card
		341398-0XX	CBA, GP-32 FAB 8 with 32MB Memory Daughter Card
		341399-0XX	CBA, GP-16 FAB 7 with 32MB Memory Daughter Card
		341400-0XX	CBA, GP-16 FAB 8 with 32MB Memory Daughter Card
36		341379-0XX	CBA, SCSI-16, SCSI/ENET, MP Node
28		317096-0XX	Assembly, diagnostic station processor
29		316315-001	Assembly, power channel
30		317423-001	Assembly, 3.5-inch disk module (RAID array module)
31		317444-002	Assembly, cardcage module, FAB 3.5
32		317499-001	Assembly, Paragon™ XP/S system cabinet front door
33		317618-001	Assembly, interior panel, air plenum

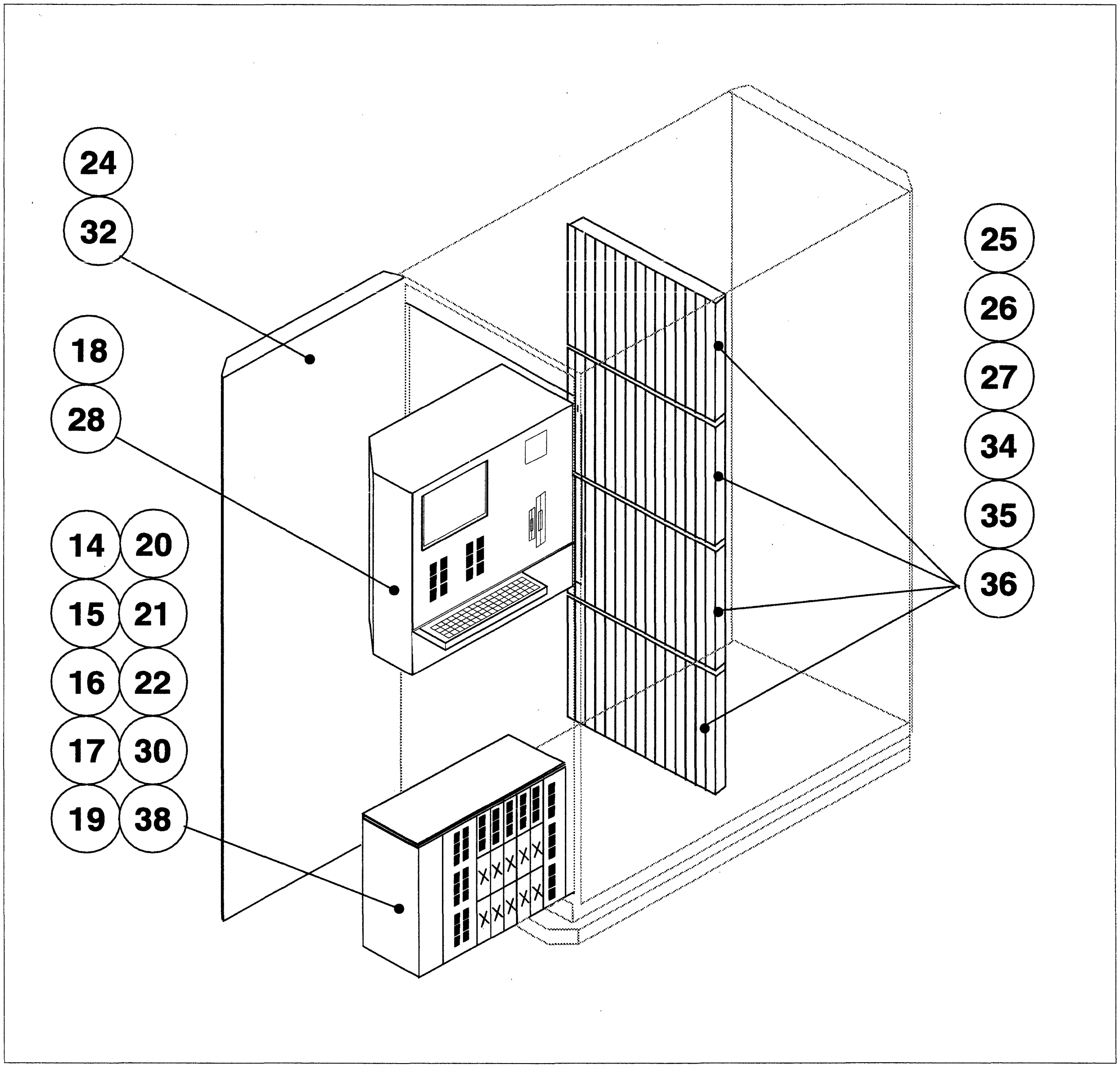


Figure A-1. Paragon™ XP/S System Cabinet (Front View)

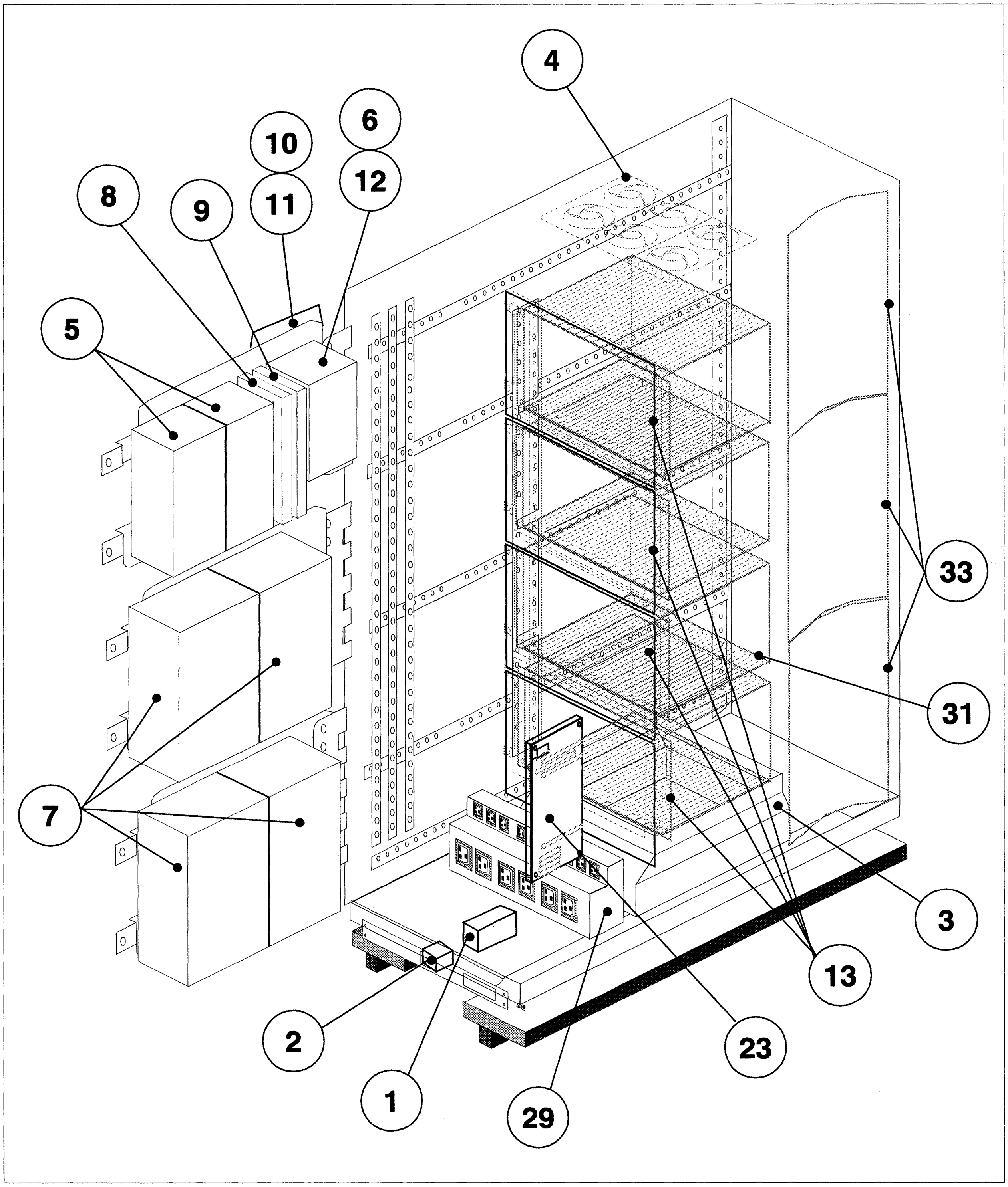
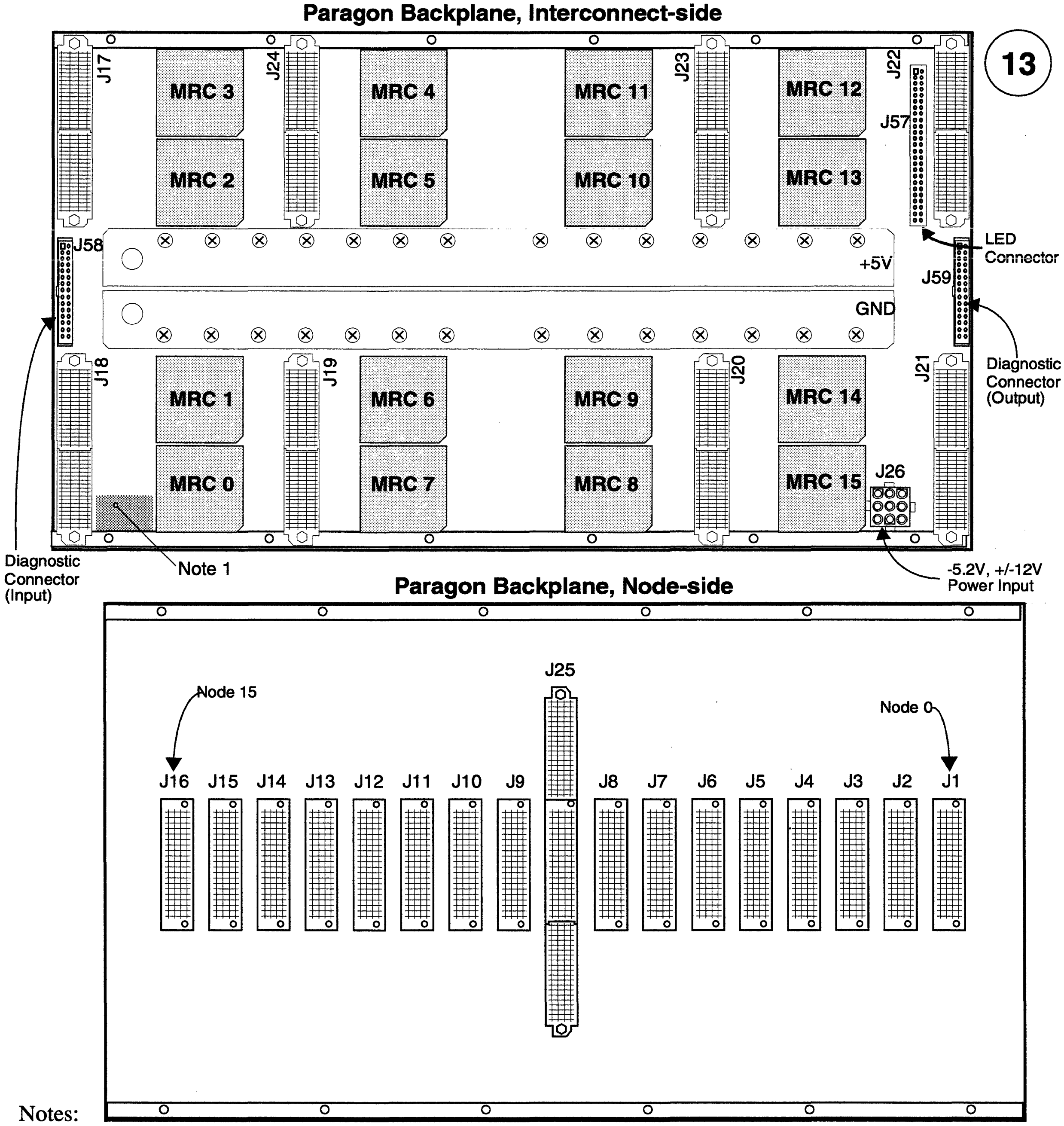


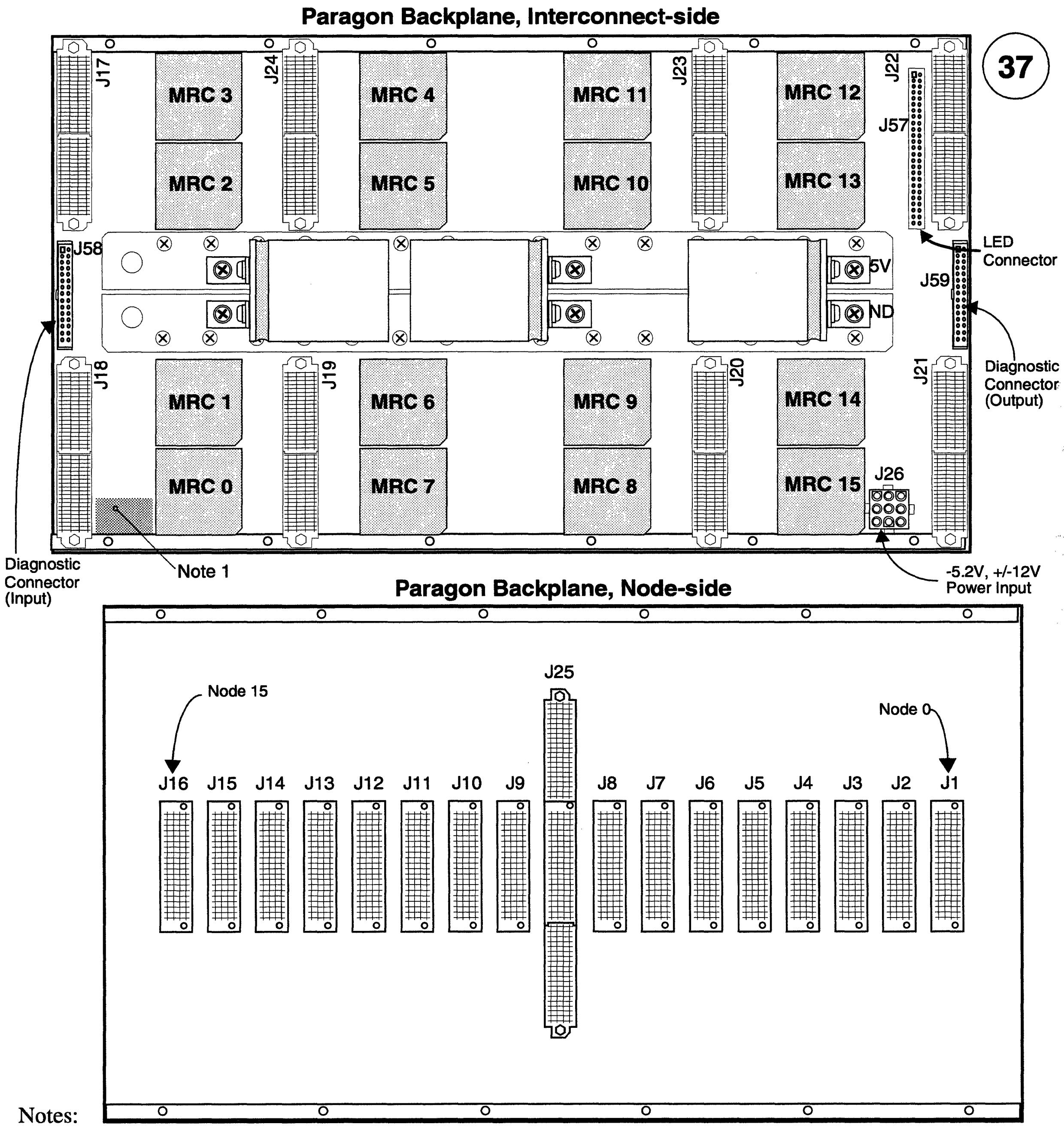
Figure A-2. Paragon™ XP/S System Cabinet (Rear View)



Notes:

1. Part number imprinted approximately in the indicated location on the interconnect-side of the backplane.

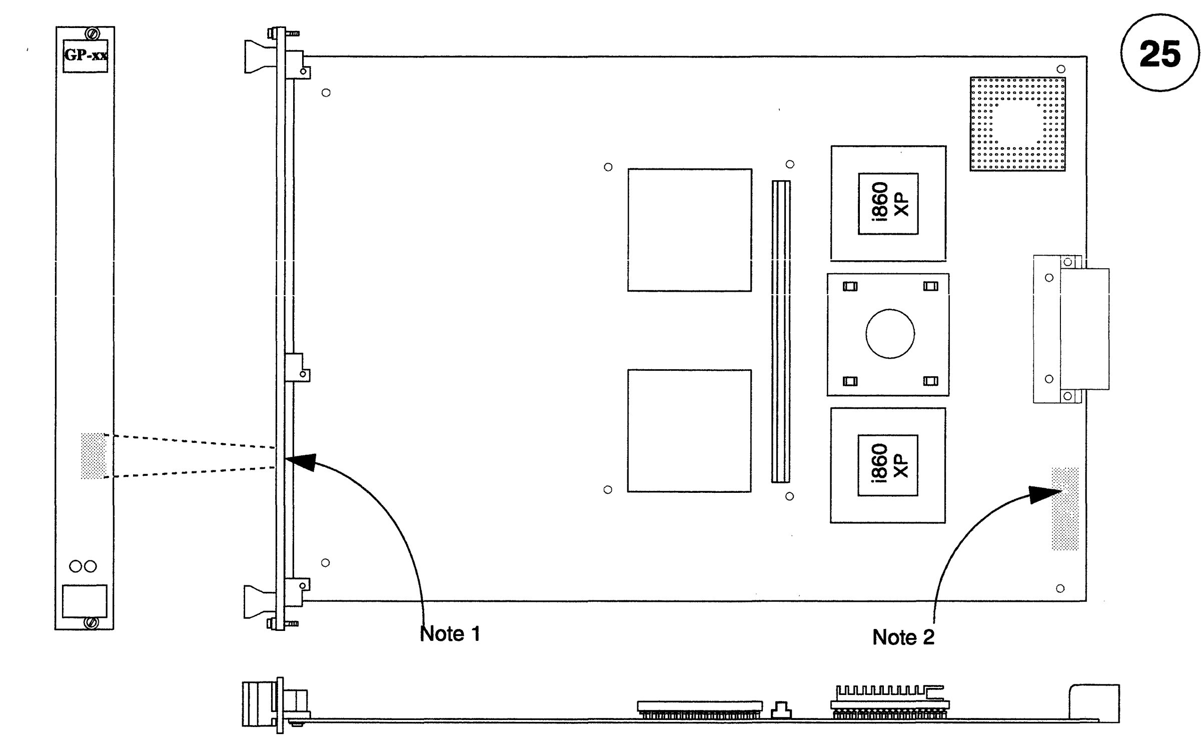
Figure A-3. Backplane (FAB 3.0)



Notes:

1. Part number imprinted approximately in the indicated location on the interconnect-side of the backplane.

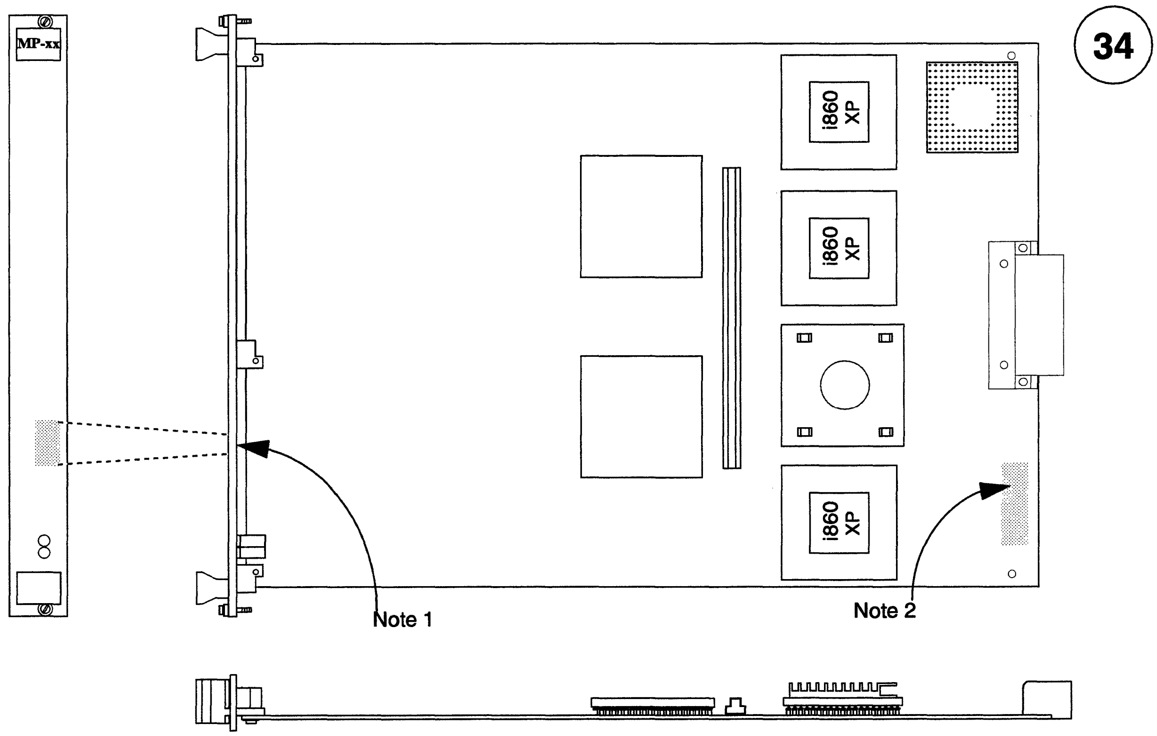
Figure A-4. Backplane Assembly with Three Capacitors (FAB 3.5, 5)



Notes:

1. Part number imprinted approximately in the indicated location on the board-side of the front panel.
2. Board serial number imprinted approximately where indicated on the component-side of the board.
3. The board fabrication (i.e., FAB7 or FAB8) and memory (i.e., 16/32M-bytes) can be determined from the part number and the front panel labels. In addition, the 16M-byte GP nodes have memory devices on only the component-side of the board. The 32M-byte GP nodes have memory devices on both sides of the board.

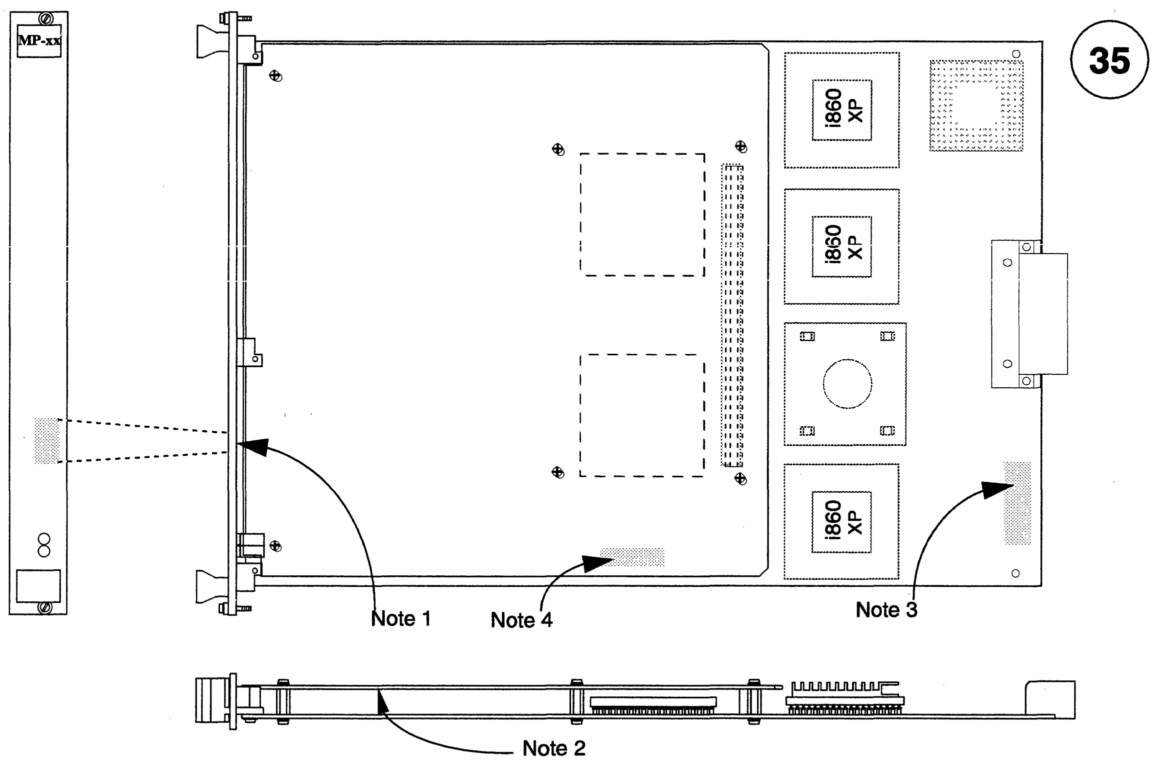
Figure A-5. GP Node Board



Notes:

1. Part number imprinted approximately in the indicated location on the board-side of the front panel.
2. Board serial number imprinted approximately where indicated on the component-side of the board.
3. The base MP node board memory (i.e., 16/32/64/128M-bytes) can be determined from the part number and the front panel labels. The 16/32M-byte MP node boards use 4M-bit DRAM devices on only one side (MP-16) or both sides (MP-32) of the base board. The 64/128M-byte MP node boards use 16M-bit DRAM devices on only one side (MP-64) or both sides (MP-128) of the base board.

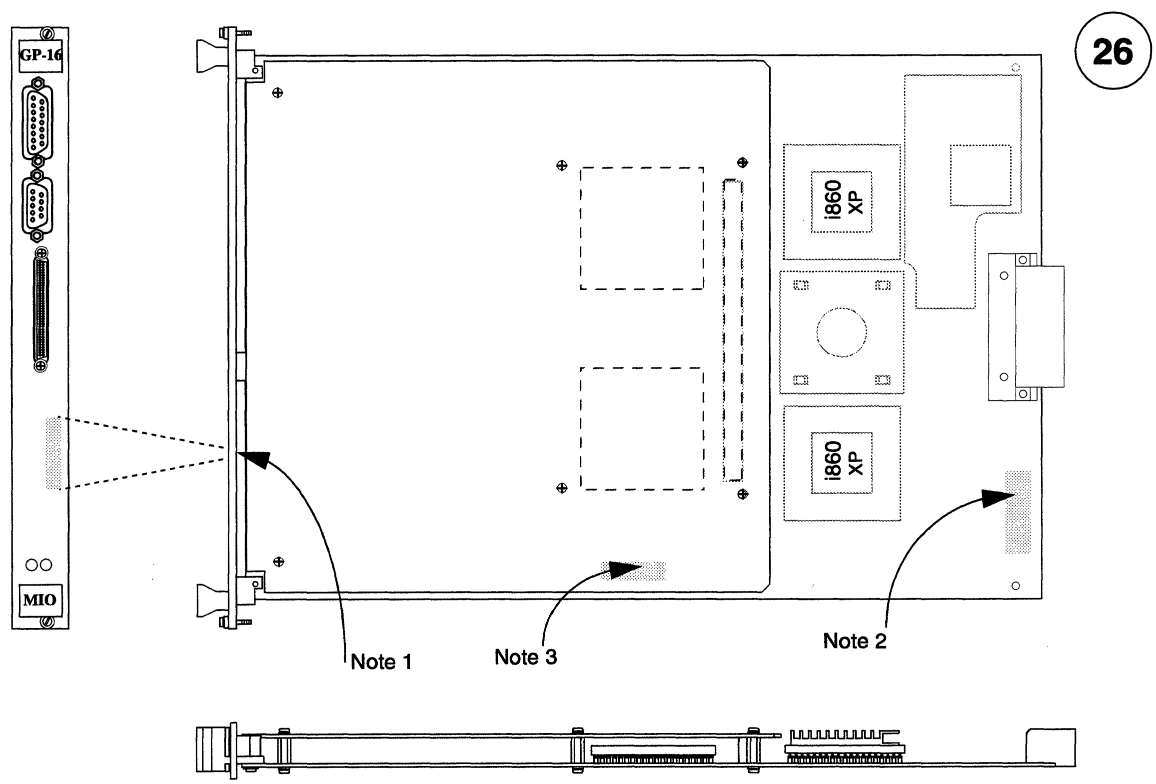
Figure A-6. MP Node Board



Notes:

1. Full node part number imprinted approximately in the indicated location on the board-side of the front panel.
2. Memory daughter board installed at factory based on memory option ordered. The memory daughter board adds 16, 32, 64, or 128 MBytes of memory to the node board memory.
3. Base board (GP/MP node) serial number imprinted approximately where indicated on the component-side of the board.
4. Board serial number (memory daughter board) imprinted approximately where indicated on the component-side of the board.
5. The base board memory can be determined from the part number and the front panel labels. GP base boards have 16/32M-bytes memory. MP base boards can have 16/32/64/128M-bytes memory.
6. The size of the memory daughter board (i.e., 16/32/64/128M-bytes) can be determined from the part number and the front panel labels of the node. The 16/32M-byte memory daughter boards use 4M-bit DRAM devices on only one side (16M-bytes) or both sides (32M-bytes) of the memory daughter board. The 64/128M-byte memory daughter boards use 16M-bit DRAM devices on only one side (64M-bytes) or both sides (128M-bytes) of the memory daughter board.

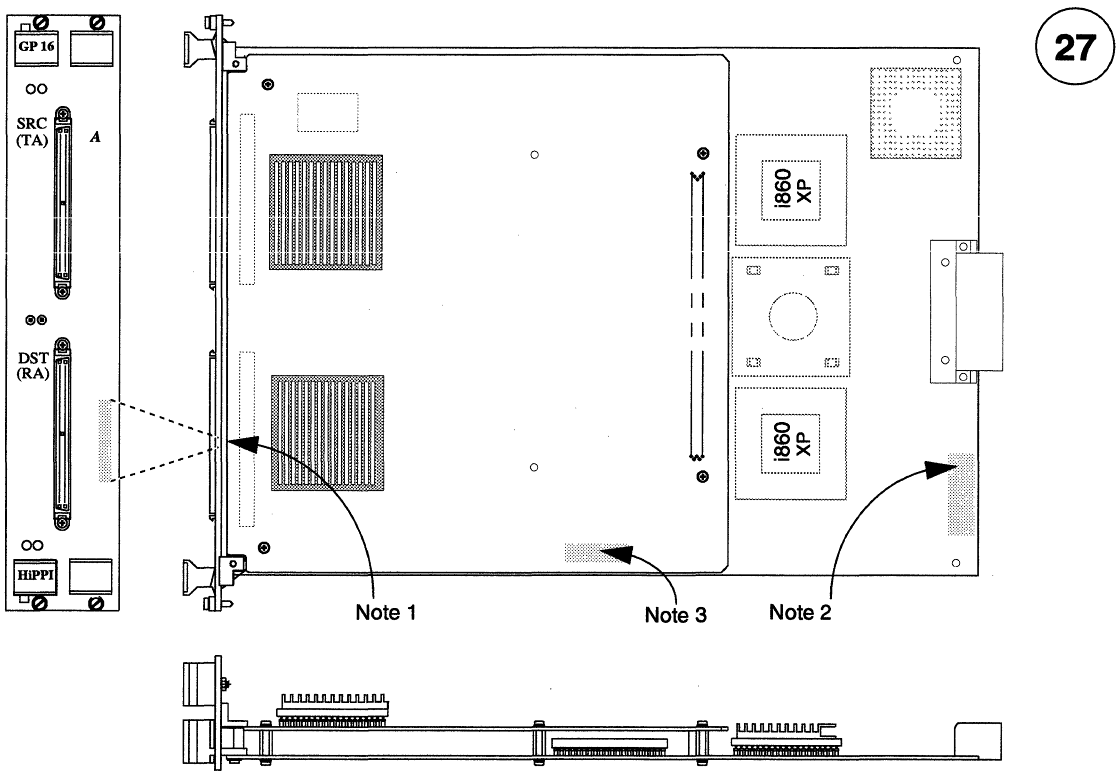
Figure A-7. GP/MP Node with Memory Daughter Board



Notes:

1. Part number imprinted approximately in the indicated location on the board-side of the front panel.
2. Base board serial number (GP or MP node) imprinted approximately where indicated on the component-side of the board.
3. Daughter board serial number (MIO daughter board) imprinted approximately where indicated on the component-side of the board.
4. The base board memory can be determined from the part number and the front panel labels. GP base boards have 16/32M-bytes memory. MP base boards can have 16/32/64/128M-bytes memory.

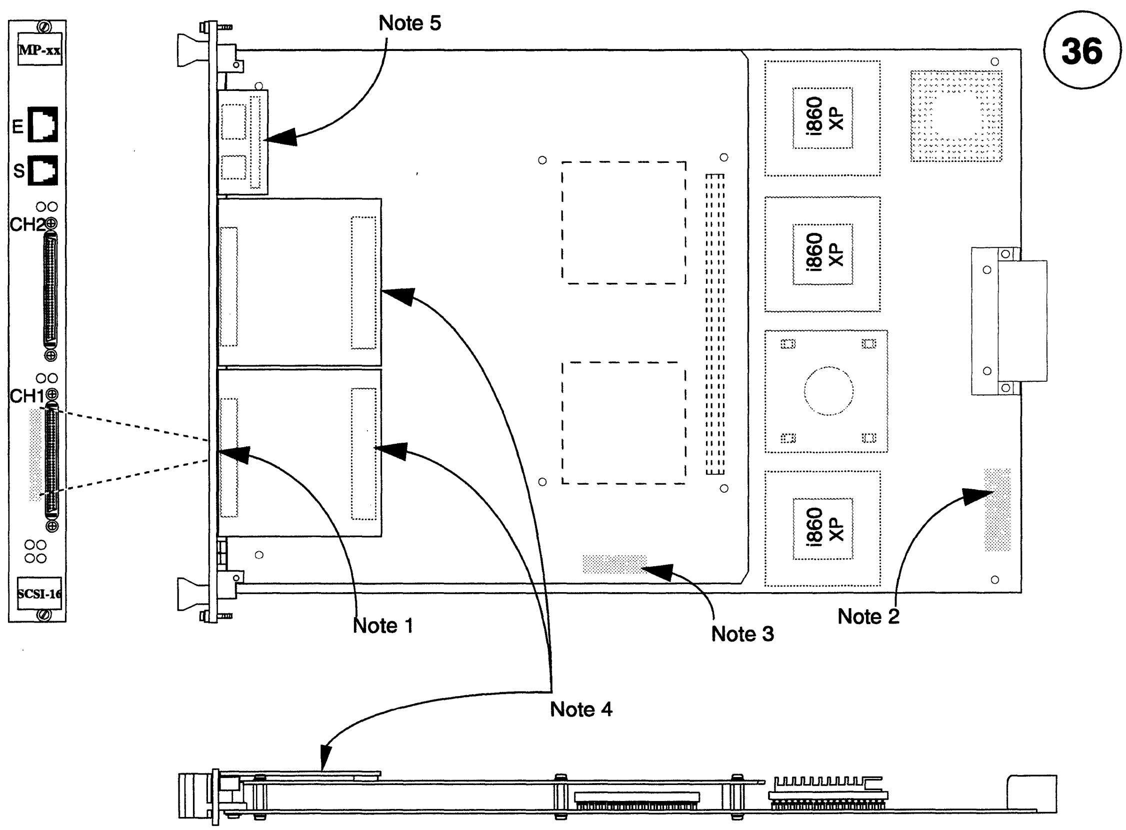
Figure A-8. MIO Node



Notes:

1. Part number imprinted approximately in the indicated location on the board-side of the front panel.
2. Base board serial number (GP or MP node) imprinted approximately where indicated on the component-side of the board.
3. Daughter board serial number (HIPPI daughter board) imprinted approximately where indicated on the component-side of the board.
4. The base board memory can be determined from the part number and the front panel labels. GP base boards have 16/32M-bytes memory. MP base boards can have 16/32/64/128M-bytes memory.

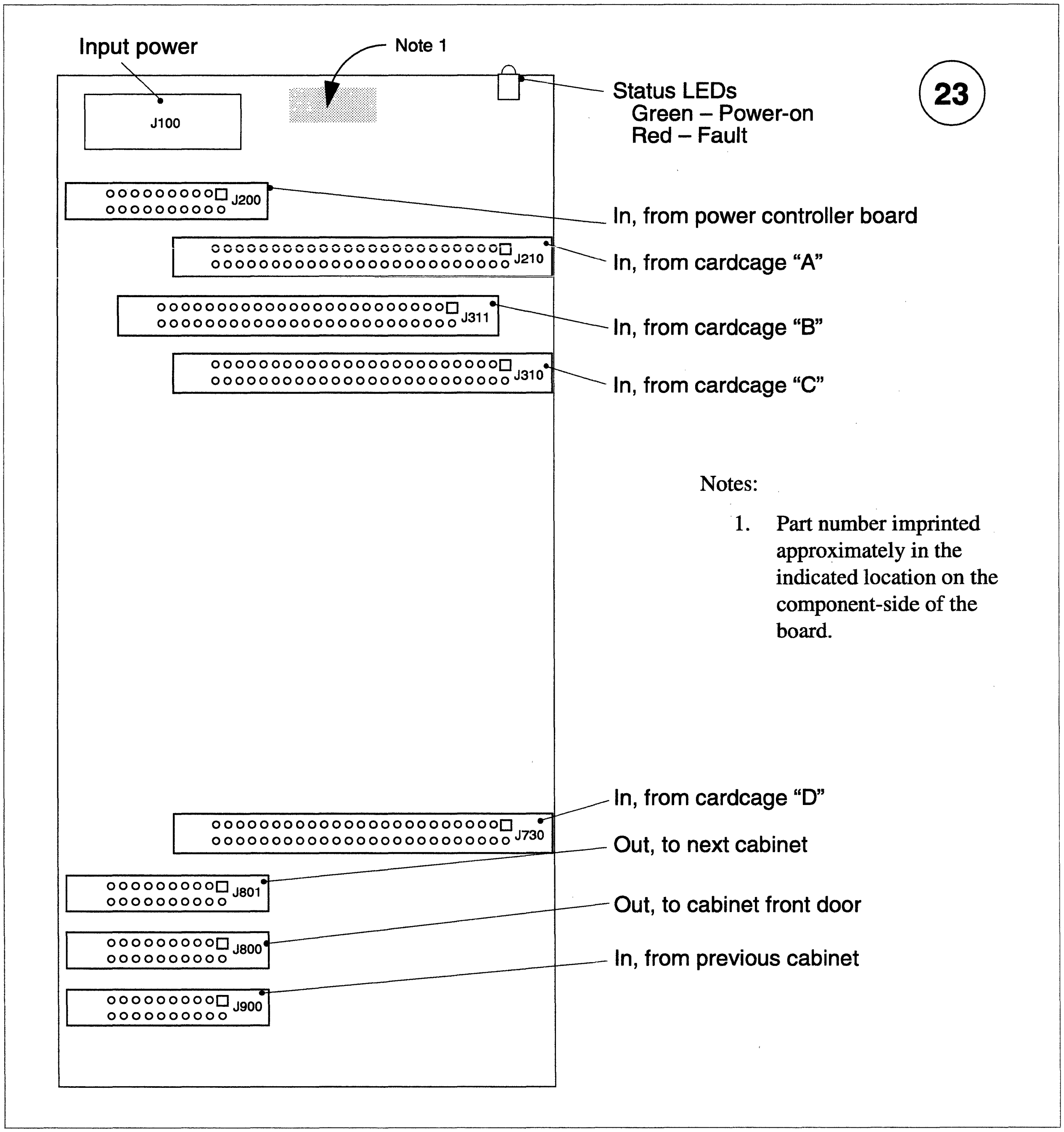
Figure A-9. HIPPI Node



Notes:

1. Part number imprinted approximately in the indicated location on the board-side of the front panel.
2. Base board serial number (GP or MP node) imprinted approximately where indicated on the component-side of the board.
3. Daughter board serial number (SCSI-16 daughter board) imprinted approximately where indicated on the component-side of the board.
4. "Granddaughter" boards hold SCSI channel connectors and determine whether a channel uses single-ended or differential signals.
5. "Granddaughter" board holds the RJ45 Ethernet and serial channel connectors.
6. The base board memory can be determined from the part number and the front panel labels. GP base boards can have 16/32M-bytes memory. MP base boards can have 16/32/64/128M-bytes memory.

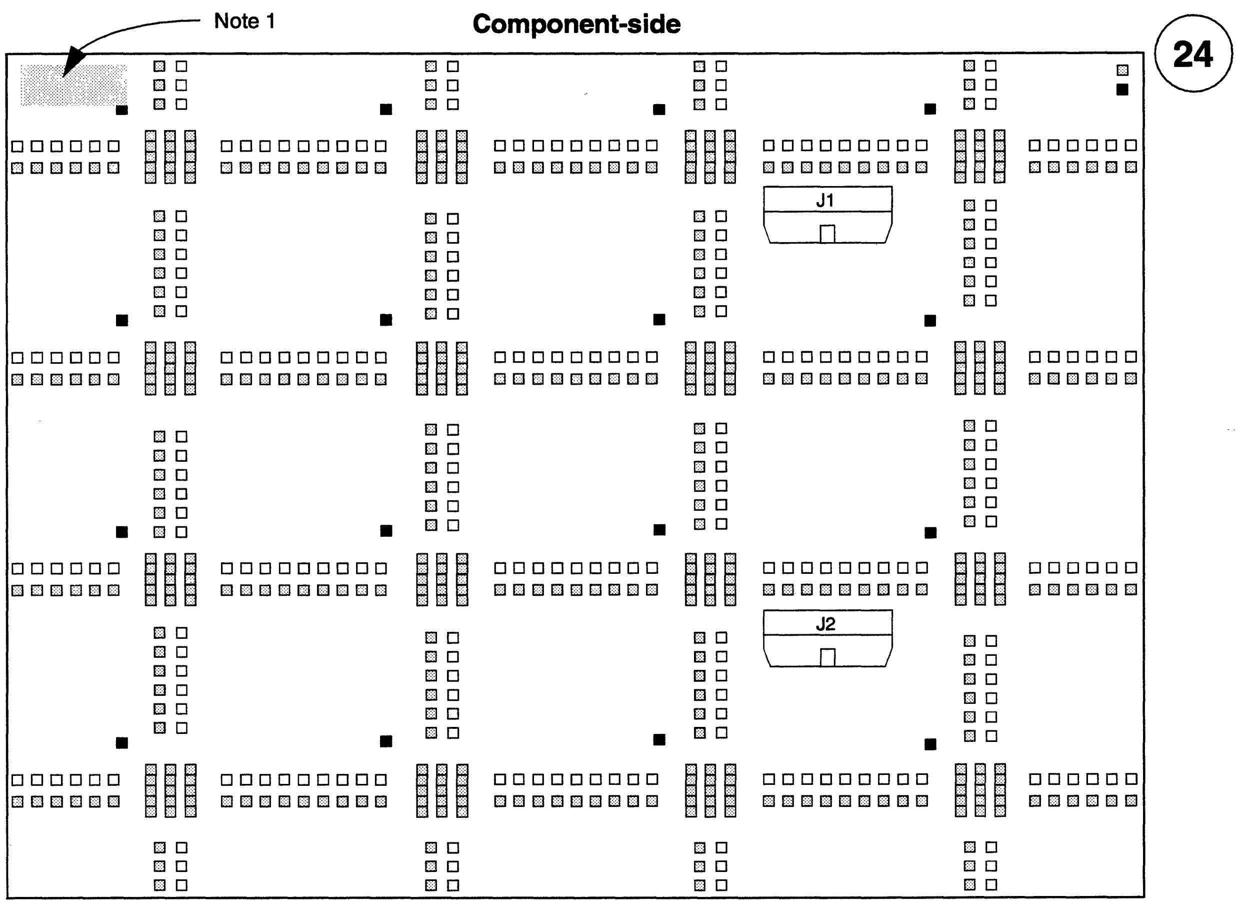
Figure A-10. SCSI-16 Node



Notes:

1. Part number imprinted approximately in the indicated location on the component-side of the board.

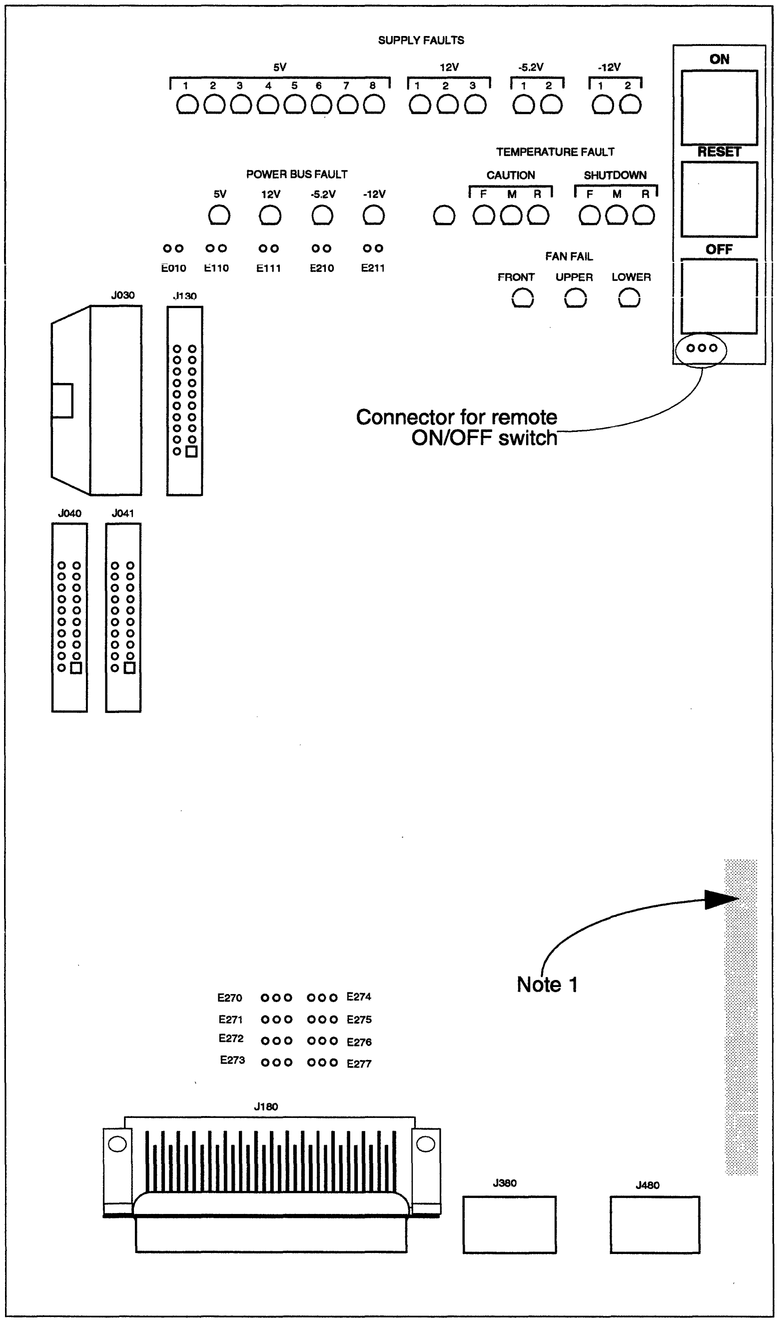
Figure A-11. LED Controller Board



Notes:

1. Part number and serial number imprinted approximately in the indicated location on the component-side of the board.
2. LED colors indicated in this figure are as follow:
   - □ Yellow LED
   - ▩ Green LED
   - ■ Red LED

Figure A-12. LED Display Board



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Notes:

1. Part number and serial number imprinted approximately in the indicated location on the component-side of the board.
2. LED colors indicated in this figure are as follow:
   ○ Red LED
3. Jumper functions are as follow:
   E010 Overtemp shutdown enable
   E110 +5V shutdown enable
   E111 +12V shutdown enable
   E210 -5.2V shutdown enable
   E211 -12V shutdown enable
   E270-E277 See Note 4.
4. Two versions of Qualidyne power supply might be installed. The old version has the following numbers:

Catalog # 31JC16F-758
Model # 31605 BFMX

The new version has the following numbers:

Catalog # 31JC16F-1266
Model # 31610 BFMX

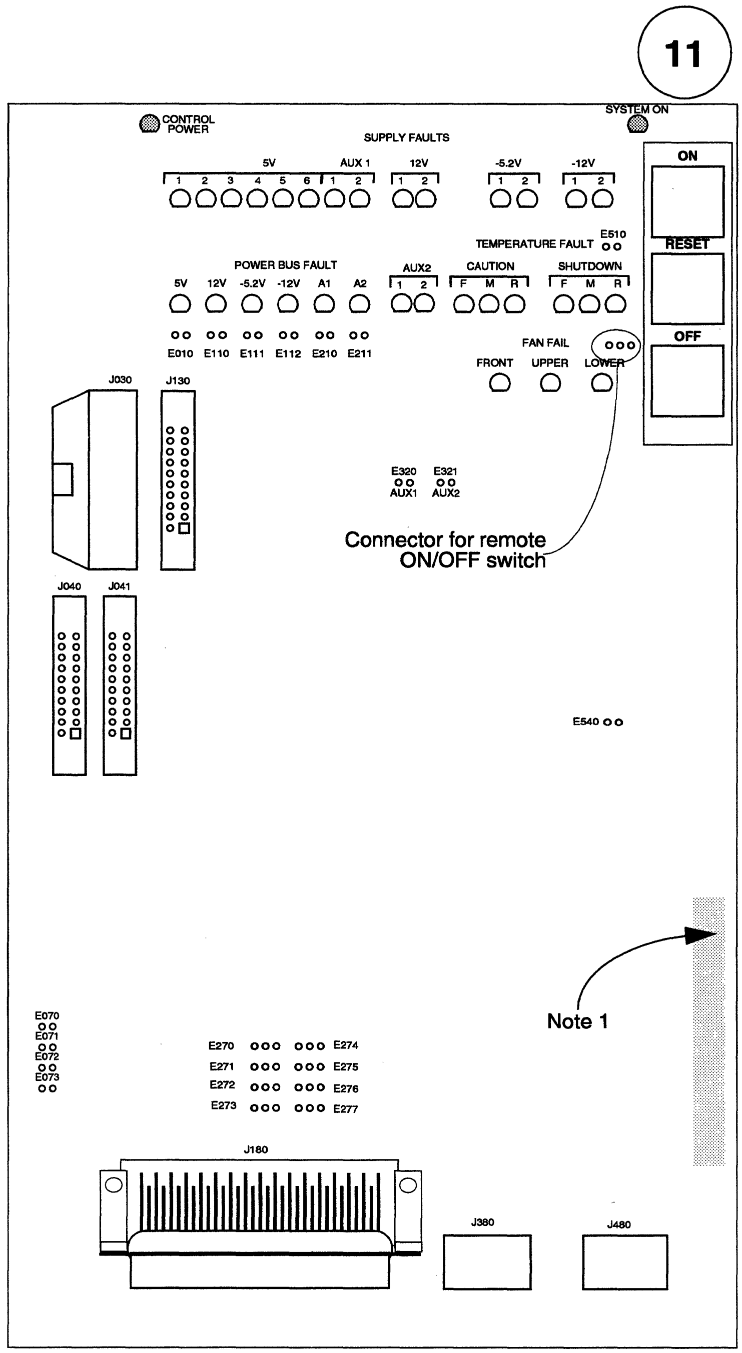
Jumpers for 4 old Qualidyne Power Supplies

		A B	A B		
1	E270			E274	5
2	E271			E275	6
3	E272			E276	A1
4	E273			E277	A2

Jumpers for new Qualidyne, Pioneer, or no power supply)

		A B	A B		
1	E270			E274	5
2	E271			E275	6
3	E272			E276	A1
4	E273			E277	A2

Figure A-13. Power Controller Board, FAB 2



Notes:

1. Part number and serial number imprinted approximately in the indicated location on the component-side of the board.
2. LED colors indicated in this figure are as follow:
   - Red LED
   - Green LED
3. Jumper functions are as follow:

E070	5% down margin (if E071 in)
E071	3% down margin (manual)
E072	3% up margin (manual)
E073	5% up margin (if E072 in)
E010	+5V shutdown enable
E110	+12V shutdown enable
E111	-5.2V shutdown enable
E112	-12V shutdown enable
E210	A1 (not used)
E211	A2 (not used)
E270-E277	See Note 4
E320	AUX1 (not used)
E321	AUX2 (not used)
E510	Overtemp shutdown enable
E540	Not used

4. Two versions of Qualidyne power supply might be installed. The old version has the following numbers:

Catalog # 31JC16F-758
Model # 31605 BFMX

The new version has the following numbers:

Catalog # 31JC16F-1266
Model # 31610 BFMX

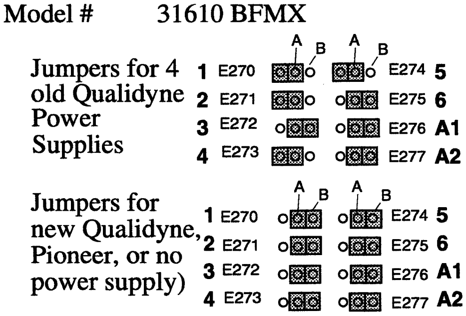
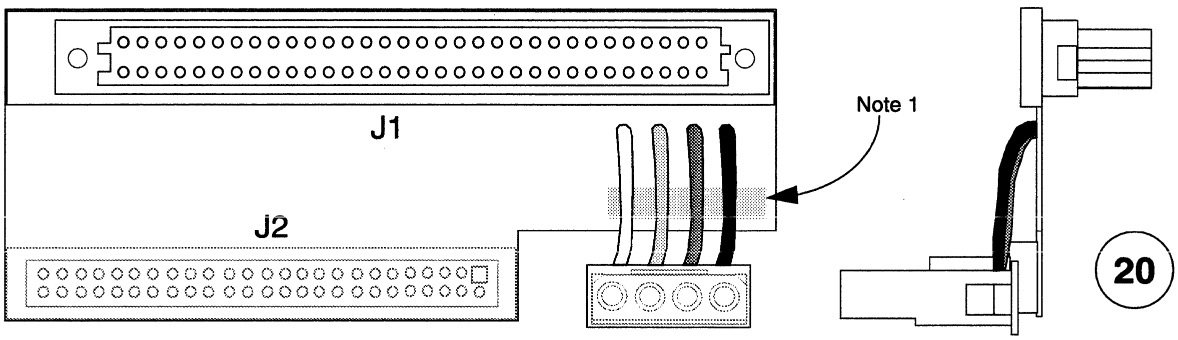


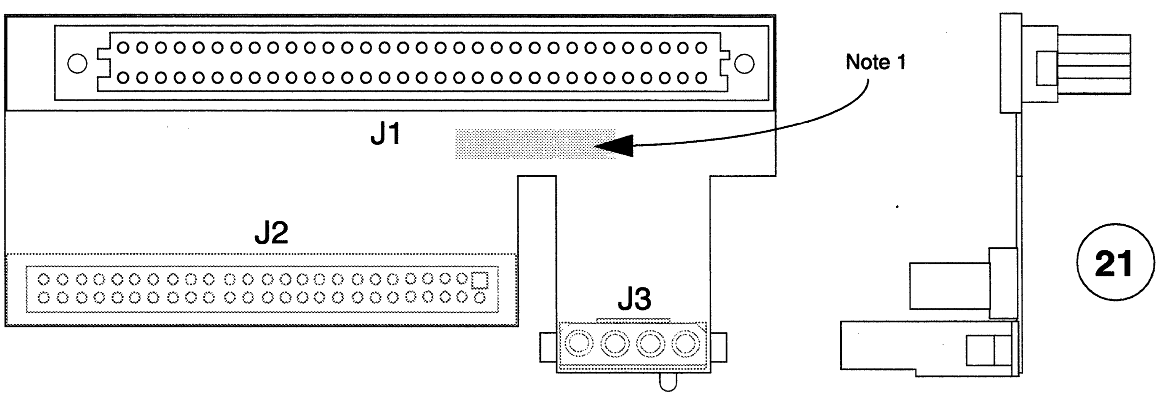
Figure A-14. Power Controller Board, FAB 3



Notes:

1. Part number imprinted approximately in the indicated location on the assembly.

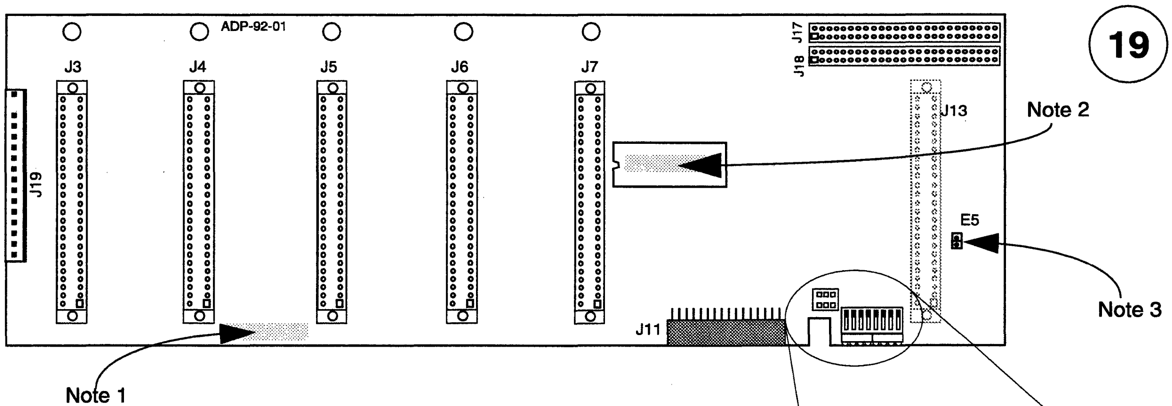
Figure A-15. SCSI/DIN Adapter Assembly

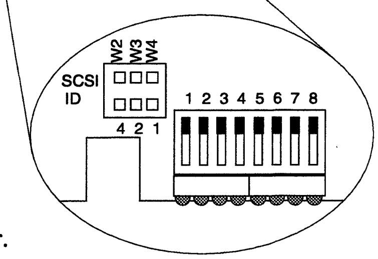


Notes:

1. Part number imprinted approximately in the indicated location on the assembly.

Figure A-16. SCSI/DIN Flex Adapter Assembly

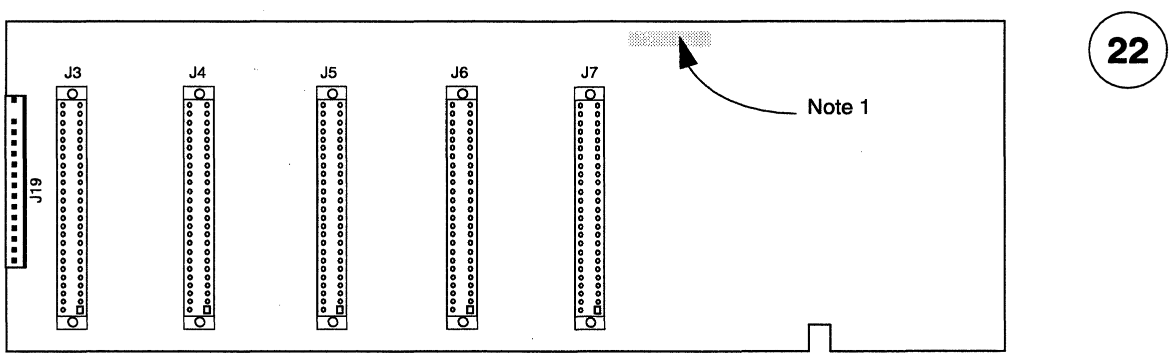




Notes:

1. Part number imprinted approximately in the indicated location on reverse side of the controller board.
2. Firmware revision number located in this approximate location on top of the ROM component.
3. Versions of the controller board with this jumper block (E5) must have a jumper installed to provide host-side SCSI terminator power.

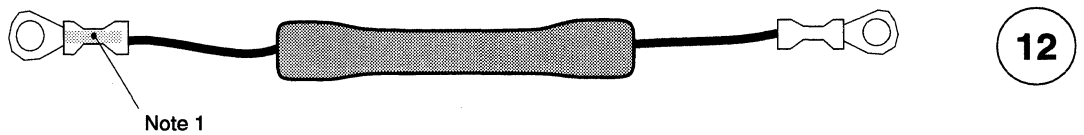
Figure A-17. RAID Controller Board (ADP92-01)



Notes:

1. Part number imprinted approximately in the indicated location on the connector side of the SCSI backplane board.

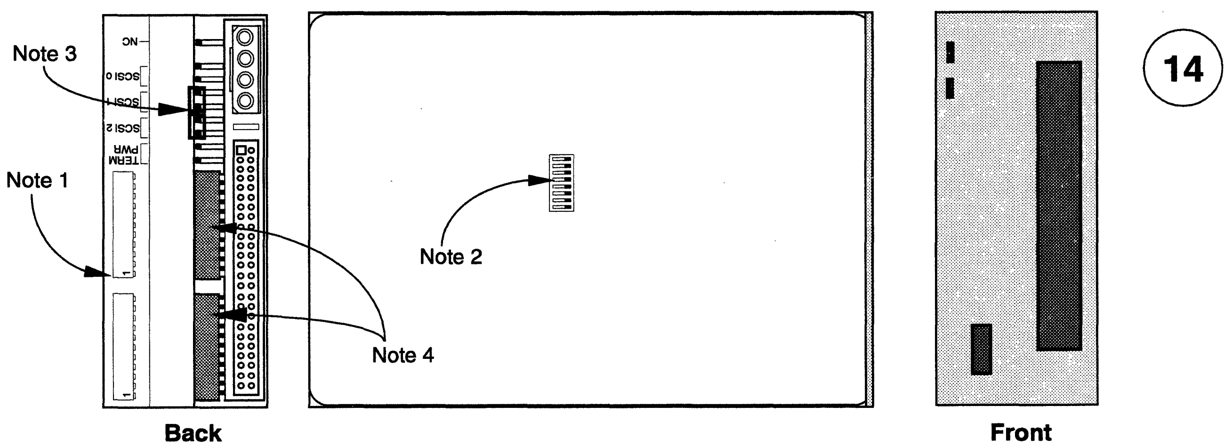
Figure A-18. SCSI Backplane Board



Notes:

1. Part number imprinted approximately in the indicated location on the terminal.

Figure A-19. Bleed Resistor Assembly



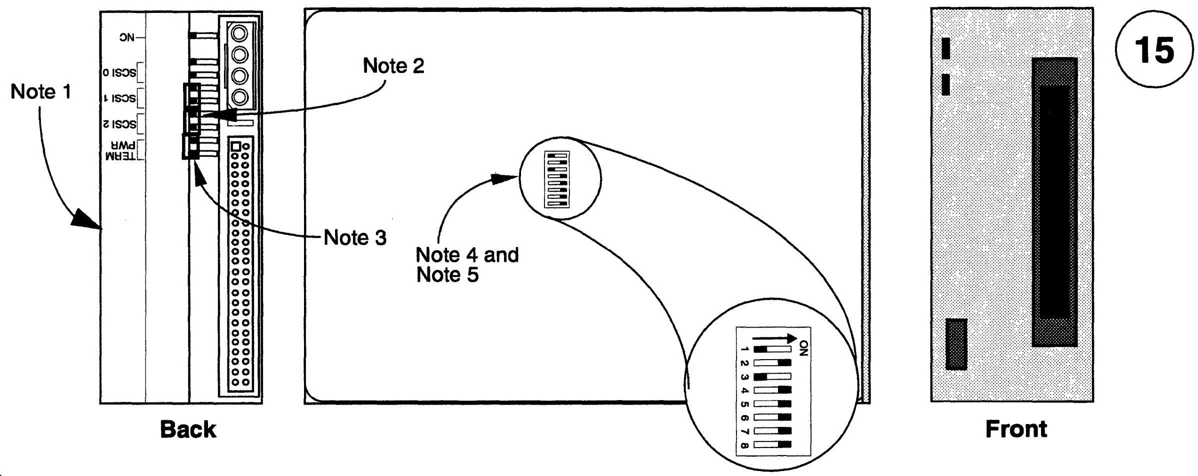
Notes:

1. Vendor model and part number imprinted approximately in the indicated location on the plate on the opposite side from the option switches.
2. Option switches 1 through 8 are all set to "ON" for Paragon™ XP/S system applications.
3. Jumpers are installed to set the default SCSI ID of this drive to "6". Possible SCSI ID settings (0 = no jumper, 1 = jumper installed) are as follow:

SCSI ID	Bit 2	Bit 1	Bit 0	SCSI ID	Bit 2	Bit 1	Bit 0
0	0	0	0	**4**	1	0	0
1	0	0	1	**5**	1	0	1
2	0	1	0	**6**	1	1	0
3	0	1	1	**7**	1	1	1

4. Termination resistor SIP's must be installed in the indicated locations when the drive is installed as the end device on the SCSI bus. Ensure SIP pin 1 is oriented as indicated on the drive back panel.

Figure A-20. DAT Tape Drive (HP Model 35470)



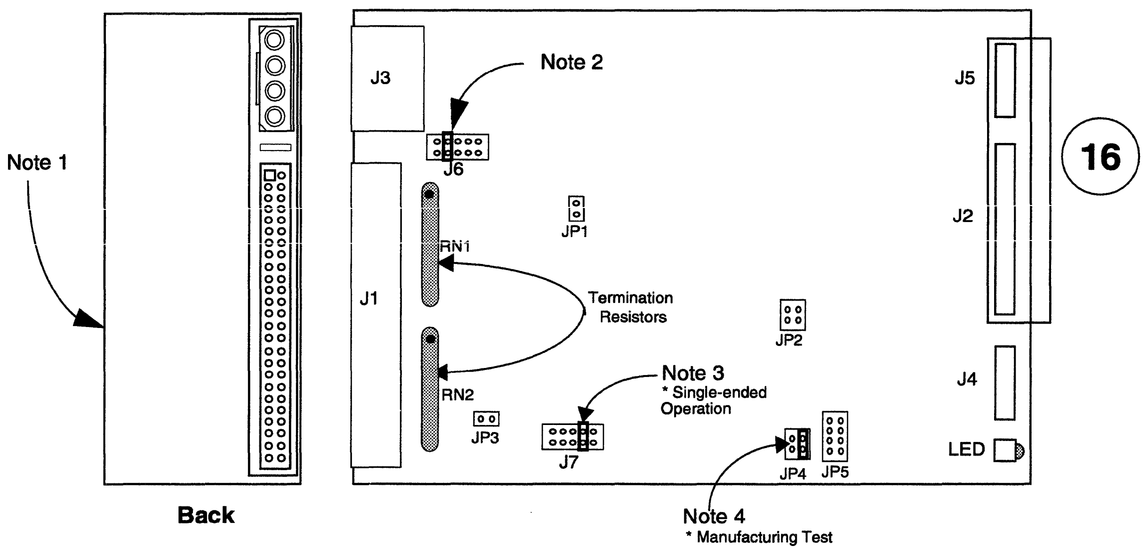
Notes:

1. Vendor model and part number imprinted approximately in the indicated location on the plate on the opposite side from the option switches.
2. Jumpers are installed as indicated to set the default SCSI ID of this drive to "6". Possible SCSI ID settings (0 = no jumper, 1 = jumper installed) are as follow:

SCSI ID	Bit 2	Bit 1	Bit 0	SCSI ID	Bit 2	Bit 1	Bit 0
0	0	0	0	**4**	1	0	0
1	0	0	1	**5**	1	0	1
2	0	1	0	**6**	1	1	0
3	0	1	1	**7**	1	1	1

3. Terminator power is enabled using the indicated jumper. External terminators must be used.
4. With Option switch 1 OFF and switch 2 ON as indicated, compression is disabled at power-on and the host is allowed to control compression.
5. With Option switch 3 OFF as indicated, the Media Recognition System is active. Non-Media Recognition System tapes are treated as if they are write-protected.

Figure A-21. DAT Tape Drive (HP Model C1533)



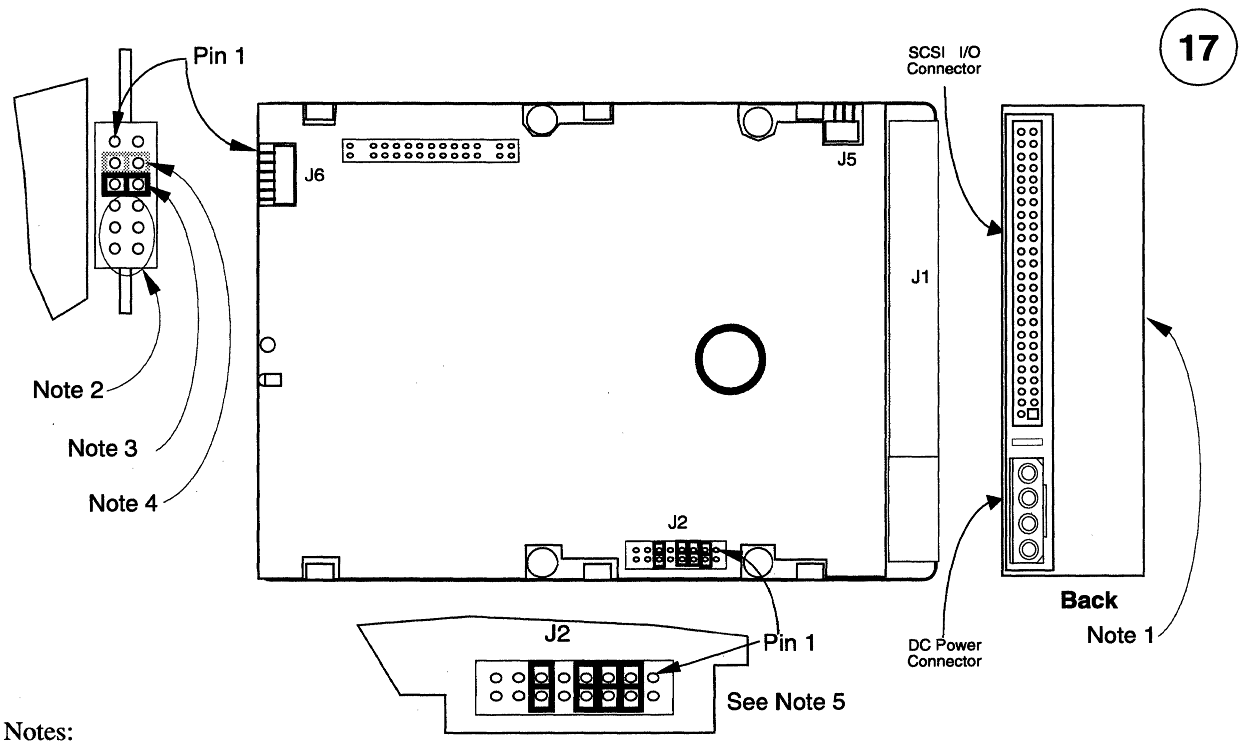
Notes:

1. Vendor model and part number imprinted approximately in the indicated location on the plate on the opposite side from the jumpers.
2. Jumpers are installed to set the default SCSI ID of this drive. In RAID applications for the Paragon XP/S system, no SCSI ID jumpers (SCSI ID of "0") are installed. A jumper is installed at 7-8 to enable parity. Possible SCSI ID settings (0 = no jumper, 1 = jumper installed) are as follow:

SCSI ID	5-6	3-4	1-2	SCSI ID	5-6	3-4	1-2
0	0	0	0	**4**	1	0	0
1	0	0	1	**5**	1	0	1
2	0	1	0	**6**	1	1	0
3	0	1	1	**7**	1	1	1

3. The jumper installed at J7 3-4 sets the drive to single-ended (instead of differential) operation.
4. Jumper blocks JP1, JP2, JP4, and JP5 are for manufacturing only. There should be only one jumper installed in any of these blocks, at JP4 2-4.

Figure A-22. 1.2G-Byte Hard Disk Drive (Maxtor)



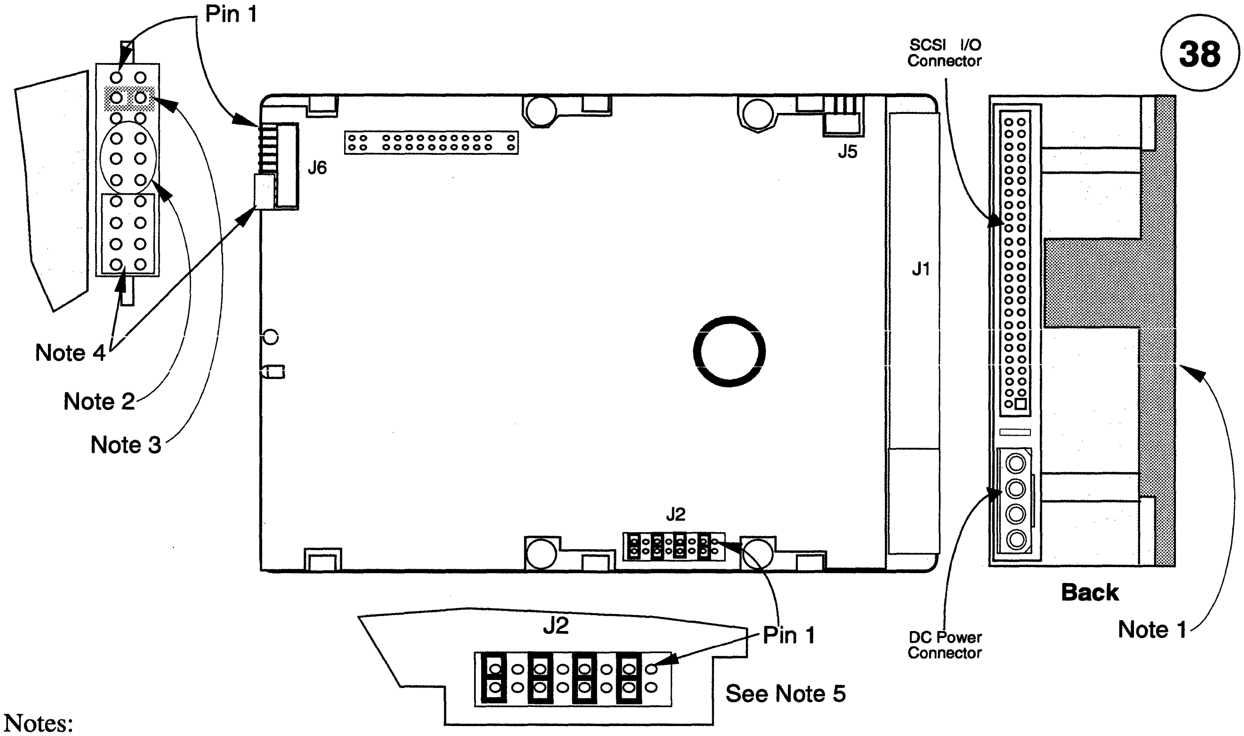
Notes:

1. Vendor model and part number imprinted approximately in the indicated location on the plate on the opposite side from the jumpers.
2. Jumpers are installed to set the default SCSI ID of this drive. In RAID applications for the Paragon XP/S system, no SCSI ID jumpers (SCSI ID of "0") are installed. Possible SCSI ID settings (0 = no jumper, 1 = jumper installed) are as follow:

SCSI ID	5-6	3-4	1-2	SCSI ID	5-6	3-4	1-2
0	0	0	0	**4**	1	0	0
1	0	0	1	**5**	1	0	1
2	0	1	0	**6**	1	1	0
3	0	1	1	**7**	1	1	1

3. The "Sync Spindle" jumper installed at J6 5-6 is required.
4. A header can be attached at J6 3-4 to a remote LED indicator. The LED cathode connects to J6, pin 4.
5. The drive option jumper block, J2, must be jumpered as shown for RAID applications in the Paragon XP/S system. The jumpers enable the following options:
   - J2, 3-4 Terminator power from drive.
   - J2, 5-6 Enable terminators.
   - J2, 7-8 Enable parity option.
   - J2, 11-12 Enable motor start on command.

Figure A-23. 1.0G-Byte Hard Disk Drive (Seagate)



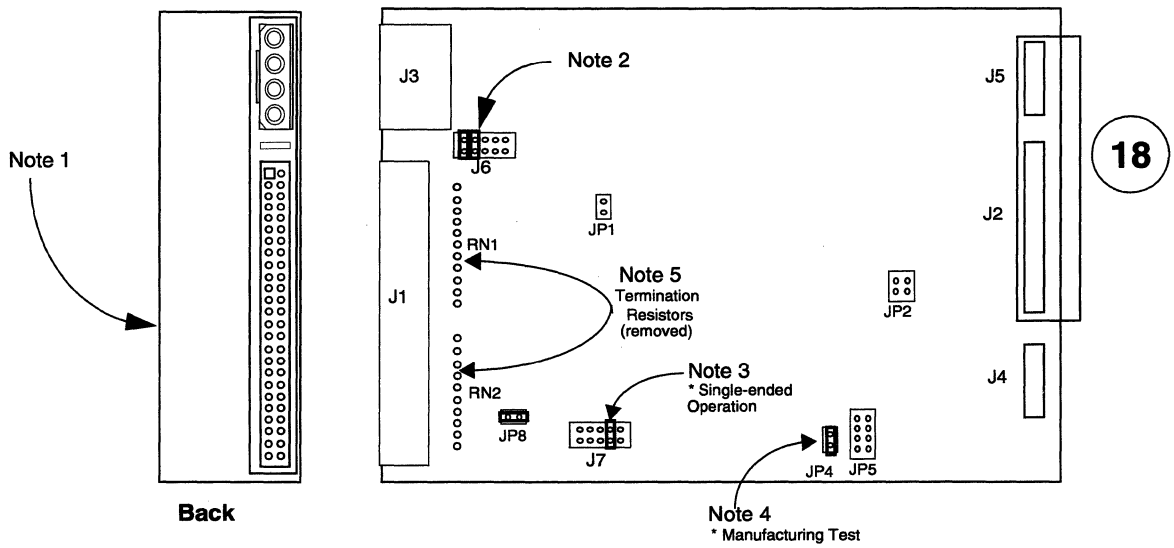
Notes:

1. Vendor model and part number imprinted approximately in the indicated location on the plate on the opposite side from the jumpers.
2. Jumpers are installed to set the default SCSI ID of this drive. In RAID applications for the Paragon XP/S system, no SCSI ID jumpers (SCSI ID of "0") are installed. Possible SCSI ID settings (0 = no jumper, 1 = jumper installed) are as follow:

SCSI ID	5-6	3-4	1-2	SCSI ID	5-6	3-4	1-2
0	0	0	0	**4**	1	0	0
1	0	0	1	**5**	1	0	1
2	0	1	0	**6**	1	1	0
3	0	1	1	**7**	1	1	1

3. A header can be attached at J6 3-4 to a remote LED indicator. The LED cathode connects to J6, pin 4.
4. Shipped with cover installed. These jumper pairs, plus J6 1-2 and J6 5-6, are reserved.
5. The drive option jumper block, J2, must be jumpered as shown for RAID applications in the Paragon XP/S system. The jumpers enable the following options:
   - J2, 3-4 Terminator power from drive.
   - J2, 7-8 Enable parity option.
   - J2, 11-12 Enable motor start on command.
   - J2, 15-16 Enable terminators.

Figure A-24. 4.0G-Byte Hard Disk Drive (Seagate)



Notes:

1. Vendor model and part number imprinted approximately in the indicated location on the plate on the opposite side from the jumpers.
2. Jumpers are installed to set the default SCSI ID of this drive. In diagnostic station applications for the Paragon XP/S system, no SCSI ID jumpers (SCSI ID of "0") are installed. A jumper is installed at 7-8 to enable parity. A jumper is installed at 9-10 to enable motor start at power-up. Possible SCSI ID settings (0 = no jumper, 1 = jumper installed) are as follow:

SCSI ID	5-6	3-4	1-2	SCSI ID	5-6	3-4	1-2
0	0	0	0	**4**	1	0	0
1	0	0	1	**5**	1	0	1
2	0	1	0	**6**	1	1	0
3	0	1	1	**7**	1	1	1

3. The jumper installed at J7 3-4 sets the drive to single-ended (instead of differential) operation.
4. Jumper blocks JP2, JP4, and JP5 are for manufacturing only. There should be only one jumper installed in any of these blocks, at JP4 2-4 (drive write enable).
5. If already in place, the termination resistors should be removed before installing the drive in the diagnostic station.

Figure A-25. 540M-Byte Hard Disk Drive (Maxtor)

Paragon™ System Cables

The Paragon XP/S system uses cables to interconnect the major modules within each cabinet, and it also uses cables to interconnect cabinets to form the full system. There are actually four subsystems within the Paragon XP/S system that can be associated with interconnections. These subsystems are linked directly to the cables that are used to effect the interconnects, as follows:

- The basic cabinet interconnect cables are installed in every cabinet. These cables include the fan cables, the thermostat cables, the LED power and signal cables, and the main power cable.
- The DC power subsystem cables distribute power to the various areas within the cabinet that require it. These cables include the cables between the main bus bars and power supplies, the straps between the main bus bars and backplanes, the DC auxiliary power cable, the power controller power cable (cabinet 0 only), the power controller board wire harness, the disk module power cable, the power supply power/cooling cable, and the power supply AC power cords.
- The I/O system cables link I/O resources (both within and outside of a cabinet) together and also to Paragon XP/S system MIO nodes. These cables include internal and stub Ethernet cables, individual drive power cables, HIPPI cables, SCSI/RAID cables, RAID array power cables, peripheral module fan cables, and peripheral module power cables.
- The mesh interconnect cables and cabinet-to-cabinet cables perform the important cardcage and cabinet interconnect functions that are necessary if the parts of a Paragon XP/S system cabinet are to become a Paragon XP/S system. These cables include the mesh interconnect cables, the power controller board power chain cables, the backplane-to-backplane scan chain cables, the power controller board scan chain cables, and the LED controller East/West cables.

The following tables and figures list and show the cables and part numbers associated with the Paragon XP/S system.

Basic Cabinet Interconnect Cables

Figure A-26 shows the field replaceable cables that are used in the basic Paragon XP/S system cabinet. Refer to Table A-2 for the part numbers associated with each of these cables.

Table A-2. Basic Cabinet Interconnect Cables

Key	Paragon Part Reference	Intel Part Number	Description
1		316342-001	Cable, fan harness, top
2		316506-001	Cable, AC input power cord, 3-phase, European
3		316654-001	Cable, AC input power cord, 3-phase, North American
4		316662-001	Cable, DC power, LED door, red
		316662-002	Cable, DC power, LED door, black
5		316807-001	Cable, thermostat
6		316812-001	Cable, fan harness, lower
7		316817-001	Cable, DC power, LED control board, power control board
8		316827-001	Cable, backplane-to-LED control board, 1.4-feet
		316827-002	Cable, backplane-to-LED control board, 1.6-feet
		316827-003	Cable, backplane-to-LED control board, 2.6-feet
		316827-004	Cable, backplane-to-LED control board, 3.4-feet
9		316828-001	Cable, LED, display-to-display
10		316829-001	Cable, LED, controller-to-display
11		316976-002	Cable, fans, disk module
12		317044-001	Cable, front fan assembly
13		317079-001	Cable, fan, front fan assembly

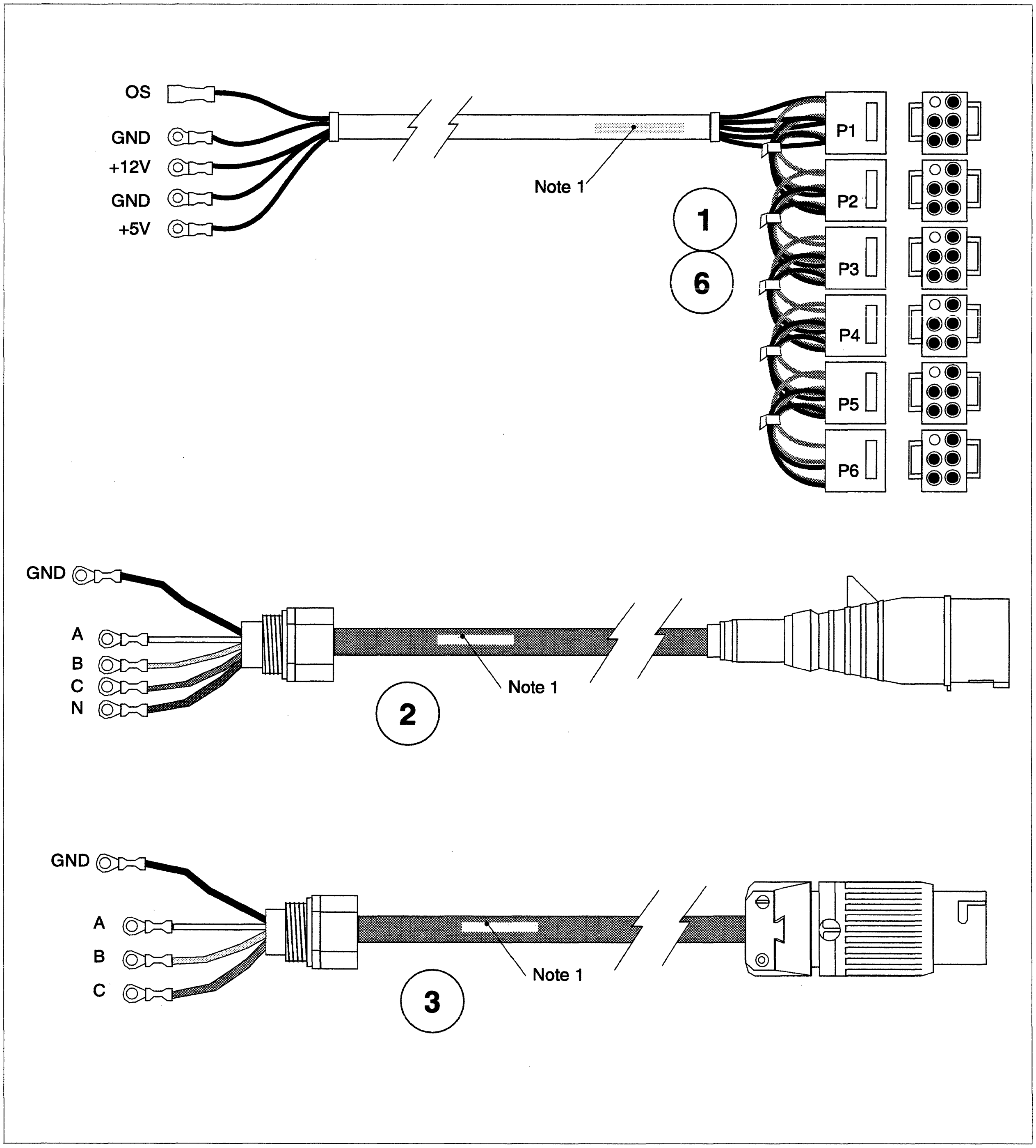


Figure A-26. Basic Cabinet Interconnect Cables (1 of 3)

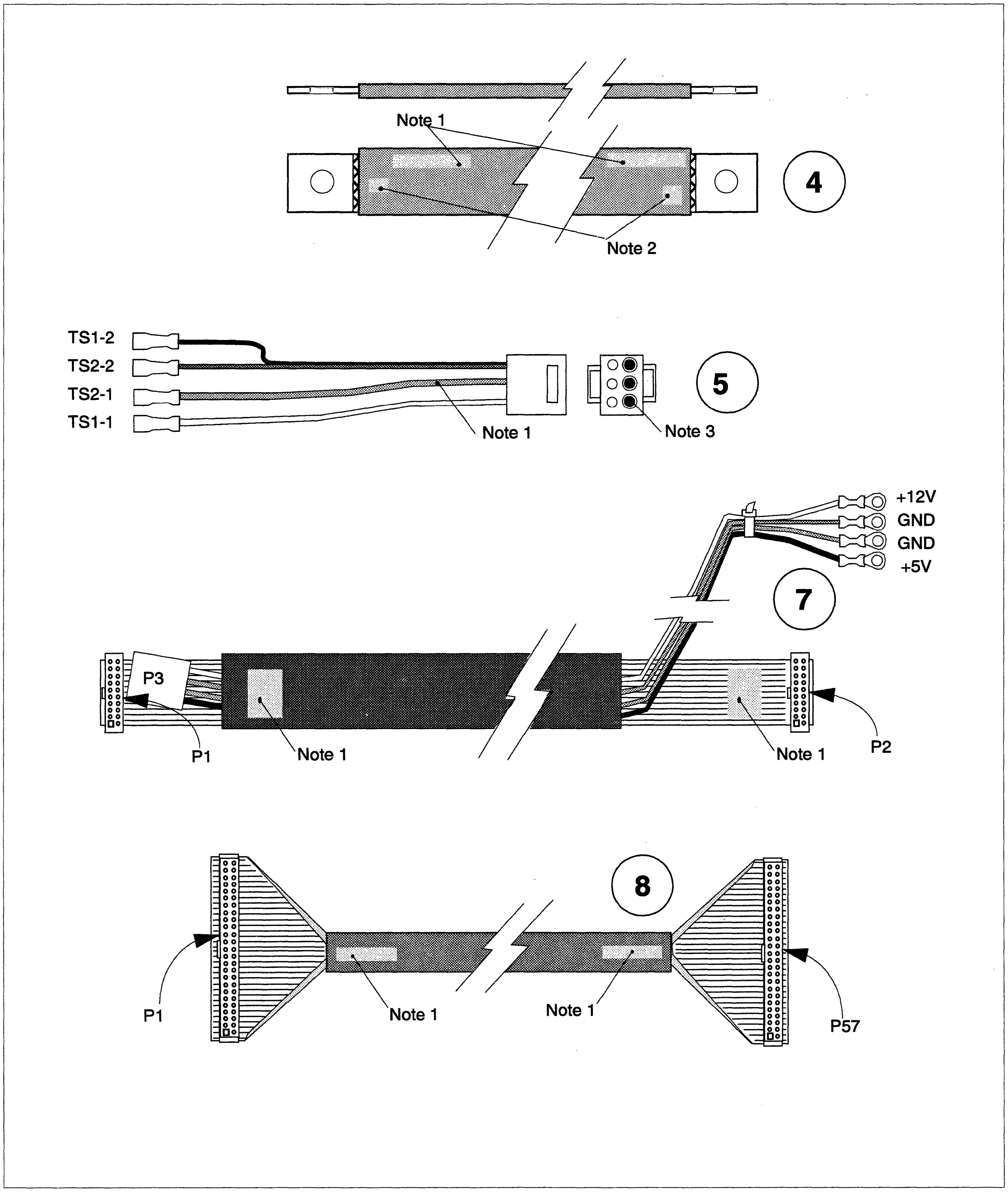
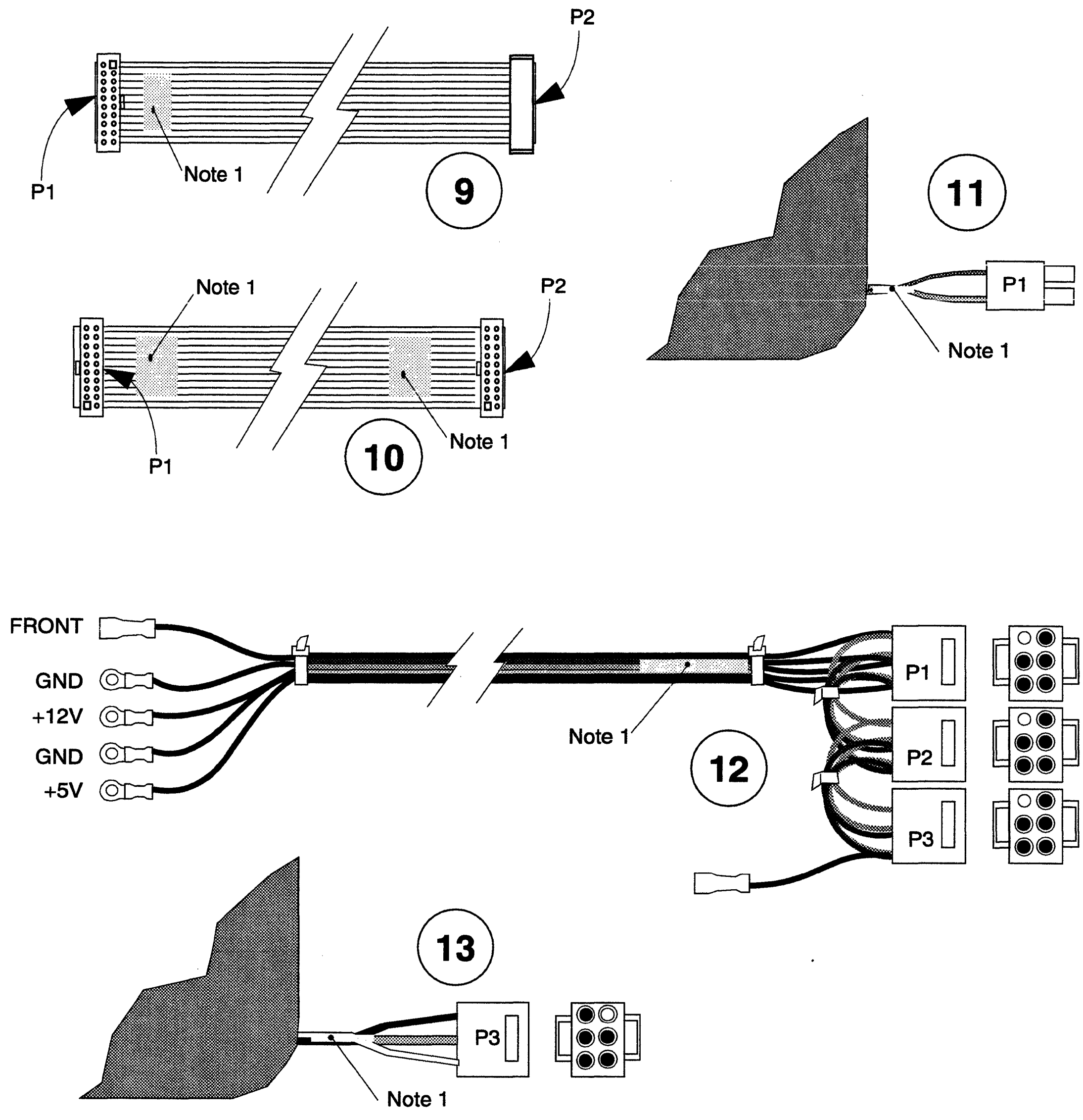


Figure A-26. Basic Cabinet Interconnect Cables (2 of 3)



Notes:

1. Cable part number imprinted approximately in the indicated location.
2. Part numbers 316662-001 has red insulated shrink tubing and is marked "+5V" in this location. Part number 316662-002 has black insulated shrink tubing and is marked "GND" in this location.
3. Connector pin-1 location shown as a square pin, or in the position indicated.

Figure A-26. Basic Cabinet Interconnect Cables (3 of 3)

DC Power Subsystem Cables

Figure A-27 shows the field replaceable cables that are used in the DC power subsystem of the Paragon XP/S system cabinet. Refer to Table A-3 for the part numbers associated with each of these cables.

Table A-3. DC Power Subsystem Cables (1 of 2)

Key	Paragon Part Reference	Intel Part Number	Description
1		316403-001	Cable, braided, ground/power, 14-inch
		316403-002	Cable, braided, ground/power, 17.3-inch
		316403-003	Cable, braided, ground/power, 22-inch
		316403-004	Cable, braided, ground, 13-inch
		316403-005	Cable, braided, ground, 21-inch
2		316404-001	Cable, braided, +5VDC, 13-inch
		316404-002	Cable, braided, +5VDC, 16-inch
		316404-003	Cable, braided, +5VDC, 21-inch
		316404-004	Cable, braided, +5VDC, 15-inch
		316404-005	Cable, braided, +5VDC, 24-inch
3		316427-001	Cable, AC power, 58-inch, 16 amp
4		316454-001	Cable, AC power, 69-inch, 16 amp
5		316459-001	Cable, AC power, 83-inch, 10 amp, 250 VAC
6		316462-001	Cable, DC power, 18.25-inch, +12VDC
7		316463-001	Cable, DC power, 20-inch, ground
8		316464-001	Cable, DC power, 14-inch, +12VDC
9		316465-001	Cable, DC power, 16-inch, ground
10		316354-001	Busbar, Vbar-to-cardcage, +5V
11		316355-001	Busbar, Vbar-to-cardcage, GND
12		316515-001	Cable, +5VDC, power input, power control board
13		316519-001	Cable, auxiliary DC power, backplane
14		316525-001	Cable, Qualidyne power/cooling
15		316535-001	Cable, main power wiring harness

Table A-3. DC Power Subsystem Cables (2 of 2)

Key	Paragon Part Reference	Intel Part Number	Description
16		317031-001	Cable, disk power harness, top
		317031-002	Cable, disk power harness, middle
		317031-003	Cable, disk power harness, bottom

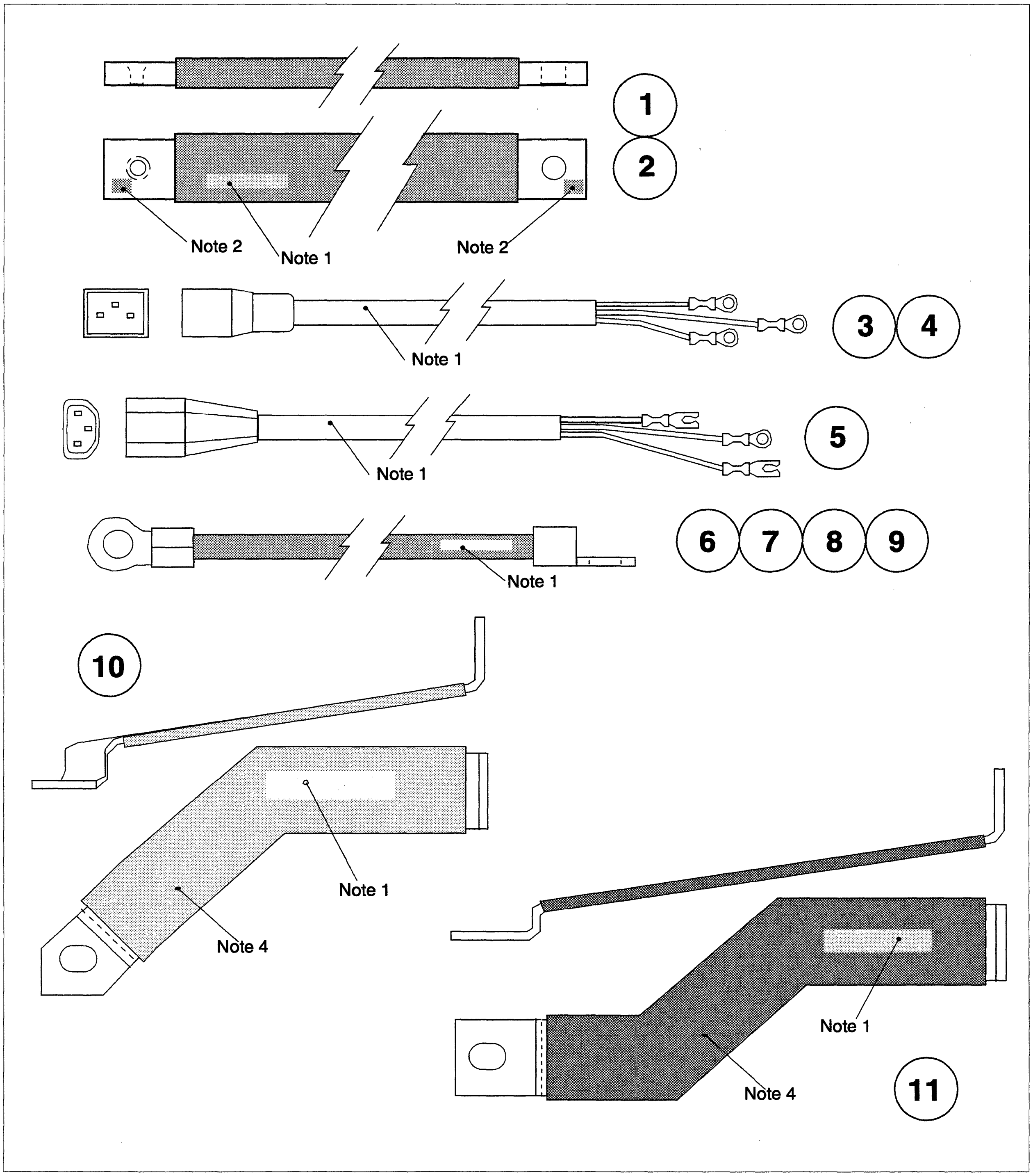


Figure A-27. DC Power Subsystem Cables (1 of 3)

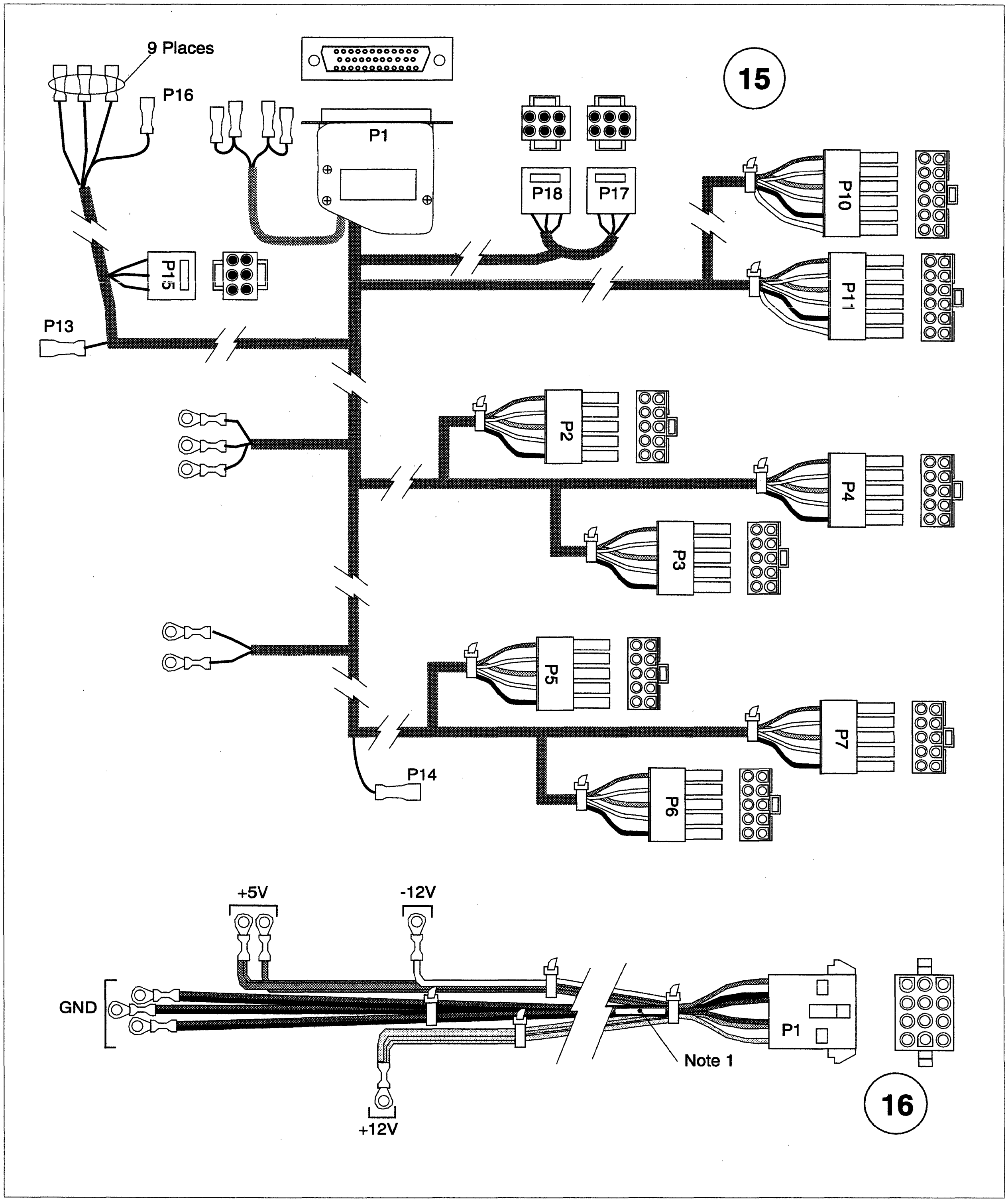
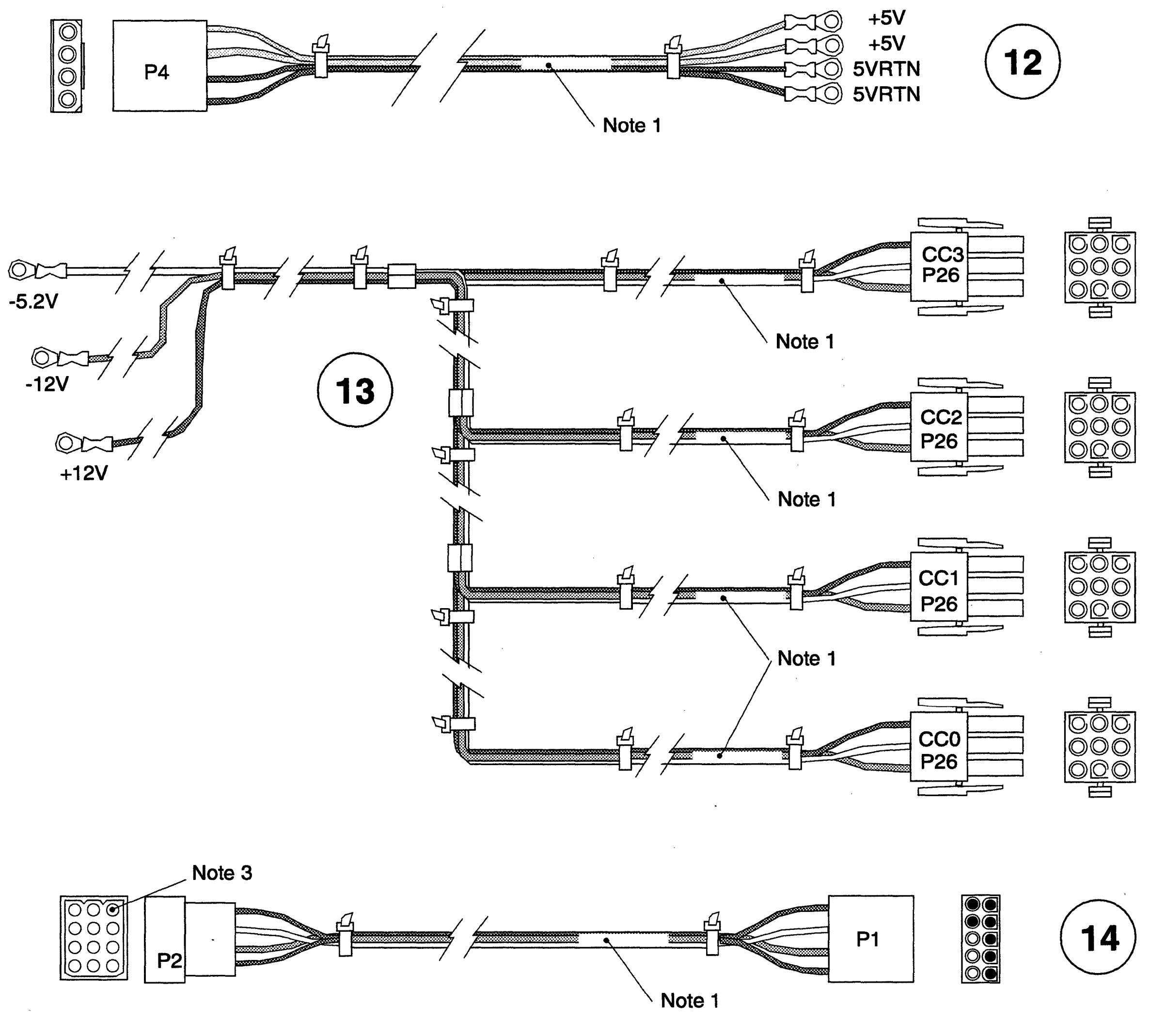


Figure A-27. DC Power Subsystem Cables (2 of 3)



Notes:

1. Cable part number imprinted approximately in the indicated location.
2. Part number 316403-XXX is marked "GND" in this location. Part number 316404-XXX is marked "5 V" in this location.
3. Connector pin-1 location shown as a square pin, or in the position indicated.
4. Part numbers 316354-001 has red insulated shrink tubing in this location. Part number 316355-002 has black insulated shrink tubing in this location.

Figure A-27. DC Power Subsystem Cables (3 of 3)

I/O System Cables

Figure A-28 shows the field replaceable cables that are used in the Paragon XP/S I/O system. Refer to Table A-4 for the part numbers associated with each of these cables.

Table A-4. I/O System Cables (1 of 3)

Key	Paragon Part Reference	Intel Part Number	Description
1		316830-001	Cable, RAID board power, 8-inch
		316830-002	Cable, RAID board power, 11.5-inch
		316830-003	Cable, RAID board power, 16.75-inch
2		316928-001	Cable, DC power, dual, 3.5-inch tape drive
3	MFCCAMIO	316929-001	Cable, tape signal, MIO dual
4		317030-001	Cable, disk module, power-in
5		317048-001	Cable, fan, DC power
6	MFCTAPECA	317088-001	Cable, tape, signal, jumper
7	MFSCSI1	317154-001	Cable, SCSI RAID, 4.2-feet
	MFSCSI2	317154-002	Cable, SCSI RAID, 5.2-feet
	MFSCSI3	317154-003	Cable, SCSI RAID, 6.2-feet
	MFSCSI4	317154-004	Cable, SCSI RAID, 7.2-feet
	MFSCSI5	317154-005	Cable, SCSI RAID, 8.2-feet
	MFSCSI6	317154-006	Cable, SCSI RAID, 9.2-feet
	MFSCSI7	317154-007	Cable, SCSI RAID, 10.2-feet
	MFSCSI8	317154-008	Cable, SCSI RAID, 11.2-feet
	MFSCSI9	317154-009	Cable, SCSI RAID, 12.2-feet
	MFSCSI10	317154-010	Cable, SCSI RAID, 13.2-feet
8		317277-001	Cable, SCSI RAID, Wisconsin, 4.2-feet
		317277-002	Cable, SCSI RAID, Wisconsin, 5.2-feet
		317277-003	Cable, SCSI RAID, Wisconsin, 6.2-feet
9		317284-001	Cable, fan power, disk module, Wisconsin
10		317285-001	Cable, board power, disk module, Wisconsin

Table A-4. I/O System Cables (2 of 3)

Key	Paragon Part Reference	Intel Part Number	Description
11		317286-001	Cable, disk module power, top
		317286-002	Cable, disk module power, middle
		317286-003	Cable, disk module power, bottom
12	MFCENETM	317302-001	Cable, Ethernet, MIO, internal
13	MFCENETI	317303-001	Cable, Ethernet, interim, stub
14		340142-001	Cable, Ethernet, Boot node
15		340502-001	Cable, HIPPI, Internal (original I/O panel FAB), 18-inch
		340502-002	Cable, HIPPI, Internal (original I/O panel FAB), 24-inch
		340502-003	Cable, HIPPI, Internal (original I/O panel FAB), 30-inch
		340502-004	Cable, HIPPI, Internal (original I/O panel FAB), 36-inch
		340502-005	Cable, HIPPI, Internal (original I/O panel FAB), 42-inch
		340502-006	Cable, HIPPI, Internal (original I/O panel FAB), 48-inch
		340502-007	Cable, HIPPI, Internal (original I/O panel FAB), 54-inch
		340502-008	Cable, HIPPI, Internal (original I/O panel FAB), 60-inch
		340502-009	Cable, HIPPI, Internal (original I/O panel FAB), 66-inch
		340502-010	Cable, HIPPI, Internal (original I/O panel FAB), 72-inch
		340502-011	Cable, HIPPI, Internal (original I/O panel FAB), 78-inch

Table A-4. I/O System Cables (3 of 3)

Key	Paragon Part Reference	Intel Part Number	Description
16		340523-001	Cable, HIPPI (current I/O panel FAB), Internal, 54-inch
		340523-002	Cable, HIPPI (current I/O panel FAB), Internal, 60-inch
		340523-003	Cable, HIPPI (current I/O panel FAB), Internal, 66-inch
		340523-004	Cable, HIPPI (current I/O panel FAB), Internal, 72-inch
		340523-005	Cable, HIPPI (current I/O panel FAB), Internal, 78-inch
		340523-006	Cable, HIPPI (current I/O panel FAB), Internal, 84-inch
		340523-007	Cable, HIPPI (current I/O panel FAB), Internal, 90-inch
		340523-008	Cable, HIPPI (current I/O panel FAB), Internal, 96-inch
		340523-009	Cable, HIPPI (current I/O panel FAB), Internal, 102-inch
		340523-010	Cable, HIPPI (current I/O panel FAB), Internal, 108-inch
		340523-011	Cable, HIPPI (current I/O panel FAB), Internal, 114-inch
17		341143-001	Cable, SCSI (current I/O panel FAB), Internal-to-External SCSI device

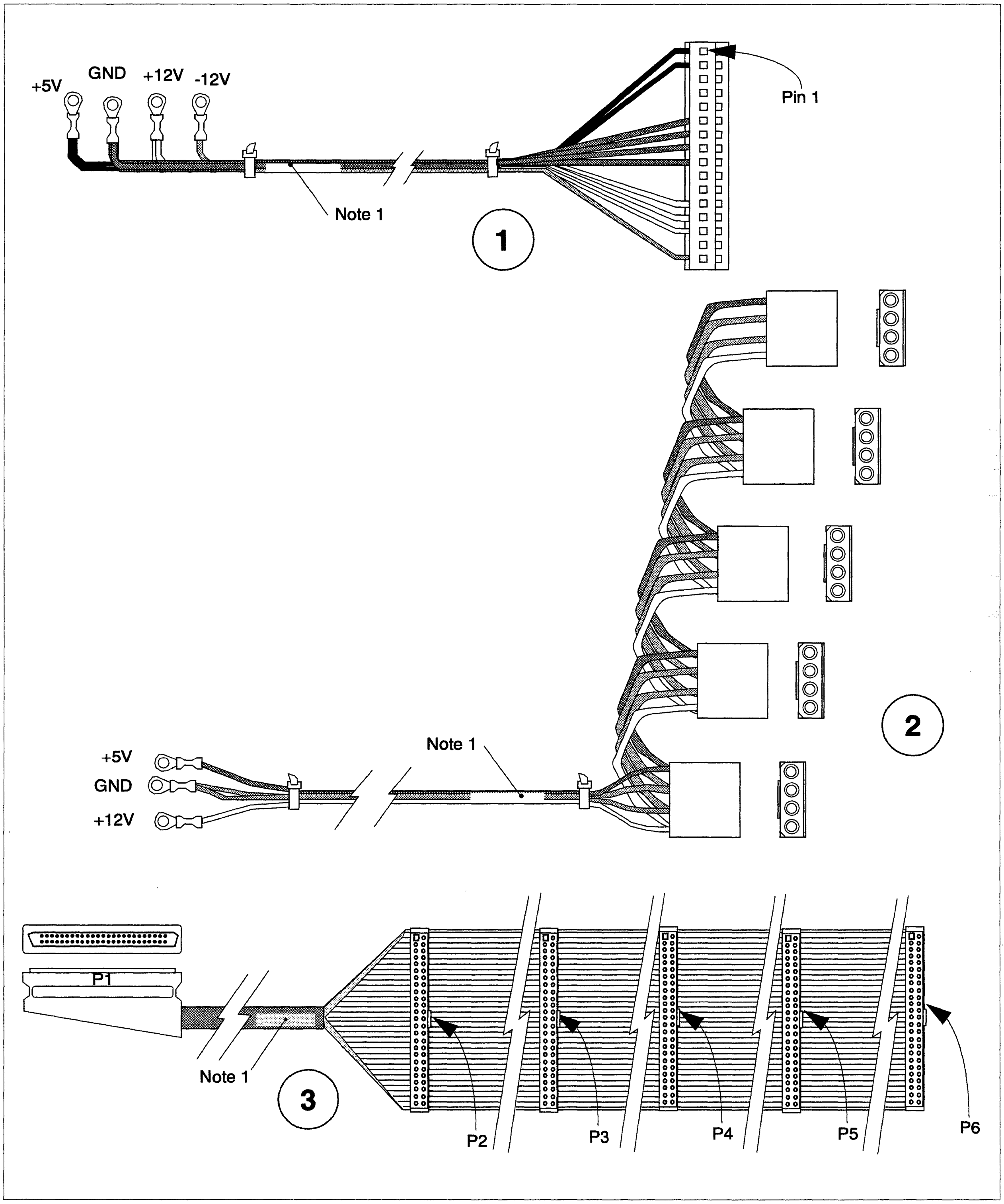


Figure A-28. I/O System Cables (1 of 5)

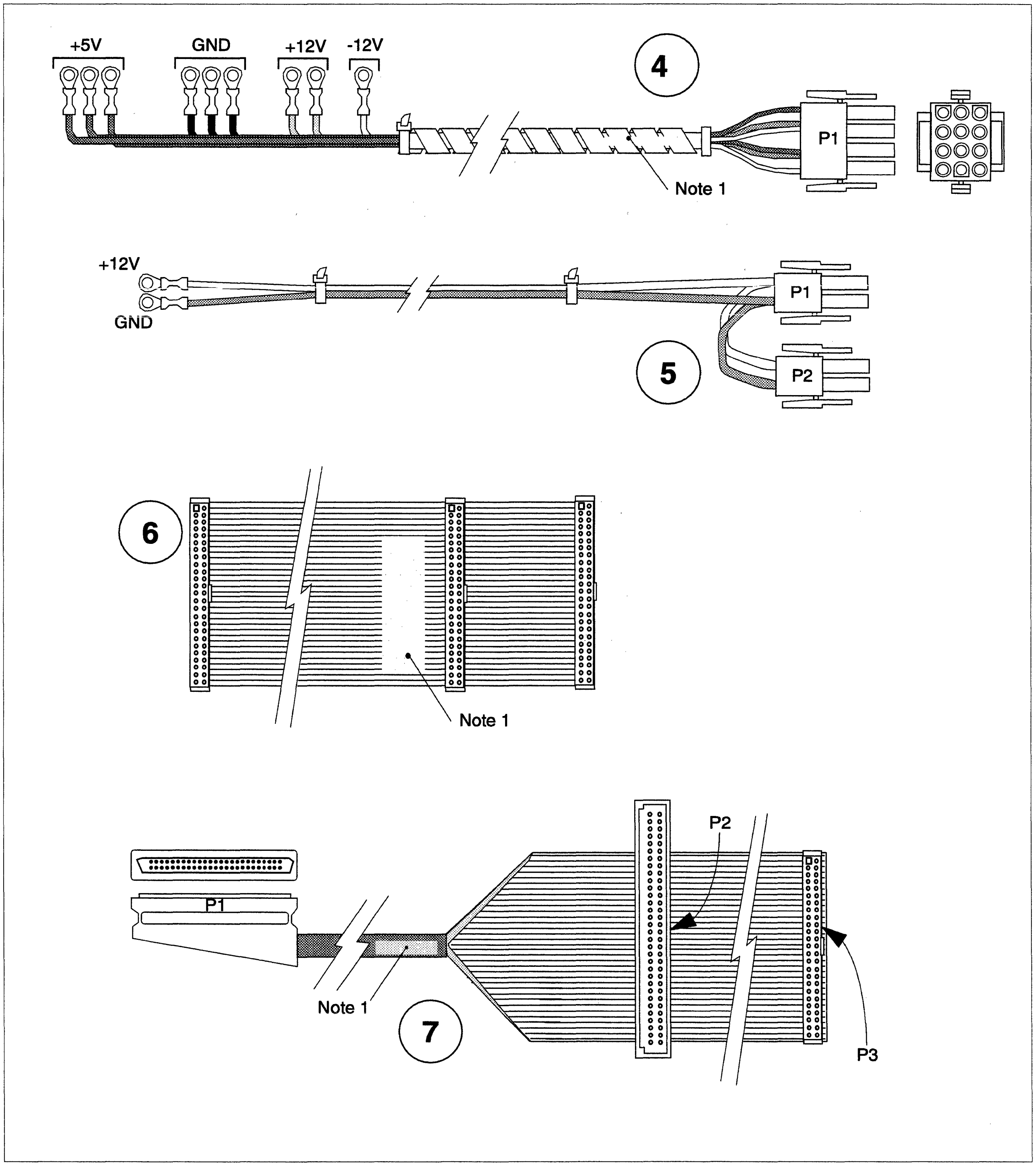


Figure A-28. I/O System Cables (2 of 5)

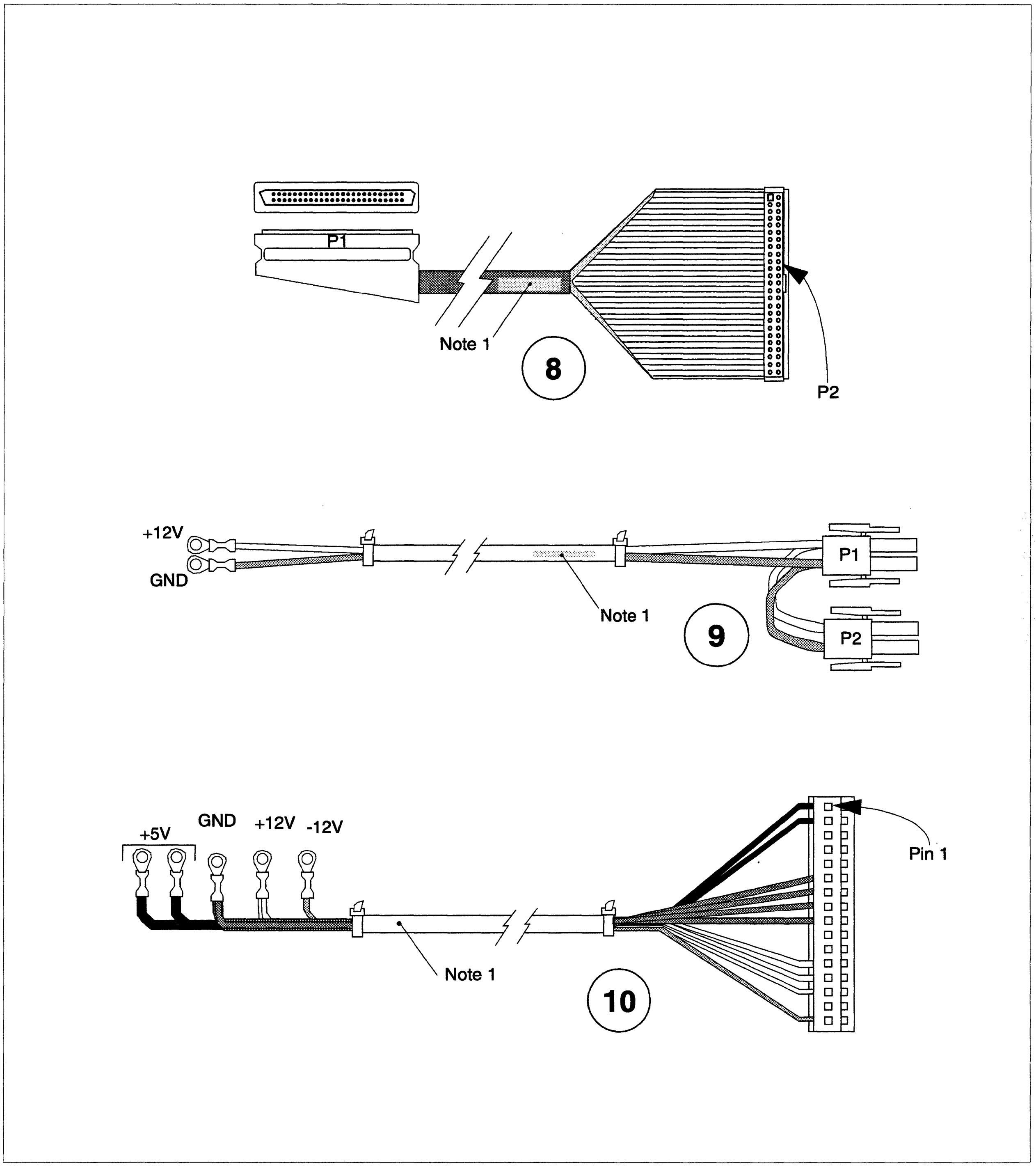


Figure A-28. I/O System Cables (3 of 5)

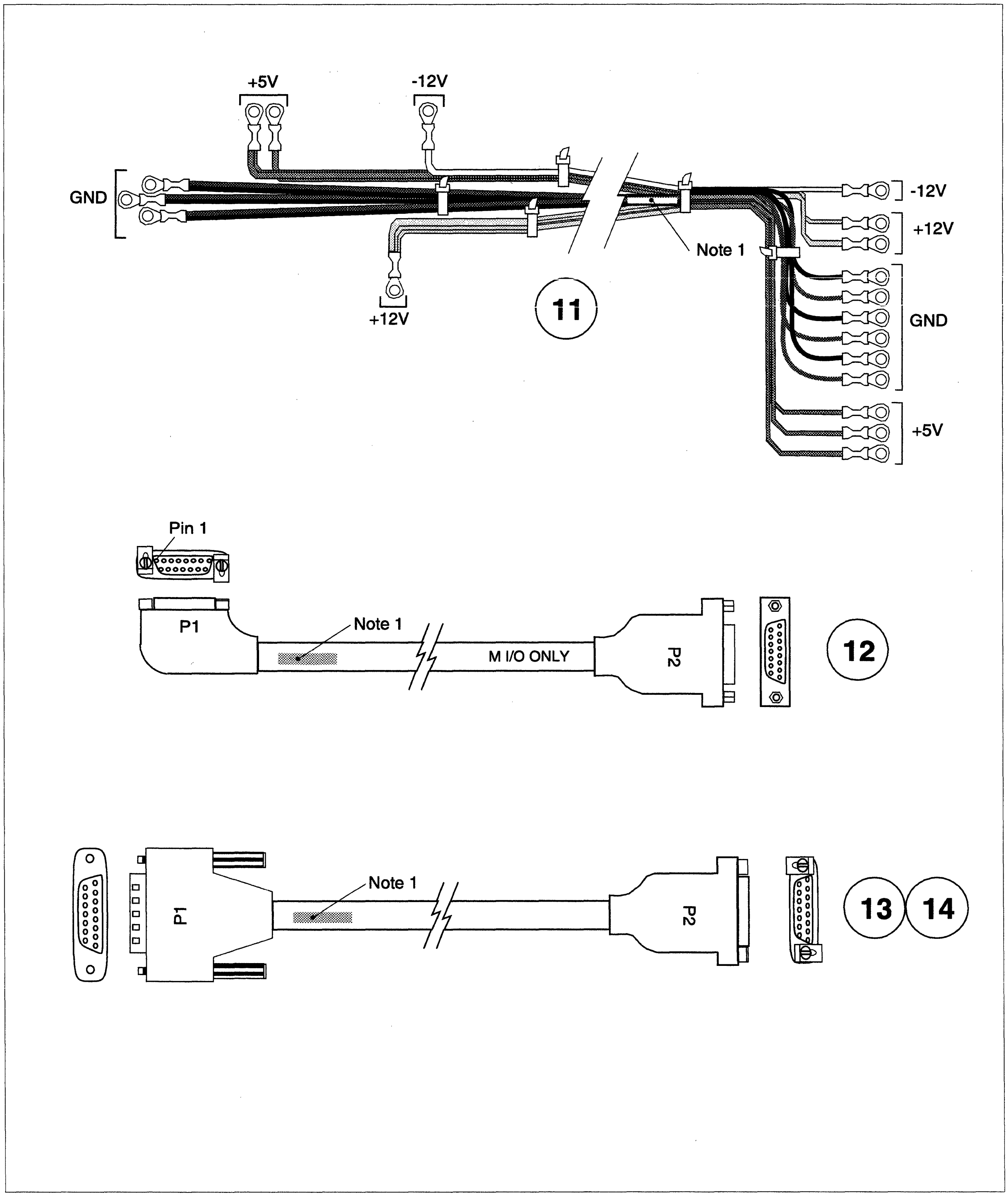
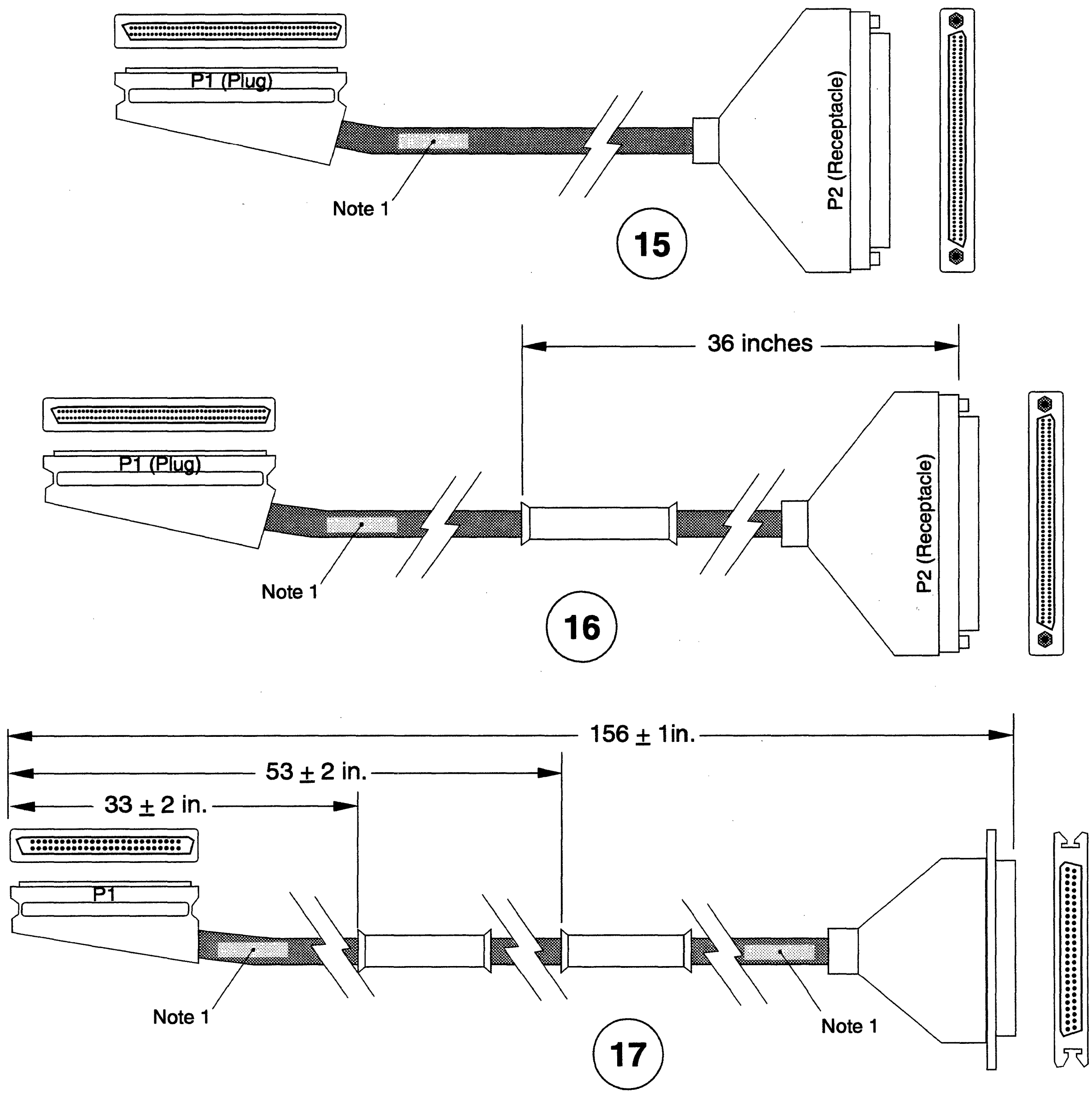


Figure A-28. I/O System Cables (4 of 5)



Notes:

1. Cable part number imprinted approximately in the indicated location.
2. Connector pin-1 location shown as a square pin, or in the position indicated.

Figure A-28. I/O System Cables (5 of 5)

Mesh and Cabinet-to-Cabinet Cables

Figure A-29 shows the field replaceable cables that are used for mesh interconnect and cabinet-to-cabinet cabling in the Paragon XP/S system cabinet. Refer to Table A-5 for the part numbers associated with each of these cables.

Table A-5. Mesh and Cabinet-to-Cabinet Interconnect Cables

Key	Paragon Part Reference	Intel Part Number	Description
1		316517-001	Cable, power chain, power control board
2		316520-001	Cable, power controller board signal chain
3		316818-001	Cable, LED control, east/west
4		316825-001	Cable, scan string expansion
5	MFCMESH	317402-002	Cable assembly, mesh routing, FAB 4
6		317506-001	Cable assembly, mesh routing, corner unit

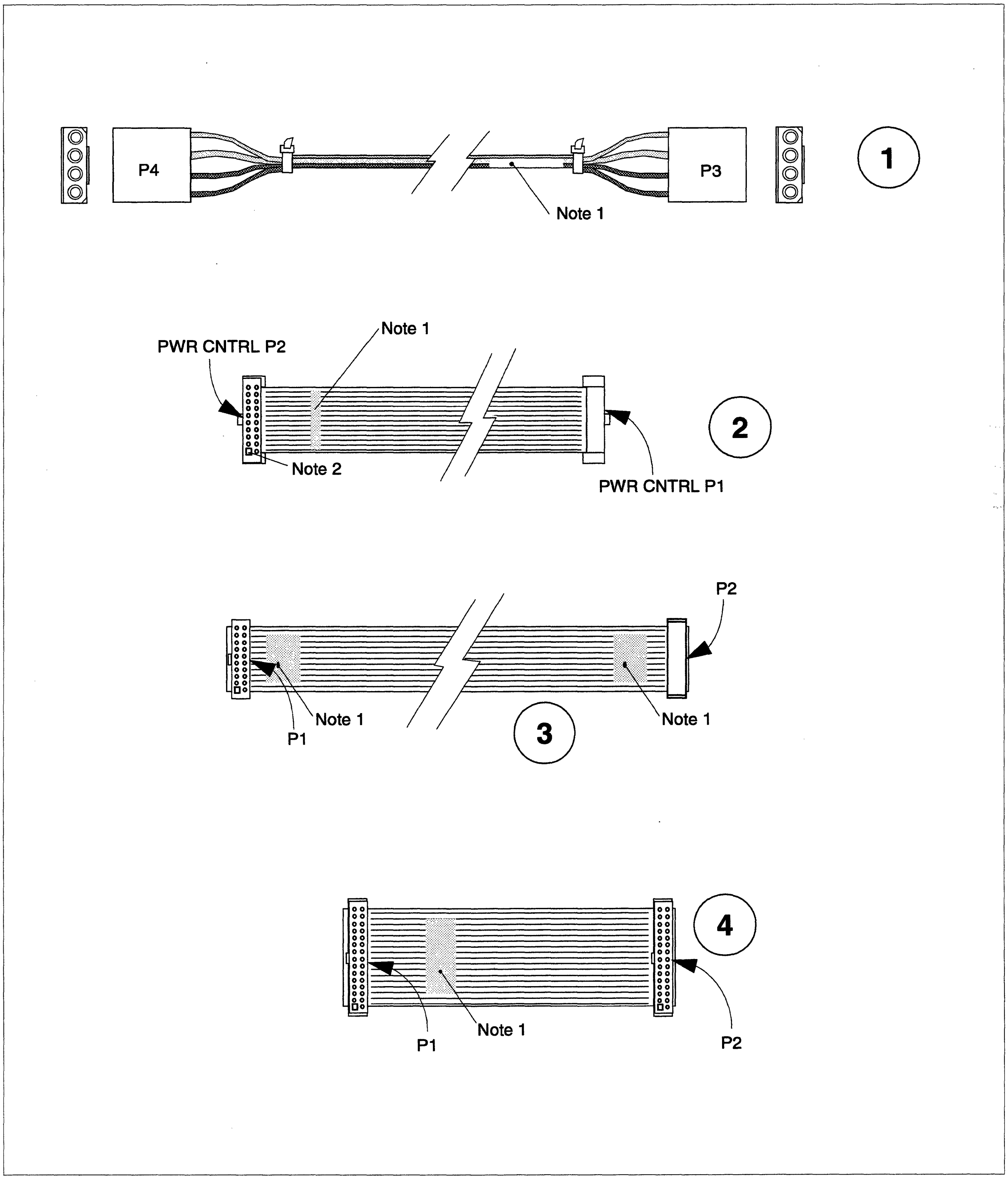
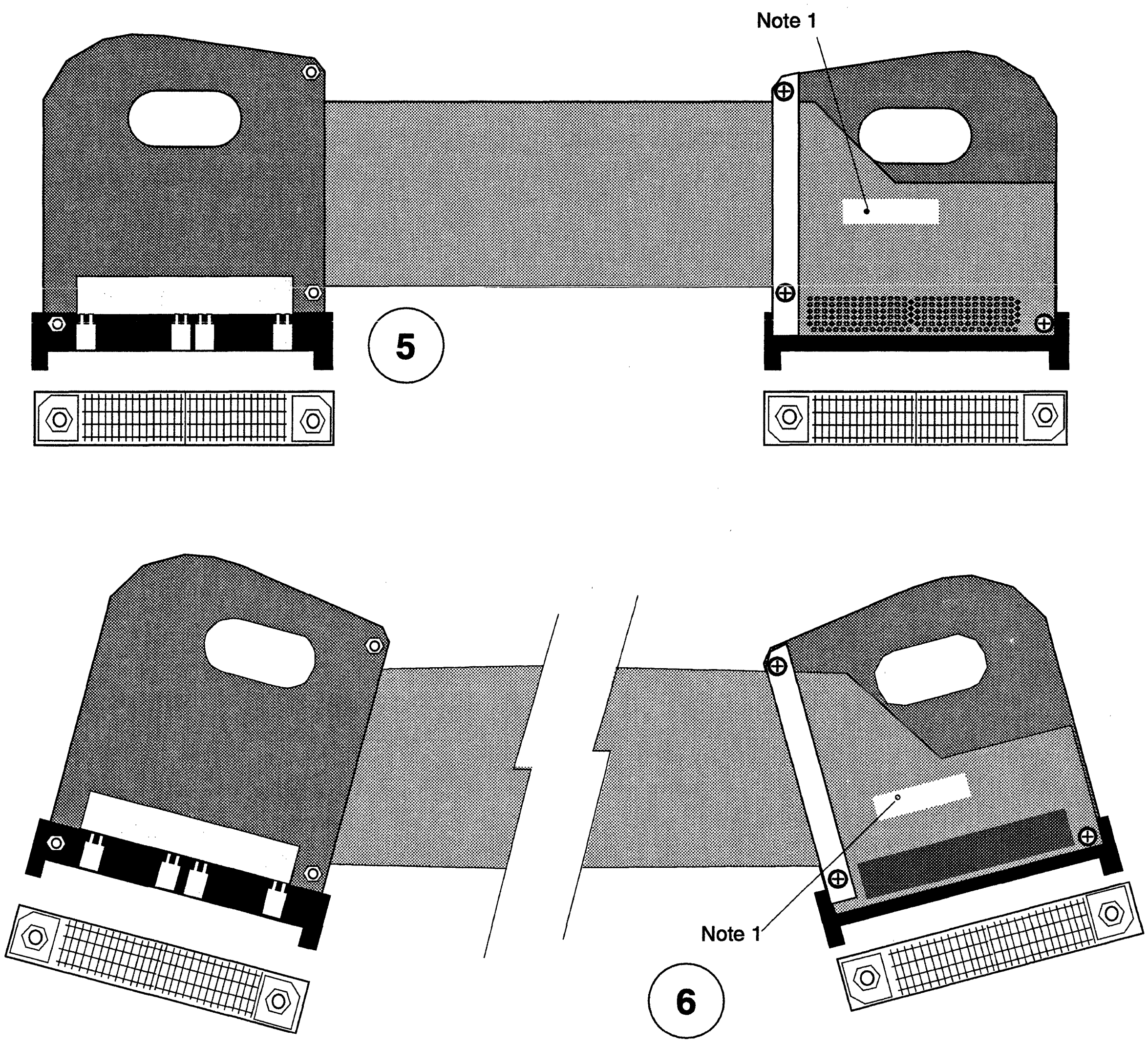


Figure A-29. Cabinet-to-Cabinet Cables (1 of 2)



Notes:

1. Cable part number imprinted approximately in the indicated location.
2. Connector pin-1 location shown as a square pin, or in the position indicated.

Figure A-29. Cabinet-to-Cabinet Cables (2 of 2)

Index

NOTE

Section headings, figure titles, table titles, abbreviations, and formal product names are listed in this index with initial capital letters or all capitals. All other entries in this index are not capitalized.

Symbols

A

B

C