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**CDC® EIGHT-INCH MODULE DRIVE  
PA8A2**

**GENERAL DESCRIPTION  
OPERATION  
INSTALLATION AND CHECKOUT  
PARTS DATA**

---

Volume 1

**HARDWARE MAINTENANCE MANUAL**

## REVISION RECORD

REVISION	DESCRIPTION
01 (05-06-85)	Preliminary release.
02 (06-24-85)	Preliminary revision.
A (09-25-85)	Original release. This edition obsoletes all previous editions.

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AND X ARE NOT USED.

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5950 Clearwater Drive  
Minnetonka, MN 55343

or use Comment Sheet in the back  
of this manual.

# MANUAL TO EQUIPMENT LEVEL CORRELATION

This manual reflects the equipment configurations listed below.

**EXPLANATION:** Locate the equipment type and series code number, as shown on the Equipment Configuration Log, in the list below. Immediately to the right of the series code number is an FCO number. If that number and all of the numbers underneath it match all of the numbers on the Equipment Configuration Log, then this manual accurately reflects the equipment.

This correlation sheet also applies to the following related manuals:

Pub. No. 83325420 Rev. A

Pub. No. 83325430 Rev. A

EQUIPMENT TYPE	SERIES CODE	WITH FCOs	COMMENTS
PA8A2	01	None	



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3-44	A	Cover	-

## PREFACE

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This manual contains maintenance information for the CONTROL DATA® PA8A2 Eight-Inch Module Drive (EMD). It provides instructions to all personnel who operate the EMD and to customer engineers who install and check out the EMD. Customer engineers who troubleshoot and repair EMDs should obtain copies of the Hardware Maintenance Manual, Volumes 2 and 3 (listed below) that pertain to the drives they are maintaining.

The information in this manual is presented as follows:

- Section 1 - General Description. Describes equipment functions and specifications.
- Section 2 - Operation. Describes and illustrates the location and use of all controls and indicators, and provides operating procedures.
- Section 3 - Installation and Checkout. Describes site requirements, unpackaging and inspection, installation and checkout.
- Section 4 - Parts Data. Contains illustrated parts breakdown and spare parts list.

The following manuals apply to the EMD and are available from Control Data Corporation, Literature Distribution Services, 308 North Dale Street, St. Paul, MN 55103:

<u>Publication No.</u>	<u>Title</u>
83325410	PA8A2 Hardware Maintenance Manual, Volume 1
83325420	PA8A2 Hardware Maintenance Manual, Volume 2 (contains theory of operation and maintenance)
83325430	PA8A2 Hardware Maintenance Manual, Volume 3 (contains diagrams)





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## IMPORTANT SAFETY INFORMATION AND PRECAUTIONS

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Proper safety and repair is important to the safe, reliable operation of this unit. Service should be done by qualified personnel only. This maintenance manual describes procedures recommended by the manufacturer as effective methods of servicing the unit. Some of these procedures require the use of specially designed tools. For proper maintenance and safety, these specially designed tools should be used as recommended.

The procedures in this maintenance manual and labels on the unit contain warnings and cautions which must be carefully read and observed in order to minimize or eliminate the risk of personal injury. The warnings point out conditions or practices that are potentially hazardous to maintenance personnel. The cautions point out practices which, if disregarded, could damage the unit and make it unsafe for use.

For the safety of maintenance and operating personnel, the following precautions must be observed:

- Perform all maintenance by following the procedures given in this manual and using only CDC/MPI replacement parts.
- Read and observe all cautions and warnings provided in the procedures and labeled on the unit.
- Use the special tools called out in the maintenance procedure.
- Observe sound safety practices when performing maintenance.
- Use caution when troubleshooting a unit that has voltages present. Remove power from unit before servicing or replacing components.
- Wear safety glasses when servicing units.
- Wear safety shoes when removing or replacing heavy components.

It is also important to understand that these warnings and cautions are not exhaustive. The manufacturer could not possibly know, evaluate and advise maintenance personnel of all conceivable ways in which maintenance might be performed or the possible risk of each maintenance technique. Consequently, the manufacturer has not completed any such broad evaluation. Thus, any persons who use any non-approved maintenance procedure or tool must first satisfy themselves that neither their safety nor the unit performance will be jeopardized by the maintenance techniques they select.





## CONFIGURATION CHART

---

EQUIPMENT NUMBER*	INTERFACE	DATA CAPACITY (MB)
PA8A2A	Dual Channel	368
<p>* Refer to Section 4 for equipment package listings that include painted parts and other supplied options.</p>		



## ABBREVIATIONS

---

A	Ampere	CLK	Clock
ABV	Above	CLR	Clear
ac	Alternating Current	cm	Centimeter
ADD	Address	CNTR	Counter
ADDR	Address	COMP	Comparator
ADJ	Adjust	CONT	Control
ADRS	Address	CONTD	Continued
AGC	Automatic Gain Control	CT	Center Tap
ALT	Alternate	CYL	Cylinder
AM	Address Mark	D/A	Digital to Analog
AME	Address Mark Enable	dc	Direct Current
AMP	Amplifier, Ampere	DET	Detect
ASSY	Assembly	DIFF	Differential
BLW	Below	DIV	Division
C	Celsius	DLY	Delay
CB	Circuit Breaker	DRVR	Driver
CDA	Complete Drive Assembly	ECL	Emitter Coupled Logic
CDC	Control Data Corporation	ECO	Engineering Change Order
CH	Channel	EMD	Eight-Inch Module Drive
CHK	Check	EN	Enable

## ABBREVIATIONS (Contd)

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ENBL	Enable	IND	Index
EXT	External	INTRPT	Interrupt
F	Fahrenheit, Fuse	I/O	Input/Output
FCO	Field Change Order	IPB	Illustrated Parts Breakdown
FDBK	Feedback	IPS	Inches per Second
FIG	Figure	kg	Kilogram
FLT	Fault	kPa	Kilopascal
ft	Foot	kW	Kilowatt
FTU	Field Test Unit	lb	Pound
FWD	Forward	LCD	Liquid Crystal Display
GND	Ground	LED	Light Emitting Diode
HD	Head	LSI	Large Scale Integration
HEX	Hexagon	LTD	Lock to Data
Hg	Mercury	m	Meter
HR	High Resolution	MAX	Maximum
HYST	Hysteresis	MB	Megabyte
Hz	Hertz	MEM	Memory
IC	Integrated Circuit	MHz	Megahertz
IDENT	Identification	mm	Millimeter
in	Inch		

## ABBREVIATIONS (Contd)

---

MPI	Magnetic Peripherals, Inc.	PLO	Phase Lock Oscillator
MPU	Microprocessor Unit	PROC	Procedure
MRK	Mark	PROG	Programmable
ms	Millisecond	PS	Power Supply
MTR	Motor	PWR	Power Supply
mV	Millivolt	RCVR	Receiver
NC	No Connection	RD	Read
NORM	Normal	RDY	Ready
NRZ	Non Return to Zero	REF	Reference
ns	Nanosecond	REQ	Request
OC	On Cylinder	RES	Resolution
OS	One-Shot	REV	Reverse, Revision
OSC	Oscillator	RGTR	Register
P	Plug	r/min	Revolutions Per Minute
PD	Peak Detect	RTZ	Return to Zero
pF	Picofarad	R/W	Read/Write
PFTU	Programmable Field Test Unit	s	Second
PG	Page	S/C	Series Code
PHH	Phillips Head	SEC	Second
		SEL	Select

## ABBREVIATIONS (Contd)

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SEQ	Sequence	VCO	Voltage Controlled Oscillator
SPD	Speed	W	Watts
SS	Sector Switch	W/	With
T	Tracks to go	W/O	Without
TF	Thread Forming	W PROT	Write Protect
TIM	Timer	W+R	Write or Read
TP	Test Point	W·R	Write and Read
TSP	Troubleshooting Procedure	WRT	Write
TTL	Transistor-Transistor Logic	XFR	Transfer
V	Volts, Voltage	Ω	Ohms
Vbb	Bias Voltage	\$	Hexadecimal Address
VCC	Bias Voltage	uF	Microfarad
		us	Microsecond

## **SECTION 1**

### **GENERAL DESCRIPTION**





---

## INTRODUCTION

The Control Data PA8A2 Eight-Inch Module Drive (EMD) is a high speed, random access digital data storage device that connects to a central processor through a controller. The total unformatted storage capacity of the PA8A2 is 368 megabytes. All the equipment specifications for the drive are listed in table 1-1.

The remainder of this section provides a general description of the drive and is divided into the following areas:

- Equipment Interface Description -- Describes available drive interfaces.
- Equipment Functional Description -- Explains the basic function of the drive.
- Equipment Physical Description -- Provides a basic description of the drive's physical characteristics.
- Equipment Configuration -- Describes the various drive configurations and how to identify them.

## EQUIPMENT INTERFACE DESCRIPTION

The drive can be configured to operate with either a standard (SMD-O) or an enhanced (SMD-E) interface. Refer to section 3 of this manual for definitions of signals on the interface cables (under Interface Requirements). Section 3 also contains instructions on selecting the various interface options available (under Setting Circuit Board Switches). Refer to volume 2 of the hardware maintenance manual for a complete description of interface functions.

## EQUIPMENT FUNCTIONAL DESCRIPTION

The drive contains all the circuits and mechanical devices necessary to record data on and recover it from its disks. The necessary power for this is provided by the power supply, which receives its input power from the site main power source.



TABLE 1-1. DRIVE SPECIFICATIONS (Contd)

Characteristics	Conditions	Specifications
<b>PERFORMANCE</b>		
<b>Latency</b>	Average	Latency is time to reach a particular track address after positioning is complete.
	Maximum	8.33 milliseconds (disk rotation speed at 3600 r/min)  16.83 milliseconds (disk rotation speed at 3564 r/min)
<b>Recording</b>	Mode	2-7 code
	Density	15 185 bits per inch (inner track) 10 132 bits per inch (outer track)
<b>Seek Time</b>	Full	35 milliseconds maximum
	Average	18 milliseconds
	Single Track	5 milliseconds maximum
<b>Start Time</b>		30 seconds maximum
<b>Stop Time</b>		50 seconds maximum

All functions performed by the drive are done under direction of the controller. The controller communicates with the drive via the interface which consists of a number of I/O lines carrying the necessary signals to and from the drive.

Some interface lines, including those that carry commands to the drive, are not enabled unless the drive is selected by the controller. Unit selection allows the controller, which can be connected to more than one drive, to initiate and direct an operation on a specific drive.

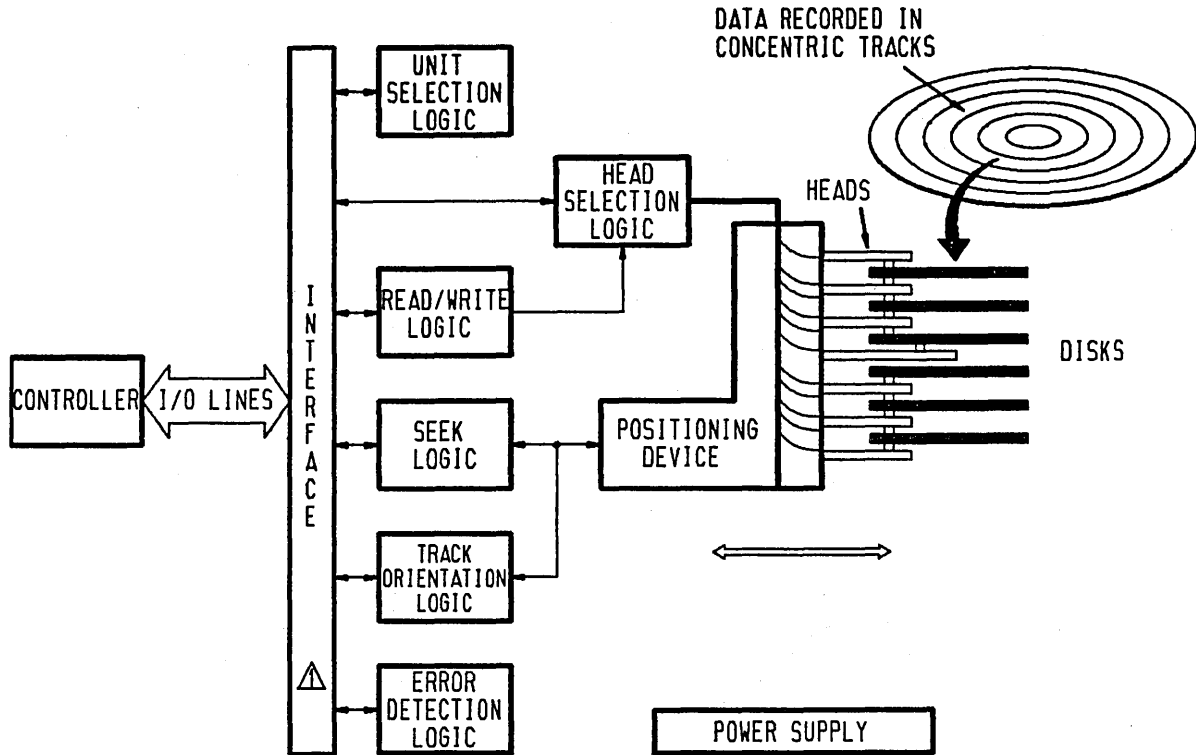
All operations performed by the drive are related to data storage and recovery (normally referred to as writing and reading). The actual reading and writing is performed by electromagnetic devices called heads that are positioned over the recording surfaces of the rotating disks. There is one head for each disk surface, and the heads are positioned in such a way that data is written in concentric tracks around the disk surfaces (see figure 1-1).

Before any read or write operation can be performed, the controller must instruct the drive to position the heads over the desired cylinder (called seeking) and also to use the head located over the surface (head selection) where the operation is to be performed.

After selecting a head and arriving at the data track, the controller must locate that portion of the track on which the data is to be written or read. This is called track orientation and is done by using the Index and Sector signals generated by the drive. The Index signal indicates the logical beginning of each track, and the Sector signals are used by the controller to determine the position of the head on the track with respect to Index.

When the desired location is reached, the controller commands the drive to actually read or write the data. During a read operation, the drive recovers data from the disks and transmits it to the controller. During a write operation, the drive receives data from the controller, processes it and writes it on the disks.

The drive is also capable of recognizing certain errors that may occur during its operation. When an error is detected, it is indicated either by a signal to the controller or by a maintenance indicator on the drive itself.



**NOTES:**

△ INTERFACE SELECTIONS = SMD-0 OR SMD-E

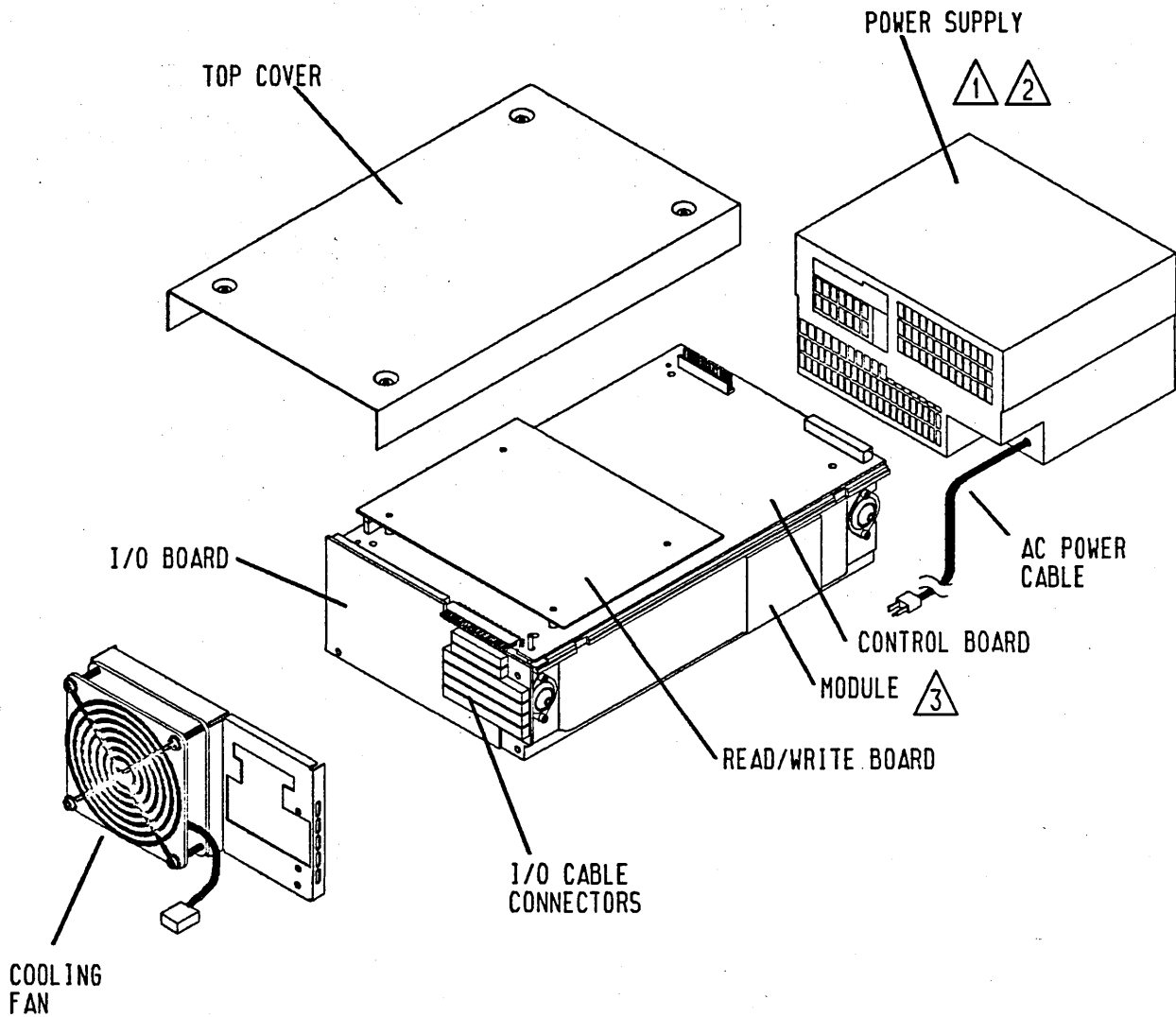
11F20

Figure 1-1. Drive Functional Block Diagram

**EQUIPMENT PHYSICAL DESCRIPTION**

The following paragraphs provide a physical description of the drive. The components mentioned in this discussion are identified in figure 1-2.

A drive installation requires a drive, interconnecting cabling, and a power supply. Site power enters the power supply via the ac power cable. The power supply develops the dc voltages required by the drive. These voltages are supplied to the drive by the dc power cable.



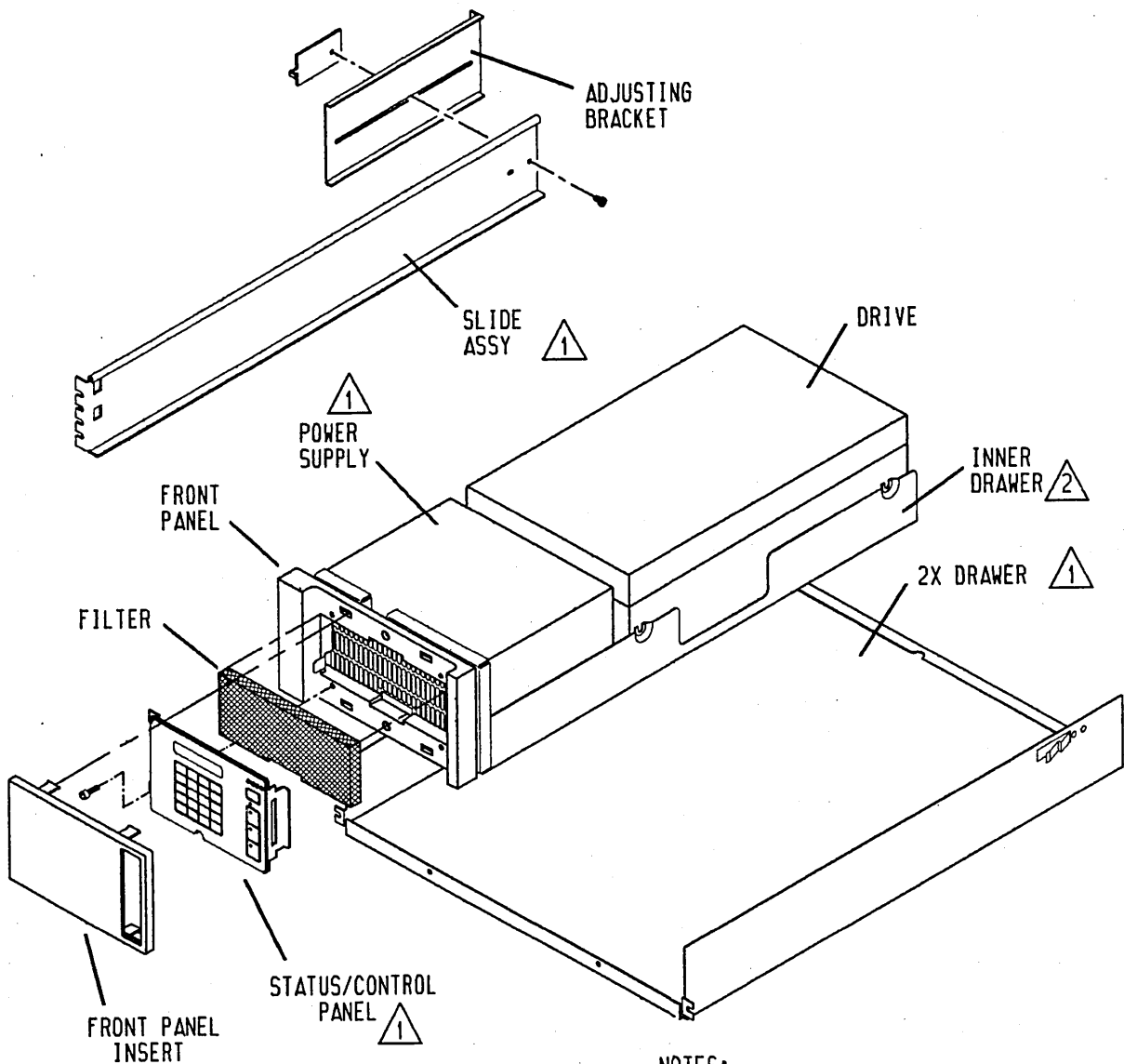
1 4  
*we may have both*

NOTES:

- 1 OPTIONAL
- 2 MOUNTED DIRECTLY IN FRONT OF DRIVE (IN 2X DRAWER) OR MOUNTED IN REMOTE LOCATION
- 3 MODULE CONTAINS THE DISKS, SPINDLE, DRIVE MOTOR, ACTUATOR, AND THE HEADS.
- 4 USED WHEN POWER SUPPLY IS MOUNTED IN REMOTE LOCATION.

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Figure 1-2. Drive Major Assemblies (Sheet 1 of 2)



NOTES:

- ① OPTIONAL
- ② TWO DRIVES AND POWER SUPPLIES MAY BE MOUNTED SIDE-BY-SIDE IN 2X DRAWER

11F62

Figure 1-2. Drive Major Assemblies (Sheet 2)

The drive package includes a top cover, rear panel, module, and three circuit boards. Air flow is provided by a cooling fan. The cooling fan is an integral part of the optional power supply, and provides cooling air to the drive when the power supply is mounted directly in front of the drive. When the power supply is mounted in a remote location, drive cooling is provided by an optional fan and rear panel assembly.

The optional status/control panel contains operator controls and a maintenance keyboard with a display for error codes.

The control panel contains the following:

- Logical Address switch
- Unit Selected Light
- Start/Stop switch and light
- Fault/Clear switch and light
- Write Protect switch and light

The maintenance keyboard provides the following general instructions:

- Unit Selected and Reserved status
- Current cylinder address
- Fault indication (type and history of occurrence)
- Internal machine status (type and history of occurrence)
- Off-line diagnostics control and display

The drive's internal components include three circuit boards and a module. The circuit boards are mounted on the module, and they contain the electronics required for drive operation. The module is a sealed unit containing the electromechanical components used for data storage and retrieval. These components include the disks, spindle, drive motor, actuator and heads.

The six disks provide the recording medium for the drive. These disks are mounted on a spindle, and the spindle is coupled directly to the drive motor. When activated, the drive motor rotates the disks at 3600 r/min and also produces a circulation of air within the sealed module.



The actuator is the assembly that holds the heads and moves the heads over the rotating disks. There are 11 heads; a servo head to sense actuator positioning, and 10 data heads used for data transfers to and from the disks. The actuator has a voice coil which rotates in and out of a permanent magnetic field in response to signals from the servo positioning circuitry. The voice coil moves the heads in an arc across the rotating disks. When the drive is not in use, the heads rest on the disk surface in the preassigned landing zone (beyond the data zone in the outer radius of the disk surface). The actuator is automatically latched in this position, at shutdown, for moving or shipping protection. When the drive is activated to bring the disks up to speed, the heads fly on a cushion of air close to the disk surface.

The drive may be mounted either in a cabinet or rack. An optional 2X drawer with a front panel for each drive is available for mounting two drives and power supplies side-by-side.

A complete listing of field-replaceable parts is given in the parts data section of this manual. Refer to volume 2 of the hardware maintenance manual for theory of operation of the drive components.

## **EQUIPMENT CONFIGURATION**

### **GENERAL**

The equipment configuration is identified by the equipment identification label and by the Equipment Configuration Log. It is necessary to identify the equipment configuration to determine if the manuals being used are applicable to the equipment. The following describes the equipment identification label, Equipment Configuration Log, and Manual To Equipment Level Correlation Sheet.

## **EQUIPMENT IDENTIFICATION**

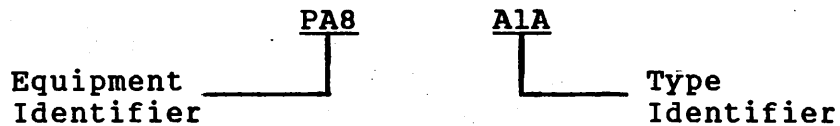
### **General**

The equipment is identified by labels attached to the drive top cover and to the power supply. The label on the drive top cover identifies the basic mechanical and logical configuration of the drive at the time it leaves the factory. To maintain drive configuration whenever the top cover is removed, always identify which drive that the top cover was removed from. The label on the power supply references the components making up the drive installation and lists the site power requirements for the power supply. The information contained on these labels is defined in the following paragraphs.

## Equipment Identification Number

The equipment identification number is divided into the two parts shown in the example:

### EXAMPLE:



The equipment identifier indicates the basic functional capabilities of the drive.

The type identifier indicates differences between drives that have the same equipment identifier. These differences are necessary to adapt a drive to specific system requirements. However, they do not change the overall capabilities of the drive as defined in table 1-1.

## Series Code

The series code represents a time period within which a unit is built. All units are interchangeable at the system level, regardless of series code; however, parts differences may exist within units built in different series codes. When a parts difference exists, that difference is noted in the parts data section of this manual.

## Part Number

The equipment identification label on the power supply lists three numbers: the equipment package part number, the CDA number, and the power supply number. The equipment package part number is the number assigned to the complete unit including drive, power supply (if applicable), painted panels, installation hardware, etc. The power supply number is the part number for the power supply only.

## Serial Number

Each drive has a unique serial number assigned to it. Serial numbers are assigned sequentially within a family of drives. Therefore, no two equipments will have the same serial number.

## **EQUIPMENT CONFIGURATION LOG**

Engineering Change Orders (ECOs) are electrical or mechanical changes that are performed at the factory and may cause a series code change. When the factory installs an ECO early (prior to a series code change), it is logged on the units configuration log.

Field Change Orders (FCOs) are electrical or mechanical changes that may be performed either at the factory or in the field. FCO changes do not affect the series code but are indicated by an entry on the Equipment Configuration Log that accompanies each machine. The components of a machine with an FCO installed may not be interchangeable with those of a machine without the FCO; therefore, it is important that the Equipment Configuration Log be kept current by the person installing the FCO.

## **MANUAL TO EQUIPMENT LEVEL CORRELATION**

Throughout the life cycle of a machine, changes are made, either in the factory build (a series code change) or by FCOs installed in the field. All of these changes are also reflected in changes to the manual package. In order to assure that the manual correlates with the machine, refer to the manual to equipment level correlation sheet located in the front matter of this manual. This sheet records all the FCOs which are reflected in the manual. It should correlate with the machine Equipment Configuration Log if all the FCOs have also been installed in the machine.



## **SECTION 2**

## **OPERATION**



---

## INTRODUCTION

This section provides the information and instructions to operate the drive. It is divided into the following areas:

- Switches and Indicators - locates and describes the various controls and indicators.
- Operating Instructions - describes procedures for operating the drive.
- Filter Replacement and Cleaning - describes filter maintenance for the drive operator.

## SWITCHES AND INDICATORS

### GENERAL

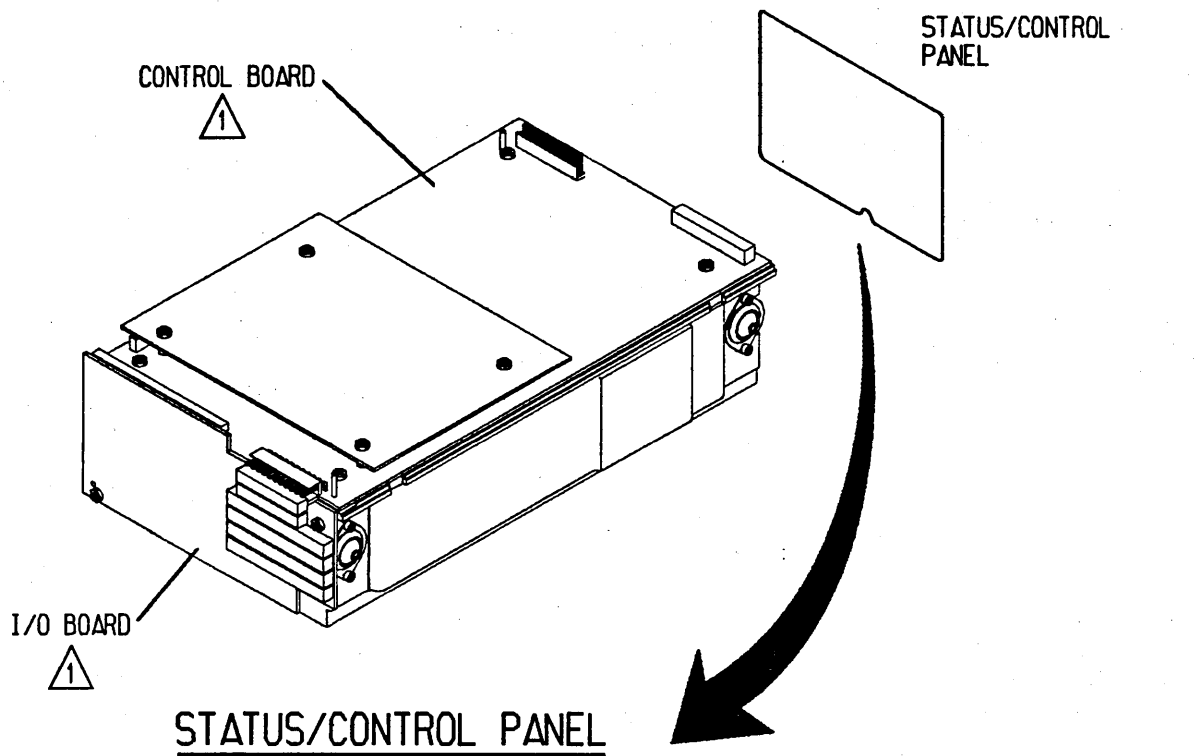
Switches and indicators are found in four locations on the drive:

- Power Supply (Optional)
- Status/Control Panel (Optional)
- Control Board
- I/O Board

Figure 2-1 shows these controls and indicators, and they are explained in table 2-1 and in the following text.

### POWER SUPPLY

The ac power is applied to the power supply when the ac power cord is connected to a power source. All operating voltages for the drive and cooling fan are generated when the On/Standby switch on the power supply is placed in the On (1) position.



**STATUS/CONTROL PANEL**

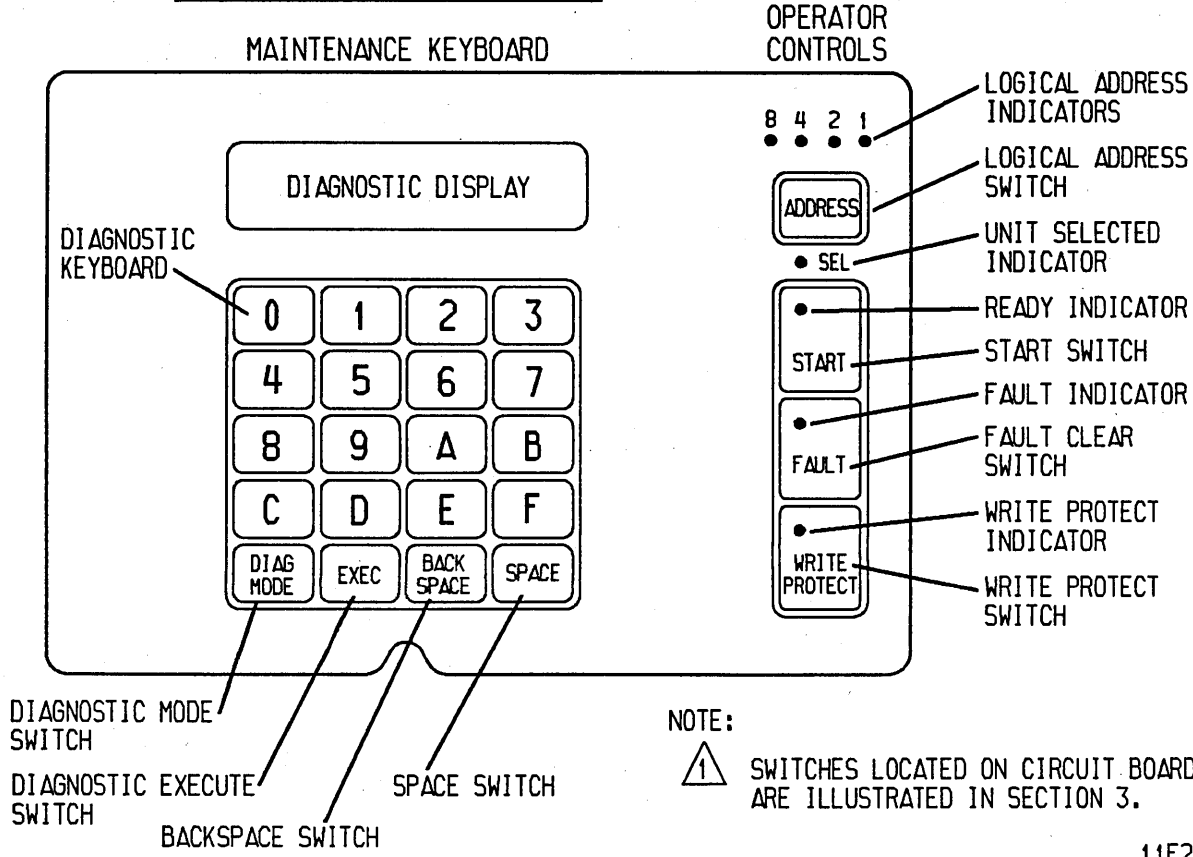
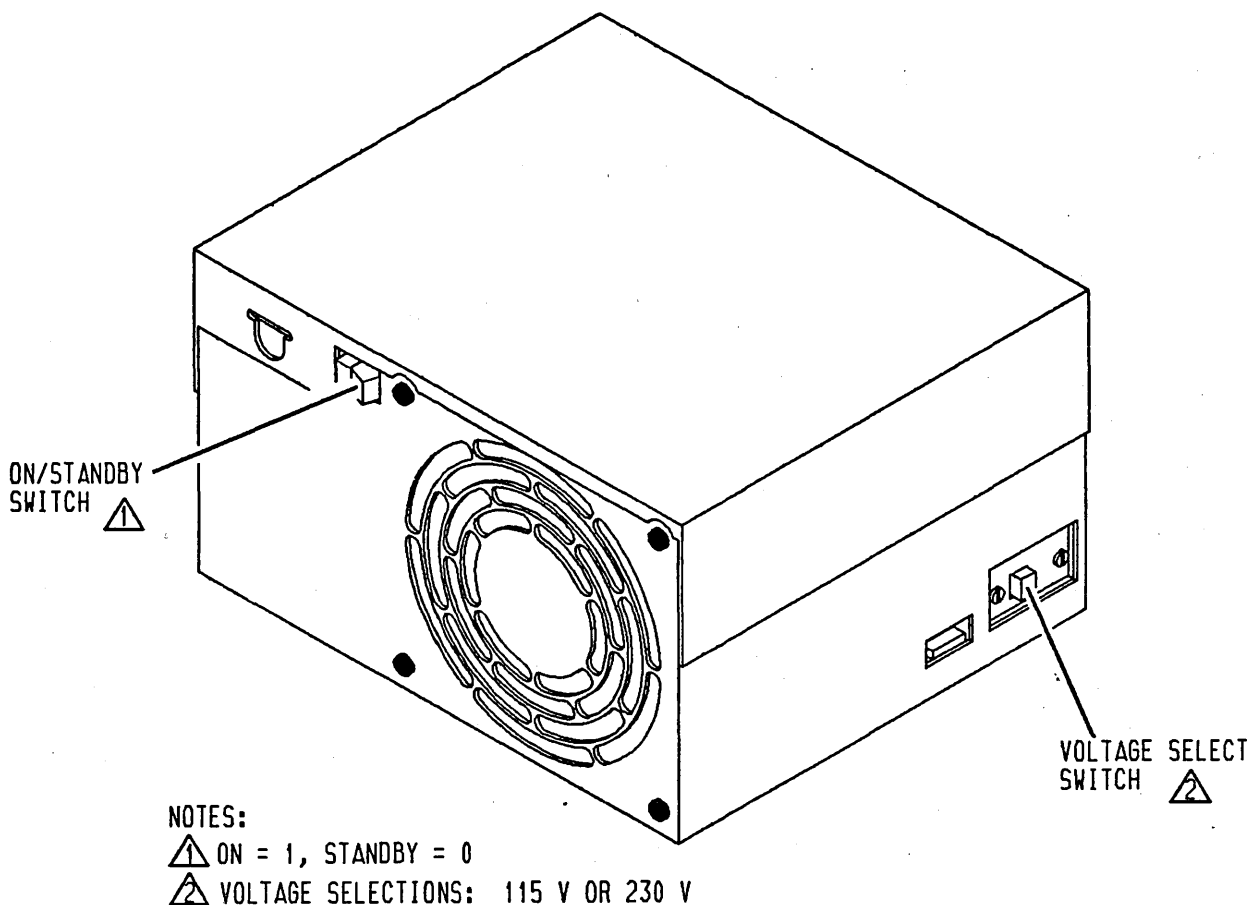


Figure 2-1. Switches and Indicators (Sheet 1 of 2)





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Figure 2-1. Switches and Indicators (Sheet 2)

### STATUS/CONTROL PANEL (OPTIONAL)

The status/control panel contains all the switches and indicators required to control and monitor the basic operation of the drive. For drives without the status/control panel, basic operation of the drive is controlled by setting the appropriate switches on the control and I/O boards. See section 3 of this manual (under Setting Circuit Board Switches) for instructions on setting the switches.

### CONTROL BOARD

The control board contains switches which are set during drive installation. Refer to section 3 of this manual (under Setting Circuit Board Switches) for instructions on setting the switches.

TABLE 2-1. DRIVE SWITCHES AND INDICATORS

Switch or Indicator	Function
<b>POWER SUPPLY</b>	
<p>On/Standby Switch (1/0)</p> <p>Voltage Select Switch</p>	<p>Applies dc operating voltages to the drive electronics and fan when placed in the On (1) position.</p> <p>Selects either of two operating voltages (115v or 230v).</p>
<b>STATUS/CONTROL PANEL (Optional)</b>	
<p>Logical Address Switch (ADDRESS)/ Indicators (8/4/2/1)</p> <p>Unit Selected Indicator</p> <p>START Switch/ Ready Indicator</p>	<p>The Logical Address switch establishes the logical address of the drive. The Logical Address Indicators display the logical address in binary. The logical address is stored in memory when dc power is removed.</p> <p>Indicates that the drive is selected by a controller.</p> <p>The START switch has momentary action for Start and Stop, and it contains the Ready indicator. Pressing the START switch activates the power up sequence, and Ready indicator flashes (rapidly) until the disks are up to speed, the heads are loaded, and there are no fault conditions. The Ready indicator is on steady with power up complete. Pressing the START switch to release it from the Start position causes the Ready indicator to flash (slowly) until disk rotation has stopped. The current condition of the START switch (Start/Stop) is stored in memory when dc power is removed.</p>
Table Continued on Next Page	

TABLE 2-1. DRIVE SWITCHES AND INDICATORS (Contd)

Switch or Indicator	Function
STATUS/CONTROL PANEL (Optional) (Contd)	
<p>FAULT Indicator/ Fault Clear Switch</p>	<p>The FAULT indicator is inside the Fault Clear switch, and it lights if a fault exists within the drive. It is turned off by any of the following (provided that the error condition or conditions no longer exist):</p> <ul style="list-style-type: none"> <li>• Pressing the Fault Clear switch</li> <li>• Fault Clear command from the controller</li> <li>• A drive power up operation</li> </ul>
<p>WRITE PROT (Write Protect) Switch/Indicator</p>	<p>The operation of the Write Protect switch or the Write Protect maintenance switch on the control board places the drive in the write protected mode (preventing write operations) and lights the WRITE PROT indicator. The current position of the WRITE PROT switch is stored in memory when dc power is removed.</p>
<p>Diagnostic Keyboard</p>	<p>Used to enter diagnostic tests and parameters.</p>
<p>Liquid Crystal Display</p>	<p>Displays drive status, faults, and current cylinder address.</p>
<p>DIAG MODE (Diagnostic Mode) Switch</p>	<p>Places drive in diagnostic mode and disables the I/O.</p>
<p>SPACE and BACK SPACE Switches</p>	<p>Used to enter the desired diagnostic tests.</p>
<p>EXEC (Execute) Switch</p>	<p>Starts and stops diagnostic tests.</p>

Table Continued on Next Page

TABLE 2-1. DRIVE SWITCHES AND INDICATORS (Contd)

Switch or Indicator	Function
<b>CONTROL BOARD</b>	
<p>WP/N (Write Protect/ Normal) Switch</p> <p>Sector Select Switches</p> <p>.8/1.6 (Sector Clock) Switch</p> <p>Logical Address Switches 2<sup>0</sup>-2<sup>3</sup></p>	<p>Placing the switch in the WP (write protect) position prevents the drive from performing write operations. The switch must be returned to the N (normal) position to enable write operations.</p> <p>Allow the dividing of the disk into specific segments or sectors. The switch settings determine the number of sectors per track (see Setting Sector Select Switches in section 3).</p> <p>Placing the switch in the .8 position allows a sector clock frequency of 806 kHz. Placing the switch in the 1.6 position allows a sector clock frequency of 1.6 MHz.</p> <p>Switches 2<sup>0</sup> through 2<sup>3</sup> are used to set the logical address for drives without the status/control panel.</p>
<b>I/O BOARD</b>	
<p>R/L (Remote/Local) Switch</p>	<p>Controls whether the drive can be powered up from the controller (Remote) or the drive (Local). In both switch positions, power up requires turning On the power supply On/Standby switch; however, in the Remote position, a power sequence signal must come from the controller. For drives with the status/control panel, the START switch must be activated whether the drive is in local or remote operation.</p>

## I/O BOARD

The R/L (Remote/Local) switch on the I/O board is set during drive installation according to instructions in section 3 of this manual (under Setting Circuit Board Switches).

## OPERATING INSTRUCTIONS

### GENERAL

For drives that have a status/control panel, operating instructions are presented in the following sequence:

- Power On Procedure
- Power Off Procedure

For drives with no status/control panel, there are no operating procedures. On these drives, when the R/L (Remote/Local) switch is placed in the Remote position, spindle power on/power off is handled by the controller. In Remote operation, the power up sequence is delayed. The length of delay is determined by the logical address number used, in increments of 5 seconds.

### POWER ON PROCEDURE (DRIVES WITH STATUS/CONTROL PANEL)

The following procedure describes how to power up the drive. It is assumed that dc power is available to the drive because the power supply On/Standby switch is normally left in the On (1) position. The R/L (Remote/Local) switch is located on the I/O board (\_VRX).

#### NOTE

Drive power up is indicated by rapid flashing of the Ready indicator. This occurs, provided either of the following conditions exist:

- R/L (Remote/Local) switch is in Local
  - R/L (Remote/Local) switch is in Remote and either sequence Pick or Hold (ground) is available from the controller
1. Press START switch. If the R/L (Remote/Local) switch was set in the Remote position, the power up sequence continues when the power sequence Pick or Hold (ground) signal is available from the controller. With the R/L (Remote/Local) switch in Remote position, power up sequence to

each drive is delayed. The length of delay is determined by the logical address number used, in increments of 5 seconds.

For example:

Logical Address 0 = 0 second delay

Logical Address 7 = 35 second delay

2. After the delay is completed, the Ready indicator (located in START switch) will flash rapidly, indicating that power up is in progress.
3. Observe that the Ready indicator lights steadily within 90 seconds, indicating that disks are up to speed and heads are loaded.
4. Ensure that the FAULT indicator is off.

The power up sequence is now complete, and the drive is ready to read or write data.

#### **POWER OFF PROCEDURE (DRIVES WITH STATUS/CONTROL PANEL)**

The following procedure describes how to power down the drive.

1. Press START switch.
2. Observe that the Ready indicator (located in START switch) flashes slowly, indicating that power down is in progress.
3. Observe that the Ready indicator goes off within 60 seconds, indicating that power down is complete.

With power down complete, the heads are positioned in the landing zone and the disks are not rotating. Normally, the power supply On/Standby switch is left On (1 position) to continue supplying dc power to the drive.

#### **FILTER REPLACEMENT AND CLEANING**

##### **GENERAL**

The air filter must be clean to ensure proper air circulation through the drive. The filter is located behind the status/control panel, as shown in figure 2-2. The operator should

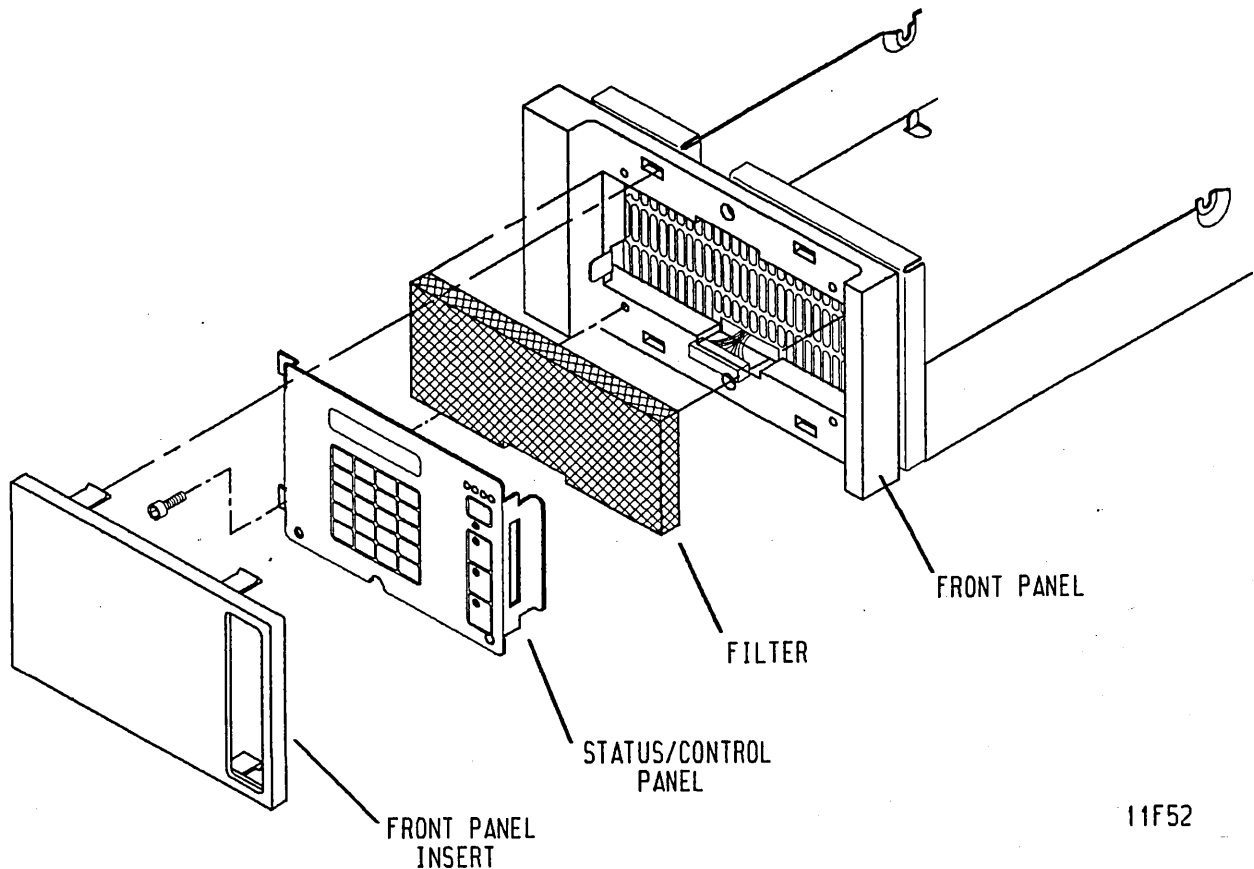


Figure 2-2. Air Filter Replacement

inspect the filter periodically and either replace or clean it when it is dirty. Cleaning the filter is recommended only if replacement filters are not available. The interval for filter maintenance depends on the operating environment. In computer room conditions, a 6-month interval is suggested. In other conditions, the filter should be checked more frequently.

#### FILTER REPLACEMENT

1. Remove front panel insert (see figure 2-2).
2. Remove screws securing status/control panel to front panel and move status/control panel away from front panel to gain access to filter.

3. Remove old filter.
4. Install new filter.
5. Align status/control panel to front panel and secure with screws.
6. Replace front panel insert.

### **FILTER CLEANING**

The filter should not be cleaned if replacement filters are available.

1. Remove front panel insert (see figure 2-2).
2. Remove screws securing status/control panel to front panel and move status/control panel away from front panel to gain access to filter.
3. Remove filter.
4. Clean filter by agitating in solution of water and mild detergent.
5. Rinse filter thoroughly with clean running water and allow to dry.
6. Install filter.
7. Align status/control panel to front panel and secure with screws.
8. Replace front panel insert.



## **SECTION 3**

### **INSTALLATION AND CHECKOUT**



---

## INTRODUCTION

The information contained in this section describes installation and initial checkout of the drive.

## SITE REQUIREMENTS

### GENERAL

The site requirements considered are electrostatic discharge protection, environment, space, power, grounding, and interface.

### ELECTROSTATIC DISCHARGE PROTECTION

All drive electronic assemblies are sensitive to static electricity, due to the electrostatically sensitive devices used within the drive circuitry. Although some of these devices such as metal-oxide semiconductors are extremely sensitive, all semiconductors as well as some resistors and capacitors may be damaged or degraded by exposure to static electricity.

Electrostatic damage to electronic devices may be caused by a direct discharge of a charged conductor, or by exposure to the static fields which surround charged objects. To avoid damage to drive electronic assemblies, service personnel must observe the following precautions when servicing the drive:

- Ground yourself to the drive whenever the drive electronics are or will be exposed. Connect yourself to ground with a wrist strap (refer to Accessories in section 4 for part numbers). Connection may be made to any metal assembly or to the ground lug at the rear of the drive. As a general rule, remember that you, the drive, and the circuit boards must all be at ground potential to avoid potentially damaging static discharges.
- Keep boards in conductive bags - when circuit boards are not installed in the drive, keep them in conductive static shielding bags (refer to Accessories in section 4 for part numbers).

These bags provide absolute protection from direct static discharge and from static fields surrounding charged objects. Remember that these bags are conductive and should not be placed where they might cause an electrical short circuit.

- Remove boards from bags only when you are grounded - all boards received from the factory are in static shielding bags, and should not be removed unless you are grounded.
- Turn off power to drive before removing or installing any circuit boards.
- Never use an ohmmeter on any circuit boards.

**ENVIRONMENTAL REQUIREMENTS**

All environmental requirements for the drive are listed in table 3-1.

**TABLE 3-1. ENVIRONMENTAL REQUIREMENTS**

Conditions	Characteristics	Specifications
<b>TEMPERATURE</b>		
Storage	Range	-10 to 50°C (14 to 122°F)
	Maximum change per hour	15°C (27°F)
Transit	Range	-40 to 60°C (-40 to 140°F)
	Maximum change per hour	20°C (36°F)
Table Continued on Next Page		

TABLE 3-1. ENVIRONMENTAL REQUIREMENTS (Contd)

Conditions	Characteristics	Specifications
TEMPERATURE (Contd)		
Operating	Range	10°C to 45°C (50 to 113°F)
	Maximum change per hour	15°C (27°F)
	Gradient	15°C (27°F)
RELATIVE HUMIDITY		
Range	Storage	10% to 90%
Range	Transit	5% to 95%
Range	Non-operating	20% to 80% 10% per hour maximum change (no conden- sation allowed).
Range	Normal Operating	20% to 80% 10% per hour maximum change (no conden- sation allowed).
	Extended Operating <sup>1</sup>	10% to 90%
Table Continued on Next Page		

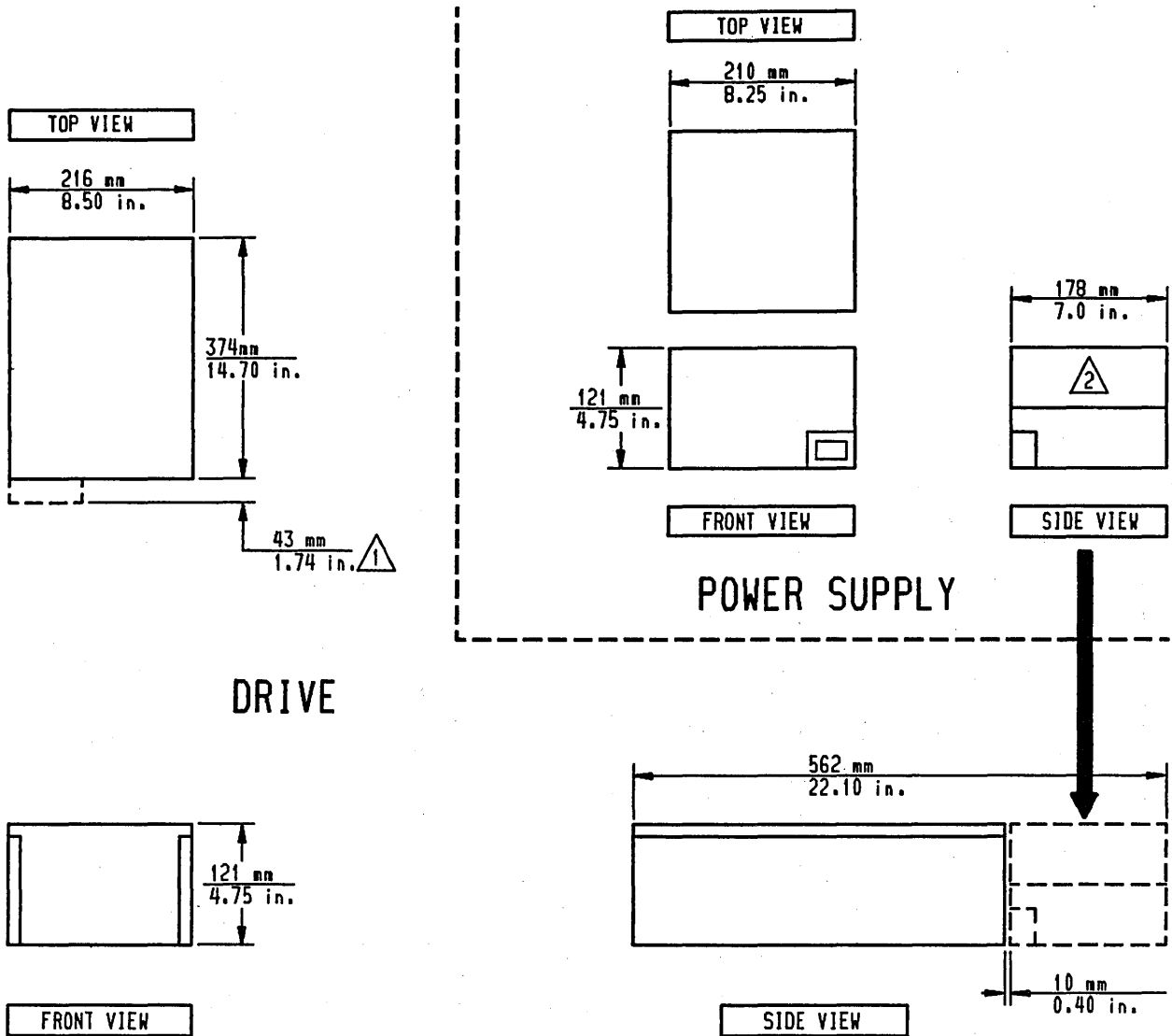
TABLE 3-1. ENVIRONMENTAL REQUIREMENTS (Contd)

Conditions	Characteristics	Specifications
BAROMETRIC PRESSURE (STANDARD DAY)		
Range	Storage/ Non-Operating	-305 m to 3000 m (-1000 ft to 10 000 ft) 104 kPa to 69 kPa (30 in to 20 in Hg)
Range	Transit	-305 m to 12 192 m (-1000 ft to 40 000 ft) 104 kPa to 19 kPa (30 in Hg to 6 in Hg)
Range	Operating	-305 m to 3000 m (-1000 ft to 10 000 ft) 104 kPa to 69 kPa (30 in Hg to 20 in Hg)
<p><sup>1</sup> When the drive is operated within the extended range limits specified, it will not incur damage but may not meet performance specifications.</p>		

**SPACE REQUIREMENTS**

The drive and power supply mount side-by-side with another drive and power supply into a 2X drawer, and the 2X drawer slide mounts into a 483 mm (19 in) standard rack. The slide action allows outward extension of the drawer for ease of maintenance. The space requirements are shown in figure 3-1.

The combined mass of the drive and power supply is 15.2 kg (32 lbs). With both units mounted in the drawer and the drawer extended on the slides, the center of gravity is approximately 32 cm (12.5 in) from the rack front.



NOTES:

$\triangle 1$  COOLING FAN MOUNTS ON REAR PANEL WHEN POWER SUPPLY IS NOT MOUNTED IN LINE WITH DRIVE.

$\triangle 2$  COOLING FAN IS INSIDE POWER SUPPLY

3 DIMENSIONS ARE NOMINAL.

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Figure 3-1. Drive Space Requirements

## POWER REQUIREMENTS

### Normal Requirements

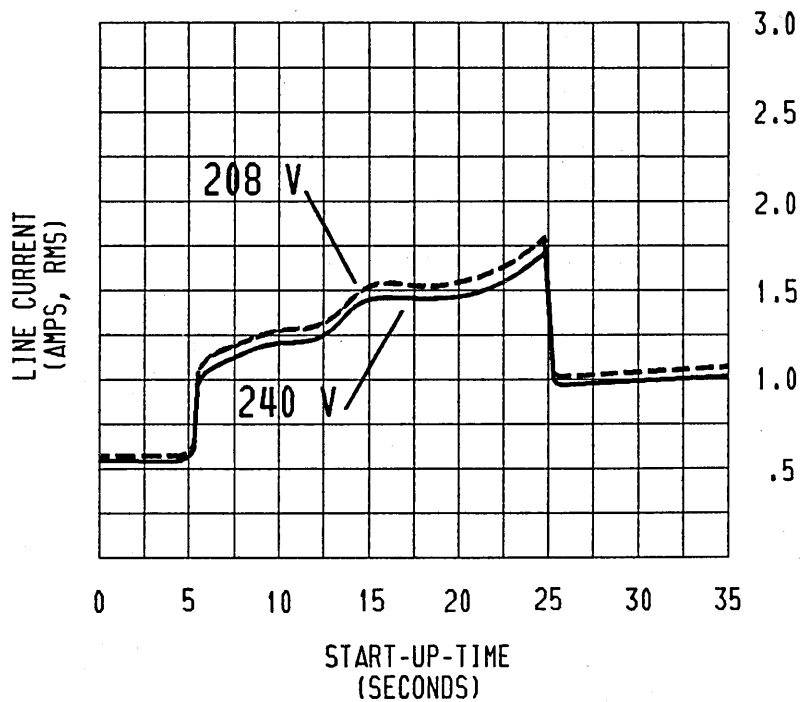
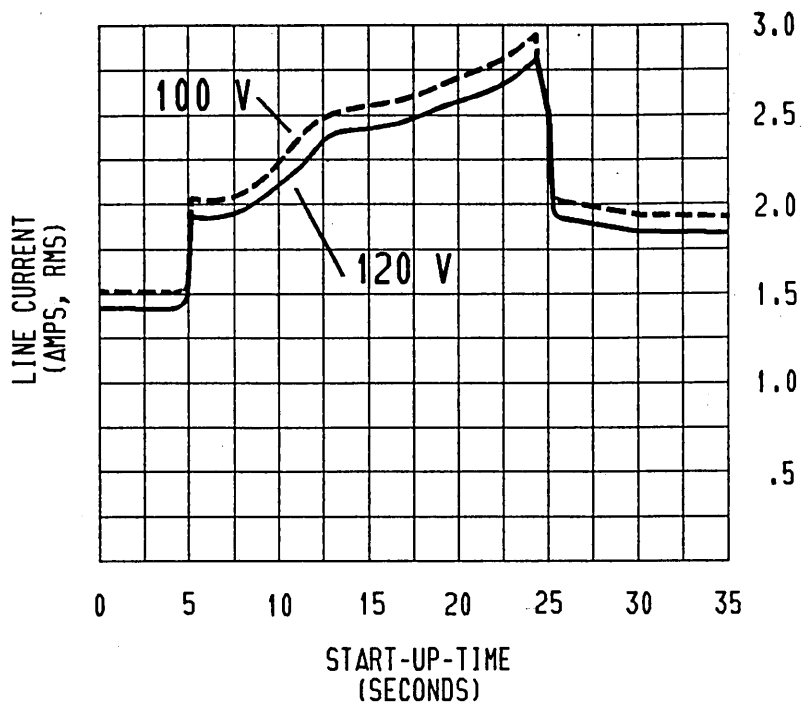
Drive ac power requirements are listed in table 3-2. Conversion to the different line voltages is explained in the installation procedures. Typical drive current versus start-up time is shown in figure 3-2 for 100-120 and 208-240 volt connections.

TABLE 3-2. POWER REQUIREMENTS

Specifications	NOMINAL VALUES	
	100 - 120 V ac	208 - 240 V ac
Voltage Range	85 to 132 V	177 to 264 V
Nominal Line Frequency	50/60 Hz	50/60 Hz
Frequency Range	48.0 to 62.0 Hz	48.0 to 62.0 Hz
Phase Requirements	Single Phase	Single Phase
Power Consumed*	0.135 - 0.140 kW	0.135 - 0.140 kW
Line Current*	2.2 - 2.0 A	1.3 - 1.2 A
Power Factor*	0.613 - 0.583	0.499 - 0.486
Start Up Current	See figure 3-2.	See figure 3-2.

\*Measured at nominal values when disks are rotating and carriage is moving.





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Figure 3-2. Typical Line Current Versus Start-up Time

## WARNING

If power to the unit originates from a 3-phase, 4-wire, wye branch or feeder circuit, always ensure that the circuit meets the requirements given in the following topic. These requirements must be met in the United States, in order to comply with the National Electrical Code, and are recommended for installations in other countries. Failure to meet these requirements may result in hazardous conditions due to high currents (and heating) in the neutral conductors and transformers supplying the system.

### Special Requirements for 3-Phase, 4-Wire Wye Site Power

#### General

This unit uses single-phase power. If the power originates from a 3-phase, 4-wire, wye branch or feeder circuit ensure that the circuit meets the following specifications (see preceding warning).

#### Specifications for Neutral Conductor

Always consider the neutral in the 3-phase, wye circuit as a current carrying conductor and ensure that it is large enough to have at least 175% of the rating of the line conductors.

#### Limiting Branch and Feeder Circuit Load Currents

The size of the neutral conductor determines the maximum load current allowed in each 3-phase, wye conductor (lines and neutral). If the neutral in the 3-phase, wye circuit has at least 175% the rating of the line conductors, limit the maximum load current in each conductor (lines and neutral) to the values shown in table 3-3. If the neutral is not 175% as large as the line conductors but is at least the same size (which is the minimum acceptable), limit current as shown in table 3-4.

TABLE 3-3. LOAD CURRENT LIMITS WITH LARGER NEUTRAL

Number of Conductors in Conduit, Cable or Raceway	Limit to this Percentage of Value Specified by NEC* or Local or National Regulations
4 through 6	80%
7 through 24	70%
25 through 42	60%
43 and above	50%
* United States National Electrical Code.	

TABLE 3-4. LOAD CURRENT LIMITS WITH SAME SIZE NEUTRAL

Number of Conductors in Conduit, Cable or Raceway	Limit to this Percentage of Value Specified by NEC* or Local or National Regulations
4 through 6	70%
7 through 24	61%
25 through 42	53%
43 and above	44%
* United States National Electrical Code.	

Transformers

If over one half of the load consists of equipment containing switching power supplies, derate the power transformer to 70% of its nameplate rating. Ensure that input protection to the transformer does not allow more than 70% of the normal (nameplate) full load primary current rating. Connect the individual neutral leads from the transformer secondary coils directly to a neutral bus or connection strap which is large enough to carry at least 175% of the total secondary load current.

## **GROUNDING REQUIREMENTS**

### **General**

Safety grounding (connecting the drive power cord to a grounded outlet) and system grounding (establishing a common ground between the drives, the power supplies, and the controller) are discussed in the following paragraphs.

### **Safety Grounding**

A safety ground must be provided by the site ac power system. The green (or green and yellow striped) wire in the drive's power cord provides the safety ground connection between the power supply and the site power system. In turn, the site ac power system must tie this connection (safety ground) to earth ground. All site ac power connection points, including convenience outlets for test equipment, must be maintained at the same safety ground potential.

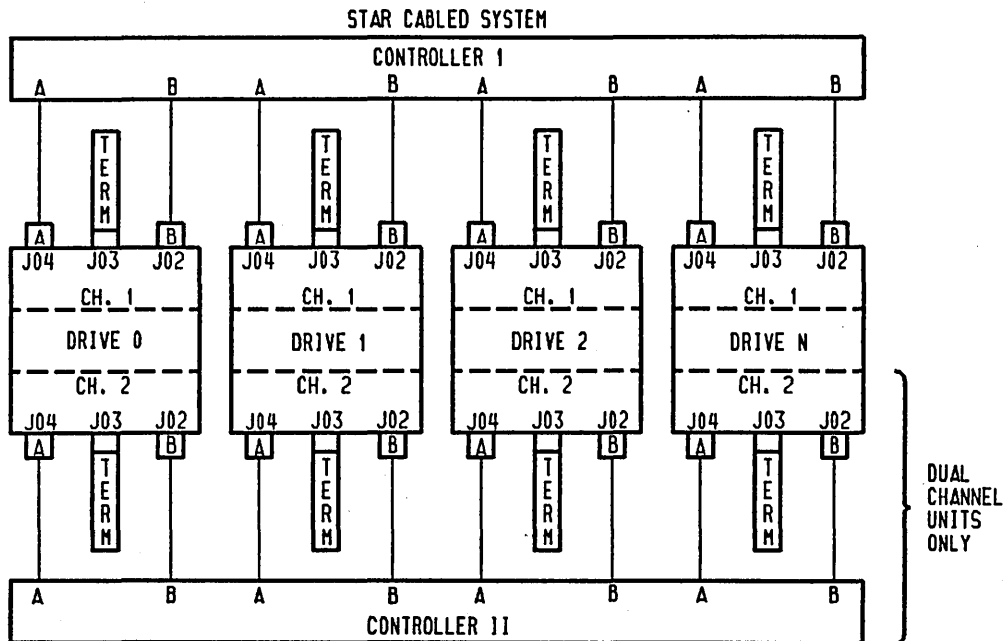
### **System Grounding**

In addition to safety grounding, system ground connections are also required. System ground is established by a set of ground straps connected in a star or daisy chain configuration. The ground straps connect ground on the controller to earth ground and to each drive in the system. The installation procedures in this section provide detailed grounding instructions and a schematic diagram of the star and daisy chain configurations.

## **INTERFACE REQUIREMENTS**

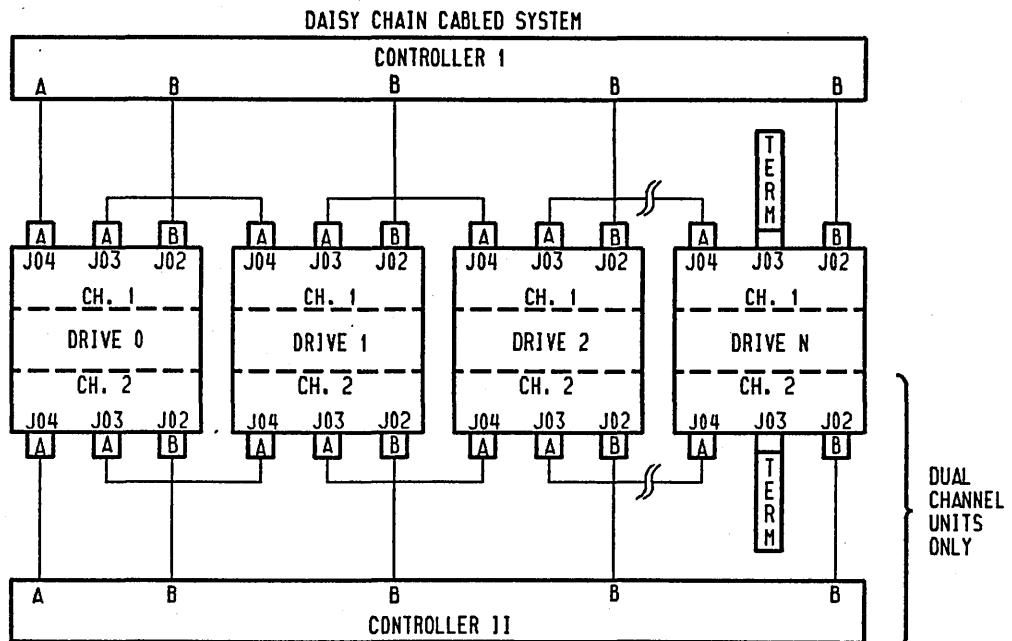
An important part of site preparation is planning the layout and routing of I/O cables. The I/O cables are designated as A and B cables. The I/O A cables may be connected in either a star or daisy chain configuration as shown in figure 3-3. Each configuration calls for the use of terminators; these too are shown in figure 3-3.

The following discussion of the I/O configurations applies to single channel installations where a set of drives are interfaced to one controller. Extending the discussion to dual channel installations (involving two controllers) requires doubling the quantities of cables and terminators because the two channels have independent cabling.



**NOTES:**

1. MAXIMUM INDIVIDUAL LENGTHS = 100 FEET (STAR)
2. MAXIMUM CUMULATIVE A CABLE LENGTHS = 100 FEET (DAISY CHAIN)
3. MAXIMUM INDIVIDUAL B CABLE LENGTHS = 50 FEET
4. A SYSTEM MAY INCLUDE UP TO 16 DRIVES



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Figure 3-3. System Cabling

The star configuration has individual A and B cables going from the controller to each drive, and each drive has a terminator installed on it. The daisy chain configuration has individual B cables going from the controller to each drive. However, a single A cable connects the controller to the first drive. Other A cables go from drive to drive, and the last drive in the string has a terminator installed on it.

In estimating the I/O cables needed for an installation, decide which configuration will be used and allow sufficient length to permit extension of rack-mounted drives. Limitations on I/O cable lengths may influence system layout. The maximum length for each B cable is 15.3 m (50 ft). Each star system A cable or the cumulative A cabling in a daisy chain system cannot exceed 30.6 m (100 ft) in length. Refer to Accessories in section 4 for terminator and I/O cable part numbers.

Figure 3-4 shows the pin assignments and signal names for the A cable. Figure 3-5 shows the pin assignments and signal names for the B cable. Detailed information about interface lines is given in section 1 of hardware maintenance manual, volume 2.

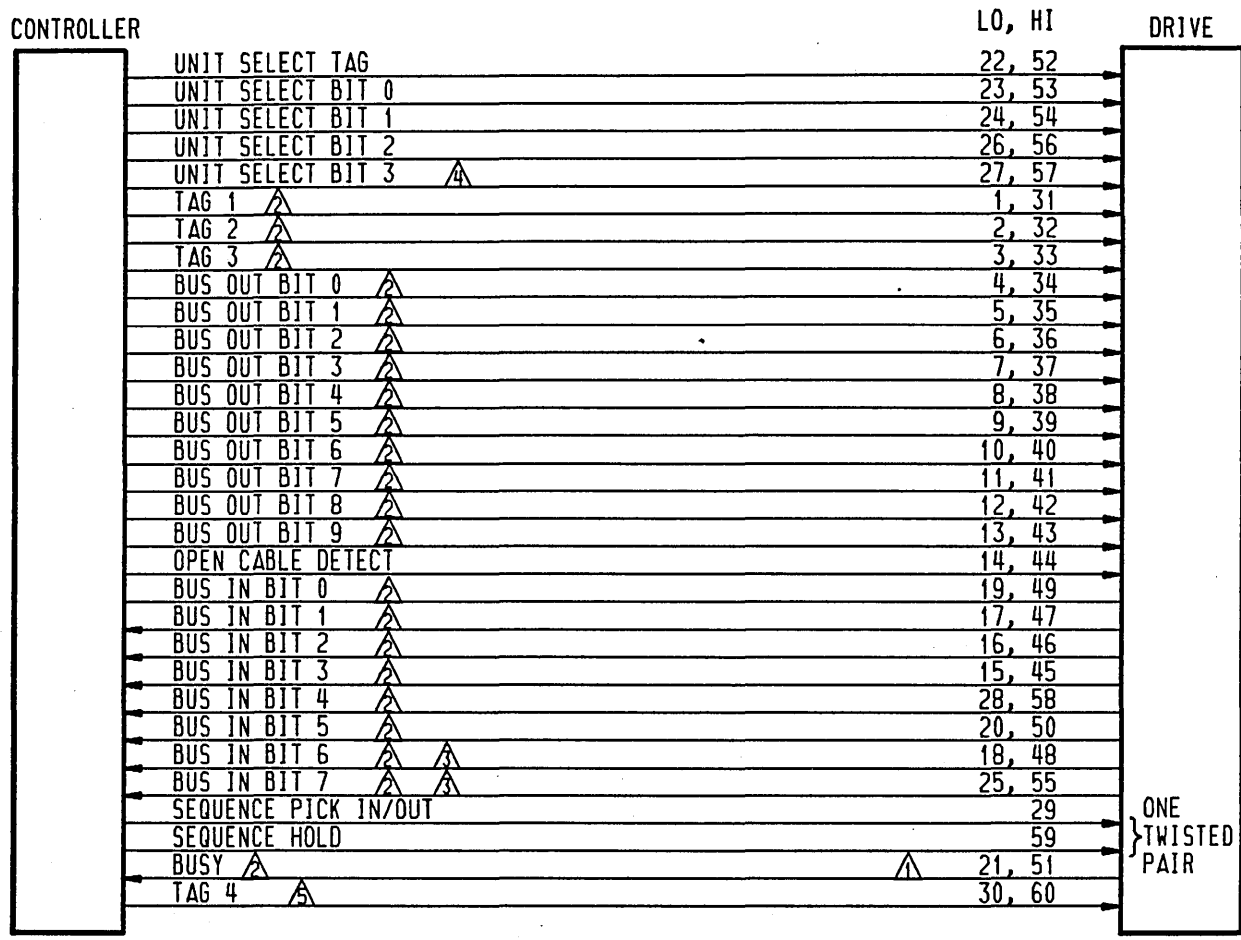
## **UNPACKAGING, INSPECTION AND REPACKAGING**

### **GENERAL**

After removing packaging material according to the unpackaging instructions provided with the drive, inspection for shipping damage should be carried out and several final unpackaging procedures performed. Save all packaging materials for future use.

### **UNPACKAGING**

1. Open package (save all packaging materials).
2. If drive has a 2X drawer with slide mount option, remove packages containing drawer, two slide mounts and slide mount hardware kit.
3. Remove package containing ac power cable and dc power cable.
4. Remove plastic dust cover from around drive and power supply.
5. Check all items against shipping bill for required equipment and hardware to complete installation. Discrepancies, missing items, damaged equipment, etc., should be reported to the CDC account sales representative responsible for the equipment.



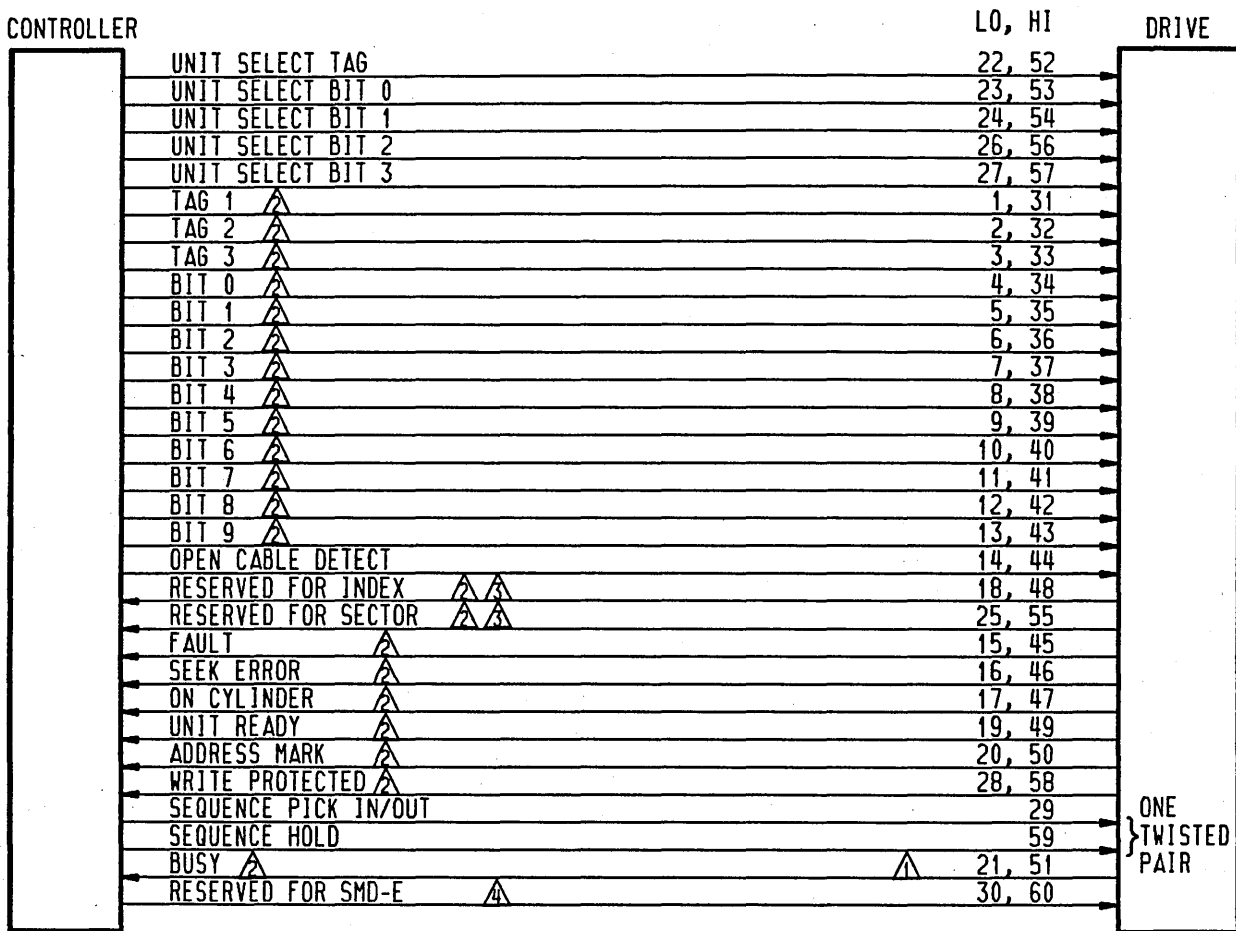
NOTES:

- <sup>△1</sup> DUAL CHANNEL UNITS ONLY
- <sup>△2</sup> GATED BY UNIT SELECT
- <sup>△3</sup> INDEX AND SECTOR MAY BE IN "A" CABLE, "B" CABLE, OR BOTH.
- <sup>△4</sup> FUNCTIONS AS TAG 5 LINE FOLLOWING UNIT SELECTION.
- <sup>△5</sup> FUNCTIONS AS CYLINDER ADDRESS BIT 2<sup>10</sup> LINE, WHEN OPERATING WITH TAG 1 EXTENDED ADDRESSING FEATURE.

SMD-E SIGNAL DEFINITIONS

11F43

Figure 3-4. A Cable (Sheet 1 of 2)



NOTES:

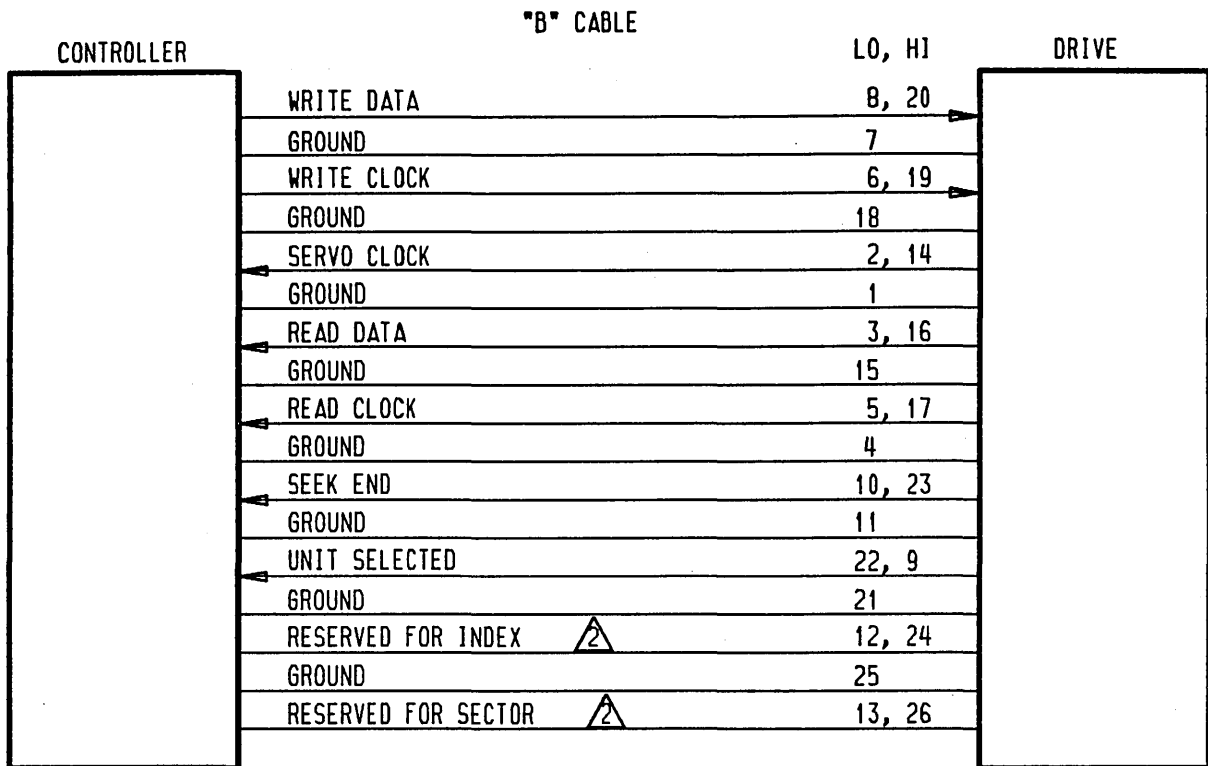
- <sup>1</sup> DUAL CHANNEL UNITS ONLY
- <sup>2</sup> GATED BY UNIT SELECT
- <sup>3</sup> INDEX AND SECTOR MAY BE IN "A" CABLE, "B" CABLE, OR BOTH.
- <sup>4</sup> FUNCTIONS AS CYLINDER ADDRESS BIT 2<sup>10</sup> LINE WHEN OPERATING WITH TAG 1 EXTENDED ADDRESSING FEATURE.

SMD-0 SIGNAL DEFINITIONS

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Figure 3-4. A Cable (Sheet 2)





NOTES:

1 NO SIGNALS GATED BY UNIT SELECTED

$\triangle$  INDEX AND SECTOR MAY BE IN "A" CABLE, "B" CABLE, OR BOTH

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Figure 3-5. B Cable

### INSPECTION

Inspect the drive, power supply, and accessory items for possible shipping damage. All claims for shipping damage should be filed with the carrier involved.

### REPACKAGING

If it is necessary to ship the drive, repackage the drive with the original packaging materials (saved during installation). Comply with the manufacturer's packaging instructions to ensure that the drive will be undamaged in shipment. To obtain packaging instructions, contact:

Packaging Engineer, Material Services Dept.  
 Normandale Division, MPI  
 7801 Computer Ave  
 Minneapolis, MN 55435

When ordering packaging instructions, specify the exact equipment number and series code of the drive as shown on the equipment identification label.

## INSTALLATION PROCEDURES

### GENERAL

The following text provides the instructions necessary to install the drive and power supply into the 2X drawer and how to rack mount the 2X drawer. It is assumed that the requirements for site preparation have been completed prior to performing the installation procedures.

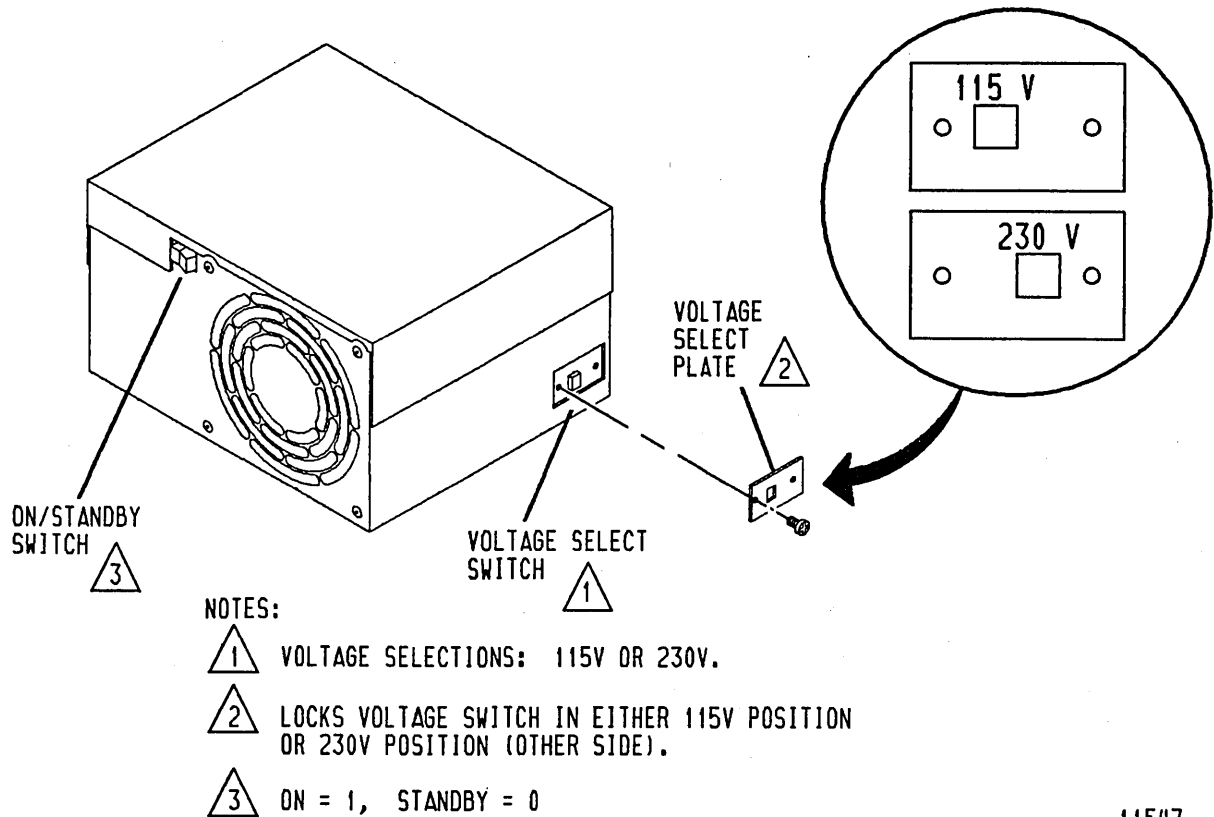
The following procedures should be considered in the order presented, but the order may be altered for a specific installation:

- Power Supply Voltage Conversion
- Mounting 2X Drawer in Rack
- Mounting Front Panel
- Mounting Status/Control Panel
- Mounting Drive and Power Supply in 2X Drawer
- System I/O Cabling
- System Grounding
- Setting Circuit Board Switches.

### POWER SUPPLY VOLTAGE CONVERSION

The power supply is configured before shipment to operate in one of two ranges of ac input voltages. The voltage select plate on the power supply (see figure 3-6) indicates the voltage range selected prior to shipment. The voltage range is determined by setting the voltage select switch to the desired range. The voltage select plate locks the switch in the desired range. The ac power cord must be replaced if the voltage range is changed. Refer to figure 3-7 and to the Parts Data section for information about ordering the replacement ac power cable.

1. Ensure that ac power cable is disconnected from power supply.
2. Remove screws securing voltage select plate to power supply and remove plate from power supply. Retain plate and hardware.



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Figure 3-6. Power Supply Voltage Conversion

3. Set the voltage select switch to the desired range.
4. Reverse the voltage select plate and install plate on power supply to lock the switch in the desired range. Plate should indicate new voltage setting.
5. Replace existing ac power cable with the ac power cable specified for new operating voltage.

#### MOUNTING 2X DRAWER IN RACK

The slide assemblies permit inline mounting of the 2X drawer in a rack. The drawer may be extended out the front surface of the rack for maintenance. The following procedure provides instructions for attaching the 2X drawer to the rack.

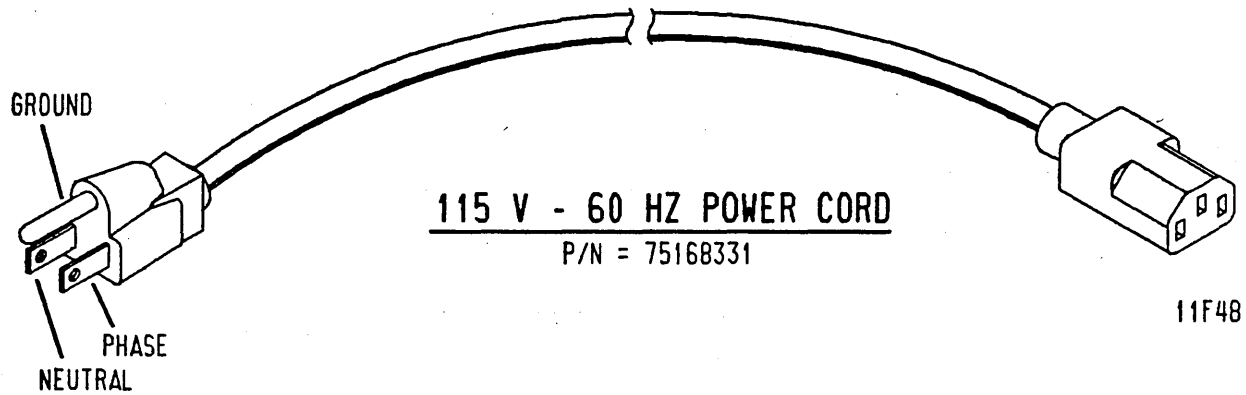
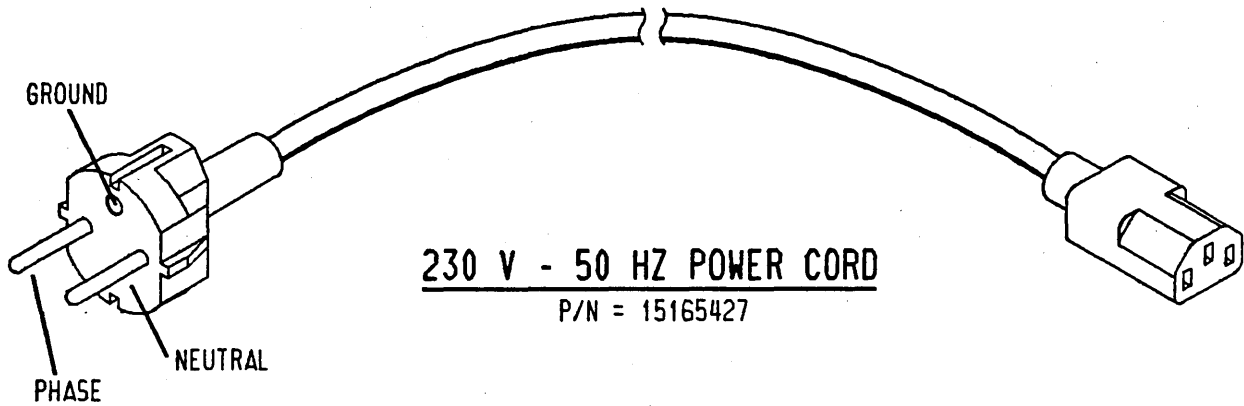


Figure 3-7. AC Power Cables

1. Remove screws from rack mounting kit.

NOTE

The four smaller diameter screws found in the rack mounting kit, are used to attach the slide adjusting brackets to the slides and the inner drawers to the 2X drawer. All other screws used with the rack mounting kit are the same size.

2. Loosely, attach a slide adjusting bracket to each slide with a bracket clamp and screw (see figure 3-8).

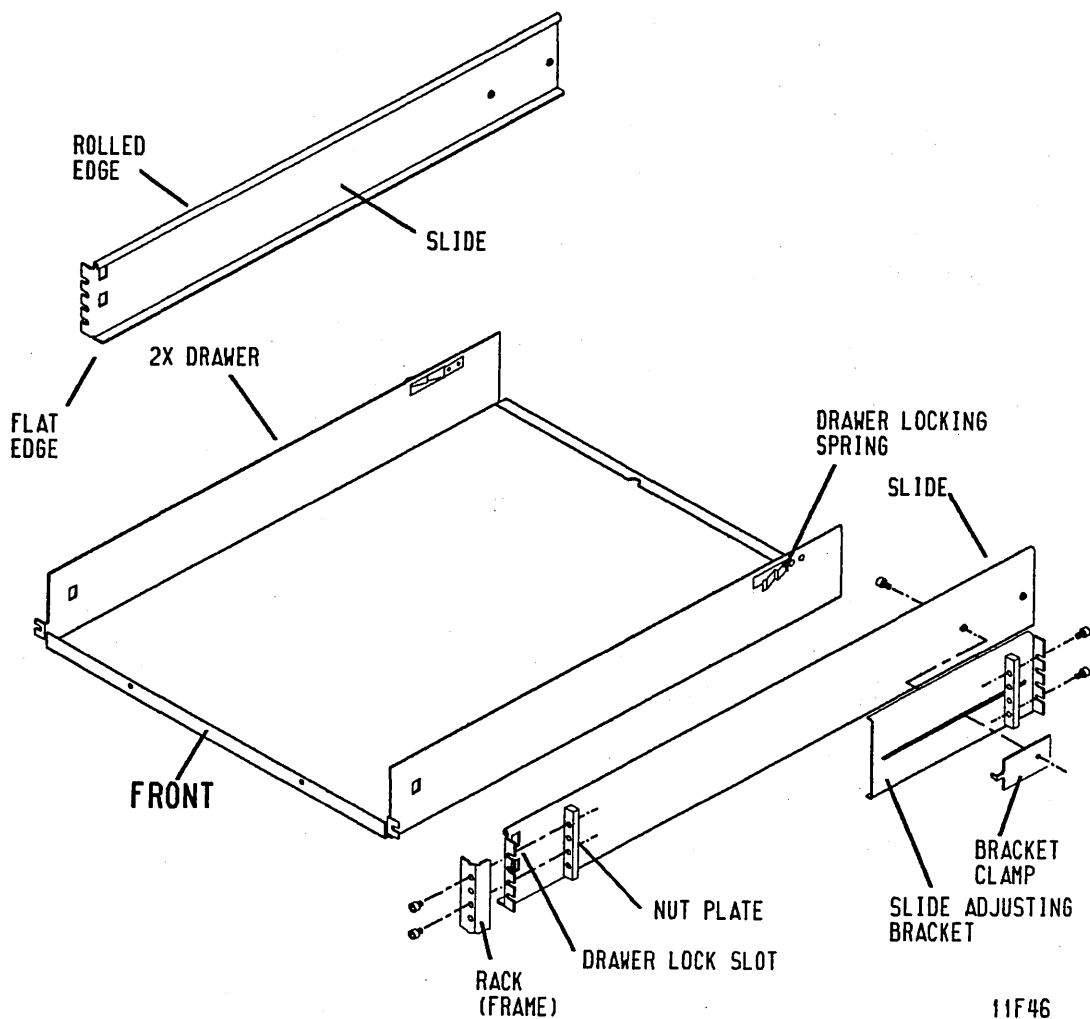


Figure 3-8. 2X Drawer Installation

3. Loosely, attach screws and nut plates (for each slide) to rack as follows (see figure 3-8):
  - For rack front, screws go in top and third holes.
  - For rack rear, screws go in top and bottom holes.
4. Set slide adjusting brackets as required for proper rack depth and mount right-hand and left-hand slides in rack in accordance with user requirements. Orient slides so that the 2X drawer rests on the flat edge of the slides as shown in figure 3-8.
5. Secure adjusting brackets to slides and slides to rack.
6. Lift drawer and guide it into slide assemblies. Continue pushing until drawer is in rack. Ensure that there is no binding when sliding 2X drawer in and out of rack.
7. To remove drawer from rack, slide drawer out to full extension. Press drawer locking springs and remove drawer from rack.

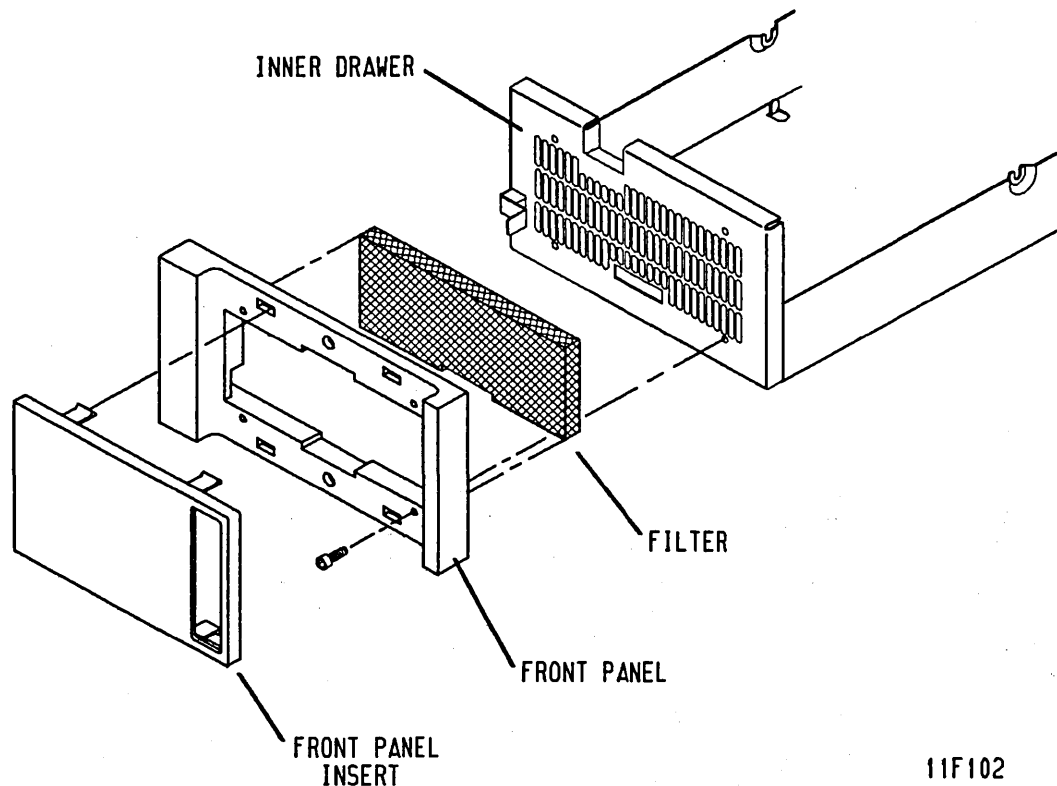
## **MOUNTING FRONT PANEL**

The following procedure describes how to install the air filter and how to attach the front panel to the inner drawer. If the status/control panel will be installed, go to the next procedure, which includes front panel mounting instructions.

### **NOTE**

When installing the front panel, ensure that the overhang covers the rack frame (vertical support). If left and right hand inner drawers are interchanged in the 2X drawer, rotate the front panels 180 degrees.

1. Align top edge of front panel to top edge of inner drawer (see figure 3-9).
2. Secure front panel into place with two screws.
3. Install filter.
4. Install front panel insert.



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Figure 3-9. Mounting Front Panel

#### MOUNTING STATUS/CONTROL PANEL

The following procedure provides complete instructions for mounting the status/control panel to an existing 2X drawer configuration (see figure 3-10).

#### NOTE

If mounting the status/control panel is part of a new site 2X drawer installation, then perform steps 11, 12, 13, and 17 through 20 only.

1. Remove front panel insert from each drive (see figure 3-10).

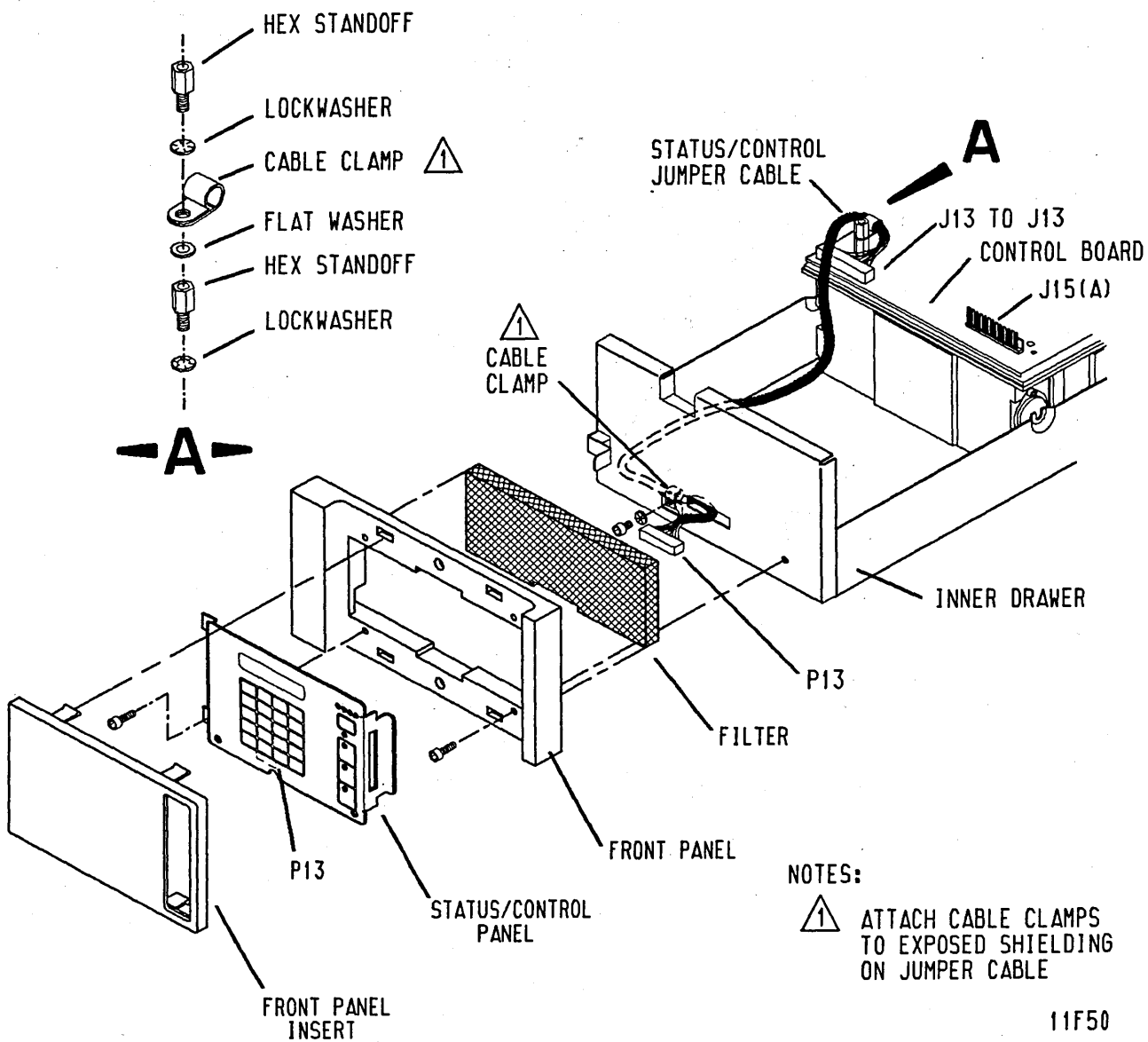


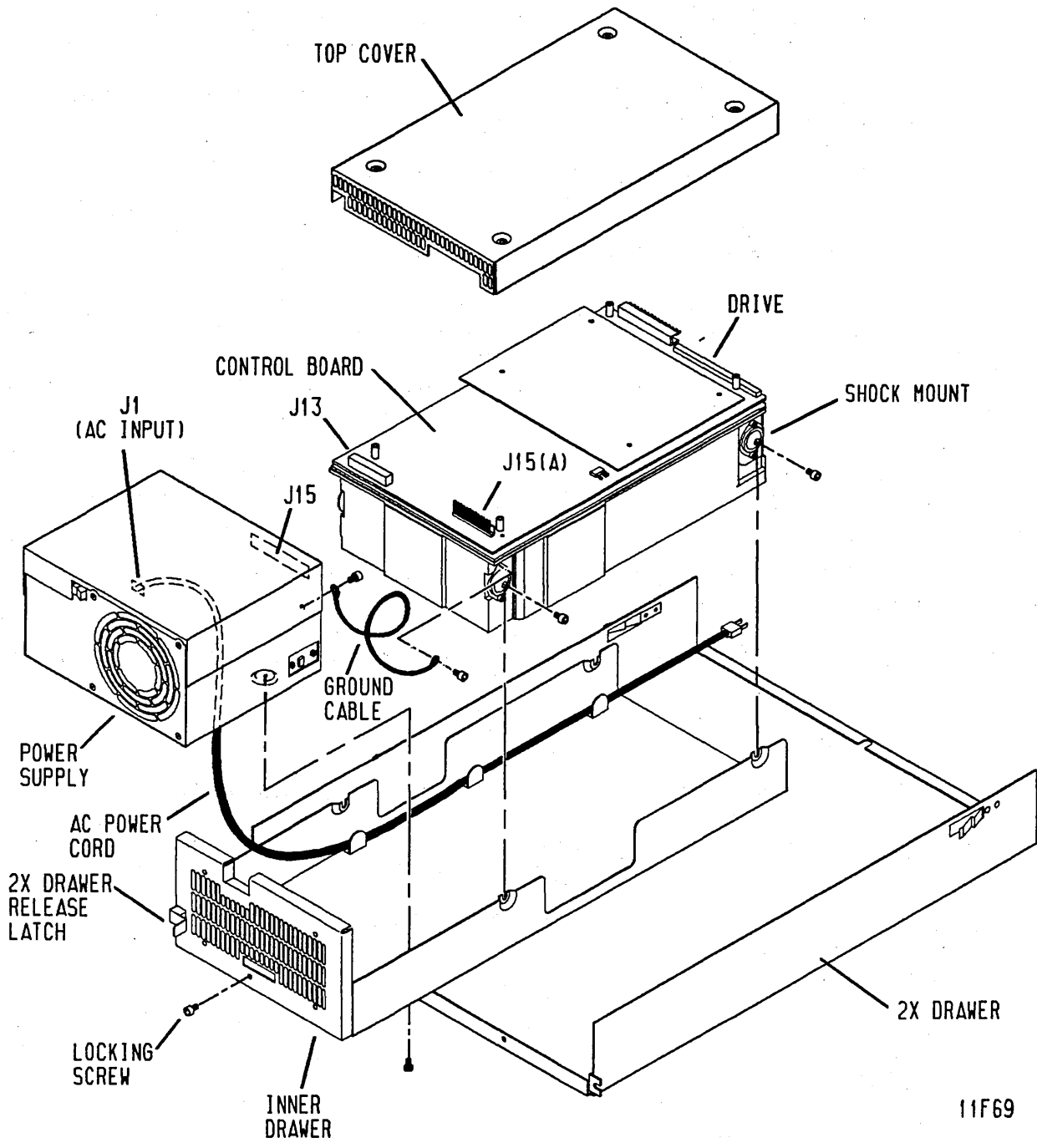
Figure 3-10. Mounting Status/Control Panel



#### NOTE

The release latch on the left-hand drive locks the 2X drawer in the rack. The release latch on the right-hand drive has no function.

2. Push 2X drawer latch to the right and extend 2X drawer to fully extended position.
3. Remove power from drive as follows:
  - a. Inactivate Sequence Pick and Hold (ground) signals from the controller.
  - b. After approximately 60 seconds, set On/Standby switch on power supply to Standby (0) position.
4. Remove screws securing front panel to inner drawer and remove front panel and filter from drawer.
5. Remove inner drawer locking screw (see figure 3-11). Push 2X drawer latch to the right, lift inner drawer up and slide it outward to gain access to top cover.
6. Remove screws securing top cover to drive. Carefully, lift off top cover.
7. Disconnect P15 (dc power cable) from J15 (A) on control board.
8. Disconnect ground cable from module.
9. Remove screws securing power supply to inner drawer.
10. Disconnect ac power cable from ac input connector J1, while removing power supply from inner drawer.
11. Attach the two metal cable clamps (found in status/control panel kit) to the exposed shielding on the jumper cable (see figure 3-10).
12. Attach cable clamp at the P13 end of jumper cable to the inner drawer using a screw and lockwasher as shown in figure 3-10.
13. Route status/control jumper cable around left side of where power supply will be, as shown in figure 3-10.
14. Remove and discard standoff (located next to P13) from control board (\_WAX) as shown in figure 3-10.



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Figure 3-11. Mounting Drive and Power Supply in 2X Drawer

15. Attach cable clamp at the J13 end of jumper cable to the control board with the washers and two short standoffs shown in figure 3-10, at location where old standoff was removed in previous step.
16. Connect jumper cable end marked J13 to J13 on control board.
17. Align top edge of front panel to top edge of inner drawer.

NOTE

When installing the front panel, ensure that the overhang covers the rack frame (vertical support). If left and right hand inner drawers are interchanged in the 2X drawer, rotate the front panels 180 degrees.

18. Secure front panel into place with the two screws on right side of front panel.
19. Install filter as shown in figure 3-10.
20. Align status/control panel to front panel as shown in figure 3-10 and secure with screws.
21. Connect jumper cable to P13 on status/control panel.

NOTE

In the following step, ensure that the P13 jumper cable does not interfere with power supply mounting. Cable is routed around left side of power supply (see figure 3-10).

22. Connect ac power cable to J1 on power supply and place power supply into position in inner drawer. Secure power supply with screws.
23. Connect ground cable to module.
24. Connect P15 (dc power cable) to J15 (A) on control board.
25. Replace drive top cover.
26. Slide inner drawer into position (in 2X drawer) and secure with locking screw.
27. Push 2X drawer to closed position in rack.
28. Install front panel insert.

## MOUNTING DRIVE AND POWER SUPPLY IN 2X DRAWER

The following procedure provides instructions for mounting the drive and power supply into the 2X drawer. See figure 3-11.

### NOTE

For drives with the status/control panel, ensure that the P13 jumper cable does not interfere with power supply mounting. Cable is routed around left side of power supply (see figure 3-10).

1. Place power supply into position in inner drawer and secure with screws, supplied with power supply kit.
2. Connect dc power cable to J15 on power supply.
3. Connect ground cable to ac ground terminal on power supply.
4. Connect ac power cable to ac input connector J1 on power supply. Route cable inside inner drawer as shown in figure 3-11.
5. Remove drive top cover.
6. Loosely, attach shock mount screws to drive.
7. Mount drive to inner drawer and secure into place.
8. Connect dc power cable to J15 (A) on the control board (\_WAX).
9. Remove upper screw securing shock mount to drive (see figure 3-11) and attach ground cable to drive with shock mount screw at that location.
10. For drives with status/control panel, perform the following steps:
  - a. Remove and discard standoff (located next to P13) from control board as shown in figure 3-10.
  - b. Attach cable clamp to the control board with the washers and two short standoffs shown in figure 3-10, at location where old standoff was removed in previous step.
  - c. Connect jumper cable end marked J13 to J13 on control board.

11. Replace drive top cover.
12. Slide inner drawer into position in 2X drawer and secure with locking screw.
13. Push 2X drawer back to closed position in rack.
14. Replace front panel insert.
15. Connect ac power cable to site power.

### SYSTEM I/O CABLING

This procedure describes how to connect the I/O cables and terminators. The recommended connections are A cable to J04 and terminator to J03. These connections may be reversed without affecting drive operation. It is assumed that the site has been prepared in accordance with the site preparation information provided earlier in this section. Refer to that discussion for cable routing information. Figure 3-12 shows typical I/O cable connections.

1. Attach cable bracket to rear panel, using the two shorter screws found in hardware kit.

#### NOTE

The following steps apply to single channel drives and must be repeated for dual channel drives. There are two sets of I/O connectors on dual channel drives: 1J02, 1J03, and 1J04 for channel 1 and 2J02, 2J03, and 2J04 for channel 2.

2. Connect B cable from controller to drive connector 1J02.

#### NOTE

Steps 3 and 4 apply only to drives using star I/O cabling configuration.

3. Connect A cable from controller to drive connector 1J04.
4. Install terminator on drive connector 1J03 and make terminator ground connection (see figure 3-13).

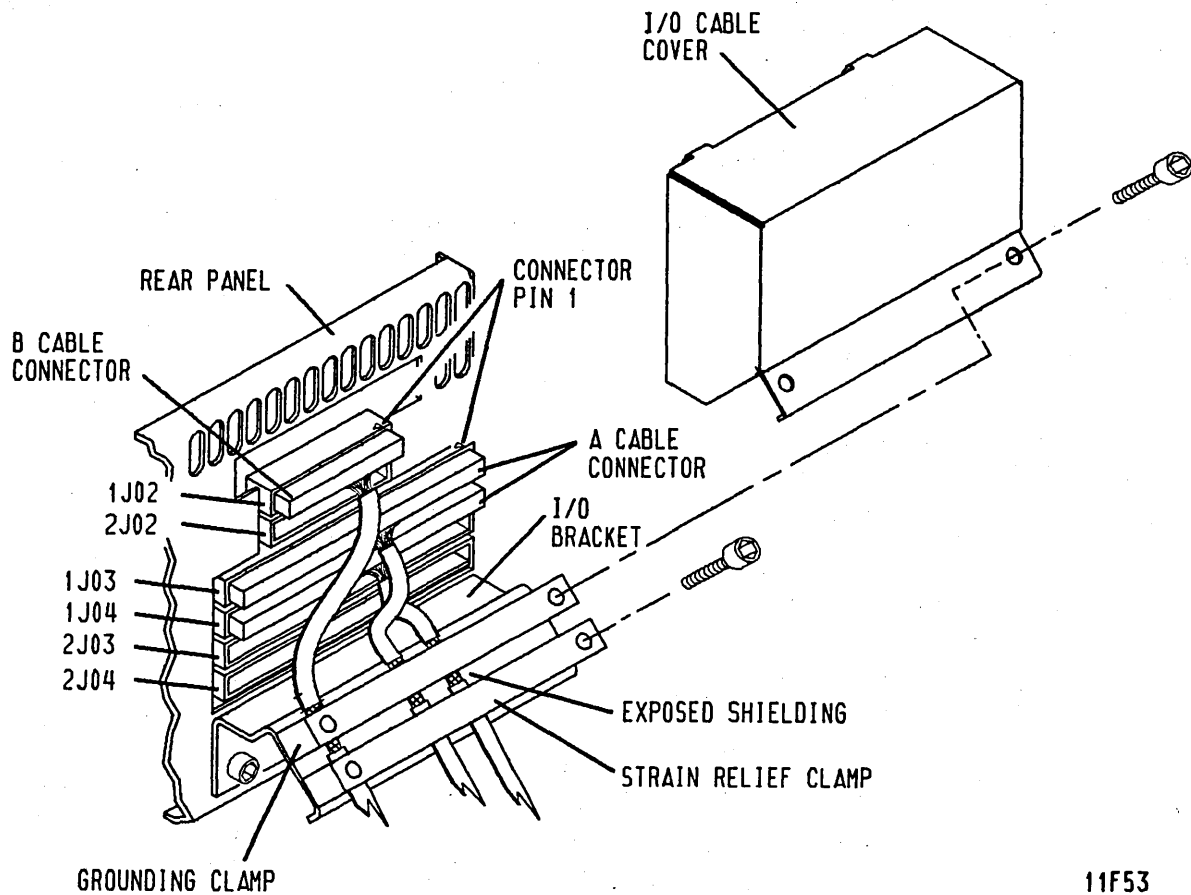
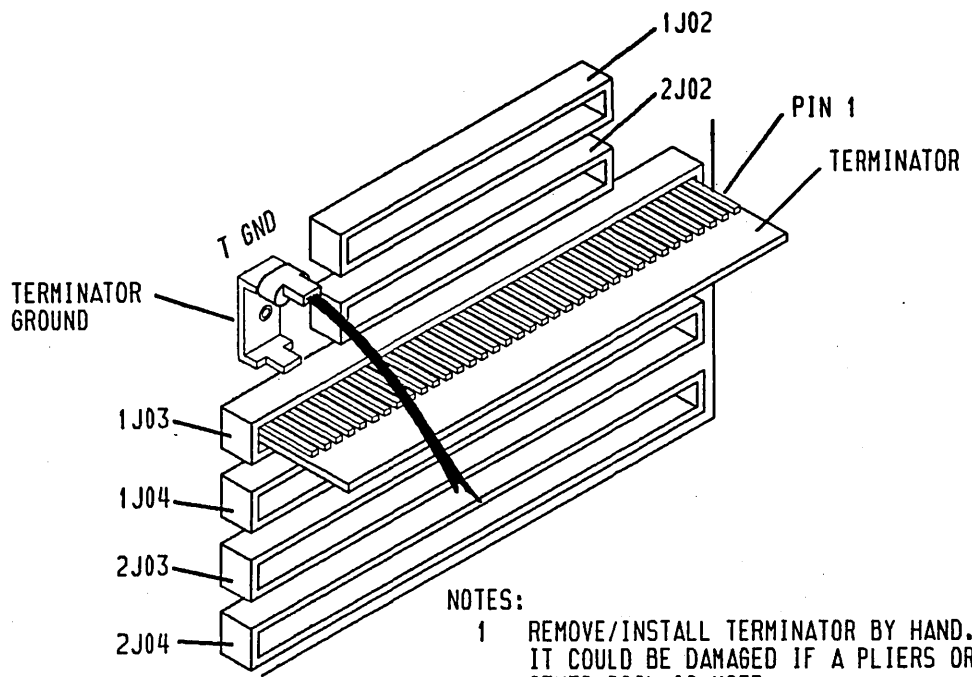


Figure 3-12. I/O Cable Attachment

NOTE

Steps 5 through 7 apply only to drives using daisy chain I/O cabling configuration. In these steps, upstream and downstream define drives adjacent to a particular drive in daisy chain with upstream drive closer to controller.

5. Connect A cable to drive connector 1J04 on rear panel either from controller or from connector 1J03 on upstream drive.



NOTES:  
 1 REMOVE/INSTALL TERMINATOR BY HAND. IT COULD BE DAMAGED IF A PLIERS OR OTHER TOOL IS USED.  
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Figure 3-13. Terminator Installation (Typical)

NOTE

If drive is not last in daisy chain, perform step 6. If drive is last in daisy chain, perform step 7.

6. Connect another A cable from drive connector 1J03 to connector 1J04 on downstream drive.
7. Install terminator on drive connector 1J03 and make terminator ground connection (see figure 3-13).

NOTE

On each I/O cable, there are several locations where heat shrink tubing can be removed to expose the ground shield. By selecting the proper section of heat shrink for removal in the following step, the ground shield will be exposed only where it is contacted by the grounding clamp.

8. Strip heat shrink tubing from all cables so that bare shielding will be in contact with grounding clamp.

9. Loosely install strain relief clamp (strain relief clamp has larger diameter openings than grounding clamp) onto cable bracket with cables positioned as shown in figure 3-12.
10. Position cabling so that outer insulation ends just above strain relief clamp; then secure strain relief clamp into place with screws. This will ensure that the grounding clamp (installed in the following step) is in contact with bare shielding of cabling.

#### NOTE

Ensure that bare shielding on each cable is in contact with grounding clamp in next step.

11. Install grounding clamp and I/O cable cover onto cable bracket with cables positioned as shown in figure 3-12 and secure with screws.

## SYSTEM GROUNDING

This section contains instructions on grounding the system to the drive. It is assumed that the site has been prepared in accordance with the site requirements information provided earlier in this section. The following procedures describe how to ground the system in a star or daisy chain configuration as shown in figure 3-14.

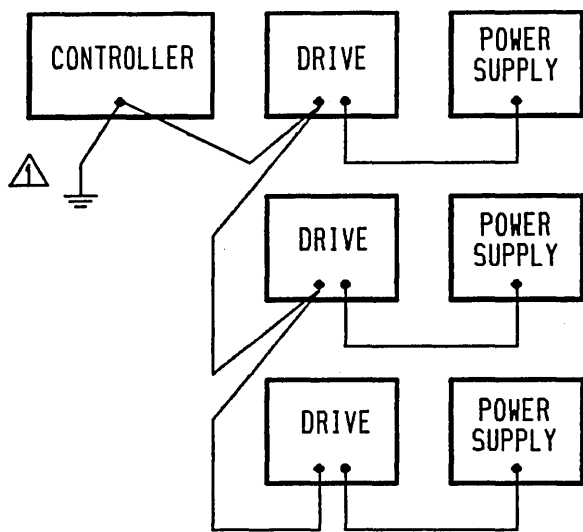
Interconnect cabling is supplied with each drive and installed on site, between case ground on each drive and case ground on its power supply. Refer to mounting drive and power supply procedure in this section, for instructions on attaching ground cable between drive and power supply.

### Star Grounding Procedure

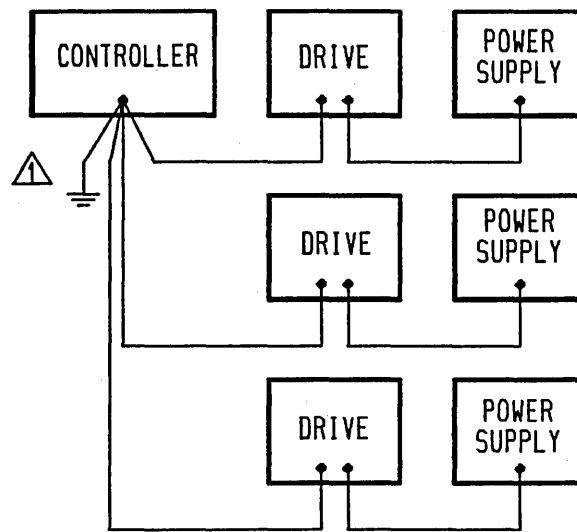
This procedure describes how to ground the system in a star configuration. In this configuration, ground straps connect the controller ground to each drive in the system as shown in figure 3-14.

1. Prepare ground straps as follows:
  - a. Allowing sufficient length for drive extension, cut ground straps to length needed for the following connections:
    - Controller to earth ground
    - Controller to each drive





DAISY CHAIN CONFIGURATION



STAR CONFIGURATION

NOTES:

△ EARTH GROUND CONNECTION

11F55

Figure 3-14. System Grounding Diagram

- b. Strip back vinyl coating at both ends of each ground strap.
- c. Crimp and solder terminal lugs to both ends of each ground strap.
2. Referring to figure 3-14, connect ground straps to controller as follows:
  - a. Connect one end of each of the ground straps to controller ground terminal.
  - b. Connect one of the ground straps to earth ground.
  - c. Route the remaining ground straps to the drives.

3. Connect a ground strap from controller to each drive as follows:
  - a. Remove screw and lockwasher from the system ground terminal (DC GND) on each drive. See figure 3-15.
  - b. Referring to figure 3-15, attach system ground strap to drive ground terminal. Ensure that lockwasher is between ground strap and ground terminal.

#### Daisy Chain Grounding Procedure

This procedure describes how to ground the system in a daisy chain configuration. In this configuration, a ground strap connects the controller ground to the first drive in the system. The remainder of the drives are connected by grounding straps going from the first drive to the second, the second to the third, and so on. See figure 3-14.

1. Prepare ground straps as follows:

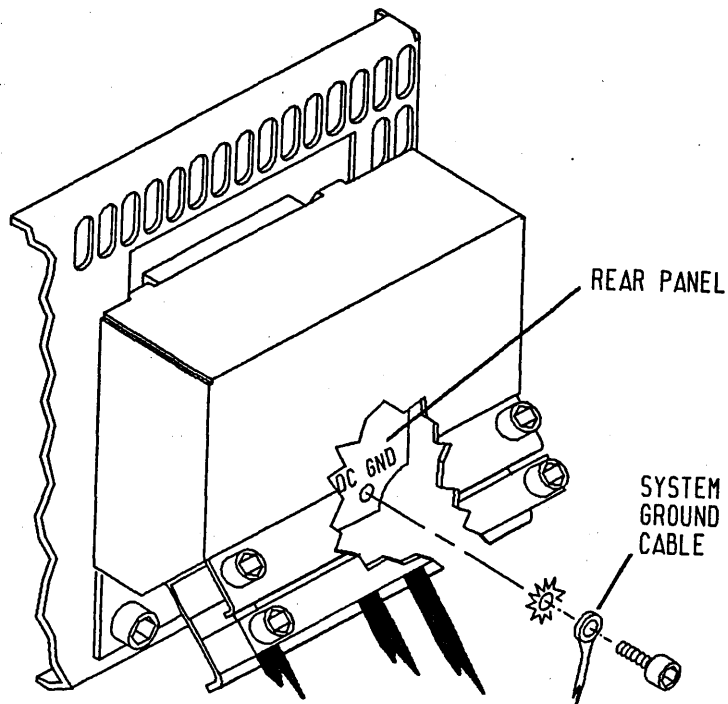
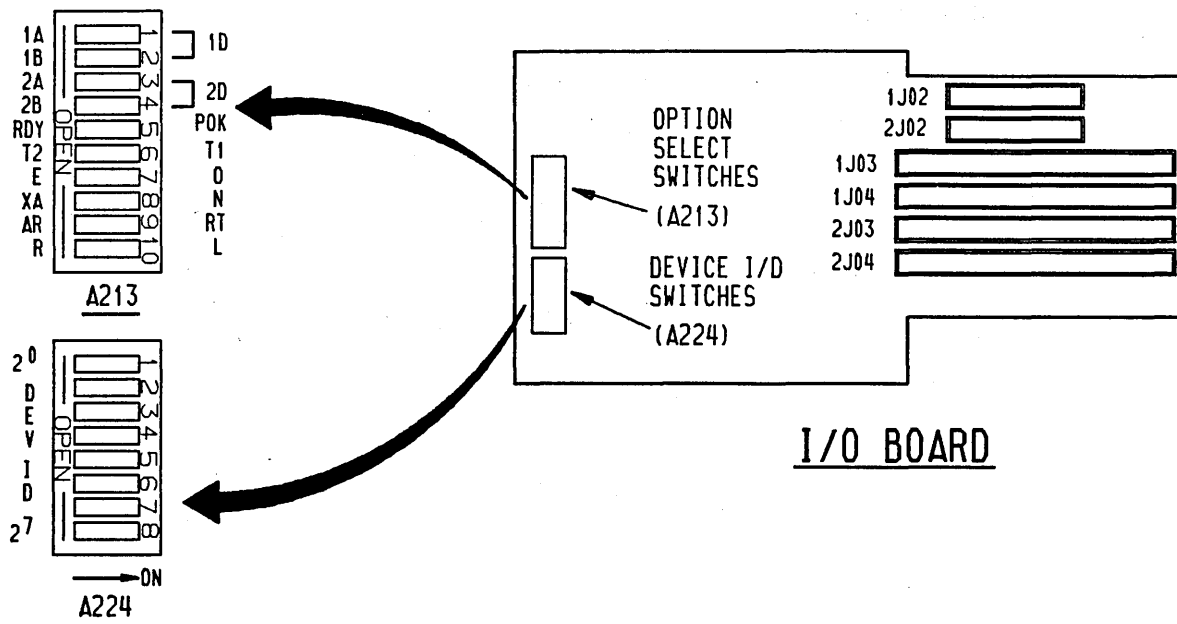


Figure 3-15. System Grounding

- a. Allowing sufficient length for drive extension, cut ground straps to length needed for the following connections:
    - Controller to earth ground
    - Controller to nearest drive
    - Each drive to next drive in daisy chain
  - b. Strip back vinyl coating at both ends of each ground strap.
  - c. Crimp and solder terminal lugs to both ends of each ground strap.
2. Referring to figure 3-14, connect ground straps to controller as follows:
    - a. Connect two ground straps to controller ground terminal.
    - b. Connect one of the ground straps to earth ground.
    - c. Route the other ground strap to the first drive in the daisy chain. Route the remaining ground straps (prepared in step 1) from drive to drive.
  3. Make the daisy chain ground connections at each drive as follows:
    - a. Remove screw and lockwasher from the system ground terminal (DC GND) on each drive. See figure 3-15.
    - b. Referring to figure 3-15, attach system ground strap to drive ground terminal. Ensure that lockwasher is between ground strap and ground terminal.

## SETTING CIRCUIT BOARD SWITCHES

The circuit boards inside the drive contain a number of switches that must be set correctly for normal operation of the drive. Figure 3-16 identifies these switches and gives their locations on the circuit boards. Tables 3-5 and 3-6 list the possible settings for normal drive operation for all switches except the sector select switches and logical address switches (used on drives without the status/control panel). The control board logical address switch settings are shown in table 3-7. For drives with the status/control panel, the logical address is set by pressing the Logical Address switch and observing the indicators, displayed in binary (See figure 2-1). In this case, the Logical Address switch settings on the control board are ignored.



I/O BOARD

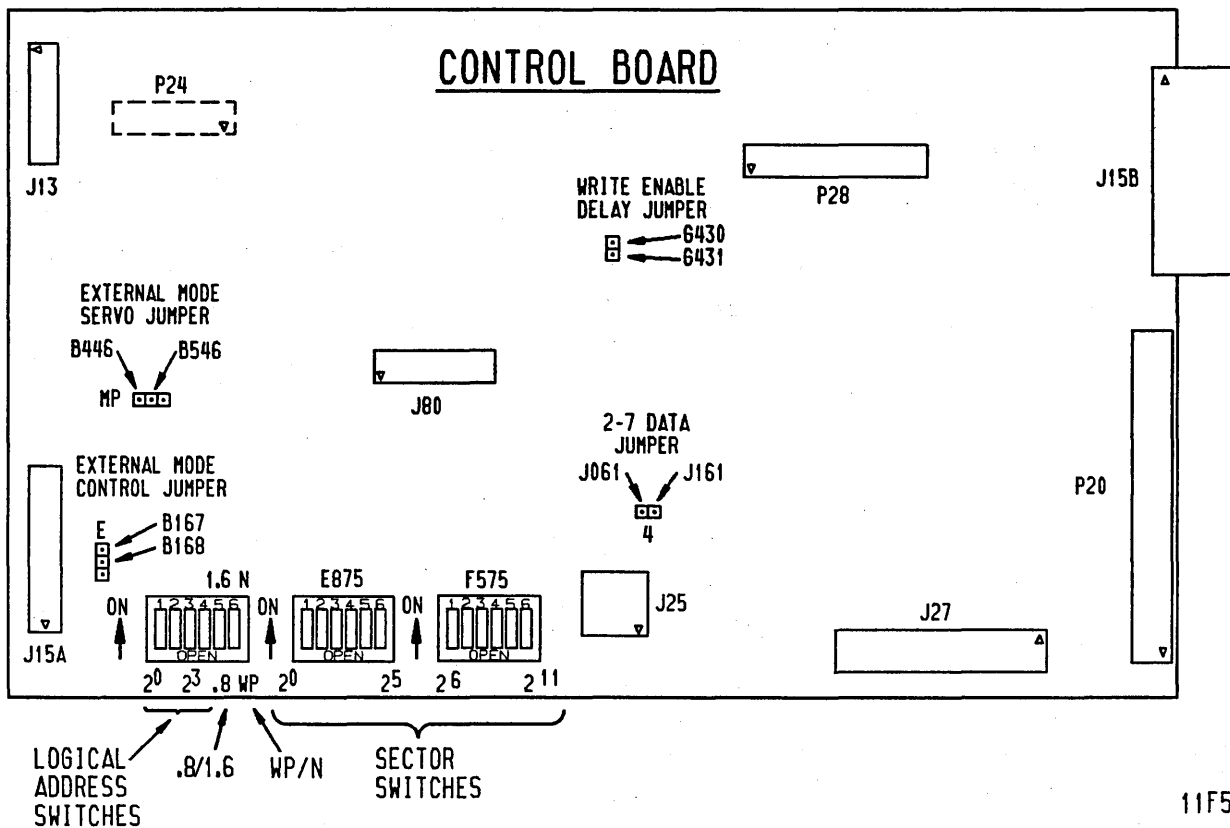


Figure 3-16. Setting Circuit Board Switches

TABLE 3-5. I/O BOARD SWITCH SETTINGS

SWITCH	SETTING	DESCRIPTION
1A/1D, 1B/1D		<p>Enable/Disable CH 1 and select an option for sending Index &amp; Sector to CH 1 controller. The four combinations of switch settings are as follows:</p>
1A/1D 1B/1D	1A 1D	This pair of switch settings enables CH 1 & sends I & S on A cable only
1A/1D 1B/1D	1D 1B	This pair of switch settings enables CH 1 & sends I & S on B cable only
1A/1D 1B/1D	1A 1B	This pair of switch settings enables CH 1 & sends I & S on A and B cables
1A/1D 1B/1D	1D 1D	This pair of switch settings disables CH 1
2A/2D, 2B/2D		Enable/Disable CH 2 and select an option for sending Index & Sector to CH 2 controller (see description of CH 1 switches)
RDY/POK	RDY  POK	<p>Normal I/O Ready status (Up to speed, heads loaded and no fault exists)</p> <p>POK (Power OK) line active: In addition to above conditions (when switch is in RDY), Ready status also indicates ac input voltage to the power supply is present.</p>

Table Continued on Next Page

TABLE 3-5. I/O BOARD SWITCH SETTINGS (Contd)

SWITCH	SETTING	DESCRIPTION
		POK (Power OK) line inactive: Indicates a loss of ac input voltage. The Ready line will go inactive (immediately). The +Voltage Fault line will remain inactive for a minimum of 850 microseconds (after the POK line goes inactive).
	T2	Enables Extended Cylinder Address bits $2^{10}$ and $2^{11}$ , via Tag 2 (Head Select).
	T1	Enables Extended Cylinder Address bit $2^{10}$ , via Tag 1 (Cylinder Select).
	E	SMD-E mode
	O	SMD-O mode
	XA	Extended Cylinder Address (cylinders 0-1217)
	N	Normal Cylinder Address (cylinders 0-1023)
	AR/RT	AR
	RT	Release Timer (Dual CH)
R/L	R	Remote power up
	L	Local power up
DEV ID $2^0-2^7$	(Closed)	Set according to customer requirements.

TABLE 3-6. CONTROL BOARD SWITCH SETTINGS

SWITCH	SETTING	DESCRIPTION
Sector Switches		See discussion on Setting Circuit Board Switches.
Logical Address Switches		Used on drives without status/control panel. See discussion on Setting Circuit Board Switches.
.8/1.6	.8	806 kHz Sector Clock
	1.6	1.6 MHz Sector Clock
WP/N	WP	Write Protect
	N	Normal
2-7 Data Jumper	4	Jumper preset during manufacturing between J061 and J161.
Write Enable Delay Jumper		Jumper preset during manufacturing between G430 and G431.
External Mode Control Jumper	E	Jumper preset during manufacturing between B167 and B168.
External Mode Servo Jumper	MP	Jumper preset during manufacturing between B446 and B546.

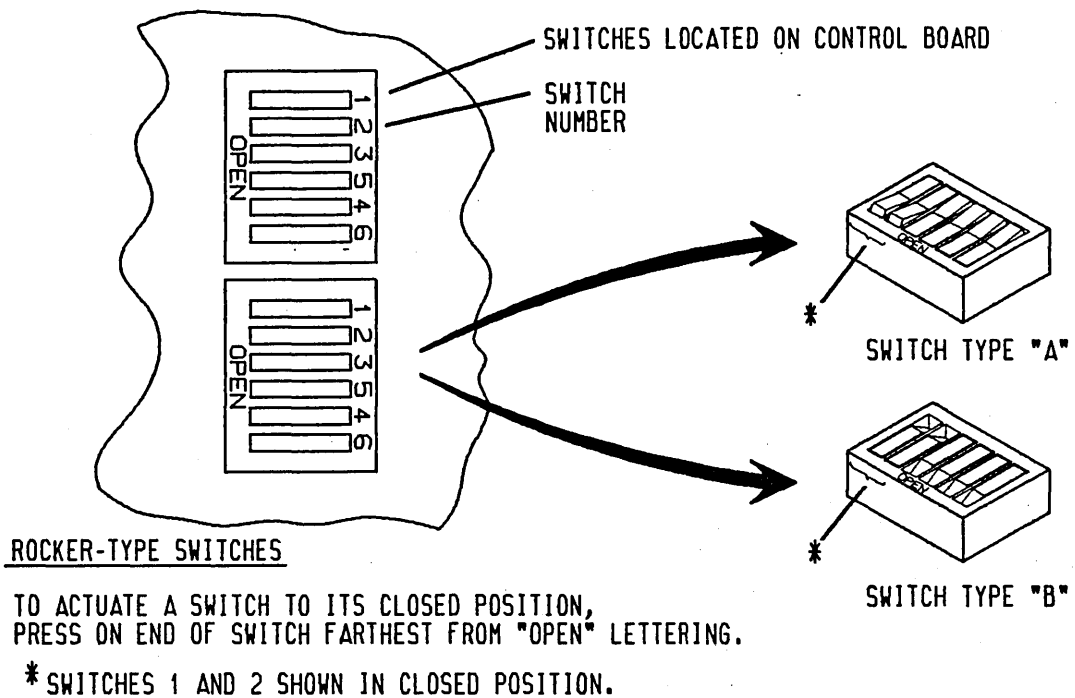
TABLE 3-7. CONTROL BOARD LOGICAL ADDRESS SWITCH SETTINGS

Logical Address	Switch (Binary Value) *			
	2 <sup>0</sup>	2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>
0	C	C	C	C
1	O	C	C	C
2	C	O	C	C
3	O	O	C	C
4	C	C	O	C
5	O	C	O	C
6	C	O	O	C
7	O	O	O	C
8	C	C	C	O
9	O	C	C	O
10	C	O	C	O
11	O	O	C	O
12	C	C	O	O
13	O	C	O	O
14	C	O	O	O
15	O	O	O	O

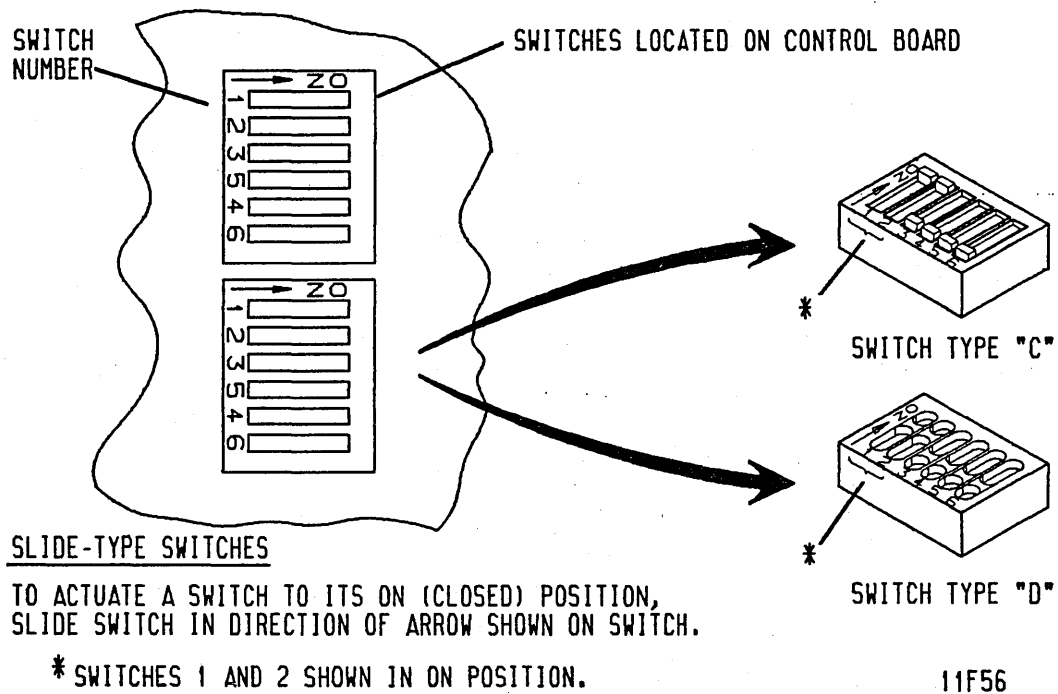
\* O = Open (Off), C = Closed (On)



## ROCKER-TYPE SWITCHES



## SLIDE-TYPE SWITCHES



11F56

Figure 3-17. Miniature Switches

Setting the sector select switches is discussed in the following paragraphs. Figure 3-16 shows the location of the sector select switch assembly.

The Sector Select switch assembly has twelve independent switches used for selecting sectors. The number of sectors per revolution generated by the drive logic must be matched to that required by the controller. Therefore, sector select switches are provided in the drive logic to allow selection of different sector counts. These switches are located on the control board and appear as in figure 3-17.

Two methods are provided for determining sector switch settings. One is a recommended method, and the other is an alternate method. The two methods are identical when the number of sector clocks per revolution of the disk is evenly divisible by the number of sectors. However, if the division has a remainder, the two methods treat the remainder differently. With the recommended method, the remainder results in a short, extra sector just before index. Some controllers, however, cannot accommodate the extra sector pulse. With the alternate method, there is no short, extra sector. Descriptions of both methods follow.

#### Recommended Method for Sector Switch Settings

Refer to the subsystem reference manual to determine the number of sectors required by the controller. There is a choice of two sector clock frequencies (806 kHz or 1.6 MHz). Table 3-8 shows sector switch settings for the 806 kHz sector clock. Across from the number of sectors listed in the table is a row of Cs and Os. C represents the Closed or On position of the sector switch. O represents the Open or Off position of the sector switch. Set the switches to the positions designated in the table while referring to figure 3-17 for an illustration of the switch positions.

The switch settings listed in table 3-8 have been determined from a formula. Use of this formula is demonstrated below to provide the user with an additional tool for determining sector switch settings. The text also provides a formula for setting sector switches for the 1.6 MHz Sector Clock.

Each sector will contain a certain number of clock pulses (received from the servo tracks). The number of clock pulses in each sector is the result of the number of sectors required by the controller. Thus with an 806 kHz Sector Clock:

$$\text{Selected Clock Pulses} = \frac{13\ 440}{\text{Number of Sectors}} - 1$$

TABLE 3-8. SECTOR SELECT SWITCH SETTINGS - 806 kHz

Number of Sectors	Location E875 Switch Number						Location F575 Switch Number					
	1	2	3	4	5	6	1	2	3	4	5	6
4	C	C	C	C	C	O	O	O	C	O	C	C
5	C	C	C	C	C	C	C	O	O	C	O	C
6	C	C	C	C	C	C	O	C	O	O	O	C
7	C	C	C	C	C	C	C	O	C	C	C	O
8	C	C	C	C	O	O	O	C	O	C	C	O
9	O	O	C	O	C	O	C	C	C	O	C	O
10	C	C	C	C	C	C	O	O	C	O	C	O
11	O	O	C	O	O	O	C	C	O	O	C	O
12	C	C	C	C	C	O	C	O	O	O	C	O
13	O	O	O	C	O	O	O	O	O	O	C	O
14	C	C	C	C	C	C	O	C	C	C	O	O
15	C	C	C	C	C	C	C	O	C	C	O	O
16	C	C	C	O	O	O	C	O	C	C	O	O
17	C	O	C	O	C	O	O	O	C	C	O	O
18	C	O	O	C	O	C	C	C	O	C	O	O
19	O	C	O	O	O	O	C	C	O	C	O	O
20	C	C	C	C	C	O	O	C	O	C	O	O
21	C	C	C	C	C	C	C	O	O	C	O	O
22	C	O	O	O	O	C	C	O	O	C	O	O
23	C	C	C	O	O	O	C	O	O	C	O	O
24	C	C	C	C	O	C	O	O	O	C	O	O
25	O	O	O	C	C	O	O	O	O	C	O	O

Table Continued on Next Page

TABLE 3-8. SECTOR SELECT SWITCH SETTINGS - 806 kHz (Contd)

Number of Sectors	Location E875 Switch Number						Location F575 Switch Number					
	1	2	3	4	5	6	1	2	3	4	5	6
26	C	C	O	O	O	O	O	O	O	C	O	O
27	O	O	O	O	C	C	C	C	C	O	O	O
28	C	C	C	C	C	O	C	C	C	O	O	O
29	O	C	C	C	O	O	C	C	C	O	O	O
30	C	C	C	C	C	C	O	C	C	O	O	O
31	O	O	O	O	C	C	O	C	C	O	O	O
32	C	C	O	O	O	C	O	C	C	O	O	O
33	O	C	C	O	C	O	O	C	C	O	O	O
34	O	C	O	C	O	O	O	C	C	O	O	O
35	C	C	C	C	C	C	C	O	C	O	O	O
36	O	O	C	O	C	C	C	O	C	O	O	O
37	O	C	O	C	O	C	C	O	C	O	O	O
38	O	O	O	O	O	C	C	O	C	O	O	O
39	C	C	C	O	C	O	C	O	C	O	O	O
40	C	C	C	C	O	O	C	O	C	O	O	O
41	O	C	C	O	O	O	C	O	C	O	O	O
42	C	C	C	C	C	C	O	O	C	O	O	O
43	C	C	C	O	C	C	O	O	C	O	O	O
44	O	O	O	O	C	C	O	O	C	O	O	O
45	C	O	O	C	O	C	O	O	C	O	O	O
46	C	C	O	O	O	C	O	O	C	O	O	O
47	O	O	C	C	C	O	O	O	C	O	O	O
48	C	C	C	O	C	O	O	O	C	O	O	O

Table Continued on Next Page

TABLE 3-8. SECTOR SELECT SWITCH SETTINGS - 806 kHz (Contd)

Number of Sectors	Location E875 Switch Number						Location F575 Switch Number					
	1	2	3	4	5	6	1	2	3	4	5	6
49	C	O	O	O	C	O	O	O	C	O	O	O
50	C	C	O	C	O	O	O	O	C	O	O	O
51	O	C	C	O	O	O	O	O	C	O	O	O
52	C	O	O	O	O	O	O	O	C	O	O	O
53	O	O	C	C	C	C	C	C	O	O	O	O
54	C	C	C	O	C	C	C	C	O	O	O	O
55	C	C	O	O	C	C	C	C	O	O	O	O
56	C	C	C	C	O	C	C	C	O	O	O	O
57	O	C	O	C	O	C	C	C	O	O	O	O
58	O	C	C	O	O	C	C	C	O	O	O	O
59	O	C	O	O	O	C	C	C	O	O	O	O
60	C	C	C	C	C	O	C	C	O	O	O	O
61	C	C	O	C	C	O	C	C	O	O	O	O
62	C	C	C	O	C	O	C	C	O	O	O	O
63	O	O	C	O	C	O	C	C	O	O	O	O
64	C	O	O	O	C	O	C	C	O	O	O	O
65	C	O	C	C	O	O	C	C	O	O	O	O
66	O	C	O	C	O	O	C	C	O	O	O	O
67	C	C	C	O	O	O	C	C	O	O	O	O
68	O	O	C	O	O	O	C	C	O	O	O	O
69	C	O	O	O	O	O	C	C	O	O	O	O
70	C	C	C	C	C	C	O	C	O	O	O	O
71	O	O	C	C	C	C	O	C	O	O	O	O

Table Continued on Next Page

TABLE 3-8. SECTOR SELECT SWITCH SETTINGS - 806 kHz (Contd)

Number of Sectors	Location E875 Switch Number						Location F575 Switch Number					
	1	2	3	4	5	6	1	2	3	4	5	6
72	C	O	O	C	C	C	O	C	O	O	O	O
73	C	C	C	O	C	C	O	C	O	O	O	O
74	O	O	C	O	C	C	O	C	O	O	O	O
75	O	C	O	O	C	C	O	C	O	O	O	O
76	C	C	C	C	O	C	O	C	O	O	O	O
77	C	O	C	C	O	C	O	C	O	O	O	O
78	C	C	O	C	O	C	O	C	O	O	O	O
79	C	O	O	C	O	C	O	C	O	O	O	O
80	C	C	C	O	O	C	O	C	O	O	O	O
81	O	O	C	O	O	C	O	C	O	O	O	O
82	O	C	O	O	O	C	O	C	O	O	O	O
83	O	O	O	O	O	C	O	C	O	O	O	O
84	C	C	C	C	C	O	O	C	O	O	O	O
85	C	O	C	C	C	O	O	C	O	O	O	O
86	C	C	O	C	C	O	O	C	O	O	O	O
87	C	O	O	C	C	O	O	C	O	O	O	O
88	C	C	C	O	C	O	O	C	O	O	O	O
89	O	C	C	O	C	O	O	C	O	O	O	O
90	O	O	C	O	C	O	O	C	O	O	O	O
91	O	C	O	O	C	O	O	C	O	O	O	O
92	C	O	O	O	C	O	O	C	O	O	O	O
93	C	C	C	C	O	O	O	C	O	O	O	O
94	C	O	C	C	O	O	O	C	O	O	O	O

Table Continued on Next Page

TABLE 3-8. SECTOR SELECT SWITCH SETTINGS - 806 kHz (Contd)

Number of Sectors	Location E875 Switch Number						Location F575 Switch Number					
	1	2	3	4	5	6	1	2	3	4	5	6
95	O	O	C	C	O	O	O	C	O	O	O	O
96	C	C	O	C	O	O	O	C	O	O	O	O
97	C	O	O	C	O	O	O	C	O	O	O	O
98	O	O	O	C	O	O	O	C	O	O	O	O
99	O	C	C	O	O	O	O	C	O	O	O	O
100	C	O	C	O	O	O	O	C	O	O	O	O
101	O	O	C	O	O	O	O	C	O	O	O	O
102	O	C	O	O	O	O	O	C	O	O	O	O
103	C	O	O	O	O	O	O	C	O	O	O	O
104	O	O	O	O	O	O	O	C	O	O	O	O
105	C	C	C	C	C	C	C	O	O	O	O	O
106	C	O	C	C	C	C	C	O	O	O	O	O
107	O	O	C	C	C	C	C	O	O	O	O	O
108	C	C	O	C	C	C	C	O	O	O	O	O
109	O	C	O	C	C	C	C	O	O	O	O	O
110	C	O	O	C	C	C	C	O	O	O	O	O
111	O	O	O	C	C	C	C	O	O	O	O	O
112	C	C	C	O	C	C	C	O	O	O	O	O
113	C	O	C	O	C	C	C	O	O	O	O	O
114	O	O	C	O	C	C	C	O	O	O	O	O
115	C	C	O	O	C	C	C	O	O	O	O	O
116	O	C	O	O	C	C	C	O	O	O	O	O
117	C	O	O	O	C	C	C	O	O	O	O	O

Table Continued on Next Page

TABLE 3-8. SECTOR SELECT SWITCH SETTINGS - 806 kHz (Contd)

Number of Sectors	Location E875 Switch Number						Location F575 Switch Number					
	1	2	3	4	5	6	1	2	3	4	5	6
118	O	O	O	O	C	C	C	O	O	O	O	O
119	C	C	C	C	O	C	C	O	O	O	O	O
120	C	C	C	C	O	C	C	O	O	O	O	O
121	O	C	C	C	O	C	C	O	O	O	O	O
122	C	O	C	C	O	C	C	O	O	O	O	O
123	O	O	C	C	O	C	C	O	O	O	O	O
124	C	C	O	C	O	C	C	O	O	O	O	O
125	O	C	O	C	O	C	C	O	O	O	O	O
126	C	O	O	C	O	C	C	O	O	O	O	O
127	O	O	O	C	O	C	C	O	O	O	O	O
128	O	O	O	C	O	C	C	O	O	O	O	O

Note: C = Closed or On position; O = Open or Off position.

NOTE

Ignore any remainder in the calculation. The existence of a remainder adds a "short" sector before index.

Each sector switch represents a binary and decimal value of clock pulses (as counted in the logic). The values related to each switch are as follows:



<u>Switch No.</u> Loc. E875	<u>Binary Value</u>	<u>Decimal Value</u>
1	$2^0$	1
2	$2^1$	2
3	$2^2$	4
4	$2^3$	8
5	$2^4$	16
6	$2^5$	32

<u>Switch No.</u> Loc. F575	<u>Binary Value</u>	<u>Decimal Value</u>
1	$2^6$	64
2	$2^7$	128
3	$2^8$	256
4	$2^9$	512
5	$2^{10}$	1024
6	$2^{11}$	2048

Here is an example of determining the switch settings for selecting 63 sectors (806 kHz Sector Clock):

$$\text{Selected Clock Pulses} = \left( \frac{13\,440}{63} - 1 \right) = (213.33 - 1) = 212.33$$

If there is a remainder, it should be ignored. In this case, the number of selected clock pulses becomes 212.

Determine which switches to place in the Closed or On position as follows:

Selected clock pulses	212
Clock pulses selected by switch F575-2	128
(Difference)	84
Clock pulses selected by switch F575-1	64
(Difference)	20
Clock pulses selected by switch E875-5	16
(Difference)	4
Clock pulses selected by switch E875-3	4
(Difference)	0

Thus, placing switches E875-3, E875-5, F575-1 and F575-2 in the Closed or On position selects 63 sectors. Since a remainder existed in the calculation formula, an additional "short" sector will be present just before index.

The 1.6 MHz Sector Clock option doubles the number of clock pulses per track (26 880). This clock allows the drive user an alternate formula for generating a specific number of sectors per track or bytes per sector. Here is an example of determining the switch settings for selecting 63 sectors with a 1.6 MHz Sector Clock:

$$\text{Selected Clock Pulses} = \left( \frac{26\ 880}{63} - 1 \right) = (426.67 - 1) = 425.67$$

If there is a remainder, it should be ignored. In this case, the number of selected clock pulses becomes 425.

Determine which switches to place in the Closed or On position as follows:

Selected clock pulses	425
Clock pulses selected by switch F575-3	256
(Difference)	169
Clock pulses selected by switch F575-2	128
(Difference)	41
Clock pulses selected by switch E875-6	32
(Difference)	9
Clock pulses selected by switch E875-4	8
(Difference)	1
Clock pulses selected by switch E875-1	1
(Difference)	0

Thus, placing switches E875-1, E875-4, E875-6, F575-2 and F575-3 in the Closed or On position selects 63 sectors. Since a remainder existed in the calculation formula, an additional "short" sector will be present just before index.

#### Alternate Method for Sector Switch Settings

Use the following formula to determine sector switch settings if the subsystem cannot accept a short, extra sector before index.

Here is an example of determining the switch settings for selecting 63 sectors: (Use 26 880 clock pulses if 1.6 MHz Sector Clock is selected)

$$\text{Selected Clock Pulses} = \left( \frac{13\ 440}{63} - 1 \right) = (213.33 - 1) = 212.33$$

If there is a remainder, it is necessary to round up to the next whole number. In this case, the number of selected clock pulses becomes 213.

Determine which switches to place in the Closed or On position as follows:

Selected clock pulses	213
Clock pulses selected by switch F575-2	128
(Difference)	85
Clock pulses selected by switch F575-1	64
(Difference)	21
Clock pulses selected by switch E875-5	16
(Difference)	5
Clock pulses selected by switch E875-3	4
(Difference)	1
Clock pulses selected by switch E875-1	1
(Difference)	0

Thus, placing switches E875-1, E875-3, E875-5, F575-1 and F575-2 in the Closed or On position selects 63 sectors. Since a remainder existed in the calculation formula, the last (63rd) sector will be shorter than those preceding it.

## CHECKOUT

After completing installation of the drive, follow the sequence outlined below for initial startup in either remote or local. Refer to section 2 of this manual for information about operation of the drive.

### CHECKOUT IN REMOTE MODE

1. Set On/Standby switch at rear of power supply in On (1) position, and observe that the power supply cooling fan operates.
2. Set drive logical address. Logical address for each drive in a system must have a unique number.
3. Press START switch on drives with status/control panel.
4. The power up sequence continues when the power sequence Pick or Hold (ground) signal is available from the controller. With the R/L (Remote/Local) switch in Remote position, power up sequence to each drive is delayed. The length of delay is determined by the logical address number used, in increments of 5 seconds.

For example:

Logical Address 0 = 0 second delay

Logical Address 7 = 35 second delay

5. For drives with the status/control panel, after the delay is completed, the Ready indicator (located in START switch) will flash rapidly, indicating that power up is in progress.
6. The Ready indicator on the status/control panel should light steadily within 90 seconds. This indicates that the drive motor is up to speed and that the heads are at track 0. For drives without the status/control panel, the Ready line on bus in will be active when the drive is ready.
7. If any of these events do not occur, a problem exists in the drive. Then refer to troubleshooting information in volume 2 of the hardware maintenance manual.
8. Drive is now ready for online operation.

#### CHECKOUT IN LOCAL MODE

##### NOTE

For drives without the status/control panel, power on sequence begins when the power supply On/Standby switch is placed in On (1) position.

1. Set On/Standby switch at rear of power supply in On (1) position, and observe that the power supply cooling fan operates.
2. Set drive logical address. Logical address for each drive in a system must have a unique number.
3. Press START switch on drives with status/control panel.
4. The Ready indicator on the status/control panel should light steadily within 90 seconds. This indicates that the drive motor is up to speed and that the heads are at track 0. For drives without the status/control panel, the Ready line on bus in will be active when the drive is ready.
5. If any of these events do not occur, a problem exists in the drive. Then refer to troubleshooting information in volume 2 of the hardware maintenance manual.
6. Drive is now ready for online operation.

## **SECTION 4**

### **PARTS DATA**



---

## INTRODUCTION

This section contains listings of field replaceable parts, manufacturer's recommended spare parts, and accessories. Use only CDC/MPI replacement parts. Using non-CDC/MPI replacement parts can adversely affect safety. Using other manufacturers' parts could also degrade reliability, increase maintenance downtime, and void warranty coverage.

## FIELD REPLACEABLE PARTS LIST

This listing is divided into four columns:

- INDEX NO - The numbers in this column correspond to the numbers shown within the facing page illustration.
- PART NUMBER - Contains one of the following:
  1. Eight digit part number - use this number to order a replacement part. Within the continental U.S., parts may be ordered from Control Data Corporation, World Distribution Center, 304 North Dale St., St. Paul, MN, 55103, Telephone 612-292-2200.
  2. Spare - indicates that the item is a manufacturer's recommended spare part. Refer to table 4-1 for replacement part number information.
- PART DESCRIPTION - Contains part nomenclature/description. If an item is indented more than the previous item, it indicates it is part of the previous item (assembly).
- NOTE - Usually contains entries to define differences between machine configurations (i.e., model differences, older units vs newer units, etc.).





## **MANUFACTURER'S RECOMMENDED SPARE PARTS**

This listing (table 4-1) is divided into three columns:

- **DESCRIPTION/NOTES** - Contains the part nomenclature/description and other pertinent information.
- **PART NUMBER** - Contains the part number of the part when the unit was manufactured or as a result of the latest FCO. This part can be used as a replacement on the series code and types of units indicated in the Description/Notes column. However, always use Replacement Part Number when ordering new parts or spares.
- **REPLACEMENT PART NUMBER** - Contains the interchangeable replacement part number. Use this number for ordering replacement or spare parts.

## **ACCESSORIES**

This listing (table 4-2) contains the following:

- **PART NUMBER** - Use this number to order this part. See Field Replaceable Parts List for ordering information.
- **DESCRIPTION** - Contains the part nomenclature/description.

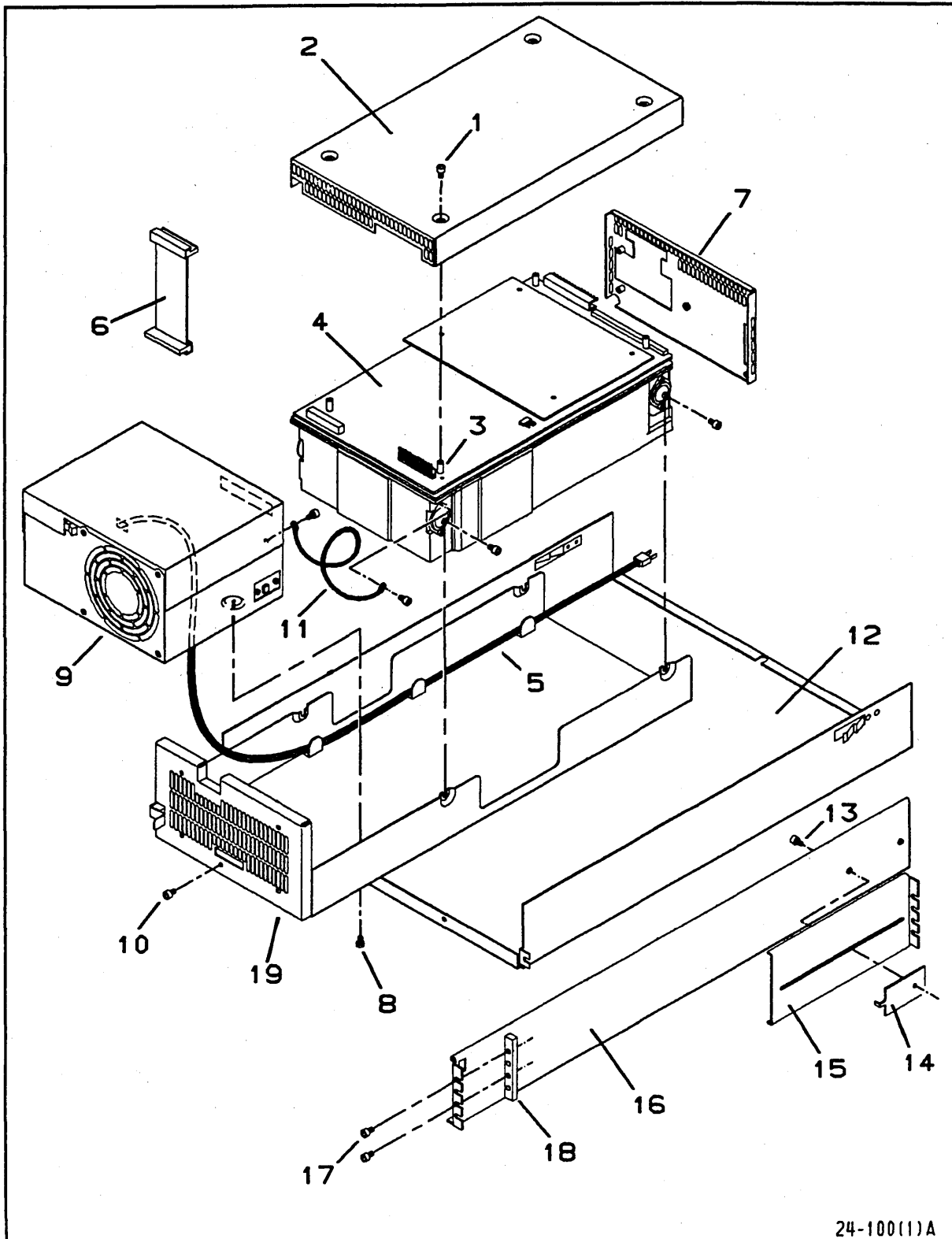
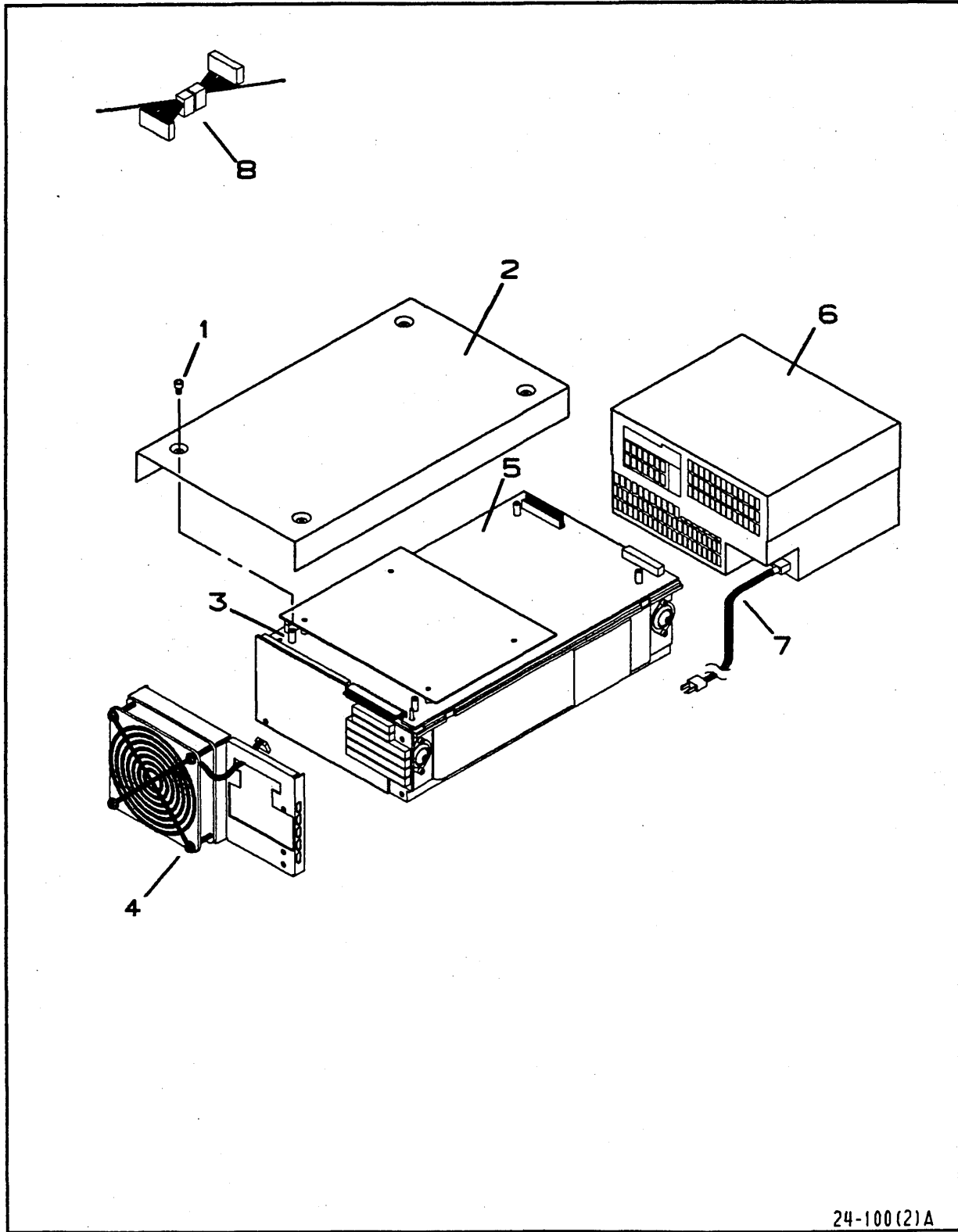


Figure 4-1. Eight-Inch Module Drive (Sheet 1 of 3)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
4-1	80416800	EIGHT-INCH MODULE DRIVE (Sheet 1 of 3)	
1	10127111	SCREW, Phillips, 6-32 x 1/4	
2	45070760	COVER, Top, Drive	
3	77613126	STANDOFF	
4		DRIVE ELECTRONICS ASSEMBLY (See Figure 4-2)	
5	Spare	AC POWER CORD	
6	Spare	DC POWER CABLE ASSEMBLY	
7	46455320	PANEL, Rear	
8	10126217	SCREW, Hex Socket, 6-32 x 1/4	
9	Spare	POWER SUPPLY	
10	10126226	SCREW, Hex Socket, 8-32 x 1/2	
11	94469414	CABLE, Ground	
	45140301	RACK MOUNTING KIT ASSEMBLY	
12	47007900	DRAWER, 2X	
13	10126226	SCREW, Hex Socket, 8-32 x 1/2	
14	75038304	BRACKET, Clamp	
15	45419000	BRACKET, Slide Adjusting, Right	
	45419001	BRACKET, Slide Adjusting, Left	
16	45070780	SLIDE, Guide, Right	
	45070781	SLIDE, Guide, Left	
17	15002644	SCREW, Hex Socket, 10-32 x 1/2	
18	94376727	PLATE, Nut	
19	47007910	DRAWER, Inner	



24-100(2)A

Figure 4-1. Eight-Inch Module Drive (Sheet 2)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
4-1		EIGHT-INCH MODULE DRIVE (Sheet 2)	
1	10127111	SCREW, Phillips, 6-32 x 1/4	
2	45070760	COVER, Top Drive	
3	77613126	STANDOFF	
4	45419400	FAN MOUNTING KIT ASSEMBLY	
	Spare	FAN, 24 V dc	
	94375408	GUARD, Fan	
	81773300	BRACKET, Fan	
	10127119	SCREW, Phillips, 6-32 x 1-1/4	
5		DRIVE ELECTRONICS ASSEMBLY (See Figure 4-2)	
6	Spare	POWER SUPPLY	
7	Spare	AC POWER CORD	
8	Spare	DC POWER CABLE ASSEMBLY	

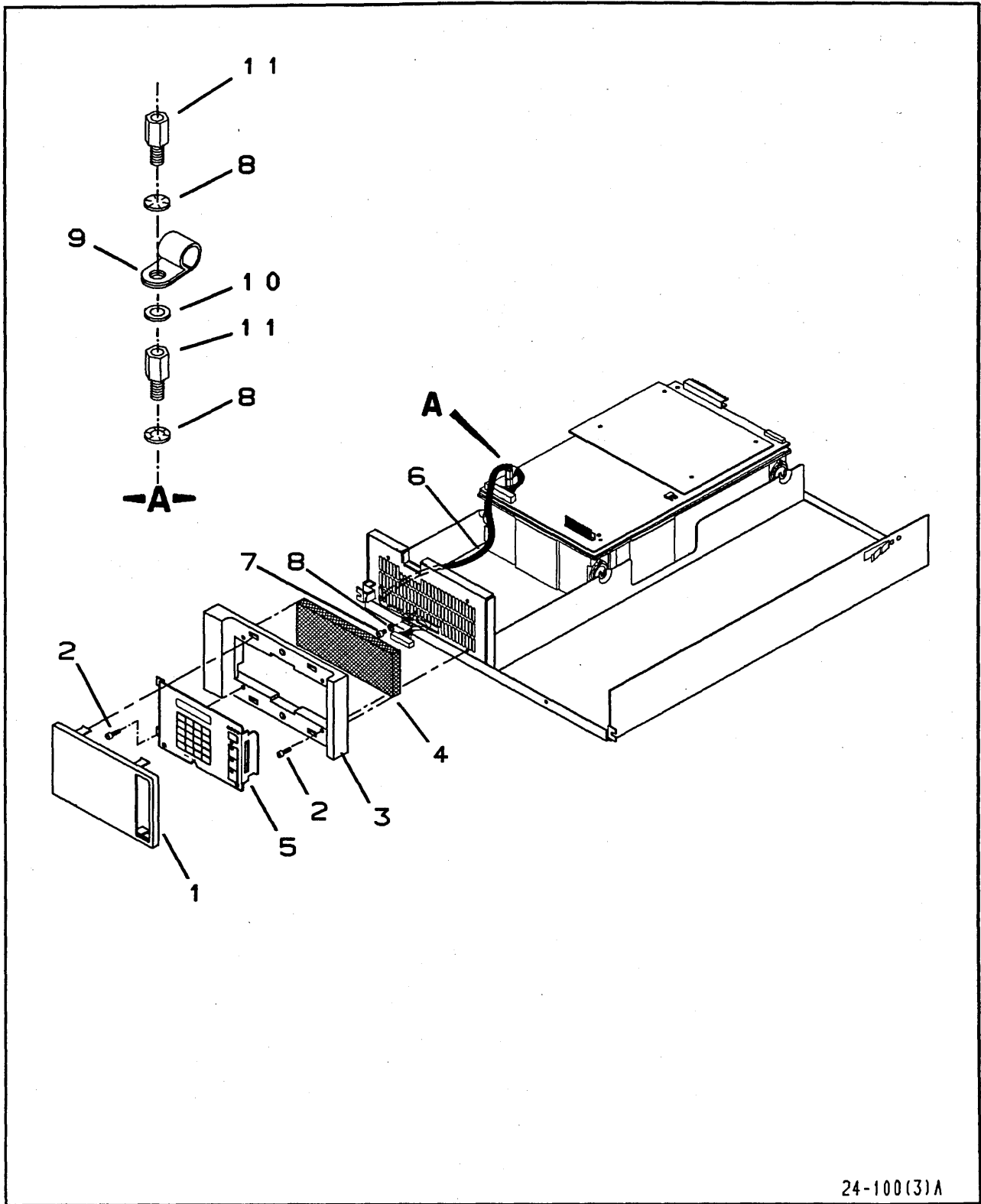


Figure 4-1. Eight-Inch Module Drive (Sheet 3)

INDEX NO	PART NO	PART DESCRIPTION	NOTE
4-1		EIGHT-INCH MODULE DRIVE (Sheet 3)	
1	92536400	INSERT, Front Panel	
2	10126222	SCREW, Hex Socket, 6-32 x 7/8	
3	92517400	PANEL, Front	
4	Spare	FILTER, Primary	
	93238900	OPERATOR PANEL KIT ASSEMBLY	
5	Spare	PANEL, Status Control	
6	Spare	JUMPER ASSEMBLY, Status Control	
7	10126217	SCREW, Hex Socket, 6-32 x 1/4	
8	10126103	WASHER, Lock, 6	
9	92777196	CLAMP, Cable	
10	10125605	WASHER, Flat, 6	
11	77613122	STANDOFF	

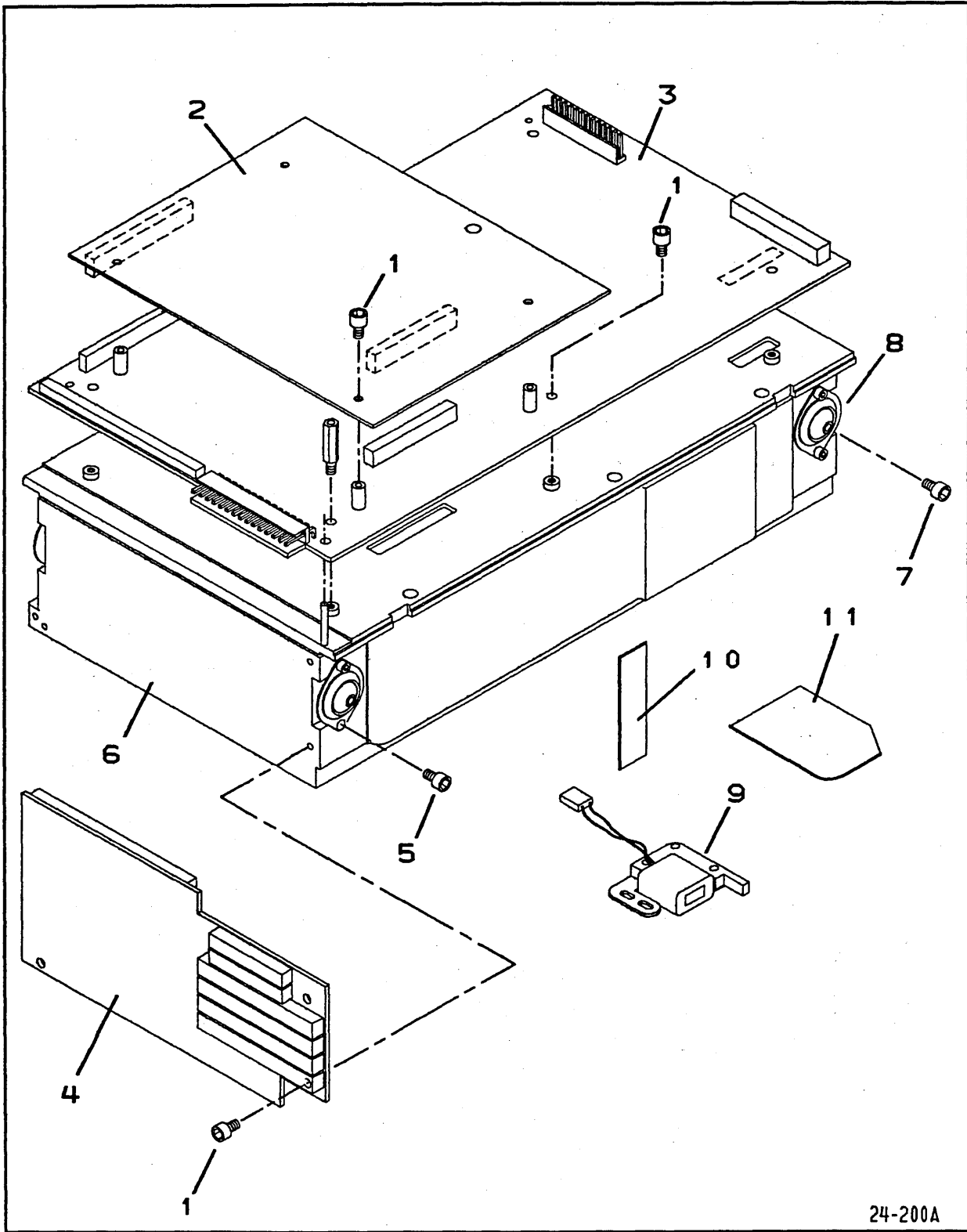


Figure 4-2. Drive Electronics Assembly



INDEX NO	PART NO	PART DESCRIPTION	NOTE
4-2		DRIVE ELECTRONICS ASSEMBLY	
1	10126217	SCREW, Hex Socket, 6-32 x 1/4	
2	Spare	_VYX READ/WRITE BOARD	
3	Spare	_WAX CONTROL BOARD	
4	Spare	_VRX I/O BOARD	
5	10126244	SCREW, Hex Socket, 10-32 x 1/2	
6	Spare	FORMATTED MODULE ASSEMBLY	
7	10126218	SCREW, Hex Socket, 6-32 x 3/8	
8	92362330	SHOCKMOUNT	
	Spare	CARRIAGE LATCH ELECTROMAGNET KIT ASSEMBLY	
9	45419016	ELECTROMAGNET, Carriage Latch	
10	46618920	COVER, Cable	
11	46618910	COVER, Electromagnet	



TABLE 4-1. MANUFACTURER'S RECOMMENDED SPARE PARTS

DESCRIPTION/NOTES	PART NUMBER	REPLACE- MENT PART NUMBER
AC POWER CORD (UL)	75168331	75168331
AC POWER CORD (VDE Shielded)	15165427	15165427
CARRIAGE LATCH ELECTROMAGNET KIT ASSEMBLY	45402901	45402901
DC POWER CABLE ASSEMBLY (6.35 cm/2.5 in)	92588100	92588100
DC POWER CABLE ASSEMBLY (1.5 m/5 ft)	92588101	92588101
FAN, 24 V dc	46455310	46455310
FILTER, Primary	72852573	72852573
FORMATTED MODULE ASSEMBLY	92651500	92651500
JUMPER ASSEMBLY, Status/Control	47001000	47001000
PANEL, Status/Control	54397702	54397702
POWER SUPPLY	45070620	45070620
_VRX I/O BOARD		
BVRX-Used S/C 01 and above	54394501	54394501
_WAX CONTROL BOARD		
AWAX-Used S/C 01 and above	54398101	54398101
_VYX READ/WRITE BOARD		
AVYX-Used S/C 01 and above	54397300	54397300



TABLE 4-2. ACCESSORIES

PART NUMBER	DESCRIPTION
12263496	STATIC GROUND WRIST STRAP, 6 1/2 to 8 inch wrist
12263623	STATIC GROUND WRIST STRAP, up to 6 1/2 inch wrist
12263624	STATIC SHIELDING BAG, 5 x 8 inch
12263625	STATIC SHIELDING BAG, 8 x 12 inch
12263626	STATIC SHIELDING BAG, 10 x 12 inch
12263499	STATIC SHIELDING BAG, 14 x 18 inch
12263627	STATIC SHIELDING BAG, 16 x 24 inch
81537400	I/O A CABLE, 5 foot (1.5 metre) long
81537401	I/O A CABLE, 10 foot (3.0 metre) long
81537402	I/O A CABLE, 15 foot (4.5 metre) long
81537403	I/O A CABLE, 20 foot (6.1 metre) long
81537404	I/O A CABLE, 25 foot (7.6 metre) long
81537405	I/O A CABLE, 30 foot (9.1 metre) long
81537406	I/O A CABLE, 40 foot (12.2 metre) long
81537407	I/O A CABLE, 50 foot (15.3 metre) long
81537408	I/O A CABLE, 100 foot (30.6 metre) long
92708900	I/O B CABLE, 5 foot (1.5 metre) long
92708901	I/O B CABLE, 10 foot (3.0 metre) long
92708902	I/O B CABLE, 15 foot (4.5 metre) long
92708903	I/O B CABLE, 20 foot (6.1 metre) long
92708904	I/O B CABLE, 25 foot (7.6 metre) long
92708905	I/O B CABLE, 30 foot (9.1 metre) long
92708906	I/O B CABLE, 40 foot (12.2 metre) long
92708907	I/O B CABLE, 50 foot (15.3 metre) long
93270700	I/O TERMINATOR
94356700	GROUND STRAP (specify length desired)
40125601	GROUND LUG
10126403	LOCKWASHER, #10 (for grounding)



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