# Seagate

Sabre Disc Drive

ST82500K, ST83050K

ST83220K

User's Manual

(IPI Interface)

# WARNING (For all drives)

Do not attempt to install, operate, or repair the unit, before you read the important safety information located directly after the preface in this manual. Failure to follow that and other safety precautions in this manual could cause injury to yourself or others.

This digital apparatus does not exceed the Class A limits for radio noise for digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

# WARNING (For ST82500K drives)

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

If the operator or status/control panel (component assembly) is not installed in the inner drawer, it is your responsibility to provide any additional RFI shielding or grounding needed to ensure FCC Class A compliance.

# WARNING (For ST83050K and ST83220K drives)

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the user's manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart B of Part 15 of the FCC Rules which are designed to provide reasonable protection against such interference when operated in a commercial environment. This device must not cause harmful interference; it must accept any interference received, including interference that may cause undesired operations.

Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Any unauthorized modifications to this equipment could result in revocation of the user's authority to operate the equipment. The subsystem must use shielded I/O cables and must meet the grounding requirements defined in the user's manual.

If the operator or status/control panel (component assembly) is not installed in the inner drawer, it is your responsibility to provide any additional RFI shielding or grounding needed to ensure FCC Class A compliance.

# VORSICHT

Versuchen Sie nicht, das Gerät zu installieren, zu betreiben oder zu reparieren bevor Sie die in der Anlage B aufgeführten Installations- und Betriebserfordernisse sorgfältig gelesen haben. Die Nichtbeachtung dieser und weiterer in diesem Manual gegebenen Informationen kann Verletzungen Ihrer selsbt und Anderer zur Folge haben.

# AVERTISSEMENT

Ne tentez pas d'installer, de mettre en marche, ou de dépanner cet appareil avant d'avoir lû les instructions d'installation et de fonctionnement données dans l'appendice C. A défaut d'observer ceci ainsi que les autres informations de ce manuel vous pourriez mettre votre propre santé en danger, ou celle d'autrui.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

# PRECAUCION

No intente instala, operar ó reparar está unidad antes de leer los requerimientos de instalación y operación dados en el Apéndice D. Cualquier negli gencia en seguir esta u otra información dada en esta manual puede causarle daños a uno mismo u otros.
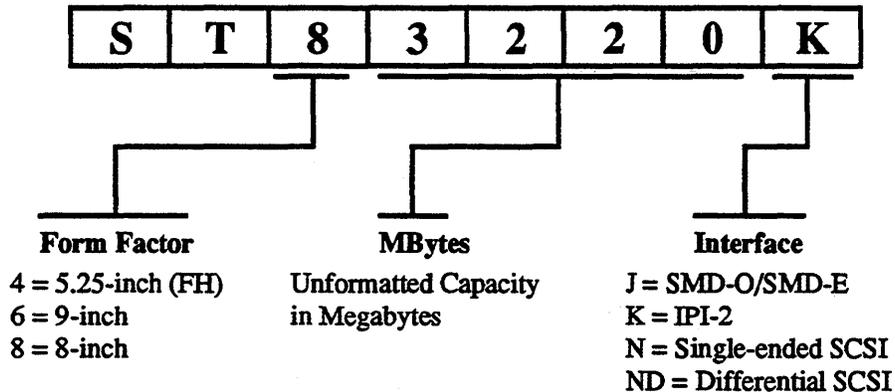
# Sabre Disc Drive


## ST82500K
## ST83050K
## ST83220K


## User's Manual
## (IPI Interface)


## General Description
## Installation
## Operation
## Diagnostic Testing


## Publication Number: 83327210, Rev. B


### ⦚ Seagate

# How to Read Seagate Model Numbers:

| S | T | 8 | 3 | 2 | 2 | 0 | K |
|---|---|---|---|---|---|---|---|

**Form Factor**
4 = 5.25-inch (FH)
6 = 9-inch
8 = 8-inch

**MBytes**
Unformatted Capacity
in Megabytes

**Interface**
J = SMD-O/SMD-E
K = IPI-2
N = Single-ended SCSI
ND = Differential SCSI

## Copyright Notice

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Printed in the United States of America

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## 2. INSTALLATION

## 3. OPERATION

# 4. DIAGNOSTIC TESTING

# A. ALTERNATE MOUNTING METHODS

# B. GERMAN INSTRUCTIONS

# C. FRENCH INSTRUCTIONS

# D. SPANISH INSTRUCTIONS

# PREFACE

This manual contains maintenance information for the Seagate ST82500K, ST83050K, and ST83220K SABRE disc drives. It provides instructions to all personnel who operate the drive and to customer engineers who install and check out the drive. Customer engineers who troubleshoot and repair drives should obtain copies of the manuals listed below.

Characteristics of the drives are explained in section 1 of this manual.

The information in this manual is presented as follows:

| | |
|---|---|
| Section 1 — | General Description. Describes equipment functions and specifications. |
| Section 2 — | Installation. Describes site requirements, unpackaging and inspection, installation and checkout. |
| Section 3 — | Operation. Describes and illustrates the location and use of all controls and indicators, and provides operating procedures. |
| Section 4 — | Diagnostic Testing. Provides simplified troubleshooting information. |
| Appendix A — | Alternate Mounting Methods. Provides additional information on installation. |
| Appendix B — | German Instructions. Contains basic installation and operation information in the German language. |
| Appendix C — | French Instructions. Contains basic installation and operation information in the French language. |
| Appendix D — | Spanish Instructions. Contains basic installation and operation information in the Spanish language. |

New features, technical changes, additions, and deletions in this manual are indicated as follows:

- A vertical bar in the outer margin of a page marks the changed area.

- A dot by the page number indicates the entire page contains new or changed information.

- A vertical bar by the page number indicates the information was moved from another page, but there were no technical or editorial changes.

The following manuals apply to the SABRE and are available for purchase from:

Seagate Technology, Inc.
Customer Services
12701 Whitewater Drive
Minnetonka, MN 55343

| | | |
|---|---|---|
| Phone: | 1-800-382-6060 | (Outside Minnesota) |
| Phone: | (612) 931-8200 | (Inside Minnesota) |
| Fax: | (612) 931-8835 | |

| Publication No. | Title |
|---|---|
| 83327210 | User's Manual |
| 83327230 | Maintenance Manual (contains general maintenance information, trouble analysis, repair & replacement, and simplified theory) |
| 83327240 | Parts Data Manual (contains listings of field replaceable parts, manufacturer's recommended spare parts, and accessories) |
| 83327530 | Theory Manual |
| 83327380 | Pocket Reference (summarizes status codes and diagnostic operation for drives with the IPI interface) |

For more information about the drive and interface described in this manual, you can request copies of the following specifications from your Seagate sales representative:

| Specification No. | Title |
|---|---|
| 64400300 | Specification for Synchronized Spindle Systems |
| 64731600 | Seagate Specification for the IPI-2 Intelligent Peripheral Interface |
| ISO 9318-2 | Device Specific Command Set for Magnetic Disc Drives (IPI-2) |
| ISO 9318-6 | Enhanced Physical Level (IPI) |

**End-User Technical Support:** A 24-hour bulletin board service provides up-to-date product technical support. Use your modem to access this information:

| Location | Telephone Number | Maximum Baud Rate |
|---|---|---|
| United States/Canada | (408) 438-8771 | 9600 |
| England | 44-62-847-8011 | 9600 |
| Germany | 49-89-140-9331 | 2400 |
| Singapore | 65-227-2217 | 9600 |
| Australia | 61-2-756-2359 | 9600 |

**NOTE:** This is a toll call.

# IMPORTANT SAFETY INFORMATION AND PRECAUTIONS

Use of proper safety and repair techniques is important for safe, reliable operation of this unit. Service should be done only by qualified persons. We recommend the procedures in this manual as effective ways of servicing the unit. Some procedures require the use of special tools. For proper maintenance and safety, you must use these tools as recommended.

The procedures in this manual and labels on the unit contain warnings and cautions that must be carefully read and followed to minimize or eliminate the risk of personal injury. The warnings point out conditions or practices that may endanger you or others. The cautions point out conditions or practices that may damage the unit, possibly making it unsafe for use.

You must also understand that these warnings and cautions are not exhaustive. We cannot possibly know, evaluate, and advise you of all the ways in which maintenance might be performed or the possible risk of each technique. Consequently, we have not completed any such broad evaluation. If you use a non-approved procedure or tool, first ensure that the method you choose will not risk either your safety or unit performance.

For the safety of yourself and others, observe the following warnings and precautions.

- Perform all maintenance by following the procedures in this manual.

- Follow all cautions and warnings in the procedures and on unit labels.

- Use the special tools called out in the procedures.

- Use sound safety practices when operating or repairing the unit.

- Use caution when troubleshooting a unit that has voltages present. Remove power from unit before servicing or replacing parts.

- Wear safety glasses when servicing units.

- Wear safety shoes when removing or replacing heavy parts.

- Use only designated Seagate replacement parts. Non-Seagate replacement parts can adversely affect safety in addition to degrading reliability, increasing maintenance downtime, and voiding warranty coverage.

- Use care while working with the power supply because line voltages are always present when the ac power cord is connected to a power source. Setting the power supply switch to position " ⏻ " disables dc power to the drive but has no effect on ac power within the supply. For complete safety, remove the ac power plug from the site power outlet.

- The site power outlet shall be installed near the equipment and shall be easily accessible.

- In case of fire or other emergency, isolate the drive from main power by removing the drive power plug from the ac outlet. In situations where pulling the plug is not possible or practical, use the system main power disconnect to isolate the drives from main power.

- In an IT power system, a disconnect device shall be provided which simultaneously interrupts all phase and neutral conductors.

- **WARNING:** In IT power systems, the unearthed neutral is considered as a phase conductor. For such IT power systems, double pole/neutral fusing is required.

- When the drive is mounted in an equipment rack or cabinet, ensure that the internal temperature of the rack or cabinet will not exceed the limits defined for the drive. Where units are stacked vertically, pay special attention to the top where temperatures are usually highest.

- This drive is designed to be installed and operated in accordance with UL1950, IEC380, IEC950, EN 60950, CSA C22.2 154, CSA C22.2 220, and VDE0806.

- Follow the precautions listed under Protecting the Drive From Electrostatic Discharge.

- If the power supply is placed on a bench for testing, position the supply so all ventilation holes are open, to allow proper air flow to internal components.

- Do not attempt to disassemble the module. It is not field repairable. Replace the entire module assembly if it is defective.

- Do not operate the drive over an extended period of time without the top cover installed.

- The power supply is designed to be connected to an IT network.

- Do not attempt to disassemble the power supply. It is not field repairable. Replace the entire supply if it is defective.

- If you do not use a recommended Seagate power supply, ensure the supply meets the specifications in this manual and is designed to be used in accordance with UL1950, IEC380, IEC950, EN 60950, CSA C22.2 154, CSA C22.2 220, and VDE0806.

# ABBREVIATIONS

| | | | | |
|---|---|---|---|---|
| A | Ampere | | EN | Enable |
| ac | Alternating Current | | ENBL | Enable |
| ACK | Acknowledge | | EPROM | Erasable Programmable Read Only Memory |
| ADD | Address | | ESD | Electrostatic Discharge |
| ADDR | Address | | EXT | External |
| ADRS | Address | | F | Fahrenheit, Fuse |
| ALT | Alternate | | FCO | Field Change Order |
| AMP | Ampere | | FLT | Fault |
| ASSY | Assembly | | FRU | Field Replaceable Unit |
| C | Celsius | | ft | Foot |
| CB | Circuit Breaker | | GND | Ground |
| CDA | Complete Drive Assembly | | HD | Head |
| cm | Centimetre | | HEX | Hexadecimal |
| CONTD | Continued | | Hg | Mercury |
| CYL | Cylinder | | Hz | Hertz |
| dc | Direct Current | | ID | Identification |
| DB | Data Bit | | IDENT | Identification |
| DLY | Delay | | in | Inch |
| ECO | Engineering Change Order | | IND | Index |
| EMC | Electromagnetic Compatibility | | INTRPT | Interrupt |

# ABBREVIATIONS (Contd)

| | | | | |
|---|---|---|---|---|
| I/O | Input/Output | | ns | Nanosecond |
| kg | Kilogram | | OC | On Cylinder |
| kPa | Kilopascal | | OSC | Oscillator |
| kW | Kilowatt | | P | Plug |
| lb | Pound | | PS | Power Supply |
| LCD | Liquid Crystal Display | | PWR | Power |
| LED | Light Emitting Diode | | RCVR | Receiver |
| LSI | Large Scale Integration | | RD | Read |
| m | Metre | | RDY | Ready |
| MAX | Maximum | | REV | Reverse, Revision |
| MB | Megabyte | | r/min | Revolutions Per Minute |
| MEM | Memory | | RTZ | Return to Zero |
| MHz | Megahertz | | R/W | Read/Write |
| mm | Millimetre | | s | Second |
| MPU | Microprocessor Unit | | S/C | Series Code |
| ms | Millisecond | | SEC | Second |
| NC | No Connection | | SS | Sector Switch |
| NORM | Normal | | V | Volts, Voltage |
| NRZ | Non Return to Zero | | W | Watts |

## INTRODUCTION

The Seagate Sabre disc drives are high speed, random access digital data storage devices that connect to a central processor through a controller. This section provides a general description of the drive.

This version of the Sabre disc drive provides up to 3.22 GB of unformatted data storage using an eight-inch module. The front panel shown can be used if the drive is mounted in a drawer or beside another drive in an optional tray (two drives side-by-side). The tray can be mounted in a standard 19-inch rack, or the drive can be mounted in a custom cabinet or enclosure.
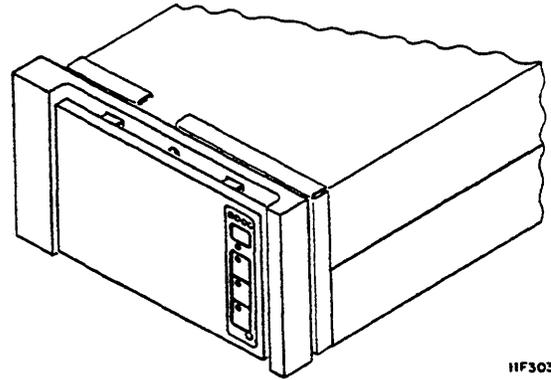


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## THE IPI-2 INTERFACE

The drive communicates with the host using the Intelligent Peripheral Interface (IPI-2) and protocol. The signals on the interface are listed in section 2 of this manual. The IPI-2 signals and protocol are described in the specifications listed in the preface of this manual. To obtain a copy of any specifications needed, contact your Seagate sales representative. A typical dual port configuration is shown at the right.
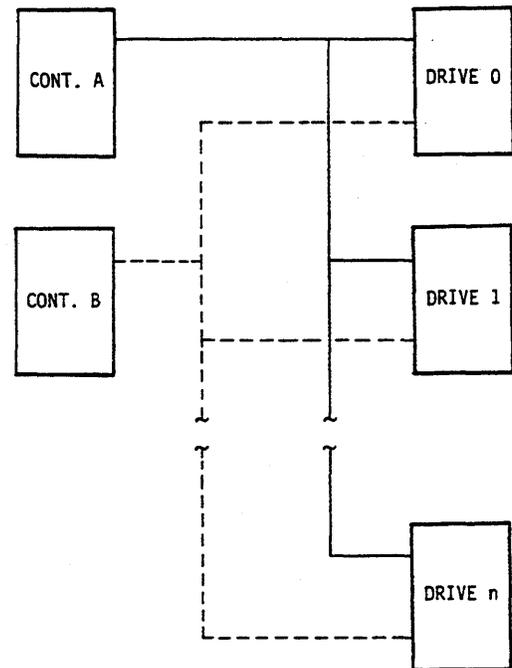


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# DRIVE SPECIFICATIONS

Drive Specifications are listed separately for the ST82500K, ST83050K, and ST83220K drives.

## ST82500K Drives

| Characteristics | Conditions | Specifications |
|---|---|---|
| Dimensions | | See Section 2 |
| Weight | Drive Only<br>Power Supply | 14.9 kg (32.8 lb)<br>3.6 kg (8.0 lb) |
| Capacity - Bytes<br>(Unformatted) | Per Drive<br>Per Track<br>Per Cylinder | 2 500 243 991<br>50 399<br>957 581 |
| Physical | Discs<br>Data Heads<br>Servo Heads<br>Heads/Surface<br>Logical Cylinders | 11<br>19<br>1<br>1<br>2611 (0 - 2610 logical)* |
| Recording | Modulation | 2-7 Code |
| Transfer Rate | 3600 r/min | 24.3 MHz (3.04 MB/s) |
| Latency | | Time required to reach a particular track after head positioning is complete. |
| | Average | 8.33 milliseconds (disc rotation speed at 3600 r/min) |
| | Maximum | 16.75 milliseconds (disc rotation speed at 3582 r/min) |
| Seek Time | | Time required to move heads to a different track address. |
| | Maximum<br>Average<br>Single Track | 26 milliseconds maximum, 24 milliseconds typical<br>13 milliseconds typical<br>3 milliseconds average |
| Start/Stop Time | Start Time<br>Stop Time | 90 seconds maximum<br>60 seconds maximum |

*Users normally reserve two cylinders for diagnostic use (cylinder 2610 for defect map and 2609 for diagnostics).

# ST83050K Drives

| Characteristics | Conditions | Specifications |
|---|---|---|
| Dimensions | | See Section 2 |
| Weight | Drive Only<br>Power Supply | 14.9 kg (32.8 lb)<br>3.6 kg (8.0 lb) |
| Capacity - Bytes<br>(Unformatted) | Per Drive<br>Per Physical Track<br>Per Logical Track<br>Per Cylinder | 3 050 913 600<br>63 840<br>127 680<br>1 149 120 |
| Physical | Discs<br>Data Heads<br>Servo Heads<br>Heads/Surface<br>Logical Cylinders | 11<br>18 (9 logical heads)<br>1<br>1<br>2655 (0 - 2654 logical)* |
| Recording | Modulation | 1-7 Code |
| Transfer Rate | 4365 r/min | 74.8 MHz (9.35 MB/s) |
| Latency | | Time required to reach a particular track after head positioning is complete. |
| | Average | 6.87 milliseconds (disc rotation speed at 4365 r/min) |
| | Maximum | 13.81 milliseconds (disc rotation speed at 4343.2 r/min) |
| Seek Time | | Time required to move heads to a different track address. |
| | Maximum<br>Average<br>Single Track | 26 milliseconds maximum, 24 milliseconds typical<br>12 milliseconds typical<br>2.2 milliseconds average |
| Start/Stop Time | Start Time<br>Stop Time | 90 seconds maximum<br>90 seconds maximum |
| *Users normally reserve two cylinders for diagnostic use (cylinder 2654 for defect map and 2653 for diagnostics). | | |

## ST83220K Drives

| Characteristics | Conditions | Specifications |
|---|---|---|
| Dimensions | | See Section 2 |
| Weight | Drive Only<br>Power Supply | 14.9 kg (32.8 lb)<br>3.6 kg (8.0 lb) |
| Capacity - Bytes<br>(Unformatted) | Per Drive<br>Per Track<br>Per Cylinder | 3 220 408 800<br>63 840<br>1 212 960 |
| Physical | Discs<br>Data Heads<br>Servo Heads<br>Heads/Surface<br>Logical Cylinders | 11<br>19<br>1<br>1<br>2655 (0 - 2654 logical) |
| Recording | Modulation | 1-7 Code |
| Transfer Rate | 4365 r/min | 37.4 MHz (4.67 MB/s) |
| Latency | | Time required to reach a particular track after head positioning is complete. |
| | Average | 6.87 milliseconds (disc rotation speed at 4365 r/min) |
| | Maximum | 13.81 milliseconds (disc rotation speed at 4343.2 r/min) |
| Seek Time | | Time required to move heads to a different track address. |
| | Maximum<br>Average<br>Single Track | 26 milliseconds maximum, 24 milliseconds typical<br>12 milliseconds typical<br>2.2 milliseconds average |
| Start/Stop Time | Start Time<br>Stop Time | 90 seconds maximum<br>90 seconds maximum |
| *Users normally reserve two cylinders for diagnostic use (cylinder 2654 for defect map and 2653 for diagnostics). | | |

## A COMPLETE DRIVE

As a minimum, a functional drive installation consists of the following:

- the drive

- a power supply

- interconnecting cables

POWER SUPPLY (OPTIONAL)

DRIVE

I/O CABLE
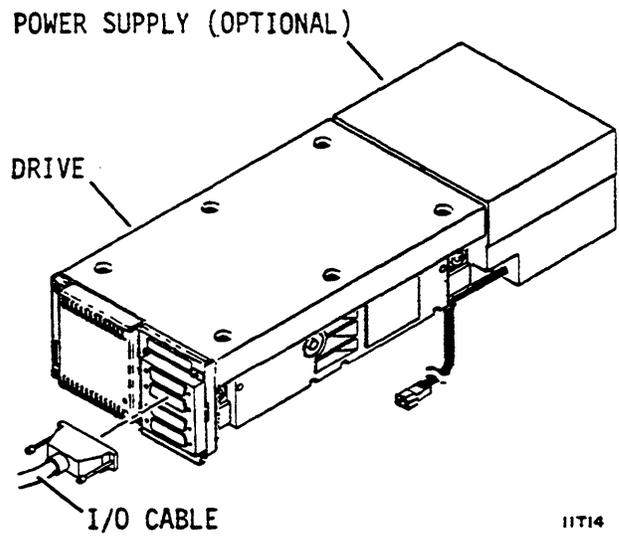
IITI4

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## The Power Supply

Site power enters the optional power supply through the ac power cable. The power supply develops the dc voltages needed by the drive. These voltages reach the drive through the dc power cable.

POWER SUPPLY

DC POWER CABLE

AC POWER CABLE
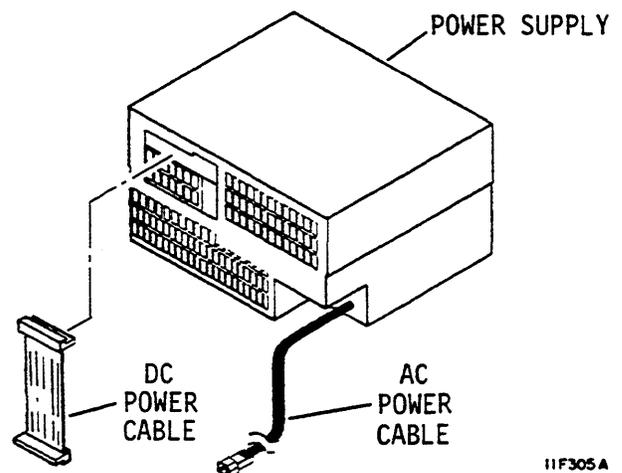
IIF305A

## The I/O Panel and Cables

The I/O panel at the back of the drive has connections for two sets of I/O cables which allows dual port operation. One shielded, 50-conductor (25 twisted pair) I/O cable is needed for each port. Use of shielded I/O cables permits meeting FCC/VDE requirements. Shielded cables also minimize inductive coupling and signal cross-talk.

The I/O cables have a female connector at one end and a male connector on the other. This allows joining cables if you must remove a drive from a daisy chain. The controller must have a female connector for each port.

FEMALE CONNECTOR

I/O CABLE TO
NEXT DRIVE

I/O CABLE FROM
PRECEDING DRIVE
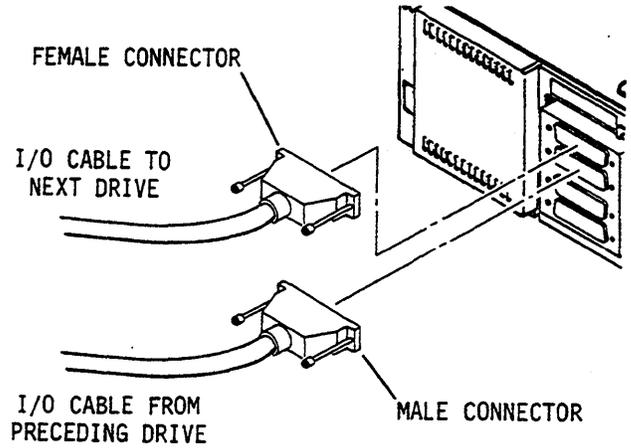
MALE CONNECTOR

11F349

## Spindle Sync Cable

The spindle sync feature makes it possible to synchronize the spindle rotation of a group of disc drives. A spindle synchronization cable connects each of these drives and allows the spindle in each drive to synchronize to an external clock.

TERMINATOR

TERMINATOR OR
CONNECTION TO
NEXT DRIVE

TO/FROM CONTROLLER
OR PRECEDING DRIVE

CONNECTS TO
J50 ON DRIVE
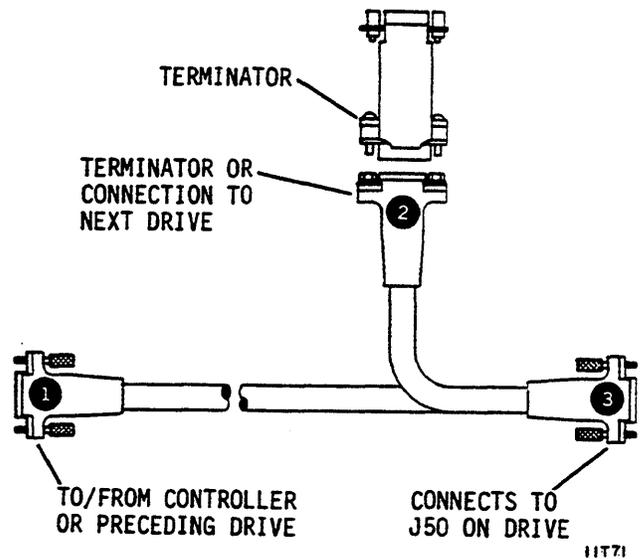
11T71

## PARTS OF THE DRIVE

The drive has the following main parts:

- top cover

- rear panel

- module

- two circuit boards

TOP COVER

I/O CABLE
CONNECTORS

I/O BOARD

MODULE

CONTROL
BOARD

REAR PANEL

11T128

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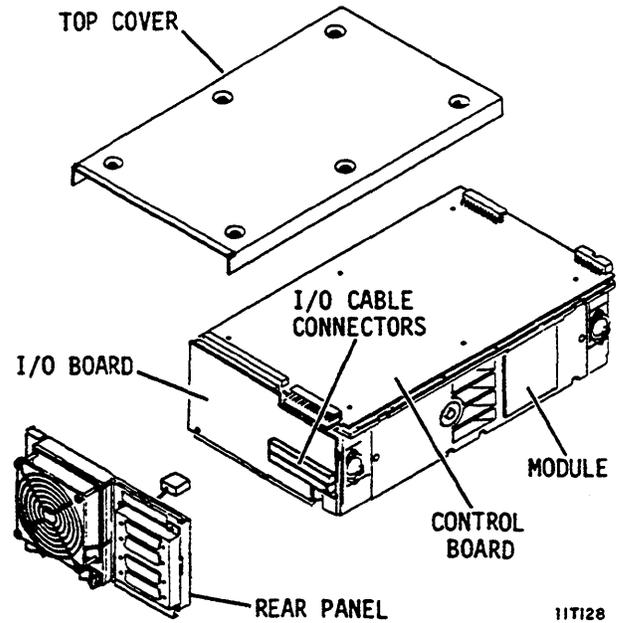
## The Top Cover

The top cover ensures proper air flow and protects
the internal components of the drive. Access holes
in the top cover allow setting the switches on the
control board without removing the cover.

TOP COVER       SWITCH       CONTROL
                ACCESS       BOARD

MODULE

11T55
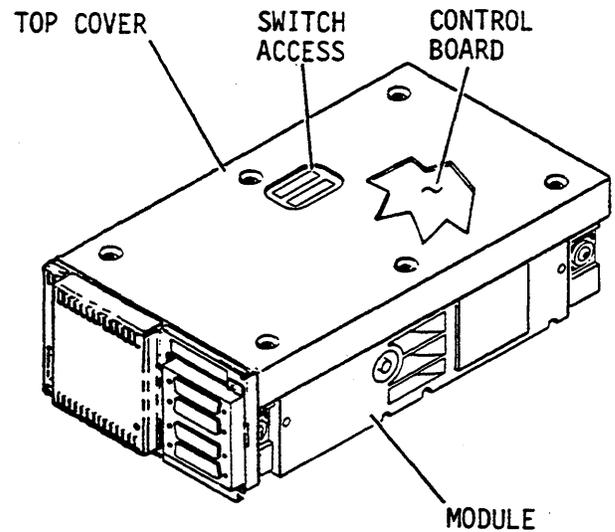
## The Rear Panel

The rear panel protects the I/O board and connectors at the rear of the drive and ensures proper air flow. An optional fan and rear panel assembly is available and must be used if the optional power supply is not used or is not mounted in-line with the drive.

Access to a row of DIP switches is provided through a hole at the left side of the rear panel.

The spindle sync connector (if present) is located below the row of DIP switches on the rear panel.

POWER SUPPLY

AIR FLOW

POWER SUPPLY
IN LINE
WITH DRIVE

AIR FLOW

OPTIONAL
REAR PANEL
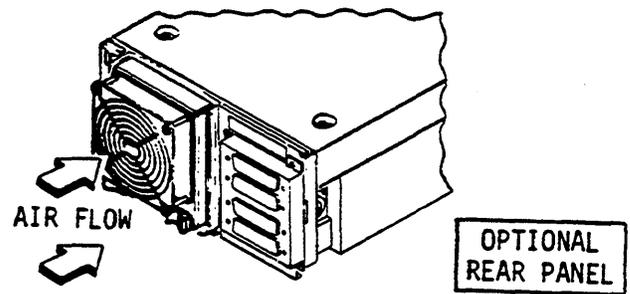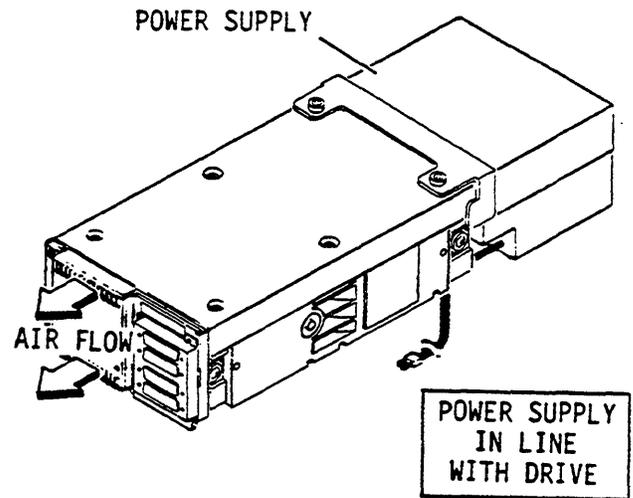
11T68

## The Module

The module is a sealed unit that houses the actuator, discs, heads, motor, spindle, and the other electrical and mechanical parts needed for drive operation.
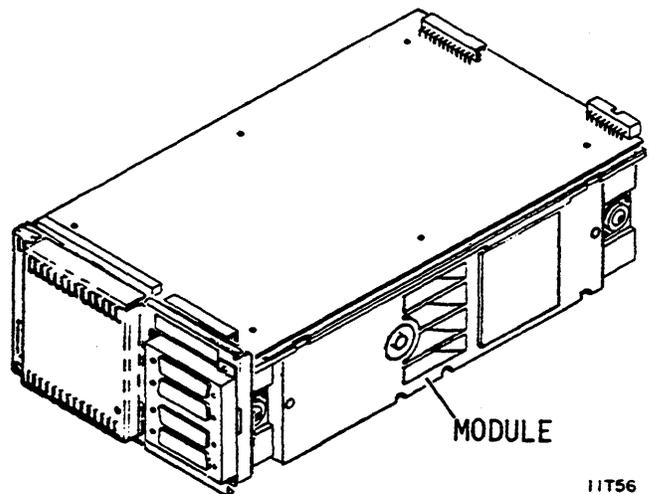
MODULE

11T56

## The Discs

The discs inside the module are mounted on a spindle coupled to the drive motor. The rotation of the discs creates air currents inside the sealed module that cause the heads to fly over the disc surfaces.

The actuator assembly holds the heads and moves them over the spinning discs. Data heads are used to transfer the data to and from the discs.

A servo head reads prerecorded information from the servo surface. The servo information is used to determine actuator position and to control its movement.
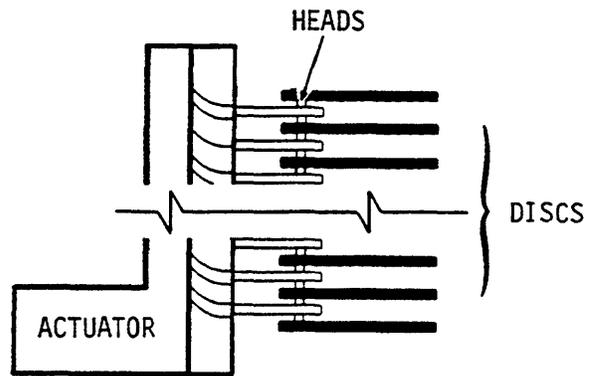
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## The Actuator

The actuator has a voice coil that operates in a permanent magnetic field in response to signals from the servo circuits. The voice coil moves the heads in an arc across the rotating discs to any one of the logical cylinders.

The heads rest in a landing zone on the disc surface when the drive is not in use. This landing zone is outside the data zone. The actuator locks in this position when the drive is stopped.

IITII
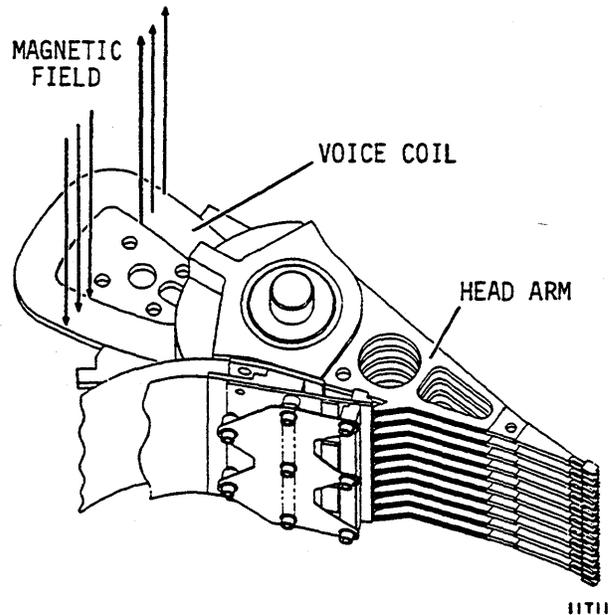
## Circuit Boards

The drive has two circuit boards. A control board is mounted on the module under the top cover. This board controls read, write, seek, spindle synchronization and other drive control functions.

The I/O board at the back of the drive controls selection of the drive, data formatting, and input/output operations.
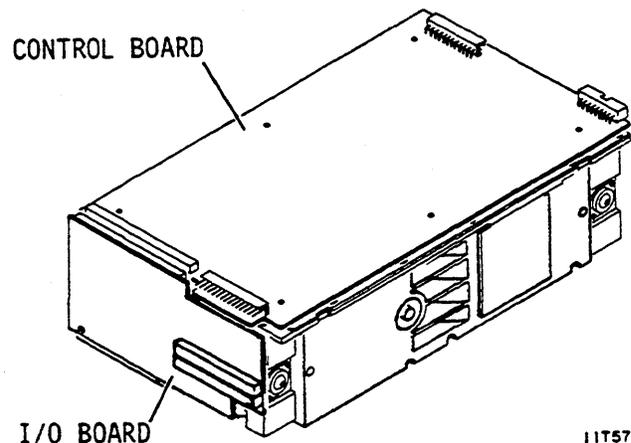
IITS7

## AIRFLOW REQUIREMENTS

The source of airflow for the drive depends on whether the drive is mounted in-line with the power supply.

When the optional power supply is mounted in-line with the drive, air flows out of the power supply, through the drive, and out the rear panel.

POWER SUPPLY

AIR FLOW

POWER SUPPLY
IN LINE
WITH DRIVE
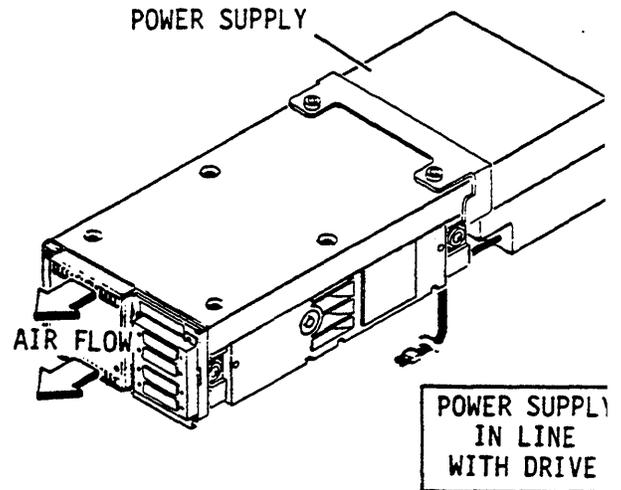
The optional rear panel is needed when the power supply is not mounted in-line with the drive. The fan forces air across the interior of the drive.

AIR FLOW

OPTIONAL
REAR PANEL

IIT6E
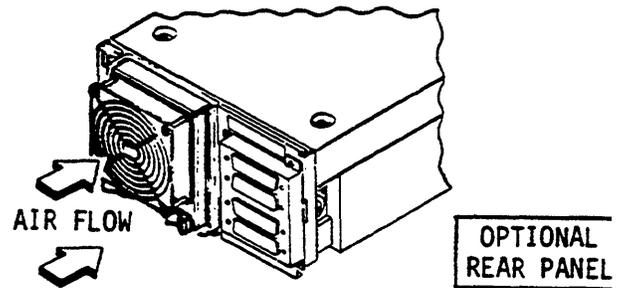
## OPERATOR PANEL

This optional operator panel provides external control of the drive. It contains the switches and indicators you use to control the drive. These controls and indicators are described in section 3 of this manual.

8 4 2 1

ADDRESS

SEL

START

FAULT

WRITE
PROTECT
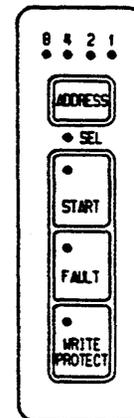
IIF3I4

## STATUS/CONTROL PANEL

The optional status/control panel is another type of control panel. It includes the same controls and indicators found on the operator panel, but it also has a maintenance panel that allows running of offline diagnostic tests and reading of various status conditions. The controls and indicators used by an operator are described in section 3 of this manual.

The controls and indicators on the maintenance panel are described in the maintenance manual.
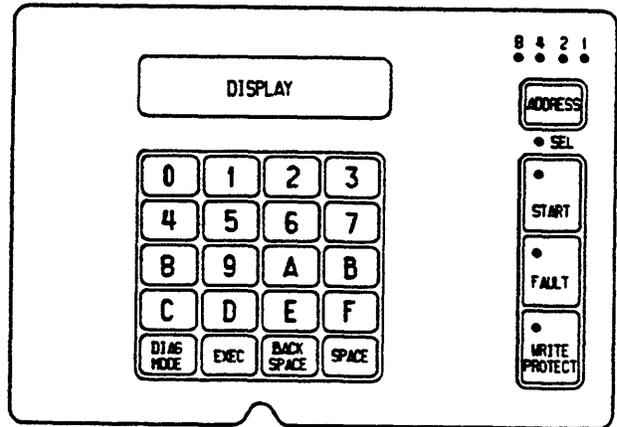


IIF3I5

## HOW THE DRIVE WRITES AND READS

The drive has all the circuits and mechanical devices needed to record data on and recover it from the discs.

The I/O board receives the commands from the controller, interprets them, and transfers the necessary commands to the control board.

DC power requirements are provided by the power supply.
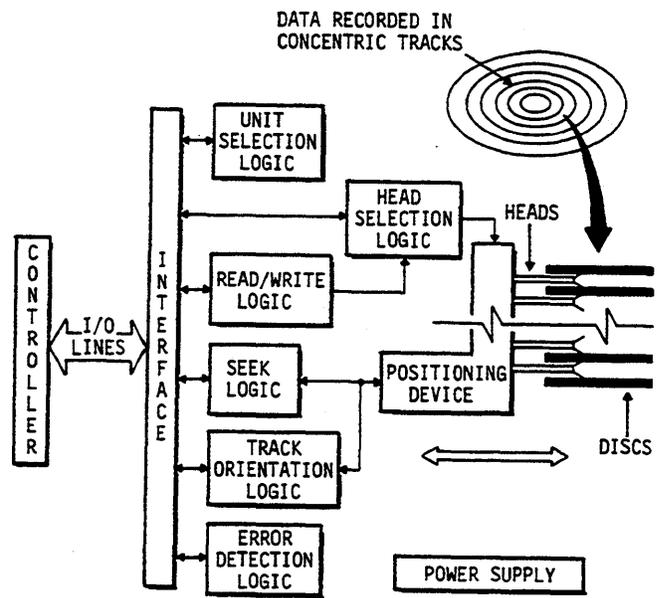
## HOW THE DRIVE WRITES AND READS (CONTD)

The control board controls the write and read process. The read and write processes use electromagnetic devices called heads, that can be moved to various tracks on the recording surfaces of the rotating discs. One head is provided for each disc surface and they are positioned such that data is written in concentric tracks around the disc surfaces.

DATA RECORDED IN
CONCENTRIC TRACKS

IIF31i
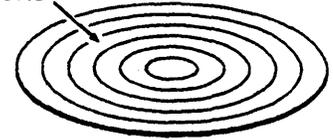
In read/write operations, the controller instructs the drive to seek (move its heads) to a given cylinder. A cylinder is formed by an imaginary line connecting the same track on each recording surface.

Having reached the desired cylinder, the controller directs the drive to select the head located over the track where the read or write operation will occur.

Two-head parallel (Model ST83050K) drives can write and read using two heads in one of three modes. See Two-Head Parallel Drives later in this section.

CYLINDER "X"

DISC 1
TRACK "X"

R/W HEAD

DISC 2
TRACK "X"

R/W HEAD

DISC 11
TRACK "X"

R/W HEAD
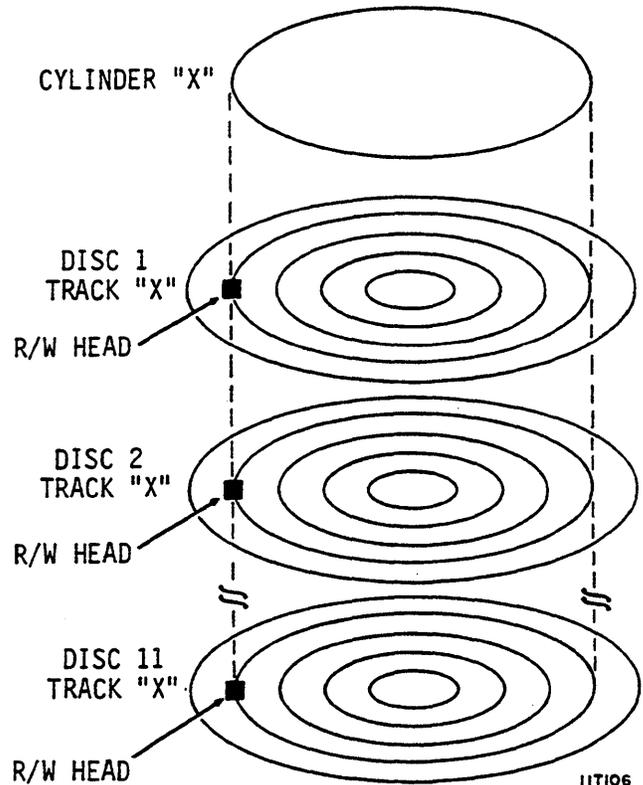
IITI06

The controller locates the part of the track where the data is to be written or read. This is called track orientation. Signals from the drive indicate the beginning of each track. The controller uses these signals to determine the position of the head on the track.

TRACK (CYLINDER)

ROTATION

INDEX

AREA WHERE
READ OR WRITE
OPERATION WILL
OCCUR
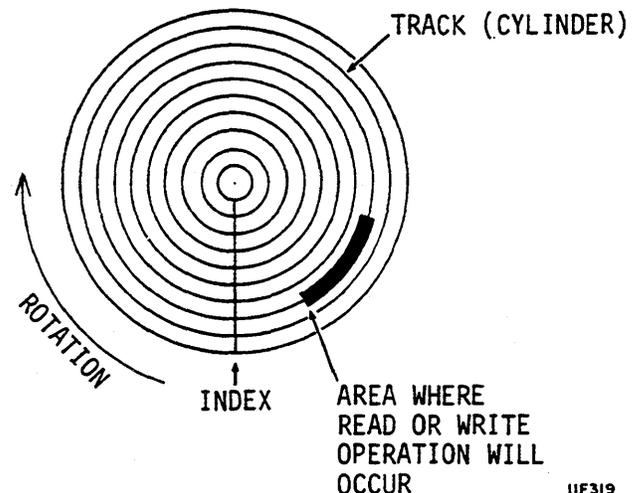
IIF319

# HOW THE DRIVE WRITES AND READS (CONTD)

When the desired location is reached the controller directs the drive to read or write the data.

During a read operation, the drive recovers (reads) data from the discs and sends it to the controller.

During a write operation the drive receives data from the controller, processes it, and records (writes) it on the discs.

TRACK (CYLINDER)

END OF READ OR WRITE OPERATION

START OF READ OR WRITE OPERATION

ROTATION

INDEX

READ/WRITE HEAD
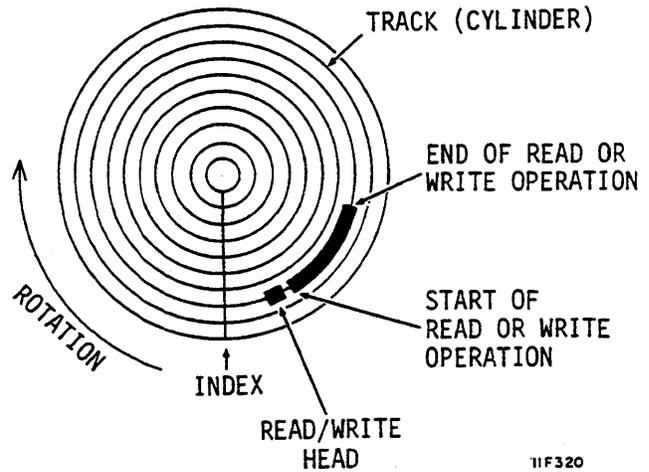
IIF320

---

The drive recognizes certain errors that may cause faults during its operation. If a fault occurs, a signal is sent to the controller or an indicator on the drive is turned on.

Both errors and faults are communicated to the controller via status responses.

8  4  2  1

ADDRESS

● SEL

●
START

●
FAULT

●
WRITE PROTECT
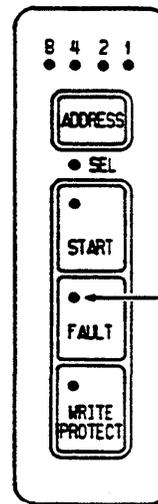
LIGHTS IF FAULT CONDITION IS DETECTED

IIF321A

# TWO-HEAD PARALLEL DRIVES (MODEL ST83050K)

Drives that have the two-head parallel feature read and write using two heads. These drives have two read/write channels and control circuits designed specifically for two-head operation. Channel 0 writes data to or reads data from head arms 1 through 5. Channel 1 writes data to or reads data from head arms 6 through 10. A write/read operation that specifies logical head 0 for example, selects physical head 17 on arm 5 (channel 0), and physical head 7 on arm 10 (channel 1). Logical head 0, as shown, is the lower head on arms 5 and 10. Two-head parallel drives can operate in any one of the three modes described below.

| LOGICAL HEAD | PHYSICAL HEADS | |
|---|---|---|
| | R/W CHANNEL 0 | R/W CHANNEL 1 |
| 0 | 17 | 7 |
| 1 | 16 | 6 |
| 2 | 15 | 5 |
| 3 | 14 | 4 |
| 4 | 13 | 3 |
| 5 | 12 | 2 |
| 6 | 11 | 1 |
| 7 | 10 | 0 |
| 8 | 9 | 18 |

NOTES:

⚠️1 PHYSICAL HEAD 8 IS NOT USED.

---
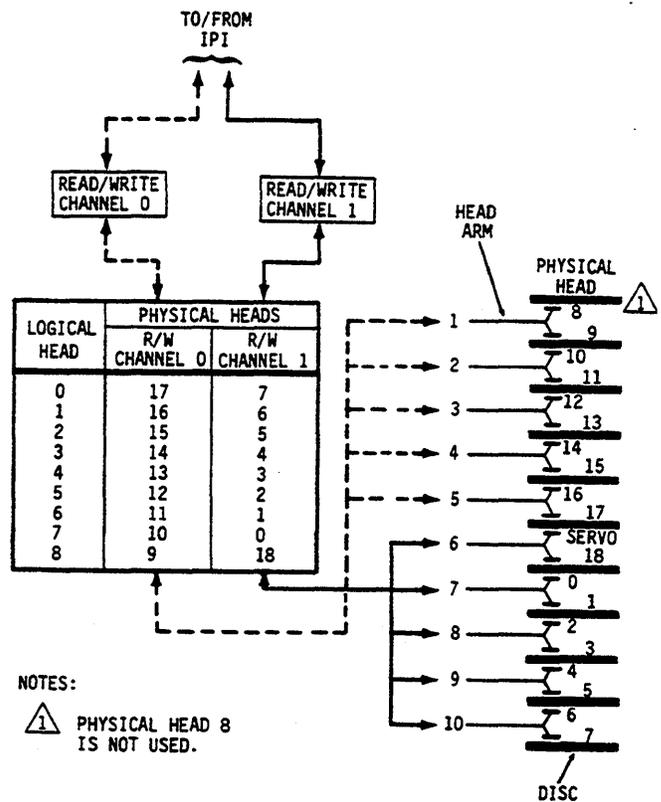
## Bit Interleave Mode

In this mode, the 16 bits of each word transferred across the IPI are alternately written to the two heads. The odd bits go to read/write channel 0 and the even bits go to read/write channel 1 starting with the MSB.

When reading, words are formed by taking bits alternately from the two heads. Odd bits are taken from read/write channel 0 and even bits from read/write channel 1, starting with the MSB.
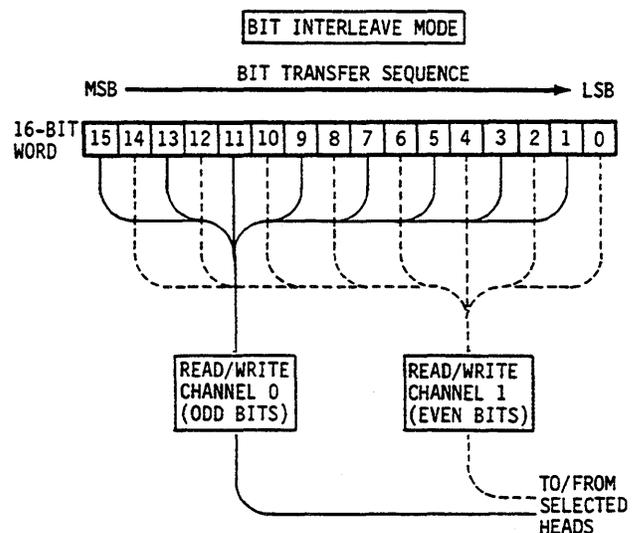
## Byte Interleave Mode

In this mode, the two bytes of each 16 bit word transferred across the IPI are alternately written to the two heads. Even bytes go to read/write channel 0 and the odd bytes go to read/write channel 1.

When reading, words are formed by taking bytes alternately from the two heads. Even bytes are taken from read/write channel 0 and odd bytes from read/write channel 1.



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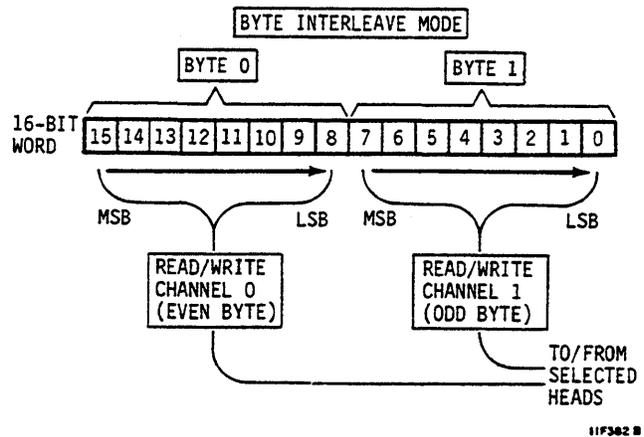
## Word Interleave Mode

In this mode, the 16 bit words transferred across the IPI are alternately written to the two heads. Even words go to read/write channel 0 and odd words go to read/write channel 1.

When reading, words are taken alternately from the two heads. Even words are taken from read/write channel 0 and odd words from read/write channel 1.
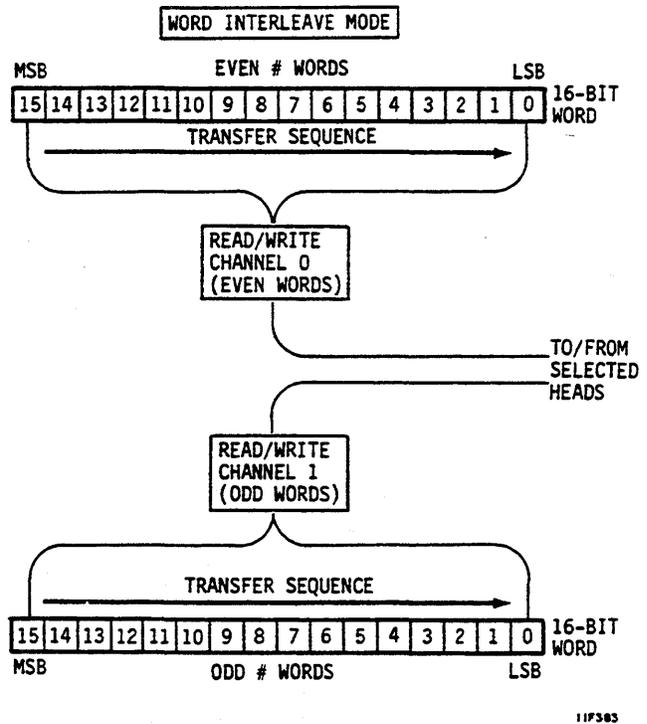
# EQUIPMENT CONFIGURATION

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.

## Equipment Identification

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 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 includes the following:

- Seagate Model Number -- Identifies a basic family of drives having the same capacity, form factor, and interface. These numbers are defined in the front of the manual. (Example = ST82500K)

- Equipment Identification Number -- Indicates the basic functional capabilities of the drive and unique characteristics that are necessary to adapt a drive to specific system requirements. A group of drives with the same Seagate model number may have different equipment identification numbers. (Example = PA8V2A)

- 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.

- Part Numbers -- Several part numbers are used to designate the drive with its options and the drive alone. They are defined in the parts data manual.

- Serial Number -- Serial numbers are assigned sequentially within a family of drives.

## Equipment Configuration Log

Engineering Change Orders (ECOs) are electrical or mechanical changes that are performed at the factory. When the factory installs an ECO early (prior to a series code change), it is logged on the unit's 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 unit with an FCO installed may not be interchangeable with those of a unit without the FCO; therefore, it is important that the you enter the FCO on the Equipment Configuration Log when you install the FCO.

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.

## INTRODUCTION

The information contained in this section describes site requirements, unpackaging, installation, and initial checkout of the drive.

## SITE REQUIREMENTS

The site requirements considered are electrostatic discharge protection, environment, space, power, grounding, and interface. As an aid in site planning, a list of accessories is also provided.

### 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 this section for part numbers). Connection may be made to any metal assembly. 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 this section 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 the drive before removing or installing circuit boards.

- Do not touch pins on power supply connector J15. The power supply circuitry is sensitive to electrostatic discharge.

- Never use an ohmmeter on any circuit boards.

## ACCESSORIES

| PART NUMBER | DESCRIPTION |
|---|---|
| 15165427 | AC Power Cord, 8', 50 Hz, 208-240 V |
| 75168346 | AC Power Cord, 8', 6-15P, 60 Hz, 208-240 V |
| 75168354 | AC Power Cord, 8', 5-15P, 60 Hz, 120 V |
| 47188871 | AC Power Cord, Internal, 2' |
| 92588100 | DC Power Cable, 63.5 mm (2.5 inch) |
| 92588106 | DC Power Cable, 152 cm (60 inch) |
| 92588107 | DC Power Cable, 244 cm (96 inch) |
| 40125601 | Ground Lug |
| 24534808 | Ground Strap (Specify length) |
| 70883011 | I/O Cable, 1.5 foot (0.46 metre) long |
| 70883014 | I/O Cable, 3 foot (0.91 metre) long |
| 70883015 | I/O Cable, 6 foot (1.83 metre) long |
| 70883018 | I/O Cable, 10 foot (3.05 metre) long |
| 70883016 | I/O Cable, 25 foot (7.62 metre) long |
| 70883017 | I/O Cable, 50 foot (15.24 metre) long |
| 70883013 | I/O Cable, 80 foot (24.38 metre) long |
| 70883019 | I/O Cable, 120 foot (36.58 metre) long |
| 10126403 | Lockwasher, #10 (for grounding) |
| 70882721 | Spindle Sync Cable, 1.5 foot (0.46 metre) long |
| 70882722 | Spindle Sync Cable, 3 foot (0.91 metre) long |
| 70882723 | Spindle Sync Cable, 6 foot (1.83 metre) long |
| 70882724 | Spindle Sync Cable, 10 foot (3.05 metre) long |
| 70882725 | Spindle Sync Cable, 25 foot (7.62 metre) long |
| 70882726 | Spindle Sync Cable, 50 foot (15.24 metre) long |
| 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 |
| 15458851 | Terminator, I/O |
| 70882711 | Terminator, Spindle Sync |

All I/O cables are shielded.

# Space Requirements

Dimensions for the drive and optional power supply are shown on this page.

If the drive and power supply will be mounted in a custom cabinet or enclosure, be sure to refer to Other Ways to Install the Drive later in this section.

**TOP VIEW**

210 mm
8.25 in

## POWER SUPPLY

183 mm
7.2 in

121 mm
4.75 in

**FRONT VIEW**

**SIDE VIEW**

**TOP VIEW**

216 mm
8.50 in

386 mm
15.22 in

13 mm
0.5 in

44 mm
1.74 in

575 mm
22.62 in

POWER SUPPLY

**SIDE VIEW**

10 mm
0.40 in

## DRIVE

121 mm
4.75 in

**FRONT VIEW**
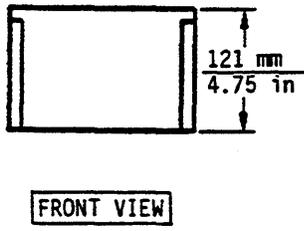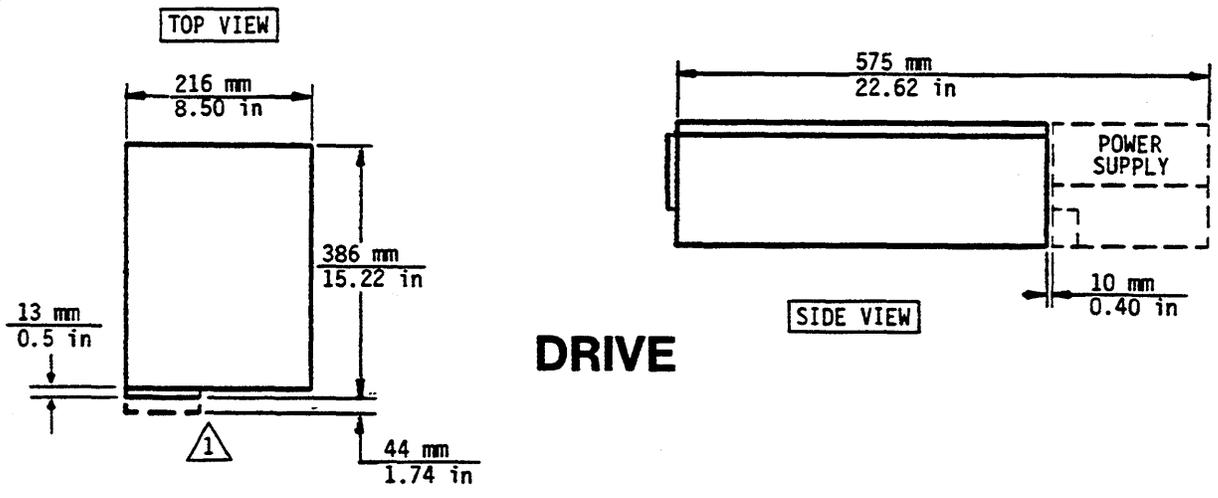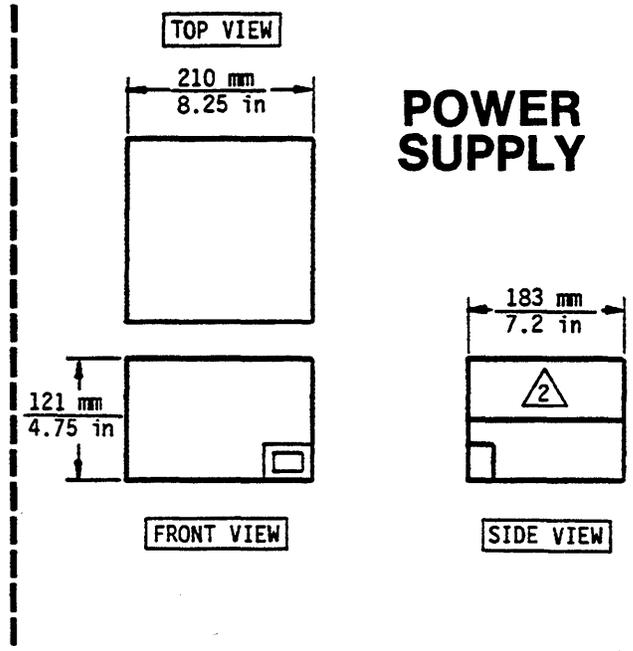
NOTES:

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

⚠️2 COOLING FAN IS INSIDE POWER SUPPLY.

3  DIMENSIONS ARE NOMINAL.

IIF269

# Environmental Requirements

The environmental requirements listed below must not be exceeded regardless of how the drive is mounted.

| Conditions | Characteristics | Specifications |
|---|---|---|
| **Temperature** | | |
| Storage (Packaged) | Range<br>Maximum change per hr | -10°C to 50°C (14°F to 122°F)<br>15°C (27°F) |
| Transit (Packaged) | Range<br>Maximum change per hr | -40°C to 60°C (-40°F to 140°F)<br>20°C (36°F) |
| Operating | Range<br>Maximum change per hr | 10°C to 45°C (50°F to 113°F)<br>15°C (27°F) |
| **Relative Humidity** | | |
| Storage (Packaged) | Range | 5% to 95% |
| Transit (Packaged) | Range | 5% to 95% |
| Operating | Range | 20% to 80% (No condensation allowed) |
| **Barometric Pressure (Standard Day)** | | |
| Storage (Packaged) | Range | -305 m to 3000 m (-1000 to 10 000 ft)<br>104 kPa to 69 kPa (30 in Hg to 20 in Hg) |
| Transit (Packaged) | Range | -305 m to 12 192 m (-1000 to 40 000 ft)<br>104 kPa to 19 kPa (30 in Hg to 6 in Hg) |
| Operating | Range | -305 m to 3000 m (-1000 to 10 000 ft)<br>104 kPa to 69 kPa (30 in Hg to 20 in Hg) |

# Electrical Requirements

An ac power cord used in the United States should be UL-listed. It should use Basic Cord Type SV (or UL-accepted equivalent). This cord must have copper conductors with a minimum gauge of 18 AWG. The following NEMA connector plugs are required:

- Type 5-15P for 120 volts

- Type 6-15P for 208 through 240 volts.

If you are installing the drive in a nation outside the United States, you should use a power cord that is acceptable in that nation and that is certified by authorities accepted in that nation.

<div style="border:1px solid">

## WARNING

This unit has a single phase power supply with a capacitor input filter (sometimes called a switching type supply). If power comes from a 3-phase, 4-wire, wye branch or feeder circuit, ensure the circuit meets the latest requirements of the United States National Electrical Code. Failure to meet these requirements may cause hazardous conditions due to high currents and heating in the neutral conductors and transformers supplying the unit.

</div>

Electrical Requirements are listed separately for the ST82500K, ST83050K, and ST83220K drives.

## ST82500K Drives

Electrical specifications for the ST82500K drives are shown below.

| 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 | Single Phase | Single Phase |
| Power Consumed* | 0.137 - 0.147 kW | 0.141 - 0.143 kW |
| Line Current* | 2.4 - 2.2 A | 1.4 - 1.3 A |
| Power Factor* | 0.56 - 0.55 | 0.48 - 0.45 |
| *Nominal values with discs rotating and carriage moving. | | |

**ST82500K Drives (Contd)**

Start current waveforms for the ST82500K drives are shown below.
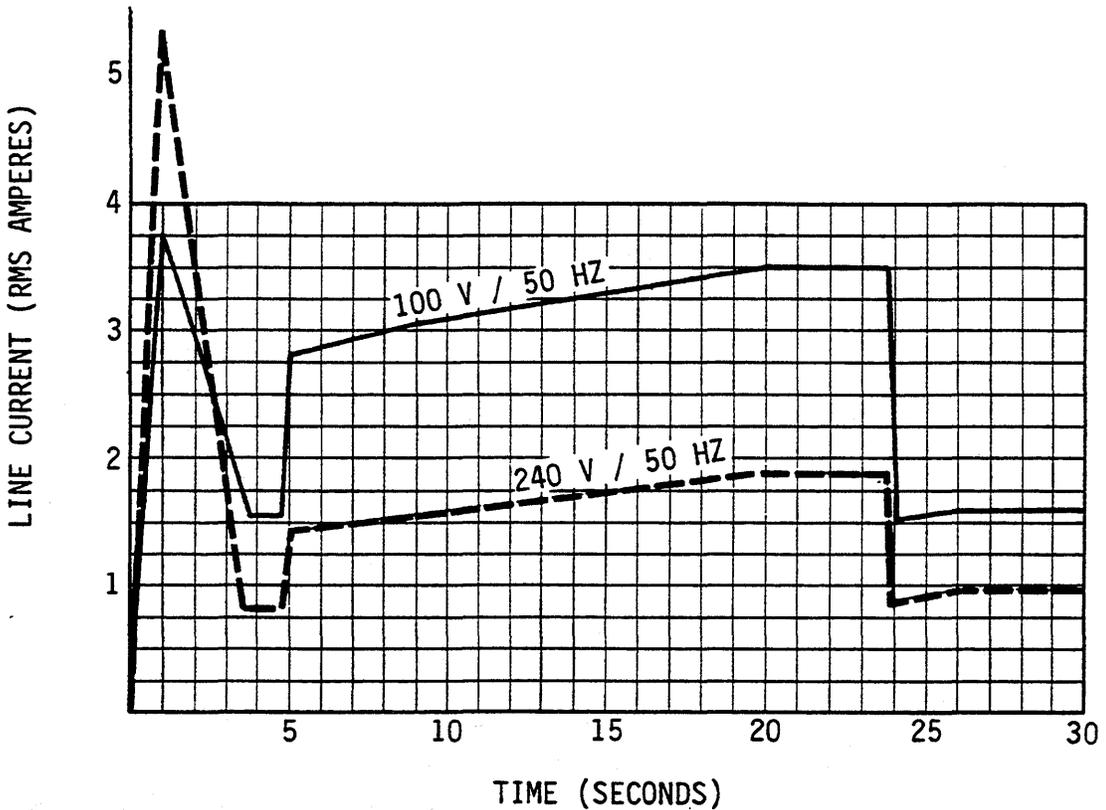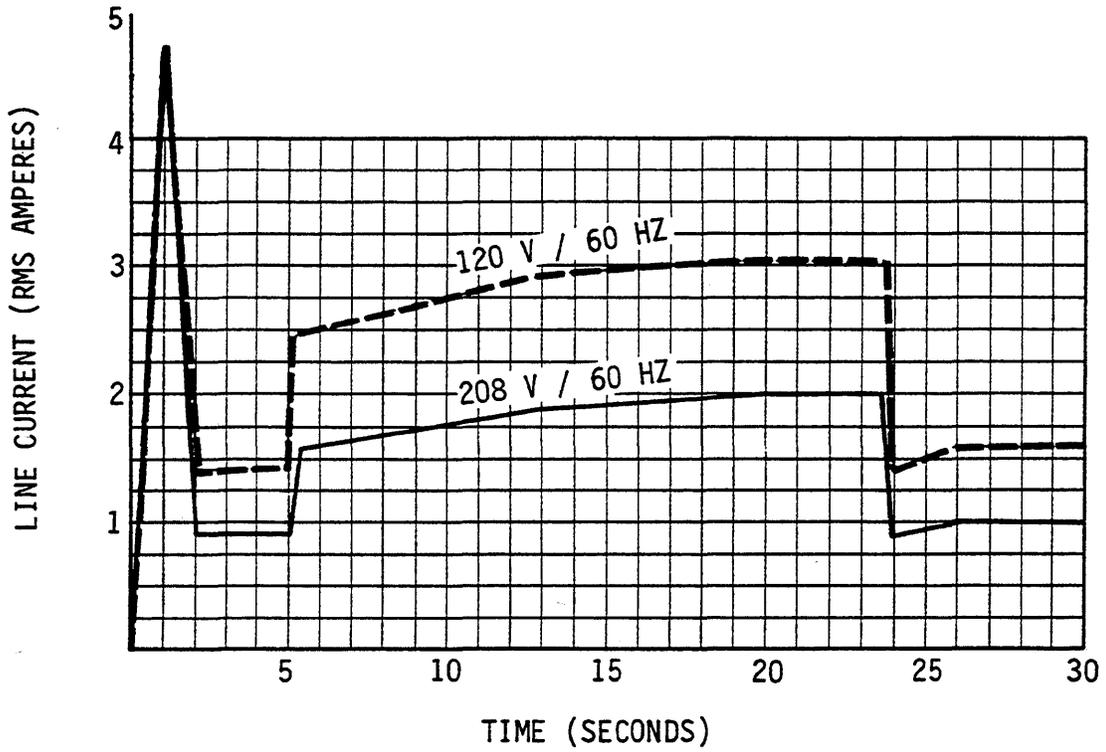
## ST83050K Drives

Electrical specifications for the ST83050K drives are shown below.

| 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 | Single Phase | Single Phase |
| Power Consumed* | 0.164 - 0.166 kW | 0.164 - 0.167 kW |
| Line Current* | 2.81 - 2.00 A | 1.65 - 1.35 A |
| Power Factor* | 0.58 - 0.69 | 0.48 - 0.52 |
| *Nominal values with discs rotating and carriage moving. | | |

## ST83050K Drives (Contd)

Start current waveforms for the ST83050K drives are shown below.
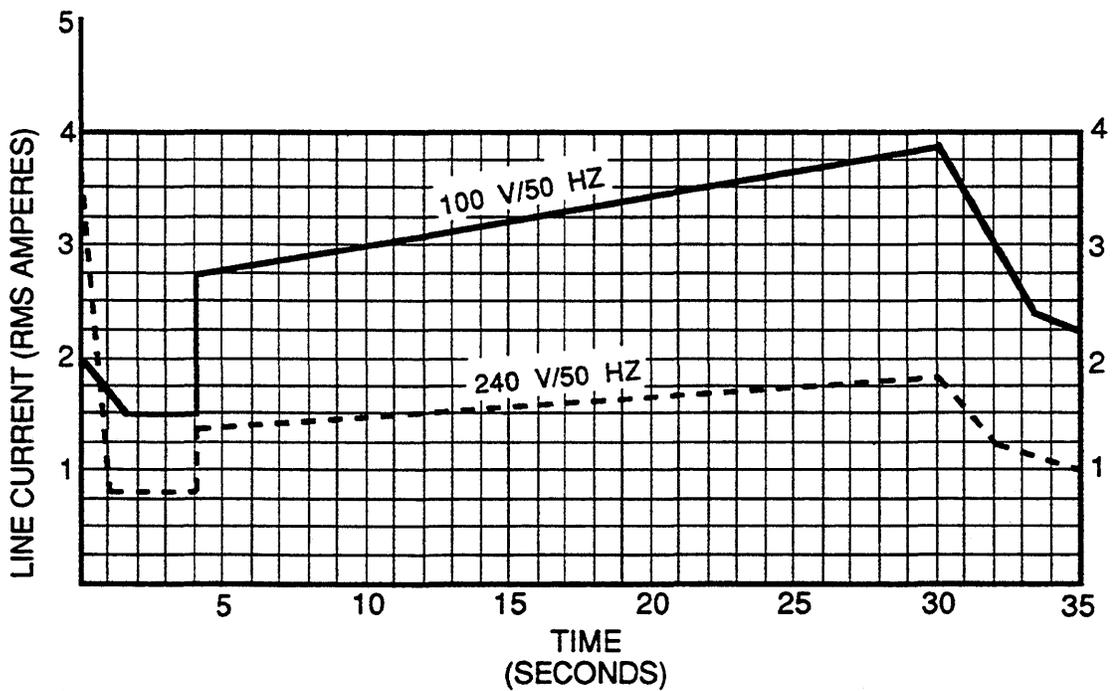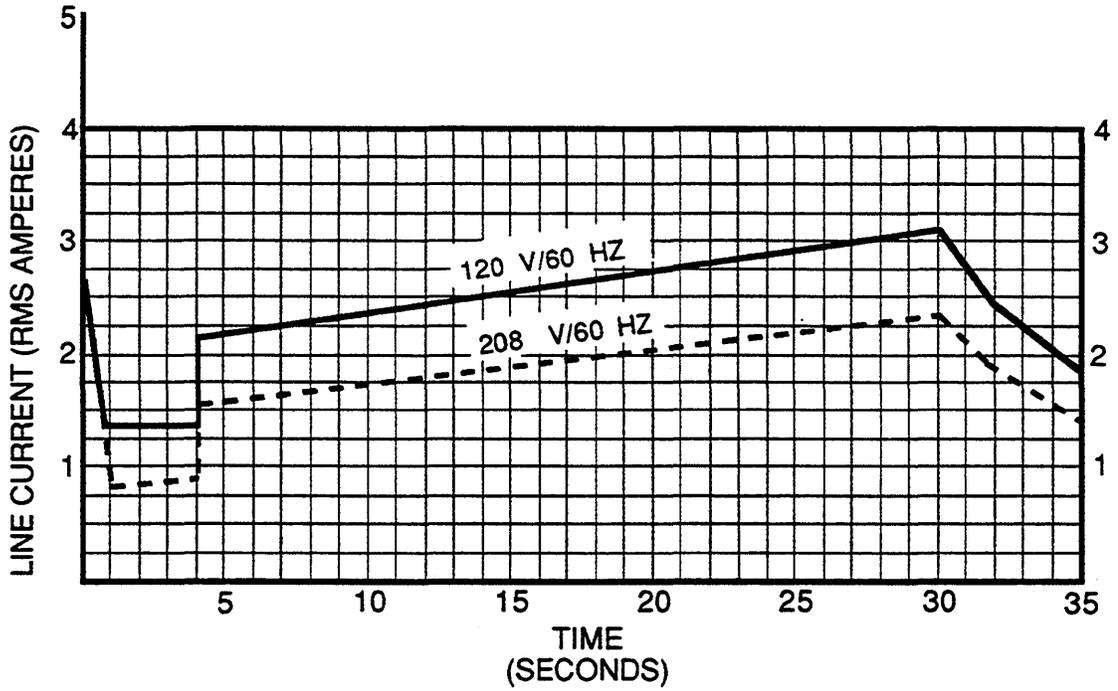
## ST83220K Drives

Electrical specifications for the ST83220K drives are shown below.

| 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 | Single Phase | Single Phase |
| Power Consumed* | 0.142 - 0.144 kW | 0.142 - 0.143 kW |
| Line Current* | 2.56 - 2.19 A | 1.34 - 1.21 A |
| Power Factor* | 0.55 - 0.55 | 0.51 - 0.49 |
| *Nominal values with discs rotating and carriage moving. | | |

## ST83220K Drives (Contd)

Start current waveforms for the ST83220K drives are shown below.
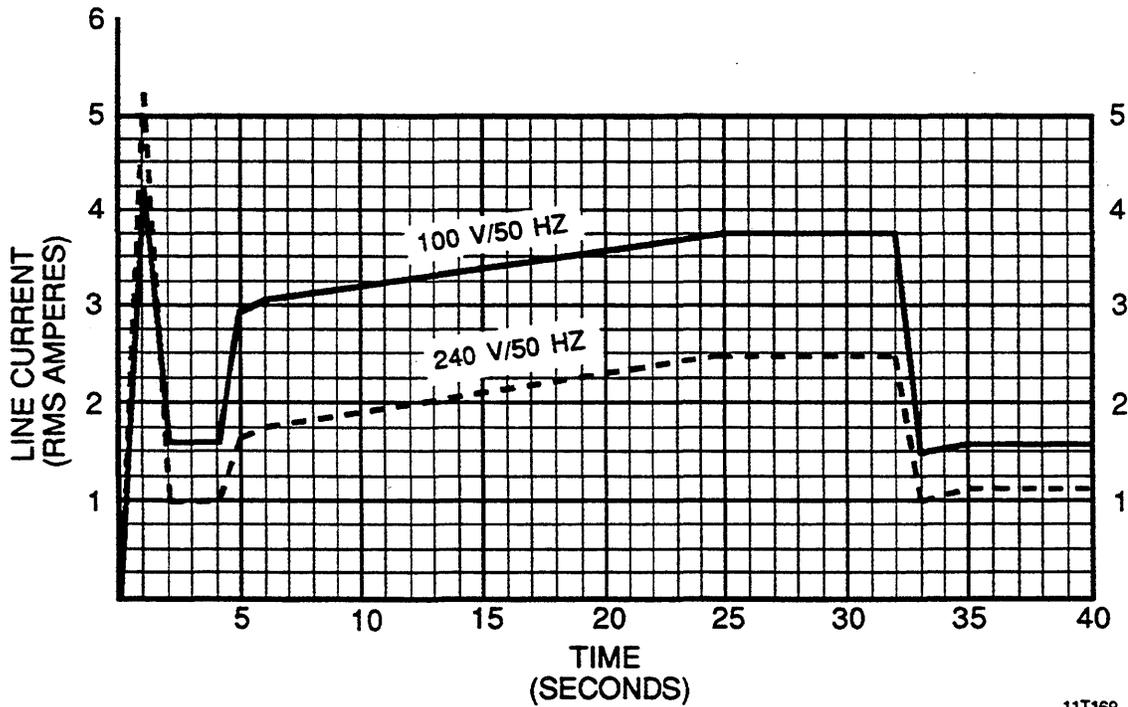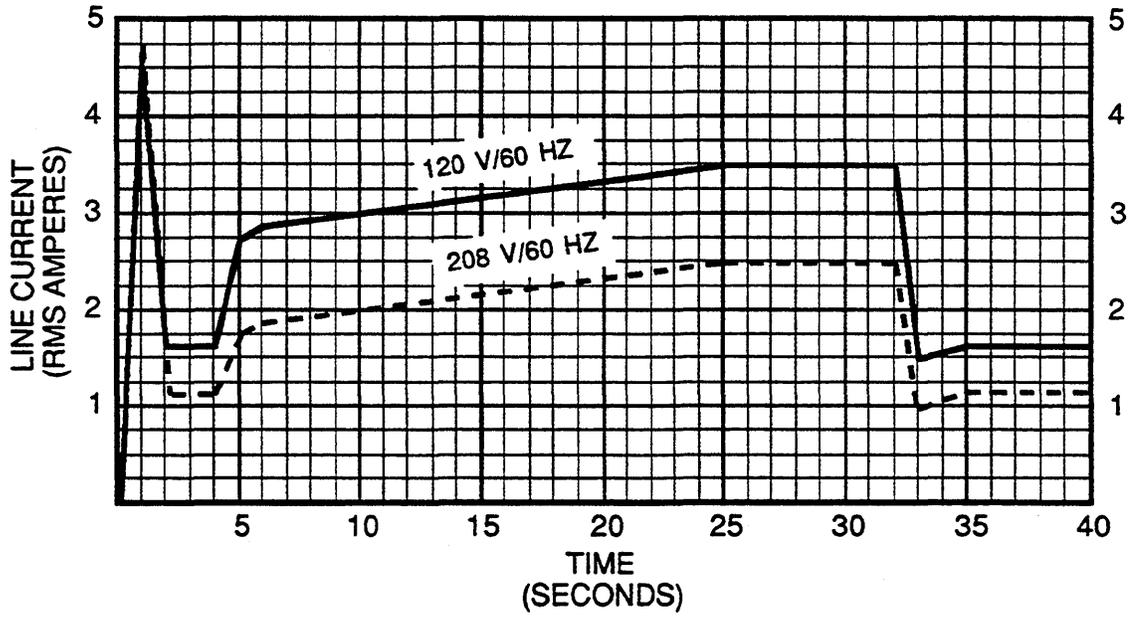
# Interface Requirements

This drive is a two channel device, so it can be shared by two controllers if necessary. It can be connected in either a star or daisy chain I/O configuration.

The four I/O connectors at the back of the drive accept the I/O cables that connect it to the system. The D-subminiature I/O connectors shown are used on most units. Micro-D I/O connectors used on some units have the same layout but are physically smaller.

J3-1 and J3-2 are the connectors for port A and B to which a terminator or the I/O cable to the next drive in a string are attached. J4-1 and J4-2 are the I/O inputs for port A and B respectively.

A terminator must be installed on J3-1 and J3-2 only if they are not used, AND an I/O cable is connected to J4-1 (port A) or J4-2 (port B). Unused ports (having no I/O cables) must be disabled as described in Setting the I/O Board Switches.

Refer to the Accessories list in this section for I/O cable and terminator part numbers. When selecting I/O cables, ensure they are long enough to permit full extension of the drive from the cabinet (if applicable).

PORT "A" TERMINATOR OR
I/O CABLE TO NEXT DRIVE

PORT "A"
I/O CABLE (INPUT)

J3-1

J4-1

PORT "B" TERMINATOR OR
I/O CABLE TO NEXT DRIVE

J3-2

J4-2

PORT "B"
I/O CABLE (INPUT)

IIF354
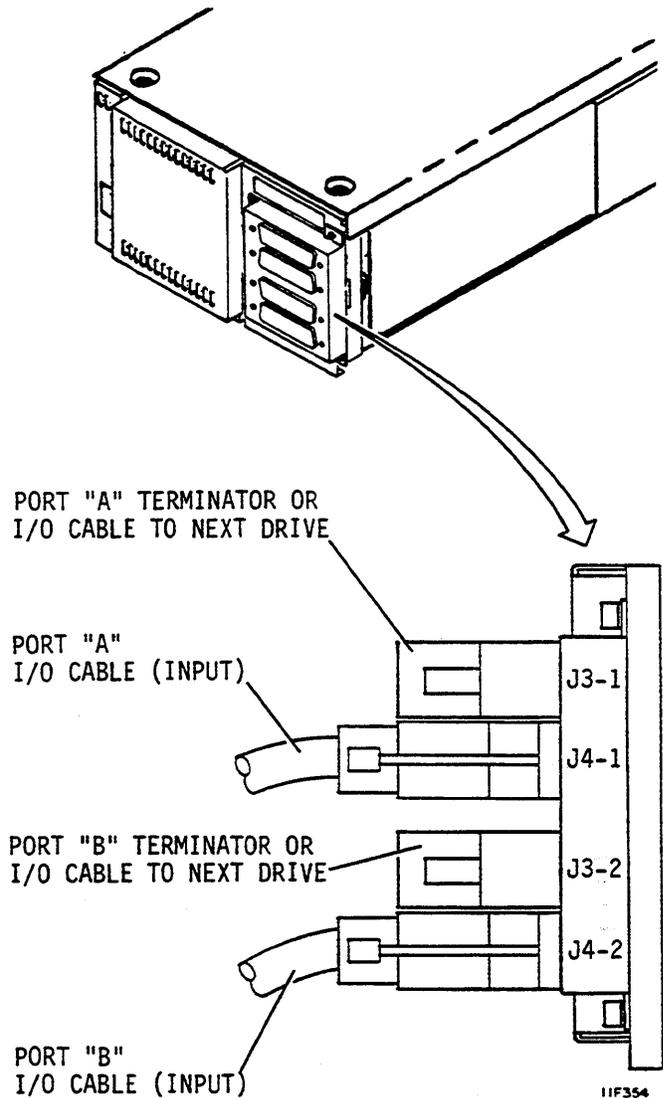
## Star I/O Cabling

A star I/O cabling scheme can be used if the controller has an I/O connector available for each drive in the system. In dual port systems, both controllers must have an I/O connector available for each drive in the system if both controllers are to have access to all drives.

I/O cable length cannot exceed 45.7 m (150 ft). Unused ports must be disabled as described in Setting the I/O Board Switches.

The number of I/O cables and terminators required in this cabling scheme is doubled if the dual port feature is used.
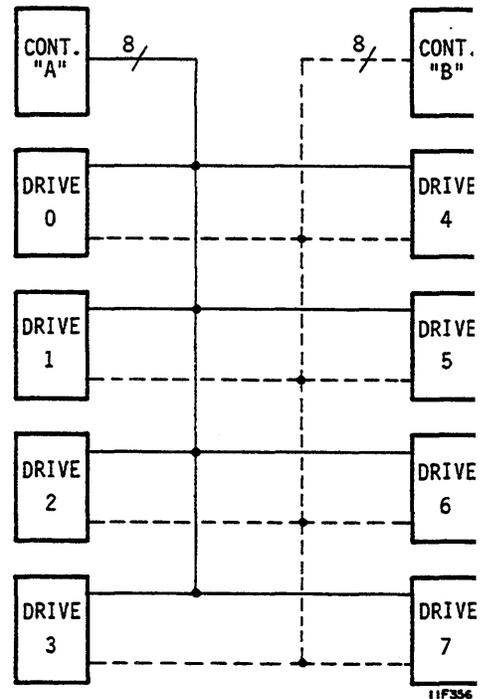
## Daisy Chain I/O Cabling

Daisy chain I/O cabling must be used if the controller has only one drive I/O connector. In this scheme, an I/O cable connects the first drive to the controller. Additional I/O cables connect the first drive to the second, second to the third, etc.

A maximum of eight drives can be connected in a daisy chain. Unused ports must be disabled as described in Setting the I/O Board Switches.

The maximum cumulative I/O cable length in a daisy chain system is 45.7 m (150 ft). The number of I/O cables and terminators required in this cabling scheme is doubled if the dual port feature is used.
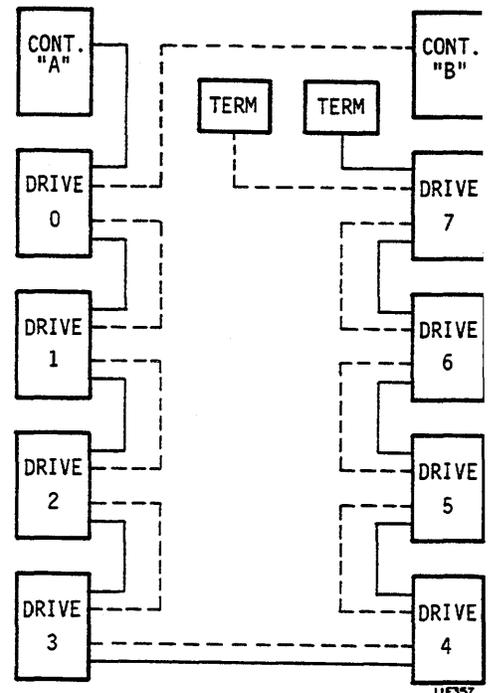
## I/O Cable Pin Assignments

Cable pin assignments are shown below. Note that D-Subminiature and Micro-D connectors have different pin assignments.

| Signal Name | D-Subminiature Connector | | Micro-D Connector | |
|---|---|---|---|---|
| | (+) Pin Number | (-) Pin Number | (+) Pin Number | (-) Pin Number |
| DC Ground | 1 | 34 | 1 | 2 |
| Select Out | 43 | 27 | 47 | 46 |
| Master Out | 45 | 29 | 41 | 40 |
| Sync Out | 41 | 25 | 23 | 24 |
| Sync In | 15 | 48 | 33 | 32 |
| Slave In | 39 | 23 | 17 | 18 |
| Attention In | 20 | 4 | 9 | 10 |
| Bus A - Bit 0 | 13 | 46 | 39 | 38 |
| Bus A - Bit 1 | 30 | 14 | 37 | 36 |
| Bus A - Bit 2 | 22 | 6 | 15 | 16 |
| Bus A - Bit 3 | 26 | 10 | 49 | 48 |
| Bus A - Bit 4 | 11 | 44 | 45 | 44 |
| Bus A - Bit 5 | 28 | 12 | 43 | 42 |
| Bus A - Bit 6 | 37 | 21 | 11 | 12 |
| Bus A - Bit 7 | 5 | 38 | 13 | 14 |
| Bus A - Parity | 47 | 31 | 35 | 34 |
| Bus B - Bit 0 | 32 | 16 | 31 | 30 |
| Bus B - Bit 1 | 49 | 33 | 29 | 28 |
| Bus B - Bit 2 | 3 | 36 | 7 | 8 |
| Bus B - Bit 3 | 7 | 40 | 19 | 20 |
| Bus B - Bit 4 | 24 | 8 | 21 | 22 |
| Bus B - Bit 5 | 9 | 42 | 25 | 50 |
| Bus B - Bit 6 | 18 | 2 | 3 | 4 |
| Bus B - Bit 7 | 35 | 19 | 5 | 6 |
| Bus B - Parity | 17 | 50 | 27 | 26 |

# UNPACKAGING, INSPECTING, AND REPACKAGING

## Unpackaging the Drive

Unpack the drive using the unpacking instructions supplied with it. Save all packing materials for use if the drive must be shipped in the future.

Unpack the drawers, tray, and tray-mounting hardware kit if applicable. The mounting kit shown to the right is called the ruggedized mounting kit. This kit is described in the installation instructions in this section.

A standard mounting kit using the 2X drawer is available as an alternative. See appendix A for information about installing the standard mounting kit.

SCREWS (12)
(10-32x1/2)

TRAY

NUTPLATE (4)

11T58

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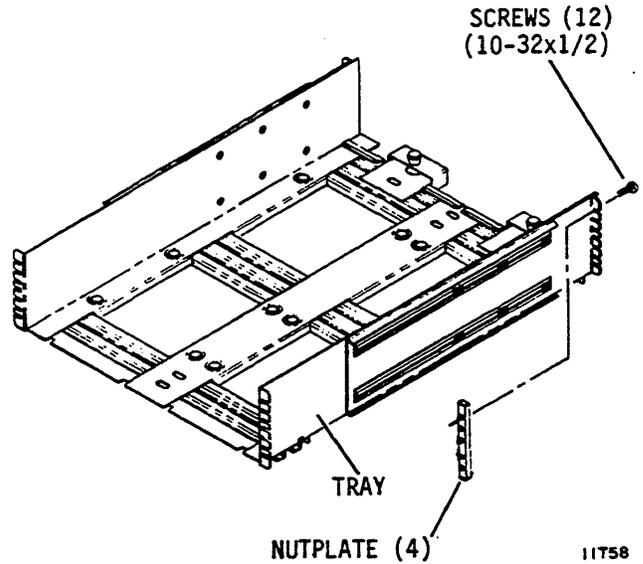
Unpack the ac and dc power cables. Several types of one and two-piece power cords may be encountered. If one short and one long cord is provided, the shorter cord connects to the power supply. The longer cord serves as an extension cord and the plug style matches the voltage selected on the power supply.

DC POWER CABLE

115 V
60 HZ

230 V
50 HZ

240 V
60 HZ

11F273A
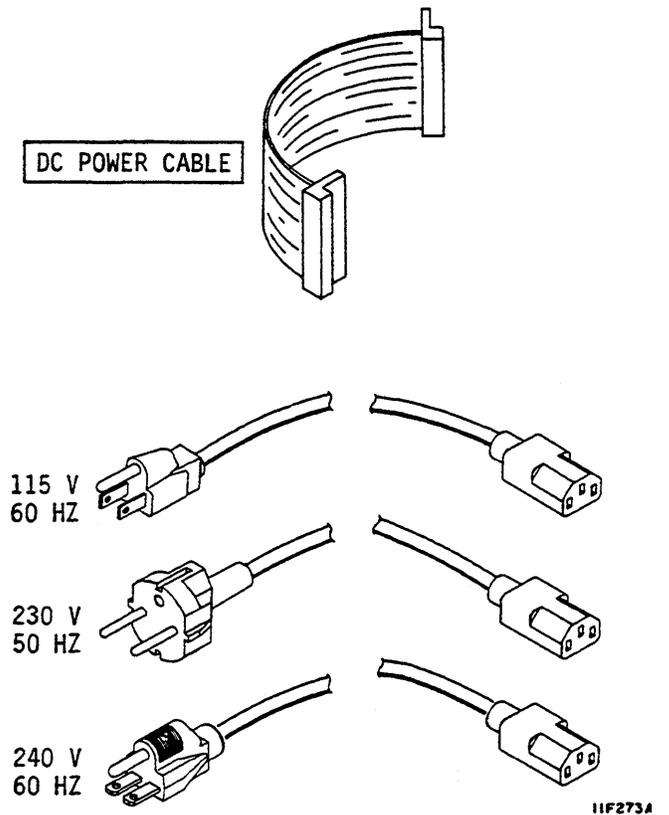
## Unpackaging the Drive (Contd)

After the drive has stabilized to the ambient temperature of the room, open the sealed vapor barrier bag and remove the drive and power supply.

Check all items against the shipping bill. Report missing items, equipment damage, etc., to the sales representative from whom the equipment was purchased.

## Inspecting the Drive

Inspect the drive, the power supply, and accessory items for possible shipping damage. Claims for shipping damage must be filed with the carrier involved.

## Repackaging the Drive

If it is necessary to ship the drive at some time in the future, pack it using the original packing materials. Follow the packing instructions carefully to ensure the drive is undamaged in shipment.

Packing instructions can be obtained at the address shown. Specify the exact equipment number and series code shown on the identification labels.

Seagate Technology, Inc.
Customer Services
12701 Whitewater Drive
Minnetonka, MN 55343

Phone: 1-800-382-6060 (outside Minnesota)
(612) 931-8200 (inside Minnesota)

Fax: (612) 931-8835

# INSTALLATION PROCEDURES

## The Installation Process

With the site requirements completed and the drive unpackaged, you are ready to begin the installation. The procedures provided are for installations that install the drive in a drawer, then install the drawer in a tray, and then mount the tray in a cabinet.

Refer to your system documentation for information on other system configurations, or for systems that use different drawers, trays, or cabinets than those shown here. Also refer to the procedure Other Ways to Mount the Drive for some basic requirements for installations that do not use a drawer. The procedures in bold print will apply to most installations regardless of system configuration.

Listed below are the installation procedures in the order they are presented. In most cases, you will find it convenient to perform the procedures in that order. However, you may find it convenient to make switch settings on both the drive and the power supply before mounting them.

- **Checking the Power Supply Voltage Selection**

- **Changing the Power Supply Voltage Selection**

- Installing a Tray in a Rack

- Installing the Operator Panel or Status/Control Panel Jumper Cable (this procedure may have been accomplished in the factory)

- Installing the Power Supply in the Drawer (this procedure may have been accomplished in the factory)

- Installing the Drive in the Drawer (this procedure may have been accomplished in the factory)

- Installing the Drawer in the Tray

- Installing the Front Panel (this procedure may have been accomplished in the factory)

- Mounting the Status/Control Panel (this procedure may have been accomplished in the factory)

- Mounting the Operator Panel (this procedure may have been accomplished in the factory)

- Other Ways to Mount the Drive

- **Connecting the System I/O Cabling**

- **Synchronizing the Spindle**

- **Grounding the System**

- **Setting the Circuit Board Switches**

## Checking the Power Supply Voltage Selection

The power supply is set at the factory to operate from either a 115 V or 230 V ac input power source. A matching power cord must be used. The position of the voltage select plate at the side of the power supply determines voltage selection. If it matches the ac power source, skip the following procedure. Use the following procedure if the voltage setting must be changed.
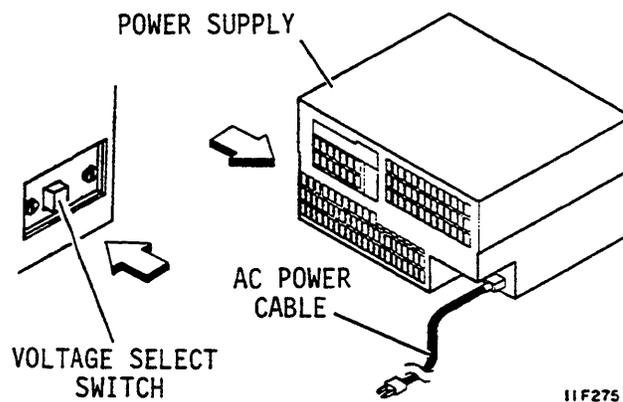
```
┌─────────────────────────────────┐
│           CAUTION               │
├─────────────────────────────────┤
│ Power supply could fail if voltage select │
│ switch is not matched with input ac │
│ voltage.                        │
└─────────────────────────────────┘
```

POWER SUPPLY

VOLTAGE SELECT SWITCH

AC POWER CABLE

IIF275

---

## Changing the Power Supply Voltage Selection

1. Disconnect ac power cord from power supply.

2. Remove screw securing voltage select plate to power supply. Remove plate. Save plate and screw.

3. Set voltage select switch to desired range.

4. Reverse voltage select plate and install it on power supply to lock switch in desired range. Plate must show new voltage setting.

5. Install an ac power cord that matches selected voltage.

VOLTAGE SELECT SWITCH

VOLTAGE SELECT PLATE

115 V

230 V

IIF276B
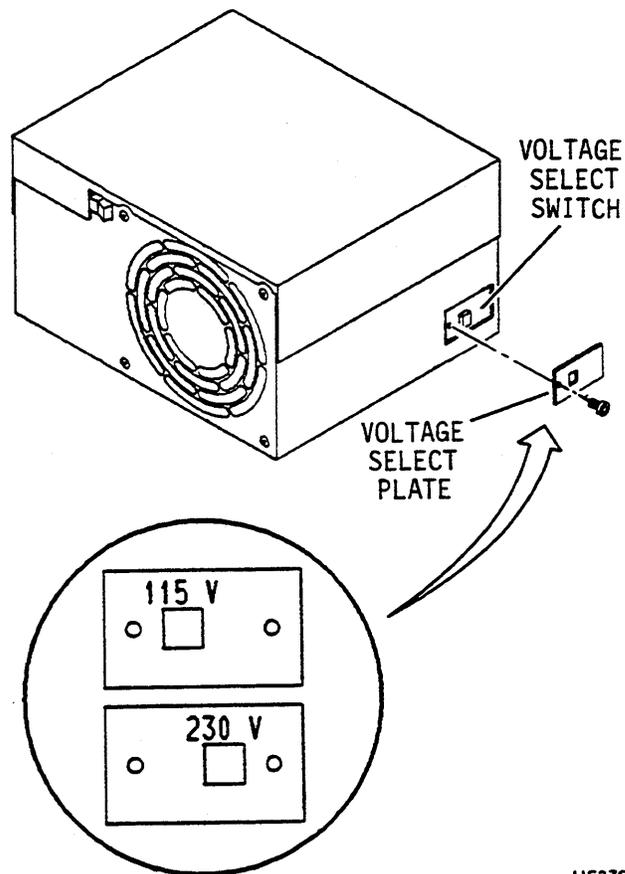
# Installing a Tray in a Rack

Use this procedure to install the tray for the ruggedized mounting kit into a standard rack. A standard mounting kit using the 2X drawer is available as an alternative. See appendix A for information about installing the standard mounting kit.

1. Remove tray, drawer, nut plates, and screws from mounting kit. The screws and nut plates attach the tray to the rack.

2. Measure rack depth (outside measurement between front and rear vertical rails in rack). Add 1.3 cm (0.5 in) to that measurement.

3. Adjust depth of tray to match the rack depth by loosening screws (6 on each side) that secure adjusting bracket to fixed part of tray. This moves captive nuts to proper locations.



ADJUSTING SCREWS (6 ON EACH SIDE)

ADJUSTING BRACKET

RACK DEPTH
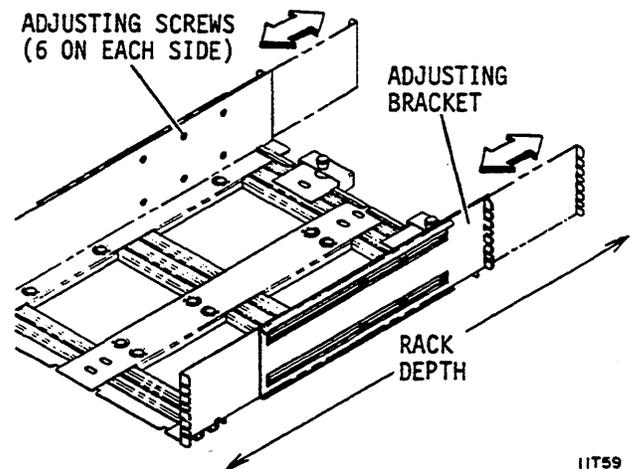
IIT59

4. Remove (6) screws securing adjusting bracket on each side to fixed part of tray. Set adjusting brackets aside.

5. After determining the desired height of the tray in the rack, move fixed part of tray into the rack from the front. Secure tray to rack using screws (3 minimum on each side) and nut plates. Tighten screws snugly. Use whichever holes in rails match holes in nut plate.



FRONT

NUT PLAT

RACK FRAME

SCREWS (10-32x1/2 IN 3 HOLES)

IIT6(
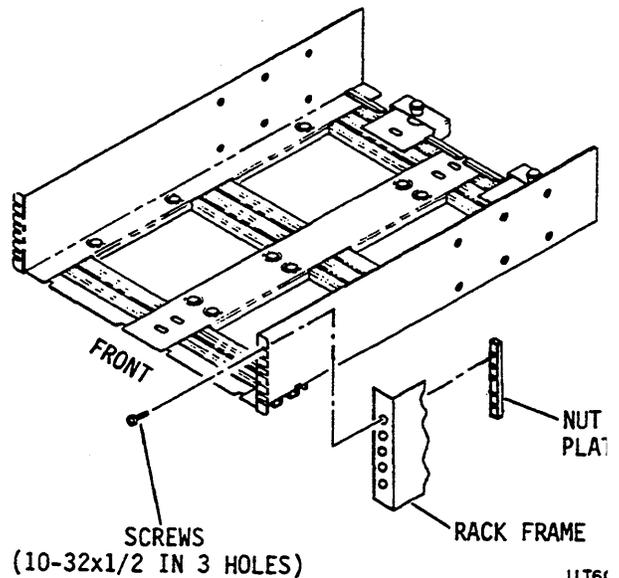
# Installing a Tray in a Rack (Contd)

6. From rear of cabinet, slide each adjusting bracket into position adjacent to fixed part of tray.

7. Loosely reinstall (6) screws attaching each adjustment bracket to fixed part of tray.

8. Attach rear flanges on adjusting brackets to rack rail with nut plates and at least 3 screws per side.
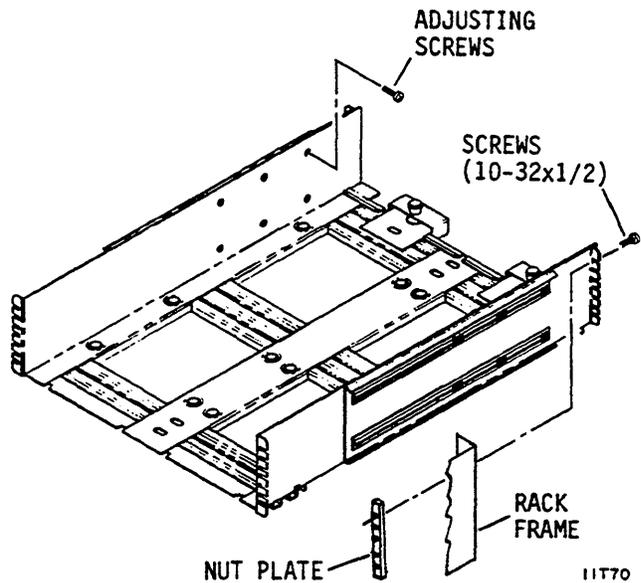
9. Tighten (12) screws that secure adjusting brackets to fixed portion of tray.

10. If you are installing multiple trays in a rack, allow a spacing of 1.6 cm to 4.4 cm (5/8 in to 1-3/4 in) between adjacent trays.
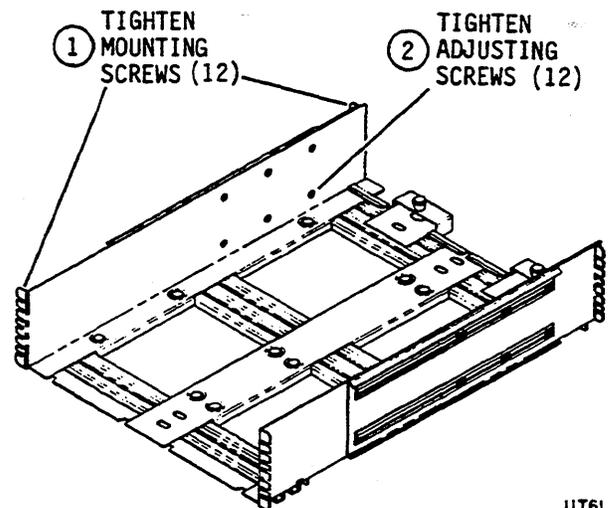
# Installing the Operator Panel or Status/Control Panel Jumper Cable

This procedure describes how to install an operator or status/control panel jumper cable as part of a new drive installation. Skip this procedure if your installation does not include an operator panel or status/control panel.

If you must add an operator panel or status/control panel to an existing installation, refer to instructions in appendix A.

1. Unpack operator panel or status/control panel kit. Remove the two short cable clamps from the kit (the longer clamp is not needed).

2. Install a cable clamp over exposed shielding on each end of jumper cable.



IIR8

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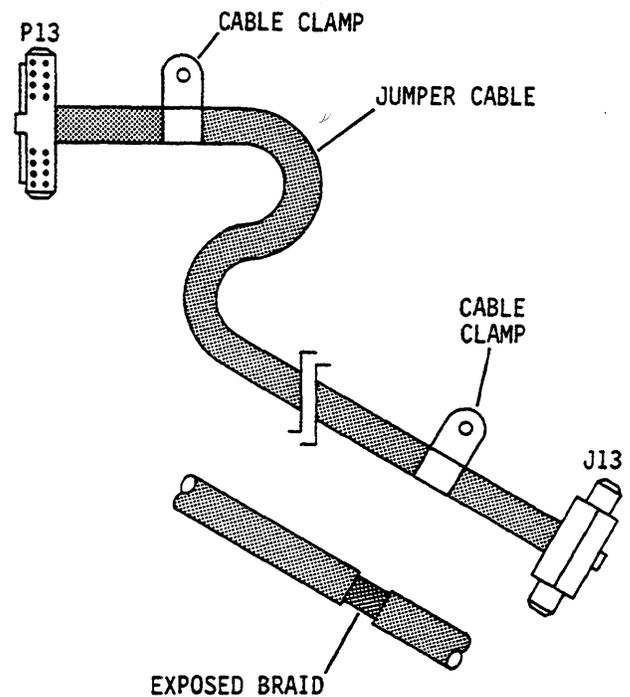
3. Attach cable clamp(s) at P13 end of jumper cable to drawer and route cable around left side. Place cable behind tab in drawer.
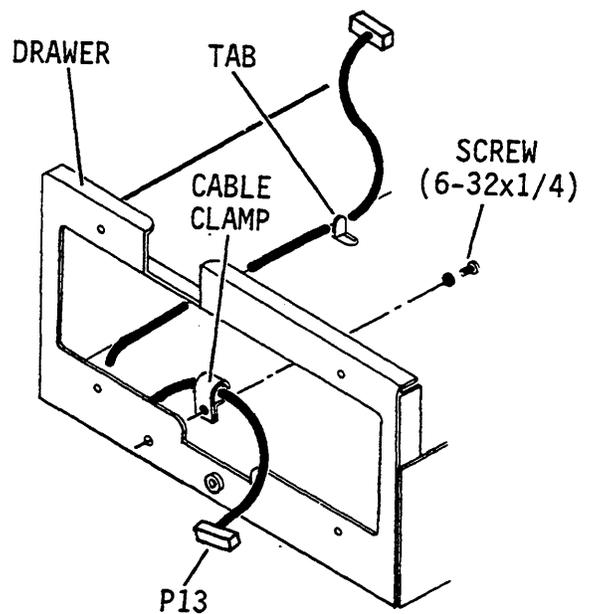


IIT62A

# Installing the Power Supply in the Drawer

This procedure describes how to install the power supply in a drawer that is part of the tray mounting kit. In some cases, the drive and power supply are mounted in the drawer at the factory.

1. If a two-piece ac power cord is used, remove heat shrink from shorter ac power cord only, to expose shield in area shown. Skip this step if a one-piece power cord is used.

2. Connect power cord to J1 on power supply, place power supply into drawer and secure with screws. Ensure cables are not pinched.

3. Place power cord behind tabs. Exposed shield on short two-piece power cord must be behind tab as shown.

4. Place clamp over tab and shield on two-piece power cords only. Bend tab to firmly secure clamp.

5. Connect dc power cable to J15 on power supply.

6. Secure ground strap to power supply. Ensure lockwasher is between strap and power supply.
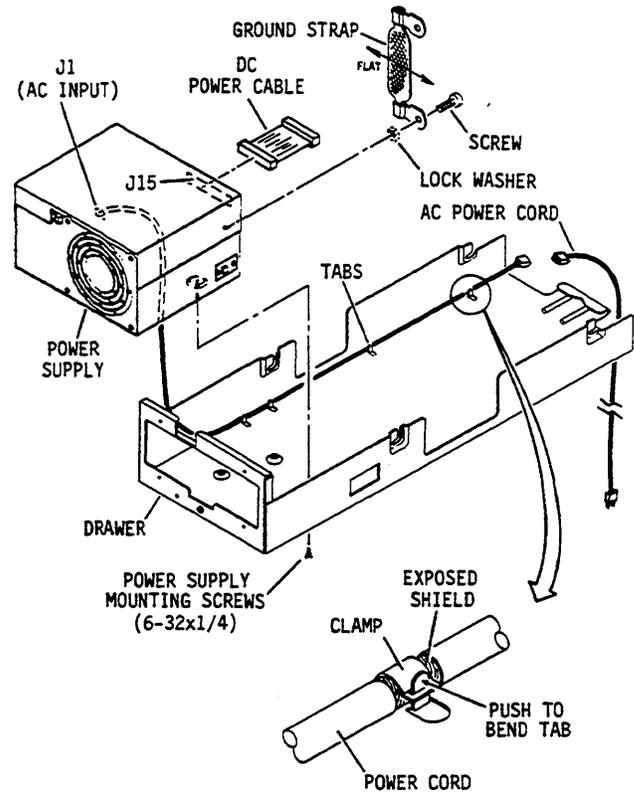
# Installing the Drive in the Drawer

> ## NOTE
>
> Perform step 1 on Model ST83050K and ST83220K drives only. Other drives do not use ground straps on rear shock mounts.

1. Attach ground straps to rear shock mounts with upper screw of each shock mount.

2. Loosely insert shock mount screws into shock mounts and into rear ground straps (if used).

3. With I/O connectors facing away from power supply, place drive into drawer so it rests on shock mount screws.

4. Orient the gasket as shown, and slide it into position between the drive and power supply.

5. Lift power supply end of drive and connect dc power cable to J15A on drive. Connect operator panel or status/control panel jumper cable (if used) to J13 on control board.

6. Move drive into position so that shock mount screws are in slots in drawer. Tighten shock mount screws.

7. Twist ground strap coming from power supply as shown. Connect ground strap to ground screw just above shock mount on drive. Ensure that lockwasher is between drive and strap.

8. If used, attach operator panel or status/control panel jumper cable clamp to hole just above shock mount. Ensure that lockwasher is between clamp and drive.

9. Remove two top cover screws and install air baffle as shown.



✱ TEXT EXPLAINS WHICH DRIVES HAVE GROUND STRAPS ON 2 REAR SHOCK MOUNTS.
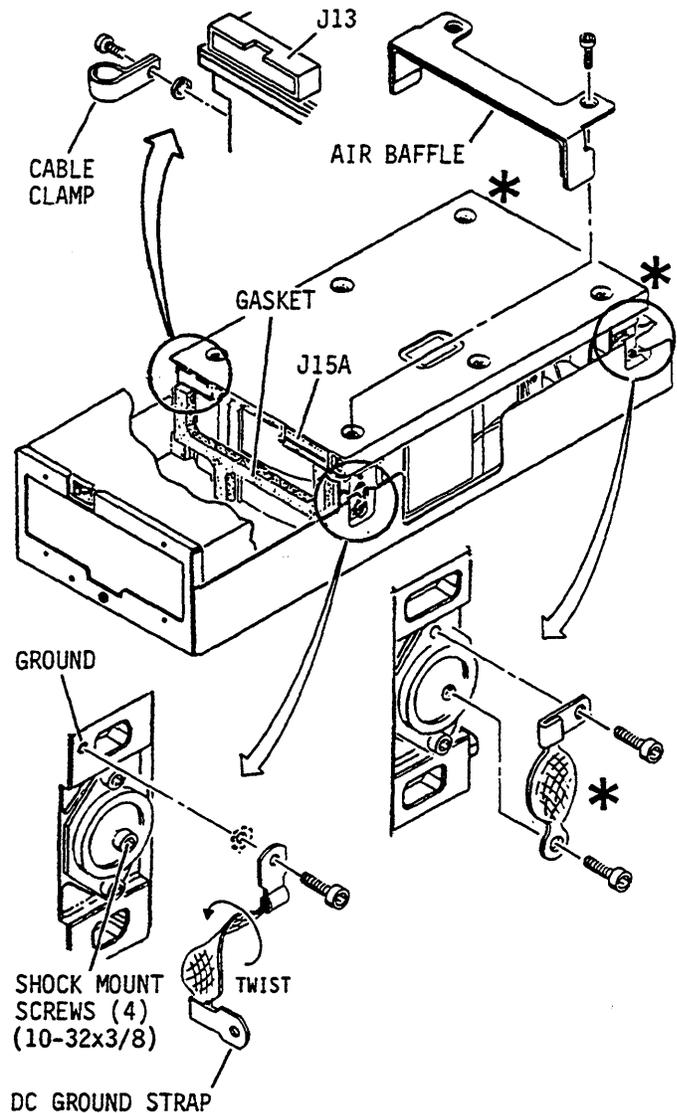
IIT I35

# Installing the Drawer in the Tray

1. Slide drawer into tray.

2. Continue pushing drawer toward rear of
   tray until locked. As shown in the
   illustration, there is a lock for each drawer
   at the rear of the tray.

3. Repeat steps 1 and 2 for other drive.

4. Connect one end of ac power cable to short
   ac power cable. Connect the other end to
   site power.



PUSH UNTIL
LOCK ENGAGES

LOCK

DRAWER          TRAY                    IIT64A
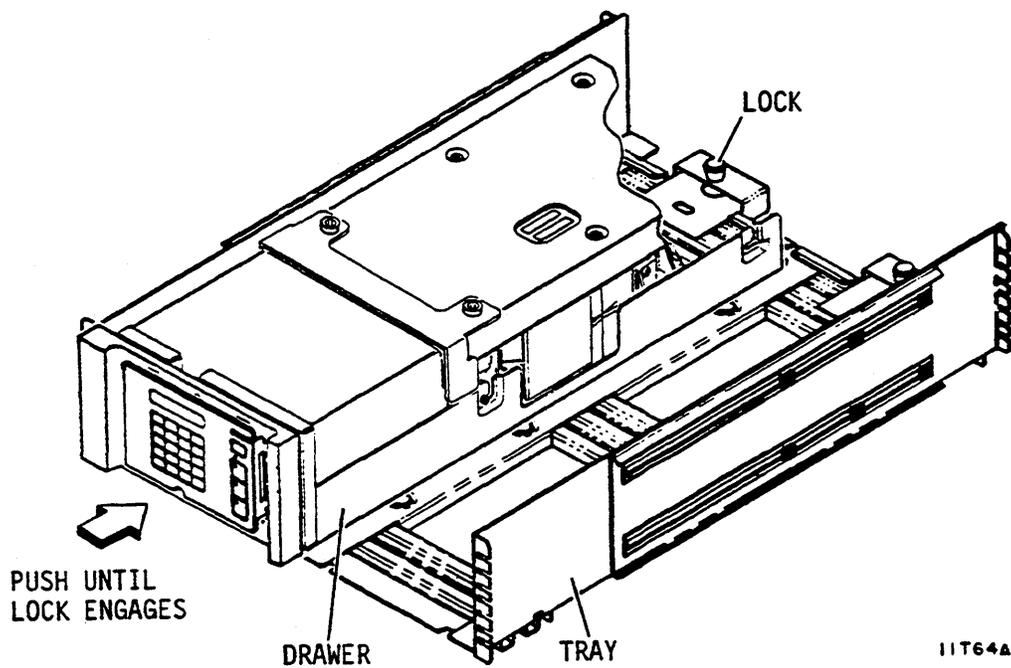
# Installing the Front Panel

Perform this procedure only if an optional operator panel or status/control panel is NOT being installed.

1. Position front panel on drive. Turn front panel 180° if drive is placed at the right side of tray.

2. Align top edge of front panel with top edge of drawer.

3. Ensure front panel is positioned for best alignment and appearance and secure it with (4) screws.

4. Install air filter.

FRONT PANEL

FRONT PANEL SCREW (4) (6-32x7/8)

FILTER

DRAWER

IITI08
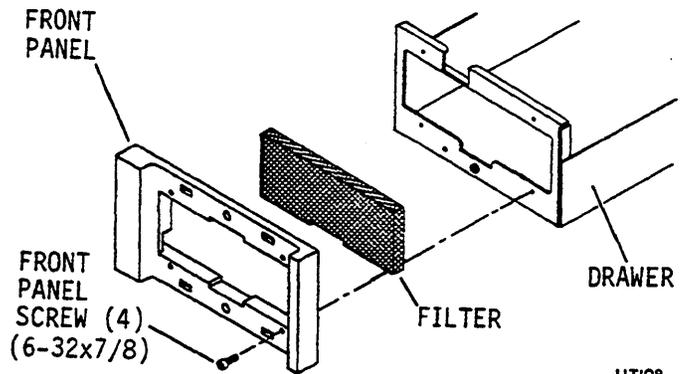
5. Remove adhesive backing from filler plate and attach it to front panel insert.

6. Install front panel insert.

FILLER PLATE

FRONT PANEL INSERT

IIF335A
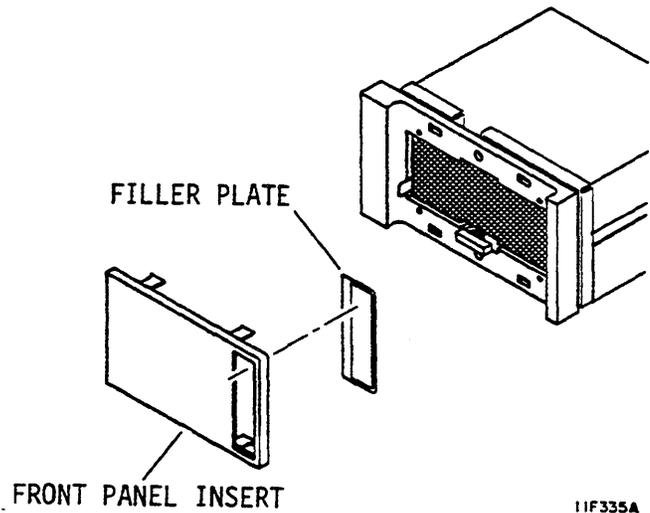
# Mounting the Status/Control Panel

Use this procedure to complete the mounting of the optional status/control panel. The jumper cable that connects the status/control panel to the control board should already be installed in the drawer.

1. Orient front panel so wide edge faces left on left drive and right on right drive.

2. Center screw holes in front panel on screw holes in drawer.

3. Insert two screws on right side of front panel.

4. Install air filter.

5. Connect P13 on jumper cable to P13 on status/control panel.

6. Align status/control panel to front panel and secure with screws.

7. Remove protective film from status/control panel.

8. Install front panel insert.
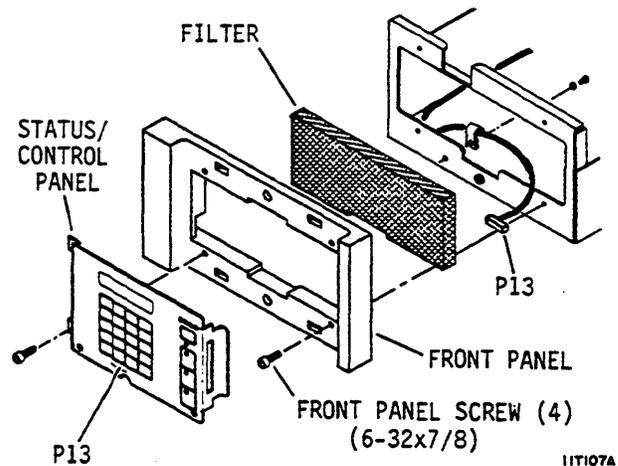
# Mounting the Operator Panel

Use this procedure to complete the mounting of an optional operator panel. The jumper cable that connects the operator panel to the control board should already be installed in the drawer.

1. Orient front panel so wide edge faces left on left drive and right on right drive.

2. Center screw holes in front panel on screw holes in drawer.

3. Insert two screws on left side of front panel.

4. Install air filter.

5. Remove screws holding operator panel to shield.

6. Align shield and front panel and secure both to drawer with screws.

7. Connect P13 on jumper cable to P13 on operator panel.

8. Position operator panel on shield and secure with screws.

9. Install front panel insert.
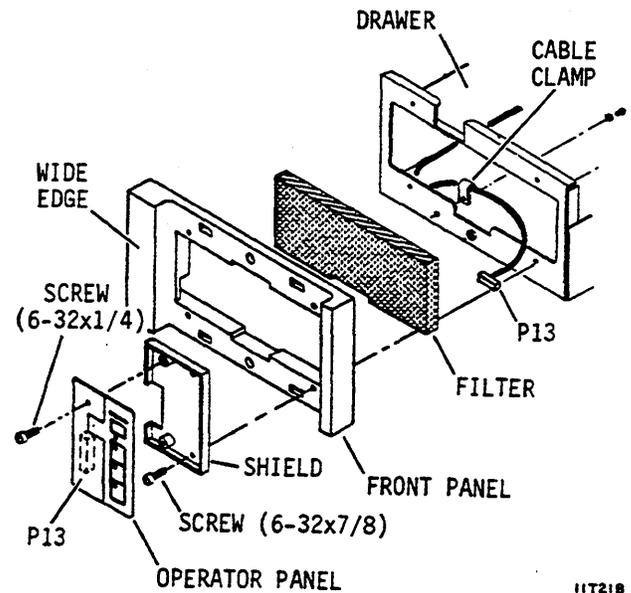
# Other Ways to Mount the Drive

The following requirements must be met if the drive is mounted in other than the optional drawer:

- Support the drive by its shock mounts, either horizontally or vertically.

- Allow adequate clearance between the drive and any surfaces near it.

- Ensure the mounting design allows adequate ventilation of the drive and power supply.

- Install the optional fan kit if the power supply is mounted remotely from the drive.

When the power supply mounting is remote from the drive, a shielded dc power cable is recommended. One end of the cable connects to J15 on the power supply, and the trailing ground lead on that end connects to the ac ground terminal on the power supply. The other end of the cable connects to J15(B) on the drive. The trailing ground lead on that end connects to the dc ground screw at the back of the drive.

When the power supply is mounted remotely from the drive, we recommend that you use a shielded ac power cable and connect the shield to the power supply case. As shown below, you must remove the heat shrink from the short ac power cable to expose the shield. Install a cable clamp on the shield and attach it to the ac ground screw on the power supply.

The optional fan assembly must be installed at the back of the drive to provide adequate cooling airflow. The fan kit has the fan mounted so the airflow arrow (on the body of the fan) will point toward the drive. This blows cooling air through the drive and is the preferred method. If, however, the installation requires it, the fan may be reversed so that the airflow arrow points away from the drive. This draws warm air out of the drive.



NOTE:

⚠ DO NOT TOUCH PINS ON CONNECTOR J15. POWER SUPPLY CIRCUITRY IS SENSITIVE TO ELECTROSTATIC DISCHARGE.

IIT65A
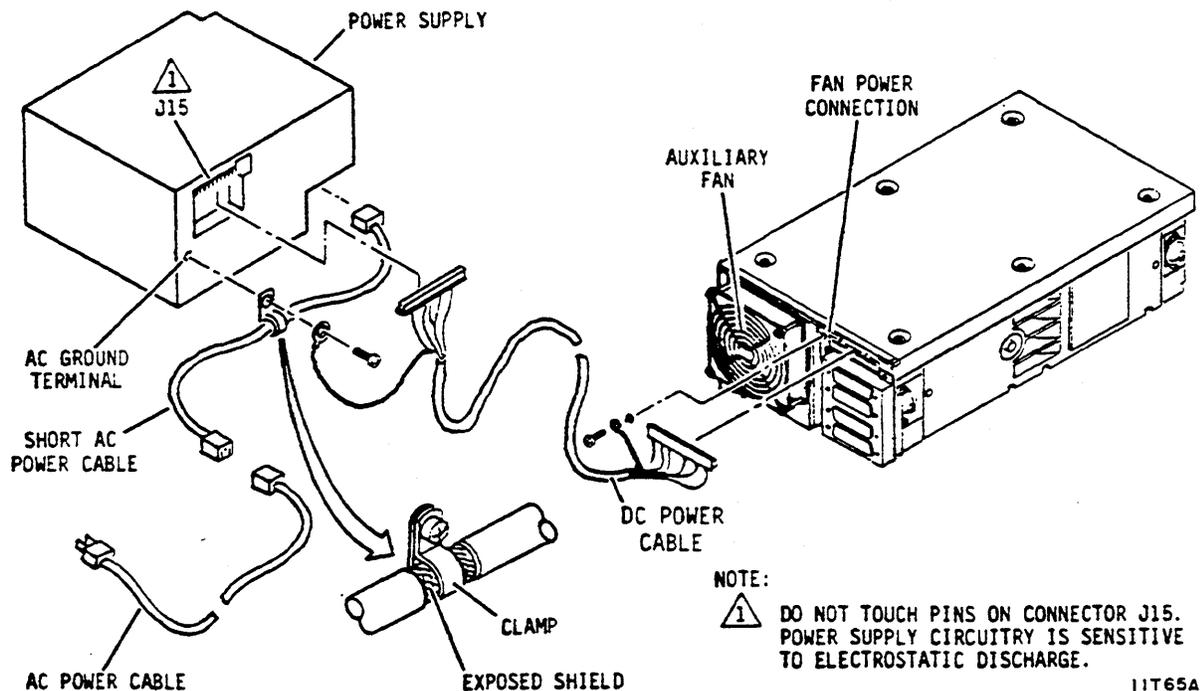
# Connecting the System I/O Cabling

The D-subminiature I/O connectors shown are used on most units. Micro-D I/O connectors used on some units have the same layout but are physically smaller.

## Star System I/O Cabling

> **NOTE**
>
> You can use the star cabling scheme only if the controller has one unused I/O connector for each drive in the system.

1. Route an I/O cable from controller to each drive in system.

2. Connect controller end (port A) of each I/O cable to appropriate I/O connector for each drive.

3. Connect drive end of each I/O cable to J4-1 on each drive.

> **NOTE**
>
> Use the enable/disable switch on I/O board to disable unused ports.

4. Install terminator on I/O connector J3-1 on each drive.

5. If this is a dual port system, repeat steps 1 through 4 for second controller (port B). I/O cables connect to J4-2 on each drive and terminator is installed on J3-2.

PORT "A" TERMINATOR

PORT "A" I/O CABLE
FROM CONTROLLER "A"

J3-1

J4-1

PORT "B" TERMINATOR

J3-2

J4-2

PORT "B" I/O CABLE
FROM CONTROLLER "B"
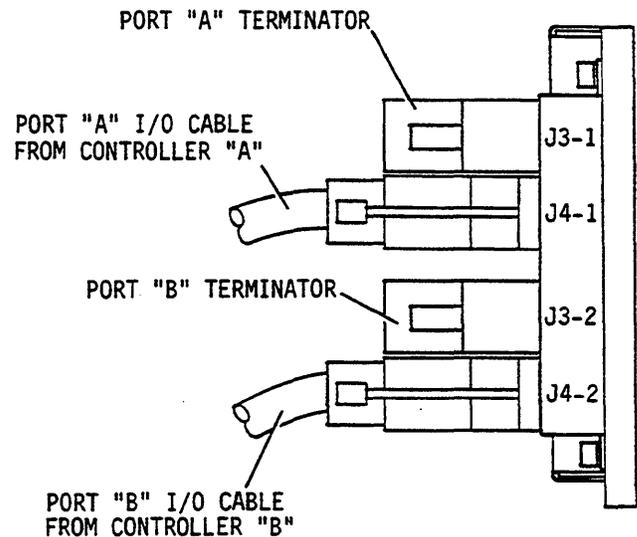
11F359A

## Daisy Chain I/O Cabling

A daisy chain I/O scheme needs only one I/O connector on the controller.

1. Route one I/O cable from controller to first drive in the string.

2. Connect controller end of I/O cable to port A drive I/O connector on controller.

3. Connect drive end of I/O cable from controller to J04-1 on first drive.

4. Continue connecting drives by routing I/O cable between J03-1 on drive and J04-1 on next drive in string.

> ## NOTE
>
> Do not install a terminator on an unused port (i.e., if an I/O cable is not connected to J04-1 or J04-2). Disable an unused port with the port enable/disable switch on I/O board.

5. Install a terminator on J03-1 on the last drive in the string.

6. If this is a dual port system, repeat steps 1 through 5 for second controller (port B). I/O cables connect to J04-2 on each drive and terminator installs on J03-2 on last drive in string.

```
ALL EXCEPT LAST DRIVE IN STRING
```

PORT "A" I/O CABLE TO NEXT DRIVE
PORT "B" I/O CABLE TO NEXT DRIVE
PORT "A" I/O CABLE FROM CONTROLLER "A" OR PRECEDING DRIVE
PORT "B" I/O CABLE FROM CONTROLLER "B" OR PRECEDING DRIVE
J3-1
J4-1
J3-2
J4-2

```
LAST DRIVE IN STRING
```

PORT "A" TERMINATOR
PORT "A" I/O CABLE FROM PRECEDING DRIVE OR CONTROLLER "A"
PORT "B" TERMINATOR
PORT "B" I/O CABLE FROM PRECEDING DRIVE OR CONTROLLER "B"
J3-1
J4-1
J3-2
J4-2
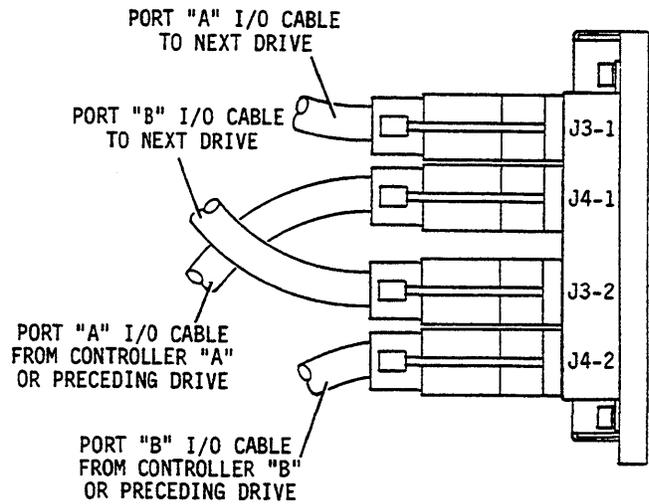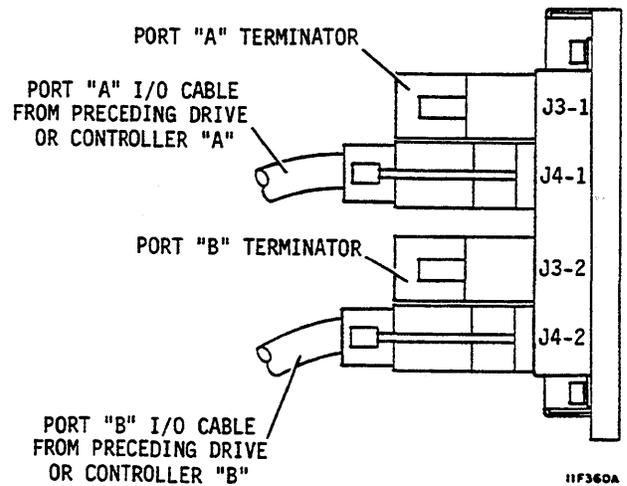
IIF360A

# Synchronizing the Spindle

The spindle sync feature makes it possible to synchronize the spindle rotation of a group of disc drives. This reduces the latency normally encountered when the controller switches between multiple disc drives. Detailed technical information about this feature is provided in Seagate specification 64400300. Use of this feature is optional.

If this feature is used, each drive in a daisy chain will synchronize its spindle to a reference clock. The following illustration shows diagrams for two system configurations. In one type of system, one of the disc drives in the system provides the reference clock. In the other type, an external signal source provides the reference clock.
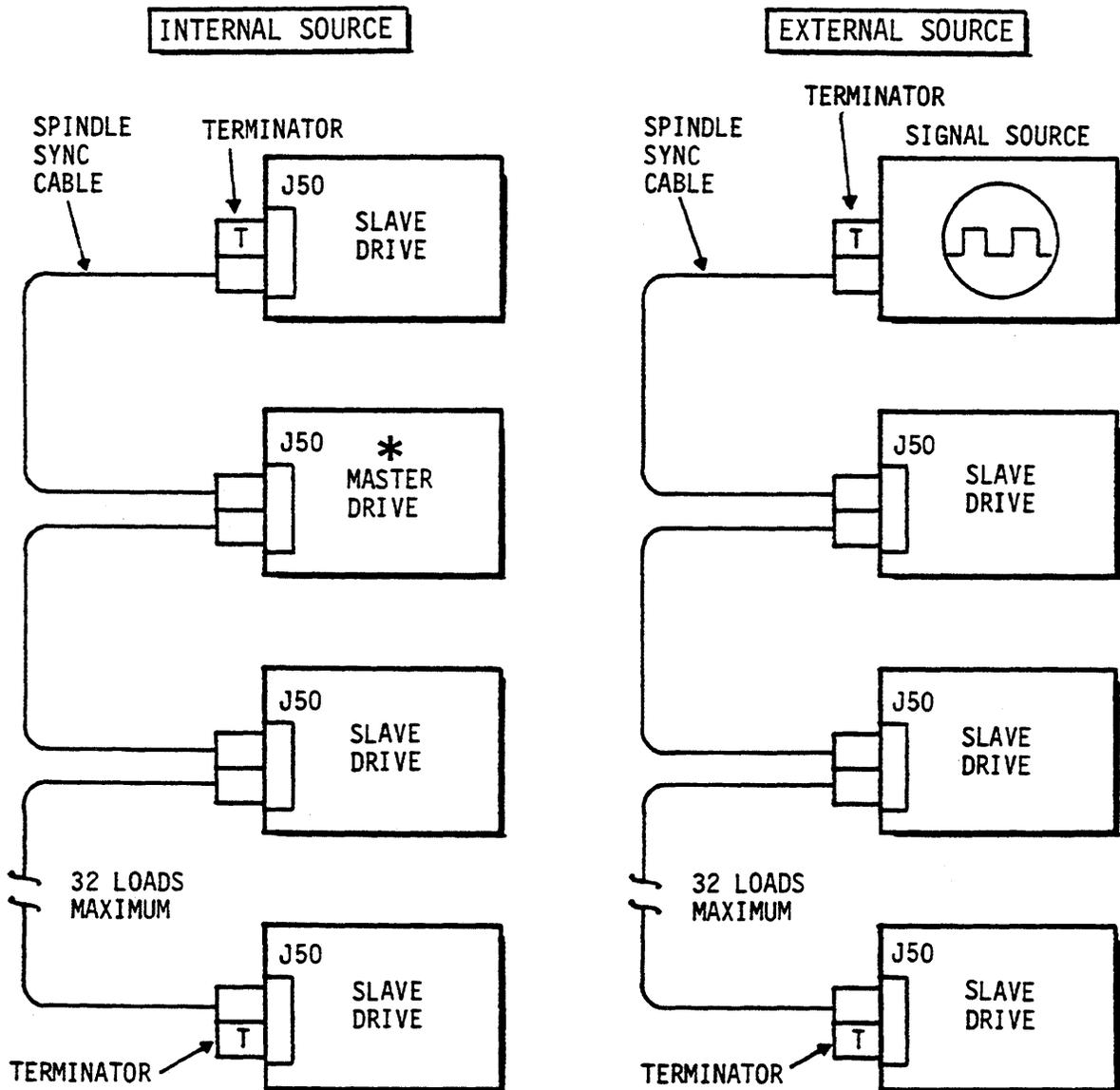


* MASTER DESIGNATED BY JUMPER OR BY CONTROLLER

IIS2I

## Locating J50 and the Rear Panel DIP Switches

As shown in the system diagrams, the spindle sync connection is made at connector J50, located on the rear panel just below the DIP switches.

The top DIP switch (farthest from J50) is called the Enable Master Sync switch. Setting this switch is discussed in the next topic.

DIP SWITCHES

CONNECTOR J50
(SPINDLE SYNC)
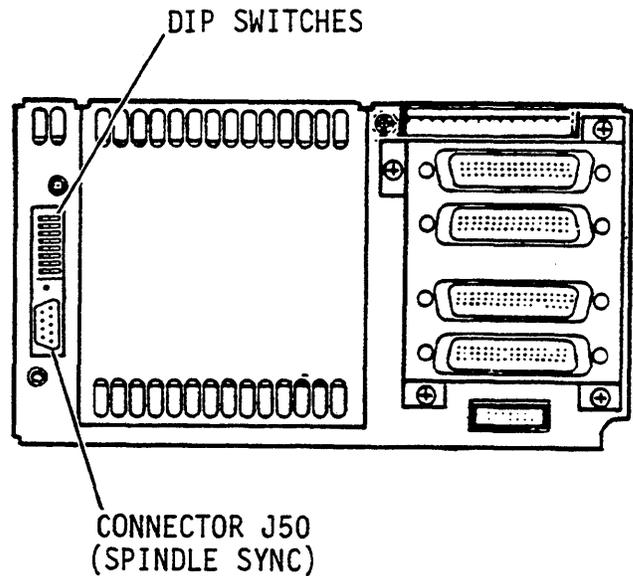
IIF385

## Master/Slave Selection

### *Setting the Enable Master Sync Switch*

The Enable Master Sync switch (shown above) allows the drive to be designated a master or slave. The Enable Master Sync switch is set in the Off (Open) position when the drive is shipped from the factory. If the Enable Master Sync switch setting is changed to the On (Closed) position, the drive is designated a master, and it provides the sync reference signal to all other drives and controllers connected in the daisy chain.

Only one drive in the daisy chain can be established as the master. The master drive can be located anywhere along the daisy chain as long as both ends of the cable are terminated.

The Enable Master Sync switch must be set in the Off (Open) position on all other drives in the string. For these drives (called slave drives), the reference signal must be provided by an external source.

The spindles will synchronize to an external source if the Enable Master Sync switch is set in the Off (Open) position on all drives and the cable is connected to an external reference.

## *Designating a Master Using Bus Controls*

A drive can be designated a master using Bus Controls issued on the IPI-2 interface, rather than using the Enable Master Sync switch on the I/O board. For Bus Controls to be effective, the Enable Master Sync switch must be set in the Off (Open) position. Bus Control 'Load Drive Function' (01) with function code 'Enable Master Sync' (2F) causes the selected drive to become a master. As such, it provides the spindle sync reference signal to the other drives in the string.

If the 'Enable Master Sync' function is presented to a drive that is designated as a master using the Enable Master Sync switch, it rejects the 'Enable Master Sync' function and provides Slave Ending status 'Bus Control Exception'. This sets bit 5 of octet 0 in Status Response 'Bus Control Exception', and bit 6 of octet 2 in Status Response 'Invalid Parameter'.

A Bus Control 'Load Drive Function' (01) with 'Disable Master Sync' function code (2E) causes the selected drive to cease being a master. It must obtain the sync reference signal from another source.

If the drive has been designated a master using the Enable Master Sync switch, it rejects the 'Disable Master Sync' function and provides Slave Ending status 'Bus Control Exception'. This condition sets bit 5 of octet 0 in Status Response 'Bus Control Exception' and bit 6 of octet 2 in Status Response 'Invalid Parameter'.

## The Spindle Sync Cable

A special spindle sync cable connects each drive to the reference clock. A terminator is installed at each end of the daisy chain cable.

Part numbers for the spindle sync terminator and cables are provided in the Accessories list earlier in this section.

The number (1, 2, 3) on each connector helps identify which connector to use when making connections described below.

TERMINATOR

TERMINATOR OR
CONNECTION TO
NEXT DRIVE

TO/FROM CONTROLLER
OR PRECEDING DRIVE

CONNECTS TO
J50 ON DRIVE

IIT7I
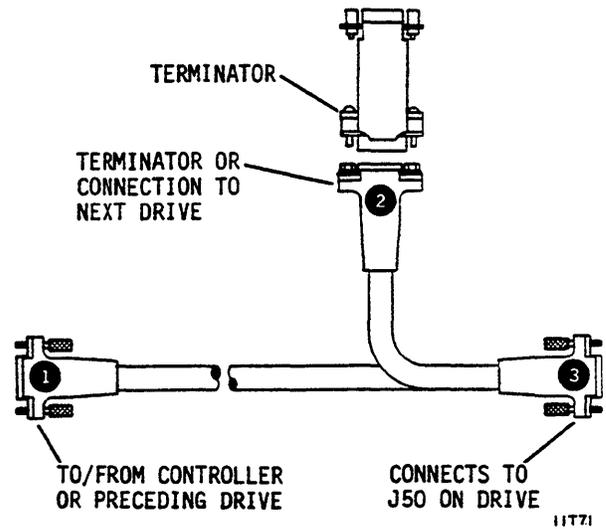
## Spindle Sync Cable Connections

The spindle sync connection is made at connector J50, located on the rear panel just below the DIP switches. The spindle motor control circuits connect to the reference clock using the special spindle sync cable.

Typical spindle sync cable connections are shown in the illustration at the right. Spindle sync cable connections are needed only if the feature is used.

A spindle sync terminator must be installed on connector J50 of each drive if the feature is not used.

CONTROLLER

INSTALL
TERMINATOR
HERE

SPINDLE
SYNC
CABLE

DRIVE 0
J50

DRIVE 1
J50

DRIVE "n"
J50

INSTALL TERMINATOR
HERE, OR HERE    IIT72
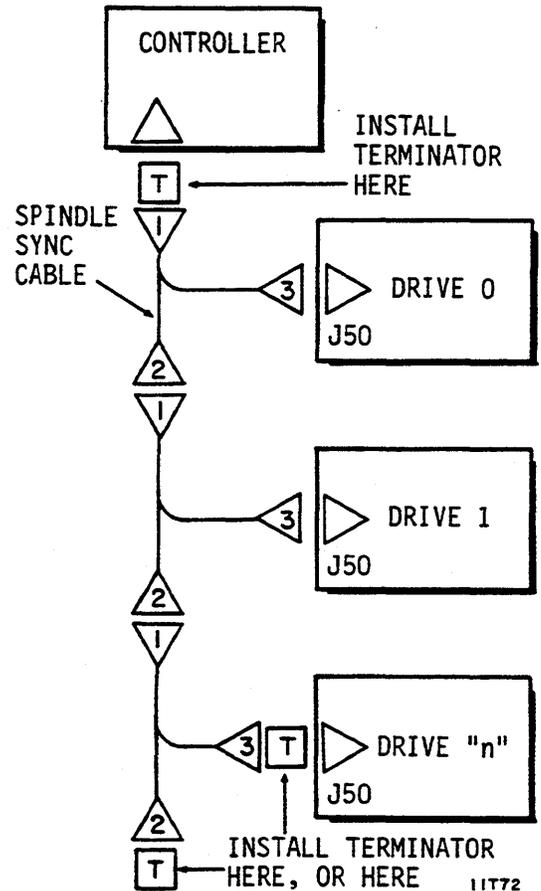
# Grounding the System

Grounding the system through the power cables and I/O cables is usually sufficient to protect against noise and emissions. If additional protection is required, the following instructions are recommended for grounding the system. The first two procedures are optional, but it is necessary to use a grounded ac power cord (see Providing a Safety Ground).

## Connecting a Star System Ground

In this system, the earth ground connection on the controller is connected to an earth ground and to each drive in the system.

1.  Allowing for extension of drives, cut ground straps to length needed to connect each drive to system ground point on controller. Cut one more strap to connect ground on controller to earth ground.

2.  Crimp and solder terminal lugs to both ends of each ground strap.

3.  Remove screw and lockwasher from ground point (DC GND) on each drive.

4.  With lockwasher under ground strap, attach a ground strap to DC GND point on each drive.

5.  Attach controller and all drive ground straps to system ground point on controller.

6.  Connect other end of controller ground strap to earth ground.
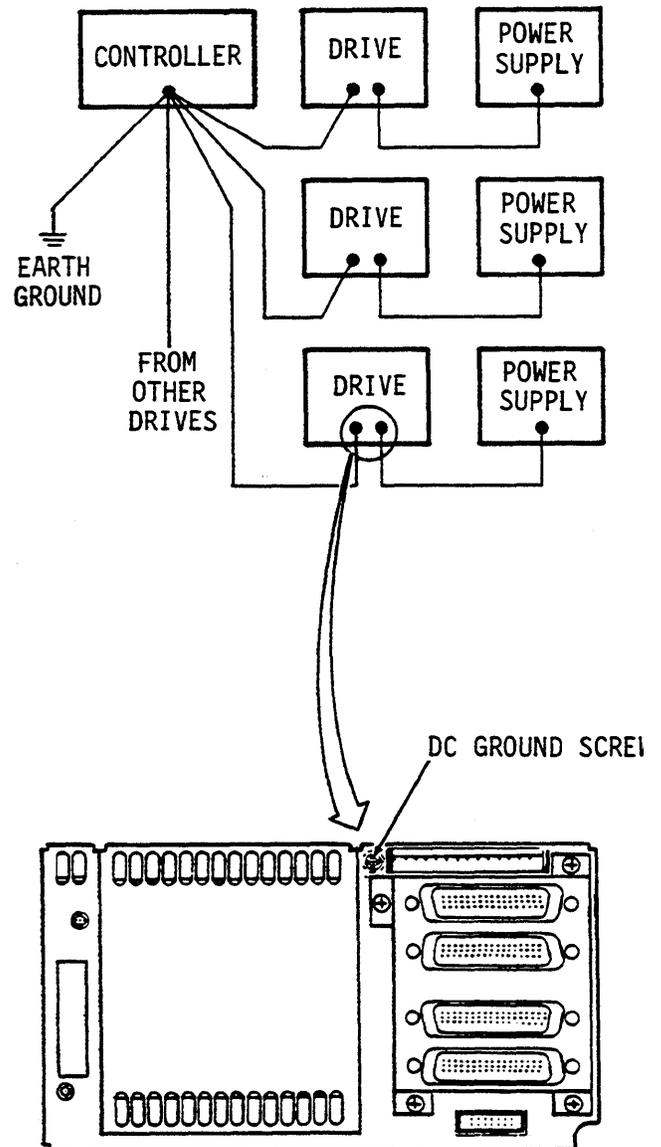
## Connecting a Daisy Chain System Ground

In this system, the earth ground connection on the controller is connected to an earth ground and to the DC GND point on the first drive in the string. Other ground straps connect between the DC GND point on the first and second drive, second and third, etc.

1. Allowing sufficient length for drive extension, cut ground straps to length for use:

   • between each drive

   • between the first drive and controller

   • between controller and earth ground

2. Crimp and solder terminal lugs to both ends of each strap.

3. Remove screw and lockwasher from DC GND point on each drive.

4. With lockwasher under ground straps, attach them to DC GND point on each drive.

5. Attach earth ground strap and ground strap from first drive, to system ground point on controller.

6. Connect other end of controller ground strap to earth ground.
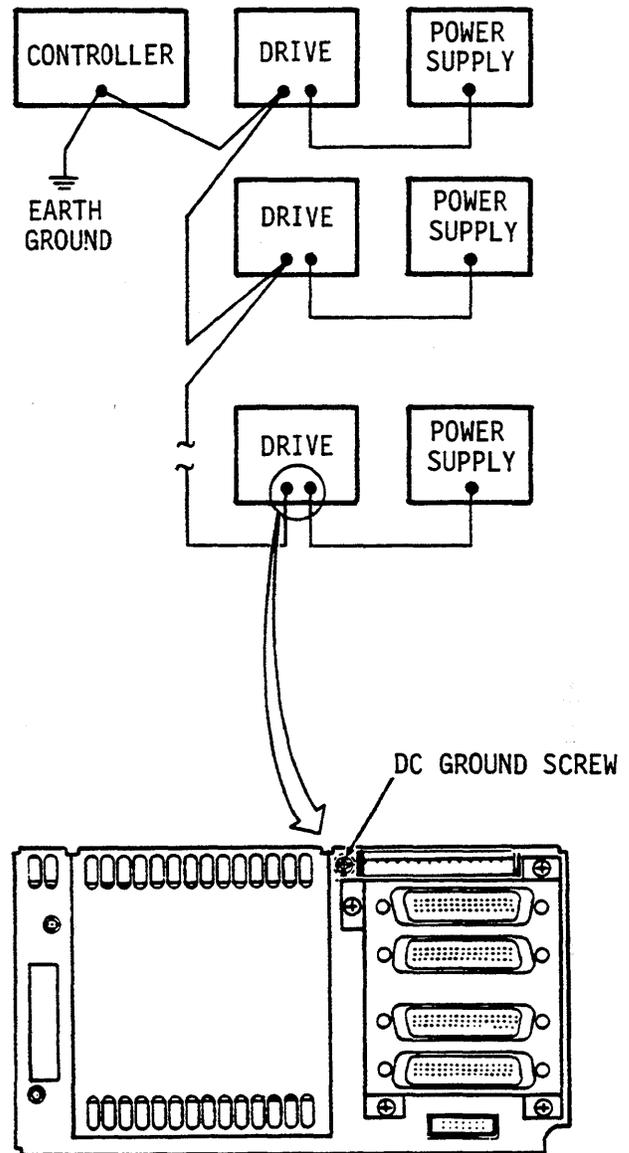


IIF362A

## Providing a Safety Ground

A safety ground must be provided by the site ac power system. The green wire (or green wire with yellow stripe) in the drive power cord provides the safety ground connection between the power supply and the site ac power system. The site ac power system must provide the safety ground to earth ground connection.

All site ac power connection points, including convenience outlets for test equipment, must be maintained at the same safety ground potential.

SAFETY
GROUND

115V - 60 Hz

NEUTRAL    PHASE

SAFETY
GROUND

230V - 50 Hz

PHASE    NEUTRAL

SAFETY
GROUND

240V - 60 Hz

NEUTRAL    PHASE
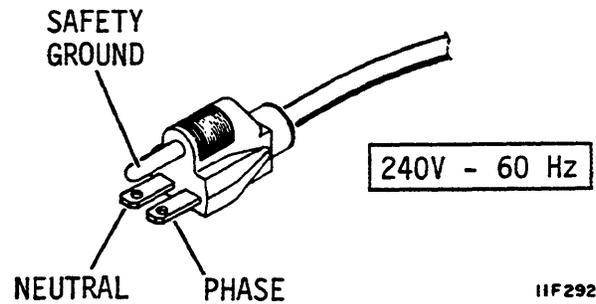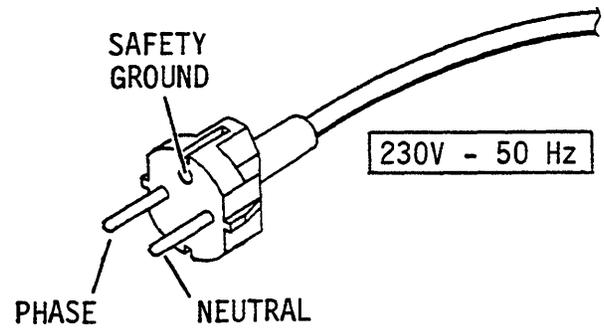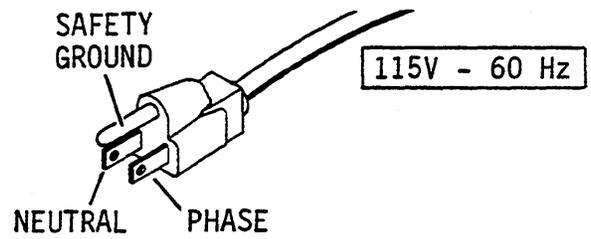
IIF292A

# Setting the Circuit Board Switches

## How to Operate DIP Switches

Two groups of small switches (called DIP switches) allow tailoring the drive to your exact needs. One set of DIP switches is found on the I/O board. You reach them through a hole at the left side of the rear panel. The other set is found on the control board. They are reached through holes in the drive top cover.

You may encounter two types of switches. Rocker switches are actuated by pressing one end of the actuator or the other (rocking it) to turn the switch on (closed) or off (open). Slide switches are turned on or off by sliding the actuator one way or the other. Use a slender ball point pen, a straightened paper clip, or any similar object to change the switch settings. Do not use a lead pencil point as it may break off and lodge in the switch, or cause the switch to malfunction.

The switches are mounted in a plastic case and are usually numbered. Other labels may appear next to the switches on the circuit board, or a label may appear at the sides of the access hole in the drive. The position of the labels may not always coincide with the switch setting that enables the function. Always use the table of switch settings to properly set the switches for your needs. A switch is considered closed in the on position and open in the off position.

SWITCH 4 IS CLOSED. PUSH DOWN HERE TO OPEN SWITCH 4.

SWITCH 7 IS OPEN. PUSH DOWN HERE TO CLOSE SWITCH 7.

ON CLOSED

OFF OPEN

**ROCKER SWITCH**

LABELS VARY

SWITCH 4 IS CLOSED. PUSH SIDEWAYS HERE TO OPEN SWITCH 4.

**SLIDE SWITCH**

SWITCH 7 IS OPEN. PUSH SIDEWAYS HERE TO CLOSE SWITCH 7.

ON CLOSED

OFF OPEN

11D652
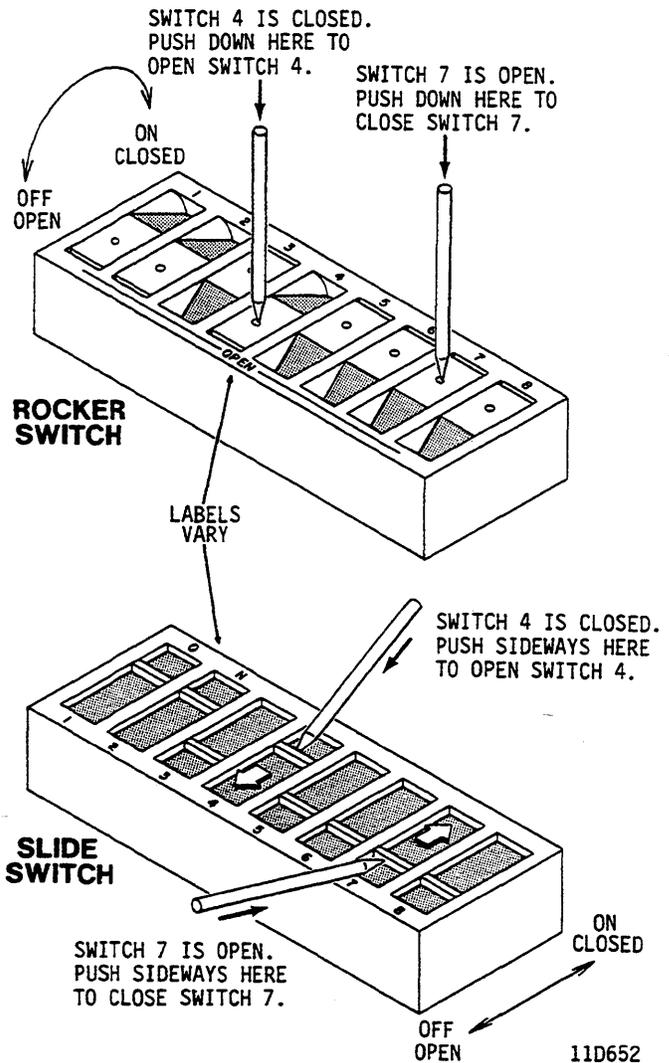
## Setting the I/O Board Switches

The switches on the I/O board are accessible through holes in the rear panel. Use the table on the following pages to determine if the switch settings must be changed. Some of the switches listed are not on all I/O boards.

ENABLE MASTER SYNC       ENABLE SLAVE SYNC

$2^0$
$2^1$ } ID MICROCODE
$2^2$
$2^3$

DISABLE R/W DIAGNOSTICS      ENABLE R/W DIAGNOSTICS
DISABLE PORT A      ENABLE PORT A
DISABLE PORT B      ENABLE PORT B
REMOTE      LOCAL

ON ◄

ON = CLOSED
OFF = OPEN

NOT USED
NOT USED
NOT USED
ENABLE DRIVE DELAY
NOT USED
DISABLE HARDWARE ASSIST
ENABLE I/O SWEEP
ENABLE SHORT RPS

1 2 3 4 5 6 7 8

ON
— OPEN —

ON = CLOSED
OFF = OPEN

DISABLE DRIVE DELAY
ENABLE HARDWARE ASSIST
DISABLE I/O SWEEP
DISABLE SHORT RPS

I/O BOARD SWITCHES

✱ SOME I/O BOARDS DO NOT HAVE
THIS SET OF DIP SWITCHES.

IIT166

## Setting the I/O Board Switches (Contd)

These switches are on all I/O boards.

| Switch | Setting | Description |
|---|---|---|
| Local/Remote (DIP SW 1) | Local (off/open) | Disc spin-up starts (after the sequence delay is satisfied) when:<br>1. DC power is applied and drive does not have an operator or status/control panel.<br>--or--<br>2. DC power is applied and the START switch on the operator or status/control panel is pressed. |
| | Remote (on/closed) | Factory set to this position. Spin-up command from interface is required to start drive. |
| Port Disable (A or B) (B = DIP SW 2) (A = DIP SW 3) | Enable (off/open) | Enables the port for normal operation. Factory set to this position. |
| | Disable (on/closed) | Disables use of the port. |
| Disable R/W Diagnostics (DIP SW 4) | Enable (off/open) | Enables internal diagnostic program to perform read and write operations. Factory set to this position. |
| | Disable (on/closed) | Prevents internal diagnostic program from doing read/write operations. Required setting if diagnostic cylinder (cylinder 2609 for ST82500K drives, cylinder 2653 for ST83050K and ST83220K drives) is used for customer data. |
| ID Microcode (ID3 = DIP SW5) (ID2 = DIP SW6) (ID1 = DIP SW7) (ID0 = DIP SW8) | | These switches assign a unique device configuration code. |
| | SW5, SW6 On; SW7, SW8 Off | ST82500K drives with no RPS Extension Parameters requested. |
| | SW6 On; SW5, SW7, SW8 Off | ST82500K drives with Mandatory RPS Extension Parameters. |
| | SW6, SW7, SW8 On; SW5 Off | ST83050K drives. |
| | SW6, SW7 On; SW5, SW8 Off | ST83220K drives. |
| Enable Master Sync (DIP SW 9) | Enable (on/closed) | Establishes drive as a master for spindle sync. |
| | Disable (off/open) | Drive is a slave unless controller designates it as master. See Synchronizing the Spindle (earlier in this section). |

## Setting the I/O Board Switches (Contd)

These switches are not on all I/O boards.

| Switch | Setting | Description |
|---|---|---|
| Unused (DIP SW 1-3) | | Reserved for future use. |
| Drive Delay Mode (DIP SW 4) | Enable (on/closed) | Drive increases the master turn-around delay received in load format specification command to account for its own internal delays. |
| | Disable (off/open) | Leaves master turnaround delay at its nominal value. |
| Reserved (DIP SW 5) | | Reserved. |
| Hardware Assist Mode (DIP SW 6) | Enable (Off/Open) | Ending status following Bus Controls 04, 05, 06, and 07 is presented much earlier due to hardware implementation. |
| | Disable (on/closed) | The RPS extension parameters are not supported. |
| I/O Board-Initiated Sweep Cycle (DIP SW 7) | Enable (on/closed) | Allows the drive to initiate a seek approximately every 15 minutes if the controller has not issued a seek command during that time. See Sweep Cycle Information (later in this section). |
| | Disable (off/open) | Sweep cycles occur only in conjunction with controller-initiated seeks. |
| Short RPS Mode (DIP SW 8) | Enable (on/closed) | Allows RPS-related commands that complete during the defined RPS time to generate the remaining part of the RPS pulse in order to avoid the loss of a revolution. |
| | Disable (off/open) | Disables Short RPS Mode. |

## Control Board Switch Identification

Use the illustration below to locate and identify the switches on the control board. When you have located and identified the control board switches, set the switches as required for your installation, using the information on the next page.



OFF ⟵⟶ ON

$2^5$ — S1
$2^6$ —
$2^7$ —
$2^8$ —
$2^9$ —
$2^{10}$ —
$2^{11}$ —
$2^{12}$ —
$2^{13}$ —
$2^{14}$ — S10

SECTOR SELECT SWITCHES

S2

OFF ⟵⟶ ON

S1 — $2^0$
— $2^1$   LOGICAL
— $2^2$   ADDRESS
— $2^3$   SWITCHES
— WP/N
— $2^0$
— $2^1$   SECTOR
— $2^2$   SELECT
— $2^3$   SWITCHES
S10 — $2^4$

S1

I/O PANEL
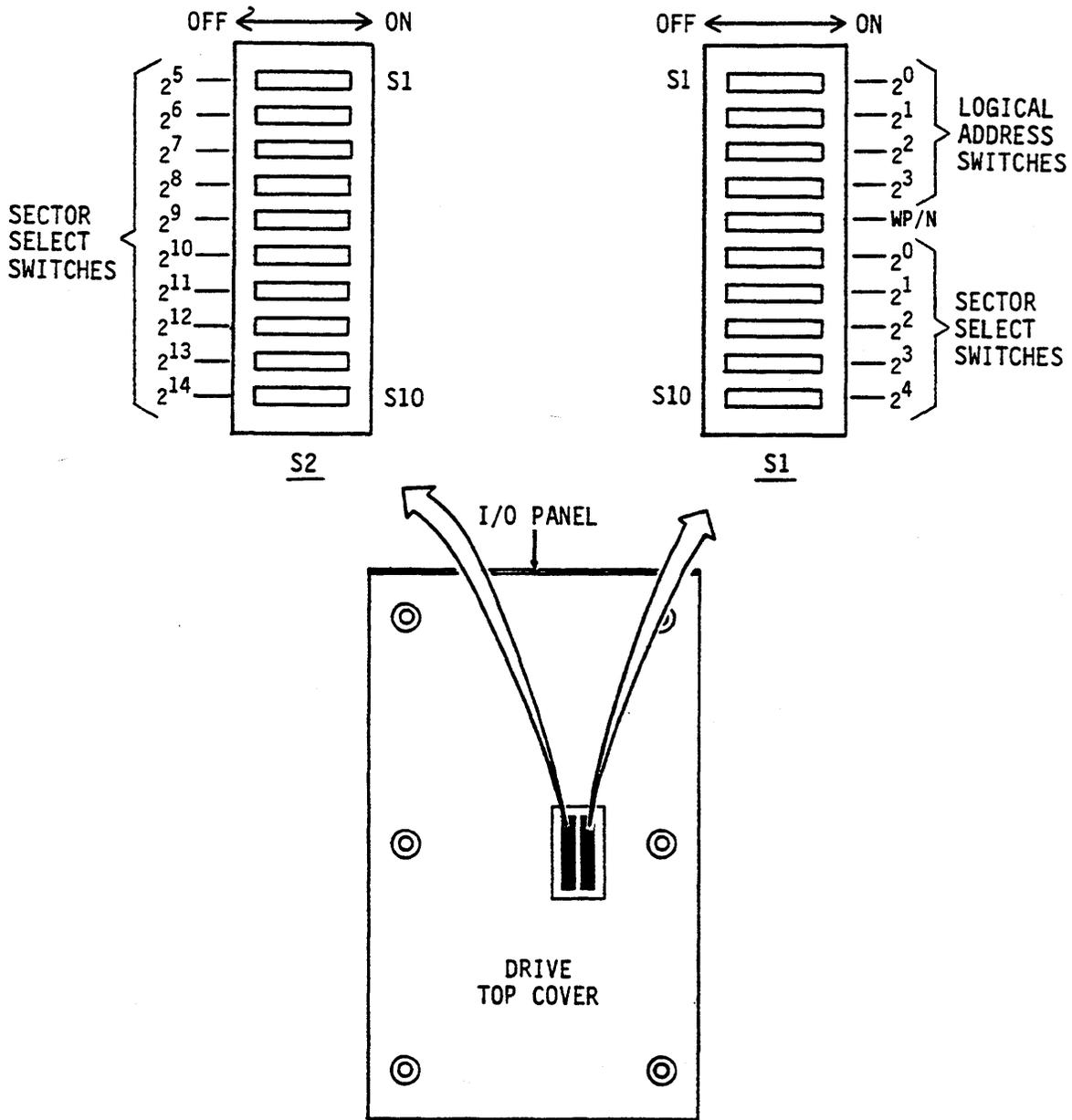
DRIVE
TOP COVER

IIT69C

## Control Board Switch Settings

Remove the plastic cover from the switch access hole in the drive top cover. Switch settings made at the factory can vary so always check these settings and change them if necessary to best meet your needs. Be sure to install the plastic cover when finished with switch settings.

| Switch | Setting | Description |
|---|---|---|
| Sector Switches | | Not used. Changing the switch settings has no effect. ST83050K drives do not have these switches. |
| Logical Address | | If no operator panel or status/ control panel is used, select the logical address from the table below and then set switches as shown. The switches are factory set for address 0 (all on/closed). |

| Logical Address | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
|---|---|---|---|---|
| 0 | ON | ON | ON | ON |
| 1 | ON | ON | ON | OFF |
| 2 | ON | ON | OFF | ON |
| 3 | ON | ON | OFF | OFF |
| 4 | ON | OFF | ON | ON |
| 5 | ON | OFF | ON | OFF |
| 6 | ON | OFF | OFF | ON |
| 7 | ON | OFF | OFF | OFF |

These switches are ignored if an operator or status/control panel is used. Select the logical address as described in section 3.

| Switch | Setting | Description |
|---|---|---|
| WP/N | WP (off/open) | Write Protect (prevents writing). |
| | N (on/closed) | Normal (allows writing). |

## Control Board Jumper Settings

The control board has jumpers that control operation of some special features. Setting of these jumpers is described in the table on the next page, and in the Sweep Cycle Information that follows it. Review this information carefully to determine if jumper settings must be changed.

You can check the jumper positions through the access hole in the top cover (they are located at the I/O panel end of the access hole). You may find it easier to change jumper positions if the top cover is removed. Install the top cover or the plastic hole cover when finished checking or setting jumpers.

A jumper is connected when it connects the two pins, and is disconnected when it is removed or left connected to only one of the two pins.

ST82500K JUMPERS

ST83050K JUMPERS

ST83220K JUMPERS
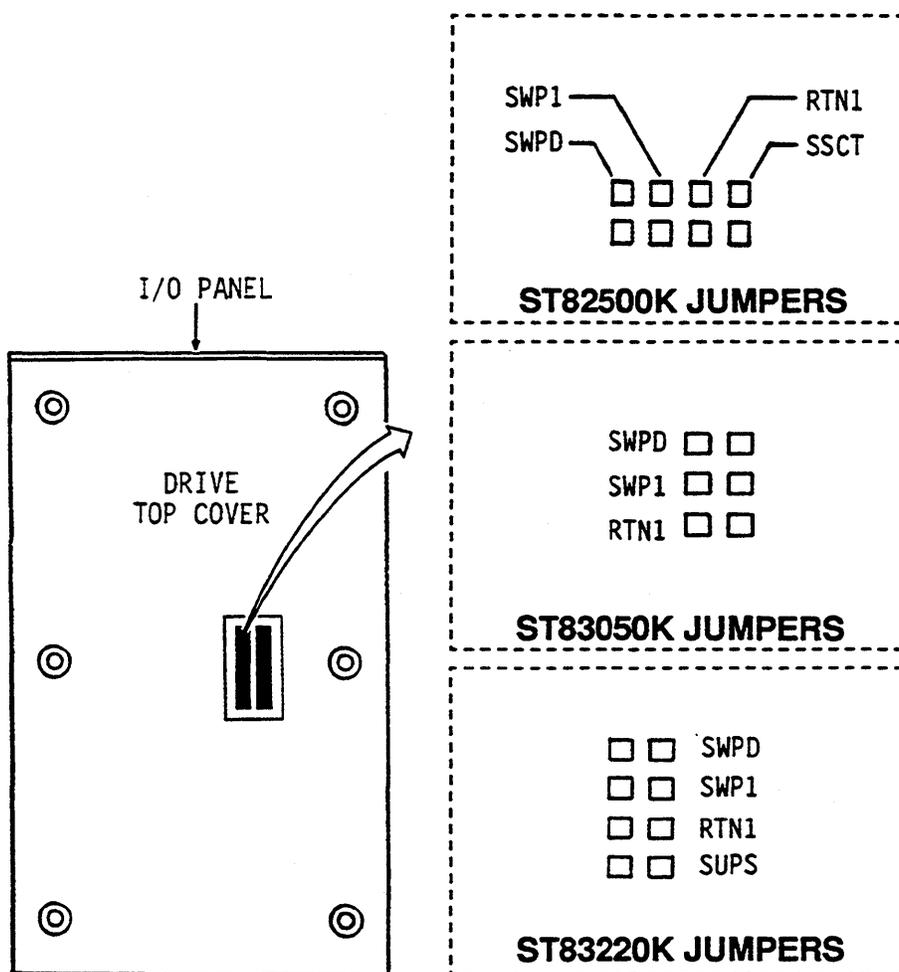
IITI33 B

## Control Board Jumper Settings (Contd)

| Jumper | Position | Description |
|---|---|---|
| SSCT or SUPS* (Runt Jumper) | Connected | Runt sector pulses are suppressed. |
| | Disconnected | Runt sector pulses may appear. The drive is shipped with this jumper disconnected. |
| SWP1** | Connected | Disables the option for sweep cycle only on seeks. This position is not used. |
| | Disconnected | Enables the option for sweep cycle only on seeks. Do not change this factory setting. |
| SWPD** | Connected | Disables sweep cycle operation. |
| | Disconnected | Enables sweep cycle operation. The drive is shipped with this jumper disconnected. (Some controllers will not function with sweep cycles enabled.) |
| RTN1** (Return) | Disconnected | Disables the option to return heads to their original position after a sweep segment. Do not change this factory setting. |
| | Connected | Enables the option to return heads to their original position after a sweep segment. This position is not used. |
| * This jumper is not on ST83050K drives. | | |
| ** See Sweep Cycle Information (next topic). | | |

2-44

INSTALLATION

83327210 B

## Sweep Cycle Information

The sweep cycle is a feature that periodically moves the heads to different locations on the discs during periods when the drive is idle. Some advantages of using a sweep cycle are:

- It enhances drive reliability. You are encouraged to use the drive sweep cycle or to use a sweep cycle that is driven at the system or subsystem level. Consult with a systems analyst before making this choice.

- The sweep cycle routine only takes about 11 seconds in a 13 hour period. This means the drive is still available to the system more than 99% of the time.

- You may disable the sweep cycle without affecting the specified Mean Time Between Failures (MTBF) or warranty agreements.

Status codes associated with the sweep cycle are discussed in section 4.

### *Enabling the Sweep Cycle Feature*

The three sweep cycle jumpers on the control board (SWPD, SWP1, and RTN1) control the sweep cycle feature. All three jumpers are disconnected to enable the sweep cycle feature when the drive ships from the factory. To ensure proper drive operation when the sweep cycle feature is used, these jumper settings must not be changed. Most I/O boards (those that have two sets of DIP switches) have a DIP switch that enables or disables I/O board-initiated sweep cycles. The effects of that option are discussed below.

### *Disabling the Sweep Cycle Feature*

To disable the sweep cycle feature, connect the SWPD jumper. Leave the SWP1 and RTN1 jumpers disconnected. Their position is irrelevant when SWPD is connected.

### *How the Sweep Cycle Works*

An internal 12-minute timer is started when the drive becomes ready following Power-On or Slave Reset. The drive enters the sweep enable mode when the 12-minutes elapses. While in this mode, the first seek operation initiated by the controller causes a sweep segment. A seek operation is generated when the controller issues a Load Cylinder Address (04) or Load Position (05) Bus Control.

Following the sweep segment, the drive seeks to the cylinder specified in the Bus Control and returns the normal response. At that time, the 12-minute timer restarts and the cycle is repeated. A sweep segment adds 150 milliseconds to the overall time for that specific seek operation. When the drive is in the sweep cycle mode and no seeks are generated by the controller, there are two possibilities:

1. If I/O board-initiated sweep cycles are disabled (DIP switch off), there will be no sweep segment until a new controller command requests a seek.

   If the drive is idle for long periods of time when using the sweep cycle feature, it is recommended that seek operations (any length other than zero-track) be initiated by the controller at regular intervals so that sweep segments are initiated. Another solution to this problem is described below.

2. If I/O board-initiated sweep cycles are enabled (DIP switch on), a 15-minute timeout begins when a sweep segment or seek occurs. If 15 minutes elapse with no sweep or seek activity, the I/O board issues a seek command to the drive. The I/O board will cause a busy condition if the controller should attempt a selection while the sweep segment is in progress. The sweep segment includes a seek to put the carriage back to the original cylinder.

# CHECKOUT

## Checkout in Local Mode

This procedure verifies that the drive power on sequence works properly in the Local mode.

1.  Place the Remote/Local switch on the I/O board in the Local position.

LOCAL MODE ⟶

I/O BOARD SWITCHES

ON ⟵
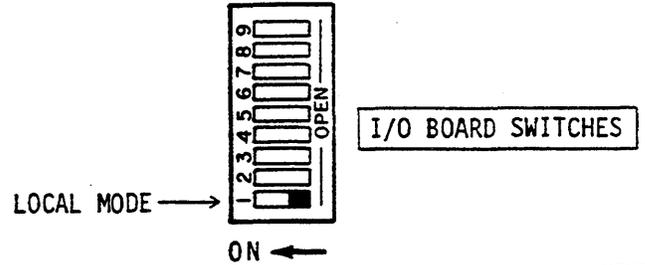
IITII5

---

> ### NOTE
>
> If operator or status/control panel is not used, drive power on sequence starts when power supply On/Standby switch is placed in On position.

2.  Set On/Standby switch on power supply to On (1) and observe that power supply cooling fan is operating.

ON/STANDBY SWITCH

STANDBY = ⏻
ON = 1

IIF262A

---

3.  Set logical address for the drive. No two drives can have same address. Press ADDRESS switch on status/control or operator panel until Address indicators show desired binary address (from 0 through 7). Use address switches on control board if drive does not have operator or status/control panel.

ADDRESS INDICATORS ⟶

8 4 2 1

ADDRESS

SEL

START

FAULT

WRITE PROTECT

PRESS 2-3 SECONDS TO ADVANCE ADDRESS. PRESS AND HOLD TO ADVANCE ADDRESS CONTINUOUSLY.

IIF369

# Checkout in Local Mode (Contd)

4. Press START switch if drive has an operator or status/control panel. Otherwise, skip this step.

START SWITCH —————————

PRESS TO START DRIVE - PRESS AGAIN TO STOP DRIVE

IIF256

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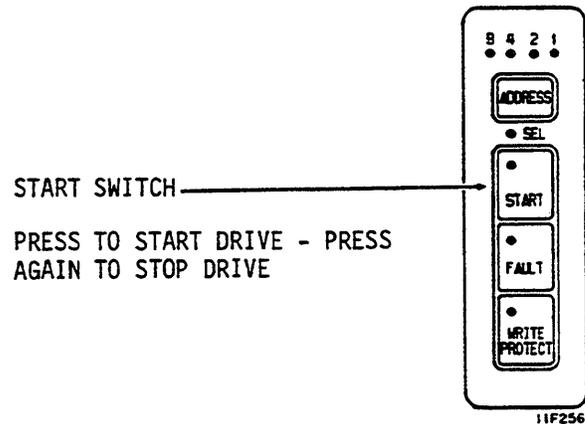
| NOTE |
| --- |
| Each drive power on sequence is delayed (*see exception below) for a time equal to five seconds times its logical address. If logical address is 3, drive starts after 15 second delay. |

Address 0 =  0 second delay
Address 1 =  5 second delay
Address 2 = 10 second delay
Address 3 = 15 second delay
Address 4 = 20 second delay
Address 5 = 25 second delay
Address 6 = 30 second delay
Address 7 = 35 second delay

---

5. Note Ready indicator in START switch flashes rapidly. This means power up sequence has started.

6. Ready indicator stops flashing but stays on within 90 seconds. This means the drive motor is up to speed and the heads are at track 0.

Refer to section 4 of this manual or to the maintenance manual if a problem exists in the drive.

READY —————
FLASHES
RAPIDLY
THEN
STOPS
BUT STAYS
ON WITHIN
90 SECONDS

IIT98A

---
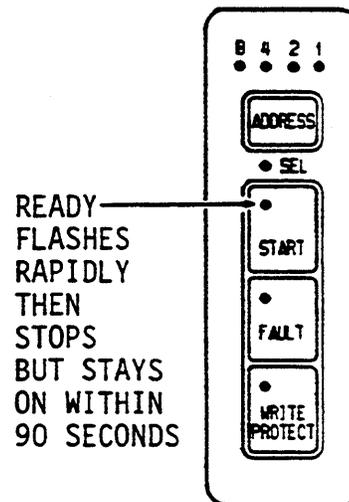
*There is no delay for ST82500K drives that have only one set of DIP switches on the I/O board.

# Checkout in Remote Mode

This procedure verifies that the drive power on sequence works properly in the Remote mode.

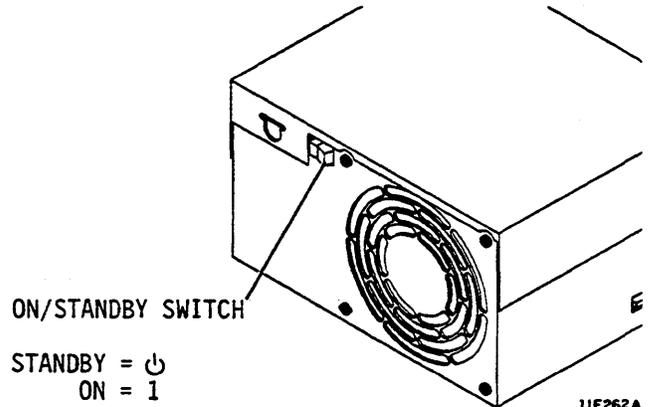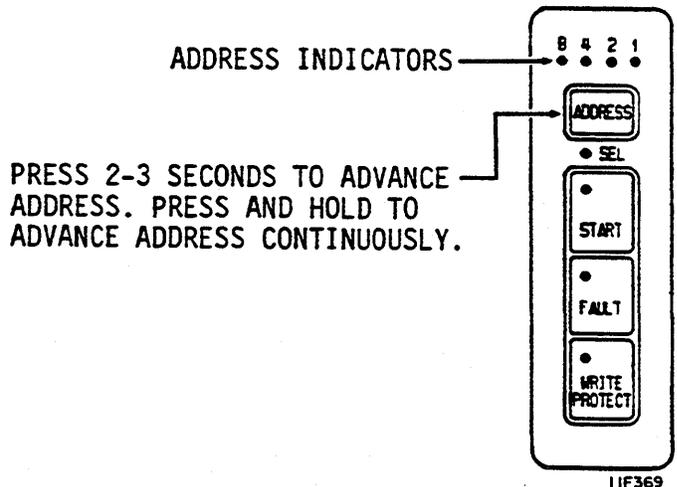1. Place the Remote/Local switch on the I/O board in the Remote position.
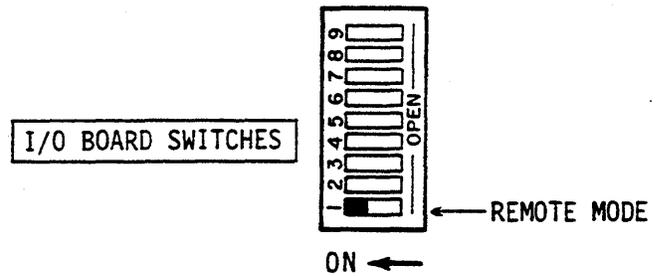
```
I/O BOARD SWITCHES
```

REMOTE MODE

ON ←

IIT114

---

2. Set On/Standby switch on power supply to On (1) and observe that power supply cooling fan is operating.

ON/STANDBY SWITCH

STANDBY = ⏻
ON = 1

IIF262A

---

3. Set logical address for the drive. No two drives can have same address. Press ADDRESS switch on status/control or operator panel until Address indicators show desired binary address (from 0 through 7). Use address switches on control board if drive does not have operator or status/control panel.

ADDRESS INDICATORS

B 4 2 1

ADDRESS

● SEL

START

FAULT

WRITE PROTECT

PRESS 2-3 SECONDS TO ADVANCE ADDRESS. PRESS AND HOLD TO ADVANCE ADDRESS CONTINUOUSLY.

IIF369
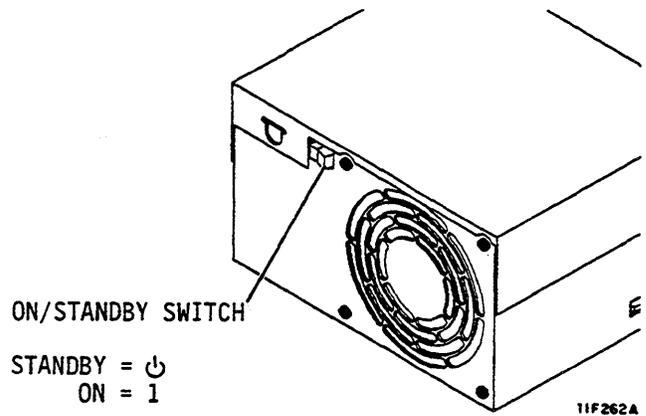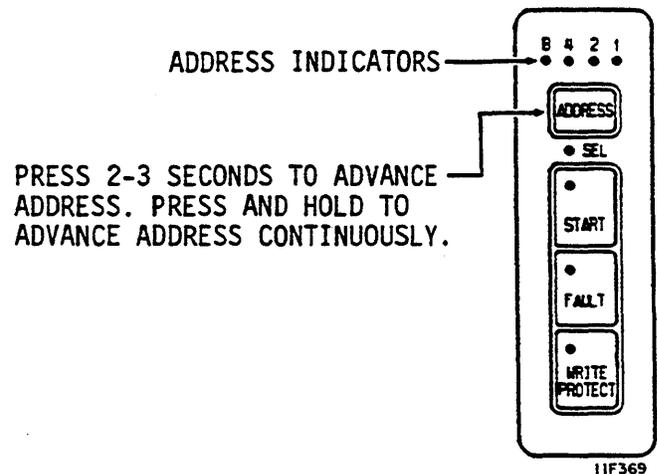
# Checkout in Remote Mode (Contd)

4.  Press START switch if drive has an
    operator or status/control panel. Otherwise,
    skip this step.

START SWITCH

PRESS TO START DRIVE - PRESS
AGAIN TO STOP DRIVE

IIF256

---
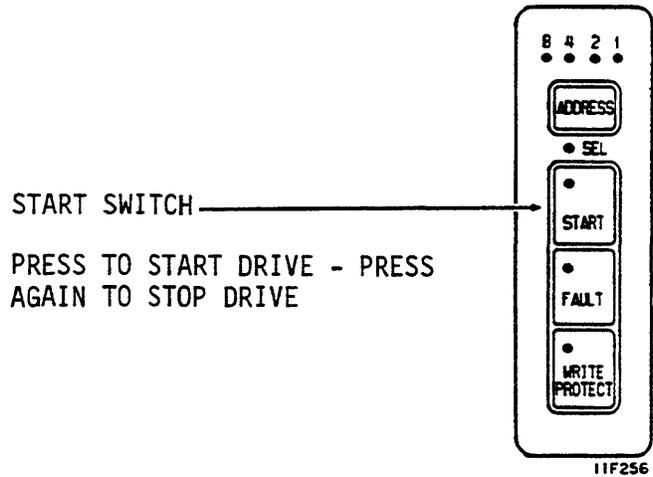
5.  Issue Spin Up command to start the drive.

### NOTE

Each drive power on sequence is
delayed for a time equal to five
seconds times its logical address. If
logical address is 3, drive starts after
15 second delay.

Address 0 =  0 second delay
Address 1 =  5 second delay
Address 2 = 10 second delay
Address 3 = 15 second delay
Address 4 = 20 second delay
Address 5 = 25 second delay
Address 6 = 30 second delay
Address 7 = 35 second delay

---

6.  Note Ready indicator in START switch
    flashes rapidly. This means power up
    sequence has started.

7.  Note Ready indicator stops flashing but
    stays on within 90 seconds. This means
    drive motor is up to speed and heads are at
    track 0.

Refer to section 4 of this manual or to the
maintenance manual if a problem exists in the drive.

READY
FLASHES
RAPIDLY
THEN
STOPS
BUT STAYS
ON WITHIN
90 SECONDS

IIT98A
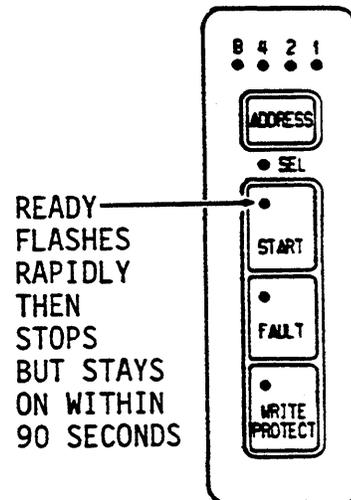
## INTRODUCTION

This section provides the information and instructions to operate the drive. It describes switches and indicators, provides operating instructions, and gives instructions for air filter replacement.

## SWITCHES AND INDICATORS

The controls used to operate the drive are provided on the optional operator panel shown at the right. A blank panel is provided if the operator panel is not used. Operation of drives without an operator panel depends on how various switches were set when the drive was first installed.



OPERATOR PANEL
(OPTIONAL)

IIF251
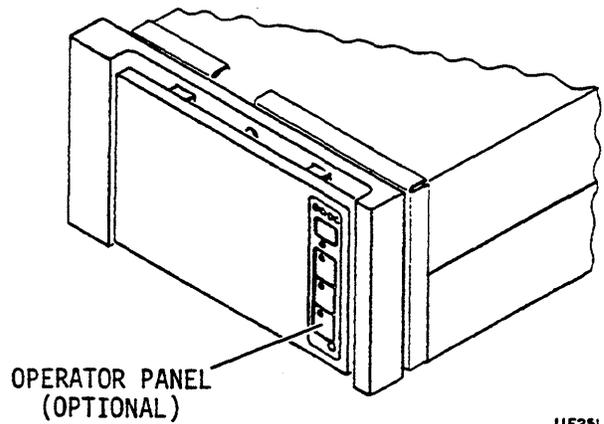
## The Address Indicators

The address indicators show in binary, the logical address of the drive. Although the operator panel allows any address from 0 to 15, you must choose a logical address from 0 to 7 (an IPI interface requirement). No two drives in a string can have the same address.

Logical addresses are set when the drive is installed, and stored in memory when dc power is off. The ADDRESS switch can be used to change the address if needed.

ADDRESS INDICATORS

ADDRESS RANGE = 0-15
(SEE ADDRESS SELECTION)



IIF253A
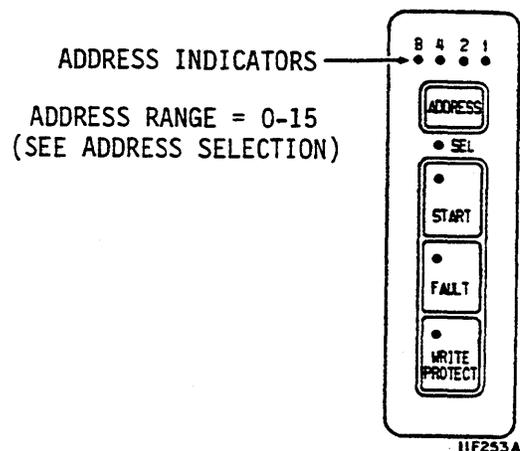
## The ADDRESS Switch

This switch sets the address of the drive. Press and hold the switch for 2 to 3 seconds to advance the address display. The address display advances continuously if the switch is held longer than 3 seconds.

ADDRESS INDICATORS

PRESS 2-3 SECONDS TO ADVANCE
ADDRESS. PRESS AND HOLD TO
ADVANCE ADDRESS CONTINUOUSLY.

11F369
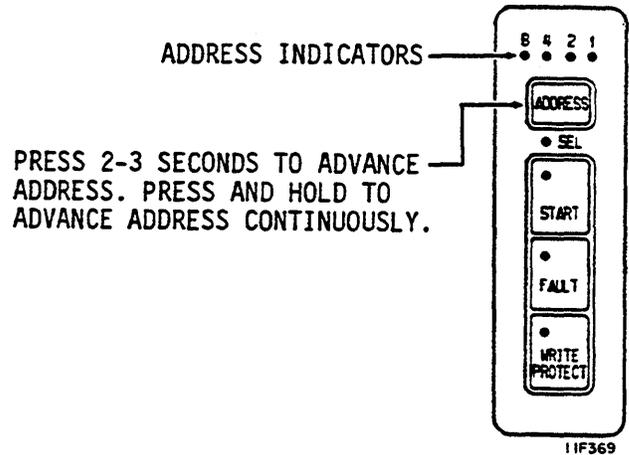
## The SEL (Selected) Indicator

When lit, this indicator tells you the drive is selected. When off, it tells you the drive is not selected.

SELECTED INDICATOR

OFF = NOT SELECTED
ON = SELECTED

11F254
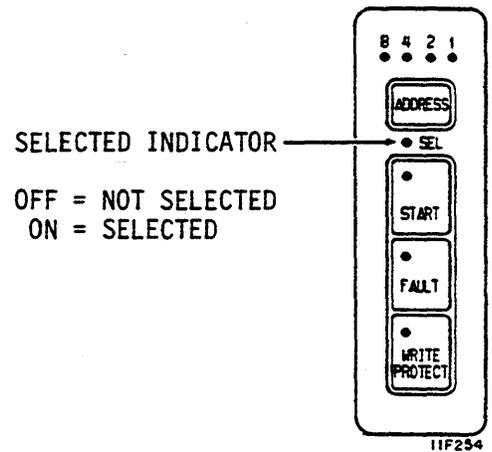
## The Ready Indicator

The Ready indicator is in the upper left corner of the START switch.

This indicator flashes rapidly during the start cycle. It stops flashing and remains on when the start cycle ends to indicate that the heads are loaded and no fault condition exists.

The indicator flashes slowly during the stop cycle. It stops flashing and remains off when the stop cycle ends.

READY INDICATOR

OFF = NOT READY
ON = READY

FLASHING = IN START OR STOP CYCLE

11F255
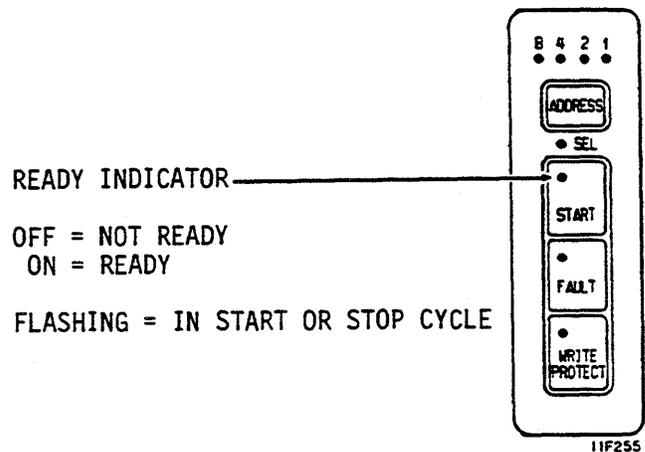
## The START Switch

Press and release this switch to start the drive. The READY indicator in the upper left corner of the switch flashes rapidly during this cycle. It stops flashing and remains on following completion of the start cycle.

Press and release the switch again to initiate the stop cycle. The Ready indicator flashes slowly during this cycle. It stops flashing and remains off when the stop cycle is complete. The switch mode is stored in memory when dc power is removed.

```
START SWITCH ───────────────────────▶

PRESS TO START DRIVE - PRESS
AGAIN TO STOP DRIVE
```

IIF256

---
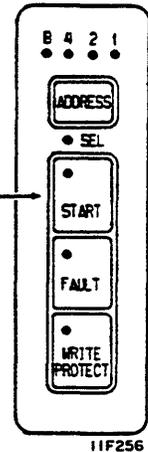
## The FAULT Indicator

This indicator is in the upper left corner of the Fault Clear switch. It lights if a fault condition exists in the drive. The indicator is turned off by any of the following, provided the fault condition is no longer present.

- Pressing the Fault Clear switch

- Reapplying dc power

- A Slave or Logical Selective Reset command from the controller.

```
FAULT INDICATOR ────────────────────▶

 ON = FAULT EXISTS
OFF = NO FAULT CONDITIONS EXIST
```

IIF257
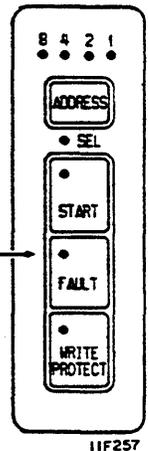
## The Fault Clear Switch

Pressing and releasing this momentary action switch
turns off the FAULT indicator if the fault condition
that initially caused the indicator to light is no
longer present.

```
FAULT CLEAR SWITCH ─────────────→

PRESS TO TURN OFF FAULT INDICATOR
```
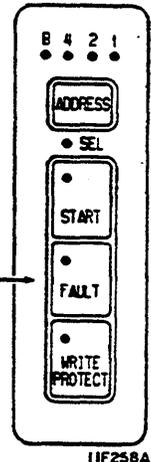
IIF258A

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## The WRITE PROTECT Indicator

The WRITE PROTECT indicator is in the upper left
corner of the WRITE PROTECT switch. When this
indicator is lit, the write protect mode is selected
and the drive is prevented from writing. The drive
can write only when this indicator is off.

```
WRITE PROTECT INDICATOR ─────────→

    ON  = PREVENTS WRITING
    OFF = PERMITS WRITING
```
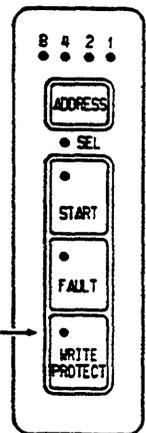
IIF259

---

## The WRITE PROTECT Switch

Pressing this switch turns on the WRITE PROTECT
indicator and prevents write operations. Pressing the
switch again turns off the indicator and allows read
or write operations. The current switch mode is
stored in memory when dc power is removed. The
WRITE PROTECT switch does not change the
selection if the WP/N switch on the control board is
set to WP (write protect).

```
WRITE PROTECT SWITCH ──────────┐

PRESS TO TURN ON INDICATOR AND
PREVENT WRITE OPERATIONS

PRESS AGAIN TO TURN OFF INDICATOR
AND ENABLE WRITE OPERATIONS
```
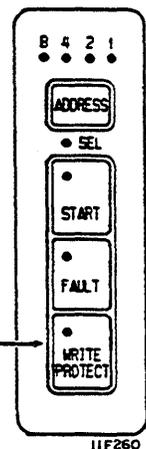
IIF260

# The Power Supply On/Standby Switch

The On/Standby switch is on the power supply.
This switch controls dc power to the drive and is not
routinely used. If the ruggedized mounting kit is
used, do the following:

1.  Gain access to rear of drive.

2.  Lift lock knob to release drawer (rotate
    lever, if present), and push drawer forward
    several inches to expose the power supply.
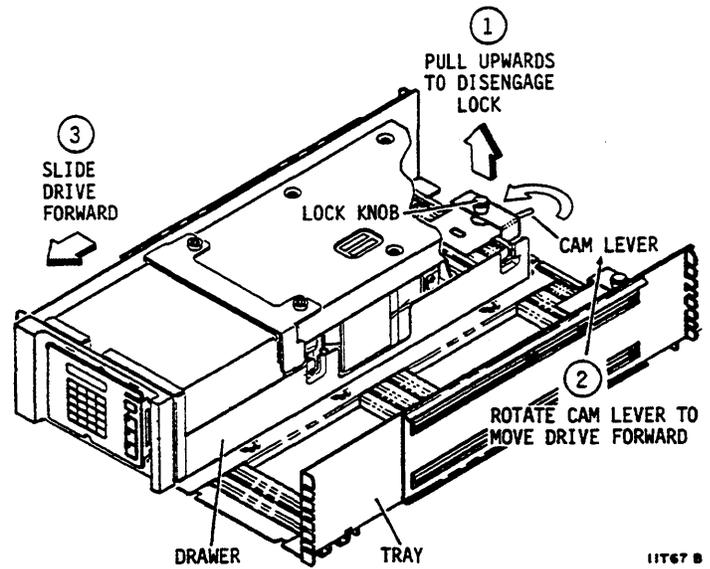
Placing the switch in the On position applies dc
power to the drive and starts the cooling fan.

Placing the switch in the Standby position removes
dc power from the drive and stops the fan.
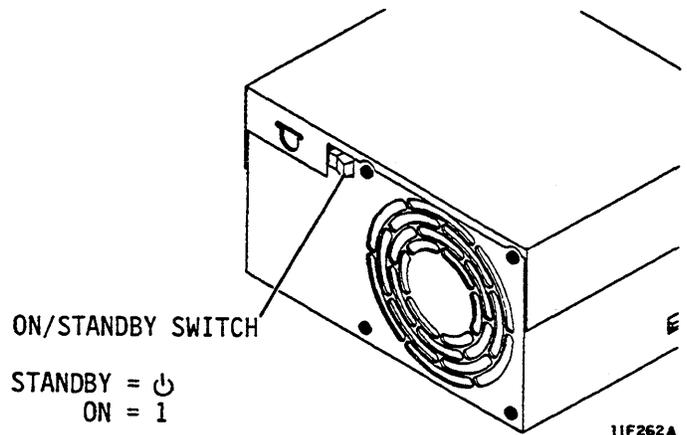
# OPERATING INSTRUCTIONS

## Starting a Drive With No Operator Panel

Drives with no operator panel are not routinely
turned on and off. Power is normally left on and the
drive motor is started and stopped using the Spin Up
and Spin Down function codes. Use the following
procedure to start the drive:

1. Set the On/Standby switch on the power
   supply to On (1).

2. Observe the following logical address delay
   except as noted below:

   Spinup of each drive can be delayed from 0
   to 35 seconds depending on its logical
   address. The delay period is 5 seconds
   multiplied by the logical address. A drive
   with a logical address of 5 starts after a 25
   second delay expires.*

3. Repeat step 1 for all drives in the string.
   After 90 seconds all drives should be
   started and ready to respond to controller
   commands.
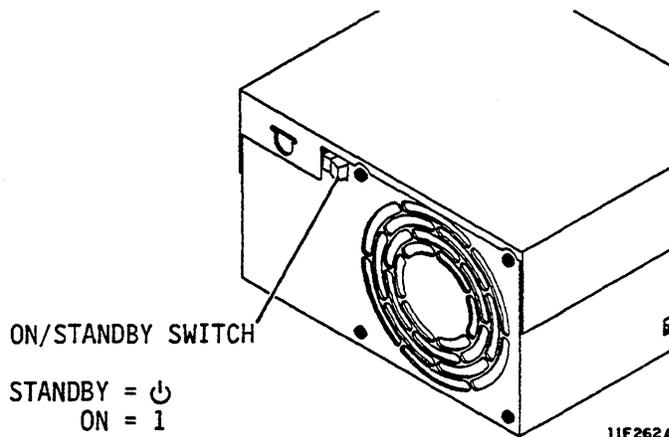
ON/STANDBY SWITCH

STANDBY = ⏻
ON = 1

11F262A

---

*In Local mode, ST82500K drives that have only one set of DIP switches on the I/O board start immediately
when the On/Standby switch is set to On (1).

# Starting a Drive With the Optional Operator Panel

1. Set the power supply On/Standby switch to On (1).

2. Observe the following logical address delay except as noted below:

   Spinup of each drive can be delayed from 0 to 35 seconds depending on its logical address. The delay period is 5 seconds multiplied by the logical address. A drive with a logical address of 5 starts after a 25 second delay expires.*

3. Press the START switch.

4. After the delay period (if applicable) observe that the Ready indicator flashes rapidly.

NOTE THAT READY INDICATOR
② FLASHES RAPIDLY AFTER 0-35 SECOND DELAY PERIOD

① PRESS START

IIF263
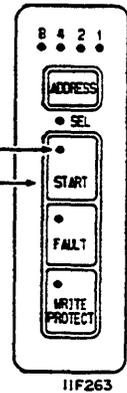
5. Observe that the Ready indicator stops flashing within 90 seconds, but remains on.

6. Observe that the FAULT indicator is off. The drive is now ready to respond to commands from the controller.

③ READY STOPS FLASHING BUT STAYS ON WITHIN 90 SECONDS

④ FAULT IS OFF
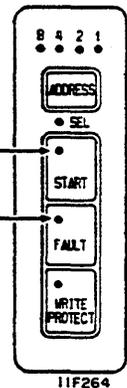
IIF264

*In Local mode, ST82500K drives that have only one set of DIP switches on the I/O board start immediately when the On/Standby switch is set to On (1).

## Stopping the Drive Using the Operator Panel

1. Press the START switch.

2. Observe that the Ready indicator flashes slowly.

3. Observe that the Ready indicator stops flashing and remains off within 60 seconds (ST82500K drives) or 90 seconds (ST83050K and ST83220K drives).

NOTE THAT READY FLASHES SLOWLY-
②THEN STOPS FLASHING & REMAINS
OFF

① PRESS START

11T171

---
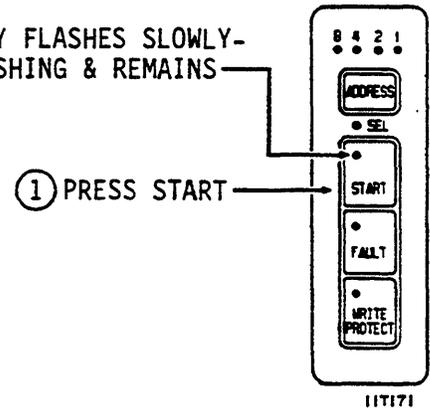
## Stopping the Drive Using the On/Standby Switch

1. Set the On/Standby switch on the power supply to the Standby position.

2. The power supply fan stops and the drive stops within 60 seconds (ST82500K drives) or 90 seconds (ST83050K and ST83220K drives).

ON/STANDBY SWITCH

STANDBY = ⏻
ON = 1

11F262A
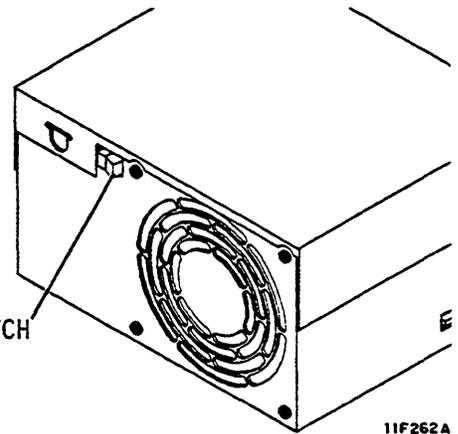
## Using the Spin Up/Spin Down Function

When the Local/Remote switch on the I/O board is in the Remote position, the Spin Down function can be used to stop the drive after it has once been started. The Spin Up function can be used to start the drive only after dc power is applied. The sequence of events when the drive receives this command is the same as pressing the START switch on the optional operator panel.

## Dual Port Failures

Failure of one controller in a dual port configuration can cause problems in all drives attached to it. If a failure of this type does occur, the affected port on each drive should be disabled. Contact the person responsible for maintenance of the system.

## REPLACING THE AIR FILTER

The air filter is located behind the front panel insert. It must be checked frequently and replaced when it is dirty. Clean the air filter only if a replacement is not available.

1. Remove the front panel insert from the drive.

2. If the ruggedized mounting kit is used, gain access to rear of drive. Lift lock knob to release drawer (rotate lever, if present), and push drawer forward several inches to expose the power supply.
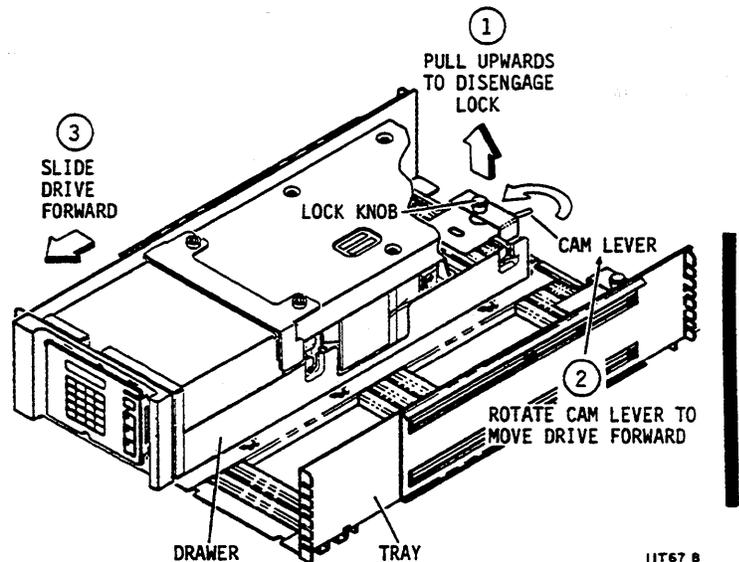
# REPLACING THE AIR FILTER (CONTD)

3. Stop the drive. Place the On/Standby switch on the power supply in the Standby position.

> ## NOTE
> Skip steps 4 and 7 if the drive does not have the optional status/control panel.

4. Remove the two screws that secure the status/control panel to the front panel. Move it away from the front panel to gain access to the air filter.

5. Remove the dirty filter. If a clean, replacement filter is not available, clean the dirty filter in a solution of water and mild detergent. Rinse the filter and allow it to dry thoroughly.

6. Install the clean filter.

7. Place the status/control panel on the front panel and secure it with the two screws.

8. Set the On/Standby switch on the power supply to the On (1) position.

9. Push the drawer fully into the tray until it locks.

10. Install the front panel insert.

FRONT PANEL

FILTER

SCREW (2)

STATUS/CONTROL PANEL
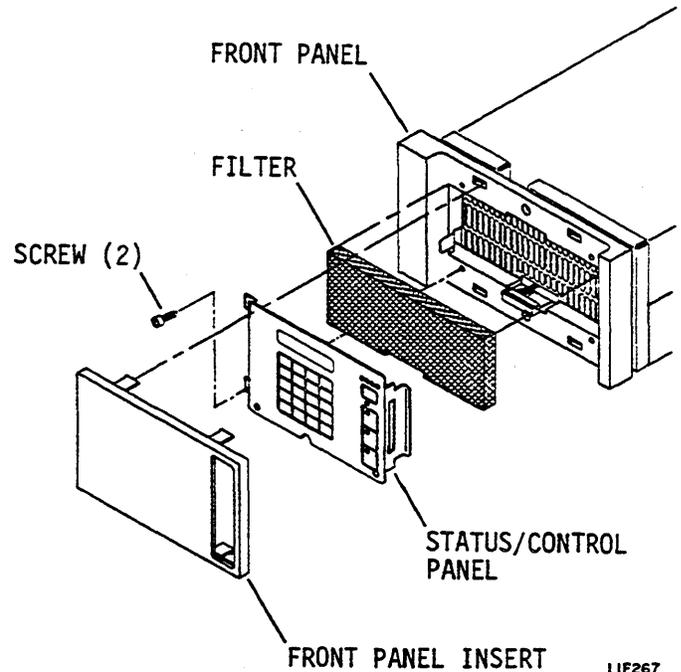
FRONT PANEL INSERT        I IF267

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> ## CAUTION
>
> When servicing the drive, observe all precautions listed under Electrostatic Discharge Protection in section 2 of this manual. Failure to observe these precautions can result in serious damage to electronic assemblies.

## INTRODUCTION

This section presents information on interpreting the information displayed on the status/control panel and running offline diagnostic tests. More complete troubleshooting information can be found in the maintenance manual. You should be familiar with the contents of that manual before doing any troubleshooting.

For trouble analysis, a status/control panel is needed. If the drive installation does not include a status/control panel, we advise that you connect one to the drive during troubleshooting. Refer to the parts data manual for part numbers of the status/control panel and its interconnect cable. Refer to appendix A of this manual for instructions on connecting the panel to the drive.

When using the status/control panel for trouble analysis, disable the I/O using the port disable switches (DA - DB) on the I/O board as described in section 2. Failure to disable the I/O may prevent status/control panel initiated diagnostics from completing and the LCD may go blank due to controller selection of the drive.

The following types of troubleshooting information are provided in this section:

- Drive Self- Tests — describes the self-tests that occur when dc power is applied to the drive, and lists the corrective actions to take if a test failure occurs.

- Diagnostic Testing — describes how to use offline diagnostic testing to isolate drive malfunctions.

- Drive Status Codes — provides information on correcting problems associated with drive power-up/down and with servo operations.

- Interface Testing — describes the I/O MPU self-tests, online diagnostics, and indications on I/O board LEDs.

# THE DRIVE SELF-TESTS

When dc power is applied to the drive, the Control MPU directs a series of self-tests on the drive circuits. During these tests the Address, Ready, FAULT, and WRITE PROTECT lights on the status/control panel or operator panel are on.

INDICATORS ON DURING SELF TEST
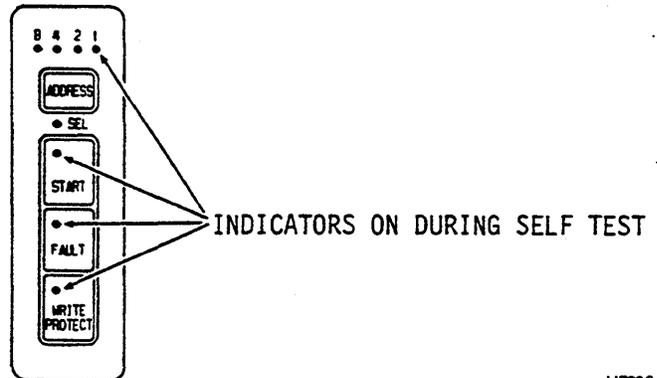
IIF228

---

After about four seconds, the FAULT light turns off which indicates the tests ran error-free.

SELF-TEST SUCCESSFUL IF INDICATOR TURNS OFF AFTER 4 SECONDS
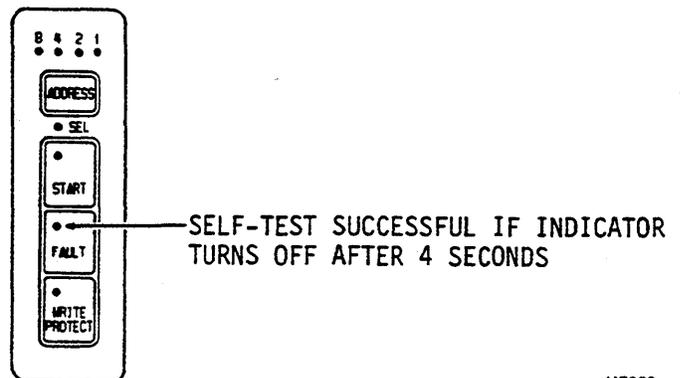
IIF229

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The drive failed the power on self-test if the Ready and FAULT lights stay on constantly. The Address lights indicate which self-test routine the drive failed to complete. Refer to the Power On Test Failure table on the next page to see which test failed and what action to take. If the Control MPU is unable to communicate with the optional status/control panel, PANEL FAILURE is displayed on the status/control panel LCD.

SHOWS WHICH TEST FAILED (RANGE = 0-15)

SELF-TEST FAILED IF INDICATOR STAYS ON AFTER 4 SECONDS
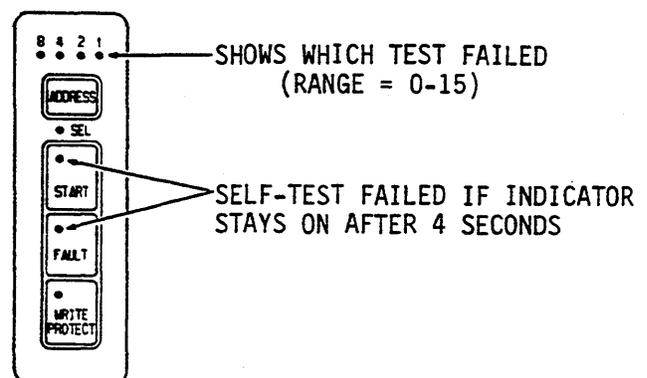
IIF230

# POWER ON TEST FAILURE

| Address Lights* | | | | Hex Code | Test Failed** & Actions |
|---|---|---|---|---|---|
| 8 | 4 | 2 | 1 | | |
| • | • | • | • | F | **RAM Test** <br><br> Action: Replace control board. |
| • | • | • | o | E | **ROM Test** <br><br> Action: Replace control board. |
| • | • | o | • | D | **I/O Chip Test** <br><br> Actions: 1. Replace I/O board. <br> 2. Replace control board. |
| • | • | o | o | C | **Peripheral Chip (Test 1)** <br><br> Action: Replace control board. |
| • | o | • | • | B | **Peripheral Chip (Test 2)** <br><br> Action: Replace control board. |

*Darkened circles indicate that the LED is On.

**Ready and FAULT lights stay on, indicating the drive failed the four second power-on self-test.

# THE OFFLINE DIAGNOSTIC TESTS

The available offline tests are shown at the right. How you select and run the tests is described on the following pages.

Do not attempt to enter a test number that is not listed. Doing so causes invalid test results. The drive does not run tests that require seeks (05, 08, 09, or OE) unless the spindle motor is up to speed and the heads are loaded. The LCD displays SPEED NOT OK if the spindle is not up to speed when the test is selected. The LCD displays ACT PARKED if the actuator was parked and locked when the test was selected.

If you temporarily connect a status/control panel to the drive for troubleshooting, run tests 06 and 07 before you continue with other tests. When drive power is removed, the panel stores its status log and fault log in a nonvolatile RAM. When power is initially applied to the drive, these logs may reflect operation of the pane as it was used on a different drive.

| Test | Description |
|------|-------------|
| 00 | Display drive operating status log. |
| 01 | Display fault log |
| 04 | Calculate three most likely field replaceable units |
| 05 | Servo test |
| 06 | Clear drive operating status log |
| 07 | Clear fault log |
| 08 | Direct or continuous seeks |
| 09 | Random seek |
| OC | Display EPROM part number |
| OE | Return to zero |
| 12 | Sequential one-track seeks |

# How to Select and Run Diagnostic Tests

Use the following procedure to select and run the diagnostic tests.

1. Disable the I/O using the port disable switches as described in section 2. Failure to disable the I/O may prevent diagnostics from completing and the LCD may go blank if the controller selects the drive.

2. Press DIAG MODE switch to enter diagnostic mode.

3. Observe that LCD reads DIAG TEST XX.

4. Enter a two hexadecimal character test number on keyboard and press EXEC switch to select first test.
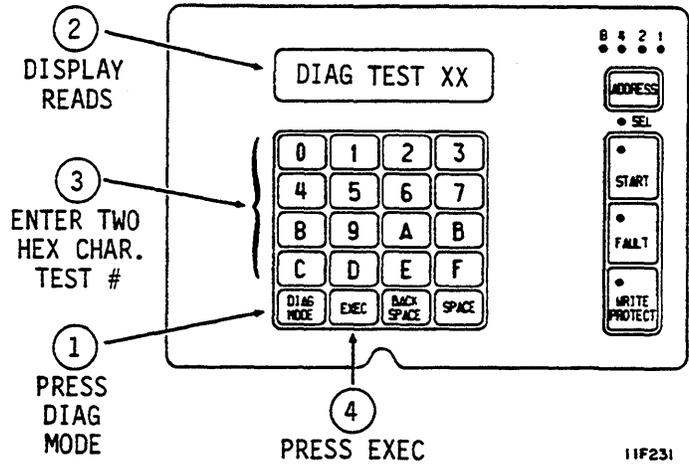
Pressing the EXEC switch one more time ends the test. The LCD again reads DIAG TEST XX.

You now have two choices:

- Enter two hexadecimal characters on keyboard and press EXEC switch to select another test, or

- Press DIAG MODE switch to leave diagnostic mode. The LCD displays drive operating status. Reenable the I/O using the port disable switches (see section 2).
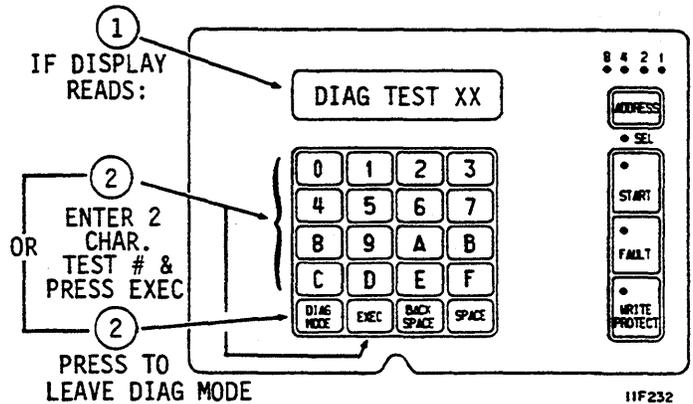
# Test 00 — Display Drive Operating Status Log

This test displays the 8 most recently generated drive status codes. After test selection, the display provides a hexadecimal status code from the internal log. This code is preceded by a character (0-7) and a colon, indicating the position of the status code in the status log. To execute test 00, perform the following steps:

1. Enter Test 00 and press EXEC switch. The LCD reads DRIVE LOG: 0:XX where 0 is the position in log and XX is status code in that position.



DISPLAY READS:

DRIVE LOG: 0 : XX

② 

① SELECT TEST 00 AND PRESS EXEC     IIF233

---
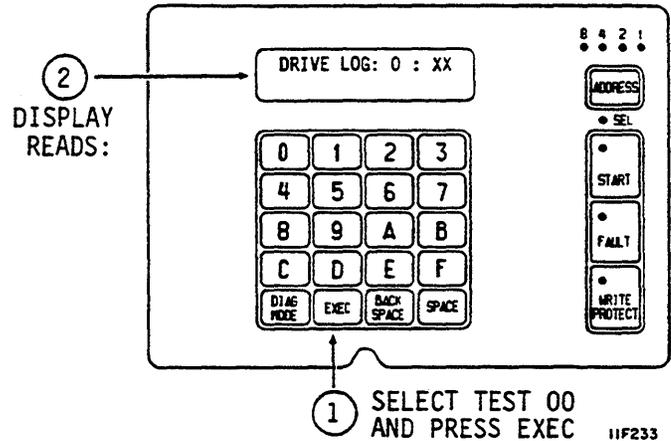
2. Press SPACE switch until a code appears, preceded by an asterisk. This is most recent code stored in status log.

3. Use SPACE switch to step through 8th most recent to most recent status.

4. Press EXEC switch to end test and return to test selection.



② DISPLAY READS:

POSITION IN LOG          STATUS CODE

DRIVE LOG: *7 : 04

③ PRESS EXEC TO END TEST

① PRESS SPACE UNTIL A 2 CHAR. HEX CODE IS DISPLAYED     IIF234
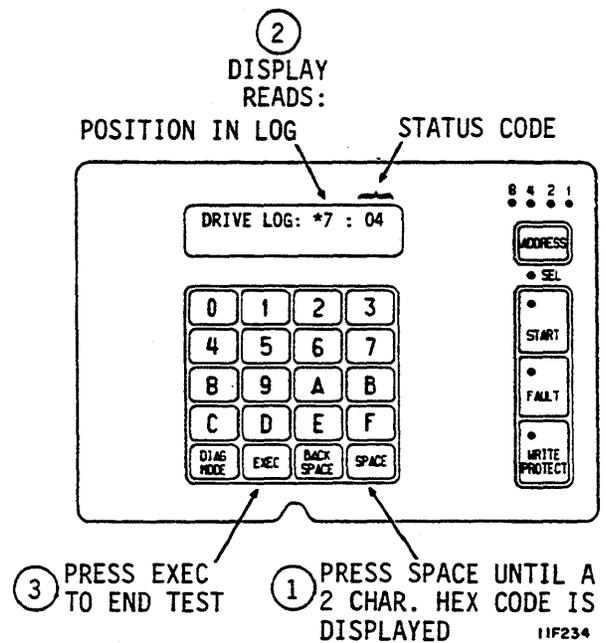
# Test 01 — Display Fault Log

This test displays the eight most recently stored fault codes. After test selection, a hexadecimal fault code will be displayed. This code is preceded by a character (0-7) and a colon, indicating the position of the fault code in the fault log. Perform the following steps to execute test 01:

1. Enter Test 01 and press EXEC switch. LCD reads FAULT LOG: 0:XX where 0 is position in log and XX is fault code in that position.



DISPLAY READS:

SELECT TEST 01

PRESS EXEC

IIF235
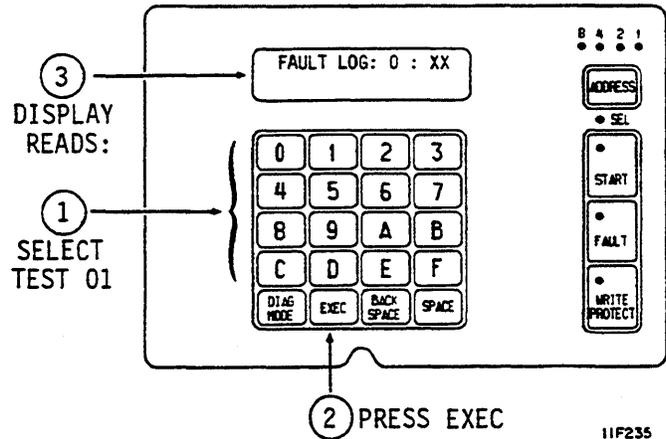
2. Press SPACE switch until a code appears, preceded by an asterisk. This indicates most recent code stored in fault log.

3. Use SPACE switch to step through from 8th most recent to most recent fault.

4. If more than one fault occurs simultaneously (multiple faults), more than one bit in fault code is set. Check bit-mapped locations of each fault in table on next page.

POSITION OF CODE IN LOG    FAULT LOG CODE



PRESS SPACE UNTIL CODE APPEARS IN DISPLAY

IIF236
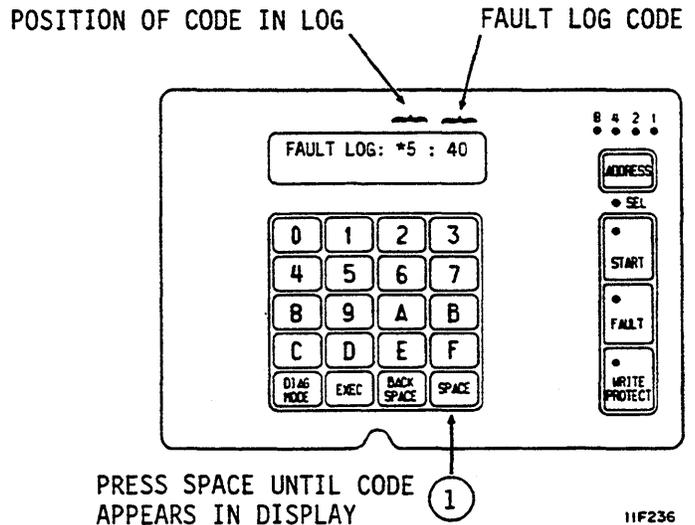
# Test 01 — Display Fault Log (Contd)

| Bit | Definition |
|-----|-----------|
| 0 (LSB) | Read•Write Fault (01) |
| 1 | (Read+Write)•Off Cylinder Fault (02) |
| 2 | First Seek Fault (04) |
| 3 | Write Fault (08) |
| 4 | Write•Write Protected Fault (10) |
| 5 | Head Select Fault (20) |
| 6 | Voltage Fault (40) |
| 7 (MSB) | Not Used (80) |

5. Press EXEC switch to end test and return to
   test selection.

# Test 04 — Calculate Three Most Likely Field Replaceable Units

```
┌─────────────────────────────────────────────┐
│                   NOTE                        │
│  Do not execute Tests 05, 06, or 07 prior to running Test 04.  │
└─────────────────────────────────────────────┘
```

This test uses the fault status and the drive operating status history (Tests 00 and 01) to predict the most likely cause of drive failure. To execute Test 04, perform the following steps:

1. Enter Test 04 and press EXEC switch.
   LCD reads FRUS: XX XX XX.

   Three FRUs are displayed at the end of the test. The first code is the most likely cause of the failure.

   FRU codes and their meaning are listed below.

③ FRU CODES

② DISPLAY READS:

① SELECT TEST 04 AND PRESS EXEC   IIF237

| FRU CODE | FRU |
|----------|-----|
| 00 | No FRU Information |
| 01 | Replace Control Board |
| 02 | Replace Module |
| 03 | Replace Power Supply |
| 04 | Replace I/O Board |

2. Press EXEC switch to end test and return to test selection.
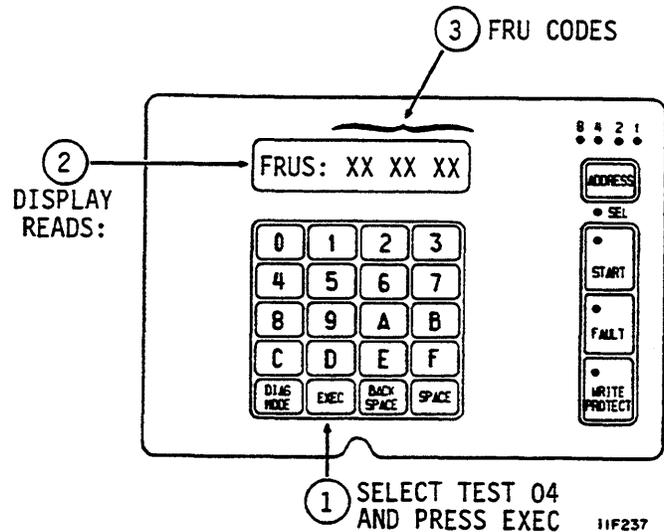
# Test 05 — Servo Test

This test clears the drive status log and fault log. Test 04 relies on status history that would be cleared by Test 05 so you may want to run Test 04 before running Test 05. Test 05 performs the seek operations listed below:

- RTZ (one time)
- One track seek (16 times)
- RTZ (one time)
- Partial servo recalibrate (one time)
- RTZ (one time)
- Maximum length seek (16 times)
- RTZ (one time)

The test stops if an error is detected or at the end of the test. Perform the following steps to run test 05:

1.  Enter Test 05, then press the EXEC switch.

    If test is successful LCD reads OK, CYL: 000.



DISPLAY READS: ② OK, CYL: 000

① SELECT TEST 05 AND PRESS EXEC    IIF238

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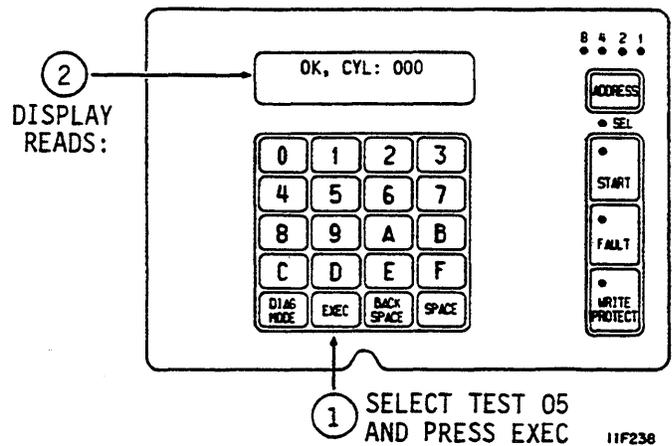
If error occurs, LCD displays SERVO ERROR: XX. Drive status codes (servo errors) are defined in table at end of this section.

2.  Press EXEC switch to end test and return to test selection.



DRIVE STATUS CODE

DISPLAY READS: ① SERVO ERROR: 4B

② PRESS EXEC TO END TEST    IIF239A
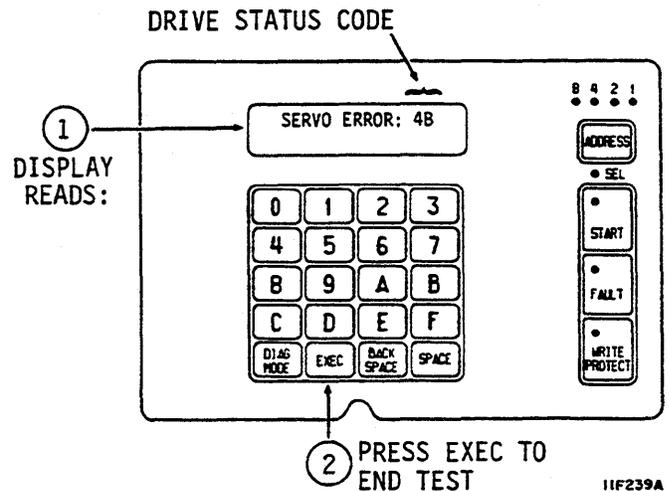
# Test 06 — Clear Drive Operating Status Log

This test clears the drive status log in the program RAM. Test 04 relies on status history that is cleared by Test 06 so you may want to run Test 04 before running Test 06. Perform the following steps to run Test 06:

1. Enter Test 06 and press EXEC switch. The LCD displays DRIVE LOG CLEAR.

2. Press EXEC switch to end test and return to test selection.



DISPLAY READS:

② → DRIVE LOG CLEAR

①SELECT TEST 06 AND PRESS EXEC

③PRESS EXEC TO END TEST

IIF240

---
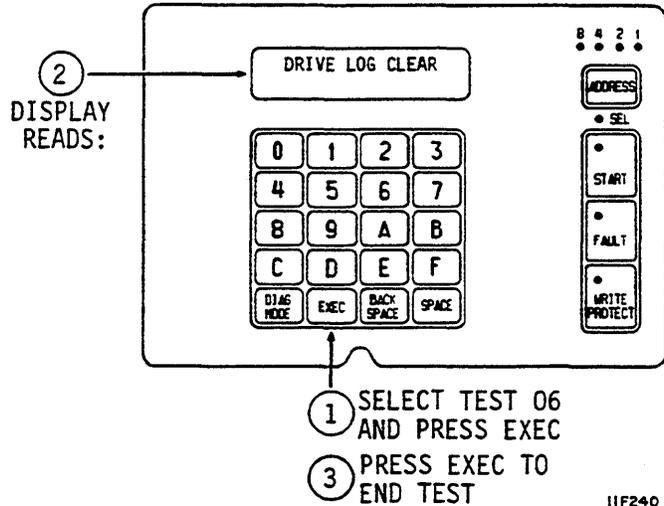
# Test 07 — Clear Fault Log

This test clears the fault log. Test 04 relies on status history that is cleared by Test 07 so you may want to run Test 04 before running Test 07. Perform the following steps to run Test 07:

1. Enter Test 07 and press EXEC switch. The LCD reads FAULT LOG CLEAR

2. Press EXEC switch to end test and return to test selection.



DISPLAY READS:

② → FAULT LOG CLEAR

①SELECT TEST 07 AND PRESS EXEC

③PRESS EXEC TO END TEST

IIF241
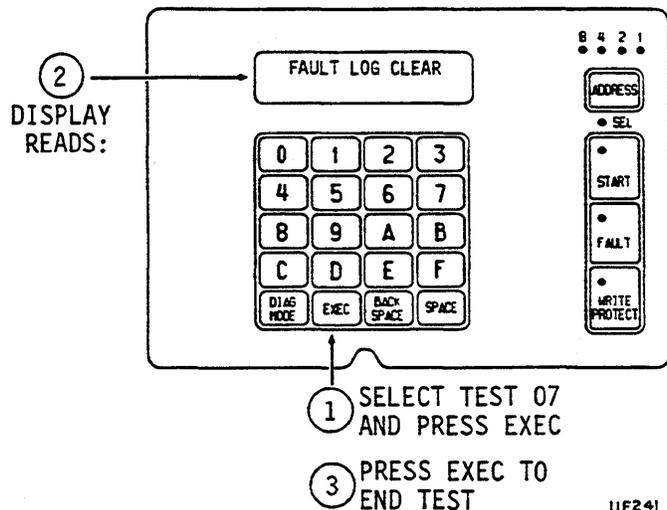
# Test 08 — Direct or Continuous Seeks

This test performs direct or continuous seeks between cylinder 0 and the desired cylinder address. The test ends if an error occurs or if the EXEC switch is pressed. Perform the following steps to run Test 08:

1. Enter Test 08 and press EXEC switch.

2. HEX CYL XXX tells you to enter valid cylinder address (between 0 and A32 for ST82500K drives; between 0 and A5E for ST83050K and ST83220K drives). Enter three characters and press SPACE switch.

② DISPLAY READS: HEX CYL XXX

③ ENTER VALID CYL #

① SELECT TEST 08 AND PRESS EXEC

IIF242
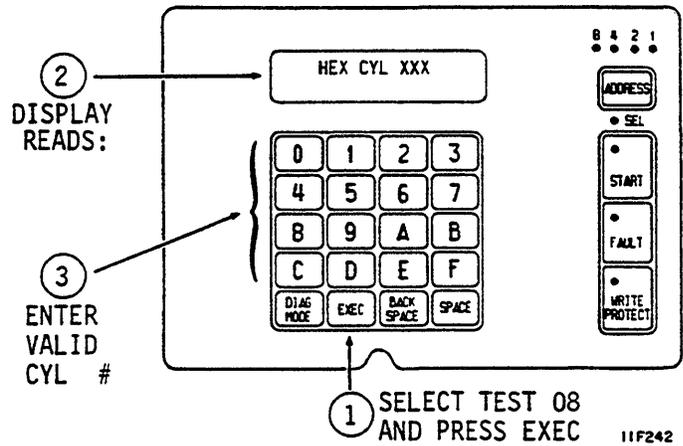
3. DIR OR CONT? D/C directs you to select either direct (D) or continuous (C) seeks. Enter either C or D to start test.

① DISPLAY READS: DIR OR CONT? D/C

② ENTER C FOR CONTINUOUS SEEKS, OR D FOR DIRECT SEEKS

IIF243A
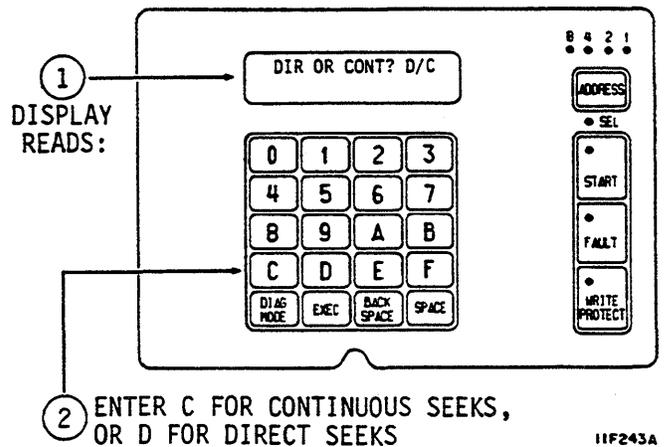
# Test 08 — Direct or Continuous Seeks (Contd)

4. If D was entered and direct seek is successful, LCD displays OK, CYL: XXX where XXX is address previously entered.

5. Press the EXEC switch to end test and return to test selection.



DISPLAY READS AS SHOWN
(1) IF D (DIRECT) WAS SELECTED
AND TEST WAS SUCCESSFUL

OK, CYL: XXX

(2) PRESS EXEC TO END TEST

IIF244
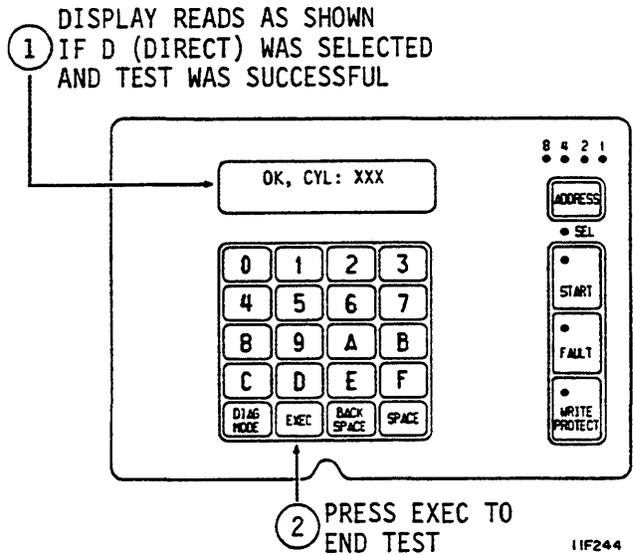
6. If either D or C was entered and an error occurs, LCD displays SERVO ERROR: XX.

   Drive status codes (servo errors) are defined in a table at the end of this section. Clear seek errors by running Test 05 or Test 0E.

   If C was entered, press EXEC switch to end test and return to test selection.



(1) IF ERROR OCCURS DISPLAY READS:

(2) ERROR CODE

SERVO ERROR: XX

(3) PRESS EXEC TO END TEST

IIF245A
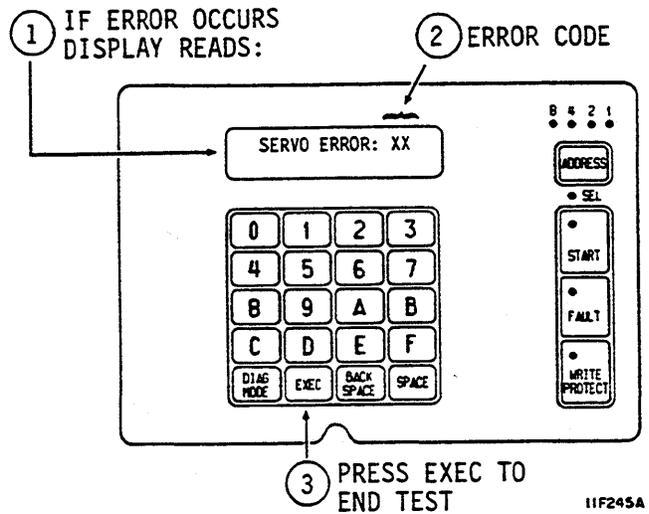
## Test 09 — Random Seek

This test performs random seeks between cylinders 0 and the maximum cylinder address. The maximum cylinder address is 2610 for ST82500K drives, and 2654 for ST83050K and ST83220K drives. The test ends if an error occurs or if the EXEC switch is pressed. Perform the following steps to run Test 09:

1. Enter Test 09 and press EXEC switch.

2. LCD reads OK, CYL: XXX if test is successful.

3. If an error occurs, LCD reads SERVO ERROR: XX. Drive status codes (servo errors) are defined in a table at end of this section.

4. Press EXEC switch to end test and return to test selection.
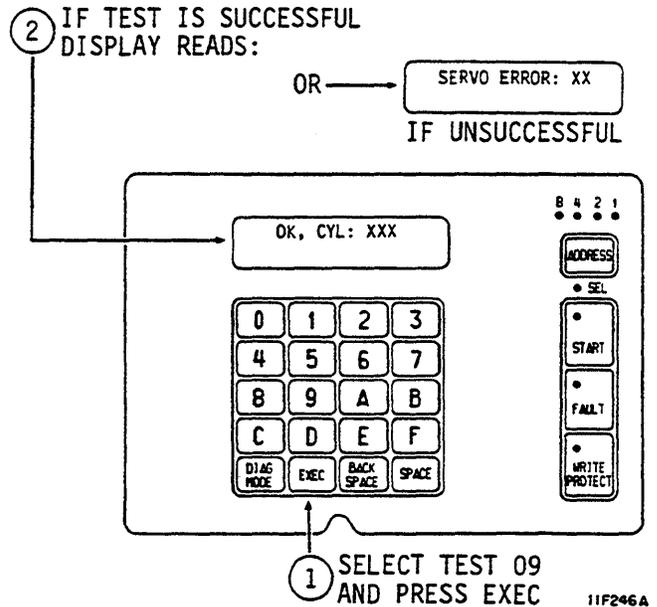


## Test 0C — Display EPROM Part Number

This test displays the eight-digit part number of the control microprocessor EPROM. Perform the following steps to run Test 0C:

1. Enter Test 0C and press EXEC switch.

   LCD displays eight-digit EPROM part number (for example EPROM# = 12345678).

2. Press EXEC switch to end test and return to test selection.
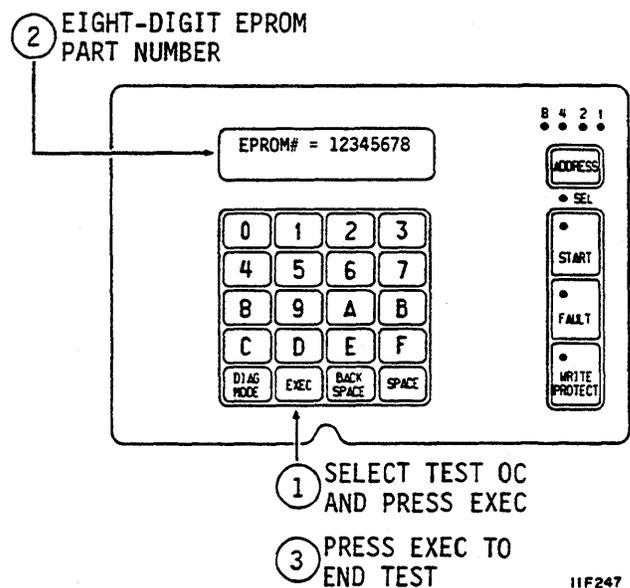
# Test 0E — Return to Zero

This test starts a return to zero command. Perform the following steps to run Test 0E:

1. Enter Test 0E and press EXEC switch. LCD reads OK, CYL: 000.

2. If error occurs during test, LCD displays SERVO ERROR: XX. Drive status codes (servo errors) are defined in a table at end of this section.

3. Press EXEC switch to end test and return to test selection.
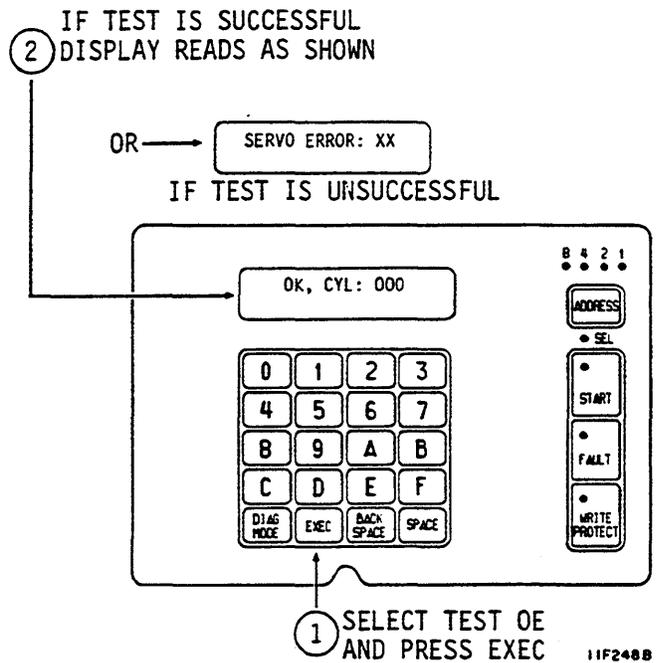


# Test 12 — Sequential One-Track Seeks

This test performs sequential one-track seeks starting at cylinder 0 and moving inward toward the maximum cylinder address. The maximum cylinder address is 2610 for ST82500K drives, and 2654 for ST83050K and ST83220K drives. When the maximum cylinder is reached, a sequence of one-track seeks is performed toward cylinder 0, and the process repeats. The test ends if an error occurs or if the EXEC switch is pressed. Perform the following steps to run Test 12:

1. Enter Test 12 and press EXEC switch.

2. LCD reads OK, CYL: XXX if test is successful.

3. If an error occurs, LCD reads SERVO ERROR: XX. Drive status codes (servo errors) are defined in a table at end of this section.

4. Press EXEC switch to end test and return to test selection.
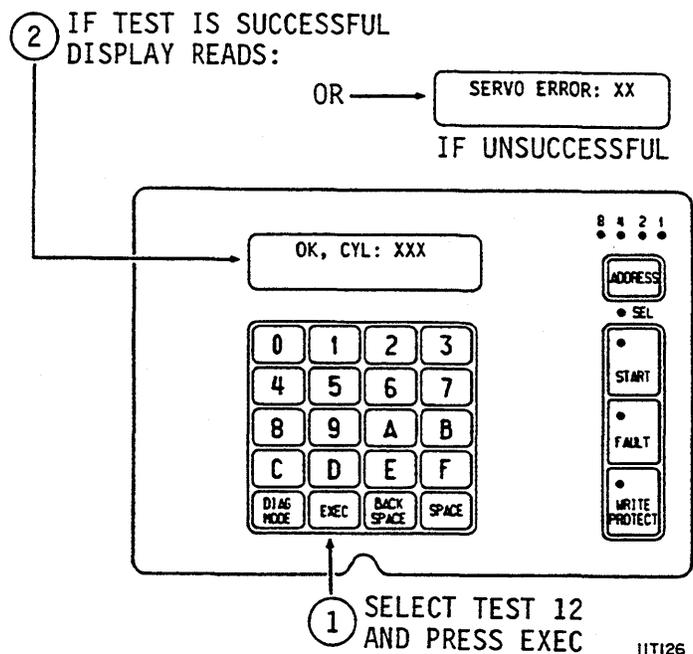
# DRIVE STATUS CODES

The Control MPU periodically checks operation of the drive and generates appropriate operating status codes when the drive has dc power applied.

The table on the next page lists the status codes and provides a definition of each. If a drive malfunction occurs, observe the error code and perform Diagnostic Test 04 to calculate the action to be taken.

---

Shown at the right is an example of the LCD (Liquid Crystal Display) during normal operation. It displays the current drive status and cylinder address.

NORMAL OPERATION

```
DRIVE STATUS: ▣ ▣ ──── CURRENT DRIVE
                              STATUS

CYL: ▣ ▣ ▣  S:1 R:1
```

CURRENT DRIVE
CYLINDER ADDRESS

NOT USED
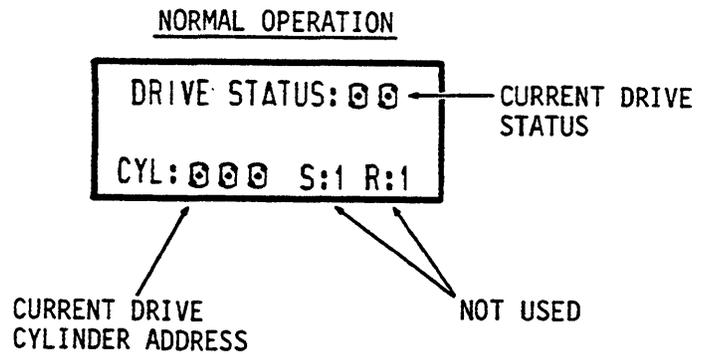
IIFI74A

---

If a fault occurs, the LCD displays the type of fault(s) that occurred along with the current drive status. If more than one fault occurred, use the SPACE switch to step through the fault log to determine what faults are present.
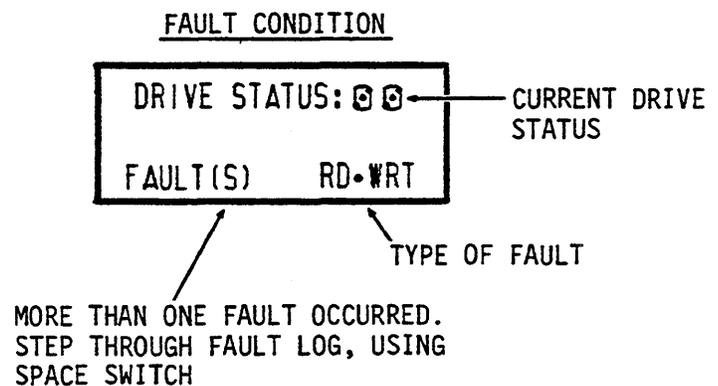
Pressing the Fault Clear switch clears the LCD fault display and the FAULT indicator provided the fault is no longer exists. A Fault Clear signal from the controller clears only the Fault indicator.

FAULT CONDITION

```
DRIVE STATUS: ▣ ▣ ──── CURRENT DRIVE
                              STATUS

FAULT(S)    RD•WRT
```

TYPE OF FAULT

MORE THAN ONE FAULT OCCURRED.
STEP THROUGH FAULT LOG, USING
SPACE SWITCH

IIF250

| Code | Title | Description |
|------|-------|-------------|
| | **Normal Operation Codes** | |
| 00 | Ready | The drive is on cylinder and ready to perform normal operations. |
| 02 | Motor Stopping | The motor is coasting down, or motor braking is in progress. |
| 03 | Motor Stopped | The spindle motor is stopped. The status remains at 03 until start conditions are available. |
| 04 | Load/Cal in Progress | The heads are moved from the landing zone to the data tracks, the first RTZ is performed, and a servo calibration (self-test) is completed. |
| 05 | Power Sequence in Progress | Displayed in Remote mode during the power on sequence delay. The length of delay is the logical address number multiplied by 5 seconds. After the delay, the status changes to 07. |
| 06 | START Switch Pressed and Waiting for Power Sequence Signals | The Control MPU sets this status code to indicate that the START switch was pressed and that the drive is waiting for power sequence signals from the controller. This code appears in Remote mode and precedes the sequence delay. |
| 07 | Starting Motor | All start conditions (codes 05 and 06) have been satisfied. The status remains at 07 until the motor reaches full speed. |
| 08 | Motor Up to Speed | The motor is up to full speed. |
| 09 | I/O Self-Test Passed | The I/O MPU successfully executed its power on initialization self-test. |
| 0A | Drive in Sweep Segment | The drive is executing a series of seeks for a sweep cycle. On Cylinder and Seek End are inactive at this time. |
| 0B | Heads Left on Last Cylinder of Sweep | Current head position determined by last sweep cycle — not by a controller-requested seek. On Cylinder and Seek End are inactive at this time. |
| 10 | Ready & Spindle in Sync | The drive is on cylinder, its spindle is synchronized, and it is ready to perform normal operations. |
| 14 | Load/Cal in Progress & Spindle in Sync | The heads are moved from the landing zone to the data tracks, the spindle is synchronized, the first RTZ is performed, and a servo calibration (self-test) is initiated. |

(Continued)

# DRIVE STATUS CODES (CONTD)

| Code | Title | Description |
|---|---|---|
| **Normal Operation Codes (Contd)** | | |
| 18 | Motor Up to Speed & Spindle in Sync | The motor is up to full speed and the spindle is synchronized. |
| 19 | I/O Self-Test Passed & Spindle in Sync | The I/O MPU successfully executed its power on initialization self-test, and the spindle is synchronized. |
| 1A | Drive in Sweep Segment & Spindle in Sync | The drive is executing a series of seeks for a sweep cycle with the spindle synchronized. On Cylinder and Seek End are inactive at this time. |
| 1B | Heads Left on Last Cylinder of Sweep & Spindle in Sync | Current head position determined by last sweep cycle — not by a controller-requested seek. The spindle is synchronized, and On Cylinder and Seek End are inactive at this time. |
| **Drive Error Codes** | | |
| 46 | Seek Timeout | The Servo MPU took longer than the time allowed by the Control MPU to respond to a move request. |
| 4A | Move Failed Due to Demodulator Check | The servo move failed because of a demodulator failure. |
| 4B | Off Track Seek Error | The drive failed to stay on cylinder. The heads float and Seek Error is set. |
| 4C | Seek Error Due to Actuator Locked or No Demodulator Active | The Servo MPU could not complete the move because the actuator was locked or the demodulator was inactive. |
| 4D | Illegal Cylinder Address | During a normal seek, the Control MPU received too high a cylinder address (>2610 for ST82500K drives, and >2654 for ST83050K and ST83220K drives). Track-following continues but Seek Error is set. |
| 4E | Seek Error Due to Fault | The drive could not complete a seek because Fault was set. The seek request is never sent to the Servo MPU. |
| 4F | Seek Error on Settle In | The Servo MPU could not settle in on the destination cylinder. The heads float and Seek Error is set. |

(Continued)

# DRIVE STATUS CODES (CONTD)

| Code | Title | Description |
|------|-------|-------------|
| **Drive Error Codes (Contd)** | | |
| 50 | Low Vcc Glitch Recovery | A Low Vcc condition occurred in the drive. The drive executed a Low Vcc glitch recovery. |
| 51 | Control MPU Hang Recovery | A Control MPU hang condition caused the drive to reset itself, and a Control MPU hang recovery was executed. |
| 52 | Motor Stopped — Braking Loop Failure | The motor stopped, but there was a braking loop failure. |
| 53 | First Seek Fault — Motor Below Speed | The Servo MPU failed to complete a first seek because the motor was not up to speed. |
| 54 | First Seek Fault — Data Ready Pulse 1 Not Found | The Servo MPU failed to complete the first seek because it did not see the first data ready pulse. |
| 55 | First Seek Fault — Data Ready Pulse 2 Not Found | The Servo MPU failed to complete the first seek because it did not see the second data ready pulse. |
| 56 | First Seek Fault — Demodulator Active Not Found | The Servo MPU failed to complete the first seek because Demodulator Active was not found. |
| 57 | First Seek Fault — Index Not Found | The Servo MPU failed to complete the first seek because Index was not found. |
| 58 | Speed Loss | Indicates that the spindle speed fell below a minimum value. The Control MPU activates the Write Protect line, drops the Ready signal, and performs a retract operation. |
| 59 | Locked Rotor | The motor would not start because the rotor was locked. |
| 5B | Motor Stopping — Braking Loop Failure | A braking loop failure is detected while the motor is being stopped. |
| 5D | Failed Flying Speed Check | The motor failed the flying speed check. |
| 5E | Failed Up to Speed Check | The motor failed the up to speed check. |
| 5F | Motor Failed RPM Control | The motor failed RPM control after the start. |
| 61 | Servo MPU Communication Check Failed | The Control MPU was unable to communicate with the Servo MPU. |

(Continued)

## DRIVE STATUS CODES (CONTD)

| Code | Title | Description |
|------|-------|-------------|
| **Drive Error Codes (Contd)** | | |
| 62 | I/O Status Transfer Failed | The I/O MPU failed to transfer status successfully to the Control MPU during a diagnostic test. |
| 64 | Seek Error on First Seek | The Servo MPU failed to complete a first seek because of a seek error. |
| 69 | Speed Loss Restart | The Servo MPU is automatically attempting to restart the motor after a speed loss without receiving another Start command. |
| 6E | I/O Self-Test Failed | The I/O MPU failed its power on initialization self-test. |

# INTERFACE TESTING

This topic describes the unique self-tests and online diagnostic tests available with the IPI interface. In addition, for drives that have LEDs on the I/O board, there is information at the end of this section about interpreting them.

## The Self-Test and Initialization Sequence

A flowchart of the drive self-test and initialization sequence is provided on the next two pages. This flowchart makes references to status codes that appear on the optional status/control panel and that are saved in the drive status log. The status log can be displayed via offline diagnostic test 00, described earlier in this section.

The I/O MPU and Control MPU self-test sequences start when dc power is applied (see the flowchart).

The I/O and drive circuits are tested simultaneously. The I/O tests include checks of the serializer/deserializer (SERDES) and I/O circuits, and an I/O MPU self-test. The drive self-test checks the Control MPU. Testing stops and status is reported if an error is found.

If the I/O and drive self-tests run error-free, the drive begins its start sequence when start conditions are present. As part of the spindle power-up, the Control MPU in the drive runs a series of servo tests. The drive is capable of normal operation if these tests run error-free.

Write/read diagnostic testing occurs only when all of the following conditions are true:

- The drive is in local mode.

- The drive is not write protected.

- Write/read diagnostic testing is enabled via an I/O board switch setting.

- This is the initial spindle power-up after dc power is applied.

If write/read diagnostic testing is performed, the I/O MPU reports pass/fail status to the Control MPU. Following a successful handshake between the two processors, the drive is ready and operational.

If write/read diagnostic testing is bypassed, the drive is ready and operational with no I/O self-test status posted.

START → INITIATE DC POWER ON

INITIATE DC POWER ON → I/O MPU RUNS SELF-TEST

INITIATE DC POWER ON → CONTROL MPU & SERVO MPU RUN SELF-TESTS

I/O MPU RUNS SELF-TEST → OK?

OK? — NO → DID I/O MPU HANG?

DID I/O MPU HANG? — YES → DISPLAY IS BLANK

DID I/O MPU HANG? — NO → DISPLAY 62 OR 6E

OK? — YES → &

CONTROL MPU & SERVO MPU RUN SELF-TESTS → OK?

OK? — YES → &

OK? — NO → DISPLAY 60 OR 61

B — SEE NOTES

& → START SWITCH ON?

START SWITCH ON? — NO → DISPLAY 03

START SWITCH ON? — YES → LOCAL MODE?

LOCAL MODE? — NO (REMOTE MODE) (DISPLAY 06) → DRIVE RECEIVES SPINUP COMMAND

LOCAL MODE? — YES → INITIAL APPLICATION OF DC POWER?

INITIAL APPLICATION OF DC POWER? — YES → A — TO SHEET 2

INITIAL APPLICATION OF DC POWER? — NO → DRIVE STARTS MOTOR, LOADS HEADS, AND CALIBRATES SERVO

DRIVE RECEIVES SPINUP COMMAND → DRIVE STARTS MOTOR, LOADS HEADS, AND CALIBRATES SERVO

DRIVE STARTS MOTOR, LOADS HEADS, AND CALIBRATES SERVO → OK?

OK? — NO → DISPLAY SERVO ERROR CODE

OK? — YES → DRIVE IS READY AND OPERATIONAL ⚠1 (DISPLAY 00)

DRIVE STARTS MOTOR, LOADS HEADS, AND CALIBRATES SERVO → OK?

OK? — NO → DISPLAY SERVO ERROR CODE

OK? — YES → DRIVE IS READY AND OPERATIONAL ⚠1 (DISPLAY 00)

**Power On Self-Test (Sheet 1 of 2)**

11T123-1

FROM
SHEET 1

A (LOCAL MODE)

SHEET 2

DRIVE STARTS
MOTOR, LOADS
HEADS, AND
CALIBRATES SERVO

OK? —NO→ DISPLAY SERVO ERROR CODE

YES

W/R DIAGNOSTICS ENABLED —NO→

YES

IS DRIVE WRITE PROTECTED —YES→ DRIVE IS READY AND OPERATIONAL △1 (DISPLAY 00)

NO

I/O MPU RUNS WRITE/READ TEST

I/O MPU RUNS HANDSHAKE TEST

BOTH OK? —NO→ DISPLAY 6E

YES

SPINDLE IN SYNC ? —YES→

NO

DISPLAY 09        DISPLAY 19

DRIVE IS READY AND OPERATIONAL △1

NOTES:

△1 IF START SWITCH IS CYCLED FROM START TO STOP TO START DURING OPERATION, REENTER FLOWCHART AT B ON SHEET 1.

2. ALL DISPLAY CODES APPEAR ON STATUS/CONTROL PANEL. IPI CODES ARE DIFFERENT.

IIT123-2B

**Power On Self-Test (Sheet 2)**

# Execute Internal Diagnostics Function

Receipt of this function runs an access test, a head select test, and a read/write test.

The access test performs the following operations:

- Return to zero seek operation

- Single track seek

- Servo recalibrate

- Maximum seek

- Random seek

Successful completion of this test allows starting of the Head Select test provided the Disable Write/Read Diagnostic bit is not set. The Head Select and Write/Read tests can be disabled by issuing the Disable Read/Write Diagnostics Function Code.

The Head Select test performs a seek to the diagnostic cylinder, waits for on-cylinder, and then sequentially selects all heads on the cylinder. Successful completion of this test allows starting of the Write/Read test.

The write and read tests run if the drive is Ready, is not write protected, and no fault conditions exist. If the drive is write protected it will run only the access and read tests. The header is read and verified on the diagnostic cylinder. If no errors are found, data patterns are written on the diagnostic cylinder, after which they are read back and verified.

# Read Drive Specific Information (Bus Control 43)

The Read Drive Specific Information bus control transfers status information to the controller. This status information fits into two general categories:

- Native-controlled status — generated by the drive MPU. Although the codes are numerically different, they report the information available via the status/control panel.

- Interface-controlled status — generated by the I/O MPU.

The response to the bus control has the parameters listed below and in the tables that follow.

- Native-Controlled Diagnostic Status Codes are presented in octets 02 - 11 and listed in the table on the next page. Each status code has an equivalent offline status code. The offline drive status codes were listed and defined earlier in this section.

- Native-Controlled Diagnostic FRU Codes are presented in octets 12 - 15.

- Native-Controlled Diagnostic Fault Codes are presented in octets 16 - 1D.

- Interface-Controlled Diagnostic Status Codes are presented in octets 1E - 1F

- Interface-Controlled Diagnostic FRU Codes are presented in octets 20 - 21.

- Interface-Controlled Diagnostic Fault Codes are presented in octets 22 - 23.

## Native-Controlled Diagnostic Status Codes

| Status Code | Status Description |
|---|---|
| **Normal Operation Codes** ||
| 80 | Ready |
| 82 | Stopping Motor |
| 83 | Motor Stopped |
| 84 | Load/Cal in Progress |
| 85 | Power Sequence in Progress |
| 86 | START Switch Pressed & Waiting for Power Sequence Signals |
| 87 | Starting Motor |
| 88 | Motor Up to Speed |
| 89 | I/O Self-Test Passed |
| 8A | Sweep Segment in Progress |
| 8B | Heads Left on Last Cylinder of Sweep |
| 90 | Ready & Spindle in Sync |
| 94 | Load/Cal in Progress & Spindle in Sync |
| 98 | Motor Up to Speed & Spindle in Sync |
| 99 | I/O Self-Test Passed & Spindle in Sync |
| 9A | Sweep Segment in Progress & Spindle in Sync |
| 9B | Heads Left on Last Cylinder of Sweep & Spindle in Sync |
| **Drive Error Codes** ||
| C6 | Seek Timeout |
| CA | Move Failed Due to Demodulator Check |
| CB | Off Track Seek Error |
| CC | Seek Error Due to Actuator Locked or No Demodulator Active |

## Native-Controlled Diagnostic Status Codes (Contd)

| Status Code | Status Description |
|---|---|
| **Drive Error Codes (Contd)** ||
| CD | Illegal Cylinder Address |
| CE | Seek Error Due to Fault |
| CF | Seek Error on Settle In |
| D0 | Low Vcc Glitch Recovery |
| D1 | Control MPU Hang Recovery |
| D2 | Motor Stopped — Braking Loop Failed |
| D3 | First Seek Fault — Motor Below Speed |
| D4 | First Seek Fault — Data Ready Pulse 1 Not Found |
| D5 | First Seek Fault — Data Ready Pulse 2 Not Found |
| D6 | First Seek Fault — Demodulator Active Not Found |
| D7 | First Seek Fault — Index Not Found |
| D8 | Speed Loss |
| D9 | Locked Rotor |
| DB | Motor Stopping — Braking Loop Failure |
| DD | Failed Flying Speed Check |
| DE | Failed Up to Speed Check |
| DF | Motor Failed RPM Control |
| E1 | Servo MPU Communication Check Failed |
| E2 | I/O Status Transfer Failed |
| E4 | Seek Error on First Seek |
| E9 | Speed Loss Restart |
| EE | I/O Self-Test Failed |

## Native-Controlled Diagnostic FRU Codes

| FRU Code | FRU Description |
|----------|-----------------|
| 81 | Control Board |
| 82 | Module |
| 83 | Power Supply |
| 84 | I/O Board |

## Native-Controlled Diagnostic Fault Codes

| Fault Code | Fault Description |
|------------|-------------------|
| 80 | Good Status |
| 81 | Read and Write Fault |
| 82 | Read or Write and Not On Cylinder Fault |
| 84 | First Seek Fault |
| 88 | Write Fault |
| 90 | Write and Write Protected Fault |
| A0 | Head Select Fault |
| C0 | Voltage Fault |

## Interface-Controlled Diagnostic Status Codes

| Status Code | Status Description |
|---|---|
| **Read/Write Tests** | |
| 00 | Good Status |
| 01 | Failed during seek to diagnostic cylinder |
| 02 | Failed during RTZ seek from diagnostic cylinder |
| 03 | Not defined |
| 04 | Not defined |
| 05 | Failed during head select test |
| 06 | Failed during read header test |
| 07 | Failed during write data test |
| 08 | Failed during read data test |
| 09 | Sync byte error during read header test |
| 0A | Data error during read header test |
| 0B | Sync byte error during read data test |
| 0C | Data error during read data test |
| **Access Tests** | |
| 13 | Failed during servo test |
| 14 | Failed during random seek test |
| 15 | Failed during access RTZ test |
| **Read Drive Specific Tests** | |
| 20 | Failed during read up of diagnostic status/error code log test |
| 21 | Failed during read up of FRU log test |
| 22 | Failed during read up of display fault log test |

# Interface-Controlled Diagnostic FRU Codes

| FRU Code | FRU Description |
|----------|-----------------|
| 01 | Control Board |
| 02 | Module |
| 03 | Power Supply |
| 04 | I/O Board |
| 05 | Control Board |

# Interface-Controlled Diagnostic Fault Codes

| Fault Code | Fault Description |
|------------|-------------------|
| 00 | Good Status |
| 01 | Read and Write Fault |
| 02 | Read or Write and Not On Cylinder Fault |
| 04 | First Seek Fault |
| 08 | Write Fault |
| 10 | Write and Write Protected Fault |
| 20 | Head Select Fault |
| 40 | Voltage Fault |

# Interpreting the I/O Board LEDs

The two I/O board LEDs are visible through holes in the upper lefthand corner of the rear panel.

When lit, the green LED indicates that the drive is ready.

The red LED has three general types of meanings:

- During power up or during a slave reset, the red LED flashes on and off continuously if the I/O MPU detects an I/O board failure.

- If the I/O MPU fails during power up, the red LED stays on constantly.

- After certain types of conditions (e.g. seek error, abnormal condition, or elapsed timeout), the red LED goes on steadily. An example of an abnormal condition is an attempt to execute the internal read/write diagnostics when the enable/disable switch is in the disable position.



REAR PANEL

IIT168

- The red LED flashes repeating patterns to indicate error codes. The following patterns are defined:

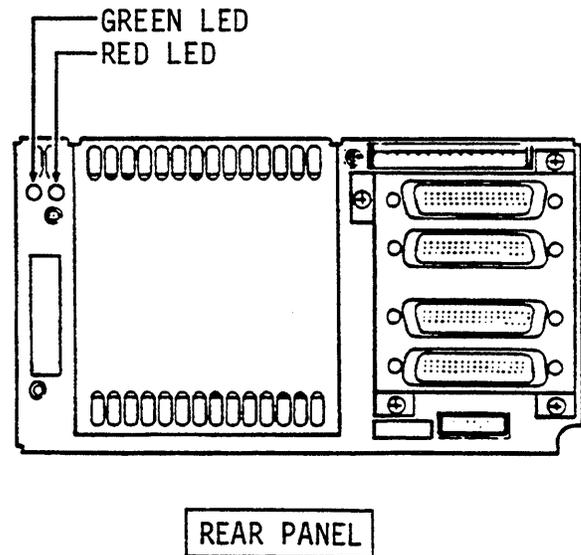Code 11 indicates an invalid ID Microcode Switch setting.

   **(—ON—) (—off—) ON off (-off-) ON off (—off—) (repeated)**

Code 21 indicates an illegal hardware sequence was detected.

   **(—ON—) (—off—) ON off ON off (-off-) ON off (—off—) (repeated)**

To turn off the red LED and restore the drive to normal operation, perform one of the following:

- Perform a slave reset.

- Perform a logical reset.

- Remove and reapply power.

---

> ## CAUTION
>
> When servicing the drive, observe all precautions listed under Electrostatic Discharge Protection in section 2 of this manual. Failure to observe these precautions can result in serious damage to electronic assemblies.

## INTRODUCTION

This appendix works in conjunction with the information presented about installation in section 2, and it contains the following topics:

- Using the Standard Rack Mounting Kit

- Adding an Operator Panel or Status/Control Panel

## USING THE STANDARD RACK MOUNTING KIT

The standard rack mounting kit differs from the ruggedized mounting kit described in section 2. As shown to the right, the standard kit has two inner drawers—one for each drive and power supply. The two inner drawers mount in a 2X drawer, which is slide-mounted in a 483 mm (19 in) standard rack. The slides allow outward extension of the 2X drawer for ease of maintenance.

In contrast, the ruggedized kit has a tray attached to the rack and individual drawers that slide in and out of the tray.
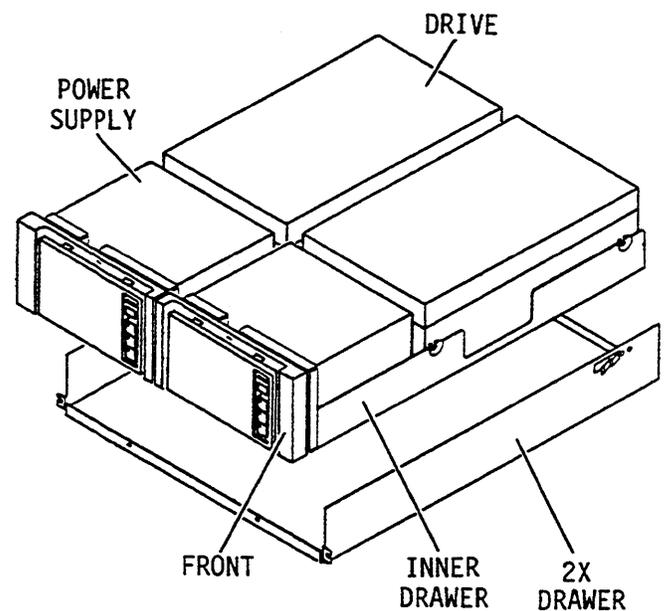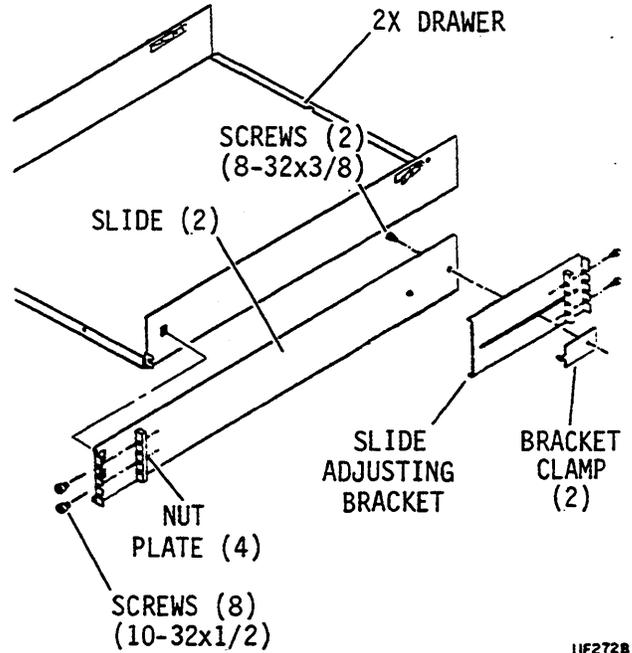


IIF268A

# Unpackaging the Drive

Unpackage the drive using the unpackaging instructions supplied with it. Save all packing materials for use if the drive must be shipped in the future.

Unpackage the 2X drawer, two slide mounts, and slide mount hardware kit if applicable.
Refer to section 2 for additional information about unpackaging cables and removing the drive and power supply from their packaging.
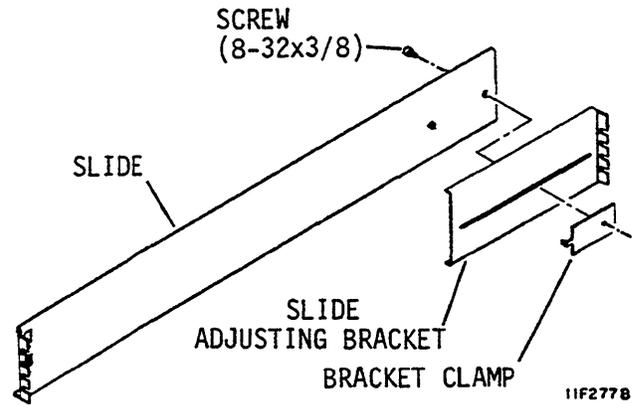
2X DRAWER

SCREWS (2)
(8-32x3/8)

SLIDE (2)

SLIDE
ADJUSTING
BRACKET

BRACKET
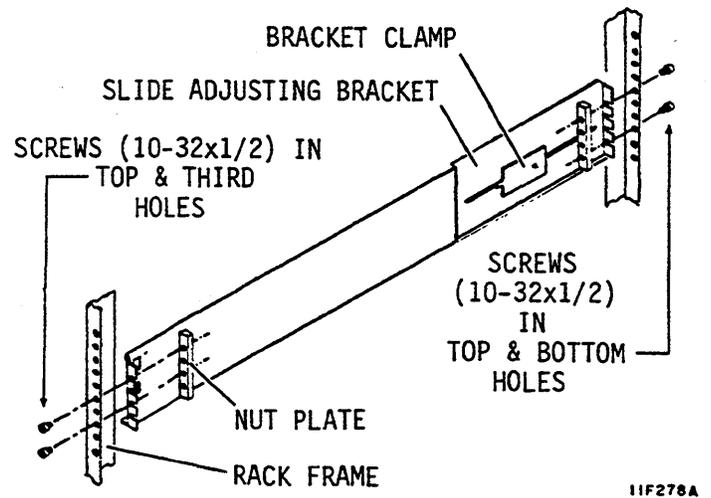CLAMP
(2)

NUT
PLATE (4)

SCREWS (8)
(10-32x1/2)

IIF272B

# Installing the 2X Drawer in a Rack

Use this procedure to install the optional 2X drawer into a standard rack.

1.  Remove screws from rack mounting kit. The four smaller screws attach the slide adjusting brackets to slides and inner drawers to the 2X drawer.

2.  Loosely attach slide adjusting bracket to each slide with bracket clamp and screw.

SCREW (8-32x3/8)

SLIDE

SLIDE ADJUSTING BRACKET

BRACKET CLAMP

IIF277B

3.  Loosely attach screws and nut plates for each slide to rack. The screws go into top and third holes at front of rack and in top and bottom holes at rear of rack.

BRACKET CLAMP

SLIDE ADJUSTING BRACKET

SCREWS (10-32x1/2) IN TOP & THIRD HOLES

SCREWS (10-32x1/2) IN TOP & BOTTOM HOLES

NUT PLATE

RACK FRAME

IIF278A

# Installing the 2X Drawer in a Rack (Contd)

4. Position slide adjusting brackets as needed for rack depth. Mount right and left slides in rack. Position slides so 2X drawer rests on flat edge of slides.

5. Tighten screws holding adjusting brackets to slides and slides to rack.

6. Lift drawer and guide it into slide assemblies. Continue pushing inward until drawer is fully in rack. Drawer should not bind when sliding it in and out of rack.

TIGHTEN SCREWS

ADJUST FOR RACK DEPTH

TIGHTEN SCREWS

RACK FRAME

SLIDE ADJUSTING BRACKE

NUT PLATE

RACK FRAME
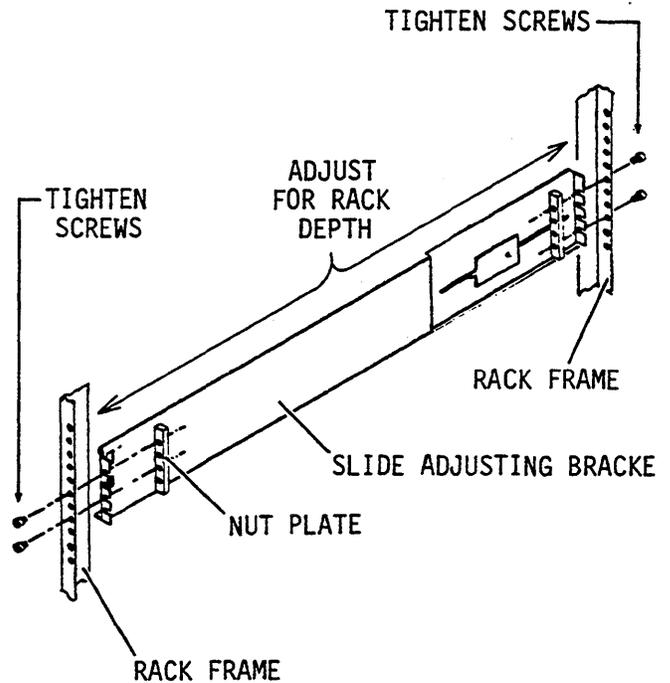
IIF279

If it is necessary to remove the 2X drawer from the rack, slide it out to full extension. Press the drawer locking springs and remove the drawer from the rack.

DRAWER LOCKING SPRINGS

2X DRAWER

FRONT
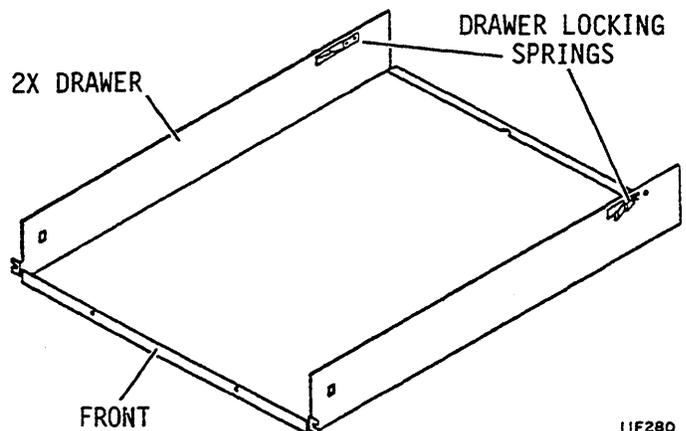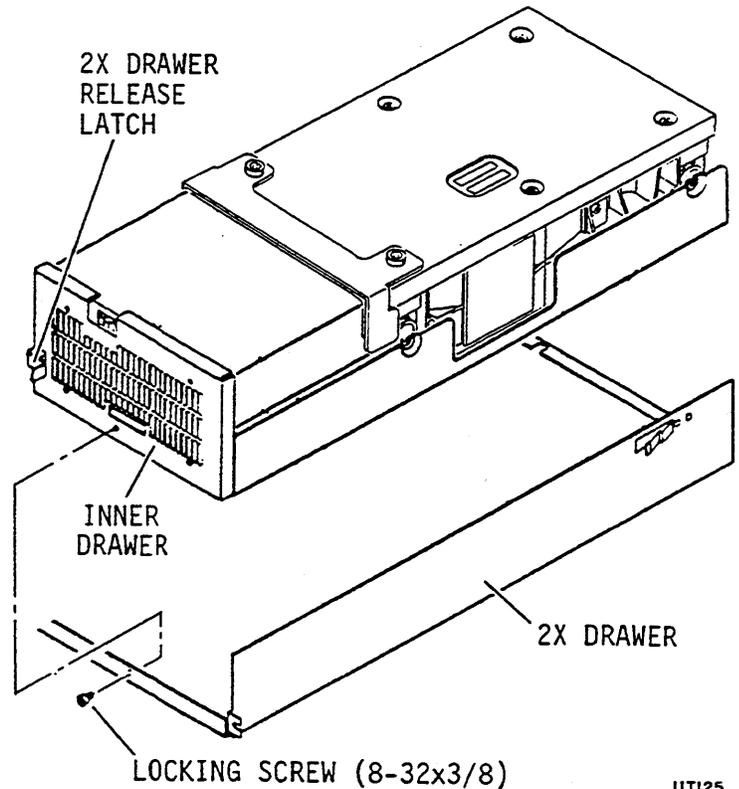
IIF280

## Preparing the Inner Drawer

Before installing the inner drawer into the 2X drawer, you should perform the following procedures, as described in section 2:

- Installing the Operator Panel or Status/Control Panel Jumper Cable

- Installing the Power Supply in the Drawer

- Installing the Drive in the Drawer

---

## Installing the Inner Drawer into the 2X Drawer

1. Fully extend 2X drawer from rack.

2. Slide inner drawer into 2X drawer so rear edge of inner drawer is under lip on 2X drawer.

3. Secure inner drawer into 2X drawer with locking screw.

4. Repeat steps 2 and 3 for other drive.

5. Push 2X drawer to closed position in rack.

6. Connect one end of ac power cable to short ac power cable. Connect the other end to site power.



2X DRAWER RELEASE LATCH

INNER DRAWER

2X DRAWER

LOCKING SCREW (8-32x3/8)

IITI25

# Completing the Installation

With the inner drawer installed in the 2X drawer, you should return to section 2 and perform the following procedures:
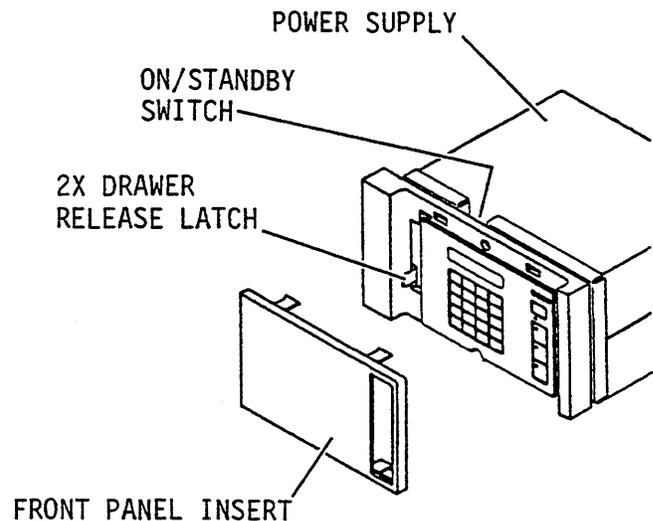
- Installing the Front Panel

- Mounting the Status/Control Panel

- Mounting the Operator Panel

- Checking the Power Supply Voltage Selection

- Changing the Power Supply Voltage Selection

- Connecting the System I/O Cabling

- Synchronizing the Spindle

- Grounding the System

- Setting the Circuit Board Switches

In most cases, you will find it convenient to perform the procedures in the order they are presented in the manual. However, you might find it convenient to make switch settings on both the drive and the power supply before mounting them.

# The Power Supply On/Standby Switch

The On/Standby switch is on the power supply. This switch controls dc power to the drive and is not routinely used. If the standard rack mounting kit is used, access the switch as follows:

1. Remove the front panel insert.

2. Push the 2X drawer release latch to the right.

3. Extend the 2X drawer from the rack to expose the power supply.

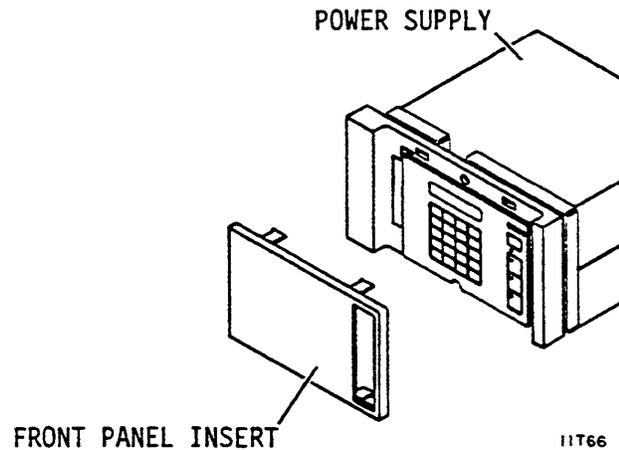4. Place the On/Standby switch in the desired position.



IIF261A

# ADDING AN OPERATOR PANEL OR STATUS/CONTROL PANEL

Use this procedure to add an optional operator panel or status/control panel to an existing drawer installation.
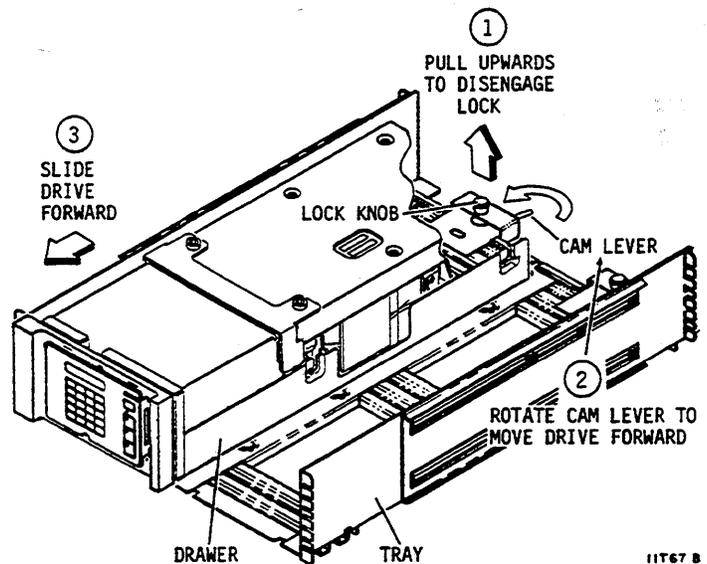
1. Remove the front panel insert from each drive.

POWER SUPPLY

FRONT PANEL INSERT

IIT66

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### NOTE

If standard rack mounting kit is used, refer to the previous page for instructions on reaching On/Standby switch.

2. Gain access to rear of drive. Lift lock knob to release drawer, and push drawer forward several inches.

3. Set On/Standby switch on power supply to Standby position.

① PULL UPWARDS TO DISENGAGE LOCK

③ SLIDE DRIVE FORWARD

LOCK KNOB

CAM LEVER

② ROTATE CAM LEVER TO MOVE DRIVE FORWARD

DRAWER        TRAY        IIT67 B

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4. Remove screws securing front panel to drawer. Remove front panel and filter from drawer.

5. Disconnect the ac power cord from the power source.

6. Disconnect the I/O cables at the rear of the drive.

FRONT PANEL

FRONT PANEL SCREW (4) (6-32x7/8)

FILTER

DRAWER

IIT108

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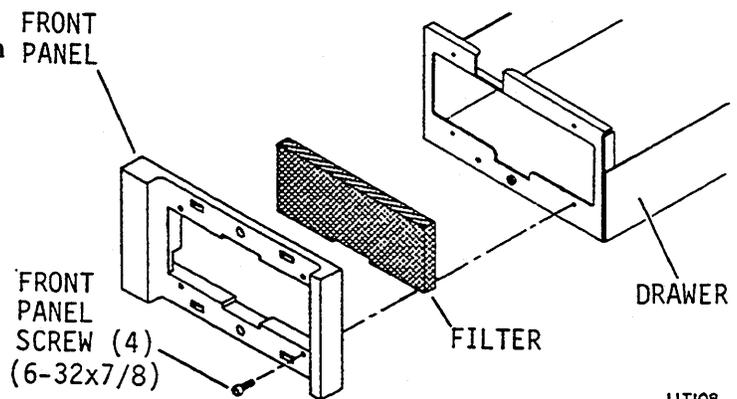
7. Remove drawer from tray (or inner drawer from 2X drawer). Place drawer on a work table.

8. Remove air baffle.

9. Loosen shock mount screws securing drive to drawer.

10. Disconnect power supply ground strap above shock mount on drive module.

11. Lift up front of drive and disconnect dc power cable from J15A on control board.

12. Lift drive from drawer and set on table.

13. Remove gasket that was inserted between drive and power supply.
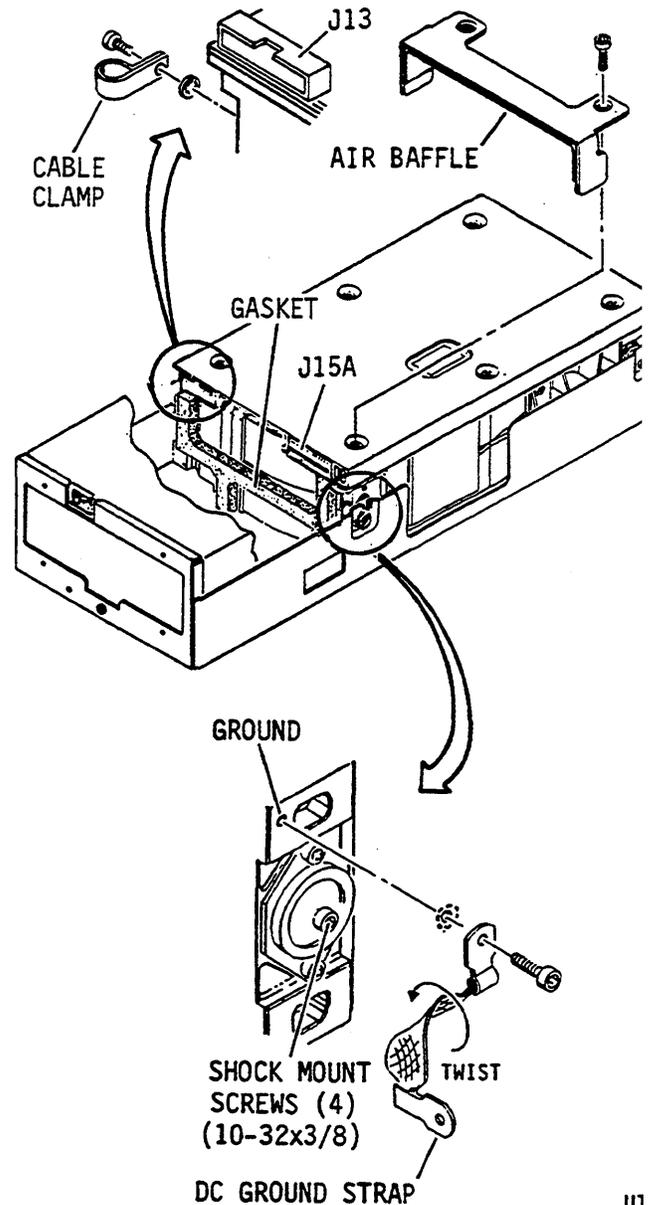
# ADDING AN OPERATOR PANEL OR STATUS/CONTROL PANEL (CONTD)

14. Remove screws holding power supply to drawer.

15. Lift power supply from drawer and disconnect ac power cord from J1.
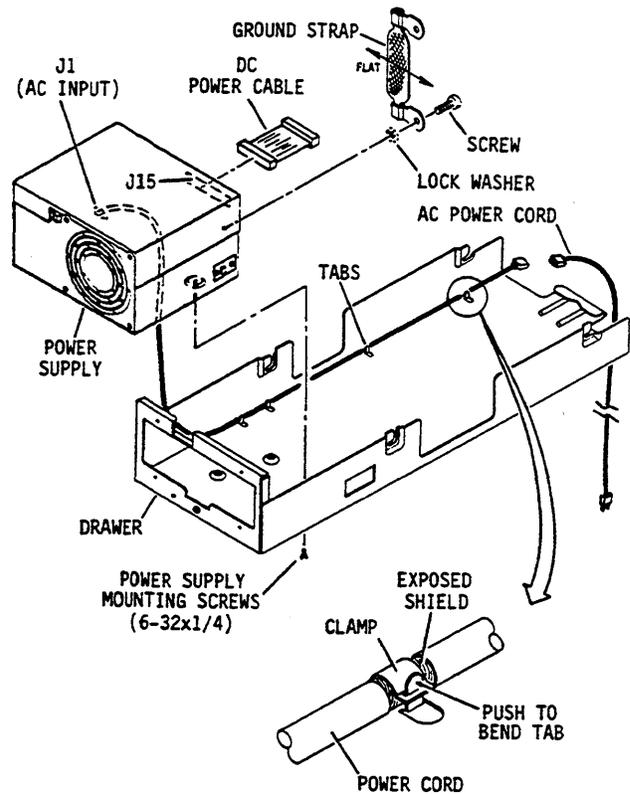


16. Perform the following procedures in the order listed.

    • Installing the Operator Panel or Status/Control Panel Jumper Cable (see section 2)

    • Installing the Power Supply in the Drawer (see section 2)

    • Installing the Drive in the Drawer (see section 2)

    • How to Mount the Status/Control Panel, or How to Mount the Operator Panel (see section 2)

    • Installing the Drawer in the Tray (see section 2) or Installing the Inner Drawer into the 2X Drawer (see this appendix).

17. Connect I/O and system ground cables.

18. Connect ac power cord to power source.

19. Place On/Standby switch on power supply to On (1).

20. Place drawer in its locked position in tray (see section 2) or place 2X drawer in its closed position in rack (see this appendix).