WANG

DATA STORAGE CABINET

Model: 2200

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Customer Engineering
Product Maintenance Manual **741-1806**

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PREFACE

This document is the Product Maintenance Manual (PMM) for the Wang 2200 Data Storage Cabinet. The manual is organized in accordance with Customer Engineering Technical Documentation's approved PMM outline. The scope of this manual reflects the type of maintenance philosophy selected for this product.

The purpose of this manual is to provide the Wang-trained Customer Engineer (CE) with sufficient instructions to operate, troubleshoot, and repair the 2200 Data Storage Cabinet. The manual will be updated on a regular schedule or as necessary. Such updates will be published either as Publication Update Bulletins (PUBs) or as full revisions.

First Edition (August, 1987)

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SECTION 1

INTRODUCTION

1.1 Scope and Purpose

This manual contains installation, operation, troubleshooting, and repair information for the Model 2200 Data Storage (DS) Cabinet. The Data Storage Cabinet houses and controls magnetic storage devices in various combinations. The availability of the various options enables customizing the cabinet to meet specific requirements. The 2200DS Cabinet is fully compatible with the 2200VP, 2200MVP/A/C, 2200LVP/C, Micro VPs, and the 2200CS.

1.2 Organization and Layout

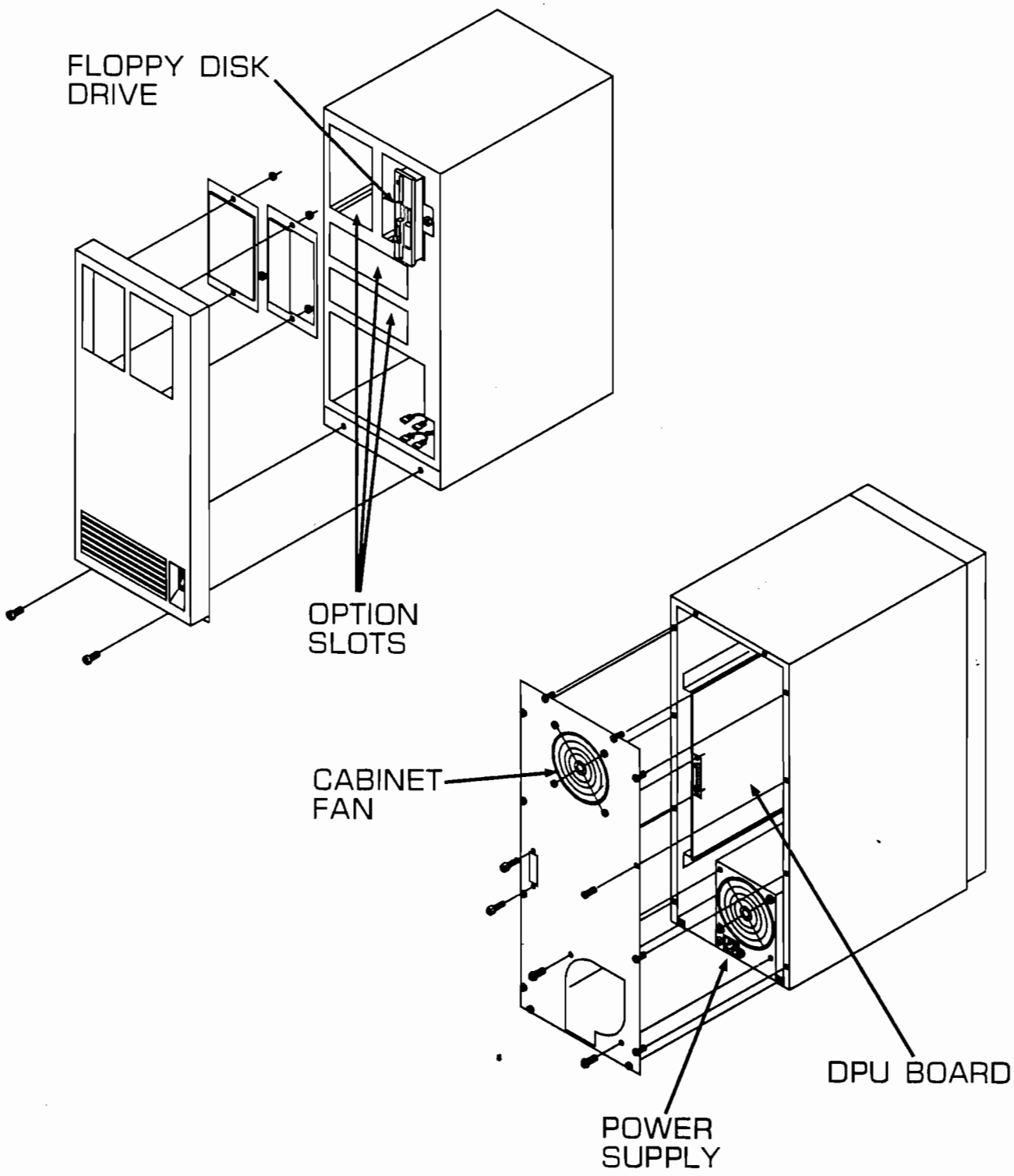
This manual is divided into 12 sections numbered 1 through 12. Each section describes a separate maintenance subject and minimizes references to other sections. All or most of the information pertaining to a specific task appears on a single or double frame. Each frame, in turn, contains illustrations, numbered steps, and/or text describing the individual steps required to accomplish each task.

SECTION 2 CONTENTS

SECTION 2

IDENTIFICATION

2.1 Major Assembly



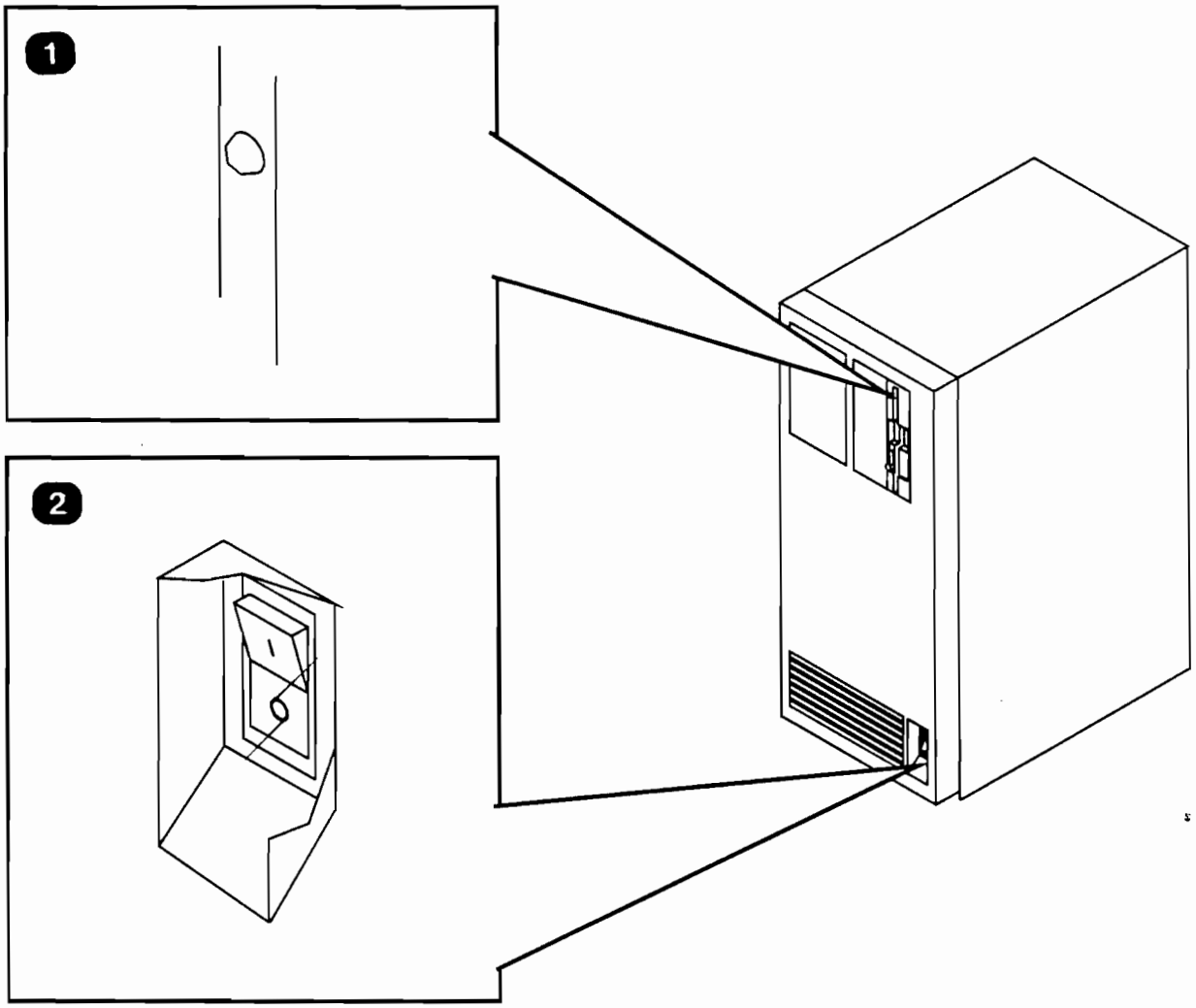
SECTION 3

CONTROLS AND INDICATORS

Page

3 CONTROLS AND INDICATORS

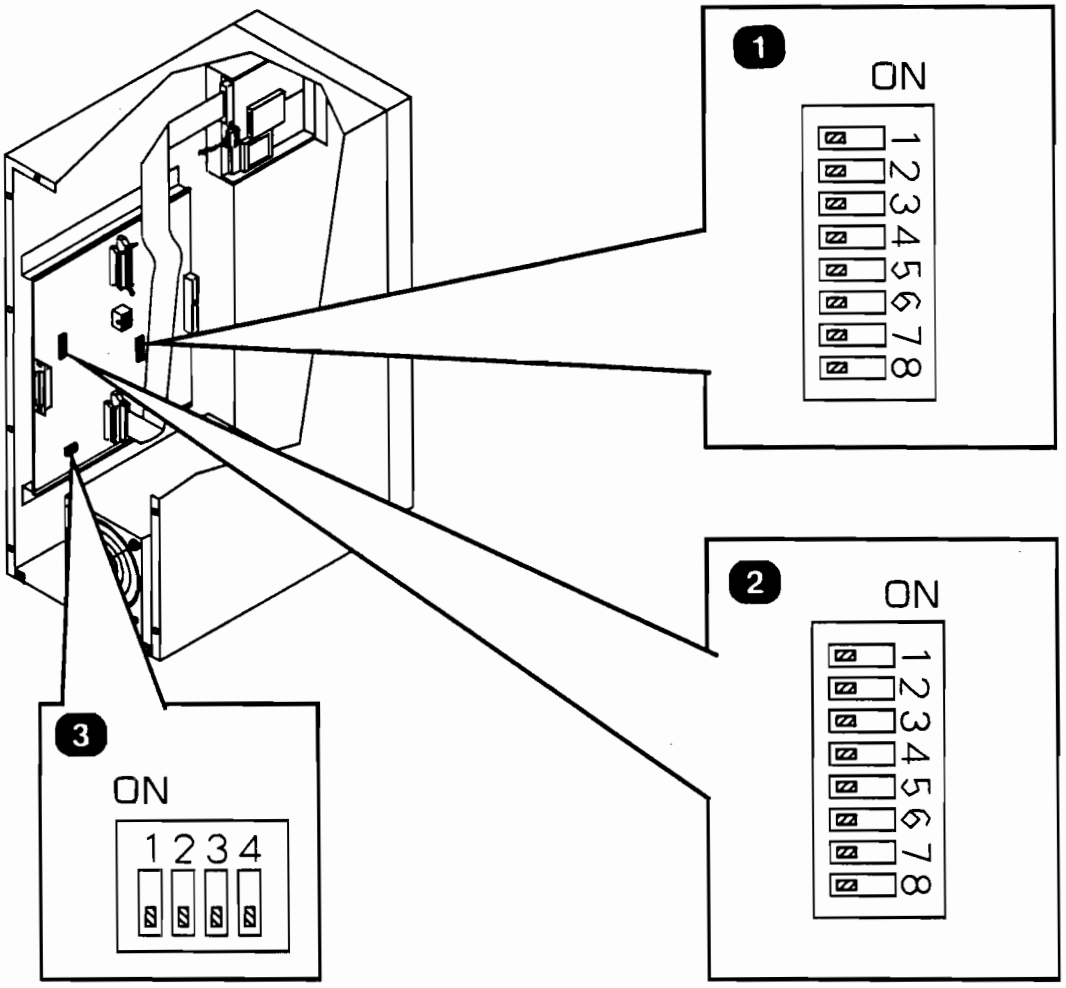
3.1 Operator Controls and Indicators



Item	*Name*	*Type and Function*
1	Select	LED; during the power on diagnostic routine, the lamp turns on, and should go out when the drive is ready for use. Thereafter, the lamp lights whenever the drive is accessed.
2	AC Power Switch	Rocker switch; applies ac power to the power supply and cooling fan.

3 CONTROLS AND INDICATORS

3.2 Service Controls



NOTE: Unused positions should be turned off.

Item	*Name*	*Type and Function*
1	SW2	DIP switch; 8-pole; defines configuration of Winchester drives 3 and 4.
2	SW1	DIP switch; 8-pole; defines configuration of Winchester drives 1 and 2.
3	SW3	DIP switch; 4-pole; identifies type of floppy drive (360kb or 1.2mb) and indicates if a tape drive is present.

SECTION 4 CONTENTS

SECTION 4

OPERATION

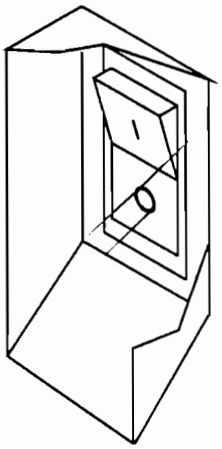
4.1 Power-Up Procedure

Installation as specifed in Section 9 must precede equipment start up.

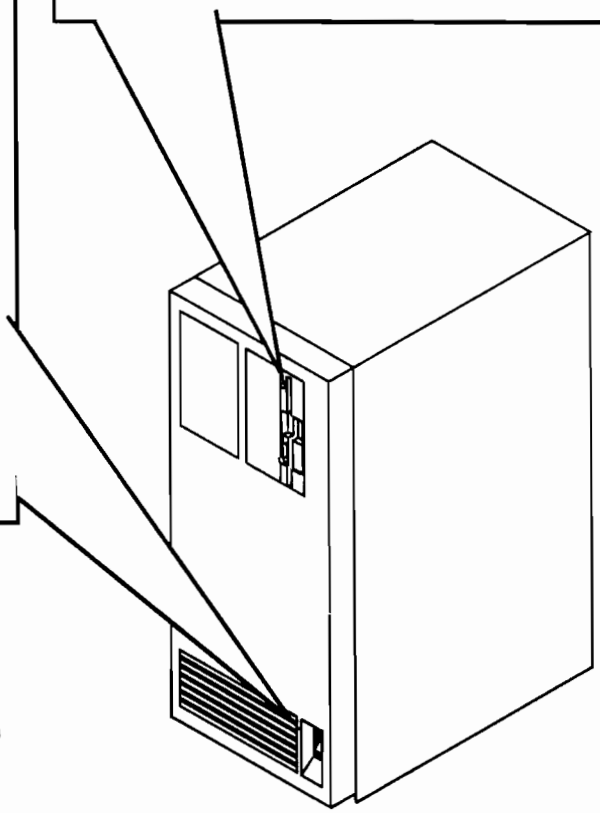
CAUTION

Do not switch DS Cabinet ON or OFF when a floppy diskette is mounted in drive. Also, never mount or remove a diskette while floppy activity LED is lighted.

1. Press "1" on DS Cabinet power switch.



2. Activity lamp turns on during the power on routine and when the drive is ready for use, the lamp goes out. Should lamp fail to light, go to Troubleshooting [➡6.1].



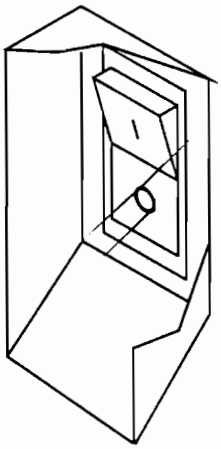
● END

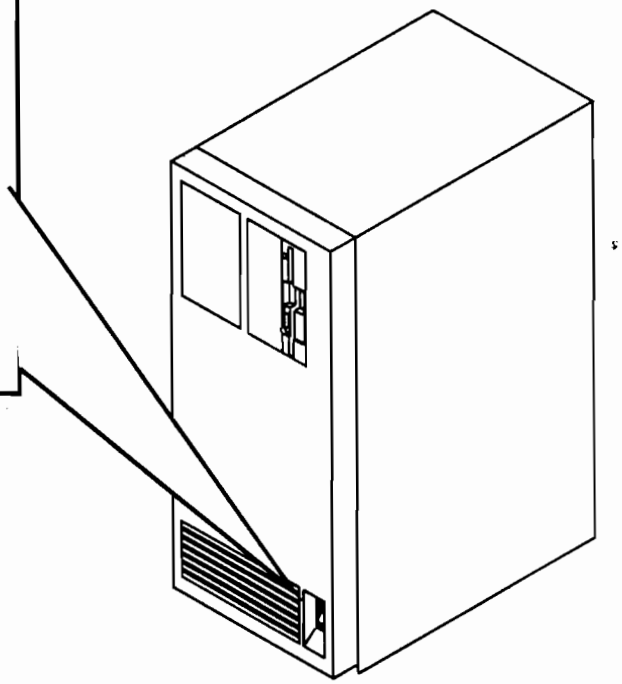
4.2 Power-Down Procedure

CAUTION

Ensure that no users are using the disk cabinet, that no diskette is in floppy drive, and that no activity lamps lamps are lighted.

1. Press "0" on DS Cabinet power switch.





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SECTION 5 CONTENTS

SECTION 5

PREVENTIVE MAINTENANCE

5 PREVENTIVE MAINTENANCE

5.1 Materials Required

All magnetic storage devices for the 2200 Data Storage Cabinet are field replaceable. There are, therfore, no scheduled preventive maintenance procedures.

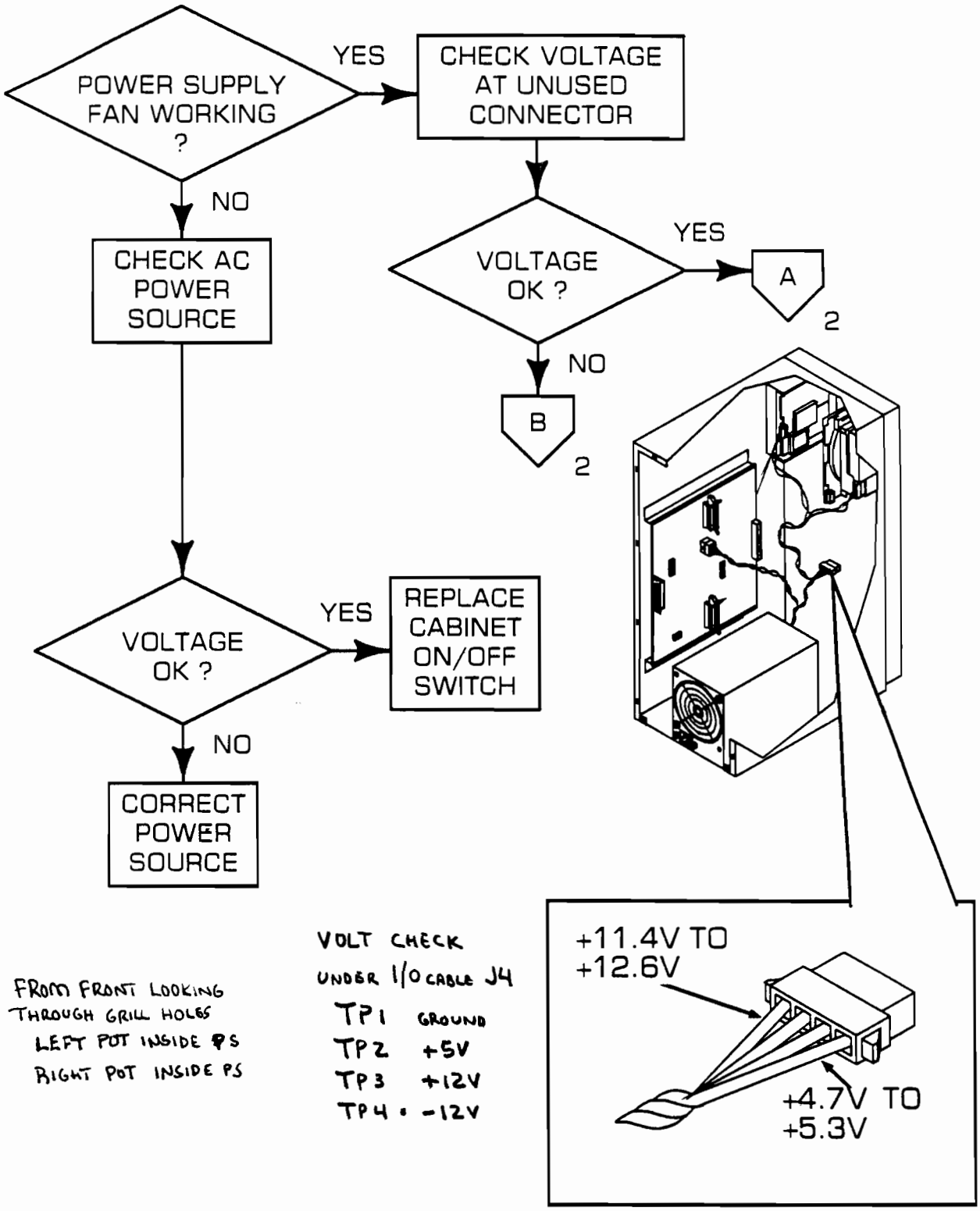
The customer is responsible for periodic cleaning of the floppy-disk drive. The diskette-drive cleaning kit, part No. 725-1413, is recommended.

SECTION 6

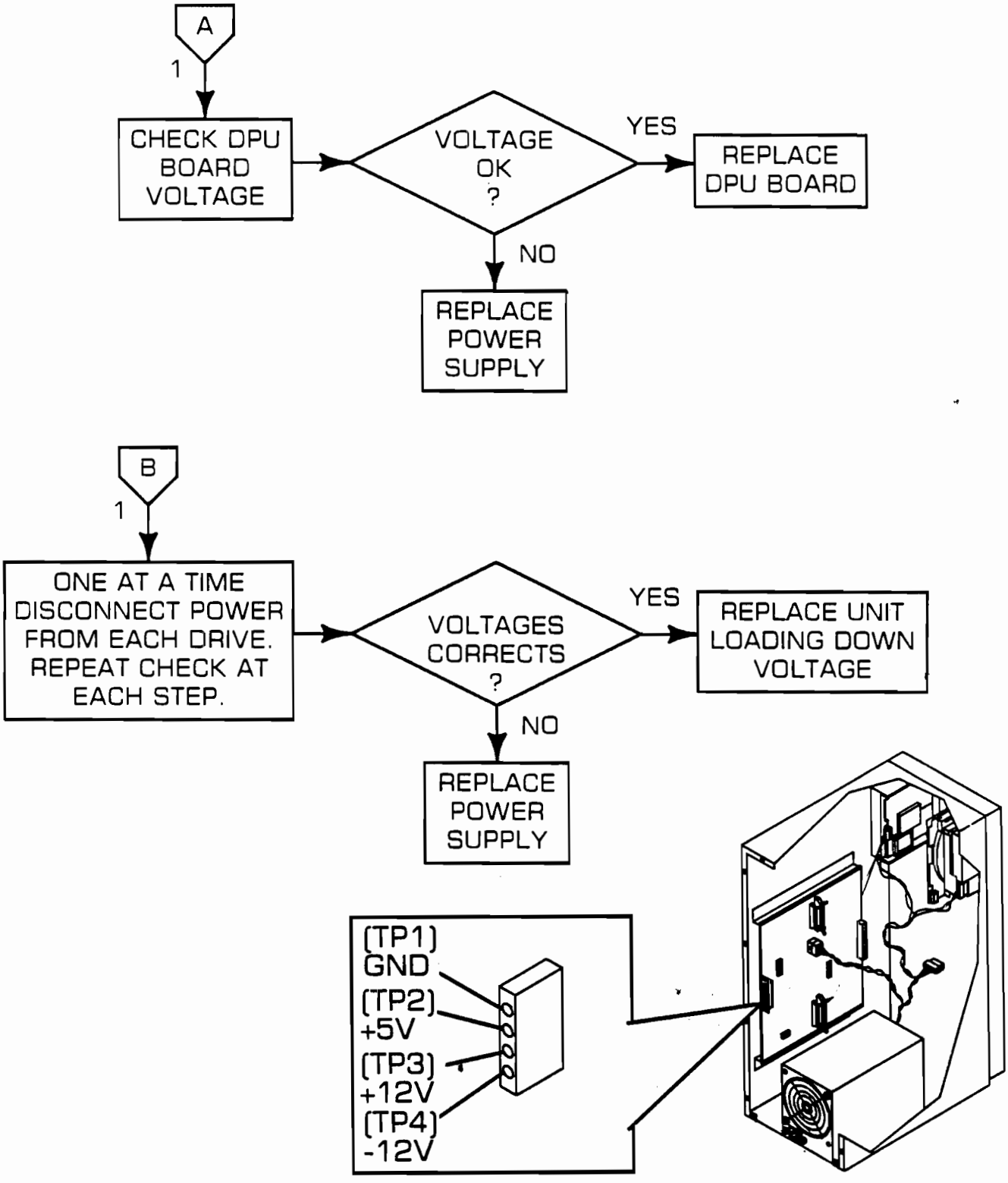
TROUBLESHOOTING

Page

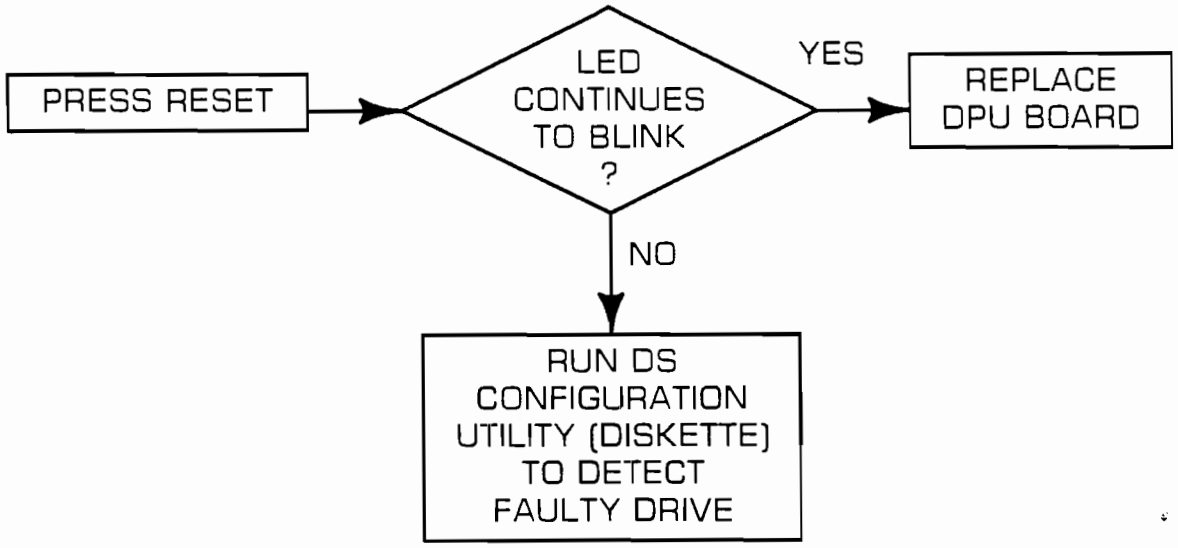
6.1 Utility Faults (Sheet 1 of 2)



6.1 Utility Faults (Sheet 2 of 2)



6.2 Floppy Light Stays On/Continues to Blink



SECTION 7

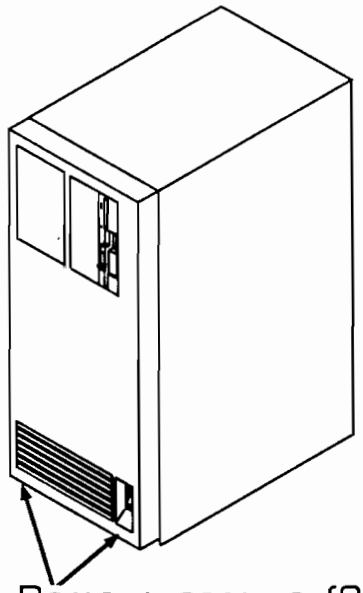
REPAIR

Page

7.1 Front Panel Removal

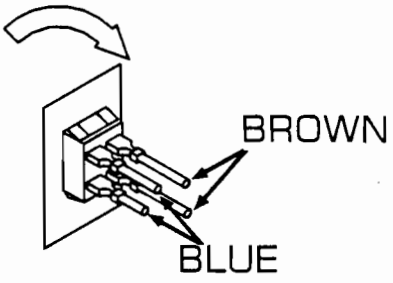
Before removing panels:

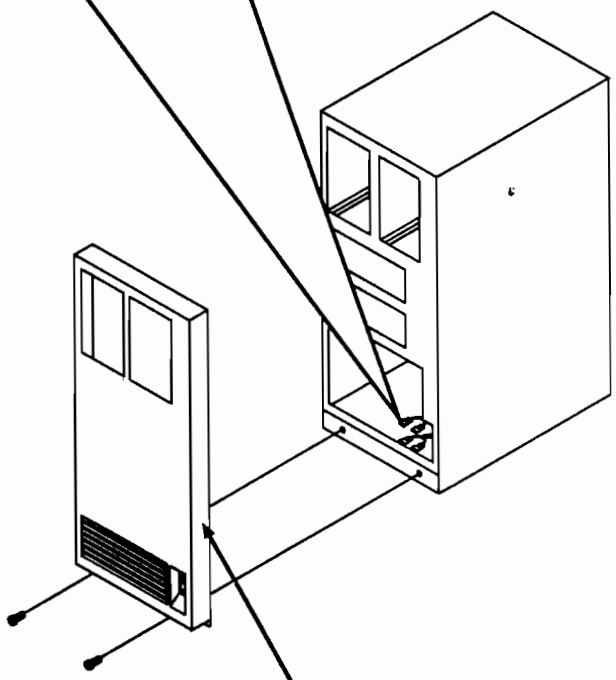
- Power off unit
- Disconnect power cable from outlet
- Power down CPU, if attached



1 Remove screws (2) from recessed portion of lower front panel.

2 Pull lower end of panel away from cabinet; remove slip-on power connectors from switch. (Note connector orientation for reconnection)



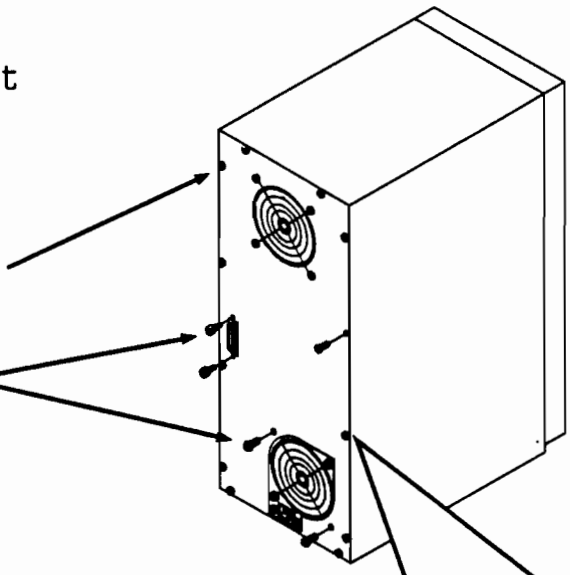


3 Lift panel free of cabinet.

7.2 Rear Panel Removal

Before removing panel:

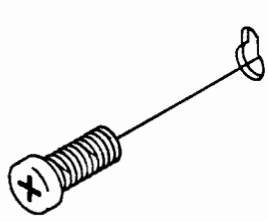
- Power off unit
- Disconnect power cable from outlet
- Power down CPU, if attached
- Remove I/O cable

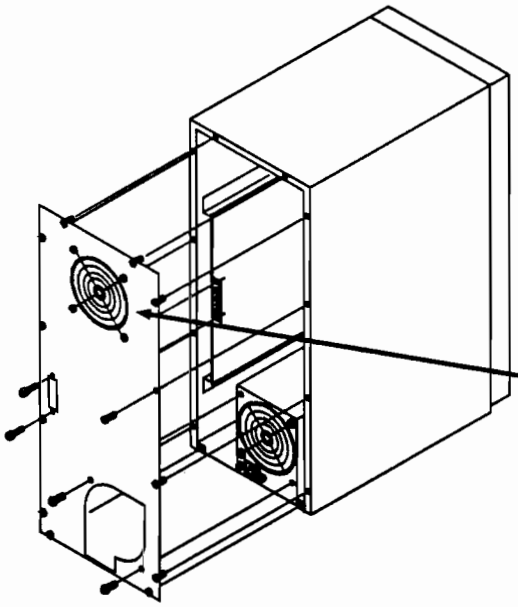


1. Loosen screws (10) around edge of panel. (Do not remove).

2. Remove I/O cable screws, and power-supply screws.

3. Lift panel to enable keyhole apertures to clear screws.





4. Disconnect power connector from cabinet fan.

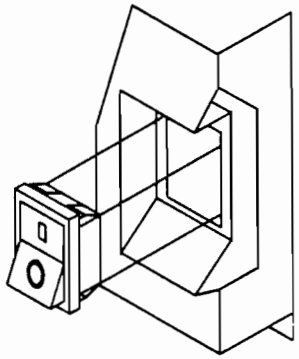
7.3 Power Switch Removal

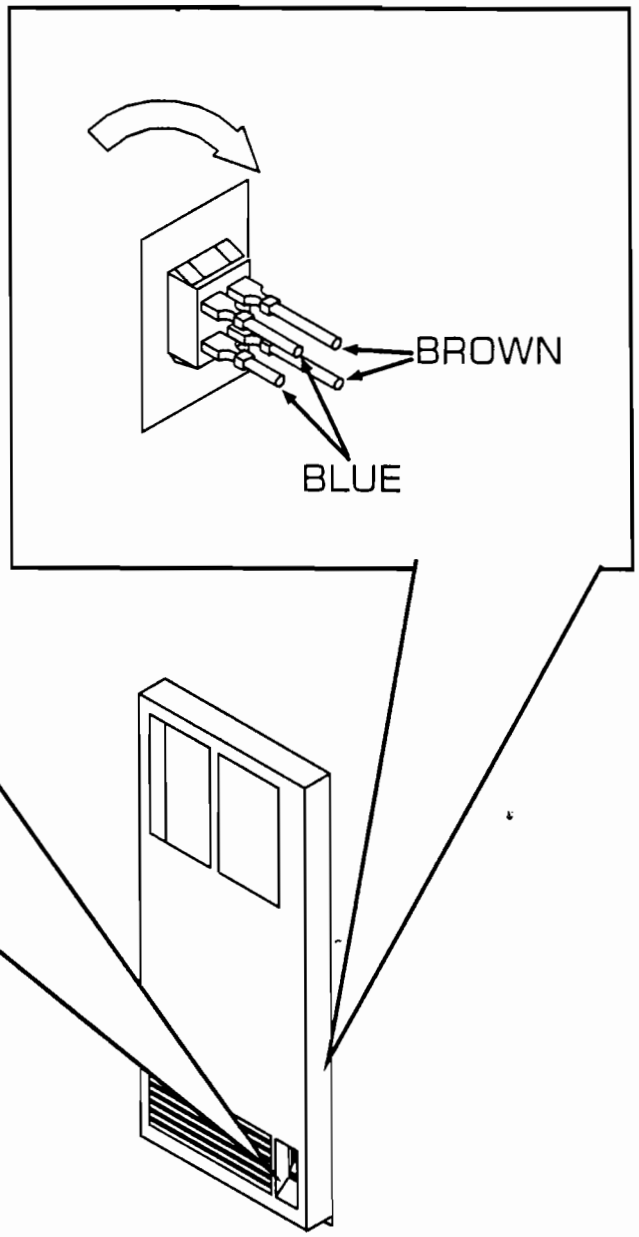
Before removing panels:

- Power off unit.
- Disconnect power cable from outlet.
- Power down CPU, if attached.

1. Remove front panel (➡7.1).

2. Press spring cams to release power switch from panel aperture.

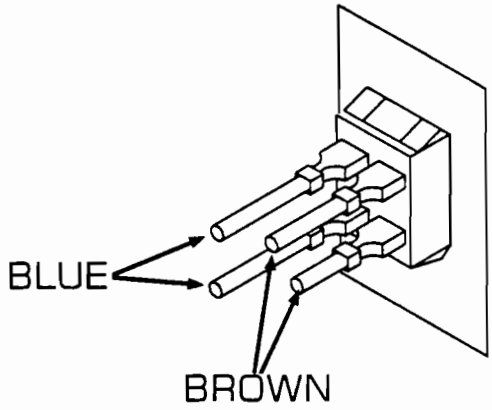




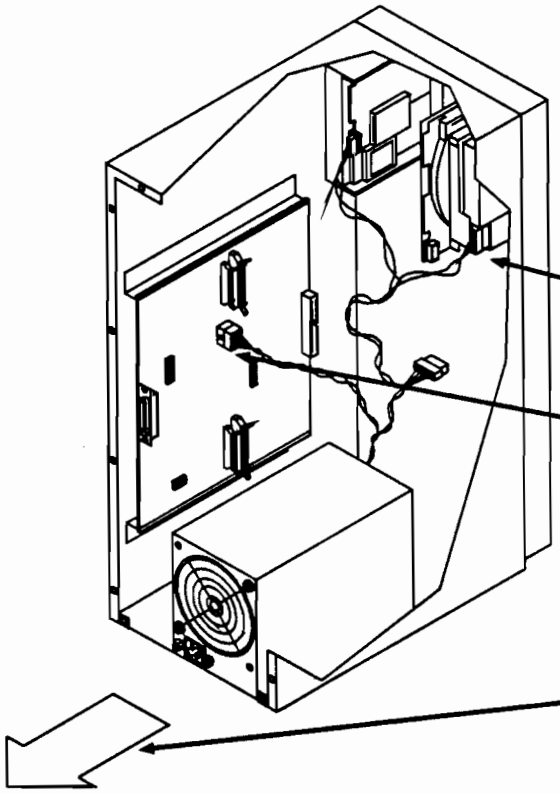
7.4 Power Supply Removal

Before removing panel:

- Power off unit
- Disconnect power cable from outlet
- Power down CPU, if attached
- Remove I/O cable



1. Disconnect ON/OFF switch slip-on connectors (➡7.1).
2. Remove rear panel (➡7.2).



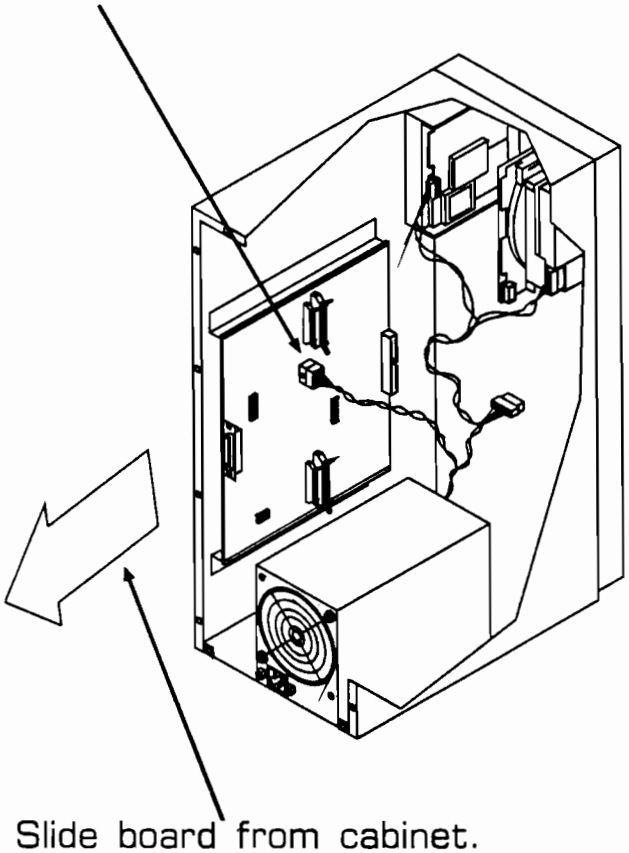
3. Disconnect power plug(s) from drive(s) power connectors.
4. Disconnect plug (J3) at DPU board.
5. Slide power supply from cabinet.

7.5 DPU Board Removal

Before removing panel:

- Power off unit
- Disconnect power cable from outlet
- Power down CPU, if attached
- Remove I/O cable

1. Remove rear panel (➡7.2).
2. Disconnect power and signal connectors from board.



3. Slide board from cabinet.

SECTION 8 CONTENTS

SECTION 8

ADJUSTMENTS

8 ADJUSTMENT AND ALIGNMENT

8.1 Adjustments and Alignment

The magnetic devices used with the DS Cabinet are field replaceable. Field maintenance of these items does not therefore include adjustment or alignment.

SECTION 9 CONTENTS

SECTION 9

UNPACKING AND SETUP

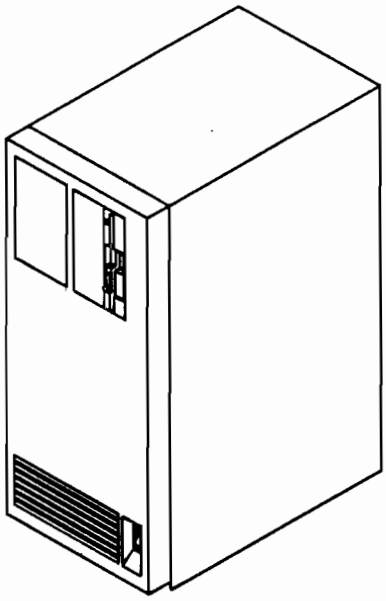
9 UNPACKING AND SETUP

9.1 Installation Site Check

Proper location and site preparation are important for overall operating efficiency. Ideally, the area should be easily accessible, relatively dust free, and temperature and humidity controlled. An adequate number of dedicated, regulated, noise-free ac power outlets should be provided to minimize electro- magnetic interference. The DS Cabinet draws up to 3.15 amps at 120 VAC; 1.57 amps at 220 VAC.

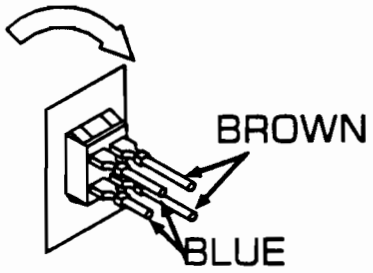
9.2 DS Cabinet Preparation (Sheet 1 of 2)

The DS Cabinet and associated magnetic storage devices are shipped separately. Ensure that all power is disconnected prior to cabinet preparation.



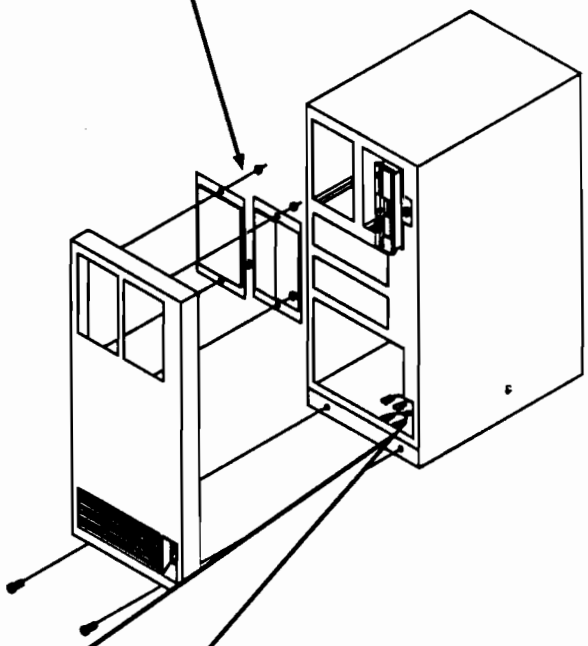
1. Remove screws (2) from recessed portion of lower front panel.

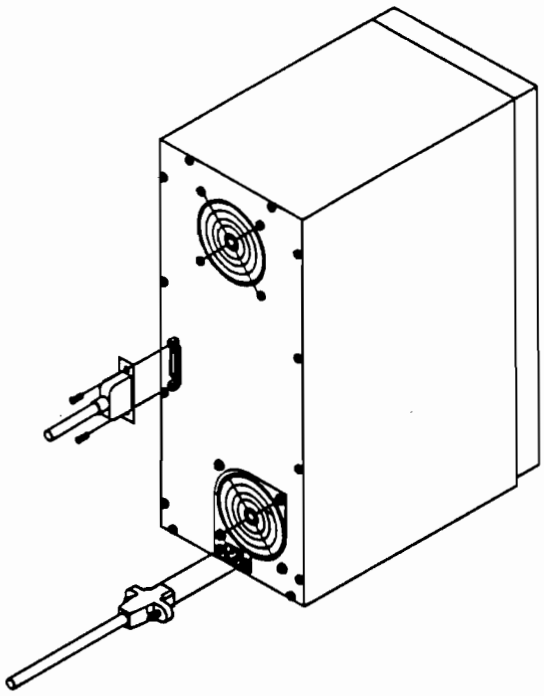
2. Pull lower end of panel away from cabinet; remove slip-on power connectors from switch. (Note connector orientation for reinstallation).



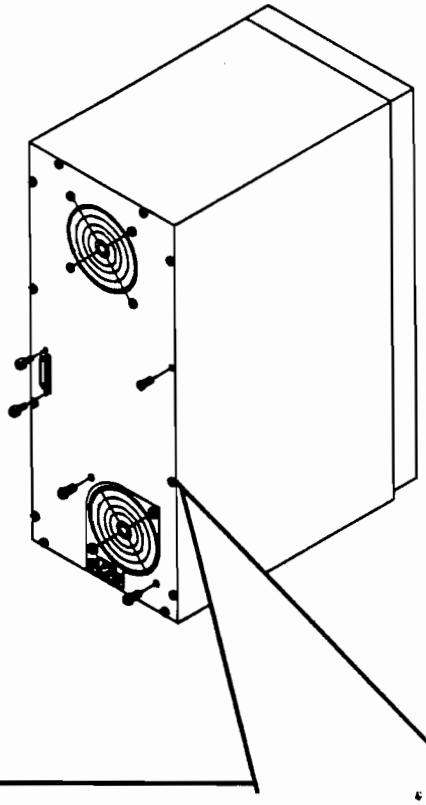
3. Lift panel free of cabinet.

4. Remove front bezel covers (4 nuts).

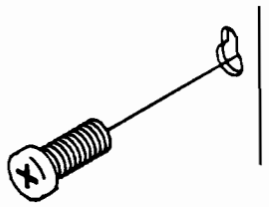




5 Remove screws (4) securing power supply and DPU board to rear panel.



6 Loosen (do not remove) screws (10) around perimeter of rear panel; lift panel to enable keyhold apertures to clear screws.

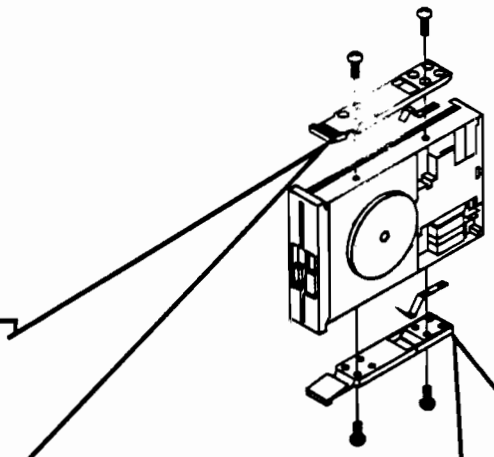


9.3 Device Preparation

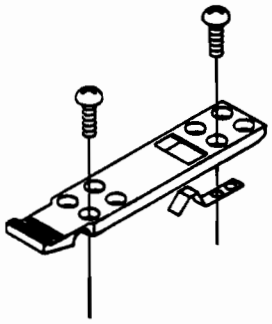
Each magnetic device is shipped with an installation kit containing (in addition to items pertaining to the specific device):

Two Drive Mounting Brackets
Four screws - 6/32 x 1/4"
Two Grounding Clips

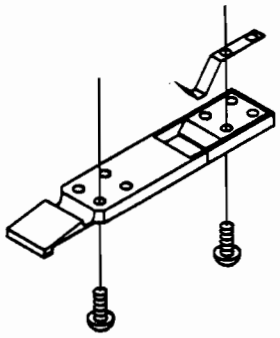
The mounting brackets must be attached to the given drive to enable installation of the drive into the selected location in the cabinet.



1. Line up holes in mounting bracket and grounding clip; fasten with screw onto drive. (Use hole in mounting bracket which best fits location of screw receptacle.) Curved end of grounding clip must protrude through bracket aperture.



2. Repeat procedure for opposite side of drive.

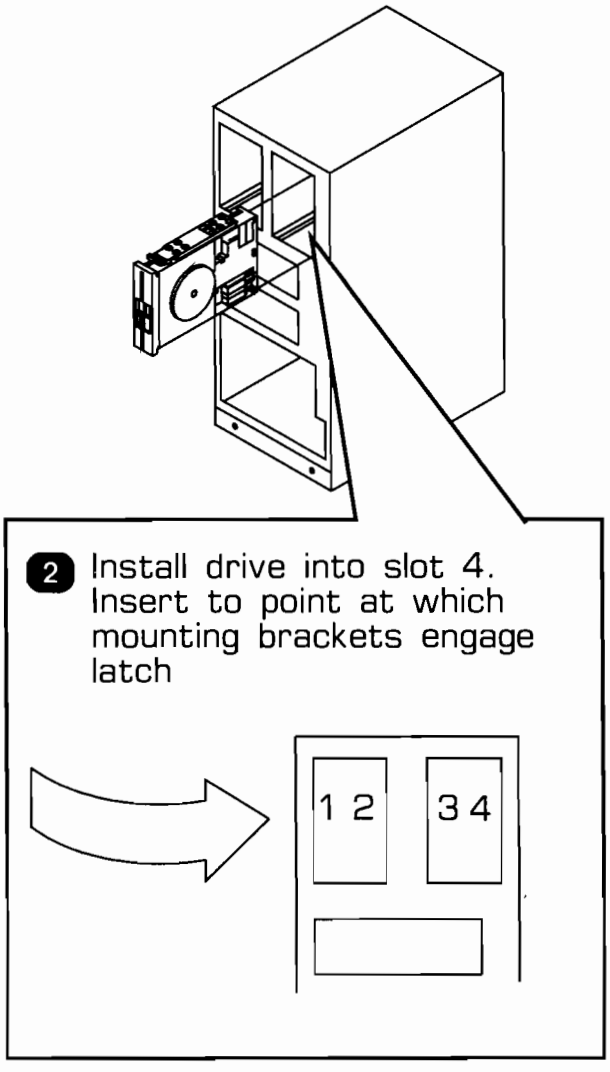


9.4 Floppy Disk Drive Installation

The floppy-disk drive is shipped with an installation kit containing:

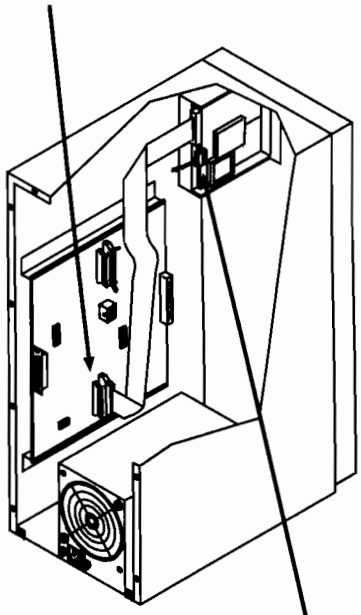
Two Drive Mounting Brackets
Four screws - 6/32 x 1/4''
Two Grounding Clips

1. Attach mounting brackets and grounding clips to drive (➡9.3).



2. Install drive into slot 4. Insert to point at which mounting brackets engage latch

3. Install floppy signal cable (furnished with DS Cabinet) between drive and J6 on DPU board.



4. Insert available power supply connector.

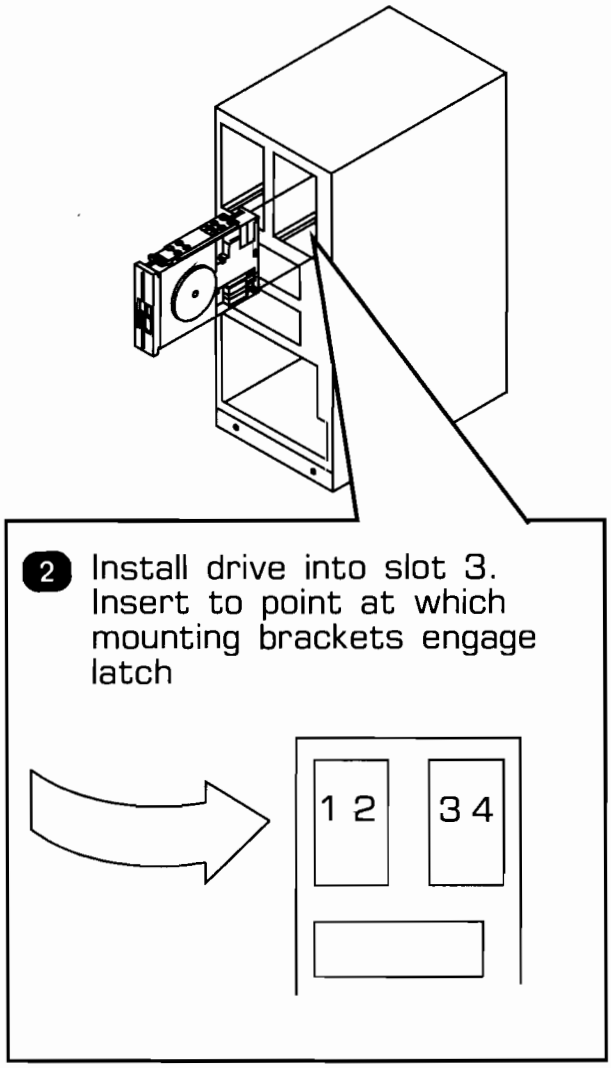
UNPACKING AND SETUP

9.5 Streaming Tape Drive Installation

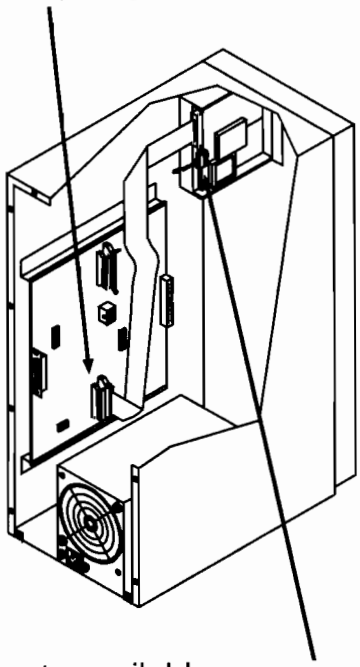
The Streaming Tape Drive is shipped with an installation kit containing:

Two Drive Mounting Brackets
Four screws - 6/32 x 1/4''
Two Grounding Clips
Tape drive cable

1. Attach mounting brackets and grounding clips to drive (➡9.3).



3. Install tape signal cable (furnished installation kit) between drive and J8 on DPU board.



4. Insert available power supply connector.

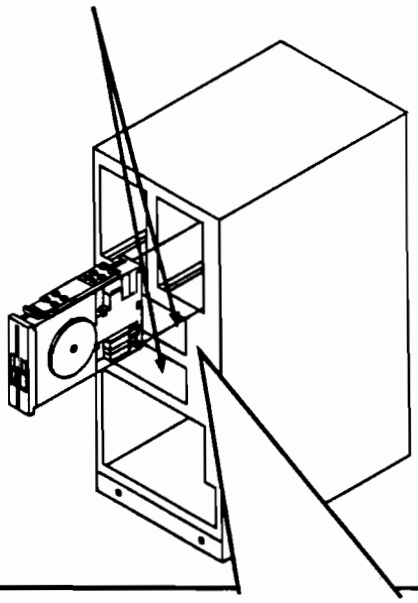
9.6 Winchester Drive(s) Installation (Sheet 1 of 3)

Each Winchester drive is shipped with an installation containing:

One Winchester "B" cable
Two Drive Mounting Brackets
Four screws - 6/32 x 1/4"
Two Grounding Clips
Half-width front bezel cover

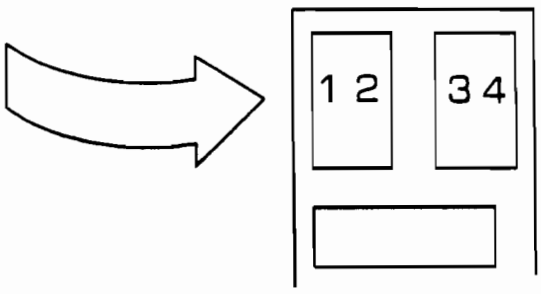
1. Attach mounting brackets and grounding clips to drive (➡9.3).

If drive is full-height, install in available full-height slot.



2. If drive is removable Winchester, install in slot 1 (for accessibility).

   If drive is half-height (non-removable), install into slot 2.

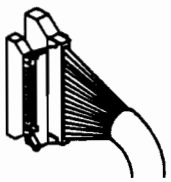


Each Winchester drive connects to the DPU board via two cables:

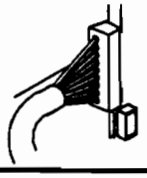
- An "A" (drive select) cable, furnished with cabinet, which connects to all Winchester drives in the DS Cabinet.
- A "B" (data) cable dedicated to the drive to which it attaches.

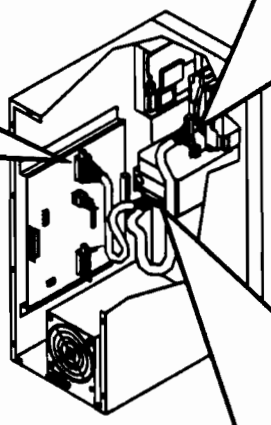
To connect the "A" cable:

1. Attach end of cable to J1 on DPU board.

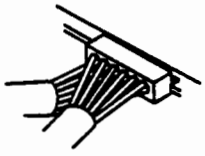


2. Attach DRIVE SELECT PLUG 1 to Winchester removable drive (if present). If removable drive not present, attach to alternate Winchester. For Winchester operation, PLUG 1 must attach to a unit.





3. Attach DRIVE SELECT PLUGS 2/3/4 to other Winchester drive(s). (Plug may be selected for locational convenience.) Plug 1 is the only plug which must be used for Winchester installation. Plug selection will affect addressing (➡Appendix A)

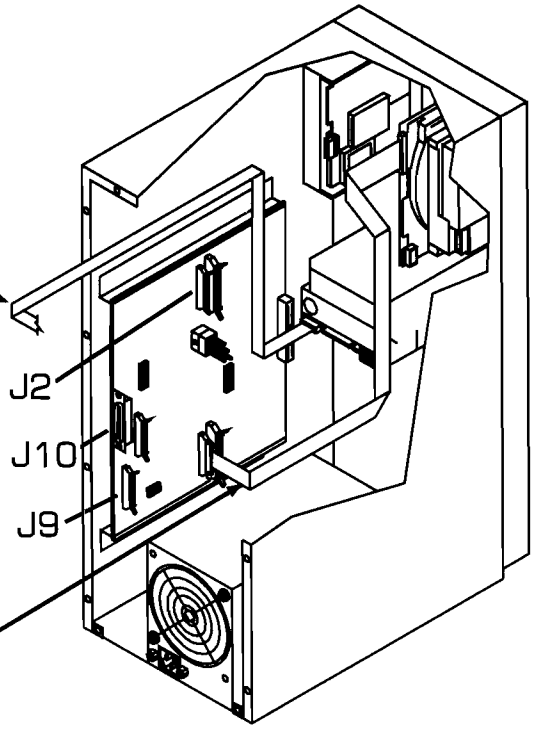


NOTE

Drive connected to SELECT PLUG1 (farthest from DPU Board) must have cable terminator installed. Drives connected to SELECT PLUGS 2/3/4 must have terminators removed (see instruction manuals pertaining to specific drive).

To connect the "B" cable:

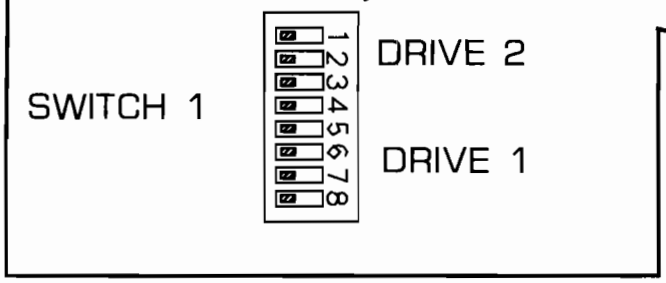
1. Connect cable between signal connector on non-removable Winchester drive and either J2, J9, or J10. Repeat for each additional non-removable Winchester drive.



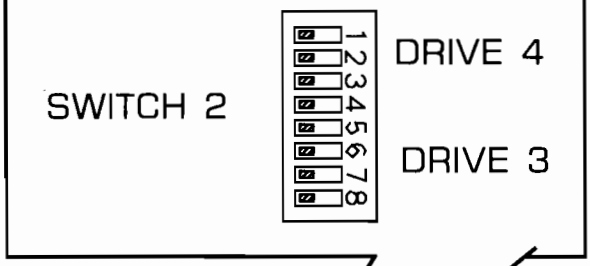
2. Connect cable between signal connector on removable Winchester drive and J7.

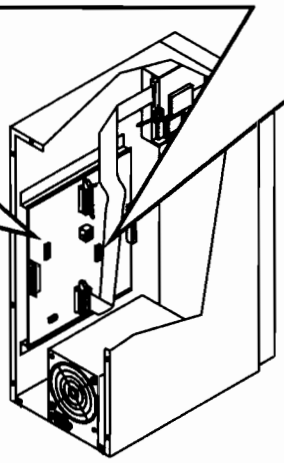
Switch 1 and switch 2 identify the types of Winchester drives in the system. Each switch bank divides into two segments of four switches each; each segment identifies a given drive numbered according to its position on the "A" cable (➡9.6).
To set switches:

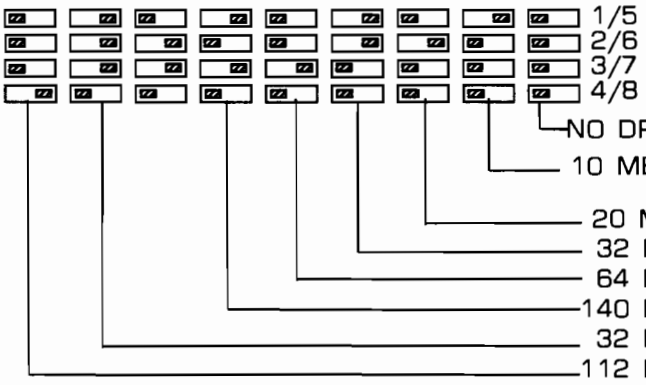
1. Verify type of drive connected to DRIVE SELECT PLUG 1 (plug located farthest from DPU board).
2. Set switches for DRIVE 1 according to chart (positions 5-8, SWITCH 1).



3. Repeat steps 1 and 2 for DRIVE SELECT PLUGs 2 through 4, if applicable.



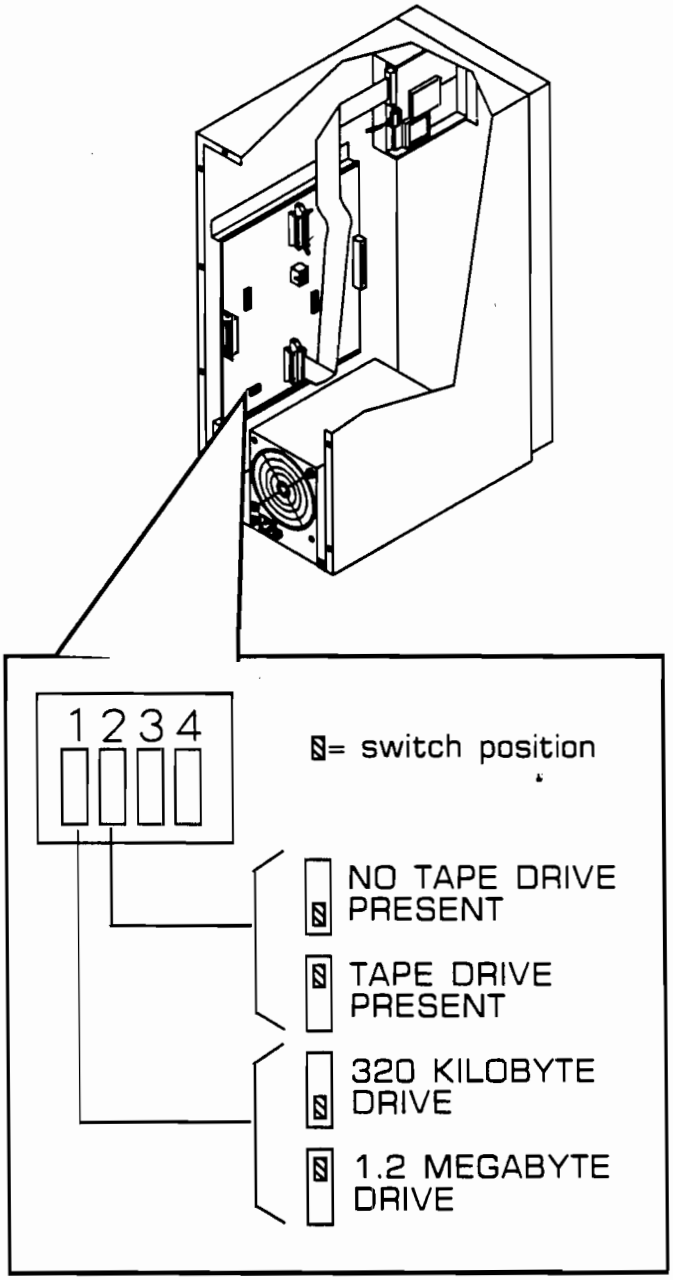




		NO. OF ADDRESSES USED
10 MEG REM	DMA360/RICOH RH5130	1
20 MEG HH	NEC D5126/SEAGATE ST225	2
32 MEG FH	QUANTUM Q540	2
64 MEG FH	MICROPOLIS 1325W	4
140 MEG FH	MAXTOR 14 X 10	14
32 MEG FH	MICROPOLIS 1323	2
112 MEG FH	MAXTOR 7 X 16	7

9.7 Switch Settings (Sheet 2 of 2)

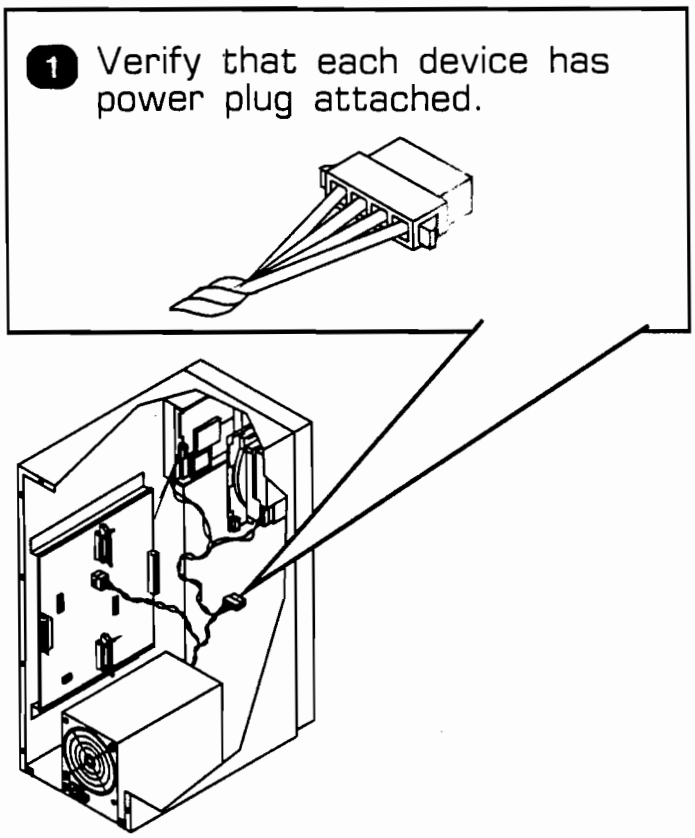
Switch 3 identifies tape drive (whether present) and type of floppy-disk drive. Set switches acording to chart. (positions 3 and 4 of switch bank not used.)



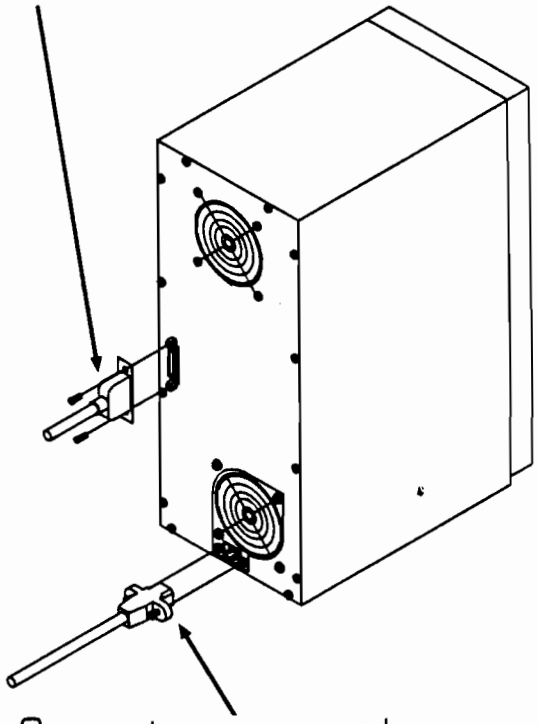
9.8 Wrap-Up

After installation steps are completed, power-up should be performed [➡4.1] for verification that devices are initializing.
Before performing power-up.

1. Verify that each device has power plug attached.



2. Verify that each Winchester device has both "A" and "B" cables attached [➡9.6].
3. Verify that floppy/tape device has signal cable attached [➡9.4/9.5].
4. Reassemble rear panel onto cabinet [verify that cabinet-fan power receptacle is connnected [➡9.2].
5. Mount half-width/full width bezel covers as required to cover empty spaces [if any].
6. Reassembly front cover onto cabinet [➡9.2].
7. Connect system signal-input cable.



8. Connect power cord.
9. Perform equipment start-up [➡4.1]. Insert utility diskette; [auto-enclosed with cabinet] run configuration utility to verify switch settings and "A" cable usage.

SECTION 10

FUNCTIONAL DESCRIPTION

FUNCTIONAL DESCRIPTION

10.1 Cabinet

The 2200 Data Storage Cabinet is an open-slotted cabinet available with either a 320-kilobyte or a 1.2-megabyte diskette drive. The additional compartments in the cabinet can accommodate a variety of magnetic storage devices to meet user requirements. The complement of devices includes both fixed-disk drives and removable disks/cartridges thus providing virtually unlimited off-line data storage. As a minimum requirement, every complement must include either a 320-KB or a 1.2-MB diskette drive. Maximum complements may be summarized:

TO USE OR

10-MB Removable Hard Disk	32|20-MB HH Fixed Hard Disk	FH32/64/~~112/140~~ MB Fixed Hard Disk ★★	Streaming Cartridge Tape Drive	112|140 MB MAXTOR ★
-	3 OR	3 OR	-	2
1	1	2 OR	-	2
1	3	-	-	-
-	1	2 OR	1	2
-	3 OR	3 OR	1	2
1	1	2 OR	1	2

★ WITH 2 140|112 MAXTOR DRIVES CANNOT HAVE A 3RD FULL HEIGHT WINC BECAUSE OF POWER SUPPLY LOAD.

★★ WITH 3 FULL HEIGHT DRIVES OF THE 32MB/64MB TYPE, NO OTHER WINCHESTER DRIVES CAN BE USED.

10.2 Magnetic Devices

Disk Processing Unit

To speed processing and provide extensive error correction, an intelligent Disk Processing Unit (DPU), contained in the cabinet, controls the data storage units. The DPU board contains 256 kilobytes of chache memory.

The DPU allows users to set aside a portion of the cache memory for use as a RAM disk. The RAM disk, once established, responds to accessing the same as a disk platter, and supports all normal disk commands. The RAM disk is not permanent storage; its current contents are lost if it is deallocated, or if there is a loss of power to the DS Cabinet. As many as 990 sectors (256 bytes/sector) of cache may be allocated for use in the RAM DISK. If the number of sectors to allocate is specified as 0, then the RAM disk is deallocated.

Diskette Drive

The diskette drive uses a 5-1/4-inch double-sided, double-density (DSDD) diskette for removable storage. Two DSDD diskette formats are supported on each of the possible diskette drives: 256 and 512 bytes per sector. All the CS systems data and word processing applications use the standard 256-bps format. The 512-bps format (PC format) is used for interchange purposes. The 512-byte sectoring is transparent to the CS operating system. The DPU in the disk peripheral maps two 256-byte logical sectors into one 512-byte physical sector.

The 1.2-MB diskette drive can read 320-KB diskettes. However, not all 320-KB diskette drives will be able to read media written by 1.2-MB diskette drives.

The BASIC-2 programming language accesses diskettes with the 512-bps format as if the platter were formatted with 256-byte sectors. All BASIC -2 disk operations can be performed.

Disk Drive

The fixed and removable 5-1/4-inch hard disk (Winchester) drives are formatted to 256 bytes per sector. The removable cartridge features a write-enable tab that allows protection of valuable data.

Streaming Tape Cassette Tape Drive

The streaming tape cassette drive is a mass storage and recovery device with a storage capacity of 45 MB at 8000 bits per inch. The drive uses a backup/recovery that works on either a file by file basis, or platter image basis. The drive supports backup by way of reference files. It can run without constant user interaction during normal disk use.

SECTION 11 CONTENTS

SECTION 11

SPECIFICATIONS

FUNCTIONAL DESCRIPTION

11.1 Disk Drives

	No. of Platters/ Addresses	Capacity/ Platter	Sectors/ Platter	Average Access Time
320-KB Diskette (half height)	1	320 KB	1280 1440 (PC)	100 ms
1.2-MB Diskette (half height)	1	1.2 MB	4160 4800 (PC)	100 ms
Removable Hard Disk (half height)	1	10 MB	38912	95 ms
20-MB Hard Disk (half height)	2	10 MB	38912	68 ms
32-MB Hard Disk (full height)	2	16 MB	65024	45 ms
Alternate 32-MB Drive (full height)	~~X~~ 2	16 ~~8~~ MB	65024 ~~38912~~	45 ms
64-MB Hard Disk (full height)	4	16 MB	65024	27 ms
112-MB Maxtor (full height)	7	16 MB	65024	27 ms
140-MB Maxtor (full height)	14	10 MB	38912	27 ms

Bytes per sector, all drives: 256

Data Transfer Rate

320-KB Diskette: 250 KB per second
1.2-MB Diskette: 500 KB per second
All hard-disk drives: 5 MB per second

11.2 Streaming Cartridge Tape Drive

Recording

Capacity: Up to 45 MB with 450-ft tape
Density: 8000 bits per inch
Format: Read/Write operation - serial/serpentine
Physical Tracks: Nine

Tape Speed, Read/Write Forward/ Reverse:

90 inches/second

Tape Heads

Dual read-after-write
Full-width erase bar

Data Transfer Rate (Drive to Controller

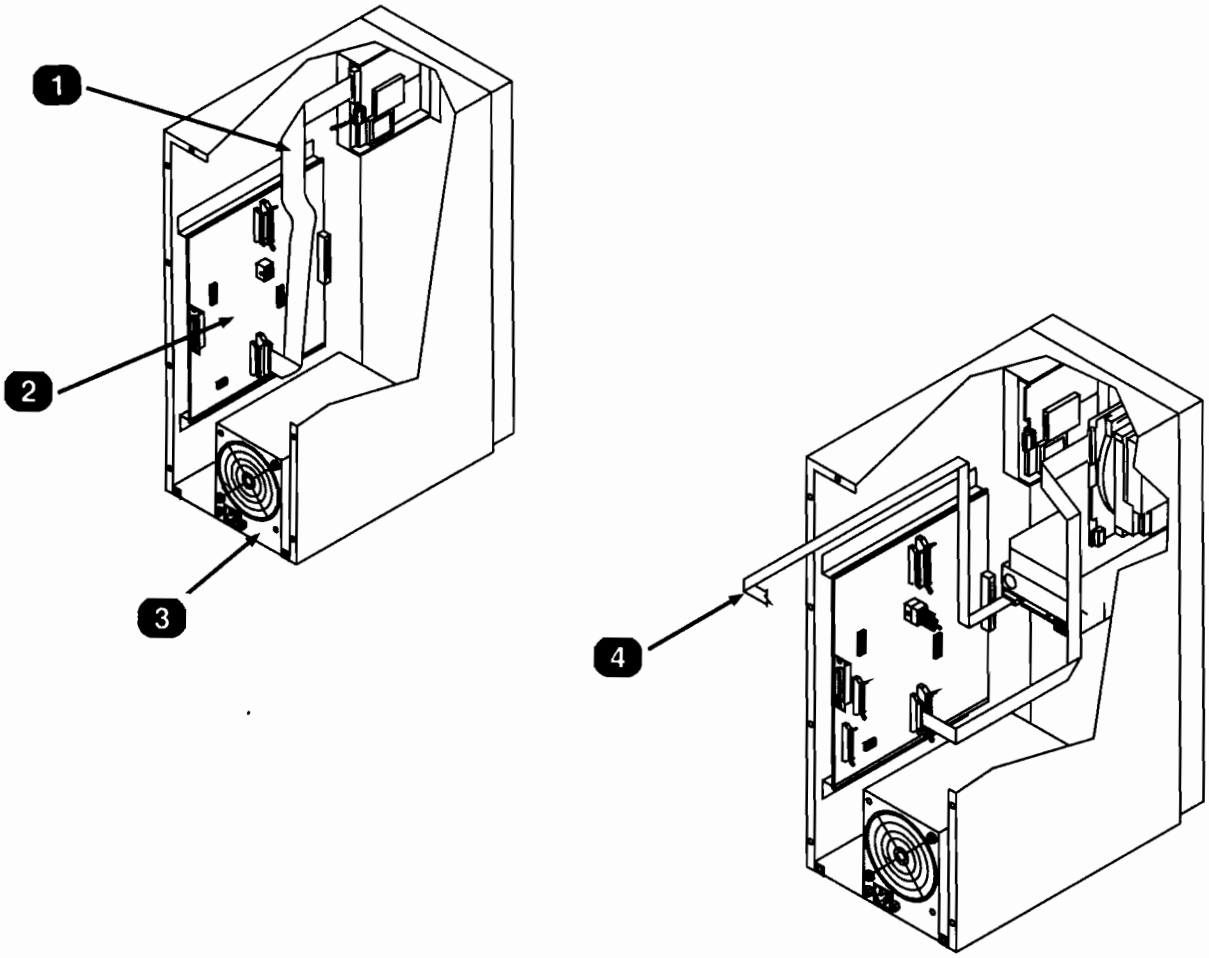
Up to 86,700 bytes/second at 90 inches/second

SECTION 12 CONTENTS

SECTION 12

ILLUSTRATED PARTS

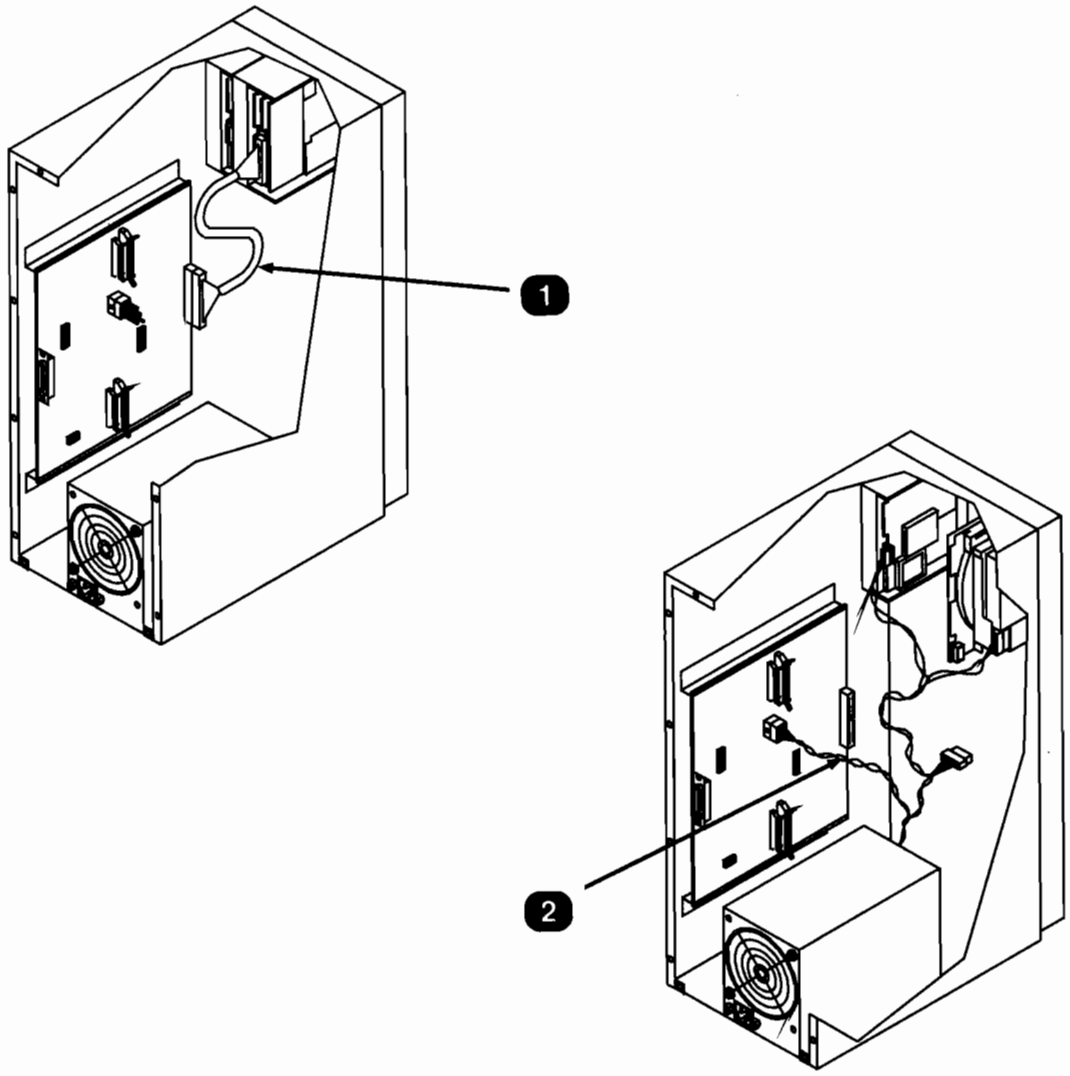
12.1 ILLUSTRATED PARTS
Major Assemblies



Item	*Part Number*	*Description*
1	220-3627	Floppy Cable
2	210-8826	DPU Board
3	270-1094	Power Supply
4	220-3630	Winchester ''B'' Cable

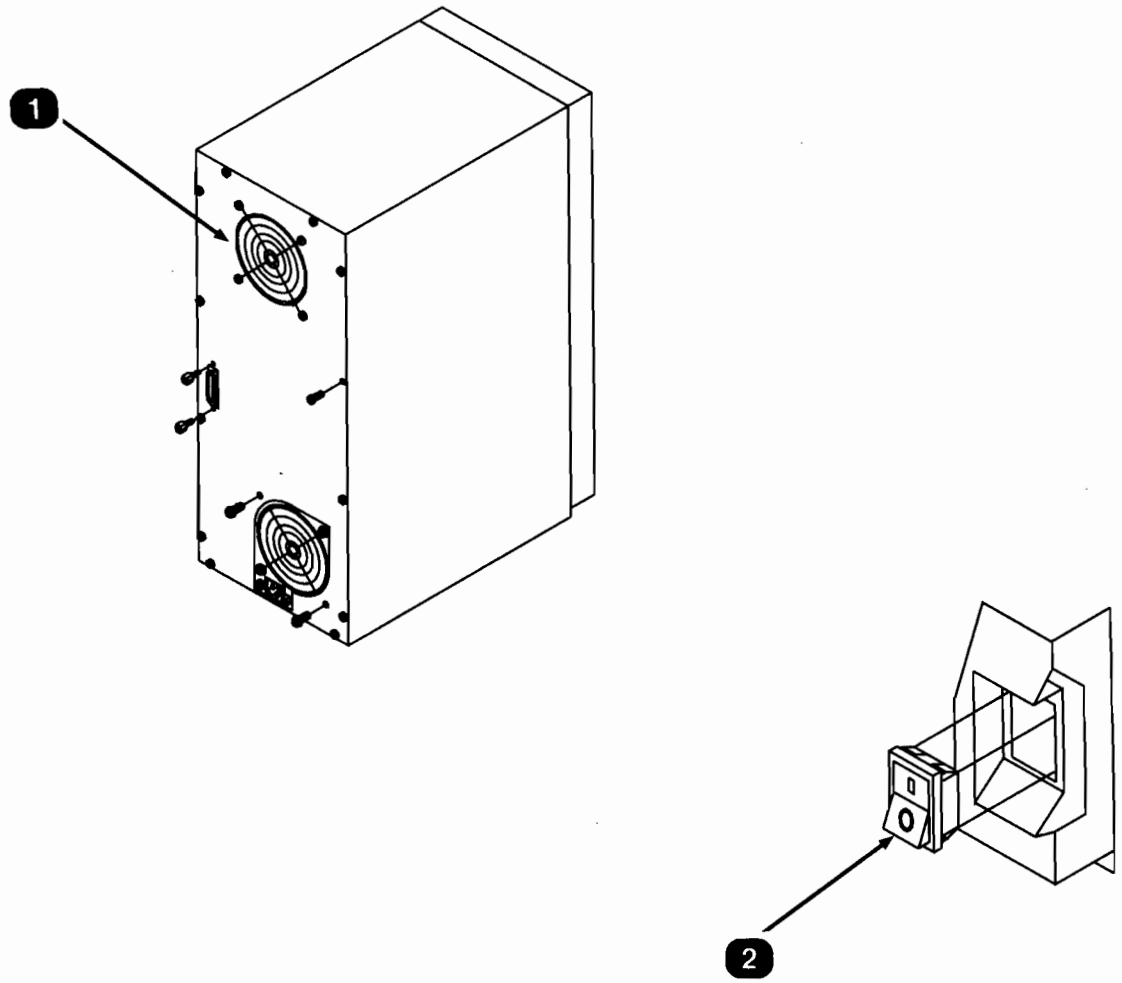
ILLUSTRATED PARTS

12.1 Major Assemblies



Item	*Part Number*	*Description*
1	220-3628	Tape Cable
2	220-3629	Winchester ''A'' Cable

12.1 ILLUSTRATED PARTS
Major Assemblies



Item	*Part Number*	*Description*
1	273-3440	Fan Assembly
2	325-0096	ON/OFF Switch

	Wang Part No.	*Vendor Part No.*
5 1/4'' HH 360KB Floppy	278-4033	JU455
5 1/4'' HH 1.2MB Floppy	278-4055	JU475
5 1/4'' HH Cassette Tape	725-1481	MT-2ST
10 MB HH Removeable Disk	278-4049	RH5130/360 RICOH/DMA
20 MB HH Winchester	278-4062	ST225/D5126
32 MB FH Winchester	278-4034	Q540
32 MB FH Winchester	278-4069	1323
64 MB FH Winchester	278-4054	1325W
112 MB FH Winchester		Maxtor 7 x 16
140 MB FH Winchester		Maxtor 14 x 10
190 MB FH WINI	725-0271	MAXTOR 190MB FH

(289-0934
289-0934-A = ADD ON)

12.3 Installation Kits

Each Winchester Disk Drive is shipped with an installation kit containing:

1	Winchester "B" Cable	220-3630
2	Drive Mounting Brackets	449-1213
2	Grounding Clips	465-1864
4	Screws - 6/32" x 1/4"	650-3080
1	Half-width front bezel cover	451-2611

The Floppy Drive Installation kit contains:

2	Drive Mounting Brackets	449-1213
2	Grounding Clips	465-1864/1866
4	Screws - 6/32" x 1/4"	650-3080

The Streaming Cartridge Tape Drive contains:

1	Tape cable	220-3628
2	Drive Mounting Brackets	449-1213
2	Grounding Clips	465-1864
4	Screws - 6/32" x 1/4"	650-3080
	HIGH DENSITY TAPE (45 60m)	725-1432-1/725-4055-1
	150M XTRA DENSITY TAPE	725-7548 (TEAC MDL# CT600-N)
	TEAC 150m PROM (ON DRIVE W/ WAND ID)	730-1774

APPENDIX A CONTENTS

APPENDIX A

DEIVCE ADDRESSING

Page

APPENDIX A

Device Addressing (Sheet 1 of 3)

Device addresses are:

	MASTER	SLAVE	
Floppy	D x 0 (hex)	D x 0 + 40 (hex)	RAM Disk
	D x 1 (hex)	D x 1 + 40 (hex)	see Note 9
	D x 2 (hex)	D x 2	
	D x 3 (hex)	D x 3	
	D x 4 (hex)	D x 4	
	D x 5 (hex)	D x 5	
FIXED WINC ADDRESSES FOR DRIVE SELECT 1 + 2	D x 6 (hex)	D x 6	FIXED WINC ADDRESSES FOR DRIVE SELECT 3 + 4
	D x 7 (hex)	D x 7	
	D x 8 (hex)	D x 8	
	D x 9 (hex)	D x 9	
	D x A (hex)	D x A	
	D x B (hex)	D x B	
	D x C (hex)	D x C	
	D x D (hex)	D x D	
	D x E (hex)	D x E	
Removeable Winchester	D x F (hex)	D x F + 40 (hex)	Streaming Tape Drive

NOTES (Drive Addressing):

1. Switch settings on the Disk Controller PCB (in CPU) control the master base addressing.
2. The slave address is master address plus 40 (hex).

Device Addressing (Sheet 2 of 3)

3. Switch settings on the DPU Board in coordinating with the Winchester "A" cable Drive Select connectors [➡ 9.6] control drive and/or platter addressing. A change to Drive Select 1 (via switches or plug connectors on the "A" cable) could result in a change of address for Drive Select 2. This relationship also holds for Drive Select 3 and 4. A change of switch settings, reflecting changed plug usage for Drive Select 3, could change the addresses for Drive Select 4.

4. The Drive Select 1 connector must be used, if any Winchesters are installed, because of termination concerns. Of the Winchesters, only the Winchester connected to Drive Select 1 will be terminated.

5. Master addresses control both the floppy and any Winchesters connected to Drive Selects 1 or 2.

6. Slave addresses control RAM Disk, tape (if applicable) and any other Winchesters connected to Drive Selects 3 or 4.

Device Addressing (Sheet 3 of 3)

NOTES (Winchester Addressing):

7. The first drive address for the fixed Winchester starting with Drive Select 1 (if applicable) starts with D X 1 (hex), and uses successive addresses as needed (see device address table for number of addresses used for each drive type).

8. If a removeable Winchester is used, Drive Select 2 address starts at D X 1 (hex); if a fixed Winchester is at Drive Select 1, the first address for Drive Select 2 will immediately follow the last address for the fixed Winchester attached to Drive Select 1.

9. Drive Select 3, if used, starts at address D X 1 + 40 (hex) using successive addresses as required (see device address table for number of addresses used for each drive type).

10. Drive Select 4 address continues at the next available address following the last address of Drive Select 3. If Drive Select 3 is not used, the first Drive Select 4 address will start at D X 1 plus 40 (hex).