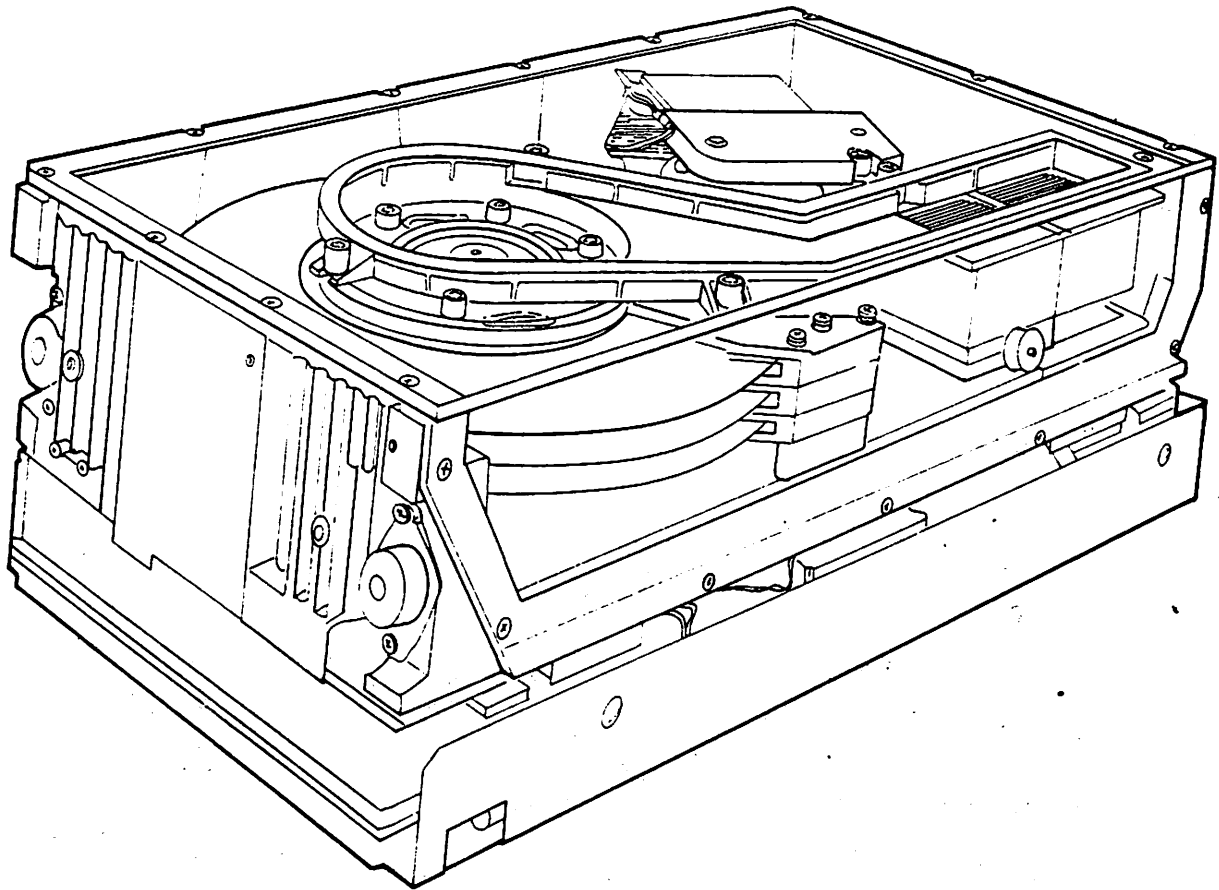


# D22x7 SERIES 8-INCH WINCHESTER DISK DRIVE PRODUCT DESCRIPTION



**NEC**  
**NEC Information Systems, Inc.**

819-000080-7001 Rev. 00

### 1.3 POWER REQUIREMENTS

D22x7 disk drives operate on externally supplied dc power. DC power requirements are listed in Table 1-3.

Table 1-3 DC Power Requirements

REQUIRED VOLTAGE	TOLERANCE	DAMAGE THRESHOLD	CURRENT (PEAK TO PEAK)	RIPPLE
+5.0V	±0.25V	±25%	4.0A	100mV
-5.0V	±0.25V	±25%	0.5A	100mV
+12.0V	±0.60V	±25%	0.6A	100mV
-12.0V	±0.60V	±25%	0.5A	100mV
+24.0V	±2.40V	±25%	2.7A* 5.0A**	240mV

\*2.7A — average running current  
\*\*5.0A — peak starting current (25 seconds maximum duration)

All power line voltages must be established within 500 milliseconds (ms) of power on. When power is turned on, voltages must be enabled in the following order: +5V, -5V, ±12V, +24V. When power is turned off, lines must be disabled in the reverse order: +24V, ±12V, -5V, +5V.

Refer to Appendix A for information on the optional 3-Input DC Regulator.

### 1.4 FEATURES

Shorter access times, high-speed data transfers, and mechanical reliability are required for efficient computer network operations. To meet these demands the NEC D22x7 disk drives offer the following features.

#### 1.4.1 Seek Time

Seek time is the time required to find requested data on the disk. Both D22x7 models have an average seek time of 20 ms, and a maximum seek time of 40 ms.

#### 1.4.2 Data Transfer Rate

Both the D2257 and the D2247E offer a data transfer rate of approximately 1.2 MB per second.

#### 1.4.3 Compact Mounting

The D22x7's compact size allows for either horizontal or vertical mounting in a limited space. The drive's lock mechanism is easily accessible even after the drive has been placed within a system cabinet.

D22x7 drives also feature an integrated cooling fan that reduces space and power requirements.

#### 1.4.4 Maintenance

The air-tight, sealed disk/head assembly and the D22x7's simplified design produce a disk drive that requires no periodic maintenance. Neither installation nor field service requires special tools. Motor electronics are placed outside the head/disk assembly and do not need "clean room" repair facilities.

An optional diagnostic panel is available for test and maintenance purposes. Refer to the *D22x7 Maintenance Guide* for information on the diagnostic panel.

#### 1.4.5 Design Reliability

D22x7 disk drives use lightweight, contact-type start/stop heads that eliminate damage to the heads and disk. A simplified rotary actuator, directly coupled, brushless dc motor, and a closed-loop air circulation system comprise the system's major mechanical components. The control logic is microprocessor controlled and designed to minimize electronic components. The design strategy ensures high reliability and low cost.

#### 1.4.6 Standard Interfaces

Both the D2257 and the D2247E use the same standard original equipment manufacturer interfaces for connection to a disk controller and to a power supply.

#### 1.4.7 Safety

D22x7 models conform to Underwriter's Laboratories Safety Regulation UL478.

#### 1.4.8 System Configuration Flexibility

One to sixteen D22x7 disk drives can be connected to a single controller in either a daisy-chain or radial system (see Figures 1-6 and 1-7).

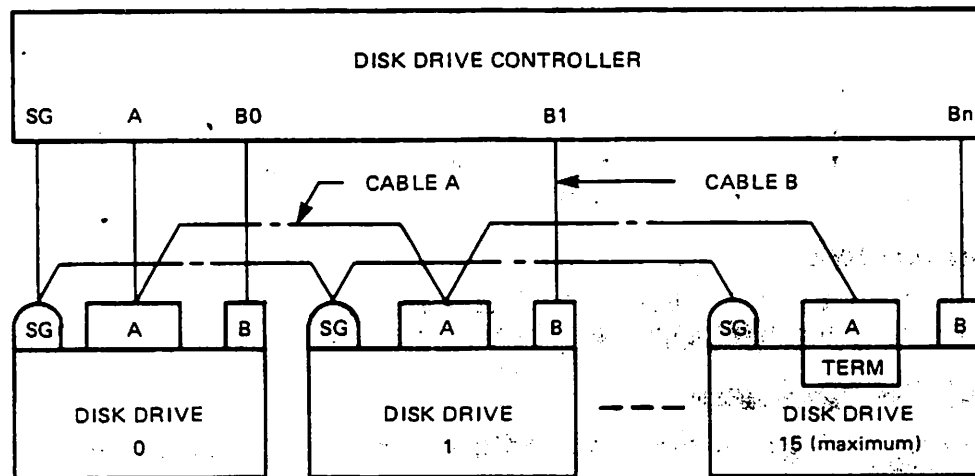


Figure 1-6 Daisy-Chain Connection Layout

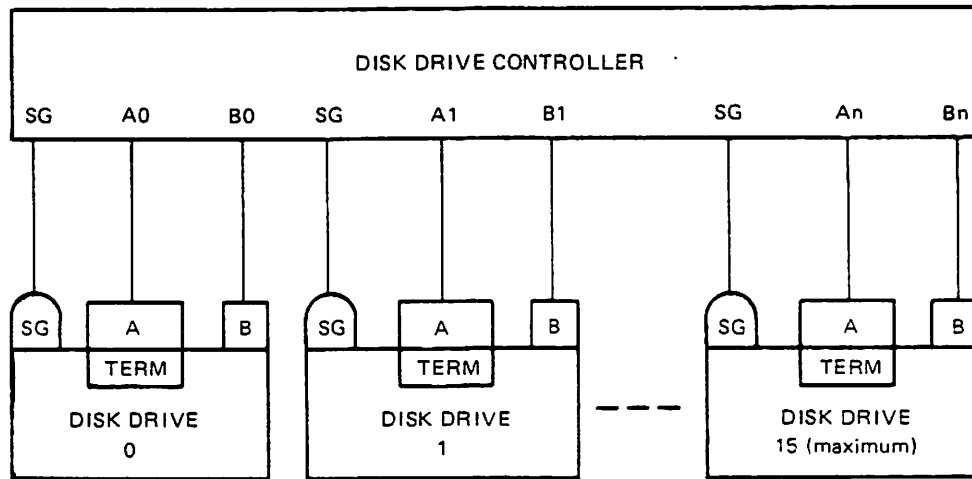


Figure 1-7 Radial Connection Layout

### 1.5 OPTIONS

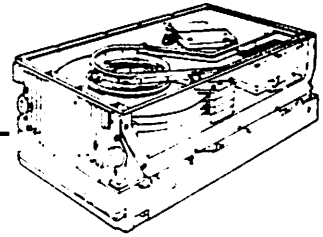
Table 1-4 lists available options for D22x7 disk drives.

Table 1-4 Available Options

OPTION	DESCRIPTION
3-Input DC Regulator Option	Supplies internal dc "power set" (+24V, +12V, +5V, -5V, -12V) by converting external dc input of +24V, +5V, and -12V.
Dual-Port Option	Enables a D22x7 drive to interface with two controllers.
DC Power Supply	Supplies internal dc "power set" (+24V, +12V, +5V, -5V, -12V) from ac input power. The unit provides power for two disk drives.
Diagnostic Panel	Maintenance tool for monitoring and testing disk drive operation.

## Chapter 2

# Specifications



This chapter describes the operational and design specifications of the D22x7 series of disk drives.

### 2.1 OPERATING SPECIFICATIONS

Table 2-1 lists operating specifications for the D2257 and D2247E disk drives.

**Table 2-1 Operating Specifications**

FEATURE	SPECIFICATION
<b>General</b>	
Start Time	Less than 35 seconds
Stop Time	Less than 25 seconds
Recording Mode	MFM
Interface Mode	NRZ
Head Positioning	Closed servo rotary actuator
Track Following	Modified-dipulse pattern
<b>Basic Power Requirements</b>	
Voltage and Current	+5 Vdc, 4.0 A -5 Vdc, 0.5 A +12 Vdc, 0.6 A -12 Vdc, 0.5 A +24 Vdc, 2.7 A (average) 5.0 A (peak)
Power Dissipation	100 W (average) 150 W (peak)
Heat Generation	86 BTU/hour

**Table 2-1 Operating Specifications (cont'd)**

FEATURE	SPECIFICATION
<b>Environmental</b>	
Temperature (Ambient) Operating Nonoperating Storage*	41° to 104° F (5° to 40° C) 14° to 140° F (-10° to 60° C) -40° to 158° F (-40° to 70° C)
Temperature (Gradient/maximum) Operating Nonoperating Storage	18°F per hour (10°C per hour) 27°F per hour (15°C per hour) 45°F per hour (25°C per hour)
Relative Humidity (No Condensation) Operating Nonoperating Storage	20% to 80% relative humidity 10% to 90% relative humidity 5% to 95% relative humidity
Vibration Operating Nonoperating Storage	0.2G 0.5G 1.5G
Shock Operating Nonoperating Storage	2G (20 ms) 5G (10 ms) 15G (30 ms)
Altitude (Maximum) Operating Nonoperating Storage	10,000 feet ( 3,048 meters) 40,000 feet (12,192 meters) 40,000 feet (12,192 meters)
*Storage-unopened, as shipped from factory	

## 2.2 DESIGN SPECIFICATIONS

Table 2-2 lists design specifications for the D2257 and D2247E disk drives.

**Table 2-2 Design Specifications**

FEATURE	MODEL	
	D2257	D2247E
Unformatted Storage Capacity		
Per Unit (MB)	167.7	103.2
Per Cylinder (bytes)	163,840	100,800
Per Track (bytes)	20,480	20,480
General		
Recording Disks	5	3
Data Heads	8	5
Servo Heads	1	1
Cylinders	1,024	1,024
Track Density (tracks/inch)	960	960
Bit Density (bits/inch)	9,420	8,670
Data Transfer Rate (MB/second)	1.19	1.20
Spindle Rotation (RPM)	3,510	3,600
Average Latency Time (ms)	8.55	8.33
One Cylinder Seek Time (ms)	5	5
Average Seek Time (ms)	20.0	20.0
Maximum Seek Time (ms)	40.0	40.0
Sectors per Track	Switch Selectable	
Reliability		
Mean Time-Between-Failures (MTBF)	12,000 hours	
Mean Time-to-Repair (MTTR)	less than one hour	
Service Life	approximately 5 years	

## 2.3 PHYSICAL DIMENSIONS

Table 2-3 summarizes the physical dimensions of the D22x7 disk drives. Figures 2-1 and 2-2 show the basic unit and the standard assembly.

**Table 2-3 Physical Dimensions**

DIMENSIONS	BASIC UNIT	STANDARD ASSEMBLY*
Width	8.54 in. (217 mm)	8.89 in. (226 mm)
Height	5.47 in. (139 mm)	5.62 in. (143 mm)
Depth	16.53 in. (420 mm)	18.50 in. (470 mm)
Weight	30.46 lbs. (13.8 kg)	32.45 lbs. (14.7 kg)

\*The standard assembly includes a frame bracket.

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TO: DISTRIBUTION

FROM: MIKE SEVERIN *MS*

DEPT: PRODUCT ENG.

DATE: MAY 8, 1985

EXT: 1-22-64038

LOC/MS:PB/1822A

SUBJECT: NEC DRIVE HANDLING AND SWITCH SETTINGS

---

The NEC models 2246 and 2257 disk drives are now being received with all switches exposed for external access. For this reason and to fully institute ship-to-stock on these drives, the end user will be responsible for setting switches to the appropriate settings for their particular use. Attached are the switch settings and their locations for all VS applications. OIS applications will require the sector switch being modified to support 64 versus 9 sectors; this will also be displayed.

Increasing numbers of drives are being returned to the OEM group with parts missing or head assemblies not locked. If the drives are not returned with the mounting chassis and heads locked, damage to the HDA assembly may result rendering the drives unrepairable

Whenever drives are moved or installed from a unit or area, it is imperative that the head locking mechanism be in the lock position. This drive should be treated as any other Winchester type drive, taking great care not to drop or shock it.

Drives have also been returned with the HDA seal broken which implies that someone has opened the HDA. At no time is there any reason to enter the HDA assembly. This area must remain sealed, airtight and dust free or the integrity of the media could be degraded or destroyed.

If you have any questions, contact myself or Al Nelson.

MS/cr  
2446A2  
Attachments

Distribution  
K. Adams  
C. Haggarty  
R. Haig  
M. Kopacz  
D. McConnell  
R. Morrison - Ireland  
A. Nelson  
R. Powers

CC:  
P. Manzer  
A. Matysczak  
E. Pearl  
A. Woodard

MANUFACTURING TEST  
PROCEDURE

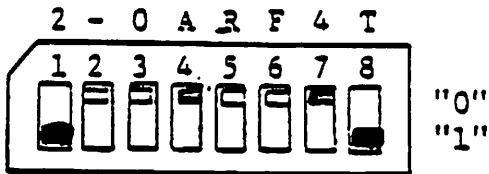
NUMBER 278-4032-00-M-TP  
PAGE 9 OF 12  
DATE 9/18/84

TITLE

NEC 85 TEST PROCEDURE

Figures 11.8

G9QST PWA "12J"



Device Type Setting SW.				
1	2	3	4	
2	1	0	A	

Spare	1
	0

Format Write Release	
Enable	1
Disable	0

TAG4 Inhibit	
Enable	0
Disable	1

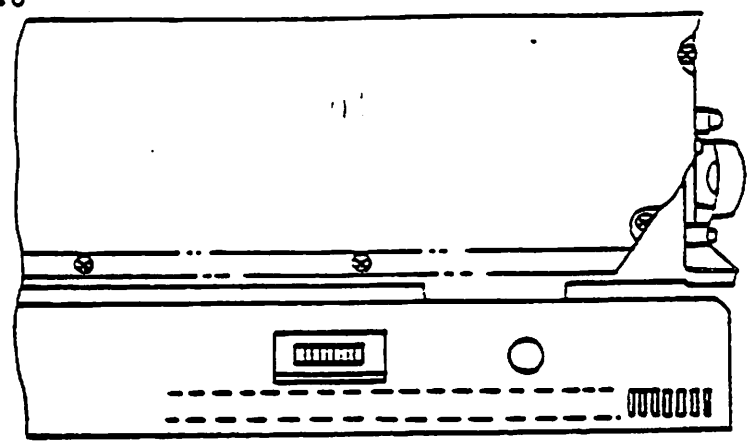
Fault Inhibit	
Enable	0
Disable	1

Control Mode Switch

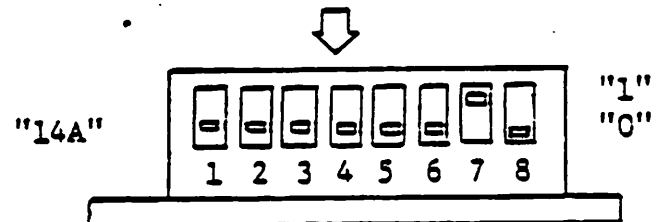
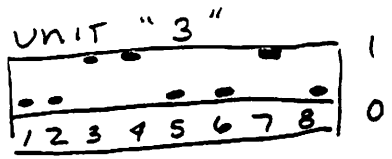
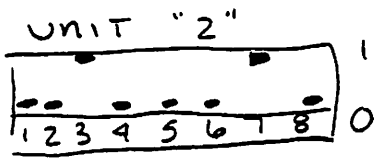
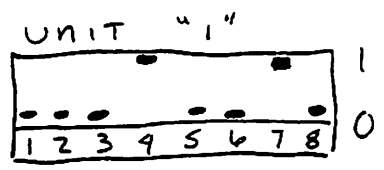
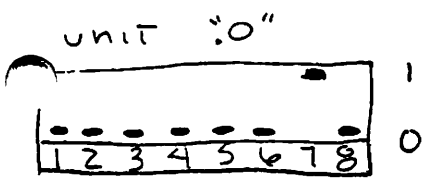
TITLE

NEC 85 TEST PROCEDURE = Top Side View =

Figures 11.6



"INSTALLATION MODE" DIP Switch Assy



Set 0  
Set 0

Unit Select	2 <sup>1</sup>	2 <sup>0</sup>
0	0	0
1	0	1
2	1	0
3	1	1

Motor Start Delay	2	1
0 sec.	0	0
30 sec.	0	1
60 sec.	1	0
90 sec.	1	1

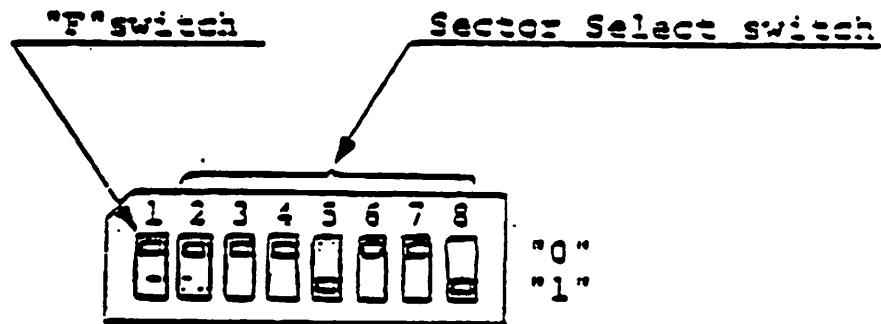
Unit Mounting Pose	
Upright (Vertical)	1
Flat (Horizontal)	0

Motor Start Mode	
Remote	1
Local	0

MANUFACTURING TEST  
PROCEDURE

NUMBER 278-4032-00-TM-TF  
PAGE 8 OF 12  
DATE 9/18/84

TITLE  
NEC 85 TEST PROCEDURE  
Figures 11.7



NOTE: SWITCHES ARE SET FOR 9 SECTORS V.S. APPLICATIONS

SECTOR-SELECT SWITCH SETTINGS

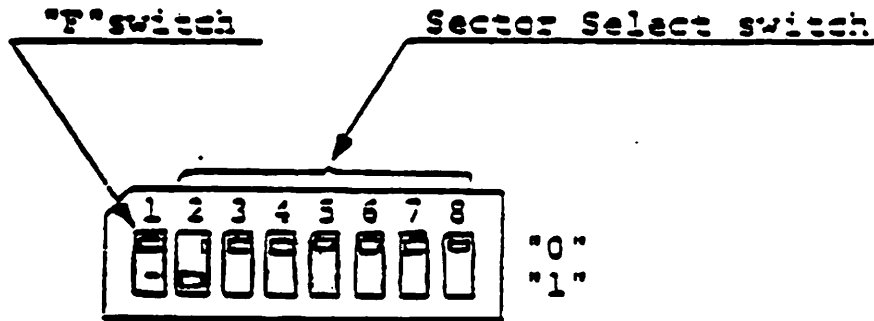
MANUFACTURING TEST  
PROCEDURE

NUMBER 278-4032-00-M-TP  
PAGE 8 OF 12  
DATE 9/18/84

TITLE

NEC 85 TEST PROCEDURE

Figures 11.7



NOTE: SWITCHES ARE SET FOR 64 SECTORS V.S. APPLICATIONS

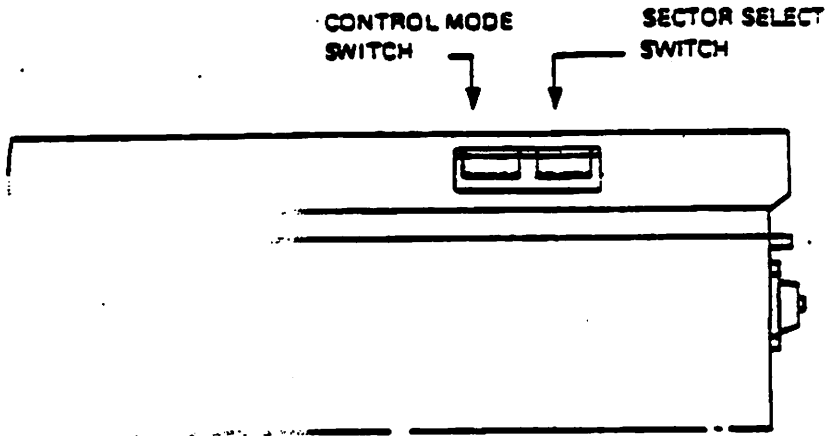
SECTOR SELECT SWITCH SETTINGS

MANUFACTURING TEST  
PROCEDURE

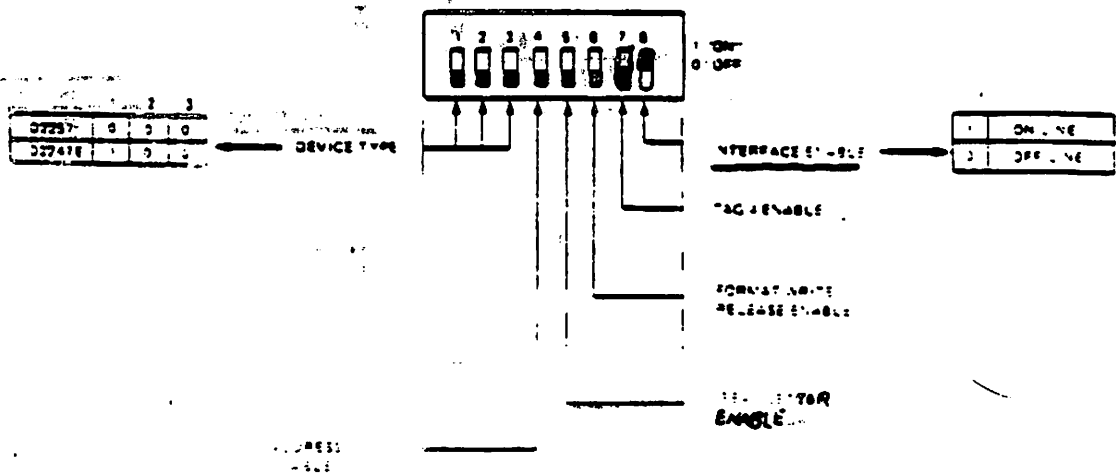
NUMBER 27A-4041-00-M-TP  
PAGE 11 OF 15  
DATE 2/22/85

TITLE

NEC 160 TEST PROCEDURE  
Figure 6-3



Control Mode DIP Switch



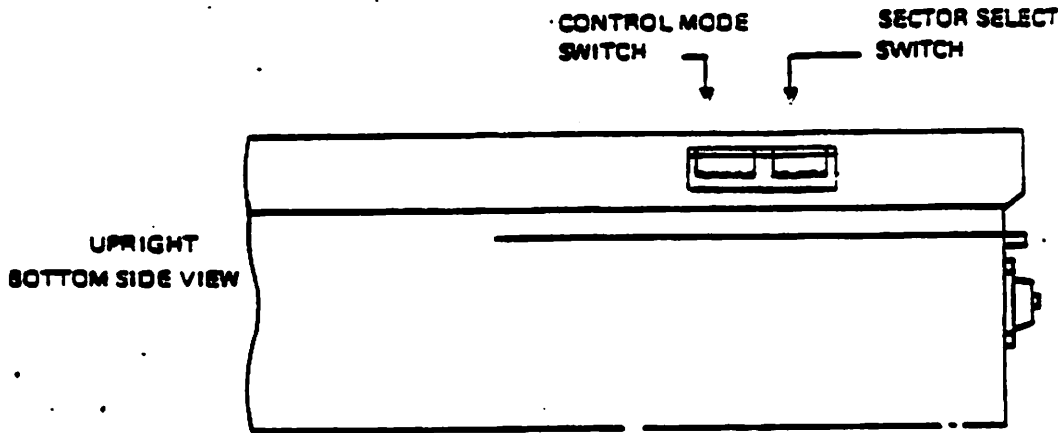
**MANUFACTURING TEST  
PROCEDURE**

NUMBER 278-4041-00-M-TP  
 PAGE 11 OF 15  
 DATE 2/22/85

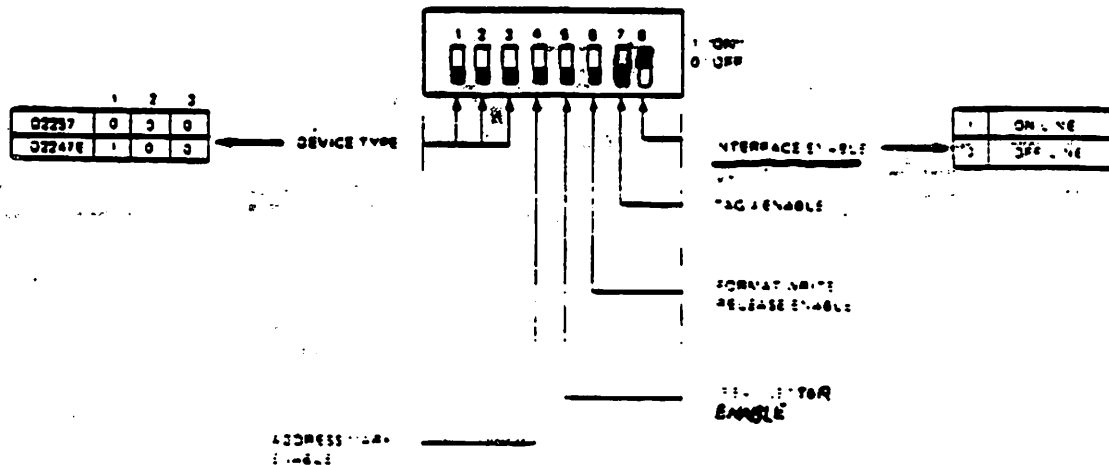
**TITLE**

**NEC 160 TEST PROCEDURE**

Figure 6-3



**Control Mode DIP Switch**



# MANUFACTURING TEST PROCEDURE

NUMBER \_\_\_\_\_

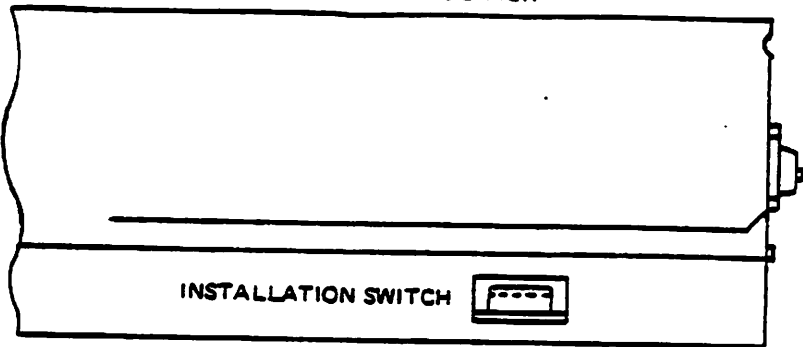
PAGE \_\_\_\_\_ OF \_\_\_\_\_

DATE \_\_\_\_\_

## TITLE

NEC 160 TEST PROCEDURE  
Figure 6-4

UPRIGHT TOP SIDE VIEW



Installation DIP Switch

Switches

3 4



1 = unit "0"



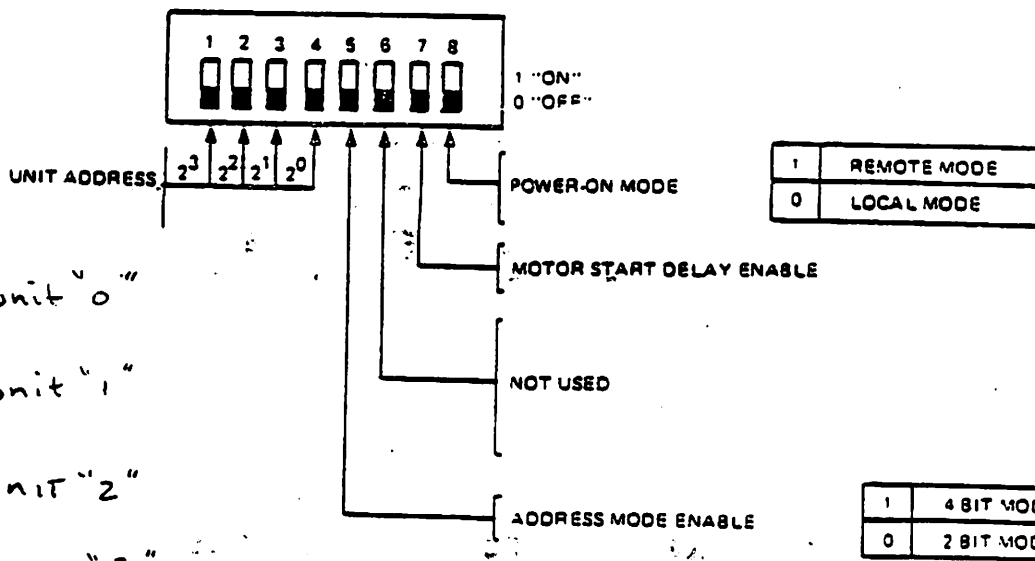
1 = unit "1"



0 = unit "2"



0 = unit "3"



1	REMOTE MODE
0	LOCAL MODE

1	4 BIT MODE
0	2 BIT MODE



MANUFACTURING TEST  
PROCEDURE

NUMBER \_\_\_\_\_

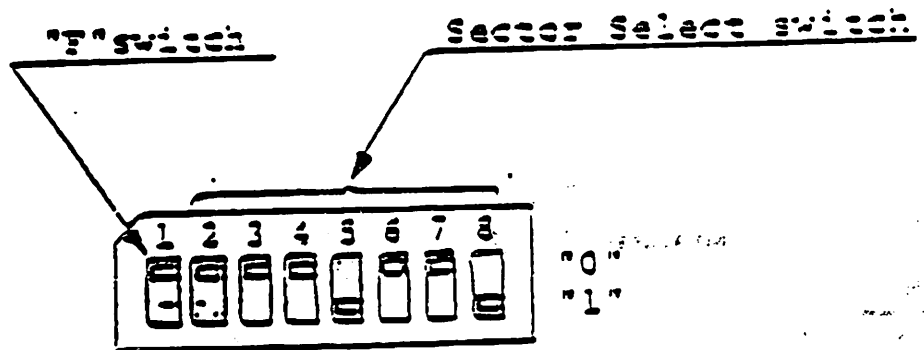
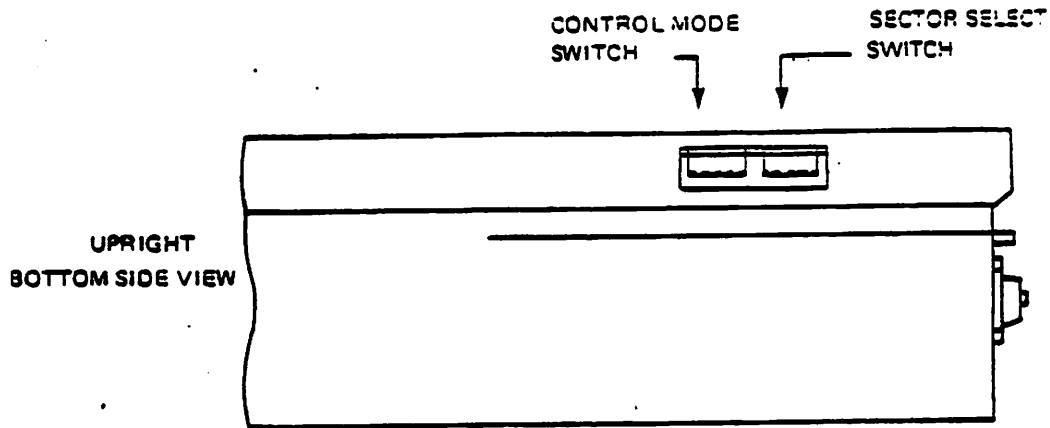
PAGE \_\_\_\_\_ OF \_\_\_\_\_

DATE \_\_\_\_\_

TITLE

NEC 160 TEST PROCEDURE

Figure 6-2



NOTE: SWITCHES ARE SET FOR 9 SECTORS V.S. APPLICATIONS

SECTOR SELECT SWITCH SETTINGS

MANUFACTURING TEST  
PROCEDURE

NUMBER \_\_\_\_\_

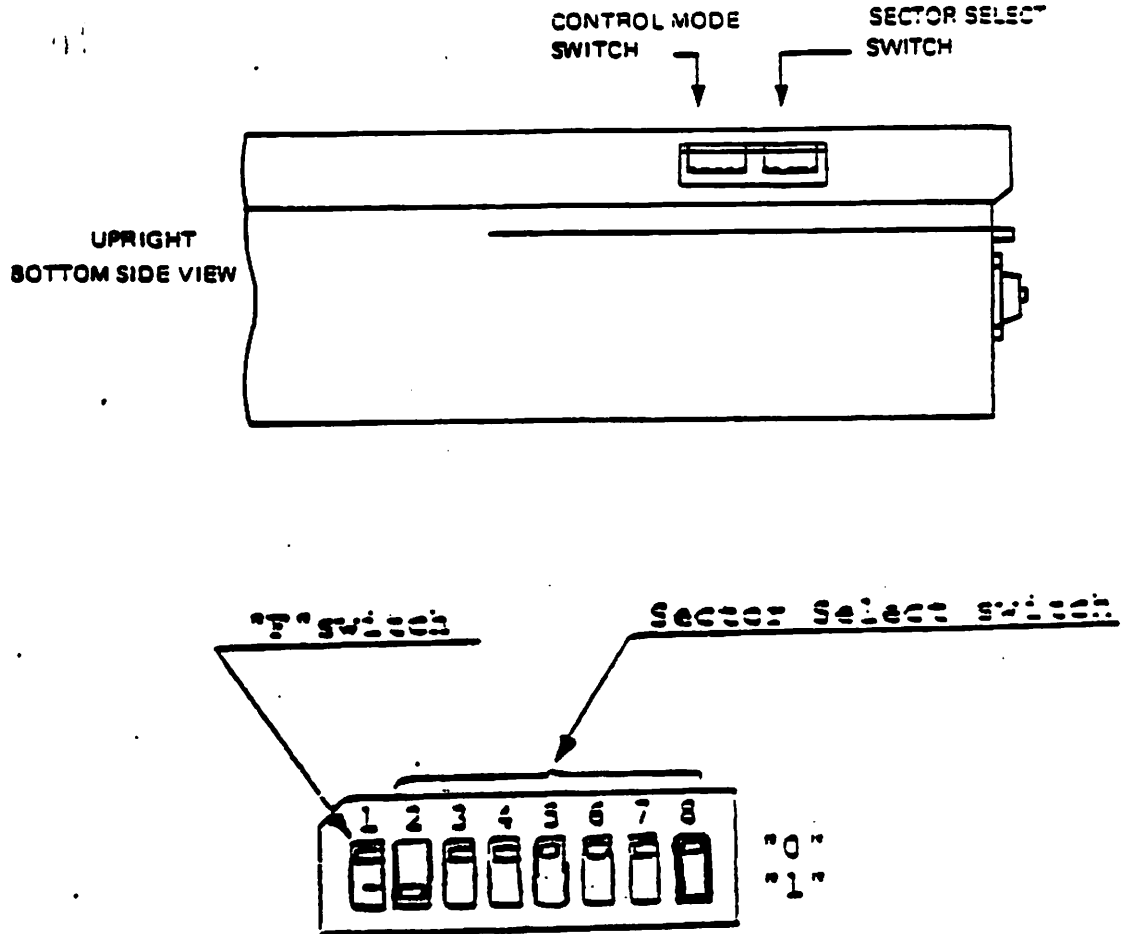
PAGE \_\_\_\_\_ OF \_\_\_\_\_

DATE \_\_\_\_\_

TITLE

NEC 160 TEST PROCEDURE

Figure 6-2

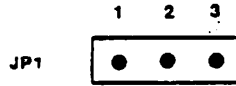
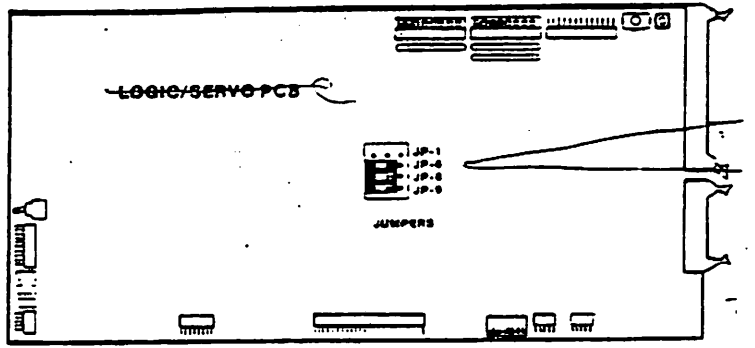


NOTE: SWITCHES ARE SET FOR 64 SECTORS V.S. APPLICATIONS

SECTOR SELECT SWITCH SETTINGS

SWITCH SETTINGS/JUMPERS

LOGIC AND SERVO PCB WLI NO. 726-8123

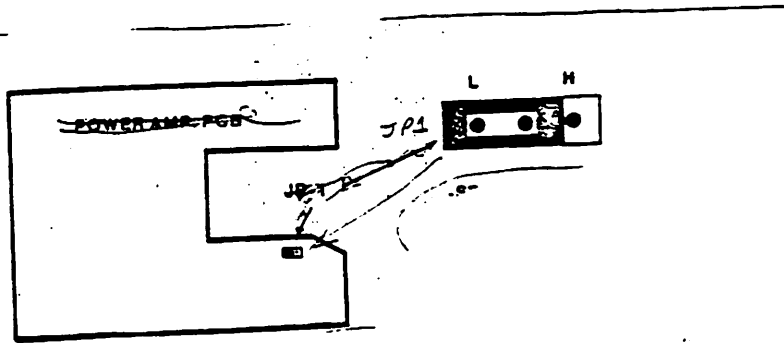


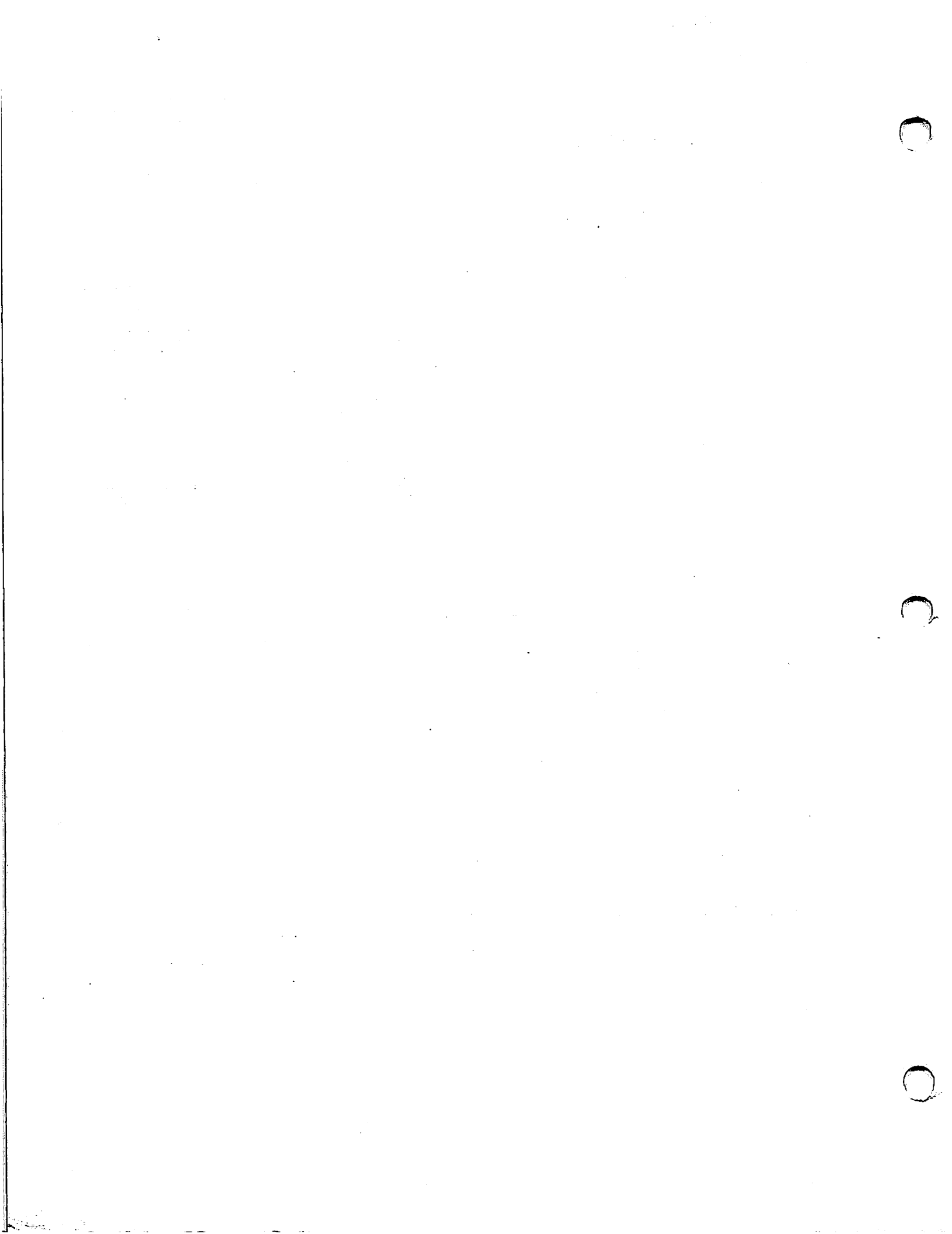
-CPU RESET/ONE STEP  
 -JUMPER REMOVED  
 TO DISABLE  
 BOTH FUNCTIONS



-FAULT DISABLE  
 -FAULT ENABLE  
 AS SHOWN

POWER AMPLIFIER PCB WLI NO. 726-8122





Form: Dual Port Options  
Date: February 15, 1985  
Subj: Dual Port Options for Data Storage Cabinet Disk Drives

Please add specified components to appropriate bills for each dual port option.

SW04-2 (177-7321; for 2267V-1, RSD, 76 Mb removable)

Dual port board (1) 725-0190  
Internal 'A' cable (1) 220-3390 (60 pin, 60")  
Internal 'B' cable (1) 220-3404 (26 pin, 59")  
Terminator (1) 725-2888  
External daisy cable (1) 220-3436 (60 pin, 32", shielded)  
'A' cable retainer assy (1) 279-0656  
'B' cable retainer assy (1) 279-0657  
Retainer mtng screws (4) 650-3169 (6-32 x 1/2 Parkerized truss head)  
Fast-on terminal (1) 654-0126 (for terminator)  
Documentation a. Board installation provided with board from CDC.  
b. General installation in CE maintenance manual.

SW04-4 (177-7294; for 2268V-1, NEC 76 Mb fixed)

Dual port board (1) 725-0191 G9QSW 726-2238 134-832957  
Internal 'A' cable (1) 220-3390 (60 pin, 60")  
Internal 'B' cable (1) 220-3403 (26 pin, 59")  
Terminator (1) 725-2888  
'A' expander cable (1) 220-3402 (60 pin, 14", 3 connectors)  
External daisy cable (1) 220-3436 (60 pin, 32", shielded)  
'A' cable retainer assy (1) 279-0656  
'B' cable retainer assy (1) 279-0657  
Retainer mtng screws (4) 650-3169 (6-32 x 1/2 Parkerized truss head)  
Fast-on terminal (1) 654-0126 (for terminator)  
Documentation a. Board installation provided with board from NEC.  
b. General installation in CE maintenance manual.

SW04-5 (177-7295); for 2268V-2, NEC 147 Mb fixed)

Dual port board (1) 725-0192 G9TXW  
Internal 'A' cable (1) 220-3390 (60 pin, 60")  
Internal 'B' cable (1) 220-3403 (26 pin, 59")  
Terminator (1) 725-2888  
'A' expander cable (1) 220-3402 (60 pin, 14", 3 connectors)  
External daisy cable (1) 220-3436 (60 pin, 32", shielded)  
'A' cable retainer assy (1) 279-0656  
'B' cable retainer assy (1) 279-0657  
Retainer mtng screws (4) 650-3169 (6-32 x 1/2 Parkerized truss head)  
Fast-on terminal (1) 654-0126 (for terminator)  
Documentation a. Board installation provided with board from NEC.  
b. General installation in CE maintenance manual.

SW04-6 (177-7322; for 2375V-1, CDC 516 Mb fixed)

Dual port board (1) 725-0193  
Internal 'A' cable (1) 220-3390 (60 pin, 60")  
Internal 'B' cable (1) 220-3404 (26 pin, 59")  
Terminator (1) 725-2888  
External daisy cable (1) 220-3436 (60 pin, 32", shielded)  
'A' cable retainer assy (1) 279-0656  
'B' cable retainer assy (1) 279-0657  
Retainer mtng screws (4) 650-3169 (6-32 x 1/2 Parkerized truss head)  
Fast-on terminal (1) 654-0126 (for terminator)  
Documentation a. Board installation provided with board from CDC.  
b. General installation in CE maintenance manual.

cc: Dana O'Malley, Mike Severin, Randy Burr, Rick Butland



TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 6292 REPLACES: \_\_\_\_\_ DATE: 12/02/86 PAGE 1 OF 2

MATRIX ID. 3112 PRODUCT RELEASE # 2268V-1/2 WITH DUAL PORT OPTION

TITLE: NEC DUAL PORT OPTIONS SW04-4 (WLN 177-7294) AND SW04-5 (WLN 177-7295)

PURPOSE

To inform the field of the procedures for installing the dual port option in Wang Model 2268V-1 or 2268V-2.

EXPLANATION

1. Remove disk drive cover.
2. Remove screws securing logic/servo board and remove from the HDA.
3. Disconnect cables J41, J53, J54 and J55 on logic/servo board.
4. Disconnect P3 (DC power), P1 (A cable), P2 (B cable) and the ground cable if necessary.
5. Assemble the servo/logic board together with dual port option board with insulator placed between boards.
6. Secure assembly with two screws (large diameter) from kit inserted from the logic/servo board. Note that screws insert in holes labeled +5 Vdc and GND on dual port option board.
7. Find J50-J60 cable kit and connect between logic/servo and dual port option.
8. Connect cable from 15A on dual port option board to J15D on logic/servo board.
9. Connect cable from 15B on dual port option board to J15C on logic/servo board.
10. Mount board assembly to HDA with 4 screws (long) from dual port installation kit.
11. On the dual port option board move jumpers on Mode switch to CDC position.
12. Set ROUTE-0 (Port A) switch (SW1) to Enable position.
13. Set ROUTE-1 (Port B) switch (SW2) to Enable position.
14. Set RELEASE TIMER switch (SW3) to OFF position.
15. Unit Address Select- Switch bank for Port B (location 13 on dual port option board) set switches SW3 and SW4 as follows:

UNIT NO	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
0	off	off	off	off	on	off	off	off
1	off	off	off	on	on	off	off	off
2	off	off	on	off	on	off	off	off
3	off	off	on	on	on	off	off	off

GROUP: Desktop Systems/Peripherals Group MAIL STOP: 001-250

COMPANY CONFIDENTIAL

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WANG

TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 6292      REPLACES: \_\_\_\_\_      DATE: 12/02/86      PAGE 2 OF 2

MATRIX ID. 3112      PRODUCT RELEASE # 2268V-1/2 WITH DUAL PORT OPTION

TITLE: NEC DUAL PORT OPTIONS SW04-4 (WLN 177-7294) AND SW04-5 (WLN 177-7295)

EXPLANATION: (cont'd)

16. Remove terminators on dual port board.
17. Remove mounting brackets on the drive and install new brackets from kit. Reinstall drive cover.
18. Reinstall drive on base plate cabinet taking care to tighten mounting screws securely. These screws are depended upon for grounding of drive.
19. Reconnect all cables to the drive (A and B cable, DC power).
20. Checkout the two VS's configurations for dual port option and check if the drive or the drives can be accessed (attach/detach) from either VS.

Note: NEC can provide two dual port option boards, the G9QSW (WLN 725-0191) and the Q9QST (WLN 725-0192). These two boards are compatible and they can be used on the 2268V-1 or the 2268V-2.

GROUP: Desktop Systems/Peripherals Group      MAIL STOP: 001-250

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TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 6130      REPLACES: N/A      DATE: 06/03/86      PAGE 1 OF 1  
MATRIX ID. 3112      PRODUCT/RELEASE# NEC Disk Drives 2268V-1, 2268V-2  
TITLE: Dual Channel PCB Information

PURPOSE:

To inform the field of new information for the NEC dual channel option.

EXPLANATION:

There have been reports from the field of NEC dual channel option boards being received with improper jumper settings on the board. All boards should be configured in the ~~SCS~~ mode so that JP1 thru JP4 have pins 2 and 3 connected. Before ordering a replacement dual channel PCB, ensure that the jumpers are set properly. The Wang part number for the dual channel PCB is 726-2238. The vendor number for the G9QSW PCB is 134-832957.

Both Manufacturing and the vendor have been alerted to the incorrect jumper problem.

NEC	CDC
1 2	3 4

GROUP: Peripheral Hardware Support Group      MAIL STOP: 0125

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TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 5144 REPLACES: \_\_\_\_\_ DATE: 07/16/85 PAGE 1 OF 1

MATRIX ID. 3112 PRODUCT/RELEASE# 2268V-1, 2268V-2 Documentation

TITLE: Replacement of Whole Drives.

PURPOSE:

To inform the field of an error in the 2268V-1, and 2268V-2 self-study workbooks 729-1463 and 741-9012, and the Product Maintenance Manuals 729-1452 and 729-1503.

EXPLANATION:

The Diagnostics & Troubleshooting Section of both workbooks and both PMMs makes several references to replacing the entire drive if certain steps do not fix the drive. This statement should be removed from all places in these manuals. The whole drive cannot be ordered from Logistics. All components of the drive are contained in one of six Field Replaceable Units (FRUs) which can be ordered from the FSC's. The NEC Diagnostic panel (727-0317) or the troubleshooting flowcharts in section 3 of the PMM should be used to isolate the problem to a particular FRU.

Listed below are the part numbers of the FRUs for each drive:

	2268V-1 85MB	2268V-2 167MB
Logic and Servo PCB	726-8109	726-8123
Earth Pad Assembly	726-8111	726-8111
Power Amp PCB	726-8108	726-8122
Read Write PCB	726-8107	726-8121
3-DC Input PCB	726-8110	N/A
Disk Enclosure	726-8112	726-8124
DUAL PORT BRD	726-2233	
POWER SUPPLY		725-2887

GROUP: Peripheral Hardware Support Group MAIL STOP: 0125

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TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 5215 REPLACES: N/A DATE: 09/24/85 PAGE 1 OF 1  
MATRIX ID. 3112 PRODUCT/RELEASE# 2268V-1/2268V-2  
TITLE: New Strategy to Support the NEC Drives

PURPOSE:

To inform the field on our new strategy to support the NEC drives in the field with the CDC TB-216.

EXPLANATION:

In a meeting with the Capital Equipment Committee group, ATE and Product Support recommended the use of CDC TB-216 in place of the NEC Panel to support the NEC drives at the Branch level.

Existing NEC Panels in the field can be relocated to the Districts. Field Districts without the NEC Panel should notify their RTSM.

ADVANTAGES/DISADVANTAGES

NEC Panel

Advantage: Possesses the ability to be attached to an on-line drive and monitor/store errors as they occur, provides specific error codes; and the codes identify faulty modules or bad HDA.

Disadvantage: Does not possess the ability to write or read. Does not have the ability to verify media errors, errors associated with the heads, or servo errors.

CDC TB-216

Advantage: This tester is available at the Branch level, and most CE's know how to use the tool. It can perform seek, do read/write, select heads, and verify the media.

Disadvantage: Does not have the ability to monitor/store errors in the on-line mode and requires technical interpretation to identify the faulty modules.

GROUP: Peripheral Hardware Support Group MAIL STOP: 0125

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TECHNICAL SERVICE BULLETIN  
SECTION: Hardware Technical

NUMBER: HWT 5289 REPLACES: \_\_\_\_\_ DATE: 12/17/85 PAGE 1 OF 05

MATRIX ID. 5103 PRODUCT/RELEASE# Unbundled OIS-140

TITLE: Requirements for installing the Small Disk cabinet on the OIS-140 system

PURPOSE:

To provide preliminary information required to install the Small Data Storage Cabinet on the Unbundled OIS 100 Master (OIS-140 System).

EXPLANATION:

The Unbundled OIS-140 System requires some changes in order to support the Small Data Storage Cabinet and the enclosed disk drives. This information will be included in changes to the OIS-140 Product Maintenance Manual. An addition to the Small and Large Data Storage Cabinet Product Maintenance Manual 741-1674 will give specific information regarding Disk Switch settings, cables, upgrades, etc. for use with the OIS-140 System.

Refer to the FOCUS Special Edition of September 18, 1985 for the marketing announcement and TSB number SWT 5175 for software notification.

The following information provides minimum OIS-140 hardware and software revisions and changes in PROMS, Disk type switch settings, Small Data Storage Cabinet configurations, cabling and Disk switch settings unique to the 140 system when used with the Small Disk Cabinet.

PROMS

In order for the OIS-140 system to operate with the new NEC disk drives 6568-1 (67 MB) and 6568-2 (134 MB), which are installed in the Small Data Storage Cabinet, a new set of proms (FCO 1152A and 1154) is required on the CPU Memory board, 210-7501A, and on the CPU with expanded memory 210-7684A (part of 212-3025 assembly).

The PROM numbers remain the same, but the PROM E-rev changes as follows:

<u>PROM</u>	<u>BOARD</u>	<u>PROM LOC</u>	<u>E-Rev</u>
378-2666-R8	210-7501-A	L101	8
378-2667-R8	210-7501-A	L102	8
378-3048-R5	210-7501-A	L100	5
378-5001-R7	210-7684-A	L109	7
378-5002-R5	210-7684-A	L110	5
378-5003-R5	210-7684-A	L111	5

GROUP: Office Automation Hardware Support Group MAIL STOP: 0114

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TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 5289 REPLACES: \_\_\_\_\_ DATE: 12/17/85 PAGE 2 OF 05

MATRIX ID. 5103 PRODUCT/RELEASE# Unbundled OIS-140

TITLE: Requirements for installing the Small Disk cabinet on the OIS-140 system

EXPLANATION (cont'):

DISK TYPE SWITCHES

In addition to the PROMS, there are new Disk Drive definition Switch settings on the SMD Disk Controller Board, 210-7506. The following switch settings are set up the same as is shown in the WP/OIS Customer Engineering Handbook under Switch Settings/Jumpers.

L33 Switches	1 2 3 4 = Port 0
L33 Switches	5 6 7 8 = Port 1
L34 Switches	1 2 3 4 = Port 2
L34 Switches	5 6 7 8 = Port 3

!!!!

<u>Drive Type</u>	<u>Capacity</u>	!!!!
-------------------	-----------------	------

*	SMD/RSD	67 MB----	1 0 0 0	CDC 6567-1 RSD
	SMDA	67 MB----	0 1 1 0	NEC 6568-1
1=ON	SMDA	134 MB----	1 1 1 0	NEC 6568-2

Note:\* The 67MB (formatted) 6567-1 RSD uses the same switch settings as the 67MB SMD.

MINIMUM SOFTWARE/HARDWARE LEVELS REQUIRED

OIS Operating System Release 10.5 is required for OIS-140. If a Customer is operating with WISE all systems must be at the same release level:

OIS-115 (10.5), OIS-40/50/60 (10.A), OIS-70 (10.H) & WISE 5.A.

WLI 210-7506 SMD B Board must be at E-rev 7

WLI 210-8098 SMD B Board must be at E-rev 1

DIAGNOSTICS

The OIS-140 System Exerciser (SYSEX40) was changed to allow testing of the new disk drives. The WLI number is 195-4583-3 which has revision 6556.

The OIS 140 Class Master DTOS (Package part # 195-2857-3) with revision 2500 allows testing with the new disk drives.

The BIT tests in PROM for both standard and expanded memory were upgraded.

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TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 5289 REPLACES: \_\_\_\_\_ DATE: 12/17/85 PAGE 3 OF 05

MATRIX ID. 5103 PRODUCT/RELEASE# Unbundled OIS-140

TITLE: Requirements for installing the Small Disk cabinet on the OIS-140 system

EXPLANATION (cont'):

SMALL DISK STORAGE CABINET CONFIGURATIONS

The Small Data Storage Cabinet is designed to house a new line of Wang disk drives. It has space for two drives. The top shelf holds a 67 MB Removable Storage Drive (RSD) and the bottom shelf accepts either a 67 MB or a 134 MB fixed disk drive. Three models of the cabinet accommodate different combinations of fixed and removable drives. Provision is also made for a Daisy Chain connection of two cabinets.

The configurations of the three models of the cabinet are as follows:

<u>Model</u> 6593-C1	<u>Drives Included</u> One 67 MB removable Model 6567-1 Lower shelf empty	<u>Storage Capacity</u> 67 megabytes
<u>Model</u> 6593-C2	<u>Drives Included</u> One 67 MB removable Model 6567-1 One 67 MB fixed Model 6568-1	<u>Storage Capacity</u> 134 megabytes
<u>Model</u> 6593-C3	<u>Drives Included</u> One 67 MB removable Model 6567-1 One 134 MB fixed Model 6568-2	<u>Storage Capacity</u> 201 megabytes

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TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 5289 REPLACES: \_\_\_\_\_ DATE: 12/17/85 PAGE 4 OF 05

MATRIX ID. 5103 PRODUCT/RELEASE# Unbundled OIS-140

TITLE: Requirements for installing the Small Disk cabinet on the OIS-140 system

EXPLANATION (cont'):

CABLES

The following cables are used to connect the Small Disk Cabinet to the 140/145 system.

System to first cabinet

*	"A" Cable	15 ft.	220-3041-32
	"A" Cable	25 ft.	220-3041-33
	"A" Cable	50 ft.	220-3041-34
*	"B" Cable	15 ft.	220-3033-46
	"B" Cable	25 ft.	220-3033-47
	"B" Cable	50 ft.	220-3033-48

Note:\* Shipped with Small Disk Cabinet

The following cables are used to connect from the cabinet to existing drives and to interconnect cabinets.

"A" Cable	15 ft.	(from one cabinet to another)	220-3041-29
"A" Cable	15 ft.	(from cabinet to 6580-1,-2,-3)	220-3041-07
"A" Cable	15 ft.	(from cabinet to 6565-1)	220-3041-09
"A" Cable	15 ft.	(from cabinet to 6565-2)	220-3041-08

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TECHNICAL SERVICE BULLETIN  
SECTION: HardWare Technical

NUMBER: HWT 5289 REPLACES: \_\_\_\_\_ DATE: 12/17/85 PAGE 5 OF 05

MATRIX ID. 5103 PRODUCT/RELEASE# Unbundled OIS-140

TITLE: Requirements for installing the Small Disk cabinet on the OIS-140 system

EXPLANATION (cont'):

DISK DRIVE SWITCH SETTINGS.

The Disk drive switch settings on the individual disk drives for the NEC (6568-1 and 6568-2) and CDC (6567-1) are the same as is used for the VS system as indicated in the Small and Large Data Storage manual (741-1647) with the exception of the Sector switches. The VS uses 9 and the OIS uses 64 sectors. The following switch settings make use of the sector switch diagrams in Figure 1-19 of the manual for the 6568-1, -2 and Figure 1-14 for the 6567-1.

Model 6568-1

Early models: Switches 1-3-4-5-6-7-8 ON  
Switch 2 OFF

Later models: Switches 1-3-4-5-6-7-8 CLOSED  
Switch 2 OPEN

Model 6568-2

Switches 1-3-4-5-6-7-8 CLOSED  
Switch 2 OPEN

Model 6567-1

Lower Switch Bank: Reading bottom to top as Sw 0 to 5  
Switch 0 and 4 to left  
Switches 1-2-3-5 to right

Upper Switch Bank: Reading bottom to top as SW 6 to 11  
Switches 6 and 7 to left  
Switches 8-9-10-11 to right

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TAC

PROBLEM CALL

CONTROL NUMBER 06077114

CONTACT NAME GLEN GUILLORY POSITION CE  
RDB # 3513 TDX # PHONE # 504 835 4863 EXT #

SYSTEM TYPE VS 85 DEVICE TYPE 2295V-68  
UTILITY NAME SOFTWARE LEVEL

METHOD OF CALL P T = TELEX, P = PHONE, M = MEMO, E = EMS  
HAS THE AREA OR DISTRICT BEEN CONTACTED  
N A = AREA, D = DISTRICT, B = BOTH, N = NONE  
IS THIS INQUIRY PERTAINING TO A NATIONAL ACCOUNT ?  
U Y = YES, N = NO, U = UNKNOWN

USE THE FOLLOWING AREA TO DESCRIBE THE SITE THAT CREATED THIS REQUEST  
CUST/OFFICE NAME SUN BELL BUS COMP. PHONE # 504 524 0649  
ADDRESS 3F95 CITY NEW ORLEANS STATE LA  
ON SITE CONTACT NAME

PROBLEM (\*) SOLUTION (+)

\*CANT ACCESS DRIVE.

3/18/86: HAS 1 76 MEG RSD IN 1 CABINET & 2 147 MEG NECS IN  
A 2ND CABINET. ONLY THE LAST MEG DOES NOT WORK.  
GETTING MESSAGE TASK W/S NOT AVAILABLE & PRNAME =  
WSFILE NOT AVAILABLE. TALKED W/ BB & THINKS IT MAY  
BE AN ADDRESSING CONFLICT. SW SETTINGS APPEAR TO  
BE CORRECT. CE TO REMOVE 1ST 147 MEG NEC LOGICALLY  
& USE FAILING UNIT IN IT'S PLACE. CAN NOT INITIAL-  
IZE DRIVE. NO FAULT LITE ON DRIVE. SUGGESTED USING  
BRDS FROM GOOD DRIVE TO ISOLATE PROBLEM ON FAILING  
DRIVE. (25MIN) MIKEB

3/18 4:45 PLEASE CLOSE CALL

M\*

+DISKINIT INITIALIZE THRU FTU APPEARS TO HAVE SOME PROBLEMS  
+& MAY NOT WORK. WOULD HANG TRYING TO INITIALIZE THE NORMAL  
+WAY. HAD TO WRITE IN IN 1ST BLOCKS OF VTOC USING FTU TO BE  
+ABLE TO INITIALIZE. REWROTE 1ST FEW BLOCKS OF VTOC USING  
+FTU & INITIALIZED OK.

(15MIN) MIKEB



NEC SUPPLIED 520 MB DISK DRIVE MODEL2268V-6

CUSTOMER ENGINEERING MAINTENANCE PLAN

---

NEW PRODUCT ENGINEER  
Jack Volpini

---

NEW PRODUCT MANAGER  
Wayne Justason

---

PRODUCT LINE MANAGER  
Ray Peltzman

---

PRODUCT LINE DIRECTOR  
Richard Petzold

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I. PRODUCT OVERVIEW

1.1 General Description

The 2268V-6 is an NEC designed and manufactured 9 inch disk drive with an unformatted capacity of 520 MB. It uses fixed disk Winchester technology which provides the most modern method of recording large amounts of data for high speed random access computer applications. Initial shipments will be on VS 300 Systems. The VS Data Storage Cabinet will be used to house this drive.

The electronics package consists of four PCB's providing read/write analog circuitry, spindle and servo controls, and an ESMD controller interface. Two fans provide cooling past the sealed data module, power supply and electronics.

The data module consists of six platters sealed in an airtight enclosure, protecting the recording surfaces from contaminants. The read/write heads, servo head, R/W preamps, spindle and rotary actuator are also assembled within this enclosure.

A dual port option is available for this disk drive. It provides a second interface, permitting a dual port drive to communicate with two control units.

1.2 Marketing Forecast

Q2 87	Q3 87	Q4 87	Q1 88	Q2 88	Q3 88
306	355	365			

1.3 First Customer Ship

Targeted FCS ship date is October 15, 1986

## II. PRODUCT SPECIFICATIONS

### 2.1 Field Replaceable Assemblies

#### HEAD DISK ASSEMBLY (HDA):

The HDA is the storage module for 520 MB of unformatted data. It contains the recording media, read/write data heads, one servo head, one spindle assembly with a direct coupled DC motor, and a rotary actuator assembly.

#### LOGIC AND SERVO PWA:

Provides interface to host controller, servo analog circuitry, ESMD control, error status detection, and micro-processor.

#### \* READ/WRITE PWA:

Controls reading and writing of data to and from the HDA.

#### \* MODEM AND PLO PWA:

Contains the encoder/decoder, write and read PLO.

#### POWER AMP PWA:

Contains the driver circuitry for the spindle and actuator motor assembly.

#### POWER SUPPLY ASSEMBLY:

Receives input from the AC power source and uses it to provide the DC voltages necessary for the drive operation.

#### FAN:

Provides airflow across the HDA and electronics package

#### CONTACT PAD:

Static eliminator spring for the HDA

#### STATOR:

DC spindle motor

#### TERMINATOR:

Terminator resistor assy for the I/O cables.

#### DISPLAY STATUS ASSY:

Provides status display via LED assy.

#### FAN, POWER SUPPLY:

Provides cooling for the Power Supply assy

#### DUAL PORT PWA:

Provides dual CPU access to single disk drive (option)

- \* These two PWAs will be in initial units only. In later versions of this drive, these two PWAs will be combined into one (G9WCB) PWA. This new PWA will be both upward and downward compatible. (See page 8 of this document for more information)

### 2.3 Media

The storage medium for this drive is fixed Winchester technology with an unformatted capacity of 520 MB.

### 2.4 Operating System

The 2268V-6 disk drive will operate VS\_\_\_\_\_ or higher.

### 2.5 Configuration

The 2268V-6 will be housed in the VS Data Storage Cabinet. For further information on cabinet configurations, refer to the VS Data Storage Cabinet documentation.

### 2.6 Site Power Requirements

Power is provided by a standard three prong plug. A single circuit 115 Volt, 60 cycle line utilizing a receptacle NEMA # 5-15IG is required.

## III. DESIGN SPECIFICATIONS

### 3.1 Specifications

#### Capacity

Unformatted	520 megabytes
Per Track	36,288 megabytes
Per Cylinder	689,472 megabytes

#### Disks

Number of data disks	6
Number of servo disks	1
Track Density	1,000 tpi
Bit Density	18,600 bpi
Rotational velocity	3,070 rpm
Recording method	2-7 code, RLL

#### Heads

Data heads	19
Servo heads	1
Number of Cylinders	760
Data Transfer Rate	1.86 MB/second
Average seek time	15 MS
Average latency time	9.8 MS

### 3.2 Physical Dimensions (includes Power Supply)

	<u>metric</u>	<u>inches/lbs</u>
Width	216 mm	(8.5 inches)
Height	259 mm	(10.2 inches)
Depth	692 mm	(27 inches)
Weight	37 kg	(82 lbs)

### 3.3 Power / Environmental Requirements

#### Power Requirements

	<u>low voltage</u>	<u>high voltage</u>
Nominal voltage	120 VAC	220VAC
Voltage range	87-128VAC	191-256VAC
Nominal line frequency		60 Hz
Frequency range		48 to 62 Hz
Phase requirements		single phase
Power consumption(average)	300 W	280 W
Power consumption(startup)	450 W	450 W
Line current(average)	3.6 A	2.2 A
Line current(startup)	5.5 A	3.5 A

#### Temperature

	<u>Celsius</u>	<u>Farenheit</u>
Storage/shipping (packaged)	-40 to 60 C	(-40 to 140 F)
Operating	10 to 40 C	(50 to 104 F)
Gradient	Less than 15 C/hour (27 F/hour)	

#### Relative Humidity

Storage	5% to 95%
Operating	20% to 80%
Gradient	10% per hour (non-condensing)

#### ALTITUDE

Operating	0 to 3000 M	(0 to 10000 F)
Non-operating	0 to 4000 M	(0 to 12000 F)

#### Shock

	<u>G's</u>	<u>milli-sec</u>
Operating	3.0	10.0
Non-operating	10.0	10.0
In-storage (shipping)	15.0	10.0

### 3.4 Government / Industry Standards

Since the drive will be housed in the VS Data Storage Cabinet, it will be certified with the cabinet.

#### SAFETY AND EMI/RFI (FCC)

The 2268V-6, when housed in the Data Storage Cabinet, will meet the following specifications:

#### DOMESTIC

UL 478 Fourth Edition, Standard For Safety....Electronic Data Units and Systems.

Wang Standard for Electrostatic Discharge (SPI 10-623)

Wang Standard for Mechanical and Environmental Testing (SPI 10-708)

Wang Standard for Equipment Operating Environment (SPI 10-625)

Wang Standard for Shipping Container Performance Test (SPI-010-521)

Wang Standard for Computing Device Susceptibility Test (SPI-010-630)

FCC rules, Part 15, Subpart J, 80-148, 27114, Docket 20780 (Class A)

#### INTERNATIONAL

CSA Standard for Safety C22.2 No. 154 (Data Processing Equipment)

IEC 380/VDE 0806/8.81

Safety of Office Machines IEC - 380

VDE 0871/6.78 (50 HZ Units)

### 3.5 Servicing Space Requirements

	<u>metric</u>	<u>inches</u>
front	91.44 cm	(36 inches)
side	61 cm	(24 inches)
rear	91.44 cm	(36 inches)

Further servicing/space requirements can be found in VS Data Storage Cabinet Documentation.

### 3.6 Special Considerations

Initial versions of this drive will have two PWAs in the read/write chain. Later versions will have only one read/write PWA. The new single PWA will be both upward and downward compatible. (See Recommended Spares List, Page 8 of this Maintenance Manual)

## IV. MAINTENANCE

### 4.1 Maintenance Objectives

Maintenance objectives for the 2268V-6 are to repair to the optimum FRU.

### 4.2 Calls Per Month

The expected calls per month are to be .35 based on 100% duty cycle.

### 4.3 Mean Time To Repair (MTTR)

MTTR goal is 1.5 hours

### 4.4 Preventive Maintenance

No Preventative Maintenance is required on this disk drive.

### 4.5 Special Tools / Test Equipment

No special tools are required to service this disk drive.

The 2268V-6 can be off-line tested using the NEC hand held tester (model DKU000-HLOG), HANG part number 727-0317.

In addition, each drive will be equipped with a status display monitor.



V. SUPPORT

5.1 Technical Documentation

Vendor manual will be modified and reprinted to reflect the drive that WANG will be purchasing. Documentation will also be provided relative to cables, cabinets, switch settings, unique PROM requirements, etc.

5.2 Training

Will provide hands on training at TTC.

5.3 Logistics

Appropriate sparing levels will be pushed to the field at FCS.

5.4 Repair

NPF checks will be done until volume warrants assumption of repair.

5.5 Diagnostics

On-Line diagnostics are being developed to access the 2268V-6 drive.

5.6 Alpha / Beta Sites

T B D

VI. ADDENDUM

6.1 Recommended Spares List / Vendor Cross Reference as of Sept 12, 1986

<u>DESCRIPTION</u>	<u>VENDOR PART NO.</u>	<u>WANG LAB NO.</u>	<u>U</u>	<u>R</u>	<u>STOCKING LOCATION</u>
G9WBR Pwr Amp PWA	134530336001	726-2654	x	x	A
G9WBX Modem & PLO,PWA	*134530342001	726-2655	x	x	A
G9WBY R/W PWA	*134530343001	726-2656	x	x	A
G9WBZ Logic & Servo PWA	134530344002	726-2657	x	x	A
HDA (data module)	134530358001	726-2660	x	x	A
Fan	134530356001	726-2658	x		A
Braking Relay	134530357001	726-2659	x		A
Contact Pad (static spring)	1345303590	726-2661	x		B
Stator	134530360	726-2662	x		A
Power Supply	134501030001	726-2663	x	x	A
Terminator	806944644001	TBD	x		A
Display Status PCB	134530669001	726-2665	x	x	A
Dual Port PWA	134530341002	726-2664	x	x	A
G9WCB R/W PWA	*134530346001	TBD	x	x	A

note: U = unique part  
R = repairable part  
A = area  
B = branch

G9WBX and G9WBY boards will be used only on the initial shipments to the field. Later versions of this drive will combine these two boards into one board, the G9WCB board. The G9WCB board will be both upward and downward compatible.

TO: INTERESTED INDIVIDUALS  
FROM: JACK VOLPINI  
DATE: SEPT 24, 1986  
SUBJECT: PROMS, SWITCH SETTINGS, ETC FOR NEC 9" DRIVES

---

The following information is correct as of September 24, 1986.

The PROMs that reside in the controller PCB (210-8785A) are part number:  
378-9077 and 378-9078 rev B ( 4 port )  
378-9073 and 378-9074 rev B ( 2 port )

These proms will handle every drive that we currently support.

The switch settings on the controller PCB are:  
344 MB NEC = 2  
520 MB NEC = 3

Since FCS of this product will occur before release of software rev 7.12, a patch will be made available for support of these NEC drives. At this time it is not known what these patches are or how distribution will be accomplished.

The NEC drive switch settings are per the attached memo from John Haynes dated September 17, 1986. Please note that there have been changes since the availability of the product spec.

# Memorandum

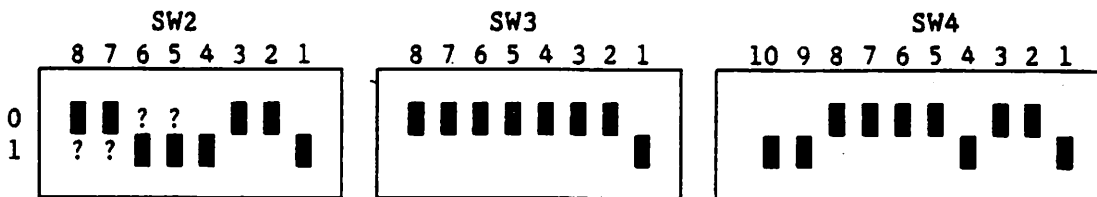
To: Distribution  
From: John Haynes  
Date: September 17, 1986

Subject: NEC Drive DIP Switch Settings

The following diagrams represent the dip switch settings for the NEC 302 and 471 MB drives (user formatted storage capacity, not including vendor map and diagnostic cylinders). They differ only in the number of sectors per track selected, 9 and 16 respectively.

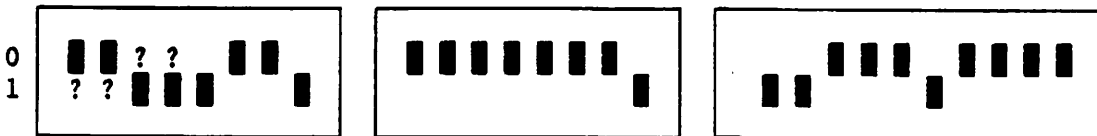
## NOTE

The NEC drives do not supply a sector zero pulse, they assume the disk controller will OR the index mark into the sector pulse logic. Any controllers not capable of ORing the index mark into the sector pulse logic can not support these drives in configurations where the number of sectors per track divides evenly into the number of bytes per track. The reason being no extra sector pulse is generated that would have masked this problem. This presents only a problem for the 471 MB drive where there are no remaining bytes, so the controller has to OR the index mark into the sector pulse logic.



???? these rockers set unit address, set for unit 3

## 302 MB Drive



## 471 MB Drive

Distribution: Mike Badzinski M/S 1479  
Helen Chueng  
Eric Herber M/S 1449  
Steve Michaelides M/S 13A2A  
Cyrus Nava  
Wesley Sylvester M/S 1369  
Phil Temples

Mat Carrano M/S 1429  
Jim Davidson  
Kevin Mahoney  
Dan Morelle M/S 1429  
Dave Reeder M/S 1429  
Bill Tarkulich  
Isabel Tomaszewski

16 Sep 86, W. Tarkulich

Disk Capacity Planning Calculator

Disk Drive Name:	NEC 302	NEC 500	
Number of Heads:	20	19	Heads
Sector Size (formatted):	2048	2048	Bytes
Sectors Per Track:	9	16	Sectors
Number Of Cylinders:	823	760	Cylinders
Number of Diagnostic Cylinders:	1	1	Cylinders
Number of Error Map Cylinders:	2	2	Cylinders
Total Available Data Cylinders:	820	757	Cylinders
Blocks Per Cylinder:	180	304	Blocks
Formatted Track Capacity:	18.432	32.768	KBytes
Formatted Cylinder Capacity:	368.64	622.592	KBytes
Total Available Data Capacity:	302.285	471.302	MBytes
PUBLISHED DISK CAPACITY:	302	471	MBytes

FOC SWITCH SETTINGS: 03 02

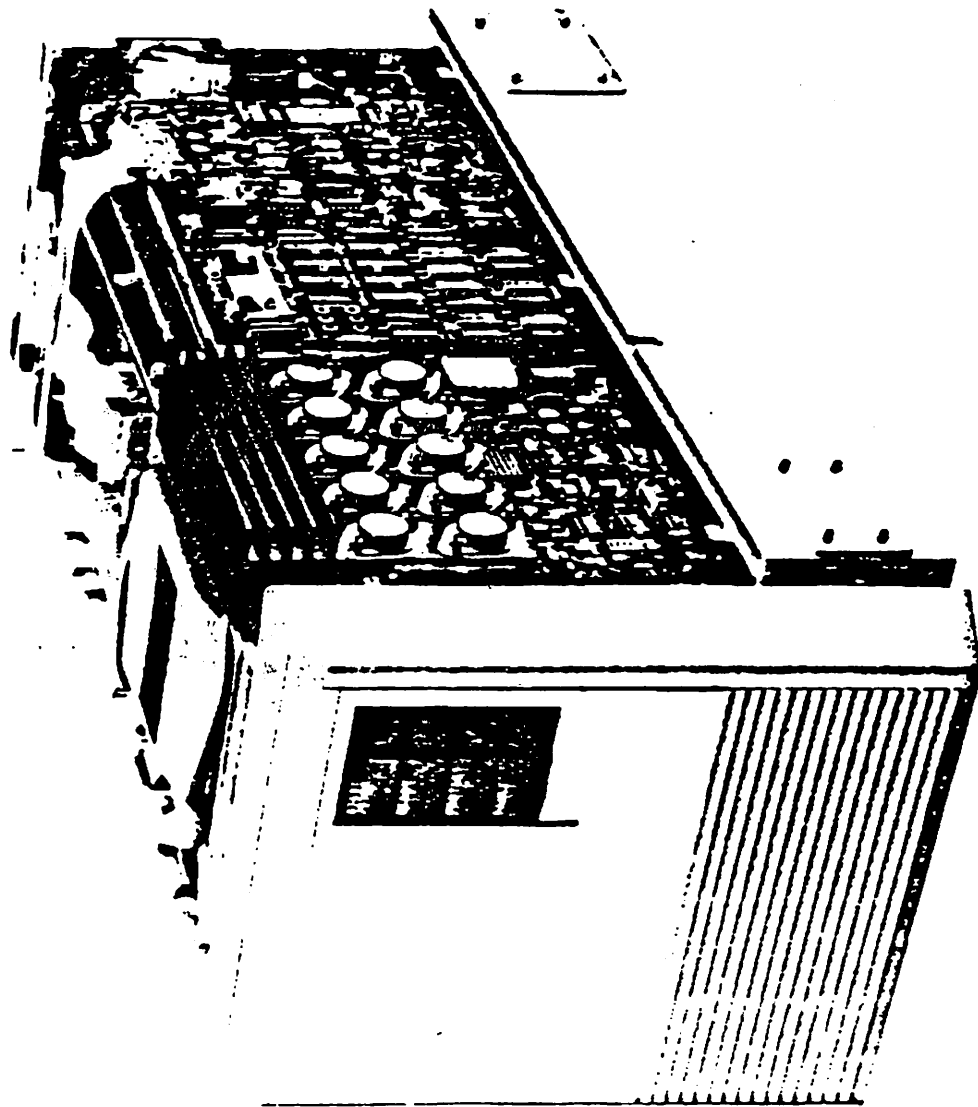
03 (MSB) 0011 (LSB)

02 (MSB) 0010 (LSB)

**D2352**

**9-inch 520 MB**

**NEC**



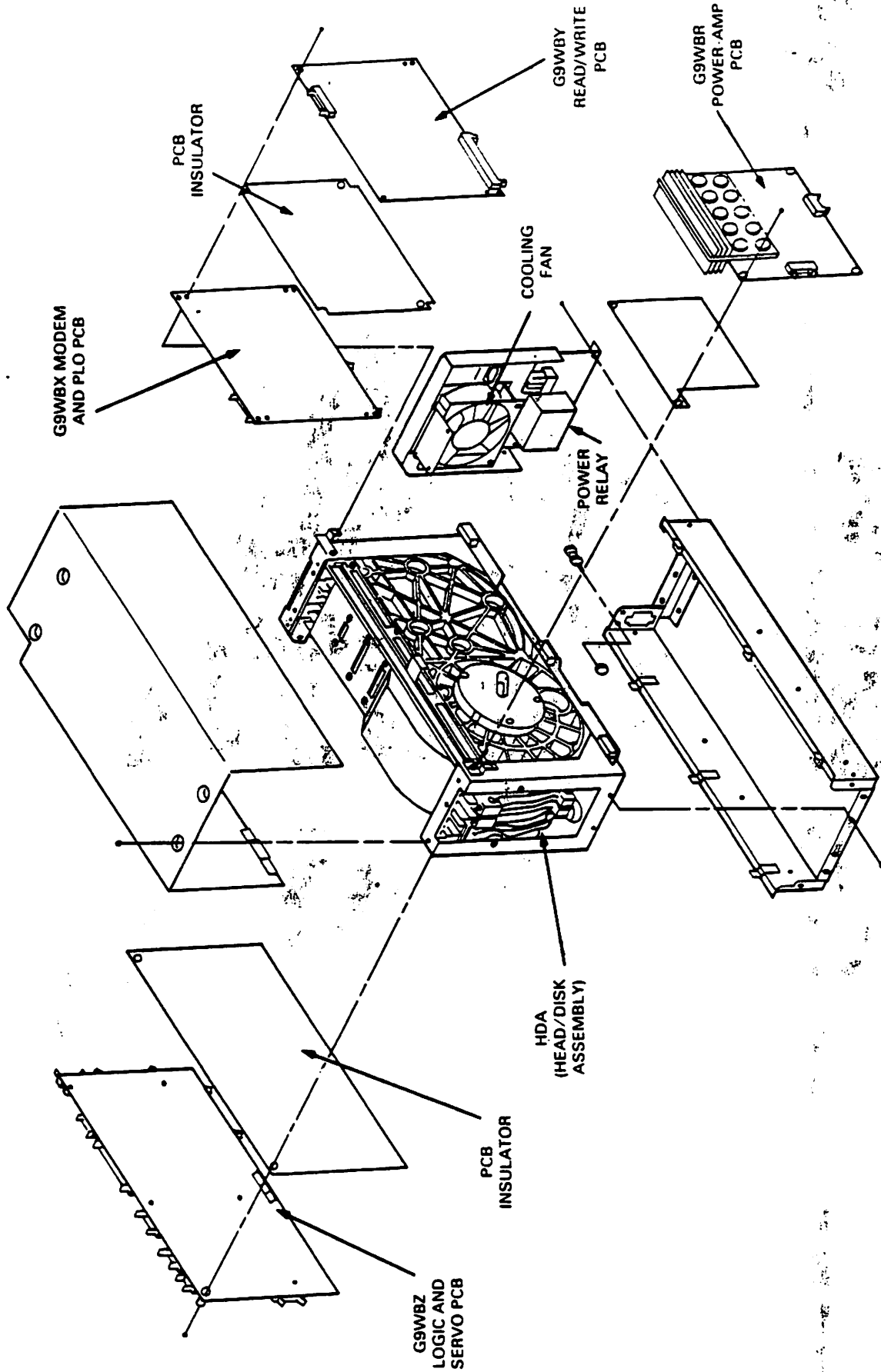


Figure 1-1 Major Components of the D2352 Disk Drive

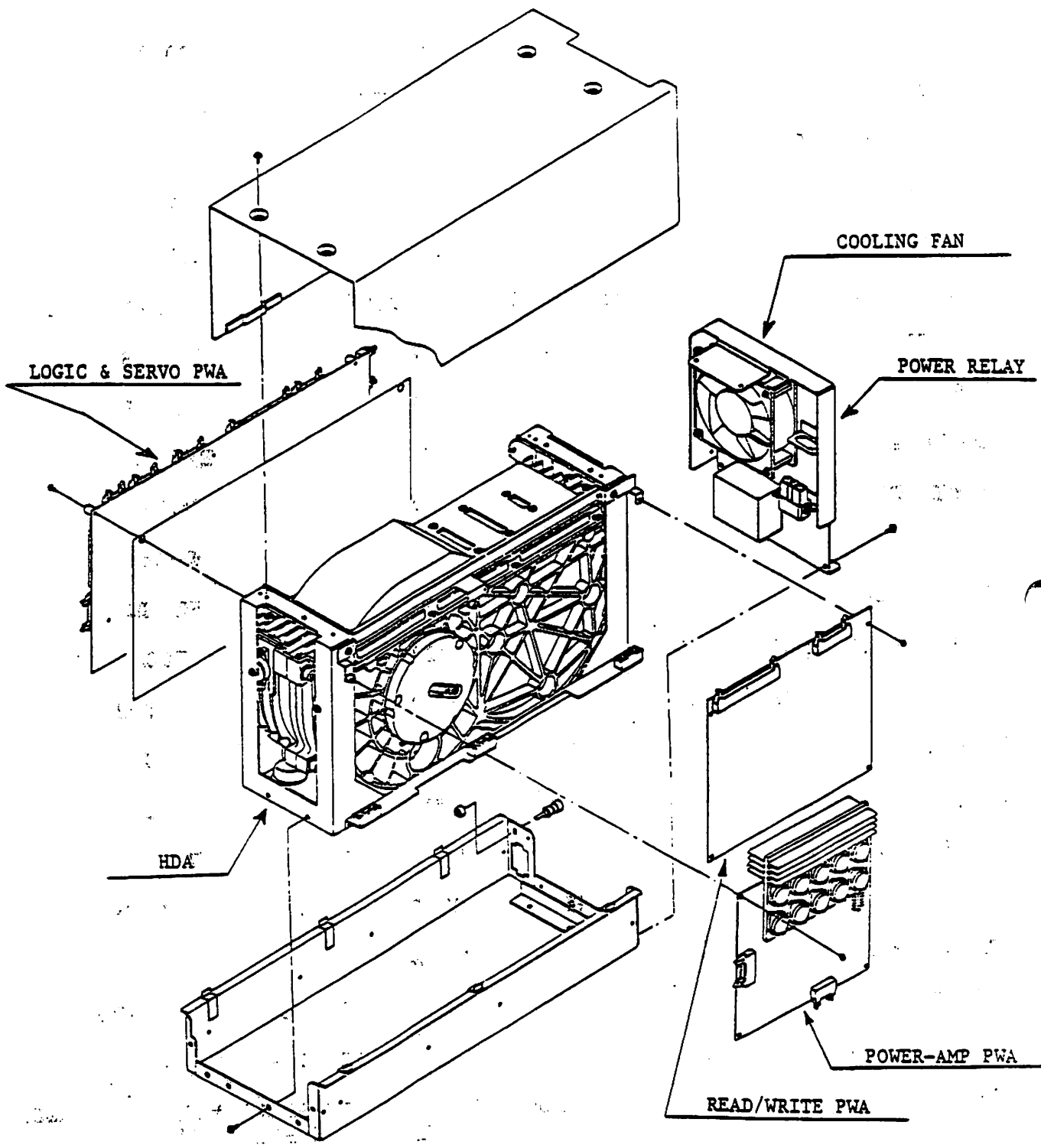


Figure 1-2 Major Components of the Basic Unit

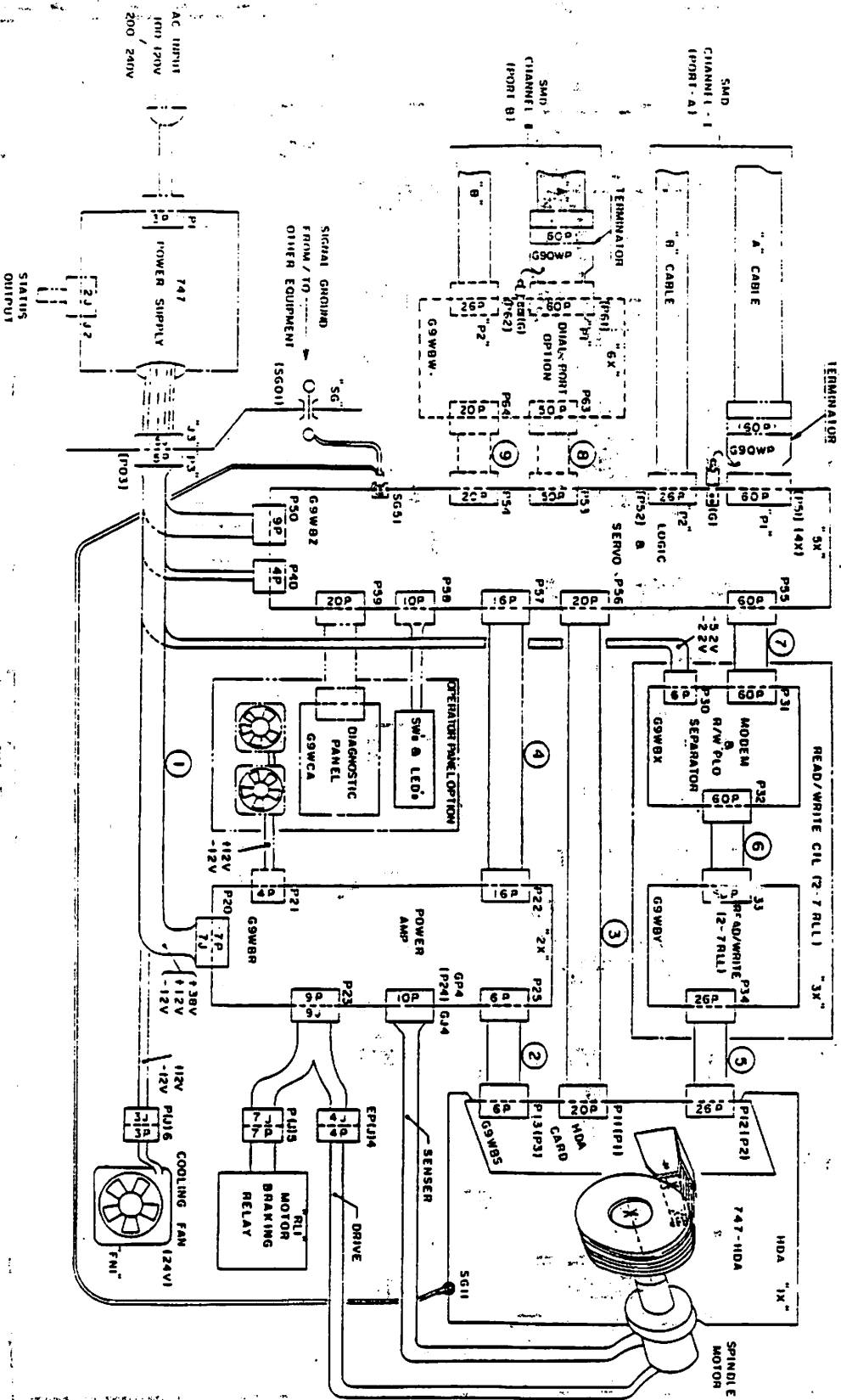


PROFILE OF D2332 VS. D2352

	2332	2352
UNFORMATTED CAPACITY	337 MBYTE	520 MBYTE
NUMBER OF DISKS	7	6
NUMBER OF HEADS	20	19
ROTATIONAL SPEED	3,600 RPM	3,070 RPM
TRANSFER RATE	<sup>10 MHz</sup> 1.21 MBYTES/SEC	1.86 MBYTES/SEC <sup>&lt; 15 MHz</sup>
AVE SEEK TIME	17 MS	15 MS
MIN SEEK TIME	4 MS	4 MS
RECORDING MODE	MFM	2/7 RLL
MAX BIT DENSITY	10,500	18,600
INTERFACE	E-SMD	E-SMD
MAGNETIC SURFACE	PLATED	PLATED
NUMBER OF CYLINDERS	823	760
RECORDING SURFACES	10	9 1/2
SERVO SURFACE	1	1/2
DRIVER/RECEIVER	TTL	TTL
PROPAGATION TIME	17 NS TYP.	17 NS TYP.
SERVO CLOCK	PHASE-LOCKED 9.58MHZ	PHASE-LOCKED 14.88 MHZ
HEAD COMPOSITION	MNZN	MNZN
HEAD POSITIONER	CLOSED LOOP SERVO ACTUATOR	
R/W RECORDING SEQUENCE	SEE ATTACHMENT	
MOTOR TYPE & CONTROL	BRUSHLESS DC WITH SERVO MOTOR CONTROL UTILIZING 6 HALL IC'S	
DISK ENCLOSURE	THE DISK ENCLOSURE IS ESSENTIALLY THE SAME. SPINDLE AND VOICE COIL ARE MODIFIED TO ACCEPT 6 ON 7 PLATTERS DEPENDING ON DRIVE TYPE. MOTOR, CONTACT GROUND AND CASTING ARE IDENTICAL.	

NEC

NEC Information Systems Inc



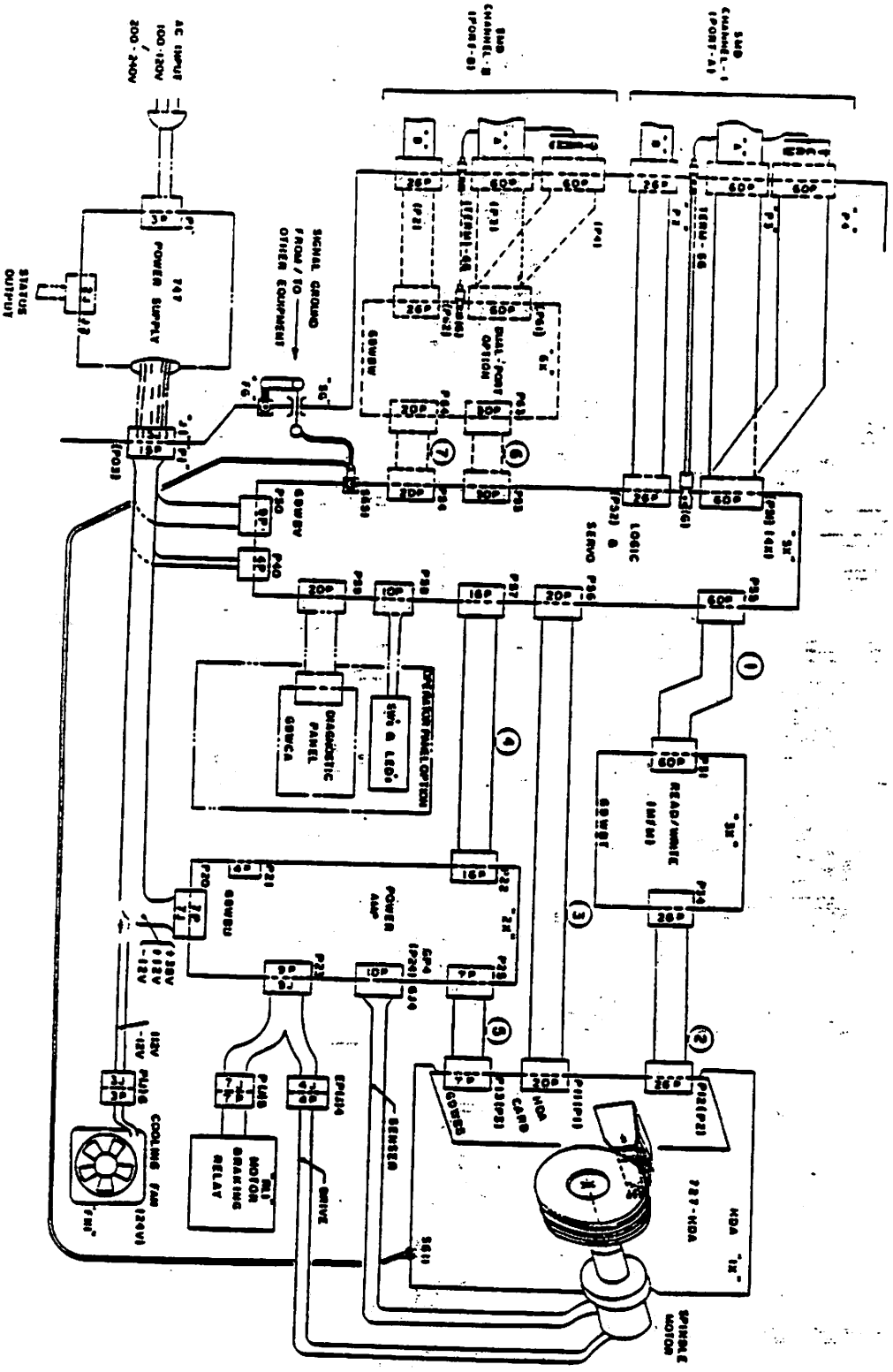
9 INCH FLOPPY DISK DRIVE  
 DKU747 (520A)  
 CABLING DIAGR

134-510902-011

NEC

REV	DESCRIPTION
1	

DRWG ABBR	
PKG LOCATION	
PKG NAME	
011	
REVISION	
DRAWN	ENG
CHEK	APP



DATE	ENG	CHK	APP	SCALE

011

9 INCH "PACER" SERIES

DKU727 (337 MB)

CABLING DIAGRAM

134-510900-011-0

### CHAPTER 3 READ/WRITE CONTROL CIRCUITS

The read/write control circuits, which control the reading of data on the disk, consist of the NRZ to 2-7 RLL converter, write drive circuit, read/write circuit, read amplifier circuit, control logic circuit, data strobe delay circuit, read phase-locked oscillator (PLO), data separator, and 2-7 RLL to NRZ converter (see Figure 3.1).

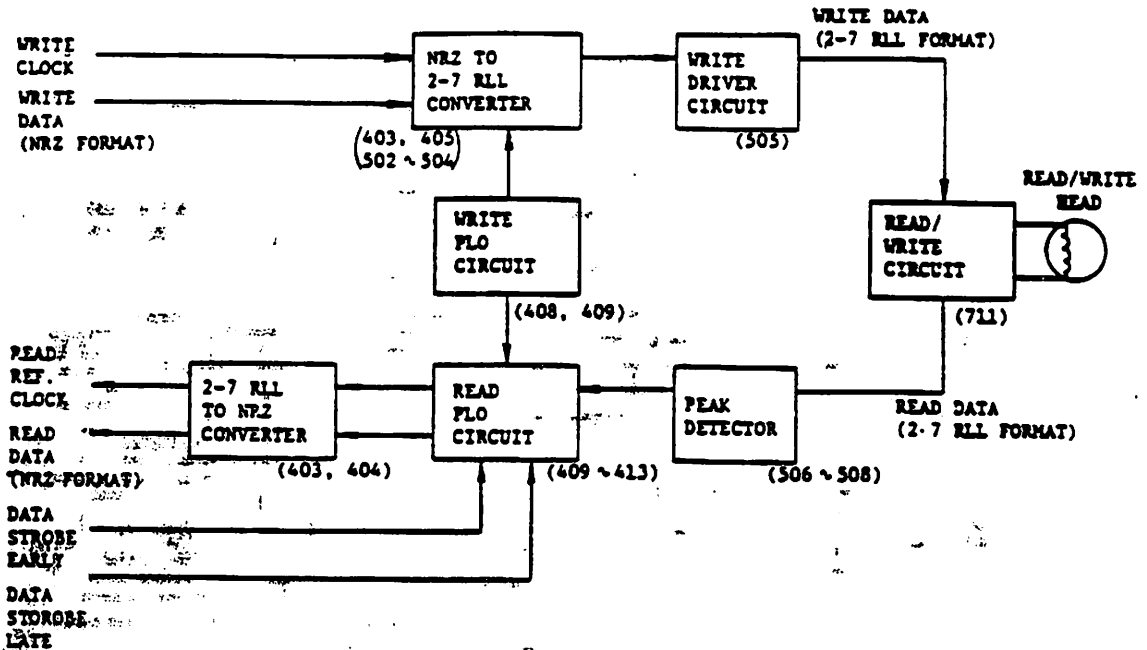


Figure 3.1 Read/Write Control Circuits Block Diagram

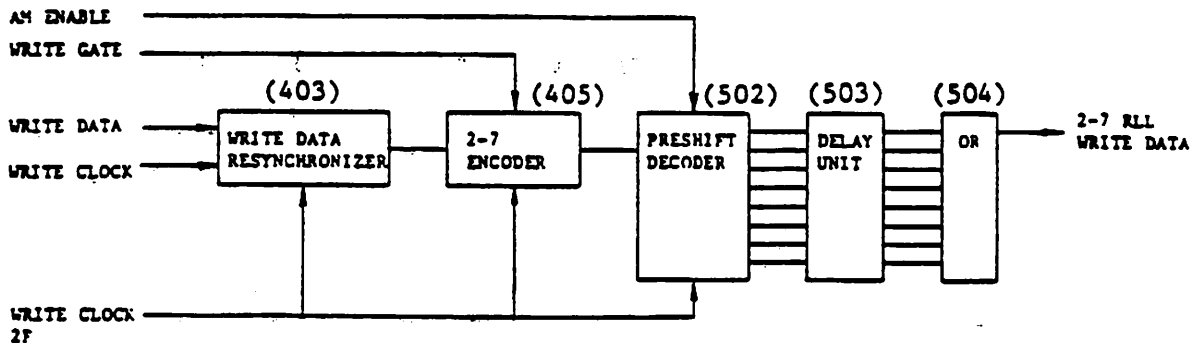


Figure 3-6 NRZ to 2-7 RLL Converter Block Diagram



This chapter includes an overview of operation and explanations of each circuit.

4.1 OUTLINE OF OPERATION

The servo control circuits read the servo data recorded on the servo disk, and demodulate this servo data and move the read/write heads on the correct cylinder by using this demodulated servo data.

(See Figure 4-1)

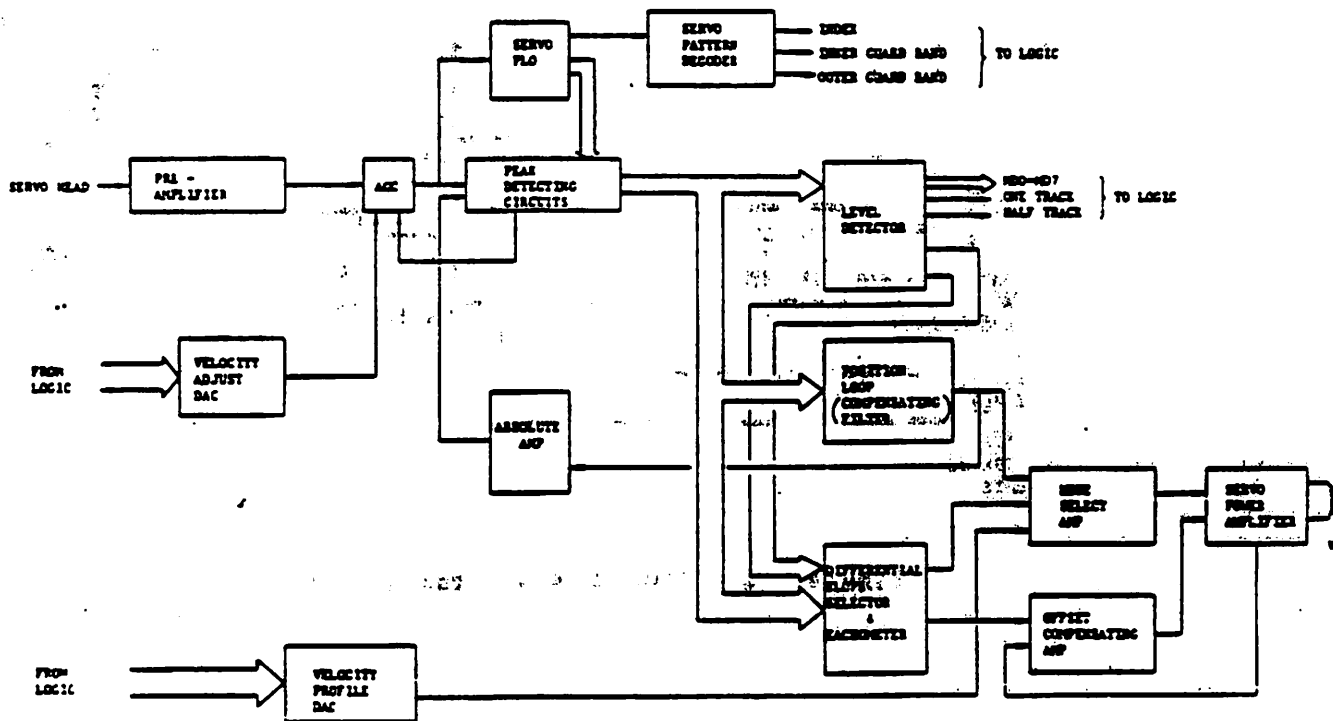


Figure 4-1 Servo Circuit Block Diagram

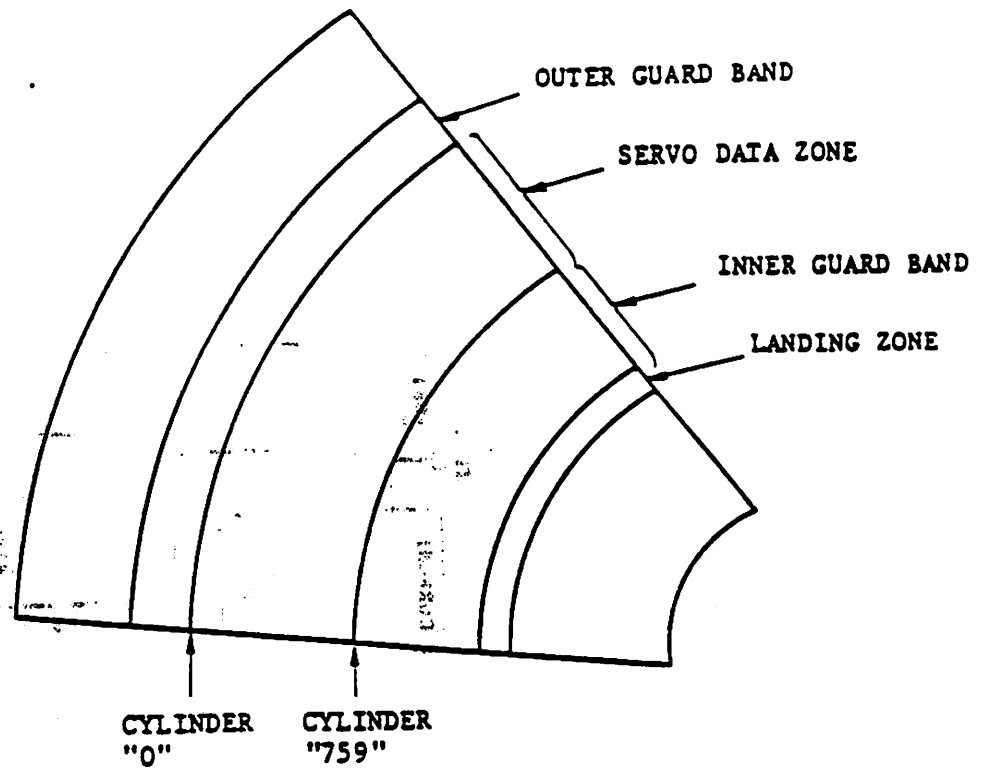


Figure 4-3 Servo Disk Surface

Table 4-1 Cylinder Positions on the Servo Disk

DISK SECTION	CYLINDER POSITION
Outer guard band	-1 cylinder to outside of the disk
Servo data zone	0 to 759 cylinders
Inner guard band	760 cylinder to inside of the disk

(601,602,603)

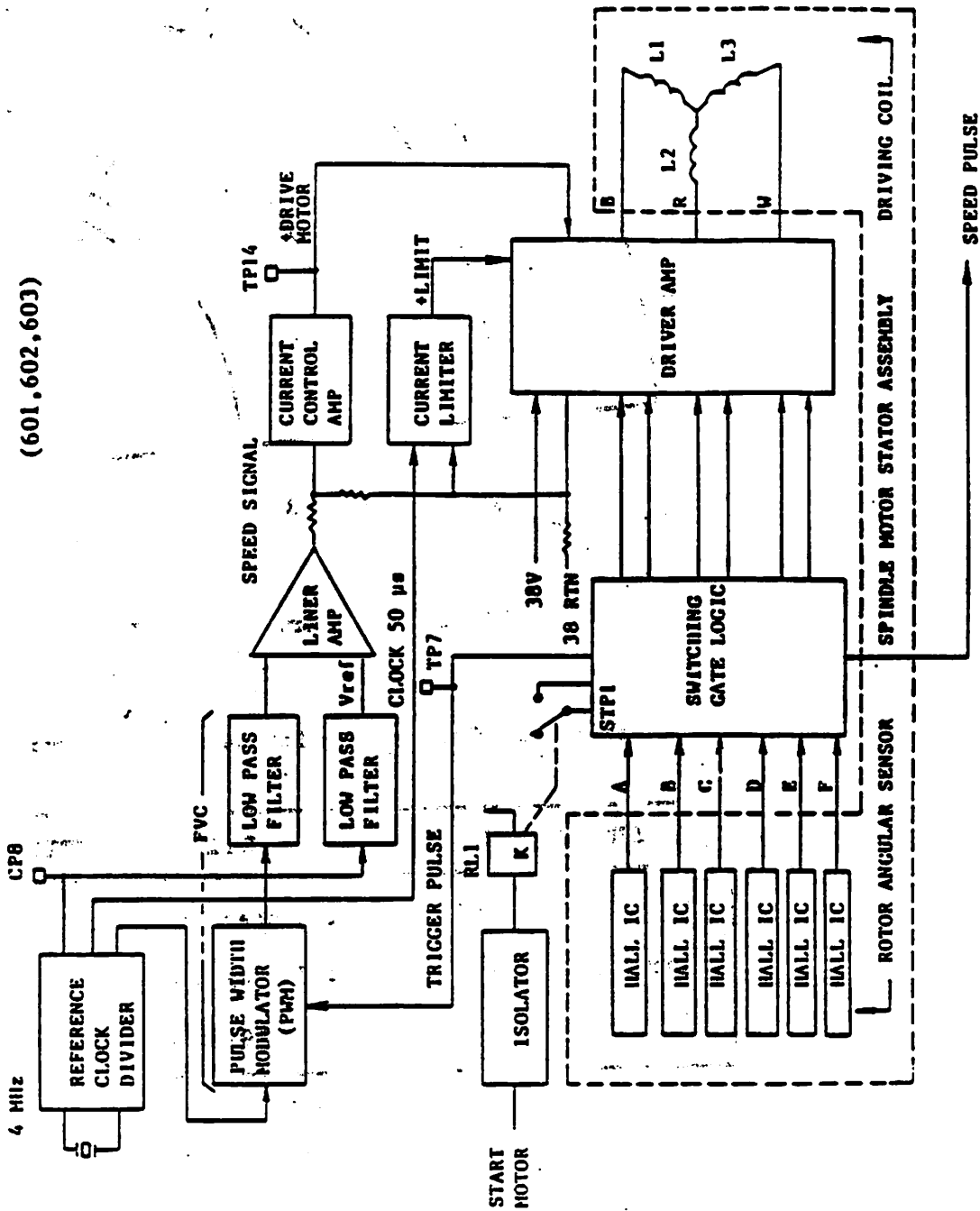
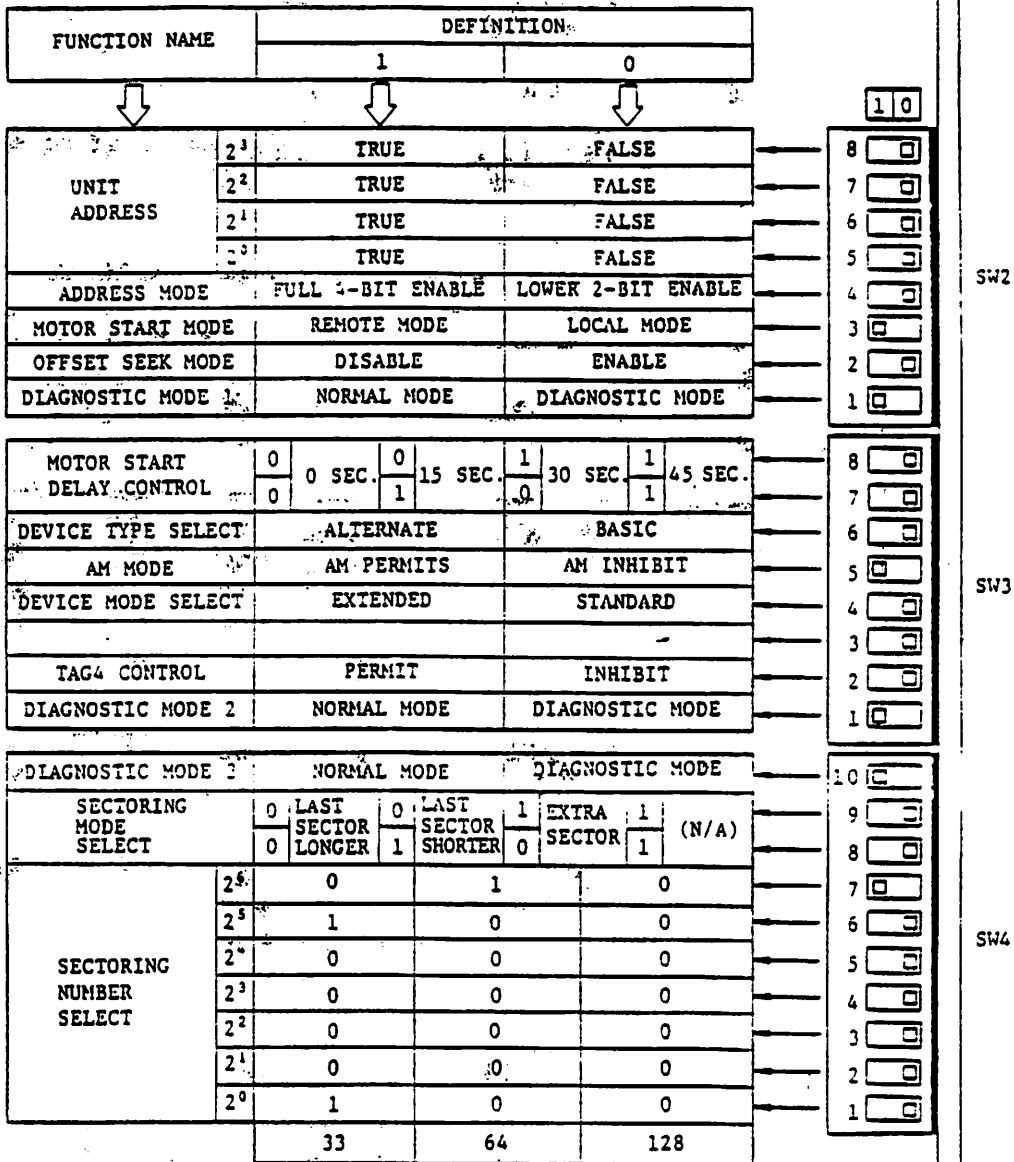


Figure 5-1 Block Diagram of Motor Control Circuit

READY  
 FAULT  
 SEEK ERROR

PROTECT SWITCH SW1  
 ON  
 OFF

LED AND SWITCHES ASSIGNMENT (BASIC)



(EXAMPLE)

"LOGIC & SERVO" PWA

Figure 4-7 Parameters Selection DIP Switches



Table 7-3 further defines the type of disk operation with an (A) though (E) character in the lower right corner of the CONTENT column. The definition of each character follows.

- (A) - Stops the sequence. The interface is not enabled..
- (B) - Stops the sequence as a fault occurs. The interface is not enabled.
- (C) - Stops the motor, resets unit ready, and causes a fault status.
- (D) - Assumes a seek error and causes a home seek operation. (Causes a return to the respective Inner Guard Band (IGB) on the disk.)
- (E) - Causes a fault status.

NOTE: In all A through E character code activity, the Write Protect is set.

Table 7-3 Detail Status Information

Data Field Display Code		Name	Content	Ready
State (X)	Fault (Y)			
0	0	CPU FAULT	Does not operate normally when power is turned on. (A)	(1) Verify that Control FROM is inserted in position 4K on the G9WBZ FWA. (2) Replace G9WBZ FWA.
1	1	VOLTAGE FAULT	Abnormal source voltage. (B)	(1) Check the source voltage.
1	2	ROM FAULT	Error in Control FROM at position 4K on the G9WBZ FWA. (B)	(1) Replace G9WBZ FWA.
1	4	FAULT LATCH	Fault latch on. (B)	(1) Replace G9WBZ FWA.
2	1	VOLTAGE FAULT	Abnormal source voltage. (C)	(1) Check the source voltage.

Table 7-3 Detail Status Information (Cont'd)

Data Field Display Code		Name	Content	Remedy
State (X)	Fault (Y)			
6	2	MOTOR SPEED LOSS	The motor rotation frequency dropped below 90%.  ⓐ	(1) Restart the motor and if a fault 4-3 or 4-4 occurs, replace G9WBR FWA.  (2) Replace G9WBZ FWA.  (3) Replace the unit.
6	3	MOTOR SPEED OVER	The motor speed exceeds 110%	See fault 5-2.
7	1	VOLTAGE FAULT	Abnormal source voltage.	(1) Check the source voltage.
7	2	MOTOR SPEED LOSS	The motor rotation frequency dropped below 90%.  ⓐ	See fault 6-2.
7	4	LOST INDEX MARK	Index cannot be detected.  ⓐ	(1) Check the di-pulse output.  (2) No di-pulse after replacement of G9WBZ FWA, replace the unit.  (3) Replace the unit.
7	5	NO IGB FOUND	The inner guard band pattern is not found.	(1) Replace G9WBZ FWA.  (2) Replace the unit.
8	1	VOLTAGE FAULT	Abnormal source voltage.  ⓐ	(1) Check the source voltage.
8	4	LOST INDEX MARK	The index mark not found.  ⓐ	See fault 7-4.

Table 7-3 Detail Status Information (Cont'd)

Data Field Display Code		Name	Content	Remedy
State (X)	Fault (Y)			
8	D	OVER SHOOT CHECK (TIME OUT)	The heads are not within $\pm 1/2$ CYL continuously for 3 ms within 20 ms after entry into the position mode. (D)	See fault 8-B.
9	1	VOLTAGE FAULT	Abnormal source voltage. (D)	(1) Check the source voltage.
9	4	LOST INDEX	The index is not found. (D)	See fault 7-4.
9	5	OGB NOT FOUND	The outer guard Band pattern does not disappear. (D)	(1) Replace G9WBZ FWA. (2) Replace the unit.
9	9	NO LINEARITY FOUND	N LIN=1 is not obtained. (D)	See fault 8-6.
9	C	OVER SHOOT CHECK	The range velocity is not attained. (D)	See fault 8-B.
9	D	OVER SHOOT CHECK (TIME OUT)	The heads are not within $\pm 1/2$ CYL continuously for 3 ms within 20 ms after entry into the position mode. (D)	See fault 8-B.
A	1	VOLTAGE FAULT	An abnormal condition in the source voltage is detected while in the ready status. (C)	(1) Check the source voltage.
A	2	LOSS OF MOTOR SPEED	The motor rotation frequency dropped below 90%. (C)	See fault 7-2.

Table 7-3 Detail Status Information (Cont'd)

Data Field, Display Code		Name	Content	Remedy
State (X)	Fault (Y)			
B	C	OVER SHOOT CHECK	+1/2 cylinder range exceeded in position mode. (D)	See fault 8-C.
B	D	OVER SHOOT CHECK (TIME OUT)	Heads not in 20 ms range after entry into position mode. (D)	See fault 8-C.
B	E	OVER TRAVEL (OGB)	OGB is detected during a seek. (D)	See fault 8-C.
B	F	OVER TRAVEL (IGB)	IGB is detected during a seek. (D)	See fault 8-C.
C	1	OVER CYLINDER	More than 760 cylinder detected. (D)	
C	3	TAG 1 WHILE NOT READY	TAG 1 is received when not ready. (D)	
D	1	VOLTAGE FAULT	Abnormal source voltage (D)	See fault B-1.
D	4	LOST INDEX MARK	The index mark not found. (D)	See fault A-4.
D	9	NO DIFFERENCE=0 FOUND	The contents of the difference register is not zero. (D)	See fault B-9.
D	C	OVER SHOOT CHECK	+1/2 cylinder range exceeded in position mode. (D)	See fault 8-C.

Table 7-3 Detail Status Information (Cont'd)

Data Field. Display Code		Name	Content	Remedy
State (X)	Fault (Y)			
E	7	RTZ UNSUC- CESSFUL	Speed adjustment seek error after RTZ (D)	Replace G9WBZ PWA.
F	1	PROTECT VIOLATION	Write gate de- tected during write protect. (E)	(1) Defective inter- face.
F	2	WRT NOT READY/WRT NOT ON CYL	Write gate is detected while not-Ready or not-on Cylinder. (E)	(1) Defective inter- face. (2) Replace G9WBZ PWA. (3) Replace the unit.
F	3	WRITE CLOCK FAULT	An abnormal con- dition is found in the clock. (E)	(1) Replace G9WBZ PWA. (2) Replace the unit.
F	4	OFF TRACK WRITE FAULT	Off track is detected during the write. (E)	(1) Readjust the servo circuit. (2) Replace G9WBZ PWA.
F	5	WRITE MARS UNSAFE FAULT	Write could not done normally. (E)	(1) Replace G9WBY PWA. (2) Replace G9WBZ PWA. (3) Replace the unit.
F	6	READ MARS UNSAFE FAULT	Write current at read time. (E)	(1) Replace G9WBY PWA. (2) Replace G9WBZ PWA. (3) Replace the unit.