

77765301



CONTROL DATA[®]
TM
WREN V DISK DRIVE
MODEL 94186 (ESDI)

OEM MANUAL

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WRENTM V ESDI
OEM MANUAL

77765301
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PREFACE

This OEM Manual 77765301 provides the basic information and instructions for installing and operating Control Data WREN V ESDI Disk Drive; Model 94186. It also provides information to aid in servicing those parts of the drive external to the sealed enclosure.

WARNING

"This product is an electromechanical device which could present hazards if improperly handled. The device should be maintained only by qualified personnel in accordance with instructions contained in this manual and sound safety practices. Careless disassembly or maintenance procedures may result in damage to the device or injury to personnel. Observe all CAUTIONS or WARNINGS attached to the device or contained in this manual.

These WARNINGS and/or CAUTIONS are not exhaustive. The manufacturer cannot know in advance all possible maintenance procedures, or tools, which may be devised by persons who choose not to follow the instructions in this manual. Any deviation from the prescribed procedures may entail risks which have not been evaluated by the manufacturer.

Any persons who use a nonapproved procedure or tool must satisfy themselves that no injury to personnel, no damage to the device, and no deterioration of device performance will result."

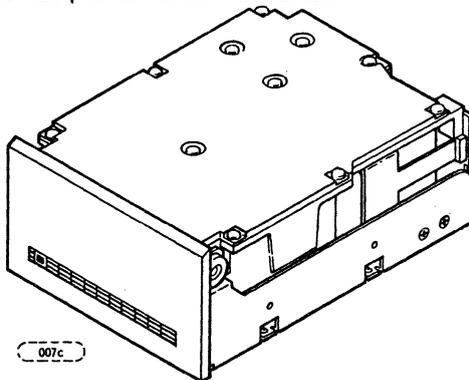


FIGURE 1. WREN V DISK DRIVE

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1.0 DESCRIPTION

The CDC WREN V ESDI is a small, low cost, high performance, random access rotating disk, mass memory device designed to record and recover data on up to eight rigid 5-1/4 inch fixed disk media. The WREN uses low mass flying read/write heads attached to a precisely controlled rotary positioner.

The Model 94186 has a maximum unformatted storage capacity of 442 megabytes. It has 15 data heads and 1412 (optional 1224) cylinders. The 94186 supports the Enhanced Small Device Interface (ESDI) as described in Control Data's ESDI Specification 77738076.

<u>MODEL NUMBER</u>	<u>UNFORMATTED MEGABYTES</u>	<u>NUMBER OF CYLINDERS</u>	<u>NUMBER OF DATA HEADS</u>
94186-442	442.2	1412	15
94186-383	383.2	1412	13
94186-383H	383.3H	1224	15
94186-324	324.3	1412	11
94186-265	265.3	1412	9

1.1 STANDARD FEATURES

The WREN V has the following standard features:

- Industry Standard Interface
- Sealed head, disk, and actuator chamber
- No preventive maintenance required
- No adjustments required
- LSI circuitry for high reliability
- Low audible noise for office environments
- Vertical (side) or horizontal (bottom) mounting
- Low power consumption
- Balanced low mass rotary voice coil actuator
- Automatic shipping lock and dynamic spindle brake
- Easy access terminator
- Integral HDA shock and vibration isolation mounts
- Dedicated head landing zone

1.2 ACCESSORIES

The following accessories are available for WREN V:

- Front Panel Kit
- Single Unit Shipping Pack Kit
- OEM Manual

1.3 WARNINGS AND CAUTIONS

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. The WREN V, as delivered, is designed for system integration before use. It is supplied as a Class A computing device per the FCC Rules and Regulations, Part 15, Subpart J governing EMI of computing devices.

CAUTION

The circuit assemblies contained in this equipment can be degraded or destroyed by Electrostatic Overstress (EOS) or by Electrostatic Discharge (ESD).

Static electrical charges can accumulate quickly on personnel, clothing, and synthetic materials. The electrostatic fields due to these charges, when brought in close proximity to delicate components cause EOS or ESD, either of which can damage or destroy them. The damage can result in degraded reliability or immediate failure of the affected component or assembly.

To insure optimum reliable equipment operation, it is required that technical support personnel discharge themselves by wearing a grounding strap around the wrist and be connected to grounding terminal while working in the vicinity of, and while handling, EOS/ESD susceptible assemblies/parts. This procedure is especially important when handling printed wiring assemblies (PWAs).

PWAs should be placed on a static dissipative work surface during all maintenance procedures on these PWAs. If possible, all persons coming near the equipment should stand on a static dissipative floor mat installed according to established procedures.

PWAs should be handled or transported in electrically conductive plastic bags to insure optimum protection against potential EOS/ESD damage. Delicate components soldered into circuits are NOT immune to EOS/ESD damage.

CAUTION

To avoid potential repair problems, observe the following precautions:

- Labels must not be put over the breather holes on the top of the drive.
- If a label has been placed over the breather holes, do not poke holes through the label, as the filter underneath is certain to be damaged, allowing contamination to enter. REMOVE THE LABEL. Do not use solvents to remove the adhesive residue. Solvent may migrate down the breather holes and contaminate the disk.
- CDC factory installed labels must not be removed from the drive or covered with additional labels, as they contain information required when repairing.
- DC power should not be switched on to the drive by plugging an electrically "live" DC source cable into the drive power connector. This practice adversely affects the reliability of the connector contacts.

2.0 OPERATION AND CHECKOUT

2.1 UNPACKING

Visually inspect the shipping container for any obvious damage. During unpacking, exercise care so that any tools being used do not damage the unit.

As the WREN is unpacked, inspect it for possible shipping damage. All claims of this type should be filed promptly with the transporter involved. If a claim is filed for damages, save the original packing materials.

After the drive is unpacked, inspect the drive for any visible damage. Verify all parts listed on the shipping bill are received with the equipment. Discrepancies or damage should be reported to the shipping company. Save the packing materials; they can be used for reshipment.

2.2 OPERATING ENVIRONMENT

The environmental conditions required for optimum performance of the disk drive are, in general, the same as those in an office environment with minimal environmental control. These conditions are:

Temperature	50° to 122°F (10° to 50°C)
Humidity	8% to 80%
Altitude	-1000 to +10,000 feet (-305 to +3,048 metres)
Wet Bulb	80°F (27°C) maximum

The room temperature should not change more than 36°F (20°C) per hour. Avoid high relative humidity as much as possible since it can result in condensation in the drive under adverse conditions.

2.3 COOLING

The WREN provides internal cooling for the PWA's and mechanical components. The WREN design also uses transistor heat sinks to dissipate heat. Direct electrical contact to the WREN heat sinks should not be made. Consideration should be given to minimizing restriction of airflow through cooling holes in the drive.

A sometimes overlooked consideration when mounting several drives in the same enclosure is heat dissipation. Because power supplies, for example, are typically heavy, they are frequently mounted in the bottom of an enclosure, where they produce heat. This heat rises to the top of the cabinet or enclosure and the temperature can reach very high levels. Cabinet ventilation, by natural convection or forced cooling, must be provided to keep the internal air temperature adjacent to the disk drive within the limits specified in paragraph 2.2.

2.4 INSTALLATION

2.4.1 SAFETY INSTRUCTIONS

1. The WREN is to be installed in a customer supplied cabinet where the surrounding air does not exceed 50°C.
2. Four(4) 6-32 UNC-2A screws are required for installation, maximum screw length into bottom of chassis 0.14 in (3.55 mm). Maximum screw length into side of chassis 0.14 in (3.55 mm).
3. The power requirements are:
+5 V $\pm 5\%$ 1.1 A
+12 V $\pm 5\%$ 2.7 A (4.5 A $\pm 10\%$ for a maximum of 30 seconds at power up)
4. The power supply must satisfy the safety requirements for SELV (Safety Extra Low Voltage) circuits.
5. Service is to be provided only by trained service personnel.
6. The incorporation of the WREN into a customer supplied cabinet must meet the appropriate safety requirements of the country in which it is to be used (e.g. UL, IEC380).

SICHERHEITSANLEITUNG

1. Das Gerät ist ein Einbaugerät, vorgesehen für eine maximale Umgebungstemperatur von 50°C.
2. Zur Befestigung der Wren Drive werden 4 Schrauben benötigt (6-32 UNC-2A). Die maximale Länge der Schrauben in der unteren Seite des Chassis darf nicht mehr als 0.14 in (3.55 mm) betragen, die in der oberen 0.14 in (3.55 mm).
3. Als Versorgungsspannungen werden benötigt:
+ 5 V $\pm 5\%$ 1.1 A
+12 V $\pm 5\%$ 2.7 A (Spitzenstrom zur Zeit der Einschaltung:
4.5 Amp. $\pm 10\%$ für 30 Sekunden max.)
4. Die Versorgungsspannung muss SELV entsprechen.
5. Alle Arbeiten dürfen nur von ausgebildetem Service personal durchgeführt werden.
6. Der Einbau des Drives muss den Anforderungen gemäss DIN IEC 380/V DC 0806/8.81 entsprechen.

2.4.2 DRIVE MOUNTING ORIENTATION

Only two drive mounting orientations are permitted: disks in the horizontal plane and disks in the vertical plane. Horizontal mounting with the front (non I/O cable end) raised as much as 15° above the horizontal is acceptable. Mounting with either end down (front or rear) or upside down is not permissible. It is recommended for optimum performance that data written in a given orientation be read in that same orientation. The limits of shock and vibration are specified with the drive mounted by any of the four methods shown in Figure 2-1.

In the vertical orientation (X axis vertical), WREN V disk drives can be mounted with either side up.

Dimensions are shown in Figure 2.2.

Screws must have 6-32 threads and be of sufficient length to pass through the cabinet mounting member and have complete WREN mounting hole thread engagement.

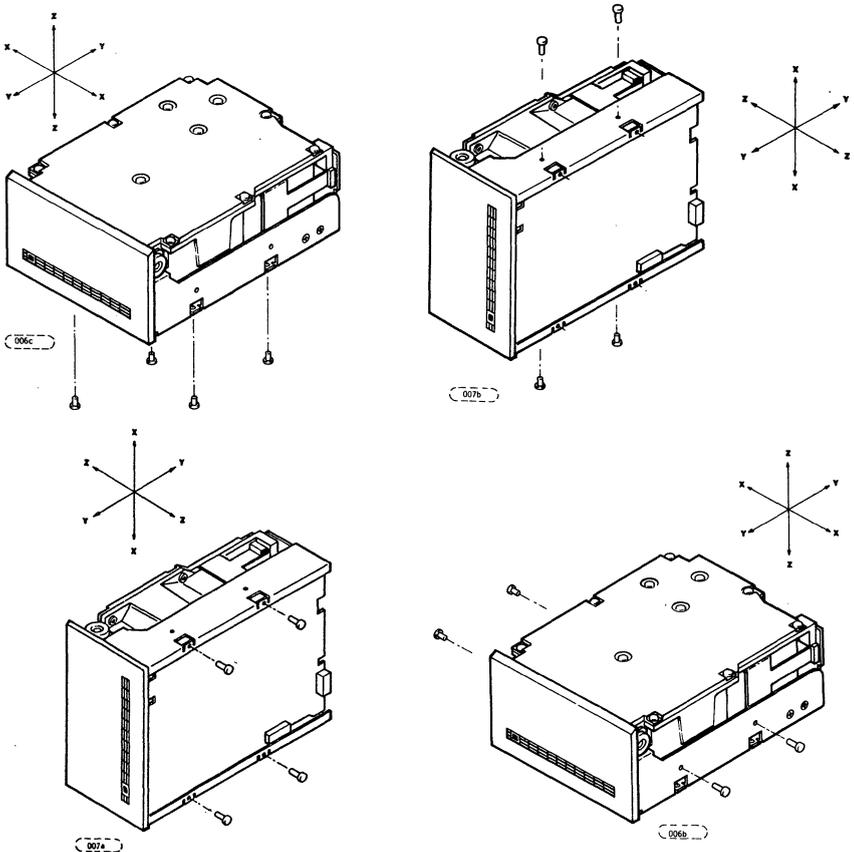


FIGURE 2-1. RECOMMENDED MOUNTING

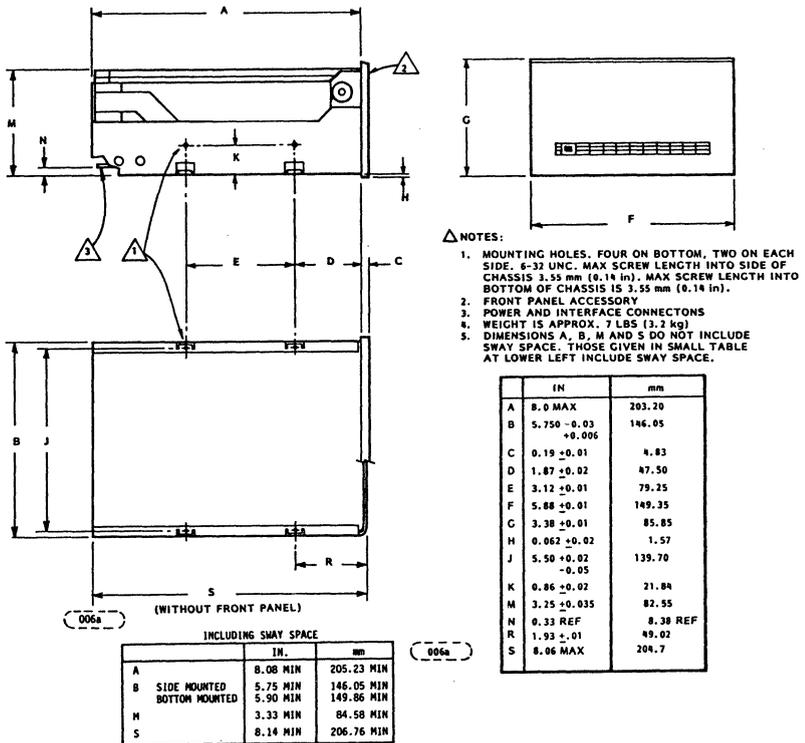


FIGURE 2-2. OUTLINE AND MOUNTING DIMENSIONS

2.5 CABLING

The WREN V can be connected in radial or daisychain configurations. See Figure 2-3. In the daisychain configuration, a maximum of seven drives can be connected.

2.5.1 RADIAL CONFIGURATION

View A of Figure 2-3 shows each WREN V Disk Drive interfaced to its own control cable, which allows interfacing an arbitrary number of drives and a variety of system operational techniques. Each drive has its data cable and control cable radially connected to the host controller. The length of each individual cable must not exceed 10 feet (3.0 metres). Each control and data cable must be terminated at each end in its characteristic impedance. The termination of these cables is accomplished in the drive by a plug in terminating resistor pack for the control cables and by resistors on the Main PWA for the data cables. These same resistor values must be installed in the host controller. See Section 2.6.2 for terminator installation instructions.

2.5.2 DAISYCHAIN CONFIGURATION

In a daisychain configuration, the drives are connected in a daisychain on the control cable, the data cables are connected in a radial configuration. The total length of all control cables used shall be not greater than 10 feet (3.0 metres). The logical address of each drive in the daisychain is determined by the "DRIVE SELECT" plug on the Main PWA. Each data and control cable must be terminated in the Host Controller.

2.5.3 DC POWER REQUIREMENTS

No AC power is required.

The voltage and current requirements for a single WREN V are shown in the following table. Values indicated apply at the drive power connector.

DC POWER REQUIREMENTS (5 VOLT)

VOLTAGE	+5 V
REGULATION	±5%
RIPPLE,(MAXIMUM PEAK-TO-PEAK)	100 mV
MAXIMUM OPERATING CURRENT [1] (WORST CASE)	1.1 A
TYPICAL IDLE CURRENT [1]	0.8 A
MAXIMUM STARTING CURRENT (PEAK) [2]	1.4 A

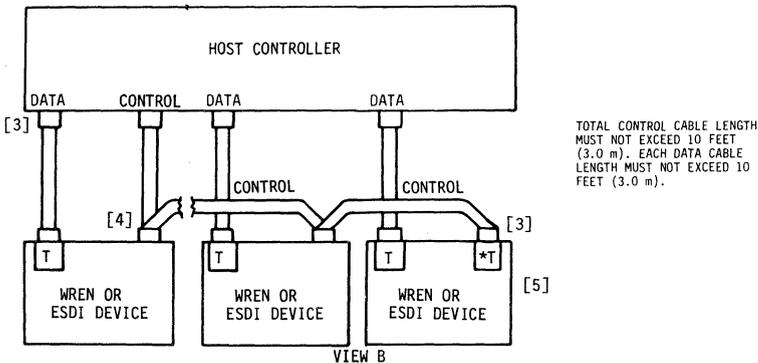
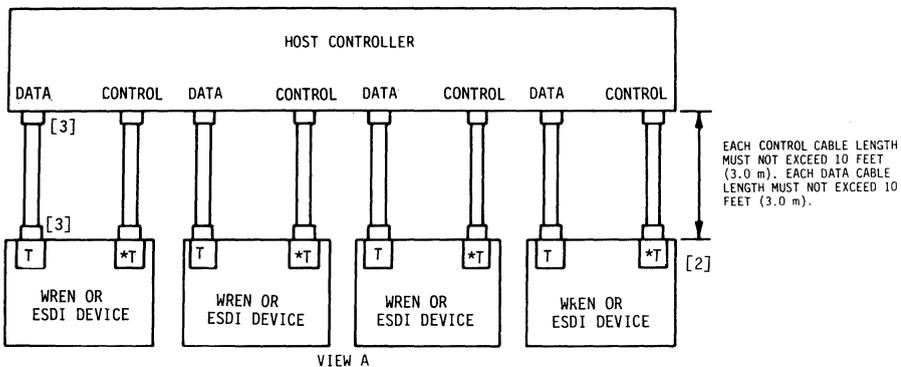
DC POWER REQUIREMENTS (12 VOLT)

VOLTAGE	+12 V
REGULATION	±5% [3]
RIPPLE (MAXIMUM PEAK-TO-PEAK)	100 mV
MAXIMUM OPERATING CURRENT [1] (WORST CASE)	2.7 A
TYPICAL IDLE CURRENT [1]	2.0 A
MAXIMUM STARTING CURRENT (PEAK) [2]	4.5 A

[1] Measured with average reading DC ammeter.

[2] Occurs during start up.

[3] A 10% tolerance is permissible during power up. ±5% must be maintained commencing with unit ready.



T* INDICATED REMOVABLE TERMINATOR RESISTOR PACK.
WREN DATA PORTS ARE PERMANENTLY TERMINATED.

[2] NUMBER OF DEVICES DEPENDS ON HOST ADAPTER CAPABILITY.

[3] CLOSED END TYPE CONNECTOR USED.

[4] OPEN END TYPE CONNECTOR USED.

[5] A MAXIMUM OF 7 DEVICES MAY BE INTERCONNECTED.

HH057a

FIGURE 2-3. INTERFACE CABLING OPTIONS

2.5.4 DC CABLE AND CONNECTOR

The WREN V receives DC power through a 4 pin right angle connector mounted on the Main PWA (see Figure 2-4a). Recommended part numbers for the mating connector are listed, but equivalent parts may be used.

DC PIN ASSIGNMENTS

<u>POWER LINE DESIGNATION</u>	<u>PIN NUMBER</u>
+12 V	J 1-01
+12 V RETURN	J 1-02
+ 5 V RETURN	J 1-03
+ 5 V	J 1-04

MATING DC CONNECTOR

<u>TYPE OF CABLE</u>	<u>CONNECTOR</u>	<u>CONTACTS</u>
14 - 18 AWG	AMP 1-480424-0	AMP 60619-4 (Loose Piece) AMP 61117-4 (Strip)

2.5.5 DATA CABLE AND CONNECTOR

Figure 2-4a shows the Data Cable Connector of the WREN. Recommended part number for the mating connector is listed, but equivalent parts may be used.

<u>CONNECTOR (20 PIN)</u>	<u>CABLE</u>
3M-3461-0001 AMP 88373-6	3M-3365-20 (Flat Stranded AWG 28)
<u>Key</u> 3M-3439-2 AMP 583274-1	3M-3517-20 (Flat Shielded AWG 28)
<u>Strain Relief</u> 3M-3448-54 (use at ends of daisychain only)	

2.5.6 CONTROL CABLE AND CONNECTORS

The connector for the control cable is a 34 Pin Board Edge Connector. The odd pins are on the back (up) side of the PWA and are connected to the ground plane. A keying slot is located between pins 3 and 5. The control cable connector is shown in Figure 2-4a. Recommended part number for the mating connector is listed, but equivalent parts may be used.

CONNECTOR (34 PIN)

3M-3463-0001
AMP 88373-3

Key

3M-3439-2
AMP 583274-1

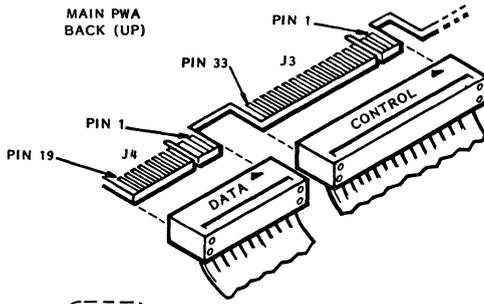
Strain Relief

3M-3448-56
(use at ends of daisychain only)

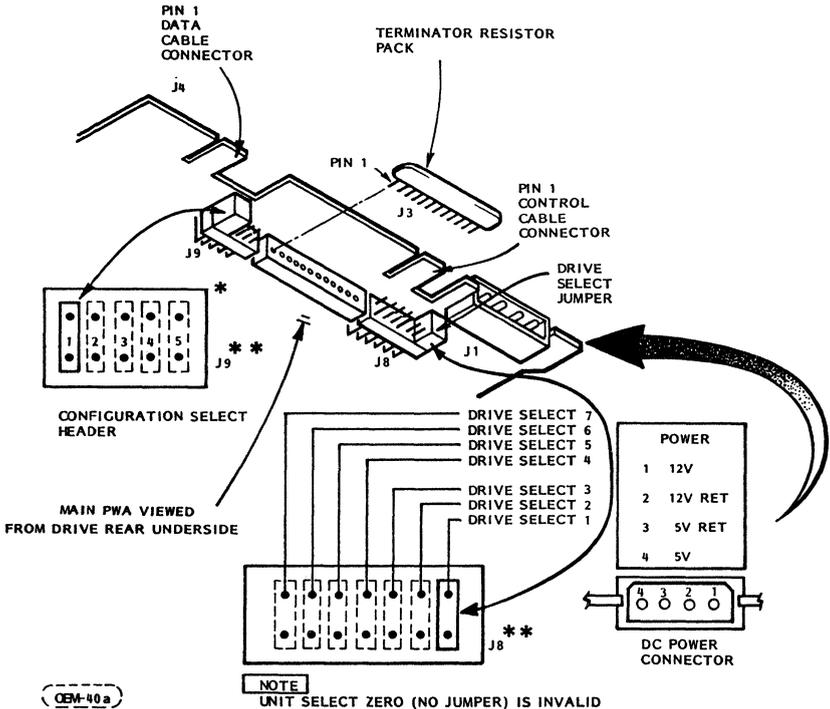
CABLE

3M-3365-34
(Flat Stranded AWG 28)

3M-3517-34
(Flat Shielded AWG 28)



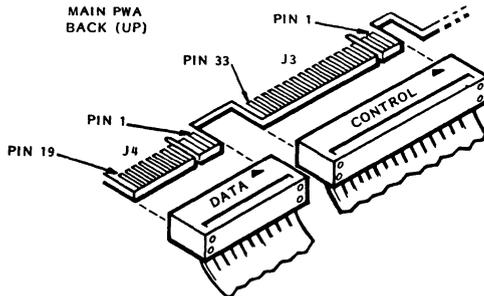
010a



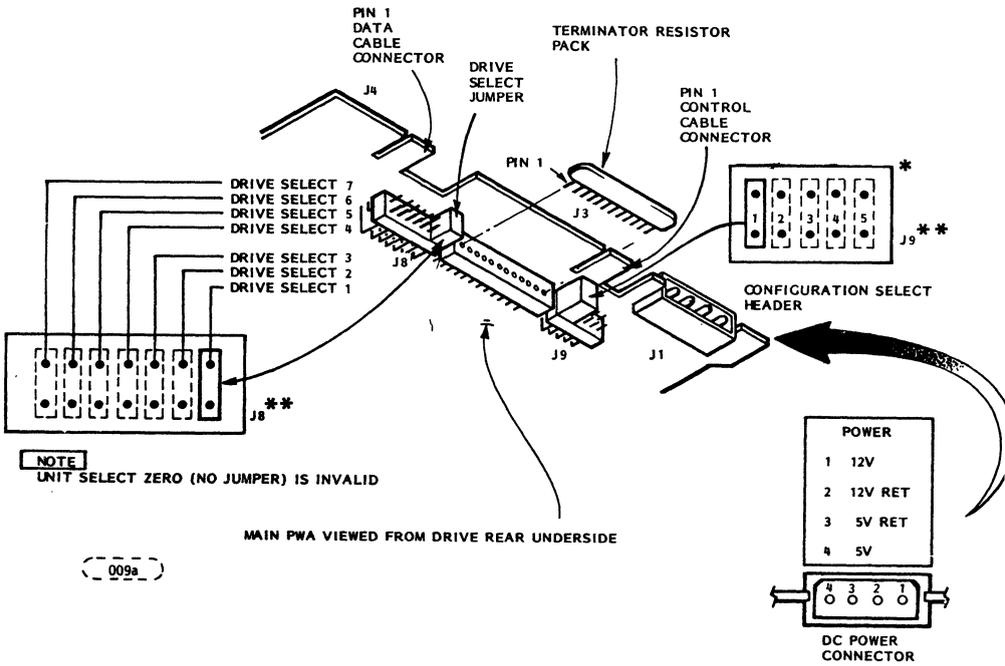
*Configuration of jumpers on this header when drive is shipped is determined by Customer Configurator Document. See Table 2-1.

**See Figure 2-4a-2 for alternate positions for these headers as found on some drives (for 5 position header next to power).

FIGURE 2-4a-1. I/O CONNECTION, TERMINATORS AND OPTION/DEVICE ID HEADERS (7 Position Header next to Power Connector)



010a



NOTE
UNIT SELECT ZERO (NO JUMPER) IS INVALID

009a

*Configuration of jumpers on this header when drive is shipped is determined by Customer Configurator Document. See Table 2-1.

**See Figure 2-4a-1 for alternate positions for these headers as found on some drives (for 7 position header next to power).

FIGURE 2-4a-2. I/O CONNECTION, TERMINATORS AND OPTION/DEVICE ID HEADERS (5 Position Header next to Power Connector)

2.6 SPECIAL INSTRUCTIONS

2.6.1 DRIVE SELECTION AND TERMINATION

The logical address of the WREN is selected by installing a jumper in the appropriate location on the DRIVE SELECT header (J8), which is accessible from the back of the drive, located on the Main PWA (see Figure 2-4c-1 or 2-4c-2). This selection is done at the time of installation.

The WREN V can be connected in radial or daisychain configuration. For radial configurations, it is recommended that the jumper be connected to Drive Select 1 (Position 1). However, check the system manufacturers instructions. For daisychain operation, the drive select jumpers should be connected in accordance with the system assignments. Be sure to check the system manufacturers on device selection instructions.

2.6.2 TERMINATION RESISTORS

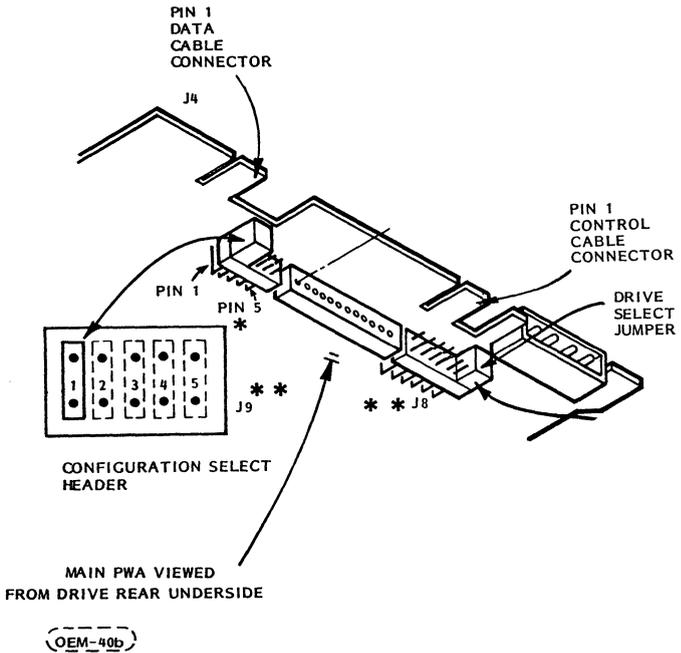
Every drive connected in a radial configuration needs a termination resistor pack (as supplied). The termination resistor pack should be removed from all daisychain drives except the drive in the last position of the daisychain. The terminator resistor pack is a SIP (Single Inline Package) resistor module plugged into a SIP socket on the Main PWA, accessible from the rear of the drive. See Figure 2-4a-1 or 2-4a-2. Drives may be ordered with or without the removable terminator SIP installed. An equivalent terminator must be provided in the Host Adapter/Initiator on each input signal line from the WREN to the Adapter/Initiator.

2.6.3 AUTO VELOCITY ADJUST

After power has been applied and spindle speed is stabilized within tolerance, the WREN actuator will perform several seeks (up to 32) to fine tune the actuator for optimum performance. After these are complete, the heads will be loaded over cylinder 00.

2.6.4 CONFIGURATION OF UNITS

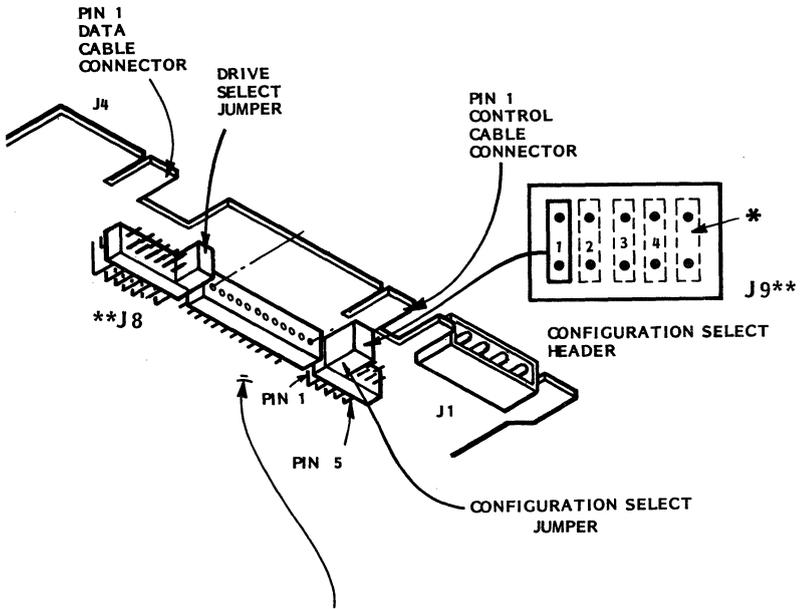
The WREN V is configured by installing or removing jumper plugs from pins on a connector header (J9) on the Main PWA, which is accessed from the rear as shown in Figure 2-4b-1 or 2-4b-2. Tables 2.1a or 2.1b shows the configurations that can be selected. Before moving any jumpers, carefully note which side of the PWA J9 (five jumper header) is on as shown by either Figure 2-4b-1 or 2-4b-2.



* JUMPER POSITION FOR FACTORY USE ONLY

**SEE FIGURE 2-4b-2 FOR ALTERNATE POSITIONS FOR THESE HEADERS AS FOUND ON SOME DRIVES. (5 Position Header next to Power Connector).

FIGURE 2-4b-1. CONFIGURATION SELECT HEADER
(5 Position Header on Left Side)



MAIN PWA VIEWED FROM DRIVE REAR UNDERSIDE

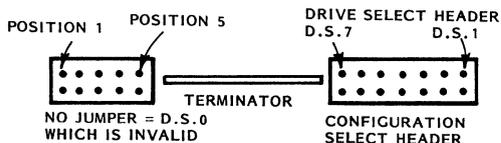
(008c)

*JUMPER POSITION FOR FACTORY USE ONLY

**SEE FIGURE 2-4b-1 FOR ALTERNATE POSITIONS OF THESE HEADERS AS FOUND ON SOME DRIVES. (5 Positon Header on Left Side)

FIGURE 2-4b-2. CONFIGURATION SELECT HEADER (5 Positon Header on Left Side)

TABLE 2-1a. WREN V CONFGURATION OPTION SELECTION



CONFIGURATION SELECT HEADER JUMPERS

SECTORS	JUMPER PLUG					(1)
	1	2	3	4	5	
64	(3)	OFF	OFF	OFF	(5)	
35	(3)	OFF	OFF	ON	(5)	
10	(3)	OFF	ON	OFF	(5)	
19	(3)	OFF	ON	ON	(5)	
36	(3)	ON	OFF	OFF	(5)	(2)
34	(3)	ON	OFF	ON	(5)	
87	(3)	ON	ON	OFF	(5)	(4)
ADDMARK	(3)	ON	ON	ON	(5)	

(OEM-40c)

- (1) ON - Plug installed; OFF - plug removed
- (2) Drives are shipped with these configurations of installed jumper plugs.
- (3) OFF = Motor Start with power on.
ON = Motor Start with command from controller.

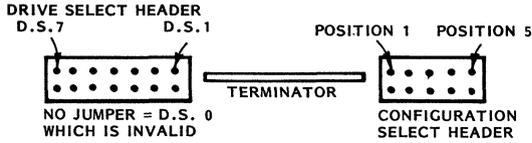
When the jumper plug-1 is installed, a Motor ON command is required from the controller to start the spindle motor. When power is applied to the drive, the drive will generate an Attention signal and assert Standard Status Bits 8 and 9 signifying "Power On Reset Conditions Exist" and "Spindle Motor Stopped". The controller must then respond with a command to Reset the interface Attention line, and the Start Motor Command in order to start the spindle motor.

NOTE

This procedure is required anytime the "Power On Reset Condition Exists" status bit is received by the controller if the "Motor Control Implemented" jumper plug is installed.

- (4) See Paragraph 2.6.4.
- (5) DO NOT USE.

TABLE 2-1b. WREN V CONGRUATION OPTION SELECTION



CONFIGURATION SELECT HEADER JUMPERS

SECTORS	JUMPER PLUG					
	1	2	3	4	5	
64	(3) (6)	OFF	OFF	OFF	(5)	(1)
35	(3) (6)	OFF	OFF	ON	(5)	
10	(3) (6)	OFF	ON	OFF	(5)	
19	(3) (6)	OFF	ON	ON	(5)	
36	(3) (6)	ON	OFF	OFF	(5)	
34	(3) (6)	ON	OFF	ON	(5)	(2)
87	(3) (6)	ON	ON	OFF	(5)	
ADDMARK	(3) (6)	ON	ON	ON	(5)	(4)

(OEM-40d)

- (1) ON - Plug installed; OFF - plug removed
- (2) Drives are shipped with these configurations of installed jumper plugs.
- (3) *OFF = Motor Start with power on.
*ON = Motor Start with command from controller.

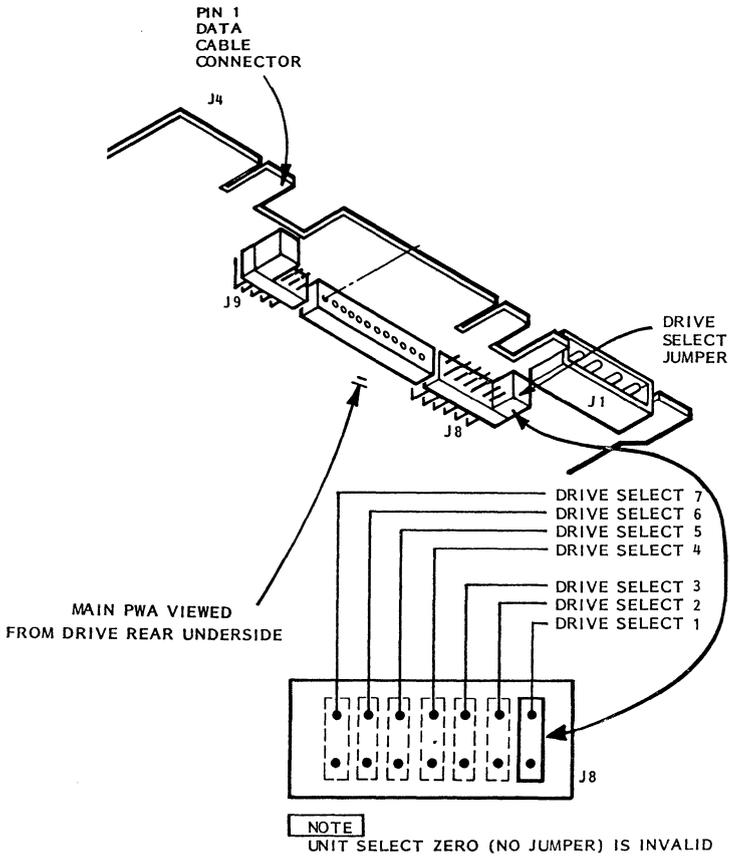
*Applies to Series Code 02 and up only (See Figure 3-4).

When the jumper plug-1 is installed, a Motor ON command is required from the controller to start the spindle motor. When power is applied to the drive, the drive will generate an Attention signal and assert Standard Status Bits 8 and 9 signifying "Power On Reset Conditions Exist" and "Spindle Motor Stopped". The controller must then respond with a command to Reset the interface Attention line, and the Start Motor Command in order to start the spindle motor.

NOTE

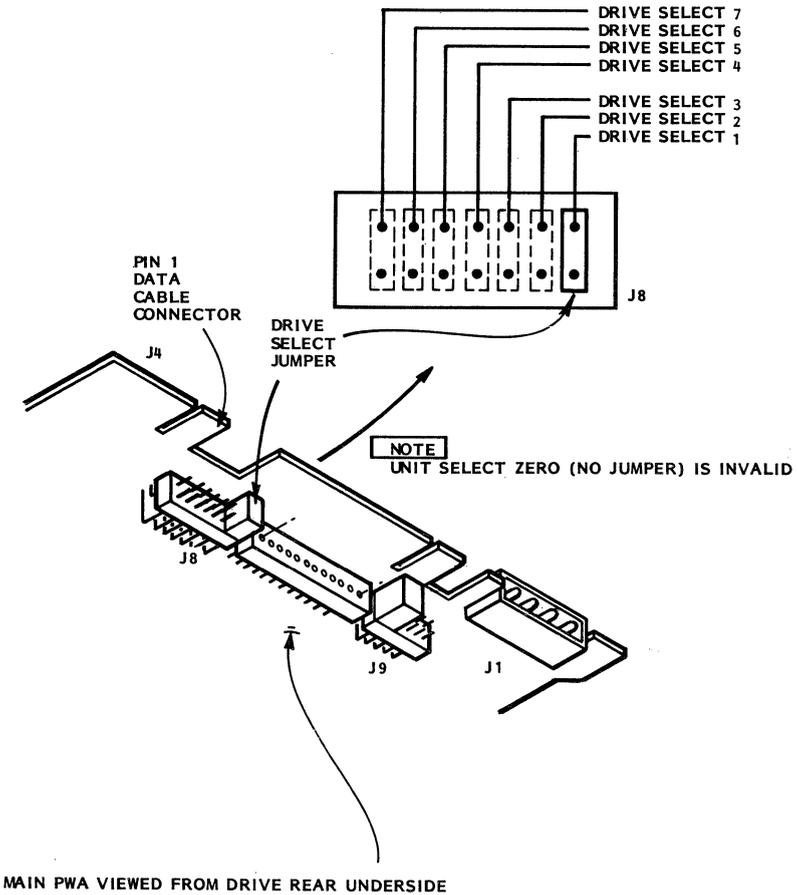
This procedure is required anytime the "Power On Reset Condition Exists" status bit is received by the controller if the "Motor Control Implemented" jumper plug is installed.

- (4) See Paragraph 2.6.4.
- (5) DO NOT USE.
- (6) For Series Code 01 drives only (See Figure 3-4):
ON = Drive configured for 1412 cylinders.
OFF = Drive configured for 1224 cylinders.



OEM-41a

FIGURE 2-4c-1. WREN V ESDI DRIVE ID SELECT JUMPER POSITIONS (7 Position Header next to Power Connector)



008a

FIGURE 2-4c-2. WREN V ESDI DRIVE ID SELECT JUMPER POSITIONS (7 Position Header on Left Side)

2.6.5 FRONT PANEL INDICATOR

When power is applied to the drive, the LED operates in one of two different ways, depending on whether or not the motor start option jumper is in place (see Figure 2-4b). Refer to paragraph 5.1.1 for a description of the power-up sequence, in which details of LED operation are given.

2.6.6 HEAD PARKING

WREN V requires no command from the Host controller to park the heads, as this is automatically done by the drive internal logic when power is removed from the drive. The computer operating system may request specification of a head parking track. If so, specify some value greater than 1412.

2.7 INITIAL CHECKOUT AND STARTUP PROCEDURE

1. Mount the WREN, horizontally or vertically, in the enclosure using standard hardware [four (4) #6-32 screws - see Section 2.4.1. through 2.4.2].
2. Connect the ribbon cables for radial or for daisychain configuration (see Section 2.5). Terminate and verify jumper settings as shown in Section 2.6.
3. Attach DC power cable from power supply to connector on the rear of the WREN.
4. Apply power.
5. Run system diagnostic to verify the operability of the disk subsystem.
6. If the drive fails to select, be sure the system manufacturers instructions on the assignment of device select ID have been followed. See Section 2.6.1.

3.0 DIAGRAMS

Most of the electronic functions of the WREN are implemented in two PWAs which are external to the sealed enclosure and one PWA (Flex Circuit) which is internal to the sealed enclosure. A block diagram of the functions included in the WREN V is shown in Figure 3.1. Figure 3-2 is a flow diagram showing possible operation of the WREN V ESDI in a system for the purpose of illustrating general ESDI interface operating principles. The interface diagram is shown in Figure 3-3. A PWA interconnection diagram is given in Figure 3-6

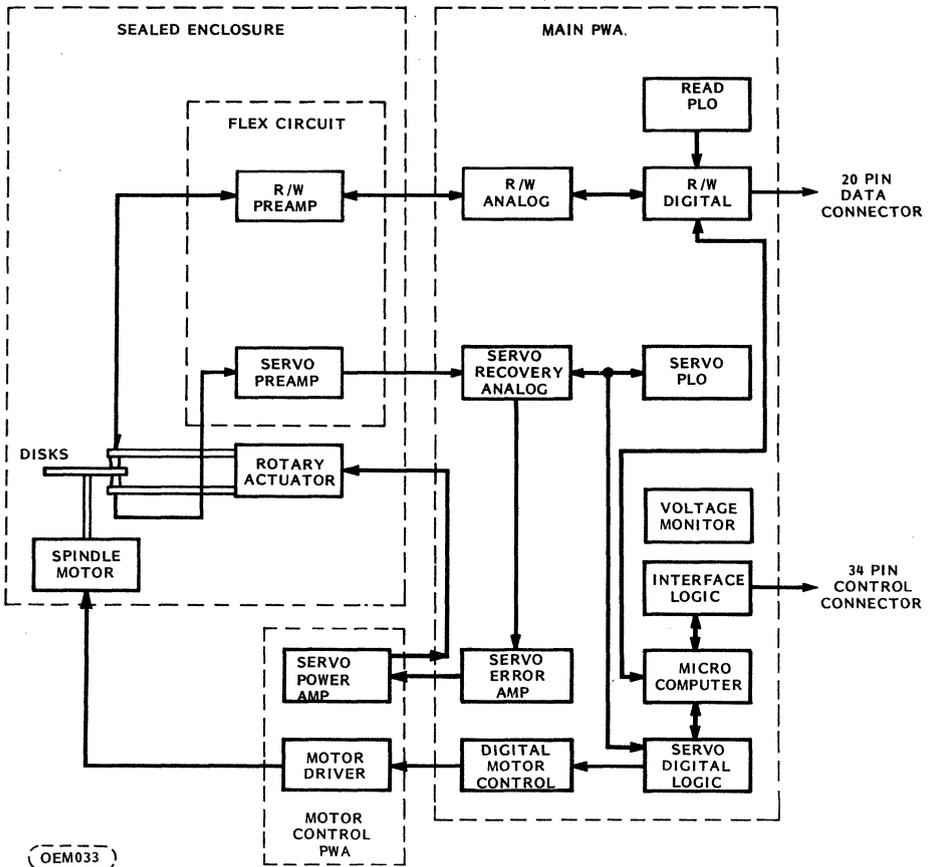
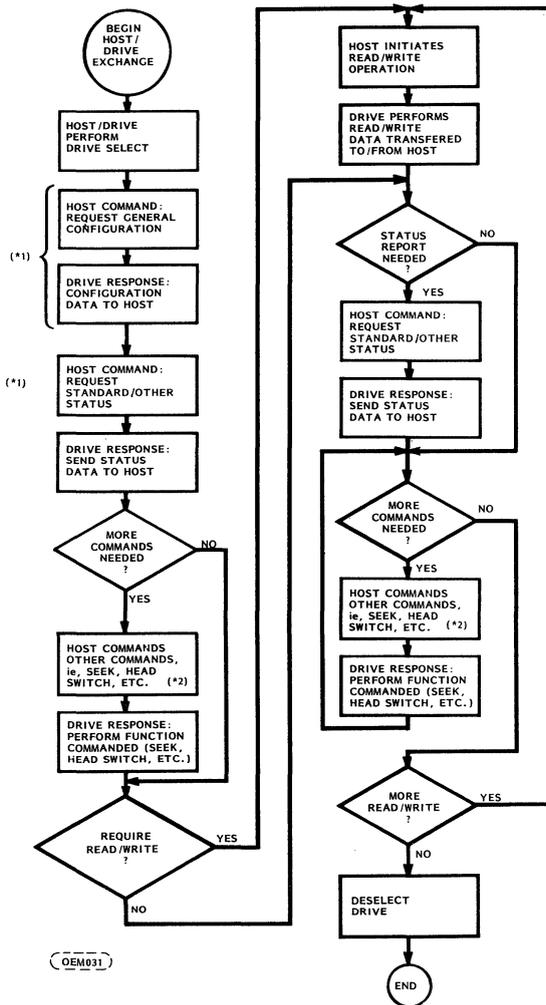


FIGURE 3-1. BLOCK DIAGRAM OF WREN V WITH ESDI INTERFACE



(*1) THESE COMMANDS MAY OR MAY NOT BE PERFORMED EACH TIME DRIVE SELECTION OCCURS.

(*2) DESELECTION OF DRIVE WILL LIKELY OCCUR DURING LONG OPERATIONS (SUCH AS SEEK).

FIGURE 3-2. TYPICAL NORMAL OPERATION SEQUENCE

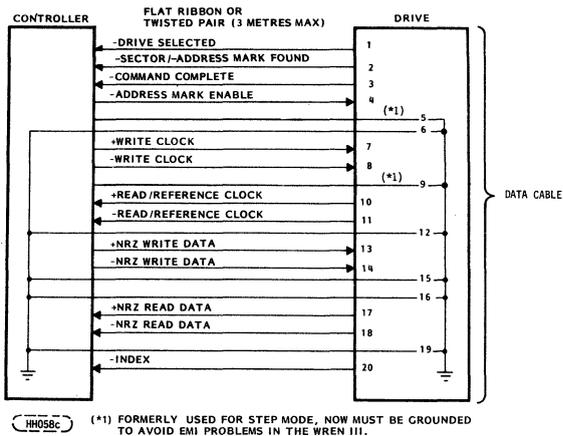
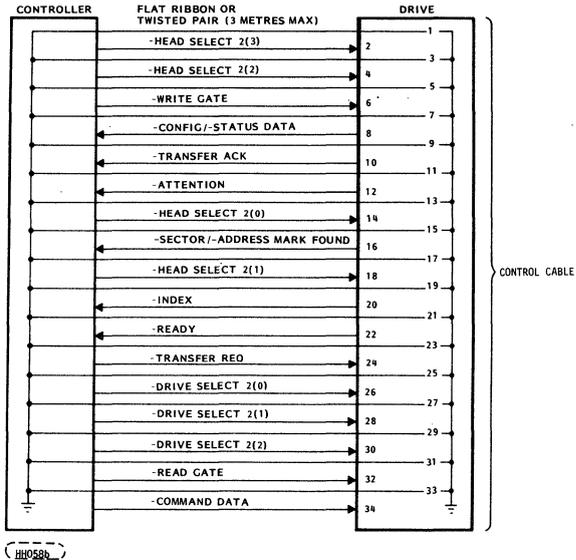
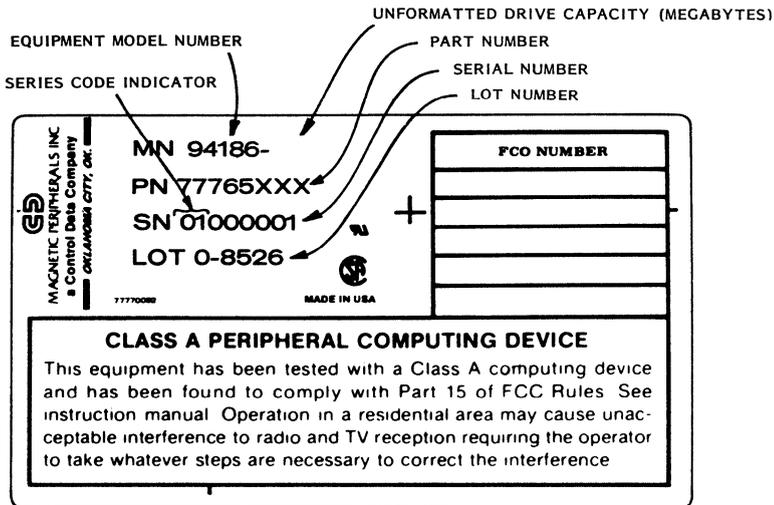
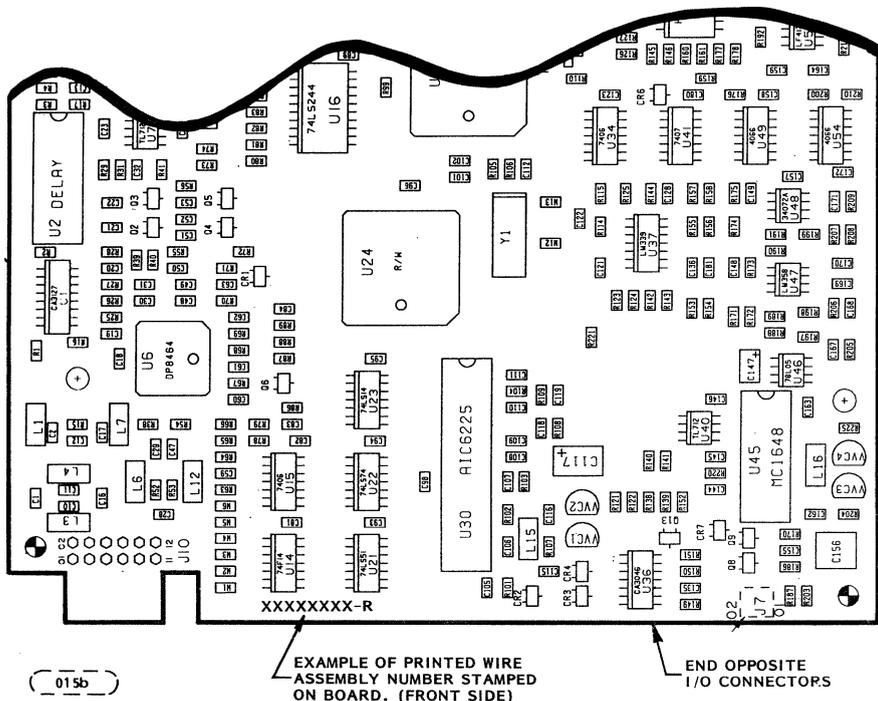


FIGURE 3-3. ESDI INTERFACE PINOUTS



015a

FIGURE 3-4. SAMPLE LABEL OF WREN V DISK DRIVE



015b

FIGURE 3-5. PWA IDENTIFICATION

4.0 SERVICE REQUIREMENTS

The special facilities required for the manufacture of the WREN generally prohibit repair in the field. If problems occur during installation, please contact your supplier for assistance. Some items external to the sealed enclosure may be replaced by a technically competent individual as instructed in Section 5.0.

CAUTION

NEVER remove the cover of the WREN. Servicing items in the sealed environmental enclosure (heads, media, actuator, enc.) requires special facilities. Opening the sealed enclosure voids the unit warranty.

5.0 MINOR FIELD REPAIR ITEMS

5.1 TROUBLE SHOOTING

WREN disk drives are designed as field replaceable units. They should be returned to the repair depot if failure occurs. Circuit board exchange, if desired, may be performed by technically competent individuals. No adjustments are required. Field repair is discouraged, because of the extensive diagnostic equipment required for effective servicing. Frequently, problems believed to be disk drive failures are not, and it is important to recognize this before taking repair action on the disk drive. The following disk power up sequence is provided to assist in identifying possible disk drive problems. Generally, if performance doesn't follow this sequence either the drive or power supply should be questioned.

5.1.1 POWER UP SEQUENCE

- Power is applied to the disk drive. The LED will glow during motor start up if the drive is selected during that time.
- Spindle motor speeds up until operating velocity is reached (approx 10 seconds). No speed variations should be heard afterward.
- Arm restraint solenoid releases producing an easily heard characteristic sound.
- The drive performs up to 32 velocity adjustment seeks, as evidenced by head motion sounds.
- Drive finds and stays at track zero, comes ready, makes no further noises, except as the system commands may demand.
- If the drive has successfully cycled up, the front panel LED will light up when the unit is selected by the system. Boot up activity may appear as LED flickering as the drive is randomly selected and deselected.
- Unit spindles down if it cannot come ready. The LED will blink continually indicating a drive fault has occurred. Removing and reapplying power may or may not clear this fault indication. If the fault condition persists, the drive may require service. Power supply problems can also create drive fault status.

5.1.2 POWER DOWN SEQUENCE

- Power is removed.
- The arm restraint solenoid release should be heard within three seconds after power is removed.
- The dynamic brake relay cut in sound may be heard many seconds later.
- Spindle rotation should stop in about 30 seconds.

5.2 PRODUCT REPAIR INFORMATION

Before returning drives to CSC for repair, first telephone 405-491-6262 for a return authorization. Then send to:

Control Data Corporation
Att: Customer Service Center
301 N. MacArthur
Oklahoma City, OK 73127

The return authorization number must be referenced on any enclosed documentation and in all correspondence concerning the returned drive.

5.3 SAFETY AND SPECIAL SERVICE PRECAUTIONS

- Avoid overtightening hardware (screws, nuts, etc.) when replacing assemblies and components. All screws and nuts are of the low carbon variety.
- Do not connect or disconnect cables without first removing all power from the drive.
- Place drive on a sponge rubber or foam mat on a flat surface.

5.4 REMOVAL/REPLACEMENT PROCEDURES

Only the PWAs, and front panel external to the sealed area can be replaced without special facilities. Be sure to observe the EOS/ESD precautions (Section 1.3) at all times to avoid damage to the electrical assemblies.

The following tool is required for these procedures:

<u>TOOL</u>	<u>APPLICATION</u>
TORX TX-10	Six spline socket drive machine screws

This can be purchased through most commercial tool catalogs.

5.4.1 MOTOR CONTROL PWA REMOVAL AND REPLACEMENT

1. Remove power from WREN drive.
2. Remove two mounting screws.
3. Disconnect three cables from PWA.

Replace Control PWA by reversing the procedure.

5.4.2 MAIN PWA REMOVAL AND REPLACEMENT

1. Remove power from WREN.
2. Disconnect DC power and ESDI interface cables. See Figure 2-4a.
3. Place the WREN on a sponge rubber or foam pad on a flat surface with the top cover down.
4. Remove the assembly with front panel attached. To do this remove two screws at "A" (see Figure 5-1) on each side of the drive (4 total). Remove screw "B" on each side. Slide chassis up.
5. Remove the 4 screws which hold the Main PWA to the HDA.
6. Disconnect the flex lead connectors at J2 and J5 (see Figure 5-1) from PWA.

Replace Main PWA by reversing the procedure.

5.4.3 LED REMOVAL AND REPLACEMENT

1. Perform steps 1 through 4 of 5.4.2. Pull LED out of its socket. Insert new LED.
2. Reverse steps 1-4 of 5.4.2.

5.4.4 PARTS DATA

Recommended spare parts for the WREN are shown in Figure 5-1. Only these parts can be replaced without special facilities. Opening the sealed enclosure voids the unit warranty. The sealed enclosure contains no user serviceable items.

When ordering replacement parts for the WREN, describe the part and include the disk drive part number and serial number from the label (Figure 3-4) located on the top of the unit. For PWAs give part number and revision letter (see Figure 3-5).

Parts may be ordered through:

CDC Commercial Sales Dept.
304 N. Dale Street
St. Paul, MN 55103 or phone
1-800-382-6060

WREN V ESDI INTERCONNECTION DIAGRAM

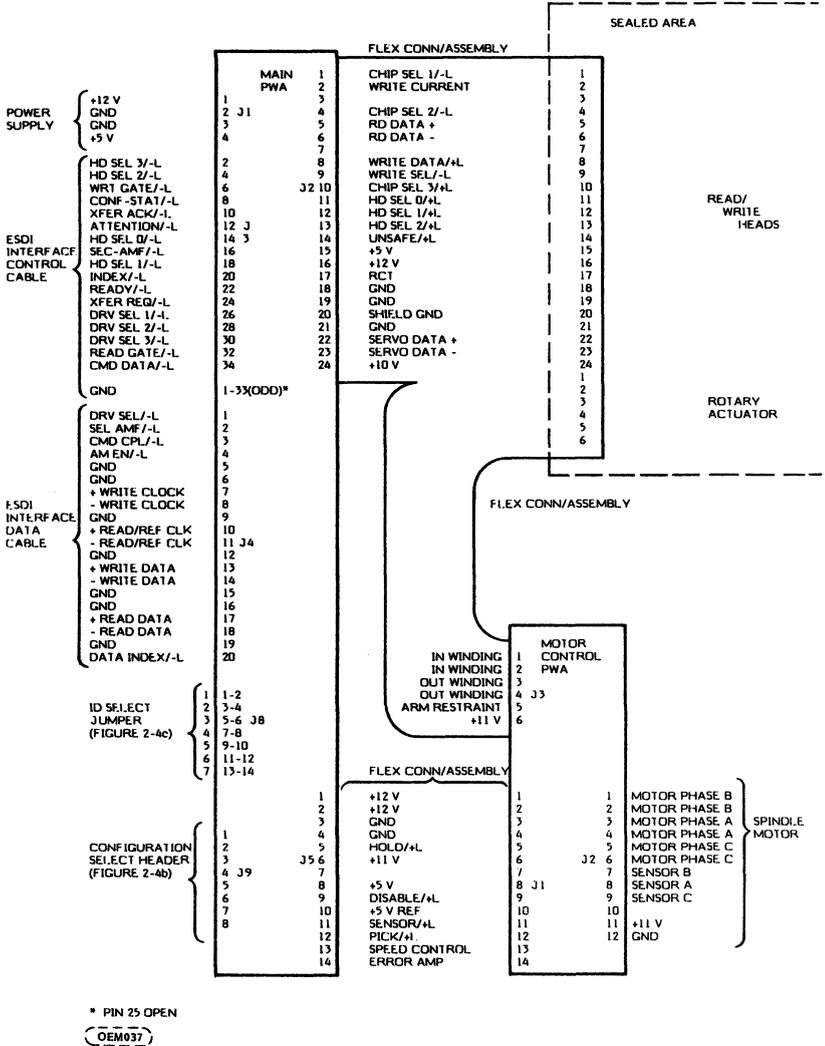


FIGURE 3-6. INTERCONNECTION DIAGRAM

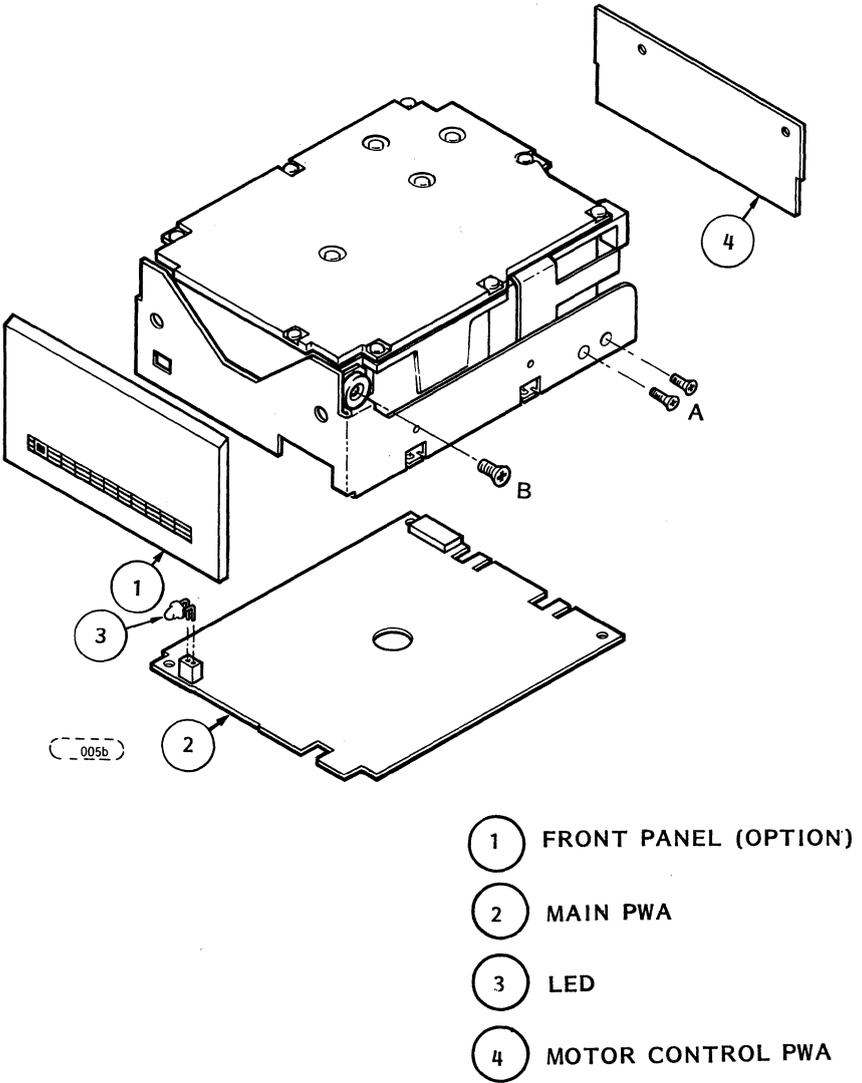


FIGURE 5-1. SPARE PARTS