
CONTROL DATA®
WREN™ II DISK DRIVE

 MAGNETIC PERIPHERALS, INC.
a Control Data Company

OEM MANUAL

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WRENTM II

OEM MANUAL

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PREFACE

This OEM Manual 77738035 provides the basic information and instructions for installing and operating the Control Data Wren II Disk Drives; Models 94151, 94155 and 94156.

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 non-approved procedure or tool must satisfy themselves that no injury to personnel, no damage to the device, and no deterioration of device performance will result."

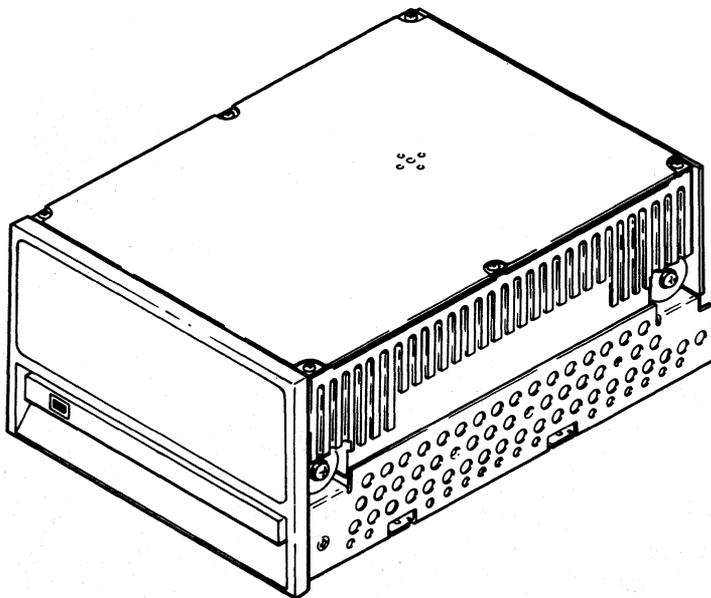


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1.0 DESCRIPTION

The CDC WREN II Disk Drive is a small, low-cost, high performance, random-access rotating-disk, mass-memory device designed to record and recover data on up to five rigid 5-1/4 inch fixed disk media. The WREN uses low-mass flying read/write heads attached to a precisely controlled rotary positioner. It has an unformatted data storage capacity of 27 to 86 megabytes, depending upon configuration. Models 94156 are units with ESDI. Models 94155 are units with CDC506 Interface. The CDC506 Interface is compatible with the ST506 Industry Standard. Models 94151 are units with SCSI (SASI™ Subset).

The model configurations are as follows:

<u>MODEL NUMBER</u>	<u>UNFORMATTED MEGABYTES</u>	<u>NUMBER OF CYLINDERS</u>	<u>NUMBER OF DATA HEADS</u>
94155-48	48	925	5
94155-57	57	925	6
94155-67	67	925	7
94155-77	77	925	8
94155-86	86	925	9
94156-48	48	925	5
94156-67	67	925	7
94156-86	86	925	9

Model 94151 configurations consists of four basic devices which differ physically by the number of installed heads and disks. Each of these devices may be formatted during production for 256 or 512 byte data blocks. The format provided is the option of the customer. This results in eight distinct models with formatted capacity as follows:

<u>25 BYTE DATA BLOCKS</u>		<u>512 BYTE DATA BLOCKS</u>	
<u>MODEL #</u>	<u>CAPACITY</u>	<u>MODEL #</u>	<u>CAPACITY</u>
94151-76*	75.9 MB	94151-80*	80.1 MB
94151-59	59.0 MB	94151-62	62.3 MB
94151-42*	42.2 MB	94151-44*	44.5 MB
94151-25	25.3 MB	94151-27	26.7 MB

*Initial production will consists of these models only.

STEP PULSES

8 to 35 Microseconds*

WRITE PRECOMPENSATION

Recommended for all cylinders on CDC506 Models.

1.1 STANDARD FEATURES

The WREN II has the following standard features:

- Industry Standard Interfaces
- Multiple Capacity Configurations
- Sealed head, disk, and actuator chamber
- No preventive maintenance 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
- Terminators
- Integral Shock mounts
- Dedicated head landing zone

The Model 94151 WREN II has the additional standard features:

- Integrated SCSI Controller (SASITM Subset)
- 4K byte data buffer
- Automatic error recovery
- Automatic flawed sector reallocation
- 256 or 512 byte data block size
- 5 bit burst ECC
- Dynamic spindle braking

*Greater step pulse intervals may be used, but seek performance will be degraded.

1.2 ACCESSORIES

The following accessories are available for WREN II:

- Maintenance Manual
- Front Panel Kit
- Wren Power Supply
- Single Unit Shipping Pack Kit

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 instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference. FCC compliance remains the responsibility of the system integrator. However, the WREN has been demonstrated to perform satisfactorily to Class B limits when installed in a typical personal computer.

CAUTION

The circuit assemblies contained in this equipment can be degraded or destroyed by ELECTRO-STATIC DISCHARGE (ESD).

Static electrical charges can accumulate quickly on personnel, clothing and synthetic materials. When brought in close proximity to or, in contact with delicate components, ELECTRO-STATIC DISCHARGE OR FIELDS can cause damage to these parts. This damage may 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 periodically touching the chassis ground prior to and during the handling of ESD susceptible assemblies. This procedure is very important when handling Printed Circuit Boards.

Printed Circuit Boards should be handled or transported in electrically conductive plastic bags to insure optimum protection against potential ESD damage.

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 cause damage to the unit.

As the drive 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 visual damage. Compare all parts listed on the shipping bill with the received 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 minimum or no environmental control. These conditions are:

ESDI, CDC506

Temperature	50° to 115°F (10° to 46°C)
Humidity	20% to 80%
Altitude	-983 to +9,830 feet (-300 to +3,000 meters)
Wet Bulb	82°F (28°C) maximum

SCSI

Temperature	50° to 115°F (10°C to 46°C)
Humidity	8% to 80%
Altitude	-1000 to 10,000 feet (-305 to +3048 Metres)
Wet Bulb	82°F (29°C) Maximum

The room temperature should not change more than 18°F (10°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

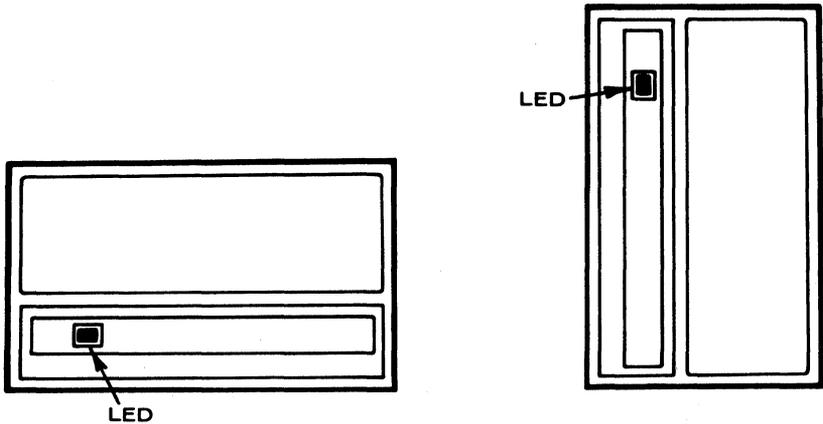
The WREN provides internal cooling for the PWA's and mechanical components. Consideration should be given to minimizing restriction of airflow through cooling holes in the drive.

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 usually mounted in the bottom of an enclosure. They also produce large amounts of heat. This heat rises to the top of the cabinet or enclosure and the temperature can increase drastically. Cabinet ventilation, either 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 should not be installed in systems where the adjacent ambient air temperature can exceed 115°F (46°C).
2. Four (4) 6-32 UNC-2A screws are required for installation.
3. The power supply must satisfy the safety requirements for SELV (Safety Extra Low Voltage) circuits.
4. Service is to be provided only by trained service personnel.
5. 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).



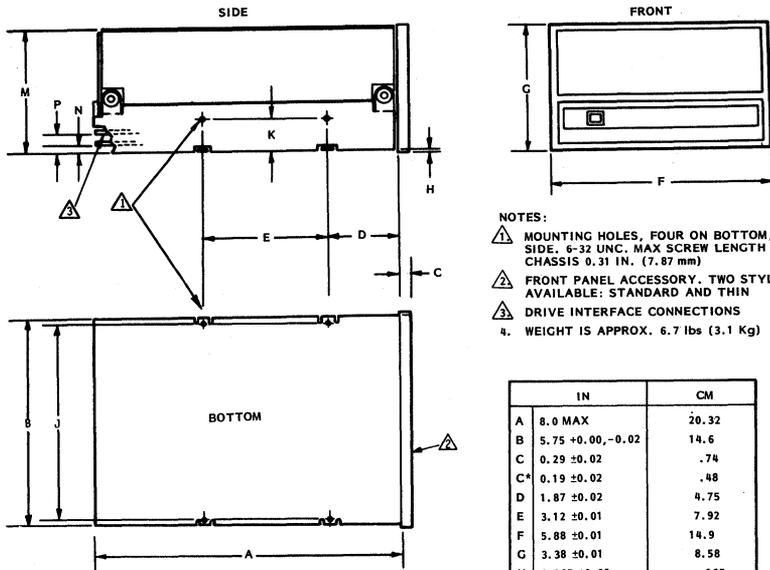
SURFACES MUST BE LEVEL

FIGURE 2-1. HORIZONTAL AND VERTICAL MOUNTING ORIENTATION

2.4.2 HORIZONTAL ORIENTATION MOUNTING

As shown in Figure 2-2, four 6-32 tapped holes are provided in the base of the chassis to facilitate mounting in the horizontal position.

The WREN II may be mounted directly to the system chassis using four (4) 6-32 screws. Shock mounts are provided as standard features. Place the drive in the system chassis and secure it with all four screws with sufficient length to ensure adequate thread engagement but avoid excessive screw lengths (see 2.4.3).



- NOTES:
- ▲ MOUNTING HOLES. FOUR ON BOTTOM, TWO ON SIDE. 6-32 UNC. MAX SCREW LENGTH INTO CHASSIS 0.31 IN. (7.87 mm)
 - ▲ FRONT PANEL ACCESSORY. TWO STYLES ARE AVAILABLE: STANDARD AND THIN
 - ▲ DRIVE INTERFACE CONNECTIONS
4. WEIGHT IS APPROX. 6.7 lbs (3.1 Kg)

	IN	CM
A	8.0 MAX	20.32
B	5.75 +0.00, -0.02	14.6
C	0.29 ±0.02	.74
C*	0.19 ±0.02	.48
D	1.87 ±0.02	4.75
E	3.12 ±0.01	7.92
F	5.88 ±0.01	14.9
G	3.38 ±0.01	8.58
H	0.065 ±0.02	.165
J	5.50 ±0.02	13.97
K	0.86 ±0.02	2.18
M	3.25 ±0.02	8.25
N	0.37 REF	.94 REF
P	0.63 REF	1.60 REF

*OPTIONAL "THIN" FRONT PANEL

OEM-9a

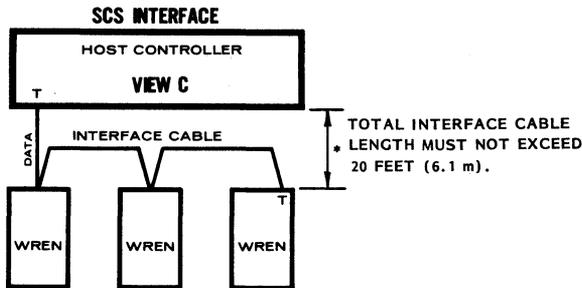
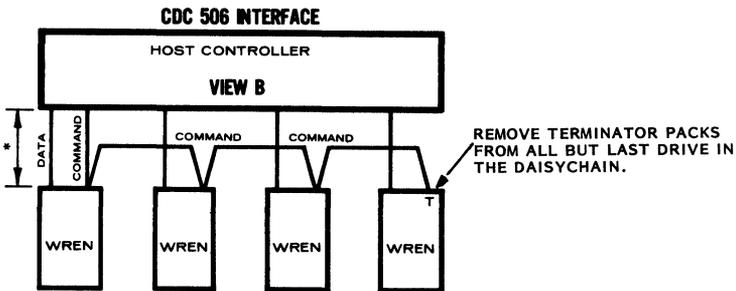
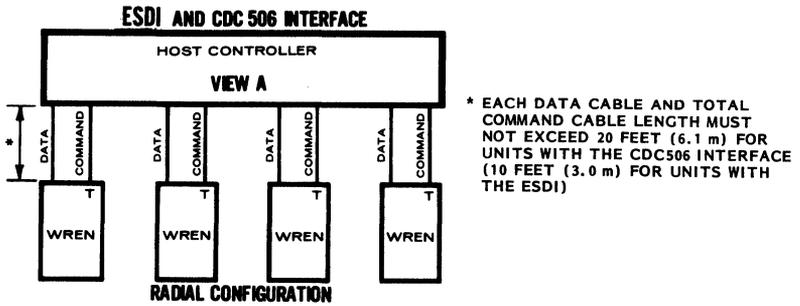
FIGURE 2-2. OUTLINE AND MOUNTING DIMENSIONS

2.4.3 VERTICAL ORIENTATION MOUNTING

In the vertical orientations, the WREN II disk drives can be mounted with either side up.

The drive should be mounted using four bottom screws for horizontal mount or four side screws for vertical mount (the four bottom screws are preferred for vertical mounting and are recommended).

Screws should be used with 6-32 threads and of sufficient length to pass through the cabinet mounting member and have 0.31 MAXIMUM inches (7.87 mm) remaining to screw into the side mounting holes of the WREN.



DEM-5b

NOTE 1: 'T' INDICATES TERMINATING RESISTOR PACK. WREN DATA CABLES ARE PERMANENTLY TERMINATED.

MAXIMUM NUMBER OF DRIVES PER CHAIN IS:
 CDC506 (4 Drives). SERIAL MODE ESDI (7 Drives),
 STEP MODE ESDI (3 Drives). SCSI (7 Drives).

FIGURE 2-3. CABLING CONFIGURATIONS

2.5 CABLING

The WREN II Disk Drives with either ESDI or CDC506 Interface can be connected in radial or daisychained configurations. Radial configurations are shown in View A of Figure 2-3. In the daisychained configurations, four drives with CDC506 interfaces are supported (see View B of Figure 2-3). The drives with ESDI can be operated in either the Step or Serial Mode (Switch Selectable). In the Step Mode, 3 drives can be connected in daisychain. In the serial mode, 7 drives can be connected in daisychain.

2.5.1 RADIAL CONFIGURATION

View A of Figure 2-3 shows each WREN II Disk Drive with either ESDI or CDC506 Interface interfaced to its own Command cable, which in turn, allows interfacing of more than four drives and a variety of system operational techniques. Each drive has its Data cable and Command cable radially connected to the host controller. The length of each individual cable must not exceed 20 feet (6.1 meters) for Disk Drives with CDC506 interfaces and 10 feet (3.0 meters) for Disk Drives with ESDI. Each Command and Data cable must be terminated at each end in its characteristic impedance. The termination of these cables is accomplished in the drive by the terminating resistor pack for the Command Cables and by resistors on the Data PWA for the Data Cables. These same resistor values must be installed in the host controller.

2.5.2 DAISYCHAINED CONFIGURATION

In a daisychain configuration, the data cables of WREN II Disk Drives with either ESDI or CDC506 Interface are connected in a radial configuration and the drives are connected in daisychain on the command cable. The total length of all command cables used shall be less than or equal to 20 feet (6.1 meters) for drives with the CDC506 interface and 10 feet (3.0 meters) for drives with ESDI. The logical address of each drive in the daisychain is determined by the "DRIVE SELECT" plug on the servo PWA. Each data and command cable must be terminated in the Host Controller. The WREN II Disk Drives with SCSI Interface can be connected in daisychain on the interface cable. Up to seven drives can be connected in daisychain configuration. The Logical Address is determined by the position of the jumper in the drive select header (Figure 2-4). The total interface cable lengths must not exceed 20 feet (6.1 M). The cable must be terminated in the last drive in the daisychain and in the Host Adapter/Initiator.

2.5.3 DC POWER REQUIREMENTS

No AC power is required.

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

<u>DC POWER REQUIREMENTS (5 VOLT)</u>		
	<u>ESDI and CDC 506 Interface</u>	<u>SCSI</u>
VOLTAGE	+5 V DC	+5 V DC
REGULATION	+5%	+5%
RIPPLE	50 mV	50 mV
AVERAGE OPERATING CURRENT (WORST CASE)	△ 0.9 A	1.5 A
OPERATING CURRENT (TYPICAL)	△ 0.75 A	1.2 A
OPERATING CURRENT (PEAK)	△ 1.3 A	1.9 A

DC POWER REQUIREMENTS (12 VOLT)	
VOLTAGE	+12 V DC
REGULATION	±5% 
RIPPLE	100 mV
AVERAGE OPERATING CURRENT  (WORST CASE)	2.4 A
OPERATING CURRENT (TYPICAL) 	2.0 A
OPERATING CURRENT (PEAK) 	4.5 A

 Measured with average reading DC ammeter, worse case conditions.

 Occurs during start-up.

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

2.5.4 DC CABLE AND CONNECTOR

The WREN II receives DC power through a 4-pin right angle connector mounted on the servo circuit board (see Figure 2-4). Recommended part numbers for the mating connector are provided, but equivalent parts may be used.

DC PIN ASSIGNMENTS

POWER LINE DESIGNATION	PIN NUMBER
+12 VOLTS	J2-01
+12 VOLTS RETURN	J2-02
+ 5 VOLTS RETURN	J2-03
+ 5 VOLTS	J2-04

DC CONNECTOR

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

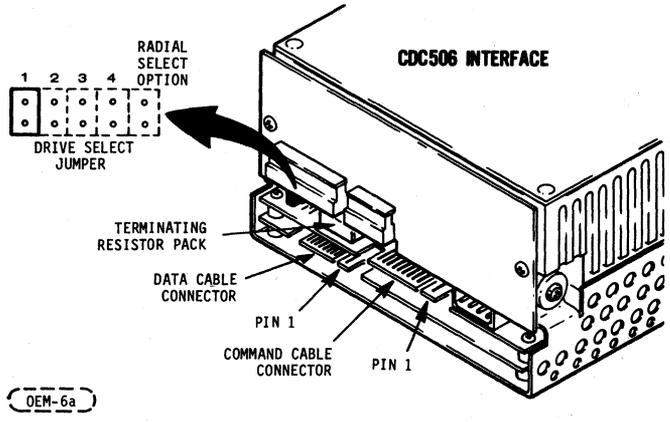
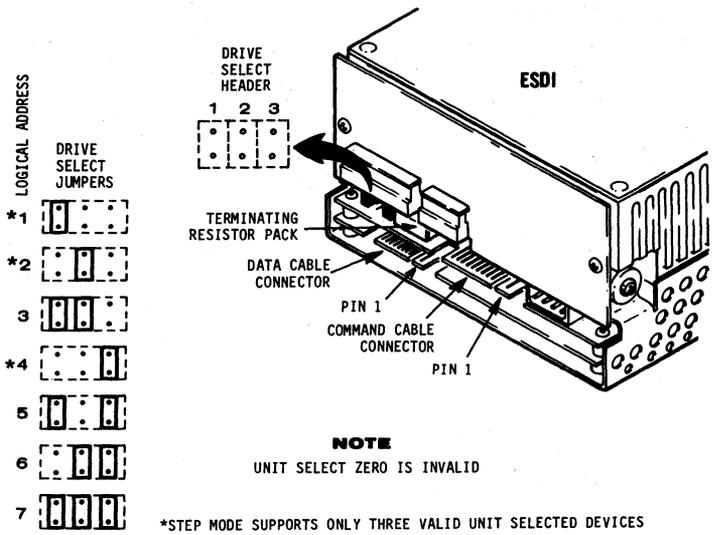
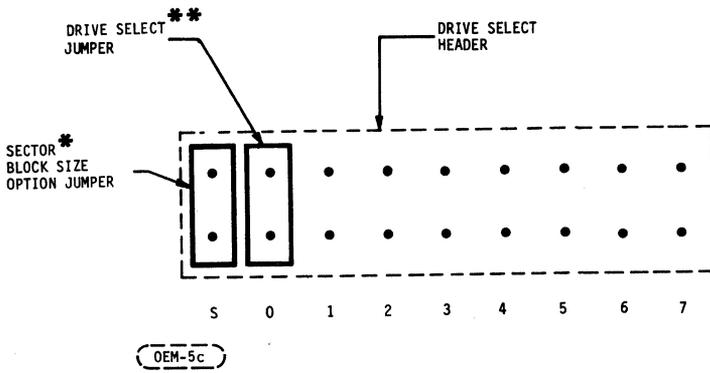
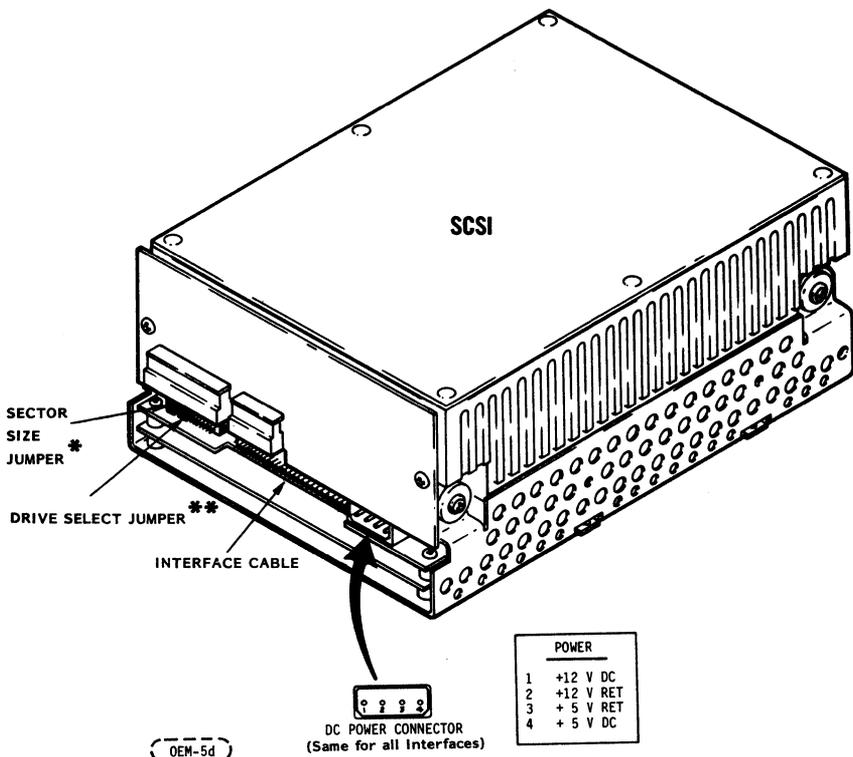


FIGURE 2-4. WREN II I/O CONNECTIONS



- * With Jumper S installed, the block size will be 512 bytes. If removed, the block size will be 256 bytes.
- ** Drive ID is consistent with the jumper position, i.e. Logical 0 Jumper would be Drive ID 0.

FIGURE 2-4. WREN II I/O CONNECTIONS (cont)

2.5.5 DATA CABLE AND CONNECTOR

Figure 2-4 shows the Data Cable Connector of the WREN (CDC506 and ESDI Interface). Recommended part number for the mating connector is provided, but equivalent parts may be used.

<u>CONNECTOR (20 PIN WITH STRAIN RELIEF)</u>	<u>CABLE</u>
3M-3461-0001	3M-3365-20 (Flat Stranded AWG 28)
<u>Key</u> 3M-3439-0000	3M-3517-20 (Flat Shielded AWG 28)

2.5.6 COMMAND CABLE CONNECTORS

The connector for the Command Cable is a 34 Pin Board Edge Connector. For both interfaces, the odd pins are on the component side of the PWA and are connected to the ground plane. A keying slot is located between pins 4 and 6. The command cable connectors are shown in Figures 2-4. Recommended part number for the mating connector is provided, but equivalent parts may be used.

<u>CONNECTOR (34 PIN)</u>	<u>CABLE</u>
3M-3463-0001	3M-3365-34 (Flat Stranded AWG 28)
<u>Key</u> 3M-3439-0000	3M-3517-34 (Flat Shielded AWG 28)

2.5.7 INTERFACE CABLE CONNECTOR

The connector for the Interface Cable used on the WREN II Disk Drives with SCS Interface is a 50 pin connector. The Interface cable connector is shown in Figure 2-4. Recommended part numbers for the mating connector are listed, but equivalent parts may be used.

Mating Connector (50 PIN)

Closed	3M-3425-7000	W/O Strain Relief
End	3M-3425-7050	With Strain Relief
Open	3M-3425-6000	W/O Strain Relief
End (Daisychain)	3M-3425-6050	With Strain Relief

2.6 SPECIAL INSTRUCTIONS

2.6.1 DRIVE SELECTION AND TERMINATION

The logical address of the WREN disk drives is selected by installing a jumper into the appropriate location on the DRIVE SELECT header which is available from the back of the drive and located on the SERVO PWA (see Figure 2-4). This selection is done at the time of installation.

The drives with ESDI (Model 94156) can be connected in radial or daisychain configuration. These drives can be operated in Step or Serial Mode (Selectable by SW1-7). For radial configurations, it is recommended that one jumper be connected in location 1 of the Drive Select Header. For daisychain operation, the drive select jumpers will be connected in accordance with Figure 2-4. Only three drives can be daisychained in the Step Mode.

The drives with the CDC506 Interface (Model 94155) have five locations in the header for drive selection. If the drive is to be operated in a radial configuration, the jumper should be in location five. For a daisychain configuration, the jumper should be in position 1, 2, 3 or 4, depending on the location of the drive in the daisychain.

The drives with SCSI have nine locations in the header for drive selection. See Figure 2-4 for location of jumpers in the header.

The radial selection causes the drive to be selected at all times.

2.6.2 TERMINATION RESISTORS

Termination resistor packs should be removed from all daisychained drives except the drive that is in the last position of the daisychains. The terminators consist of a DIP resistor module which is plugged into a DIP socket in each drive. (See Figure 2-4 for location.) An equivalent terminator must be provided in the controller on each input signal line from the WREN to the controller.

2.6.3 AUTO VELOCITY ADJUST

After power has been applied and spindle speed is in tolerance, the WREN actuator will perform several seeks (up to 20) 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 WITH ESDI

Units with the ESD interface may be optionally configured to reflect the specific requirements of the user. Refer to Table 1 and Figure 2-5 for details.

2.6.5 AC/DC GROUND OPTION

Normally, the WREN II has the DC ground and the AC Ground (chassis) joined together. These grounds may be separated by removing W4 from the data PWA (see Figure 2-6) for units with ESDI or CDC506 Interface. Two zero Ohm resistors are used for units with SCSI (See Figure 2-6B).

TABLE 1. CONFIGURATION SWITCH SETTINGS (ESDI Only)

<u>SWITCH NO.</u>	<u>ON</u>	<u>OFF</u>
SW1-1	Factory Test	Normal
SW1-2	Motor Control Implemented 	Motor Control Not Implemented
SW1-7	Serial Mode	Step Mode
<u>SWITCH NO.</u>		
<u>SECTORS/TRACK</u>	<u>SW1-3</u>	<u>SW1-4</u>
17	ON	ON
16	OFF	ON
34	ON	OFF
32	OFF	OFF
<u>SWITCH NO.</u>		
<u>FORMAT MODE</u>	<u>SW1-5</u>	<u>SW1-6</u>
Address Mark	ON	ON
Byte Clock	OFF	ON
Sector Pulse	OFF	OFF
Sector Pulse	ON	OFF

 When the SW1-2 switch is ON, 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 activate 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 also the Start Motor Command in order to start the spindle motor.

NOTE: This procedure is required anytime that the "Power On Reset Condition Exists" status bit is received by the controller if the "Motor Control Implemented" switch is ON.

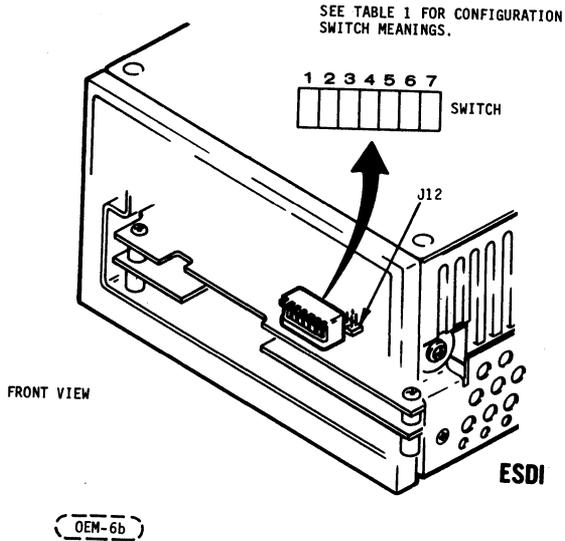


FIGURE 2-5. CONFIGURATION SWITCH AND J12 LOCATION (ESDI Only)

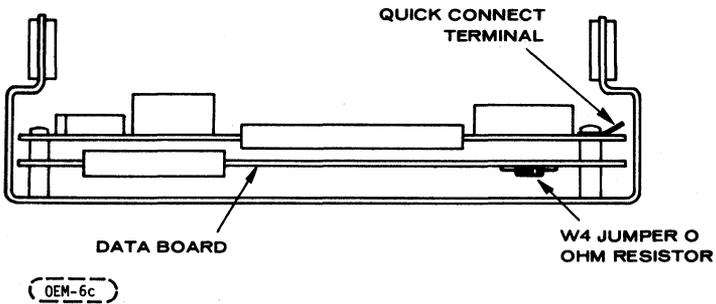
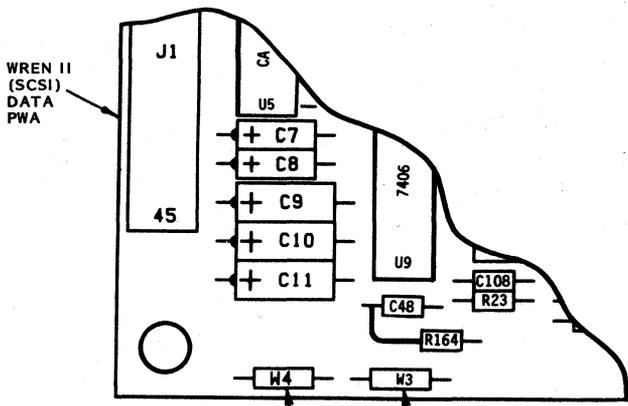
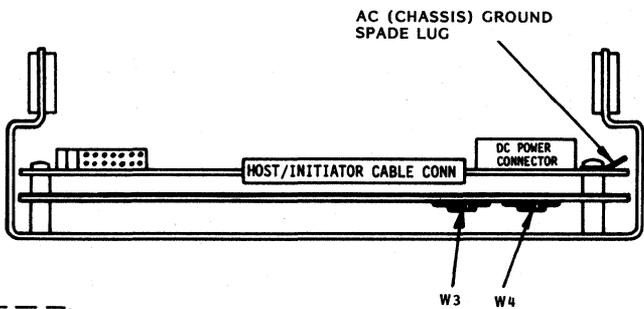


FIGURE 2-6a. LOCATION OF W4 FOR UNITS WITH ESDI AND CDC506 INTERFACE



W3 - CONNECTS DC GROUND AND AC GROUND TOGETHER
 W4 - CONNECTS AC GROUND TO THE DRIVE CHASSIS
 (W3 AND W4 ARE ZERO OHM RESISTORS)

OEM-6d



OEM-9b

FIGURE 2-6b. LOCATION OF W3 & W4 FOR UNITS WITH SCSI

2.6.6 FRONT PANEL INDICATOR (OPTIONAL)

The front panel indicator under normal operation will serve as a Drive Selected indicator. It will also flash to indicate a drive failure when one of the following conditions exist.

1. Rotor is locked.
2. Spindle speed exceeds $\pm 5\%$ tolerance for more than 30 seconds.
3. The WREN cannot load heads after 6 attempts (i.e. PLO does not lock, automatic arm restraint fails to release).

2.7 INITIAL CHECKOUT AND STARTUP PROCEDURE

1. Mount the Drives either horizontally or vertically in the enclosure using standard hardware.
2. Connect the ribbon cables for either radial or daisy-chained configuration. Terminate as required.
3. Attach DC power cable from power supply to connector on the rear of the WREN.
4. Apply power to the drive.
5. Run system diagnostic to ensure the operability of the disk subsystem.

3.0 DIAGRAMS

Most of the electronic functions of the WREN are included in three 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 each board is as shown in Figures 3-1a and 3-1b. Interface diagrams are shown in Figures 3-2a, 3-2b, and 3-2c.

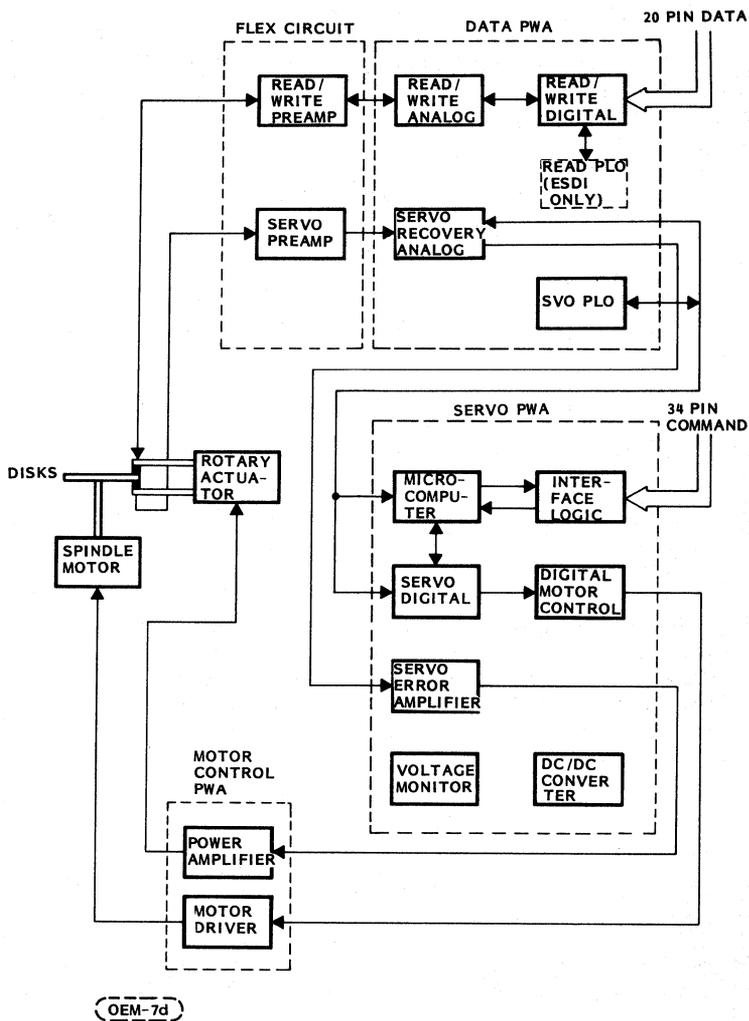
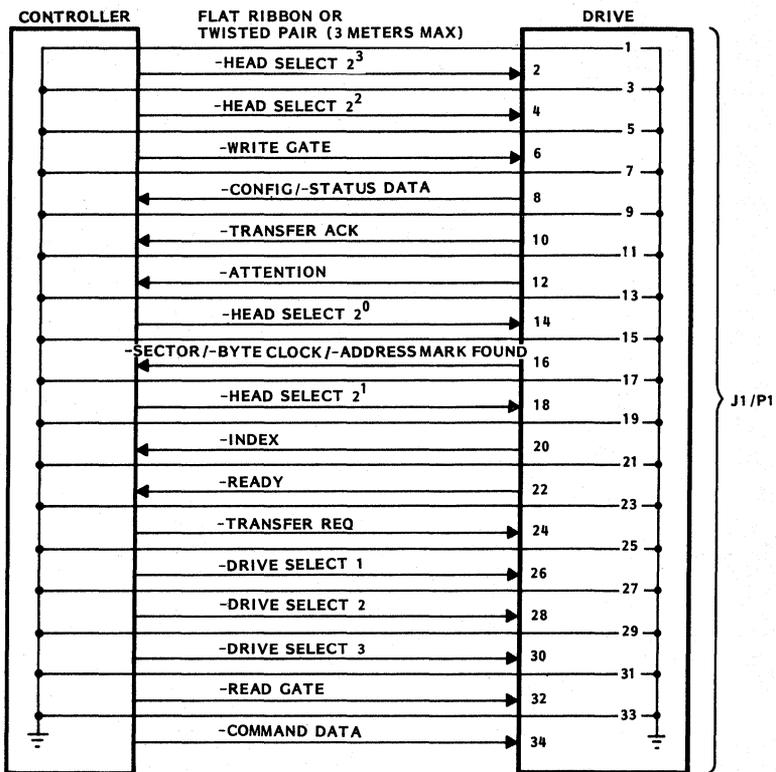
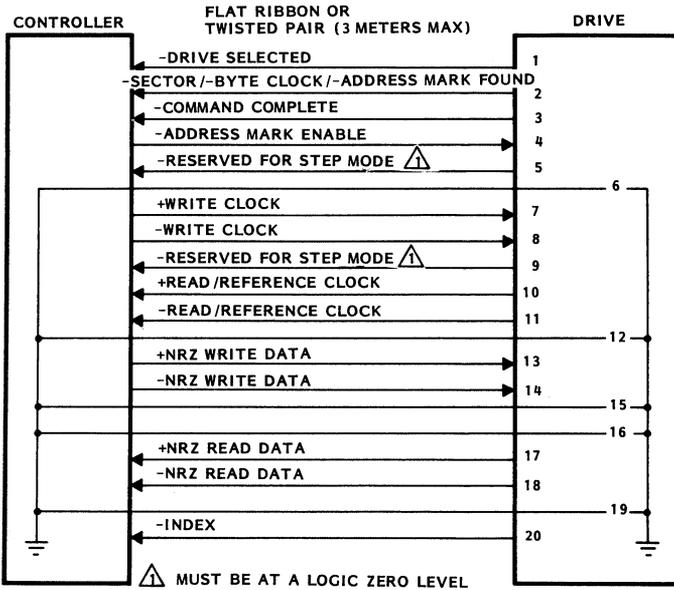


FIGURE 3-1a. BLOCK DIAGRAM OF WREN II WITH ESDI AND , CDC506 INTERFACE



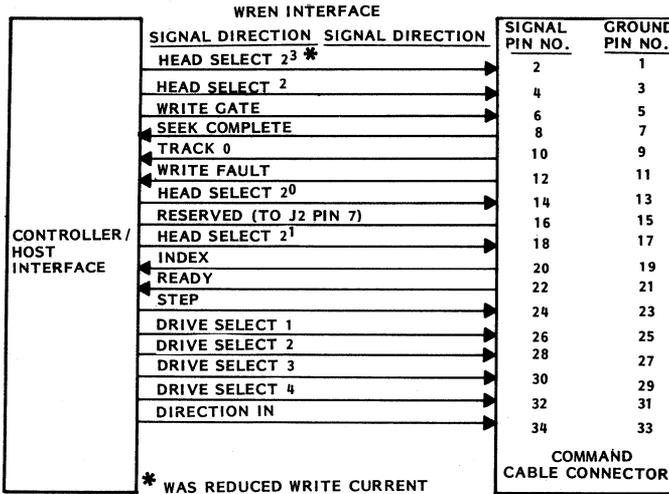
OEM-7c

FIGURE 3-2a. ESDI (1 of 2)



OEM-7e

FIGURE 3-2a. ESDI (2 of 2)



NOTE: ALL SIGNALS IN THE COMMAND CABLE ARE SINGLE ENDED SIGNALS.

CDC 506 COMMAND CABLE

OEM-3a

FIGURE 3-2b. CDC506 INTERFACE (1 of 2)

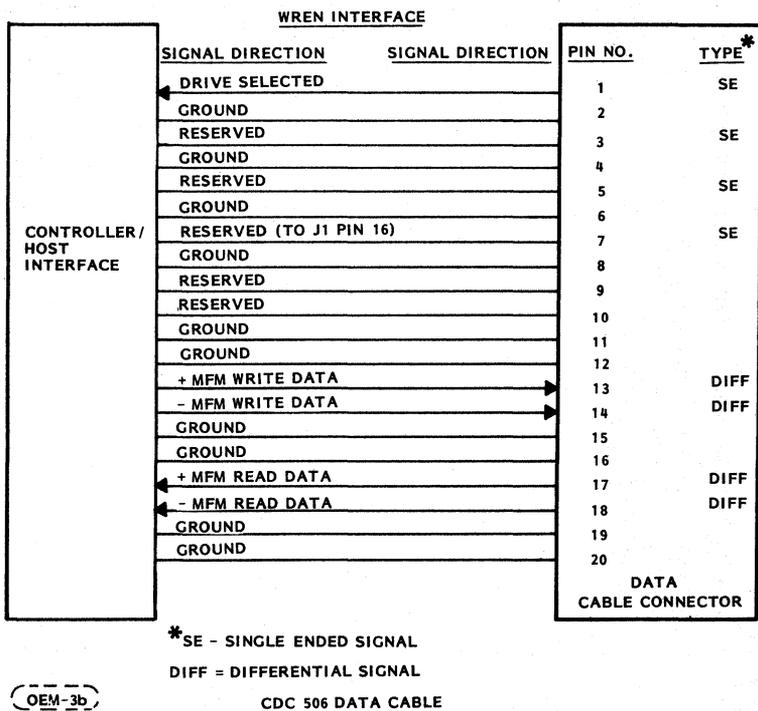
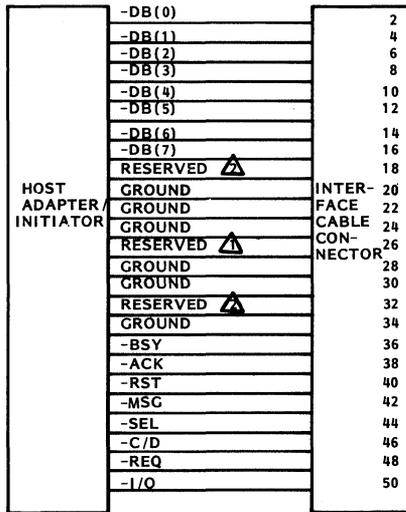


FIGURE 3-2b. CDC506 INTERFACE (2 of 2)



OEM-8b

NOTES:

-  PIN 26 IS RESERVED. THIS PIN WILL NOT BE TERMINATED BY THE DRIVE'S INTERFACE TERMINATING RESISTORS.
-  PINS 18 AND 32 ARE RESERVED. THESE PINS WILL BE TERMINATED BY THE DRIVE'S INTERFACE TERMINATING RESISTORS.
-  ALL ODD PINS EXCEPT PIN 25 WILL BE CONNECTED TO GROUND. PIN 25 WILL BE LEFT OPEN.
-  THE MINUS SIGN NEXT TO THE SIGNALS INDICATES ACTIVE LOW.

FIGURE 3-2c. SCSI INTERFACE (1 of 1)

3.1 SCHEMATIC/PWA ORDERING

Schematic Diagrams and/or Printed Wire Assembly Layouts can be ordered by contacting the CDC OEM Sales Office. Information needed will be the part number and the serial number from the label (Figure 3-3) located on the back of the unit. The Printed Wire Assembly number will also be needed. This number is stamped on the PWA (example shown in Figure 3-4).

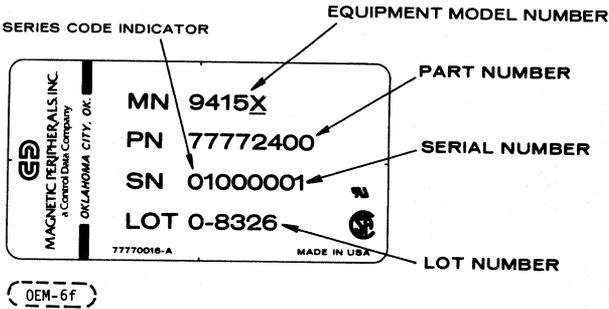


FIGURE 3-3. SAMPLE LABEL OF WREN II DISK DRIVE

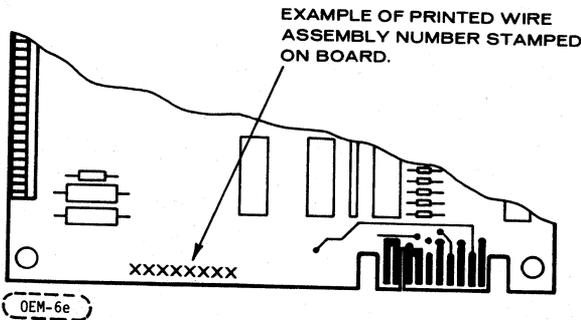


FIGURE 3-4. PWA IDENTIFICATION

4.0 SERVICE REQUIREMENTS

The complex design and exacting requirements for the manufacture of WREN generally prohibit repair in the field. If problems are incurred during installation, please contact your supplier for assistance. Although WREN is designed primarily for depot repair service, some items may be replaced by a technically competent individual as instructed in the Maintenance Manual.

CAUTION

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

 **MAGNETIC PERIPHERALS, INC.**
a Control Data Company

10321 WEST RENO AVENUE
P.O. BOX 12313
OKLAHOMA CITY, OKLA. 73157
405/324-3000

**FOR INFORMATION CONCERNING OEM MAINTENANCE
TRAINING ON THIS EQUIPMENT CONTACT :**

**MAGNETIC PERIPHERALS, INC.
P.O. BOX 12313
OKLAHOMA CITY, OKLA. 73157
ATTN: CUSTOMER TRAINING
PHONE: (405) 324-3001**