

ND-110396/110395 CDC WREN IV 155/310 MB 5 1/4" DISK DRIVE (SCSI)

Maintenance and Parts Manual

Norsk Data use this model:
WREN IV 94171-344

Part No. 753100
MAN MAINT & PARTS DISK
WREN IV 5 1/4"

ND Rev.: 01
ND Reprint Date: 880804

This reprint version is intended for ND internal use only,
and may be obtained directly from the ND central stores.



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WREN/94171-344

Date: 19880804

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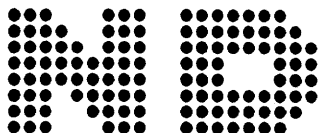
Circuit boards layout and schematics diagrams are not included in this manual

WREN/94171-344
DATE: 19880728

DISC 310 MB CDC 5 1/4" SCSI WREN IV: ND 110396 Modul no: 326392
DISC 155 MB CDC 5 1/4" SCSI WREN IV: ND 110395 Modul no: 326407

WREN IV SPARES LIST:

ND nr.:	CDC nr.:	Description:
753100	-	! Man Maint & Parts Disc Wren IV 5 1/4"
753101	! 15388226-1	! Led.
753102	! 77701042-2	! Ground Spring.
753103	! 77763600-2	! Card AWA Motor Control.
753104	! 77778585-8	! Card PWA Data 310MB ND-PROM
753105	! 77766390-7	! Card PWA Servo.
753106	! 77701394	! Front panel only.
753107	! 77701380	! Front panel assy.
753108	! 77746401	! IC PROM NDCDC 310MB 27C512K.
753109	! 77746406	! IC PROM NDCDC 155MB 27C512K.
753110	! 90541493	! Single Unit Shipping Pack.
753111	! 77765252 Rev C	! Man OEM Rev C.
753112	! -	! Card PWA Data 155MB ND-PROM
500817	! -	! IC 27512 and 250ns EPROM
!	!	!
!	!	!
!	!	!
!	!	!
!	!	!



- TECH INFO -

To : All recipients of the Tech Info Bulletin

COPY : ALL SERVICE PERSONNEL

From : Ingar Stenslet

Date : 26.08.1988 *Whe 55*

SUBJECT: NEW 310/155MB 5 1/4 INCH DISK (ND-110396/110395)

Positions for jumpers:

- [1] Drive ID is binary coded by jumper position (most significant bit on left), ie., jumper in position 0 would be Drive ID 1, no jumpers means ID 0.
- [2] Jumper plug installed enables the Motor Start Option. In this mode of operation the drive will wait for a Start Unit Command from the Host before starting the motor. If the jumper plug is not installed, the motor will start as soon as DC power is applied to the unit. NORSK DATA DOES NOT HAVE THIS JUMPER INSTALLED.
- [3] Jumper plug installed means parity checking by the Wren IV is enabled. NORSK DATA HAS THIS JUMPER INSTALLED.
- [4] If the unit is not to be terminated, remove terminator resistor DIPs (see figure 2). If installed, the TP jumper must be placed in either one of the two positions shown with dotted lines in figure 1.

Jumper in vertical position means terminator power (+5 V) is from Wren IV power connector. Jumper in horizontal position means terminator power is taken from interface cable (ND SCSI adaptor)

If the drive is not terminated, the TP jumper need not be installed. NORSK DATA USES NO JUMPERS INSTALLED.

- [5] See figure 3. NORSK DATA HAS BOTH JUMPERS INSTALLED.

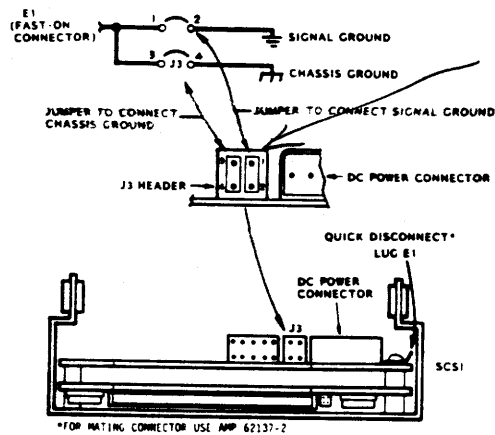


Figure 3.

WREN IV Spare parts list:

ND No.	CDC No.	Description
753100	-	Man Maint & Parts Disk Wren IV 5 1/4"
753101	15388226-1	LED
753102	77701042-2	Ground Spring
753103	77763600-2	Card AWA Motor Control
753104	77778585-8	Card PWA Data 310MB ND-PROM
753105	77766390-7	Card PWA Servo
753106	77701394	Front panel only
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753110	90541493	Single Unit Shipping Pack
753111	77765252 Rev C	Man OEM Rev C
753112	-	Card PWA Data 155MB ND-PROM
500817	-	IC 27512 and 250ns EPROM

Test program:

Disk-Media-Maintenance (D-MM) Version B00: Released.
SCSI-Test-Verification (S-TV) Version C00: Not released yet.

ND 110395 (155MB):

If you want to downgrade the drive from 310MB to 155MB you have to change the PROM on the DATA board from 753108 to 753109. Then you must use D-MM version B00 and do a FORMAT-INITIALIZE. Remember to change the ND number from 110396 to 110395.

77765252



CONTROL DATA®

**WREN IV DISK DRIVETM
MODEL 94171**

OEM MANUAL

WREN IVTM MODEL 94171
OEM MANUAL

77765252
Revision C
April 1988

PREFACE

This OEM Manual 77765252 provides the basic information and instructions for installing and operating Control Data WREN IV Disk Drive; Model 94171. 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."

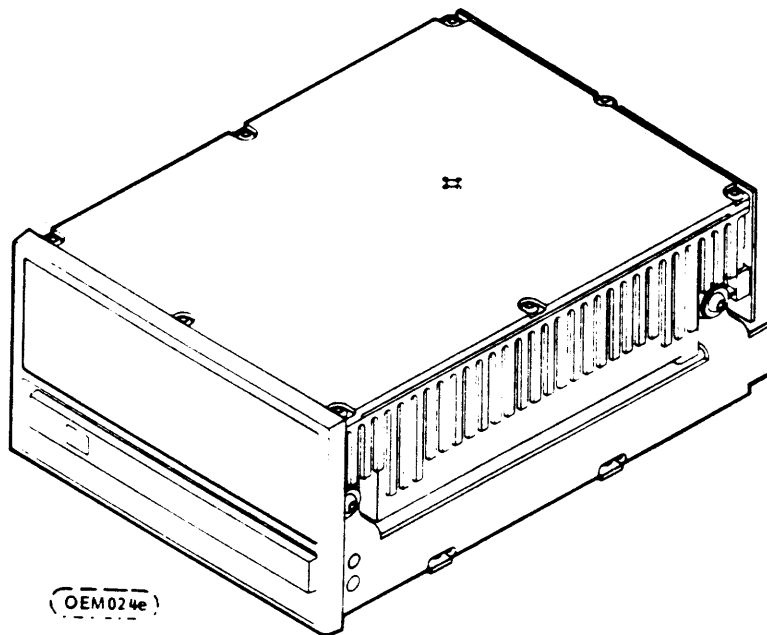


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1.0 DESCRIPTION

The CDC WREN IV 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.

The Model 94171 has a factory formatted storage capacity of 320 or 344 megabytes (1024 byte data blocks). However, the drive user can reformat using any integer data block size between 256 and 4096 bytes. The formatted capacity achieved depends on the data block size used. The 94171 conforms to the ANSI SCSI Interface Specification.

1.1 STANDARD FEATURES

The WREN IV has the following standard features:

- Industry Standard Interface
- 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 and dynamic spindle brake
- Terminators
- Integral Shock mounts
- Dedicated head landing zone
- Integrated SCSI controller
- Single ended SCSI drivers and receivers
- Asynchronous or synchronous* SCSI bus data transfer protocol
- 32 kilobyte data buffer with user selectable read look ahead
- User selectable data block size
- Flawed sector reallocation at format time
- Reallocation of defects on command (post format) or user selectable auto re-allocation
- User selectable reallocation sector locations:
 - On each track, or
 - Within a cylinder, or
 - Within dedicated tracks, or
 - None of the above
- Error correction (48 bit ECC)
- 1:1 sector interleave
- Automatic retries on seek or data read errors (can be disabled)
- Command queing of up to one command per Initiator.
- Automatic single track seek error correction capability.
- Automatic adaptive temperature compensation

* 344 MB Model Only

1.2 ACCESSORIES

The following accessories are available for WREN IV:

- Front Panel Kit
- 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 instruction manual, may cause interference to radio communications. The WREN IV, 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/MPI 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	82°F (28°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 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 0.24 in (6.1 mm). Maximum screw length into side of chassis 0.31 in (7.87 mm).
3. The power requirements are:
+ 5 V $\pm 5\%$ 2.0 A Max
+12 V $\pm 5\%$ 2.3 A
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, IEC 380).

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 0.24 in (6.1 mm) betragen, die in der oberen 0.31 in (7.87 mm).
3. Als Versorgungsspannungen werden benötigt:
+ 5 V $\pm 5\%$ 2.0 A Max
+12 V $\pm 5\%$ 2.3 A
4. Die Versorgungsspannung muss SELV entsprechen.
5. Alle Arbeiten dürfen nur von ausgebildetem Servicepersonal durchgeführt werden.
6. Der Einbau des Drives muss den Anforderungen gemäss DIN IEC 380/V DE URD6/B.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. The uppermost surface must be maintained in a level position or drive performance may be adversely affected. Mounting with either end down (front or rear) is not permissible. The drive may not be mounted inverted (upside down) in the horizontal orientation. 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, WREN IV disk drives can be mounted with either side up. LED down is the preferred vertical mounting orientation.

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.

2.5 DC POWER REQUIREMENTS

No AC power is required.

The voltage and current requirements for a single WREN IV 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 (Peak to Peak)	100 mV
MAXIMUM OPERATING CURRENT [1] (WORST CASE)	2.0 A
AVERAGE IDLE CURRENT [1]	1.8 A
MAXIMUM STARTING CURRENT (PEAK) [2]	1.9 A

DC POWER REQUIREMENTS (12 VOLT)

VOLTAGE	+12 V
REGULATION	+5% [3]
RIPPLE (Peak to Peak)	100 mV
MAXIMUM OPERATING CURRENT [1] (WORST CASE)	2.3 A
AVERAGE IDLE CURRENT [1]	1.4 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. $\pm 5\%$ must be maintained commencing with unit ready.

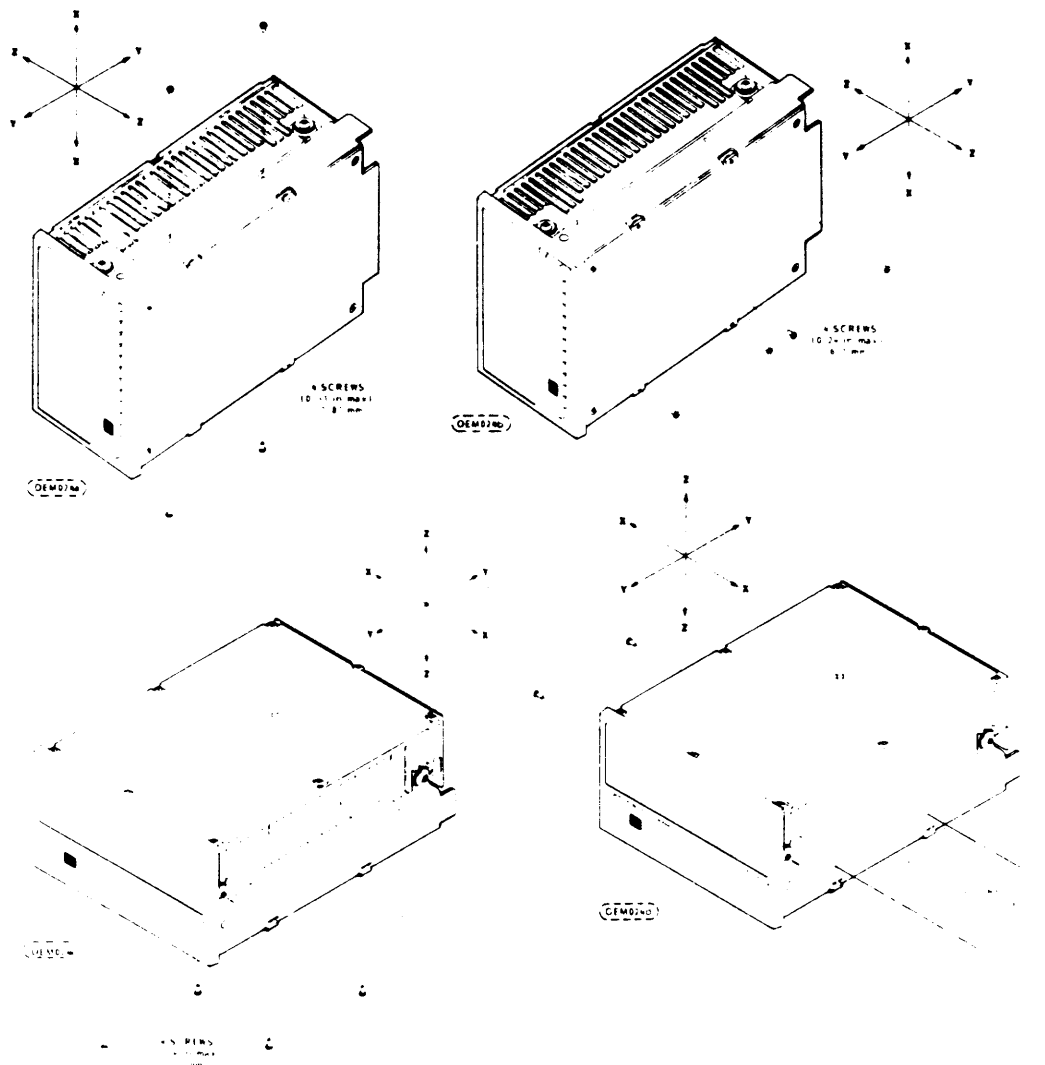


FIGURE 2-1. RECOMMENDED MOUNTING

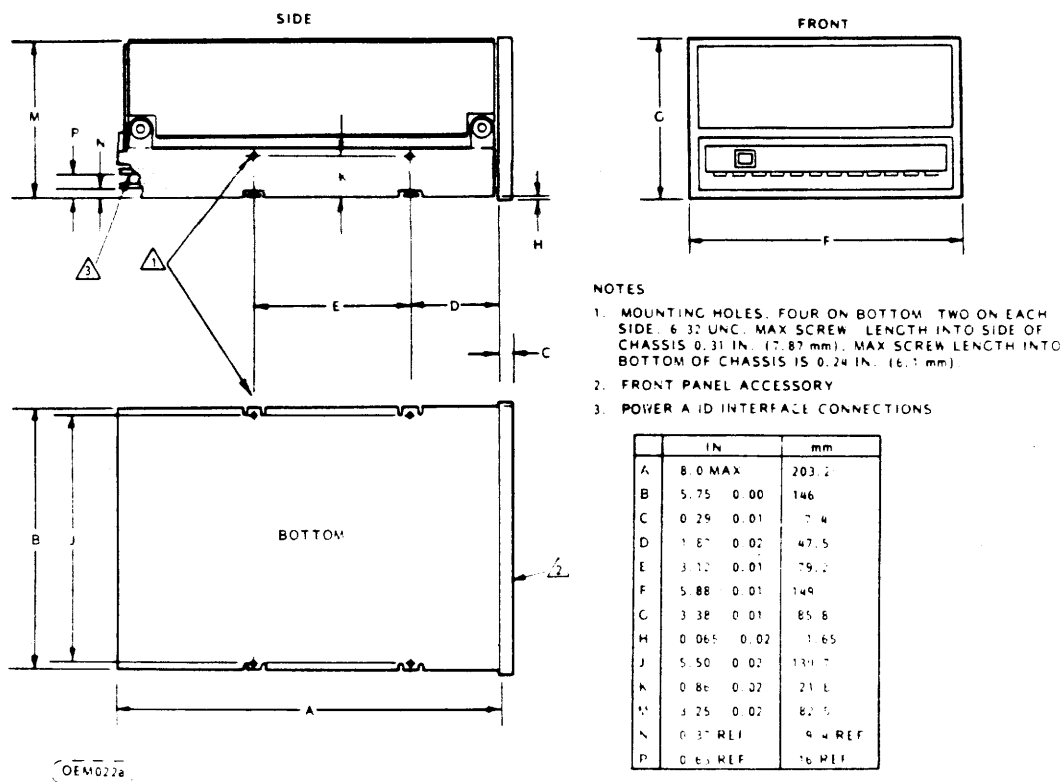
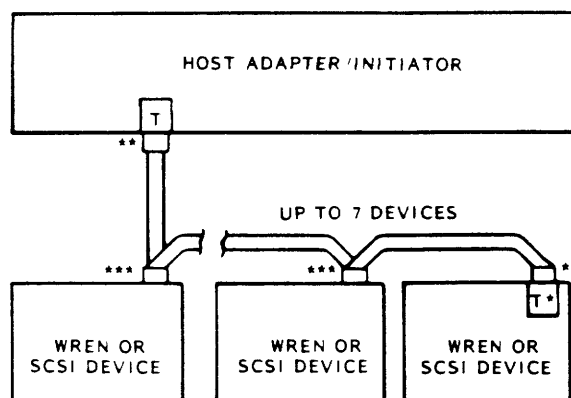


FIGURE 2-2. OUTLINE AND MOUNTING DIMENSIONS

2.6 CABLING

2.6.1 SCSI I/O CONNECTION

The WREN IV can be connected in daisychain configurations. In the daisychain configuration, a maximum of seven drives can be connected. Figure 2-3 shows WREN IV SCSI Disk Drives or other SCSI devices connected in a daisychain configuration. Up to eight SCSI devices (including the Host Adapter) can be supported on the SCSI bus. The SCSI ID for each drive in the daisychain is determined by the unit ID jumper(s) on the Servo PWA. The total length of the interface cable must not exceed 20 feet (6.0 m) and must be terminated at the Host Adapter and the last SCSI device in the daisychain.



TOTAL INTERFACE CABLE
LENGTH MUST NOT EXCEED
20 FEET (6.0 m).

VIEW B

- T INDICATES TERMINATION REQUIRED.
- *T INDICATES TWO REMOVABLE TERMINATOR
RESISTOR PACKS ON DATA PWA.
- ** CLOSED END TYPE CONNECTOR USED.
- (OEM022b) *** OPEN END TYPE CONNECTOR USED.
- **** NUMBER OF DEVICES DEPENDS ON THE HOST
ADAPTER.

FIGURE 2-3. INTERFACE CABLING OPTIONS

2.6.2 DC CABLE AND CONNECTOR

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

DC PIN ASSIGNMENTS

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

DC CONNECTOR

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

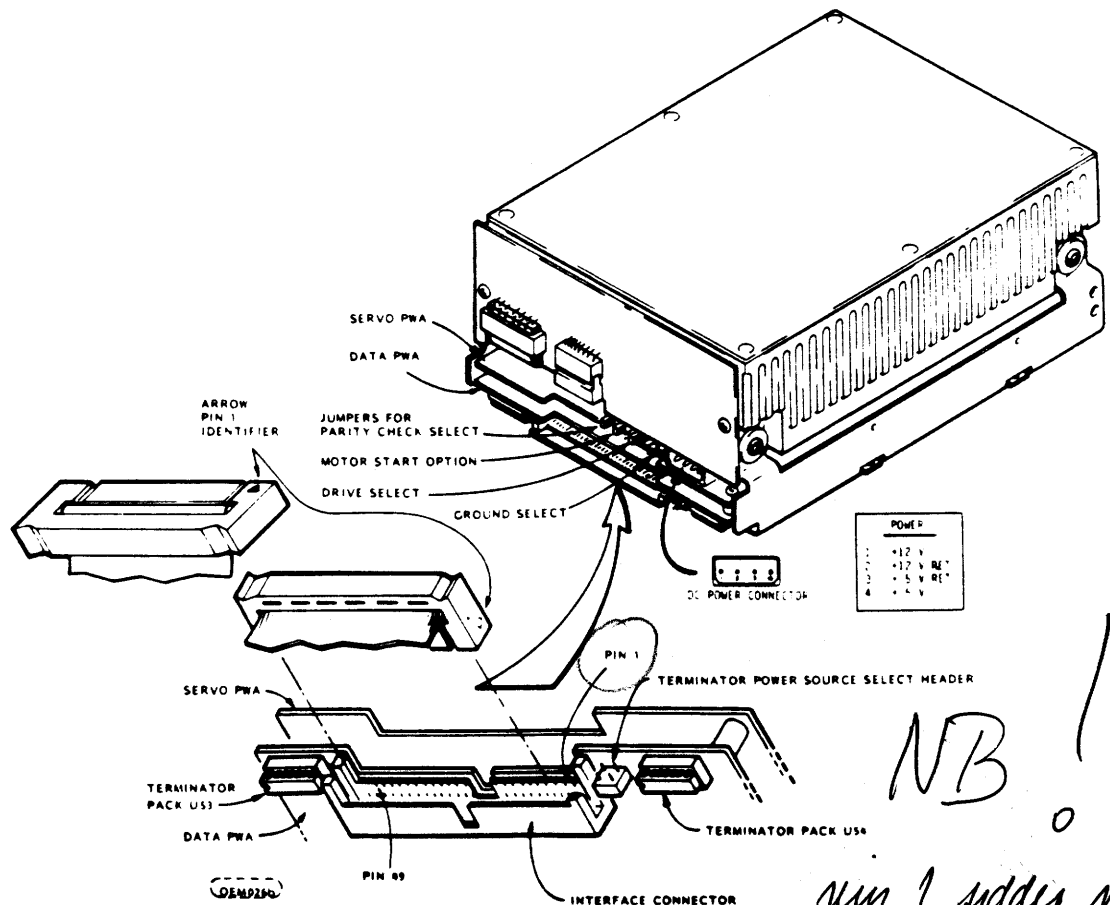


FIGURE 2-4a. I/O CONNECTION

NB!
pin 1 adds motor
i forhold til microproli

2.6.3 SCSI CABLE REQUIREMENTS

A 50 conductor flat cable or 25 twisted pair cable shall be used. The maximum total cable length shall be 20 feet (6.0 metres). A stub length of no more than 0.1 metres is allowed off the mainline interconnection within any connected equipment.

A minimum conductor size of 28 AWG should be used to minimize noise effects.

2.6.4 SCSI CONNECTOR REQUIREMENTS

The nonshielded cable connector shall be a 50 conductor connector consisting of two rows of 25 female contacts with adjacent contacts 100 mils apart.

Recommended Mating Flat Cable Connector Part Numbers are:

Closed end	3M-3425-7000	W/O Strain Relief, No Center Key*
(For cable ends)	3M-3425-7050	With Strain Relief, No Center Key*
	Dupont - 66900-950	With Strain Relief, With Center Key
Open end	3M-3425-6000	W/O Strain Relief, No Center Key*
(In Daisychain)	3M-3425-6050	With Strain Relief, No Center Key*
	Dupont - 66900-250	With Strain Relief, With Center Key

The Model 94171 WREN device connector is a nonshielded 50 conductor connector consisting of two rows of 25 male pins with adjacent pins 100 mils apart. The connector is keyed.

CAUTION

Pin 25 must not be connected to ground at the Host end or the drive end of the cable. If Pin 25 were connected to ground and if an unkeyed connector should be accidentally plugged in upside down, terminator power on Pin 26 would be shorted to ground.

Drive Connector Part Number: Berg - 65496 - 031 or equivalent. See Figure 2-4a.

1KB/block.

2.6.5 SYSTEM GROUND QUICK CONNECT TERMINAL

System ground may be connected to the Quick connect terminal shown in Figure 2-6. Recommended part numbers for this connector and the mating ground cable connector are listed, but equivalent parts may be used.

Drive Connector Terminal
AMP P/N 61664-1

Cable Connector Terminal
AMP P/N 62137-2

2.7 SPECIAL INSTRUCTIONS

2.7.1 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, which is accessible from the back of the drive, located on the Servo PWA (see Figure 2-4a or 2-4b). This selection is done at the time of installation.

The WREN IV is connected in daisychain configuration. For daisychain operation, the drive select jumpers should be connected in accordance with the system assignments.

2.7.2 TERMINATION RESISTORS

Drives are normally shipped with termination resistor packs installed. Termination resistor packs should be removed from all daisychain drives except the drive in the last position of the daisychain. The terminator DIP (Dual Inline Package) resistor modules plug into DIP sockets at the rear of each drive, on the underside of the Data PWA, on each side of the interface cable connector. See Figure 2-4a. Drives may be ordered with or without terminator resistors installed. On the device at the head of the daisychain, an equivalent terminator must be provided on each input signal line. A Host/Adapter need not be the head of the daisychain, it can be a WREN or other device.

2.7.3 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.

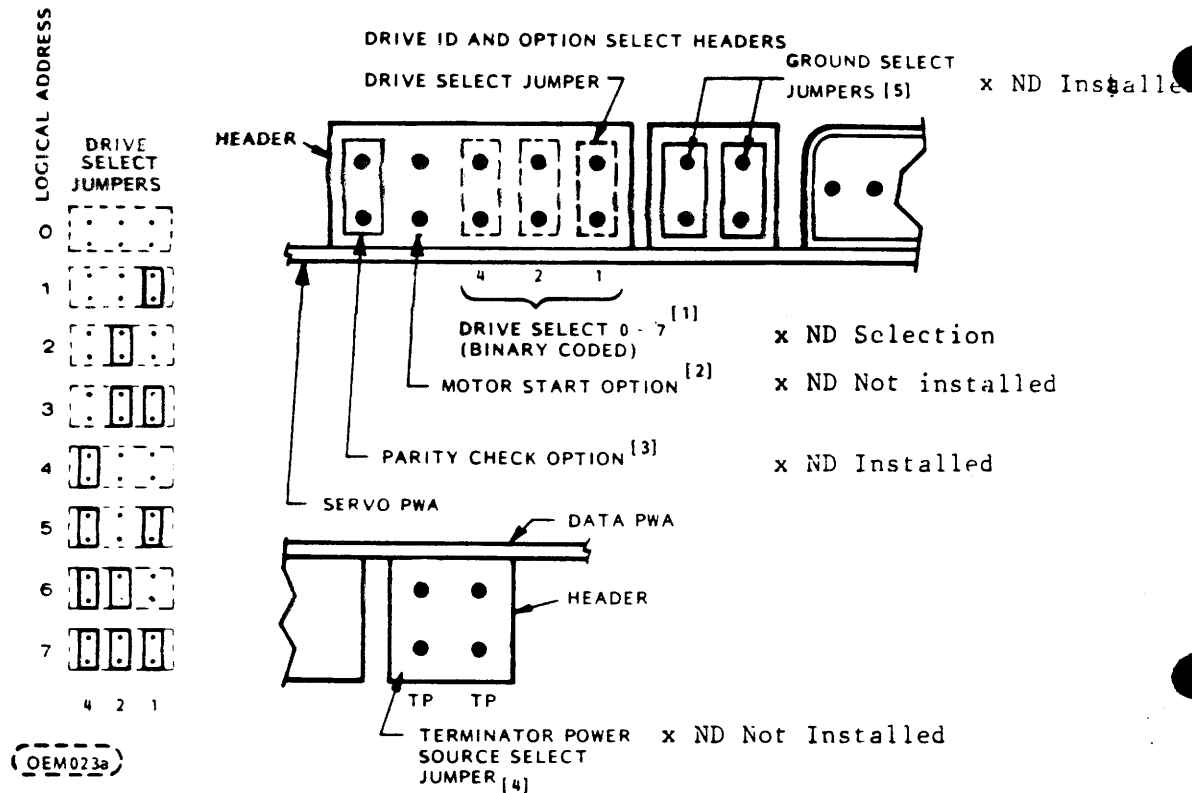
2.7.4 CONFIGURATION OF UNITS

WREN IV SCSI models are configured via software over the SCSI bus, with the exception of the options selectable by installing jumper plugs on the header next to the D.C. power cable connector. See Figures 2-4a and 2-4b.

2.7.5 AC/DC GROUND OPTION

Normally, the WREN IV has the DC ground and the AC Ground (chassis) joined together. These grounds may be separated by removing a jumper, as shown in Figure 2-4b.

NOTE: x Norsk Data (ND) configuration.



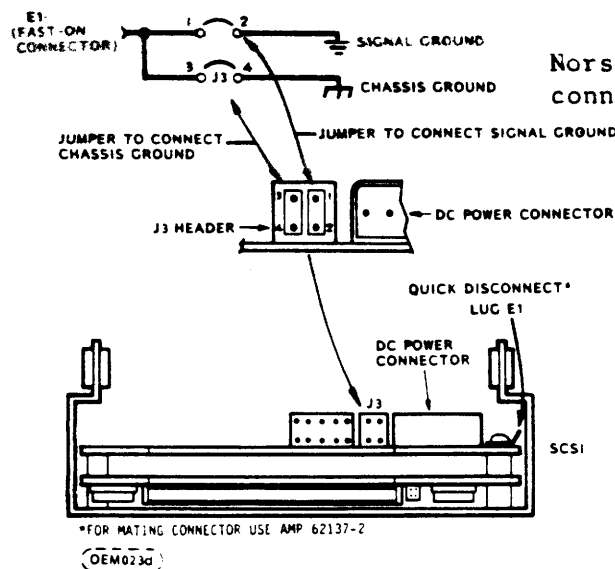
- [1] Drive ID is binary coded by jumper position (most significant bit on left), i.e., jumper in position 0 would be Drive ID 1, no jumpers means ID 0.
- [2] Jumper plug installed enables the Motor Start Option. In this mode of operation the drive will wait for a Start Unit Command from the Host before starting the motor. If the jumper plug is not installed, the motor will start as soon as DC power is applied to the unit.
- [3] Jumper plug installed means parity checking by the WRFN IV is enabled.
- [4] If the unit is not to be terminated, remove terminator resistor DIPs (see Figure 2-4a). If installed, the TP jumper must be installed only in one of the two positions shown in figure above.

Jumper in vertical position (default position) means terminator power (+5 V) is from WREN IV power connector. Jumper in horizontal position means terminator power is taken from interface cable.

If the drive is not terminated, the TP jumper need not be installed.

- [5] See Figure 2-6.

FIGURE 2-4b. POSITIONS FOR JUMPERS ON OPTION SELECT HEADERS



NOTE:

Norsk Data use both jumpers connected. Signal ground and chassis ground together.

FIGURE 2-5. LOCATION FOR GROUND JUMPERS J3-1, 2 AND J3-3, 4

2.7.6 FRONT PANEL INDICATOR - SCSI (OPTIONAL)

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 5.1.2 for a description of the power-up sequence, in which details of LED operation are given.

2.8 INITIAL CHECKOUT AND STARTUP PROCEDURE

1. Mount the WREN, horizontally or vertically, in the enclosure using standard hardware [four (4) #6-32 screws - see Sections 2.4.1 through 2.4.2.
2. Connect the ribbon cable for radial or for daisychain configuration (see Section 2.5). Terminate and verify jumper/switch 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.

3.0 DIAGRAMS

Most of the electronic functions of the WREN are implemented 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 the WREN IV is shown in Figure 3-1. The interface diagram is shown in Figure 3-2.

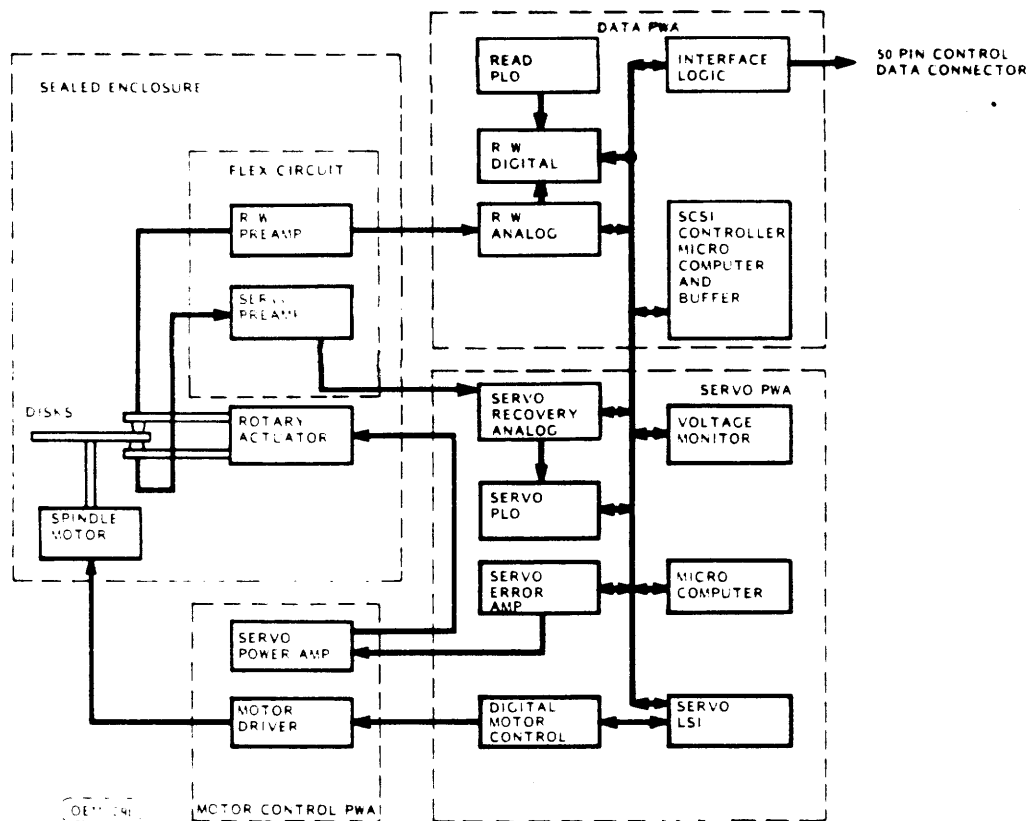
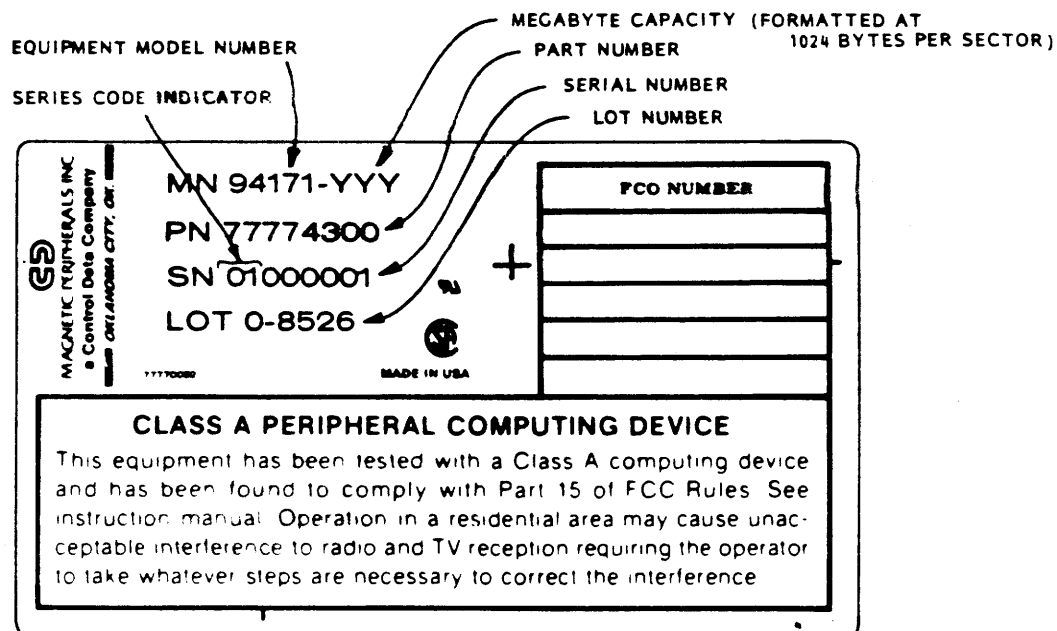


FIGURE 3-1. BLOCK DIAGRAM OF WREN IV WITH SCSI INTERFACE



(OEM025b)

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

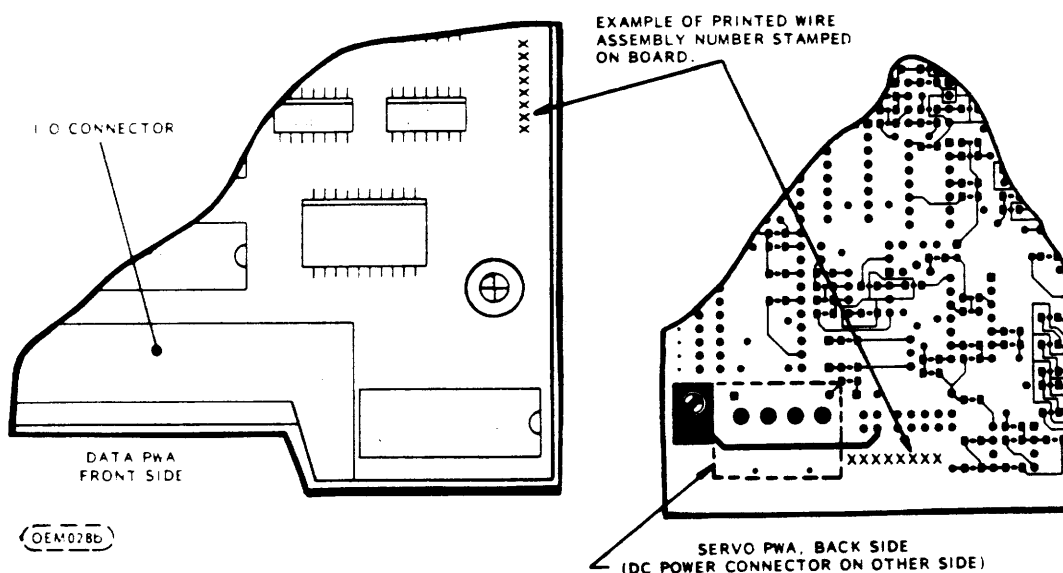


FIGURE 3-4. PWA IDENTIFICATION

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, etc.) requires special facilities. In addition, parts within the sealed area are not available as spares. 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.

The diagram illustrates the electrical connections for a control system. It features several main sections:

- SERVO PWA:** A vertical column of pins (1-45) with associated labels like GND, BURN IN, EM LED, T.COMP ANALOG DATA, TRK CENT, SVO PLU, SVO PLO ECL, WRITE INHIBIT, SYS RES, DRAIN, VOLT TOL FLT, RESET, INDR, GND, WDA, WDS, MCDATA, RCSIS, DDB, DDB2, DDB3, DDB4, DDB5, DDB6, DDB7, GND, +5 V, MOTOR UN, PARITY, SCS1 ADDR, SCS1 ADDR 1, SCS1 ADDR 2, +5 V REF, +10 V R, +5 V, and 10 MHZ CLOCK.
- DATA/PWA/GND:** A central block with pins (1-45) and labels like DATA, PWA, GND, +12 V, +12 V, RCT, WRITE DATA, WRITE SFL, MNT CURRENT, RD DATA, RD SEL, HD SEL, HD SFL, +5 V R, C SEL, C SEL 1, UNSAFE, MNT CURRENT, RD PULSE, GND, READ CLOCK, INDR, RETIMDA, RD EN, QUAL, 1. PWR, +5 V, TERM PWR, -DB(0), -DB(1), -DB(2), -DB(3), -DB(4), -DB(5), -DB(6), -DB(7), -DB(P), GND, 10 MHZ, GND, 10 MHZ, GND, -ATN, GND, -BSY, -ACK, -RS1, -MSG, -SEL, -C/D, -REQ, -1/D, GND, and *1-49(000).
- FIER/R/W/CIRCUIT/SERVO A:** A block on the right with pins (1-26) and labels like FIER, R/W, CIRCUIT, SERVO A, MNT, HDA, C11, H1Y, H1A, H2Y, H2A, C1Y, H3Y, H3A, H4Y, H4A, C1Y, H5Y, H5A, H6Y, H6A, C1Y, H7Y, H7A, H8Y, H8A, C1Y, and H9Y.
- SCS1/MOTOR/PARITY:** A block on the left with pins (1-10) and labels like SCS1 ADDER, O/L, GND, SCS1 ADDER, 1/-L, GND, SCS1 ADDER, 2/-L, GND, MOTOR ON, ENABLE, GND, PARITY, ENABLE, ARM RESTRAINT, +11 V, OUT WINDING, +11 V, IN WINDING, GND, SVO DATA, SVO DATA, +10 V R, LED-C, LED-A, and POWER SUPPLY.

Legend:

- [1] POWER SUPPLY
- [2] DC GROUND CONNECT JUMPER
- [3] AC GROUND CONNECT JUMPER
- [4] ADDRESS/OPTION SELECT HEADER
- [5] ROTARY ACTUATOR VOICE COIL
- [6] TEST POINTS
- [7] FRONT PANEL LED
- [8] TEST POINTS
- [9] TEST POINTS
- [10] TERMINATION POWER SOURCE SELECT JUMPER
- [11] SCS1 INTERFACE CABLE
- [12] SPINDLE MOTOR
- [13] READ/WRITE HEADS

FIGURE 4-1. INTERCONNECTION DIAGRAM FOR SCSI INTERFACE

5.1.1 POWER UP SEQUENCE

- Power is applied to the disk drive.
- When power is applied, one of two sequences could occur:
 1. If the Motor Start option is NOT selected (Motor Start jumper NOT in place - see Figure 2-4b), the LED glows steadily while the motor comes up to speed and the drive becomes ready. During this time the drive controller will not perform any commands from the SCSI interface until the LED goes dark, indicating the drive is Ready. However, commands will be transferred and put in queue until the drive is able to respond.
 - * 2. If the Motor Start option IS selected (Motor Start jumper in place), the LED glows at application of power, but goes dark after two seconds. At that point the drive's internal controller will respond to the SCSI interface when the Host commands the motor to start. The motor starts, and the LED glows while the motor is coming up to speed for as long as the Host and the drive are connected.
- Spindle motor reaches operating velocity in approximately 36 seconds. No speed variations should be heard afterward.
- Arm restraint solenoid releases producing an audible indication of it's occurrence.
- 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 powered up, the front panel LED goes dark and the drive is ready to communicate over the SCSI bus. The LED glows with each use of the SCSI bus (except arbitration), so boot up activity may appear as random LED flickering as the drive is rapidly selected and deselected.
- If the drive does not successfully power up, the LED glows for approximately 2 seconds and then goes dark. The drive can be interrogated via the SCSI bus to determine the cause of the malfunction. The drive spindles down, but can still communicate over the SCSI bus. The LED will glow each time the drive is connected and communicating.
- If during the power up sequence the internal controller detects a fault condition which prohibits communication over the SCSI bus, the front panel LED flashes.

5.1.2 POWER DOWN SEQUENCE

- Power is removed.
- The arm restraint solenoid sound should be heard within three seconds after power is removed.
- The dynamic brake relay cuts in seconds later, producing an audible indication of it's occurrence.
- Spindle rotation should stop in about 30 seconds.

5.2 CUSTOMER SERVICE

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

CONTROL DATA CORPORATION
Attn: 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, LED and ground spring 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 tools are required for these procedures:

TOOL APPLICATION

TORX TX-10	Six spline socket drive machine screws
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These can be purchased through most commercial tool catalogs.

5.4.1 LED REMOVAL AND REPLACEMENT

1. Remove power from WREN Disk Drive.
2. Disconnect DC power, interface, and data signal cables.
3. Place the WREN on a sponge rubber or foam pad on a flat surface with the chassis down.
4. Remove front panel by removing the four mounting screws.
5. Slide the LED out from the socket on the PWA.

Replace LED by reversing the procedure.

NOTE

The shorter lead of the LED is nearest to the outside edge of the front panel.

5.4.2 MOTOR CONTROL PWA REMOVAL AND REPLACEMENT

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

Replace Control PWA by reversing the procedure.

5.4.3 SERVO PWA REMOVAL AND REPLACEMENT

1. Follow instructions 1 thru 4 in paragraph 5.4.1 describing LED Removal and Replacement.
2. Remove the two shield mount screws behind the front panel.
3. Remove the front chassis brace/shield screws.
4. Remove the shock mount screws at each corner of the chassis.
5. Disconnect the three cables from the Servo and Data PWA.

CAUTION

Be sure to support the drive so it does not fall onto the PWAs. Note the orientation of all cables, screws, and spacers for later reassembly.

6. Lift the sealed enclosure of the drive carefully.
7. Place the sealed enclosure on its cover (upside down) on the sponge rubber or foam pad.
8. Remove the 4 screws attaching the PWA assembly to the bottom side of the chassis.
9. Remove the 4 screws holding the PWA assembly together.
10. Separate the two PWAs, being careful not to damage the boards while releasing the center spacer.

Install the Servo PWA by reversing these instructions.

5.4.4 DATA PWA REMOVAL AND REPLACEMENT

1. Follow instructions 1 thru 10 in paragraph 5.4.3 describing Servo PWA Removal and Replacement.
2. Remove the four spacers and retaining sleeves, being careful not to lose them.

Install the Data PWA by reversing these instructions.

5.4.5 GROUND SPRING REMOVAL AND REPLACEMENT

1. Follow instructions 1 thru 7 in paragraph 5.4.3 describing Servo PWA Removal and Replacement.
2. Remove the two screws attaching the ground spring.
3. Remove ground spring.

Install ground spring by reversing the instructions.

NOTE

Center the ground spring button over the center of the motor as nearly as possible.

5.4.6 PARTS DATA

Recommended spare parts for the WREN are shown in Figure 4-2. Only these parts can be replaced without special facilities. Opening the sealed enclosure voids the unit warranty. The sealed enclosure contains no user servicable items. Spare parts for items within the sealed enclosure are not available to the user.

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

Parts may be ordered through:

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

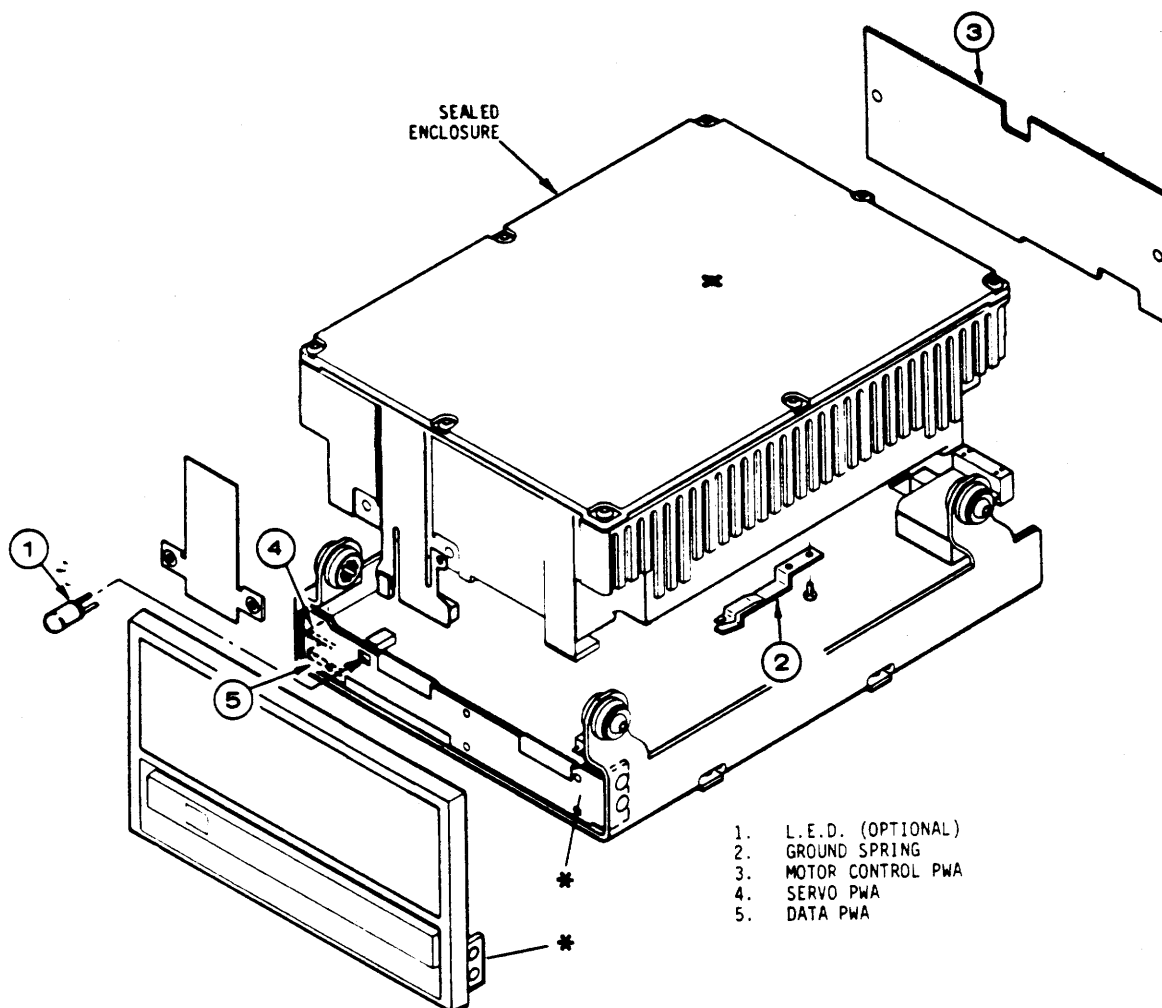


FIGURE 4-2. WREN IV RECOMMENDED SPARES

