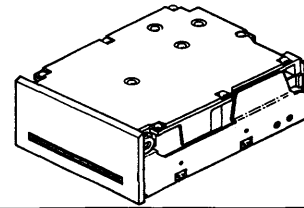




WREN™ 7 DISC DRIVE SCSI

MODEL 94601 INSTALLATION MANUAL



77765375
Revision A
January 1990

PREFACE

This manual provides the basic information and instructions for installing and operating Seagate WREN™ 7 Disc Drive SCSI. Model 94601. It also provides information to aid in servicing those parts of the drive external to the sealed head, disc assembly (HDA).

WARNINGS

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with these instructions, may cause interference to radio communications. The WREN 7, as delivered, is designed to provide reasonable protection against interference when installed in a suitable enclosure.

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

These WARNINGS and 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.

DESCRIPTION

The WREN 7 SCSI is a 5 1/4 inch form factor, low cost, high performance, random access rotating disc, mass memory device designed to record and recover data on eight rigid fixed disc media. The WREN uses low mass flying read/write heads attached to a precisely controlled rotary positioner.

Model 94601 has a typical unformatted storage capacity of 1200 megabytes. The formatted capacity varies with the data block size and the sparing scheme used. It has 15 data heads and 1931 cylinders. Model 94601 supports the Small Computer System Interface (SCSI) as described in the Imprints WREN 7 SCSI Specification 77765417.

MODEL NUMBER	UNFORMATTED MEGABYTES	DATA BLOCK SIZE (BYTES)	NUMBER OF CYLINDERS	NUMBER OF DATA HEADS	FORMATTED MEGABYTES*
94601-12G	1200	512	1931	15	1035
94601-12D	1200	512	1931	15	1035 (Differential I/O)
94601-767H	767	512	1356	15	676 (Faster Access)

STANDARD FEATURES

The WREN 7 has the following standard features:

- o Industry Standard Interface
- o Sealed head, disc, and actuator chamber
- o No preventive maintenance required
- o No adjustments required
- o LS1 circuitry for high reliability
- o Low audible noise for office environments
- o Vertical (side) or horizontal (bottom) mounting
- o Single ended or differential SCSI drivers and receivers
- o 240 K byte data buffer
- o Flowed sector reallocation at format time
- o Reallocation of defects on command (post format)
- o Data recovery circuitry contained in the WREN
- o Command queuing of up to one command per initiator
- o User selectable reallocation sector locations:
 - On each track, or
 - within a cylinder, or
 - within dedicated tracks, or
 - none of the above
- o Low power consumption
- o Balanced low mass rotary voice coil actuator
- o Automatic shipping lock and dynamic spindle brake
- o Easy access terminator
- o Integral HDA shock and vibration isolation mounts
- o Dedicated head landing zone
- o Integrated SCSI controller
- o Asynchronous or synchronous SCSI bus data transfer protocol
- o User selectable byte data block size from 256 to 4096 bytes in one byte increments*
- o Error correction
- o 1:1 sector interleave
- o Automatic retries on seek or data read errors (Automatic read retries may be disabled by users)
- o Automatic single track seek error correction capability
- o Automatic Adaptive Thermal Compensation
- o Zone Bit Recording™
- o Delayed Motor Start

*Units are formatted at the factory with 512 byte data blocks with one spare sector per track, giving a capacity (for 15 data heads) of 1035 MB. However, the user can reformat the drives using any integral data block size between 256 and 4096 bytes and with a different sparing scheme. Drive formatted capacity varies from the 1035 MB if other than 512 data block size or other sparing scheme is used.

ACCESSORIES

- The following accessories are available for WREN 7:
- o Front Panel Kit
 - o Single Unit Shipping Pack Kit

CAUTIONS

CAUTION: The circuit assemblies and components 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 cause EOS or ESD which, when brought in close proximity to susceptible circuit assemblies and components, 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 a 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:

- o Labels must not be put over the breather holes on the top of the drive. (See Figure 1).
- o 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 the HDA. REMOVE THE LABEL. Do not use solvents to remove the adhesive residue. Solvent may migrate down the breather holes and contaminate the HDA.

- o Manufacturers installed labels must not be removed from the drive or covered with additional labels, as they contain information required when repairing.
- o 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 and may damage other susceptible components.

UNPACKING

Visually inspect the shipping container for any obvious damage. 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.

OPERATING ENVIRONMENT

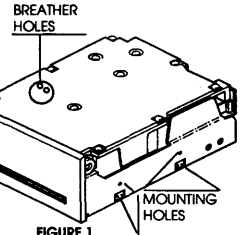
The environmental conditions required for optimum performance of the disc drive are, in general, the same as those in an office environment with minimal environmental control. These conditions are:

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 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.

COOLING

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 above.



Temperature of the top cover, when measured at the center of the cover, (FIGURE 1) should not exceed 140°F (60.4°C) during operation. Large (>2°F) external thermal gradients across the top cover should be avoided.

SAFETY INSTRUCTIONS

1. The WREN is to be installed in a customer supplied enclosure 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 chassis mounting holes is 0.12 in (3.17 mm).
 3. The power requirements are:
 - +5 V ±5% 1.0 A (1.8 A for differential I/O circuits)
 - +12 V ±5% 2.0 A (4.5 A, +12 V ±10% regulation, for a maximum of 10 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 enclosure must meet the appropriate safety requirements of the country in which it is to be used (e.g. UL 478, CSA 22.2 No. 220 and IEC950).
- NOTE: Power off when connecting or disconnecting.

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 0.12 in (3.17 mm) betragen, die in der oberen 0.12 in (3.17 mm).
3. Als Versorgungsspannungen werden benötigt:
 - +5 V ±5% 1.0 A (1.8 A Für Differentiale Schnittstelle)
 - +12 V ±5% 2.0 A (Spitzenstrom zur Zeit der Einschaltung: 4.5 Amp, +12 V ±10% Regelung für 10 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/VDE 0806/8.81 oder EN60 950 entsprechen.

EMI CONSIDERATIONS

The WREN 7, as delivered, is designed for system integration and installation into a suitable enclosure prior to use. As such the WREN 7 is supplied as a sub-assembly and is not subject to Subpart J of Part 15 of the FCC Rules and Regulations nor the Radio Interference Regulations of the Canadian Department of Communications. However, the unit has been tested using proper shielding and grounding and found to be compliant with Class A limits of the FCC Rules and the Regulations of The Canadian Department of Communications.

The physical design characteristics of the WREN 7 serve to minimize radiation when installed in an enclosure that provides reasonable shielding. As such, the WREN 7 is capable of meeting the Class A limits of the FCC Rules and Regulations of the Canadian Department of Communication. However, it is the users responsibility to assure that the WREN 7 meets the appropriate EMI requirements in their system. Shielded I/O cables may be required if the enclosure does not provide adequate shielding. If the I/O cables are external to the enclosure, shielded cables should be used, with the shields grounded to the enclosure and to the host controller.

DRIVE MOUNTING ORIENTATION

The WREN 7 may be mounted with a horizontal orientation (PCB down) or with either of two vertical orientations (on side orientation). Four 6-32 tapped holes are provided in the bottom of the chassis and two on each side. (See Figure 1). The drive may be mounted using four bottom screws or four side screws (two in each side). Four bottom screws are preferred and recommended. Screws must be of sufficient length to engage the threaded holes, but must not penetrate more than 0.14 in. (3.55 mm) into the chassis. A sway space of 0.075 in. (1.9 mm) is required for the HDA on all sides, regardless of mounting orientation.

SCSI INTERFACE CONFIGURATION

The WREN 7 can be connected in a daisychain configuration in which a maximum of seven drives can be connected. The Logical Address of each drive in the daisychain is determined by the drive select jumper plug(s) on the Main PWA. See Figures 3 and 4.

Figure 2 shows each WREN 7 Disc Drives or other SCSI devices interfaced in a daisy chain host adaptor. For single ended I/O circuits, the length of the cable must not exceed 20 ft. (6.0 metres) or 82 feet (25.0 metres) for differential I/O circuits. The cable must be terminated at each end in its characteristic impedance. The termination of these cables is accomplished in the drive by plug-in terminator resistor packs on the Main PWA see (Figures 3 and 4). These same resistor values must be installed in the host controller. See TERMINATION RESISTORS for terminator installation instructions.

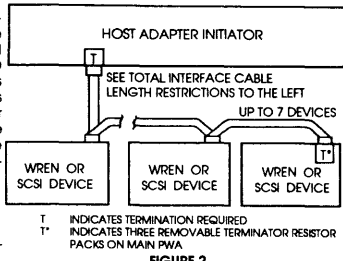


FIGURE 2.

DC POWER REQUIREMENT

No AC power is required. The voltage and current requirements for a single WREN 7 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)	1.0 A (4)
(WORST CASE)	
TYPICAL IDLE CURRENT (1)	0.8 A (5)
MAXIMUM STARTING CURRENT (PEAK) (2)	1.1 A (6)

DC POWER REQUIREMENTS (12 VOLT)

VOLTAGE	+12V
REGULATION	±5% (3)
RIPPLE (MAXIMUM PEAK-TO-PEAK)	100 mV
MAXIMUM OPERATING CURRENT (1)	2.0 A
(WORST CASE)	
TYPICAL IDLE CURRENT (1)	1.6 A
MAXIMUM STARTING CURRENT (PEAK) (2)	4.5 A

- (1) Measured with average reading DC ammeter.
- (2) Occurs during 10 second start up.
- (3) A 10% tolerance is permissible during power up. ±5% must be maintained commencing with unit ready.
- (4) 1.8 A for differential I/O circuits (5) 1.1 A for differential I/O circuits (6) 1.4 A for differential I/O circuits.

DC CABLE AND CONNECTOR

The WREN 7 receives DC power through a 4 pin right angle connector mounted on the Main PWA (see Figure 3)

DRIVE SELECTION AND TERMINATION

The logical address of the WREN 7 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 Main PWA (see Figure 4). This selection is done at the time of installation.

The WREN 7 is to be connected in a daisychain configuration.

The drive select jumpers should be connected in accordance with the system assignments. Be sure to check the system manufacturer's device selection instructions.

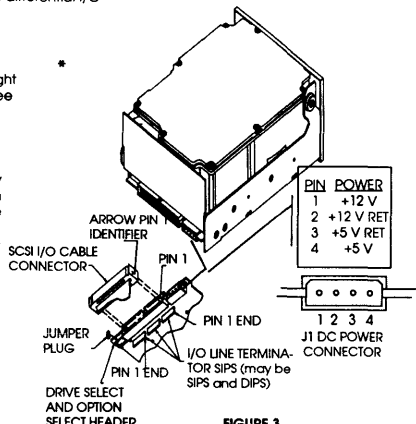
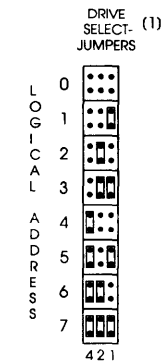


FIGURE 3.

*NOTE: PINS ON THE DRIVE ID SELECT AND CONFIGURATION SELECT HEADER ARE PROVIDED TO FACILITATE MANUAL DRIVE CONFIGURATION. NO DEVICES OTHER THAN JUMPERS SHOULD BE CONNECTED TO THESE PINS. CONNECTIONS MADE TO EXTERNAL DEVICES (SWITCHES, CONNECTORS, ETC.) COULD RESULT IN ADVERSE DRIVE PERFORMANCE. EXACT LOCATION AND NUMBER OF THESE PINS AND HEADERS MAY CHANGE WITHOUT NOTICE.



- (1) Drive ID is binary coded jumper position (most significant bit on left), i.e., jumper in position 1 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. (See (6) for delayed motor start).
- (3) Jumper plug installed means parity checking by the WREN 7 is enabled.
- (4) If the unit is not to be terminated, remove terminator resistor SIPs (or SIPs and DIPs on differential interface units). 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 7 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) Removable I/O Line Terminators (may be SIPs or SIPs and DIPs).
- (6) Jumper on enables delayed motor start (Motor Start jumper (2) must be OFF): Motor start up is delayed 16 times the drive ID in seconds; i.e., drive 0 starts immediately, drive 1 starts 16 seconds later, drive 2 starts 16 seconds after drive 1, and etc.
- (7) Reserved jumper position.

FIGURE 4.

TERMINATION RESISTORS

Only the end drive connected in a daisychain configuration needs termination resistor modules (as supplied). The termination resistor modules should be removed from all daisychain drives except the drive in the last position of the daisychain. The terminator resistor modules are SIPs (Single In Line Packages) of resistors (or SIPs and DIPs for differential I/O circuits) plugged into SIP sockets on the Main PWA, accessible from the rear of the drive (see Figure 3). Drives may be ordered with or without the removable terminator resistor modules installed. Equivalent terminators must be provided in the Host Adapter/Initiator on each input signal line from the WREN to the Adapter/Initiator.

WRITE PRECOMP AND HEAD PARKING TRACK

These two parameters are handled within the drive. Use some value greater than maximum track for each.

INITIAL CHECKOUT AND STARTUP PROCEDURE

1. Mount the WREN, horizontally or vertically, in the enclosure using standard hardware (four (4) #6-32 screws see DRIVE MOUNTING ORIENTATION).

2. Connect the ribbon cables for radial or for daisychain configuration. Terminate and verify jumper settings.
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 disc subsystem.
6. If the drive fails to select, be sure the drive and system manufacturer's instructions on the assignment of device select ID have been followed.

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 HDA may be replaced by a technically competent individual.

CAUTION

- o NEVER remove the cover of the WREN. Servicing items in the sealed HDA (heads, media, actuator, etc.) requires special facilities.
- o Opening the sealed HDA voids the WREN warranty.
- o Applying a soldering device to the components on PWA voids WREN warranty.

TROUBLE SHOOTING

WREN disc 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 disc drive failures are not, and it is important to recognize this before taking repair action on the disc drive. The following disc power up sequence is provided to assist in identifying possible disc drive problems. Generally, if performance doesn't follow this sequence either the drive or power supply should be questioned.

POWER UP SEQUENCE

- o Power is applied to the disc drive.
- o 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 4), The LED glows steadily while the motor comes up to speed and the drive becomes ready. During this time the controller will not respond to the SCSI interface until the LED goes dark, indicating the drive is Ready.
 2. If the Motor Start option IS selected (Motor Start jumper in place), the LED glows momentarily at application of power, then goes dark. 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 may or may not glow while the motor is coming up to speed, depending on whether or not the drive remains selected by the Host.
- o Spindle motor reaches operating velocity in approximately 15 seconds. No speed variations should be heard afterward.
- o Arm restraint solenoid releases producing a recognizable sound.
- o The drive performs up to 32 velocity adjustment seeks as evidenced by head motor sounds.
- o Drive finds and stays at track zero, comes ready, makes no further noises, except as the system commands may demand.
- o 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 35 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.

- o 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.

POWER DOWN SEQUENCE

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

PRODUCT REPAIR INFORMATION

To properly service and maintain warranty, before returning drives to CSC for repair, first telephone 405-491-6262 for a return authorization. Then send to:

Seagate Technology, Inc.
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. TECHNICAL ASSISTANCE IS NOT AVAILABLE AT THIS LOCATION. Contact drive purchase source or 1-900-820-3001.

SAFETY AND SPECIAL SERVICE PRECAUTIONS

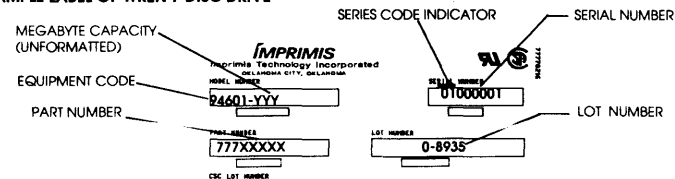
- o Avoid overtightening hardware (screws, nuts, etc.) when replacing assemblies and components.
- o Do not connect or disconnect cables without first removing all power from the drive.
- o Place drive on a flat static dissipative surface.

REMOVAL/REPLACEMENT

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 at all times to avoid damage to the electrical assemblies. The following tool is required for removal and replacement of these items.

TOOL	APPLICATION	This can be purchased through most commercial tool dealers.
TOOL TORX™ TX-10	APPLICATION Six spline socket drive machine screws	

SAMPLE LABEL OF WREN 7 DISC DRIVE



CLASS A PERIPHERAL COMPUTING DEVICE
THIS EQUIPMENT HAS BEEN TESTED WITH A CLASS A COMPUTING DEVICE AND HAS BEEN FOUND TO COMPLY WITH PART 15 OF FCC RULES. SEE INSTRUCTION MANUAL. OPERATOR IS TO BE RESPONSIBLE FOR ANY UNDESIRABLE INTERFERENCE TO RADIO AND TO RECTIFY SITUATIONS. THE OPERATOR IS TO TAKE UNNECESSARY STEPS AND NECESSARY TO CORRECT THE INTERFERENCE.