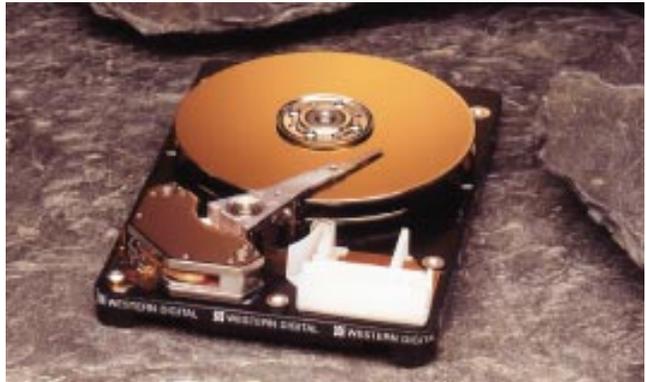


3.5-Inch Drive Handling Guide



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Western Digital Corporation

Western Digital Plaza, 8105 Irvine Center Drive, Irvine, CA 92718

For Service and Literature, call:

(714) 932-4900

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Introduction

This drive handling guide illustrates how to properly handle disk drives from the time they reach your receiving department through installation and shipping. Guidance is also provided for handling drives that have to be returned to Western Digital Corporation.

Disk drives are precision instruments that store information by reading, writing and holding the information on spinning magnetic disks. Special care must be used in the handling of these drives to protect them from damage.

In this guide, precautions and important issues that pertain to all phases of drive handling are found in Section 1. Information that applies to specific areas of handling is presented in separate sections. Please read Section 1 before turning to the section that is specific to your area. This guide is organized as follows:

- Section 1 – General Information
- Section 2 – Receiving
- Section 3 – IQC/Drive Pre-test/Kitting
- Section 4 – Assembly
- Section 5 – System Burn-in/Test
- Section 6 – Shipping/Drive Returns
- Appendix

The appendix contains detailed information on power supply requirements, recommended low-impact torque screwdrivers and drive mounting screw torque, examples of Electrostatic Discharge (ESD) padding, information service, and voltages generated by common materials and actions, a temperature stabilization chart, a drop height table, and connector mating cycles.

Drives are typically damaged because of ESD, rough handling, or shock and vibration. It is also important to note that drives must be treated the same whether they are functional or not.

Please read and observe the instructions in this guide before handling drives.



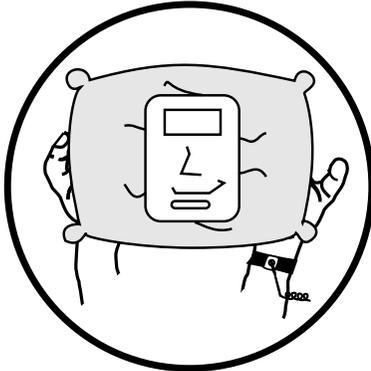
This symbol is used in a number of the graphics that follow. It represents an earth ground requirement.

Section 1 – General Information

Precautions



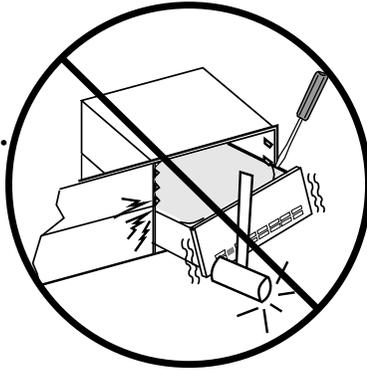
Avoid extreme temperatures



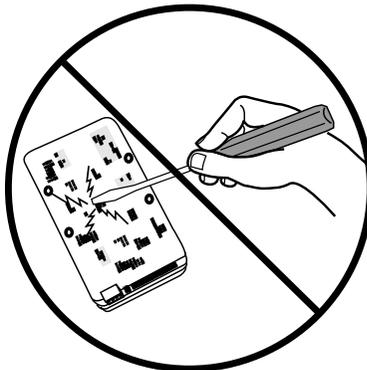
Handle drives gently



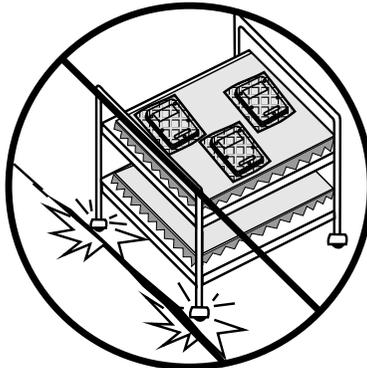
Do not drop drives



Do not force the drive or drive bracket assembly into the drive bay



Do not touch the PCBA circuits with tools or your hands

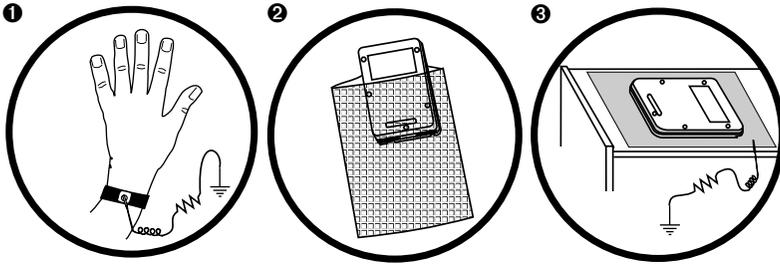


Never roll carts over large cracks or cords

Important Issues

Electrostatic Discharge (ESD) Protection

To prevent drive damage it is essential to maintain the drive in an ESD safe environment. Always return the drive to its original packaging material before and after testing.



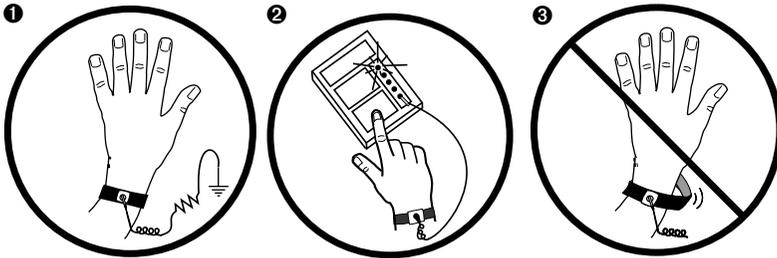
- 1** A grounded wrist strap must be tested daily and worn throughout all phases of drive handling.
- 2** Keep the drive in the shielded anti-static bag prior to operation and testing.
- 3** Gently place the drive on a grounded anti-static surface when it is not in its shipping container. Refer to "ESD Table Top Protective Padding" in the appendix.



- 4** **5** Articles of clothing generate static electricity. Do not allow clothing to come in direct contact with the drive or PCBA.
- 6** Do not put anything in the shielded anti-static bag with the drive.

Wrist Straps

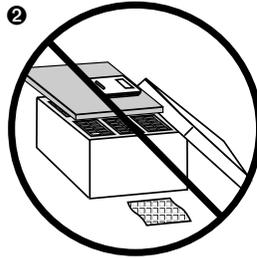
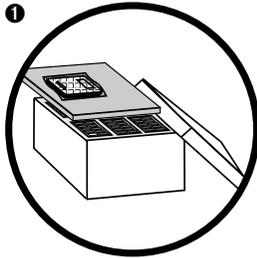
Grounded wrist straps should be worn during all stages of drive handling to avoid Electrostatic Discharge (ESD) that can permanently damage the drive.



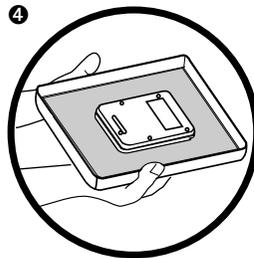
- ❶ A grounded wrist strap must be worn when handling drives to eliminate static.
- ❷ Verify daily that the wrist strap is working.
- ❸ The wrist strap must fit snugly and be in direct contact with the skin.

Handling the Drive

Drives are extremely sensitive and should be handled with care.



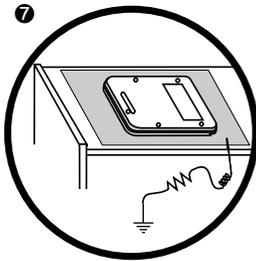
- 1 2** Never place the drive on the packaging foam unless the drive is in the shielded anti-static bag.



- 3** Hold the drive by the sides only (preferably PCBA side down). Do not touch the circuit board components or connectors.
- 4** Transport drive in a padded tray carrier whenever possible.



- 5 Never stack drives(s) upon drive(s).
- 6 Never place any object(s) on top of the drive.

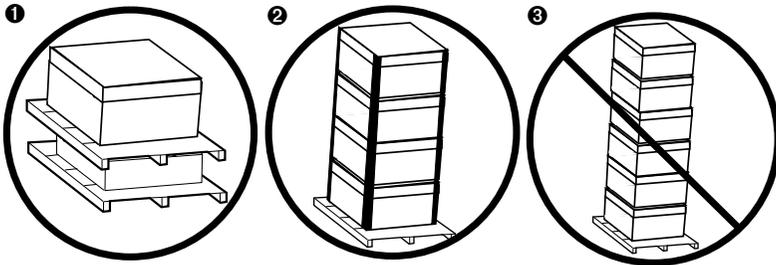


- 7 Gently place the drive horizontally (preferably PCBA side down) on a flat surface so it won't topple over. For more information, refer to the drop height table in the appendix.

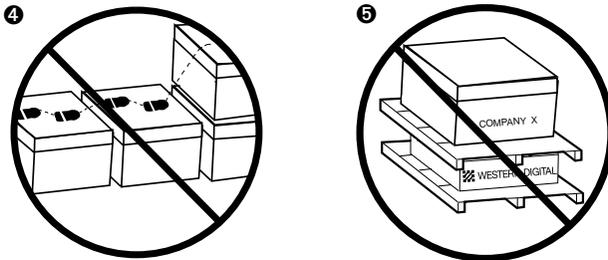
Section 2 – Receiving

Handling the Shipping Container

Examine the shipping container for obvious signs of shipping damage (excessive moisture, holes, crushed corners, etc.). Notify the carrier if shipping damage has occurred. You are entitled to issue a claim against the carrier to recover costs associated with damaged product.



- ❶ Stack no more than two pallets high.
- ❷ ❸ Stack individual boxes no more than four high unless they are supported with corner stiffeners. (Eight high maximum with corner stiffeners.)

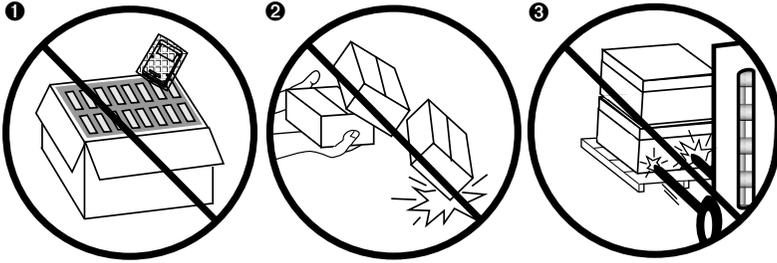


- ❹ Never walk on top of the shipping container.
- ❺ Do not stack Western Digital and non-Western Digital pallets on top of each other.

Note: Leave corner stiffeners in place in case pallet stacking is needed. It is preferred that pallets are not stacked.

Transporting the Shipping Container

Ensure that the shipping containers are protected from shock and vibration when using carts, trolleys, or other equipment for transport from one area to another.



- ❶ Do not unpack the container prior to drive testing or installation.
- ❷ Take care not to drop the shipping containers.
- ❸ Avoid puncturing the shipping containers with a forklift.

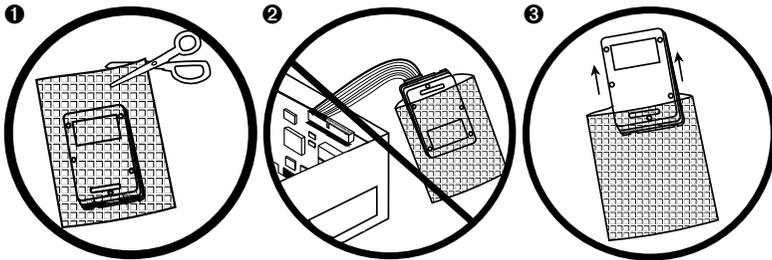
Section 3 – IQC/Drive Pre-test/Kitting

In addition to the information provided here, please refer to Section 1 and follow the procedures for:

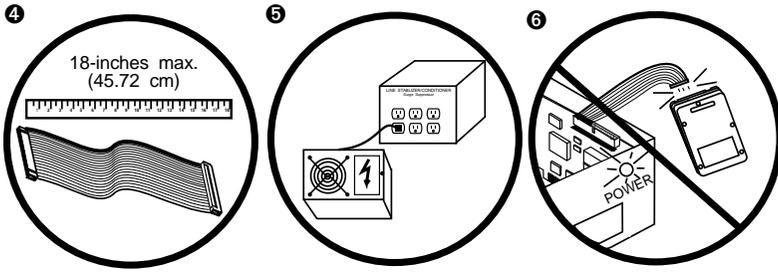
- ESD Protection
- Wrist Straps
- Handling the Drive

Test Procedure Precautions

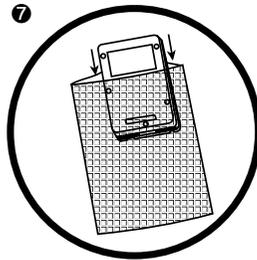
Allow the drives enough time to reach room temperature before testing. See the temperature stabilization chart in the appendix. Do not place drives on an ESD bag when testing. The ESD bag is conductive and could cause damage to the drive when applying power to it.



- ❶ Open the shielded anti-static bag close to the heat seal so that the bag can be reused. (Fold the top of the bag over to reuse.)
- ❷ Do not test the drive while it is still in the shielded anti-static bag.
- ❸ Remove the drive from the shielded anti-static bag for testing.



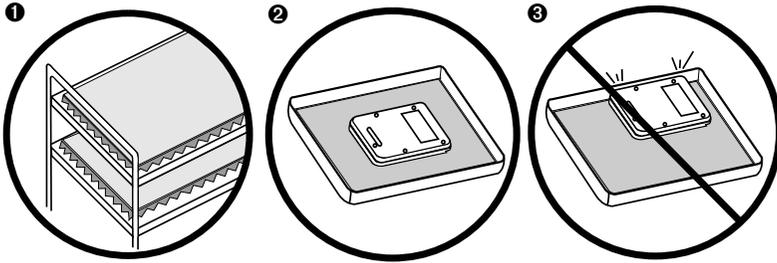
- 4 Verify that the IDE cable length is no longer than 18 inches (45.72 cm).
- 5 Test stations must provide "clean" power. Always plug the power supply into a surge suppressor. See "Power Supply Requirements" in the appendix.
- 6 Do not connect or disconnect the drive cables while system power is turned on.



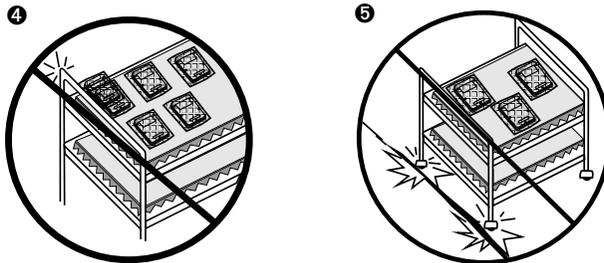
- 7 Return the drive to the shielded anti-static bag after testing.

Transporting the Drives

Ensure that the drives are protected from shock and vibration when using carts, trolleys or other equipment for transport from one area to another.



- ❶ Use anti-static foam padding on all transportation surfaces. Refer to "ESD Table Top Protective Padding" in the appendix.
- ❷ ❸ Transport the drive in a padded tray carrier. Do not let the drive bump into the sides of the padded tray carrier.

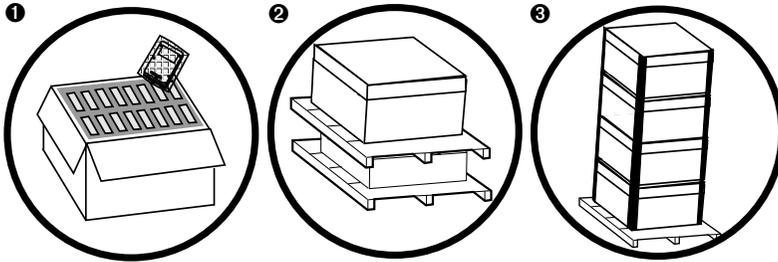


- ❹ Never let drives bump the sides of the cart.
- ❺ Do not roll carts carrying drives over large cracks or cords. Ensure cart paths are free of debris.

Repacking the Drives

Special care must be taken when repacking all drives.

"Bad" or "rejected" drives must be handled just as if there is nothing wrong with them. They must be repackaged into complete Western Digital approved packaging for return. If you do not have approved packaging, ask your purchasing agent to contact the local Western Digital representative.



- ❶ **Always** put the drive in a shielded anti-static bag before placing it into a shipping container. **Gently** place the ESD protected drive into the original or Western Digital approved container.
- ❷ Stack no more than two pallets high.
- ❸ Stack individual boxes no more than four high unless they are supported with corner stiffeners. (Eight high maximum with corner stiffeners.)

Note: Leave corner stiffeners in place in case pallet stacking is needed. It is preferred that pallets are not stacked.

Section 4 – Assembly

In addition to the information provided here, please refer to Section 1 and follow the procedures for:

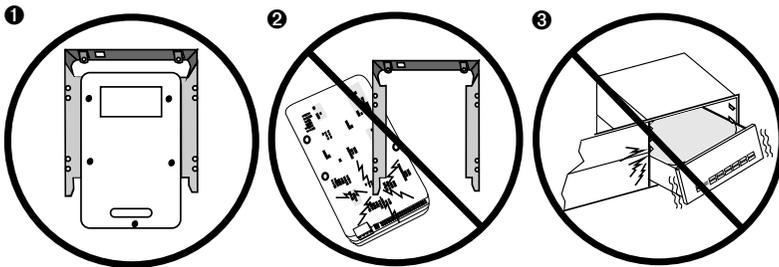
- ESD Protection
- Wrist Straps
- Handling the Drive

Drive Installation/Tool Considerations

All work areas and transportation surfaces must be covered with padded anti-static mats during drive handling. All padded surfaces (other than transportation surfaces), must be covered with "grounded" anti-static mats.

Ensure that all assembly tools are properly maintained and calibrated. Always use the hardware specified in the Western Digital drive technical reference manuals or installation guides. Contact Western Digital to receive the most current documentation. For screw torque specifications see the appendix or the appropriate drive documentation.

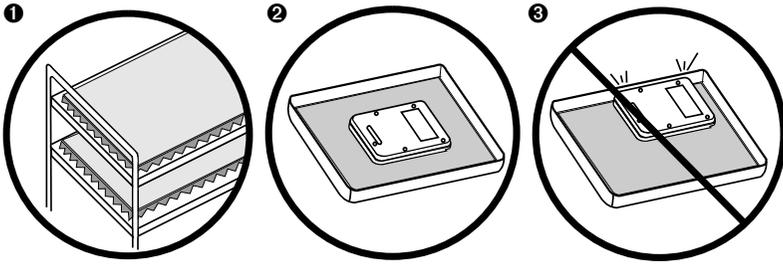
Only use power screwdrivers with low-impact torque drivers. See the appendix for recommended low-impact torque screwdrivers.



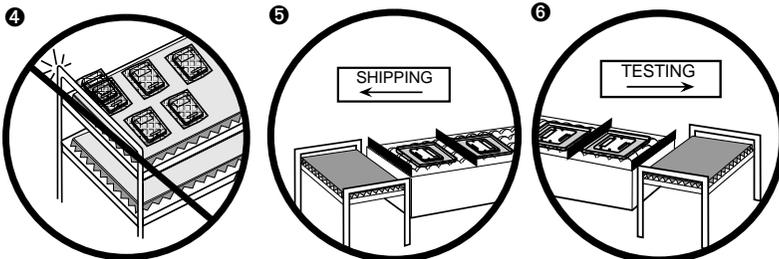
- 1 2** Assembly frames or brackets must not short PCBA or induce mechanical stress to drives.
- 3** Avoid impact and vibration of drive and drive bracket assembly during assembly and installation.

Transporting the Drives in the Assembly Area

Ensure that the drives are protected from shock and vibration when using carts, trolleys or other equipment for transport from one area to another.



- ❶ Use anti-static foam padding on all transportation surfaces. Refer to "ESD Table Top Protective Padding" in the appendix.
- ❷ ❸ Transport the drive in a padded tray carrier. Do not let the drive bump into the sides of the padded tray carrier.

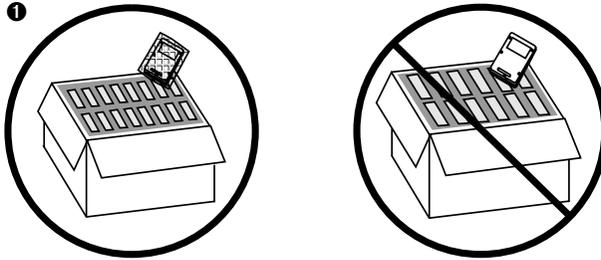


- ❹ Never let drives bump the sides of the cart.
- ❺ ❻ Use rubber bumpers at end stops and between drive trays/carriers of push-line frames.

Repacking the Drives

Special care must be taken when repacking all drives.

"Bad" or "rejected" drives must be handled just as if there is nothing wrong with them. They must be repackaged into complete Western Digital approved packaging for return. If you do not have approved packaging, ask your purchasing agent to contact the local Western Digital representative.



- ❶ **Always** put the drive in a shielded anti-static bag before placing it into a shipping container. Gently place the ESD protected drive into the original or Western Digital approved container.

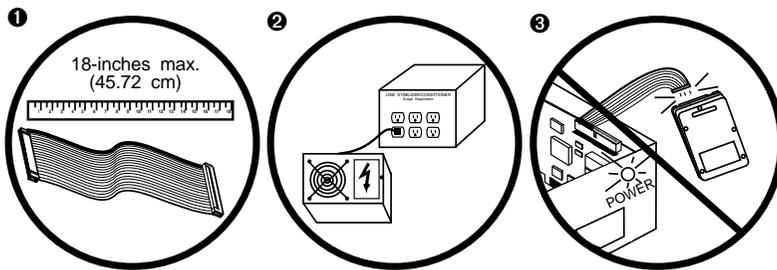
Section 5 – System Burn-in/Test

In addition to the information provided here, please refer to Section 1 and follow the procedures for:

- ESD Protection
- Wrist Straps
- Handling the Drive

Test Procedure Precautions

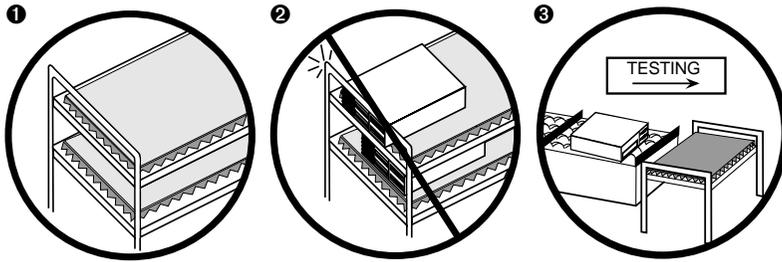
Keep in mind that a drive in a system requires the same care as an unpacked drive. Padded test work areas and padded shelving must be used for the system as well as the drive.



- ❶ Verify that the IDE cable length is no longer than 18 inches (45.72 cm).
- ❷ Test stations must provide "clean" power. Always plug the power supply into a surge suppressor. See "Power Supply Requirements" in the appendix.
- ❸ Do not connect or disconnect the drive cables while system power is turned on.

Transporting the Systems

Ensure that the drives are protected from shock and vibration when using carts, trolleys or other equipment for transport from one area to another.

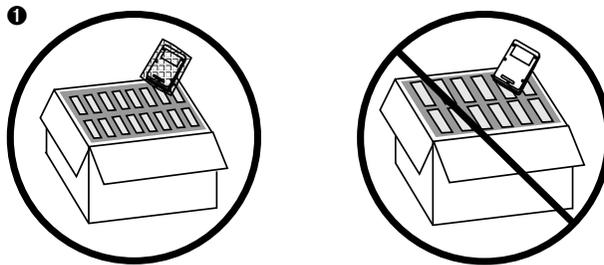


- ❶ Use anti-static foam padding on all transportation surfaces. Refer to "ESD Table Top Protective Padding" in the appendix.
- ❷ Never let the systems bump against anything.
- ❸ Use rubber bumpers at end stops and between systems on push-line frames.

Repacking Drives for Return to Western Digital

Take special care when repacking drives.

"Bad" or "rejected" drives must be handled as if nothing is wrong with them. They must be repackaged in complete, Western Digital approved packaging for return. If you do not have approved packaging, ask your purchasing agent to contact the local Western Digital representative. See Section 6 for additional drive return information.



- ❶ **Always** put the drive in a shielded, anti-static bag before placing it into a shipping container. **Gently** place the ESD protected drive into the original or approved container.

Section 6 – Packaging/Drive Returns

Packaging Test Standards

System level packaging and shipping should comply with the National Safe Transit Association (NSTA), the American Society for Testing and Materials (ASTM), or international equivalents.

As a guideline, it is recommended to provide a 50 percent margin in the packaging design. The assembled product in its shipping container should be tested to one of the following packaging test standards.

American Society for Testing and Materials (ASTM)
Procedure: ASTM D 775 - 80
1916 Race Street
Philadelphia, Pennsylvania 19103

National Safe Transit Association (NSTA)
Project 1A (Over 100 lbs use Project 1)
625 N. Michigan Avenue
Chicago, Illinois 60611

Drive Returns

Drives require careful packaging to protect against Electrostatic Discharge (ESD) and shipping damage. Return the drives in the original containers with shielded anti-static bags. Damage due to neglect or shipping will void the drive's warranty and the drive will be returned unrepaired.

Drives authorized by Western Digital to be returned for "credit only" may be shipped freight collect to Western Digital as long as an authorized shipping carrier is used. If the customer does not use a Western Digital assigned freight carrier, the customer will be responsible for inbound freight charges.

For more specific details please refer to the current Western Digital RMA Procedure manual or contact your sales representative.

Appendix

Power Supply Requirements

VOLTAGE	RIPPLE	FREQUENCY
+12 VDC \pm 5%	200 mV (peak to peak) max.	0 to 20 MHz
+5 VDC \pm 5%	100 mV (peak to peak) max.	0 to 20 MHz

It is recommended that the power supply have a current rating for each output that is 5 percent greater than the maximum requirements of the drive in use.

Recommended Drive Mounting Screw Torque

6 lbf-inch (minimum) to 8 lbf-inch (maximum)

Examples of Low-Impact Torque Screwdrivers

MANUAL SCREWDRIVERS	Model 12LTDH-A Mountz Inc. 1080 North 11th Street San Jose, CA 95112 (408) 292-2214 (800) 538-3931 from outside California
ELECTRIC SCREWDRIVERS	Model S5X2A-750 Desoutter Inc. 4780 Chino Avenue, Unit E Chino, CA 91710 (714) 590-7844

Examples of ESD Padding and Information Service

<p>ESD PROTECTIVE PADDING ApacheStat Techpad (P/N 54-350-0500) 1/4-inch Pad</p> <p>STATICIDE SPRAY ACL Heavy Duty Staticide Spray (P/N 01-2005) (Recommend use on ESD table top)</p>	<p>SVS 377 South Daniel Way San Jose, CA 95128 (408) 241-2300</p>
<p>ESD CONTROL ANALYST</p> <p>ESD SHIELDED ANTI-STATIC BAG (P/N 2100 or 2100E)</p>	<p>3M 6807 Riverplace Blvd. Austin, Texas 78726 (800) 328-1368</p>

Temperature Stabilization Chart

Move the drive shipping containers into the testing area and allow time for the drives' temperature to stabilize before unpacking. Unpacking drives at or below 50° F (10° C) can result in damage due to condensation. Use the following chart as a guideline.

OUTSIDE/STORAGE TEMPERATURE	HOURS REQUIRED BEFORE UNPACKING/TESTING
+ 40° F + 4.44° C	13
+ 30° F - 1.11° C	15
+ 20° F - 6.67° C	16
+ 10° F - 12.22° C	17
0° F - 17.78° C	18
- 10° F - 23.33° C	20
- 20° F - 28.89° C	22
- 30° F - 34.44° C	27

ESD Voltages Generated by Common Materials and Actions

MEANS OF ESD GENERATION	ESD VOLTAGES	
	10 to 20 Percent Relative Humidity	65 to 90 Percent Relative Humidity
Walking across carpet	35,000	1,500
Walking over vinyl floor	12,000	250
Worker at bench	6,000	100
Common poly bag picked up from bench	20,000	1,200
Work chair padded with polyurethane foam	18,000	1,500
Packing drives in foam lined box	21,000	1,200

Drop Height Table

The shock rating of a drive is typically 70 G's in a non-operational state. The following table depicts the drop height versus G's onto selected surfaces.

DROP HEIGHT IN INCHES	G's			
	Granite Surface	Concrete Floor	Formica Table	*Anti-Static Foam
.5	387	217	200	26
1.0	595	457	310	37
2.0	1,133	600	680	70
4.0	1,795	1,040	1,050	267

* 1/4-inch Apachestat Techpad Foam

Connector Mating Cycles

To avoid intermittent electrical connection problems, monitor and change the interface test cables on a regular basis. To maximize the number of reliable mating cycles, select extended life connectors where possible.

The following table shows connector life expectancy. Please note that these figures are just guidelines. Actual mating cycle life depends on specific connector materials, internal contact geometry, and other factors. Consult your connector vendor for specifications.

CONNECTOR PLATING AND CONFIGURATION	TYPICAL MATING CYCLE LIFE EXPECTANCY
Tin/Lead Plating	25 to 50 Connections
Standard Gold Plating (15 μ -40 μ inches)	100 to 200 Connections
* Extended Life with Thick Gold Plating (50 μ inches plus typical)	500 to 1000 Connections

* Typically only available directly from connector suppliers as special orders.