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**EZ5xx-Series  
Solid-State Disk Drive  
User's Guide**

**Model EZ51R**

**Model EZ54R**

**Model EZ58R**

**Document Order Number: EK-EZ5XX-UG. B01**

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This equipment generates, uses, and may emit radio frequency. The equipment has been type tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC rules, which are designed to provide reasonable protection against such radio frequency interference.

Any changes or modifications made to this equipment may void the user's authority to operate this equipment.

Operation of this equipment in a residential area may 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.

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# Contents

1	Introduction .....	1
2	Data Retention Description .....	2
2.1	Continuous Data Retention Feature .....	2
2.2	Restoring Data .....	2
2.3	Data Retention Cycle Specifications .....	3
3	SCSI Address and Options Selections .....	4
3.1	SCSI Bus Address Selection .....	4
3.2	LED Indicators .....	6
3.3	Remote Options .....	6
4	SCSI Bus Termination .....	8
5	Power Connections and Requirements .....	10
5.1	Power Requirements .....	11
6	EZ5xx-Series Preventive Maintenance .....	11
7	Removal and Replacement of the Battery Pack .....	12
7.1	Disposing of the Battery .....	15
7.2	Charging the Battery .....	15
8	Back Up of Data .....	15
9	Summary of Specifications .....	16

## Figures

1	SCSI ID Pin Numbers .....	5
2	Connection of Remote Options .....	7
3	Termination Jumper Settings .....	9
4	Power Connections .....	10
5	Removing the Top of the Chassis on an EZ5xx-Series Solid-State Disk .....	13
6	Removing the Battery Pack of an EZ5xx-Series Solid-State Disk .....	14



# 1 Introduction

This user guide contains the information you need to configure and install the following Electronic Storage Products SCSI solid-state disk drive models:

- EZ51R is a 5.25-inch model with a formatted capacity of 106.9 megabytes, with data retention, and a single-ended SCSI-2 interface.
- EZ54R is a 5.25-inch model with a formatted capacity of 427.7 megabytes, with data retention, and a single-ended SCSI-2 interface.
- EZ58R is a 5.25-inch model with a formatted capacity of 855.3 megabytes, with data retention, and a single-ended SCSI-2 interface.

Be sure to read this user guide thoroughly, including all caution and warning notes, before unpacking or handling the drive, or attempting installation.

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## CAUTION

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Handle the disk drive with care. Observe antistatic precautions. Static electricity can damage integrated circuits. Always use a properly grounded wrist strap and antistatic pad when removing the disk drive from its antistatic bag and handling it outside the bag.

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Note that the expressions *EZ5xx* and *EZ5xx drives* are used occasionally in this document to refer to all three solid-state disk drive models: EZ51R, EZ54R, and EZ58R.

## 2 Data Retention Description

### 2.1 Continuous Data Retention Feature

Unlike Digital's earlier ESE20 and ESE50 solid-state disks, each of these solid-state drives continuously move modified data to its internal data-retention disk. This minimizes the amount of data that must be saved under battery power and assures that the data retention disk is still functional. Continuous data retention is performed as a low-priority, background task of the EZ5xx internal firmware that minimizes the effect of saving data on performance.

Upon a power failure, the EZ5xx drives instantly switch over to battery power. Within one minute, EZ5xx firmware detects that external power has failed. This firmware then write-protects the EZ5xx, preventing further data changes. Saving data to the internal data-retention disk continues under battery power until all contents of the memory arrays are safely on the internal data-retention disk.

Then the EZ5xx shuts itself off to conserve battery power. Although continuously saving data dramatically decreases the time needed to completely save all data, the fully charged battery has sufficient power to completely save the contents of the arrays to the internal data-retention disk. While saving data under battery power, the yellow Write-Protect LED is on and the green Run/Ready LED blinks once per second. (These LEDs are also described in Section 3.2, and their location is shown in Figure 3.)

### 2.2 Restoring Data

When power is restored, the EZ5xx undergoes approximately two minutes of power-on self-test (POST), which verifies the integrity of the electronics and the firmware.

After POST, the EZ5xx is available for mounting and begins restoring data to the memory arrays. While restoring data in the offline state, the green Run/Ready LED blinks twice per second.

After mounting, user requests from the host receive top priority and are satisfied before restore requests. If a user requests data that has not been restored yet, the EZ5xx fetches the data from the internal data-retention disk and returns the data to the user.

## 2.3 Data Retention Cycle Specifications

The following table shows data retention cycle specifications.

Drive	Maximum Save Time <sup>1</sup>	Minimum Number of Full Save Cycles
EZ51R	2 minutes	15 cycles
EZ54R	8 minutes	3 cycles
EZ58R	16 minutes	1 cycle

<sup>1</sup> These are worst-case times. Actual save times are dependent on workload throughput and in most cases will be significantly less, due to the EZ5xx continuous data retention feature.

### Note

The table shows the minimum number of full save cycles that can occur in a 24 hour period with a fully-charged battery and with no battery recharging between save cycles.

*EZ5xx drives incorporate NiCAD batteries as an integral part of the data retention system. These batteries may discharge during storage and at times when the unit's power is removed for more than one month. The EZ5xx drives will write-protect automatically when the battery charge-level is insufficient for saving data completely. Upon initial receipt of the unit, you may find the device is write-protected because of insufficient battery charge-level. It is recommended that an EZ5xx drive be powered on for a minimum of four hours before operating.*

EZ5xx drives employ a fast-charge battery charge circuit. The battery charger is capable of replacing 90% of a full discharge in four hours. After the batteries are charged, the battery charger trickle-charges the batteries to maintain the charge-level while power is applied.

### **3 SCSI Address and Options Selections**

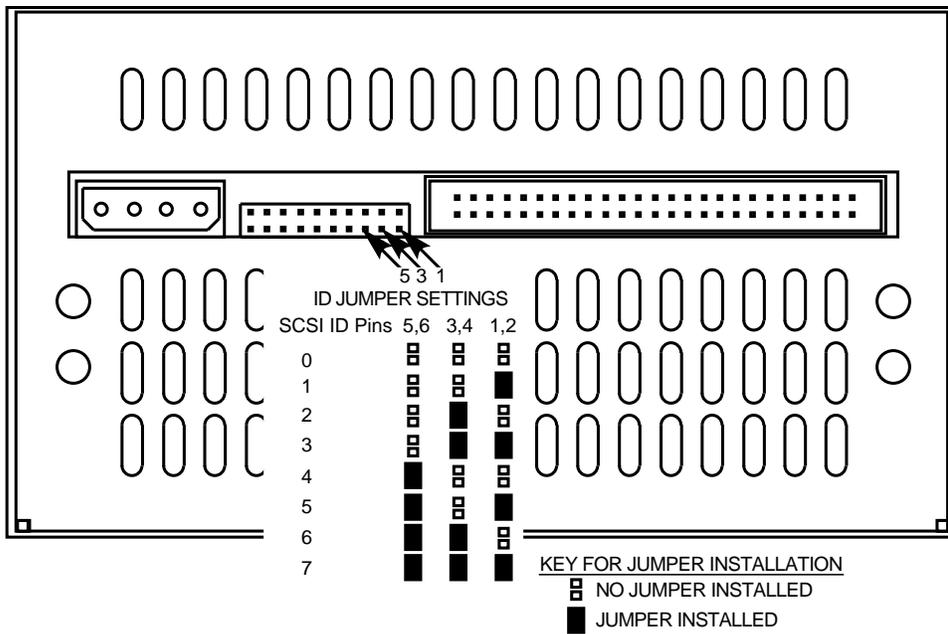
These solid-state disk drives have option connectors for setting the SCSI address and various operating options. These operating options are described in the following sections. The connector is normally used in conjunction with jumpers which are supplied. The jumpers are placed in the connector to select the desired SCSI address and operating options.

Connector and various jumper placements are shown in the figures that follow.

#### **3.1 SCSI Bus Address Selection**

Three pairs of pins on the option connector, shown in Figure 1, set the disk drive's address on the SCSI bus. The drive accepts addresses 0 through 7. You must assign a unique address to each device on a SCSI bus. Typically, the first drive on the bus is assigned address 0, the second drive address 1, and so on. SCSI address 7 is usually reserved for the host adapter.

**Figure 1 SCSI ID Pin Numbers**



## 3.2 LED Indicators

The disk drive has the following two surface-mounted LED indicators:

- Busy (BSY), which is green, indicates that the drive is working on a SCSI command. It is not equivalent to the SCSI BSY signal.
- Fault (FLT), which is yellow, indicates a drive fault condition.

It is normal for both LEDs to light briefly during power on. (These LEDs are also described in Section 2.1, and their location is shown in Figure 3.)

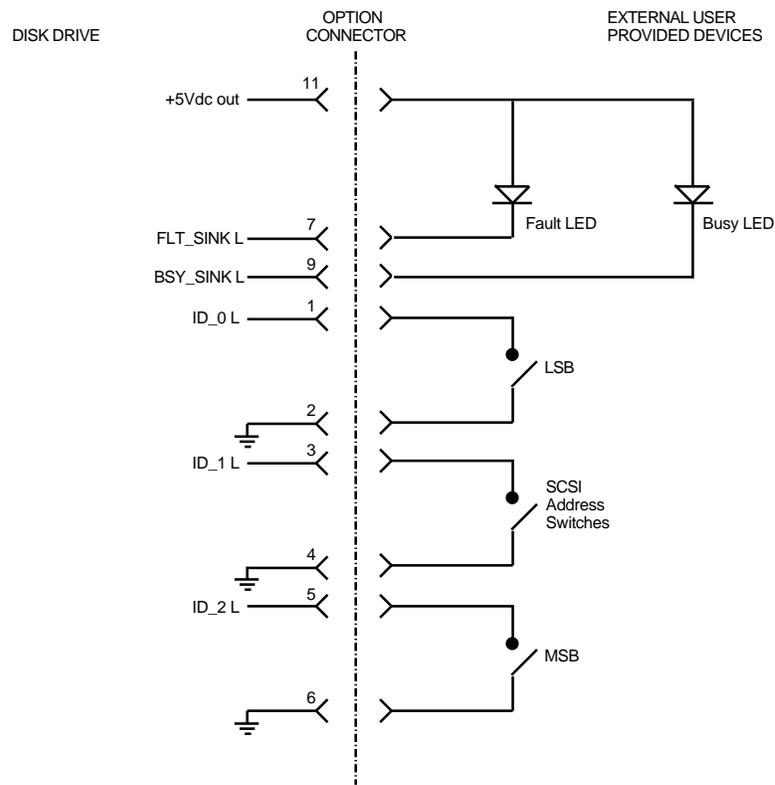
## 3.3 Remote Options

You can also use the option connector to connect the drive for various remote capabilities when the necessary user-provided facilities are available. Remote options include:

- SCSI address selection from external switches; for example, from an operator control panel.
- Busy and Fault conditions monitoring, using external LED indicators instead of those on the drive.

Figure 2 shows the proper connection of remote options.

**Figure 2 Connection of Remote Options**



## 4 SCSI Bus Termination

Figure 3 shows the proper jumper arrangement for each terminator power configuration. As defined in the illustration:

- The jumpers determine the source of the active termination power.
- The Active Termination Switch determines whether or not the EZ5xx is the last device on the SCSI bus.

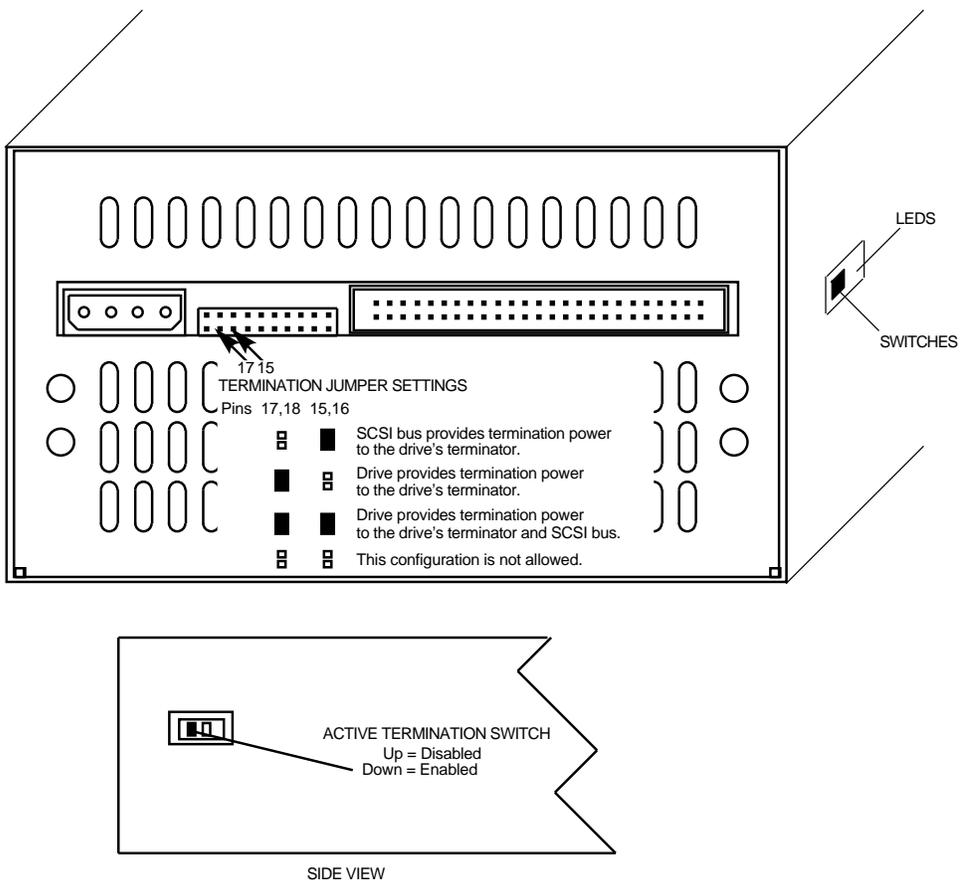
An EZ5xx drive uses an active termination device. Termination power must always be applied to this device, whether or not the EZ5xx drive is terminating the SCSI bus (that is, whether or not the EZ5xx drive is the last device on the SCSI bus). This means you must select one of the three jumper settings shown in Figure 3.

In addition, you must choose the appropriate setting for the Active Termination Switch shown in Figure 3. Set the switch as follows:

- Down (enabled) if the EZ5xx is the last device on the SCSI bus
- Up (disabled) if the EZ5xx is not the last device on the SCSI bus

Note that the third set of jumper settings shown in Figure 3 is rarely used. It is used only when you need to provide termination power to both the drive and to the SCSI bus.

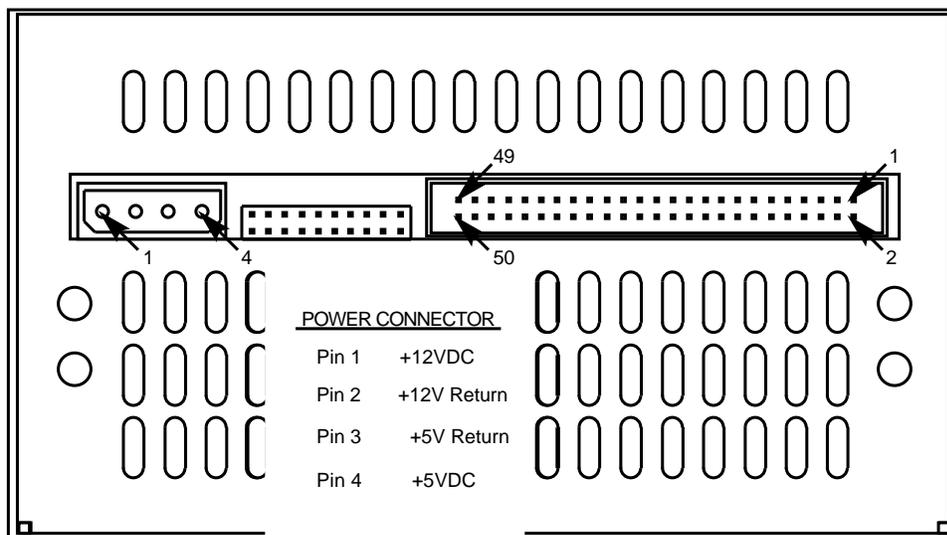
**Figure 3 Termination Jumper Settings**



## 5 Power Connections and Requirements

Each disk drive requires +5 V dc and +12 V dc which is supplied from an external source by means of the 4-pin power connector of the drive. Refer to the table in Section 5.1 for more detailed information.

Figure 4 Power Connections



## 5.1 Power Requirements

Voltage and regulation	+5 V dc +/- 5% +12 V dc +/- 5% (+/- 6% during spin-up)
Ripple and noise	+5 V dc: <100 mv p-p +12 V dc: <200 mv p-p

Average current and power	Typical EZ51R	Typical EZ54R	Typical EZ58R
+5 V dc current	— <sup>1</sup>	— <sup>1</sup>	— <sup>1</sup>
+12 V dc current	1.10 A	1.40 A	2.05 A
Total power	13.2 W	16.8 W	24.6 W

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<sup>1</sup> These drives derive operational power from +12 V dc current. The +5 V dc is still needed; it is used for SCSI Termpwr.

## 6 EZ5xx-Series Preventive Maintenance

The EZ5xx drives require no preventive maintenance. (Occasionally, a user may need to replace the battery pack, as described in Section 7.)

## 7 Removal and Replacement of the Battery Pack

Remove the battery pack as follows:

1. With the controller module connectors facing you, as shown in Figure 6, place the chassis on its bottom. The slot for the cable connectors should be toward the top of the chassis (Figure 5).
2. Remove the screws located on each side of the top of the chassis (Figure 5). Put the screws aside.
3. Remove the top of the chassis (Figure 5) and set it aside.
4. Disconnect the battery connector from the battery harness connector (Figure 6).

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### Caution for Next Step

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Do not open screw all the way, or the battery holding bracket will disassemble.

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5. **Loosen** the holding screw located on the right side of the chassis until you are able to gently pull the battery pack out of the chassis (Figure 6).
6. Reverse the procedure to install a new battery pack.

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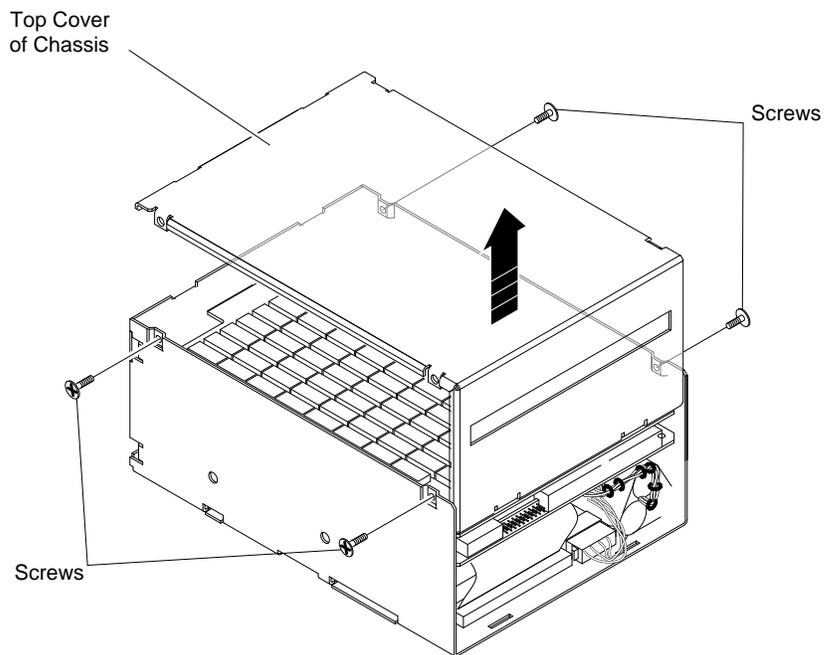
### Note

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The battery temperature must be stable or declining before the battery is installed into the unit. The battery temperature should be within its operating range; that is, 10°C (50°F) to 40°C (104°F). Longer charge times will result if the battery temperature is outside this range. (Batteries should never be left in direct sunlight while being transported in vehicles.)

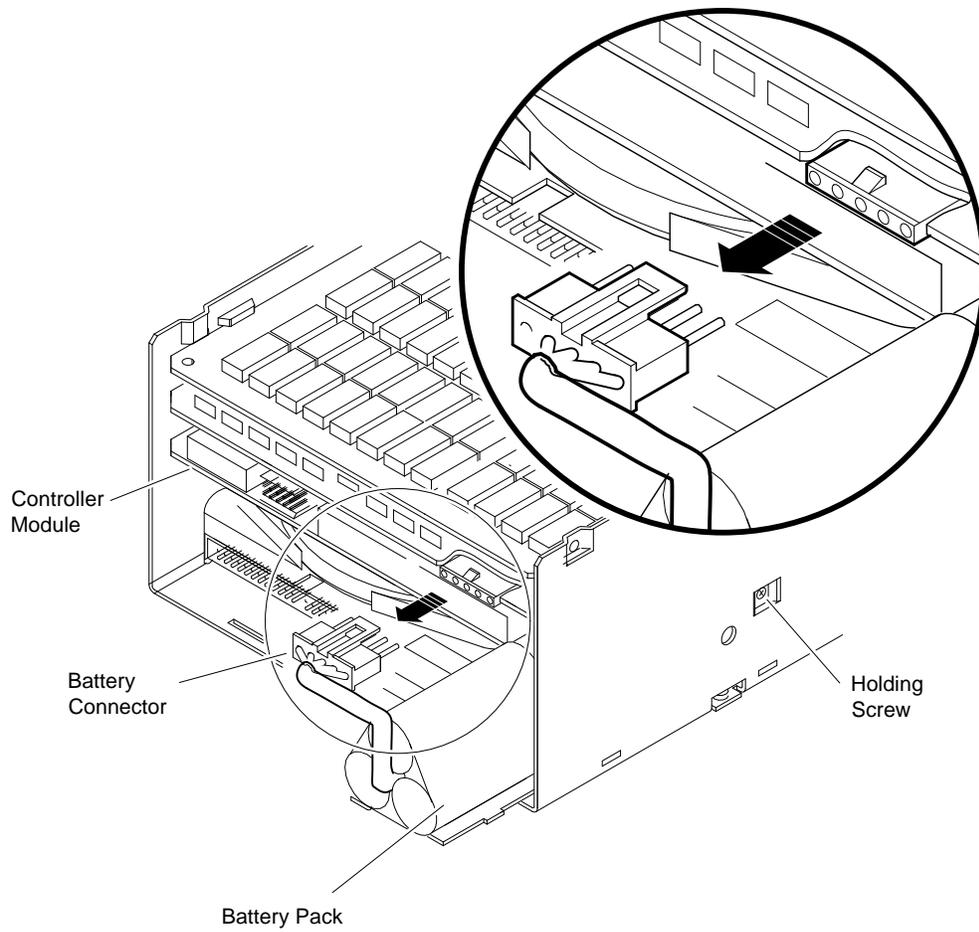
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**Figure 5 Removing the Top of the Chassis on an EZ5xx-Series Solid-State Disk**



MLO-0011380

**Figure 6 Removing the Battery Pack of an EZ5xx-Series Solid-State Disk**



## 7.1 Disposing of the Battery

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**WARNING**

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It is important that faulty batteries be carefully disposed of after removal.

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Send the batteries to one of the following addresses:

- In the United States:

PDC (Property Disposal Center)  
Digital Equipment Corporation  
RR # 2 P.O. Box 69  
Contoocook, NH 03229-9210

- In Europe:

Digital Equipment Corporation Parts Center BV  
15 St. Teunismolenweg  
NL-6503, Nijmegen  
The Netherlands

## 7.2 Charging the Battery

The battery is shipped fully discharged. Replaced batteries must be allowed four hours to charge up before the unit can be considered nonvolatile and capable of supporting a full save operation.

## 8 Back Up of Data

Although the EZ5xx provides a data retention feature, it is the user's responsibility to protect data through the same types of backup procedures used for hard disk drives. The EZ5xx drives should be treated as any other master media in this regard, and included in regular system and site back ups.

## 9 Summary of Specifications

This section shows the specifications for the EZ5xx-series solid-state drives.

### Disk Drive Functional Specifications

Characteristics	EZ51R	EZ54R	EZ58R
Interface	SCSI_2	SCSI_2	SCSI_2
Formatted Storage (Mbytes)	106.9	427.7	855.3
Sector capacity (bytes)	512–520	512–520	512–520
Transfer rate (to/from media — Mbytes/s)	6.9	6.9	6.9
Transfer rate to bus (synchronous — Mbytes/s)			
Normal mode	5.0	5.0	5.0
Fast mode	10.0	10.0	10.0

### Environmental Specifications

Characteristic	Operating Specifications	Nonoperating Specifications
Ambient temperature	10°C to 40°C (50°F to 104°F)	-40°C to 66°C (-40°F to 151°F)
Maximum wet bulb (noncondensing)	25.6°C (78°F)	46°C (115°F)
Relative humidity	10% to 90%	8% to 95%
Altitude	2,500 m (8,000 ft)	4,878 m (16,000 ft)

## Capacity and Geometry Specifications

### Specifications

<b>Formatted Capacity</b>	<b>EZ51R</b>	<b>EZ54R</b>	<b>EZ58R</b>
Sector capacity <sup>1</sup> (bytes)	512–520	512–520	512–520
Sector capacity (Mbytes)	106.9	427.7	855.3
Drive Capacity	208800	835300	1670600
Reserved Sectors	64	220	568
<b>Geometry</b>	<b>EZ51R</b>	<b>EZ54R</b>	<b>EZ58R</b>
Unit Size	208800	835300	1670600
Spindles	0	0	0
Cylinders	4176	16706	33414
Groups/Cyl	1	1	1
Tracks/Groups	1	1	1
Sectors/Tracks	50	50	50

<sup>1</sup>Supported Sectors are 512, 516, 518, 520 bytes.

### Single-Ended SCSI 50-Pin Connector Pin Assignments

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
2	-DB (0)	16	-DB (7)	30	GROUND	42	-MSG
4	-DB (1)	18	-DB (P)	32	-ATN	44	-SEL
6	-DB (2)	20	GROUND	34	GROUND	46	-C/D
8	-DB (3)	22	GROUND	36	-BSY	48	-REQ
10	-DB (4)	24	RESERVED	38	-ACK	50	-I/O
12	-DB (5)	26	TERMPWR	40	-RST		
14	-DB (6)	28	RESERVED				

**Notes:**

1. All odd numbered pins (except pins 23,25,27) must be connected to ground.
2. Pin 25 should be left open.
3. Pin 26 (SCSI\_TERMPWR) is reserved for terminator resistor power source.
4. The minus sign indicates an active low signal.

