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# ***DAT Drive***

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- Reorient or relocate the receiving antenna.
- Increase the separation between the computer and the receiver.
- Connect the computer into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

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## Introduction

This installation manual gives you information about installing Seagate Digital Audio Tape (DAT) drives. The range of DAT drives covered in this manual support the Digital Data Storage (DDS), Digital Data Storage Data Compression (DDS-DC), and Digital Data Storage-2 (DDS-2) tape formats.

The following table identifies the various models of DAT drives covered by this manual and the formats that they support.

<i>Parameter</i>	<i>DDS</i>	<i>DDS-DC</i>	<i>DDS-2</i>
<b>Capacity</b>	2.0 GB	2.0/4.0 GB*	4.0/8.0 GB*
<b>3.5-in internal</b>	4320NT CTD2004H-S STD12000N	4324NP CTD4004H-S STD14000N	4326NP CTD8000H-S STD18000N
<b>5.25-in internal</b>	4320RT CTD2004R-S STD22000N	4324RP CTD4004R-S STD24000N	4326RP CTD8000R-S STD28000N
<b>External</b>	4350XT CTD2004E-S STD62000N	4324XP CTD4004E-S STD64000N	4326XP CTD8000E-S STD68000N

\*Typical with data compression

## Before You Begin (Internal Models Only)

Keep the following guidelines in mind as you install the unit:

- To protect the internal drive from static electricity, DO NOT remove it from the antistatic bag until you are ready to install it.
- Before you remove the drive from the antistatic bag, touch a grounded metal surface to discharge any static electricity buildup from your body.



**Caution: If you touch static-sensitive parts of the drive, such as the printed circuit board, and discharge static electricity, the components may be damaged.**

- Hold the drive by its edges only and avoid direct contact with any printed circuit board exposed.
- Lay the drive only on top of the anti-static bag or return it to the bag when you need to lay it down.

## ***Cabling and Connectors***

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These DAT drives support connection to a standard, single-ended SCSI or SCSI-2 interface. Either a 50-conductor flat cable or 25-signal twisted-pair cable with a maximum length of 6 meters (19.5 feet) may be used to connect the drive to its SCSI host adapter output.

### **Single-Ended SCSI Connector-Internal Models**

The internal drives provide a 50-pin, right-angle, dual-row connector on the main PCB at the rear of the unit.

### **Single-Ended SCSI Connector-External Models**

The external drives provide two 50-pin, shielded connectors (ANSI Alternative 2) on the rear panel of the drive. These connectors consist of two rows of ribbon contacts spaced 2.16 mm (0.085 in) apart.

These two connectors facilitate adding the drive to a daisy-chain configuration. Either connector is a “SCSI IN” connection; the other is a “SCSI OUT” connection. When the drive is the last device in the chain (or the only device), an external terminator must be plugged in the “SCSI OUT” connector. (Seagate P/N 38-9-7400000)

## ***Installing the Internal Models***

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In this manual, two types of drives are referenced—the 3.5-inch drive and the 5.25-inch drive, respectively. Installing these two types of drives consists of a few easy steps:

1. Configure options.
2. Mount the drive unit.
3. Complete the power and interface connections.

The installation procedure is the same for both types of drives except physically mounting the unit in the computer. The following text explains the installation steps for both types of drives.

## Configuring Options

You configure the drive options by setting switches or installing jumpers, as described in the following subsections.

If you do not wish to use the switch, set all switches to the off position, and configure the drive using the jumper block.

### **SCSI Device Address (S1 through S3)**

The three switches S1 through S3 correspond to the SCSI address identification bits 0 (LSB) through 2 (MSB) respectively. Set the switches to match your address. If using the DIP switch to set SCSI address, move jumpers for SCSI address on the jumper block to the OFF position.

### **Media Recognition System (NIRS) (S4)**

The S4 switch enables or disables Media Recognition System (MRS) mode. The default is MRS disabled (S4=ON). If S4 is ON, the drive reads or writes both MRS and non-MRS media. If S4 is OFF, the drive only writes to MRS media.

### **Parity Check Enable (S5)**

The S5 switch enables or disables parity checking for the SCSI bus. The default is parity disabled (S5=OFF).

### **DDS-Pass-Through Mode (S6)**

The S6 switch enables or disables DDS pass through mode. The default is DDS pass through mode disabled (S6=OFF). If using the DIP switch to set DDS-Pass-Through mode, move jumpers for DDS Pass-through on the jumper block to the OFF position.

S6=ON, enables pass through, (Data Compression disabled)

S6=OFF, disables pass-through, (Data Compression enabled) (DC models only.)

### **Reserved Switch (S7)**

The S7 switch is reserved and should be left in its factory default setting. (Off)

### **Power-on Self Test Mode (S8)**

The S8 Switch enables or disables execution of power-on self diagnostics when the power comes on. The default is power-on self-test mode disabled (S8=OFF). If ON, the drive responds to SCSI commands after successful completion of the test (about 5 seconds). If using the DIP switch to set power-on self-test mode, configure jumpers for power-on self-test on the jumper block to the OFF position.

## **Setting Operational Switches**

Set the switches before you install the drive in the computer.

The following configuration is the standard default setup:

- SCSI ID0
- The drive reads or writes both MRS and non-MRS 4-mm media.
- Parity checking is disabled.
- DDS-DC data compression is enabled. (**Applies only to models that support data compression**)
- The power-on self-test diagnostics of the drive are disabled.
- Terminator power is disabled.
- Active terminator is disabled.

Figure 1 illustrates the switchbank location for the 3.5-inch internal drive (view of the bottom of the drive). You access the switchbank through one of the rectangular cutouts depending on the model of the drive.

*Figure 1*  
*Switchbank Access-3.5-Inch Drive*

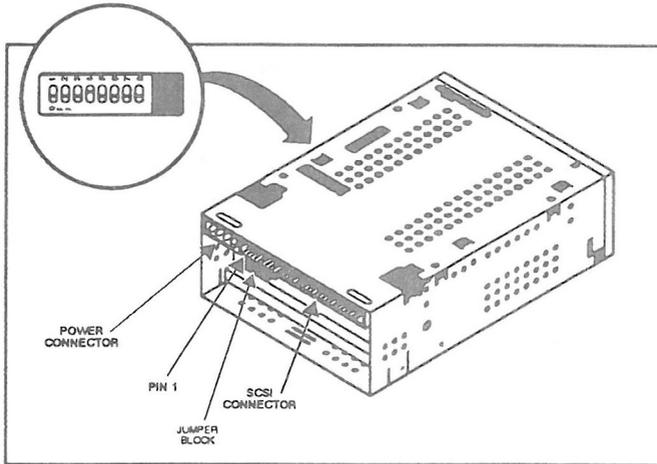


Figure 2 illustrates the switchbank location for the 5.25-inch internal drive (view of the bottom of the drive). You access the switchbank through one of the rectangular cutouts depending on the model of the drive.

*Figure 2*  
*Switchbank Access-5.25-Inch Drive*

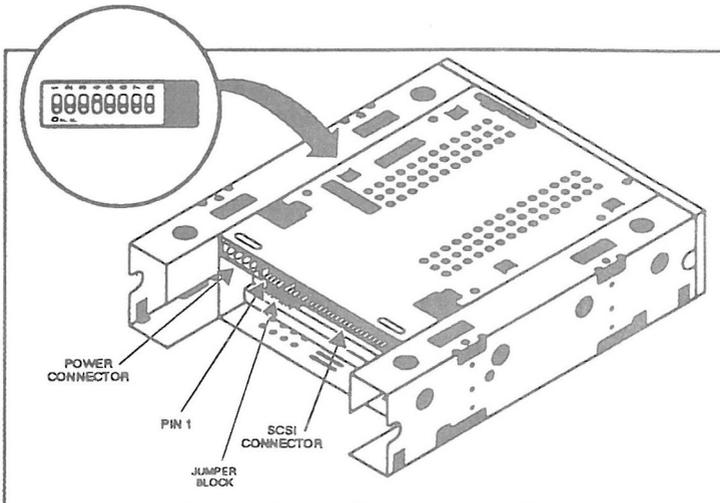
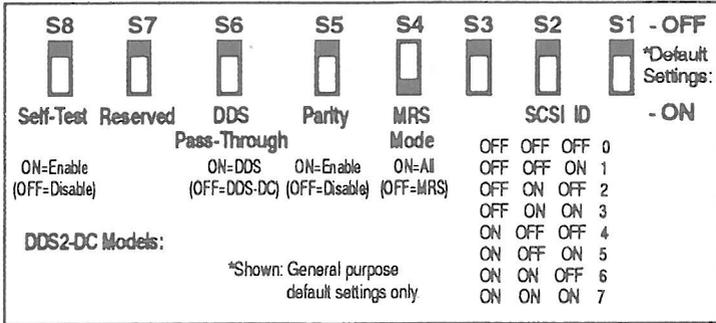


Figure 3 shows the default settings for the internal drives.

**Figure 3**  
**Dip Switch Default Settings**



► **Note:** The drive must be turned OFF then ON or a SCSI Bus Reset must be received in order for switch settings to take effect.

If the default settings are correct for your system, go to **Mounting the Drive Unit**.

If you need to change any default settings, refer to the appropriate following section; make the changes and then go to **Mounting the Drive Unit**.

### SCSI Device Address (S1 through S3)

The three switches S1 through S3 correspond to the SCSI device address identification bits 0 (LSB) through 2 (MSB), respectively. Figure 3 shows the switch settings for the eight possible SCSI device addresses. The default setting is SCSI address 0.

► **Note:** Each SCSI device on a bus must have a unique SCSI ID. The host controller usually uses ID 7.

### Media Recognition System (MRS)(S4)

The media recognition system allows the drive to detect DDS cartridges that support this feature. Use of non-DDS media might appear to give satisfactory results, but the inferior specifications of such media might cause data integrity problems.

The S4 switch enables or disables Media Recognition System (MRS) mode. If S4 is ON, the drive reads or writes both MRS and non-MRS 4-mm media.

If S4 is OFF, the drive only writes to MRS media but will read any kind of 4-mm media.

S4 = ON disables MRS (Default)

S4 = OFF enables MRS

### Parity Check Enable/Disable (S5)

The S5 switch enables or disables parity checking for the SCSI bus.

S5 = ON enables parity checking

S5 = OFF disables parity checking (Default)

When parity checking is disabled, parity is still generated by the drive.

### DDS Pass-Through Mode Enable/Disable (S6)

The S6 switch enables or disables DDS pass-through mode.

S6 = ON enables DDS pass-through mode  
(Data compression disabled)

S6 = OFF disables DDS pass-through mode  
(Default)  
(Data compression enabled)

The function of the S6 switch can be over-ridden by the proper SCSI **MODE SELECT** command issued from the host computer. Regardless of the position of S6, the **MODE SELECT** command can enable or disable data compression.

### Reserved Switch (S7)

The S7 switch is reserved and should be left in its factory default setting (OFF).

## Power-on Self-Test Mode Enable/Disable (S8)

The S8 switch enables or disables execution of power-on self-test diagnostics when the power comes ON. If ON, the drive will only respond to SCSI commands after successful completion of the test (about 5 seconds).

S8 = ON enables power-on self-test mode

S8 = OFF disables power-on self-test mode (Default)

## Configuring Jumpers

The configuration jumpers are used to control SCSI bus termination and terminator power. The jumpers can also be used for remote SCSI address selection. Figure 4 illustrates the location of the jumpers for the 3.5-inch drive.

*Figure 4*  
*Location of Jumpers for 3.5-Inch Drives*

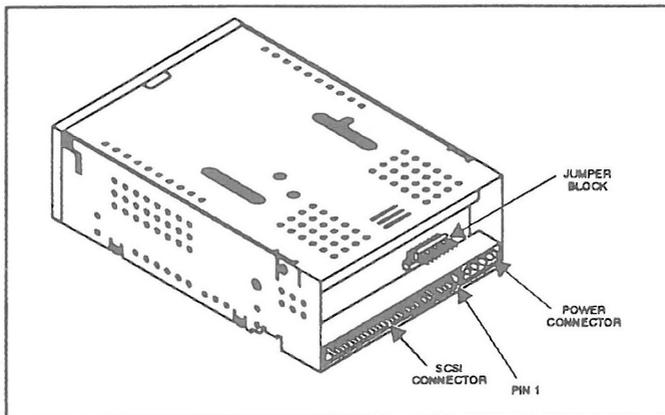
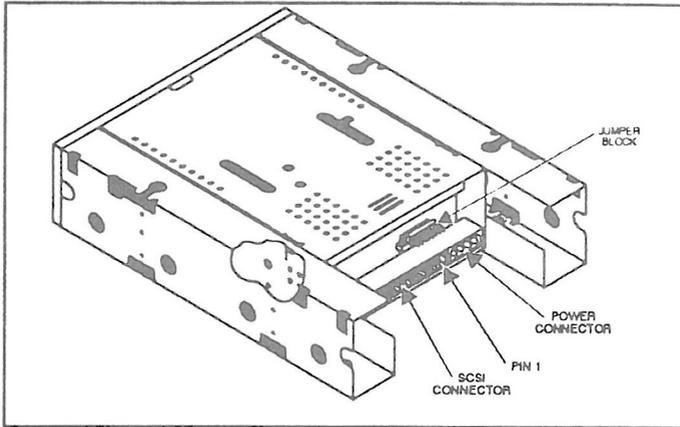


Figure 5 illustrates the location of the jumpers for the 5.25-inch drives

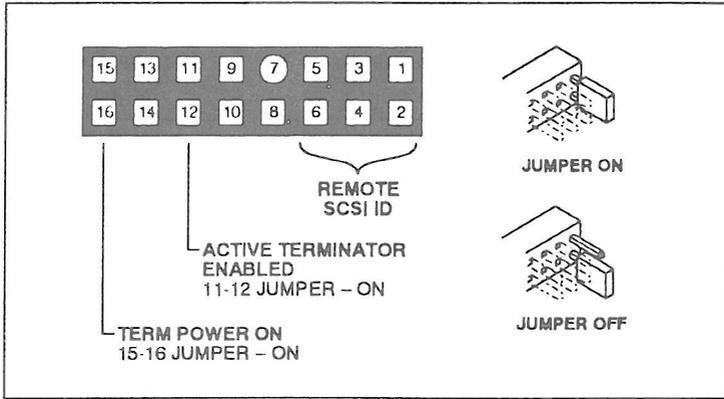
*Figure 5*  
*Location of Jumpers for 5.25-inch Drives*



## Remote SCSI Address Selection

You can use pins 1 through 6 to remotely select the SCSI address. To do so, install a remote SCSI ID switch and connect it to pins 1 through 6. Pins 1-2 configure bit 0; pins 3-4 configure bit 1; and pins 5-6 configure bit 2. If you use this method for ID selection, set switches S1 through S3 to the OFF position. (See Figure 3.) Figure 6 shows the jumper layout.

**Figure 6**  
**Jumper Configurations**



### Active Terminator

The active terminator option is disabled as the factory default. If you need enable active termination on the drive, place a jumper between pins 11 and 12.

- ▶ **Note:** You only need to enable the active terminator option if the drive is the only device on the SCSI bus or is the last device on the bus.

### Terminator Power

You can enable terminator power if needed for terminators or other SCSI devices through a jumper placement. The factory default for internal drives is with terminator power disabled (jumper over one pin). To enable terminator power, place the jumper over the two pins-15 and 16-as shown in Figure 6. Be sure the jumper is firmly in place.



**Caution:** If the jumper is installed, be careful not to short the TERMPWR signal to ground.

The drive contains a terminator power fuse to prevent damage to drive components in case the terminator power is shorted. If terminator power is enabled and the SCSI cable is connected upside down for example, this fuse may blow to prevent damage to the drive itself. If this occurs, the drive will not longer supply terminator power to the bus and will need to be returned to an authorized repair facility to correct the problem.

## Mounting the Drive Unit

The internal drives can be installed in three different orientations: one horizontally (eject button right) and two vertically (eject button up or eject button down).

The chassis for both 3.5-inch and 5.25-inch drives contain threaded mounting holes for M3.0 metric screws. The maximum length for the M3.0 metric screws is 4 mm. Use of longer length screws may damage the drive.

On the 3.5-inch drive, four screws are located on the bottom, and five are on each side of the frame. For the 5.25-inch drive, four screws are located on the bottom, and six are on each side.

## Completing Connections

The power and interface connectors for the internal drives are located at the back of the drive unit. Figures 1 and 4 illustrate these connections for the 3.5-inch drives, and Figures 2 and 5 illustrate these connections for the 5.25-inch drives.

- ▶ **Note:** Turn off all power before inserting connectors. Pin 1 on the SCSI connector is to your right as you look at the back of the drive. (See Figure 1, 2, 4, or 5.) Your SCSI cable should have Pin 1 highlighted by a color strip. Be sure to mate Pin 1 on the cable to Pin 1 on the drive. Failure to do so could make the drive inoperative.

- The recommended power mating connector requires an AMP 1-48024-0 housing with AMP 60617-1 pins or equivalent.

The external drives are compact external units that connect as a turnkey subsystem to the computer. The following configuration is the standard default setup:

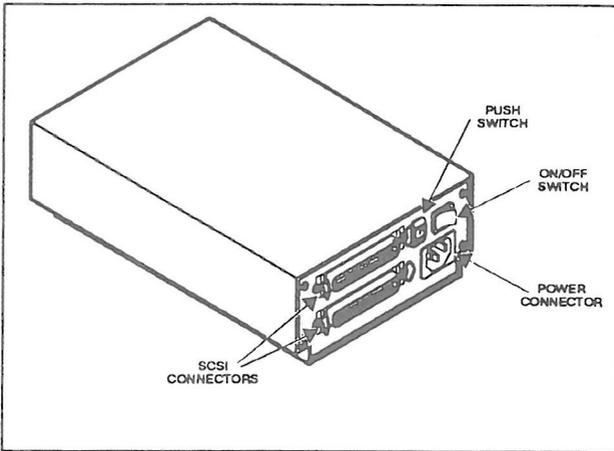
- The drive reads or writes both MRS and non-MRS 4-mm media.
  - Parity checking is disabled.
  - DDS-DC data compression is enabled. (**Applies only to models that support data compression**)
  - The power-on self-test diagnostics of the drive are disabled.
  - Terminator power is supplied to the SCSI bus.
- **Note:** Some configuration settings in the EEPROM can be changed using the Mode Select command. Refer to the appropriate product description manual for your model of drive for the specific SCSI information.

Installing these drives consists of a few easy steps:

1. Select SCSI ID.
2. Complete the interface connection.
3. Complete the power cord connection.

The rear panel of the external drive unit contains the SCSI address selection push switch, the two interface connectors, the ON/OFF switch, and the power cord connection. Figure 7 illustrates the rear panel.

*Figure 7*  
*Rear Panel of External Drives*



## Selecting the SCSI ID

Locate the SCSI address push switch. Select the SCSI address for the drive by pressing the + or - button until the desired address (0 through 7) appears in the window. Turn the unit power OFF; then, ON.

- ▶ **Note:** The unit power must be switched OFF then ON, or a bus reset must occur for any change in SCSI ID to take effect.

## Completing the Interface Connection

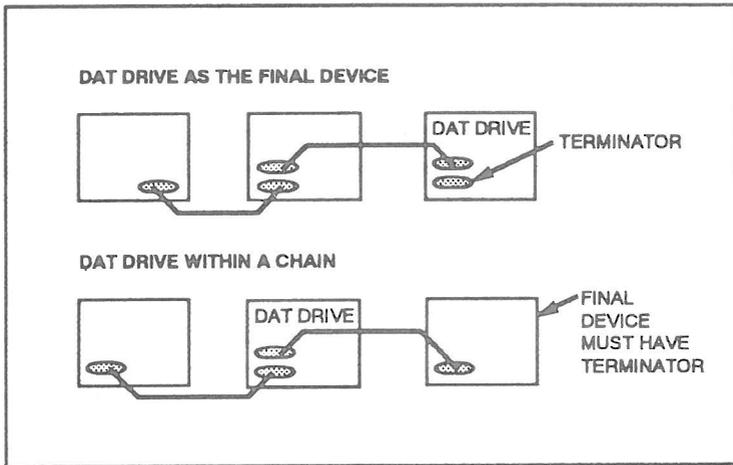
The external drives provide two SCSI connectors to allow daisy chaining. (See Figure 8.) Either connector can connect to the host computer or any SCSI device in a daisy chain.

- ▶ **Note:** Turn off all power before connecting cables and the terminator.

- When the drive is the last drive in the chain (or the only drive), a single interface cable is attached to one connector, and a terminating plug is installed in the other connector. (Seagate P/N 38-9-74000000)
- When the drive is within the chain, the interface cable from the preceding device is connected in one connector; an interface cable is also connected from the other connector to the following device. In this case, no termination is required.

Figure 8 illustrates the daisy-chain connections

*Figure 8*  
*Daisy Chain Diagram*



The same type of mating connector is used for either of the daisy-chain connections. The mating interface connector is a single-ended connector as described earlier.

## Connecting the Power Cord

See Figure 7 for the location of the power cord connector. Insert the power cord mating connector into the connector on the rear panel. Be sure the connection is secure.

## Using the Drive

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Seagate DAT drives are simple to operate. The following information outlines front panel operations for all the DAT drive models covered in this manual.

### Front Panel LED Operation

The front panel of these drives contains two rectangular LEDs. The yellow rectangular LED indicates the drive status; the green LED, the cartridge status. These two indicators provide operating information for normal as well as error conditions.

The external subsystems also contain a round, green power-on LED on the front panel.

The Drive Status LED is yellow and indicates the following conditions:

- When ON (lit), the drive is reading or writing the tape. (SCSI or DAT activity is present.) During a SCSI **PREVENT MEDIA REMOVAL** command, the LED is always ON.
- ▶ **Note:** Do not push the eject button while this LED is ON. If you do, the operation in progress is aborted and the cartridge is ejected, possibly causing loss of data.
- When flashing rapidly, a hardware fault has occurred. If this situation occurs immediately after power-on and you have enabled the power-on self-test through a jumper setting, the power-on self-test may have failed. In that case, the drive will not operate.

The green, rectangular Cartridge Status LED indicates the following conditions:

- When ON (lit), a cartridge is inserted and does NOT generate excess errors.
- When flashing slowly, a cartridge is inserted but generates excess errors beyond a predefined DDS error threshold. This signal is a warning only and does not indicate data loss. First, clean the drive heads using an approved DDS DAT cleaning cartridge (such as the Seagate Model 91301).

If the LED continues flashing or flashes when ejecting the cartridge, use a new cartridge for future writes. Otherwise, operation is proceeding normally

- **Note:** As routine maintenance, the drive heads should be cleaned after every 25 hours of operation. See subsequent information about maintenance.
- When flashing slowly in conjunction with the yellow LED, a prerecorded audio cartridge is inserted and is being played automatically.
  - When flashing rapidly, the drive could not write the tape correctly (maximum rewrite count exceeded). The **WRITE** operation failed. First, clean the drive heads using an approved DDS DAT cleaning cartridge, such as the Seagate Model 91301. If the LED continues flashing, use a new cartridge for future writes.

The round, green LED on the external drive illuminates when power is applied to the drive.

Figure 9 shows the front panel of the 3.5-inch internal drive which is also representative of the front panel of the 5.25-inch internal drive.

**Figure 9**  
**Front Panel of Internal Drives**

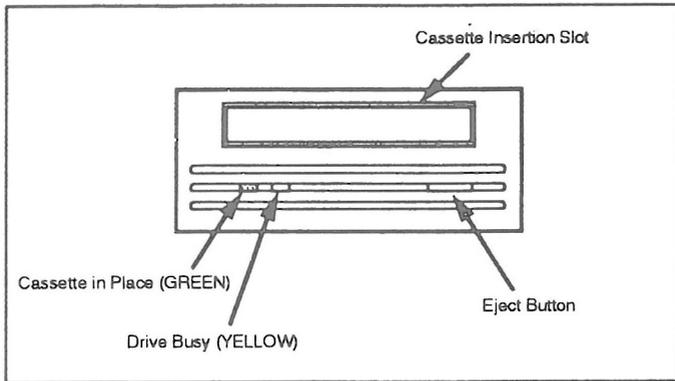
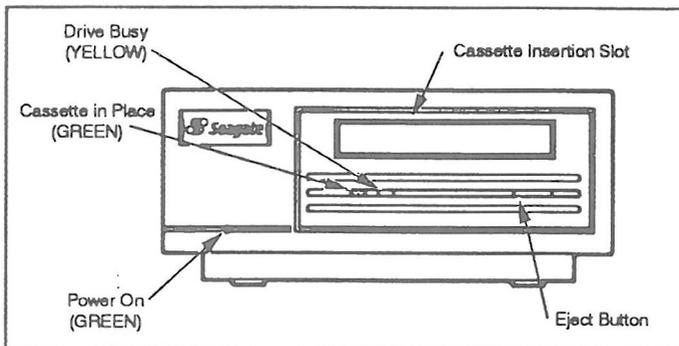


Figure 10 shows the front panel of the external sub-systems.

**Figure 10**  
**Front Panel of External Drives**



The following table summarizes front-panel LED operation.

<b>LED</b>	<b>Action</b>	<b>Meaning</b>
Yellow	ON (lit)	The drive is reading or writing the tape.
Yellow	Flashing Rapidly	A hardware fault occurred.
Green	ON (lit)	A cartridge is inserted and does NOT generate excess errors.
Green	Flashing Slowly	A cartridge is inserted but generates excessive errors beyond a predefined error threshold. (Warning only) <i>Use a DDS cleaning cartridge to clean the heads.</i>
Green	Flashing Slowly (with yellow LED flashing)	A prerecorded audio cartridge is inserted and is being played automatically.
Green	Flashing Rapidly	The drive could not write the tape correctly. (Error) <i>Use a DDS DAT cleaning cartridge to clean the heads.</i>
Green, round (external drives only)	ON (lit)	The external drive is powered on.

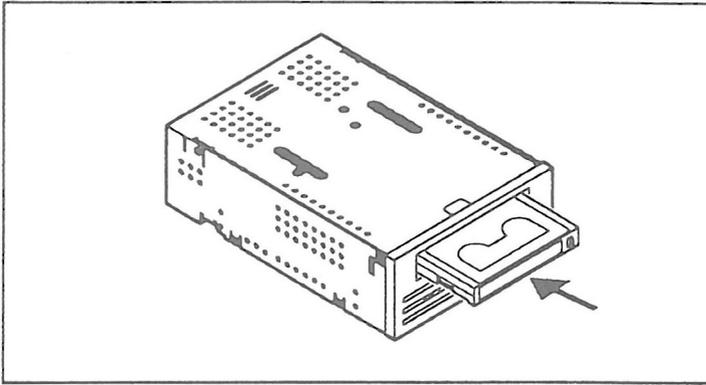
### Loading/Unloading the Cartridge

The cartridge insertion slot on the front panel of the drives provides easy access to the drive. This section explains loading and unloading a cartridge under normal operating conditions.

### Loading/Unloading a Cartridge (Normal Operation)

The DAT drives have a front-loading cartridge insertion mechanism that allows the operator to easily load the cartridge by pushing against the middle part of the cartridge opening until it is fully recessed into the cartridge insertion slot. Figure 11 illustrates cartridge loading (3.5-inch internal drive shown).

*Figure 11*  
*Cartridge Loading (3.5-inch Drive Shown)*



Unload the cartridge by pressing the eject button on the front panel. (See Figures 9 and 10 for the location of the eject button.) Once you press the eject button, the drive ejects the cartridge. It can then be easily removed from the drive.

- ▶ **Note:** The time between pressing the eject button and cartridge ejection may be several seconds. Do not power down the external drive or the internal drive host computer during this time.

## Using a Blank Cartridge

When you insert a blank cartridge into the drive for the first time, it is automatically initialized. The drive first detects that the tape is blank (about 10-12 seconds). It then initializes the tape when it receives a command that causes writing to the tape.

- ▶ **Note:** Initializing the tape takes about 30 seconds. Ejecting the cartridge before the initialization is completed causes the procedure to abort. The initialization then restarts from the beginning the next time a **WRITE** command is received.

The following steps outline a typical sequence for using a blank cartridge.

1. Gently push the blank DAT cartridge into the cartridge insertion slot on the front panel. (See Figure 11.)

Once the cartridge is partially inserted, the drive mechanism automatically completes the cartridge insertion and proper positioning.

The yellow and green rectangular LEDs on the front panel go ON as the drive checks the cartridge to determine its state (blank, write-protected, prerecorded audio, firmware update, etc.) and positions to the start of the data area. This process takes about 10-12 seconds.

2. Start the software application and issue a command.

For example, if you want to back up a file, issue the appropriate command or make the appropriate menu selections from backup application software. The drive begins initializing the tape before completing the backup (**WRITE**) operation. **WRITE** operations are completed during the initializing operation without delay until all internal buffers are filled.

3. After completing the backup and after the yellow rectangular LED on the front panel is OFF, push the eject (tape unload) button on the front panel to remove the cartridge. The drive buffer is then flushed to tape, and the tape is rewound and unloaded.

The data buffer of the drive is flushed to tape in three cases:

- A **REWIND** command is issued.
- The eject button is pushed.
- A delay in SCSI activity occurs. By default, the delay before the flush occurs is set to one minute. However, this delay time can be modified by the host application using a **MODE SELECT** command.

Before the drive ejects the cartridge it automatically updates the system log, which requires a few seconds; then it rewinds and ejects the cartridge. When ejected, the cartridge is pushed out of the cartridge insertion slot to a half-way position for easy removal.

## Using a Cartridge Containing Data

The sequence for writing a cartridge that already contains data is similar to the blank cartridge sequence except the cartridge is not automatically initialized by the drive. A brief delay occurs when the cartridge is first inserted as the drive identifies the cartridge type and state, and positions to the data area.

## ***DAT Cartridge***

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Seagate DAT products are designed to use data-grade DDS DAT cartridges, which comply with the specifications in the **3.81 mm Helical-Scan Digital Computer Tape Cartridge for Information Interchange, ANSI X3B5/89-156** standard. Seagate recommends Seagate-qualified, DDS DAT cartridges Model M31300 (60 meters); Model M32000 (90 meters); and Model M34000 (120 meters) to ensure optimal data integrity and reliability.

Seagate also recommends the use of Seagate-qualified DDS DAT head-cleaning cartridges (Model 91301).

- ▶ **Note:** Proper maintenance of the drive requires that the DDS head-cleaning cartridge be used every 25 hours of read/write operation and whenever the rectangular, green cartridge-in-place LED flashes during operation.

Both DAT data and head-cleaning cartridges can be ordered from Seagate.

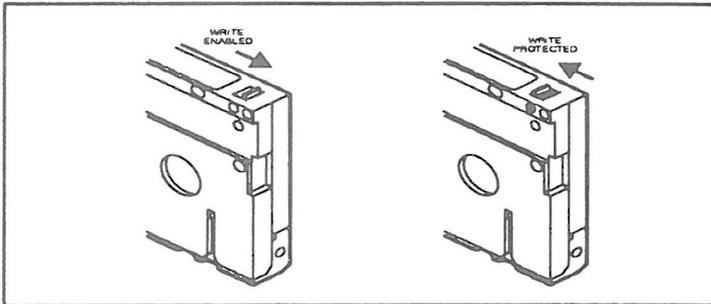
Qualified DAT cartridges are designed with specific file protect, lid, and other features for information interchange and are tested to comply with the ANSI DDS specifications.

The drives that support DDS-2 also recognize 120 meter MP+ cartridges and other MRS cartridges when MRS is enabled. MRS cartridges have a series of alternate opaque and clear stripes at the beginning of the tape. This stripping classifies the media as data grade, rather than audio grade media. Four recognition holes allow the drive sensors to identify the type of tape, its magnetic thickness, and to determine whether the tape is prerecorded or unrecorded or is a cleaning cartridge. Other cartridge features to allow the drive to optically sense “cartridge in”, BOT, and EOT.

### Write-Protecting a DAT Cartridge

Figure 12 shows the sliding write-protect tab on the DAT cartridge and its positions for write protect and write permit. When the tab is pushed into the closed position, it allows writing to the cartridge tape.

*Figure 12*  
*Write-Protect Tab on the DAT Cartridge*



## *Maintaining the Drive*

If excessive magnetic dust or debris collects at one or more of the heads, magnetic media may become unreadable or unwriteable. This situation may occur infrequently, or not at all, depending on the media used.

### Head Cleaning

Whenever the Cartridge In Place status LED (green) flashes, you should clean the drive heads with a cleaning cartridge.

Also, as routine maintenance, the drive heads should be cleaned after the first four hours of tape movement of a new cartridge and thereafter after every 25 hours of read/write operation.

- ▶ **Note:** The slowly flashing green LED may also refer to a damaged tape or a tape nearing the end of its life. If cleaning the head does not correct the flashing LED condition, replace the cartridge. The slowly flashing LED does not indicate a loss of data nor does it affect SCSI operation. (A slowly flashing green LED in conjunction with the yellow LED indicates the presence of a prerecorded audio tape.)

To clean the heads of the drive, use only a Seagate-qualified DDS DAT cleaning cartridge designed for DAT drives. Seagate offers a cleaning cartridge, Model 91301 that you may order. Cleaning cartridges are ordered (and packaged) in multiples of five.

The DDS cleaning cartridge contains the correct recognition holes to allow the drive to recognize that it is a cleaning cartridge.

To use the cleaning cartridge, insert the cleaning cartridge. The drive immediately detects that the cartridge is a cleaning cartridge.

The drive loads and runs the cartridge for about 30 seconds; then ejects the cartridge.

- ▶ **Note:** Each time the cleaning cartridge is loaded, a new, unused portion of cleaning tape is advanced over the entire tape path. Eventually, the entire tape is used, and a new cleaning cartridge is required. (A cleaning cartridge provides approximately 30 uses.) The drive will not rewind the cartridge.

If an exhausted cleaning tape is used, the drive will eject the tape without completing a cleaning operation. This process takes just under 25 seconds.

Do not use an audio DAT cleaning cartridge. It will not be properly recognized by the drive.

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## Technical Support

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If you experience problems with the drive and need technical assistance, contact the Seagate support group at

<b>UK</b>	Hotline	+ 44 (0) 1628 894083
	FaxBack	+ 44 (0) 1628 894084
	BBS	+ 44 (0) 1628 478011
	Fax	+ 44 (0) 1628 890660
<b>France</b>	Hotline Tape	+ 33 1 41861086
	BBS	+ 33 1 48253595
	Fax	+ 33 1 46044250
<b>Germany</b>	Hotline Tape	+ 49 89 1409333
	BBS	+ 49 89 1409331
	Fax	+ 49 89 14305100