

Application Note

Installing a Super DLTtape or DLTtape Drive into a Sun Solaris 2.X System (versions 2.5 and lower)

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Revision History

Revisions made to this document are listed below in chronological order.

Document Release	Date	Summary of Changes
A	July 1, 2003	Initial release per ECO C007166. Process Owner: Bob Henderson.

Installing a Super DLTtape or DLTtape Drive into a Sun Solaris 2.X System (versions 2.5 and lower)

1. Introduction

This document provides instructions for integrating a Quantum® Super DLTtape™ or DLTtape drive into a Sun™ SPARCstation™ workstation, an Ultra™ server, or an Enterprise™ server running Solaris™ 2.X.

- Notes:**
- This document applies to Sun Solaris 2.5 and lower. The system configurations are not supported by Quantum or Sun, and may or may not be tested. These systems are available so that owners can install and operate a Super DLT or DLT product on a legacy system. There is no implied liability or support coverage.
 - For current Solaris system versions, refer to document number 6464158-01, which provides instructions for integrating a Quantum Super DLT or DLTtape drive into a Sun workstation, Ultra server, or Enterprise server running Solaris 2.6 and above.

1.1 Purpose and Scope

This document pertains to the following products:

- **Tape drives:** DLT 2000, DLT 2000XT, DLT 4000, DLT 7000, DLT 8000, SDLT 220, and SDLT 320.

Note: The Super DLT1 tape drive is currently known as the SDLT 220 tape drive.
- **Mini-libraries:** DLT 2500, DLT 2500XT, DLT 2700, DLT 2700XT, DLT 4500, and DLT 4700.

This document includes the following sections:

- [“Installation” on page 4](#) describes how to install a Super DLTtape or DLTtape drive in a Sun SPARCstation workstation, Ultra server, or Enterprise server running Solaris 2.X.
- [“Data Cartridge Compatibility” on page 12](#) provides information about Super DLTtape and DLTtape data cartridges and tape drive compatibility.
- [“Using a DLTtape Mini-Library” on page 13](#) provides information about using a DLTtape mini-library.

2. Installation

This section describes how to install the tape drive and how to configure the Solaris operating system to recognize and communicate with the tape drive. The operating system includes a driver to communicate efficiently with Small Computer System Interface (SCSI) tape drives, such as a Super DLTtape or DLTtape drive.

2.1 Before You Begin

Before you install the tape drive, follow these steps:

1. If you have a DLT 2000, DLT 2500, or DLT 2700 product, make sure it is using version V10 (or higher) controller firmware.

Note: The DLT 2000XT, DLT 2500XT, DLT 2700XT, DLT 4000, DLT 7000, DLT 8000, SDLT 220, and SDLT 320 tape drives do not have a firmware revision restriction.

2. Make sure that the hardware has the appropriate SCSI interface for the tape drive. If you have a SCSI single-ended (SE) tape drive, you need a SCSI SE interface; if you have a SCSI low-voltage differential (LVD) or high-voltage differential (HVD) tape drive, you need a SCSI LVD or HVD interface.
3. Obtain the appropriate manual for your tape drive as listed in [Table 1](#). These manuals provide detailed hardware installation instructions, including switch and jumper settings and information about SCSI bus termination.

Note: To view these manuals online, go to: <http://www.quantum.com/AM/support/DLTtapeDrivesMedia/Manuals/Default.htm>.

Table 1. Order Numbers for Tape Drive Manuals

Manual Title	Order Number
<i>DLT 2000/DLT 2700 Product Manual</i>	81-109132
<i>DLT 2500 Owner's Manual</i>	81-109374
<i>DLT 2000XT/DLT 2500XT/DLT 2700XT Product Manual</i>	81-109253-03
<i>DLT 4000 Product Manual</i>	81-60043-04
<i>DLT 7000 Product Manual</i>	81-60000-06
<i>DLT 8000 Product Manual</i>	81-60118-04
<i>SDLT 220 and SDLT 320 Product Manual</i>	81-85002-01

2.2 Installing the Tape Drive

To install the tape drive, follow these steps:

1. Power down your workstation or server and disconnect the AC power from the system.
2. Follow instructions in your product manual to install the tape drive and set the SCSI ID.

2.3 Editing the `st.conf` File

1. Power on the hardware and execute a `probe-scsi` command. The system should indicate that the tape drive is attached. You can then verify the tape drive's SCSI ID.
2. Boot the system and log in as `root`.
3. Change the directory to `/kernel/drv`.

The `st.conf` file is located in this directory and is used by Sun's `st` (SCSI tape) driver. The `st` man page on Solaris has more information about the `st` driver and the `st.conf` file.

CAUTION

Back up your `st.conf` file before making any modifications. Only someone who is familiar with rebuilding the Solaris kernel should make changes.

4. Edit the `st.conf` file by adding the following line before the first occurrence of `name=` in the file:

```
tape-config-list = "<DLTtape tape unit>",  
"<DLTtape reference name>", "<DLTtape data>" ;
```

The variable `tape-config-list` is defined by a series of tape configuration parameters listed in [Table 2](#).

Table 2. Tape Configuration Parameters for the `tape-config-list` Variable

Parameter	Description																						
<code><DLTtape tape unit></code>	The vendor and product ID string for the tape drive. Depending on the tape drive you are installing, insert the appropriate vendor and product ID. Note: The vendor and product ID strings shown are case sensitive. The vendor must be exactly eight characters, including spaces.																						
	<table border="1"> <thead> <tr> <th>For This Tape Drive...</th> <th>Specify This for <code><DLTtape tape unit></code></th> </tr> </thead> <tbody> <tr> <td>DLT2000 or DLT2000XT</td> <td>DEC DLT2000</td> </tr> <tr> <td>DLT2500 or DLT2500XT</td> <td>DEC DLT2500</td> </tr> <tr> <td>DLT2700 or DLT2700XT</td> <td>DEC DLT2700</td> </tr> <tr> <td>DLT4000</td> <td>QUANTUM DLT4000</td> </tr> <tr> <td>DLT4500</td> <td>QUANTUM DLT4500</td> </tr> <tr> <td>DLT4700</td> <td>QUANTUM DLT4700</td> </tr> <tr> <td>DLT7000</td> <td>QUANTUM DLT7000</td> </tr> <tr> <td>DLT8000</td> <td>QUANTUM DLT8000</td> </tr> <tr> <td>SDLT220</td> <td>QUANTUM SuperDLT1</td> </tr> <tr> <td>SDLT320</td> <td>QUANTUM SDLT320</td> </tr> </tbody> </table>	For This Tape Drive...	Specify This for <code><DLTtape tape unit></code>	DLT2000 or DLT2000XT	DEC DLT2000	DLT2500 or DLT2500XT	DEC DLT2500	DLT2700 or DLT2700XT	DEC DLT2700	DLT4000	QUANTUM DLT4000	DLT4500	QUANTUM DLT4500	DLT4700	QUANTUM DLT4700	DLT7000	QUANTUM DLT7000	DLT8000	QUANTUM DLT8000	SDLT220	QUANTUM SuperDLT1	SDLT320	QUANTUM SDLT320
	For This Tape Drive...	Specify This for <code><DLTtape tape unit></code>																					
	DLT2000 or DLT2000XT	DEC DLT2000																					
	DLT2500 or DLT2500XT	DEC DLT2500																					
	DLT2700 or DLT2700XT	DEC DLT2700																					
	DLT4000	QUANTUM DLT4000																					
	DLT4500	QUANTUM DLT4500																					
	DLT4700	QUANTUM DLT4700																					
	DLT7000	QUANTUM DLT7000																					
	DLT8000	QUANTUM DLT8000																					
	SDLT220	QUANTUM SuperDLT1																					
SDLT320	QUANTUM SDLT320																						
<code><DLTtape reference name></code>	The name that you want the system to use to identify the tape drive. This name is independent of the product ID. When the system boots, it displays this name in a list of peripheral devices recognized by the system.																						
<code><DLTtape data></code>	A variable referring to additional tape drive configuration information. You create a name in place of the <code><DLTtape data></code> string.																						

5. Continue editing the `st.conf` file by defining the name you created for `<DLTtape data>`. The definition depends on the type of tape drive you are installing. See [Table 3](#).

Table 3. Values for the `<DLTtape data>` Variable

For This Drive Series...	Add the Following Line for <code><DLTtape data></code> ...
DLT2000	<code><DLTtape data> = 1, 0x38, 0, 0x8639, 4, 0x17, 0x18, 0x80, 0x81, 3;</code>
DLT4000	<code><DLTtape data> = 1, 0x38, 0, 0x8639, 4, 0x17, 0x18, 0x82, 0x83, 3;</code>
DLT7000	<code><DLTtape data> = 1, 0x38, 0, 0x8639, 4, 0x82, 0x83, 0x84, 0x85, 3;</code>
DLT8000	<code><DLTtape data> = 1, 0x38, 0, 0x8639, 4, 0x84, 0x85, 0x88, 0x89, 3;</code>
SDLT220	<code><DLTtape data> = 1, 0x38, 0, 0x8639, 2, 0x90, 0x91, 1;</code>
SDLT320	<code><DLTtape data> = 1, 0x38, 0, 0x8639, 4, 0x90, 0x91, 0x92, 0x93, 3;</code>

IMPORTANT: You must enter a semicolon after every `<DLTtape data>` line.

See [“Parameters for DLTtape Data”](#) on page 14 for definitions of the parameters comprising the `<DLTtape data>` lines.

6. When you have edited the `st.conf` file, go to [“Verifying the Installation”](#) on page 9.

2.4 Verifying the Installation

After editing the `st.conf` file, follow these steps:

1. Load a data cartridge into the tape drive, following the instructions in your manual.
2. Change the directory to `/`.
3. Enter `shutdown -i0 -g0` to shut down the system.
4. Enter `boot -rv` to reboot the system.

The `r` switch in the `boot` command recompiles the kernel and creates a special device file the system uses for communicating with the tape drive.

Note: The device files created for the tape drive are located in the `/dev/rmt/` path and are discussed in [“Device File Assignments” on page 10](#).

The `v` switch enables verbose mode display during system bootup. With verbose mode, the system indicates that the tape drive is attached by displaying the `<DLTtape reference name>` string you selected (see [Table 2 on page 7](#)).

Note: If you did not edit the `st.conf` file correctly, the system displays the following during `boot -rv`:

```
<Vendor 'vendor' Product 'tape drive'>
```

5. To verify that the tape drive has been installed and that a data cartridge is loaded, enter `mt -f /dev/rmt/0 status`.

On Solaris configurations 2.5.1 and below, `mt` responds with a display similar to the following:

```
Other tape drive
sense key(0x6)= Unit Attentionresidual= 0 retries= 0
file no= 0 block no= 0
```

Installation is complete.

2.4.1 Device File Assignments

When you issue a `boot -rv` command, Solaris recompiles the kernel and creates a special device file used for communicating with the tape drive. This file, located in the `/dev/rmt` path, has the following form:

```
[0-127] [l, m, h, c, u] [b] [n]
```

Note: This file name may not include all possible values.

[Table 4](#) defines the values of this file.

Table 4. Device File Values and Definitions

Device File Value	Definition
[0-127]	The target tape drive designation Solaris assigns during <code>boot -rv</code> (see “Target Tape Drive Designations” on page 11).
[l, m, h, c, u]	The tape density the tape drive uses during write operations. The first four letters map to the four density assignments in the <code><DLTtape data></code> line in the <code>st.conf</code> file. If these letters are not in the device file, the tape drive uses the default density designated by the last parameter in the <code><DLTtape data></code> line in the <code>st.conf</code> file. This is the highest density with compression for this configuration. The following list defines each letter: <ul style="list-style-type: none"> • l - low density • m - medium density • h - high density • c - compressed (same density as u) • u - ultra (same density as c).
[b]	The BSD behavior. See <code>mtio</code> man page for more information.
[n]	The rewind behavior. The tape drive does not rewind the tape when the command is complete.

For example, listing the device files in `/dev/rmt` for the first tape drive assigned by Solaris may look similar to the following:

```
ls /dev/rmt/0*

/dev/rmt/0      /dev/rmt/0cbn  /dev/rmt/0hn   /dev/rmt/0m    /dev/rmt/0u
/dev/rmt/0b     /dev/rmt/0cn  /dev/rmt/01    /dev/rmt/0mb   /dev/rmt/0ub
/dev/rmt/0bn   /dev/rmt/0h   /dev/rmt/01b   /dev/rmt/0mbn  /dev/rmt/0ubn
/dev/rmt/0c    /dev/rmt/0hb  /dev/rmt/01bn  /dev/rmt/0mn   /dev/rmt/0un
/dev/rmt/0cb   /dev/rmt/0hbn /dev/rmt/01n   /dev/rmt/0n
```

2.4.2 Target Tape Drive Designations

The target drive designations Solaris assigns may take on values higher than those established in the `/dev/rmt/` path. This is not a problem; however, during a `boot -rv`, Solaris does not remove the tape device files for tape drives that are no longer attached to the system. As a result, it can become difficult to locate the device file for the configured tape drive. To minimize this problem, initially delete the tape device files (`rm /dev/rmt/*`). Then either boot the system with a `boot -rv` or enter the following at the command line prompt:

```
drvconfig -i st; tapes
```

If the DLTtape drive is the only drive on the system, its target assignment should be 0. The Solaris man pages have more information about `drvconfig` and `tapes`.

3. Data Cartridge Compatibility

Table 5 provides information about data cartridge and tape drive compatibility. Use this matrix when determining data cartridges to use in your tape drive.

Note: The SDLT 220 and SDLT 320 tape drives can read, but not append data to, DLTtape IV data cartridges that were previously written by a DLT 4000, DLT 7000, or DLT 8000 tape drive.

Table 5. Data Cartridge and Tape Drive Compatibility (Native/Compressed)

Data Cartridge	Drive Type						
	DLT 2000 DLT 2500 DLT 2700	DLT 2000XT DLT 2500XT DLT 2700XT	DLT 4000 DLT 4500 DLT 4700	DLT 7000	DLT 8000	SDLT 220	SDLT 320
DLTtape™ III (CompacTape III™)	10/20 GB	10/20 GB	10/20 GB	10/20 GB	10/20 GB		
DLTtape™ IIIXT (CompacTape IIIXT)		15/30 GB	15/30 GB	15/30 GB	15/30 GB		
DLTtape™ IV (CompacTape IV™)			20/40 GB	20/40 GB 35/70 GB	20/40 GB 35/70 GB 40/80 GB	20/40 GB 35/70 GB 40/80 GB	20/40 GB 35/70 GB 40/80 GB
Super DLTtape I						110/220 GB	110/220 GB 160/320 GB
DLT Cleaning Tape		20 uses	20 uses	20 uses	20 uses	20 uses	20 uses

4. Using a DLTtape Mini-Library

The Solaris operating system does not support SCSI-2 media changer device commands. Therefore, you cannot use a DLT 2500, DLT 2500XT, DLT 2700, DLT 2700XT, DLT 4500, or DLT 4700 in random access mode. You can access the mini-library in sequential mode only.

For a detailed description of these access modes, refer to the appropriate product manual for your DLTtape mini-library. See [Table 1 on page 5](#).

Appendix A

Parameters for DLTtape Data

<DLTtape data> consists of the 10 parameters described in [Table 6](#).

Table 6. Parameters for the <DLTtape data> Variable

Parameter	Value	Description	
1	1	The version number. This parameter should not change.	
2	0x38	The tape drive as "other SCSI drive." This is defined in /usr/include/sys/mtio.h. Note: If you are using Solaris 2.5.1 or below, use 0x36 in place of the 0x38.	
3	0	The block size. Because the tape drive uses variable block sizes, this value should always be 0.	
4	0x8639	A summation of values that represent selected device options.	
		Device Options	Values
		ST_VARIABLE	0x0001
		ST_BSF	0x0008
		ST_BSR	0x0010
		ST_LONG_ERASE	0x0020
		ST_KNOWS_EOD	0x0200
		ST_UNLOADABLE	0x0400
		ST_NO_RECSIZE_LIMIT	0x8000
		Note: The st man page has more information about these and other device options. For certain applications, you may want to add or remove one or more of the device options.	

Table 6. Parameters for the `<DLTtape data>` Variable (*continued*)

Parameter	Value	Description
5	4 or 2	The number of densities. The maximum definable number of densities is 4.
6, 7, and possibly 8 and 9	The density codes supported by the tape drive. Although the entries described in Table 3 on page 8 are recommended, other density codes are possible. Refer to the product manual for your tape drive for additional density code information (see Table 1 on page 5).	
	Density Codes and Descriptions	
	0x17	2.6 GB (uncompressed), using a DLTtape III (CompacTape III) data cartridge. ^a
	0x18	6.0 GB (uncompressed), using a DLTtape III (CompacTape III) data cartridge. ^a
	0x80	10 GB or 15 GB (uncompressed), vendor unique density code for DLT 2000 and DLT 4000 series tape drives, and DLT 7000 and DLT 8000 tape drives. The data cartridge capacity is 10 GB for the following products: DLT 2000, DLT 2500, DLT 2700, DLT 4000 or DLT 7000 and DLT 8000 loaded with a DLTtape III (CompacTape III) data cartridge. The data cartridge capacity is 15 GB for the following products: DLT 2000XT, DLT 2500XT, DLT 2700XT, DLT 4000 or DLT 7000 and DLT 8000 loaded with a DLTtape IIIXT (CompacTape IIIXT) data cartridge.
	0x81	20 GB or 30 GB (compressed), vendor unique density code for DLT 2000 and DLT 4000 series tape drives and DLT 7000 and DLT 8000 tape drives. The data cartridge capacity is 20 GB for the following products: DLT 2000, DLT 2500, DLT 2700, DLT 4000 tape drive or DLT 7000 and DLT 8000 loaded with a DLTtape III (CompacTape III) data cartridge. The data cartridge capacity is 30 GB for the following products: DLT 2000XT, DLT 2500XT, DLT 2700XT, DLT 4000 or DLT 7000 and DLT 8000 loaded with a DLTtape IIIXT (CompacTape IIIXT) data cartridge.
0x82	20 GB (uncompressed), vendor unique density code for DLT 4000 series drives and DLT 7000 and DLT 8000 drives loaded with a DLTtape IV (CompacTape IV) data cartridge.	

Table 6. Parameters for the `<DLTtape data>` Variable (*continued*)

Parameter	Value	Description
	0x83	40 GB (compressed), vendor unique density code for DLT 4000 series drives and DLT 7000 and DLT 8000 drives loaded with a DLTtape IV (CompacTape IV) data cartridge.
	0x84	35 GB (uncompressed), vendor unique density code for DLT 7000 and DLT 8000 drives loaded with a DLTtape IV (CompacTape IV) data cartridge.
	0x85	70 GB (compressed), vendor unique density code for DLT 7000 and DLT 8000 drives loaded with a DLTtape IV (CompacTape IV) data cartridge.
	0x88	40 GB (uncompressed), vendor unique density code for DLT 8000 drives loaded with a DLTtape IV (CompacTape IV) data cartridge.
	0x89	80 GB (compressed), vendor unique density code for DLT 8000 drives loaded with a DLTtape IV (CompacTape IV) data cartridge.
	0x90	110 GB (uncompressed), vendor unique density code for SDLT 220 or SDLT 320 drives loaded with a Super DLTtape I data cartridge.
	0x91	220 GB (compressed), vendor unique density code for SDLT 220 or SDLT 320 drives loaded with a Super DLTtape I data cartridge.
	0x92	160 GB (uncompressed), vendor unique density code for SDLT 320 drives loaded with a Super DLTtape I data cartridge.
	0x93	320 GB (compressed), vendor unique density code for SDLT 320 drives loaded with a Super DLTtape I data cartridge.
10	<i>density code number</i>	The density the system will use as the default density, assuming that the four densities—the sixth, seventh, eighth, and ninth parameters in the <code><DLTtape data></code> string—are referenced by the system as 0, 1, 2, and 3, respectively. For example, in a DLT 8000 configuration, the value of 3 for the tenth parameter selects 0x89 as the default density code.

- a. This density code is invalid and results in the tape drive defaulting to the optimal density for the loaded data cartridge if you are using one of the following drives: DLT 2000XT, DLT 2500XT, DLT 2700XT, DLT 4000, DLT 4500, DLT 4700, or DLT 7000 loaded with a DLTtape IIIXT (CompacTape IIIXT) data cartridge or a DLT 4000, DLT 4500, DLT 4700, or DLT 7000 loaded with a DLTtape IV (CompacTape IV) data cartridge.