



# Sun StorageTek™ Crypto Key Management System

## HP LTO4 Encryption-Capable Tape Drives

**Technical Brief**

Part Number: 316196601

Revision: A





# Crypto Key Management System Version 2.0

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## HP LTO4 Tape Drive Technical Brief

Sun Microsystems, Inc.  
[www.sun.com](http://www.sun.com)

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# Preface

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This technical brief is intended for Sun StorageTek™ representatives, customers, and anyone responsible for planning the installation of the Crypto Key Management System (KMS) encryption solution.

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## Organization

This guide has the following organization:

Chapter	Use this chapter to:
<a href="#">Chapter 1, "Introduction"</a>	
<a href="#">Chapter 2, "Dione Card"</a>	
<a href="#">Chapter 3, "Virtual Operator Panel"</a>	

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## Related Information

These publications contain the additional information:

Publication Description	Part Number
Crypto Key Management System Systems Assurance Guide	StorageTek: 31619480x
Crypto Key Management System Installation and Service Manual	StorageTek: 31619490x
Crypto Key Management System Administrator Guide	StorageTek: 31619510x

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# Introduction

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**Overview** The Hewlett Packard (HP) LTO4 is the fourth-generation of Ultrium, Linear Tape-Open tape drives. This generation offers more capacity and increased performance than earlier versions of LTO tape drives.

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**Encryption Capable** The Hewlett Packard LTO4 is the *first*, non-StorageTek T-Series tape drive to support the Crypto Key Management System Version 2.0.

This encryption-capability requires a special, custom designed, Ethernet card—called the Dione card—that enables the LTO4 drive to connect to and interface with the Key Management System (KMS) network.

With this connection, the LTO4 is capable of communicating with the KMS to transfer encryption keys over the secure network.

*Note:* The HP LTO4 can only use *one encryption key at a time*. During a read operation, if another encryption key is found, the Dione card requests the key directly from the KMS.

---

**Media**  
(Native capacity) The HP LTO4 drive with LTO4 media can store up to 800 GB of data. This drive can also read and write on LTO3 media (400 GB), and provides read-only capabilities with LTO2 media (200 GB).

The LTO4 tape drive also supports Write Once, Read Many (WORM) secure media. This non-erasable, non-rewritable media meets several compliance regulations such as HIPAA, Sarbanes-Oxley, and SEC 17A-4.

*Note:* Encryption is only possible using LTO4 media, including LTO4 WORM media, with the HP LTO4 tape drive. If you insert LTO2 or LTO3 media, encryption will be disabled.

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**Interfaces**  
(Native rates) The HP LTO4 drive supports up to 120 MB/s data transfer rates using Data Rate Matching (DRM). This feature allows the tape drive to dynamically and continuously adjust the speed of the drive, from 40 to 120 MB/s for maximum performance

Interface support for the HP LTO4 includes:

- Ultra 320 Small Computer System Interface (SCSI)
  - 4 Giga-bits per second (Gbps) Fibre Channel
-

Installing this tape drive in one of Sun StorageTek’s automated tape configurations offers customers with an even wider choice of tape-based storage solutions.

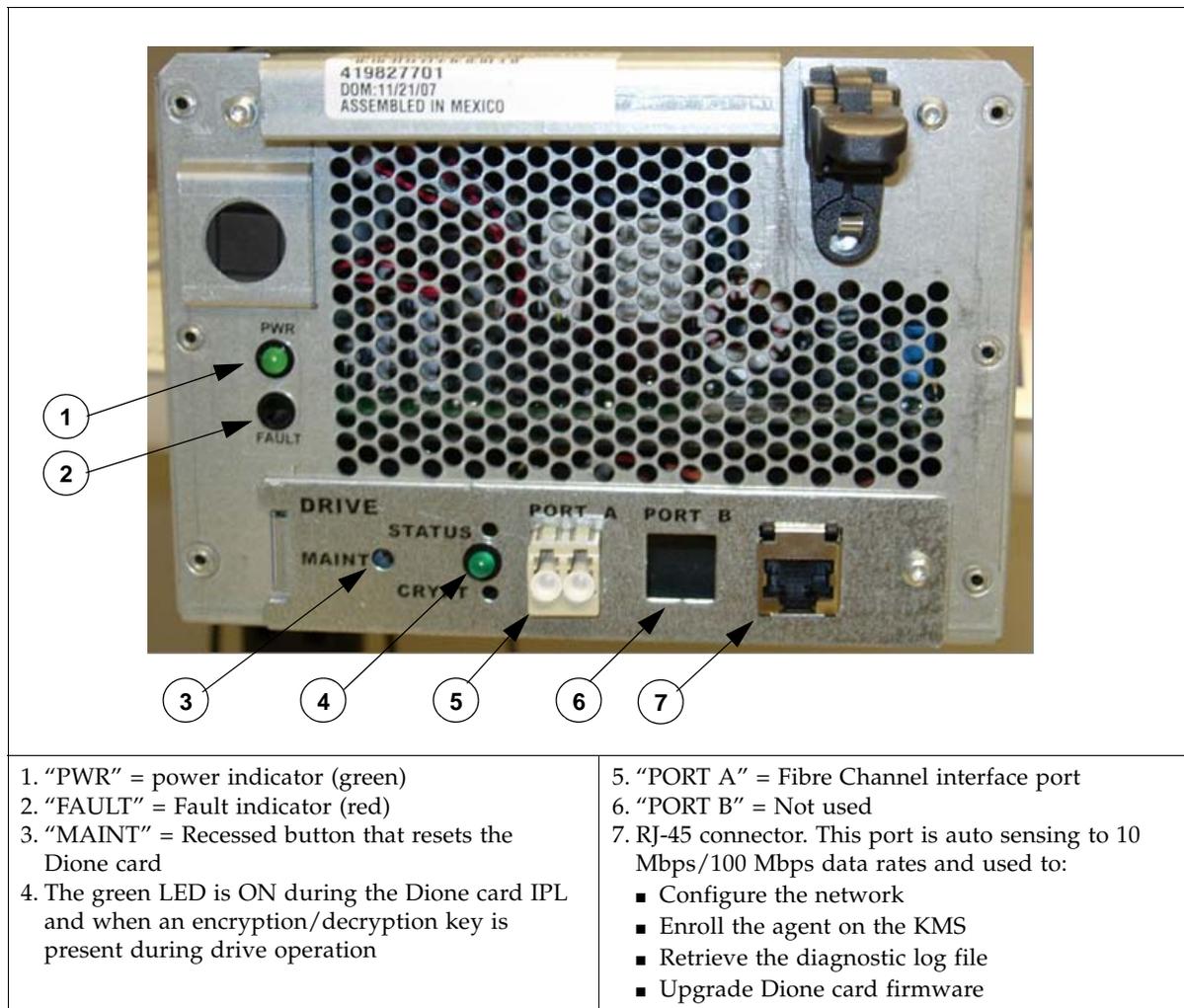
- Server compatibility: Fibre Channel and SCSI models on popular (qualified) platforms from vendors such as Sun, HP, IBM, and Dell.
- Software compatibility: Support for an extensive list of software applications such as ACSLS, HP, CA, VERITAS, Legato, Tivoli, and many more.
- Support for WORM media: Allows for unalterable backups using Write-Once Read-Many (WORM) media to meet compliance regulations such as HIPAA, Sarbanes-Oxley, SEC 17A-4.
- Mid-range class: Delivers confidence with a wide variety of supported backup applications.

---

## Drive Tray

FIGURE 1-1 shows an example of an LTO4 tape drive mounted in a drive tray.

**FIGURE 1-1** LTO4 Tape Drive in Drive Tray—SL8500



# Specifications

TABLE 1-1 provides a comparison of tape drive specifications.

**TABLE 1-1** Tape Drive Specifications

	LTO2	LTO3	LTO4
<b>Physical Specifications</b>			
Height	8.25 cm (3.25 in.)	8.25 cm (3.25 in.)	8.25 cm (3.25 in.)
Width	14.6 cm (5.75 in.)	14.6 cm (5.75 in.)	14.6 cm (5.75 in.)
Length (depth)	21.38 cm (8.4 in.)	21.38 cm (8.4 in.)	21.38 cm (8.4 in.)
Weight	2.1 kg (4.6 lb)	2.24 kg (4.94 lb)	2.24 kg (4.94 lb)
<b>Performance Specifications</b>			
Capacity (native)	200 GB	400 GB	800 GB
Transfer rate (native)	30 MB/s	80 MB/s	120 MB/s
Streaming range (native)	13.7 to 35.6 MB/s	27 to 80 MB/s	40 to 120 MB/s
Data Buffer size	64 MB	128 MB	128 MB
Number of tracks	512	704	896
Load to ready *	15–24 sec	19 sec	19 sec
Access time-average (to first file)	64–75 sec	72 sec	62 sec
Tape speed (meters per second)	5.50 m/s	5.32 m/s	7.0 m/s
Tape read/write speed	6.20 m/s	5.32 m/s	6.20 m/s
Rewind time (maximum/average)	104/52 sec	98/49 sec	124 sec
Unload time	13–19 sec	19 sec	19 sec
Cleaning time	58 to 152 sec		
Interface Support (SCSI) (Fibre Channel)	Ultra3 SCSI (LVD) FC1	Ultra-320 (LVD) FC2	Ultra-320 (LVD) FC4
MTBF (100% duty cycle)	250,000 hrs	250,000 hrs	250,000 hrs
<b>Media/Format Compatibility</b>			
Read	LTO1, LTO2	LTO 1, 2, 3	LTO 2, 3, 4
Write	LTO1, LTO2	LTO2, LTO3	LTO3, LTO4
<b>Note:</b> HP drives support the LTO standard for backward compatibility, which is to write back one generation and read back two generations.			
<b>Power</b>			
Consumption	38 W	35 W	30 W
<b>Interface Codes:</b> Fibre Channel: FC1 = Fibre Channel 1Gb, FC2 = Fibre Channel 2Gb, FC4 = Fibre Channel 4Gb			
<b>Note:</b> * Encryption-capable and un-initialized WORM cartridges can take longer to load.			

TABLE 1-2 provides a comparison of media specifications.

**TABLE 1-2** Media Specifications

Specification	LTO 2	LTO 3	LTO 4
Tape Base film	PEN (Poly-Ethylene-Naphthalate)		
Tape length	609m	680m	820m
Tape length used for data	580m	648m	783m
Tape width	12.65 mm	12.65 mm	12.65 mm
Tape dimensional stability	1200 ppm	1200 ppm	900 ppm
Maximum tape speed	7.29 m/s		
Rewind speed	7.00 m/s		
Durability	1,000,000 passes		
Cartridge Width	105.4±0.30 mm		
Depth	102.0±0.30 mm		
Height	21.5±0.25 mm		
Weight	0.220 kg		
Track density (TPI)	1260	1773	2212
Data tracks	512	704	896
Data channels	8	16	16
Number of wraps	64	44	56
Number of bands	4	4	4
Bit density	7.40 Kb/mm	9.64 Kb/mm	13.52 Kb/mm
Cartridge memory capacity	4096 bytes	4096 bytes	8192 bytes

TABLE 1-3 lists the reliability specifications.

**TABLE 1-3** Reliability Specifications

Description	Specification
MTBF (100% duty cycle)	250,000 hours
Load/unload life	100,000 swaps
Head life	60,000 hours
Media durability	1,000,000 passes
Maximum cartridge use	20,000 threads

## Compatibility

HP LTO Ultrium 4 drives are specified to interchange with un-encrypted data cartridges from other tape drives that comply to the LTO U-28, U-316 and U-416 specifications:

Future compatibility:

In the future, HP LTO Ultrium drives will be capable of:

- Reading and writing tapes from the current generation
- Reading and writing tapes from one earlier generation
- Reading tapes from two earlier generations

HP LTO Ultrium drives will always maintain write and read compatibility with other manufacturers' LTO Ultrium drives and tapes that meet the LTO Ultrium format specification.

**TABLE 1-4** LTO Media Compatibility

Native Capacity (Length)	Format	Capability	
		Write	Read
800 GB WORM	LTO4	Yes	Yes
800 GB (820m)	LTO4	Yes	Yes
400 GB WORM	LTO3	Yes	Yes
400 GB (680m)	LTO3	Yes	Yes
200 GB (580m)	LTO2	No	Yes
100 GB (580m)	LTO1	No	No
50 GB (290m)	LTO1	No	No



**Note** – Currently, only LTO4 media is encryption-capable on the LTO4 tape drives.

While LTO4 can read and “write” to LTO3 media, if an LTO4 drive encrypted data on LTO3 media, then LTO3 drives could not read those tapes. Therefore, when LTO3 media is inserted into an LTO4 drive, the encryption capability is disabled and the drive will write non-encrypted data without notification.

# Order Numbers

## License Keys

**FIGURE 1-2** License Keys

LTO4 Encryption Key	Marketing Number	Description
Bundled	X-HP-LTO4-EKEY-B	One required per encryption enabled drive. Bundled with the drive at time of sale.
After market	X-HP-LTO4-EKEY-A	One required per encryption enabled drive. After market for drives previously purchased.

## Configured End Items

**TABLE 1-5** Configured End Items—Order Numbers

Part Numbers	Description
<b>SL500</b>	
LTO4E-HP4FC-SL500Z	LTO4 HP FC 4Gb SL500 Encryp Dr
LTO4E-HPSC-SL500Z	LTO4 HP SCSI SL500 Encryp Dr
<b>SL8500</b>	
LTO4E-HP4FC-SL85Z	LTO4 HP FC 4Gb SL8500 EncrypDr
<b>SL3000</b>	
LTO4E-HP4FC-SL30Z	LTO4 HP FC 4Gb SL3000 EncrypDr

## X-Options (Conversion Bills)

**TABLE 1-6** Conversion Bill Numbers

Part Numbers	Description
<b>SL500</b>	
XHPLTO4E-FCUPL500Z	Crypto drive upgrade for HP LTO4 FC SL500
XHPLTO4E-SCUP500Z	Crypto drive upgrade for HP LTO4 SCSI SL500
<b>SL3000/8500</b>	
XHPLTO4E-FCUP3085Z	Crypto drive upgrade for HP LTO4 FC SL3000/SL8500

## Dione Card

**TABLE 1-7** Dione Card Part Number

Part Number	Description
419954901	HP LTO4 Dione Card

## Dione Card

The Dione card—pronounced (D - O - nee)—is a custom design that provides an Ethernet interface for the HP LTO4 tape drive. With this interface, the HP LTO4 tape drive can:

- Encrypt and decrypt data using the Sun StorageTek Crypto Key Management System (KMS), Version 2.0 and above
- Configure and enroll the tape drive using the Virtual Operator Panel (VOP), Version 1.0.12 or higher

Basically, the Dione card is a translation device between the serial interface on the tape drive and the secure Ethernet port for use with the KMS.

The Dione card includes:

- Telnet server for configuration and management
- FTP server for installing new firmware and retrieving firmware trace logs
- SOAP client (with TLS 1.0 support) for communication with the KMS

## Firmware Requirements

The minimum firmware requirements include:

**TABLE 2-1** Firmware Requirements

Component	Version (or above)
Dione card	1.178
HP LTO4 tape drive	H45S Fibre Channel B44S SCSI
KMS Version 2.0	2.02
ACSLs	7.1 and 7.1.1 with PUT0701, or 7.2, and 7.3
SL8500 library	3.98B
SL3000 library	2.01 (SPS)—Requires approval
SL500 library	i15 — 1300 (SPS)—Requires approval
L-Series	3.18.xx
Virtual Operator Panel	1.0.12

## Dione Card Components

The Dione card installs in the open area of the drive trays behind the tape drives. Library drive trays that support this card are the:

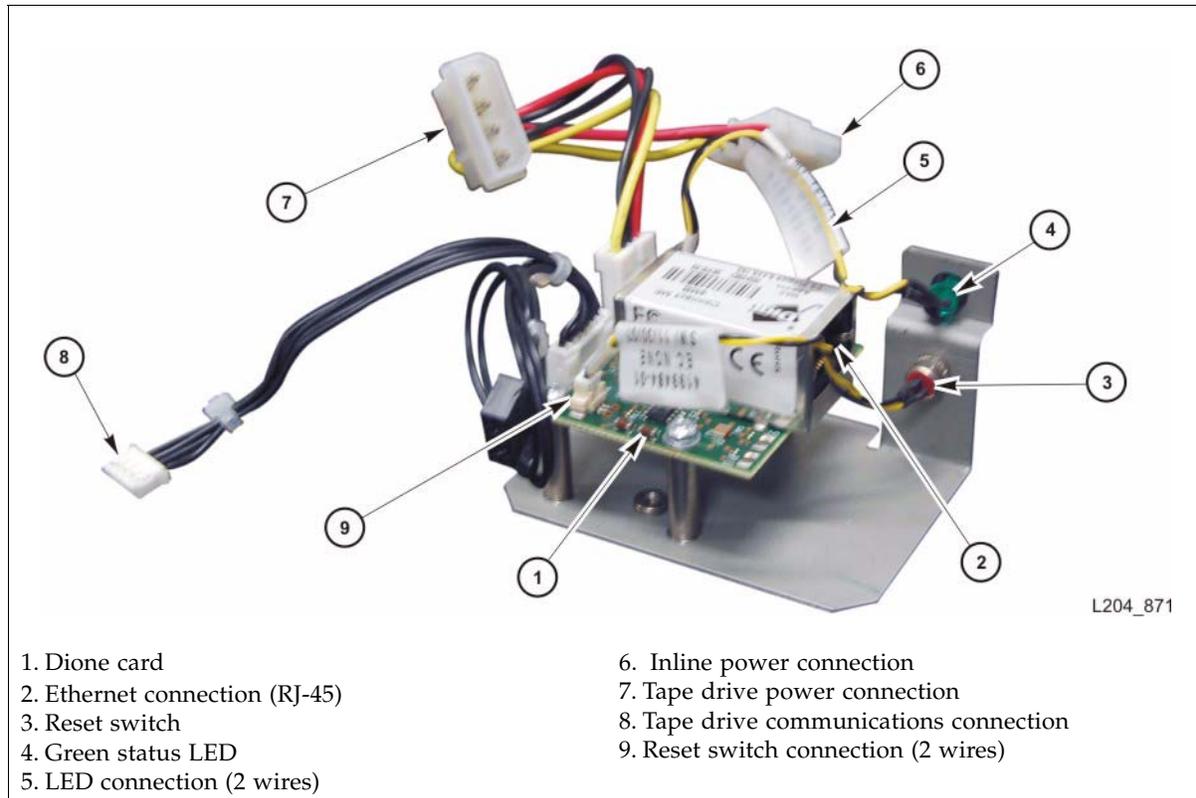
- SL8500
- SL3000
- SL500
- L-Series

Each drive tray has its own unique configuration depending on the space in the open area of the drive tray.

FIGURE 2-1 shows an example of a Dione card, which consists of:

- Dione card
- Ethernet connector (RJ-45)
- Power connection (inline with the tape drive power)
- Communications connection to the tape drive
- Reset switch (on the drive tray rear panel)
- Green Status LED (on the drive tray rear panel)

FIGURE 2-1 Dione Card Components



## Connecting to the Dione Card

FIGURE 2-2 shows two ways to connect to the Dione card:

- Point-to-point using a crossover cable
- Network using a switch or hub and standard (straight-through) Ethernet cables

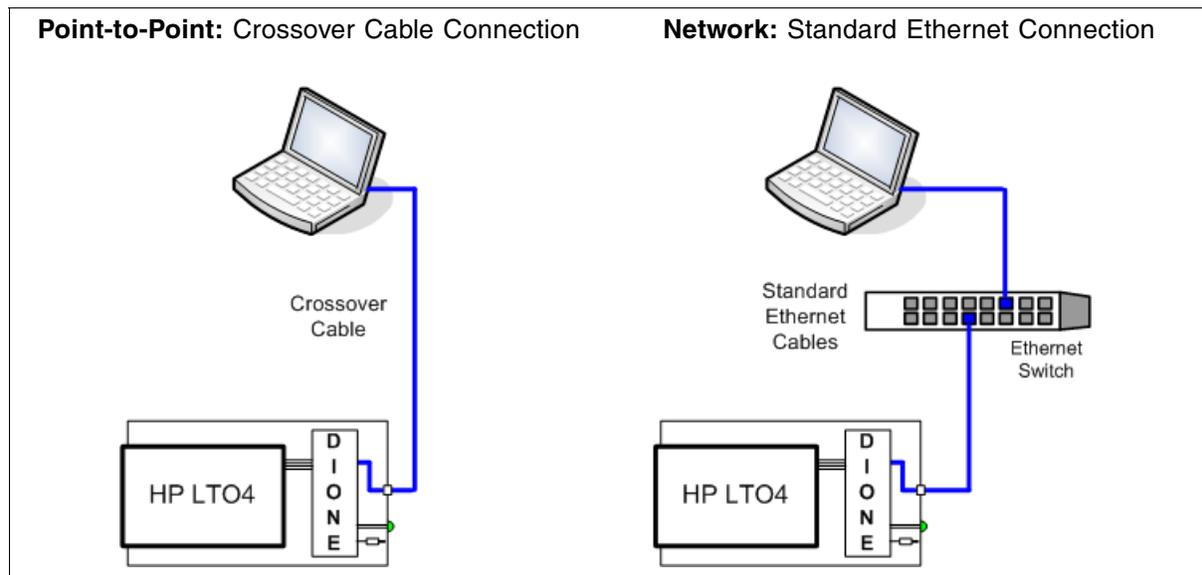
**Note** – The default IP address of the Dione card is **10.0.0.1**.

This address is the same as the T-Series tape drives.



Because of this, the initial connection to the Dione card and LTO4 tape drive should be with a crossover cable to set a new IP address. Then once the IP address is set, you can connect the drive to the network for configuration and enrollment. See [Chapter 3, “Virtual Operator Panel”](#) for information.

**FIGURE 2-2** Connecting to the Dione Card



### Green LED operation:

When you power-on the LTO4 tape drive, the green LED lights for 30 seconds as the Dione card performs an initial program load (IPL).

- If the LED does not come on when power is applied (and there is power on the tape drive) there is a problem with the Dione card.
- If this LED does not go out after 30 seconds (approximately), there is a problem with the Dione card.

After 30 seconds, the LED goes out and stays out until the tape drive is in an encryption-capable mode (tape loaded, key available, encrypting or decrypting).

### Reset Switch operation:

The reset switch performs one of three functions:

1. In normal operation, pressing this button resets the Dione as if at power-on.
2. Pressing and holding for more than 3 to 4 seconds resets all the stored settings to their manufacturing defaults, and then resets the Dione as if at power-on.
3. When Running the LED Test it temporarily changes the mode of operation allowing you to press the switch causing the LED to flash. The flashing stops when the switch is released.

---

## KMS Operations

When the tape drive is powered-on, the Dione card communicates to the drive over the serial port to take control of drive encryption and decryption.

HP LTO4 tape drives have the capability of storing one (1) key while encrypting or decrypting data. Therefore; it is essential that these drives stay connected to the KMS network for communications. Failover and load balancing will also occur between the KMAs in the system (KMS).

The following is a brief description about how the drive implements encryption:

- During **write operations**, when the backup application starts writing, the Write command triggers the drive to request an encryption key from the Dione card.

The Dione creates a secure connection to the KMA and requests a key.

The KMA provides the key.

The Dione card unwraps the key and sends it to the drive, which continues with the write operation.

- During **read operations**, a similar set of operations occur.

The backup application sends a read request.

The drive recognizes that the data is encrypted and requests a decryption key from the Dione card.

Note: The LTO4 tape format stores the metadata (key) along with encrypted data. This gives the Dione card a method to retrieve the required key for decryption.

The Dione card verifies the Key Associated Data in the data block to determine the Key ID for that block and requests the corresponding key from the KMA.

Once the key has been received, it is sent to the drive and the read proceeds.

- During media **loads and unloads** the Dione card monitors tape drive and fetches the appropriate Data Unit (for loads) or clearing of the encryption status (for unloads).

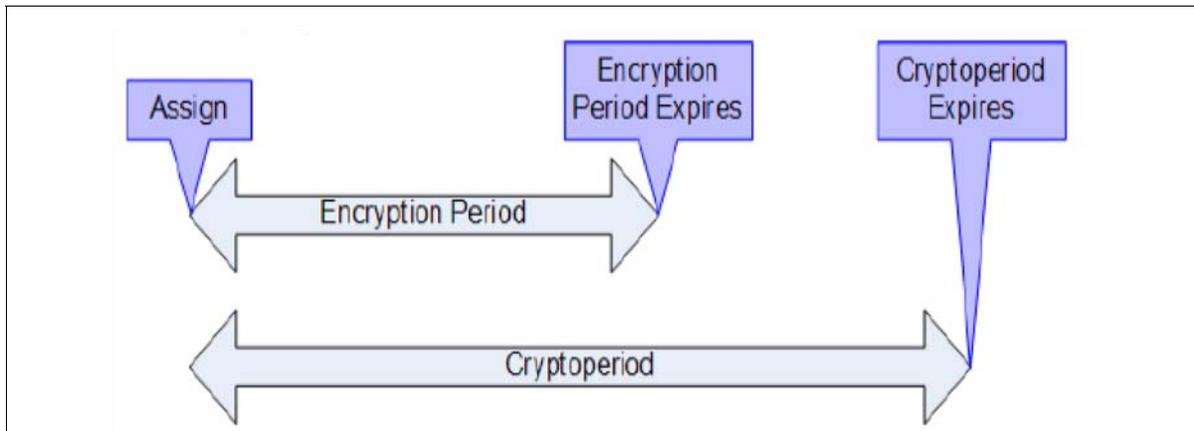
## Key Lifecycle

Keys undergo a lifecycle based on the key policy. The lifecycle imposed by the KMS is based on the NIST 800-57 guidelines and has two time periods:

- Encryption period the time after a key is assigned that it can be used to encrypt.
- Cryptoperiod the time period it can be used for decryption.

It is assumed the two periods start at the same time when the key is assigned.

[FIGURE 2-3](#) shows an example of how these periods interacts.

**FIGURE 2-3** Key Lifecycle**A potential issue:**

That LTO4 drive firmware will not request a write key in the following scenario:

Read, Space, Write-Filemark, Write.

The drive will use the same key obtained for the Read command to encrypt the data provided for the Write command. The state of this key may be inappropriate for writing due to the policy associated with the drive (an expired key).

**Work-Around:**

Assign the drive's Key Group having a key policy with a long encryption period. An encryption period of a year or longer is recommended.

**Details:**

The LTO-4 drive firmware will not request a write key in the following scenario: Read, Space, Write-Filemark, Write. The drive will use the key obtained from the Read command to encrypt the data provided for the Write command.

Most applications go through this sequence of operations when appending data to a tape.

The end result is that encryption keys previously used on that tape will continue to be used for write operations even if the state of the key has changed to expired or compromised.

The encryption period is a user defined policy.

An encryption period of a year or longer is recommended to mitigate the risk of write operations using an expired key. Most applications write sequentially to a tape cartridge until it is full. It is rare that a customer would not fill a tape cartridge with data within a year.

This is a low impact issue due to ability to mitigate exposure with a user defined encryption period and due to the non-disruptive nature of the error. Data encrypted with an expired key can still be accessed normally on future attempts to append or restore.

It is recommended that the customer *not destroy encryption keys* as a means to enforce data life-cycle management. Instead, enforce data life-cycle management by expiring volumes through the backup and archive applications.

At release, the functionality to set a key in a compromised state is not present. This is a low impact issue due to the system assigning unique encryption keys for each tape cartridge. It is rare that a compromised key scenario would ever be encountered. If it was it would only impact future writes to a single tape cartridge. This functionality will be implemented in the next drive firmware update.

## Media RFID Chips

Use [FIGURE 2-4](#) to connect the bulleted terms with the KMS Manager.

New data cartridges may not have the physical barcode information written to the Radio Frequency Identification (RFID)<sup>1</sup> chip—also known as the cartridge memory—in the LTO4 cartridge during the initial mount (load).

This requires updated library firmware, and not all libraries support this function. Future updates to library firmware will correct this problem allowing the cartridge memory to write the physical barcode. Libraries include:

- SL8500 = supported (3.98B and above)
- SL3000 = supported (2.01 and above)
- SL500 = supported (i15)
- L-Series = requires an update (3.18.xx)

- ① The barcode information from the cartridge memory is passed to the KMS and stored as additional metadata for a **Data Unit** (cartridge).
- ② The **External Tag field** of the Data Unit contains the physical barcode information when the library firmware update is available.

Refer to the *Crypto KMS Administration Guide* for more information about Data Units and the ExternalTag field.

**Note** – When installing the HP LTO4 tape drive in an SL500 library, you must disable the “Fast Load” option. Disabling this option allows the library and tape drive to update the RFID chip with the physical barcode information. This is not necessary for the SL3000 and SL8500 libraries.

## Media Types



### Important:

Encryption is only possible on LTO4 media, including LTO4 WORM media. If an earlier media-type (such as an LTO3 data cartridge) is found in the drive, encryption is disabled until that media is unloaded.

When fetching the Data Unit from the KMA, the Dione card sets the:

- ③
  - **Description field** to either “LTO4” or “LTO4WORM”
  - **External Tag field** if the library stored a barcode label in the Cartridge Memory
- ④
  - **External Unique ID** is the (vendor-unique) Cartridge Memory Attribute

---

1. Radio Frequency Identification (RFID) chips are also called cartridge memory chips. The RFID chip contains information about the cartridge, the tape, and the performance over time. This non-volatile storage information includes:

- Manufacturing information
- Usage
- Pass history
- Tape Alert flags
- Initialization information
- Tape directory
- Error history
- Status of the MIR

FIGURE 2-4 provides an example of a KMS Manager display screen using the elements from an HP LTO4 drive.

FIGURE 2-4 KMS Manager Data Unit List

The screenshot shows the KMS Manager Data Unit List interface. The window title is "KMS Manager". The left sidebar shows a tree view with "Data Unit List" selected. The main area displays a table of data units with columns: Data Unit ID, External Tag, Description, and External Unique ID. Four blue arrows point to specific columns: 1 points to Data Unit ID, 2 to External Tag, 3 to Description, and 4 to External Unique ID. Below the table are buttons for "Details...", "Activity History...", "Destroy Keys...", "Modify Key Group...", and "Export Keys...". At the bottom, a log shows session inactivity and successful data unit listings.

Data Unit ID	External Tag	Description	External Unique ID
94138F140C77D63FC1F09058471A3A50	STV011		
AC078F8B7E269F30668AE8C7F3082DC4		LTO4	846B440A4734414141
AC078F8B7E269F3073C0B7C907229146	SL0992		
AC078F8B7E269F30A08A9F9FE5192B6B	PQ4603L4 ...	LTO4	9C02110A4734414141
AC078F8B7E269F30F0097457CD65CDAB	PQ4602L4 ...	LTO4	CC02110A4734414141
D4107DE3E6C90788A88575F762BF011D			
EF4E27F726B23D7A0A653909EE981935			745D6D94EAEF38B09F
EF4E27F726B23D7A11B646C8D5929CB			81C911484860DD980
EF4E27F726B23D7A1BB870115D882BA7	ABCDEF		883BFACB70F1197AD
EF4E27F726B23D7A1F2B378BAC2293FF	ABCDEF		40BCBB68672ACF403
EF4E27F726B23D7A27284BAA618A728C	ABCDEF		3CD5FC6DCB25DDCD
EF4E27F726B23D7A2CDDFFD0B04F221B	ABCDEF		02EC55468BA9D5048
EF4E27F726B23D7A59644E70F6B32C63			
EF4E27F726B23D7A62B2C927438810E0			0C742AD0E013E7C0

Log entries:

- 6/3/2008 10:18:50 AM - Session inactivity timeout: 15 minutes
- 6/3/2008 10:18:52 AM - List Key Groups succeeded.
- 6/3/2008 10:18:52 AM - List Data Units succeeded.
- 6/3/2008 10:20:57 AM - List Data Units succeeded.
- 6/3/2008 10:21:13 AM - List Data Units succeeded.
- 6/3/2008 10:21:34 AM - List Data Units succeeded.

System status: super Connected 10.80.44.55 (inchgower)

1. Data Unit ID (data cartridge)
2. External Tag (volume serial number)
3. Description (LTO4 or LTO4WORM)
4. External Unique ID (vendor-unique RFID contents)



- Place the drive and drive tray on a suitable work surface.

---

**Caution:**

*Potential ESD damage:* The encryption card contains ESD-sensitive components. Make sure you follow proper ESD precautions.

---

- Remove the two T9 screws from the top cover and remove the cover.
- Remove the connectors from the HBD card.
- Remove the four T10 screws that attach the drive to the tray.
- Remove the T10 screw that attaches the encryption card.
- Pull out the drive part way to gain access to the cables and connectors.
- Remove the cable/connectors in this order:
  - Ethernet cable
  - P5
  - P6
  - Power cable
  - Signal cable
- Remove the four T10 screws that fasten the card to its plate.

## Replacement

---

**Caution:**

- ESD-sensitive components. Make sure you follow the proper precautions.
  - Use care not to damage the thin, glass cable attached to J5. This cable is fragile and easily damaged.
- 

To replace the Dione card:

- Obtain the encryption card and remove it from its wrapper.
- Align the card on the plate and insert the T10 mounting screws.
- Connect P5 and P6 to the card.
- Plug in the following cables in this order:
  - Signal connector from the card to the rear of the drive
  - Drive power (from rear of the drive)
  - Power jumper
- Insert the card and plate into its position and fasten it with one T10 screw.
- Position the HBD card back into place.
- Re-connect the cables to the HBD card.
- Insert the drive and fasten it to the tray with four T10 screws.
- Replace the top cover plate and fasten it with two T10 screws.
- Insert the drive tray into its slot in the array.
- Reconnect the cables to the rear of the drive.



# Virtual Operator Panel

The Sun StorageTek Virtual Operator Panel (VOP) is a computer-based application that provides a graphical user interface (GUI) to these tape drives:

- T10000A
- T10000B
- T9840D



With the VOP at Version 1.0.12 and higher, support for the HP LTO4 tape drive is provided through the “[Dione Card](#)” on page 7—which serves as a serial to Ethernet translation device for the tape drive.

FIGURE 3-1 shows an example of the VOP Display.

**FIGURE 3-1** Virtual Operator Panel Display

<p>1. Connect Tab</p> <p>2. Monitor Drive Tab</p> <p>3. Configure Drive Tab</p> <p>4. Diagnose Drive Tab</p>	<p>5. Drive status indicators (colors)</p> <ul style="list-style-type: none"> <li>■ Online/Offline</li> <li>■ Loaded</li> <li>■ Service</li> <li>■ Encrypt (<b>Encryption indicator</b>)</li> </ul>
--	---

The VOP application uses an Ethernet connection to communicate with the tape drives, either:

- Point-to-point, using a cross-over cable
- Networked, using a switch and standard—straight—Ethernet cables

This Ethernet interface provides communication with the tape drives and allows:

- Customer operators to:
  - Select and monitor drive status indicators
  - View, load, and configure drive settings
  - **Enroll and un-enroll agents (tape drives) for use with the KMS**
- Services representatives to:
  - View, delete, load, and configure encryption and communication settings
  - IPL a drive
  - Run diagnostics, retrieve dumps, and logs for the Dione card
  - **Enable and disable encryption**

## VOP Prerequisites

Before you can install and operate the VOP application, your computer system must meet certain prerequisites. These are the minimum:

- Hardware requirements
- Operating system certifications
- Java Runtime Environment (JRE) minimum release level requirements

## Computer Hardware Requirements

The minimum hardware requirements include:

- 512 MB memory
- 1.0 GHz processor
- Ethernet port available for static IP addressing
- RJ45–RJ45 Ethernet cross-over cable (direct connection to drive)
- RJ45–RJ45 Ethernet cables (indirect connection through an Ethernet switch)

## Operating System Certification

These operating systems are certified for use with the VOP:

- Windows 2000 or XP
- Linux–Redhat 9.0, ES
- Solaris–SunOS 5.8, SunOS 5.9, and SunOS 5.10

## Java Runtime Environment Requirement

The VOP software application is a Java-based program; therefore, you need a compatible version of Java Runtime Environment (JRE) installed.

Before attempting to install and run VOP, verify the presence, and release level of JAVA is version J2SE 1.5, or higher.

## Using VOP

There are two versions of VOP: 1) Customer and 2) Service.  
Refer to the VOP documentation for information about how to download and install these applications. [TABLE 3-1](#) is an *example* of these versions.

**TABLE 3-1** VOP Versions, Files, Documents, and Download Sites

Version	Document	Files	Posted	File Size
Customer	96179	VOP_CUST_REL_1.0.12.zip	05/28/2008 21:30	6055192
		General_Instructions_Download	05/28/2008 21:42	47104
		Document.txt	05/28/2008 21:56	173
Download Site:		<a href="https://spe.sun.com/spx/control/Home">https://spe.sun.com/spx/control/Home</a>		
Service	96180	VOP_SVC_REL_1.0.12.zip	05/28/2008 22:12	7006234
		General_Instructions_Download	05/28/2008 22:24	47104
		Document.txt	05/28/2008 22:44	173
Download Site:		<a href="http://dlrequest.sfbay.sun.com:88/">http://dlrequest.sfbay.sun.com:88/</a>		

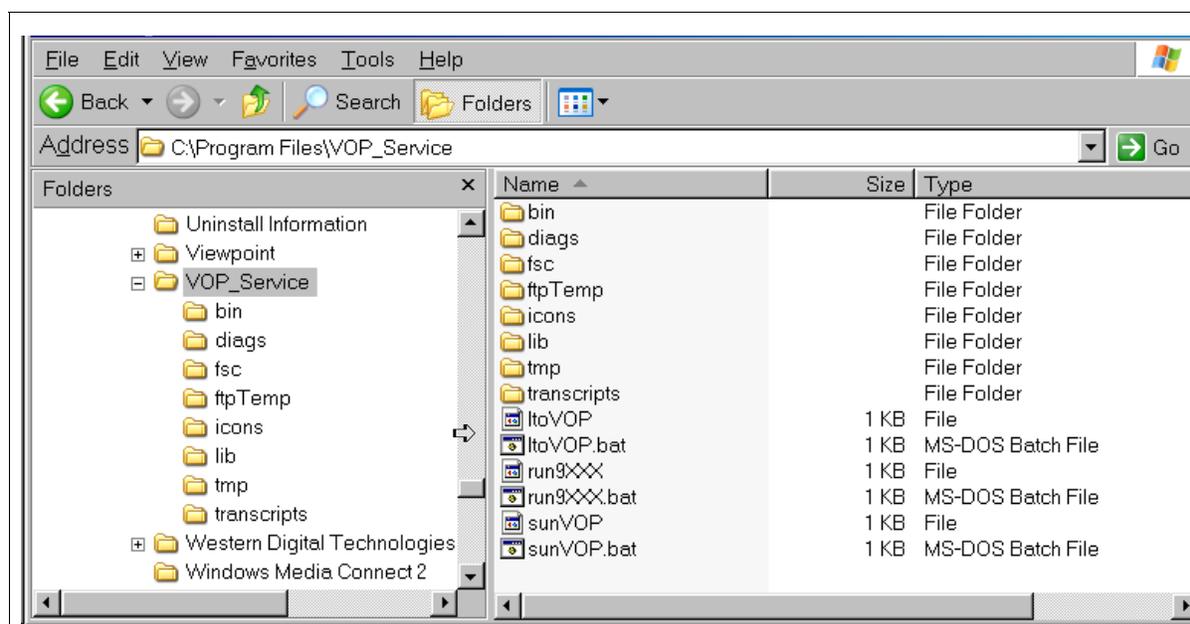


For the initial configuration, use a secure point-to-point connection and the default IP address 10.0.0.1. Because all tape drives use the same default IP address, connecting them to a switch for the initial configuration will cause problems; unless you power the drives on and configure them one-by-one.

To use VOP for LTO4 tape drives, you need to launch a special file:

- **Windows:** Launch the batch file (**ltoVOP.bat**)
- **Solaris/Linux:** Launch the **ltoVOP** file (above the batch file)

**FIGURE 3-2** VOP Files and LTO Batch File



## Start VOP



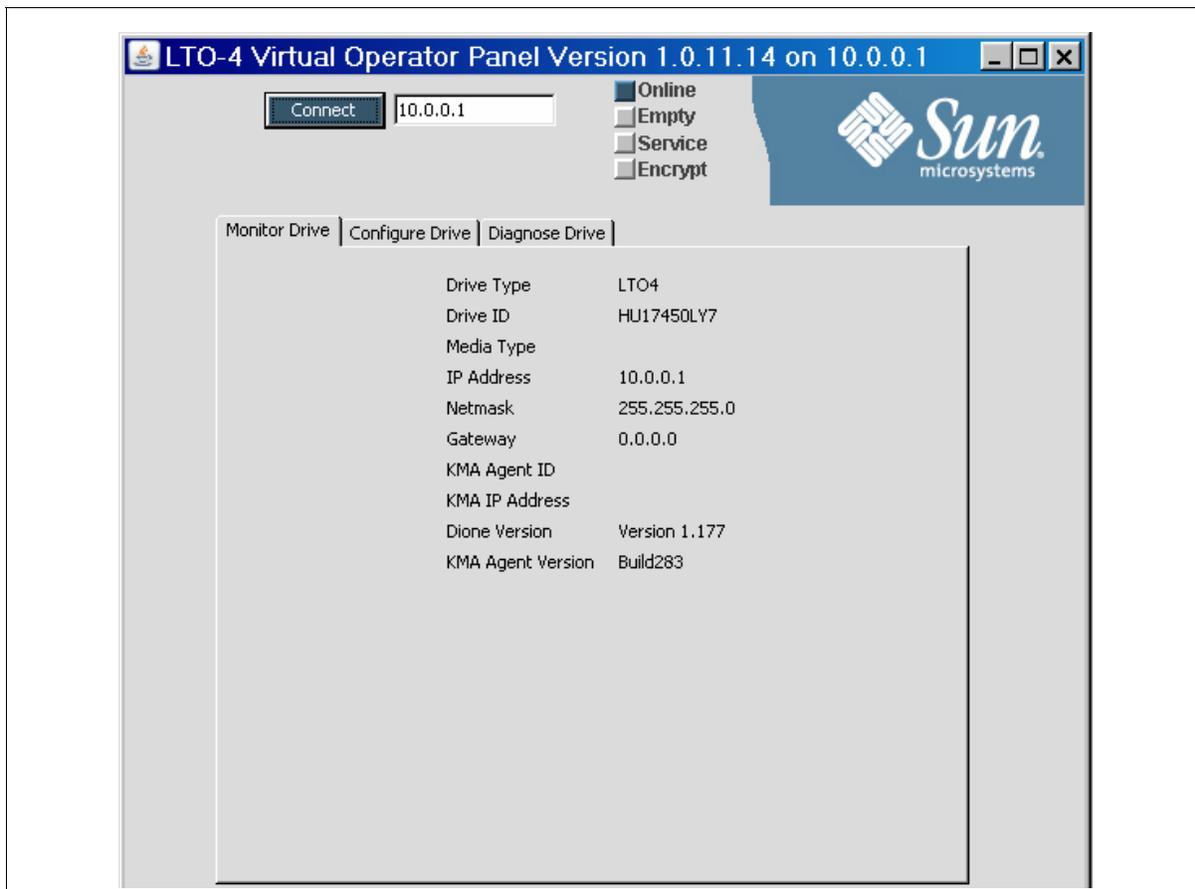
### Important:

- Remember, the Service Delivery Platform (SDP) does not support the LTO4 drives. You may need to make adjustments to the network addresses if mixing tape drives on the same KMA and/or SDP network (LAN 2).
- With this Ethernet connection, you cannot perform the same or similar functions with this tape drive that you can with the T-Series drives, such as downloading tape drive code and running tape drive diagnostics.
- Before beginning, make sure you have the assigned IP addresses and Agent names for the tape drives available and defined in the KMS manager.

To start the VOP for the LTO4:

1. Configure and connect your laptop to an LTO4 tape drive.  
(For example: use a cross-over cable and connect directly to a tape drive.)
2. Start the executable file (ltoVOP .file or .bat) to start the application.
3. Enter the default IP address (10.0.0.1) and click Connect.

**FIGURE 3-3** LTO VOP Connect Screen

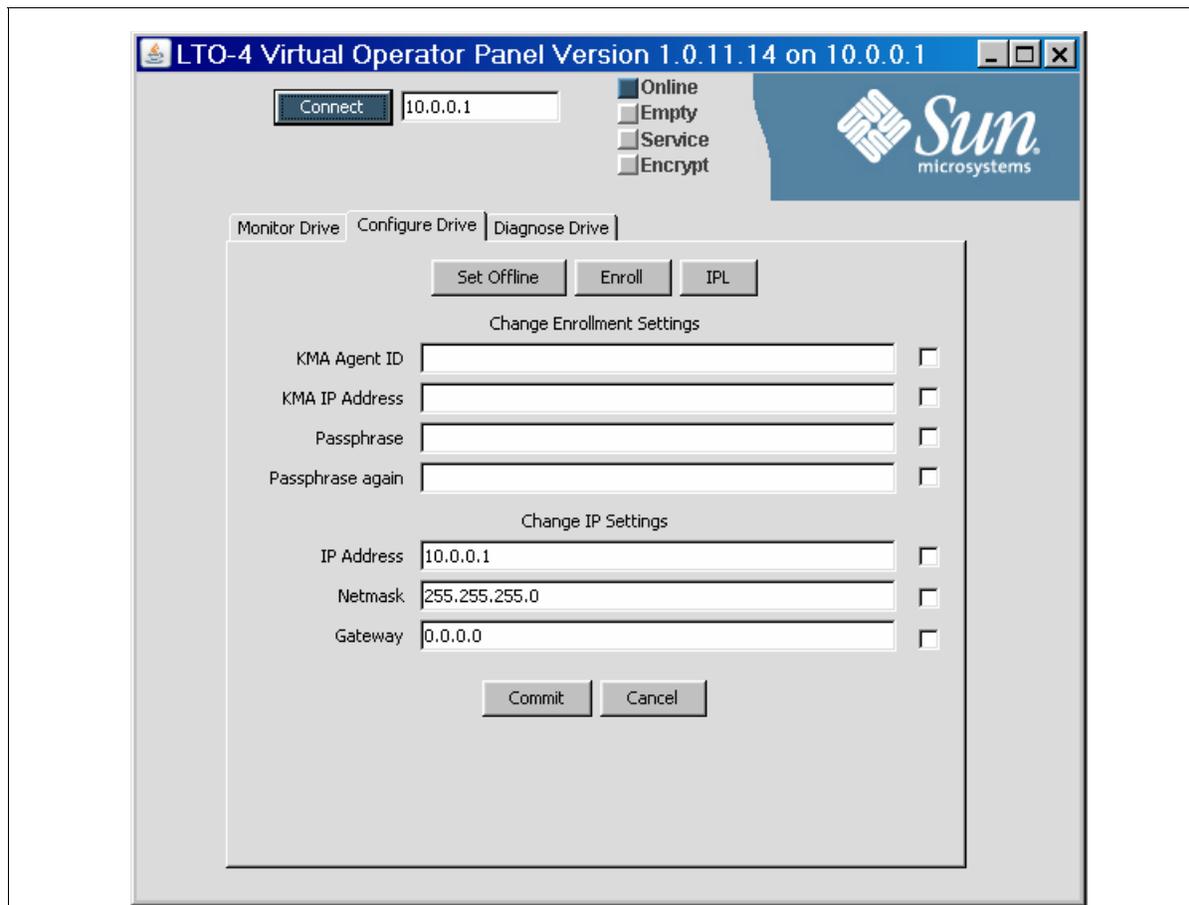


### TIP:

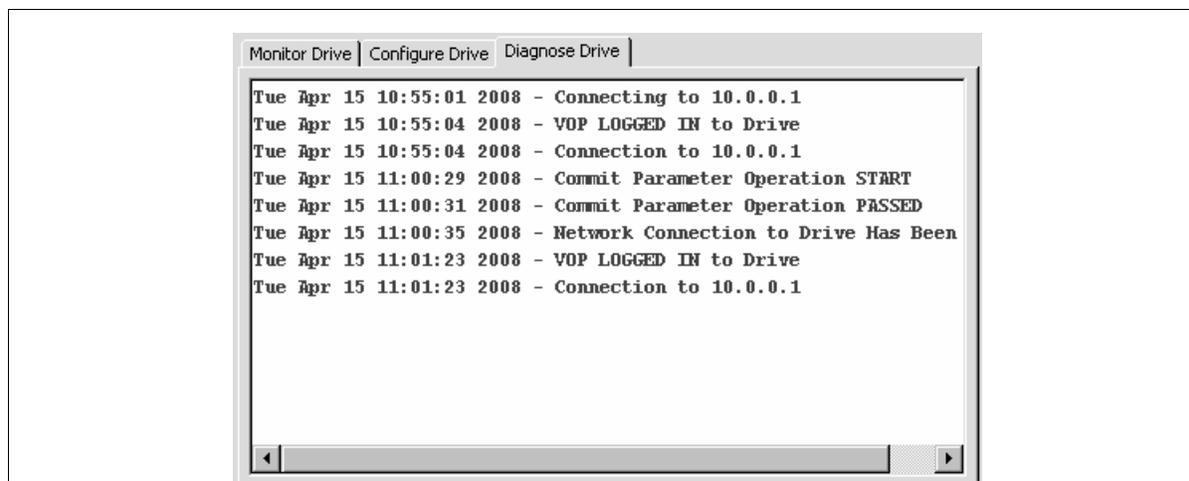
You may want to create a shortcut on your desktop that links you to the **ltoVOP** executable file. Then click on this shortcut to launch this application.

4. Set the drive offline.

- Select the Configure Drive tab and enter the required information.  
You will need customer input for the KMA ID, IP Address, and Passphrase.

**FIGURE 3-4** Configure Drive

- Click Commit and respond “Yes” to the set drive offline pop-up (if still online).  
The commit process takes about 30 seconds to complete.
- Click on the Diagnose Drive tab to observe the commit process.

**FIGURE 3-5** Commit—Passed

During the commit process, the tape drive goes offline then IPLs to save the new settings to the Dione card.

**Important:**

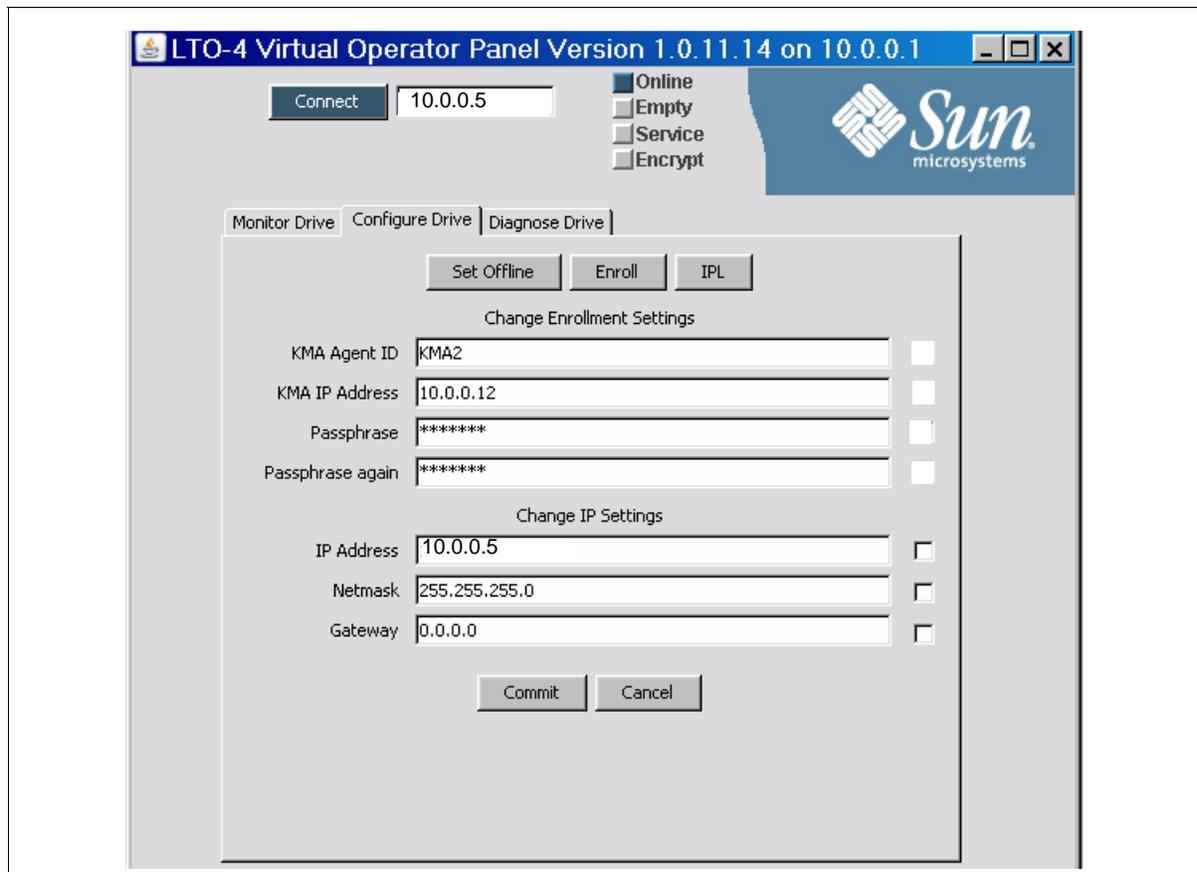
When the drive comes back online, it is now using the new IP address.

8. To continue with the configuration and to “enroll” the tape drive, you must connect the drive to the KMS network. The KMS must be able to communicate with the tape drive to complete the enrollment process.

**Note** – The Agent must be already created with a pass phrase assigned in the KMS before you can enroll the drive. If you were to “Unenroll” the Agent—for example: To turn encryption off, then re-enroll the agent to turn encryption back on—the pass phrase must be re-entered or the agent recreated in the KMS before re-enrollment.

9. Enter the new IP address in the connection window and click Connect (10.0.0.5 for this example).

**FIGURE 3-6**



10. Select the Configure Drive tab. The new settings are shown in the display.
11. Click “Enroll.”
12. Click on the Diagnose Drive tab to observe the enroll process.
  - The enroll process takes about 40 seconds to complete.
  - When the enrollment is complete, the button now indicates Unenroll.
  - You would use this button to unenroll the tape drive; which would turn encryption off (see the note in Step 8).

## Diagnose Drive Tab

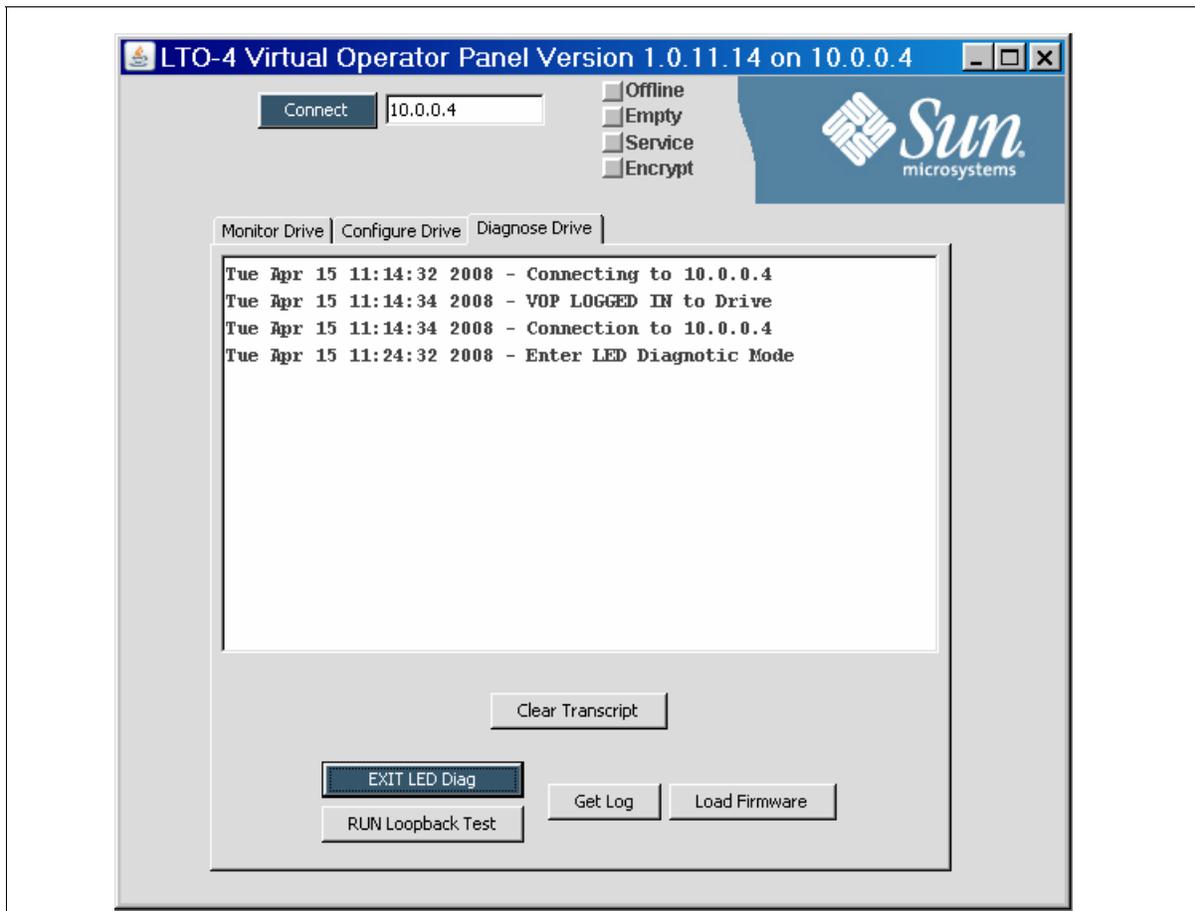
The Dione card and the VOP Diagnose Drive tab allow you to perform limit tests, get logs for engineering review, and to load Dione card firmware.

### Run LED Diagnostic Test

To run the LED diagnostic test:

1. Click on Run LED Diag. The display changes the button to EXIT LED Diag.
2. During this time, if you press the Reset switch, the green encryption LED will flash.
3. Click EXIT LED Diag to end this test.

**FIGURE 3-7** Run LED Diag



The green LED is on when you power-on the LTO4 tape drive for 30 seconds as the Dione card performs an initial program load (IPL).

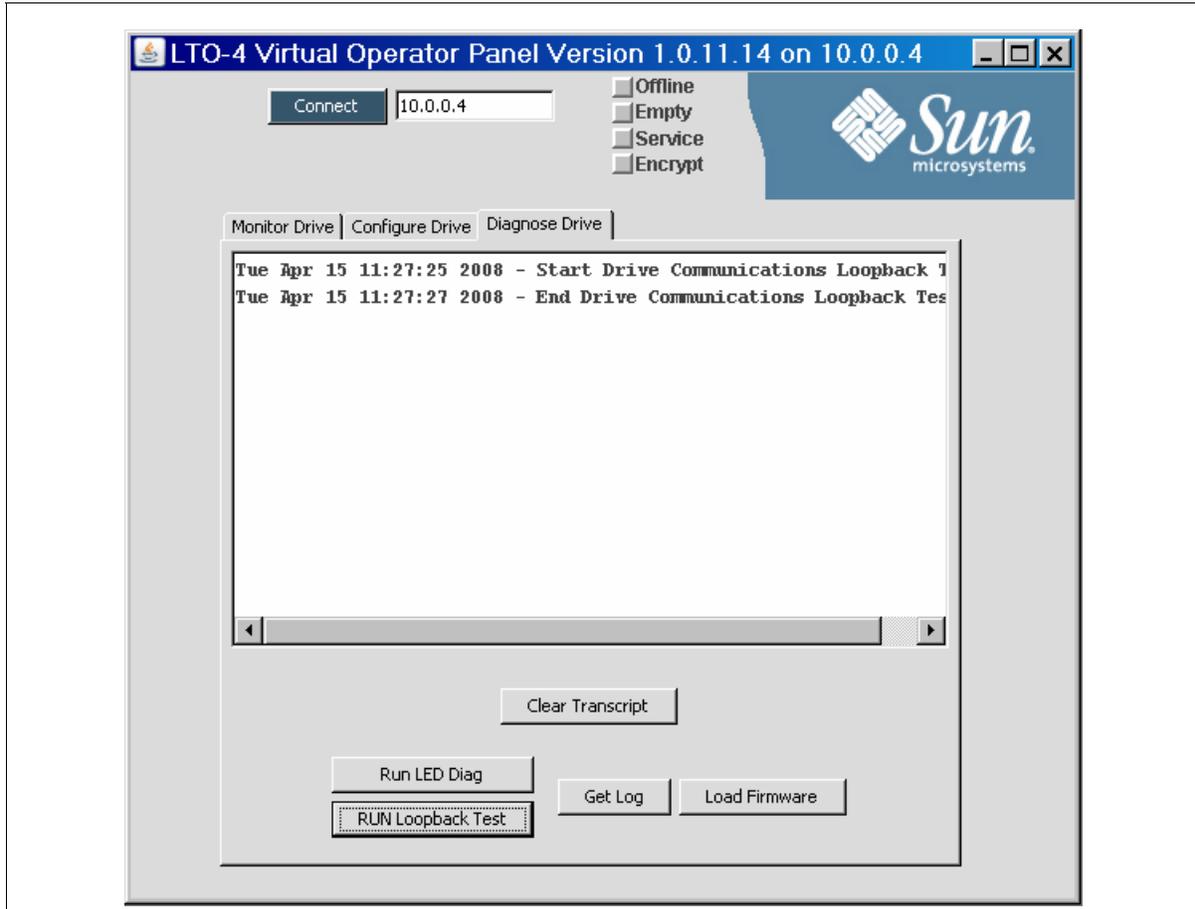
After 30 seconds, the LED goes out and stays out until the tape drive is in an encryption-capable mode (tape loaded, key available, encrypting or decrypting).

## Run Loopback Test

To run the Loopback diagnostic test:

1. Click on Run Loopback Test.
2. Observe the display as the test starts and ends.

**FIGURE 3-8** Run LED Diag

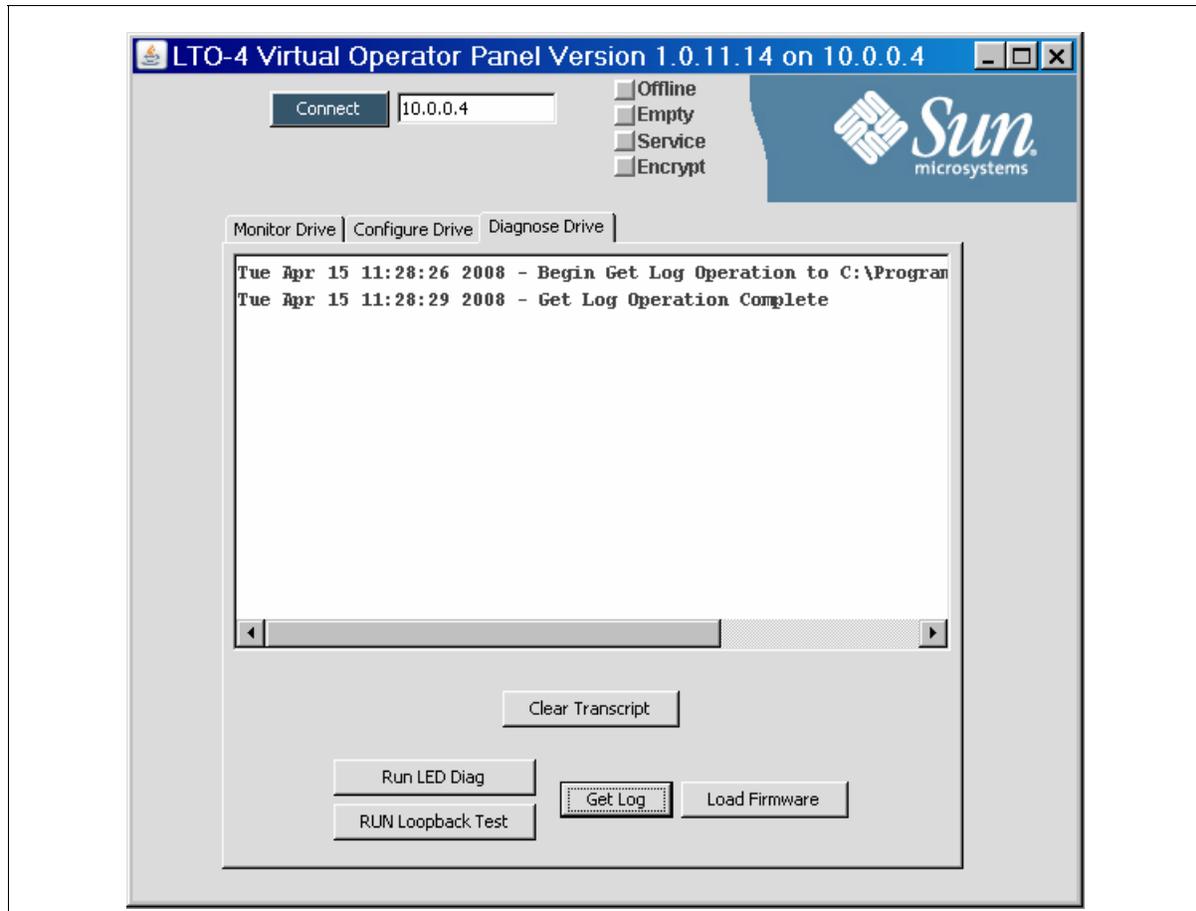


## Get Log

If a Dione card or connection is consistently having problems, engineering may request you retrieve a log of events from the Dione card.

1. Click Get Log.
2. Create and select a location for the file.  
Once the file has transferred, the operation is complete.

**FIGURE 3-9** Run LED Diag



## Load Firmware

To load new Dione card firmware:

Obtain the firmware and place it in a directory file easy to locate.

Click on Load Firmware.

A dialog box opens requesting the location of the firmware.

Navigate to that location and load the files.

Note there are two files to download: \*.bin and \*.hdr.



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