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Fujitsu Storage
ETERNUS LT140 Tape Library

User's Guide -Installation & Operation-

FUJITSU

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Preface

Fujitsu would like to thank you for purchasing our Fujitsu Storage ETERNUS LT140 Tape Library (hereinafter referred to as LT140).
The LT140 is designed to be connected to Fujitsu (PRIMEQUEST, PRIMERGY, Fujitsu M12/M10) or non-Fujitsu servers.
This manual describes operational management and maintenance of the LT140.
This manual is intended for use of the LT140 in regions other than Japan.
Carefully read the information that is provided in this manual to ensure correct usage of the LT140.

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About This Manual

Organization

This manual is composed of the following seven chapters and an appendix:

- Chapter 1 Preparation

  This chapter describes the necessary preparation for installation of the LT140.

- Chapter 2 Components

  This chapter describes hardware module configurations for the LT140.

- Chapter 3 Basic Operation

  This chapter describes basic operations that are required every day.

- Chapter 4 Default Setting

  This chapter explains how to satisfy the minimum setup requirements for installation.

- Chapter 5 Monitoring the LT140 Status

  This chapter explains how to confirm the tape library status and other items.

- Chapter 6 Function Expansion Option

  This chapter explains product options that can be added as required after system operation starts.

- Chapter 7 Troubleshooting

  This chapter provides troubleshooting.

The following content is described as an appendix:

- Tape Cartridge and Barcode Label Specifications

Warning Notations

Warning signs are shown throughout this manual in order to prevent injury to the user and/or material damage. These signs are composed of a symbol and a message describing the recommended level of caution. The following section explains the symbols, their levels of caution, and their meanings as used in this manual.

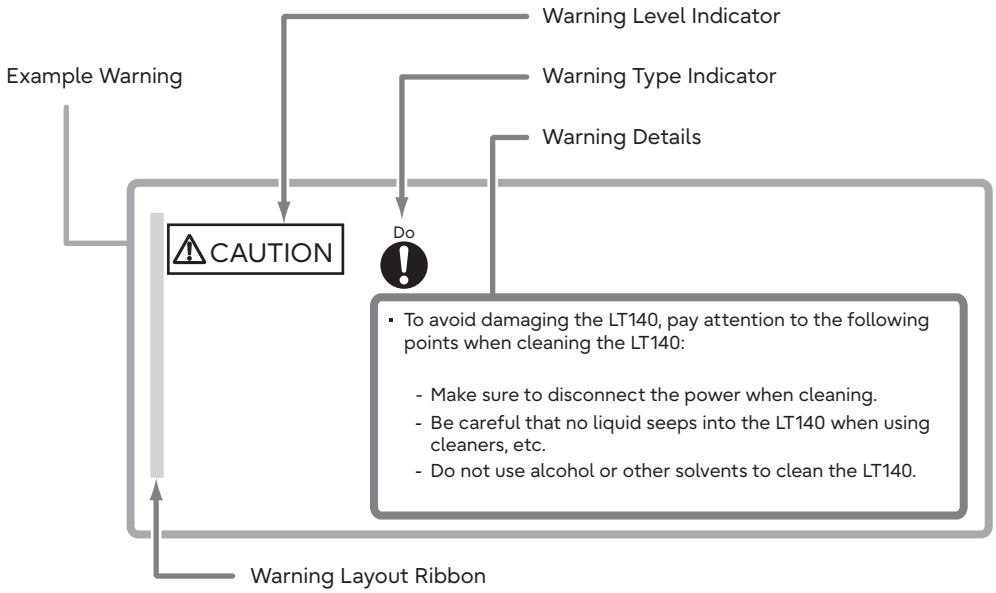
WARNING	This symbol indicates the possibility of serious or fatal injury if the LT140 is not used properly.
CAUTION	This symbol indicates the possibility of minor or moderate personal injury, as well as damage to the LT140 and/or to other users and their property, if the LT140 is not used properly.
IMPORTANT	This symbol indicates IMPORTANT information for the user to note when using the LT140.

The following symbols are used to indicate the type of warnings or cautions being described.

Electric Shock 	△The triangle emphasizes the urgency of the WARNING and CAUTION contents. Inside the triangle and above it are details concerning the symbol (e.g. Electrical Shock).
No Disassembly 	⃠The barred "Do Not..." circle warns against certain actions. The action which must be avoided is both illustrated inside the barred circle and written above it (e.g. No Disassembly).
Unplug 	●The black "Must Do..." disk indicates actions that must be taken. The required action is both illustrated inside the black disk and written above it (e.g. Unplug).

How Warnings are Presented in this Manual

A message is written beside the symbol indicating the caution level. This message is marked with a vertical ribbon in the left margin, to distinguish this warning from ordinary descriptions.
An example is shown here.



Naming Conventions

Symbols Used in This Manual

The following symbols are used throughout this manual:

Caution This symbol alerts operators to particularly important information. Be sure to read this information.

Note Functions and know how which can be useful when setting up or operating the LT140.

Abbreviations Used in This Manual

- "LT140" refers to the Fujitsu Storage ETERNUS LT140 Tape Library.
- Trademark symbols such as ™ and ® are omitted in this manual.

Warning Labels and Manufacturer's Labels

Caution labels, manufacturer's labels, and a device ID label are found in various places of the LT140.
Never remove these labels from the equipment or allow them to become dirty.

Note that the labels shown below are examples. The LT140 also has other labels that include important information.

■ Prohibition

Do not put anything on the LT140. In addition, putting the LT140 like an above picture is forbidden.

■ Warning for making the LT140 transferred

More than two people are required to carry the LT140.

■ Notes on the weight

The LT140's weight is range of 22kg to 36kg.
A breakdown of the weight is as follows:
Base Module: 22kg (robot x1, PSU x 2, tape drive x 0)
Expansion Module: 14kg (robot x 0, tape drive x 0)
A single tape drive is approximately 2kg and a single power supply is approximately 1kg.

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Chapter 1
Preparation

This chapter describes the necessary preparation for installation of the LT140.
This section describes the necessary information, and the devices and cables that should be prepared before you connect the LT140 to a Storage Area Network (SAN) and a LAN for operation management.

1.1 Host Connection

A SAN is a dedicated network for connecting a server (host) to an LT140. A Fibre Channel (FC)/ Serial Attached SCSI (SAS) interface can be used for the host interface. The connection destination may be the server or the switch depending on which connection configuration is used.
The host interface cables that are used for connecting the LT140 to a SAN must be obtained separately. When a switch is used to connect the LT260 to the server, the appropriate switch for the type of host interface that is to be connected must also be prepared separately.

1.2 Connection to LAN for Operation Management

The LT140 must be connected to the LAN for operation management during operation management and system maintenance.

Acquire an IP address for the LT140 beforehand so that a LAN environment can be set up during installation. In addition, network devices and other items must be prepared so that the LT140 can be connected to a LAN for operation management.

Chapter 2
Components

This chapter describes the hardware component configurations for the LT140.
All components such as operator panels, magazines, Mailslots, drive modules, robots, library controllers, tape drives, and power supply units are installed in modules.

2.1 Module

Two types of Modules are available for the LT140: a Base Module and an Expansion Module.
Major components are installed in each module.

The external view of the LT140 is shown blow.

2.1.1 Base Module Front View

Figure 2.1 Base Module front view

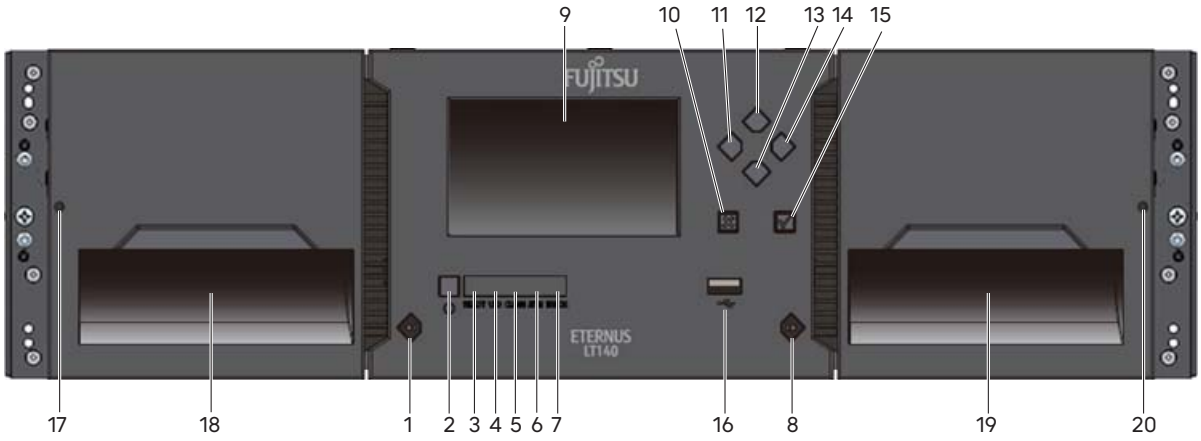


Table 2.1 Name of each component (front side of the Base Module)

No.	Name	Detail
1	Left magazine open button	Button with a status LED. Used for opening the left magazine. The status LED (blue) indicates the state of the left magazine.
2	Power button	ON/OFF power button.

No.	Name	Detail
3	LED Panel	Ready LED (green)
4		Unit Identification LED (blue)
5		Clean LED (Amber)
6		Attention LED (Amber)
7		Error LED (Amber)
8	Button for opening the right magazine or Mailslot	Button with a status LED. Used for opening the right magazine or Mailslot. The status LED (blue) indicates the state of the right magazine or Mailslot.
9	LCD screen	Display screen for the operator.
10	Operation button	Back/Return [×] button
11		Left button
12		Up button
13		Down button
14		Right button
15		Enter [4] button
16	USB port	For maintenance. Not used for normal operations.
17	Hole for manually releasing the left magazine	Used for manually unlocking the left magazine.
18	Handle for pulling out the left magazine	Used for pulling the left magazine out of the module.
19	Handle for pulling out the right magazine or Mailslot	Used for pulling the right magazine or Mailslot out of the module.
20	Hole for manually releasing the right magazine	Used for manually unlocking the right magazine.

Selecting a Menu

Menus can be selected using the operation buttons. Move the cursor over the target menu using the Up, Down, Left, and Right buttons and then press the Enter button to confirm. To cancel the selection or return to the previous screen, select the target menu or press the Back/Return button.

Selecting from the Drop-down List

Use the Up and Down buttons to select from the drop-down list. Move the cursor over the target menu and press the Enter button to display the pull down box. After that, move the cursor over the target item using the Up and Down buttons and then press the Enter button.

Entering Values

Values can be entered using the operation buttons (Up, Down, Left, and Right). Move the cursor over the target menu and press the Enter button to display the combo box. After that, select a value for each digit using the Up and Down buttons. To move to another digit, use the Left and Right button. After entering the values, press the Enter button.

2.1.2 Base Module Rear View

Figure 2.2 Base Module rear view

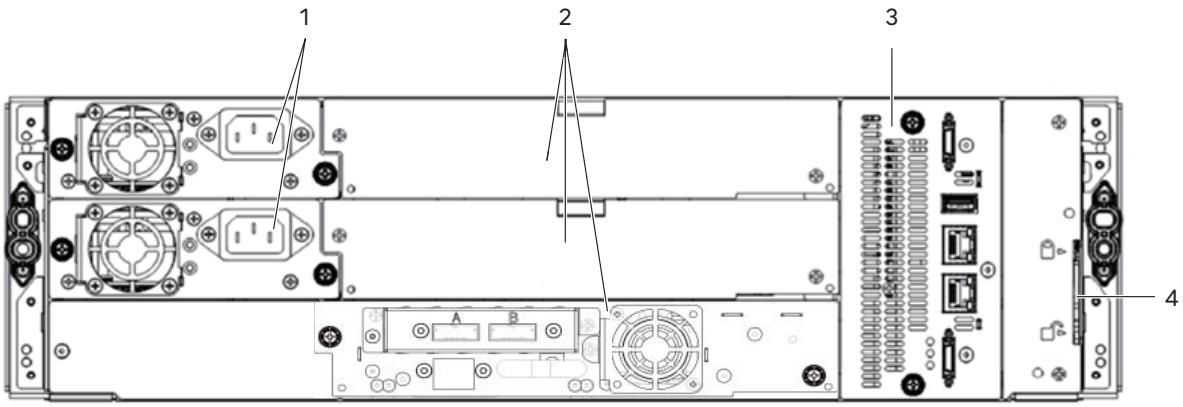


Table 2.2 Name of each component (rear side of the Base Module)

No.	Name	Detail
1	Power Supplies	Base modules (LT14AC) are installed with two PSUs as standard.
2	Half-Height Tape Drive Bays	A maximum of three half-height drives can be installed. A maximum of one full-height drive can be installed and two drive bays are used from the bottom of the module.
3	Library Controller (for Base Modules)	—
4	Module Alignment Mechanism	The mechanism for locating modules when connected.

2.1.3 Expansion Module Front View

Figure 2.3 Expansion Module front view

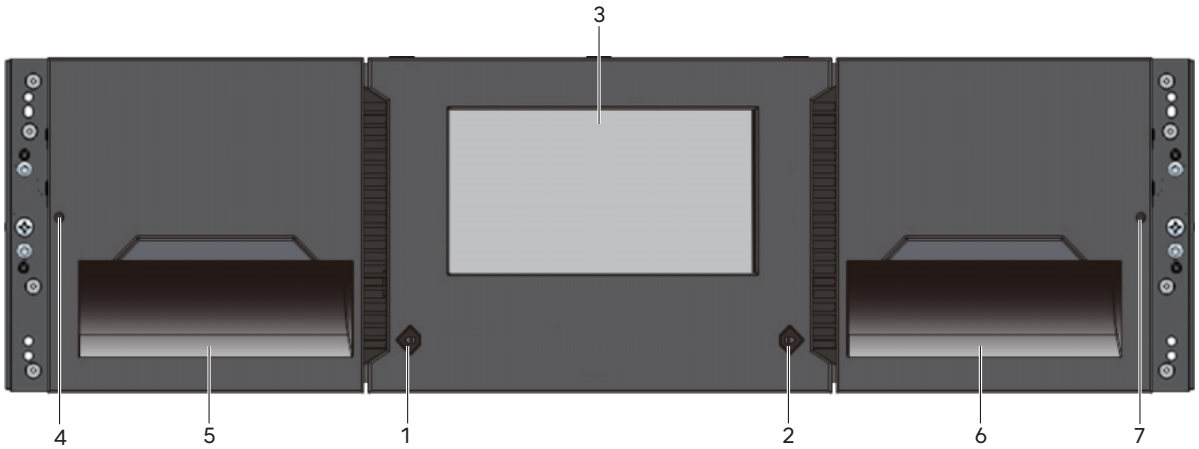


Table 2.3 Name of each component (front side of the Expansion Module)

No.	Component	Detail
1	Left magazine open button	Button with a status LED. Used for opening the left magazine. The status LED (blue) indicates the state of the left magazine.
2	Button for opening the right magazine or Mailslot	Button with a status LED. Used for opening the right magazine or Mailslot. The status LED (blue) indicates the state of the right magazine or Mailslot.
3	Transparent window	—
4	Hole for manually releasing the left magazine	Used for manually unlocking the left magazine.
5	Handle for pulling out the left magazine	Used for pulling the left magazine out of the module.
6	Handle for pulling out the right magazine or Mailslot	Used for pulling the right magazine or Mailslot out of the module.
7	Hole for manually releasing the right magazine	Used for manually unlocking the right magazine.

2.1.4 Expansion Module Rear View

Figure 2.4 Expansion Module rear view

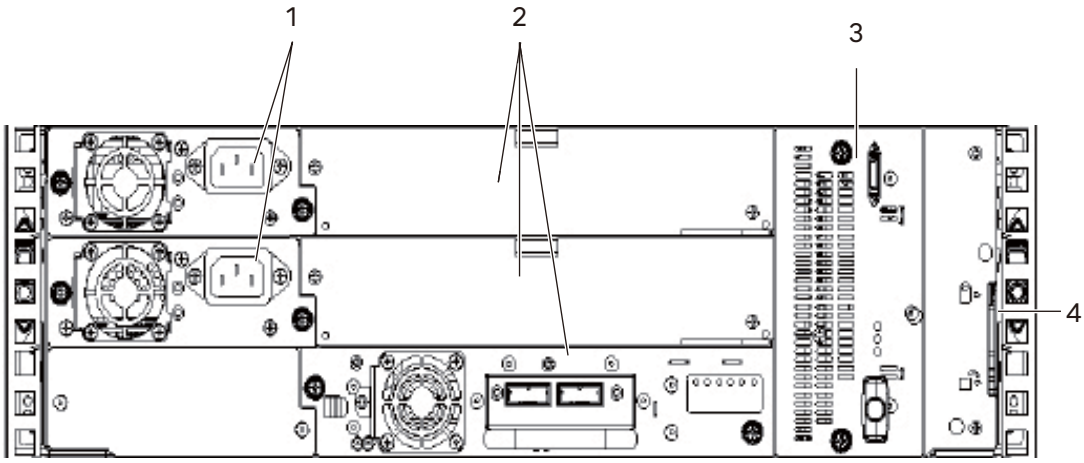


Table 2.4 Name of each component (rear side of the Expansion Module)

No.	Name	Detail
1	Power Supplies	Optional PSUs are available for Expansion Modules.
2	Half-Height Tape Drive Bays	A maximum of three half-height drives can be installed. A maximum of one full-height drive can be installed and two drive bays are used from the bottom of the module.
3	Library Controller (for Expansion Modules)	—
4	Module Alignment Mechanism	The mechanism for locating modules when connected.

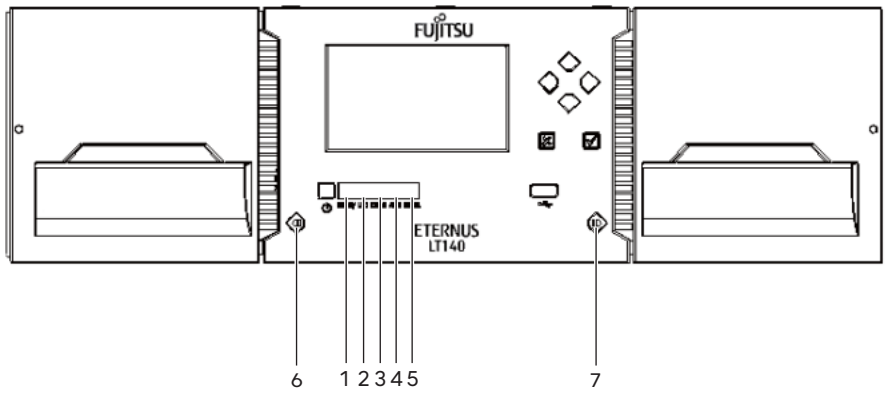
2.2 Operator Panel

The operator panel consists of a power button, display, six operation buttons, left and right magazine open buttons, and five LEDs. The operator panel allows the user to use functions such as monitoring, configuring, and operating the library. All operator panel operations are performed using the buttons. LEDs indicate the library status based on the lighting state. The magazine open buttons are used to operate the magazines or indicate the status of the magazines based on the lighting state of an LED.

Status LEDs

Status LEDs are mounted on the front panel of the Base Module. Use these LEDs to check the status of the LT140.

Figure 2.5 Status LEDs



The LEDs turn on or blink to indicate the statuses that are listed below.

Table 2.5 Meanings of each LED (LT140 status)

No.	LED status		Meaning
1	Ready	Green	When the power is on, the green LED turns on. The LED flashes when the library robot is in operation.
2	Unit Identification	Blue	The LED of the Unit ID (UID) is controlled by the user with the Maintenance > UID LED Control screen of the operator panel or remote panel. The UID LED can be used for identifying the location of the data center library.
3	Clean	Amber	When a tape drive cleaning operation is required, the amber LED turns on.
4	Attention	Amber	The LED turns on or flashes when the user attention is required. However, the library can still perform most operations.
5	Error	Amber	The LED turns on when an unrecoverable tape drive or library error occurs. A corresponding error message is displayed on the LCD screen. User intervention is required; the library is not capable of performing some operations.

No.	LED status		Meaning
6	Left magazine open button LED	Blue	Table 2.6 describes details of the left magazine open button LED.
7	Right magazine open button LED	Blue	

Table 2.6 Details of the magazine open buttons

Magazine state	LED status	Description
Closed	ON	Mailslot is enabled
Closed	Flashing (slow)	The magazine lock is being released
Closed	Flashing (fast)	The magazine is unlocked
Closed	Off	Mailslot is disabled
Opened	Off	The magazine is open

Note

The LCD screen may be initialized if time elapses without logging in or during the logout process.
As a feature, the operator panel turns white for a few seconds during the initialization of the screen and then login screen appears.

2.3 Magazine

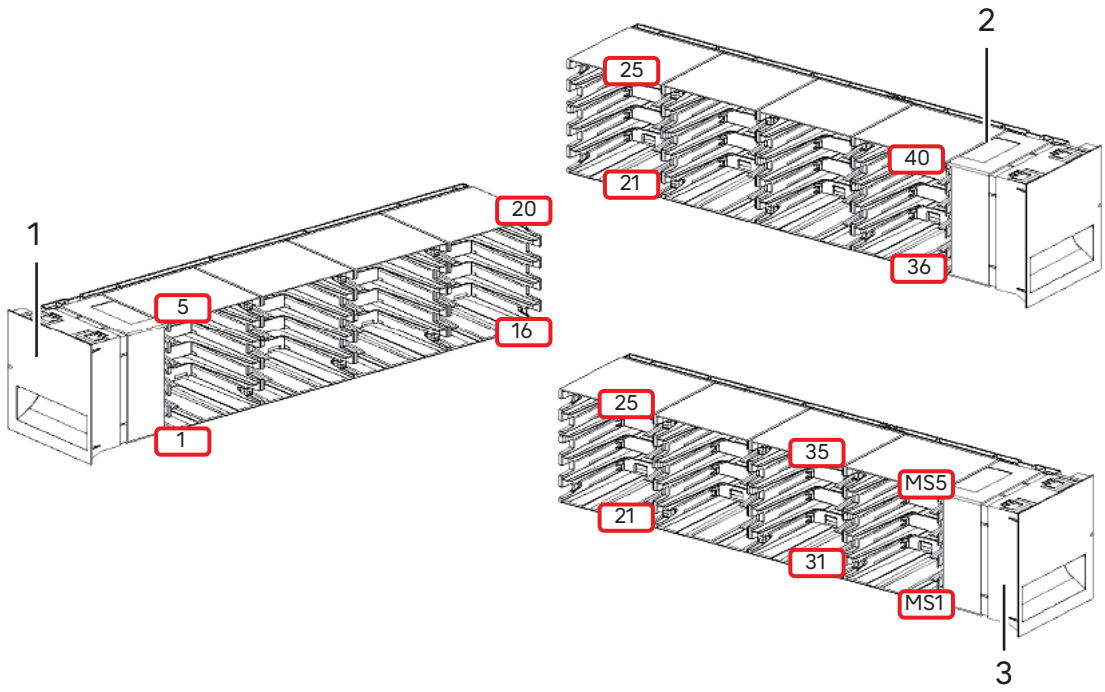
Magazines are used to store tape cartridges for saving user data.
The left and right magazines can hold 20 volumes of tape cartridges (15 volumes can be installed in the right magazine when the Mailslot is used).
Each slot number is described in Figure 2.6.
Use the remote panel or the operator panel to eject magazines.

Note

For the base and expansion cabinets, the LT140 magazines can store up to 35 cartridges when the Mailslot is enabled. If the Mailslot is disabled, up to 40 cartridges can be stored because the Mailslot can be used as a part of the magazine.

A magazine consists of the following mechanisms:

Figure 2.6 Magazine mechanism



1 Left magazine
2 Right magazine (Mailslot is disabled)
3 Right magazine (Mailslot is enabled)

Caution

Each slot has a number in the "m.s" format. For the base cabinet, "m" is fixed to "1". "s" indicates the slot location as shown in the above figure.
If the slot expansion license is not installed, only the slots (1.21 to 1.40) of the right magazine can be used. In this case, the tape cartridges in the slots of the left magazine are not recognized.

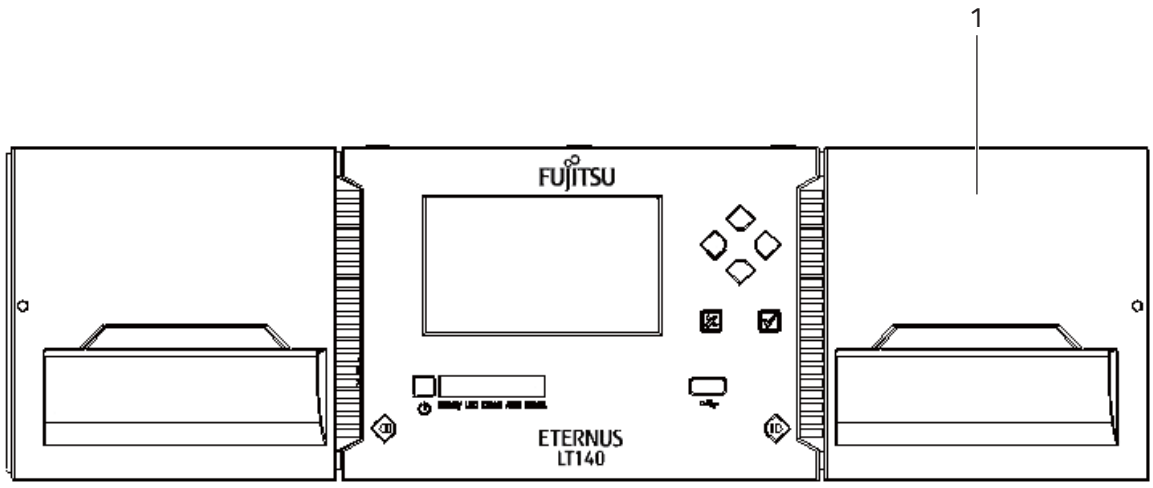
2.4 Mailslot

The Mailslot is a mechanism through which the operator inserts or ejects tape cartridges when the LT140 is being operated.
If the lock is released from the operator panel or the remote panel, the Mailslot can be pulled out. For more details, refer to "3.5.1 Unlocking the Magazine or Mailslot" (page 39).
A Mailslot has a 5-level shelf to store tape cartridges and up to 5 volumes of tape cartridges can be inserted or ejected at a time.

Note

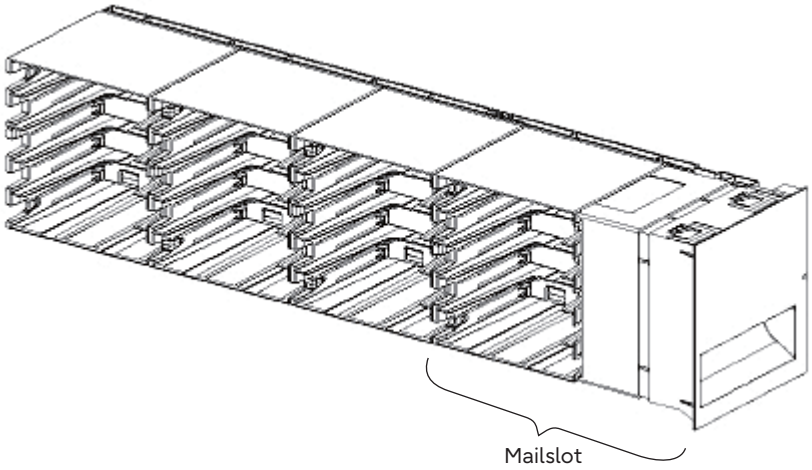
Mailslots are attached to the right magazines for the base and expansion modules.

Figure 2.7 Mailslot mounting locations (base module)



1 Mailslot

Figure 2.8 Mailslot mechanism



2.5 Drive Module

The drive module is a module unit that contains the tape drive for recording data and external interface. For installation location of drive modules, refer to "2.8 Tape Drive Unit" (page 29). When, for example, a tape drive fails, maintenance replacement is carried out in units of drive modules. The host interface supports the Serial Attached SCSI (SAS) and the Fibre Channel (FC).

CAUTION

Do Not

Malfunction

Do not pull out the drive module. If necessary to pull out a faulty drive module for replacement, contact your maintenance engineer.

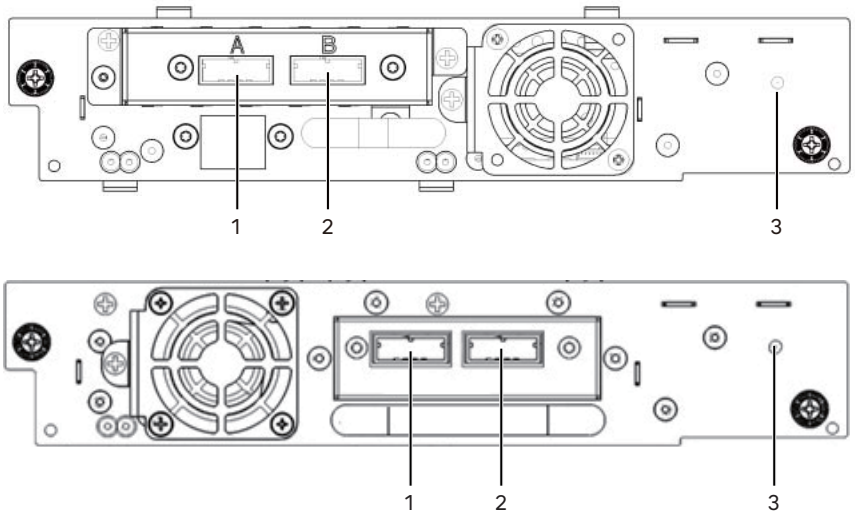
2.5.1 Rear Side of the Drive Module

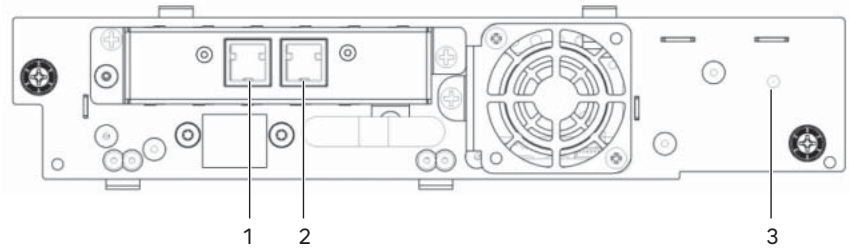
This section describes the rear side of each drive module.

LTO-7 HH SAS, LTO-8 HH SAS, LTO-9 HH SAS

There are three types of rear panels for the SAS interface.

Figure 2.9 Rear view of LTO-7 HH SAS (Product ID: LT14ASME, LT14ASML),
Rear view of LTO-8 HH SAS (Product ID: LT14ASNE, LT14ASNL),
Rear view of LTO-9 HH SAS (Product ID: LT14ASPE, LT14ASPL)

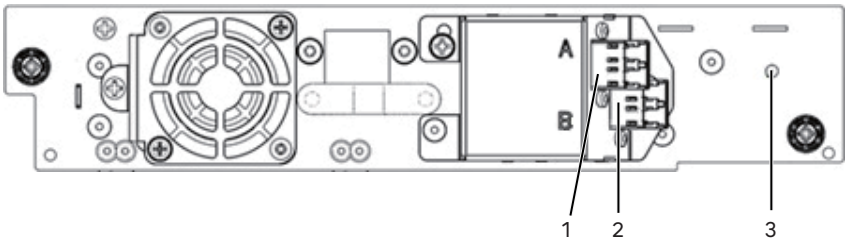




1	SAS Port A	2	SAS Port B (unavailable)
3	Tape Drive Power LED (Green)		

LTO-7 HH FC, LTO-8 HH FC, LTO-9 HH FC

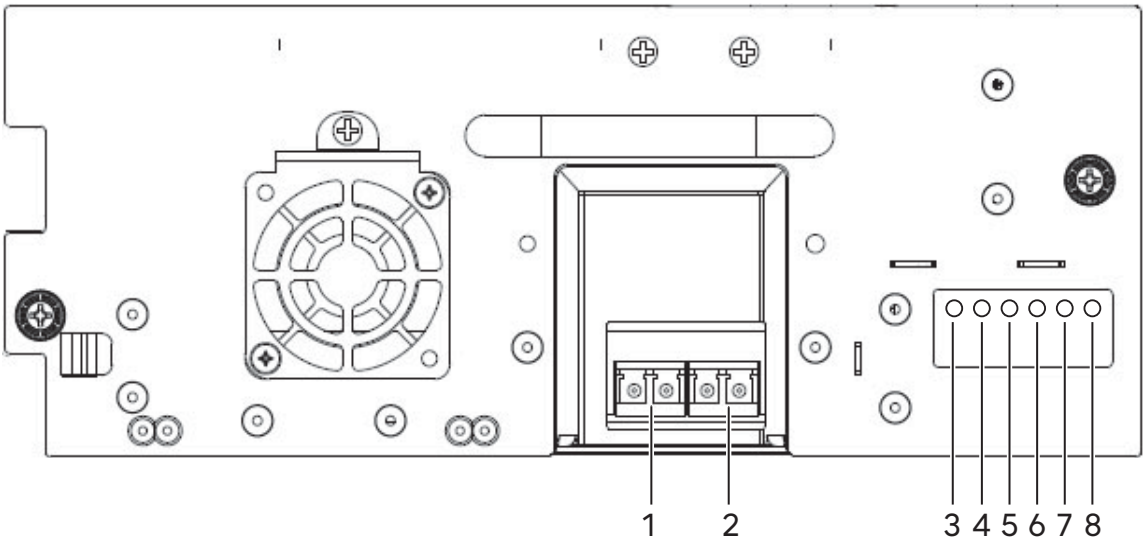
Figure 2.10 Rear view of LTO-7 HH FC (Product ID: LT14AFME, LT14AFML),
Rear view of LTO-8 HH FC (Product ID: LT14AFNE, LT14AFNL),
Rear view of LTO-9 HH FC (Product ID: LT14AFPE, LT14AFPL)



1	FC Port A	2	FC Port B (unavailable)
3	Tape Drive Power LED (Green)		

LTO-9 FH FC

Figure 2.11 Rear view of LTO-9 FH FC (Product ID: LT14BFPE, LT14BFPL)



1	FC Port A	2	FC Port B (unavailable)
3	Port 0	4	Port 1
5	10101 mark	6	Cartridge mark
7	Power mark	8	Information mark

Table 2.7 Meanings of each LED (rear view of the LTO9 FH drive)

No.	LED status		Meaning
3	Port 0	OFF	The cable is not connected
		Flashing yellow	Not linked but light is visible
		Flashing green	Linked up, and sending and receiving
		Solid green	Linked up, but not sending or receiving
4	Port 1	OFF	The cable is not connected
		Flashing yellow	Not linked but light is visible
		Flashing green	Linked up, and sending and receiving
		Solid green	Linked up, but not sending or receiving
5	10101 mark	Flashing green	Sending and receiving with the library
6	Cartridge mark	OFF	There is no cartridge in the drive
		Yellow	The drive is running a self-diagnosis
		Green	A cartridge is loaded
7	Power mark	Green	The power of the drive module is ON
8	Information mark	OFF	There is no information from the drive module controller
		Blue	There is information from the drive module controller

2.6 Robotic Assembly

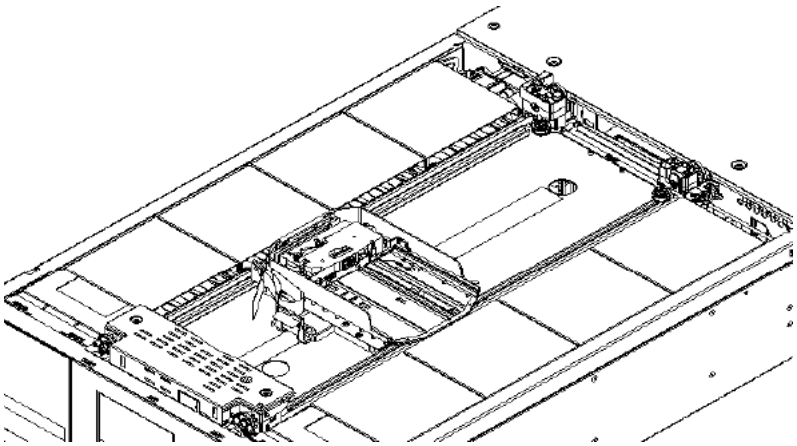
The robotic assembly is used to transport tape cartridges from a slot or Mailslot (refer to "2.4 Mailslot" (page 23)) to a different slot or a tape drive.

A faulty robot can be replaced or repaired.

Caution

Only maintenance engineer should replace or repair a robot.

Figure 2.12 Robotic Assembly

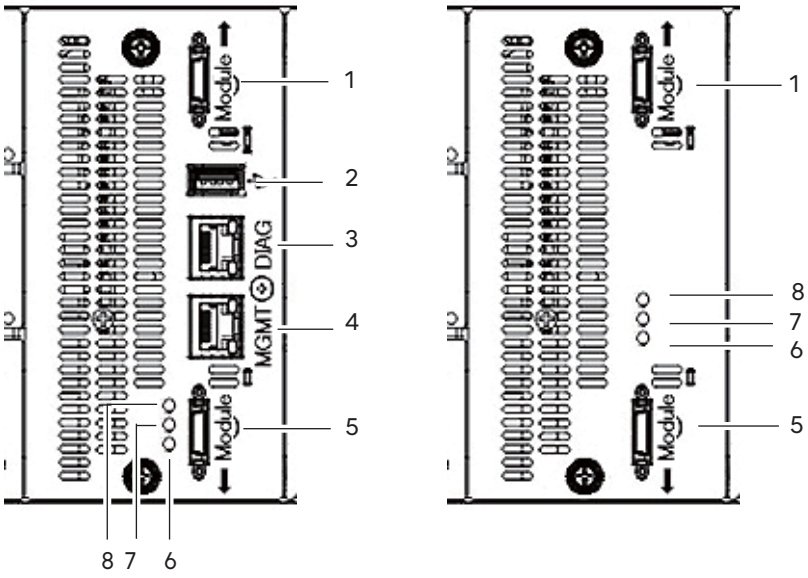


2.7 Library Controller

The library controller is located at the rear right of each module.
The library controller of the Base Module controls the system as the main controller.

The library controller of the Expansion Modules will not provide LAN ports and USB ports.

Figure 2.13 Library controller (Base Module/Expansion Module)



1 Module Interconnect (to top)
2 USB Port (service) (not used) (*1)
3 LAN Port (DIAG) (service) (not used) (*1)
4 LAN Port (MGMT) (remote panel) (*1)
5 Module Interconnect (to bottom)
6 Unit Identification LED (blue)
7 Controller Error LED (yellow)
8 Controller Health Status LED (green)

*1: Only installed for Base Modules.

Table 2.8 Meanings of each LED (library controller)

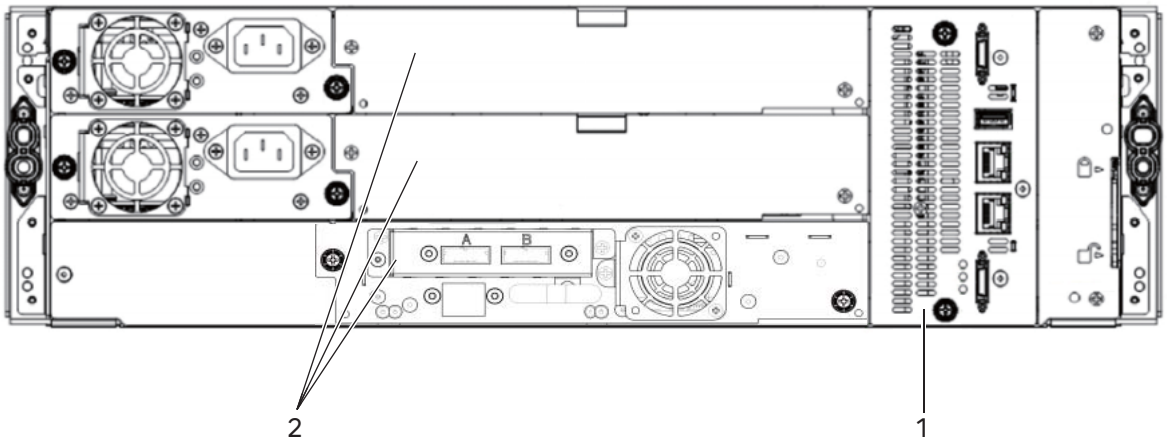
No.	LED status		Meaning
6	Unit Identifier LED	Blue	The LED of the Unit ID (UID) is controlled by the user with the Maintenance > UID LED Control screen of the operator panel or remote panel. The UID LED can be used for identifying the location of the data center library.

No.	LED status		Meaning
7	Controller Error LED	Yellow	When lit, the controller is not functioning.
8	Controller Health Status LED	Green	When the state of the library controller is normal, the LED flashes green.

2.8 Tape Drive Unit

Up to three half-height drive modules or one full-height drive module can be installed in the tape drive unit. A mixed installation with a full-height drive module and a half-height drive module is also available. Power is supplied to the tape drive with a drive power board.

Figure 2.14 Tape drive unit and drive power board



1 Drive power board (behind library controller)
2 Half-Height Tape Drive Bay

- Drive module

  For details on the drive module, refer to "2.5 Drive Module" (page 24).

2.9 Power Supply Unit (PSU)

The power supply unit (PSU) distributes the power that is supplied from an external power source to the LT140.

Figure 2.15 Power supply unit (PSU)

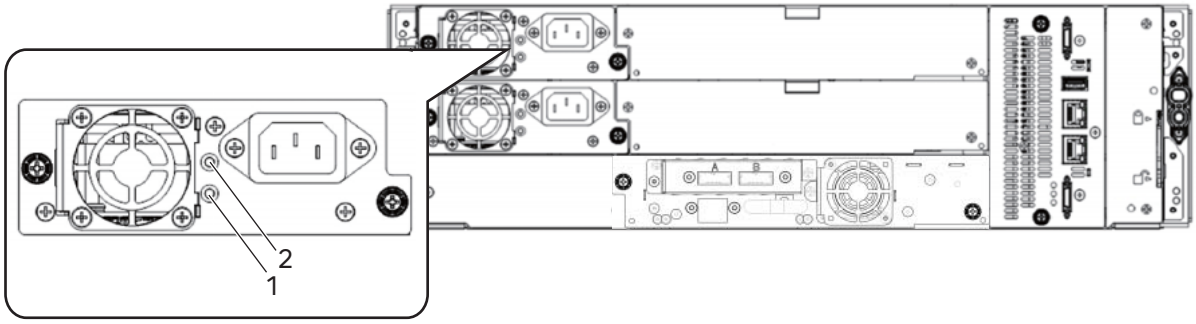


Table 2.9 Meanings of each LED (power supply unit)

No.	Status	Meaning
1	White	AC power is connected.
2	Green	Module is powered on.

- Power supply unit (PSU)

Each PSU receives 100VAC – 240VAC. It converts AC power to DC power for the internal component, such as Backplane, drive power board and library controller.
PSUs that are installed in the Base Module can supply power to all the drive modules and to the robot module that are installed in the Base Module. Two PSUs are installed in the Base Module (LT14AC) as standard. If one of the PSUs fail, operations can continue with the other PSU.
PSUs are not installed in Expansion Modules as standard. In the Base Modules sold by Fujitsu Technology Solutions GmbH (FST), one PSU is installed as standard. An optional PSU can be added.

Note

The tape library differentiates the management information of multiple tape cartridges by the barcode label volume number and is a device that is suitable for management.
Because operations without barcode labels may cause a malfunction, operations using barcode labels is recommended.

Chapter 3
Basic Operation

This chapter explains how to perform basic daily operations.

3.1 Powering On/Off

This section explains how to turn on and off the LT140.

CAUTION

Do

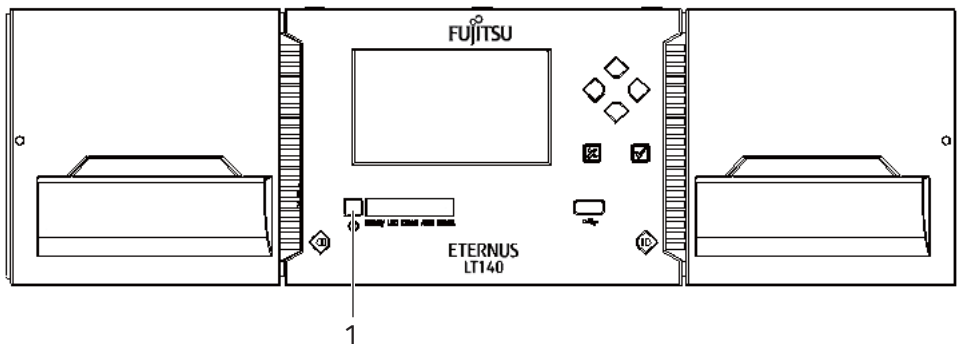
Injury or fire hazard

If the LT140 supports multiple power supply units and the associated power cords are connected to a single power strip, high leakage current might flow through the grounding conductor of the power strip.
Be sure to connect the ground conductor before connecting the power cords. If the power cords are not wired directly to a power distribution board, use industrial grade power strips.

Powering On

Plug the power cables into the power connectors on each PSU and insert power plugs into the power outlets.
Power on the library by pressing the power button on the Base Module; the green light will illuminate. When the library is powered on, it inventories the tape cartridges in the magazines, checks the firmware version on all modules, configures the tape drives, confirms the presence of the existing modules, and searches for any new modules.

Figure 3.1 Power switch



1 Power Button

Powering Off

To power off the library, press the power button on the Base Module. Press the power button and hold it for 3 seconds to display a screen for selecting the park position of the robotic assembly (Figure 3.2).
For normal operation, do not select any options, or select "The default parked position". If 10 seconds pass before making a selection "The default parked position" is selected automatically.
To relocate or carry the LT140, select "The shipping position" within 10 seconds.
If the library does not start a shutdown operation, press and hold the power button for 10 seconds.

If "The default parked position" is selected, the robotic assembly moves behind the operator panel.

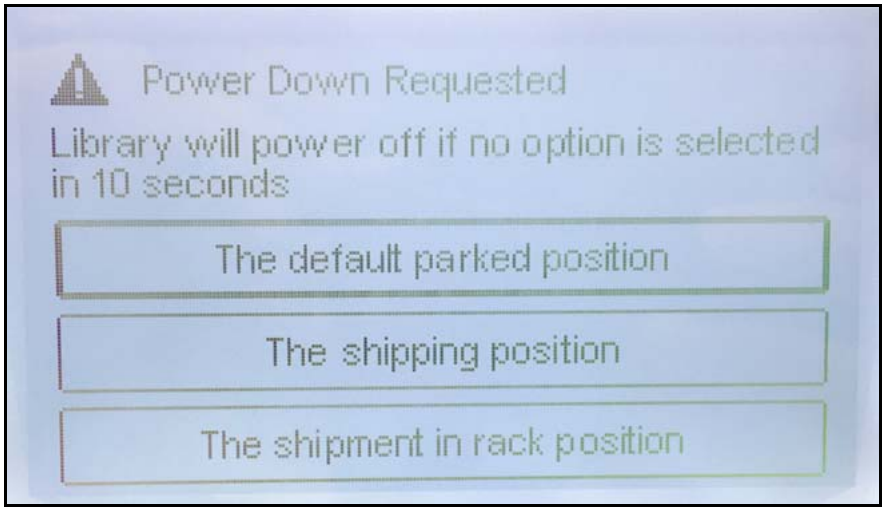
If "The shipping position" is selected, the robotic assembly moves underneath the Base Module.
If "The shipment in rack position" is selected, the robotic assembly moves underneath the bottom-most module that is installed in the rack.

Verify that all host processes are idle.

Note

Before turning off the LT140, make sure that the operation is stopped and that no tape cartridge remains in the tape drives.

Figure 3.2 Window selecting the robotic assembly parked position



3.1.1 Points to Note when Turning On or Turning Off the LT140

CAUTION

Data destruction

Do not ever run backup software while the library power is being turned off or a power-on initialization sequence is in progress. Otherwise, a malfunction may result.
If the library power is turned off while a backup is in progress, the validity of the data being written is not guaranteed. In addition, the tape cartridges to which data has been written might become unusable. If these problems occur, contact the support department of the backup software vendor and take their suggested corrective actions before retrying the backup.

3.1.2 Turning on the Server

If the server power is turned on while the library is initializing, a library identification error might result. Be sure to allow the library to finish its initialization sequence before turning on the server power.

3.2 Operator Panel Operation

This section describes the login method and the screen configuration of the operator panel.

3.2.1 Logging into the Library

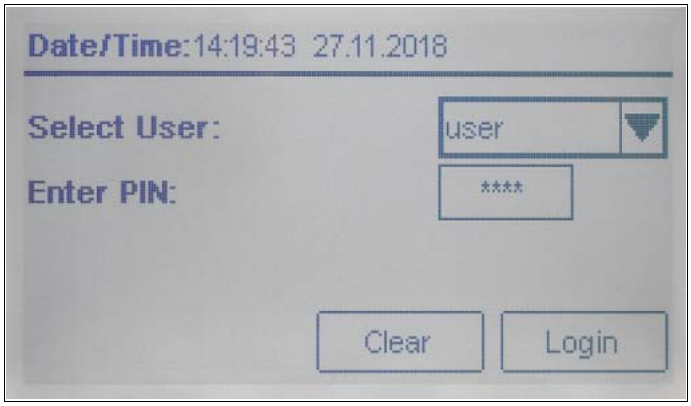
This section explains how to login to the library:

Procedure

1. Display the login screen.
   Press the Enter button to exit the screen saver if it is being displayed on the operator panel.

2 Select a user.

Figure 3.3 Login screen



3 If required, enter the PIN.

4 Select Login.

The user levels are:

- user
  The user account provides access to status information, but not configuration, maintenance or operation functions. There is no initial PIN. Log in to the library without entering a PIN.
  In addition, the administrator account can set a user account PIN, allow or deny the use of some operation functions. For details, refer to "2.5.5 Changing the PIN" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

- administrator
  The administrator PIN is required to login as the administrative user. An initial administrator PIN is not set. Log in to the library without entering a PIN.
  The administrator user can use most functions except for the log configuration function and the maintenance function.

  Caution

  For security purposes, changing the initial administrator PIN after starting the library is recommended.
  During the initial login, the Initial System Setup function is used to configure the library and set the administrator PIN. The remote panel can be used by changing the administrator PIN and by configuring the network settings with this function.
  For more details, refer to "3.4.1 Using Initial System Setup" (page 38).

- security
  The "security" account cannot log in to the library from the operator panel. When logging in to the library with the "security" account, use the remote panel.
  For details, refer to "3.2 Logging into the Library" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- service
  Access to this user is by Service personnel only. The service PIN is set at the factory.

Note

Basically, only one user can log in to the library regardless of whether the user logs in from the remote panel or operator panel.
If a user is already logged in, a warning message appears. Select whether to continue the login process.

- Select Leave to stop the login process.
- Select Login to continue the login process and forcibly log the currently logged in user out.

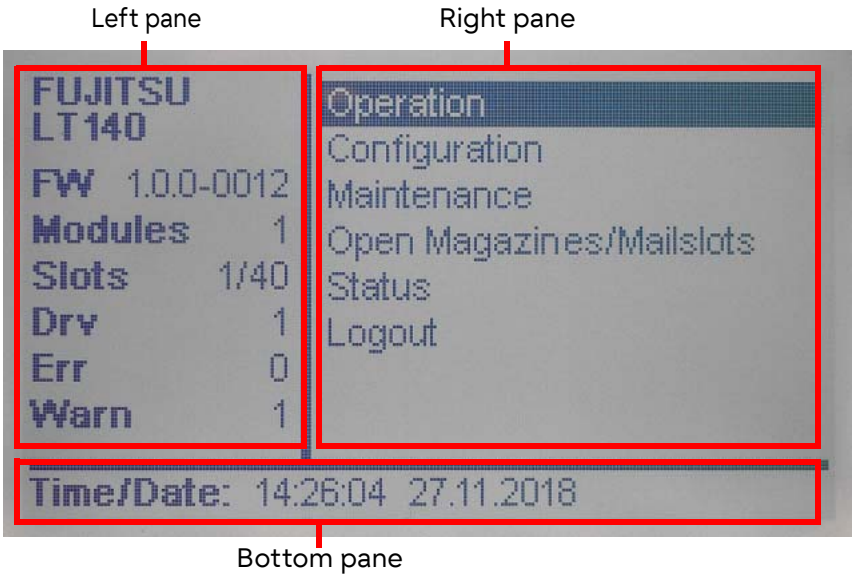
As an exception, only the "user" account can log in to the library regardless of whether other users are logged in.
Note that if no operation is performed for a certain period of time, the user is forcibly logged out.

End of procedure

3.2.2 Using the Operator Panel Home Screen

The Home screen of the operator panel is configured in the following areas:

Figure 3.4 Operator panel Home screen



Items displayed in the left pane

Displays a part of the library status.

- FW
  Displays the library firmware version.
- Modules
  Displays the number of modules that configures the library.
- Slots
  Displays the number of library slots and the number of used slots.
  Displayed as "the number of library slots /the number of used slots".
- Drv
  Displays the number of tape drives installed in the library.
- Err
  Displays the number of detected Error statuses.
- Warn
  Displays the number of detected Warning statuses.

Items displayed in the right pane

Displays the operation menu list.

- Operation (non-user account)
  Using the operation function of the library. For more details, refer to "3.3 Operating the Library" (page 37).
- Configuration (non-user account)
  Configuring the library. For more details, refer to "3.4 Configuring the Library" (page 38).
- Maintenance (non-user account)
  Using the maintenance function of the library. For details, refer to "2.6 Maintaining the Library" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- Open Magazines/Mailslots
  Uses the magazines or Mailslots of the library. For more details, refer to "3.5 Loading and Ejecting Tape Cartridges" (page 39).
- Status
  Referencing the library status information. For details, refer to "2.8 Viewing the Library Information" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- Logout
  Logging out to return to the login screen.

Items displayed in the bottom pane

Displays information such as the IP addresses that are set for the library or the date and time in sequence.

3.3 Operating the Library

This section describes the library operation functions.
Select Operation in the Home screen to use the operation functions of the library from the menu that is displayed.

3.3.1 Moving Media

From the Operation > Move Media screen you can move a tape cartridge located in a source element to an available destination element within the same partition.

Procedure

1. Press the Enter button in the Operation > Move Media screen.
2. Select a cartridge from the Source Elements list.
3. Select the destination location from Destination Elements list.
4. When the confirmation screen for the operation appears, select Submit.

End of procedure

3.3.2 Moving the Media from the Tape Drive to a Slot

In the Operation > Move Cartridge from Drive to Slot screen, the tape cartridge can be moved back to its original slot prior to being mounted in the tape drive.

Procedure

1. From the list of tape drives, select the tape drive from which the tape cartridge is to be ejected.
2. Press the Enter button.

End of procedure

3.3.3 Rescanning the Cartridge Inventory

Rescan the tape cartridge using the library from the Operation > Inventory Scan screen.
To rescan the tape cartridge using the library, press the Enter button. The library changes to the Scanning state. Other operations cannot be performed until the scan is completed.

3.4 Configuring the Library

This section explains about the library configuration.
Perform a library configuration. To display the menu, select Configuration in the Home screen.

3.4.1 Using Initial System Setup

By using the wizard from the Configuration > Initial System Setup screen, the library network settings, the date and time, and the administrator PIN can be configured. Items can be skipped or the wizard can be stopped at any time. If the network configuration is completed, the remaining configuration can be performed from the remote panel using the Initial Configuration Wizard.

Caution

Configuring the library with this function during the initial login is recommended. Therefore, a message recommending the use of this function is displayed when logged in for the first time. Until settings are completed with this function, the message is displayed every time the user logs in to the operator panel.

3.4.2 Setting the Date and Time

The date and time can be set from the Configuration > Date & Time screen.

Procedure

1. Select Date to enter the date. Enter the date in order of day, month, and year.
2. Select Time to enter the time. Enter the time in order of hour, minute, and second.
3. Select Submit and press the Enter button.

End of procedure

3.4.3 Tape Drive Power Operation

In the Configuration > Drive Power On/Off screen, the power of the tape drive that is installed in the library can be turned on or off.

Procedure

1. Select the target tape drive.

2 If there are no problems with the information of the selected tape drive that is displayed, press the Enter button.

3 When the confirmation screen for the operation appears, select Yes.

End of procedure

3.5 Loading and Ejecting Tape Cartridges

This section explains how to insert and eject a tape cartridge.

Caution

If a logical library is configured, make sure to eject the target tape cartridge and load a tape cartridge in the slot of the correct partition.
Check the following points before opening the Mailslot.

- The number and position of the Mailslot to be opened
- The number and position of the slot where a tape cartridge is to be loaded or ejected
- The slot location of each partition

For details about how to check the above information, refer to "3.7.3 Using Inventory Graphical View" and "3.7.4 Partition Map Graphical View" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

3.5.1 Unlocking the Magazine or Mailslot

This section explains how to open the magazine or Mailslot:
The front panel of the LT140 has magazine open buttons that correspond to the left and right magazines.

To unlock and open the magazines and Mailslots, use the magazine/Mailslot open button after logging in to the operator panel and accessing Open Magazines/Mailslots of the Home screen.

Note

Some of the slots in the right magazines can be configured as the Mailslots.
Refer to "3.4.12 Enabling or Disabling Mailslots" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-" for the detailed settings.

Procedure

1 Log in to the Home screen (refer to "3.2.1 Logging into the Library" (page 33)).

2 Select Open Magazines/Mailslots in the Home screen and press the Enter button.

Figure 3.5 Selecting Open Magazines/Mailslots

Note

User accounts can use this function only when permitted by the administrator to operate the magazines and Mailslots. The Open Magazines/Mailslots screen cannot be accessed without permission. For details about the permission settings, refer to "3.4.15.3 Changing privileges of the account" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

The Open Magazines/Mailslots screen appears.

Figure 3.6 Open Magazines/Mailslots screen

3 Select the target component to open.

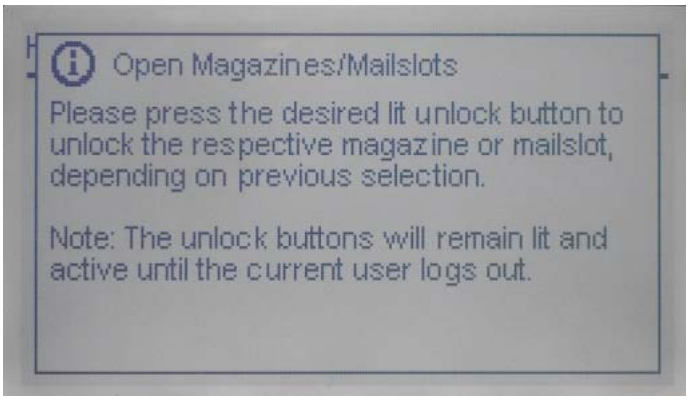
To open a magazine, select Open Magazines and press the Enter button. To open a Mailslot, select Open Mailslots and press the Enter button.

Note

User accounts can select only the components that they are permitted to open.

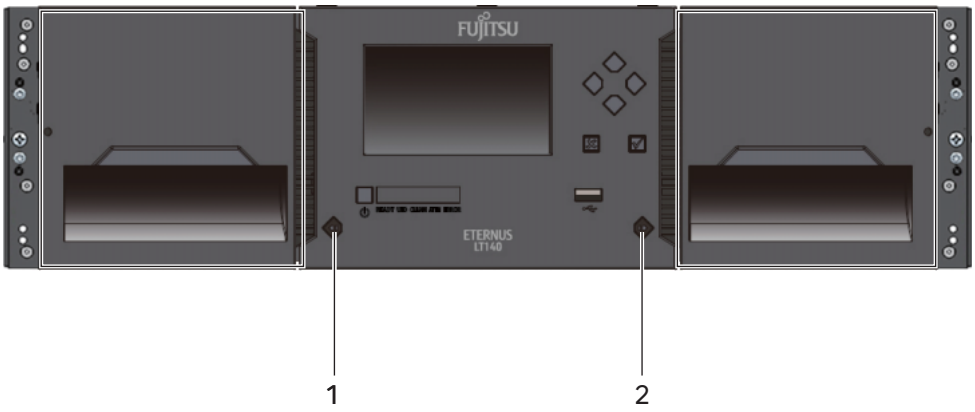
The notification screen for opening the magazine/Mailslot is displayed and the LED of the target magazine/Mailslot is lit. The notification screen automatically closes.

Figure 3.7 Open Magazines/Mailslots notification screen



4 Press the magazine/Mailslot open button that corresponds to the target magazine/Mailslot to unlock and open.

Figure 3.8 Magazine/Mailslot



1 Left magazine open button, status LED (blue)
2 Right magazine/Mailslot open button, status LED (blue)

Table 3.1 Details of the magazine open buttons

LED status	Description
Off	The magazine/Mailslot open button is disabled
Flashing (slow)	The magazine lock is being released
Flashing (fast)	The magazine is unlocked
On	The magazine/Mailslot open button is enabled

Note

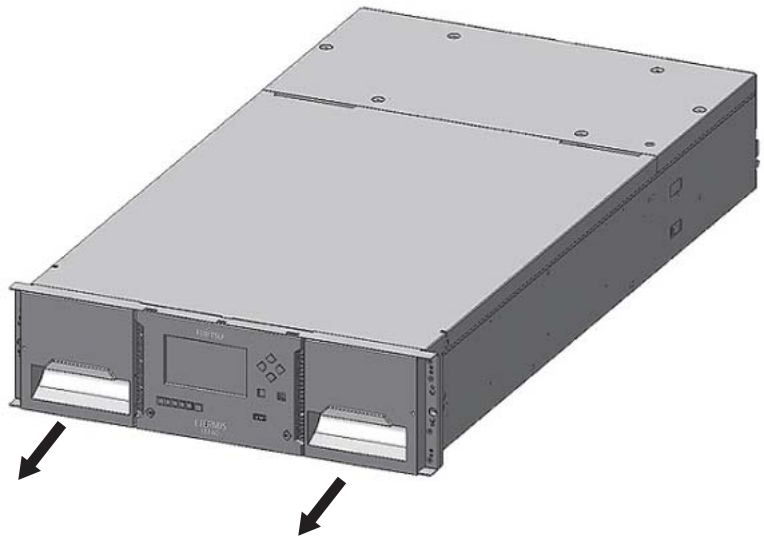
- For details on each parts of the operator panel or buttons, refer to "1.1.1 Overview of the Operator Panel" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- If the LED is on, magazines and Mailslots can be opened.
- If the currently logged in user logs out, the LED turns off and the magazines and Mailslot cannot be opened.

End of procedure

3.5.2 Pulling Out a Magazine or Mailslot

The magazine/Mailslot open button flashes slowly while the magazine is being unlocked.
When the magazine is unlocked, the magazine/Mailslot open button flashes quickly. Pull out the magazine or Mailslot.

Figure 3.9 Direction to pull out the magazine or Mailslot



Note

- Mailslots must be enabled before use. For details on how to enable the Mailslots, refer to "3.4.12 Enabling or Disabling Mailslots" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- The Mailslot must be pulled out of the library within 30 seconds after releasing the lock. The library will relock the Mailslot after 30 seconds.
- When remounting the Mailslot, insert the Mailslot at a right angle to the LT140.

WARNING

Do Not

- Hazardous moving parts exist inside this product. Do not insert tools or any portion of your body into the interior of the library through the Mailslot access door.

CAUTION

Do

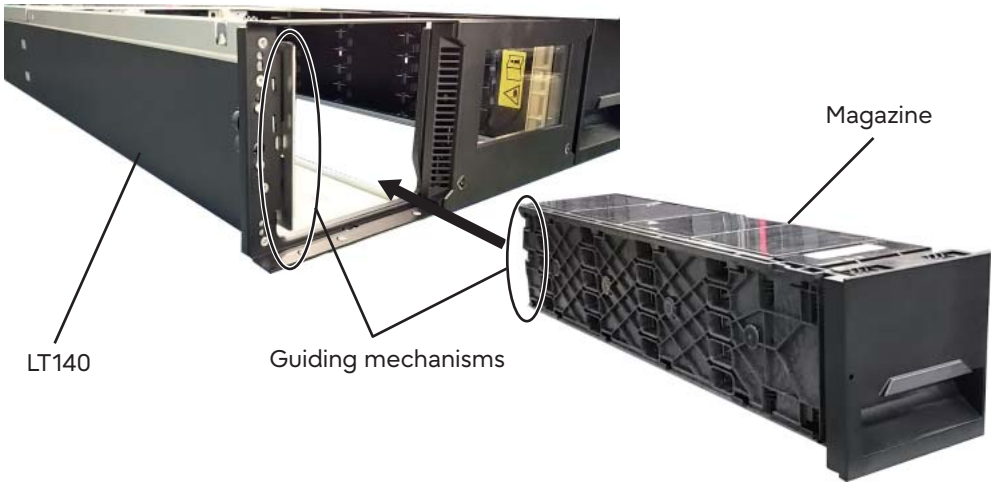
- When inserting the magazine or Mailslot, push the magazine or Mailslot into the library slowly and carefully.

3.5.3 Notes on Installing Magazines

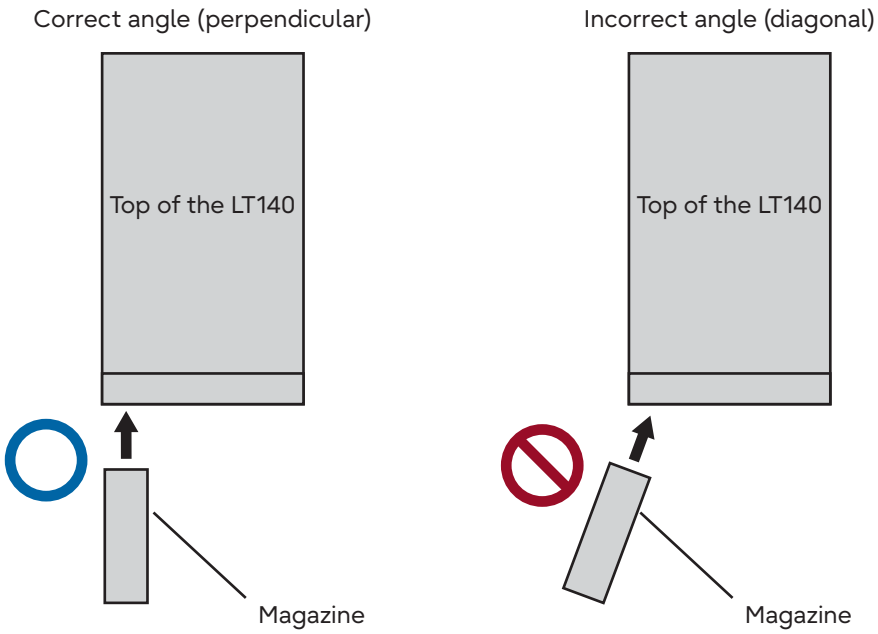
The following describes notes when a magazine is removed and then reinstalled in the LT140.

Caution

- The LT140 and magazines have the guiding mechanisms to correctly install magazines to the LT140.
  Make sure that the guides on the LT140 and magazine are in the correct position before installing the magazine.



- Insert the magazine perpendicular to the LT140. If the magazine is not inserted straight from the front of the LT140, it may not slide into the guides correctly.



CAUTION

Do

- If the guides are not in the correct position, the magazine may get stuck and not be inserted smoothly. If the magazine gets stuck, pull it out and reinsert it. If the magazine is forced in, it may become immovable and damage the LT140.

● Correct installation of the guides

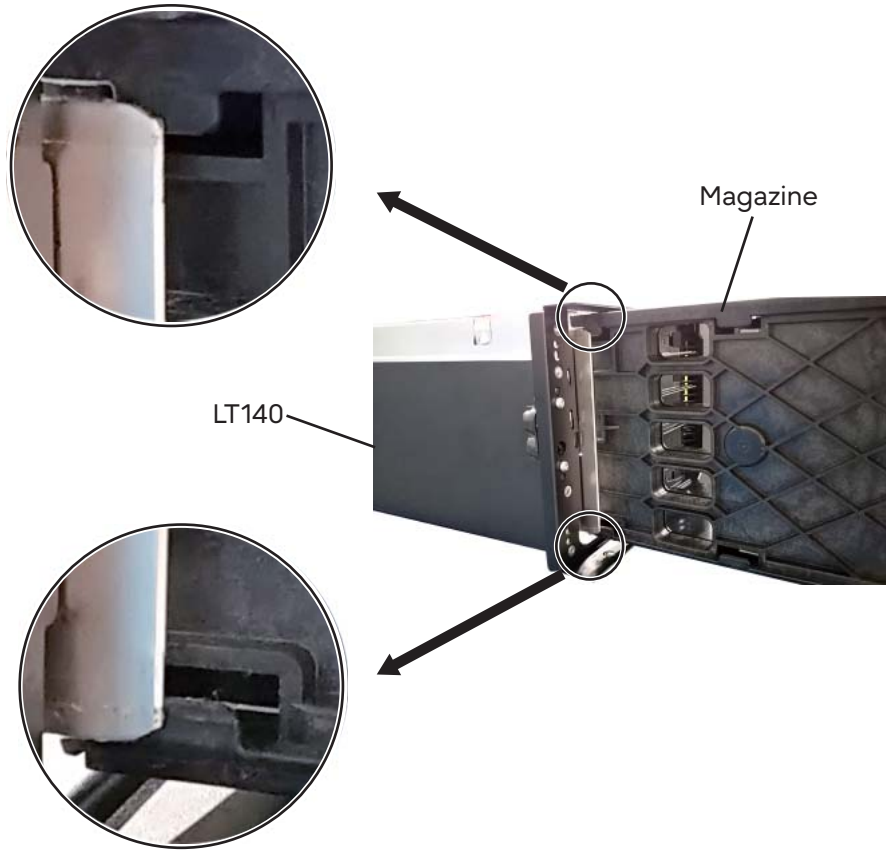
If the guides are in the correct position, the guides of the LT140 will be caught by the guides of the magazine.
If the guides are in this position, the magazine can be inserted smoothly.

Figure 3.10 Inserting magazines (correct guide position)

- Incorrect installation of the guides

  If the guides are installed incorrectly, the guides of the LT140 will not be caught by the guides of the magazine.
  In this situation, the magazine may get stuck and not be inserted smoothly.

  Figure 3.11 Inserting magazines (incorrect guide position)



CAUTION

Do

- If there is even the slightest resistance when inserting the magazine, pull it out and reinsert it.
  If the magazine is forced in, it may become immovable and damage the LT140.

3.5.4 Inserting Tape Cartridges

This section explains how to insert tape cartridges.

Procedure

1 Insert a tape cartridge into the Mailslot or magazine.

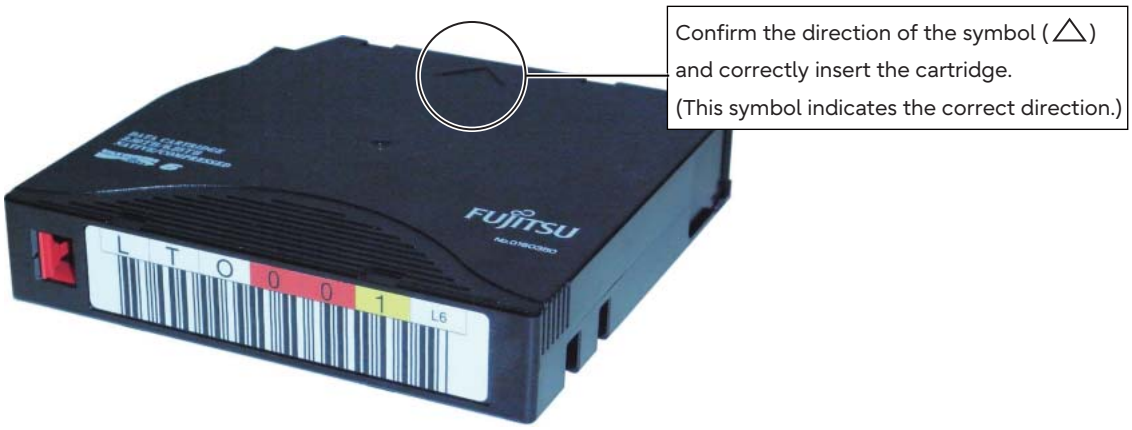
Insert the tape cartridge into the correct direction as shown in Figure 3.12. When the direction is correct, the barcode label faces the front (direction in which the robot can read). In addition, the reel surface of the cartridge faces downward. The hand section can be moved by hand. When manually inserting a tape cartridge into the slot, insert it such that it has the correct orientation by checking the following points:

- The barcode label faces the front (direction in which the robot can read).
- The reel surface of the cartridge faces downward.

Note

The tape library differentiates the management information of multiple tape cartridges by the barcode label volume number and is a device that is suitable for management. Because operations without barcode labels may cause a malfunction, operations using barcode labels is recommended.

Figure 3.12 Tape cartridge insertion direction



2 After inserting the tape cartridge into the Mailslot or the magazine, re-insert the Mailslot or magazine into the LT140.

The LT140 automatically performs inventory operation.
The management information of tape cartridges managed by the LT140 is updated, and the LT140 goes back on-line.

3 Perform the inventory operation of the backup software to update the tape cartridge management information for cartridges held by the backup software.

End of procedure

CAUTION

Damage to the LT140

Never insert a tape cartridge in the wrong direction and never insert an out-of-spec tape cartridge. Otherwise, the robot may be damaged.
The robot may not operate normally if a tape cartridge is inserted into any slot other than the specified one. The insertion location of tape cartridges differs by model.

Malfunction

If a Mailslot containing inserted tape cartridges is positioned with the tape cartridge storage shelves facing downward and the Mailslot is subject to impact, the tape cartridges may fall out of the Mailslot. To prevent this from occurring, do not position the Mailslot with the tape cartridge storage shelves facing downward when carrying the Mailslot.

3.6 Cleaning Tape Drives

There are two methods for cleaning the magnetic head of the tape drive: one is "manual cleaning", which is operated from the remote panel; the other is "auto-cleaning with the backup software", which automatically performs a cleaning for the specified number of times.
To perform a cleaning with the backup software, one cleaning cartridge must be stored in the tape library at all times. Note that the number of data cartridges that can be stored is reduced by one.

3.6.1 Auto-Cleaning with the Backup Software

Use the backup software to clean tape drives periodically. Since the cleaning cartridge that is used by this method is managed by the backup software, the cleaning cartridge must be stored in slots of the LT140.

Refer to the manuals of each software for the detailed settings of the backup software.

Note

To perform auto-cleaning with NetVault, individual settings are required. For details, refer to "4.5 NetVault" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Server Connection-".

Notes for cleaning with the backup software during a backup operation

For cleanings with the backup software, perform a tape drive cleaning when no other backup operation (backup/restore) is being performed in the target tape drive.

Although some backup software allows cleaning management during the operation, the actual cleaning starts after the backup is complete.

CAUTION

Damage to the LT140 and data destruction

If incorrect settings are applied for auto-cleaning with the backup software, the LT140 or the tape cartridge may become damaged, or data destruction may occur.
Understand the setting contents before performing a configuration.

Malfunction

During a cleaning operation with the backup software, "DRIVE CLN" is displayed on the operator panel, but it is not displayed on the remote panel.
Logging in to the remote panel may not be allowed if a cleaning with the backup software is being performed.
In this case, a login is allowed after the cleaning is complete.

3.6.2 Cleaning Tape Drives Manually

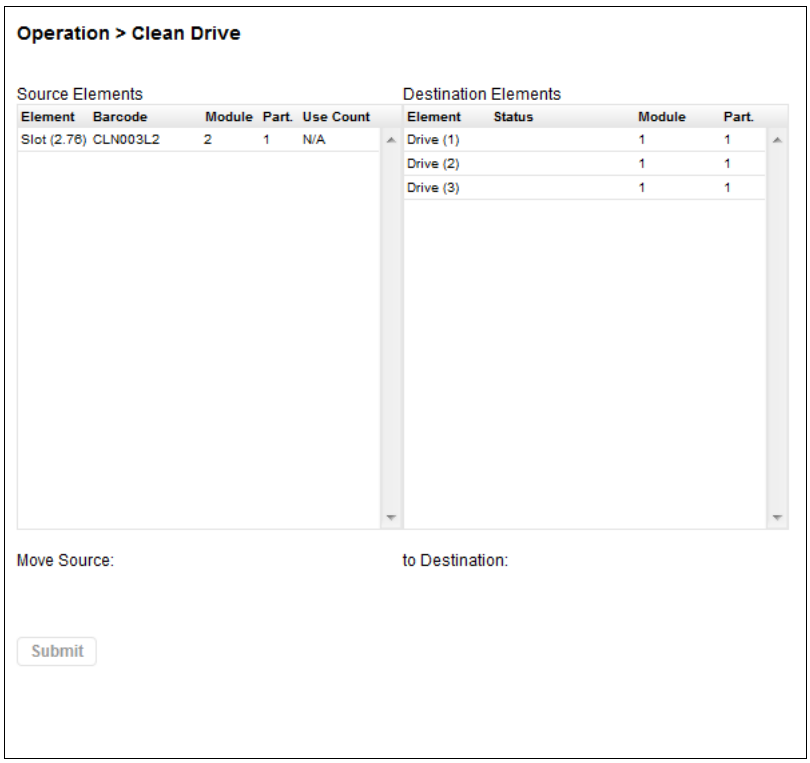
Request the cleaning of tape drives from the remote panel of the LT140. This method must be performed every time cleaning of the tape drives is required. In this method, the cleaning cartridges that are stored in the slots of the LT140 are used.

This section explains how to clean the tape drive.

Procedure

1 From the Operation > Clean Drive screen, initiate a tape drive cleaning operation.

Figure 3.13 Clean Drive screen



2 Select a cleaning cartridge from the Source Elements list.

The library uses the barcode label to identify cleaning cartridges.
If no cleaning cartridges are available, load one into a Mailslot or slot.

3 Select a cleaning cartridge from the Source Elements list.

Tape drives currently containing a cartridge are not listed. To clean a tape drive not listed, move the cartridge out of the drive.

4 Click Submit.

End of procedure

Chapter 4
Default Setting

This chapter explains how to make the minimum settings required during installation of the LT140.
Although this chapter explains how to configure the settings using the operator panel, the same settings can be configured from the remote panel after the network is configured.
For details on this setting method, refer to "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

4.1 Login

Log in with the administrator account from the operator panel.

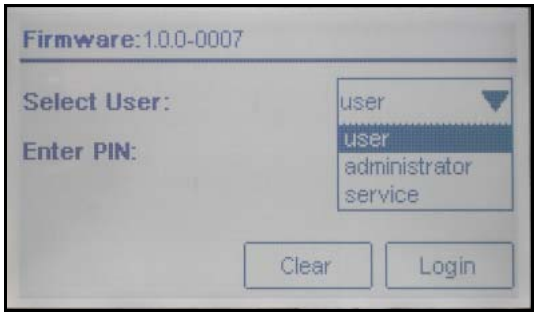
Procedure

1 Display the login screen.
If the screensaver is on, press the Enter button to turn it off.

Figure 4.1 Screensaver screen

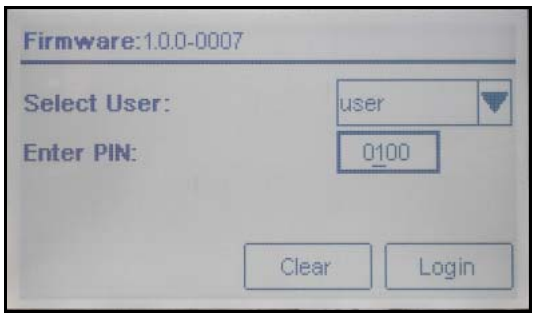
2 From Select User, use the up and down buttons to select the administrator.

Figure 4.2 Select User selection screen



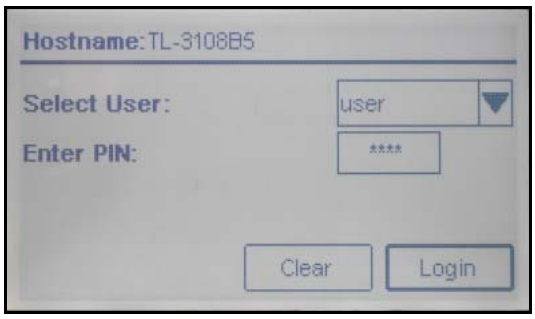
3 Select Enter PIN and use the up and down buttons or the left and right buttons to enter the administrator PIN.
There is no default administrator PIN. Log in without a PIN.

Figure 4.3 Enter PIN screen



4 Select Login and press the Enter button.

Figure 4.4 Enter PIN confirmation screen



Move to the Home screen.

Figure 4.5 Home screen

5 On the Home screen of the operator panel, select Configuration and press the Enter button.

Figure 4.6 Configuration selection screen

Move to the Configuration screen.

End of procedure

4.2 Using the Initial System Setup

By using the wizard from the Configuration > Initial System Setup screen, the library network settings, the date and time, and the administrator PIN can be configured. If the network settings are completed, operations can be performed from the remote panel. During the initial login, configuring the library with this function is recommended.

Note

For internal communication between modules, the tape library uses an Ethernet connection with an internal IP address range.
The initial internal IP address range is 192.0.2.0/24. If a conflict with the external Ethernet port occurs, the internal IP address range setting must be changed. For details about how to change the setting, refer to the "2.5.8 Resetting the IP Range" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

Figure 4.7 Initial Configuration screen

To set the library configuration, perform the following procedure:

Procedure

1 On the Configuration > Initial System Setup screen, select Next and press Enter.

Note

Items whose settings are not changed can be skipped by selecting Next without entering a value.

2 Configure the network.

Figure 4.8 Network Configuration screen

- Host Name
  Enter a value.
- Domain Name
  Enter a value.
- Protocol
  Select a protocol to use from the drop-down list.

For the selected protocol, enter the remaining setting values.

Note

To automatically obtain an IP address for the library, select DHCP (for IPv4) or Stateless (for IPv6) in Method.

3 After entering the values, select Next and press Enter.

4 Set the date and time.

Figure 4.9 Date / Time Configuration screen

- Date (DD.MM.YYYY)
  Set the date. Enter the day, month, and year.
- Time (HH:MM:SS 24hr)
  Set the time. Enter the hour, minute, and second.

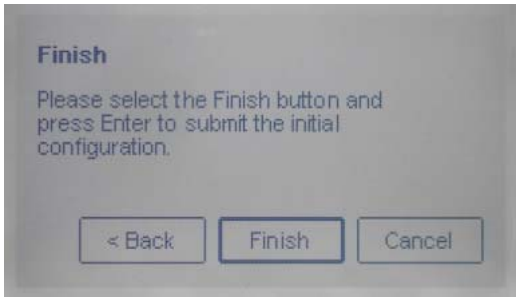
After entering the values, select Next and press Enter.

5 After entering the administrator PIN twice, select Next and press Enter.

Figure 4.10 Administrator PIN input screen

6 When a confirmation screen appears, select Finish and press Enter.

Figure 4.11 Administrator PIN input confirmation screen



The configuration is performed.

7 Select Exit and press Enter to finish.

Figure 4.12 Initial Configuration completion screen

End of procedure

4.3 Saving and Restoring the Library Configuration Setting File

For the LT140, the library configuration setting can be saved as a file or restored using the remote panel. For the operation procedure, refer to "3.4.2 Saving, Restoring and Resetting the Library Configuration" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

Caution

When the library is configured or set after purchasing the LT140 or when the library configuration or setting is changed during operation, make sure to save the library configuration settings as a file. The saved library configuration setting file can be restored by using the operator panel or the remote panel. Keep the latest library configuration setting file in a safe location. This file may be required for maintenance. Saving the library configuration setting file once a year is recommended.

Chapter 5
Monitoring the LT140 Status

This chapter explains how to check the LT140 status and what information is reported.

5.1 Operator Panel

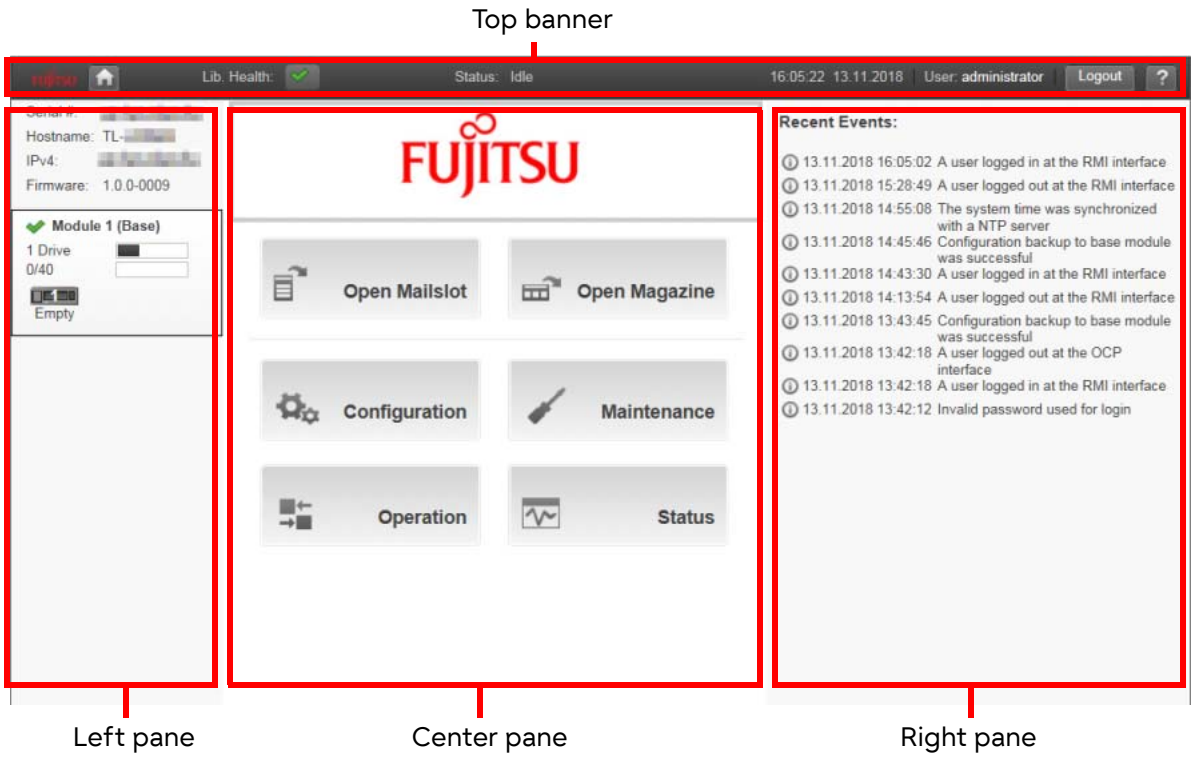
LT140 status can be checked using the status LEDs on the front of the Base Module.
For details, refer to "Status LEDs" (page 20) in "2.2 Operator Panel" (page 20).

5.2 Remote Panel

The Home screen is configure in the following areas:

- Top banner
  Contains the home button and displays the overall status and information about the library and user.
- Left pane
  Displays the library identity and module status.
- Center pane
  Provides access to operate and configure the library and to view additional status information.
- Right pane
  Displays a log of recent events.

Figure 5.1 Home screen of remote panel



5.2.1 Top Banner Elements

Table 5.1 Top banner elements

Display item	Description	
Home icon		Returns to the Home screen.
Library Health	An icon indicating the overall health status of the library.	
		Status OK icon indicates that all library components are fully operational and that no user intervention is required.
		Status Warning icon indicates that user attention is necessary, but that the library can still perform most operations. Click the icon to display the event ticket log.
		Status Error icon indicates that user intervention is required and the library is not capable of performing some operations. Click the icon to display the event ticket log.
Status	The status of the library robotic.	
	Idle	The library robotic is ready to perform an action.
	Moving	The library robotic is moving a cartridge.
	Scanning	The library robotic is performing an inventory of cartridges.
	Offline	The library robotic has been taken off line by the library.

Display item	Description
Library Time & Date	Helpful when analyzing event logs and support tickets, and might be needed when contacting support.
User	The user account for this session.
Logout	Logs out of this session.
	Accesses online help.

5.2.2 Left Pane Elements

Table 5.2 Left pane elements

Display item	Description		
Library status	Overall library confirmation and status.		
	Serial #	The base library serial number	
	Hostname	The library hostname	
	Network Configuration	The IP version (IPv4 or IPv6) and IP address.	
	Firmware	The library firmware version.	
Module Status Overviews	A summary of each module's configuration and health. Click or tap the module status area to select the module.		
	Module Health Icon		Status OK icon indicates that the module and each of its components are fully operational and that no user intervention is required.
			Status Warning icon indicates that user attention is necessary, but that the library can still perform most operations.
			Status Error icon indicates that user intervention is required and the module is not capable of performing some operations.
	Module Number	Modules are numbered based on their location in the physical library. The bottom module is Module 1. The base module is annotated with (Base).	
	Tape Drive Status	The number of tape drives installed in the module and the health of each tape drive. Click or tap on the tape drive to display tape drive configuration and status information in the center pane.	
		Black square	A black square indicates that the tape drive is fully operational and that no user intervention is required.
		Yellow square	A yellow square indicates that user attention is necessary, but that the tape drive can still perform most operations.
		Red square	A red square indicates that user intervention is required or the tape drive is not capable of performing some operations.

Display item	Description		
Module Status Overviews	Magazine Slot Usage	The number of cartridge slots available and the number in use.	
	Tape Drive Operation Status	The current tape drive activity for each tape drive in the module. Only the tape drive operation status is displayed for the selected module.	
		Write	The tape drive is performing a write operation.
		Read	The tape drive is performing a read operation.
		Idle	A cartridge is in the tape drive but the tape drive is not performing an operation.
		Empty	The tape drive is empty.
		Encrypt	The tape drive is writing encrypted data.

5.2.3 Center Pane Elements

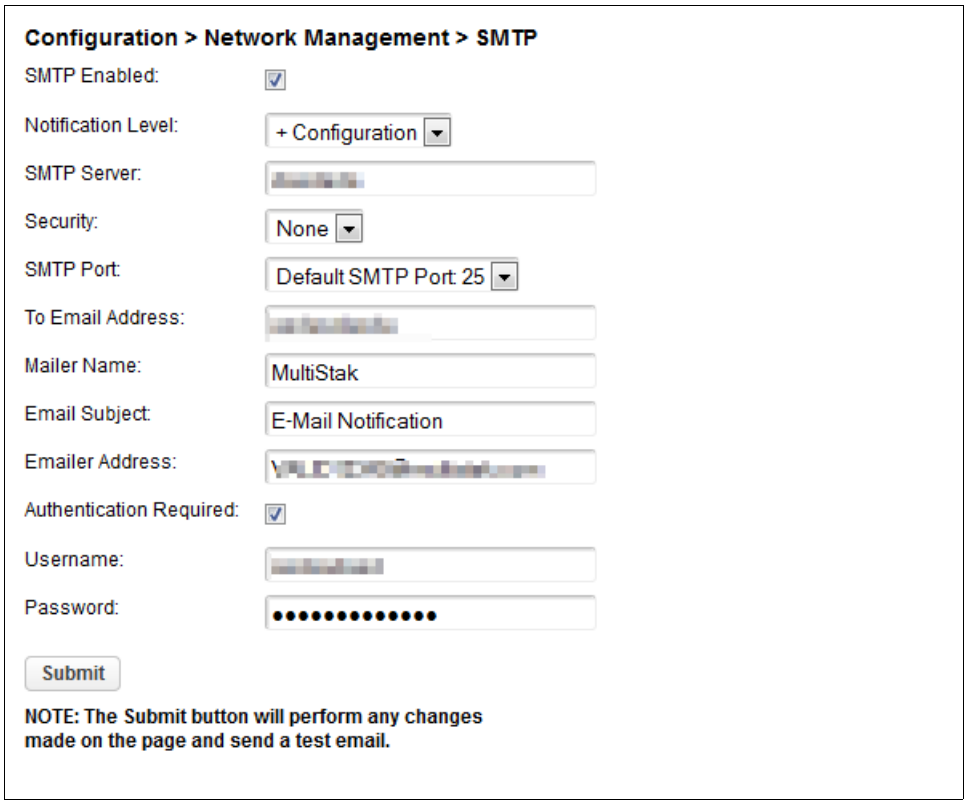
Table 5.3 Center pane elements

Display item	Description
Open Mailslot	(Non-user account) Click or tap to unlock the Mailslot on the selected module. Mailslots must be enabled before the slots can be used as Mailslots. Refer to "3.4.12 Enabling or Disabling Mailslots" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
Open Magazine	(Non-user account) Click or tap to unlock a magazine in the selected module. Only one magazine in the library can be open at a time. For details, refer to "7.6.2 Using the Remote Panel" (page 105).
Configuration	(Non-user account) Click or tap to configure the library. Refer to "2.5 Configuring the Library" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
Maintenance	(Non-user account) Click or tap to access maintenance functions. Refer to "3.5 Maintaining the Library" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
Operation	(Non-user account) Click or tap to access operation functions. Refer to "3.6 Operating the Library" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
Status	Click or tap to access status information. Refer to "3.7 Viewing Status Information" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

5.3 Configuring Event Notification Parameters

From the Configuration > Network Management > SMTP screen you can enable SMTP (Simple Mail Transfer Protocol) functionality and configure e-mail notification of library events. The library must have network access to an SMTP server.

Figure 5.2 SMTP screen



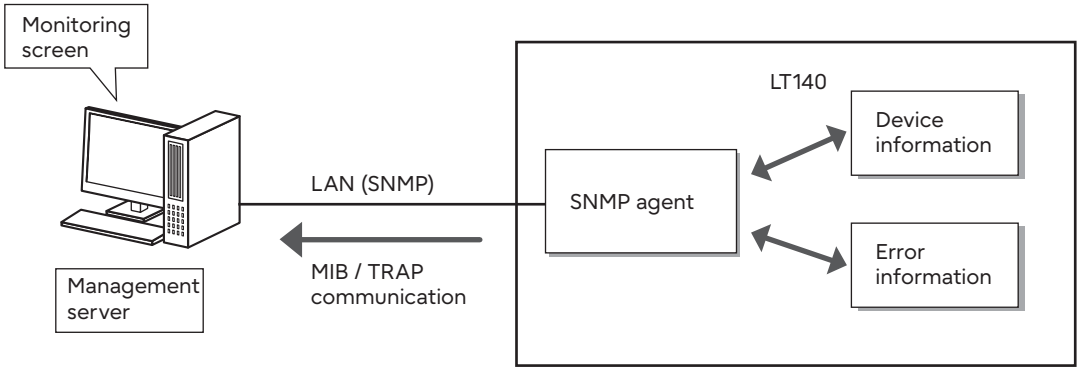
- SMTP Enabled
  Check to enable SMTP. When checked, the subsequent configuration items become active.
- Notification Level
  The types of events for which the library should send e-mail:
  - Inactive
    No events are sent.
  - Critical
    Only critical events are sent.
  - + Warnings
    Only critical and warning events are sent.
  - + Configuration
    Only critical, warning, and configuration events are sent.
  - + Information
    All events are sent.
- SMTP Server
  Hostname or IP address of the SMTP server.

- Security
  Security protocol for accessing the SMTP server:
  - None
  - SSL
  - TLS
- SMTP Port
  SMTP server port. The default port for the selected protocol will be selected. You can choose one of the default ports or configure a custom port.
- To Email Address
  The address that receives the reported events (for example firstname.lastname@example.com). Only one email address can be configured.
- Mailer Name
  Name of the sender of the e-mail
- Email Subject
  Subject line for the e-mail message
- Emailer Address
  The reply address used for e-mail messages
- Authentication Required
  When checked, a username and password are required to access the SMTP server.
- Username
  User account for logging into the SMTP server when authentication is required.
- Password
  Password associated with the Username when authentication is required.

5.4 Fault Monitoring (SNMP Report Function)

The SNMP report function can be used to link the LT140 to a hardware management system that is connected to a network.
The SNMP report function uses the SNMP protocol to transmit device information obtained via MIB and error information obtained via TRAP from the SNMP agent incorporated into the LT140 to the management software. This enables centralized management of the LT140 at one location, as is the case with other network devices.
For details on the SNMP TRAP list, refer to "Appendix A Event List" in "Fujitsu Storage ETERNUS LT140 Tape Library Overview".
The LT140 supports SNMP v1, v2, and v3.

Figure 5.3 SNMP function



Settings related to the SNMP agent can be made from the remote panel.

Note

Download the LT140 MIB file from the following website.
https://www.fujitsu.com/global/support/products/computing/storage/download/index.html#id_lt

Chapter 6

Function Expansion Option

This chapter explains product options that can be added as required after system operation starts.

6.1 Expandable Components

Configuration of the Base Module (LT14AC) components and the expandable configurations are shown below.

Table 6.1 Component configurations (Base Module / Expansion Module: with half-height drives)

Maximum number of stored cartridges	Number of Us	Number of tape drives	Base Module (LT14AC)	Slot expansion license (LT14AZ03) (*1)	Expansion Module (LT14AZ40)	Tape drive (*2)	Power (LT14AZ07) With power redundancy	Power cable (*3)
20	3	1 to 3	1	0	0	1 to 3	0	2
40	3	1 to 3	1	1	0	1 to 3	0	2
80	6	1 to 3	1	1	1	1 to 3	0	2
		4 to 6				4 to 6	1	4
120	9	1 to 3	1	1	2	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
160	12	1 to 3	1	1	3	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
200	15	1 to 3	1	1	4	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
240	18	1 to 3	1	1	5	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12

Maximum number of stored cartridges	Number of Us	Number of tape drives	Base Module (LT14AC)	Slot expansion license (LT14AZ03) (*1)	Expansion Module (LT14AZ40)	Tape drive (*2)	Power (LT14AZ07) With power redundancy	Power cable (*3)
280	21	1 to 3	1	1	6	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12
		19 to 21				19 to 21	6	14
320	24	1 to 3	1	1	7	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12
		19 to 21				19 to 21	6	14
		22 to 24				22 to 24	7	16
360	27	1 to 3	1	1	8	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12
		19 to 21				19 to 21	6	14
		22 to 24				22 to 24	7	16
		25 to 27				25 to 27	8	18
400	30	1 to 3	1	1	9	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12
		19 to 21				19 to 21	6	14
		22 to 24				22 to 24	7	16
		25 to 27				25 to 27	8	18
		28 to 30				28 to 30	9	20

Maximum number of stored cartridges	Number of Us	Number of tape drives	Base Module (LT14AC)	Slot expansion license (LT14AZ03) (*1)	Expansion Module (LT14AZ40)	Tape drive (*2)	Power (LT14AZ07) With power redundancy	Power cable (*3)
440	33	1 to 3	1	1	10	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12
		19 to 21				19 to 21	6	14
		22 to 24				22 to 24	7	16
		25 to 27				25 to 27	8	18
		28 to 30				28 to 30	9	20
		31 to 33				31 to 33	10	22
480	36	1 to 3	1	1	11	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12
		19 to 21				19 to 21	6	14
		22 to 24				22 to 24	7	16
		25 to 27				25 to 27	8	18
		28 to 30				28 to 30	9	20
		31 to 33				31 to 33	10	22
		34 to 36				34 to 36	11	24
520	39	1 to 3	1	1	12	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12
		19 to 21				19 to 21	6	14
		22 to 24				22 to 24	7	16
		25 to 27				25 to 27	8	18
		28 to 30				28 to 30	9	20
		31 to 33				31 to 33	10	22
		34 to 36				34 to 36	11	24
		37 to 39				37 to 39	12	26

Maximum number of stored cartridges	Number of Us	Number of tape drives	Base Module (LT14AC)	Slot expansion license (LT14AZ03) (*1)	Expansion Module (LT14AZ40)	Tape drive (*2)	Power (LT14AZ07) With power redundancy	Power cable (*3)
560	42	1 to 3	1	1	13	1 to 3	0	2
		4 to 6				4 to 6	1	4
		7 to 9				7 to 9	2	6
		10 to 12				10 to 12	3	8
		13 to 15				13 to 15	4	10
		16 to 18				16 to 18	5	12
		19 to 21				19 to 21	6	14
		22 to 24				22 to 24	7	16
		25 to 27				25 to 27	8	18
		28 to 30				28 to 30	9	20
		31 to 33				31 to 33	10	22
		34 to 36				34 to 36	11	24
		37 to 39				37 to 39	12	26
		40 to 42				40 to 42	13	28

*1: This is required when the Expansion Module is used.

*2: Select from the LT14ASM, LT14AFM, LT14ASN, LT14AFN, LT14ASP, or LT14AFP.

*3: Select two power cables for each LT14AZ07 from the LTCBP05, LTCBP10, LTCBP15, LTCBP30, LTCBPN30, or LTCBPN40.

Note

Each option name may be suffixed with an "E" (for factory installed options) or an "L" (for field upgrades). For details on the model numbers, refer to "Fujitsu Storage ETERNUS LT140 Product List".

Table 6.2 Component configurations (Base Module / Expansion Module: with half-height drives and full-height drives)

Maximum number of stored cartridges	Number of Us	Number of tape drives (half-/ full-height)	Base Module (LT14AC)	Slot expansion license (LT14AZ03) (*1)	Expansion Module (LT14AZ40)	Tape drive (*2)	Power (LT14AZ07) With power redundancy	Power cable (*3)
20	3	1 / 1	1	0	0	1/1	0	2
40	3	1 / 1	1	1	0	1/1	0	2
80	6	1 to 2 / 1 to 2	1	1	1	1 to 2 / 1 to 2	0	2
							1	4
120	9	1 to 3 / 1 to 3	1	1	2	1 to 3 / 1 to 3	0	2
							1	4
							2	6
160	12	1 to 4 / 1 to 4	1	1	3	1 to 4 / 1 to 4	0	2
							1	4
							2	6
							3	8

Maximum number of stored cartridges	Number of Us	Number of tape drives (half-/ full-height)	Base Module (LT14AC)	Slot expansion license (LT14AZ03) (*1)	Expansion Module (LT14AZ40)	Tape drive (*2)	Power (LT14AZ07) With power redundancy	Power cable (*3)
200	15	1 to 5 / 1 to 5	1	1	4	1 to 5 / 1 to 5	0	2
							1	4
							2	6
							3	8
							4	10
240	18	1 to 6 / 1 to 6	1	1	5	1 to 6 / 1 to 6	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
280	21	1 to 7 / 1 to 7	1	1	6	1 to 7 / 1 to 7	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
							6	14
320	24	1 to 8 / 1 to 8	1	1	7	1 to 8 / 1 to 8	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
							6	14
							7	16
360	27	1 to 9 / 1 to 9	1	1	8	1 to 9 / 1 to 9	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
							6	14
							7	16
							8	18

Maximum number of stored cartridges	Number of Us	Number of tape drives (half-/ full-height)	Base Module (LT14AC)	Slot expansion license (LT14AZ03) (*1)	Expansion Module (LT14AZ40)	Tape drive (*2)	Power (LT14AZ07) With power redundancy	Power cable (*3)
400	30	1 to 10 / 1 to 10	1	1	9	1 to 10 / 1 to 10	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
							6	14
							7	16
							8	18
							9	20
440	33	1 to 11 / 1 to 11	1	1	10	1 to 11 / 1 to 11	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
							6	14
							7	16
							8	18
							9	20
							10	22
480	36	1 to 12 / 1 to 12	1	1	11	1 to 12 / 1 to 12	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
							6	14
							7	16
							8	18
							9	20
							10	22
							11	24

Maximum number of stored cartridges	Number of Us	Number of tape drives (half-/ full-height)	Base Module (LT14AC)	Slot expansion license (LT14AZ03) (*1)	Expansion Module (LT14AZ40)	Tape drive (*2)	Power (LT14AZ07) With power redundancy	Power cable (*3)
520	39	1 to 13 / 1 to 13	1	1	12	1 to 13 / 1 to 13	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
							6	14
							7	16
							8	18
							9	20
							10	22
							11	24
							12	26
560	42	1 to 14 / 1 to 14	1	1	13	1 to 14 / 1 to 14	0	2
							1	4
							2	6
							3	8
							4	10
							5	12
							6	14
							7	16
							8	18
							9	20
							10	22
							11	24
							12	26
							13	28

*1: This is required when the Expansion Module is used.

*2: Select HH drives from the LT14ASM, LT14AFM, LT14ASN, LT14AFN, LT14ASP, or LT14AFP. Select LT14BFP for FH drives.

*3: Select two power cables for each LT14AZ07 from the LTCBP05, LTCBP10, LTCBP15, LTCBP30, LTCBPN30, or LTCBPN40.

6.2 License Partitioning Option (Logical Library Function)

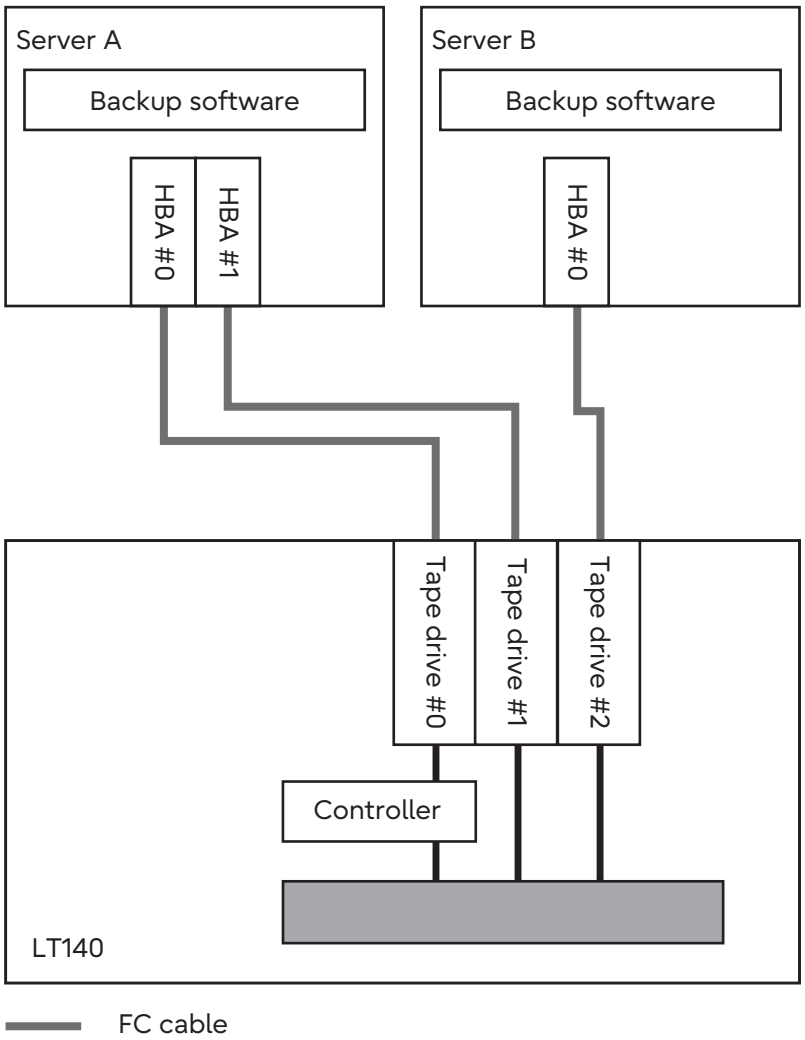
A logical library is a function that logically partitions the robots, slots, and tape drives of a tape library and shows it as having multiple tape libraries. By using the logical library, a single LT140 can be physically shared from different platforms and backup software.

For the LT140, a single tape library can be seen as having up to 21 tape libraries.

Note

To use the logical library function, a license for the License Partitioning Option is necessary.

Figure 6.1 Direct connection (FC-AL connection, a multiple server connection, a shared library, and tape drives that are not shared)



Libraries that are on physical partitions are hereinafter called "physical libraries" and libraries that are on logical partitions are hereinafter called "logical libraries".

6.2.1 Function Overview

License Partitioning Option is valid for several UNIX / PC servers to use the Library as a shared device.
As a result, decreasing the installation space, uniform management of the tapes, and operation cost reduction can be achieved.

Caution

- Take special care when changing configurations after logical libraries are created because removing tape cartridges and changing backup software definitions may be required.
- If the logical library design (such as the number of slots) is changed, the backup software license may be affected. Refer to handbooks from each ISV before changing.
- To use the logical libraries, an additional option is necessary.
- Make sure to design the logical library configuration before creating logical libraries.

CAUTION

Do Not

Malfunction
After defining the LT140 configuration in the backup software, the logical library configuration must not be changed. Changing the configuration may cause unexpected behavior of the backup software.

6.2.2 Hardware Configuration

This function logically partitions the slots, tape drives, mail slots to be seen as having multiple tape libraries.

Number of Logical Libraries

By using the License Partitioning Option, a single tape library can be seen as having up to 21 logical libraries.

Assigning Slots

Five slots are assigned to each partition.
The following two methods are available for assigning slots.

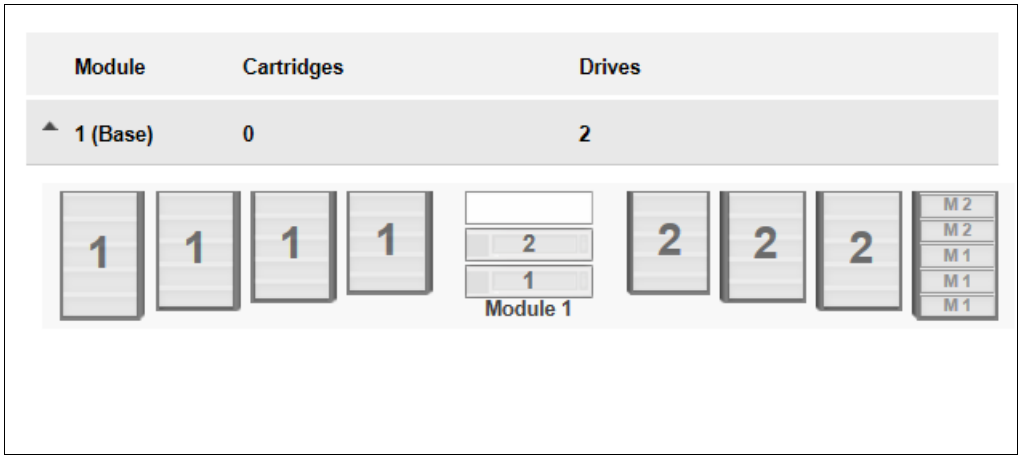
- Basic Partition Wizard
  If you specify the number of partitions, the wizard removes the current partition configuration and assigns the tape drives and storage slots as evenly as possible to the partitions.
- Expert Partition Wizard
  You can add or remove partitions from the current partition configuration. Use the Expert Partition Wizard to adjust resource (slots and tape drives) assignments for existing partitions or those created with the Basic Partition Wizard.

Refer to "6.2.3 Designing Logical Libraries" (page 74) for details about operations.

To re-assign a larger number of resources than the assigned number of cells after setting the partition, tape cartridges in the cell that is to be added by re-assignment must be removed from the library to prevent the tape cartridge from being assigned to another logical library.
By preparing free slots by using the Expert menu, a new logical library can be added.

Figure 6.2 Example for partitioning cells: In the case that the Basic Partition Wizard is used

Partition	Slots	Mailslot	Drives
Partition1	20	3	1
Partition2	15	2	1

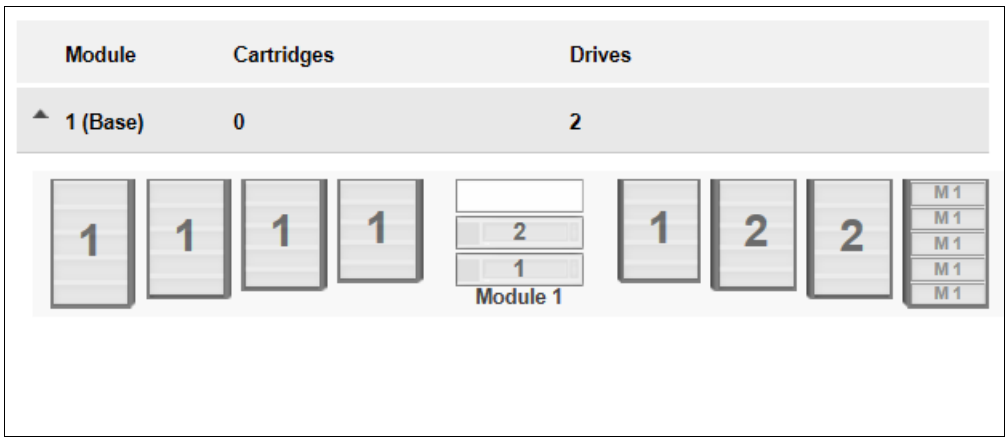


Conditions when configuring:

- One Base Module without an Expansion Module
- Slot expansion license options are installed
- The Mailslot is available
- Two tape drives are mounted in the Base Module

Figure 6.3 Example for partitioning cells: In the case that the Expert Partition Wizard is used

Partition	Slots	Mailslot	Drives
Partition1	25	5	1
Partition2	10	0	1



Conditions when configuring:
- One Base Module without an Expansion Module
- Slot expansion license options are installed
- The Mailslot is available
- Two tape drives are mounted in the Base Module

Assigning Tape Drives

At least one tape drive must be assigned to a logical library.

Using Mailslots

Each Mailslot can be assigned to different logical libraries. One Mailslot has five slots. Take special care when assigning Mailslots to logical libraries.
To insert or eject tape cartridges from Mailslots by using backup software, operator panel, or remote panel, assigning Mailslots to logical libraries with these panels.

Note

- Changing the backup software setting is not required when the assigning of Mailslots is changed.
- Note that the LT140 does not have multiple accounts for each logical library.

6.2.3 Designing Logical Libraries

To use the logical libraries, designing how to assign resources in a single library (slots and tape drives) to logical libraries is required in advance.

- Determining the number of logical libraries

  Determine the number of logical library partitions that is to be created from the physical library. Up to 20 logical libraries can be created.

- Determining the name of logical libraries

  After determining the number of logical libraries, decide the logical library name to manage logical libraries. Specify the logical library name as "Partition Name" in the LT140.
  Specify the logical library name with up to 16 alphanumeric characters.

- Determining the number of stored cartridges (slots)

  Determine the number of slots to be assigned for each logical library in units of 5.

- Determining Mailslots

  Determine the number of Mailslots to be assigned for each logical library in units of 1.

Table 6.3 An example of a layout for logical libraries

	Physical library (*1)	Logical library 1	Logical library 2
Connection server	—	Windows server	UNIX server
Logical library name (Partition Name)	—	Partition_1	Partition_2
Number of assigned slots (Partition Slots)	70 Slot (1.1–1.35) Slot (2.1–2.35)	40 Slot (1.1–1.35) Slot (2.1–2.5)	30 Slot (2.6–2.35)
Number of assigned Mailslots (Partition Mailslots)	10 Mailslot (1.36–1.40) Mailslot (2.36–2.40)	5 Mailslot (1.36–1.40)	5 Mailslot (2.36–2.40)
Number of tape drives (Drive)	2 Drive (1–2)	1 Drive1	1 Drive2
Auto Clean	—	Disable	Disable

*1: Conditions when configuring:
One Base Module and one Expansion Module
Slot expansion license options are installed
The Mailslot is available only for the Base Module
Three tape drives are mounted in the Base Module

6.2.4 Configuring Logical Libraries

After designing of the logical library completes, actually create the logical library.

6.2.4.1 Configuring Library Partitions

This operation is performed with the remote panel.

The LT140 has less-restricted adaptable partitioning methods.

- Basic Partition Wizard
  If you specify the number of partitions, the wizard removes the current partition configuration and assigns the tape drives and storage slots as evenly as possible to the partitions. Any extra tape drives or slots are assigned to the first partition.

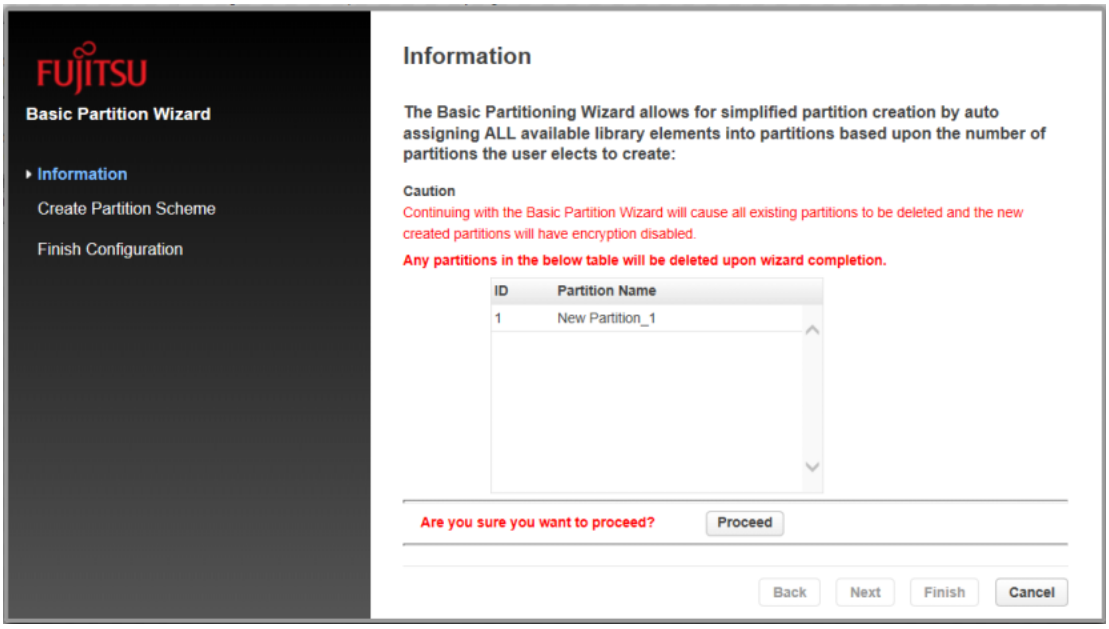
- Expert Partition Wizard
  You can add or remove partitions from the current partition configuration and then edit each partition configuration to add or remove library resources.
  Use the Expert Partition Wizard to configure partitions that will have different resources or to adjust resource assignments for existing partitions or those created with the Basic Partition Wizard. Note that the auto tape drive cleaning function on each partition must be disabled.

For details about the operator panel and the remote panel, refer to "3.4.13 Configuring Library Partitions" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

6.2.4.2 Using the Basic Partition Wizard

Procedure

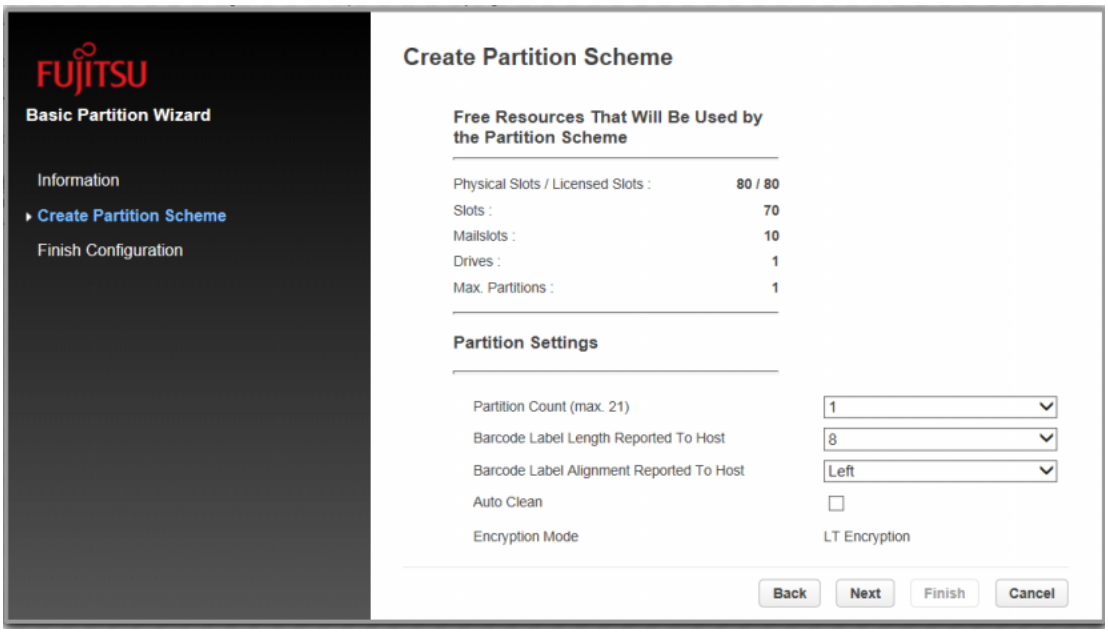
1. Click Configuration > Partition > Basic Wizard.
   The Information screen displays the existing partitions, which will be deleted by the wizard.
2. Click Proceed.



3. Click Next.
   The Create Partition Scheme screen displays the number of slots, Mailslots, tape drives, and maximum available partitions for the library.

Note

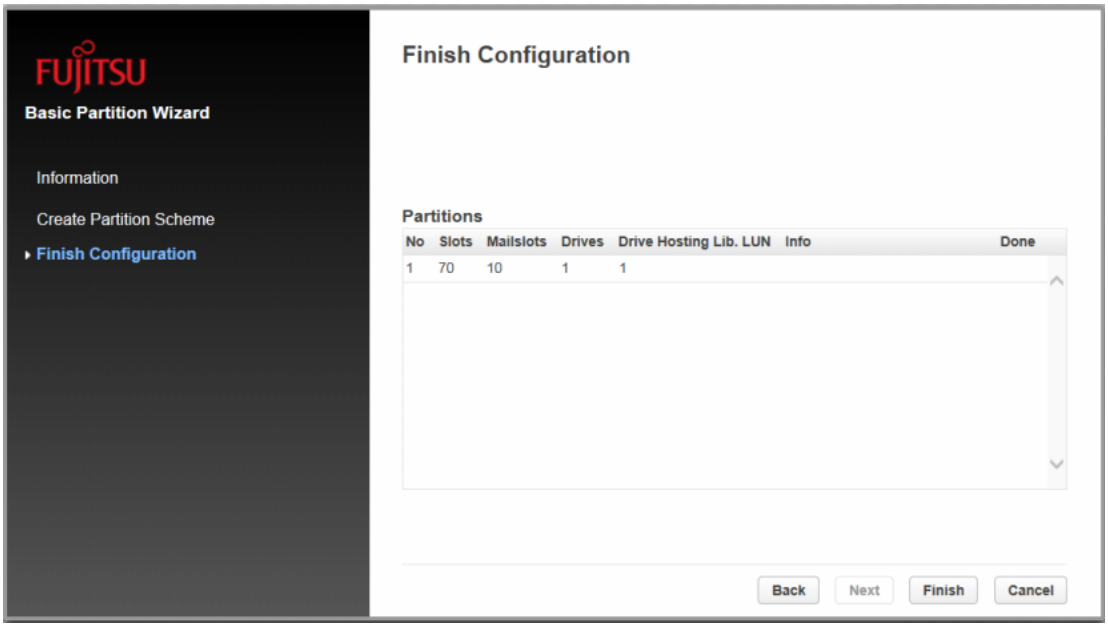
If you want to enable or disable the Mailslots, cancel the wizard and update the Mailslot configuration before configuring partitioning.



4 Enter the following items for "Partition Settings" and click Next.

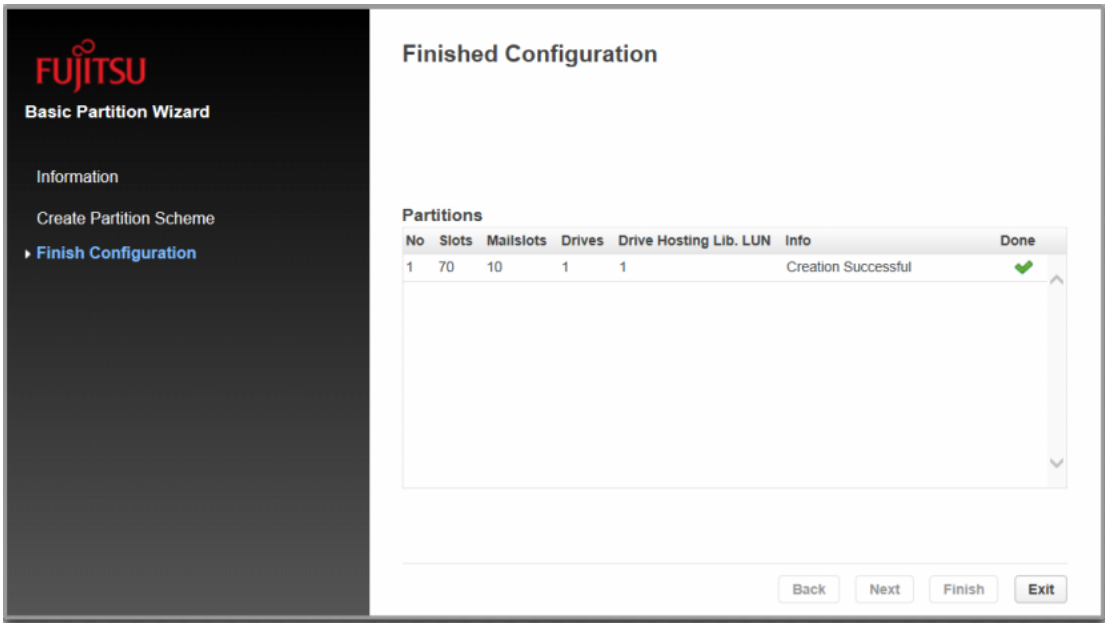
- Partition Count (max. 21)
  Select the number of partitions.
- Barcode Label Length Reported To Host
  Select the number of barcode characters reported to the host application.
- Barcode Label Alignment Reported To Host
  Select whether to report the barcode characters from the left or right end of the barcode label to the host application.
- Auto Clean
  Set auto-cleaning to enable or disable.

5 Click Finish.



After the wizard reconfigures the partition, the library becomes online automatically.

6 The Finish Configuration screen displays the allocation of the partitions. Confirm that the allocation is correct and then click Exit.



End of procedure

Note

You can use the Expert Partition Wizard to adjust the allocation of resources after creating the partitions with the Basic Partition Wizard.

6.2.4.3 Using the Expert Partition Wizard

Use the wizard to configure one partition at a time.

Note

If you want to enable or disable the Mailslots, cancel the wizard and update the Mailslot configuration before configuring partitioning.

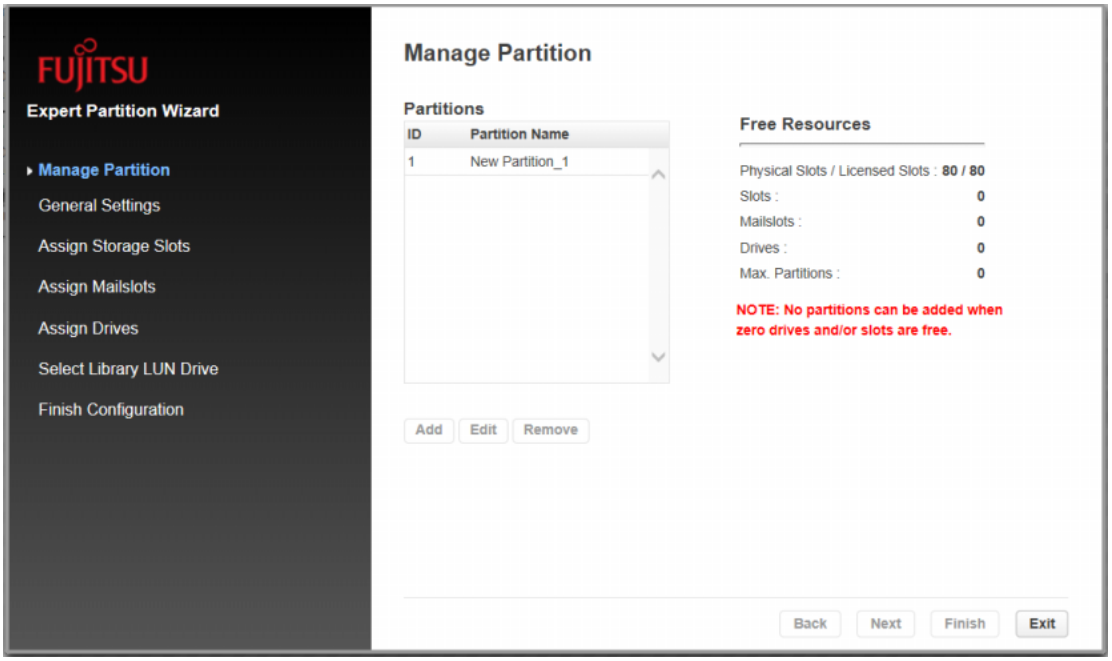
Procedure

1 Click Configuration > Partition > Expert Wizard.

2 To add a partition, click Add. To edit an existing partition, select the partition and click Edit.

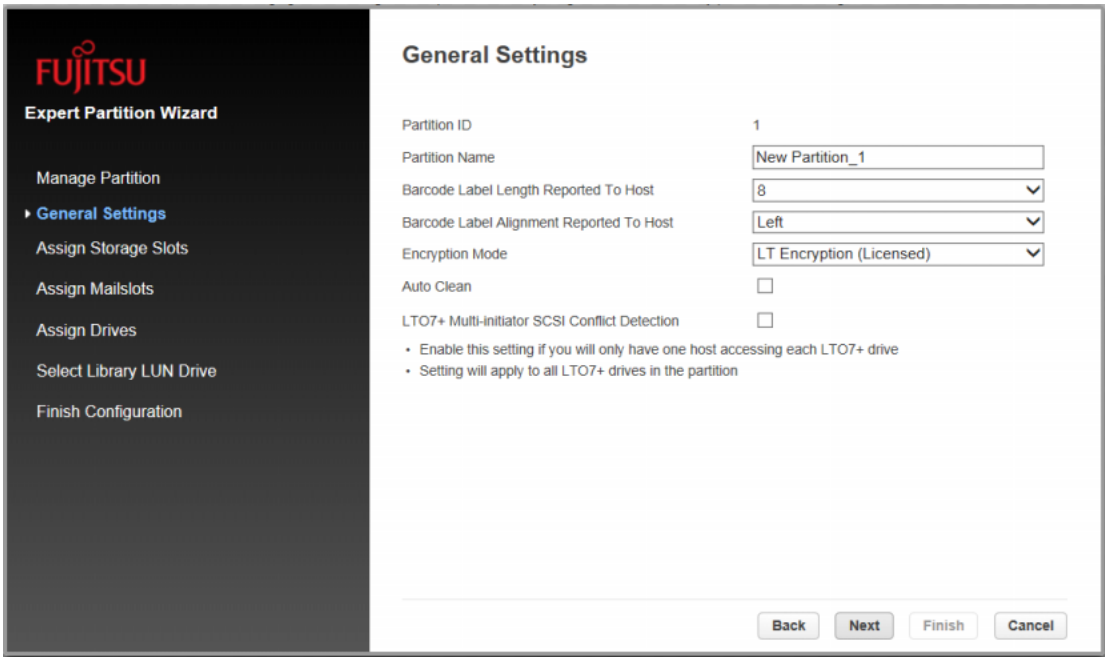
Note

The Add button will only be active if there are available resources. If there are no available resources, either edit a partition and release resources from it or remove a partition that contains extra resources.



3 Click Next.

The General Settings screen appears.



4 Enter the following items and click Next.

- Partition Name
  Enter a partition name
- Barcode Label Length Reported To Host
  Select the number of barcode characters reported to the host application. This option provides interchange compatibility with libraries with more limited barcode reading capabilities. The maximum length is 15 and the default is 8. This configuration will apply to all partitions.

  Note

  The industry standard length for LTO barcode labels is eight characters. Barcode labels longer than eight characters might be scanned incorrectly, particularly if they are not high quality labels.

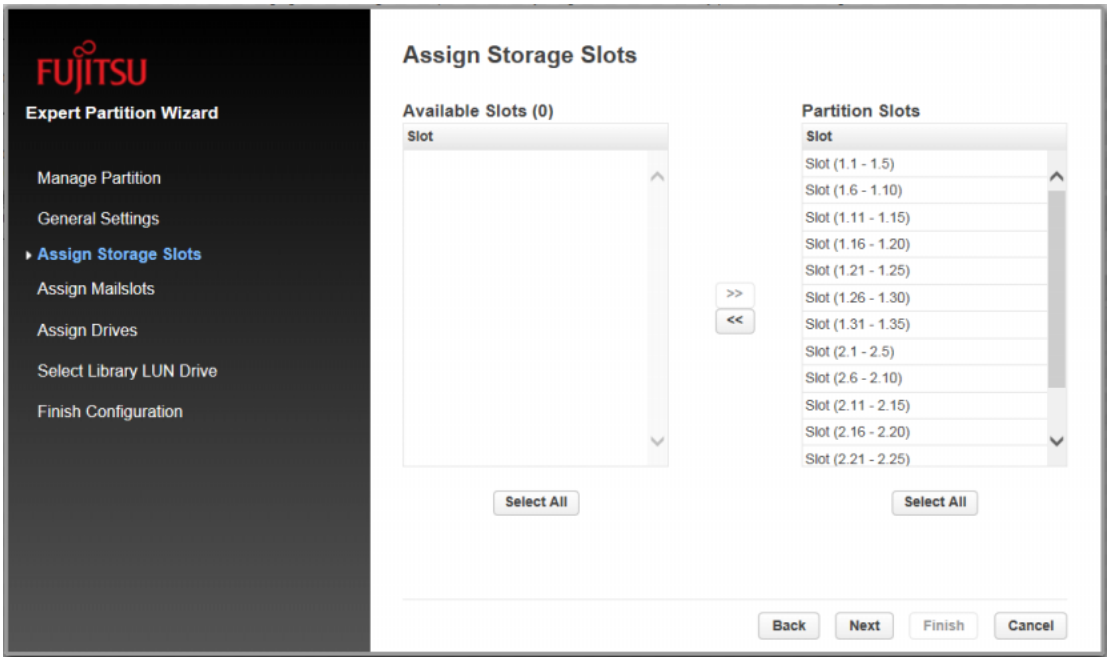
- Barcode Label Alignment Reported To Host
  Select whether to report the barcode characters from the left or right end of the barcode label to the host application.
  For example, when reporting only six characters of the barcode label "12345678", if alignment is left, the device will report 123456. If alignment is right, the device will report 345678.
  The default is left.
- Encryption Mode
  Select an encryption method to use for the partitions.
- Auto Clean
  Set auto-cleaning to enable or disable.
  If the backup software is used, the auto cleaning function must be disabled (default setting).
  If the auto-cleaning function is enabled, conflicts with the cleaning function of the backup software may lead to errors.
  If operations are performed with the LTFS option, the auto cleaning function can be enabled. For details, refer to "3.7 Cleaning the Tape Drive" in "Fujitsu Storage ETERNUS LT series Tape Libraries LTFS Option User's Guide".
- LTO7+ Multi-initiator SCSI Conflict Detection
  Do not use this item. Make sure to leave the LTO7+ Multi-initiator SCSI Conflict Detection checkbox unchecked.

5 Click Next.

6 In the Assign Storage Slots screen, use the >> and << buttons to assign slots to the partition that is currently being edited and then click Next.

Note

"Available Slots" indicates the remaining slots that can be assigned and "Partition Slots" indicates the slots that are to be assigned to the partition that is currently being edited.

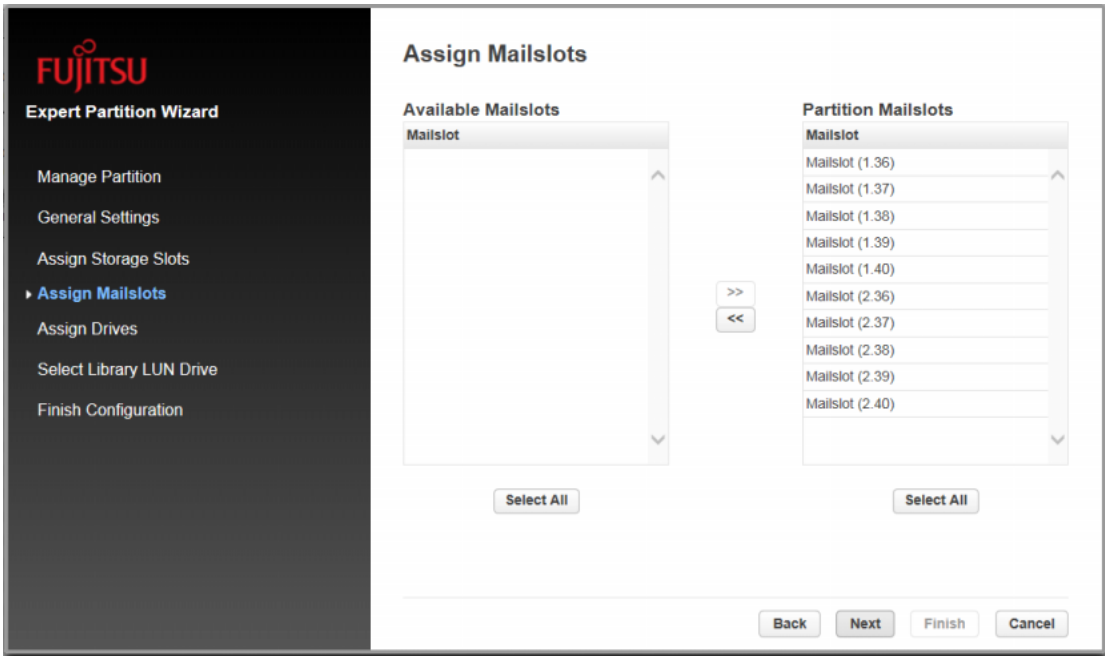


7 In the Assign Mail Slots screen, use the >> and << buttons to assign Mailslots to the partition that is currently being edited and then click Next.

Individual Mailslot elements cannot be shared between partitions. Importing or exporting cartridges in a partition without an assigned Mailslot will require magazine access. Opening a magazine takes the library offline.

Note

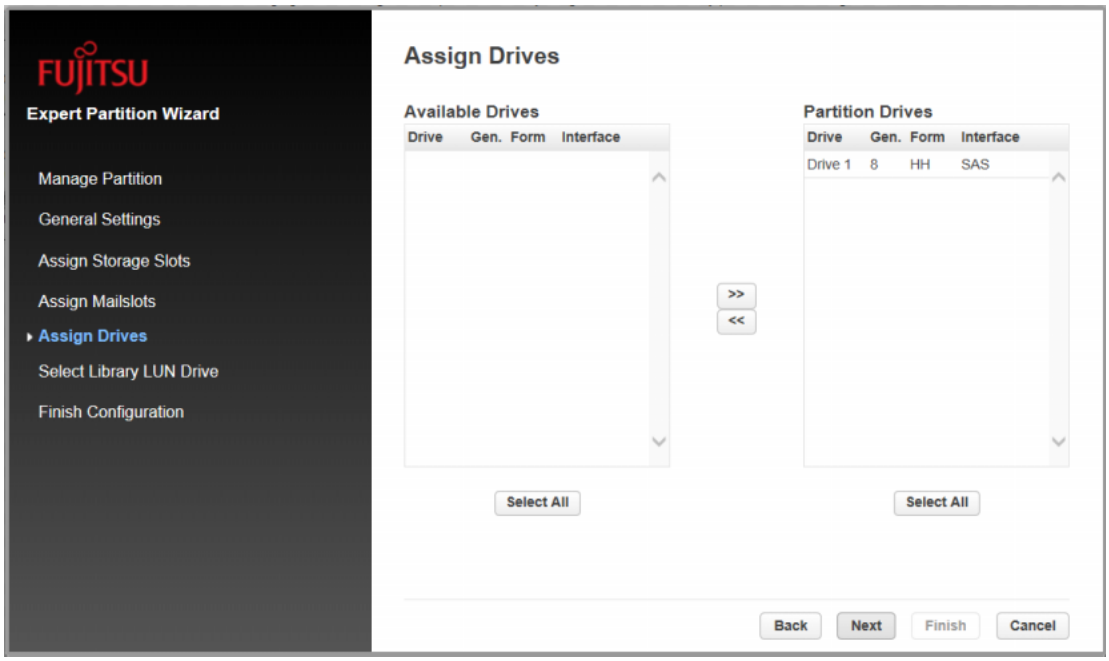
"Available Mailslots" indicates the remaining Mailslots that can be assigned and "Partition Maillots" indicates the Mailslots that are to be assigned to the partition that is currently being edited.



8 In the Assign Drives screen, use the >> and << buttons to assign tape drives to the partition that is currently being edited and then click Next.

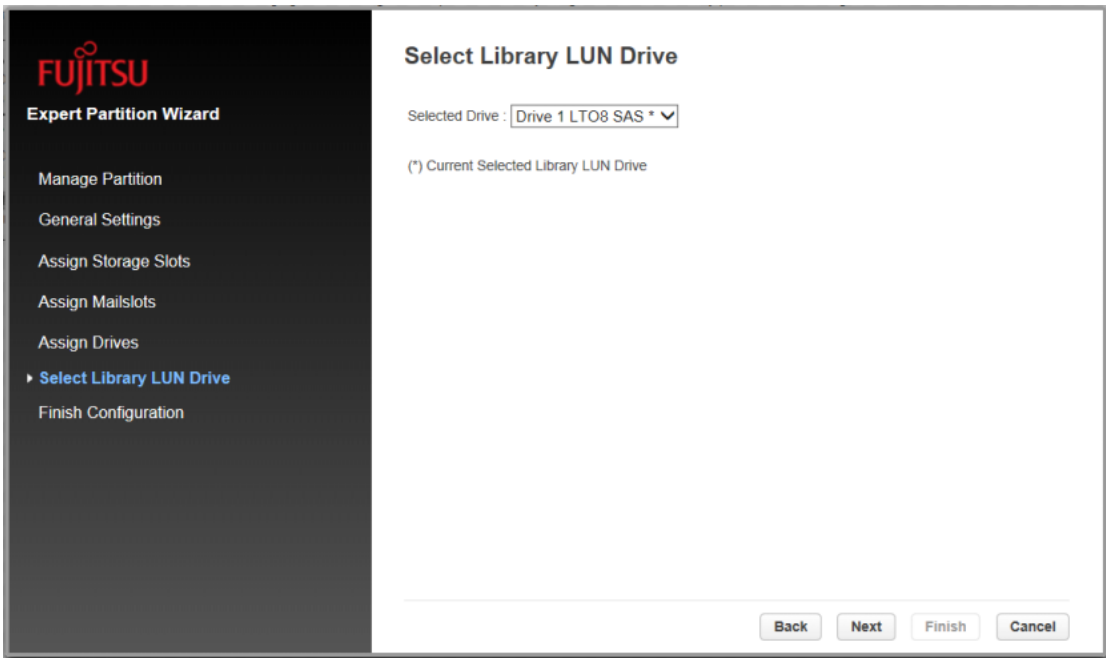
Note

"Available Drives" indicates the remaining tape drives that can be assigned and "Partition Drives" indicates the tape drives that are to be assigned to the tape drive that is currently being edited.

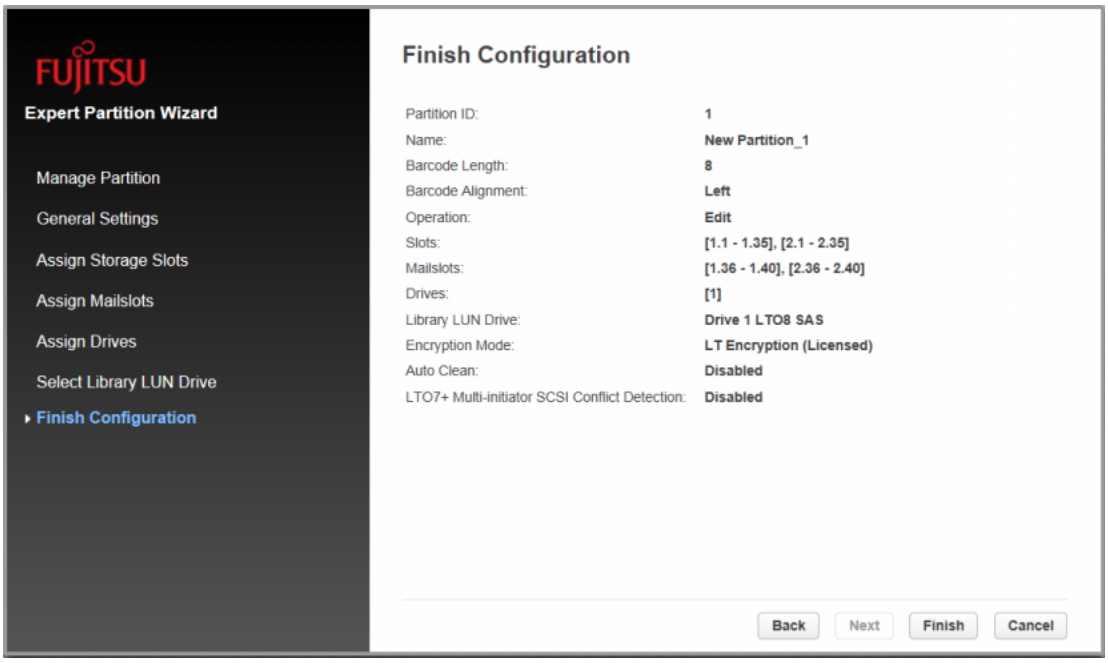


9 Select a tape drive to use for the SCSI communication to the host and then click Next.

The lowest numbered tape drive in the partition is the default.

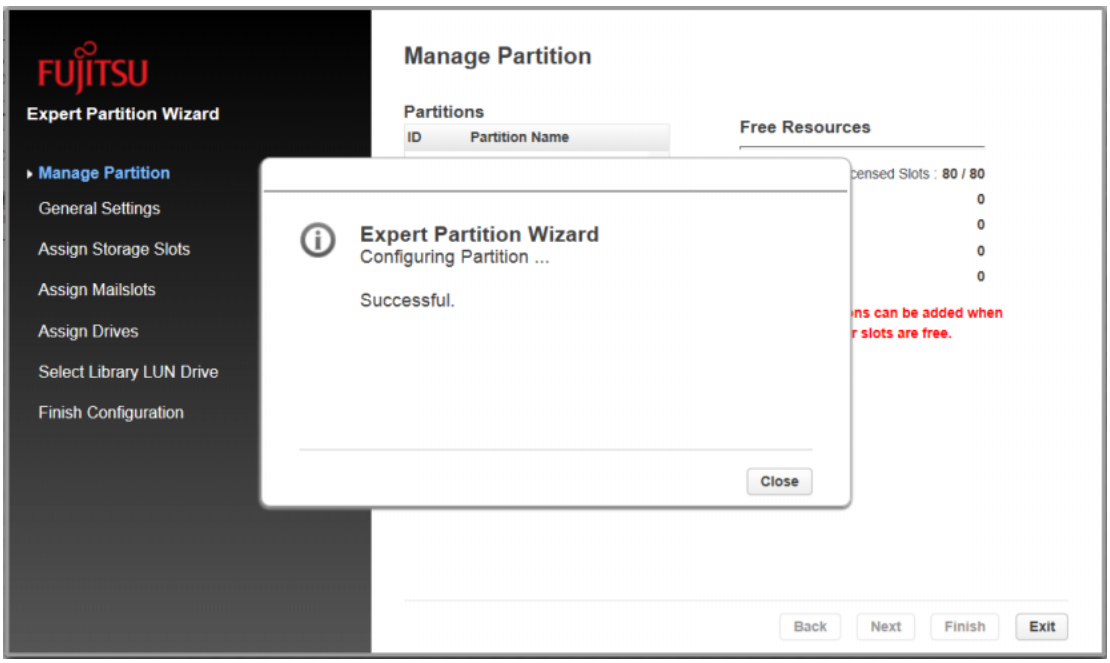


10 The Finish Configuration screen displays the partition allocation and then click Finish.



After the wizard reconfigures the partition, the library automatically becomes online.

11 Click Close.



12 Click Exit.

End of procedure

6.3 Key Management Function Option

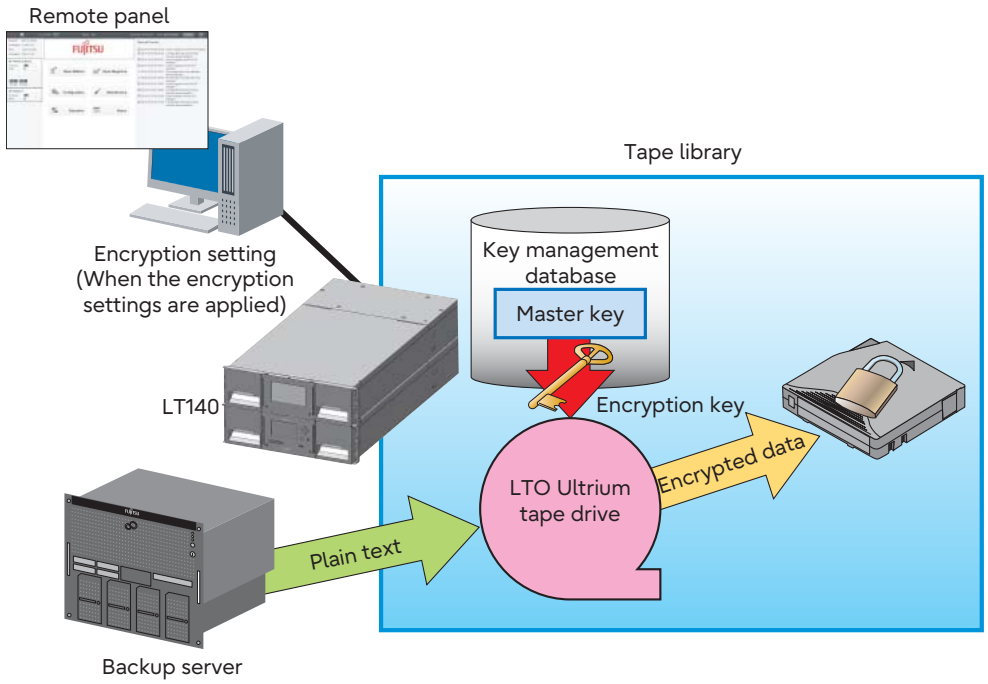
This section explains the Key Management Function Option.

6.3.1 Overview

The Key Management Function Option allows the use of the encryption function provided by LTO Ultrium tape drives to manage encryption keys on the tape library.

Figure 6.4 shows the concept of this option.

Figure 6.4 Key Management Function Option



The Key Management Function Option applies the encryption settings from the remote panel to the tape library and assigns one key called the master key. The encryption key that is automatically generated for each data cartridge by the tape library is based on the master key, and this information is stored in a database in the tape library.
During a data backup from a backup server, the tape library automatically assigns an encryption key to the specified data cartridge, encrypts the data (plain text), and saves the data. The encryption process is performed transparently during this time.

Caution

The following tape drives and tape cartridges are required to use the Key Management Function Option:

- LTO Ultrium 6 (G6) or later tape drives.
- LTO Ultrium 4 (G4) or later tape cartridges

For other required optional products, refer to "Fujitsu Storage ETERNUS LT140 Tape Library Product List". For more details about tape cartridges, refer to "A.1 Ultrium Tape Cartridge" (page 111).

Note

To use the key management function, purchasing the Key Management Function Option is required.

6.3.2 Features of the Key Management Function Option

This option has the following features:

- The Key Management Function Option can be used independently of the OS and backup software because the LT140 automatically performs encryption operations. This allows a secure backup system to be easily constructed (*1).
- Encryption keys are assigned to tape libraries from the Web browser terminal. This means that the tape library administrators can maintain security without intervention by backup operators.
- When a single key (master key) is assigned to a tape library, an encryption key is automatically assigned to each data cartridge within the tape library. This means that the administrator does not need to manage the encryption keys of each data cartridge.
- The ETERNUS LT140, LT220, LT230, LT250, LT260, LT270, and LT270 S2 in the ETERNUS tape library series have compatible master keys (*2), so setting a common master key for these tape libraries facilitates data sharing or data migration of encrypted tape cartridge data between the tape libraries.
- To share data among multiple tape libraries, Fujitsu recommends operation with a common master key. If a disaster occurs, however, it might be necessary to read data from a data cartridge stored at an external site using a tape library assigned a different master key. For this purpose, you can export encryption keys in advance using the encryption key export/import function.

*1: This encryption function cannot be used together with the encryption function of the backup software.

*2: The ETERNUS LT20, LT20 S2, LT40, LT40 S2, LT60, LT60 S2, LT200, LT210 do not support the encryption key management function. Note that sales of the ETERNUS LT20, LT40, LT40 S2, LT60, LT60 S2, LT220, LT230, LT250, LT260, LT270, and LT270 S2 tape libraries have been discontinued.

6.3.3 Types of Key

There are two types of encryption keys; a master key that is required for each LT140 and an encryption key that is assigned for each tape cartridge in the tape library.

Master key

The master key is a key assigned to each tape library.
You must assign a master key before using this option.
The functions of a master key are listed below.

- The master key is used to automatically create encryption keys for individual data cartridges (*1).
- The same master key can be assigned to multiple tape libraries. A data cartridge that stores encrypted data can be shared between multiple tape libraries by setting the same master key for these tape libraries.
- The master key can be set by the administrator of the tape library.
- For logical library configurations, a master key can be assigned to each logical library.

*1: Since automatically generated master keys are managed by the tape library alone, their values are not visible to users.

The two methods of creating a master key are as follows: automatic generation by the LT140 and creation by the user using arbitrary characters.
If you choose automatic generation, a master key is created based on information that is specific to the tape library. The same master key as already assigned to another tape library is never created. Master keys, once created, cannot be restored even by the manufacturer or maintenance engineer.
Although the master key is stored redundantly in the database of the tape library, it may be lost in the rare event that the tape library fails. Because the encrypted data becomes unreadable in these cases, be sure to download the master key (as a binary file) and keep it in a safe place.

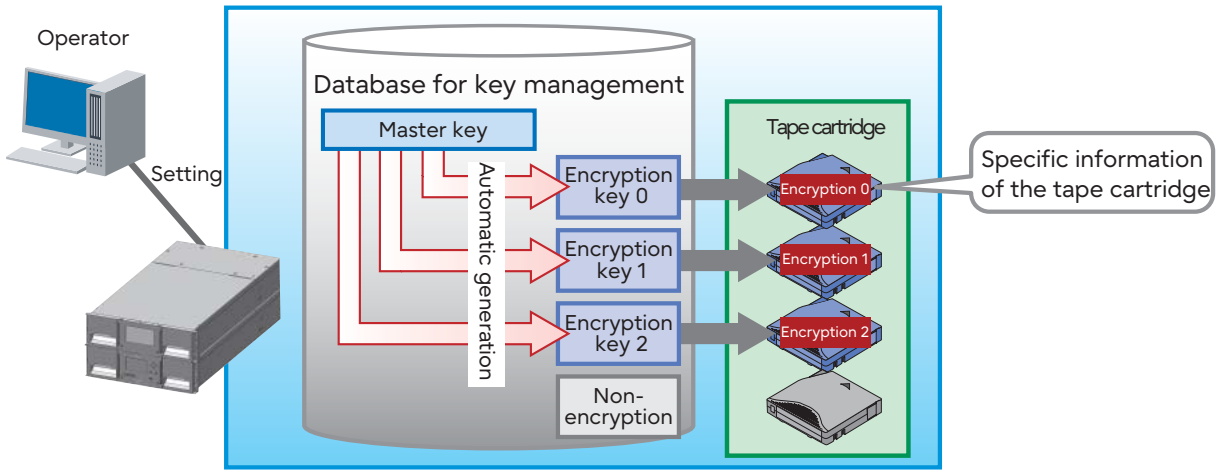
Encryption key

An encryption key is a key uniquely assigned to each data cartridge.
Encryption keys are automatically generated based on the master key and the data that is unique to each data cartridge. This assures that different data cartridges never have the same encryption key.
If the same master key and the same tape cartridge are used in different tape libraries, the tape libraries will generate the same encryption key for the cartridge.
Each data cartridge can be assigned only one encryption key.
In normal operation, the tape library performs encryption key operations automatically, without requiring any operations by the user.

Caution

The encryption key export/import function can be used to export or import only an encryption key (a password and encrypted binary file) for data sharing between tape libraries with different master keys. However, note that if the encryption key is lost, the data can no longer be restored. To share data among multiple tape libraries, Fujitsu recommends operation with a common master key.

Figure 6.5 Concept of automatic encryption key generation



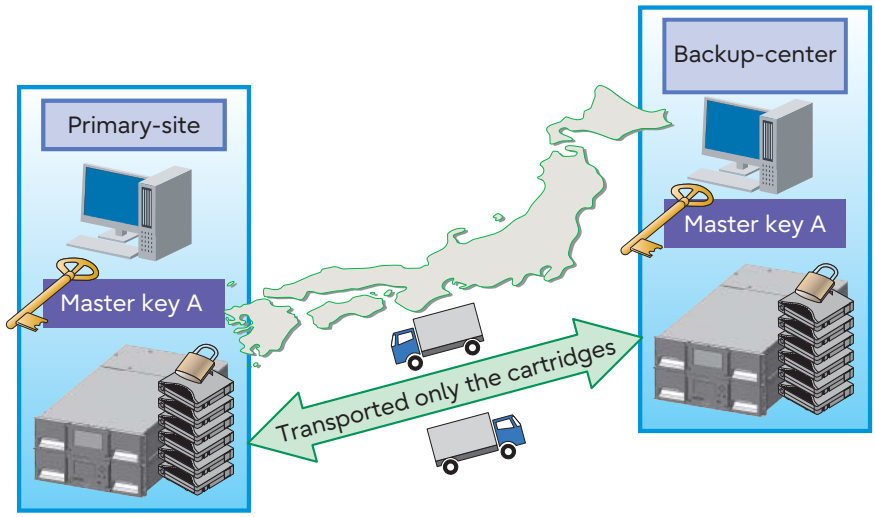
6.3.4 Operational Examples

Data encryption by the Key Management Function Option does not affect normal operation. This section provides some examples of using the Key Management Function Option, including storage of an encrypted data cartridge at another site and data sharing among multiple tape libraries.

Data sharing between centers

Assigning the same master key for multiple tape libraries installed at the same center or separate centers enables these tape libraries to share data cartridges with encryption keys hidden from view.

Figure 6.6 Sharing data cartridges using a master key



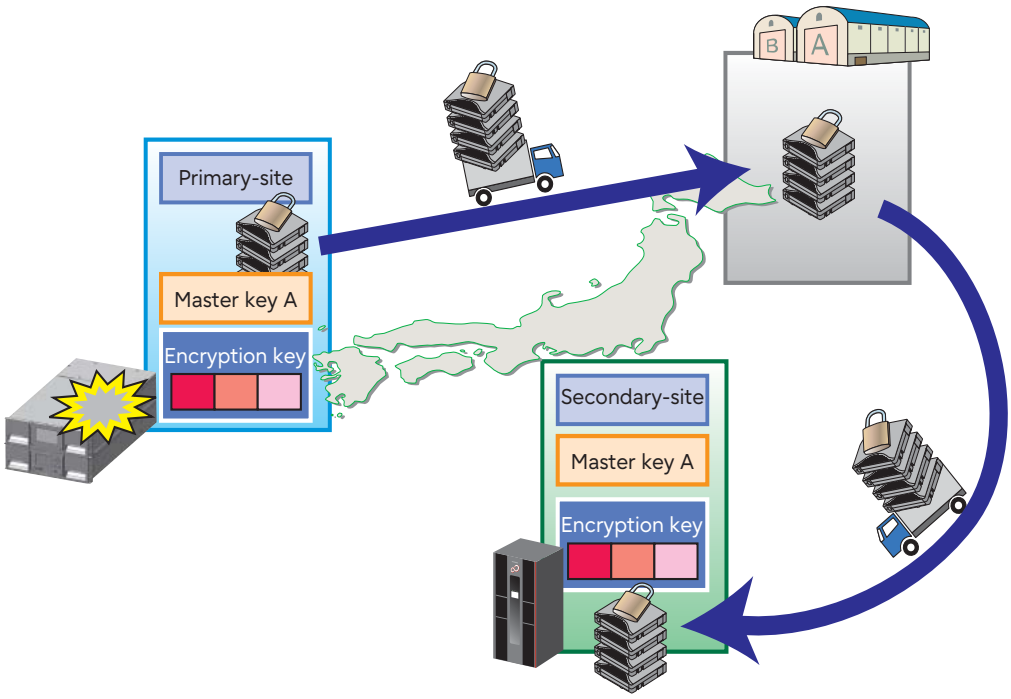
Encryption of data on a data cartridges stored at an external location

For disaster recovery, encrypted data cartridges can be stored at an external location, such as an external warehouse, and, when needed, brought back to read the data on them. Even if a data cartridge in storage is lost or stolen, the encryption can prevent data leakage.
Once a data cartridge in storage is inserted into its original tape library or one with the same master key, the data can be read from the tape library without setting the key again.

Note

Once encryption keys are exported, even if the tape library becomes unavailable such as in the event of a disaster, data on the data cartridge can be read by importing the encryption key to a tape library with a different master key.

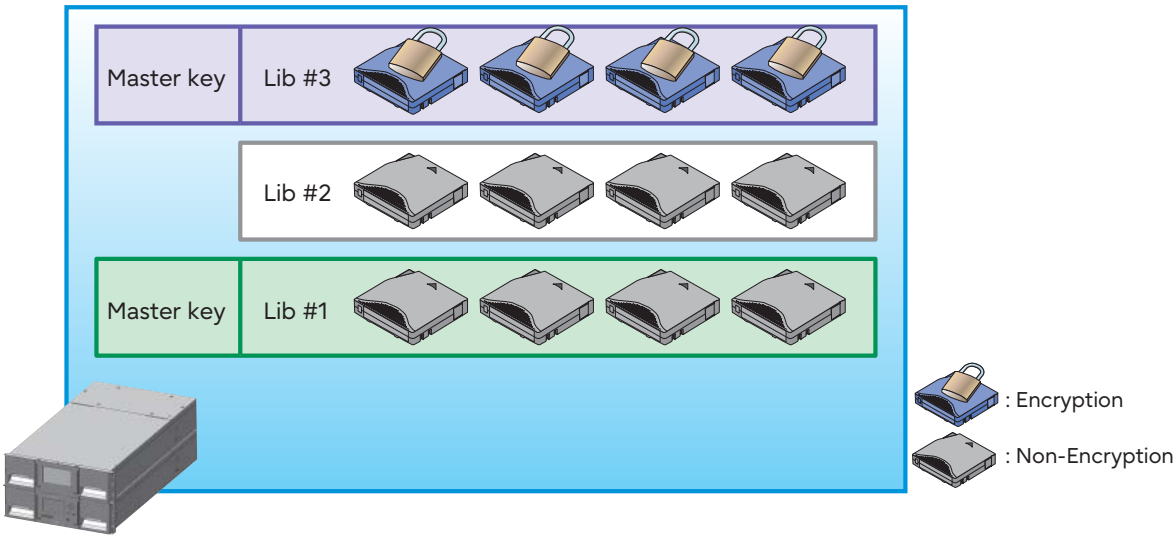
Figure 6.7 External storage of data cartridges



Encryption key setting for each logical library

When using the logical library configuration, individual master key assignments and encryption/non-encryption can be specified for each logical library.

Figure 6.8 Encryption key setting for each logical library



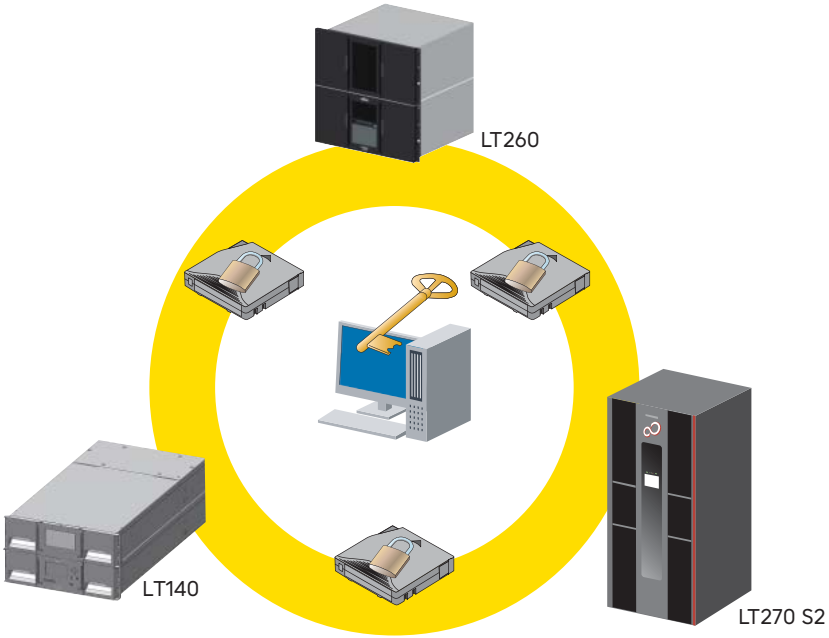
Interoperation among LT-series models

The ETERNUS LT140, LT220, LT230, LT250, LT260, LT270, and LT270 S2 tape libraries (LT-series) share compatible master keys and encryption keys, so keys and encrypted data cartridges can be shared among the LT-series tape libraries.
Setting a common master key for these tape libraries facilitates data sharing or data migration between the tape libraries with the keys hidden from view.

Caution

- The Key Management Function Option does not support interoperability with data cartridges encrypted by the encryption function of tape libraries, software, or other products manufactured by other companies.
  Refer to "A.1.2 Tape Drive Compatibility with Tape Cartridges" (page 113) for details.
- Sales of the ETERNUS LT220, LT230, LT250, LT260, LT270, and LT270 S2 tape libraries have been discontinued.

Figure 6.9 Interoperation among LT-series models



6.3.5 Connectivity with Backup Software

On a system using the encryption key management function, Fujitsu recommends using verified backup software.
Make sure to disable the native encryption function of the backup software if a backup software that supports the tape drive encryption function of Ultrium 6 or later is used.

Chapter 7
Troubleshooting

This chapter explains troubleshooting.

Caution

This library is designed to operate when installed in a rack using the rack rail kit. Operating the library without installing it in the rails, such as on a table or rack shelf, could result in library errors. Placing any weight on top of the library might also cause errors.

7.1 Fibre Channel Connection Problems

Use the Status> Drive Status screen to check the link connection for your tape drive.

If the screen shows Logged Out:

- Check that the Fibre speed is set to Automatic or that the correct Fibre speed is selected. If you are unsure of the speed of the HBA or switch that the tape drive is connected to, try Automatic.
- Check that the correct port type, fabric or loop, is selected. Loop requires additional configuration. If you are unsure of the correct port type, try Automatic.

If the screen shows No Link, the Speed Status is "-" and the Link LED on the back of the tape drive is off:

The speed is probably set incorrectly. Try setting the speed to Automatic.
If there are still issues, change the port type to Auto Detect.

If the screen shows No Light:

- The cable is not plugged in correctly. Check that it is connected correctly to Port A of the tape drive.
- The cable is damaged. FC cables are delicate. If the cable has been bent or twisted sharply, it might be broken and must be replaced.

If the screen shows ALPA Conflict:

There might be a conflict with the ALPA address on Loop ports.
Select Soft for the Loop mode to allow the system to select an available address each time the tape drive connects to the FC fabric.
If your server configuration does not support changing addresses, try using the Hard Auto-Select Option for the Loop mode. This allows the system to select an available address when it first connects, and then retain that address for future connections.

7.2 Detection Problems after Installing a SAS Drive

Problems encountered after installation are often caused by improper SAS cable connections, application software configuration errors, or an incorrectly configured operating system. If the application software or operating system does not communicate with the library after installation, determine the extent of the detection problem:

- Does the application software detect the tape drive?
- Does the application software detect the library?
- Does the operating system detect the tape drive?
- Does the operating system detect the library?
- Does the operating system detect the library, but list it as a generic device?

Based on the extent of the detection problem, check the following:

If neither the application software nor operating system detects the tape drive, or they do not detect both the tape drive and the library:

- Verify that all SAS cables are securely connected on both ends. If the mini-SAS connectors that connect to the tape drive and some HBAs will not plug in, check the key. The mini-SAS connector on the tape drive is keyed at location four, which is the standard location for end devices. If the connector on the cable is keyed in a different location, not only will the connector not plug in, but the cable probably will not work.
- Check the length and integrity of your SAS cabling. For reliable operation, do not use a SAS cable longer than six meters. Do not use a cable adapter or converters between the HBA and the library.
- Check the SAS connectors for damage or debris.
- Verify that your HBA is supported by the host computer and qualified with the library.
- Verify that your HBA has the latest firmware.

If the application software or operating system detects the tape drive, but not the library:

Verify that multiple LUN support is enabled on the HBA. The library uses two Logical Unit Numbers (LUNs) to control the tape drive (LUN 0) and robotic (LUN 1). The library requires an HBA with multiple LUN support and multiple LUN support must be enabled on the host computer. When multiple LUN support is not enabled, the host computer can see the tape drive, but not the library.

Note

Many RAID or array controllers do not provide multiple LUN support.

If the application software or operating system does not detect any devices on the HBA:

- Verify that the SAS host adapter is installed correctly. Refer to the manual that came with your host adapter for installation and troubleshooting instructions. Pay particular attention to any steps describing configuration settings. Make sure that the host adapter is properly seated in the motherboard slot and the operating system correctly detects the host adapter.
- Verify that the proper device driver is installed for the SAS host adapter.

If the library is detected by the operating system, but not by the application software:

Refer to the documentation included with your backup application for instructions on how to verify proper installation. Some backup software packages require an additional module to communicate with the robotics.

If the library is detected by the operating system, but is listed as an unknown or generic device:

- Make sure that the proper device driver, if applicable, is installed for the device. Check your software provider's website for the latest drivers and patches.

  Note

  Many backup applications use their own drivers. Before installing a driver, make sure it is not in conflict with the application software.

- If you continue to have problems with a SAS library, check the following:
  - Ensure that the library is compatible with the SAS host adapter and backup application you plan to use.
  - Verify that your HBA is supported by the host computer and qualified with the library.
  - Ensure you are using a compatible, high-quality cable.

7.3 Operation Problems

This section describes problems that may occur during operation and how to resolve them.

7.3.1 Power Problems

Device does not power on.

Perform the following procedure:

Procedure

1. Check all power cord connections.
2. Check the LEDs on the power supplies.
3. Make sure the power button on the operator panel has been pressed, and the green Ready LED is lit.
4. Make sure the outlet has power.
   Try another working outlet.
5. Replace the power cord.

End of procedure

No message appears on the LCD screen.

Perform the following procedure:

Procedure

1. Check all power cord connections.
2. Check the LEDs on the power supplies.
3. Make sure the power button on the operator panel has been pressed, and the green Ready LED is lit.
4. Make sure the outlet has power.
   Try another working outlet.

End of procedure

7.3.2 Failure/Attention Indications Displayed on the Operator Panel

- The operator panel displays "Err" or "Warn".

  Check the event log detail by referring to "7.5 Checking Event Information" (page 104).

7.3.3 Tape Movement Problems

- Tape stuck in drive.

  Try the following steps, in this order, to remove the stuck tape.

  Note

  The tape drive must rewind the tape before ejecting it. This can take as long as five minutes, depending on how much tape must be rewound. Once the tape is rewound, the eject cycle will take fewer than 16 seconds.

  The Ready light flashes while the tape rewinds. Wait for the tape to finish rewinding before attempting another operation.

  Procedure

  1. Attempt to unload the tape from your backup software.
  2. Shut down the backup software and stop the operating system's removable storage services. From the Operation > Move Media screen, attempt to unload or move the tape to a slot.
  3. Power down the library, disconnect the cable from the tape drive, power up the library, and wait until the tape drive is idle or ready. From the Operation > Move Media screen, attempt to unload or move the tape to a slot.
  4. From the Operation > Force Drive Media Eject screen, attempt a force eject or emergency unload operation.

  End of procedure

  IMPORTANT

  Inspect the tape cartridge that was stuck. Damage or misplaced labels on the cartridge could have caused the load/unload failure. Discard any tape cartridge found to have issues.

Tape cannot be removed from slot.

If the operator panel or remote panel is still operational:

Procedure

1. Unlock the magazine from the Operation > Open Magazine screen and extend it to access the slot.
2. Grasp the cartridge and remove it from the slot.
   Some tapes need to be inserted and removed several times to condition them for free movement in and out of the magazine.
3. Check the barcode label and verity that it is secure to the cartridge.
4. Check the cartridge for damage.
5. Check the slot for damage.

End of procedure

Inserted tapes are not recognized.

If the slot expansion license is not installed, the tape cartridges in the slots of the left magazine are not recognized. Use the slots (1.21 to 1.40) of the right magazine.
If the number of slots that can be used is insufficient, consider the installation of the expansion license.

7.3.4 Media Problems

Cleaning or data cartridge incompatible with tape drive.

- Check the event log to see which cartridge is incompatible.
- Make sure you are using data and cleaning cartridges that are compatible with the tape drive and model of your device and that you are using the correct cartridge type for the operation. The device automatically unloads incompatible cartridges, the Attention LED flashes. Export the media.

Cannot write to or read from tape.

- Make sure that the cartridge is not a WORM cartridge that has already been used.
- Make sure that the cartridge is write enabled (move the write-protect switch to the enabled position).
- Make sure the data cartridge is compatible with the tape drive model. LTO tape drives can read data cartridges from two generations back and write to data cartridges one generation back.
- Make sure you are using an Ultrium cartridge that has not been degaussed. Do not degauss Ultrium cartridges!

- Make sure that the cartridge has not been exposed to harsh environmental or electrical conditions and is not physically damaged in any way.
- Many backup applications do not read or write to cartridges that were created using a different backup application. In this case, you may have to perform an erase, format, or label operation on the cartridge.
- Make sure you understand any data protection or overwrite protection schemes that your backup application may be using, which could prevent you from writing to a given cartridge.
- Retry the operation with a different, known good tape.
- Clean the tape drive from the Operation > Clean Drive screen.

7.3.5 Attention LED is Lit

Both the Attention and Cleaning LEDs are lit.

This is most likely caused by a dirty tape drive that cannot read a tape and marks the tape invalid. Log into the operator panel or remote panel and check the event log to see which tape drive has reported that it needs cleaning. Clean the tape drive with an approved Ultrium cleaning cartridge.

A particular cartridge sets off the cleaning light.

Remove the cartridge from the library.

A cartridge recently imported from a different environment is causing issues.

Media that is moved from one environment to another can cause issues until it has acclimated to the new conditions. A cartridge should be acclimated for at least 24 hours before being used, particularly if it has been stored at a substantially different temperature or level of humidity than the device.

The Attention LED is lit but the Cleaning LED is not lit after a cartridge load.

The library was unable to complete the requested operation with the selected tape cartridge.

- Use only cartridges that are compatible with the tape drive type.
- Use the correct type of cartridges for the operation. For example, use a cleaning cartridge for cleaning.
- Make sure you are using an Universal cleaning cartridge.

The Cleaning LED is lit after using a cleaning cartridge.

The cleaning cartridge has expired. A cleaning cartridge will expire after approximately 50 cleaning cycles. Replace the expired cleaning cartridge with a new one. For the replacement procedure, refer to "3.5 Loading and Ejecting Tape Cartridges" (page 39).

- A particular cartridge sets off the Attention LED and possibly the Cleaning LED.

  Retry the operation with a different cleaning cartridge.
  If the Attention LED is cleared and the tape drive has been cleaned, and then immediately re-displays each time a particular cartridge is reloaded, that cartridge should be suspected as being defective.
  - If this occurs, export the cartridge and load a known good cartridge. In some cases, a cartridge can be worn out, have a defective Cartridge Memory, or have been formatted as a Firmware Upgrade Cartridge.
  - Any cartridge that is suspected of being defective or contaminated should NOT be reused in any tape drive.
  - If the bad cartridge is a cleaning cartridge, it might be expired. Replace the cleaning cartridge with a new one. For the replacement procedure, refer to "3.5 Loading and Ejecting Tape Cartridges" (page 39).

7.3.6 Turning Off the Attention LED

The Attention LED that is turned on with the warning event may turn off automatically in the conditions described below, but a manual operation is required to turn it off for all other cases. Note that most of the warning events require manual operation to turn the Attention LED off.
The following events do not require manual operation to turn the Attention LED off.

- Events related to cleanings (Event code: 4002, 4008, 4067, 4068, and 4072)
- Events related to the fan status (Event code: 4000, 4071, and 4096)
- Event related to tape drive disconnections (Event code: 4021)

The following procedure shows how to manually turn the Attention LED off.

Procedure

1. Login to the library with administrative privileges.
2. Move to Maintenance > Logs and Traces > View Logs screen.
3. In the Event Ticket Log screen, click Close all open tickets.
   A confirmation screen (pop-up screen) related to the Close Tickets operation appears.
4. Click Close all open tickets.
   Logs displayed in the Event Ticket Log screen are cleared.

End of procedure

7.3.7 Inventory Problems

The library displays incorrect bar codes.

- Verify that the label is properly applied.
- Verify that the label is not soiled.

When the cartridges in the magazine are not detected after an inventory

- Operate the remote panel or the operator panel to check that the cartridges are recognized correctly by removing and reinserting the magazine. For the operation method, refer to "2.7 Opening the Magazines/Mailslots" and "3.6.3 Opening a Magazine" of "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-". If the solution does not resolve the issue, contact your maintenance engineer.

7.3.8 Remote Panel Network Connection Issues

Cannot connect to the remote panel.

- Verify that the Ethernet cable is connected to the Base Module's library controller and to the LAN.
- Verify that the link LED on the RJ45 (LAN) connector is lit when the device is powered up. If the LED is not lit, the device is not communicating with the LAN. See your network administrator for help.
- Verify that the device has been configured with a valid static network address or DHCP has been enabled so the device can obtain a network address.
  If using DHCP, write down the device's network address from the operator panel login screen. If the device did not obtain a valid address via DHCP, verify that the DHCP server is up and the library has network access to it. If necessary, set a static network address instead.
- Enter the library's IP address into the address bar of a web browser connected to the same LAN as the device.
  If the remote panel web page does not display, ping the device's IP address.
  If the ping fails, verify that the device has a valid network address and that there are no firewalls or other obstructions to network traffic between the computer with the web browser and the device. See your network administrator for help.

7.3.9 Cleaning Problems

Cannot load the cleaning cartridge.

- Make sure you are using an Ultrium cleaning cartridge.
- Make sure the cleaning cartridge has not expired. The cleaning cartridge will expire after approximately 50 cleaning cycles. If the cleaning cartridge has expired, replace it with a new one. For the replacement procedure, refer to "3.5 Loading and Ejecting Tape Cartridges" (page 39).
- Power cycle the library.

7.4 Performance Problems

The process of backing up files involves many system components, from the files in the file system on the disk, through the backup server, and out to the library, all managed by software running on an operating system. The backup process can only run as fast as the slowest component in the system.
Performance issues are solved by identifying and addressing performance limitations in your system. Refer to sections below for the following potential performance limitations:

- Average File Size
- File Storage System
- Connection from the Backup/Archive Host Server to the Disk Storage System
- Backup/Archive Server
- Backup/Archive Software and Method
- Connection from the Archive/Backup Host Server to the Library
- Media

7.4.1 Average File Size

The hard disk drive must seek to the position of a file before it can start reading. The more time the disks are seeking to files, the lower the performance. Therefore, if the average file size is small, the read performance will be lower.
To determine the average file size, divide the size of the backup by the number of files.
If the average file size is small (64 KB or less), consider using a sequential, image, or block backup method that backs up the whole hard disk drive or LUN image instead of individual files. The trade off for using one of these methods is that you might only be able to restore the entire image instead of individual files.

Note

File fragmentation will also cause excessive hard disk drive seeking, which lowers performance, so ensure that files are regularly defragmented.

7.4.2 File Storage System

The file storage system determines the organization of the files on the disks. Using RAID controllers to spread files over multiple disks can improve performance because some disks can be seeking while others are reading. Storing files on a single non-RAID disk results in the slowest performance while storing files on a high-end Disk storage system results in the fastest performance.
Converting standalone disks to RAID can improve performance.

7.4.3 Connection from the Backup/Archive Host Server to the Disk Storage System

The connection between the host server and the disks determines how much data can be transferred from the disks to the host computer at a time. A connection with insufficient bandwidth cannot provide enough data for the tape drives to write at full speed. For optimum performance, the storage subsystem must be able to provide data at the tape drive's maximum transfer rate.
Backup systems using a lower speed Ethernet network should use multiple network connections.

7.4.4 Backup/Archive Server

The backup server must have enough RAM and processor power to transfer the files from the disk to the tape drive, in addition to running the backup or archive software and any other processes.
Check the RAM and processor usage during a backup operation. If they are operating at capacity, adding RAM or processor capability can improve performance.

7.4.5 Backup/Archive Software and Method

Each backup method has its own impact on performance, depending on how well it can keep data streaming to the tape drive. In most cases, native applications don't have the features required to maximize performance for LTO tape drives. It is recommended to use a full-featured backup or archive application with this library.
File-by-file backup or archive methods provide the best restore performance if you only need to restore individual files. However, if the average file size is small, file-by-file methods will significantly reduce performance.
Disk image, flash, or sequential backup methods provide the fastest performance because they back up an entire disk, partition, or LUN, which minimizes disk seeking. The disadvantage is that backup and restore operations work on an entire disk, partition, or LUN. You might not be able to back up a subset of files or restore a single file. If you can restore a single file, the restore process will be slow.

Database backup performance will vary based on the use model. To improve performance when backing up data from a database:

- Use specific backup agents for the database.
- Use the latest versions of the databases.
- Do not back up individual mailboxes.
- Do not back up specific records or do a record-by-record backup.
- Do not back up when the database is in heavy use.

7.4.6 Connection from the Archive/Backup Host Server to the Library

For the best performance, the connection from the host server to the library must have enough bandwidth to provide enough data to keep the tape drive streaming. Current LTO tape drives take advantage of some of the fastest interfaces available so the type of interface used to connect the library to the host server is not likely to be the cause of a performance issue. However, issues with cables and connectors can limit performance.
Do not exceed recommended cable lengths.

7.4.7 Media

The type and condition of the media also affect backup performance. For best performance, use media that is the same LTO generation as the tape drives.

7.5 Checking Event Information

Event information can be checked from the operator panel or the remote panel.

- For the operator panel
  From the Maintenance > View Event Ticket Logs screen, event logs can be checked.
  Error and Warning level events can be checked from the remote panel.
  For details, refer to "2.6.2 Checking Event Logs" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

- For the remote panel
  From the Maintenance > Logs and Traces > View Logs screen, event logs can be checked.
  For details, refer to "3.5.2 Viewing Log Files" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

7.6 Unlocking the Magazine

Unlocking the magazine with the magazine open button located on the front of the module or the remote panel is recommended. Only one magazine or Mailslot can be open at a time.
If these methods fail, or if a magazine needs to be removed when the power to the device is off, you can release the magazine manually.

Note

As a best practice, perform this procedure while applications are idle. While the magazine is extended, the library robotic assembly cannot move media.

7.6.1 Using the Magazine Open Button

Refer to "3.5.1 Unlocking the Magazine or Mailslot" (page 39) for instructions on how to unlock the magazine using the magazine open button located on the front of the module.

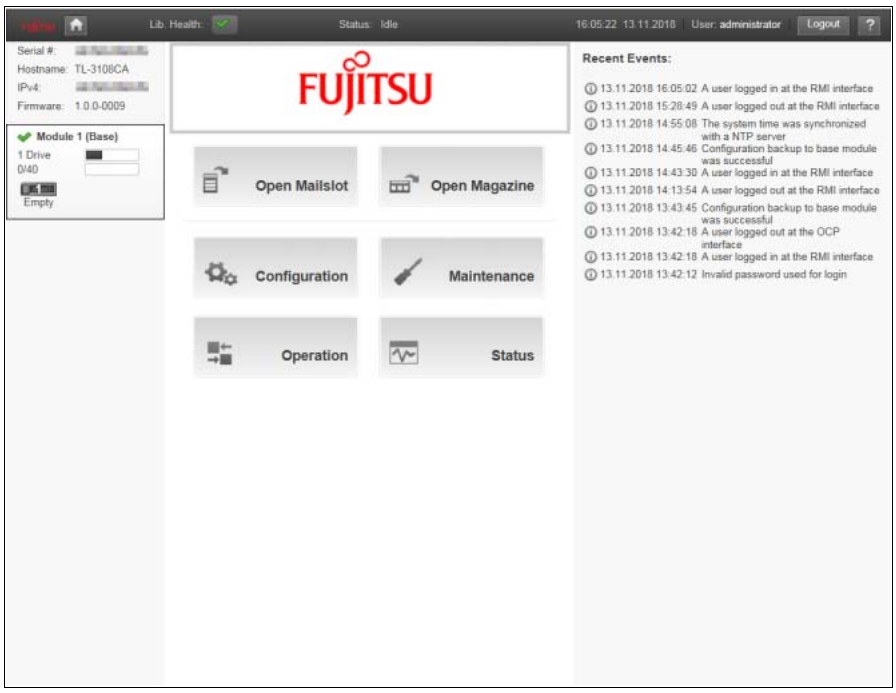
7.6.2 Using the Remote Panel

This section describes how to unlock the magazine using the remote panel.

Procedure

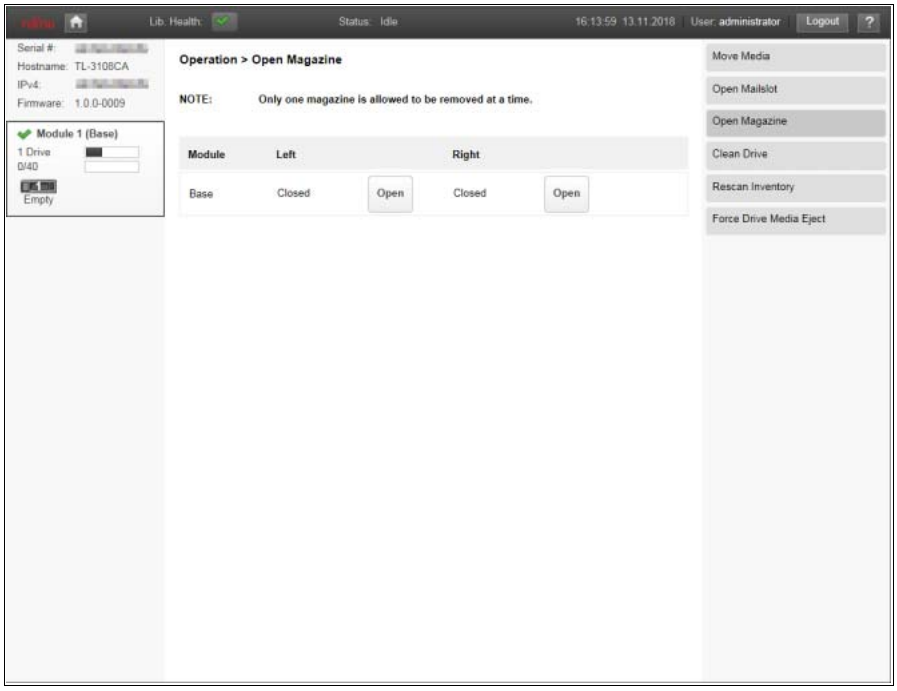
1. Log in as an administrator.
2. On the Home screen, click Open Magazine.

Figure 7.1 Home screen of remote panel



3 Tap Open in the left or right magazine column within the module containing the magazine to be replaced.

Figure 7.2 Open Magazine screen



4 Click Submit.
A message box is displayed to indicate that the magazine has been unlocked.

5 Click OK to close the message.

Open Magazine screen shows that the magazine is now unlocked.

Note

If the magazines and the Mailslot are not removed, they are locked again after 30 seconds.

End of procedure

7.6.3 Using the Manual Release

This section describes how to manually unlock the magazine.

Procedure

1 To unlock the magazine, use a tool such as a narrow tip screwdriver or a hex key (with a length of 50mm or longer and a diameter of 4mm or smaller). Gently insert the tool into the manual release hole of the appropriate magazine.

Figure 7.3 How to use the Manual Release

2 Pull the magazine out while the lock is released.

IMPORTANT

Do not exert force once you encounter resistance. Doing so can damage the device.

End of procedure

7.7 Unloading a Stuck Tape

If the tape is stuck in a tape drive, eject the tape from the tape drive in the Operation > Force Drive Media Eject screen.
If a tape is stuck in a magazine, open the magazine, grasp the cartridge, and pull it out of the slot.

7.8 Identifying a Failed Component

This section describes how to identify failed components.

Procedure

1. Activate the UID LEDs from the Maintenance > UID LED Control screen.
   This will illuminate the blue LED on the front and rear of the Base Module to identify the library containing the failed module or component.
2. Identify which of the modules (Base or Expansion) in the library contains the failed component.
   - **2-1** In the upper left of the Home screen, locate the module that indicates an error.
   - **2-2** Click or tap the module for information on the failed component.

End of procedure

7.9 Returning the Robotic Assembly to the Base Module

If you have powered off the library and the robotic assembly did not return to its park position in the Base Module behind the operator panel:

Procedure

1. Power on the library by pressing the power button on the Base Module.
2. From the remote panel, return the robotic assembly to its park position from the Maintenance > Move Robotic to Base Module screen.
3. Power off the library by pressing the power button on the Base Module and holding for 3 seconds.

End of procedure

If the robotic assembly is still not in the Base Module, contact your maintenance engineer.

7.10 Running Library Tests

The library provides tests to verify library operations.

- Wellness Test
  Refer to "3.5.1.5 Wellness Test" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- System Test
  Exercises overall library functionality by moving cartridges within the library.
  Cartridges are returned to their original location.
  Refer to "3.5.1.1 System Test" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- Slot to Slot Test
  Randomly exchanges cartridges within the library.
  Cartridges are NOT returned to their original locations.
  Refer to "3.5.1.2 Slot to Slot Test" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- Element to Element Test
  Moves a cartridge to a specific element and then returns it to its original location.
  Refer to "3.5.1.3 Element to Element Test" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- Position Test
  Moves the robotic assembly vertically between two elements. The number of movements can be specified.
  The robotic assembly does not move cartridges in this test.
  Refer to "3.5.1.4 Position Test" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- Robotic Test
  Performs a full inventory and exercises all robotic assembly movements and sensors.
  Refer to "3.5.1.6 Robotic Test" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- Operator Panel LED Test
  Turn the LEDs on of the operator panel.
  Refer to "3.5.1.7 Operator Panel Test" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

7.11 Assistance during Maintenance

Your maintenance engineer may ask you to collect the log files when troubleshooting the error. For details about how to collect log files, refer to "3.5.5 Downloading Drive Logs" and "3.5.6 Downloading Logs and Trace Files" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
To replace maintenance parts other than the library magazines due to, for example, a tape library failure, stop the backup software and power off the tape library. In addition, note that the server must be rebooted after the maintenance parts are replaced.

7.12 User Operations after Replacing Maintenance Parts

When maintenance parts are replaced due to, for example, a tape library failure, users need to perform operations such as those shown below.

- Rebooting the server
- Resetting the backup software
- Initial settings
  Refer to "4.2 Using the Initial System Setup" (page 53) for instructions on the initial settings.
- Restoring the library configuration
  Refer to "3.4.2 Saving, Restoring, and Resetting the Library Configuration" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-" for instructions on how to restore the library configuration.
- Importing the master key and encryption key (when using the Key Management Function Option)
  Refer to "Fujitsu Storage ETERNUS LT140 Tape Library Key Management Function Option User's Guide" for instructions on how to import the master key or encryption key.

Appendix A

Tape Cartridge and Barcode Label Specifications

This appendix describes tape cartridge and barcode label specifications and notes on using tape cartridges and barcode labels.

A.1 Ultrium Tape Cartridge

A.1.1 Tape Cartridge Specifications

The LT140 uses the tape cartridge for LTO Ultrium listed in Table A.1.
For information on tape drive compatibility with data cartridges, refer to Table A.3.

Table A.1 Tape cartridge specifications (1/2)

Item	Ultrium 5 data cartridge (*1)	Ultrium 5 data cartridge WORM (*2)	Ultrium 6 data cartridge (*1)	Ultrium 6 data cartridge WORM (*2)	Ultrium 7 data cartridge (*1)	Ultrium 7 data cartridge WORM (*2)
Product number	160340	160345	160350	0160355-P (*3)	160360	0160365-P (*3)
Type	Single-reel tape cartridge					
Tape width	12.65mm (1/2 inch)					
Tape length	846m		846m		960m	
Storage capacity (*4)	1.5TB (3.0TB)		2.5TB (6.25TB)		6.0TB (15.0TB)	
External dimensions	102.0 x 105.4 x 21.5 mm					

*1: The tape drive encryption function is used only with Ultrium 4 data cartridges or later. Moreover, it requires a backup software product that supports the hardware data encryption function.

*2: Write Once Read Many (WORM) refers to a type of data cartridge that can be written only once. To use the WORM feature together with backup software in linkage with the LT140, the backup software must support the WORM feature. Before using WORM cartridges together with any backup software, be sure to refer to the backup software manual.

*3: One set is sold with 20 cartridges.

*4: The storage capacity specification is a nominal value. The value enclosed in parentheses is the storage capacity when data is compressed. The data compression ratio is 2.5:1 for Ultrium 7, Ultrium 8, and Ultrium 9 data cartridges.

Table A.2 Tape cartridge specifications (2/2)

Item	Ultrium 8 data cartridge (*1)	Ultrium 8 data cartridge WORM (*2)	Ultrium 9 data cartridge (*1)	Ultrium 9 data cartridge WORM (*2)	Ultrium 1 cleaning cartridge U (*3)
Product number	160390	0160395-P (*4)	160400	0160405-P (*4)	160280
Type	Single-reel tape cartridge				
Tape width	12.65mm (1/2 inch)				
Tape length	960m		1,035m		305m
Storage capacity (*1)	12.0TB (30.0TB)		18.0TB (45.0TB)		-
External dimensions	102.0 x 105.4 x 21.5 mm				

*1: The tape drive encryption function is used only with Ultrium 4 data cartridges or later. Moreover, it requires a backup software product that supports the hardware data encryption function.

*2: Write Once Read Many (WORM) refers to a type of data cartridge that can be written only once. To use the WORM feature together with backup software in linkage with the LT140, the backup software must support the WORM feature. Before using WORM cartridges together with any backup software, be sure to refer to the backup software manual.

*3: The cleaning cartridge is common to and can be used with Ultrium 1 to Ultrium 9 drives.

- A cartridge can be used up to 50 times as a rough standard. After approximately 50 uses, this cartridge can no longer be used. Fujitsu recommends replacing it before the 50th time.
- Be sure not to use a cleaning cartridge intended for another LT series tape library, or a cleaning cartridge already used on a tape library manufactured by another company. Otherwise, errors and other problems may occur.
- For details on how to use cleaning cartridges, refer to "3.6 Cleaning Tape Drives" (page 48).

*4: One set is sold with 20 cartridges.

*5: The storage capacity specification is a nominal value. The value enclosed in parentheses is the storage capacity when data is compressed. The data compression ratio is 2.5:1 for Ultrium 7, Ultrium 8, and Ultrium 9 data cartridges.

A.1.2 Tape Drive Compatibility with Tape Cartridges

Table A.3 Tape drive compatibility with data cartridges

Data cartridge	Storage capacity (*1)	Tape drive		
		LTO Ultrium 7	LTO Ultrium 8	LTO Ultrium 9
LTO Ultrium 5	2.5TB (6.25TB)	Reading enabled	Cannot be used	Cannot be used
LTO Ultrium 5 WORM				
LTO Ultrium 6	2.5TB (6.25TB)	Reading and writing enabled (*2)	Cannot be used	Cannot be used
LTO Ultrium 6 WORM				
LTO Ultrium 7	6.0TB (15.0TB)	Reading and writing enabled (*3)	Reading and writing enabled (*3)	Cannot be used
LTO Ultrium 7 WORM				
LTO Ultrium 8	12.0TB (30.0TB)	Cannot be used	Reading and writing enabled (*4)	Reading and writing enabled (*4)
LTO Ultrium 8 WORM				
LTO Ultrium 9	18.0TB (45.0TB)	Cannot be used	Cannot be used	Reading and writing enabled (*5)
LTO Ultrium 9 WORM				

*1: The storage capacity specification is a nominal value. The value enclosed in parentheses is the storage capacity when data is compressed. The data compression ratio is 2.5:1 for Ultrium 6, Ultrium 7, Ultrium 8, and Ultrium 9 data cartridges.

*2: Data in LTO Ultrium 6 data cartridges is written in Ultrium 6 format.

*3: Data in LTO Ultrium 7 data cartridges is written in Ultrium 7 format.

*4: Data in LTO Ultrium 8 data cartridges is written in Ultrium 8 format.

*5: Data in LTO Ultrium 9 data cartridges is written in Ultrium 9 format.
Note the following when LTO Ultrium 9 data cartridges are used.

- To use an unused LTO Ultrium 9 data cartridge for the first time, initialize the LTO Ultrium 9 data cartridge in a tape library that is equipped with an LTO Ultrium 9 tape drive. When initializing LTO Ultrium 9 data cartridges, refer to "3.5.11 Initializing LTO9 Tape Cartridges" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".
- Because initialization of an LTO Ultrium 9 tape cartridge takes up to two hours, use the initialized LTO Ultrium 9 data cartridges for operations.

A.1.3 Notes Regarding the Use of Tape Cartridges

To assure required performance and reliability, tape cartridges must be handled with care. A tape cartridge is a consumable, meaning that it wears out after a certain period of use.

Precautions to Follow when Using the Tape Cartridge

- The Ultrium drives of the LT140 are dedicated drives for LTO Ultrium cartridges. In addition to the LT140, these tape cartridges can also be used with the LT20 S2, LT40 S2, LT60 S2, LT130, LT160, LT200, LT210, LT220, LT230, LT250, LT260, LT270, and LT270 S2. Note that DLT, 8 mm, DDS, LT300 tape cartridges and the like cannot be used with Ultrium tape drives.
- The data cartridge and the cleaning cartridge are consumable supplies. Be sure to purchase them separately. For details of the tape cartridge specifications, refer to "A.1.1 Tape Cartridge Specifications" (page 111).
- A cleaning cartridge can be used up to 50 times as a rough standard. If the maximum number is reached, replace the cleaning cartridge.
- A cleaning cartridge is for exclusive use in the tape library device being used. Be sure not to use a cleaning cartridge in the LT140 Tape Library that was used in another library device.
- To use a data cartridge that was used in another library device in this library, check the following points. If any relevant point is found, perform recovery work or replacement with a new one before using LT140.
  - Barcode label
    Use the tape cartridge vendor's label for the barcode label to be affixed to the cartridge. For details on the specifications, refer to "A.2 Barcode Labels" (page 120).
  - Leader pin
    Check for any leader pin that has been detached from the tape cartridge. For more details on leader pins, refer to "A.1.4 Handling Tape Cartridges" (page 115).
  - Replacement cycle of tape cartridges
    A tape cartridge, being a consumable, wears out due to mechanical abrasion and/or chemical deterioration. If storage under the environment conditions recommended by Fujitsu is assumed, the service life of the tape cartridge is about 30 years. However, if circumstances such as the environment for use, number of times of use, and storage environment are considered for actual operation, we recommend replacing the tape cartridge with a new one.

About LTO9 Tape Cartridges

To use an unused LTO Ultrium 9 data cartridge for the first time, affix a barcode label to the LTO Ultrium 9 data cartridge. Initialize the LTO Ultrium 9 data cartridge in a tape library that is equipped with an LTO Ultrium 9 tape drive before using it for operations. Initialization of LT Ultrium 9 tape cartridges takes up to two hours for one cartridge.
If a backup is performed to LTO Ultrium 9 data cartridges that have not been initialized, the LTO Ultrium 9 tape drive will perform an initialization of the LTO Ultrium 9 data cartridge, so the backup time will increase significantly.
In addition, if an LTO Ultrium 9 data cartridge that does not have a barcode label is loaded in a tape library that does not support LTO Ultrium 9 data cartridges, unexpected errors may occur or, depending on the tape library settings, unnecessary trap notifications may occur.
When initializing LTO Ultrium 9 data cartridges, refer to "3.5.11 Initializing LTO9 Tape Cartridges" in "Fujitsu Storage ETERNUS LT140 Tape Library User's Guide -Panel Operation-".

A.1.4 Handling Tape Cartridges

To assure required performance and reliability, tape cartridges must be handled with care.
A tape cartridge is a consumable, meaning that it wears out after a certain period of use.
Generally, the longer a tape cartridge is used, the greater the number of errors.

The following paragraphs are notes on handling tape cartridges.

Notes on storage

Storage environment

Table A.4 lists the environment conditions required for storing a recorded tape cartridge.

Table A.4 Tape cartridge storage environment

Item	Data/cleaning cartridge
Temperature	16 to 32 °C
Humidity	20 to 80 % RH
Maximum wet-bulb temperature	26 °C
Miscellaneous	No condensation

In addition, note the following points:

- For long-term storage, keep tape cartridges upright.
- Do not leave tape cartridges in direct sunlight or in a dusty environment.
- Do not put tape cartridges near a power cable, motor, or power supply. Recorded data might be destroyed by a radiating magnetic field.

Notes on transport

Environmental conditions for transport

To transport or carry tape cartridges, observe the environmental conditions listed in Table A.5.

Table A.5 Tape cartridge transport environment

Item	Data/cleaning cartridge
Temperature	-23 to 49 °C
Humidity	5 to 80 %
Maximum wet-bulb temperature	26 °C
Magnetic field	4000A/m or less
Miscellaneous	No condensation

In addition, note the following points:

- When using a tape cartridge brought in from outdoors, avoid any sudden changes in the environment, and let the tape adapt to the operating environment by exposing as long as it has been stored outside (up to 24 hours).
  Example:
  - Outside for six hours
    Leave the tape cartridge in the operating environment for six hours to let it adapt before using it.
  - Outside for one day or more
    Leave the tape cartridge in the operating environment for 24 hours to let it adapt before using it.
- During transportation, put the tape cartridge in a container to protect it from water damage, contamination, magnetic fields, temperature changes, vibration, and shock.

Handling

This section provides notes on handling tape cartridges.

- To prevent tape cartridges from falling, do not stack them more than six cartridges high. If you damage a cartridge by mistakenly allowing it to fall, repair the cartridge and immediately copy the data to other medium. After doing so, dispose of the damaged cartridge.
- An LTO Ultrium tape cartridge has a factory-written servo track, enabling precise reading and writing to the tape using this information. Although data can be deleted using a dedicated device (1200 oersteds or more) for security protection of the data, the servo track is also deleted. Thus, a cartridge whose data has been deleted cannot be reused.
- Due to chemical deterioration of tape cartridges, an adhesive constituent in the tape binder might sometimes ooze and stick to the magnetic head, causing read/write errors.

  If an adhesive contaminant sticks to the head, a chemical contained in the contaminant (binder constituent) might corrode the MR element of the head. Since this adhesive contaminant oozes regardless of the number of times the tape is used, tape cleaning does not solve the problem; the only solution is to dispose of the tape.
  In addition, an adhesive contaminant tends to emerge if a tape is stored in a hot or humid environment. Maintenance of the correct storage environment is important.

Notes on the shutter and leader pin

Before loading a tape cartridge in the device, confirm that the tape cartridge shutter can open and close and that the leader pin has been removed from the tape cartridge.
If the shutter cannot open and close normally, do not use the tape cartridge because loading it in a tape drive may not be possible. In addition, even if the leader pin of a tape cartridge with recorded data has been removed, the tape cartridge can be used again with the leader pin reattached to the cartridge. In such cases, contact the support section. Note that repairs to a tape are limited to within 30 cm from the end of the tape.

The procedure to check a shutter and a leader pin is as follows:

Procedure

1 Before using a tape cartridge, confirm that its leader pin is latched.

Figure A.1 Latched state of the leader pin (the leader pin is latched)

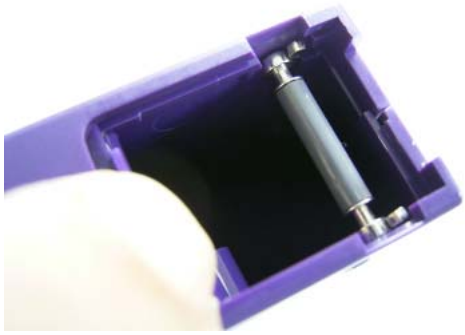


Figure A.2 Latched state of the leader pin (the leader pin has been removed)

2 Confirm that the tape is correctly attached with clips to the leader pin.

Do not use the tape cartridge until the clips are verified as fitting correctly into the leader pin as shown below.

Figure A.3 Fit state of clips (clips fit correctly)

Figure A.4 Fit state of clips (clips do not fit correctly (the leader pin is misaligned))

End of procedure

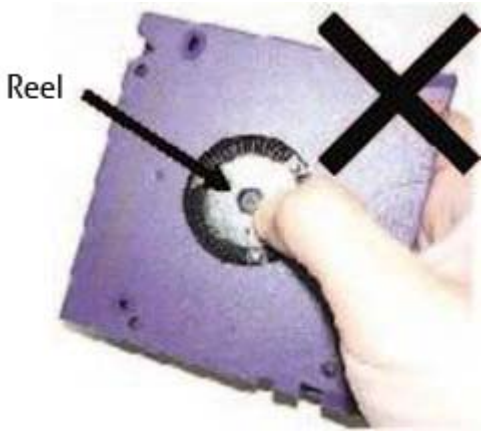
Caution

Do not apply force to or pull out the leader pin or tape of a tape cartridge because it is a precision component. Do not push or turn the reel.

Notes when handling the tape cartridges

Because the data cartridge is a precision product with an enclosed structure, be sure to keep the following in mind when inspecting it.

- Do not drop the data cartridge or expose it to shock or vibration.
- Do not apply excessive force to the data cartridge, or pull on the leader pin or the magnetic tape.
- Do not press on the magnetic tape reel or turn it.



Notes on affixing a label

It is important to affix a highly adhesive, high-quality label on each tape cartridge.
Loading a tape cartridge whose label is loose will cause problems in the LT140.
Therefore, be sure to use the labels provided with the tape cartridges.

A.2 Barcode Labels

The tape library is suitable for differentiating and managing multiple tape cartridges using the barcode label volume numbers affixed to the tape cartridges. If a barcode label is affixed to a tape cartridge, the barcode is read by the internal barcode reader in the library and a volume registration can be completed quickly. Because operations without the use of barcode labels may cause unexpected issues, the use of barcode labels is recommended.

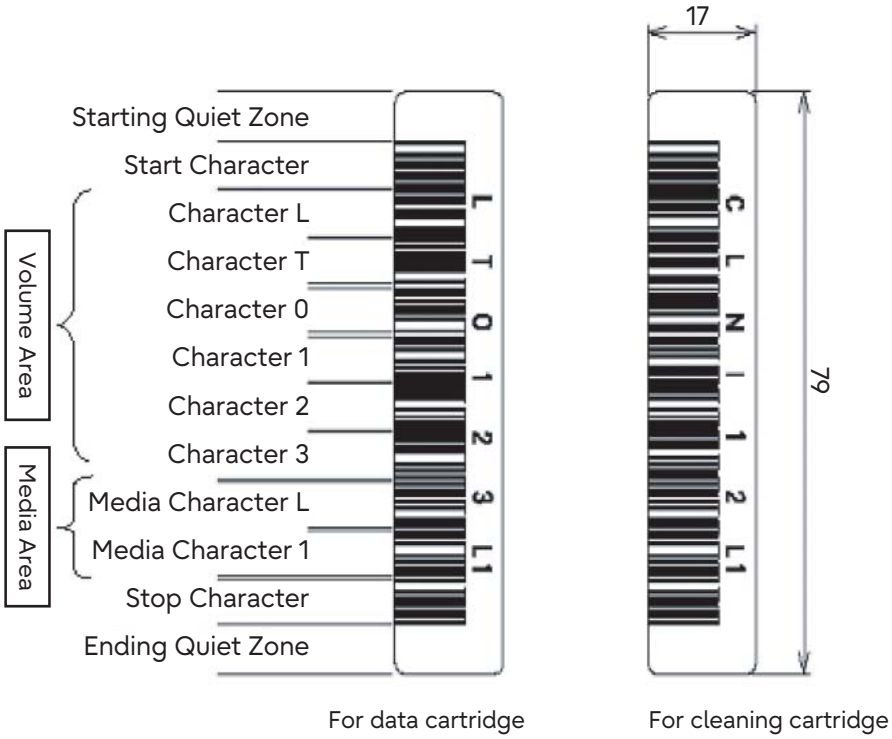
Purchase and use the barcode labels available from EDP/COLORFLEX or the magnetic tape vendor.

Data cartridge label: EDP/Colorflex #1700-00
Cleaning cartridge label: EDP/Colorflex #1700-CN

A.2.1 Barcode Label Specifications

When purchasing labels, specify an eight-character string indicating the "volume area + media area."

Figure A.5 Character string on barcode label



Specifying a character string in the volume area (Volser)

Strings in the volume area of the data cartridges are six-character strings.
However, note that the following six-character strings cannot be used:
"CLN*xxx*", "DG*xxxx*, and "CEVL*xx*" (*x* is an arbitrary character string)
Table A.6 lists the characters that can be used in the volume area.

Table A.6 Characters that can be used on barcode labels

Character type	Description
Upper-case alphabetic character	26 characters from A to Z
Numeric characters	10 characters from 0 to 9

Specifying a string in the media area (Media ID)

Table A.7 shows the relationship between the cartridge type and the specified string.

Table A.7 Cartridge type and specified string

Specified string	Tape cartridge type
L5	Ultrium 5 data cartridge 1.5TB (Non-compressed), 3.0TB (Compressed)
L6	Ultrium 6 data cartridge 2.5TB (Non-compressed), 6.25TB (Compressed)
L7	Ultrium 7 data cartridge 6.0TB (Non-compressed), 15.0TB (Compressed)
L8	Ultrium 8 data cartridge 12.0GB (Non-compressed), 30.0GB (Compressed)
L9	Ultrium 9 data cartridge 18.0GB (Non-compressed), 45.0GB (Compressed)
LV	Ultrium 5 data cartridge WORM 1.5TB (Non-compressed), 3.0TB (Compressed)
LW	Ultrium 6 data cartridge WORM 2.5TB (Non-compressed), 6.25TB (Compressed)
LX	Ultrium 7 data cartridge WORM 6.0TB (Non-compressed), 15.0TB (Compressed)
LY	Ultrium 8 data cartridge WORM 12.0TB (Non-compressed), 30.0TB (Compressed)
LZ	Ultrium 9 data cartridge WORM 18.0TB (Non-compressed), 45.0TB (Compressed)

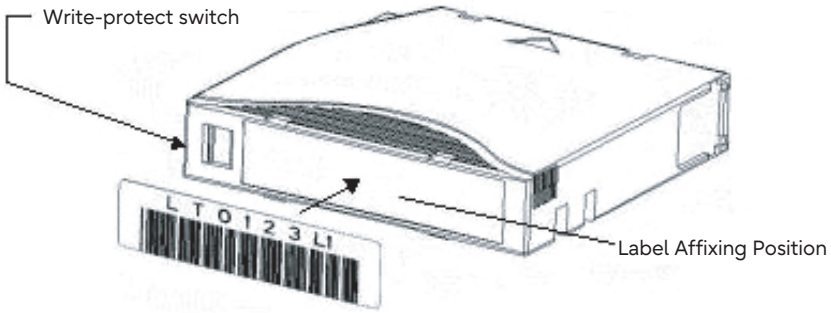
Specifying a string on a cleaning cartridge label

Specify the character strings of a cleaning cartridge barcode label as "CLNU *xx* L1" (where *xx* represents any usable characters).

A.2.2 Notes on Affixing a Barcode Label

- Keep the surface clean and free of fingerprints or dirt.
- Affix the barcode label on the specified location (concavity beside the write-protect switch) of the tape cartridge correctly (refer to Figure A.6).
  The barcode may not be recognized if the label is affixed in an incorrect position or orientation or if the label is wrinkled.
- After affixing the barcode label, press on it firmly. Notice that the end parts of the label are easily broken.
- To replace the label, peel the old label from the tape and then affix a new one.

Figure A.6 Barcode label affixing location



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