

# TeraStation III iSCSI User Manual



**TS-IXL**  
**TS-RIXL**

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# Chapter 1

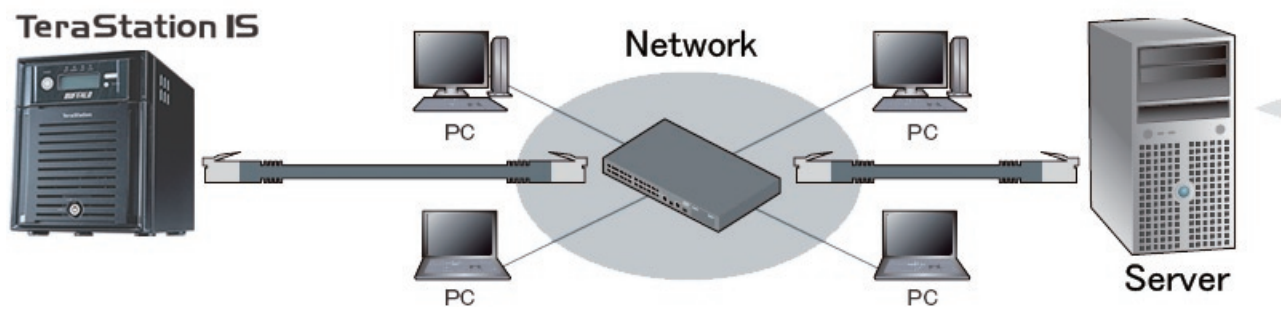
## Introduction

### iSCSI

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#### iSCSI Compatible Hard Drive

iSCSI ("Internet Small Computer System Interface") is a standard to transmit data on an Ethernet network by encapsulating SCSI commands in TCP/IP protocol. Connecting Ethernet cabling as iSCSI, it is recognized as a local drive by computers or servers.



This example shows a TS-IXL TeraStation. The rackmount TS-RIXL is functionally identical.

#### Can be placed anywhere

It is recognized as a local hard disk just like USB hard drives, but you don't have to place this unit close to your computer or server unlike a USB hard drive since this unit is connected via the network.

#### Can be used as a local drive

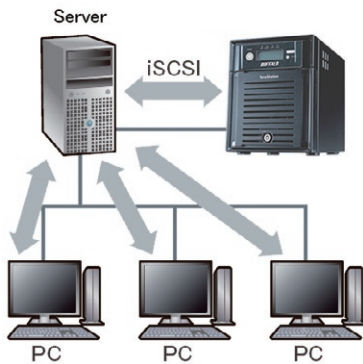
Since it is recognized as a local drive, all features of your OS and applications can be used. You can format the drive with NTFS from Windows.

## Differences between NAS and iSCSI

### iSCSI

A server creates shared folders on the iSCSI drive, and a computer accesses shared folders on the server.

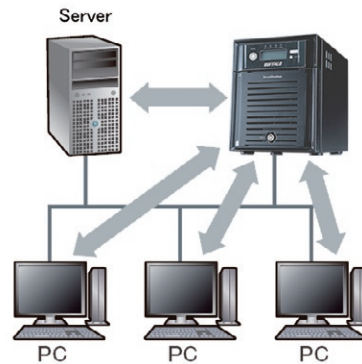
- Can be used as a local drive from Windows Server and accessed via the server by client computers.
- All standard Windows features such as Access Restrictions with Active Directory can be used on iSCSI drives.
- Database software that requires special formatting can be used with iSCSI drives..



### NAS

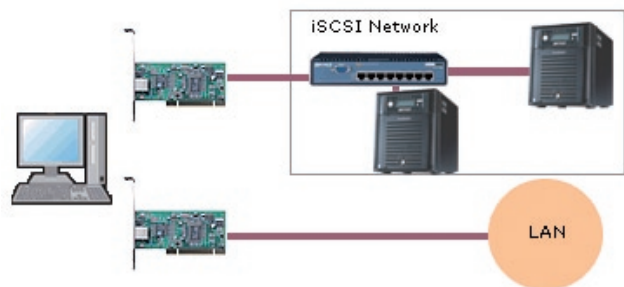
Servers and computers directly access shared folders on a NAS.

- Create and use shared folders easily (no extra server needed)
- Access files directly using XFS format.
- Features like backup are built-in to the NAS.



## Consider Network Structure

For best results, use dedicated Gigabit (1000BASE-T) NICs, cabling, and routers to connect iSCSI drives. Use of slower network equipment, or sharing a network with normal Ethernet traffic, will compromise performance.



# Install the Microsoft iSCSI Software Initiator

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## Windows XP/2000、 Windows Server 2003/2000 Server

### Install the "Microsoft iSCSI Software Initiator" first.

Before you can use iSCSI equipment with Windows XP, 2000, or Server 2003, you must download and install the "Microsoft iSCSI Software Initiator".

1. Navigate to Microsoft's web site ( **[www.microsoft.com](http://www.microsoft.com)**).
2. Search for "Microsoft iSCSI Software Initiator".
3. Download the latest version of the Microsoft iSCSI Software Initiator.
4. When the download is complete, double-click on the installer. Uncheck the "Initiator Service" and "Software Initiator" checkboxes. Follow the wizard to install the Microsoft iSCSI Software Initiator.

## Windows 7/ Vista, Windows Server 2008

If you're using Windows 7, Vista, or Windows Server 2008, the iSCSI Software Initiator is already installed on your computer. You don't need to download and install it.

# Setup

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- Notes:**
- If there is a DHCP server in the network, the TeraStation will get an IP address from it automatically.
  - Running the TeraNavigator software will automatically assign an unused IP address to a TeraStation.
  - TeraNavigator can automatically configure only one unit at a time. To reconfigure a TeraStation with TeraNavigator after its initial installation, initialize the TeraStation first.
  - If no DHCP server is available and TeraNavigator is not run, a random IP address of the form 169.254.xxx.xxx (where each xxx is a random number from 1 - 256) will be assigned to the TeraStation.

If you are using Windows 2000, XP, 2000 Server, or Server 2003, install the "Microsoft iSCSI Software Initiator" before installing the TeraStation.

Refer to the separate "Quick Setup Guide" for connection instructions.



Turn on your computer



Insert the Utility CD included in the package into the CD/DVD drive



After "TeraNavigator" launches, follow the instructions on the screen.



Launch the iSCSI Hard Disk Connection Tool, click "Register the iSCSI Hard Disk", then "Connect".

## Adding multiple TeraStations

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Run TeraNavigator separately for each iSCSI TeraStation.

**Note:** If no DHCP server is available on the network, an IP Address of the form 169.254.xxx.xxx is randomly assigned. Run TeraNavigator to configure the Terastation automatically.

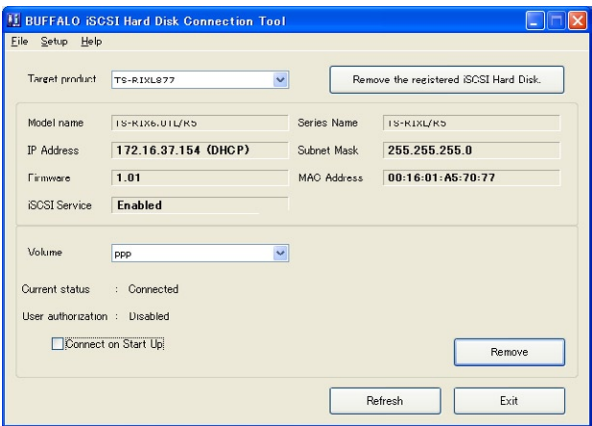
# Chapter 2

## Using the iSCSI Hard Disk Connection Tool

### iSCSI Hard Disk Connection Tool

When you set up the TeraStation with TeraNavigator, the iSCSI Hard Disk Connection Tool was installed. You will use this tool to connect to the TeraStation.

**To launch:** Click “Start” - “All Programs” - “BUFFALO”-“iSCSI Hard Disk Connection Tool”-“iSCSI Hard Disk Connection Tool”.



Name	Meaning
Target product	Select a TeraStation from the drop-down list. Any iSCSI TeraStations on the LAN should be available. “Register the iSCSI Hard Disk” registers all volumes of the selected TeraStation to your computer. If a TeraStation is already registered, click “Remove the registered iSCSI Hard Disk” to unregister all volumes of that TeraStation.
Model Name	TeraStation's model name
Series Name	TeraStation's series name
IP Address	TeraStation's IP address.
Subnet mask	TeraStation's subnet mask.
MAC Address	TeraStation's MAC address.
Firmware	TeraStation's firmware version.
iSCSI Service	Shows whether the iSCSI service of the TeraStation is running or stopped.
Volume	Select individual volumes from a registered TeraStation. Select a volume and click “Connect”. The selected volume will be recognized as a local drive on your computer in My Computer. Volumes will not be visible until the TeraStation is registered above. If IP address restrictions are set, volumes are displayed only on computers with allowed IP addresses. If a volume is connected, click “Remove” to disconnect it.



Current status	<p>Displays Current status of the selected volume.</p> <ul style="list-style-type: none"> <li>• Not connected. Volume is disconnected.</li> <li>• Connected. Volume is connected.</li> <li>• Connected to other computer. Volume is connected to other computer. Displays other computer's IP address.</li> </ul> <p>*You must register TeraStation as an iSCSI hard drive at "Target product" to display it.</p>
User Authorization	<p>Displays user authentication for the specified volume.</p> <p>Disabled: No authentication</p> <p>Enabled: With authentication. User authentication is needed to connect to a volume.</p> <p>*You must register TeraStation as an iSCSI hard drive at "Target product" to display it. It is not displayed when the volume is already connected from other computer.</p>
Connect on Start Up	<p>Displays check mark in the check box, and click "Connect (or Remove)" to set the volume automatically connected when the computer is booted (always connected).</p> <p>Uncheck the check mark and click "Connect (or Remove)" to set the volume automatically not connected when the computer is booted (always connected).</p> <p>*You must register TeraStation as an iSCSI hard drive at "Target product" to display it. It is not displayed when the volume is already connected from other computer.</p>
Refresh	Search the TeraStation within the LAN.
Exit	Exit iSCSI Hard Disk Connection Tool.

#### Menu Navigation:

File	Refresh	Search the TeraStation within the LAN.
	Exit	Finish iSCSI Hard Disk Connection Tool.
Setup	Browse Web setting	Opens the Configuration Screen of the selected TeraStation.
	Change IP Address	Open "Change IP Address" screen. You can change the IP address of the selected TeraStation.
	Remove the registered iSCSI Hard Disk	<p>Displays "Remove the registered iSCSI Hard Disk" screen.</p> <p>If you disconnect the TeraStation without unregistering it or changing its IP address, it will take a long time to search since the registration information stays in your computer. In such a case, unregister old TeraStation from "Remove the registered iSCSI Hard Disk" screen.</p>
	Set Mutual CHAP Secret	Set the CHAP password on the computer side.
	Use share folder on a Persistent Volume	If TeraStation is always connected and folders are shared in the network, click this to insert the check mark. If the checkmark is not inserted, the share will be disconnected when the computer is restarted.
	Connect some Volumes	Displays the screen to connect multiple volume at a time.
	Disconnect some Volumes	Displays the screen to disconnect multiple volume at a time.
	Launch "Disk Management"	<p>Displays the Disk Management screen on Windows.</p> <p>To use the connected TeraStation, you must reserve the volume area and format it on the Disk Management Screen.</p>
Help	Version	Displays iSCSI hard drive version information.

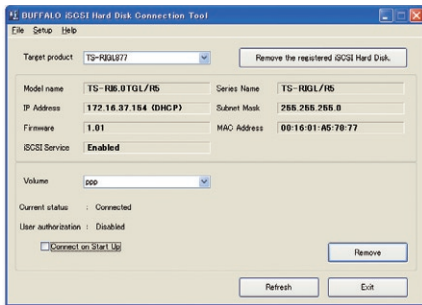
# Disconnecting and Removing TeraStation

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To remove an iSCSI TeraStation, disconnect any connected volumes first and then unregister the TeraStation.

- 1 Click “Start”-“All Programs”-“BUFFALO”-“iSCSI Hard Disk Connection Tool”-“iSCSI Hard Disk Connection Tool”. The iSCSI Hard Disk Connection Tool will launch.

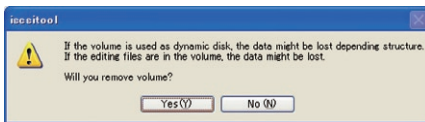
2



Select the volume to disconnect from “Volume” and click “Remove”.

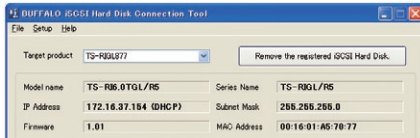
**Note:** To disconnect multiple volumes at once, choose “Remove the Registered iSCSI Hard Disk” from the “Setup” menu. Click on “Select All”, then “Remove”.

3



Click “Yes” to disconnect the volume(s).

4



1 Select the TeraStation to remove from “Target product”

2 Click “Remove the registered iSCSI Hard Disk.”.

**Note:** If a TeraStation is connected to multiple computers, unregister it from each computer.

5 You can now power down the TeraStation and unplug its cables.

**Note:** • If you disconnect a TeraStation without unregistering it or changing its IP address, it will take a long time to search since the registration information is still in your computer. Use the following procedure to unregister the TeraStation.

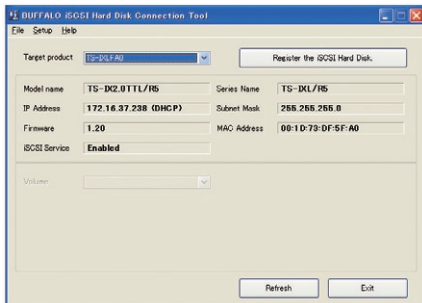
1. Launch the iSCSI Hard Disk Connection Tool.
2. Choose “Remove the Registered iSCSI Hard Disk” from the “Setup” menu. .
3. Select the disconnected TeraStation and click “Remove the registered iSCSI Hard Disk”.

# Reconnect a TeraStation

To reuse a TeraStation that you previously removed, follow the instructions below to register it and connect a volume.

- 1 Connect the TeraStation and power it on.
- 2 Click “Start” -> “All Programs” -> “BUFFALO” -> “iSCSI Hard Disk Connection Tool” -> “iSCSI Hard Disk Connection Tool” to open the iSCSI Hard Disk Connection Tool.

3

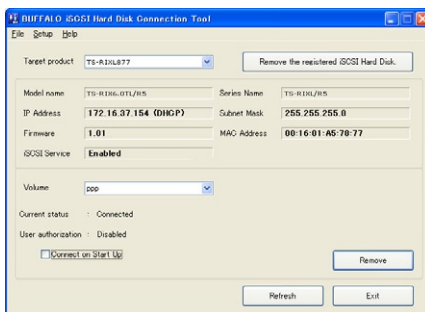


1 Select the TeraStation from “Target product”.

2 Click “Register the iSCSI Hard Disk”.

**Note:** If you set access restrictions for “Access Control (Whole System)” from the “Basic” menu, enter the user name and password to continue.

4



1 Select the volume to connect to.

2 Click “Connect”.

**Note:** If you set access restrictions in “iSCSI Volumes” -> “Create Volume” -> “Access Control”, enter the user name and password to continue.

The volume you just connected will be added as a local drive to Computer (My Computer).

## Notes:

If a volume is not formatted, it is not added as a local drive. To format, select “Launch Disk Management” from “Setup” in the iSCSI Hard Disk Connection Tool’s menus.

To connect multiple volumes at once, choose “Connect some Volumes” from the Setup menu.

To connect more than one volume at a time, choose “Connect some Volumes” from the “Setup” menu.

To always connect a volume or volumes, check “Connect on Start Up”.

With Windows XP or Windows 2000, you cannot connect to volumes larger than 2 TB. Use Logical Volume Manager (LVM) to create volumes smaller than 2 TB, then connect.

# Mutual Authentication

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The iSCSI TeraStation supports mutual authentication for security. Mutual authentication lets a computer only recognize a TeraStation when the mutual password set on each volume and the mutual authentication password match. To configure mutual authentication, turn to page 26.

## **Mutual Authentication password set to the TeraStation (Entire system):**

Select "Basic"->"Security" in the configuration utility, and click "Mutual Authentication" from "Access Control" in "Access Control (Whole System)". If the password set on the computer matches the volume name in "Volume", the iSCSI Hard Disk Connection Tool will be functional.

**Note:** If the volume name is not displayed in the "Volume" field, then the mutual authentication password on the computer does not match. In such a case, select "Setup", then "Set Mutual CHAP Secret" from in the iSCSI Hard Disk Connection Tool menu to enter the correct password. Click "Refresh".

## **Mutual Authentication password set to each volume:**

In the TeraStation Configuration utility, click on "iSCSI Volumes", then "iSCSI Volumes". In "Access Control", click "Mutual Authentication" and set Password (Mutual Authentication).

The password set here is used to connect to the volume. The mutual authentication password on the computer must be set to connect to the volume.

## **Mutual Authentication password set on the Computer Side**

If you configure mutual authentication on a TeraStation or individual volumes, enter the same password as you set on the TeraStation for access restrictions for each volume on the mutual authentication password screen. The password you entered is maintained as a mutual authentication password on the computer. If there are multiple volumes, the computer will connect to the volume which has the correct password. You cannot connect to multiple volumes with different mutual authentication passwords. To connect to a volume with a different password, you must change the password in the iSCSI Hard Disk Connection Tool menu.

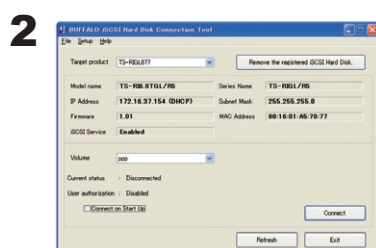
**Note:** If the mutual authentication password of the TeraStation and that of the volume are different, the volume name will not be displayed on the main screen in the iSCSI Hard Disk Connection Tool. Select "Setup", "Set Mutual CHAP Secret", "Refresh" to enter the matching password.

# Chapter 3

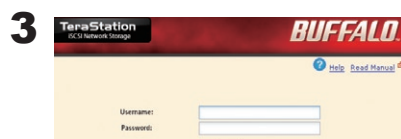
## Configuration

Configuration is done from the TeraStation's web-based configuration utility.

- 1 Click "Start" - "All Programs" - "BUFFALO" - "iSCSI Hard Disk Connection Tool" - "iSCSI Hard Disk Connection Tool". The iSCSI Hard Disk Connection Tool will launch.



If 2 or more TeraStations are connected, select the one to configure. Write down the TeraStation's IP Address. Click "Browse Web setting" from the "Setup" menu.

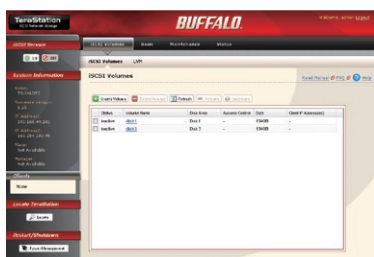


- 1 Enter the username and password.

By default, the username is "admin" and the password is "password".

- 2 Click "Login".

- 4 The TeraStation's web-based configuration utility opens.



- Notes:**
- The configuration utility supports Firefox 1.5 or later, Internet Explorer 6 SP 2 or later, and Safari 3 or later.
  - If proxy is enabled on your browser, the configuration screen will not be displayed correctly. Disable proxy if it is enabled.
  - Security settings may prevent the configuration utility from displaying normally. In Internet Explorer, select "Tools" - "Internet Options" - "Security" and set security to "Local Intranet".
  - To open the configuration utility from a browser window, type the TeraStation's IP address into the URL field of the browser, then press the "Enter" key. Enter the username and password as above.

# Chapter 4

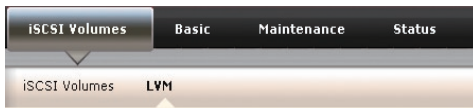
## Using Logical Volume Manager (LVM)

### Enable/Disable Logical Volume Manager (LVM)

Logical Volume Manager (LVM) is disabled by default. Enabling LVM will allow you to divide volumes and extend capacity, but will degrade access speeds.

**Note:** Changing the operation mode of a disk or array (such as enabling LVM) will delete all volumes and data from the disk or array. Back up any important data before making any configuration changes!

**1** Click "iSCSI Volume"->"LVM" on the TeraStation Configuration Screen.



**2** Select "Disk Area" from the RAID array or the drive, and click "Enable LVM" or "Disable LVM".



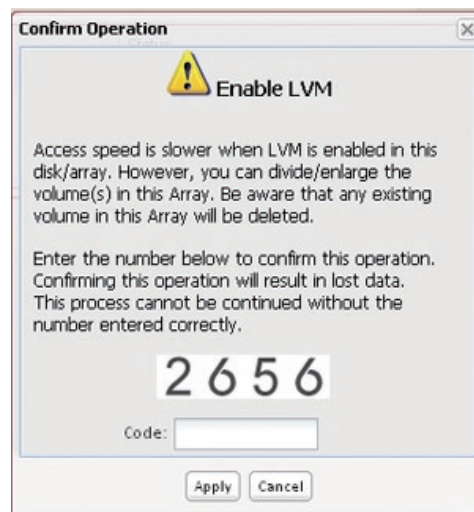
**3** The Confirm Operation screen will appear.  
Enter the number from the Confirmation Number field and click "Apply" within 60 seconds.

LVM is now enabled.

#### Confirm Operation

The following tasks open the Confirm Operation screen. To complete the task, type in the number from the "Confirmation Number" field and click "Apply" within 60 seconds.

- Creating or deleting RAID arrays
- Initialization
- Formatting drives
- Set as a normal drive
- Delete iSCSI volume
- Format Array or Disk
- Unplug hard drives
- Rebuild RAID Array
- Configure hot spare
- Enable or disable LVM



# Create Volume

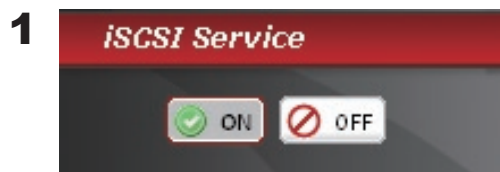
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By default, one volume uses all available space on the TeraStation. If you delete the factory volume, you may create up to 10 volumes. Different volumes can be connected to different computers, but each volume can only be connected to a single computer.

## Notes:

Deleting the default volume will delete all data from the TeraStation. Back up any important data before making any configuration changes!

Enable LVM (previous page) to delete or create volumes.



Turn off the iSCSI service on the left side of the screen.

**Note:** To stop iSCSI service for the target volume only, navigate to "iSCSI Volumes" - "iSCSI Volumes", select the target volume, and click "Inactive".



Navigate to "iSCSI Volumes" - "iSCSI Volumes". Highlight the default volume and click "Delete Volume". Then, click "Create Volume".



Enter "Volume Name", "Volume Description", "Disk Area", and "Size".

**4** Click "Save".

**5** Turn back on the iSCSI service.

**Note:** To start iSCSI service for the target volume only, navigate to "iSCSI Volumes" - "iSCSI Volumes", select the target volume, and click "Active".

You have created a new volume.

**Note:** To use the new volume, you need to connect it (page 11), and format it with Windows Disk Management. You may open Disk Management from the iSCSI hard disk connection tool by clicking "Launch (Disk Management)" from the "Setup" menu.

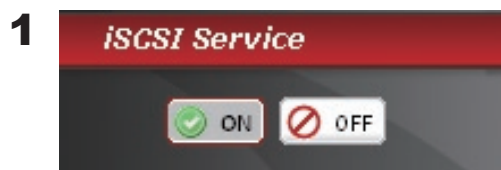


# Extend Volume Space

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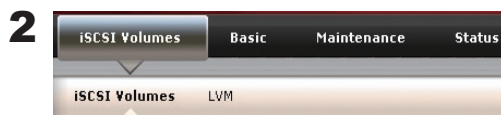
Volume space can be extended after you create the volume.

- Notes:**
- Extending the volume may delete all data on the volume with some file systems. Before extending the volume, back up any important data on the volume.
  - Before you can extend volumes, you must enable LVM (page 14).

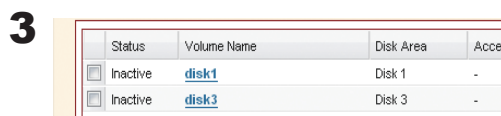


Turn off the iSCSI Service in the configuration utility.

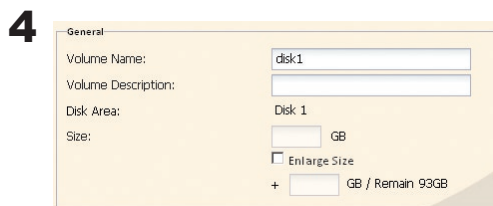
**Note:** To stop iSCSI service for the target volume only, navigate to “iSCSI Volumes”-“iSCSI Volumes”, select the target volume, and click “Inactive”.



Navigate to “iSCSI Volumes” - “iSCSI Volumes”.



Click the volume you want to extend.



**1** Check the “Enlarge Size” box.

**2** Enter the amount of space to increment the volume in GB.

**5** Click “Save” at the bottom of the screen.

**6** Turn the iSCSI service back on.

**Note:** To start iSCSI service for the target volume only, navigate to “iSCSI Volumes”-“iSCSI Volumes”, select the target volume, and click “Active”.

You have now extended the size of a volume.

# Chapter 5

## Changing RAID Mode

Out of the box, your TeraStation is configured with all four hard drives in a RAID 5 array. Many other RAID array modes are available.

### Notes:

- All data on your drive will be deleted if you change the RAID mode. Back up any important data before changing RAID modes.
- In this document, "Recovery" means restoring the TeraStation back to the state it was in before a drive failure. It does not refer to reading data from broken hard disks.

### • RAID 5 array with 4 hard drives (factory default)

Uses 4 hard drives in one array. Parity information for correcting errors is stored, so access speeds are slower than other RAID modes. Total usable space is the sum of the capacity of 3 drives. If a drive is damaged, you can recover data on the array by replacing the damaged drive. You cannot recover data if 2 or more drives are damaged.

### • RAID 5 array with 3 hard drives

Uses 3 hard drives in one array. Parity information for correcting errors is stored, so access speeds are slower than other RAID modes. Total usable space is the sum of the capacity of 2 hard drives. The fourth disk may be used as a hot spare, which replaces a failed drive automatically. If a drive is damaged, you can recover data on the array by replacing the damaged drive. You cannot recover data if 2 or more drives are damaged.

### • RAID 10 array

Uses 4 hard drives in one array. The space you can use is the sum of 2 hard disks' space. Data will be written speeded and this makes access speed slightly faster. Since same data are written in the 2 hard disks at a same time, even though one of the paired hard disks (1-2 or 3-4) is damaged, data can be recovered by replacing the damaged hard disk (if both 1-2 or 3-4 hard disks are damaged, you cannot recover data).

### • RAID 1 array

Uses 2 hard drives in a mirrored array. You can create up to 2 RAID 1 arrays. Total usable space on a RAID 1 array is the capacity of one of the drives. If either drive is damaged, data can be recovered by replacing the damaged drive. You cannot recover data if both drives are damaged. The other two drives not used in the RAID 1 array may be used as hot spares which replace failed drives automatically, or as a second RAID 1 array, or as individual drives. Or, one may be configured as an individual drive and the other as a hot spare.

**Note:** After replacing a failed drive in any of the above arrays, file transfer speeds will be slower for several hours while the RAID array is being rebuilt. During this period, the front LED display will show "RAID ARRAYx Resyncing".

- **RAID 0 array**

Combines 4 drives into one fast array. The full capacity of all drives combined is available for use. RAID 0 is fast and efficient, but includes no parity or redundancy. If any drive is damaged, all data on the array is lost.

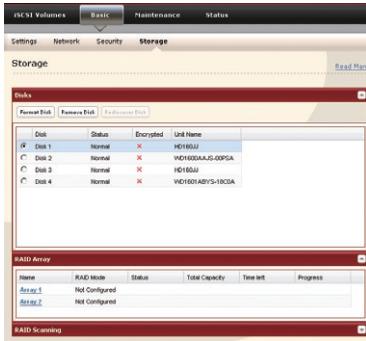
- **Normal mode**

In Normal mode, drives are not combined into arrays. Each drive is individually available. The full capacity of each drive is usable. If a drive is damaged, all data on that drive is lost.

# Configuring Normal mode

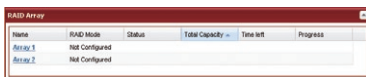
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**1**



In the configuration utility, click "Basic" - "Storage" - "RAID Array".

**2**



Choose the array to change.

**3** Click "Delete RAID Array". This will take several seconds, and the front panel display will show "RAID ARRAY x Creating".

**4** When "Are you sure you want to change the RAID mode?" is displayed, click "Apply".

**5** The Confirm Operation screen will appear. Type in the confirmation number and click "Apply" within 60 seconds.

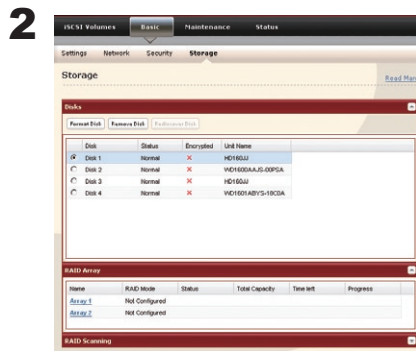
**6** Follow the instructions displayed on the screen.

You have configured Normal mode. Refer to page 15 to create volumes on the four drives. Use Windows Disk Management to format the volumes on the drives, then connect to the formatted volumes with the iSCSI hard disk connection tool and use them as local drives on your computer.

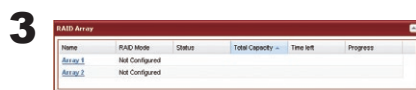
# Configuring a RAID 5 array with 4 hard drives

Note: This is the default configuration.

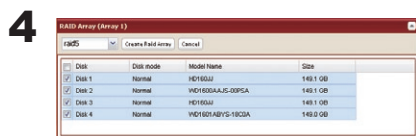
**1** Delete any preexisting array as described in "Configuring Normal mode" on page 19.



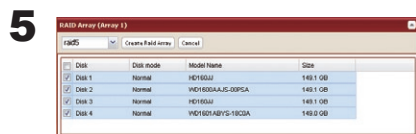
In the configuration utility, click "Basic" - "Storage" - "RAID Array".



Choose the array you want to configure.



Select all 4 hard disks.



**1** Select "RAID 5".

**2** Click "Create Raid Array".

**Note:** Building the RAID array will take about 10 hours per TB of drive space. During this time, the LCD will display "RAID ARRAY x Resyncing" and file transfers will be slower than usual. Do not turn off the TeraStation until the array is built, or the process will start over at reboot.

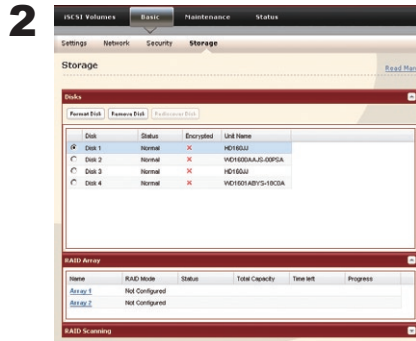
**6** The confirmation screen will appear. Enter the displayed number and click "Apply" within 60 seconds to continue.

**7** Follow the instructions displayed on the screen.

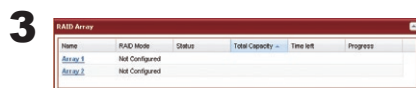
You have configured a RAID 5 array with 4 drives. Refer to page 15 to create a volume on the array. Use Windows Disk Management to format the volume, then connect to the formatted volume with the iSCSI hard disk connection tool and use it as a local drive on your computer.

# Configuring a RAID 5 array with 3 hard drives

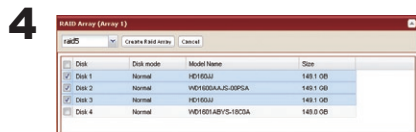
**1** Delete any preexisting array as described in “Configuring Normal mode” on page 19.



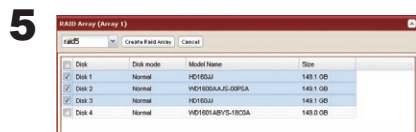
In the configuration utility, click “Basic” - “Storage” - “RAID Array”.



Choose the array you want to configure.



Select 3 hard disks.



**1** Select “RAID 5”.

**2** Click “Create Raid Array”.

**Note:** Building the RAID array will take about 10 hours per TB of drive space. During this time, the LCD will display “RAID ARRAY x Resyncing” and file transfers will be slower than usual. Do not turn off the TeraStation until the array is built, or the process will start over at reboot.

**6** The confirmation screen will appear. Enter the displayed number and click “Apply” within 60 seconds to continue.

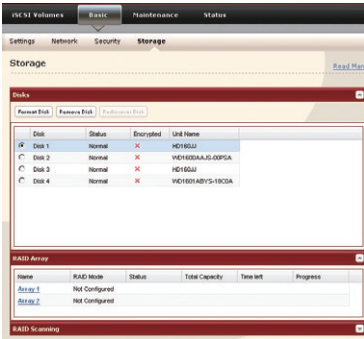
**7** Follow the instructions displayed on the screen.

You have configured a RAID 5 array with 3 drives. Refer to page 15 to create a volume on the array. Use Windows Disk Management to format the volume, then connect to the formatted volume with the iSCSI hard disk connection tool and use it as a local drive on your computer. For best results, configure the remaining hard drive as a hot spare (page 25).

# Configuring a RAID 10 array

**1** Delete any preexisting array as described in “Configuring Normal mode” on page 19.

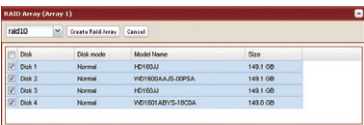
**2** In the configuration utility, click “Basic” - “Storage” - “RAID Array”.



**3** Choose the array you want to configure.

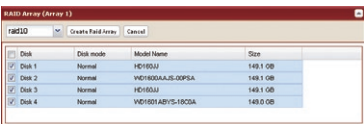


**4** Select all four hard drives.



**5**

- 1** Select “RAID 10”.
- 2** Click “Create Raid Array”.



**Note:** Building the RAID array will take about 10 hours per TB of drive space. During this time, the LCD will display “RAID ARRAY x Resyncing” and file transfers will be slower than usual. Do not turn off the TeraStation until the array is built, or the process will start over at reboot.

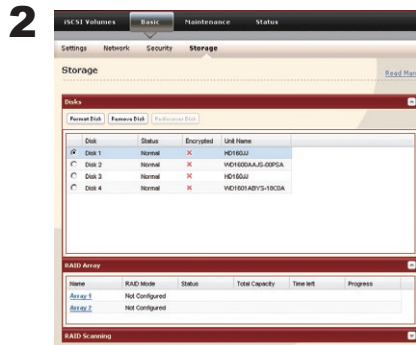
**6** The confirmation screen will appear. Enter the displayed number and click “Apply” within 60 seconds to continue.

**7** Follow the instructions displayed on the screen.

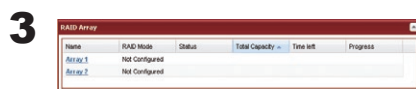
You have configured a RAID 10 array. Refer to page 15 to create a volume on the array. Use Windows Disk Management to format the volume, then connect to the formatted volume with the iSCSI hard disk connection tool and use it as a local drive on your computer.

# Configuring a RAID 1 array

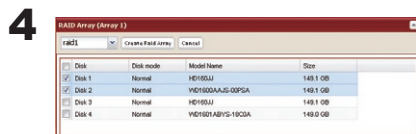
**1** Delete any preexisting array as described in “Configuring Normal mode” on page 19.



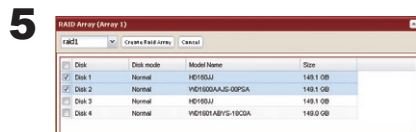
In the configuration utility, click “Basic” - “Storage” - “RAID Array”.



Choose the array you want to configure.



Select disk 1 and disk 2, or disk 3 and disk 4.



- 1** Select “RAID 1”.
- 2** Click “Create Raid Array”.

**Note:** Building the RAID array will take about 10 hours per TB of drive space. During this time, the LCD will display “RAID ARRAY x Resyncing” and file transfers will be slower than usual. Do not turn off the TeraStation until the array is built, or the process will start over at reboot.

**6** The confirmation screen will appear. Enter the displayed number and click “Apply” within 60 seconds to continue.


**7** Follow the instructions displayed on the screen.

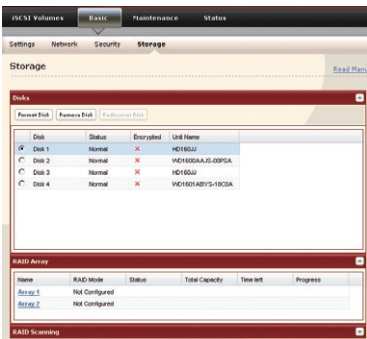
You have configured a RAID 1 array with 2 drives. Refer to page 15 to create a volume on the array. Use Windows Disk Management to format the volume, then connect to the formatted volume with the iSCSI hard disk connection tool and use it as a local drive on your computer. For best results, configure one or both of the remaining drives as a hot spare (page 25).



## Configuring a RAID 0 array

- 1 Delete any preexisting array as described in “Configuring Normal mode” on page 19.

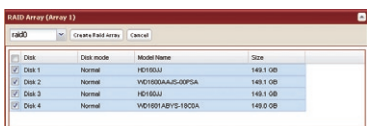
- 2**  In the configuration utility, click "Basic" - "Storage" - "RAID Array".



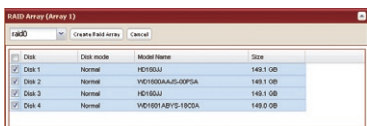
- ### 3 Choose the array you want to configure.



- Select all 4 hard drives.



- | Disk   | Disk mode | Model Name       | Size     |
|--------|-----------|------------------|----------|
| Disk 1 | Normal    | HC100UJ          | 143.1 GB |
| Disk 2 | Normal    | VC1000AAJS-00PSA | 143.1 GB |
| Disk 3 | Normal    | HC100UJ          | 143.1 GB |



- 6** The confirmation screen will appear. Enter the displayed number and click “Apply” within 60 seconds to continue.

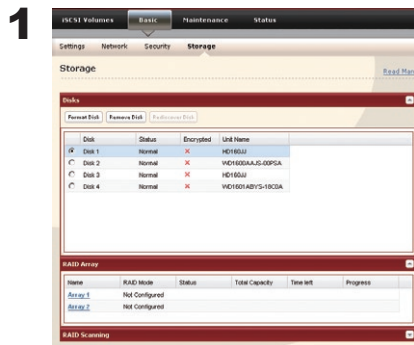
- 7** Follow the instructions displayed on the screen.

You have configured a RAID 0 array. Refer to page 15 to create a volume on the array. Use Windows Disk Management to format the volume, then connect to the formatted volume with the iSCSI hard disk connection tool and use it as a local drive on your computer.

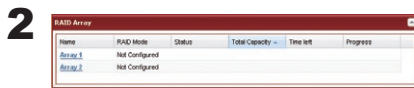
# Configuring a Hot Spare

A hot spare will automatically replace a failed drive in a RAID array. You must have an extra drive to configure a hot spare, so it is only usable with a RAID 5 array of 3 drives or a RAID 1 array. Configure a hot spare as follows.

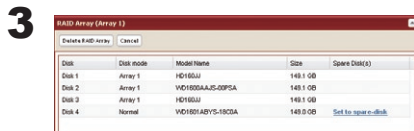
**Note:** When you change a drive from normal mode to a hot spare, or from a hot spare back to normal mode, all data on the drive is lost. Back up any important data on the drive before changing settings.



Click "Basic"-"Storage"-"RAID Array" on the TeraStation Configuration Screen.



Click an array which is set either RAID5 or RAID1.



Click "Set to spare-disk".

**Note:** You can change a hot spare drive to a normal drive by clicking "Set to a normal disk".

**4** The confirmation screen will appear. Enter the displayed number and click "Apply" within 60 seconds to continue.

**5** Follow the instructions displayed on the screen.

You have configured a hot spare.

# Chapter 6

## Access Restrictions

You may configure access restrictions for the TeraStation, or for individual volumes on it. When access restrictions are set, a username and password are required to connect to the TeraStation with the iSCSI hard disk connection tool.

## Configuring Access Restrictions for the TeraStation

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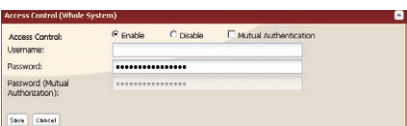
- 1** Turn off the iSCSI Service.



- 2** Navigate to "Basic" - "Security" - "Access Control (Whole System)".  
Click "Modify Settings".



- 3**
- 1** Click "Enable".
  - 2** Enter the user name and password.
  - 3** Click "Save".



- 4** Turn the iSCSI service back on again.

### **Note:** Access Restrictions by mutual authentication

Use the following settings to set access restrictions by mutual authentication in addition to the normal access restrictions:

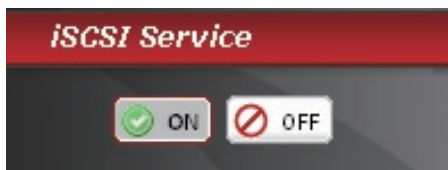
In the screen described in step 2, check "Mutual Authentication" and set any password you want for "Password (Mutual Authorization)". Select "Mutual Authorization" for "User Authentication". The screen to enter the mutual authentication password will open. Enter the password you set.

You've configured access restrictions for the TeraStation.

# Configuring Access Restrictions for Individual Volumes

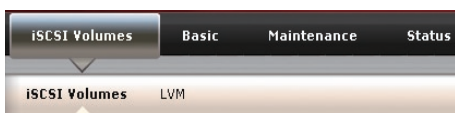
---

1



Turn off the iSCSI Service.

2



Navigate to “iSCSI Volumes” - “iSCSI Volumes”.

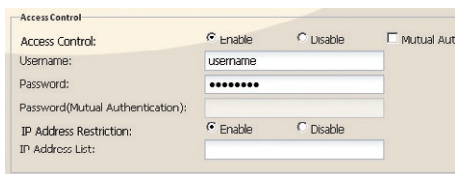
3



Status	Volume Name	Disk Area	Access
<input type="checkbox"/> Inactive	<a href="#">disk1</a>	Disk 1	-
<input type="checkbox"/> Inactive	<a href="#">disk3</a>	Disk 3	-

Select the volume that you want to set access restrictions for.

4

A screenshot of the 'Access Control' configuration window. It contains several sections: 'Access Control' with radio buttons for 'Enable' (selected), 'Disable', and 'Mutual Auth'; 'Username:' with a text field containing 'username'; 'Password:' with a password field containing '\*\*\*\*\*'; 'Password(Mutual Authentication):' with a text field; 'IP Address Restriction:' with radio buttons for 'Enable' (selected) and 'Disable'; and 'IP Address List:' with a text field.

To restrict access by user names and passwords, enable “IP Address Restriction”, and set the user name and password.

To restrict access by IP Address, enable “IP Address Restriction”, and enter the IP addresses that are to be allowed access. Separate each IP address by a comma.  
Example: 192.168.11.1,192.168.11.2

5

Click “Save”.

6

Turn the iSCSI service back on again.

## **Note:** Access Restrictions by Mutual Authentication using User name and Password

Use the following settings to set access restrictions by mutual authentication in addition to the normal access restrictions:

In the screen described in step 2, check “Mutual Authentication” and set any password you want for “Password (Mutual Authorization)”. Select “Mutual Authorization” for “User Authorization”. The screen to enter the mutual authentication password will open. Enter the password you set.

Changes to access restriction settings will not take effect until the iSCSI service has been turned off and then on again.

You’ve configured access restrictions for a volume.

# Chapter 7

## TeraStation Maintenance

### Host Name and Time

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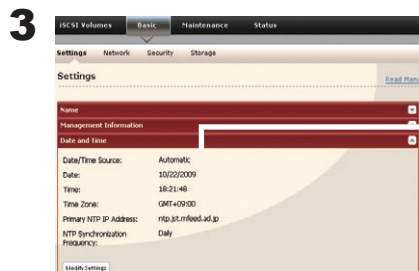


- 1 Navigate to "Basic" - "Settings" in the configuration utility.
- 2 Under Name Settings, click "Modify Settings".



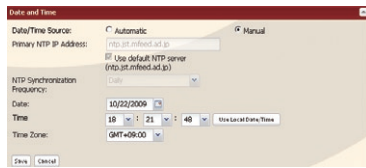
- 1 Enter a name for the TeraStation. This will identify it on the network.
- 2 Click "Save".

**Note:** TeraStation names can contain up to 15 alphanumeric characters. Hyphens (-) can also be used. Don't use a symbol as the first character of the name.



- 1 Click "Date and Time".
- 2 Under Time Settings, click "Modify Settings".

4



**1** Set the time.

**Note:** Click “User Local Date/Time” to use the time and date from your computer’s settings.

**2** Click “Save”.

■ For best results, use an NTP server to set the TeraStation’s internal clock and the clocks of other devices on your network automatically.

#### Notes on NTP:

NTP may not be usable in some network environments.

The default NTP Server (ntp.jst.mfeed.ad.jp) is the property of Internet Multi Feed Inc. Refer to [www.jst.mfeed.ad.jp](http://www.jst.mfeed.ad.jp) for more information.

Use this service at our own risk. BUFFALO is not responsible for any loss or damage caused by using this service, stopping the service, or missing service.

If the first attempt to access an NTP server fails, the NTP server’s address is not saved.

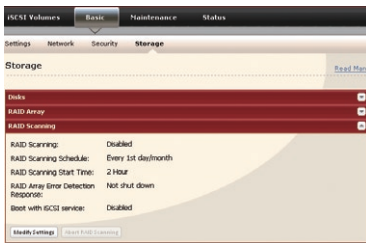
You may need to configure DNS to access an NTP server.

Name and time settings for the TeraStation are complete.

# RAID Scanning

A RAID scan tests your RAID array for errors. If errors are found, they are fixed automatically if possible. If you are using a RAID array, regular RAID scans are recommended. Configure a schedule for RAID scans as below.

1



1 In the configuration utility, navigate to “Basic” - “Storage” - “RAID Scanning”.

2 Under RAID Scanning, click “Modify Settings”.

2



1 Click “Enable”.

2 Select a schedule for RAID scanning.

**Note:** Check “Shutdown” to automatically shut down the TeraStation if a RAID error is found.

3 Click “Save”.

Check “Begin Immediate RAID Scan” to start a RAID scan immediately. To stop a RAID scan, click “Abort RAID Scanning”.

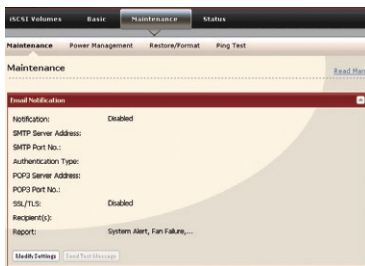
You have configured RAID scanning.

# Mail Notification

You can choose to send status report emails from the TeraStation to a specified email address. Emails are normally send when TeraStation settings are changed or an error occurs.

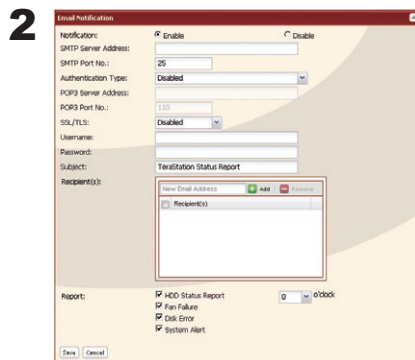
Status emails contain the following:

- hard drive status
- RAID configuration changes
- RAID errors
- Fan errors
- Drive read errors
- Drive replacement alerts



**1** To configure status email reports, navigate to “Maintenance” - “Maintenance” in the configuration utility.

**2** Under Mail Notification, click “Modify Settings”.



**1** Enable Mail Notification.

**2** Enter the SMTP server address and SMTP port number.

**Note:** If using pop before smtp, enter the POP3 server address and POP3 port number.

**3** Select the authentication type from Disabled/POP before SMTP/ LOGIN (SMTP-AUTH)/CRAM-MD5(SMTP-AUTH/CRAM-MD5)).

**4** Enter a username.

**5** Enter a password.

**Note:** You cannot use ' (a single quote mark) for a password.

**6** To use a secure connection, select SSL/TLS.

**7** Enter the subject line for notification Emails.

**Note:** Use single-byte alphanumeric characters only. Hantsu, kanji, and other double-byte characters should not be used. .

**8** Enter an email address. Up to 5 email addresses may be entered.



**9 Select the conditions to send.**

HDD Status Report.....Sends the condition of the hard drives at specified time.

Fan Failure.....Sends when a fan error occurs.

Disk Error.....Sends when a drive error occurs.

System Alert.....Sends when the TeraStation is rebooted or shut down, or the RAID configuration is changed.

**10 Click "Save".**

You have configured email alerts.

**Examples:**

These emails are for example only. Your notification emails may be different.

- **This email includes a "HDD Status Report":**

TeraStation Status Report: Periodical Report: Information

"TeraStation Information"

TeraStation Name: TS-xxxxx

Time Stamp: 2009/03/23 00:00:01

IP Address: 172.16.37.62

Configuration Screen: <http://172.16.37.62/>

Continuous operating time: 13:51:57

- **This email includes a "Disk Error":**

TeraStation Status Report: DISK Error Notification: Failure: Fail to mount a disk

DISK Error Notification

The error occurred on HDD.

The erroneous disk drive: Disk 1

Disk could not be mounted.

- **This email includes a "Fan Failure":**

TeraStation Status Report: FAN Error Notification: Failure: FAN stopped.

FAN Error Notification

The FAN has stopped.

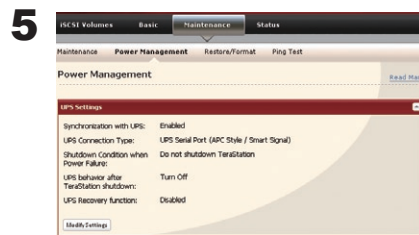
The internal temperature is now over the threshold. Shut down the system.

System temperature: 52 "°C "

# Using the TeraStation with a UPS

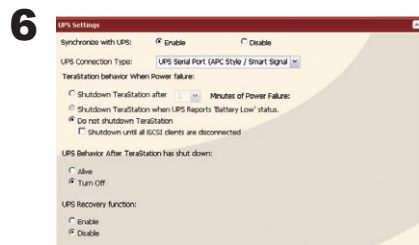
For best results, plug your TeraStation in to a UPS (uninterruptible power supply). This will protect it from many kinds of power outages. Connected to a UPS, the TeraStation can be automatically shut down and its data protected. Configure the following settings to use the TeraStation with a UPS.

- 1** Connect the UPS to a wall socket.
- 2** Connect the AC cable of the TeraStation to the UPS.
- 3** Connect the UPS and the TeraStation with either a USB cable or a serial cable.
- 4** Turn on the UPS, then turn on the TeraStation.



**1** In the configuration utility, navigate to “Maintenance” - “Power Management”.

**2** Under UPS settings, click “Modify Settings”.



**1** Select “Enable”.

**2** Configure each setting.

**3** Click “Save”.

Your UPS is now configured.

## Notes:

Consult Buffalo Technology’s website ([www.buffalotech.com](http://www.buffalotech.com)) for compatible UPS units.

After the TeraStation has automatically shut down during a power outage, do not turn the TeraStation on again until normal power is restored. If you do, the TeraStation will run on the UPS’s battery, and will not shut down automatically a second time, even as the UPS’s battery becomes exhausted.

If UPS recovery is configured, the UPS will automatically restart the TeraStation when normal power is restored.

# Beep Alerts

---

The TeraStation can beep when errors occurs. Select the events that cause the TeraStation to beep as below.

**1** Navigate to “Maintenance” - “Maintenance” - “Alert Sound Settings” in the configuration utility.

**2** Click “Modify Settings”.



**1** Select the conditions to beep the alert from Overheating, Drive Error, Fan Error, or UPS Power Error.

**2** Click “Save”.

Your alert sounds are configured.

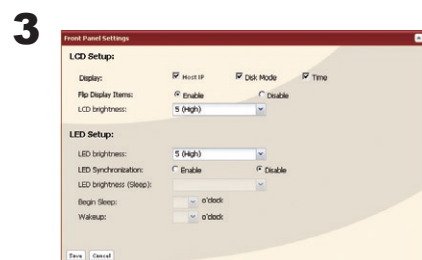
# Display Settings

---

Configure the main TeraStation display settings here.

**1** Navigate to “Maintenance” - “Maintenance” in the configuration utility.

**2** Under Front Panel Settings, click “Modify Settings”.



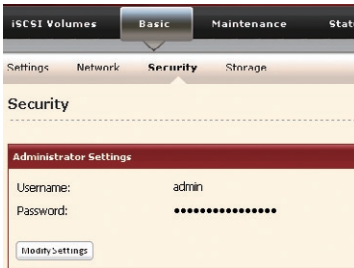
Under LCD setup, you may configure displayed items and brightness, and flip display items if desired. Under LED setup, you may configure brightness and synchronization.

Click “Save” to save your changes.

You have reconfigured your display settings.

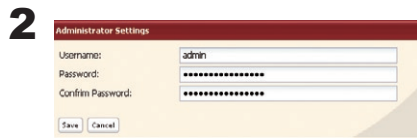
# Changing the Admin Username and Password

The admin account is used to access the configuration utility and change the TeraStation's settings. . By default, the admin username is "admin" and the password is "password". You may change them as shown below.



**1** Navigate to "Basic" - "Security" - "Administrator Settings" in the configuration utility.

**2** Click "Modify Settings" in the Administrator setting.



**1** Enter the new username and password (twice).

**2** Click "Save".

**Note:** Passwords on the TeraStation can contain up to 20 alpha-numeric letters. The following characters can be used; -(hyphen), \_ (underscore), @, !, #, \$, %, &, ' ( , ), \*, +, ,(comma) ., /, ;(semi-column), <, >, =, ?, ", ", ^, {, }, |, and ~(tilde). Do not use any symbol except the underscore as the first character of the password.

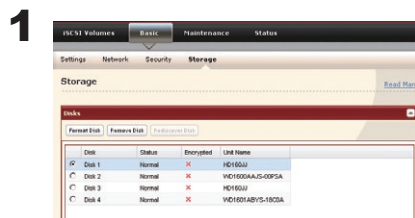
You've changed the admin username and password. To access the configuration utility in the future, use the new username and password.

# Formatting Drives

---

You may reformat any or all drives on the TeraStation as described below. After a format, you must create a partition and format it from within your operating system. A link to Microsoft's disk management tool is available from within Buffalo's iSCSI tool, available on your software CD.

Formatting a drive will erase all data and settings from that drive. Back up any important data before formatting a drive. Formatting will take several minutes. During a format, other volumes or drives on the TeraStation are not accessible. Do not turn off the TeraStation in the middle of a format.



**1** Navigate to "Basic" - "Storage" in the configuration utility.

**2** Select the disk you want to format, and click "Format Disk".



Select the format type (XFS). If you check "Encryption", the drive will be encrypted with 128 bit AES. It will be normally accessible in the TeraStation, but if removed, it will not be accessible from other devices. If encryption is enabled, data recovery services will not be able to recover data from a damaged disk. To unencrypt the drive, uncheck "Encryption" and format it again.

**3** Click "Format". The Confirm Operation screen will appear. Type in the confirmation number and click "Apply" within 60 seconds.

**4** Follow any instructions on the screen.

While formatting, the word "Formatting" is displayed on the front LCD.

**Note:** The time needed to format a drive varies depending on the size of the drive. It will take several minutes at least.

You have formatted the drive.

# Encrypting Drives

---

If “Encryption” is checked when a drive is formatted, the drive will be encrypted with 128 bit AES encryption. The data on the drive will only be readable when the drive is attached to your TeraStation. It will not be readable from other devices. To unencrypt the hard drive, uncheck “Encryption” and format the drive again. Refer to the previous page for more information.

**Note:** Encrypting a drive degrades its overall performance somewhat.

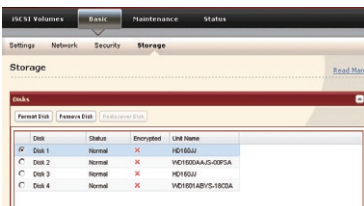
## Dismounting a Drive

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Before removing a drive from the TeraStation, dismount the drive. Follow the instructions below to dismount the drive.

**Note:** Repeatedly dismounting and/or removing drives is not recommended. Only dismount and remove drives if you have a good reason for doing so.

**1**



**1** In the configuration utility, navigate to “Basic”-“Storage”.

**2** Select the drive you want to remove and click “Remove Disk”.

**2**

The Confirm Operation screen will appear. Type in the confirmation number and click “Apply” within 60 seconds.

**3**

Follow the instructions displayed on the screen.

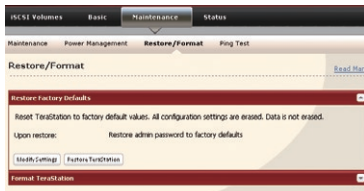
It's now safe to physically remove the hard drive.

# Erasing All Data

---

Data on the hard drive is not completely erased by just deleting it, or even formatting the drive. It could theoretically be recovered. To completely wipe all data from the drive and replace it with zeros, follow the steps below.

1



In the configuration utility, navigate to “Maintenance” - “Restore/Format” - “Format TeraStation”.

2



Click “Format TeraStation”.

3

The Confirm Operation screen will appear. Type in the confirmation number and click “Apply” within 60 seconds.

4

Follow the instructions on the screen.

When the process finishes, all partitions and data on the TeraStation will have been replaced by zeros. The TeraStation will automatically shut down when complete. After a reboot, the TeraStation’s settings will be as follows:

Hard drives: normal mode  
All settings: factory defaults  
Logs: Deleted

**Note:** If you execute the erasure process on the TeraStation while a drive is missing, the error "HDx Error E22 HDx Can't Mount" (x indicates the hard drive number you have removed) will appear on the front LCD display when the process is complete. However, you can still use the TeraStation, since its functionality is not affected.

# Initializing Settings

---

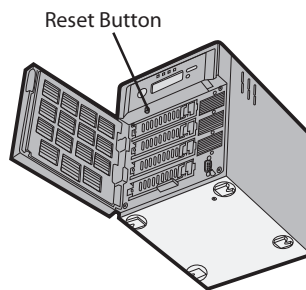
## Initialization Button

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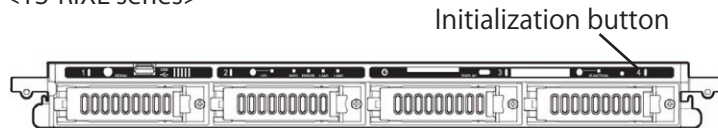
To reset the TeraStation's settings to factory defaults, use the key (included) to open the front cover. While the TeraStation is running and the power LED is lit, hold in the button to initialize the TeraStation.

Hold down the initialization button until it beeps (about 5 seconds). This will reset the TeraStation's settings to their factory defaults.

<TS-IXL series>



<TS-RIXL series>



To press the Initializing Switch on TS-RIXL Series, insert a tip of unfolded paper clip to press this button.

The initialization button initializes the following settings: IP address, Ethernet frame size, admin username and password, port trunking (initial setting: disabled), iSCSI HDD connection tool detection (initial setting: enabled). Other settings can be initialized from the configuration utility (page 40).

To keep the current username and password when initializing the TeraStation, navigate to "Maintenance" - "Restore/Format" in the configuration utility. Select "Keep current admin password" and click "Save".

If you configure the TeraStation to not initialize the admin password, you can no longer configure the TeraStation if you forget the password. Write down your password and don't lose it!



## Initialization from the Configuration Utility

---

You can also initialize the TeraStation from the configuration utility.

### The following settings are reset to their factory defaults:

TeraStation Name, Description, NTP setting, RAID maintenance, setting of the Initialization switch of the main unit, Mail notification setting, UPS synchronization setting, Administrator password, network settings (IP address, subnet mask, etc.), alert beep, display panel, language setting, system log

1



1 Navigate to “Maintenance” - “Restore/Format”.

2 Click “Restore TeraStation”.

**Note:** To keep the current admin username and password, navigate to “Maintenance” - “Restore/Format”, select “Change Settings”, “Keep current admin password”, then “Save”.

2 The Confirm Operation screen will appear. Type in the confirmation number and click “Apply” within 60 seconds.

3 Follow the instructions displayed on the screen.

# Changing the IP address

---

If desired, you may manually set the TeraStation's IP address. Use the iSCSI hard drive connection tool (included on your CD) to manually set the TeraStation's IP address.

**Note:** You can only change the TeraStation's IP address settings from a computer that is connected to the same subnet as the TeraStation.

- 1 Click "Start" - "All Programs" - "BUFFALO" - "iSCSI HDD Connection Tool" - "iSCSI HDD Connection Tool". The iSCSI HDD Connection Tool will launch.
- 2 Select your TeraStation from the "Target" dropdown menu, then click "Setup", then "Change IP Address".

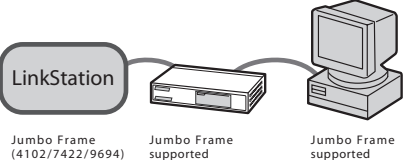

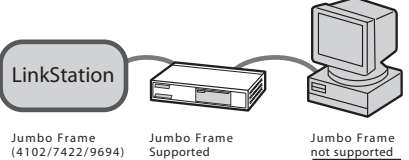

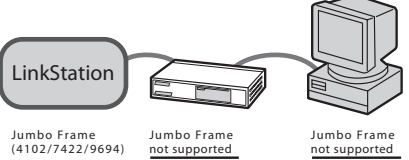

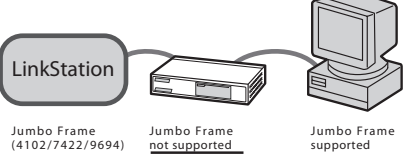

- 3

You have changed your TeraStation's IP Address settings.

# Using Jumbo Frames

If all of your network devices support jumbo frames, enabling them can make your network faster. To configure jumbo frames on the TeraStation, navigate in the configuration utility to "Basic" - "Network" - "Ethernet Frame Size", click "Modify Settings", and change the Ethernet frame size to one of the jumbo frame settings: 4102, 7422, or 9694 bytes.

**Caution:** If you enable jumbo frames but some of your network devices don't support it, you may not be able to transfer data. If you run into compatibility issues, disable jumbo frames and set all of your network devices to use standard 1518 byte frames.

Connection	Transmission	
 <p>LinkStation Jumbo Frame (4102/7422/9694)</p> <p>Jumbo Frame supported</p> <p>Jumbo Frame supported</p>		Transmit Jumbo Frame (4102/7422/9694)
 <p>LinkStation Jumbo Frame (4102/7422/9694)</p> <p>Jumbo Frame Supported</p> <p>Jumbo Frame <u>not supported</u></p>		Transmit normally(1518)
 <p>LinkStation Jumbo Frame (4102/7422/9694)</p> <p>Jumbo Frame <u>not supported</u></p> <p>Jumbo Frame <u>not supported</u></p>		Transmit normally(1518)
 <p>LinkStation Jumbo Frame (4102/7422/9694)</p> <p>Jumbo Frame <u>not supported</u></p> <p>Jumbo Frame supported</p>		No transmission

This illustration shows TS-IXL TeraStations.

# Using Port Trunking

---

Port trunking (link aggregation) allows you to connect the TeraStation to two Ethernet ports for increased speed and reliability. Your hub or switch must support IEEE 802.1AX-2008 to use port trunking. Turn to the next page for instructions on configuring port trunking on the TeraStation.

The TeraStation supports the following port trunking modes:

**Disabled:** Port trunking is not used.

**Round-robin policy \*** - Sets a round-robin policy for fault tolerance and load balancing.

**Active-backup policy** - Sets an active-backup policy for fault tolerance.

**XOR policy \*** - Sets an XOR (exclusive-or) policy for fault tolerance and load balancing.

**Broadcast policy** - Sets a broadcast policy for fault tolerance.

**Dynamic link aggregation \*** - Sets an IEEE 802.3ad dynamic link aggregation policy.

**Adaptive transmit load balancing (TLB)** - Sets a Transmit Load Balancing (TLB) policy for fault tolerance and load balancing.

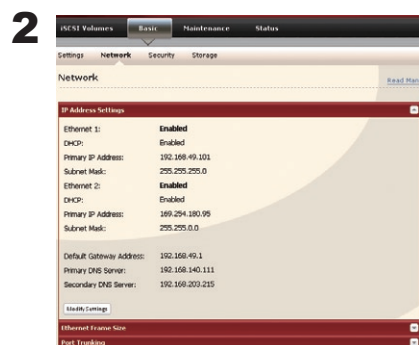
\* Configure your switch for the appropriate port trunking mode before configuring these modes on the TeraStation.

## Note

- After configuring Port Trunking, reboot the TeraStation with the power button. If you fail to reboot it, network communication may become unstable.

Configuring port trunking on the TeraStation:

- 1 Connect TeraStation's LAN port 1 to a LAN port on your switch. If you've configured a port on the switch for port trunking, use that one. Do not connect the TeraStation's LAN port 2 yet.



Navigate to "Basic" - "Network" - "Port Trunking" in the configuration utility.

- 3 Click "Modify Settings".



- 1 Select the items to configure for port trunking.
- 2 Click "Save".

- 5 Connect TeraStation's LAN port 2 to a second LAN port on your switch. If you've configured another port on the switch for port trunking, use that one.
- 6 Press and hold the power button on the TeraStation for 3 seconds to turn it off. Press the power button again to power up the TeraStation.

Port trunking is now configured.

# Chapter 8

## Configuration Utility

The following options can be set from the configuration screens.

### Common Settings

Common Settings (Displayed on the left side of the screen)	
iSCSI Service	Click "OFF" to stop iSCSI service. Click "ON" to start iSCSI service. Stop iSCSI service before creating or extending volumes,
Name	Displays the TeraStation's name.
Firmware version	Displays the TeraStation's firmware version number.
IP Address	Displays IP address of the TeraStation's LAN ports 1 and 2.
Place	Displays the Place from "Basic" - "Settings" - "Management Information".
Manager	Displays the Administrator from "Basic" - "Settings" - "Management Information".
Clients	Displays connected client
Locate TeraStation	Click to make the TeraStation beep.
Restart/Shutdown	To restart the TeraStation, click "Power Management", then "Restart". To turn off the TeraStation, click "Shutdown" under "Shutdown TeraStation" screen.
Logout (displayed on the upper right of the screen)	Log out of the Configuration Utility.

### iSCSI Volumes

iSCSI Volumes	
iSCSI Volumes	<p>To add volumes, click "Create Volume".</p> <p>To edit a volume, click a volume name.</p> <p>Select a volume and click "Delete Volume" to delete the volume.</p> <p>Click "Refresh" to update the volume information.</p> <p>Select a volume and click "Active" will enable the iSCSI service for the selected volume.</p> <p>Select a volume and click "Inactive" will disable the iSCSI service for the selected volume.</p> <p><b>Note:</b> If the IP address of the computer is displayed in the iSCSI volume screen even though the iSCSI volume is not connected to the computer, enabling or disabling the iSCSI volume or LVM will fail.</p> <p>Turning off or disconnecting the computer without disconnecting the drive with the iSCSI HD Connection Tool may cause this symptoms. If this happens, connect the iSCSI volume with the iSCSI HD Connection Tool after rebooting the computer, or stop the iSCSI service once and perform enabling/disabling operation of iSCSI Volume or LVM.</p>

Create Volume To display, click "Create Volume" on the Volume Configuration Screen.	Volume Name	Enter a name for the volume. * You can enter up to 12 alphanumeric characters (number of characters depends on byte of character). * You may use hyphens (-). * Do not use a number or symbol as the first character of the name.
	Volume Description	Enter a description for the volume. * You can enter up to 50 alphanumeric characters or 25 two-byte characters. * You can use alphanumeric characters, two-byte characters, hyphens, and underscores.
	Disk Area	Select hard disk space to create a volume.
	Size	Enter the volume capacity (size).
	Access Control	Click "Enable" in "Access Control" to apply Access Restrictions. You will be required to enter the user name and password you entered here when connecting with the iSCSI HDD Connection Tool. Select "Mutual Authorization" on the User Authorization Screen upon connection when you have set the password in "Password (Mutual Authorization)". The screen to enter the mutual authentication password is displayed again. Enter the mutual authentication password you set and connect to the unit.  To restrict access by IP address, click "Enable" in "IP Address Restriction". Only IP addresses that are entered in the IP Address List are allowed access. Input parameters for IP address restrictions Enter all IP addresses as 192.168.11.1,192.168.11.2. Use commas to separate IP addresses. You can simply type 192.168.11.1 if there is only one IP address. All IP addresses will be allowed if nothing is entered. Only entered IP address(es) are allowed to connect.
	Advanced Settings	Not supported. If you change settings here and can no longer connect to a volume, restore default settings and reconfigure.
LVM	Logical Volume Manager (LVM)	Selecting a drive and clicking "Enable LVM" will enable the Logical Volume Manager (LVM) for the selected drive. Selecting a drive and clicking "Disable LVM" will disable the Logical Volume Manager (LVM) for the selected drive.

# Basic

Basic		
Name Click "Modify Settings" to change settings.	Name	Enter a name to identify the TeraStation on the network. * Enter up to 12 alphanumeric characters. * You can use alphanumeric characters and hyphens (-). * Don't use a symbol as the first character of the name.
	Descriptions	Enter a description for the TeraStation on the network. * Enter up to 50 alphanumeric characters or 25 two-byte characters. * You can use alphanumeric characters, two-byte characters, spaces, hyphens, and underscores. * Do not use a space as the first character.
Management Information Click "Modify Settings" to change settings.	Place	Enter the location of the TeraStation * Enter up to 50 alphanumeric characters or 25 two-byte characters. * You can use alphanumeric characters, two-byte characters, spaces, hyphens, and underscores. * Do not use a space as the first character.
	Manager	Enter the name of the computer's administrator. * Enter up to 50 alphanumeric characters or 25 two-byte characters. * You can use alphanumeric characters, two-byte characters, spaces, hyphens, and underscores. * Do not use a space as the first character.
Date and Time Click "Modify Settings" to change settings.	Date/Time	Select "Automatic" to use NTP to set your system clock automatically. Select "Manual" to set the time manually.
	Primary NTP IP Address	Enter the DNS name or the IP address of an NTP server. Examples: ntp.jst.mfeed.ad.jp or 192.168.11.123 To specify ntp.jst.mfeed.ad.jp as the NTP server, select "Use default NTP server (ntp.jst.mfeed.ad.jp)".
	NTP Synchronization Frequency	Select frequency to access the NTP server and adjust the time from "Daily", "Weekly", or "Every 3 hours". If you access the NTP server through a proxy server, accessing the NTP server may fail in some network environments.
	Time Zone	Select the time zone.
	Date	Displays year, month and date. Enter numbers to change these values.
	Time	Displays time. Enter numbers to change the value. To use your computers time, click "Use Local Date/Time". For best results, use an NTP server to correct the clocks on your TeraStation and other network devices automatically.
Language Click "Modify Settings" to change settings.	Language	Select the language to use.



Network		
<p>IP Address Settings</p> <p>Click "Modify Settings" to change settings.</p> <p>*The LAN cable connected to LAN port 2 should be set for Ethernet 2.</p>	DHCP	If a DHCP server is available, enable DHCP to assign IP addresses automatically.
	IP Address	If not using DHCP, enter an IP address manually.
	Subnet Mask	Set a subnet mask.
	Default Gateway Address	Specify the IP address if the default gateway if it exists.
	Primary DNS Server	Specifies an IP address for the primary DNS server.
	Secondary DNS Server	Specifies an IP address for the secondary DNS server.
<p>Ethernet Frame Size</p> <p>Click "Modify Settings" to change settings.</p> <p>*The LAN cable connected to LAN port 2 should be set for Ethernet 2.</p>	Ethernet Frame Size	<p>You can improve data transmission speed by increasing the maximum amount of data that can be sent at once.</p> <ul style="list-style-type: none"> <li>• 1518 bytes (Default)</li> <li>• 4102 bytes (Jumbo Frame)</li> <li>• 7422 bytes (Jumbo Frame)</li> <li>• 9694 bytes (Jumbo Frame)</li> </ul>
<p>Port Trunking</p> <p>Click "Modify Settings" to change settings.</p>	Port Trunking	<p>Set this option to connect 2 Ethernet ports to the TeraStation. The following settings are available:</p> <p>Disable: Do not use port trunking.</p> <p>Round-robin policy - Sets a round-robin policy for fault tolerance and load balancing.</p> <p>Active-backup policy - Sets an active-backup policy for fault tolerance.</p> <p>XOR policy - Sets an XOR (exclusive-or) policy for fault tolerance and load balancing.</p> <p>Broadcast policy - Sets a broadcast policy for fault tolerance.</p> <p>Dynamic link aggregation - Sets an IEEE 802.3ad dynamic link aggregation policy.</p> <p>Adaptive transmit load balancing (TLB) - Sets a Transmit Load Balancing (TLB) policy for fault tolerance and load balancing</p>

Security		
Administrator Settings Click "Modify Settings" to change settings.	Username	You may change the admin account's username. * Enter up to 20 alphanumeric characters. * You can use single-byte alphanumeric characters and hyphens (-). * Do not use a symbol as the first character of the username.
	Password	Change the admin password. * Enter up to 20 alphanumeric characters. * You can use single-byte alphanumeric characters, hyphens (-), and underscores (_). * Don't use any symbol except an underscore as the first character of the password.
	Confirm Password	Re-enter the new admin password for confirmation.
Access Control (Whole System) Click "Modify Settings" to change settings.	Access Control	Select whether or not to apply access restrictions to the TeraStation. If you apply access restrictions, you will be required to enter a user name and password to connect with the iSCSI HDD connection tool.
	Mutual Authentication	Set when mutually authenticating.
	Username	Enter a username for access restrictions.
	Password	Enter a password for access restrictions.
	Password (Mutual Authorization)	Set the password for mutual authentication.
HDD Connection Tool Click "Modify Settings" to change settings.	iSCSI HDD Connection Tool	Set whether or not to replying to a query from the iSCSI HD connection tool. Selecting "Do not reply" will prevent you from using the iSCSI HD connection tool.

Storage		
Disks	Format Disk	<p>Formatting a drive or array will erase all volumes on the drive or array. After formatting a disk from the configuration utility, you must allocate a partition and format it before it is usable. Use "Disk Management" to allocate a partition and format it.</p> <p>Checking "Encryption" before formatting encrypts the drive or array with 128 bit AES encryption. Only the TeraStation will be able to read the disk after that. To unencrypt the hard drive, uncheck "Encryption" and format it again.</p>
	Remove Disk	Before physically removing a drive from the TeraStation, select the drive and click "Remove Disk" to dismount the disk. It's then safe to remove it.
	Rediscover Disk	After dismounting and removing a disk, click here to have the TeraStation recognize a replacement drive without restarting the TeraStation.
RAID Array	RAID Array	<p>By default, the TeraStation is in RAID 5 mode. You may configure any of the following RAID modes: "RAID5", "RAID1", "RAID10", and "RAID0".</p> <p>To configure a RAID array, check the hard drives to use, select RAID mode, and click "Create Raid Array".</p> <ul style="list-style-type: none"> <li>• To build a RAID 1 array, check 2 drives.</li> <li>• To build a RAID 10 or RAID 0 array, check all drives.</li> <li>• To build a RAID 5 array, check 3 or 4 drives.</li> <li>• To delete an array, click "Delete RAID Array".</li> </ul> <p>Changing RAID modes will erase all data on the array. Back up any important data before changing the RAID mode.</p> <p>If you have a leftover drive after building a RAID 5 array with 3 drives, or a RAID 1 array, it can be set as a hot spare by clicking "Set to spare-disk". Click "Set to normal disk" to change it back to a normal drive.</p>

RAID Scanning  Click "Modify Settings" to change settings.	RAID Scanning:	<p>A RAID scan read checks all sectors in the data area of drives in an array. If a bad sector error is found during the scan, it is repaired automatically. Note that some kinds of errors are repaired automatically by the array even without a RAID scan.</p> <table><tr><td>Status</td><td>Descriptions</td></tr><tr><td>repair possible</td><td>• Read error in the data area of array</td></tr><tr><td>impossible to repair</td><td>• Write Error • RAID management area error • Drive partition information area error • Drive recognition failure, etc.</td></tr></table> <p>If many repairable errors are found in one drive, that drive is removed from the RAID and the system will automatically move to degraded mode. The system will continue to function, but data is not protected in degraded mode, so the faulty drive should be replaced immediately.</p> <p>Before running a RAID scan for the first time, back up your data.</p> <p>RAID Scanning: Enable to configure RAID scanning.</p> <p>Scheduling: Select the schedule to perform RAID Maintenance.</p> <ul style="list-style-type: none"><li>• Every week "Sun - Sat"</li><li>• First "Sun - Sat"</li><li>• Second "Sun - Sat"</li><li>• Third "Sun - Sat"</li><li>• Forth "Sun - Sat"</li><li>• First and Third "Sun - Sat"</li><li>• Second and Forth "Sun - Sat"</li><li>• Once a month</li></ul> <p>Select "Begin Immediate RAID Scan" and click "Save" to immediately run a scan.</p> <p>Starting Time: Select the time to start RAID scans from 0 to 23 o'clock. To stop a RAID scan, click "Abort RAID Scanning".</p> <p>RAID Array Error Detection Response With a RAID 1, RAID 5, or RAID 10 array, you may choose to have the system shut down automatically if an error is detected. This feature is not available for RAID 0 arrays or disks in normal mode. By default, this is set to "Shutdown".</p> <p>Boot with iSCSI service After an error occurs, the iSCSI service may be enabled or disabled at the next boot. By default, it will be disabled.</p>	Status	Descriptions	repair possible	• Read error in the data area of array	impossible to repair	• Write Error • RAID management area error • Drive partition information area error • Drive recognition failure, etc.
	Status	Descriptions						
	repair possible	• Read error in the data area of array						
	impossible to repair	• Write Error • RAID management area error • Drive partition information area error • Drive recognition failure, etc.						

# Maintenance

Maintenance		
Email Notification Click "Modify Settings" to change settings. Click "Send Test Message" to send a test email to the email address which has been set.	Notification	Enable to use Email notification.
	SMTP Server Address	Enter the address of your SMTP mail server.
	SMTP Port No.	Enter the SMTP Port Number. If this is left blank, the standard port number (25) is used. If user authentication is set to "Disabled" or "POP before SMTP", then port 25 is used regardless of the number entered in this field.
	Authentication Type	Select Authentication Type from "POP before SMTP", "LOGIN (SMTP-AUTH)", and "CRAM-MD5(SMTP-AUTH/CRAM-MD5)".
	POP3 Server Address	Enter the address of the POP3 email server
	POP3 Port No.	Enter the POP3 Port Number. If this is left blank, the standard port number (110) is used.
	SSL/TLS	When "LOGIN (SMTP-AUTH)" and "CRAM-MD5 (SMTP-AUTH/CRAM-MD5)" are selected for Authentication Type, specify either "SSL" or "TLS".
	Username	Enter the username for authentication.
	Password	Enter the password for authentication.
	Subject	Specify the subject line that emails will be sent with. Alphanumeric characters are supported. Do not use two-byte characters.
	Recipient(s)	Enter the email address of the recipient, and click "Add". You can register up to 5 email addresses as recipients.
Syslog Click "Modify Settings" to change settings.	Report	Select the contents for email notifications. <ul style="list-style-type: none"> <li>• HDD Status Report Sends the drive status.</li> <li>• Fan Failure Sends a message if a fan error occurs.</li> <li>• Disk Error Sends a message if a drive error occurs.</li> <li>• System Alert Sends a message when the TeraStation is rebooted or shut down, or its RAID configuration is changed.</li> </ul>
	Syslog	You may elect to send logs to a syslog server. "Enable" Log information transmission, enter the IP address of the syslog server, and select "Save" to transmit logs to a syslog server.

Alert Sound Settings Click "Modify Settings" to change settings.	Alert Sound Settings	Beep alerts can be triggered by the following conditions : "Overheating", "Disk Error", "FanError", and "UPS Power Error".
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Front Panel Settings Click "Modify Settings" to change settings.	Display	Select items to display on LCD display at the front of the TeraStation from "Host IP", "Disk Mode", and "Time".
	Flip Display Items	Set if automatically switching the item to display on the LCD or not.
	LCD brightness	Adjust backlight brightness of the LCD display in 5 levels.
	LED brightness	Adjust the brightness at the front of the TeraStation in 5 levels.
	LED Synchronization	Select whether using the feature to change the LED brightness synchronized with time. For example, you can change the brightness on day time and night time.
	LED brightness (Sleep)	Adjust the brightness of LED in 4 levels while in dark.
	Begin Sleep	Set the time (0 to 23 o'clock) to darken LED brightness. This can be set in every 00 minute at 1 hour interval.
	Wakeup	Set the time (0 to 23 o'clock) to change LED brightness back to the normal setting. This can be set in every 00 minute at 1 hour interval.

Power Management		
UPS Settings Click "Modify Settings" to change settings.	Synchronize with UPS	"Enable" to sync the TeraStation with a UPS. "USB Port/APC Style (or OMRON Style)" can only be set if you are using a USB type UPS manufactured by APC.
	UPS Connection Type	Select a connection method for the UPS. "USB Port/APC Style (or OMRON Style)" can be set only when you are using USB type UPS manufactured by APC.
	TeraStation behavior When Power failure	You may set how long the Terastation runs after a power failure before it shuts down. Or, you can set it to shut down when the UPS signals "Battery Low". Shutting down when the battery is low is only available when the UPS is connected with a USB cable. You can also set the TeraStation to shut down when the number of iSCSI connections becomes 0 (zero).
	UPS Behavior After TeraStation has shut down	You may also elect to have the UPS shut down after the TeraStation shuts down.
	UPS Recovery function	Enable to have the TeraStation reboot automatically when normal AC power is restored.
Restart TeraStation	Restart	Click "Restart" to reboot the TeraStation.
Shutdown TeraStation	Shutdown	Click "Shutdown" to turn off the TeraStation. To turn it back on, press the power button on the front of the unit.

Restore/Format		
Restore Factory Defaults	Restore TeraStation	<p>Click "Restore TeraStation" to initialize the following settings: TeraStation Name, NTP settings, RAID Scanning, Restore/Format, Mail Notification, UPS Settings, Administrator Settings, Network, Alert Sound Settings, Front Panel Settings, RAID Array Error Detection Response, Management Information, Place</p> <p>You may choose to not initialize the admin username and password when other settings are initialized from the front panel button. Click "Modify Settings" to change this setting. If you select "Keep current admin password", you will not be able to make any further changes to the settings of the TeraStation without the admin username and password. Write them down and do not lose them!</p>
Format TeraStation	Format TeraStation	Click "Format TeraStation" to format the drives on the TeraStation. All data and settings will be lost. Back up any important data before formatting the TeraStation! During the format, configuration settings cannot be changed.

Ping Test		
Ping Test	Ping Test	Enter the target IP Address in "Target IP Address", and click "Ping". The response is displayed in "Result".

## Status

System		
System	System Information	Displays TeraStation Name, Model Name, Firmware version, NTP, Date and Time, Time Zone, Email Notification, Fan Status, etc.
Network		
Network	Network Information	Displays IP Address, Subnet Mask, Ethernet Frame Size, Primary DNS Server, Secondary DNS Server, Default Gateway Address, Port Trunking, etc.
Connection History		
Connection History	Connection History	Displays the Volume Connection Log, Volume, Status, Volume Name and Initiator Name.

# Appendix

## Factory Defaults

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Initial configuration defaults:

- Administrator Username: admin
- Administrator Password: password
- DHCP Client; automatically requests an IP address from any available DHCP server. If no DHCP server is detected, the following settings are used:
  - IP Address: 169.254.xxx.xxx (where each xxx is a random number from 1- 255).
  - Subnet Mask: 255.255.0.0
- Ethernet Frame Size: 1518 bytes
- NTP: Enabled
- RAID Mode: 4 drives in a RAID 5 array

**Note:** To restore the TeraStation to the factory defaults above, refer to "Initialize Settings" on page 39.



# Main LCD

The main LCD display on the front of the TeraStation displays information about the status and operation of the TeraStation. Below is a guide to the meanings of various displayed information.

## Normal Display

Press the Display button to cycle through the various displays available. You may configure the display settings in the configuration utility at [Maintenance] - [Maintenance] - [Front Panel Settings].

Display		Meaning
LINK SPEED  * If connecting a LAN cable to the LAN Port 2, "LINK SPEED2" is displayed.	LINK SPEED NO LINK	Not connected to the network.
	LINK SPEED 10Mbps HALF	Connected as 10 Mbps half-duplex.
	LINK SPEED 10Mbps FULL	Connected as 10 Mbps full-duplex.
	LINK SPEED 100Mbps HALF	Connected as 100 Mbps half-duplex.
	LINK SPEED 100Mbps FULL	Connected as 100 Mbps full-duplex.
	LINK SPEED 1000Mbps	Connected as 1000 Mbps full-duplex.
Host Name/IP Address	TS-IXL xxx 192.168.11.50	Displays the host name and the IP address. The letter F at the end of the IP address means that it is static; the letter D means that the IP address is from DHCP.  If LAN port 2 is connected, the hostname is displayed as "NETWORK2".
Calendar clock	DATE      TIME 2007/11/11 11:11	Displays the date and time.
Operation, MODE	HD 1-2-3-4 RAID5	RAID5 using drives 1 - 4.
	HD 1-2-3: RAID 5 4 :SINGLE	RAID 5 using drives 1 to 3, with drive 4 in normal mode.
	HD 1-2-3: RAID 5 4 :STANDBY	RAID 5 using drives 1 to 3, with drive 4 a hot spare.
	HD 1-2-3-4 RAID 0	RAID 0 using drives 1 - 4.
	HD 1-2-3-4 RAID 10	RAID 10 using drives 1 - 4.
	HD 1, 2, 3, 4 SINGLE	Drives 1 - 4 are stand-alone drives.
	HD 1 - 2 : RAID 1 3 - 4 : RAID 1	RAID 1 arrays with drives 1 and 2 and drives 3 and 4.
	HD 1 - 2 : RAID 1 3, 4 : SINGLE	RAID 1 array using drives 1 and 2, and drives 3 and 4 are stand-alone drives.
	HD 1, 2 : SINGLE 3 - 4 : RAID 1	Drives 1 and 2 are stand alone drives, and drives 3 and 4 are in a RAID 1 array.

These examples show the two-line display of a TS-IXL TeraStation. Rack-mount TS-RIXL TeraStations have a slightly different LCD display, with the two lines of information displayed on a single line. Scroll horizontally to view the rest of the information.

## Status

Displays the current status when changing the settings or formatting drives.

Display	Meaning
HDx Warning I11 Bad Sectors	The bad sectors in the Xth hard drive are serious. Replace the Xth hard drive.
OperationModel12 DEGRADE MODE	The RAID array is running in degraded mode.
RAID I13 ARRAYx Formatting	Formatting the Xth RAID array.
RAID I14 ARRAYx Checking	Checking the Xth RAID array.
RAID I15 ARRAYx Scanning	Scanning the Xth RAID array. Transfer speeds will be slower until this finishes.
RAID I16 ARRAYx Creating	Creating the Xth RAID array.
RAID I17 ARRAYx Resyncing	Recycling the Xth RAID array. Transfer speeds will be slower until this finishes.
RAID I18 ARRAY xRebuilding	Rebuilding Xth RAID array. Transfer speeds will be slower until this finishes.
RAID I19 ARRAYx 0 Filling	Deleting data completely by filling zeros into Xth RAID array.
DISK I20 DISKx Formatting	Formatting the Xth hard drive.
DISK I22 DISKx 0 Filling	Deleting data in the Xth hard drive.
SYSTEM I23 Initializing	Initializing the system.
Network I24 Setting Config	Configuring network settings (such as querying DHCP for an IP address).
SYSTEM I25 F/WUPDATING	Updating the TeraStation's firmware. Do not turn off the TeraStation until the update is complete.
Web Setting I26 Initializing	Initializing web configuration.
iSCSI I30 Connected	A computer is connected to the volume. Before turning off the computer, disconnect the TeraStation (page 11).
PressFuncSW I31 New Diskx ready	The new drive is ready to mount. Press the function button to mount it.
Set From Web I32 New Diskx ready	The new drive is ready to configure. Use the configuration utility to restructure the drive or rebuild a RAID array.

These examples show the two-line display of a TS-IXL TeraStation. Rack-mount TS-RIXL TeraStations have a slightly different LCD display, with the two lines of information displayed on a single line. Scroll horizontally to view the rest of the information.

## Errors and Warnings

Displays the current status when changing the settings or formatting drives.

Examples of LCD	Meaning
SYSTEM Error E00 MPU No Response	The system is not responding. Disconnect power for 10 seconds, then reattach and boot the TeraStation. If the error persists, contact tech support.
DRAM LINES E01 DATA Failure	IC error. Contact tech support.
DRAM LINES E02 ADDRESS Failure	IC error. Contact tech support.
RTC Chip E03 No RTC Clock	Clock error. Disconnect power for 10 seconds, then reattach and boot the TeraStation. If the error persists, contact tech support.
SYSTEM Error E04 Can't Load Krnl!	The firmware is corrupted. Contact tech support for assistance.
WDT E05 SYSTEM Stopped	System hung. Disconnect power for 10 seconds, then reattach and boot the TeraStation. If the error persists, contact tech support.
TFTP MODE E06 Lost boot image	The firmware is corrupted. Wait for 5 minutes. If "E04" appears on the display, turn off the unit. Contact tech support for assistance.
HD ALL E07 ALL HD Not Found	Hard disks are not found. If the drives are installed but this message appears, contact Buffalo's tech support for assistance.
UPS E10 Dependent Mode	Power outage. The TeraStation is running on UPS battery power and will be shut down safely.
SYSTEM I10 TOO HOT!	System temperature is above safe limits. Move the TeraStation to a cooler place. Do not place anything too close to the Terastation that might block airflow.
SYSTEM Error E11 Fan Failure	The fan is not spinning. Check for dirt or objects caught in fan. Remove any debris with tweezers or canned air. If the error persists, contact tech support.
SYSTEM Error E12 Cooling Failure	System temperature is above safe limits. Move the TeraStation to a cooler place. Do not place anything too close to the Terastation that might block airflow.
RAID Error E13 ARRAYx Error	An error has occurred in the Xth RAID array. The system will run in degraded mode if RAID1 or RAID5 is used. For best results, test the drives individually and replace the defective drive.
RAID Arrayx E14 Can't Mount	The Xth RAID array could not be mounted. Turn off the TeraStation, then reboot it. If the error persists, rebuild the RAID array. If the error still persists, contact Buffalo's tech support for assistance.
HDx Error E15 Many Bad Sectors	The bad sectors in the Xth hard drive have become serious. Replace the drive.
HDx Error E16 HDx Not Found	Cannot find the Xth hard drive. The Xth hard drive may not be connected or may be damaged. Check the drive and replace if necessary.

Examples of LCD	Meaning
Chip Error E17 RTC Failure	The circuit board is damaged. Disconnect power for 10 seconds, then reattach and boot the TeraStation. If the error persists, contact tech support.
Chip Error E18 SATA1 Failure	The circuit board is damaged. Disconnect power for 10 seconds, then reattach and boot the TeraStation. If the error persists, contact tech support.
Chip Error E19 SATA2 Failure	The circuit board is damaged. Disconnect power for 10 seconds, then reattach and boot the TeraStation. If the error persists, contact tech support.
Chip Error E20 USB Failure	The circuit board is damaged. Disconnect power for 10 seconds, then reattach and boot the TeraStation. If the error persists, contact tech support.
Chip Error E21 Ethernet Failure	The circuit board is damaged. Disconnect power for 10 seconds, then reattach and boot the TeraStation. If the error persists, contact tech support.
HDx Error E22 HDx Can't Mount	Failed to mount the hard drive. Format the hard disk. After formatting, reboot the system. If the error is still displayed, replace the hard disk. If the error persists, contact tech support.
HDx Error E23 HDx Is Faulty	An error occurred and the Xth hard disk was removed from the RAID array. Replace the Xth hard drive.
SATAx Error E24 COMM. Failure	Failed to communicate with the Xth hard drive. Reboot the TeraStation. If the error persists, contact tech support.

These examples show the two-line display of a TS-IXL TeraStation. Rack-mount TS-RIXL TeraStations have a slightly different LCD display, with the two lines of information displayed on a single line. Scroll horizontally to view the rest of the information.

## Firmware Updates

Visit Buffalo's web site ([www.buffalotech.com](http://www.buffalotech.com)) for the latest firmware updates for your TeraStation. Download the update to your Windows desktop and run the update by double-clicking on it. It will detect TeraStations on your network and give you the option of updating their firmware.

# Term Lists

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## **DHCP (Dynamic Host Configuration Protocol) Server**

A DHCP server manages network configuration information for all the devices on a network. If a compatible client device is connected to the network, the DHCP server will automatically assign necessary network information such as IP address, subnet mask, gateway to the device. With a DHCP server on the network, you don't have to configure network information for each device manually.

## **IP Address**

A unique IP address identifies each network device on a subnet.

## **iSCSI (Internet Small Computer System Interface)**

A communication protocol that allows SCSI device communication over a gigabit Ethernet network.

## **Jumbo Frames**

Ethernet communication with frames larger than the standard 1518 bytes. Common jumbo frame sizes are 4102 bytes, 7422 bytes, and 9694 bytes.

## **MAC (Media Access Control) address**

The unique physical address assigned to each network card. It consists of 3 bytes for the vendor code (manufacturer ID) and 6 bytes for the individual user code. Ethernet sends and receives frames based on this address.

## **NTP (Network Time Protocol)**

A protocol to correct time via the network. It periodically synchronize time settings with that of an NTP server to correct the time.

## **RAID (Redundant Arrays of Inexpensive Disks)**

A technology that allows computer users to achieve high levels of storage reliability from low-cost hard drives by arranging them into arrays for redundancy. Many types of RAID are available, including the well known RAID 1 and RAID 5.

## **TCP/IP (Transmission Control Protocol / Internet Protocol)**

The standard communication protocol for Ethernet networks and the Internet. It is a combination of the TCP protocol (data separation and error detection) and the IP protocol (providing a receiver and sender IP address).

## **UPS (Uninterruptable Power Supply)**

An Uninterruptable Power Supply contains a battery for backup, and can run devices for a few minutes when utility power is not available so that the devices can be shut down safely.

**Gateway**

Device, computer or software which connects networks together. Packets pass through gateways to travel between networks.

**Subnet mask**

Subnet masks divide networks into groups of computers that have common, designated IP address routing prefixes.

**Degraded Mode**

When errors occur in a RAID 1, RAID 5, or RAID 10 array because of a failing drive, the array enters degraded mode to limit data loss. Performance will be lowered, and though the array will try to maintain data integrity if possible, data may be lost anyway. For best results, replace the failing drive as soon as possible.

**Firewall**

A firewall is a network device that is designed to block unauthorized access while permitting authorized communications. It may be hardware, or software, or both. It will permit, deny, or proxy traffic between domains based on rules and other criteria.

**Port Trunking**

Port trunking (link aggregation) uses multiple network connections in parallel to increase link speed and redundancy.

**Hot Spare**

A hot spare is an extra hard drive that is connected as a failover backup to increase reliability. When another drive fails, the hot spare takes over its functionality immediately.

**Hot Swap**

Hot swap components may be replaced without shutting down or significantly interrupting the system.

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## iSCSI TeraStation User Manual

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