

# RAID

## Technical Note

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# 1 Introduction

Redundant Array of Independent Disks (RAID) is a data storage virtualization technology that combines multiple physical disk drive components into one or more logical units for the purposes of performance improvement, data redundancy, or both.

Data is distributed across the drives in one of several ways, referred to as RAID levels, depending on the required level of redundancy and performance. The different schemes, or data distribution layouts, are named by the word "RAID" followed by a number, for example, RAID 0 or RAID 1. Each schema, or RAID level, provides a different balance among the key goals; reliability, availability, performance, and capacity. RAID levels greater than 0 provide protection against unrecoverable sector read errors, in addition to protection against failures of whole physical drives.

Kemp LoadMasters that have a RAID controller installed receive notifications from the RAID disk relating to the current status of the physical disks on the hardware appliance.

This document outlines the various options, notifications, and messages relating to RAID disks on LoadMasters.

## 1.1 Important Notes

Some important notes to be aware of are below:

- The disk size shown in the examples in this document may be different from yours, depending on the model you receive. This does not affect any of the messages other than the size.
- RAID disks must be the same size, no greater or smaller. This is because of RAID1 mirroring. If they are not the same size, the rebuild LED does not come on because it is not the correct size.
- It is best practice to have both disks of the same manufacturer and model.
- If you replace one disk, rebuilding begins. If the source disk (the one that was not replaced) is then removed before rebuilding is done, you risk losing data.
- If a disk fails, a "degraded" message alert appears in the syslog.


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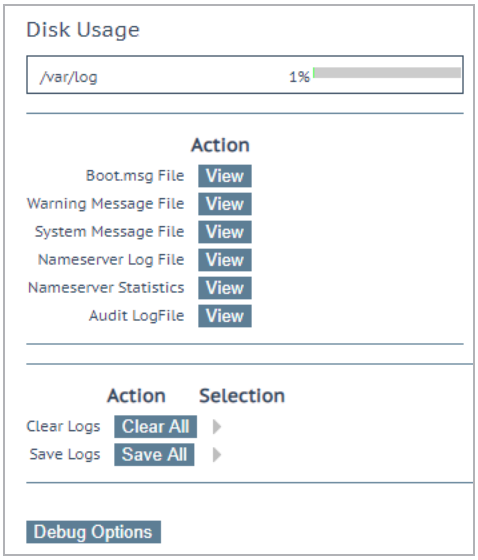
# 2 View RAID Information

This section outlines the RAID options available in the LoadMaster Web User Interface (WUI). To display information relating to the RAID controller and disks, follow the steps below:

1. In the main menu of the LoadMaster WUI, go to **System Configuration > Logging Options > System Log Files**.




2. Click **Debug Options**.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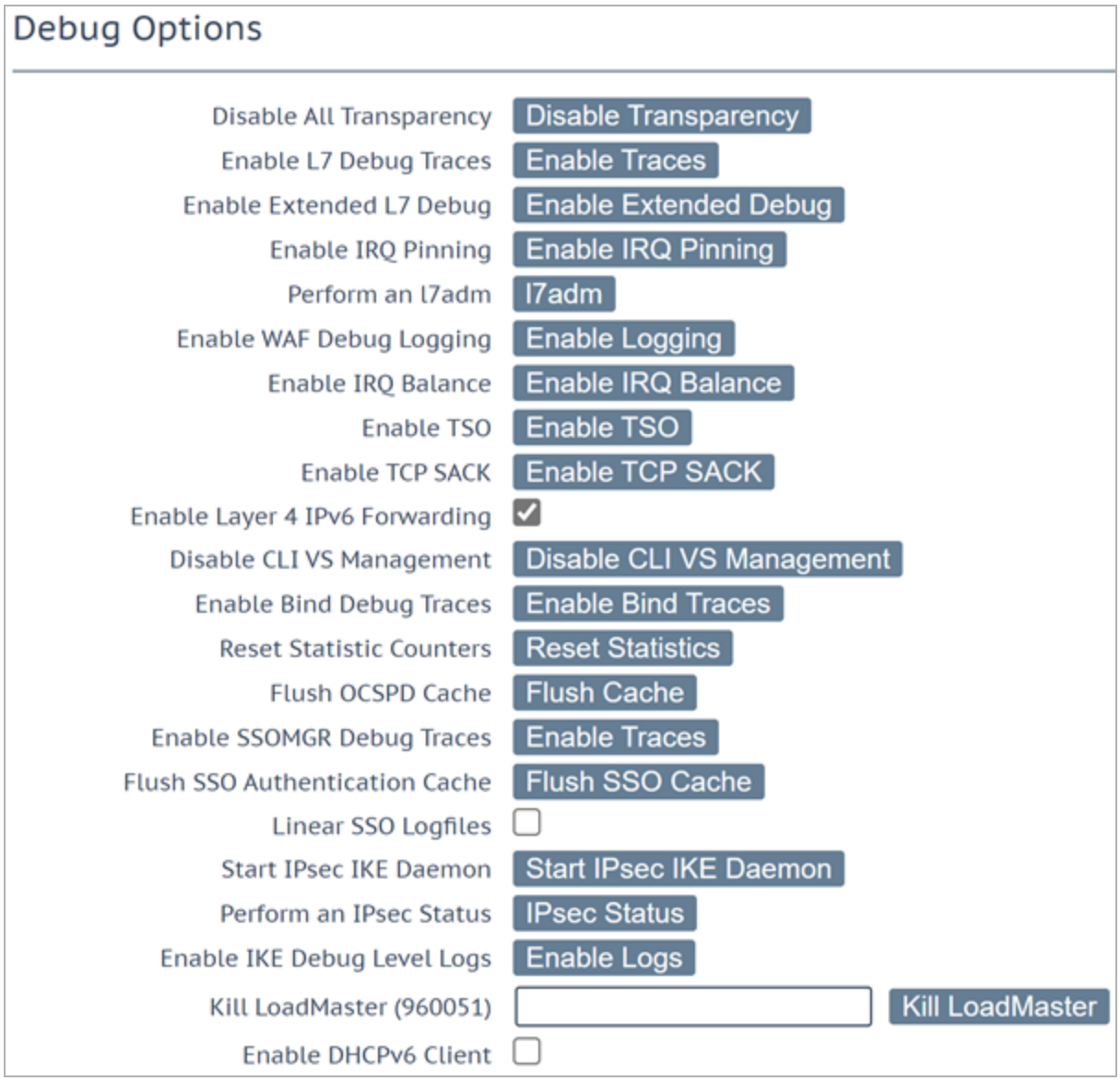


3. Click **RAID Info** to display the RAID controller details.

4. Click **RAID Disks Info** to display details about each RAID disk in the controller.

The **Display RAID Information** and **Display RAID Disks Information** buttons only appear if a RAID controller is installed on the LoadMaster.

You can also view this information using Application Program Interface (API) commands. Refer to the relevant Kemp API documentation for further information on this.

Refer to the sections below for some example output relating to RAID states.


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## 2.1 RAID Info States

This section provides examples of the normal, degraded, and rebuilding states that you may see when you click **RAID Info**.

### 2.1.1 RAID Info Normal State

The following example shows the normal state.

```
------------------------------------------------------------------
Controller details
------------------------------------------------------------------
- Chip ID.................: 10
- Parent Controller Index: 255
- OS Physical Name.......: /dev/sda
- Serial Number..........: 427491329
- AES Power on State.....: 0
- Sata Ports.............: 2
------------------------------------------------------------------
Raid Port 0 details
------------------------------------------------------------------
- Raid Model Name............: H/W RAID1
- Raid Serial Number.........: OUEYEXCXTQ53GE1BSOSN
- EZBackup Disk Support.....: 0
- Port Multiplier port.....: 0
- Raid Capacity.............: 953 (29 GB)
- Raid Capacity low word.....: 0
- Raid State................: 1 (Active)
- Raid Status...............: 3 (Normal)
- Raid Level................: 1 (Raid 1 (mirror))
- Mark Type.................: 0
- Active Member.............: 15
- Active Level..............: 0
- Rebuild Priority..........: 3
- Standby Timer.............: 0
- Total members in the RAID....: 2
Member disk 0
- Ready.....................: 1
```


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```
- Lba 48 Bit Support.......: 1
- SATA Page................: 0
- SATA Port................: 0
- SATA Base................: 0
- SATA Size................: 953
------------------------------------------------------------
Member disk 1
- Ready....................: 1
- Lba 48 Bit Support.......: 1
- SATA Page................: 0
- SATA Port................: 1
- SATA Base................: 0
- SATA Size................: 953
------------------------------------------------------------
```

### 2.1.2 RAID Info Degraded State

The following example shows the degraded state when the bottom disk is removed.

```
----------------------------------------------------------------------
Controller details
----------------------------------------------------------------------
- Chip ID..................: 10
- Parent Controller Index: 255
- OS Physical Name.......: /dev/sda
- Serial Number...........: 427491329
- AES Power on State.....: 0
- Sata Ports..............: 1
----------------------------------------------------------------------
Raid Port 0 details
----------------------------------------------------------------------
- Raid Model Name..............: H/W RAID1
- Raid Serial Number...........: OUEYEXCXTQ53GE1BSOSN
- EZBackup Disk Support........: 0
- Port Multiplier port.........: 0
- Raid Capacity................: 953 (29 GB)
- Raid Capacity low word.......: 0
- Raid State...................: 1 (Active)
- Raid Status..................: 1 (Degrade)
```


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```
- Raid Level...................: 1 (Raid 1 (mirror))
- Mark Type....................: 0
- Active Member................: 15
- Active Level.................: 0
- Rebuild Priority.............: 3
- Standby Timer................: 0
- Total members in the RAID....: 2
Member disk 0
- Ready........................: 1
- Lba 48 Bit Support.......: 1
- SATA Page................: 0
- SATA Port................: 0
- SATA Base................: 0
- SATA Size................: 953
------------------------------------------------------------
Member disk 1
- Ready........................: 0
- Lba 48 Bit Support.......: 0
- SATA Page................: 0
- SATA Port................: 0
- SATA Base................: 0
- SATA Size................: 0
------------------------------------------------------------
```

### 2.1.3 RAID Info Rebuilding State

The following example shows the rebuilding state when the bottom disk is put back in.

```
----------------------------------------------------------------------
Controller details
----------------------------------------------------------------------
- Chip ID................: 10
- Parent Controller Index: 255
- OS Physical Name.......: /dev/sda
- Serial Number..........: 427491329
- AES Power on State.....: 0
- Sata Ports.............: 2
----------------------------------------------------------------------
Raid Port 0 details
```


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```
------------------------------------------------------------------
- Raid Model Name..............: H/W RAID1
- Raid Serial Number...........: OUEYEXCXTQ53GE1BSOSN
- EZBackup Disk Support........: 0
- Port Multiplier port.........: 0
- Raid Capacity................: 953 (29 GB)
- Raid Capacity low word.......: 0
- Raid State...................: 1 (Active)
- Raid Status..................: 2 (Rebuilding)
- Raid Level...................: 1 (Raid 1 (mirror))
- Mark Type....................: 0
- Active Member................: 1
- Active Level.................: 316
- Rebuild Priority.............: 3
- Standby Timer................: 0
- Total members in the RAID....: 2
Member disk 0
- Ready.....................: 1
- Lba 48 Bit Support.......: 1
- SATA Page.................: 0
- SATA Port.................: 0
- SATA Base.................: 0
- SATA Size.................: 953
------------------------------------------------------------
Member disk 1
- Ready.....................: 1
- Lba 48 Bit Support.......: 1
- SATA Page.................: 0
- SATA Port.................: 1
- SATA Base.................: 0
- SATA Size.................: 953
------------------------------------------------------------
```

## 2.2 RAID Disks Info States

This section provides examples of the normal, degraded, and rebuilding states that you may see when you click **RAID Disks Info**.


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From the perspective of the RAID controller:

- Top disk: Sata Port 0
- Bottom disk: Sata Port 1

### 2.2.1 RAID Disks Info Normal State

The following example shows the normal state.

```
------------------------------------------------------------------
Sata Port 0 details
------------------------------------------------------------------
- Disk Model Name..............: 32GB SATA Flash Drive
- Disk Serial Number...........: C0122916B01000000074
- Disk Firmware Version........: SFDC001D
- EZBackup Disk Support........: 1
- Port Multiplier port.........: 15
- Disk Capacity................: 954 (29 GB)
- Port Type....................: 2 (RAID)
- Port Speed...................: 2 (GB)
- Page 0 State.................: 2
- Page 0 Raid Index............: 0
- Page 0 Member Index..........: 0
- Page 0 Raid Name.............:
- Page 0 Raid Serial Number....:
- Page 0 Raid Segment Base.....: 0
- Page 0 Raid Size.............: 953
- Page 0 Raid EZ Backup Support: 0
- Page 1 State.................: 0
- Page 1 Raid Index............: 0
- Page 1 MemberIndex...........: 0
- Page 1 Raid Name.............:
- Page 1 Raid Serial Number....:
- Page 1 Raid Segment Base.....: 0
- Page 1 Raid Size.............: 0
- Page 1 Raid EZ Backup Support: 0
- PortErrorStatus..............: 0
------------------------------------------------------------------
```


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```
Sata Port 1 details
------------------------------------------------------------------
- Disk Model Name..............: 32GB SATA Flash Drive
- Disk Serial Number...........: E011321290100000005A
- Disk Firmware Version........: SFDC001D
- EZBackup Disk Support........: 1
- Port Multiplier port.........: 15
- Disk Capacity................: 954 (29 GB)
- Port Type....................: 2 (RAID)
- Port Speed...................: 2 (GB)
- Page 0 State.................: 2
- Page 0 Raid Index............: 0
- Page 0 Member Index..........: 1
- Page 0 Raid Name.............:
- Page 0 Raid Serial Number....:
- Page 0 Raid Segment Base.....: 0
- Page 0 Raid Size.............: 953
- Page 0 Raid EZ Backup Support: 0
- Page 1 State.................: 0
- Page 1 Raid Index............: 0
- Page 1 MemberIndex...........: 0
- Page 1 Raid Name.............:
- Page 1 Raid Serial Number....:
- Page 1 Raid Segment Base.....: 0
- Page 1 Raid Size.............: 0
- Page 1 Raid EZ Backup Support: 0
- PortErrorStatus..............: 0
```

### 2.2.2 RAID Disks Info Degraded State

The following example shows the degraded state when the bottom disk is removed.

```
------------------------------------------------------------------
Sata Port 0 details
------------------------------------------------------------------
- Disk Model Name..............: 32GB SATA Flash Drive
- Disk Serial Number...........: C0122916B01000000074
```


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```
- Disk Firmware Version........: SFDC001D
- EZBackup Disk Support........: 1
- Port Multiplier port.........: 15
- Disk Capacity................: 954 (29 GB)
- Port Type....................: 2 (RAID)
- Port Speed...................: 2 (GB)
- Page 0 State.................: 2
- Page 0 Raid Index............: 0
- Page 0 Member Index..........: 0
- Page 0 Raid Name.............:
- Page 0 Raid Serial Number....:
- Page 0 Raid Segment Base.....: 0
- Page 0 Raid Size.............: 953
- Page 0 Raid EZ Backup Support: 0
- Page 1 State.................: 0
- Page 1 Raid Index............: 0
- Page 1 MemberIndex...........: 0
- Page 1 Raid Name.............:
- Page 1 Raid Serial Number....:
- Page 1 Raid Segment Base.....: 0
- Page 1 Raid Size.............: 0
- Page 1 Raid EZ Backup Support: 0
- PortErrorStatus..............: 0
```

### 2.2.3 RAID Disks Info Rebuilding State

The following example shows the rebuilding state when the bottom disk is put back in.

> Disk rebuild time is dependent on the size of the disk and disk activity. You can expect this to take hours.

```
----------------------------------------------------------------
Sata Port 0 details
----------------------------------------------------------------
- Disk Model Name..............: 32GB SATA Flash Drive
- Disk Serial Number...........: C0122916B01000000074
- Disk Firmware Version........: SFDC001D
- EZBackup Disk Support........: 1
- Port Multiplier port.........: 15
```


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```
- Disk Capacity.................: 954 (29 GB)
- Port Type.....................: 2 (RAID)
- Port Speed....................: 2 (GB)
- Page 0 State..................: 2
- Page 0 Raid Index.............: 0
- Page 0 Member Index...........: 0
- Page 0 Raid Name..............:
- Page 0 Raid Serial Number....:
- Page 0 Raid Segment Base.....: 0
- Page 0 Raid Size..............: 953
- Page 0 Raid EZ Backup Support: 0
- Page 1 State..................: 0
- Page 1 Raid Index.............: 0
- Page 1 MemberIndex............: 0
- Page 1 Raid Name..............:
- Page 1 Raid Serial Number....:
- Page 1 Raid Segment Base.....: 0
- Page 1 Raid Size..............: 0
- Page 1 Raid EZ Backup Support: 0
- PortErrorStatus...............: 0
-----------------------------------------------------------------
Sata Port 1 details
-----------------------------------------------------------------
- Disk Model Name...............: 32GB SATA Flash Drive
- Disk Serial Number............: E011321290100000005A
- Disk Firmware Version.........: SFDC001D
- EZBackup Disk Support.........: 1
- Port Multiplier port..........: 15
- Disk Capacity.................: 954 (29 GB)
- Port Type.....................: 2 (RAID)
- Port Speed....................: 2 (GB)
- Page 0 State..................: 2
- Page 0 Raid Index.............: 0
- Page 0 Member Index...........: 1
- Page 0 Raid Name..............: H/W RAID1
- Page 0 Raid Serial Number....: OUEYEXCXTQ53GE1BSOSN
- Page 0 Raid Segment Base.....: 0
```


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```
- Page 0 Raid Size.............: 953
- Page 0 Raid EZ Backup Support: 0
- Page 1 State.................: 0
- Page 1 Raid Index............: 0
- Page 1 MemberIndex...........: 0
- Page 1 Raid Name.............:
- Page 1 Raid Serial Number....:
- Page 1 Raid Segment Base.....: 0
- Page 1 Raid Size.............: 0
- Page 1 Raid EZ Backup Support: 0
- PortErrorStatus..............: 0
```


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# 3 RAID Syslog Messages

The RAID controller generates syslog events. For further details on syslog, refer to the **WUI Configuration Guide** on the Kemp Documentation Page.

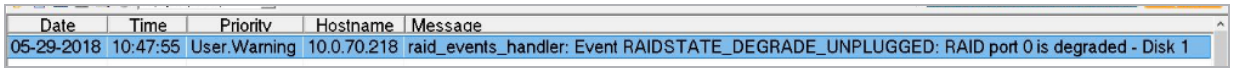
All syslog messages are also available in the LoadMaster **System Message File** which you can access by going to **System Configuration > Logging Option > System Log Files**.

Refer to the section below for further details on the states.

In our example:

- RAID controller: RAID port 0
- Top: Disk 0
- Bottom: Disk 1

## 3.1 RAID Syslog Degraded State



| Date | Time | Priority | Hostname | Message |
|---|---|---|---|---|
| 05-29-2018 | 10:47:55 | User.Warning | 10.0.70.218 | raid_events_handler: Event RAIDSTATE_DEGRADE_UNPLUGGED: RAID port 0 is degraded - Disk 1 |

The above screenshot shows a syslog example when the bottom disk is ejected.

## 3.2 RAID Syslog Rebuilding State



| | | | | |
|---|---|---|---|---|
| 05-29-2018 | 11:22:28 | User.Info | 10.0.70.218 | raid_events_handler: Event RAIDSTATE_REBUILDING_PLUGIN: RAID port 0 - Disk 1 is rebuilding now |

The above screenshot shows a syslog example when the bottom disk is put back in.



| | | | | |
|---|---|---|---|---|
| 05-29-2018 | 11:26:04 | User.Warning | 10.0.70.218 | raid_events_handler: Event RAIDSTATE_REBUILDING_INPROGRESS: RAID port 0 - Disk 1 rebuilding in progress |
| 05-29-2018 | 11:26:04 | User.Info | 10.0.70.218 | raid_events_handler: RAID Controller 0 Port 0 rebuilding percentage == 18 |

The above screenshot shows a syslog example when the bottom disk is restarting, with percentage progress over time.

> Disk rebuilding percentage is polled at a fixed interval. Therefore, you see a 100% complete percentage unless the poll time is exactly 100% when 100% is hit. Look for the **rebuilding done** message instead to confirm completion.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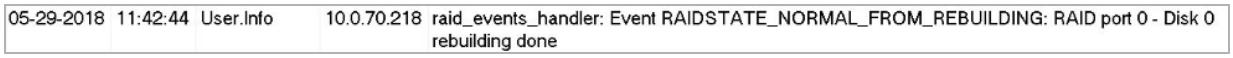
## 3.3 RAID Syslog Finished Rebuilding State




The above screenshot shows a syslog example when the disk is finished rebuilding.

> Note that it says Disk 0, because rebuilding actually uses both disks - one to read and one to write. Therefore, it does not matter which disk number it refers to because mirroring means both disks are the same.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# Last Updated Date

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