



# **Intel® RAID Basic Troubleshooting Guide**

## ***Technical Summary Document***

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**Enterprise Platforms and Services Division - Marketing**

## ***Revision History***

Date	Revision Number	Modifications
April, 2008	1.0	Initial Release
June, 2009	2.0	Update the RAID Log extraction method and the detail explanation for VD, PD and BBU related RAID events

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# 1. Introduction

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## 1.1 Purpose of this Document

This troubleshooting guide is designed to provide information on basic troubleshooting for Intel® SAS/SATA RAID Controller related issues. It is designed for use by knowledgeable system integrators and is not intended to address broader system related failures. This guide provides a high level review of troubleshooting options that can be used to identify and resolve RAID related problems or failures.

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**Note:** *Before attempting to diagnosis RAID failures or make any changes to the RAID configuration, please verify that a complete and verified backup of critical data is available. Verified data has been read from a backup and compared against the original data.*

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**Note:** *When encountering a failed drive or drive offline issue, do not remove any hot-plug drives from the system or shut the system down until you have verified the cause of the failure. Contact Intel Customer Support if you have any questions.*

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## 2. Drive State Definition

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### 2.1 Physical Drive (PD) State

The SAS Software Stack firmware defines the following states for physical disks connected to the controller.

- **Unconfigured Good** – A disk is accessible to the RAID controller but is not configured as part of a virtual disk. For example, a new drive inserted into a system.
- **Online** – A disk accessible to the RAID controller and configured as part of a virtual disk.
- **Failed** – A disk drive that is part of a virtual disk, but has failed and is no longer usable.
- **Rebuild** – A disk drive where data is written to restore full redundancy to a virtual disk.
- **Unconfigured Bad** – A hard drive that is no longer part of an array and that is known to be bad. This state is typically assigned to a drive that has failed but is no longer part of a configured virtual disk because it has been replaced by a hot-spare drive.
- **Foreign** – When disks are imported from a different RAID controller (foreign metadata), the physical disk is marked as foreign until user action is taken to add the configuration on the disks to the existing configuration on the controller. Foreign is not a drive state, but it indicates that a drive is from another configuration. Foreign drives typically have a state of Unconfigured Good until they are imported into the current configuration. For example, powering on with drives that contain a RAID set that have not previously been installed in the system.
- **Hot spare** – A disk drive that is defined as a hot spare. If the hot spare is not activated, the online LED is displayed.
- **Offline** – A disk drive that is still part of a configured virtual disk drive, but is not active (that is, the data is invalid). This state is used to represent a configured drive with invalid data. This state can occur as a transition state, or due to user action.

### 2.2 Virtual Disk (VD) State

The following states are defined for virtual disks on the controller:

- **Optimal** – A virtual drive with online member drives.
- **Partially Degraded** – A virtual disk with a redundant RAID level capable of sustaining more than one member disk failure, where there is one or more member failure but the virtual disk is not degraded or offline.
- **Degraded** – A virtual disk with a redundant RAID level and one or more member failures that cannot sustain a subsequent drive failure.
- **Offline** – A virtual disk with one or more member disk failures that make the data inaccessible.

## 3. Tips and Tricks

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### 3.1 Setup Tips

- Check cables for proper connection.
- Verify that all the cable ends are properly seated and the pins are not bent.
- Verify that an approved cable is used. Cables must be speed compatible and meet signal integrity specifications.

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**Note:** SATA cables are designed to connect directly from the RAID controller to the hard drive or drive enclosure.

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### 3.2 Debug Tips

- Improvements in RAID controller and hard drive communication and control are frequently incorporated into updated versions of RAID controller and hard drive firmware. It is generally recommended to review the release notes for firmware updates and apply the updates as warranted.
- Review firmware updates for the server board and backplane and apply as warranted.
- Drives with grown defects may not reflect a failing drive, but if the number of grown defects is large or the number is increasing, the drive may be in the process of failing. The drive should be replaced.
- Drives with bad block redirections may not reflect a failing drive, but if the number of redirections is large in number or the number is increasing, the drive may be in the process of failing. The drive should be replaced.
- Parity errors in a log may indicate a failing controller, failing drive, or a controller memory issue. Replace the controller and / or hard drive. Some RAID controllers include a DIMM site; verify that the memory in the DIMM site is listed on the RAID controller's tested memory list. If errors persist, try changing the memory module or the RAID controller.
- Write compare errors indicate a failing controller or failing drive. Replace the controller and / or hard drive.
- Do not re-use a failed drive.

# 4. Troubleshooting

You should never rely on a RAID subsystem as your only disaster protection. Always keep an independent backup of critical data in a separate physical location.

If there is an issue, gather as much information as possible and evaluate all options before shutting down, restarting the system, or taking any action that will change either the status of a physical or logical drive or the RAID configuration.

## 4.1 Troubleshooting Guidance

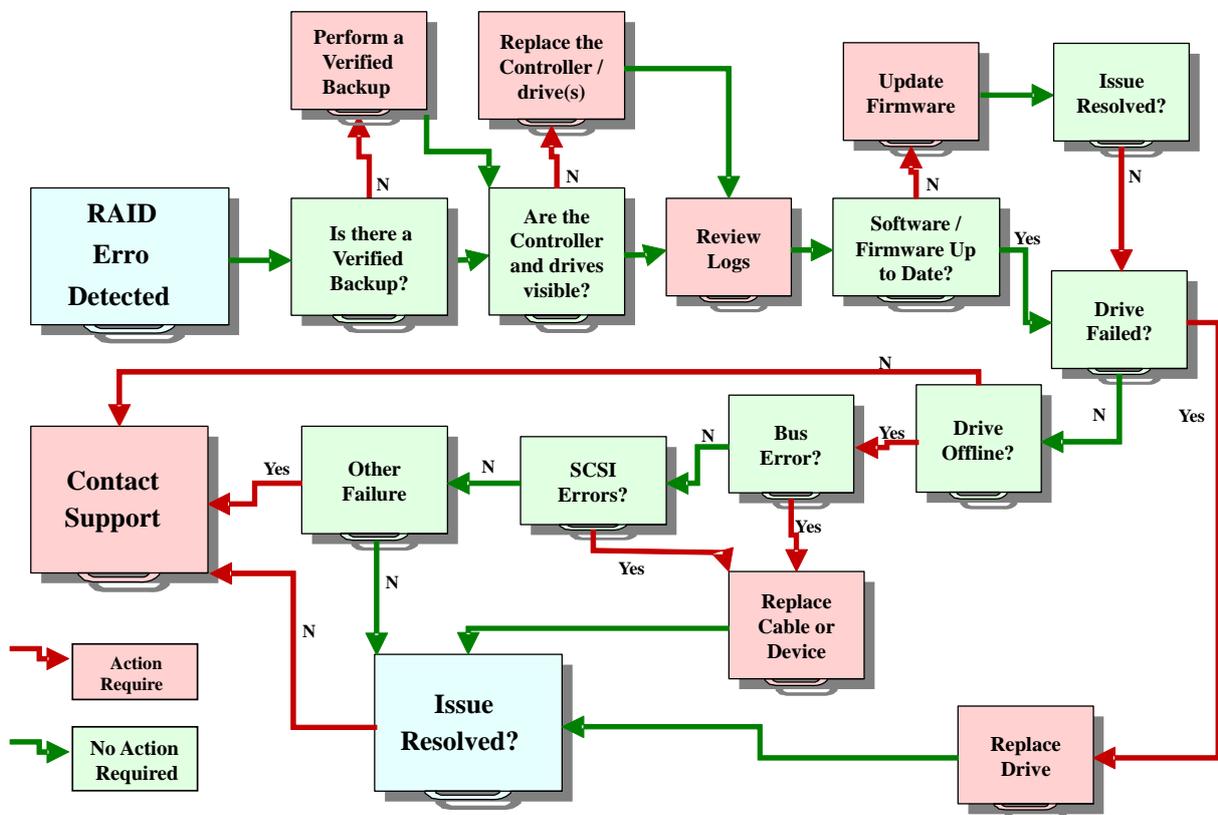


Figure 1. Troubleshooting Flow Chart

Listed below are some basic troubleshooting scenarios and guidance. For more information please refer to <http://support.intel.com>.

#### 4.1.1 If there is an issue, follow these steps before any other actions are taken:

- Do not reboot the system during a drive rebuild or if a drive is offline until the issue is identified or all other troubleshooting efforts have been exhausted.
- Make sure a verified backup is available.

#### 4.1.2 Retrieve the logs

If possible, retrieve the RAID event Log, System Event Log, OS Event Log, and Application Logs.

- If the operating system is functional:
  - Retrieve the OS system event log (do not reboot the system).
    - Under Windows, right click '**My Computer**' and select '**Manage**'. Double click '**Event Viewer**' then right click '**System**' and select '**Save log file as...**' to save the system event log. Select the default file type (\*.evt).
    - Under Linux, go to a terminal, run 'dmesg > /linuxos.log' to save the Linux OS log to /linuxos.log file
  - Retrieve the RAID Log.
    - Under OS or DOS, use the Intel® RAID Command Line Tool 2 Utility to retrieve the RAID Controller NVRAM Log. Follow the utility release notes instruction to get the RAID log files. For example: CmdTool2 - AdpAllLog -aALL > saslog.txt
  - Retrieve the Server Board System Event Log.
    - Use the SEL Viewer application to view the event log. Do not reboot the system to extract this log until all other options have been exhausted.
- If the operating system has crashed or is hung:
  - Reboot the system to DOS; use the Intel® RAID Command Line Tool 2 Utility to retrieve the RAID Controller NVRAM Log.
  - Retrieve the Server Board System Event Log using the SEL Viewer application.

#### 4.1.3 Review the logs

- Review the RAID and system logs for configuration information.
- Review the log for errors and coordinate the time stamp with errors seen in other logs.
  - Review the RAID Controller NVRAM Log using the Intel® RAID Command Line Tool 2 Utility.
  - Review the Server Board System Event Log.
  - Review the OS event log(s)
- Determine the failure error event. Common errors include:

- Failed physical drive.
- Excessive number of hard drive grown defects or hard drive block redirection events.
- Unexpected sense code errors (such as drive medium errors).
- Data bus errors.
- Power interruptions or an unexpected reboot.
- Processor, power supply, drive enclosure, or hard drive thermal issues.
- Review the RAID log, OS log, and System logs to verify that the Server Board, RAID controller, drive enclosure, and hard drives are updated with the latest firmware.
  - Intel® Server Board, Intel® RAID controller, and Intel® drive enclosure firmware is available at:  
<http://support.intel.com/support/motherboards/server>.
  - Hard drive firmware is available from the hard drive vendor.
- Check the System Front Panel LEDs, drive enclosure LEDs, and other diagnostic LEDs for fault status.
  - Drive enclosure LEDs: Green = normal, amber = a drive failure.
  - Power module LEDs: Green = normal, amber = power module failure.
  - Front panel system status LEDs: Green = normal, amber may indicate a system error such as fan or drive problem.

#### 4.1.4 Check for controller or system beep codes.

- Continuous RAID controller beeping during POST or operation indicates a degraded or failed Virtual Disk Drive condition.
  - The following list of beep tones is used on Intel® RAID products with Software Stack 2. These beeps usually indicate a drive failure.
    - Degraded Array - Short tone, 1 second on, 1 second off
    - Failed Array - Long tone, 3 seconds on, 1 second off
    - Hot Spare Commissioned - Short tone, 1 second on, 3 seconds off
  - The tone alarm will stay on during a rebuild.
  - The disable alarm option in the RAID BIOS Console or RAID Web Console 2 management utilities will disable the alarm after a power cycle. The enable alarm option must be used to enable the alarm.
  - The silence alarm option in either the RAID BIOS Console or RAID Web Console 2 management utilities will silence the alarm until a power cycle or another event occurs.
  - System beep codes: Verify the beep code in the product Hardware or Quick Start Guide.

#### 4.1.5 Check for virtual drive status

Determine if the virtual drive is available to the operating system by viewing the virtual disk Drive from the OS version of the RAID management utility (RAID Web Console 2).

- If the virtual disk drive is available but in a degraded state, do not remove any drives or shut the system down until you have verified the failure.

- If the virtual disk drive is degraded, verify the status of the physical drives from within the RAID management tool.
- If a drive has failed and a hot spare is present, determine if the hot spare is on line and a rebuild has started.
- If a drive has failed and a hot spare is not present, remove the failed drive and replace it with a drive of the same or larger capacity. Do not reuse a previously failed drive. Verify that the newly inserted drive is brought on line and a rebuild starts. See Section 4.2 How to Replace a Physical Drive for more information.
- If multiple drives have failed or have been marked offline, there is a significant probability of data loss and the condition may not be recoverable. You can call Intel support for assistance; or you can attempt to mark all but the first failed drive as online, replace the remaining failed drive, and attempt a rebuild. A verified backup is required to complete a rebuild.
- If the virtual drive is not available, determine if the RAID controller is detected by the RAID management Utility.
  - If the adapter is not detected by the RAID Management utility and virtual disk drives are not visible to the operating system, power down the system and verify that the controller is firmly seated in the PCI slot.
  - Determine if the adapter is detected during POST. If it is not detected, replace the controller.
  - Determine if the physical and virtual drives are detected during POST
    - If physical drives are not detected during POST, check the drive cables, drive power, backplane power, and other physical connections that might prevent detection.
    - If a physical drive is visible, check to see if the virtual drives are detected during POST.
    - If the virtual drive is visible, press <CTRL> + <G> to enter the BIOS management utility.
      - If a drive has failed and a hot spare is present, determine if the hot spare is online and a rebuild has started.
      - If a drive has failed and a hot spare is not present, remove the failed drive and replace it with a drive of the same or larger capacity. Verify that the newly inserted drive is brought on line and a rebuild starts.
      - If multiple drives have failed or have been marked offline, the probability of data loss is significant and the data may not be recoverable. You can call Intel support for assistance; or you can attempt to mark all but the first failed drive as online, replace the remaining failed drive, and attempt a rebuild.
    - If the physical devices are visible, but the virtual drive configuration is missing, contact Intel Customer Support.

#### 4.1.6 Requesting customer support

- Provide a simple description of the failure with information that will aid in duplicating the failure.

- Provide exact system configuration including Firmware and BIOS versions, system memory configuration, RAID configuration, and configuration of other adapters in the system.
- List the steps to reproduce the failure and include a history of the system, the simplest failure mode, and all troubleshooting completed.
- Provide a copy of all available logs.

## 4.2 How to Replace a Physical Drive

Do not attempt to replace an online drive if the virtual drive that the drive belongs to, is in a degraded or rebuild state.

If a spare drive is rebuilding and a second drive in the same RAID group reports errors such as Soft Bus errors, do not replace the second drive until the rebuild is complete. It is strongly recommended that you wait until the rebuild is completed before replacing the bad drive.

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**Note:** *Do not reuse failed drives that have been marked failed by the RAID controller.*

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To replace a physical drive, follow the steps below.

- Identify the drive that needs to be replaced. You can use the 'Locate Physical Drive' function under RAID Web Console 2 or RAID BIOS Console to identify the drive.
- Before replacing the drive, it is recommended that you use RAID Web Console 2 or RAID BIOS Console to determine the state of the physical drive and the virtual disk group that the drive belongs to. Do not replace a drive if the virtual disk group that the drive belongs to is degraded or rebuilding. Call technical support if you are unsure.
- When replacing a commissioned hot-spare drive, it is strongly recommended to wait until the rebuild is completed. After the rebuild completes and the virtual drive is optimal, add a new hot-spare drive and use the 'Make Global/Dedicated Hot spare' function under RAID Web Console 2 or RAID BIOS Console to add that drive as a hot-spare drive.
- Before removing a drive that is in the Unconfigured Good state, use the 'Prepare For Removal' function under RAID Web Console 2 or RAID BIOS Console, and then pull out the physical drive. Then a new physical drive can be inserted.

## 4.3 Questions and Answers

Table 1. Common Problems and Solutions

Problem	Possible Causes	Action
<b>RAID controller not detected by the OS management Utility or detected during POST</b>	RAID controller is not seated properly.	Reseat controller.
	Bad memory on controller.	Replace memory (if configurable).
	Bad controller.	Replace controller.
<b>Virtual Disk Drive Degraded</b>	Physical drive marked failed.	Check cables for proper installation, type, and length. Check cable routing, reseat cable connectors.
		Update hard disk drive firmware.
		Update enclosure firmware.
	Update RAID controller firmware.	
	Physical drive failed.	Replace failed drive.
<b>Virtual Disk Drive Offline</b>	Multiple drives marked failed.	Check cables for proper installation, type, and length. Check cable routing, reseat cable connectors.
		Check drive power.
		Check enclosure, reseat drives.
	Caution: It may not be possible to recover from this condition. Contact Intel Support or try to mark drives online and replace failed drives one at a time.	
	Multiple Physical Drives failed.	Caution: It may not be possible to recover from this condition. Contact Intel Support or try to mark drives online and replace failed drives one at a time.
<b>Physical Drive Failed</b>	Power failure.	Check power supply and power connections.
	Bus Noise.	Check cables for proper installation, type, and length. Check cable routing, reseat cable connectors.
	Physical Drive Failed.	Replace failed drive.
<b>Data bus or device timeout error</b>	Cable improperly seated or pins are bent.	Check SAS/SATA cable for proper installation, type, and length. Check cable routing, reseat cable connectors, and check cable for bent pins. Replace if faulty.
	Cables are not speed compatible or do not meet signal integrity specifications.	Replace cables.
<b>Write Compare Errors</b>	Failing Controller.	Replace controller.
	Failing Hard drive.	Replace hard drive.
	Cabling problem.	Review cabling type and layout, check for bent pins, and reseat cables.
	Firmware problem.	Review the firmware versions for the RAID controller, hard drive set,

Problem	Possible Causes	Action
		enclosure, and server board and update accordingly.
<b>Grown Defects and Bad Block Redirection Errors</b>	Failing hard disk drive.	Replace hard drive.

## 4.4 FAQ

Table 2. Physical Drive Related Events and Messages

Message	Description
WARNING: Removed: PD 08(e1/s0)	Check the cable, power connection, backplane, SATA/SAS port, and the hard drive, to find out why the specific physical drive is plugged out.
WARNING: Error on PD 09(e1/s1) (Error f0)	A firmware error was detected on the specific physical drive.
WARNING: PD missing: SasAddr=0x0, ArrayRef=1, RowIndex=0x1, EnclPd=0x0e, Slot=3	Check the cable, power connection, backplane, SATA/SAS port, and the hard drive, to find out why the specific Physical drive is plugged out.
WARNING: PDs missing from configuration at boot	Check the cable, power connection, backplane, SATA/SAS port, and the hard drive, to find out why the specific Physical drive is plugged out during POST.
WARNING: Predictive failure: PD 0d(e1/s3)	The specific physical drive reported a predictive failure caution through the SMART function. Please refer to Section 4.2'How to Replace a Physical Drive' and replace the drive.
WARNING: Enclosure PD 0e(e1/s255) temperature sensor 0 differential detected	A specific physical drive's temperature changed. The environment temperature may be too hot. Check the cooling system and system fan to make sure they are functioning.
WARNING: Consistency Check inconsistency logging disabled on VD 00/0 (too many inconsistencies)	The specific virtual disk contains inconsistent data. The messages might appear before the full background initialization is completed. For example, after a fast initialization or an online expansion reconstruction, the background full initialization will automatically start. If you run the check consistency option before it is completed, you will see this message. If the message appears after the full initialization, check to see if the system has shutdown unexpectedly in the past.
WARNING: Controller ID: 0 Unexpected sense: PD 0d(e1/s3), CDB: 2f 00 00 69 00 00 00 80 00 00, Sense: 70 00 03 00 00 00 00 0a 00 00 00 00 14 01 00 00 00 0	A specific physical drive failed to handle the SCSI Command defined in the CDB strings. Check the sense code and additional debug information to see why the SCSI Command fails. If the issue is related to a bad block, replace the drive with a new drive. Refer to the <i>Intel® RAID Controller SAS-SATA Logged Alert Decode</i> white paper for more information on the meaning of unexpected sense codes returned by SAS/SATA RAID devices attached to an Intel® RAID Controller using the SAS software stack.
CRITICAL: VD 00/0 is now DEGRADED	A specific physical drive failed. Check the cable, power connect backplane, SATA/SAS port, and the hard drive. Fix the problem and then rebuild the array as soon as possible.
CRITICAL: Rebuild failed on PD 09(e1/s1) due to target drive error	A specific physical drive failed. Check the cable, power connection, backplane, SATA/SAS port, and the hard drive. Fix the problem and then rebuild the array as soon as possible.
FATAL: VD 00/0 is now OFFLINE	A specific physical drive failed. Check the cable, power connection, backplane, SATA/SAS port, and make sure the hard drive is installed and connected correctly..

Table 3. BBU Related Events and Messages

<b>Message</b>	<b>Description</b>
WARNING:BBU disabled; changing WB virtual disks to WT	The BBU is not connected or is not fully charged. You can still use the Bad BBU mode under RAID Web Console 2 to enable Write Back mode on Virtual disks. Unexpected power failure may cause data loss. Wait until the BBU is fully charged before rebooting the system. If the WB mode was enabled before the charge, then after the BBU is fully charged it will be automatically re-enabled.
WARNING: Battery requires reconditioning; please initiate a LEARN cycle	Use RAID Web Console 2 or RAID BIOS Console to initiate a Battery Backup Unit Re-Learn cycle.
FATAL: Controller cache discarded due to memory/battery problems	The issue occurs when Write Back mode is enabled but the BBU is not fully charged, or if the system lost power for more than 72 hours. Check the BBU status to see if the BBU should be charged or replaced.

## Appendix A: PD Related RAID Event Annotation

The following table lists the Intel® RAID Web Console 2 PD related event log messages

Num	Type	Description	Indication	Actions
50	F	Background Initialization detected uncorrectable multiple medium errors (%s at %lx on %s)	B	1,2,3,4
51	C	Background Initialization failed on %s	A,	2,3
60	F	Consistency Check detected uncorrectable multiple medium errors (%s at %lx on %s)	F, D	1,2,3,4
68	C	Initialization failed on %s	N/A	1,2,3,4
75	F	Reconstruction of %s stopped due to unrecoverable errors	N/A	3,1,2,4
76	F	Reconstruct detected uncorrectable multiple medium errors (%s at %lx on %s at %lx)	E,	1,3
95	F	Patrol Read found an uncorrectable medium error on %s at %lx	F, D	3,1,2,4
96	W	Predictive failure: %s	L	7
97	F	Puncturing bad block on %s at %lx	G	6
101	C	Rebuild failed on %s due to source drive error	A,	3,5
102	C	Rebuild failed on %s due to target drive error	A,	3,5
108	F	Reassign write operation failed on %s at %lx	G	6
109	F	Unrecoverable medium error during rebuild on %s at %lx	F,D,	3,1,2,4
111	F	Unrecoverable medium error during recovery on %s at %lx	F,D,	3,1,2,4
196	W	Bad block table on %s is 80% % full	H	7
197	F	Bad block table on %s is full; unable to log block %lx	I	8
236	W	%s is not a certified drive	N/A	9, 10
238	W	PDs missing from configuration at boot	N/A	3
254	W	VD %s disabled because RAID-5 is not supported by this RAID key	J	11
257	W	PD missing: %s	N/A	3
269	W	VD bad block table on %s is 80% % full	H	7
270	F	VD bad block table on %s is full; unable to log block %lx (on %s at %lx)	I	8
271	F	Uncorrectable medium error logged for %s at %lx (on %s at %lx)	G	1
273	W	Bad block table on %s is 100% full	H	7
274	W	VD bad block table on %s is 100% full	H	7
282	C	CopyBack failed on %s due to source %s error	A	3,5
301	W	Microcode update timeout on %s	K	10
302	W	Microcode update failed on %s	K	10
312	W	Drive security key, re-key operation failed	N/A	12
313	W	Drive security key is invalid	N/A	12
315	W	Drive security key from escrow is invalid	N/A	12
322	F	Security subsystem problems detected for PD %s	N/A	12
328	W	Drive security key failure, cannot access secured configuration	N/A	12
329	W	Drive security pass phrase from user is invalid	N/A	12

**Type**

W=Warning, C=Critical, F=Fatal, D=Dead

**Indication / possible causes**

- A) A specific physical drive failed.
- B) This is likely a hard drive issue.
- C) This is likely a cable connection / backplane / vibration issue.
- D) The messages might appear before the full background initialization is completed, or if drives have errors.
- E) The specific virtual disk failed due to medium errors.
- F) If multiple hard drives are impacted, it's more likely a cable connection / backplane / vibration issue. If single hard drive is impacted, it's more likely a hard drive issue.
- G) RAID firmware detected bad block (medium error) on specific Physical Drive and tried to recover the block.
- H) Certain hard disk(s) drive(s) may have excessive bad blocks and may fail.
- I) Certain hard disk drive(s) already has (have) too many bad blocks and is(are) failed.
- J) The virtual drive for this RAID level was created previously but disabled now due to no RAID key present or the RAID key doesn't support this RAID level.
- K) The physical drive firmware update failed.
- L) The specific physical drive reported a predictive failure caution through the SMART function.

**Suggested actions**

- 1) Verify if a hard drive firmware update is available, or if the hard drive needs to be replaced due to medium error.
- 2) Update the RAID controller firmware to the latest version.
- 3) Check the cable, power connection, backplane, SATA/SAS port, and make sure the hard drive is installed and connected correctly.
- 4) If the problem still exists, get RAID log, contact Intel technical support for help.
- 5) Fix the problem and then rebuild the array as soon as possible.
- 6) Keep monitoring the specific Physical Drive and replace it if possible.
- 7) Replace this hard disk drive(s) with known good drive(s).
- 8) The hard disk drive(s) must be replaced with good one(s) immediately.
- 9) Check to see if the hard disk drive is a qualified drive for the RAID controller.
- 10) Check to see there is a hard disk drive firmware update available. May need to check the firmware or update it with the drive connected to a controller in Non-RAID mode. .
- 11) Install a correct RAID key to re-enable this RAID level.
- 12) Check to use correct security key / password or to use proper settings for physical drive(s).

## Appendix B: VD Related RAID Event Annotation

The following table lists the Intel® RAID Web Console 2 VD related event log messages

ID	Type	Description	Indication	Actions
61	C	Consistency Check failed on %s	A,	N/A
62	F	Consistency Check completed with uncorrectable errors on %s	A,	N/A
64	W	Consistency Check inconsistency logging disabled on %s (too many inconsistencies)	A, B,	1,2,3,4
79	F	Reconstruction resume of %s failed due to configuration mismatch	C,	N/A
83	C	Clear failed on %s (Error %02x)	D,	3,2
239	W	VDs missing drives and will go offline at boot: %s	E,	3
240	W	VDs missing at boot: %s	F,	3
241	W	Previous configuration completely missing at boot	G,	3
250	W	%s is now PARTIALLY DEGRADED	H,	3, 5
251	C	%s is now DEGRADED	I,	3,5
252	F	%s is now OFFLINE	K,	3
255	W	VD %s disabled because RAID-6 is not supported by this controller	J	6
256	W	VD %s disabled because SAS drives are not supported by this RAID key	J,	6
262	W	Global affinity Hot Spare %s commissioned in a different enclosure	M,	N/A
292	W	Patrol Read can't be started, all VD's have active processes	N,	N/A
296	F	Controller cache discarded for missing or offline %s	L,	3, 7
323	F	Controller cache pinned for missing or offline %s	L,	N/A
324	F	Controller cache pinned for missing or offline VD's %s	L,	N/A
327	W	Consistency Check started on an inconsistent VD %s	A,	N/A

### Type

W=Warning, C=Critical, F=Fatal, D=Dead

### Indication / possible causes

- A) The specific virtual disk contains inconsistent data. The messages might appear before the full background initialization is completed.
- B) After a fast initialization or an online expansion reconstruction, the background full initialization will automatically start. The message may appear if the check consistency option is run before it is completed.
- C) This might happen if the specific virtual disk configuration has been changed before reconstruction resumes.
- D) Clearing a virtual disk configuration has failed.
- E) Some physical drives are missing which will result in virtual disk offline during next system reboot.
- F) Some physical drives are missing which result in virtual disks missing during system reboot.
- G) All physical drives in all virtual disks are missing.
- H) A specific physical drive which belongs to RAID 6 array has failed, which makes the specific virtual disk partially degraded.
- I) A specific physical drive failed, which makes an array degraded.
- J) The virtual drive of this RAID level was created previously but is disabled now due to no RAID key present or the RAID key doesn't support this RAID level.
- K) Several physical drives failed which make the virtual disk failed/offline.
- L) Some cached data cannot be written back to a failed/offline virtual disk.

- M) Global affinity hot spare usually is for a virtual disk in the same enclosure. This log could be recorded if action is planned to commission the Global affinity Hot Spare in a different enclosure.
- N) Patrol Read can't be started, as PDs are either not ONLINE, or are in a virtual drive with an active process, or are in an excluded VD

**Suggested actions**

- 1) If the message appears after the full initialization, check to see if the system has shutdown unexpectedly in the past.
- 2) Update the RAID controller firmware to latest version.
- 3) Check the cable, power connection, backplane, SATA/SAS port, and make sure the hard drive is installed and connected correctly.
- 4) If problem still exists, get the RAID log; contact Intel technical support for help.
- 5) Fix the problem and then rebuild the array as soon as possible.
- 6) Install a correct RAID key to re-enable the needed RAID level.
- 7) Check if the virtual disk can be detected.

## Appendix C: BBU Related RAID Event Annotation

The following table lists the Intel® RAID Web Console 2 BBU related event log messages.

Num	Type	Description	Indication	Actions
2	F	Unable to recover cache data from TBBU	A,B	1
10	F	Controller cache discarded due to memory/battery problems	A,B	1
11	F	Unable to recover cache data due to configuration mismatch	A,B,C	1
146	W	Battery voltage low	N/A	1,2
162	W	Current capacity of the battery is below threshold	B	1,2
150	F	Battery needs replacement - SOH Bad	D	1,2
154	W	Battery relearn timed out	D	1,2
161	W	Battery removed	D	1,2
200	C	Battery/charger problems detected; SOH Bad	D	1,2
211	C	BBU Retention test failed!	G	1,2
142	W	Battery Not Present	N/A	1,2
253	W	Battery requires reconditioning; please initiate a LEARN cycle	N/A	3
307	W	Periodic Battery Relearn is pending. Please initiate manual learn cycle as Automatic learn is not enabled	H	3
195	W	BBU disabled; changing WB to WT	E, F	4, 5
330	W	Detected error with the remote battery connector cable	N/A	6

### Type

F= Fatal. W=Warning. C=Critical.

### Indication

- A) Sudden power loss or system hang, when BBU is not fully charged and Write Back mode is forcefully enabled
- B) The extended power loss to the system has resulted in the BBU being thoroughly discharged before power recovery.
- C) The specific virtual drive configuration may have changed, so that previous virtual drive information cannot be recovered from BBU data
- D) BBU failure or it is installed or connected incorrectly.
- E) BBU not connected or not fully charged.
- F) If WB mode was enabled before BBU charge, then it will be automatically re-enabled after the charge
- G) BBU not able to keep cache data long enough during system power off.
- H) The battery requires a relearn cycle to re-calibrate itself.

### Action

- 1) Check the BBU status to see if the BBU should be charged or replaced.
- 2) Check the cable, power connection, backplane, SATA/SAS port, and make sure the BBU is installed and connected correctly.
- 3) Use RAID Web Console 2 or RAID BIOS Console to initiate a battery re-learn cycle.
- 4) Wait until the BBU is fully charged before rebooting the system.
- 5) WB can still be used through Bad BBU mode under RAID Web Console 2 but unexpected power failure may cause data loss.
- 6) Check if the remote battery connector cable is properly connected and functional.

## ***Appendix D: Reference Documents***

Refer to the following documents for additional information:

- *Intel® RAID Controller Command Line Tool 2 User Guide, Version 1.0.*
- *Intel® RAID Controller SAS-SATA Logged Alert Decode, Version 1.0*