Technical Information Document

COE
Servers

Document Title:	LSI SAS Card and BBU error / BBU calibration Troubleshoot BBU issues
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Product Class:	Servers

Product and Version:	RAID SAS LSI Controller:
	    1068 based: 8300XLP, 8408E, 8480E, ROMB of R840
	    1078 based: 8704ELP, 8708EM2, ROMB of R480 E1

## Symptoms / Facts

Example of error on POST

```
LSI MegaRAID SAS-MFI BIOS Version MT25 (Build March 06, 2006)
Copyright(c) 2006 LSI Logic Corporation

HA -0 (Bus 4 Dev 14) MegaRAID SAS 8408E
FW package: 5.0.1-0033

Your battery is bad or missing, and you have VDs configured for write-back
mode.  Because the battery is not usable, these VDs will actually run in
write-through mode until the battery is replaced.
The following VDs are affected: 00
Press any key to continue.

1 Logical Drive(s) found on the host adapter.
1 Logical Drive(s) handled by BIOS
Press <Ctrl><H> for WebBIOS
```

Example of error on operation system (MegaRAID Storage Manager on Windows)
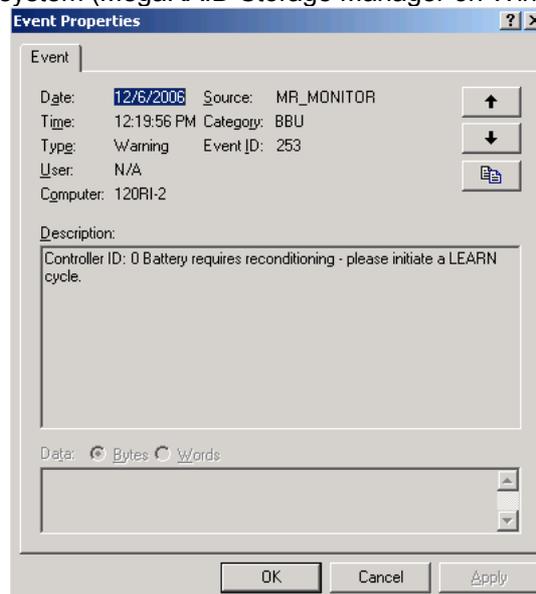
What's calibration ? (Autolearn)

Before a battery backup unit (BBU) could be used, it has to be calibrated. The controller will not use the BBU until the calibration is done and as a consequence it will disable WriteBack cache on any logical drive for data integrity reason causing performance issue. Controller is enlightening this fact on POST.

The calibration is a process where the controller records battery discharging curve in order to know the battery autonomy, maximum and minimum voltages. It is split in three steps:
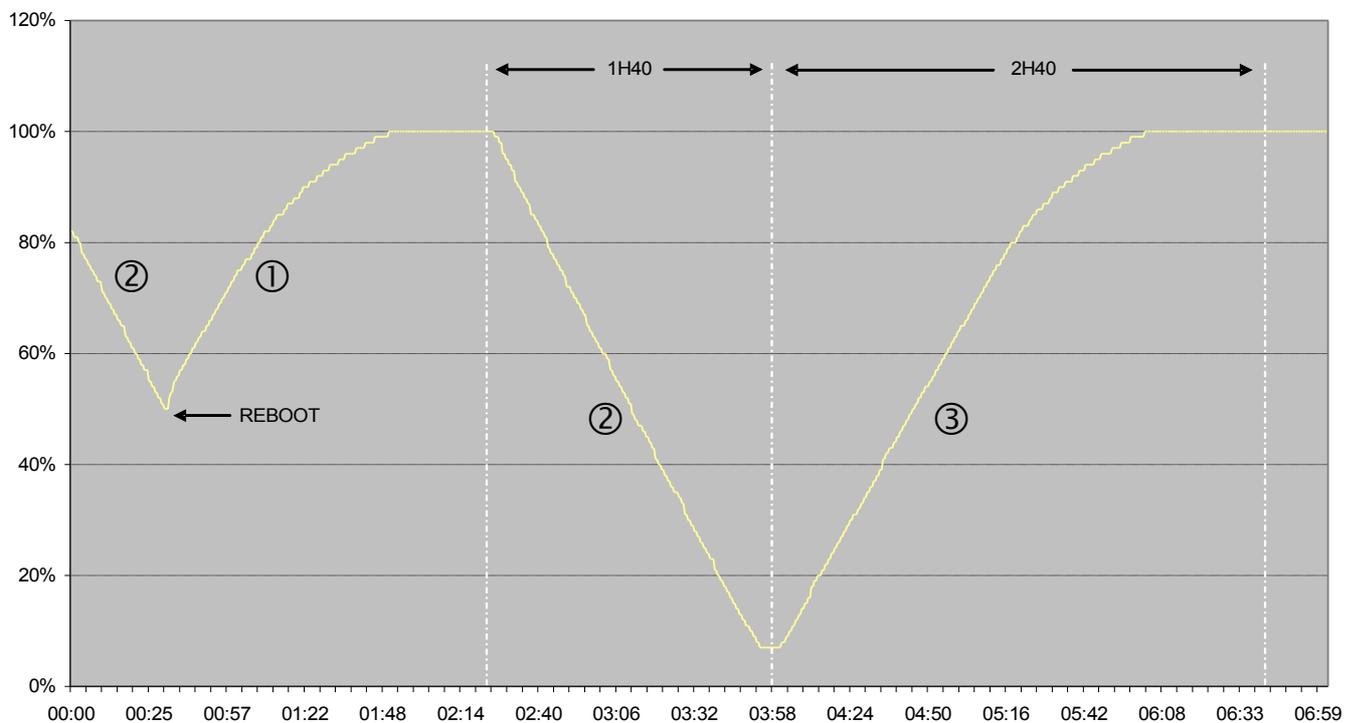
Step 1: Begin of calibration, controller loads BBU to maximum value.

Step 2: Controller discharges BBU.

Step 3: Controller recharges BBU, when maximum is reached, process is finished.

Note: If step 2 or step 3 are interrupted, learning process is stopped and will not restart.

BBU FULL CALIBRATION CYCLE

Exemple of calibration with BBU of 8708EM card

With LSI firmware, this calibration will start automatically after 30 days of battery function (in case of BBU upgrade or when installed directly in factory). This feature is called "Autolearn". As consequence this error message should disappear after this amount of time automatically.

EXCEPTION: on 8708EM2, "Autolearn" feature is disabled so far with current firmware.

Cause of BBU problem

1. Some versions of LSI SAS controller firmware have a bug about BBU calibration, version and card impacted:

Card	Impacted version	Good version
8300XLP	5.0.1-00.32 or less	5.1.1-0020 or more
8408E/8480E/ROM R480	5.0.1-00.53 or less	5.1.1-0054 or more
8708EM2	8.0.1-0020	8.0.1-0030 or more

2. Some versions of LSI SAS controllers doesn't calibrate BBU periodically. This is the case on 8708EM2 where "Autolearn" feature is disabled so far with current firmware

BBU Troubleshooting

1) If the card is impacted, flash your SAS controller with latest firmware (using BOOT_CD) refer to documentation coming with BOOT_CD ("relase notes" and "how to use")
2) Try to force a manual calibration of your BBU in order to find if there is a true failure, next chapter will explain how to do

✓ Forced calibration using MSM (Method valid for Windows,Linux (including VMWare)
✓ Forced calibration using URU
✓ Forced calibration using MegaCLI (Method valid for Windows, Linux (including VMWare)

Forced calibration using MSM (method valid for Windows, Linux and cards 8300XLP, 8408E, 8480E, 8704ELP, ROM of R480)
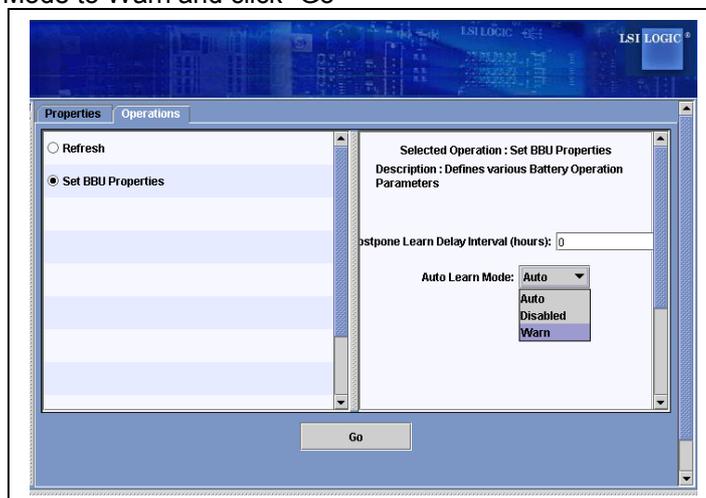
1. Log in to MSM, open BBU properties (The next Learn Time "0Days" is a clue that a re-learn is required)
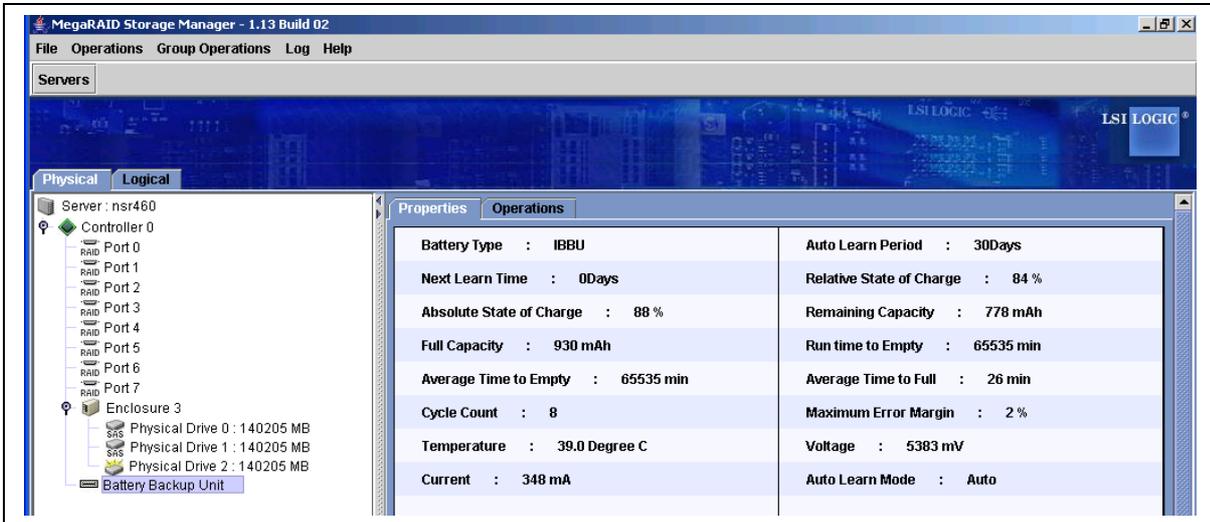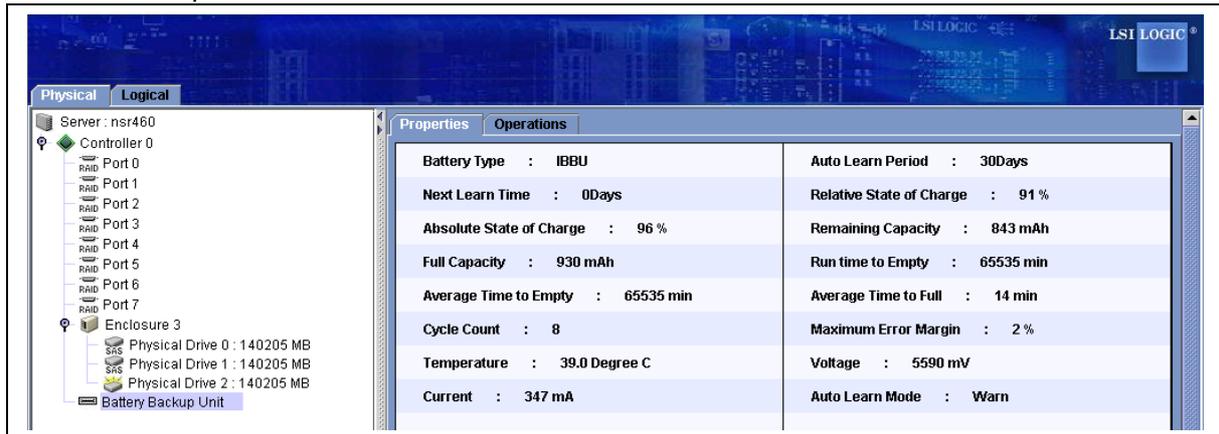

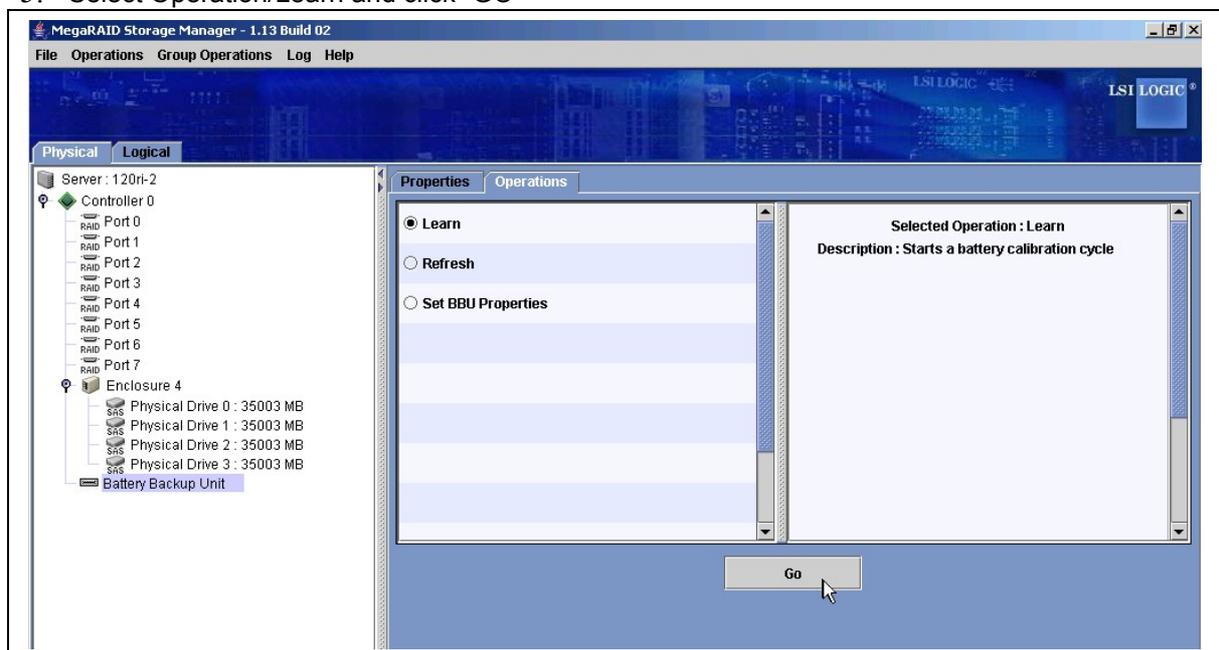2. Select Operations and click set BBU Properties, then click Go
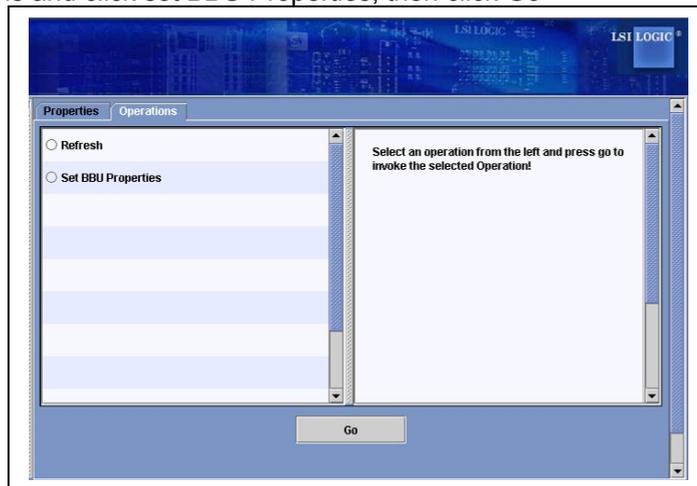
3. Set Auto Learn Mode to Warn and click "Go"

4. Select Properties and check that Auto Learn is set to "Warn"

5. Select Operation/Learn and click "GO"

Note:

- Calibration process may take up to 8 hours
- Calibration process must not be interrupted, that's to say server should not be rebooted nor shut down otherwise learning cycle will be cancelled and will never restart itself.

6. Controller will let the battery discharge and the following events should appear in the Windows Event Log
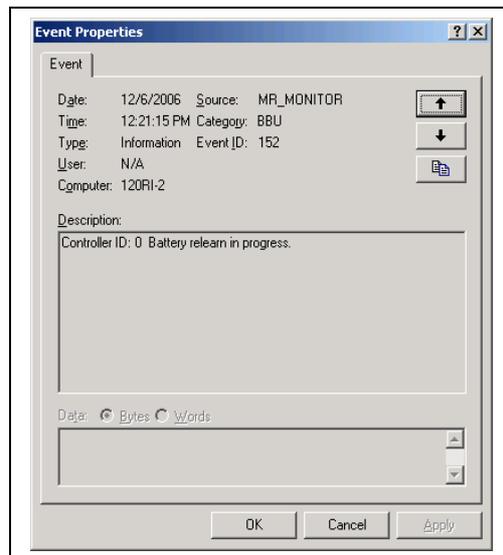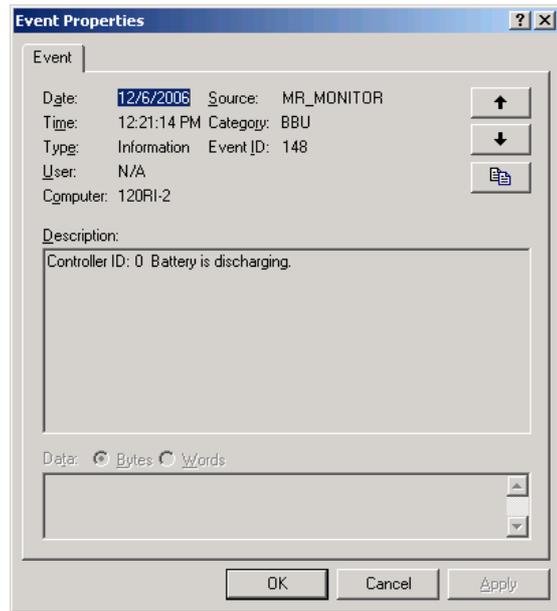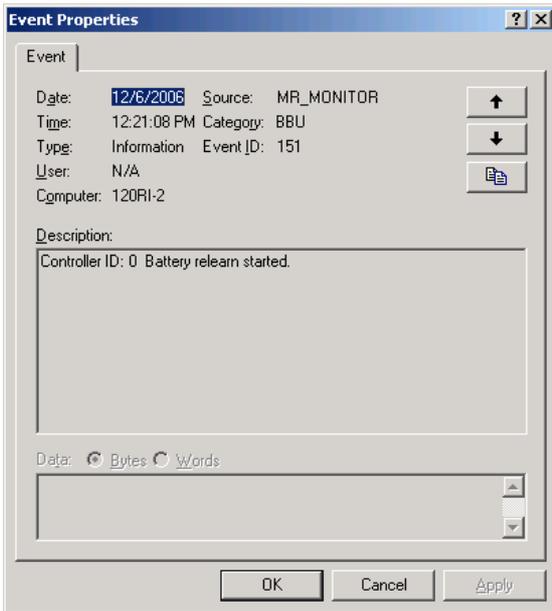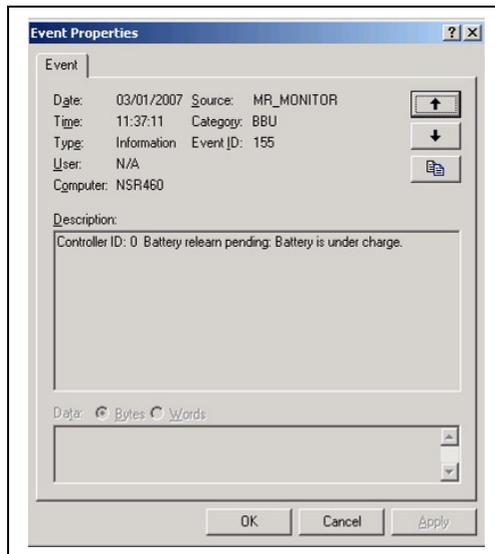

7. When the Re-Learn is finished, change the Auto Learn Mode to "Auto" using MSM. This will start another Re-Learn automatically. (see "Point 1)

8. If at any point this error message occurs, it is probably because the battery is not yet fully charged or a Re-Learn is already pending

NOTE: a Re-learn will start by fully charged the battery.

9. The windows log will usually say something like Re-Learn pending, battery under charge.

Event Properties

Event

Date: 03/01/2007 Source: MR_MONITOR
Time: 11:37:11 Category: BBU
Type: Information Event ID: 155
User: N/A
Computer: NSR460

Description:

Controller ID: 0 Battery relearn pending: Battery is under charge.

Data: ● Bytes ○ Words

[OK] [Cancel] [Apply]

10. When the battery is fully charged a reboot is sometimes required to stop the Re-Learn off. In following log Here we see the Battery has been charged and a Re-Learn started. The battery starts to discharge, and a Re-Learn is in progress.

Error Level	Date / Time	Description
Information	2007-01-03, 11:58:53	Controller ID: 0 Battery relearn in progress
Information	2007-01-03, 11:58:53	Controller ID: 0 Battery is discharging
Information	2007-01-03, 11:57:49	Controller ID: 0 Policy change on VD 1 Previous = Current Write Policy: Write Back Current = Current Write Policy: Write Through
Information	2007-01-03, 11:57:49	Controller ID: 0 Policy change on VD 0 Previous = Current Write Policy: Write Back Current = Current Write Policy: Write Through
Warning	2007-01-03, 11:57:49	Controller ID: 0 BBU disabled; changing WB logical drives to WT
Information	2007-01-03, 11:57:48	Controller ID: 0 Battery relearn started
Information	2007-01-03, 11:57:48	Controller ID: 0 Battery charge complete

Displaying log from server

11. BBU discharge can be monitored by MSM

Forced calibration using URU

So far, URU doesn't offer any way to calibrate BBU, refer to calibration method using Megacli.

Forced calibration using MegaCLI (Method valid for Linux, Windows and cards 8300XLP, 8480E, 8408E, 8704ELP, 8708EM2 and ROM of R480/R480 E1)

Note:
   - For 8300XLP, 8480E, 8408E, 8704ELP and ROM of R480, the "Autolearn" mode has to be switched from "Auto" to "Warn" mode. It can be done using WebBIOS SETUP as follow (go to point 1)
   - For other cards, go directly to step 3 because "Autolearn" is not enablable in this firmware.

1. Press CTRL+H during POST.
2. Adapter Properties > Next > Battery Backup <u>Present</u>:> AutoLearn mode "Auto" => "Warn".
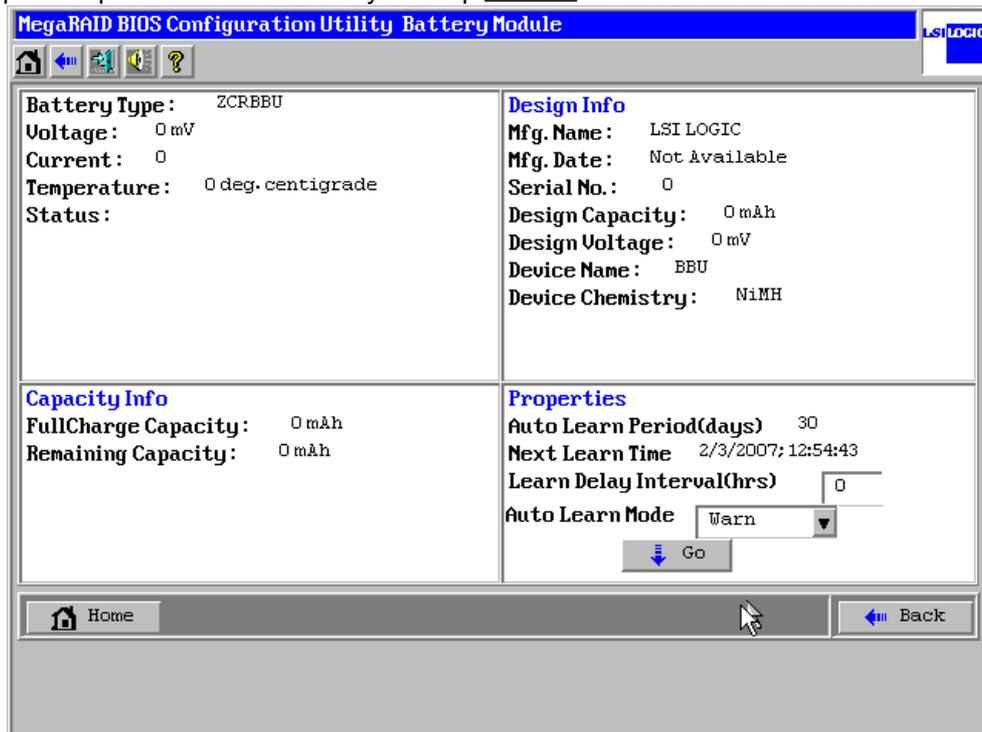
3. The calibration process can be run using MegaCLI utility which is available on LSI web site: http://www.lsi.com/storage_home/products_home/internal_raid/megaraid_sas/value_line/megaraid_sas_8708em2/index.html?remote=1&locale=EN#Miscellaneous

4. The following command line will run a calibration process:
MegaCli -AdpBbuCmd -BbuLearn –aX

Note:
   - In "-aX", X is the controller number starting from "0". In case of several controllers are present in the system, use the following command to know each controller number:
MegaCli -AdpAllInfo –aALL
   It is important to identify properly the controller in order not to impact both disk system.
   - Calibration process may take up to 8 hours
   - Calibration process must not be interrupted, that's to say server should not be rebooted nor shut down otherwise learning cycle will be cancelled and will never restart itself.

5. The proper execution of the process can be checked by reading log on the card with the following command

MegaCli -AdpEventLog -GetSinceReboot -f LOGSAS.TXT -aX

Note: Log has to be saved into a file, it means last command must be run from location with write access.

Example of log when "Learn" process started properly:

seqNum: 0x000003cc
Time: Tue Jan 2 11:01:33 2007

Code: 0x00000098
Class: 0
Locale: 0x08
Event Description: Battery relearn in progress
Event Data:
===========
None

seqNum: 0x000003cd
Time: Tue Jan 2 11:01:33 2007

Code: 0x00000094
Class: 0
Locale: 0x08
Event Description: Battery is discharging
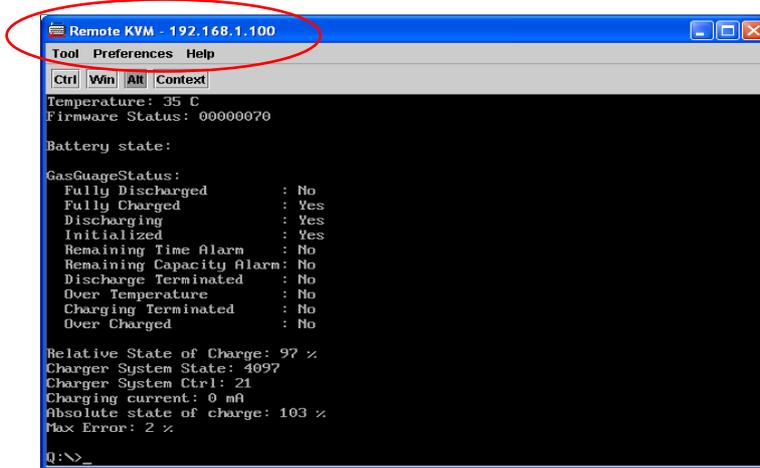**Event Data:**
===========
None

The "Learn" process is finished successfully when the following event appear in log.

seqNum: 0x000005b5
Time: Thu Jan 4 12:54:43 2007

Code: 0x00000099
Class: 0
Locale: 0x08
Event Description: Battery relearn completed
Event Data:
===========
None

Or also by using following command

MegaCli –AdpBbuCmd –GetBbuStatus –aX (with X as card number)

"Firmware Status" must be 00000020
Note: firmware status value is reseted to 00000000 after a reboot.

6. For 8300XLP, 8480E, 8408E, 8704ELP and ROM of R480, controller has to be switched back to Autolearn mode to "auto". It can be done only using WebBIOS.

Notice a new calibration process will occur. BBU will be usable only when the cycle will be finished and when BBU will be fully charged again.

BBU Status / BBU properly qualibrated ?

The status of the BBU can be done by typing:

MegaCli –AdpBbuCmd –GetBbuStatus –aX

```
Temperature: 35 C
Firmware Status: 00000070

Battery state:

GasGuageStatus:
  Fully Discharged        : No
  Fully Charged           : Yes
  Discharging             : Yes
  Initialized             : Yes
  Remaining Time Alarm    : No
  Remaining Capacity Alarm: No
  Discharge Terminated    : No
  Over Temperature        : No
  Charging Terminated     : No
  Over Charged            : No

Relative State of Charge: 97 %
Charger System State: 4097
Charger System Ctrl: 21
Charging current: 0 mA
Absolute state of charge: 103 %
Max Error: 2 %

Q:\>_
```

Note: this command is valid only for 8408E, 8480E, 8704ELP, 8708EM2 because only BBU of those cards are able to monitor BBU status. This command is not valid for 8300XLP card

A BBU is considered has properly calibrated when
- Field "Initialized" is set at "Yes" => it is the case after the first calibration.
- No calibration pending.
- "Absolute state of charge" is over a certain level depending of BBU model and cache size. (around 80%)

BBU and Write cache

Write back can be enabled in reliable way when BBU is properly calibrated (see previous part). When you are in this situation, LSI SAS offer the possibility to enable WriteBack on all LD. Use the following command

MegaCli -LDSetProp -WB -Lall -aX
MegaCli -LDSetProp -NoCachedBadBBU -Lall –aX

Write back can also be enabled whatever the BBU status or even when no BBU is populated. When doing this, keep in mind that UPS is required to secure data. If no UPS is used, there is no absolutely no warranty of data protection. Command line is the following

MegaCli -LDSetProp -WB -Lall -aX
MegaCli -LDSetProp -CachedBadBBU -Lall –aX

Document owner: COE Servers
Applies to: Any server where LSI SAS card qualified