Technical Information Document



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Document Revision:	 (for MegaCLI command) (for AutoLearn mode) (for firmware update) (for another firmware update) (more documented calibration steps, add URU info and update for 8708EM/8704ELP) additional info on charge curve and how to confirm completed learn cycle
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 BIDS 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)

rene rrope	ues				<u></u>
Event					
D <u>a</u> te: Ti <u>m</u> e: Typ <u>e</u> : <u>U</u> ser: C <u>o</u> mputer:	12/6/2006 12:19:56 PM Warning N/A 120RI-2	<u>S</u> ource: Catego <u>r</u> y: Event <u>I</u> D:	MR_MONITOR BBU 253		 ↑ ↓ □
<u>D</u> escription	n:				
cycle.	iv: u Battery n	equires rec	onditioning - pleas	e initiate a L	LAHN
Data: 📀	Bytes C 🔟a	ords			
					×
		0	IK Car	ncel	Apply

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

	South and the LSUGGE of LSU LOGIC
Properties Operations	
 Refresh Set BBU Properties 	Select an operation from the left and press go to invoke the selected Operation!
	Go

3. Set Auto Learn Mode to Warn and click "Go"



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

Physical Logical		LSI LOCIC
Server : nsr460	Properties Operations	2
	Battery Type : IBBU	Auto Learn Period : 30Days
- RAD Port 1	Next Learn Time : 0Days	Relative State of Charge : 91 %
RAID Port 3	Absolute State of Charge : 96 %	Remaining Capacity : 843 mAh
RAID Port 5	Full Capacity : 930 mAh	Run time to Empty : 65535 min
- RAID Port 6 - RAID Port 7	Average Time to Empty : 65535 min	Average Time to Full : 14 min
♥-	Cycle Count : 8	Maximum Error Margin : 2 %
- See Physical Drive 0 140205 MB	Temperature : 39.0 Degree C	Voltage : 5590 mV
 Physical Drive 2 : 140205 MB Battery Backup Unit 	Current : 347 mA	Auto Learn Mode : 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

Event Properties	? ×	Event Properties	<u> </u>
Event		Event	
Date: <u>12/6/2006</u> Source: MR_MONITOR Time: 12:21:08 PM Category: BBU Typ <u>e</u> : Information Event ID: 151 User: N/A Computer: 120RI-2		Date: 12/5/2005 Source: MR_MONITOR Time: 12:21:14 PM Category: BBU Type: Information Event [D: 148 User: N/A Image: Computer: 12:0RI-2 Event [D: 148	
Description: Controller ID: 0 Battery relearn started.		Description: Controller ID: 0 Battery is discharging.	
Dața: © Bytes C Words		Data: © Bytes © Words]
OK Cancel	Apply	OK Cancel Apply	
	Event Properties Event Dgte: 12/6/2006 Source: Time: 12.21:15 PM Category: Type: Information Event ID: User: N/A Computer: 120RI-2 Description: Controller ID: 0 Battery relearning Data: © Bytes C Words	MR_MONITOR BBU 152	

- 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.

vent Date: 03 Time: 11 Typg: Int User: N/ Computer: NS Description: Controller ID:	/01/2007 <u>9</u> :37:11 () ormation E (A ;R460 0 Battery re	≩ource: Category: Event [D:	MR_MONITOR BBU 155	 ★ ■
Date: 03 Time: 11 Typg: Ini User: N/ Computer: NS Description: Controller ID:	/01/2007 <u>\$</u> :37:11 (ormation E :R 460 0 Battery re	<u>S</u> ource: Category: Event [D:	MR_MONITOR BBU 155	+ +
Time: 11 Typ <u>e</u> : Ini User: N/ Computer: NS Description: Controller ID:	:37:11 (ormation E /A 6R460 0 Battery re	Category: Event [D:	BBU 155	+
Typ <u>e</u> : Ini User: N/ Computer: NS Description: Controller ID:	ormation E A R 460 O Battery re	Event ID:	155	 •
User: N/ Computer: NS Description: Controller ID:	A R460 O Battery re	learn nen	feer Patternie m	
C <u>o</u> mputer: NS <u>D</u> escription: Controller ID:	R460 0 Battery re	learn nen	fina: Dattanuia un	
Description: Controller ID:	0 Battery re	learn nen	fing: Pattern is u	
Controller ID:	0 Battery re	learn nen	fina: Dattanu is un	
Deta: @ Ro	les C Mar	40		
	VV UI	20		
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	and a second			<u>^</u>
				*

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	199
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	-
Dienlaving log	from server		

11. BBU discharge can be monitored by MSM

Server: nsr460 Controller 0 Server: nsr460 Controller 0 Server: nsr460 Controller 0 Server: nsr460 Controller 0 Server: nsr460 Serv	Physical Logical		
Proto Auto Learn Period : 30Days Port 1 Port 2 Port 2 Port 3 Port 5 Relative State of Charge : 93 % Port 6 Remaining Capacity : 369 mAh Port 7 Port 6 Port 7 Port 7 Port 8 Port 7 Port 9 Enclosure 3 Prepriot 0 Provide 0: 140205 MB Physical Drive 0: 140205 MB Temperature : 41.0 Degree C Physical Drive 1: 140205 MB Temperature : 41.0 Degree C Voltage : 5462 mV Current : -162 mA Current : -162 mA Auto Learn Mode : Auto Information 2007-01-03, 11:56:33 Controller 10: 0 Battery relearn in progress Information 2007-01-03, 11:56:33 Controller 10: 0 Battery relearn in progress Information 2007-01-03, 11:56:33 Controller 10: 0 Battery relearn in progress Information 2007-01-03, 11:56:33 Controller 10: 0 Battery relearn in progress Information 2007-01-03, 11:57:48 Controller 10: 0 Battery relearn in progress Information 2007	Server : nsr460	Properties Operations	
Fort 1 Next Learn Time : 0Days Relative State of Charge : 93 % Port 2 Port 3 Absolute State of Charge : 99 % Remaining Capacity : 869 mAh Run Time to Empty : 321 min Average Time to Empty : 321 min Average Time to Full : 65535 min Port 7 Prysical Drive 0 : 140205 MB Maximum Error Margin : 2% Voltage : 5462 mV Physical Drive 1 : 140205 MB Temperature : 41.0 Degree C Voltage : 5462 mV Physical Drive 2 : 140205 MB Current : -162 mA Auto Learn Mode : Auto Error Level Date / Time Controller ID: 0 Battery relearning regrees to the state of the progrees to the prog		Battery Type : IBBU	Auto Learn Period : 30Days
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Full Capacity: 930 mAh Run time to Empty: 321 min Average Time to Support 6 Average Time to Full : 65535 min Physical Drive 0: 140205 MB Maximum Error Margin : 2% Physical Drive 1: 140205 MB Temperature : 41.0 Degree C Voltage : 5462 mV Physical Drive 2: 140205 MB Temperature : -162 mA Auto Learn Mode :: Auto Physical Drive 2: 140205 MB Current :: -162 mA Auto Learn Mode :: Auto Current :: -162 mA Description Information 2007-01-03, 11:58:53 Controller ID: 0 Battery Backup Unit Description Information 2007-01-03, 11:57:49 Controller ID: 0 Battery Is discharging Information 2007-01-03, 11:57:49 Controller ID: 0 Battery relearn in progress Information 2007-01-03, 11:57:49 Controller ID: 0 Plotey change on VD Previous = Current Write Policy. Write Back Current = Current Write Policy. Write Through Variang 2007-01-03, 11:57:49 Controller ID: 0 Ploty change on VD Previous = Current Write Policy. Write Through	RAID Port 3	Absolute State of Charge : 99 %	Remaining Capacity : 869 mAh
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Enclosure 3 Cycle Count : 8 Maximum Error Margin : 2 % Physical Drive 1: 140205 MB Physical Drive 2: 140205 MB Temperature : 41.0 Degree C Voltage : 5462 mV Physical Drive 2: 140205 MB Current : -162 mA Auto Learn Mode : Auto Emperature : -162 mA Auto Learn Mode : Auto Import 2: 140205 MB Emperature : -162 mA Auto Learn Mode : Auto Import 2: 140205 MB Emperature : -162 mA Auto Learn Mode : Auto	- RAID Port 6	Average Time to Empty : 321 min	Average Time to Full : 65535 min
Temperature 140205 MB Physical Drive 1: 140205 MB Temperature 140.0 Degree C Voltage S 462 mV Current 162 mA Auto Learn Mode Auto Matter Current 162 mA Auto Matter Description Information 2007-01-03, 11:58:53 Controller ID: 0 Battery releam in progress Information 2007-01-03, 11:58:53 Controller ID: 0 Battery is discharging Current Write Policy: Write Back Current = 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 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 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 Information 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 BBU disabled; changi	P Inclosure 3 P Device Drive 0 : 140305 MD	Cycle Count : 8	Maximum Error Margin : 2 %
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Warning 2007-01-03, 11:57:48 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, 11:57:49 Control	lier ID: 0 Policy change on VD_0_Previous = Current Write Pr	olicy, while Back Current = Current Write Policy, Write Through
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	Warning 2007-01-03, 11:57:49 Control	lier ID: 0 BBU disabled: changing WB logical drives to WT	ener, this basic outent - outent which only, while through
Information 2007-01-03, 11:57:48 Controller ID: 0 Battery charge complete	Information 2007-01-03, 11:57:48 Control	ller ID: 0 Battery relearn started	
	Information 2007-01-03, 11:57:48 Control	ller ID: 0 Battery charge complete	

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 Present:> AutoLearn mode "Auto" => "Warn".

MegaRAID BIOS Configuration Utility Battery N	lodule Lsitoge
n 🐽 🗱 😢 💡	
Battery Type: 2CRBBU Voltage: 0mV Current: 0 Temperature: 0deg.centigrade Status:	Design Info Mfg. Name: LSI LOGIC Mfg. Date: Not Available Serial No.: 0 Design Capacity: 0 mAh Design Voltage: 0 mV Device Name: BBU Device Chemistry: NiMH
Capacity Info FullCharge Capacity: OmAh Remaining Capacity: OmAh	Properties Auto Learn Period(days) ³⁰ Next Learn Time ^{2/3/2007; 12:54:43} Learn Delay Interval(hrs) 0 Auto Learn Mode Warn V Go
Home	🔒 🗼 Back

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_870_8em2/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

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

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

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

Or also by using following command

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

🛱 Remote KVM - 192.168.1.10	0	
Tool Preferences Help		
Ctrl Win Alt Context		
Temperature: 35 C Firmware Status: 0000007	0	
Battery state:		
GasGuareStatus:		
Fully Discharged	: No	
Fully Charged	: Yes	
Discharging	: Yes	
Initialized	: Yes	
Remaining Time Alarm	: No	
Remaining Capacity Ala	rm: No	
Discharge Terminated	: No	
Over Temperature	: No	
Charging Terminated	: No	
Over Charged	: No	
Relative State of Charge Charger Sustem State: 40	97 %. 97	
Charger System Ctrl: 21		
Charging current: 0 mA		
Absolute state of charge	103 %	
Max Error: 2 %		

"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