



Shock and Vibration Test Report SBCs and Ethernet Switches

4/23/2024

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1 Introduction

This document provides a test report for shock and vibration tests performed on Diamond Systems' board-level products EPS-8130-XT, EPS-24G4X-HSP, Saturn, Jasper, and Gemini. The tests reported here were conducted on February 24-25, 2024 at Envitest Laboratories in Bangalore Electronics City, India: <https://www.envitestlab.com/about-us/>

A copy of the reference specification used for the testing may be found at the link below:

[MIL-STD-202H CONSOLIDATED 18APR2015.pdf](#)

The specific test methods used for this test are as follows:

Reference test Standard	MIL-STD-202H
Sine sweep vibration test specifications	Method 204, tested at x, y, z axis 10-57 Hz @ 0.06 inch pk-pk 57-2000Hz @ 10G Sweep rate: 7.5 Min/Sweep 2 Sweeps per axis
Random vibration test specifications	Method 214, Table-1, Test Condition A, B, C & D, tested at x, y, z axis Condition D- 11.95 Grms for 15min
Shock test specifications	Method 213, Condition J, tested at x, y, z axis Half sine waveform test, 30G, 11mSec, 3 shocks/direction

2 Test Sample and configuration details

Following describes the test configuration of each stack which is tested for shock and vibration test:

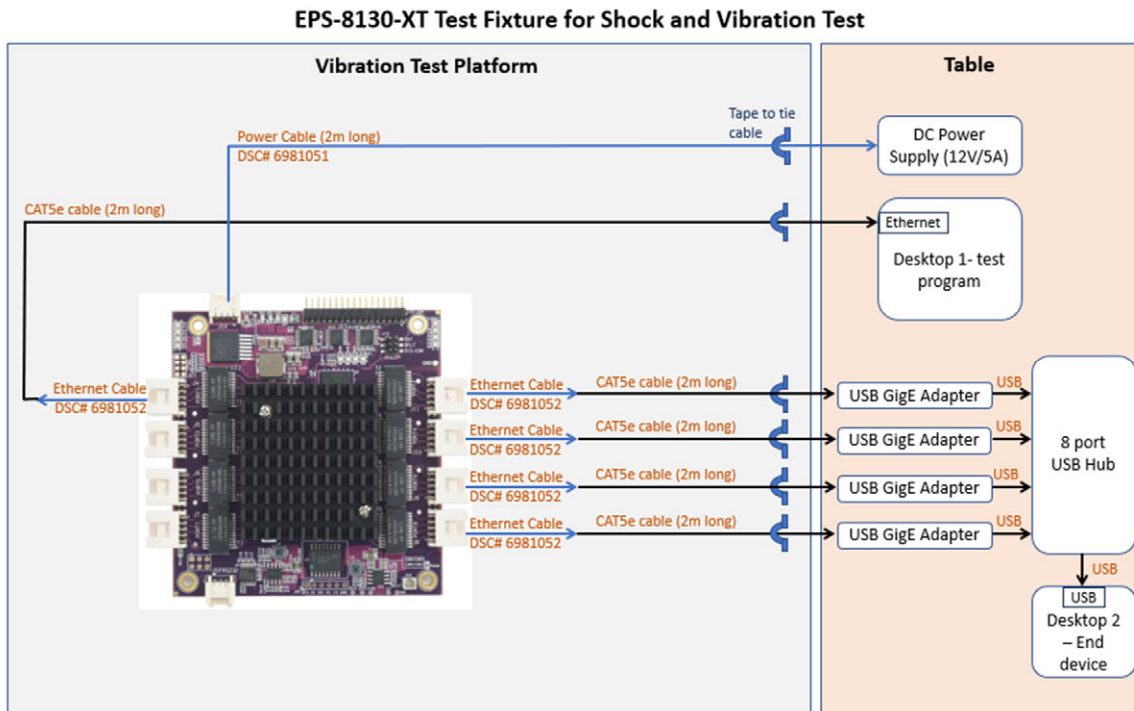
S. No	Stack name	Position	Part No.	Serial No.	Revision
1	EPS-8130-XT	Main Board	EPS-8130-XT	W577337	A
2	EPS-24G4X-HSP	Main Board	EPS-24G4X-HSP	W566727	A
		EPSM module	EPSM-10GX4	W578150	A
3	SATURN	Main Board	SAT-E3940-4GA	E510025	A
		M.2 socket	APM2T42SM22064GFN-6FTMW**	182213108270	NA
4	GEMINI	Main Board	GEM-1185GRE-32G	P300601	A
		M.2 socket	DEM24-64GDK1EW1DF-B270**	B0012312210130004	NA
		PCIe104 socket	E104-MPE-04	P300651	B
		MPE socket 1	DS-MPE-GE210	W573512	A
		MPE socket 2	DS-MPE-GE210	W573517	A
		MPE socket 3	DS-MPE-GE210	W582275	A
5	JASPER	Main Board	JSP-1185GRE-32G-02D	P300526	A
		Minicard 1	DS-MPE-SER4M	W508325	A
		M.2 socket	DEM24-A28DK1EW1DF-B270**	2CA22204130010001	NA
		PCIe104 socket	EMM-8E-XT	W575855	B

** Third party items

2.1 EPS-8130-XT

Epsilon-8130 is a managed Layer 2+ Ethernet switch module offering eight 10/100/1000Mbps copper twisted pair ports in the compact PC/104 form factor.

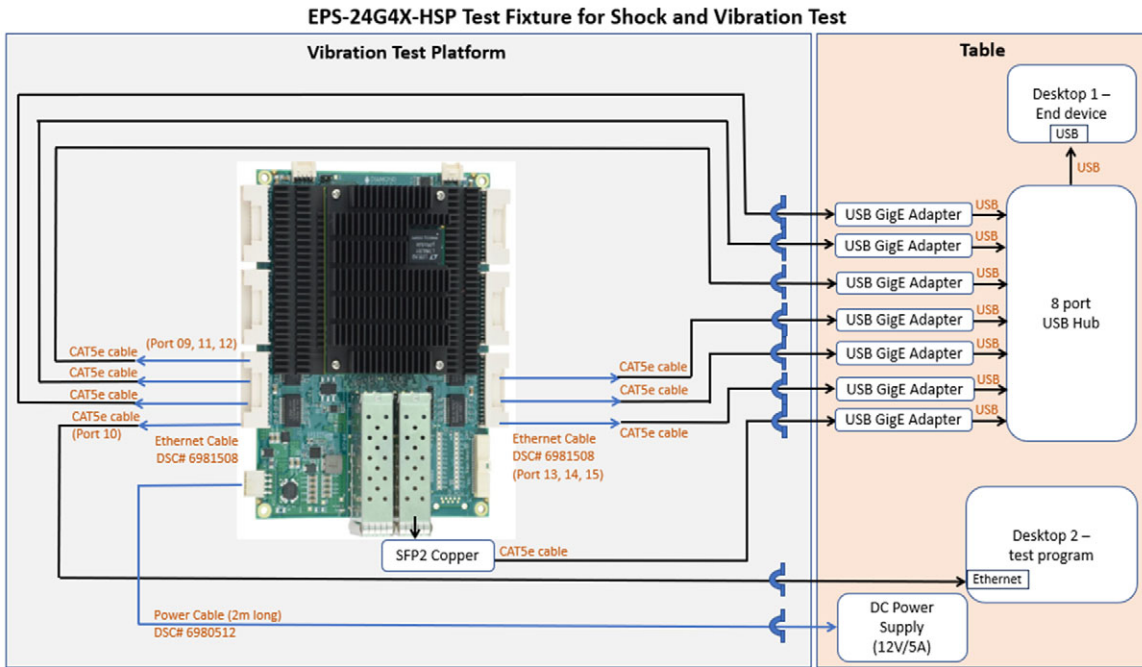
The following figure shows the EPS-8130-XT board test setup.



2.2 EPS-24G4X-HSP

The EPS-24G4X is a managed Ethernet switch based on Diamond's EPSM-10GX4 switch module. The switch implements all features of the EPSM-10GX4 module, including 24 10/100/1000Mbps copper ports and 4 1/2.5/5/10Gbps SFI ports accessed via SFP+ sockets.

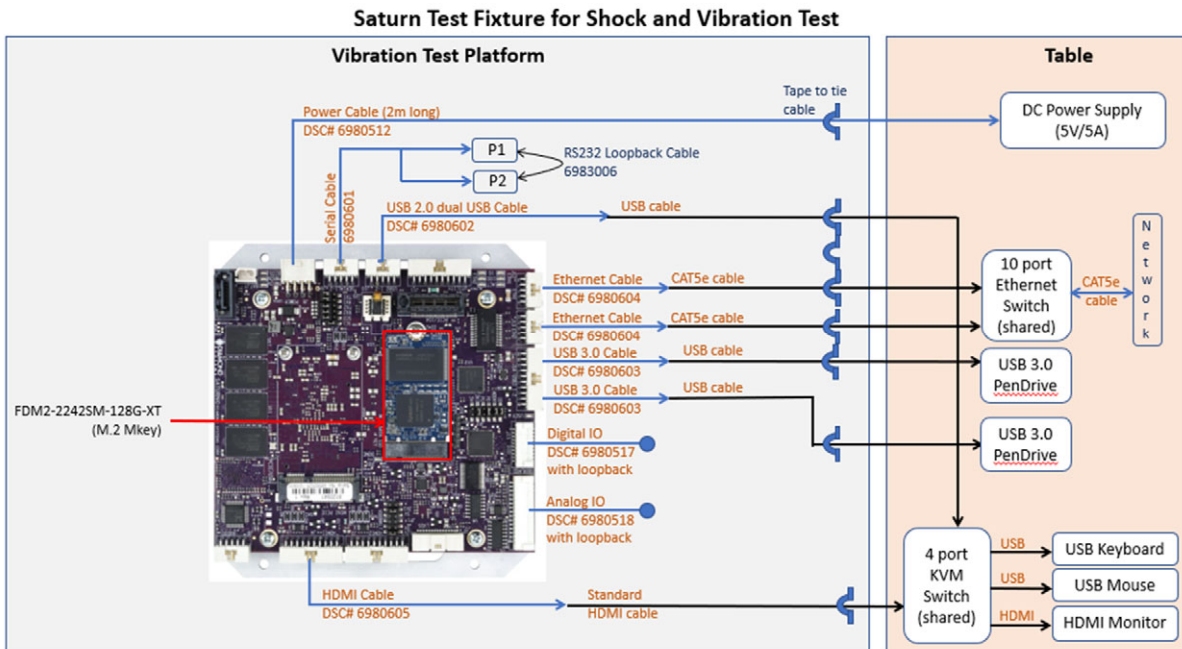
The following figure shows the EPS-24G4X board test setup.



2.3 SATURN

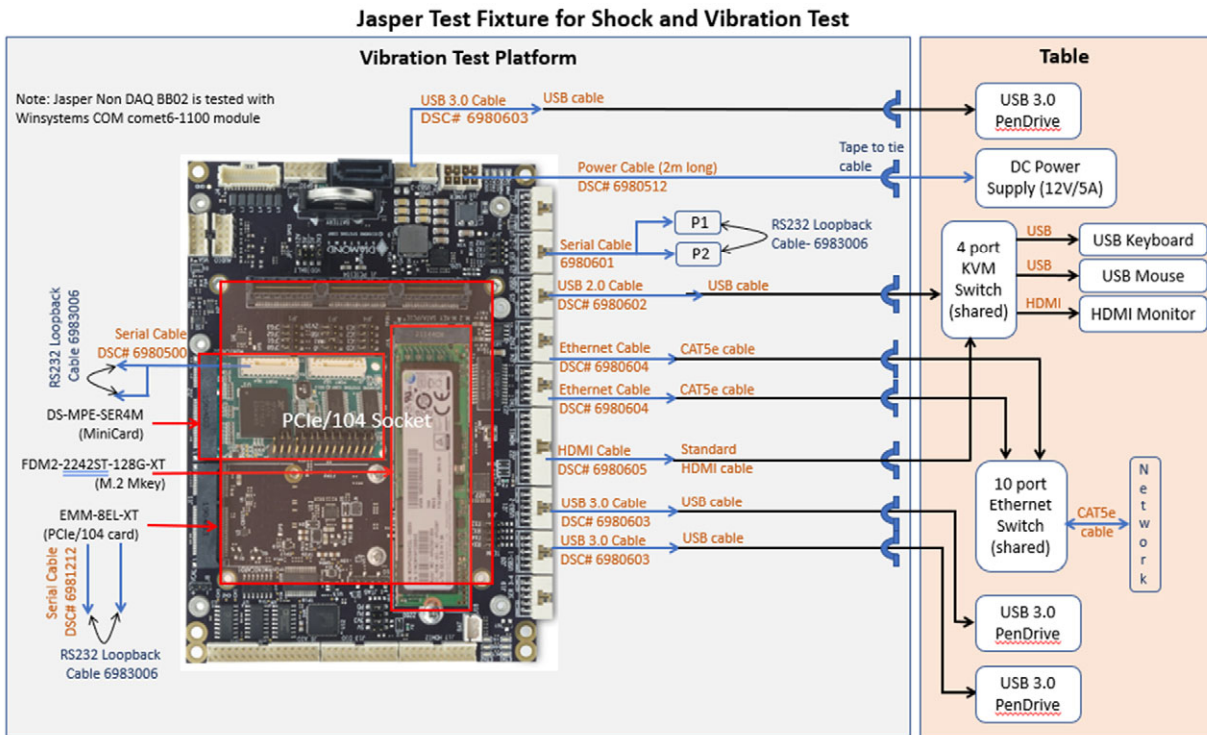
Saturn combines a feature-rich Atom-class processor-based SBC with a professional-quality industrial analog and digital data acquisition subsystem and flexible I/O expansion in a single board designed for rugged applications.

The following figure shows the Saturn board test setup.



2.4 JASPER

Jasper is a COM Express carrier board and SBC for Type 6 Basic (125x95mm) and Compact (95x95mm) modules. It is designed for applications that require ruggedness, a high level of I/O, or extended product lifetime. Winsystems COM comet6-1100 module is mounted on Jasper baseboard. **DS-MPE-SER4M** serial minicard is inserted on the minicard slot. **EMM-8E-XT** PCI/104-Express 8-port serial port module is inserted on PCIe/104 connector. The following figure shows the Jasper board test setup.

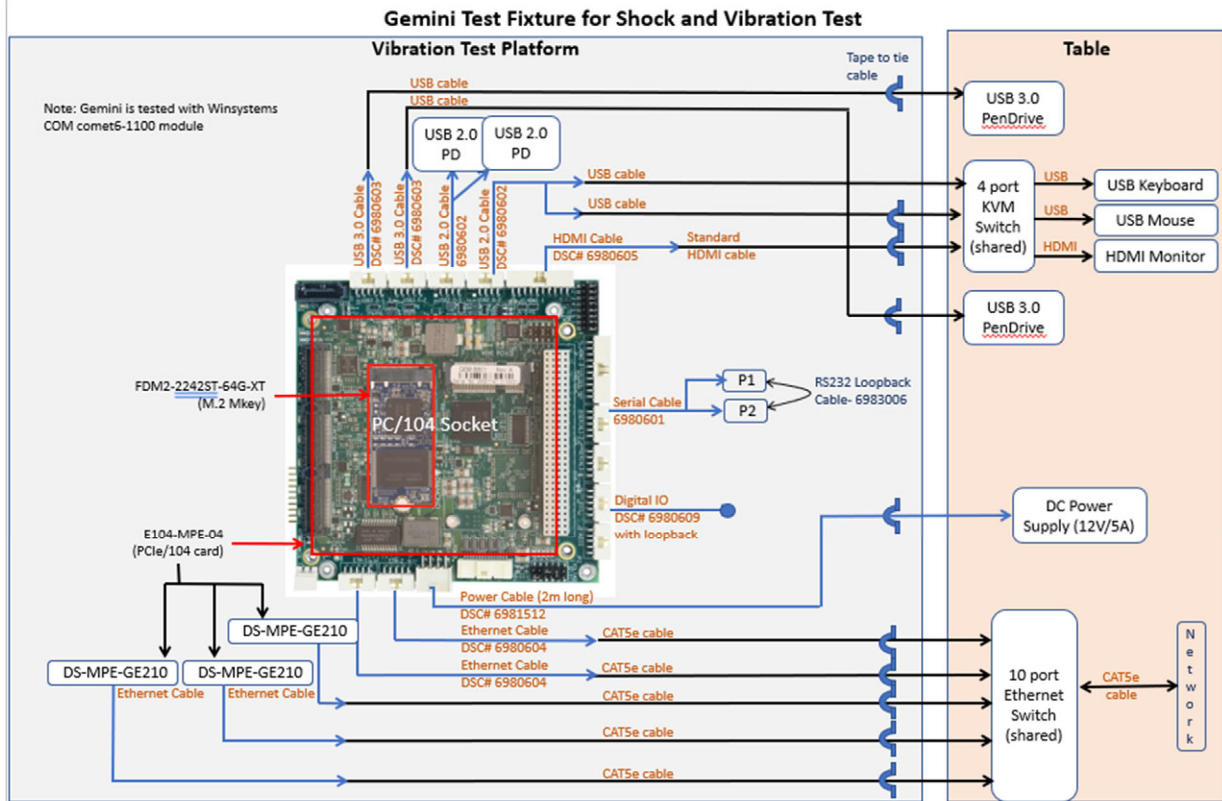


2.5 Gemini

GEMINI is a COM Express Compact type 6 carrier board and SBC with PCI/104-Express and minicard I/O expansion. Feature-rich GEMINI offers the highest performance in a compact 4.0 x 4.0" / 102 x 102mm size, with its combination of COM Express CPU module and full support for PCIe/104 type 1 connectivity.

Winsystems COM comet6-1100 module is used in Gemini baseboard. **E104-MPE-04** PCI/104-Express quad PCIe minicard carrier card is inserted on PCIe/104 connector and 3x **DS-MPE-GE210** Gigabit Ethernet minicards connected on E104-MPE-04 card.

The following figure shows the Gemini board test setup.



3 Board preparation before shock and vibration test

This section describes the details of rework done on each board to improve ruggedness of the boards during shock and vibration test:

- Applied Epoxy and RTV on EPS-24G4X board as described in section EPS-24G4X3.2.
- Jumpers on the SBC boards were removed, and the required configuration was done with 0 ohm resistors soldered on board.
- Removed batteries and sockets on SBCs

3.1 EPS-8130

No rework is done on this board.

3.2 EPS-24G4X

Following rework were done on this board:

1. Applied epoxy on the SFP connector of the board.
2. Applied RTV on the connector of Ethernet cables which are used to connect Ethernet ports on the board.

3.3 Saturn

3.3.1 LVDS Backlight and LVDS VDD (JP1)

Jumper block JP1 configures the voltage supply for the LCD backlight and LVDS VDD.

By default, LVDS backlight is provided with +12V and the LVDS VDD is provided with 3.3V.

AUO M215HTN01.1 dual channel LVDS display supports 12V backlight with 5V VDD power settings.

Position	Function	IN	OUT	Desired settings	Rework done
x	-	-	-	-	None
12V*	LCD Backlight Voltage	12V	-	IN	Mounted R255
5V	LCD Backlight Voltage	5V	-	OUT	None
5V	LCD VDD Voltage	5V	-	IN	Mounted R290
3V3*	LCD VDD Voltage	3.3V	-	OUT	None
RTS	AUTO_RTS_FPGA			OUT	None

3.3.2 Digital IO and Address (JP2)

Jumper block JP2 configures the Voltage level for Digital IO and Pull up/down. It also selects the base address for Data acquisition FPGA.

By default, Digital IO is 3.3V and pulled down. FPGA base address is set to 0x280 and USB3.0/2.0 Port 0 is Host by default.

Position	Function	IN	OUT	Desired settings	Rework done
5V	DIO Voltage Level	5V	-	OUT	None
3V3*	DIO Voltage Level	3.3V	-	IN	Mounted R136
PU	DIO Pull Up Enable	Enabled	Disabled	OUT	None
PD*	DIO Pull Down Enable	Enabled	Disabled	IN	Mounted R460
ADDR	FPGA Base Address	0x240	0x280	OUT	None
ID*	USB3.0/2.0 Port0 Mode	Host	Device	IN	Mounted R145

3.3.3 Serial Port Configuration (JP3)

Jumper block JP3 configures Serial Port1-2 protocol and termination select during RS422/485 mode.

By default, Serial ports are set to Internal loopback mode and terminations are disabled. The protocol selection is superseded by DAQ software setting.

Position	Function	IN	OUT	Desired settings	Rework done
TX1	Serial Port1 TX Termination	Enabled	Disabled	OUT	None
RX1	Serial Port1 RX Termination	Enabled	Disabled	OUT	None
TX2	Serial Port2 TX Termination	Enabled	Disabled	OUT	None
RX2	Serial Port2 RX Termination	Enabled	Disabled	OUT	None
SC0	Ser Port1-2 Mode select0	Refer Table Below	-	OUT	None
SC1	Ser Port1-2 Mode select1	Refer Table Below	-	IN	Mounted R226

Serial port Mode selection Jumper (Detailed):

SC1	SC0	Protocol
OUT	OUT	Internal Loopback
OUT	IN	RS485
IN	OUT	RS232
IN	IN	RS422

3.3.4 Complete reworks done on Saturn:

1. Removed JP1, JP2, JP3 Jumper connectors.
2. Mounted R255, R290, R136, R460, R145, R226 with 0E 0603 resistors.
3. Removed BAT1 connector.

3.4 Jasper (JSB-BB02D Full Feature Module without DAQ)

3.4.1 Jumper Block JP1

JP1 Jumpers are provided to set the base address of the FPGA.

This jumper block is not present in JSP-BB02D, so, no rework is done regarding this jumper block.

3.4.2 Jumper Block JP2

JP2 Jumpers are provided to select the voltage level of the LVDS display and backlight.

AUO M215HTN01.1 dual channel LVDS display supports 12V backlight with 5V VDD power settings.

Position	Function	IN	OUT	Desired settings	Rework done
12V	LCD Backlight Voltage	12V*	-	IN	Mounted R268
5V	LCD Backlight Voltage	5V	-	OUT	None
5V	LCD VDD Voltage	5V	-	IN	Mounted R283
3V3	LCD VDD Voltage	3.3V*	-	OUT	None

3.4.3 Jumper Block JP3

JP3 Jumpers are provided to select the configuration pins of the FPGA, USB interface and Power IN option. USB interface from COMe Type AB connector is multiplex to mPCIe and PCIe/104 connector. Board can be powered with 18V-36V wide input or 12V fixed supply.

Position	Function	IN	OUT	Desired settings	Rework done
U0	FPGA Config 0	TBD	TBD*	OUT	None
U1	FPGA Config 1	TBD	TBD*	OUT	None
USB	USB SEL	Minicard	PCIe104*	OUT	None
12VIN	Wide Input SEL	12V Fixed	Wide Input*	OUT	None

3.4.4 Jumper Block JP4

JP4 Jumpers are provided to select the mode of serial ports 1, 2, 3 & 4. SC0 and SC1 jumpers are used to select mode for serial ports 1 & 2 and SC2 and SC3 jumpers are used to select mode for serial ports 3 & 4.

Position	Port	RS232	RS485	RS422	Internal Loop	Rework done
SC0	1&2	IN*	OUT	OUT	IN	Mounted R354
SC1	1&2	OUT*	IN	OUT	IN	None
SC2	3&4	IN*	OUT	OUT	IN	Mounted R352
SC3	3&4	OUT*	IN	OUT	IN	None

Applicable only for 8242211 model. JP4 Jumper is software overridden by FGPA for 8242212 model.

3.4.5 Jumper Block JP5

JP5 Jumpers are provided to select the voltage level and Pullup/pull down configuration of the DIO. By default, the DIOs are 3.3 Voltage and pulled down. This jumper is not available in 8242211 and 8242210 model. So, no rework is required.

3.4.6 Jumper Block JP6

JP6 Jumpers Configuration is provided to enable and disable the termination of serial ports3-4.

Position	Function	IN	OUT	Desired settings	Rework done
TX3	Serial Port3 TX Termination	Enabled	Disabled*	OUT	None
RX3	Serial Port3 RX Termination	Enabled	Disabled*	OUT	None
TX4	Serial Port4 TX Termination	Enabled	Disabled*	OUT	None
RX4	Serial Port4 RX Termination	Enabled	Disabled*	OUT	None

3.4.7 Jumper Block JP7

JP7 Jumpers Configuration is provided to enable and disable the termination of serial ports1-2.

Position	Function	IN	OUT	Desired settings	Rework done
TX1	Serial Port1 TX Termination	Enabled	Disabled*	OUT	None
RX1	Serial Port1 RX Termination	Enabled	Disabled*	OUT	None
TX2	Serial Port2 TX Termination	Enabled	Disabled*	OUT	None
RX2	Serial Port2 RX Termination	Enabled	Disabled*	OUT	None

3.4.8 Complete reworks done on Jasper:

1. Removed JP2, JP3, JP4, JP6, JP7 Jumper connectors.
2. Mounted R268, R283, R354, R352 with 0E 0603 resistors.
3. Removed BAT1 connector.

3.5 Gemini

3.5.1 Serial Termination Jumper (JP1)

Gemini provides option termination resistors for RS422 and RS485 protocols. JP1 jumpers are not loaded by default. So, no rework was done regarding JP1 jumper.

3.5.2 Peripheral voltage selector (JP2)

On Gemini, JP2 provides an option to select PCI I/O voltage level, LCD supply voltage, and LCD backlight supply voltage. The pinout is designed to prevent the possibility of shorting two supply voltages if loaded correctly.

PIN	Function	Desired settings	Rework done
PINS_1-3	VIO_PCI = 5V	IN	Mounted R261
PINS_5-7	LVDS_VDD = 5V	IN	Mounted R259
PINS_10-12	LVDS_BKLT = 12V	IN	Mounted R260

3.5.3 Serial Port Protocol Selector and USB Mux selection (JP3)

Gemini has jumper JP3 to select the Serial protocols for serial port pairs and USB 2.0 signals for USB to I2C bridge or mini-card socket.

PIN	Function	Desired settings	Rework done
PINS_1-2	USB -> GPIO EXPANDER	IN	Mounted R609
PINS_5-6	Serial port 3 & 4 - RS232	IN	Mounted R607
PINS_9-10	Serial port 1 & 2 - RS232	IN	Mounted R605

3.5.4 Complete reworks done on Gemini:

1. Removed JP1, JP2, JP3 Jumper connectors.
2. Mounted R261, R259, R260, R609, R607, R605 with OE 0603 resistors.

4 Vibration Test Specifications

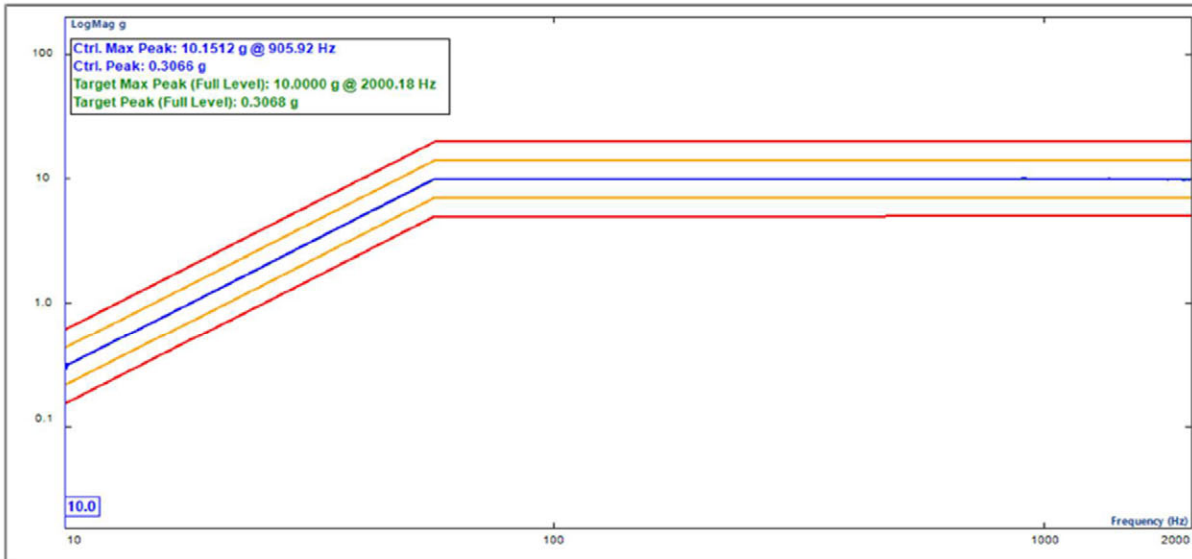
This section defines the vibration tests performed on the 5 stacks tested.

Test Conditions:

- Axes** : Vertical / Transverse / Longitudinal.
- Test Condition** : MIL-STD-202H.
- Test Description** : METHOD 201, SINUSOIDAL VIBRATION.
METHOD 204, RANDOM VIBRATION, HIGH FREQUENCY.

4.1 Sinusoidal Vibration Test

Axis	Frequency Hz	Displacement & Acceleration	No of Sweeps & Duration
X, Y & Z-axis	10 – 57	1.524 mm	2 Sweeps, 7.5 Minutes/Sweep
	57 – 2000	10 g	



Total elapsed time: 00:15:10 **Full level elapsed time:** 00:15:00 **Run Start Time:** Feb-24-2024 14:26:51

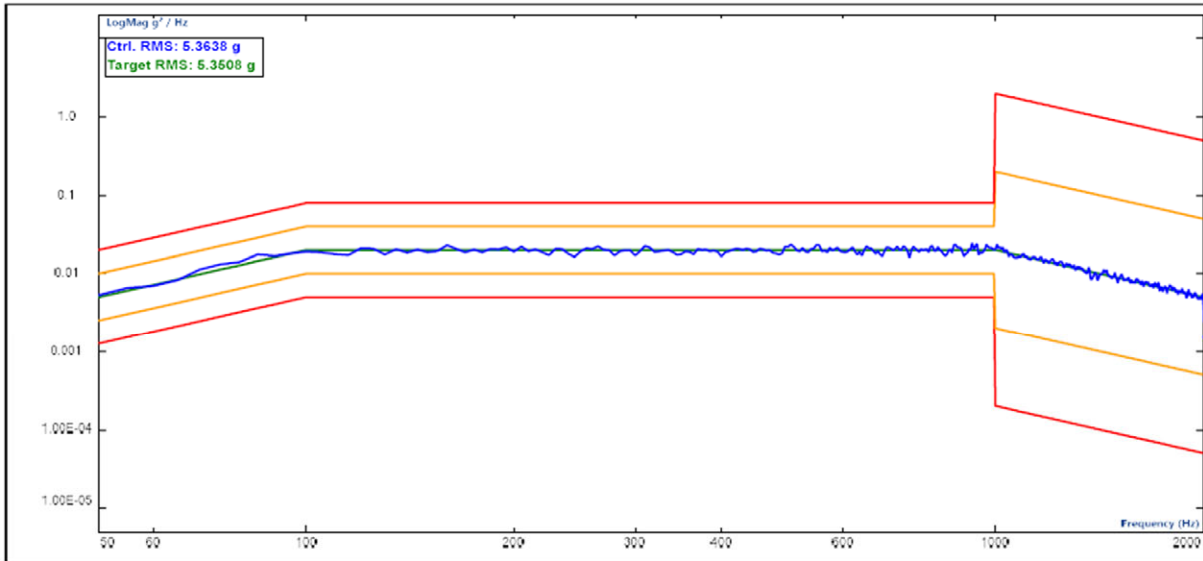
Graph 1: Sine Sweep Vibration Test X-Axis

4.2 Random Vibration Test

Random Vibration Test is performed with 4 test conditions as mentioned below.

4.2.1 Test Condition A

Axis	Frequency Hz	Slope & Power Spectral Density	Duration & Overall g ^{RMS}
X, Y & Z-Axis	50 – 100	+6dB/Octave	15 Minutes/Axis, 5.35g ^{RMS}
	100 – 999	0.02 g ² /Hz	
	999 – 1000	0.02 g ² /Hz	
	1000 - 2000	-6dB/Octave	

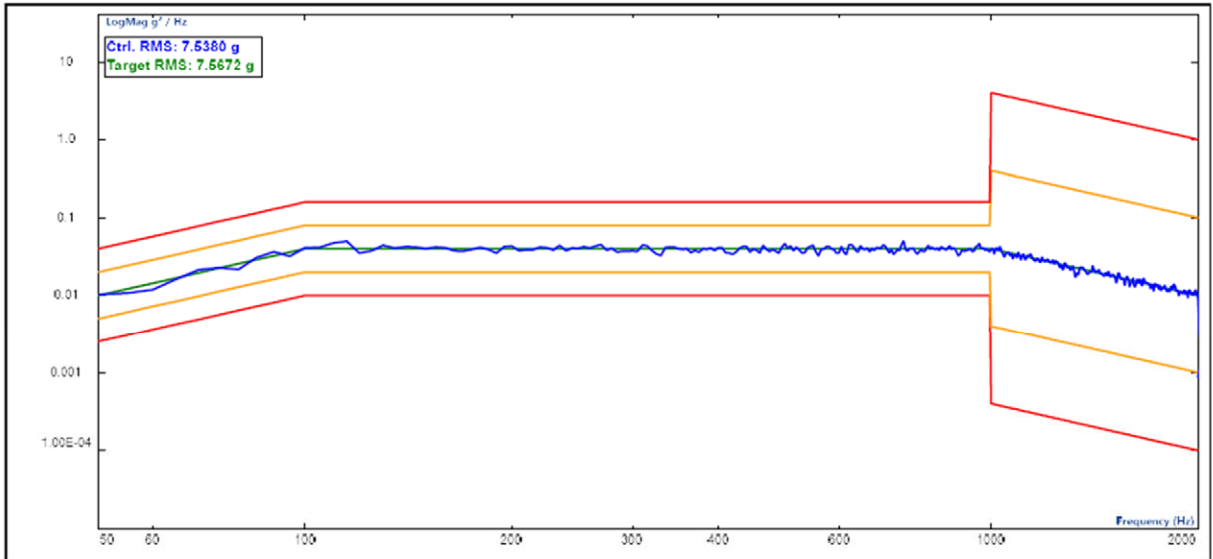


Total elapsed time: 00:15:59 Full level elapsed time: 00:15:00 Run Start Time: Feb-24-2024 15:00:47

Graph 2: Random Vibration Test X-Axis Condition A

4.2.2 Test Condition B

Axis	Frequency Hz	Slope & Power Spectral Density	Duration & Overall g^{RMS}
X, Y & Z-Axis	50 – 100	+6dB/Octave	15 Minutes/Axis, 7.56 g^{RMS}
	100 – 999	0.04 g^2/Hz	
	999 – 1000	0.04 g^2/Hz	
	1000 - 2000	-6dB/Octave	

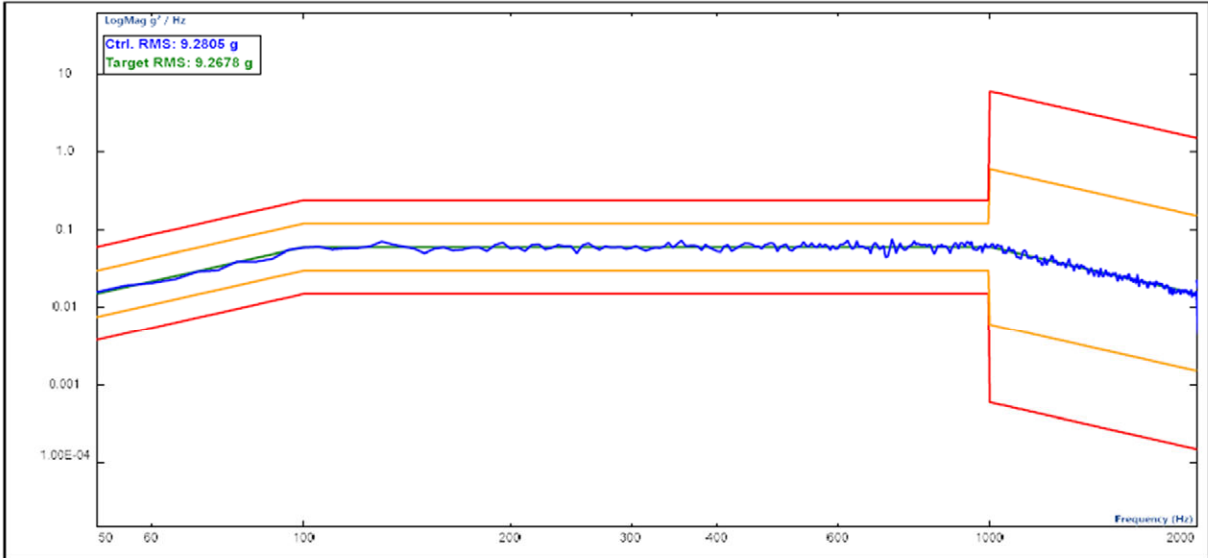


Total elapsed time: 00:15:58 **Full level elapsed time:** 00:15:00 **Run Start Time:** Feb-24-2024 15:20:42

Graph 3: Random Vibration Test X-Axis Condition B

4.2.3 Test Condition C

Axis	Frequency Hz	Slope & Power Spectral Density	Duration & Overall g^{RMS}
X, Y & Z-Axis	50 – 100	+6dB/Octave	15 Minutes/Axis, 9.26 g^{RMS}
	100 – 999	0.06 g^2/Hz	
	999 – 1000	0.06 g^2/Hz	
	1000 - 2000	-6dB/Octave	

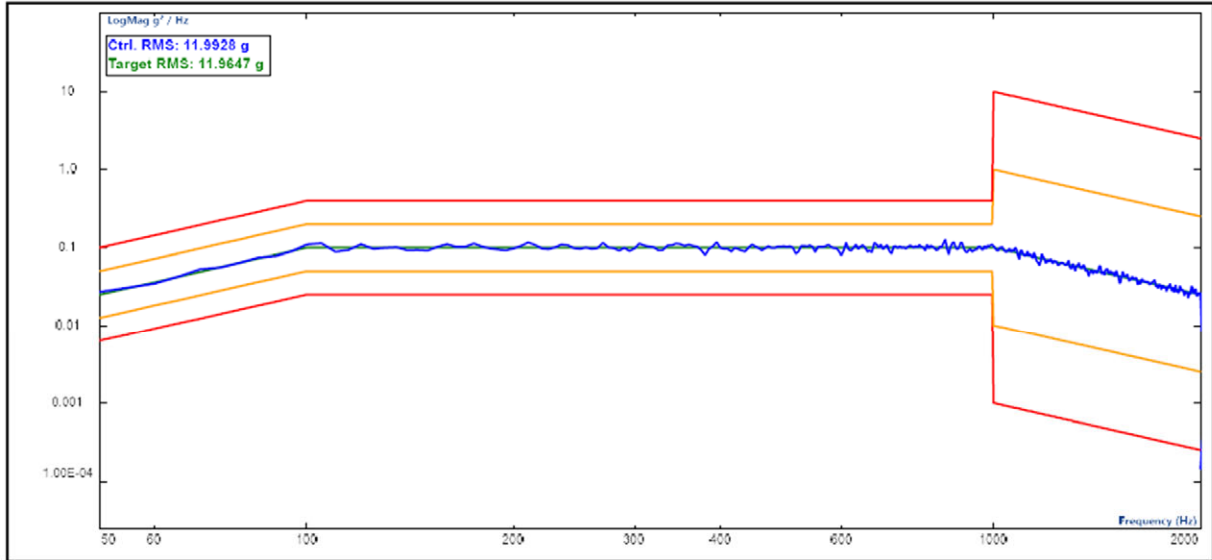


Total elapsed time: 00:15:59 Full level elapsed time: 00:15:00 Run Start Time: Feb-24-2024 15:39:15

Graph 4: Random Vibration Test X-Axis Condition C

4.2.4 Test Condition D

Axis	Frequency Hz	Slope & Power Spectral Density	Duration & Overall g^{RMS}
X, Y & Z-Axis	50 – 100	+6dB/Octave	15 Minutes/Axis, 11.95 g^{RMS}
	100 – 999	0.1 g^2/Hz	
	999 – 1000	0.1 g^2/Hz	
	1000 - 2000	-6dB/Octave	



Total elapsed time: 00:15:59 Full level elapsed time: 00:15:00 Run Start Time: Feb-24-2024 16:22:52

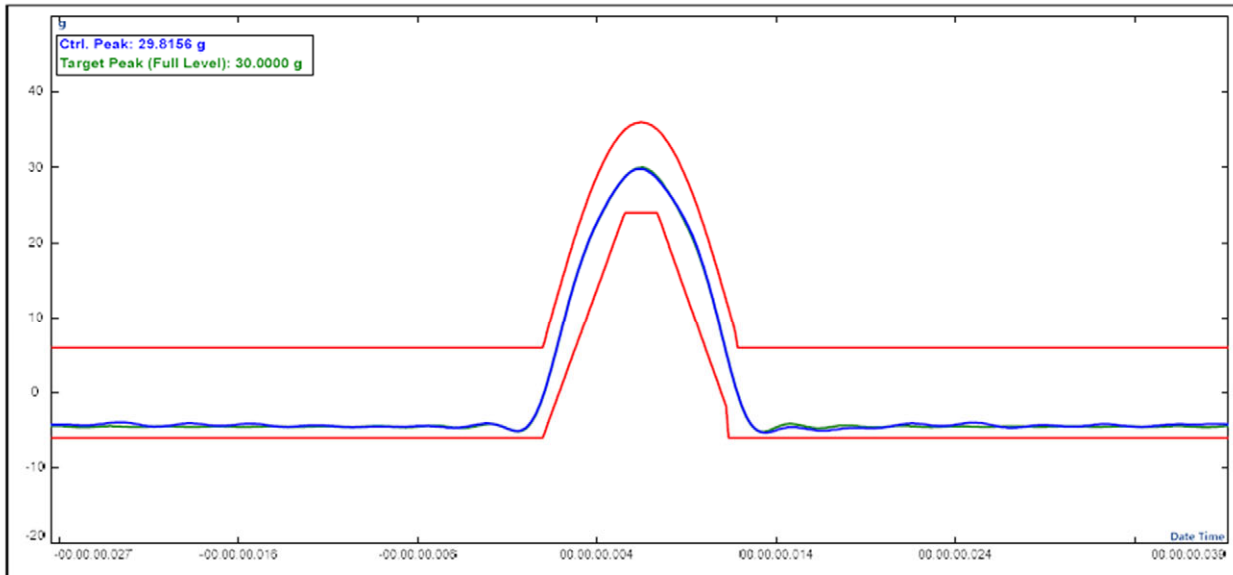
Graph 5: Random Vibration Test X-Axis Condition D

5 Shock Test Specification

This section defines the shock test performed on the 5 stacks designed by Diamond Systems.

Test Conditions:

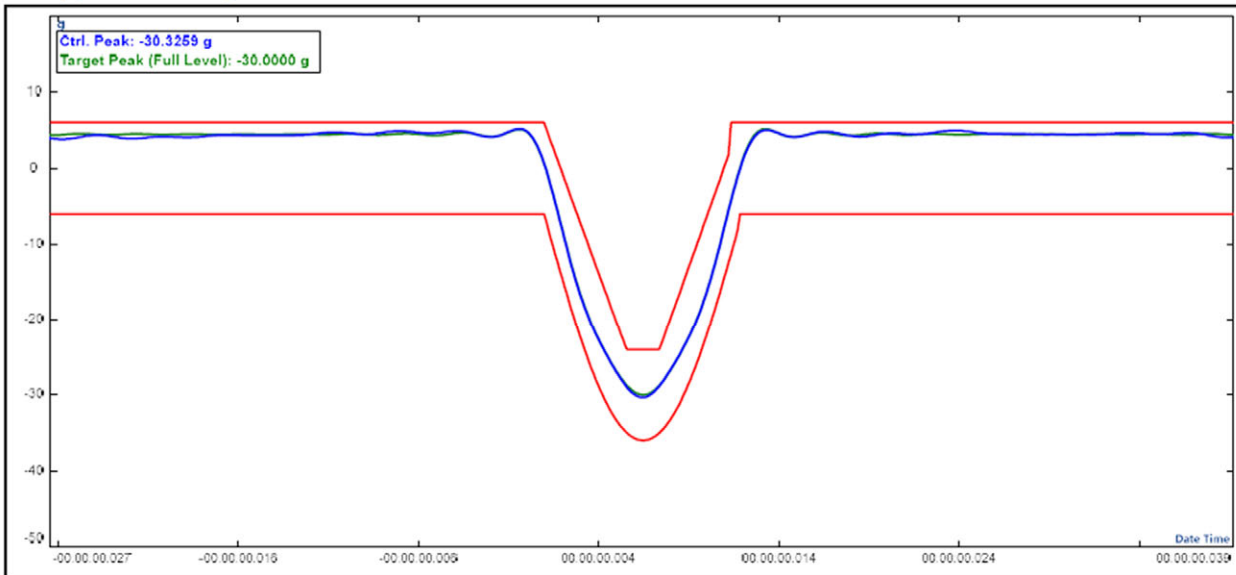
- Axes** : Vertical / Transverse / Longitudinal.
- Test condition** : MIL-STD-202H.
- Test Description** : METHOD 213, Shock Test, Condition J, Half sine waveform.
- Test Spec** : 30G , 11ms 3 shocks per direction.



Full level elapsed: 3.0

Run Start Time: Feb-24-2024 16:44:29

Graph 6: Mechanical Shock Test X-Axis Positive



Full level elapsed: 3.0

Run Start Time: Feb-24-2024 17:09:32

Graph 7: Mechanical Shock Test X-Axis Negative

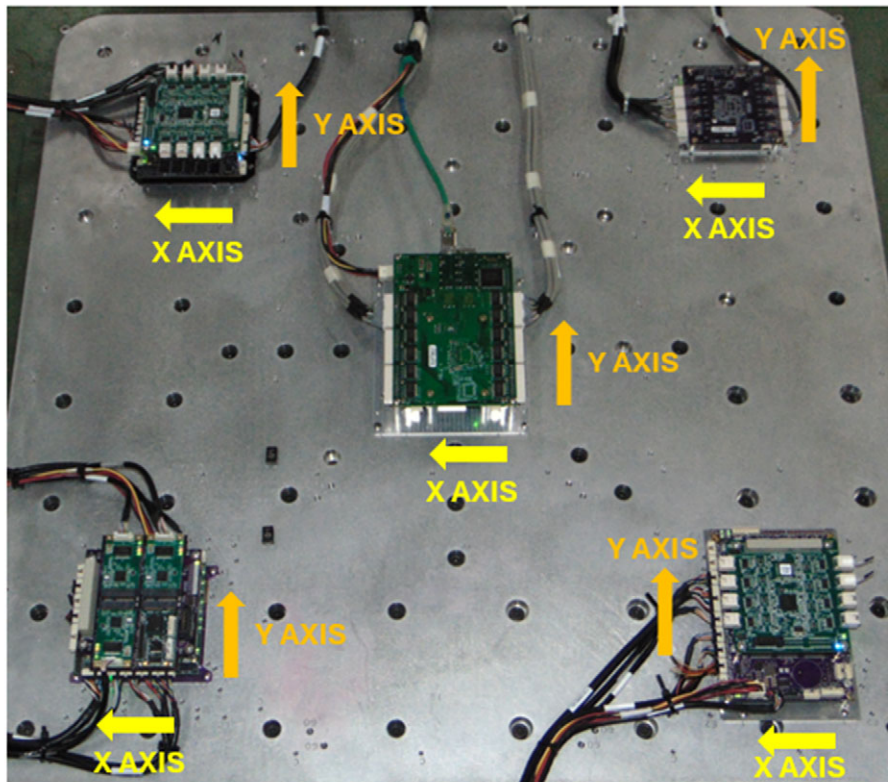
6 Test sequence

Performed Shock and Vibration test in the sequence as mentioned below:

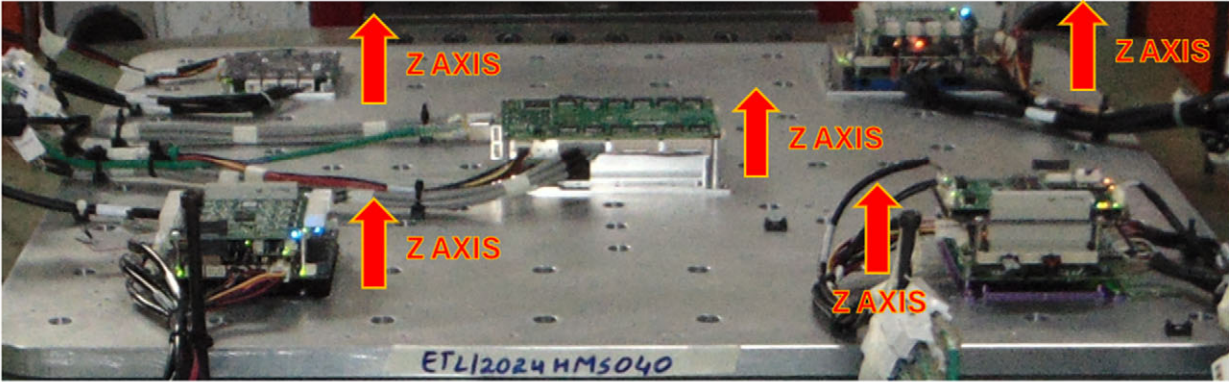
1. X axis test: Performed all tests in the X axis first.
 - i. Sine Sweep Vibration Test
 - ii. Random Vibration Test
 - iii. Mechanical Shock Test
2. Y axis test: Performed all tests in the Y axis after the X axis test.
 - i. Sine Sweep Vibration Test
 - ii. Random Vibration Test
 - iii. Mechanical Shock Test
3. Z axis test: Performed all tests in the Z axis after the Y axis test.
 - i. Sine Sweep Vibration Test
 - ii. Random Vibration Test
 - iii. Mechanical Shock Test

Below pictures depict the test fixture with X, Y, and Z axis positive direction indication. The X and Y axis movement was in forward and backward direction, rotated all boards by 90 degrees for Y direction testing after the X direction test. Z axis movement was in upward and downward direction of boards.

Test Fixture Top View



Test Fixture Side View



7 Test Results

During the Shock and vibration test all the boards were in power on condition in all three axes. During and after each vibration test, board has been checked for the following diagnostic tests:

- Functional check: Run the test software and tested the interfaces on board. The test has passed without any errors. Please refer to the tables below for more details.
- Visual inspection: Not observed any sign of damaged or loose components on any board.

7.1 EPS8130

SL. No	Interface	Before SNV test	During SNV test	After SNV test	Remarks
1	Gigabit Ethernet x8	PASS	PASS	PASS	Tested only 5 Ethernet ports (1,2,4,6,8) during SNV test.

7.2 EPS24G4X

SL. No	Interface	Before SNV test	During SNV test	After SNV test	Remarks
1	Gigabit Ethernet x24	PASS	PASS	PASS	Tested only 7 Ethernet ports (9,10,11,12,13,14,15) during SNV test. Port 10 link was down for some time during the test and the link is up after 1min without any restart of board. This is due to cable connectivity issue.
2	SFP x4	PASS	PASS	PASS	Tested only 1 SFP port (28) during SNV test.

7.3 Saturn

SL. No	IO card	Connector RefDes	Interface	Before SNV test	During SNV test	After SNV test	Remarks
1	NA	J4	HDMI 1 Display	PASS	PASS	PASS	
2	NA	J3	HDMI 2 Display	PASS	Not tested	PASS	
3	NA	J10	USB 2.0 x2	PASS	PASS	PASS	
4	NA	J15	USB 3.0 x2	PASS	PASS	PASS	
5	NA		Memory (RAM)	PASS	PASS	PASS	
6	NA	J13, J14	Ethernet x2	PASS	PASS	PASS	
7	NA	J9	Serial interface	PASS	PASS	PASS	Serial ports 1-2 were tested on Saturn board
8	NA	J17	On-board DIO	PASS	PASS	PASS	
9	NA	J18	On-board DAQ	PASS	PASS	PASS	
10	FDM2-2242SM-64G-XT	J19	M.2 SATA Interface	PASS	PASS	PASS	
11	NA	J6	SATA HDD	PASS	Not tested	PASS	
12	NA	J5	Audio	PASS	Not tested	PASS	
13	NA	J20	LVDS	PASS	Not tested	PASS	
14	NA	J12	Reset, Power Button	PASS	Not tested	PASS	
15	NA	J7	Battery	PASS	Not tested	PASS	

7.4 Jasper

SL No	IO card	Connector RefDes	Feature/ IO	Before SNV test	During SNV test	After SNV test	Remarks
1	NA	J22	HDMI 1	PASS	PASS	PASS	
2	NA	J17	HDMI 2	PASS	Not tested	PASS	
3	NA	J25	USB 2.0 x2	PASS	PASS	PASS	
4	NA	J20, J21, J14	USB 3.0 x3	PASS	PASS	PASS	
5	NA	J23, J24	Ethernet x2	PASS	PASS	PASS	
6	NA	J26	Serial interface	PASS	PASS	PASS	Serial ports 1-2 were tested
7	NA	J19	Serial interface	PASS	Not tested	PASS	
8	FDM2-2242ST-128G-XT	J15	M.2 socket (SATA)	PASS	PASS	PASS	During the SNV test DEM24-A28DK1EW1DF failed to detect. Hence it is replaced with SA400M8/240G M.2 module.
9	DS-MPE-SER4M	J12	Minicard 1	PASS	PASS	PASS	Serial ports 1-2 were tested
10	EMM-8EL-XT	J1	PCIe104	PASS	PASS	PASS	Serial ports 1-2 were tested
11	NA	J2	VGA	PASS	Not tested	PASS	
12	NA	J4	LVDS	PASS	Not tested	PASS	
13	NA	J3	Audio	PASS	Not tested	PASS	
14	NA	J9	SATA connector	PASS	Not tested	PASS	
15	NA	J18	Battery	PASS	Not tested	PASS	

7.5 Gemini

SL No	IO card	Connector RefDes	Interface	Before SNV test	During SNV test	After SNV test	Remarks
1	NA	J27	HDMI 1	PASS	PASS	PASS	
2	NA	J27	HDMI 2	PASS	Not tested	PASS	
3	NA	J17,J16	USB 2.0 Interface x4	PASS	PASS	PASS	USB2.0-keyboard & mouse failed to detect during the test. After the test, restarted the board and the issue resolved. This might be due to KVM switch used
4	NA	J15,J14	USB 3.0 Interface x2	PASS	PASS	PASS	
5	NA	J21,J22	Ethernet Interface x2	PASS	PASS	PASS	
6	NA	J3	Serial interface	PASS	PASS	PASS	Serial ports 1-2 were tested
7	NA	J4	Serial interface	PASS	Not tested	PASS	
8	NA	J33	On-board DIO	PASS	PASS	PASS	
9	FDM2-2242ST-128G-XT	J19	M.2 SATA Interface	PASS	PASS	PASS	
10	3 minicards on E104-MPE-04: DS-MPE-GE210.	J1	PCIe/104 with 3 minicards	PASS	PASS	PASS	
11	NA	J32	LVDS Display	PASS	Not tested	PASS	
12	NA	J23	Audio	PASS	Not tested	PASS	
13	NA	J20	SATA HDD	PASS	Not tested	PASS	
14	NA	J26	RTC test	PASS	Not tested	PASS	
15	NA	J7	Battery	PASS	Not tested	PASS	

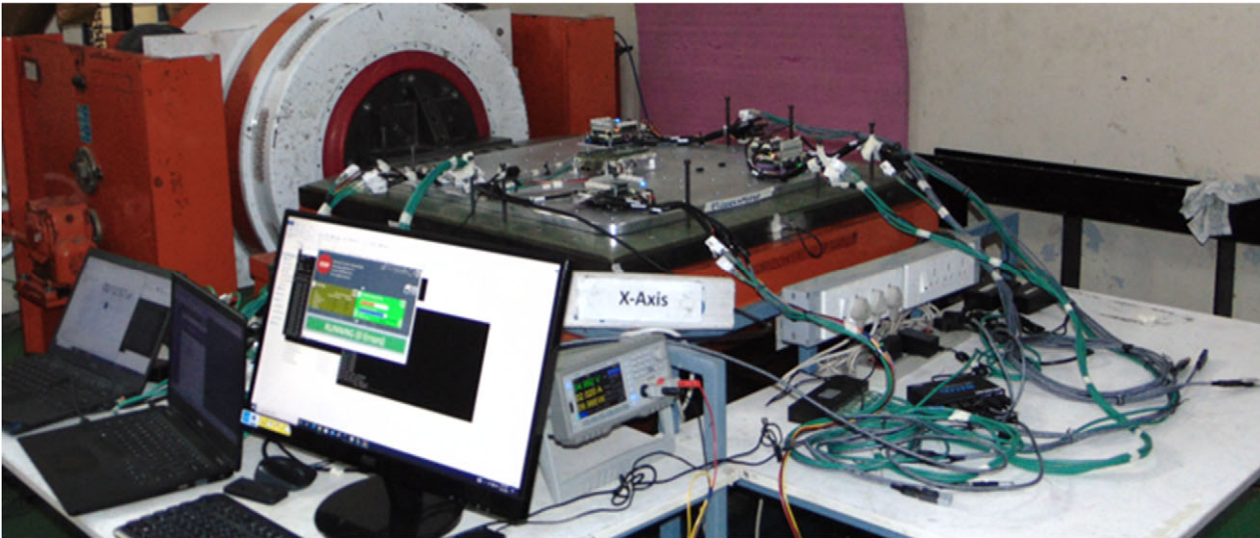
7.6 Shock and Vibration consolidated test summary

This table lists the complete passed boards in the shock and vibration test.

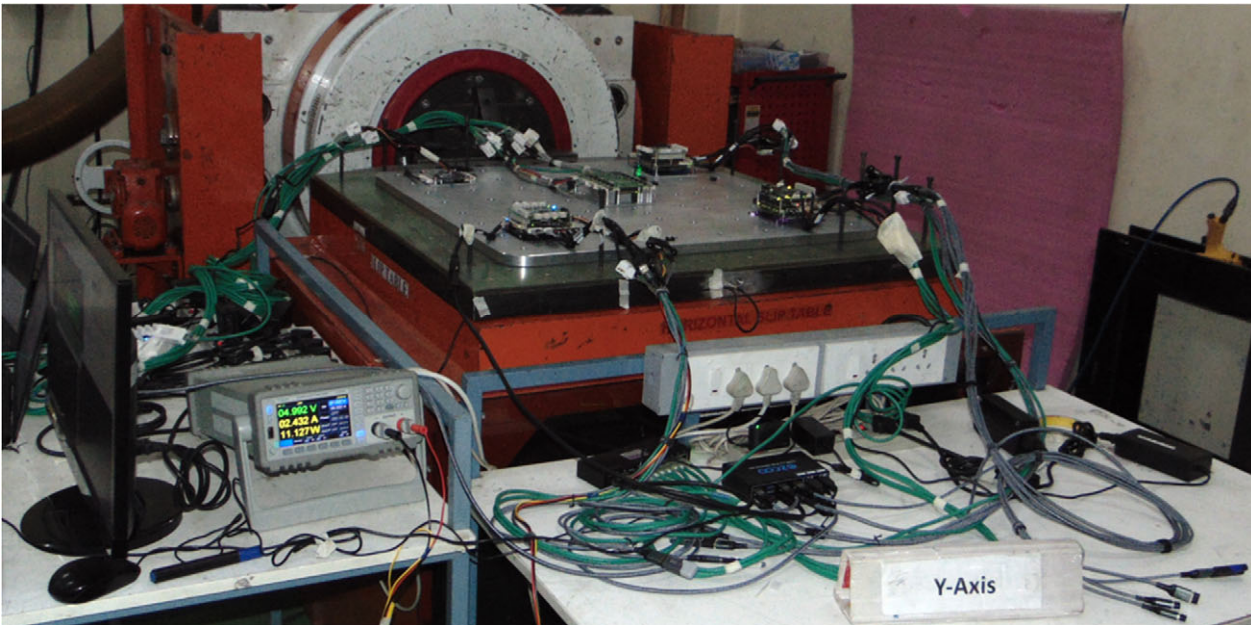
SI No	Stack name	Position	Part No.	Serial No.	Revision	Sine sweep vibration test	Random vibration test	Shock test
1	EPS-8130-XT	Main Board	EPS-8130-XT	W577337	A	PASS	PASS	PASS
2	EPS-24G4X-HSP	Main Board	EPS-24G4X-HSP	W566727	A	PASS	PASS	PASS
		EPSM module	EPSM-10GX4	W578150	A	PASS	PASS	PASS
3	SATURN	Main Board	SAT-E3940-4GA	E510025	A	PASS	PASS	PASS
4	GEMINI	Main Board	GEM-1185GRE-32G	P300601	A	PASS	PASS	PASS
		PCle104 socket	E104-MPE-04	P300651	B	PASS	PASS	PASS
		MPE socket 1	DS-MPE-GE210	W573512	A	PASS	PASS	PASS
		MPE socket 2	DS-MPE-GE210	W573517	A	PASS	PASS	PASS
		MPE socket 3	DS-MPE-GE210	W582275	A	PASS	PASS	PASS
5	JASPER	Main Board	JSP-1185GRE-32G-02D	P300526	A	PASS	PASS	PASS
		Minicard 1	DS-MPE-SER4M	W508325	A	PASS	PASS	PASS
		PCle104 socket	EMM-8E-XT	W575855	B	PASS	PASS	PASS

8 Test Sample Photos

1. X axis test photo



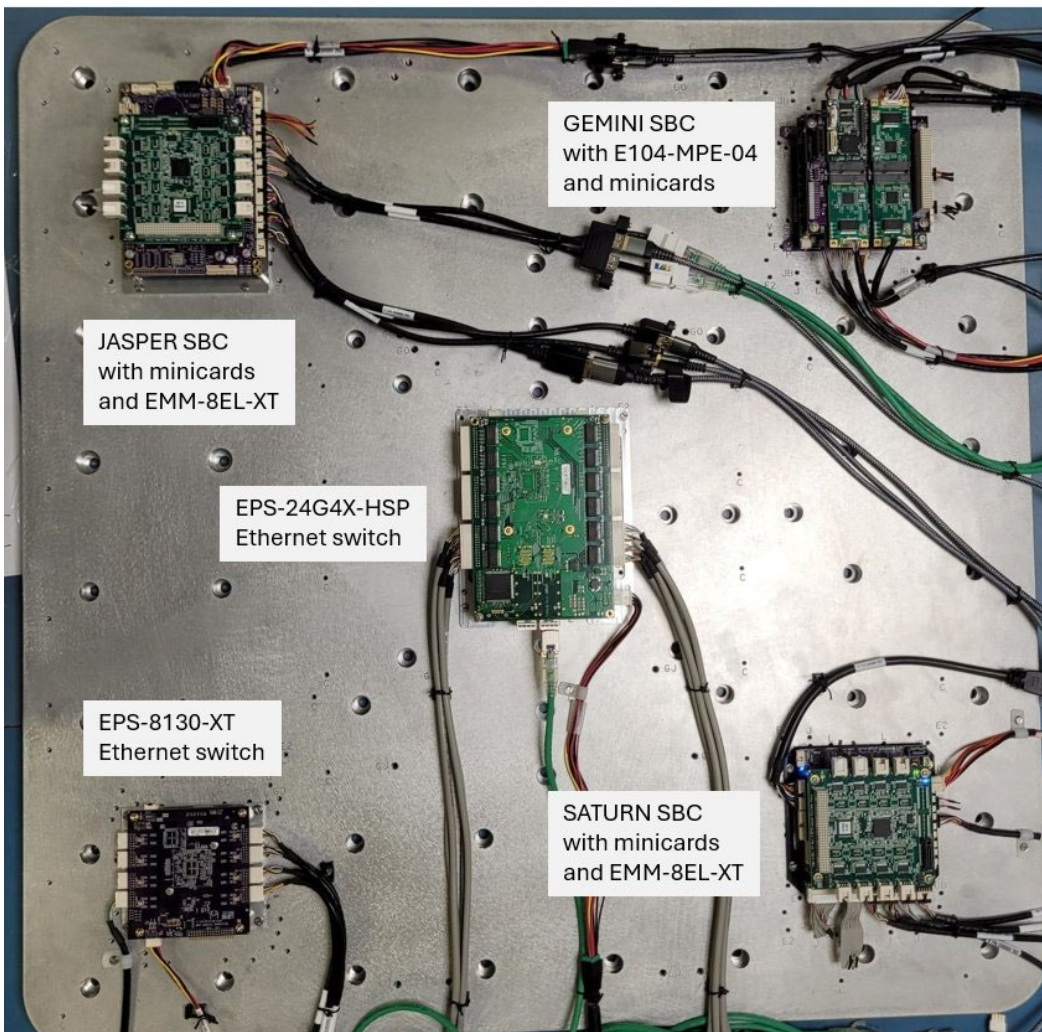
2. Y axis test photo



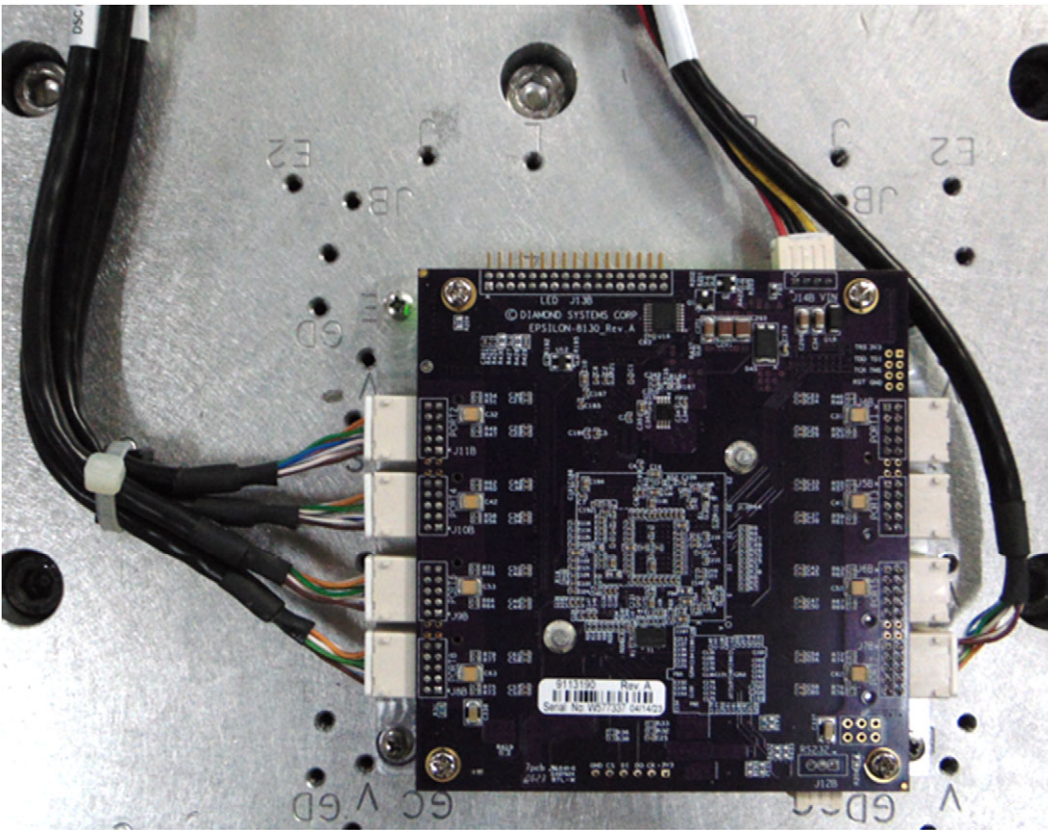
3. Z axis test photo



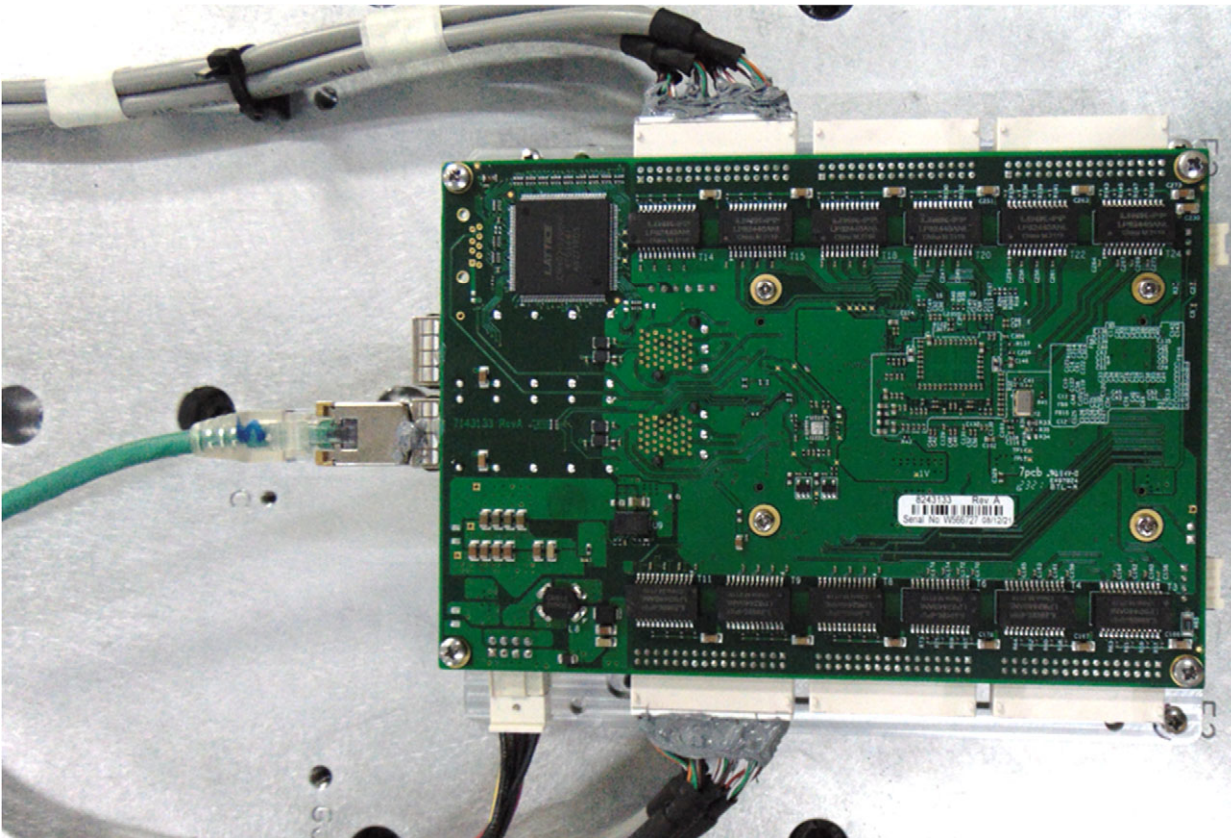
4. All 5 board stacks on test platform



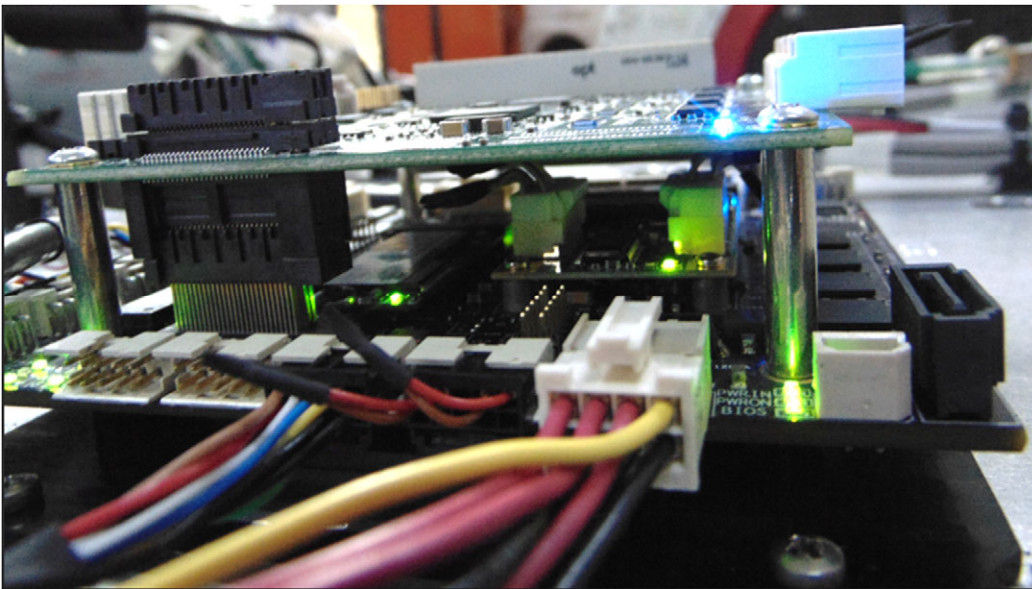
5. EPS-8130-XT Ethernet switch



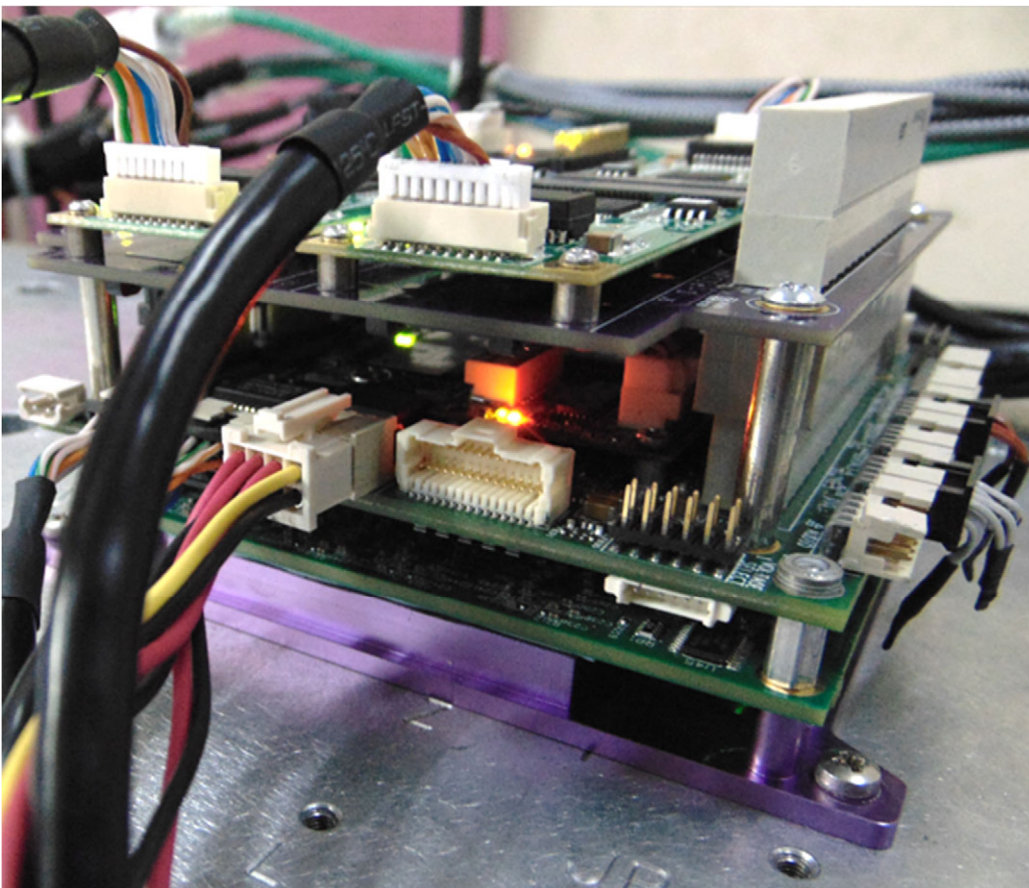
6. EPS-24G4X-HSP Ethernet switch with EPSM-10GX4 switch module (not visible in photo)



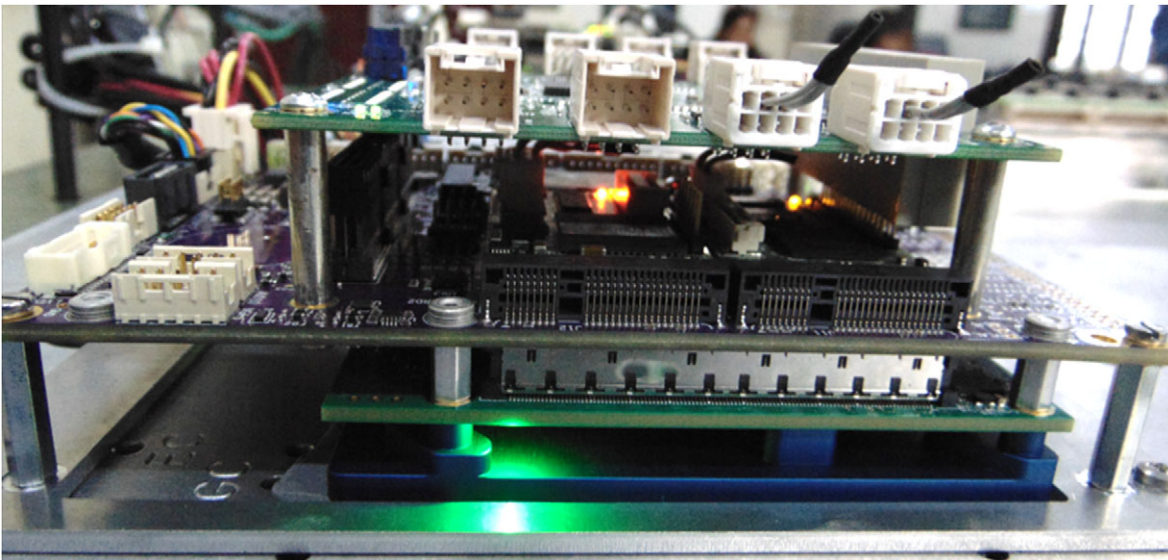
7. SATURN SBC with add-on boards



8. GEMINI SBC with add-on boards



9. JASPER SBC with add-on boards



9 Detailed summary of failures and observations

This section includes the list of all boards tested during the shock and vibration test, including boards that were installed and underwent testing but did not pass the test. Boards that did not pass the full test regimen are excluded from the claims in this report. This information is provided for completeness.

Consolidated test summary with failures

SI No	Stack name	Position	Part No.	Serial No.	Rev	Sine sweep vibration test	Random vibration test	Shock test
1	EPS-8130-XT	Main Board	EPS-8130-XT	W577337	A	PASS	PASS	PASS
2	EPS-24G4X-HSP	Main Board	EPS-24G4X-HSP	W566727	A	PASS	PASS	PASS
		EPSM module	EPSM-10GX4	W578150	A	PASS	PASS	PASS
3	SATURN	Main Board	SAT-E3940-4GA	E510025	A	PASS	PASS	PASS
		Minicard socket	DS-MPE-DAQ0804	W578243	A	PASS at X, Y axis and FAIL at Z axis	PASS at X, Y axis and FAIL at Z axis	PASS at X, Y axis and FAIL at Z axis
		M.2 socket	APM2T42SM22064GFN-6FTMW	182213108270		PASS	PASS	PASS
		PCle104 socket	EMM-8E-XT	W575859	B	PASS	PASS at X, Y axis and FAIL at Z axis	PASS at X, Y axis and FAIL at Z axis
4	GEMINI	Main Board	GEM-1185GRE-32G	P300601	A	PASS	PASS	PASS
		Minicard socket	DS-MPE-GPIO	W476864	A	PASS at X, Y axis and FAIL at Z axis	PASS at X, Y axis and FAIL at Z axis	PASS at X, Y axis and FAIL at Z axis
		M.2 socket	DEM24-64GDK1EW1DF-B270	B0012312210130004		PASS	PASS	PASS
		PCle104 socket	E104-MPE-04	P300651	B	PASS	PASS	PASS
		MPE socket 1	DS-MPE-GE210	W573512	A	PASS	PASS	PASS
		MPE socket 2	DS-MPE-GE210	W573517	A	PASS	PASS	PASS
		MPE socket 3	DS-MPE-GE210	W582275	A	PASS	PASS	PASS
		MPE socket 4	DS-MPE-SER4M	W577271	A	PASS at X, Y axis and FAIL at Z axis	PASS at X, Y axis and FAIL at Z axis	PASS at X, Y axis and FAIL at Z axis
5	JASPER	Main Board	JSP-1185GRE-32G-02D	P300526	A	PASS	PASS	PASS
		Minicard 1	DS-MPE-SER4M	W508325	A	PASS	PASS	PASS
		Minicard 2	DS-MPE-GPIO	W581438	A	PASS	PASS at X, Y axis and FAIL at Z axis	PASS at X, Y axis and FAIL at Z axis
		M.2 socket	DEM24-A28DK1EW1DF-B270	2CA22204130010001	A	PASS	PASS	PASS
		PCle104 socket	EMM-8E-XT	W575855	B	PASS	PASS	PASS

9.1 EPS24G4X

Tested only 7 Ethernet ports (9,10,11,12,13,14,15) of EPS24G4X board during SNV test.

9.1.1 Port 10 link down

Test details: Type D test of Random vibration test at Z axis.

Observation:

- Port 10 link was down for some time (1 min) during the vibration test and the link is up without any restart of board. This issue might be because of the RJ45 socket.
- We observed a similar link failure of a few Ethernet ports while making test setup on test platform, before starting the SNV test. This link down issue was cleared by re-inserting the Ethernet cables with proper cable routing.

Post Shock and Vibration Test observation:

- After completion of shock and vibration test, functional test performed at Envitest lab with test platform. All 7 Ethernet ports are up, and the ping test has passed.
- Tested again at hardware lab, all 7 Ethernet ports are up, and the ping test has passed.

9.2 SATURN

9.2.1 Minicard failure in onboard minicard socket

Minicard used: DS-MPE-DAQ0804

Test details: Sine sweep vibration test at Z axis.

Observation:

- DIO test was observed to be failed and AIO test was passed after 10 minutes of testing.
- 5 minutes later the minicard failed to detect.
- After the current vibration test completion, we removed and re-inserted the minicard and powered ON the board. Saturn board with DAQ minicard didn't power on.
- We inserted serial minicard and powered ON the board, still Saturn didn't power on.
- Saturn didn't power on due to the power supply maximum current limit of 1A in the power supply after the power cycle.
- Changed the maximum current limit to 5A in the power supply and turned on the board without any minicard inserted.
- Saturn board has turned on and continued further testing without any minicard inserted on board due to lack of minicard availability.

Post Shock and Vibration Test observation:

- After completion of shock and vibration test, functional test was performed at Envitest lab with test platform. DS-MPE-DAQ0804 minicard failed to detect and Saturn didn't power on.
- Retest was conducted at hardware lab, again DS-MPE-DAQ0804 minicard failed to detect and Saturn didn't power on.
- On the same slot, serial minicard was inserted and tested. Saturn board powered up successfully,, serial minicard was detected, and serial port test on minicard has passed. This confirms that there is no issue with the minicard socket or circuit, and the issue is with the minicard.
- Checked for impedance on voltage rails of minicard and observed no short on any voltage rail.
- Visual inspection was done through microscope and didn't observe any damaged component on minicard.
- The DS-MPE-DAQ0804 is removed from the list of boards claimed to pass testing.

9.2.2 Serial card failure in PCIe104 socket

Addon card used: EMM-8E-XT.

Test details: Type B test of Random vibration test at Z axis.

Observation:

- The serial loopback test on port 1 and port 2 failed after 10 min from start of the test.
- The Loopback test has failed after 81st cycle out of 116 test cycles.
- Removed and re-inserted the loopback cables after the completion of the Type B Random vibration test and observed that loopback test was failing as before.
- But the EMM-8E-XT was detected always throughout the shock and vibration test.
- This issue might be because of serial loopback cables.

Post Shock and Vibration Test observation:

- After completion of shock and vibration test, functional test was performed at Envitest lab with test platform. EMM-8E-XT card was detected and serial port loopback test on port 1 and port 2 has passed without any issue.
- Tested again at hardware lab, EMM-8E-XT card was detected and serial port loopback test on port 1 and port 2 has passed without any issue.

9.3 GEMINI

9.3.1 Onboard USB 2.0 detection issue

Test details: Sine sweep vibration test at X axis and Random vibration test (Type B and Type D) at Z axis.

Observation:

- USB2.0-keyboard & mouse that was connected to J16 connector of Gemini has stopped working during SNV test.
- The keyboard and mouse were connected through KVM switch to Gemini board.
- After the completion of the current vibration test, we inserted keyboard and mouse directly into USB port J16 of Gemini without KVM switch, but the keyboard and mouse were still not detected.
- Then connected the keyboard and mouse to another USB2.0 port - J17 of Gemini to save the log and performed restart.
- After restart of board, both keyboard and mouse worked as expected.
- Connected the keyboard & mouse back to J16 and observed that both are working fine.
- So, we continued vibration test.
- Again, we observed the same issue during Random vibration test (Type B and Type D) at Z axis.
- As before, the USB keyboard and mouse issue was solved after restarting Gemini board.
- This issue might be due to KVM switch.

Post Shock and Vibration Test observation:

- After completion of shock and vibration test, functional test was performed at Envitest lab with test platform. USB mouse and keyboard were detected and worked properly as expected without any issue.
- Tested again at hardware lab, USB mouse and keyboard were detected and worked properly as expected without any issue.

9.3.2 DS-MPE-GPIO failure in onboard minicard socket

Addon card used: DS-MPE-GPIO.

Test details: Sine sweep vibration test, Random vibration test (Type B, C, D) and shock test at Z axis.

Observation:

- The GPIO loopback test failed after 10 min from testing.
- But the minicard was detected always throughout the shock and vibration test.
- This issue might be because of the DS-MPE-GPIO assembly at Wellex.

Post Shock and Vibration Test observation:

- After completion of shock and vibration test, functional test was performed at Envitest lab with test platform. The GPIO minicard was detected and GPIO loopback test has failed.
- Tested again at hardware lab, the GPIO minicard was detected and GPIO loopback test has failed.
- Changed the loopback cable on the GPIO minicard, still loopback test has failed.
- But when serial minicard is inserted into the minicard socket, minicard gets detected and serial port test on minicard has passed. This confirms that there is no issue with Gemini board, and the issue is with GPIO minicard.
- Checked for impedance on voltage rails of minicard and observed no short on any voltage rail.
- Done visual inspection through microscope and didn't observe any damaged component.

9.3.3 Serial minicard failure in E104-MPE-04 Minicard socket

Addon card used: DS-MPE-SER4M inserted on slot 4 of E104-MPE-04 card.

E104-MPE-04 card has 4 minicard slots, 3 Ethernet minicards and one serial minicard with SN# W577278 were inserted on it.

Test details: Sine sweep vibration test at Z axis.

Observation:

- The serial minicard was working fine initially, but during vibration test we observed loopback test failure and after some time we faced detection issue on E104 slot 4.
- After the completion of the current vibration test, we swapped serial and ethernet minicards of slot 3 and slot 4. Serial minicard on slot 3 didn't detected and ethernet minicard on slot 4 has detected. This confirms that there is no issue with E104-MPE-04 card and Ethernet minicards and there is an issue with serial minicard itself.
- Then the non-working serial minicard was replaced with a new serial minicard with SN# W577271 and inserted it on slot 3.
- Serial loopback test of new minicard has passed during the Type A Random vibration test.
- But during Type B Random vibration test we observed serial loopback test failure again and then after some time it failed to detect as before.
- This issue might be because of the DS-MPE-SER4M assembly at Wellex.

Post Shock and Vibration Test observation:

- After the completion of shock and vibration test, functional test was performed at Envitest lab with test platform, the serial minicard was not detected on E104-MPE-04 card.
- Tested again at hardware lab, the serial minicard failed to detect.
- But when other working serial minicard is inserted into the slot3 of E104-MPE-04 card, minicard gets detected and serial port test on minicard has passed. This confirms that there is no issue with Gemini board, E104-MPE-04 card and the issue is with serial minicard.
- Checked for impedance on voltage rails of minicard and observed no short on any voltage rail.
- Done visual inspection through microscope and didn't observe any damaged component.

9.4 Jasper

9.4.1 GPIO minicard failure in onboard minicard-2 socket.

Addon card used: DS-MPE-GPIO.

Test details: Random vibration test (Type B) at Z axis:

Observation:

- The GPIO loopback test failed after 5 min from testing.
- But the minicard was detected always throughout the shock and vibration test.
- This issue might be because of the DS-MPE-GPIO assembly at Wellex.

Post Shock and Vibration Test observation:

- After the completion of shock and vibration test, functional test was performed at Envitest lab with test platform, the GPIO minicard was detected and GPIO loopback test has passed without any issue.
- Tested again at hardware lab, the GPIO minicard was detected and GPIO loopback test has passed without any issue.