

EPC-R7200 with NVIDIA TX2 Function Test Report

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Revision History :

Date	Revision	Description	Creator
2021/12/09	1.0	Initial version	Johnny Wang

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Chapter 1 : General

1.01 Product Specification :

Specifications

Model		EPC-R7200IN-ALA100	EPC-R7200IN-ALA120	EPC-R7200IN-ALA140	EPC-R720IN-ALA160
Compatible Modules	NVIDIA Jetson Series	Nano / TX2 NX / Xavier NX			
Graphics	HDMI	1 x HDMI 2.0, Maximum Resolution 3840 x 2160 at 60Hz			
	Graphics Engine	NVIDIA Maxwell GPU / Pascal GPU / Volta GPU on Jeston Modules			
	H/W Video Codec	Up to 4K encode/decode			
Ethernet	Chipset	NVIDIA Jetson integrated RGMII and Intel 1GbE Controller			
	Speed	2 10/100/1000 Mbps			
Indicator	LED	1 x Power LED; 1 x programmable LED			
Front I/O	USB	2 x USB3.2 Gen 1 Type A			
	GbE	2 x RJ45 for GbE			
Rear I/O		1 x RS-485, 1 x 2 wires RS-232 4 x DIs, 4 x DOs	2 x 2 wires RS-232 1 x GbE, 2 x USB 2.0	2 x 2 wires RS-232 1 x CAN Bus 2.0B	4 X GbE (Hub)
Expansion	M.2	1 M.2 2230 Key E Slot (USB2.0/PCIe/UART/I2S) 1 M.2 3042 Key B Slot (USB3.0/I2C)			
	SD Socket	1 Micro SD Socket			
	SIM	1 Nano SIM Slot			
	Antenna Holes	4			
Power	Power Supply Voltage	9-24V			
	Power Type	2-pole lockable DC-in			
	Power Consumption	5 ~ 15 W (Depends on Module Selection)			
Environment	Operating Temperature	-20~60 / -20~70*			
	Operating Humidity	5% ~ 95% relative humidity, non-condensing			
Mechanical	Dimensions	152 x 137 x 42 mm			
	Mounting	Wall mount, DIN Rail mount			
	Weight	925g			
Operating System	Linux	Ubuntu			
Certifications		CE/FCC Class B			

1.02 System Configuration : (Driver & firmware version)

Item.	Description.	Item.	Description.
Project Name.	EPC-R7200 with Nvidia TX2	PCB Version.	A101-1
M/B No	ESE0364674	OS Version.	Linux localhost 4.9.201-tegra #2 SMP PREEMPT Wed Nov 17 11:39:23 CST 2021 aarch64 aarch64 aarch64 GNU/Linux
CPU Model/Info	Quad-Core NVIDIA TX2		
Memory Type/Info	Onboard LPDDR4	Total Memory Size	8GB
Output Display Type	HDMI	AC/DC Adaptor Model	LE-0309BDSP12V

1.03 Testing Software and Equipments

Testing software :

Test Program	Version / Description
memtester	Memory test
dd	Storage Read/Write test
Play.sh	LVDS,HDMI output function test
Echo	Serial Port test
Iperf	WLAN test, LAN test
hwclock,date	RTC test

Test Equipments :

Model	Description
Power on/off test equipment (ATX/AT)	
WLAN Access Point (Model.ASUS Gigabit RT-N66U)	● 802.11b/g/n- ● d2.0 2.4/5-GHz Mod Auto AP; ● 6 RP-TNC; ● FCC 
TECPEL Digital Multi Meter (Model. DMM 8050)	● DMM-8050: ● True RMS. ● 19.999 count LCD display. ● 0.05% DC V accuracy. ● High voltage to 1,000 DC and 750V AC. ● 20A DC/AC current range and 20MΩ. ● Frequency measurement. ● Data hold. ● Logic test. ● Duty cycle measurement. ● Drop-proof to 10ft. ● Overload protection. ● Meet IEC-348 and UL-1244 standard. 

1.04 Test Results Definition :

Criteria	Definition
PASS	Test result pass and function work perfectly.
Fail	Test fail or can not meet the spec requirement.
Limitation	There are no plans to fix this erratum.
Skip	Test can not execute due to no test program, driver or test device.
N/A	Spec not support or driver not ready.
Note	Reference Data

1.05 Test Results Summary :

Num.	Test Item	Result	Remark
Chapter.2	System function Test		
2.01	CPU	PASS	
2.02	Memory	PASS	
2.03	MicroSD	PASS	
2.04	USB	PASS	
2.05	Video Display	PASS	
2.06	Ethernet	PASS	
2.07	M.2 Test	PASS	
2.08	RTC	PASS	
2.09	SIM Slot Check	PASS	
2.10	UIO-4030 extension Board Function	PASS	
2.11	UIO-4032 extension Board Function	PASS	
2.12	UIO-4034 extension Board Function	PASS	
2.13	UIO-4036 extension Board Function	PASS	
Chapter.3	Performance Test		
3.01	MicroSD Performance	PASS	
3.02	USB Performance	PASS	
3.03	Ethernet Performance	PASS	
Chapter.4	System Compatibility Test		
4.01	MicroSD Compatibility	PASS	
4.02	USB Compatibility	PASS	
Chapter.5	Reliability Test		
5.01	CPU Burinin Test	PASS	
5.02	Memory Burinin Test	PASS	
5.03	Graphic Burinin Test	PASS	
5.04	LAN Stress Test	PASS	

Chapter 2 : System function test

2.01 CPU

2.01.1.01 Test Purpose:

The test ensures that the function of the CPU tallies with the CPU specification.

2.01.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable

2.01.1.03 Testing Configuration:

1. Test environment: Room temperature

2.01.1.04 Test Procedure:

1. Press any key to enter U-Boot when device Power-up. Check CPU info in U-Boot log.
2. Boot into OS, check the processor info under OS
cat /proc/cpuinfo
3. Check CPU frequency.
cat /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_max_freq
cat /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_cur_freq

2.01.1.05 Test Result:

Item	Criteria	Result	Notes
OS CPU info	Check the CPU information is correct	PASS	
CPU frequency	Check the CPU information is correct. CPU Current Frequency will dynamicly change by system loading and temperature.	PASS	

2.02 Memory

2.02.1.01 Test Purpose :

The test ensures that the function of the Memory tallies with the Memory specification.

2.02.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable

2.02.1.03 Testing Configuration:

1. Test environment: Room temperature

2.02.1.04 Test Procedure:

1. Press any to enter U-Boot when device Power-up. Check DRAM info in U-Boot log.
2. Boot into OS. Check memory info.
cat /proc/meminfo

2.02.1.05 Test Result:

Item	Criteria	Result	Notes
U-Boot DRAM Check	Memory Capacity information is correct	PASS	
OS memory info	Memory Capacity information is correct	PASS	

2.03 MicroSD card

2.03.1.01 Test Purpose :

Evaluate whether the SD is workable and maintained in a stable condition when working at reading and writing.

2.03.1.02 Test Tool or Equipment:

1. DMS-AF55
2. lenovo L430
3. MicroSD card: SanDisk Ultra microSDXC UHS-I (A1) 32GB

2.03.1.03 Testing Configuration:

1. Test environment: Room temperature

2.03.1.04 Test Procedure:

1. Power on the device and boots into OS
2. Check the space of SDcard.
fdisk -l /dev/mmcbk1
3. Mount SDcard.
mkdir /mnt/sdcard
mount /dev/mmcbk1p1 /mnt/sdcard
4. Run command to read/write 1G file on SD card. Record the read/write speed in Notes below.
dd if=/dev/zero of=/mnt/sdcard/testFile bs=1M count=1000
dd if=/mnt/sdcard/testFile of=/dev/zero bs=1M
5. Enable the write protect on SD card, verify the SD card can mount and read, but can't write files on it.
6. Un-mount SD card. Re-insert SD card 5 times, mount again and check read/write function.
umount /mnt/sdcard
mount /dev/mmcbk1p1 /mnt/sdcard
7. Check SD card read/write function after reboot
(SD card could be located at /dev/mmcbk0 , /dev/mmcbk1, check with RD first)

2.03.1.05 Test Result:

Item	Criteria	Result	Notes
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SD Card	The capacity of SD card is correct.	PASS	
	Read/Write test 1G file to check the SD card function can work properly	PASS	
	SD card can read/write after re-insert	PASS	
	SD card can read/write after reboot	PASS	

2.04 USB

2.04.1 USB mass storage

2.04.1.01 Test Purpose :

The purpose of this test is to ensure the functional of the USB port.

2.04.1.02 Test Tool or Equipment:

1. EPC-R7000

2.04.1.03 Testing Configuration:

1. Test environment: Room temperature

2.04.1.04 Test Procedure:

1. Power on the device and boots into OS
2. Plug in a USB flash device into USB connector and check system can detect it.
3. Run command to read/write 1G file on USB flash. Record the read/write speed in Notes below.

```
# mkdir /mnt/usb
# mount /dev/sda1 /mnt/usb
# dd if=/dev/zero of=/mnt/usb/testFile bs=1M count=1000
# dd if=/mnt/usb/testFile of=/dev/zero bs=1M
```
4. Un-mount USB disk. Re-insert USB flash 5 times. Mount USB again and and check read/write function.

```
# umount /mnt/usb
# mount /dev/mmcblk1p1 /mnt/usb
```
1. Check USB read/write function after reboot / wakeup.
 (USB could be located at /dev/sda0 , /dev/sda1, check with RD first)
 (If dd command does not show read/write speed, use “time dd ...” to measure the time.)

2.04.1.05 Test Result:

Item	Criteria	Result	Notes
USB_1	System should detect the USB flash device.	PASS	
	Read/Write test 1G of data file to check the USB function can work properly.	PASS	

	USB can read/write after re-insert 5 times.	PASS	
	USB can read/write after reboot	PASS	
USB_2	System should detect the USB flash device.	PASS	
	Read/Write test 1G of data file to check the USB function can work properly.	PASS	
	USB can read/write after re-insert 5 times.	PASS	
	USB can read/write after reboot	PASS	

2.05 Video Display

2.05.1 HDMI

2.05.1.01 Test Purpose :

The purpose of this test is to examine the function of the LVDS Interface.

2.05.1.02 Tool or Equipment:

1. USB to serial RS232 cable.
2. 3.3V panel (Test panel: AUO G070VW01 V0 7" 640x480)
3. Test tool: gplay Video information:MPEG-4(Base Media / Version 2) (.mp4) bit rate:5217kb/s

2.05.1.03 Testing Configuration:

1. Test environment: Room temperature

2.05.1.04 Test Procedure:

1. Use LVDS cable to connect LVDS panel
2. Power on device and boot into U-boot.

```
# setenv mmcargs setenv bootargs console=${console},${baudrate} ${smp}
root=${mmccroot} video=mxcfb0:dev=hdmi,1920x1080M@60,if=RGB24
video=mxcfb1:dev=ldb,640x480M@60,if=RGB24
video=mxcfb2:dev=ldb,640x480M@60,if=RGB24
```
3. Restart the system and boot to OS.
4. Run program to play media file.

```
# gst-launch-1.0 playbin uri=file:///mnt/usb/psy.mp4 video-sink= "imxv4l2sink
device=/dev/video18" audio-sink="alsasink device=plughw:0"
```
5. Check LVDS panel can play video and audio normally without any error.
6. Check LVDS function after reboot / wakeup.

2.05.1.05 Test Result:

Item		Criteria	Result	Notes
HDMI	3840x2160@60P	1. There is no shivering.	PASS	
		2. There is no water ripple		
		3. There is no color error	PASS	
		4. There is no flicker		

	HDMI-Audio Function	check if the voice is from HDMI device	PASS	
	Cable Hot-Plug checks under OS for 5 times.		PASS	
	Function after reboot		PASS	

2.06 Ethernet

2.06.1 LAN Basic Function test

2.06.1.01 Test Purpose :

The purpose of this test is to examine the LAN basic function and to ensure the functional of ethernet controllers.

2.06.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. Cable length: Cat.5E (3m).
3. Ubuntu server

2.06.1.03 Testing Configuration:

1. Test environment: Room temperature

2.06.1.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect Client (DUT) to internet with dhcp.
3. Download a 100MB file from ftp server

```
# mkdir /ftptest
```

```
# ftpget -v -u ftp -p ftp 210.61.132.2 /ftptest/test_100m.zip test_100m.zip
```

2.06.1.05 Test Result:

Item	Method	Criteria	Result	Notes
LAN port1	Download test	There is no error by test	PASS	
LAN port2			PASS	

2.07 RTC

2.07.1.01 Test Purpose :

Evaluate whether the RTC functions are working and are maintained in a stable condition.

2.07.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. SD Card

2.07.1.03 Testing Configuration:

1. Test environment: Room temperature

2.07.1.04 Test Procedure:

1. Power on EUT and boots into OS with network connected
2. Calibrate RTC timer through NTP Sever, and sync the system clock to hwclock.
ntpdate 172.20.1.100; hwclock -w;
(or ntpdate 118.163.81.61; hwclock -w @ Taiwan to time.stdtime.gov.tw)
3. Repeat step2 3 times check whether the system time can be calibrated every time.
4. Disconnect network and let the device power-on running for 24 hours.
5. Re-connect network. Run ntpdate to check the time difference with NTP server
ntpdate 172.20.1.100; hwclock -w;
6. Disconnect network and let the device power off for 24 hours.
7. Power on the device, and wait the device completely boot up. Then connect the network and check the time difference with NTP server.
ntpdate -q 172.20.1.100

2.07.1.05 Test Result:

Test Item	Criteria	Result	Notes
Calibrate RTC Timer	The timer should work properly no any deviation for 3 times	PASS	
Poweron 24 hours (no network)	Inaccuracy $\leq \pm 2\text{sec/day}$	PASS	
Power off 24 hours		PASS	

2.08 M.2

2.08.1.01 Test Purpose :

Evaluate whether the M.2 slot function are workable and maintained in a stable condition

2.08.1.02 Test Tool or Equipment

1. USB to serial RS232 cable
2. RS232 Cable

2.08.1.03 Testing Configuration:

1. Test environment: Room temperature

2.08.1.04 Test Procedure:

1. Insert M.2 card to M.2 slot of DUT
2. Turn on the DUT and boot into OS.
3. Check M.2 Key E/M.2 Key B module card can be recognized.

2.08.1.05 Test Result:

Test item		Criteria	Result	Note
M.2 slot	M.2 Key E	M.2 module card can be recognized.	PASS	EWM-163
	M.2 Key B		PASS	Sierra Wireless EM7565

2.09 SIM Slot Check

2.09.1.01 Test Purpose :

Evaluate whether the SIM slot function are workable and maintained in a stable condition

2.09.1.02 Test Tool or Equipment

3. USB to serial RS232 cable
4. RS232 Cable

2.09.1.03 Testing Configuration:

2. Test environment: Room temperature

2.09.1.04 Test Procedure:

1. Insert sim card to sim slot of DUT
2. Turn on the DUT and boot into OS.
- 3 .Check sim card cn be recognized in the OS.

2.09.1.05 Test Result:

Test item	Criteria	Result	Note
SIM slot	sim card cn be recongized.	PASS	

2.10 UIO-4030 extension Board Function

2.10.1 RS232

2.10.1.01 Test Purpose :

The purpose of this test is to examine the Serial Port basic function.

2.10.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable
3. Advantech RS232 loopback testing fixture.
4. Tool: st-fsl

2.10.1.03 Testing Configuration:

1. Test environment: Room temperature

2.10.1.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect RS232 loopback testing fixture to COM port.
3. Run command to test loopback function


```
# stty -F /dev/ttymx1 -echo -onlcr 115200 crtscts
# cat /dev/ttymx1 &
# echo "Serial Port Test" > /dev/ttymx1
```
4. Connect the RS-232 port to PC. Set configuration of UART as Full Tx/Rx, 9600bps, 8n1 and run command to test COM port. Repeat for baud rate 19200, 38400, 57600, and 115200.


```
# stty -F /dev/ttymx1 speed 9600 -crtscts -echo // baud rate 9600bps
# st-fsl /dev/ttymx1 -b 9600 -m 232 -g 60 -f none -c n81 -srvoa
```
5. Test function after reboot/resume.

2.10.1.05 Test Result:

Port.	Item	Baud Rate	Criteria	Result	Note
COM1	Loopback Test		Lookback test shouldn't have any error.	PASS	
		9600bps		PASS	

		19200bps		PASS	
		38400bps		PASS	
		57600bps		PASS	
		115200bps		PASS	
	Function after reboot	115200bps	The COM PORT Port can work normally after reboot	PASS	

2.10.2 GPIO Test

2.10.2.01 Test Purpose :

Evaluate whether the GPIO function are workable and maintained in a stable condition.

2.10.2.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable

2.10.2.03 Testing Configuration:

1. Test environment: Room temperature

2.10.2.04 Test Procedure:

1. Power on the device and boots into OS.
2. Set GPIO1~8


```
# echo 121 > /sys/class/gpio/export //extend GPIO1
# echo 122 > /sys/class/gpio/export //extend GPIO2
# echo 123 > /sys/class/gpio/export //extend GPIO3
# echo 124 > /sys/class/gpio/export //extend GPIO4
# echo 125 > /sys/class/gpio/export //extend GPIO5
# echo 126 > /sys/class/gpio/export //extend GPIO6
# echo 127 > /sys/class/gpio/export //extend GPIO7
# echo 133 > /sys/class/gpio/export //extend GPIO8
```
- 3.Short GPIO1/2, GPIO3/4, GPIO5/6, GPIO7/8
- 4.Set GPIO1/3/5/7 as output port, GPIO2/4/6/8 as input port.


```
# cd /sys/class/gpio/
# echo out > gpio1/direction
# echo out > gpio3/direction
# echo out > gpio5/direction
# echo out > gpio7/direction
# echo out > gpio2/direction
# echo in > gpio4/direction
# echo in > gpio6/direction
# echo in > gpio8/direction
```

5. Write GPIO2/4/6/8 to “0” and read the value of GPIO1/3/5/7 pins.

```
# echo 0 > gpio2/value
```

```
# echo 0 > gpio4/value
```

```
# echo 0 > gpio6/value
```

```
# echo 0 > gpio8/value
```

```
# cat gpio1/value
```

```
# cat gpio3/value
```

```
# cat gpio5/value
```

```
# cat gpio7/value
```

6. Write GPIO2/4/6/8 to “1” and read the value of GPIO1/3/5/7 pins.

7. Set GPIO2/4/6/8 as output port and GPIO1/3/5/7 as input port.

8. Write GPIO1/3/5/7 to “0” and read the value of GPIO2/4/6/8 pins.

9. Write GPIO1/3/5/7 to “1” and read the value of GPIO2/4/6/8 pins.

10. Retest after system reboot.

2.10.2.05 Test Result:

Item	Criteria	Result	Note.
GPIO	1. According to step5, the value of the GPIO1/3/5/7 should be “0” 2. According to step6, the value of the GPIO1/3/5/7 should be “1” 3. According to step8, the value of the GPIO2/4/6/8 should be “0” 4. According to step9, the value of the GPIO2/4/6/8 should be “1”	PASS	
Reboot	GPIO function normal after reboot	PASS	

2.11 UIO-4032 extension Board Function

2.11.1 RS232

2.11.1.01 Test Purpose :

The purpose of this test is to examine the Serial Port basic function.

2.11.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable
3. Advantech RS232 loopback testing fixture.
4. Tool: st-fsl

2.11.1.03 Testing Configuration:

1. Test environment: Room temperature

2.11.1.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect RS232 loopback testing fixture to COM port.
3. Run command to test loopback function


```
# stty -F /dev/ttymx1 -echo -onlcr 115200 crtscts
# cat /dev/ttymx1 &
# echo "Serial Port Test" > /dev/ttymx1
```
4. Connect the RS-232 port to PC. Set configuration of UART as Full Tx/Rx, 9600bps, 8n1 and run command to test COM port. Repeat for baud rate 19200, 38400, 57600, and 115200.


```
# stty -F /dev/ttymx1 speed 9600 -crtscts -echo // baud rate 9600bps
# st-fsl /dev/ttymx1 -b 9600 -m 232 -g 60 -f none -c n81 -srvoa
```
5. Test function after reboot/resume.

2.11.1.05 Test Result:

Port.	Item	Baud Rate	Criteria	Result	Note
COM1	Loopback Test	9600bps	Loopback test shouldn't have any error.	PASS	
		19200bps		PASS	
		38400bps		PASS	
		57600bps		PASS	

		115200bps		PASS	
	Function after reboot	115200bps	The COM PORT Port can work normally after reboot	PASS	
	Function After wake up		It can work properly as former status after wake up	PASS	
COM2	Loopback Test	9600bps	Lookback test shouldn't have any error.	PASS	
		19200bps		PASS	
		38400bps		PASS	
		57600bps		PASS	
		115200bps		PASS	
	Function after reboot	115200bps	The COM PORT Port can work normally after reboot	PASS	
	Function After wake up		It can work properly as former status after wake up	PASS	

2.11.2 LAN Function Test

2.11.2.01 Test Purpose :

The purpose of this test is to examine the LAN basic function and to ensure the functional of ethernet controllers.

2.11.2.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable
3. Cable length: Cat.5E (3m).

2.11.2.03 Testing Configuration:

1. Test environment: Room temperature

2.11.2.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect Client (DUT) to internet with dhcp.
3. Download a 100MB file from ftp server
mkdir /ftptest
ftpget -v -u ftp -p ftp 210.61.132.2 /ftptest/test_100m.zip test_100m.zip

2.11.2.05 Test Result:

Item	Method	Criteria	Result	Notes
LAN port0	Download test	There is no error by test	PASS	

2.11.3 LAN speed and LED check

2.11.3.01 Test Purpose :

The purpose of this test is to ensure the functional of the LAN LED.

2.11.3.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable
3. Cable length: Cat.5E (3m).

2.11.3.03 Testing Configuration:

1. Test environment: Room temperature

2.11.3.04 Test Procedure:

1. Connect LAN cable from LAN port of DUT to SmartBits
2. Turn on DUT, boot into OS.
3. Using follow comman to test LED status.
 - # ethtool -s eth0 speed 10 duplex full autoneg on //10m
 - # ethtool -s eth0 speed 100 duplex full autoneg on //100m
 - # ethtool -s eth0 speed 1000 duplex full autoneg on //1000m

2.11.3.05 Test Result:

Board LED			Criteria		Result		Notes
			Color	Status	Color	Status	
LAN Port 0	Left	Speed LED-10 Mbps	Off	Off	PASS	PASS	
		Speed LED-100 Mbps	Orange	On	PASS	PASS	
		Speed LED-1000 Mbps	Green	On	PASS	PASS	
	Right	Activity LED	Green	Blink	PASS	PASS	
		Link LED	Green	On	PASS	PASS	

2.11.4 USB mass storage

2.11.4.01 Test Purpose :

The purpose of this test is to ensure the functional of the USB port.

2.11.4.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable
3. USB Storage

2.11.4.03 Testing Configuration:

1. Test environment: Room temperature

2.11.4.04 Test Procedure:

1. Power on the device and boots into OS
2. Plug in a USB flash device into USB connector and check system can detect it.
3. Run command to read/write 1G file on USB flash. Record the read/write speed in Notes below.

```
# mkdir /mnt/usb
```

```
# mount /dev/sda1 /mnt/usb
```

```
# dd if=/dev/zero of=/mnt/usb/testFile bs=1M count=1000
```

```
# dd if=/mnt/usb/testFile of=/dev/zero bs=1M
```
4. Un-mount USB disk. Re-insert USB flash 5 times. Mount USB again and check read/write function.

```
# umount /mnt/usb
```

```
# mount /dev/mmcblk1p1 /mnt/usb
```
5. Check USB read/write function after reboot / wakeup.
 (USB could be located at /dev/sda0 , /dev/sda1, check with RD first)
 (If dd command does not show read/write speed, use “time dd ...” to measure the time.)

2.11.4.05 Test Result:

Item	Criteria	Result	Notes
USB0_1	System should detect the USB flash device.	PASS	
	Read/Write test 1G of data file to check the USB function can work properly.	PASS	

	USB can read/write after re-insert 5 times.	PASS	
	USB can read/write after reboot	PASS	
USB0_2	System should detect the USB flash device.	PASS	
	Read/Write test 1G of data file to check the USB function can work properly.	PASS	
	USB can read/write after re-insert 5 times.	PASS	
	USB can read/write after reboot	PASS	

2.12 UIO-4034 extension Board Function

2.12.1 RS232

2.12.1.01 Test Purpose :

The purpose of this test is to examine the Serial Port basic function.

2.12.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable
3. Advantech RS232 loopback testing fixture.
4. Tool: st-fsl

2.12.1.03 Testing Configuration:

1. Test environment: Room temperature

2.12.1.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect RS232 loopback testing fixture to COM port.
3. Run command to test loopback function


```
# stty -F /dev/ttymx1 -echo -onlcr 115200 crtscts
# cat /dev/ttymx1 &
# echo "Serial Port Test" > /dev/ttymx1
```
4. Connect the RS-232 port to PC. Set configuration of UART as Full Tx/Rx, 9600bps, 8n1 and run command to test COM port. Repeat for baud rate 19200, 38400, 57600, and 115200.


```
# stty -F /dev/ttymx1 speed 9600 -crtscts -echo // baud rate 9600bps
# st-fsl /dev/ttymx1 -b 9600 -m 232 -g 60 -f none -c n81 -srvoa
```
5. Test function after reboot/resume.

2.12.1.05 Test Result:

Port.	Item	Baud Rate	Criteria	Result	Note
COM1	Loopback Test	9600bps	Lookback test shouldn't have any error.	PASS	
		19200bps		PASS	

		38400bps		PASS	
		57600bps		PASS	
		115200bps		PASS	
	Function after reboot	115200bps	The COM PORT Port can work normally after reboot	PASS	
	Function After wake up		It can work properly as former status after wake up	PASS	
COM2	Loopback Test	9600bps	Lookback test shouldn't have any error.	PASS	
		19200bps		PASS	
		38400bps		PASS	
		57600bps		PASS	
		115200bps		PASS	
	Function after reboot	115200bps	The COM PORT Port can work normally after reboot	PASS	
	Function After wake up		It can work properly as former status after wake up	PASS	

2.12.2 CAN-Bus Test

2.12.2.01 Test Purpose :

Evaluate whether the CAN-Bus function are workable and maintained in a stable condition.

2.12.2.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. ICP DAS i7565H1 set

2.12.2.03 Testing Configuration:

1. Test environment: Room temperature

2.12.2.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect ICP DAS i7565H1 to PC and DUT
3. Run the test program "I-7565-H1H2_utility.exe
4. Set bitrate as 5K.
5. Send/Receive data and Check the message from the utility.
6. Change the bitrate as 1000K
7. Repeat step5 to test.

2.12.2.05 Test Result:

Port	Item	Criteria	Measurement	Judgement
CAN-Bus1	With bitrate as 5K to do read/write test.	There is no error	PASS	
	With bitrate as 1000K to do read/write test.		PASS	

2.13 UIO-4036 extension Board Function

2.13.1 LAN Function Test

2.13.1.01 Test Purpose :

The purpose of this test is to examine the LAN basic function and to ensure the functional of ethernet controllers.

2.13.1.02 Test Tool or Equipment:

4. USB to serial RS232 cable
5. RS232 cable
6. Cable length: Cat.5E (3m).

2.13.1.03 Testing Configuration:

2. Test environment: Room temperature

2.13.1.04 Test Procedure:

4. Turn on the power and boot to OS.
5. Connect Client (DUT) to internet with dhcp.
6. Download a 100MB file from ftp server
 - # mkdir /ftptest
 - # ftpget -v -u ftp -p ftp 210.61.132.2 /ftptest/test_100m.zip test_100m.zip

2.13.1.05 Test Result:

Item	Method	Criteria	Result	Notes
LAN_CN1	Download test	There is no error by test	PASS	
LAN_CN2			PASS	
LAN_CN3			PASS	
LAN_CN4			PASS	

Chapter 3 : Performance Test

3.01 Micro SD Performance

3.01.1.01 Test Purpose :

The purpose of this test is to validate and ensure the SD card performance of the DUT.

3.01.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. Memory SD card: SanDisk Extreme Pro SDHCI class 10 32GB

3.01.1.03 Testing Configuration:

1. Test environment: Room temperature

3.01.1.04 Test Procedure:

1. Run command
dd if=/dev/zero of=/mnt/sdcard/testFile bs=1M count=1000
dd if=/mnt/sdcard/testFile of=/dev/zero bs=1M
(If dd command does not show read/write speed, use “time dd ...” to measure the time.)

3.01.1.05 Test Result:

Item	Criteria	Result	Notes
SD Card	Read 1 GB transferred 12.25 seconds, 85.5 MB/s	PASS	
	Write 1 GB transferred 2 seconds, 534 MB/s	PASS	

3.02 USB Performance

3.02.1.01 Test Purpose :

The purpose of this test is to validate and ensure the usb performance of the DUT.

3.02.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. Memory SD card
3. USB 3.0 Storage Kingston 64GB(US-A00199)

3.02.1.03 Testing Configuration:

1. Test environment: Room temperature

3.02.1.04 Test Procedure:

1. Run command

```
# dd if=/dev/zero of=/mnt/sdcard/testFile bs=1M count=1000
```

```
# dd if=/mnt/sdcard/testFile of=/dev/zero bs=1M
```

 (If dd command does not show read/write speed, use “time dd ...” to measure the time.)

3.02.1.05 Test Result:

Item	Criteria	Result	Notes
USB_1	Read 1 GB transferred 24.5 seconds, 42.8MB/s	PASS	
	Write 1 GB transferred 110 seconds, 9.5MB/s	PASS	
USB_2	Read 1 GB bytes transferred 25 seconds, 42.1MB/s	PASS	
	Write 1 GB bytes transferred 116 seconds, 9.0MB/s	PASS	

3.03 Ethernet Performance

3.03.1.01 Test Purpose :

The purpose of this test is to validate and ensure the Ethernet performance of the DUT.

3.03.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. Memory SD card

3.03.1.03 Testing Configuration:

1. Test environment: Room temperature

3.03.1.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect Iperf Server and Client (DUT) by LAN cable.
3. Setting Client (DUT) ip 172.22.12.68
ifconfig eth0 172.22.12.68
4. DUT Send test:
Server: PC
iperf -s -t 86400
Client: DUT
./iperf -c 172.22.12.76 -w 300k -t 60
Waiting 60 seconds to check LAN throughput speed.
5. DUT Receive test:
Server: DUT
./iperf -s -t 86400
Client: PC
iperf -c 172.22.12.68 -w 300k -t 60
Waiting 60 seconds to check LAN throughput speed.

3.03.1.05 Test Result:

Item	Criteria	Result	Notes
Eth	Upload: 869 Mbits/sec	PASS	
	Download: 897 Mbits/sec		

Chapter 4 : Compatibility Test

4.01 USB Compatibility

4.01.1.01 Test Purpose :

The purpose of this test is to validate and ensure the USB devices compatibility of the DUT.

4.01.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. USB Storage Device

4.01.1.03 Testing Configuration:

1. Test environment: Room temperature

4.01.1.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect USB Storage to USB.
3. Make sure system can detect the USB Storage and can be access.
4. Repeat step2 to step3 to test.

4.01.1.05 Test Result:

Test Item Description					Criteria	Result	Notes
Brand Name	Model/Type	Capacity	Interface	QE NO.			
Kingston	DT101/G2	32GB	USB 2.0	US-A00475	There is no error by test	PASS	
Kingston	DTU30G3	32GB	USB3.0	US-A00570		PASS	
Trenscend	JetFlash 770	16GB	USB3.0	US-A00119		PASS	

Chapter 5 : Reliability Test

5.01 CPU Burinin Test

5.01.1.01 Test Purpose :

The purpose of this test is to stress and ensure the stability of the CPU.

5.01.1.02 Test Tool or Equipment

1. USB to serial RS232 cable
2. RS232 cable
3. Software: stress test

5.01.1.03 Testing Configuration:

1. Test environment: Room temperature

5.01.1.04 Test Procedure:

1. Turn on the power and boot to OS
2. Run cpuburn-in test program under OS
stress -c 2 -m 2 -d 1 -t 720M

5.01.1.05 Test Result:

Item	Criteria	Result	Note
Stress test	Burn-in for 12 hours. The DUT MUST maintain a stable condition after the test has been completed.	PASS	

5.02 Memory Burinin Test

5.02.1.01 Test Purpose :

The purpose of this test is to stress and ensure the stability of the Memory.

5.02.1.02 Test Tool or Equipment :

1. USB to serial RS232 cable
2. SD Card
3. Testing tool: memtester

5.02.1.03 Testing Configuration:

1. Test environment: Room temperature

5.02.1.04 Test Procedure:

1. Turn on the power and boot to OS
2. Run memtester test program under OS.
memtester 1000 500

5.02.1.05 Test Result:

Item	Criteria	Result	Note
memtester	Burn-in for 12 hours. The DUT MUST maintain a stable condition after the test has been completed.	PASS	

5.03 Graphic Burinin Test

5.03.1.01 Test Purpose :

The purpose of this test is to stress and ensure the stability of the Graphic Interface.

5.03.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. RS232 cable
3. Testing tool: GStreamer

5.03.1.03 Testing Configuration:

1. Test environment: Room temperature

5.03.1.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Using GStreamer to play a media file for 12 hours.
/tools/play.sh (with psy.mp4)

5.03.1.05 Test Result:

Item	Criteria	Result	Note
HDMI	Burn-in for 12 hours. The DUT MUST maintain a stable condition after the test has been completed.	PASS	

5.04 LAN Stress Test

5.04.1.01 Test Purpose :

The purpose of this test is to examine the LAN performance and to ensure the quality and stability of the Ethernet controllers.

5.04.1.02 Test Tool or Equipment:

1. USB to serial RS232 cable
2. Cble length: Cat.5E (3m).
3. Ubuntu server

5.04.1.03 Testing Configuration:

1. Test environment: Room temperature
2. Test tool: Iperf, Window Size: 300Kbytes

5.04.1.04 Test Procedure:

1. Turn on the power and boot to OS.
2. Connect Iperf Server and Client (DUT) by LAN cable.
3. Setting Client (DUT) ip 172.22.12.68
ifconfig eth0 172.22.12.68
4. DUT Send test:
Server: PC
iperf -s -t 86400
Client: DUT
./iperf -c 172.22.12.76 -w 300k -t 86400 -P 5
Waiting 1 day to check LAN stability.
5. DUT Receive test:
Server: DUT
./iperf -s -t 86400
Client: PC
iperf -c 172.22.12.68 -w 300k -t 86400 -P 5
Waiting 1day to check LAN stability.

5.04.1.05 Test Result:

Item	Criteria	Result	Note
LAN	Burn-in for 12 hours. The DUT MUST maintain a stable condition after the test has been completed.	PASS	