

# Test Procedure

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# Chapter 1. Initial test set up

- AM572X-BEL-MMRFIC board
- SD card with image

# **Chapter 2. TST001 Verify whether board is booting properly after powered up**

## **2.1. Procedure**

- Provide power supply to phytec carrier board and press power button for booting
- Check whether it is booting correctly or struck anywhere

## **2.2. Expected result**

- Board should be booted successfully



# **Chapter 3. TST002 Verify whether board is rebooting properly after Reset Button pressed**

## **3.1. Procedure**

- Press the Reset Button when Board is in Running
- Check whether it is rebooting properly or struck anywhere

## **3.2. Expected result**

- Board should be rebooted successfully

# **Chapter 4. TST003 Verify the consistency of booting when power cycle a Device multiple times**

## **4.1. Procedure**

- Plug the power cable and press the power button check the board is booting properly
- Unplug and plug the power button for multiple times and check the board is properly booting

## **4.2. Expected result**

- The board should boot successfully for multiple times also

# Chapter 5. TST004 Check release version

## 5.1. Procedure

- We can check the release version by using the below command

```
$ cat /etc/os-release.
```

## 5.2. Expected result

```
ID="arago"  
NAME="Arago"  
VERSION="2019.11"  
VERSION_ID="2019.11"  
PRETTY_NAME="Arago 2019.11"
```

# Chapter 6. TST005 Check the U-boot software version

## 6.1. Procedure

- After booting the board at the initial stage of the boot log we can check the version of U-Boot

## 6.2. Expected result

```
U-Boot 2019.01-gdf704de-BSP-Yocto-TISDK-AM57xx-PD20.1.2-dirty (Jul 19 2022 - 09:20:58 +
```

# Chapter 7. TST006 Check the Kernel version

## 7.1. procedure

- After completion of booting process we can check kernel version

```
$ uname -r
```

## 7.2. Expected result

- Kernel version should be displayed

# Chapter 8. TST007 Verify the total RAM size

## 8.1. Procedure

- We can Check ram size by using command

```
$ cat /proc/meminfo
```

## 8.2. Expected result

```
MemTotal:      1847828 kB
MemFree:       1614256 kB
MemAvailable:  1741080 kB
Buffers:       12792 kB
Cached:        133992 kB
SwapCached:    0 kB
Active:        46652 kB
Inactive:      117928 kB
Active(anon):  19176 kB
Inactive(anon): 9028 kB
Active(file):  27476 kB
Inactive(file): 108900 kB
Unevictable:   0 kB
Mlocked:       0 kB
HighTotal:     1291264 kB
HighFree:      1131312 kB
LowTotal:      556564 kB
LowFree:       482944 kB
SwapTotal:     0 kB
SwapFree:      0 kB
Dirty:         0 kB
Writeback:     0 kB
AnonPages:     17832 kB
Mapped:        26532 kB
Shmem:         10400 kB
Slab:          38532 kB
SReclaimable:  15020 kB
SUnreclaim:    23512 kB
KernelStack:   1072 kB
PageTables:    1224 kB
NFS_Unstable:  0 kB
Bounce:        0 kB
WritebackTmp:  0 kB
CommitLimit:   923912 kB
Committed_AS:  202984 kB
VmallocTotal:  245760 kB
VmallocUsed:    0 kB
VmallocChunk:  0 kB
Percpu:        312 kB
CmaTotal:      188416 kB
```

CmaFree:	175148 kB
----------	-----------

# Chapter 9. TST008 Verify the available RAM space size

## 9.1. Procedure

- we can check the available RAM size by using the command

```
$ cat /proc/meminfo
```

## 9.2. Expected result

```
MemTotal:      1847828 kB
MemFree:       1614256 kB
MemAvailable:  1741080 kB
Buffers:       12792 kB
Cached:        133992 kB
SwapCached:    0 kB
Active:        46652 kB
Inactive:      117928 kB
Active(anon):  19176 kB
Inactive(anon): 9028 kB
Active(file):  27476 kB
Inactive(file): 108900 kB
Unevictable:   0 kB
Mlocked:       0 kB
HighTotal:     1291264 kB
HighFree:      1131312 kB
LowTotal:      556564 kB
LowFree:       482944 kB
SwapTotal:     0 kB
SwapFree:      0 kB
Dirty:         0 kB
Writeback:     0 kB
AnonPages:     17832 kB
Mapped:        26532 kB
Shmem:         10400 kB
Slab:          38532 kB
SReclaimable:  15020 kB
SUnreclaim:    23512 kB
KernelStack:   1072 kB
PageTables:    1224 kB
NFS_Unstable:  0 kB
Bounce:        0 kB
WritebackTmp:  0 kB
CommitLimit:   923912 kB
Committed_AS:  202984 kB
VmallocTotal:  245760 kB
VmallocUsed:    0 kB
VmallocChunk:  0 kB
Percpu:        312 kB
CmaTotal:      188416 kB
```



CmaFree:	175148 kB
----------	-----------

# Chapter 10. TST009 Verify the total Storage size

## 10.1. Procedure

- we can check the total storage size by using the below command

```
$ df -h
```

## 10.2. Expected result

Filesystem	Size	Used	Available	Use%	Mounted on
/dev/root	7.2G	6.7G	107.4M	98%	/
devtmpfs	809.3M	4.0K	809.3M	0%	/dev
tmpfs	902.3M	8.0K	902.3M	0%	/dev/shm
tmpfs	902.3M	9.5M	892.7M	1%	/run
tmpfs	902.3M	0	902.3M	0%	/sys/fs/cgroup
tmpfs	902.3M	608.0K	901.7M	0%	/tmp
tmpfs	16.0M	0	16.0M	0%	/media/ram
tmpfs	50.0M	16.0K	50.0M	0%	/var/volatile
/dev/mmcblk0p1	4.0M	770.0K	3.2M	19%	/run/media/mmcblk0p1
/dev/mmcblk1p2	2.2G	1.8G	209.9M	90%	/run/media/mmcblk1p2
tmpfs	180.4M	0	180.4M	0%	/run/user/0

# Chapter 11. TST010 Verify the Available Storage size

## 11.1. Procedure

- we can check the available storage size by using the below command

```
$ df -h
```

## 11.2. Expected result

Filesystem	Size	Used	Available	Use%	Mounted on
/dev/root	7.2G	6.7G	107.4M	98%	/
devtmpfs	809.3M	4.0K	809.3M	0%	/dev
tmpfs	902.3M	8.0K	902.3M	0%	/dev/shm
tmpfs	902.3M	9.5M	892.7M	1%	/run
tmpfs	902.3M	0	902.3M	0%	/sys/fs/cgroup
tmpfs	902.3M	608.0K	901.7M	0%	/tmp
tmpfs	16.0M	0	16.0M	0%	/media/ram
tmpfs	50.0M	16.0K	50.0M	0%	/var/volatile
/dev/mmcblk0p1	4.0M	770.0K	3.2M	19%	/run/media/mmcblk0p1
/dev/mmcblk1p2	2.2G	1.8G	209.9M	90%	/run/media/mmcblk1p2
tmpfs	180.4M	0	180.4M	0%	/run/user/0

# Chapter 12. TST011 Verify the SOC Name and number of core

## 12.1. Procedure

- By using the below command we can check the SOC name and number of core

```
$ cat /proc/cpuinfo
```

## 12.2. Expected result

```
processor       : 0
model name     : ARMv7 Processor rev 2 (v7l)
BogoMIPS      : 12.29
Features       : half thumb fastmult vfp edsp neon vfpv3 tls vfpv4 idiva idivt vfpd3
CPU implementer : 0x41
CPU architecture: 7
CPU variant    : 0x2
CPU part       : 0xc0f
CPU revision   : 2

processor       : 1
model name     : ARMv7 Processor rev 2 (v7l)
BogoMIPS      : 12.29
Features       : half thumb fastmult vfp edsp neon vfpv3 tls vfpv4 idiva idivt vfpd3
CPU implementer : 0x41
CPU architecture: 7
CPU variant    : 0x2
CPU part       : 0xc0f
CPU revision   : 2
Hardware       : Generic DRA74X (Flattened Device Tree)
Revision       : 0000
Serial        : 0b01400e64fa0922
```

# Chapter 13. TST012 Verify the architecture of SOC

## 13.1. Procedure

- we can find the architecture of SOC by using the below command

```
$ uname -m
```

## 13.2. Expected result

```
armv7l
```

# Chapter 14. TST013 Verify whether Ethernet ports are detected

## 14.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Ethernet ports is to be enabled

## 14.2. Procedure

- Connecting ethernet port and pc through ethernet cable we can find whether ethernet ports are detected by using the below commands

```
$ ethtool eth0
```

or

```
$ ethtool eth1
```

## 14.3. Expected result

```
Settings for eth1:
  Supported ports: [ TP MII ]
  Supported link modes:   10baseT/Half 10baseT/Full
                        100baseT/Half 100baseT/Full
                        1000baseT/Half 1000baseT/Full
  Supported pause frame use: Symmetric Receive-only
  Supports auto-negotiation: Yes
  Supported FEC modes: Not reported
  Advertised link modes:  10baseT/Half 10baseT/Full
                        100baseT/Half 100baseT/Full
                        1000baseT/Half 1000baseT/Full
  Advertised pause frame use: No
  Advertised auto-negotiation: Yes
  Advertised FEC modes: Not reported
  Link partner advertised link modes:  10baseT/Half 10baseT/Full
                                      100baseT/Half 100baseT/Full
                                      1000baseT/Full
  Link partner advertised pause frame use: No
  Link partner advertised auto-negotiation: Yes
  Link partner advertised FEC modes: Not reported
  Speed: 1000Mb/s
  Duplex: Full
  Port: MII
  PHYAD: 2
  Transceiver: internal
  Auto-negotiation: on
  Supports Wake-on: d
  Wake-on: d
  Current message level: 0x00000000 (0)
```

Link detected: yes

Settings for eth0:

Supported ports: [ TP MII ]

Supported link modes: 10baseT/Half 10baseT/Full  
100baseT/Half 100baseT/Full  
1000baseT/Half 1000baseT/Full

Supported pause frame use: Symmetric Receive-only

Supports auto-negotiation: Yes

Supported FEC modes: Not reported

Advertised link modes: 10baseT/Half 10baseT/Full  
100baseT/Half 100baseT/Full  
1000baseT/Half 1000baseT/Full

Advertised pause frame use: No

Advertised auto-negotiation: Yes

Advertised FEC modes: Not reported

Speed: 10Mb/s

Duplex: Half

Port: MII

PHYAD: 1

Transceiver: internal

Auto-negotiation: on

Supports Wake-on: d

Wake-on: d

Current message level: 0x00000000 (0)

Link detected: no

# Chapter 15. TST014 Verify LAN Ethernet port is getting ip address when it is connected to LAN

## 15.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Ethernet ports is to be enabled

## 15.2. Procedure

- Connect ethernet port in phytec board and check whether the port is getting ip address from WAN by using the command

```
$ ifconfig
```

## 15.3. Expected result

```
eth0      Link encap:Ethernet  HWaddr 50:51:A9:92:C8:92
          inet addr:10.42.0.27  Bcast:10.42.0.255  Mask:255.255.255.0
          inet6 addr: fe80::5251:a9ff:fe92:c892/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:163 errors:0 dropped:0 overruns:0 frame:0
          TX packets:148 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:37147 (36.2 KiB)  TX bytes:26487 (25.8 KiB)
          Interrupt:98

eth1      Link encap:Ethernet  HWaddr 50:51:A9:92:C8:93
          inet6 addr: fe80::5251:a9ff:fe92:c893/64 Scope:Link
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:32 errors:0 dropped:0 overruns:0 frame:0
          TX packets:69 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7737 (7.5 KiB)  TX bytes:11460 (11.1 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:140 (140.0 B)  TX bytes:140 (140.0 B)
```



# Chapter 16. TST015 Verify the GPIO pins are populated in sysfs

## 16.1. Preconditions

- AM572X-BEL-MMRFIC board
- SD card
- GPIO pins is to be enabled

## 16.2. Procedure

- Go to /sys/bus and check whether the GPIO pins are enabled.

## 16.3. Expected result

cec	gpio	mmc	rpmsg	spmi
clockevents	hid	mmc_rpmb	scsi	usb
clocksource	i2c	nvmem	sdio	usb-serial
container	iio	pci	serial	virtio
cpu	mdio_bus	pci-epf	serio	wl
edac	media	pci_express	soc	workqueue
event_source	mipi-dsi	platform	spi	

# Chapter 17. TST016 Verify whether UART ports are Detected

## 17.1. Preconditions

- AM572X-BEL-MMRFIC board
- SD card
- UART Image is to be flashed

## 17.2. Procedure

- Go to /sys/class/ and check whether UART is detecting or not.
- ls /sys/class/tty/tty\*

## 17.3. Expected result

```
ttys0:
dev      power      subsystem uevent

ttys1:
dev      power      subsystem uevent

ttys2:
dev      power      subsystem uevent

ttys3:
dev      power      subsystem uevent

ttys4:
dev      power      subsystem uevent

ttys5:
dev      power      subsystem uevent

ttys6:
dev      power      subsystem uevent

ttys7:
dev      power      subsystem uevent

ttys8:
dev      power      subsystem uevent

ttys9:
dev      power      subsystem uevent

ttysa:
dev      power      subsystem uevent

ttysb:
dev      power      subsystem uevent
```

```
ttysc:
dev      power      subsystem uevent

ttysd:
dev      power      subsystem uevent

ttyse:
dev      power      subsystem uevent

ttysf:
dev      power      subsystem uevent
```

# Chapter 18. TST017 Verify whether \$(n) UART ports are detected

## 18.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 18.2. Procedure

- Check the UART ports are detected using below command

```
$ ls /dev/ttyS*
```

## 18.3. Expected result

- Number of UART ports detected should be 7

```
/dev/ttyS0 /dev/ttyS1 /dev/ttyS2 /dev/ttyS3 /dev/ttyS4 /dev/ttyS5 /dev/ttyS6 /dev/ttyS7
```

# Chapter 19. TST018 Verify whether \$(n) I<sup>2</sup>C ports are detected

## 19.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 19.2. Procedure

- Check the I<sup>2</sup>C ports are detected using below command

```
$ ls /dev/i2c-*
```

## 19.3. Expected result

- Number of I<sup>2</sup>C ports detected should be 5

```
/dev/i2c-0 /dev/i2c-2 /dev/i2c-3
```

# Chapter 20. TST019 Verify Scanning of slave devices in I<sup>2</sup>C buses

## 20.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 20.2. Procedure

- Run i2cdetect command to scan the slave devices connected to i2c bus
- You will need to specify <busno> as the i2c port number

```
$ i2cdetect -y <busno>
```

## 20.3. Expected result

- It should output a table of the currently detected I<sup>2</sup>C devices

```
root@am572x-bel-mmrfic:~# i2cdetect -y 0
Warning: Can't use SMBus Quick Write command, will skip some addresses
   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:
10:
20:
30: -- -- -- -- -- -- -- --
40:
50: UU -- -- -- -- -- -- -- UU UU UU 5b -- -- -- --
60:
70:
```

```
root@am572x-bel-mmrfic:~# i2cdetect -y 2
Warning: Can't use SMBus Quick Write command, will skip some addresses
   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:
10:
20:
30: -- -- -- -- -- -- -- --
40:
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60:
70:
```

```
root@am572x-bel-mmrfic:~# i2cdetect -y 3
Warning: Can't use SMBus Quick Write command, will skip some addresses
   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:
10:
20:
30: -- -- -- -- -- -- -- --
40:
```

50: - - - - -  
60:  
70:

# Chapter 21. TST020 Verify whether \$(n) SPI ports are detected

## 21.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 21.2. Procedure

- Check the SPI ports are detected using below command

```
$ ls /dev/spi*
```

## 21.3. Expected result

- Number of SPI ports detected should be 2

```
/dev/spidev1.0  
/dev/spidev1.1
```



# Chapter 22. TST021 Verify whether \$(n) USB ports are detected

## 22.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 22.2. Procedure

- Check the USB ports are detected using below command

```
$ lsusb
```

## 22.3. Expected result

```
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub  
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
```

# Chapter 23. TST022 Verify whether USB slave device is detected

## 23.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image
- Pendrive

## 23.2. Procedure

- Connect the pendrive in USB port 1 of board
- Check the dmesg log to verify whether pendrive is detected in USB port 1

## 23.3. Expected result

- Pendrive should be detected in USB port 1

```
root@am572x-bel-mmrfic:~# [ 3975.978165] usb 2-1: new SuperSpeed Gen 1 USB device number 1
[ 3976.009065] usb 2-1: New USB device found, idVendor=0781, idProduct=5581, bcdDevice=1.00
[ 3976.017285] usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 3976.025121] usb 2-1: Product: Ultra
[ 3976.028976] usb 2-1: Manufacturer: SanDisk
[ 3976.033093] usb 2-1: SerialNumber: 4C531003560526109191
[ 3976.129677] usb-storage 2-1:1.0: USB Mass Storage device detected
[ 3976.136532] scsi host1: usb-storage 2-1:1.0
[ 3976.142295] usbcore: registered new interface driver usb-storage
[ 3976.152572] usbcore: registered new interface driver uas
[ 3977.199035] scsi 1:0:0:0: Direct-Access      SanDisk Ultra                1.00 PQ: 0 ANSI
[ 3977.226311] sd 1:0:0:0: [sda] 30464000 512-byte logical blocks: (15.6 GB/14.5 GiB)
[ 3977.234966] sd 1:0:0:0: [sda] Write Protect is off
[ 3977.240174] sd 1:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO
[ 3977.255074] sda: sda1
[ 3977.259567] sd 1:0:0:0: [sda] Attached SCSI removable disk
[ 3991.098360] usb 2-1: USB disconnect, device number 2
[ 3991.268280] FAT-fs (sda1): unable to read boot sector to mark fs as dirty
```

# Chapter 24. TST023 Verify Audio codec driver is detected

## 24.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 24.2. Procedure

- Check the audio codec driver are detected using below command

```
$ dmesg | grep "audio"
```

## 24.3. Expected result

- Audio driver Initialization should be shown in dmesg log

```
root@am572x-bel-mmrfic:~# dmesg | grep "audio"
[ 9.004476] omap-hdmi-audio omap-hdmi-audio.0.auto: snd-soc-dummy-dai <-> 58040000.e
[ 9.044884] omap-hdmi-audio omap-hdmi-audio.0.auto: ASoC: no DMI vendor name!
[ 9.401116] of_get_named_gpiod_flags: can't parse 'simple-audio-card,hp-det-gpio' pr
[ 9.401134] of_get_named_gpiod_flags: can't parse 'simple-audio-card,mic-det-gpio' p
```

# Chapter 25. TST024 Verify Audio ports are detected

## 25.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 25.2. Procedure

- Check the list of audio port detected using below command

```
$ aplay -l
```

## 25.3. Expected result

- List of audio ports should be detected

```
aplay -l
**** List of PLAYBACK Hardware Devices ****
card 0: PCH [HDA Intel PCH], device 0: ALC3204 Analog [ALC3204 Analog]
  Subdevices: 0/1
  Subdevice #0: subdevice #0
card 0: PCH [HDA Intel PCH], device 3: HDMI 0 [HDMI 0]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 0: PCH [HDA Intel PCH], device 7: HDMI 1 [HDMI 1]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 0: PCH [HDA Intel PCH], device 8: HDMI 2 [HDMI 2]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```

# Chapter 26. TST025 Verify whether Board enter into uboot prompt properly when press any key

## 26.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 26.2. Procedure

- Power up the board
- While booting the board, check the autoboot count is 5 seconds in boot log
- Then press enter key go to u-boot prompt

## 26.3. Expected result

- Board should be entered into uboot prompt

```
U-Boot 2019.01-dirty (Jul 22 2022 - 13:25:15 +0000)

CPU   : DRA752-GP ES2.0
Model: MMRFIC phyCORE-AM572x Carrier Board
Board: AM572X-BEL-MMRFIC
DRAM:  2 GiB
MMC:   OMAP SD/MMC: 0, OMAP SD/MMC: 1
Loading Environment from FAT... *** Warning - bad CRC, using default environment

Loading Environment from MMC... *** Warning - bad CRC, using default environment

PHYTEC: unknown board name. Defaulting to am572x_bel_mmrfic, a MINIMAL AM5716 configura
Warning: fastboot.board_rev: unknown board revision
Net:
Warning: ethernet@48484000 using MAC address from ROM
eth0: ethernet@48484000
Hit any key to stop autoboot:  0
=>
=>
```

# Chapter 27. TST026 Check the board SOC in u-boot

## 27.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 27.2. Procedure

- Check the board soc using below command

```
$ print board_soc
```

## 27.3. Expected result

- Board SOC should be am572x

```
=> print board_soc  
board_soc=am572x
```

# Chapter 28. TST027 Check the CPU model in u-boot

## 28.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 28.2. Procedure

- Check the CPU model using below command

```
$ print cpu
```

## 28.3. Expected result

- CPU model should be armv7

# Chapter 29. TST028 Check the board name in u-boot

## 29.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 29.2. Procedure

- Check the board name using below command

```
$ print board_name
```

## 29.3. Expected result

- Board name should be am572x\_bel\_mmrfic

```
=> print board_name  
board_name=am572x_bel_mmrfic
```



# Chapter 30. TST029 Check the U-boot version

## 30.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 30.2. Procedure

- Check the U-boot using below command

```
$ print ver
```

## 30.3. Expected result

- U-boot version should be ver=U-Boot 2019.01-dirty

```
=> print ver  
ver=U-Boot 2019.01-dirty (Jul 22 2022 - 13:25:15 +0000)
```

# Chapter 31. TST030 Verify whether kernel log is displayed using dmesg

## 31.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 31.2. Procedure

- Check the kernel log is displayed in dmesg

```
$ dmesg
```

## 31.3. Expected result

- Kernel log should be shown in dmesg command output

# Chapter 32. TST031 Verify whether Kernel data structure is accessible using sysfs

## 32.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 32.2. Procedure

- check kernel data structure is accessible by getting current kernel log level from sysfs

```
$ cat /proc/sys/kernel/printk
```

## 32.3. Expected result

- Kernel data should be accessible using sysfs

```
7      4      1      7
```

# Chapter 33. TST032 Verify whether board shell is accessible

## 33.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 33.2. Procedure

- Power up the board
- After Board booted up, login the board
- Run sh command and check whether shell is accessible

```
$ sh
```

```
root@am572x-bel-mmrfic:~# ls /bin/sh
/bin/sh
root@am572x-bel-mmrfic:~# echo $SHELL
/bin/sh
```

# Chapter 34. TST033 Check whether Rootfs have basic commands for testing

## 34.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 34.2. Procedure

- Power up and login the board
- Run below commands and check whether commands are available in board

```
* dmesg
* i2cdetect -V
* aplay --version
* spidev_test -v
* ls /dev/ttyS*
* dmesg | grep <name>
```

## 34.3. Expected result

- All mentioned Basic commands should be available in board

# Chapter 35. TST034 Verify MMC\_1 8 pins working as SD Card boot

## 35.1. precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 35.2. procedure

- Insert image flashed SD card into card slot
- Power up the board

## 35.3. Expected Result

- Board Should boot, and we should get the linux prompt

# Chapter 36. TST035 Verify ETH\_0 8 pins working as 10/100/1000M Ethernet(RGMII0)

## 36.1. Precondition

- AM572X-BEL-MMRFIC board
- SD card with image

## 36.2. Procedure

- set the speed(10/100/1000M) and other properties using ethtool
- connect the live ethernet cable to the connector
- Check the configured parameters using ethtool

## 36.3. Expected Result

```
root@am572x-bel-mmrfic:~# ethtool eth0
Settings for eth0:
    Supported ports: [ TP MII ]
    Supported link modes:   10baseT/Half 10baseT/Full
                           100baseT/Half 100baseT/Full
                           1000baseT/Half 1000baseT/Full
    Supported pause frame use: Symmetric Receive-only
    Supports auto-negotiation: Yes
    Supported FEC modes: Not reported
    Advertised link modes:  100baseT/Full
    Advertised pause frame use: No
    Advertised auto-negotiation: Yes
    Advertised FEC modes: Not reported
    Link partner advertised link modes:  10baseT/Half 10baseT/Full
                                         100baseT/Half 100baseT/Full
    Link partner advertised pause frame use: No
    Link partner advertised auto-negotiation: Yes
    Link partner advertised FEC modes: Not reported
    Speed: 100Mb/s
    Duplex: Full
    Port: MII
    PHYAD: 1
    Transceiver: internal
    Auto-negotiation: on
    Supports Wake-on: d
    Wake-on: d
    Current message level: 0x00000000 (0)

    Link detected: yes

root@am572x-bel-mmrfic:~# ethtool -s eth0 speed 1000 duplex full autoneg on
```

```
root@am572x-bel-mmrfic:~# ethtool eth0
Settings for eth0:
    Supported ports: [ TP MII ]
    Supported link modes:   10baseT/Half 10baseT/Full
                           100baseT/Half 100baseT/Full
                           1000baseT/Half 1000baseT/Full
    Supported pause frame use: Symmetric Receive-only
    Supports auto-negotiation: Yes
    Supported FEC modes: Not reported
    Advertised link modes:  1000baseT/Full
    Advertised pause frame use: No
    Advertised auto-negotiation: Yes
    Advertised FEC modes: Not reported
    Link partner advertised link modes:  10baseT/Half 10baseT/Full
                                         100baseT/Half 100baseT/Full
                                         1000baseT/Full
    Link partner advertised pause frame use: No
    Link partner advertised auto-negotiation: Yes
    Link partner advertised FEC modes: Not reported
    Speed: 1000Mb/s
    Duplex: Full
    Port: MII
    PHYAD: 1
    Transceiver: internal
    Auto-negotiation: on
    Supports Wake-on: d
    Wake-on: d
    Current message level: 0x00000000 (0)

    Link detected: yes
```



# Chapter 37. TST036 verify AMBE Codec 4 MHz clock on boot up

## 37.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Digital Oscilloscope

## 37.2. procedure

- Boot up the board.
- check the resistor R51 with DSO Probe.

## 37.3. Expected result

- 4MHZ waveform on DSO.

# Chapter 38. TST037 verify the PHY MDIO.

## 38.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Ethernet Driver

## 38.2. procedure

- Boot into linux.
- Connect ethernet cable.
- Configure eth0 speed to 100Mbps/1000Mbps using `ethtool`
  - `ethtool -s eth speed <100/1000> duplex full autoneg on`

## 38.3. Expected result

```
root@am572x-bel-mmrfic [mailto:root@am572x-bel-mmrfic]:/sys/class/leds# ethtool -s eth0
speed 100 duplex half autoneg on root@am572x-bel-mmrfic [mailto:root@am572x-bel-mmrfic]:/
sys/class/leds# ethtool eth0 Settings for eth0: Supported ports: [ TP MII ] Supported link
modes: 10baseT/Half 10baseT/Full 100baseT/Half 100baseT/Full 1000baseT/Half 1000baseT/Full
Supported pause frame use: Symmetric Receive-only Supports auto-negotiation: Yes Supported
FEC modes: Not reported Advertised link modes: 100baseT/Half Advertised pause frame use: No
Advertised auto-negotiation: Yes Advertised FEC modes: Not reported Link partner advertised
link modes: 10baseT/Half 10baseT/Full 100baseT/Half 100baseT/Full Link partner advertised
pause frame use: No Link partner advertised auto-negotiation: Yes Link partner advertised FEC
modes: Not reported Speed: 100Mb/s Duplex: Half Port: MII PHYAD: 1 Transceiver: internal Auto-
negotiation: on Supports Wake-on: d Wake-on: d Current message level: 0x00000000 (0)
```

```
Link detected: yes
```

# Chapter 39. TST038 verify the TLV CODEC test.

## 39.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card

## 39.2. procedure

- Boot into linux.
- Play the test file aplay.

## 39.3. Expected result

`root@am572x-bel-mmrfic [mailto:root@am572x-bel-mmrfic]:/sys/class/leds# aplay /usr/share/sounds/alsa/Noise.wav` Playing WAVE `/usr/share/sounds/alsa/Noise.wav` : Signed 16 bit Little Endian, Rate 48000 Hz, Mono

# Chapter 40. TST039 verify RP Message test.

## 40.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- DSP Firmware

## 40.2. procedure

- Boot the board to Linux.
- Load the firmware to DSP Engines and IPU Engines.
- Execute the below commands.

```
# DSP 1

$ ln -sf /home/root/dsp-binaries/rpmsg/server_dsp1.xe66 /lib/firmware/dra7-dsp1-fw.xe66
$ echo 40800000.dsp > /sys/bus/platform/drivers/omap-rproc/unbind
$ echo 40800000.dsp > /sys/bus/platform/drivers/omap-rproc/bind
$ cd /root/dsp-binaries/rpmsg
$ ./app_host DSP1

# DSP 2

$ ln -sf /home/root/dsp-binaries/rpmsg/server_dsp1.xe66 /lib/firmware/dra7-dsp2-fw.xe66
$ echo 41000000.dsp > /sys/bus/platform/drivers/omap-rproc/unbind
$ echo 41000000.dsp > /sys/bus/platform/drivers/omap-rproc/bind
$ cd /root/dsp-binaries/rpmsg
$ ./app_host DSP2

# IPU 1

$ ln -sf /home/root/dsp-binaries/rpmsg/server_ipu1.xem4 /lib/firmware/dra7-ipu1-fw.xem4
$ echo 58820000.ipu > /sys/bus/platform/drivers/omap-rproc/unbind
$ echo 58820000.ipu > /sys/bus/platform/drivers/omap-rproc/bin
$ cd /root/dsp-binaries/rpmsg
$ ./app_host IPU1

# IPU 2

$ ln -sf /home/root/dsp-binaries/rpmsg/server_ipu1.xem4 /lib/firmware/dra7-ipu2-fw.xem4
$ echo 55020000.ipu > /sys/bus/platform/drivers/omap-rproc/unbind
$ echo 55020000.ipu > /sys/bus/platform/drivers/omap-rproc/bin
$ cd /root/dsp-binaries/rpmsg
$ ./app_host IPU2
```

## 40.3. Expected result

```
` `` root@am572x-bel-mmrfic [mailto:root@am572x-bel-mmrfic]:~/dsp-binaries/rpmsg# ./
app_host DSP1 -> main: -> Main_main: -> App_create: App_create: Host is ready #- App_create:
```

-> App\_exec: App\_exec: sending message 1 App\_exec: sending message 2 App\_exec: sending message 3 App\_exec: message received, sending message 4 . . App\_exec: message received, sending message 15 App\_exec: message received App\_exec: message received App\_exec: message received #- App\_exec: 0 -> App\_delete: #- App\_delete: #- Main\_main: #- main:

root@am572x-bel-mmrpic [mailto:root@am572x-bel-mmrpic]:~/dsp-binaries/rpmsg# ./app\_host DSP2 -> main: -> Main\_main: -> App\_create: App\_create: Host is ready #- App\_create: -> App\_exec: App\_exec: sending message 1 App\_exec: sending message 2 App\_exec: sending message 3 App\_exec: message received, sending message 4 . . App\_exec: message received, sending message 15 App\_exec: message received App\_exec: message received App\_exec: message received #- App\_exec: 0 -> App\_delete: #- App\_delete: #- Main\_main: #- main:

root@am572x-bel-mmrpic [mailto:root@am572x-bel-mmrpic]:~/dsp-binaries/rpmsg# ./app\_host IPU1 -> main: -> Main\_main: -> App\_create: App\_create: Host is ready #- App\_create: -> App\_exec: App\_exec: sending message 1 App\_exec: sending message 2 App\_exec: sending message 3 App\_exec: message received, sending message 4 . . App\_exec: message received, sending message 15 App\_exec: message received App\_exec: message received App\_exec: message received #- App\_exec: 0 -> App\_delete: #- App\_delete: #- Main\_main: #- main:

root@am572x-bel-mmrpic [mailto:root@am572x-bel-mmrpic]:~/dsp-binaries/rpmsg# ./app\_host IPU2 -> main: -> Main\_main: -> App\_create: App\_create: Host is ready #- App\_create: -> App\_exec: App\_exec: sending message 1 App\_exec: sending message 2 App\_exec: sending message 3 App\_exec: message received, sending message 4 . . App\_exec: message received, sending message 15 App\_exec: message received App\_exec: message received App\_exec: message received #- App\_exec: 0 -> App\_delete: #- App\_delete: #- Main\_main: #- main:

...

# Chapter 41. TST040 verify IPC Big Data test.

## 41.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- DSP binary

## 41.2. procedure

- Boot the board to Linux.
- Load the firmware to DSP.
- Execute the below commands.

```
# DSP 1
$ ln -sf /home/root/dspl-bigdata/server_dsp.xe66 /lib/firmware/dra7-dsp1-fw.xe66
$ echo 40800000.dsp > /sys/bus/platform/drivers/omap-rproc/unbind
$ echo 40800000.dsp > /sys/bus/platform/drivers/omap-rproc/bind
$ cd /root/dspl-bigdata
$ ./app_host DSP1

# DSP 2
$ ln -sf /home/root/dspl-bigdata/server_dsp.xe66 /lib/firmware/dra7-dsp2-fw.xe66
$ echo 41000000.dsp > /sys/bus/platform/drivers/omap-rproc/unbind
$ echo 41000000.dsp > /sys/bus/platform/drivers/omap-rproc/bind
$ cd /root/dspl-bigdata
$ ./app_host DSP2
```

## 41.3. Expected Result

```
$ ./app_host DSP1
--> main:
--> Main_main:
--> App_create:
App_create: Host is ready
<-- App_create:
--> App_exec:
CMEM_init success
CMEM_allocPool success: Allocated buffer 0xaa50e000
SharedRegion_setup success
HeapMem_setup success
.
HeapMem_create success
App_exec: sending message 1
.
App_exec: sending message 2
App_exec: sending message 3
.
App_exec: message received: 16
```

```
App_exec: Data check clean
<-- App_exec: 0
--> App_delete:
<-- App_delete:
<-- Main_main:
Host: Test Passed
<-- main:

$ ./app_host DSP2
--> main:
--> Main_main:
--> App_create:
App_create: Host is ready
<-- App_create:
--> App_exec:
CMEM_init success
CMEM_allocPool success: Allocated buffer 0xaa50e000
SharedRegion_setup success
HeapMem_setup success
.
HeapMem_create success
App_exec: sending message 1
.
App_exec: sending message 2
App_exec: sending message 3
.
App_exec: message received: 16
App_exec: Data check clean
<-- App_exec: 0
--> App_delete:
<-- App_delete:
<-- Main_main:
Host: Test Passed
<-- main:
```

# Chapter 42. TST041 Verify u-boot log on UART-3/ttyS2.

## 42.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card

## 42.2. procedure

- Connect UART3 to Serial Terminal.
- Power on the Board.
- Press Enter Key on bootup.

## 42.3. Expected result

- U-Boot log should be shown as below.

```
U-Boot 2019.01-dirty (Jul 22 2022 - 13:25:15 +0000)

CPU   : DRA752-GP ES2.0
Model: MMRFIC phyCORE-AM572x Carrier Board
Board: AM572X-BEL-MMRFIC
DRAM:  2 GiB
MMC:   OMAP SD/MMC: 0, OMAP SD/MMC: 1
.
.
.
.
Hit any key to stop autoboot:  0
=>
=>
```



# Chapter 43. TST042 verify Linux log on UART-3/ttyS2.

## 43.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card

## 43.2. procedure

- Connect UART4 to Serial Terminal/PC.
- Power on the Board.

## 43.3. Expected result

- Linux boot log should be shown in Serial Terminal.

# Chapter 44. TST043 Verify Loopback test on UART-2/ttys1

## 44.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Loopback setup

## 44.2. procedure

1.Connect(Loopback) Carrier Board MB Connector PIN#133(RX) & PIN#134(TX) 2.Run the test as below 3.TX and RX data should be same

## 44.3. Expected result

```
root@am572x-bel-mmrfic [mailto:root@am572x-bel-mmrfic]:~# uart_test /dev/ttyS1 Writting  
Data..... Device Reading ..... mmrfhello Loopback Test Success
```

# Chapter 45. TST044 Verify Loopback test on UART-4/ttys3

## 45.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Loopback setup

## 45.2. procedure

1.Connect(Loopback) Carrier Board MB Connector PIN#(RX) & PIN#(TX) 2.Run the test as below 3.TX and RX data should be same

## 45.3. Expected result

```
root@am572x-bel-mmrfic [mailto:root@am572x-bel-mmrfic]:~# uart_test /dev/ttyS3 Writting  
Data..... Device Reading ..... mmrfhello Loopback Test Success
```

# Chapter 46. TST045 Verify AMBE CODEC reset pin toggling

## 46.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Digital Oscilloscope

## 46.2. procedure

- Export GPIO\_13(MBC - 42)
- Set direction to `out`.
- set a number to `value` file.

```
$ cd /sys/class/gpio
$ echo 173 > export
$ cd gpio173
$ echo out > direction
$ echo 1 > value
$ echo 0 > value
```

## 46.3. Expected result

- MBC PIN#42 should toggle as per the value written.

# Chapter 47. TST046 Verify USB Webcam test

## 47.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Digital Oscilloscope

## 47.2. procedure

- Connect the USB webcam to the USB port.
- We can record the stream using the following three methods 1.gstreamer pipeline 2.Python script 3.cpp code

## 47.3. 1.Record Camera using GStreamer CLI

The following gstreamer pipeline can be used to record camera data to a file.

```
target# gst-launch-1.0 v4l2src device=/dev/video1 name=cam_src ! videoconvert ! \
      queue ! videoconvert ! avimux ! filesink location=output2.avi
```

## 47.4. 2.Record Camera using OpenCV in Python

This example Python script saves the camera feed into a file.

### 47.4.1. Step 1: Save the file

Save the below Python code on the target's filesystem as **opencv\_save.py**.

```
import cv2

def save_feed_to_file(path, fps, codec):
    # open camera
    cam = cv2.VideoCapture(1)
    width = cam.get(cv2.CAP_PROP_FRAME_WIDTH) # float
    # Get current height of frame
    height = cam.get(cv2.CAP_PROP_FRAME_HEIGHT) # float

    # setup video writer object
    codec = cv2.VideoWriter_fourcc(*codec)
    out = cv2.VideoWriter(path, codec, fps, (int(width), int(height)))

    while (cam.isOpened()):
        # read a frame
        ret, frame = cam.read()

        # write frame using video writer
        out.write(frame)

def main():
```

```
save_feed_to_file("test.avi", 60, "MJPG")

if __name__ == "__main__":
    main()
```

### 47.4.2. Step 2: Run the script

Use the below command to run the script.

```
target# python3 <path-to-file>/opencv_save.py
```



#### Note

To stop saving the feed press **ctrl+c**.

---

## 47.5. 3.Record Camera using OpenCV in C++

This cpp example code saves the camera feed as a file.

### 47.5.1. Step 1: Save the file

Save the below file on target's filesystem as **opencv\_save.cpp**.

```
#include <opencv2/core.hpp>
#include <opencv2/highgui.hpp>
#include <opencv2/videoio.hpp>
#include "opencv2/imgproc/imgproc.hpp"

#include <iostream>

using namespace std;
using namespace cv;

int main(int argc, char *argv[])
{
    Mat frame;
    VideoCapture cap(1);

    int width = cap.get(cv::CAP_PROP_FRAME_WIDTH);
    int length = cap.get(cv::CAP_PROP_FRAME_HEIGHT);
    int fps = cap.get(cv::CAP_PROP_FPS);
    Size sizeFrame(width, length);

    if (!cap.isOpened()) {
        cerr << "Error in opening feed\n";
        return -1;
    }

    //Video Codec, create video writer object
    int codec = VideoWriter::fourcc('M', 'J', 'P', 'G');
    VideoWriter writer("./feed_save.avi", codec, fps, sizeFrame);

    if (!writer.isOpened()) {
```

```
        cerr << "Error in opening writer\n";
        return -1;
    }

    while (1) {

        // read frame
        if (!cap.read(frame)) {
            cerr << "Error, blank frame\n";
            return -1;
        }

        // write frame
        writer.write(frame);
    }
    cap.release();
    writer.release();
    return 0;
}
```

### 47.5.2. Step 2: Compile the source

Use the below command to compile.

```
target# arm-linux-gnueabihf-g++ <path-to-file>/opencv_save.cpp \
-I/usr/include/opencv4 -L/usr/local/libc -lopencv_videoio \
-lopencv_imgproc -lopencv_highgui -lopencv_core -o opencv_save
```

### 47.5.3. Step 3: Run the executable

Run the executable as shown below.

```
target# ./opencv_save
```



#### Note

To stop saving the feed press **ctrl+c**.

---

## 47.6. Expected result

- All three of the methods described above save the camera feed as a file into the webcam.

# Chapter 48. TST047 Verify SPI Loopback test.

## 48.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Loopback setup

## 48.2. procedure

1.Download and Build the spidev-test as below(<https://github.com/rm-hull/spidev-test>)

```
$ git clone https://github.com/rm-hull/spidev-test
$ cd spidev-test
$ gcc spidev_test.c -o spidev_test
$ ./spidev_test /dev/spidev{1.0/1.1}
```

2.Connect(Loopback) Carrier Board MB Connector PIN#39(MOSI) & PIN#40(MISO) 3.Run the test as below 4.TX and RX data should be same

## 48.3. Expected result

```
root@am572x-bel-mmrfic:~/spidev-test# pwd
/home/root/spidev-test
root@am572x-bel-mmrfic:~/spidev-test# ./spidev -v -D /dev/spidev1.0
spi mode: 0x0
bits per word: 8
max speed: 500000 Hz (500 KHz)
TX | FF FF FF FF FF FF 40 00 00 00 00 95 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
RX | FF FF FF FF FF FF 40 00 00 00 00 95 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

root@am572x-bel-mmrfic:~/spidev-test# ./spidev -v -D /dev/spidev1.1
spi mode: 0x0
bits per word: 8
max speed: 500000 Hz (500 KHz)
TX | FF FF FF FF FF FF 40 00 00 00 00 95 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
RX | FF FF FF FF FF FF 40 00 00 00 00 95 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```



# Chapter 49. TST048 Verify eMMC Boot test.

## 49.1. preconditions

- AM572X-BEL-MMRFIC board
- SD card
- Loopback setup

## 49.2. procedure

- Copy tisd-k-rootfs-image-am572x-bel-mmrfic.tar, u-boot.img and MLO to SDCARD.
- Boot Linux from SDCARD.
- Create partitions on eMMC as below.
  - When prompted, enter the following sequence of characters one at a time. Do not enter the comments following the "#".

```
```sh $ fdisk /dev/mmcblk1 # eMMC device command:: g #GPT partition table command:: n #new partition command:: 1 #partition number command:: 2048 #first sector command:: +2M #last sector command:: n #new partition command:: 2 #partition number command:: <enter> #first sector command:: <enter> #use default value command:: w #write table to disk and exit
```

```
``` * format the partitions using mkfs
```

```
``` $ mkfs.vfat /dev/mmcblk1p1 $ mkfs.ext4 -b 4096 /dev/mmcblk1p2 ``` * Mount the eMMC partitions
```

```
``` $ mkdir -p /mnt/uboot/ $ mount /dev/mmcblk1p1 /mnt/uboot $ mkdir -p /mnt/rootfs $ mount /dev/mmcblk1p2 /mnt/rootfs ``` * Copy the rootfs and uboot contents from SD to eMMC.
```

```
``` $ cp /path/to/MLO /path/to/u-boot.img /mnt/uboot $ tar -xvf /path/to/tisd-k-rootfs-image-am572x-bel-mmrfic.tar -C /mnt/rootfs $ touch /mnt/rootfs/eMMC ``` * Boot from eMMC. - Power OFF the Board. - Remove the SD Card. - Power ON the Board.
```

## 49.3. Expected result

- Board should boot from eMMC without SD Card.