MRS-801-RE

User Manual

Revision	Release Date
V0.1	2014/09/24
V0.2	2017/11/10

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Safety Information

Your MRS-801-RE is designed and tested to meet the latest standards of safety for information technology equipment. However, to ensure your safety, it is important that you read the following safety instructions

Setting up your system

- Read and follow all instructions in the documentation before you operate your system.
- Do not use this product near water.
- Set up the system on a stable surface. Do not secure the system on any unstable plane.
- Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
- Slots and openings on the chassis are for ventilation. Do not block or cover these openings. Make sure you leave plenty of space around the system for ventilation. ***Never insert objects of any kind into the ventilation openings***.
- This system should be operated from the type of power indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.
- Use this product in environments with ambient temperatures between 0˚C and 50˚C.
- If you use an extension cord, make sure that the total ampere rating of the devices plugged into the extension cord does not exceed its ampere rating.
- DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THESTORAGE TEMPERATURE MAY GO BELOW -20° C OR ABOVE 60° C. THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.

Care during use

- Do not walk on the power cord or allow anything to rest on it.
- Do not spill water or any other liquids on your system.
- When the system is turned off, a small amount of electrical current still flows. Always unplug all power, and network cables from the power outlets before cleaning the system.
- If you encounter the following technical problems with the product, unplug the power cord and contact a qualified service technician or your retailer.
  - ➢ The power cord or plug is damaged.
  - ➢ Liquid has been spilled into the system.
  - ➢ The system does not function properly even if you follow the operating instructions.
  - ➢ The system was dropped or the cabinet is damaged.

Lithium-Ion Battery Warning

CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer’s instructions.

NO DISASSEMBLY

The warranty does not apply to the products that have been disassembled by users.

WARNING
HAZARDOUS MOVING PARTS
KEEP FINGERS AND OTHER BODY PARTS AWAY

Acknowledgments

CHAPTER 1 INTRODUCTION

1.1 General Description

MRS-801-RE, an 8” RISC-based Power-over-Ethernet panel PC, utilizes the Freescale I.MX6 Cortex A9 Processor providing high computing performance and low power consumption.

It comes with 1GB DDR3 memory and one 4GB eMMC and one SD card slot for data storage. It has one Gigabit Ethernet LAN PoE, an RS-232/485 port and USB OTG that are well suited for industrial applications. The unit is equipped with 5-side IP65 protection. It supports Linux 3.x and Android 4.x. The MRS-801-RE supports 12V DC single power input.

MRS-801-RE overview

1.2 System Specification

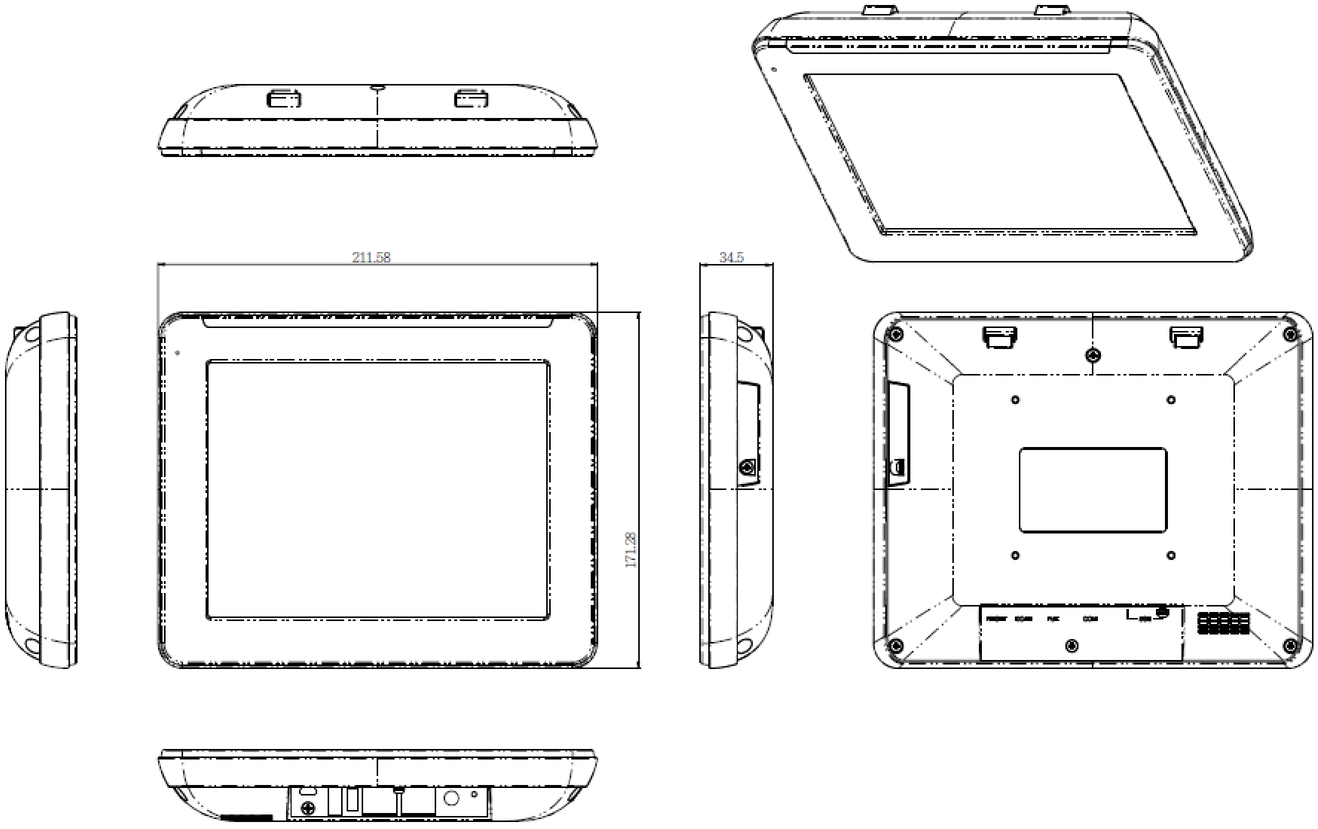
1.2.1 Hardware Specifications

Model Name	MRS-801-RE
System Mainboard	IB102
CPU	Freescale I.MX6 Cortex A9 Solo (1 Cores @ 1GHz)
Memory	1GB DDR3 memory
I/O Interface	1x USB (USB Host. A-Type) 1x USB OTG (mini USB B Type) 1x RS-232/485 via RJ45 connector 1x GbE LAN POE 802.3at 1x Power reset button Switch 1x 12V DC-in power jack
Storage	1x 4GB eMMC onboard 1x SD card slot
Expansion Slots	None
Power Supply	12V DC input/POE
LCD Size	8” TFT LCD
LCD Color	262K
LCD Resolution	800 x 600
LCD Brightness	250
LCD View Angle (H°/V°)	140/120
Backlight MTBF	30,000 hrs
Touch Screen	Resistive Touch Screen
Construction	Plastic
Mounting	VESA 75x75mm
Dimensions (W)x(D)x(H) mm	211.6 x 171.2 x 33.5
Operating Temperature	0°C~ 50°C
Storage Temperature	-20°C ~ 60°C
Relative Humidity	10%~90% (non-condensing)
Protection Class	IP65 front bezel
Certification	CE/FCC Class A
Operating System Support	Linux3.X,Android4.X

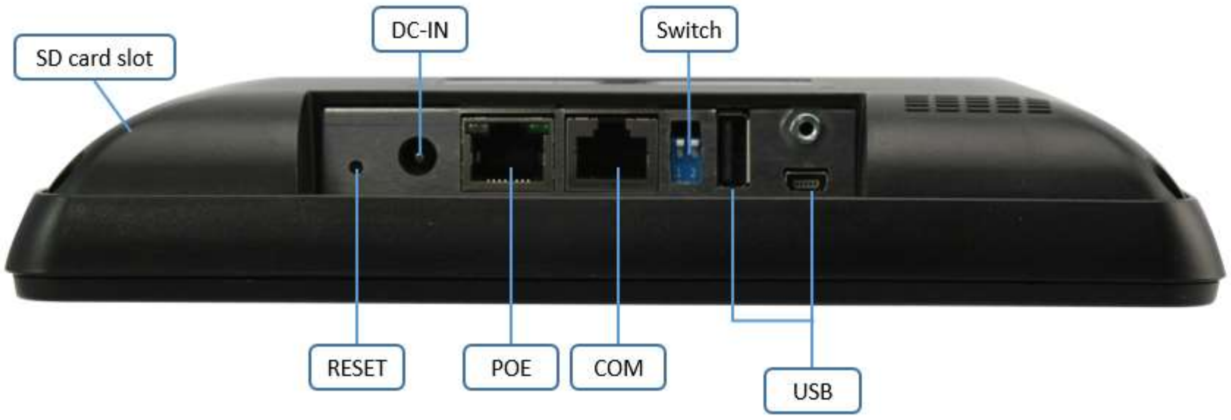
·This specification is subject to change without prior notice.

1.2.2 Dimensions

MRS-801-RE



1.2.3 I/O View



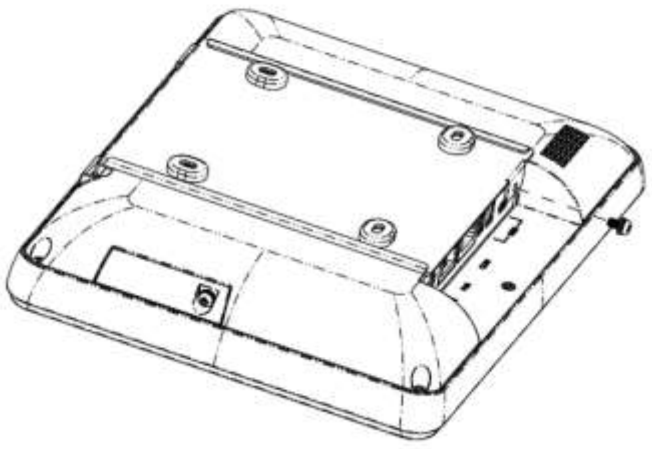
1.3 Packing List

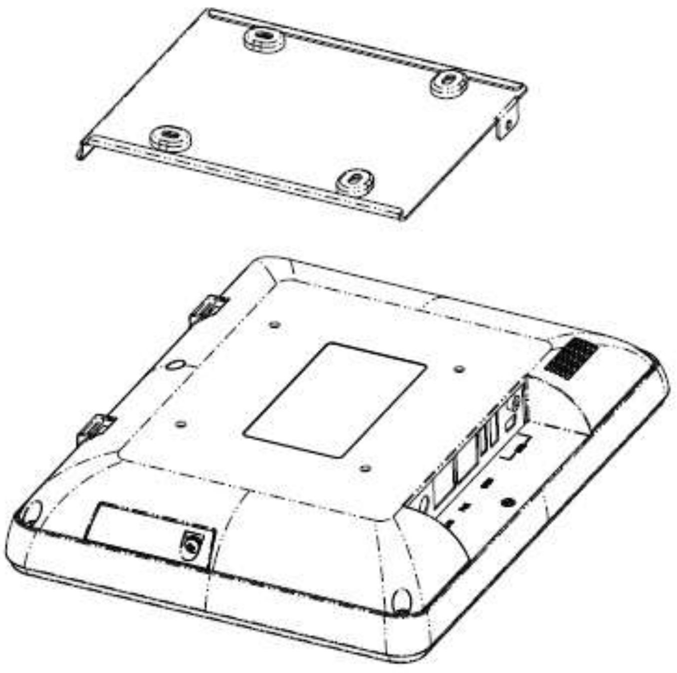
Part No.	Description	Quantity
1	60W power adaptor	1 pc

1.4 Installation

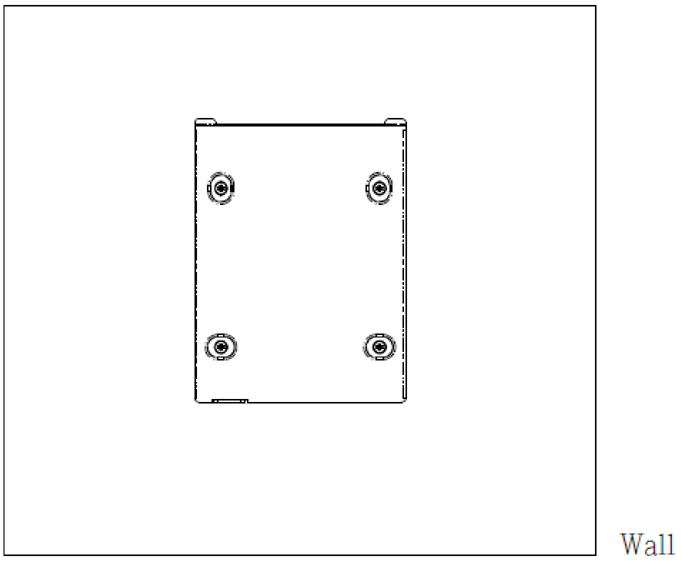
1.4.1 Installing wall mount

1. Loosen one screw and then replace the mounting bracket.

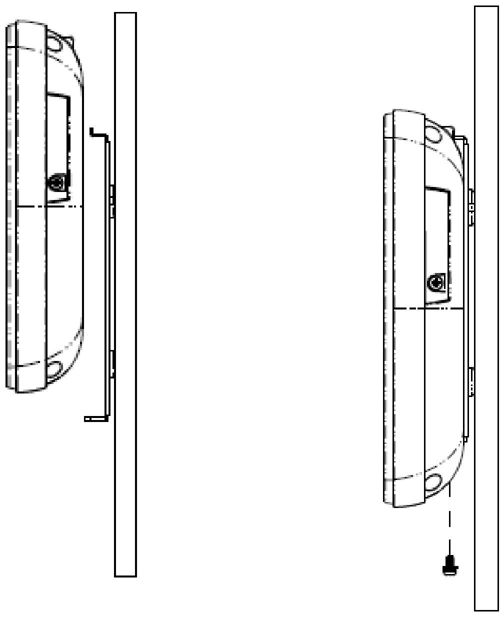




2. Install the mounting bracket on the wall.



3. Hang up the MRS-801-RE on the wall and twist one screw as shown.



CHAPTER 2 MOTHERBOARD INTRODUCTION

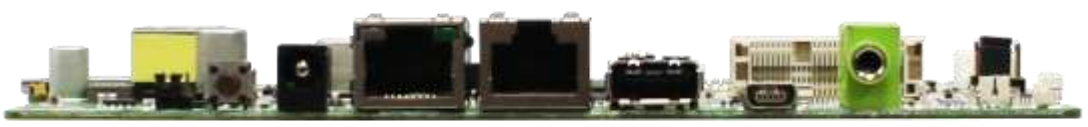
2.1 Introduction

The IB102 i.MX6 SBC comes with extended consumer-grade Freescale i.MX6 Solo Core Cortex-A9 1GHz CPU. LVDS, POE+, and light bar design to bring you the scalability and flexibility you need. The device offers 3D graphics acceleration, while also supporting numerous peripherals, including DDR3, RS232/422/485 port and USB OTG that are well suited for industrial applications.

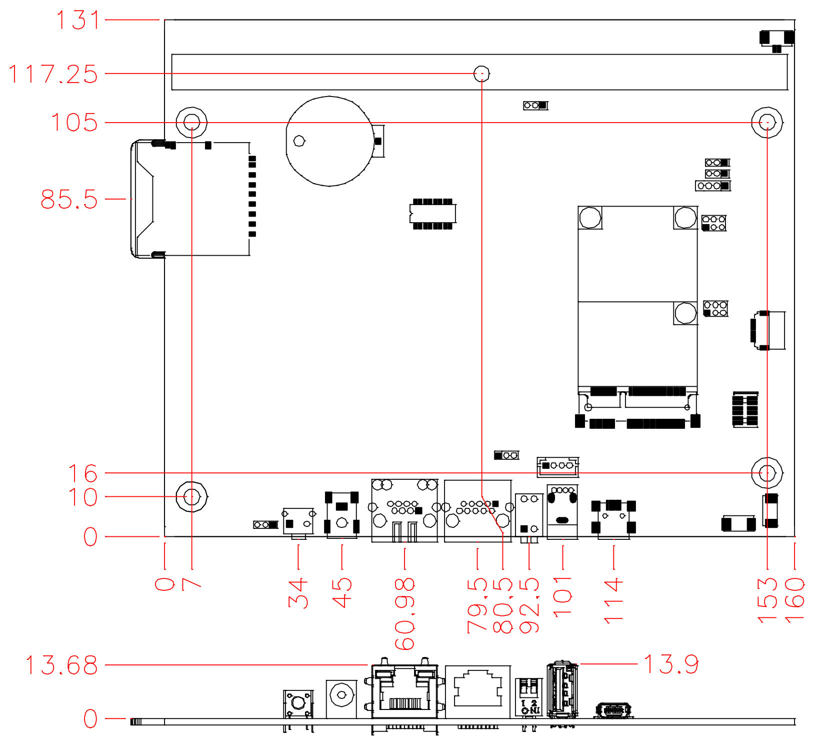
Specifications – Mainboard	
Product Name	**IB102**
Form Factor	150mm x 165mm
CPU Type	Freescale i.MX6 Solo Core Coretex-A9 on Board
CPU Speed	1GHz
Memory	DDR3 1GB on Board
VGA Controller	IPU v3H IPU Engine
Edge IO	10/100/1000 LAN x1 (RJ45 connector with POE+ support) USB x 1 (USB Host. A-Type) USB OTG x 1 (mini AB type) COM1 RS-232/422/485 x 1 Dip switch x 1 (for 232/485 selection) SD card slot x 1 Reset button x1 12V DC-IN Jack x 1,
Internal Headers	LVDS Connector x 1 GPIO x (10pin, pitch 2.0 with 3.3V, refer to RP100) Audio pin Header x3 I2C connector x1 Battery: BR2032 with socket
Expansion Slots	miniPCIE x1 (with USB support)
Others	LEDs light bar x 1 (3xGPIO pin control Red, Orange and Green)
Operating Temperature	0~60 degree
SW Support	1. Ubuntu Linux 11.10 (kernel 3.0) 2. Android 4.3

This specification is subject to change without prior notice.

I/O View



Board Dimensions



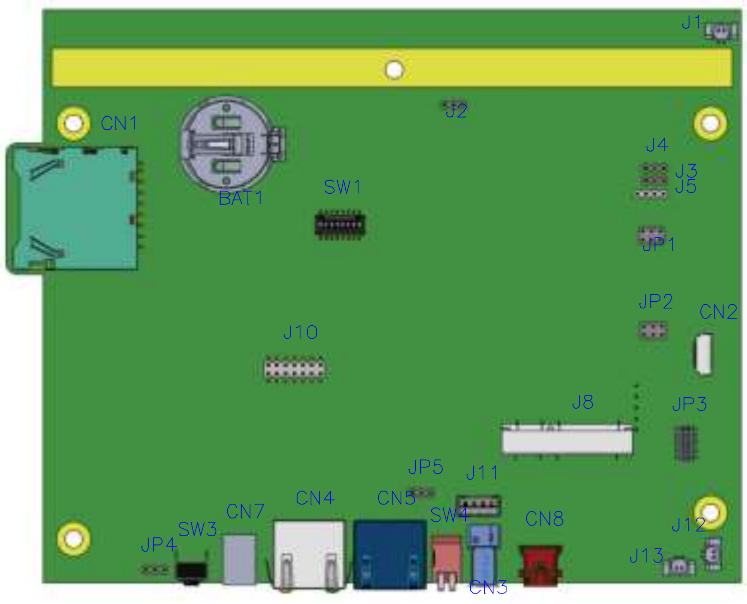
2.2 Setting Jumpers

[Important] Please check the jumpers, DIP, buttons and switches on IB102 before doing the panel connection and boot up.

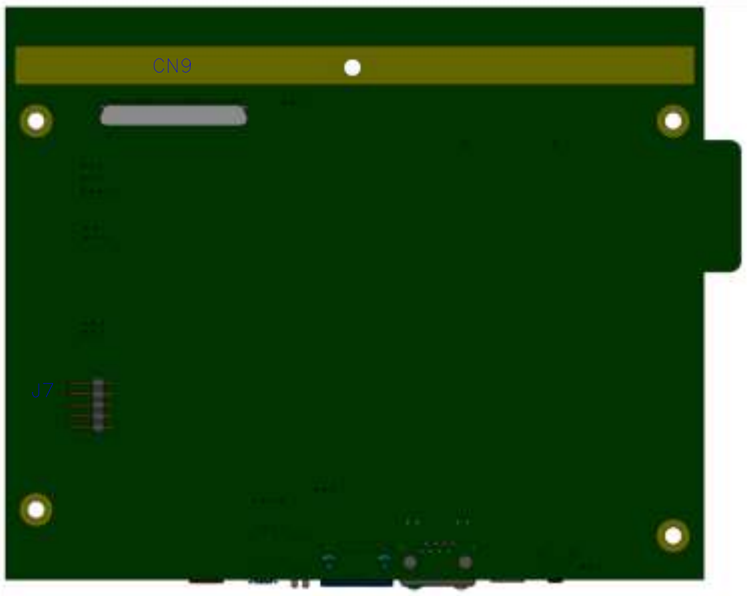
Jumpers are used on IB102 to select various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your needs. The following lists the connectors on IB102 and their respective functions.

Jumper Locations on IB102

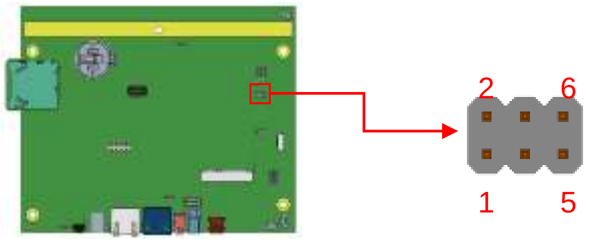
Top Side

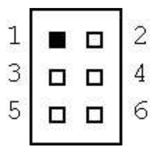


Bottom Side

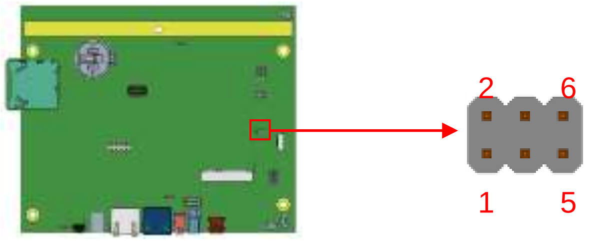


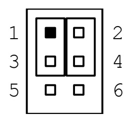
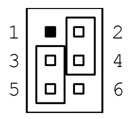
JP1: Touch Pad Wire Setting 2.0mm



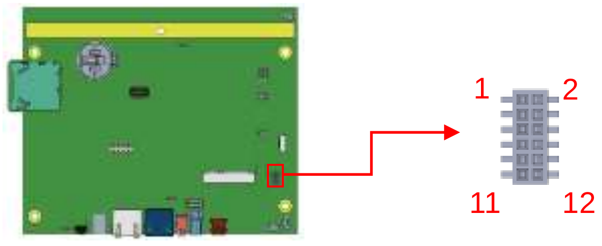
JP1	Setting	Function
	Pin 1-2 Short/Open	4 or 8 wire/5 wire (Default)
	Pin 3-4 Short/Open	4 or 8 wire/5 wire (Default)
	Pin 5-6 Short/Open	4 or 8 wire/5 wire (Default)

JP2: Touch USB/UART Mode Setting 2.0mm

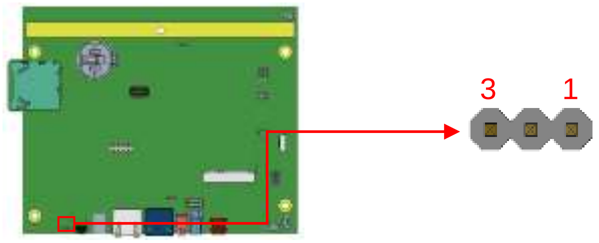


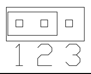
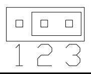
JP2	USB Setting*	Function
	Pin 1-3 Short/Closed	USB
	Pin 2-4 Short/Closed	
JP2	**UART Setting**	**Function**
	Pin 3-5 Short/Closed	UART*
	Pin 2-4 Short/Closed	Baud rate 19200*
	Pin 4-6 Short/Closed	Baud rate 9600

JP3: Program Interface (E-CALL 0519-03-2161-120) (Factory use only)

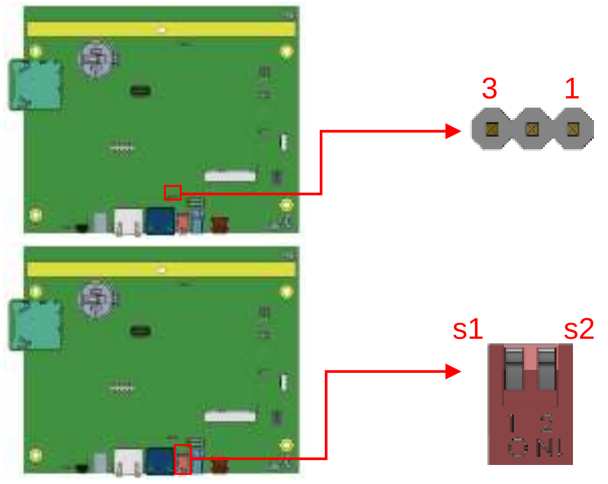


JP4: System reset/GPIO Mode Setting 2.0mm



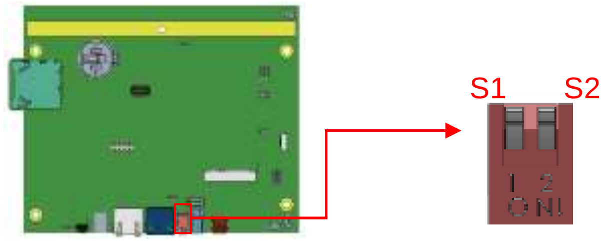
JP4	Setting	Function
	Pin 1-2 Short/Closed	GPIO
	Pin 2-3 Short/Closed	System Reset (Default)

JP5, SW4 (S2): RS-232/422/485 Mode Selection 2.0mm



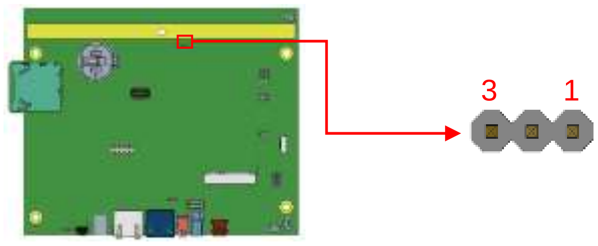
COM1 Mode	SW4 (S2)	JP5
RS-232	Off (Default)	2-3 Short (Default)
RS-485	On	2-3 Short
RS-422	Off	1-2 Short

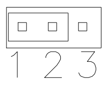
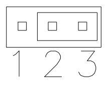
SW4 (S1): RS-422/485 Device Termination Selection



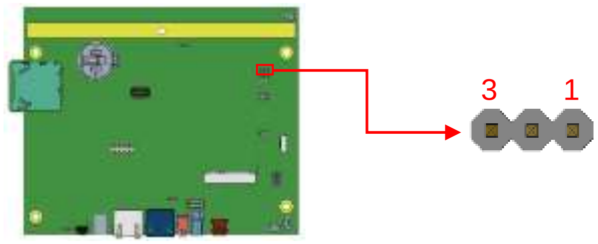
SW4 (S1)	Device Mode
On	None Terminal (Default)
Off	Terminal

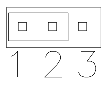
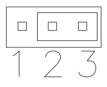
J2: BL Voltage Setting 2.0mm



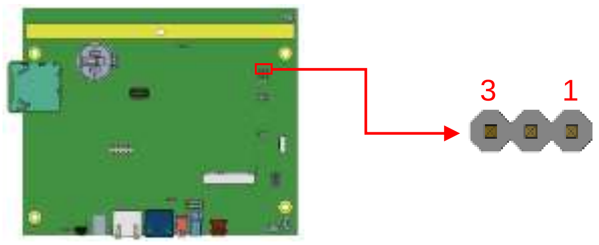
J2	Setting	Panel Voltage
	Pin 1-2 Short/Closed	5V (default)
	Pin 2-3 Short/Closed	12V

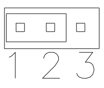
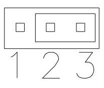
J3: BL ADJ Level Setting 2.0mm



J3	Setting	Panel Voltage
	Pin 1-2 Short/Closed	5V
	Pin 2-3 Short/Closed	3.3V (default)

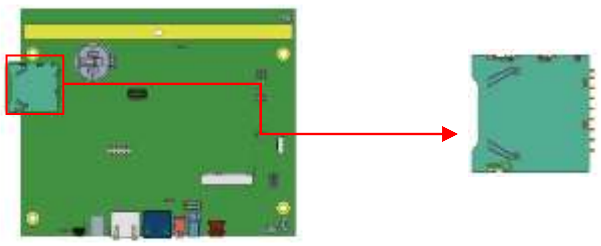
J4: LVDS Panel Power Selection 2.0mm



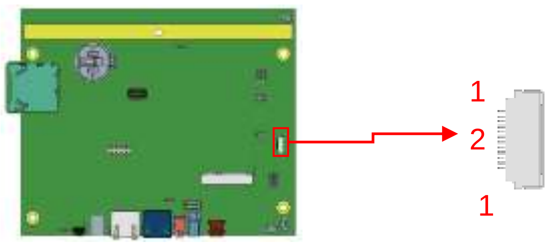
J4	Setting	Panel Voltage
	Pin 1-2 Short/Closed	5V
	Pin 2-3 Short/Closed	3.3V (default)

2.3 Connectors on IB102

CN1: SD Card Connector

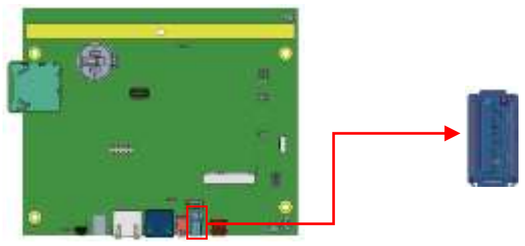


CN2: Capacitor Touch Pad Connector (ENTERY 7083K-F12N-04L)



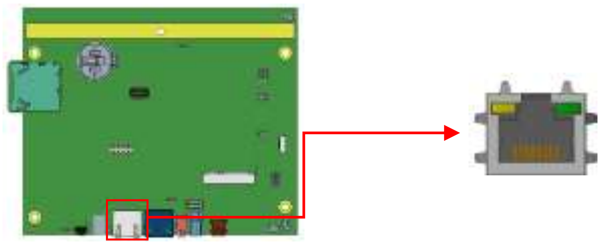
Pin #	Signal Name
1	GND
2	NC
3	NC
4	NC
5	NC
6	GND
7	SDA
8	SCL
9	NC
10	INT
11	3.3V
12	3.3V

CN3: USB 2.0 Connector

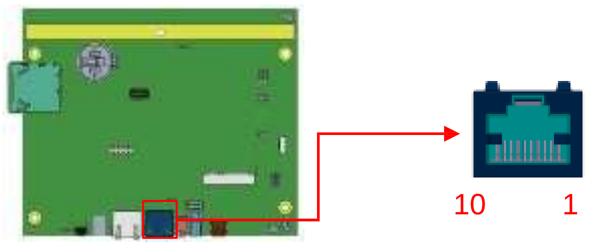


CN4: 10/100/1000Mb LAN (PoE+ supported)

This RJ45 LAN connector supports PoE+ function.



CN5: COM1 RJ45 Connector

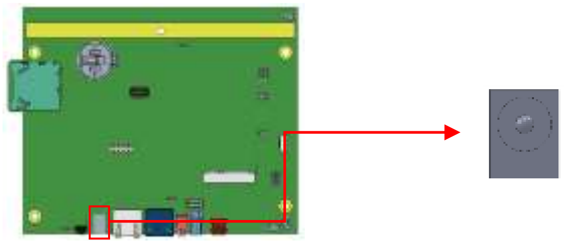


Pin #	Signal Name
1	COM1 DSR, Data set ready
2	GND
3	GND
4	COM1 TXD, Transmit data
5	COM1 RXD, Receive data
6	COM1 DCD, Data carrier detect
7	COM1 DTR, Data terminal ready
8	COM1 CTS, Clear to send
9	COM1 RTS, Request to send
10	Boot by SD card detection

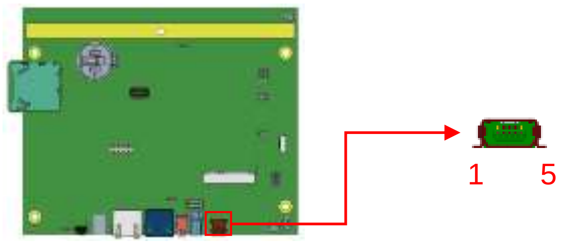
COM1 is jumper less for RS-232, RS-422 and RS-485 and configured with SW4 (S2) and JP5 Selection.

Pin #	Signal Name		
	RS-232	**R2-422**	**RS-485**
1	DSR	NC	NC
2	Ground	Ground	Ground
3	Ground	Ground	Ground
4	TX	RX+	NC
5	RX	TX+	DATA+
6	DCD	TX-	DATA-
7	DTR	RX-	NC
8	CTS	NC	NC
9	RTS	NC	NC
10	NC	NC	NC

CN7: +12V DC-IN Power Connector



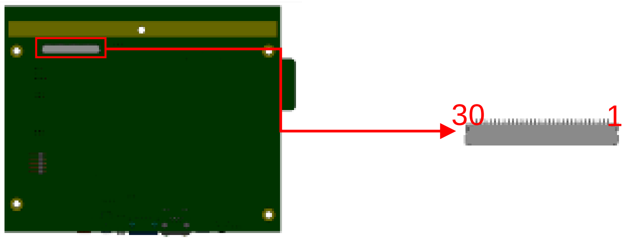
CN8: Mini USB OTG Connector



Pin #	Signal Name
1	+5V
2	D-
3	D+
4	ID
5	GND

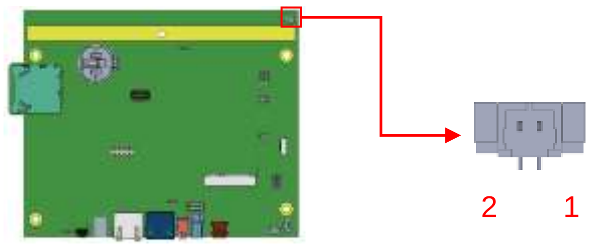
Note: CN8 will be used for USB device when ID is floating.

CN9: LVDS Connector (HRS DF19G-30P-1H(54))



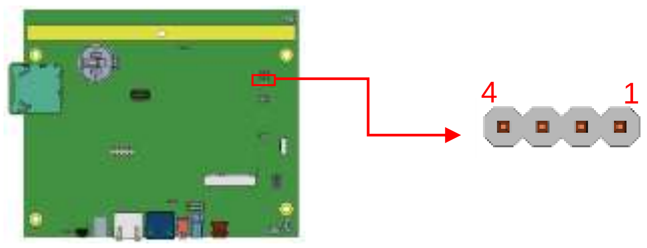
Pin #	Signal Name
1	NC
2	LCD_VDD
3	LCD_VDD
4	NC
5	TX0-
6	TX0+
7	GND
8	TX1-
9	TX1+
10	GND
11	TX2-
12	TX2+
13	GND
14	CLK-
15	CLK+
16	GND
17	TX3-
18	TX3+
19	GND
20	GND
21	GND
22	GND
23	GND
24	NC
25	BKLT_ADJ
26	BKLT_EN
27	NC
28	BKLT_VCC
29	BKLT_VCC
30	BKLT_VCC

J1: Mic Connector (WT04M-30003-02032)



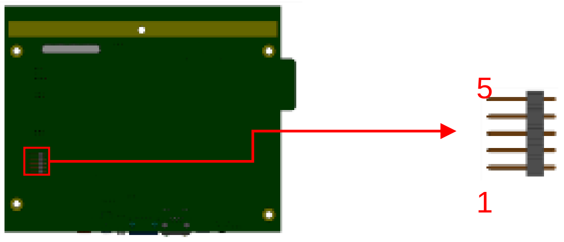
Pin #	Signal Name
1	MIC Input
2	GND

J5: COM2 RS232 Connector, Debug Port Connector 2.0mm (Factory use only)



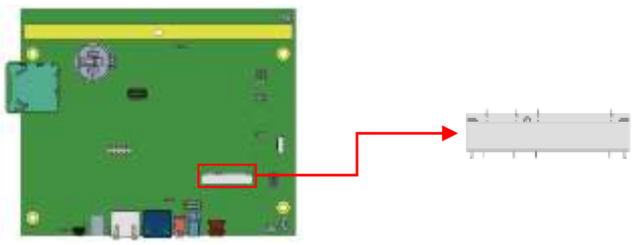
Pin #	Signal Name
1	COM2 RXD, Receive Data
2	COM2 TXD, Transmit Data
3	GND
4	NC

J7: Resistive Touch Panel Connector 2.5mm

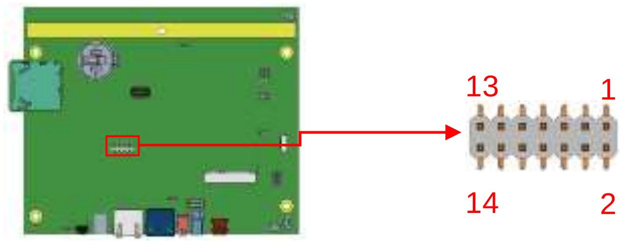


Pin #	Signal Name
1	Touch XP
2	Touch XM
3	Touch SG
4	Touch YP
5	Touch YM

J8: Mini PCI-E Connector

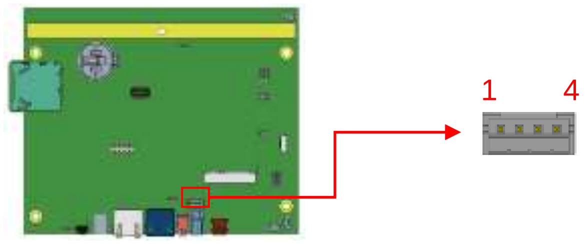


J10: Digital In/Out Connector 2.0mm



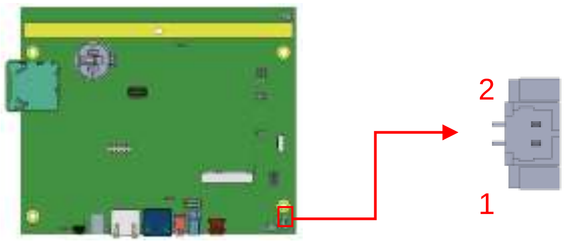
Signal Name	Pin #	Pin #	Signal Name
3.3V	1	2	GPIO2
GPIO1	3	4	GPIO5
GPIO3	5	6	GPIO8
GPIO7	7	8	Reset
GPIO9	9	10	Watch Dog
GPIO10	11	12	GPIO11
GPIO12	13	14	GND

J11: USB2.0 Connector (JST B4B-PH-K-S)



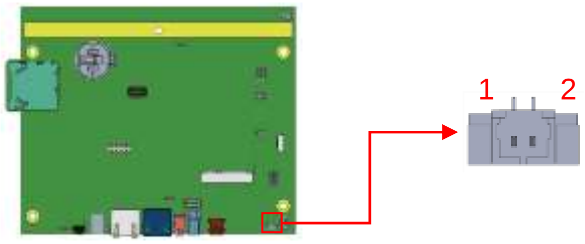
Pin #	Signal Name
1	+5V
2	D-
3	D+
4	GND

J12: Speaker Right-Out Connector (WT04M-30003-02032)



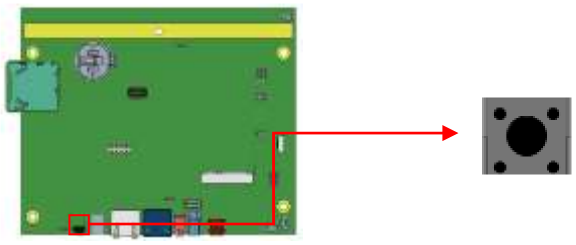
Pin #	Signal Name
1	SPEAKER_RIGHT+
2	SPEAKER_RIGHT-

J13: Speaker Left-Out Connector (WT04M-30003-02032)



Pin #	Signal Name
1	SPEAKER_LEFT-
2	SPEAKER_LEFT+

SW3: System Reset Button



CHAPTER 3 Software SETUP

Basically, the IB102 is preloaded O.S (Android / Linux) into eMMC by default. Connect the 8" LVDS panel (optional) with IB102, and 12V/ POE+ power directly.

3.1 Make a Recovery SD Card (for advanced user only)

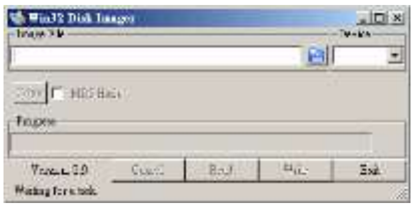
For advanced user who has Ibase standard image file, refer to this chapter to prepare the recovery boot-up SD card. Ibase optionally provides 8" LVDS panel for users to prepare the software application pre-development easily under Linux / Android platform.

Preparing the Recovery SD card to install the Linux/ Android image into eMMC

Note: all data in the eMMC will be erased.
-- for IB102
Please download the **Recovery SD card's image by FTP in advance.**
Host: 219.87.145.180 port: 21
User: bsp
Password: (please check with your sales)
Image path: (image path may change / update)
/bsp/RISC_IMAGE/IB102/IB102/Linux/IB102-Linux_3.0.35-v1.1.rar
/bsp/RISC_IMAGE/IB102/IB102/Android/IB102-Android_4.3-v1.1.rar
(based on Freescale BSP: L3.3.35.4.1.0)

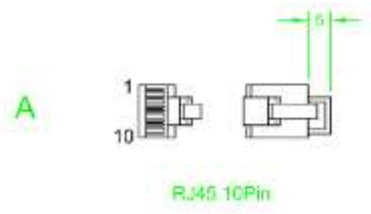
For advanced users who want to return to the factory reset status, the instructions below will guide you through installing a recovery program on your SD card to allow you to easily install the default OS's and to recover your card when needed.

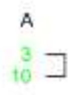
1. Insert an SD card that is 8GB or greater in size into your computer
2. Format the SD card
   i. Download the SD Association's Formatting Tool (SD Card Formatter 4.0) from https://www.sdcard.org/downloads/formatter_4/eula_windows/
   ii. Install and run the Formatting Tool on your machine
   iii. Set "FORMAT SIZE ADJUSTMENT" option to "ON" in the "Options" menu
   iv. Check that the SD card you inserted matches the one selected by the Tool
   v. Click the "Format" button
3. Download the target operating system image from the DVD/ or FTP (Descripted in previous page)
4. Download the Win32DiskImager from **http://sourceforge.net/projects/win32diskimager/ and use it to restore the target operating system.**



And then, flash the Android/ Linux image into your SD card in your PC (Windows).

6. Please check insert (special COM1 RJ45 dongle, pin3 short to pin10, this dongle is for IB102 only) and make sure it can boot from SD Card by checking item8.





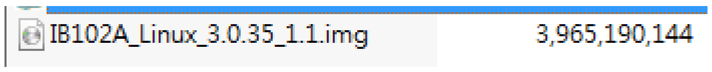
--- Boot Up with IB102---

Please double check the Boot device selection before powering on. IB102, by default, is set to boot up from eMMC.

1. Insert the SD card/MicroSD into the motherboard. Make sure the 8" **panel** (or your own panel) is connected and connect the power supply to boot up the system.
2. Recovery program on your SD card will execute automatically. The eMMC on PCB will be formatted and the OS will be installed while the progress bar shows 100% complete.
3. Remove the power and the recovery SD. Remember to remove the special RJ45 dongle.
4. **Connect the power** and boot up the IB102,; you will see the Linux/ Android boot up pages.

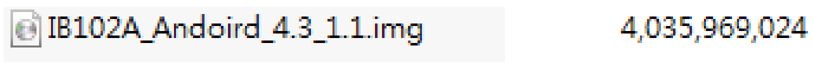
Note for IB102A:

IB102A, by default, is set to boot up from SD card only. Just insert/ prepare your SD card, and connect the power. To create IB102A SD card images, please download the **boot SD card's image by FTP in advance.**



IB102A_Linux_3.0.35_1.1.img 3,965,190,144

/bsp/RISC_IMAGE/IB102/IB102A/Linux_sd/ IB102A_Linux_3.0.35_1.1.rar



IB102A_Andoird_4.3_1.1.img 4,035,969,024

/bsp/RISC_IMAGE/IB102/IB102A/Android_sd/IB102A_Andoird_4.3_1.1.rar

3.2 Parameter Setting on U-boot

IB102 supports 8” LVDS panel (optional) by default. If you have any other LVDS panel to be customized, please contact Ibase sales or FAE staff.

3.2.1 Preparation (debug console)

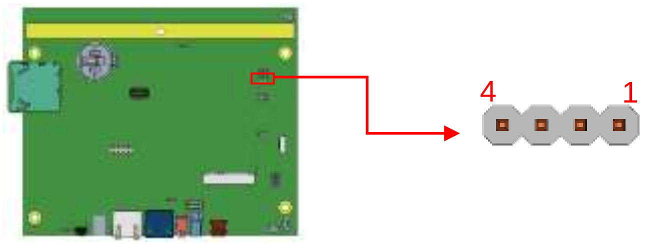
i. The COM1 (Tx1, Rx1) is the default debug port. Check that it can be connected to (RX, Tx) in your PC environment.

ii. Use 115200 bps (8n1, no flow control) in Windows terminal (for example Putty.exe)

iii. During system boot up, you can ***press “Enter” t***o stop auto boot and modify your environment.

(Note: For users who are not sure about the COM connection, please check if Board.COM1.Tx1 is connected to PC.COM.Rx ; Board.COM1.Rx1 to PC.COM.Tx)

J5: COM2 RS232 Connector, Debug Port Connector (Factory use only)



Pin #	Signal Name
1	COM2 RXD, Receive Data
2	COM2 TXD, Transmit Data
3	GND
4	NC

3.2.2 Display setting command For Android (for advanced software engineers only)

With the debug port, follow the reference command examples to help you to be familiar with display modification.

Select boot device:

```
MX6SDL SABREDS U-BOOT > setenv bootcmd “booti mmcX”
```

Where mmcX =1, means boot from SD card.
Where mmcX =2, means boot from eMMC device.

Command to set 8” LVDS panel (default):

```
setenv bootargs 'console=ttymxc0,115200 androidboot.console=ttymxc1
androidboot.hardware=freescale init=/init vmalloc=400M
video=mxcfb0:dev=ldb,IB102-XGA,if=RGB666 ldb=sep0'
```

(Please also save the environment and reboot with the following command.)

```
MX6SDL SABREDS U-BOOT > saveenv
MX6SDL SABREDS U-BOOT > boot
```

3.2.3 Display setting for Linux

Command to set 8" panel (Default):

```
setenv bootargs_base 'setenv bootargs mem=1G console=ttymxc1,115200'
setenv bootcmd_mmc 'run bootargs_base bootargs_mmc; mmc dev 2; mmc read
${loadaddr} 0x800 0x2000; bootm'
setenv bootargs_mmc 'setenv bootargs ${bootargs} root=/dev/mmcblk0p1 rootwait rw
video=mxcfb0:dev=ldb,IB102-XGA,if=RGB666 ldb=sep0 video=mxcfb1:off
video=mxcfb2:off fbmem=15M rootfstype=ext4'
```

Command to set the boot device

```
Carrier SD :    root=/dev/mmcblk1p1
```

Note: (remember to save the environment and reboot with the following command)

```
MX6SDL SABREDS U-BOOT > saveenv
MX6SDL SABREDS U-BOOT > boot
```

CHAPTER 4 BSP User Guide (for advanced software engineer only)

This Chapter is an example only, and it is mainly for advanced SW engineers to build the image for IBASE ARM PCB. Any other modification, new device or driver should be handled carefully.

4.1 Building BSP Source

4.1.1 Preparation

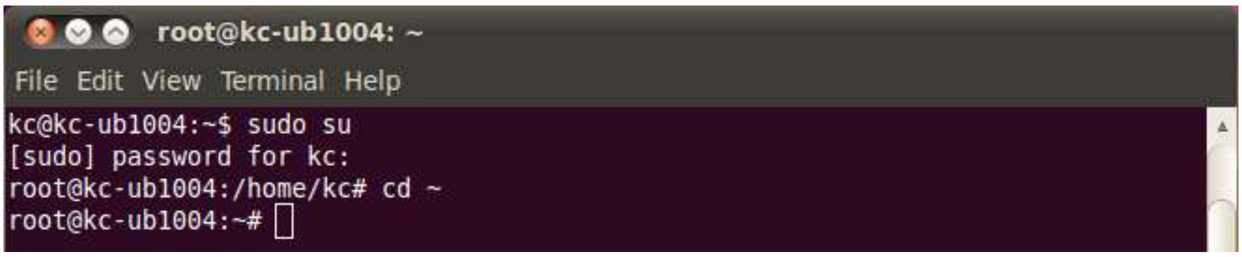
Suggested Host Platform: Ubuntu 10.04 x64 version

Install necessary packages before build:
apt-get install build-essential uboot-mkimage ia32-libs
Note: ** To simplify build process, please run build/installation with root on your x86 host PC. **

4.1.2 Installing Toolchain

Download and extract freescale toolchain
(gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12.tgz)
# assume your toolchain file is located at root home dir:

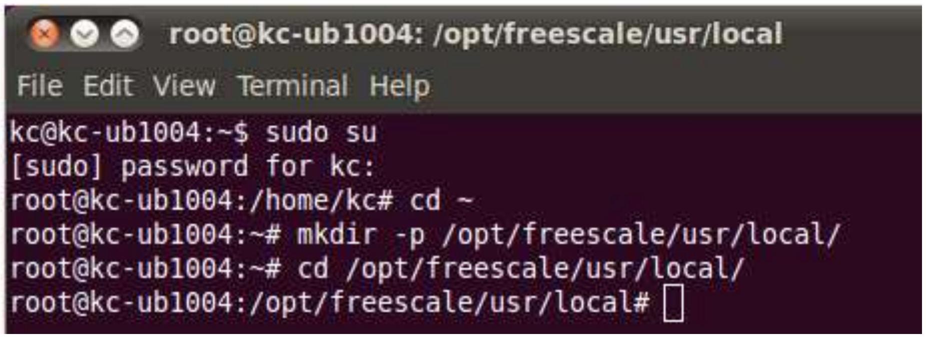
```
sudo su

cd ~
```



```
kc@kc-ub1004:~$ sudo su
[sudo] password for kc:
root@kc-ub1004:/home/kc# cd ~
root@kc-ub1004:~#
```

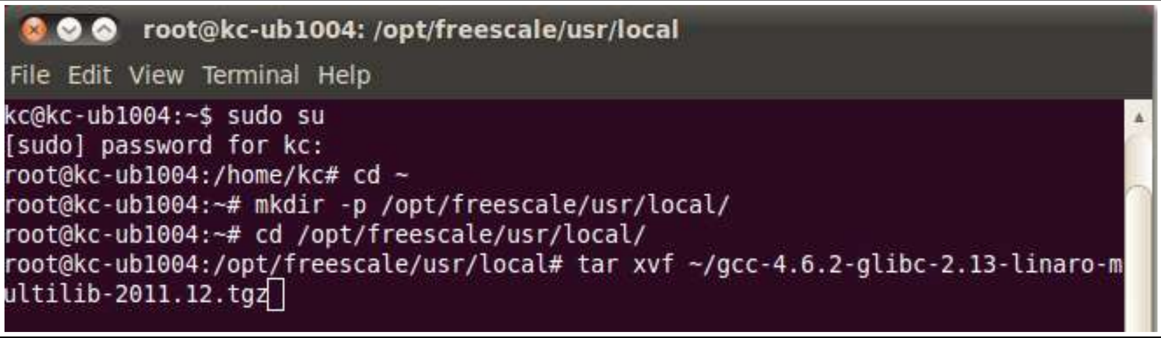
mkdir -p /opt/freescale/usr/local/

cd /opt/freescale/usr/local/

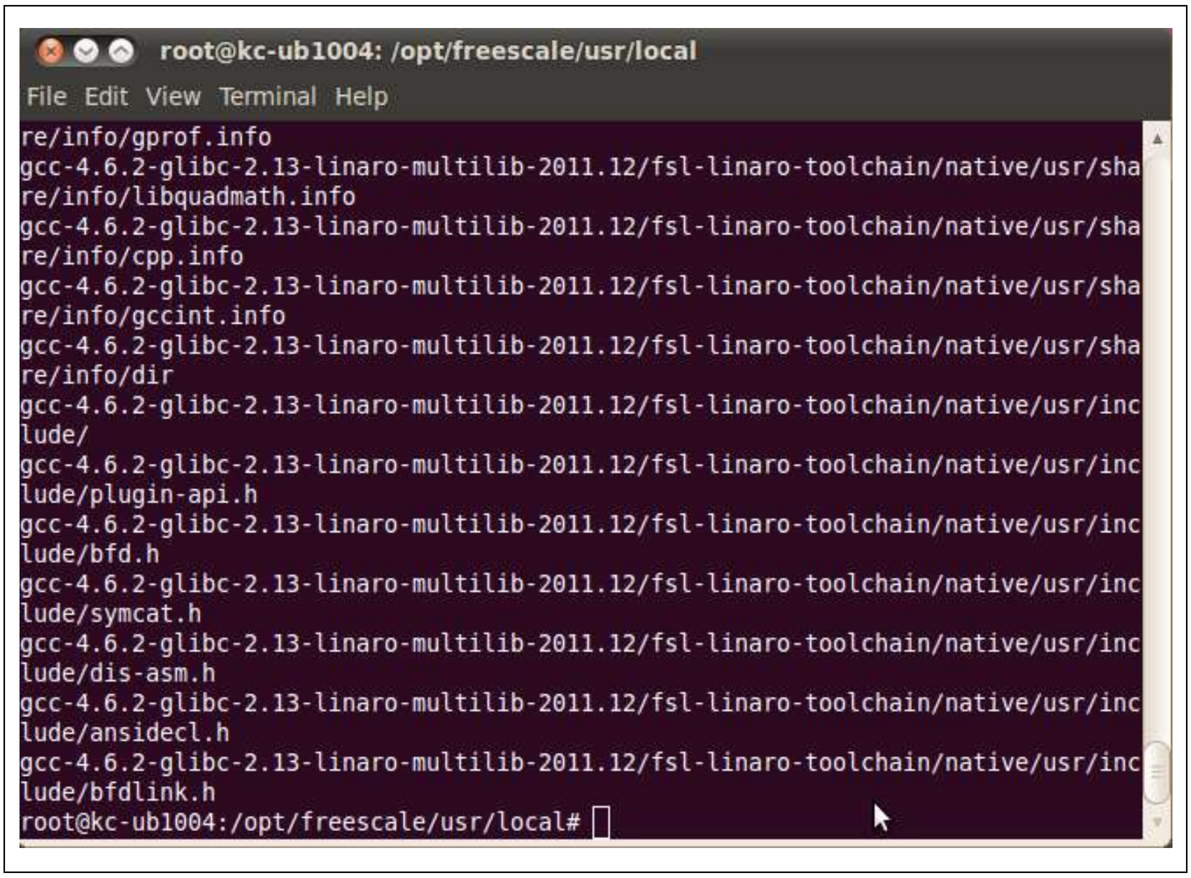

root@kc-ub1004: /opt/freescale/usr/local
File Edit View Terminal Help

```
kc@kc-ub1004:~$ sudo su
[sudo] password for kc:
root@kc-ub1004:/home/kc# cd ~
root@kc-ub1004:~# mkdir -p /opt/freescale/usr/local/
root@kc-ub1004:~# cd /opt/freescale/usr/local/
root@kc-ub1004:/opt/freescale/usr/local#
```

tar xvf ~/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12.tgz


root@kc-ub1004: /opt/freescale/usr/local
File Edit View Terminal Help

```
kc@kc-ub1004:~$ sudo su
[sudo] password for kc:
root@kc-ub1004:/home/kc# cd ~
root@kc-ub1004:~# mkdir -p /opt/freescale/usr/local/
root@kc-ub1004:~# cd /opt/freescale/usr/local/
root@kc-ub1004:/opt/freescale/usr/local# tar xvf ~/gcc-4.6.2-glibc-2.13-linaro-m
ultilib-2011.12.tgz
```

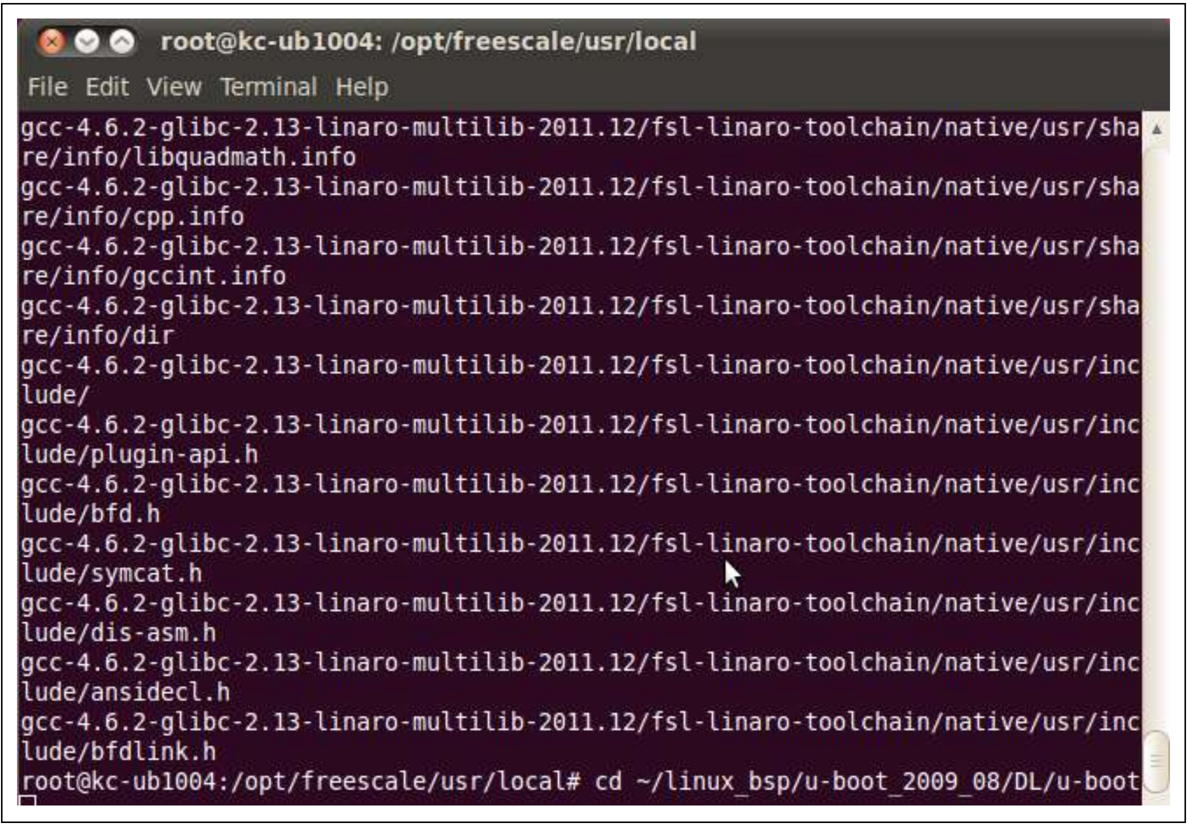

root@kc-ub1004: /opt/freescale/usr/local
File Edit View Terminal Help

```
re/info/gprof.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/libquadmath.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/cpp.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/gccint.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/dir
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/plugin-api.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfd.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/symcat.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/dis-asm.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/ansidecl.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfdlink.h
root@kc-ub1004:/opt/freescale/usr/local# 
```

4.1.3 Building u-boot

# Assume your linux BSP u-boot source is at~/linux_bsp/u-boot_2009_08/DL/u-boot

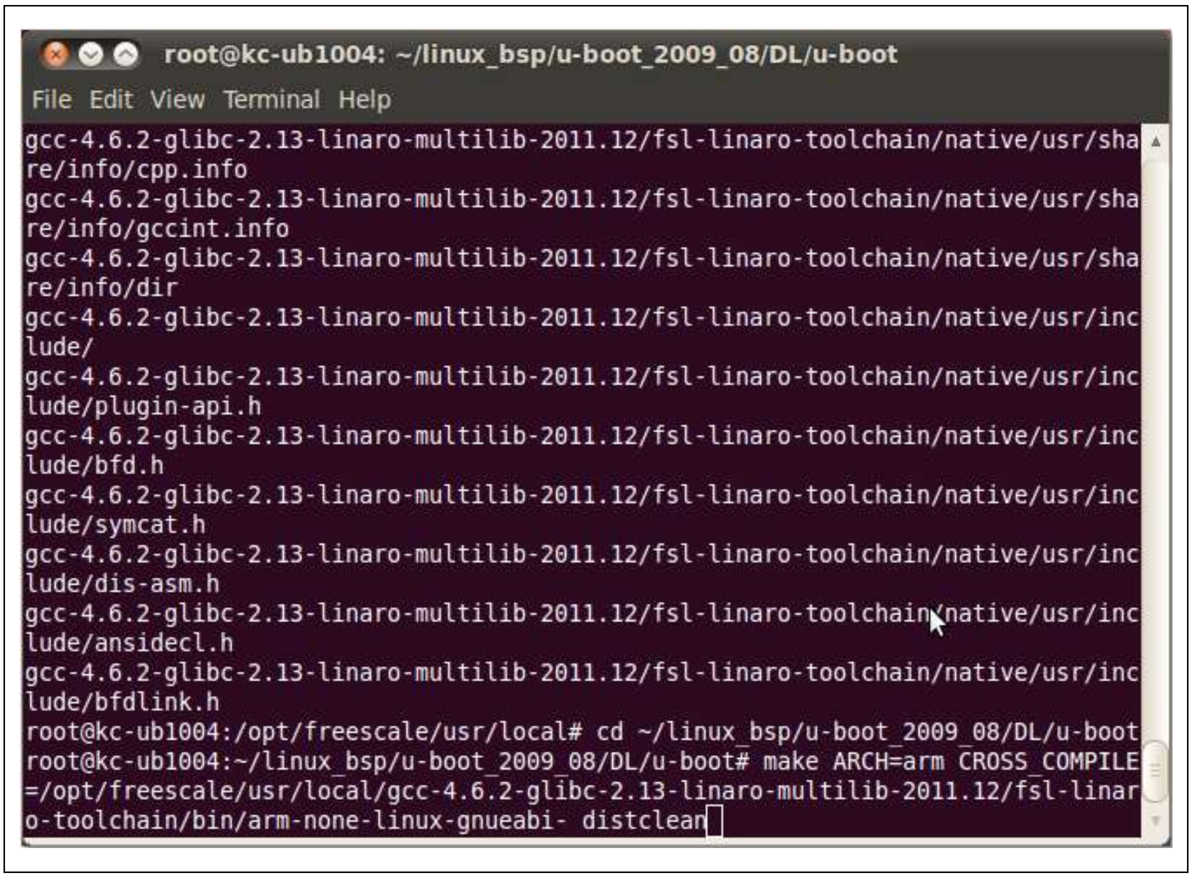
cd ~/linux_bsp/u-boot_2009_08/DL/u-boot


root@kc-ub1004: /opt/freescale/usr/local
File Edit View Terminal Help

```
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/libquadmath.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/cpp.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/gccint.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/dir
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/plugin-api.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfd.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/symcat.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/dis-asm.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/ansidecl.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfdlink.h
root@kc-ub1004:/opt/freescale/usr/local# cd ~/linux_bsp/u-boot_2009_08/DL/u-boot
```

make ARCH=arm

CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-lin aro-toolchain/bin/arm-none-linux-gnueabi- distclean

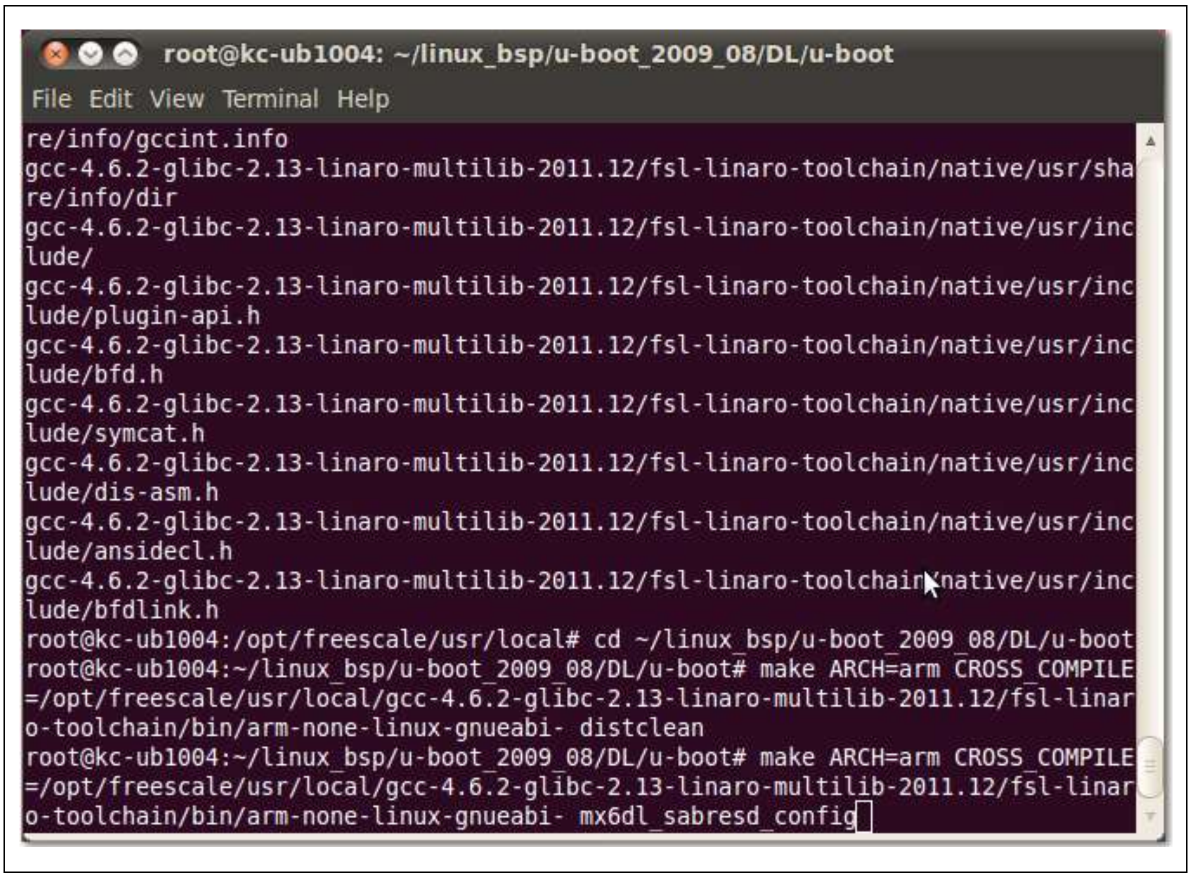

root@kc-ub1004: ~/linux_bsp/u-boot_2009_08/DL/u-boot
File Edit View Terminal Help

```
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/cpp.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/gccint.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/dir
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/plugin-api.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfd.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/symcat.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/dis-asm.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/ansidecl.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfdlink.h
root@kc-ub1004:/opt/freescale/usr/local# cd ~/linux_bsp/u-boot_2009_08/DL/u-boot
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# make ARCH=arm CROSS_COMPILE
=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linar
o-toolchain/bin/arm-none-linux-gnueabi- distclean
```

make ARCH=arm

CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-lin

aro-toolchain/bin/arm-none-linux-gnueabi- mx6solo_sabresd_config

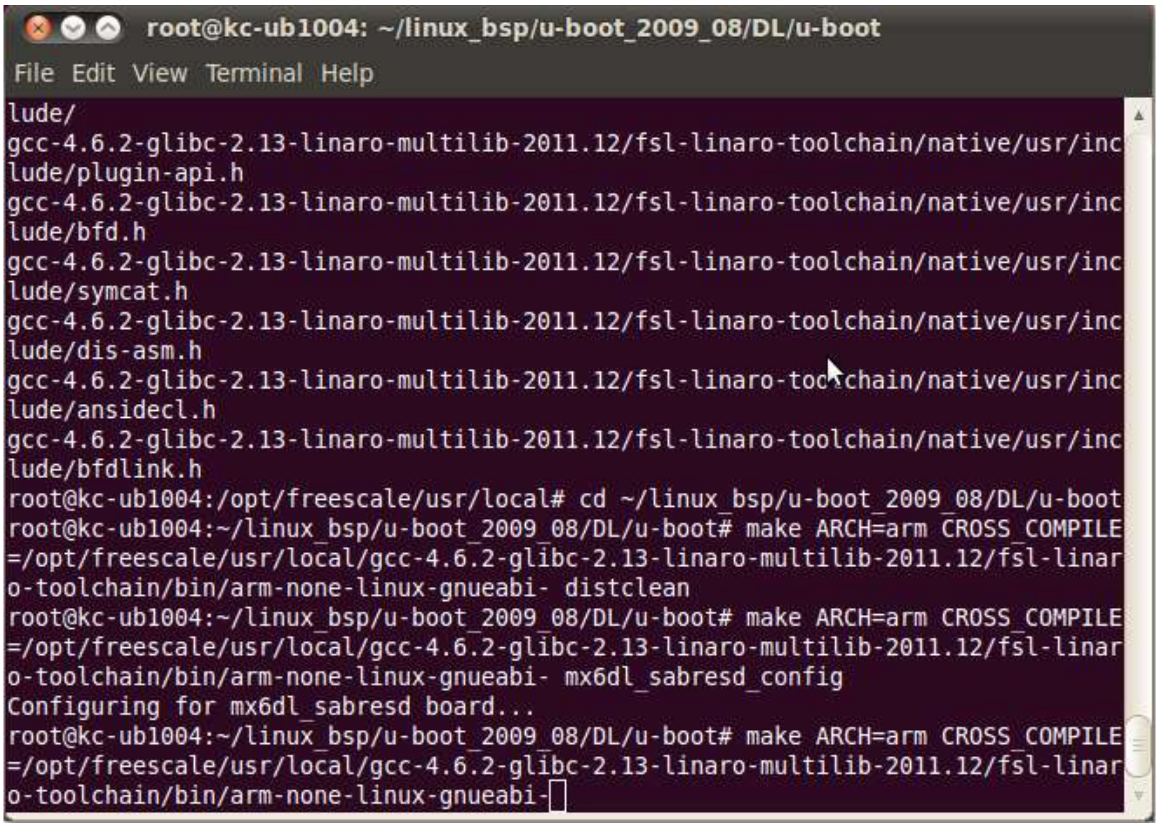

root@kc-ub1004: ~/linux_bsp/u-boot_2009_08/DL/u-boot
File Edit View Terminal Help

```
re/info/gccint.info
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/sha
re/info/dir
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/plugin-api.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfd.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/symcat.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/dis-asm.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/ansidecl.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfdlink.h
root@kc-ub1004:/opt/freescale/usr/local# cd ~/linux_bsp/u-boot_2009_08/DL/u-boot
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# make ARCH=arm CROSS_COMPILE
=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linar
o-toolchain/bin/arm-none-linux-gnueabi- distclean
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# make ARCH=arm CROSS_COMPILE
=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linar
o-toolchain/bin/arm-none-linux-gnueabi- mx6dl_sabresd_config
```

make ARCH=arm

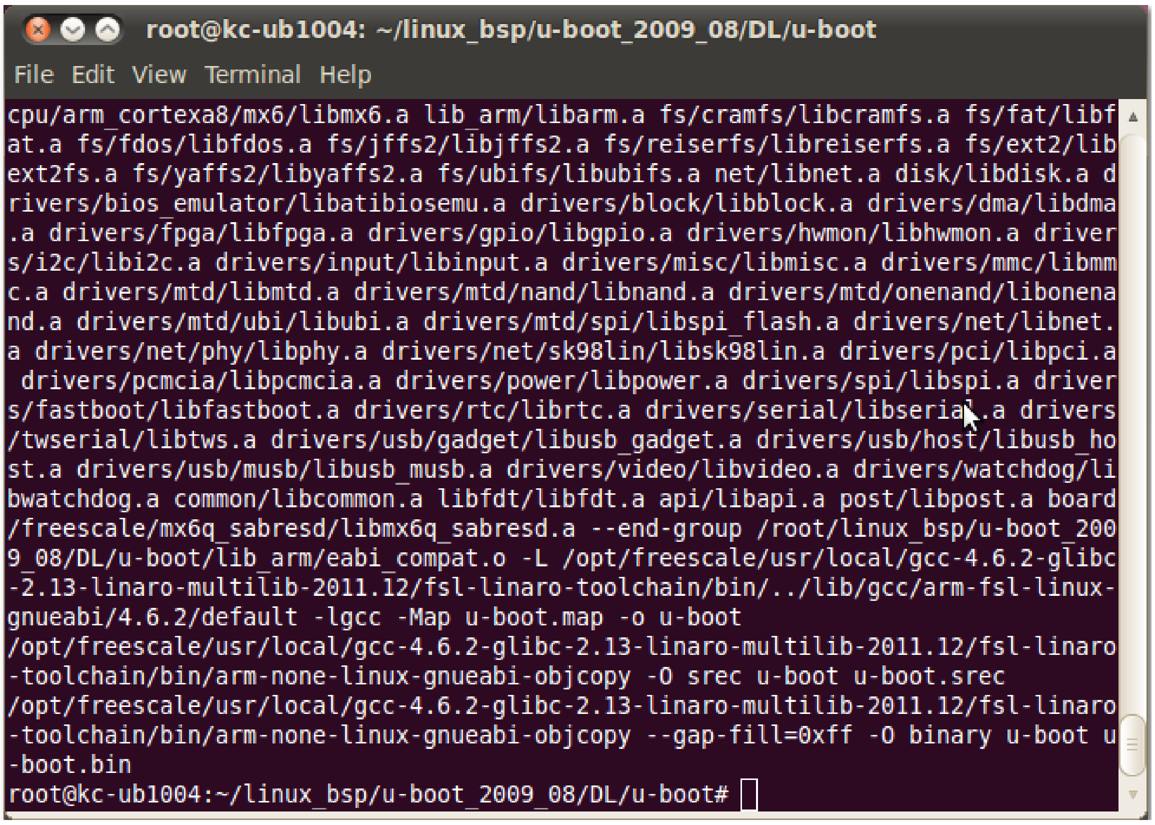
CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-lin

aro-toolchain/bin/arm-none-linux-gnueabi-


root@kc-ub1004: ~/linux_bsp/u-boot_2009_08/DL/u-boot
File Edit View Terminal Help

```
lude/
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/plugin-api.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfd.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/symcat.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/dis-asm.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/ansidecl.h
gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/native/usr/inc
lude/bfdlink.h
root@kc-ub1004:/opt/freescale/usr/local# cd ~/linux_bsp/u-boot_2009_08/DL/u-boot
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# make ARCH=arm CROSS_COMPILE
=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linar
o-toolchain/bin/arm-none-linux-gnueabi- distclean
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# make ARCH=arm CROSS_COMPILE
=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linar
o-toolchain/bin/arm-none-linux-gnueabi- mx6dl_sabresd_config
Configuring for mx6dl_sabresd board...
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# make ARCH=arm CROSS_COMPILE
=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linar
o-toolchain/bin/arm-none-linux-gnueabi-
```

Note: **** If the building process is successful, **u-boot.bin** file will be generated. ****

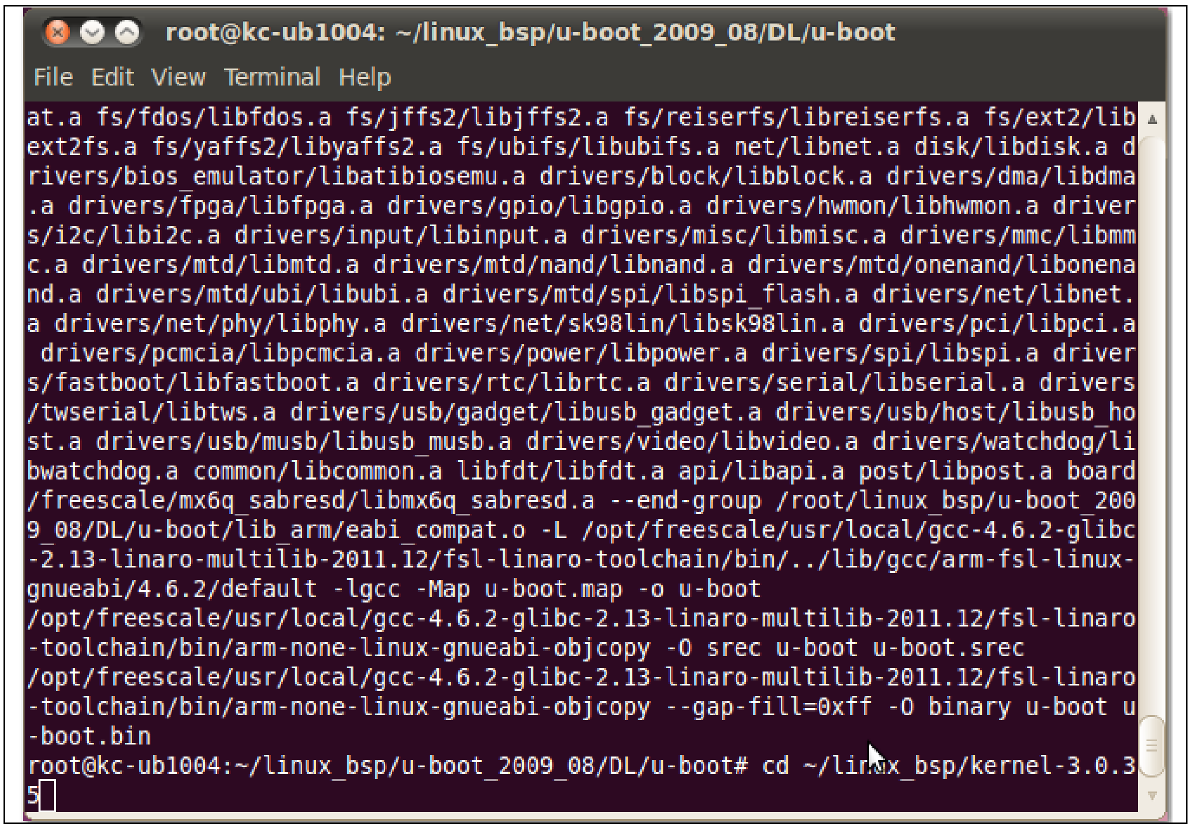

root@kc-ub1004: ~/linux_bsp/u-boot_2009_08/DL/u-boot
File Edit View Terminal Help

```
cpu/arm_cortexa8/mx6/libmx6.a lib_arm/libarm.a fs/cramfs/libcramfs.a fs/fat/libf
at.a fs/fdos/libfdos.a fs/jffs2/libjffs2.a fs/reiserfs/libreiserfs.a fs/ext2/lib
ext2fs.a fs/yaffs2/libyaffs2.a fs/ubifs/libubifs.a net/libnet.a disk/libdisk.a d
rivers/bios_emulator/libatibiosemu.a drivers/block/libblock.a drivers/dma/libdma
.a drivers/fpga/libfpga.a drivers/gpio/libgpio.a drivers/hwmon/libhwmon.a driver
s/i2c/libi2c.a drivers/input/libinput.a drivers/misc/libmisc.a drivers/mmc/libmm
c.a drivers/mtd/libmtd.a drivers/mtd/nand/libnand.a drivers/mtd/onenand/libonena
nd.a drivers/mtd/ubi/libubi.a drivers/mtd/spi/libspi_flash.a drivers/net/libnet.
a drivers/net/phy/libphy.a drivers/net/sk98lin/libsk98lin.a drivers/pci/libpci.a
 drivers/pcmcia/libpcmcia.a drivers/power/libpower.a drivers/spi/libspi.a driver
s/fastboot/libfastboot.a drivers/rtc/librtc.a drivers/serial/libserial.a drivers
/twserial/libtws.a drivers/usb/gadget/libusb_gadget.a drivers/usb/host/libusb_ho
st.a drivers/usb/musb/libusb_musb.a drivers/video/libvideo.a drivers/watchdog/li
bwatchdog.a common/libcommon.a libfdt/libfdt.a api/libapi.a post/libpost.a board
/freescale/mx6q_sabresd/libmx6q_sabresd.a --end-group /root/linux_bsp/u-boot_200
9_08/DL/u-boot/lib_arm/eabi_compat.o -L /opt/freescale/usr/local/gcc-4.6.2-glibc
-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/bin/../lib/gcc/arm-fsl-linux-
gnueabi/4.6.2/default -lgcc -Map u-boot.map -o u-boot
/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro
-toolchain/bin/arm-none-linux-gnueabi-objcopy -O srec u-boot u-boot.srec
/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro
-toolchain/bin/arm-none-linux-gnueabi-objcopy --gap-fill=0xff -O binary u-boot u
-boot.bin
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# 
```

4.1.4 Building kernel

# Assume your linux kernel source is at ~/linux_bsp/kernel-3.0.35

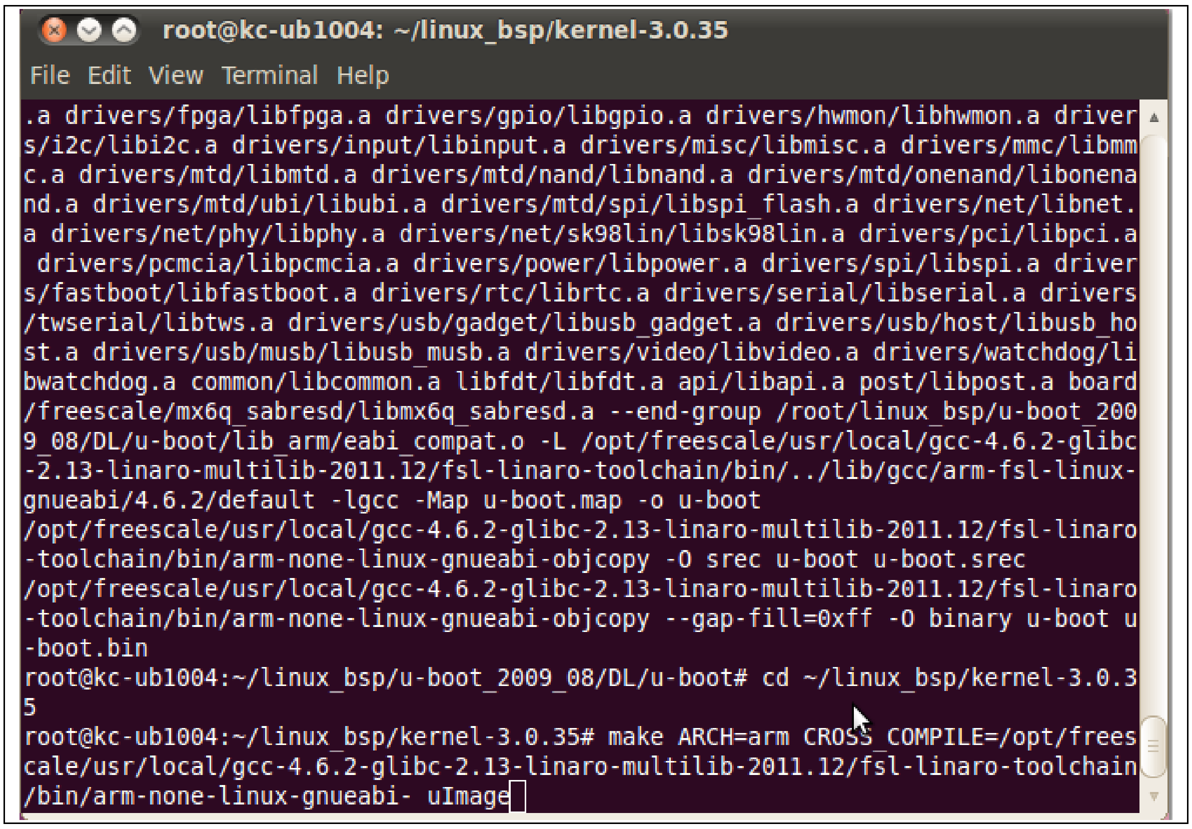
cd ~/linux_bsp/kernel-3.0.35


root@kc-ub1004: ~/linux_bsp/u-boot_2009_08/DL/u-boot
File Edit View Terminal Help

```
at.a fs/fdos/libfdos.a fs/jffs2/libjffs2.a fs/reiserfs/libreiserfs.a fs/ext2/lib
ext2fs.a fs/yaffs2/libyaffs2.a fs/ubifs/libubifs.a net/libnet.a disk/libdisk.a d
rivers/bios_emulator/libatibiosemu.a drivers/block/libblock.a drivers/dma/libdma
.a drivers/fpga/libfpga.a drivers/gpio/libgpio.a drivers/hwmon/libhwmon.a driver
s/i2c/libi2c.a drivers/input/libinput.a drivers/misc/libmisc.a drivers/mmc/libmm
c.a drivers/mtd/libmtd.a drivers/mtd/nand/libnand.a drivers/mtd/onenand/libonena
nd.a drivers/mtd/ubi/libubi.a drivers/mtd/spi/libspi_flash.a drivers/net/libnet.
a drivers/net/phy/libphy.a drivers/net/sk98lin/libsk98lin.a drivers/pci/libpci.a
 drivers/pcmcia/libpcmcia.a drivers/power/libpower.a drivers/spi/libspi.a driver
s/fastboot/libfastboot.a drivers/rtc/librtc.a drivers/serial/libserial.a drivers
/twserial/libtws.a drivers/usb/gadget/libusb_gadget.a drivers/usb/host/libusb_ho
st.a drivers/usb/musb/libusb_musb.a drivers/video/libvideo.a drivers/watchdog/li
bwatchdog.a common/libcommon.a libfdt/libfdt.a api/libapi.a post/libpost.a board
/freescale/mx6q_sabresd/libmx6q_sabresd.a --end-group /root/linux_bsp/u-boot_200
9_08/DL/u-boot/lib_arm/eabi_compat.o -L /opt/freescale/usr/local/gcc-4.6.2-glibc
-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/bin/../lib/gcc/arm-fsl-linux-
gnueabi/4.6.2/default -lgcc -Map u-boot.map -o u-boot
/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro
-toolchain/bin/arm-none-linux-gnueabi-objcopy -O srec u-boot u-boot.srec
/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro
-toolchain/bin/arm-none-linux-gnueabi-objcopy --gap-fill=0xff -O binary u-boot u
-boot.bin
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# cd ~/linux_bsp/kernel-3.0.3
5
```

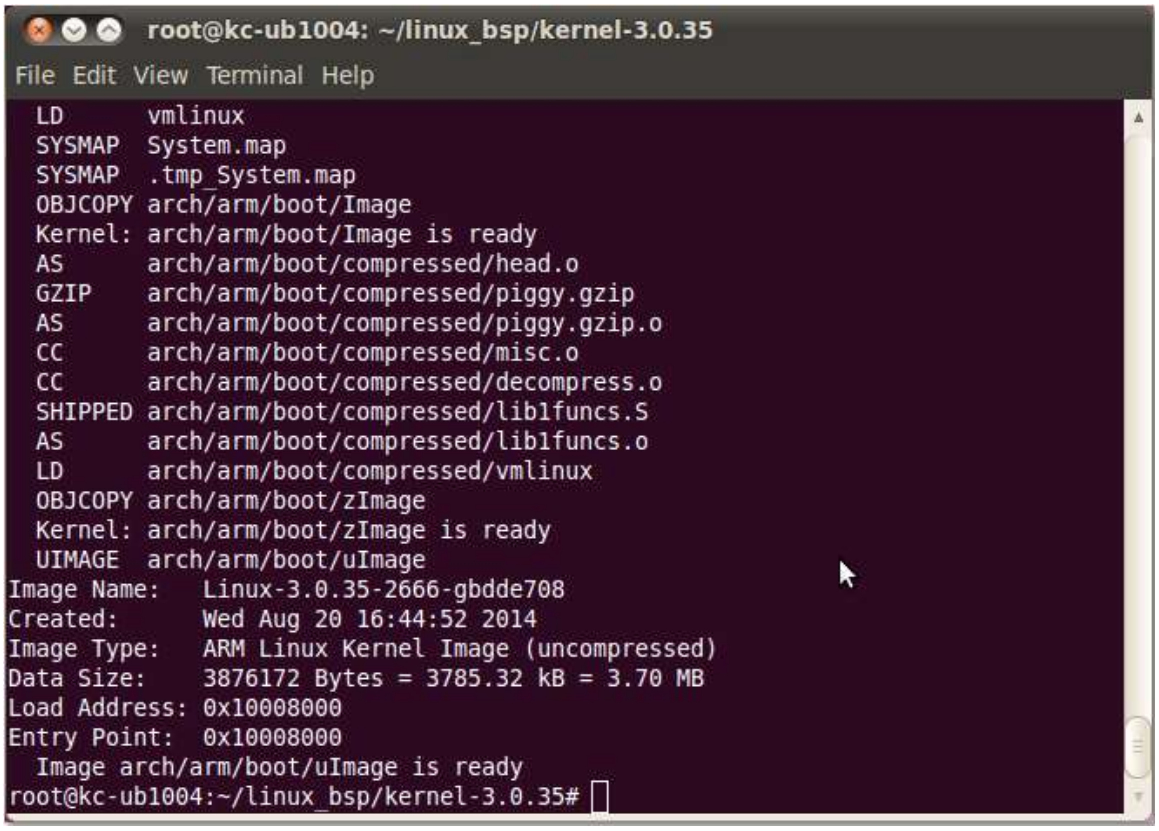
make ARCH=arm clean

make ARCH=arm CROSS_COMPILE=/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/bin/arm-none-linux-gnueabi- uImage


root@kc-ub1004: ~/linux_bsp/kernel-3.0.35
File Edit View Terminal Help

```
.a drivers/fpga/libfpga.a drivers/gpio/libgpio.a drivers/hwmon/libhwmon.a driver
s/i2c/libi2c.a drivers/input/libinput.a drivers/misc/libmisc.a drivers/mmc/libmm
c.a drivers/mtd/libmtd.a drivers/mtd/nand/libnand.a drivers/mtd/onenand/libonena
nd.a drivers/mtd/ubi/libubi.a drivers/mtd/spi/libspi_flash.a drivers/net/libnet.
a drivers/net/phy/libphy.a drivers/net/sk98lin/libsk98lin.a drivers/pci/libpci.a
 drivers/pcmcia/libpcmcia.a drivers/power/libpower.a drivers/spi/libspi.a driver
s/fastboot/libfastboot.a drivers/rtc/librtc.a drivers/serial/libserial.a drivers
/twserial/libtws.a drivers/usb/gadget/libusb_gadget.a drivers/usb/host/libusb_ho
st.a drivers/usb/musb/libusb_musb.a drivers/video/libvideo.a drivers/watchdog/li
bwatchdog.a common/libcommon.a libfdt/libfdt.a api/libapi.a post/libpost.a board
/freescale/mx6q_sabresd/libmx6q_sabresd.a --end-group /root/linux_bsp/u-boot_200
9_08/DL/u-boot/lib_arm/eabi_compat.o -L /opt/freescale/usr/local/gcc-4.6.2-glibc
-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain/bin/../lib/gcc/arm-fsl-linux-
gnueabi/4.6.2/default -lgcc -Map u-boot.map -o u-boot
/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro
-toolchain/bin/arm-none-linux-gnueabi-objcopy -O srec u-boot u-boot.srec
/opt/freescale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro
-toolchain/bin/arm-none-linux-gnueabi-objcopy --gap-fill=0xff -O binary u-boot u
-boot.bin
root@kc-ub1004:~/linux_bsp/u-boot_2009_08/DL/u-boot# cd ~/linux_bsp/kernel-3.0.3
5
root@kc-ub1004:~/linux_bsp/kernel-3.0.35# make ARCH=arm CROSS_COMPILE=/opt/frees
cale/usr/local/gcc-4.6.2-glibc-2.13-linaro-multilib-2011.12/fsl-linaro-toolchain
/bin/arm-none-linux-gnueabi- uImage
```

**** If the building process is successful, **uImage** file will be generated under arch/arm/boot directory. ****


root@kc-ub1004: ~/linux_bsp/kernel-3.0.35

File Edit View Terminal Help

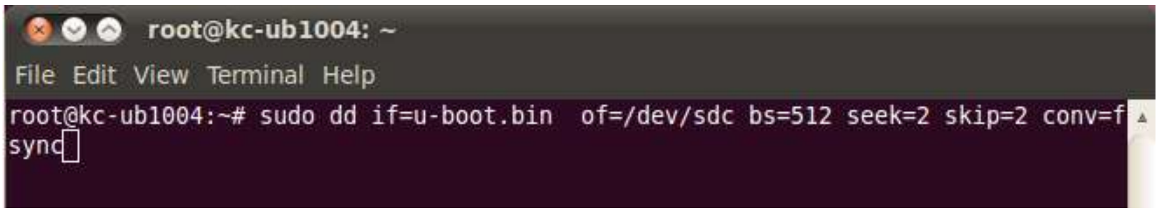
```
  LD      vmlinux
  SYSMAP  System.map
  SYSMAP  .tmp_System.map
  OBJCOPY arch/arm/boot/Image
  Kernel: arch/arm/boot/Image is ready
  AS      arch/arm/boot/compressed/head.o
  GZIP    arch/arm/boot/compressed/piggy.gzip
  AS      arch/arm/boot/compressed/piggy.gzip.o
  CC      arch/arm/boot/compressed/misc.o
  CC      arch/arm/boot/compressed/decompress.o
  SHIPPED arch/arm/boot/compressed/lib1funcs.S
  AS      arch/arm/boot/compressed/lib1funcs.o
  LD      arch/arm/boot/compressed/vmlinux
  OBJCOPY arch/arm/boot/zImage
  Kernel: arch/arm/boot/zImage is ready
  UIMAGE  arch/arm/boot/uImage
Image Name:   Linux-3.0.35-2666-gbdde708
Created:      Wed Aug 20 16:44:52 2014
Image Type:   ARM Linux Kernel Image (uncompressed)
Data Size:    3876172 Bytes = 3785.32 kB = 3.70 MB
Load Address: 0x10008000
Entry Point:  0x10008000
  Image arch/arm/boot/uImage is ready
root@kc-ub1004:~/linux_bsp/kernel-3.0.35#
```

4.1.5 Copying u-boot, kernel to SD card

Insert an empty SD card with at least 8GB size and put it in a card reader connecting to your host PC. Assume your SD card is /dev/sdb on your x86 host PC

# Copying the u-boot Boot Loader Image

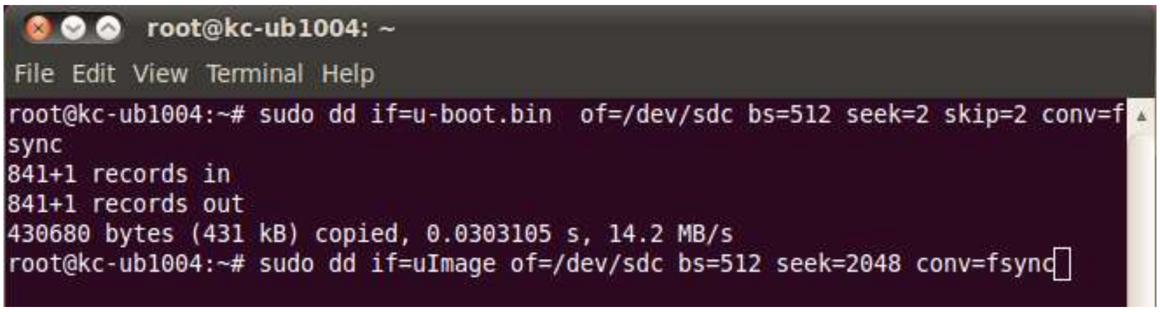
sudo dd if=u-boot.bin   of=/dev/sdb bs=512 seek=2 skip=2 conv=fsync



```
root@kc-ub1004:~# sudo dd if=u-boot.bin  of=/dev/sdc bs=512 seek=2 skip=2 conv=f
sync
```

# Copying the Kernel Image

sudo dd if=uImage of=/dev/sdb bs=512 seek=2048 conv=fsync



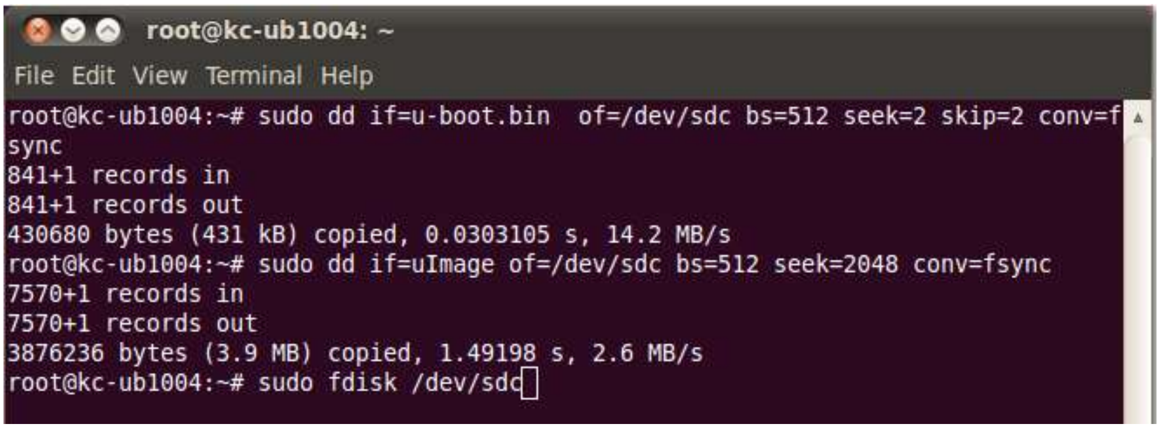
```
root@kc-ub1004:~# sudo dd if=u-boot.bin  of=/dev/sdc bs=512 seek=2 skip=2 conv=f
sync
841+1 records in
841+1 records out
430680 bytes (431 kB) copied, 0.0303105 s, 14.2 MB/s
root@kc-ub1004:~# sudo dd if=uImage of=/dev/sdc bs=512 seek=2048 conv=fsync
```

4.1.6 Copying Filesystem to SD card

Assume your SD card is /dev/sdb.
# Copying the Root File System (rootfs)
First, a partition table must be created. If a partition already exists and it is big enough for the file system you want to deploy, then you can skip this step.

To create a partition, at offset 16384 (in sectors of 512 bytes) enter the following
command:

sudo fdisk /dev/sdb



```
root@kc-ub1004:~# sudo dd if=u-boot.bin  of=/dev/sdc bs=512 seek=2 skip=2 conv=f
sync
841+1 records in
841+1 records out
430680 bytes (431 kB) copied, 0.0303105 s, 14.2 MB/s
root@kc-ub1004:~# sudo dd if=uImage of=/dev/sdc bs=512 seek=2048 conv=fsync
7570+1 records in
7570+1 records out
3876236 bytes (3.9 MB) copied, 1.49198 s, 2.6 MB/s
root@kc-ub1004:~# sudo fdisk /dev/sdc
```

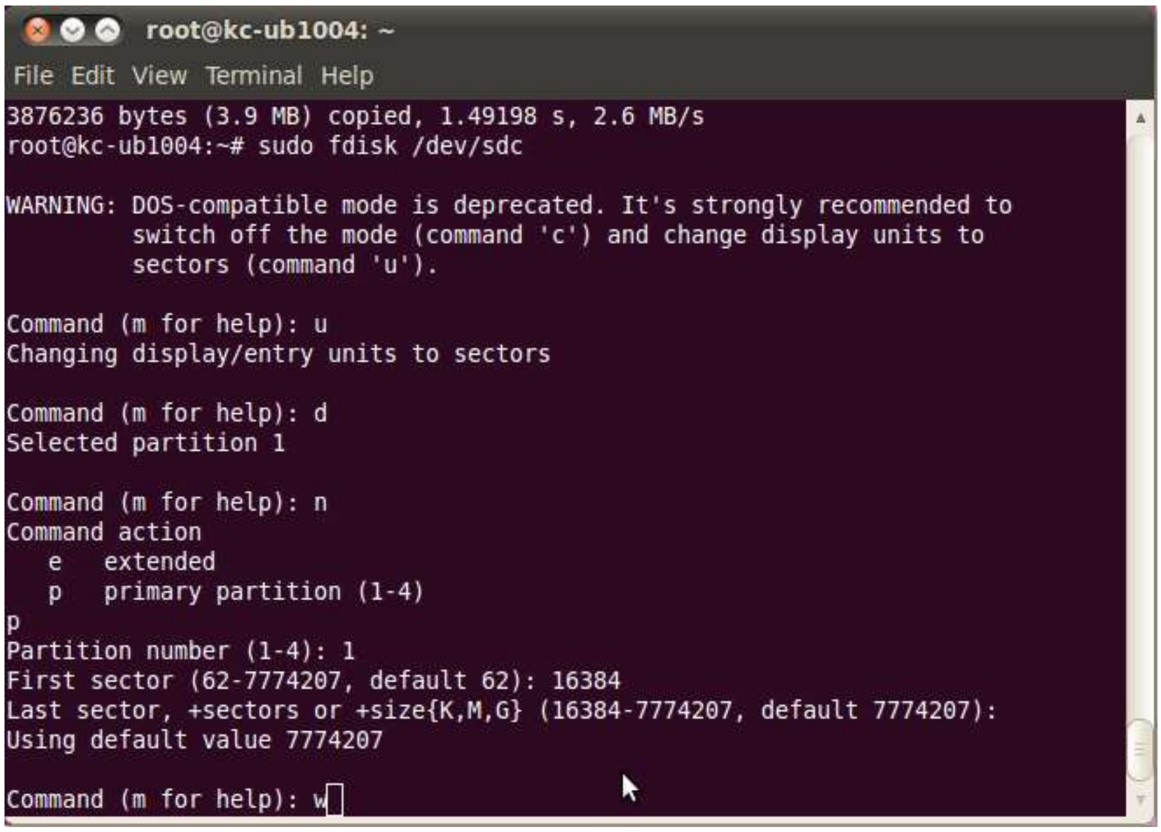
NOTE

On most Linux host operating systems, SD card will be mounted automatically upon insertion. Therefore, before running fdisk, **please make sure that SD card is unmounted** (via 'sudo umount /dev/sdb').

Type the following parameters (each followed by <ENTER>):

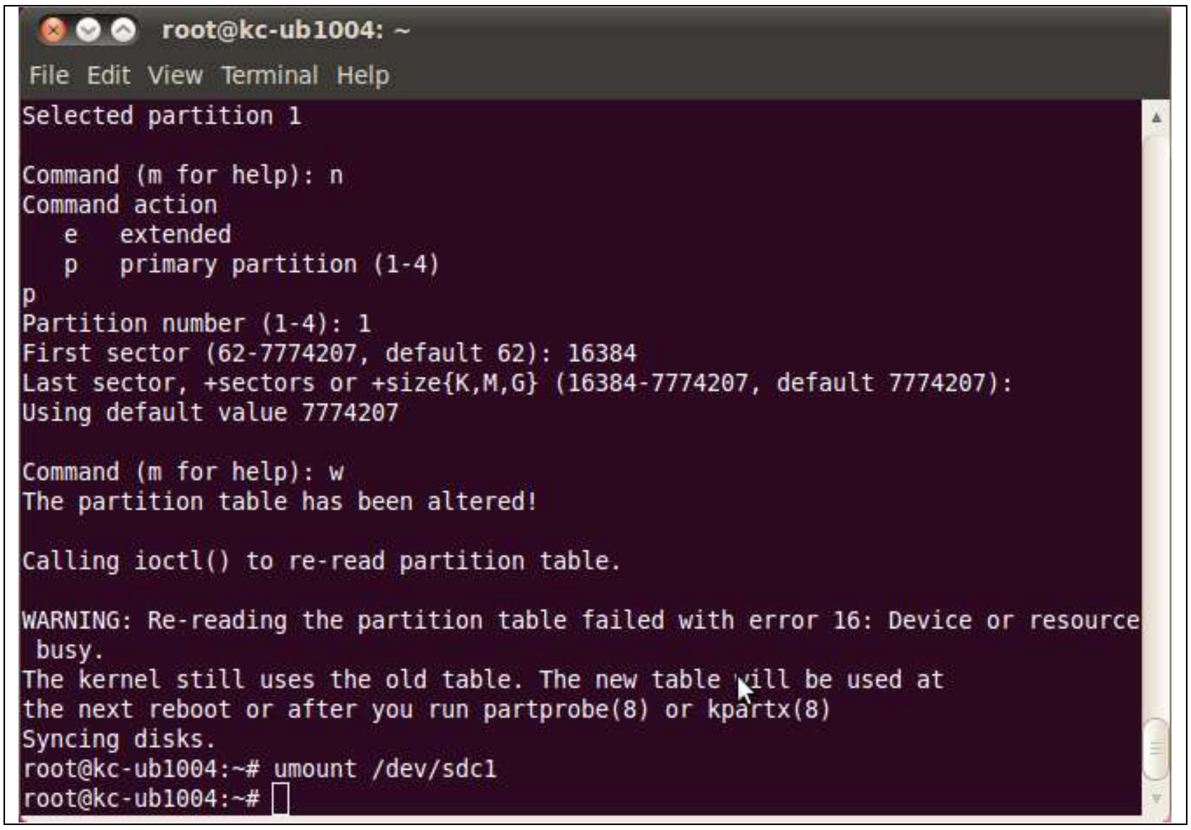
u	[switch the unit to sectors instead of cylinders]
d	[repeat this until no partition is reported by the 'p' command]
n	[create a new partition]
p	[create a primary partition]
1	[the first partition]
16384	[starting at offset sector #16384, i.e. 8MB, which leaves enough space for the kernel, the boot loader and its configuration data]
<enter>	[using the default value will create a partition that spans to the last sector of the medium]
w	[this writes the partition table to the medium and fdisk exits]

The file system format ext3 or ext4 is a good option for removable media due to the built-in journaling. Run the following command to format the partition:



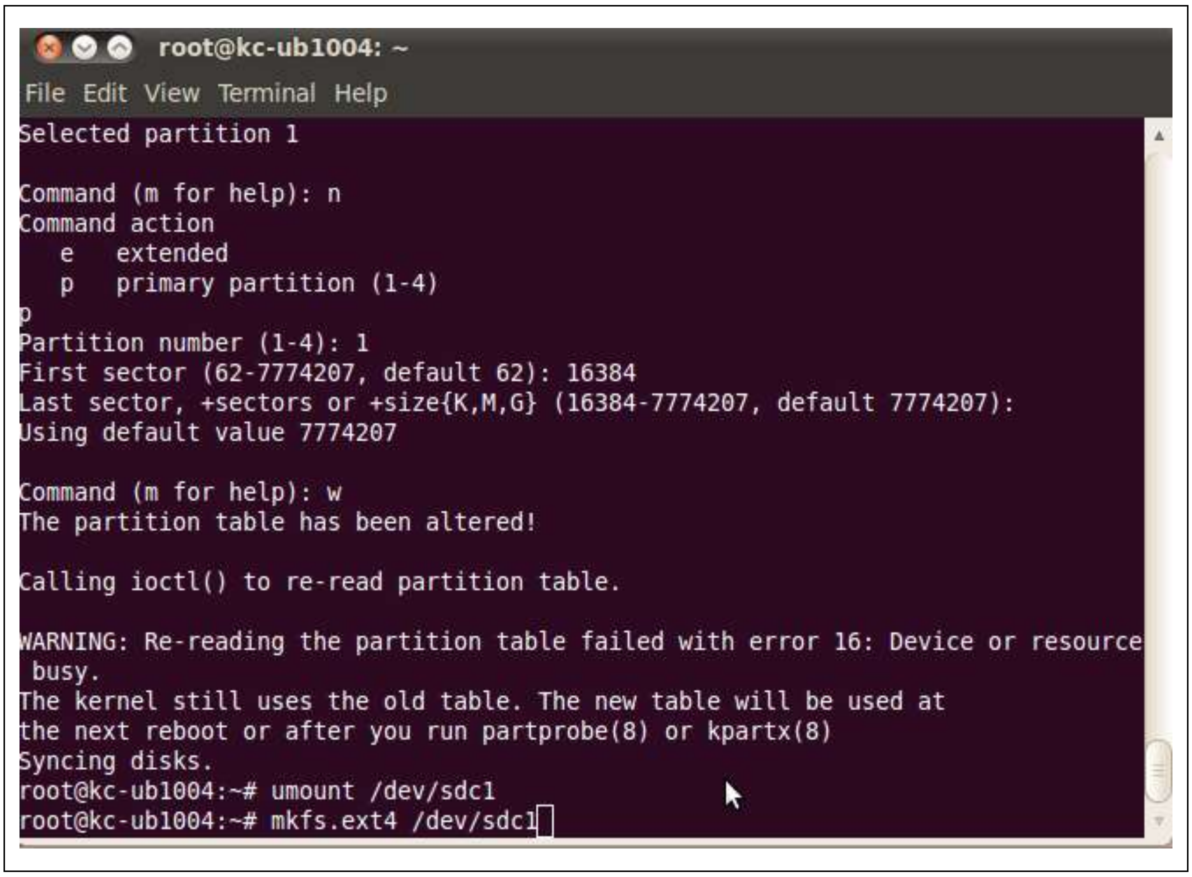
```
3876236 bytes (3.9 MB) copied, 1.49198 s, 2.6 MB/s
root@kc-ub1004:~# sudo fdisk /dev/sdc

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to
         switch off the mode (command 'c') and change display units to
         sectors (command 'u').

Command (m for help): u
Changing display/entry units to sectors

Command (m for help): d
Selected partition 1

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First sector (62-7774207, default 62): 16384
Last sector, +sectors or +size{K,M,G} (16384-7774207, default 7774207):
Using default value 7774207

Command (m for help): w
```

sudo umount /dev/sdb1



```
Selected partition 1

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First sector (62-7774207, default 62): 16384
Last sector, +sectors or +size{K,M,G} (16384-7774207, default 7774207):
Using default value 7774207

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource
 busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
root@kc-ub1004:~# umount /dev/sdc1
root@kc-ub1004:~#
```

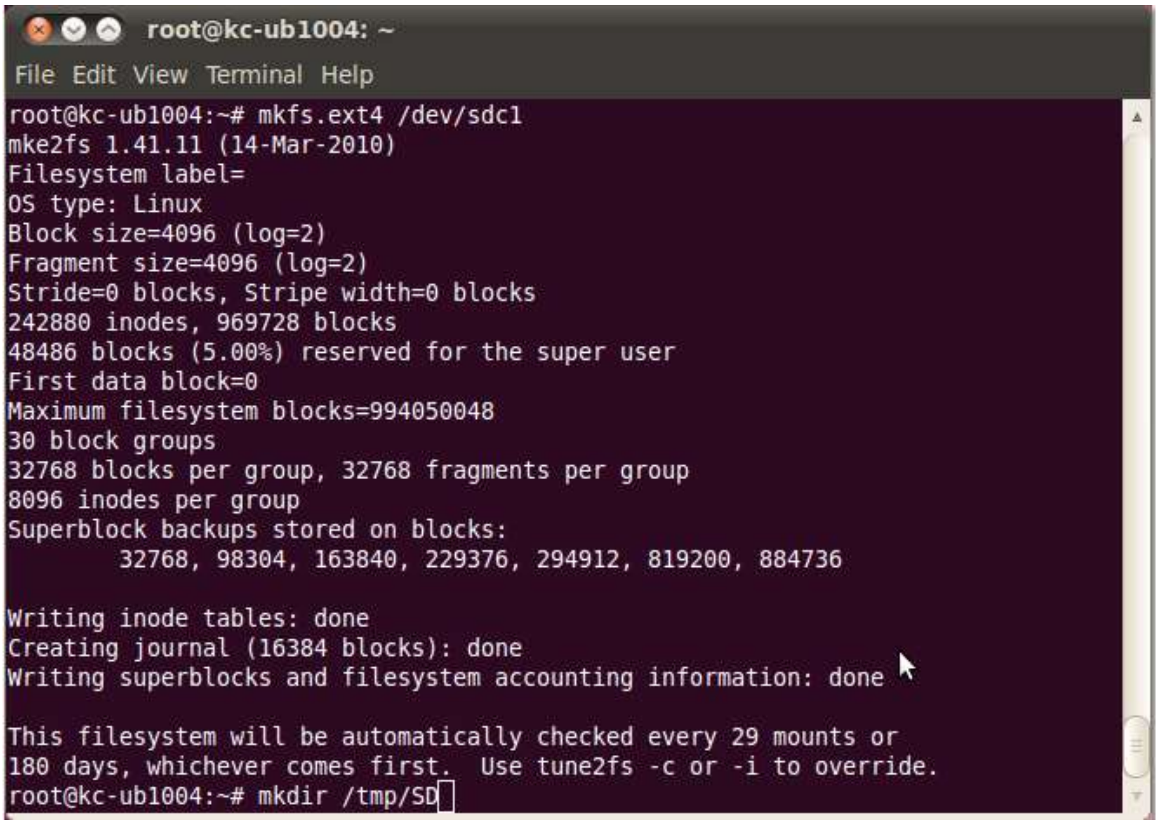
sudo mkfs.ext4 /dev/sdb1



```
Selected partition 1

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First sector (62-7774207, default 62): 16384
Last sector, +sectors or +size{K,M,G} (16384-7774207, default 7774207):
Using default value 7774207

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource
 busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
root@kc-ub1004:~# umount /dev/sdc1
root@kc-ub1004:~# mkfs.ext4 /dev/sdc1
```

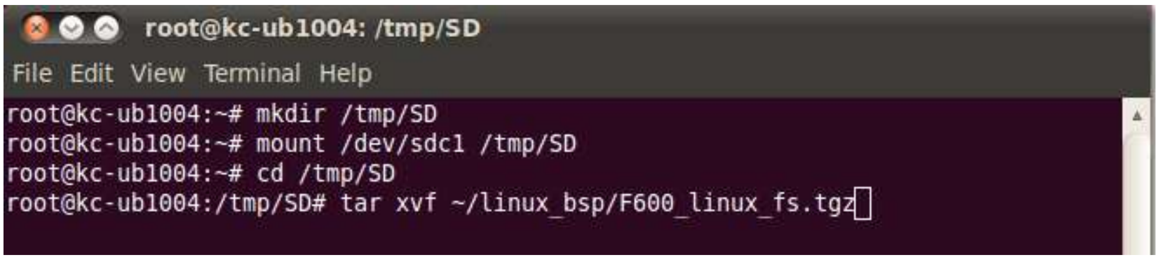
Copy the target file system to SD card partition by extracting rootfs package to mounted directory:
(assume compressed root file system is F600_linux_fs.tgz)

mkdir /tmp/SD



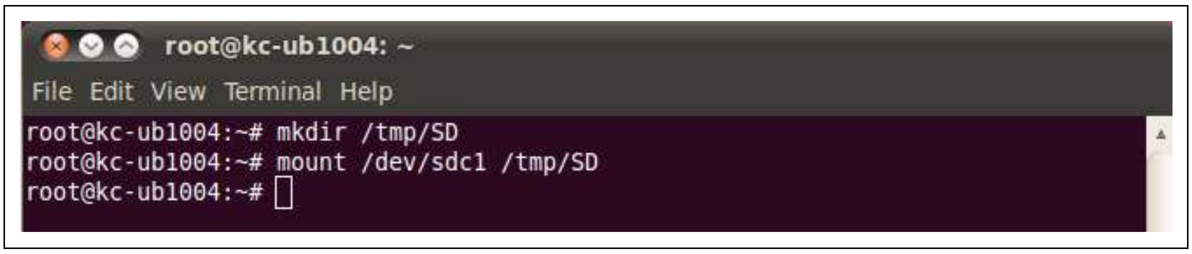
```
root@kc-ub1004:~# mkfs.ext4 /dev/sdc1
mke2fs 1.41.11 (14-Mar-2010)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
242880 inodes, 969728 blocks
48486 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=994050048
30 block groups
32768 blocks per group, 32768 fragments per group
8096 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736

Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 29 mounts or
180 days, whichever comes first.  Use tune2fs -c or -i to override.
root@kc-ub1004:~# mkdir /tmp/SD
```

sudo mount /dev/sdb1 /tmp/SD

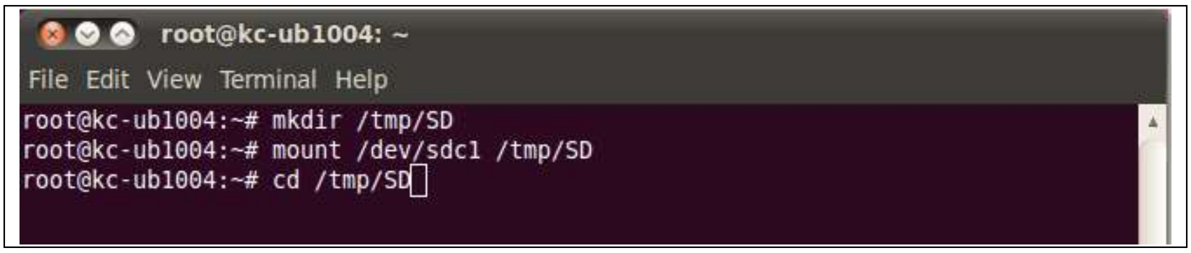


```
root@kc-ub1004:~# mkdir /tmp/SD
root@kc-ub1004:~# mount /dev/sdc1 /tmp/SD
root@kc-ub1004:~# cd /tmp/SD
root@kc-ub1004:/tmp/SD# tar xvf ~/linux_bsp/F600_linux_fs.tgz
```

cd /tmp/SD

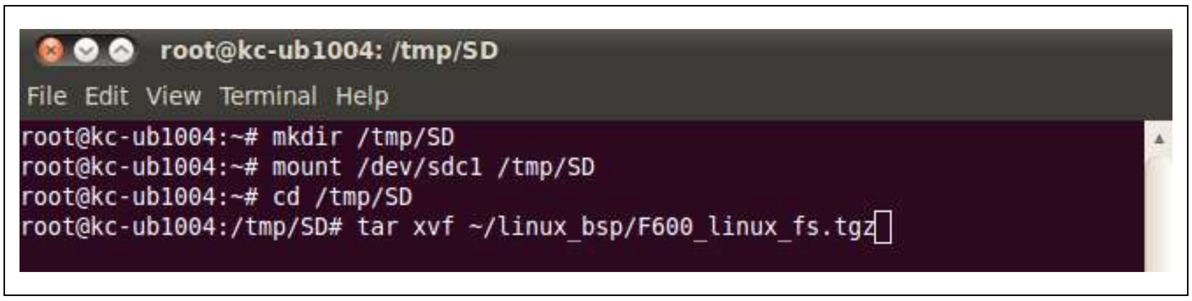


```
root@kc-ub1004:~# mkdir /tmp/SD
root@kc-ub1004:~# mount /dev/sdc1 /tmp/SD
root@kc-ub1004:~#
```

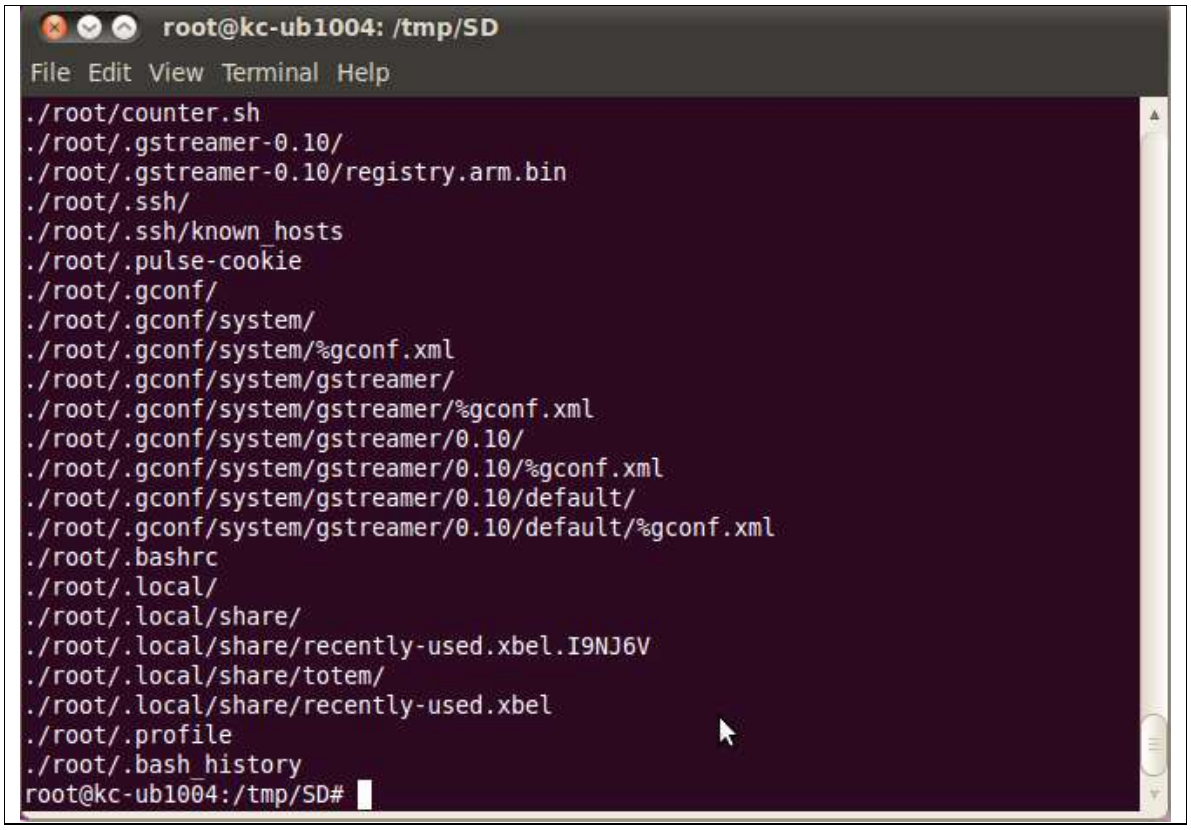


```
root@kc-ub1004:~# mkdir /tmp/SD
root@kc-ub1004:~# mount /dev/sdc1 /tmp/SD
root@kc-ub1004:~# cd /tmp/SD
```

tar xvf ~/linux_bsp/F600_linux_fs.tgz



```
root@kc-ub1004:~# mkdir /tmp/SD
root@kc-ub1004:~# mount /dev/sdc1 /tmp/SD
root@kc-ub1004:~# cd /tmp/SD
root@kc-ub1004:/tmp/SD# tar xvf ~/linux_bsp/F600_linux_fs.tgz
```



```
./root/counter.sh
./root/.gstreamer-0.10/
./root/.gstreamer-0.10/registry.arm.bin
./root/.ssh/
./root/.ssh/known_hosts
./root/.pulse-cookie
./root/.gconf/
./root/.gconf/system/
./root/.gconf/system/%gconf.xml
./root/.gconf/system/gstreamer/
./root/.gconf/system/gstreamer/%gconf.xml
./root/.gconf/system/gstreamer/0.10/
./root/.gconf/system/gstreamer/0.10/%gconf.xml
./root/.gconf/system/gstreamer/0.10/default/
./root/.gconf/system/gstreamer/0.10/default/%gconf.xml
./root/.bashrc
./root/.local/
./root/.local/share/
./root/.local/share/recently-used.xbel.I9NJ6V
./root/.local/share/totem/
./root/.local/share/recently-used.xbel
./root/.profile
./root/.bash_history
root@kc-ub1004:/tmp/SD#
```

Copying the file system takes several minutes. The file system content is now on the media.

4.1.7 Booting with your SD card

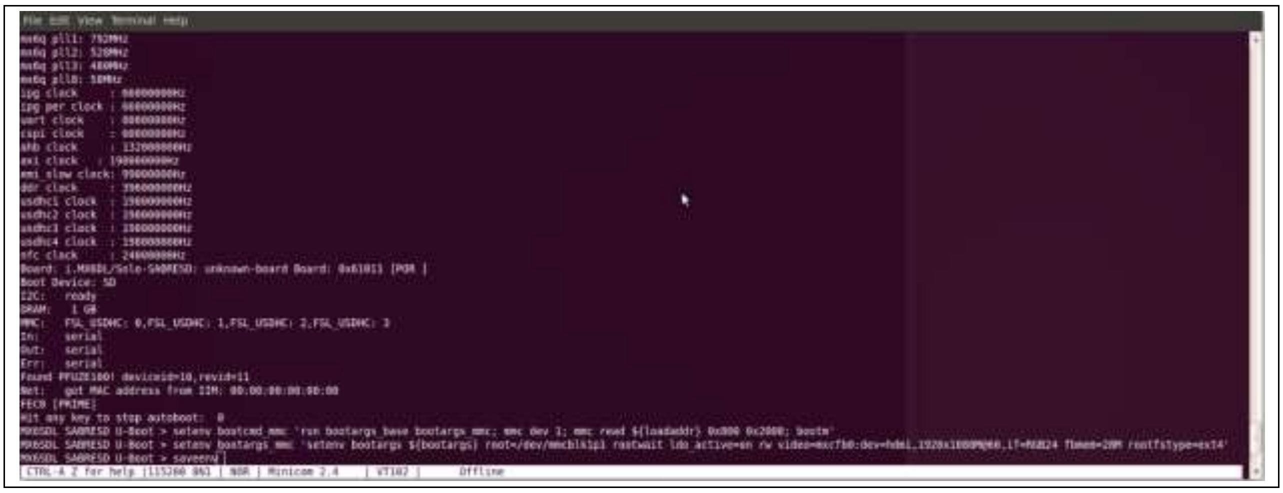
(For advance software users only)
Put SD card in your board and insert special COM port dongle to boot from SD. Connect a debug cable to debug port with serial port 115200/N/8/1 setting on your PC’s serial port program such hyperterminal/teraterm. Connect LVDS panel. Power on and you will see u-boot prompt.

At u-boot prompt, press Enter before time out. Type the following setting to boot from SD card + LVDS panel:

setenv bootcmd_mmc 'run bootargs_base bootargs_mmc; mmc dev 1; mmc read ${loadaddr} 0x800 0x2000; bootm'

setenv bootargs_mmc 'setenv bootargs ${bootargs} root=/dev/mmcblk1p1 rootwait rw video=mxcfb0:dev=ldb,IB102-XGA,if=RGB666 ldb=sep0 video=mxcfb1:off video=mxcfb2:off fbmem=15M rootfstype=ext4'

saveenv



```
mx6q pll1: 792MHz
mx6q pll2: 528MHz
mx6q pll3: 480MHz
mx6q pll8: 50MHz
ipg clock     : 66000000Hz
ipg per clock : 66000000Hz
uart clock    : 80000000Hz
cspi clock    = 60000000Hz
ahb clock     : 132000000Hz
axi clock   : 198000000Hz
emi_slow clock: 99000000Hz
ddr clock     : 396000000Hz
usdhc1 clock  : 198000000Hz
usdhc2 clock  : 198000000Hz
usdhc3 clock  : 198000000Hz
usdhc4 clock  : 198000000Hz
nfc clock     : 24000000Hz
Board: i.MX6DL/Solo-SABRESD: unknown-board Board: 0x61011 [POR ]
Boot Device: SD
I2C:   ready
DRAM:   1 GB
MMC:   FSL_USDHC: 0,FSL_USDHC: 1,FSL_USDHC: 2,FSL_USDHC: 3
In:    serial
Out:   serial
Err:   serial
Found PFUZE100! deviceid=10,revid=11
Net:   got MAC address from IIM: 00:00:00:00:00:00
FEC0 [PRIME]
Hit any key to stop autoboot:  0
MX6SDL SABRESD U-Boot > setenv bootcmd_mmc 'run bootargs_base bootargs_mmc; mmc dev 1; mmc read ${loadaddr} 0x800 0x2000; bootm'
MX6SDL SABRESD U-Boot > setenv bootargs_mmc 'setenv bootargs ${bootargs} root=/dev/mmcblk1p1 rootwait ldb_active=en rw video=mxcfb0:dev=hdmi,1920x1080M@60,if=RGB24 fbmem=28M rootfstype=ext4'
MX6SDL SABRESD U-Boot > saveenv
CTRL-A Z for help |115200 8N1 | NOR | Minicom 2.4    | VT102 |      Offline
```

After that, prepare your LCD, power off and ***power on again.***
You can see Ubuntu Linux is running on monitor.

Appendix A– I2C, GPIO, Watchdog Reference Code Coding

How to use I2C in Linux

Reading / writing i2c

i2cget.c

```
/*
    i2cget.c - A user-space program to read an I2C register.
    Copyright (C) 2005-2012   Jean Delvare <jdelvare@suse.de>

    Based on i2cset.c:
    Copyright (C) 2001-2003   Frodo Looijaard <frodol@dds.nl>, and
                               Mark D. Studebaker <mdsxyz123@yahoo.com>
    Copyright (C) 2004-2005   Jean Delvare

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    along with this program; if not, write to the Free Software
    Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston,
    MA 02110-1301 USA.
*/

#include <sys/ioctl.h>
#include <errno.h>
#include <string.h>
#include <stdio.h>
#include <stdlib.h>
```

```
#include <unistd.h>
#include <linux/i2c-dev.h>
#include "i2cbusses.h"
#include "util.h"
#include "../version.h"

static void help(void) __attribute__ ((noreturn));

static void help(void)
{
    fprintf(stderr,
        "Usage: i2cget [-f] [-y] I2CBUS CHIP-ADDRESS [DATA-ADDRESS [MODE]]\n"
        "  I2CBUS is an integer or an I2C bus name\n"
        "  ADDRESS is an integer (0x03 - 0x77)\n"
        "  MODE is one of:\n"
        "    b (read byte data, default)\n"
        "    w (read word data)\n"
        "    c (write byte/read byte)\n"
        "    Append p for SMBus PEC\n");
    exit(1);
}

static int check_funcs(int file, int size, int daddress, int pec)
{
    unsigned long funcs;

    /* check adapter functionality */
    if (ioctl(file, I2C_FUNCS, &funcs) < 0) {
        fprintf(stderr, "Error: Could not get the adapter "
            "functionality matrix: %s\n", strerror(errno));
        return -1;
    }

    switch (size) {
    case I2C_SMBUS_BYTE:
        if (!(funcs & I2C_FUNC_SMBUS_READ_BYTE)) {
            fprintf(stderr, MISSING_FUNC_FMT, "SMBus receive byte");
            return -1;
        }
        if (daddress >= 0
         && !(funcs & I2C_FUNC_SMBUS_WRITE_BYTE)) {
            fprintf(stderr, MISSING_FUNC_FMT, "SMBus send byte");
            return -1;
        }
        break;

    case I2C_SMBUS_BYTE_DATA:
        if (!(funcs & I2C_FUNC_SMBUS_READ_BYTE_DATA)) {
            fprintf(stderr, MISSING_FUNC_FMT, "SMBus read byte");
            return -1;
        }
        break;

    case I2C_SMBUS_WORD_DATA:
        if (!(funcs & I2C_FUNC_SMBUS_READ_WORD_DATA)) {
            fprintf(stderr, MISSING_FUNC_FMT, "SMBus read word");
            return -1;
        }
        break;
    }

    if (pec
     && !(funcs & (I2C_FUNC_SMBUS_PEC | I2C_FUNC_I2C))) {
        fprintf(stderr, "Warning: Adapter does "
            "not seem to support PEC\n");
    }

    return 0;
}

static int confirm(const char *filename, int address, int size, int daddress,
           int pec)
{
    int dont = 0;

    fprintf(stderr, "WARNING! This program can confuse your I2C "
          "bus, cause data loss and worse!\n");

    /* Don't let the user break his/her EEPROMs */
    if (address >= 0x50 && address <= 0x57 && pec) {
          fprintf(stderr, "STOP! EEPROMs are I2C devices, not "
                "SMBus devices. Using PEC\non I2C devices may "
                "result in unexpected results, such as\n"
                "trashing the contents of EEPROMs. We can't "
                "let you do that, sorry.\n");
          return 0;
    }

    if (size == I2C_SMBUS_BYTE && daddress >= 0 && pec) {
          fprintf(stderr, "WARNING! All I2C chips and some SMBus chips "
                "will interpret a write\nbyte command with PEC as a"
                "write byte data command, effectively writing a\n"
                "value into a register!\n");
          dont++;
    }

    fprintf(stderr, "I will read from device file %s, chip "
          "address 0x%02x, ", filename, address);
    if (daddress < 0)
          fprintf(stderr, "current data\naddress");
    else
          fprintf(stderr, "data address\n0x%02x", daddress);
    fprintf(stderr, ", using %s.\n",
          size == I2C_SMBUS_BYTE ? (daddress < 0 ?
          "read byte" : "write byte/read byte") :
          size == I2C_SMBUS_BYTE_DATA ? "read byte data" :
          "read word data");
    if (pec)
          fprintf(stderr, "PEC checking enabled.\n");

    fprintf(stderr, "Continue? [%s] ", dont ? "y/N" : "Y/n");
    fflush(stderr);
    if (!user_ack(!dont)) {
          fprintf(stderr, "Aborting on user request.\n");
```

```
                return 0;
        }

        return 1;
}

int main(int argc, char *argv[])
{
        char *end;
        int res, i2cbus, address, size, file;
        int daddress;
        char filename[20];
        int pec = 0;
        int flags = 0;
        int force = 0, yes = 0, version = 0;

        /* handle (optional) flags first */
        while (1+flags < argc && argv[1+flags][0] == '-') {
                switch (argv[1+flags][1]) {
                case 'V': version = 1; break;
                case 'f': force = 1; break;
                case 'y': yes = 1; break;
                default:
                        fprintf(stderr, "Error: Unsupported option "
                                "\"%s\"!\n", argv[1+flags]);
                        help();
                        exit(1);
                }
                flags++;
        }

        if (version) {
                fprintf(stderr, "i2cget version %s\n", VERSION);
                exit(0);
        }

        if (argc < flags + 3)
                help();
```

```
i2cbus = lookup_i2c_bus(argv[flags+1]);
if (i2cbus < 0)
        help();

address = parse_i2c_address(argv[flags+2]);
if (address < 0)
        help();

if (argc > flags + 3) {
        size = I2C_SMBUS_BYTE_DATA;
        daddress = strtol(argv[flags+3], &end, 0);
        if (*end || daddress < 0 || daddress > 0xff) {
                fprintf(stderr, "Error: Data address invalid!\n");
                help();
        }
} else {
        size = I2C_SMBUS_BYTE;
        daddress = -1;
}

if (argc > flags + 4) {
        switch (argv[flags+4][0]) {
        case 'b': size = I2C_SMBUS_BYTE_DATA; break;
        case 'w': size = I2C_SMBUS_WORD_DATA; break;
        case 'c': size = I2C_SMBUS_BYTE; break;
        default:
                fprintf(stderr, "Error: Invalid mode!\n");
                help();
        }
        pec = argv[flags+4][1] == 'p';
}

file = open_i2c_dev(i2cbus, filename, sizeof(filename), 0);
if (file < 0
  || check_funcs(file, size, daddress, pec)
  || set_slave_addr(file, address, force))
        exit(1);
```

```
    if (!yes && !confirm(filename, address, size, daddress, pec))
        exit(0);

    if (pec && ioctl(file, I2C_PEC, 1) < 0) {
        fprintf(stderr, "Error: Could not set PEC: %s\n",
            strerror(errno));
        close(file);
        exit(1);
    }

    switch (size) {
    case I2C_SMBUS_BYTE:
        if (daddress >= 0) {
            res = i2c_smbus_write_byte(file, daddress);
            if (res < 0)
                fprintf(stderr, "Warning - write failed\n");
        }
        res = i2c_smbus_read_byte(file);
        break;
    case I2C_SMBUS_WORD_DATA:
        res = i2c_smbus_read_word_data(file, daddress);
        break;
    default: /* I2C_SMBUS_BYTE_DATA */
        res = i2c_smbus_read_byte_data(file, daddress);
    }
    close(file);

    if (res < 0) {
        fprintf(stderr, "Error: Read failed\n");
        exit(2);
    }

    printf("0x%0*x\n", size == I2C_SMBUS_WORD_DATA ? 4 : 2, res);

    exit(0);
}
```

```
i2cset.c
/*
    i2cset.c - A user-space program to write an I2C register.
    Copyright (C) 2001-2003  Frodo Looijaard <frodol@dds.nl>, and
                             Mark D. Studebaker <mdsxyz123@yahoo.com>
    Copyright (C) 2004-2012  Jean Delvare <jdelvare@suse.de>

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    along with this program; if not, write to the Free Software
    Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston,
    MA 02110-1301 USA.
*/

#include <sys/ioctl.h>
#include <errno.h>
#include <string.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <linux/i2c-dev.h>
#include "i2cbusses.h"
#include "util.h"
#include "../version.h"

static void help(void) __attribute__ ((noreturn));

static void help(void)
{
    fprintf(stderr,
        "Usage: i2cset [-f] [-y] [-m MASK] [-r] I2CBUS CHIP-ADDRESS DATA-ADDRESS [VALUE] ... [MODE]\n"
        "  I2CBUS is an integer or an I2C bus name\n"
        "  ADDRESS is an integer (0x03 - 0x77)\n"
        "  MODE is one of:\n"
        "    c (byte, no value)\n"
        "    b (byte data, default)\n"
        "    w (word data)\n"
        "    i (I2C block data)\n"
        "    s (SMBus block data)\n"
        "    Append p for SMBus PEC\n");
    exit(1);
}

static int check_funcs(int file, int size, int pec)
{
    unsigned long funcs;

    /* check adapter functionality */
    if (ioctl(file, I2C_FUNCS, &funcs) < 0) {
        fprintf(stderr, "Error: Could not get the adapter "
            "functionality matrix: %s\n", strerror(errno));
        return -1;
    }

    switch (size) {
    case I2C_SMBUS_BYTE:
        if (!(funcs & I2C_FUNC_SMBUS_WRITE_BYTE)) {
            fprintf(stderr, MISSING_FUNC_FMT, "SMBus send byte");
            return -1;
        }
        break;

    case I2C_SMBUS_BYTE_DATA:
        if (!(funcs & I2C_FUNC_SMBUS_WRITE_BYTE_DATA)) {
            fprintf(stderr, MISSING_FUNC_FMT, "SMBus write byte");
            return -1;
        }
```

```
            break;

        case I2C_SMBUS_WORD_DATA:
            if (!(funcs & I2C_FUNC_SMBUS_WRITE_WORD_DATA)) {
                fprintf(stderr, MISSING_FUNC_FMT, "SMBus write word");
                return -1;
            }
            break;

        case I2C_SMBUS_BLOCK_DATA:
            if (!(funcs & I2C_FUNC_SMBUS_WRITE_BLOCK_DATA)) {
                fprintf(stderr, MISSING_FUNC_FMT, "SMBus block write");
                return -1;
            }
            break;
        case I2C_SMBUS_I2C_BLOCK_DATA:
            if (!(funcs & I2C_FUNC_SMBUS_WRITE_I2C_BLOCK)) {
                fprintf(stderr, MISSING_FUNC_FMT, "I2C block write");
                return -1;
            }
            break;
        }

        if (pec
         && !(funcs & (I2C_FUNC_SMBUS_PEC | I2C_FUNC_I2C))) {
            fprintf(stderr, "Warning: Adapter does "
                "not seem to support PEC\n");
        }

        return 0;
}

static int confirm(const char *filename, int address, int size, int daddress,
           int value, int vmask, const unsigned char *block, int len,
           int pec)
{
        int dont = 0;
```

```
fprintf(stderr, "WARNING! This program can confuse your I2C "
        "bus, cause data loss and worse!\n");

if (address >= 0x50 && address <= 0x57) {
        fprintf(stderr, "DANGEROUS! Writing to a serial "
                "EEPROM on a memory DIMM\nmay render your "
                "memory USELESS and make your system "
                "UNBOOTABLE!\n");
        dont++;
}

fprintf(stderr, "I will write to device file %s, chip address "
        "0x%02x, data address\n0x%02x, ", filename, address, daddress);
if (size == I2C_SMBUS_BYTE)
        fprintf(stderr, "no data.\n");
else if (size == I2C_SMBUS_BLOCK_DATA ||
          size == I2C_SMBUS_I2C_BLOCK_DATA) {
        int i;

        fprintf(stderr, "data");
        for (i = 0; i < len; i++)
                fprintf(stderr, " 0x%02x", block[i]);
        fprintf(stderr, ", mode %s.\n", size == I2C_SMBUS_BLOCK_DATA
                ? "smbus block" : "i2c block");
} else
        fprintf(stderr, "data 0x%02x%s, mode %s.\n", value,
                vmask ? " (masked)" : "",
                size == I2C_SMBUS_BYTE_DATA ? "byte" : "word");
if (pec)
        fprintf(stderr, "PEC checking enabled.\n");

fprintf(stderr, "Continue? [%s] ", dont ? "y/N" : "Y/n");
fflush(stderr);
if (!user_ack(!dont)) {
        fprintf(stderr, "Aborting on user request.\n");
        return 0;
}
```

```
        return 1;
}

int main(int argc, char *argv[])
{
        char *end;
        const char *maskp = NULL;
        int res, i2cbus, address, size, file;
        int value, daddress, vmask = 0;
        char filename[20];
        int pec = 0;
        int flags = 0;
        int force = 0, yes = 0, version = 0, readback = 0;
        unsigned char block[I2C_SMBUS_BLOCK_MAX];
        int len;

        /* handle (optional) flags first */
        while (1+flags < argc && argv[1+flags][0] == '-') {
                switch (argv[1+flags][1]) {
                case 'V': version = 1; break;
                case 'f': force = 1; break;
                case 'y': yes = 1; break;
                case 'm':
                        if (2+flags < argc)
                                maskp = argv[2+flags];
                        flags++;
                        break;
                case 'r': readback = 1; break;
                default:
                        fprintf(stderr, "Error: Unsupported option "
                                "\"%s\"!\n", argv[1+flags]);
                        help();
                        exit(1);
                }
                flags++;
        }

        if (version) {
```

```
        fprintf(stderr, "i2cset version %s\n", VERSION);
        exit(0);
    }

    if (argc < flags + 4)
        help();

    i2cbus = lookup_i2c_bus(argv[flags+1]);
    if (i2cbus < 0)
        help();

    address = parse_i2c_address(argv[flags+2]);
    if (address < 0)
        help();

    daddress = strtol(argv[flags+3], &end, 0);
    if (*end || daddress < 0 || daddress > 0xff) {
        fprintf(stderr, "Error: Data address invalid!\n");
        help();
    }

    /* check for command/mode */
    if (argc == flags + 4) {
        /* Implicit "c" */
        size = I2C_SMBUS_BYTE;
    } else if (argc == flags + 5) {
        /* "c", "cp",   or implicit "b" */
        if (!strcmp(argv[flags+4], "c")
          || !strcmp(argv[flags+4], "cp")) {
            size = I2C_SMBUS_BYTE;
            pec = argv[flags+4][1] == 'p';
        } else {
            size = I2C_SMBUS_BYTE_DATA;
        }
    } else {
        /* All other commands */
        if (strlen(argv[argc-1]) > 2
            || (strlen(argv[argc-1]) == 2 && argv[argc-1][1] != 'p')) {
```

```
            fprintf(stderr, "Error: Invalid mode '%s'!\n", argv[argc-1]);
            help();
        }
        switch (argv[argc-1][0]) {
        case 'b': size = I2C_SMBUS_BYTE_DATA; break;
        case 'w': size = I2C_SMBUS_WORD_DATA; break;
        case 's': size = I2C_SMBUS_BLOCK_DATA; break;
        case 'i': size = I2C_SMBUS_I2C_BLOCK_DATA; break;
        default:
            fprintf(stderr, "Error: Invalid mode '%s'!\n", argv[argc-1]);
            help();
        }
        pec = argv[argc-1][1] == 'p';
        if (size == I2C_SMBUS_BLOCK_DATA || size == I2C_SMBUS_I2C_BLOCK_DATA) {
            if (pec && size == I2C_SMBUS_I2C_BLOCK_DATA) {
                fprintf(stderr, "Error: PEC not supported for I2C block writes!\n");
                help();
            }
            if (maskp) {
                fprintf(stderr, "Error: Mask not supported for block writes!\n");
                help();
            }
            if (argc > (int)sizeof(block) + flags + 5) {
                fprintf(stderr, "Error: Too many arguments!\n");
                help();
            }
        } else if (argc != flags + 6) {
            fprintf(stderr, "Error: Too many arguments!\n");
            help();
        }
    }

    len = 0; /* Must always initialize len since it is passed to confirm() */

    /* read values from command line */
    switch (size) {
    case I2C_SMBUS_BYTE_DATA:
    case I2C_SMBUS_WORD_DATA:
        value = strtol(argv[flags+4], &end, 0);
        if (*end || value < 0) {
            fprintf(stderr, "Error: Data value invalid!\n");
            help();
        }
        if ((size == I2C_SMBUS_BYTE_DATA && value > 0xff)
            || (size == I2C_SMBUS_WORD_DATA && value > 0xffff)) {
            fprintf(stderr, "Error: Data value out of range!\n");
            help();
        }
        break;
    case I2C_SMBUS_BLOCK_DATA:
    case I2C_SMBUS_I2C_BLOCK_DATA:
        for (len = 0; len + flags + 5 < argc; len++) {
            value = strtol(argv[flags + len + 4], &end, 0);
            if (*end || value < 0) {
                fprintf(stderr, "Error: Data value invalid!\n");
                help();
            }
            if (value > 0xff) {
                fprintf(stderr, "Error: Data value out of range!\n");
                help();
            }
            block[len] = value;
        }
        value = -1;
        break;
    default:
        value = -1;
        break;
    }

    if (maskp) {
        vmask = strtol(maskp, &end, 0);
        if (*end || vmask == 0) {
            fprintf(stderr, "Error: Data value mask invalid!\n");
            help();
        }
        if (((size == I2C_SMBUS_BYTE || size == I2C_SMBUS_BYTE_DATA)
             && vmask > 0xff) || vmask > 0xffff) {
            fprintf(stderr, "Error: Data value mask out of range!\n");
            help();
        }
    }

    file = open_i2c_dev(i2cbus, filename, sizeof(filename), 0);
    if (file < 0
     || check_funcs(file, size, pec)
     || set_slave_addr(file, address, force))
        exit(1);

    if (!yes && !confirm(filename, address, size, daddress,
                 value, vmask, block, len, pec))
        exit(0);

    if (vmask) {
        int oldvalue;

        switch (size) {
        case I2C_SMBUS_BYTE:
            oldvalue = i2c_smbus_read_byte(file);
            break;
        case I2C_SMBUS_WORD_DATA:
            oldvalue = i2c_smbus_read_word_data(file, daddress);
            break;
        default:
            oldvalue = i2c_smbus_read_byte_data(file, daddress);
        }

        if (oldvalue < 0) {
            fprintf(stderr, "Error: Failed to read old value\n");
            exit(1);
        }

        value = (value & vmask) | (oldvalue & ~vmask);
```

```
		if (!yes) {
			fprintf(stderr, "Old value 0x%0*x, write mask "
				"0x%0*x: Will write 0x%0*x to register "
				"0x%02x\n",
				size == I2C_SMBUS_WORD_DATA ? 4 : 2, oldvalue,
				size == I2C_SMBUS_WORD_DATA ? 4 : 2, vmask,
				size == I2C_SMBUS_WORD_DATA ? 4 : 2, value,
				daddress);

			fprintf(stderr, "Continue? [Y/n] ");
			fflush(stderr);
			if (!user_ack(1)) {
				fprintf(stderr, "Aborting on user request.\n");
				exit(0);
			}
		}
	}

	if (pec && ioctl(file, I2C_PEC, 1) < 0) {
		fprintf(stderr, "Error: Could not set PEC: %s\n",
			strerror(errno));
		close(file);
		exit(1);
	}

	switch (size) {
	case I2C_SMBUS_BYTE:
		res = i2c_smbus_write_byte(file, daddress);
		break;
	case I2C_SMBUS_WORD_DATA:
		res = i2c_smbus_write_word_data(file, daddress, value);
		break;
	case I2C_SMBUS_BLOCK_DATA:
		res = i2c_smbus_write_block_data(file, daddress, len, block);
		break;
	case I2C_SMBUS_I2C_BLOCK_DATA:
		res = i2c_smbus_write_i2c_block_data(file, daddress, len, block);
		break;
```

```
default: /* I2C_SMBUS_BYTE_DATA */
        res = i2c_smbus_write_byte_data(file, daddress, value);
        break;
}
if (res < 0) {
        fprintf(stderr, "Error: Write failed\n");
        close(file);
        exit(1);
}

if (pec) {
        if (ioctl(file, I2C_PEC, 0) < 0) {
                fprintf(stderr, "Error: Could not clear PEC: %s\n",
                        strerror(errno));
                close(file);
                exit(1);
        }
}

if (!readback) { /* We're done */
        close(file);
        exit(0);
}

switch (size) {
case I2C_SMBUS_BYTE:
        res = i2c_smbus_read_byte(file);
        value = daddress;
        break;
case I2C_SMBUS_WORD_DATA:
        res = i2c_smbus_read_word_data(file, daddress);
        break;
default: /* I2C_SMBUS_BYTE_DATA */
        res = i2c_smbus_read_byte_data(file, daddress);
}
close(file);

if (res < 0) {
```

```
            printf("Warning - readback failed\n");
        } else
        if (res != value) {
            printf("Warning - data mismatch - wrote "
                   "0x%0*x, read back 0x%0*x\n",
                   size == I2C_SMBUS_WORD_DATA ? 4 : 2, value,
                   size == I2C_SMBUS_WORD_DATA ? 4 : 2, res);
        } else {
            printf("Value 0x%0*x written, readback matched\n",
                   size == I2C_SMBUS_WORD_DATA ? 4 : 2, value);
        }

        exit(0);
}

Utils/headers
/*
        i2cbusses: Print the installed i2c busses for both 2.4 and 2.6 kernels.
                   Part of user-space programs to access for I2C
                   devices.
*/

/* For strdup and snprintf */
#define _BSD_SOURCE 1

#include <sys/types.h>
#include <sys/stat.h>
#include <sys/param.h>      /* for NAME_MAX */
#include <sys/ioctl.h>
#include <string.h>
#include <strings.h>      /* for strcasecmp() */
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <limits.h>
#include <dirent.h>
#include <fcntl.h>
#include <errno.h>
```

```
#include "i2cbusses.h"

#include <linux/i2c-dev.h>


enum adt { adt_dummy, adt_isa, adt_i2c, adt_smbus, adt_unknown };


struct adap_type {

        const char *funcs;

        const char* algo;

};


static struct adap_type adap_types[5] = {

        { .funcs        = "dummy",

            .algo               = "Dummy bus", },

        { .funcs        = "isa",

            .algo               = "ISA bus", },

        { .funcs        = "i2c",

            .algo               = "I2C adapter", },

        { .funcs        = "smbus",

            .algo               = "SMBus adapter", },

        { .funcs        = "unknown",

            .algo               = "N/A", },

};


static enum adt i2c_get_funcs(int i2cbus)

{

        unsigned long funcs;

        int file;

        char filename[20];

        enum adt ret;


        file = open_i2c_dev(i2cbus, filename, sizeof(filename), 1);

        if (file < 0)

                return adt_unknown;


        if (ioctl(file, I2C_FUNCS, &funcs) < 0)

                ret = adt_unknown;

        else if (funcs & I2C_FUNC_I2C)

                ret = adt_i2c;
```

```
    else if (funcs & (I2C_FUNC_SMBUS_BYTE |
                      I2C_FUNC_SMBUS_BYTE_DATA |
                      I2C_FUNC_SMBUS_WORD_DATA))
        ret = adt_smbus;
    else
        ret = adt_dummy;

    close(file);
    return ret;
}

/* Remove trailing spaces from a string
   Return the new string length including the trailing NUL */
static int rtrim(char *s)
{
    int i;

    for (i = strlen(s) - 1; i >= 0 && (s[i] == ' ' || s[i] == '\n'); i--)
        s[i] = '\0';
    return i + 2;
}

void free_adapters(struct i2c_adap *adapters)
{
    int i;

    for (i = 0; adapters[i].name; i++)
        free(adapters[i].name);
    free(adapters);
}

/* We allocate space for the adapters in bunches. The last item is a
   terminator, so here we start with room for 7 adapters, which should
   be enough in most cases. If not, we allocate more later as needed. */
#define BUNCH    8

/* n must match the size of adapters at calling time */
static struct i2c_adap *more_adapters(struct i2c_adap *adapters, int n)
```

```
{
        struct i2c_adap *new_adapters;

        new_adapters = realloc(adapters, (n + BUNCH) * sizeof(struct i2c_adap));
        if (!new_adapters) {
                free_adapters(adapters);
                return NULL;
        }
        memset(new_adapters + n, 0, BUNCH * sizeof(struct i2c_adap));

        return new_adapters;
}

struct i2c_adap *gather_i2c_busses(void)
{
        char s[120];
        struct dirent *de, *dde;
        DIR *dir, *ddir;
        FILE *f;
        char fstype[NAME_MAX], sysfs[NAME_MAX], n[NAME_MAX];
        int foundsysfs = 0;
        int count=0;
        struct i2c_adap *adapters;

        adapters = calloc(BUNCH, sizeof(struct i2c_adap));
        if (!adapters)
                return NULL;

        /* look in /proc/bus/i2c */
        if ((f = fopen("/proc/bus/i2c", "r"))) {
                while (fgets(s, 120, f)) {
                        char *algo, *name, *type, *all;
                        int len_algo, len_name, len_type;
                        int i2cbus;

                        algo = strrchr(s, '\t');
                        *(algo++) = '\0';
                        len_algo = rtrim(algo);
                name = strrchr(s, '\t');
                *(name++) = '\0';
                len_name = rtrim(name);

                type = strrchr(s, '\t');
                *(type++) = '\0';
                len_type = rtrim(type);

                sscanf(s, "i2c-%d", &i2cbus);

                if ((count + 1) % BUNCH == 0) {
                    /* We need more space */
                    adapters = more_adapters(adapters, count + 1);
                    if (!adapters)
                        return NULL;
                }

                all = malloc(len_name + len_type + len_algo);
                if (all == NULL) {
                    free_adapters(adapters);
                    return NULL;
                }
                adapters[count].nr = i2cbus;
                adapters[count].name = strcpy(all, name);
                adapters[count].funcs = strcpy(all + len_name, type);
                adapters[count].algo = strcpy(all + len_name + len_type,
                                    algo);
                count++;
            }
            fclose(f);
            goto done;
        }

        /* look in sysfs */
        /* First figure out where sysfs was mounted */
        if ((f = fopen("/proc/mounts", "r")) == NULL) {
            goto done;
```

```
}
while (fgets(n, NAME_MAX, f)) {
        sscanf(n, "%*[^ ] %[^ ] %[^ ] %*s\n", sysfs, fstype);
        if (strcasecmp(fstype, "sysfs") == 0) {
                foundsysfs++;
                break;
        }
}
fclose(f);
if (! foundsysfs) {
        goto done;
}

/* Bus numbers in i2c-adapter don't necessarily match those in
      i2c-dev and what we really care about are the i2c-dev numbers.
      Unfortunately the names are harder to get in i2c-dev */
strcat(sysfs, "/class/i2c-dev");
if(!(dir = opendir(sysfs)))
        goto done;
/* go through the busses */
while ((de = readdir(dir)) != NULL) {
        if (!strcmp(de->d_name, "."))
                continue;
        if (!strcmp(de->d_name, ".."))
                continue;

        /* this should work for kernels 2.6.5 or higher and */
        /* is preferred because is unambiguous */
        sprintf(n, "%s/%s/name", sysfs, de->d_name);
        f = fopen(n, "r");
        /* this seems to work for ISA */
        if(f == NULL) {
                sprintf(n, "%s/%s/device/name", sysfs, de->d_name);
                f = fopen(n, "r");
        }
        /* non-ISA is much harder */
        /* and this won't find the correct bus name if a driver
              has more than one bus */
        if(f == NULL) {
            sprintf(n, "%s/%s/device", sysfs, de->d_name);
            if(!(ddir = opendir(n)))
                continue;
            while ((dde = readdir(ddir)) != NULL) {
                if (!strcmp(dde->d_name, "."))
                    continue;
                if (!strcmp(dde->d_name, ".."))
                    continue;
                if ((!strncmp(dde->d_name, "i2c-", 4))) {
                    sprintf(n, "%s/%s/device/%s/name",
                        sysfs, de->d_name, dde->d_name);
                    if((f = fopen(n, "r")))
                        goto found;
                }
            }
        }

found:
        if (f != NULL) {
            int i2cbus;
            enum adt type;
            char *px;

            px = fgets(s, 120, f);
            fclose(f);
            if (!px) {
                fprintf(stderr, "%s: read error\n", n);
                continue;
            }
            if ((px = strchr(s, '\n')) != NULL)
                *px = 0;
            if (!sscanf(de->d_name, "i2c-%d", &i2cbus))
                continue;
            if (!strncmp(s, "ISA ", 4)) {
                type = adt_isa;
            } else {
                /* Attempt to probe for adapter capabilities */
                type = i2c_get_funcs(i2cbus);
            }

            if ((count + 1) % BUNCH == 0) {
                /* We need more space */
                adapters = more_adapters(adapters, count + 1);
                if (!adapters)
                    return NULL;
            }

            adapters[count].nr = i2cbus;
            adapters[count].name = strdup(s);
            if (adapters[count].name == NULL) {
                free_adapters(adapters);
                return NULL;
            }
            adapters[count].funcs = adap_types[type].funcs;
            adapters[count].algo = adap_types[type].algo;
            count++;
        }
    }
    closedir(dir);

done:
    return adapters;
}

static int lookup_i2c_bus_by_name(const char *bus_name)
{
    struct i2c_adap *adapters;
    int i, i2cbus = -1;

    adapters = gather_i2c_busses();
    if (adapters == NULL) {
        fprintf(stderr, "Error: Out of memory!\n");
        return -3;
    }
```

```
        /* Walk the list of i2c busses, looking for the one with the
              right name */
        for (i = 0; adapters[i].name; i++) {
                if (strcmp(adapters[i].name, bus_name) == 0) {
                        if (i2cbus >= 0) {
                                fprintf(stderr,
                                        "Error: I2C bus name is not unique!\n");
                                i2cbus = -4;
                                goto done;
                        }
                        i2cbus = adapters[i].nr;
                }
        }

        if (i2cbus == -1)
                fprintf(stderr, "Error: I2C bus name doesn't match any "
                        "bus present!\n");

done:
        free_adapters(adapters);
        return i2cbus;
}

/*
 * Parse an I2CBUS command line argument and return the corresponding
 * bus number, or a negative value if the bus is invalid.
 */
int lookup_i2c_bus(const char *i2cbus_arg)
{
        unsigned long i2cbus;
        char *end;

        i2cbus = strtoul(i2cbus_arg, &end, 0);
        if (*end || !*i2cbus_arg) {
                /* Not a number, maybe a name? */
                return lookup_i2c_bus_by_name(i2cbus_arg);
        }
        if (i2cbus > 0xFFFFF) {
                fprintf(stderr, "Error: I2C bus out of range!\n");
                return -2;
        }

        return i2cbus;
}

/*
  * Parse a CHIP-ADDRESS command line argument and return the corresponding
  * chip address, or a negative value if the address is invalid.
  */
int parse_i2c_address(const char *address_arg)
{
        long address;
        char *end;

        address = strtol(address_arg, &end, 0);
        if (*end || !*address_arg) {
                fprintf(stderr, "Error: Chip address is not a number!\n");
                return -1;
        }
        if (address < 0x03 || address > 0x77) {
                fprintf(stderr, "Error: Chip address out of range "
                        "(0x03-0x77)!\n");
                return -2;
        }

        return address;
}

int open_i2c_dev(int i2cbus, char *filename, size_t size, int quiet)
{
        int file;

        snprintf(filename, size, "/dev/i2c/%d", i2cbus);
        filename[size - 1] = '\0';
        file = open(filename, O_RDWR);
        if (file < 0 && (errno == ENOENT || errno == ENOTDIR)) {
                sprintf(filename, "/dev/i2c-%d", i2cbus);
                file = open(filename, O_RDWR);
        }

        if (file < 0 && !quiet) {
                if (errno == ENOENT) {
                        fprintf(stderr, "Error: Could not open file "
                                "`/dev/i2c-%d' or `/dev/i2c/%d': %s\n",
                                i2cbus, i2cbus, strerror(ENOENT));
                } else {
                        fprintf(stderr, "Error: Could not open file "
                                "`%s': %s\n", filename, strerror(errno));
                        if (errno == EACCES)
                                fprintf(stderr, "Run as root?\n");
                }
        }

        return file;
}

int set_slave_addr(int file, int address, int force)
{
        /* With force, let the user read from/write to the registers
              even when a driver is also running */
        if (ioctl(file, force ? I2C_SLAVE_FORCE : I2C_SLAVE, address) < 0) {
                fprintf(stderr,
                        "Error: Could not set address to 0x%02x: %s\n",
                        address, strerror(errno));
                return -errno;
        }

        return 0;
}

/*
        i2cbusses.h
*/
```

```
#ifndef _I2CBUSSES_H
#define _I2CBUSSES_H

#include <unistd.h>

struct i2c_adap {
	int nr;
	char *name;
	const char *funcs;
	const char *algo;
};

struct i2c_adap *gather_i2c_busses(void);
void free_adapters(struct i2c_adap *adapters);

int lookup_i2c_bus(const char *i2cbus_arg);
int parse_i2c_address(const char *address_arg);
int open_i2c_dev(int i2cbus, char *filename, size_t size, int quiet);
int set_slave_addr(int file, int address, int force);

#define MISSING_FUNC_FMT	"Error: Adapter does not have %s capability\n"

#endif

/*
	util.c - helper functions
*/

#include <stdio.h>
#include "util.h"

/* Return 1 if we should continue, 0 if we should abort */
int user_ack(int def)
{
	char s[2];
	int ret;
	if (!fgets(s, 2, stdin))
		return 0; /* Nack by default */

	switch (s[0]) {
	case 'y':
	case 'Y':
		ret = 1;
		break;
	case 'n':
	case 'N':
		ret = 0;
		break;
	default:
		ret = def;
	}

	/* Flush extra characters */
	while (s[0] != '\n') {
		int c = fgetc(stdin);
		if (c == EOF) {
			ret = 0;
			break;
		}
		s[0] = c;
	}
	return ret;
}
/*
	util - helper functions
*/

#ifndef _UTIL_H
#define _UTIL_H

extern int user_ack(int def);

#endif /* _UTIL_H */
```

```
Version.h

#define VERSION "3.1.1"
```

How to use GPIO in Linux

1.2.1 GPIO Mapping Table

GPIO	
Logical Number	**Physical Number**
1	32
2	33
3	34
5	36
7	38
8	39
9	81
10	82
11	40
12	41

1.2.2 GPIO Sample Code

```
# GPIO example 1: Output (take GPIO 32 as example)
echo 32 > /sys/class/gpio/export
echo out > /sys/class/gpio/gpio32/direction
echo 0 > /sys/class/gpio/gpio32/value
echo 1 > /sys/class/gpio/gpio32/value


# GPIO example 2: Input (take GPIO 32 as example)
echo 32 > /sys/class/gpio/export
echo in > /sys/class/gpio/gpio32/direction
cat /sys/class/gpio/gpio32/value
```

1.2.3 How to use Watchdog in Linux

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <fcntl.h>

int main(void)
{
        int fd = open("/dev/watchdog", O_WRONLY);
        int ret = 0;
        if (fd == -1) {
                perror("watchdog");
                exit(EXIT_FAILURE);
        }
        while (1) {
                ret = write(fd, "\0", 1);
                if (ret != 1) {
                        ret = -1;
                        break;
                }
                puts("[WDT] Keep alive");
                sleep(50);
        }
        close(fd);
        return ret;
}
```

Appendix B: How to flash the image to eMMC

(For advanced users only) This is **just an example (form SMARC eval kit) i**f users have the ability to customize the system in the SD card. Users can flash the current SD image system (standard or customized by user) to eMMC by using the following method.

Use “fdisk -l” command to check current storage devices, current boot device is represented as /dev/mmcblk1, SMARC module’s eMMC device is /dev/mmcblk0

```
#sudo fdisk –l
```

Flash Module eMMC:

```
# cd flash_emmc/rp100_emmc
# ./fsl-sdcard-partition.sh –f /dev/mmcblk0
```

Remember to remove the special dongle, then, you can boot from eMMC (the IB102 default status) with the above concept.

Appendix C – ADB configuration (For Android only)

Update the ADB configuration to scan for the new vendor ID. Below are the steps to update the ADB configuration for Windows PC. These steps (and the steps for Linux PC as well) can also be found in the R10,3.x user guide.

1. Run the SDK's tools to generate an ADB configure file:

```
C:\Program Files\Android\android-sdk\tools> android.bat update adb
```

2. Modify the adb usb configure file to add the new vendor id 0x18d1.

File: X:\Profile\<your account>\.android\adb_usb.ini

```
# ANDROID 3RD PARTY USB VENDOR ID LIST -- DO NOT EDIT.
# USE 'android update adb' TO GENERATE.
# 1 USB VENDOR ID PER LINE.
0x15a2
0x18d1
```

3. Unpack the Freescale Android USB win driver "android_usb_fsl.zip" in your Android BSP release package. If you can't find this file in your current package, please get the R10.3.x release for i.MX5x and unpack it.

4. File "tetherxp.inf" in the unpacked "android_usb_fsl" may not be the updated one if the "android_usb_fsl.zip" is extracted from an old release. So, please overwrite the file "tetherxp.inf" in unpacked "android_usb_fsl.zip" by the new "tetherxp.inf" in your current Android BSP release.

5. Enable the "USB debugging" option on the i.MX6 device

System settings -> Developer options -> USB debugging

6. Connect the Android Device into PC, uninstall your old driver named "Android Phone" in the device manager, then re-install driver by scanning and locating .inf file under the directory you unpack the android_usb_fsl.zip manually.

7. Restart the ADB server

```
C:\Program Files\Android\android-sdk\platform-tools> adb kill-server
C:\Program Files\Android\android-sdk\platform-tools> adb start-server
```

8. Finally, test your ADB connection

```
C:\Program Files\Android\android-sdk\platform-tools> adb devices
List of devices attached
0123456789ABCDEF     device
```

Appendix D –Useful links

For more information about Android, please visit:
http://developer.android.com/index.html

For more information Freescale i.MX6 CPU , please visit:
http://www.freescale.com/webapp/sps/site/homepage.jsp?code=IMX_HOME