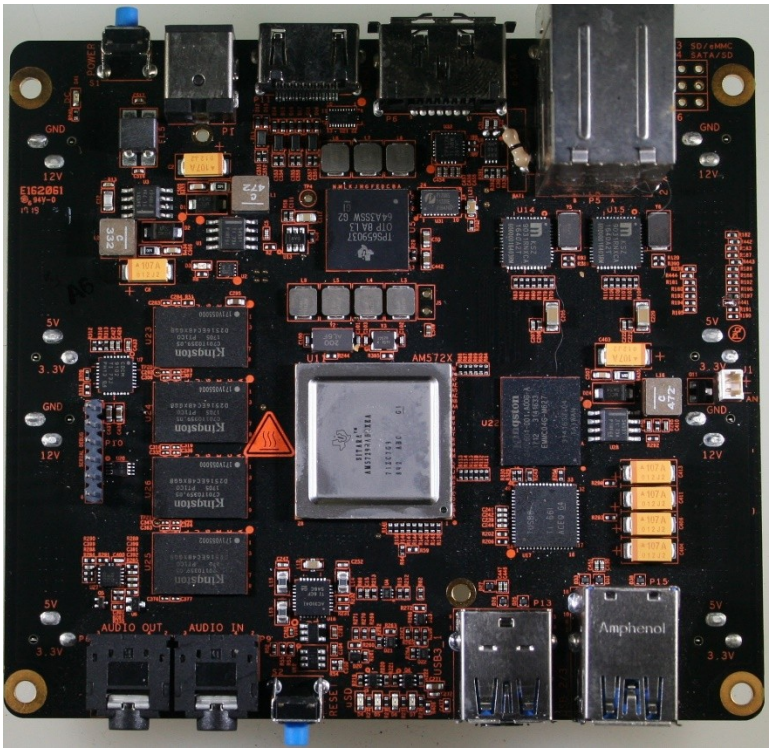
beagleboard.org®



BEAGLEBOARD-X15 REV C

Quick Start Guide

Rev 0.1

July 2017

CONTENTS

BEAGLEBOARD-X15 QUICK START GUIDE

TABLE OF FIGURES

WHAT'S THE IN THE BOX

In the box you will find an X15 board inside an ESD bag.

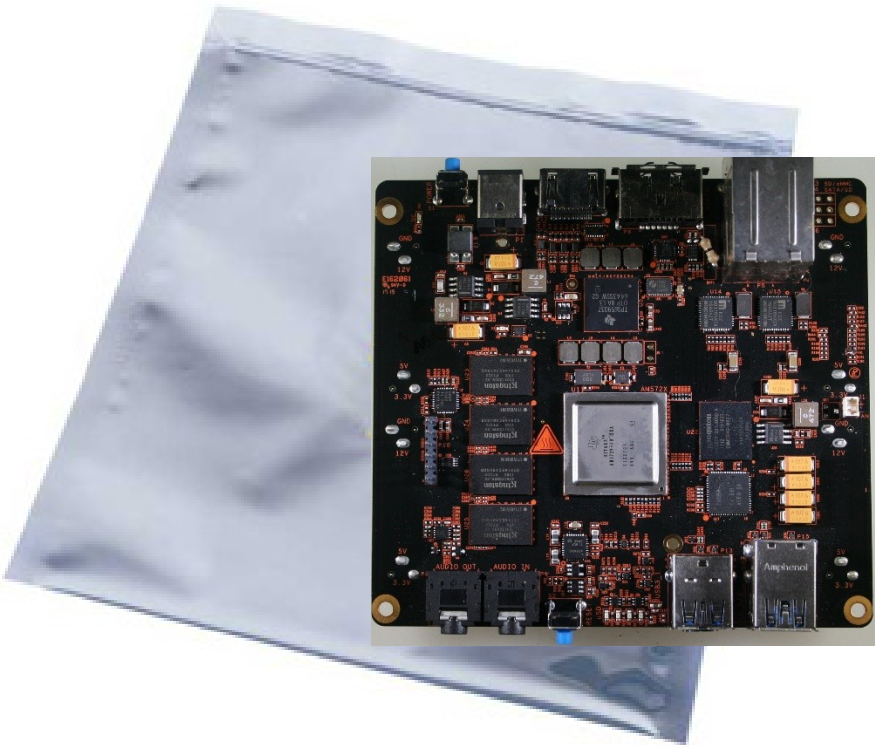


Figure 1 – X15 Box Contents

TOP EDGE AND BOTTOM SIDE

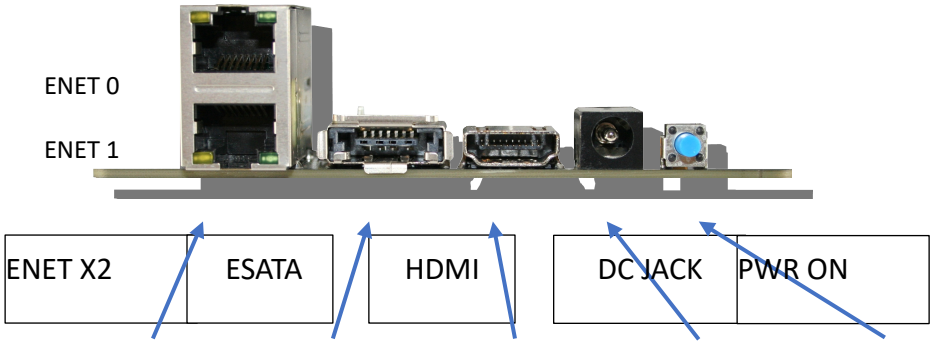


Figure 1 – BEAGLEBOARD-X15 Side View of Top Edge

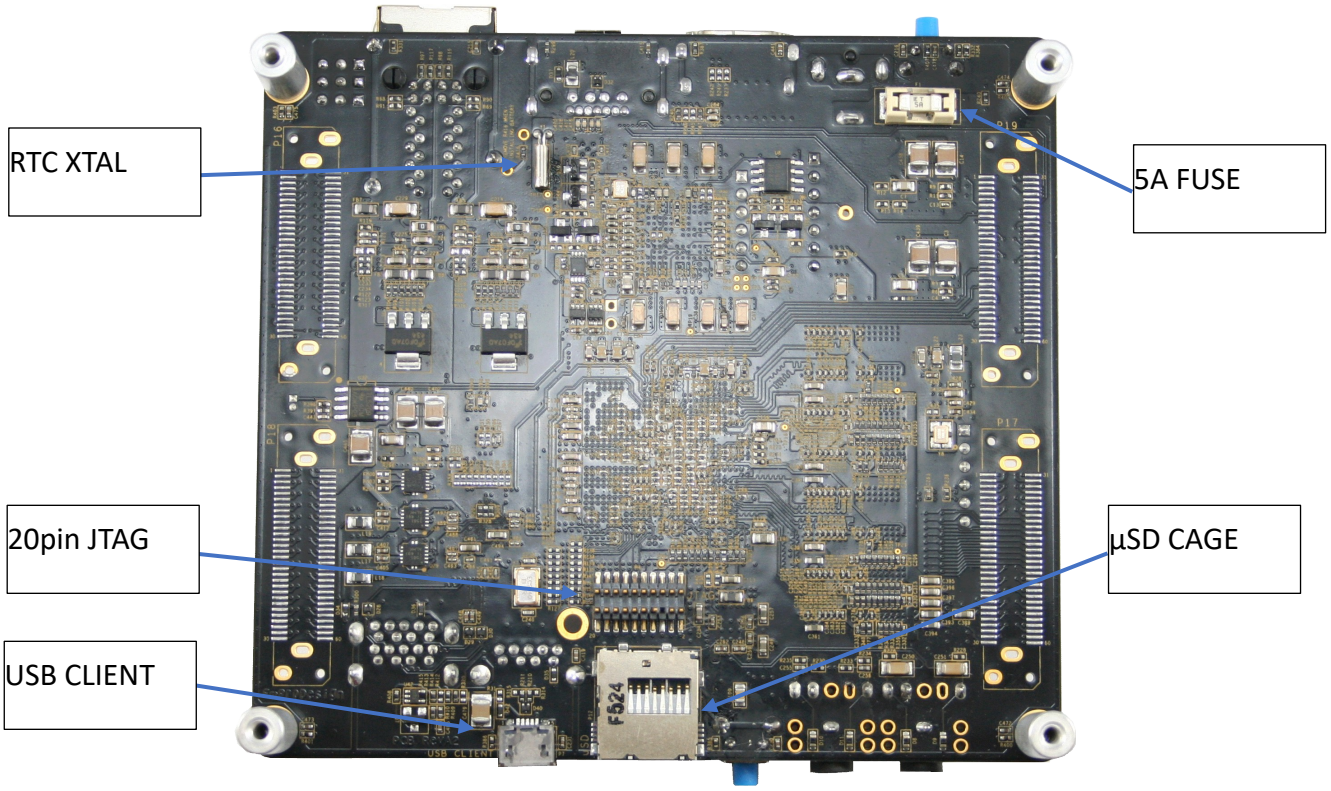


Figure 2 – Bottom side of BEAGLEBOARD-X15

TOP SIDE AND BOTTOM EDGE

Figure 5 shows the edge connectors and the on-board headers and optional devices

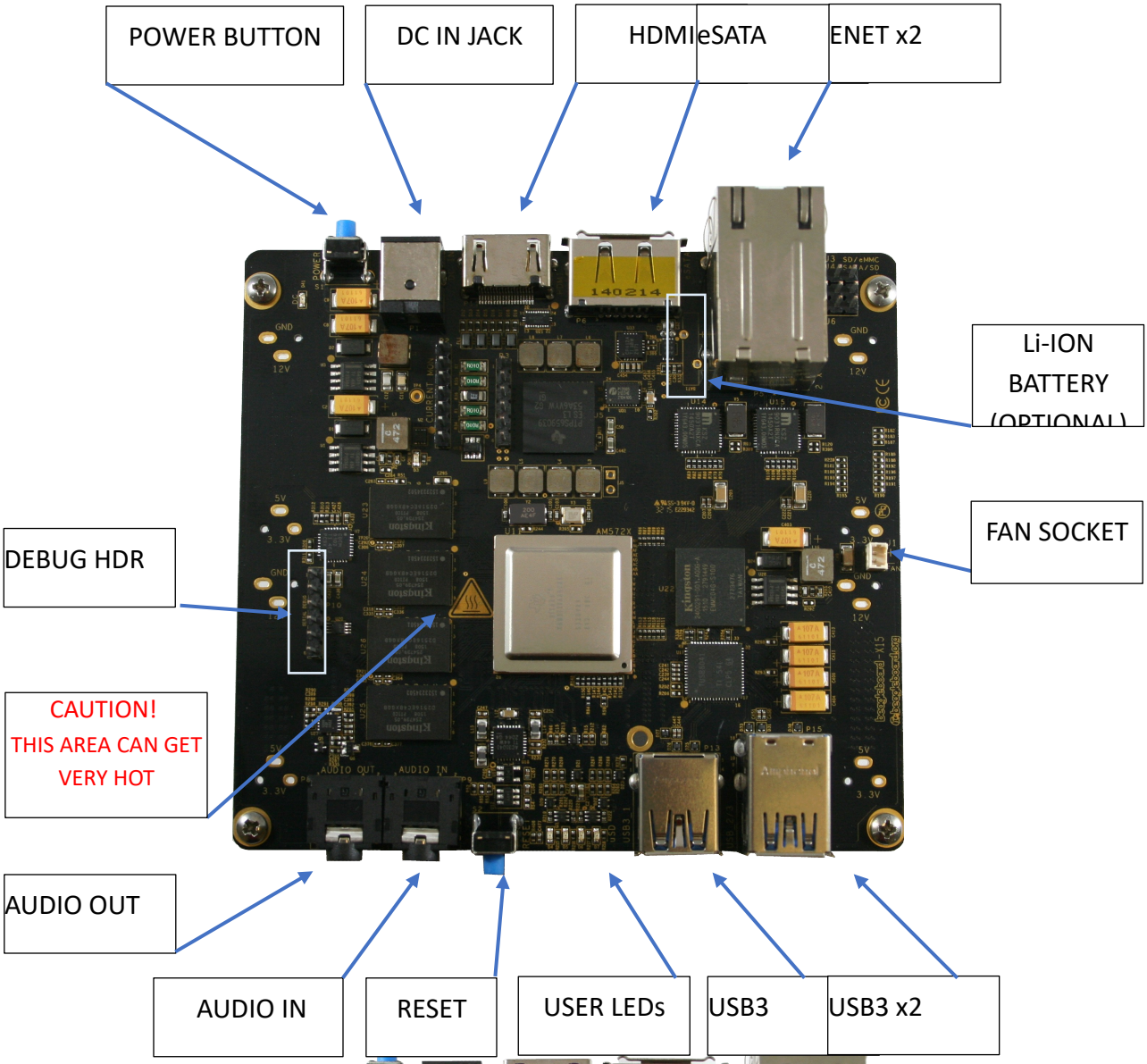


Figure 3 – TOP Side of BEAGLEBOARD-X15 Major Interfaces

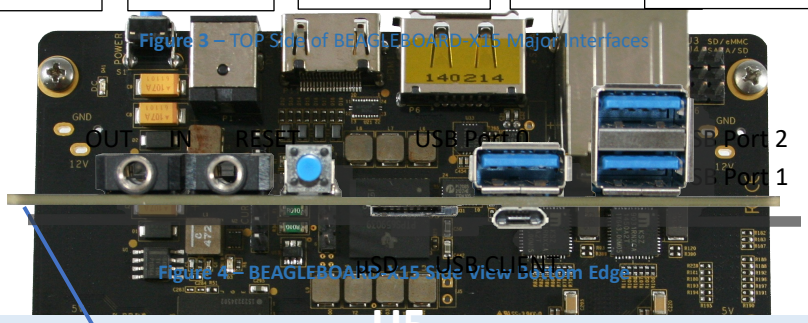


Figure 4 – BEAGLEBOARD-X15 Side View Bottom Edge

MAJOR COMPONENTS

Figure 5 shows the major IC and components on the BEAGLEBOARD-X15.

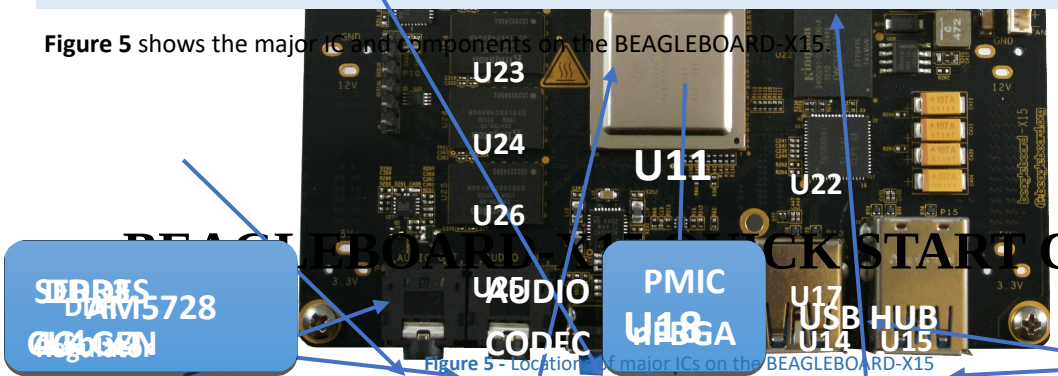


Figure 5 - Location of major ICs on the BEAGLEBOARD-X15

CHECK IT OUT

WHAT YOU WILL NEED

shows the accessories needed to test all BEAGLEBOARD-X15 peripherals. Some of these items may purchased if the user does not already own them. For power supply and serial cables please observe irements when purchasing. The power jack on the BEAGLEBOARD-X15 accepts a 2.5mm barr differentiate it from other board supplies.

Table 1 – LIST OF NEEDED ACCESSORIES

SUPPLY V Supply W (5A min) • 2.5mm x 5.5mm Barrel Plug Size • Option 1: TRG70A120 • Option 2: VEF65US12 • Option 3: CENB1060A1203F01 • Option 4: TRG70A120-02E01 • Option 5: PSAC60M-120 (needs adapter below)	
2.5mm ADAPTER • Needed only for 12V supplie mm plug • Can be purchased online • One such source: http://www.newark.com/multicomp/c4074/2-5mm-dc-socket-to-2-1mm-dc-plug/dp/71T9782	
TTL TO USB SERIAL CABLE • 3.3V USB to SERIAL • Can be purchased from various sources • One such cable can be purchased here: http://www.digikey.com/product-detail/en/TTL-232R-3V3/768-1015-ND/1836393	
HDMI AUDIO-VIDEO CABLE • Off the shelf quality Cable • HDMI-A Male to HDMI-A Male • Preferably 3ft or longer	

ETHERNET CABLE • Two cables needed if both interfaces used • Use Cat5e cables • ENET PHYs have Auto MDI/MDI-x • Crossover or straight cables can be used	
AUDIO CABLE • 3.5mm jacks on both ends • Need two if Speakers do not come with one	
SPEAKERS • Any desktop speaker system • With 3.5mm cable	
HDMI MONITOR • HD monitor capable of 1080P • With integrated audio • Or Output jack for Audio	
MICRO SD CARD • 4GB to 16GB • Class 10 • Standard Adapter	
eSATA ADAPTER CABLE • eSATA to SATA cable • Combo cable	
SATA DRIVE • SATA HDD - Hard Disk Drive • SATA SSD - Solid State Drive	

USB THUMB DRIVE • USB3.0 thumb drive • Needed for file storage • Or to boot from USB3	
WIRELESS KEYBOARD/MOUSE • Wireless combo will save USB ports used • Less wire clutter	

Besides the accessories mentioned it is assumed the user has a PC or Laptop running Linux or Windows.

SETUP INSTRUCTIONS

Standalone w/Display and Keyboard/Mouse

In this configuration, the board works more like a PC, totally free from any connection to a PC as shown in **Figure 8**. It allows you to create your code to make the board do whatever you need it to do. It will however require certain common PC accessories. These accessories and instructions are described in the following section

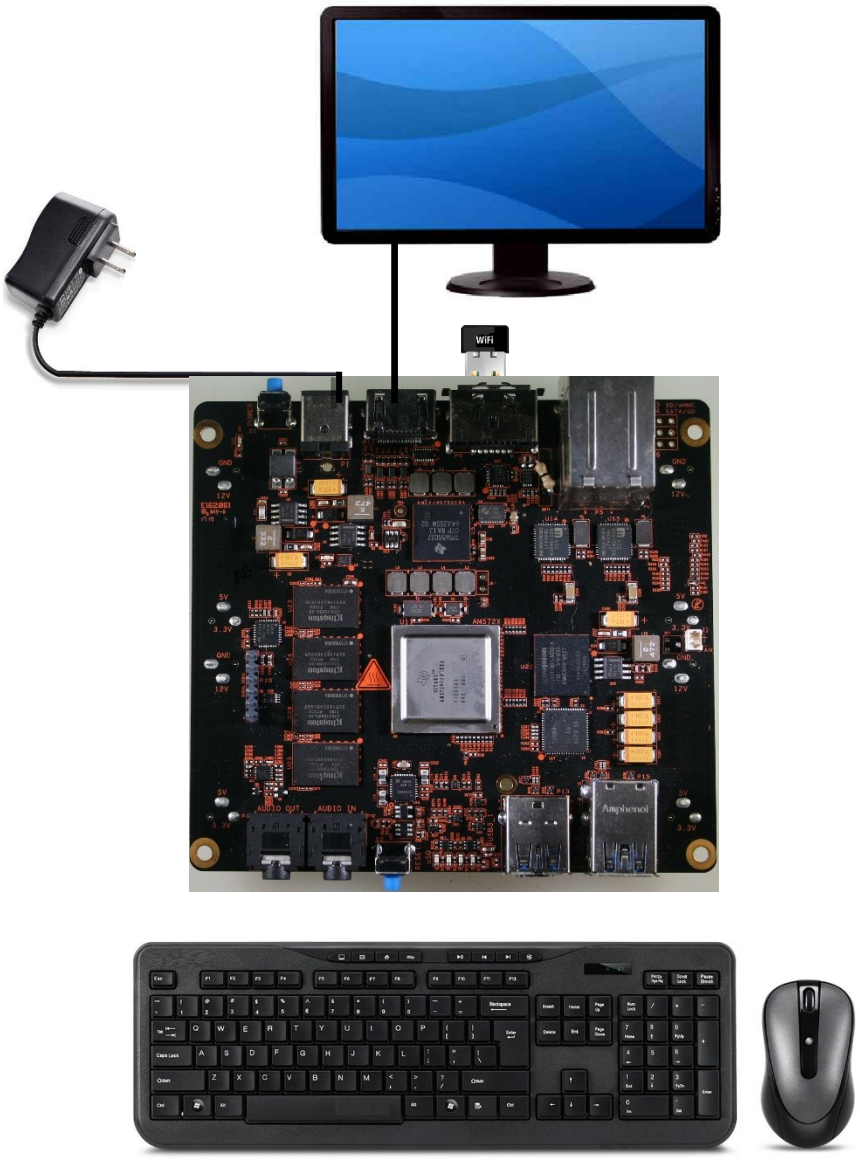


Figure 6 - Desktop Configuration

Additionally an Ethernet cable can be connected for network access.

PLUG IN YOUR CABLES

ETHERNET

There are two ports on the Ethernet connector on BEAGLEBOARD-X15. Plug cable into either port. Notice the orientation of cable insertion between the two ports in **Figure 9**.

Figure 7 - ETHERNET PORTS

HDMI

Plug in HMDI cable into P11 HDMI connector on the top edge of the BEAGLEBOARD-X15 board.

Figure 8 – HDMI PORT

ESATA

Plug in eSATA cable as shown in Figure 10.

Figure 10 –eSATA PORT

KEYBOARD AND MOUSE

To avoid using up multiple USB ports a Wireless keyboard and mouse combination is preferred. The transceiver can be installed in either USB port including P6 eSATA connector.

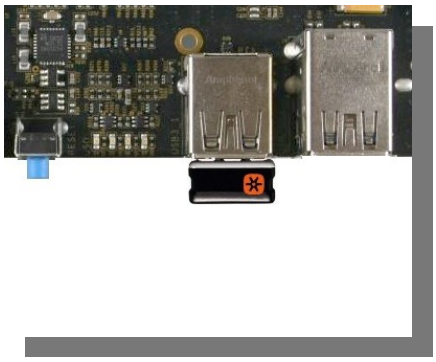


Figure 9 – Keyboard Transmitter

AUDIO

To playback and record audio, insert speaker cable into Audio OUT jack of the BEAGLEBOARD-X15 and an audio source into the Audio IN jack.

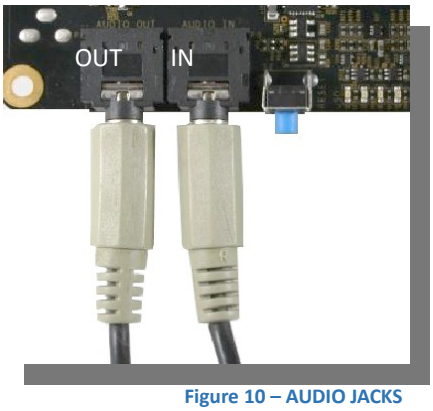


Figure 10 – AUDIO JACKS

MICRO SD CARD

On the bottom edge of the BEAGLEBOARD-X15 board, on the bottom side is the micro SD card cage. I booting from SD card the micro SD card is inserted as shown in Figure 14 with the top side facing up.

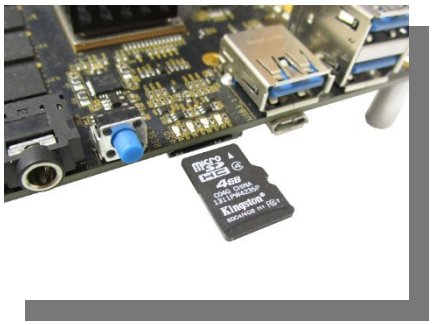


Figure 11 – micro SD CAGE

SERIAL DEBUG

Plug in the USB to Serial cable into the 6 pin header P10. Observe correct orientation. Pin1 is located at the top side of the header.

PIN NUMBER	SIGNAL
1	Ground
4	Receive
5	Transmit

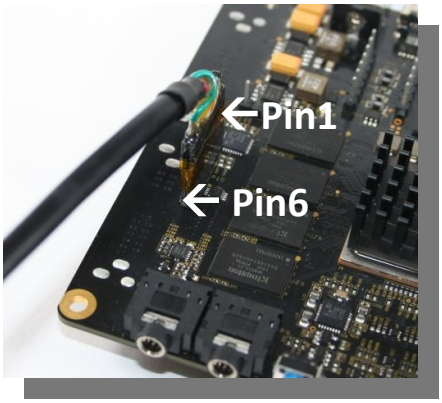


Figure 125 – SERIAL DEBUG PORT

TERMINAL SETUP

Plug the USB end into your PC or Laptop and invoke **MINICOM** or **TERATERM** or your favorite Terminal emulator program. The settings for serial communications are:

Baud rate:	115200
Data:	8 bit
Parity:	none
Stop:	1 bit
Flow control:	none

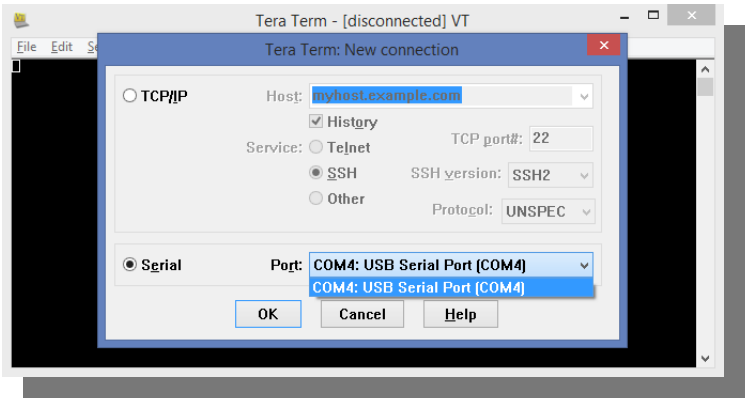


Figure 136 – TERMINAL WINDOW

PLUG IN POWER

Once all the needed cables are inserted, plug in the DC power adapter into the P1 jack. This is a 2.5mm center contact and requires a supply that comes with a 2.5mm jack or an adapter to 2.5mm. See **Table 1** for more info.

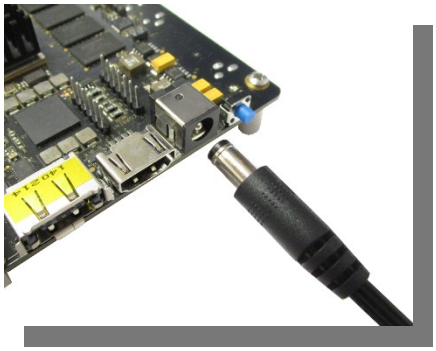


Figure 17 – DC IN JACK P1

POWER LEDS

Once the power plug is inserted in P1, the Power LED D41 will light up.

D41 - 12V
Present LED

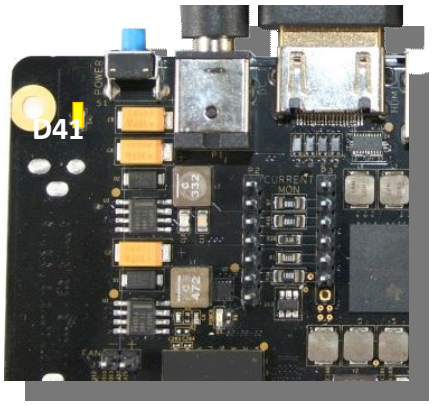


Figure 19 – DC 12V LED

TURN ON HD MONITOR

Once power is connected, turn on HDMI monitor. Change input to the HDMI port the BEAGLEBOARD-X15 is connected to.

Figure 14 – MONITOR POWER BUTTON

TURN ON BEAGLEBOARD-X15 POWER

Though power is plugged in and the terminal is connected there will be no activity observed on the terminal. LED D41 will glow.

D41 - 12V
Present LED

To turn ON the BEAGLEBOARD-X15 main power press the blue momentary switch S1. This will cause LED D3 to glow showing that the board power is ON.

D3 - POWER ON
LED

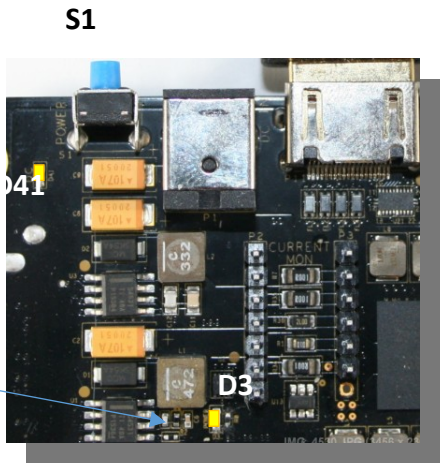


Figure 15 – POWER LEDs

BOOTING

At this point the software present in eMMC will start to boot and activity can be seen on the terminal.

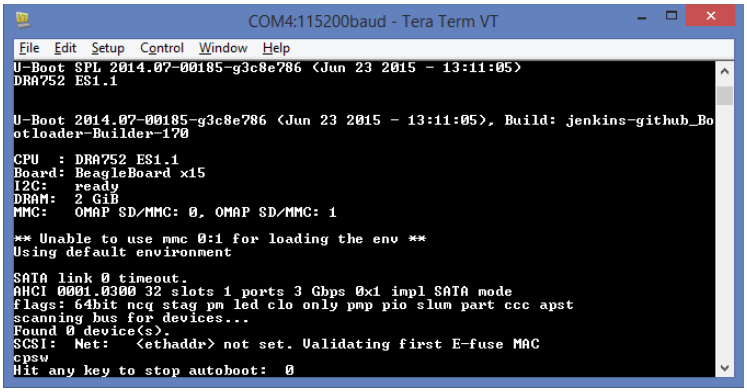


Figure 16 – POWER LEDs

USER LEDS

During the botting process the user may notice that the user LEDs will blink.

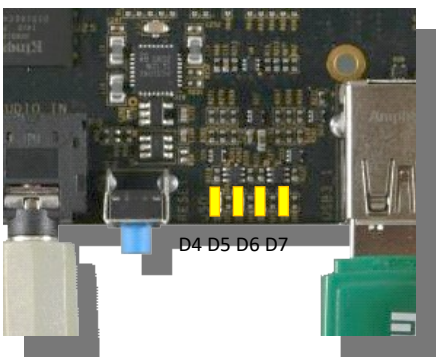


Figure 17 – POWER LEDs

Once the BEAGLEBOARD-X15 interfaces are connected your system is ready to test. The next section will go through what you can test.

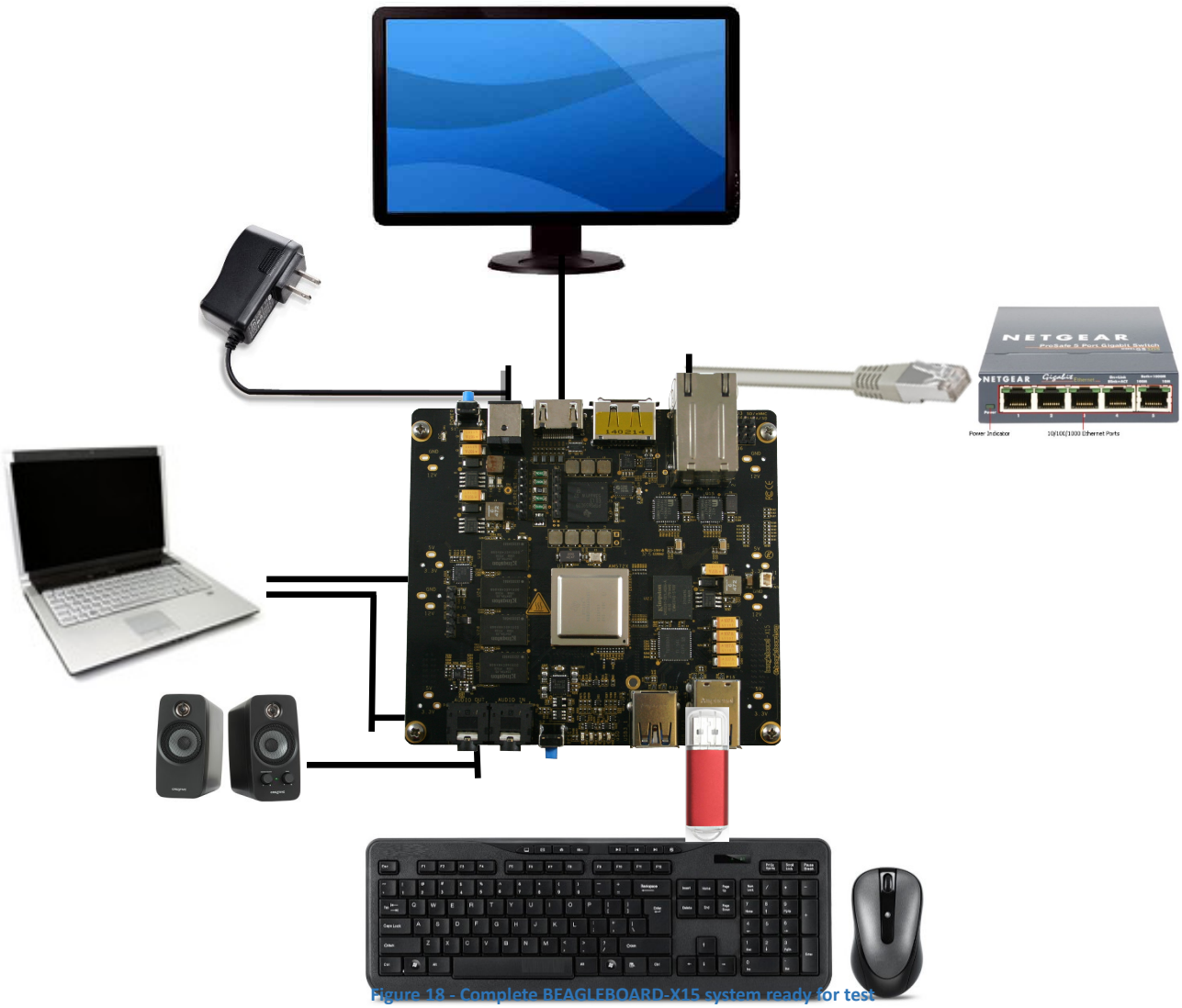


Figure 18 - Complete BEAGLEBOARD-X15 system ready for test

TESTING

DEBUG:

The Serial debug port on the processor is UART3 via a single 1x6 pin header. In order to use the interface a USB to TTL adapter will be required. The header is compatible with the one provided by FTDI and can be purchased from various sources. Signals supported are TX and RX. None of the handshake signals are supported. On the PC you will see activity that will take you to login prompt.

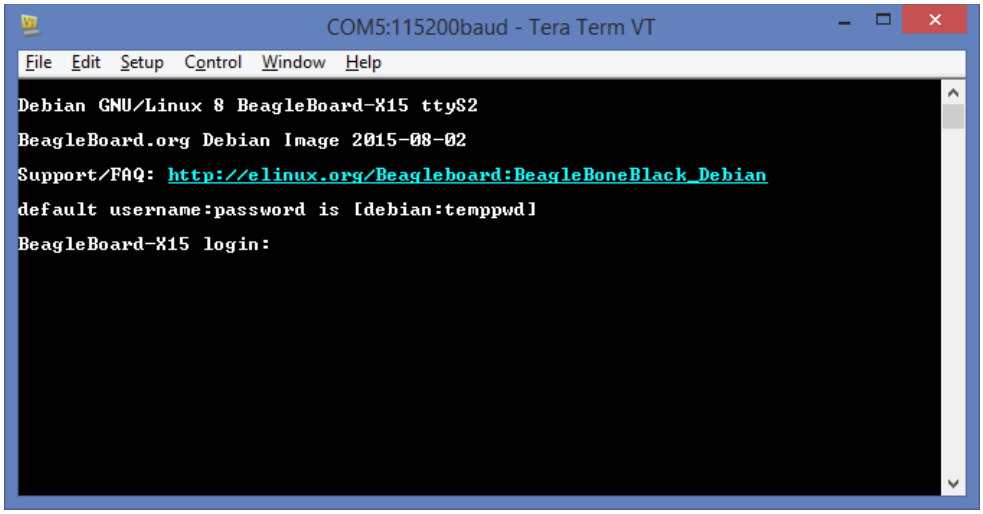


Figure 19 - Terminal activity on the Tera Term

A few seconds after the board power is turned on, the image in eMMC will boot and the Debian desktop will soon show up on the HDMI monitor.

Figure 20 - Debian Desktop

ETHERNET

Assuming the Ethernet cable is connected to one of the ENET ports on the BEAGLEBOARD-X15 a quick test can be performed by pointing the mouse to the bottom left corner of the Desktop and clicking the Debian menu logo. From here point to Internet → Chromium Browser.

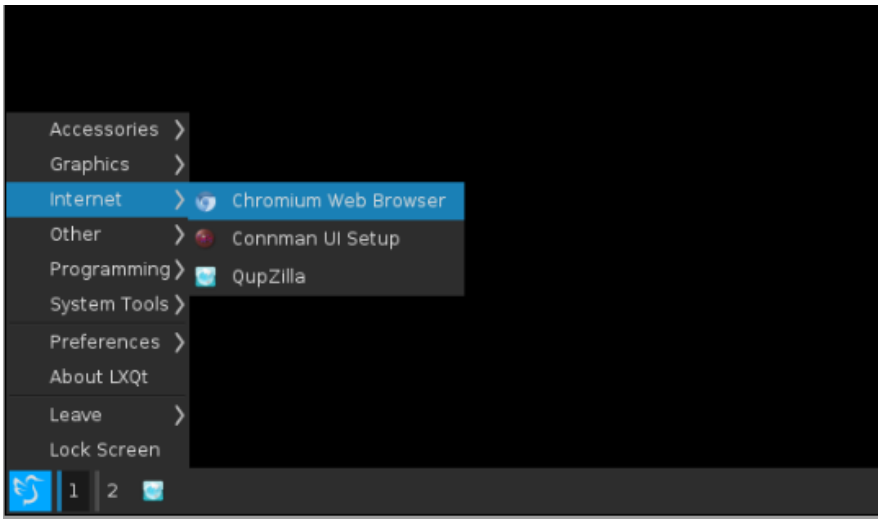


Figure 21 - Open Web Browser

The browser window will open and if there is an internet connection, the browser will go to the homepage.

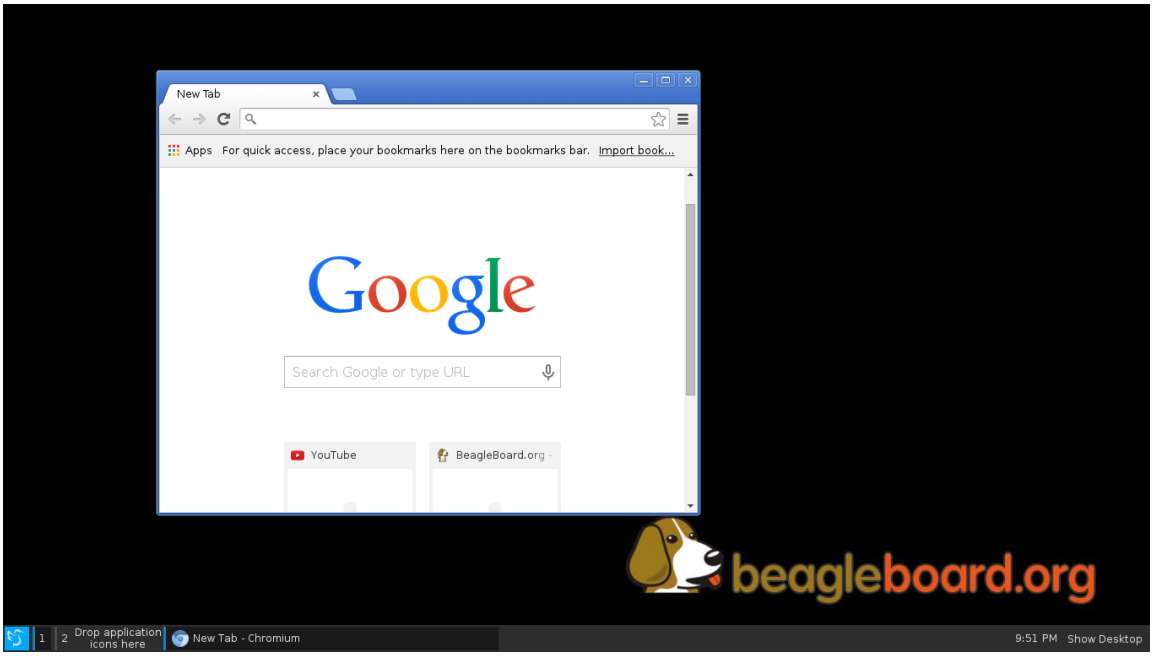


Figure 22 - Browser opens to the home page

The second Ethernet port can be similarly tested by moving the cable from ENET0 to ENET1. See **Figure 1**

To test the sound of your BEAGLEBOARD-X15 you can open a sound file or via file and play it back. In the example below, a simple file is played via the Chromium Web browser. Inserting a USB drive into the USB3.0 ports is one option.

On the Debian Desktop a window will pop-open and ask you if you want to see the contents of the newly installed flash drive. Also on the Tera Term console you can also read the logs associated with the insertion of the drive.

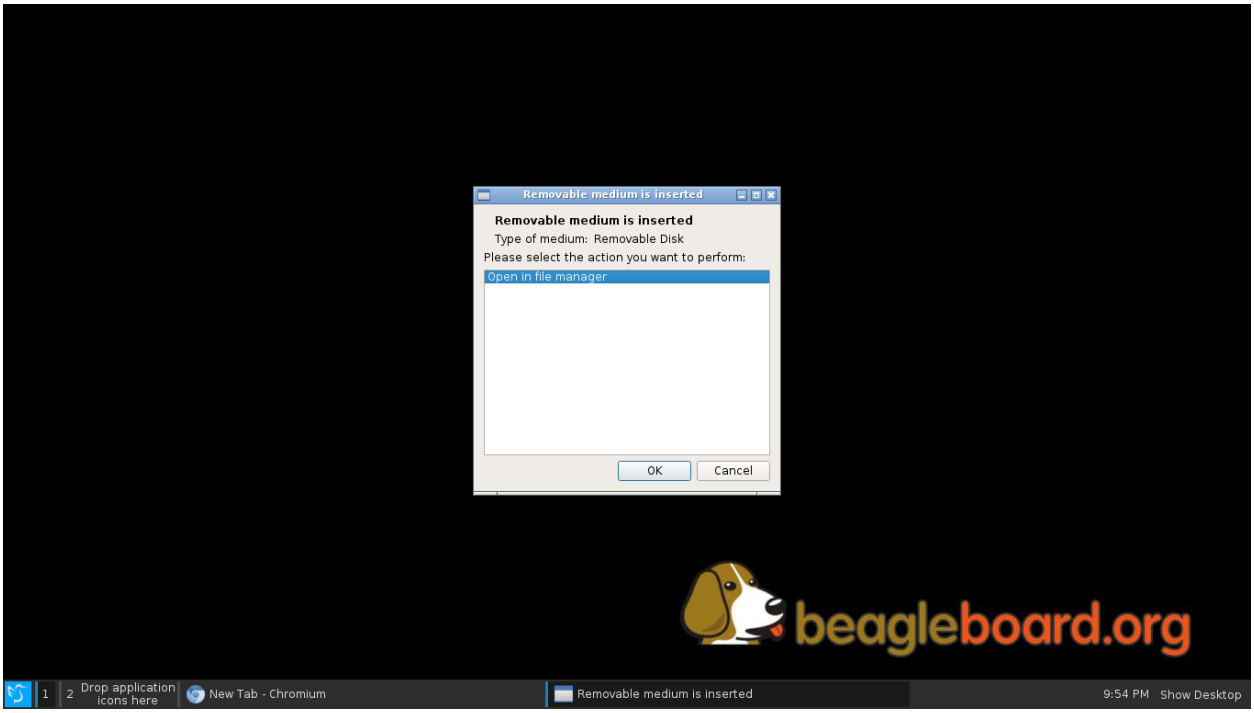


Figure 23 - Media Inserted window

Click 'Open in file Manager' to see the contents of the flash drive. Proceed to open the sound file. In case there is no music player installed yet, open the wav file with Chromium Brower. Then click play.

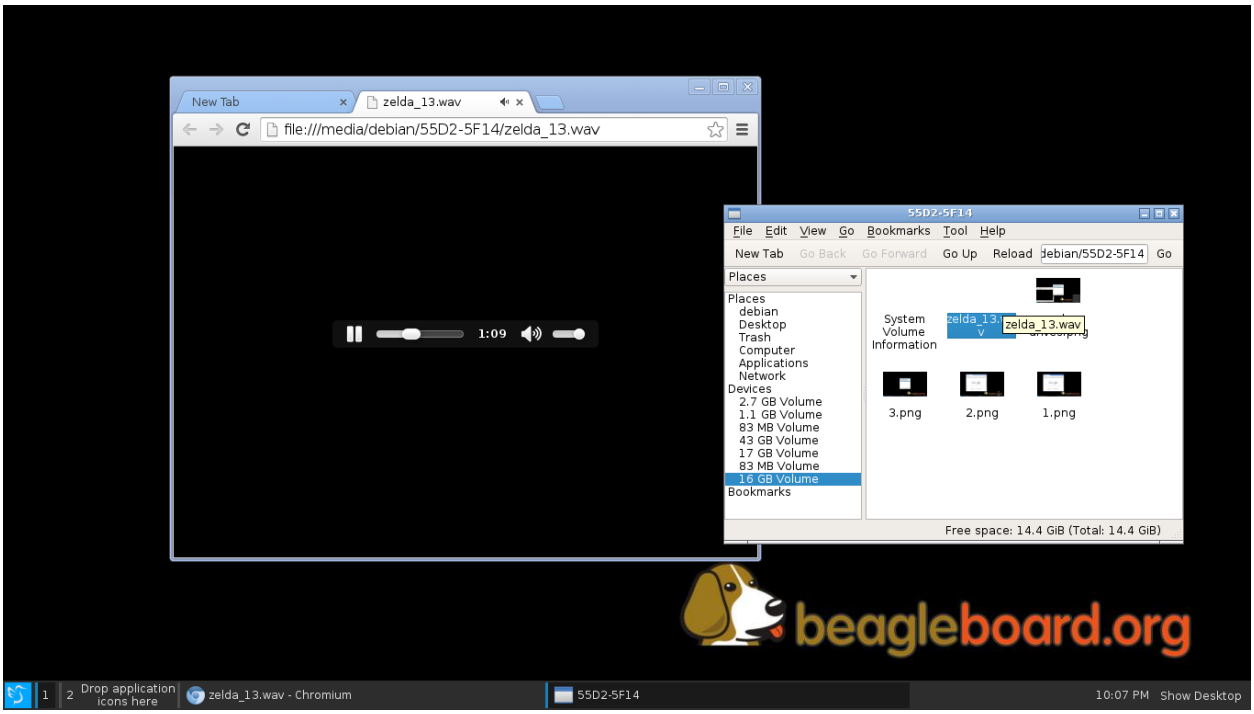


Figure 24 - Open and Play sound file

To adjust volume make sure your speakers are connected and the speaker volume is turned to a nominal volume. The BEAGLEBOARD-X15 volume can be adjusted by clicking on the lower right hand side left of the clock (icon missing in this example) and adjusting the volume lever up and down.

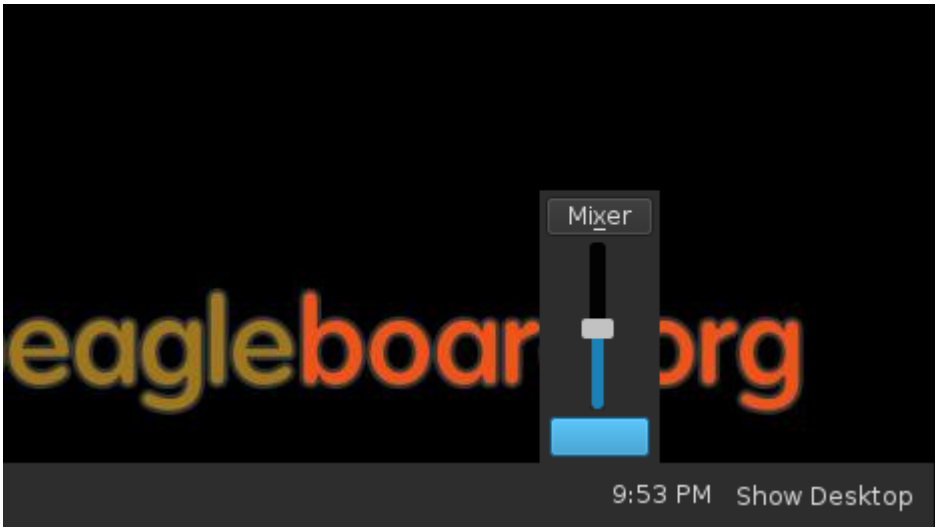


Figure 25 - Debian Volume adjustment

Audio In can be similarly tested by using a 3.5mm to 3.5mm audio cable between a PC playing a sound file and the BEAGLEBOARD-X15 recording it via connector jack P9.

ESATA

To test the eSATA interface you will need a cable and drive as described in **Table 1.** Simply plug in the cable into connector P6 and the drive will be detected. The connector also accepts a USB 2.0 flash drive or other USB 2.0 devices.

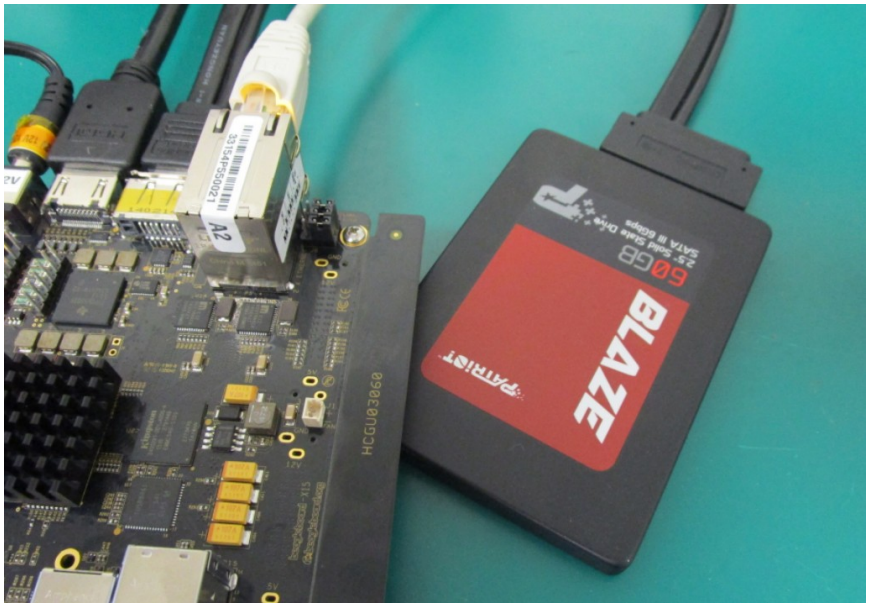


Figure 26 - Plug in eSATA cable and SSD

When plugged in the eSATA or USB will be listed on the Debian Desktop as shown below:

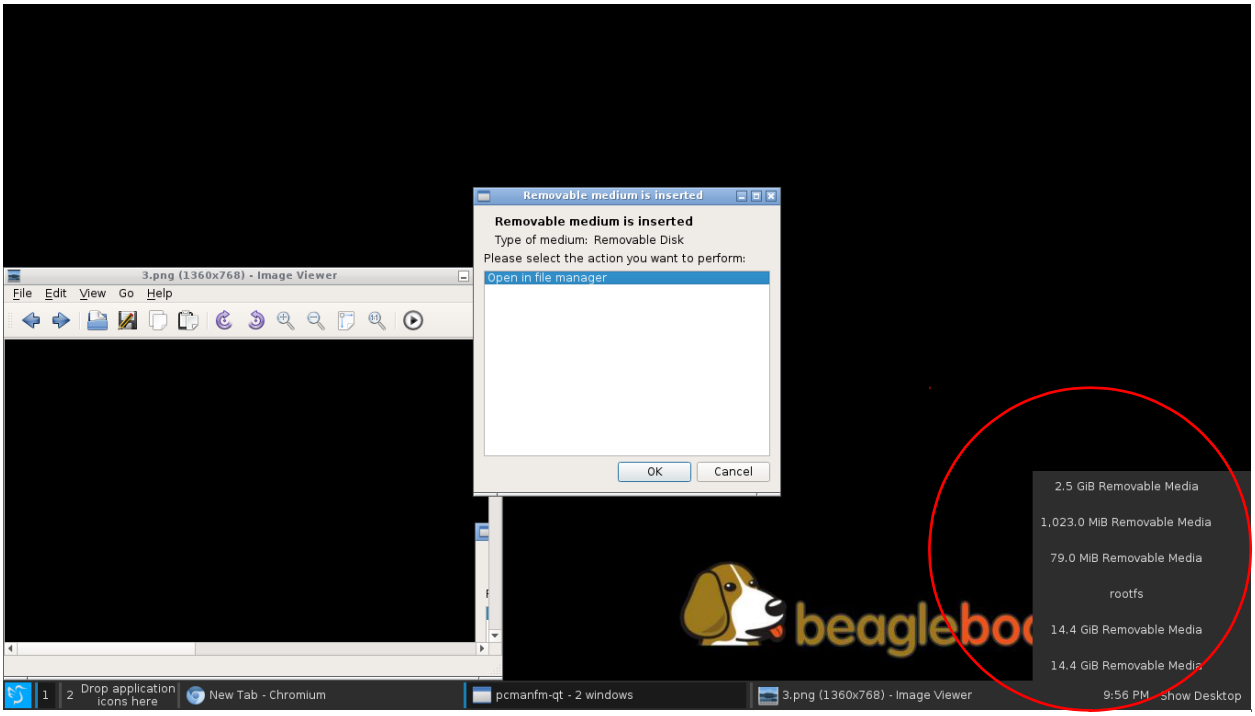


Figure 27 - Attached drives show up in Debian pop-up window

POWER ON AND RESET

To power OFF the board you can Press-and-Hold the power button for 12 seconds.

Another way to power off the board is to use the '**shutdown'** command at the terminal prompt. The board will then start powering off.

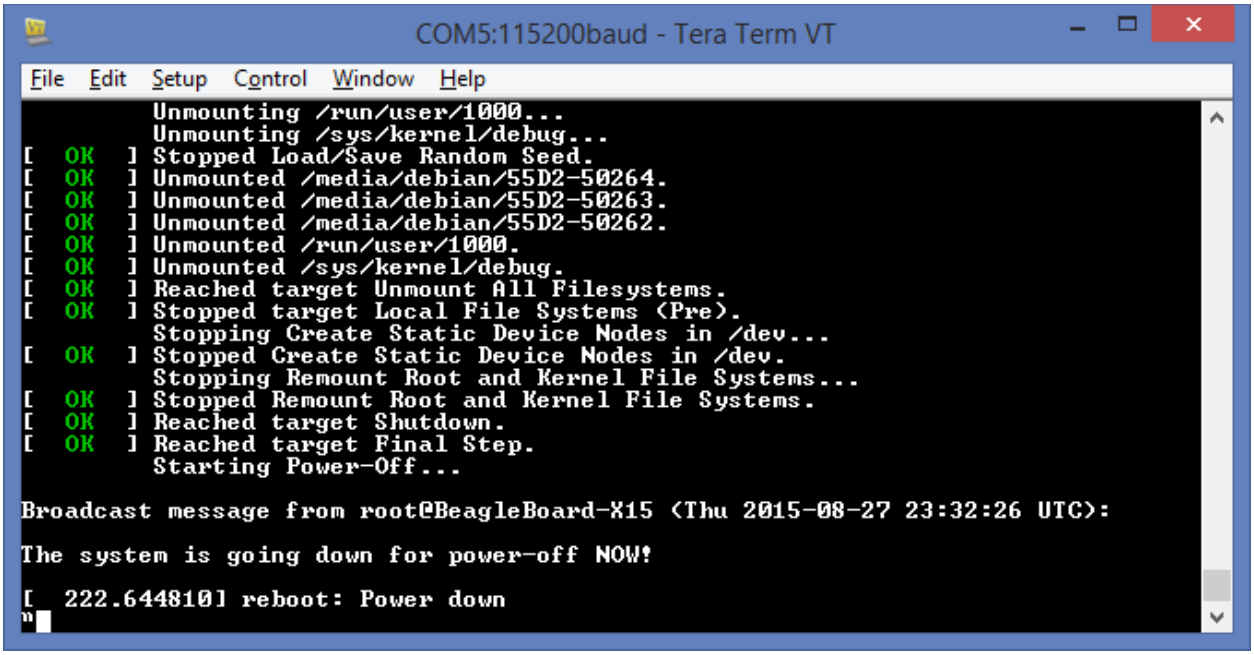


Figure 28 - Powering OFF using the shutdown command

To **RESET** the board you can press the RESET button S2. Pressing once should reboot the board.

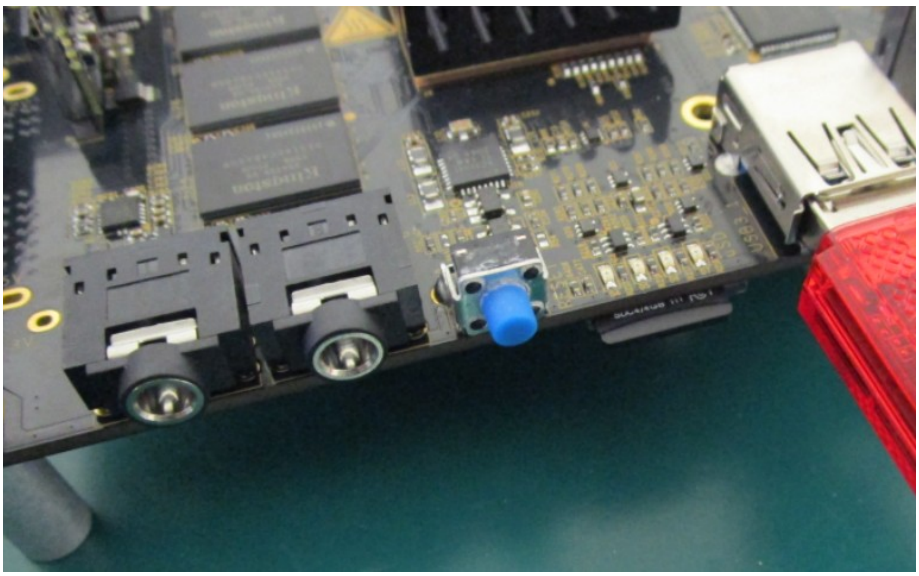
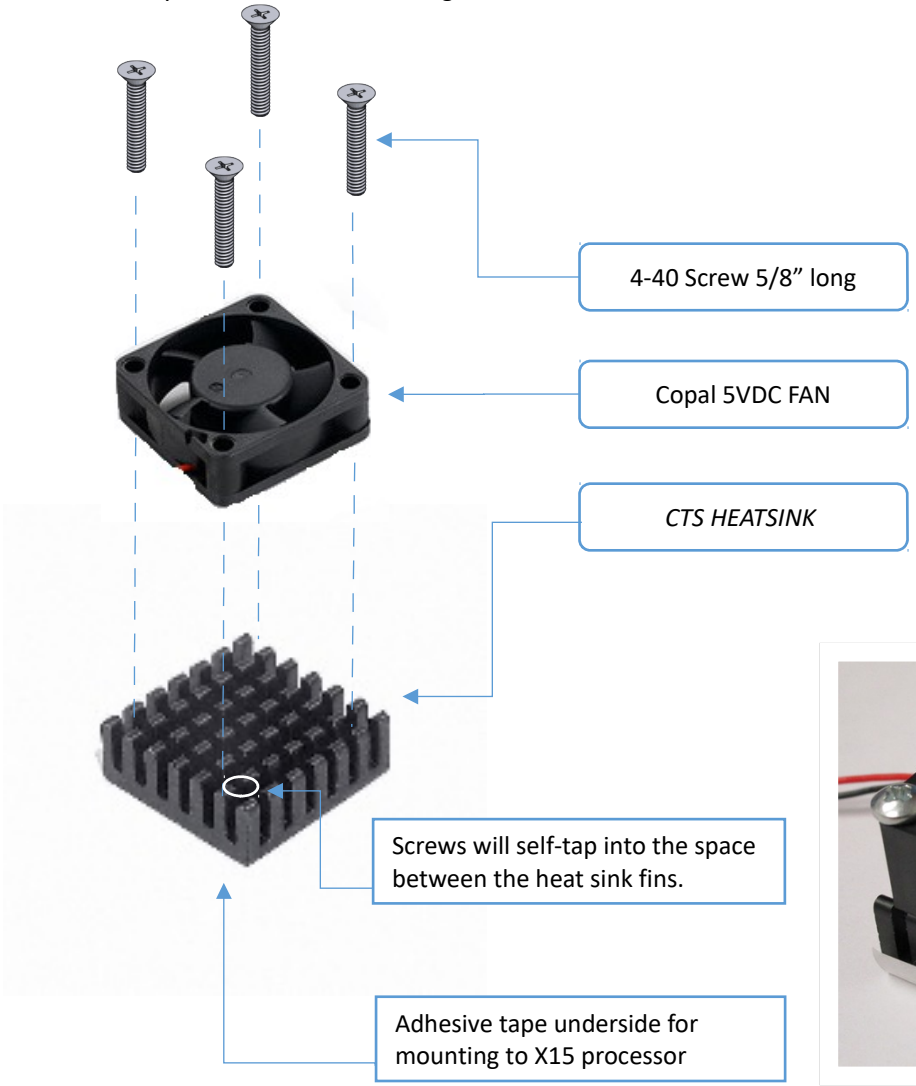


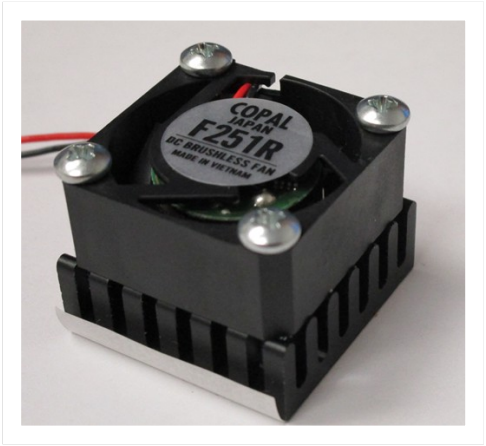
Figure 29 - The RESET Button P2

FAN

The BEAGLEBOARD- X15 is comes does not come with a heatsink or fan installed but they can be added if required. The heatsink can be applied to the processor prior to sticking it onto the processor. The fan will connect to the socket located on the top side of the board, on the left edge as shown in **Figure 36 . NOTE, under some conditions the area close to the processor can get very hot to touch. Observe cautions: SEE Figure 3.**

To install a fan you will need the following additional hardware:





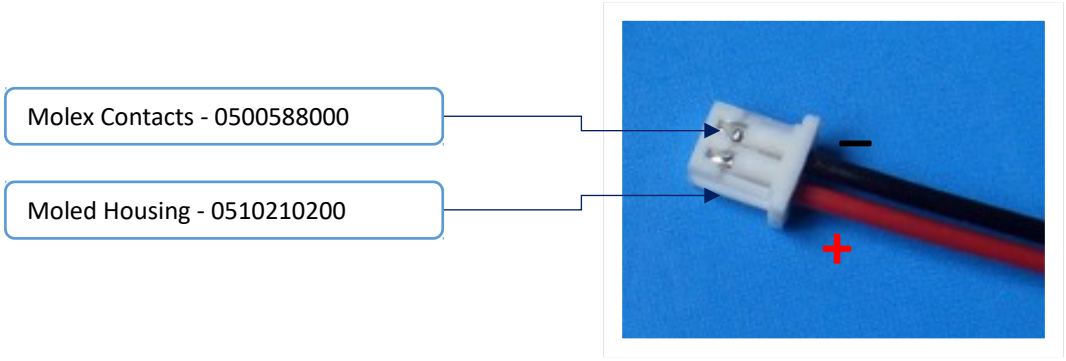


Table 2 shows the parts list for the BEAGLEBOARD-X15 Heatsink and Fan Assembly.

Table 2 – Heatsink and Fan Bill of Materials

1	**1**		**FAN**	**COPAL**	**F251R-05LB**	**FAN AXIAL 25X10MM 5VDC WIRE**
2	**4**		**Machine Screw**	**McMaster**	**96640A059**	**Box of 100 4-40 Flat head Machine screws 5/8" Black**
3	**1**		**Connector Housing**	**MOLEX**	**0510210200**	**CONN HOUSING 2POS 1.25MM NATURAL**
4	**2**		**Contact**	**MOLEX**	**0500588000**	**CONN TERM FEMALE 28-32AWG TIN**
5	**1**		**Heatsink**	**CTS Thermal Management**	**BDN10-3CB/A01**	**HEATSINK w/ADHESIVE CPU1.01" SQUARE**

Figure 6 shows the connection for the fan cable.

Connector Assembly Instructions:

Attention must be paid to the orientation of the crimped contact inside the plastic jacket. Follow insertion direction shown by the picture on the right. **NEG (-)** wire as shown on the previous page.

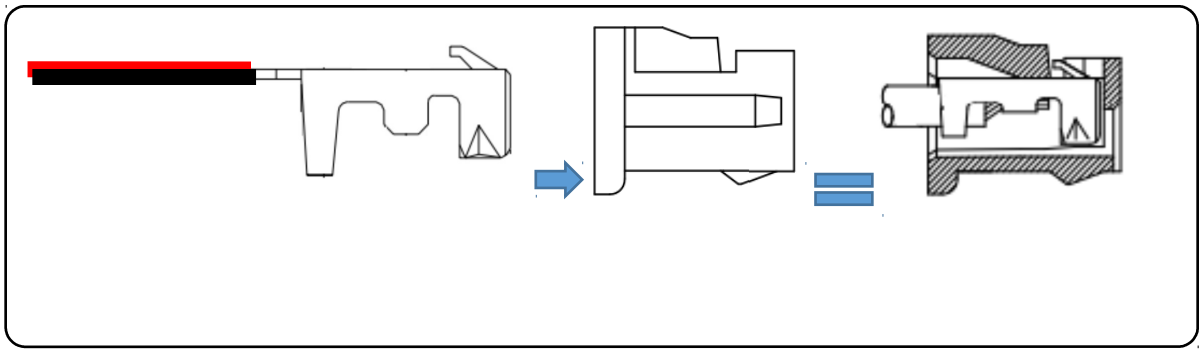


Figure 30 - Polarity details for Fan connector