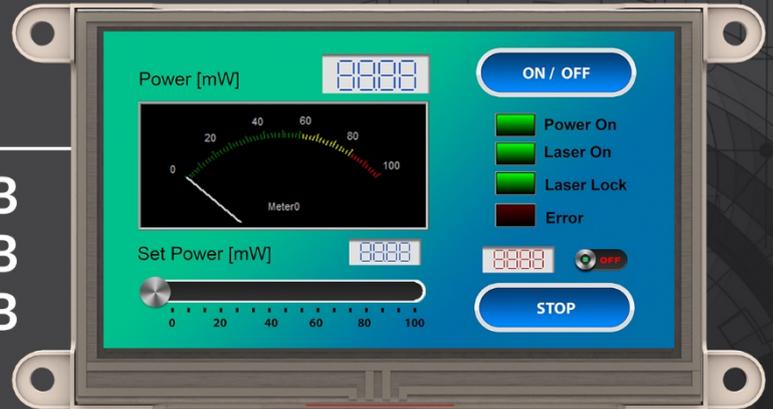


GETTING STARTED MANUAL

GEN4-4DCAPE-43T/CT-CLB
GEN4-4DCAPE-50T/CT-CLB
GEN4-4DCAPE-70T/CT-CLB

gen4 LCD CAPE FOR BEAGLEBONE BLACK



This manual will help you get started using the gen4-4DCAPE-XXT/CT-CLB modules. It also includes a list of essential project examples and application notes.

CONTENTS

03 Introduction

System Requirements

- Hardware Requirements
- Software Requirements

05 How to use the gen4-LCD-CAPE

- Connecting the gen4-LCD-CAPE
- gen4-4DCAPE Troubleshooting

09 Getting Started with a Simple Project

12 Reference Documents

14 Glossary

WHAT'S IN THE BOX



gen4-4DCAPE-
XXT/CT-CLB



gen4-4DCAPE
Adaptor



30-way Flat Flex
Cable (FFC)

Supporting documents, datasheet, CAD step models and application notes are available on the 4D Systems website.

INTRODUCTION

This Getting Started Manual is an introduction to becoming familiar with the gen4-4DCAPE-XXT/CT-CLB. This manual should be treated only as a useful starting point and not as a comprehensive reference document.

In this Getting Started Manual, we will briefly focus on the following topics:

- Hardware Requirements
- Image Flashing
- Getting Started with Simple Projects
- Reference Documents

The gen4-4DCAPE-XXT and gen4-4DCAPE-XXCT-CLB are part of the gen4 series of display capes designed and manufactured by 4D Systems for BeagleBone boards. These capes feature a 4.3", 5.0" and 7.0" colour LCD display powered through a BeagleBone board and come in resistive and capacitive touch variants—gen4-4DCAPE-XXT and gen4-4DCAPE-XXCT-CLB, respectively.

SYSTEM REQUIREMENTS

The following subsections discuss the hardware and software requirements for this manual.

1 Hardware

1.1 Beaglebone Black Board

One of the most important requirements is the BeagleBone Board that will control the Cape. It should be loaded with a system image with desktop for the Cape to start functioning.

1.2 gen4-4DCAPE-XXT/CT-CLB

The gen4-4DCAPE-XXT/CT-CLB and its accessories should be included in the box delivered to you after your purchase from our website or through one of our distributors. Please refer to the section "What's in the box" for images of the display module and its accessories.

1.3 gen4-4DCAPE Adaptor

The adaptor included is needed to connect the BeagleBone board and the gen4-4DCAPE. It is a module stacked into the BeagleBone board.

1.4 30-way Flat Flex Cable (FFC)

The Flat Flex cable is connected to the gen4-4DCAPE Adaptor to connect it to the gen4-4DCAPE Display.

1.5 5V DC Supply

To know the specifications needed for the power supply, please refer to the gen4-4DCAPE Datasheet.

CONNECTING THE DISPLAY MODULE TO THE PC

The gen4-LCD-CAPE is designed to work with the Debian Operating System supplied for the BeagleBone Black. It could however be adapted to work on other distributions by the user.

Hardware

Software



gen4-4DCAPE
Display



gen4-4DCAPE
Adapter



30-way Flat Flex
Cable (FFC)



Latest BBB Image



BeagleBone Black
(BBB)
With suitable
distribution loaded



5V DC Supply
Suitable for the
BeagleBone Black
(using DC Jack),
recommended 2A
@5V



Stylus
Recommended for
accurate touch,
however is not
required

HOW TO USE THE GEN4 LCD CAPE

Connecting the gen4-LCD-CAPE

1. Connect the gen4-4DCAPE Adaptor to the BeagleBone Black while the BeagleBone Black is not powered.



2. Connect the 30-way FFC cable to the gen4-4DCAPE Adaptor, and to the gen4-4DCAPE Display. The 30-way FFC connectors are 'Upper Contact' meaning the blue stiffener on the FFC cable should be against the PCB, with the metal pads on the cable facing upward.



3. If using with other capes on your BBB, ensure the gen4-4DCAPE is not conflicting pin wise to any other cape installed (Pins reserved for the gen4-4DCAPE is indicated by the white dash beside the header pins)
4. Ensure the EEPROM ID switch on the gen4-4DCAPE Display is set to a different EEPROM ID to any other capes.
5. Ensure your BeagleBone Black is loaded with a suitable Linux distribution which is compatible with 4D Systems' gen4-4DCAPEs. Debian is the distribution shipping with current BBB boards now, and can be installed onto older BBB's. If the distribution you wish to use is not supporting 4D Systems' gen4-4DCAPEs by default, the supplied source files can be used, please refer to our Product Page.
6. Connect a 5V Supply to the DC Jack of the BeagleBone Black. It is recommended to use a 2A supply to ensure sufficient supply. By default, the gen4-4DCAPE requires power via the DC Jack, as the on-board power management of the BBB may not be able to supply the required power. So, the USB jack will not supply power to the gen4-4DCAPE unless the Solder Bridge jumper on the top of the gen4-4DCAPE Adaptor board, is cut and resoldered. (Discussed further in the gen4-4DCAPE Datasheet.)



7. Once power is connected, something should be displayed on the gen4-4DCAPE a few moments after it has started to boot. Each distribution will behave differently and might require different input from the User (It is recommended to have a keyboard attached while setting the system up, as login details etc. may be required). Some distributions may prompt for LCD calibration during the first boot, while others may prompt for Username/Password.



gen4-4DCAPE Troubleshooting

For older versions of the BeagleBone Boards, the eMMCs of these boards might have an outdated version of the U-boot which will not load with the gen4-4DCAPE properly.

To know the bootloader version and if it is applicable to be used with the gen4-4DCAPE, run the following code:

```
$ sudo /opt/scripts/tools/version.sh | grep bootloader
```

Check the versions of “microSD” and “eMMC”. To work properly, the “microSD” version must be *older* than the “eMMC” version and it must be greater than 2018.03.

To fix this, remove the version of U-boot from the eMMC. An example is clearing the 10Mb of the drive:

```
$ sudo dd if=/dev/zero of=/dev/mmcblk1 bs=1M count=10
```

Changing the Screen Orientation

The Screen Orientation of the display can be changed. To implement this, there are two things that need to be changed:

1. Rotate Screen Orientation

Run the command: `sudo nano /etc/X11/xorg.conf`
Find the "Device Section" with "Builtin Default fbdev Device 0" identifier as below and add the text in red in the section.

```
Section "Device"  
    Identifier "Builtin Default fbdev Device 0"  
    Driver "fbdev"  
    Option "Rotate" "CCW"  
EndSection
```

2. Rotate and set the touch coordinates

Run the command: `sudo nano /usr/share/X11/xorg.conf.d/40-libinput.conf`

Find the "InputClass" section with "libinput touchscreen catchall" identifier as below and add the text in red in the section.

```
Section "InputClass"  
    Identifier "libinput touchscreen catchall"  
    MatchIsTouchscreen "on"  
    MatchDevicePath "/dev/input/event*"  
    Driver "libinput"  
    Option "TransformationMatrix" "0 -1 1 1 0 0 0 0 1"  
EndSection
```

Save the files and reboot. The screen should already be in portrait mode after rebooting.

GETTING STARTED WITH A SIMPLE PROJECT

After connecting the display and flashing the image, you can now start doing projects. This project simply shows a message box on the gen4-4DCAPE that says “Hello World”.

Part 1: Scripting

Step 1: Update the Python version

This project uses Python 3.5.3. To know the version of your python3, you can use

```
$ python3 --version
```

You can update your python3 version by using the command

```
$ sudo apt-get update
```

```
$ sudo apt-get install python3
```

Step 2: Install PyQt

PyQt is one of the most popular Python bindings. This project uses the PyQt binding for displaying the output.

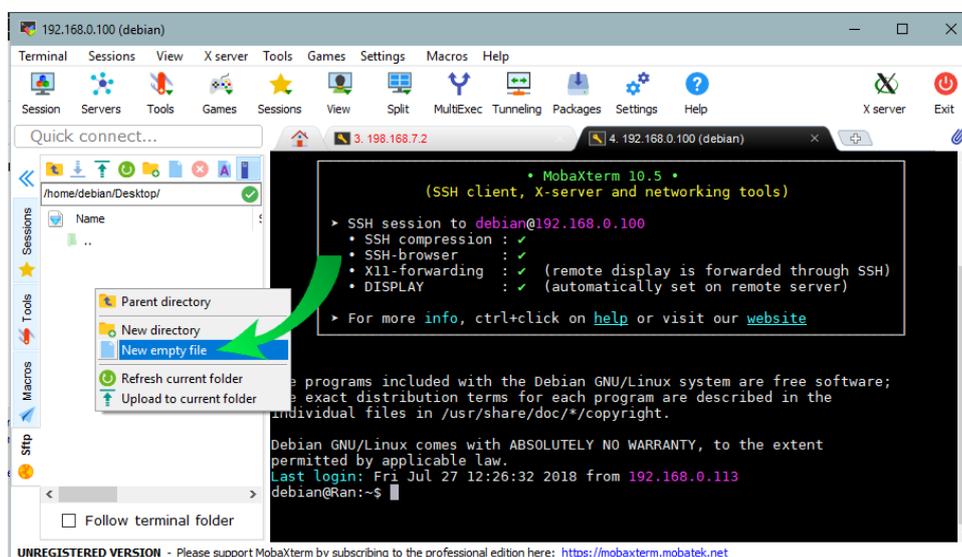
To install PyQt, run the following command:

```
$ sudo apt-get install python3-pyqt4
```

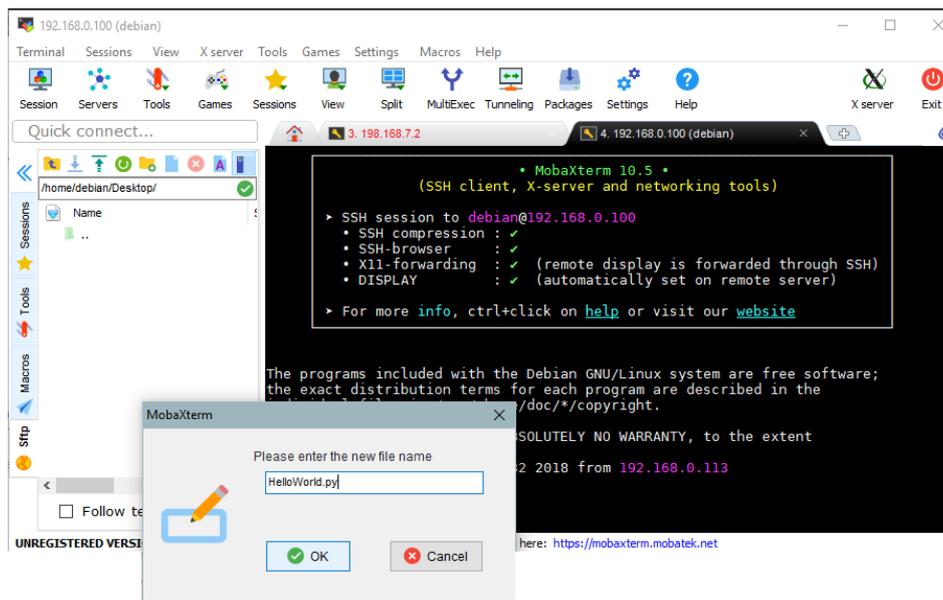
Step 3: Connect to SSH

You can operate your BeagleBone device from a remote terminal using many means. This example shows how to do it using SSH.

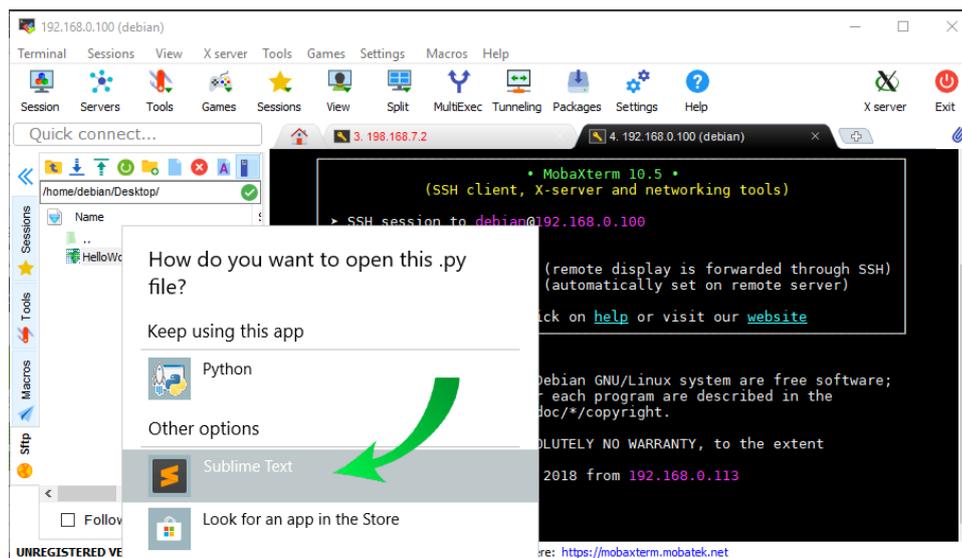
1. Login using your SSH. This appnote uses MobaXterm tool to connect through SSH.



2. Go to Desktop and create a new file "HelloWorld.py".



3. Open using *Sublime Text* or any other editor you have installed in you computer.



4. Paste the script below and Save:

```
import sys
from PyQt4 import QtGui
def window():
    app = QtGui.QApplication(sys.argv)
    widget = QtGui.QWidget()
    label = QtGui.QLabel(widget)
    label.setText("Hello World!")
    widget.setWindowTitle("PyQt")
    widget.show()
    sys.exit(app.exec_())
if __name__ == '__main__':
    window()
```

Part 2: Running the Project

Option 1: Run the Python Script Using the BeagleBone Terminal

To run the python script using the gen4-4DCAPE Display, navigate to where the python script is saved then run the command:

```
$ python3 HelloWorld.py
```

Option 2: Run the Python Script Using SSH

Navigate to the script's directory (in this case, Desktop).

This is optional but you can test your script in your remote terminal by running,

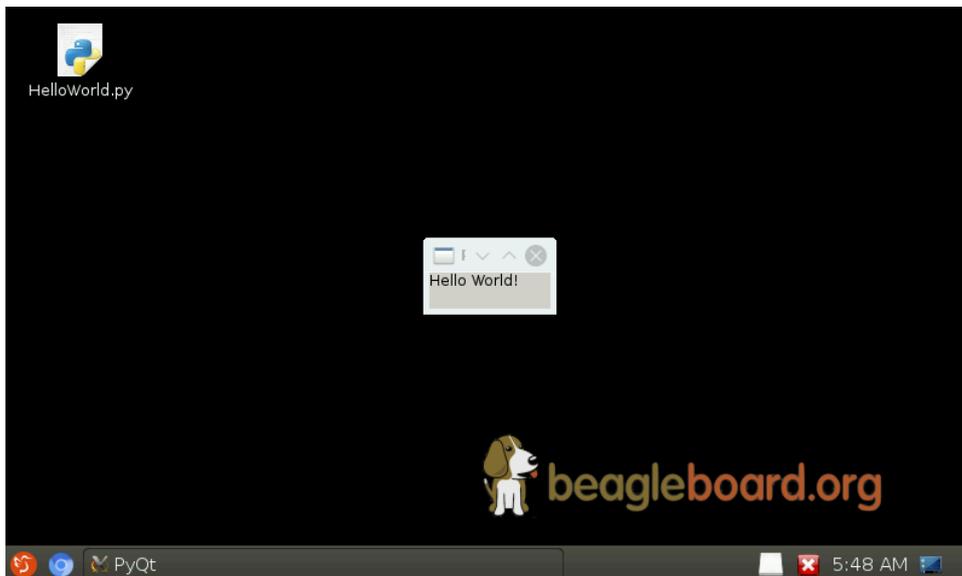
```
$ python3 HelloWorld.py
```



To run the script from a remote terminal and display it on the gen4-4DCape,

```
$ DISPLAY=:0.0 python3 HelloWorld.py
```

The gen4-4DCAPE should now look like this:



REFERENCE DOCUMENTS

The “HelloWorld” project is one of the most common and basic projects to be made in almost every language and that includes Python. The following is a list of the sites and documents that may help the user to further enhance GUI programming and to know more about gen4-4DCAPE:

gen4-4DCAPE Datasheet

This document contains the essential information related to the gen4-4DCAPE.

BeagleBone Website

A good place to start for information and support regarding the BBB and various distributions available

BeagleBone Latest Images

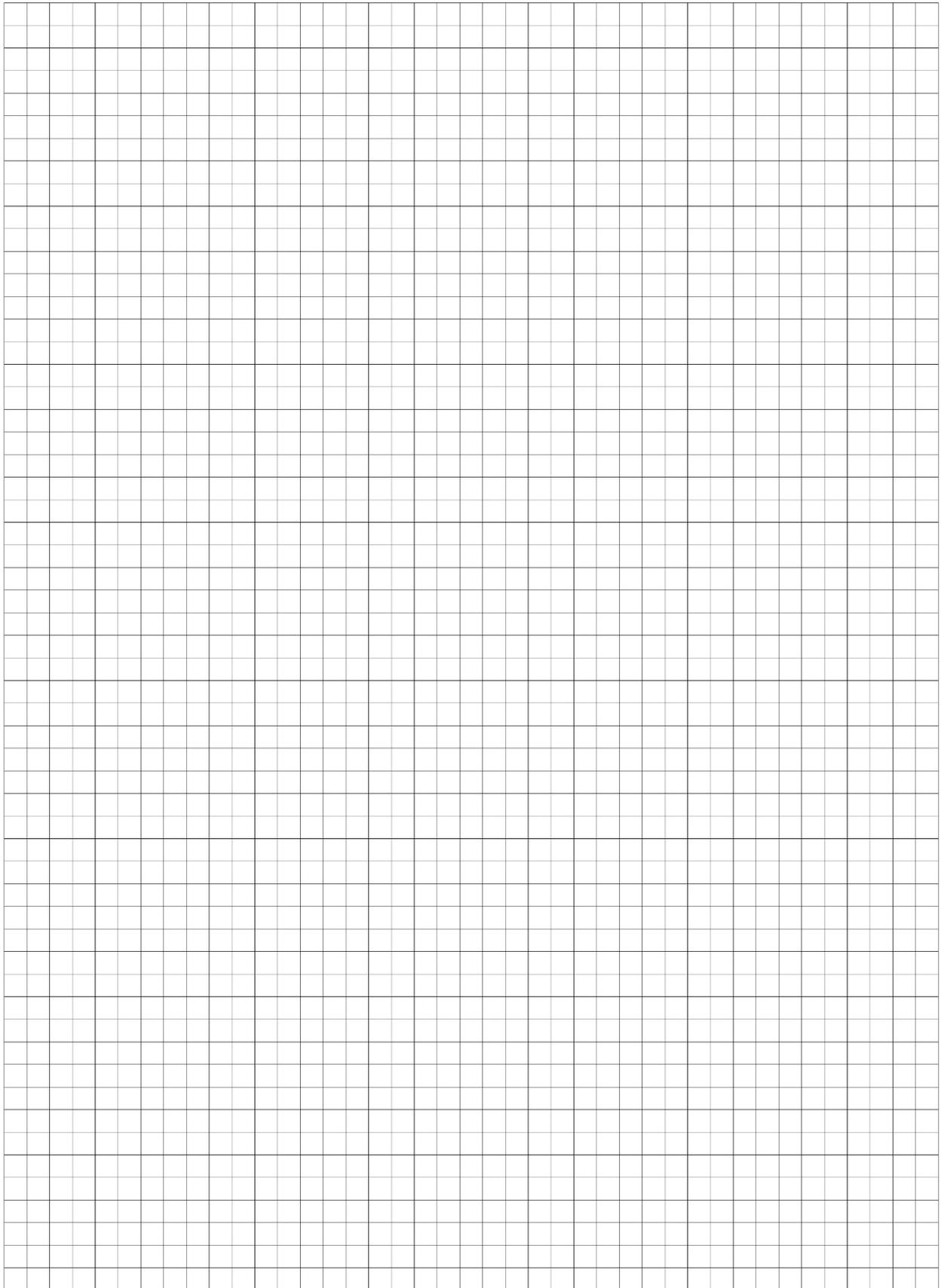
This website details the latest firmware images for the BBB.

BeagleBone Configuration

This website details how to get started with the BBB.

Note: For support regarding the gen4-4DCAPE hardware itself, please go to the 4D Systems website and either contact Support directly via a Ticket, or use the 4D Systems Forum.

NOTES



GLOSSARY

1. **Cape** – Plug-in boards to the popular BeagleBone computer that allows hobbyists, makers and developers to quickly and easily augment BeagleBone's capabilities with LCD screens, motor control and battery power as well as the ability to create their own circuits.
2. **Debian** – A free operating system (OS) for BeagleBone. It provides more than a pure OS: it comes with over 51000 packages, precompiled software bundled up in a nice format for easy installation on your machine.
3. **eMMC** - Embedded Multi-Media Controller. Refers to a package consisting of both flash memory and a flash memory controller integrated on the same silicon die.
4. **Flashing** - is a process for updating the eMMC software chip, done through chip erasure and SD Card update.
5. **Image** - is a serialized copy of the entire state of a computer system stored in some non-volatile form.
6. **LCD** - Liquid Crystal Display. Technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology.
7. **Linux Distribution** - often abbreviated as “distro”. An operating system made from a software collection, which is based upon the Linux kernel and, often, a package management system. The software is usually adapted to the distribution and then packaged into software packages by the distribution's maintainers.
8. **Python** - is a high-level programming language designed to be easy to read and simple to implement.
9. **PyQt** - PyQt is one of the most popular Python bindings for the Qt cross-platform C++ framework.
10. **SSH** - Secure Shell or Secure Socket Shell, is a network protocol that gives users, particularly system administrators, a secure way to access a computer over an unsecured network.

Visit our website at: www.4dsystems.com.au

Technical Support: www.4dsystems.com.au/support

Sales Support: sales@4dsystems.com.au