

# DE2i-150 Manual Insert

## Atom for Intelligent Systems

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*29 April 2013*

*Draft Copy*



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# 1 Introduction

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The Intel® Atom™ Processor coupled with an Altera FPGA provides a user with a way to quickly build and adapt to a wide range of new applications.

Intel® Atom™ processor's low power consumption and compatibility with existing x86 code make Intel® Atom™ processor powered devices perfect platforms for a great variety of applications. Because there is such an enormous body of x86 code in existence today, porting existing applications to the Intel® Atom™ microarchitecture is a sensible way to quickly build applications for Intel® Atom™ processor powered devices.

The flexibility of the FPGA allows the user to rapidly re-target Intel® Atom™ Processor to different applications in which the volumes may not justify a full custom ASIC development. The added flexibility allows the user to address a wide range of needs. For example, one could use the FPGA to implement I/O functionality for a particular segment; or you could use the FPGA to implement an acceleration functionality that provides value to a specific application. As a result of the configurability that the FPGA affords, the user can implement different functionality through a combination of different software, firmware, and FPGA bit file loads.

## 1.1 Revision History

Date	Revision	Description
29 April 2013	0.1	Initial Release



## **1.2 Intel® Atom™ N2600 Processor and Intel® NM10 Express Chipset**

The cpu and chipset on the DE2i-150 board are the Intel® Atom™ N2600 Processor and Intel® NM10 Express Chipset (referred to in this document as the cpu and chipset).

The cpu is a dual-core processor which operates, at top frequency, at 1.6 GHz. The cpu can support a 2 GHz DDR3 SO-DIMM, running at either 800 MT/s or 1066 MT/s.



## 1.3 Peripheral Interfaces

There are several peripherals interfaces available to the cpu and chipset, which are listed in the table below.

<b>Feature</b>	<b>Usage</b>
<b>DDR3 SO-DIMM/N2600</b>	Equipped with a 2Gbyte memory module
<b>HDMI 1.3a/N2600</b>	To attach a monitor
<b>VGA/N2600</b>	To attach a monitor
<b>XDP/N2600 – software debug port</b>	To use as software debug port
<b>SPI Flash/NM10</b>	Contains system BIOS, programming header available
<b>Buzzer/NM10</b>	Note: used during BIOS boot to indicate successful initial load
<b>Ethernet PHY/NM10</b>	Equipped with an Intel® 82583 Gigabit Ethernet Controller – (10/100/1000 M) Ethernet connection
<b>Audio Codec/NM10</b>	For audio input and output
<b>Mic In port</b>	
<b>SATA Gen2/NM10</b>	To connect external devices
<b>mSATA/NM10</b>	Equipped with a 60Gbyte SSD
<b>USB Port 1/ NM10</b>	To connect external USB 2.0 devices
<b>USB Port 2/NM10</b>	To connect external USB 2.0 devices
<b>USB Port 3/NM10</b>	To connect external USB 2.0 devices
<b>USB Port 4/NM10</b>	To connect external USB 2.0 devices
<b>PCIe Mini Card (Half size)/NM10</b>	Equipped with Intel® WiFi Link 6205 62205AN.HMWG Half Height MiniCard and a WLAN Dual Band Antenna Assembly
<b>PCIe/NM10</b>	1x connection to FPGA hard PCIe IP block
<b>PCIe/NM10</b>	1x connection to FPGA soft PCIe IP block
<b>Reset Button</b>	
<b>Battery Holder</b>	



## 1.4 About the Development Kit

The development kit includes a platform or board(s) along with the cables, power supply, and SSD (or hard drive) and additional cards or daughter boards to allow the user to quickly connect up the platform to a monitor<sup>1</sup> and keyboard.

In addition, there are many other resources that are available for you and your students.<sup>2</sup> This section of the document attempts to provide you with information about these resources.

### 1.4.1 Intel Embedded Web Site

Click on or paste the following url into your browser-

For N2600 (CedarView) information:

[http://www.intel.com/p/en\\_US/embedded/hwsw/hardware/atom-n2000-d2000/overview](http://www.intel.com/p/en_US/embedded/hwsw/hardware/atom-n2000-d2000/overview)

If you have not used this resource before, you will have to register to access this site.

Note: Information on how to register for access, is provided in the appendix.

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<sup>1</sup> The monitor and keyboard are not included with the development kit.

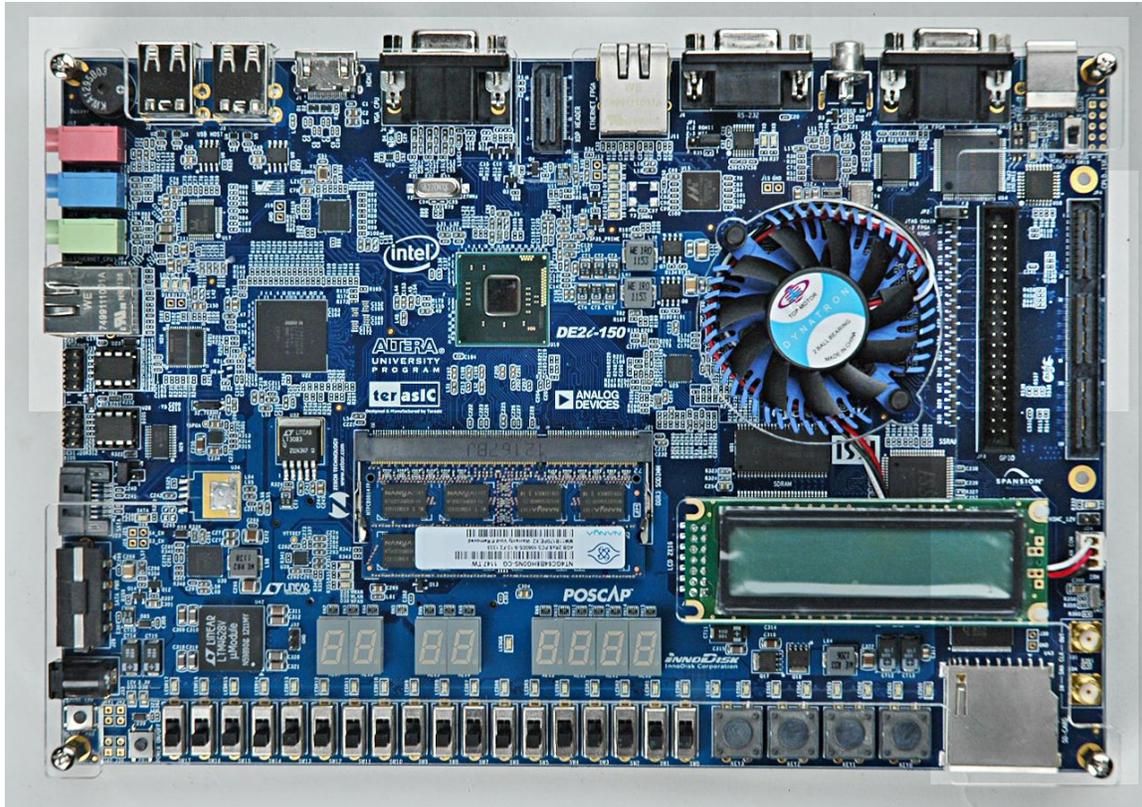
<sup>2</sup> Intel does not take responsibility for content or materials available on external websites or by other companies or entities.

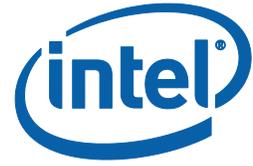


## 2 Getting the Kit/Board Setup

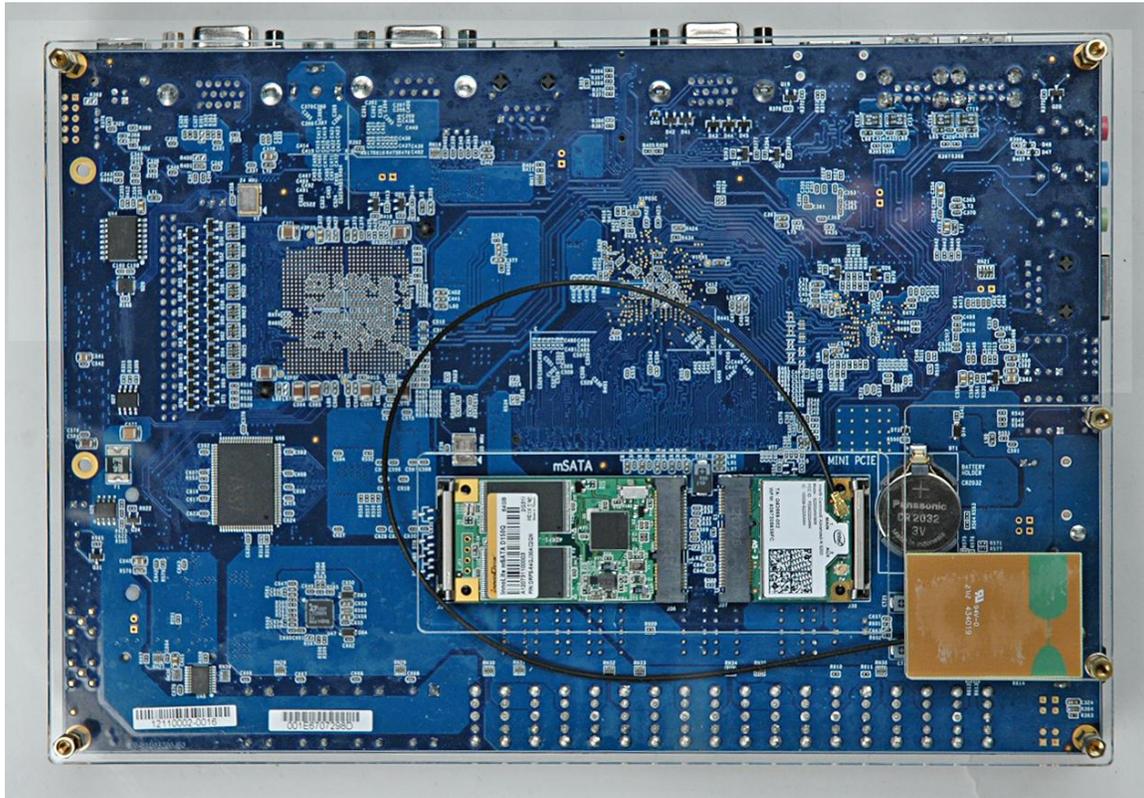
The process for setting up the board is outlined in the Quick Start section of the User Manual. Some additional details are provided in this section.

Below is a photo of the top side of the development board.





And here is the reverse side of the board.





## 3 Yocto Operating System

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The SSD (hard drive) enclosed with the development kit has been pre-loaded with Yocto Operating System.

Note- There are many other Operating Systems which will work with this board, but you may need to create your own FPGA PCIe driver to work with the FPGA and OS on the DE2i-150 board. Drivers are provided for Yocto and Windows 7.

### 3.1.1 User ID for Yocto

TBD – to be updated for next Yocto release.

The user id and passwd combination for this hard drive is:

User id:

Passwd:

### 3.1.2 Linux - Yocto distribution

The Yocto project is

<http://www.yoctoproject.org/>

BSPs (Board Support Package) for the Yocto distribution are available on the following webpage:

<http://www.yoctoproject.org/download>

Select the BSP download page that corresponds to the cpu that you are using from there.

#### 3.1.2.1 Using Pre-compiled Image

TBD – to be updated for next Yocto release.

The file `/etc/version` contains the current version information for the build.

Note: This should be something like 20130314... for the latest version.



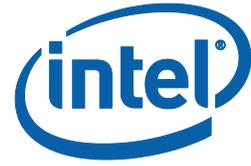
### 3.1.2.2 Checking out drivers

Boot the Yocto that is preinstalled, go to a terminal window and type "ifconfig". This will list the ethernet interface and you should be able to see if the MAC address matches the MAC address label on the white sticker on the bottom side of the board.

If you type iwconfig, you should see wlan0 available if the WiFi drivers are installed.

### 3.1.3 Yocto BSP

The BSP package for the [Intel® Atom™ Processor N2000 and D2000 Series-based Platform \(CEDAR TRAIL\) with PowerVR Graphics](#), which supports CedarView is available on the download page (as shown next).



yocto PROJECT

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## DOWNLOADS

### Releases

The current stable Poky release is 7.0 "Denzil" (released on April 30, 2012). The release tar files can be downloaded from these locations:

- [Yocto Project](#)
- [Kernel.org Mirror#](#)

Use the **DOWNLOAD** navigation pane to the right on this page and select "Yocto Downloads" to access Release Notes for any Yocto Project release. Release Notes provide details about the release and a list of known issues. Export compliance information is at [The Yocto Project Export Compliance Page](#).

Previous releases of the Poky project are available from the [Poky Linux release page](#) *if*.

### Upstream Source Code

To access the upstream source tarballs from the Yocto Project use the following link:

- [Yocto Project Upstream Source Tarballs](#)

### Board Support Package (BSP)

We support "like" BSP images for some publicly available embedded hardware. To see the hardware we currently support and access the supported BSPs, visit the [Board Support Package \(BSP\) Downloads](#) page. You can download images and get board-specific information from the page.

The BSPs available for download from the BSP downloads page represent a partial list. If you do not see a BSP for your particular hardware, ask your hardware manufacturer.

If you would like to build the beagleboard, routerstationpro, mpc8315e-rdb, or atom-pc BSP, follow the instructions in the [Yocto Project Quick Start](#) and specify the architecture you need. If you want to build any other BSP from the BSP Download page, see the [transcript from git checkout to meta-intel BSP](#) for an example.

For more details on how to use layers, see the [Understanding and Creating Layers](#) section in the Yocto Project Development Manual.

### Nightly Builds

We make nightly builds to test Poky and to make the latest developments available. These can be found on our [Build Bot](#) *if*.

### Development Code

Yocto Project code can be found in the [Yocto Project Source Repositories](#).

To check out current development code using [git](#) *if*:

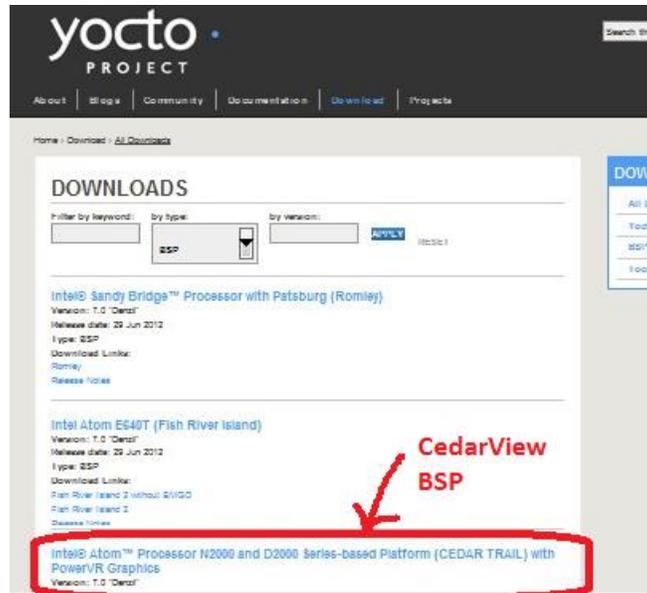
```
$ git clone git://git.yoctoproject.org/poky.git
```

[Print-friendly version](#)

#### DOWNLOAD

- All Downloads
- Yocto Downloads
- BSP Downloads**
- Tools Downloads

BSP Downloads



Steps to use binaries w/o modification:

Get a USB based Flash storage device.

Copy the tarball onto a "host" Unix system.

Untar – tar **-svfj** <tarball\_file\_name>

Mount the device on a "host" Linux system.

Use the commands provided in the README file to setup the binary on the USB device as a "bootable" image.

### 3.1.3.1 Further information about Yocto

Video on Yocto development.

<http://edc.intel.com/Video-Player.aspx?id=5474>

FAQ on Yocto project

<https://wiki.yoctoproject.org/wiki/FAQ>



## **4 Software Downloads**

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### **4.1 Intel® Software Network**

TBA – Introduction To be added later

#### **4.1.1 Resources for Academics**

Many Intel software tools are available for deep discounts to the academic community. The following web site contains some of the latest software tools supported by Intel:

<http://software.intel.com/en-us/articles/intel-academic-developer-program>

#### **4.1.2 Resources for Students**

“Intel has created Student Suites for all of our development tools under a single user license to allow students to get access to our tools at the lowest possible cost. We offer the student suites at prices ranging from \$49 to \$129 per user depending on the operating system required. There are no functional differences in the student suites. This is a specially priced package available to students.

A student is defined as full and part-time matriculated students of a higher education institution defined as a public or private, vocational school, correspondence school, junior college, college, university, or scientific or technical institution.”

<http://software.intel.com/en-us/articles/intel-academic-developer-program/#student>

Additional resources are available to the academic community:  
<http://software.intel.com/en-us/articles/intel-academic-community>



## ***5 Communicating between Atom Processor and FPGA***

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Needs to be updated.

On the development board, the Intel® Atom™ Processor N2600 Series, the FPGA is designed and programmed with Altera Quartus\* II Subscription Edition Software.

### **5.1.1 PCIe IP**

The Atom processor communicates to the Aria FPGA through a PCIe port. Information about the PCIe port within the Atom processor is provided within the Intel specifications. More details about the PCIe IP for the FPGA can be found on the Altera web page below.

Altera - [http://www.altera.com/technology/high\\_speed/protocols/pci\\_exp/pro-pci\\_exp.html](http://www.altera.com/technology/high_speed/protocols/pci_exp/pro-pci_exp.html)

There is a PCI Express reference design provided by Altera at the following web page:

<http://www.altera.com/support/refdesigns/ip/interface/ref-pciexpress-hp.html>

### **5.2 Connections**

There are several connectors on the development board.

Needs to be updated.



## ***6 Contact Info***

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Technical Issues for development platform - Joy Shetler, PhD

[joy.shetler@intel.com](mailto:joy.shetler@intel.com)

Office phone: (480)552-0972

Other needs and resources - Your Intel representative for your University Program



## 7 Appendix

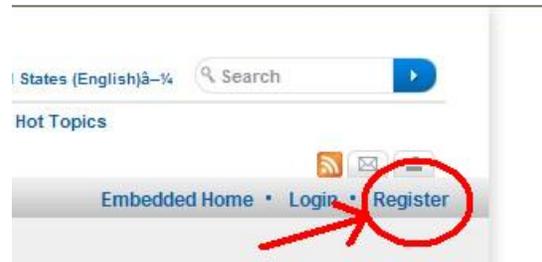
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### 7.1 Errata

This section contains corrections to key processes and documentation.

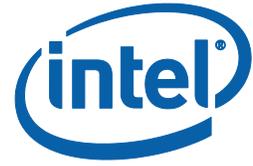
### 7.2 EDC Web Site

#### 7.2.1 Registering for the site

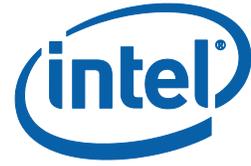


You should see the Register button on the left side of your screen.

There are two types of registration, privileged (red) and basic (green) shown in the picture below. You may want to register as a “privileged user” to have access to confidential documents that are available with the privileged registrations. Since your university has signed an NDA with Intel, you should be able to access Intel Confidential material.



After registering for the site, you should be able to access the web site and resources. If you have any difficulties, please contact us.



## 7.2.2 EDC Web Site Setup

There are many resources available on this site.<sup>3</sup> A sample screen shot of the web page for the E6x5C (which is used in the DE2i-150 Board) is shown below. For example, you can click on the “Technical Documents” tab to find documentation.

## 7.2.3 Documents on EDC Site

There are many technical documents available on this site.<sup>4</sup>

### 7.2.3.1 Reference Documents Available on the Site

Some documents that may be useful are listed in the following table.

Document/File	Document Revision
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To be updated

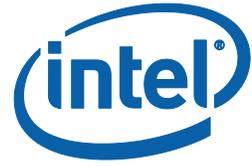
### 7.2.3.2 Reference Documents Not on the Site

If you see something listed with the notation:  
 “Contact your Intel Field Representative for the latest version of this document.”  
 Please contact the Intel representative for your school.

To obtain these documents, your university should have a Non-Disclosure Agreement (NDA) on file with Intel. This NDA could be filed for an individual professor, a department, college or at the university level (such as provost, dean, vice-president, president, etc) so that it would provide either specific or blanket coverage for the confidential material to be accessed.

<sup>3</sup> You may have to join the user group to access the site.

<sup>4</sup> You may have to join the user group to access the site. You will want to register as a “privileged user”.



### 7.3 Macraigor software tools

usbDemon Finder – This tool finds all the Macraigor USB devices currently connected to the host and lets the user flash each device's LED and program license codes for additional Macraigor software tools into a Macraigor USB JTAG device.

- Scan Chain Analyzer – This tool determines if the JTAG scan chain is working, what devices are on it, and what order they are in.
- OCD Commander – This is an assembly language-level debugger with a built-in assembler/disassembler, s19/elf/hex image loader and macro file parser.

Needs to be updated.