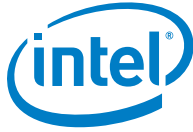


Intel[®] Gateway Solutions for the Internet of Things - DK50 Series Development Kit

Getting Started Guide

May 2014



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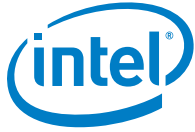
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Revision History

Date	Revision	Description
01 May 2014	001	First Public Version
28 Apr 2014	0.98	Errata section update, Boot menu change option instructions on new image build
24 Apr 2014	0.97	Errata section updated, added Set up picture, minor edits and fixes
14 Apr 2014	0.92	Added instructions for installation of Host System software
11 Apr 2014	0.91	Changed the name to the official marketing name
03 Apr 2014	0.90	Draft Revision for Early Access Development Kits

§



1 Introduction

This guide describes how to set up and begin running the Intel® Gateway Solutions for the Internet of Things (IoT) DK50 Development Kit. In this document:

- **Development Kit** refers to the Intel® Gateway Solutions for the Internet of Things (IoT) DK50 Development Kit, including the Target System hardware, board firmware, and Wind River* software.
- **Target System** refers to the Intel® Galileo Development Board included in the kit.
- **Host System** refers to a stand-alone computer system onto which the Wind River Development Tools software is installed. A Host System and the Wind River Development Tools are not included in the kit.

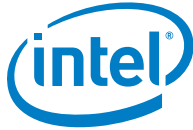
1.1 Development Kit Contents

The Development Kit contains the following:

- Intel® Galileo Development Board
- Power adapter, power cord, and power plugs
- Documentation packet
- Micro-SD flash memory card (installed), includes Wind River Linux OS with Wind River Intelligent Device Platform (IDP) software
- USB to flash memory card adapter
- USB flash memory drive, includes a backup image for the Target System OS and Development Kit documentation.

In addition, some versions of the Development Kit may contain the following:

- Four nylon standoffs and screws
- Intel® 7260 dual-band wireless network adapter (PCIe* Mini Card)
- 2x internal Wi-Fi* antenna with U.FL connector
- Metal chassis for the Intel® Galileo Development Board
- 2x external Wi-Fi* antenna with RP-SMA male connector



1.2 Reference Documents

The following documents provide additional details and related information for developing Intel® gateway solutions.

Table 1. Reference Documents

Title (Revision)	Location
<i>Dear Customer Letter</i>	Included with Development Kit (Intel Document #545653)
<i>Intel® Galileo Board Getting Started Guide</i>	Intel Document #329685 https://communities.intel.com/docs/DOC-22204
<i>Wind River Intelligent Device Platform Release Notes 2.0</i>	Included on USB flash drive as wr_idp_release_notes_2.0_ed4.pdf
<i>Wind River Intelligent Device Platform Programmer's Guide 2.0</i>	Included on USB flash drive as wr_idp_programmers_guide_2.0_ed7.pdf
<i>Wind River Linux* 5.0/5.0.1 Recommended Development Host Distributions</i>	Included on USB flash drive as Recommended-Hosts-List_5.0.1_Apr13.pdf

1.3 Technical Support

Intel provides technical support for this Development Kit through Intel® Premier Support. To submit a support request using Intel Premier Support go to businessportal.intel.com

See the *Dear Customer Letter* included with the Development Kit for additional details. Contact your Intel representative for further assistance.

1.4 Documentation Conventions

The following conventions are used in this manual:

- `Courier font` - code examples, command line entries, API names, parameters, filenames, directory paths, and executables
- **Bold text** - graphical user interface entries and buttons

1.5 Target System Photos

Photos of the Target System are included below for your reference.

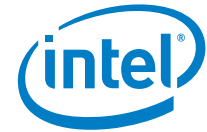


Figure 1. Target System - Top View

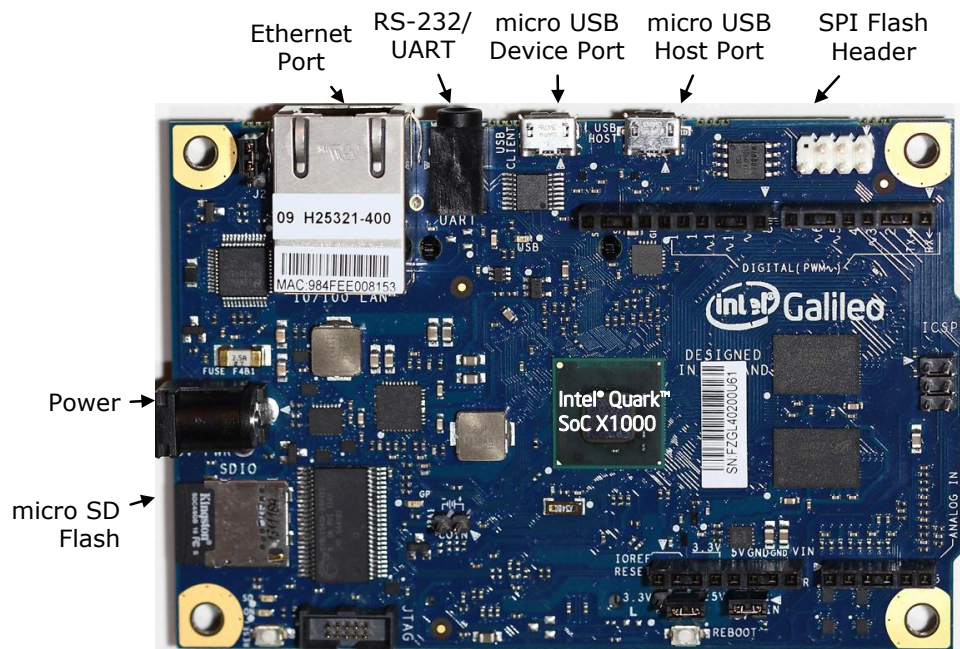
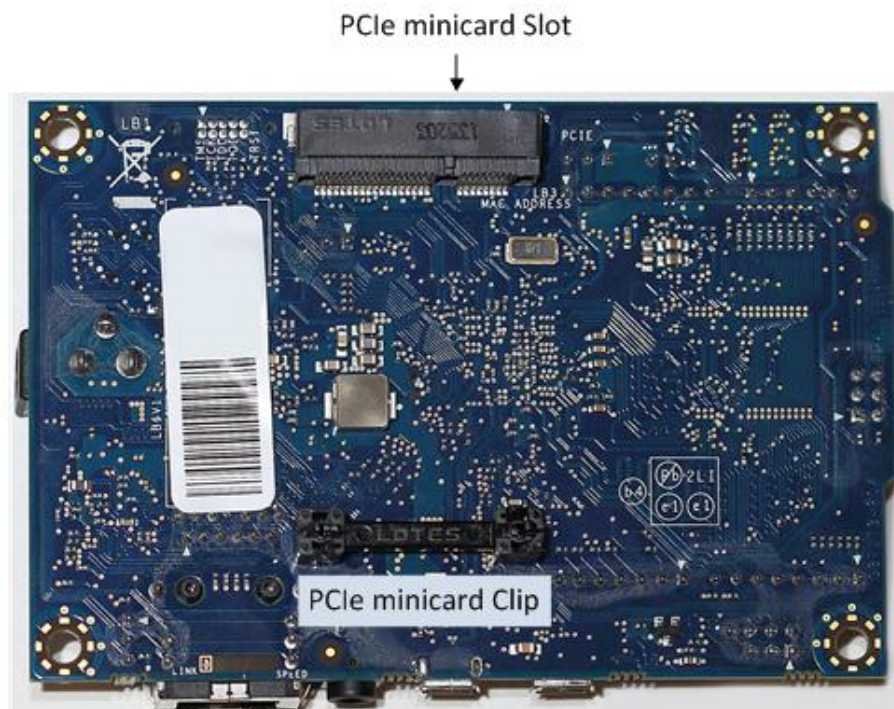


Figure 2. Target System - Bottom View





2 Host System Setup

The Development Kit requires a Host System to interface with the Target System and for Target System software development.

2.1 Host System Hardware Recommendations

The following Host System hardware is recommended, especially if the Host System will be used for Target System software development.

- 3rd Generation Intel® Core™ i5 processor or better
- CPU with four or more cores and with Intel® Hyper-Threading Technology (Intel® HT Technology)
- 150 GB or more of free disk space
- 4 GB or more RAM
- Wired Ethernet port or Wireless Ethernet (Wi-Fi)
- At least one USB 2.0 port
- Micro SDHC flash memory card reader or adapter

2.2 Host System Software Requirements

Recommended Host System OS

Intel recommends Linux for the Host System operating system. The instructions in this guide were developed on a system running Ubuntu 12.04 (64-bit).

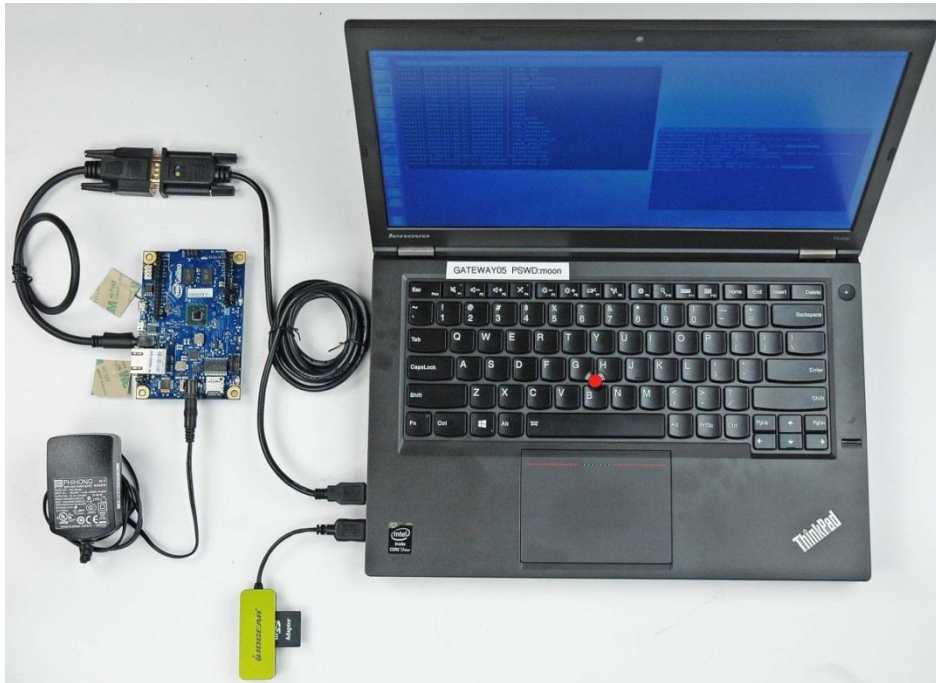
Serial Port Communication Software

The Host System must have serial port interface software installed, such as PuTTY*, to communicate with the Target System over the serial RS-232/UART interface.

3 Target System Setup

Follow the steps below to set up the Target System. When finished, the setup should look like the following picture.

Figure 3. Target System Set Up



3.1 Target System Hardware

The following hardware is needed to set up the Target System. This hardware is included with the Development Kit:

- Intel® Galileo Development Board
- Power adapter, power cord, and power plug
- Micro-SD Flash Card (capacity of 4 to 16 GB)

The following additional hardware is included with some versions of the Development Kit for wireless connectivity:

- Intel® 7260 dual-band wireless network adapter (PCIe* Mini Card)
- 2x internal Wi-Fi* antenna with U.FL connector (if the Target System does not have a metal chassis)
- 2x external Wi-Fi antenna with RP-SMA male connector (if the Target System has a metal chassis)



The following hardware is recommended, but not included in the Development Kit:

- 1/8 inch stereo to Male DB9 Serial cable
- Female DB9 Serial to USB cable
- Micro USB 2.0 to USB Female adapter (an On-The-Go adapter will work)
- Micro USB 2.0 to USB Male adapter (an On-The-Go adapter will work)

3.2 Connecting Power

Plug in the 12 Volt DC jack of the included power adapter to the DC Input of the Target System. Connect the appropriate plug to the power adapter. Plug in the power adapter to wall power.

3.3 Confirming Serial Port

The serial port provides Linux command line interface to the Target System.

Note: A 1/8 inch stereo to Male DB9 Serial cable is needed for Serial Port I/O. This is not included in the kit.

Use the *lsusb* command in a Linux command line to confirm that the USB-Serial (UART) interface was recognized correctly by the operating system. The following figure shows the FT232 USB-Serial (UART) USB device as an example.

Figure 4. Confirm USB-Serial Device is Recognized in Linux

```
moon@Gateway05: /
moon@Gateway05:/$ lsusb
Bus 001 Device 002: ID 8087:8008 Intel Corp.
Bus 002 Device 002: ID 8087:8000 Intel Corp.
Bus 003 Device 010: ID 0403:6001 Future Technology Devices International, Ltd FT232 USB-Serial (UART) IC
Bus 003 Device 009: ID 13fe:1d00 Kingston Technology Company Inc. DataTraveler 2.0 1GB/4GB Flash Drive / Patriot Xp
orter 4GB Flash Drive
Bus 003 Device 006: ID 17ef:6025 Lenovo
Bus 003 Device 002: ID 138a:0017 Validity Sensors, Inc.
Bus 003 Device 003: ID 8087:07dc Intel Corp.
Bus 003 Device 004: ID 5986:0268 Acer, Inc
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 003 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 004 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
moon@Gateway05:/$
```

Use the following settings to connect to the Target System via a serial port interface, such as PuTTY*:

- BAUD Rate: 115200
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- Flow Control: None

Figure 5 and Figure 6 show PuTTY application snapshots as an example.

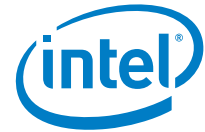


Figure 5. PuTTY Configuration Snapshot 1

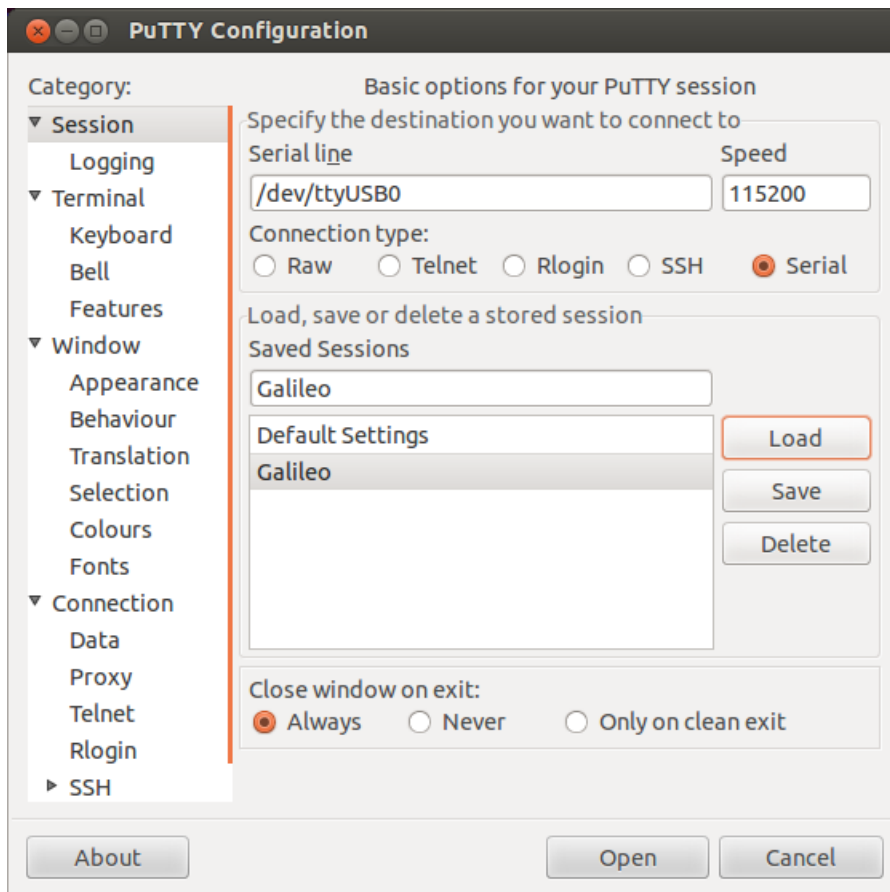
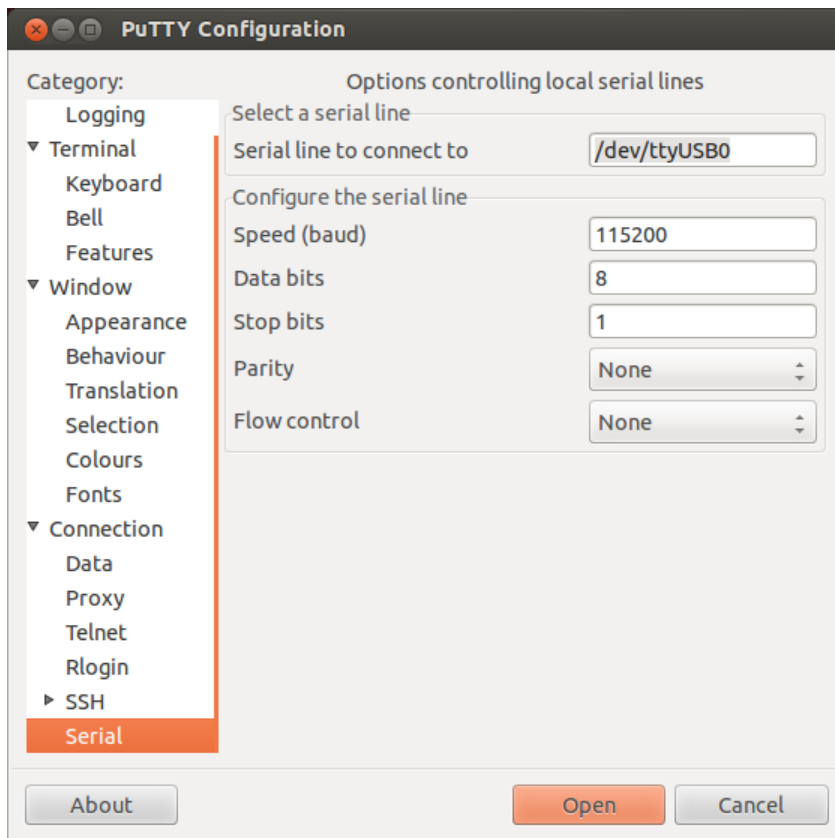
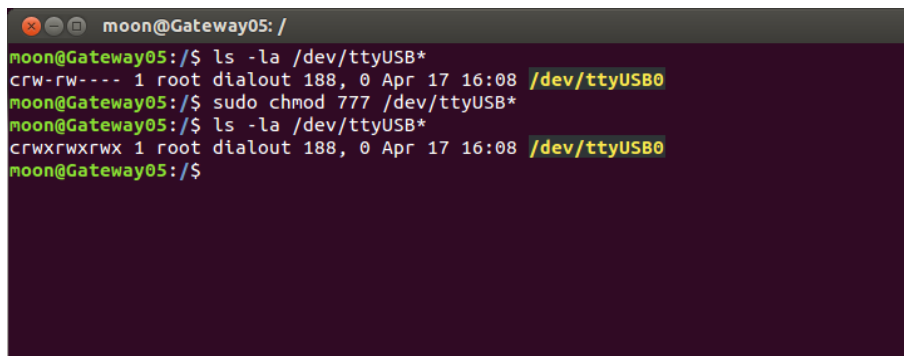


Figure 6. PuTTY Configuration Snapshot 2

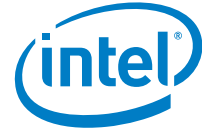


If the PuTTY connection fails using the above settings, check for incorrect rd/wr/exe permissions for the file handle /dev/ttyUSBn (where n is the device number that the OS assigns. It is typically 0 through 9). Update the permission settings using the `chmod` linux command. See the following figure.

Figure 7. Confirm USB-Serial Device is recognized in Linux



Detailed instructions for connecting the serial port from the Target to the Host System are in the *Intel® Galileo Board Getting Started Guide*.



3.4 Target System Software

The included micro-SD flash memory card is bootable and is pre-loaded with the Wind River* Linux and Wind River Intelligent Device Platform software.

After establishing connectivity via Serial Port or SSH, use the following login and password to access the Linux command line interface:

```
login: root
Password: root
```

3.5 Wired Ethernet Connection

The best way to connect the Target System to the internet or to another network is through an Ethernet router with integrated DHCP server. Use an Ethernet cable to connect the **10/100 LAN port** of the Target System to one of the I/O ports of the router.

The Wind River IDP runtime software implements a network gateway function that assumes the Ethernet eth0 interface (10/100 LAN port) has a WAN connection. The Target System will attempt to obtain an IP address from a DHCP server on this interface.

As an alternative to connecting the Target System to an Ethernet router with an integrated DHCP server, the Target System may be configured with a static IP address after the system has booted. (See Section 3.7.1 Configuring a Static IP Address Using WebIF)

3.6 Wireless Ethernet Connection

A wireless connection requires installing a wireless network adapter (PCIe* Mini Card). The Intel® 7260 dual-band wireless network adapter supported by the default Target System runtime software is used in this section for illustration.

Note: The following instructions assume a wireless network adapter is installed.

After the Target System has booted, the IDP gateway advertises a wireless LAN network with Service Set Identifier (SSID) of: IDPDK-xxxx (where xxxx is the last 4 digits of the wireless network card MAC address).

To find the last 4 digits of the wireless network card MAC address, issue the Linux command: `ifconfig wlan0` from the Target System command line. The MAC address is listed in the `ifconfig wlan0` output as the `HWaddr`, such as:

```
HWaddr 00:0F:20:CF:8B:42
```

In this case, the last four digits of the MAC address are: 8B42, and the Target System advertises an SSID of: IDPDK-8B42.

Connect to this local wireless network using the password: **windriveridp**.



3.6.1 Connecting to the Target System's Local Wireless Network

This section provides instructions to connect the Host System or another wireless device to the Target System's local wireless network.

The following steps were performed on a Host System running Ubuntu* 12 operating system. The procedure should be similar for other Linux operating systems.

1. Select the Network Icon at the top of the screen, or go to System Settings -> Network Connections.
2. Find the Target System's local wireless network with an SSID of IDPDK-xxxx.
3. Select the Target System's local wireless network to connect to it.
4. When prompted, enter the password: `windriveridp`.

You should now be connected to the Target System's local wireless network.

Note: The onboard wireless LAN is statically defined to use subnet 192.168.1.0

3.7 Wind River* Web Interface Tool (WebIF)

Wind River provides a Web Interface tool (WebIF*) that allows the user to control and change many Target System settings.

Note: The following instructions assume a wireless network adapter is installed.

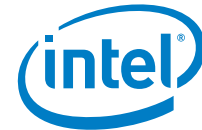
Use the following steps to access the Web Interface (WebIF) tool.

1. Connect from a Host System to the Target System on the wired or wireless Ethernet interface as explained in [Section 3.5](#) or [Section 3.6](#).
2. On the Host System, open an internet browser.
3. In the address window of the browser, enter internet address `http://192.168.1.1`
4. If the connection to the Web Interface is successful, a popup box will ask for a user name and password. Use

User Name: `admin`

Password: `admin.`

See the *Wind River Systems IDP Programmer's Guide* and *Release Notes* on the USB key for details regarding the Web Interface tool and its Target System customization options.



3.7.1 Configuring a Static IP Address Using WebIF

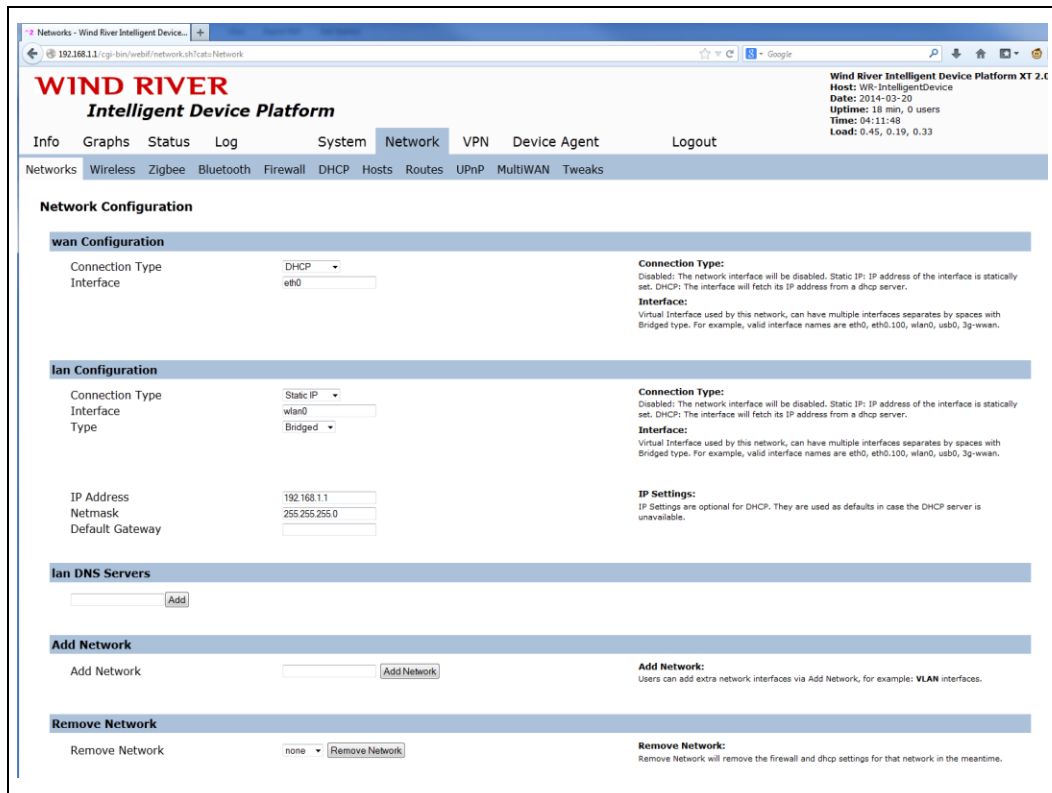
To configure a static IP address for the wired and wireless network interfaces go to the **Network** → **Networks** tab, and setup the **Network Configuration**.

Note the following:

- **WAN Configuration** applies to the wired Ethernet port.
- **LAN Configuration** applies to the wireless Ethernet (Wi-Fi) interface.

An example of setting the Wireless Ethernet port to a static IP Address is shown in the following screen capture.

Figure 8. Configuring a Static IP Address on the Wireless Ethernet Port



After making your changes, scroll to the bottom of the screen and click **Save Changes**, and then click **Apply Changes**.

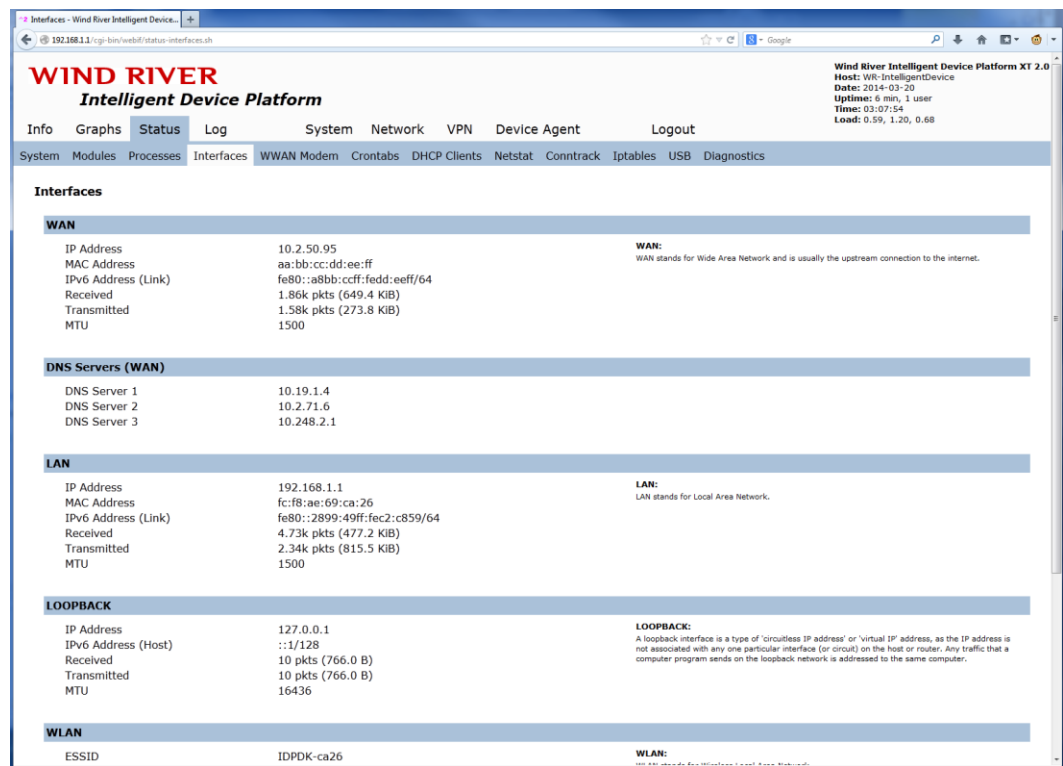
3.7.2 Finding the Target System IP Address in WebIF

The Status → Interfaces tab of WebIF has information about the Target System network connections. See the figure below for an example.

Note the following:

- WAN is the wired Ethernet port information.
- LAN is the wireless Ethernet port information.

Figure 9. WebIF List of Network Connections (Status → Interfaces)



3.8 Using SSH to Login to the Target System

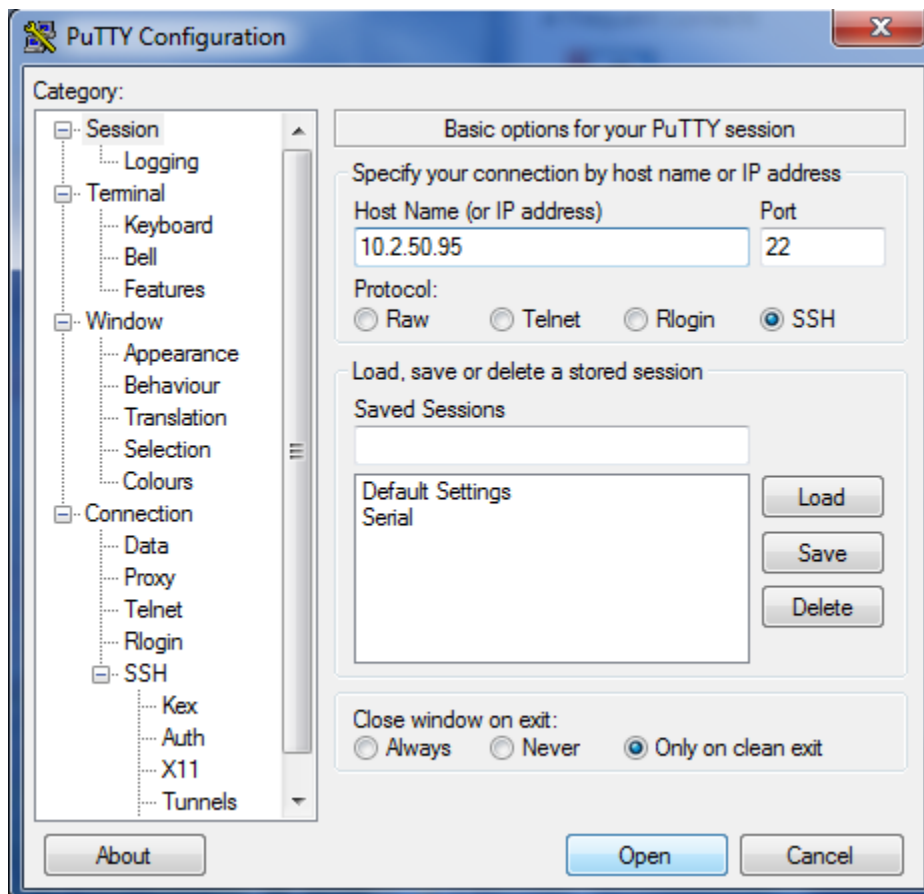
To use a Secure Shell Session (SSH) to login from the Host System to the Target System, use these steps:

1. Connect from the Host System to the Target System on the wired or wireless Ethernet interface as explained in [Section 3.5](#) or [Section 3.6](#).
2. Find the IP Address of the Target System.
 - Wireless Ethernet Connection: If connected to the Target System through the Wireless Ethernet interface, you can find the IP Address of the Target System in the WebIF tool's Status → Interfaces tab. (See [Section 3.7.2](#))



- Wired Ethernet Connection: If connected to the Target System through the Wired Ethernet Interface, you can find the IP address of the Target System in the DHCP Client Table of the router to which the Target and Host systems are connected.
3. Start the SSH session between the Host and Target Systems:
- On a Linux Host System, issue the command: `ssh <ip address>` where <IP Address> is the IP Address of the Target System. You may need to add `sudo` to your `ssh` command for admin access.
 - On a Windows or Linux Host System, use terminal software, such as PuTTY, to connect to the Target System using the Target System's IP Address. See the following figure.

Figure 10. SSH Terminal Configuration Using PuTTY*





4 Installing Wind River IDP Tools on the Host System

The Intel® Gateway Solutions for the Internet of Things (IoT) DK50 Development Kit includes access to an installer for the Wind River* tools for software development. The host software tools are Wind River Linux 5.0.1, Wind River Intelligent Device Platform (IDP) 2.0 XT, and Wind River Workbench 3.3.5.

See the *Dear Customer Letter* included in the Development Kit for instructions to obtain the installer and necessary licenses.

4.1 Host System OS Requirements

The Wind River Systems development tools may be installed on many different Linux*-based Host Systems. Before proceeding, review *Wind River Linux 5.0/5.0.1 Recommended Development Host Distributions* to ensure that you have installed the appropriate packages and that your system meets the minimum operating system requirements. The document is included on the USB flash drive in the `documents` folder and is called `Recommended-Hosts-List_5.0.1.pdf`.

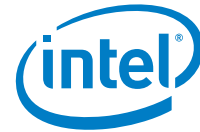
Note: These instructions have been validated on an Ubuntu 12.04 LTS 64-bit Host System.

4.2 Host System Hardware Recommendations

The following Host System hardware is recommended.

- 3rd Generation Intel® Core™ i5 processor or better
- CPU with four or more cores and with Intel® Hyper-Threading Technology (Intel® HT Technology)
- 150 GB or more of free disk space
- 4 GB or more RAM
- Ethernet connection to the internet

With the minimum hardware above, a typical initial compile will take about 3 hours. Improving the specifications of the Host System can decrease that time to about 2 hours.



4.3 Wind River Software Installation Prerequisites

Before starting the host tools installation, check the following:

4.3.1 Disk Space and Installation Folders

About 42 gigabytes of disk space is needed during the host tools installation. About 12 GB of that will be permanently used after the installation is complete.

The installation process creates three folders in the home directory of your Host System:

1. `WindRiver` - The folder to install the host tools. The installation requires approximately 12 GB of free space in this folder.
2. `Installer` - A temporary folder that can be deleted later. The installation requires approximately 15 GB of free space in this folder.
3. `tmp` - A temporary folder used by the installation process. The installation requires approximately 15 GB of free disk space.

4.3.2 Wind River Host Tools License

You must have a temporary *License Authentication Code* or a permanent *License Authentication File* to install the IDP host tools.

- For Early Access kits, instructions to obtain a temporary *License Authentication Code* are included in the Dear Customer Letter that accompanied the kit.
- If you purchased a kit, instructions to obtain a permanent License Authentication File will be provided at the time of purchase.

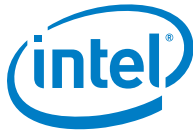
4.3.3 Internet Connection

The time required to install the host tools is primarily dependent on the download speed of the Host System's internet connection. The installer downloads approximately 15 gigabytes of data from Wind River's servers. This may take several hours.

4.3.4 Download the Installer

The Wind River Host Tools are installed on the Host System using an installer.

- If you have an Early Access Development Kit, then the Installer folder is on the USB flash drive that was shipped with the Development Kit.
- If you purchased the Development Kit, then see the *Dear Customer Letter* included in the kit or sent to you at the time of purchase for instructions to download the Installer.



4.4 Installing the Host Tools Base Packages

Follow the steps below to install Wind River* Linux 5.0.1, Wind River IDP 2.0.1 XT, and Wind River Workbench 3.3.5 on the Host System.

1. Plug in the provided USB key into the Host System.
2. Using the GUI or command line, copy the Installer files that you downloaded to the `Installer` folder on the Host System. The Installer file is named `DVD-R181165.1-1-00.zip` or similar. Use command:

```
cp /media/AtomGatewaySW/install/DVD-R181165.1-1-00.zip \  
$HOME/Installer/
```
3. Using the GUI or command line, unzip the Installer zip file. Use commands:

```
cd $HOME/Installer  
unzip DVD*.zip -d ./
```
4. Go to the unzipped `DVD-R181165.1-1-00` folder and run the `setup_linux` executable. An Installer window opens. Use commands:

```
cd DVD-R181165.1-1-00  
./setup_linux
```
5. On the Installer pop-up window, select the Wind River Host Tools install location. Use the **Browse** button select the `WindRiver` folder you created in [Section 4.3.1](#), or enter the complete path to that folder.
6. On **Online Update Settings** page, keep the default boxes checked.
7. On this same page, if your network requires a proxy server for access to the internet, do the following:
 - a) Mark the box titled **Connect to the internet using a proxy server**.
 - b) Provide the proxy server information for your network.
8. On the **Install Now or Create a Local Download** screen, keep the default **Install** box checked. Local download is for administrators planning multiple installations of this product.
9. On the **Choose Activation Type** screen, do one of the following:
 - If you received a permanent License Activation File with the purchase of the Development Kit:
 - i) Make a directory called `license` in the `$HOME/WindRiver` directory.
 - ii) Copy the license activation file into the `$HOME/WindRiver/license` directory.
 - iii) Select **Permanent activation** and enter the full path and filename of the license file, or use the **Browse** button to find it using the GUI.
 - For temporary activation, select **Temporary activation**. A *License Activation Code* will be required later. Use the license obtained in [Section 4.3.2](#).
10. On the **Host Information** page, select the Ethernet adapter that will be used to download the Host tools from the internet.
11. On the **User Information** screen, do the following:
 - a) If you selected **Temporary activation**, enter the temporary *License Authentication Code* provided in the *Dear Customer Letter*.
 - b) Enter the required user information.



12. On the **Choose Installation Filters** screen, select only **Intel**.
13. On the **Select Products** screen, keep the default selections.
14. When the **License Agreement** window pops up, click **I ACCEPT** to accept the standard license agreement and the product evaluation license agreement for Wind River Linux and IDP.
15. On the **Confirm and Install** page, click Install.

Note: The download and install can take several hours depending on the speed of your Internet connection.

16. Successful installation will end with a message that says: `Media Installation Completed`. Click **Finish** to exit the Installer window.
17. If you encounter installation issues, provide the `$HOME/WindRiver/setup.log` and `setup_install_failure.log` files to your Intel support contact.

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5 Building the Wind River* IDP Runtime Software

This section describes how to use the Host System to build a Wind River IDP runtime file system and operating system that can be installed onto the Target System.

5.1 Build Requirements

The build process requires two folders on your Host System at the same level as the `WindRiver` and `Install` folders:

- `Project` - The project folder in which you will develop your IDP-based solution. The build requires approximately 40 GB of free space in this folder.
- `Project/build-cache` - The folder where the build cache is stored. Using a build cache can significantly reduce the time required to build the project after incremental changes are made. The build requires approximately 10 GB of free space in this folder.

Create these folders before proceeding. You can substitute different names for these folders if desired. Use these commands:

```
cd $HOME
mkdir Project
mkdir Project/build-cache
```

5.2 Wind River Linux Configure Command

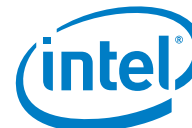
Go to the `Project` folder. Use command:

```
cd $HOME/Project.
```

Configure the Wind River software build using the `configure` command. A typical `configure` command for creating software for the Target System in this kit looks like this:

Note: The `\` symbols in the command tell the Linux command line interpreter to ignore the following return or newline. The `configure` command above does not need the `\` symbols if the full command is on one line.

Note: In the option for `--enable-parallel-pkgbuilds=4`, use the number of process threads available in the CPU of your Host System. For example, when using a CPU with 2 cores and hyperthreading, there 4 process threads are available, so specify "4" for optimal performance.



Note: Specifying `--enable-jobs=50` will generate a warning, but trials have shown that using this number of jobs will result in shorter compile times. You may ignore the warning.

```
../WindRiver/wrlinux-5/wrlinux/configure \  
--enable-board=intel-quark \  
--enable-kernel=standard \  
--enable-rootfs=glibc-idp \  
--enable-addons=wr-idp \  
--enable-bootimage=ext3,hdd \  
--enable-jobs=50 \  
--enable-parallel-pkgbuilds=4 \  
--with-layer=wr-mcafee,wr-wks-oneagent-oma-dm-ia,wr-intel-  
support \  
--with-template=feature/mqtt,feature/webif,feature/intel-  
wilkinpeak2,feature/idp_devkit_full,feature/intel-  
wilkinpeak2,feature/recovery \  
--without-layer=wr-srm \  
--with-sstate-dir=./buildcache
```

The configure command may take a few minutes to complete.

5.3 Build the Target System Runtime Software

When the Configure command is finished, build the Target System runtime OS by issuing the following commands from the `Project` folder:

```
cd $HOME/Project  
make fs
```

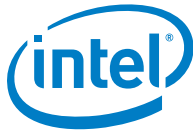
This builds the Linux* runtime system and generates the runtime components that can be installed on your Target System.

The software images and a script to deploy the images to a USB flash drive or SD Flash Card are created in the `$HOME/Project/export` directory. For the Target System in this Development Kit, use the image titled `intel-quark-glibc-idp-standard-dist.tar.bz2`

The first time a target runtime system is built, it can take several hours depending on your Host System's specifications. Subsequent builds will be shorter if the option `--with-sstate-dir=./build-cache` was included in the configure command.

The only supported method to organize the Target root file system and boot procedure is based on the above configuration line with the default Wind River IDP platform settings.

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6 Installing Software on the Target System

Wind River Linux 5 and Wind River IDP XT 2.0 runtime software come pre-loaded on the micro-SD flash card that is installed in the Target System.

This section describes how to install a new image of the Wind River runtime software to the micro-SD flash card.

Note: Before proceeding, ensure the Target System is set up as described in [Section 3](#).

6.1 Obtain the Target System Software Image

Begin by obtaining a new image, or the provided backup image, of the Wind River runtime software for the Target System. The backup image for the Target System is on the USB Flash Memory Drive in the backup directory. The software on the backup image is the same as, or similar to, the software that came pre-loaded on the micro-SD flash card.

A new Wind River runtime software image can be created using the Wind River Host Tools, as described in [Section 5](#). The new image is created in the directory `HOME/Project/export`

Note: Before using the backup image, copy the entire `backup` directory from the USB Flash Drive to the Host System.

6.2 Writing the Micro-SD Flash Card

Use these steps to program a Target System runtime image onto a micro-SD card or to a USB Flash Drive:

1. In a Linux terminal window on the Host System navigate to either the `backup` directory, or the `$HOME/Project/export` directory.
2. Insert the micro-SD Flash Card into a USB Flash Card reader.
3. Insert the USB Flash Card reader into the USB Port of the Host System
4. Determine the `/dev/sd#` device the micro-SD flash card was assigned to.
5. Run this command:

```
sudo ./deploy.sh -f wrlinux-image-glibc-idp-intel-quark-sdcard.tar.bz2 -d /dev/sd# -y
```

(Where `/dev/sd#` is the drive assignment of the micro-SD card.)

This will take a few minutes to run. The figure below shows the terminal window after the script completed successfully.

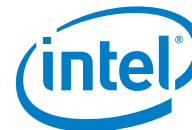


Figure 9. SSH Terminal Configuration using PuTTY

```

root@IGS-Laptop-4: ~/recovery
root@IGS-Laptop-4:~/recovery# sudo ./deploy.sh -f wrlinux-image-glibc-idp-intel-quark-s
dcard.tar.bz2 -d /dev/sdb -y
=====
Deploy rootfs and kernel image
=====
./deploy.sh: line 277: ECHO_WARNING: command not found
INFO: Need to format device firstly.
INFO: Unmount /dev/sdb ...
INFO: Delete all partition on: /dev/sdb ...
INFO: Creating a primary partition in /dev/sdb ...
INFO: Current partition: /dev/sdb1
INFO: Formatting /dev/sdb1 to ext3 ...
INFO: Need to mount device node firstly.
INFO: mount /dev/sdb1 /tmp/deploy-image-0bzxSFVc/tmp.BluZs8LcBP ...
INFO: Remove all files in "/tmp/deploy-image-0bzxSFVc/tmp.BluZs8LcBP"
INFO: Extract rootfs ...
.....
INFO: Unmount all temporary mount point if exist.
INFO: Unmount /tmp/deploy-image-0bzxSFVc/tmp.BluZs8LcBP ...
INFO: Remove all temporary files.
INFO: DONE!
root@IGS-Laptop-4:~/recovery#
    
```

The micro-SD flash card should now have a viable Target System runtime software image.

6. With the power off on the Target System, insert the micro-SD flash card.
7. Plug in the power adapter to boot the Target System.

6.3 Changing default boot menu option

After the Target system boots up with the new image, the default boot is set to USB and not the MMC card (see Figure 12). Use the serial terminal (described in Section 3.3) to control the target system and use the down arrow key to change boot menu option to MMC (see Figure 13). Once booted, on the target system edit /boot/grub/grub.conf file and move MMC ahead of USB (see Figure 14 and 15). In other words, change the boot order to have MMC as the primary boot option in grub. After power cycling the target system the default boot device will now be MMC.

Figure 12. Boot device menu (default on new image) on target system

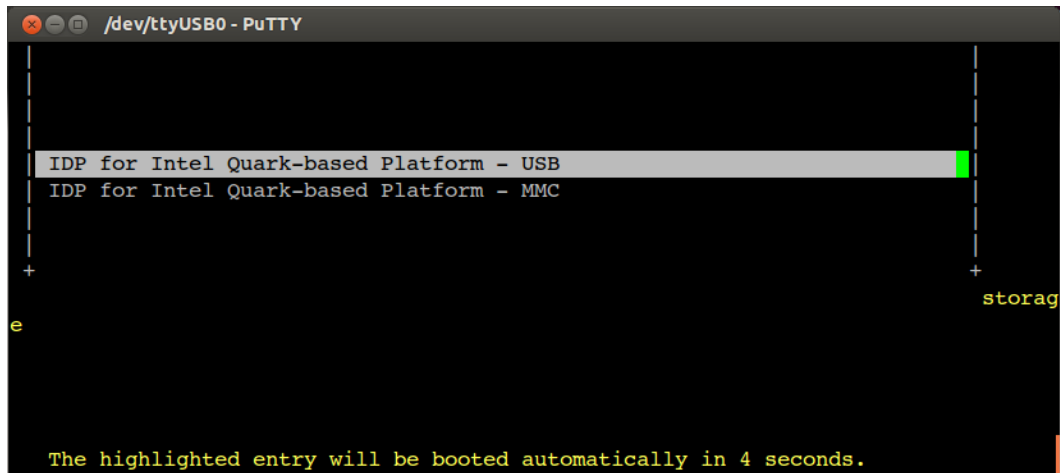


Figure 13. Boot device option changed to MMC on target system

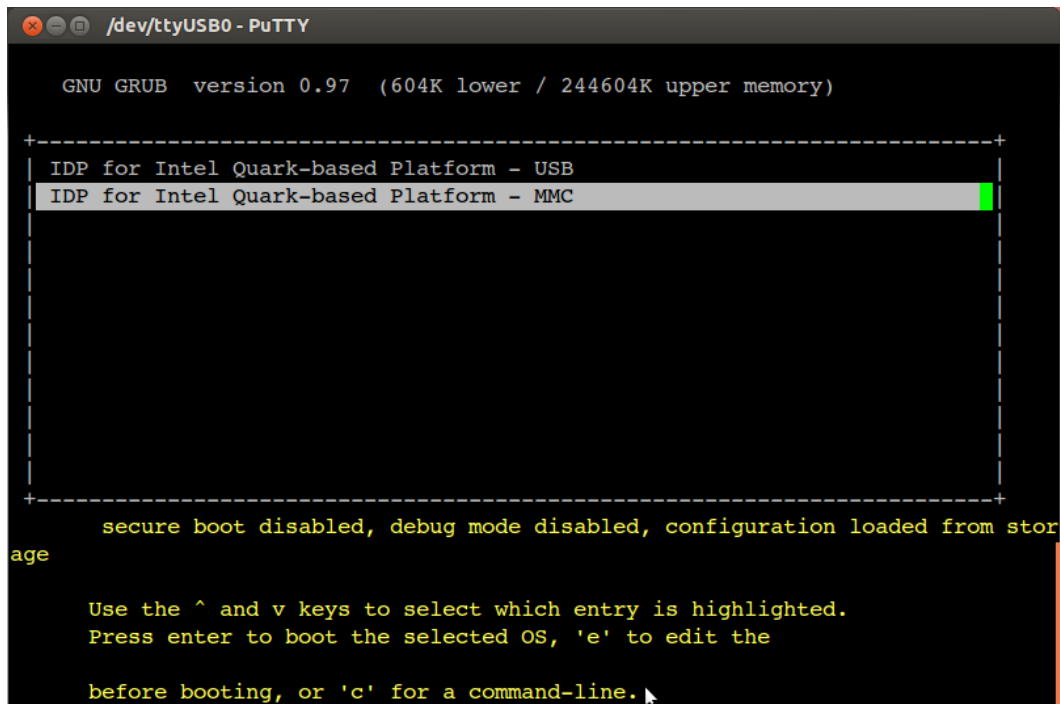




Figure 14. GRUB configuration original (grub.conf)

```
/dev/ttyUSB0 - PuTTY
default 0
timeout 5

title IDP for Intel Quark-based Platform - USB
    root (hd0,0)
    kernel /boot/bzImage console=ttyS1,115200n8 root=/dev/sda1 ro rootwait reboot=efi,warm vmalloc=384M

title IDP for Intel Quark-based Platform - MMC
    root (hd0,0)
    kernel /boot/bzImage console=ttyS1,115200n8 root=/dev/mmcblk0p1 ro rootwait reboot=efi,warm vmalloc=384M
```

Figure 15. GRUB configuration updated (grub.conf)

```
/dev/ttyUSB0 - PuTTY
default 0
timeout 5

title IDP for Intel Quark-based Platform - MMC
    root (hd0,0)
    kernel /boot/bzImage console=ttyS1,115200n8 root=/dev/mmcblk0p1 ro rootwait reboot=efi,warm vmalloc=384M

title IDP for Intel Quark-based Platform - USB
    root (hd0,0)
    kernel /boot/bzImage console=ttyS1,115200n8 root=/dev/sda1 ro rootwait reboot=efi,warm vmalloc=384M

~/
~/
"/boot/grub/grub.conf" 14L, 367C written          14,0-1          All
```

7 Programming the SPI Flash Firmware

During application development, it may be necessary to modify or reprogram the firmware contained in the SPI Flash of the Target System. For this Development Kit the recommended method to program the SPI Flash is by using a DediProg programmer.

A backup copy of the firmware for the Development Kit is on the USB flash drive in the backup directory.

7.1 DediProg Programmer Information

See www.DediProg.com to purchase a DediProg SPI Flash programmer. The SF100, SF600, and SF600Plus models are compatible with the Target System. The Target System uses a 2X4 2.54mm ISP pin header on the board. Obtain the cables necessary to plug into this header.

Figure 16. DediProg SF100 Flash Programmer





7.2 Programming the Firmware

The following items are required to program the firmware:

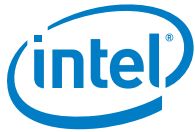
- DediProg SF100.
- DediProg software. Download from www.DediProg.com
- Flash image file in .bin format.
- Target System board.

Warning: Before updating the firmware, save a backup copy of the existing firmware. See [Section 7.3](#) for instructions.

1. Disconnect the power supply from the Target System.
2. Identify the 7-pin SPI header on the Target System. See the red arrow in the figure below.

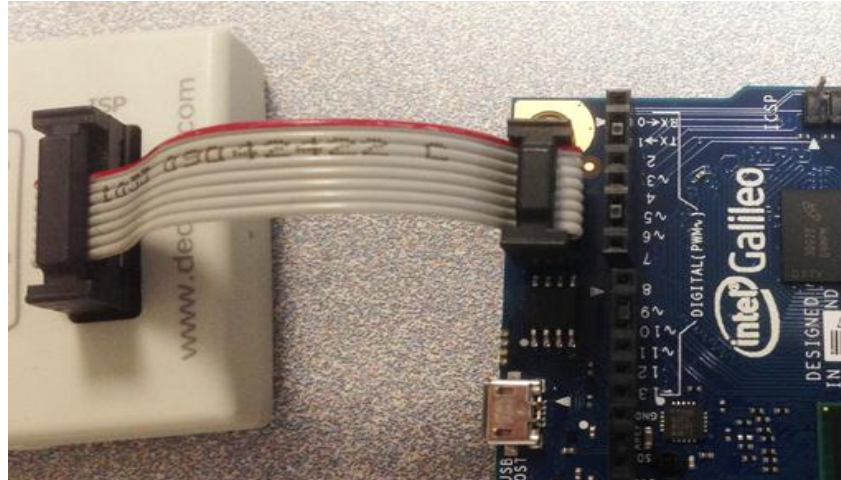
Figure 10. DediProg Header on the Target System





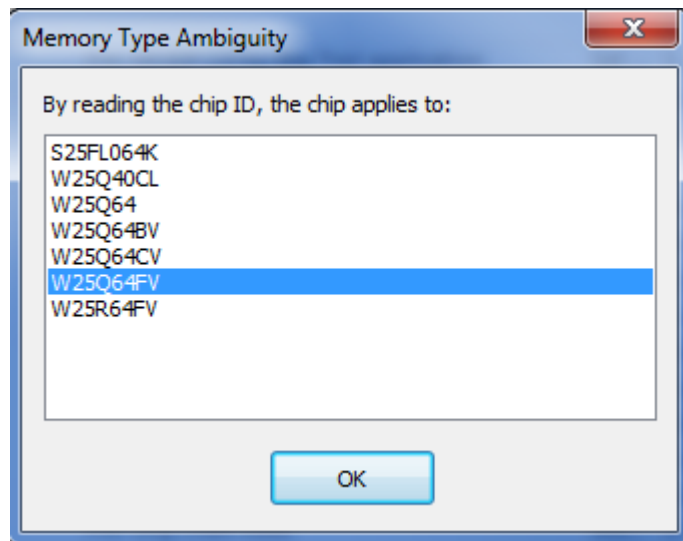
3. Connect the DediProg to the Target System as shown in the figure below.

Figure 18. Connection from DediProg to Target System



4. Plug in the USB connection of the DediProg Flash Programmer to the Host PC. The DediProg software must already be installed on the Host System. You will see a pop-up message similar to the one shown below. Select **W25Q64FV** and click **OK**.

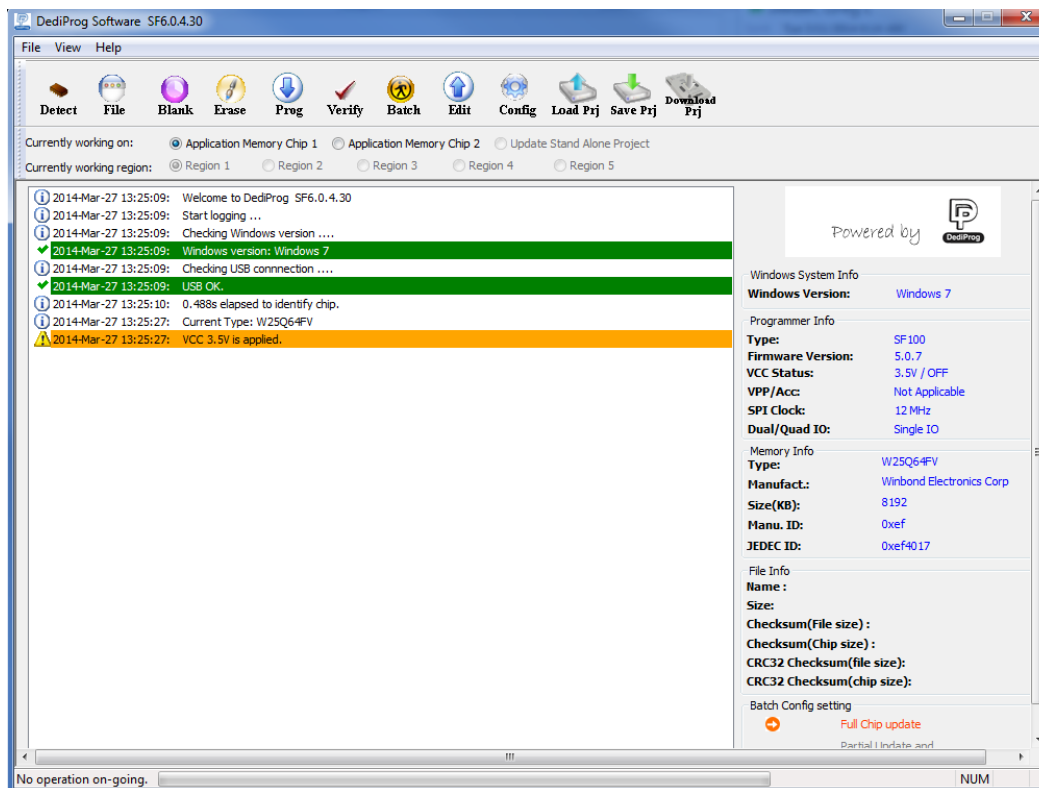
Figure 19. Flash Memory Selection



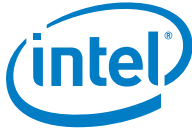


5. The DediProg GUI should start as shown in the figure below.

Figure 20. DediProg Programming Software - Graphical User Interface (GUI)

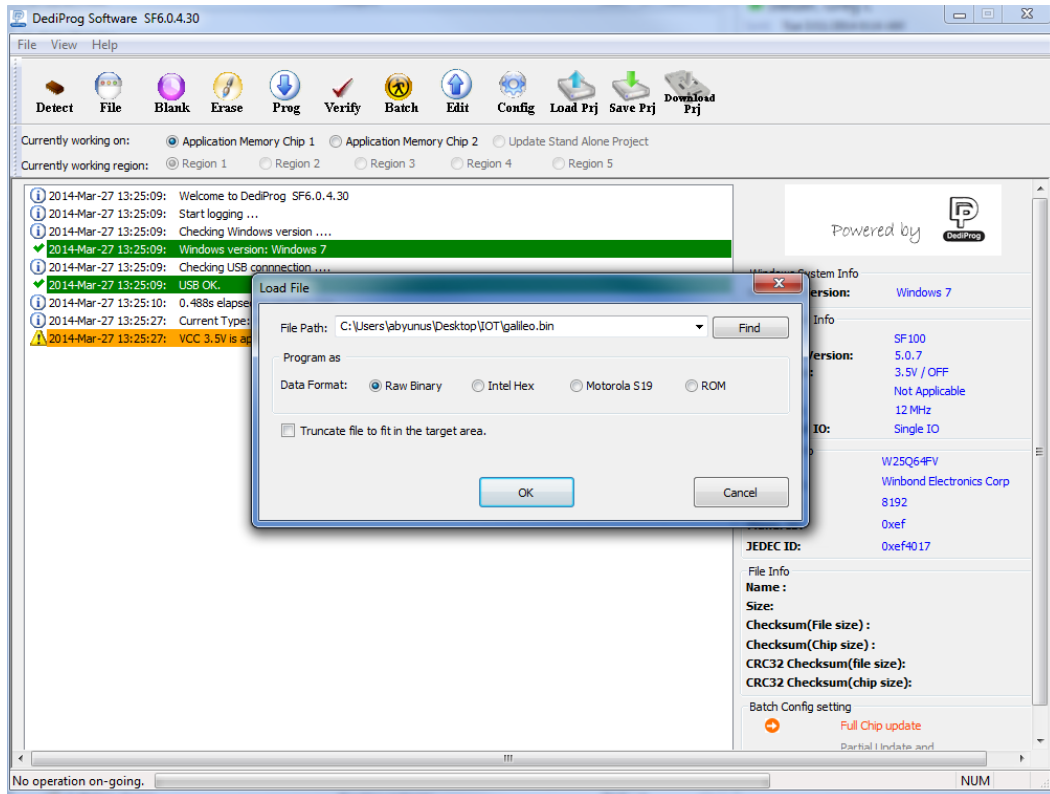


6. Save a backup copy of the existing firmware. See Section 7.3 for instructions.



- Click **File** and select the binary image that you want to flash. The figure below shows the file `galileo.bin` is selected. Click **OK**.

Figure 21. Load File Dialog Box



- Click **Batch** to start the programming. An 8 MB file will take about 45 seconds to complete. See the figure below.

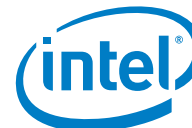
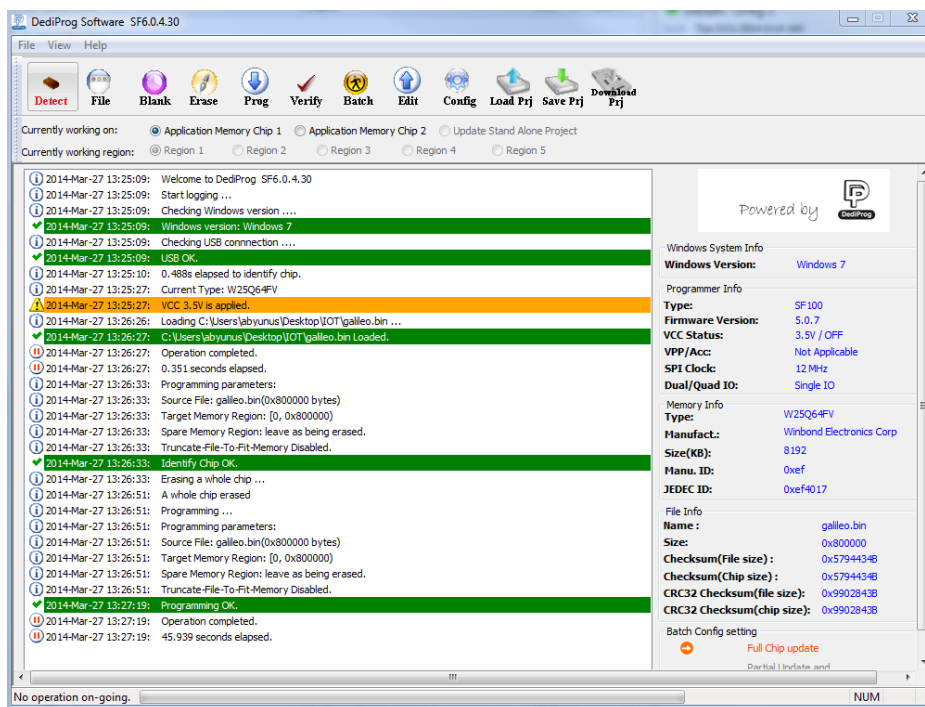


Figure 22. Programming Complete



9. Disconnect the USB cable from the Host System.
10. Disconnect the DediProg cable from the header on the Target System.

7.3 Backing Up the Firmware

Perform the following steps to make a backup copy of the firmware that is on the micro-SD card.

1. Disconnect the power supply from the Target System.
2. Identify the 7-pin SPI header on the Target System. See the red arrow in the figure below.

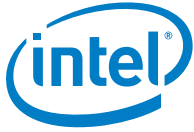
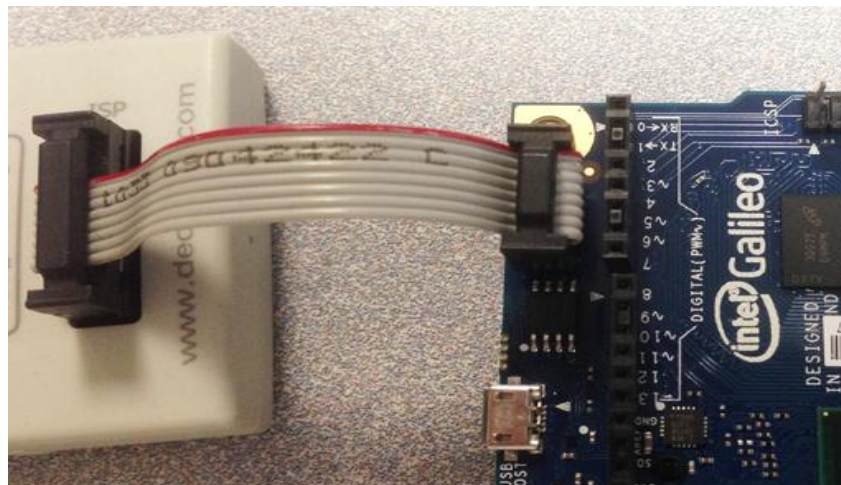


Figure 23. DediProg Header on the Target System



3. Connect the DediProg to the Target System as shown in the figure below.

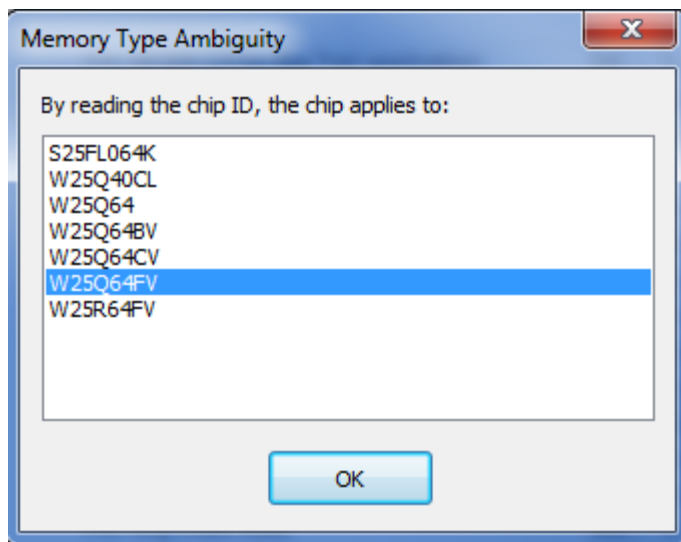
Figure 24. Connection from DediProg to Target System





- 4. Plug in the USB connection of the DediProg Flash Programmer to the Host System. The DediProg software must already be installed on the Host PC. You will see a pop-up message similar to the one shown below. Select **W25Q64FV** and click **OK**.

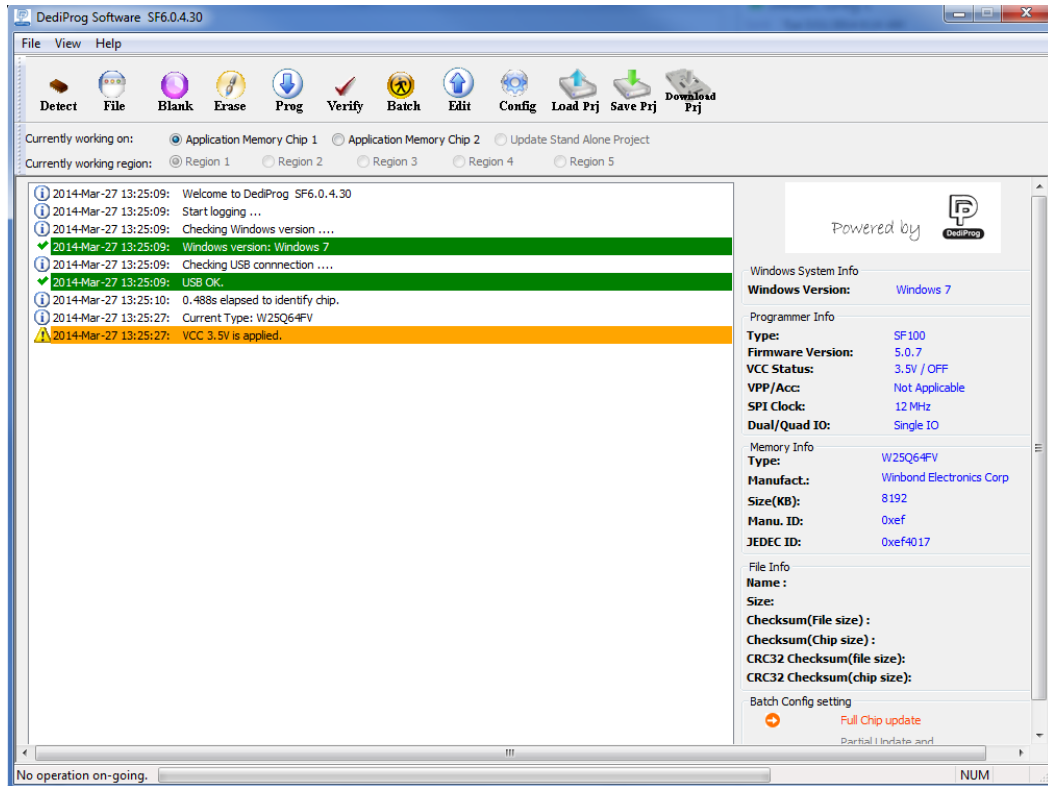
Figure 25. Flash Memory Selection





5. The DediProg GUI should start as shown in the figure below.

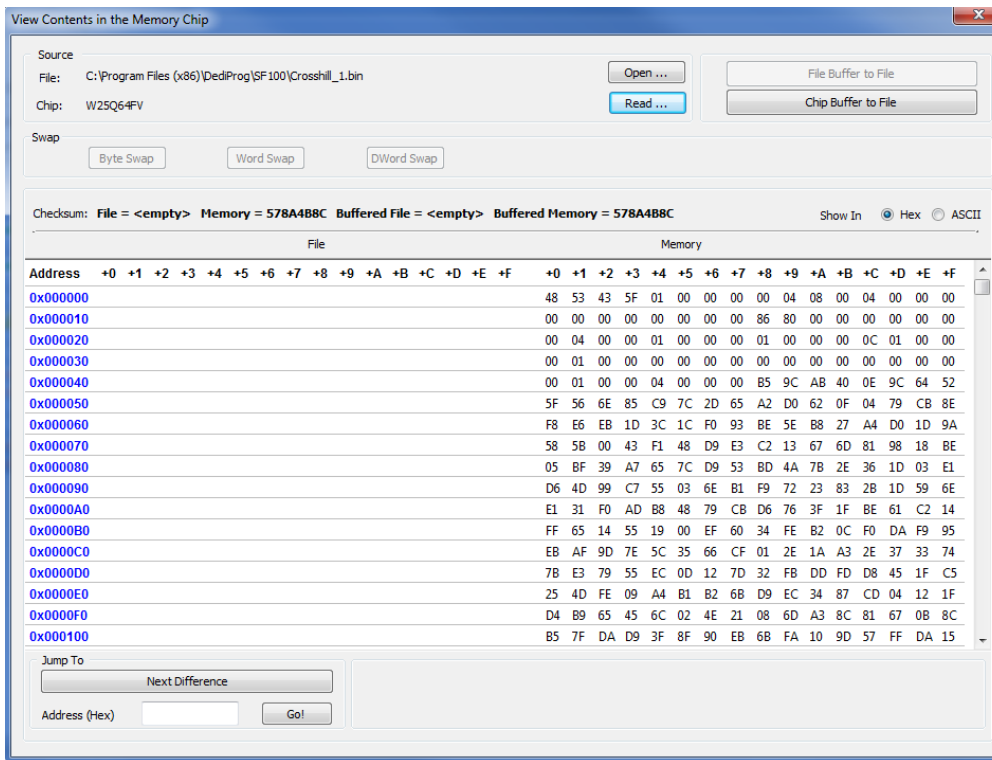
Figure 26. DediProg Programming Software - Graphical User Interface (GUI)



6. Click the **Edit** button. The **View Contents in the Memory Chip** window pop-up is shown in the figure below.



Figure 11. DediProg Edit Screen – with SPI Flash Contents Displayed



7. Click **Read**.
8. The DediProg software will read the contents of the SPI flash memory and display them in the window.
9. Click **Chip Buffer to File**.
10. Enter a file name when prompted.
11. The chip image is saved to the file.

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8 Errata

Errata pertaining to this version of the Development Kit are shown in [Table 2](#).

Table 2. Development Kit Errata

Errata Number	Errata Description	Workaround/Future Fix
1	On the Target System, the micro-USB port labeled "Client USB" does not work.	A fix for this erratum is planned in a future release of Target System firmware.
2	On the Target System, the MAC address of the wired Ethernet interface (eth0) is AA:BB:CC:DD:EE:FF by default.	A fix for this erratum is planned in a future release of Target System firmware. See Section 8.1 for a workaround.
3	Continuous messages including error messages requesting hardware reset are displayed on command line interface after powering on the target system if Intel® 7260 dual-band wireless network adapter is installed.	Login with username as <code>root</code> and password as <code>root</code> while the messages are being displayed. Type <code>reboot</code> . After reboot, these messages will not be displayed.

8.1 Modifying the MAC Address of Wired Ethernet Interface (eth0)

The procedure to modify the MAC address of the wired Ethernet interface requires changes to the Target System's firmware. Follow the steps below to change and then rebuild the firmware.

1. Complete the steps in [Section 5.1](#) and [Section 5.2](#).
2. Find the MAC address of the Target System. It is labelled on the Ethernet port. See figure below.



Figure 28. Location of MAC Address on Target System Ethernet Port



3. On the Host System, edit `galileo-platform-data.ini`. This file can typically be found under `$HOME/Project/layers/wr-bsps/intel-quark/recipes-support/spi-layout-tools/files/platform-data`.
4. Change the string `AABBCCDDEEFF` in to match the MAC address of the Target System. See the figure below.

```
[MAC address 1]
id=3
desc=1st MAC
data.type=hex.string
data.value=AABBCCDDEEFF
```

5. Save and close the file.
6. Execute `make fs` as described in [Section 5.3](#) to rebuild the firmware.
7. Firmware file `Flash-galileo-8M-secured.bin` is created in `$HOME/Project/export/images`.
8. Update the firmware of the Target System as described in [Section 7](#).

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