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Mailing Address:
Productivity Systems, Inc.
1711 Analog Drive
Richardson, Texas 75081
Preface

Read This First

About This Manual

This manual describes the Innovator™ Development Kit for Texas Instruments OMAP™ Platform Deluxe Model. Innovator combines hardware, software, firmware, and documentation to form a standalone platform. This platform can be used in developing and testing applications designed for wireless devices that use popular operating systems.

Chapter 1  Introduction
Introduces the Innovator™ Development Kit Standard Model concept.

Chapter 2  Innovator™ Development Kit Components
Describes at a high level each of the components that make up Innovator.

Chapter 3  User Interfaces
This section covers all of the connectors and buttons that the user will interact with on the Innovator System.

Chapter 4  Innovator Out of Box
This section covers the unpacking and initial checkout of the Innovator Development Kit to be done upon receipt of the system.

Chapter 5  Innovator Disassembly and Assembly Procedures
Describes how to disassemble and reassemble the Innovator.

Chapter 6  Innovator Breakout Board
This chapter provides details about the Innovator Breakout Box.
Please read each caution and warning carefully.

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This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at their own expense will be required to take whatever measures may be required to correct this interference.

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Innovator™ Development Kit is a trademark of Texas Instruments.

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OMAP™ is a trademark of Texas Instruments.


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Chapter 1 – Introduction

1.0 Introduction
This manual describes the Innovator™ Development Kit from a technical standpoint and is targeted at the user of the system. It provides detailed information about the system to be used by personnel that are developing hardware and software for the OMAP310, OMAP710, and OMAP1510 devices.

NOTE: Please be sure and read the Errata Sheet on the Innovator™ Development Kit CD for exceptions to this manual and for other useful information.

1.1 Overview
The Innovator™ Development Kit is designed to run embedded operating systems and provide a generic wireless communication chipset interface. The OMAP™1510 device supports the development and testing of wireless device applications that use Microsoft Windows CE, Symbian EPOC or other operating systems. Innovator™ Development Kit provides developers with an application development platform.

The OMAP™1510 device is based on dual-processor architecture with external memory shared between the two processors through the use of a memory and traffic controller. The two processors are:

- A TI Reduced Instruction Set Computer (RISC) microprocessor unit (MPU) subsystem. The MPU subsystem is based on the TI925T control processor, peripherals, and other components. The TI925T processor is based on the Advanced RISC Machine’s (ARM™) ARM9 technology.
- A TI Digital Signal Processor (DSP) Subsystem. The DSP subsystem incorporates a TI TMS320C55x™ DSP, peripherals, and other components.

The following matrix gives an overview of the goals of the Innovator™ Development Kit.

Table 1. Innovator™ Development Kit Overview Matrix

<table>
<thead>
<tr>
<th>IS</th>
<th>IS NOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A development platform for OMAP™1510 devices with 289 pins.</td>
<td>Offering full pin count visibility for debug</td>
</tr>
<tr>
<td>Cost optimized.</td>
<td>Enables process voltage limits tests</td>
</tr>
<tr>
<td>A small form factor.</td>
<td>Optimal memory configurations</td>
</tr>
<tr>
<td>Optimal mechanical form factor for demonstration.</td>
<td>A bench for power consumption measurements (operation and leakage)</td>
</tr>
<tr>
<td>A Production Module</td>
<td></td>
</tr>
<tr>
<td>Providing a basic peripheral set for wireless computing solutions</td>
<td></td>
</tr>
<tr>
<td>Offering opportunity for OMAP™1510 modules development</td>
<td></td>
</tr>
<tr>
<td>A development platform for OMAP™1510 peripheral drivers</td>
<td></td>
</tr>
<tr>
<td>A development platform for application oriented software</td>
<td></td>
</tr>
</tbody>
</table>
The Innovator™ Development Kit is comprised of several different modules:

- **Processor Module (PM):** Memory, power and support logic for the OMAP™1510 device.
- **Standard Interface Module (IM):** Supports the buttons, LCD display, touch screen, support logic (front light and power supplies), battery management, audio, USB and Serial Interfaces. Chapter 2 provides an illustration of different Interface Module configurations.
- **Standard Expansion Module (EM):** Sits between the Processor and Interface Modules. It supports various add-on functions. The Standard EM has an IrDA and a stereo Audio Input jack.
- **Breakout Board:** Provides Ethernet, Keyboard/Mouse support, advanced debugging capabilities.
- **The CAMERA Module:** Supports a CIF CMOS camera - (output formats of YCrCb 4:2:2, GRB 4:2:2, or RGB raw data. The module is not physically the same as on the OMAP™1510DCEVM)

The Innovator™ Development Kit is delivered in a plastic case with a keypad and an LCD/Touch-Screen Panel.

### 1.2 Purpose and Scope

The purpose of this document is to specify and provide the reader with guidelines to configure the Innovator™ Development Kit, and to develop software to drive the hardware on the Innovator™ Development Kit. The intended audiences for this document include anyone installing, using, or developing on the Innovator™ Development Kit system.

### 1.3 Innovator™ Development Kit Features

- OMAP™1510 289-pin chip.
- Five button Keypad.
- Dual UART interface with voltage adaptation to connectors.
- Clock Generation: 32 KHz and 12 MHz.
- Embedded Flash memory.
- JTAG interfaces MPU.
- Thin film Transistor (TFT) Liquid crystal display (LCD) with Quarter Video Graphics Array (QVGA) 240x320 resolution and 16-bit color. Touch screen mounted over LCD.
- USB Client & Host Interface.
- Multi Media Card Interface.
- I2S Audio Codec AIC 23 power amplifier, speaker, headphones, and microphone connections.
- CIF resolution (352x288) CMOS image sensor that acts as a camera.
- 12.288MHz and 16.934MHz Oscillators, software controlled
- One configuration DIP switch.
- Power and reset circuitry monitor.
- Stand-alone operation.
- Complete set of interface cables
- Reset/status LED on the front.
- Option switch on the back
- Reset button on the back.
- Ethernet Interface (Deluxe Model Only).
- PS/2 Keyboard and Mouse interface (Deluxe Model Only).
1.4 Innovator™ Development Kit Configuration
The Innovator™ Development Kit is supplied in two configurations: Innovator and Innovator Deluxe. Table 2 shows the components that are available with each configuration. Figure 1 shows a picture of the assembled Innovator Module. This manual is for the deluxe version of Innovator.

Table 2. Innovator™ Development Kit Product Matrixes

<table>
<thead>
<tr>
<th>Component</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Innovator</strong></td>
<td></td>
</tr>
<tr>
<td>Standard Interface Module</td>
<td>110-0002-001</td>
</tr>
<tr>
<td>Processor Module</td>
<td>110-0005-001</td>
</tr>
<tr>
<td>Standard Expansion Module</td>
<td>110-0006-001</td>
</tr>
<tr>
<td>Enclosure</td>
<td>110-0012-001</td>
</tr>
<tr>
<td>Stand</td>
<td>240-0020-001</td>
</tr>
<tr>
<td>Accessories</td>
<td>See List</td>
</tr>
<tr>
<td><strong>Innovator Deluxe</strong></td>
<td></td>
</tr>
<tr>
<td>Standard Interface Module</td>
<td>110-0002-001</td>
</tr>
<tr>
<td>Processor Module</td>
<td>110-0005-001</td>
</tr>
<tr>
<td>Standard Expansion Module</td>
<td>110-0006-001</td>
</tr>
<tr>
<td>Enclosure</td>
<td>110-0012-001</td>
</tr>
<tr>
<td>Stand</td>
<td>240-0020-001</td>
</tr>
<tr>
<td>Camera Module</td>
<td>120-0001-001</td>
</tr>
<tr>
<td>Breakout Board</td>
<td>110-0007-001</td>
</tr>
<tr>
<td>Accessories</td>
<td>See List</td>
</tr>
<tr>
<td><strong>Processor Modules</strong></td>
<td></td>
</tr>
<tr>
<td>Processor Module</td>
<td>110-0005-001</td>
</tr>
<tr>
<td><strong>Interface Modules</strong></td>
<td></td>
</tr>
<tr>
<td>Standard 2432 NC Interface Module</td>
<td>110-0002-001</td>
</tr>
<tr>
<td>Standard 2432 NL Interface Module</td>
<td>110-0002-001</td>
</tr>
<tr>
<td><strong>Expansion Modules</strong></td>
<td></td>
</tr>
<tr>
<td>Standard Expansion Module</td>
<td>110-0006-001</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>330-0002-001</td>
</tr>
<tr>
<td>USB Host Cable</td>
<td>220-0003-001</td>
</tr>
<tr>
<td>USB Client Cable</td>
<td>220-0001-001</td>
</tr>
<tr>
<td>Dual Serial Port Cable</td>
<td>220-0002-001</td>
</tr>
<tr>
<td>Headphones</td>
<td>315-0002-001</td>
</tr>
<tr>
<td>Headset</td>
<td>315-0001-001</td>
</tr>
<tr>
<td>Audio Cable</td>
<td>325-0002-001</td>
</tr>
<tr>
<td>Speakers</td>
<td>320-0001-001</td>
</tr>
<tr>
<td>Breakout Board (Deluxe Only)</td>
<td>110-0007-001</td>
</tr>
<tr>
<td>Keyboard w/touchpad (Deluxe Only)</td>
<td>310-0001-001</td>
</tr>
<tr>
<td>Ethernet Cable (Deluxe Only)</td>
<td>325-0003-001</td>
</tr>
</tbody>
</table>
Figure 1. Innovator Module, Front and Side Views
Figure 2. Innovator Module, Top and Rear Views
1.5 Feature/Capability Matrix
The following tables show the different features for each configuration.

Table 3. Standard Interface Module Feature Matrix

<table>
<thead>
<tr>
<th>Feature</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCD</td>
<td>240x320, TFT</td>
</tr>
<tr>
<td>LCD Colors</td>
<td>65,535</td>
</tr>
<tr>
<td>Touchscreen</td>
<td>4-Wire</td>
</tr>
<tr>
<td>Frontlight</td>
<td>CCFL or LED</td>
</tr>
<tr>
<td>Audio CODEC</td>
<td>AIC23</td>
</tr>
<tr>
<td>Headphone/Headset</td>
<td>3.5mm/2.5mm</td>
</tr>
<tr>
<td>Integrated Speakers (2)</td>
<td>On-board</td>
</tr>
<tr>
<td>Navigation Button</td>
<td>5-Pole</td>
</tr>
<tr>
<td>Four User Defined Buttons</td>
<td>Momentary</td>
</tr>
<tr>
<td>USB Port</td>
<td>1 Client/2 Host</td>
</tr>
<tr>
<td>Serial Ports</td>
<td>2</td>
</tr>
<tr>
<td>On/Off Switch</td>
<td>Recessed</td>
</tr>
<tr>
<td>Sleep/Wake Button</td>
<td>Momentary</td>
</tr>
<tr>
<td>Microphone</td>
<td>Omni Directional</td>
</tr>
<tr>
<td>Camera Interface</td>
<td>Dual Placement</td>
</tr>
</tbody>
</table>

Table 4. Processor Module Feature Matrix

<table>
<thead>
<tr>
<th>Feature</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>OMAP™ 1510</td>
</tr>
<tr>
<td>SDRAM</td>
<td>32MB</td>
</tr>
<tr>
<td>User Flash</td>
<td>32MB</td>
</tr>
<tr>
<td>External Memory Interface</td>
<td>SD/MMC</td>
</tr>
<tr>
<td>Boot Flash/RAM</td>
<td>4MB/256K</td>
</tr>
</tbody>
</table>

Table 5. Standard Expansion Module Feature Matrix

<table>
<thead>
<tr>
<th>Feature</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>IrDA</td>
</tr>
<tr>
<td>Stereo Input</td>
<td>2.5mm</td>
</tr>
</tbody>
</table>
1.6 Innovator Modules
The modules included with the standard system are an Interface Module, a Processor Module and an Expansion Module. Figure 3 shows an exploded view of the module assembly.

Figure 3. Innovator Module, Exploded View
1.7 Innovator™ Development Kit Breakout Board
The Innovator™ Development Kit Breakout Board (BoB) is designed to allow full access to each module. It is useful for checking out Expansion Modules that may be designed to plug into the Innovator™ Development Kit. Its unique design allows access to both sides of each of the modules. The Processor, Standard Interface, and Standard Expansion Modules can be installed on the BoB, as shown in Figure 5.
1.7.1 **BoB Test Point Board**

The Test Point Board serves as an access point to test the signals that pass between the modules in the system.

![Figure 6. Test Point Board, Top Side](image)

![Figure 7. Test Point Board, Bottom Side](image)
1.7.2 Keyboard
The keyboard is a Mini-Input 88/89 key keyboard with embedded numeric keypad, 12 dedicated function keys and a built-in touch-pad.

1.7.3 Ethernet Cable
The Ethernet cable is used primarily to assist developers in performing debug functions using the Innovator BoB.
1.7.4 JTAG to Multi-ICE Adapter
The JTAG to Multi-ICE Adapter converts one type of connector to the other. The Breakout Board has both types of connectors, so this adapter is not needed when using the BoB.

Figure 10. JTAG to Multi-ICE Adapter
Chapter 2 – Innovator™ Development Kit Components

2.0 Innovator™ Development Kit Components
This chapter provides a high-level description of the components that make up the Innovator™ Development Kit.

2.1 Processor Module
The heart of the Innovator platform is the Processor Module. Figure 11 shows the current Processor Module. Additional Processor Module designs may appear later, as new processors may be introduced. Figure 13 illustrates the Processor Module Naming Convention.

Figure 11. Processor Module, Front View
The following table defines the features of the Processor Module.

Table 6. Processor Module Features

<table>
<thead>
<tr>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMAP™ 1510 Processor</td>
</tr>
<tr>
<td>32MB SDRAM</td>
</tr>
<tr>
<td>32MB User Flash</td>
</tr>
<tr>
<td>SD/MMC Interface</td>
</tr>
<tr>
<td>4MB/256K Boot Flash/RAM</td>
</tr>
<tr>
<td>Real Time Clock</td>
</tr>
<tr>
<td>JTAG Connector</td>
</tr>
<tr>
<td>Expansion Connectors</td>
</tr>
<tr>
<td>Reset Switch</td>
</tr>
<tr>
<td>Memory Configuration Switch</td>
</tr>
</tbody>
</table>
Options:

- **Processor:**
  - 1510 = OMAP1510

- **Flash Type:**
  - R = NOR
  - N = NAND

- **SDRAM Size:**
  - 64 = 64MB
  - 32 = 32MB
  - 16 = 16MB

- **User Flash Size:**
  - 32 = 32MB
  - 16 = 16MB

00 = Reserved for Future Use

**Figure 13. Processor Module Naming Convention**
2.2 Standard 2432 NC Interface Module
The Standard 2432 NC Interface Module is the first interface module developed. Other interface modules will be added to accommodate additional LCD and switch configurations. Figure 16 illustrates the Interface Module Naming Convention.

NOTE: DO NOT PICK UP THE INTERFACE MODULE BY THE SPEAKERS

Figure 14. Standard 2432 NC Interface Module, Top View
Figure 15. Standard 2432 NC Interface Module, Bottom View
The features of the Standard 2432 NC Interface Module are listed in the following table.

### Table 7. Standard 2432 NC Interface Module Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LCD</strong></td>
<td></td>
</tr>
<tr>
<td>Display Size</td>
<td>240 x 320</td>
</tr>
<tr>
<td>Display Colors</td>
<td>3.5&quot; Diagonal</td>
</tr>
<tr>
<td>Frontlight</td>
<td>64K</td>
</tr>
<tr>
<td>Overlay</td>
<td>CCFL</td>
</tr>
<tr>
<td></td>
<td>4-Wire Touchscreen</td>
</tr>
<tr>
<td><strong>Buttons</strong></td>
<td></td>
</tr>
<tr>
<td>User Defined</td>
<td>Momentary, Single Pole</td>
</tr>
<tr>
<td>Navigation</td>
<td>Five Pole Switch</td>
</tr>
<tr>
<td>On/Off</td>
<td>Recessed Slide Switch</td>
</tr>
<tr>
<td>Sleep/Wake</td>
<td>Momentary, Single Pole</td>
</tr>
<tr>
<td><strong>Interfaces</strong></td>
<td></td>
</tr>
<tr>
<td>Audio</td>
<td>AIC23 Stereo Codec</td>
</tr>
<tr>
<td>Stereo</td>
<td>2.5mm, Stereo Amp</td>
</tr>
<tr>
<td>UART</td>
<td>Dual Serial Port Connector</td>
</tr>
<tr>
<td>USB</td>
<td>Client &amp; Host</td>
</tr>
<tr>
<td>Headphone Jack</td>
<td>3.5mm, Stereo</td>
</tr>
<tr>
<td>Headset Jack</td>
<td>2.5mm, Mono</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td></td>
</tr>
<tr>
<td>Battery Supply</td>
<td>3.7V Li-ION Battery¹</td>
</tr>
<tr>
<td>DC Input</td>
<td>AC/DC Converter, Battery Charger</td>
</tr>
<tr>
<td>Indicator</td>
<td>Red/Green LED</td>
</tr>
</tbody>
</table>

**IM-3.5 L N C-00**  
Interface Module  
Screen Size  
Mode  
Lighting  
Reserved  
LCD Manufacturer  

**Options:**  
**Screen Size:**  
3.5 = 3.5”  
3.2 = 3.2”  
2.2 = 2.2”  

**Mode:**  
L = Landscape  
C = Portrait  

**LCD Manufacturer:**  
N = NEC  
S = Sharp  
G = Samsung  
E = Epson  

00 = Reserved for Future Use

**Figure 16. Interface Module Naming Convention**

¹ All batteries in the field have been recalled and should be returned to PSI immediately.
2.3 Standard 2432 NL Interface Module
The Standard 2432 NL Interface Module is the first interface module developed. Other interface modules will be added to accommodate additional LCD and switch configurations.

NOTE: DO NOT PICK UP THE INTERFACE MODULE BY THE SPEAKERS

Figure 17. Standard 2432 NL Interface Module, Top View
Figure 18. Standard 2432 NL Interface Module, Bottom View
The features of the Standard 2432 NL Interface Module are listed in the following table.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LCD</strong></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>240 x 320</td>
</tr>
<tr>
<td>Size</td>
<td>3.5” Diagonal</td>
</tr>
<tr>
<td>Display Colors</td>
<td>64K</td>
</tr>
<tr>
<td>Frontlight</td>
<td>LED</td>
</tr>
<tr>
<td>Overlay</td>
<td>4-Wire Touchscreen</td>
</tr>
<tr>
<td><strong>Buttons</strong></td>
<td></td>
</tr>
<tr>
<td>User Defined (4)</td>
<td>Momentary, Single Pole</td>
</tr>
<tr>
<td>Navigation</td>
<td>Five Pole Switch</td>
</tr>
<tr>
<td>On/Off</td>
<td>Recessed Slide Switch</td>
</tr>
<tr>
<td>Sleep/Wake</td>
<td>Momentary, Single Pole</td>
</tr>
<tr>
<td><strong>Interfaces</strong></td>
<td></td>
</tr>
<tr>
<td>Audio</td>
<td>AIC23 Stereo Codec</td>
</tr>
<tr>
<td>Stereo</td>
<td>2.5mm, Stereo Amp</td>
</tr>
<tr>
<td>UART</td>
<td>Dual Serial Port Connector</td>
</tr>
<tr>
<td>USB</td>
<td>Client &amp; Host</td>
</tr>
<tr>
<td>Headphone Jack</td>
<td>3.5mm, Stereo</td>
</tr>
<tr>
<td>Headset Jack</td>
<td>2.5mm, Mono</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td></td>
</tr>
<tr>
<td>Battery Supply</td>
<td>3.7V Li-ION Battery(^1)</td>
</tr>
<tr>
<td>DC Input</td>
<td>AC/DC Converter, Battery Charger</td>
</tr>
<tr>
<td>Indicator</td>
<td>Red/Green LED</td>
</tr>
</tbody>
</table>

\(^1\) All batteries in the field have been recalled and should be returned to PSI immediately.
2.4 Standard Expansion Module
The Expansion Module provides for the addition of various mass storage and expansion interfaces. The Standard Expansion Module provides an IrDA interface and a 2.5mm Stereo input interface. Figure 21 illustrates the Expansion Module Naming Convention.
**Figure 20. Standard Expansion Module, Bottom View**

**Figure 21. Expansion Module Naming Convention**

**EM-STD-00**

- Expansion Module
- Module Function
- Reserved

**Module Function:**

- STD = Standard
- GSM = GSM Modem
- BT = Bluetooth
- CFC = Compact Flash
- 00 = Reserved for Future Use
- VGA = VGA Adapter
- TST = Test Point Board

715-0003-203, Version 1.0
2.5 Innovator™ Development Kit Accessories
The following sections describe the accessories that are supplied with each Innovator System.

The Innovator™ Development Kit has its own set of accessories that are shipped with each unit. Your accessory model may vary from the pictures shown below. The accessories included with the Innovator™ Development Kit are:

- AC/DC Power supply
- Stand
- Two Stylus
- Keyboard/Touch Pad Combo
- A pair of powered speakers w/batteries
- Stereo headphones
- Stereo headset
- Dual Serial Cable
- USB Client Cable
- USB Host Cable
- Stereo Audio Cable
- Camera Module (Deluxe only)

2.5.1 AC/DC Power Supply
The power supply converts an input range of 100 – 240Vac, 50 or 60Hz to the 5Vdc needed by the Innovator System.

Figure 22. ASTRODYDNE AC/DC Power Supply
2.5.2 Stand and Stylus
The stand is used to hold the Innovator Module in an upright position. The back cover of the Innovator Module is slotted to fit over the brads on the stand. The stylus can be used as a writing device or as a navigation and selection tool.

Figure 23. Stand and Stylus

2.5.3 Powered Speakers
The active speaker system provides up to 2W of stereo audio. Speakers can be powered through an AC adapter, or in some cases using AA batteries. The AC adapter is not provided with the system, but can be purchased at locations where powered speakers are sold.

Figure 24. Sony SRS-A21 Speakers
2.5.4 Headphones
The headphones provide a frequency response of 80 to 18,000 Hz and an impedance of 32 ohms.

![Koss KTX-1 Headphones](image)

**Figure 25. Koss KTX-1 Headphones**

2.5.5 Headset
The headset provided is a headband style headset with outside-the-ear speaker and boom mic. The rotating boom microphone adjusts to either side of the head.

![Jensen JTH940 Headset](image)

**Figure 26. Jensen JTH940 Headset**
2.5.6 USB Client Cable
This cable is used to connect to the USB interfaces. A dongle is used to convert the 10-pin connector from the Innovator™ Development Kit to a client USB cable.

![USB Client Cable](image1)

Figure 27. USB Client Cable

2.5.7 USB Host Cable
The USB Host Cable passes the USB transceiver's digital inputs and outputs to transmit and receive USB signals.

![USB Host Cable](image2)

Figure 28. USB Host Cable
2.5.8 Dual Serial Port Cable
The connectors for each of the serial ports are 9-pin PDA I/O female low profile connectors. A dongle is used to convert the 9-pin connectors to the male/female DB9 connectors labeled COM1 and COM2. COM2 is used as a null modem interface. COM1 and COM2 connectors can be connected together to perform loop-back testing.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
</tr>
<tr>
<td>3</td>
<td>TX</td>
</tr>
<tr>
<td>4</td>
<td>DTR</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
</tr>
</tbody>
</table>

Figure 29. Dual Serial Port Cable
2.5.9 Stereo Input Cable
The Stereo Input Cable connects the Innovator to a PC audio out jack. It is equipped with a 2.5mm connector on one end and a 3.5mm connector on the other end. The 2.5mm end of the cable plugs into the stereo input jack on the Expansion Module. These cables are used to connect the 3.5mm jack from CD players, stereos, speakers, PC/TV tuners and other audio devices to the Innovator.

2.5.10 Camera Module
The Camera Module is a CMOS CIF Color Digital Camera with a ¼ inch lens. It has a dual placement connector so it can be plugged in either direction. This affords the ability to face the camera towards or away from the user. No matter which way it is plugged in, the pinout of the Interface Module connector will be compatible with the Camera Module. The camera should not be plugged in with power connected.
Table 9. Camera Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array Element – CIF (QCIF)</td>
<td>352x288 (176x144)</td>
</tr>
<tr>
<td>Data Format</td>
<td>YCrCb 4:2:2, GRB 4:2:2, RGB Raw Data</td>
</tr>
<tr>
<td>Image Area</td>
<td>3.1mm x 2.5mm</td>
</tr>
<tr>
<td>8/16 bit Video Data</td>
<td>ITU-601, ITU-656, ZV Port</td>
</tr>
<tr>
<td>Max. Frames/Second</td>
<td>60 FPS</td>
</tr>
<tr>
<td>Image Enhancement</td>
<td>Brightness, Contrast, Gamma, Saturation, Sharpness</td>
</tr>
<tr>
<td>Synchronization</td>
<td>Internal/External</td>
</tr>
<tr>
<td>Gamma Correction</td>
<td>0.45/0.55/1.00</td>
</tr>
<tr>
<td>SCCB Programmable</td>
<td>Color Saturation, Brightness, Contrast, White Balance, Exposure Time, Gain</td>
</tr>
<tr>
<td>Scan Mode</td>
<td>Progressive</td>
</tr>
<tr>
<td>S/N Ratio</td>
<td>&gt; 48dB (AGC off, Gamma = 1)</td>
</tr>
<tr>
<td>Power Supply</td>
<td>3.0 – 3.6Vdc</td>
</tr>
<tr>
<td></td>
<td>5Vdc/3.3Vdc (DIO)</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>&lt; 20mA Active, &lt; 10µA Standby</td>
</tr>
<tr>
<td>Package</td>
<td>48-pin LCC</td>
</tr>
</tbody>
</table>
Chapter 3 – User Interfaces

3.0 User Interfaces
This section covers all of the connectors and buttons that the user will interact with on Innovator Module.

![User Interfaces Diagram](image)

Figure 32. User Interfaces, Front View
Figure 33. User Interfaces, Top and Side Views
3.1 Battery Compartment
The Innovator™ Development Kit will operate off of a 3.7V Lithium Ion Rechargeable Battery\(^1\). The battery is installed and replaced by removing the back cover. Plug the Battery into battery jack on the Expansion Module with the pins on the plug facing the circuit board. Push the plug all the way into the connector.

Figure 34. Battery Connection

When the modules are assembled, the battery should be positioned as shown below. Tuck the wires up underneath the Processor Module to keep them from getting pinched when the cover is put on.

Figure 35. Battery Position

\(^1\) All batteries in the field have been recalled and should be returned to PSI immediately.
3.2 DC Input Jack (J12)
A +5V 2Amp supply provides power to the system through the DC Input Jack on the Interface Module. Note that the plug is a 1.3mm center negative connector.

![Figure 36. DC Input Jack](image1)

3.3 Recessed On/Off Switch (SW1)
The On/Off switch is a recessed slide switch that turns power On in the up position and turns power Off in the down position. This switch is meant to be used as the initial power-up switch for the Innovator. Once the Innovator is turned on, the Sleep/Wake button should be used to cycle power on and off if the OS supports this function. Use the Stylus as shown below to power-up the Innovator Module.

![Figure 37. Recessed On/Off Switch](image2)
3.4 Five Pole Switch (SW2)
The Five Pole Switch is a sub-miniature navigation tact switch with up to five single pole normally open contacts. Actuating the shaft in the up, down, right or left direction individually closes four momentary contacts, which provide the scanning function. The fifth contact is a push-to-select contact.

3.5 Microphone (MK1)
The microphone is an omni directional microphone and is mounted on the Interface Module. The microphone is automatically disabled when a Headphone is plugged into J11.

3.6 Camera Interface (J9)
A camera can be mounted on the top of the Innovator and can be plugged in either direction. This will allow the camera to be facing toward or away from the user.
3.7 IrDA Interface
The Innovator provides a two-way cordless infrared light transmission data port for high-speed short range, line of sight, point-to-point cordless data connectivity between devices of all types.

3.8 Optical Sensor (CCFL Displays)
The Optical Sensor on CCFL Displays is used to detect the ambient light level. This information can be used to adjust the brightness of the LCD Display as ambient light changes. The actual changing of the LCD brightness on the CCFL Display is under software control.

3.9 Status LED (D13)
The Status LED illuminates green when power is applied, even while the Innovator is in Sleep Mode. When power switch is in the off position and power supply is plugged in, the LED will illuminate red, and if a battery is installed, the battery will be charging. The LED color can also be controlled by certain software functions.

3.10 Sleep/Wake Button (SW8)
The Sleep/Wake button is used as the Innovator’s On/Off switch if supported by the OS. When pressed, it will put the Innovator into sleep mode, or restore (wake) the Innovator from sleep mode. This is a way to conserve power (battery life) without removing power from the unit.

3.11 User Defined Buttons (SW4, SW5, SW6 and SW7)
These four buttons are provided for user-defined functionality. Buttons SW4-SW7 are low profile SMT devices that lay flat onto the board. They are configured as momentary single pole devices with tactile feedback.

3.12 Headphone Jack (J11)
A stereo headphone or external speakers can be connected to the headphone jack. This provides for stereo audio to be heard through a pair of headphones or external powered speakers. The headphone jack is a standard 3.5mm jack and will accept any commercially available devices intended for audio use. When the headphone jack is used, the Innovator’s on-board speakers are disabled.
Figure 40. Headphone Connection

Figure 41. Speakers Connection
3.13 Headset Jack (J10)
The headset jack is a 2.5mm jack used with a headset. This jack used to connect a combination earphone and microphone. It features a single audio output and a built-in microphone input. When installed, it removes the connection to the Innovator’s built-in microphone and disables the Innovator’s on-board speakers.

Figure 42. Headset Connection

3.14 Stereo Input
The Stereo Input jack is a standard 2.5mm jack and will accept any commercially available 3.5mm devices intended for audio use when used with the audio cable. When the Stereo Input jack is used, the Innovator’s on-board speakers are disabled.

Figure 43. Stereo Input Connection
3.15 Reset Switch
The reset switch is accessible from the rear of the Innovator case or the back of the Processor Module. It is a dual function reset switch in that it can generate an ARM only reset or full Power On reset. When switch is just pressed and released, it generates an ARM reset. When pressed and held for at least 2 seconds, it generates a Power On reset.

Figure 44. Processor Module Reset Switch
3.16 Memory Configuration Switch

Figure 45 shows the location of the Memory Configuration switch. This switch is used to allow the running of the IBoot application. IBoot is used to run diagnostics or to flash the User Flash with an operating system. Table 10 lists the function of each switch. Innovator has the ability to flash two OSs in the User Flash as long as they do not exceed 32MB each. This switch is used to select which of these OSs is run when the Innovator is reset.

![Memory Configuration Dipswitch](image)

**Figure 45. Memory Configuration Dipswitch**

**Table 10. Memory Configuration Switch**

<table>
<thead>
<tr>
<th>Mode</th>
<th>SW1</th>
<th>SW2</th>
<th>SW3</th>
<th>SW4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot RAM</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Run Image in User Flash0</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Run Image in User Flash1</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>IBoot (Boot Flash)</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
</tbody>
</table>
3.17 USB Interface
There are two types of cables supplied to connect to the USB interfaces. One is for the Client function and the other is for the Host function.

3.17.1 Client USB Interface
The table below defines the pin connections from the Interface Module connector to the Client USB connector. The figures below show how the USB Client is installed.

Table 11. Client USB Interface

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Pin</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB_DP</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>USB_DM</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Not Used</td>
<td>3</td>
<td>Not Used</td>
</tr>
<tr>
<td>VCC_USB</td>
<td>4</td>
<td>VCC</td>
</tr>
<tr>
<td>Ground</td>
<td>5</td>
<td>Ground</td>
</tr>
<tr>
<td>Not Used</td>
<td>6</td>
<td>Not Used</td>
</tr>
<tr>
<td>Not Used</td>
<td>7</td>
<td>Not Used</td>
</tr>
<tr>
<td>Not Used</td>
<td>8</td>
<td>Not Used</td>
</tr>
<tr>
<td>Not Used</td>
<td>9</td>
<td>Not Used</td>
</tr>
<tr>
<td>Not Used</td>
<td>10</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

Figure 46. USB Client Cable Installation
Press in on both sides to insert and release the cable

Figure 47. USB Connector Installation

3.17.2 Host USB Interface
The table below defines the pin connections from the Interface Module connector to the Host USB connector.

Table 12. Host USB Interface

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Pin</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Used</td>
<td>1</td>
<td>Not Used</td>
</tr>
<tr>
<td>USB1D+</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>USB1D-</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5VCC_MAIN</td>
<td>4</td>
<td>VCC</td>
</tr>
<tr>
<td>Ground</td>
<td>5</td>
<td>Ground</td>
</tr>
<tr>
<td>Ground</td>
<td>6</td>
<td>Ground</td>
</tr>
<tr>
<td>Ground</td>
<td>7</td>
<td>Ground</td>
</tr>
<tr>
<td>VCC_USB</td>
<td>8</td>
<td>VCC</td>
</tr>
<tr>
<td>USB2D+</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>USB2D-</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Figure 48. USB Host Cable Installation
3.18 Dual Serial Port Interface
UART1 from the Processor Module is used as the serial port referred to as COM1. UART2 from the Processor Module is used as the serial port referred to as COM2. Figure 49 and Figure 50 show the location of Connector Pin 1. Table 12 lists the pin names and signal descriptions.
Table 13. Serial Cable Connector Pinouts

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Pin</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTR_SUBD2</td>
<td>1</td>
<td>Data terminal ready</td>
</tr>
<tr>
<td>TX_SUBD2</td>
<td>2</td>
<td>Transmit Signal. Data output</td>
</tr>
<tr>
<td>RTS_SUBD2</td>
<td>3</td>
<td>Request to send</td>
</tr>
<tr>
<td>CTS_SUBD2</td>
<td>4</td>
<td>Clear to send</td>
</tr>
<tr>
<td>RI_SUBD2</td>
<td>5</td>
<td>Ring input</td>
</tr>
<tr>
<td>DCD_SUBD2</td>
<td>6</td>
<td>Data Carrier Detect</td>
</tr>
<tr>
<td>DSR_SUBD2</td>
<td>7</td>
<td>Data set ready</td>
</tr>
<tr>
<td>RX_SUBD2</td>
<td>8</td>
<td>Receive signal. Data input</td>
</tr>
<tr>
<td>Ground</td>
<td>9</td>
<td>Ground</td>
</tr>
<tr>
<td>Ground</td>
<td>10</td>
<td>Ground</td>
</tr>
<tr>
<td>DTR_SUBD1</td>
<td>11</td>
<td>Data terminal ready</td>
</tr>
<tr>
<td>TX_SUBD1</td>
<td>12</td>
<td>Transmit Signal. Data output</td>
</tr>
<tr>
<td>RTS_SUBD1</td>
<td>13</td>
<td>Request to send</td>
</tr>
<tr>
<td>CTS_SUBD1</td>
<td>14</td>
<td>Clear to send</td>
</tr>
<tr>
<td>RI_SUBD1</td>
<td>15</td>
<td>Ring input</td>
</tr>
<tr>
<td>DCD_SUBD1</td>
<td>16</td>
<td>Data Carrier Detect</td>
</tr>
<tr>
<td>DSR_SUBD1</td>
<td>17</td>
<td>Data set ready</td>
</tr>
<tr>
<td>RX_SUBD1</td>
<td>18</td>
<td>Receive signal. Data input</td>
</tr>
</tbody>
</table>
Chapter 4 – Innovator™ Development Kit Out of Box

4.0 Innovator™ Development Kit Out of Box
This chapter provides information on unpacking Innovator and verifying that it is operational upon receipt by the user.

4.1 Unpacking Innovator
The figures below show the Innovator™ Development Kit as it is shipped. Open the box and remove the top layer of foam material to expose the contents as you see below. The Power Supply is located beneath the Innovator Module (see Figure 52).

Figure 51. Innovator™ Development Kit Package
Figure 52. Power Supply Location
4.2 Connecting Power
To connect power to the Innovator Module, insert connector from power supply into jack as shown in the picture below. DO NOT force the power connector into the jack as it may cause damage to the jack.

**NOTE:** It is normal on the NC Version for the power connector to be exposed.

![Power Supply Connection](image.png)

**Figure 53. Power Supply Connection**

4.3 Turning the Innovator Module Power Switch On
To apply power to the Innovator, put the stylus into opening on the case as shown below. Push upward on power switch until the Power On LED illuminates green.

![Turning On the Innovator Module Power Switch](image.png)

**Figure 54. Turning On the Innovator Module Power Switch**
4.4 Innovator Operating System Verification
Operating Systems (OS) may be preloaded at the factory. The OS may be loaded in either User Flash location (User Flash 0 or User Flash 1), or in some cases both User Flash locations (User Flash 0 and User Flash 1). If no operating system is loaded, refer to the IBoot System Software User’s Guide.

4.4.1 Running an Operating System from User Flash 0
To enable the OS from User Flash 0, insure the Memory Configuration switch on the back of the unit is set as shown below. Before changing a switch setting, the Innovator should be turned off. If the Innovator is left on when switch settings are made, you must use the reset button to do a power reset before switch settings will take affect.

```
SW1 – OFF
SW2 – OFF
SW3 – ON
SW4 – OFF
```

After setting the switches, turn the Innovator on, or press the Reset Button to display the OS.
4.4.2 Running an Operating System from User Flash 1
To enable the OS from User Flash 1, insure the Memory Configuration switch on the back of the unit is set as shown below. Before changing a switch setting, the Innovator should be turned off. If the Innovator is left on when switch settings are made, you must use the reset button to do a power reset before switch settings will take affect.

SW1 – OFF
SW2 – OFF
SW3 – ON
SW4 – ON

![User Flash 1 Switch Settings](image)

After setting the switches, turn the Innovator on, or press the Reset Button to display the OS.

4.4.3 Running IBoot
IBoot is the third bootable kernel in Innovator. This should be run to use the diagnostics and insure that the Innovator system is operating properly. For instructions on how to load and use the Innovator IBoot kernel, please refer to the IBoot System Software User’s Guide.
4.5 Registering Innovator

In order to receive technical support for your Innovator™ Development Kit, you MUST register your individual unit. To register your Innovator™ Development Kit, follow the instructions on the Registration Card included with the Innovator™ Development Kit.

NOTE: Your registration card may appear differently than the one shown below.

Figure 57. Sample Registration Card, Front and Back
Chapter 5 – Innovator Disassembly/Assembly

5.0 Innovator Disassembly and Assembly Procedures
This chapter describes how to disassemble and reassemble the Innovator. This is normally done when moving from the case to the Breakout board or from the Breakout Board to the case.

5.1 Innovator Disassembly
To disassemble the Innovator, proceed as follows:

Caution: To avoid damage to the Innovator, please read each step carefully and completely before proceeding with that step.

Step 1: Using a Philips Screwdriver, remove four Philips Head screws from back cover and set cover aside. Do not remove screws from front cover.

Figure 58. Back Cover Philips Head Screws
Step 2: Remove Processor Module and set it aside.

Step 3: Remove Expansion Module.

Step 4: Unplug battery from Expansion Module connector. Grip plug with fingernail and thumbnail and remove plug from connector. Set battery aside.

---

1 All batteries in the field have been recalled and should be returned to PSI immediately.
Step 5: Using a small flat blade screwdriver, slide blade in between Headphone Jack, Headset Jack and front cover, and gently pry the Interface Module loose from the front cover. If necessary, depress the Sleep/Wake Button to clear the opening in the cover. Remove Interface Module from front cover.

Figure 60. Removing Interface Module
5.2 Innovator Assembly
To assemble the Innovator, proceed as follows:

Caution: To avoid damage to the Innovator, please read each step carefully and completely before proceeding with that step.

Step 1: Locate connectors P2 and P3 on Expansion Module, place the Interface Module connectors over Expansion Module connectors and press the two modules together until they fit tight.

Figure 61. Expansion Module Connectors P2 and P3

Step 2: Orient the Processor Module so that SD/MMC connector will be at the top when assembled. Place the Processor Module connectors over Expansion Module connectors and press the two modules together until they fit tight. If the connectors do not mate, check to make sure Processor Module is oriented properly.
Step 3: Squeeze all module connections once more to insure there are no gaps in the connections.

![No Gaps Between Connectors](image1)

Figure 62. Module Connections

Step 4: Plug the Battery¹ into battery jack on the Expansion Module with the pins on the plug facing the circuit board. Push the plug all the way into the connector. The battery should be positioned as shown below. Tuck the wires up underneath the Processor Module to keep them from getting pinched when the cover is put on.

![Battery Installation](image2)

Figure 63. Battery Installation

¹ All batteries in the field have been recalled and should be returned to PSI immediately.
Step 5: Insert the assembled modules into the front cover.

Step 6: Push the other side of the assembled modules into the cover so that it snaps into place, with the audio jacks and Sleep/Wake button properly aligned with the opening in the cover. Care should be taken not to damage the Sleep/Wake button, depress switch if necessary. Bow the cover out slightly using a small screwdriver or other device so the button will clear the front cover.

Step 7: Once the Sleep/Wake button clears the front cover, it may take a little more force to completely seat the assembled modules in place. You should hear a "snap" when this happens.

Step 8: Slide the top insert into the top of the front cover so that the openings line up with the connectors on the Interface and Processor modules.

Figure 64. Assembled Modules Installation

Figure 65. Top Insert Orientation
Step 9: Ensure the battery wires are up underneath the Processor Module. If wires are exposed, the back cover may not fit properly.

Step 10: Place the back cover over the Processor Module.

Step 11: Using a Philips Screwdriver, secure back cover in place using two (2) Philips head screws on each side.

Figure 66. Back Cover Philips Head Screw Locations
Chapter 6 – Innovator Breakout Board (BoB)

6.0 Innovator Breakout Board (BoB)
This chapter explains the Innovator Breakout Board (BoB). The Innovator Breakout Board (BoB) is designed to allow full access to each module. It is useful for checking out Expansion Modules that may be designed to plug into the Innovator™ Development Kit. Its unique design allows access to both sides of each module plugged directly into it.

NOTE: SW1 dipswitch 4 must be set to ON to apply power to the BoB’s onboard circuitry. See Figure 70 for a close-up view of SW1.
6.1 BoB Module Configurations
For testing purposes, modules can be configured on the BoB in a number of different ways. The diagrams below show most all of the configuration possibilities.
Figure 69. BoB Module Configurations
6.2 Breakout Board Top Side Features

This section describes the components, test points and connections featured on the topside of the BoB.

Figure 70. Breakout Board Top Side
6.3 Breakout Board Bottom Side Features
This section describes the components, test points and connections featured on the bottom side of the BoB.
6.4 Ethernet Configuration Switch
Switch SW1 sets different configurations of Ethernet. Dipswitch 4 must always be set to ON to apply power to the BoB’s onboard circuitry.

<table>
<thead>
<tr>
<th>SW1-4</th>
<th>SW1-3</th>
<th>SW1-2</th>
<th>SW1-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

6.5 Jumper Settings
JTAG and Multi-ICE are selected using Jumpers 1 and 2. The table below shows the jumper positions and the connector that is activated.

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Pin #s</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP1</td>
<td>1-2</td>
<td>Multi-ICE</td>
</tr>
<tr>
<td>JP1</td>
<td>2-3</td>
<td>JTAG</td>
</tr>
<tr>
<td>JP2</td>
<td>1-2</td>
<td>Multi-ICE</td>
</tr>
<tr>
<td>JP2</td>
<td>2-3</td>
<td>JTAG</td>
</tr>
</tbody>
</table>

6.6 Test Points
The table below shows the signals that appear at each test point.

<table>
<thead>
<tr>
<th>Test Point</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>External Power Supply</td>
</tr>
<tr>
<td>TP2</td>
<td>Power Connector Voltage</td>
</tr>
<tr>
<td>TP3</td>
<td>Interface Module 5V Supply</td>
</tr>
<tr>
<td>TP4</td>
<td>Expansion Module 5V Supply</td>
</tr>
<tr>
<td>TP5</td>
<td>Interface Module 5V Supply</td>
</tr>
<tr>
<td>TP6</td>
<td>Processor Module 5V Supply</td>
</tr>
<tr>
<td>TP7</td>
<td>Processor Module 3.3V Supply</td>
</tr>
<tr>
<td>TP8</td>
<td>Expansion Module 3.3V Supply</td>
</tr>
<tr>
<td>TP9</td>
<td>Processor Module 3.3V Supply</td>
</tr>
<tr>
<td>TP10</td>
<td>Interface Module 3.3V Supply</td>
</tr>
<tr>
<td>TP11</td>
<td>Processor Module V I/O</td>
</tr>
<tr>
<td>TP12</td>
<td>Expansion Module V I/O</td>
</tr>
<tr>
<td>TP13</td>
<td>Processor Module V I/O</td>
</tr>
<tr>
<td>TP14</td>
<td>Interface Module V I/O</td>
</tr>
</tbody>
</table>
6.7 Breakout Board Equipment Connections
The following illustrations show how external equipment and accessories are connected to the BoB.

6.7.1 JTAG Connection
A JTAG is connected to J12. Before using, Jumper 1 and Jumper 2 should be placed in accordance with Table 15.

Figure 72. JTAG Connection
6.7.2 Multi-ICE Connection

The Multi-ICE Emulator is connected to J13. Before using, Jumper 1 and Jumper 2 should be placed in accordance with Table 15.

NOTE: The Power Supply shown in the figure below is not included with the Breakout Board.

Figure 73. Multi-ICE Connection
6.7.3 Keyboard and Ethernet Connections

Figure 74. Keyboard and Ethernet Cable Connections
6.8 BoB Test Point Module
The Test Point Module serves as an access point to test the signals that pass between the modules in the system. The illustration below shows the location of the A and B Bus connectors. Adjacent to each connector are test points that allow you to monitor the signals that are present on each bus. The pins at the top of the module allow access to all of the LCD connections.

![Test Point Module Diagram]

Figure 75. Test Point Module, Top and Bottom