Innovator Development Kit for the OMAP Platform

User's Guide

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Preface

Read This First

About This Manual

The Innovator™ Development Kit for the OMAP™ platform is a hand-held expandable, flexible development board for TI's OMAP platform that supports multiple operating systems, reducing the need for separate development boards.

Supporting the OMAP5910 and OMAP1510 digital signal processors (DSPs), this Innovator Development Kit provides a single environment for development that takes advantage of TI's family of high-performance, power-efficient processors, a robust software infrastructure, and a comprehensive support network.

Trademarks

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Chapter 1

Introduction

This manual describes the Innovator™ Development Kit. It provides detailed information about how the system is to be used for developing hardware and software for the OMAP1510 device.

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1.1 Overview

The Innovator Development Kit is designed to run embedded operating systems and provide a generic wireless communication chipset interface. The OMAP1510 device supports the development and testing of wireless device applications that use Microsoft Windows CE, Symbian EPOC, or other operating systems. The Innovator Development Kit provides developers with an application development platform.

The OMAP1510 DSP is a 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 (MU) subsystem. The MU 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 DSP subsystem. The DSP subsystem incorporates a TMS320C55x™ DSP, peripherals, and other components.

Table 1–1 gives an overview of the goals of the Innovator Development Kit.

Table 1–1. Innovator Development Kit Overview Matrix

IS	IS NOT
A development platform for an OMAP1510 DSP with 289 pins	Offering full pin count visibility for debug
Cost optimized	Enables process voltage limits tests
A small form factor	Optimal memory configurations
Optimal mechanical form factor for demonstration	A bench for power consumption measurements (operation and leakage)
A production module	
Providing a basic peripheral set for wireless computing solutions	
Offering opportunity for OMAP1510 modules development	
A development platform for OMAP1510 peripheral drivers	
A development platform for application oriented software	

The Innovator Development Kit consists of several different modules:

- ❑ Processor Module (PM): Memory, power, and support logic for the OMAP1510 device.
- ❑ Interface Module (IM) that supports buttons, LCD, touch-screen, support logic (front light and power supplies), battery management, audio, USB, and serial interfaces.
- ❑ Expansion Module (EM) that sits between the processor and interface modules. It contains the IrDA and stereo audio input jack.
- ❑ Breakout Board (BoB) provides Ethernet, keyboard/mouse support, and advanced debugging capabilities.
- ❑ The Camera Module supports a CIF CMOS camera – (with 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 Innovator Development Kit Features

- ❑ OMAP1510 289-pin chip
- ❑ Five pole switch
- ❑ Dual UART interface with voltage adaptation to connectors
- ❑ Clock generation: 32 KHz and 12 MHz
- ❑ Embedded flash memory
- ❑ JTAG interface to microcontroller and digital signal processor
- ❑ Thin film transistor (TFT) liquid crystal display (LCD) with quarter video graphics array (QVGA) 240x320 resolution and 16-bit color. Touchscreen mounted over LCD.
- ❑ USB client and host interface
- ❑ MMC/SD card interface
- ❑ I2S audio codec AIC 23 power amplifier, speaker, headphones, and microphone connections

- ❑ CIF resolution (352 × 288) CMOS image sensor that acts as a camera
- ❑ 12.288-MHz and 16.934-MHz software controlled oscillators
- ❑ One configuration DIP switch on back
- ❑ Power and reset circuitry monitor
- ❑ Stand-alone operation
- ❑ Complete set of interface cables
- ❑ Reset/status LED on the front
- ❑ Reset button on the back
- ❑ Ethernet Interface
- ❑ PS/2 keyboard and mouse interface

1.3 Innovator Development Kit Configuration

The Innovator Development Kit includes the components listed in Table 1–2. Figure 1 shows a picture of the assembled Innovator System.

Table 1–2. Innovator Development Kit Product Matrixes

Component	Part Number
Interface Module	110–0002–001
Processor Module (either 16M or 32M)	
Processor Module 16M	110–0011–001
Processor Module 32M	110–0005–001
Enclosure	110–0012–001
Stand	130–0003–011
Expansion Module w/Stereo Jack and IrDA Interface	110–0006–001
Camera Module	120–0001–001
Breakout Board	110–0007–001
Accessories	
Power Supply	330–0002–001
USB Host Cable	220–0003–001
USB Client Cable	220–0001–001
Dual Serial Port Cable	220–0002–001
Headphones	315–0002–001
Headset	315–0001–001
Audio Cable	325–0002–001
Speakers	320–0001–001
Keyboard w/touchpad	310–0001–001
Ethernet Cable	325–0003–001

Figure 1–1. Innovator Module, Front and Side Views

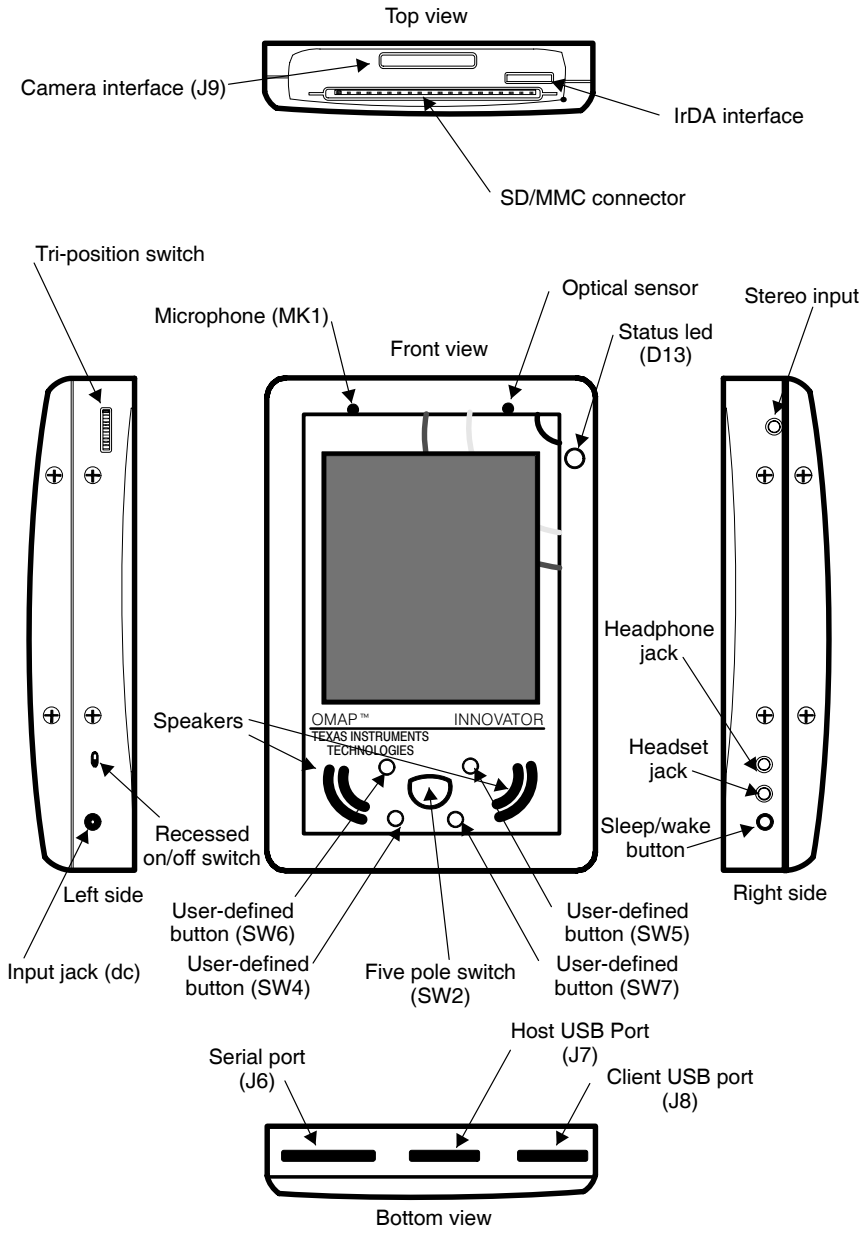
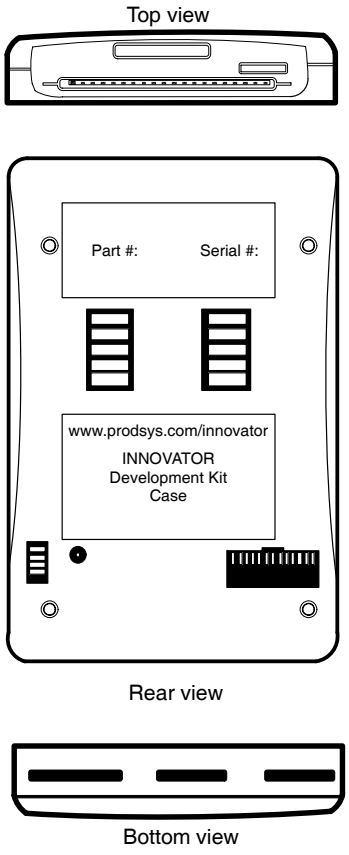


Figure 1–2. Back View



1.4 Feature/Capability Matrix

Table 1–3 through Table 1–5 show the different features for each configuration.

Table 1–3. Interface Module Feature Matrix

Feature	Type
LCD	240 × 320, TFT
LCD Colors	65,535
Touchscreen	4-Wire
Front light	CCFL or LED
Audio CODEC	AIC23
Headphone/Headset	3.5 mm/2.5 mm
Integrated Speakers (2)	On-board
Navigation Button	5-Pole
Four User Defined Buttons	Momentary
Scroll Select Button	Tri-Position
USB Port	1 Client/2 Host
Serial Ports	2
On/Off Switch	Recessed
Sleep/Wake Button	Momentary
Microphone	Omni Directional
Camera Interface	CIF CMOS

Table 1–4. Processor Module Feature Matrix

Processor Module 16M	
Feature	**Type**
Processor	OMAP1510
SDRAM	16 MBytes
User Flash	16 MBytes

Table 1–4. Processor Module Feature Matrix (Continued)

Processor Module 16M	
Feature	**Type**
External Memory	SD/MMC
Boot Flash/RAM	4 MBytes/256 KBytes

Processor Module 32M	
Feature	**Type**
Processor	OMAP1510
SDRAM	32 MBytes
User Flash	32 MBytes
External Memory	SD/MMC
Boot Flash/RAM	4 MBytes/256 KBytes

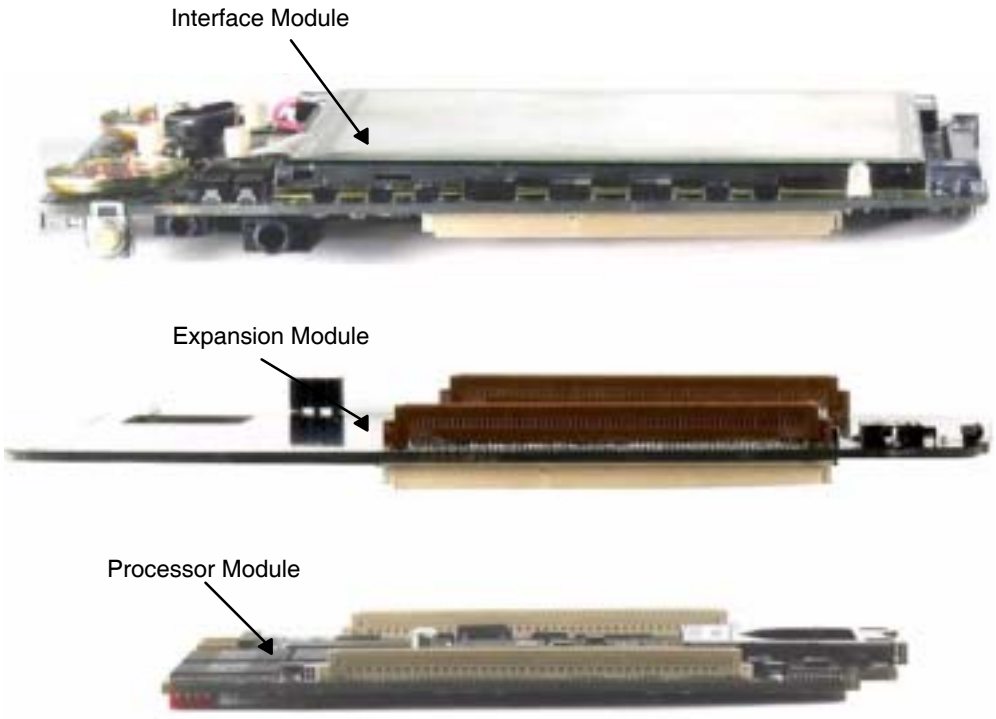
Table 1–5. Expansion Module Feature Matrix

Expansion Module	
Feature	**Type**
Communications	IrDA
Stereo Input	2.5 mm

1.5 Innovator Modules

The modules included are an Interface Module, a Processor Module and an Expansion Module. Figure 1–3 shows an exploded view of the module assembly.

Figure 1–3. Innovator Module, Exploded View



1.6 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 user-created 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, Interface, and Expansion Module can be installed on the BoB, as shown in Figure 1–5.

Figure 1–4. Innovator Development Kit Breakout Board

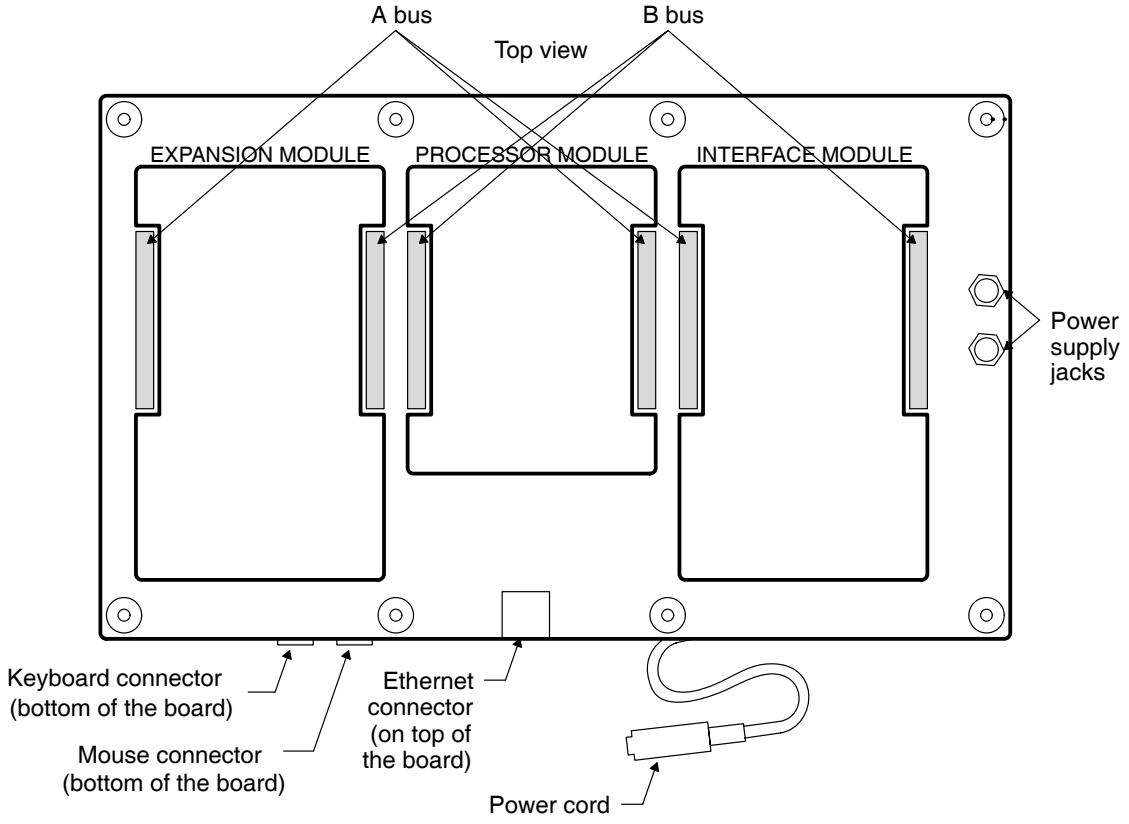
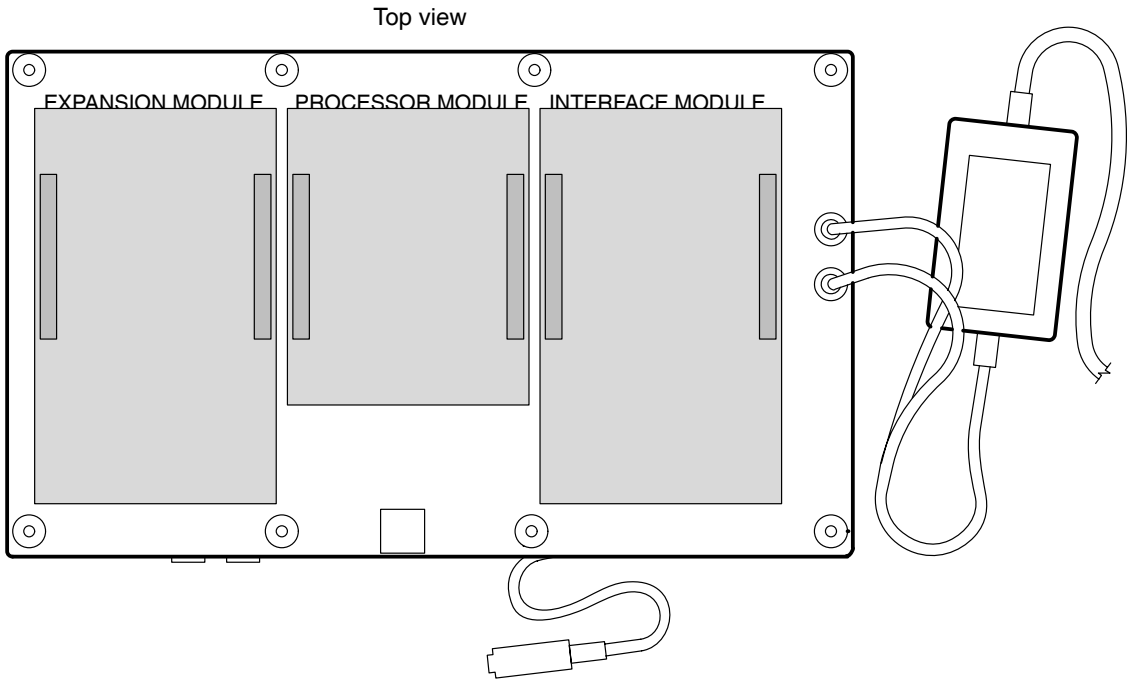


Figure 1–5. Innovator Development Kit Breakout Board with Modules Installed



1.6.1 Keyboard

The keyboard is a PS/2 compatible Mini-Input 88/89 key keyboard with embedded numeric keypad, 12 dedicated function keys and a built-in touch-pad.

1.6.2 Ethernet Cable

The Ethernet cable is used primarily to assist developers in performing debug functions using the Innovator BoB.

Chapter 2

Innovator™ Development Kit Components

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

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2.1 Processor Module

The heart of the Innovator platform is the Processor Module, shown in Figure 2–1 and Figure 2–2.

Figure 2–1. Processor Module, Front View

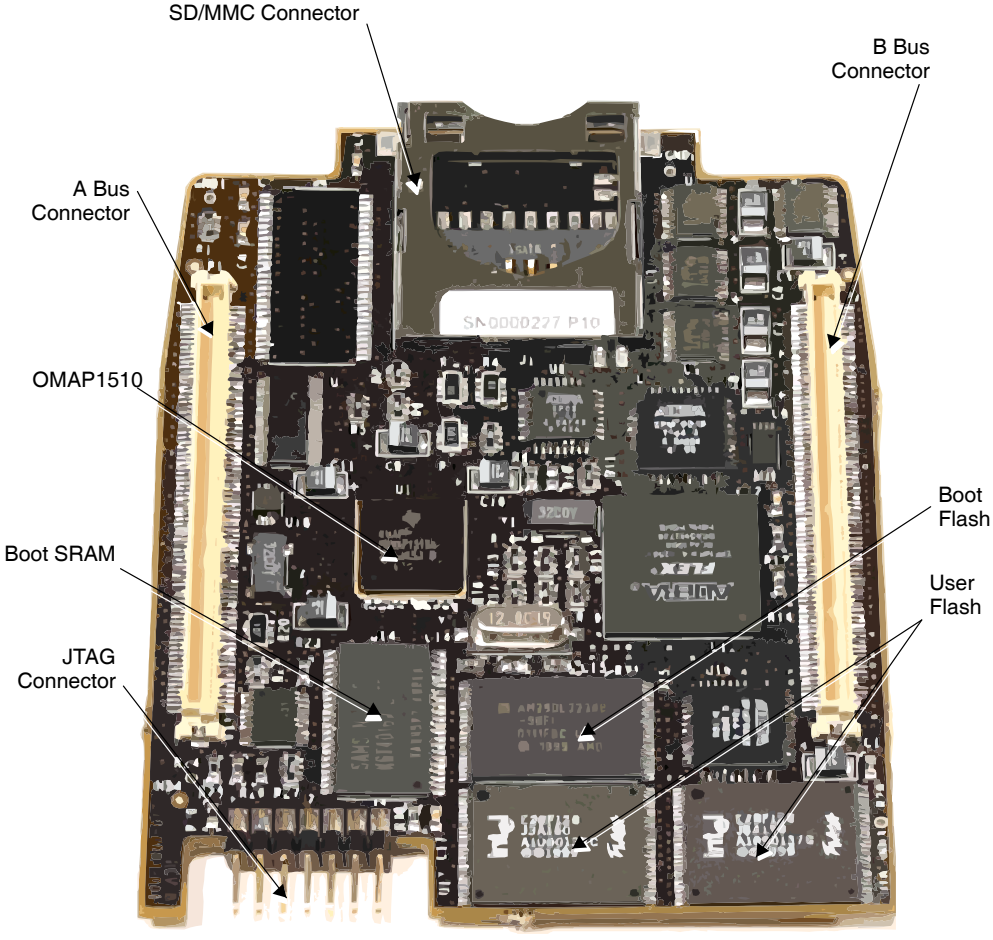


Figure 2–2. Processor Module, Bottom View

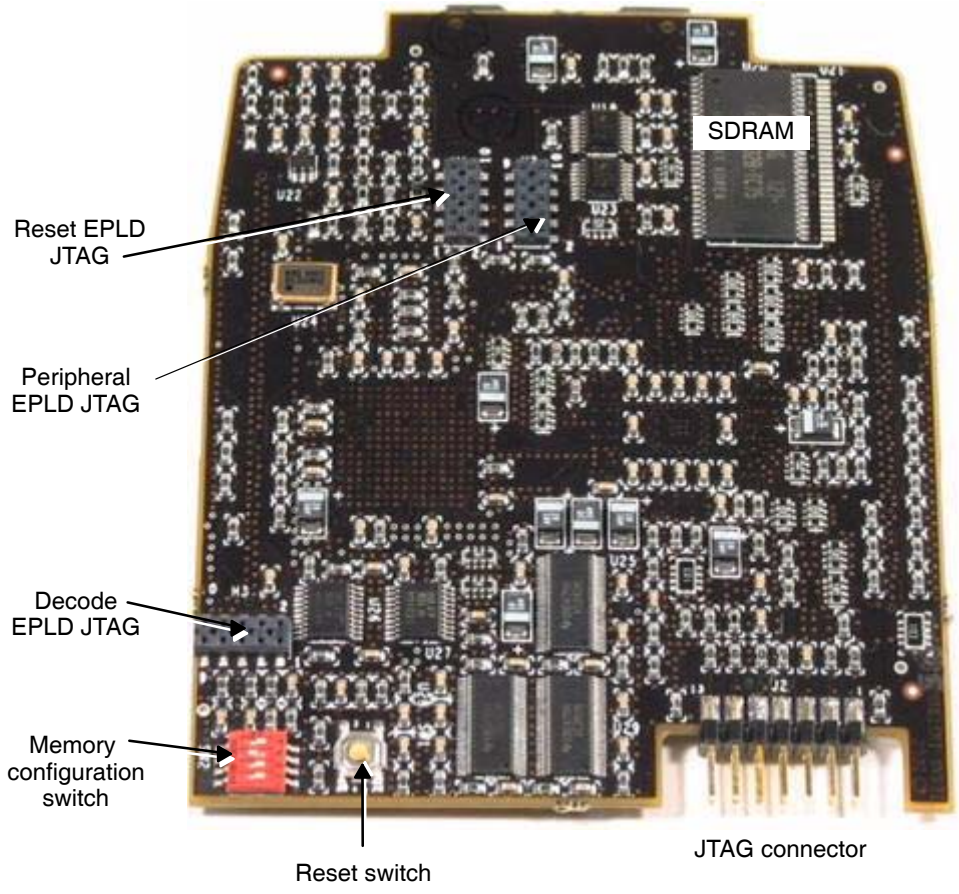


Table 2–1 defines the features as they apply to the the processor module.

Table 2–1. Processor Module Features

Feature	Processor Module
Processor	OMAP1510
SDRAM	32M Bytes
User Flash	32M Bytes
SD/MMC	Yes
Boot Flash/RAM	4M Bytes/256K Bytes
Real Time Clock	Yes
JTAG Connector	Yes
Expansion Connectors	Yes
Reset Switch	Yes
Memory Configuration Switch	Yes

2.2 Interface Module

The Interface Module 2432 is the first interface module developed. Other interface modules are added to accommodate additional LCD and switch configurations.

NOTE: Do not pick up the interface module by the speakers.

The features of the interface module are listed in Table 2–2.

Table 2–2. Interface Module Features

Feature	Specification
	LCD
Display	240 × 320
Size	3.5” Diagonal
Display Colors	64K
Front light	CCFL
Overlay	4-Wire Touchscreen
	Buttons
User Defined (4)	Momentary, Single Pole
Up/Dn/Select	Tri-position Switch
Navigation	Five Pole Switch
On/Off	Recessed Slide Switch
Sleep/Wake	Momentary, Single Pole
	Interfaces
Audio	AIC23 Stereo Codec
Stereo	2.5 mm, Stereo Amp
UART	Dual Serial Port Connector
USB	Client and Host
Headphone Jack	3.5 mm, Stereo
Headset Jack	2.5 mm, Mono
	Power
Battery Supply	3.7-V Li-ION Battery
dc Input	ac/dc Converter, Battery Charger
Indicator	Red/Green LED

Figure 2–3. Interface Module, Top View

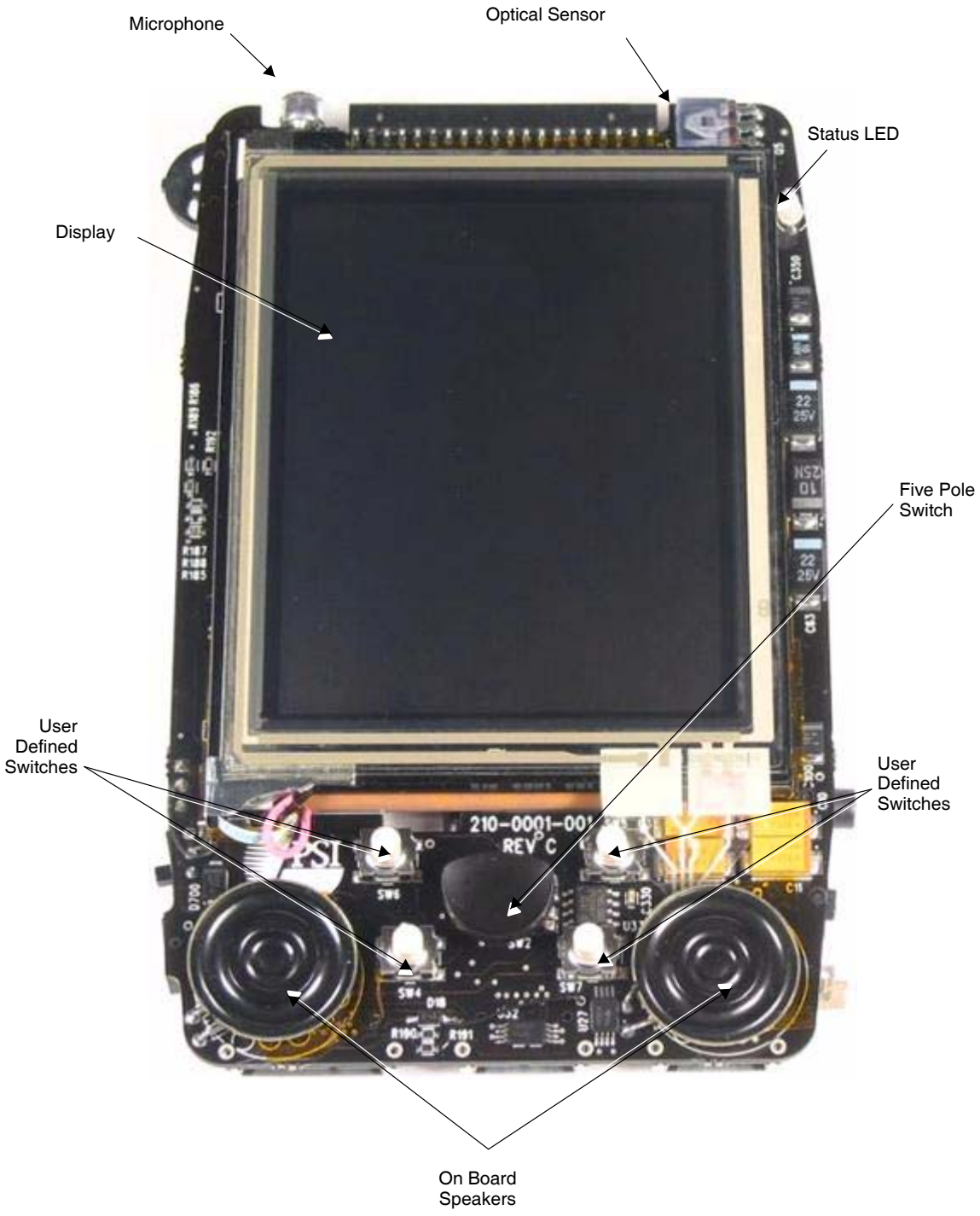
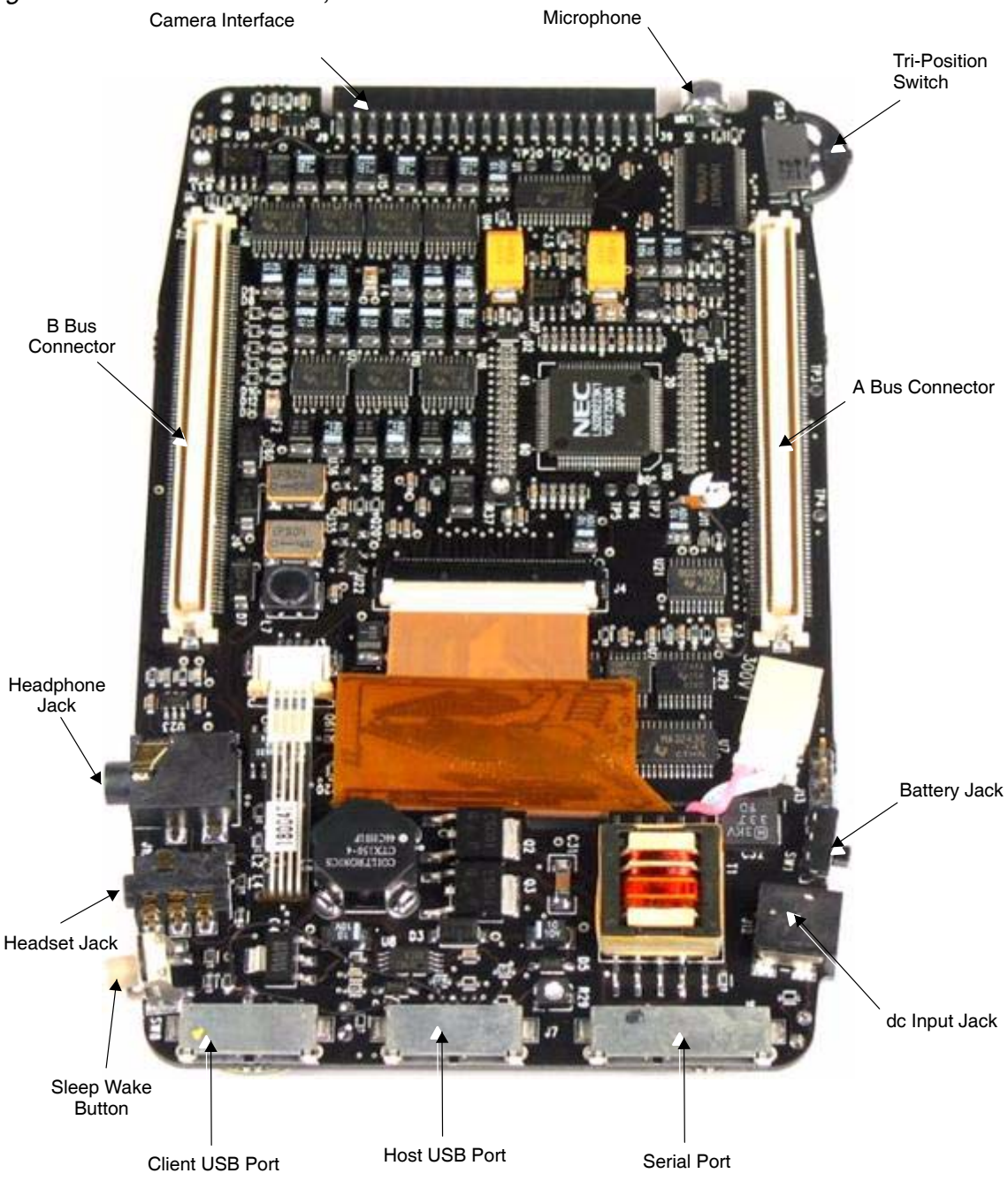


Figure 2–4. Interface Module, Bottom View



2.3 Expansion Module

The expansion module provides for the addition of various mass storage and expansion interfaces. The Expansion Module provides an IrDA interface and a 2.5-mm stereo input interface.

Figure 2–5. Expansion Module, Top View

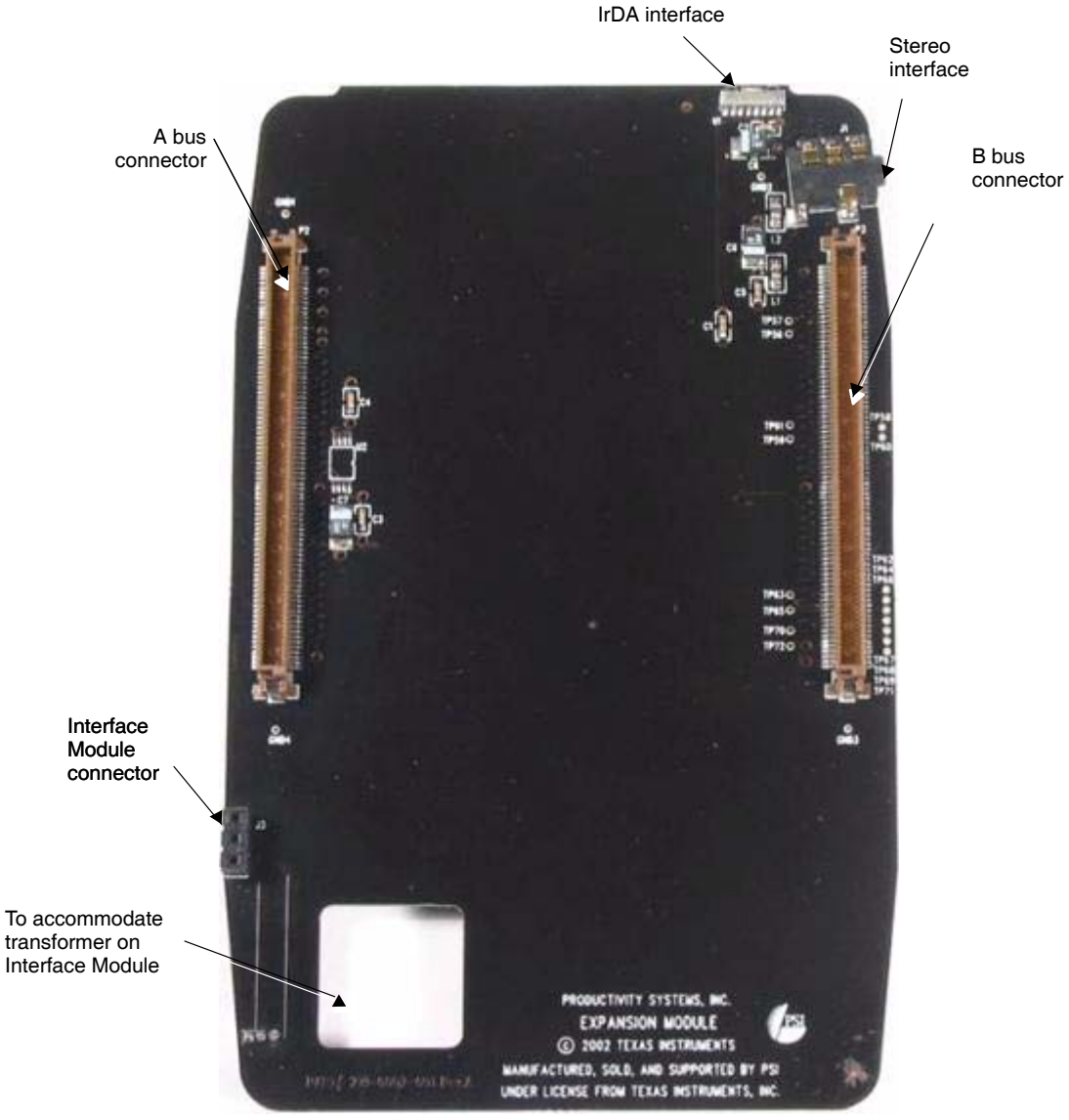
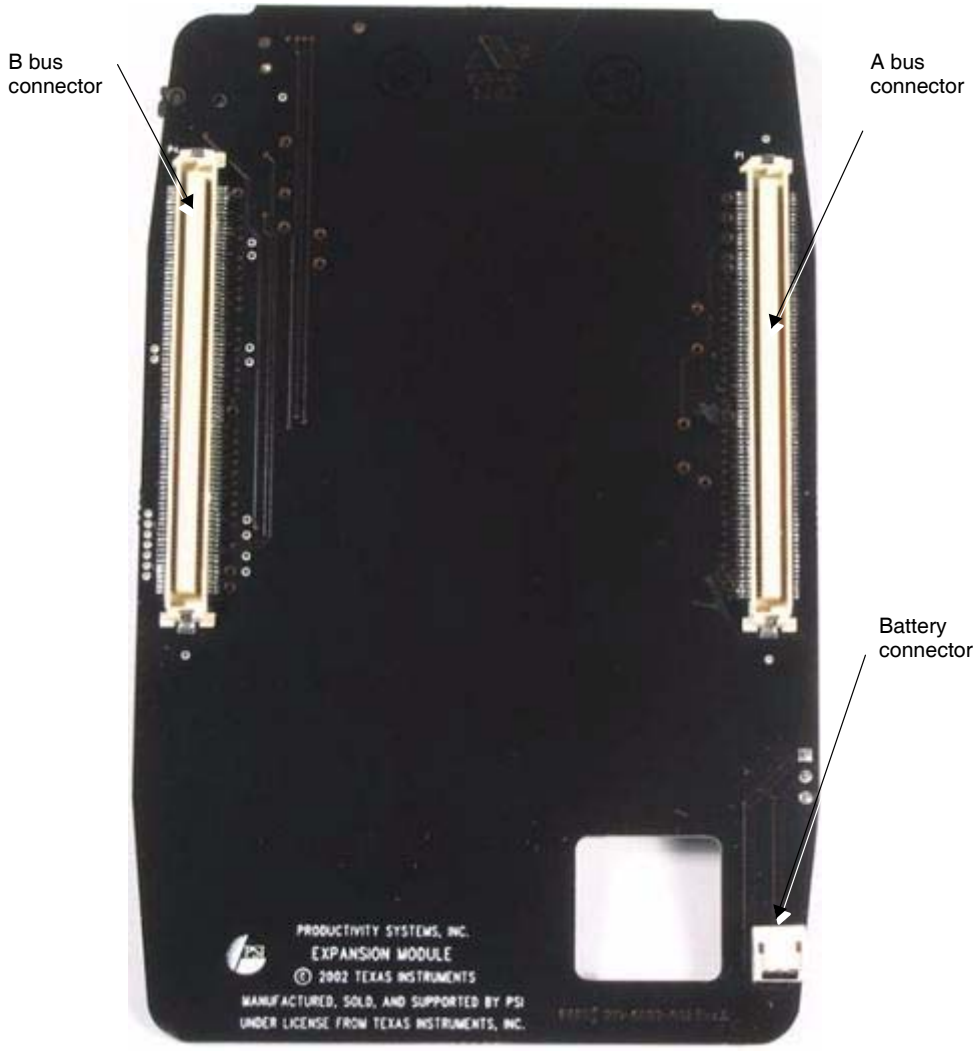


Figure 2–6. Expansion Module, Bottom View



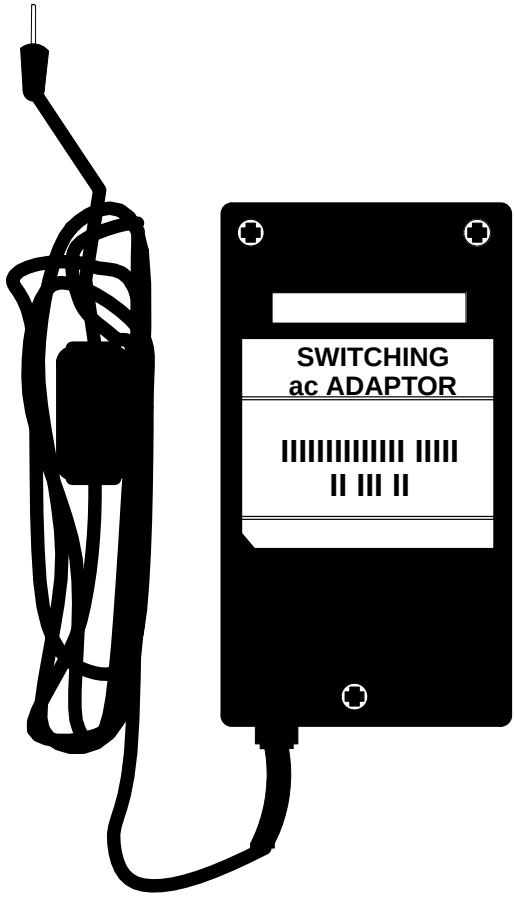
2.4 Innovator Development Kit Accessories

The Innovator Development Kit has its own set of accessories that are shipped with each unit. This section covers those accessories. The accessories include:

- ❑ Universal ac/dcpPower supply
- ❑ Stand
- ❑ Two stylus pens
- ❑ Keyboard/touch pad combo
- ❑ A pair of speakers
- ❑ Stereo Headphones
- ❑ Stereo Headset
- ❑ Dual Serial Cable
- ❑ USB Client Cable
- ❑ USB Host Cable
- ❑ Stereo Audio Cable
- ❑ Camera Module

2.4.1 Universal ac/dc Power Supply

The power supply converts an input range of 100-V ac–240-V ac, 50 Hz or 60 Hz to the 5-V dc needed by the Innovator system. It comes with three cables for power outlets in Asia, Europe, and America.



2.4.2 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.

2.4.3 Speakers

The active speaker system provides up to 2 W of stereo audio.

2.4.4 Headphones

The headphones provide a frequency response of 80 Hz to 18,000 Hz and an impedance of 32 Ω.

2.4.5 Headset

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

2.4.6 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.

2.4.7 USB Host Cable

The USB Host Cable passes the USB transceiver's digital inputs and outputs to transmit and receive USB signals. The pinout conforms to the "Serial Interface Engine." Implementation of the serial interface engine along with the USB transceiver allows the designer to make USB compatible devices with off-the-shelf logic and to easily modify and update the application.

2.4.8 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.

Table 2–3. Dual Serial Port Cable

Pin	Signal
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR

Table 2–3. Dual Serial Port Cable (Continued)

Pin	Signal
7	RTS
8	CTS
9	RI
1	DCD
2	TX
3	RX
4	DSR
5	GND
6	DTR
7	CTS
8	RTS
9	RI

2.4.9 Stereo Input Cable

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

2.4.10 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 toward or away from the user. No matter which way it is plugged in, the pinout of the interface module connector is compatible with the camera module. The camera should not be plugged in with power connected.

Table 2–4. Camera Features

Feature	Specification
Array Element – CIF (QCIF)	352x288 (176 × 144)
Data Format	YCrCb 4:2:2, GRB 4:2:2, RGB Raw Data
Image Area	3.1 mm × 2.5 mm
8/16 Bit Video Data	ITU-601, ITU-656, ZV Port
Max. Frames/Second	60 FPS
Image Enhancement	Brightness, Contrast, Gamma, Saturation, Sharpness
Synchronization	Internal/External
Gamma Correction	0.45/0.55/1.00
SCCB Programmable	Color Saturation, Brightness, Contrast, White Balance, Exposure Time, Gain
Scan Mode	Progressive
S/N Ratio	> 48dB (AGC off, Gamma = 1)
Power Supply	3.0 – 3.6-V dc 5 V dc/3.3‘–V dc (DIO)
Power Requirements	< 20 mA Active, < 10 μA Standby
Package	48-pin LCC

Chapter 3

User Interfaces

This section covers all of the connectors and buttons that the user interacts with on Innovator Module.

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3.1 Overview

Figure 3–1. User Interface Diagram, Front and Side Views

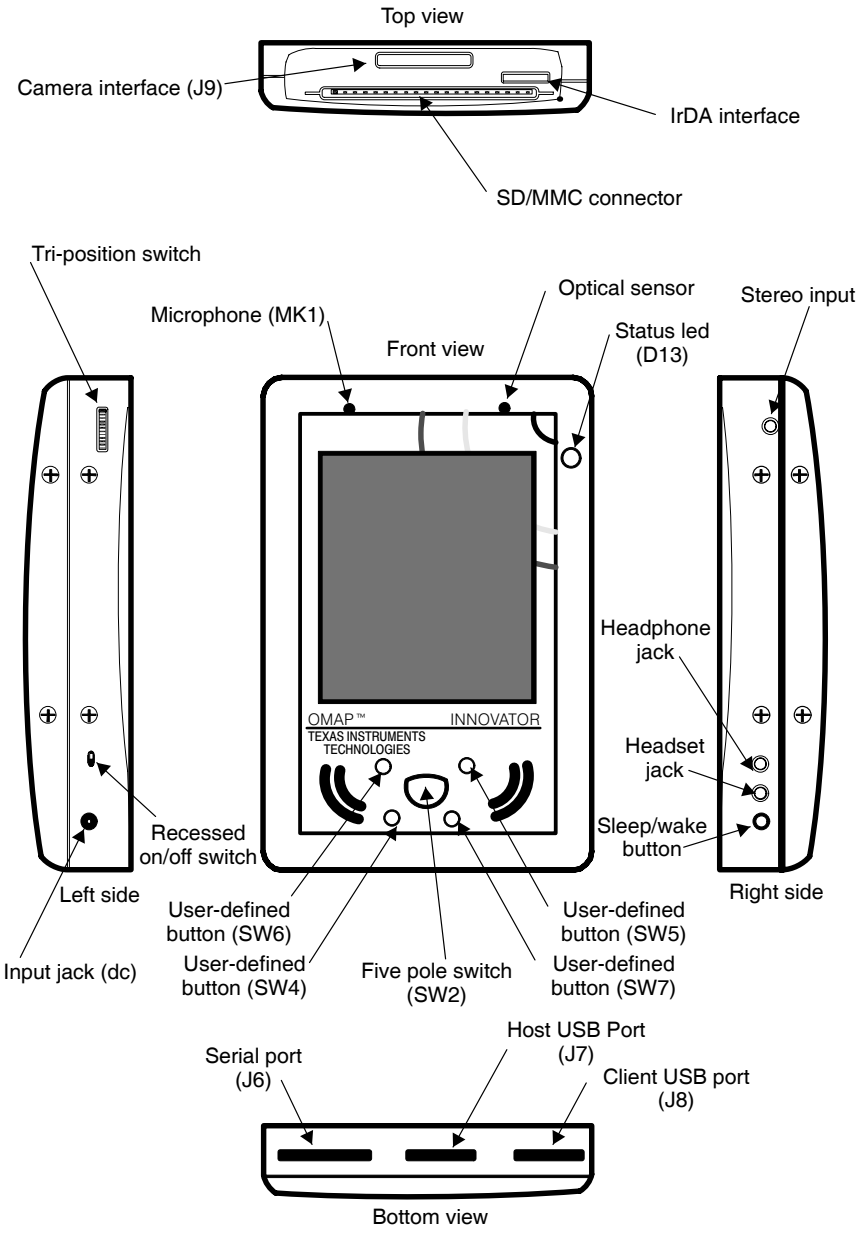
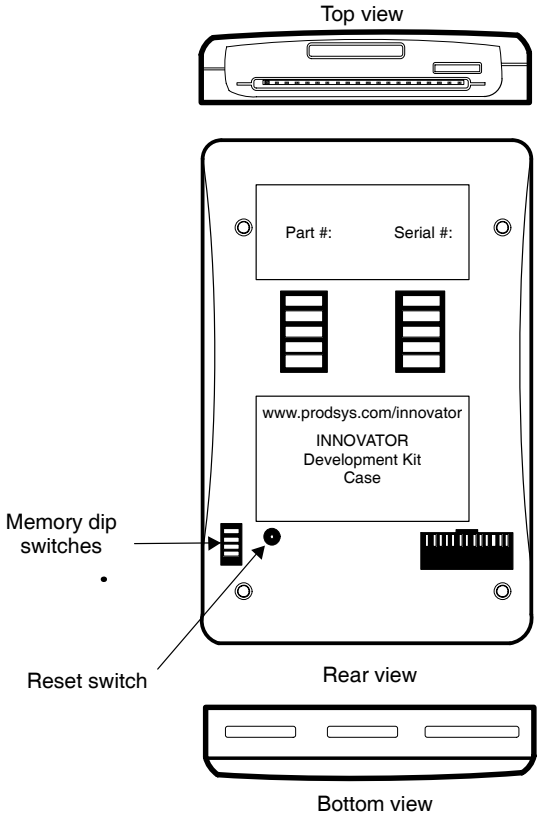


Figure 3–2. User Interface Diagram, Back View



3.2 Power

3.2.1 Battery Compartment

The Innovator™ Development Kit operates off of a 3.7-V lithium Ion rechargeable battery. 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.

When the modules are assembled, the battery should be positioned with the wires up underneath the processor module to keep them from getting pinched when the cover is put on.

3.2.2 Input Jack (J12), dc power

A +5 V 2 Amp supply provides power to the system through the dc input jack on the interface module. The plug is a 1.3 mm center negative connector.

3.2.3 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.

3.2.4 Tri-Position Switch (SW3)

The Tri-Position Switch is a side-actuated miniature switch with normally open contacts providing tactile feedback. Rotation of the actuator closes two individual contacts (up or down), while pushing down in the central position closes simultaneously the two contacts (select).

3.2.5 Five Pole Switch (SW2)

The Five Pole Switch is a sub-miniature navigation tactile 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.

3.3 Audio Components

3.3.1 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.

3.3.2 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 externally powered speakers. The headphone jack is a standard 3.5 mm jack that accepts any commercially available devices intended for audio use. When the headphone jack is used, the Innovator's on-board speakers are disabled.

3.3.3 Headset Jack (J10)

The headset jack is a 2.5 mm jack used with a headset. This jack is used to connect to 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.

3.3.4 Stereo Input

The stereo input jack is a standard 2.5 mm jack and accepts any commercially available 3.5 mm 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.

3.4 Camera Interface (J9)

The camera module can be mounted on the top of the Innovator and can be plugged into the device in either direction. This allows the camera to be facing toward or away from the user.

3.5 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.

3.6 Optical Sensor

The optical sensor 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 model is under software control.

3.7 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 illuminates red, even though the battery is charging. The LED can also be controlled by the software.

3.8 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 puts the Innovator into sleep mode, or restores (wakes) the Innovator from sleep mode. This is a way to conserve power (battery life) without removing power from the unit.

3.9 Switches

3.9.1 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.

3.9.2 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.

3.9.3 Memory Configuration Switch

Figure 3–3 shows the location of the memory configuration switch. This switch is used to allow the running of the iBoot application. iBoot is use to run diagnostics or to flash the user flash with an operating system. Table 3–1 lists the function of each switch. Innovator has the ability to flash two operating systems in the user flash as long as they do not exceed 16M Bytes each. This switch is used to select which operating system is run when the Innovator is reset.

Figure 3–3. Memory Configuration Dipswitch

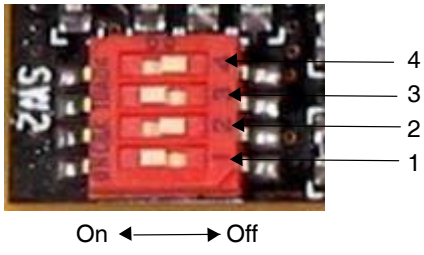


Table 3–1. Memory Configuration Switch

Mode	SW1	SW2	SW3	SW4
Boot RAM	Off	Off	Off	Off
Run Image in User Flash0	Off	Off	On	Off
Run Image in User Flash1	Off	Off	On	On
iBoot (Boot Flash)	On	Off	Off	Off

3.10 USB Interface

There are two types of cables supplied for connecting to the USB interfaces. One is for the client function and the other is for the host function.

3.10.1 Client USB Interface

Table 3–2 defines the pin connections from the interface module connector to the client USB connector.

Table 3–2. Client USB Interface

Pin Name	Pin	Definition
USB_DP	1	DATA POS
USB_DM	2	DATA NEG
Not Used	3	Not Used
V_{CC_USB}	4	V_{CC}
Ground	5	Ground
Not Used	6	Not Used
Not Used	7	Not Used
Not Used	8	Not Used
Not Used	9	Not Used
Not Used	10	Not Used

3.10.2 Host USB Interface

Table 3–3 defines the pin connections from the interface module connector to the host USB connector.

Table 3–3. Host USB Interface

Pin Name	Pin	Definition
Not Used	1	Not Used
USB1D+	2	DATA POS
USB1D–	3	DATA NEG
5 V_{CC_MAIN}	4	V_{CC}
Ground	5	Ground
Ground	6	Ground
Ground	7	Ground
V_{CC_USB}	8	V_{CC}
USB2D+	9	DATA POS
USB2D–	10	DATA NEG

3.11 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.

Chapter 4

Registers and Memory Map

This chapter provides information on the breakdown of external system memory as well as the registers found in the peripheral EPLD on the processor module. Only those registers used are discussed. The correlation between bit and signal name is provided, along with the default signal level and access capabilities.

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4.1 System Memory Map 4-2

4.2 Peripheral EPLD Register Map 4-5

4.3 EPLD Register Detail 4-7

4.1 System Memory Map

The external system memory map is dependent upon the settings of dipswitch SW2. SW2 S2 is not used for memory mapping.

4.1.1 Boot RAM

Boot RAM is unaffected by the setting of S4.

SW2 Setting	System Address
S1–OFF, S3–OFF	0x0000:0000 – 0x0003:FFFF
S1–ON, S3–OFF	0x0040:0000 – 0x0043:FFFF
S1–OFF, S3–ON	0x0C00:0000 – 0x0C03:FFFF
S1–ON, S3–ON	0x0C40:0000 – 0x0C43:FFFF

4.1.2 Boot Flash

Boot RAM is unaffected by the setting of S4.

SW2 Setting	System Address
S1–OFF, S3–OFF	0x0040:0000 - 0x007F:FFFF
S1–ON, S3–OFF	0x0000:0000 - 0x003F:FFFF
S1–OFF, S3–ON	0x0C40:0000 - 0x0C7F:FFFF
S1–ON, S3–ON	0x0C00:0000 - 0x0C3F:FFFF

4.1.3 User Flash 0

User flash is unaffected by the setting of S1.

SW2 Setting	System Address
S3–OFF, S4–OFF	0x0C00:0000 - 0x0CFF:FFFF
S3–OFF, S4–ON	0x0D00:0000 - 0x0DFF:FFFF
S3–ON, S4–OFF	0x0000:0000 - 0x00FF:FFFF
S3–ON, S4–ON	0x0100:0000 - 0x01FF:FFFF

4.1.4 User Flash 1

User flash is unaffected by the setting of S1.

SW2 Setting	System Address
S3–OFF, S4–OFF	0x0D00:0000 - 0x0DFF:FFFF
S3–OFF, S4–ON	0x0C00:0000 - 0x0CFF:FFFF
S3–ON, S4–OFF	0x0100:0000 - 0x01FF:FFFF
S3–ON, S4–ON	0x0000:0000 - 0x00FF:FFFF

4.1.5 EPLD Registers

The EPLD registers are located at system address 0x0800:0xxx. See the LOOKUP TABLE in the next section.

4.1.6 SDRAM

The system SDRAM is located at system address 0x1000:0000 - 0x11FF:FFFF.

4.1.7 Internal SRAM

The internal system SRAM is located at system address 0x2000:0000 - 0x2002:FFFF.

4.1.8 Reserved Memory Ranges

The following table depicts the memory ranges that are reserved by the system.

Starting Address	Ending Address
0x0200:0000	0x03FF:FFFF
0x0600:0000	0x07FF:FFFF
0x0A00:0000	0x0BFF:FFFF
0x0E00:0000	0x0FFF:FFFF
0x1400:0000	0x1FFF:FFFF
0x2003:0000	0x2FFF:FFFF

4.1.9 EPLD/Board Revision

The EPLD has revision registers that indicate the current revision level of the board, Reset EPLD, Memory EPLD, and Peripheral EPLD. The board

assembly revision increments when any modifications are made to the board. All revisions are hard coded into the EPLD therefore, the EPLD must be changed each time any of the above are changed. The EPLD revision level increments each time any design changes are made. All bits of these registers are read-only.

EPLD Revision Minor	0x0800:0000
EPLD Revision Major	0x0800:0001
Board Revision	0x0800:0018
Reset EPLD Rev. Minor	0x0800:0200
Reset EPLD Rev. Major	0x0800:0201
Memory Decode EPLD Rev. Minor	0x0800:0202
Memory Decode EPLD Rev. Major	0x0800:0203

4.2 Peripheral EPLD Register Map

The peripheral EPLD register locations are listed in Table 4−1. Details of each register are contained in the following paragraphs. The states listed in this table reflect the hardware initialization/default state, not their state after iBOOT is loaded. That information is included in the next chapter.

Table 4−1. Register Summary

System Address	Register	Default	Type	Page
0x0800:0000	EPLD Revision Low	00	R	4-4
0x0800:0001	EPLD Revision High	02	R	4-4
0x0800:0002	LCD Panel Control	07	R/W	4-7
0x0800:0003	LED/Status Digit	00	R/W	Not used
0x0800:0004	HID SPI	20	R/W	4-8
0x0800:0005	Power Control Register	61	R/W	4-8
0x0800:0006	Interrupt Status Low	00	R	4-9
0x0800:0007	Interrupt Status High	00	R	4-10
0x0800:0008	Interrupt Mask Low	00	R/W	4-10
0x0800:0009	Interrupt Mask High	00	R/W	4-11
0x0800:000A	EVM Reset	00	R/W	4-11
0x0800:000B	Peripheral Reset	11	R/W	4-12
0x0800:000C	Audio register	00	R/W	Not used
0x0800:000D	Reserved	00	−−	N/A
0x0800:000E	DIP switch	00	R	Not used
0x0800:000F	EPLD IO	00	R/W	Not used
0x0800:0010−0x0800:0013	Reserved	00	−−	N/A
0x0800:0014	UART1	0D	R/W	4-12
0x0800:0015	UART2	0D	R/W	4-13
0x0800:0016	OMAP1510DC Status Register	00	R	4-15
0x0800:0017	Reserved	00	−−	N/A
0x0800:0018	Board Revision	10	R	4-4
0x0800:0019−0x0800:00FF	Reserved	00	−−	N/A

Table 4–1. Register Summary (Continued)

System Address	Register	Default	Type	Page
0x0800:0100	PPT Data	00	R/W	Not used
0x0800:0101	PPT Status	00	R	Not used
0x0800:0102	PPT Control	00	R/W	Not used
0x0800:0103–0x0800:01FF	Reserved	00	––	N/A
0x0800:0200	Reset EPLD Rev Low	00	R	4-4
0x0800:0201	0Reset EPLD Rev High	00	R	4-4
0x0800:0202	MemDec CPLD Rev Low	00	R	4-4
0x0800:0203	MemDec CPLD Rev High	00	R	4-4
0x0800:0204	Touch Screen	25	R/W	4-15
0x0800:0205	Information	1F	R/W	4-16
0x0800:0206	LCD Brightness Low	00	R/W	4-16
0x0800:0207	LCD Brightness High	00	R/W	4-16
0x0800:0208	Status LED Green Low	00	R/W	4-16
0x0800:0209	Status LED Green High	FF	R/W	4-17
0x0800:020A	Status LED Red Low	00	R/W	4-18
0x0800:020B	Status LED Red High	00	R/W	4-18
0x0800:020C	Camera/USB Control	03	R/W	4-18
0x0800:020D	Expansion Control	00	R/W	4-19
0x0800:020E	Interrupt Status 2 Low	03	R	4-20
0x0800:020F	Spare, unused address	00	––	Not used
0x0800:0210	Interrupt Mask 2 Low	00	R/W	4-20
0x0800:0211	Spare, unused address	00	––	Not used
0x0800:0300–0x0800:030F	Ethernet registers	00	R/W	

Note: R – Read, W – Write, R/W – Read/Write

4.3 EPLD Register Detail

4.3.1 LCD Panel Control Register

Figure 4–1. LCD Panel Control Register – 0800:0002

7	6	5	4	3	2	1	0
Reserved		SPARE8_ LCD_CMD	SPARE1_ LCD_CMD	OE_CMD	IO_ ENAVEE	IO_ ENAVDD	IO_ ENABLK
		R/W-0	R/W-0	R/W-0	R/W-1	R/W-1	R/W-1

Note: R – Read, W – Write, R/W – Read/Write

Table 4–2. LCD Panel Control Register Field Descriptions

Bit	Field	Description
7–6	Reserved	Reserved
5	SPARE8_LCD_CMD	SPARE8_LCD_CMD is not supported in Innovator Development Kit. Not used
4	SPARE1_LCD_CMD	SPARE1_LCD_CMD is not supported in Innovator Development Kit. Not used
3	OE_CMD	Enable the LCD buffer 0 Enable the LCD buffer 1 The LCD buffer is not enabled
2	IO_ENAVEE	IO_ENAVEE turns on the LCD controller.
1	IO_ENAVDD	IO_ENAVDD turns on and off the LCD front light power. In the Innovator, this bit is not used. The output from the EPLD goes to the PWM control input on the LCD front light brightness control and comes from the brightness control register.
0	IO_ENABLK	IO_ENABLK turns the LCD front light on and off. It also enables the front light PWM output. 0 Off 1 On

4.3.2 Serial Interface to HID

NOTE: This feature is supported on the BoB (Breakout Board).

The SPU for the HID device is three control bits and two status bits. Operations are carried through bit-banging the HID SPI register (note that even the serial clock must be toggled via register writes).

When bit 2 (CS) is 1, it enables the HID device to receive serial data and subsequently transmits serial data. Bit 0 (CLK) is the serial data clock. Transmit data is changed on the falling edge of CLK to be latched by the HID device on the rising edge of CLK. Subsequently, receive data is changed by the HID device on the falling edge of CLK and read by the host on the rising edge of CLK.

The ATN signal is able to interrupt the host.

Figure 4–2. HID SPI Register – 0800:0004

7	6	5	4	3	2	1	0
HRESn	Reserved	ATN	SDI	HSUS	nHID_HSUS	SDO	HID_CLK
R/W-0	R-0	R/W-1	R-0	R/W-0	R/W-0	R/W-0	R/W-0

Note: R – Read, W – Write, R/W – Read/Write

Table 4–3. HID SPI Register Field Descriptions

Bit	Field	Description
7	HRESn	HRESn connects to the $\overline{\text{RESET}}$ signal of the HID controller. Resets when 0.
6	Reserved	Reserved
5	ATN	ATN is the inverted connection of the $\overline{\text{ATN}}$/$\overline{\text{CTS}}$ signal of the HID controller.
4	SDI	SDI is serial data in. Connects to MISO/TXD of the HID controller.
3	HSUS	HSUS is the host suspended output, and controls the inverted state of $\overline{\text{HSUS}}$ signal of the HID.
2	nHID_HSUS	CS is chip select and controls the inverted state of the $\overline{\text{SS}}$/$\overline{\text{RTS}}$ signal of the HID.
1	SDO	SDO is serial data out. Connects to MOSI/RXD of the HID controller.
0	CLK	CLK is serial clock. Connects to SCLK/ISEL of the HID controller.

4.3.3 Power Control Register

This controls the enables for clock oscillators, as well as the voltage level shifters for the UARTs to convert from 3.3 V to the PC serial port voltages.

Figure 4–3. Power Control Register – 0800:0005

7	6	5	4	3	2	1	0
Reserved	COM2_EN	COM1_EN	Reserved	MMC_EN	48MHZ_ CLK_EN	4MHZ_ CLK_EN	CODEC_ EN_SEL
R-0	R/W-0	R/W-0	R-0	R/W-0	R/W-0	R/W-0	R/W-1

Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset value

Table 4–4. Power Control Register Field Descriptions

Bit	Field	Description
7	Reserved	Reserved
6	COM2_EN	COM2_EN shuts down the COM 2 UART when 0 and turns it on when 1.
5	COM1_EN	COM1_EN shuts down the COM1 UART when 0 and turns it on when 1.
4	Reserved	Reserved
3	MMC_EN	MMC_EN enables the Multi Media card when set to a 1.
2	48MHZ_CLK_EN	48MHZ_CLK_EN enables the external EPLD oscillator when 1 (hard coded to one because the oscillator is required to be one at all times)
1	4MHZ_CLK_EN	4MHZ_CLK_EN enable the HID and touch screen controller oscillators when 1.
0	CODEC_EN_SEL	CODEC_EN_SEL selects the 12.000 MHz codec oscillator when set to a 0 and the 16.000 MHz codec oscillator when set to a 1.

4.3.4 Interrupt Registers

The peripheral EPLD can generate an interrupt based on several different events – such as, UART changes and the Ethernet port. The interrupt status and mask registers are based on the TI925DC – all reserved slots are interrupts that are on the TI925 but not on Innovator (i.e., Compact PCI interrupts, etc).

The status register indicates the current status of the interrupt line regardless of the state of the mask register. To determine if an interrupt is valid, this register should be logically ANDed with the interrupt mask register (a value of 1 means that the interrupt is enabled and active). All signals are active high and double buffered. ATR occurs when the HID device detects an input event. The various interrupt sources are:

4.3.4.1 Interrupt Status Register (Low)

Figure 4–4. Interrupt Status Register – 0800:0006

7	2	1	0
Reserved		ACK	ATN
R-0		R-0	R-0

Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

4.3.4.2 Interrupt Status Register (High)

Figure 4–5. Interrupt Status Register (High) – 0800:0007

15	14	13	12 … 8
UART2	UART1	ETHR	Reserved
R-0	R-0	R-0	R-0

Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–5. Interrupt Status Register Field Descriptions

Bit	Field	Description
15	UART2	UART2 is active when the Com 2 UART signals a DSR, DCD, or RI change.
14	UART1	UART1 is active when the Com 1 (PC) signals a DSR, DCD, or RI change.
13	ETHR	ETHR is the state of the Ethernet interrupt.
12–8	Reserved	Reserved. Not Used

Note: The parallel port is not supported on Innovator Development Kit but the register is reserved.

4.3.4.3 Interrupt Mask Register (Low)

The interrupt masks indicate that interrupt sources are to be masked. All signals are active highs – logic 1 in a bit enables the corresponding interrupt. The default is that all interrupts are disabled.

Figure 4–6. Interrupt Mask Register (Low) – 0800:0008

7 … 2	1	0
Reserved	ACK	ATNM
R-0	R/W-0	R/W-0

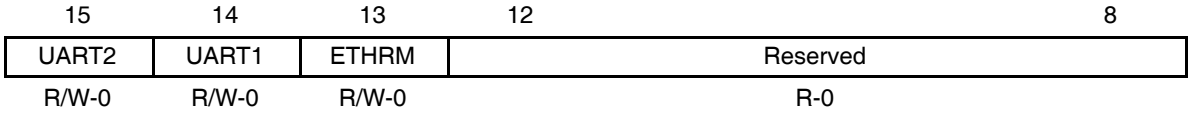
Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–6. Interrupt Mask Register (Low) Field Descriptions

Bit	Field	Description
7–2	Reserved	Reserved
1	ACK	ACK is the acknowledge signal from the parallel port and is not used in the Innovator. Not used
0	ATNM	ATNM masks the HID $\overline{\text{ATN}}$ interrupt.

4.3.4.4 Interrupt Mask Register (High)

Figure 4–7. Interrupt Mask Register (High) – 0800:0009



Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–7. Interrupt Mask Register (High) Field Descriptions

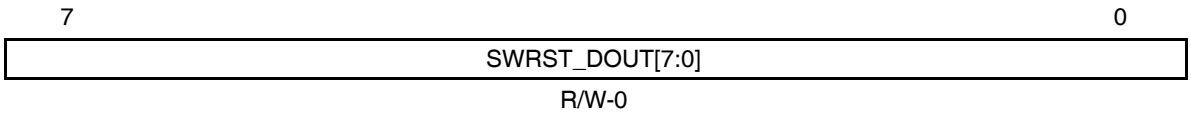
Bit	Field	Description
15	UART2	UART2 masks the interrupt caused by UART2 status change.
14	UART1	UART1 masks the interrupt caused by UART1 status change.
13	ETHRM	ETHR masks the Ethernet section interrupt.
12–8	Reserved	Reserved. Not Used

4.3.5 Reset Registers

4.3.5.1 EVM Reset

The software can initiate an EVM reset by writing 0xAA to the EVM Reset register. Note that this does not reset the OMAP1510 device itself.

Figure 4–8. EVM Reset – 0800:000A



Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–8. EVM Reset Field Descriptions

Bit	Field	Description
7–0	SWRST_DOUT[7:0]	SWRST_DOUT[7:0] causes an EVM reset when set to 0xAA.

4.3.6 Peripheral Reset

The Bluetooth interface and camera can be reset via this register. The HID should be reset using the HID SPI register.

Figure 4–9. Peripheral Reset – 0800:000B

7 – 5	4	3 – 1	0
Reserved	CAM_ RESET_CMD	Reserved	Lan_Reset
R-0	R/W-1	R-0	R/W-0

Note: R – Read, W – Write, R/W – Read/Write, -n – Reset Value

Table 4–9. Peripheral Reset Field Descriptions

Bit	Field	Description
7–3	Reserved	Reserved
4	CAM_ RESET_CMD	CAM_RESET_CMD resets the TI camera board when 0.
3–1	Reserved	Reserved
0	Lan_Reset	Lan_Reset resets the Ethernet 91C96 when set to 1. Powers up in reset state.

Note: The Camera and Bluetooth are not currently available.

4.3.7 UART Registers

4.3.7.1 UART1 Register

Figure 4–10. UART1 Register – 0800:0014

7	6	5	4	3	2	1	0
RIxCH	DCDxCH	Reserved	DSR1CH	RIx	DCDx	DTRx	DSR1
R-0	R-0	R-0	R-0	R/W-1	R/W-1	R/W-0	R/W-1

Note: R – Read, W – Write, R/W – Read/Write

Table 4–10. UART1 Register Field Descriptions

Bit	Field	Description
7	RIxCH	RI signal change status
		0 No change occurred in the RI signal.
		1 A change occurred in the RI signal.
6	DCDxCH	DCD signal change status
		0 No change occurred in the DCD signal.
		1 A change occurred in the DCD signal.

Table 4–10. UART1 Register Field Descriptions (Continued)

Bit	Field	Description
5	Reserved	Reserved
4	DSRxCH	DSR signal change status
		0 No change occurred in the DSR signal.
		1 A change occurred in the DSR signal.
3	RIx	Indicates the state of the RI signal
		0
		1
2	DCDx	Indicates the state of the DCD signal
		0
		1
1	DTRx	Controls the state of the DTR signal
		0
		1
0	DSR1	DSR1 indicates the state of the DSR signal.
		0
		1

4.3.7.2 UART2 Register

NOTE: If you are migrating from an OMAP1510DC EVM, UART2 is used in place of UART3. You MUST rebuild the bootloader software if you are using the bootloader from TI.

Figure 4–11. UART2 Register – 0800:0015

7	6	5	4	3	2	1	0
RIxCH	DCD2CH	Reserved	DSR2CH	RIx	DCD2	DTRx	DSR2
R-0	R-0	R-0	R-0	R/W-1	R/W-1	R/W-0	R/W-1

Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–11. UART2 Register Field Description

Bit	Field	Description
7	RIxCH	RI signal change status
		0 No change occurred in the RI signal.
		1 A change occurred in the RI signal.
6	DCD2CH	DCD2 signal change status
		0 No change occurred in the DCD2 signal.
		1 A change occurred in the DCD2 signal.
5	Reserved	0 Reserved
4	DSR2CH	DSR signal change status
		0 No change occurred in the DSR signal.
		1 A change occurred in the DSR signal.
3	RI2	0 RI signal change status
		0
		1
2	DCD2	0 DCD2 indicates the state of the DCD signal.
1	DTR2	0 DTR2 controls the state of the DTR signal**.**
0	DSR2	DSR signal.
		0
		1

4.3.8 Status Registers

4.3.8.1 OMAP1510DC Status Registers

The OMAP1510DC Status register indicates what memory is present on the EVM. It can be read from location 0800:0016. These bits are hard-coded since both Flash and SRAM are always present.

Figure 4–12. OMAP1510DC Status Register – 0800:0016

7	2	1	0
Reserved		PRES_ FLASH	PRES_ SDRAM
R-0		R-0	R-0

Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–12. OMAP1510DC Status Register Field Description

Bit	Field	Description
7–2	Reserved	Reserved
1	PRES_FLASH	Flash module present – preset to 0
0	PRES_SDRAM	SDRAM module present – preset to 0

4.3.8.2 Touch Screen Register

The SPI for the touch screen is comprised of three control bits and two status bits. Operations are carried through bit-banging the TS register (note that even the serial clock must be toggled via register writes).

Figure 4–13. Touch Screen Register – 0800:0204

7	6	5	4	3	2	1	0
Reserved		NPENIRQ	SDI	BUSY	nCS	SDO	CLK
		R-1	R-0	R-0	R/W-1	R/W-0	R/W-1

Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–13. Touch Screen Register Field Descriptions

Bit	Field	Description
7–6	Reserved	Reserved
5	NPENIRQ	NPENIRQ connects to the pen-down signal from the touchscreen controller that indicates when the stylus is on the touch screen.

Table 4–13. Touch Screen Register Field Descriptions (Continued)

Bit	Field	Description
4	SDI	SDI is serial data in. Connects to DOUT of the touchscreen controller.
3	BUSY	BUSY is connected to the BUSY pin of the touchscreen controller and a low indicates when the controller is either shifting data in or out. It is high impedance when nCS is high.
2	nCS	nCS is chip-select and controls conversion timing and enables the serial input/output register. 0 Enables the serial input/output register. 1 Causes power down of the ADC in the touchscreen controller**.**
1	SDO	SDO is serial data out. Connects to DIN of the touchscreen controller.
0	CLK	CLK is serial clock. Connects to DCLK of the touchscreen controller.

4.3.8.3 Information Register

Figure 4–14. Information Register – 0800:0205

7 5	4	3	2	1	0
Reserved	CD	BATT_FAIL	DIP4	FSH_STS2	FSH_STS1
	R-0	R-0	R-0	R-0	R-0

Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–14. Information Register Field Descriptions

Bit	Field	Description
7–5	Reserved	Reserved
4	CD	Indicates that the Multi Media Card has been inserted if CD is set to 0
3	BATT-FAIL	Indicates that the battery is no longer operational if this bit is 0
2	DIP4	DIP4 reads bit position four of the Dipswitch**.**
1	FSH_SSTS2	Indicates that the second bank of the user flash is ready when set to 1
0	FSH_SSTS1	Indicates that the first bank of the user flash is ready when set to 1.

4.3.9 Control Registers

4.3.9.1 LCD Front Light Brightness Control Register

This is a new function provided on innovator. These two registers set the PWM pattern used to control the brightness of the LCD front light. Both registers must be written before a new pattern takes effect. All bits set to one causes the highest brightness.

Figure 4–15. LCD Front Light Brightness Control Register – 0800:0206/7

LCDBrt_HI

15							8
LCD_BRT [15:8]							
R/W							

Note: R – Read, W – Write, R/W – Read/Write

LCDBrt_LO

7							0
LCD_BRT [7:0]							
R/W							

Note: R – Read, W – Write, R/W – Read/Write

4.3.9.2 Status LED Control Register

A 32-bit PWM is used to control the LED on the Interface Module. Setting one 16-bit register HI and the other 16-bit register low causes one or the other color to appear. By setting an alternating pattern, another color, a combination of the two colors appears.

StLED_GRN Registers

Figure 4–16. StLED_Grn (LSB)– 0800:0208

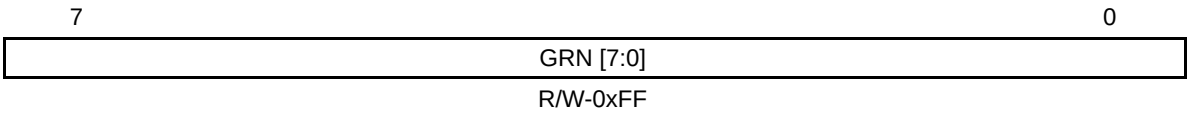
7							0
GRN [7:0]							
R/W-0							

Note: R – Read, W – Write, R/W – Read/Write, -0 – Reset Value

Table 4–15. StLED_Grn (LSB) Field Descriptions

Bit	Field	Value	Description
7–0	Grn [7:0]		Grn [7:0] controls the on time of the yellow portion of the bicolor led.

Figure 4–17. StLED_Grn (MSB) – 0800:0209



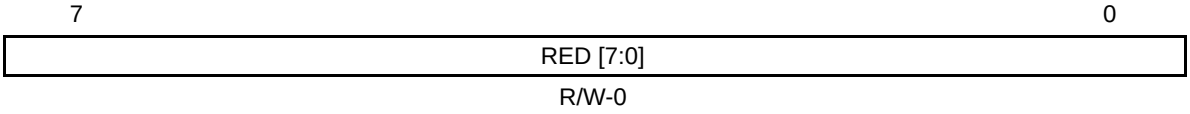
Note: R – Read, W – Write, R/W – Read/Write

Table 4–16. StLED_Grn (MSB) Field Descriptions

Bit	Field	Description
7–0	Grn [7:0]	Grn [7:0] controls the on time of the red portion of the bicolor led.

StLED_Red Registers

Figure 4–18. StLED_Red (LSB)– 0800:020A

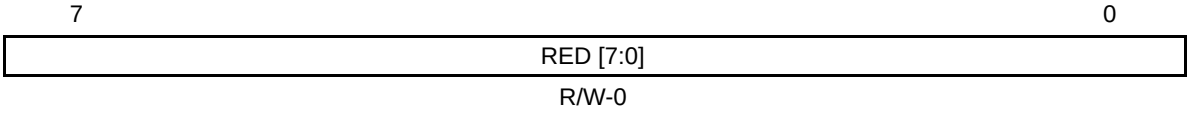


Note: R – Read, W – Write, R/W – Read/Write

Table 4–17. StLED_Red (LSB) Field Descriptions

Bit	Field	Value	Description
7–0	Red [7:0]		Red [7:0] controls the on time of the yellow portion of the bicolor led.

Figure 4–19. StLED_Red (MSB) – 0800:020B



Note: R – Read, W – Write, R/W – Read/Write

Table 4–18. StLED_Red (MSB) Field Descriptions

Bit	Field	Value	Description
7–0	Red [7:0]		Red [7:0] controls the on time of the red portion of the bicolor led.

4.3.9.3 Camera/USB Host Control Register

Figure 4–20. Camera/USB Host Control Register – 0800:020C

7	6	5	4	3	2	1	0
IF_PD0	USB1_ MODE	USB1_ HOST_EN	USB2_ MODE	USB2_ HOST_EN	BCAM_ EN	CAM_ SENS1	CAM_ SENSO
R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R-1	R-1

Note: R – Read, W – Write, R/W – Read/Write

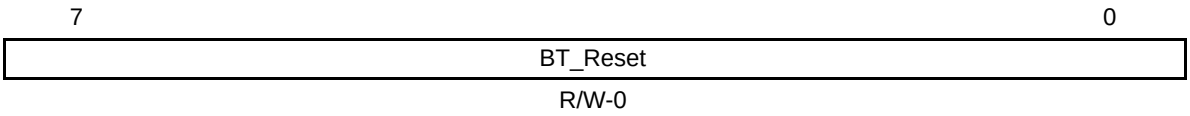
Table 4–19. Camera/USB Host Control Register Field Descriptions

Bit	Field	Description
7	IF_PD0	Controls the power to the audio amp on the Interface Module. 0 Power to the audio amp on the Interface Module is on. 1 Power to the audio amp on the Interface Module is off.
6	USB1–MODE	Sets mode of host interface 1
5	USB1–HOST_EN	USB Host interface 1 enable 0 Disables USB Host interface 1 1 Enables USB Host interface 1
4	USB2–MODE	Sets mode of host interface 2
3	USB2–HOST_EN	USB Host interface 2 enable 0 Disables USB Host interface 2 1 Enables USB Host interface 2
2	BCAM_EN	Turns on the power to the camera when set to 1
1–0	CAM–SENS1/ CAM_SENS0	Determine whether the camera is present and its position

	CAM-SENS0	CAM-SENS1
No Camera	1	1
Camera Fwd	0	1
Camera Rev	1	0

4.3.9.4 Expansion Control Register

Figure 4–21. Expansion Control Register – 0800:020D



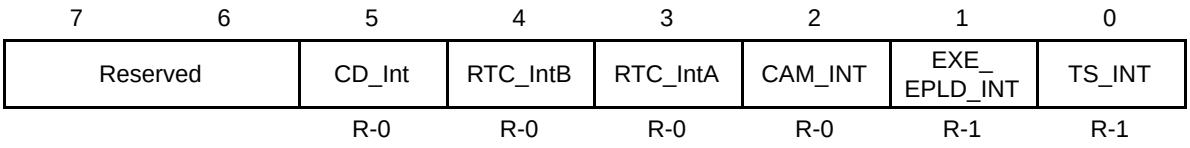
Note: R – Read, W – Write, R/W – Read/Write

Table 4–20. Expansion Control Register Field Descriptions

Bit	Field	Description
7–0	BT_Reset	BT_Reset resets the Bluetooth interface when 0.
		0 BT_Reset resets the Bluetooth interface.
		1 BT_Reset does not reset the Bluetooth interface.

4.3.10 Interrupt Status Register2 (Low)

Figure 4–22. Interrupt Status Register2 (Low) – 0800:020E



Note: R – Read, W – Write, R/W – Read/Write

Table 4–21. Interrupt Status Register2 (Low) Field Descriptions

Bit	Field	Description
7–6	Reserved	Reserved
5	CD_Int	Multimedia card interrupt is caused by inserting the Multimedia Card. Not used
4	RTC_IntB	RTC_IntB is the real time clock interrupt B. Not used
3	RTC_IntA	RTC_IntA is the real time clock interrupt A. Not used
2	CAM_INT	Camera interrupt is caused by removing the camera when it is enabled.
1	EXT_EPLD_INT	External EPLD interrupt. Currently not used.
0	TS_INT	Touchscreen interrupt is active when there is a pen down on the touchscreen.

4.3.10.1 Interrupt Mask Register2 (Low)

Figure 4–23. Interrupt Mask Register2 (Low) – 0800:0210

7	6	5	4	3	2	1	0
Reserved		CD_IntM	RTC_IntBM	RTC_IntAM	CAM_INTM	EXT_ EPLD_INTM	TS_INTM
		R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0

Note: R – Read, W – Write, R/W – Read/Write

Table 4–22. Interrupt Mask Register2 (Low) Field Descriptions

Bit	Field	Description
7–6	Reserved	Reserved
5	CD_IntM	Card interrupt mask. Masks the interrupt caused by inserting the Multimedia Card. Not used
4	RTC_IntBM	Real-time clock interrupt B mask. Masks the real time clock interrupt B. Not used
3	RTC_IntAM	Real-time clock interrupt A mask. Masks the real time clock interrupt A. Not used
2	CAM_INTM	Camera interrupt mask. Masks the camera interrupt
1	EXT_EPLD_INTM	External EPLD interrupt mask. Masks the interrupt caused by the external EPLD.
0	TS_INTM	Touchscreen interrupt mask. Masks the pen down interrupt from the touchscreen.

4.3.10.2 Interrupt Control Register

Figure 4–24. Interrupt Control Register – 0800:0218

7	6	1	0
Reserved			Cam_Int_Clr
R/W-0			R/W-0

Note: R – Read, W – Write, R/W – Read/Write

Table 4–23. Interrupt Control Register Field Descriptions

Bit	Field	Description
7–1	Reserved	Reserved
0	Cam_Int_Cir	Camera Interrupt Clear
		0 Enable the interrupt again
		1 Clears the camera removal interrupt

Chapter 5

Tools Setup

This chapter describes how to load and set up the tools used by the Innovator™ Development Kit.

Before starting the installation of the required software packages you must have administrative rights on the computer if the computer operating system is Windows NT or 2000.

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5.1 iBoot Host Installation

Before software downloads can be performed using iBoot, iBoot Host must be loaded on the host PC. After iBoot host has been loaded, it is necessary to load the Innovator USB driver in order to connect the Innovator to the host PC. To load iBoot Host, proceed as follows:

Step 1: Unzip iBoot Host.zip to the Innovator folder that you create.

Step 2: Locate and run Setup.exe from the Innovator folder and follow the instructions on the screens.

Step 3: Enter the location for the iBoot Host program, or use the default setting.

Step 4: Click on **Finish** to complete the installation. You do not have to reboot your PC.

The installation program places an ICON on your desktop, as shown below.

IBOOT HOST.lnk

5.1.1 USB Driver Installation

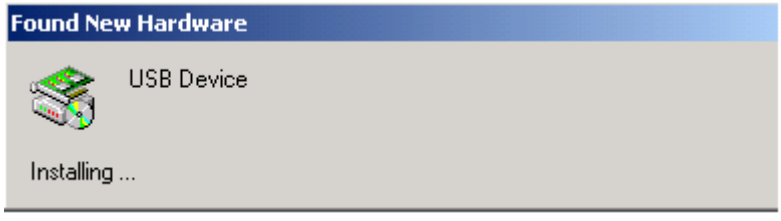
The Innovator USB driver must be installed before the Innovator can communicate with the host PC. Start this procedure with the Innovator Module turned Off. To load the USB driver, proceed as follows:

Step 1: Connect the Innovator module to the host PC via the client USB port.

Step 2: With Windows running on the host PC, turn the Innovator Module on.

Step 3: Windows detects the hardware by acknowledging a new USB device (this might take several minutes).

Figure 5–1. Found New Hardware Screen



Step 4: Once the device has been acknowledged, the Hardware Wizard appears.

Step 5: On the second screen of the Hardware Wizard, select the first option "*Search for a suitable driver for my device*" and click on **Next**.

Step 6: On the Locate Driver Files screen check the third option "Specify a location" and press Next.

Step 7: A dialog box appears asking for the directory where the driver is located. Browse to the Innovator Installation CD and open the Driver folder.

Step 8: In the Driver folder open the InnovatorUSB.inf file.

Step 9: The Wizard notifies you when it has found the corresponding driver. Once this is done, click on **Next** and the Wizard finishes the Driver installation.

Step 10: Once the driver is installed, you will be able to find the Innovator hardware on your system's Device Manager under the Universal Serial Bus Controllers as Innovator.

5.2 Code Composer Studio

Code Composer Studio is not included in the Innovator™ Development Kit.

You can purchase a copy from Texas Instruments, request a Code Composer Studio 90-day Free Evaluation Tools CD, or obtain an evaluation copy from the website — www.ti.com.

If you use the Tools CD, see the installation guide included on the CD Insert with Code Composer Studio 90-Day Free Evaluation Tools.

Install the OMAP™ Code Composer Studio using the instructions provided with it.

It is recommended that Code Composer Studio be installed on a PC that has Internet access. Follow the on screen instructions. Use the default settings for the installation.

5.3 Installing Spectrum Digital XDS510PP+ Drivers

To load the Spectrum Digital XDS510PP+ Drivers, proceed as follows:

Step 1: Open the computers Internet browser and navigate to the Spectrum Digital FTP server at the following address:

ftp://ftp.spectrumdigital.com/pub/Software-Releases/CodeComposer-5.x/omap/Release-1.52/

Step 2: Right click on the file named **SetupCCOMAP.exe** and select **Save Target As** or **Copy To Folder**.

Step 3: Save the file in a location where it can be easily accessed.

Step 4: After downloading the SetupCCOMAP.exe file, navigate to the folder containing the program and run the program by double clicking on it. The program installs the drivers required by Code Composer Studio and the XDS510PP+ emulator to allow the emulator to communicate with the ARM and DSP processor package. When the installation program asks where it should be installed the user needs to change the default location from **c:\ti** to **c:\tieval2**.

Please note that the following changes are needed for use of the Spectrum Digital emulator. By changing these settings the user can cause undesirable effects to other installed software that use the Parallel Port for communications.

Step 5: When the installation is complete, reboot the computer and enter the BIOS setup for the computer.

Step 6: Check that the parallel port is setup as ECP. If ECP is not available try to set the parallel port for SPP or SPP8. As a last resort set the parallel port to Bi-Directional. Once the port has been properly set, save the settings and reboot the computer.

Step 7: Connect the DB25 pin cable to the parallel port of the computer.

Step 8: Connect the other end of the DB25 pin cable to the parallel port connector on the XDS510PP+ emulator.

Step 9: Connect one end of the dual serial port cable to the COM port of the computer.

Step 10: Connect the dongle end of the dual serial port cable to the serial port on the Interface Module.

Step 11: Connect the power supply to the Innovator.

Step 12: Connect the JTAG connector from the emulator to the JTAG connector on the Processor Module. Note that pin 6 has been removed and is used as a key for the JTAG connector.

Step 13: Turn on the Innovator power switch.

Step 14: Connect the emulator power supply to the emulator.

Step 15: The hardware is now set up and the required software has been installed.

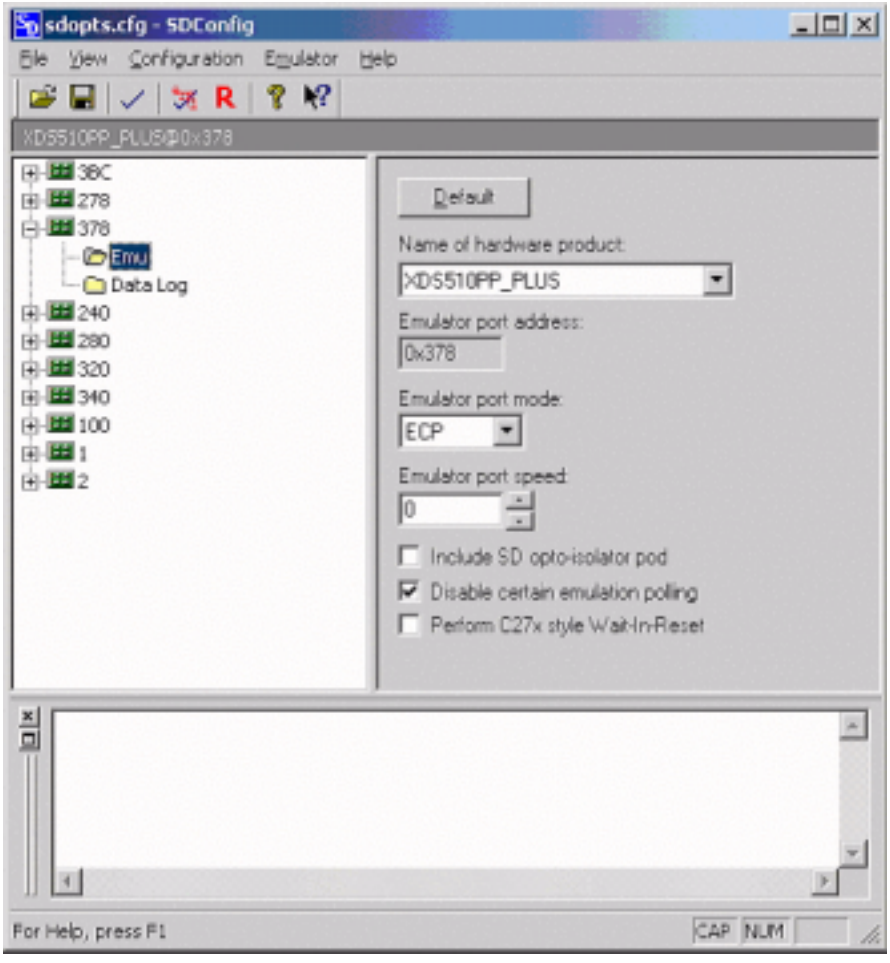
5.4 Configuring and Testing the XDS510PP+

From the installation of the Spectrum Digital software there should be an “SDConfig” icon on the desktop of the computer. Double click on the icon to start the SDConfig program.

Step 1: In the SDConfig program select the port in the left window that has 378 next to it. This is the standard parallel port LPT1 for most computers. Double click on the 378. Two sub folders should appear. The first is Emu. The second is Data Log.

Step 2: Single click on the Emu folder. Match the settings to the example to the right.

Figure 5–2. Emu Settings



Step 3: Once the settings are correct, select the **File** option on the top menu bar and select **Save**.

Step 4: Select the **File** option on the top menu bar again and select **Exit**.

Step 5: From the desktop, restart the SDConfig program by double clicking on the SDConfig icon. Just as was done previously open the 378 port, verify the settings are correct. If the settings are not correct, repeat the steps on this page or contact PSI for assistance. If the settings are correct, continue to the next step.

Step 6: On the icon menu, there is a check mark next to the floppy disk icon. Mouse over the check mark and click it once. The following information should appear in the bottom window of the SDConfig tool.

```
** Checking for a valid emulator/eZdsp
  $$ You are connected to:
  $$ EmuProductName=XDS510PP_PLUS
  $$ EmuPortAddr=0x378
  $$ EmuPortMode=SPP8
  $$ ProductId=10
  $$ ProductVersion=02
```

Step 7: Click on the emu check mark next to the check mark icon. The following information should appear in the bottom window.

Figure 5–3. Emu Scan Test

```
** Emulator Scan Test
-- Found JTAG IR length of 50
-- Found 3 JTAG device(s) in the scan chain
```

Step 8: Finally, click on the red "**R**" icon. The following information should appear in the bottom window.

```
**Emulator is reset
```

Step 9: Select **File** from the top menu and **Exit** the SDConfig program. The emulator has successfully been connected to the computer and the EVM.

Chapter 6

iBoot Internal Test Software

iBoot is used to download software from the host PC to Innovator. It also provides a set of commands for initializing and accessing the target from the host PC. The iBoot program includes tests such as linear memory check (SDRAM, User flash) buttons, touchscreen, LCD, camera and audio.

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6.1 Loading iBoot Using Code Composer

Step 1: Start with the Innovator turned off.

Step 2: Set the Innovator Memory Configuration switches:

SW1 – Off

SW2 – Off

SW3 – Off

SW4 – Off

Step 3: Connect JTAG to Innovator Processor Module.

Step 4: Start SDConfig.exe to reset JTAG.

Step 5: Turn Innovator Module power switch on.

The example that follows uses the PCI JTAG. Your particular JTAG can indicate a different port address.

Step 6: Reset JTAG by clicking on the reset icon (red "**R**") as shown in Figure 6–1.

Step 7: Click on the emulator test icon and verify bottom two lines of text read:

Figure 6–1. Emulator Reset

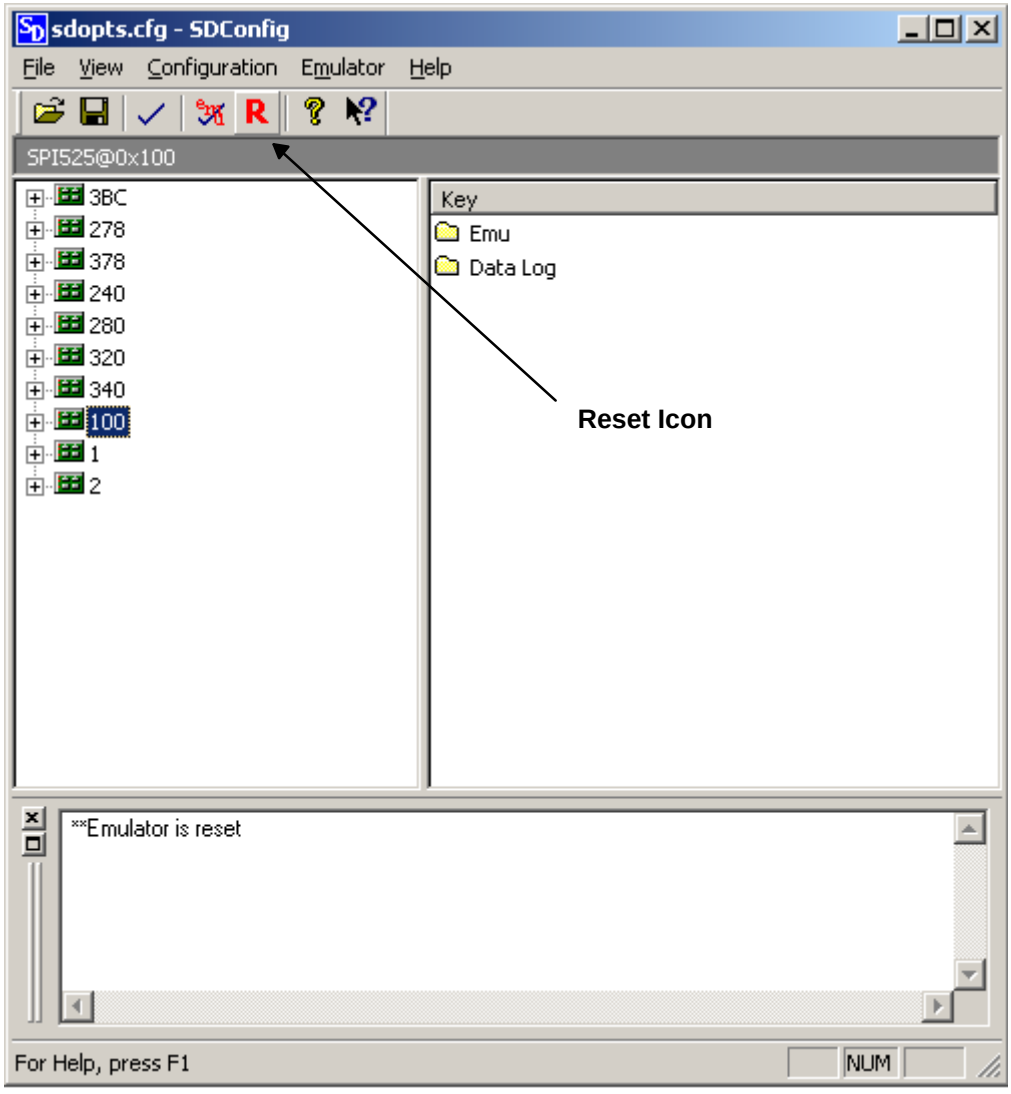
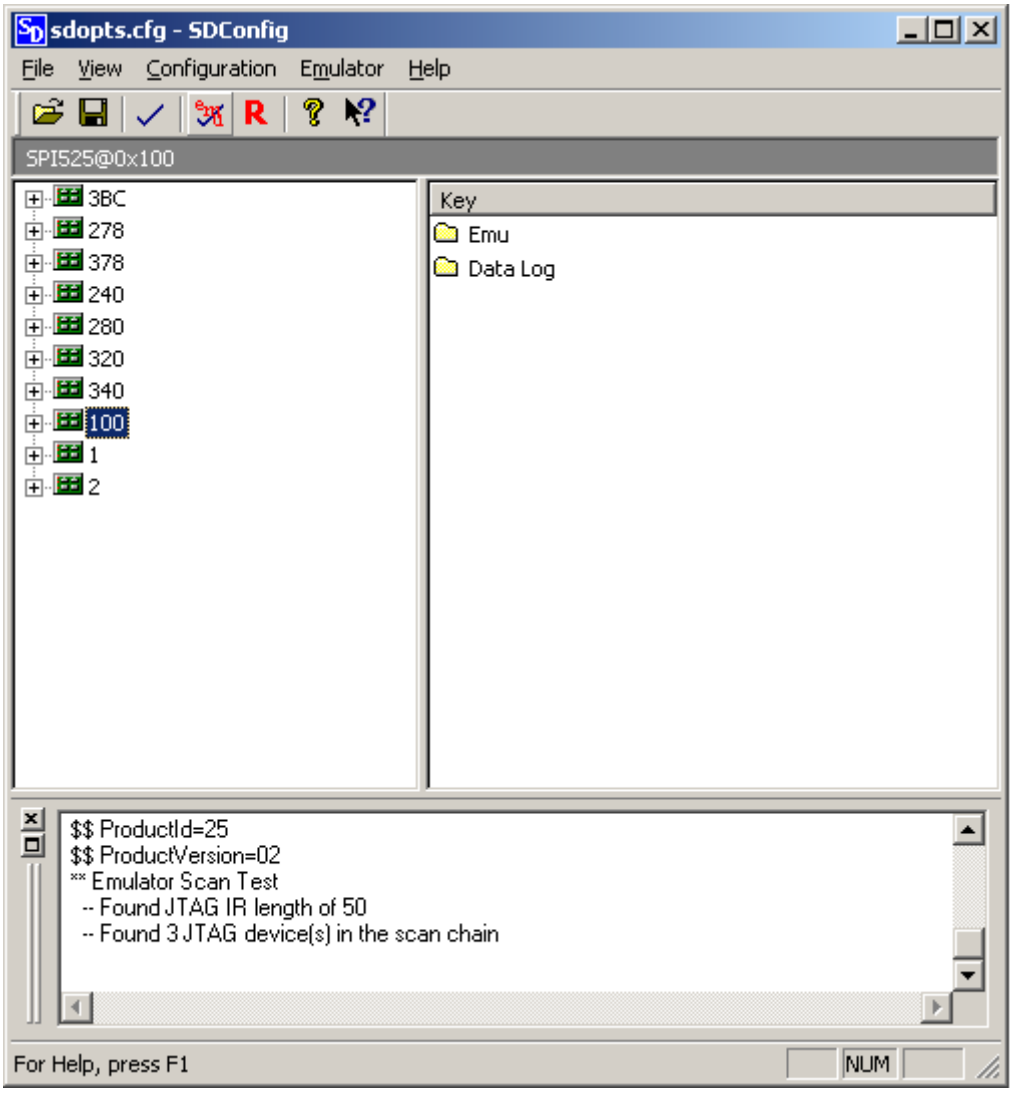
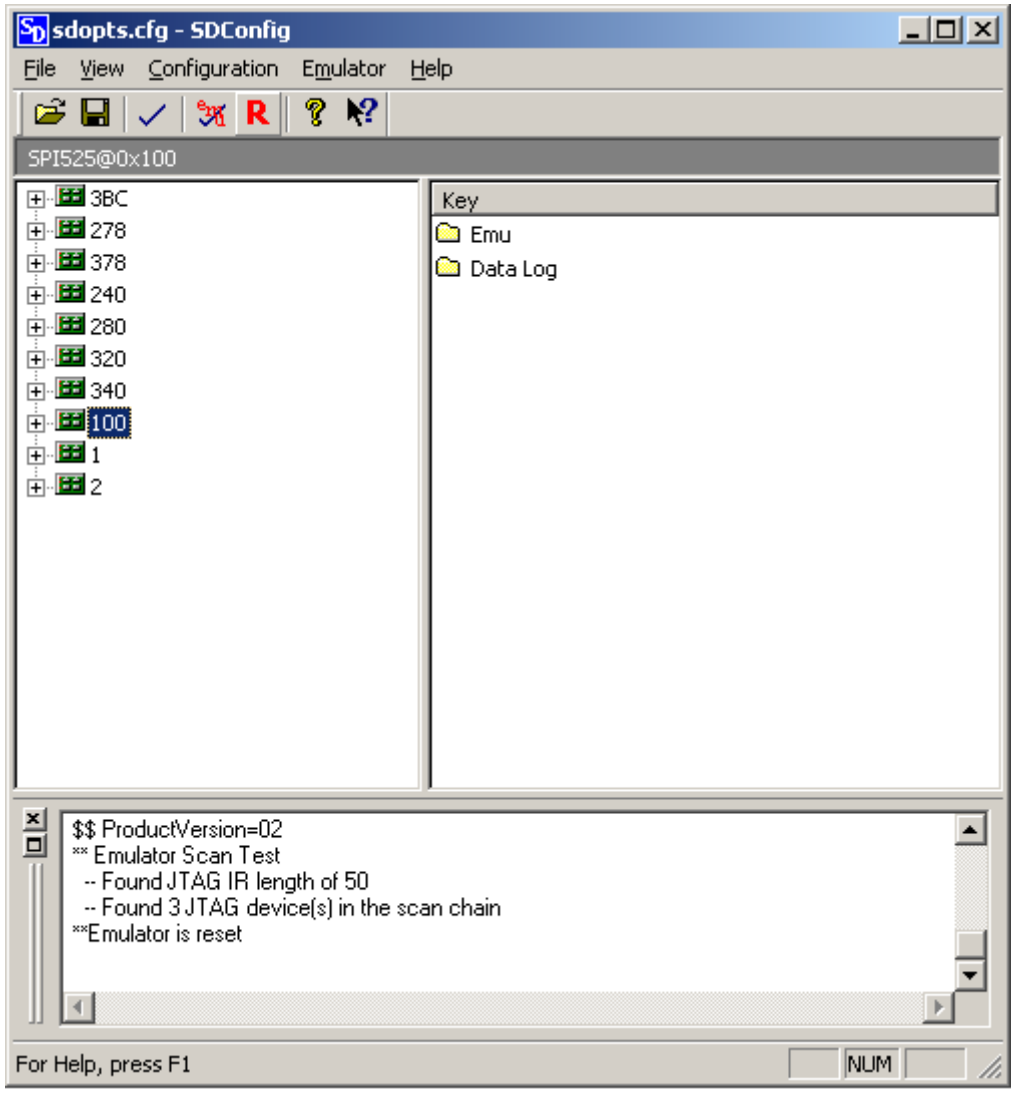


Figure 6–2. Emulator Test



Step 8: Reset JTAG again.

Figure 6–3. JTAG Reset



Step 9: Open Code Composer Studio using the ARM-side.

Figure 6–4. Opening Code Composer Studio

Step 10: Load iBBFload.out file from the support CD. A progress bar appears to show the status of the program loading.

Figure 6–5. Loading iBoot Program

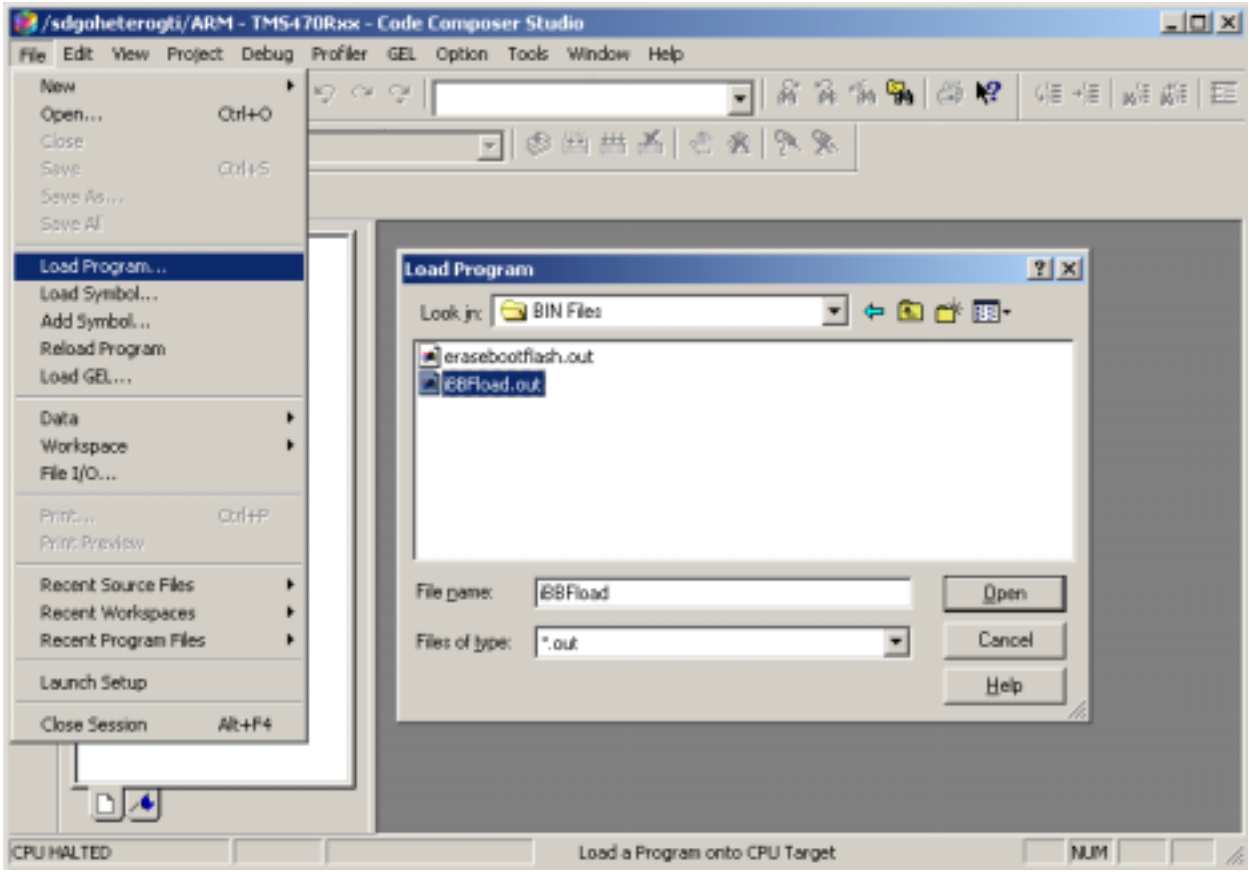
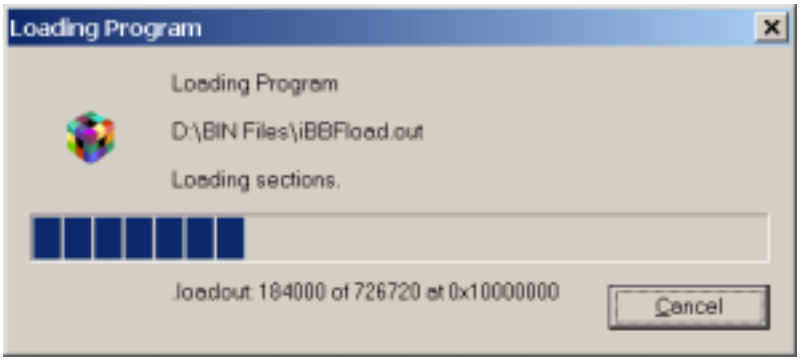
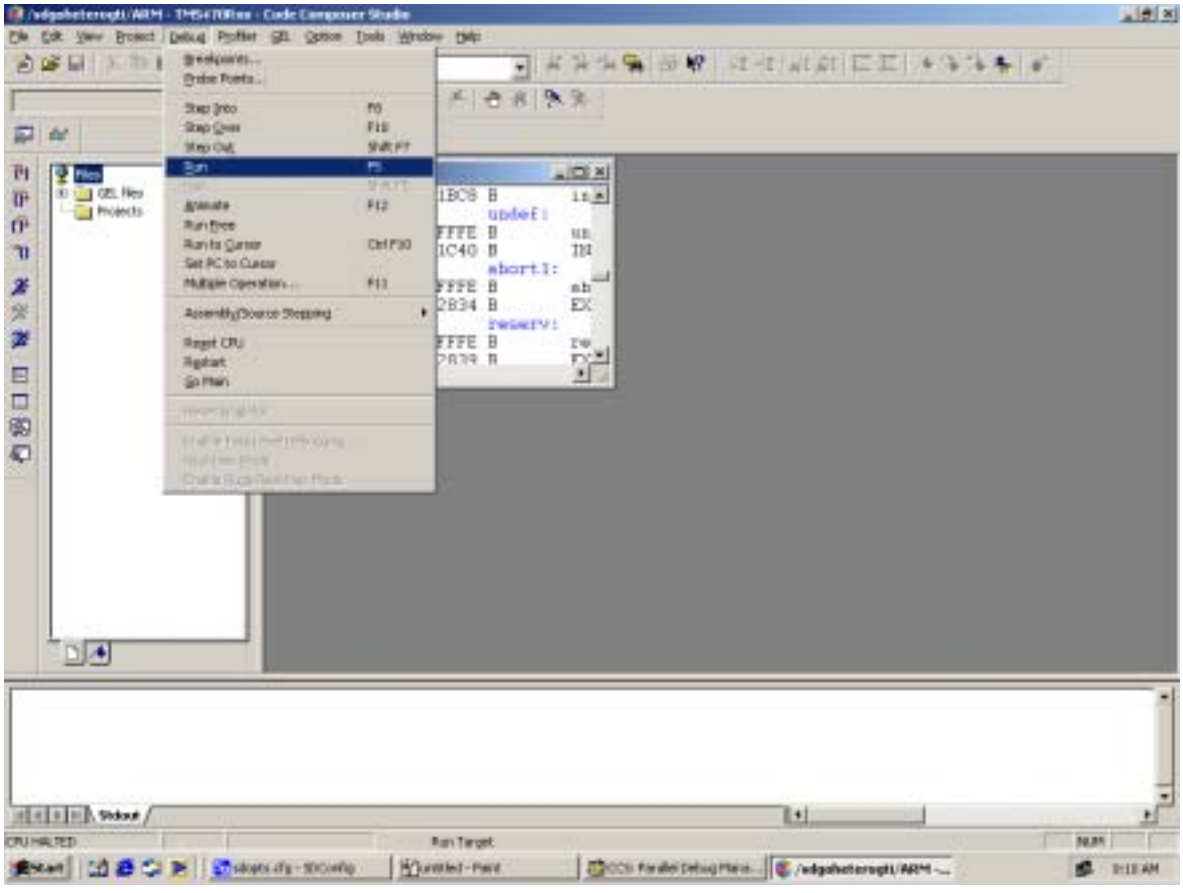


Figure 6–6. Program Loading Progress



Step 11: After program file loads, select Run from the Debug menu (or press F5) to download the program to the Innovator.

Figure 6–7. Downloading iBoot Into the Innovator



Step 12: As the program is loading, the LED starts blinking. After iBoot has been loaded into the Innovator (approximately 3 to 5 minutes), the LED changes to solid red. Close Code Composer Studio and power down the Innovator.

Step 13: Set SW1 to on and turn on the Innovator power switch to see iBoot.

6.2 Running iBoot

It is recommended that iBoot be run initially to calibrate the touch screen. It can also be run to test certain functional areas of the Innovator.

6.2.1 Memory Configuration Switch Settings

Before iBoot displays, the Innovator must be turned off and the memory configuration switch must be set as follows:

SW1 – ON

SW2 – OFF

SW3 – OFF

SW4 – OFF

After setting the switches on the memory configuration switch, turn the power back on.

6.2.2 iBoot Applets

Use the five pole switch to navigate to each applet, and then use the select function of the switch to initiate the applet. Follow the directions within each applet to perform that function.

Use switch 4 to exit each function.

NOTE: Switches 4, 5, 6 and 7 are user-defined switches. Only switch 4 has been programmed to be used with iBoot.

6.2.3 Navigating Through iBoot Screens

Navigating through the menu is done using the five pole switch and switch 4. Navigating from screen to screen is done with the page up, page down and back buttons.

6.3 Power Source Indications

The following indications show the status of the Innovator Module's battery. When the power cord is used, the battery charging indication is displayed.

- ❏ Innovator Module in running off the Battery
- ❏ Low Battery
- ❏ Power Cord is powering the Innovator and the Battery is Charging

Chapter 7

Loading Operating Systems

It is possible to load up to two operating systems on the Innovator, provided neither operating system is greater than 16M. The operating system is then selected by configuring the memory configuration switch. This chapter describes how to load operating systems into User Flash locations using IBoot Host, and how to select the operating system to use. This procedure assumes that iBoot, USB Drivers, and IBoot Host have already been loaded.

Topic **Page**

7.1 Loading an Operating System into User Flash 0 7-2

7.2 Loading an Operating System Into User Flash 1 7-5

7.1 Loading an Operating System into User Flash 0

To load operating system images files into User Flash 0, proceed as follows:

Step 1: Make sure Memory Configuration switch is set with SW1 On.

Step 2: Connect a USB cable from the USB Port on the host PC to the USB Client Port on the Innovator.

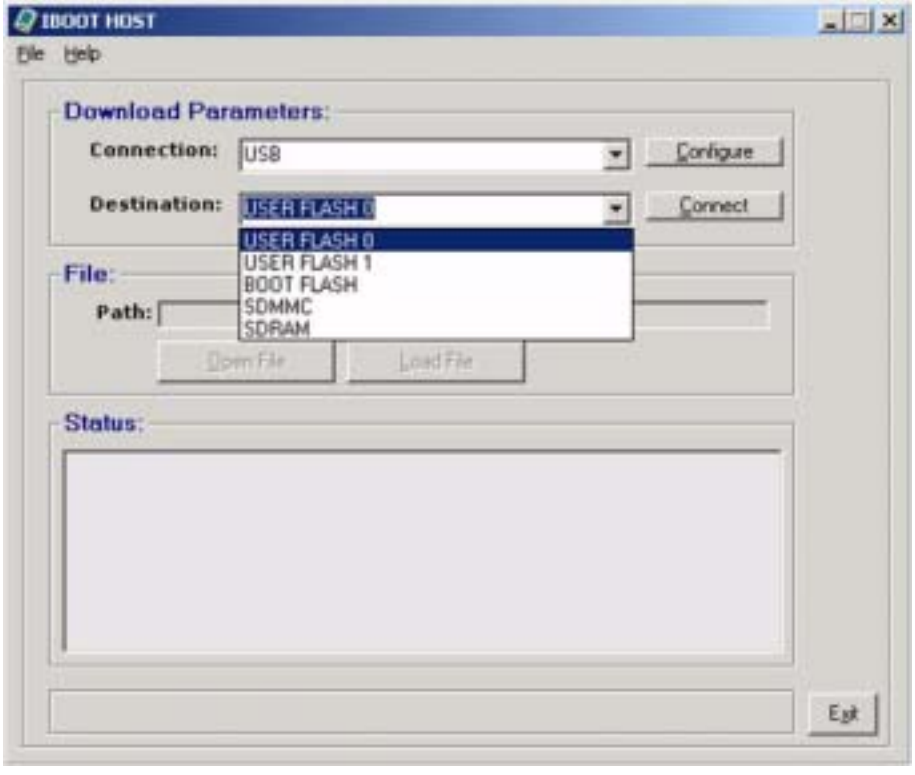
Step 3: Turn on the Innovator.

Step 4: Launch IBoot Host by double-clicking on the Icon on the host PC desktop.

Figure 7–1. IBoot Host Icon

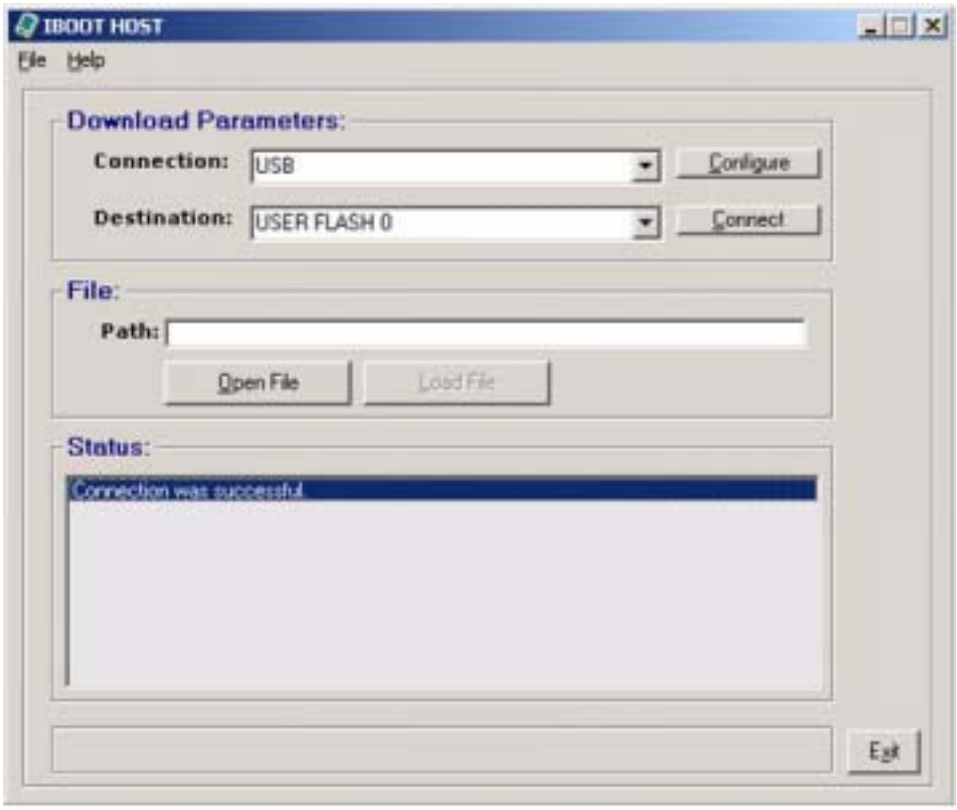
Step 5: Select USB as the connection type and USER FLASH 0 as the destination.

Figure 7–2. Download Parameters



Step 6: Click on **Connect** and make sure "*Connection was successful*" appears in the Status window.

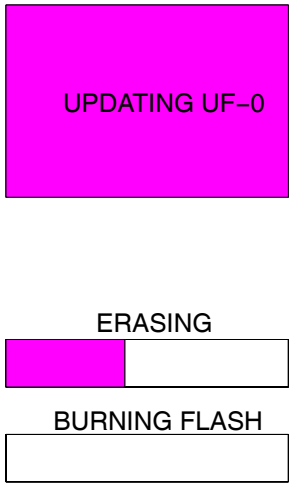
Figure 7–3. Connection Status Window



Step 7: Click on **Open File** and enter path and filename for the operating systems.

Step 8: Click on **Load File**. Observe the following screen is displayed on the Innovator (after about 10 to 15 seconds). IBoot Host erases the User Flash destination first. The LED blinks green while erasing.

Figure 7–4. Erasing User Flash Screen



LED blinks orange when IBoot Host begins loading the User Flash.

The LED goes to solid red when loading is done. Unplug the USB cable and press SW4 to exit.

Step 9: Turn the Innovator off.

Step 10: To run the operating system, configure memory configuration switches as follows:

SW1 – Off

SW2 – Off

SW3 – On

SW4 – Off

Step 11: Power on the Innovator and you should see the operating system screen.

7.2 Loading an Operating System Into User Flash 1

To load operating system files into User Flash 1, proceed as follows:

Step 1: Make sure Memory Configuration switch is set with SW1 On.

Step 2: Connect a USB cable from the USB Port on the host PC to the USB Client Port on the Innovator.

Step 3: Turn on the Innovator.

Step 4: Launch IBoot Host by double-clicking on the Icon on the host PC desktop.

Step 5: Select USB as the Connection type and USER FLASH 1 as the Destination.

Step 6: Click on **Connect** and make sure "*Connection was successful*" appears in the Status window.

Step 7: Click on **Open File** and enter path and filename for the operating systems.

Step 8: Click on **Load File**. Observe the following screen is displayed on the Innovator (after about 10 to 15 seconds). IBoot Host erases the User Flash destination first. The LED blinks green while erasing.

Step 9: Observe LED blinks orange when IBoot Host begins loading the User Flash.

Step 10: The LED goes to solid red when loading is done. Unplug the USB cable and press SW4 to exit.

Step 11: Turn the Innovator off.

Step 12: To run the operating system, configure memory configuration switches as follows:

SW1 – Off

SW2 – Off

SW3 – On

SW4 – On

Step 13: Power on the Innovator and you should see the operating system screen.

Chapter 8

Updating iBoot

This chapter describes how to update the iBoot program.

The latest iBoot is located at:

\BIN Files\iBBFload.out

Topic **Page**

8.1 Converting an “out” (.out) File to a “bin” (.bin) File 8-2

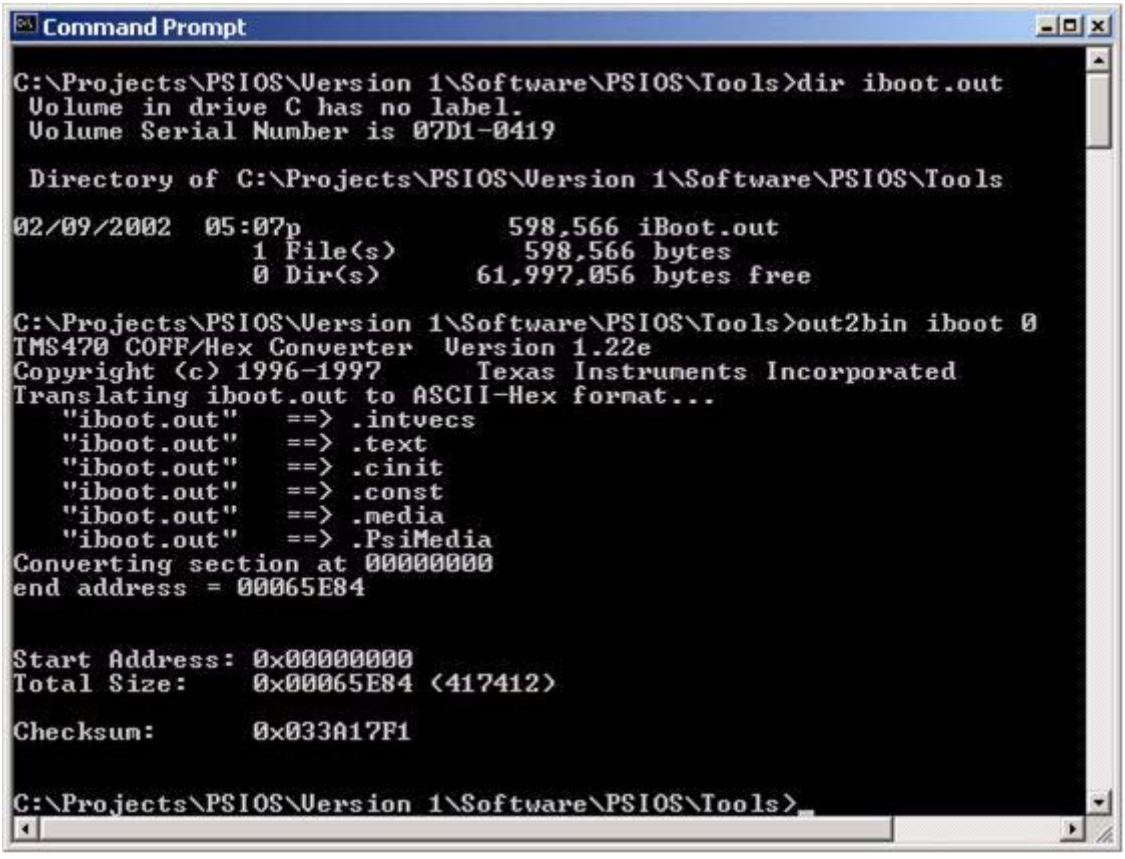
8.2 Erasing The Boot Flash 8-3

8.3 Flashing iBoot Using Code Composer 8-5

8.4 Boot RAM Version 8-6

8.1 Converting an “out” (.out) File to a “bin” (.bin) File

Figure 8–1. DOS Command Prompt Screen



8.2 Erasing The Boot Flash

You need to erase Boot flash prior to flashing iBoot into Boot Flash.

Step 1: Set memory configuration switches:

SW1 – Off

SW2 – Off

SW3 – Off

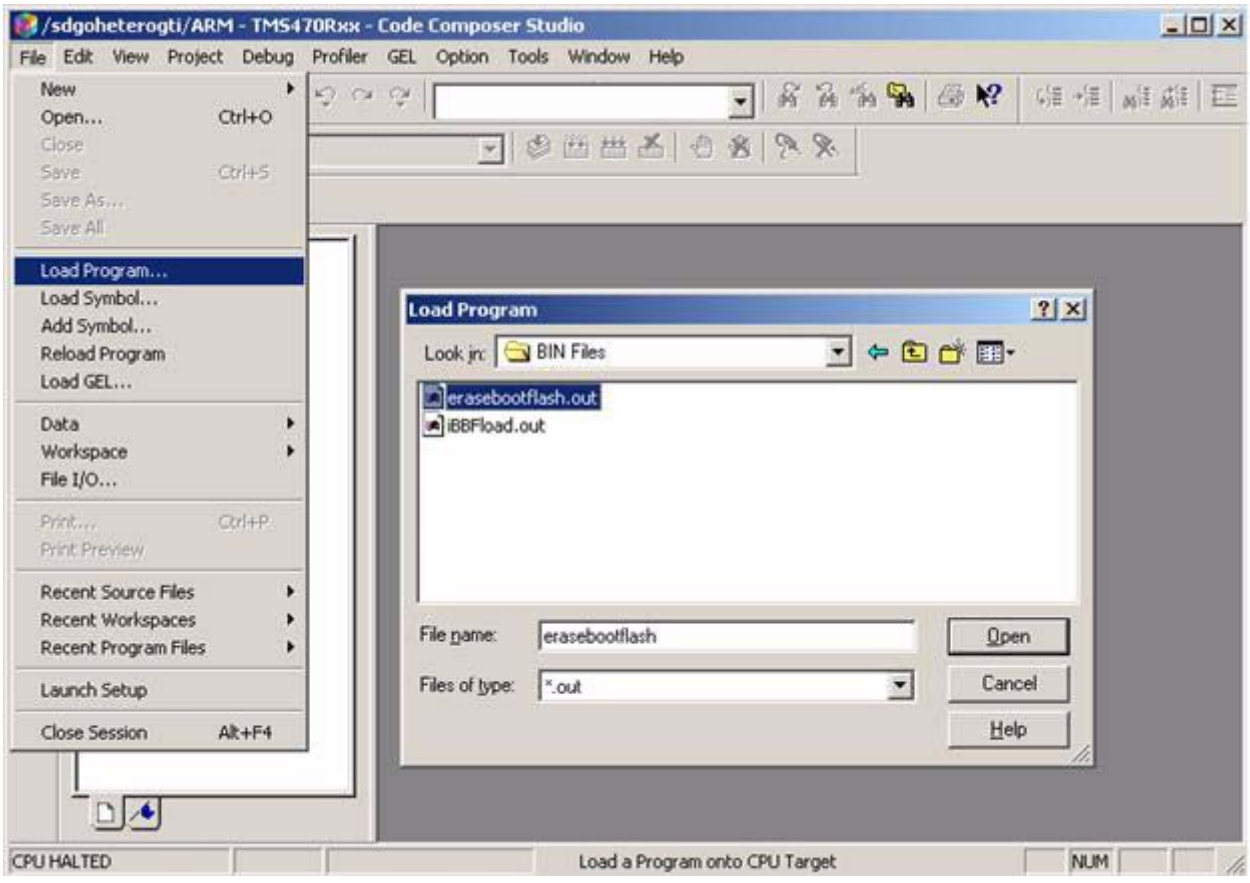
SW4 – Off

Step 2: Open Code Composer Studio using the ARM-side.

Figure 8–2. Selecting ARM Side

Step 3: Load erasebootflash.out file from the Support CD. A progress bar appears to show the status of the program loading.

Figure 8–3. Loading Boot Flash Erase Program



Step 4: From the Debug menu, select Reset CPU, then Restart, then Run.

Step 5: Set memory configuration SW1 to On and press the Processor Module Reset Switch to verify that nothing appears on the Innovator display.

8.3 Flashing iBoot Using Code Composer

Step 1: Start with the Innovator turned off.

Step 2: Set Innovator Memory Configuration switches:

SW1 – Off

SW2 – Off

SW3 – Off

SW4 – Off

Step 3: Connect JTAG to Innovator Processor Module.

Step 4: Start SDConfig.exe to reset JTAG.

Step 5: Turn Innovator Module power switch on.

Step 6: Reset JTAG by clicking on the reset icon (red "**R**") as shown above.

Step 7: Click on the emulator test icon (see NO TAG) and verify bottom two lines of text read:

Step 8: Reset JTAG again.

Step 9: Open Code Composer Studio using the ARM-side.

Step 10: Load iBBFload.out file from the Support CD. A progress bar appears to show the status of the program loading.

Step 11: After program file loads, select Run from the Debug menu (or press F5) to download the program to the Innovator.

Step 12: After iBoot has been loaded into the Innovator (approximately 3 to 5 minutes), the LED changes from green to red. Close Code Composer Studio and power down the Innovator

Step 13: Set SW1 to On and turn on the Innovator power switch to see iBoot.

8.4 Boot RAM Version

To run the Boot RAM version of iBoot:

Step 1: Run BootRam GEL procedure.

Step 2: Download the following file:

\Innovator\Kernels\iBoot\iBootRAM.out

8.4.1 Debugging

To debug the User Flash version of iBoot:

Step 1: Run UserFlash GEL procedure.

Step 2: File ! Load Symbols on:

\Innovator\Kernels\iBoot\iBootFlash.out

Step 3: Debug ! Reset CPU

Step 4: Debug ! Restart

Chapter 9

Innovator Disassembly/Assembly

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.

Topic **Page**

9.1 Innovator Disassembly 9-2

9.2 Innovator Assembly 9-4

9.1 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 the sides of the back cover and set cover aside. **Do not** remove screws from front cover.

Figure 9–1. Location of Screws for Disassembly

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

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. It may be necessary to

depress the Sleep/Wake Button to clear the opening in the cover. Do not remove the Interface Module from the cover until you read the next step.

Step 6: Slide Interface Module out of front cover at an angle to avoid breaking the Tri-Position Switch.

9.2 Innovator Assembly

Note: Read Each Step

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

To assemble the Innovator, proceed as follows:

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.

Step 2: Orient the Processor Module so that SD/MMC connector is at the top when assembled. Place the Processor Module connectors over Expansion Module connectors and press the two modules together until they fit tightly. If the connectors do not mate, check to make sure Processor Module is oriented properly.

Step 3: Squeeze all module connections once more to be certain there are no gaps in the connections.

Step 4: 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. The battery should be positioned with the wires up underneath the Processor Module to keep them from getting pinched when the cover is put on.

Step 5: With the assembled modules in one hand and the front cover in the other hand, angle the assembled modules into the front cover so that the tri-position switch slides into the opening on the side of the 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 clears 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.

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.

Chapter 10

Innovator Breakout Board (BoB)

This chapter explains the Innovator Breakout Board (BoB).

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10.1 Layout of the Breakout Board 10-2
10.2 BoB Module Configurations 10-5
10.3 Jumper Settings 10-7
10.4 Test Points 10-7
10.5 Breakout Board Equipment Connections 10-8

10.1 Layout of the Breakout Board

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.

Figure 10–1. Breakout Board, Top View

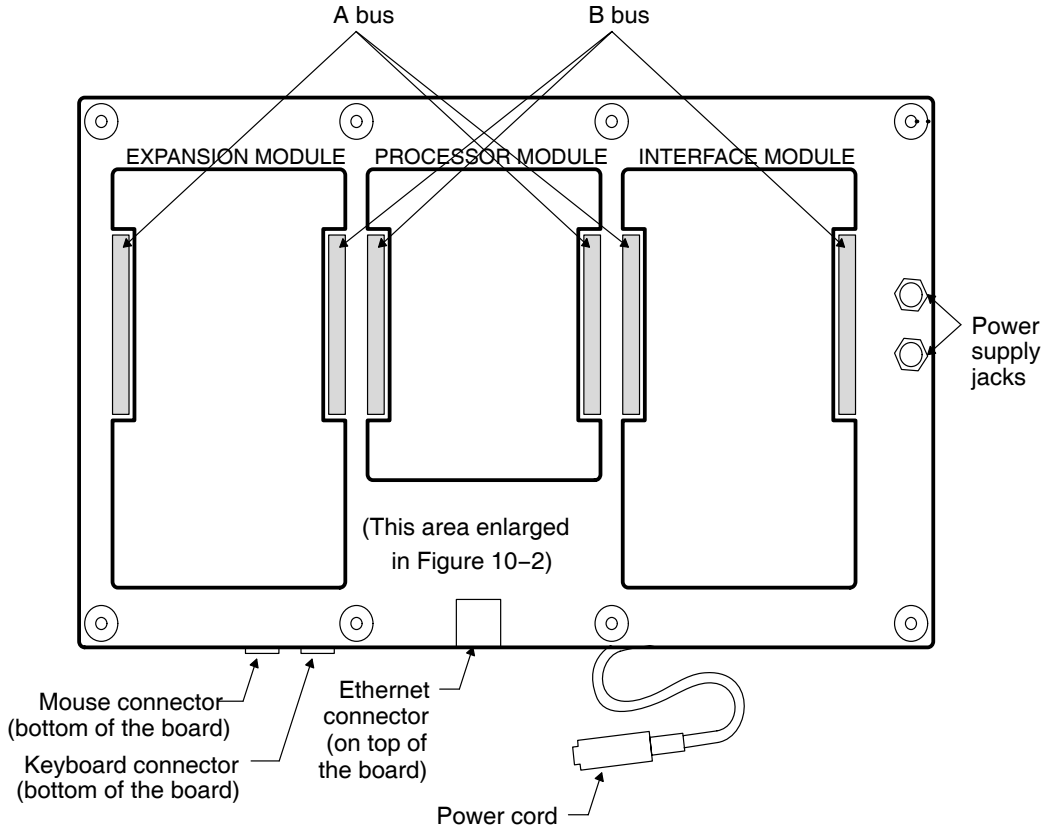


Figure 10–2. BoB Enlarged Section

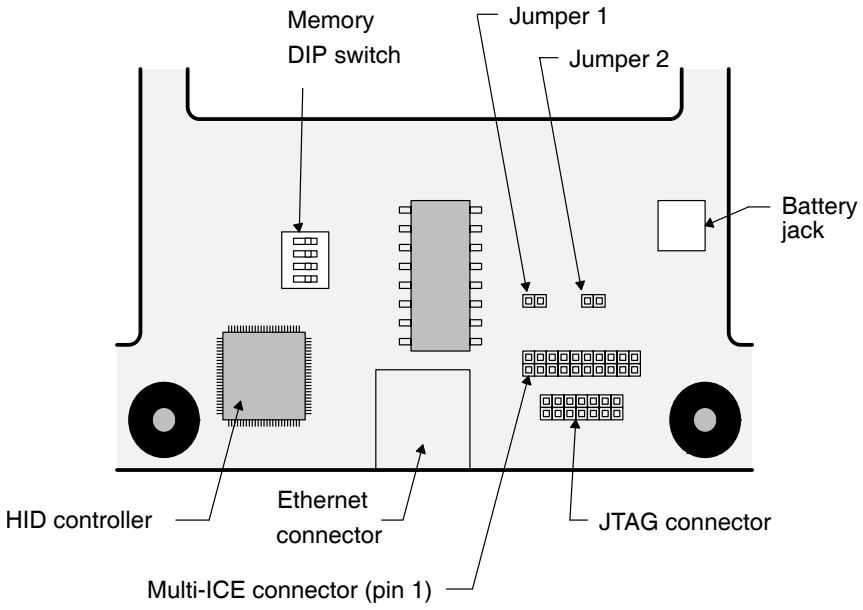


Figure 10–3. Top View With Modules Installed

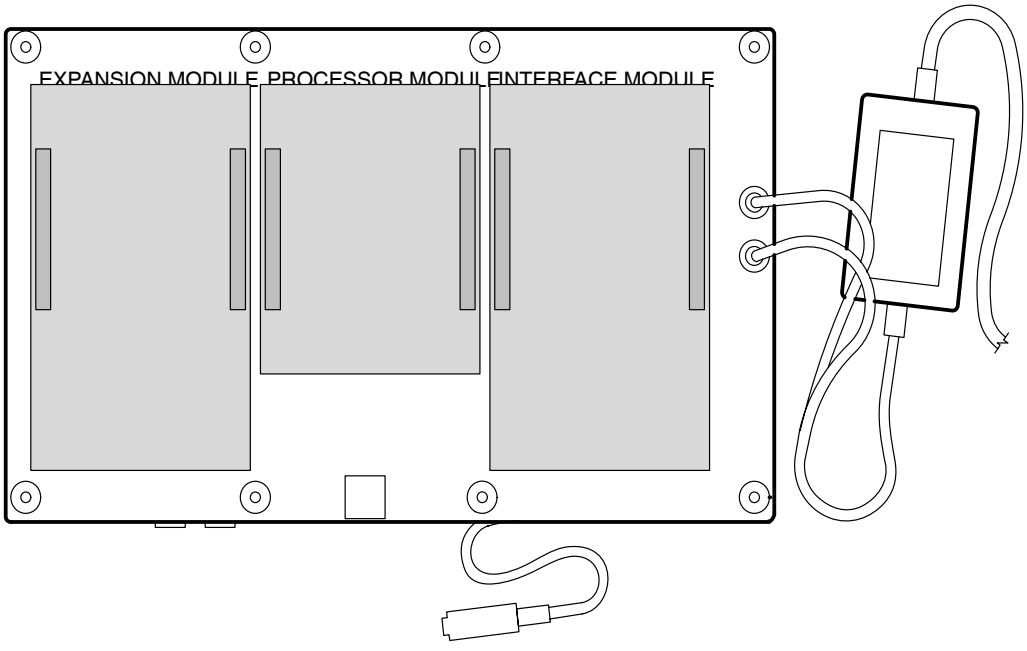
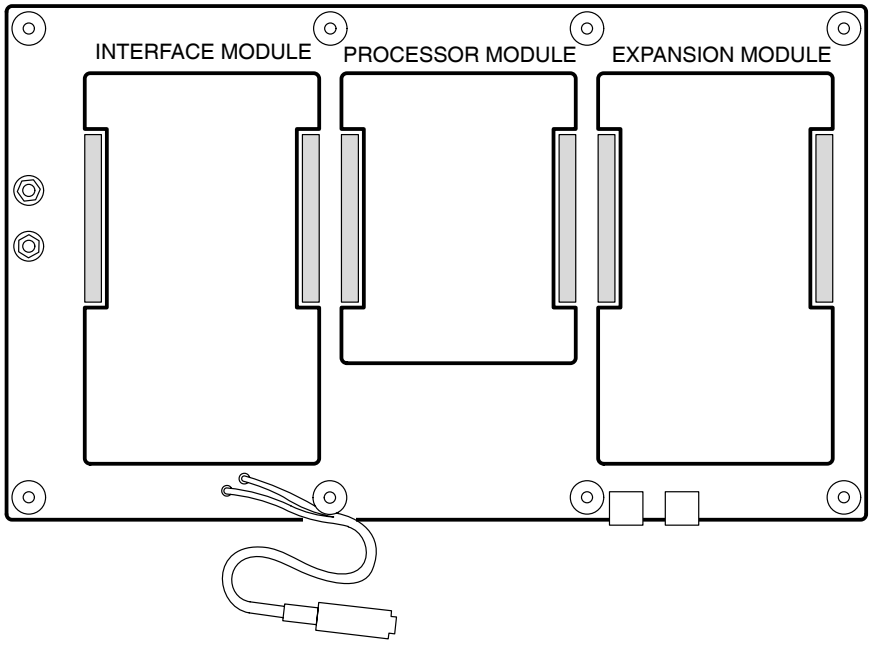


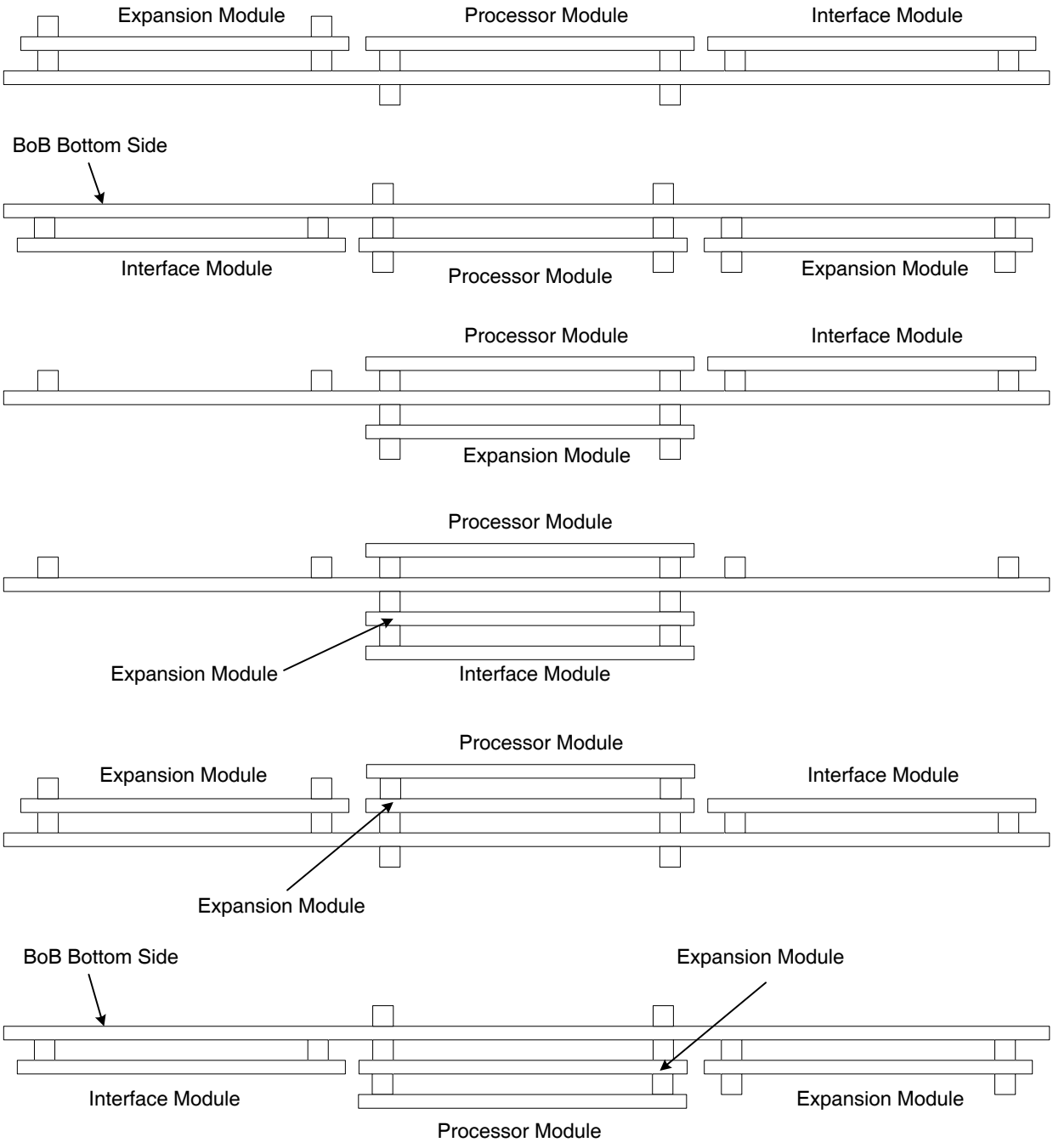
Figure 10–4. Breakout Board, Bottom View



10.2 BoB Module Configurations

For testing purposes, the modules can be configured on the BoB in a number of different ways. The diagrams below show most of the configurations that are possible.

Figure 10–5. BoB Module Configurations



10.3 Jumper Settings

JTAG and Multi-Ice are selected using Jumpers 1 and 2. Table 10–1 shows the jumper positions with the connector that is activated.

Table 10–1. Breakout Board Jumper Settings

Jumper	Pin Numbers	Connector
JP1	1–2	Multi-Ice
JP1	2–3	JTAG
JP2	1–2	Multi-Ice
JP2	2–3	JTAG

10.4 Test Points

Table 10–2 shows the signals that appear at each test point.

Table 10–2. Breakout Board Test Points

Test Point	Signal
TP1	External Power Supply
TP2	Power Connector Voltage
TP3	Interface Module 5-V Supply
TP4	Expansion Module 5-V Supply
TP5	Interface Module 5-V Supply
TP6	Processor Module 5-V Supply
TP7	Processor Module 3.3-V Supply
TP8	Expansion Module 3.3-V Supply
TP9	Processor Module 3.3-V Supply
TP10	Interface Module 3.3-V Supply
TP11	Processor Module V I/O
TP12	Expansion Module V I/O
TP13	Processor Module V I/O
TP14	Interface Module V I/O

10.5 Breakout Board Equipment Connections

Before connecting a JTAG or Multi-Ice to the BoB, jumpers 1 and 2 should be placed in accordance with Table 10–1.