ECHELON®

FT 6000 EVB
Hardware Guide

Develop, prototype, test, and debug applications using the FT 6000 EVB.

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Preface

The FT 6000 EVB is a development board for evaluating the Echelon platform for the Industrial Internet of Things (IzoT). The platform consists of chips, stacks, modules, routers and management software. The FT and Neuron 6000 family of chips enable the creation of the most compact and cost-effective IzoT capable devices. The FT 6000 EVB is a complete Series 6000 device that uses an FT 6000 Smart Transceiver. It includes a variety of I/O devices that you can use to develop prototype and production devices.

Welcome

The FT 6000 EVB is a complete Series 6000 device that you can use to evaluate the Echelon platform and create IzoT™ capable devices. The FT 6000 EVB includes an FT 6000 Smart Transceiver with an external 10 MHz crystal (you can adjust the system's internal clock speed from 5MHz to 80MHz), an FT-X3 communication transformer, external serial flash memory device, and a 3.3V power source. The FT 6000 EVB features a compact design that includes the following I/O devices that you can use to develop prototype and production devices and test the FT 6000 EVB example applications:

- 4 x 20 character LCD
- 4-way joystick with center push button
- 2 push-button inputs
- 2 LED outputs
- Light-level sensor
- Temperature sensor

The FT 6000 EVB also includes EIA-232/TIA-232 (formerly RS-232) and USB interfaces that you can use to connect the board to your development computer and perform application-level testing and diagnostics. Note that you can only use one of the EIA-232 and USB interfaces at a time.

Each FT 6000 EVB also features support for the in-circuit programming of the external serial non-volatile flash memory device on the board using the serial peripheral interface bus (SPI) interface.

Purpose

This document describes how to connect the FT 6000 EVB boards, and it describes the Neuron core, I/O devices, service pin and reset buttons and LEDs, and jumper settings on the FT 6000 EVB hardware.

Audience

This guide is intended for device and system designers with an understanding of control networks.

Box Contents

The FT 6000 EVB hardware ships with the following material:

- FT 6000 EVB Evaluation Boards. The FT 6000 EVB hardware includes two FT 6000 EVBs that you can connect to a LONWORKS TP/FT-10 channel.

- IzoT Network Services Server CD.   Contains the network operating system that is the standard network management software platform for commercial and industrial IzoT and LONWORKS networks.

- IzoT Commissioning Tool DVD Contains the software package for designing, installing, and maintaining LONWORKS and IzoT control networks.

- Quick Start Guide. This document describes how to install the software included with your FT 6000 EVB; connect the FT 6000 EVBs and your development computer to an Echelon FT-10 channel; and create a simple network using the Neuron C example application pre-loaded on the FT 6000 EVB.

- Power supplies (90–240VAC 50/60Hz) with power cords (US/Japan and Continental European).

- IzoT Router and Ethernet Cable

- Network cable. The network cable lets you interconnect your FT 6000 EVBs, and it lets you connect the boards to other devices and to the IzoT Router over a LONWORKS FT-10 channel.

- FT 6000 sample chips

Content

This guide includes the following content:

- *Connecting the FT 6000 EVB Hardware*. Describes how to power your FT 6000 EVB and connect it to the FT-10 channel and your development computer.

- *FT 6000 EVB Hardware Details*. Describes the Neuron core, service pin and reset buttons and LEDs, I/O devices, and jumper settings on the FT 6000 EVB hardware.

Related Manuals

The documentation related to the IzoT NodeBuilder tool is provided as Adobe Acrobat PDF files. The PDF files for the IzoT NodeBuilder tool are installed in the **Echelon NodeBuilder** program folder when you install the IzoT NodeBuilder tool. You can download the latest IzoT NodeBuilder documentation, including the latest version of this guide, from Echelon's website at *www.echelon.com/docs*.

EIA-232C Serial Interfacing with the Neuron® Chip	Describes a simple level conversion circuit to allow the FT 6000 chip to communicate with EIA-232C devices. Also includes Neuron C software to drive an RS232C CRT terminal.
FT 6000 EVB Examples Guide	Describes how to run the Neuron C example applications included with the IzoT NodeBuilder Development on an FT 6000 EVB.
I/O Model Reference for Neuron® Chips and Smart Transceivers	Describes the I/O objects that are available for use with the Neuron Chips and Smart Transceivers.
Introduction to the LONWORKS® Platform	Provides a high-level introduction to LONWORKS networks and the tools and components that are used for developing, installing, operating, and maintaining them.
Neuron® C Reference Guide	Provides reference information for writing programs using the Neuron C language.
IzoT NodeBuilder® User's Guide	Describes how to use the NodeBuilder tool to develop IZOT device applications and build and test prototype and production devices
Series 6000 Chip Data Book	Provides specifications and user instructions for engineers who develop applications and devices that use FT 6000 Smart Transceivers, and for users of network interfaces based on the FT Smart Transceivers or Neuron Chips.

For More Information and Technical Support

The **IzoT NodeBuilder ReadMe** documents provide descriptions of known problems, if any, and their workarounds for the NodeBuilder tool. To view these ReadMe documents, click **Start**, point to **Programs**, point to **Echelon NodeBuilder**, and then select **NodeBuilder ReadMe First**. For

additional information about the NodeBuilder tool, you can go to the NodeBuilder web page at *www.echelon.com/nodebuilder*.

If you have technical questions that are not answered by this document, the IzoT NodeBuilder tool online help, or the NodeBuilder tool ReadMe files, you can contact technical support. Free e-mail support is available, or you can purchase phone support from Echelon or an Echelon support partner. See *www.echelon.com/support* for more information on Echelon support and training services.

You can also view free online training or enroll in training classes at Echelon or an Echelon training center to learn more about developing devices. You can find additional information about device development training at *www.echelon.com/training*.

You can obtain technical support via phone, fax, or e-mail from your closest Echelon support center. The contact information is as follows:

Region	Languages Supported	Contact Information
The Americas	English Japanese	Echelon Corporation Attn. Customer Support 550 Meridian Avenue San Jose, CA 95126 Phone (toll-free): 1-800-258-4LON (258-4566) Phone: +1-408-938-5200 Fax: +1-408-790-3801 *lonsupport@echelon.com*
Europe	English German French Italian	Echelon Europe Ltd. Suite 12 Building 6 Croxley Green Business Park Hatters Lane Watford Hertfordshire WD18 8YH United Kingdom Phone: +44 (0)1923 430200 Fax: +44 (0)1923 430300 *lonsupport@echelon.co.uk*
Japan	Japanese	Echelon Japan Holland Hills Mori Tower, 18F 5-11-2 Toranomon, Minato-ku Tokyo 105-0001 Japan Phone: +81-3-5733-3320 Fax: +81-3-5733-3321 *lonsupport@echelon.co.jp*
China	Chinese English	Echelon Greater China Rm. 1007-1008, IBM Tower Pacific Century Place 2A Gong Ti Bei Lu Chaoyang District Beijing 100027, China Phone: +86-10-6539-3750 Fax: +86-10-6539-3754 *lonsupport@echelon.com.cn*

Region	Languages Supported	Contact Information
Other Regions	English Japanese	Phone: +1-408-938-5200 Fax: +1-408-328-3801 *lonsupport@echelon.com*

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Connecting the FT 6000 EVB Hardware

This chapter describes how to power your FT 6000 EVB and connect it to your development computer.

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Connection Instructions

To connect the FT 6000 EVB boards, follow these steps:

1. Unpack the equipment from the shipping carton.

   Note: The FT 6000 EVB boards are shipped in protective anti-static packaging. When assembling the FT 6000 EVB boards, the boards must not be subjected to high electrostatic potentials. Avoid touching the component pins, or any other metallic equipment on the evaluation boards.

2. Verify that all of the following hardware and software items are present.

Item	Qty
FT 6000 EVB	2
Power supply (90–240VAC 50/60Hz) and power cords (US/Japan and Continental European)	2
Network cable	1
IzoT Router	1
Ethernet cable	1
IzoT Network Services Server CD	1
IzoT Commissioning Tool DVD	1

3. Install the software included with your development kit on your computer.

   - Follow the instructions in the IzoT FT 6000 EVK Quick Start Guide to install the software included with your EVK. The development tool software is available by download.

4. Connect the barrel connectors of the included power supplies into the barrel jacks on the FT 6000 EVBs, connect the power supplies to the included power cords that are appropriate for your region (US/Japan or Continental European), and then plug the power cords into a power outlet. The power LEDs on the boards will activate when they are powered on.

5. Connect one of the orange network connectors on each FT 6000 EVB to the included network cable. Each board contains two orange network connectors (JP101, JP102) that are connected together. You can use these network connectors to daisy-chain multiple devices.

6. Follow the instructions in the IzoT FT 6000 EVK Quick Start Guide to connect your Izot router.

7. If you are using the IzoT NodeBuilder tool, complete the quick-start exercise in Chapter 3 of the *IzoT NodeBuilder User's Guide*.   In the quick-start exercise, you will develop a device with one sensor and one actuator. The sensor is a simple sensor that monitors a push button on the FT 6000 EVB and toggles a network variable output each time the button is pressed. The actuator drives the state of an LED on the FT 6000 EVB based on the state of a network variable input.

    The quick-start exercise guides you through all the steps of creating a device with the IzoT NodeBuilder tool, including: creating the NodeBuilder project, the device template, the device interface, and the Neuron C code that implements your device interface; plus, implementing device functionality in the Neuron C code; building and downloading the device application; testing the device in an IzoT network; and debugging the device application.

8. Run the Neuron C example applications included with the IzoT NodeBuilder tool on your FT 6000 EVBs. The NodeBuilder tool includes three Neuron C example applications (*NcSimpleExample*, *NcSimpleIsiExample*, and *NcMultiSensorExample*) that you can use to test the I/O devices on the FT 6000 EVBs, and create simple managed and self-installed IᴢoT networks.

The *NcMultiSensorExample* application is pre-loaded on the FT 6000 EVBs and runs in Interoperable Self-installation (ISI) mode by default. You install and connect this example application and the other examples using the OpenLNS Commissioning tool or using the ISI protocol. See the *FT 6000 EVB Examples Guide* for more information on using these example applications.

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FT 6000 EVB Hardware Details

This chapter describes the Neuron core, service pin and reset buttons and LEDs, I/O devices, and jumper settings on the FT 6000 EVB hardware.

Introduction to FT 6000 EVB Hardware Details

The following sections provide additional details on the FT 6000 EVB hardware, including descriptions of the core circuit, I/O devices, service and reset buttons and LEDs, and jumper settings.

You can view schematics for the peripheral circuitry of the FT 6000 EVB. The peripheral circuitry is the section of the evaluation board external to the core circuit that is labeled **CORE**. To view the FT 6000 EVB schematics, click **Start**, point to **Programs**, point to **Echelon NodeBuilder**, point to **Documentation**, and then click **FT 6000 EVB Schematics**.

Neuron Core

The Neuron core of the FT 6000 EVB includes the FT 6000 Smart Transceiver with an external 10 MHz crystal (you can adjust the system's internal clock speed from 5MHz to 80MHz), an FT-X3 communication transformer, and an external serial flash non-volatile memory device. For details on the FT 6000 core, see the *Series 6000 Chip Data Book*.

**FT-X3
Communication
Transformer**

**FT 5000
Smart Transceiver**

Crystal (10MHz)

**Serial SPI Flash
(1MB)**
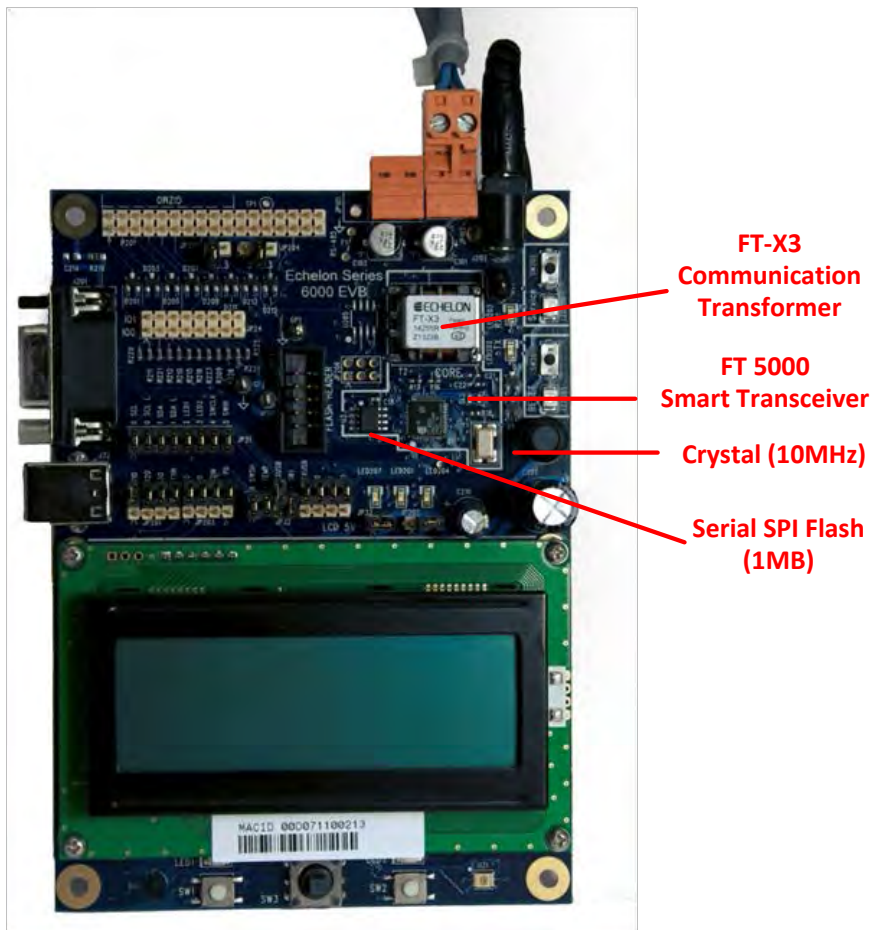
The flash memory device is used to store your application code, configuration data, and an upgradable system firmware image (the Series 6000 chips have no user-accessible on-chip non-volatile memory). The external serial flash memory device communicates with the FT 6000 Smart Transceiver via the SPI interface. When a device is reset, the application code and configuration data are copied from the external non-volatile memory into the 64 KB internal on-chip RAM, and the device application is then executed.

I/O Devices

This section briefly describes the I/O devices included on the FT 6000 EVB, which consists of two push buttons, two LEDs, a temperature sensor, a light sensor, an LCD, and a joystick.
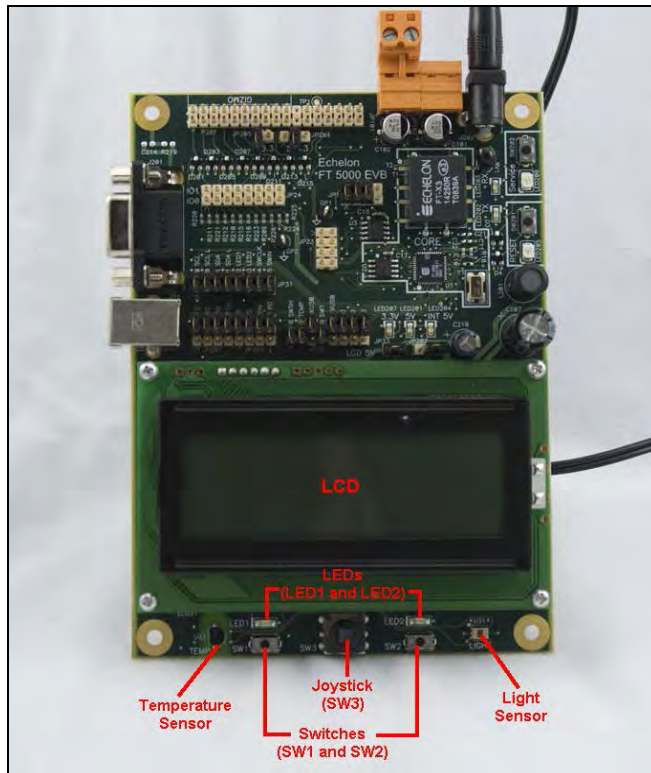
Push Button Switches

The FT 6000 EVB includes two push-button switches. The switches are labeled **SW1** and **SW2**. The **SW1** push button is connected to the **IO9** pin on the FT 6000 Smart Transceiver. The **SW2** push button is connected to a 74HC165 8-bit parallel-in/serial-out shift register, and data is shifted on the FT 6000 Smart Transceiver **IO4** (clock) and **IO5** (data) pins, with a latch strobe on **IO6** (active low to capture). The button readings must be debounced under application control.

LEDs

The FT 6000 EVB includes two blue LEDs that are labeled **LED1** and **LED2**. **LED1** is connected to the FT 6000 Smart Transceiver **IO2** pin when jumper pins 9-10 on JP31 are connected. **LED2** is connected to the **IO3** pin when jumper pins 11-12 on JP31 are connected.

Temperature Sensor

The FT 6000 EVB includes a temperature sensor based on a 1-Wire® Maxim Integrated Products digital thermometer (Part No. DS18S20). The thermometer uses the Touch I/O interface and is connected to the FT 6000 Smart Transceiver **IO7** pin. For more information about this temperature sensor, see its data book at *datasheets.maxim-ic.com/en/ds/DS18S20.pdf*.

Light-Level Sensor

The FT 6000 EVB includes a light-level sensor based on a Texas Advanced Optoelectronic Solutions® Light-To-Digital Converter (Part No. TSL2561). The light sensor is connected to the FT 6000 Smart Transceiver **IO0** and **IO1** pins (via the I^2C interface). The I^2C address for the light level sensor is 0x39. For more information about this light sensor, see its data book at *www.taosinc.com/getfile.aspx?type=press&file=tsl2560-e58.pdf*.

LCD

The FT 6000 EVB includes a 4 x 20 character LCD with a yellow-green backlight from Newhaven Display International Inc (Part No. NHD-0420D3Z-FL-GBW). The LCD is connected to the FT 6000 Smart Transceiver **IO0** and **IO1** pins (via the I^{2}C interface). For more information about this LCD, see its data book at *www.newhavendisplay.com/specs/NHD-0420D3Z-FL-GBW.pdf*.

Joystick

The FT 6000 EVB includes a 4-way joystick with center push button from ALPS® Electric Co (Part No. SKQUCAA010). The joystick is connected to a 74HC165 8-bit parallel-in/serial-out shift register, and data is shifted on the FT 6000 Smart Transceiver **IO4** (clock) and **IO5** (data) pins, with a latch strobe on **IO6** (active low to capture). For more information about this joystick, go to the ALPS Web site at
www3.alps.com/WebObjects/catalog.woa/E/HTML/Switch/Tact/SKQU/SKQUAAA010.html.

Service Pin and Reset Buttons and LEDs

The FT 6000 EVB includes a Service button and a Reset button that have corresponding LEDs.

You can use the Service Pin button to send a service pin message from an evaluation board. You will use the Service Pin button when you install the device with the OpenLNS Commissioning tool as described in the *FT 6000 EVB Examples Guide*. You can use the Service LED to identify the device state (applicationless, unconfigured, configured), and you can also use it to provide additional application-specific information.

You can use the Reset button to reset the FT 6000 EVB when an application running on the board appears to have failed, or to test the reset behavior of an application loaded on the board. The Reset LED illuminates when you press the Reset button, or the FT 6000 Smart Transceiver is reset.
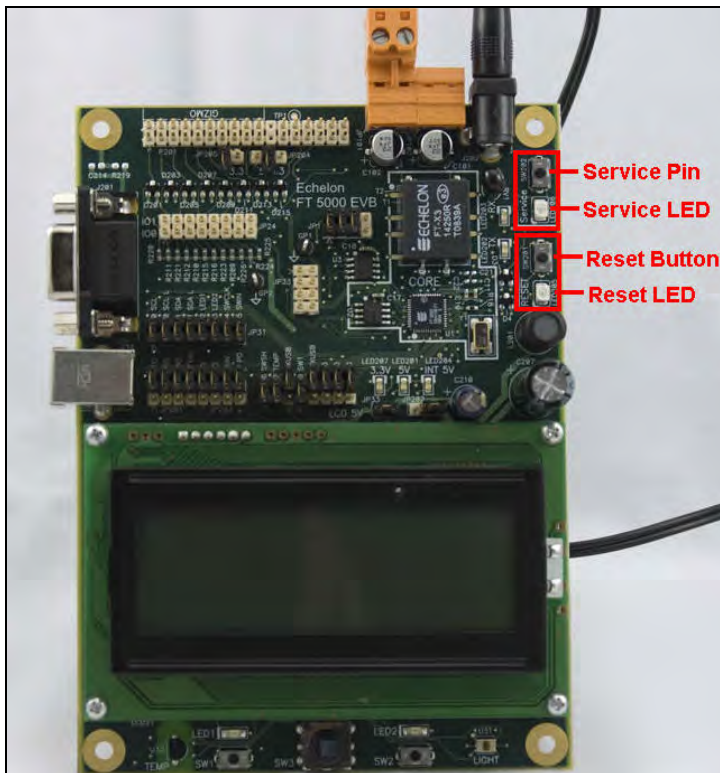
Jumper Settings

The FT 6000 EVB contains multiple sets of jumpers that you can use to configure the board. The following sections display the locations of the jumpers on the FT 6000 EVB, show the default settings of the jumpers, and describe how to use the jumpers to enable and disable various connections on the board.

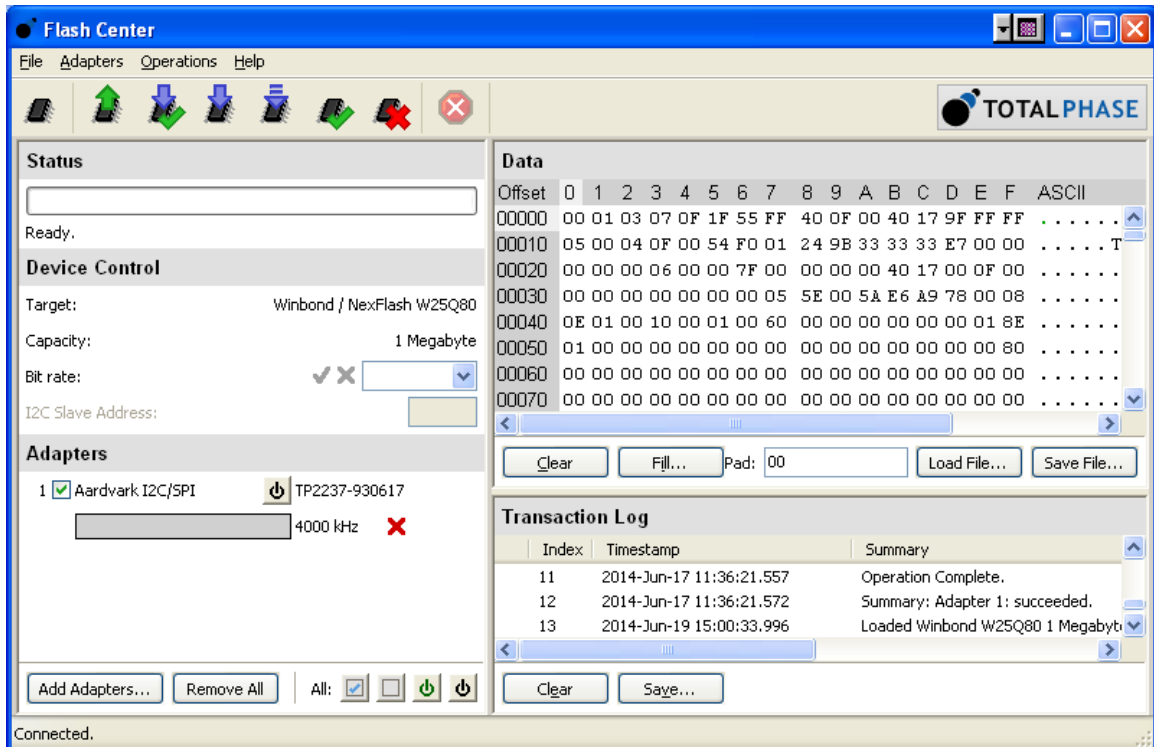### Performing In-Circuit Programming of the External Serial Memory Device

The JP23 shrouded connector provides support for third-party in-circuit device programmers, which you can use to update the data in the external serial flash device used by the FT 6000 Smart Transceiver on the FT 6000 EVB. This provides an alternative to loading application images into the external serial memory device over the TP/FT-10 network. Note that the IzoT NodeBuilder tool only supports downloading application images over an IzoT network; they do not directly support loading application images through third-party device programmers or memory ICE. Echelon has tested a third-party in-circuit programmer, the Aardvark™ I2C/SPI USB Host Adapter from TotalPhase™, as described below.

To perform in-circuit programming of the external serial flash memory device on the FT 6000 EVB, you use the programmer's SPI interface.   Echelon has tested the Aardvark™ I2C/SPI USB Host Adapter from TotalPhase™ (Part No. TP240141), with the 10-pin ribbon cable from TotalPhase (Part No. TP240212), as one method for creating this connection (for more information on this adapter, go to the TotalPhase Web site at *www.totalphase.com/products/aardvark_i2cspi/*). The Aardvark has six signal lines: two for the I^{2}C interface (SDA and SCL), and four for the SPI interface (MOSI, MISO, SCL, and SS/CS).

To set up the Aardvark for programming the serial flash chip, choose the Device menu, and select the SPI Winbond W25Q80 part as shown below:
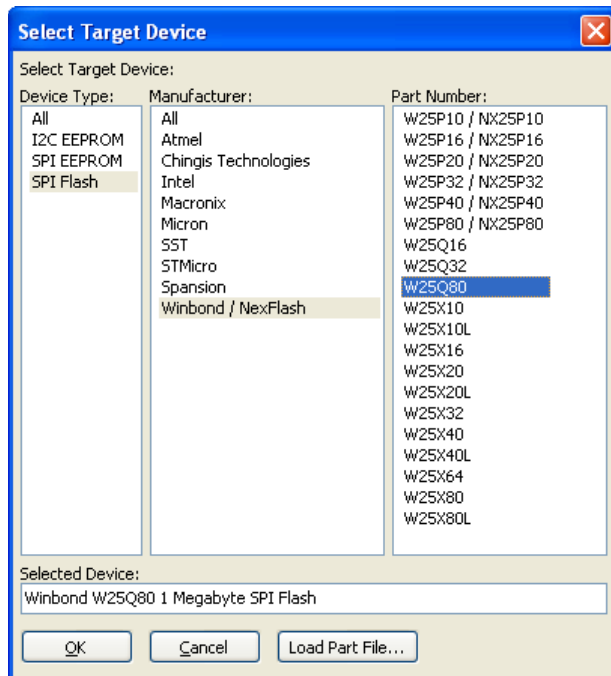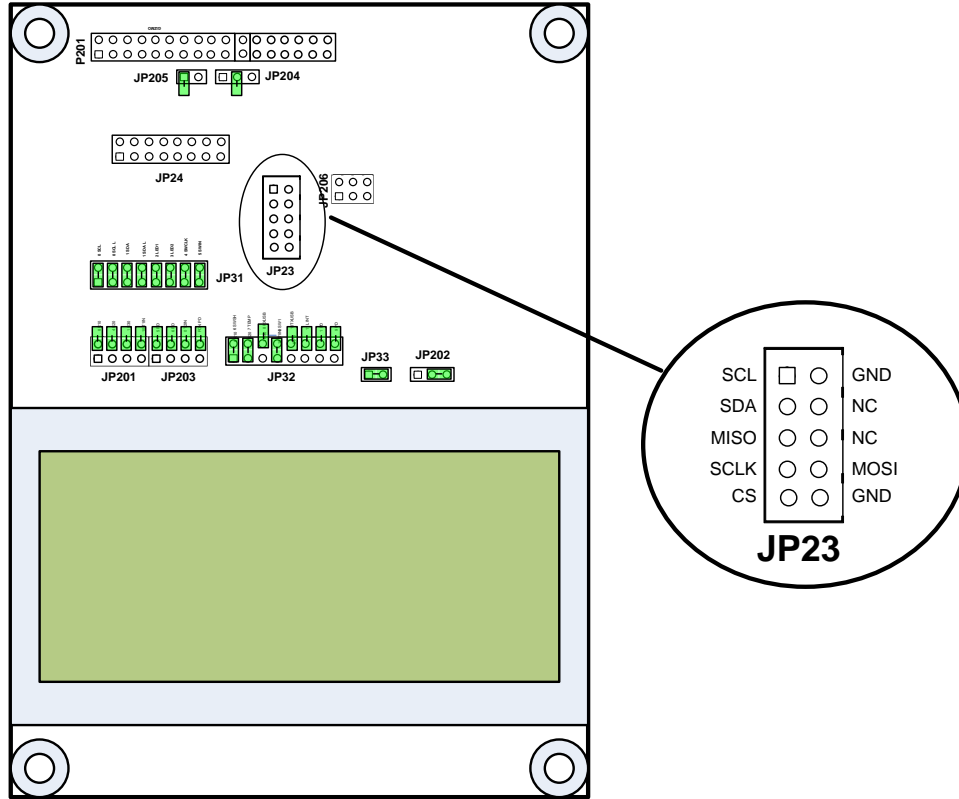

Load the target *.HEX file into the Aardvark programmer's buffer to prepare for programming the serial flash chip:

To perform in-circuit programming of the external serial flash memory device on the FT 6000 EVB, follow these steps:

1. Power off the FT 6000 EVB.

1. Plug the Aardvark programmer pod's ribbon cable connector into the EVB's shrouded header JP23. The ribbon cable connector and JP23 are polarized to ensure proper connector orientation.

The following figure shows the JP23 header pinout:

SCL	☐ ○	GND
SDA	○ ○	NC
MISO	○ ○	NC
SCLK	○ ○	MOSI
CS	○ ○	GND

JP23

2. Power on the FT 6000 EVB. The EVB will automatically be held in reset when the Aardvark cable is plugged into JP23.

3. Use the Flash GUI software from TotalPhase to download the *.NME file to the EVB. Note that the file extension must be renamed to *.HEX for the FlashGui software to recognize the file.

4. Power down the EVB, remove the Aardvark connector from JP23, and power up the EVB.

I/O Line Access (JP24)

This header provides access to the 12 I/O, service, and reset lines of the FT 6000 Smart Transceiver on the FT 6000 EVB, and it provides a ground reference for instrumentation with a scope or logic analyzer. Although JP24 can be used to wire other I/O devices, you should use the Gizmo Header (P201) to do this because it can also provide power for other devices (see *I/O Connector* later in this chapter for more information about the Gizmo header). By default, this header is open as illustrated in the following figure:
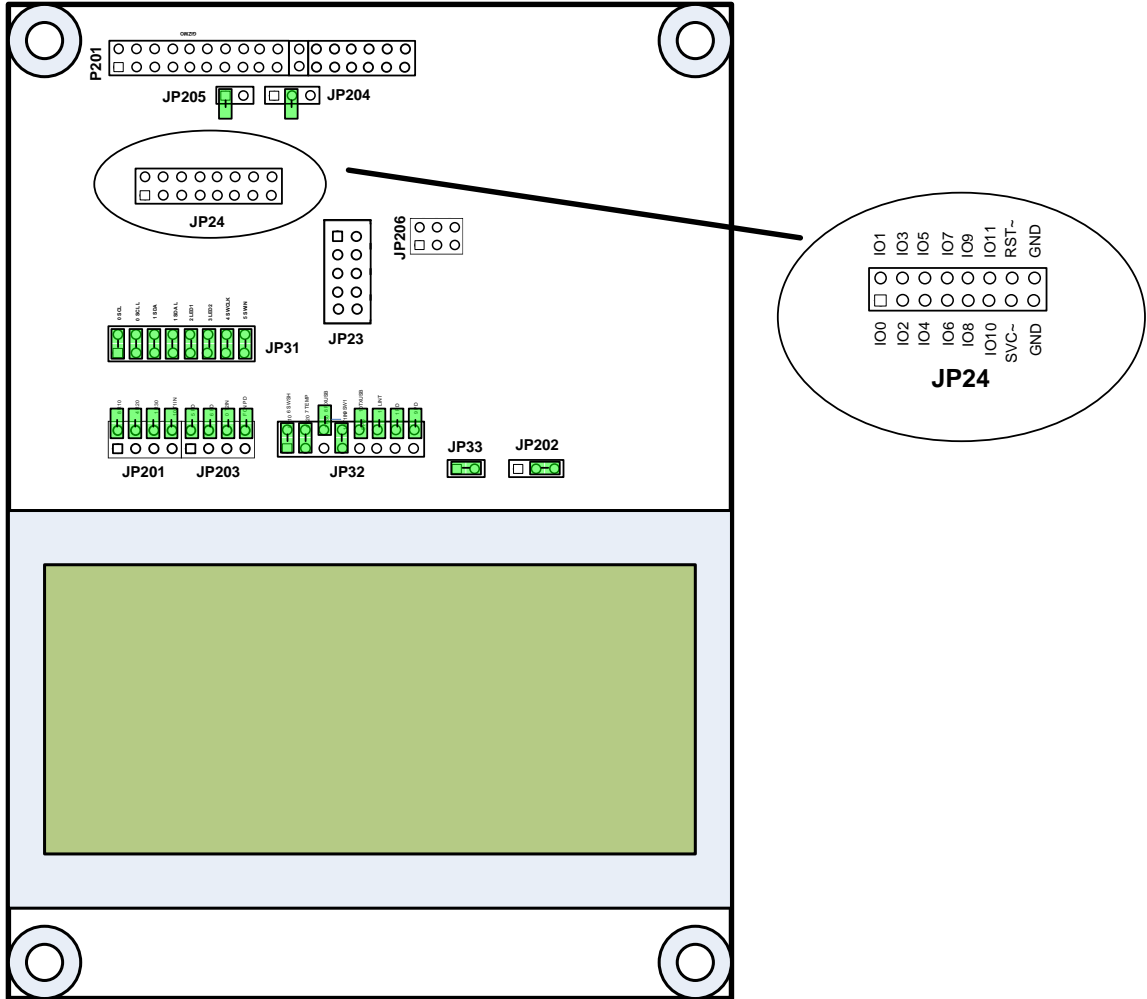
LCD, Light Sensor, LEDs, Switch, and Joystick Connections (JP31)

This set of jumpers is used to connect the LCD, Light Sensor, LEDs, and the shift register for the SW2 push button (lines 1 and 2 of three) and joystick (SW3) on the FT 6000 EVB.   The 13-14 and 15-16 pins on JP31 are used with the 1-2 pins on JP32 for bitshift I/O with the SW2 push button and the Joystick. By default, all the jumpers are connected, as illustrated in the figure below. You can use an I/O line for other I/O functions by disconnecting the jumper that connects the I/O line to an I/O device on the FT 6000 EVB.
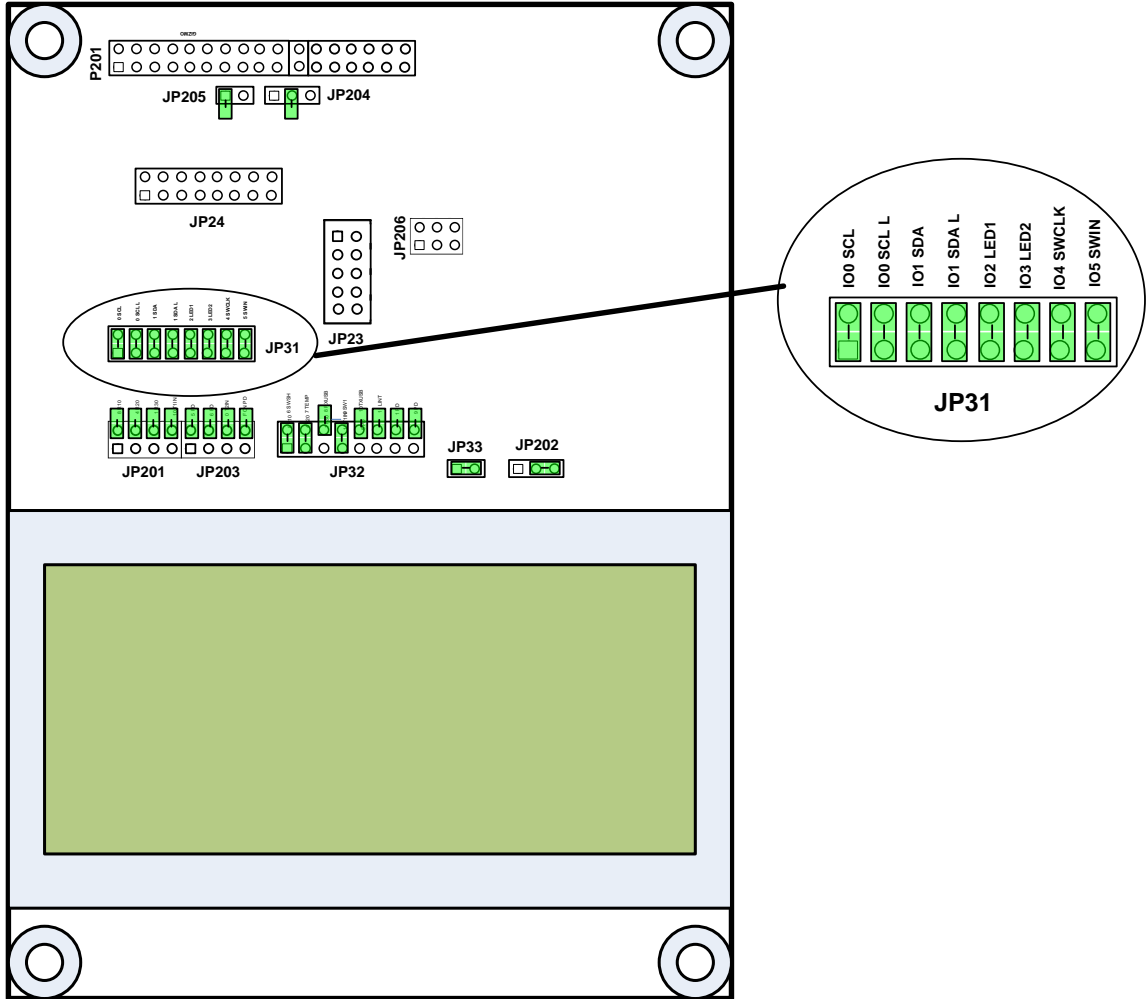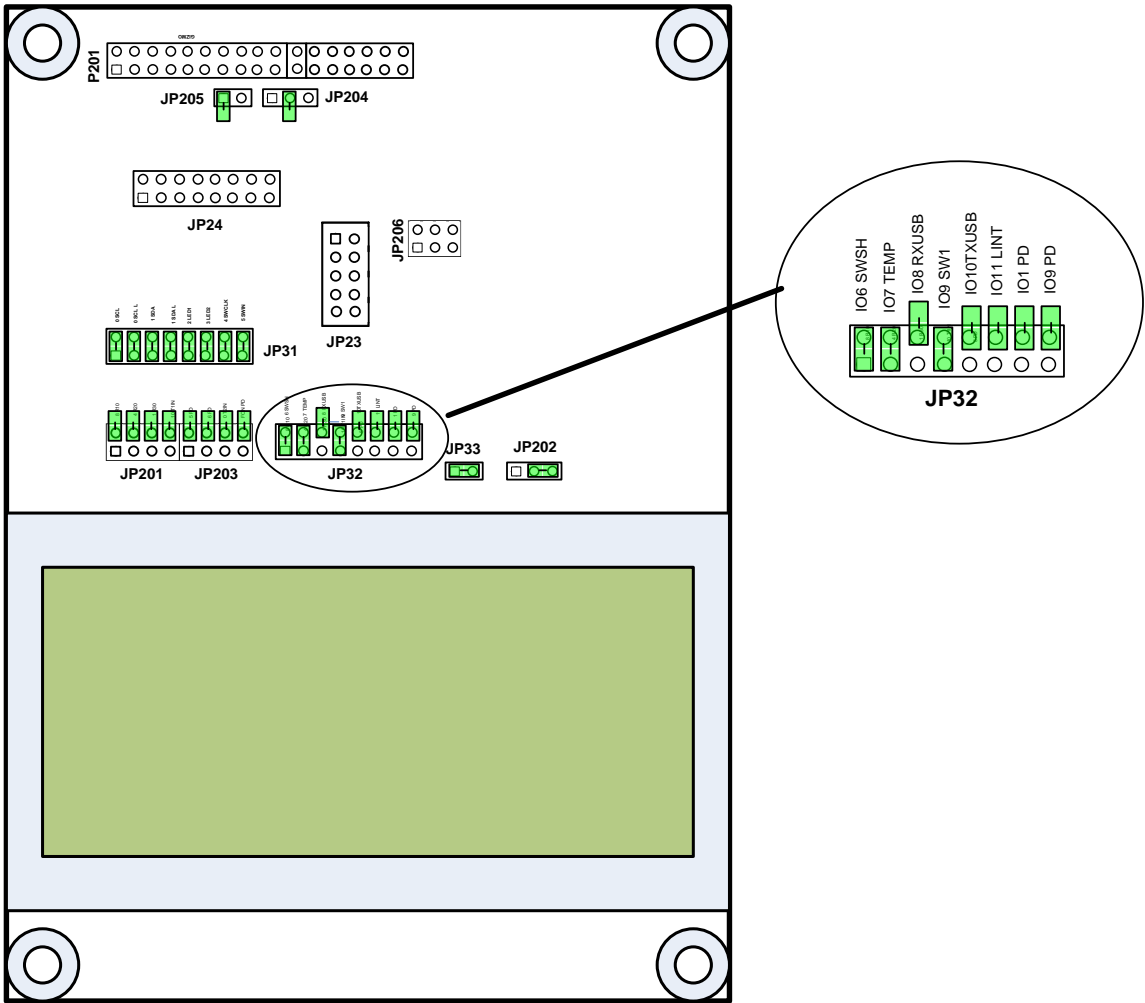
The following table lists the I/O pins and I/O devices associated with the jumpers on JP31.

Jumper	I/O Pin	I/O Device/Functionality on FT 6000 EVB
1-2	IO0	SCL LCD
3-4	IO0	SCL L Light sensor
5-6	IO1	SDA LCD
7-8	IO1	SDA L Light sensor
9-10	IO2	LED1
11-12	IO3	LED2
13-14	IO4	SWCLK (Shift register clock for SW2 and Joystick)
15-16	IO5	SWIN (Shift register data in for SW2 and Joystick)

Switch, Joystick, Temperature Sensor, and USB Connections (JP32)

This set of jumpers is used to connect the shift register for the SW2 push button (line 3 of three) and joystick (SW3), temperature sensor, USB interface, SW1 push button, and I/O pull-downs on the FT 6000 EVB. The 1-2 pins on JP32 are used with the 13-14 and 15-16 pins on JP31 for bitshift I/O with

the SW2 push button and the Joystick. By default, the switch and temperature sensor jumpers are connected, and the USB interface jumpers are disconnected as illustrated in the figure below. You can use an I/O line for other I/O functions by disconnecting the jumper that connects the I/O line to an I/O device on the FT 6000 EVB.

FT 6000 EVB Hardware Details

The following table lists the IO pins and IO devices associated with the jumpers on JP32.

| Jumper	I/O Pin	IO Device/Functionality on FT 6000 EVB
1-2	IO6	SWSH (Shift register latch strobe for SW2 and Joystick)
3-4	IO7	TEMP (temperature sensor)
5-6	IO8	RXUSB (USB receive)
7-8	IO9	SW1
9-10	IO10	TXUSB (USB transmit)
11-12	IO3	PD (connects a 499 Ω pull-down resistor to IO3)
13-14	IO1	PD (connects a 499 Ω pull-down resistor to IO1)
15-16	IO9	PD (connects a 499 Ω pull-down resistor to IO9)

Connecting the USB Interface

You can enable serial communication without handshake lines and then connect your FT 6000 EVB to your development computer via a USB interface. This lets you perform application-level debugging, tests, or diagnosis. Once you create this USB connection, you can output debugging and tracing information from the device application running on your FT 6000 EVB to a terminal emulation program on your computer such as Windows HyperTerminal.

To create the USB connection for performing application-level debugging, follow these steps:

1. Connect the type A connector on a USB Type A to Type B Cable to an available USB port on your computer, and then connect the type B connector to the USB interface on the left side of the FT 6000 EVB.
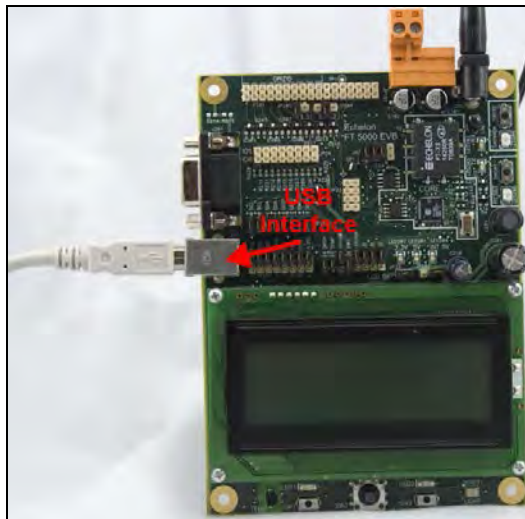
2. Connect jumpers 5-6 (IO8 RXUSB) and 9-10 (IO10 TXUSB) on JP32. This connects the **IO8** and **IO10** pins on the FT 6000 Smart Transceiver to the USB communications interface on the board. **IO10** is connected to pin 5 RXD as a serial data output to the USB interface, and **IO8** is connected to pin 1 TXD as a serial data input from the USB interface.
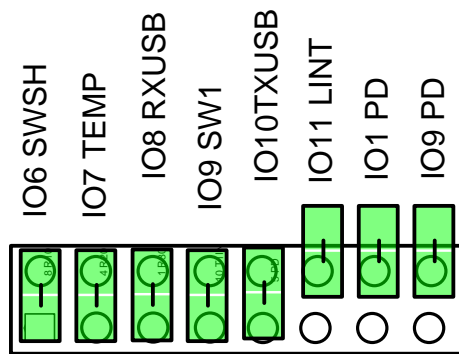
JP32

3. Run Windows HyperTerminal or another terminal emulation program on your computer to monitor the serial output. Configure your terminal emulation program for direct connection to your serial port using the serial parameters specified in the device application. See the next section, *Configuring a Device Application for Serial Debugging*, for how to configure your device application for application-level debugging.

   Note: You can use only one of the EIA-232 or USB interfaces on the FT 6000 EVB at a time.

For information on implementing serial I/O, see the *EIA-232C Serial Interfacing with the Neuron Chip* engineering bulletin (005-0008-01D).

Configuring a Device Application for Serial Debugging

If you are connecting the USB or EIA-232 interface to perform application-level debugging, you must declare an SCI I/O object in your device application that specifies the communication parameters to be used by Windows HyperTerminal or another terminal emulation program on your computer to monitor the serial output. In addition, you must specify code in your device application that outputs data to the interface.

For example, the example applications included with the FT 6000 EVB include the following code that declares an SCI I/O object in the **FT6000EvalBoard.h** file specifying a baud rate of 9600 bps (see the *SCI (UART) Input/Output* section in Chapter 4 of the *I/O Model Reference* for more information on creating SCI I/O objects):

```
#ifdef FT6000EVALBOARD_USE_SERIALDEBUG
#include <io_types.h>
#pragma specify_io_clock "10 MHz"
IO_8 sci baud(SCI_9600) ioSerialDebug;
void EvalBoardPrintDebug(char* string);
#endif // FT6000EVALBOARD_USE_SERIALDEBUG
```

The **FT6000EvalBoard.nc** file in the example applications includes a `EvalBoardPrintDebug()` function. This function calls the built-in **io_out_request ( )** function, which establishes and initiates the output operation over the serial interface [see the *Neuron C Reference Guide* for more information on the **io_out_request ( )** function]. The declaration of the `EvalBoardPrintDebug()` function is as follows:

```
#ifdef FT6000EVALBOARD_USE_SERIALDEBUG

void EvalBoardPrintDebug(char *string)
{
        io_out_request(ioSerialDebug, string, (unsigned int) strlen(string));
        while (!io_out_ready(ioSerialDebug));
}
```

```
#endif // FT6000EVALBOARD_USE_SERIALDEBUG
```

The **Switch.nc** and **LED.nc** files in the example device applications store various values in strings and then call the `EvalBoardPrintDebug()` function to output the strings to the serial interface.

```
if (bOn) {
        // Toggle the state of the switch
        nvoSwitch[0].state ^= 1;
        nvoSwitch[0].value = nvoSwitch[0].state ? 200u : 0;

        // Copy to feedback NV
        nviSwitchFb[0] = nvoSwitch[0];
         (void)strcpy(string, "Switch 1 pressed\r\n");
        EvalBoardPrintDebug(string);
    }
    else {
        (void)strcpy(string, "Switch 1 released\r\n");
        EvalBoardPrintDebug(string);
    }
```

You can view the source code for the FT 6000 EVB example device applications by clicking **Start**, pointing to **Programs**, pointing to **Echelon NodeBuilder**, pointing to **Examples,** pointing to **FT 6000 EVB**, clicking the desired **Example Source Code** folder, and then clicking the Source folder. See the *FT 6000 EVB Examples Guide* for more information on the example device applications you can run on your FT 6000 EVB.

LCD 5V Power (JP33)

This jumper provides 5V power for the LCD on the FT 6000 EVB. If you are using the FT 6000 EVB example applications or you are developing a device application that uses the LCD, leave this jumper connected as illustrated in the following figure:
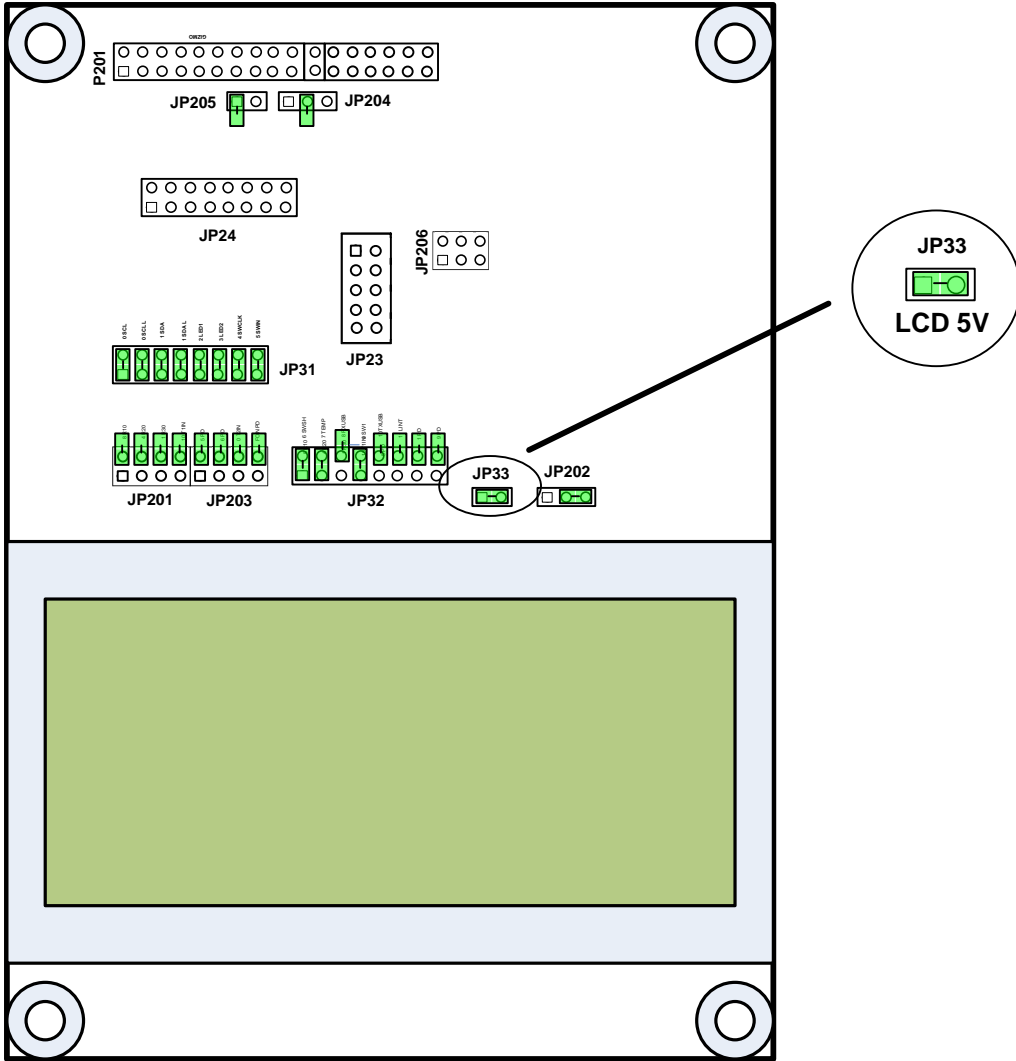
If you are not using the LCD and you want to reduce the power consumption of the FT 6000 EVB, you can disconnect the LCD's power as illustrated in the following figure (you can hang the shunt off pin 1 or pin 2):
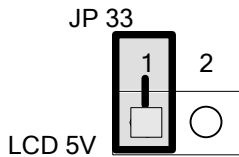
EIA-232 Interface (JP201and JP203)

This set of jumpers enables the EIA-232 on the FT 6000 EVB. These jumpers are disconnected by default (these interface are disabled) as illustrated in the following figure:
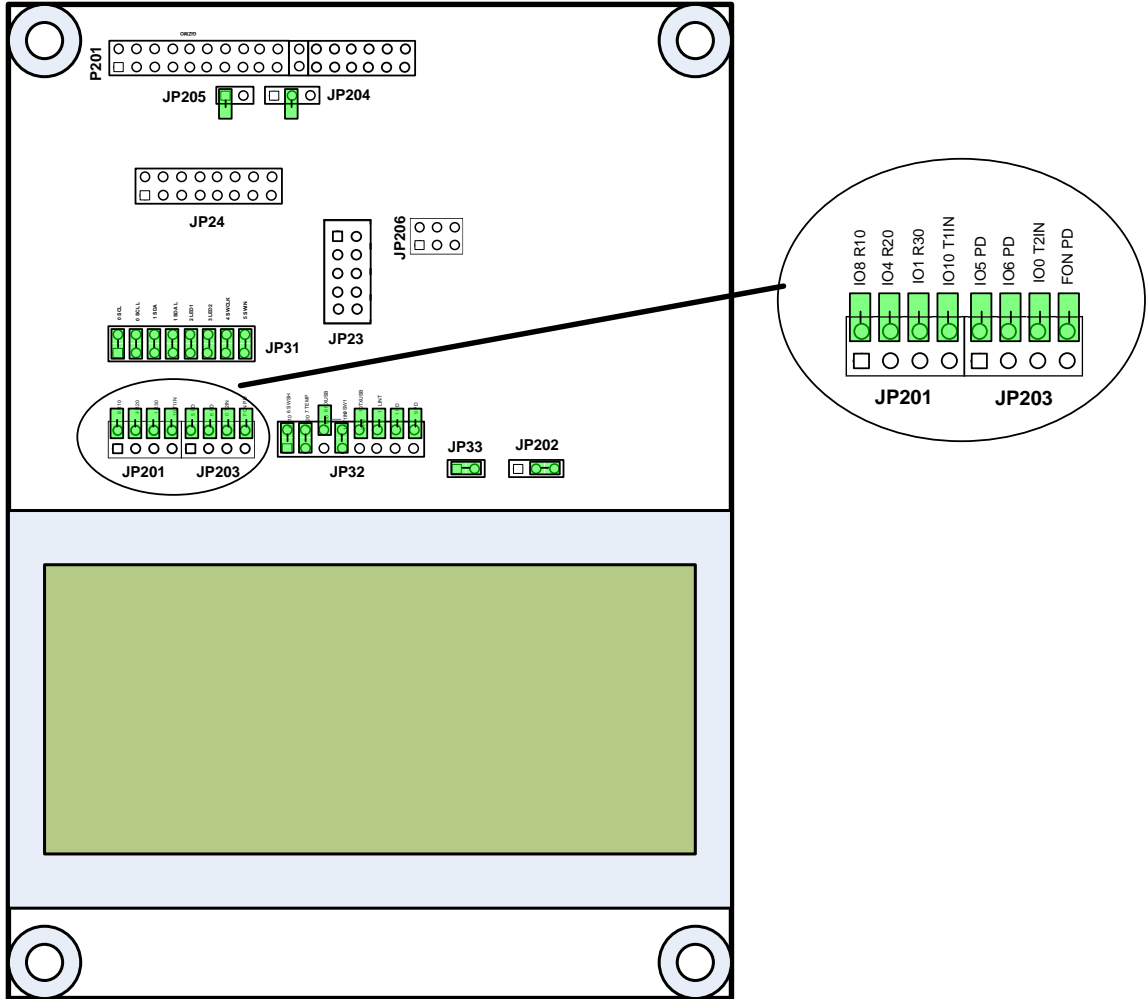
You can enable the EIA-232 interface without and with handshake lines. You can enable the EIA-232 interface without handshake lines to connect your FT 6000 EVB to your development computer for performing application-level debugging. You can enable the EIA-232 interface with handshake lines to connect your FT 6000 EVB to a development computer for performing application-level debugging or to connect it to other microcontrollers.

Note: When you connect the EIA-232 interface, you need to disconnect the same I/O signals from the on-board I/O devices on jumpers JP31 and JP32.

The following sections describe how to enable the EIA-232 interface without and with handshake lines.

Connecting the EIA-232 Interface (without handshake lines)

To create the EIA-232 connection without handshake lines, follow these steps:

1. Connect the male end of a DB9 Male-Female Serial Extension Cable to the DB9 socket on the upper left-hand side of the FT 6000 EVB, and then connect the female end to one of the COM ports (typically COM1 or COM2) on your computer.
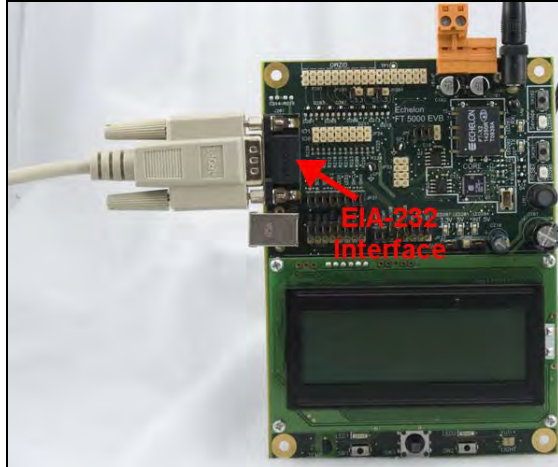
2. Verify that jumpers 5-6 (RXUSB) and 9-10 (TXUSB) on JP32 for the USB interface are disconnected. This is because you can only use one of the EIA-232 and USB interfaces on the FT 6000 EVB at a time. See *Switch, Temperature Sensor, Joystick, and USB Connections (JP32)* earlier in this chapter for more information.

3. Connect jumpers 1-2 (IO8 R10) and 7-8 (IO10 T1IN) on JP201. This connects the **IO8** and **IO10** pins on the FT 6000 Smart Transceiver to the EIA-232 communications interface on the board. **IO10** is connected to pin 12 as a serial data output (TX) on the EIA-232 interface, and **IO8** is connected to pin 14 as a serial data input (RX).

JP201
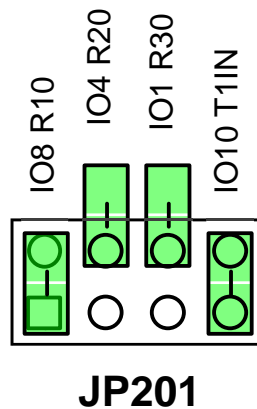
4. Run Windows HyperTerminal or another terminal emulation program on your computer to monitor the serial output. Configure your terminal emulation program for direct connection to your serial port using the serial parameters specified in the device application. See *Configuring a Device Application for Serial Debugging* earlier in this chapter for more information on configuring your device application for application-level debugging.

   **Note**: You can use only one of the EIA-232 or USB interfaces on the FT 6000 EVB at a time.

For information on implementing serial I/O, see the *EIA-232C Serial Interfacing with the Neuron Chip* engineering bulletin (005-0008-01D).

Connecting the EIA-232 Interface (with handshake lines)

You can enable the EIA-232 interface with handshake lines to connect your FT 6000 EVB to a development computer for performing application-level debugging or to connect it to other microcontrollers.

To create the EIA-232 connection with handshake lines, follow these steps:

1. If you are connecting your FT 6000 EVB to a development computer for performing application-level debugging, follow step 1 in the previous section.

2. Verify that jumpers 5-6 (RXUSB) and 9-10 (TXUSB) on JP32 for the USB interface are disconnected. This is because you can only use one of the EIA-232 and USB interfaces on the FT 6000 EVB at a time. See *Switch, Temperature Sensor, Joystick, and USB Connections (JP32)* earlier in this chapter for more information.

3. Connect jumpers 1-2 (IO8 R10), 3-4 (IO4 R20), and 7-8 (IO10 T1IN) on JP201. This connects the **IO4**, **IO8**, and **IO10** pins on the FT 6000 Smart Transceiver to the EIA-232 communications interface on the board. **IO10** is connected to pin 12 on the EIA-232 connector as a serial data output (TX), **IO8** is connected to pin 14 as a serial data input (RX), and **IO4** is connected to pin 7 as a request to send input (RTS).
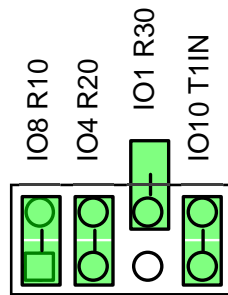

JP201

4. Connect jumpers 5-6 (IO0 T2IN) on JP203 to route the IO0 signal through the EIA-232 interface level shifter. This signal is connected to the CTS~ signal on the EIA-232 interface.
    You can connect the RTS~ signal from the EIA-232 interface to the IO4 input on the FT 6000 Smart Transceiver using jumper 3-4 on JP201.
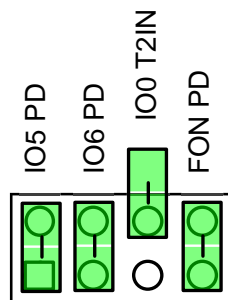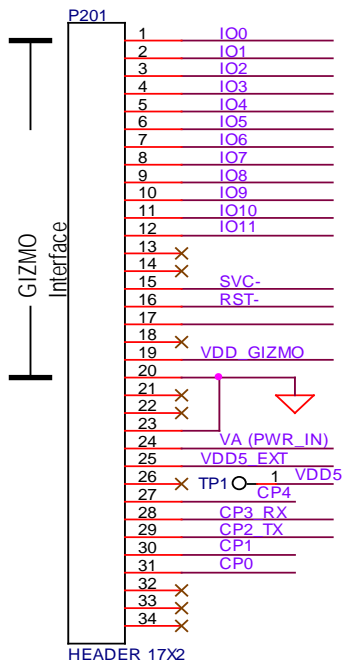

JP203

In addition, you can connect jumpers 7-8 (FON PD) on JP 203 to prevent the EIA-232 level shifter from entering sleep mode during idle periods

JP203
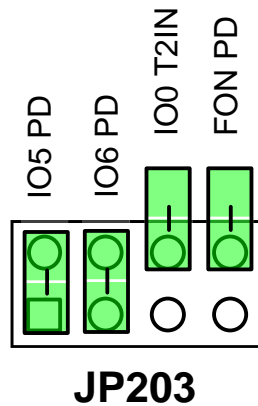
I/O Connector

The following figure shows the I/O connector pinout for the FT 6000 EVB board. You can use this connector to attach custom I/O devices to an evaluation board.

Design and Test for Electromagnetic Compatibility

Echelon's free topology twisted pair technologies support the creation of products that meet a wide variety of regulatory requirements. Chapter 4 of the *FT 6000 Smart Transceiver Data Book* describes how to create products with Echelon's free topology twisted pair technology that meet electromagnetic compatibility regulations.

The FT 6000 EVB boards are designed to facilitate testing of Echelon's free topology twisted pair technologies. As such, they have no enclosure, providing open access to the IO connectors, buttons, LEDs, and other I/O components. They have been developed to allow consumer and commercial device OEM suppliers to evaluate the technology quickly, and have not been designed to be installed permanently in homes or commercial buildings. If you work with the FT 6000 EVB boards in a home

environment, operation of other electronic equipment that is sensitive to RF radiated emissions, such as televisions or radios, might be temporarily impaired during the evaluation period.

The standards for RF emissions vary by geographic region. To determine which standards apply in your region, consult the appropriate regulatory agencies. In the European Union, CISPR 22 (or equivalently, EN 55022) applies. In the North American market, the FCC regulates emissions from unintentional radiators under 47CFR15.109, Subpart B, which allows for substitution of CISPR 22. The FT 6000 EVB boards comply with CISPR 22 Level A, but not Level B (which is required for deployment in home and commercial environments).

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Emulating an FT-6010 Board

This appendix gives you the instructions for using the FT 6050 EVB to emulate an FT 6010 board.

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Emulating an FT-6010 Board

The FT 6050 EVB may be used to emulate an FT 6010 board. Once loaded with an FT 6010 system image, the FT 6050 EVB will behave like an FT 6010. In particular, the EVB will no longer support LonTalk Services compatibility mode. This means the EVB will respond to a query status command with the model set to FT 6010, even when running on FT 6050 hardware.

You may load the FT 6050 EVB with the FT 6010 image using a PROM programmer or using a I2C/SPI Host Adaptor, using the image:

    <LonWorks>\images\ver21\b6010v4.hex

Alternatively you may load the FT 6050 EVB with the FT 6010 image over the network as follows:

1. Make sure that the EVB is loaded with the b6050V4 image version 21.02.03 or later.

2. Load the "b6010v4.evb.ndl" image using the 'Y' command. Note the "evb" in the name (nodeUtil will not allow you to load the b6010v.ndl file into a 6050. Once the load has completed the device will behave as an FT 6010.

You may restore the FT 6050 EVB by loading the b6050v4.hex image using a PROM programmer or using a I2C/SPI Host Adaptor. Alternatively, you may restore the FT 6050 EVB by loading the b6050v4.evb.ndl image over the network.

WARNING: Do not ever attempt to load the b6050v4.evb.ndl into a real FT 6010 device. Doing so is unrecoverable over the network.