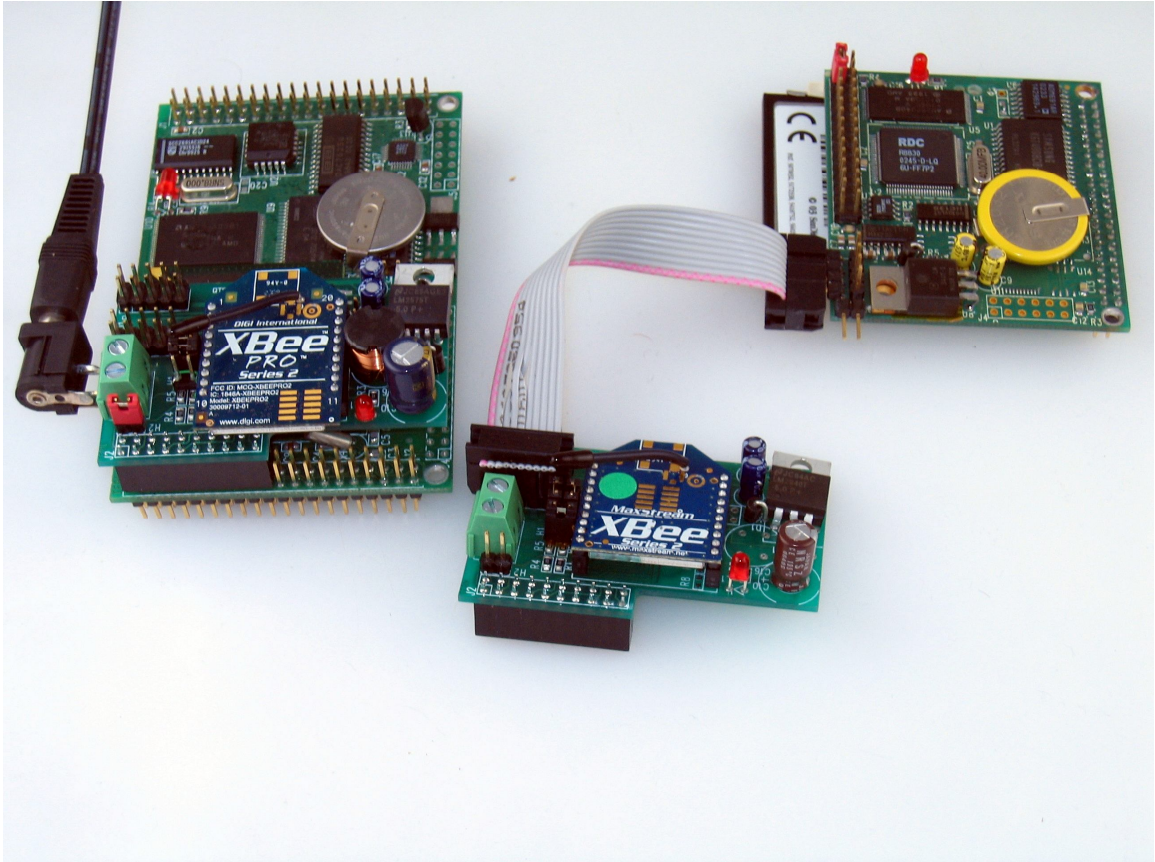


Z232™

Low cost wireless interface for TERN controllers



Technical Manual



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Chapter 1: Introduction

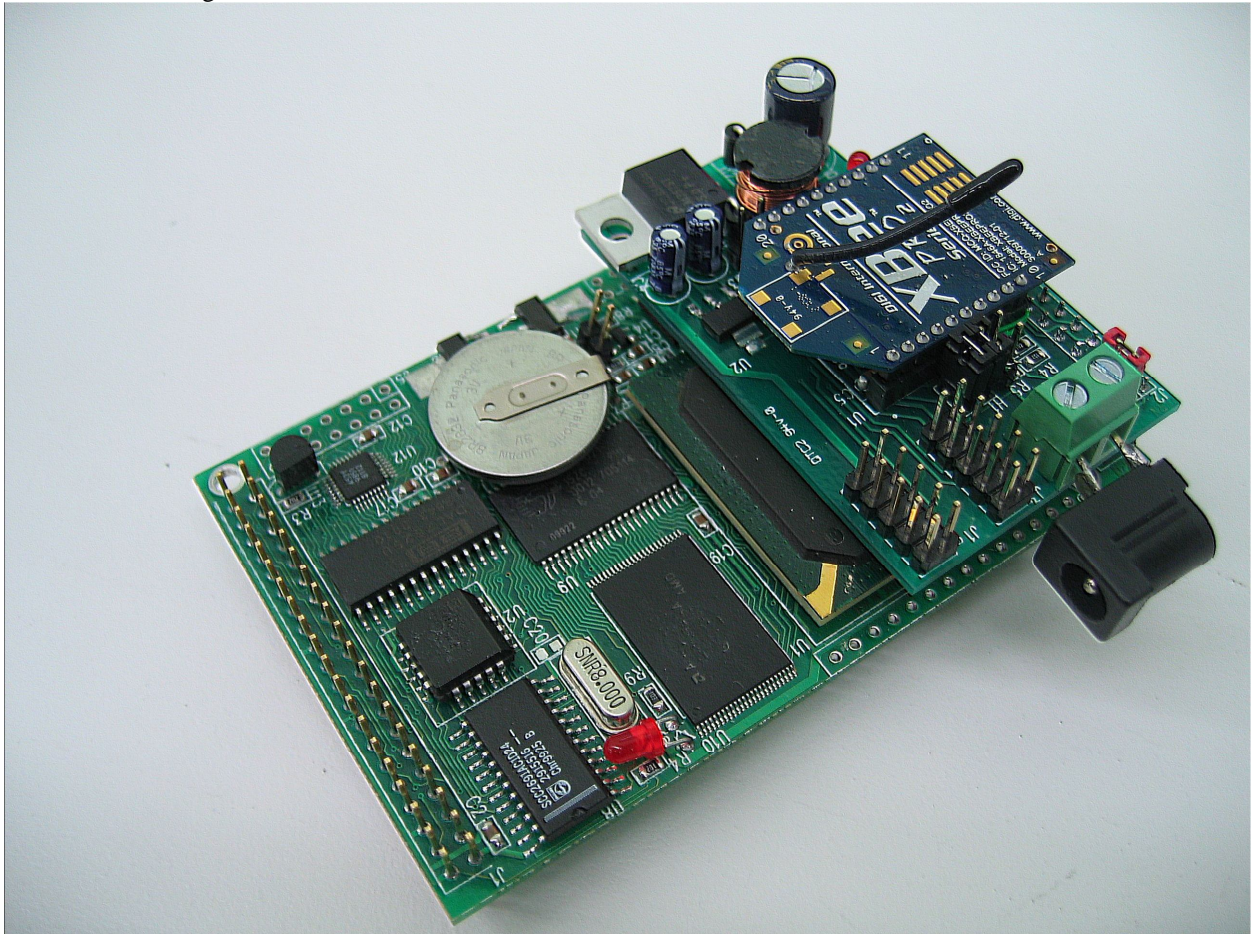
1.1 Functional Description

The Z232™ is designed to provide a wireless solution for TERN controllers. The Z232 supports a ZigBee wireless module from DIGI International. It can be driven by an RS232 serial port or a PIO (5V or 3.3V) UART at 9600 baud. Compatible TERN controllers include AE, EE, RE, i386E, 586E, or any TERN board with a PIO-UART or an RS232 UART.

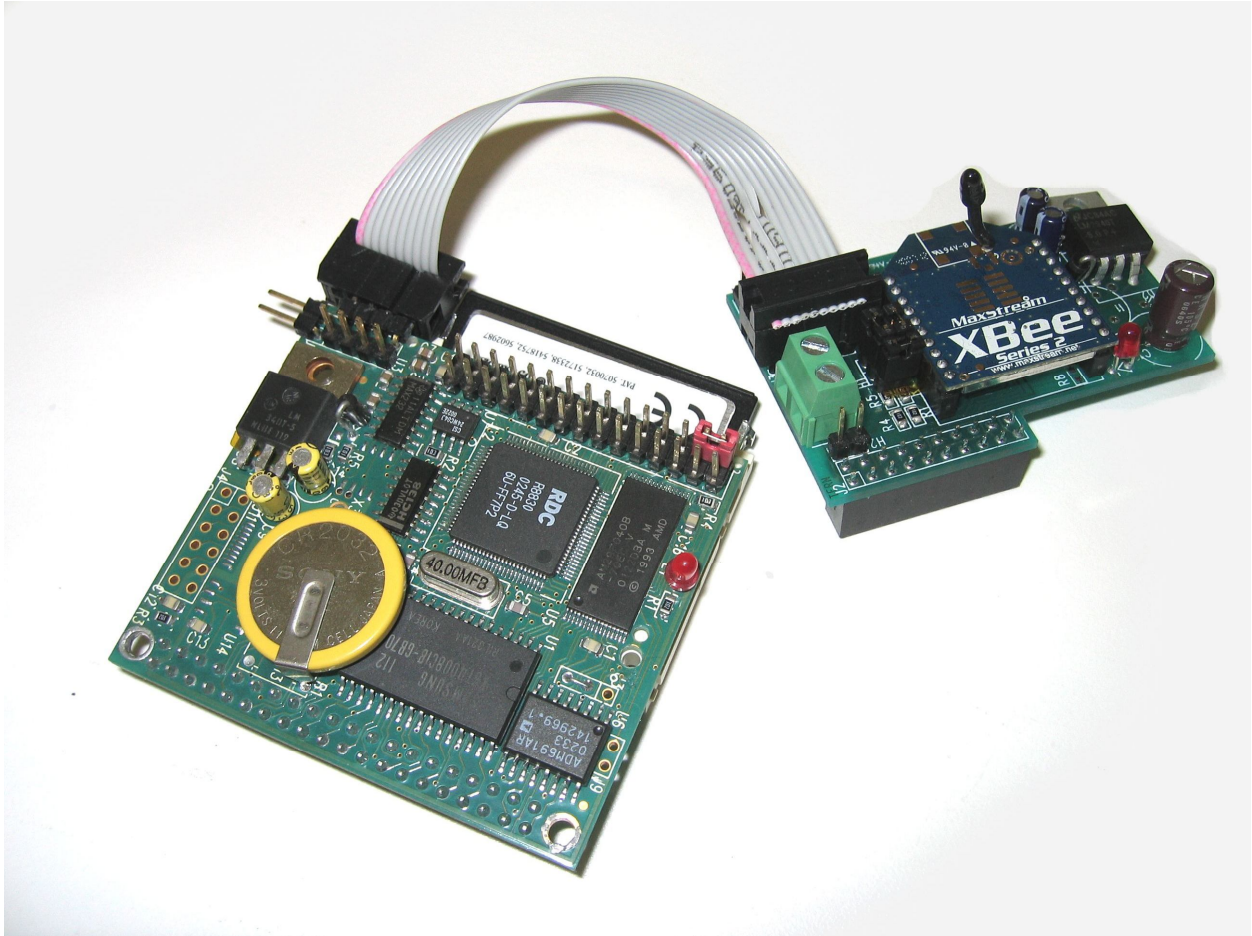
Features:

- * 1.5 x 2.3", 5-24V DC power
- * Interface DIGI Wireless Modules to TERN controllers
- * Supports PIO-UART to wireless mode
- * Supports RS232 to wireless mode
- * Field firmware update, LED indicator for wireless activity
- * On-board linear or switching 5V and 3.3V regulator
- * J2 socket for interfacing to PIO-UART lines

Z232 with 586-Engine in PIO-UART to wireless mode



Z232 with FlashCore-B in RS232 to wireless mode



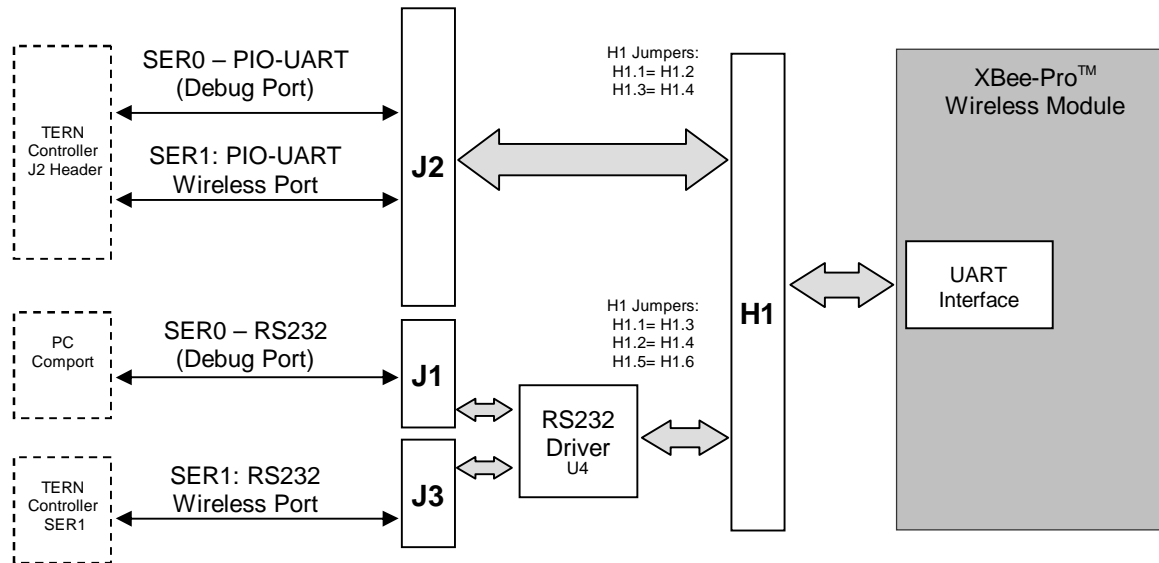
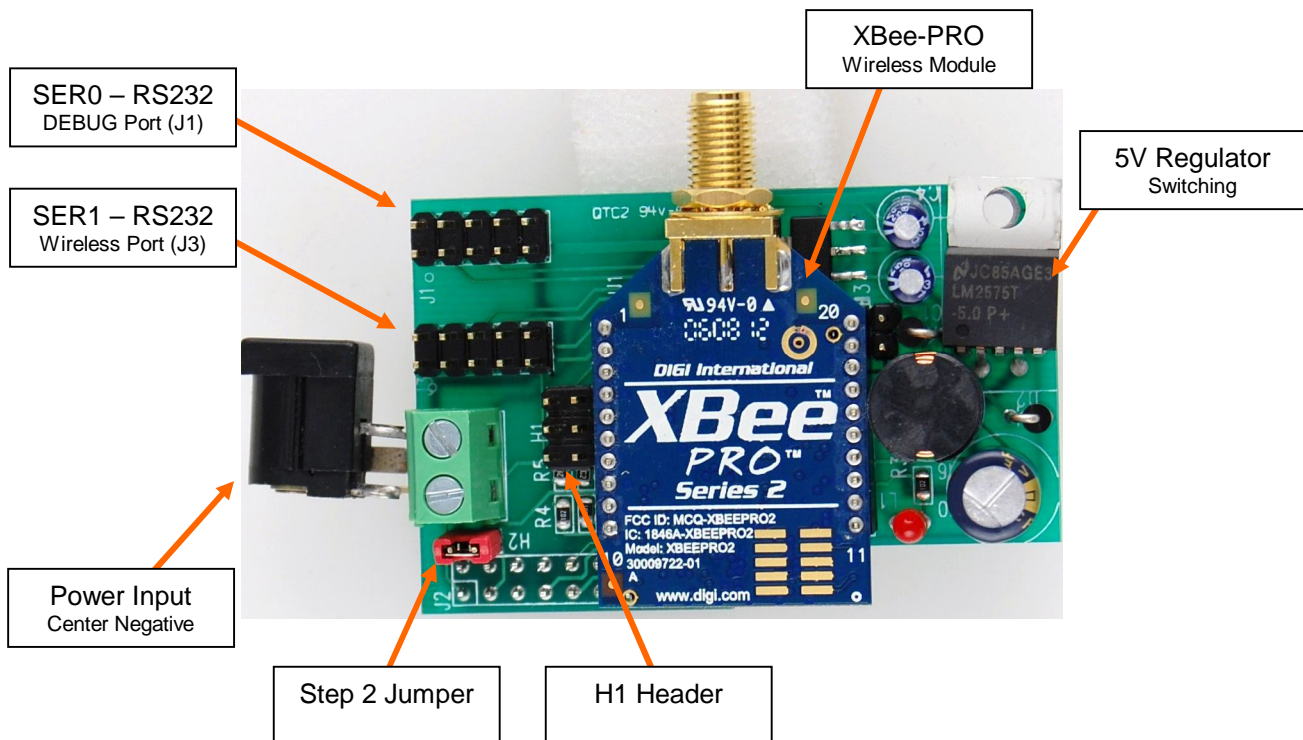


Figure 1.1 Z232 Functional Diagram

Physical Description

Below shows the physical layout of the Z232.



Chapter 2: Installation

2.1 Software Installation

Please refer to the “software_kit.pdf” technical manual on the TERN installation CD, under tern_docs/manual/software_kit.pdf, for information on installing software.

See DIGI International’s website (www.digi.com/support) regarding the X-CTU software for configuring and testing XBee Wireless modules.

2.2 Hardware installation

The Z232 can be connected to TERN controller directly on to the controller’s J2 header (PIO-UART mode) or connected to the controller’s RS232 serial port via serial cable (RS232 mode). Hardware installation for the Z232 will vary based upon which TERN controller board is used. Refer to the technical manual of the controller board for additional details.

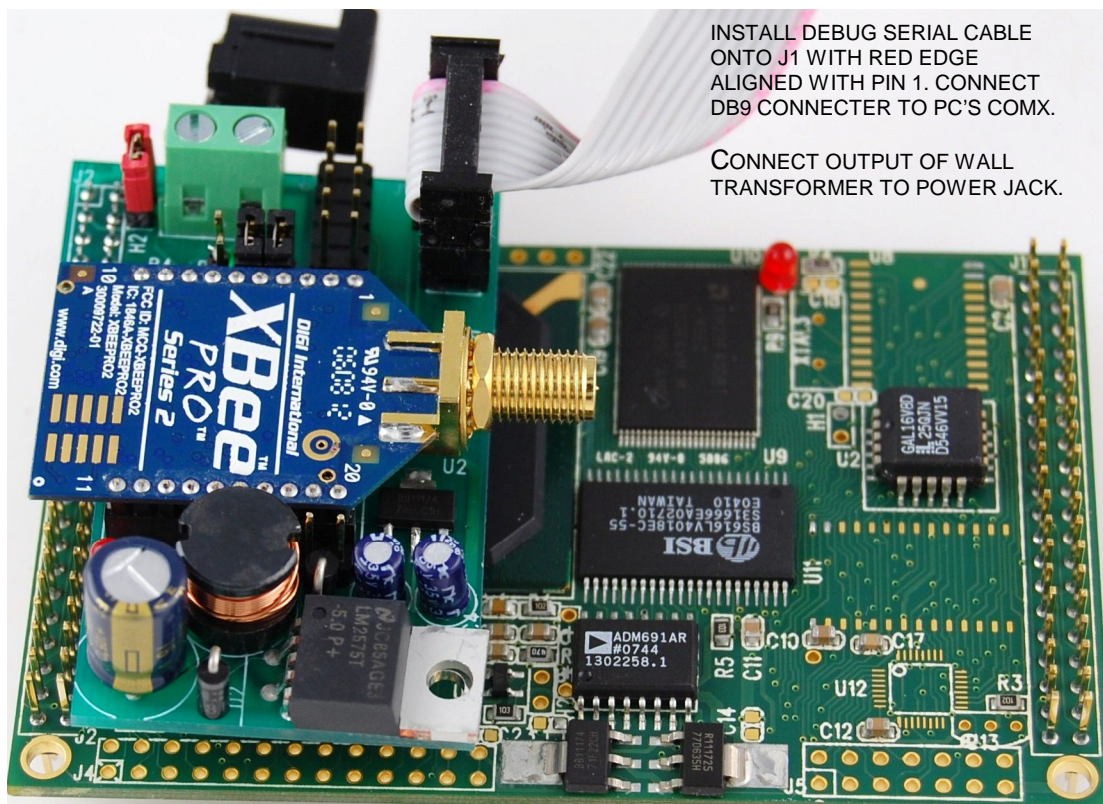


Figure 2.1 Z232 connected to 586-Engine in PIO-UART to wireless mode.

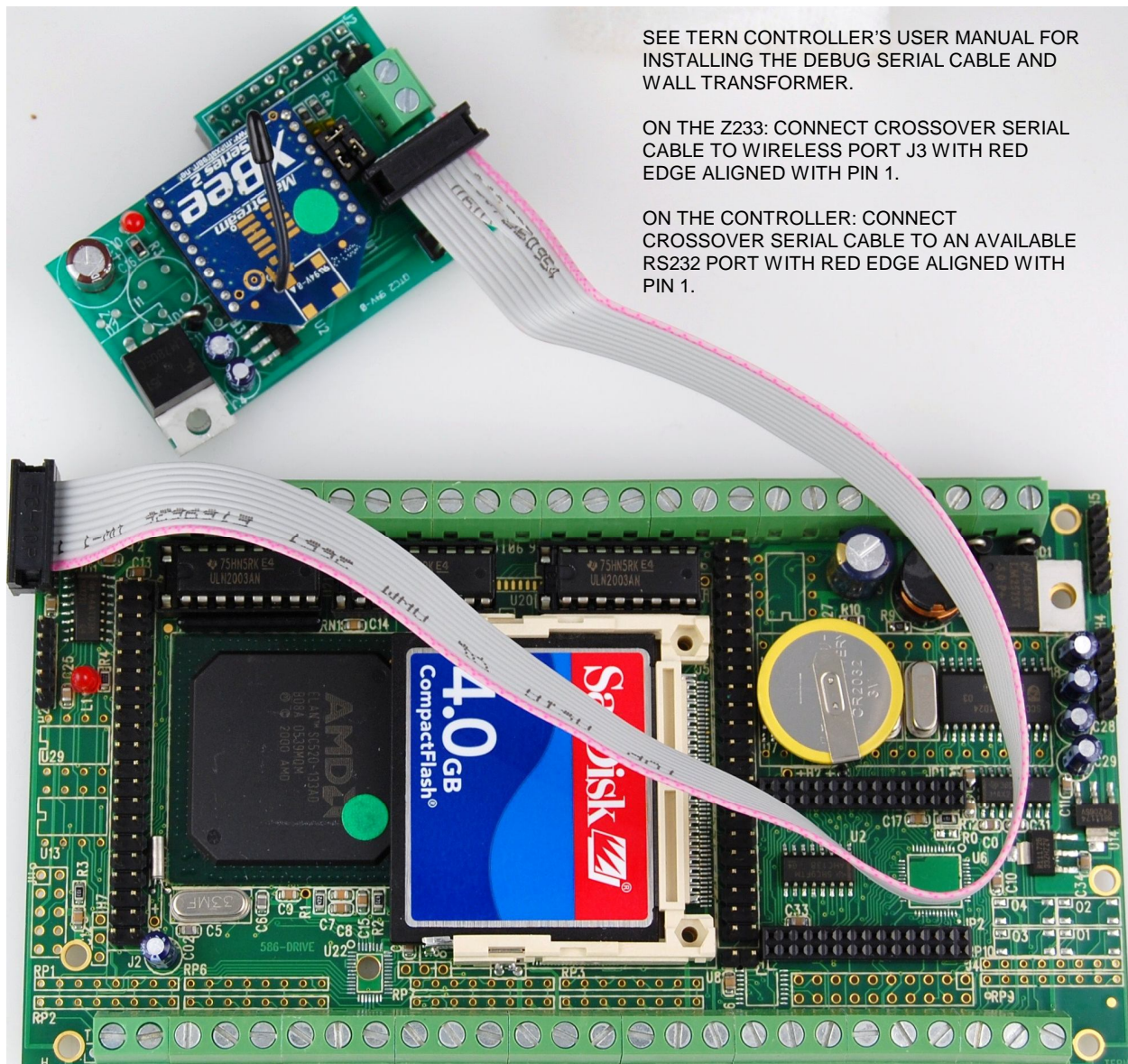


Table 2.1 Z232 connected to 586-Drive in RS232 to wireless mode.

Chapter 3: Hardware

3.1 Introduction

The Z232™ is designed to provide a wireless solution for TERN controllers. The Z232 supports a ZigBee wireless module from DIGI International. It can be driven by an RS232 serial port or a PIO (5V or 3.3V) UART at 9600 baud. Compatible TERN controllers include AE, EE, RE, i386E, 586E, or any TERN board with a PIO-UART or an RS232 UART.

3.2 XBee-PRO Features

The XBee-PRO OEM RF Modules are engineered to meet IEEE 802.15.4 standards and support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data between devices. The modules operate within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other.

Features:

- 2.4GHz operational frequency
- Up to 300' (90m) range indoors
- Up to 1 mile (1600m) range outdoor line-of-sight.
- RF data rate of 250,000 bps
- 250mA @ 3.3V transmit peak current
- 55mA @ 3.3V receive peak current

3.3 Wireless Interface

TERN controllers can interface the Z232 either directly in PIO-UART to wireless mode or over an RS232 serial cable in RS232 to wireless mode.

PIO-UART to Wireless Mode

In PIO-UART to wireless mode, the Z232 plugs directly on top of the TERN controller at header J2. The controller communicates with the XBee wireless module over a 0-5V or 0-3.3V UART connection. Jumpers on the H1 2x3 header must be set to correctly in order to facilitate this mode (H1.1=H1.2, H1.3=H1.4).

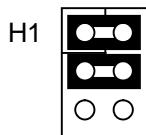


Figure 3.1 H1 jumpers for PIO-UART to wireless mode

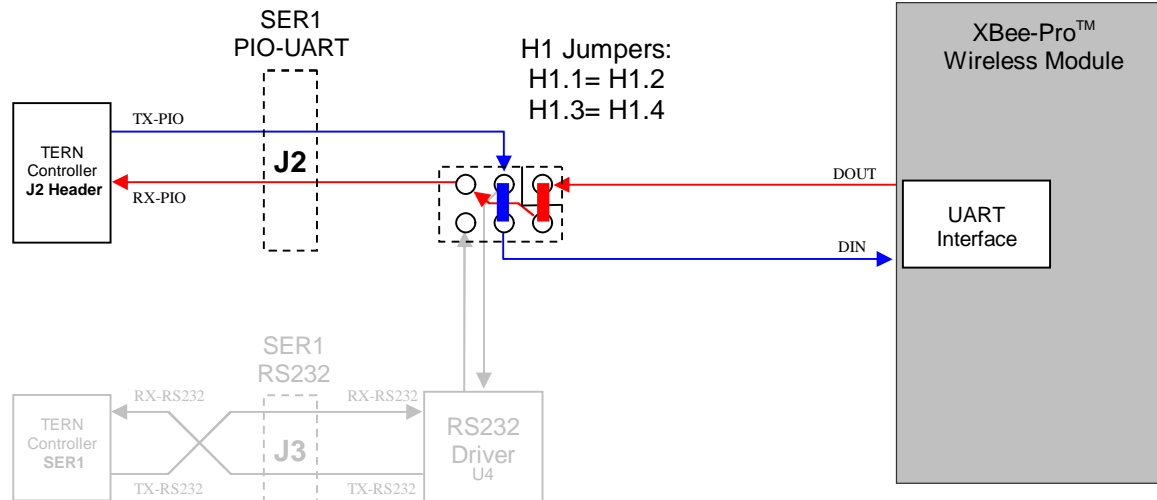


Figure 3.2 PIO-UART to wireless mode

RS232 to Wireless Mode

In RS232 to wireless mode, the Z232 is connected by a crossover flat cable to one of the TERN controller's RS232 ports. The controller communicates with the XBBee wireless module over a RS232 serial connection. Jumpers on the H1 2x3 header must be set correctly in order to facilitate this mode (H1.1=H1.3, H1.2=H1.4, H1.5=H1.6). Note that the serial cable must crossover in order to communicate properly.

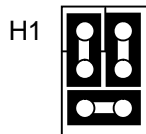


Figure 3.3 H1 Jumpers for RS232 to wireless mode

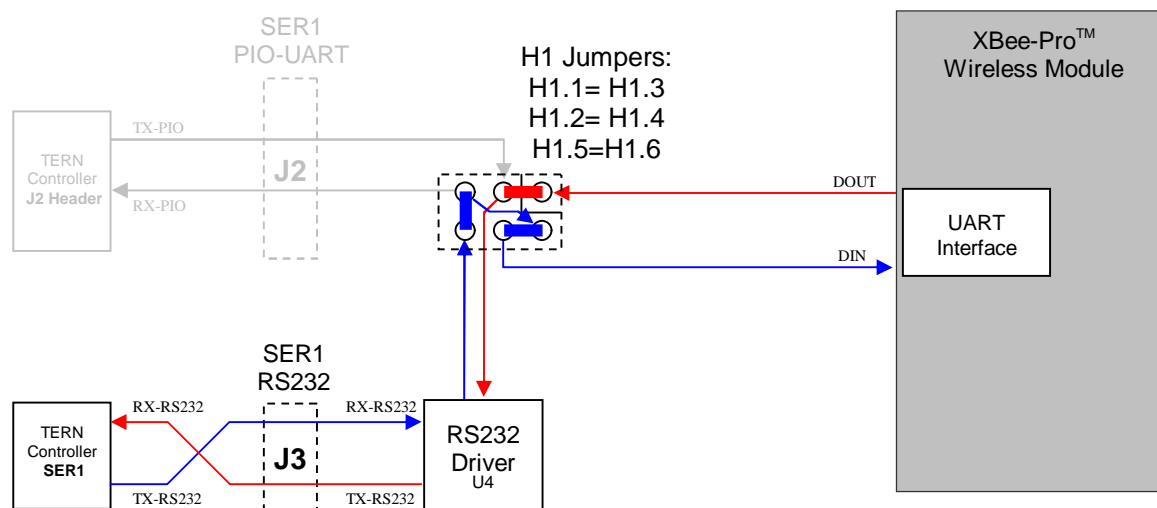


Figure 3.4 RS232 to wireless mode

Power Supply

The Z232 has an on-board 5V linear regulator by default. The linear regulator requires 9-12VDC input at the two pin terminal block T1. For applications requiring more flexibility in input voltage range, the Z232 supports an optional 5V switching regulator. The switching regulator can accept an input voltage range of 9 to 35VDC.

In PIO-UART to wireless mode, the 5V regulator will supply power to the TERN controller as well as the Z232. In RS232 to wireless mode, the Z232 and TERN controller must be powered separately.

Chapter 4: Software

4.1 Introduction

By default, XBee®/XBee-PRO RF Modules operate in Transparent Mode. When operating in this mode, the modules act as a serial line replacement - all UART data received through the DI pin is queued up for RF transmission. When RF data is received, the data is sent out the DO pin. While the modules can operate in other modes, TERN configures and supports only the Transparent Mode. Information about addition features and operation modes can be found in the XBee/XBee-PRO OEM RF Modules Product Manual.

**** See the XBee/XBee-PRO Product Manual for detailed information on using the modules.**

4.2 X-CTU Configuration & Test Utility Software

DIGI International, makers of the XBee and XBee-PRO wireless, provide a free configuration utility for use with their wireless modules. X-CTU is a Windows-based configuration utility designed to interact with the firmware files on DIGI's XBee modules. X-CTU can either be downloaded from DIGI's website or installed from an installation CD. The figure below shows how to connect the Z232 to interact with the X-CTU software.

**** See the X-CTU User Manual for detailed information on using the utility.**

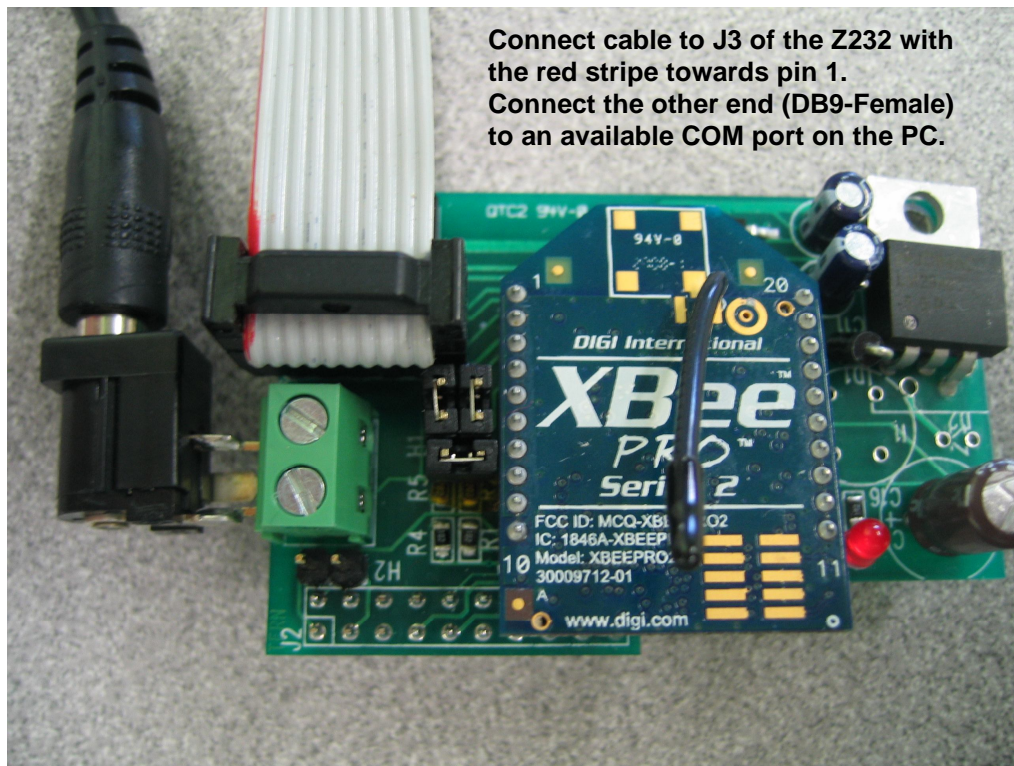
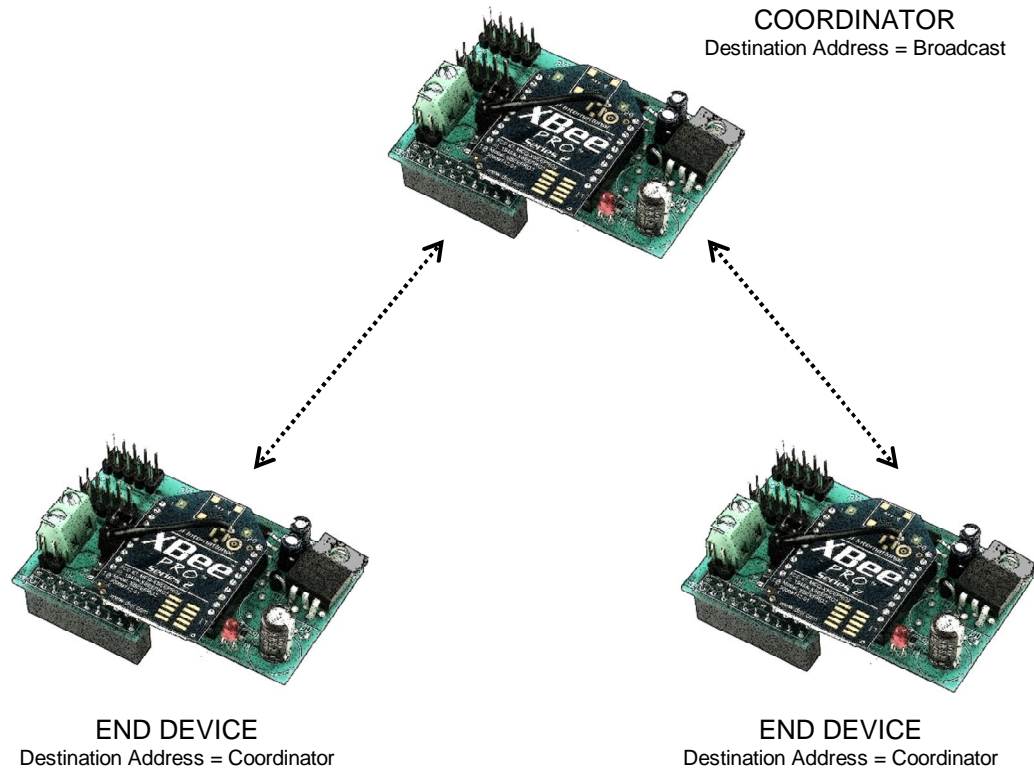
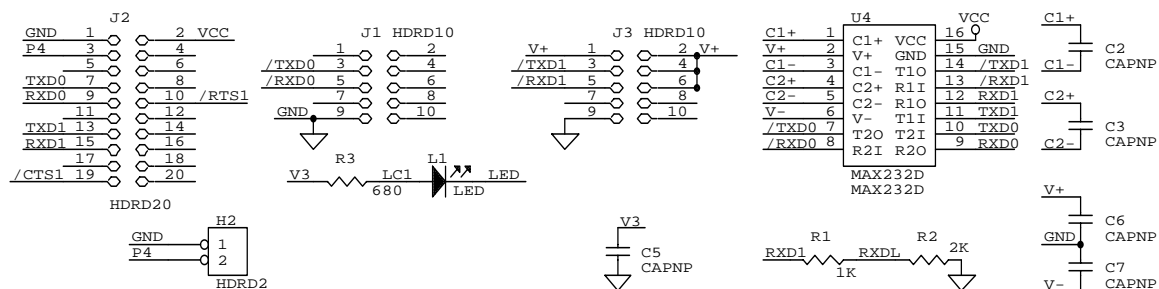


Figure 4.1 Connecting the Z232 to X-CTU

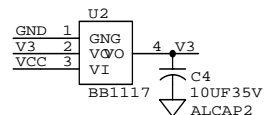
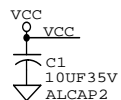
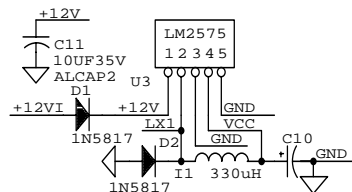
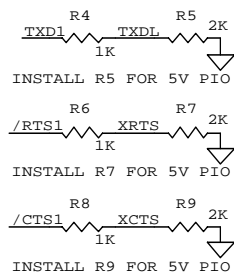
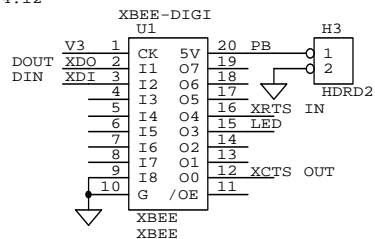
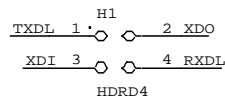
Default Network Configuration

TERN configures the XBee modules to operate in a NonBeaconing system where one device is a Coordinator and the other devices are End Devices. TERN configures the Coordinator to broadcast to all End Devices and the End Devices to transmit to the Coordinator. The X-CTU software can be used to configure a device for Coordinator or End Device. See the XBee/XBee-PRO and the X-CTU user manuals for detailed information.





TTL-XBEE: H1.1=H1.3, H1.2=H1.4, CUT U4.12
 232-XBEE: H1.1=H1.2, H1.3=H1.4



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