IEEE 802.15.4 Wireless Gateway Reference Manual

Contents

About this Manual

This manual provides detailed reference information for the Jennic IEEE 802.15.4 Wireless Gateway board (type DR1135), which can act as an interface between an IPv4-based system and an IEEE 802.15.4-based wireless network.

Organisation

The manual consists of 3 chapters, as follows:

- Chapter 1 introduces the IEEE 802.15.4 Wireless Gateway board, its purpose and features.

- Chapter 2 describes the hardware features and the associated connectors on the board.

- Chapter 3 describes how to configure the board's USB interface and download application code to the board.

Conventions

Files, folders, functions and parameter types are represented in **bold** type.

Function parameters are represented in *italics* type.

Code fragments are represented in the Courier typeface.

Acronyms and Abbreviations

IPv4	Internet Protocol version 4
LED	Light Emitting Diode
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
JTAG	Joint Test Action Group (boundary-scan integrated circuit debug system)
PSU	Power Supply Unit
SPI	Serial Peripheral Interface
MISO	Master In Slave Out
MOSI	Master Out Slave In
SMA	Subminiature Type A (coaxial cable/antenna connector)

Related Documents

JN-AN-1151   Jennic Low-Cost JenNet IP Gateway Application Note

JN-DS-JN5148   Jennic JN5148 Data Sheet

Feedback Address

If you wish to comment on this manual, or any other Jennic user documentation, please provide your feedback by writing to us (quoting the manual reference number and version) at the following postal address or e-mail address:

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1 Introduction

1.1 Overview

The Jennic IEEE 802.15.4 Wireless Gateway board (type DR1135) provides an interface between an IPv4-based system and an IEEE 802.15.4-based wireless network. The board accepts a Jennic wireless microcontroller module and features an Ethernet port for IPv4 connectivity, allowing connection to a local hard-wired computer network or the Internet. All RF layout and decoupling issues are handled by the design of the Jennic module, which can be easily incorporated into the Gateway hardware by mounting the module on the board.

The Gateway board provides a stable hardware environment for developing IEEE 802.15.4, ZigBee or Jenie/JenNet wireless network applications with IPv4 connectivity, allowing designers to rapidly develop and test both Ethernet- and Internet-enabled applications based around the Jennic wireless microcontroller products. This hardware also supports an IP gateway to the Jennic Intelligent Lighting and Active-RFID solutions.

1.2 Features

The IEEE 802.15.4 Wireless Gateway provides the following features:

- Standard footprint to accept a Jennic module
- Ethernet port for connection to other devices via IPv4
- SMA connector for antenna
- Regulated 3V DC power supply
- 4 LED indicators
- Mini-USB interface for program downloads (via UART0)
- JTAG interface for software verification (via UART1)
- Expansion port for additional sensors or outputs

1.3 Reference Design

A Reference Design for the IEEE 802.15.4 Wireless Gateway board is available from the Support area of the Jennic web site (http://www.jennic.com/support). This Reference Design (JN-RD-6026) comprises a ZIP file containing the following files:

- This Reference Manual
- The schematic diagram for the board
- The BOM (Bill Of Materials) for the board
- PADS for the board
- Gerbers for the board

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2 Hardware Features and Connectors
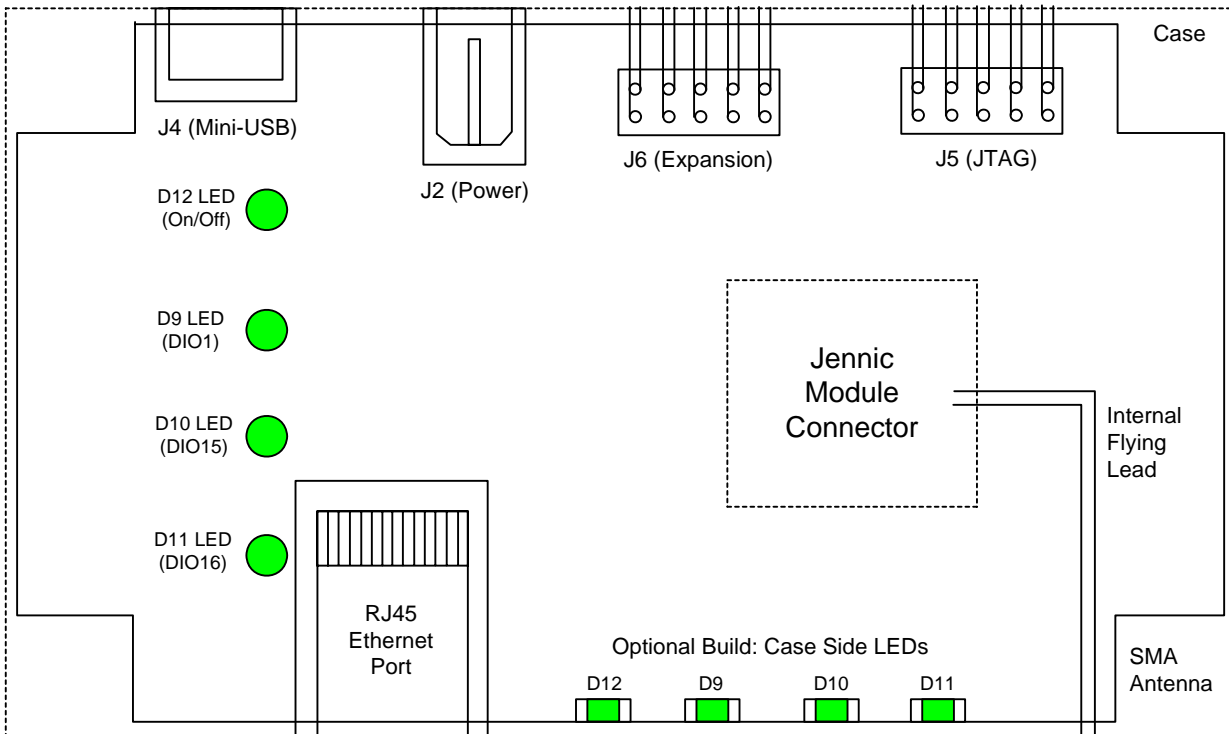
2.1 Board Layout

Figure 1: IEEE 802.15.4 Wireless Gateway Board Layout

2.2 Jennic Module Connector

The module connector provides an easy way of mounting different types of module containing Jennic wireless microcontrollers.

> **!** *Caution: When replacing modules, ensure that power is removed from the board and that the replacement module is connected correctly before reapplying power. Failure to do so may result in permanent damage to both the module and the PCB.*

An option of the build also allows these modules to be soldered directly to the PCB as surface mount components.

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2.3 Power Supply

The Gateway can be powered with an external PSU via a 2.1-mm jack socket (J2) or via the USB port (J4). The input is protected against reverse polarity. When a power source is attached, the Gateway will power on immediately.

> **Note:** A positive DC voltage of 5V must be applied to the centre pin of the J2 connector with the outer ring grounded. The Gateway will remain unpowered if the polarity is reversed.

2.4 Mini-USB Interface

The USB interface is an FTDI FD232RL device used to interface between the data connections of the USB port and the standard UART connections for UART0 of the Jennic microcontroller. It can be used to program the microcontroller from a PC running the Jennic JN51xx Flash Programmer utility.

A standard USB mini-series B type connector is provided on the board and labelled J4. This can be connected to any computer with a USB socket, using a 'USB-A to USB mini-B' cable.

> **Note:** When connected by USB to a computer, the Gateway does not require power from a PSU.

An FTDI device driver must be installed on the PC. This can be obtained and installed as described in the *JN51xx Flash Programmer User Guide (JN-UG-3007)*. Once the device driver is installed, the Gateway board will appear as an additional COM port on the Windows PC. The FTDI device must be configured as described in Section 3.1 of this manual.

2.5 RF Antenna Connector

An externally accessible SMA connector for the antenna is provided, which connects internally to the Jennic microcontroller module via a flying lead.

2.6 Ethernet Port

A standard RJ45 port is provided that accepts an RJ45 terminated CAT-5E cable.

The RJ45 port connects to an internal stand-alone Ethernet controller which, in turn, interfaces with the microcontroller's SPI (MISO, MOSI, Slave Select and SPI clock), enabling IPv4 connectivity between the microcontroller and the outside world.

The RJ45 port should be connected directly to your network hub/switch.

2.7 JTAG Interface

The JTAG interface connects to the Jennic microcontroller through UART1 and can be used for software verification. The interface is compatible with the Atomic Programming AP-114 ISP/JTAG Programmer system.

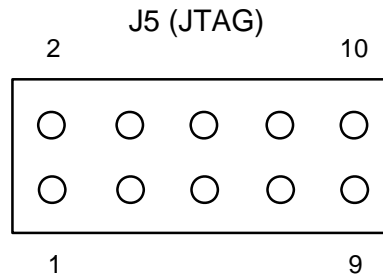A 10-pin JTAG connector is provided on the board and labelled J5.

J5 (JTAG)

Figure 2: JTAG (J5) Socket

Pin	Signal	JTAG Function
1	DIO17	JTAG Clock (TCK)
2	Ground	
3	DIO19	JTAG Data Out (TDO)
4	VCC	
5	DIO18	JTAG Control (TMS)
6	N/C	
7	N/C	
8	N/C	
9	DIO20	JTAG Data In (TDI)
10	Ground	

N/C = Not Connected

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2.8 Expansion Connector

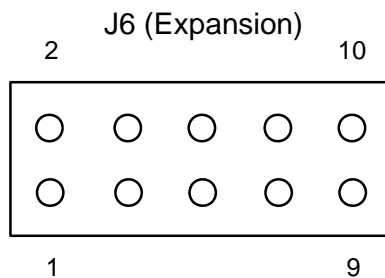A 10-pin expansion connector is provided on the board and labelled J6.

J6 (Expansion)

2   10

1   9

Figure 3: Expansion (J6) Socket

Pin	Signal	Expansion Function
1	DIO2	NO Connect when JN5148-M04 is connected
2	DIO3	NO Connect when JN5148-M04 is connected
3	DIO8	Timer 0 Clk/Gate Input
4	DIO11	Timer 1 Clk/Gate Input
5	DIO12	Timer 1 Capture Input
6	DIO13	Timer 1 Output
7	DIO14	Serial Interface Clock
8	DIO15	LED Indicator 3
9	DIO16	LED Indicator 4
10	GND	

2.9 Indicator LEDs

Four LEDs can be viewed on the top side of the Gateway board, indicating from top to bottom:

- Power On
- DIO1
- DIO15
- DIO16

DIO15 and DIO16 are also connected to the expansion port (J6).

An optional build allows these four LEDs to be populated on the lower edge of the Gateway board instead, in which case the above list runs from left to right.

> **Note:** For correct LED operation, the application must configure DIO1, DIO15 and DIO16 as outputs. DIO15 and DIO16 are also connected to the expansion port (J6) and must be used with care if the DIO signals are also to be used for switch/indicator functions.

3 Programming

3.1 Configuring the FTDI Device (USB Interface)

The FTDI device of the mini-USB interface (see Section 2.4) needs to be programmed in order for this Reference Design to function as required. The FT_Prog tool provided on the FTDI web site (www.ftdichip.com) should be used to program the device - the required configuration is shown in Figure 4. It is necessary to first select the chip type, FT232R, in the Chip_Details page.
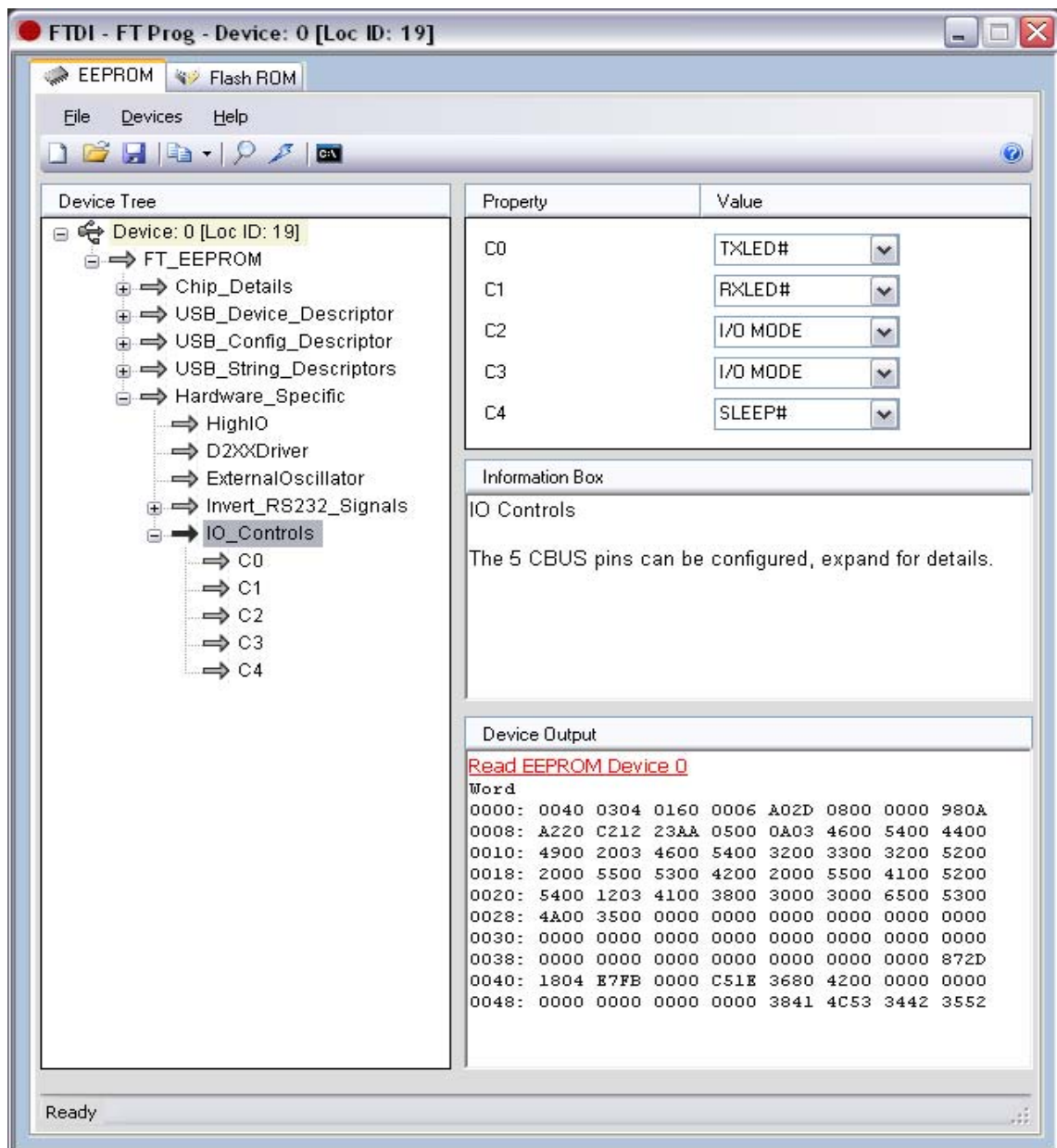

Figure 4: Configuration Settings for FTDI device

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3.2 Downloading Application Code to Gateway

Application code can be downloaded from a PC to the Flash memory on the Jennic module via the board's mini-USB interface (see Section 2.4) using a 'USB-A to USB mini-B' cable.

The download can be performed from the PC using the Jennic JN51xx Flash Programmer utility, which is supplied in the toolchain of the Jennic Software Developer's Kits (SDKs) and is described in the *JN51xx Flash Programmer User Guide (JN-UG-3007)*.

This board uses automatic PROGRAM and RESET signalling. In the JN51xx Flash Programmer interface, you must make sure that the **Automatic Program and Reset** checkbox is ticked.

Revision History

Version	Date	Description
1.0	18-May-2010	First release

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