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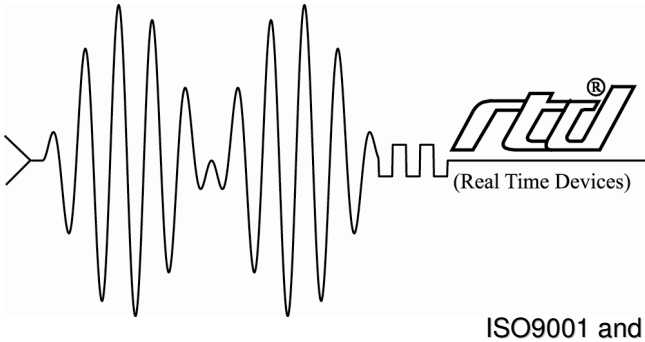
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WLAN17202ER User's Manual

Embedded Wireless LAN 802.11a/b/g PC/104-Plus Module



(Real Time Devices)

RTD Embedded Technologies, Inc.
"Accessing the Analog World"®

BDM-610020036
Rev. B

ISO9001 and AS9100 Certified

WLAN17202ER User's Manual



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Manual Revision History

Rev A	Initial Release
Rev B	Updated jumper descriptions
	Updated rotary switch settings table
	Updated board picture
	Added section to describe network activity LED

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Introduction

Product Overview

The WLAN17202ER is designed to provide wireless communication for PC/104-*Plus* and PCI-104 based systems. It communicates via the standard 802.11a/b/g protocols. The WLAN17202ER can be used to connect multiple PC systems together. The WLAN17202ER uses the 5004 MP Atheros 4G Mini-PCI module from Netgate. This module is connected to the PC/104 PCI bus through a Mini-PCI connector and special circuitry to allow for compatibility with either 3.3V or 5V PCI signaling.

Board Features

- PC/104 PCI and ISA stack through busses
- 5004 MP Atheros 4G Mini-PCI module
- Atheros AR5004X Client Chipset
- Supports IEEE 802.11a, 80211b, 802.11g protocols
- Two MCX Jacks for dual antennas
- Structural support system for the Mini-PCI module to increase ruggedness.
- Needs only +5V input power

THE WLAN17202ER IS AN EMBEDDED MODULE WHICH IS INTENDENDED TO BE INTEGRATED INTO A FINAL SYSTEM. IT PROVIDES POWER, ANTENNA ACCESS, AND STRUCTURAL SUPPORT FOR RUGGED SYSTEMS. IT IS INCUMBENT ON THE USER TO OBTAIN ANY CERTIFICATIONS WHICH MAY BE REQUIRED FOR OPERATION WHEN INTEGRATED INTO ITS FINAL APPLICATION. THE ONLY CURRENT CERTIFICATIONS WHICH MAY RELATE TO THIS MODULE ARE THE ONES WHICH HAVE BEEN OBTAINED FOR THE 5004 MP ATHEROS 4G MINI-PCI MODULE FROM NETGATE.

PCI Interface

- Supports 3.3V and 5.0V PCI Signaling
- User-selectable PCI Slot Number

Physical Attributes

- Size: 3.6”L x 3.8”W x 0.6”H (90mm L x 96mm W x 15mm H)
- Weight: Approximately 0.18 lbs (0.08 Kg)
- Operating Temperature: 0° C to +70° C
- Storage Temperature: -20° C to +80° C
- Power Requirements @ +5 VDC:

	802.11a	**802.11b**	**802.11g**
FTP Tx :	1.39 W	1.43 W	1.35 W
FTP Rx :	0.99 W	1.02 W	1.02 W
Standby mode:	0.86 W	0.83 W	0.89 W
Power saving mode:	0.17 W	0.17 W	0.17 W
RF Kill :	0.13 W	0.13 W	0.13 W

5004 MP Atheros 4G Mini-PCI Module Features

THE FOLLOWING SPECIFICATIONS COME FROM THE **NATEGATE DATASHEET** FOR THE 5004 MP ATHEROS 4G MINI-PCI MODULE. RTD EMBEDEDED TECHNOLOGIES ASSUMES NO RESPONSIBLILITY FOR ANY ERRORS IN THAT DATA SHEET AND DOES NOT ASSUME RESPONSIBILITY FOR VERIFYING ITS ACCURACY. INFORMATION FROM THIS DATASHEET IS PROVIDED FOR CONVIENIENCE ONLY. IT IS THE RESPONSIBILITY OF THE USER TO OPTAIN THE LATEST VERSION OF THE DATASHEET TO VERIFY THAT NO CHANGES HAVE BEEN MADE WHICH MAY CONFLICT WITH THE DATA PRESENTED BELOW.

- Atheros AR5004X Client Chipset

- Frequency Range:
  - USA: 2.400 – 2.483GHz, 5.15 ~ 5.35Ghz, 5.725 ~ 5.825Ghz
  - Europe: 2.400 – 2.483GHz, 5.15 ~ 5.35Ghz, 5.47 ~ 5.725Ghz
  - Japan: 2.400 – 2.483GHz, 4.90 - 5.091GHz, 5.15 – 5.25GHz
  - China: 2.400 – 2.483GHz, 5.725 ~5.85Ghz

- Modulation Technique :
  - **802.11b/g**: DSSS (DBPSK, DQPSK, CCK)
    OFDM (BPSK,QPSK, 16-QAM, 64-QAM)
  - **802.11a**: OFDM(BPSK,QPSK, 16-QAM, 64-QAM)

- Channels Support:
  - **802.11b/g**:
    US/Canada: 11 (1 ~ 11)
    Major European country: 13 (1 ~ 13)
    France: 4 (10 ~ 13)
    Japan: 11b: 14 (1~13 or 14th), 11g: 13 (1 ~ 13)
    China: 13 (1 ~ 13)
  - **802.11a**:
    US/Canada:12 non-overlapping channels (5.15~ 5.35GHz, 5.725 ~ 5.825GHz)
    Europe: 19 non-overlapping channel (5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz)
    Japan: 4 non-overlapping channels (5.15 ~ 5.25GHz)
    China : 5 non-overlapping channels (5.725 ~ 5.85GHz)

- Output Power :
  - **802.11b:** 18dBm
  - **802.11g:** 18dBm @6Mbps
    15dBm @54Mbps
  - **802.11a:** 17dBm @6Mbps
    13dBm @54Mbps

- Operating distance: Depends on Antenna performance, LOS, and the laws of physics
  - **802.11a:** Outdoor: 85m@54Mbps, 300m@6Mbps
    Indoor: 20m@54Mbps, 40m@6Mbps
  - **802.11b:** Outdoor:300m@11Mbps, 400m@1Mbps
    Indoor: 30m@11Mbps, 50m@1Mbps
  - **802.11g:** Outdoor: 80m@54Mbps, 300m@6Mbps
    Indoor: 15m@54Mbps, 35m@6Mbps

- Receive Sensitivity:
  - **802.11a:** -88dB@6Mbps, -87dB@9Mbps, -85@12Mbps, -83dB@18Mbps, -80dB@24Mbps,-75dB@36Mbps, -73dB@48Mbps, -71dB@54Mbps
  - **802.11b:** -95dB@1Mbps, -94dB@2Mbps, -92dB@5.5Mbps, -90dB@11Mbps
  - **802.11g:** -90dB@6Mbps, -89dB@9Mbps, -87@12Mbps, -85dB@18Mbps, -82dB@24Mbps,-79dB@36Mbps, -76dB@48Mbps, -74dB@54Mbps

- Security:
  - 64-bit,128-bit, 152-bit WEP Encryption
  - 802.1x Authentication
  - AES-CCM & TKIP Encryption

- Operating Modes: Infrastructure & Ad-hoc mode
  (depends upon OS, driver, and band)

- Transfer Data Rate:
  802.11b/g: 11, 5.5, 2, 1 Mbps, auto-fallback, 802.11g up to 54 Mbps
  802.11g (Super mode): Up to 108 Mbps
  802.11a (Normal mode): 54, 48, 36, 24, 18, 12, 9, 6Mbps, autofallback
  802.11a (Turbo mode): 108,96,72,48,36,24,18,12 Mbps, autofallback

- Wi-Fi Alliance: WECA Compliant

- WHQL: Microsoft XP Compliant

- FAA: S/W audio On/Off support

- EMC Certificate: FCC part 15 (USA), with multiple e-Antenna
  Telec (Japan), with multiple e-Antenna
  These certifications do not imply the certification of the WLAN17202ER. Please see not in Section: "Board Features" above.

- Media Access Protocol : CSMA/CA with ACK architecture 32-bit MAC

Available Options

The WLAN17202ER is available as part of a starter kit, bundled with an external antenna and cabling. The WLAN17202ER can also be purchased as an IDAN module for integration into an RTD IDAN system.

The following is a summary of the different WLAN17202ER configurations:

Part Number	Description
WLAN17202ER	WLAN17202ER board (no antennas)
SK-WLAN17202ER	WLAN17202ER with external antenna
IDAN-WLAN17202ER	WLAN17202ER mounted in an IDAN frame

Getting Technical Support

For help with this product, or any other product made by RTD, you can contact RTD Embedded Technologies via the following methods:

Phone: +1-814-234-8087

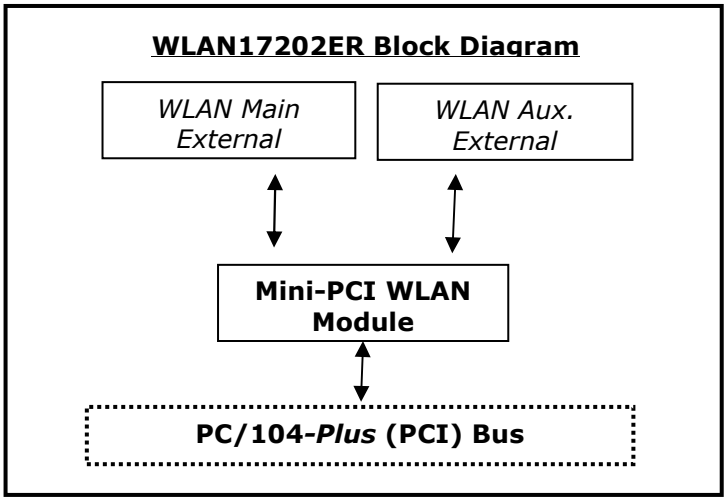
E-Mail: techsupport@rtd.com

Be sure to check the RTD web site (http://www.rtd.com) frequently for product updates, including newer versions of the board manual and application software.

Board Hardware

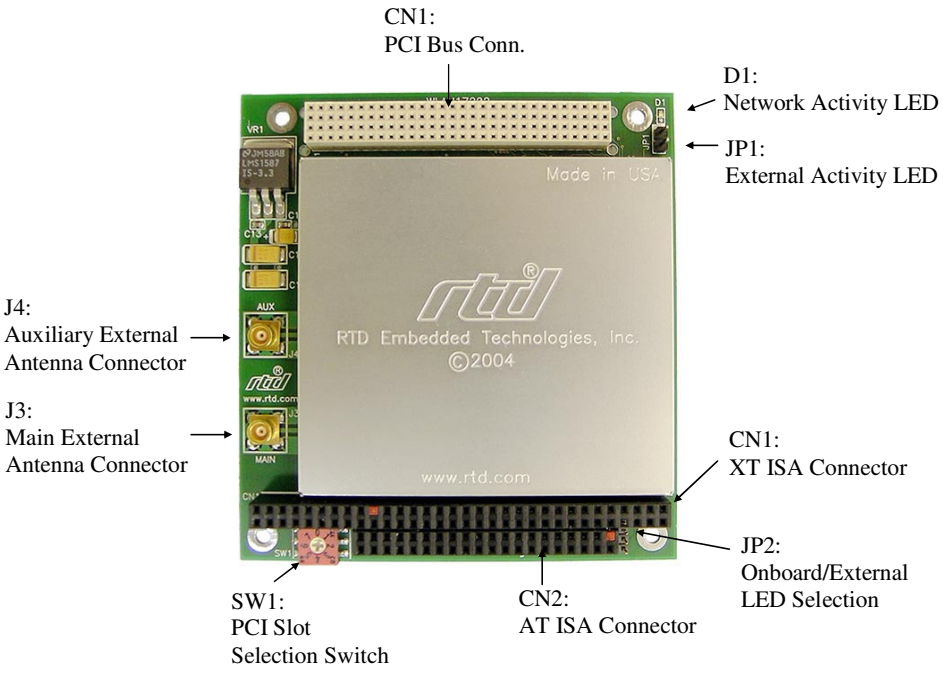
Block Diagram

Below is a block diagram of the WLAN17202ER. Primary board components are in bold, while external I/O connections and jumpers are italicized.



Connector and Jumper Locations

The following diagram shows the location of all connectors and jumpers on the WLAN17202ER. For a description of each jumper and connector, refer to the following sections.



External I/O Connections

The following sections describe the external I/O connections of the WLAN17202ER.

Connector CN1/CN2 - PC/104 ISA

Connector CN1/CN2 carries the signals of the PC/104-*Plus* ISA bus. The signals from this bus are not used on this module. The connector serves as a pass-through to other PC/104 and PC/104-*Plus* modules.

Connector CN3 - PC/104 PCI Bus

Connector CN3 carries the signals of the PC/104-*Plus* PCI bus. These signals match definitions of the PCI Local Bus specification Revision 2.2. The following tables list the pinouts of the PC/104-*Plus* bus connector.

PCI Bus Signal Assignments

Pin	A	B	C	D
1	GND	Reserved	+5 AD00	
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0#	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1#	AD15	+3.3V
9	SERR#	GND	Reserved	PAR
10	GND	PERR#	+3.3V	Reserved
11	STOP#	+3.3V	LOCK#	GND
12	+3.3V	TRDY#	GND	DEVSEL#
13	FRAME#	GND	IRDY#	+3.3V
14	GND	AD16	+3.3V	C/BE2#
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3#	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0#	GND	REQ1#	VI/O
24	GND	REQ2#	+5V	GNT0#
25	GNT1#	VI/O	GNT2#	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD#	+5V	RST#
29	+12V	INTA#	INTB#	INTC#
30	-12V	REQ3#	GNT3#	GND

PCI Bus Signal Description

Address and Data

AD[31:00]	**Address and Data** are multiplexed on the same PCI pins. A bus transaction consists of an address phase followed by one or more data phases.
C/BE[3:0]#	**Bus Command/Byte Enables** are multiplexed. During the address phase of a transaction, they define the bus command. During the data phase, they are used as byte enables.
PAR	**Parity** is even parity across AD[31:00] and C/BE[3:0]#. Parity generation is required by all PCI signals.

Interface Control Pins

FRAME#	**Cycle Frame** is driven by the current master to indicate the beginning of an access and will remain active until the final data cycle.
TRDY#	**Target Ready** indicates the selected device's ability to complete the current data phase of the transaction. Both IRDY# and TRDY# must be asserted to terminate a data cycle.
IRDY#	**Initiator Ready** indicates the bus master's ability to complete the current data phase of the transaction.
STOP#	**Stop** indicates the current selected device is requesting the master to stop the current transaction.
DEVSEL#	**Device Select**, when actively driven, indicates the driving device has decoded its address as the target of the current access.
IDSEL	**Initialization Device Select** is used as a chip-select during configuration read and write transactions.
LOCK#	**Lock** indicates an atomic operation to a bridge that may require multiple transactions to complete.

Error Reporting

PERR#	**Parity Error** is for reporting data parity errors.
SERR#	**System Error** is for reporting address parity errors.

Arbitration (Bus Masters Only)

REQ#	**Request** indicates to the arbitrator that this device desires use of the bus.
GNT#	**Grant** indicates to the requesting device that access has been granted.

System

CLK	**Clock** provides timing for all transactions on the PCI bus and is an input to every PCI device.
RST#	**Reset** is used to bring PCI-specific registers, sequencers, and signals to a consistent state.
M66EN	**66 MHz Enable** indicates to a device whether the bus segment is operating at 33 MHz or 66 MHz. The PCI bus has been simulated at 33MHz. For the purpose of this specification, 66MHz is not supported. To support future enhancements, the M66EN signal should be grounded on any module that cannot support 66MHz and left open for modules that can support a 66MHz clock.

Interrupts

INTA#	**Interrupt A** is used to request Interrupts.
INTB#	**Interrupt B** is used to request Interrupts.
INTC#	**Interrupt C** is used to request Interrupts.
INTD#	**Interrupt D** is used to request Interrupts.

Connectors J3 and J4 – WLAN Antenna Connectors

WLAN17202ER is capable of hardware antenna diversity if external antennas are connected to both of the on-board Main and Auxiliary antenna connectors. These connectors are of the MCX/OSX type. External WLAN antennas are available as part of the SK-WLAN17202ER starter kit.

Note: The WLAN17202ER will automatically use whichever antenna has the greatest signal strength. If only one antenna is attached, that one will always be used.

PCI Configuration Options

To install the WLAN17202ER into the stack, the PCI Slot Number must be configured correctly. This is done by the rotary switch SW1. There are four possible PCI Slot Numbers (0 – 3). Each PCI device (PC/104-*Plus* or PCI-104) must a use a different slot number. The slot number is related to the position of the board in the stack. Slot 0 represents the PCI device closest to the CPU. Slot 3 represents the PCI devices farthest away from the CPU.

Note: In a PC/104-*Plus* or PCI-104 system, all PCI devices should be located on one side of the CPU board (above or below the add-on cards). The CPU should not be located between two PCI devices.

Rotary Switch SW1 – PCI Slot Selector

The WLAN17202ER has an eight position rotary switch which supports both 3 and 4 bus master configurations. The PCI Slot Number can be configured as follows:

Switch Position	PCI Slot Number	Bus Master
0	Slot 0 (closest to CPU)	*4 bus master configuration*
1	Slot 1	
2	Slot 2	
3	Slot 3	
4	*Slot 0*	*3 bus master configuration*
5	*Slot 1*	
6	*Slot 2*	
7	*Slot 2*	

Bus Master Control

When the PC/104-*Plus* Specification was first introduced, it only allowed for three PCI add-on cards to be bus masters. Version 2.0 of the PC/104-*Plus* specification was released in November 2003. This version of the specification (which the WLAN17202ER is designed for) adds support for all 4 PCI slots to be bus masters.

For compatibility with CPUs designed for the older PC/104-*Plus* Specification, the WLAN17202ER offers several rotary switch settings. If the rotary switch is set in positions 0 through 3, the board supports bus mastering in all 4 PCI slots. If the rotary switch is set to positions 4 through 7, the board will work in a 3 bus master configuration.

Network Activity LED

A network activity LED (D1) may be enabled by setting jumper JP2 to pins 1-2 (default configuration). When JP2 is configured to pins 2-3, an external activity LED connector (JP1) is enabled.

When configured to use an external LED, the onboard activity LED (D1) will be disabled. Use the following table to connect an external LED to jumper JP1:

External LED Connection (JP1)	
Pin	**Function**
1	Cathode
2	Anode

Note: Pin 1 is indicated by a square solder pad on the bottom side of the board.

Board Installation

Installing the Hardware

The WLAN17202ER can be installed into a PC/104-*Plus* or PCI-104 stack. It can be located above or below the CPU, as long as all PCI add-on cards are on the same side of the CPU.

Static Precautions

Keep your board in its antistatic bag until you are ready to install it into your system! When removing it from the bag, hold the board at the edges and do not touch the components or connectors. Handle the board in an antistatic environment and use a grounded workbench for testing and handling of your hardware.

Steps for Installing

1. Shut down the PC/104-*Plus* system and unplug the power cord.
2. Ground yourself with an anti-static strap.
3. Set the PCI Slot Selector as described in the previous chapter.
4. If any other PCI add-on cards are to be included in the stack, be sure that their PCI slot numbers are configured correctly (Slot 0 for the board closest to the CPU, Slot 1 for the next board, etc).
5. Line up the pins of the WLAN17202ER's PC/104 and PC/104-*Plus* connectors with the corresponding bus connectors of the stack. Make sure that both connectors are lined up.
6. Apply pressure to both bus connectors and gently press the board onto the stack. The board should slide into the matching bus connectors. Do not attempt to force the board, as this can lead to bent/broken pins.
7. Attach the Main WLAN antenna to connector J3.
8. If using an Auxiliary WLAN antenna, attach it to connector J4.
9. If any boards are to be stacked above the WLAN17202ER, install them.
10. Attach any necessary cables to the PC/104-*Plus* stack.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

Note: If multiple PCI devices are configured to use the same PCI slot number, the system will not boot.

Installing Software

After physically installing the WLAN17202ER, your operating system must be configured to recognize the new board.

Windows Drivers

Windows drivers should be included on CD-ROM with the WLAN17202ER. Installation instructions should be provided in the file README.TXT. Follows these instructions to install and configure the software.

Note: Before installing any drivers, it is recommended that you visit the RTD web site (http://www.rtd.com) to check for a newer version.

Linux Drivers

Linux software support is provided by the “madwifi” open source project. For installation instructions and technical support, visit http://www.madwifi.org.

Additional Information

5004 MP Atheros 4G Mini-PCI WLAN Module

For detailed information about the 5004 MP Atheros 4G Mini-PCI WLAN module, Netgate at:

Web: http://www.netgate.com

Atheros AR5004X Chipset

For detailed information about the Atheros AR5004X chipset, contact Atheros at:

Web: http://www.atheros.com

IEEE 802.11 WLAN Specifications

A copy of the 802.11 WLAN specifications can be downloaded from the IEEE web site at:

Web: http://www.ieee.org

Limited Warranty

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During the one year warranty period, RTD EMBEDDED TECHNOLOGIES will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD EMBEDDED TECHNOLOGIES. All replaced parts and products become the property of RTD EMBEDDED TECHNOLOGIES. Before returning any product for repair, customers are required to contact the factory for an RMA number.

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