Digi Connect® Wi-EM 9210 Hardware Reference

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www.digiembedded.com

Contents

About This Guide

Scope of Reference Manual

The scope of this guide is to enable developers to integrate the Digi Connect Wi-EM 9210 modules into other devices. Graphics illustrate the placement and dimensions of components for both the modules and the development board.

Related Documentation

See the *NS 9210 Hardware Reference* for information on the NS 9210 chip.

Support Information

To get help with a question or technical problem or make comments and recommendations about Digi products and documentation, use the following contact information.

General	***Customer Service and Support***
Digi International	United States: 1 877-912-3444
11001 Bren Road East	Other Locations: 1 952-912-3444
Minnetonka, MN 55343	www.digiembedded.com/support
U.S.A.	www.digiembedded.com

Support Information

About the Embedded Module

CHAPTER 1

Overview

Digi Connect Wi-EM 9210 Overview

The embedded modules are part of the Digi Connect family of device servers that provide simple, reliable and cost-effective network connections for serial devices. They provide fully transparent serial device connectivity over industry-standard wireless connections and allow both equipment manufacturers and systems integrators to network-enable products at a fraction of the time and cost required to develop a custom solution. It is a highly flexible and compact single component solution with a robust on-board TCP/IP stack and wireless support. Features include the following:

- 32-bit Digi Wi-EM 9210 processor with ARM926EJ-S core
- 4MB Flash and 8MB RAM on board
- 2 High Speed Serial Ports
- SPI Master Mode Interface
- 9 General Purpose Input/Output Port Options
- NetSilicon NET+Works platform for embedded software development

From medical systems to building control and industrial automation, in virtually any application where embedded serial connectivity over WLAN is needed, the embedded module is the ideal choice, delivering high-performance functionality.

Cautions

To guard against damage to the module due to electrostatic discharge (ESD), do not remove it from its protective packaging until you have been properly grounded. To ground yourself, put the wrist strap on (included in the package) and then attach the clip to a metal surface.

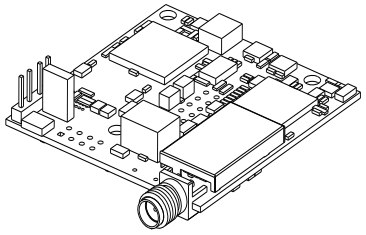
- Input voltage for the module is 3.3 VDC.

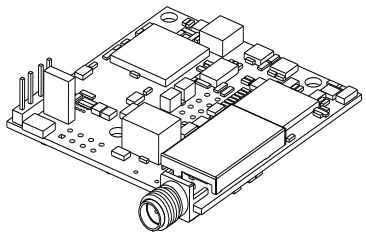
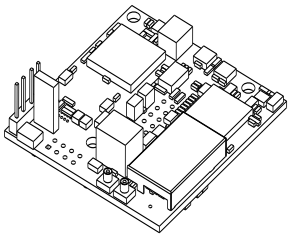
Types of Modules

The following describes the available types of Digi Connect Wi-EM 9210 modules:

Choosing a Module for Your Product

Although any of the embedded modules can be designed into your product, a JTAG header would typically be used only for debugging during the development process. The following shows all available Digi Connect Wi-EM 9210 product options.

Digi Connect Wi-EM Modules		
Model	**Description**	**Figure**
DC-WEM-9210-JT	--- Used for development purposes only --- JTAG interface --- Pin headers LED functionality --- Single RP-SMA Antenna Connector.	

Digi Connect Wi-EM Modules		
Model	**Description**	**Figure**
DC-WEM-9210-IN-1	--- No JTAG interface --- Pin headers LED functionality --- Single RP-SMA Antenna Connector --- Ordered independently of development kit for use in your implementation	
DC-WEM-9210-SB-1	--- No JTAG interface --- No LED array/pin header --- Dual U.FL Antenna Connector --- Ordered independently of either development or integration kit for use in your implementation.	

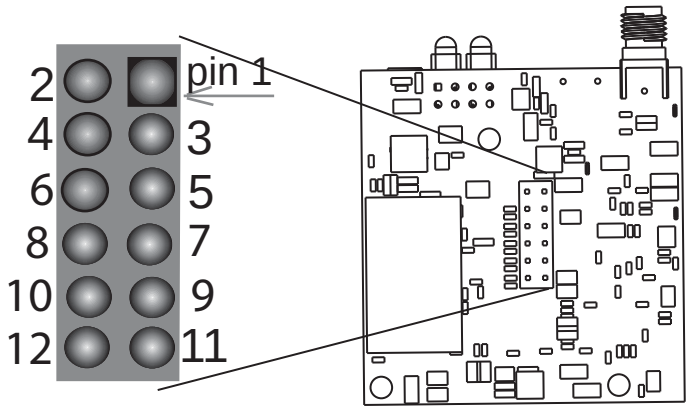
Digi Connect Wi-EM Antennae

The Digi Connect Wi-EM 9210 is available with U.FL dual-diversity or single RP-SMA antenna connectors. In case of dual diversity, the right antenna (P2) is always used for transmit and receive. The left antenna is receive only. The antenna will choose the best signal.

Connectors: Power and Serial Interface

This single 12-pin, serial interface port (P5) supports 2 TTL serial interfaces, data rates up to 921 Kbps and full-modem control (on port 1). See the figure for help locating pins and the table for pin assignments.

Power and Serial Interface



top view

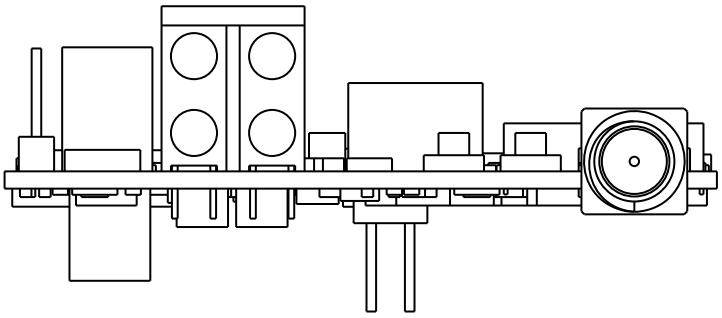
Power and Serial Interface Pin Assignments		
Pin	**Signal Name**	**Description and Notes**
1	VCC	+3.3 VDC (input only)
2	GND	Reference Ground for input power
3	RXD/GPIO-7	Port 1 RXD (input)/GPIO-7
4	TXD/GPIO-6	Port 1 TXD (output)/GPIO-6
5	RTS/GPIO-4/SPI_CLK	Port 1 RTS/GPIO-4/SPI clock
6	DTR/GPIO-5	Port 1 DTR (output)/GPIO-5
7	CTS/GPIO-2	Port 1 CTS (input)/GPIO-2
8	DCD/GPIO-1/SPI_EN	Port 1 DCD (input)/GPIO-1/SPI enable
9	DSR/GPIO-3	Port 1 DSR (input)/GPIO-3
10	/RST	Reset (input)
11	RXD/GPIO-9	Port 2 RXD (input)/GPIO-9
12	TXD/GPIO-8	Port 2 TXD (output)/GPIO-8

Connectors: Antenna

The Digi Connect Wi-EM is available in two antenna configurations: (1) two U.FL antenna connectors for dual-diversity, or (2) a single RP-SMA antenna connector.

Caution: This Part 15 radio device operates on a non-interference basis with other devices operating at this frequency when using the antennae listed in the Antenna Specification table. Any changes or modification to the product not expressly approved by Digi International could void the user's authority to operate the device.

Wi-EM Antenna Connectors



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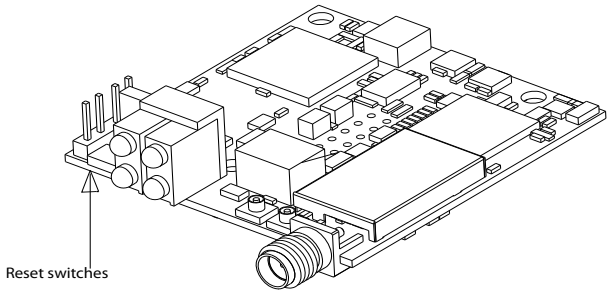
Reset Switch

The behavior of the reset switch is determined by software, which means that it has a predefined behavior in the integration kit. In the development kit, its behavior is determined by your implementation. See the following table for details.

Reset Switch Behavior	
Kit	**Behavior**
Integration	The reset switch does one of the following: ■ If pressed and released immediately, the device is rebooted. ■ If pressed and held down (for about 20 seconds) during power-up, the device is rebooted and restored to the default configuration.
Development	■ The behavior of the switch is user-defined. See "Embedded Module Reset" on page 40 for more information.

Reset Switch Location

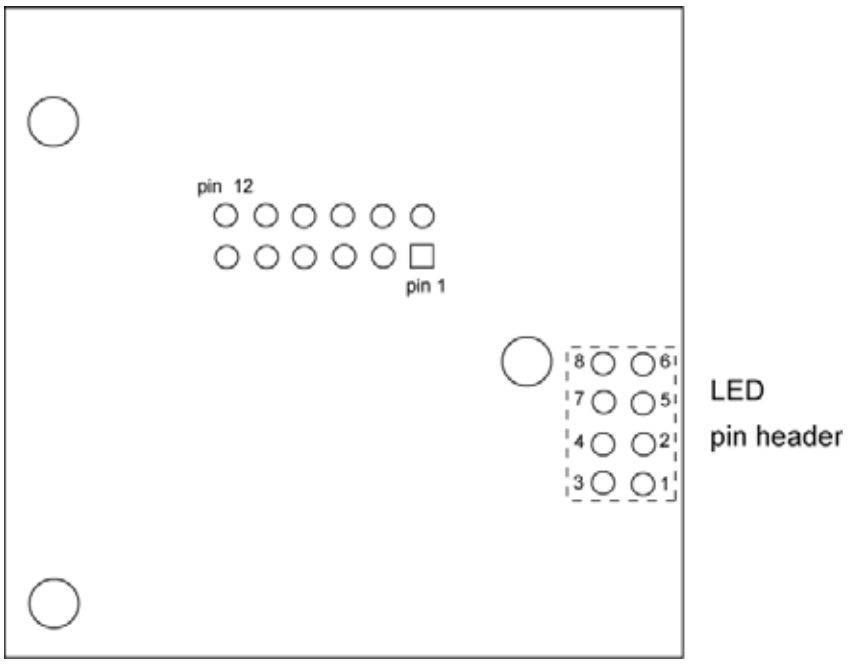


Module LEDs

The modules provide two hardware options for LEDs, with or without on board LED array. The integration kit provides predefined LED behavior. With the development kit, some LED behavior can be determined by your implementation. See the following table for more information..

LED Behaviors				
LED	**Pin** Header EM	**Description**		**Notes**
Top left (green)	1 (+) 3(-)	Serial port activity: Off - the serial channel is idle. Blinking - serial data is transmitted or received.		This LED is software programmable
Top right (green)	5 (+) 7 (-)	Network link status: Off - no link has been detected. On - a link has been detected.	Network link status: On - unit is associated with an access point Blinking slowly - unit is in ad hoc mode Blinking quickly - unit is scanning for a network	Same as Integration Kit (Network link status)
Bottom left (red)	2 (+) 4 (-)	Diagnostics: Blinking 1-1-1 - starting the operating system. Blinking 1-5-1 - configuration has been returned to factory defaults. **Note:** If other blinking patterns occur, contact Digi Technical Support.		This LED is software programmable
Bottom right (yellow)	6 (+) 8 (-)	Blinking - network data is transmitted or received		This LED is software programmable

Digi Connect Wi-EM 9210 Pin Header Locations (Top view)



LED pin header

LED pins and pin header configuration are described in the "LED Behaviors" table on page 15.

About the Development Board

CHAPTER 2

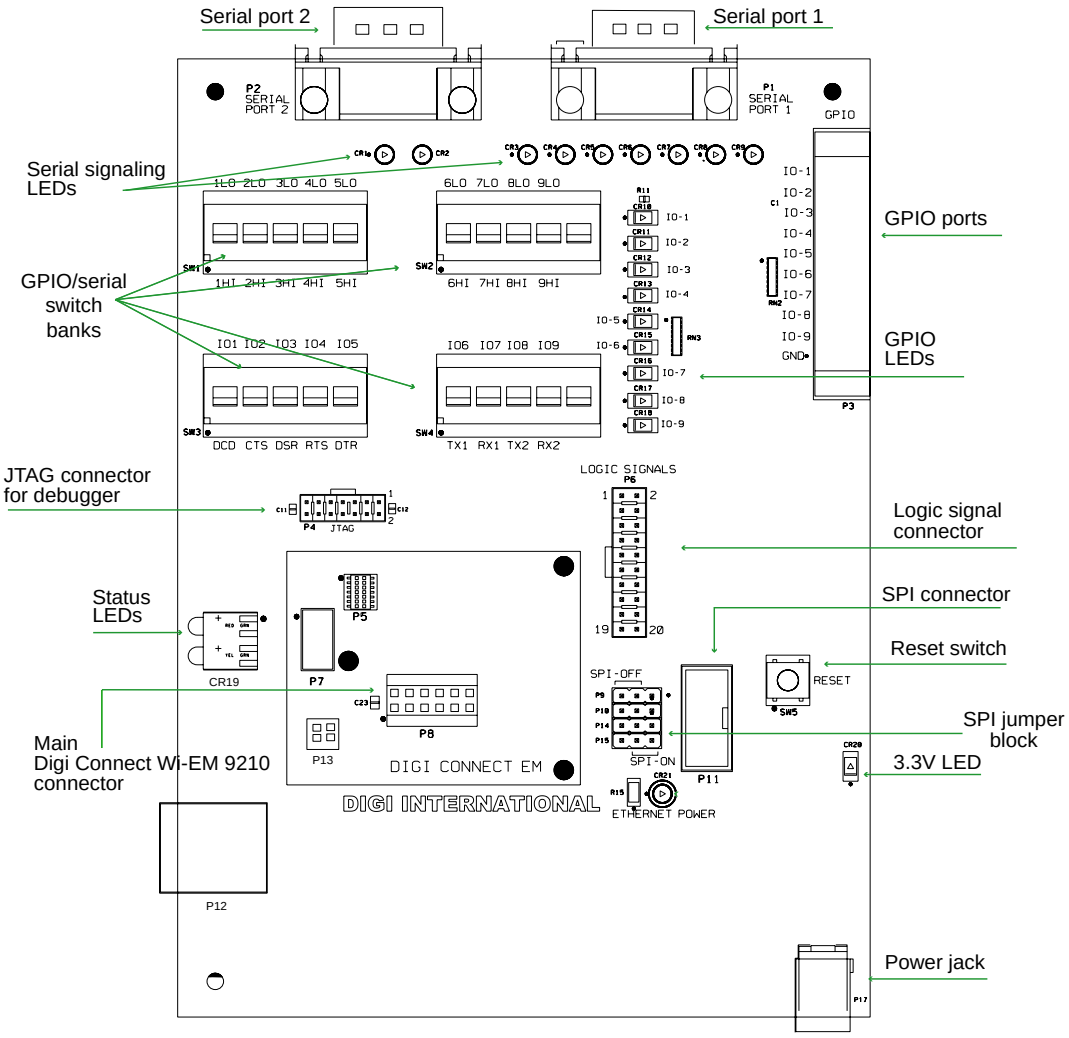
Overview

This chapter provides information on the development board, a hardware platform from which you can determine how to integrate the embedded module into your design. For additional information, see the schematic and mechanical drawings.

Basic Description

The following graphic is a layout of the development board.

Basic Description



Ports

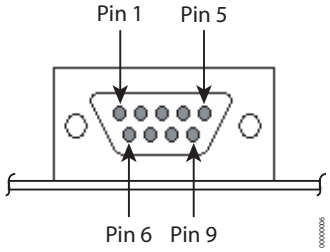
The development board provides the following ports:

- Serial Port 1 (P1) and Serial Port 2 (P2)
- Ethernet Port (P12)
- GPIO Port (P3)

Serial Port 1 (P1) and Serial Port 2 (P2)

Serial port 1 and port 2 are DB-9 male connectors labeled P1 and P2. Use the following figure and table for pin orientation and pin assignment information.

Serial Port Pin Orientation

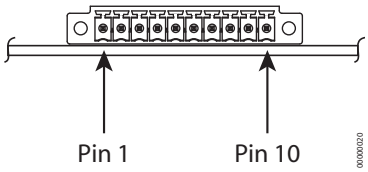


Serial Pin Assignment									
Port	**Signal Pin 1**	**Signal Pin 2**	**Signal Pin 3**	**Signal Pin 4**	**Signal Pin 5**	**Signal Pin 6**	**Signal Pin 7**	**Signal Pin 8**	**Signal Pin 9**
1	DCD	RXD	TXD	DTR	GND	DSR	RTS	CTS	Not Connected
2	Not Connected	RXD	TXD	Not Connected	GND	Not Connected	Not Connected	Not Connected	Not Connected

GPIO Port (P3)

The GPIO port is a 10-pin male right-angle connector (labeled P3). See the following figure and table for pin orientation and pin assignments.

GPIO Port Pin Orientation



GPIO Port Pin Assignments	
Pin	**Signal Name**
1	GND
2	GPIO-9
3	GPIO-8
4	GPIO-7
5	GPIO-6
6	GPIO-5
7	GPIO-4
8	GPIO-3
9	GPIO-2
10	GPIO-1

Connectors and Blocks

The development board provides the following connectors and blocks:

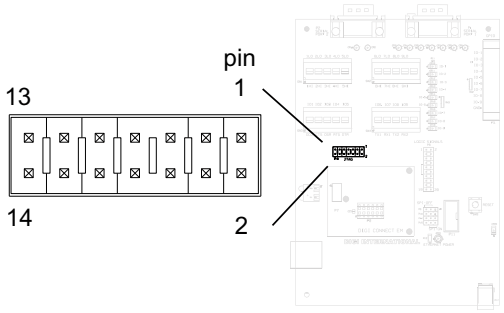
- JTAG Debugger Connector (P4)
- SPI Connector (P11) and SPI Jumper Block

- Logic Signal Analyzer Header (P6)
- Main Connector (P8)

JTAG Debugger Connector (P4)

This 14-pin male vertical header labeled P4 mates with a JTAG debugger plug (for example, a Digi JTAG Link). It is used with the development kit only. See the following figure and table for pin orientation and assignments.

JTAG Debugger Connector Pin Orientation

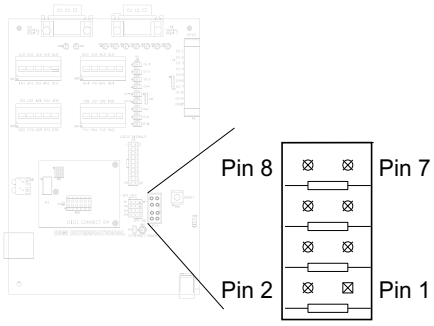


JTAG Debugger Connector Pin Assignments														
	Pin 1	**Pin 2**	**Pin 3**	**Pin 4**	**Pin 5**	**Pin 6**	**Pin 7**	**Pin 8**	**Pin 9**	**Pin 10**	**Pin 11**	**Pin 12**	**Pin 13**	**Pin 14**
Signal	VCC+	GND	/TRST	GND	TDI	GND	TMS	GND	TCK	GND	TDO	/SRST	VCC+	GND

SPI Connector (P11)

This connector is used for a Serial Peripheral Interface (SPI) connection. When enabled, signals are disconnected from serial port 1 and GPIO connectors. See the following figure and table for pin orientation and pin assignments.

SPI Connector Pin Orientation



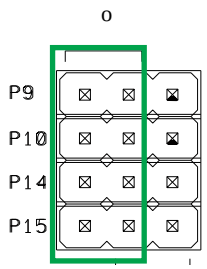
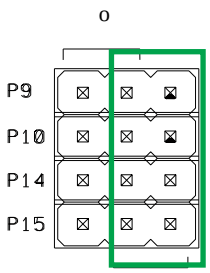
SPI Pin Assignments										
	Pin 1	**Pin 2**	**Pin 3**	**Pin 4**	**Pin 5**	**Pin 6**	**Pin 7**	**Pin 8**	**Pin 9**	**Pin 10**
Signal	SPI-EN	GND	SPI-CLK	GND	SPI-TX	GND	SPI-RX	GND	Not connected	Not connected

SPI Jumper Block

The SPI jumper block determines whether the SPI connector is connected or not. If SPI is off (the default), serial and GPIO signals are routed to switch banks 1 through 4. (See "Serial/GPIO Switch Bank 3 (SW3) and Switch Bank 4 (SW4)" on page 26 and "GPIO Switch Bank 1 (SW1) and 2 (SW2)" on page 27.) If SPI is on, SPI signals are routed to the SPI connector (P11).

The following figures demonstrate how to set the SPI jumper block

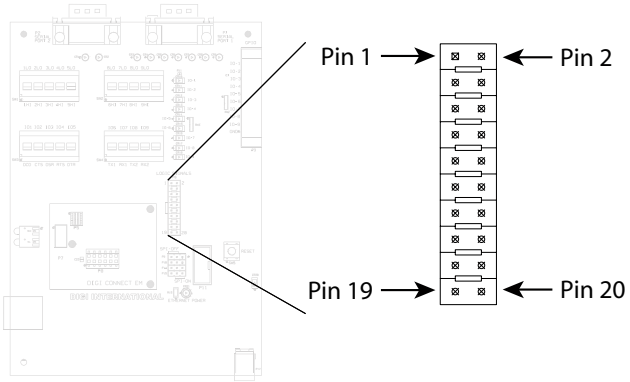
SPI Jumper Settings

SPI OFF	SPI ON
	

Logic Signal Analyzer Header (P6)

This 20-pin male vertical header (labeled P6) connects a digital signal analyzer (for example, a logic analyzer) to the development board. It is used with the development kit only. See the following figure and table for pin orientation and pin assignments.

Logic Analyzer Header Pin Orientation



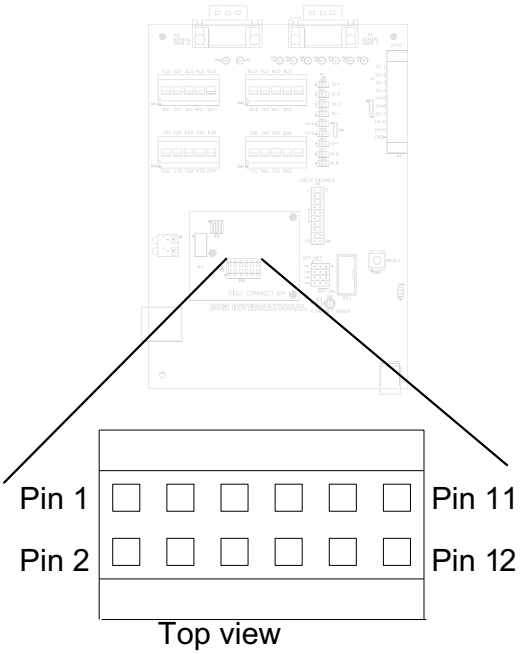
Logic Analyzer Header Pin Assignments	
Pin	**Signal**
1 - 8	Not connected

Logic Analyzer Header Pin Assignments	
Pin	**Signal**
9	/RST
10	Not connected
11	DTR/GPIO-5
12	TXD-2/GPIO-8
13	CTS/GPIO-2
14	RXD-2/GPIO-9
15	DSR/GPIO-3
16	TXD-1/GPIO-6
17	RTS/GPIO-4/SPI_CLK
18	RXD-1/GPIO-7
19	DCD/GPIO-1/SPI_EN
20	GND

Main Connector (P8)

This 12-pin connector is used to interface with the embedded module. See the following figure for pin orientation.

Main Connector Pin Orientation



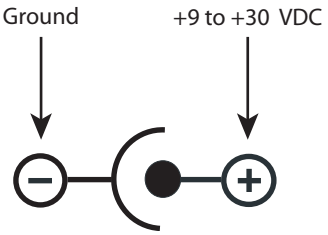
Power Jack (P17)

The Power Jack is a barrel connector that accepts 9 to 30 VDC +/- 5%. The jack is labeled P17. The following table shows the polarity of the power jack.

Power Jack Polarity	
Contact	**Polarity**
Center	+9 to +30 VDC
Outer	Ground

The following figure schematically represents the polarity of the power jack

Power Jack Polarity Schematic.



Switches

The development board provides the following switches:

- Reset Switch (SW5)
- Serial/GPIO Switch Bank 3 (SW3) and Switch Bank 4 (SW4)
- GPIO Switch Bank 1 (SW1) and 2 (SW2)

Reset Switch (SW5)

This push button switch is labeled SW5. Pressing it sets the module's /RST line low, holding the module in a hard reset until the switch is released.

Note: This is a "hard" reset using the /RST pin on the main connector, not a "soft" reset. The reset button on the embedded module performs a "soft" reset (see also "Main Connector (P8)" on page 24).

Serial/GPIO Switch Bank 3 (SW3) and Switch Bank 4 (SW4)

Each switch bank holds five slide switches that enable either serial or GPIO signaling between the development board and the module. When set for GPIO signaling, SW3 works in conjunction with SW1, and SW4 works with SW2. See "GPIO Switch Bank 1 (SW1) and 2 (SW2)" on page 27 for more information. See the following table for SW3 and SW4 switch definitions.

Note: These switches control where the development board routes a signal. They do not reconfigure the Wi-EM 9210 processor. Software should be configured to track with switch settings. See "GPIO" on page 33 for more information.

GPIO Switch Banks 3 and 4 Settings			
Switch Bank	**Switch Number**	**Left Position**	**Right Position**
SW3	1	DCD	GPIO-1
	2	CTS	GPIO-2
	3	DSR	GPIO-3
	4	RTS	GPIO-4
	5	DTR	GPIO-5
SW4	6	TXD-1	GPIO-6
	7	RXD-1	GPIO-7
	8	TXD-2	GPIO-8
	9	RXD-2	GPIO-9
	10	Not connected	Not connected

GPIO Switch Bank 1 (SW1) and 2 (SW2)

GPIO Switch Bank 1 and Switch Bank 2, labeled SW1 and SW2, are two sets of five slide switches that set GPIO inputs to logic levels of high (switch to left) or low (switch to right).

If the GPIO port is configured as an output, then the switch should always be to the left. If there is an external device connected to P3, the switch should always be set to the left.

Each GPIO port can be used independently.

Notes:

- These switches do not determine whether the GPIO is an input or output. That is determined by the module software.
- If GPIO is set to an output by software, switches must be set to the left (high).
- These switches are used in conjunction with SW3 and SW4.

Development Board LEDs

The development board contains 21 LEDs labeled CR1 through CR21. The following table lists and describes the LEDs.

LED Descriptions			
Board Label	**Description**	**Color or State**	**Indication**
CR1	TXD-2	Flickering	Serial activity
		Green	Inactive
CR2	RXD-2	Flickering	Serial activity
		Green	Inactive
CR3	CTS	Yellow	Active
		Green	Inactive
		Off	Not connected or signal not being driven
CR4	DTR	Yellow	Active
		Green	Inactive
		Off	Not connected or signal not being driven
CR5	TXD-1	Flickering	Serial activity
		Green	Inactive
CR6	RXD-1	Flickering	Serial activity
		Green	Inactive
CR7	RTS	Yellow	Active
		Green	Inactive
		Off	Not connected or signal not being driven

LED Descriptions			
Board Label	**Description**	**Color or State**	**Indication**
CR8	DCD	Yellow	Active
		Green	Inactive
		Off	Not connected or signal not being driven
CR9	DSR	Yellow	Active
		Green	Inactive
		Off	Not connected or signal not being driven
CR10 -18	GPIO-1 through GPIO-9. (CR10=GPIO-1, CR11=GPIO-2, etc. All can be used for input or output.)	On	Logic high
		Off	Logic low
CR20	3.3V Indicator	On	Power on
		Off	Power off
CR21	EPWR, Powered Ethernet Enabled	On	Ethernet power present from external powered Ethernet connector (Ethernet hub or switch)
		Off	No powered Ethernet voltage

Test Points

The development board provides 25 test points that can be identified by board label or test point number. The board labels are adjacent to each test point on the board. The test point numbers are in the development board schematic drawings. The following table lists the test point number, board label, and a brief description of each test point.

Test Point Descriptions		
Test Point	**Board Label**	**Description**
TP2	TXD	TXD-2
TP3	RXD	RXD-2
TP4	CTS	CTS
TP5	DTR	DTR
TP6	TXD	TXD-1
TP7	RXD	RXD-1
TP8	RTS	RTS
TP9	DCD	DCD
TP10	DSR	DSR
TP11	IO-1	GPIO-1
TP12	IO-2	GPIO-2
TP13	IO-3	GPIO-3
TP14	IO-4	GPIO-4
TP15	IO-5	GPIO-5
TP17	3.3V	3.3V Supply
TP20	RESET	Reset (active low)
TP21	E+	Ethernet Power +
TP22	E-	Ethernet Power -
TP23	V-IN	9-30 VDC Input
TP24	GND	Ground
TP25	GND	Ground
TP26	IO-8	GPIO-8
TP27	IO-7	GPIO-7

Test Point Descriptions		
Test Point	**Board Label**	**Description**
TP28	IO-6	GPIO-6
TP29	IO-9	GPIO-9

Test Points

Programming Considerations

C H A P T E R 3

This chapter addresses the embedded modules programming considerations.

Note: This chapter applies only to development kit customers.

GPIO

General Information

The Wi-EM 9210 processor supports 16 general purpose I/O (GPIO) lines, some of which are reserved for specific functions and some of which can be customized. These GPIO lines fall into three categories:

- Those labeled “Reserved” in the following table are reserved for a specific use and must not be reprogrammed, or the unit may not operate correctly. Often, these lines are not connected to external interfaces.
- Those labeled “Allocated” in the following table are exposed to an external interface and allocated to a specific use by the software, but they can be customized safely with code modifications.
- Those labeled “Available” are exposed to an external interface, not controlled directly by the software, and can be customized.

GPIO Registers

Six registers govern the 16 GPIO pins. There are four configuration registers. Each has eight bits dedicated to the configuration of each GPIO.

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Register	D31:24	D23:D16	D15:08	D07:00
A090 2000, config 0	GPIO [15]	GPIO [14]	GPIO [13]	GPIO [12]
A090 2004, config 1	GPIO [11]	GPIO [10]	GPIO [9]	GPIO [8]
A090 2008, config 2	GPIO [7]	GPIO [6]	GPIO [5]	GPIO [4]
A090 200C, config 3	GPIO [3]	GPIO [2]	GPIO [1]	GPIO [0]

Each GPIO configuration section is set up the same way. The following table shows the settings using bits D07:00; the same settings apply to the corresponding bits in D31:24, D23:D16, and D15:08.

GPIO pin configuration registers

GPIO Configuration Setings using bits D07:00	
D07:06 Reserved	N/A
D05:03 FUNC	Use these bits to select the function you want to use. For a detailed description of each function see the NS 9210 HRM in the Pinout chapter under "General purpose I/O (GPIO)" and the "GPIO pin use" table in this manual. 000 Function #0 001 Function #1 010 Function #2RESET_DONE - default for GPIO[12] 011 Function #3GPIO - default, except for GPIO[12] 100 Function #4

GPIO Configuration Setings using bits D07:00	
D02 DIR	Controls the pin direction when the FUNC field is configured for GPIO mode, function #3. 0 Input 1 Output All GPIO pins reset to the input state. Note: The pin direction is controlled by the selected function in modes #0 through #2.
D01 INV	Controls the inversion function of the GPIO pin. 0 Disables the inversion function 1 Enables the inversion function This bit applies to all functional modes.
D00 PUDIS	Controls the GPIO pin pullup resistor operation. 0 Enables the pullup 1 Disables the pullup Note: The pullup cannot be disabled on GPIO[9], GPIO[12]

GPIO [15:0] Control Register

There is one GPIO control Register that governs all 16 GPIO pins. When a GPIO pin is configured as a GPIO output, the corresponding bit in the GPIO Control Register is driven out the GPIO pin. In all configurations, the CPU has read/write access to these registers. Register bits D31:16 are unused GPIO pins. These pins are being used as memory data bits 15:00. It is safest to read all 32 bits, modify the bit(s) corresponding to the GPIO(s) of interest, and then write back the full 32 bits. In this way the behavior of the other GPIO lines will be preserved.

Register	D31:24	D23:D16	D15:08	D07:00
A090 206C	GPIO [31:24] not used]	GPIO [23:16] not used	GPIO [15:8]	GPIO [7:0]

GPIO [15:0] Status Register

There is one GPIO Status Register. This register contains the status information for each of the 16 GPIO pins. Bits D31:16 are used as memory data therefore their status will not be meaningful. In all configurations, the value on the GPIO input pin is brought to the status register and the CPU has read-only access to this register.

Register	D31:24	D23:D16	D15:08	D07:00
A090 207C	GPIO [31:24] not used]	GPIO [23:16] not used	GPIO [15:8]	GPIO [7:0]

GPIO pin use table

GPIO Pin Use				
Name	**Register Bit**	**Category**	**External Interface**	**Description**
TXSD/ SPI_TX/ GPIO-6	GPIO[7]	Allocated	Pin 4 on the main header	Used for the serial TXD or SPI_TX, but could be reassigned as a GPIO, timer out 7 or in 8. If used with the development board, this pin maps to GPIO-6.
DTR/GPIO-5	GPIO[6]	Allocated	Pin 6 on the main header	Usedc for the serial DTR but could be reassigned as a GPIO, or timer in 7. If used with the development board, this pin maps to GPIO-5.
RTS/ SPI_CLK/ GPIO-4 (See description)	GPIO[5]or GPIO[4]	Allocated	Pin 5 on the main header	Since these two processor pins map to the same header pin, one must be configured as an input to avoid contention. UART: GPIO[5] is confiured for RTS and GPIO[4] for GPIO input. SPI: GPIO[5] for GPIO input and GPIO[4] for SPI_CLK. Other: GPIO[5] supports IRQ3 and timer out 6. GPIO[4] supports IRQ2 and timer in 6. If used with the development board, header pin 5 maps to GPIO-4.
RXD/ SPI_RX/ GPIO-7	GPIO[3]	Allocated	Pin 3 on the main header	Used for the serial RXD or SPI_RX, but could be reassigned as a GPIO or PICO-3. If used with the development board, this pin maps to GPIO-7.
DSR/GPIO-3	GPIO[2]	Allocated	Pin 9 on the main header	Used for the serial DSR, but could be reassigned as a GPIO or PICO-2. If used with the development board, this pin maps to GPIO-3.

GPIO Pin Use				
Name	**Register Bit**	**Category**	**External Interface**	**Description**
CTS/GPIO-2	GPIO[1]	Allocated	Pin 7 on the main header	Used for the serial CTS, but could be reassigned as a GPIO, IRQ0 or PICO-1. If used with the development board, this pin maps to GPIO-2.
DCD// SPI_EN/ GPIO-1	GPIO[0]	Allocated	Pin 8 on the main header	Used for the serial DCD or SPI_EN, but could be reassugned as a GPIO or PICO-0. If used with the development board, this pin maps to GPIO-1.
TXD2/ GPIO-8	GPIO[15]	Allocated	Pin 12 on the main header	Used for the serial2 TXD, but could be reassigned as a GPIOor timer in 9. If used with the development board, this pin maps to GPIO-8.
Network link Green LED	GPIO[14]	Reserved	Connected to the Green LED above the Yellow LED	Network link status: On - unit is associated with an access point Blinking slowly - unit is in ad hoc mode Blinking quickly - unit is scanning for a network
/INIT	GPIO[13]	Available	Connected to the button on the module	Should be configured as a GPIO input.
Serial Port activity LED/MFGO	GPIO [12]	Allocated	Connected to the green LED above the red LED	Used as the NET+OS green LED, but can be reassigned as a general purpose LED. It must remain a GPIO output for the LED to operate correctly. The LED is lit when the signal is low.
RXD2/ GPIO-9	GPIO[11]	Allocated	Pin 11 on the main header	Used for the serial2 RXD, but could be reassigned as a GPIO or IRQ2. If used with the development board, this pin maps to GPIO-9.
IRQ1	GPIO[10]	Reserved	N/A	N/A

GPIO Pin Use				
Name	**Register Bit**	**Category**	**External Interface**	**Description**
MFGI	GPIO[9]	Reserved	N/A	N/A
Red LED	GPIO[8]	Allocated	Connected to the Red LED	Used for diagnostics and power on indication.

Note: The Wi-EM 9210 signals PIC0-[0:3] provided by the programmable FIMs (DRPIC) are only applicable when running NET+OS.

About Embedded Module LEDs

Embedded Module LED Description	
LED	**Description**
Green (above yellow LED)	This LED is wired to the network hardware and provides an indication of link status.
Green (the one above the red LED)	This LED is software programmable and is wired to processor GPIO register bit GPIO[12] and wired to be lit when low. Use for serial port activity.
Yellow	This LED is wired to the network hardware and provides an indication of network activity.
Red	This LED is software programmable, wired to processor GPIO register bit GPIO[8], and wired to be lit when low. LED ON indicates power on and is in addition used for diagnostics.

Embedded Module Reset

Hard Reset

The embedded modules support a hardware reset on pin 10 of the 12-pin header. The unit will be forced into a hard reset if this pin is pulled low. When used with the development board, this pin is wired to reset button SW5, which means it acts as a hard reset button.

The JTAG version of the Wi-EM 9210 EM module has a 3-pin jumper (JP1) to allow two modes of operation.

Shorted 1-2: The CPU and other registers are reset. The PLL, GPIOs, and memory are not. Debugger connection is maintained. This is the same as SRST# from the debugger.

Shorted 2-3: The entire module is reset. Debugger connection will need to be re-established.

Soft Reset

NET+OS provides an internal facility to enact a soft reset, but it is the responsibility of a specific implementation to choose a reasonable trigger to invoke it. One choice is to use a GPIO pin as a signal to trigger a soft reset. The embedded modules have one GPIO pin GPIO[13] which is not normally assigned to any other task named "/INIT." It is an ideal candidate for use as a signal for soft reset. The signal is wired to the push button on the module (next to the LEDs), and is pulled high unless the button is pushed.

The "naresetapp" sample application demonstrates a simple mechanism for monitoring a GPIO pin and then initiating a soft reset when the pin achieves a particular value.

Memory

Flash

The Wi-EM 9210 module has 4 MB of flash memory, which is controlled by chip select 2 (default = st_cs1) located at 0x50000000.

SDRAM

The Wi-EM 9210 module has 16 MB of SDRAM memory, controlled by chip select 1 (default = dy_cs0), located at 0x00000000.

Memory

Specifications

A P P E N D I X A

Network Interfaces

- Standard: IEEE802.11b/g
- Frequency: 2.4 GHz
- Data rate: Up to 54 Mbps with fallback
- Modulation: DBPSK (1 Mbps), DQPSK (2 Mbps), CCK (5.5, 11 Mbps), BPSK (6, 9 Mbps), QPSK (12, 18 Mbps), 16-QAM (24, 36 Mbps), 64-QAM (48, 54 Mbps)
- Transmit power: 16 dBm typical
- Receive sensitivity: -73 dBm @ 54 Mbps

Serial Interface

Two serial ports, one with full modem control signals and the other with TXD and RXD only.

Data Rates (bps)

50, 110, 134, 150, 200, 300, 600, 1200, 2400, 3600, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460000, 921600

Flow Control Options

RTS/CTS, XON/XOFF, None

Environmental

	Digi Connect Wi-EM 9210
Ambient Temperature	-22°F to 140°F (-30°C to 60°C) 60°C max at 100% duty cycle 65°C max at 50% duty cycle 70°C max at 30% duty cyce .
Storage Temperature	-40°F to 257°F (-40°C to 125°C)
Humidty	5% to 90%
Altitude	12000 feet (3657.60 meters)

DC Characteristics

The following tables provide DC characteristics for operating conditions, inputs, and outputs.

Operating Conditions					
Symbol	**Description**	**Min**	**Typ**	**Max**	**Unit**
V_{CC}	Supply Voltage	3.14	3.3	3.45	V
n/a	Power Supply Ripple			40	mVpp
I_{CC}	Supply Current	—	390	630	mA
I_{IL}	Input Current as “0” (16.5K equivalent pull-up)	—	—	200	µA
I_{IH}	Input Current as “1” (16.5K equivalent pull-up)	-10	—	10	µA
I_{OZ}	HighZ Leakage Current	-10	—	10	µA
I_{OD}	Output Drive Strength	—	—	2	mA
C_{IO}	Pin Capacitance (V_O=0)	—	—	4	pF

Inputs					
Symbol	**Description**	**Min**	**Typ**	**Max**	**Unit**
V_{IH}	Input High Voltage	2	—	V_{CC}+0.3	V
V_{IL}	Input Low Voltage	V_{SS}-0.3	—	0.2*V_{CC}	V

Outputs					
Symbol	**Description**	**Min**	**Typ**	**Max**	**Unit**
V_{OH}	Output High Voltage	2.4	—	3.45	V
V_{OL}	Output Low Voltage	0	—	0.4	V

Note: The embedded modules use a supervisory circuit with a 2.93V reset threshold. When VCC falls to the threshold voltage, a reset pulse is issued, holding the output in active state. When power rises above 2.93V, the reset remains for approximately 200 ms to allow the system clock and other circuits to stabilize.

Warning: The rise time of the 3.3v power supply must be between 700 mS and 140ms and the inrush current must be limited to less than 2 A. A rise time outside of these limits may cause the device to malfunction and give a 3-1-3 diagnostic error.

Mechanical

Module Dimensions		
Dimension	**Digi Connect Wi-EM**	
Length:	2.287 in (58.09 mm)	
Width:	1.885 in (47.879 mm)	
Height:	**Fully populated** 0.785 in (19.939 mm) **Pin header model** 0.653in (16.586 mm)	
Weight	Antenna -.408 oz. (11.567 g)	.672 oz. (19.051 g)
	Total - 1.080 oz. (30.617 g)	

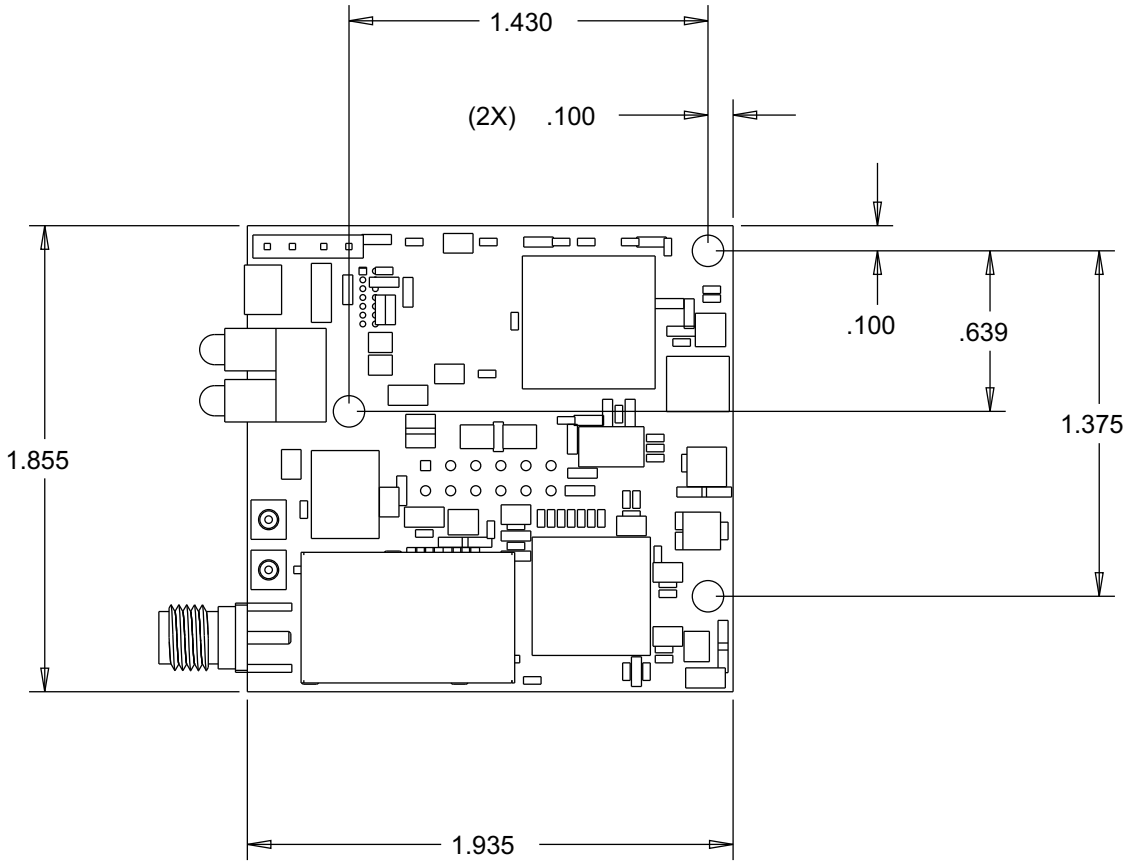
Layouts and Dimensions

All dimensions are in inches. These are the tolerances for the drawings shown in this section:

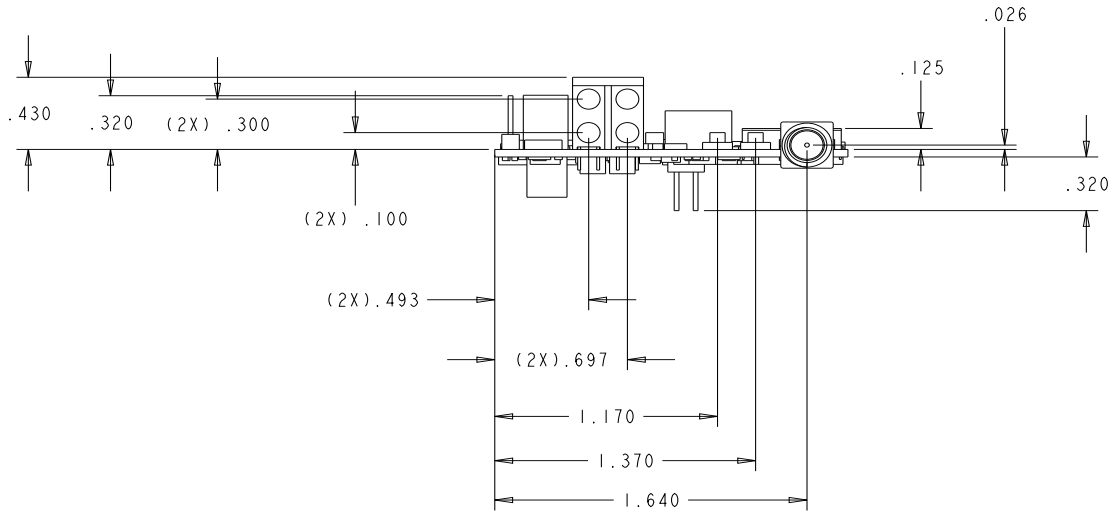
Measure	Tolerance
.XX	± .02
.XXX	± .010
Angles	± 2 degrees

Digi Connect Wi-EM (w/LED Array)

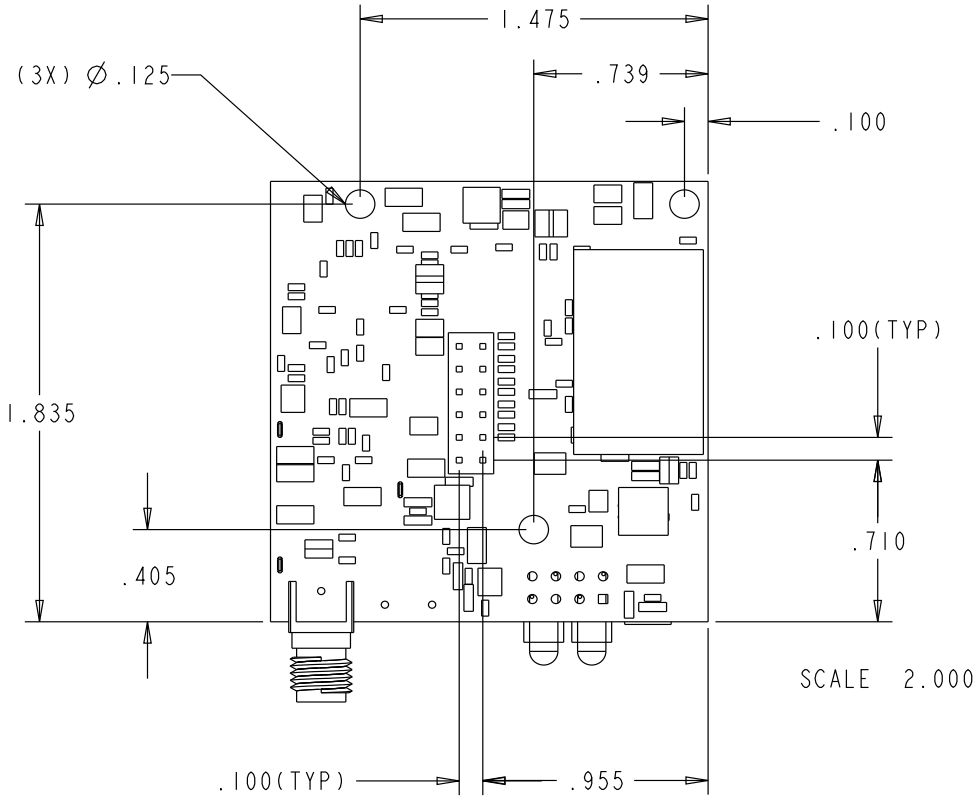
Top



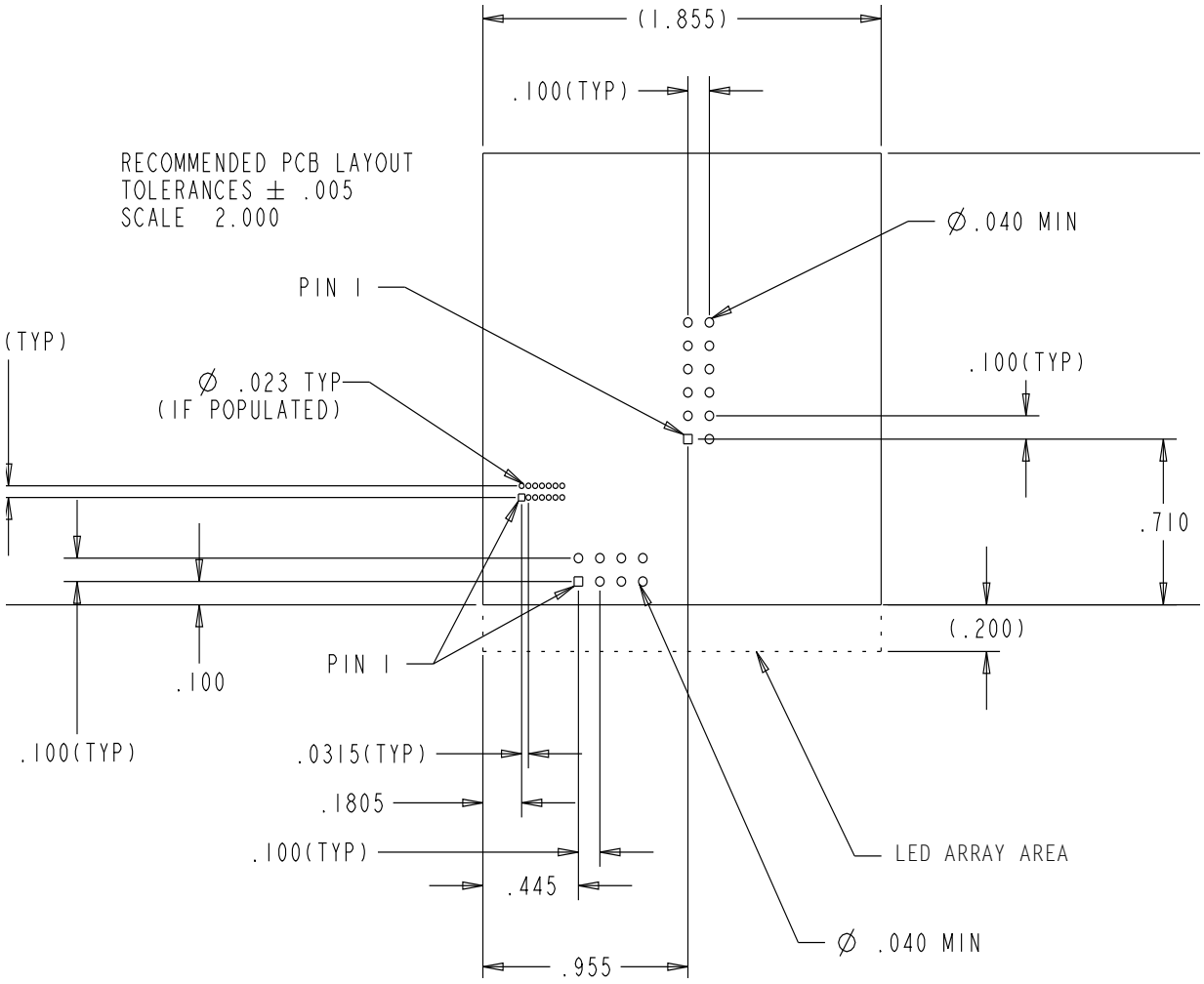
Front



Bottom


1.475
(3X) Ø.125
.739
.100
.100(TYP)
1.835
.710
.405
SCALE 2.000
.100(TYP)
.955

Digi Connect Wi-EM (w/LED Pin Headers)

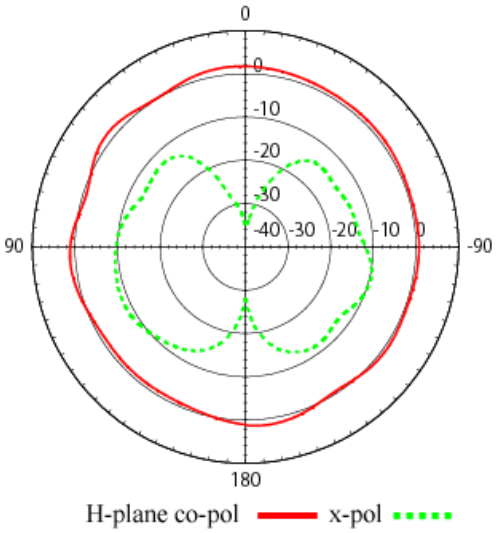


Antenna Information

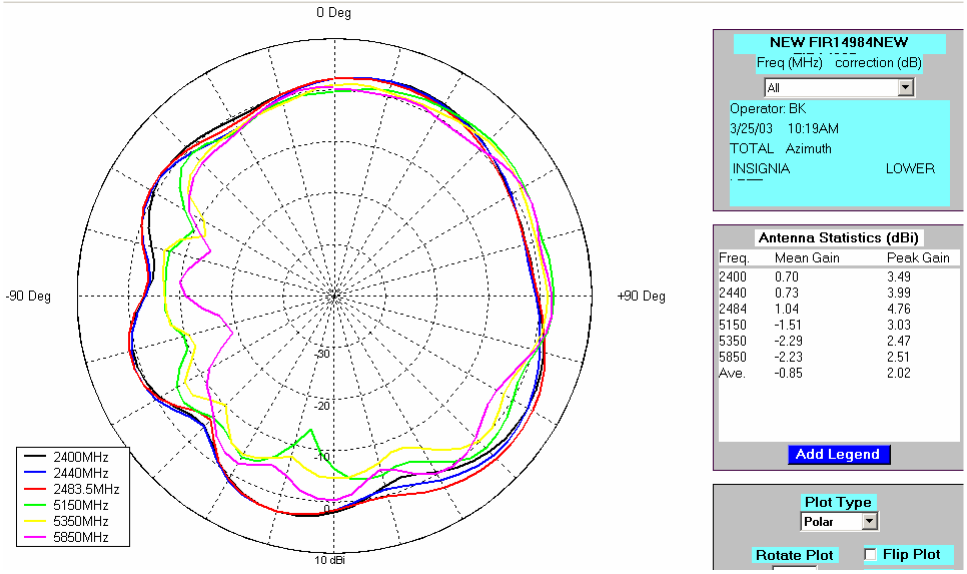
Antenna Strength

The following diagram demonstrates the strength of the signal received by the antenna on both a horizontal and vertical plane. The diagram shows the magnetic field when the antenna is in a vertical position. The red line represents the horizontal plane and the dotted green lined represents the vertical plane. You can see in the illustration that at 90degrees, the signal strength is (as expected) 0.

Radiation Patterns



Radiation Patterns for PCB Mount Antenna

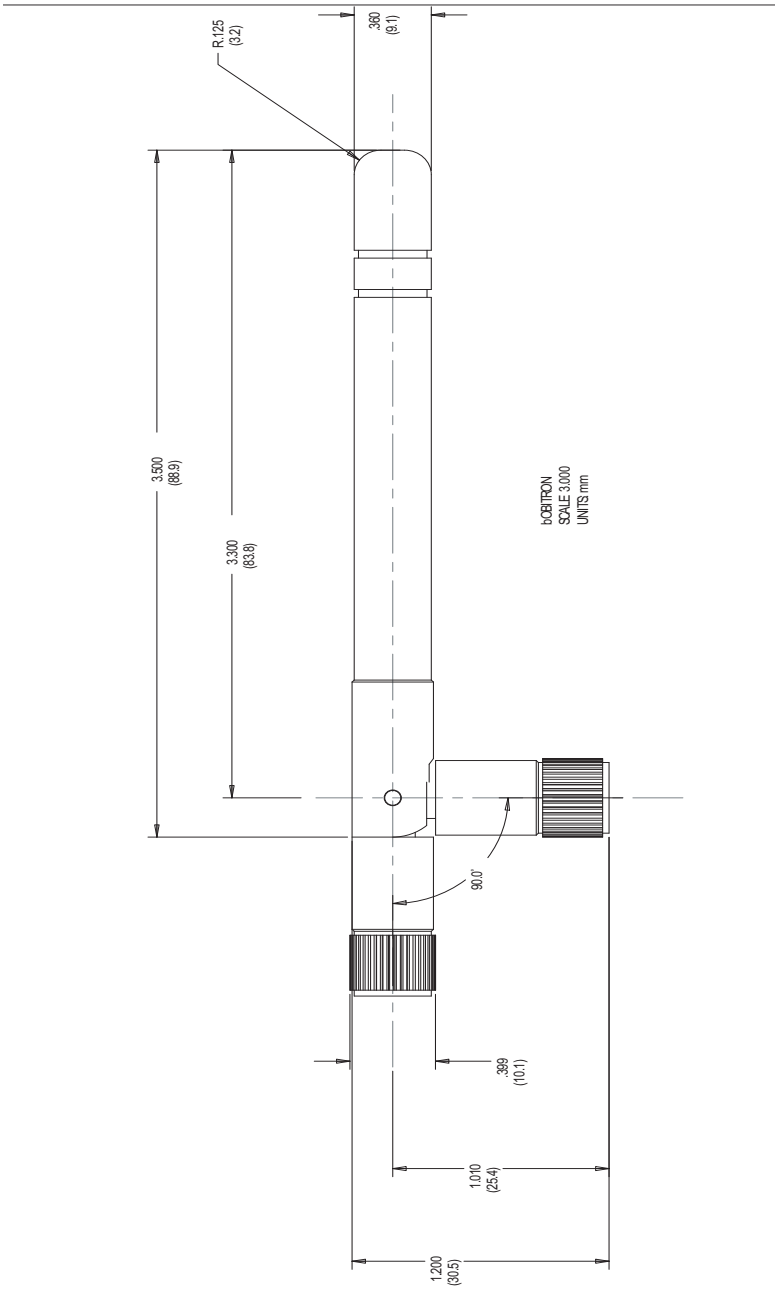


Antenna Specifications for North America

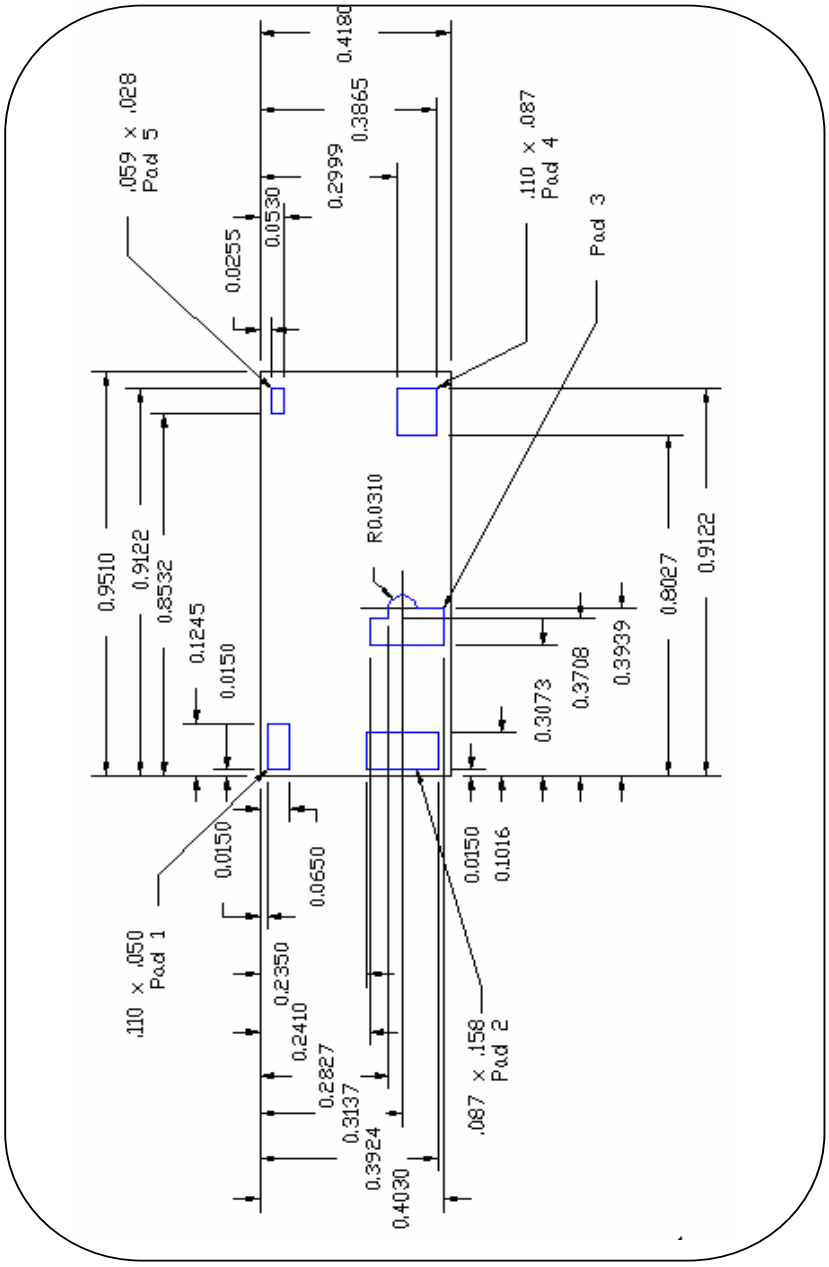
Antenna Description	Dipole	PCB Mount
Frequency	2.4~2.5GHz	2.4~2.5 GHz 4.9~5.9GHz
Power Output	2W	10W
DB Gain	2dBi	>2dBi
VSWR	< or = 2.0	< 2.5
Dimension	108.5 mm x 10.0 mm	24.13 x 10.67 mm
Weight	10.5g	< 1g
Connector	RP-SMA	U.FL
Part Number	DG-ANT-20DT-BG	DG-ANT-20CB-AG

In the United States, any antenna matching the in-band and out-of-band signal patterns and strengths of the antenna, whose characteristics are given in the Antenna Description table and the Radiation pattern graphic, may be used with the Digi Connect Wi-EM 9210.

Dipole Antenna Dimensions



PCB Mount Antenna Dimensions



RF Exposure Statement

The Digi Connect Wi-EM 9210 module complies with the RF exposure limits for humans as called out in RSS-102. It is exempt from RF evaluation based on its operating frequency of 2.4 GHz, and effective radiated power less than the 3 watt requirement for a mobile device (>20 cm separation) operating at 2.4 GHz.

Safety Statements

To avoid contact with electrical current:

- Never install electrical wiring during an electrical storm.
- Use a screwdriver and other tools with insulated handles.
- You and those around you should wear safety glasses or goggles.
- Installation of inside wire may bring you close to electrical wire, conduit, terminals and other electrical facilities. Extreme caution must be used to avoid electrical shock from such facilities. You must avoid contact with all such facilities.
- Protectors and grounding wire placed by the service provider must not be connected to, removed, or modified by the customer.
- Do not touch or move the antenna(s) while the unit is transmitting or receiving.
- Do not hold any component containing a radio such that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not operate a portable transmitter near unshielded blasting caps or in an explosive environment unless it is a type especially qualified for such use

Any *external* communications wiring you may install needs to be constructed to all relevant electrical codes. In the United States this is the National Electrical Code Article 800. Contact a licensed electrician for details.

Notes to original equipment manufacturer (OEM) integrators

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users for all installations, and

2) The transmitter module may not be co-located with any other transmitter or antenna, and

3) The Module is approved using the FCC ‘unlicensed modular transmitter approval’ method.

Therefore the module must only be used with the originally approved antennas. As long as the 3 conditions above are met, further transmitter testing will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

NOTE: In the event that any of these conditions can not be met (for example portable configurations, co-location with another transmitter, or use of a different antenna), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Notes to original equipment manufacturer (OEM) integrators

Certifications

A P P E N D I X B

These products comply with the following standards.

FCC Part 15 Class B

Radio Frequency Interference (RFI)(FCC 15.105)

The Digi Connect Wi-EM 9210 embedded modules have been tested and found to comply with the limits for Class B digital devices pursuant to Part 15 Subpart B, of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Labeling Requirements (FCC 15.19)

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

If the FCC ID / IC ID is not visible when installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module FCC ID / IC ID. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: MCQ-501538” / IC: 1846A-50M1538”.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Digi may void the user's authority to operate this equipment.

Industry Canada

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

Declaration of Conformity

(In accordance with FCC Dockets 96-208 and 95-19)

Manufacturer's Name:	Digi International
Corporate Headquarters:	11001 Bren Road East Minnetonka MN 55343
Manufacturing Headquarters:	10000 West 76th Street Eden Prairie MN 55344

Digi International declares, that the products:

Product Name:	Digi Connect Wi-EM 9210
Model Numbers:	50001538-xx

to which this declaration relates, meet the requirements specified by the Federal Communications Commission as detailed in the following specifications:

- Part 15, Subpart B, for Class B Equipment
- FCC Docket 96-208 as it applies to Class B personal
- Computers and Peripherals

The products listed above have been tested at an External Test Laboratory certified per FCC rules and has been found to meet the FCC, Part 15, Class B, Emission Limits. Documentation is on file and available from the Digi International Homologation Department.

International EMC Standards

The Digi Connect Wi-EM 9210 meet the following standards:

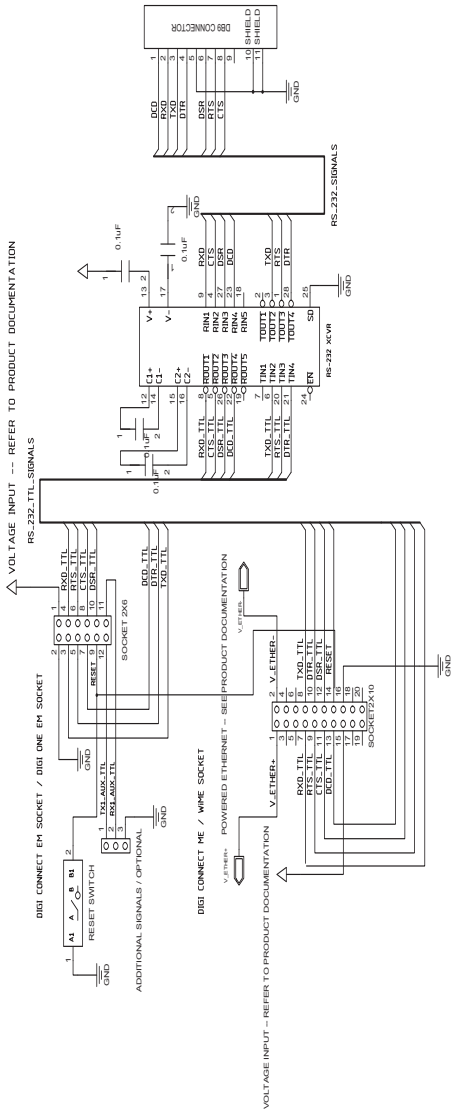
Standards	Digi Connect Wi-EM 9210
Emmissions	**FCC Part 15 Subpart C** **RSS-210 Issue 7 and RSS-GEN Issue 2** **FCC ID: MCQ-50M1538** **IC: 1846A-50M1538**
Immunity	**EN 55024**
Safety	**UL 60950-1** **CSA 22.2 No. 60950--1** **EN 60950-1**

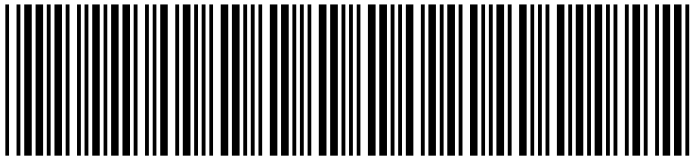
Sample Application: TTL Signals to EIA-232

A P P E N D I X C

The following schematic is an example of how to convert the module's TTL signals to EIA-232.

SAMPLE APPLICATION





PN (1P): 90000955 A