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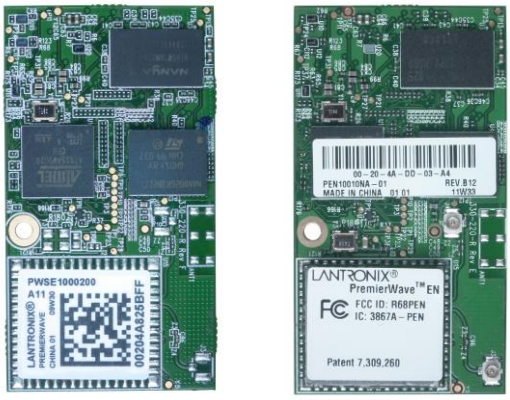

PremierWave®
Embedded System on Module Integration Guide

Part Number 900-580
Revision K January 2016

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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 to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and 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.

This device complies with Part 15 of the 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.

This device is intended only for OEM Integrators. The OEM integrator should be aware of the following important issues.

Labeling of the End Product

The label on the end product incorporating the Lantronix® PremierWave® EN embedded system on module must clearly state that it contains an FCC-approved RF module. Canada and Japan also require a similar statement.

For example, “This product contains RF transmitter ID # (put FCC, IC, and/or Japan module grant numbers here).” The label must include the ID numbers for the regions where the end product is installed. The grant numbers are below.

- PremierWave FCC ID number: R68PEN
- PremierWave IC ID number: 3867A-PEN
- PremierWave Japan ID numbers: 006WWC0244, 006XWA0019, 006YWA0009

RSS-GEN Sections 7.1.4 and 7.1.5 Statement for Devices with Detachable Antennas

This device has been designed to operate with the antennas listed in the Certificate and that has a maximum gain of 5 dBi. Antennas not included in this list or having a gain greater than 5 dBi are strictly prohibited for use with this device, unless system level FCC approval is gained. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

Integration Notes:

- *This module is authorized under limited module approval specified to mobile host equipment. So, the antenna must be installed such that 20cm is maintained between the antenna and users.*
- *The transmitter module may not be co-located with any other transmitter or antenna.*
- *As long as the two 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 emission, PC peripheral requirements, etc.)*
- *In the event that these conditions cannot be met (for example certain laptop configurations, general purpose PCMCIA or similar cards, or co-location with another transmitter)* and obtaining a separate FCC authorization will be required*, then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product (including the transmitter).*
- *Changes or modifications to this device not explicitly approved by Lantronix will void the user's authority to operate this device.*

Revision History

Date	Rev.	Comments
January 2011	A	Initial Draft
February 2011	B	Added a zoom top assembly diagram.
July 2011	C	Added mounting requirements and notes for the EN module clip.
August 2011	D	Updated connector and tolerance information, the mechanical dimension diagrams and the evaluation board power supply circuitry diagram.
September 2011	E	Added Power Supply information with a new diagram and specified information about general purpose IO signals.
October 2011	F	Updated end product labeling information.
March 2012	G	Updated information on maximum input leakage current and module initial power up sequence.
July 2014	H	Added content pertaining to the PremierWave SE1000 module and updated images and input signal information.
January 2015	I	Updated compliance, USB host port and product label information.
August 2015	J	Updated reset signal information.
January 2016	K	Updated minimal signal voltage and drive strength information.

Table of Contents

1: Introduction

About the Integration Guide

This guide provides the information needed to integrate the Lantronix® PremierWave® EN and PremierWave SE1000 systems on module within another product. The intended audiences are the engineers responsible for integrating a PremierWave system on module into their product.

Note: *This integration guide supports PremierWave system on module part numbers: PEN100100A-01, PEN10010SA-01, PEN10010NA-01, PEN10010NASA-01, PWSE1000100B, PWSE1000200B, and PWSE1000200S.*

Additional Documentation

For supporting product documentation, or the most current version of this document, please visit the Lantronix Web site at www.lantronix.com/support/documentation.

Document	Description
PremierWave EN Embedded System on Module User Guide	Provides information needed to configure, use, and update the PremierWave EN module firmware.
PremierWave SE1000 Embedded System on Module User Guide	Provides information needed to configure, use, and update the PremierWave SE1000 module firmware.
PremierWave EN Embedded System on Module Command Reference	Lists and explains PremierWave EN command line and XML commands.
PremierWave SE1000 Embedded System on Module Command Reference	Lists and explains PremierWave SE1000 command line and XML commands.
PremierWave Embedded System on Module Evaluation Board Quick Start Guide	Briefly explains how to connect the PremierWave and assign an IP address.
PremierWave Embedded System on Module Evaluation Board User Guide	Provides information needed to use the PremierWave on the evaluation board.

2: Description and Specifications

The PremierWave EN and the PremierWave SE1000 embedded system on modules deliver a new dimension of Ethernet and Wi-Fi networking with the highest levels of security to virtually any electronic product. It provides affordable connectivity in a compact form factor, enabling OEMs to add Wi-Fi or wired Ethernet networking to their products on a single PCB design.

With a choice of flexible, media-independent modules ranging from Ethernet, Wi-Fi and ultra-secure Wi-Fi, the PremierWave EN takes the complexity out of RF design and networking. OEMs can focus on their core competencies while minimizing engineering risk, shortening development time and reducing development cost.

The PremierWave SE1000 module is a version of the PremierWave EN system on module but without any Wi-Fi networking capabilities.

The PremierWave EN system on module has a dedicated 32-bit processor module running at 400 MHz and features 32 kilobytes (KB) data cache, 32 KB instruction cache, embedded 64 KB ROM, 16 KB SRAM and a memory management unit. The system on module includes 64 megabytes (MB) of SDRAM and 64 MB of NAND flash.

The PremierWave SE1000 system on module is available with 64 MB of SDRAM and 64 MB of NAND Flash. There is also an option for 256 MB of NAND Flash available.

With its combination of high performance CPU, ample memory, variety of serial interface options (Serial, I2C, High Speed SPI, USB 2.0) and a Linux operating system, the PremierWave system on module can be designed as the primary host processor, for most demanding embedded applications.

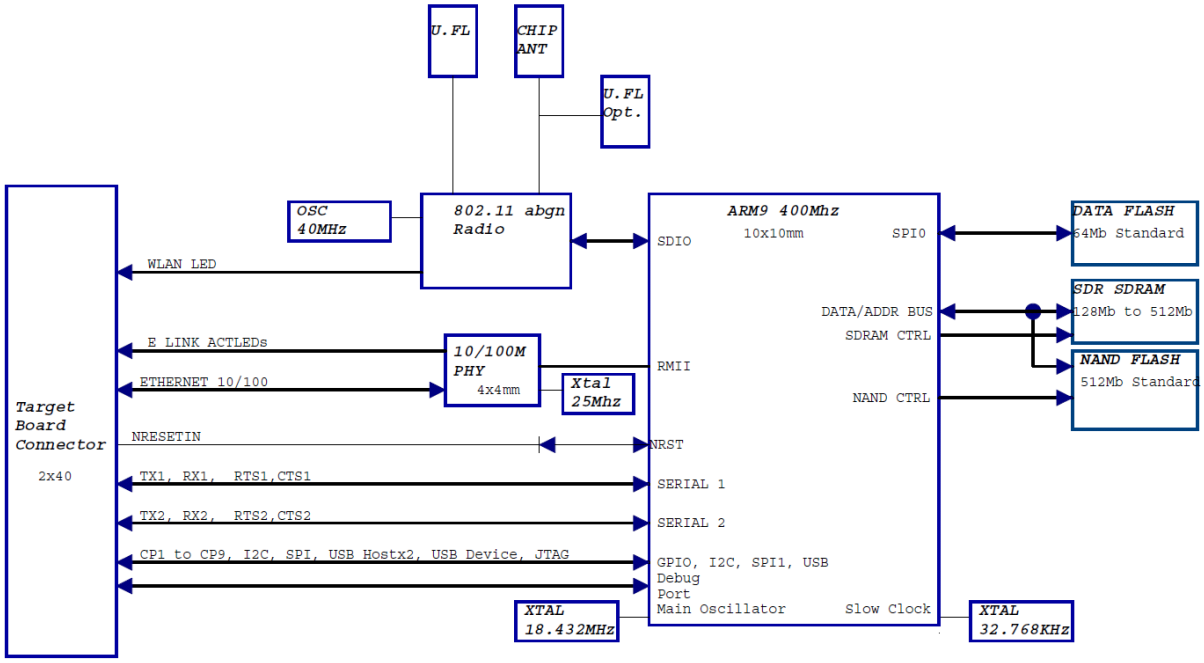
The PremierWave system on modules offer an unmatched portfolio of security technologies; the PremierWave EN goes far beyond compliance with the popular 802.11i, WPA and WPA2 wireless security specifications. It ensures data integrity and privacy for highly sensitive requirements, such as medical or financial applications.

PremierWave EN Block Diagram

The following drawing is a block diagram of the PremierWave EN module showing the relationships of the components.

Note: *The 802.11abgn radio block is not installed on the PremierWave SE1000 system on module.*

Figure 2-1 PremierWave Block Diagram



PremierWave Connector Pin Assignments and Descriptions

All IO signals are 3.3V +/-10% tolerant, unless otherwise stated.

Table 2-1 PremierWave Connector Pins and Descriptions

Pin#	Pin Name	Dir	Function Name
1	GND		Ground. Connect to unit signal ground.
2	NRESETIN	I	**Reset** (Active Low) Once the unit has booted properly, pin 2 can be driven low for a minimum of 50 milliseconds (ms) with an open drain circuit to reset the module when desired.
3	HDPB	I/O	USB Host Port B +
4	NRSTTODFLT	I	Reset Configuration to Defaults (Active Low)
5	HDMB	I/O	USB Host Port B -
6	TX1	O	UART 1 Transmit

Pin#	Pin Name	Dir	Function Name
7	GND		
8	RTS1	O	UART 1 Request To Send
9	S3V3		3.3V Power Input
10	RX1	I	UART 1 Receive
11	S3V3		3.3V Power Input
12	CTS1	I	UART1 Clear To Send
13	GND		
14	CP1	I/O	I/O Configurable Pin 1
15	S3V3		3.3V Power Input
16	CP2	I/O	I/O Configurable Pin 2
17	S3V3		3.3V Power Input
18	CP3	I/O	I/O Configurable Pin 3
19	GND		
20	CP4	I/O	I/O Configurable Pin 4
21	E_SPEED	O	Ethernet Link LED
22	GND		
23	E_LNKACT	O	Ethernet Activity LED
24	TX2	O	UART 2 Transmit
25	W_LINKLED	O	Wireless LAN Status LED
26	RTS2	O	UART 2 Request To Send
27	CP6	I/O	I/O Configurable Pin 6
28	RX2	I	UART 2 Receive
29	RSVD	I	Reserved (DO NOT CONNECT)
30	CTS2	I	UART 2 Clear To Send
31	I2CSCL	I/O	I2C Clock
32	CP5	I/O	I/O Configurable Pin 5
33	I2SDA	I/O	I2C Data
34	DBTXD	O	Debug UART Tx
35	GND		
36	DBRXD	I	Debug UART Rx
37	NSPI1_IRQ	I/O	SPI IRQ
38	CP8	I/O	I/O Configurable Pin 8
39	SPI1_MISO	I/O	SPI Master In Slave Out
40	GND		
41	NSPI1_CS	I/O	SPI Chip Select
42	CP9	I/O	I/O Configurable Pin 9
43	SPI1_MOSI	I/O	SPI Master Out Slave In
44	CP7	I/O	I/O Configurable Pin 7
45	SPI1_CLK	I/O	SPI Clock

Pin#	Pin Name	Dir	Function Name
46	WKUP	I	CPU Wakeup Drive low with Open Drain, Signal pulled up internally, Do not Drive high
47	GND		
48	S3V3		3.3V Power Input
49	DDP	I/O	USB Device Port +
50	S3V3		3.3V Power Input
51	DDM	I/O	USB Device Port -
52	S3V3		3.3V Power Input
53	GND		
54	GND		
55	HDPA	I/O	USB Host Port A +
56	ICE_NTRST	O	JTAG/Debug Signal Pins
57	HDMA	I/O	USB Host Port A -
58	TDI	I	JTAG/Debug Signal Pins
59	GND		
60	GND		
61	GND		
62	TMS	I	JTAG/Debug Signal Pins
63	ERX-	I	Ethernet Receive Data -
64	TCK	I	JTAG/Debug Signal Pins
65	ERX+	I	Ethernet Receive Data +
66	GND		
67	GND		
68	ICE_RTCK	I	JTAG/Debug Signal Pins
69	RXCT	I	Ethernet Receive Data Center Tap
70	TDO	O	JTAG/Debug Signal Pins
71	TXCT	I	Ethernet Transmit Data Center Tap
72	GND		
73	GND		
74	ICE_NRST	O	JTAG/Debug Signal Pins Use a buffer on this signal to disable external logic inputs when the module is in initial power up or Shut Down mode. See *Module Initial Power Up Sequence* below.
75	ETX-	O	Ethernet Transmit Data -
76	GND		
77	ETX+	O	Ethernet Transmit Data +
78	S3V3		3.3V Power Input
79	GND		
80	S3V3		3.3V Power Input

Mating Connector

The mating connector for the PremierWave system on module is Hirose part number DF40C (2.0)-80DS-0.4V (51). Special care must be taken when mating and unmating the PremierWave module to the mating connector. Refer to the Hirose DF40 data sheet below for proper connector mating and unmating, along with the proper connector footprint.

The mating connector data sheet is available for download at: https://www.hirose-connectors.com/connectors/H204ProductListCompare.aspx?clprm=06844132651&mode=%EF%BC%90%EF%BC%91

Module Radio and Antenna Connection Options

The PremierWave EN module supports connectivity with two antenna ports for single stream diversity. The unit can be operated with diversity enabled or in single antenna mode using either antenna port. The PremierWave EN module has two options for antenna connections. SKU 1 may be operated in single antenna mode without an external antenna using the on-board chip antenna.

Table 2-2 PremierWave Antenna SKU options

PremierWave SKU options	Antenna Port 1 Connection	Antenna Port 2 Connection
SKU 1 with Chip Antenna P/N PEN100100A-01 bulk P/N PEN10010SA-01 sample	Internal Chip antenna	U.FL for external antenna
SKU 2 without Chip Antenna P/N PEN10010NA-01 bulk P/N PEN10010NASA-01 sample	U.FL for external antenna	U.FL for external antenna

External Antennas

The PremierWave EN module has been certified using the external antennas listed below in addition to the internal antenna provide on the module. Per FCC guidelines, the PremierWave certification remains valid if using an antenna similar to the antennas below or the internal chip antenna. If using an antenna similar to one of the antennas below, but from a different manufacturer part number the antenna gain must be equal to or less than specified in the table. Consult with your certification lab for more details.

Table 2-3 PremierWave External Antenna Options

Antenna Type	Peak Gain Typical	Vendor	Vendor Part Number
Swivel type antenna, with RP-SMA(M) connector	5 dBi, 2.4 Ghz to 2.5 Ghz, 5 dBi, 5.15 Ghz to 5.85 Ghz	Taoglas	GW.71.5153
Swivel type antenna, with RP-SMA(M) connector	2 dBi, 2.4 Ghz to 2.5 Ghz, 2 dBi, 5.15 Ghz to 5.85 Ghz	Wanshih	WSS002
Internal Chip Antenna Option	2.17 dBi, 2.4 GHz to 2.5 Ghz 2.74 dBi, 4.9 Ghz to 5.8 Ghz.	N/A	N/A

Both the U.FL to Reverse SMA cable (Lantronix part number 500-180-R-ACC) and the U.FL to U.FL cable (Lantronix part number 500-181-R-ACC) can be purchased separately as an accessory from either Lantronix or an RF cable manufacturer. External antennas can be purchased from the antenna vendor. Components for cable design should be selected for low loss over the entire 2.4 Ghz to 5.9 Ghz signal range.

Figure 2-2 Reverse-SMA to U.FL (P/N 500-180-R-ACC)

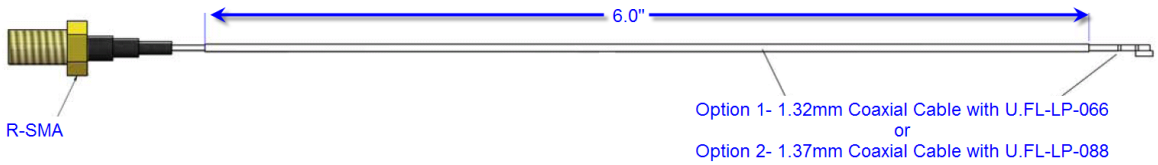
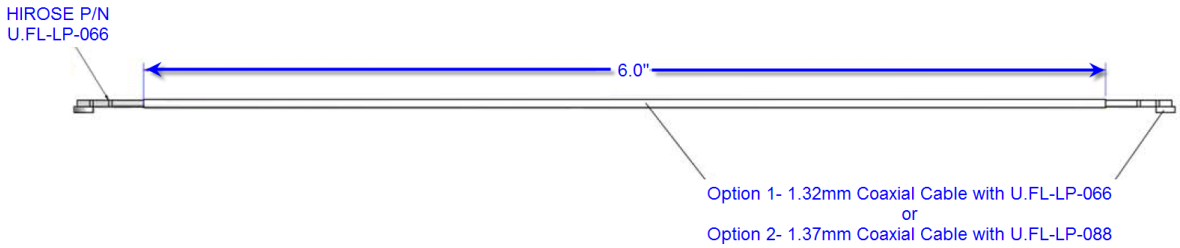


Figure 2-3 U.FL to U.FL Cable (P/N 500-181-R-ACC)



Antenna Placement

The PremierWave EN module has an option for an on-board chip antenna. When designing the PremierWave EN system on module to a mating board, it is important to consider the final installation of the unit and its location with respect to connecting access points. The PremierWave EN module should be placed such that the chip antenna has as clear as possible path to the connecting access point for maximum range. Avoid placing the PremierWave module such that the on-board chip antenna is blocked by metal walls or ground planes of adjacent circuit boards. When using external antennas connected to the U.FL ports the same considerations apply.

WLAN LED

Pin 25 on the PremierWave connector is driven low when the radio has been enabled by software. This pin may be used to drive an LED for WLAN status. Connect pin 25 to the cathode of an LED through a 220 ohm resistor. Connect the anode of the LED to 3.3V.

Ethernet Input/Output

The unit provides a 10/100 Mbps Ethernet interface for connection to an external network through external magnetics and an external RJ45. *Figure 2-4* below shows the Ethernet connections from the Lantronix Evaluation board to a 10/100 Ethernet RJ45 Jack with Magnetics, J5 in the figure. The RJ45 Magnetic Jack on the evaluation board is Belfuse part number 08B0-1D1T-06-F.

The Ethernet differential pair signals, ERXM/ERXP and ETXM/ETXP should be routed as 100-ohm differential pairs on a layer next to the signal ground plane. The use of vias on these signals should be minimized. Center tap signals RXCT and TXCT should be routed with at least 20 mil trace thickness. The area underneath the RJ45 magnetic jack should be void of all signals and planes. The connector shield should be connected to chassis. It is recommended that 1206 resistor pads from chassis ground to signal ground be placed next to each of the shield tabs. The resistor pads allow for 0 ohm jumper, ferrite beads, or decoupling caps to be installed as needed for EMI/EMC improvement.

The Ethernet LED signals should be routed to discrete LEDs or to the LED pins on the RJ45 through 220 ohm or larger resistors. The LED signals are active low.

Also shown in the figure is an optional active choke that can be used to improve ESD, EFT, and EMI/EMC performance in harsh environments. The device is shown as U22 in the figure and is Akros part number AS1602. This device features route through pin assignments allowing for the Ethernet differential signal pairs to be routed without altering the trace impedance or adding vias. Due to this routing the device could be installed or depopulated as needed. Lantronix has performed all certification to FCC Class B without U22 populated.

The Ethernet signals may be left unconnected if unused.

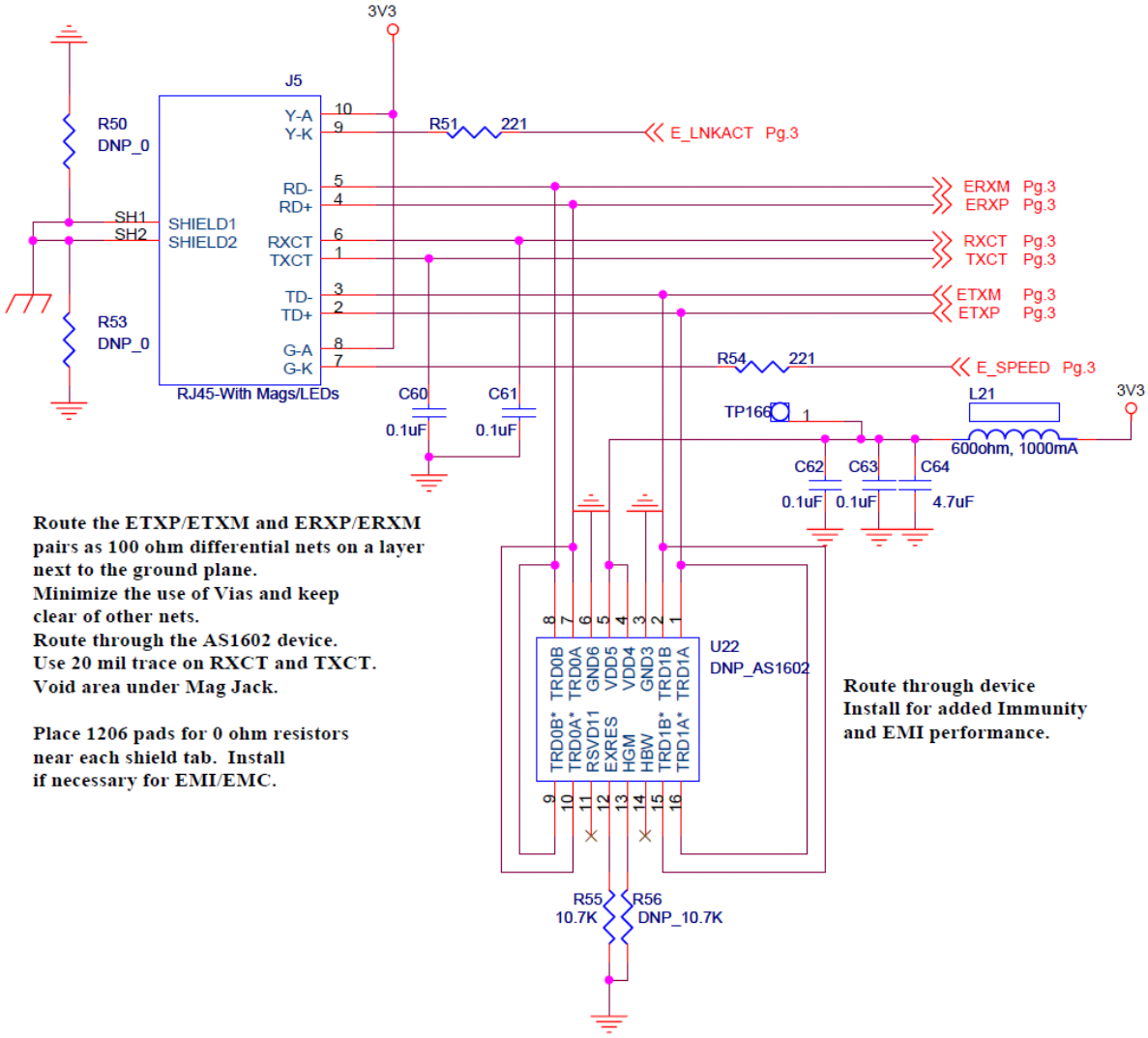
See the Lantronix app note, “How to Connect a Lantronix Embedded Module to a Wired Ethernet Port” for more details on Ethernet connection and routing, http://www.lantronix.com/pdf/appnotes/Connect-LTRX-Embed-Module-to-Wired-Ethernet_AN.pdf.

Table 2-4 Ethernet Port Signals

Pin Name	Description	PremierWave Connector Pins	Signal Requirement	RJ45 MagJack Belfuse, 08B0-1D1T-06-F Pin assignment
ERXM	Ethernet Receive Negative signal.	63	100 ohm differential pair with ERXP	5
EXRP	Ethernet Receive Positive signal.	65	100 ohm differential pair with ERXM	4
ETXM	Ethernet Transmit Negative signal.	75	100 ohm differential pair with ETXP	3
ETXP	Ethernet Transmit Positive signal.	77	100 ohm differential pair with ETXM	2
RXCT	Center tap for receive pair.	69	Route > 20 mil width	6
TXCT	Center tap for transmit pair	71	Route > 20 mil width	1
Chassis	Unit chassis	-	RJ45 connector shield	Shield tabs
E_LNKACT	Link / activity LED. Active low. Solid for link, blink for activity.	23	Route to LED cathode through 220 ohm or greater.	9

Pin Name	Description	PremierWave Connector Pins	Signal Requirement	RJ45 MagJack Belfuse, 08B0-1D1T-06-F Pin assignment
E_SPEED	Link Speed Active low for 100Mbps, Off (high) for 10Mbps.	21	Route to LED cathode through 220 ohm or greater.	7
3V3	3.3 V power	3V3	3.3V power, connect to LED anodes.	8, 10

Figure 2-4 Ethernet connections to an external 10/100 RJ45 Magnetic Jack (J5)



Serial Input/Output

The unit has up to three serial ports compatible with RS232 serial standards at data rates up to 921 Kbps. The serial I/O signals are 3.3V CMOS logic level tolerant. Serial signals connect to the OEM CPU/UART. For evaluation and prototype work, it is convenient to have an external RS-232 interface that can connect to the serial port on a PC. The PremierWave evaluation board has RS-232/422/485 transceivers to implement this external interface. If desired, use the CPs to create a DTE or DCE-style interface using any available CPs. To create these interfaces, connect the signals according to the tables below. These pins may be left unconnected if unused.

It is recommended that all external logic input signals be tristated or driven low during the initial boot sequence due to the internal power sequencing. Pin 74 of the PremierWave module can be used to disable external drivers. It is recommended that a buffer be placed on this signal. When Pin 74 is low the module is in its initial power up sequence or in the module power down state described below.

Note: *CPx, and CPy are any of the available CPs.*

Table 2-5 PremierWave UART Ports

UART Signal	Description	PremierWave pin number
TXD1	UART1 Transmit Out	6
RXD1	UART1 Receive IN	10
RTS1	UART1 Request to Send Out	8
CTS1	UART1 Clear to Send In	12
TXD2	UART2 Transmit Out	24
RXD2	UART2 Receive IN	28
RTS2	UART2 Request to Send Out	26
CTS2	UART2 Clear to Send In	30
TXD3	CP6/UART3 Transmit Out	27
RXD3	CP5/UART3 Receive IN	32
RTS3	CP8/UART3 Request to Send Out	38
CTS3	CP9/UART3 Clear to Send In	42

Table 2-6 RS232 Connections

PremierWave EN		DCE Connector			DTE Connector		
Signal (Logic)	Description	DB9	DB25	Signal	DB9	DB25	Signal
RXDx	Data In	2	3	RXDx	3	2	TXDx
TXDx	Data Out	3	2	TXDx	2	3	RXDx
RTSx	H/W Flow Control Output	7	4	RTSx	8	5	CTSx
CTSx	H/W Flow Control Input	8	5	CTSx	7	4	RTSx
CPx	Modem Control Input	1	8	DCDx	4	20	DTRx
CPy	Modem Control Output	4	20	DTRx	1	8	DCDx

Table 2-7 RS422/485 Connections

Premier Wave EN Signal (logic)	Description	RS485 Signal	DB25 4 Wire	DB25 2 Wire	DB9 4 wire	DB9 2 wire
TXDx	Data Out	TX+485	14	14	7	7
TXDx	Data Out	TX-485	15	15	3	3
RXDx	Data In	RX+485	21	14	2	7
RXDx	Data In	RX-485	22	15	8	3
RTSx	TX Enable					
CPx	RS485 Select					
CPy	RS485 2-wire					

Sample Layouts for RS-485 Connectivity

Figure 2-5 Combined RS-232/422 Transceiver

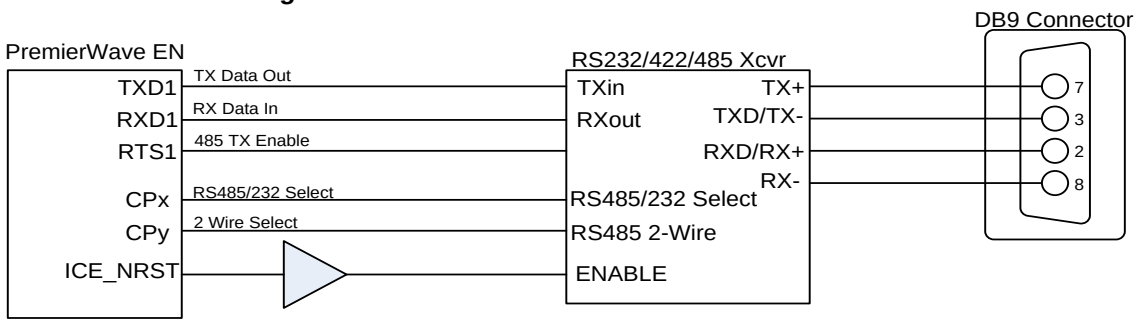


Figure 2-6 Separate RS-232/422 Transceivers

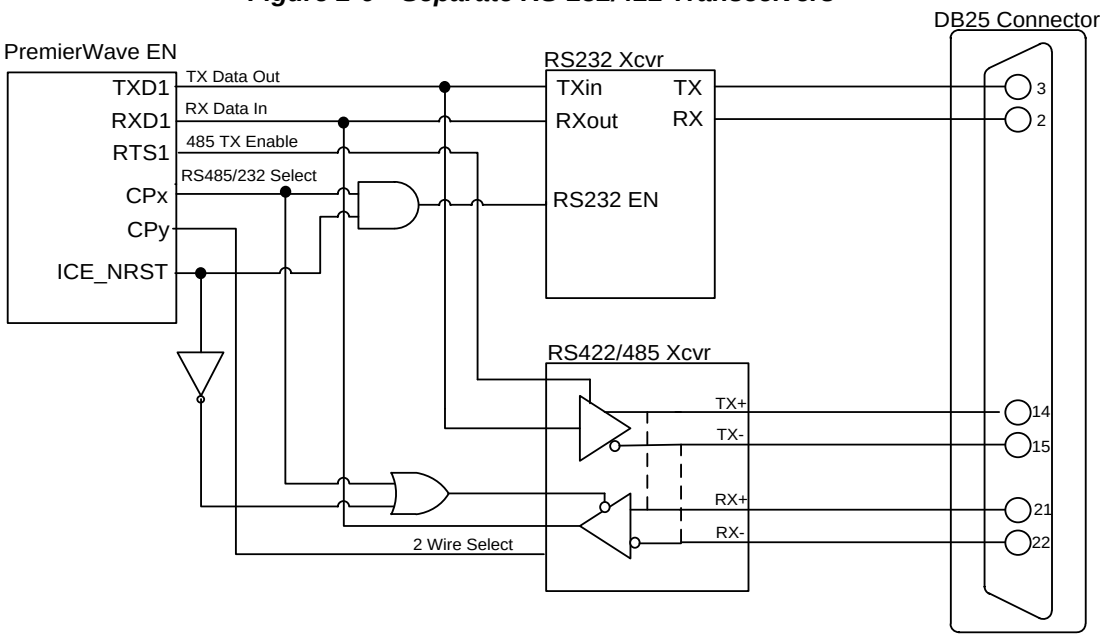
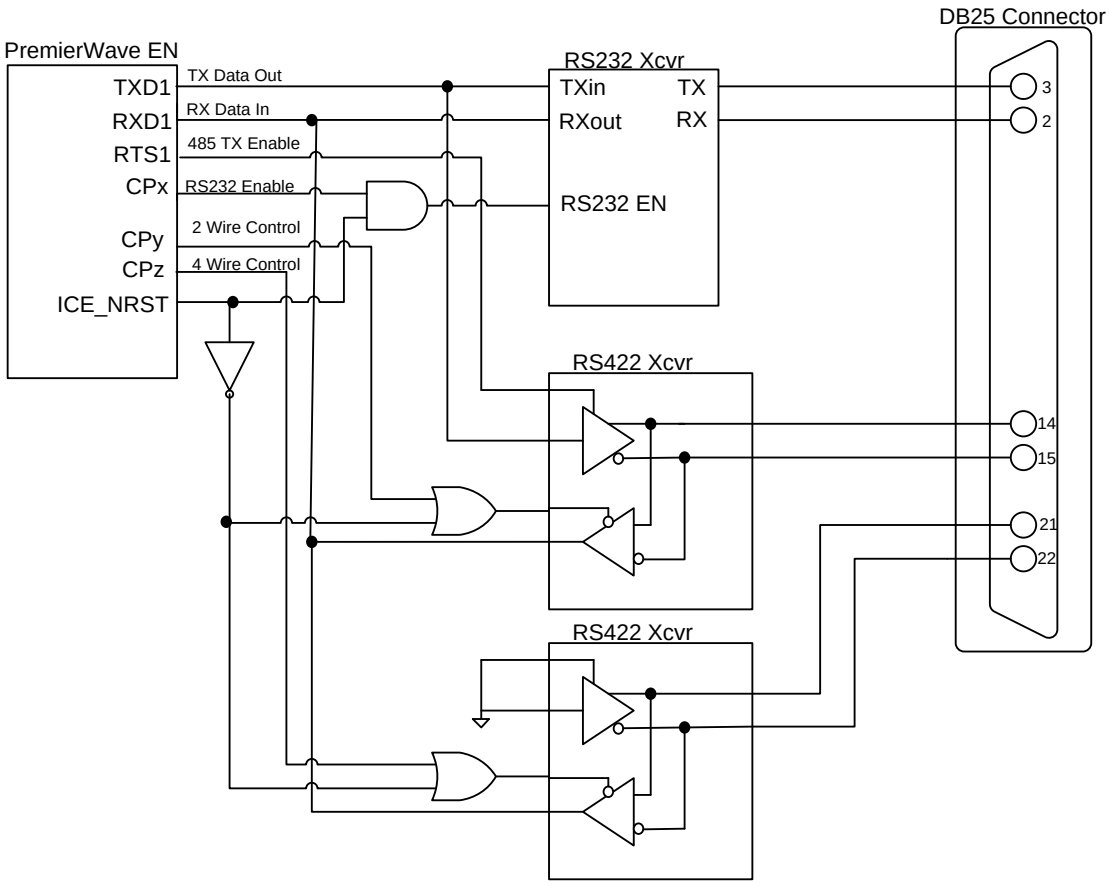


Figure 2-7 Separate RS-422 Transceivers for 2-Wire and 4-Wire Setups



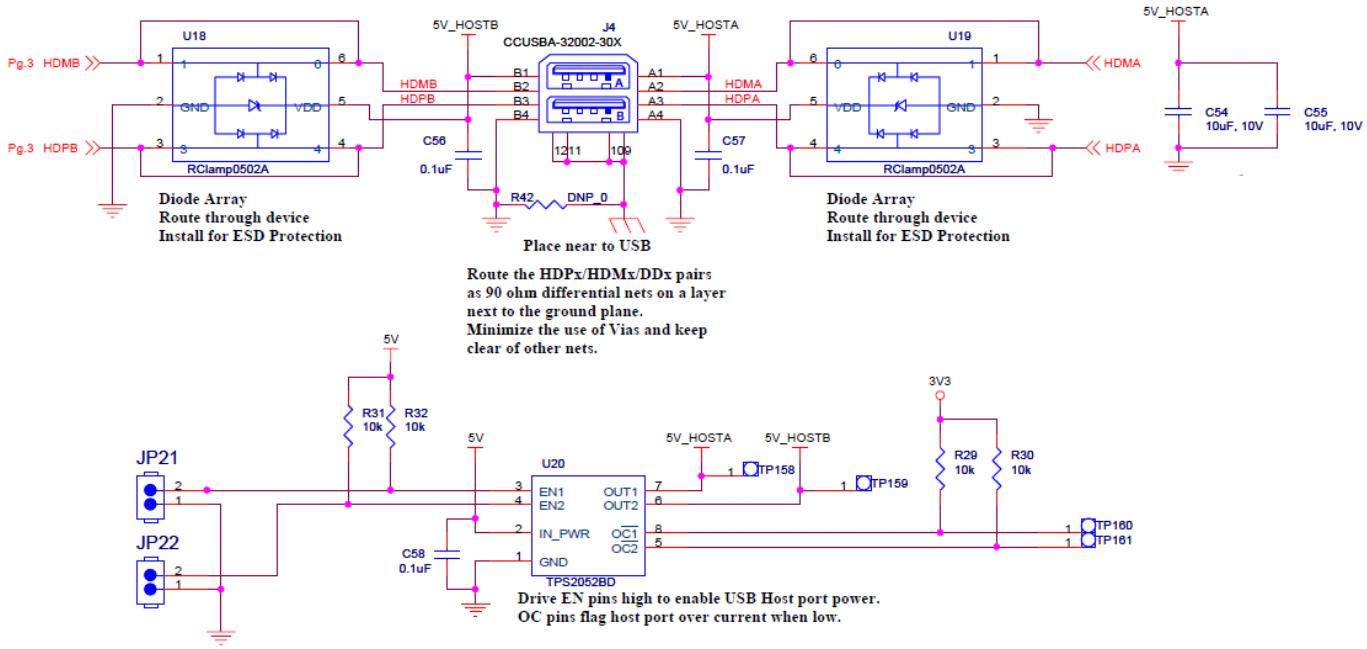
USB Host Ports

The PremierWave module has two USB 2.0 Full Speed Host port interfaces for connection to downstream USB devices. Each port consists of a differential pair, signals HDPA/HDMA and HDPB/HDMB. These signals should be routed as 90 ohm differential pairs on a signal layer next to the signal ground plane. The use of vias should be minimized on these signals. The USB signals can be connected to a USB Type A dual USB port as shown in *Figure 2-8* or directly to an IC with a USB device port. If connecting to an external port that is user accessible it is recommended to add a TVS diode array to the signal nets for ESD protection. The ESD array shown in the figure is of type Semtech RCLAMP0502A. This device features through pin routing to minimize trace impedance changes and simplify routing. The footprint for the TVS array can be added to the PCB and the part can be depopulated if it is not needed. If connecting to an off board device that needs power add a USB power switch to current limit the 5V power connection at the connector. USB requires that each port be limited to 500 mA maximum sustained current. The schematic below shows how to connect 5V to a USB host connector using a TI, TPS2052 Power Distribution Switch. The USB host port 5V power is not provided by the PremierWave module. If the USB host ports are unused their pins may be left unconnected.

Table 2-8 USB Host Port Signals

Pin Name	Description	PremierWave Connector Pins	Signal Requirement	Type A USB Host connector pin
HDPA	USB Host Port A Positive pin	55	Route as 90 ohm differential pair with HDMA signal	A3
HDMA	USB Host Port A Negative pin	57	Route as 90 ohm differential pair with HDPA signal	A2
HDPB	USB Host Port B Positive pin	3	Route as 90 ohm differential pair with HDMB signal	B3
HDMB	USB Host Port B Negative pin	5	Route as 90 ohm differential pair with HDPB signal	B2
5V(User supplied)	5V power for USB connector		Current limit to 500 mA per port	A1, B1
Ground	Signal Ground	Ground	Ground plane	A4, B4

Figure 2-8 USB Host Interface Connections



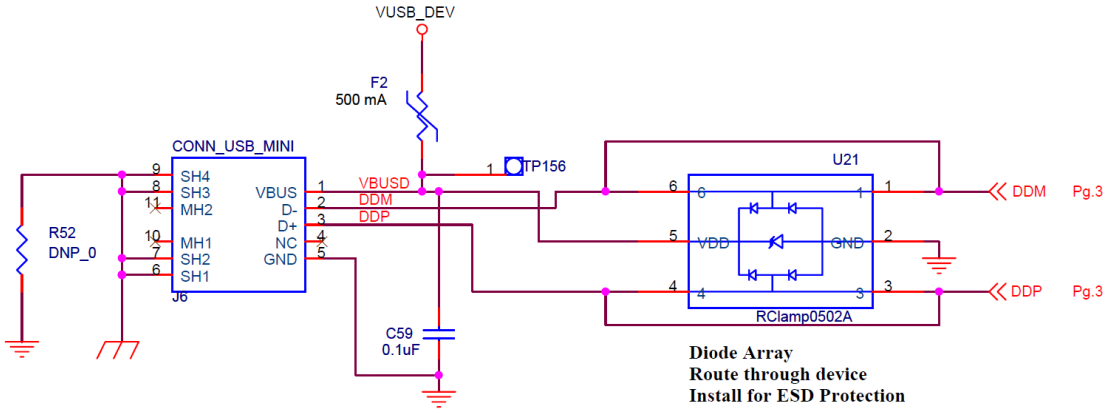
USB Device Port

The PremierWave module has one USB 2.0 Full Speed Device port interface for connection to an upstream USB device. The port consists of a differential pair, signals DDP and DDM. These signals should be routed as a 90 ohm differential pair on a signal layer next to the signal ground plane. The use of vias should be minimized on these signals. The USB signals can be connected to a USB Mini Type B USB port as shown in *Figure 2-9* or directly to an IC with a USB host port. If connecting to an external port that is user accessible it is recommended to add a TVS diode array to the signal nets for ESD protection. The ESD array shown in the figure is of type Semtech RCLAMP0502A. This device features through pin routing to minimize trace impedance changes and simplify routing. The footprint for the TVS array can be added to the PCB and the part can be depopulated if it is not needed. It is recommended that the power drawn off the USB Mini Type B connector be limited to less than 500mA per USB requirements. The peak current of the PremierWave EN module with wireless enabled is greater than 500 mA at 3.3V. It is not recommended to power the PremierWave module with a regulator connected to the USB device port input power if wireless transmission will be used. The USB device port power is sufficient to power the PremierWave NR module. If the USB device port is unused the DDP and DDM pins may be left unconnected.

Table 2-9 USB Host Port Signals

Pin Name	Description	PremierWave Connector Pins	Signal Requirement	Mini Type B USB Device connector pin
DDP	USB Device Port Positive pin	49	Route as 90 ohm differential pair with DDM signal	3
DDM	USB Device Port Negative pin	51	Route as 90 ohm differential pair with DDP signal	2
5V	5V power from USB cable		Current limit to 500 mA per port	1
Ground	Signal Ground	Ground	Ground plane	5

Figure 2-9 USB Device Interface Connections



General Purpose IO

Many of the IO signals on the PremierWave can be used as software configurable I/O pins. The table below shows all the pins that can be used as configurable IO along with their default function. All general purpose IO pins should be left floating if unused. All pins are 3.3V + 10% tolerant.

Table 2-10 General Purpose IO Pins

Pin#	Pin Name	Default Function	Alternate Function	Internal Pull up
6	TX1	UART 1 TX (Out)	I/O Configurable Pin	100K
8	RTS1	UART 1 RTS (Out)	I/O Configurable Pin	100K
10	RX1	UART 1 RX (In)	I/O Configurable Pin	100K
12	CTS1	UART1 CTS (In)	I/O Configurable Pin	100K
24	TX2	UART 2 TX (Out)	I/O Configurable Pin	100K
26	RTS2	UART 2 RTS (Out)	I/O Configurable Pin	100K
27	CP6	I/O Configurable Pin 6	UART3 TX (Out)	*note 1
28	RX2	UART 2 RX (In)	I/O Configurable Pin	100K
30	CTS2	UART 2 CTS (In)	I/O Configurable Pin	100K
31	I2CSCL	I2C Clock (driven by master)	I/O Configurable Pin	10K
32	CP5	I/O Configurable Pin 5	UART3 RX (In)	*note 1
33	I2SDA	I2C Data (I/O)	I/O Configurable Pin	10K
37	NSPI1_IRQ	SPI IRQ (driven by slave)	I/O Configurable Pin	10K
38	CP8	I/O Configurable Pin 8	UART3 RTS (Out)	*note 1
39	SPI1_MISO	SPI Master In Slave Out	I/O Configurable Pin	10K
41	NSPI1_CS	SPI Chip Select	I/O Configurable Pin	470K
42	CP9	I/O Configurable Pin 9	UART3 CTS (In)	*note 1
43	SPI1_MOSI	SPI Master Out Slave In	I/O Configurable Pin	10K
44	CP7	I/O Configurable Pin 7		*note 1
45	SPI1_CLK	SPI Clock (driven by master)	I/O Configurable Pin	*note 1

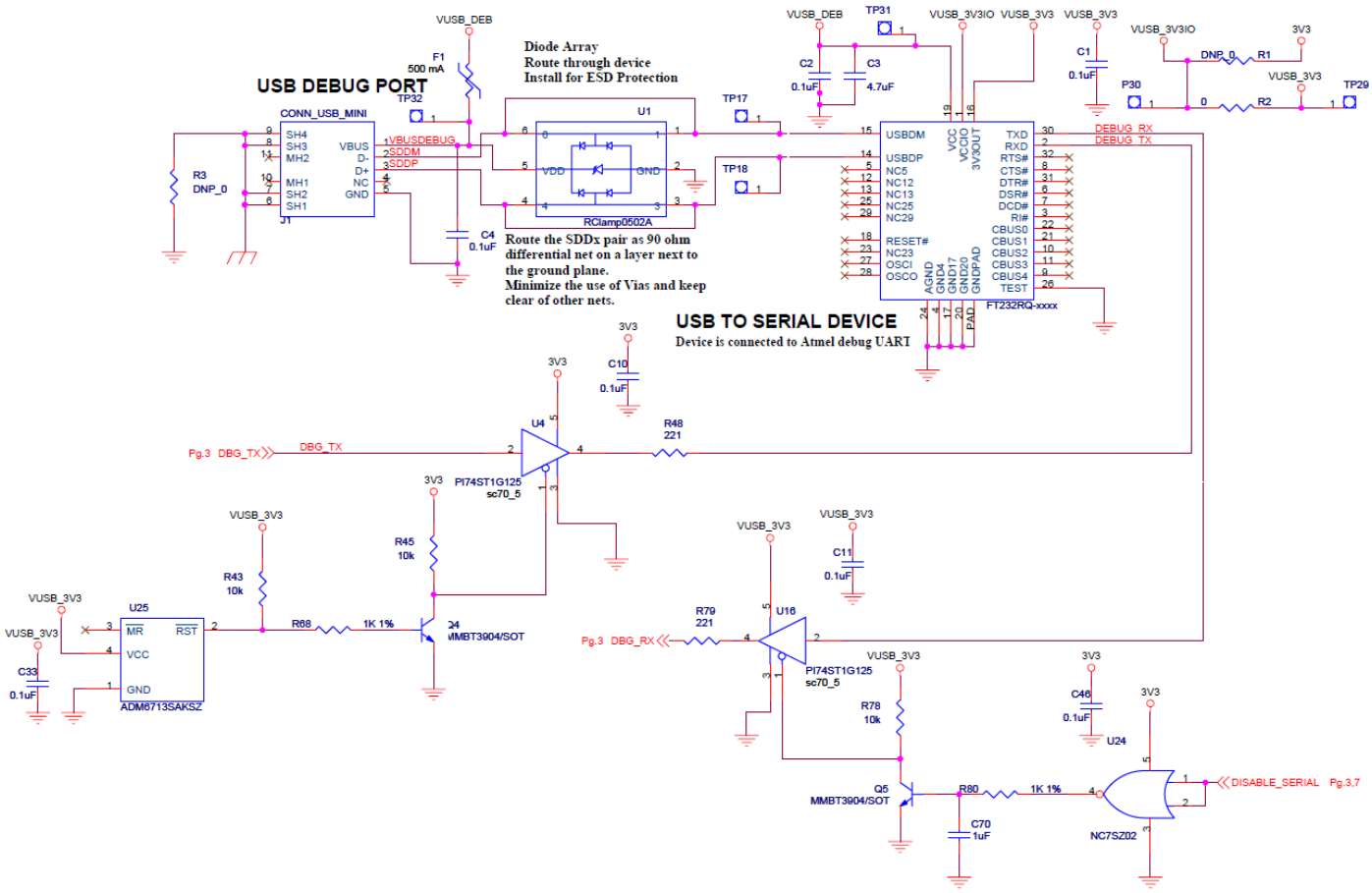
The SPI and I2C interfaces can be configured as Master or Slave. See the ***PremierWave EN User Guide*** for configuration register programming and more info.

Note 1: *These pins have internal pull ups with values between 40K and 190K. The pull ups can be enabled or disabled by software. The default state is Pull Up Enabled. See the User Guide for more info.*

Serial Debug Port

The PremierWave has an additional logic level serial port that can be used for debug, loading, and monitoring the unit boot status. Pin 34 is the debug port TX (output) pin and Pin 36 is the debug port RX (Input). These pins are 3.3V logic level tolerant. The default baud rate for these pins is 115200 baud. These pins can be connected to a serial transceiver or to a serial to USB converter device for connection to PC without a standard serial port. The Lantronix PremierWave evaluation board connects the debug port to an FTDI FT232RQ serial to USB converter IC. See the figure below for the connection to the FTDI device. The USB signal routing is similar to the routing above in the USB device port section.

Figure 2-10 Serial Debug Port



Power Supply Requirements

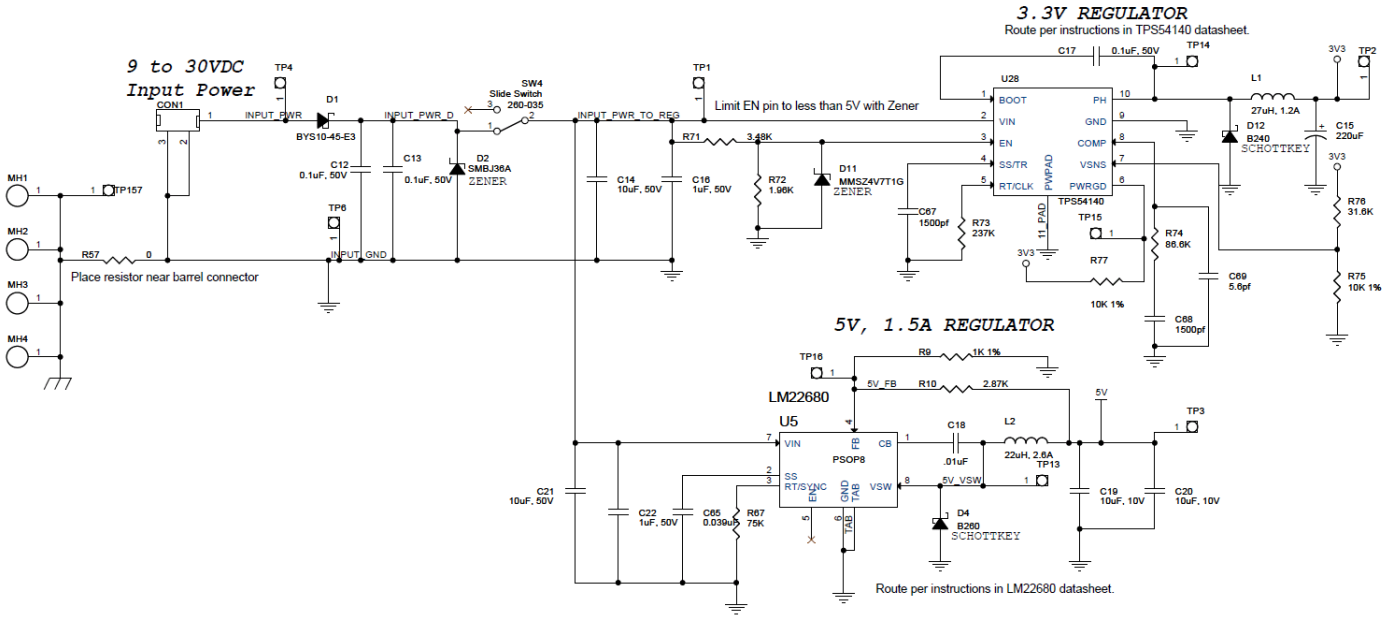
The PremierWave EN module uses up to 600 mA during normal operation. In addition, there are power in rush currents of approximately 2A that occur at various stages of the power up, boot sequence, and wake up from shutdown mode. These in rush currents are due to internal power rails turning on. The duration of the inrush is less than 750us. The PremierWave evaluation board uses the TI TPS54140DGQ to power the 3.3V input to the PremierWave module. We also recommend a minimum of 220 uF capacitance on the 3.3V rail. Additional capacitance can be added, however, sufficient time should be allowed on power cycles for the 3.3V input voltage to reach 0.5V prior to re-applying power. We recommend that the power supply rise to 3.13V in less than 1ms.

It is recommended that all logic IO signals be tristated or driven low when the EN module is powered off or in its initial power up sequence. Please see *Module Initial Power Up Sequence* below.

For applications requiring USB host port functionality it is recommended that at least 500mA current be provided for each external host port. The PremierWave Evaluation board uses the National LM22680 regulator to provide power for the two evaluation board USB host ports.

The figure below shows the power supply circuitry used on the PremierWave evaluation board. The full evaluation board schematic is in the *PremierWave Evaluation Board User Guide*.

Figure 2-11 PremierWave Evaluation Board Power Supply Circuitry



Note: *Components in the same circuit shall be placed close together in the manner as drawn in the schematic, except where noted otherwise.*

Module Initial Power Up Sequence

The PremierWave module incorporates internal power sequencing to allow the various internal components to boot properly. When 3.3V is initially applied to the unit, the reset signal on pin 2 should be left floating. Once the unit has booted properly, pin 2 can be driven low with an open drain circuit to reset the module when desired. It is recommended that all external logic IO signals be tristated or driven low during the initial boot sequence due to the internal power sequencing. Pin 74 of the PremierWave module can be used to disable external drivers. It is recommended that a buffer be placed on this signal. When Pin 74 is low the module is in its initial power up sequence or in the module power down state described below. Use of external pull-ups on logic IO signals is not recommended as the logic IO signals are pulled up to an internally sequenced rail. The internal logic signals will be off until the power up sequence is complete. The power up sequence may take approximately 6 ms to complete.

Module Power Down State

The PremierWave module includes an option for driving the unit into a low current, sub 200uA state, if the unit is not going to be active for some time. Recovery from this state can be made from either an internal RTC event or by toggling the Wakeup signal, pin 46. The wakeup signal should be driven with an open drain source with no external pullup. The signal is pulled up internally on the PremierWave module. Recovery from the shutdown state requires a full module boot cycle. All external logic IO signals should be tristated or driven low while the unit is in the shutdown state. Use of external pull-ups is not recommended. The external reset on pin 2 should be left floating. As described in the initial power up sequence section, a buffer should be placed on pin 74, the output of which can be used to disable external logic signals when the unit is in shutdown or initial power up. Once the unit has booted properly, pin 2 can be driven low for a minimum of 50 milliseconds with an open drain circuit to reset the module when desired.

See the *PremierWave EN Embedded System on Module User Guide* for more information about entering the Shutdown state.

Recommended Operating Conditions

Table 2-11 Recommended Operating Conditions

Symbol	Parameter	Min	Typical	Max	Units
Vcc	Supply voltage (typical 3.3) (+/-5%)	3.14	3.3	3.46	V
V_{IL}	Low Level Input Voltage	-0.3		0.8	V
V_{IH}	High Level Input Voltage	2.0		3.6	V
V_{OL}	Low Level Output Voltage			0.4	V
V_{OH}	High Level Output Voltage	2.6			V
I_I	3.3 IO Leakage Current		+/-1		µA
I_{CC} (PW EN)	Module Power Down Current			200	µA
I_o	CPx pins, UART pins, Output Current			8	mA
I_{CC} (PW EN)	Supply Current AVG (WLAN Assoc 5Ghz, No Ethernet link)		302		mA
I_{CC} (PW EN)	Supply Current AVG (WLAN activity 5Ghz, low duty cycle, No Ethernet link)		331		mA
I_{CC} (PW EN)	Supply Current AVG (WLAN activity 5Ghz, high duty cycle, Ethernet linked)		491		mA
I_{CC} (PW EN)	Supply Current (WLAN TX surge, 5Ghz, Ethernet linked)		577		mA
I_{CC} (PW EN)	Supply Current AVG (Ethernet Linked, WLAN not associated)		154		mA
I_{CC} (PW EN)	Supply Current AVG(Ethernet high duty cycle, WLAN not associated)		199		mA
I_{CC} (PW EN)	Supply Current AVG (Ethernet Linked, WLAN OFF)		131		mA
I_{CC} (PW EN)	Supply Current AVG (Ethernet high duty cycle, WLAN OFF)		154		mA

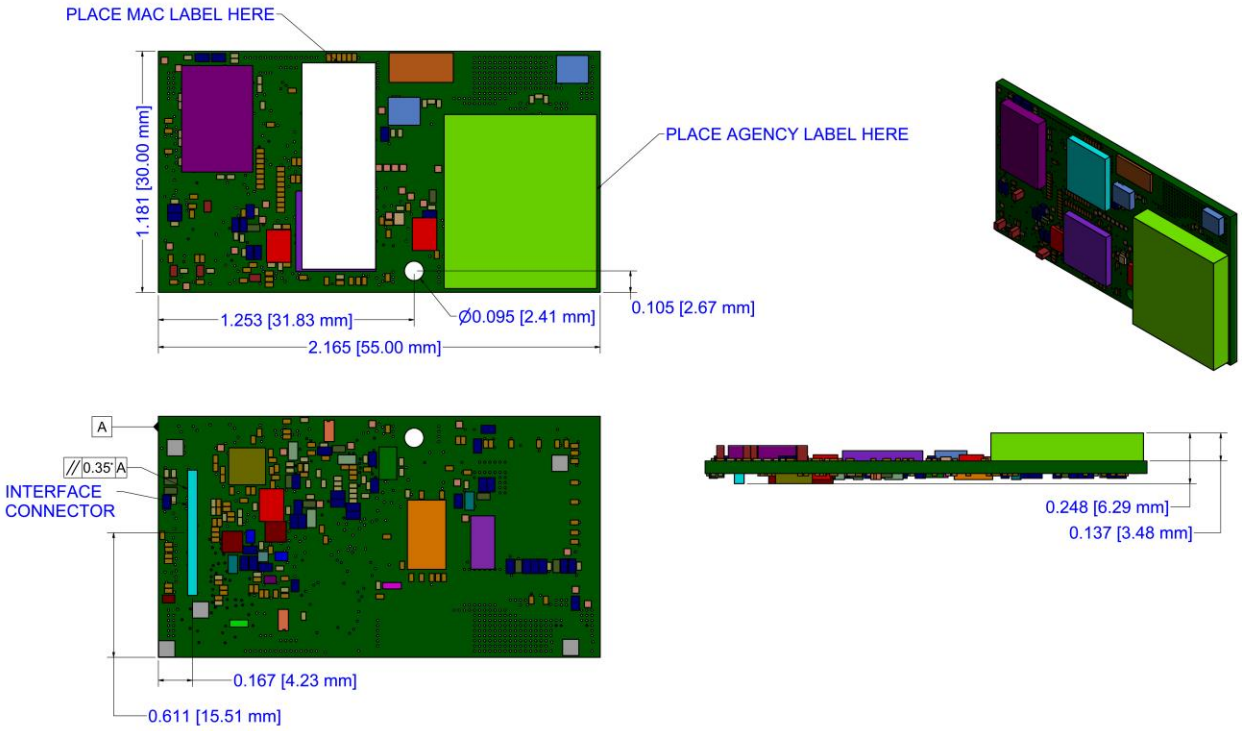
Wireless Specifications

Table 2-12 Wireless Specifications

Wireless Standard	Channel Frequency Range	Transmit Power (Typical)	Receive Sensitivity (Typical)
802.11 b/g/n	2.412 – 2.484 GHz	17 dBm for 802.11b DSSS 17 dBm for 802.11b CCK 15 dBm for 802.11g/n OFDM	-71.0 dBm (<10% PER) @65Mbps -74.0 dBm (<10% PER) @54Mbps -94.0 dBm (<8% PER) @1Mbps
802.11 a/n	4.900 – 5.925 GHz	12 dBm	-69.0 dBm (<10% PER) @65Mbps -72.0 dBm (<10% PER) @54Mbps -88.0 dBm (<10% PER) @6Mbps

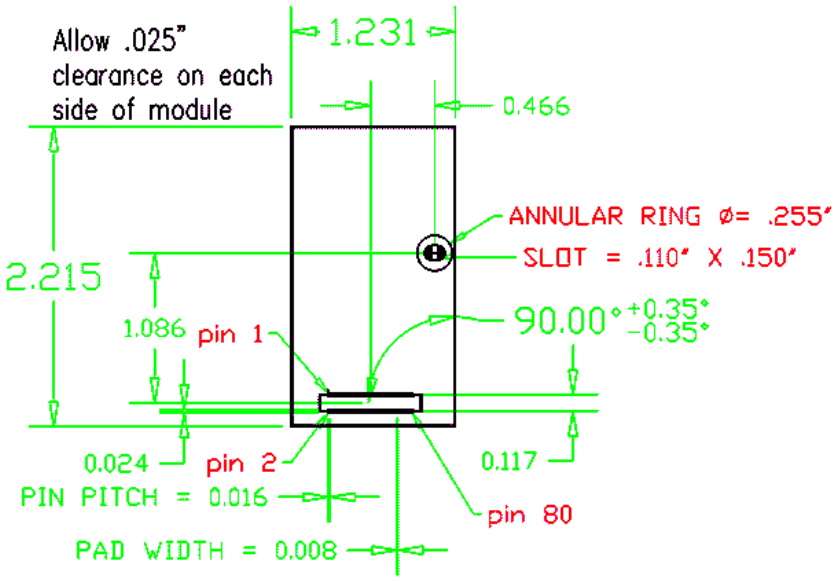
Dimensions

Figure 2-12 Mechanical Dimensions



Note: *Dimensions are in inches unless otherwise noted. Tolerance is +/- 0.005 inches.*

Figure 2-13 Pin Locations of PremierWave Module (Top View)



Note: *The recommended mounting diagram above assumes that both male and female I/O connectors are placed with an angular tolerance of ±0.35° or better. If this tolerance cannot be held on the customer's PCBA, a larger slot and component keepout should be used to accommodate.*

Mounting Instructions

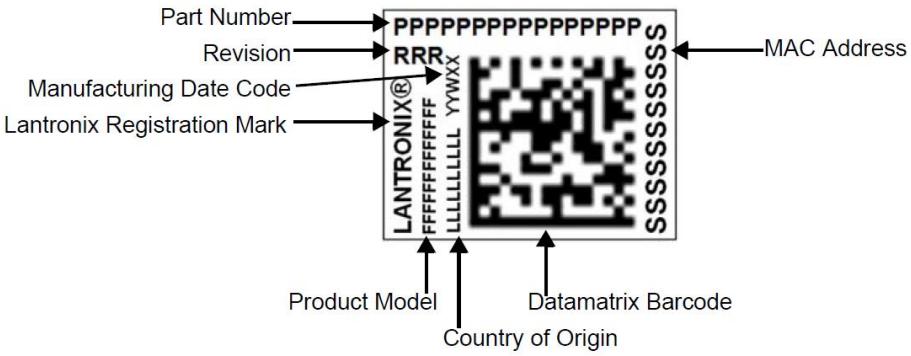
The PremierWave module should be mounted with hardware that maintains a 2mm height. Lantronix can provide this hardware as part number 120-093-R. The mated height of the interface connector is 2mm. If custom hardware is made, it must maintain the mounting height of 2mm to ensure the interface connector is properly seated.

If the PremierWave module will be subjected to drops, or significant shock and vibration, additional methods of securing the module are recommended. Any additional securing mechanism should prevent the interface connector from disconnecting. The design of this mechanism may change depending on the customer enclosure, PCB and weight of the system.

Product Information Labels

Figure 2-14 PremierWave EN Product Label

Figure 2-15 PremierWave SE1000 Product Label



A: Compliance

Compliance Information Emission/Susceptibility

(According to ISO/IEC Guide 17050-1, 17050-2 and EN 45014)

Manufacturer's Name & Address:

Lantronix 7535 Irvine Center Drive, Suite 100, Irvine, CA 92618 USA

Declares that the following product:

Product Name Model: PremierWave® EN Embedded Device Server,
and PremierWave® SE1000 Embedded Device Server*

***Note:** Wireless standards are not applicable to the PremierWave SE1000 device server.*

Conforms to the following standards or other normative documents:

- FCC Part 15.247/15.407 Class B
- RSS-210
- RSS-Gen Issue 2
- ICES-003 Issue 4
- ETSI EN 301 489-1 V1.8.1
- ETSI EN 301 489-17 V2.1.1
- ETSI EN 300 328 V1.8.1
- ETSI EN 301 893 V1.7.1
- Japan Article 2, Section 1, No. 19
- Japan Article 2, Section 1, No. 19-3
- Japan Article 2, Section 1, No. 19-3-2
- EN 60950-1, Second Edition
- CSA 22.2, No. 60950-1-07, Second Edition

Safety

Low Voltage Directive (2006/95/EC),

- IEC/EN 60950-1, Second Edition
- UL 60950-1, Second Edition
- CAN/CSA-C22.2 No. 60950-1-07, Second Edition

Table A-1 Soldering Profiles and Washing Notification

Process Product	Reflow Soldering [Profile]	Wave Soldering [Profile]	Hand Soldering [Profile]	Washing
PremierWave® EN PremierWave® SE1000	Not Applicable	Not Applicable	Not Applicable	Not Compatible[1]

1 - Washing is a process to remove manufacturing process contaminants, typically after soldering. Washing enclosed products can force outside contaminants to become trapped inside product and affect product function.

Manufacturer's Contact

Lantronix, Inc.
7535 Irvine Center Drive, Suite 100
Irvine, CA 92618 USA
Tel: 949-453-3990

Table A-2 PremierWave Regulatory Domains

		REGION:	US/CANADA		JAPAN		EUROPEAN UNION		WORLDWIDE	
	Frequency	Channel	Scan Type	Adhoc Permitted	Scan Type	Adhoc Permitted	Scan Type	Adhoc Permitted	Scan Type	Adhoc Permitted
2.4 GHz Band	2412	1	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2417	2	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2422	3	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2427	4	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2432	5	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2437	6	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2442	7	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2447	8	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2452	9	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2457	10	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2462	11	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	2467	12	N/A	N/A	Active	Yes	Active	Yes	Passive	Yes
	2472	13	N/A	N/A	Active	Yes	Active	Yes	Passive	Yes
	2484	14	N/A	N/A	Active	Yes	N/A	N/A	Passive	Yes
5 GHz Band	5180	36	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	5200	40	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	5220	44	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	5240	48	Active	Yes	Active	Yes	Active	Yes	Passive	Yes
	5260	52	Passive	No	Passive	No	Passive	No	Passive	No
	5280	56	Passive	No	Passive	No	Passive	No	Passive	No
	5300	60	Passive	No	Passive	No	Passive	No	Passive	No
	5320	64	Passive	No	Passive	No	Passive	No	Passive	No
	5500	100	Passive	No	Passive	No	Passive	No	Passive	No
	5520	104	Passive	No	Passive	No	Passive	No	Passive	No
	5540	108	Passive	No	Passive	No	Passive	No	Passive	No
	5560	112	Passive	No	Passive	No	Passive	No	Passive	No
	5580	116	Passive	No	Passive	No	Passive	No	Passive	No
	5600	120	N/A	N/A	Passive	No	Passive	No	Passive	No
	5620	124	N/A	N/A	Passive	No	Passive	No	Passive	No
	5640	128	N/A	N/A	Passive	No	Passive	No	Passive	No
	5660	132	Passive	No	Passive	No	Passive	No	Passive	No
	5680	136	Passive	No	Passive	No	Passive	No	Passive	No
	5700	140	Passive	No	Passive	No	Passive	No	Passive	No
	5745	149	Active	Yes	N/A	N/A	N/A	N/A	Passive	Yes
	5765	153	Active	Yes	N/A	N/A	N/A	N/A	Passive	Yes
	5785	157	Active	Yes	N/A	N/A	N/A	N/A	Passive	Yes
	5805	161	Active	Yes	N/A	N/A	N/A	N/A	Passive	Yes
	5825	165	Active	Yes	N/A	N/A	N/A	N/A	Passive	Yes

Note: *The PremierWave EN does not support 40Mhz bandwidth channels. Country codes are not available to the end user. Last updated for Ganges driver version 3.2.12.*

B: Warranty

For details on the Lantronix warranty replacement policy, please go to our web site at www.lantronix.com/support/warranty.