1 915B FUNCTIONAL OVERVIEW

The 915B is a 900MHz radio module intended to provide connectivity between an end-user's computer and an Internet Service Provider. It is a single PCB wireless solution based on the Intersil PRISM II Direct Sequence Chip Set. The 915B is functionally equivalent to the 915A PCBA (previously certified with FCC ID: OOX-915A), the EUM3006/E3K6 (OOX-E3K6), the MMT9000 (OOX-WMAN), in regards to frequency of operation, output power, and modulation scheme.

The 915B is intended for mounting in variety of chassis, including an aluminum enclosure for external mounting as a base station.

1.1 Overall functionality

The 915B consists of two main sections; the digital and the RF section. Block diagrams for both sections can be found in the document "915B Block Diagrams". The digital section contains the following functionality:

1. I/O
2. Ethernet PHY
3. Microprocessor/MAC
4. Memory
5. Power Regulation

The radio module's RF section contains the following functionality:

1. Baseband Processor
2. Modulator/Demodulator (with IF synthesizer)
3. RF Synthesizer
4. Up Converter
5. Power Amplifier
6. Low Noise Amplifier (LNA)
7. Down Converter
8. RF VCO
9. IF VCO
10. Reference Oscillator
11. Antenna (RF) Interface

During transmission, data obtained by the Microprocessor from the I/O ports, is transferred to the MAC. The MAC reformats the data and places it on the Baseband Processor TX data line. This data is modulated using CCK modulation and then spread using a defined PN code such that the data is sent at a rate of 2.75Mbit/s. The data is preceded by a header that uses DPSK modulation.

Two signals are generated, the In-Phase (I) and Quadrature (Q) components. The I & Q signals are sent to the Modulator/Demodulator where they are first filtered and then modulated with the IF frequency (70 MHz).

The IF oscillator generates a 140 MHz signal which is divided by two inside the Modulator/Demodulator and used to modulate the I & Q signals. The final IF signal of 70 MHz is then sent to the Up converter. The Up converter will shift this signal to the RF frequency for the channel programmed in the synthesizer, for operation within the 902-928 MHz ISM band. In the final stage, this signal is amplified to produce +27.3 dBm RF power as measured at the output of the antenna port.

In receive mode, the radio signal is amplified by the LNA, and then sent to the Down converter. The Down converter converts this signal from the 902-928 MHz range to the IF frequency, 70 MHz. The Modulator/Demodulator then converts the signal to baseband and splits the signal into its I & Q components, before sending it to the Baseband Processor. Finally, the Baseband Processor despreads and demodulates the data contained in the CCK format, and places it on the RX data line to the MAC. The MAC modifies the data, then transfers it to the Microprocessor which reformats the information and sends it out the I/O ports.

The RF and IF Local Oscillator signals are generated using the synthesizers and voltage controlled oscillators. The RF synthesizer is programmed with the desired RF channel frequency plus the IF frequency. The IF synthesizer in the Modulator/Demodulator is programmed with 140MHz. The baseband processor and the synthesizer are driven from a common 44 MHz oscillator to control the timing of these chips.

Example (for Channel 1 operation)**:** **RF** **IF** **LO**

905 MHz + 70 MHz = 975 MHz

1.2 Output Power

Each 915B is calibrated at 905, 915 and 925 MHz during manufacturing to output the 27.3 dBm power at the antenna connector.

The maximum time the transmitter is on is 5.1 msec after which it is in receive mode for at least 0.9 msec, so that the max. duty cycle is 5.1/6.0 = 85%. This duty cycle is not under the control of the user, but is inherent in the Dynamic Polled MAC used to control access to the channel.

1.3 Antennas

The antennas being cerified with the 915B board include:

- Omni-Directional Dipole – 10 dBd / 12.15 dBi
- Log-periodic Sector – 14 dBd / 16.15 dBi
- Dipole array – 11.5 dBd / 13.65 dBi

There are two criteria on the max. EIRP for a Part 15 transmitter in the 902-928 MHz range: 1) Maximum of 36 dBm EIRP and 2) Max. of 0.603 mW/cm^2 for radiation exposure The min. separation distance to ensure RF exposure is acceptable for an EIRP of 36 dBm is 22.9 cm.

Outdoor antennas are intended to be mounted in a permanent fixed location, where we require installers to provide at least 30 cm separation between people and the antenna.

The following tables show antenna gains for each type of antenna and the associated antenna system gain including cable losses for installations to ensure that the 36 dBm EIRP outdoor requirement is met. The installer will determine the cable losses based in cable types, cable lengths and insertion losses of all devices (e.g. cavity filters, Surge protectors) between the antenna connector and the antenna connector.

Table 1 – Tested Antennas

#	Antenna Type	Manufacturer / Model Number	Gain (dBd)	Gain (dBi)
1	Onmi-Directional Dipole	Antel / BCD-87010N	10	12.15
2	Log-periodic	Swedcom / SC9014	14	16.15
3	Dipole array	Til-tek / TA-926VH-8-120	11.5	13.65

Table 2 – Cable Loss Requirements for Outdoor Antennas

#	Antenna Type	Power at Antenna Port (dBm) – peak	+ Antenna Gain (dBi)	- Cable Loss (dB)*	System EIRP (dBm)	Min. Sep. Warning
1	Onmi-Directional Dipole	27.3	12.15	3.45	36.0	30 cm
2	Log-periodic	27.3	16.15	7.45	36.0	30 cm
3	Dipole array	27.3	13.65	4.95	36.0	30 cm

* Cable loss here also includes insertion losses due to devices and connectors.

For antennas of the same type, but with less gain, the cable loss requirements can be reduced. For example, a 9 dBi Dipole antenna would only require 0.3 dB cable loss.

The following table shows the cable losses required to use the highest gain antennas of each approved type when mounted indoors. Note that the System EIRP must be no more than 34.8 dBi for an indoor antenna, so that the radiation at a min. separation of 20 cm is within the required safety limits. For practical installations, an antenna of lesser gain is more likely to be used for indoor installations, so this table is a guideline for the worst cases.

Table 3 – Cable Loss Requirements for Indoor Antennas

#	Antenna Type	Power at Antenna Port (dBm) – peak	+ Antenna Gain (dBi)	- Cable Loss (dB)*	System EIRP (dBm)	Min. Sep. Warning
1	Onmi-Directional Dipole	27.3	12.15	4.65	34.8	20 cm
2	Log-periodic	27.3	16.15	8.65	34.8	20 cm
3	Dipole array	27.3	13.65	6.15	34.8	20 cm

* Cable loss here also includes insertion losses due to devices and connectors.

1.4 Power Supply

The 915B is powered from an AC/DC power supply, the AULT PW147RB4800F01. This power supply has been tested with the 915B as well as having its own FCC Class B acceptance.