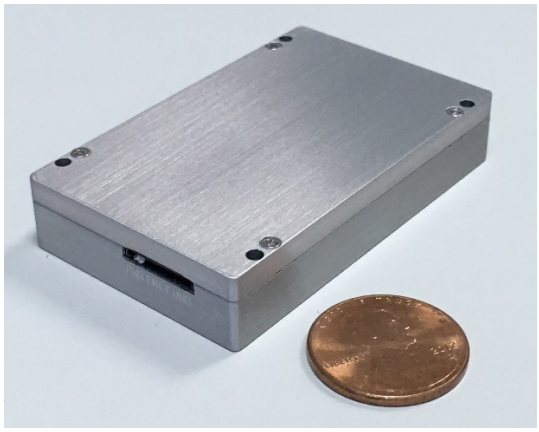
User manual

Model: RM-915-2H

900 MHz, Rugged, Long Range 2 Stream Broadband Radio Transceiver



Features

- Very low size, weight, and power (SWaP) for mobile applications
    - 37x68x11 mm, 70 grams (2 stream)
- Available in frequency bands up to 6 GHz
- Configurable channel size from 3~40 MHz
- Dynamic Link adaptation to optimize throughput depending on channel conditions
- Adaptive radio modulations from DSSS up to 64QAM
- High Tx power for long range (adjustable up to 1W)
- Up to 50 Mbps Iperf throughput
- Ethernet interface to allow easy integration into various applications
- Point-to-Point, Point-to-Multipoint, and Adhoc operating modes
- Mobile mesh router (Optional)
- High wireless data security with up to 128 bit AES encryption
- OTA firmware upgrade
- Industrial temperature range (-40C to +85C)
- COTS – Commercial off the Shelf

Target Applications

- Unmanned Aerial Vehicles (Drones)
- Mobile robotics
- Mines and Construction site machines
- Public Safety/Video surveillance
- Private Networks in Oil and gas fields
- Wind Turbine and Solar farms
- Wireless ethernet extensions

TECHNICAL SPECIFICATIONS	
Model No.	**RM-915-2H** (Rugged, Long Range applications
Chipset	Qualcomm Atheros QCA4531 with Extended Temperature range
Software Support	OpenWRT (Wireless Router/Linux OS)
Center Frequency Range	902 MHz ~ 928 MHz
Channel Bandwidth*	5 MHz
Radio Modulation (Auto Adjust)	CCK, BPSK, QPSK, 16 QAM, and 64 QAM
Data Rates Supported	802.11 b/g: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48 and 54 Mbps (2.4 GHz) 802.11n: MCS0-15
802.11n version 2.0 Capabilities	Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Tx/Rx), Maximal ratio combining (MRC), Cyclic shift diversity (CSD), Frame aggregation, block ACK, 802.11e compatible bursting, Spatial multiplexing, cyclic-delay diversity (CDD), low-density parity check (LDPC), Space Time Block Code (STBC)
Operating Modes	AP, STA and Adhoc modes to implement Point to Point, Point to multi Point, and Mesh networks
MAC Protocol	TDD with Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)
Wireless Error Correction	FEC, ARQ
Wireless Data Security	128 bit AES, WEP, TKIP and WAPI hardware encryption. Support for IEEE 802.11d, e, h, i, k, r, v, w and time stamp standards
FIPS Certification	Loop back mode to facilitate FIPS AES certification, Small packet size (96 bytes) in AES encryption at full packet rate

Tx/Rx Specification	Radio Modulation	Coding Rate	Tx Power (±2dBm)**	Rx Sensitivity (Typ)
5 MHz Channel				
802.11n	BPSK	1/2	30	-98

802.11n	16 QAM	3/4	30	-89
802.11n	64 QAM	3/4	24	-82

* It is advantageous to use the smallest Channel Bandwidth that can support the Throughput requirements. Smaller bandwidths provide more channels to choose and help avoid interference issues. The system's SNR is higher at smaller Channel Bandwidths and Range is longer.

Antenna Signal Strength	-35 to -85 dBm (Recommended), Absolute Maximum=+12 dBm
Receiver LNA Gain	>10 dB
Receive chain Noise Figure	6 dB
RF Power control by Driver	In 0.5 dBm steps. Accuracy of power calibration loop ±2 dBm. Each transceiver individually calibrated and tested.
RF Hardware Disable (RF Kill)	Pin 20 of miniPCI-E interface. (Required for FAA compliance)
Control for External Power Amp	Available as an optional configuration
Receiver Adjacent Channel Rejection (ACR)	>18 dB @ 11a, 6 Mbps (Typ)
Receiver Alternate Channel Rejection (ALCR)	>35 dB @ 11a, 6 Mbps (Typ)
Transmitter Adjacent Channel Leakage power Ratio (ACLR)	45 dB (Fc ± ChBW)
Transmitter Spurious Emission Suppression	-40 dBc
PHYSICAL, ENVIRONMENTAL AND OTHER SPECIFICATIONS	
Antenna Ports	2 Ports (50 Ohms) with MMCX connectors
Integrated Antenna Port Protection	>20 KV (Human Body Model)
Host Interface	100Base-T Ethernet
Host CPU Board	Any CPU board with Industry standard miniPCI-Express

	interface with minimum 6 mm connector height
Operating Voltage	5~42 V
Power Consumption	9.0W in data transfer mode 3.3W in data receive mode
Shield case temperature range (Operating)	-40°C to +85°C (Rugged, Long range RM-915-1G model) The System's thermal design should ensure that the transceiver's shield case temperature is maintained within these specifications.
Cable Assembly	Assembly drawing available upon request.
Dimensions	68 x 57 x 11.5 mm 70 grams Mechanical drawing and 3D-CAD files available upon request
Humidity (Operating)	0% – 95% (Non-condensing)
Regulatory Requirements	Designed and Verified to meet various regulatory requirements. Formal testing and approval is required based on the System Integrator's particular host platform and antenna type. The System Integrator is also responsible for obtaining all required regulatory approvals in target markets for the finished product. Doodle Labs can offer assistance for compliance testing of the System Integrator's host platform.
RoHS/WEEE Compliance	Yes. 100% Recyclable/Biodegradable packaging

* Specifications are subject to change without prior notice.

FCC Radiation Exposure Statement

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following: "Contains Transmitter Module 2AG87RM-915-2H" In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), 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.

The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host product must be labelled to display the Innovation, Science and Economic Development Canada certification number for the module, preceded by the word "Contains" or similar wording expressing the same meaning, as follows: Contains IC: 21411-RM9152H.

IC Statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

The term "IC: " before the certification/registration number only signifies that the Industry Canada technical specifications were met. This product meets the applicable Industry Canada technical specifications.

Le présent appareil est conforme aux CNR d'Industrie Canada applicable aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

Singapore:
Doodle Labs (SG) Pte. Ltd.
150 Kampong Ampat
KA Center, Suite 05-03
Singapore 368324
Tel: +65 6253 0100

USA:
Doodle Labs LLC
2 Mattawang Drive
Somerset, NJ 08873
Tel: +1 862 345 6781
Fax: +65 6353 5564