RDL-3000 Family

Broadband Wireless Systems

RDL-3000-RMH
Fixed White Space Device Radio Module

Product Manual

Copyright Information

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1 Product Overview

The RDL-3000 Radio Module RDL-3000-RMH fixed white space device is comprised of a proprietary Media Access Control (MAC) protocol engine and Time Division Duplexing (TDD)/ Orthogonal Frequency Division Duplexing (OFDM) digital radio.

The RDL-3000-RMH module is not designed for stand-alone operation. The module is sold as one component of a packaged system which includes a suitable housing for the module connectors for required external components including a power supply and antenna system. This is afterwards referred to as the 'final product'. The final product may be designed and manufactured by Redline or a licensed third party.

Frequency settings within the specified frequency ranges are software keyed to be compliant with specific regulatory agency requirements in the region of deployment.

RDL-3000-RMH:	473 - 611 MHz

Important: Read this entire document prior to installing or operating the RDL-3000-RMH module.

2 Conditions of Use

2.1 General Conditions

The RDL-3000-RMH is not provided for sale to the general public.

The RDL-3000-RMH fixed white space device contains a proprietary radio interface and can not be directly connected to any standard telecommunications or computer devices.

This manual is provided as supplement to technical and operational documentation and training provided by Redline and its agents. Any operation or use of the RDL-3000-RMH in any manner not expressly specified within this manual or approved in writing by Redline (or its agents) is expressly forbidden and voids the users right to operate the module. This includes, but is not limited to, any modification of the module hardware or software, installation of the module in a non approved enclosure, and use with non approved antennas.

2.2 Country of Use

Refer to the regulatory notices in this document before installing or operating the module.

The RDL-3000-RMH is certified with limiter modular approval for use as an 'intentional radiator' in the United States as device FCC ID: QC8-RDL3000RMH.

2.3 Product Labeling

Information labels are applied to the final product. The final product features a label on the outside surface listing the registration number for the enclosed RDL-3000-RMH module.

Contains	FCC ID:QC8-RDL3000RMH

Do not to remove any labels from the module or the final product.

3 Module Installation and Service

3.1 Installation Into a Final Product

The RDL-3000-RMH must only be installed by trained professional technicians authorized by Redline or its agents. The module must be installed only into an approved enclosure (see Conditions of Use) and only at an approved manufacturing facility or service depot.

3.2 Module Servicing

The RDL-3000-RMH is not intended to be field serviceable, and contains no field serviceable or field replaceable parts. The module must be serviced only at an approved manufacturing facility or service depot.

 **Warning:** The RDL-3000-RMH are susceptible to damage from electrostatic charge. Electrostatic Discharge (ESD) must be avoided to prevent damaging or destroying the module. The module must always be store in an anti-static container/bag prior to installation and following removal from the product for servicing. Observe ESD precautions when handling the module.

3.3 Professional Installation

Devices containing the Redline RDL-3000-RMH require professional installation. It is the responsibility of the installer to understand the product operation by attending training as required, reading and understanding the product documentation, and ensuring that all building, safety and regulatory codes are met and the installation is complete and secure.

3.4 Safety Precautions

Installation and service must be done by personnel having technical training and experience necessary to be aware of hazards during installation and/or service of RF equipment. The installation and/or service must be done using procedures designed to minimize any danger to technical personnel or any other person.

3.5 Radio Frequency Safety

The installer of this radio equipment must ensure the antenna is located or pointed such that it does not emit RF fields in excess of the general population limits as defined by:

- FCC CFR 47, Part 2.1091
  http://www.gpo.gov/fdsys/pkg/CFR-2009-title47-vol1/pdf/CFR-2009-title47-vol1-sec2-1091.pdf
- FCC OET Bulletin 65, Radio frequency radiation exposure evaluation for fixed devices
  http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65c.pdf

Refer to the regulatory statements included in this document.

4 Final Product Requirements

The following requirements apply to all final products incorporating the RDL-3000-RMH.

4.1 Frequency Bands

Operation of the final product requires a software 'key' that is available exclusively from Redline. This key restricts device operation to the FCC 473 - 611 MHz band on TV channels 14 - 37. The professional installer and operator can not modify or otherwise circumvent these operational restrictions.

To operate in the whitespace devices frequency range, each RDL-3000-RMH must contact and register with the WSDB database server (server URL is programmed into the RDL-3000-RMH). The RDL-3000 may only transmit on channels indicated as 'available' by the WSDB database. Channel assignments are temporary and the RDL-3000-RMH must periodically contact the WSDB to refresh the channel list. The RDL-3000-RMH vacates a channel in-use immediately when a WSDB database status update indicates the channel is no longer available or the expiry time for an obtained list has elapsed.

The RDL-3000-RMH operating as a PMP Sector Controller/PTP Master (PMP-SC) is not allowed to transmit on any channel before registering with the WSDB database and obtaining a list of available channels for its location. The RDL-3000-RMH operating as a PMP Subscriber/PTP Slave (PMP-SS) is allowed to transmit on the channel currently being used by the PMP-SC initially only for the purpose of registering with the WSDB database and obtaining a list of available channels for its location. If the channel in-use is not available, the PMP-SS notifies the PMP-SC and stops transmitting. The PMP-SS may register and obtain the current channel list once per hour.

4.2 Antenna Use and Transmit Power

The RDL-3000-RMH module supports operation with 2x2 MIMO antenna systems with two transmit chains and two receive chains. The RDL-3000-RMH module must be used only with certified antennas and using the channel size and output power level specified by the FCC regulations.

4.3 Certified Antennas

The RDL-3000-RMH module has been designed to operate with the antennas listed in the following table. Any additional antennas will be used only after authorization is obtained through Class II permissive change.

Table 1: Approved Antennas

Supplier	Part #	Gain (dBi)	Frequency Range (MHz)	Beamwidth (degrees)	Size	Polarity
Redline	AFD-DB-600-2ft-02	11	470-698MHz	48	48 cm (19 in)	dual
Redline	ALP-SB-60055-D1	11	470-698MHz	65	116 cm (46 in)	single

5 Regulatory Notices

5.1 FCC Notices: Deployment in USA

The following notices about deployment in the USA are included in training and documentation provided to professional installers and operators of the final product:

1. The final product must be professionally installed.
2. WARNING -- FCC RF Exposure Warnings

   To satisfy FCC RF exposure requirements for RF transmitting devices, a minimum distance of 40 cm (15 3/4") should be maintained between the antenna of this device and persons during device operation:

   To ensure compliance, operation at closer than these distances is not recommended. The antenna used for this transmitter must not be collocated in conjunction with any other antenna or transmitter.
3. FCC §15.706 Information to the user.

   (a) In addition to the labeling requirements contained in §15.19, the instructions furnished to the user of a white space device shall include the following statement, placed in a prominent location in the text of the manual:

   This equipment has been tested and found to comply with the rules for white space devices, pursuant to part 15 of the FCC rules. These rules are designed to provide reasonable protection against harmful interference. 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. 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 or more of the following measures:

   (1) Reorient or relocate the receiving antenna.

   (2) Increase the separation between the equipment and receiver.

   (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

   (4) Consult the manufacturer, dealer or an experienced radio/TV technician for help.
4. FCC Information to Users § FCC 15.19:

   Operation is subject to the following two conditions:

   (1) This device may not cause harmful interference.

   (2) This device must accept any interference received, including interference that may cause undesired operation.
5. FCC Information to Users § FCC 15.21:

   Warning: Changes or modifications not expressly approved by Redline Communications could void the user's authority to operate the equipment.

5.2 Power & EIRP (MIMO Operation)

473 - 611 MHz: FCC 47 CFR Part 15 Subpart H, §15.709

Table 2: 473 - 611 MHz: RF Power & EIRP: 6 MHz Channel

Frequency, MHz	Modulation	Antenna 1 power (dBm) / 6 MHz	Antenna 2 power (dBm) / 6 MHz	Total output power	Output power limit
473	BPSK	17.81	17.02	20.44	23.00
473	256QAM	17.70	17.24	20.49	23.00
545	BPSK	17.73	17.15	20.46	23.00
545	256QAM	17.94	17.19	20.59	23.00
611	BPSK	17.87	17.04	20.49	23.00
611	256QAM	17.85	17.10	20.50	23.00

Table 3: 476 - 608 MHz: RF Power & EIRP: 12 MHz Channel

Frequency, MHz	Modulation	Antenna 1 power (dBm) / 6 MHz	Antenna 2 power (dBm) / 6 MHz	Total output power	Output power limit
476	BPSK	16.58	16.82	19.71	22.00
476	256QAM	16.55	16.85	19.71	22.00
542	BPSK	16.46	16.80	19.64	22.00
542	256QAM	16.54	16.84	19.70	22.00
608	BPSK	16.59	16.60	19.61	22.00
608	256QAM	16.55	16.65	19.61	22.00

Table 4: 479 - 605 MHz: RF Power & EIRP: 18 MHz Channel

Frequency, MHz	Modulation	Antenna 1 power (dBm) / 6 MHz	Antenna 2 power (dBm) / 6 MHz	Total output power	Output power limit
479	BPSK	15.14	15.19	18.18	21.00
479	256QAM	15.13	15.13	18.14	21.00
545	BPSK	15.03	15.09	18.07	21.00
545	256QAM	15.11	15.16	18.15	21.00
605	BPSK	15.01	14.98	18.01	21.00
605	256QAM	15.07	15.01	18.05	21.00

Table 5: 482 - 602 MHz: RF Power & EIRP: 24 MHz Channel

Frequency, MHz	Modulation	Antenna 1 power (dBm) / 6 MHz	Antenna 2 power (dBm) / 6 MHz	Total output power	Output power limit
482	BPSK	12.79	13.67	16.26	20.00
482	256QAM	12.74	13.75	16.28	20.00
542	BPSK	13.32	12.70	16.03	20.00
542	256QAM	13.33	12.69	16.03	20.00
602	BPSK	13.78	13.76	16.78	20.00
602	256QAM	13.72	13.76	16.75	20.00

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