RM5800 User Manual

Emerson™ Automation Solutions, Rosemount® Inc

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ROSEMOUNT

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1 PURPOSE

This document serves as a user manual for the Emerson Rosemount RM5800 radio module.

2 GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION

Rosemount Inc.'s RM5800 WirelessHART 2.4GHz Radio Module has been specifically designed to interface with industrial and process control equipment designed and marketed by the Emerson family of companies. The RM5800 is designed to be fully compliant with the WirelessHART specification. The RM5800 utilizes the global license-free 2.4GHz band at output power levels that are compatible with government regulations throughout the world.

The RM5800's very low power consumption characteristics make it perfect for battery-powered equipment. The multi-functional interface of the RM5800 is flexible enough for it to be integrated into many types of sensors. From pressure, temperature, and flow monitoring to machinery health and valve position control, the RM5800 is the best choice for WirelessHART compatible communications.

3 PRODUCT SPECIFICATIONS

3.1 OPERATIONAL DESCRIPTION

The RM5800 radio module is an 802.15.4 standard radio with the following features:

- +8 dBm (6.3 mW) conducted RF output power specification
- –95 dBm receiver sensitivity
- AES FIPS PUB 197 (128 bit) encryption

3.2 NORMAL OPERATING CONDITIONS

Parameter	Min	Typ	Max	Units	Comments
Operational supply voltage range (between V_{DD} and V_{SS})	2.1		3.76	V	Including noise and load regulation
Voltage on analog input pins	0		1.8	V	
Voltage supply noise			250	mV_{p-p}	50 Hz to 2 MHz
Operating temperature range	–40		+85	°C	
Maximum allowed temperature ramp during operation			8	°C/min	–40 °C to +85 °C

Unless otherwise noted, assume V_{DD} is 3.0 V and temperature is 25 °C.

3.3 RADIO SPECIFICATIONS

Parameter	Min	Typ	Max	Units	Comments
Operating frequency	2.4000		2.4835	GHz	Channel center: 2.440Ghz
Number of channels		15			
Channel separation		5		MHz	
Occupied channel bandwidth		2.5		MHz	At –20 dBc
Modulation					IEEE 802.15.4
Raw data rate		250		kbps	
Receiver operating maximum input level		0		dBm	
Receiver sensitivity		–95 –93		dBm dBm	At 50% PER, V_{DD} = 3 V, 25 °C At 1% PER, V_{DD} = 3 V, 25 °C, (inferred from 50% PER measurement)
Output power, conducted		+8	+8.5	dBm	V_{DD} = 3 V, 25 °C, manufacturing tolerance variation +0.5dBm

3.4 ANTENNA SPECIFICATIONS

The antenna used with this module must meet specifications below.

Parameter	Value
Frequency range	2.4–2.4835 GHz
Antenna connector	MMCX
Minimum cable length	100mm (3.937in)
Trace antenna specifications	N/A

When the RM5800 is placed inside an enclosure, the antenna should be mounted such that the radiating portion of the antenna protrudes from the enclosure and connected using a coaxial cable. For optimum performance, allow the antenna to be positioned vertically when installed.

Note, local government regulations must be consulted with regards to approved antenna type and allowed antenna gain for use with this module.

4 INTEGRATION INSTRUCTIONS

4.1 DESIGN DESCRIPTION

The RM5800 connects to a host feature board via 22 pin connectors. Antennas or antenna adapter cables are connected to the radio module via MMCX cable connector.

4.1.1 Device Photo

4.2 INSTALLATION GUIDELINES

The RM5800 radio module is only available for use in the Emerson family of products. The RM5800 is not readily available to consumers; it is not sold by retail to the public. The RM5800 radio module has a limited modular approval, which requires that it be installed by approved host integrators under advisement of the module manufacturer. Host products are used in industrial and commercial environments.

5 REGULATORY AND STANDARDS COMPLIANCE

The RM5800 allows a limited modular host product implementation in the United States, Canada, and European Union. The following guidance must be reviewed to ensure final compliance to regulatory standards.

5.1 FCC COMPLIANCE TESTING

The RM5800 radio module has demonstrated compliance to FCC 15.247:2021.

To fulfill FCC certification requirements, products incorporating the RM5800 must comply with the following:

1. An external label must be provided on the outside of the final product enclosure specifying the FCC identifier as described in 5.1.3 below.
2. The antenna must be electrically identical to the FCC-approved antenna specifications for the RM5800 as described in 5.1.2 with the exception that the gain may be lower than specified in Section 5.1.2.
3. The device integrating the RM5800 may not cause harmful interference, and must accept any interference received, including interference that may cause undesired operation.
4. An unintentional radiator scan must be performed on each final device integrating the RM5800, per FCC rules and regulations, CFR Title 47, Part 15, Subpart B. If the final device system (host product and modular transmitter) exceeds the spurious emissions or output power limit, the product must not be marketed in the United States.
5. Professional installation as per section 4.3 of the modular integration manual, available upon request.

Reference KDB 996369 D04 Module Integration Guide v02 for detailed integration and testing guidance.

5.1.1 FCC Antenna Selection

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 within a host device, except in accordance with FCC multi-transmitter product procedures.

Compliance to FCC rule 15.203 must be ensured in the final design of the product. Reference KDB 353028 for direct guidance on meeting this requirement. This can be done by either ensuring the professional installation of the final product or designing it in such a way as to make the antenna integral to the final product. Further, the RM5800 is only utilized by Emerson internal companies, and is not available to the general public. The RM5800 is an industrial network communication module and only works on Wireless Hart protocols and as such is part of an industrial process control system professionally installed and maintained per Section 4.3 of the modular integration manual, available upon request.

5.1.2 FCC Allowed Antenna Types

Allowed antenna types include:

1. Maximum 8.0dBi dipole antenna (tested kinds include Taoglas 2.5/3.0dBi PCB strip, Emerson 4.5dBi per drawing 00753-2035, and PCTEL 8.0dBi omnidirectional antenna BOA24008NF)
2. Maximum 14.5dBi yagi-uda (tested L-COM 14.5dBi model HG2415Y-HF)
3. Maximum 18dBi reflective array (tested L-COM 18dBi flat panel antenna model HG2418P)

5.1.3 FCC Labeling Requirements

The exterior of the host product must have a label with the following (or similar) text specifying the FCC identifier in 4 points or larger.

> Contains transmitter module FCC ID: LW2-RM5801
>
> Or Contains FCC ID: LW2-RM5801

5.1.4 FCC Documentation Requirements

User documentation must contain the following statements:

- 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 must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.
- Changes or modification to the equipment not expressly approved by Rosemount, Inc. could void the user's authority to operate the equipment.

5.2 ISED Compliance Testing

The RM5800 radio module has demonstrated compliance to ISED RSS 247. Host products are required to meet all applicable requirements in RSS-Gen, including the radio frequency exposure compliance requirements in RSS-102.

5.2.1 ISED Antenna Requirements

This radio module HVIN 5801 IC: 2731A-RM50801 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna types:

1. Maximum 8.0dBi dipole antenna (tested kinds include Taoglas 2.5/3.0dBi PCB strip, Emerson 4.5dBi per drawing 00753-2035 and PCTEL 8.0dBi omnidirectional antenna BOA24008NF), nominal impedance 50 ohms
2. Maximum 14.5dBi yagi-uda (tested L-COM 14.5dBi model HG2415Y-HF), impedance 50 ohms
3. Maximum 18dBi reflective array (tested L-COM 18dBi flat panel antenna model HG2418P), impedance 50ohms

5.2.2 ISED Labeling Requirements

The exterior of the host product must have a label with the following (or similar) text specifying the IC identifier in 4 points or larger.

Contains IC: 2731A-RM5801

5.2.3 ISED Documentation Requirements

User documentation of host products must contain the following statements:

- This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions: This device may not cause interference. This device must accept any interference, including interference that may cause undesired operation of the device.
- Cet appareil est conforme à la norme RSS-247 Industrie Canada exempt de licence. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas provoquer

d'interférences et (2) cet appareil doit accepter toute interférence, y compris les interférences pouvant causer un mauvais fonctionnement du dispositif.

5.3 EU COMPLIANCE

The RM5800 has been demonstrated compliance to EN 300 328.

Host products are required to demonstrate compliance to EU Radio Equipment Directive (RED) 2014/53/EU and follow all documentation and labeling requirements.

Antennas may have a maximum gain of 12dBi.