



MODEL: SFI-MD200

# **IOT/M2M Radio Module Type 2 OEM/Integrators Manual**

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Revision 1.0

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# FCC and Industry Canada Regulatory Statements

## FCC

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. Any changes or modifications not expressly approved by manufacturer could void the user's authority to operate the equipment.

IMPORTANT! Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

## Industry Canada

This device complies with Industry Canada license-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables 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.

IMPORTANT! Tous les changements ou modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner cet équipement.

## 47 CFR 15.105- FCC

NOTE: 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 or more 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 Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada

#### FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

#### **Important Note:**

##### **Radiation Exposure Statement:**

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

#### **Note Importante: (Pour l'utilisation de dispositifs mobiles)**

##### **Declaration d'exposition aux radiations:**

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

## OEM Requirements

- This module is limited to OEM Installation only.
- The OEM is responsible for ensuring that the end-user has no manual instructions to remove or install this module.
- The antenna on this module is neither removable, replaceable or modifiable by the OEM or end user.
- This module is limited to installation on mobile or fixed applications.
- If the FCC ID of the module is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label stating:
  - Contains FCC ID: 2ADZ3D001
  - Contains FCC ID: SH6MDBT42Q
  - Contains IC: 12684A-D001
  - Contains IC: 8017A-MDBT42Q
- Separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093. Guidance for achieving this compliance can be obtained from Sure-fi Inc. in the Contact Information section at the end of this manual.
- The OEM integrator is responsible for ensuring compliance with Part 15 Subpart B requirements when this module is installed in a host product. Guidance for achieving this compliance can be obtained from Sure-fi Inc. in the Contact Information section at the end of this manual.

## Description

The Sure-Fi SFI-MD200 Wireless Radio Module is the most versatile and highest performance modular solution available for the IOT/M2M industries. Programmable radio settings allow the user to optimize application requirements through trade-offs between range (or obstruction and interference), data rate and latency, or power savings. All settings are configurable through a simple serial interface.

Sure-Fi's patented PCB antenna eliminates the need for bulky, expensive external antennas without sacrificing performance. Adjustable power outputs from 1 mWatt to 1 Watt (1.65 Watts radiated when including 2.6 dBi antenna gain).

## Specifications

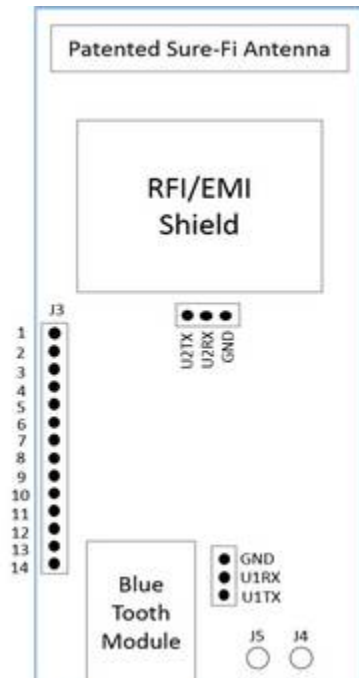
RADIO			Note
Frequency Band	902 – 928 MHz		ISM Band
Channel Quantity	72		@ 350 KHz channel spacing
Modulation Method	Frequency Hopping: Chirped Spread Spectrum		
Bandwidths	125 - 250 KHz		MIN, MAX
Data Rates	≈ 540 bps		
Antenna	Integrated PCB		No user antenna allowed
Antenna Gain	2.6 dBi		
Transmit Power	0 dBm (1 milliWatt)	30 dBm (1 Watt)	MIN, MAX
Receiver Sensitivity	-129 dBm	-148 dBm	MIN, MAX
Interface			
	UART 115,200 Baud		
Data Encryption	AES128, proprietary		

ELECTRICAL	MIN	TYP	MAX
Supply Voltage	12V AC/DC	24V AC/DC	30V AC/DC
Voltage on any Pin w/ respect to VSS		VSS - 0.3 VDC	
Voltage on any Pin w/ respect to VDD		VDD +0.3 VDC	
Logic input Low Voltage		≤ .2 x VDD	
Logic input High Voltage		≥ .8 x VDD	
Output voltage per pin	12V AC/DC	24V AC/DC	30V AC/DC
Output current per pin			150 mA
Input voltage per pin	12V AC/DC	24V AC/DC	30V AC/DC
Input current per pin			1.2 mA

Current Consumption			
Transmit			
1 Watt (30dBm)		222 mAAC /168 mADC	
½ Watt (27dBm)		191 mAAC/136 mADC	
¼ Watt (24 dBm)		157 mAAC/102 mADC	
1/8 Watt (21dBm)		107 mAAC/65 mADC	
1/16 Watt (18dBm)		69 mAAC/41 mADC	
1 mWatt (0 dBm)		35 mAAC/20 mADC	
Receive		22 mAAC/12 mADC	
Standby		TBD	
Sleep		TBD	

	LENGTH	WIDTH	HEIGHT
DIMENSIONS	4.30 in (109.22 mm)	2.57 in (65.28 mm)	.450 in (11.43 mm)
<b>ENVIRONMENTAL</b>	<b>MIN</b>	<b>TYP</b>	<b>MAX</b>
Operating Temperature	-40C		+85C
Storage Temperature	-40C		+115C
Humidity	10%		90%
Non Condensing			

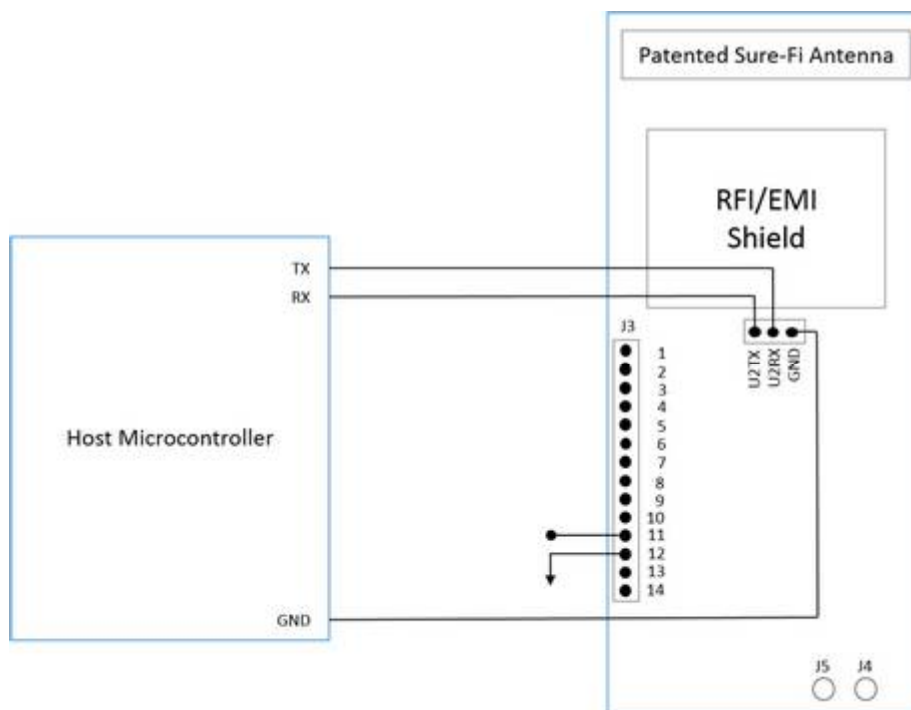
## Pin Diagram



## Pin Description

PIN	DESCRIPTION	NOTE
1	INPUT 1	
2	INPUT 2	
3	INPUT 3	
4	INPUT 4	
5	INPUT 5	
6	INPUT 6	
7	INPUT 7	
8	INPUT 8	
9	OUTPUT 1	
10	OUTPUT 2	
11	12-30V AC/DC	J4 OPTIONAL
12	COMMON	J5 OPTIONAL
13	GND	
14	GND	
U1TX	UART_TX	Data Out
U1RX	UART_RX	Data In
GND	GND	
U2TX	UART_TX	Data Out
U2RX	UART_RX	Data In
GND	GND	

## Minimum Hardware Connection



# Command Reference

## Command Enumeration

Command Name	HEX Value	Payload Size (bytes)
<b>Run-Time Commands</b>		
SureCmd_DefaultSettings	0x30	0
SureCmd_ClearFlags	0x31	1
SureCmd_WriteConfig	0x32	1
SureCmd_SetIntEnableBits	0x33	4
SureCmd_Reset	0x34	0
SureCmd_Sleep	0x35	0
SureCmd_QosLightshow	0x36	0
SureCmd_TransmitData	0x37	0 – 62
SureCmd_StartEncryption	0x38	0
SureCmd_StopEncryption	0x39	0
SureCmd_ShowQualityOfService	0x3A	0
<b>Get Information Commands</b>		
SureCmd_GetStatus	0x40	0
SureCmd_GetIntEnableBits	0x41	0
SureCmd_GetModuleVersion	0x42	0
SureCmd_GetPacketTimeOnAir	0x43	0
SureCmd_GetRandomNumber	0x44	0
SureCmd_GetPacket	0x45	0
SureCmd_GetAckPacket	0x46	0
SureCmd_GetReceiveInfo	0x47	0
SureCmd_GetTransmitInfo	0x48	0
SureCmd_GetRegisteredSerial	0x49	0
<b>Set Setting Commands</b>		
SureCmd_SetAllSettings	0x50	14
SureCmd_SetRadioMode	0x51	1 or 3
SureCmd_SetFhssTable	0x52	1
SureCmd_SetReceiveUID	0x53	0 - 8
SureCmd_SetTransmitUID	0x54	0 - 8
SureCmd_SetReceivePacketSize	0x55	1
SureCmd_SetRadioPolarity	0x56	1
SureCmd_SetTransmitPower	0x57	1
SureCmd_SetAckData	0x58	0 – 62
SureCmd_SetTableHoppingEnabled	0x59	1
-	-	-
SureCmd_SetQosConfig	0x60	1
SureCmd_SetIndications	0x61	3
SureCmd_SetQuietMode	0x62	1
SureCmd_SetButtonConfig	0x63	1
SureCmd_SetAcksEnabled	0x64	1



SureCmd_SetNumRetries	0x65	1
<b>Get Setting Commands</b>		
SureCmd_GetAllSettings	0x70	0
SureCmd_GetRadioMode	0x71	0
SureCmd_GetFhssTable	0x72	0
SureCmd_GetReceiveUID	0x73	0
SureCmd_GetTransmitUID	0x74	0
SureCmd_GetReceivePacketSize	0x75	0
SureCmd_GetRadioPolarity	0x76	0
SureCmd_GetTransmitPower	0x77	0
SureCmd_GetAckData	0x78	0
SureCmd_GetTableHoppingEnabled	0x79	0
-	-	-
SureCmd_GetQosConfig	0x80	0
SureCmd_GetIndications	0x81	0
SureCmd_GetQuietMode	0x82	0
SureCmd_GetButtonConfig	0x83	0
SureCmd_GetAcksEnabled	0x84	0
SureCmd_GetNumRetries	0x85	0

### Command Format

Attention	Command	Length	Data
~	0x01-0xFF	0x00 – 0x40	Length as Required

## Bluetooth Module

The Bluetooth Module is an OEM device provided by Raytac, Inc. part number MDBT42Q that utilizes a Nordic Semiconductor NRF52 radio transceiver SOC.

Bluetooth commands are sent via a simple UART communication connection.

## Specifications

RADIO			Note
Frequency Band	2360 – 2500 MHz		ISM Band
Data Rates	≈ 1 Mbps – 2 Mbps		
Antenna	Integrated PCB Chip		No user antenna allowed
Transmit Power	-20 dBm	4 dBm (2.5 milliWatt)	MIN, MAX
Receiver Sensitivity	-93 dBm	-96 dBm	MIN, MAX
Interface: UART	115,200 Baud		
Data Encryption	AES128		

## Commands

The Bluetooth Module is primarily used for firmware updating of the Sure-Fi Radio Module. For instructions and source code to implement firmware updating, contact Sure-Fi.

For information to use the Bluetooth module in other modes, consult Raytac, Inc. and/or Nordic Semiconductor.

## APPENDIX

### Frequency Table (MHz)

<b>0x00</b>	902.5	<b>0x12</b>	908.8	<b>0x24</b>	915.1	<b>0x36</b>	921.4
<b>0x01</b>	902.85	<b>0x13</b>	909.15	<b>0x25</b>	915.45	<b>0x37</b>	921.75
<b>0x02</b>	903.2	<b>0x14</b>	909.5	<b>0x26</b>	915.8	<b>0x38</b>	922.1
<b>0x03</b>	903.55	<b>0x15</b>	909.85	<b>0x27</b>	916.15	<b>0x39</b>	922.45
<b>0x04</b>	903.9	<b>0x16</b>	910.2	<b>0x28</b>	916.5	<b>0x3A</b>	922.8
<b>0x05</b>	904.25	<b>0x17</b>	910.55	<b>0x29</b>	916.85	<b>0x3B</b>	923.15
<b>0x06</b>	904.6	<b>0x18</b>	910.9	<b>0x2A</b>	917.2	<b>0x3C</b>	923.5
<b>0x07</b>	904.95	<b>0x19</b>	911.25	<b>0x2B</b>	917.55	<b>0x3D</b>	923.85
<b>0x08</b>	905.3	<b>0x1A</b>	911.6	<b>0x2C</b>	917.9	<b>0x3E</b>	924.2
<b>0x09</b>	905.65	<b>0x1B</b>	911.95	<b>0x2D</b>	918.25	<b>0x3F</b>	924.55
<b>0x0A</b>	906	<b>0x1C</b>	912.3	<b>0x2E</b>	918.6	<b>0x40</b>	924.9
<b>0x0B</b>	906.35	<b>0x1D</b>	912.65	<b>0x2F</b>	918.95	<b>0x41</b>	925.25
<b>0x0C</b>	906.7	<b>0x1E</b>	913	<b>0x30</b>	919.3	<b>0x42</b>	925.6
<b>0x0D</b>	907.05	<b>0x1F</b>	913.35	<b>0x31</b>	919.65	<b>0x43</b>	925.95
<b>0x0E</b>	907.4	<b>0x20</b>	913.7	<b>0x32</b>	920	<b>0x44</b>	926.3
<b>0x0F</b>	907.75	<b>0x21</b>	914.05	<b>0x33</b>	920.35	<b>0x45</b>	926.65
<b>0x10</b>	908.1	<b>0x22</b>	914.4	<b>0x34</b>	920.7	<b>0x46</b>	927
<b>0x11</b>	908.45	<b>0x23</b>	914.75	<b>0x34</b>	921.05	<b>0x47</b>	927.35

### Contact Information

Sure-Fi, Inc

3000 Vista Way, STE 1

Provo, UT, 84606

Sure-Fi.com

### Liability

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