APPENDIX H

: USER'S MANUAL

NEWRUN_RF_module Description

1. Product Overview

- Advanced mesh networking

- Low power / low cost Rbee module

- 2.4 GHz for worldwide deployment

- Multiple antenna options

- Industrial temperature rating
  (−40°C to 85°C)

Rbee are the most advanced Zigbee modules available in the RBee footprint and are ideal for deployment in ZigBee networks. Available in the low-cost RBee, and utilizing the ZigBee Feature Set, these embedded RF modules are interoperable with ZigBee Feature Set device from other vendors. With advanced mesh networking functionality, RBee modules improve data traffic management, allow for greater noce density,, and provide OEMs with the ability to change firmware remotely with over-the-air updates.

RBee Protocols

RBee embedded modules are available with different protocols to suit a variety of applications and networking topologies. Supported protocols include IEE 802.15.4, the Zigbee Feature Set, proprietary long range, and RBee embedded RF modules share a common hardware footprint and are modeled after a common software API. Once deployed into an application, OEMs can rapidly change from one protocol to another with minimal time and development risk.

Drop-in Networking Comatibility

RBee embedded RF modules are compatible with Digi's Drop-in Networking adapters, network extenders and gateways that use the same protocol. This allows OEMs to embed RBee solutions into an application and have seamless communication to other devices using USB, RS-232,,digital I/O, analog I/O, Ethernet, Wi-Fi and even cellular connections with plug-and-play ease.

2 Product Specification

No.	Iteam	
Performance	Specification	Remark
RF Data Rate	32Kbps ~ 1Mbps	
Indoor/Urban Range	100m	
Outdoor/RF Line-of-Sight Range	500m	
Transmit Power	Max 0 dBm	
Adjust Gin Range	25dB	
Receiver Sensitivity (1%PER)	-100 dBm @ 250Kbps	
Features		
Serial Data interface	3.3V CMOS UART	
Configuration Method	API or AT commands, local or over-the-air	
Frequency Band	2.405 ~ 2.475GHz	
Modulation	DSSS (Direct Sequence Spread Spectrum)	
Channel Number	15ch	
ADC Inputs	4-bit ADC inputs	
Digital I/O	22	
Antenna Options	Patch , Dipole antenna	
Networking @ Security		
Encryption	128-bit AES	
Reliable Packet Delivery	Retries	
IDs and Channels	PAN ID, 64-bit IEEE MAC, 15 channels	
Power Requirements		
Supply Voltage	3.3VDC	
Transmit Current	95 mA @ 3.3VDC / 10dBm 85mA @ 3.3VDC / 0dBm	
Receive Current	25 mA @ 3.3VDC	
Power-Down Current	< 1.25 uA @ 25° C	
Chip Set		
Manufacture	Radio Pulse	KOREA
Part Number	RP-2S470	
Operating Temperature	-40℃ ~ + 85℃	

Antenna		
Patch antenna	GAIN : 4.3dBi	Peak gain
	VSWR : 1.5:1	
Dipole antenna	GAIN : 5dBi	Peak gain
	VSWR : 1.5 : 1	

3 Working Description

RP2470 RF transmitter method

☐ test period : TBD

☐ test detail location : Nextronics.co.ltd., by LAP

☐ test equipment and accessory

- PC(HOST), RP2470 RF module, module jig, Test Program(UartTest_1055)

☐ test environment

- newrun.co.ltd., AP, Door Host function & same PC Test Program ready (newrun data transmitter method the same)

- Test PGM Test Setting at windows transmitter size, transmitter number, retry number, TimeOut setting

   :: transmitter size : 1-PACKET(1055bytes), transmitter number: 48ea, retry number tree time, Time Out 400)
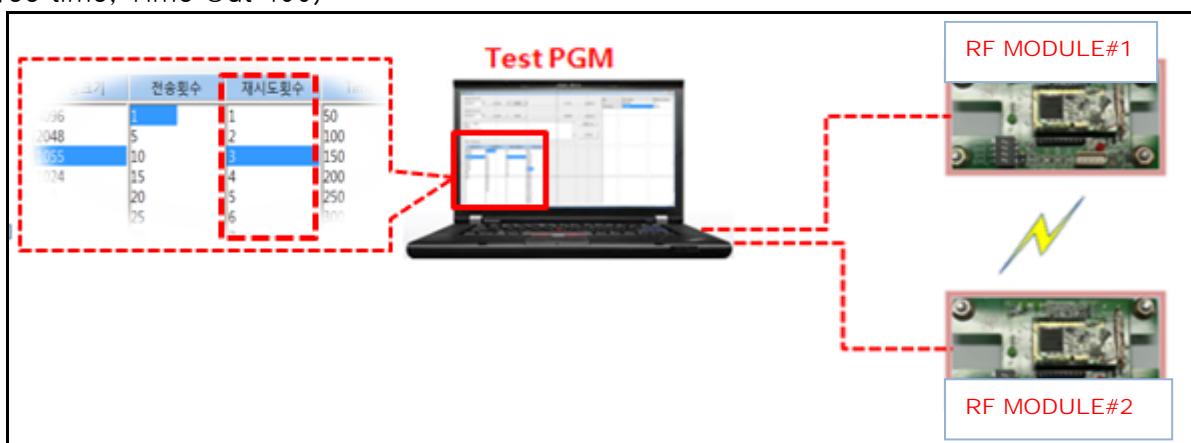
☐ Test Process

1. PC & module jig(1,2) 2ea connection, active Test PGM

2. Test PGM set environment .

2. RF module apply to zigbee and active reset.

3. Test PGM   at zigbee that open the UART port

4. Test PGM 48-packet(1055byte) transmitter and check result
     Result at the check picture. (red box)

No	Tx State	Retry Count
1	GOOD	0
0.254sec	100%	0.00

☐ Test method

1 Test condition

[Test condition]
- ✓ PC(D) <-> RP2470 RF module(Door) <-> RP2470 RF module(AP) <-> PC(A)
- ✓ Data Rate : 250kbps
- ✓ PAN ID : 0x1234
- ✓ PC(D)의 at Test PGM 48-Packet transmitter check

2 Active check

[Active status check]
- ✓ At receive Data of RF module RSSI strength display LED check
- ✓ PC(D) Tx state check test PGM status of windows

No	Tx State	Retry Count
1	GOOD	0
0.254sec	100%	0.00

- ➔ No : transmitter number
- ➔ Tx State : transmitter status display (GOOD : success, FAIL : fail)
- ➔ Retry Count : transmitter error   Host, re tray (at number re tray)
- ➔ Under result : total transmitter time, transmitter rate, re-tray number

☐ Check item

① Packet error re tray(HOST)

② Packer Ack signal processor(interval HOST)

③ 50-Kbyte transmitter time (total time : 16sec +/- 2sec)

④ Received at channel strength LED (Power value   LED status)

☐ Test Result data

No	Tx State	Retry Count
1	GOOD	1
47	GOOD	0
48	GOOD	0
13.419sec	100%	0.06

ITEM	ACTIVE	JUDGMENT	REMARK
At packet error re tray		OK	
packet Ack signal processor		OK	

50-Kbyte transmitter time		OK	
RSSI LED Display		OK	

Pairing test method

☐ Test Period : TBD

☐ Test detail location : Nextronics.co.ltd., LAP

☐ Test equipment and accessory

  - PC(power supply), RP2470 RF module,module jig

☐ Test environment

  - RF module PIR-ON-OFF pin GND.
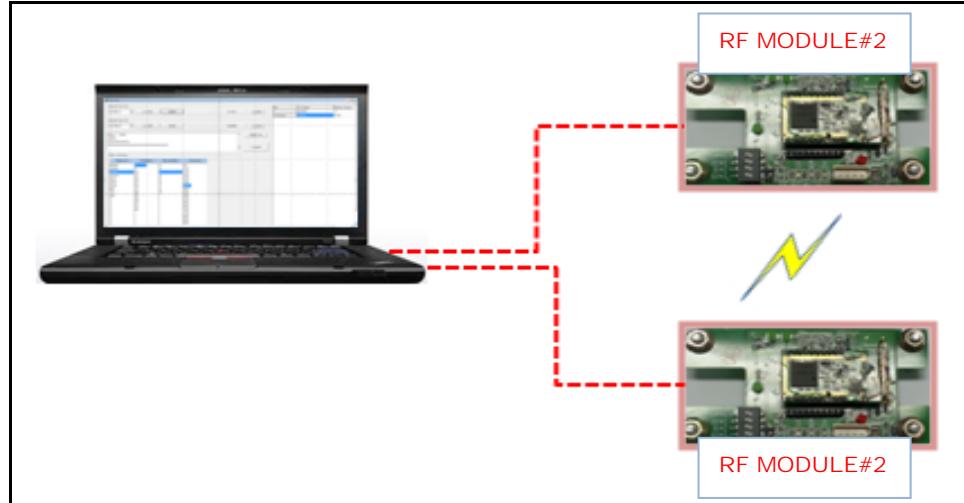
☐ Test processor

1. RF module PIR-ON-OFF pin GND.

2. AP RF module power on.(PC USB connection)

3. Door RF module power on.(PC USB connection)

4. From Door RF module to AP RF pairing requiring PAN ID.

☐ Test method

1 test condition

[test condition]
  ✓ RF module PIR-ON-OFF pin GND
  ✓ After AP RF module power on and   Door RF module power on

2 Active check

[Active   status   check]
  ✓ AP RF module pairing mode DB-MID LED active
  ✓ Door RF module pairing mode   DB-HIG LED active
  ✓ If the pairing done
    ➔ AP RF module DB-HIG, DB-MID LED each on/off
    ➔ Door RF module DB-HIG, DB-MID, DB-LOW LED each on/off
  ✓ Done pairing and then power Reset normal Pair active

☐ Check item

  ① PIR-ON-OFF pin on or off

  ② Pairing active check

□ Test Result data

① AP pairing mode

AP MODULE

② Door pairing mode

Door MODULE
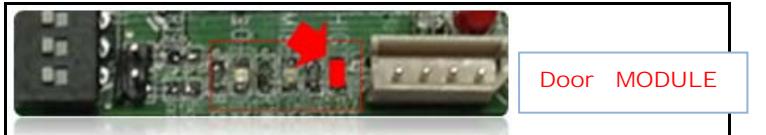
③ AP pairing done

AP MODULE
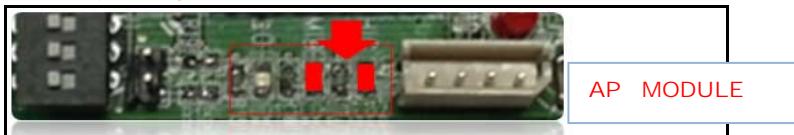
④ Door pairing done

Door MODULE
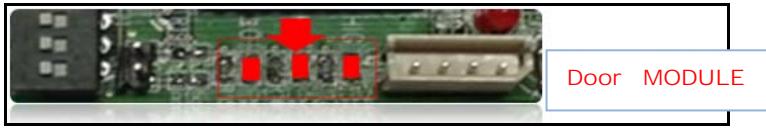
ITEM	ACTIVE	JUDGMENT	REMARK
PIR-ON-OFF		OK	
Active pairing		OK	

At emergency　Dip set for channel avoid and then switch active method

☐ Test　period : TBD

☐ Test detail location : Nextronics.co.ltd., LAP

☐ Test equipment and accessory

－　PC(power supply), RP2470 RF module,module jig,ComMaster PGM(PC RS232 PGM)

☐ Test environment

－ RF module Channel change DIP switch setting

－ PC ComMaster PGM installation
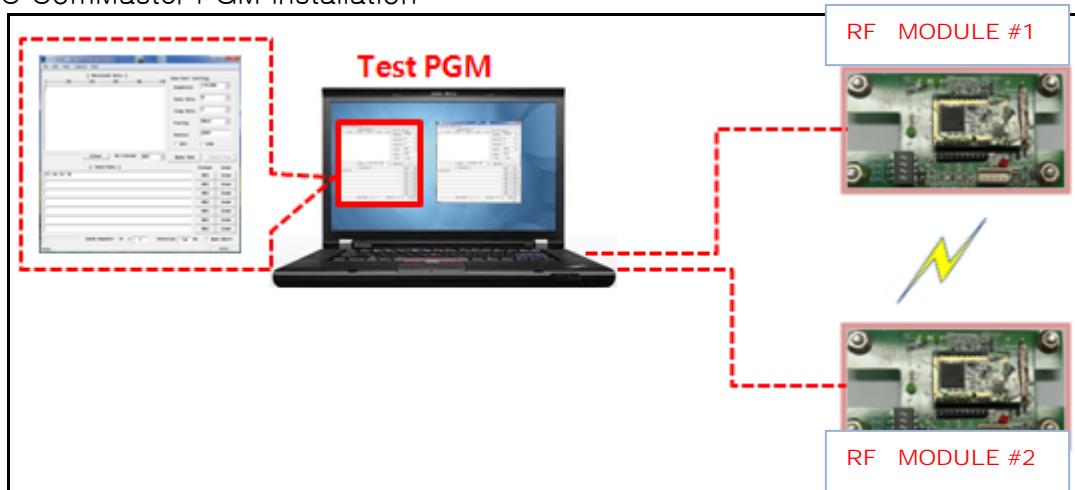
☐ Test Processor

1. Approve RF module all after channel alteration by DIP switch.

2. Connect PC and module jig (1, 2) 2, and execute ComMater PGM about individuation module.

3. Open COM port in ComMaster.

4. Do DIP switch agreement or communication because is different test

☐ Test method

1 Test condition

[TEST CONDITION]
✓ By DIP switch RF module that amendment is available and jig or terminal ready
✓ When initialize Reset -> MCU necessarily all after control do DIP switch, channel is established

2 Active check

| [Active　status　check] |
| --- |
| ✓ Channel as is different or whether or not data output that is transmited on other part ComMaster screen because do to establish do DIP switch equally, and do data transmission confirmation |

☐ Check item

① Channel frequency establishment confirmation by DIP switch alteration

② Intercommunication confirmation by channel alteration

ITEM	ACTIVE	JUDGMENT	REMARK
Frequency change DIP		OK	

4. Mechanical Drawings

(top view)   (side view)

Unit : mm
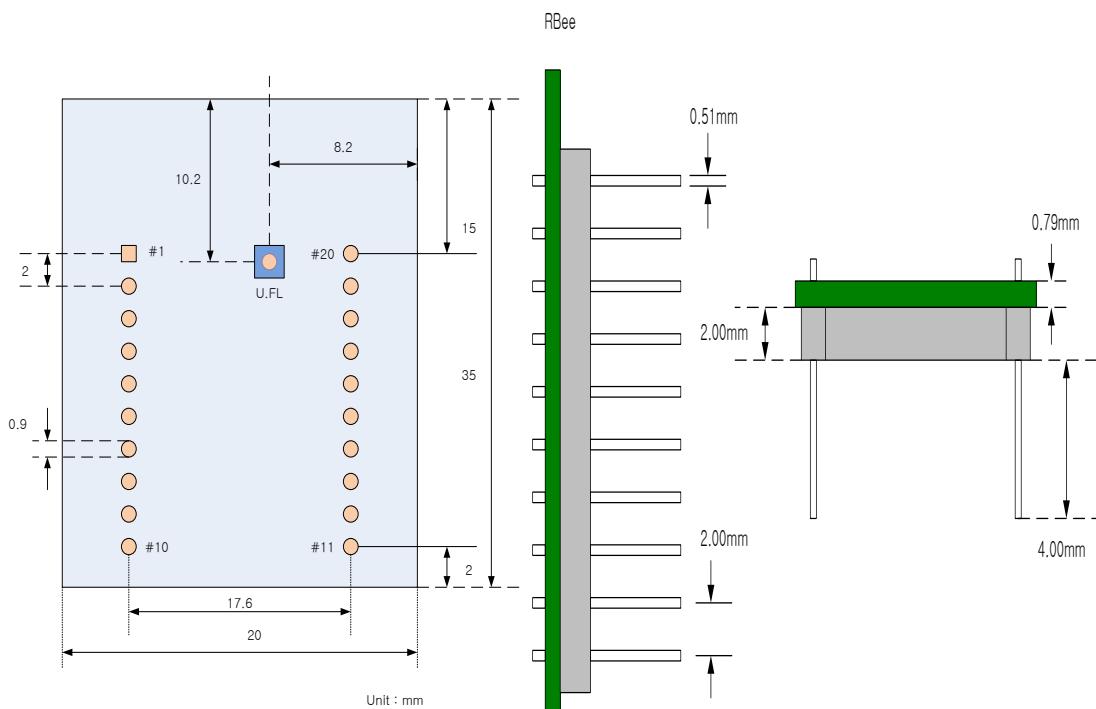
5. PIN Allocation

Pin	NAME	Default Function	Direction	Description
J2-1	DB-HIG	Received RSSI high	O	Number expansion command century LED indication (very good)
J2-2	GPIO_2	General I/O	NC	-
J2-3	GPIO_3	CHA_MODE	I	Channel collision escaping function vitality monad function vitality GND processing
J2-4	GPIO_4	HALT	O	Channel collision escaping function action information

				(Active Low)
J2-5	GPIO_5	RSSI_REQ	I	Reception request signal (Active Low)
J2-6	ISP	RF 모듈 전용	NC	-
J2-7	RX0	UART RX(Ext MCU)	-	UART(External MCU reference)
J2-8	TX0	UART TX(Ext MCU)	-	
J2-9	VCC3.3V	Supply Voltage	VCC	External power input
J2-10	GND	Ground	GND	GND
J1-1	DB-LOW	Received RSSI low	O	Receive strength LED (low)
J1-2	DB-MID	Received RSSI middle	O	Receive strength LED (normal)
J1-3	RESET	Chip reset	I	RF module Reset port
J1-4	PIR-ON-OFF	Pairing switch	I	pairing mode port(GND) *AP GND
J1-5	CH1	Frequency selection 1	I	Frequency setting 4-DIP
J1-6	CH2	Frequency selection 2	I	
J1-7	CH3	Frequency selection 4	I	
J1-8	CH4	Frequency selection 8	I	
J1-9	GPIO_1	M/S select	I	RF module Master/Slaver sel MASTER :: GND(AP) SLAVER :: OPEN(DOOR)
J1-10	GND	Ground	GND	

6. Product installation method

6.1 Direction of module power pin after is rapidly control Baud and conclusion do

6.2 Contract by possible brazing for control baud and conclusion that strong

6.3 Observe parts of other control baud and unnecessary contact

6.4 Module and antenna that attach directly do by soldering for fixing that strong.

6.5 Must avoid defilade of material such as tablet public peace hoop or season that attach directly in module

7. Guarantee and A/S information

Company Name : Nextronics.co.ltd.,
Address : #505,han-shin, IT Tower,235, Guro 3-Dong Guro-gu,Seoul,152-768,korea
Telephone number   : 02 -2108 – 6170
Person : heak sock,wong
FAX : 02 – 2108 – 6175

8. Product Information

Company name	Newrun.co.ltd.,	비고
Name of product	little power radio appliance	
Manufacture y,m,d	Different indicator	
Manufacture	Newrun.co.ltd.,	
Manufacture national	South Korea	
Approve part	MSIP-CRM-NRd-SDRF-110	

9. Caution

※ Must supply voltage entire regulated power supply in finished product being not having regulated power supply circuit.

※ Relevant radio appliance can not play service connected with person's name safety because there is electric wave jamming possibility

10. FCC (Certification)

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.

FCC WARNING : This equipment may generate or use radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made

U.S. Regulatory wireless Notice
This products emits radio frequency energy, but the radiated output power of this device is far below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact with the the antenna during normal operation is minimized.

FCC Radiation Exposure Statement
This equipment compiles with FCC radiation exposure limits set forth an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operation in conjunction with any other antenna or transmitter.

Federal Communications Commission (FCC) Statement
You are cautioned that changes of modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

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 to radio communications. However, there is no guarantee that 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 of 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.

End Product Labeling

The modular transmitter must be labeled with its own FCC ID number, and, if the FCC ID 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 referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2ABTORF_Z110" or "Contains FCC ID: 2ABTORF_Z110." Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.