



RFU-920 User Manual

920 MHz RS-232/RS-485 Wireless Modem

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Warranty

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1. Introduction

The RFU-920 is an RS-232/RS-485 to 920 MHz radio modem that converts data from RS-232/RS-485 devices into 920 MHz wireless messages in the ISM band and transmitted then out using transparent mode.



The RFU-920 can reach up to 500 meters in a 125 kbps wireless baud rate and in a direct line-of-sight (LOS) environment. In order to overcome the interference that may be encountered in the environment, the RFU-920 provides a range of wireless baud rates from 250 kbps to a minimum of 5 kbps for the user to adjust. In addition, the user can adjust the wireless channel and group ID to avoid interference between two neighboring RFU-920 networks. The RFU-920 also supports repeater mode to solve the problem of communication distance or dead space. All these functions can be achieved through the dedicated software with simple settings, and because of the easy setup, it is also relatively simple to replace the RFU-920 device for system maintenance.

1.1 Features

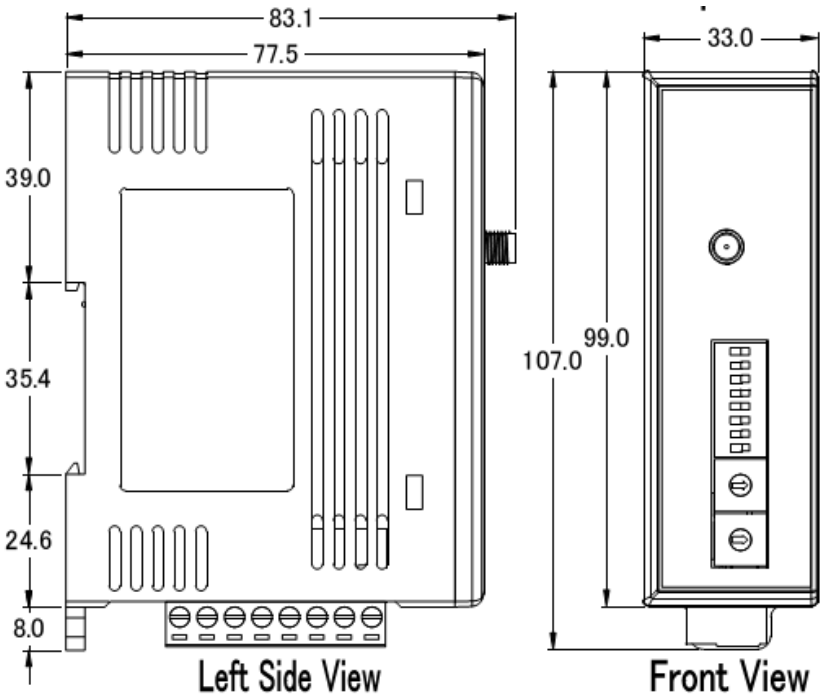
- 920 MHz Radio Frequency
- 16 RF channels
- Provides RF Baud Rates from 5k to 250 kbps
- RF output power maximum 18 dBm
- Wireless line of sight (LOS) transmission range of up to 500 meters at an RF Baud Rate of 125 kbps and output power 18 dBm.
- Transparent transmission mode
- Message package is up to 512 bytes
- Provides Baud Rates from 1200 to 115200 bps for both the RS-232 and RS-485 interfaces
- ESD Protection: Contact +/-4 kV
- Isolation: 3000 VDC for DC-to-DC, 2500 Vrms using a photocoupler
- DIN-Rail Mountable
- Operating Temperatures, -25°C ~ +75°C

1.2 Specification

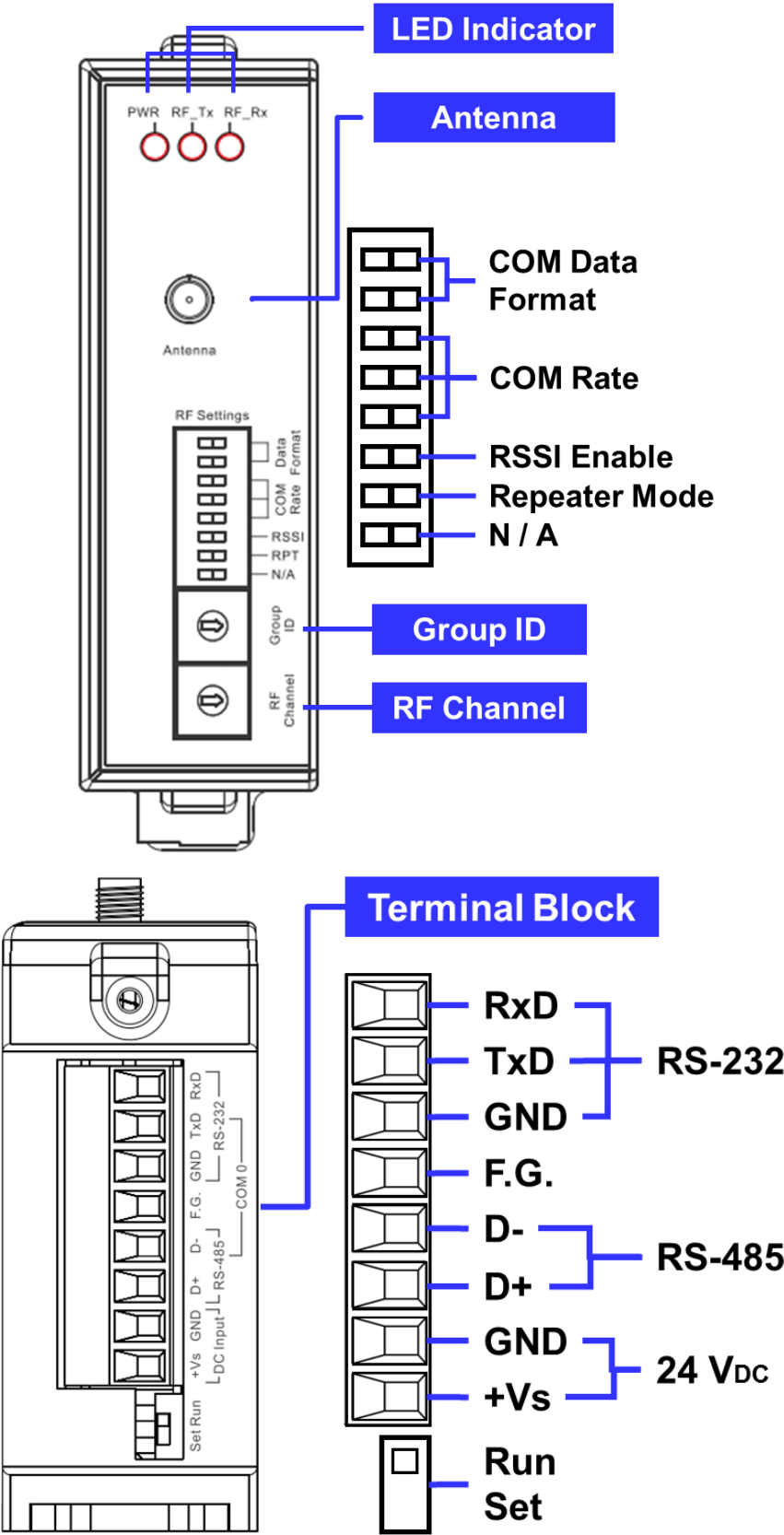
RF Interface	
Radio Frequency	920.0000 MHz ~ 924.6875 MHz
Channels	0 ~ 15
Baud Rate	5 k ~ 250 kbps (default is 125 kbps, setting by utility)
Transmission Power	Max 18 dBm
Antenna	0 dBi Omni directional, RPSMA
Transmission Distance (LoS)	500 m (125 kbps, output power 18 dBm)
Group ID	0x0 ~ 0xE : Setting by rotary switch 0xF : Setting by utility
Protocols	Transparent transmit
Repeater	Support repeater mode
Temporary Buffer Size	512 Bytes
COM Port Interface	
RS-232	TxD, RxD and GND
RS-485	D+, D- ; 3000 VDC for DC-to-DC
Baud Rate (bps)	1200 ~ 115200 bps
Data Format	N,8,1 / O,8,1 / E,8,1
LED Indicators	
RF_Tx	Green (RF Transmit)
RF_Rx	Yellow (RF Receive)

PWR	Red (Power)
Isolation	
Intra-module Isolation	2500 Vrms for photocoupler (COM Port)
EMS Protection	
ESD	+/- 4 kV Contact
EFT	+/- 1 kV
Surge	+/- 1 kV
Power	
Input Voltage Range	+10 V _{DC} ~ +30 V _{DC}
Power Consumption	1 W @ 24 V _{DC}
Mechanical	
Dimensions (W x L x H) (not include antenna)	108 mm x 84 mm x 33 mm
Antenna Dimensions (L x Ø)	108 mm x 10 mm
Installation	DIN-Rail
Environment	
Operating Temperature	-25°C ~ +75°C
Storage Temperature	-30°C ~ +80°C
Relative Humidity	10 to 90% RH (Non-condensing)

1.3 Dimensions



1.4 Appearance



Terminal Block

	Pin	Description
	RxD	RS-232
	TxD	
	GND	
	F.G.	Frame Ground
	D-	RS-485
	D+	
	GND	Power:
	+Vs	+10 ~ +30 V _{DC} , 1A

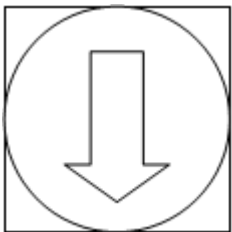
LED Indicator

LED	Behavior	Description
PWR	On	+10 ~ +30 V _{DC} Power On
	Off	Power Off
RF_Tx	On	RF is transmitting data
	Off	RF is no data to transmit
RF_Rx	Always On	RF is receiving data, signal strength high
	100ms Flash	RF is receiving data, signal strength middle
	500ms Flash	RF is receiving data, signal strength low
	Off	RF is no data to receive

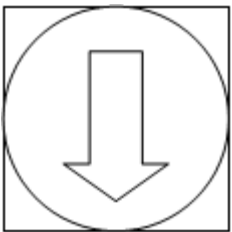
2. Configuration

The RFU-920 has the following descriptions about the rotary and dip switches in the hardware setting mode:

RF Channel

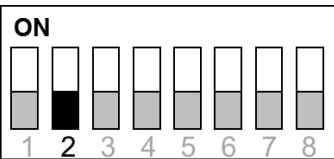
Switch Name	No.	Freq. (MHz)	No.	Freq. (MHz)
 RF Channel	0	920.000	8	922.5000
	1	920.3125	9	922.8125
	2	920.6250	A	923.1250
	3	920.9375	B	923.4375
	4	921.2500	C	923.7500
	5	921.5625	D	924.0625
	6	921.8750	E	924.3750
	7	922.1875	F	924.6875

Group ID

Switch Name	No.	Description
 Group ID	0x0 ~ 0xE	Group ID setting by rotary switch
	0xF	Group ID setting by utility ID range: 0x0000 ~ 0xFFFF

* RFU-920 with different Group ID cannot communicate with each other.

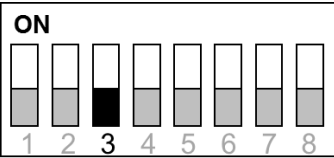
Repeater Mode

Switch Name	Status	Description
 RPT (Repeater Mode)		Enable repeater mode (supports 1 hub)
		Normal communication mode

* The repeater mode can bypass RF message from one side to another. For example, if the repeater received a message "0x01 0x02 0x03 0x04", then the repeater will transmitted the same message to RF.

Note that, repeater mode only support 1 hub.

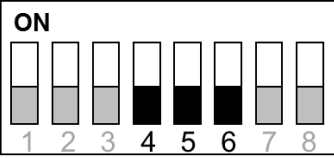
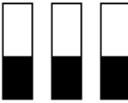
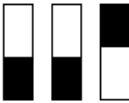
RSSI Data

Switch Name	Status	Description
 RSSI		Enable RSSI data
		Disable RSSI data

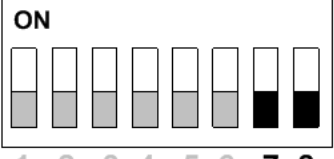
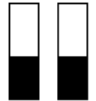
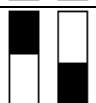
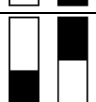
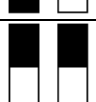
Note: When this function is enabled, the RFU-920 appends the RSSI values of both the sender and local receiver to the end of each received wireless packet before forwarding it via RS-232/RS-485. For example, if the received data is 0x01 0x02 0x03 0x04, and the sender's RSSI is 0x63 and the local RSSI is 0x75, the output will be 0x01 0x02 0x03 0x04 0x63 0x75. RSSI ranges from 0x00 to 0xFF, where 0xFF indicates the strongest signal.

- For the comparison between RSSI Data and signal strength, please refer to Appendix A.

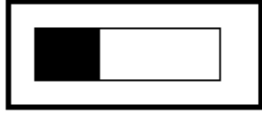
COM Data Rate

Switch Name	Status	Data Rate (bps)	Status	Data Rate (bps)
 COM Rate		115200		9600
		57600		4800
		38400		2400
		19200		1200

COM Data Format

Switch Name	Status	Data Format
 COM Data Format		N, 8, 1
		O, 8, 1
		E, 8, 1
		Reserved

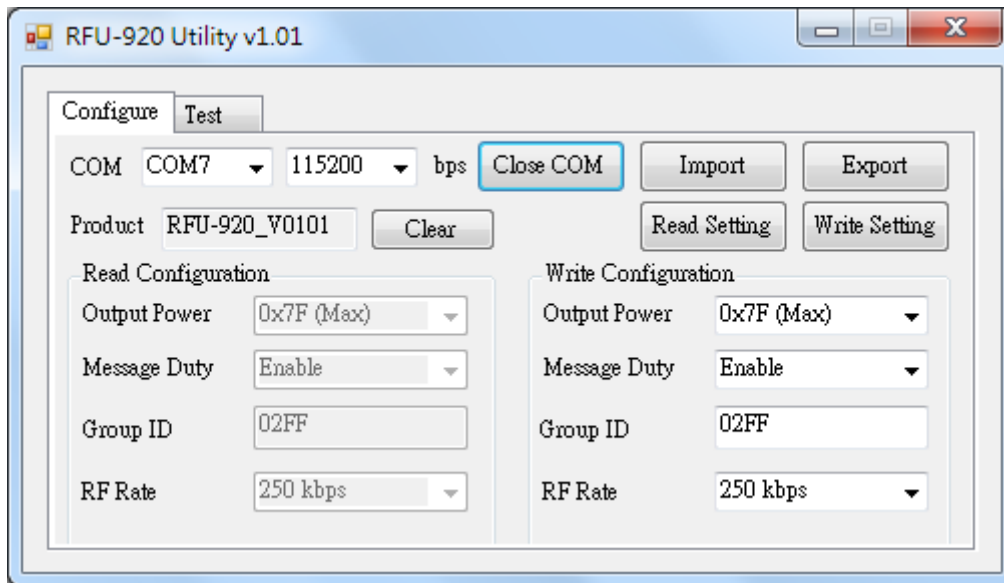
Set Switch

Switch Name	Status	Description
 Set Run	Set *	Utility setting mode
	Run	Normal run mode

- In the setting mode, users can set parameters such as wireless channel, output power, message duty cycle, etc. through the RFU-920 utility.

3. RFU-920 Utility

When RFU-920 utility connects with RFU-920 in set mode through COM port. The utility will get the RFU-920 firmware version and configuration. User also can change the RF channel and communication frequency to RFU-920 through the utility.



Open COM Button: Open COM port and connect to RFU-920.

Close Button: Close COM port.

Clear Button: Clears the value in the “Read Configuration” field.

Read Setting Button: Read the setting of RFU-920 and display it in the “Read Configuration” field.

Write Setting Button: Write the parameters in the “Write Configuration” field to the RFU-920 and read them back to the “Read Configuration” field for confirmation.

Import Button: Load the RFU-920's configuration file and display it in the

“Write Configuration” field.

Export Button: Export the settings of the “Write Configuration” field.

Product: Here will show the module name and firmware version.

Output Power: The RF output power is from 0x00 ~ 0x7F.

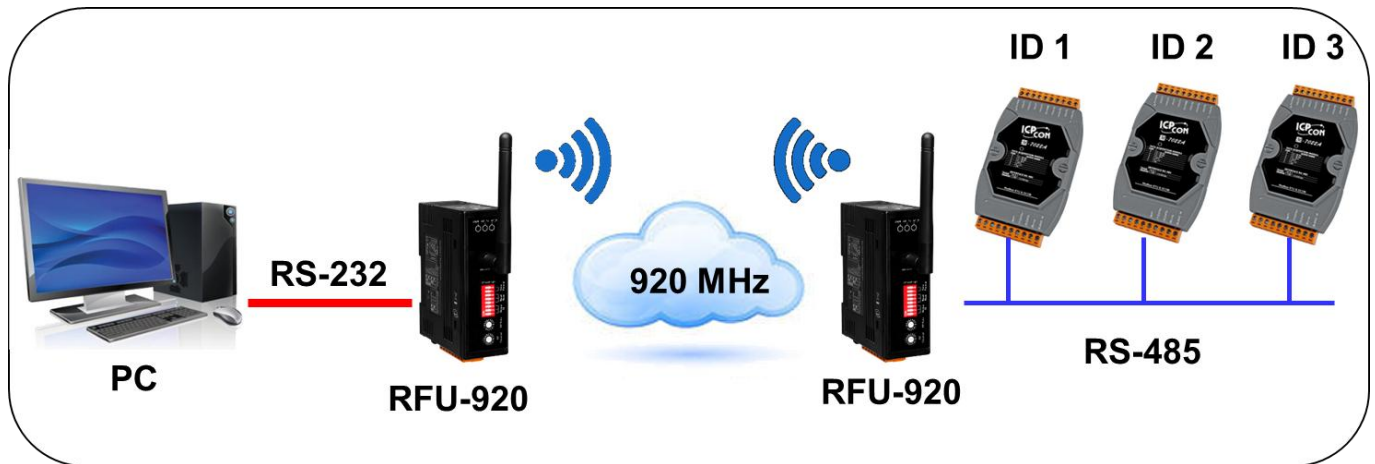
Message Duty: Message duty is the minimum time interval for RF message. The “next package” time interval is calculated as 100 times of the “current package” transmission time. For example, if a 20 Bytes data is transmitted at 125 kbps, the transmission time is about 2 ms, so the next time RFU-920 can transmit a wireless packet is after 200 ms, that is, the signal duty ratio is 1%, which is the FCC specification for wireless transmission in 920 MHz band.

Group ID: When the Group ID switch is set to F, the utility setting Group ID will be enable. It supports the range of 0x0000 to 0xFFFF, where 0x0000 to 0x000E is equivalent to Group ID 0 to E provided on the switch.

RF Rate: The RF data rate supports 6 settings: 5k, 10k, 25k, 50k, 125k, and 250k. The factory default RF Rate is 125 kbps. Users can change the setting according to their needs.

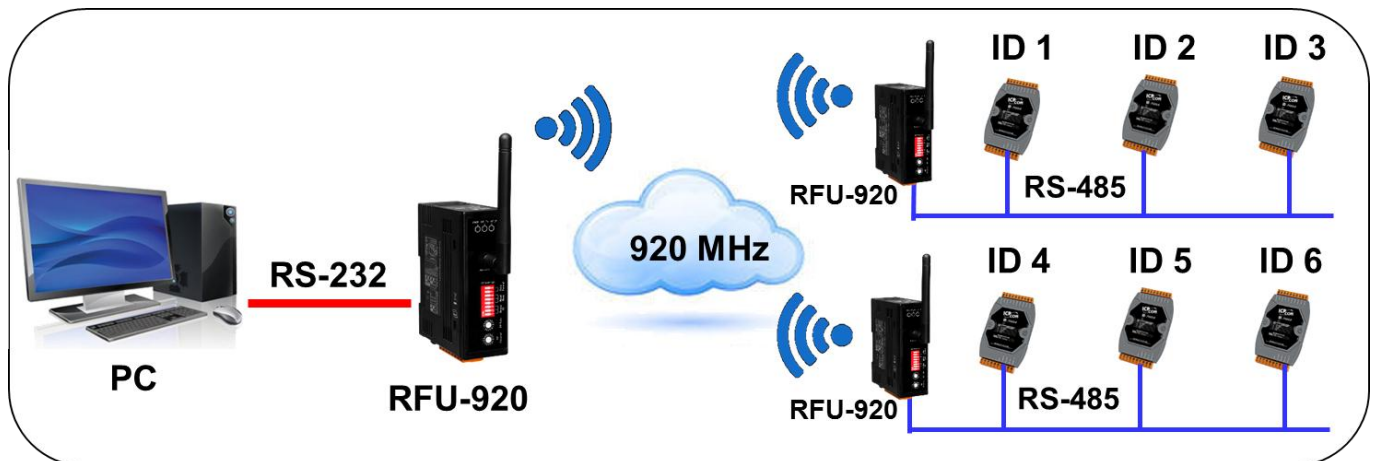
4. Application Example

1 - 1 Transfer



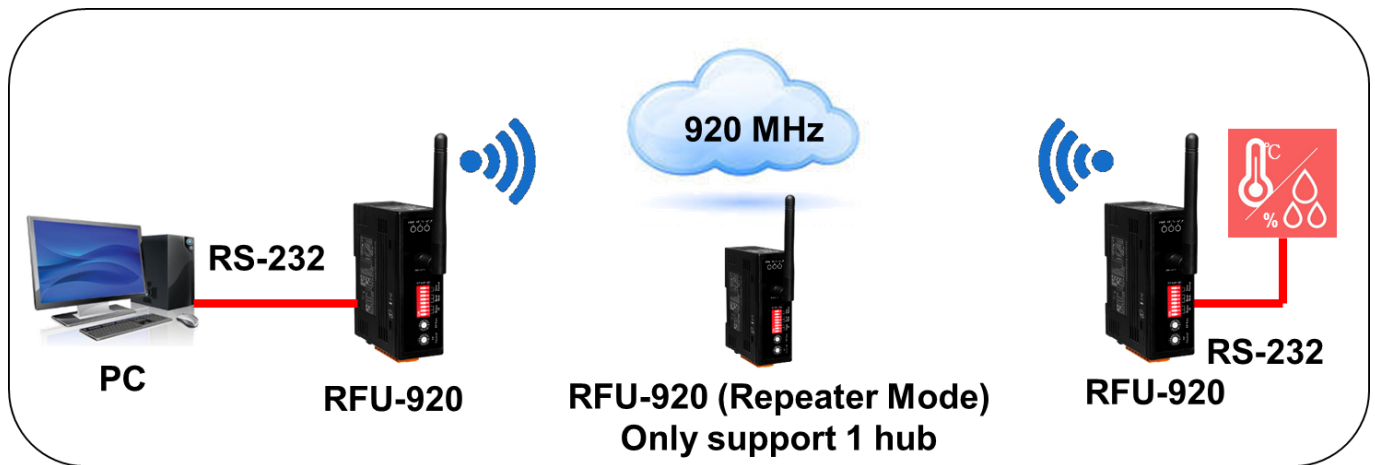
PC controls RS-485 modules 1 ~ 3 through RFU-920.

1 - Multi Transfer



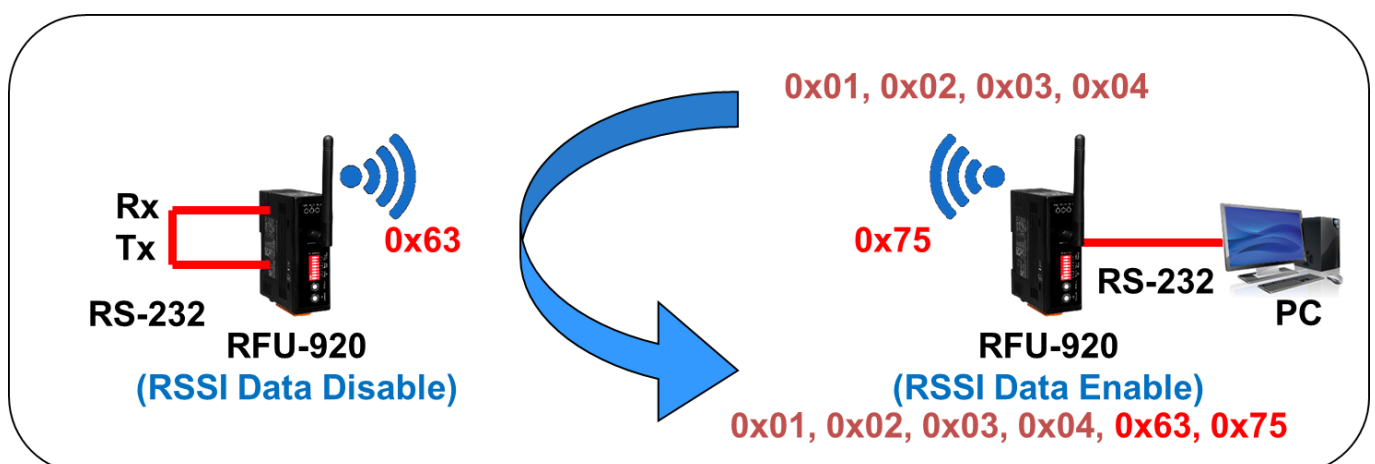
PC controls RS-485 modules 1 ~ 3 through a RFU-920 and modules 4 ~ 6 through another RFU-920

Repeater Mode



PC cannot monitor the thermometer and hygrometer directly because the distance is too far. But the repeater can bypass the RF message one side to another and let PC can monitor the thermometer and hygrometer.

RSSI Test



User can enable “RSSI Data” to check the RSSI value.

A. RSSI Data and Signal Strength Description

RSSI Data	dBm	Icon	Strength Description
0 ~ 89	< -85		Unconnectable or invisible
90 ~ 119	-85 ~ -71		The vast majority of terminals are not connectable
120 ~ 159	-71 ~ -53		Connectable, unstable
160 ~ 199	-53 ~ -35		Normal use
200 ~ 255	> -35		Strong signal, best experience

- RSSI Data corresponds to the dBm conversion formula:

$$\text{dBm} = -126 + (\text{RSSI Data} * 0.457)$$