(t)RFU-2400

Quick Start

1 *What's in the shipping package?*

The package includes the following items:

RFU-2400	tRFU-2400
① RFU-2400 ② ANT-124-05 ③ CA-0910 (RS-232 Cable) ④ Quick Start ⑤ CD	① tRFU-2400 ② CA-0910 (RS-232 Cable) ③ Quick Start ④ CD

2 *Preparing the device*

1. Wiring-connection

RFU-2400								tRFU-2400									
1	2	3	4	5	6	7	8	1	2	3	4	5	6	7		1	2	3
PWR		RS-485			RS-232			RS-485/RS-422				RS-232				PWR		
+Vs	GND	D+	D-	F.G.	GND	TxD	RxD	T+/D+	T-/D-	R+	R-	TxD	RxD	GND		+Vs	GND	F.G.

2. Install the (t)RFU-2400 Configuration Utility (Option)

   CD: \Napdos\RF_Modem\Utility

   http://ftp.icpdas.com/pub/cd/usbcd/napdos/rf_modem/utility

3 Configuring the (t)RFU-2400

RF Channel   Group ID   App. Mode   Configuration Mode   Baud Rate   Data Format   RFU-2400   tRFU-2400
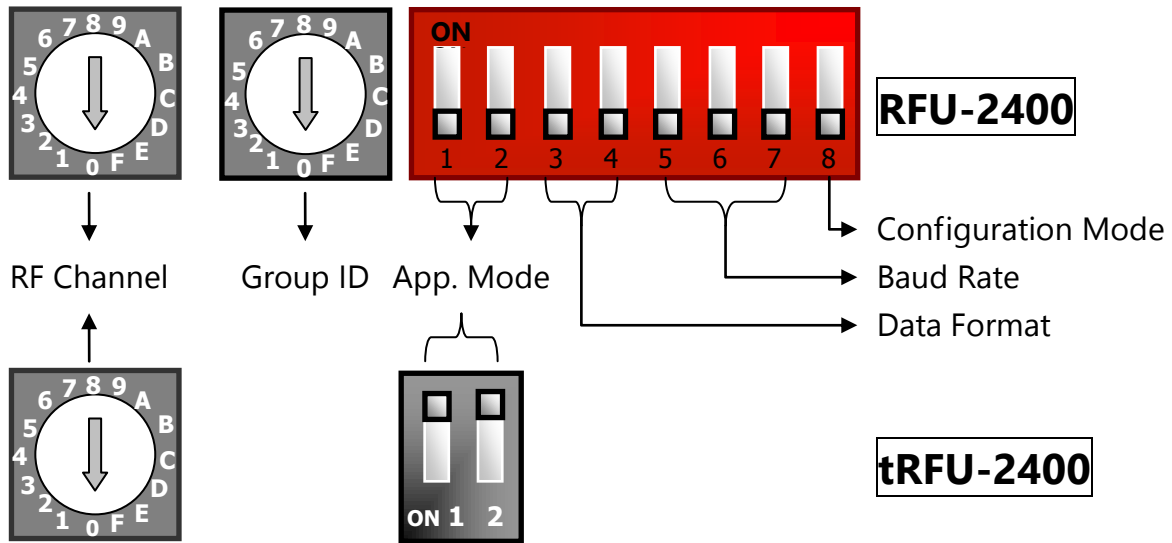
1. RF Channel：

	Frequency (MHz)	RFU-2400		tRFU-2400	
		HW_Cfg	SW_Cfg	HW_Cfg	SW_Cfg
0	2405	RSW=0	✓Default	RSW=0	✓Default
1	2410	RSW=1	✓	RSW=1	✓
......	......	......	✓	......	✓
F	2480	RSW=F	✓	RSW=F	✓

The "RF Channel" parameter specifies the actual radio frequency channel to be used by the (t)RFU-2400 module, and must be set to the same channel if the module is in the same communication group as other (t)RFU-2400 modules.
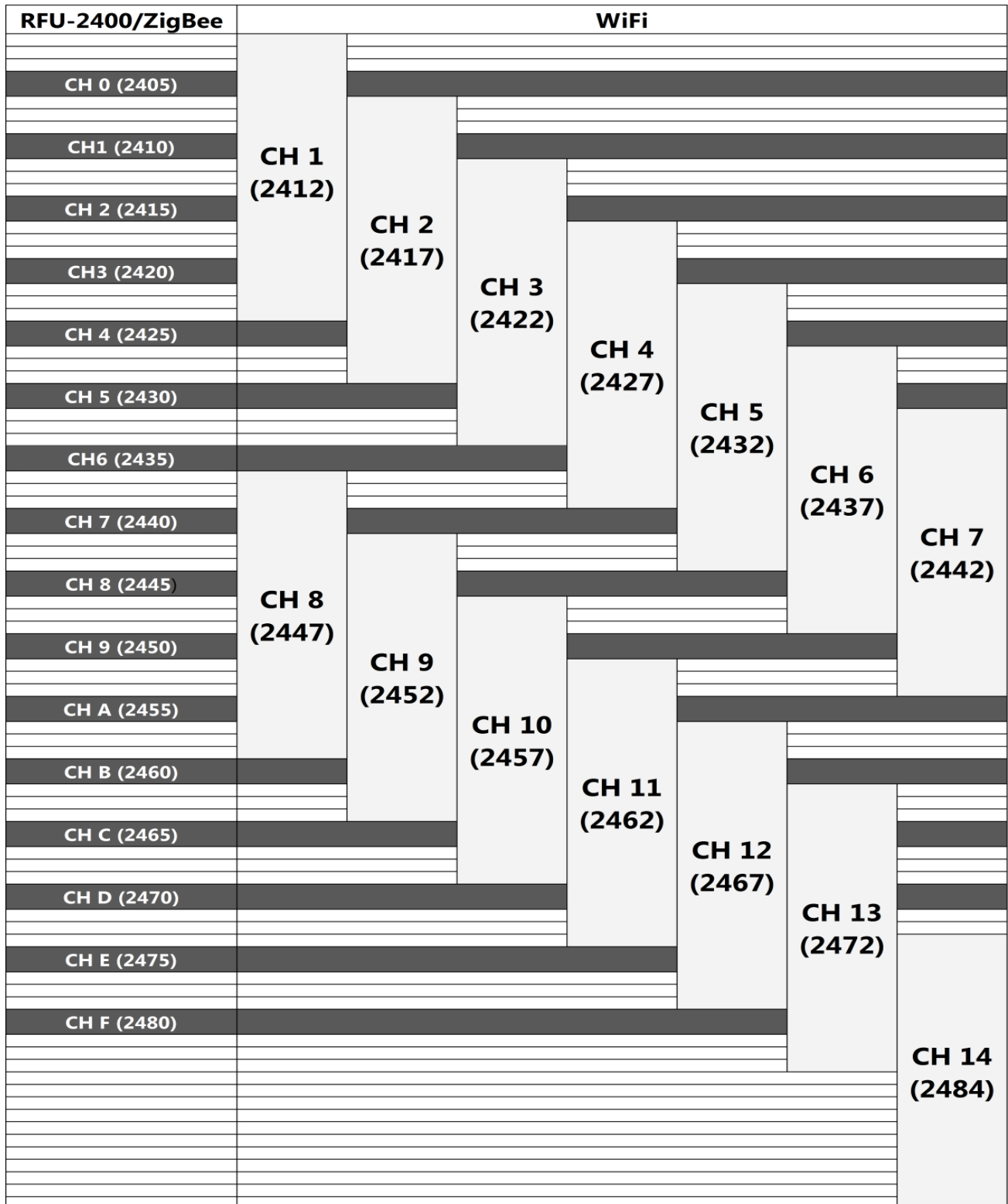
- **Channel Selection:**

As the 2.4 GHz ISM band is a globally available frequency range, a significant number of devices operate within this band, which may, of course, generate a high possibility of signal interference. Consequently, the selection of a suitable channel is an extremely important consideration when implementing an (t)RFU-2400 network. The most ideal solution would be to select an RF channel that is not occupied by other devices, as this will improve the efficiency of wireless transmission.

- **Channel Selection Method:**

The best approach when attempting to identify a suitable RF channel for use by the (t)RFU-2400 module is to employ a WiFi Analyzer application on a smartphone or other WiFi enabled device to scan for WLAN channels that are currently occupied by other devices within range of the (t)RFU-2400 module,

thereby assisting in the detection of wireless signals in the vicinity and allowing an analysis of the WLAN to be performed.

The chart shown below provides an overview of the wireless channels that are appropriate for the (t)RFU-2400/ZigBee (IEEE 802.15.4) specifications in comparison to the WLAN (IEEE 802.11b/g) standard, and illustrates the relationship between the WiFi and the ZigBee channels. This can be used to give an indication of the most suitable channel that can be selected for use by the (t)RFU-2400.

RFU-2400/ZigBee	WiFi
CH 0 (2405)	
CH1 (2410)	CH 1 (2412)
CH 2 (2415)	CH 2 (2417)
CH3 (2420)	CH 3 (2422)
CH 4 (2425)	CH 4 (2427)
CH 5 (2430)	CH 5 (2432)
CH6 (2435)	CH 6 (2437)
CH 7 (2440)	CH 7 (2442)
CH 8 (2445)	CH 8 (2447)
CH 9 (2450)	CH 9 (2452)
CH A (2455)	CH 10 (2457)
CH B (2460)	CH 11 (2462)
CH C (2465)	CH 12 (2467)
CH D (2470)	CH 13 (2472)
CH E (2475)	
CH F (2480)	CH 14 (2484)

2. Group ID：

Group ID	RFU-2400		tRFU-2400	
	HW_Cfg	SW_Cfg	HW_Cfg	SW_Cfg
0x0000	RSW=0	✓Default	✓Fixed	✓Default
0x0001	RSW=1	✓	✕	✓
......	......	✓	✕	✓
0x000F	RSW=F	✓	✕	✓

The **"Group ID"** parameter specifies the logical group identity for (t)RFU-2400 devices, and each (t)RFU-2400 module must be set to the same value if it is in the same group as other modules.

※ Reminder: When attempting to differentiate between different communication groups, the first priority is to adjust the RF Channel. However, if too many (t)RFU-2400 groups occupy all the RF channels, the Group ID parameter is the second priority to be configured when creating a new group.

3. App. Mode (Application Mode)

App. Mode	RFU-2400			tRFU-2400		
	HW_Cfg		SW_Cfg	HW_Cfg		SW_Cfg
	DIP 1	DIP 2		DIP 1	DIP 2	
Broadcast	☐ OFF	☐ OFF	✓Default	☐ OFF	☐ OFF	✓Default
P2P/Master	☐ OFF	■ ON	✓	☐ OFF	■ ON	✓
P2P/Slave	■ ON	☐ OFF	✓	■ ON	☐ OFF	✓

Two wireless communication modes can be configured, Peer-to-Peer (P2P) mode and Broadcast mode, as described below.

- **Peer-to-Peer (P2P) Mode**

In Peer-to-Peer (P2P) mode, full-duplex (TDD, time-division duplexing) communication is supported between the two nodes, with the limitation that only two (t)RFU-2400 devices are allowed to be included in a single communication group.

- **Broadcast Mode**

In Broadcast mode, data transmission is performed via a broadcast frame. Broadcast mode is suitable for multi-point communication. Although there are no limitations to the number of (t)RFU-2400 devices that can be included in a single communication group, only half-duplex communication supported. Since there is the possibility that data collision can occur during wireless transmission, a Master-Slave (Question-Response) architecture is recommended.

4. Data Format & Baud Rate

The specific **"Data Format"** and **"Baud Rate"** values that need to be used will entirely depend on how the serial port has been configured. The RS-232/RS-485 connections to each (t)RFU-2400 device are independent, so the Data Format and Baud Rate settings for each connection are also independent

Data Format	RFU-2400			tRFU-2400	
	HW_Cfg		SW_Cfg	HW_Cfg	SW_Cfg
	DIP 3	DIP 4			
N,8,1	☐ OFF	☐ OFF	✓ Default	✓ Fixed	✓ Default
O,8,1	☐ OFF	■ ON	✓	✕	✓
E,8,1	■ ON	☐ OFF	✓	✕	✓
N,8,2	■ ON	■ ON	✓	✕	✓

Baud Rate	RFU-2400				tRFU-2400	
	HW_Cfg			SW_Cfg	HW_Cfg	SW_Cfg
	DIP 5	DIP 6	DIP 7			
115200	☐ OFF	☐ OFF	☐ OFF	✓ Default	✕	✓ Default
57600	☐ OFF	☐ OFF	■ ON	✓	✕	✓
38400	☐ OFF	■ ON	☐ OFF	✓	✕	✓
19200	☐ OFF	■ ON	■ ON	✓	✕	✓
9600	■ ON	☐ OFF	☐ OFF	✓	✓ Fixed	✓
4800	■ ON	☐ OFF	■ ON	✓	✕	✓
2400	■ ON	■ ON	☐ OFF	✓	✕	✓
Debug	■ ON	■ ON	■ ON	✓	✕	✓

5. Configuration Mode

	RFU-2400	tRFU-2400	
	DIP 8	DIP 1	DIP 2
Hardware Configuration Mode (HW_Cfg)	☐ OFF	other positions	
Software Configuration Mode (SW_Cfg)	■ ON	■ ON	■ ON

- **Hardware Configuration Mode (HW_Cfg)**

Typically, each (t)RFU-2400 module will be configured using the device hardware, based on the positions of both the Rotary Switch and the DIP Switches, and this normally applies in the majority of cases.

- **Software Configuration Mode (SW_Cfg)**

As mentioned above, each (t)RFU-2400 module will generally be configured using the device hardware. However, software configuration can be performed in situations where advanced configuration settings are required, such as when adjusting the RF Power.

4 *Software Configurations*

- **RF Power**

The **"RF Power"** parameter specifies the wireless transmit power value, and is used to adjust the transmit power via the configuration utility. If the transmit power is too low to be able to communicate with a remote device, increasing it will improve the quality of the communication so that it becomes more stable.

Any adjustment of the RF Power should be performed in Software Configuration mode (SW_Cfg), although the RF Power value affects the status of both the Hardware Configuration (HW_Cfg) and the Software Configuration (SW_Cfg).

※ *The adjustment of this parameter is based purely on individual requirements, and ICP DAS cannot guarantee compliance with CE/FCC certification if this parameter is adjusted, nor is any liability assumed if the adjustment parameters are derived from the RF Power.*
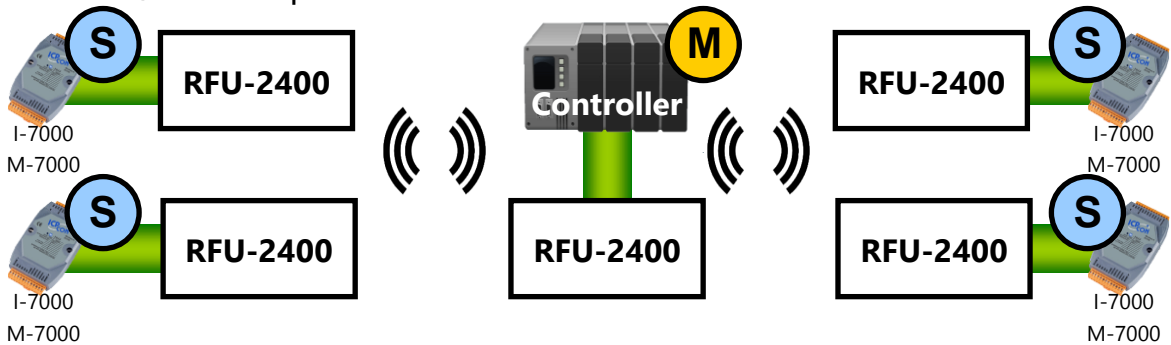
Configuration Steps

Step 1. Move the INIT DIP Switch on the (t)RFU-2400 to the ON position and then reboot the device.

Step 2. Start the configuration utility for the (t)RFU-2400 device and then select the relevant COM port to establish a connection with the device.

Step 3. Click the "Read Configuration" button to display the current configuration for the (t)RFU-2400 device. Enter the required configuration details and then click the "Start Configuration" button to save the new parameters for the device.

Step 4. Once the configuration update has been completed, turn off the power to the machine, move the INIT switch to off position, turn on the power again to reboot the machine.

<Reminder> Configuration Mode

- RFU-2400: switch DIP 8 to [On] position before reboot.
- tRFU-2400: switch both DIP 1 and DIP 2 to [On] position before reboot.

5 *Examples* (RFU-2400)

1. Broadcast / Half-duplex

Item	Switch	Controller		I/O	
RF Channel	Rotary (L)	E	2475 MHz	E	2475 MHz
Group ID	Rotary (R)	0	Network = 0x0000	0	Network = 0x0000
App. Mode	DIP 1	☐	Broadcast (Half-duplex)	☐	Broadcast (Half-duplex)
	DIP 2	☐		☐	
Data Format	DIP 3	☐	N,8,1	☐	N,8,1
	DIP 4	☐		☐	
Baud Rate	DIP 5	☐	115200 bps	☐	115200 bps
	DIP 6	☐		☐	
	DIP 7	☐		☐	
Config. Mode	DIP 8	☐	Hardware Config.	☐	Hardware Config.
Notes		Off : ☐	On : ■		

2. P2P / Full-duplex

| Item	Switch	Controller		I/O	
RF Channel	Rotary (L)	E	2475 MHz	E	2475 MHz
Group ID	Rotary (R)	0	Network = 0x0000	0	Network = 0x0000
App. Mode	DIP 1	☐	P2P_Master (Full-duplex)	■	P2P_Slave (Full-duplex)
	DIP 2	■		☐	
Data Format	DIP 3	☐	N,8,1	☐	O,8,1
	DIP 4	☐		■	
Baud Rate	DIP 5	☐	57600 bps	☐	57600 bps
	DIP 6	☐		☐	
	DIP 7	■		■	
Config. Mode	DIP 8	☐	Hardware Config.	☐	Hardware Config.
Notes		Off : ☐	On : ■		

6 Communication Verification

The RFU-2400 can be used once the configuration has been completed. However, if a failure occurs in the wireless communication, use the following procedure to analyze the status of the communication in order to determine the source of the problem.

(1) Configure the RFU-2400 devices

Before beginning an analysis of the communication status, first set both the RFU-2400 device that is acting as the monitoring target and the device connected to the Host PC to Debug Mode using the procedure described below.

- Move the INIT DIP Switch on both RFU-2400 devices to the OFF position

- Move DIP Switches 5, 6 and 7 on both RFU-2400 devices to the ON position and reboot the devices.
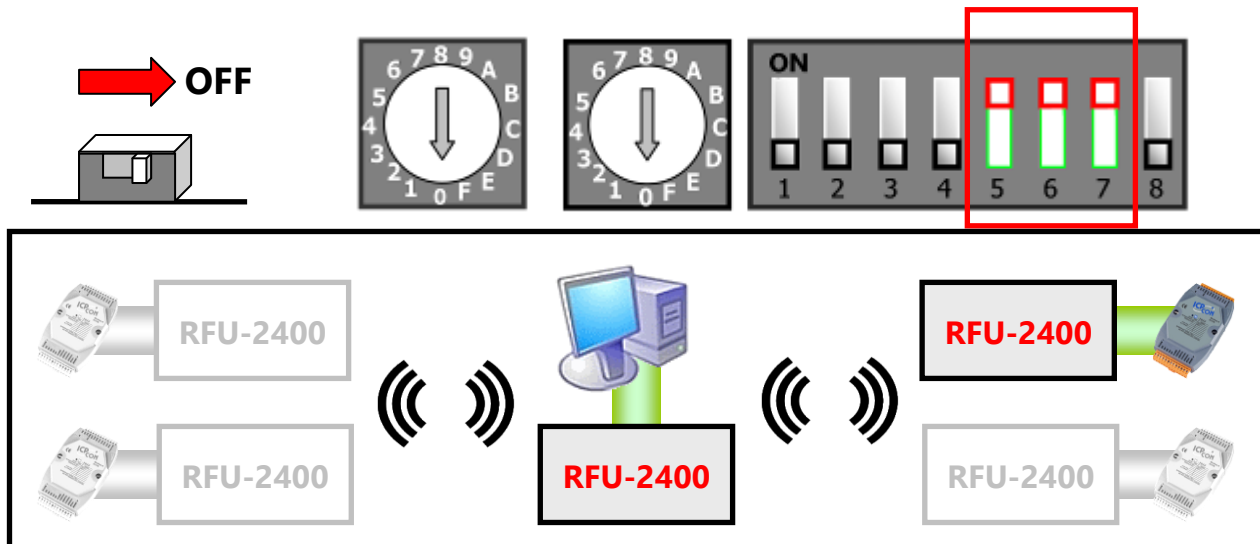
(2) Start the configuration utility for the RFU-2400

COM Port Selection

Communication Test
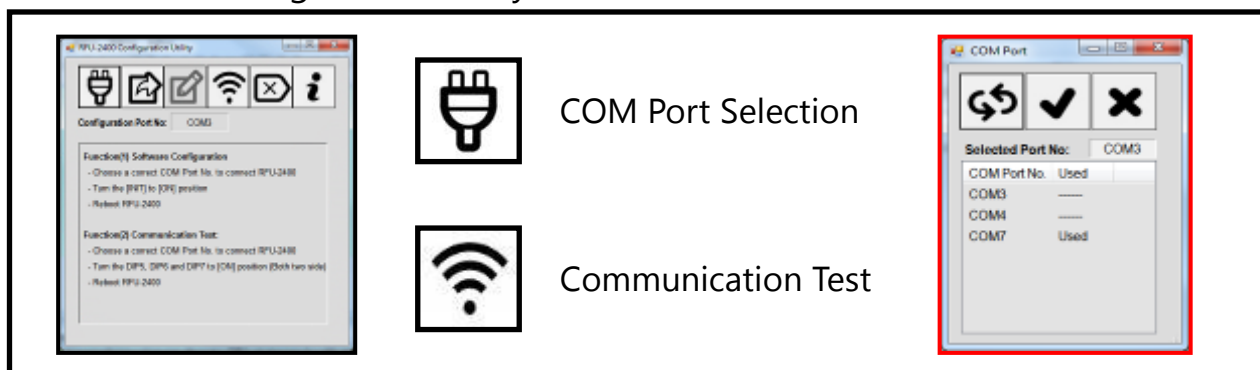
(3) View the test results for the Received Signal Strength Indicator (RSSI) and Success Rate. For more details regarding the "Communication Verification", refer to user manual of RFU-2400.