RFD TX Pole

User Manual

Table of contents

Document revision history

Version	Date	Changes
1.0	01/09/2020	Initial release

1 Introduction

1.1 Features

- Long range using RFD900x telemetry modem

- Wi-Fi host or client

- Easy configuration by web-based wizard

- TCP and UDP packet format support

- Wide range 9 to 16 V input supply

- Built-in battery

- Expandable I/O port

- IP66 rated enclosure

1.2 Applications

- Ground Control Station (GCS) telemetry gateway over Wi-Fi

- Long range remote control (RC) via PPM

- Permanent field installations

1.3 Description

The RFD TX Pole is a rugged data and control system for long term outdoor deployment.

Providing long range connection through RFD 900x long range modem the system can be used for functions ranging from messaging to sensor monitoring to equipment controls.

The wide range of supported input voltages and internal battery system accommodates a wide range of power solutions. The heavy-duty sealed enclosure protects the system in punishing outdoor conditions. The module's built-in Wi-Fi allows for simple webpage-based configuration of the system even in the most inaccessible installations.

1.4 Typical application diagram

Wi-Fi   **900MHz**

Ground Control Station

Drone fitted with RFD900x

Figure 2 - Typical application

1.5 Getting to know the product
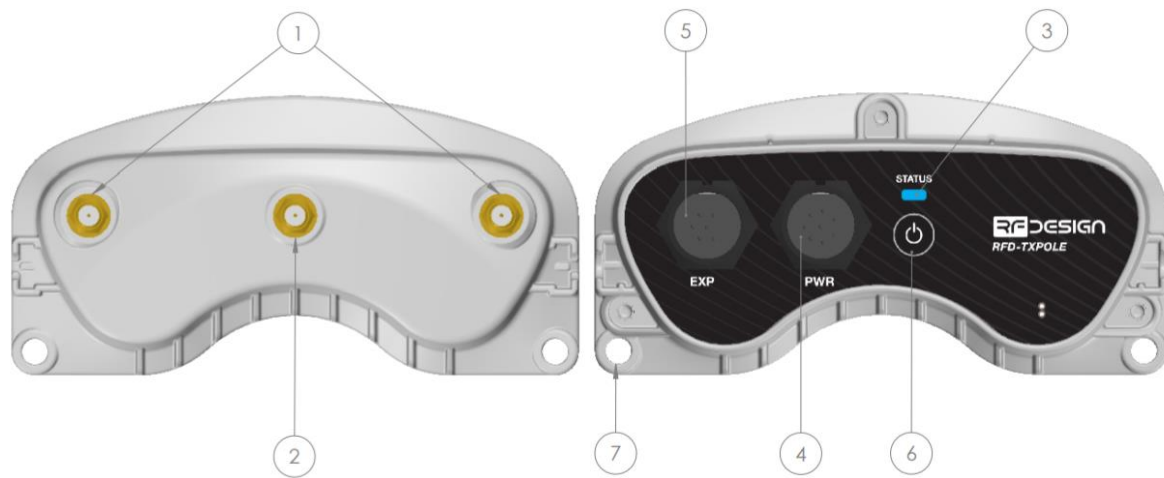
Figure 2 - TX Pole product parts description

Table 1 - TX Module Description

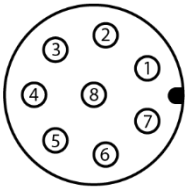| Item	Description/Operation		
1. Long-Range Modem Antenna Ports (x2)	Female RPSMA antenna connector. Connect an antenna matched to the 902-928MHz ISM band. For antenna recommendations refer to section 4. Use of both antennas enables diversity operation.		
2. Wi-Fi Antenna Port	Female RPSMA antenna connector. Connect an antenna matched to the 2.4 GHz ISM band. For antenna recommendations refer to section 4.		
3. Status LED	**Red**	**Solid**	Low battery warning, no Wi-Fi connection
		Alternating with blue	Battery low, connected to Wi-Fi
	Green	**Solid**	Healthy battery, no Wi-Fi connection
		Alternating with blue	Healthy battery, connected to Wi-Fi
4. Main Connector	External supply connector to power and/or charge device. Two different harnesses can be used depending on application. Refer to section 7 for more information about the harnesses. For connector pinout refer to table 2.		
5. Expansion Connector	Not implemented – Reserved for future models		
6. Power Button	**Press for 5 secs while OFF**		Turn on the device.
	Hold for 5 seconds while ON		Turn off the device.
	Press 5 times within 5 seconds		Perform a factory reset.
7. Mounting Mechanism	A kit with a variety of mounting mechanisms is supplied with the TX Pole. Use the enclosure mounting holes to attach the one that best suits your application.		

Table 2 – Main connector pinout

PINOUT	PIN	Name	I/O	Description
Main connector Front View	1	ESP_TX0	O	ESP transmit serial 0
	2	+V_PLUG	-	Device external supply with priority over internal battery.
	3	ESP_RX0	I	ESP receive serial 0
	4	GND	-	Ground
	5	EXT_ON_N	I	A switch can be connected across EXT_ON_P and EXT_ON_N to turn on the device while mounted far up to a pole.
	6	EXT_ON_P	I	
	7	ESP_EN_BOOT	I	Connect to GND during power up to enter ESP bootloader.
	8	DIO3	I/O	GPIO pin

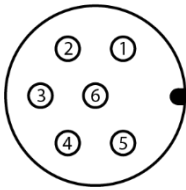**Table 3 - Expansion connector pinout – Reserved for future models**

PINOUT	PIN	Name	I/O	Description
Expansion connector Front view	1	RSVD1	-	Reserved
	2	RSVD2	-	Reserved
	3	RSVD3	-	Reserved
	4	RSVD4	-	Reserved
	5	RSVD5	-	Reserved
	6	RSVD6	-	Reserved
	7	RSVD7	-	Reserved
	8	RSVD8	-	Reserved
	9	RSVD9	-	Reserved
	10	RSVD10	-	Reserved

Table 4 - Power Supply Ratings

Parameter	Minimum	Maximum	Units
Supply Voltage (+V_PLUG relative to GND)	+9	+16	V
DC Plug Current Consumption (I _PLUG)	0.12	3*	A

*Maximum current consumption occurs when internal modem constantly transmits, and internal battery is being charged.

For further detail about power consumption depending on mode of operation, see section 5.1.

2 Getting Started

2.1 Product Setup

The TX Pole has two communication links that require configuration before operation: Wi-Fi and 900 MHz telemetry. The easiest way to set up your TX Pole for its initial use is through the 'First Run Wizard' as explained in this section. Further configuration will be explained in detail in sections 2.2 and 2.3.

Ensure the TX Pole is charged, or it is being supplied externally via the main connector. Power up the device by pressing the mode button for at least 5 seconds or connect the EXT_ON_N and EXT_ON_P wires together on the power.

The system defaults to be a Wi-Fi Access Point (AP) and self-assigns the IP 192.168.4.1. Use your computer or smart device to search for and connect to the access point Wi-Fi network generated by the TX Pole (SSID: **TXPOLE-XX-XX-XX**, Password: **txpole123 ,** by default). It may be necessary to disable mobile data on tablets and phones to force the browser to use the TX Pole network. If the TX Pole is properly powered up, but the access point is not visible from your personal device, a factory reset may help bringing the Wi-Fi settings back to a known state.
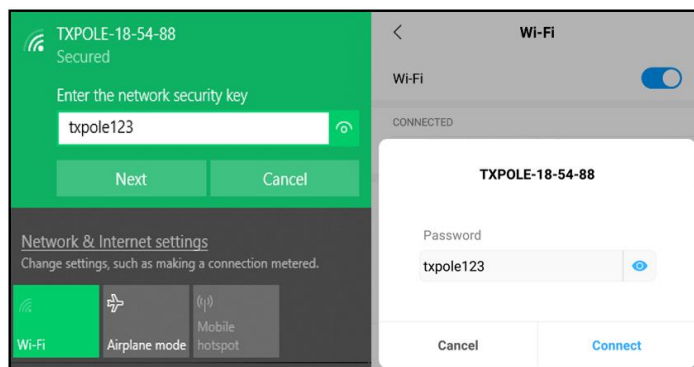

Figure 1 - Network settings. A) Windows 10. B) Android.

Once connected to the TX Pole, point your preferred browser to the device IP address, which by default is *http://192.168.4.1/*, to access the configuration homepage of figure 2.
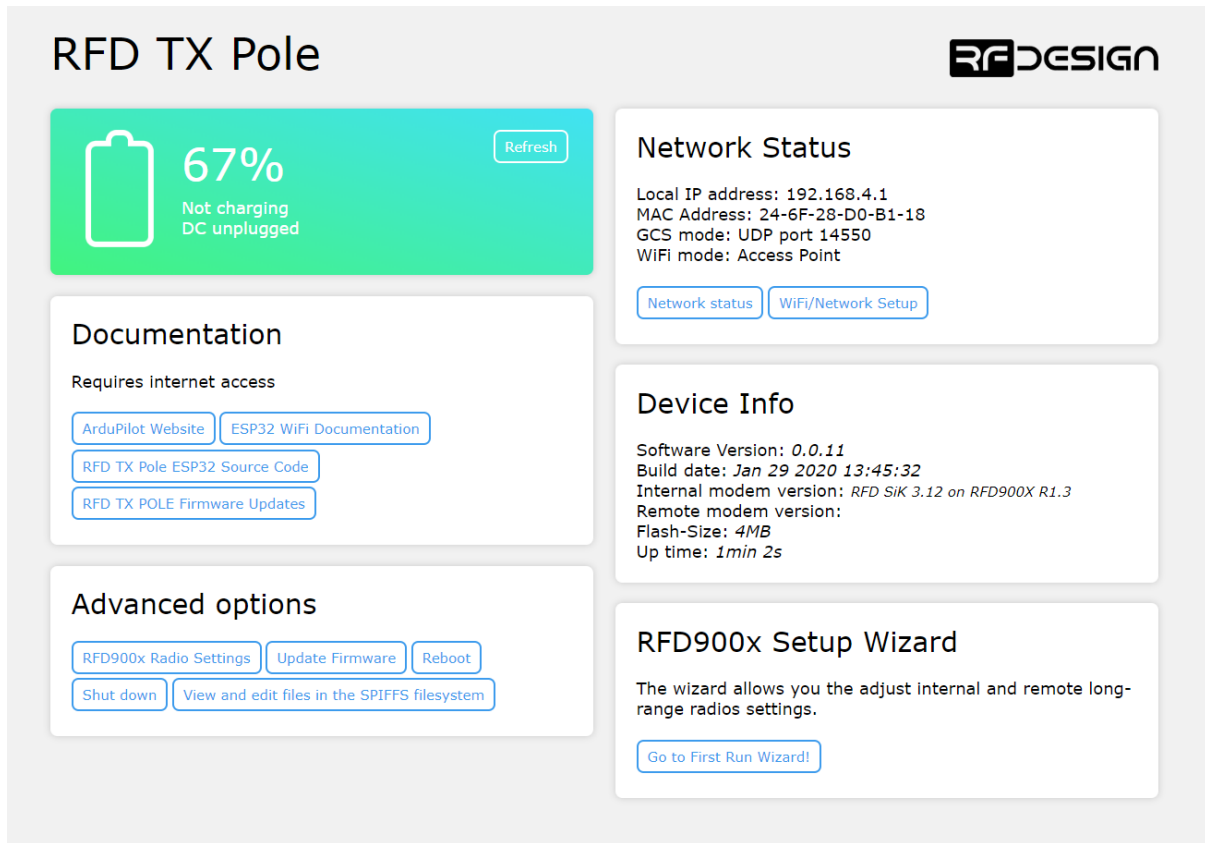
Figure 2 - Configuration homepage.

Click on 'Go to First Run Wizard!' button to access the wizard on figure 8 which will guide you through the steps to get your module ready to use.

Figure 3 - First run wizard

To complete the wizard, the remote modem on the aircraft should be powered up, have the same firmware version, and be bound to the TX Pole. If the remote RFD900x modem is the one supplied along the TX Pole, both devices are ready to proceed. If it is not, refer to section 2.5 to flash on the

– **Version 1** – Status – ISSUED FOR USE
Document Number – **PRJ-TXP-MAN-002**

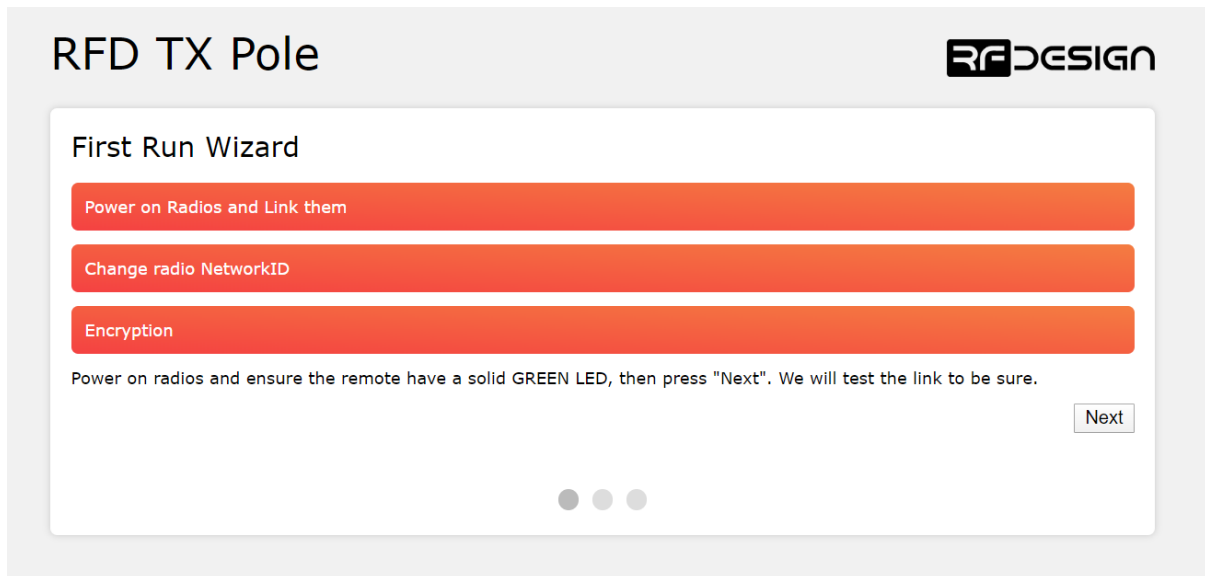remote modem the same firmware version being used on the TX Pole, which is displayed on the 'Device Info' section of the homepage interface of figure 2 under 'Internal modem version:'. If both firmware versions are already the same, reset remote modem to default settings and the green LED on the modem should go green indicating it has been bound to the TX Pole. If that were not case, press the button on the TX Pole 5 times rapidly to reset default values. After that, the wizard can be reengaged.
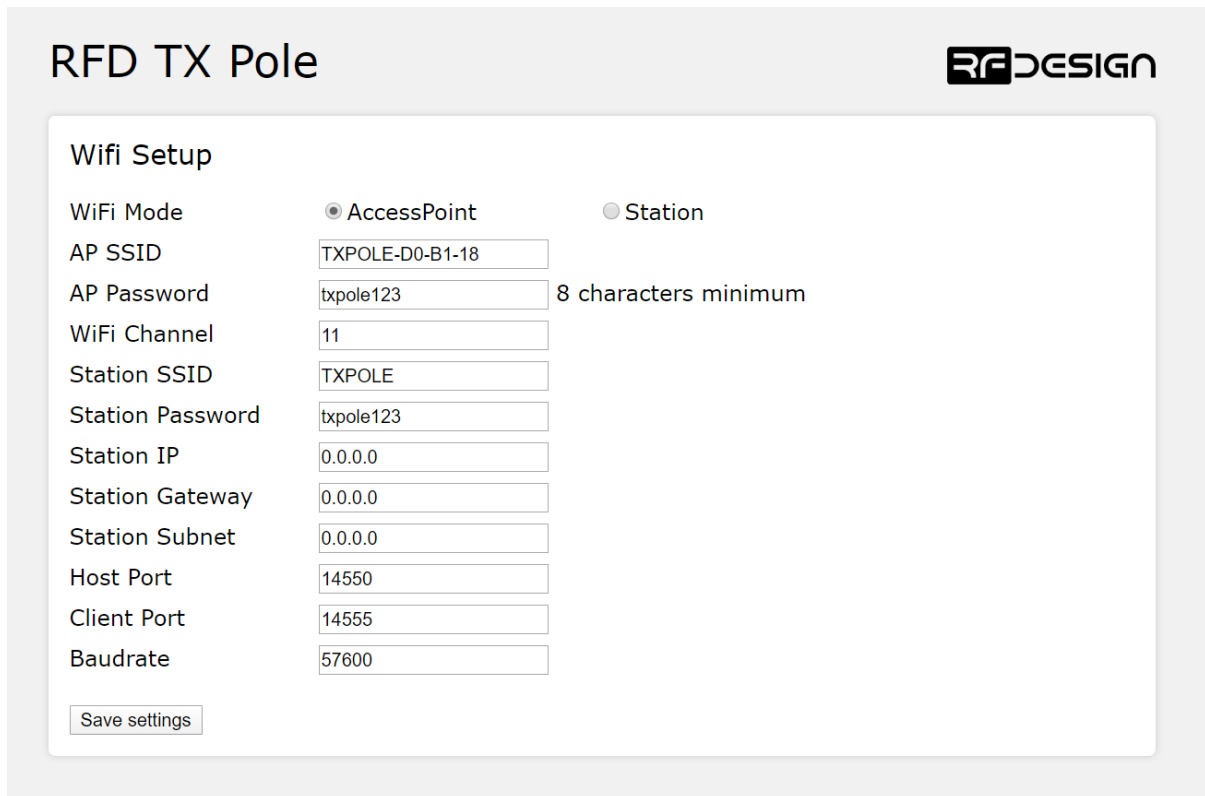
Follow on-screen instructions and once the wizard is successfully completed, your device is ready to be used and further configuration is optional.

2.2 Wi-Fi Configuration

It is strongly recommended to change the default Wi-Fi settings to ensure the security of the radio link and overall system. This section explains how to do this.

2.2.1 Change Network Settings

While on the configuration homepage of figure 2, click on the 'Wi-Fi/Network Setup' button, to access the Wi-Fi settings configuration page of figure 4.

Figure 4 -Wi-Fi settings configuration page.

The Wi-Fi settings of figure 4 are described in table 5:

Table 5 - Wi-Fi Settings Description

Parameter	Description
Wi-Fi mode	This sets the module to act as an access point (default) or as a station on an existing access point, such as a home network.
AP SSID	Is the SSID used for creating the Access Point (AP).
AP Password	This is the password that will be used for the access point. It must be a minimum of 8 character long
Wi-Fi Channel	Allows the user to set the channel as per the Wi-Fi 802.11 standard definitions. This can be used as needed to prevent interference or to meet the requirements of the network that the module is joining. The default is channel 11 a part of the most commonly used channel set of 1, 6 and 11.
StationSSID	The SSID of the network that the TX Pole should attempt to join.
Station Password	The password of the network that the TX Pole should attempt to join.
Station IP	The static IP address to assign the TX Pole when joining the network. (**Note** this may require appropriate settings to be made on the network router. Once assigned as a station the landing page for the TX Pole settings becomes the Station IP address that was assigned.)
Station Gateway	The Gateway IP address of the network that the TX Pole should attempt to join.
Station Subnet	The Subnet Mask of the network that the TX Pole should attempt to join as a station.
Host Port	This is the UDP host port number. This is the port that you will direct a connection to in UDP mode
Client Port	This is the UDP client port number.
Baudrate	Baudrate of the serial link with the modem. It must match the modem serial speed setting to allow the two to communicate.

After changing the desired settings, press 'Save Settings' and power cycle the TX Pole either by holding the mode button for 5 seconds to power off and then 1 second to power up again, maintaining EXT_ON_N and EXT_ON_P or by pressing the button 'Reboot' of the 'Advanced options' on the configuration interface of figure 2 .

Note that after the changes take place, it might be required to change the network settings saved on your computer or personal device in order to reconnect to the TX Pole. It may be required to force the system to forget the old password/settings and then try to connect again with the new Wi-Fi settings.

2.2.2 TX Pole as a station

To use the TX Pole on an existing Wi-Fi network to provide telemetry data to a GCS while still allowing access to the internet, for example to download maps, there are a couple of possible implementations.

Basic users

Windows and Linux users will require the installation of a support software. For Windows, the Bonjour Service from Apple (https://support.apple.com/kb/DL999?locale=en_US) and for Linux the Avahi service are suitable. Windows users may also need to use Chrome (or Chrome based) browsers as this has more consistent interoperability with the Bonjour service.

Once this has been installed, connect to the TX Pole in default AP mode go to Wi-Fi settings and choose 'Station' in 'Wi-Fi Mode', set the correct SSID (in *StationSSID*) and password of the network in "Station Password", leave "Station IP", "Station Gateway" and "Station Subnet Mask" as 0.0.0.0 then press "Save" and finally reboot the device. You can connect now your computer or smart device to the Wi-Fi network with the name specified on *StationSSID* in the previous step. On your device open a Chrome-based browser and enter the following address http://TXPOLE-XX-XX-XX.local where the Xs are the same as the Xs in the access point network name. Analogously on Android download Bonjour Browser app to find and access to the TX Pole IP address.

Advanced users

The module must be set up by choosing 'Station' in 'Wi-Fi Mode', set the correct SSID (in *StationSSID*) and password of the network in "Station Password".

You will need to find the Gateway and Subnet mask of the network then to write the appropriate values in 'Station Gateway', 'Station Subnet'. Assigning the 'Station IP' requiring that a static IP is set on the DHCP server, normally the network router, this is so the device will be at a known address on the network allowing for the user to connect using this new fixed IP in place of the 192.168.4.1 of access point mode. Network information such as the Subnet Mask and Gateway address can be found on a network connected device. For instance, in windows launch a command prompt, type *'ipconfig'* and press enter. Information similar to figure 5 will be shown. In Linux-based devices typing *'ifconfig'* *to the terminal should give similar results.*

Figure 5 – Command Prompt.

Default Gateway → 'Station Gateway'

Subnet Mask → 'Station Subnet'

2.2.3 Wi-Fi Troubleshooting:

If you forget your settings or the device is not available on the network, resetting your TX Pole unit to default settings may be required. This is done by pressing the button 5 times rapidly within 5 seconds. The TX Pole unit will then reset to factory default configuration and reboot.

In some cases, user connection settings may prevent devices from accessing the Wi-Fi addresses. It may therefore be necessary to do some basic troubleshooting such as removing the existing network settings from the device memory, resetting the wireless adaptor, turn off mobile data and disconnect other networking devices such as LAN cables. In other cases, running the Windows Network Diagnostics may help.

2.3 TX Pole Internal RFD900x Modem settings

A description of the parameters that define the communication between TX Pole and remote RFD900x modem is presented in *Table 6* - **RFD900x parameters**. For further information regarding the internal modem on which the TX Pole is based on, refer to the *RFD900x Peer to Peer Firmware* and *RFDesign Modem 900x Datasheet* documents using the links in section 6.

Table 6 - RFD900x parameters

Reg #	S Register Description	Default Value	Maximum Value	Minimum Value	Must be the same at both ends of the link?
S0	**FORMAT** This is for EEPROM version, it should not be changed. It is set by the firmware	Firmware dependant	N/A	N/A	No
S1	**SERIAL_SPEED** Serial speed in 'one-byte form'. Accepted values are 1, 2, 4, 9, 19, 38, 57, 115, 230, 460 and 1000 corresponding to 1200bps, 2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps, 115200bps, 230400bps, 460800bps and 1000000bps respectively.	57	1000	1	No
S2	**AIR_SPEED**[1] Air data rate in 'one-byte form'. Accepted values are 12, 56, 64, 100, 125, 200, 224, 500 and 750 corresponding to 12000bps, 56000bps 64000bps, 100000bps, 125000bps, 200000bps, 250000bps, 224000bps, 500000bps and 750000bps respectively.	64/200[4,8]	750	12	Yes
S3	**NETID** Network ID.	25	255	0	Yes
S4	**TXPOWER**[1] Transmit power in dBm.	30	30	0	No
S5	ECC[2] Enables or disables the Golay error correcting code.	0	1	0	Yes
S6	MAVLINK[3] Enables or disables the MAVLink framing and reporting	1	1	0	No

Reg #	S Register Description	Default Value	Maximum Value	Minimum Value	Must be the same at both ends of the link?
S7	OP_RESEND Opportunistic resend allows the node to resend packets if it has spare bandwidth	0	1	0	No
S8	**MIN_FREQ**[1] Min frequency in KHz	915000 /868000[4,8]	927000 /870000[4]	902000 /865000[4,8]	Yes
S9	**MAX_FREQ**[1] Max frequency in KHz	928000 /870000[4]	928000 /870000[4]	903000 /865000[4,8]	Yes
S10	**NUM_CHANNELS**[1] Number of frequency hopping channels	20/1[4,8]	51[8]/8[4,8]	1	Yes
S11	**DUTY_CYCLE**[1] The percentage of time to allow transmit	100	100	10	No
S12	**LBT_RSSI**[1] Listen before talk threshold	0	220	25	Yes
S13	**RTSCTS** Ready-to-send and Clear-to-send flow control.	0	1	0	No
S14	**Max Window** Max transit window size used to limit max time/latency if required otherwise will be set automatically	131	400	20	Yes
S15	**Encryption Level** Encryption level 0=off, 1=128bit AES	0	1	0	Yes
S16	**GPIO1.1 R/C input** Set GPIO 1.1 (pin 15) as R/C(PPM) input	0	1	0	No
S17	**GPIO1.1 R/C output** Set GPIO 1.1 (pin 15) as R/C(PPM) output	0	1	0	No
S18	**GPIO1.1 SBUS input**[7] Set GPIO 1.1 (pin 15) as R/C(PPM) input	0	1	0	No
S19	**GPIO1.1 SBUS output**[7] Set GPIO 1.1 (pin 15) as R/C(PPM) output	0	1	0	No
S20	**ANT_MODE** 0= Diversity, 1= Antenna 1 only, 2= Antenna 2 only, 3= Antenna 1 TX and antenna 2 RX	0	3	0	No
S21	**GPIO1.3 Status LED output** Set GPIO 1.3 (pin 12) as output with state that mirrors the status LED on the modem	0	1	0	No
S22	**GPIO1.0 485 TX control output**[6] Set GPIO 1.0 (pin 13) as control signal on DINIO and RS485 interface boards.	0	1	0	No

Reg #	S Register Description	Default Value	Maximum Value	Minimum Value	Must be the same at both ends of the link?
S23	**Rate and Frequency Band** Switches between valid settings for the frequencies, channels and airspeeds that can be set on compliant modems ensuring compliance is maintained. See section 3.4 for FCC-related information.	0	3	0	Yes
R0	**TARGET_RSSI** Optimal RSSI value to try to sustain (255/0[8] disables the feature) V3.09 and earlier this is based on RSSI figures. After v3.12 this changes to being based on receiver dBm	255/110[8]	50/0[8]	255/0[8]	No
R1	**HYSTERESIS_RSSI** Amount of change before power levels altered. V3.09 and earlier this is based on RSSI figures. After v3.12 this changes to being based on receiver dBm	50/15[8]	20/2[8]	50/5[8]	No

Notes:

[1] The listed values are the full range of options available on unrestricted modems. The range of settings available may be altered on compliant systems to maintain compliance to the appropriate standards

[2] ECC - Software Detection and correction, extra packet information, twice the packet length, is sent to allow the recovery of corrupted packets. Disabled in version 3.15 and up. Error detection is handled by CRC since at least version 3.01

[3] Injects RSSI packet when MAVLink protocol used and heartbeat packet detected.

[4] 868 modems

[5] Experimental feature settings not currently available

[6] This setting controls modem functionality linked with 485 interface and DINIO products it is not intended for use outside of this application.

[7] Version 3.09 the SBUS function is mapped to GPIO1.3

[8] Version 3.15 or higher

2.3.1 Modifying parameters with the TX Pole web interface

The settings described in table 6 can be set up on the TX Pole and on any modem it may be bond to by using the browser interface. The TX Pole will appear as local and the aircraft modem as remote.

Click on 'View/*Edit 900x Radio Setup*' to access the modem's setup interface of figure 6. If the TX Pole has not been paired yet with any other modem, the remote side will appear empty and the message "Sorry no parameters available" will be shown.
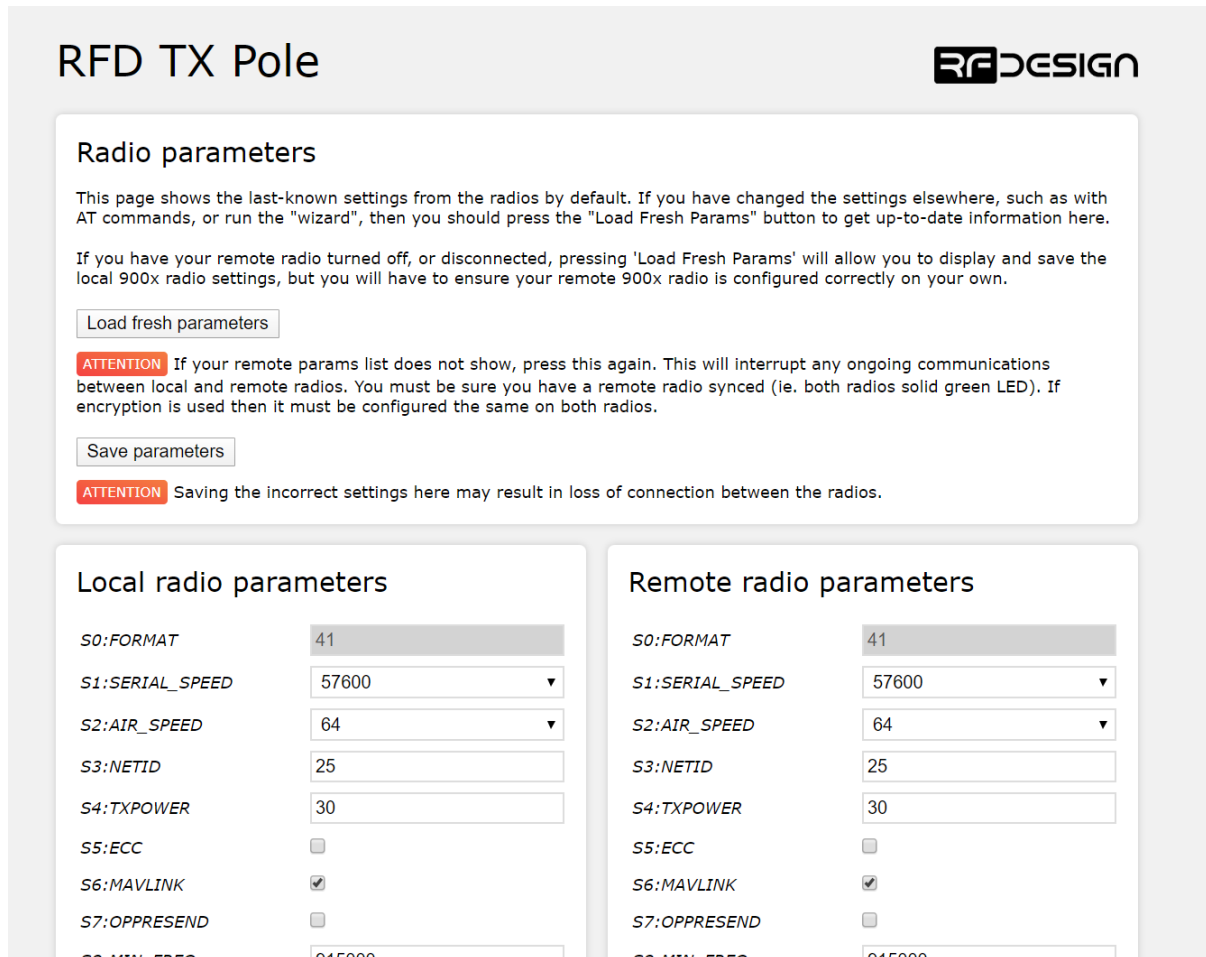

Figure 6 – T Pole modem configuration page.

Settings can be refreshed using the '*Load Fresh parameters*' button. Parameters can be adjusted in the text boxes as required and then applied by means of the '*Save parameters*' button. Changes on the AIR_SPEED, NETID, TXPOWER, MIN_FREQ, MAX_FREQ and NUM_CHANNELS parameters should be applied to remote radio settings as well to avoid losing the radio link.

2.4 Firmware Update

Updating the TX Pole requires two different files; the 'firmware.bin' and the 'spiffs.bin' files which can be found through the links in section 6. Before proceeding with the firmware update ensure the device is charged at least 80%. On the browser configuration landing page shown in figure 2, select 'Update Firmware' and follow the on-screen commands on figure 7 to flash the files onto the device.

Once the new SPIFFS is uploaded, you will be required to reboot your TX Pole. The subsequent bootup might also update the internal radio firmware. For that reason, ensure you have no other RFD900x or RFD900ux modems on at the same time, and allow up to 10 minutes for the device to bootup completely.
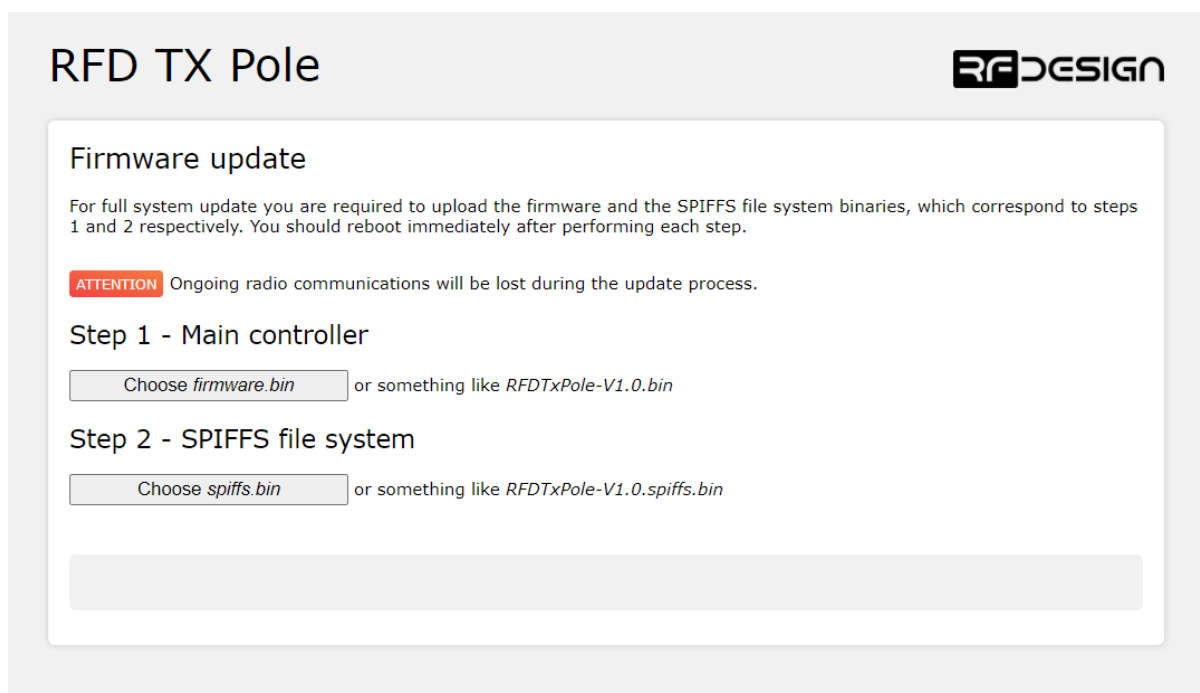

Figure 7 - Update page

2.5 Vehicle Modem

If the vehicle modem to be used is the one supplied with the TX Pole, unless changed by the user, it will have a compatible firmware version and it will be bound to the modem in the TX Pole. If that is the case, the easiest way to configure it is through the browser interface already explained in the previous section.

On the other hand, if the modem is not the one supplied with the kit or both modems are not bound, the vehicle modem should be flashed with the same firmware and configured with the same parameters as the modem on the TX Pole to ensure a proper communication link. To do so, an FTDI cable, a jumper and the RFD900 tools or a serial terminal program are needed.

Connect the FTDI cable and the jumper as per figure 8 or 9 depending on the remote modem model. The black wire of the FTDI, i.e. pin 1, should connect to pin 1 on the modem and the jumper should connect pins 2 and 3 on the top row together.

Figure 8 - Modem connected to FTDI cable (pins 1,3,5,7,9, and 11) to enable serial communications, and jumper connected to pins 4 and 6.

Figure 9 – RFD900ux Modem connected to FTDI cable

To configure the modem using the RFD900 tools, download and install the software using the links on section 6 if it is not installed on your computer yet. Launch the program and the configuration interface of figure 8 should pop-up.

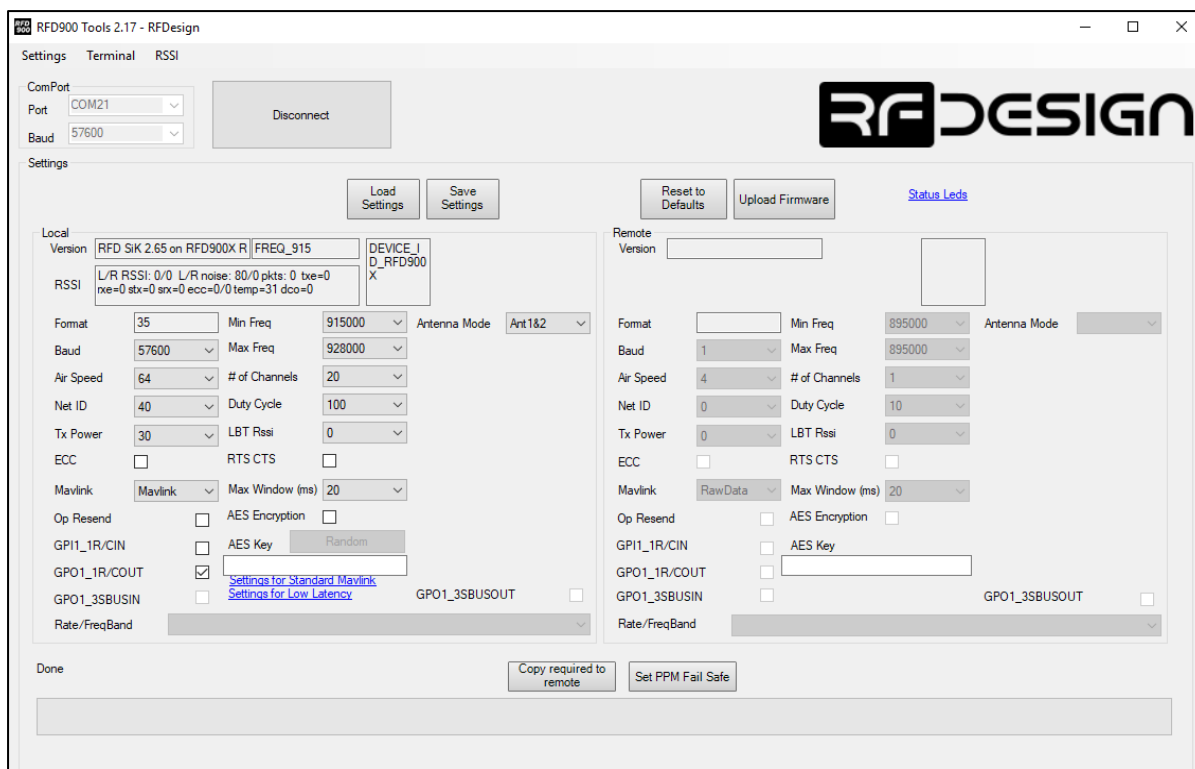
RFD900 Tools 2.17 - RFDesign
Settings
Terminal
RSSI
Disconnect
Load Settings
Save Settings
Reset to Defaults
Upload Firmware
Status Leds
RFDESIGN
Random
Settings for Standard Mavlink
Settings for Low Latency
Copy required to remote
Set PPM Fail Safe

ComPort
Port: COM21
Baud: 57600

Settings

Local
Version: RFD SiK 2.65 on RFD900X R | FREQ_915 | DEVICE_ID_RFD900X
RSSI: L/R RSSI: 0/0 L/R noise: 80/0 pkts: 0 txe=0 rxe=0 stx=0 srx=0 ecc=0/0 temp=31 dco=0
Format: 35
Baud: 57600
Air Speed: 64
Net ID: 40
Tx Power: 30
ECC: ☐
Mavlink: Mavlink
Op Resend: ☐
GPI1_1R/CIN: ☐
GPO1_1R/COUT: ☑
GPO1_3SBUSIN: ☐
Rate/FreqBand:
Min Freq: 915000
Max Freq: 928000
# of Channels: 20
Duty Cycle: 100
LBT Rssi: 0
RTS CTS: ☐
Max Window (ms): 20
AES Encryption: ☐
AES Key:
Antenna Mode: Ant1&2
GPO1_3SBUSOUT: ☐

Remote
Version:
Format:
Baud: 1
Air Speed: 4
Net ID: 0
Tx Power: 0
ECC: ☐
Mavlink: RawData
Op Resend: ☐
GPI1_1R/CIN: ☐
GPO1_1R/COUT: ☐
GPO1_3SBUSIN: ☐
Rate/FreqBand:
Min Freq: 895000
Max Freq: 895000
# of Channels: 1
Duty Cycle: 10
LBT Rssi: 0
RTS CTS: ☐
Max Window (ms): 20
AES Encryption: ☐
AES Key:
Antenna Mode:
GPO1_3SBUSOUT: ☐

Done

Figure 8 – Vehicle modem configuration on RFD900 tools.

First ensure the firmware on the vehicle modem is the same as the one on the TX Pole, the version of which can be obtained in the first page of the browser interface of figure 2. If both versions don't match download the one currently in use on the TX Pole through the links in section 6.

Then on the RFD900 tools click on 'Upload Firmware' and choose the *.bin file you just downloaded. Wait until the process finishes (a message will appear at the bottom of the page) and reboot the modem. You have successfully updated the firmware.

Then use the interface to configure the parameters described in *Table 6* - RFD900x parameters. The AIR_SPEED, NETID, TXPOWER, MIN_FREQ, MAX_FREQ and NUM_CHANNELS parameters should be the same as the ones in the TX Pole modem. When connected directly through the FTDI cable the vehicle modem will appear as local. If these parameters have been not modified on the TX Pole side or they have been reset to default values by pressing the button 5 times rapidly, the easiest way to configure them on the remote modem is by pressing 'Reset to Defaults' button.

Another important step is to set modem GPIO1.1 as a PPM output. This allows the modem pin 15 to output the PPM stream received from the TX Pole modem. This will be configured automatically by the First Run Wizard. In case the wizard were not to be used, enable this by checking the 'CPI1_1R/COUT' box in any and ensure later on that 'CPI1_1R/CIN' is unchecked on the TX Pole. Then save the settings to upload the configuration onto the modem.

After the modem has been configured correctly it will be able to link with the TX Pole modem, indicated by a solid green LED on both devices. From this point onwards the FTDI cable is no longer needed to configure the vehicle modem. Instead this can be done over the air via the TX Pole using the browser interface. This only works while the modem in the vehicle and TX Pole are linked as indicated by a solid green LED.

3 Applications

3.1 Ground Control Station

Wi-Fi   **900MHz**

**Ground
Control Station**   **Drone fitted
with RFD900x**

Figure 10 - Typical Application Diagram.

The immediate application for the TX Pole is to set up a ground station for unmanned aircraft applications were long range and reliable communications are a must.

In this scenario, the TX Pole will allow control of the aircraft from your computer or personal device and at the same time display on your preferred software the telemetry data received from the aircraft.

In this section, the process is explained using Mission Planner for Windows and Tower for Android. However, this process can be extrapolated to other software supporting Transmission Control Protocol (TCP) or User Datagram Protocol (UDP).

Once the TX Pole is configured as described throughout section 2, connect your computer or smart device to the configured Wi-Fi network; that is either the TX Pole Access Point or the linked network when using the module as a station. Then open Mission Planner on your computer or Tower App on your Android device and choose TCP or UDP and press the button "CONNECT" as per figure 11. Parameters should start loading provided that the TX Pole is properly bond to the modem on the aircraft (solid green LED) and both devices are powered up.
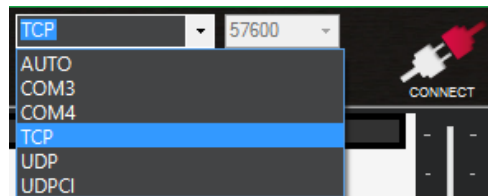

Figure 11 – Mission planner connection options.

When prompted, enter the IP address and port number in the pop-up boxes as shown in figure. Default values in AP mode are IP *192.168.4.1,* TCP port number 23 and UDP 14550. After that, if properly connected, telemetry data should be available, and the control software should run missions as normal.
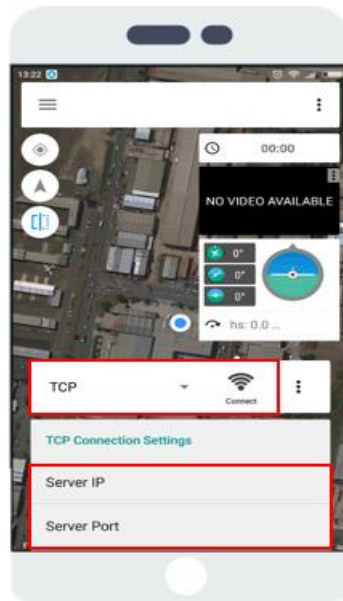
Figure 12 - Tower configuration on Android.

4   Antenna Recommendation

The RFD TX Pole has three antenna connectors: one for the Wi-Fi and two for the 900 MHz communication link. Any antenna with a male RPSMA fitting and matched to the 2.4 GHz and to the 902-928MHz ISM band respectively can be used, however the ones supplied along with the TX Pole and shown in figure 13 are recommended for almost every application. For other antenna options visit our store at http://store.rfdesign.com.au/.

Figure 13 – a) 900MHz 3dBi Half Wave Dipole Antenna (RPSMA) *, b)* Antenna 2.4GHz 5dBi Dipole (RPSMA)

Any of the two 900 MHz antennas can be left unmounted if antenna diversity is not to be used. For further detail about the diversity options that the modem inside TX Pole provide, refer to the RFDesign Modem 900x Datasheet, the link of which can be found in section 6 of this document:

5 Technical Specifications

5.1 Power Consumption

Table 7 – Power Consumption vs Mode of Operation

Mode of operation	Average Consumption [A]	Expected Battery Life [Hours]
Modem constantly transmitting while connected via Wi-Fi in AP	0.53	11
Modem constantly receiving MAVLINK stream while connected via Wi-Fi in AP	0.2	30
Modem not transmitting (just bound) and Wi-Fi in AP	0.19	32
Modem not bound (trying to connect) and Wi-Fi in AP	0.18	33
Modem Disconnected	0.12	50
Powered off	19µ	-

The product has an internal battery of 6Ah, 7.4 V. Expected battery life assumes no external charge is applied.

Recommended external power supply:

In order to charge the device, an external power supply of +9V to 16V is needed and must be able to supply at least 2A. If additionally the device is to be used while charging, the power supply must supply the nominal current consumption. **For this reason a power supply of +9V to 16V and 3A is recommended.**

5.2 Modem Specification

Table 8- Performance	
Supported RF Data Rates	4, 64, 125, 250 and 500 Kbps
Indoor Range	500 m – 1 km
Line-Of-Sight Range	40km or more depending on antennas
Transmit Power	0 to 30dBm in 1dBm steps
Receiver Sensitivity	>121dBm

Table 9 - Features	
Configuration Method	AT Commands, APM Planner, Customized Configuration Tool
Frequency Band	902 MHz – 928 MHz
Interference Immunity	FHSS (Frequency Hopping Spread Spectrum)
Serial Interface Data Rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 450800, 1000000 baud/s

Table 10 - Networking and Security	
Addressing Options	Network ID: 0 –255
Channels	Up to 50 Frequency Hopping Channels
Supported Network Topologies	Point to point

5.3 Wi-Fi Specifications

Table 11 - Wi-Fi Parameters	
Wi-Fi Protocols	802.11 b/g/n (802.11n up to 150 Mbps)
	A-MPDU and A-MSDU aggregation and 0.4 µs guard interval support
Frequency Range	2.4 GHz - 2.5 GHz
Wi-Fi mode	Access Point (AP) /station (STA)
Security	WPA/WPA2
Encryption	WEP/TKIP/AES
Firmware Upgrade	OTA (via network)
Network Protocols	IPv4, TCP/UDP/HTTP/FTP
User Configuration	Browser interface

Table 12 – Wi-Fi Radio Characteristics

Parameters	Condition	Min	Typical	Max	Unit
Input Frequency	-	2412		2484	MHz
Output Impedance	-	-	50	-	Ω
Tx Power	11n, MCS7	**12**	**13**	14	dBm
	11b mode	**17.5**	**18.5**	20	dBm
Sensitivity	11b,1 Mbps	-	-98	-	dBm
	11b,11 Mbps	-	-89	-	dBm
	11g, 6 Mbps	-	**-92**	-	dBm
	11g, 54 Mbps	-	**-74**	-	dBm
	11n, HT20, MCS0	-	**-91**	-	dBm
	11n, HT20, MCS7	-	-71	-	dBm
	11n, HT40, MCS0	-	-89	-	dBm
	11n, HT40, MCS7	-	-69	-	dBm
Adjacent Channel Rejection	11g, 6 Mbps	-	31	-	dB
	11g, 54 Mbps	-	14	-	dB
	11n, HT20, MCS0	-	31	-	dB
	11n, HT20, MCS7	-	13	-	dB

5.4 Module Compliance

Table 13 - Compliance	
Contains RFD900x Modem	Contains FCC ID RFD900X-2ADLE AS/NZS 4268:2017
Contains Wi-Fi Module ESP32-WROOM-32U	Contains FCC ID 2AC7Z-ESP32WROOM32U RF Certification: FCC/CE-RED/IC/TELEC/KCC/SRRC/NCC Wi-Fi Certification: Wi-Fi Alliance Green Certification: REACH/RoHS

5.5 Ordering Guide

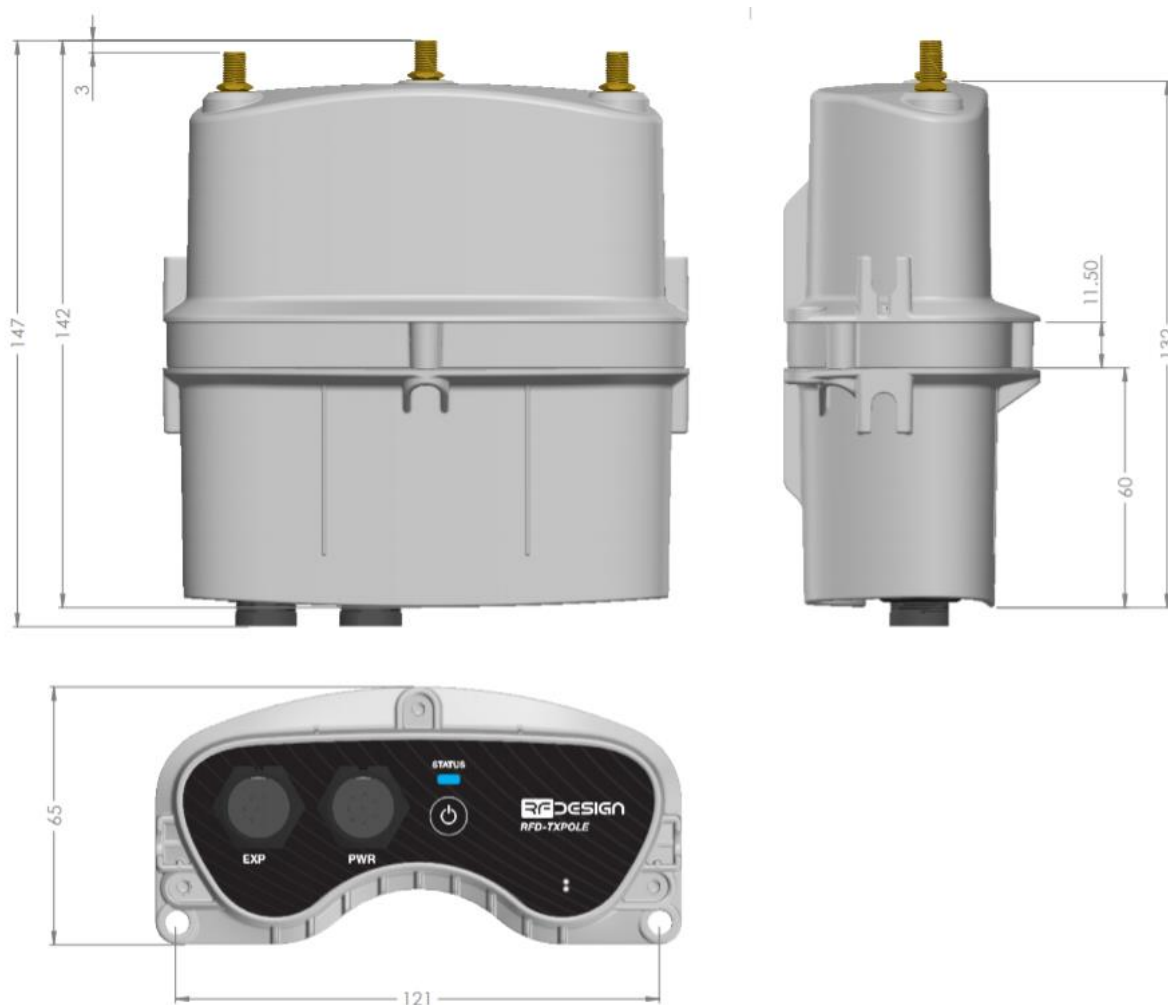| Order code	Description
TXPOLE-900	TX Pole – unlocked region 902-928MHz
TXPOLE-868	TX Pole – unlocked region 865-870MHz
TXP-HRN-01	External Mast Power Harness 5m

5.6 Physical Dimensions

Figure 14 - TX Pole physical dimensions in millimeters.

6   Useful Links

TX Pole Wi-Fi firmware
http://files.rfdesign.com.au/firmware/

RFDesign Modem 900x
Datasheet
http://files.rfdesign.com.au/Files/documents/RFD900x%20DataSheet.pdf

Firmware
http://files.rfdesign.com.au/firmware/

Peer to Peer firmware - User Manual
http://files.rfdesign.com.au/Files/documents/RFD900x%20Peer-to-peer%20User%20Manual%20V1.1.pdf

RFDesign Programming Tools
Software:
http://files.rfdesign.com.au/tools/

Manual:
http://files.rfdesign.com.au/Files/documents/RFD%20Modem%20Tools%20Manual%20V1.1.pdf

Mission Planner
http://ardupilot.org/planner/docs/common-install-mission-planner.html

Appendix A – TXP-HRN-01 – External Mast Harness 5m
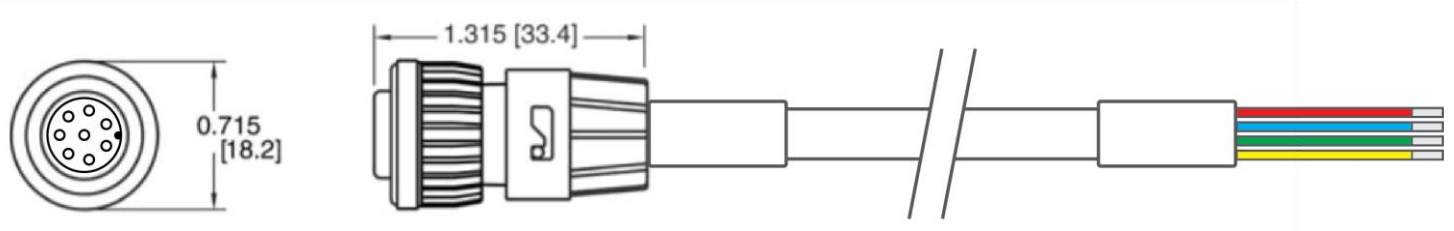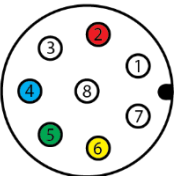
Table 16 – Main connector pinout

PINOUT	PIN	Name	Wire colour	Description
	1	NC	-	Not connected
	2	+V_PLUG	Red	Device external supply with priority over internal battery.
	3	NC	-	Not connected
	4	GND	Blue	Ground
	5	EXT_ON_N	Green	A switch can be connected across EXT_ON_P and EXT_ON_N to switch on and off TX Pole when connected far up to a pole.
Main connector Cable view	6	EXT_ON_P	Yellow	
	7	NC	-	Not connected
	8	NC	-	Not connected