



## RF-USB Multi-Channel USB RF Transceiver

The RF-USB is a serial data radio transceiver modem that enables wireless data communication between USB host computers. A simple driver installation creates a virtual COM port and establishes a plug and play connection for the RF-USB transceivers. The RF-USB transceiver features 10 operating channels on the 433 MHz and the 868 MHz versions, and 169 channels on the 900 MHz model. Output power can also be set to operate at -8, -2, +4 or +10 dBm. The operating channels and output power can be changed from their defaults through a simple set of AT commands. Monitoring of channel occupation can also be performed through simple serial commands. The serial data rate is configured via two on-board jumpers, SP1 and SP2.

### Features

- USB Port powered
- Selectable data rates: 9600, 19200, 38400 57600 and 115200bps
- 10 selectable operating channels on 433-434 MHz and 868 MHz versions
- 169 selectable operating channels: 902-928 MHz version
- User adjustable output power from -8 to +10 dBm
- -104 dBm sensitivity
- Transparent data throughput
- Uses standard USB cable with USB-A connectors terminated at each end
- LED indicators for receive, transmit and power status
- RSSI and test link modes
- Available with or without enclosure
- Compatible with the RF-232 transceiver, RF-SDS Ethernet transceiver and AT-XTR-7020 RF transceiver modules



### Typical Applications

- Remote data transfer
- Wireless Data Acquisition
- Robotics
- Instruments monitoring
- Remote control applications



## Technical Characteristics

Absolute Limits	
Operating Temperature	-20 °C to +70 °C
Storage Temperature	-40 °C to +100 °C

	Min.	Typ.	Max.	Units
<b>DC values</b>				
Current (rx mode)		30		mA
Current (tx mode @ -8 dBm)		25		mA
Current (tx mode @ 10 dBm)		40		mA
<b>RF</b>				
Modulation Type		FSK		
Frequency Band	433.19 to 434.57			MHz
Rx Sensitivity		-100		dBm
Tx Power Output	-8		10	dBm
<b>Performance</b>				
Input Bit Rate <sup>1</sup>	9600, 19200, 38400, 57600, 115200			bps
Outdoor range		200		m
Available Channels			10	
Channel Spacing		153.6		KHz
<b>Timing</b>				
TX to RX			20	ms
RX to TX			20	ms
<b>Default Values ( NO programming )<sup>2</sup></b>				
Operating Channel		433.96		MHz
Tx Output Power		10		dBm

<sup>1</sup> Input signal consists of 1 start bit, 8 data bits and 1 stop bit, no parity.

<sup>2</sup> Default values are factory configured. May be changed with AT command programming.

## Data Rate Configuration

The data rate is selected by setting the jumpers located on the circuit board which are labeled SP1 and SP2. The following truth table shows the possible combinations:

SP1	SP2	I/O Data Rate	
		Register S5=0 *	Register S5=1
N	N	9600 *	9600
I	N	19200	57600
N	I	38400	115200
I	I	Test Mode Pseudo noise	Test Mode Data packet

Note — I: jumper IS installed, N: jumper NOT installed: \* = Default

A different degree of redundancy and protection is associated with the RF packet according to the selected speed. This means that slower data rate results in a higher level of reliability and/or longer communication distance. To install, insert the CD provided into your CD-ROM drive.

## Loading the Driver (download from [www.ftdichip.com](http://www.ftdichip.com))

The driver provided for **FT232BL** USB chipset designed into the RF-USB RF transceiver module creates a virtual COM port on the computer. This allows programs to access the USB transceiver in the same way it would access a standard COM port using the Windows VCOMM API calls or by using a COM port Library. To install the driver, download the latest **FT232BL** driver version from [www.ftdichip.com](http://www.ftdichip.com). Next, plug the RF-USB RF transceiver into the USB port. If a Windows “Found New Hardware Wizard” does not pop up, you can open it from your Control Panel. When prompted for the location of the driver, choose the folder location on your hard drive where you downloaded the driver to. Refer to the Adobe Acrobat file “COMPORT” in the driver folder for instructions on selecting the COM port number.

## Command Mode

Command mode allows the user to configure the main parameters that change the module’s operating conditions, such as selecting a new operating frequency channel or adjusting the RF output power to a desired value. Programming is carried out via simple AT commands. To enter the command mode, the following data string must be sent to the unit via the USB port:

- 3 consecutive ASCII plus characters (+++) without pauses.

Within 35ms, the module will respond with **OK<CR><LF>** string to confirm it is in Command mode. (<CR> represents ‘Carriage Return’) (<LF> represents ‘Line Feed’)

Programming information is stored in 16 available registers (from 1 to 16). Some of these are available only for read operations, whilst others are available for read/write operations.

The syntax to read a value stored in a register is as follows:

**ATSx<CR><LF>** (x= register 1, ..., 16)

Assuming that the command was issued correctly, the answer to this command is the value of the contents of the register. For a command issued with errors, the following answer is returned:

**ERROR<CR><LF>**

To change the value of parameter in a register, the following syntax is used:

**ATSx=Y<CR><LF>** (x= 1, ..., 16) , Y= value to be inserted

A command issued correctly will receive **OK<CR><LF>** response. If the command contained a syntax error or if the value that was entered to be written is an unacceptable parameter for that register, an **ERROR<CR><LF>** response will be received.

All the values written into registers are volatile and will be lost when the module is powered OFF, unless they were previously saved into the EEPROM memory available in the embedded microprocessor. In this case, the modified values will be non-volatile and will be retained even if the module's power supply is cycled.

The command for non-volatile saving of ALL the values in register is:

**ATWR<CR><LF>**

To exit Command Mode and return the transceiver to normal operating , the following command is issued:

**ATCC<CR><LF>**

When in Command mode, it is possible to include multiple commands in a single command line by separating each command by a comma (,) operator. With following command line, for example, register 3 is set to value 2, the change is permanently saved and the Command Mode is exited:

**Example: ATs3=2,WR,CC <CR><LF>**  
**OK<CR><LF>**

As shown in the above example, the prefix -AT- is only used once in the beginning of the command of line and not required for the following commands which are separated with the comma operator.

Command chaining is possible only for write operations. If used in read operations, an "ERROR" message will be returned as in the following example:

**Example: ats1,cc <CR><LF>**  
**ERROR <CR><LF>**

Commands are not case sensitive, so either uppercase or lowercase characters may be used.

Refer to **Appendix A**. for details on register values and possible configurations.

## Appendix A – Register Programming

Different operating characteristics of the transceiver, such as RF channel selection, RF emitted power, etc..., can be programmed by the user through setting special parameters in 16 available registers. The following information provides the meaning and programming possibilities for each register. The current AT-XTR-7020 transceiver modules implement 4 out of 16 registers - registers 1,2,3 and 16. Only these registers will be described, the remaining registers are reserved for possible future enhancements.

### Register 1 - FREQUENCY BAND

This register is READ ONLY and will supply information relating to the module's operating RF band. The AT-XTR-7020 transceiver modules are available in three different models, 433 MHz, 868 MHz and 900 MHz .

Command	Values	Read (R) / Write (W)
ATS1	0 =433-434 MHz	R
	1 =868-870 MHz	
	2 =902-928 MHz	

#### Example 1: Reading the operational band of the module

```
+++OK<CR><LF>
ATS1<CR><LF>
0<CR><LF>          (note: 0 = 433-434 MHz band)
```

#### Example 2:

```
+++OK<CR><LF>
ATS1=2<CR><LF>
NO ACCESS<CR><LF>
```

Syntax Error: This register is available for Read only!

### Register 2 – RF CHANNEL

This register is available for read and write operations. It allows to get feed backs of the RF frequency (channel) setting for both receiving and transmitting circuits. Makes it possible to "write" a different frequency (channel).

Command	Values	Read (R)/ Write (W)
ATS2	0 = 433.19 MHz 1 = 433.34 MHz 2 = 433.50 MHz 3 = 433.65 MHz 4 = 433.80 MHz 5 = 433.96 MHz 6 = 434.11 MHz 7 = 434.27 MHz 8 = 434.42 MHz 9 = 434.57 MHz	R/W

**Example 1: Reading the configured RF channel (433,5 MHz)**

```
+++OK<CR><LF>  
ATS2<CR><LF>  
2<CR><LF>
```

**Example 2: Selecting channel 8 as the operating frequency (434,42 MHz)**

```
+++OK<CR><LF>  
ATS2=8<CR><LF>  
OK<CR><LF>
```

**Register 3 – EMITTED RF POWER**

This register is available for read and write operations. With the read command, feedback is given about the RF output power emitted from the module's transmitter section. The write command enables the user to configure the transmitter section for the preferred RF output power.

Command	Values	Read (R)/ Write (W)
ATS3	0 = - 8 dBm 1 = - 2 dBm 2 = + 4 dBm 3=+10 dBm	R/W

**Example 1: Reading the configured RF output power (-2 dBm)**

```
+++OK<CR><LF>  
ATS3<CR><LF>  
1<CR><LF>
```

**Example 2: Setting RF output power to +10 dBm**

```
+++OK<CR><LF>  
ATS3=3<CR><LF>  
OK<CR><LF>
```

**Register 16 – RSSI (Received Strength Signal Indicator)**

The register is read only and will supply a numeric value proportional to the RF Field Strength sensed from the receiving circuitry. The range of possible values returned from the register are 0 through 9. Reading register 16 starts a process of analysis of the RF channel that the module is programmed to operate on. This routine has a fixed duration of 200 ms and the analysis result is given after this period. The analysis period should be allowed to run its course without interruption through issuing another command. The signal strength command is useful for determining possible channel occupation or for setting up the link in conjunction with the TEST mode.

Command	Values	Read (R)/ Write (W)
ATS16	0 = Minimum Field Strength 1 2 3 4 5 6 7 8 9 = Maximum Field Strength	R

**Example 1: Reading Field Strength (strong received signal)**

```
+++OK<CR><LF>
ATS16<CR><LF>
9<CR><LF>
```

**Example 2: Reading Field Strength (very weak or no received signal)**

```
+++OK<CR><LF>
ATS16<CR><LF>
0<CR><LF>
```

**Example 3: Syntax Error: register is read only!**

```
+++OK<CR><LF>
ATS16=3<CR><LF>
ERROR<CR><LF>
```

**Additional Information**

The RF-USB transceiver is designed around the AT-XTR-7020 RF transceiver module. Full details on the AT-XTR-7020 module may be found on ABACOM's website <http://www.abacom-tech.com/Multi-Channel-Intelligent-FM-Transceiver-Module-AT-XTR-7020-P93269.aspx>

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