

FC-301/C Wireless RF Transceiver

USER MANUAL



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I . General overview

FC-301/C module integrates transmitter and receiver for wireless signal. It works in half duplex mode, which can provide two-way audio transmission in VHF/UHF. Its frequency bandwidth is 20MHz.

FC-301/C has independent RF module and MCU. It adopts dual PLL /VCO which makes the module work stably. The user's interface of FC-301/C is simple and applicable with several parameters adjustable. It has two audio signal output, one is audio pulse output and the other is audio power output to drive the speaker. The module is widely used in area of electric power, hydrology, water conservancy and military.

II . Features of FC-301/C

1. Dual PLL and VCO structure with stable work frequency and rapid Rx/Tx switch.
2. Wide work frequency covers 20MHz.
3. Able to store 4 receiving or transmitting channels, User can select the channel via DIP switch.
4. Able to set a receiving or transmitting frequency with a setting frequency device, the number of the frequency reaches up to 800.
5. Encapsulated with plating lithium metal resistant to electromagnetic interfere.
6. SMT assembly with high integration.
7. Small and light for convenient embedding.

III. Technical specifications of FC-301/C

1. General specifications:

- 1) Carrier frequency: VHF/UHF (140-160,150-170, 220-240,400-420,450-470MHz)
- 2) Channel spacing: 12.5/25KHz
- 3) Frequency stability: 5ppm
- 4) Signal modulation mode: FM
- 5) Antenna impedance: 50Ω
- 6) Temperature: -20 ~ 60°C
- 7) Humidity: 10%-90%RH, non-condensing
- 8) Size: 106 x 54 x 18mm (antenna port & heat sink excluded)
- 9) Weight: 150g (antenna port included, heat sink excluded)

2. Specifications of receiver:

- 1) Modulation deviation: $\leq \pm 5.0\text{kHz}$
- 2) Receiving sensitivity: $\leq 0.25 \mu\text{V}$ (12dB SINAD)
- 3) Clutter and images rejection: $\geq 65\text{dB}$
- 4) Intermodulation rejection: $\geq 65\text{dB}$
- 5) Audio distortion: $\leq 3\%$
- 6) Audio output: 240± 20mV
- 7) Standby current: $\leq 50\text{mA}$

3. Specifications of transmitter:

- 1) Modulation sensitivity: 100mv± 10mv
- 2) Transmitting current: $\leq 2\text{A}$ (13.8V/5W)
- 3) Transmitter startup time: $\leq 50\text{ms}$
- 4) RF power: 5W/2W
- 5) Audio distortion: $\leq 3\%$

4. Power supply:

- 1) 9~15V DC typically 13.8V
- 2) Standby current(reception status) : $\leq 50\text{mA}$
- 3) Transmitting current: $\leq 2.0\text{A}$ (13.8V, RF power 5W)

IV. Main Parts and basic principle of FC-301/C

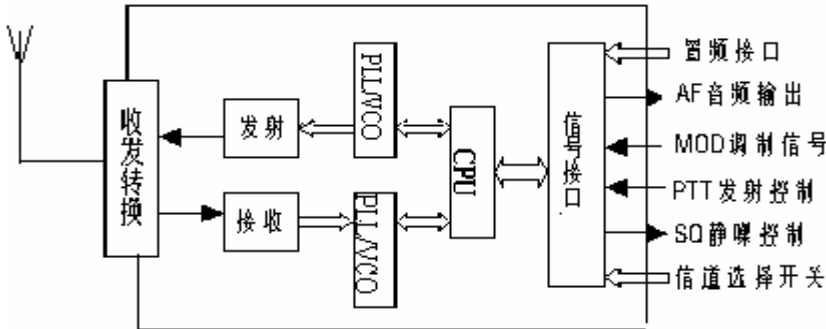


Fig.1

FC-301/C is mainly composed of transmitter circuit, receiver circuit, PLL, CPU, Audio MODEM (shown as fig.1). The Receiver circuit amplifies the signal from the antenna and demodulates the signal to audio signal via audio demodulator. Transmitter circuit amplifies magnifies the modulated RF signal and radiates it via the antenna. PLL is controlled by CPU to generate needed frequency for Rx /Tx.

V. Shape and Interface description

1. Shape sketch (shown as Fig2)

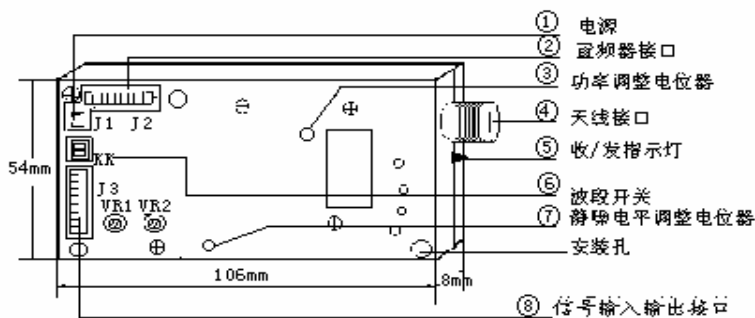


图2

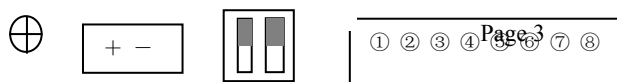
Fig.2

2. Interface description.

FC-301C interface position is shown as Fig.3. The signal interface diagram is shown in fig. 5. The detail description is listed below.

①J1: power source port: 9-15V DC, typically 13.8V.

The port is a 2-pin socket, One the positive, the other is negative.



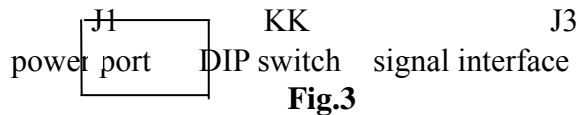


Fig.3

② **J2: Freq-Set port:** 10-pin standard socket, Set or change the working frequency.

③ **Power adjustment rheostat:** It has been adjusted while EX-works

④ **Antenna port:** TNC female connector, impedance is 50Ω.

⑤ **Indicate LED:** The LED is red in Tx, it is green in Rx.

⑥ **DIP switch KK:** It's used to select channels , Fig.4



⑦ **SQ level adjustment rheostat:** It has been adjusted while EX-works

⑧ **J3 signal port:** 8-pin socket, pin ① is near KK. Each pin definition is shown in table 1:

Table 1

Pin No.	name	Description
1	GND	Grounding
2	SQ	SQ control signal, output low level (0 V) while EX-works.
3	PTT	Transmitting control signal, output low level (0 V) while EX-works.
4	PULSE	Output reshaped TTL rectangle wave to output 0 or 1. The amplitude is about 4.8V.
5	B.B	Output original FM demodulated signal, the amplitude is about 110mV.
6	AF	Output the reshaped base signal by phase discriminator, the amplitude is about 220mV.
7	MOD	Modulation signal input. It's 75mV while EX-works. Adjust VR1 to make the freq deviation to be 3.0KHz, if the external modulation signal input is greater than 75mV, Adjust VR1 to meet the requirement of freq deviation less than 5.0KHz.
8	APO	Audio power amplifier output can be connected directly to an 8 ohm 0.25W speaker for monitor. Its volume can be adjusted via VR2 to judge whether the receiving /transmitting is in good working status.

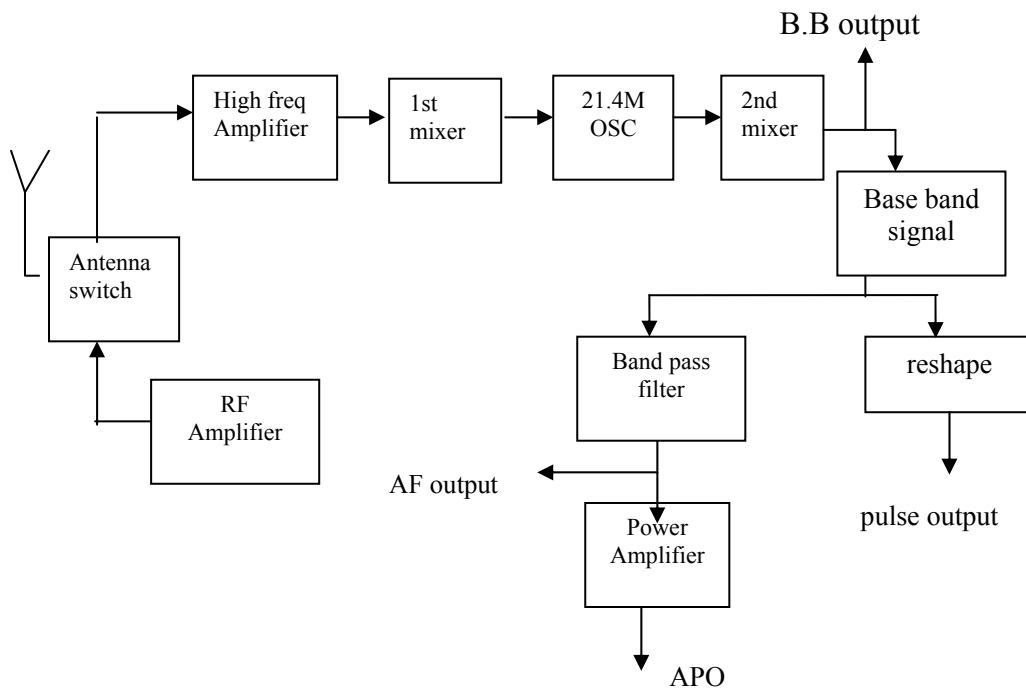


Fig. 5

3. User Interface signal Timing

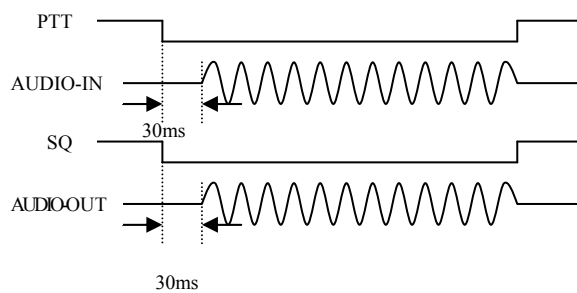


Fig. 6

Signal description :

- 1) Keep PTT signal to be high level, FC-301/C keeps in receiving status.
- 2) There is a delay of 30ms from PTT input or SQ output to the input or output of the real signal.
- 3) The freq of the audio input signal is no more than $\pm 5\text{KHz}$.

VI. Notes

1. Power supply:

- A. The power supply is typically 13.8V, when RF power is 5W, the consumption is $<2\text{A}$, when

RF power is 2W, the consumption is <1A.

B. If we use an on-off power supply, To be sure the power supply should not be near to the FC-301/C module, or the power will be self-excited and cause the voltage to be unstable.

C. Before power-on, Please make sure the polarity of the power to be correct and the antenna port to be connected with dummy load or antenna for avoiding the antenna port to be open or short-circuit.

2. Electromagnetic environment testing

Electromagnetic environment should be tested to avoid blind area or interfere before using the module.

3. The Anti-thunder measures

If FC-301/C module is used in thunder area, Anti-thunder measures should be taken into account. And make sure the module to be well-grounding.

4. Choice for Antenna

Generally, the effective band of antenna is 3-5Mhz. So we should select the antenna based on its frequency band. If long transmission distance is required, directional antenna with high gain should be used.

5. Heat dissipation

A fan would better be installed if the module is required to work a long time when the RF power is 5W. Pay attention not to take the noise into the module.

Appendix:

How to use Freq-Set Device

Freq-Set Device is especially designed to set channel and Tx/Rx frequency for FC-301/C. The shape is shown in Fig 1. It has four digital LED, named LED1, LED2, LED3 and LED4 from the pin socket. LED1 indicates the No. of channel which is controlled by key 1. LED 2, LED 3, LED 4 compose the corresponding Freq-set values (001-999) for the Rx or Tx frequency, Which is respectively controlled by Key 2-4. The method of setting frequency is described as the following:

FC-301/C Module

Freq-set device

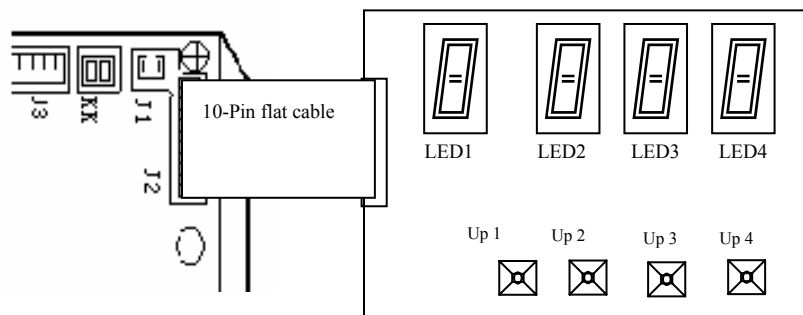


Fig.1 The connection sketch of Wireless transmission module and Freq-set device

1. Calculate the corresponding Freq-set value of the Tx/Rx frequency. The formula is shown below:

$$\text{Freq-set value} = (\text{the work frequency} - \text{base frequency}) / \text{channel space}$$

where, The base frequency is respectively 220MHz、400Mhz and 450Mhz corresponding to frequency band 220-240MHz、400MHz-420MHz and 450-470MHz。The channel space is 0.025Mhz and 0.0125MHz, typically 0.025MHz. The Freq-set value is set to the digit of LED2、LED3、LED4. That's the corresponding freq-set value of the Tx/Rx frequency.

2. Determine the Tx/Rx work frequency, Using base frequency and channel space to calculate the freq-set value.
3. Connect the FC-301/C module with freq-set device by 10-pin flat cable as fig.1.

4. Power on the FC-301/C module, the freq-set device has no display. Press UP 1 one time, The LEDs is on and displays '0', it means the device keeps in reset status.
5. Press Up1, LED1 can display 1、 2、 3、 4、 5、 6、 7、 8 in turn corresponding to Rx of channel 1, Tx of channel 1, Rx of channel 2, Tx of channel 2, Rx of channel 3, Tx of channel 3, Rx of channel 4, Tx of channel 4. At the same time ,LED2-LED4 display the Rx/Tx freq-set value of the current channel.
6. Press Up1 to select the channel to be set, Press Up2、 Up3、 Up4 to set the freq-set value of the channel. For example, if the FC-301/C's work frequency is 455.850,and the base frequency is 450MHz, channel spacing is 25KHz, the freq-set value is: $(455.850-450.0000) \div 0.025=234$.(LED2 set to 2, LED3 set to 3, LED4 set to 4).
7. Press Up1, The freq-set value is finished. The freq-set device display reset status. At this time, The MCU of FC-301/C switches from program status to normal working status, and we can operate the FC-301/C.
8. Power off the FC-301/C module, disconnect the module and the freq-set device.
9. Select the current work channel with DIP switch, The Module can work in the selected channel.