

FC-201/E Data Transceiver

USER MANUAL



SHENZHEN FRIENDCOM TECHNOLOGY DEVELOPMENT CO. , LTD
Address: 2/F, Multifunction Building, Dongpeng Industrial
Park, Wuhao Road, North Section of Hi-tech
Park, Shenzhen 518057 China
Tel: +86-755-86026603 +86-755-29926100
Fax: +86-755-86026300
E-mail: faq@friendcom.com
Website: <http://www.friendcom.cn>

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I . General overview

The product is a modularized bidirectional data transmission radio with low power consumption. It adopts multiple advanced techniques such as SCM, RF and digital processing etc. SMT and high quality components are used in production. Its technical specifications satisfy GB/T16611-1996.

FC-201/E can operate in E protocol and P protocol. It is suitable for various communication environment to implement point to point or point to multi-point networking. The addressing capacity is 4096. It can provide a simple and convenient wireless data transmission solution of low cost for industrial control. FC-201/E is most suitable for industrial remote control, wireless vehicle, workshop automation and data reading /collecting system etc.

II . Features of FC-201/E

1. Digital PLL for stable frequency.
2. The working frequency covers 12MHz.
3. MSK modulation mode.
4. Store 16 receiving /transmitting channels.
5. Air data rate is 1200/2400 bps. Operate in multiple communication protocols with high compatibility.
6. Providing RS-232, RS-485, UART/TTL optional interface, easy to connect with various equipments.
7. Programmable interface.
8. Built-in software watchdog to ensure long-time reliable work.
9. SMT assembly, high integration and advanced technics.

III. Technical specifications of FC-201/E

1. General specifications:

- 1) Carrier frequency: 223 ~ 235MHz
- 2) Channel spacing: 25kHz/12.5kHz optional.
- 3) Frequency stability: ± 5 ppm
- 4) Modulation mode: MSK
- 5) Air data rate: 2,400/1,200bps
- 6) Channel: 16
- 7) Antenna impedance: 50Ω
- 8) Temperature: $-20^{\circ}\text{C} \sim 60^{\circ}\text{C}$
- 9) Size: 72 x 46 x 14mm
- 10) Weight: 140g

2.Specifications of receiver:

- 1) Receiving sensibility: $\leq 0.25 \mu \text{V}(12\text{dB SINAD})$
- 2) Adjacent channel selectivity: $\geq 65\text{dB}$
- 3) Frequency deviation: $\leq \pm 5.0\text{kHz}$
- 4) Spurious and images rejection $\geq 65\text{dB}$
- 5) Intermodulation rejection: $\geq 65\text{dB}$
- 6) Audio distortion: $\leq 3\%$

3. Specifications of transmitter:

- 1) RF power: 500mW /100mW
- 2) Adjacent channel rejection: $\geq 65\text{dB}$
- 3) Transmitter startup time: $\leq 50\text{ms}$

4. Interface: RS-232, RS-485 and UART/TTL, data rate: 1,200 ~ 9,600bps optional, format: 8N1/8E1/8O1.

5. Power supply: DC 5V

6.Consumption current:

Standby current(reception status) : $\leq 50\text{mA}$
Transmitting current: $\leq 300\text{mA}(\text{RF power } 500\text{mW})$
 $\leq 180\text{mA}(\text{RF power } 100\text{mW})$

IV. Main Parts of FC-201/E

FC-201/E is mainly composed of transmitter, receiver, PLL, baseband processing and MODEM, CPU, interface RS-232/485/UART(shown as fig.1).

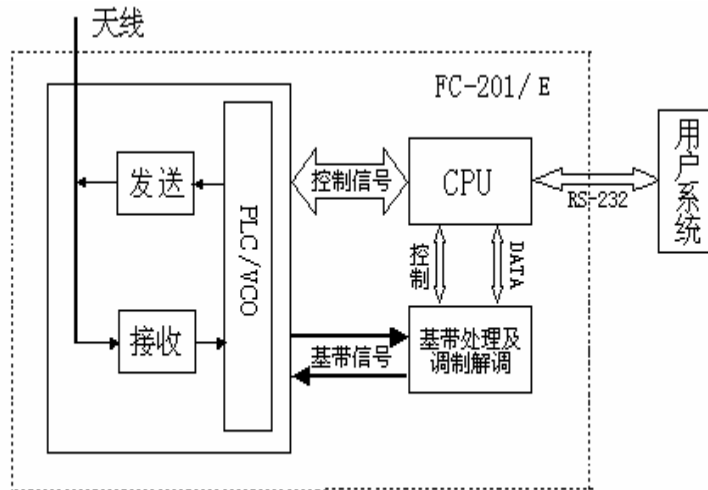


Fig. 1

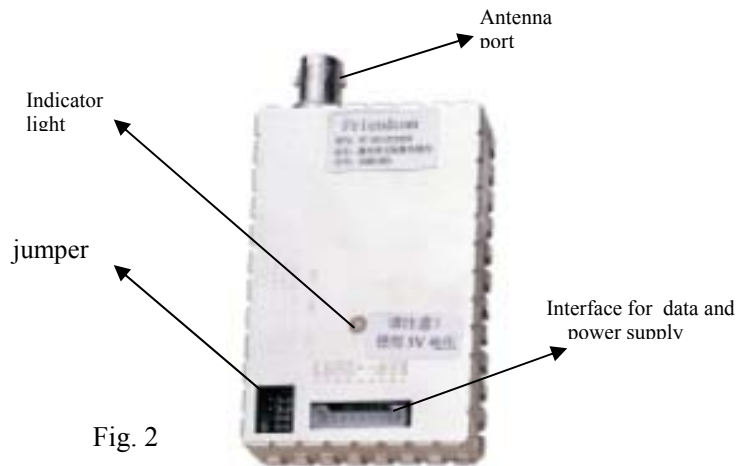
The main function of each part is shown below.

- (1) Transmitter: To modulate the baseband signal to radio frequency and amplify its power.
- (2) Receiver: To demodulate the RF signal and amplify it to baseband signal.
- (3) PLL: Providing standard high-stability RF signal for transmitter and receiver
- (4) Baseband processing and MODEM: This part carry out processes such as filtering, amplifying and reshaping modulating/demodulating, encrypting/ decrypting and squelching.
- (5)CPU: To carry out interface control, parameter setting and data processing etc.

(6)Interface RS-232/485/UART: data exchange with the user's terminal.

V. Shape and Interface

1. Shape



2. Interface

9-pin port of FC-201/E is shown in fig. 3. The definition of each pin is shown in table 1.

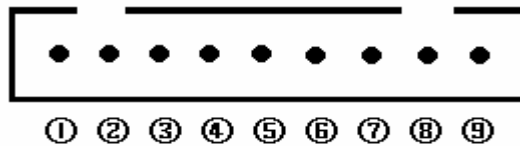


Fig.3

Table 1:

NO.	DESCRIPTION
1	Signal GND
2	RxD—Receiving Data End: Input of FC-201/E
3	TxD—Transmitting Data End: Output of FC-201/E
4	CTS—Clear-to-Send : Output, If the buffer of FC-201/E is full, CTS take effect to forbid data transmission from terminal to FC-201/E.
5	RS-485 B
6	RS-485 A
7	RESET: Input. If input a TTL low level, FC-201/E will reset.
8	+5V DC power supply
9	Grounding of power supply

3. Setting data interface

FC-201/E can provide three types of data interface, but only one interface can be used at one time. The choice of the interface depends on the different jumper wire way of the short circuit. There is a line of jumper wires on the left of data interface while opening the upper cover of FC-201/E module. Different interface mode will be available as the jumper wire way of fig.4.

VI.Connected with the terminal and parameter setting.

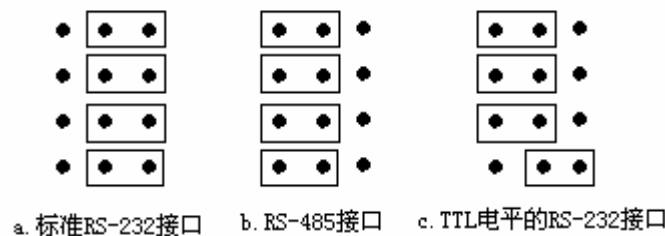


Fig 4 FC-201/E interface selection jumper

1. Connection before power-on.

- a. Connecting the antenna port with antenna or dummy load, the working frequency of the connected antenna is same with the actual frequency of the module.
- b. Connecting FC-201/E to +5V DC power supply, Be careful the voltage should not be too high, or the module will be destroyed easily.
- c. Connecting two modules with computers respectively via the attached RS-232 cable. The connection sketch is shown below.

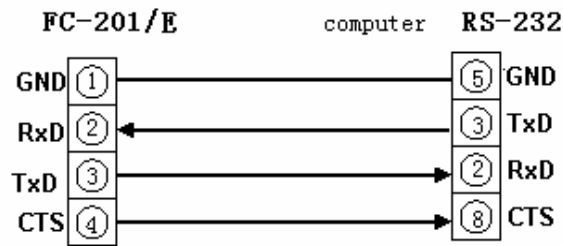


Fig. 5

- d. Install the DEMO testing software to the computer.

2. Power-on examination

- a. Turn on the +5V DC power supply
- b. Carry out communication and data transmission in default setting for examination.

3. Data transmission examination

- a. Connect the two being tested FC-201/E to computers, turn on the power and set the channel to channel 1.

- b. Run the setting software, reading the parameters of the module, which will be the same with its default setting.
- c. Select the menu of“data transmission”, input the prepared word or numbers and press the send button. Two modules will transmit data continuously. The screen of the computer displays the transmitted data. It indicates that data transmission works well.

4. Setting parameters

The setting for parameters should be carried out if the needed parameters of user’s network are different from the default ones. User can change the default setting stored in the module such as carrier frequency, air data rate, interface data rate and protocol to meet the needs of the practical network. The steps for setting parameters are as the following.

- a. Run the software and open the menu for setting.
- b. Select the item to be changed. For example, If we want to change the frequency, first input the needed frequency, then press the setting button and the new frequency is well set. One thing should be noticed that the transmitting frequency of the master is the same as the receiving one of the slave while the receiving frequency of the master is the same as the transmitting one of the slave. But the receiving/ transmitting frequency of the same module can be diverse.
- c. System code and address code should be encoded in network.

VII. Data transmission protocol

There are two types of data transmission protocol known as P-protocol and E-protocol in FC-201/E. P-protocol has three modes: Addressing mode, General mode and transparent mode, which can be set with DEMO software. E-protocol is an all-transparent protocol.

VIII. Wireless networking and programming

It's a more complicated project to form a wireless network with FC-201E especially for point to Multi-point, multi-hierarchy management, dynamic channel assignment, which needs the support and control of system programming software. The notes for networking and programming are listed below.

1. To determine the communication protocol of network.

FC-201/E can support multiple communication modes such as point to Multi-point, point to point etc. User can select one based on his needs.

Addressing mode is recommended to transmit data if point to Multi-point network is adopted.

General mode is recommended to transmit data if point to point or other user-defined network is adopted.

E-protocol is a preferable choice in wireless auto meter reading system.

2. To determine the working channel.

FC-201/E can work in single channel, multi-channel and dynamic channel assignment mode.

a. Single channel

Single channel is used in simple network or point to point communication. The channel No. and frequency of all the FC-201/E or its compatible modules in the network are the same.

b. Multi-channel

Multi-channel is applied in more complicated network with more users and large amount of data transmission. Channel frequency should be determined and then channel resources should be assigned in this mode. In general case, It is recommended that the maximal assigned channels is 4.

c. Dynamic channel assignment mode.

Dynamic channel assignment mode is applied in more complicated network with more users and large random data transmission amount. It can work in two modes known as centralized resources management mode and random assignment mode.

The application development is relatively complicated in dynamic channel assignment mode. But larger system capacity, more flexible network and high use rate for frequency will be available.

3. Notes:

In system programming, Suitable communication protocol should be selected due to networking plan. Programming should be carried out referring to the data structure of the P-protocol or E- protocol. It is worth to mention that some projects substitute the wire data

transmission system with a wireless one, the below points should be taken into account because of the different transmitting way between wire and wireless system.

a. Data delay in wireless communication

Because the transmitter needs some startup time for stability, the transmission time of data will be long from master to slave and reverse. The master program should make the corresponding adjustment in timing.

b. Interface data flow control

FC-201/E is an intelligent data transceiver, Its built-in MCU can provide some data buffer used for storing the received data or the data to be transmitted. Since the data buffer is limited, if the interface data rate is greater than the air one, the problem of data flow control should be considered. Or some data will be lost during interface communication.

4. Error control

The module just provides data transmission of link layer to user. If user needs to enhance the transmission reliability, he can develop the protocol layer of the module.

IX. Type description

The type description is shown below, Please point out the needed type while making an order.

FC-201 / E 23 A5 E

FC-201 indicates the product code name of manufacturer.

E indicates Small power

23 indicates the carrier frequency

A5 indicates RF power , A5=500mW, B5=100mW

E indicates communication protocol. E=E protocol, P=P protocol.

X.The default setting and accessories

a. The default setting of parameters and accessories.

The default setting		accessories:	
Interface data rate	1200bps	Manual	1
Air data rate	1200bps	9-pin port	1
check	even	External antenna	Optional
		Data CD	1

b. The default frequency of each channel.

Frequency Channel	223 ~ 235MHz	
	Tx (MHz)	Rx (MHz)
Base frequency	220	220
Channel 1	225	225
Channel 2	225.5	225.5
Channel 3	226	226
Channel 4	226.5	226.5
Channel 5	227	227
Channel 6	227.5	227.5
Channel 7	228	228
Channel 8	228.5	228.5
Channel 9	229	229
Channel 10	229.5	229.5
Channel 11	230	230
Channel 12	230.5	230.5

Channel 13	231	231
Channel 14	231.5	231.5
Channel 15	232	232
Channel 16	232.5	232.5