

FC-206/A High Speed Data Transceiver

USER MANUAL



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I . General overview

FC-206/A is designed with multiple advanced techniques such as digital signal processing, RF, micro-processor and network technique etc. GMSK modulation mode, FEC/CRC, TCXO is also used in the product. It implements bidirectional data transmission with high data rate (9600Bps) in narrow band (25KHz).

FC-206/A can operate in network mode, remote diagnosis mode, repeater mode to implement point to point or point to multi-point networking communication with transparent compatible protocol. It can be connected with data terminal such as SCM, PLC, RTU, GPS or user's computer via standard RS-232/485 interface.

FC-206/A is widely used in telemetry and data collection for electric power data, SCADA system, information automatization of oil field and oil well, automatization of power supply networking, water supply and environment monitoring, topography drawing and earthquake info transmission, traffic, GPS, lottery machine, and martial military communication etc.

II . Features of FC-206/A

1. Industrial design standard with high reliability and stability.
2. Dual digital PLL and TCXO providing stable precise frequency.
3. Resistant to 4KV group pulse, 8KV static electricity to stand against bad electromagnetic environment, perfect EMC performance.
4. GMSK modulation mode, the data rate can reach 9.6kbps.

5. Adopting DSP technique with wide working frequency which can be set by software.
6. FEC/CRC used for low BER and reliable transmission.
7. Built-in hardware and software watchdog to avoid CPU out of work.
8. With self-diagnosis system to test the working parameters and status.
9. It can work as a network radio or a remote radio or a repeater radio.
10. It can be connected directly with SCM, RTU, or user's computer via standard RS-232/485 interface.
11. SMT assembly, Small for convenient installation.

III. Technical specifications of FC-206/A

1. General specifications:

- 1) Carrier frequency: 223 ~ 235MHz
- 2) Channel spacing: 25kHz
- 3) Frequency stability: ± 2.5 ppm
- 4) Modulation mode: GMSK
- 5) Air data rate: 9,600bps
- 6) Channel: 4
- 7) Antenna impedance: 50 Ω
- 8) Temperature: -20 ~ 60 $^{\circ}$ C
- 9) Size: 106 x 54 x 18mm (antenna port and heat sink excluded)
- 10) Weight: 150g (antenna port included, heat sink excluded)

2. Specifications of receiver:

- 1) Receiving sensitivity: $\leq 0.25\mu$ V(12dB SINAD)
- 2) Adjacent channel selectivity: ≥ 65 dB
- 3) Spurious and images output: < 65dB

3. Specifications of transmitter:

- 1) RF power: 5W
- 2) Transmitter startup time: ≤ 50 ms

4. Interface: RS-232/485, data rate: 2,400 ~ 19,200bps optional, format: 8N1/8E1/8O1.

5. Power supply: 13.8V DC typical (9~15V)

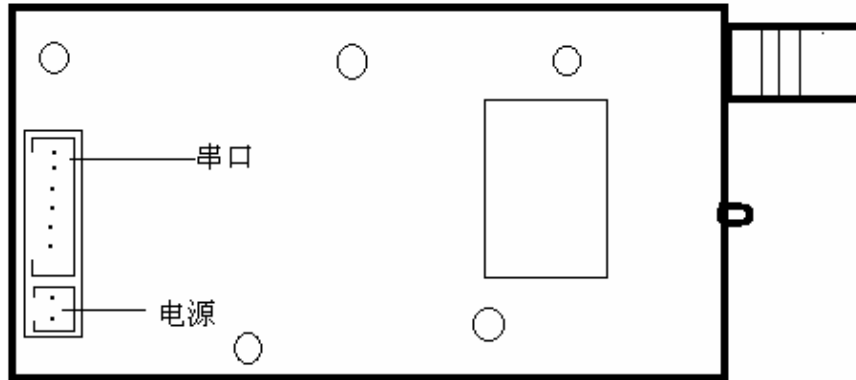
6. Consumption current:

Standby current (reception status): $\leq 100\text{mA}$

Transmitting current: $\leq 2.0\text{A}$ (13.8V, RF power 5W)

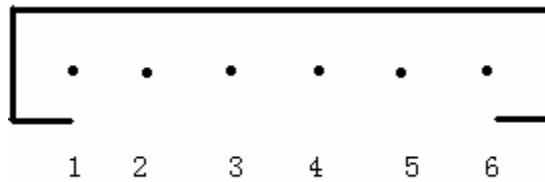
IV. Shape and Installation sketch

The shape is shown below:



The external interface

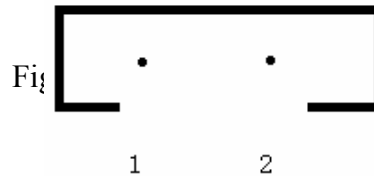
1. The data interface sketch



2. The data interface definition

Pin	Definition	Pin	Definition
1	GND	2	TXD
3	RXD	4	CTS
5	B	6	A

3. Power supply port



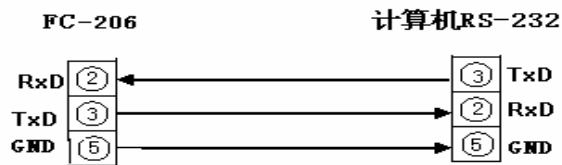
1 +13.8V
2 GND

V. Connect with the terminal and parameter setting.

The necessary setting and online debugging is needed before using the module. The steps are listed below.

1. Connection before power-on.

- a. Connecting the antenna port with antenna or dummy load, the working frequency of the connected antenna is the same with the actual frequency of the module.
- b. Connecting FC-206/A to +13.8V DC power supply
- c. Connecting two modules with computers respectively via the attached RS-232 cable. The connection sketch is shown below.



- d. Install the DEMO software to the computer.

2. Power-on examination

- a. Turn on the +13.8V 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-206/A to computers, turn on the power of the radios.
- 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 means 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, input the needed frequency first, then press the setting button and the new frequency is set well. 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.

VII. Data transmission protocol

FC-206/A adopts a all-transparent data transmission protocol. It means that the module can transmit data correctly without changing the format and data bit regardless whatever protocol and data structure the upper device adopts.

The following cases will occur if the interface data rate is different from the air one.

- ① The module can implement transparent data transmission if interface data rate is less than or equal to the air one.
- ② The module can transmit no more than 5K bytes at one time if interface data rate is greater than the air one.

VIII. Wireless networking and programming

It's a more complicated project to form a wireless network with FC-206/A. The notes for networking and programming are listed below.

1. To determine communication mode.

a. Point to point communication

Point to point communication is the most common remote networking plan, in which one FC-206/A as master station is connected with the control computer, another one as remote station is connected with remote RTU or PLC (shown as fig.5). For example, it can be used to control the close/open of a remote water pump or to monitor the remote communication base station on a mountain.

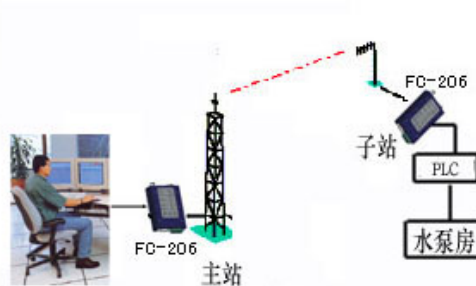


Fig.5. Point to point communication example

b. Point to multi-point communication

The system is composed of a central master station and several remote stations in this communication mode (shown as fig.6). It is often used to control remote stations in oil field or heat

systems. If some remote station is far from the center (50Km), a FC-206/A can be used as repeater station to transmit the data of the remote one to the center.

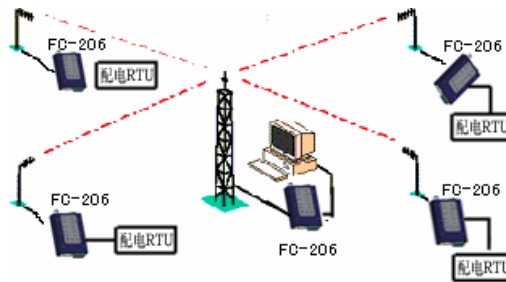


Fig.6. Point to multi-point communication example

2. To determine the working frequency.

The principle of selecting a working frequency is to avoid interference based on the actual requirement. Before we determine the frequency, we should know about the situation of the local frequency and measure the interference around the selected frequency. If there is interference around the selected frequency, we should select another one with less interference.

3. To select power supply:

The module requires its power supply to be with desirable ripple factor and high load capacity. If the RF power is 5W, the load capacity should greater than 2.5A.

4. To select antenna.

Antenna is the important part of a communication system. Its performance influences the system's specifications. User should pay

attention to its performance while selecting antenna. In detail, there are two aspects to be considered. One is the antenna type. The direction map of selected antenna should be accorded with the coverage requirements of electromagnetic wave. The second is the electric performance. It is required that the frequency band, the gain, the rated power of the antenna should satisfy the design requirements of the system. The principle of selecting antenna is listed as the following:

- a. Beamed antenna with high gain is used for remote station if long transmission distance is required. Beamed antenna can reduce the external interfere and increase the transmission distance. The most popular beamed antenna is yagi.(Shown as fig.8.)
- b. All-direction mobile antenna with 3dB gain can be used in 1-2Km transmission communication. (Shown as fig.9)

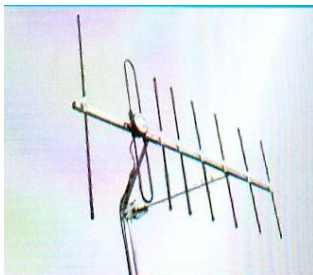


Fig.8 Beamed antenna



Fig.9 Mobile antenna

To select feeder:

Coaxial cable with characteristic impedance value of 50 ohms is usually used as feeders in mobile communication system. Transmission attenuation of feeders should be reduced as possible in order to transmit the electromagnetic wave to antenna port effectively. Transmission attenuation depends on the diameter and length of cables. The attenuation is less if the diameter is larger at the same frequency. In principle, the attenuation of cables should not be more than 3dB. The following table lists the attenuation values (db/m) of common cables, User can reasonably select its model and its length based on his own needs.

frequency model	150MHz	400MHz
SYV-50-7	0.121	0.203
CTC-50-7	0.060	0.100
CTC-50-9	0.050	0.085
CTC-50-12	0.040	0.060
Imported10D-FB	0.040	0.070

IX. Type description

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

FC – 206/A 23 05 E

FC- indicates the product code name of manufacturer.

206/A indicates high speed data transmission radios.

23 indicates the carrier frequency, 23—223-235MHz.

05 indicates RF power, 05=5W.

E indicates transparent transmission protocol.

X.Default setting and accessories
a. The default setting of parameters and accessories.

The default setting		accessories:	
Channel No.	1	RS-485 port cable and power supply cable (optional)	1
Serial port	Com1		
Interface data rate	9600bps	RS-232 port cable (optional)	1
Air data rate	9600bps	Fix screws(3x6)	8
Check	None	Manual book	1
Protocol	E (transparent)	CD(Demo software)	1

b. The default frequency of each channel.

Band Channel	223 ~ 235MHz	
	Tx	Rx
Base frequency	220	220
Channel 1	223	223
Channel 2	228	228
Channel 3	230	230
Channel 4	235	235