

HR-1027 Low Power RF Module User Manual



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Before using HR-1027 Module, please read the user manual of HR-1027 carefully. Any question in technical, you can contact us. Tel: 86 755 817812516 Cell: 86 15813856667

● About HR-1027

HR-1027, the ultra wireless transceiver data module is used as the wireless data transceiver in long-ranges, with the small size, weight and power consumption and good stability and reliability. Narrowband low power UHF wireless data transmitters and receivers with channel spacing as low as 25 kHz.

If necessary, we can provide USB interface to make it easy to settle the question of Power Supply for Mini

computer and PC users.

● Features of HR-1027:

1. Transmit-Power

The standard transmit power 1W(30dB), Receiving sensitivity: -123dbm(1200bps),-118dbm(9600bps)

2. Low power consumption

DC7.5V Power, Receiving current <28mA, transmitting current <350mA; Sleeping current <20uA;

3. Power model

HR-1027 has three power- saving models: Awaken from Hardware, awaken from COM Port, Awaken from Air

4.IO control function

HR-1027 has 2 I (control On/Off switch input), 2 OFF (control On/Off switch output), user can control remotely terminal without developing (the user need to customize this IO function)

5. ISM frequency band, no need to apply Frequency

Carrier Frequency: 433MHz, also capable of 868/915MHz.

6. High Anti-Interference and Low BER (Bit error Rate)

Based on the GFSK modulation mode, it adopts the efficient communication protocol. The actual bit error rate is $10^{-5} \sim 10^{-6}$ when channel bit error rate is 10^{-2} .

7. Long transmission distance

The standard transmit power 1W(30dB), within the range of visibility, the reliable transmission distance can >4500m (BER= 10^{-3} /1200bps), and >3000m (BER= 10^{-3} /9600bps) when place the antenna higher than 3m.

8. Transparent data transmission

Transparent data interface is offered, which can be fit for nonstandard user protocol. Any false data generated in the air can be filtrated automatically (What has been received is exactly what has been transmitted).

9. Multi-channel and speed

HR-1027 provides 8, 16, 32 or more channels to meet the multiple communication modes of the users. Baud rate is 1200, 2400, 4800, 9600, 19200 and 38400bps, Extra special baud rate 57600bps, 115200bps, 250Kbps, 2Mbps (Customers need to inform us before shipped if need) The wireless transmission speed and the connection baud rate are proportional, to satisfy the customer's equipment.

10. Three kinds of interface modes (UART, TTL, RS232, RS485)

UART, RS232, RS485 interface diversion chip, User can choose any of them.

11. Transparent data interface

Transparent data interface is offered to meet any standard or nonstandard user protocol. Any false data generated in the air can be filtrated automatically (What has been received is exactly what has been transmitted). The change time between receiving and sending is <10ms.

12. High speed wireless communication and big data buffer

When the RF baud rate is bigger than the COM baud rate, it can transmit unlimited data at one time, and when the RF baud rate is smaller than or was equal to the COM baud rate, may transmit 512 bytes data.

13. Intelligent data control and the user doesn't need to prepare excessive programs

Even it's half duplex, the user doesn't need to prepare excessive programs, only receiving/transmitting the data from the interface. It will automatically complete the other operations, such as transmission/receiving

conversion in the air, control, etc.

14. High reliability, small and light

Single chip radio frequency integrated circuit and single chip MCU ATmega8L are used for lessened peripheral circuits, high reliability, and low failure rate.

15. Watchdog monitor

Watchdog monitors the inner function, so it can change the traditional product structure and improve the product reliability.

● Application of HR-1027

HR-1027 the ultra wireless transceiver data module is suitable for:

- * AMR Automatic Meter Reading
- * Wireless alarm and security systems
- * Building automation, security, wireless monitoring and control of room equipment, Access Control System;
- * Wireless data transmission, automatic data collection system;
- * Low power telemetry
- * 433 / 868 and 915 MHz ISM/SRD band systems
- * Data radio can be used for Wireless conference voting system;
- * Mapping;
- * Radio modem can be used for Sports training & competition;
- * Wireless dishes ordering;
- * Wireless POS, PDA wireless smart terminal;
- * RF modem can be used for Electronic bus station and intelligent traffic;
- * RF transmitter Wireless electronic display screen and queuing machine;
- * Wireless telemetry Charging for parking, parking lot;
- * Wireless modem Automobile inspection and four-wheel orientation;
- * Wireless sensor Industrial wireless remote control and air conditioning remote controller;
- * Data communication used for railway, oil field, dock and army.
- * LED display in thruway and public places
- * Wireless RS232/RS485 conversion/connector;
- * Point to multi-point wireless network, wireless on-the-spot bus and automatic data collection system;

● How to use HR-1027

1. Power supply

HR-1027 work with supply voltage+7.5V DC. By using better ripple factor, HR-1027 transceivers can also share power supply with other equipment. If possible, a voltage-stabilizing chip with 7.5V voltage is more recommended as the only power supply than switch power supply. But if only switch power supply available, the jam by switch pulse to the transceivers should be avoided. In addition, the reliable grounding must be used if there is other device in the system equipment. In case of failing to connect with the ground, it can form its own grounding but must be absolutely separated from the municipal electric supply. If lower power for lower power consumption needed, we can design to meet users' demands.

2. Connection Definition with terminal

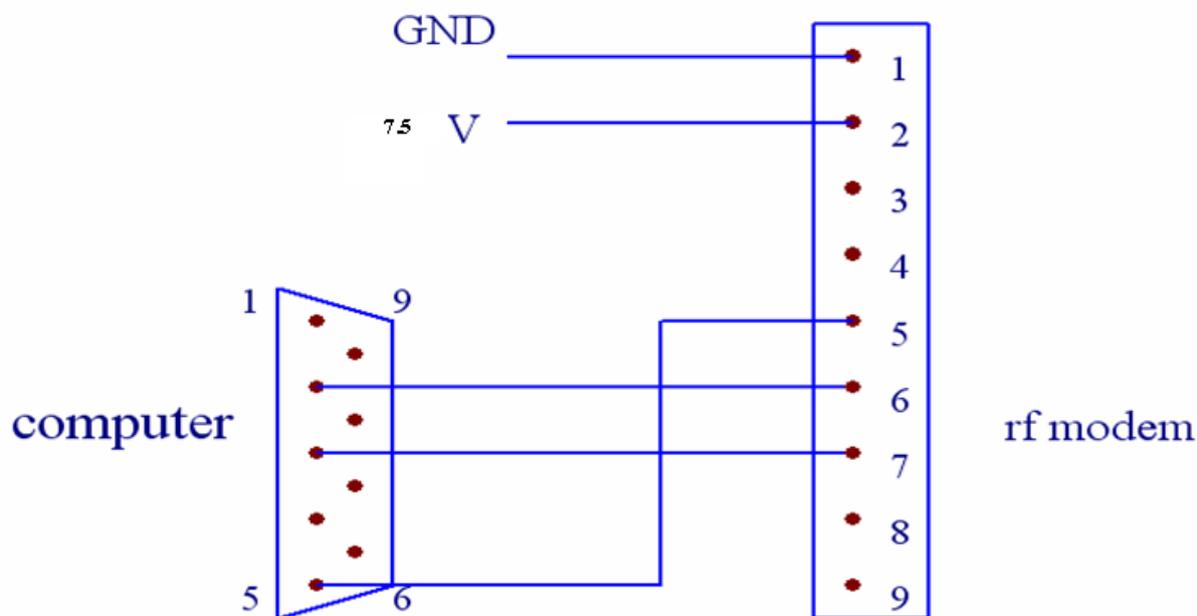
The space between each pin is 2.0mm.

HR-1027 transceivers supply one 9-pin connector(JP1),their definitions and connection methods with terminals are shown in Table 1.

Table 1: JP1 Pin Definitions and connection methods

Pin No.	Signal Name	Function	Level	Connection with terminal	Remarks
1	GND	Grounding of power supply		Ground	
2	VCC	Power supply DC	7.5V		
3	RxD/TTL	Serial data input to the transceiver	TTL	TxD	
4	TxD/TTL	Transmitted data out of the transceiver	TTL	RxD	
5	SGND	Signal			
6	A (TXD)	A of RS-485(TxD of RS-232)		A(RxD)	
7	B (RXD)	B of RS-485(RxD of RS-232)		B(TxD)	
8	SLEEP	Sleep control (input)	TTL	Sleep signal	High level sleep
9	RESET	Reset signal(input)	TTL		Negative pulse reset

3. The connection schematic diagram between computer and our RF module



4. Setting of channel, interface, and data format

Before using HR-1027, the user needs to make simple configuration based on its own needs to determine the channel, interface mode and data format.

The user can change or view the module's interface baud rate, channel and address code. Parameter setting or reading as per the testing software HRPRO.exe in the PC (in products box).And the configuration is as follows:

i. Channel configuration:

433Mhz

Channel	Frequency	Channel	Frequency
1	429.0325MHZ	5	433.0325MHZ
2	430.0325MHZ	6	434.0325MHZ
3	431.0325MHZ	7	435.0325MHZ
4	432.0325MHZ	8	436.0325MHZ

868MHz:

Channel	Frequency	Channel	Frequency
1	868.0500MHz	5	869.3500MHz
2	868.3500MHz	6	869.6750MHz
3	868.5750MHz	7	869.5000MHz
4	869.2250MHz	8	869.9260MHz

915MHz:

Channel	Frequency	Channel	Frequency
1	912.2000MHz	5	916.6940MHz
2	913.4288MHz	6	916.2332MHz
3	913.7360MHz	7	915.1580MHz
4	912.5072MHz	8	915.9260MHz

Note: the frequency points corresponding to each channel can be adjusted based on the user's needs.

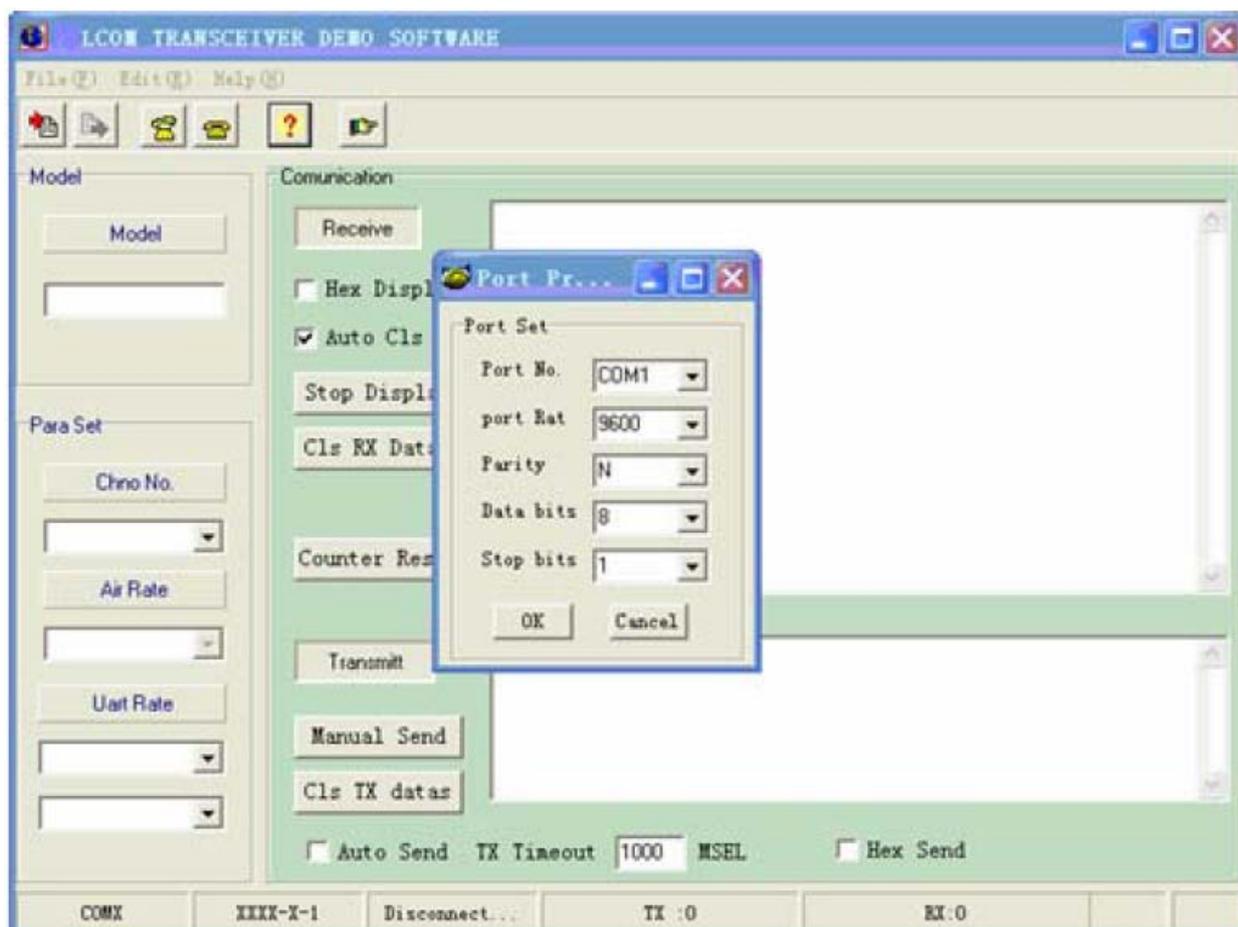
ii. The schematic diagram of setting the parameter as follows:

a. Connect the PC and module with data line

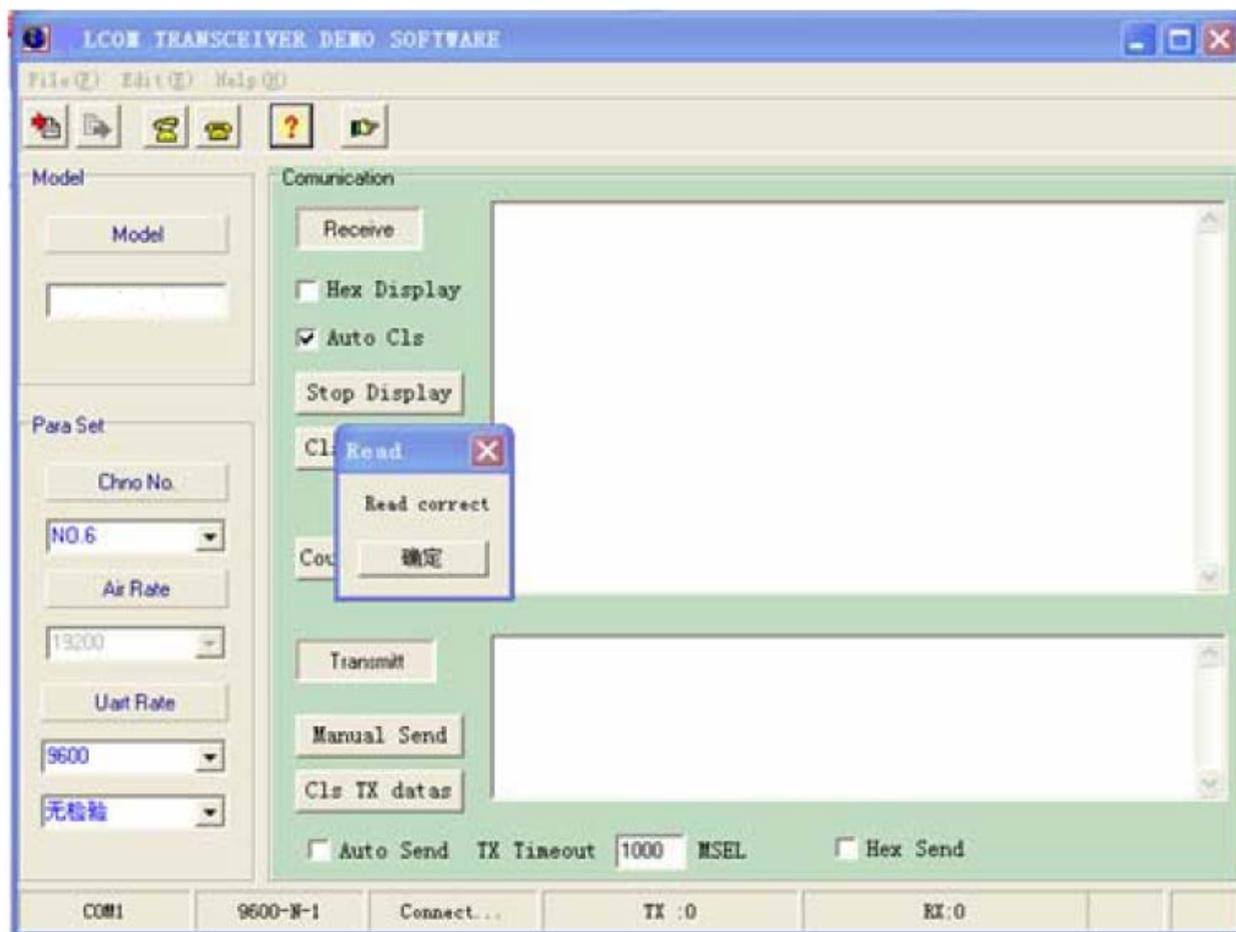
b. Double-click the "HRPRO.EXE" PC software, then select "English" as follows:



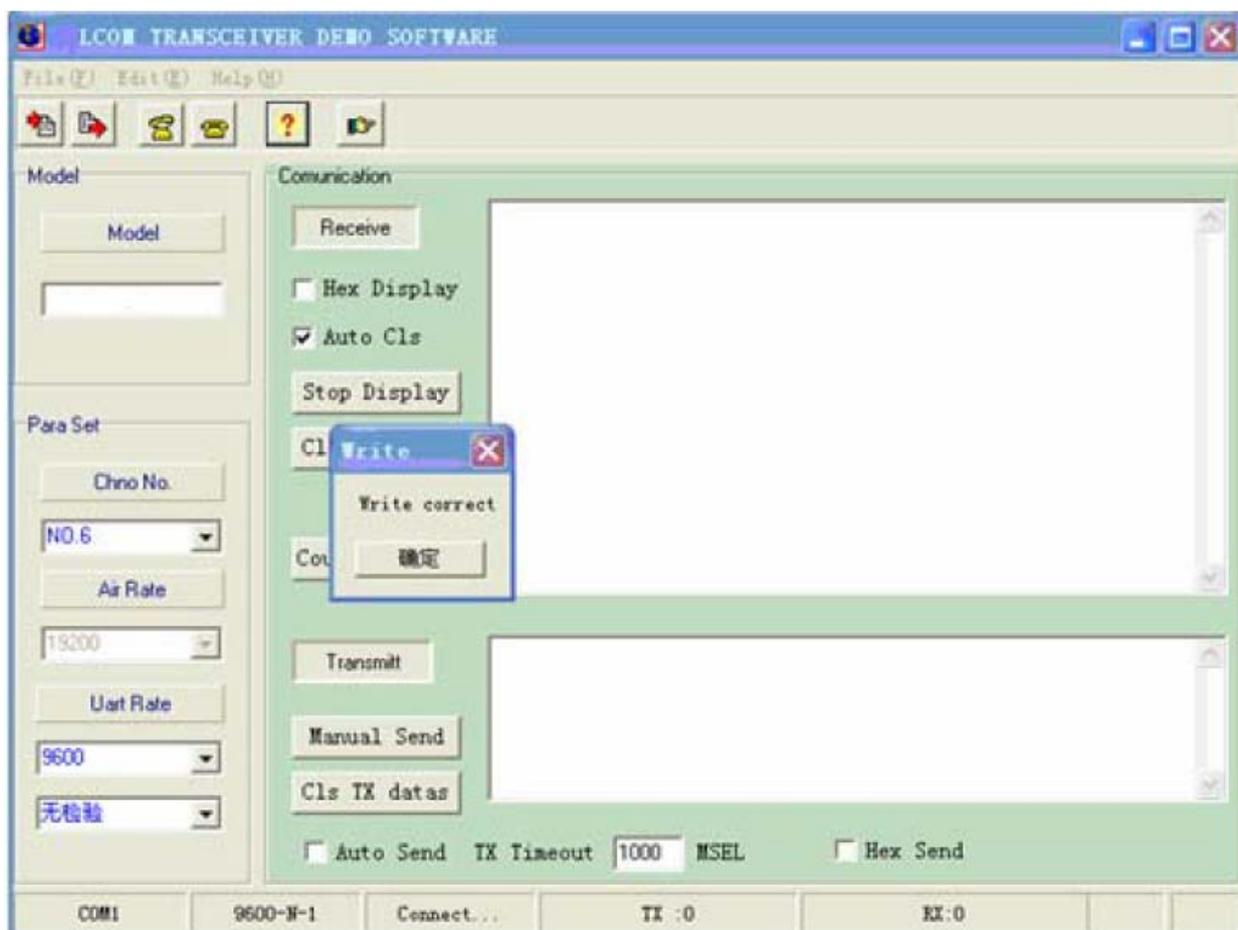
c. Click "open port" of the submenu in the "Edit" of the main menu, it will appear the picture as follows, then user can set parameter through the small window.



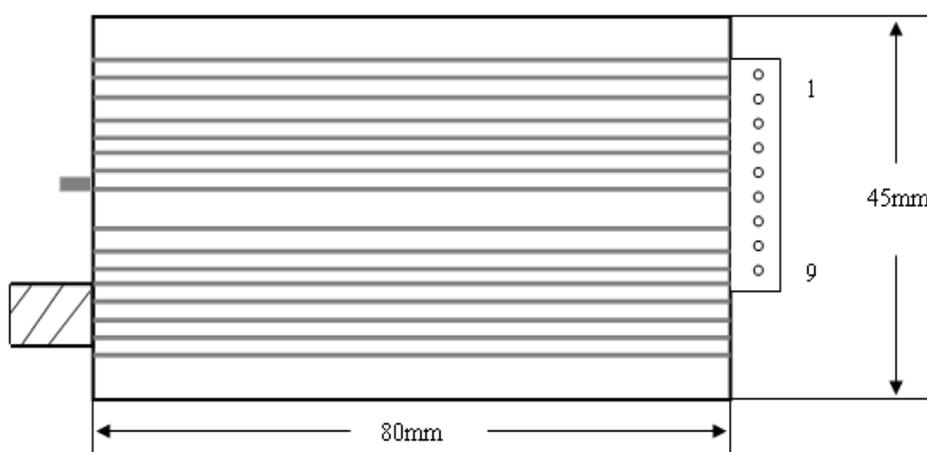
- d. Click “read paras” of the submenu in “File” of the main menu. It is a process to read data. During this process, the red indicator light of the module will glitter, when have checked out the transceiver, there will be clewed as “Read correct”, at the same time, the red indicator light will stop glittering. And there will display the current parameter of the RF module at the left window. The diagram as follows:



- e. User can modify the parameter such as channel and interface rate according to actual demand through the button of the left window. After modifying click “write paras” of the submenu in “File” of the main menu, then there will clew “write correct”. At the same, the current parameter will be saved. The diagram as follows:



5. Installation dimension:



6. Supported protocol and Transmit capability

HR-1027 standard transceiver offer transparent protocol to support various applications and protocols of users. If the user needs to decrease his cost or ease the workload of terminal CPU, we can add other specific functions based on the transparent protocol, such as addressing, data acquisition, command interpretation, etc. As using FIFO mode, HR-1027 is able to satisfy user big data package transmission.

7. Description of Indicator light

- a. The red and green lights are on about 500Ms at the same time after supplying the electricity.
- b. The red light is normally on when transmitting data, while the red light will crush out after ending the data.
- c. The green light is normally on when receiving the air signal, while the green light will crush out after receiving the air signal.

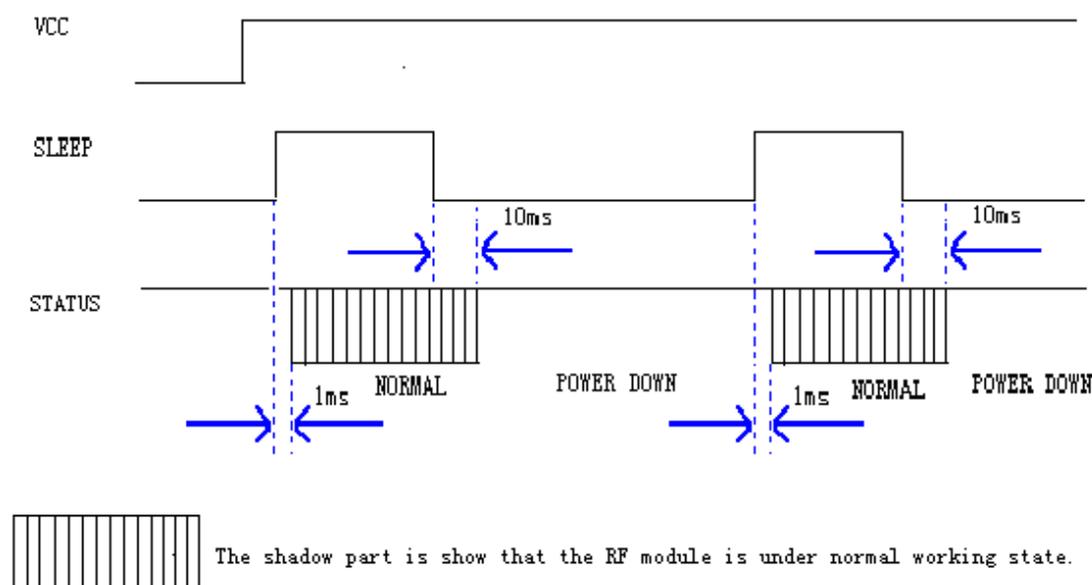
8. Sleep function instruction:

Due to reducing more consumption, HR-1027 transceivers support Sleep function. In sleep mode, the current consumption is <20uA.

The default set of sleep function is usually closed to ensure the reliability of preventing transceivers from getting in wrong sleep mode. The sleep function can be opened by HR after informed or by user via programming them software.

- a. How to use the sleep function:

The Sleep Timing diagram:



NOTICE:

The Pin8"SLP" in JP1 is the signal of sleep control. In high power level, when the transceivers stays in sleep mode, the conversion from idle mode to sleep will be finished in 1ms(It is means that the delay time(tc) of conversion between transmitting and receiving is less than 1Ms).The SLP signal can convert transceiver from idle to sleep mode in 1ms after rising edge. If the sleep signal arrives when the transceiver is transmitting data, the module will enter sleep mode after finishing transmission. From sleep mode to idle, it takes the transceiver 10ms after falling edge.

- b. Attentions about use of sleep function:

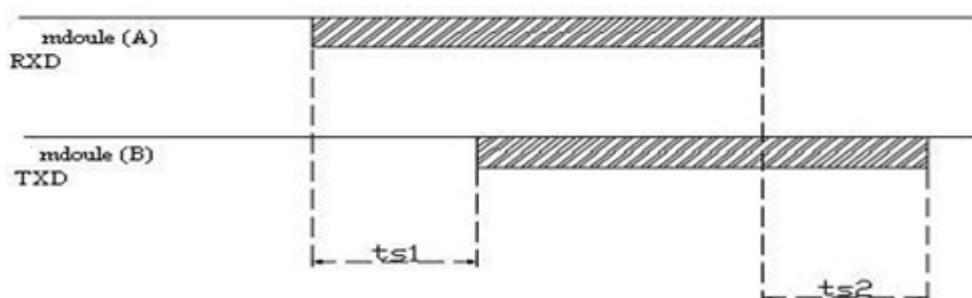
When the sleep function enabled, any supply glitches, such as switch dithering, fire striking or quick switching on and off, could cause the transceiver to be switched to the wrong sleep mode. After switching on,

users can avoid this error by making a compulsive restoration once after the CPU delays 150ms.

9. Transmitting from A Module, received by B module

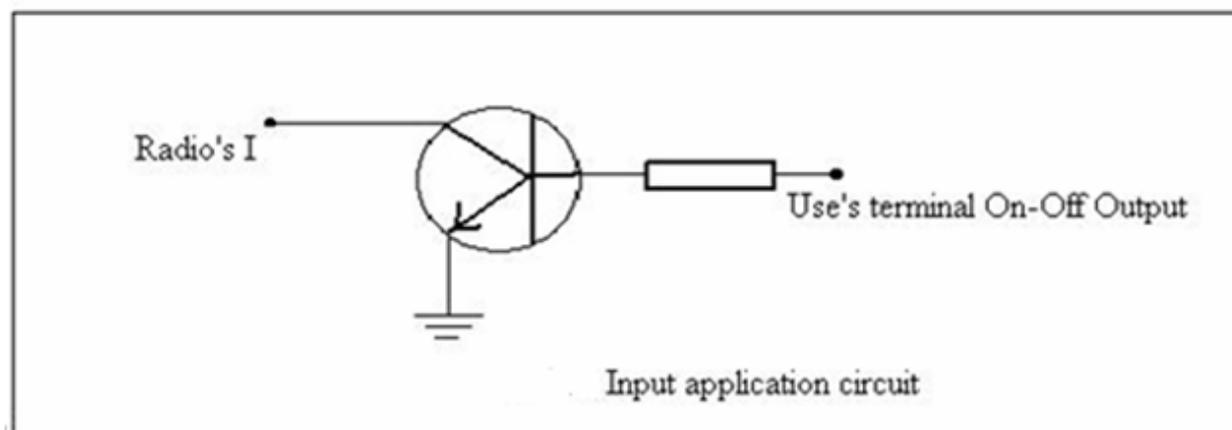
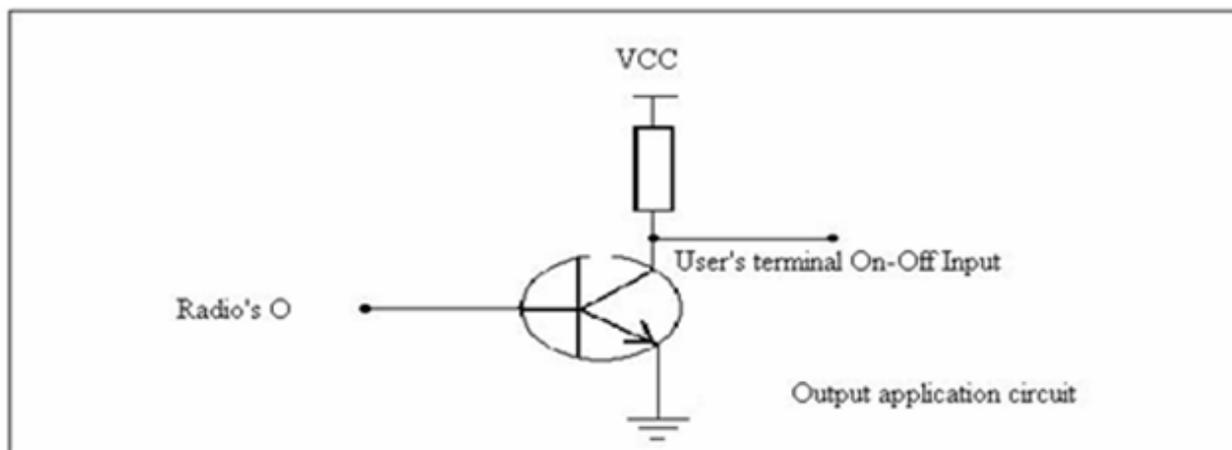
When transmitting data, the user should consider the time delay, in order to ensure the reliability of wireless communication; we joined the FEC (wrong before) and other coding rules. In that case, the communication delay is related to baud rate, the following is details:

COM baud rate (bps)	Time ts1 (ms)	RF baud rate (bps)	Time ts1(ms)
38400	11	4800	43
19200	15	2400	83
9600	25	1200	140



10. How to use the IO

HR-1027 offers two IO, applications are as follows:



11. IO Control Function

HR-1027 has two communication protocols: Full transparency protocol and ID protocol.

(Note: Full transparency protocol is Factory set, if the user needs HR-1027 with ID protocol, please customize it.)

Full transparency protocol

All transparent data transfer, that is, no matter what agreement the upper equipment, data structure, the radio can send them to the other station, don't change the data format, increase or reduce the data bits. The agreement can be widely used in Table meter reading, RTU, PLC with address, and single-chip microcomputer applications.

ID protocol

If the user's terminal without Address or ID, they can use HR-1027 with ID protocol.

They only need to use our software to set the address of the radio, then the radio can transmit as our company's data format, the user's senior should be program under the communication agreement of our company.

Note: We can offer programming guide if the user need the ID protocol.

IO control function

You can use one HR-1027 with full transparency protocol for the Main station, some HR-1027 with ID protocol for the slave stations, each HR-1027 of the slave station must set one unrepeatable ID. You can control the slave station IO according to communication protocol of HR-1027

Users can use one HR-1027 as dispatch center, used them to read or control other slave station by many HR-1027 with IO, but each slave station HR-1027 should a separate ID number (that is, modules address).

When control the slave IO by Main station, it must be controlled according to our company's control protocol.

Note: We can offer programming guide if the user need the ID control.

12. Standard configuration and Antenna configuration

i: Standard configuration:

- * One HR-1027 RF module
- * A 9pin flat Connection Line
- * A whip antenna (about 10cm)

ii: Antenna configuration:

Many appropriate antennas for low power RF modules are selected for meeting different user antenna configuration Please ask our Sales office for further information about the antenna's dimension and performance. The main options of antennas are exterior flagelliform rubber antenna with helical SMA joint, small osculum antenna, small rod antenna and elbow antenna. If the user has special demands on antennas, we can design and produce for them specially.

a. Helical SMA antennas



b. Elbow antenna



c. Small rod antenna



d. Small osculum antenna



● Application of HR-1027 Networking

The communication channel of HR-1027 is half duplex, which is most suitable for the communication mode of point to multi-point. Under this mode, one master station must be set, and all of the rest are slave stations. A unique address is given to each station. The coordination of communication is controlled by master station that uses data frames containing address code to transmit data or command. Slave station will receive all of the data and command and compare the received address code with local address code. If they are different, the data will be deserted without any response. If those address codes are the same, it means the data is sent to the local. Slave station will make different responses according to the transmitted data or command and send back the data of response. All these jobs must be performed by upper protocol, and it is assured that there is only one transmitter-receiver in the state of transmission in the communication network at any instant moment so as to avoid the cross-interference.

HR-1027 can also be used for point-to- point communication with easier operation. For the programming of serial port, all you have to do is to remember that its communication mode is semi duplex while always

observing the time sequence of come-and-go for receiving and transmitting.

● Technical specification of HR-1027

- * Modulation mode: GFSK
- * Working frequency: 433~915MHz (customized)
- * Power supply: DC 7.5V (customized)
- * RF power: ≤ 1W (customized);
- * Interface data rate: 1200/2400/4800/9600/38400bps, set before delivery.
- * Receive current: <28mA (TTL connect)
- * Receive sensitivity: -123dBm (1200bps); -118dBm (9600bps)
- * Transmitting current: <350mA;
- * Sleep current: <20uA;
- * Interface data format: 8E1/8N1
- * Working humidity: 10%~90%relative humidity without condensation
- * Working temperature: -35℃~+80℃(industrial)
- * RF Line-of-sight Range: 3km (BER=10-5@9600bps); 4.5km(BER=10-5@1200bps);
- * Size: 80mm*45mm*19mm (without antenna port).

How to solve the trouble

Item	Trouble	Solve ways
1	Short distance	<ol style="list-style-type: none"> 1. Check whether the environment is bad, the antenna is shielding or not, lead out the antenna or replace the antenna with higher gain. 2. Check whether the same frequency, power, strongly magnetic interference exist, change the channel or far away from the interference source. 3. Check whether the power, Voltage and current are matched or not.
2	Transmission unable	<ol style="list-style-type: none"> 1. The power is bad connect. Check whether the red lamp glitter in the transmitter, re-connect the power line. 2. Signal line is bad connecting. Check whether the red lamp glitter in the transmitter or is the green lamp glitter in the receiver; 3. Check whether the Channel (frequency) and the RF baud rate between the two modules is the same, re-read and the set them; 4. Whether the Module and user's terminal or computer's level are matching or not (TTL/232/485 interface).
3	BER high	<ol style="list-style-type: none"> 1. Check whether the green lamp glitter transmitting on the other side, that is, whether there is the same frequency interference. 2. Change the channel. Matching System is bad, check whether the line connect good; 3. COM or RF baud rate is not correct, re-set them; 4. Power's ripple is too big, replace the power