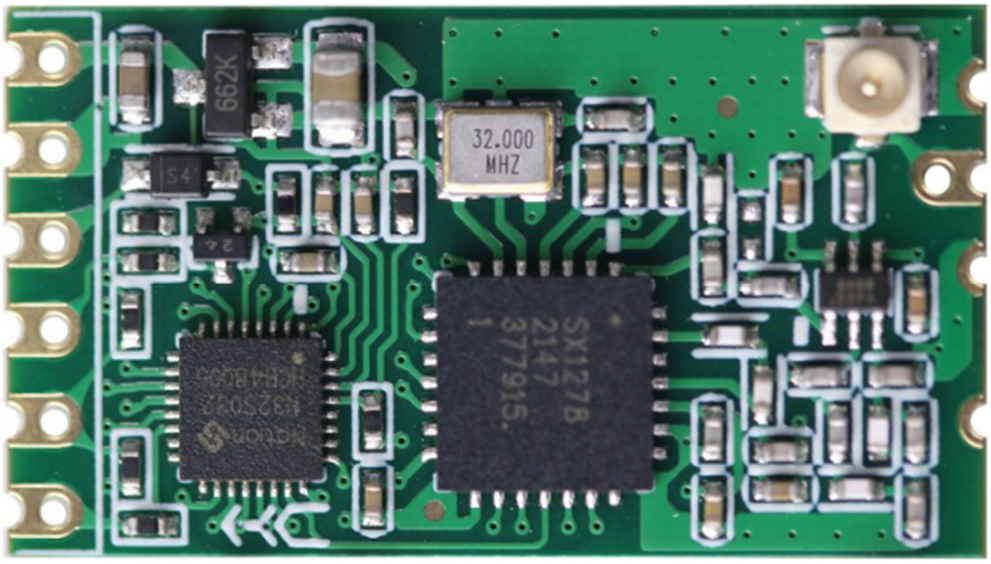
HC-14 Wireless Serial Communication Module User Manual V.1.1



Product Applications

Wireless Sensors
Cellular Building Security
Robot wireless control
Industrial remote control, telemetry
Automation Data Acquisition
Container Information Management
POS system
Gas Meter Data Acquisition
Vehicle keyless entry system
PC Wireless Networking

Version Information

HC-14V1.1

Release Date 2022 Dec 12

① Add command to query or change the wireless transmit power of the module.

② STA Pin add busy indication function

③ Optimise communication speed.

Website: www.hc01.com
Address： Room 608, No.19 Jiangong Road, Tianhe Software Park, Keyun Road, Tianhe District, Guangzhou, China.

Product Features

Long-range wireless transmission with LoRa technology (3000 metres in open field/at radio rate S1)
Operating frequency range (415-450MHz, 50 communication channels)
Built-in MCU, communicates with external devices through serial port, supports 1200~115200 serial port baud rate.

Products

HC-14 wireless serial communication module is a new generation of multi-channel embedded wireless data transmission module. The wireless working frequency band is

434MHz frequency band, up to 50 communication channels can be set. The maximum transmitting power of the module is 100mW (20dBm).

It adopts advanced LoRa technology, with reception sensitivity of -140dBm at wireless rate S1, and communication distance of 3000 metres in open field.

The module adopts stamp hole package, can be patch welding, module size 27.4mm×15.6mm×4mm (including antenna cap, excluding spring antenna).

The module size is 27.4mm×15.6mm×4mm (including antenna cap, excluding spring antenna), which is very convenient for customers to embed in the application system. There is a PCB antenna holder ANT1 on the module.

module has a PCB antenna holder ANT1, users can use the coaxial cable, using 434MHz band external antenna; module also has an antenna welding holes ANT2, convenient for users to weld the spring antenna.

There is also an antenna welding hole ANT2 inside the module, which is convenient for users to weld spring antenna. Users can choose one of the antennas according to their requirements (only one antenna can be chosen, not two antennas at the same time).

(only one antenna can be selected, two antennas cannot be connected at the same time).

The module contains MCU, users do not need to program the module separately, all kinds of transmission modes just send/receive the serial data, which is easy to use.

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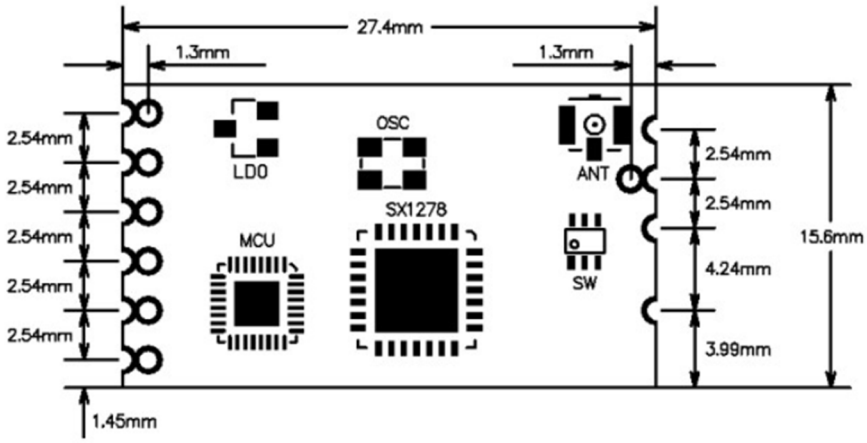
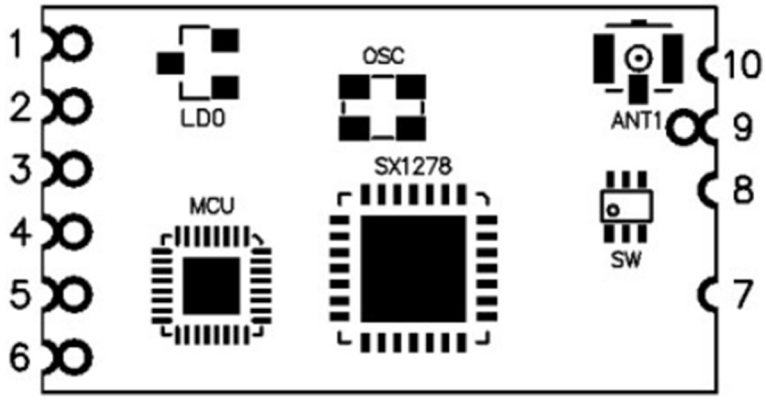
Product Size



Pin Definitions



The HC-14 module can be soldered on a chip or on a 2.54mm pitch pin header for direct insertion onto the user's PCB. Module

There are 10 pins and one RF antenna holder, ANT1, which are defined in the following table.

Pin	Definition	I/O	Instructions
1	VCC		Power input, DC3.0V-5.5V, required load capacity not less than 250mA
2	GND		
3	RXD	Serial Input, Internal Pull-Up	UART input, high level voltage in line with VCC
5	TXD	Serial output	UART output port, high voltage in line with VCC
6	KEY	Input, Internal Weak Pull-Up	Parameter setting control pin, active low
6	STA	exports	The high level voltage is generally slightly lower than the VCC voltage and is up to 3.3V; internal 1K resistor can be connected to MCU input pin, or directly connected to an external LED (this

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			pin is a busy indication output, which outputs a high level at normal times and a low level when the module is busy. This pin is a busy indication output, which outputs a high level in normal time and a low level when the module is busy. Please do not send data to the module serial port RXD when it is busy).
7	NC	Input, drop down	No function for the moment, please leave it blank, or connect the MCU output pins.
8	GND		
9	ANT	RF Input/Output	433MHz Antenna Pin, Spring Loaded Antenna Solder Hole
10	GND		
ANT1	ANT	RF Input/Output	IPEX20279-001E-03 Antenna Sockets

Pins 1-6 and 9 each have two pads, the outer half-hole pads are for SMD soldering. The inner half-hole pads on pins 1-6 are used for soldering 2.54mm pitch pins directly into the user PCB chassis.

The round hole pads on the inside of pins 1-6 are used for soldering 2.54mm pitch pins, which can be directly inserted into the user's PCB chassis; the pad on the inside of pin 9 is used for hand soldering the spring antenna during module patch soldering.

The pads on the inside of pin 9 are used to solder the spring antenna when the module is mounted.

The working current of the module is about 24mA in receiving state and 125mA in transmitting state.

The working current of the module is about 24mA in the receiving state and about 125mA in the transmitting state. The working voltage is DC3.0V-5.5V, and the load capacity of the power supply should not be less than 250mA, and the power supply should be connected near the module power pin.

A capacitor of not less than 47uF should be connected in parallel with the power pin of the module.

Wireless serial port pass-through

A brief introduction to the principle of operation

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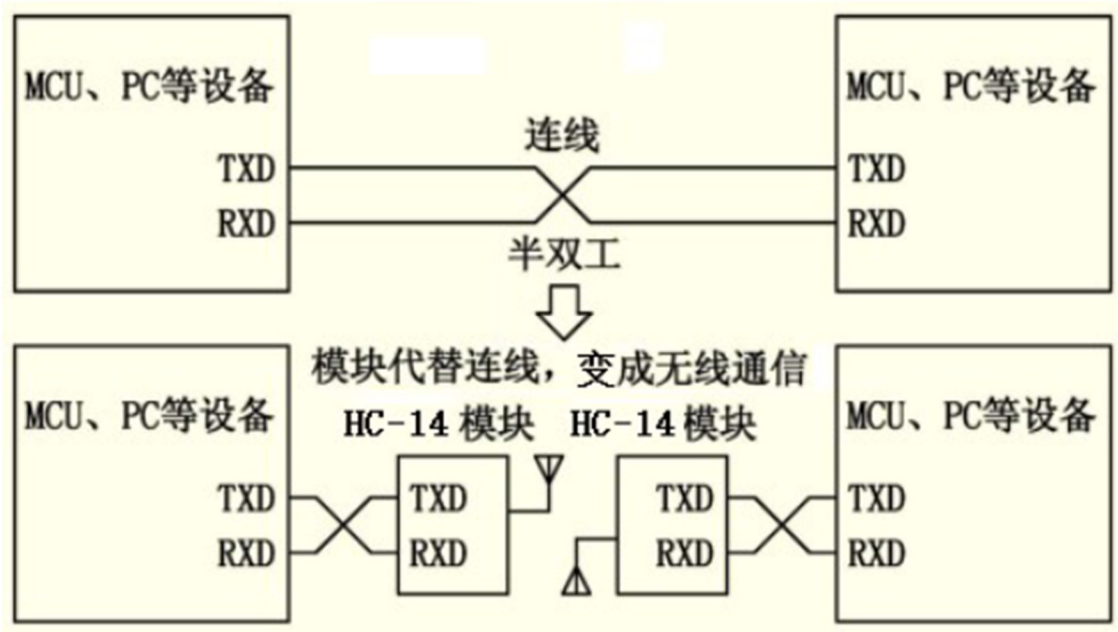

As shown above, the HC-14 module is used in place of a physical connection for half-duplex communication. The device on the left sends the module

The device on the left sends serial data to the module, and the module's RXD port receives the serial data and automatically sends it over the air as radio waves.

The module on the right automatically receives and restores from TXD the serial data originally sent by the device on the left. From right to left it is the

same. The modules can only work in half-duplex, they cannot send and receive data at the same time.

The module has 8 wireless rates, different rates cannot transmit data to each other, the default rate is S3, S1 is the lowest rate, when the module receives the highest sensitivity, the communication distance is the longest.

S1 is the lowest rate, when the module has the highest reception sensitivity and the farthest communication distance. The higher the rate, the lower the receiving sensitivity of the module and the closer the communication distance. The user can choose the optimal rate according to the actual situation.

Modules are generally used in pairs to transmit data to each other in half-duplex mode. There is a limit on the number of bytes that can be sent to the module's serial port at one time.

The default maximum number of bytes to be sent to the serial port is 1000 bytes, and if the number exceeds 1000 bytes, the data will be lost. In addition, in view of the environmental interference and other factors, when sending a large amount of data continuously at a time, it is possible to lose some bytes. Therefore, it is better for the host computer to have mechanisms such as answering and retransmitting to avoid information loss.

Module Parameter Setting AT Command

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The AT command is used to set the parameters of the module and switch the function of the module, and it takes effect only after exiting the setting state after setting. At the same time, the modification of parameters and functions will not be lost after power down.

(1) Command mode entry

First entry method - In normal use (already powered on), set pin 5 'KEY' low.

The second entry method - power off, pin 5 'KEY' is set low first and then re-power on.

Both methods enable the module to enter the AT command mode, and release ('KEY' pin is not connected low) to exit the command mode. After exiting the command mode, if the module function is changed, it will switch to the corresponding function state.

The second way is fixed to enter command mode in the 9600, N, 1 serial format.

Note: After exiting the command mode, the module is in the reset state and must wait at least 250mS before entering the command mode again. Otherwise, the module may enter the command mode in the second way!

(2) Command Description

① Test communication

Command	Response	Instruction
AT	OK	AT command test

Example:

Query if the module has entered AT mode

Sent to module: AT

Return from module side: OK

② Restore factory defaults

Command	Response	Instruction
AT+DEFAULT	OK+DEFAULT	Restore parameters such as serial port baud rate to factory defaults.

Example:

Send to module: AT+DEFAULT

Module return: OK+DEFAULT

③ Query or change serial port baud rate command

Command	Response	Instruction
AT+B?	OK+B:xxxx	Query Baud Rate
AT+Bxxxx	OK+B:xxxx	Set Baud Rate Default: 9600

Change serial port baud rate command. The baud rate can be set to 1200bps, 2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps or 115200bps. The factory default is 9600bps.

Example:

To set the baud rate of the serial port of the module to 19200bps, please send the command 'AT+B19200' to the module, and the module will return 'OK+B:19200'.

④ Query or change the wireless channel of the module

Command	Response	Instruction
AT+C?	OK+C:xxx	Query the wireless channel of the Lora module
AT+Cxxx	OK+C:xxx	Setting the wireless channel of Lora module Modification range of wireless frequency: 001~050 Default: 028 (434.00MHz)

Example:

Query wireless channel:

Send to module: AT+C?

Return from module side: OK+C:xx

Set wireless channel:

Send to module: AT+C028

Module return: OK+C:28

Wireless channel and frequency correspondence

Channel	Freq. [MHz]	Channel	Freq. [MHz]	Channel	Freq. [MHz]	Channel	Freq. [MHz]	Channel	Freq. [MHz]
1	415.09	11	422.41	21	429.73	31	435.83	41	442.54
2	415.70	12	423.63	22	430.34	32	436.44	42	443.15
3	416.31	13	424.24	23	430.95	33	437.05	43	443.76
4	416.92	14	424.85	24	431.56	34	437.66	44	444.37
5	417.53	15	425.46	25	432.17	35	438.27	45	445.59
6	418.14	16	426.07	26	432.78	36	438.88	46	446.20
7	419.36	17	426.68	27	433.39	37	440.10	47	446.81
8	420.58	18	427.29	28	434.00	38	440.71	48	447.42
9	421.19	19	427.90	29	434.61	39	441.32	49	448.64
10	421.80	20	429.12	30	435.22	40	441.93	50	449.86

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⑤ Query or change the wireless rate of the module

Command	Response	Instruction
AT+S?	OK+S:x	Query the wireless rate of the Lora module
AT+Sx	OK+S:x	Setting the wireless rate of Lora module Modification range of wireless rate:1~8 Default: 3

Example:

Query radio frequency:

Send to module: AT+S?

Return from module side: OK+S:x

Set wireless frequency:

Send to module: AT+S1

Module returns: OK+S:1

The module has 8 kinds of wireless rate, different rate can't transmit data to each other, S1 is the lowest rate, at this time the communication speed is the slowest, wireless receiving.

The highest sensitivity and the longest communication distance. The higher the rate, the closer the communication distance, the user can choose the optimal rate according to the actual situation.

Attachment: Receiving sensitivity and serial communication speed for various wireless rates.

Rate	Receiving Sensitivity (reference value) [dBm]	Serial communication speed (the time it takes for a message to be received at the receiving end after it has been sent from the sending end)
1	-140.0	Send 1 byte, receive the message after about 2.2 seconds; send 10 bytes, receive the message after about 2.9 seconds; Send 20 bytes and receive the message after approx. 3.6 seconds; send 40 bytes and receive the message after approx. 5.0 seconds. message. Sending more than 40 bytes will be received in packets (up to 40 bytes per packet), and the first packet will be received after 5 seconds. 1 packet, and subsequent packets are received with a delay according to the number of bytes in each packet (max. 40 bytes/4.7 seconds).
2	-137.5	Send 1 byte, receive message after approx. 1.4 seconds; send 10 bytes, receive message after approx. 1.8 seconds; 20 bytes sent, about 2.1 seconds after receiving the message; 40 bytes sent, about 2.8 seconds after receiving the message. The message is received after about 2.8 seconds for 40 bytes. If more than 40 bytes are sent, the message will be received in packets (up to

		40 bytes per packet), the first packet will be received after 2.8 seconds, and subsequent packets will be received on a per packet basis. The first packet is received after 2.8 seconds, and subsequent packets are received with a delay according to the number of bytes in each packet (max. 40 bytes/2.6 seconds).
3	-135.0	Send 1 byte, receive the message after about 0.8 seconds; send 10 bytes, receive the message after about 1.0 seconds; Send 40 bytes and receive the message after approx. 1.7 seconds; send 80 bytes and receive the message after approx. 2.6 seconds. If more than 80 bytes are sent, the message will be received in packets (up to 80 bytes per packet), the first packet will be received after 2.6 seconds, and subsequent packets will be received on a per packet basis. 1 packet, and subsequent packets are received with a delay according to the number of bytes in each packet (max. 80 bytes/2.3 seconds).
4	-132.5	Send 1 byte, about 0.44 seconds after receiving the message; send 10 bytes, about 0.6 seconds after receiving the message; 40 bytes are sent, the message is received after about 1.0 seconds; 80 bytes are sent, the message is received after about 1.53 seconds. The message is received after about 1.53 seconds for 80 bytes. If more than 80 bytes are sent, the message will be received in packets (up to 80 bytes per packet), the first packet will be received after 1.53 seconds, and subsequent packets will be received on a per packet basis. The first packet is received after 1.4 seconds, and subsequent packets are received with a delay according to the number of bytes in each packet (max. 80 bytes/1.3 seconds).
5	-130.0	Send 1 byte, receive the message after about 0.3 seconds; send 10 bytes, receive the message after about 0.4 seconds; 80 bytes are sent, the message is received after about 1.0 seconds; 160 bytes are sent, the message is received after about 1.6 seconds. If more than 160 bytes are sent, the message will be received in packets (up to 160 bytes per packet), and the first packet will be received after 1.6 seconds. The first packet is received, and subsequent packets are received with a delay according to the number of bytes in each packet (max. 160 bytes/1.3 sec.)
6	-127.5	Send 1 byte and receive the message after about 0.2 seconds; send 10 bytes and receive the message after about 0.26 seconds; 80 bytes are sent and the message is received after about 0.66 seconds; 160 bytes are sent and the message is received after about 1.1 seconds for 160 bytes. If more than 160 bytes are sent, the message will be received in packets (up to 160 bytes per packet), and the first packet will be received after 1.1 seconds. The first packet is received after 1.1 seconds, and subsequent packets are received with a delay according to the number of bytes in each packet (maximum 160 bytes/0.8 seconds)
7	-124.5	Send 1 byte and receive the message after about 0.15 seconds; send 10 bytes and receive the message after about 0.2 seconds; 160 bytes are sent and the message is received after approximately 0.7 seconds; 250 bytes are sent and the

		message is received after about 1 second. If more than 250 bytes are sent, the message will be received in packets (up to 250 bytes per packet), and the first packet will be received after 1 second. The first packet is received after 1 second, and subsequent packets are received with a delay according to the number of bytes in each packet (max. 250 bytes/0.6 seconds).
8	-121.5	Send 1 byte, about 0.1 seconds after receiving the message; send 10 bytes, about 0.13 seconds after receiving the message; 160 bytes are sent and the message is received after about 0.55 seconds; 250 bytes are sent and the message is received after about 0.7 seconds. If more than 250 bytes are sent, the message is received in packets (up to 250 bytes per packet), and the first packet is received after 0.7 seconds and subsequent packets are received with a delay according to the number of bytes in each packet (max. 250 bytes/0.3 seconds).

9600 baud rate and above, the S8 communication rate is approximately 850 bytes/second.

⑥ Query module firmware version information

Command	Response	Instruction
AT+V	www.hc01.com HC-14V1.12022.12.12	Return to official website URL and firmware version number

Example:

Sent to module: AT+V

Returned on module side: www.hc01.com HC-14V1.12022.12.12

⑦ Get the basic parameters of the module

Command	Instruction
AT+RX	Returns information about the current module's serial port baud rate, wireless channel, wireless rate, and wireless transmission power and other information.

Example:

Send to module: AT+RX

Return from module side: OK+B:9600

OK+C:28

OK+S:3

OK+P:+20dBm

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⑧ Query or change the wireless transmit power of the module

Command	Response	Instruction
AT+P?	OK+P:X	Query Transmit Power
AT+PX	OK+P:X	Setting Transmit Power Setting range: 6~20dBm Default: 20dBm

The factory default setting is 20dBm, the maximum transmit power and the longest communication distance. The transmit power is set to 6dBm for the smallest transmit power.

Example:

Query radio frequency:

Send module command 'AT+P?'.

The module returns 'OK+P:+20dBm'.

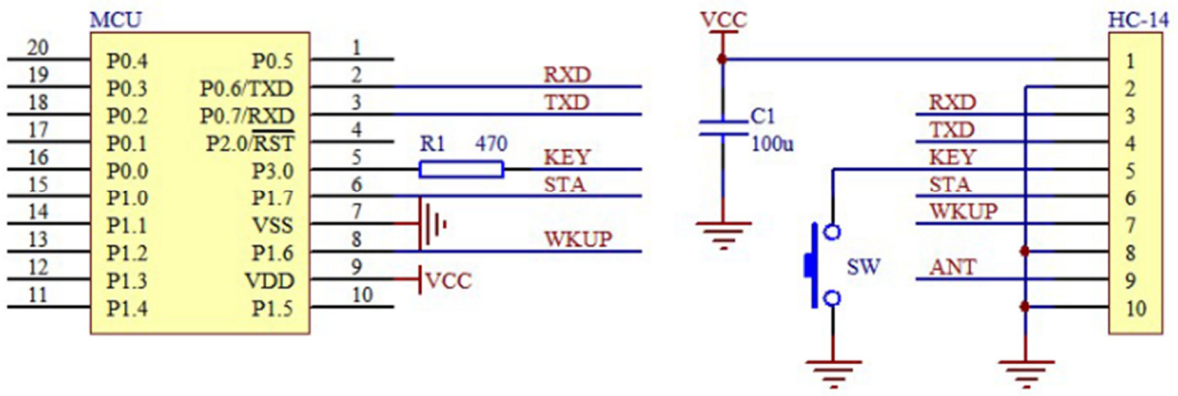
Set wireless frequency:

Send module command 'AT+P15'.

The module returns 'OK+P:+15dBm'.

Application examples and circuits

HC-14 Module Connection to MCU Serial Port



The 'KEY' pin in MCU should be set to high resistance or high level output normally, and set to low level when setting parameters;

Wake-up pin 'WKUP' in MCU should be set to low level output or left unconnected; 'STA' in MCU should be configured as

STA' in MCU should be configured as an input pin or left unconnected.

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