

HAC-SHM24 Data Radios



I. Features of HAC-SHM24 Data Radios

1. Large power transmission with the transmission power of 44dBm (25W).
2. High receiving sensitivity.
3. High anti-interference and low BER(Bit Error Rate)

Based on the GFSK modulation mode, the high-efficiency forward error correction channel encoding technology is used to enhance data's resistance to both burst interference and random interference and the actual bit error rate of $10^{-5} \sim 10^{-6}$ can be achieved when channel bit error rate is 10^{-2} .

4. Long transmission distance

Within the range of visibility, the reliable transmission distance is $>25\text{km}$ ($\text{BER}=10^{-3}$) when the antenna height is higher than 10m and antenna gain is 11dbi .

5. Transparent data transmission

Transparent data interface is offered to suit 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).

6. Multi-channel

The standard HAC-HM24 configuration provides 8 channels. If the user needs, it can be extended to 16/32 channels, meeting the multiple communication combination mode of the user.

7. Three interface modes(TTL、RS-232、RS-485).

8. Large data buffer zone

To HM24, air effective baud rate is 2400bps, air actual speed is 4800bps as FEC.

Interface baud rate is 1200/2400/4800/9600bps with format of 8N1/8E1 and user self-definition, allowing

the transmission of unlimited data frames at one time for more flexible programming by users under Interface baud rate air effective baud rate band .

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

Even for semi duplex communication, the user doesn't need to prepare excessive programs, only receiving/transmitting the data from the interface. HAC-SHM24 will automatically complete the other operations, such as transmission/receiving conversion in the air.

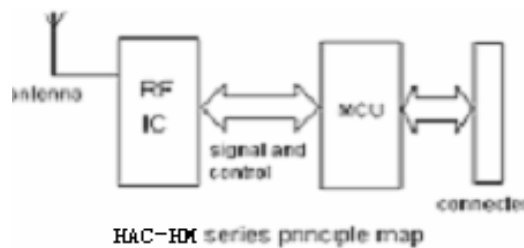
10 HAC-SHM24 can indicate the intensity of magnetic field, the power source and the transmit and receive of data.

II. Application of series HAC-SHM24 Data radios

Series HAC-SHM24 data RF module is suitable for standard industrial data transmission, the product is widely applied to meters and instruments of railway, oil well, electric grid, thermal network, water supply piping and environmental protection for data collection and working status monitor.

III. How to use series HAC-SHM24 Data Radios

Series HAC-SHM24 data radios provides three interface modes including standard RS-232, RS-485 and UART/TTL levels allowing direct connection with computer, user's RS-485 device, monolithic processor and other UART components for application.



1. Power supply

HAC-SHM24 uses DC power supply with voltage of +13.8V. It can also share power supply with other equipment, however, the high quality power supply with desirable ripple factor should be selected. We suggest not use the switch power. But if you must, please pay more attention to the interference of switch pulse on module. In addition, the reliable grounding must be used if there is other device in the system equipment. In case of failure to connect with the earth, it can form its own grounding but it must be absolutely separated from the municipal electric supply.

2. Definition of HAC-SHM24 connecting terminal

HAC-SHM24 can supply one 9-pin connector (DB9), and its definitions as well as connection method for terminals are shown in Table 1.

Table 1: Definition of 2P power supply interface pins and connection method

Pin No.	Pin Name	Description	Level	Connected to the terminal	Remarks
1	GND	Black wire	—	Earth	
2	VCC	Red wire	+	DC13.8V@2A	

Table 2: Definition of DB9 interface pins and connection method

Pin No	Pin Name	Description	Level	Connected to the terminal	Remarks
1	NC				
2	RxD	The RxD of RS-232	RS-232	TxD	Connect to 3pin of computer com
3	TxD	The TxD of RS-232	RS-232	RxD	Connect to 2pin of computer com
4	Kept				
5	SGND	Grounding of the signal			Connect to 5pin of computer com
6	TxD	TxD of TTL	TTI	RxD	
7	RxD	RxD of TTL	TTL	TxD	
8	A	The A of RS-485	RS-485	A	
9	B	The B of RS-485	RS-485	B	

3. Setting of channel, interface and data format:

Before using HAC-SHM24, the user needs to make simple configuration based on its own needs to determine the channel, interface mode and data format.

There is a switch of 8 bits on the HAC-SHM24. When turn it to “ON”, it means 0 and the opposite means 1.

a. Channel configuration:



The 1,2,3 bit on the switch provide 8 channel options, and the user can choose to use 0-7 channels through them. Within one small communication network, as long as the operation of switch mode is same, there can be mutual communication.

The standard set in factory is channel 7,321=111(7) , frequency is: 433.926MHZ.

The standard frequency is a designative one which can be chosen by the customer.

Table 3: Corresponding frequency points of 0~7 channels

Channel No.	Frequency	Channel No.	Frequency
321=000(0)	430.2000 MHz	321=100(4)	434.6940 MHz
321=001(1)	431.4288 MHz	321=101(5)	434.2332 MHz
321=010(2)	431.7360 MHz	321=110(6)	433.1580 MHz
321=011(3)	430.5072 MHz	321=111(7)	433.9260MHz

b. Parity mode selection:

HAC-SHM24 can support no-parity or even parity modes, i.e. 8N1/8E1. It can choose parity mode through the fifth bit of the switch:

The standard set in factory: 5=1, 8E1 (even parity)

5=1 Parity: 8E1 (even parity)

5=0 Parity: 8N1 (no parity)

c. Selection of interface data rate:

We can set the interface baud rate to satisfy different demands of customers. It can be set through the 7,8 bit on the switch.

The high-efficiency forward error correction channel encoding technology is used to make the data transmit in the air is much more than it at the interface.

If we want to transmit the data in unlimited length at one time, the baud rate in the air should be higher than it at the interface. The transmission data will be limited if the interface baud rate is more than or equal to it in the air. The capacity of it is related to the data buffer zone in MCU, the specific parameters are shown in the table below.

In addition, the higher the baud rate in the air is, the wider the modulated bandwidth is, then it makes much noise. At the same time, the wider the bandwidth received is, the lower the receiving sensitivity is, so the transmission distance will be short. (The distance and the baud rate in the air are in inverse proportion.)



When the data is not too large and customers need long transmission distance, they can choose the interface baud rate higher than it in the air.

If we transmit data by that mode, there may be some intervals between the receiving data. Then the customer should pay attention that whether peripherals have received the data completely or not.

The standard set in factory is that the baud rate in the air is two times as long as it at the interface and the transmission data is unlimited.

There is a “ * ” behind the standard in the table below.

Table 4: The interface baud rate and the capacity of data on SHM24

The 7,8 bit of the switch	78(00)	78(10)	78(01)	78(11)
Interface baud rate	1200bp	2400bps *	4800bps	9600bps
data capacity	Unlimited	unlimited	500byte	400byte

Choosing the switch bits each time, the choice will be effective after the power supply start again.

4. The indicator of the magnetic field intensity, power supply and the transmission of data;

HAC-SHM24 shows the intensity of magnetic field which discern the valid data automatically.

Table 5: State of the indicator lamp

State	POWER	TxD	RxD	RSSI1	RSSI2	RSSI3
Electrify	on					
Transmit data	on	on				
Receive data	on		On			
Intensity not good	on		On	on		
Intensity good	on		On	on	on	
Intensity excellent	on		On	on	on	on

Note: Connected to the power supply, the system keeps receiving data. If the magnetic density one isn't lighted and the light receiving data is on, it demonstrates the density of magnetic field is not very good.

5 Antenna Configuration

HAC-SHM24 series wireless data module uses the BNC type of antenna connector to satisfy



customer's different requirements about antenna.

When choosing the antenna, the customer must notice the compatibility of the 50 impedance matching so that the antenna can support the transmission power of 5W. The regular small antenna can't take so much power.

IV. Application of series HAC-SHM24 networking

The communication channel of HAC-SHM24 is semi 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.

HAC-SHM24 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 HAC-SHM24

Modulation mode: GFSK

Working frequency: 429.00~434.90MHz

Transmission power: 44dBm (25W)

Receiving sensitivity: -121dBm

Working temperature: -40 ~80 (industry level)

Transmitting current: 5A

Receiving current: 100mA

Working humidity: 10%~90% relative humidity without condensation



Interface velocity: 1200/2400/4800/9600bps

Interface data format: 8E1/8N1

Power supply: +13.8V@5A

Frequency stability: ± 3PPM

Structural Size : 138 × 84 × 52mm (not include BNC antenna connector)

. Description of type

For product type HAC- SHM24, HAC- indicates the name of manufacturer Shenzhen HAC Technology Co., Ltd., SHM indicates ultra high power, i.e. transmission power is 44dBm, and 24 indicates that the baud rate in the air is 2400bps.

