7 Register Read and Write Control

7.1Instruction format

configuration mode (mode 2: M1=1, M0=0), the list of supported commands is as follows (**when setting, only 9600, 8N1formats are supported**):

serial number	command format	Detailed description
1	set register	Command: C0+start address+length+parameter Response: C1+start address+length+parameter Example 1: Configure the channel as 0x09 Instruction start address length parameter Send: C0 05 0109 Return: C105 0109 Example 2: Simultaneously configure module address (0x1234), network address (0x00), serial port (9600 8N1), airspeed (2.4k) Send: C0 00 04 12 34 00 61 Return: C100 04 12 34 00 61
2	read register	Command: C1+start address+length Response: C1+start address+length+parameter Example 1: Reading a Channel Instruction start address length parameter Send: C105 01 Return: C105 0109 Example 2: Simultaneously read module address, network address, serial port, and airspeed Send: C100 04 Return: C100 04 12 34 00 61
3	set temporary register	Command: C2 + start address + length + parameters Response: C1+ start address + length + parameters Example 1: Configure the channel as 0x09 Instruction start address length parameter Send: C2 05 0109 Return: C105 0109 Example 2: Simultaneously configure module address (0x1234), network address (0x00), serial port (9600 8N1), airspeed (2.4k) Send: C2 00 04 12 34 00 61 Return: C100 04 12 34 00 61
5	wireless configuration	Instructions: CF CF + regular instructions Response: CF CF + Regular Response Example 1: The wireless configuration channel is 0x09 Wireless instruction header instruction start address length parameter Send: CF CF C0 05 0109 Return: CF CF C105 0109 Example 2: Simultaneous wireless configuration module address (0x1234), network address (0x00), serial port (9600 8N1), airspeed (2.4k) Send: CF CF C0 00 04 12 34 00 61 Return: CF CF C100 04 12 34 00 61

| 6 | wrong format | format error response
FF FF FF | |

7.2 Register description

serial number	read and write	name	describe					Remark
00H	read/write	ADDH	ADDH (default 0)					Module address high byte and low byte ; Note: When the module address is equal to FFFF, it can be used as the broadcast and listening address, that is, the module will not perform address filtering at this time
01H	read/write	ADDL	ADDL (default 0)					
02H	read/write	NETID	NETID (default 0)					Network address, used to distinguish the network ; When communicating with each other, they should be set to be the same.
0 3H	read/write	REG0	7	6	5	U ART serial port rate (bps)		For the two modules communicating with each other, the serial port baud rate can be different , and the verification method can also be different ; When continuously transmitting large data packets, users need to consider the data blocking caused by the same baud rate, and may even be lost ; It is generally recommended that the baud rate of both communication parties be the same.
			0	0	0	The serial port baud rate is 1200		
			0	0	1	The serial port baud rate is 2400		
			0	1	0	The serial port baud rate is 4800		
			0	1	1	The serial port baud rate is 9600 (default)		
			1	0	0	The serial port baud rate is 19200		
			1	0	1	The serial port baud rate is 38400		
			1	1	0	The serial port baud rate is 57600		
			1	1	1	The serial port baud rate is 115200		
			4	3	serial check digit			The serial port modes of the communication parties can be different ;
			0	0	8 N1(default)			
			0	1	8 O1			
			1	0	8 E1			
			1	1	8 N1(equivalent to 0 0)			
			2	1	0	Wireless air rate (bps)		The air speed of both communication parties must be the same ; air rate, the smaller the delay and the shorter the transmission distance.
			0	0	0	Air rate 2.4k		
			0	0	1	Air rate 2.4k		
			0	1	0	Air rate 2.4k (default)		
			0	1	1	Air rate 4.8k		
			1	0	0	Air rate 9.6k		
			1	0	1	Air rate 19.2k		

			1	1	0	Air rate 38.4k		
			1	1	1	Air rate 62.5k		
0 4H	read/write	REG1	7	6		subcontract settings		The data sent by the user is less than the sub-packet length, and the serial port output of the receiving end presents an uninterrupted continuous output ; If the data sent by the user is larger than the length of the packet, the serial port at the receiving end will output the packet.
			0	0		2 40 bytes (default)		
			0	1		128 bytes		
			1	0		6 4 bytes		
			1	1		3 2 bytes		
			5			RSSI ambient noise enable		Enable command (subpackage setting, transmit power are default parameters, configuration mode): C0 04 0120 ; After enabling, the command C0 C1C2 C3 can be sent in the transmission mode or WOR transmission mode to read the register ; Register 0x00: current ambient noise RSSI ; Register 0X01: RSSI at Last Data Received (Current channel noise is: dBm = -(256 - RSSI)) ; Instruction format: C0 C1C2 C3+start address+read length ; Return: C1+ address + read length + read valid value; for example: send C0 C1C2 C3 00 01 Return C100 01RSSI **(the address can only start from 0 0)**
			0			disabled (default)		
			1			enable		
			4	3	2	reserve		
			1	0		transmit power		The relationship between power and current is non-linear, and the power supply efficiency is the highest at maximum power ; Current does not decrease proportionally with power reduction.
			0	0		3 3dBm (default)		
			0	1		30d B m		
			1	0		27d B m		
			1	1		24d B m		
0 5H	read/write	REG2	Channel Control (CH) 0-80 represent a total of 81channels					Actual Frequency = 850.125 + CH *1M
0 6H	read/write	REG3	7			enable rssi byte		When enabled, the module receives wireless data and outputs it through the serial port TXD, followed by an RSSI strength byte.
			0			disabled (default)		
			1			enable		
			6			transfer method		During fixed-point transmission, the module will recognize the first three bytes of serial port data as: address high + address low + channel, and use it as the wireless transmission target.
			0			transparent transmission (default)		
			1			Fixed-point transmission		
			5			relay function		After the relay function is enabled, if the target address is not the module itself, the module will start a forwarding ; In order to prevent data return, it is recommended to use it in conjunction with the fixed-point mode ; that is, the destination address is different from the source address.
			0			Disable relay function (default)		
			1			Enable relay function		
			4			LBT enable _		After enabled, wireless data will be monitored before transmission, which can avoid interference to a certain extent, but may cause data delay ; The maximum stay time of LBT is 2 seconds, and it will be issued forcibly when it reaches 2 seconds.
			0			disabled (default)		
			1			enable		
			3			WOR mode transceiver control		Only valid for mode 1;

			0	W OR receiver (default) The module cannot transmit data and works in WOR monitoring mode. The monitoring cycle is shown below (WOR cycle), which can save a lot of power consumption.		After the WOR receiver receives the wireless data and outputs it through the serial port, it will wait for 1000ms before entering WOR again. During this period, the user can input the serial data and return it through the wireless ; Each serial port byte will be refreshed for 1000ms ; The user must initiate the first byte within 1000ms.
			1	W OR Transmitter The transceiver of the module is turned on, and when transmitting data, a wake-up code for a certain period of time is added.		
			2	1	0	W OR cycle	Only valid for mode 1; Period T= (1+WOR) *500ms , the maximum is 4000ms , and the minimum is 500ms ; the WOR monitoring interval period, the lower the average power consumption, but the greater the data delay; The sending and receiving parties must be consistent (very important)

2	1	0	W OR cycle
0	0	0	500ms _
0	0	1	1000ms _
0	1	0	1500ms _
0	1	1	2000ms _
1	0	0	2500ms _
1	0	1	3000ms _
1	1	0	3500ms _
1	1	1	4000ms _

0 7H	Write	CRYPT_H	key high byte (default 0)	Write only, read returns 0 ; Used for encryption to avoid interception of air wireless data by similar modules ; Inside the module, these two bytes will be used as calculation factors to transform and encrypt the wireless signal in the air.
0 8H	Write	CRYPT_L	Key low byte (default 0)	
8 0H ～8 6H	read	PIDs	Product information 7 bytes	Product information 7 bytes

7.3 Factory Default Parameters

model	Factory default parameter value: C0 00 09 00 00 00 62 00 12 03 00 00						
Module model	frequency	address	channel	air speed	baud rate	Serial format	transmit power
E22-900T33S	868.125MHz	0x0000	0x12	2.4kbps	9600	8N1	33 dbm

8 AT command

● AT commands are used in configuration mode, AT commands are divided into three categories: command commands, setting commands and query commands;

● The user can query the AT command set supported by the module through "AT+HELP=?", and the baud rate adopted by the AT command is 9600 8N0;

● When the input parameter exceeds the range, it will be restricted. Please do not let the parameter exceed the range to avoid unknown situations.

8.1 AT command table

command instruction	describe	example	Example description
AT+IAP (use with caution, please refer to 8.3 IAP Upgrade Notes in this article for details)	Enter IAP upgrade mode	AT+IAP	Enter IAP upgrade mode
AT+RESET	device restart	AT+RESET	device restart
AT+DEFAULT	The configuration parameters are restored to default and the device reboots	AT+DEFAULT	The configuration parameters are restored to default and the device reboots

set command	describe	example	Example description
AT+UART=baud,parity	Set baud rate and parity	AT+UART=3,0	Set the baud rate to 9600, 8N0
AT+RATE=rate	set air speed	AT+RATE=7	Set the air rate to 62.5K
AT+PACKET=packet	Set packet length	AT+PACKET=0	Set the packet to 240 bytes
AT+WOR=role	Set WOR role	AT+WOR=0	Set to WOR reception
AT+POWER=power	Set send power	AT+POWER=0	Set the transmit power to 22dBm
AT+TRANS=mode	Set send mode	AT+TRANS=1	Set to fixed point mode
AT+ROUTER=router	Set repeater mode	AT+ROUTER=1	Set to repeater mode
AT+LBT=lbt	Set the Listen Before Talk function switch	AT+LBT=1	Set to enable, refer to section 7.2 LBT enable for details
AT+ERSSI=erssi	Set ambient noise RSSI switch	AT+ERSSI=1	Set to enable, refer to Section 7.2 RSSI Environmental Noise Function for details
AT+DRSSI=data_rssi	Set receive data RSSI switch	AT+DRSSI=1	Receive data RSSI function open
AT+ADDR=addr	Set module address	AT+ADDR=1234	Set the module address to

			1234
AT+CHANNEL=channel	Set the working channel of the module	AT+CHANNEL=23	Set the frequency to 433.125M
AT+NETID=netid	set network ID	AT+NETID=2	Set the network ID to 2
AT+KEY=key	set module key	AT+KEY=1234	Set the module key to 1234
AT+DELAY=delay	Set WOR delay sleep time	AT+DELAY=1000	Set the WOR delay sleep time to 1000ms
AT+SWITCH=switch	Set software switching mode switch	AT+SWITCH=1	Set to open, allow software switching

query command	describe	return example	Example description
AT+HELP=?	Query the AT command table		Return to AT command table
AT+DEVTYPE=?	Query module model	DEVTYPE=E29-400T22S/D	return module model
AT+FWCODE=?	Query firmware code	FWCODE=7432-0-10	return firmware version
AT+UART=?	Query baud rate and checksum	AT+UART=3,0	Return baud rate 9600, 8N0
AT+RATE=?	Query air rate	AT+RATE=7	The return air rate is 16.4K
AT+PACKET=?	Query packet length	AT+PACKET=0	The return packet is 240 bytes
AT+WOR=?	Query WOR roles	AT+WOR=0	The return is WOR reception
AT+POWER=?	Query sending power	AT+POWER=0	Return transmit power is 22dBm
AT+TRANS=?	query sending mode	AT+TRANS=1	return to fixed-point mode
AT+ROUTER=?	Query relay mode	AT+ROUTER=1	Return to repeater mode
AT+LBT=?	Query the function switch of Listen Before Talk	AT+LBT=1	Return LBT switch state
AT+ERSSI=?	Query the ambient noise RSSI switch	AT+ERSSI=1	Returns the ambient noise switch status
AT+DRSSI=?	Query RSSI output	AT+DRSSI=1	The return channel RSSI function is enabled
AT+ADDR=?	Query module address	AT+ADDR=1234	The return module address is 1234
AT+CHANNEL=?	Query the working channel of the module	AT+CHANNEL=23	The return frequency is 433.125M
AT+NETID=?	Query network ID	AT+NETID=2	The return network ID is 2
AT+KEY=?	query module key	Reading is not supported (security considerations)	return ERR
AT+DELAY=?	Query WOR delay sleep time	AT+DELAY=1000	Return WOR delay sleep time is 1000ms

8.2 AT parameter analysis

When the serial port receives the correct command, the serial port will return "command=OK", otherwise it will return "=ERR"

command parameter	parameter meaning
Baud (serial port baud rate)	0:1200 1:2400 2:4800 3:9600 4:19200 5:38400 6 : 57600 7:115200
Parity (serial check digit)	0:8N1 1:8O1 2:8E1 3:8N1
Rate (air rate)	0:2.4K 1:2.4K 2:2.4K 3:4.8K 4:9.6K 5:19.2K 6:38.4K 7:62.5K
Packet (packet length)	0: 240 1: 128 2:64 _ 3:32 _
Role (WOR role)	0: receive 1: send
Period (WOR period)	0 : 500ms 1: 10 00 ms 2 : 1500 ms 3: 20 00 ms 4 : 2500 ms 5: 30 00 ms 6 :3 500 ms 7: 4000 ms
Power (transmission power)	0:33dBm 1:30dBm 2:27dBm 3:24dBm
Mode (transmission mode)	0: transparent 1: fixed point
Router (relay mode)	0: off 1: open
LBT (listen before talk)	0: off 1: open
Erssi (environmental RSSI)	0: off 1: open
Data_rssi (Data RSSI)	0: off 1: open
Addr (module address)	Module address 0~65535 (decimal system)
Channel (module channel)	Module channel 0~83 (decimal system)
Netid (Network ID)	Module network 0~255 (decimal)
Key _	Module key 0~65535 (decimal)
Delay (WOR delayed sleep)	Delay sleep 0~65535 (decimal system)

8.3 Precautions for IAP upgrade

If the customer needs to upgrade the firmware, he needs to find the corresponding BIN file provided by the official, and then use the official host computer to upgrade the firmware. Generally, the user does not need to upgrade the firmware. Please do not use the "AT+IAP" command.

The pins necessary for the upgrade must be led out (M1, M0, AUX, TXD, RXD, VCC, GND), and then send the "AT+IAP" command in the configuration mode to enter the upgrade mode. If you need to exit the IAP upgrade mode, you need to keep Power on and wait for 60 seconds, the program will automatically exit, otherwise it will enter the upgrade mode infinitely even if it is restarted.

After entering the upgrade mode, the baud rate will automatically switch to 115200 until it exits automatically, during which there will be log output.

9 Use of relay networking mode

serial number	Description of relay mode
1	After setting the relay mode through the configuration mode, switch to the general mode and the relay starts to work.
2	In the repeater mode, ADDH and ADDL are no longer used as module addresses, but correspond to NETID forwarding pairs respectively. If one of the networks is received, it will be forwarded to another network ; The repeater's own network ID is invalid.
3	In relay mode, the relay module cannot send and receive data, and cannot operate with low power consumption.
4	When the user enters other modes from mode 3 (sleep mode) or during the reset process, the module will reset the user parameters, during which AUX outputs low level.

Relay networking rules description:

1、Forwarding rules, the relay can bidirectionally forward data between two NETIDs.

2、In relay mode, ADDH\ADDL is no longer used as a module address, but as a NETID forwarding pair.

As shown in the picture:

①relay

"Node 1" has a NETID of 08.

"Node 2" has a NETID of 33.

The ADDH\ADDL of trunk 1are 08 and 33 respectively.

So the signal sent by node 1(08) can be forwarded to node 2 (33)

At the same time, node 1and node 2 have the same address, so the data sent by node 1can be received by node 2.

② Secondary relay

The ADDH\ADDL of relay 2 are 33 and 05 respectively.

So relay 2 can forward the data of relay 1to network NETID:05.

Thus node 3 and node 4 can receive node 1data. Node 4 outputs data normally, and node 3 has a different address from node 1, so no data is output.

③Two -way relay

Configuration as shown in the figure: the data sent by node 1can be received by nodes 2 and 4, and the data sent by nodes 2 and 4 can also be received by node 1.