E90-DTU(400SL47)



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Chengdu Ebyte Electronic Technology Co.,Ltd.

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1 Product Introduction

1.1 Product Description

E90-DTU(400SL47) is a real high-quality industrial-grade wireless digital transmission radio (the radio won the national design patent ZL202030009845.3), the radio adopts LORA spread spectrum technology, and its strong anti-interference ability makes the wireless communication more stable and reliable in the industrial site.

It has a variety of transmission modes, working in the (410.125 ~ 460.125M) frequency band (default 433.125MHz), the radio provides transparent RS232/RS485 interfaces.LoRa direct-sequence spread-spectrum technology will bring a longer communication distance, and has the advantage of strong anti-jamming ability. The module has software FEC forward error correction algorithm, which has high coding efficiency and strong error correction capability, and can actively correct the interfered data packets in case of sudden interference, greatly improving the reliability and transmission distance. In the absence of FEC, such packets can only be discarded. The radio has data encryption function, the data transmitted by the radio in the air, with randomness, through the strict encryption and decryption algorithms, which makes the data interception lose its significance; it supports the sub-packet length setting, and supports different real-time and data packets.

As a communication medium, wireless digital transmission radio, like fiber optic, microwave, open wire, has a certain scope of application: it provides real-time, reliable data transmission of monitoring signals in the special network under some special conditions, with low cost, easy installation and maintenance, strong ability to bypass the shooting, flexible network structure, and far-reaching coverage. It is characterized by low cost, easy installation and maintenance, strong bypassing ability, flexible network structure and long coverage, suitable for multi-point and decentralized location, complex geographic environment and other occasions, and can be connected with PLC, RTU, rain gauge, liquid level meter and other data terminals.

1.2 Functional characteristics

Ideally the communication distance can be up to 70KM+;

AT commands are supported;

Support IAP online upgrade;

Transmit power up to 50W;

Ambient field strength dynamic indication, packet RSSI dynamic indication;

Hardware and software dual watchdog;

Dust and moisture resistant;

The product is easy to use and configured by the upper computer;

Adopting the latest LoRa technology, it has a longer distance and more powerful performance than traditional LoRa digital transmission radios;

Adopting military-grade LoRa modulation technology, features data encryption and programmable packet length;

Extra large single packet, single packet support up to 240 bytes;

Simple and efficient power supply design with crimped wires to support 12V\20A power supply;

Support LBT function, the radio automatically waits for transmission according to the current environmental noise intensity. Greatly improve the communication success rate of the module in harsh environments;

Supports communication key function to effectively prevent data from being intercepted;

It can realize multi-level relay networking, effectively extend the communication distance and realize

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ultra-long-distance communication;

Adopting temperature compensation circuit, the frequency stability is better than ±1.5PPM;

Full aluminum alloy shell, compact size, easy to install, good heat dissipation; perfect shielding design, good electromagnetic compatibility, strong anti-interference ability;

Powerful software functions, all parameters can be programmed: e.g. power, frequency, air rate, address ID, etc;

Temperature monitoring, antenna anomaly monitoring

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2 Quick Start

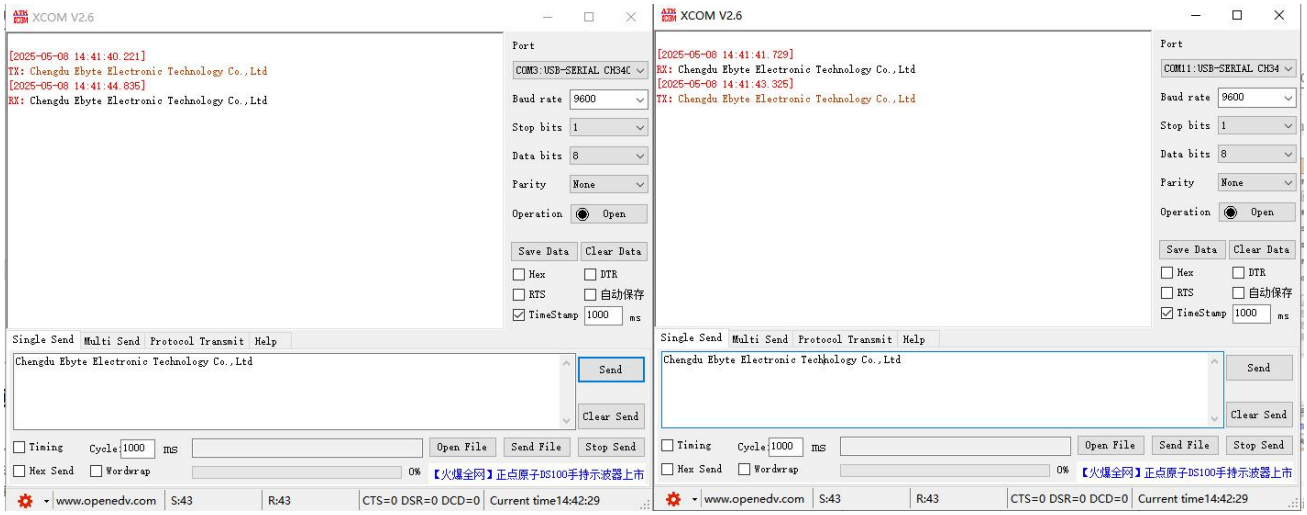
The use of this equipment must be external antenna, two devices must be used more than 20 meters apart, otherwise it will cause damage to the equipment, not according to the above operation caused by the damage to the equipment at their own risk.!!!!

You need to prepare E90-DTU (400SL47) radio, antenna, 12V/20A or above power supply, serial connection cable.

1、 First install the antenna to the digital transmission radio, then install the power supply, which only supports the compression mode, at this time, the power supply lamp is on, and the exception lamp has no indication;

2、 Use USB to RS-232 or USB to RS-485 to connect your computer to the digital radio;

3、 Start two serial port debugging assistants, select the serial port baud rate of 9600bps, the checksum method is 8N1, you can realize the serial port pass-through;

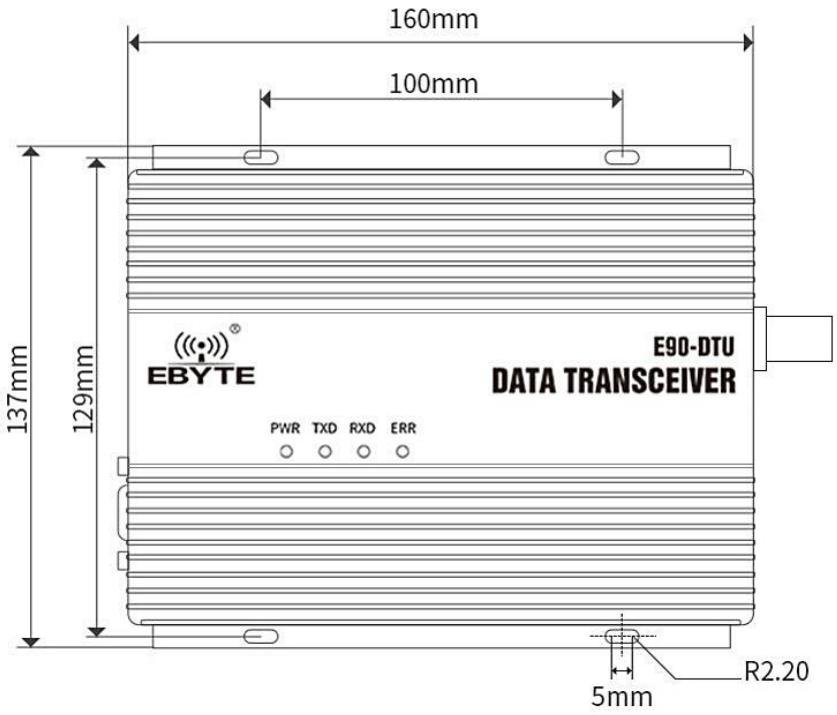


4、 If the customer needs to modify the parameters, please short the MOD pin to GND, enter the configuration mode, and turn on the E90-DTU SL digital radio configuration software, you can modify the relevant parameters, after completing the configuration, please put the MOD pin to the empty state.

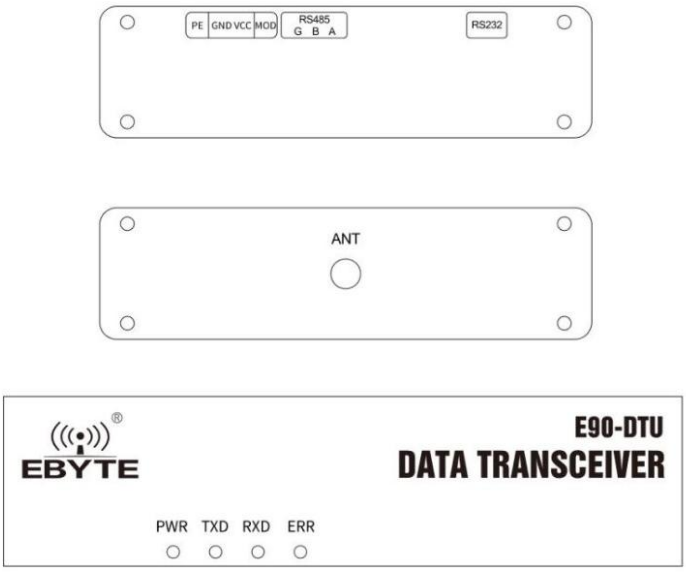
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3 Installation dimensions



3.1 Interfaces and Indications



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fo otnote	name (of a thing)	functionality	clarification
1	PE	connection with the earth	connection with the earth
2	GND	Crimped Power Supply Input Negative	Power Reference Ground
3	VCC	Positive input for crimped power supply	Power input (12V/20A)
4	MOD	Mode Control	Suspended, General Mode; Grounded, Configuration Mode
5	RS485 G	RS485 interface G	RS485 interface G connected to the device GND interface (recommended connection)
6	RS485 B	RS485 Interface B	RS485 interface B connected to device B interface
7	RS485 A	RS485 Interface A	RS485 interface A connected to device A interface
8	RS232	RS232 interface	Standard RS232 interface
9	ANT	N-K connector	External threaded bore, 19.2mm long, characteristic impedance 50 Ω
10	PWR	Power indicator	Red, illuminated when power is on
11	TXD	Serial Data Transmission Indicator	Yellow, blinking when sending data
12	RXD	Serial Data Receiving Indicator	Yellow, blinking when receiving data
13	ERR	warning indicator	Red, not connected to the antenna or voltage, temperature abnormalities, not connected to the antenna abnormalities resolved need to be re-powered to work normally

4 interface definition

4.1 Power Interface Description

The user is powered by a pressurized wire, 12V/20A DC power supply.

4.2 RS232 Interface Definition

The E90-DTU can be connected to the device via RS232 using a standard DB9 interfac

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4.3 RS485 Interface Definition

The E90-DTU can use RS485 interfaces A, B, and G to connect to RS485's A, B, and G of the device respectively.

Note: Poor communication occurs when connecting the radio to multiple devices, but not with a single device, try connecting a 120Ω matching resistor in parallel between the 485_A terminal and the 485_B terminal.

5 Technical indicators

5.1 Model Specifications

Model Specification	operating frequency	firing power	reference distance	Specification Characteristics	Recommended Scenarios
	Hz	W	km		
E90-DTU(400SL47)	433.125M	50	70	LoRa spread spectrum anti-interference	Suitable for long distances and interference-prone environments

Note: Sunny weather, open environment without obstruction, 12V/10A power supply, 5dBi suction cup antenna, antenna height of 2 meters from the ground, using factory default parameters.

5.2 General specification parameters

serial number	sports event	norm	clarification
1	Product Size	160*137*44mm	See mounting dimensions for details
2	Product weight	846.2g	Weight tolerance 4.5g
3	operating temperature	-40℃～+85℃	Meets the demands of industrial-grade use
4	Antenna Impedance	50Ω	Standard 50Ω characteristic impedance
5	voltage range	12V DC	Recommended to support instantaneous current 10A
6	communication interface	RS232/RS485	Standard DB9 hole type/5.08 terminal block

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7	baud	Factory default 9600	Baud rate range 1200 to 115200
8	address code	Factory default 0	Total 65536 address codes can be set

5.3 Frequency range and number of channels

Model Specification	Default frequency	frequency range	channel spacing	channel count
	Hz	Hz	Hz	
E90-DTU (400SL47)	433.125M	410.125 to 460.125M	1M	61, half-duplex

Note: When using multiple sets of digital transmission radios to communicate one-to-one at the same time in the same area, it is recommended that each set of digital transmission radios set a channel interval of 2MHz or more.

5.4 Emission power levels

Model Specification	50W
E90-DTU (400SL47)	Factory default, not adjustable

5.5 Air Rate Class

Model Specification	Default Air Rate	degree (math.)	airspeed rating
	bps		bps
E90-DTU(400SL47)	2.4k	6	2.4, 4.8, 9.6, 19.2, 38.4, 62.5

Note: The higher the air rate setting, the faster the transmission rate and the closer the transmission distance; therefore, it is recommended that the air rate be as low as possible if the rate meets the usage requirements.

5.6 Current parameters

Model Specification	Supply voltage V	Emission current A	Guard current mA
E90-DTU (400SL47)	12	10	40

Note: It is recommended to keep more than 50% current margin when selecting power supply, which is conducive to the long-term and stable operation of the radio.

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5.7 Length of delivery and receipt and mode of subcontracting

Model Specification	Cache size	Subcontracting
E90-DTU (400SL47)	1000 bytes	Command-set packetized 32/64/128/240 byte sends

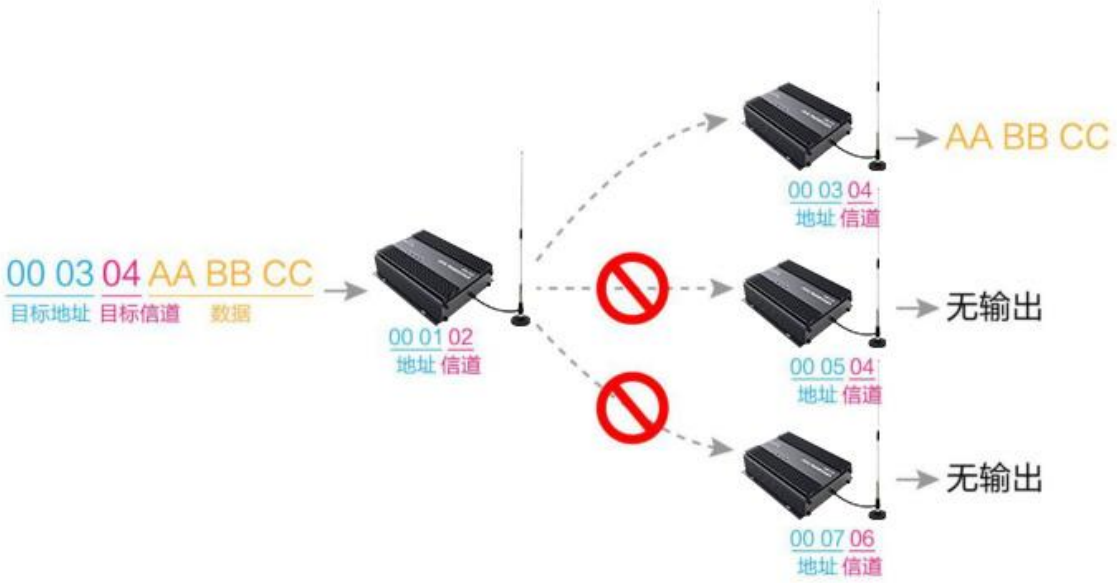
Note: 1. If the radio receives data for a single time that is larger than the capacity of a single packet, the exceeding part of the data will be automatically assigned to the second transmission until the transmission is completed;

2. The radio's single reception data must not be larger than the cache capacity.

6 Functional details

6.1 Targeted launches (hexadecimal)

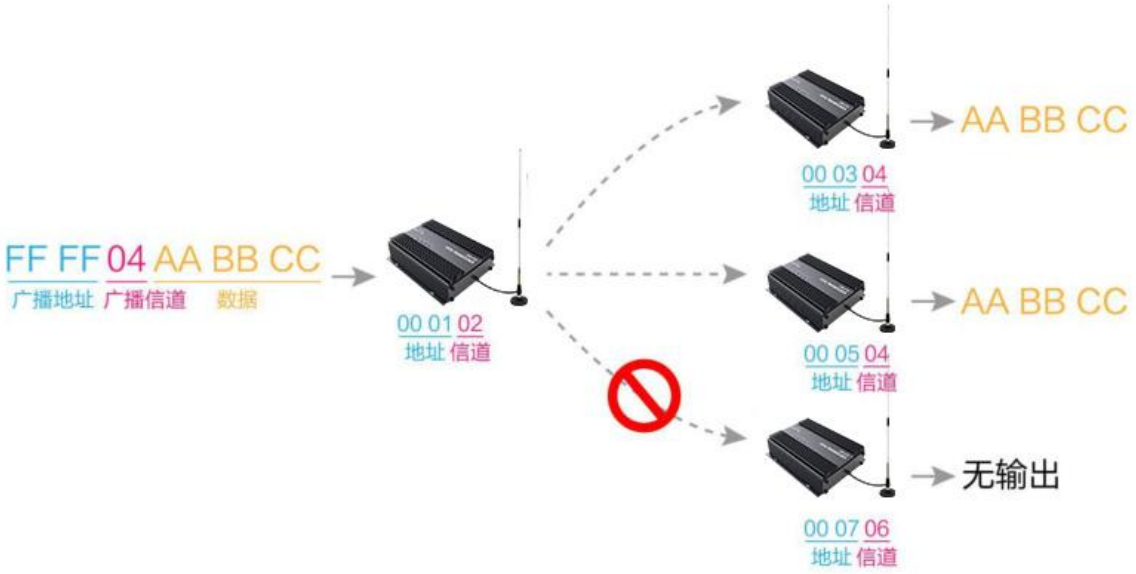
For fixed-point transmission, the module recognizes the first three bytes of the received serial data: Address High + Address Low + Channel and use it as a wireless transmit target.



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6.2 Broadcast Transmission (hexadecimal)



6.3 Broadcast address

- Example: set the module A address to 0xFFFF and the channel to 0x04.
- When module A acts as a transmitter (same mode, transparent transmission method), all receiving modules under channel 0x04 can receive the data for the purpose of broadcasting.

6.4 Listener address

- Example: set the module A address to 0xFFFF and the channel to 0x04.
- When module A acts as a receiver, it can receive all the data under channel 0x04 for the purpose of listening.

6.5 Exception Work Status Log Printing Details

1. The ERR indicator will blink according to the following table based on the specific abnormal operating status.

Abnormal working condition	Thresholds for determining anomalous states	ERR indicator blinking condition
phase sequence	Supply voltage <11V	Blinks once in 500ms
overpressurization	Supply voltage >13V	1s blinks once
overheat (e.g. an economy)	Module temperature > 120°C	Flashes once in 2s
Overpressure and	Supply voltage >13V and	Ever Bright

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overheating	module temperature >120° C	
unplugged antenna	Send without antenna	Ever Bright

2. The module will temporarily turn off the RF transmitter function under abnormal working condition, and will restart the transmitter function when it returns to normal working condition.

3. The module will print the cycle log every 500ms in the abnormal state (can be turned on/off) to inform the user of the current abnormal working state, the format of the print log is shown in the table below:

Abnormal working condition	Print Log Format
phase sequence	Under Voltage!!!
overpressurization	Over Voltage!!!
overheat (e.g. an economy)	Over Temperature!!!
Overpressure and overheating	Over Voltage & Over Temperature!!!!
Unconnected antenna	WARNING!!! : No antenna

Note: Exception log printing enable bit (bit2 of instruction register 04H) 0: off 1: on Default is 0 (off)

7 Working modalities

E90-DTU has two working modes, MOD pin is suspended, general mode, i.e. the radio communicates normally; MOD pin is grounded, configuration mode.

form	marginal notes
General mode	Serial on, wireless on, transparent transmission (factory default mode)
Configuration Mode	The user can access the registers through the serial port to control the working state of the radio, and the user can configure the module through the upper computer configuration software.

7.1 General model

typology	Module operates in general mode (MOD pin suspended state)
emit (a particle)	The user can enter data through the serial port and the module will initiate wireless transmission.
reception (of transmitted signal)	The module's wireless reception function is turned on, and wireless data will be output via the serial port pins when received.

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7.2 Configuration mode

typology	Module operating in configuration mode (MOD pin ground state)
Emit (a particle)	Wireless transmitter shutdown
Reception(of transmitted signal)	Wireless reception off
Configure	User access to registers to configure module operating parameters

8 Register Read/Write Control

8.1 Command Format

The list of supported commands in the configuration mode is as follows (only 9600, 8N1 format is supported during setup):

serial number	command format	particular
1	Setup Registers	Instruction: C0 + start address + length + parameters Response: C1 + start address + length + parameters Example 1: Configure the channel as 0x09 Command Start address Length Parameters Send: C0 05 01 09 Return: C1 05 01 09 Example 2: Simultaneously configure the module address (0x1234), network address (0x00), serial port (9600 8N1), and airspeed (1.2K) Send: C0 00 04 12 34 00 61 Return: C1 00 04 12 34 00 61
2	Read registers	Instruction: C1 + start address + length Response: C1 + start address + length + parameters Example 1: Reading a channel Command Start address Length Parameters Send: C1 05 01 Return: C1 05 01 09 Example 2: Simultaneous reading of module address, network address, serial port, airspeed

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		Send: C1 00 04 Return: C1 00 04 12 34 00 61
3	formatting error	Format Error Response FF FF FF FF

8.2 Register Description

address	fill out or in (information on a form)	name (of a thing)	descriptive				note
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 listen address, i.e.: at this point the module will not be address filtered1
01H	Read/Write	ADDL	ADDL (default 0)				
02H	Read/Write	NETID	NETID (default 0)				Network address for distinguishing networks. It should be set to the same when communicating with each other.
03H	Read/Write	REG0	7	6	5	UART serial port rate (bps)	Two modules communicating with each other can have different serial port baud rates. The checksum method can also be different. When transmitting larger packets continuously, users need to consider the data blocking and even possible loss caused by the same baud rate. It is generally recommended that both sides of the communication have the same baud rate.
			0	0	0	Serial port baud rate of 1200	
			0	0	1	Serial port baud rate of 2400	
			0	1	0	Serial port baud rate of 4800	
			0	1	1	Serial port baud rate of 9600 (default)	
			1	0	0	Serial port baud rate of 19200	
			1	0	1	Serial port baud rate of 38400	

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			1	1	0	Serial port baud rate of 57600	
			1	1	1	Serial port baud rate of 115200	
			4	3	serial port parity bit		
			0	0	8N1 (default)		
			0	1	8O1		
			1	0	8E1		
			1	1	8N1 (00 equivalent)		
			2	1	0	Wireless air rate (bps) E90-DTU (400SL47)	Both sides of the communication must be identical. The higher the rate, the lower the delay and the shorter the 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	Airspeed 62.5k	
04H	Read/Write	REG1	7	6	Subcontracting Settings		The user sends data less than the packet length, and the serial port output at the receiving end is presented as uninterrupted continuous output. The user sends data larger than the packet length, the serial port on the receiving end will packetize the output.
			0	0	240 bytes (default)		
			0	1	128 bytes		
			1	0	64 bytes		
			1	1	32 bytes		
			5	RSSI Ambient Noise Enable			When enabled, instruction C0 C1 C2 C3 can be sent in transfer mode to read the registers. Register 0x00 : Current ambient noise RSSI Register 0X01 : RSSI of the last received data.(Current channel noise is: dBm = -(256-RSSI)) Instruction format: C0 C1 C2 C3 + start address + read length Return: C1 + address address + read length + read valid value; e.g.: send C0 C1 C2 C3 00 01
			0	Disable (default)			
			1	start using			

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<table>
<tr><td rowspan="8"></td><td rowspan="8"></td><td rowspan="8"></td><td></td><td colspan="3"></td><td>Return C1 00 01 RSSI (address can only start at 00)</td></tr>
<tr><td>4</td><td>3</td><td colspan="2">reservations</td><td></td></tr>
<tr><td>2</td><td colspan="4">Abnormal operation status log printing enable</td><td rowspan="3">According to the different abnormal working status to print the corresponding different formats of the log, for details, see section 6.5, abnormal working status log printing details.</td></tr>
<tr><td>0</td><td colspan="4">Disable (default)</td></tr>
<tr><td>1</td><td colspan="4">start using</td></tr>
<tr><td>1</td><td>0</td><td colspan="2">firing power</td><td rowspan="4">Power and current are nonlinearly related, and the power supply is most efficient at maximum power.
Current does not decrease proportionally with power</td></tr>
<tr><td>0</td><td>0</td><td colspan="2" rowspan="4">46.5±0.5dBm (default)</td></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>1</td><td>0</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>05H</td><td>Read/Write</td><td>REG2</td><td colspan="5">Channel Control (CH)
0-83 represent a total of 84 channels respectively E90-DTU (400SL42)</td><td>Actual frequency = 410.125+CH*1M</td></tr>
<tr><td rowspan="11">06H</td><td rowspan="11">Read/Write</td><td rowspan="11">REG3</td><td>7</td><td colspan="4">Enable RSSI bytes</td><td rowspan="3">When enabled, the module receives wireless data, which will follow an RSSI intensity byte when output through the serial port TXD.</td></tr>
<tr><td>0</td><td colspan="4">Disable (default)</td></tr>
<tr><td>1</td><td colspan="4">start using</td></tr>
<tr><td>6</td><td colspan="4">transmission method</td><td rowspan="3">The module will recognize the first three bytes of the serial data as: address high + address low + channel, and use them as the wireless transmit target.</td></tr>
<tr><td>0</td><td colspan="4">Transparent transmission (default)</td></tr>
<tr><td>1</td><td colspan="4">fixed-point transmission</td></tr>
<tr><td>5</td><td colspan="4">relay function</td><td rowspan="3">When the relay function is enabled, the module will initiate a forwarding if the destination address is not the module itself.
In order to prevent data backhauling, it is recommended to use it in conjunction with fixed-point mode. That is, the destination address is different from the source address.</td></tr>
<tr><td>0</td><td colspan="4">Disable trunking (default)</td></tr>
<tr><td>1</td><td colspan="4">Enable relay function</td></tr>
<tr><td>4</td><td colspan="4">LBT Enable</td><td rowspan="2">When enabled, wireless data will be listened to before transmitting, which can avoid</td></tr>
<tr><td>0</td><td colspan="4">Disable (default)</td></tr>
</table>

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			1	start using				interference to a certain extent, but may bring data delays The LBT has a maximum dwell time of 2 seconds and will be forced to issue when it reaches two seconds.
			3	reservations				
			2	1	0	reservations		
07H	write	CRYPT_H	Key high byte (default 0)					Write only, read returns 0 Used for user encryption to avoid interception of over-the-air wireless data by similar modules. These two bytes will be used internally by the module as a computational factor to transform the encryption of the over-the-air wireless signal.
08H	write	CRYPT_L	Key low byte (default 0)					
80H~86H	read-only (computing)	PID	7 bytes of product information					7 bytes of product information

8.3 Factory Default Parameters

model number	E90-DTU (400SL47) factory default parameter values: 00 00 00 62 00 17 03 00 00						
Module Model	frequency	address	signal path	airspeed	baud	Serial Port Format	firing power
E90-DTU (400SL47)	433.125MHz	0x0000	0x17	2.4kbps	9600	8N1	46.±0.5dBm

9 AT instructions

AT commands are used in the configuration mode. AT commands are divided into a total of three categories: command commands, setup commands, and query commands;

Users can "AT+HELP=?" to query the AT instruction set supported by the module, and the baud rate used for AT instruction is 9600 8N1;

When the input parameter exceeds the range, it will be limited, so please do not let the parameter exceed the range to avoid unknown situation.

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9.1 AT Instruction Table

setup instruction	descriptive	typical example	Example Description

command instruction	descriptive	typical example	Example Description
AT+IAP (use with caution, see this document for details) Chapter 11 IAP Upgrade Caution)	Entering IAP upgrade mode	AT+IAP	Entering IAP upgrade mode
AT+RESET	Device reboot	AT+RESET	Device reboot
AT+DEFAULT	Configuration Parameters Restore Defaults And the device reboots.	AT+DEFAULT	Configuration Parameters Restore Defaults And the device reboots.
AT+UART=baud,parity	Set baud rate and checksum	AT+UART=3,0	Set baud rate to 9600, 8N1
AT+RATE=rate	Setting the air rate	AT+RATE=7	Set air rate to 62.5K
AT+PACKET=packet	Set packet length	AT+PACKET=0	Set packet to 240 bytes
AT+TRANS=mode	Setting the sending mode	AT+TRANS=1	Set to fixed point mode
AT+ROUTER=router	Setting the Relay Mode	AT+ROUTER=1	Set to relay mode
AT+LBT=lbt	Setting the Listen Before Talk function switch	AT+LBT=1	Set on, refer to section 8.2 LBT enable for details.
AT+ERSSI=erssi	Setting the ambient noise RSSI switch	AT+ERSSI=1	Set on, refer to section 8.2 RSSI ambient noise function for details
AT+DRSSI=data_rssi	Setting the receive data RSSI switch	AT+DRSSI=1	Receive data RSSI function on
AT+ADDR=addr	Setting the module address	AT+ADDR=1234	Set the module address to 1234
AT+CHANNEL=channel	Setting the module operating channel	AT+CHANNEL=23	Set frequency to 433.125M
AT+NETID=netid	Setting the Network ID	AT+NETID=2	Set the network ID to 2
AT+KEY=key	Setting the Module Key	AT+KEY=1234	Set the module key to 1234

query instruction	descriptive	Return to Example	Example

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			Description
AT+HELP=?	Query AT command table		Return to the AT command table
AT+DEVTYPE=?	Query Module Model	DEVTYPE=E90-DTU(400SL47)	Back to Product Models
AT+FWCODE=?	Query Firmware Code	FWCODE=7432-0-10	Return to Firmware Version
AT+UART=?	Query baud rate and calibration	AT+UART=3,0	Returns baud rate of 9600, 8N0
AT+RATE=?	Query Air Rate	AT+RATE=7	Return air rate is 62.5K
AT+PACKET=?	Query Packet Length	AT+PACKET=0	Return packet is 240 bytes
AT+TRANS=?	Query Send Mode	AT+TRANS=1	Return to fixed point mode
AT+ROUTER=?	Query Relay Mode	AT+ROUTER=1	Return to relay mode
AT+LBT=?	Query Listen Before Talk function switch	AT+LBT=1	Return to LBT switch status
AT+ERSSI=?	Query Environmental Noise RSSI Switch	AT+ERSSI=1	Return to Ambient Noise Switch Status
AT+DRSSI=?	Query RSSI output	AT+DRSSI=1	Return channel RSSI function on
AT+ADDR=?	Query Module Address	AT+ADDR=1234	Returns the module address to 1234
AT+CHANNEL=?	Query module operating channel	AT+CHANNEL=23	Return frequency is 433.125M
AT+NETID=?	Query Network ID	AT+NETID=2	Returns the network ID as 2
AT+KEY=?	Query Module Key	Reading is not supported (security considerations)	Return ERR

9.2 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	meaning of a parameter
Baud (serial port baud rate)	0:1200 1:2400 2:4800 3:9600 4:19200 5:38400 6:57600 7:115200
Parity (serial port parity bit)	0:8N1 1:8O1 2:8E1 3:8N1
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	0:240 1:128 2:64 3:32

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Mode	0:transparent 1:fixed point
Router (relay mode)	0:off 1:on
LBT (listen before talk)	0:off 1:on
Erssi (environmental RSSI)	0:off 1:on
Data_rssi (data RSSI)	0:off 1:on
Addr (module address)	Module address 0 to 65535 (decimal)
Channel	Module channel 0 to 83 (decimal)
Netid (network ID)	Module network 0~255 (decimal)
Key	Module key 0~65535 (decimal)

Note 1: The settings are different for different power modules, you can check the manual section 8.2 Transmit Power.

10 Trunked Network Mode Usage

serial number	Description of trunking mode
1	After setting the relay mode by configuration, switch to the general mode and the relay starts to work.
2	In repeater mode ADDH,ADDL are no longer used as module address, but correspond to NETID to forward pairing respectively, and if one of the networks is received, it will be forwarded to the other network. The repeater's own network ID is invalid.
3	In relay mode, the relay module serial port cannot send and receive data for low-power operation.

Trunking Grouping Rules Description:

1、Forwarding rules, the relay can forward data in both directions between two NETIDs.

2、In relay mode, ADDH\ADDL is no longer used as a module address and is forwarded as a NETID for pairing.

3、 In relay mode, please do not send more data than the set single packet bytes.

As pictured:

① First Class Relay

"Node 1" NETID is 08.
"Node 2" NETID is 33.
The ADDH\ADDL of Relay 1 is 08, 33 respectively.
So the signal sent by node 1 (08) can be forwarded to node 2 (33)
Also node 1 and node 2 have the same address, so the data sent by node 1 can be received by node 2.

② Secondary Relay

The ADDH\ADDL of Relay 2 is 33, 05 respectively.

So relay 2 can forward data from relay 1 to network NETID: 05.
Thus node 3 and node 4 can receive node 1 data. Node 4 outputs data normally and node 3 has a different address

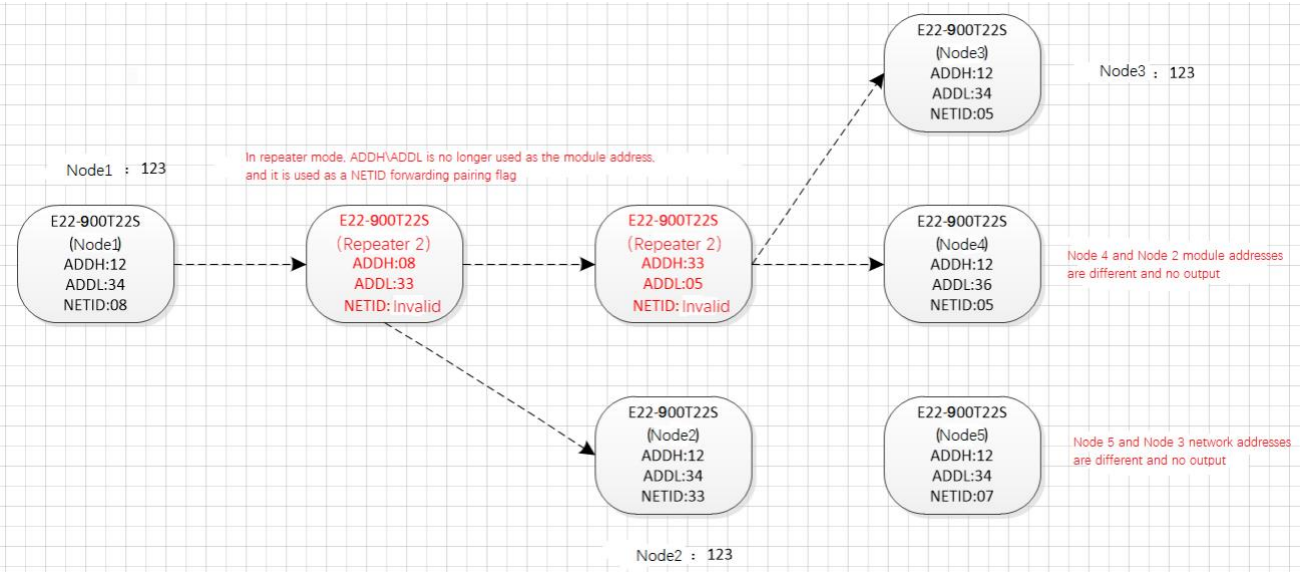
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from node 1, so it does not output data.

③Bidirectional trunking

As configured in the figure: the data sent by node 1 can be received by nodes 2 and 4, and the data sent by nodes 2 and 4 can be received by node 1.



11 Configuration instructions for the host computer

- The following figure shows the E90-DTU SL configuration upper computer display interface, users can switch to the configuration mode through the MOD pin ground, in the upper computer for fast parameter configuration and reading.



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In the Configuration Upper, the module address, frequency channel, network ID, and key are displayed in decimal display mode, where each parameter takes a range of values:

Web address: 0-65535

Frequency channel: 0-83

Network ID: 0-255

Key: 0-65535

- Users need to pay special attention when using the upper computer to configure the relay mode, because in the upper computer, each parameter is in decimal display mode, so the module address and network ID need to be filled in by converting the system. For example, if the network ID inputted by transmitter A is 02, and the network ID inputted by receiver B is 10, then when relay R sets the module address, it will convert the hexadecimal value 0X020A to the decimal value 522 as the module address filled by relay R. That is to say, at this time, relay R needs to fill in the module address. That is, the module address value to be filled in by relay R is 522.

12 IAP Online Firmware Upgrade

IAP (In Application Programming) means online application programming, this module adopts this method to upgrade the firmware online.

- Upper computer command upgrade

1、Ground the module through the MOD pin to put the module into configuration mode (note: the baud rate in configuration mode is 9600);

2、Open the official website configuration uploader "RF_Setting(E22-E9X(SL)) V2.9.exe", select Serial Port > Open Serial Port;



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3、Click on Read Parameters to view the module information in the left window of the upper computer;



4、Click Firmware Upgrade > Click Open File (select the firmware .bin file) > Click Start Download;



5、Click OK and the firmware starts to upgrade;



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6、When the firmware upgrade is complete, click OK and the firmware upgrade is complete.



Upgrade logic of the host computer command: the host computer sends "AT+IAP", the module replies "AT+IAP=OK", and waits for the module to automatically reset into the IAP upgrade mode. The serial port output "C" character indicates that the module is waiting to receive the firmware bin file, after the host computer detects the character "C", it will start to send the bin file in packets automatically. After the module finishes receiving, it will automatically reset to enter the application program and the upgrade is completed.

Product Model	Interface Type	Operating frequency Hz	Transmit power W	Communication distance km	Functional Features
E90-DTU(230SL22)	RS232 RS485	230M	0.16	5	LoRa Spread Spectrum, Wireless Configuration, Networked Transmission, for Complex Environments
E90-DTU(230SL3)	RS232 RS485	230M	1	10	LoRa Spread Spectrum, Wireless Configuration, Networked Transmission, for Complex Environments
E90-DTU(400SL2)	RS232 RS485	433\470M	0.16	5	LoRa Spread Spectrum, Wireless Configuration, Networked Transmission, Long Distance Anti-Interference
E90-DTU(400SL3)	RS232 RS485	433\470M	1	10	LoRa Spread Spectrum, Wireless Configuration, Networked Transmission, Long Distance Anti-Interference
E90-DTU(900SL2)	RS232 RS485	868\915M	0.16	5	LoRa Spread Spectrum, Wireless Configuration, Networked Transmission, Long Distance Anti-Interference

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E90-DTU(900SL3)	RS232 RS485	868\915M	1	10	LoRa Spread Spectrum, Wireless Configuration, Networked Transmission, Long Distance Anti-Interference
E90-DTU (170L30)	RS232 RS485	170M	1	8	LoRa Spread Spectrum, Ultra Penetrating Bypass Emission
E90-DTU (433L30)	RS232 RS485	433M	1	8	LoRa spread spectrum, anti-interference over long distances
E90-DTU (433L37)	RS232 RS485	433M	5	20	LoRa spread spectrum, 20km ultra-long distance, anti-interference
E90-DTU (433C30)	RS232 RS485	433M	1	3	High-speed continuous transmission with ModBus protocol support
E90-DTU (433C33)	RS232 RS485	433M	2	4	High-speed continuous transmission with ModBus protocol support
E90-E90-DTU(433C37)	RS232 RS485	433M	5	10	High-speed continuous transmission, supports ModBus protocol, long distance
E90-DTU (230N27)	RS232 RS485	230M	0.5	5	Low-frequency narrow band for complex environments
E90-DTU (230N33)	RS232 RS485	230M	2	8	Low-frequency narrow band for complex environments
E90-DTU (230N37)	RS232 RS485	230M	5	15	Low frequency narrow band for complex environments, superb shot wrapping

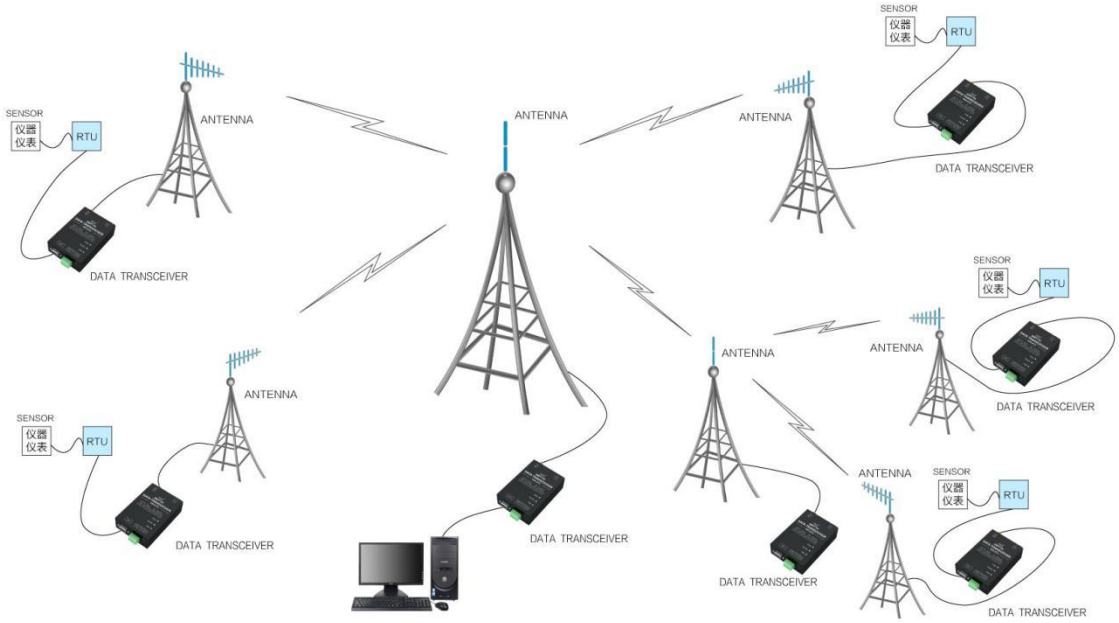
13 Related products

14 Areas of practical application

EBYTE digital transmission radio is suitable for all kinds of point-to-point and point-to-multipoint wireless data transmission systems, such as smart home, Internet of Things transformation, power load monitoring, distribution network automation, hydrological and water condition measurement and reporting, water mains network monitoring, urban street light monitoring, air defense alarm control, railroad signal monitoring, centralized control of railroad water supply, monitoring of oil and gas pipeline network, GPS positioning system, remote meter reading, electronic crane, automatic alarm target, earthquake detection and reporting, fire prevention, environmental monitoring and other industrial automation systems. target reporting, seismic reporting, fire and theft prevention, environmental monitoring and other industrial automation systems, as shown in the figure below:

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15 Precautions for Use

- Please keep the warranty card of this equipment, the warranty card has the factory number of the equipment (and important technical parameters), for the user's future maintenance and new equipment has an important reference value.
- Radio in the warranty period, if due to the quality of the product itself and non-man-made damage or damage caused by lightning and other natural disasters, enjoy free warranty; please do not repair the user, the problem is to get in touch with the Division I, Yibaiyi BaiTe to provide first-class after-sales service.
- Do not operate this radio when it is in the vicinity of flammable locations (such as coal mines) or explosive hazardous objects (such as detonators for detonation).
- Should choose a suitable DC regulated power supply, the requirements of high-frequency interference resistance, small ripple, and have sufficient load capacity; it is best to have over-current, over-voltage protection and lightning protection, to ensure that the digital radio work properly.
- Do not use the digital radio in an operating environment that exceeds its environmental characteristics, such as high temperature, humidity, low temperature, strong electromagnetic fields or dusty environments.
- Do not allow the digital radio to continuously transmit at full capacity or you may burn out the transmitter.

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- The ground wire of the digital radio should be well connected with the ground wire of the external equipment (such as PC, PLC, etc.) and the ground wire of the power supply, otherwise it is easy to burn out the communication interface, etc.; do not plug or unplug the serial port with electricity.
- When testing the digital radio, a matching antenna or 50 Ω dummy load must be connected, otherwise the transmitter will be easily damaged; if an antenna is connected, it is better for the human body to be more than 2 meters away from the antenna to avoid injury, and never touch the antenna while transmitting.
- Wireless digital transmission radio in different environments often have different communication distance, communication distance is often affected by temperature, humidity, obstacle density, obstacle volume, electromagnetic environment; in order to ensure that you can get stable communication, it is recommended to reserve more than 50% of the communication distance margin.
- If the measured communication distance is not satisfactory, it is recommended to analyze the antenna quality and antenna installation method to improve the communication distance. You can also contact with support@cdebyte.com.
- When selecting the power supply, in addition to the need to retain 50% of the current margin in accordance with the recommendations, more attention should be paid to its ripple should not exceed 100mV.
- Wireless communication products need to be connected to the impedance matching antenna in order to work properly, even for a short period of time can not be omitted, if the cause of product damage will not be covered by the warranty.

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Important Notice

- Chengdu Ebyte Electronic Technology Co., Ltd. reserves the right of final interpretation and modification of all contents of this manual.
- Due to the continuous improvement with the hardware and software of the product, this manual may be changed without further notice, and the latest version of the manual should prevail in the end.
- Protecting the environment is everyone's responsibility: to reduce the use of paper, this manual is only printed in Chinese, the English manual only provides electronic documents, if necessary, please download from our official website; In addition, if not specifically requested by the user, the user bulk order, we only provide product manuals according to a certain percentage of the order quantity, not each digital radio are one by one with, please understand.

Revision history (of a document, web page etc)

releases	revision date	revised description	maintainer
1.0	2023-12-25	initial version	GU
1.1	2024-3-27	Content correction	Hao
1.2	2024-5-8	Change antenna description	Hao

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