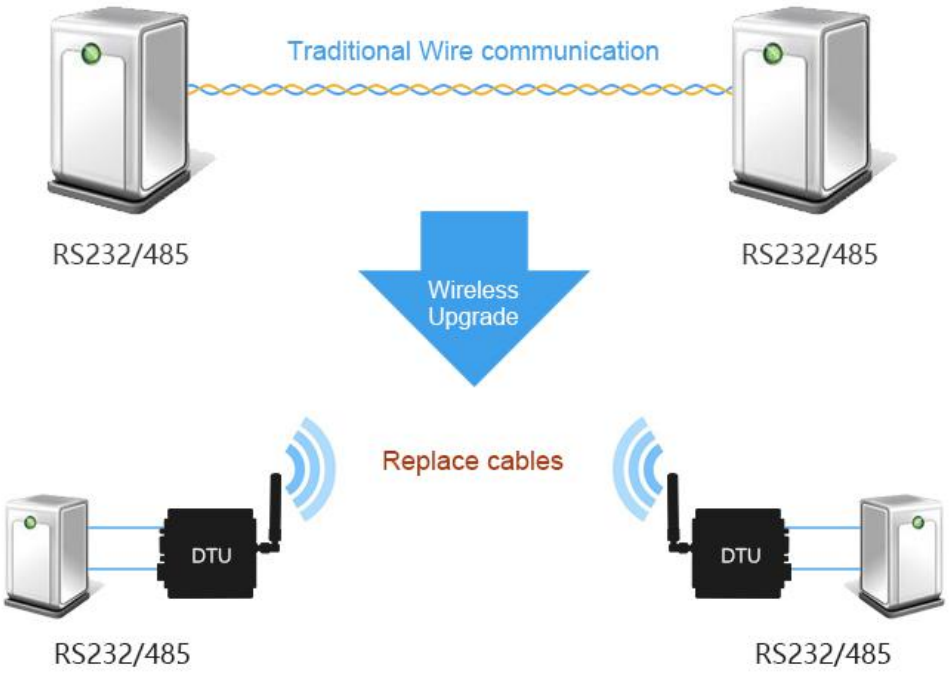
成都亿佰特电子科技有限公司
Chengdu Ebyte Electronic Technology Co.,Ltd.

E61-DTU-50 Datasheet v4.6



1. Introduction E61-DTU-50

1.1 Features E61-DTU-50

E61-DTU-50 is a high-speed data transfer unit (DTU) with RS232/RS485 interface, 8V~28V, operating at 425~450.5MHz (Default: 433MHz). Transparent transmission is available.

The package length is unlimited when module works in Continuous mode, which perfectly realizes continuous transmission for baud rate of 57600/38400/19200/9600, etc. In fixed-length transmission, air data rate, FEC, password etc. are configurable. Transmit data with configured air data rate in the most efficient way, which realizes low-latency and high-response. The high-speed feature of module is suitable for polling sampling, handshake response communication, and supporting Modbus protocol.

The data of the module transmitted on the air features randomness. And with the rigorous encryption & decryption, data interception becomes pointless. 65536 configurable addresses for user to define, which makes only the module with matched password can receive the data.

No.	Feature	Description
1	Continuous transmission (010: Continuous Mode)	In this mode the data transmitting length is unlimited: Perfectly realize continuous transmission for baud rate of 57600/38400/19200/9600/4800/2400/1200.
2	Fixed-length transmission (000: Constant Length)	Air data rate, FEC and Encryption is configurable by users; To transmit data to the receiver in present air data rate in a most effective way to realize low delay and high respond.
3	Encryption	Module has 65536 ciphers reserved for user to define, only when the cipher is matched can the module receive data.
4	Modbus	433M high rate and low latency, suitable for polling sampling, handshake response communication, and supporting Modbus protocol.
5	Broadcast	Set the address as 0xFFFF: All data transmission of modules in the same channel can be monitored. Data transmitted can be received by modules in the same channel to realize broadcasting and monitoring.
6	FEC	It features FEC (Forward Error Correction) algorithm. It has high coding efficiency & good correction performance. In a sudden interference, it can correct the interfered data packets proactively, so that the reliability & transmission range are improved proactively. Without FEC, those data packets can only be dropped.
7	Watchdog	With a built-in watchdog and precise time configuration, once an exception occurs the DTU will restart within 0.107 second and continue to work on previous parameter settings.
See more details in related manual		

1.2 Basic Usage E61-DTU-50

No.	Usage	Description
1.	Continuous transmission	Modules work on mode 0, and set "Continuous transmission", air data rate is matched automatically. Suitable for huge data transmission continuously(transparent transmission). i.e.: A send 1000 bytes FF 00...FF 00 to B(HEX), then B receives 1000 bytes FF 00...FF 00 accordingly.
2.	Fixed-length transmission	Modules work on mode 0, and set "fixed-length transmission"; Suitable for the transparent transmission of small data(within dozens of bytes). Users can set air data rate, FEC, password etc to realize low-latency and high-response. Note：77 bytes at most per package in this mode. i.e.: A send 5 bytes 01 02 03 04 05 to B(HEX), then B receive 5 bytes 01 02 03 04 05 accordingly.

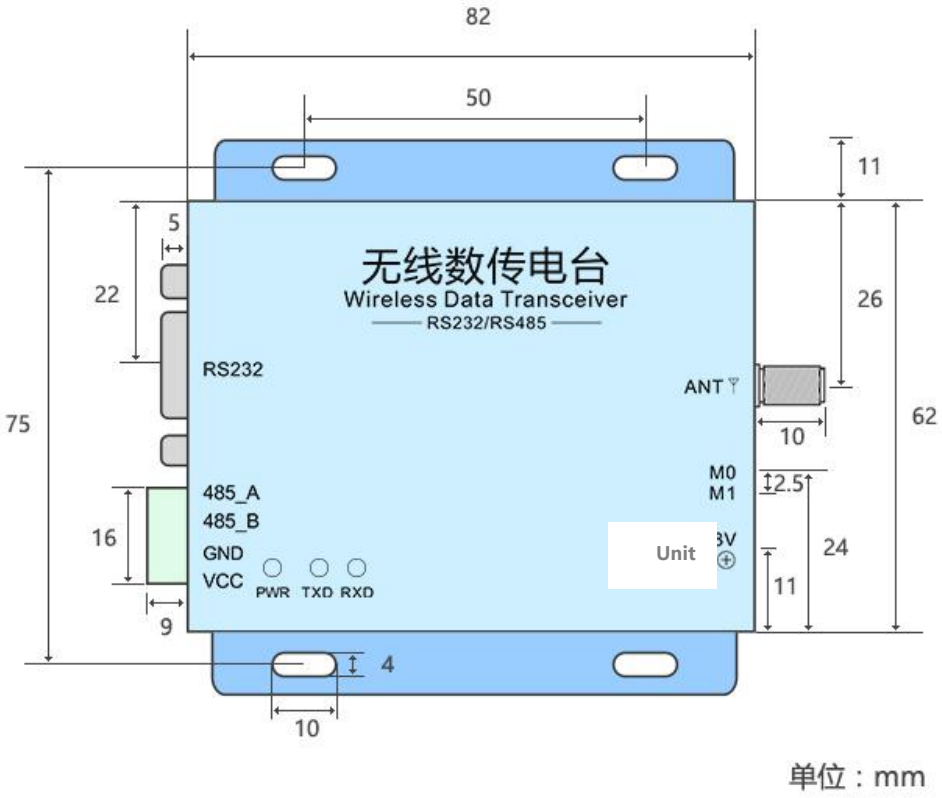
1.3 Electronic Parameter E61-DTU-50

No.	Item	Parameter details	Description
1	Size	82 * 62 *25mm	Without antenna
2	Weight	133g	Without antenna
3	Frequency band	Default: 433MHz	425~450.5MHz channel:256, 433±5MHz(recommended)
4	Process	SMD, lead-free	Ensure the consistency and reliability of mass production
5	Connector	RS485：1 * 4 * 3.81mm RS232：DB9	Screwing Standard DB9, hole
6	Supply voltage	8 ~ 28V DC	Note: the voltage higher than 28V is forbidden
7	Communication level	RS232/RS485	Available for RS232 and RS485
8	Operation range	Continuous transmission:1000 m	Test condition: clear and open area, antenna gain: 5dBi，height:> 2m, baud rate: 9600
		Fixed-length transmission:2000 m	Test condition: clear and open area, antenna gain: 5dBi，height:> 2m, air data rate: 1.2kbps
9	Transmitting power	Maximum 17dBm	About 50mW, can be configured to 17, 14, 10, 7dBm
10	Receiving sensitivity	-126dBm@1.2kbps	Sensitivity has nothing to do with baud rate and timing
11	Air data rate	Continuous transmission: baud rate will be matched automatically.	
		Fixed-length transmission:Can be configured to 1.2, 2.4, 4.8, 9.6, 19.2,38.4, 50, 70kbps	
12	Standby current	14mA	power supply: 12V
13	Transmitting current	69mA@17dBm	≥200mA (recommended)
14	Receiving current	26mA	average
15	Communication interface	RS232/RS485	8N1, 8E1, 8O1 Eight kinds of baud rate, from 1200 to 115200 bps (default: 9600)

16	Driving mode	RS232/RS485	Can be configured to push-pull/high pull, open-drain
17	Transmitting length	Continuous transmission: unlimited(≤57600)	
		Fixed-length transmission:256 bytes buffer, 77 bytes per package	
18	Receiving length	Continuous transmission: unlimited	
		Fixed-length transmission:256 bytes buffer	
19	Address	65536 configurable address, 0xFF FF is for broadcasting	
20	Password	65536 transmitting password(ciphertext)	
21	Antenna type	SMA-K	External thread hole, 50Ω impedance
22	Operating temperature	-40 ~ +85℃	Industrial grade
23	Operation Humidity	10% ~ 90%	No condensation
24	Storage temperature	-40 ~ +125℃	Industrial grade

2. Functional description E61-DTU-50

2.1 Pin definition E61-DTU-50

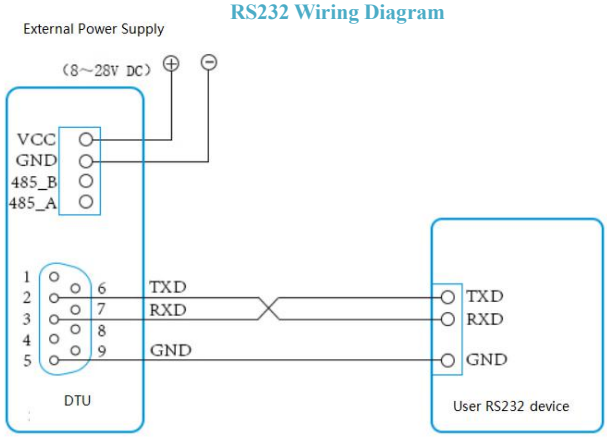


No.	Pin item	Application
1	RS232	Standard DB9, hole
2	485_A	Connect to end A of other RS485 devices
3	485_B	Connect to end B of other RS485 devices
4	GND	Ground
5	VCC	Power supply，default: 8~28V（5V version can be customized），(DTU will select the higher voltage of power supply between 5 and 6)
6	DC8~28V	DC power connector(5.5*2.5) for DC8~28V（5V version can be customized）
7	ANT	Antenna（SMA-K：External thread hole, 50Ω characteristic impedance）
8	PWR	Power indicator
9	TXD	Transmitting indicator
10	RXD	Receiving indicator
11	M0	Dip switch (control operating mode)
12	M1	Dip switch (control operating mode)
★ E61-DTU-50 can be compatible with other E61 series ★		

2.2 Connection type E61-DTU-50

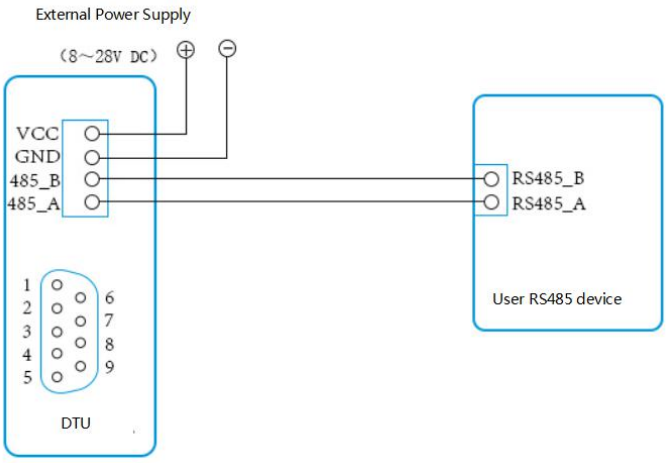
- RS232 Connection

RS232 Wiring Diagram



- RS485 Connection

RS485 Wiring Diagram



3. Operating mode E61-DTU-50

	Mode	M1	M0	Description
M0	Normal Mode	On	On	Open UART and RF and transparent transmission is on
M1	Remained Mode	On	Off	UART and module are closed.
M2	Command Mode	Off	On	Parameter setting
M3	Sleep Mode	Off	Off	UART and module are closed.

4. Instruction format E61-DTU-50

In sleep mode (mode 3：M1=0ff, M0=off) , it supports below instructions on list.

(**Only support 9600 and 8N1 format when setting**) :

No.	Format	Description
1	C0+working parameter	C0 + 5 bytes working parameters are sent in hexadecimal format. 6 bytes (in total) must be sent in succession. (Save the parameters when power- down)
2	C1+C1+C1	Three C1 are sent in hexadecimal format. The DTU returns the saved parameters and they must be sent in succession.
3	C2+working parameter	C2 + 5 bytes working parameters are sent in hexadecimal format. 6 bytes(in total) must be sent in succession. (Do not save the parameters when power-down).
4	C3+C3+C3	Three C3 are sent in hexadecimal format. The DTU returns the version information and they must be sent in succession.
5	C4+C4+C4	Three C4 are sent in hexadecimal format. The DTU will reset for one time and they must be sent in succession.

4.1 Factory default parameter E61-DTU-50

Model	Factory default parameter：C0 00 00 18 50 50						
DTU	Frequency	Address	Channel	Air data rate	Baud rate	UART format	Transmitting power
E61-DTU-50	433MHz	0x0000	0x50	Continuous transmission	9600	8N1	17dBm
E61-DTU-1W	433MHz	0x0000	0x50	Continuous transmission	9600	8N1	30dBm

4.2 Parameter setting instruction E61-DTU-50

C0 and C2 are operating parameters. The difference between C0 command and C2 command is that C0 command will write parameters into the internal flash memory and can be saved when power- down, while C2 command can not be saved when power-down, because C2 command is temporarily mend instruction. C2 is recommended for the occasion that need to change the operating parameters frequently, such as C2 00 00 18 50 50.

No.	Item	Description	Notes
0	HEAD	Fix 0xC0 or 0xC2, it means this frame data is control instruction	● Must be 0xC0 or 0xC2 C0: Save the parameters when power- down C2: Do not save the parameters when power-down
1	ADDH	High address byte of module (the default 00H)	00H-FFH ● Address is defined by ADDH and ADDL to form a 16 bit. ● When ADDH=FFH, ADDL=FFH, the module has the broadcasting function: 1. As the transceiver, module can transmit data to all modules in different address. 2. As the receiver, module can monitor data packets in different address.
2	ADDL	Low address byte of module (the default 00H)	00H-FFH
3	SPED	Rate parameter，including UART baud rate and air data rate 7，6 UART parity bit 00：8N1（default） 01：8O1 10：8E1 11：8N1（equal to 00） ---------- 5，4，3 TTL UART baud rate（bps） 000：1200bps 001：2400bps 010：4800bps 011：9600bps（default） 100：19200bps 101：38400bps 110：57600bps 111：115200bps ----------	● UART mode can be different between communication parties. ---------- ● In Continuous Mode, the baud rate must be same for both communication parties. The higher the baud rate the shorter the transmission distance. In Constant Length Mode, UART baud rate can be different between communication parties. The UART baud rate has nothing to do with wireless transmission parameters & won’t affect the wireless transmit / receive features. ----------

		2，1，0 Air data rate (bps) 000：1.2Kbps (default) 001：2.4Kbps 010：4.8Kbps 011：9.6Kbps 100：19.2Kbps 101：38.4Kbps 110：50Kbps 111：70Kbps	● In Continuous Mode, the setting is unavailable. The air data rate will match automatically according to UART baud rate. In Constant Length Mode, The air date rate must keep the same for both communication parties. the lower the air date rate, the longer the transmitting distance, better anti-interference performance and longer transmitting time.
4	CHAN	Communication channel (425M + CHAN * 0.1M), Default (433MHz)	● 00H-1FH 425 ~ 450.5MHz
5	OPTION	7， FEC Enable 1：turn on FEC 0：turn off FEC (default)	● When FEC turns on, the data transmitting time will be extended while greatly improved the probability of successful sending and receiving data. User can enable this function if your application do not need low-latency transaction.
		---	---
		6 IO drive mode(the default 1) 1：TXD and AUX push-pull outputs, RXD pull-up inputs 0：TXD、AUX open-collector outputs, RXD open-collector inputs	● This bit is used to the module internal pull-up resistor. It also increases the level＇s adaptability in case of open drain. But in some cases, it may need external pull-up (4~10kΩ) resistor.
		---	---
		5，4，3 Transmission mode: (for receiver it is monitoring gap time, for transceiver it is gap time for continuously transmitting preamble code) 000: Constant Length 001: Reserved, like 0 010: Continuous Mode (default) 011: Reserved, like 0 100: Reserved, like 0 101: Reserved, like 0 110: Reserved, like 0 111: Reserved, like 0	● See more details in related chapters.
		---	---

		2, Enable Encryption 1: Turn on 0: Turn off (default) ---------- 1, 0 transmission power (approximation) 00： 17dBm (Default) 01： 14dBm 10： 10dBm 11： 7dBm	● Defined by users and the encryption must be the same for both parties. ● The switch must keep the same for both parties. ---------- The external power must ensure that the ability of current output is more than 200mA and the power supply ripple is within 100mV. ● Low power transmission is not recommended due to its low power supply efficiency.

For example: The meaning of No.3 "SPED" byte:

The binary bit of the byte	7	6	5	4	3	2	1	0
The specific value (configured by user)	0	0	0	1	1	0	0	0
Meaning	UART parity bit 8N1		UART baud rate is 9600			Air data rate is 1.2k		
Corresponding hexadecimal	1				8			

4.3 Reading operating parameter E61-DTU-50

Instruction format	Description
C1+C1+C1	In command mode (M0=0 , M1=1) , User gives the module instruction (HEX format): C1 C1 C1, Module returns the present configuration parameters. For example, C0 00 00 18 50 50.

4.4 Reading version number E61-DTU-50

Instruction format	Description
C3+C3+C3	In command mode (M0=0 , M1=1) , User gives the module instruction (HEX format): C3 C3 C3, Module returns its present version number, for example C3 61 xx yy. 61 here means the module model (E61 series); xx is the version number and yy refers to the other module features.

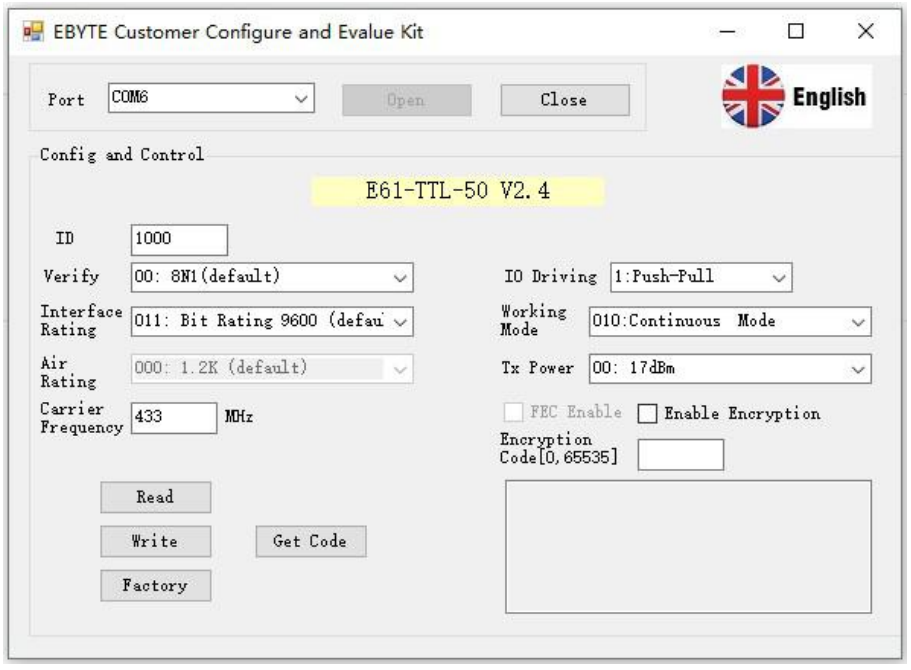
4.5 Reset instruction E61-DTU-50

Instruction format	Description
C4+C4+C4	In command mode (M0=0 , M1=1) , User gives the module instruction (HEX format): C4 C4 C4, the module resets for one time. During the reset process, the module will conduct self-check, AUX outputs low level. After reset completing, the AUX outputs high level, then the module starts to work regularly which the working mode can be switched or be given another instruction.

5. Parameter setting E61-DTU-50

Step	Operation	Description
1	Install Driver	Please install the USB adapter driver (CP2102).
2	Pull out the jumper	Pull the jumper out as module in command mode (M1=Off, M0=Off).
3	Connect to module	Connect the module with USB adapter. Connect to the USB interface of PC.
4	Connect to Power	Make sure it connected to the external power supply(8V-28V)
5	Open serial port	Operate the parameter setting software, choose corresponding serial number and press the "Open" button, choose other serial numbers until open successfully.
6	Interface	Press "Read" button as shown below If failed, check if the module is in mode 2, or the driver has been installed or not.
7	Write parameter	Please adjust the parameter as your request according to the corresponding setting, then click "Write" button, write the new parameter to the module
8	Complete the operation	Please operate the "Fifth step" if you need to reconfigure, if the configuration is completed, click "Close" and then take off the module.

Configure the DTU to commend mode. Switch the dip switch to M1 (as shown in the picture)	



6. About us E61-DTU-50

Chengdu Ebyte Electronic Technology Co., Ltd., a high-tech company focusing on application of Internet of Things, owns a number of independently researched and developed products and obtains unanimous approvals from customers. With a powerful R&D team, perfect after-sales system, our company provides perfect solutions and technical assistance, shortens R&D period, reduces R&D cost and provides a strong platform for brand new ideas about product R&D.

Our products have been widely applied in various fields, such as consumer electronics, industrial control, healthcare, security alarm, field acquisition, smart home, expressway, property management, water and electricity meter reading, power monitoring, etc.

EBYTE 成都亿佰特电子科技有限公司
Chengdu Ebyte Electronic Technology Co.,Ltd.

【Website】：www.cdebyte.com 【Technical support】：support@cdebyte.com
【Address】: Innovation Center D347, 4 # XI-XIN road, High-tech district (West), Chengdu, Sichuan, China