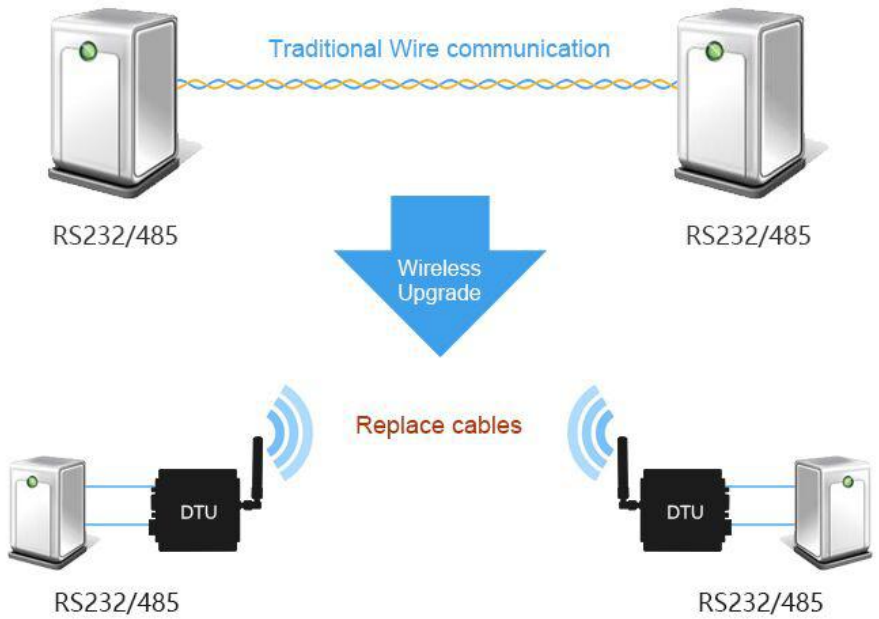
成都亿佰特电子科技有限公司
Chengdu Ebyte Electronic Technology Co.,Ltd.

E32-DTU-1W Datasheet v1.0



1. Introduction E32-DTU-1W

1.1 Features E32-DTU-1W

E32-DTU-1W is a high speed wireless data transfer unit (DTU) with RS232/RS485 interface, operating at 410-441MHz (Default: 433MHz) and 8V~28V. It features LoRa spread spectrum and transparent transmission.

The DTU adopts LORA spread spectrum technology, which means the transmitting distance is much longer than before. The advantages include more concentrated power density and better anti-interference performance. It features FEC （Forward Error Correction） algorithm, which ensure its high coding efficiency & good correction performance. In the case of sudden interference, it can correct the interfered data packets automatically, so that the reliability & transmission range are improved correspondingly. But without FEC, those data packets can only be dropped.

The DTU has the function of data encryption & compression. The data transmitted over the air features randomness. And with the rigorous encryption & decryption, data interception becomes pointless. The function of data compression can decrease the transmission time & probability of being interference, while improving the reliability & transmission efficiency.

No.	Feature	Description
1	LoRa spread spectrum	It can lengthen the communication distance; Lower transmitting power means less interference to other devices;it is unlikely to be captured;with high anti-interference ability, it can suppress various noises and interference at the same frequency band; It features good anti-multi-path fading performance.
2	Ultra low power consumption	It supports WOR to reduce overall power consumption: In power-saving mode (M2), it can adjust overall power consumption by setting receiving response latency;The maximum receiving response latency can be configured is 2000ms.
3	Fixed transmission	Master can transmit data to other DTUs in random channels or addresses, easy for networking and repeater,etc. For example: DTU A transmits AA BB CC to DTU B (address: 0x00 01, channel: 0x80), HEX format is 00 01 80 AA BB CC (00 01 refers to the address of DTU B, 80 refers to the channel of DTU B), then DTU B receives AA BB CC (only DTU B).
4	Broadcast transmission	Set the DTU address as 0xFFFF, then the DTU can communicate with other DTUs in the same channel. Any transmitted data can be received by DTUs in random address but in the same channel.
5	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 automatically, so that the reliability & transmission range are improved correspondingly. Without FEC, those data packets can only be dropped.
6	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 Electrical parameter E32-DTU-1W

No.	Item	Parameter details	Description
1	Size	82 * 62 *25mm	Without antenna
2	Weight	135g	Without antenna
3	Frequency band	Default: 433MHz	410 - 441MHz, channel:32, 433±5MHz(recommended)
4	Process	SMT , lead-free	The lot consistency and reliability of wireless products can only be ensured by SMT
5	connector	RS485: 1 * 4 * 3.81 mm 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	8000m	Test condition : clear and open area& maximum power, antenna gain: 5dBi , height:> 2m , air data rate: 2.4kbps
9	Transmitting power	Maximum 30dBm	About 1W, can be configured to 30, 27, 24, 21dBm
10	Receiving sensitivity	-130dbm@2.4kbps	Sensitivity has nothing to do with baud rate and latency
11	Air data rate	2.4kbps	Can be configured to 0.3, 1.2, 2.4, 4.8, 9.6, 19.2kbps
12	Standby current	14mA	Mode 3 (power supply:12V)
13	Transmitting current	679mA@30dBm	≥1.5A
14	Receiving current	29mA	Mode 0
15	Communication interface	RS232/RS485	8N1, 8E1, 8O1 , Eight kinds of UART baud rate, from 1200 to 115200 bps (default: 9600)
16	Driving mode	RS232/RS485	UART can be configured to push-pull/high pull, open-drain
17	Transmitting length	512 bytes buffer	58 bytes per package
18	Receiving length	512 bytes buffer	58 bytes per package
19	Address	65536 configurable addresses	Easy for networking, broadcast and fixed transmission
20	RSSI support	Built-in intelligent processing	-
21	Antenna type	SMA-K	External thread hole, 50 ohm impedance
22	Operating temperature	-40 ~ +85℃	Industrial grade
23	Operating humidity	10% ~ 90%	Relative humidity, no condensation
24	Storage temperature	-40 ~ +125℃	Industrial grade

1.3 E32 series E32-DTU-1W

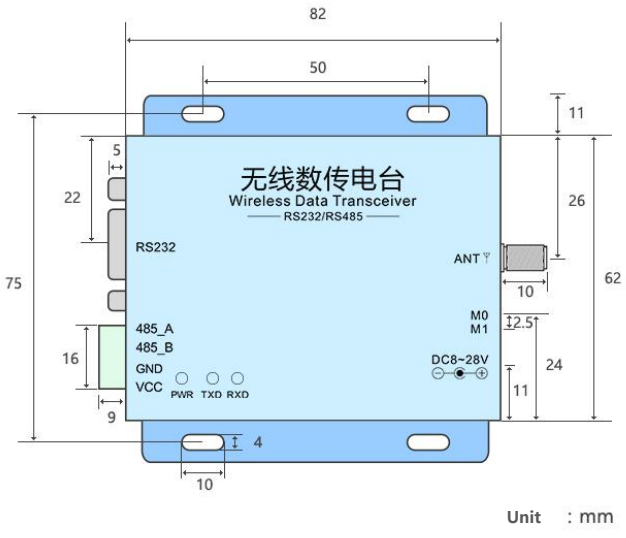
Model	Interface	Frequency (Hz)	Power (dBm)	Operation range (km)	Air data rate (bps)	Feature
E32-DTU-100	RS232/RS485	433M	20	3.0	0.3k~19.2k	LoRa spread spectrum
E32-DTU-500	RS232/RS485	433M	27	5.0	0.3k~19.2k	LoRa spread spectrum
E32-DTU-1W	RS232/RS485	433M	30	8.0	0.3k~19.2k	LoRa spread spectrum
E32-DTU-1W can be compatible with other E32 series						

1.4 FAQ E32-DTU-1W

NO.	Question	Description
1	Air data rate	Low air data rate is recommended, the higher the air data rate, the shorter the distance and the higher the packet losing rate.
2	Antenna selection	The frequency of the antenna must match with that of the DTU, the higher the gain and the lower the SWR the better, sucker antenna is recommended.
3	Unreadable code	One reason may be the baud rate does not match, the other may be insufficient power supply.
4	High latency	The latency could be reduced by turning off the FEC function at the receiving and transmitting ends and raising the air data rate.
5	Receiving response time	Only valid in M1 & M2, the longer the time the lower the power consumption and the higher the receiving latency.

2. Functional description E32-DTU-1W

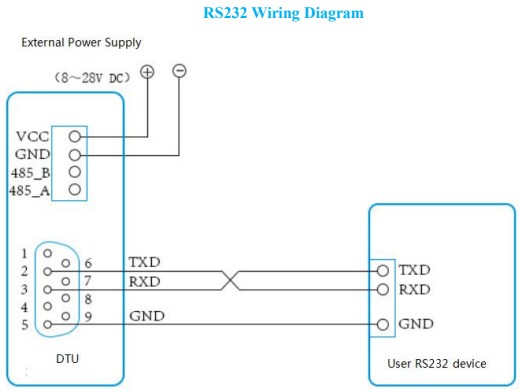
2.1 Pin definition E32-DTU-1W



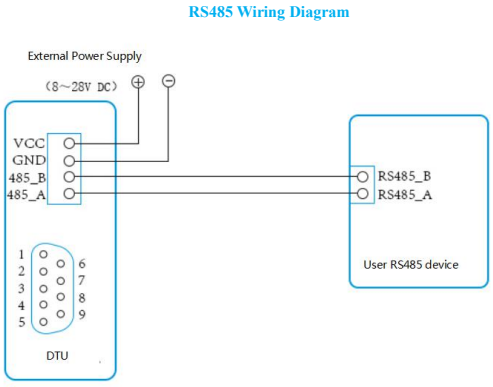
No.	Pin item	Application
1	RS232	Standard DB9, hole
2	485_A	Connect to end A of other RS485 devices
3	485_B	connect to end B of other RS485 devices
4	GND	Ground
5	VCC	Power supply ,default: 8~28V(5V version can be customized) , (5 , 6 will select high voltage end automatically)
6	DC8~28V	DC power connector (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	Control dip switch (control operating mode)
12	M1	Control dip switch (control operating mode)
★ E32-DTU-1W can be compatible with other E32 series ★		

2.2 Connection type E32-DTU-1W

- RS232 Connection



- RS485 Connection



3. Operating mode E32-DTU-1W

	Mode	M1	M0	Description
M0	Normal Mode	On	On	Open UART and Wifi and then start transparent transmission
M1	Wake-up Mode	On	Off	The DTU can transmit data in WOR and data packet contains preamble code
M2	Power-saving Mode	Off	On	In WOR mode receiving power is saved, but can not transmit data in this mode
M3	Sleep Mode	Off	Off	Enter sleep mode and the DTU can receive parameter setting instruction

4. Instruction format E32-DTU-1W

In sleep mode（M3: M1=Off, M0=Off）,available formats are listed as below（**only support 9600 ,8N1** when setting）：

No.	Format	Description
1	C0+operating 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 to the saved parameters and they must be sent in succession.
3	C2+operating 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 to the version information and they must be sent in succession.
5	C4+C4+C4	Three C4 are sent in hexadecimal format. The DTU will be reset once and they must be sent in succession.

4.1 Factory default parameter E32-DTU-1W

Model	Factory default parameter: C0 00 00 1A 17 44						
DTU	Frequency	Address	Channel	Air data rate	Baud rate	UART format	Transmitting power
E32-DTU-1W	433MHz	0x0000	0x17	2.4kbps	9600	8N1	27dBm

4.2 Parameter setting instruction E32-DTU-1W

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 1A 17 44.

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
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 ---------- 2 , 1 , 0 Air data rate (bps) 000 : 1Kbps (default)	● UART mode can be different between communication parties. ---------- ● 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. ---------- ● The lower the air data rate, the longer the transmitting distance,

		001：2Kbps 010：5Kbps 011：8Kbps 100：10Kbps 101：15Kbps 110：20Kbps 111：25Kbps	the better anti-interference performance and longer transmitting time. ● The air data rate must keep the same for both communication parties.
4	CHAN	7，6，5： N/A ---------- 4-0：Communication channel, default 17H（433MHz）	● 0 (recommended) ---------- 00H-1FH
5	OPTION	7， Fixed transmission（similar to MODBUS） 0： Transparent transmission mode（default） 1： Fixed transmission mode ---------- 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 ---------- 5，4，3 wireless wake-up time（for the receiver, it means the monitor interval time ,while for the transmitter it means continuously sending preamble code time.） 000：250ms（default） 001：500ms 010：750ms 011：1000ms 100：1250ms 101：1500ms 110：1750ms 111：2000ms	● In fixed transmission mode, the first three bytes of each user's data frame can be used as high/low address and channel. The module changes its address and channel when transmitting. And it will revert to original setting after the process is completed. ---------- This bit is used to the 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 resistor. ---------- ● The transmit & receive module work in mode 0, whose delay time is invalid & can be arbitrary value. ● The transmitter works in mode 1 can transmit the preamble code of the corresponding time continuously. ● When the receiver works in mode 2, the time means the monitor interval time (wireless wake-up). Only the data from transmitter that works in mode 1 can be received. ● The wake-up time set by transmitter cannot be less than the monitor interval time of receiver; otherwise, it may lead to data loss. In case of two-way communication, both

			parties should keep the wake-up time the same. ● The longer the wake-up time, the lower the average receive current consumption.
		---------- 2 , FEC switch 0 : Turn off FEC 1 : Turn on FEC (Default) ---------- 1, 0 transmission power (approximation) 00 : 30dBm (Default) 01 : 27dBm 10 : 24dBm 11 : 21dBm	---------- ● After turn off FEC, the actual data transmission rate increases while anti-interference ability decreases. Also the transmission distance is relatively short. Both communication parties must keep on the same pages about turn-on or turn-off FEC. ---------- ● 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	1	0
Meaning	UART parity bit 8N1		UART baud rate is 9600			Air data rate is 2.4k		
Corresponding hexadecimal	1				A			

4.3 Reading operating parameter E32-DTU-1W

Instruction format	Description
C1+C1+C1	In sleep mode , user gives the DTU instruction (HEX format): C1 C1 C1, It returns to the present configuration parameters. For example, C2 00 00 1A 17 44.

4.4 Reading version number E32-DTU-1W

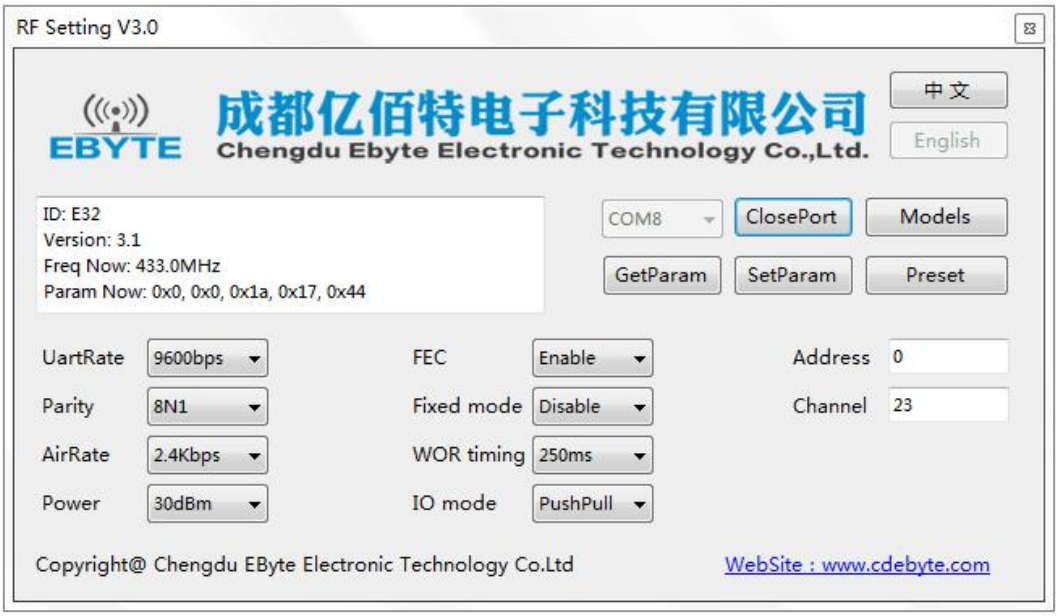
Instruction format	Description
C3+C3+C3	In sleep mode, user gives the DTU instruction (HEX format): C3 C3 C3, It returns to its present version number, for example C3 32 xx yy. 32 here means the DTU model (E32 series); xx is the version number and yy refers to other features.

4.5 Reset instruction E32-DTU-1W

Instruction format	Description
C4+C4+C4	In sleep mode,user gives the DTU instruction (HEX format): C4 C4 C4, it resets for one time. During the reset process, the DTU will conduct self-check, AUX outputs low level. After reset is completed, the AUX outputs high level, then it starts to work regularly, then the working mode can be switched or be given another instruction.

5. Parameter setting E32-DTU-1W

Configure the DTU to sleep mode. Switch the dip switch to M3 (as shown in the picture)	



6. About us E32-DTU-1W

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.

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