

# KB8111 4G DTU Module User Manual



## Shenzhen Kingbird Network Technology CO.,LTD

Add: BLDG 2,1609, Yanxiang Zhigu R&D Building, No. 11 Gaoxin West Road,Guangming District, Shenzhen,Guangdong,China

TEL:+86-755-82556825

Web : http://www.gprs-modem.com

Skype : huzheng168 EMAIL : sales@kingbirdnet.com



# **1** Introduction

Thank you for choosing our product !

## **1.1 Brief Introduction**

KB8111 embedded 4G DTU Module (Data Terminal Unit) is 4G/GSM transparent wireless data transmission terminal and embedded with high reliable ARM 7 CPU. It is applicable to small and medium data transmission with the characters of center to multi-points and multi-points scatter.



4G mobile net can supply TCP/IP connection, and 4G DTU can be used for internet connection and data transmitting application. KB8111 is wireless data transmission device, which can realize data transmission from COM port through 4G mobile network. Aim at different requirements of users from different fields, combining with industry characteristics, we can supply special designed 4G terminal unit for users by developing hardware, software and making system integration.

Based on the public net, KB8111 transmit widely, stably and reliably. It is widely used in unattended operation device, remote data acquisition, remote AMR, remote scheduling and other fields. KB8111 is designed for industry integrated. In order to keep good stability in the severe atmosphere, we adopt special designs in temperature scope, shaking, EMC, interface multiform, et, al.

Additionally, KB8111 can be used in electric power automatic system, industry monitoring, traffic management, Meteorological monitoring, pro-environment project, pipe network monitoring, finance, securities departments and so on. Considering the networking



requests from different application scope, KB8111 can support network structure of virtual private network (VPN).

## **1.2 Product Feature**

- Standard industrial products, EMC anti-jamming design, strong adaptiveness.
- Embedded Watchdog chip, provide multiple Reset mechanism, can be controlled by software, achieve industrial security mechanism perfectly.
- Global frequencies and bands can be used in all countries all over the world.
- Modify parameters expediently: you can modify parameters by Mobile or Notebook at close quarters by Wi-Fi and you can modify DTU parameters by server remote too.
- Support TCP, UDP, MQTT, HTTP protocol;
- Advanced and strict data communication protocol, with the function of correction and encryption. Never lose package when data transmission, can achieve pictures over than 100K and Flash animation files transmission, no Mosaic happened.
- Automatically IP register mechanism, can achieve various server modes, build complete super large SCADA system..
- IO switching value function: Two switch inputs, two switch outputs. Through 4G
  network to control the state of the switch input or query switch input.Remotely turn
  on the alarm,set the input alarm mode(4G alarm) and alarm threshold(low level
  alarm or high level alarm),the user also can customize the alarm information
  content.
- Powerful communication backup function: if you open an alternate service functions, the main server and backup server connection can antomatically switch, and antomatically connect to the backup server once the main server problems.
- Strong server software support, application for many years, strong function.
- Support fixed IP and DDNS, dedicated APN.
- Working temperature range: -40°C-80°C, communication is not effected at -40°C.

### 1.3 Safe Use

KB8111 4G DTU completely complied with national radio product safety technical regulations.

Warm Tip: You must not touch the antenna with your hands or other parts of body. During 15 seconds after KB8111 power on, please keep away from the antenna. If the antenna is damaged, you must replace it with qualified cable and antenna in time.



## 1.4 EMI

Now most of electric devices have taken measures of electromagnetic pulse hardening, but some old devices may have not, it may go wrong under RF power radiation. So when you are using KB8111, please make sure the device nearby have good electromagnetic pulse hardening.

## 1.5 Appearance and Interface

. Size: 54mm(L)\*36mm(W)\*6.8mm(H) Pin space: 2.0mm



side

# **2** Technical Specification

## 2.1 GSM/4G:

Frequency Band:

LTE-FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/ B18/B19/B20/B25/B26/B28/B66 LTE-TDD B34/B38/B39/B40/B41



GSM/GPRS/EDGE 850/900/1800/1900 MHz Upload/Download speed: LTE Cat1: Uplink up to 5Mbps, Downlink up to10Mbps EDGE: Uplink/Downlink up to 236.8Kbps GPRS: Uplink/Downlink up to 85.6Kbps Output Power: Working mode:1.5A(maximum) Off mode:20uA Sleep mode:3mA(average)

Sensitivity: <-96 dBm

### 2.2 Basic Function:

Embed TCP/IP Protocol Embed standard AT command (GSM07.05 and 07.07) Support extend command Transparent data transmitting Support IP address or domain name Support special APN

### 2.3 Interface

#### 2.3.1 User Interface



front view

back view

Pin No.	Definition	Description	Remark
1	RST	Reset	
2	Retain		
3	Retain		
4	Retain		
5	ADC	ADC input	



6	Output1	Output no.1			
7	Output2	Output no.2			
8	Retain				
9	Retain				
10	TXD	Serial port TXD (DTU→Device),RS485:A	RS232 or TTL interface sending or A(RS485)		
11	RXD	Serial port RXD (Device→DTU),RS485:B	RS232 or TTL interface receiving or B(RS485)		
12	Retain				
13	Retain				
14	STATUS	Work status: Connect with server or not	Low: connected, High:Disconnect		
15	SIM_RST	The Reset of SIM card			
16	SIM_CLK	The Clock of SIM card	Optional, if you need to set SIM case in your		
17	SIM_VDD	The power supply of SIM card, Max current	product, can use PIN 15, 16, 17, 24.		
17		flow is 10mA			
18	GND	Ground			
19	GND	Ground			
20	VBAT	DC positive input terminal, input voltage			
20		5V-24V			
21	VBAT	DC positive input terminal, input voltage			
		5V-24V			
22	Retain				
23	GND	Ground			
24	SIM_DATA	SIM card data Pin			

### Pin statements

**RST**: The terminal is reset pin; give RST a low level to reset KB8111.

ADC:ADC input..

**Output1**: IO output terminal, the IO terminal is standard 2.8V electrical level, can use to output high or low electrical level.

**Output2**: IO output terminal, the IO terminal is standard 2.8V electrical level, can use to output high or low electrical level.

**TXD**: Serial port output terminal, connect with user's serial port receiving point; Baud rate: 300 ~ 115200 BPS;

**RXD**: Serial port input terminal, connect with user's serial port output point; Baud rate: 300 ~ 115200 BPS;

**SIM\_RST**: The Reset of SIM card, if users needn't user-defined SIM case, then hangs the feet in the air.

**SIM\_CLK**: The Clock of SIM card, if users needn't user-defined SIM case, then hangs the feet in the air.

**SIM\_VDD**: The power supply of SIM card, Max current flow is 10mA, if users needn't user-defined SIM case, then hangs the feet in the air.



**GND**: Module ground.

**VBAT** : system power supply positive electrode, voltage range:5VDC $\sim$ 24VDC, When normal situation,5-16V will be the best; Under poor signal, the peak point current can reach up to1.5A. When designing PCB, we suggest line width: ≥40mil, The voltage is influential if serial interface is TTL voltage, when users need 5V TTL serial ports level, here must be 5V power supply;

SIM DATA: SIM card data pin.

#### 2.3.2 SIM Card Interface



Please open the SIM card cover according to the sign on it, correctly put the SIM card in, and then make the cover closed and locked.

**Notice**: Please don't insert and pull SIM card when DTU is power on. If do so, please make the power off in advance.

## 2.4 Electric Specificity

Work Voltage: DC 5V-24V (can specially design DC7-60V as per users' requriments ) Power:



Standby: < 25mA@5V Communicating: < 120mA@5V Peak point current: 1.5A@5V

### 2.5 Circumstances Specificity

Working Temperature: $-40^{\circ}C \sim 80^{\circ}C$ Storage Temperature: $-45^{\circ}C \sim 125^{\circ}C$ Relative Humidity: $20\% \sim 95\%$  (No Condensation)

# 3 Product Install

### 3.1 Overview

KB8111 can't achieve designed functions unless complete correct installation. Device installation always must be done under guidance of appointed qualified engineer in our company.

Notice: please don't install when charged.

#### 3.2 Unpack

For transportation safety, KB8111 usually requires reasonable packaging. Please reserve packaging materials in case of transshipment. Each set of KB8111 includes the following parts:

KB8111 embedded 4G DTU1 UnitSmall chuck antenna or club-shaped antenna (SMA interface)1 rootWhen unpacking the case, please check the specific items as above.1

### 3.3 Antennas and SIM card installed

Antenna adopt SMA female pedestal, please do clockwise rotation and make it locked. Notice: Please connect the antenna before charged.

#### 3.4 Inspect network situation

Connect cable and antenna, insert effective SIM card, make power on, then the Green light of Module will flash, after 10 seconds later, the power light will always light, it means KB8111 is under a normal work condition and connect with network successfully.



Notice:

Before power-on, please make sure the cable is correctly connected;

Before power-on, please make sure the antenna is correctly connected, in order to

avoid RF impedance mismatch and module damage.

# **4** Configuration DTU Parameters

KB8111 4G DTU configuration parameters basic mode include Three Types:

• Serial Port;



• WiFi (Mobile or Notebook);







• Server(4G network).



## 4.1 Serial Port Setting

Through the serial port to configure parameter of KB8111 4G DTU, first you need to obtain the serial port configuration software(4G\_DTU.exe) from our company(when delivery



goods along with this software to you)

Operation steps:

- 1. **Power Off DTU and Connect the Cable:** KB8111 4G DTU serial port( here refers to the rs232 interface of the device, if the purchased is not rs232 interface products, please put converter interface type to rs232 interface to connect) connected to a PC serial port or use one USB to serial converter cable.
- 2. **Run setting software**: Run configuration software 4G\_DTU.exe, please chose setting type in the software(Menu: File-setting Type), as follow, chose By Com port:

er		OK
er		
ww.xjymedia.com	Connect	Cancel
4251		
92.168.4.1	Connect	
000		
	4251 92.168.4.1 000	4251 92.168.4.1 Connect

After you chosed the setting type to Com port, Run the setting software, tips are as follows:



Click OK, and enter the interface configuration software, as follows:



<u>File Parameters h</u> elp					—	×
COM Port Search		Setting All	X	<b>K</b>		
Local Parameters APN Server Para	meters   COM Parar	meters	oloui			^
DTU ID SIM Code Dis_Recon Interval(S) Local Port Heartbeat Interval(S) Max Package(Bytes) Data MinInterval(100ms Recon. Interval(S) Debug Information Heartbeat Type		<ul> <li>Zone</li> <li>Zone Enability</li> <li>Control No</li> <li>SMS Control</li> <li>SMS Control</li> <li>SMS Control</li> <li>IO Auto ai</li> <li>IO Auto ai</li> <li>IO A thresi</li> <li>IOB thresi</li> </ul>	led umber ol Number1 ol Number2 ol Number3 larm type nold(6pin) nold(10pin)			
	furs Set	Save & Re	star			

3. Chose COM port and Click Search button: This software will automatically open corresponding serial search DTU, processing, please confirm whether the serial port which opened by software is the serial port connected with KB8111 4G DTU, if not, please click the "stop" button in toolbars in the menu options from the file, then change information in COM parameters settings window. (Note: configuration parameters are fixed by 38400bps)

4. **Power on DTU**: Connect the KB8111 4G DTU to the power supply, the system will prompt that search DTU successfully in 5 seconds, and the user can obtain the current product firmware library verion information through the pop-up dialog box information(a new version of the configuration software to support this feature). As shown below:

Inform	nation 🔀
(į)	Searched DTV Successfully!
	ОК

5. **Read and Set parameters**: Click Read in toolbars, the software will read the parameters, and the display the parameter of DTU. Specific parameters doesnot enumerate here, the user can open the configuration software to view.

#### Local parameter:

**DTU ID**: 4G DTU the only mark, important at communication.

**SIM Code**: The SIM card number is only for user record.

**Dis\_Reconnection interval**: The interval of DTU re-connects with backup server or the Main server when DTU connection error or disconnected with Main server or backup server.

Local port: DTU local TCP or UDP port.

**Heartbeat interval**: The interval of server with DTU's heartbeat for units in seconds, scope: 0-300S.

**Max package**: To send data packet maximum DTU data bytes (optional 512 bytes) or 1024 bytes.

**Data Mininterval**: The smallest interval packets (0-1000ms) serial receives data between two value is less than this if a packet, 1~10 units for 100ms.

**Recon. Interval**:No Response reconnection cycle, if it do not received answer from server for some time, DTU will reconnect with the server. The value scope: 0-3600s. If you set this parameter to Zero, DTU will not reconnect.

**Debug information**: You can set DTU output its working state information or not. None: DTU will not output working state information; Normal: DTU will not output Sample working state information; Detail: DTU will output detailed working state information. When you connect DTU with your device, please set this parameters value to NONE, in order to avoid output information affect users of the equipment.

**Device type**: Three types as DTU, Modem, SMS. User can change this parameter to change the working mode. DTU is for 4G data transmission, SMS Modem is data transmission by SMS (type A and type B), When set to Modem, through AT instructions users can achieve dialing, Internet, making phone calls, use of messages and so on. (Note: Modem can't switch by this way; it only can switch through AT command when power on)

**Zone**: The working code DTU belongs. Generally we just use this parameter when networking.

**Zone Enabled**: The enabled or disabled working code which DTU belongs to.

### **APN Parameter And Server Parameter:**

Use APN: APN disable or enable;

**APN**: Name of 4G Access Point. In China: cmnet

**User name**: Name of login 4G account. When using VPN networking, user name must be input.

Password: the password when DTU login 4G.

Main server IP: IP Address of main server connected with 4G DTU.

Main server port: Port of main server connected with 4G DTU.

**Network Protocol**: The protocol of Main server connected with 4G DTU, include two types as TCP & UDP.

**User Protocol**: Single, Normal, Transparent, normally set it as "Single" if no special requirement, user is forbidden to change.

**Backup server IP**: IP Address of Backup server connected with 4G DTU. User can set this parameters same as main server's.

**Backup server port**: Port of Backup server connected with 4G DTU. User can set this parameters same as main server.

#### **COM Parameter:**

Baud Rate: The speed of 4G DTU adopted, support from 300 to 115200bps.

Data bits: The data bits of 4G DTU COM data, support four kinds of bits as 5/6/7/8.

**Stop bits**: The stop bits of 4G DTU COM data, support three kinds of bits as1/2/1.5, generally the stop bits is 1bit.

**Verify**: The way of checking 4G DTU COM data, Classify it to None, Even, Odd, Mark, Space, etc.

**Flow Control**: Com data transmission classify to none flow control, hardware flow control, software flow control. None flow control is in genaral.

Notice: After choose or import parameters, and click Set button, software will prompt:



Now, if you need to change others parameter, please choose NO, after changed others parameter, then click Set, will prompt it again, DTU will restart, and exit the Parameters configuration state after choose Yes, If you need to change parameter again, you should to outage DTU and re-search after Power-on.

## 4.2 WiFi Setting

You can use a android mobile or notebook computer to modify parameters.

## (A) android mobile

**Operation steps:** 



#### 1. Install DTUconfig andriod APP : DTUConfig;

**2.Run DTUConfig APP:** the interface as follow, Connect DTU wifi(SSID: KB8111), then connect DTU, at last read parameters:



**3. Read and write Parameters :** When you read parameters successfully, then to the second page as follow, you can modify parameters and set it.

Note: APP only set the main and Commonly used Parameters



## (B) Notebook Computer

**Operation steps:** 

1. Install configuration software for PC windows(4G\_DTU.exe);



2.Connect DTU WiFi: use notebook connect DTU's WiFi, the SSID is KB8111,the

password : 12345678, after connect successfully, please keep connection;

**3.Chose wifi Wireless type:** in the setting software , please Click Setting Type menu of File, then Chose: By WiFi wireless , the interface as follow:

Setting Type			×
C By Com Port			ок
C By Internet	server		
Server IP/Do	maiwww.xjymedia.com	Connect	Cancel
Server Port	64251		
By WiFi Wire	eless		
Host IP	192.168.4.1	Connect	
Host Port	5000		

4.The setting software restart: You can read and set parameters.

### 4.3 Server Remote setting

In order to meet the needs of different customers,KB8111 4G DTU also support remote modification of DTU basic parameters,but the premise of using the function is product work in the conventional protocol of the 4G Wireless mode,and server-side or client side support for remote modify DTU basic parameters of the agreement. If customers use our company server,all support this function,if not, you can contact our company related personnel access to the configuration or SDK to use this function.

If your DTU connected with Kingbird's Server, you can use setting software to config the parameters, please chose the setting type:By internet server, as follow:



Setting Type			×
C By Com Port			ок
• By Internet s	erver		
Server IP/Dom	aiwww.xjymedia.com	Connect	Cancel
Server Port	64251		
C By WiFi Wirel	ess		
Host IP	192.168.4.1	Connect	
Host Port	5000		

# 5. KB8111 4G DTU Application Guide

#### 5.1 Operation Steps:

- (1). Plug in SIM card;
- (2). Connect the antenna;

#### (3). Set DTU Parameters;

Connect the data cable. DTU's user interface is 10PIN socket, If DTU is RS232 interface, you can connect it with DB9 of COM port, if DTU is RS485 interface, and you can use one converter of RS232-RS485 to connect it with DB9 of COM port.

Run the configuration software, choose and open all the COM port that DTU connected;

Connect with the Power. The power adaptor(5V) is One of the enclosures, first you can plug the power adaptor into the power socket, then connect the male into the female socket of the power cable. DTU can get power. KB8111 4G DTU Setting Software will list the menu of configuration. You can choose different menu to set different parameters, such as server IP, port, baud rate and so on. (Baud rate and Verify must be same with the device), then save the parameters and reset DTU.

#### (4). Connect DTU with the device

Connect DTU with the device according to the interface define of DTU. If DTU is RS232 interface, you can connect it with the device of RS232, If the DTU is RS485 interface, you can connect it with device of RS232.

(5). Star the control center software or the SCADA software to collect the remote



#### device's data.

#### 5.2 User utility software R&D and server planning

Users need planning on R&D software which in 4G application, user can choose fixed IP servers or dynamic domain mode. Based on dynamic DNS is unstable, User is not advised to adopt this way. Here is the explain for the planning on software R&D based on fixed IP servers

Fixed IP server user can rent or hosting ISP Internet service provider, or can apply special line to our server.

Generally speaking, user's monitoring software can divide into two modes:

One is the user monitoring software and Data center software (Data center) integration. Namely the user monitoring software is installed on the Server, and its working mode as Server, it communicate with and manage every scene DTU directly, the advantage of this way is communication directly, no data transfer, Disadvantage is that the flexibility for application is not strong, server must be in the user's master-control room (special line). So that users just can monitor and data collect in that server only.

Another is the user monitoring software and Data Center software (Data Center) separation, Data Center dedicated to Data transfer and each machine DTU's management, monitoring software only in charge of the customer's business logic processing, it communicate with Data Center software through network, and it with Data Center software is C/S architecture, the monitoring software working mode as Client, and Data center as Server. The advantage of this way is very flexible application, user no need special line, only need place the server in ISP service provider, and install Data center software into server. User can manage it only by user's monitoring software, and when monitoring software install into a computer which connect with internet, it can achieve communication even in company or on business trip outside. The disadvantage of this mode is data need to transfer, monitoring software is not communicate with DTU directly, But communicate with data center software first, and then forward data to scene DTU.

Users can plan the whole 4G application system according to user's request. Normally, users are suggested using the second modem, our company's server and server software is available to offer a lot of support when user debugging and trial in the early time. If users develop software completely, Our company can offer SDK or Demo program when user monitoring software work as the server (when user monitoring software and data center software is integration) or Client (when user monitoring software is separation).