

# USR-LG206-P User Manual

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## Features

- Adopt LoRa point-to-point protocol
- Support fixed-point transmitting mode.
- Data encryption transmission.
- Support RS232/RS485 interface.
- Maximum communication distance: 2300m. (Test in an empty area, under the 20 dBm transmitting power and 3.5dBi antenna gain)
- Receiving sensitivity: -138.5dBm.
- Support AT command mode and setup software based on AT command mode.
- Support hardware watchdog.
- 5~36V power supply.
- Support ESD protection.
- Support power supply anti surge.
- Support RS485 anti surge.

## 1. Get Start

If user has any question, please submit it back to customer center: <http://h.usriot.com>.

### 1.1. Product introduction

USR-LG206-P is half duplex Serial to LoRa covnerter which supports point-to-point protoco.

LG206 transmits/receives data by serial and it can realize one-to-one or one-to-many communication.

Model	Frequency
USR-LG206-L-P	398Mhz~525Mhz
USR-LG206-H-P	803Mhz~930Mhz

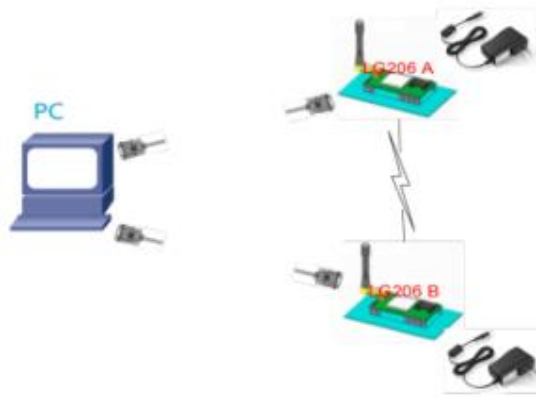
### 1.2. Basic parameters

Parameter		Value
Wireless parameters	Frequency band	-L: 398~525MHz; -H: 803~930MHz
	Transmitting power	10dBm~20dBm
	Receiving sensitivity	-138.5dBm@0.268Kbps
	Transmission distance	3500 meters. Test condition: Open area, clear weather, 20dBm transmitting power, 5dBi antenna gain, height is greater than 2 meters, 0.268K air rate.
	Antenna	SMA
Hardware parameters	Data interface	Serial port: Support RS232/RS485. Baud rate: 1200bps~115200bps
	Working voltage	5~36V
	Working current	Transmitting current: 45mA@12V. Standby mode: 12mA@12V.
	Working temperature	-30°C ~ +80°C
	Storage temperature	-45°C ~ +90°C
	Working humidity	10~90%RH
	Storage humidity	10~90%RH

Figure 1 Basic parameters

### 1.3. Application diagram

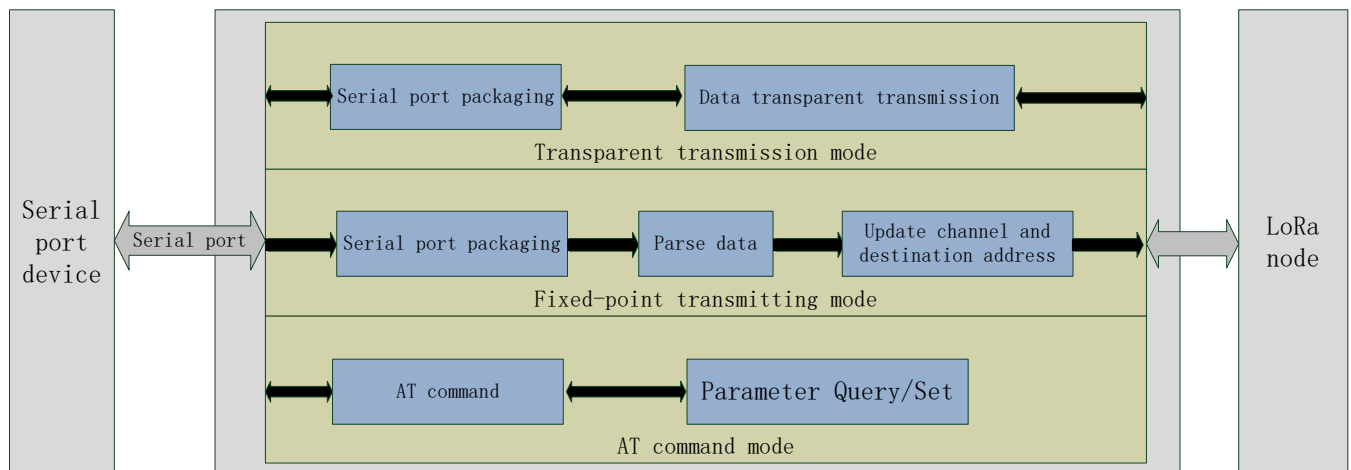
User can refer to following application diagram to test the LG206.



**Figure 2 Application diagram**

## 2. Product function

USR-LG206-P functional diagram as follow:



**Figure 3 Functional diagram**

### 2.1. Work mode

USR-LG206-P supports three work modes:

- AT command mode
- Transparent transmission mode
- Fixed-point transmitting mode

**Note:** Length of single data package can't exceed 252 bytes in all three work modes, otherwise the package will be discarded.

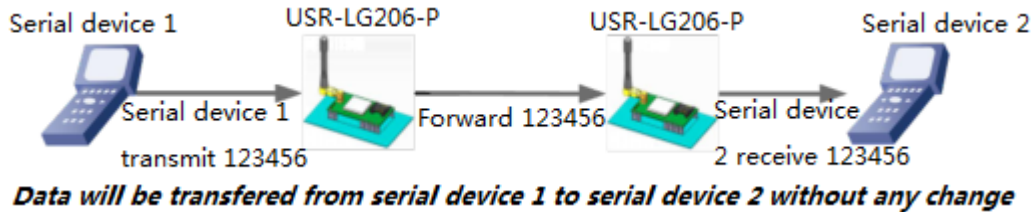
#### 2.1.1. AT command mode

In AT command mode, user can send AT command to query/set LG206 parameters by serial. User can refer to **3. AT command** to enter AT command mode and send AT commands.

#### 2.1.2. Transparent transmission mode

In transparent transmission mode, data transmission process won't influence data content. Two LoRa device can realize data transmission without any data transport protocol. To realize transparent transmission, both sides of communication must satisfy three conditions:

- Same rate level
- Same channel
- Same destination address or use broadcast address



**Figure 4 Transparent transmission mode**

**Note:**

- To ensure data security, data encryption is enabled during data transmission.
- If user configures LG206-P's destination address to broadcast address, all other LG206-P with same rate level and same channel can receive data from LG206-P which transmits data.

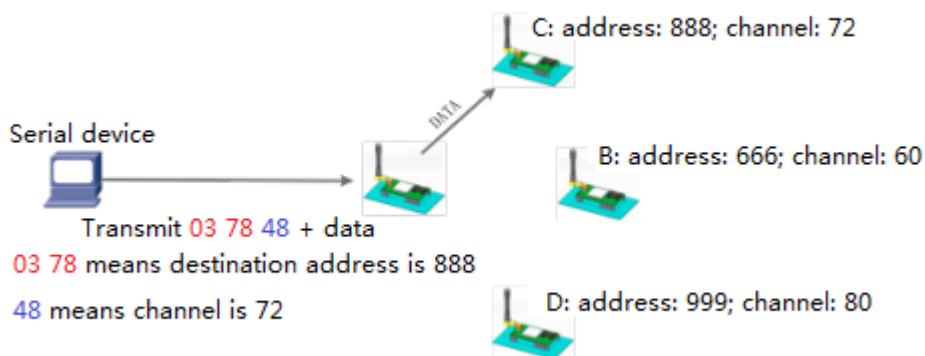
Related AT command:

	Command	Function
1	WMODE	Query/Set work mode
2	SPD	Query/Set rate level
3	CH	Query/Set channel
4	ADDR	Query/Set destination address

**Figure 5 Transparent transmission mode AT commands**

### 2.1.3. Fixed-point transmitting mode

In fixed-point transmitting mode, LG206-P can change destination address and channel flexibly when LG206-P is transmitting data. Based on transparent transmission, the first two bytes of transmitted data will be destination address( High-order in the former) and the third byte of transmitted data will be channel, and LG206-P can change destination address and channel before transmitting and reset to original settings after transmitting.



**Figure 6 Fixed-point transmitting mode**

**Note:** Both sides of communication must in same rate level.

Related AT command:

	Command	Function
1	WMODE	Query/Set work mode
2	SPD	Query/Set rate level

**Figure 7 Fixed-point transmitting mode AT command**

## 2.2. Power consumption mode

LG206-P supports two power consumption modes:

- RUN: Run mode. After powering, LG206-P will enter continuous receiving status. LG206-P will switch to transmitting status when there is data being transmitted and reset to receiving status after transmitting data.
- WU: Wake up mode. In this mode, a certain time length waking up code will be added into data before transmitting data. So the transmission efficiency of WU mode is lower than RUN mode, which leads to average transmitting power consumption of WU mode will be greater than RUN mode.

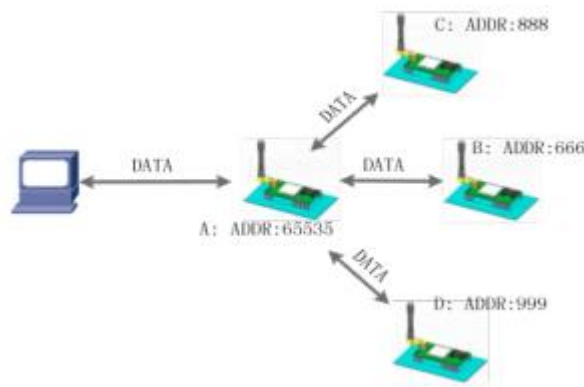
Related AT command:

	Command	Function
1	PMODE	Query/Set power consumption mode.
2	WTM	Query/Set wake up interval

**Figure 8 Power consumption mode AT command**

## 2.3. Broadcast transmitting/receiving

When user configures LG206-P's destination address to 65535, the LG206-P can realize broadcast transmitting and broadcast receiving with other nodes which has same rate and same channel. Application diagram as follow:

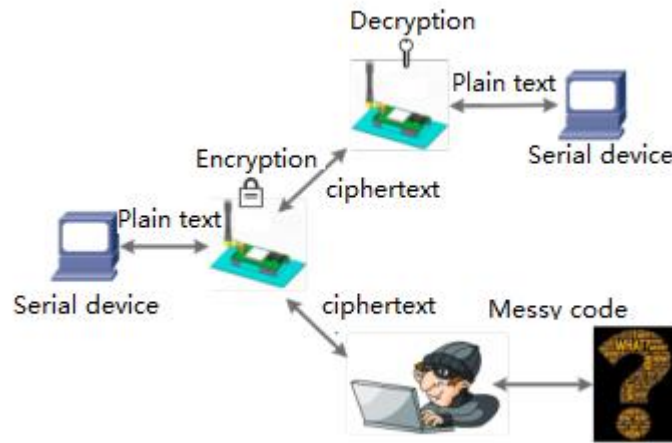


**Figure 9 Broadcast transmitting/receiving**

In above diagram, A's destination address is 65535, so data from A can be received by other three nodes and data from other three nodes can also be received by A.

## 2.4. Data security

LG206-P will encrypt data to make data transmission more secure. User can enter AT command mode and use command: AT+KEY to set encryption word.



**Figure 10 Data security**

## 2.5. RSSI indication

This function can query RSSI of both sides of communication to provide a reference for assessing communication quality. The usage as follow:

1. Configure rate, channel and destination address of serial server LG206-P A,B to ensure communication.
2. Make A enter AT command mode and send AT+SQT to enter listening status.
3. User can make B transmit data manually by serial or make B enter AT command mode and send AT+SQT=Time to transmit data automatically.(For example, user can send AT+SQT=500 to make B transmit data every 500ms)
4. A will output RSSI information by serial when A receives data.

The RSSI information as follow:

```
ADDR: 0 SNR: 8 RSSI: -15.742600
ADDR: 0 SNR: 8 RSSI: -15.742600
ADDR: 0 SNR: 8 RSSI: -16.809200
ADDR: 0 SNR: 8 RSSI: -16.809200
ADDR: 0 SNR: 8 RSSI: -15.742600
ADDR: 0 SNR: 8 RSSI: -15.742600
```

**Figure 11 RSSI indication**

ADDR: destination address; SNR: signal-to-noise ratio. The grater SNR is, the more stable the communication will be; RSSI: Received Signal Strength Indicator. The grater RSSI is, the more stable the communication will be.



### 3. AT command

User can refer to <https://www.usriot.com/support/faq/enter-serial-command-mode.html> to enter AT command mode.

#### 3.1. AT command return code

Return code	Description
OK	Successful response
ERR-1	Invalid command format
ERR-2	Invalid command
ERR-3	Invalid operator
ERR-4	Invalid parameter
ERR-5	Operation is not allowed

#### 3.2. AT command set

Number	Command	Function
<b>Basic command</b>		
1	<b>ENTM</b>	Exit AT command mode.
2	<b>E</b>	Query/Set AT command echo function enable/disable.
3	<b>Z</b>	Restart LG206.
4	<b>CFGTF</b>	Save current settings as default settings.
5	<b>RELD</b>	Reset to default settings.
6	<b>NID</b>	Query node ID
7	<b>VER</b>	Query firmware version
8	<b>WMODE</b>	Query/Set work mode.
9	<b>UART</b>	Query/Set serial port parameters.
10	<b>PMODE</b>	Query/Set power consumption mode.
11	<b>WTM</b>	Query/Set wake up interval
<b>LoRa command</b>		
12	<b>SPD</b>	Query/Set rate level
13	<b>ADDR</b>	Query/Set destination address.
14	<b>CH</b>	Query/Set channel.
15	<b>FEC</b>	Query/Set forward error correction enable/disable.
16	<b>PWR</b>	Query/Set transmitting power.
17	<b>SQT</b>	Display RSSI/Transmit test data automatically
18	<b>KEY</b>	Set data encryption word.

### 3.3. AT command details

#### 3.3.1. AT+ENTM

Format	
Set	AT+ENTM<CR><LF>
Return	<CR><LF><CR><LF>OK<CR><LF>

#### 3.3.2. AT+E

Parameter	Description	Default Value	Range
<Status>	Status of AT command Echo function	ON	ON/OFF
Format			
Query	AT+E<CR><LF>		
Return	<CR><LF>OK=<Status><CR><LF>		
Set	AT+E=<Status><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

#### 3.3.3. AT+Z

Format	
Set	AT+Z<CR><LF>
Return	<CR><LF>OK<CR><LF>

#### 3.3.4. AT+CFGTF

Format	
Set	AT+CFGTF<CR><LF>
Return	<CR><LF>+CFGTF:SAVED<CR><LF><CR><LF>OK<CR><LF>

#### 3.3.5. AT+RELD

Format	
Set	AT+RELD<CR><LF>
Return	<CR><LF>REBOOTING<CR><LF>

#### 3.3.6. AT+NID

Parameter	Description
<NID>	4 bytes HEX format character string
Format	
Query	AT+NID<CR><LF>
Return	<CR><LF>+NID:<NID><CR><LF><CR><LF>OK<CR><LF>

#### 3.3.7. AT+VER

Parameter	Description
-----------	-------------

<VER>	Firmware version
<b>Format</b>	
Query	AT+VER<CR><LF>
Return	<CR><LF>+VER:<VER><CR><LF><CR><LF>OK<CR><LF>

### 3.3.8. AT+WMODE

Parameter	Description	Default Value	Range
<Mode>	Work mode	TRANS	TRANS: Transparent transmission mode
			FP: Fixed-point transmitting mode
<b>Format</b>			
Query	AT+WMODE<CR><LF>		
Return	<CR><LF>+WMODE:<Mode><CR><LF><CR><LF>OK<CR><LF>		
Set	AT+WMODE=<Mode><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

### 3.3.9. AT+UART

Parameter	Description	Default Value	Range
<Baud rate>	Baud rate	115200	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
<Data bits>	Data bits	8	8
<Stop bits>	Stop bits	1	1, 2
<Parity>	Parity	NONE	NONE, EVEN, ODD
<Flow Control>	Flow Control	485	NFC: No flow control
			485: Enable RS485
<b>Format</b>			
Query	AT+UART<CR><LF>		
Return	<CR><LF>+UART:<Baud rate>,<Data bits>,<Stop bits>,<Parity><Flow Control><CR><LF><CR><LF>OK<CR><LF>		
Set	AT+UART=<Baud rate>,<Data bits>,<Stop bits>,<Parity><Flow Control><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

### 3.3.10. AT+PMODE

Parameter	Description	Default Value	Range
<Mode>	Power consumption mode	RUN	RUN: Run mode
			WU: Wake up mode
<b>Format</b>			
Query	AT+PMODE<CR><LF>		
Return	<CR><LF>+PMODE:<Mode><CR><LF><CR><LF>OK<CR><LF>		
Set	AT+PMODE=<Mode><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

### 3.3.11. AT+WTM

Parameter	Description	Default Value	Range
<Time>	Waking up interval	2000ms	500~4000ms
<b>Format</b>			
Query	AT+WTM<CR><LF>		
Return	<CR><LF>+WTM:<Time><CR><LF><CR><LF>OK<CR><LF>		
Set	AT+WTM=<Time><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

**Note:** This parameters is invalid in RUN mode. In WU mode, the waking up code that corresponds to waking up interval will be added into data before transmitting data.

### 3.3.12. AT+SPD

Parameter	Description	Default Value	Range
<Class>	LoRa air rate level	10	1: 268bps
			2: 488bps
			3: 537bps
			4: 878bps
			5: 977bps
			6: 1758bps
			7: 3125bps
			8: 6250bps
			9: 10937bps
			10: 21875bps
<b>Format</b>			
Query	AT+SPD<CR><LF>		
Return	<CR><LF>+SPD:<Class><CR><LF><CR><LF>OK<CR><LF>		
Set	AT+SPD=<Class><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

### 3.3.13. AT+ADDR

Parameter	Description	Default Value	Range
<Address>	Destination address	0	0~65535
<b>Format</b>			
Query	AT+ADDR<CR><LF>		
Return	<CR><LF>+ADDR:<Address><CR><LF><CR><LF>OK<CR><LF>		
Set	AT+ADDR=<Address><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

**Note:** 65535 is broadcast address and all LG206-P with same channel and same rate can receive the data.

### 3.3.14. AT+CH

Parameter	Description	Range
<Channel>	Channel	-L: 0~127( Default is 72, frequency band 470Mhz) -H: 0~127( Default is 65, frequency band 868Mhz)
Format		
Query	AT+CH<CR><LF>	
Return	<CR><LF>+CH:<Channel><CR><LF><CR><LF>OK<CR><LF>	
Set	AT+CH=<Channel><CR><LF>	
Return	<CR><LF><CR><LF>OK<CR><LF>	

**Note:** -L: Working frequency band=(398+ch)MHz; -H: Working frequency band=(803+ch)MHz

### 3.3.15. AT+FEC

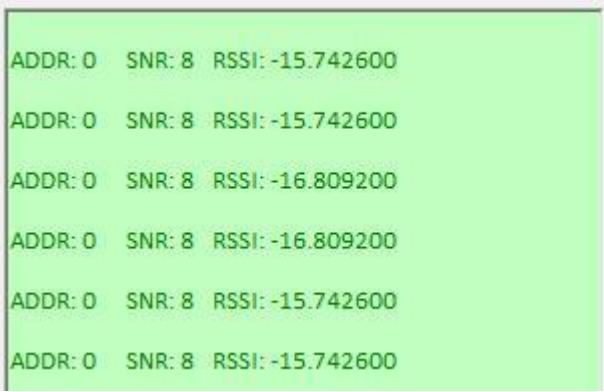
Parameter	Description	Default Value	Range
<Status>	Status of forward error correction function	OFF	ON/OFF
Format			
Query	AT+FEC<CR><LF>		
Return	<CR><LF>+FEC:<Status><CR><LF><CR><LF>OK<CR><LF>		
Set	AT+FEC=<Status><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

**Note:** Enable this function can make data transmission more stable but lower communication rate.

### 3.3.16. AT+PWR

Parameter	Description	Default Value	Range
<Status>	Transmitting power	20dbm	10dBm~20dBm
Format			
Query	AT+PWR<CR><LF>		
Return	<CR><LF>+PWR:<Status><CR><LF><CR><LF>OK<CR><LF>		
Set	AT+PWR=<Status><CR><LF>		
Return	<CR><LF><CR><LF>OK<CR><LF>		

### 3.3.17. AT+SQT

Parameter	Description	Range
<Time>	Data transmission interval	100~6000ms
<b>Format</b>		
Query	AT+SQT<CR><LF> Display RSSI	
Return	 <pre> ADDR: 0 SNR: 8 RSSI: -15.742600 ADDR: 0 SNR: 8 RSSI: -15.742600 ADDR: 0 SNR: 8 RSSI: -16.809200 ADDR: 0 SNR: 8 RSSI: -16.809200 ADDR: 0 SNR: 8 RSSI: -15.742600 ADDR: 0 SNR: 8 RSSI: -15.742600           </pre>	
Set	AT+SQT=<Time><CR><LF> Transmit test data automatically	
Return	<CR><LF><CR><LF>OK<CR><LF>	

### 3.3.18. AT+KEY

Parameter	Description
<Key>	16 bytes HEX format character string
<b>Format</b>	
Set	AT+KEY=<Key><CR><LF>
Return	<CR><LF><CR><LF>OK<CR><LF>

**Note:** To ensure data security, this data encryption word can only be set but not be queried.

## 4. Contact Us

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## 5. Disclaimer

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## 6. Update History

2018-04-10 V1.0.6.01 established based on Chinese version V1.0.6.