

# RAK4600 Module AT Command Manual

## Introduction

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The RAK4600 module is designed to simplify LoRa P2P (peer to peer) and LoRaWAN communication. This module saves customers to deal with complicated SPI protocol with the LoRa transceivers. Instead, a well-known serial communication interface is provided to send commands and request internal status of the module. This approach allows a straightforward way to integrate LoRa technology into your projects.

On top of this serial interface a set of AT commands are defined, an external microcontroller will be able to control the RAK4600 module as a classic AT modem. Through the AT commands, customers can set parameters of the LoRaWAN communication, controlling GPIO pins, analog inputs, etc.

In the RAK4600 module, the serial communication is exposed on the UART1 port, through Pin 22 (USART1\_RX) and Pin 23 (USART1\_TX). The parameters of the UART1 communication are **115200 / 8-N-1**. The firmware upgrade is also possible through this port. To get familiar with the pin distribution of this module and find a schematic circuit of a reference application, refer to the RAK4600 [Datasheet](#).

In addition, the RAK4600 also supports BLE. You can use your mobile phone to communicate with the module via BLE interface, or you can use the module to scan the surrounding Bluetooth beacon information.

## Links to Quick Start Guide

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For AT commands example usage, you can check these sections of quick start guide:

- [TTN OTAA/ABP](#)
- [ChirpStack OTAA/ABP](#)
- [LoRa P2P](#)

## Software Tool

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If you don't have a serial port tool yet, it is recommended to download and install the RAK Serial Port Tool. There are some ready-made AT commands in this tool that will be very useful for you.

- [RAK Serial Port Tool](#) 

For more detailed information on how to use this tool, refer to the following guide:

- [RAK Serial Port Tool Guide](#)

## AT Command Syntax

The AT command is based on ASCII characters. A command begins with the prefix `at` and ends with `<CR>` `<LF>` (i.e. `\r\n`). The maximum length is 255 characters which includes the `<CR><LF>` characters at the end of the command. For the rest of the document, the `\r\n` part is omitted for the sake of clarity.

The AT commands can be classified in the following groups:

- **Read Command:** Reads the current configuration or status of the module. The command name and the list of parameters are separated by `=` character. The `<m>` parameter is separated with its associated value `<n>` by the `:` character.

```
at+get_config=<m>:<n>
```

- **Write Command:** Writes/Modifies the current configuration of the module. The command name and the list of parameters are separated by `=` character. The `<m>` parameter is separated with its associated value `<n>` by the `:` character.

```
at+set_config=<m>:<n>
```

- **Operational Commands:** Some commands are neither read nor write commands but are used to execute an action.

```
at+send=lora:<m>:<n> // Sends data through the LoRa transceiver.
```

- **Special Command:** The RAK4600 UART port has two operational modes: **Configuration Mode** and **Data Transmission Mode**. When switching from data transmission mode to configuration mode the command to be entered is `+++` and does not contain terminators such as `\r` and `\n`.

After the command is executed by the module, a reply is sent back to the external MCU. In the case the command was successful, the usual reply has the following format:

```
OK [information]\r\n
```

#### NOTE:

Only Read commands have information in the replied message, while Write commands do not have an informative description.

The firmware you developed, running in the external MCU, will expect at a minimum a string of `ok\r\n` after sending a successful command to the board. On the other hand, when the command is not successfully executed by the board, a reply will be received in the following format:

```
ERROR: [Err Code]\r\n
```

## Error Code Table

Error Code	Description
1	The last command received is an unsupported AT command.
2	Invalid parameter in the AT command.
3	There is an error when reading or writing the flash memory.
5	There is an error when sending data through the UART port.
41	The BLE fell into an invalid state, could not applied the command.
80	The LoRa transceiver is busy, could not process a new command.
81	LoRa service is unknown. Unknown MAC command received by node. Execute commands that are not supported in the current state, such as sending "adjoin" command in P2P mode.
82	The LoRa parameters are invalid.
83	The LoRa frequency is invalid.
84	The LoRa data rate (DR) is invalid.
85	The LoRa frequency and data rate are invalid.
86	The device hasn't joined into a LoRa network.
87	The length of the packet exceeded that maximum allowed by the LoRa protocol.
88	Service is closed by the server. Due to the limitation of duty cycle, the server will send "SRV_MAC_DUTY_CYCLE_REQ" MAC command to close the service.
89	This is an unsupported region code.
90	Duty cycle is restricted. Due to duty cycle, data cannot be sent at this time until the time limit is removed.
91	No valid LoRa channel could be found.
92	No available LoRa channel could be found.
93	Internal state error. Generally, the internal state of the protocol stack is wrong
94	Time out reached while sending the packet through the LoRa transceiver.
95	Time out reached while waiting for a packet in the LoRa RX1 window.
96	Time out reached while waiting for a packet in the LoRa RX2 window.
97	There is an error while receiving a packet during the LoRa RX1 window.

Error Code	Description
98	There is an error while receiving a packet during the LoRa RX2 window.
99	Failed to join into a LoRa network.
100	Duplicate downlink message is detected. A message with an invalid downlink count is received.
101	Payload size is not valid for the current data rate (DR).
102	Many downlink packets are lost.
103	Address fail. The address of the received packet does not match the address of the current node.
104	Invalid MIC is detected in the LoRa message.

## General AT Command

### 1. at+version

This command is used to get version the current firmware version number.

Operation	Command	Response
Read	<code>at+version</code>	<code>OK &lt;version number&gt;</code>

**Parameter:** None

**Example:**

```
at+version\r\n
OK V3.3.0.14
```

### 2. at+help

This command is used to obtain all the AT commands supported by the current firmware.

Operation	Command	Response
Read	<code>at+help</code>	<code>OK &lt;all AT commands&gt;</code>

**Parameter:** None

**Example:**

```

at+help\r\n
OK Device AT commands:
  at+version
  at+help
  at+set_config=device:restart
  at+set_config=device:sleep:X
  at+get_config=device:status
  at+set_config=device:uart:X:Y
  at+set_config=device:uart_mode:X:Y

LoRaWAM AT commands:
  at+set_config=lora:default_parameters
  at+join
  at+send=lora:X:YYY
  at+set_config=lora:region:XXX
  at+get_config=lora:channel
  at+set_config=lora:dev_eui:XXXX
  at+set_config=lora:app_eui:XXXX
  at+set_config=lora:app_key:XXXX
  at+set_config=lora:dev_addr:XXXX
  at+set_config=lora:apps_key:XXXX
  at+set_config=lora:nwks_key:XXXX
  at+set_config=lora:multicastenable:X
  at+set_config=lora:multicast_dev_addr:XXXX
  at+set_config=lora:multicast_apps_key:XXXX
  at+set_config=lora:multicast_nwks_key:XXXX
  at+set_config=lora:join_mode:X
  at+set_config=lora:work_mode:X
  at+set_config=lora:ch_mask:X:Y
  at+set_config=lora:class:X
  at+set_config=lora:confirm:X
  at+set_config=lora:dr:X
  at+set_config=lora:tx_power:X
  at+set_config=lora:adr:X
  at+get_config=lora:status
  at+set_config=lora:dutycycle_enable:X
  at+set_config=lora:send_repeat_cnt:X

LoRaP2P AT commands:
  at+set_config=lorap2p:XXX:Y:Z:A:B:C
  at+set_config=lorap2p:transfer_mode:X
  at+send=lorap2p:XXX

BLE AT commands:
  at+set_config=ble:work_mode:X:Y

```

### 3. `at+set_config=device:restart`

This command is used for restarting the device.

Operation	Command	Response
Write	<code>at+set_config=device:restart</code>	

**Parameter:** None

**Example:**

```
at+set_config=device:restart\r\n
UART1 work mode: RUI_UART_NORMAL
Current work_mode:LoRaWAN, join_mode:ABP, Class: A
Initialization OK
```

**4. at+set\_config=device:sleep: <status>**

This command is used to change the current state of the device between the sleep and the wake-up mode.

Operation	Command	Response
Write	at+set_config=device:sleep:<status>	OK <STATUS>

**Parameter:**

status  
0: wake up  
1: sleep

**Example:**

```
at+set_config=device:sleep:1\r\n
OK Sleep

at+set_config=device:sleep:0\r\n
OK Wake Up
```

**5. at+get\_config=device:status**

This command is used to obtain the current status of the device.

Operation	Command	Response
Read	at+get_config=device:status	OK <information>

**Parameter:** None

**Example:**

```
at+get_config=device:status\r\n
OK Board Core:RAK4600
MCU:nRF52832
LoRa chip: SX1276
```

# Interface Type AT Command

### 1. `at+set_config=device:uart:<index>:<baud_rate>`

This command is used to configure the baud rate for an UART port.

Operation	Command	Response
Write	<code>at+set_config=device:uart:&lt;index&gt;:&lt;baud_rate&gt;</code>	OK

Parameter :

index	UART Number
baud_rate	UART Baud rate: 1200,2400,4800,9600,19200,38400,57600,115200

### 2. `at+set_config=device:uart_mode:<index>:<mode>`

This command is used to set the UART operation between the AT configuration mode and the data transmission mode.

Operation	Command	Response
Write	<code>at+set_config=device:uart_mode:&lt;index&gt;:&lt;mode&gt;</code>	OK

Parameter :

index	UART Port Number. Currently, the RAK4600 only supports UART1.
mode	UART Mode : Only '1' can be selected, which means the UART is set to data transmission mode.

#### NOTE:

To switch from data transmission mode to configuration mode, use `+++` ( `+++` without `\ r \ n` ).

Example:

```
at+set_config=device:uart_mode:1:1\r\n
OK

+++
OK
```

## LoRaWAN Type AT Command

### 1. `at+join`

This command is used to join a LoRaWAN network.

Operation	Command	Response
	<code>at+join</code>	OK Join Success

**Parameter:** None

**Example :**

```
at+join\r\n
OK Join Success
```

## 2. `at+send=lora:<port>:<data>`

This command is used to send data via LoRaWAN.

Operation	Command	Response
	<code>at+send=lora:&lt;port&gt;:&lt;data&gt;</code>	OK

**Parameter :**

**port** Sending port of LoRa. The value range is 1-223.

**data** The sending data format is in hexadecimal format. The possible values are between **\*\*00-FF\*\***. The module internally will cast every two characters into a byte before sending it to the LoRa transceiver. The maximum length varies depending on the band frequency and DR (LoRaWAN standard). Refer to [Appendix III](#).

**Example :**

When sending data as unconfirmed uplink:

```
at+send=lora:1:5A00\r\n
OK
```

When sending data as confirmed uplink:

```
OK
at+recv=0, -105, -12, 0
```



 **NOTE**

- When sending a confirmed message, you will receive an ACK response, i.e. `at+recv=...`. The `0, -105, -12, 0` stands for:
  - `0` : For the LoRa port;
  - `-105` : For the RSSI;
  - `-12` : For the SNR;
  - `0` : For the length of the data (no valid data in ACK).
- When sending an unconfirmed message, sometimes the gateway will send MAC commands to nodes, and the node will also receive `at+recv=...`.

### 3. `at+set_config=lora:region:<region>`

This command is used to set the appropriate working frequency band.

Operation	Command	Response
Write	<code>at+set_config=lora:region:&lt;region&gt;</code>	OK

**Parameter :**

region EU433, CN470, IN865, EU868, US915, AU915, KR920, AS923.  
The default is EU868.

**Example :**

```
at+set_config=lora:region:EU868\r\n
OK
```

 **NOTE:**

In the AS923 frequency band, the supported frequency plan is "as2" and dwell time is set to 1.

### 4. `at+get_config=lora:channel`

This command is used for reading all the LoRa channel information for the device's current region.

Operation	Command	Response
Read	<code>at+get_config=lora:channel</code>	<code>OK &lt;channel information&gt;</code>

**Parameter :** None

**Example :**

```
at+get_config=lora:channel\r\n
OK *0,on,868100000,0,5; *1,on,868300000,0,5; *2,on,868500000,0,5; 3,off,0,0,0; 4,off,0,0,0; 5,off
```

 **NOTE**

With `*0,on,868100000,0,5` as an example, the following is the channel parameter analysis:

- `*` at the beginning if the channel is open;
- `0` is the channel ID;
- `on` indicates the current status of the channel;
- `868100000` is the actual frequency of the channel, unit is Hz;
- `0,5` indicates the DR of the channel, DR0~DR5.

5. `at+set_config=lora:ch_mask:<channel_number>:<status>`

This command is used to enable (on) or disable (off) a channel in the current region.

Operation	Command	Response
Write	<code>at+set_config=lora:ch_mask:&lt;channel_number&gt;:&lt;status&gt;</code>	OK

**Parameter :**

channel_number	Channel number
status	0: off 1: on

**Example:**

```
at+set_config=lora:ch_mask:0:0\r\n
OK
```

6. `at+set_config=lora:dev_eui:<dev_eui>`

This command is used to set the Device EUI parameter for LoRaWAN OTAA mode.

Operation	Command	Response
Write	<code>at+set_config=lora:dev_eui:&lt;dev_eui&gt;</code>	OK

**Parameter :**

dev_eui	Device EUI
---------	------------

**Example :**

```
at+set_config=lora:dev_eui:3530353064377716\r\n
OK
```

**7. at+set\_config=lora:app\_eui: <app\_eui>**

This command is used to set the Application EUI parameter for the LoRaWAN OTAA mode.

<b>Operation</b>	<b>Command</b>	<b>Response</b>
Write	<code>at+set_config=lora:app_eui:&lt;app_eui&gt;</code>	OK

**Parameter :**

app\_eui    Application EUI

**Example :**

```
at+set_config=lora:app_eui:0000000000000001\r\n
OK
```

**8. at+set\_config=lora:app\_key: <app\_key>**

This command is used to set the Application Key parameter for the LoRaWAN OTAA mode.

<b>Operation</b>	<b>Command</b>	<b>Response</b>
Write	<code>at+set_config=lora:app_key:&lt;app_key&gt;</code>	OK

**Parameter :**

app\_key    Application Key

**Example :**

```
at+set_config=lora:app_key:841986913ACD00BBC2BE2479D70F3228\r\n
OK
```

**9. at+set\_config=lora:dev\_addr: <dev\_addr>**

This command is used to set the Device Address parameter for the LoRaWAN ABP mode.

Operation	Command	Response
Write	<code>at+set_config=lora:dev_addr:&lt;dev_addr&gt;</code>	OK

**Parameter :**

dev\_addr                      Device Address

**Example :**

```
at+set_config=lora:dev_addr:260125D7\r\n
OK
```

**10. at+set\_config=lora:apps\_key: <apps\_key>**

This command is used to set the Application Session Key parameter for the LoRaWAN ABP mode.

Operation	Command	Response
Write	<code>at+set_config=lora:apps_key:&lt;apps_key&gt;</code>	OK

**Parameter :**

apps\_key                      Application Session Key

**Example :**

```
at+set_config=lora:apps_key:841986913ACD00BBC2BE2479D70F3228\r\n
OK
```

**11. at+set\_config=lora:nwks\_key: <nwks\_key>**

This command is used to set the Network Session Key parameter for the LoRaWAN ABP mode

Operation	Command	Response
Read	<code>at+set_config=lora:nwks_key:&lt;nwks_key&gt;</code>	OK

**Parameter :**

nwks\_key                      Network Session Key

**Example :**

```
at+set_config=lora:nwks_key:69AF20AEA26C01B243945A28C9172B42\r\n
OK
```

## 12. `at+set_config=lora:multicastenable: <IsEnable>`

This command is used to enable or disable the multicast feature.

Operation	Command	Response
Write	<code>at+set_config=lora:multicastenable:&lt;IsEnable&gt;</code>	OK

### Parameter :

	0: disable
IsEnable	1: enable
	The default is disable.

### Example :

```
at+set_config=lora:multicastenable:1\r\n
OK
```

## 13. `at+set_config=lora:multicast_dev_addr: <multicast_dev_addr>`

This command is used to set the Device Address for the multicast feature.

Operation	Command	Response
Write	<code>at+set_config=lora:multicast_dev_addr:&lt;multicast_dev_addr&gt;</code>	OK

### Parameter :

multicast_dev_addr	Multicast Device Address
--------------------	--------------------------

### Example :

```
at+set_config=lora:multicast_dev_addr:260111fd\r\n
OK
```

## 14. `at+set_config=lora:multicast_apps_key: <multicast_apps_key>`

This command is used to set the Application Session Key for the multicast feature.

Operation	Command	Response
Write	<code>at+set_config=lora:multicast_apps_key:&lt;multicast_apps_key&gt;</code>	OK

**Parameter :**

multicast\_apps\_key    Multicast Application Session Key

**Example :**

```

at+set_config=lora:multicast_apps_key:F13DDFA2619B10411F02F042E1C0F356\r\n
OK

```

15. `at+set_config=lora:multicast_nwks_key: <multicast_nwks_key>`

This command is used to set the Network Session Key for the multicast feature.

Operation	Command	Response
Write	<code>at+set_config=lora:multicast_nwks_key:&lt;multicast_nwks_key&gt;</code>	OK

**Parameter :**

multicast\_nwks\_key    Multicast Network Session Key

**Example :**

```

at+set_config=lora:multicast_nwks_key:1D1991F5377C675879C39B6908D437A6\r\n
OK

```

16. `at+set_config=lora:join_mode: <mode>`

This command is used to switch the LoRaWAN access mode between the OTAA and the ABP mode.

Operation	Command	Response
Write	<code>at+set_config=lora:join_mode:&lt;mode&gt;</code>	OK

**Parameter :**

Activation mode

0: OTAA

1: ABP

mode

The default is OTAA.

**Example :**

```
at+set_config=lora:join_mode:1\r\n
OK
```

### 17. `at+set_config=lora:class: <class>`

This command is used to set LoRaWAN class to Class A, Class B, or Class C.

Operation	Command	Response
Write	<code>at+set_config=lora:class:&lt;class&gt;</code>	OK

#### Parameter :

class

- 0: Class A
- 1: Class B (Not supported at this time)
- 2: Class C

The default is Class A.

#### Example :

```
at+set_config=lora:class:0\r\n
OK
```

### 18. `at+set_config=lora:confirm: <type>`

This command is used to set the type data to be sent: Confirmed/Unconfirmed.

Operation	Command	Response
Write	<code>at+set_config=lora:confirm:&lt;type&gt;</code>	OK

#### Parameter :

type

- 0: unconfirm type
- 1: confirm type

The default is unconfirm type.

#### Example :

```
at+set_config=lora:confirm:0\r\n
OK
```

### 19. `at+set_config=lora:dr: <dr>`

This command is used to set the data rate (DR) of LoRa.

Operation	Command	Response
Write	<code>at+set_config=lora:dr:&lt;dr&gt;</code>	OK

**Parameter :**

dr The data rate of LoRa is related to the current region. In most LoRa areas, it is common to use 0 to 5. Detailed reference can be made to LoRaWan 1.0.2 specification.

**20. at+set\_config=lora:tx\_power: <tx\_power>**

This command is used to set the RF transmission power level of the LoRa transceiver. The unit is in dBm.

Operation	Command	Response
Write	<code>at+set_config=lora:tx_power:&lt;tx_power&gt;</code>	OK

**Parameter :**

tx\_power LoRa's transmit power level varies depending on frequency band and DR. Refer to the LoRaWAN 1.0.2 specification or [Appendix II](#) for details. The default is 0.

**Example :**

```
at+set_config=lora:tx_power:0\r\n
OK
```

**21. at+set\_config=lora:adr: <status>**

This command is used to turn on/off the ADR feature of the LoRa communication.

Operation	Command	Response
Write	<code>at+set_config=lora:adr:&lt;status&gt;</code>	OK

**Parameter :**

status  
 0: Turn off  
 1: Turn on  
 The default is on.

**Example :**



```
at+set_config=lora:adr:0\r\n
OK
```

## 22. at+get\_config=lora:status

This command is used to get all the information related to the current LoRa status, except channel information.

Operation	Command	Response
Read	at+get_config=lora:status	OK <lora status detail>

**Parameter:** None

**Example:**

```
at+get_config=lora:status\r\n
OK Work Mode: LoRaWAN
Region: EU868
Send_interval: 600s
Auto send status: false.
MulticastEnable: true.
Multi_Dev_Addr: 260111FD
Multi_Apps_Key: F13DDFA2619B10411F02F042E1C0F356
Multi_Nwks_Key: 1D1991F5377C675879C39B6908D437A6
Join_mode: OTAA
DevEui: 00000000000000888
AppEui: 00000000000000888
AppKey: 000000000000008880000000000000888
Class: C
Joined Network:false
IsConfirm: unconfirm
AdrEnable: true
EnableRepeaterSupport: false
RX2_CHANNEL_FREQUENCY: 869525000, RX2_CHANNEL_DR:0
RX_WINDOW_DURATION: 3000ms
RECEIVE_DELAY_1: 1000ms
RECEIVE_DELAY_2: 2000ms
JOIN_ACCEPT_DELAY_1: 5000ms
JOIN_ACCEPT_DELAY_2: 6000ms
Current Datarate: 4
Primeval Datarate: 4
ChannelsTxPower: 0
UpLinkCounter: 0
DownLinkCounter: 0
```

## 23. at+set\_config=lora:dutycycle\_enable: <status>

This command is used for enabling or disabling the Duty Cycle feature.

Operation	Command	Response
Write	<code>at+set_config=lora:dutycycle_enable:&lt;status&gt;</code>	OK

**Parameter :**

status

0: disable  
1: enable

The default is disable.

**Example :**

```
at+set_config=lora:dutycycle_enable:1\r\n
OK
```

**24. at+set\_config=lora: send\_repeat\_cnt: <num>**

This command is used to set the number of retransmitting attempts on an uplink message. When activated, the board will resend a message if its corresponding ACK (downlink) is not received after sending a confirmed uplink message. The default value is 0, which means that the board will not resend any message by default.

Operation	Command	Response
Write	<code>at+set_config=lora: send_repeat_cnt:&lt;status&gt;</code>	OK

**Parameter :**

num

Number of retries, up to 7.

The default is 0.

**Example :**

```
at+set_config=lora:send_repeat_cnt:1\r\n
OK
```

**25. at+set\_config=lora:default\_parameters**

This command is used to restore OTAA, ABP, multicast related network access parameters set at the factory, including dev\_eui, app\_eui, etc.

Operation	Command	Response
Write	<code>at+set_config=lora:default_parameters</code>	OK

**Parameter :** None

**Example :**

```
at+set_config=lora:default_parameters\r\n
OK
```

## LoRa P2P Type AT Command

### 1. `at+set_config=lora:work_mode:<mode>`

This command is used to switch the LoRa's transmission mode between the LoRaWAN and LoRa P2P mode. This command will cause the module to restart once applied.

Operation	Command	Response
Write	<code>at+set_config=lora:work_mode:&lt;mode&gt;</code>	

**Parameter :**

**mode**

Work mode of LoRa  
0: LoRaWAN  
1: LoRaP2P

The default is LoRaWAN mode

**Example :**

```
at+set_config=lora:work_mode:1\r\n
UART1 work mode: RUI_UART_NORMAL
Current work_mode:P2P
Initialization OK
```

### 2. `at+set_config=lorap2p:<frequency>:<spreadfact>:<bandwidth>:<codingrate>:<premlen>:<power>`

This command is used to set the relevant parameters of LoRa P2P mode and is only valid when the LoRa work mode is changed to LoRa P2P before.

Operation	Command	Response
Write	<code>at+set_config=lorap2p:&lt;frequency&gt;:&lt;spreadfact&gt;:&lt;bandwidth&gt;:&lt;codingrate&gt;:&lt;premlen&gt;:&lt;power&gt;</code>	OK

**Parameter :**

frequency	Frequency, the unit is Hz The default is 869525000 Hz.
spreadfact	Spreading factor The default is 12.
bandwidth	0: 125 kHz 1: 250 kHz 2: 500 kHz  The default is 0.
codeingrate	1: 4/5 2: 4/6 3: 4/7 4: 4/8  The default is 1.
preamble	Preamble Length. 5~65535 The default is 8.
power	TX power. The unit is in dBm. 5~20 The default is 20.

**Example :**

```
at+set_config=lorap2p:869525000:12:0:1:8:20\r\n
OK
```

**3. at+set\_config=lorap2p:transfer\_mode: <mode>**

This command is used to change the state of the LoRa transceiver between sending and receiving state, and it is only valid when the LoRa mode is set to LoRa P2P before.

Operation	Command	Response
Write	at+set_config=lorap2p: transfer_mode:<mode>	OK

**Parameter :**

mode	1: receiver mode 2: sender mode  The default is sender mode.
------	---

**Example :**

```
at+set_config=lorap2p:transfer_mode:1\r\n
OK
```

#### 4. `at+send=lorap2p: <data>`

This command is used to send data through LoRa P2P and only valid when the LoRa work mode was set to LoRa P2P before.

Operation	Command	Response
Send	<code>at+send=lorap2p:&lt;data&gt;</code>	OK

#### Parameter :

`data`            The data to be sent, and the format is hexadecimal

#### Example :

```
at+send=lorap2p:1234\r\n
OK
```

In LoRa P2P mode, the receiving node receives the data and outputs the data in the following format:

```
at+recv=<RSSI>,<SNR>,< Data Length >:< Data >
```

## BLE Type AT Command

#### 1. `at+set_config=ble:work_mode: <mode>:<long_range>`

This command is used to configure the BLE mode.

Operation	Command	Response
Write	<code>at+set_config=ble:work_mode:&lt;mode&gt;:&lt;long_range&gt;</code>	OK

#### Parameter :

`mode`            BLE work mode.  
 0: Peripheral mode (Default)  
 1: Central mode  
 2: Beacon scan mode

`long_range`    Long range enable, only '0' can be selected because RAK4600 does not support this feature.

#### Example :

```
at+set_config=ble:work_mode:0:0\r\n
OK
```

## Appendix I : Data Rate by Region

### EU433/EU868/AS923

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440
2	LoRa: SF10 / 125 kHz	980
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470
6	LoRa: SF7 / 250 kHz	11000
7	FSK: 50 kbps	50000
8 ~ 15	RFU	

### CN470/KR920

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440
2	LoRa: SF10 / 125 kHz	980
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470
6 ~ 15	RFU	

### US915

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF10 / 125 kHz	980
1	LoRa: SF9 / 125 kHz	1760
2	LoRa: SF8 / 125 kHz	3125
3	LoRa: SF7 / 125 kHz	5470
4	LoRa: SF8 / 500 kHz	12500
5 ~ 7	RFU	
8	LoRa: SF12 / 500 kHz	980
9	LoRa: SF11 / 500 kHz	1760
10	LoRa: SF10 / 500 kHz	3900
11	LoRa: SF9 / 500 kHz	7000
12	LoRa: SF8 / 500 kHz	12500
13	LoRa: SF7 / 500 kHz	21900
14 ~ 15	RFU	

## AU915

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440
2	LoRa: SF10 / 125 kHz	980
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470
6	LoRa: SF8 / 500 kHz	12500
7	RFU	RFU
8	LoRa: SF12 / 500 kHz	980
9	LoRa: SF11 / 500 kHz	1760
10	LoRa: SF10 / 500 kHz	3900
11	LoRa: SF9 / 500 kHz	7000
12	LoRa: SF8 / 500 kHz	12500

**IN865**



Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
0	LoRa: SF12 / 125 kHz	250
1	LoRa: SF11 / 125 kHz	440
2	LoRa: SF10 / 125 kHz	980
3	LoRa: SF9 / 125 kHz	1760
4	LoRa: SF8 / 125 kHz	3125
5	LoRa: SF7 / 125 kHz	5470
6	RFU	RFU
7	FSK: 50 kbps	50000
8 ~ 15	RFU	RFU

## Appendix II : TX Power by Region

### EU868

By default, MaxEIRP is considered to be +16 dBm.

TXPower	Configuration (EIRP)
0	MaxEIRP
1	MaxEIRP - 2 dB
2	MaxEIRP - 4 dB
3	MaxEIRP - 6 dB
4	MaxEIRP - 8 dB
5	MaxEIRP - 10 dB
6	MaxEIRP - 12 dB
7	MaxEIRP - 14 dB
8 ~ 15	RFU

### US915

<b>TXPower</b>	<b>Configuration (conducted power)</b>
0	30 dBm - 2*TX Power
1	28 dBm
2	26 dBm
3 ~ 9	
10	10 dBm
11 ~ 15	RFU

### AU915

By default, MaxEIRP is considered to be +30 dBm.

<b>TXPower</b>	<b>Configuration (EIRP)</b>
0	MaxEIRP
1 ~ 10	MaxEIRP - 2*TX Power
11 ~ 10	RFU

### KR920

By default, MaxEIRP is considered to be +14 dBm.

<b>TXPower</b>	<b>Configuration (EIRP)</b>
0	MaxEIRP
1	MaxEIRP - 2 dB
2	MaxEIRP - 4 dB
3	MaxEIRP - 6 dB
4	MaxEIRP - 8 dB
5	MaxEIRP - 10 dB
6	MaxEIRP - 12 dB
7	MaxEIRP - 14 dB
8 ~ 15	RFU

### AS923

By default, MaxEIRP shall be 16 dBm.

<b>TXPower</b>	<b>Configuration (EIRP)</b>
0	MaxEIRP
1	MaxEIRP - 2 dB
2	MaxEIRP - 4 dB
3	MaxEIRP - 6 dB
4	MaxEIRP - 8 dB
5	MaxEIRP - 10 dB
6	MaxEIRP - 12 dB
7	MaxEIRP - 14 dB
8 ~ 15	RFU

### IN865

By default, MaxEIRP is considered to be 30 dBm.

<b>TXPower</b>	<b>Configuration (EIRP)</b>
0	MaxEIRP
1	MaxEIRP - 2 dB
2	MaxEIRP - 4 dB
3	MaxEIRP - 6 dB
4	MaxEIRP - 8 dB
5	MaxEIRP - 10 dB
6	MaxEIRP - 12 dB
7	MaxEIRP - 14 dB
8	MaxEIRP - 16 dB
9	MaxEIRP - 18 dB
10	MaxEIRP - 20 dB
11 ~ 15	RFU

#### **CN470**

By default, MaxEIRP is considered to be +19.15 dBm.

TXPower	Configuration (EIRP)
0	MaxEIRP
1	MaxEIRP - 2 dB
2	MaxEIRP - 4 dB
3	MaxEIRP - 6 dB
4	MaxEIRP - 8 dB
5	MaxEIRP - 10 dB
6	MaxEIRP - 12 dB
7	MaxEIRP - 14 dB
8 ~ 15	RFU

### EU433

By default, MaxEIRP is considered to be +12.15 dBm.

TXPower	Configuration (EIRP)
0	MaxEIRP
1	MaxEIRP - 2 dB
2	MaxEIRP - 4 dB
3	MaxEIRP - 6 dB
4	MaxEIRP - 8 dB
5	MaxEIRP - 10 dB
6 ~ 15	RFU

## Appendix III : Maximum Transmission Load by Region

 **NOTE:**

The LoRaWAN stack adds 8 bytes to the user payload. In the following list, M is the maximum payload size and N is the maximum usable payload size for the user data without MAC header.

**EU868**

<b>DataRate</b>	<b>M</b>	<b>N</b>
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242
6	250	242
7	250	242
8 ~ 15	Not Defined	Not Defined

**US915**

<b>DataRate</b>	<b>M</b>	<b>N</b>
0	19	11
1	61	53
2	133	125
3	250	242
4	250	242
5 ~ 7	Not Defined	Not Defined
8	61	53
9	137	129
10	250	242
11	250	242
12	250	242
13	250	242
14 ~ 15	Not Defined	Not Defined

**AU915**

DataRate	M	N
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242
6	250	242
7	Not Defined	Not Defined
8	61	53
9	137	129
10	250	242
11	250	242
12	250	242
13	250	242
14 ~ 15	Not Defined	Not Defined

KR920



DataRate	M	N
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242
6 ~ 15	Not Defined	Not Defined

### AS923

DataRate	Uplink MAC Payload Size (M)		Downlink MAC Payload Size (M)	
	UplinkDwellTime = 0	UplinkDwellTime = 1	DownlinkDwellTime = 0	DownlinkDwellTime = 1
0	59	N/A	59	N/A
1	59	N/A	59	N/A
2	59	19	59	19
3	123	61	123	61
4	250	133	250	133
5	250	250	250	250
6	250	250	250	250
7	250	250	250	250
8	RFU		RFU	

### IN865

<b>DataRate</b>	<b>M</b>	<b>N</b>
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242
6	250	242
7	250	242
8 ~ 15	Not Defined	Not Defined

#### CN470

<b>DataRate</b>	<b>M</b>	<b>N</b>
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242
6 ~ 15	Not Defined	Not Defined

#### EU433

DataRate	M	N
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242
6	250	242
7	250	242
8 ~ 15	Not Defined	Not Defined

## Appendix IV: Pin Description of RAK4600

The pin definition of the RAK4600 module can be reviewed in the [Pin Definition](#) section of the Datasheet.

A summary of the pins of the RAK4600 module:

### 1. About the UART Pin:

- Pin 22 (USART1\_RX) and Pin 23 (USART1\_TX).
- During sleep, Pin 22 (USART1\_RX) is configured as EXTI, with internal pull-down and rising edge triggering wake-up.

2. **About the SWD debug Pin:** Pin 37 (SYS\_SWDIO) and Pin 38 (SYS\_SWDCCLK) are used for SWD debug programming.

3. **About the Power Pin:** The power pins on the RAK4600 module includes the VCC Pins on Pin 40 (3V3\_IN) and Pin 41 (3V3\_IN), and the ground pins (GND) are on the Pin 1, Pin 8, Pin 12, Pin 13, Pin 14, Pin 16, Pin 18, Pin 19, Pin 20, Pin 31, Pin 39, and Pin 42.

4. **About the Reset Pin:** The reset pin on the RAK4600 module is the pin 36 (MCU\_NRST);

5. **About the RF Antenna Pin:** The RF Antenna pins on the RAK4600 module are the pin15 (RF\_BT) BLE antenna and pin 17 (RF\_L) LoRa antenna.

6. **About the GPIO Pin:** The GPIO pins available on the RAK4600 module are Pin 4, Pin 5, Pin 6, Pin 7, Pin 9, Pin 10, Pin 21, and Pin 24.

#### NOTE:

The subsequent firmware upgrade of the product is carried out through the OTA interface.

