AT Command Manual

AT Commands

Introduction

The RAK4200 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 and instead, a well-known serial communication interface is provided for sending commands and requesting 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 micro controller 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 RAK4200 module, the serial communication is exposed on the UART1 port, through the pin 4 (UART1_TX) and pin 5 (UART1_RX). The parameters of the UART1 communication are: 115200 / 8-N-1. The firmware upgrade is also possible through this port. In order to get familiar with the pin distribution of this module and find a schematic circuit of a reference application, please refer to the "RAK4200 Specification Manual". We provide a summary in the Appendix IV.

In addition, the RAK4200 module also exposes another serial port through the pin 2 (UART2_TX) and pin 1 (UART2_RX). This port is named as UART2. You can use it to connect another MCU or an additional UART peripheral such as a GPS module.

UART2 is PIN2 (TX2) and PIN1 (RX2) on modules.

In the case that the target application only requires one single UART port, then it is recommended that the customer to make use of the UART2 to connect to the customer’s MCU and reserved the UART1 for future firmware upgrade.

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 `at+get_config=<m>:<n>` 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.
- Write Command – `at+set_config=<m>:<n>` 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.
- Operational Commands - There are also commands that are neither read nor write commands. The purpose is to execute an action, for example: `at+send=lora:<m>:<n>`, will send data through the LoRa transceiver.
- Special Command — The RAK4200 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 that only Read commands have information in the replied message, while Write commands do not have an informative description. The firmware developed by the customer, running in the external MCU, will expect at minimum a string of "Ok\r\n" after sending a successful command to the module. In the other hand, when the command is not successfully executed by the module. A reply with will be received in the following format:

```
ERROR: [ErrCode]\r\n
```

The error codes are shown in the following section:

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.
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 "at+join" 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	Status is 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.
98	There is an error while receiving a packet during the LoRa RX2 window.

Error Code	Description
99	Failed to join into a LoRa network.
100	Duplicated down-link message detected. A message with an invalid down-link count was received.
101	Payload size is not valid for the current data rate (DR).
102	There many down-link packets were lost.
103	Address fail. The address of the received packet does not match the address of the current node.
104	Invalid MIC was detected in the LoRa message.

General AT Command

at+version

This command is used for reading the version number of the current firmware.

Operation	Command	Response
Read	`at+version`	`OK <version number>`

Parameter: None

Example:

```sh
at+version\r\n
OK V3.2.0.14
```

at+help

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

Operation	Command	Response
Read	`at+help`	`OK <all AT commands>`

Parameter: None

Example:

```sh
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
at+send=uart:X:YYY
at+set_config=device:gpio:X:Y
at+get_config=device:gpio:X
at+get_config=device:adc:X

LoRaWAN 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
```

at+set_config=device:restart

This command is used to restart the device.

Operation	Command	Response
Write	`at+set_config=device:restart`	

Parameter: None

Example:

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

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	Description
status	0: wake up
	1: sleep

Example

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

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

at+get_config=device:status

This command is used to obtaining the status of the device.

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

Parameter: None

Example:

```sh
at+get_config=device:status\r\n
OK Board Core:RAK4200
MCU:STM32L071KB
LoRa chip:SX1276
```

AT Command of Interface Type

at+set_config=device:uart:<index>:<baud_rate>

This command is used to configure the baud rate of a UART port.

Operation	Command	Response
Write	`at+set_config=device:uart:<index>:<baud_rate>`	`OK`

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

Example:

```sh
at+set_config=device:uart:1:115200\r\n
OK
```

at+set_config=device:uart_mode:<index>:<mode>

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

Operation	Command	Response
Write	`at+set_config=device:uart_mode:<index>:<mode>`	`OK`

Parameter	Description
index	UART Port Number. Currently, the RAK4200 supports UART1 and UART2.
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:

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

+++
OK
```

at+send=uart:<index>:<data>

This command is used to send data through a UART port.

Operation	Command	Response
Write	`at+send=uart:<index>:<data>`	`OK`

Parameter	Description
index	UART Port Number. Currently, the RAK4200 supports UART1 and UART2.
data	The data you want to send.
	The maximum length of data is 250 characters, equivalent to 255 – the length of "at+..." – the length of "\ r\ n".

Example:

```sh
at+send=uart:1:12345\r\n
OK
```

at+get_config=device:gpio:<pin_num>

This command is used to obtain the voltage level status of a pin on a module.

Operation	Command	Response
Read	`at+get_config=device:gpio:<pin_num>`	`OK <status>`

Parameter	Description
pin_num	Pin index of the module
status（Return Value)	0: Low voltage level
	1: High voltage level

Example:

```sh
at+get_config=device:gpio:3\r\n
OK 1
```

at+set_config=device:gpio:<pin_num>:<status>

This command is used to set the voltage level state (high or low) of a pin on a module.

Operation	Command	Response
Write	`at+set_config=device:gpio:<pin_num>:<status>`	`OK`

Parameter	Description
pin_num	Pin index of the module
status	0: Low voltage level
	1: High voltage level

Example:

```sh
at+set_config=device:gpio:3:0\r\n
OK
```

at+get_config=device:adc:<pin_num>

This command is used to obtain the voltage level of an ADC pin of the module.

Operation	Command	Response
Read	`at+get_config=device:adc:<pin_num>`	`OK <voltage>`

Parameter	Description
pin_num	ADC pin index of the module
Voltage（Return Value）	Voltage，Unit mV

Example:

```sh
at+get_config=device:adc:3\r\n
OK 1663mV
```

AT Command of LoRaWAN Type

at+join

This command is used to join into the LoRaWAN network.

Operation	Command	Response
	`at+join`	`OK Join Success`

Parameter: None

Example：

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

at+send=lora:<port>:<data>

This command is used to send data via LoRaWAN.

Operation	Command	Response
	`at+send=lora:<port>:<data>`	`OK`

Parameter	Description
port	LoRa sending port. 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). Please refer to Appendix III.

Example：

When sending data as unconfirmed uplink:

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

When sending data as confirmed uplink:

```sh
at+send=lora:1:5A00\r\n
OK
at+recv=0,-105,-12,0
```

When sending a confirmed message, you will receive an ACK response, i.e. "at+recv=...". In "0, -105, -12,0", "0" stands for the LoRa port, "-105" stands for the RSSI, "-12" stands for the SNR, and "0" stands for the length of the data (no valid data in ACK).

> 📝 **NOTE**
>
> When sending an unconfirmed message, sometimes the gateway will send MAC commands to nodes, and the node will also receive "at + recv =...".

at+set_config=lora:region:<region>

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

Operation	Command	Response
Write	`at+set_config=lora:region:<region>`	`OK`

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

Example：

```sh
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.

at+get_config=lora:channel

This Command is used to read all the LoRa channel information for the device's current region.

Operation	Command	Response
Read	`at+get_config=lora:channel`	`OK <channel information>`

Parameter: None

Example (EU868 region):

```sh
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，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.

at+set_config=lora:ch_mask:<channel_number>:<status>

This command is used to turn on or off a channel in the current region.

Operation	Command	Response
Write	`at+set_config=lora:ch_mask:<channel_number>:<status>`	`OK`

Parameter	Description
channel_number	Channel number
status	0: off
	1: on

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

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	`at+set_config=lora:dev_eui:<dev_eui>`	`OK`

Parameter	Description
dev_eui	Device EUI.

Example：

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

at+set_config=lora:app_eui:<app_eui>

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

Operation	Command	Response
Write	`at+set_config=lora:app_eui:<app_eui>`	`OK`

Parameter	Description
app_eui	Application EUI.

Example：

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

at+set_config=lora:app_key:<app_key>

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

Operation	Command	Response
Write	`at+set_config=lora:app_key:<app_key>`	`OK`

Parameter	Description
app_key	Application Key.

Example:

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

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	`at+set_config=lora:dev_addr:<dev_addr>`	`OK`

Parameter	Description
dev_addr	Device Address.

Example:

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

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	`at+set_config=lora:apps_key:<apps_key>`	`OK`

Parameter	Description
apps_key	Application Session Key.

Example:

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

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	`at+set_config=lora:nwks_key:<nwks_key>`	`OK`

Parameter	Description
nwks_key	Network Session Key.

Example:

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

at+set_config=lora:multicastenable:<IsEnable>

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

Operation	Command	Response
Write	`at+set_config=lora:multicastenable:<IsEnable>`	`OK`

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

Example:

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

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	`at+set_config=lora:multicast_dev_addr:<multicast_dev_addr>`	`OK`

Parameter	Description
multicast_dev_addr	Multicast Device Address

Example:

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

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	`at+set_config=lora:multicast_apps_key:<multicast_apps_key>`	`OK`

Parameter	Description
multicast_apps_key	Multicast Application Session Key

Example:

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

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	`at+set_config=lora:multicast_nwks_key:<multicast_nwks_key>`	`OK`

Parameter	Description
multicast_nwks_key	Multicast Network Session Key

Example:

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

at+set_config=lora:join_mode:<mode>

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

Operation	Command	Response
Write	`at+set_config=lora:join_mode:<mode>`	`OK`

Parameter	Description
mode	Activation mode
	0: OTAA
	1: ABP
	The default is OTAA.

Example：

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

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	`at+set_config=lora:class:<class>`	`OK`

Parameter	Description
class	0: Class A
	1: Class B (Not supported at this time)
	2: Class C
	The default is Class A.

Example:

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

at+set_config=lora:confirm:<type>

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

Operation	Command	Response
Write	`at+set_config=lora:confirm:<type>`	`OK`

Parameter	Description
type	0: unconfirm type
	1: confirm type
	The default is unconfirm type.

Example:

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

at+set_config=lora:dr:<dr>

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

Operation	Command	Response
Write	`at+set_config=lora:dr:<dr>`	`OK`

Parameter	Description
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 LoRaWan1.0.2 specification.

at+set_config=lora:tx_power:<tx_power>

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

Operation	Command	Response
Write	`at+set_config=lora:tx_power:<tx_power>`	`OK`

Parameter	Description
tx_power	LoRa's transmit power level varies depending on frequency band and DR. Please refer to the LoRaWAN 1.0.2 specification or Appendix II for details.
	The default is 0.

Example:

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

at+set_config=lora:adr:<status>

This command is used to turn on or off the ADR (Adaptive Data Rate) feature of the LoRa communication.

Operation	Command	Response
Write	`at+set_config=lora:adr:<status>`	`OK`

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

Example:

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

at+get_config=lora:status

This command is used to get all of the information related to the current LoRa status (except channel information）

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

Parameter: None

Example:

```sh
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: 0000000000000888
AppEui: 0000000000000888
AppKey: 00000000000008880000000000000888
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
```

at+set_config=lora:dutycycle_enable:<status>

This command is used to enable or disable the Duty Cycle feature.

Operation	Command	Response
Write	`at+set_config=lora:dutycycle_enable:<status>`	`OK`

Parameter	Description
status	0: disable
	1: enable
	The default is disable.

Example:

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

at+set_config=lora:send_repeat_cnt:<num>

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

Operation	Command	Response
Write	`at+set_config=lora:send_repeat_cnt:<status>`	`OK`

Parameter	Description
num	Number of retries, 0~7. The default value is 0.

Example:

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

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	`at+set_config=lora:default_parameters`	`OK`

Parameter: none

Example:

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

AT Command of LoRa P2P Type

at+set_config=lora:work_mode:<mode>

This command is used to set the LoRa work mode. This command will cause the module to restart once applied.

Operation	Command	Response
Write	`at+set_config=lora:work_mode:<mode>`	

Parameter	Description
mode	LoRa work mode
	0: LoRaWAN
	1: LoRaP2P
	The default is LoRaWAN mode.

Example:

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

at+set_config=lorap2p:<frequency>:<spreadfact>:<bandwidth>:<codingrate>:<preamlen>:<power>

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

Operation	Command	Response
Write	`at+set_config=lorap2p:<frequency>:<spreadfact>:<bandwidth>:<codingrate>:<preamlen>:<power>`	`OK`

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

Example:

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

at+set_config=lorap2p:transfer_mode:<mode>

This command is to change the state of the LoRa transceiver between sending and receiving state. It is only valid when the LoRa work mode was set to LoRa P2P before.

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

Parameter	Description
mode	1: receiver mode
	2: sender mode
	The default is sender mode.

Example:

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

at+send=lorap2p:<data>

This command is used to send data through LoRa P2P network. It is only valid when the LoRa work mode was set to LoRaP2P before.

Operation	Command	Response
Send	`at+send=lorap2p:<data>`	`OK`

Parameter	Description
data	The data to be sent, and the format is hexadecimal

Example:

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

> 📝 **NOTE**
>
> In LoRa P2P mode, the receiving node receives the data and display the data in the following format: `at+recv=<RSSI>,<SNR>,< Data Length >:< Data >`

Data Rate by Region

EU868/EU433/AS923

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

CN470/KR920

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

US915

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

AU915

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

IN865

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

TX Power by Region

EU868

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

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

US915

TX Power	Configuration (conducted power)
0	30 dBm - 2 * TX power
1	28 dBm
2	29 dBm
3 : 9	…
10	10 dBm
11 : 15	RFU

AU915

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

TX Power	Configuration (EIRP)
0	MaxEIRP
1 : 10	MaxEIRP - 2 * TXPower
11 : 15	RFU

KR920

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

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

AS923

By default, Max EIRP shall be 16dBm.

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

IN865

By default, MaxEIRP is considered to be 30dBm.

TX Power	Configuration (EIRP)
0	MaxEIRP
1	MaxEIRP - 2dB
2	MaxEIRP - 4dB
3	MaxEIRP - 6dB
4	MaxEIRP - 8dB
5	MaxEIRP - 10dB
6	MaxEIRP - 12dB
7	MaxEIRP - 14dB
8	MaxEIRP - 16dB
9	MaxEIRP - 18dB
10	MaxEIRP - 20dB
11 … 15	RFU

CN470

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

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

EU433

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

TX Power	Configuration (EIRP)
0	MaxEIRP
1	MaxEIRP - 2dB
2	MaxEIRP - 4dB
3	MaxEIRP - 6dB
4	MaxEIRP - 8dB
5	MaxEIRP - 10dB
6 … 15	RFU

Maximum Transmission Load by Region

> 📝 **NOTE**
>
> M in the following list is the length with MAC header, N is the length without MAC header, and the maximum sending data length is N.

EU868

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	-	-

US915

DataRate	M	N
0	19	11
1	61	53
2	133	125
3	250	242
4	250	242
5 : 7	-	-
8	61	53
9	137	129
10	250	242
11	250	242
12	250	242
13	250	242
14 : 15	-	-

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	-	-
8	61	53
9	137	129
10	250	242
11	250	242
12	250	242
13	250	242
14 : 15	-	-

KR920

DataRate	M	N
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242
6 : 15	-	-

AS923

Uplink MAC Payload Size (M)

DataRate	UplinkDwellTime = 0	UplinkDwellTime = 1
0	59	N/A
1	59	N/A
2	59	19
3	123	61
4	250	133
5	250	250
6	250	250
7	250	250
8 : 15	RFU	RFU

Downlink MAC Payload Size (M)

DataRate	DownlinkDwellTime = 0	DownlinkDwellTime = 1
0	59	N/A
1	59	N/A
2	59	19
3	123	61
4	250	133
5	250	250
6	250	250
7	250	250
8 : 15	RFU	RFU

IN865

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	-	-

CN470

DataRate	M	N
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242
6 : 15	-	-

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	-	-

Pin Description of RAK4200

The pin definition of the RAK4200 module can be reviewed here.

A summary of the pins of the RAK4200 module:

- About the UART pins: Pin 4(UART1_TX) and pin 5 (UART1_RX) are reserved for UART1. Pin 2 (UART2_TX) and pin 1 (UART2_RX) are reserved for UART2. During sleep, pin 5 and pin 1 are configured as external interrupt mode, internal pull-down resistor, rising edge trigger wake-up.
- About the SWD debug pin : Pin 7 (SWDIO) and pin 8 (SWCLK) are used for SWD debug port.
- About the power pins: The power pins on the RAK4200 module includes: Pin 20 is VDD pin. Pins 11,13, 14, 15, 19 are GND pins.

- About the reset pin. The reset pin on the RAK4200 module is pin 18;
- About the RF antenna pin. The RF antenna pin on RAK4200 module is PIN 12;
- About the ADC pin. The ADC pin on RAK4200 is PIN 3;

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