

RAK3172 Evaluation Board Deprecated AT Command Manual

⚠ WARNING

AT Commands (DEPRECATED) - FW version 1.0.4 and below.

- There are RAK3172 devices loaded with old firmware versions which are not based on RUI3 (RAKwireless Unified Interface V3). These devices have v1.0.4 and below.
- If the host microcontroller code is based on this old firmware, we have a [RAK3172 AT Command migration guide](#) that explains in detail the few differences between the two AT commands set.

Here are the complete list of the old FW version of AT commands:

AT Command Syntax

The AT command is based on ASCII characters. In general, the AT Command starts with the prefix `AT` and ends with `<CR><LF>` (i.e. `\r\n`). For the rest of the document, the `\r\n` part is omitted for the sake of clarity.

The AT commands have the standard format `AT+XXX`, with XXX denoting the command.

There are four available command formats:

AT COMMAND FORMAT	Description
<code>AT+XXX?</code>	Provides a short description of the given command
<code>AT+XXX=?</code>	Reading the current value on the command
<code>AT+XXX=<input parameter></code>	Writing configuration on the command
<code>AT+XXX</code>	Used to run a command

The output of the commands is returned via UART.

The format of the reply is divided into two parts: returned value and the status return code.

💡 NOTE

`<CR>` stands for “carriage return” and `<LF>` stands for “line feed” .

- `<value><CR><LF>` is the first reply when (`AT+XXX?`) command description or (`AT+XXX=?`) reading value is executed then it will be followed by the status return code. The formats with no return value like (`AT+XXX=<input parameter>`) writing configuration command and (`AT+XXX`) run command will just reply to the status return code.
- `<CR><LF><STATUS><CR><LF>` is the second part of the reply which is the status return code.

The possible status codes are:

STATUS RETURN CODE	Description
<code>OK</code>	Command executed correctly without error.
<code>AT_ERROR</code>	Generic error or input is not supported.
<code>AT_PARAM_ERROR</code>	The input parameter of the command is wrong.

STATUS RETURN CODE	Description
AT_BUSY_ERROR	The network is busy so the command is not completed.
AT_TEST_PARAM_OVERFLOW	The parameter is too long.
AT_NO_NETWORK_JOINED	Module is not yet joined to a network.
AT_RX_ERROR	Error detected during the reception of the command.
AT_DUTYCYCLE_RESTRICTED	Duty cycle limited and cannot send data.

More details on each command description and examples are given in the remainder of this section.

NOTE

On the examples of AT Commands on this document, ATE is active therefore each input AT Command is printed before the return values and status return code.

General Commands

This section describes the generic commands related to the “attention” help list, link control, and CPU `AT_Slave` reset.

- [AT](#)
- [ATZ - MCU reset](#)
- [ATR - Restore default parameters](#)
- [ATE - Echo command](#)
- [AT+SN - Device serial number](#)
- [AT+BAUD - Baud rate setting](#)

AT

Description: Attention

This command is used to check that the UART communication link is working properly and to show all available AT commands.

Command	Input Parameter	Return Value	Return Code
AT	-	-	OK
AT?	-	All available AT commands	OK

Example:

```
AT
OK
```

ATZ

Description: MCU reset

This command is used to trigger an MCU reset.

Example:

```

|_ _ V _ \ | / / | | ( )   | |
| | / / _ \ | / / | | |_ _ _ _
| / _ || _ | | | | ' _ / _ \ / _ |
| \ \ | | | | \ \ \ / | | _ | _ \ \ \
\ \ \ \ | \ \ \ \ \ V V | | \ \ | \ \ | | \ / _ /
=====
RAK3172-H Version:v1.0.2 May 26 2021
Current Work Mode: LoRaWAN.
```

This command is used to restore all parameters to the initial default values of the module.

Example:

```

|_ _ _ _ _
|_ _ V _ \ | / / | | ( )   | |
| | / / _ \ | / / | | | _ _ _ _ | | _ _ _ _ _
| / | _ | | \ | | | | ' _ _ \ | / _ V _ / _ |
| | \ | | | | \ \ \ \ / | | | _ / | _ \ _ _ \ \
\ | \ \ | | \ | \ \ \ V V | | | \ _ | | \ _ | | \ _ / _ /
=====
RAK3172-H Version:v1.0.2 May 26 2021
Current Work Mode: LoRa P2P.

```

This command is used to see the AT command input on the Serial Terminal.

Command	Input Parameter	Return Value	Return Code
ATE?	-	ATE: Set command echo	OK
ATE	-	-	OK

Example:

```
ATE
OK
```

AT+SN

Description: Serial number

This command is used to read the device serial number.

Command	Input Parameter	Return Value	Return Code
AT+SN?	-	AT+SN: Read the device serial number	OK
AT+SN=?	-	0080E11500004CF6	OK

Example:

```
AT+SN=?
0080E11500004CF6
OK
```

AT+BAUD

Description: Baudrate setting

This command is used to configure the baud rate of the device.

Command	Input Parameter	Return Value	Return Code
AT+BAUD?	-	AT+BAUD: Get or set the uart baud rate (4800, 9600, 115200)	OK
AT+BAUD=?	-	4800, 9600, or 115200	OK
AT+BAUD=<Input Parameter>	4800, 9600 or 115200	-	OK or AT_PARAM_ERROR

NOTE

You need to restart the module for the new baud rate to take effect.

Example:

```
AT+BAUD=115200
OK
AT+BAUD=?
```

```
115200
```

```
OK
```

```
AT+BAUD=100000
```

```
AT_PARAM_ERROR
```

Keys, IDs, and EUIs Management

This section describes the commands related to the activation of the end device. EUI's and Keys are **MSB first**.

- [AT+DEVEUI - Set or get device EUI](#)
- [AT+APPEUI - Set or get application EUI](#)
- [AT+APPKEY - Set or get application key](#)
- [AT+DEVADDR - Set or get device address](#)
- [AT+APPSKEY - Set or get application session key](#)
- [AT+NWKSKEY - Set or get network session key](#)

AT+DEVEUI

Description: Device EUI or DEVEUI

This command is used to access and configure the device EUI or DEVEUI.

Command	Input Parameter	Return Value	Return Code
<code>AT+DEVEUI?</code>	-	<code>AT+DEVEUI</code> : Get or set the device EUI	OK
<code>AT+DEVEUI=?</code>	-	<code>< 8 hex ></code>	OK
<code>AT+DEVEUI=<Input Parameter></code>	<code>< 8 hex ></code>	-	OK or AT_PARAM_ERROR

Examples:

```
AT+DEVEUI=1122334455667788
```

```
OK
```

```
AT+DEVEUI=?
```

```
1122334455667788
```

```
OK
```

```
AT+DEVEUI=112233445566778800
```

```
AT_PARAM_ERROR
```

AT+APPEUI

Description: Application unique identifier

This command is used to access and configure the APPEUI.

Command	Input Parameter	Return Value	Return Code
<code>AT+APPEUI?</code>	-	<code>AT+APPEUI</code> : Get or set the application EUI	OK

Command	Input Parameter	Return Value	Return Code
AT+APPEUI=?	-	< 8 hex >	OK
AT+APPEUI=<Input Parameter>	< 8 hex >	-	OK or AT_PARAM_ERROR

Examples:

```
AT+APPEUI=0080E11500004CF6
```

```
OK
```

```
AT+APPEUI=?
```

```
0080e11500004cf6
```

```
OK
```

```
AT+APPEUI=0080E11500004CF61234
```

```
AT_PARAM_ERROR
```

AT+APPKEY

Description: Application key

This command is used to access and configure the APPKEY.

Command	Input Parameter	Return Value	Return Code
AT+APPKEY?	-	AT+APPKEY: Get or set the application key	OK
AT+APPKEY=?	-	< 16 hex >	OK
AT+APPKEY=<Input Parameter>	< 16 hex >	-	OK or AT_PARAM_ERROR

Examples:

```
AT+APPKEY=01020AFBA1CD4D20010230405A6B7F88
```

```
OK
```

```
AT+APPKEY=?
```

```
01020afba1cd4d20010230405a6b7f88
```

```
OK
```

```
AT+APPKEY=01020AFBA1CD4D20010230405A6B7F
```

```
AT_PARAM_ERROR
```

AT+DEVADDR

Description: Device address or DEVADDR

This command is used to access and configure the device address or DEVADDR.

Command	Input Parameter	Return Value	Return Code
AT+DEVADDR?	-	AT+DEVADDR: Get or set the device address	OK

Command	Input Parameter	Return Value	Return Code
AT+DEVADDR=?	-	< 4 hex >	OK
AT+DEVADDR=<Input Parameter>	< 4 hex >	-	OK or AT_PARAM_ERROR

Examples:

```
AT+DEVADDR=01020A0B
```

```
OK
```

```
AT+DEVADDR=?
```

```
01020a0b
```

```
OK
```

```
AT+DEVADDR=01020A0BCC
```

```
AT_PARAM_ERROR
```

AT+APPSKEY

Description: Application session key

This command is used to access and configure the application session key or APPSKEY.

Command	Input Parameter	Return Value	Return Code
AT+APPSKEY?	-	AT+APPSKEY: Get or set the application session key	OK
AT+APPSKEY=?	-	< 16 hex >	OK
AT+APPSKEY=<Input Parameter>	< 16 hex >	-	OK or AT_PARAM_ERROR

Examples:

```
AT+APPSKEY=01020AFBA1CD4D20010230405A6B7F88
```

```
OK
```

```
AT+APPSKEY=?
```

```
01020afba1cd4d20010230405a6b7f88
```

```
OK
```

```
AT+APPSKEY=01020AFBA1CD4D20010230405A6B7F
```

```
AT_PARAM_ERROR
```

AT+NWKSKEY

Description: Network session keys

This command is used to access and configure the network session keys or NWKSKEY.

Command	Input Parameter	Return Value	Return Code
AT+NWKSKEY?	-	AT+NWKSKEY: Get or set the network session key	OK

Command	Input Parameter	Return Value	Return Code
AT+NWKSKEY=?	-	< 16 hex >	OK
AT+NWKSKEY=<Input Parameter>	< 16 hex >	-	OK or AT_PARAM_ERROR

Examples:

```
AT+NWKSKEY=01020AFBA1CD4D20010230405A6B7F88
```

```
OK
```

```
AT+NWKSKEY=?
```

```
01020afba1cd4d20010230405a6b7f88
```

```
OK
```

```
AT+NWKSKEY=01020AFBA1CD4D20010230405A6B7F
```

```
AT_PARAM_ERROR
```

Joining and Sending Data to LoRaWAN Network

This section describes the commands related to the joining process of the device to the LoRaWAN network.

- [AT+NJM - Set or get LoRaWAN join mode \(OTAA or ABP\)](#)
- [AT+CFM - Configure confirmed/unconfirmed payload](#)
- [AT+JOIN - Join command](#)
- [AT+NJS - Check join status](#)
- [AT+SEND - LoRaWAN payload send](#)
- [AT+CFS - Status of last payload if confirmed or unconfirmed](#)
- [AT+RECV - Read last received data](#)

AT+NJM

Description: LoRaWAN network join mode

This command is used to access and configure the activation method of the device either OTAA or ABP.

Command	Input Parameter	Return Value	Return Code
AT+NJM?	-	AT+NJM: Get or set the network join mode (0:ABP, 1:OTAA)	OK
AT+NJM=?	-	0 or 1	OK
AT+NJM=<Input Parameter>	0 or 1	-	OK or AT_PARAM_ERROR

Examples:

```
AT+NJM=1
```

```
OK
```

```
AT+NJM=?
```

```
1
```

```
OK
```

```
AT+NJM=2
```


AT_PARAM_ERROR

AT+CFM

Description: Confirmed payload mode

This command is used to access and configure the type of payload of the device.

Command	Input Parameter	Return Value	Return Code
AT+CFM?	-	AT+CFM: Get or set the confirm mode (0:unconfirmed, 1:confirm)	OK
AT+CFM=?	-	0 (if Unconfirmed) or 1 (if confirmed)	OK
AT+CFM=<Input Parameter>	0 or 1	-	OK or AT_PARAM_ERROR

Examples:

```

AT+CFM=1

OK
AT+CFM=?
1

OK
AT+CFM=2

AT_PARAM_ERROR

```

AT+JOIN

Description: Join the LoRaWAN network

This command is used to join a LoRaWAN network.

Command	Input Parameter	Return Value	Return Code
AT+JOIN?	-	AT+JOIN: Join network	OK
AT+JOIN=?	-	Param1, Param2, Param3, Param4	OK or AT_BUSY_ERROR
AT+JOIN=<Input Parameter>	Param1:Param2:Param3:Param4	-	OK
	Param1 = Join command : 1 for joining the network, 0 for stop joining		
	Param2 = Auto-Join config : 1 for Auto-join on power up), 0 for no auto-join. (0 is default)		
	Param3 = Reattempt interval : 7 - 255 seconds (8 is default)		

Command	Input Parameter	Return Value	Return Code
	<i>Param4= No. of join attempts: 0 - 255 (0 is default)</i>		

NOTE

This is an asynchronous command. OK means that the device is joining. The completion of the JOIN can be verified with the `AT+NJS=?` command.

Examples:

Successful join attempt

```
AT+JOIN=1:0:10:8
```

```
OK
+EVT:JOINED
```

Failed join attempt

```
AT+JOIN=1:0:10:8
```

```
OK
+EVT:JOIN FAILED
```

NOTE

If joining fails, make sure your device is within the coverage of the gateway. Also, ensure that the RAK3172 is in LoRaWAN mode via `AT+NWM=1`, the region is correct via `AT+BAND`, and the EUIs and keys are correct.

AT+NJS

Description: Network join status

This command is used to check the status of the devices if it is connected to a LoRaWAN network.

Command	Input Parameter	Return Value	Return Code
<code>AT+NJS?</code>	-	<code>AT+NJS</code> : Get the join status	OK
<code>AT+NJS=?</code>	-	0 (not joined) or 1 (joined)	OK

Examples:

```
AT+NJS=?
```

```
1
```

```
OK
```

AT+SEND

Description: Send payload data

This command is used to send the LoRaWAN payload to a specific port.

Command	Input Parameter	Return Value	Return Code
AT+SEND?	-	AT+SEND1 : Send data along with the application port	OK
AT+SEND=<Input Parameter>	port:payload	-	OK , AT_NO_NETWORK_JOINED , AT_PARAM_ERROR , or AT_BUSY_ERROR

Examples:

Unconfirmed Payload

```
AT+SEND=2:1234
```

```
OK
```

Confirm Payload

```
AT+SEND=2:1234
```

```
OK
```

```
+EVT:SEND CONFIRMED OK
```

With Downlink from the Network Server. Downlink info: FPort = 3, Payload = 4321.

```
AT+SEND=2:1234
```

```
OK
```

```
+EVT:RX_1, RSSI -52, SNR 9
```

```
+EVT:UNICAST
```

```
+EVT:3:4321
```

AT+CFS

Description: Confirm status

This command is used to access the status of the last confirmed “SEND” command

Command	Input Parameter	Return Value	Return Code
AT+CFS?	-	AT+CFS : Get the confirmation status of the last AT+SEND (0-1)	OK
AT+CFS=?	-	0 or 1	

Example:

Last confirmed uplink packet is successful.

```
AT+CFS=?
```

```
1
```

```
OK
```

Last confirmed uplink packet failed.

```
AT+CFS=?
0
OK
```

NOTE

AT+CFS=? only reflects the status of the last confirmed packet sent via the **AT+SEND** command. If the last confirmed packet is successful, it will return 1. If the last confirmed packets fail, it will return 0. This is true regardless if you send successful unconfirmed packets in between confirmed payloads. **AT+CFS=?** only tracks the last confirmed packet.

AT+RECV

Description: Last received data

This command is used to get the last received data in hex format.

Command	Input Parameter	Return Value	Return Code
AT+RECV?	-	AT+RECV: Print the last received data in hex format	OK
AT+RECV=?	-	port:payload (in HEX)	OK

Example:

```
AT+RECV=?
3:4321
OK
```

NOTE

When called twice, without new data received between the calls, the second **AT+RECV=?** returns an empty value:

```
AT+RECV=?
0:
OK
```

LoRaWAN Device Configuration

This section describes the commands related to the configuration of the LoRaWAN device.

- [AT+ADR - Set or get ADR - Adaptive Data Rate](#)
- [AT+CLASS - LoRaWAN Class Configuration](#)
- [AT+DCS - Duty Cycle Settings](#)
- [AT+DUTYTIME - Get the duty cycle time](#)
- [AT+DR - Configure and checking data rate](#)
- [AT+JN1DL - Join delay on RX1 window](#)
- [AT+JN2DL - Join delay on RX2 window](#)
- [AT+RX1DL - Delay on RX1 window](#)
- [AT+RX2DL - Delay on RX2 window](#)
- [AT+RX2DR - Data Rate on RX2 window](#)

- [AT+RX2FQ - Frequency of the RX2 window](#)
- [AT+TXP - Transmit power](#)
- [AT+RETY - Confirm payload retransmission](#)
- [AT+MASK - Setting masked channels](#)
- [AT+BAND - Regional frequency band](#)
- [AT+LPSEND - Long data payload](#)
- [AT+LINKCHECK - Network link status](#)
- [AT+USEND - Unified send payload data](#)
- [AT+PNM - Public Network Mode](#)

AT+ADR

Description: Adaptive data rate

This command is used to access and configure the adaptive data rate of the module.

Command	Input Parameter	Return Value	Return Code
<code>AT+ADR?</code>	-	<code>AT+ADR</code> : Get or set the adaptive data rate setting (0:disable, 1:enable)	OK
<code>AT+ADR=?</code>	-	0 (<i>ADR off</i>) or 1 (<i>ARD on</i>)	OK
<code>AT+ADR=<Input Parameter></code>	0 or 1	-	OK or <code>AT_PARAM_ERROR</code>

Examples:

```
AT+ADR=1

OK
AT+ADR=?
1

OK
```

AT+CLASS

Description: LoRaWAN class

This command is used to access and configure the LoRaWAN class of the module.

Command	Input Parameter	Return Value	Return Code
<code>AT+CLASS?</code>	-	<code>AT+CLASS</code> : Get or set the device class (A, B, C)	OK
<code>AT+CLASS=?</code>	-	A, B, or C	OK
<code>AT+CLASS=<Input Parameter></code>	A, B, or C	-	OK or <code>AT_PARAM_ERROR</code>

Examples:

```
AT+CLASS=A

OK
```

AT+CLASS=?

A

OK

NOTE

When operating in CLASS B, more return value is shown that shows the current state of Class B operation:

Class B Status	Description
B,S0	DeviceTimeReq
B,S1	Beacon Searching
B,S2	Beacon Locked
B,S3	Beacon Failed

Example:

AT+CLASS=B

OK

AT+CLASS=?

B,S0

OK

AT+DCS

Description: Duty cycle settings

This command is used to access and configure duty cycle settings.

Command	Input Parameter	Return Value	Return Code
AT+DCS?	-	AT+DCS: Get or set the ETSI duty cycle setting (0:disable, 1:enable)	OK
AT+DCS=?	-	0 (disabled) or 1 (enabled)	OK
AT+DCS=<Input Parameter>	0 or 1	-	OK or AT_PARAM_ERROR

Examples:

AT+DCS=1

OK

AT+DCS=?

1

OK

AT+DUTYTIME

Description: Get the duty cycle time

This command is used to get the duty cycle time (in seconds). The command is only used in the EU868, RU864, and EU433 frequency bands. Other frequency band query will return 0.

Command	Input Parameter	Return Value	Return Code
AT+DUTYTIME?	-	AT+DUTYTIME: Get the duty cycle time	OK
AT+DUTYTIME=?	-	<time is in seconds>	OK

Example:

```
AT+DUTYTIME=?
0

OK
```

AT+DR

Description: Data rate settings

This command is used to access and configure data rate settings.

Command	Input Parameter	Return Value	Return Code
AT+DR?	-	AT+DR: Get or set the data rate (0-7 corresponding to DR_X)	OK
AT+DR=?	-	0,1,2,3,4,5,6,7	OK
AT+DR=<Input Parameter>	0,1,2,3,4,5,6,7	-	OK or AT_PARAM_ERROR

Examples:

```
AT+DR=1

OK
AT+DR=?
1

OK
```

NOTE

AT+DR command will return AT+ERROR if ADR is active via the AT+ADR command.

AT+JN1DL

Description: Join delay on RX1 window

This command is used to access and configure the join delay on the RX1 window.

Command	Input Parameter	Return Value	Return Code
AT+JN1DL?	-	AT+JN1DL: Get or set the join accept delay between the end of the Tx and the join Rx window 1 in ms	OK
AT+JN1DL=?	-	< integer >	OK or AT_BUSY_ERROR
AT+JN1DL=<Input Parameter>	< integer >	-	OK, AT_BUSY_ERROR, or AT_PARAM_ERROR

Examples:

```
AT+JN1DL=5000
```

```
OK
```

```
AT+JN1DL=?
```

```
5000
```

```
OK
```

AT+JN2DL

Description: Join delay on RX2 window

This command is used to access and configure the join delay on the RX2 window.

Command	Input Parameter	Return Value	Return Code
AT+JN2DL?	-	AT+JN2DL: Get or set the join accept delay between the end of the Tx and the join Rx window 2 in ms	OK
AT+JN2DL=?	-	< integer >	OK or AT_BUSY_ERROR
AT+JN2DL=<Input Parameter>	< integer >	-	OK, AT_BUSY_ERROR, or AT_PARAM_ERROR

Examples:

```
AT+JN2DL=6000
```

```
OK
```

```
AT+JN2DL=?
```

```
6000
```

```
OK
```

AT+RX1DL

Description: Delay on RX1 window

This command is used to access and configure the delay on the RX1 window.

Command	Input Parameter	Return Value	Return Code
AT+RX1DL?	-	AT+RX1DL: Get or set the delay between the end of the Tx and the Rx window 1 in ms	OK
AT+RX1DL=?	-	< integer >	OK or AT_BUSY_ERROR
AT+RX1DL=<Input Parameter>	< integer >	-	OK, AT_BUSY_ERROR, or AT_PARAM_ERROR

Examples:

```
AT+RX1DL=1000
```

```
OK
```

```
AT+RX1DL=?
```

```
1000
```

```
OK
```

AT+RX2DL

Description: Delay on RX2 window

This command is used to access and configure the delay on the RX2 window.

Command	Input Parameter	Return Value	Return Code
AT+RX2DL?	-	AT+RX2DL: Get or set the delay between the end of the Tx and the Rx window 2 in ms	OK
AT+RX2DL=?	-	< integer >	OK or AT_BUSY_ERROR
AT+RX2DL=<Input Parameter>	< integer >	-	OK, AT_BUSY_ERROR, or AT_PARAM_ERROR

Examples:

```
AT+RX2DL=6000
```

```
OK
```

```
AT+RX2DL=?
```

```
6000
```

```
OK
```

AT+RX2DR

Description: Data Rate on RX2 window

This command is used to access and configure the data rate of the RX2 window.

Command	Input Parameter	Return Value	Return Code
AT+RX2DR?	-	AT+RX2DR: Get or set the Rx2 window data rate (0-7) corresponding to DR_X	OK
AT+RX2DR=?	-	0,1,2,3,4,5,6,7	OK or AT_BUSY_ERROR
AT+RX2DR=<Input Parameter>	0,1,2,3,4,5,6,7	-	OK, AT_BUSY_ERROR, or AT_PARAM_ERROR

Examples:

```
AT+RX2DR=8
```

```
OK
```

```
AT+RX2DR=?
```

```
8
```

```
OK
```

AT+RX2FQ

Description: Frequency of the RX2 window

This command is used to access and configure the frequency of the RX2 window.

Command	Input Parameter	Return Value	Return Code
AT+RX2FQ?	-	AT+RX2FQ: Get or set the Rx2 window frequency	OK
AT+RX2FQ=?	-	< Frequency in Hz >	OK or AT_BUSY_ERROR
AT+RX2FQ=<Input Parameter>	< Frequency in Hz >	-	OK, AT_BUSY_ERROR, or AT_PARAM_ERROR

Examples:

```
AT+RX2FQ=923300000
```

```
OK
```

```
AT+RX2FQ=?
```

```
923300000
```

```
OK
```

NOTE

RX2 Frequency via the **AT+RX2FQ** command has a preset value depending on the regional band you selected via the **AT+BAND** command.

AT+TXP

Description: Transmit Power

This command is used to access and configure the transmit power.

Command	Input Parameter	Return Value	Return Code
<code>AT+TXP?</code>	-	<code>AT+TXP</code> : Get or set the transmit power	OK
<code>AT+TXP=?</code>	-	< value >	OK or AT+PARAM_ERROR
<code>AT+TXP=<Input Parameter></code>	< value >	-	OK or AT_PARAM_ERROR

Check [Appendix II Section](#) **TXPower** for the input parameter depending on the frequency band selected.

For example, at EU868, a value of 2 represents **MaxEIRP - 4 dB** where MaxEIRP = +16 dBm.

Examples:

```
AT+TXP=2

OK
AT+TXP=?
2

OK
```

AT+RETY

Description: Confirmed payload retransmission

This command is used to access and configure the number of retransmission for confirmed payloads.

Command	Input Parameter	Return Value	Return Code
<code>AT+RETY?</code>	-	<code>AT+RETY</code> : Set the number of retransmissions of Confirm packet data	OK
<code>AT+RETY=?</code>	-	0, 1, 2, 3, 4, 5, 6, 7	OK
<code>AT+RETY=<Input Parameter></code>	0, 1, 2, 3, 4, 5, 6, 7	-	OK or AT+PARAM_ERROR

Examples:

```
AT+RETY=7

OK
AT+RETY=?
7

OK
```

AT+MASK

Description: Setting masked channels

This command is used to access and configure masked channels.

Command	Input Parameter	Return Value	Return Code
AT+MASK?	-	AT+MASK: Set the channel mask, close or open the channel. Only for US915, AU915, and CN470.	OK
AT+MASK=?	-	< mask >	OK
AT+MASK=<Input Parameter>	Channels (hex)	-	OK or AT+PARAM_ERROR

AT+MASK Input Parameter Options

Sub-Band	Channels (hex)	US915	AU915	CN470
ALL	0000	All Enabled	All Enabled	All enabled
1	0001	0-7	0-7	0-7
2	0002	8-15	8-15	8-15
3	0004	16-23	16-23	16-23
4	0008	24-31	24-31	24-31
5	0010	32-39	32-39	32-39
6	0020	40-47	40-47	40-47
7	0040	48-55	48-55	48-55
8	0080	56-63	56-63	56-63
9	0100	-	-	64-71
10	0200	-	-	72-79
11	0400	-	-	80-87
12	0800	-	-	88-95

Examples:

```
AT+MASK=0002
```

```
OK
AT+MASK=?
0002
```

```
OK
```

AT+BAND

Description: Regional frequency band

This command is used to access and configure the regional frequency band.

Command	Input Parameter	Return Value	Return Code
AT+BAND?	-	AT+BAND: Set number corresponding to active regions (0: EU433, 1: CN470, 2: RU864, 3: IN865, 4: EU868, 5: US915, 6: AU915, 7: KR920, 8: AS923)	OK
AT+BAND=?	-	0, 1, 2, 3, 4, 5, 6, 7, 8, 8-1, 8-1-JP, 8-2, 8-3, 8-4	OK
AT+BAND=<Input Parameter>	0, 1, 2, 3, 4, 5, 6, 7, 8, 8-1, 8-1-JP, 8-2, 8-3, 8-4	-	OK or AT_PARAM_ERROR

List of Band Parameter Options

Code	Regional Band
0	EU433
1	CN470
2	RU864
3	IN865
4	EU868
5	US915
6	AU915
7	KR920
8 or 8-1	AS923-1
8-1-JP	AS923-1 for Japan with LBT support
8-2	AS923-2
8-3	AS923-3
8-4	AS923-4

Examples:

```
AT+BAND=5
```

```
OK
```

```
AT+BAND=?
```

```
5
```

```
OK
```

AT+LPSSEND

Description: Long data payload

This command is used to send a long data payload up to 1024 bytes. The total number of payload uplinks is dependent on the DR set using `AT+DR` and the frequency band using `AT+BAND`. It follows the limits set on the LoRaWAN Regional Specification.

Command	Input Parameter	Return Value	Return Code
AT+LPSSEND?	-	AT+LPSSEND: Send long packet data (Maximum is 1024 bytes)	OK
AT+LPSSEND=<Input Parameter>	port:ack:payload	-	OK or AT_PARAM_ERROR
ack: 0-unconfirmed, 1-confirmed			

This command exclusively works in RAKwireless WisGate Edge LoRaWAN Gateways, in which the long payload is automatically combined in the backend. You need to activate the long payload mode (**Enable LPTP** switch) in the device configuration in the RAKwireless WisGate Edge LoRaWAN Gateway built-in network server, as shown in **Figure 1**, to enable this functionality in the gateway side.

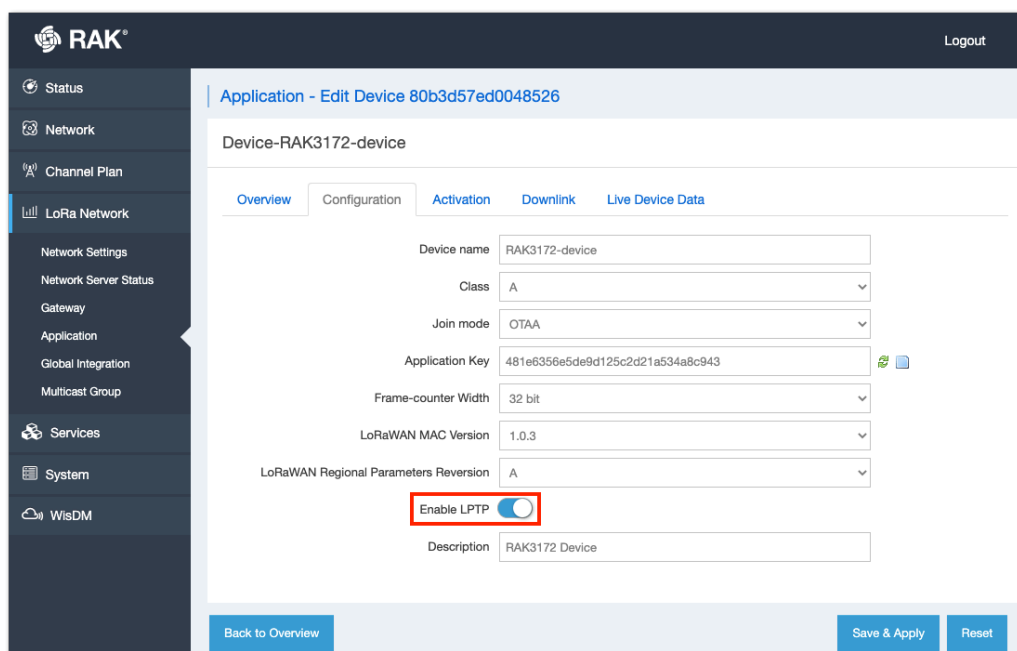


Figure 1: Enable long payload mode in the device configuration

Example:

In this example, the device is configured in US915 and illustrated to send 100 bytes confirmed payload in different datarate specifically 2, 1 and 0.

```
AT+LPSSEND=2:1:111111111112222222223333333333444444444455555555556666666666777777777788888888889999999999000000000
```

```
OK
```

```

AT+DR=2
OK
AT+LPSSEND=2:1:111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000
OK
+EVT:SEND CONFIRMED OK
AT+DR=1
OK
AT+LPSSEND=2:1:111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000
OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
AT+DR=0
OK
AT+LPSSEND=2:1:111111111122222222223333333333444444444455555555556666666666777777777788888888889999999999000000000
OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK
+EVT:SEND CONFIRMED OK

```

Figure 2: AT+LPSSEND command

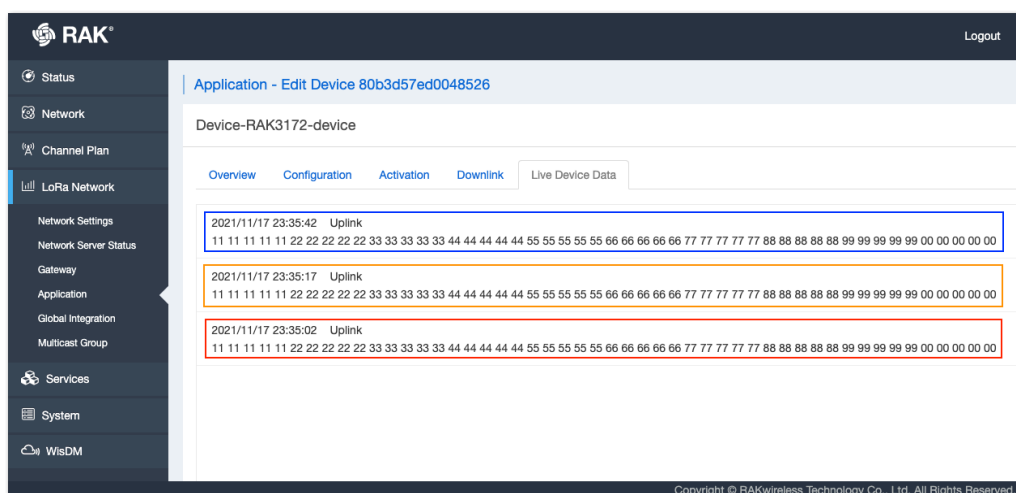


Figure 3: Payload sent in the network server

NOTE

The large payload via **AT+LPSSEND** will be sliced automatically depending on the DR that follows the LoRaWAN specifications. You can check [Appendix III](#) for the maximum size.

AT+LINKCHECK

Description: Network link status

This command is used to access and configure the device network link status.

Command	Input Parameter	Return Value	Return Code
AT+LINKCHECK?	-	AT+LINKCHECK: Verify Network Link Status	OK
AT+LINKCHECK=?	-	0, 1, 2	OK
AT+LINKCHECK=<Input Parameter>	0, 1, 2	-	OK or AT_PARAM_ERROR

Input parameter details: 0 - Disable Link Check 1 - Execute Link Check just once on the next payload uplink. 2 - Module will automatically execute one-time Link Check after every payload uplink.

Reply format:

```
+EVT:LINKCHECK:Y0,Y1,Y2,Y3,Y4
```

- **Y0** represents the result of Link Check.
 - 0 – represents the Link Check execute success.
 - Non-0 – represents the Link Check execute fail.
- **Y1** represents the DemodMargin.
- **Y2** represents the GwCnt (Number of Gateways that received link check command).
- **Y3** represents the RSSI.
- **Y4** represents the SNR.

Examples:

```
AT+LINKCHECK=1

OK
AT+SEND=2:12345678

OK
+EVT:LINKCHECK:0,25,1,-53,11
```

AT+USEND

Description: Unified Send Data

This command is used to send unified data on a dedicated port number.

Command	Input Parameter	Return Value	Return Code
AT+USEND?	-	AT+USEND: Unified SEND data along with the application port	OK
AT+USEND=<Input Parameter>	port:confirm:nbtrials:payload	-	OK, AT_PARAM_ERROR, AT_BUSY_ERROR, or AT_NO_NETWORK_JOINED

Input parameter details:

- **port**: value (1 to 223)
- **confirm**: value (0/confirm or 1/unconfirm)
- **nbtrials**: set the number of retransmissions, value (0 to 7)
- **payload**: data to be transmitted

Example:

```
AT+USEND=1:1:2:1234

OK
+EVT:SEND CONFIRMED OK
```

AT+PNM

Description: Public Network Mode

This command is used to enable public network mode. This is only available in LoRaWAN mode and it will return `MODE_NOT_SUPPORT` if the device is in P2P mode. The default setting is `1`.

Command	Input Parameter	Return Value	Return Code
<code>AT+PNM?</code>	-	<code>AT+PNM</code> : Get or set the public network mode (0=off, 1=on)	<code>OK</code>
<code>AT+PNM=?</code>	-	<code>0</code> or <code>1</code>	<code>OK</code>
<code>AT+PNM=<Input Parameter></code>	<code>0</code> or <code>1</code>	-	<code>OK</code> or <code>AT_PARAM_ERROR</code>

Example:

```
AT+PNM=1
OK
AT+PNM=?
1
OK
```

Class B Mode

This section describes the commands related to Class B mode.

NOTE

The commands in these sections work in Class B mode. You need to configure your device to Class B via `AT+CLASS=B` to ensure that

- [AT+PGSLOT - Slot Periodicity Command](#)
- [AT+BFREQ - Beacon Frequency Command](#)
- [AT+LTIME - Local Time Command](#)

AT+PGSLOT

Description: Slot Periodicity Command

This command is used to access and configure unicast ping slot periodicity.

Command	Input Parameter	Return Value	Return Code
<code>AT+PGSLOT?</code>	-	<code>AT+PGSLOT</code> : PS:periodicity	<code>OK</code>
<code>AT+PGSLOT=?</code>	-	PS: <code>0</code> up to PS: <code>7</code>	<code>OK</code>
<code>AT+PGSLOT=<Input Parameter></code>	<code><0 to 7></code>	-	<code>OK</code> or <code>AT_PARAM_ERROR</code>

Examples:

```
AT+PGSLOT=3
OK
AT+PGSLOT=?
3
```

OK

AT+BFREQ

Description: Beacon Frequency Command

This command is used to get the current beacon (default broadcast) frequency.

Command	Input Parameter	Return Value	Return Code
AT+BFREQ?	-	AT+BFREQ: Get the Beacon frequency	OK
AT+BFREQ=?	-	*<DRx, psfreq>*	OK

Examples: EU868

```
AT+BFREQ=?
3,869.525

OK
```

US915

```
AT+BFREQ=?
8,923.300

OK
```

AT+LTIME

Description: Local Time Command

This command is used to access the local time in a UTC format.

Command	Input Parameter	Return Value	Return Code
AT+LTIME?	-	AT+LTIME: Get the local time in UTC format	OK
AT+LTIME=?	-	LTIME: *<hms on MM/DD/YYYY>*	OK

Example:

```
AT+LTIME=?
LTIME:03h56m52s on 09/18/2021

OK
```

Device Information

This section describes the commands for getting device information.

- [AT+RSSI - Receive signal strength indicator](#)
- [AT+SNR - Signal to Noise Ratio](#)

- [AT+VER - Version of the firmware](#)
- [AT+TIMEREQ - UTC time request](#)

AT+RSSI

Description: Receive signal strength indicator

This command is used to get the RSSI value of the last packet received.

Command	Input Parameter	Return Value	Return Code
<code>AT+RSSI?</code>	-	AT+RSSI: Get the RSSI of the last received packet	OK
<code>AT+RSSI=?</code>	-	< integer > in dBm	OK

NOTE

`AT+RSSI` will show the RSSI based on the last downlink received. If there is no downlink received yet, it will return 0.

Example:

```
AT+RSSI=?
-31

OK
```

AT+SNR

Description: Signal to Noise Ratio

This command is used to get the SNR value of the last packet received.

Command	Input Parameter	Return Value	Return Code
<code>AT+SNR?</code>	-	AT+SNR: Get the SNR of the last received packet	OK
<code>AT+SNR=?</code>	-	< integer >	OK

NOTE

`AT+SNR` will show the SNR based on the last downlink received. If there is no downlink received yet, it will return 0.

Example:

```
AT+SNR=?
8

OK
```

AT+VER

Description: Version of the firmware

This command is used to get the firmware version installed on the device.

Command	Input Parameter	Return Value	Return Code
AT+VER?	-	AT+VER: Get the version of the firmware	OK
AT+VER=?	-	< V.x.y >	OK

Example:

```
AT+VER=?
V1.0.4

OK
```

AT+TIMEREQ

Description: UTC time request

This command is used to get the UTC time. It only works if the device is in LoRaWAN mode and successfully joined.

Command	Input Parameter	Return Value	Return Code
AT+TIMEREQ?	-	AT+TIMEREQ: Request the current date and time	OK
AT+TIMEREQ=<Input Parameter>	0 or 1		OK, AT_PARAM_ERROR, or AT_NO_NETWORK_JOINED

NOTE

With the AT+TIMEREQ command, you will have an asynchronous reply +EVT: TIMEREQ OK after a successful uplink.

You also need to use the AT+LTIME command to get the exact time data/value.

Example:

Send AT+TIMEREQ=1 after a successful join.

```
+EVT:JOINED
AT+TIMEREQ=1

OK
```

Send an uplink payload and see if TIMEREQ is successful.

```
AT+SEND=2:12345678

OK
+EVT:TIMEREQ OK
+EVT:SEND CONFIRMED OK
```

Check the returned time/value.

```
AT+LTIME=?
LTIME:02h46m12s on 22/10/2021
```

OK

RF Test

Description: Radio frequency test management

This section describes the commands related to RF test management.

- [AT+CW - Send Continuous Wave](#)
- [AT+TRSSI - Receive Signal Strength Indicator](#)
- [AT+TTONE - Start radio frequency tone test](#)
- [AT+TTX - Start RF Tx LoRa test](#)
- [AT+TRX - Start RF Rx LoRa test](#)
- [AT+TCONF - LoRa RF test configuration](#)
- [AT+TTH - RF Tx hopping test](#)
- [AT+TOFF - Stop ongoing radio frequency test](#)
- [AT+CERTIF - LoRaWAN Certification mode](#)

AT+CW

Description: Send a continuous wave

This command is used to enable continuous RF transmissions with configurable frequency, transmit power, and duration.

Command	Input Parameter	Return Value	Return Code
<code>AT+CW?</code>	-	<code>AT+CW:</code> Send continuous wave	OK
<code>AT+CW=<Input Parameter></code>	<code>freq:txpower:time</code>	-	OK or <code>AT_PARAM_ERROR</code>

NOTE

Frequency configuration:

- RAK3172(L) is needed to use the low-frequency range 150000000 - 600000000.
- RAK3172(H) is needed to use the high-frequency range 600000000 - 960000000.

Txpower:

- 5 to 22

Time (seconds):

- 0 - 65535

Example:

```
AT+CW=868000000:20:60
```

OK

AT+TRSSI

Description: Receive Signal Strength Indicator

This command is used to get the RF RSSI tone test of the device.

Command	Input Parameter	Return Value	Return Code
AT+TRSSI?	-	AT+TRSSI: Start RF RSSI tone test	OK
AT+TRSSI	-	[TimeDisplay]: RSSI Value in dBm	OK

Example:

```
AT+TRSSI
1632128999s205:Rx FSK Test
1632128999s219:>>> RSSI Value= -12 dBm

OK
```

AT+TTONE

Description: Start radio frequency tone test

This command is used to get the RF RSSI tone test of the device.

Command	Input Parameter	Return Value	Return Code
AT+TTONE?	-	AT+TTONE: Start RF tone test	OK
AT+TTONE	-	[TimeDisplay]:Tx FSK Test	OK or AT_BUSY_ERROR

Example:

```
AT+TTONE
1632128969s345:Tx FSK Test

OK
```

AT+TTX

Description: Start RF Tx LoRa test

This command is used to set the number of packets to be sent for a PER RF TX test.

Command	Input Parameter	Return Value	Return Code
AT+TTX?	-	AT+TTX: Set number of packets sent with RF LoRa test	OK
AT+TTX=<Input Parameter>	< 0 < Integer < 64 >	-	OK or AT_PARAM_ERROR

Example:

```
AT+TTX=3
1632129370s692:Tx LoRa Test
1632129370s698:Tx 1 of 3
1632129372s022:OnTxDone
1v32129372s522:Tx 2 of 3
1632129373s844:OnTxDone
1v32129374s344:Tx 3 of 3
1632129375s666:OnTxDone
```

OK

AT+TRX

Description: Start RF Rx LoRa test

This command is used to set the number of packets to be received for a PER RF TX test.

Command	Input Parameter	Return Value	Return Code
AT+TRX?	-	AT+TRX: Set number of packets received with RF LoRa test	OK
AT+TRX=<Input Parameter>	< 0 < Integer < 64 >	-	OK or AT_PARAM_ERROR

Example:

Another separate device should have a simultaneous AT+TTX=3 command to get the right readings for `AT+TRX=3`.

```

AT+TRX=3
154s047:OnRxDone
154s047:RssiValue=-24 dBm, SnrValue=7
154s047:Rx 1 of 3 >>> PER= 0 %
155s871:OnRxDone
155s871:RssiValue=-25 dBm, SnrValue=7
155s871:Rx 2 of 3 >>> PER= 0 %
157s693:OnRxDone
157s693:RssiValue=-26 dBm, SnrValue=6
157s693:Rx 3 of 3 >>> PER= 0 %

OK

```

AT+TCONF

Description: Config LoRa RF test

This command is used to access and set LoRa configuration test.

Command	Input Parameter	Return Value	Return Code
AT+TCONF?	-	AT+TCONF: Configure LoRa RF test	OK
AT+TCONF=?	-	Summary of configuration	OK or AT_ERROR
AT+TCONF=<Input Parameter>	Check on the example	-	OK or AT_PARAM_ERROR

NOTE

Guide on Bandwidth parameter (in Hz): 0=7812, 1=15625, 2=31250, 3=62500, 4=125000, 5=250000, 6=500000

Examples:

```

AT+TCONF=?
1: Freq= 868000000 Hz
2: Power= 14 dBm
3: Bandwidth= 125000 Hz
4: SF= 12

```

```

5: CR= 4/5
6: LNA State= 0
7: PA Boost State= 0
8: modulation LORA
9: Payload len= 16 Bytes
10: Frequency deviation not applicable
11: LowDROpt[0 to 2]= 2
12 BT product not applicable
can be copy/paste in set cmd: AT+TCONF=868000000:14:4:12:4/5:0:0:1:16:25000:2:3

OK
AT+TCONF=868000000:14:4:12:4/5:0:0:1:16:25000:2:3

OK

```

AT+TTH

Description: RF Tx hopping test

This command is used to access and configure RF Tx hopping test.

Command	Input Parameter	Return Value	Return Code
AT+TTH?	-	AT+TTH: Starts RF Tx hopping test from Fstart to Fstop, with Fdelta steps.	OK
AT+TTH=<Input Parameter>	Fstart,Fstop,FDelta,PacketNb	-	OK

Example:

```

AT+TTH=p68000000,868300000,100000,4
1467s836:Tx Hop at 868000000Hz. 0 of 4
1467s836:Tx LoRa Test
1467s841:Tx 1 of 1
1468s176:OnTxDone
1468s676:Tx Hop at 868100000Hz. 1 of 4
1468s676:Tx LoRa Test
1468s681:Tx 1 of 1
1469s016:OnTxDone
1469s516:Tx Hop at 868200000Hz. 2 of 4
1469s516:Tx LoRa Test
1469s521:Tx 1 of 1
1469s856:OnTxDone
1470s356:Tx Hop at 868300000Hz. 3 of 4
1470s356:Tx LoRa Test
1470s361:Tx 1 of 1
1470s696:OnTxDone

OK

```

AT+TOFF

Description: Stop ongoing radio frequency test

This command is used to stop the ongoing RF test.

Command	Input Parameter	Return Value	Return Code
AT+TOFF?	-	AT+TOFF: Stops ongoing RF test	OK
AT+TOFF	-	-	OK

Example:

```
AT+TOFF
Test Stop

OK
```

AT+CERTIF

Description: LoRaWAN Certification mode

This command is used to enable LoRaWAN Certification mode (1-OTAA, 0-ABP).

Command	Input Parameter	Return Value	Return Code
AT**+CERTIF?	-	AT+CERTIF: Set the module in LoRaWAN Certification mode	OK
AT+CERTIF=<Input Parameter>	0 or 1	-	OK or AT_PARAM_ERROR

NOTE

AT+CERTIF puts the timer to handler data transmission equal to 5 s.

Examples:

OTAA

```
AT+CERTIF=1

OK
+EVT:JOINED
```

ABP

```
AT+CERTIF=0
+EVT:JOINED

OK
```

P2P Mode

This section describes the commands related to LoRa point to point functionality.

- [AT+NWM - LoRa network work mode \(LoRaWAN or P2P\)](#)
- [AT+PFREQ - P2P mode frequency](#)
- [AT+PSF - P2P mode spreading factor](#)
- [AT+PBW - P2P mode bandwidth](#)

- AT+NWM**

This command is used to switch to LoRaWAN or (P2P)point-to-point mode.

Command	Input Parameter	Return Value	Return Code
AT+NWM?	-	AT+NWM: Get or set the network work NWM (0:P2P, 1:LoRaWAN)	OK
AT+NWM=?	-	-	OK
AT+NWM=<Input Parameter>	0 P2P or 1 LoRaWAN	-	OK or AT_PARAM_ERROR

LoRa P2P to LoRaWAN

Current Work Mode: LoRaWAN.

[illegible]

RAK3172-H Version:v1.0.2 May 26 2021
Current Work Mode: LoRa P2P.

AT+PFREQ

Description: P2P mode frequency

This command is used to access and configure P2P mode frequency.

Command	Input Parameter	Return Value	Return Code
AT+PFREQ?	-	AT+PFREQ: Configure P2P frequency	OK
AT+PFREQ=?	-	<frequency> in Hz	OK
AT+PFREQ=<Input Parameter>	<frequency> in Hz	-	OK or AT_PARAM_ERROR

NOTE

Frequency configuration:

- RAK3172(L) is needed to use the low-frequency range 150000000 - 600000000.
- RAK3172(H) is needed to use the high-frequency range 600000000 - 960000000.

Example:

```
AT+PFREQ=868000000

OK
AT+PFREQ=?
868000000

OK
```

AT+PSF

Description: P2P mode spreading factor

This command is used to access and configure the P2P mode spreading factor.

Command	Input Parameter	Return Value	Return Code
AT+PSF?	-	AT+PSF: Configure P2P SpreadingFactor (6, 7, 8, 9, 10, 11, 12)	OK
AT+PSF=?	-	6, 7, 8, 9, 10, 11, 12	OK
AT+PSF=<Input Parameter>	<6 to 12>	-	OK or AT_PARAM_ERROR

Examples:

```
AT+PSF=9

OK
AT+PSF=?
9
```

OK

AT+PBW

Description: P2P mode bandwidth

This command is used to access and configure P2P mode bandwidth.

Command	Input Parameter	Return Value	Return Code
AT+PBW?	-	AT+PBW: Configure P2P Bandwidth (125, 250, 500)	OK
AT+PBW=?	-	125, 250, or 500	OK
AT+PBW=<Input Parameter>	125, 250, or 500	-	OK or AT_PARAM_ERROR

Examples:

AT+PBW=125

OK

AT+PBW=?

125

OK

AT+PCR

Description: P2P mode coding rate

This command is used to access and configure the P2P mode coding rate.

Command	Input Parameter	Return Value	Return Code
AT+PCR?	-	AT+PCR: Configure P2P code rate (4/5=0, 4/6=1, 4/7=2, 4/8=3)	OK
AT+PCR=?	-	0, 1, 2, or 3	OK
AT+PCR=<Input Parameter>	0, 1, 2, or 3	-	OK or AT_PARAM_ERROR

Examples:

AT+PCR=0

OK

AT+PCR=?

0

OK

AT+PPL

Description: P2P mode preamble length

This command is used to access and configure P2P mode preamble length.

Command	Input Parameter	Return Value	Return Code
AT+PPL?	-	AT+PPL: Configure P2P Preamble Length (2-65535)	OK
AT+PPL=?	-	2 up to 65535	OK
AT+PPL=<Input Parameter>	2 up to 65535	-	OK or AT_PARAM_ERROR

Examples:

AT+PPL=8

OK

AT+PPL=?

8

OK

AT+PTP

Description: P2P mode TX power

This command is used to access and configure P2P mode TX power.

Command	Input Parameter	Return Value	Return Code
AT+PTP?	-	AT+TP: Configure P2P Power (5-22)	OK
AT+PTP=?	-	5 up to 22	OK
AT+PTP=<Input Parameter>	5 up to 22	-	OK or AT_PARAM_ERROR

Examples:

AT+PTP=15

OK

AT+PTP=?

15

OK

AT+P2P

Description: P2P configuration settings

This command is used to access and configure all P2P mode settings.

Command	Input Parameter	Return Value	Return Code
AT+P2P?	-	AT+P2P: Configure P2P all parameters	OK
AT+P2P=?	-	<Freq>,<SF>,<Bandwidth>,<CR>,<Preamble>,<Power>	OK or AT_ERROR

Command	Input Parameter	Return Value	Return Code
AT+P2P=<Input Parameter>	<Freq>, <SF>, <Bandwidth>, <CR>, <Preamble>, <Power>	-	OK or AT_PARAM_ERROR

Input parameter details:

- RAK3172(L) is needed to use the low-frequency range 150000000 - 525000000.
- RAK3172(H) is needed to use the high-frequency range 525000000 - 960000000.
- SF: 5 to 12
- Bandwidth: 125, 250 or 500
- CR: 0=4/5, 1=4/6, 2=4/7, 3=4/8
- Preamble: 2 to 65535
- Power: 5 to 22 dBm. If the value is 14, it means 14 dBm.

Examples:

```
AT+P2P=868000000:9:125:0:8:15
```

```
OK
```

```
AT+P2P=?
```

```
868000000:9:125:0:8:15
```

```
OK
```

AT+PSEND

Description: P2P send data

This command is used to send P2P data.

Command	Input Parameter	Return Value	Return Code
AT+PSEND?	-	AT+PSEND: P2P send data	OK
AT+PSEND=<Input Parameter>	*<Payload>*	-	OK or AT_PARAM_ERROR

Example:

```
AT+PSEND=11223344
```

```
OK
```

NOTE

To successfully transmit P2P, you must have another device configured with the same P2P parameters and ready to receive the payload with the **AT+PRECV** command. The maximum payload in P2P mode is 255 bytes.

AT+PRECV

Description: P2P receive data window

This command is used to configure the timeout period for P2P window reception.

Command	Input Parameter	Return Value	Return Code
AT+PRECV?	-	AT+PRECV: Set the timeout period for P2P window reception (0-65535) ms	OK
AT+PRECV=?	-	*<Time in mSec>*	OK
AT+PRECV=<Input Parameter>	*<Time in mSec>*	-	OK or AT_PARAM_ERROR

Input parameter details:

- If the value is set to 65534, the device will continuously listen to P2P LoRa TX packets without any timeout. This is the same as setting the device in RX mode.
- If the value is set to 65535, the device will listen to P2P TX without a timeout. But it will stop listening once a P2P LoRa packet is received to save power.
- If the value is 0, the device will stop listening to P2P TX data. The device is in TX mode.

Example:

```
AT+PRECV=65535

OK
+EVT:RXP2P, RSSI -37, SNR 11
+EVT:11223344
```

Multicast Group

This section describes the commands related to multicast group functionality.

- [AT+ADMULC](#) - Add multicast group
- [AT+RMVMULC](#) - Remove multicast group
- [AT+LSTMULC](#) - Multicast list

AT+ADMULC

Description: Add multicast group

This command is used to add a new multicast group and multicast parameters.

Command	Input Parameter	Return Value	Return Code
AT+ADMULC?	-	AT+ADMULC: Add a new multicast group	OK
AT+ADMULC=<Input Parameter>	[Class]:[DevAddr]:[NwkSKey]:[AppSKey]:[Frequency]: [Datarate]:[Periodicity]	-	OK or AT_PARAM_ERROR
Input parameter details:			

If Class is C, the periodicity parameter is removed.

Examples:

For class B,

```
AT+ADDMULC=B:11223344:11223344556677881122334455667788:11223344556677881122334455667788:868000000:0:0
```

```
OK
```

For class C,

```
AT+ADDMULC=C:11223344:11223344556677881122334455667788:11223344556677881122334455667788:868000000:0
```

```
OK
```

AT+RMVMULC

Description: Remove multicast group

This command is used to remove the configured multicast group.

Command	Input Parameter	Return Value	Return Code
AT+RMVMULC?	-	AT+RMVMULC: Delete multicast group	OK
AT+RMVMULC=<Input Parameter>	<DevAddr>	-	OK

Example:

You can only remove a group with the address already added.

```
AT+RMVMULC=11223344
```

```
OK
```

AT+LSTMULC

Description: Multicast list

This command is used to get the information about the configured multicast group.

Command	Input Parameter	Return Value	Return Code
AT+LSTMULC?	-	AT+RMVMULC: Get multicast group information	OK
AT+LSTMULC=?	-	MC1:[Class]:[DevAddr]:[NwkSK ey]:[AppSK ey]:[Frequency]:[Datarate]	OK

Examples:

```
AT+LSTMULC=?
MC1:ClassC:11223344:11223344556677881122334455667788:11223344556677881122334455667788:868000000:0
```

```
OK
```

Data Transparent Transmission

This section describes the commands related to transparent data transmission in UART.

ATD

Description: Set transparent transmission mode

This command is used to set the transparent transmission mode. This only works in LoRaWAN mode.

NOTE

In data transparent transmission mode, all your input to the UART port will be transmitted to the network server. Standard AT commands will not work. To get out of data transparent transmission mode, you need to input the `+++` command without any termination (e.g. CR or LF).

Command	Input Parameter	Return Value	Return Code
ATD?	-	ATD: Enter data transparent transmission mode	OK
ATD	-	-	OK

Example:

Two packets are transmitted on the demo below. During a transparent transmission mode, there is no string shown on the payload sent.

```
ATD
OK
OK
+EVT:SEND CONFIRMED OK
OK
+EVT:SEND CONFIRMED OK
```

+++

Description: Stop transparent transmission mode

This command is used to stop the transparent transmission mode.

Command	Input Parameter	Return Value	Return Code
+++?	-	+++ : Exit transparent transmission mode	OK
+++	-	-	OK

NOTE

There must be no any UART termination after `+++`. There must be no CR or LF after the `+++` command else it will be transmitted as payload and the device will continue in Data Transparent Transmission mode.

Appendix

Appendix I: Data Rate by Region

EU433/EU868/RU864/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

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
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

Data Rate	Configuration	Indicative Physical Bit Rate [bit/s]
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

TXPower	Configuration (Conducted Power)
0	30 dBm - 2*TXpower
1	28 dBm
2	26 dBm
3 ~ 9	-
10	10 dBm
11 ~ 15	RFU

AU915

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

TXPower	Configuration (EIRP)
0	MaxEIRP
1 ~ 10	MaxEIRP - 2*TXPower
11 ~ 10	RFU

KR920

By default, MaxEIRP is considered to be +14 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

AS923

By default, Max EIRP 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

IN865

By default, MaxEIRP is considered to be 30 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	MaxEIRP - 16 dB
9	MaxEIRP - 18 dB
10	MaxEIRP - 20 dB
11 ~ 15	RFU

RU864

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

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

M in the following list is the length with MAC header, N is the maximum usable payload size for the user data without MAC header.

EU868

Data Rate	M	N
0	59	51
1	59	51
2	59	51
3	123	115

Data Rate	M	N
4	250	242
5	250	242
6	250	242
7	250	242
8 ~ 15	Not Defined	Not Defined

US915

Data Rate	M	N
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

Data Rate	M	N
0	59	51
1	59	51
2	59	51
3	123	115
4	250	242
5	250	242

Data Rate	M	N
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

Data Rate	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

Data Rate	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

Data Rate	Uplink MAC Payload Size (M)		Downlink MAC Payload Size (M)	
7	250	250	250	250
8	RFU		RFU	

IN865

Data Rate	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

RU864

Data Rate	M	N
0	59	51
1	59	51
2	59	51
3	123	115
4	230	222
5	230	222
6	230	222
7	230	222
8 ~ 15	Not Defined	Not Defined

CN470

Data Rate	M	N
0	59	51
1	59	51

Data Rate	M	N
2	59	51
3	123	115
4	250	242
5	250	242
6 ~ 15	Not Defined	Not Defined

EU433

Data Rate	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: Asynchronous Events

This section describes the output from UART lines of RAK3172 that can occur at any point in time while the device is operational.

Event	UART output	Status description
Beacon acquisition process	+BC: <status>	<div>FAILED</div> - Beacon sync failed
		<div>DONE</div> - Switch to classB mode
		<div>LOST</div> - No Beacon received for 2 hours, switch to classA
		<div>LOCKED</div> - Receive Beacon
Pingslot process	+PS: <status>	<div>DONE</div> - At this time, ping slots will be opened periodically. The modem is now in Class B mode.
Class B/C downlink	+EVT: <status>	<div>RX3/RXC, RSSI -110, SNR 5</div> - Indicates that data has been received on pingslot received window.
		<div>PortNumber:12345678</div> - Received binary data on PortNumber.

Event	UART output	Status description
		UNICAST - Let the host know that the Rx is in unicast Class B mode.
		MULCAST MC1 - Data received in multicast group 1
Class A downlink	+EVT: < status >	RX1/RX2, RSSI -110, SNR 5
		PortNumber:12345678 - Received binary data on PortNumber.
Join	+EVT: < status >	JOIN FAILED
		JOINED
Confirm	+EVT: < status >	SEND CONFIRMED OK
		SEND CONFIRMED FAILED
P2P	+EVT: < status >	00112233 - Received binary data format data
		RXP2P, RSSI -110, SNR 5 - Indicates that data has been received on P2P received window.
Link Check	+EVT: < status >	LINKCHECK:Y0,Y1,Y2,Y3,Y4
		Y0 - represents link status (1:links success, 2: link fail)
		Y1 - represents the DemodMargin
		Y2 - represents the NbGateways
		Y3 - represents the RSSI of the command' s download
		Y4 - represents the SNR of the command' s download