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RUI3 AT Command Manual

Overview

AT command is the initial setting in the default serial port used on RUI3 devices. The default baud rate is 115200.



NOTE

When communicating through AT commands with the WisDuo modules, it is important to always wait for the response from the WisDuo module before sending the next command. Some AT commands respond not only immediately, but also with a second asynchronous event response that must be handled before the next command can be processed.

For users that write the firmware for the host MCU with Arduino or PlatformIO, it is recommended to use a communication library. The [RUI3-Arduino-Library](#) is a helper for the AT command communication between a RUI3 based RAKwireless WisDuo module and an Arduino based host MCU. This library can be installed using the Arduino IDE library manager. [Library documentation](#). [Library examples](#)

RUI3-Supported RAK Modules

- [RAK4630](#)
- [RAK4631-R](#)
- [RAK3172 or RAK3172-T](#)
- [RAK3272S](#)
- [RAK3372 / RAK3172 Evaluation Board](#)
- [RAK3172-SiP](#)
- [RAK3272-SiP](#)
- [RAK11720](#)
- [RAK11721](#)

- RAK11722 ↗

RUI3 AT Command Format

The AT commands have the standard format `AT+XXX`, with `XXX` denoting the command. There are four available command behaviors:

- `AT+XXX?` provides a short description of the given command, for example, `AT+DEVEUI?`.
- `AT+XXX` is used to run a command, such as `AT+JOIN`.
- `AT+XXX=?` is used to get the value of a given command, for example, `AT+CFS=?`.
- `AT+XXX=<value>` is used to provide a value to a command, for example, `AT+CFM=1`.

The output format is as below:

```
AT+XXX=<value><CR><LF>
<CR><LF><Status><CR><LF>
```

💡 NOTE

- `<CR>` stands for “carriage return” and `<LF>` stands for “line feed”.
- The `<value><CR><LF>` output is returned whenever the “help `AT+XXX?`” or the “get `AT+XXX=?`” commands are run.

When no value is returned, the `<value><CR><LF>` output is not returned at all. Every command (except for `ATZ` used for MCU reset) returns a status string, which is preceded and followed by `<CR><LF>` in a `<CR><LF><Status><CR><LF>` format.

The possible status codes are:

- `OK`: command runs correctly without error.
- `AT_ERROR`: generic error.
- `AT_PARAM_ERROR`: a parameter of the command is wrong.
- `AT_BUSY_ERROR`: the LoRa network is busy, so the command has not been completed.
- `AT_TEST_PARAM_OVERFLOW`: the parameter is too long.
- `AT_NO_CLASSB_ENABLE`: End-node has not yet switched in Class B.

- **AT_NO_NETWORK_JOINED**: the LoRa network has not been joined yet.
- **AT_RX_ERROR**: error detection during the reception of the command.

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

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General Commands

This section describes the generic commands related to the device.

AT

Description: Attention

This command is used to check that the communication is working properly.

Command	Input Parameter	Return Value	Return Code
AT	-	-	OK

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AT?

Description: Short help

This command provides short help for all the supported commands.

Command	Input Parameter	Return Value	Return Code
AT?	-	<ul style="list-style-type: none"> - AT+<CMD>? : help on <CMD> - AT+<CMD> : run <CMD> - AT+<CMD>=<value> : set the value - AT+<CMD>=? : get the value - followed by the details of all commands 	OK

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ATE

Description: AT Command Echo

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

Command	Input Parameter	Return Value	Return Code
AT	-	-	OK
AT?	-	ATE: toggle the AT Command echo	OK

Example:

```
ATE
```

```
OK
```

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ATZ

Description: MCU Reset

This command is used to trigger a reset on the module.

Command	Input Parameter	Return Value	Return Code
ATZ?	-	ATZ: triggers a reset on the MCU.	OK
ATZ	-	No return value and return code. The module resets.	<i>Shows device information</i>

Example:

```
ATZ
RAKwireless RAK3172
-----
Version: RUI_4.0.4_RAK3172-E
Current Work Mode: LoRa P2P.
```

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ATR

Description: Restore default parameters

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

Command	Input Parameter	Return Value	Return Code
ATR?	-	ATR: restore default parameters	OK
ATR	-	No return value.	OK

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AT+SN

Description: Serial number

This command can read the device serial number.

Command	Input Parameter	Return Value	Return Code
AT+SN?	-	AT+SN: get the serial number of the device (max 18 char)	OK
AT+SN=?	-	<1-18char>	OK

Example:

```
AT+SN=?
9181004E20900057
OK
```

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AT+BAT

Description: Battery level

This command is used to access the battery level.

Command	Input Parameter	Return Value	Return Code
AT+BAT?	-	AT+BAT: get the battery level (volt)	OK
AT+BAT=?	-	AT+BAT = <float>	OK

Example:

```
AT+BAT=?
AT+BAT=2.971191
OK
```

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AT+BUILDTIME

Description: Build time of the firmware

This command is used to access the build date and time of the firmware.

Command	Input Parameter	Return value	Return code
AT+BUILDTIME?	-	AT+BUILDTIME: get the build time of the firmware	OK
AT+BUILDTIME=?	-	AT+BUILDTIME= <i>date - time of build</i>	OK AT_BUSY_ERROR

Example:

```
AT+BUILDTIME=?
AT+BUILDTIME=20220324-153044
OK
```

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AT+REPOINFO

Description: Repo information

This command is used to access the Repo Information of the firmware.

Command	Input Parameter	Return value	Return code
AT+REPOINFO?	-	AT+REPOINFO: get the commit ID of the firmware	OK

Command	Input Parameter	Return value	Return code
AT+REPOINFO=?	-	AT+REPOINFO = <i>firmware repo information</i>	OK

Example:

```
AT+REPOINFO=?
AT+REPOINFO=713fbcca:6ecbb45f:e198f620:b43f5395:4a6defb9:c9438443:5ccb8eec:70e5
OK
```

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AT+VER

Description: Version of the firmware

This command is used to access the version of the firmware.

Command	Input Parameter	Return Value	Return Code
AT+VER?	-	AT+VER: get the version of the firmware	OK
AT+VER=?	-	AT+VER = <i>firmware version</i>	OK

Example:

```
AT+VER=?
AT+VER=RUI_4.1.0_RAK4631
OK
```

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AT+CLIVER

Description: Version of the AT Command

This command is used to access the version of the AT command.

Command	Input Parameter	Return Value	Return Code
AT+CLIVER?	-	AT+CLIVER: get the version of the AT command	OK
AT+CLIVER=?	-	AT+CLIVER =x.y.z	OK

Example:

```
AT+CLIVER=?
AT+CLIVER=1.5.2
OK
```

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AT+APIVER

Description: Version of the API

This command is used to access the version of the RUI API.

Command	Input Parameter	Return Value	Return Code
AT+APIVER?	-	AT+APIVER: get the version of the RUI API	OK
AT+APIVER=?	-	AT+APIVER =x.y.z	OK

Example:

```
AT+APIVER=?
AT+APIVER=3.0.0
OK
```

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AT+HWMODEL

Description: The string of the hardware model

This command is used to access the string of the hardware model.

Command	Input Parameter	Return Value	Return Code
AT+HWMODEL?	-	AT+HWMODEL: get the string of the hardware model	OK
AT+HWMODEL=?	-	AT+HWMODEL = <i>module model</i>	OK

Example:

```
AT+HWMODEL=?
AT+HWMODEL=rak4631
OK
```

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AT+HWID

Description: The string of the hardware ID

This command is used to access the string of the hardware mode.

Command	Input Parameter	Return Value	Return Code
AT+HWID?	-	AT+HWID: get the string of the hardware ID	OK
AT+HWID=?	-	AT+HWID= <i>module hw ID</i>	OK

Example:

```
AT+HWID=?
AT+HWID=nrf52840
OK
```

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AT+ALIAS

Description: Alias name of the device

This command allows the user to set an alias name for the device.

Command	Input Parameter	Return Value	Return Code
AT+ALIAS?	-	AT+ALIAS: add an alias name to the device	OK
AT+ALIAS=?	-	<string, 16char>	OK
AT+ALIAS=<Input>	<string, 16char>	-	OK AT_PARAM_ERROR

Example:

```
AT+ALIAS=RAK
```

OK

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- `<string, 16char>`: set of 16-character string.

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AT+SYSV

Description: System voltage of the device

This command allows the user to get the System Voltage.

Command	Input Parameter	Return Value	Return Code
<code>AT+SYSV?</code>	-	<code>AT+SYSV</code> : get the System Voltage	OK
<code>AT+SYSV=?</code>	-	<code><float></code>	OK

Example:

```
AT+SYSV=?
AT+SYSV=3.318750
OK
```

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AT+BLEMAC

NOTE

This command is **ONLY** available on the RAK4630 and RAK11720 modules.

Description: BLE Mac Address of the device

This command allows the user to get or set the BLE Mac address.

Command	Input Parameter	Return Value	Return Code
AT+BLEMAC?	-	AT+BLEMAC: get or set the BLE Mac address	OK
AT+BLEMAC=?	-	<string>:<string>:<string>: <string>:<string>:<string>	OK
AT+BLEMAC= <Input>	<string, 12 char>	<string>	OK

Example:

```
AT+BLEMAC=?
AT+BLEMAC=d1:e0:f2:4d:58:1a
OK
```

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AT+BOOTVER

Description: RUI bootloader version of the device

This command allows the user to get the version of RUI bootloader.

Command	Input Parameter	Return Value	Return Code
AT+BOOTVER?	-	AT+BOOTVER: get the version of RUI bootloader	OK
AT+BOOTVER=?	-	<string>	OK

Command	Input Parameter	Return Value	Return Code
AT+BOOTVER= <Input>	-	RUI Bootloader Version	OK

Example:

```
AT+BOOTVER=?
AT+BOOTVER=*****
OK
```

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Low Power

AT+SLEEP

Description: Sleep mode

This command enables sleep mode.

Command	Input Parameter	Return Value	Return Code
AT+SLEEP	-	-	OK
AT+SLEEP?	-	AT+SLEEP: enter sleep mode for a period of time (ms)	OK
AT+SLEEP=<Input>	<integer>	-	OK AT_PARAM_ERROR

Example:

```
AT+SLEEP=1000
```

OK

NOTE

- `AT+SLEEP` command with no parameter will enable sleep mode continuously without timeout period.
- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- `<Input>`: 1 decimal integer and the range of values is $1 \sim (2^{32} - 1)$.

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AT+LPM

Description: Low power mode of the device

This command provides a way to enable/disable low power mode. LPM makes the device sleep automatically after sending AT commands. This eliminates the need to send `AT+SLEEP`.

Command	Input Parameter	Return Value	Return Code
<code>AT+LPM?</code>	-	<code>AT+LPM</code> : get or set the low power mode (0=OFF; 1=ON)	OK
<code>AT+LPM=?</code>	-	<code><string></code>	OK
<code>AT+LPM=</code> <code><Input></code>	<code>0</code> or <code>1</code>	-	OK <code>AT_PARAM_ERROR</code>

Example:

```
AT+LPM=?
```

```
AT+LPM=0
```

OK

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- `<string>`: either "0" or "1"

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AT+LPMLVL

NOTE

The two sleep modes can **ONLY** be selected with RAK3172. This AT command has **NO EFFECT** on other modules.

Description: Sleep level for low power mode

This command sets the low power mode level of the RAK3172 module in LPM. Stop2 Mode is more optimized for low current consumption compared to Stop1 Mode but it will not allow you to wake up using UART1. On Stop1 Mode, both UART1 and UART2 can wake up the device from LPM.

Command	Input Parameter	Return Value	Return Code
<code>AT+LPMLVL?</code>	-	<code>AT+LPMLVL</code> : get or set the low power mode level (1 = STOP1 Mode; 2 = STOP2 Mode)	OK
<code>AT+LPMLVL=?</code>	-	1 or 2	OK
<code>AT+LPMLVL=</code> <code><Input></code>	1 or 2	-	OK <code>AT_PARAM_ERROR</code>

Example:

```
AT+LPMLVL=?  
AT+LPMLVL=1
```

OK

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- This command is only applicable to RAK3172 devices.

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Serial AT Command

These commands are related to device serial configurations.

AT+LOCK

Description: Lock the AT Command serial port

This command locks the AT command serial port.

Command	Input Parameter	Return Value	Return Code
<code>AT+LOCK?</code>	-	<code>AT+LOCK</code> : lock the serial port	OK
<code>AT+LOCK</code> or <code>AT+LOCK=</code>	-	-	-

NOTE

- If you input the `AT+LOCK` or `AT+LOCK=` command, it will lock the serial port.
- The default password is '00000000' and can be changed via the `AT+PWDWORD` command.

Example:

AT

OK

AT+LOCK

AT+VER=?

COMMAND_LOCKED

00000000

AT+VER=?

3.1.0-p1_21q4_rc2.50

OK

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AT+PWORD

Description: Set the AT Command serial port password

This command sets the password for locking the AT command serial port.

Command	Input Parameter	Return Value	Return Code
AT+PWORD?	-	AT+PWORD: set the serial port locking password	OK
AT+PWORD= <input>	<1-8 character>	-	OK

Example:

AT+PWORD=~!@pword

OK



NOTE

- Any printable characters. <Input>: 1-8 characters.

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AT+BAUD

Description: Set the serial port baud rate

This command sets the serial port baud rate.

Command	Input Parameter	Return Value	Return Code
AT+BAUD?	-	AT+BAUD: get or set the serial port baud rate	OK
AT+BAUD=<Input>	<integer>	-	OK AT_PARAM_ERROR

Example:

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

AT+BAUD=921600
AT_PARAM_ERROR
```

💡 NOTE

- The last configured baudrate will be retained to the module even with reset or power recycle.
- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- `<Input>`: 1 decimal integer and the range of values is $1 \sim 2^{32}$.

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AT+ATM

Description: AT Command mode

This command provides a way to switch to AT command mode.

Command	Input Parameter	Return Value	Return Code
AT+ATM?	-	AT+ATM: switch to AT command mode	OK
AT+ATM	-	-	OK

NOTE

AT Command mode is the default serial port setting of RUI3 devices.

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Bootloader Commands

This section describes the bootloader commands related to the device.

AT+BOOT

Description: Bootloader mode

This command causes the device to enter Bootloader mode to upgrade firmware.

Command	Input Parameter	Return Value	Return Code
AT+BOOT?	-	AT+BOOT: enter bootloader mode for firmware upgrade	OK
AT+BOOT or AT+BOOT=	-	<BOOT MODE>	

Example:

AT+BOOT
<BOOT MODE>

💡 NOTE

To escape BOOT MODE, execute `at+run` command. This will end the BOOT MODE then restart the RUI3 device.

`AT_BUSY_ERROR` is returned when the bootloader process is already running.

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AT+VER

Description: Version of the Bootloader (Bootloader only).

This command is used to access the version of the bootloader (Bootloader only).

Command	Input Parameter	Return Value	Return Code
<code>AT+VER=?</code>	-	<code>RUI_BOOT_0.6_STM32WLE5CC</code>	-

Example:

```
AT+VER=?  
RUI_BOOT_0.6_STM32WLE5CC
```

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AT+VERSION

Description: Version of the Bootloader (Bootloader only).

This command is used to access the version of the bootloader (Bootloader only).

Command	Input Parameter	Return Value	Return Code
AT+VERSION	-	RUI_BOOT_0.6_STM32WLE5CC	-

Example:

```
AT+VERSION
RUI_BOOT_0.6_STM32WLE5CC
```

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AT+BOOTSTATUS

Description: Bootloader Status (Bootloader only).

This command is used to get the status of the bootloader (Bootloader only).

Command	Input Parameter	Return Value	Return Code
AT+BOOTSTATUS	-	Boot Mode	-

Example:

```
AT+BOOTSTATUS
Boot Mode
```

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AT+RUN

Description: Leaving Boot Mode (Bootloader only).

This command is used to leave and boot into application (Bootloader only).

Command	Input Parameter	Return Value	Return Code
AT+RUN	-	Stop Boot Mode	-

Example:

```
AT+RUN
Stop Boot Mode
```

RAKwireless Arduino Digital Example

Current Work Mode: LoRa P2P.

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AT+RESET

Description: Device Reset (Bootloader only).

This command is used to reset the device (Bootloader only).

Command	Input Parameter	Return Value	Return Code
AT+RESET	-	-	-

Example:

```
AT+RESET
RAKwireless Arduino Digital Example
-----
Current Work Mode: LoRa P2P.
```

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LoRaWAN Keys and IDs

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

AT+DEVEUI

Description: Device EUI

This command is used to access the unique end-device ID. Used in OTAA mode.

Command	Input Parameter	Return Value	Return Code
AT+DEVEUI?	-	AT+DEVEUI: get or set the device EUI (8 bytes in hex)	OK
AT+DEVEUI=?	-	< 8 hex >	OK
AT+DEVEUI= <Input>	< 8 hex >	-	OK AT_PARAM_ERROR

Example:

```
AT+DEVEUI=?
AT+DEVEUI=1122334455667788
OK
```

```
AT+DEVEUI=1122334455667788
OK
```

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.
- Keys are MSB first. <Input>: 16 digit length, character 0-9, a-f, A-F only, representing eight (8) hexadecimal numbers.

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AT+APPEUI

Description: Application identifier

This command is used to access the unique application identifier in OTAA mode.

Command	Input Parameter	Return Value	Return Code
AT+APPEUI?	-	AT+APPEUI: get or set the application EUI (8 bytes in hex)	OK
AT+APPEUI=?	-	< 8 hex >	OK
AT+APPEUI= <Input>	< 8 hex >	-	OK AT_PARAM_ERROR

Example:

```
AT+APPEUI=0102030405060708
```

```
OK
```

```
AT+APPEUI=010203040506070809
```

```
AT_PARAM_ERROR
```

```
AT+APPEUI=?
```

```
AT+APPEUI=0102030405060708
```

```
OK
```

NOTE

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.
- Keys are MSB first. **<Input>**: 16 digit length, character 0-9, a-f, A-F only, representing eight (8) hexadecimal numbers.

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AT+APPKEY

Description: Application Key

This command is used to access the application key in OTAA mode.

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

Example:

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

```
OK
```

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

```
AT_PARAM_ERROR
```

```
AT+APPKEY=?
```

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

```
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- Keys are MSB first. `<Input>`: 32 digit length, character 0-9, a-f, A-F only, representing 16 hexadecimal numbers.

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AT+DEVADDR

Description: Device Address

This command is used to access the device address in ABP mode.

Command	Input Parameter	Return Value	Return Code
AT+DEVADDR?	-	AT+DEVADDR: get or set the device address (4 bytes in hex)	OK
AT+DEVADDR=?	-	< 4 hex >	OK
AT+DEVADDR= <Input>	< 4 hex >	-	OK AT_PARAM_ERROR

Example:

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

```
OK
```

```
AT+DEVADDR=?
```

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

```
OK
```

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.
- Keys are MSB first. <Input>: 8 digit length, character 0-9, a-f, A-F only, representing four (4) hexadecimal numbers.

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AT+APPSKEY

Description: Application Session Key

This command is used to set the application session key in ABP mode.

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

Example:

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

```
OK
```

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

```
AT_PARAM_ERROR
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- Keys are MSB first. `<Input>`: 32 digit length, character 0-9, a-f, A-F only, representing 16 hexadecimal numbers.

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AT+NWKSKEY

Description: Network Session Key

This command is used to get or set the network session key in ABP mode.

Command	Input Parameter	Return Value	Return Code
AT+NWKSKEY?	-	AT+NWKSKEY: get or set the network session key (16 bytes in hex)	OK
AT+NWKSKEY=?	-	AT+NWKSKEY=< 16 hex >	OK
AT+NWKSKEY= <Input>	< 16 hex >	-	OK AT_PARAM_ERROR

Example:

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

```
OK
```

```
AT+NWKSKEY=?
```

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

```
OK
```

 **NOTE**

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- Keys are MSB first. `<Input>`: 32 digit length, character 0-9, a-f, A-F only, representing 16 hexadecimal numbers.

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AT+NETID

Description: Network ID (NetID)

This command is used to access the network identifier (NetID) of 3 octets.

Command	Input Parameter	Return Value	Return Code
AT+NETID?	-	AT+NETID: get or set the network ID (NetID) (3 bytes in hex)	OK
AT+NETID=?	-	AT+NETID=< 3 hex >	OK

Example:

```
AT+NETID=?
AT+NETID=000001
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- Keys are MSB first. **Return Value:** 6-digit length, character 0-9, a-f, A-F only, representing three (3) hexadecimal numbers.

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AT+MCROOTKEY

Description: Multicast Root Key

This command is used to get the multicast root key of the device.

Command	Input Parameter	Return Value	Return Code
AT+MCROOTKEY?	-	AT+MCROOTKEY: get the multicast root key (32 bytes in hex)	OK
AT+MCROOTKEY=?	-	<32 hex>	OK

Example:

```
AT+MCROOTKEY=?
AT+MCROOTKEY=46B1A450DDDE349310F0EFDEEDFBB44B
OK
```

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LoRaWAN Joining and Sending

This section describes the commands related to the join procedure and data payload.

AT+CFM

Description: Confirm Mode

This command is used to configure the uplink payload to be confirmed or unconfirmed type.

Command	Input Parameter	Return Value	Return Code
AT+CFM?	-	AT+CFM: get or set the confirmation mode (0 = OFF, 1 = ON)	OK
AT+CFM=?	-	AT+CFM = (0 or 1)	OK
AT+CFM=<Input>	0 or 1	-	OK AT_PARAM_ERROR

Example:

```
AT+CFM=1
OK
```

```
AT+CFM=?
```

```
AT+CFM=1
```

```
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.

- In this case, the **default value is 0**.

`AT+CFS=?` is used to know whether the last sent message has been confirmed or not.

When the confirmation mode is 1, each sent message must be confirmed FAILED or OK.

e.g.

```
?>at+send=12:123456
?>+EVT: SEND CONFIRMED FAILED
?>at+send=12:123456
?>+EVT: SEND CONFIRMED OK
```

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AT+CFS

Description: Confirm Status

This command is used to access the status of the last **SEND** command.

Command	Input Parameter	Return Value	Return Code
<code>AT+CFS?</code>	-	<code>AT+CFS</code> : get the confirmation status of the last <code>AT+SEND</code> (0 = failure, 1 = success)	OK
<code>AT+CFS=?</code>	-	0 or 1	OK

Example:

AT+CFS=?

AT+CFS=0

OK

NOTE

This command works together with `AT+CFM=1`, which is the confirm mode configuration. If the return of this command is `1`, the last confirmed uplink is successful. If it is `0`, then the last confirmed uplink attempt failed. This command is read only, and the default value on device startup is `0`.

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AT+JOIN

Description: Join LoRaWAN Network

This command is used to join a LoRaWAN network.

Command	Input Parameter	Return Value	Return Code
<code>AT+JOIN?</code>	-	<code>AT+JOIN: join network</code>	OK
<code>AT+JOIN=?</code>	-	<code>AT+JOIN=Param1: Param2: Param3: Param4</code>	OK or <code>AT_BUSY_ERROR</code>
<code>AT+JOIN=<Input Parameter></code>	<code>Param1:Param2:Param3:Param4</code>	-	OK
	<code>Param1 = Join command: 1 for joining the network, 0 for stop joining.</code>		

Command	Input Parameter	Return Value	Return Code
	<p><i>Param2 = Auto-Join config:</i> 1 for Auto-join on power up, 0 for no auto-join. (Optional parameter 0 is default)</p>		
	<p><i>Param3 = Reattempt interval:</i> 7 - 255 seconds (Optional parameter 8 seconds is default).</p>		
	<p><i>Param4 = No. of join attempts:</i> 0 - 255 (Optional parameter 0 times is default).</p>		

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.

Parameters of `AT+JOIN` command are optional. You can use `AT+JOIN` directly to join the LoRaWAN network. If no parameters are configured, the device will use the default values.

The device will as well respond with an asynchronous message whether the join process was successful or failed.

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



If joining fails, make sure your device is within the coverage of the gateway. Also, ensure that the RUI3 LoRaWAN device is in LoRaWAN mode via `AT+NWM=1`. The region is correct via `AT+BAND`, and the EUIs and keys are correct.

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AT+NJM

Description: Network Join Mode

This command is used to access the network join mode.

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

Example:

```
AT+NJM=?
```

0

OK

AT+NJM=1

OK

AT+NJM=2

OK

AT_PARAM_ERROR

NOTE

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.
- In this case, the default value is **1**.

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AT+NJS

Description: LoRa Network Join status

This command is used to access the current activation status of the device. It shows if the device joined or not in a LoRaWAN network.

Command	Input Parameter	Return Value	Return Code
AT+NJS?	-	AT+NJS: get the join status (0 = not joined, 1 = joined)	OK
AT+NJS=?	-	AT+NJS= (0 or 1)	OK

Example:

AT+NJS=?

AT+NJS=0

OK

AT+NJS=?

```
AT+NJS=1
```

```
OK
```

 **NOTE**

The command will return `1` if the device has successfully joined the network and `0` if the device hasn't joined the network yet.

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AT+RECV

Description: Last received data

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

Command	Input Parameter	Return Value	Return Code
<code>AT+RECV?</code>	-	<code>AT+RECV</code> : print the last received data in hex format	OK
<code>AT+RECV=?</code>	-	<code>AT+RECV=</code> <port>:<payload>	OK

Where:

- <port>: 1 decimal integer and the range of values is 1~233.
- <payload>: 2500 digit length, must be an even number of digits and character 0~9, a~f, A~F only, representing 1256 hexadecimal numbers.

Example:

```
AT+RECV=?
AT+RECV=45:112233
OK
```

This command returns the last received data in a form, along with the port on which it was received. The format of the output is as follows:

```
<port>:<payload><CR><LF>
<CR><LF>OK<CR><LF>
```

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

```
0:
OK
```

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AT+SEND

Description: Send data

This command provides the way to send data on a dedicated port number.

Command	Input Parameter	Return Value	Return Code
<code>AT+SEND?</code>	-	<code>AT+SEND</code> : send data along with the application port	OK
<code>AT+SEND=<input></code>	<code><port>:<payload></code>	-	OK <code>AT_PARAM_ERROR</code> <code>AT_BUSY_ERROR</code> <code>AT_NO_NETWORK_JOINED</code>

Where:

- `<port>`: 1 decimal integer and the range of values is 1~233.

- <payload>: 2~500-digit length, must be an even number of digits and character 0-9, a-f, A-F only, representing 1~256 hexadecimal numbers.

Example:

```
AT+SEND=12:112233
```

OK

NOTE

- **AT_PARAM_ERROR** R is returned when setting wrong or malformed value.
- **AT_BUSY_ERROR** is returned when the previous send is not complete (send waiting for duty cycle, rx window not consumed).
- **AT_NO_NETWORK_JOINED** is returned when the network is not yet joined.

NOTE

This is an asynchronous command. **OK** means that the device has started to send. The device will respond with an asynchronous message whether the send process was successful or failed.

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AT+LPSEND

Description: Long packet data

This command provides the way to send long packet text data.

Command	Input Parameter	Return Value	Return Code
AT+LPSEND?	-	AT+LPSEND: send long packet data (Maximum is 1000 bytes)	OK

Command	Input Parameter	Return Value	Return Code
AT+LPSEND= <Input>	-	<port>:<ack>:<payload>	OK AT_PARAM_ERROR

Where: <port>: application port to be transmitted <ack>; – 0: indicates this is an unconfirmed message; – 1: indicates this is a confirmed message; <payload>: payload in hexadecimal format strings (maximum length is 1000 bytes).

Example:

```
AT+LPSEND=2:1:123456
```

```
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- This command is only supported by WisGate Edge gateways and their internal LoRaWAN server.

NOTE

This is an asynchronous command. `OK` means that the device has started to send. The device will respond with an asynchronous message whether the send process was successful or failed.

NOTE

Long packet data mode is only supported for uplink packets. Downlink packets **cannot** have the long packet data format.

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AT+RETY

Description: Confirm packet retransmission

This command sets the number of retransmissions of confirmed packet data.

Command	Input Parameter	Return Value	Return Code
AT+RETY?	-	AT+RETY: set the number of retransmissions of Confirm packet data	OK
AT+RETY=?	-	AT+RETY= [0,1,2,3,4,5,6,7]	OK
AT+RETY= <input>	[0,1,2,3,4,5,6,7]	-	OK AT_PARAM_ERROR

Example:

```
AT+RETY=?  
AT+RETY=3  
OK
```

```
AT+RETY=2  
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is 0, and the retry cycle range of values is 0~7.

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LoRaWAN Network Management

This section provides a set of commands for network management.

AT+ADR

Description: Adaptive Rate

This command is used to access the adaptive data rate.

Command	Input Parameter	Return Value	Return Code
AT+ADR?	-	AT+ADR : get or set the adaptive data rate setting (0 = OFF, 1 = ON)	OK
AT+ADR=?	-	AT+ADR =(0 or 1)	OK
AT+ADR= <Input>	0 or 1	-	OK AT_PARAM_ERROR

Example:

```
AT+ADR=?
AT+ADR=1
OK
```

 **NOTE**

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is 1.

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AT+CLASS

Description: LoRa Class

This command is used to access the LoRaWAN class.

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

Examples:

```
AT+CLASS=A
```

```
OK
```

```
AT+CLASS=?
```

```
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=?

AT+CLASS=B:S0

OK

[Back](#) **AT+DCS**

Description: Duty cycle settings

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

Example:

AT+DCS=?

AT+DCS=1

OK

AT+DCS=1

OK

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the **EU868 default value is 1**. It depends on the region to disable or enable, and it can only be read.

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AT+DR

Description: Data rate

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

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

Example:

```
AT+DR=?
```

```
AT+DR=3
```

```
OK
```

```
AT+DR=2
```

```
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the EU868 default value is 0.

- **EU433 / RU864 / IN865 / EU868 / CN470 / KR920:** The data rate range of values is 0-5 (DR0-DR5).
- **AS923:** The data rate range of values is 2-5 (DR2-DR5).
- **US915:** The data rate range of values is 0-4 (DR0-DR4).
- **AU915 / LA915:** The data rate range of values is 0-6 (DR0-DR6).
- Complete information about DR parameter on each region can be found on [RUI3 Appendix - LoRaWAN Regional Parameter \(Data Rate\)](#).

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AT+JN1DL

Description: Join delay on RX window 1

This command is used to configure the join delay on RX window 1. The range of acceptable values is 1 to 14 seconds.

Command	Input Parameter	Return Value	Return Code
<code>AT+JN1DL?</code>	-	<code>AT+JN1DL</code> : get or set the join accept delay between the end of TX and the join RX window 1 in second	OK
<code>AT+JN1DL=?</code>	-	5	OK <code>AT_BUSY_ERROR</code>
<code>AT+JN1DL=<input></code>	<code><integer></code>	-	OK <code>AT_PARAM_ERROR</code> <code>AT_BUSY_ERROR</code>

Example:

```
AT+JN1DL=?
AT+JN1DL=5
OK
```

```
AT+JN1DL=10
```

```
OK
```

NOTE

- `AT_BUSY_ERROR` is returned when a join or a send is being processed.
- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is 5. `<Input>`: 1-decimal integer and the range of values is 1~14.

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AT+JN2DL

Description: Join delay on RX window 2

This command is used to configure the join delay on RX window 2. The range of acceptable values is 2 to 15 seconds.

Command	Input Parameter	Return Value	Return Code
<code>AT+JN2DL?</code>	-	<code>AT+JN2DL</code> : get the join accept delay between the end of TX and the join RX window 2 in second	OK
<code>AT+JN2DL=?</code>	-	6	OK <code>AT_BUSY_ERROR</code>
<code>AT+JN2DL=<input></code>	<code><integer></code>	-	OK <code>AT_PARAM_ERROR</code> <code>AT_BUSY_ERROR</code>

Example:

```
AT+JN2DL=?  
AT+JN2DL=6  
OK
```

NOTE

- Take note that `AT+JN2DL` must be larger than `AT+JN1DL` or it will not work. `AT_BUSY_ERROR` is returned when wrong setting is applied.
- Also, `AT_BUSY_ERROR` is returned when a join or a send is being processed.
- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.

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AT+PNM

Description: Public network mode

This command is used to access the public network mode.

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)	OK
<code>AT+PNM=?</code>	-	0 or 1	OK
<code>AT+PNM=<input></code>	0 or 1	-	OK <code>AT_PARAM_ERROR</code>

Example:

```
AT+PNM=?  
AT+PNM=0  
OK
```

```
AT+PNM=1
```

OK

```
AT+PNM=2
```

AT_PARAM_ERROR

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.
- In this case, the default value is 1.

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AT+RX1DL

Description: Delay of the received window 1

This command is used to access the delay of the received window 1. The range of acceptable values is 1 to 15 seconds. Whenever AT+RX1DL is updated, AT+RX2DL is also updated automatically.

Command	Input Parameter	Return Value	Return Code
AT+RX1DL?	-	AT+RX1DL : get or set the delay between the end of TX and the RX window 1 (in 1~15 seconds)	OK
AT+RX1DL=?	-	<integer>	OK
AT+RX1DL=<input>	<integer>	-	OK AT_PARAM_ERROR AT_BUSY_ERROR

Example:

AT+RX1DL=?

AT+RX1DL=1

OK

AT+RX1DL=10

OK

NOTE

- `AT_PARAM_ERROR` is returned when a join or a send is being processed.
- `AT_BUSY_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is 1. `<Input>`: 1-decimal integer and the range of values is 1~15.

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AT+RX2DL

Description: Delay of the received window 2

This command is used to access the delay of the received window 2. The range of acceptable values is 2 to 15 seconds. Whenever `AT+RX2DL` is updated, `AT+RX1DL` is also updated automatically.

Command	Input Parameter	Return Value	Return Code
<code>AT+RX2DL?</code>	-	<code>AT+RX2DL</code> : get the delay between the end of TX and the RX window 2 (in 2~15 seconds)	OK
<code>AT+RX2DL=?</code>	-	<code><integer></code>	OK <code>AT_BUSY_ERROR</code>

Example:

```
AT+RX2DL=?
```

```
AT+RX2DL=2
```

```
OK
```

 **NOTE**

- `AT_BUSY_ERROR` is returned when setting wrong or malformed value.

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AT+RX2DR

Description: Data rate of the received window 2

This command is used to access the data rate of received window 2.

Command	Input Parameter	Return Value	Return Code
<code>AT+RX2DR?</code>	-	<code>AT+RX2DR</code> : get or set the RX2 window data rate	OK
<code>AT+RX2DR=?</code>	-	[0,1,2,3,4,5,6,7] or [8,9,10,11,12,13]	OK <code>AT_BUSY_ERROR</code>
<code>AT+RX2DR=<input></code>	[0,1,2,3,4,5,6,7] or [8,9,10,11,12,13]	-	OK <code>AT_PARAM_ERROR</code> <code>AT_BUSY_ERROR</code>

Example:

```
AT+RX2DR=?
```

```
AT+RX2DR=6
```

```
OK
```

```
AT+RX2DR=5
```

```
OK
```

NOTE

- **AT_PARAM_ERROR** is returned when a join or a send is being processed.
- **AT_BUSY_ERROR** is returned when setting wrong or malformed value.
- In this case, the EU868 default value is 0 and the US915 default value is 8.
EU433 / RU864 / IN865 / EU868 / CN470 / KR920 and the data rate range of values is 0-5 (DR0-DR5).
AS923 and the data rate range of values is 2-5 (DR2-DR5).
US915 / AU915 / LA915 and the data rate range of values is 8-13 (DR8-DR13).

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AT+RX2FQ

Description: Frequency of the received window 2

This command is used to access the frequency of the received window 2.

Command	Input Parameter	Return Value	Return Code
AT+RX2FQ?	-	AT+RX2FQ: get the Rx2 window frequency (Hz)	OK
AT+RX2FQ=?	-	Frequency in Hz	OK AT_BUSY_ERROR

Example:

```
AT+RX2FQ=?
AT+RX2FQ=869535000
OK
```

NOTE

- **AT_BUSY_ERROR** is returned when setting wrong or malformed value.

- In this case, the EU868 default value is 869525000. It depends on the region frequency, and it can only be read.

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AT+TXP

Description: Transmit power

This command is used to access the transmit power.

Command	Input Parameter	Return Value	Return Code
AT+TXP?	-	AT+TXP: get or set the transmitting power (0 = highest TX power, 10 = lowest TX power)	OK
AT+TXP=?	-	<value>	OK AT_PARAM_ERROR
AT+TXP= <input>	<value>	-	OK AT_PARAM_ERROR

Example:

```
AT+TXP=?
AT+TXP=1
OK
```

```
AT+TXP=4
OK
```

NOTE

- AT_PARAM_ERROR is returned when a join or a send is being processed.

- In this case, the TX Power default value is 0.
EU868 / RU864 / KR920 / AS923 / CN470 and Transmit power range of values is 0-7.
US915 / AU915 and Transmit power range of values is 0-14.
EU433 and Transmit power range of values is 0-5.
IN865 and Transmit power range of values is 0-10.
- Highest power start from 0. Complete information about TXP parameter on each region can be found on [RUI3 Appendix - LoRaWAN Regional Parameter \(TX Power\)](#).

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AT+LINKCHECK

Description: Verify 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: get or set the link check setting (0 = disabled, 1 = once, 2 = everytime)	OK
AT+LINKCHECK=?	-	[0,1,2]	OK
AT+LINKCHECK=<Input>	[0,1,2]	-	OK 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.

Example:

```
AT+LINKCHECK=?
```

```
AT+LINKCHECK=0
```

```
OK
```

```
AT+LINKCHECK=1
```

```
OK
```

```
AT+SEND=3:12341234
```

```
OK
```

```
+EVT:LINKCHECK:0,21,1,-60,11
```

NOTE

`LINKCHECK` is a dedicated LoRaWAN MAC command that checks the connectivity status of the end-device to the network. You will have the `LINKCHECK` status reply once the `AT+SEND` command is executed. In case of a failed uplink (regardless if confirmed or unconfirmed), the `LINKCHECK` reply will be `+EVT:LINKCHECK:1,0,0,0,0`.

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

- **Y0** represents the result of Link Check
 - 0 – represents the Link Check execute success (`+EVT:LINKCHECK:0,0,1,-107,4`)
 - Non-0 – represents the Link Check execute fail (`+EVT:LINKCHECK:1,0,0,0,0`)
- **Y1** represents the DemodMargin
- **Y2** represents the NbGateways
- **Y3** represents the RSSI
- **Y4** represents the SNR

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AT+LBT

Description: LoRaWAN "Listen Before Talk" (LBT)

This command is used to enable or disable LoRaWAN LBT.

Command	Input Parameter	Return Value	Return Code
AT+LBT?	-	AT+LBT: get or set the LoRaWAN LBT (support Korea Japan) (0=Disabled; 1=Enabled)	OK
AT+LBT=?	-	<0-1>	OK
AT+LBT= <Input>	<0-1>	-	OK AT_PARAM_ERROR

Example:

```
AT+LBT=?
```

```
AT+LBT=0
```

```
OK
```

💡 NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.

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AT+LBTRSSI

Description: LoRaWAN "Listen Before Talk" RSSI (LBTRSSI)

This command is used to set or get LoRaWAN LBT RSSI.

Command	Input Parameter	Return Value	Return Code
AT+LBTRSSI?	-	AT+LBTRSSI: get or set the LoRaWAN LBT RSSI (support Korea Japan)	OK

Command	Input Parameter	Return Value	Return Code
AT+LBTRSSI=?	-	<RSSI>	OK
AT+LBTRSSI= <Input>	<RSSI>	-	OK AT_PARAM_ERROR

Example:

```
AT+LBTRSSI=?
AT+LBTRSSI=-80
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.

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AT+LBTSCANTIME

Description: LoRaWAN "Listen Before Talk" Scantime (LBTSCANTIME)

This command is used to set or get LoRaWAN LBT Scantime.

Command	Input Parameter	Return Value	Return Code
AT+LBTSCANTIME?	-	AT+LBTSCANTIME: get or set the LoRaWAN LBT scantime (support Korea Japan)	OK
AT+LBTSCANTIME=?	-	<time>	OK

Command	Input Parameter	Return Value	Return Code
AT+LBTSANTIME= <Input>	<time>	-	OK AT_PARAM_ERROR

Example:

```
AT+LBTSANTIME=?
AT+LBTSANTIME=5
OK
```

**NOTE**

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

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AT+TIMEREQ

Description: Time Request

This command is used to request the current date and time.

Command	Input Parameter	Return Value	Return Code
AT+TIMEREQ?	-	AT+TIMEREQ: request the current date and time (0=Disabled, 1=Enabled)	OK
AT+TIMEREQ=?	-	<0-1>	OK
AT+TIMEREQ=<Input>	<0-1>	-	OK AT_PARAM_ERROR

Example:

```
AT+TIMEREQ=?  
AT+TIMEREQ=0  
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value. The time can be acquired with `at+ltime=?` and is returned in UTC+0 timezone as `04h36m00s on 11/27/2023`

[Back](#)**AT+LTIME**

Description: Local time

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

Command	Input Parameter	Return Value	Return Code
<code>AT+LTIME?</code>	-	<code>AT+LTIME</code> : get the local time	OK
<code>AT+LTIME=?</code>	-	<code>LTIME:<HOUR>h<MINUTE>m<SECOND>s<DAY>-<MONTH></code>	OK

Example:

```
AT+LTIME=?  
LTIME: 04h36m00s on 11/27/2023  
OK
```

NOTE

The time is returned in UTC+0 timezone as `04h36m00s` on `11/27/2023`

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Class B Mode

This section provides a set of commands for Class B mode management.

AT+PGSLOT

Description: Periodicity

This command is used to get or set the unicast ping slot periodicity.

Command	Input Parameter	Return Value	Return Code
<code>AT+PGSLOT?</code>	-	<code>AT+PGSLOT</code> : get or set the unicast ping slot periodicity (0-7)	<code>OK</code>
<code>AT+PGSLOT=?</code>	-	[0,1,2,3,4,5,6,7]	
<code>AT+PGSLOT=<input></code>	[0,1,2,3,4,5,6,7]	-	<code>OK</code> <code>AT_PARAM_ERROR</code>

Example:

```
AT+PGSLOT=?
AT+PGSLOT=0
OK

AT+PGSLOT=1
OK
```



NOTE

- **AT_PARAM_ERROR** is returned when a join or a send is being processed.

- In this case, the default value is 0.

<Input>: 1 decimal integer and the range of values is 0~7.

Periodicity = 0 means that the end device opens a ping slot approximately every second during the beacon_window interval.

Periodicity = 7, every 128 seconds, which is the maximum ping period.

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AT+BFREQ

Description: Beacon frequency

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

Command	Input Parameter	Return Value	Return Code
AT+BFREQ?	-	AT+BFREQ : get the data rate and beacon frequency (MHz)	OK
AT+BFREQ=?	-	BCON: < 0, 1, 2, 3, 4, 5, 6, or 7 >, <integer>	OK

Example:

```
AT+BFREQ=?
BCON: 3, 869.525
OK
```

NOTE

- In this case, the EU868 SF9 / 125 MHz and the default frequency value is 869525000. It depends on the region frequency, and it can only be read.

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AT+BTIME

Description: Beacon time

This command is used to access the current beacon time.

Command	Input Parameter	Return Value	Return Code
AT+BTIME?	-	BTIME: get the beacon time (seconds since GPS Epoch time)	OK
AT+BTIME=?	-	BTIME: GPS epoch time	OK

Example:

```
AT+BTIME=?
BTIME: 1226592311
OK
```

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AT+BGW

Description: Gateway GPS coordinate, NetID, and GwID

This command is used to access the GW GPS coordinate, NetID, and GwID.

Command	Input Parameter	Return Value	Return Code
AT+BGW?	-	AT+BGW: get the gateway GPS coordinate, NetID and GwID	OK
AT+BGW=?	-	BGW: <INFO>, <netid>, <gwid>, <longitude>, <latitude>	OK

Example:

```
AT+BGW=?
BGW: 3, "NetID", "GwID", "N/A", "N/A"
OK
```



NOTE

In this case, the default value is 0,0,0,0.

- For a single omnidirectional antenna gateway, the INFO value is 0 with GPS coordinates.
- For a site featuring three sectored antennas, for example, the first antenna INFO equals 0 with GPS coordinates, the second antenna INFO equals 1 with GPS coordinate, etc. In this case, netid and gwid are not relevant. When INFO = 3, the content of network NetID plus a freely allocated gateway gwid and longitude and latitude are not relevant.
- Time in seconds since January 6, 1980 00:00:00 UTC (start of the GPS epoch) modulo 2^{32} .

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Asynchronous Events

This section describes the output from serial/comm lines of the module that can occur at any point in time while the device is operational. Host parser may need to handle this event at any time.

Event	UART output	Status description
Beacon check via <code>AT+CLASS=?</code>	<code>+BC: < status ></code>	<code>LOCKED</code> = Receive Beacon.
		<code>DONE</code> = Switch to Class B mode.

Event	UART output	Status description
		FAILED = Beacon sync failed.
Pingslot process	+PS:< <i>status</i> >	DONE = At this time, ping slots will be opened periodically. The modem is now in Class B mode.
Class B/C downlink	+EVT:< <i>status</i> >	RX_B:-47:3:UNICAST:2:4321 -47 is RSSI, 3 is SNR, Unicast for B / Multicast for C, 2 is Fport, 4321 is payload.
Class A downlink	+EVT:< <i>status</i> >	RX_1:-70:8:UNICAST:1:1234 -70 is RSSI, 8 is SNR, 1 is Fport, 1234 is payload.
Join	+EVT:< <i>status</i> >	JOINED
		JOIN_FAILED_TX_TIMEOUT
		JOIN_FAILED_RX_TIMEOUT
		JOIN_FAILED_errorcode = errorcode can specify specific error on joining process.
LoRaWAN Uplink		+EVT:TX_DONE
		AT_NO_NETWORK_JOINED
Confirm	+EVT:< <i>status</i> >	SEND_CONFIRMED_OK
		SEND_CONFIRMED_FAILED
P2P	+EVT:< <i>status</i> >	TXP2P DONE = Done sending data.

Event	UART output	Status description
		RXP2P RECEIVE TIMEOUT = Nothing received on the configured P2P LoRa RX window.
		RXP2P: -112:1:1234 = -112 is RSSI, 1 is SNR and 1234 is the payload.
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
		Y4 = represents the SNR

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LoRaWAN Information

This section provides a set of commands for battery level, RF signal quality, and FW version.

AT+RSSI

Description: RSSI on reception

This command is used to access the RSSI on reception.

Command	Input Parameter	Return Value	Return Code
AT+RSSI?	-	AT+RSSI: get the RSSI of the last received packet	OK
AT+RSSI=?	-	-31	OK

NOTE

- AT+RSSI=? provides a value in dBm, and it can only be read.
- When the connection is successful, it gets the RSSI of the last received packet.

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AT+ARSSI

Description: Inquire all channel RSSI

This command allows you to view all open channels RSSI

Command	Input Parameter	Return value	Return code
AT+ARSSI?	-	AT+ARSSI: access all open channel RSSI	OK
AT+ARSSI=?	-	0:<Channel 0 rssi> 1:<Channel 1 rssi> 15:<Channel 15 rssi>	OK

Example:

```
AT+ARSSI=?
0:-57,1:-57,2:-57
OK
```

NOTE

- `AT+ARSSI=?` provides a value in dBm, and it can only be read.
- When the connection is successful, it views all open channels RSSI of the last received packet.

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AT+SNR

Description: Signal noise ratio

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

Command	Input Parameter	Return Value	Return Code
<code>AT+SNR?</code>	-	<code>AT+SNR</code> : get the SNR of the last received packet	OK
<code>AT+SNR=?</code>	-	32	OK

NOTE

- `AT+SNR=?` provides a value in dB and it can only be read. When the connection is successful and gets the SNR of the last received packet

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LoRaWAN Regional Commands

This section provides the set of commands related to channels and LoRaWAN® regions.

AT+MASK

Description: Set the channel mask, close or open the channel

This command configures the channel of the device by setting the hexadecimal channel mask.

Command	Input Parameter	Return Value	Return Code
AT+MASK?	-	AT+MASK: get or set the channel mask to close or open the channel (only for US915, AU915, LA915, CN470)	OK
AT+MASK=?	-	<mask>	OK
AT+MASK=<input>	<mask>	-	OK AT_PARAM_ERROR AT_BUSY_ERROR

Example:

```
AT+MASK=0001
```

```
OK
```

```
AT+MASK=?
```

```
AT+MASK=0001
```

```
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- `AT_BUSY_ERROR` is returned when the set command process is already running.
- In this case, the channel mask mode is only for US915, AU915, CN470, and LA915.
- For US915 / AU915 / LA915, the default value is 01FF.
- For CN470, the default value is 0FFF.
- `<Input>`: 4-digit length, character 0-9, a-f, A-F only, representing a 16-bit mask.

The table below shows the attached list on setting the channel mask.

Sub-Band	Channels	16bits	US915	AU915	LA915	CN470
ALL	0000	0000000000000000	All Channels	All Channels	All Channels	All Channels
1	0001	0000000000000001	0-7, 64	0-7, 64	0-7, 64	0-7
2	0002	0000000000000010	8-15, 65	8-15, 65	8-15, 65	8-15
3	0004	00000000000000100	16-23, 66	16-23, 66	16-23, 66	16-23
4	0008	0000000000001000	24-31, 67	24-31, 67	24-31, 67	24-31
5	0010	0000000000010000	32-39, 68	32-39, 68	32-39, 68	32-39
6	0020	0000000000100000	40-47, 69	40-47, 69	40-47, 69	40-47
7	0040	0000000001000000	48-55, 70	48-55, 70	48-55, 70	48-55
8	0080	0000000010000000	56-63, 71	56-63, 71	56-63, 71	56-63
9	0100	0000000100000000	-	-	-	64-71
10	0200	0000001000000000	-	-	-	72-79
11	0400	0000010000000000	-	-	-	80-87
12	0800	0000100000000000	-	-	-	88-95

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AT+CHE

Description: Eight channel mode

This command sets the node to eight-channel mode.

Command	Input Parameter	Return Value	Return Code
AT+CHE?	-	AT+CHE : get or set eight channels mode (only for US915 AU915 LA915 CN470)	OK
AT+CHE=?	-	<value>	OK
AT+CHE=	<value>	-	OK AT_PARAM_ERROR
<Input>			

Example:

```
AT+CHE=1:2:3:4
OK
```

```
AT+CHE=?
AT+CHE=1:2:3:4
OK
```



NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.
- In this case, the eight-channel mode is only for US915, AU915, CN470, and LA915.
- US915 / AU915 / LA915 range of values is 0~9.
- CN470 range of values is 0~12.
- For example, AT+CHE=1:2:3:4 to enable ch0~31. <value>: maximum 12 decimal numbers and the range of values depends on region.

- According to LoRaWAN Regional Parameters v1.0.3revA, the first 64 channels are numbered 0 to 63, starting at 902.3 MHz and increments linearly by 200 kHz to 914.9 MHz.
- The next eight (8) channels numbered 64 to 71 are starting at 903.0 MHz and increments linearly by 1.6 MHz to 914.2 MHz.

US915 Uplink Channels & Attached List

CHE	US915 Uplink Channels (125 kHz,4/5,Unit:MHz,CHS=0)									
0	ENABLE Channel 0-71									
1	902.3	902.5	902.7	902.9	903.1	903.3	903.5	903.7	Channel 0-7	
2	903.9	904.1	904.3	904.5	904.7	904.9	905.1	905.3	Channel 8-15	
3	905.5	905.7	905.9	906.1	906.3	906.5	906.7	906.9	Channel 16-23	
4	907.1	907.3	907.5	907.7	907.9	908.1	908.3	908.5	Channel 24-31	
5	908.7	908.9	909.1	909.3	909.5	909.7	909.9	910.1	Channel 32-39	
6	910.3	910.5	910.7	910.9	911.1	911.3	911.5	911.7	Channel 40-47	
7	911.9	912.1	912.3	912.5	912.7	912.9	913.1	913.3	Channel 48-55	
8	913.5	913.7	913.9	914.1	914.3	914.5	914.7	914.9	Channel 56-63	

CHE	US915 Uplink Channels (125 kHz,4/5,Unit:MHz,CHS=0)									
9	903.0	904.6	906.2	907.8	909.4	911.0	912.6	914.2	Channel 64-71	

 **NOTE**

- According to LoRaWAN® Regional Parameters v1.0.3revA, the first 64 channels are numbered 0 to 63, starting at 902.3 MHz and increments linearly by 200 kHz to 914.9 MHz. The next eight (8) channels numbered 64 to 71 are starting at 903.0 MHz and increments linearly by 1.6 MHz to 914.2 MHz.

AU915 Uplink Channels & Attached List

CHE	AU915 Uplink Channels (125 kHz,4/5,Unit:MHz, CHS=0)									
0	ENABLE Channel 0-71									
1	915.2	915.4	915.6	915.8	916.0	916.2	916.4	916.6	Channel 0-7	
2	916.8	917.0	917.2	917.4	917.6	917.8	918.0	918.2	Channel 8-15	
3	918.4	918.6	918.8	919.0	919.2	919.4	919.6	919.8	Channel 16-23	
4	920.0	920.2	920.4	920.6	920.8	921.0	921.2	921.4	Channel 24-31	
5	921.6	921.8	922.0	922.2	922.4	922.6	922.8	923.0	Channel 32-39	
6	923.2	923.4	923.6	923.8	924.0	924.2	924.4	924.6	Channel 40-47	

CHE	AU915 Uplink Channels (125 kHz, 4/5, Unit: MHz, CHS=0)									
7	924.8	925.0	925.2	925.4	925.6	925.8	926.0	926.2	Channel 48-55	
8	926.4	926.6	926.8	927.0	927.2	927.4	927.6	927.8	Channel 56-63	
9	915.9	917.5	919.1	920.7	922.3	923.9	925.5	927.1	Channel 64-71	

 **NOTE**

- According to LoRaWAN® Regional Parameters v1.0.3revA, the first 64 channels are numbered 0 to 63, starting at 915.2 MHz and increments linearly by 200 kHz to 927.8 MHz. The next eight (8) channels numbered 64 to 71 are starting at 915.9 MHz and increments linearly by 1.6 MHz to 927.1 MHz.

CN470 Uplink Channels & Attached List

CHE	CN470 Uplink Channels (125 kHz, 4/5, Unit: MHz, CHS=0)									
0	ENABLE Channel 0-95									
1	470.3	470.5	470.7	470.9	471.1	471.3	471.5	471.7	Channel 0-7	
2	471.9	472.1	472.3	472.5	472.7	472.9	473.1	473.3	Channel 8-15	
3	473.5	473.7	473.9	474.1	474.3	474.5	474.7	474.9	Channel 16-23	
4	475.1	475.3	475.5	475.7	475.9	476.1	476.3	476.5	Channel 24-31	

CHE	CN470 Uplink Channels (125 kHz, 4/5, Unit: MHz, CHS=0)									
5	476.7	476.9	477.1	477.3	477.5	477.7	477.9	478.1		Channel 32-39
6	478.3	478.5	478.7	478.9	479.1	479.3	479.5	479.7		Channel 40-47
7	479.9	480.1	480.3	480.5	480.7	480.9	481.1	481.3		Channel 48-55
8	481.5	481.7	481.9	482.1	482.3	482.5	482.7	482.9		Channel 56-63
9	483.1	483.3	483.5	483.7	483.9	484.1	484.3	484.5		Channel 64-71
10	484.7	484.9	485.1	485.3	485.5	485.7	485.9	486.1		Channel 72-79
11	486.3	486.5	486.7	486.9	487.1	487.3	487.5	487.7		Channel 80-87
12	487.9	488.1	488.3	488.5	488.7	488.9	489.1	489.3		Channel 88-95

NOTE

- According to LoRaWAN® Regional Parameters v1.0.3revA, the 96 channels are numbered 0 to 95, starting at 470.3 MHz and increments linearly by 200 kHz to 489.3 MHz.

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AT+CHS

Description: Single channel mode

This command sets the node to single-channel mode.

Command	Input Parameter	Return Value	Return Code
AT+CHS?	-	AT+CHS : get or set single channels mode (only for US915 AU915 CN470)	OK
AT+CHS=?	-	0 or <frequency>	OK
AT+CHS= <Input>	<frequency>	-	OK

Example:

```
AT+CHS=902300000
```

```
OK
```

```
AT+CHS=?
```

```
AT+CHS=902300000
```

```
OK
```



In this case, the single-channel mode is only for US915, AU915, CN470.

- US915 frequency range is from 902300000 to 914900000 and increments linearly by 200 kHz (ch0-63).
- US915 frequency range is from 903000000 to 914200000 and increments linearly by 1.6 MHz (ch64-71).
- AU915 frequency range is from 915200000 to 927800000 and increments linearly by 200 kHz (ch0-63).
- AU915 frequency range is from 915900000 to 927100000 and increments linearly by 1.6 MHz (ch64-71).
- CN470 frequency range is from 470300000 to 489300000 and increments linearly by 200 kHz (ch0-95).
- If you input AT+CHS=903900000, it will overwrite the AT+MASK and AT+CHE settings.

- AT+MASK=0001(single channel mode: 903900000), the 0001 is the previous one, and the current is 90390000.

US915 Uplink Channels Frequency & Attached List

US915 Uplink Channels (125k Hz,4/5,Unit:MHz,CHS=Freq)						
ENABLE Channel 0-71						
Channel 0-7	902300000	902500000	902700000	902900000	903100000	903300000
Channel 8-15	903900000	904100000	904300000	904500000	904700000	904900000
Channel 16-23	905500000	905700000	905900000	906100000	906300000	906500000
Channel 24-31	907100000	907300000	907500000	907700000	907900000	908100000
Channel 32-39	908700000	908900000	909100000	909300000	909500000	909700000
Channel 40-47	910300000	910500000	910700000	910900000	911100000	911300000
Channel 48-55	911900000	912100000	912300000	912500000	912700000	912900000
Channel 56-63	913500000	913700000	913900000	914100000	914300000	914500000
Channel 64-71	903000000	904600000	906200000	907800000	909400000	911000000



According to LoRaWAN® Regional Parameters v1.0.3revA, the first 64 channels are numbered 0 to 63, starting at 902.3 MHz and increments linearly by 200 kHz to 914.9 MHz. The next eight (8) channels numbered 64 to 71 are starting at 903.0 MHz and increments linearly by 1.6 MHz to 914.2 MHz

AU915 Uplink Channels Frequency & Attached List

AU915 Uplink Channels (125 kHz, 4/5, Unit:MHz, CHS=Freq)						
ENABLE Channel 0-71						
Channel 0-7	915200000	915400000	915600000	915800000	916000000	916200000
Channel 8-15	916800000	917000000	917200000	917400000	917600000	917800000
Channel 16-23	918400000	918600000	918800000	919000000	919200000	919400000
Channel 24-31	920000000	920200000	920400000	920600000	920800000	921000000
Channel 32-39	921600000	921800000	922000000	922200000	922400000	922600000
Channel 40-47	923200000	923400000	923600000	923800000	924000000	924200000
Channel 48-55	924800000	925000000	925200000	925400000	925600000	925800000
Channel 56-63	926400000	926600000	926800000	927000000	927200000	927400000

AU915 Uplink Channels (125 kHz,4/5,Unit:MHz,CHS=Freq)

Channel 64-71	915900000	917500000	919100000	920700000	922300000	92
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NOTE

According to LoRaWAN® Regional Parameters v1.0.3revA, the first 64 channels are numbered 0 to 63, starting at 915.2 MHz and increments linearly by 200 kHz to 927.8 MHz. The next eight (8) channels numbered 64 to 71 are starting at 915.9 MHz and increments linearly by 1.6 MHz to 927.1 MHz.

CN470 Uplink Channels Frequency & Attached List**CN470 Uplink Channels (125 kHz,4/5,Unit:MHz,CHS=Freq)****ENABLE Channel 0-95**

Channel 0-7	470300000	470500000	470700000	470900000	471100000	47
Channel 8-15	471900000	472100000	472300000	472500000	472700000	47
Channel 16-23	473500000	473700000	473900000	474100000	474300000	47
Channel 24-31	475100000	475300000	475500000	475700000	475900000	47
Channel 32-39	476700000	476900000	477100000	477300000	477500000	47

CN470 Uplink Channels (125 kHz,4/5,Unit:MHz,CHS=Freq)

Channel 40-47	478300000	478500000	478700000	478900000	479100000	47
Channel 48-55	479900000	480100000	480300000	480500000	480700000	48
Channel 56-63	481500000	481700000	481900000	482100000	482300000	48
Channel 64-71	483100000	483300000	483500000	483700000	483900000	48
Channel 72-79	484700000	484900000	485100000	485300000	485500000	48
Channel 80-87	486300000	486500000	486700000	486900000	487100000	48
Channel 88-95	487900000	488100000	488300000	488500000	488700000	48

NOTE

According to LoRaWAN® Regional Parameters v1.0.3revA, the 96 channels are numbered 0 to 95, starting at 470.3 MHz and increments linearly by 200 kHz to 489.3 MHz.

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AT+BAND

Description: Active region

This command sets numbers corresponding to active regions.

Command	Input Parameter	Return Value	Return Code
AT+BAND?	-	AT+BAND: get or set the active region (0 = EU433, 1 = CN470, 2 = RU864, 3 = IN865, 4 = EU868, 5 = US915, 6 = AU915, 7 = KR920, 8 = AS923-1, 9 = AS923-2, 10 = AS923-3, 11 = AS923-4, 12 = LA915)	OK
AT+BAND=?	-	0,1,2,3,4,5,6,7,8,9,10,11,12	OK
AT+BAND= <Input>	0,1,2,3,4,5,6,7,8,9,10,11,12	-	OK AT_PARAM_ERROR AT_BUSY_ERROR

Example:

```
AT+BAND=?
```

```
AT+BAND=3
```

```
OK
```

```
AT+BAND=2
```

```
OK
```

NOTE

- If you are using US915, it is common to have an 8-ch Gateway/LNS setup with channels 8–15. To enable these channels, use `AT+MASK=0002`.
- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- `AT_BUSY_ERROR` is returned when the set command process is already running.

- In this case, the default value is 4, and it depends on the region. 0: EU433 1: CN470 2: RU864 3: IN865 4: EU868 5: US915 6: AU915 7: KR920 8: AS923-1 9: AS923-2 10: AS923-3 11: AS923-4 12: LA915 <Input>: 1 decimal integer and the range of values is 0~8.
- RUI3 LoRa/LoRaWAN® devices are divided into two variants - Low Frequency and High Frequency. Examples are the RAK4630(L) and RAK4630(H) devices.
 - Low frequency variant is compatible only to 0 - 1.
 - High frequency variant is compatible only to 2 - 12.

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LoRaWAN Multicast Group

This section describes the commands related to multicast group functionality.

AT+ADDMULC

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+ADDMULC?	-	AT+ADDMULC: add a new multicast group	OK
AT+ADDMULC=<Input Parameter>	[Class]:[DevAddr]: [NwkSKey]:[AppSKey]: [Frequency]:[Datarate]: [Periodicity]	-	OK or AT_PARAM_ERROR



NOTE

Class B and Class C use the same command input parameters. The periodicity needs to be configured even on Class C so that the command will be accepted with the needed parameters.

Examples:

```
AT+ADDMULC=B:11223344:11223344556677881122334455667788:112233445566778811223344
```

OK

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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 a 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

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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: view multicast group information	OK
AT+LSTMULC=?	-	MC1:[Class]:[DevAddr]:[NwkSK ey]:[AppSKey]:[Frequency]:[Datarate]	OK

Examples:

```
AT+LSTMULC=?
B:11223344:11223344556677881122334455667788:11223344556677881122334455667788:86
OK
```

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P2P Instructions

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

AT+NWM

Description: LoRa network work mode

Switch to point-to-point mode, or LoRaWAN mode [0:Point-to-point, 1:LoRaWAN].

Command	Input Parameter	Return Value	Return Code
AT+NWM?	-	AT+NWM: get or set the network working mode (0 = P2P_LORA, 1 = LoRaWAN, 2 = P2P_FSK)	OK
AT+NWM=?	-	0,1,2	OK
AT+NWM= <Input>	0,1,2	<i>The RUI3 device will restart automatically to switch network work mode</i>	-

Example:

AT+NWM=?

AT+NWM=1

OK

AT+NWM=0

OK

RAKwireless RAK3172

Version: RUI_4.0.4_RAK3172-E

Current Work Mode: LoRa P2P.

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is 1.
- On RAK4630/RAK4631, the device will restart which requires reconnection to detect it again via UART.

[Back](#)**AT+PFREQ**

Description: P2P mode frequency

This command sets the frequency of P2P mode.

Command	Input Parameter	Return value	Return code
AT+PFREQ?	-	AT+PFREQ: configure P2P Frequency	OK
AT+PFREQ=?	-	<Frequency>	OK
AT+PFREQ=<param>	<Frequency>	-	OK AT_PARAM_ERROR

Example:

```
AT+PFREQ=?
AT+PFREQ=868000000
OK
```

```
AT+PFREQ=868500000
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default frequency value is **868000000**, and the frequency range is from **150000000** to **960000000**.
- RUI3 LoRa/LoRaWAN devices are divided into two variants - Low Frequency and High Frequency. Examples are the RAK4630(L) and RAK4630(H) devices.
 - Low frequency variant is compatible only to 150000000 - 600000000.
 - High frequency variant is compatible only to 600000000 - 960000000.

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AT+PSF

Description: P2P mode spreading factor

This command provides a configuration of the spreading factor for the P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+PSF?	-	AT+PSF: configure P2P Spreading Factor (5-12)	OK
AT+PSF=?	-	<Spreading Factor>	OK
AT+PSF= <param>	<Spreading Factor>	-	OK AT_PARAM_ERROR

Example:

```
AT+PSF=?
```

```
AT+PSF=7
```

```
OK
```

```
AT+PSF=12
```

```
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is **7**, and the Spreading Factor range of values is **5~12**.
P2P is an SW proprietary protocol, and it depends on HW support the range of Spreading Factors SF5~SF12.

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AT+PBW

Description: P2P mode bandwidth

This command provides bandwidth configuration for the P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+PBW?	-	AT+PBW: configure P2P Bandwidth (LORA: 0 = 125, 1 = 250, 2 = 500, 3 = 7.8, 4 = 10.4, 5 = 15.63, 6 = 20.83, 7 = 31.25, 8 = 41.67, 9 = 62.5 FSK: 4800-467000)	OK
AT+PBW=?	-	<Bandwidth>	OK
AT+PBW= <param>	<Bandwidth>	-	OK AT_PARAM_ERROR

Example: Changing to bandwidth 250 kHz from 100 kHz.

AT+PBW=?

AT+PBW=0

OK

AT+PBW=1

OK

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is 0 = 125 kHz.

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AT+PCR

Description: P2P mode code rate

This command provides the configuration code rate for the P2P mode.

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

Example:

AT+PCR=?

AT+PCR=2

OK

AT+PCR=3

OK

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.
- In this case, the default value is 0, and the code rate range of values is 0~3. LoRa using coding rate 4/5.

[Back](#)**AT+PPL**

Description: P2P mode preamble length

This command provides configuration Preamble Length for the P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+PPL?	-	AT+PPL: configure P2P Preamble Length (5-65535)	OK
AT+PPL=?	-	<Preamble Length>	OK
AT+PPL= <param>	<Preamble Length>	-	OK AT_PARAM_ERROR

Example:

AT+PPL=?

AT+PPL=8

OK

AT+PPL=8

OK

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.
- In this case, the default value is 8. <param>: 1 decimal integer, and the range of values is 5~65535.

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AT+PTP

Description: P2P mode TX power

This command provides configuration TX Power for the P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+PTP?	-	AT+PTP: configure P2P TX power (5-22)	OK
AT+PTP=?	-	<TX Power>	OK
AT+PTP=<param>	<TX Power>	-	OK AT_PARAM_ERROR

Example:

AT+PTP=?

AT+PTP=14

OK

AT+PTP=20

OK

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.
- In this case, the TX Power default value is **14 dBm**, and the range of values is **5~22 dBm**.

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AT+PBR

Description: P2P FSK bitrate

This command gets or sets the P2P FSK modem bitrate (600 b/s-300000 b/s).

Command	Input Parameter	Return Value	Return Code
AT+PBR?	-	AT+PBR: get or set the P2P FSK modem bitrate (600-300000 b/s)	OK
AT+PBR=?	-	<fbitrate>	OK
AT+PBR=<param>	<fbitrate>	-	OK AT_PARAM_ERROR

Example:

```
AT+PBR=?
AT+PBR=4915
OK
```

```
AT+PBR=4915
OK
```

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.

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AT+PFDEV

Description: P2P FSK modem frequency deviation

This command gets or sets the P2P FSK modem frequency deviation (600-200000 Hz).

Command	Input Parameter	Return Value	Return Code
AT+PFDEV?	-	AT+PFDEV: get or set the P2P FSK modem frequency deviation	OK

Command	Input Parameter	Return Value	Return Code
		(600-200000 Hz)	
AT+PFDEV=?	-	<frequency deviation>	OK
AT+PFDEV= <param>	<frequency deviation>	-	OK AT_PARAM_ERROR

Example:

AT+PFDEV=?

AT+PFDEV=5000

OK

AT+PFDEV=5000

OK



NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.

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AT+PSEND

Description: P2P send data

This command provides the way to P2P send data.

Command	Input Parameter	Return Value	Return Code
AT+PSEND?	-	AT+PSEND: send data in P2P mode	OK

Command	Input Parameter	Return Value	Return Code
AT+PSEND= <Input>	<payload>	-	OK +EVT: TXP2P DONE AT_PARAM_ERROR

Example:

AT+PSEND=112233

OK

+EVT: TXP2P DONE

NOTE

- OK will return immediately after the command is sent to the module.
- +EVT: TXP2P DONE will return once the payload has been sent.
- AT_PARAM_ERROR is returned when setting wrong or malformed value.
- <payload>: 2...500 digit length, must be an even number of digits and characters 0-9, a-f, A-F only, representing 1...256 hexadecimal numbers.
- AT+PSEND can be blocked by certain settings of P2P RX mode. You can disable P2P RX mode and switch to P2P TX mode via the AT+PRECV=0 command to ensure that P2P RX mode is not blocking the AT+PSEND command.

[Back](#)**AT+CAD**

Description: P2P Channel Activity Detection

This command allows the user to get or set the Channel Activity Detection of P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+CAD?	-	AT+CAD: get or set the Channel Activity Detection of P2P mode (1 = ON, 0 = OFF)	OK
AT+CAD=?	-	<0 or 1>	OK
AT+CAD= <Input>	<0 or 1>	-	OK AT_PARAM_ERROR

Example:

```
AT+CAD=?
```

```
AT+CAD=0
```

```
OK
```

```
AT+CAD=1
```

```
OK
```

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.

NOTE

When CAD mode is enabled, the device will continue to check for channel activity until it can send the packet.

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AT+PRECV

Description: P2P received data

This command provides configuration the timeout period for P2P window reception.

Command	Input Parameter	Return Value	Return Code
AT+PRECV?	-	AT+PRECV: enter P2P RX mode for a period of time (ms)	OK
AT+PRECV=<Input>	<time>	-	OK

When valid LoRa P2P packets are received, the format is RSSI, SNR and Payload.

+EVT:RXP2P:-30:13:1234

- RSSI = -30
- SNR = 13
- Payload = 1234

Examples:

1. P2P LoRa RX configurable duration value ranges from 1 to 65532 ms. In this example, the device will wait 30 seconds for LoRa P2P packets. After the timeout, it will automatically disable RX mode and switch to TX mode. The callback after timeout is +EVT:RXP2P RECEIVE TIMEOUT.

```
AT+PRECV=30000
OK
```

2. If the value is set to 65535, the device will listen to P2P LoRa packets without timeout but it will stop listening once a P2P LoRa packet is received. The device is configured to RX mode until a LoRa P2P packet is received. After the reception, it will disable RX mode and automatically switch to TX mode.

```
AT+PRECV=65535
OK
```

3. If the value is set to **65534**, the device will continuously listen to P2P LoRa packets without any timeout. **The device is in RX mode**. It will continuously be listed to LoRa P2P packets.

```
AT+PRECV=65534
```

```
OK
```

NOTE

If configured in continuous RX mode `AT+PRECV=65534`, any new values to `AT+PRECV` will not be accepted. RX mode must be disabled first via `AT+PRECV=0`. During continuous RX mode, many LoRa P2P parameters cannot be modified as well. `AT+PRECV` must be set to zero first.

4. If the value is set to **65533**, the device will continuously listen to P2P LoRa packets without any timeout and will still allow P2P TX. **The device is in RX mode and also allows P2P Transmission**. After P2P transmission, it will switch to RX mode.

```
AT+PRECV=65533
```

```
OK
```

5. If the value is 0, the device will stop listening to P2P LoRa packets. It disables LoRa P2P RX mode and switches to TX mode.

```
AT+PRECV=0
```

```
OK
```

NOTE

- LoRa P2P default setting is TX mode. This consumes lower power compared to RX mode where the radio is always listening for LoRa packets.
- `AT_BUSY_ERROR` is returned if the device is configured to RX mode and still waiting for LoRa P2P packets.
- `AT_PARAM_ERROR` is returned when the setting is wrong or malformed value.

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AT+ENCRY

Description: P2P encryption enabled

This command enables P2P mode encryption.

Command	Input Parameter	Return Value	Return Code
AT+ENCRY?	-	AT+ENCRY: get or set the encryption status of P2P mode	OK
AT+ENCRY=?	-	0 or 1	OK
AT+ENCRY=<Input>	<value>	-	OK

Example:

```
AT+ENCRY=1
OK
```

```
AT+ENCRY=?
AT+ENCRY=1
OK
```

 **NOTE**

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is 0.

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AT+ENCKEY

Description: P2P Encryption Key

This command Key will encrypt the data being sent and received.

Command	Input Parameter	Return Value	Return Code
AT+ENCKEY?	-	AT+ENCRY: get or set the encryption key of P2P mode (16 bytes in hex)	OK
AT+ENCKEY=?	-	< 16 hex >	OK
AT+ENCKEY=<Input>	< 16 hex >	-	OK

Example:

```
AT+ENCKEY=01020304050607080102030405060708
```

```
OK
```

```
AT+ENCKEY=?
```

```
AT+ENCKEY=01020304050607080102030405060708
```

```
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- `<Input>`: 32 digit length, character 0-9, a-f, A-F only, representing eight (16) hexadecimal numbers.

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AT+PCRYPT

Description: P2P crypt status

This command allows the user to access the crypt status in P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+PCRYPT?	-	AT+PCRYPT: get or set the encryption status of P2P mode	OK
AT+PCRYPT=?	-	0 or 1	OK
AT+PCRYPT=<Input>	<value>	-	OK

Example:

```
AT+PCRYPT=1
OK
```

```
AT+PCRYPT=?
AT+PCRYPT=1
OK
```

 **NOTE**

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- In this case, the default value is 0.

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AT+PKEY

Description: P2P encryption and decryption key

This command allows the user to access the encryption and decryption key in P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+PKEY?	-	AT+PKEY: get or set the encryption key of P2P mode (8 bytes in hex)	OK
AT+PKEY=?	-	<8 hex>	OK
AT+PKEY= <Input>	<8 hex>	-	OK

Example:

```
AT+PKEY=0011223344556677
```

```
OK
```

```
AT+PKEY=?
```

```
AT+PKEY=0011223344556677
```

```
OK
```

**NOTE**

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

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AT+CRYPIV

Description: P2P encryption IV

This command allows the user to get or set the encryption IV of P2P mode (16 bytes in hex).

Command	Input Parameter	Return Value	Return Code
AT+CRYPIV?	-	AT+CRYPIV: get or set the encryption key of P2P mode (16 bytes in hex)	OK
AT+CRYPIV=?	-	<16 hex>	OK
AT+CRYPIV=<Input>	<16 hex>	-	OK

Example:

AT+CRYPIV=00112233445566770011223344556677

OK

AT+CRYPIV=?

AT+CRYPIV=00112233445566770011223344556677

OK

**NOTE**

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

[Back](#)**AT+P2P**

Description: View P2P all parameters

This command provides configuration of all parameters for the P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+P2P?	-	AT+P2P: get or set all P2P	OK

Command	Input Parameter	Return Value	Return Code
		parameters	
AT+P2P=?	-	-	OK AT_BUSY_ERROR
AT+P2P= <param>	<Frequency>:<Spreading Factor>:<Bandwidth>:<Code Rate>:<Preamble Length>:<TX Power>	-	OK AT_PARAM_ERROR

Example:

```
AT+P2P=?
AT+P2P=868000000:7:0:0:20:14
OK
```

```
AT+P2P=868:12:300:3:200:14
AT_PARAM_ERROR
```

NOTE

- `AT_PARAM_ERROR` is returned when setting a wrong or malformed value.
- In this case, the default value is "868000000:7:125:0:8:14".
- Frequency = {150000000-960000000}, SF = {6, 7, 8, 9, 10, 11, 12}, Bandwidth {0=125, 1=250, 2=500, 3=7.8, 4=10.4, 5=15.63, 6=20.83, 7=31.25, 8=41.67, 9=62.5}, CR = {4/5=0, 4/6=1, 4/7=2, 4/8=3}, Preamble Length = {2-65535}, TX Power = {5-22}.
- RUI3 LoRa/LoRaWAN® devices are divided into two variants - Low Frequency and High Frequency. Examples are the RAK4630(L) and RAK4630(H) devices.
 - Low frequency variant is compatible only to 150000000 - 600000000.
 - High frequency variant is compatible only to 600000000 - 960000000.

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AT+IQINVER

Description: P2P IQ Inversion

This command is used to get or set P2P IQ Inversion (1 = ON, 0 = OFF).

Command	Input Parameter	Return Value	Return Code
AT+IQINVER?	-	AT+IQINVER: get or set P2P IQ inversion (1 = ON, 0 = OFF)	OK
AT+IQINVER=?	-	<0 or 1>	OK
AT+IQINVER=	<0 or 1>	-	OK AT_PARAM_ERROR
<Input>			

Example:

```
AT+IQINVER?
AT+IQINVER: get or set P2P IQ inversion (1=ON, 0=OFF)
OK
```

```
AT+IQINVER=?
AT+IQINVER=0
OK
```

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.

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AT+SYNCWORD

Description: P2P Syncword in P2P Mode

This command is used to get or set P2P syncword (0x0000 - 0xffff).

Command	Input Parameter	Return Value	Return Code
AT+SYNCWORD?	-	AT+SYNCWORD: get or set P2P syncword (0x0000 - 0xffff)	OK
AT+SYNCWORD=?	-	<2 Hex>	OK
AT+SYNCWORD= <Input>	<2 Hex>	-	OK AT_PARAM_ERROR

Example:

```
AT+SYNCWORD?
AT+SYNCWORD: get or set P2P syncword (0x0000 - 0xffff)
OK
```

```
AT+SYNCWORD=?
AT+SYNCWORD=1424
OK
```

NOTE

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

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AT+RFFREQUENCY

Description: Frequency in P2P Mode

This command is used to access the frequency in P2P mode.

Command	Input Parameter	Return Value	Return Code
AT+RFFREQUENCY?	-	AT+RFFREQUENCY: get or set P2P Frequency	OK
AT+RFFREQUENCY=?	-	<integer>	OK
AT+RFFREQUENCY=<Input>	<integer>	-	OK AT_PARAM_ERROR

Example:

AT+RFFREQUENCY?
 AT+RFFREQUENCY: get or set P2P Frequency
 OK

AT+RFFREQUENCY=?
 AT+RFFREQUENCY=868000000
 OK

NOTE

- AT_PARAM_ERROR is returned when setting wrong or malformed value.

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AT+TXOUTPUTPOWER

Description: P2P Tx Power (5 - 22)

This command is used to get or set the P2P Tx Power (5 - 22).

Command	Input Parameter	Return Value	Return Code
AT+TXOUTPUTPOWER?	-	AT+TXOUTPUTPOWER: get or set P2P Tx Power(5-22)	OK
AT+TXOUTPUTPOWER=?	-	<powerlevel>	OK
AT+TXOUTPUTPOWER=<Input>	<powerlevel>	-	OK AT_PARAM_ERROR

Example:

```
AT+TXOUTPUTPOWER?
AT+TXOUTPUTPOWER: get or set P2P Tx Power(5-22)
OK
```

```
AT+TXOUTPUTPOWER=?
AT+TXOUTPUTPOWER=14
OK
```



- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

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AT+BANDWIDTH

Description: P2P Bandwidth

This command is used to get or set the P2P Bandwidth.

Command	Input Parameter	Return Value	Return Code
AT+BANDWIDTH?	-	AT+BANDWIDTH: get or set P2P Bandwidth(LORA: 0 = 125, 1 = 250, 2 = 500, 3 = 7.8, 4 = 10.4, 5 = 15.63, 6 = 20.83, 7 = 31.25, 8 = 41.67, 9 = 62.5 FSK:4800-467000)	OK
AT+BANDWIDTH=?	-	<bandwidth>	OK
AT+BANDWIDTH=<Input>	<bandwidth>	-	OK AT_PARAM_ERROR

Example:

AT+BANDWIDTH?

AT+BANDWIDTH: get or set P2P Bandwidth(LORA: 0 = 125, 1 = 250, 2 = 500, 3 = 7.8, 4 = 10.4, 5 = 15.63, 6 = 20.83, 7 = 31.25, 8 = 41.67, 9 = 62.5 FSK:4800-467000)

OK

AT+BANDWIDTH=?

AT+BANDWIDTH=0

OK

**NOTE**

- AT_PARAM_ERROR is returned when setting wrong or malformed value.

[Back](#) **AT+SPREADINGFACTOR**

Description: P2P Spreading Factor (5 -12)

This command is used to get or set the P2P spreading factor (5 - 12).

Command	Input Parameter	Return Value	Return Code
AT+SPREADINGFACTOR?	-	AT+SPREADINGFACTOR: get or set P2P Spreading Factor (5-12)	OK
AT+SPREADINGFACTOR=?	-	<spreading factor>	OK
AT+SPREADINGFACTOR= <Input>	<spreading factor>	-	OK AT_PARAM_ERROR

Example:

```
AT+SPREADINGFACTOR?
AT+SPREADINGFACTOR: get or set P2P Spreading Factor (5-12)
OK
```

```
AT+SPREADINGFACTOR=?
AT+SPREADINGFACTOR=7
OK
```

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.

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AT+CODINGRATE

Description: P2P Coding Rate

This command is used to get or set the P2P code rate.

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

Example:

```
AT+CODINGRATE?
AT+CODINGRATE: get or set P2P Code Rate(0=4/5, 1=4/6, 2=4/7, 3=4/8)
OK
```

```
AT+CODINGRATE=?
AT+CODINGRATE=0
OK
```

NOTE

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

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AT+PREAMBLELENGTH

Description: P2P Preamble Length (5 - 65535)

This command is used to get or set the P2P preamble length (5 - 65535).

Command	Input Parameter	Return Value	Return Code
AT+PREAMBLELENGTH?	-	AT+PREAMBLELENGTH: get or set P2P Preamble Length (5-65535)	OK
AT+PREAMBLELENGTH=?	-	<integer>	OK
AT+PREAMBLELENGTH=<Input>	<integer>	-	OK AT_PARAM_ERROR

Example:

AT+PREAMBLELENGTH?

AT+PREAMBLELENGTH: get or set P2P Preamble Length (5-65535)

OK

AT+PREAMBLELENGTH=?

AT+PREAMBLELENGTH=8

OK

**NOTE**

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

[Back](#)**AT+SYMBOLTIMEOUT**

Description: P2P Symbol Timeout (0 - 248)

This command is used to get or set the P2P symbol timeout (0 - 248).

Command	Input Parameter	Return Value	Return Code
AT+SYMBOLTIMEOUT?	-	AT+SYMBOLTIMEOUT: get or set P2P symbolTimeout (0-248)	OK
AT+SYMBOLTIMEOUT=?	-	<integer>	OK
AT+SYMBOLTIMEOUT=<Input>	<integer>	-	OK AT_PARAM_ERROR

Example:

```
AT+SYMBOLTIMEOUT?
AT+SYMBOLTIMEOUT: get or set P2P symbolTimeout (0-248)
OK
```

```
AT+SYMBOLTIMEOUT=?
AT+SYMBOLTIMEOUT=0
OK
```

NOTE

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

[Back](#)**AT+FIXLENGTHPAYLOAD**

Description: P2P fix length payload on/off (1 = ON, 0 = OFF)

This command allows the user to get or set P2P fix length payload on/off (1 = ON, 0 = OFF).

Command	Input Parameter	Return Value	Return Code
AT+FIXLENGTHPAYLOAD?	-	AT+FIXLENGTHPAYLOAD: get or set P2P fix length payload on/off (1 = ON, 0 = OFF)	OK
AT+FIXLENGTHPAYLOAD=?	-	<0 or 1>	OK
AT+FIXLENGTHPAYLOAD= <Input>	<0 or 1>	-	OK AT_PARAM_ERROR

Example:

```
AT+FIXLENGTHPAYLOAD=1
```

```
AT+FIXLENGTHPAYLOAD=1
```

```
OK
```

```
AT+FIXLENGTHPAYLOAD=?
```

```
AT+FIXLENGTHPAYLOAD=0
```

```
OK
```

NOTE

- **AT_PARAM_ERROR** is returned when setting wrong or malformed value.

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RF Test

This section describes the commands related to RF test management.

AT+TRSSI

Description: Start RF RSSI tone test

This command is used to start the RF RSSI tone test.

Command	Input Parameter	Return Value	Return Code
AT+TRSSI?	-	AT+TRSSI: start RF RSSI tone test	OK
AT+TRSSI=?	-	-115	OK AT_BUSY_ERROR

NOTE

- `AT_BUSY_ERROR` is returned when the start radio frequency RSSI process is already running.
- This command is used for the RF certification test, `AT+TRSSI=?`. It provides a value in dBm, and it can only be read.

Example:

```
AT+TRSSI=?
Rx FSK Test
RSSI Value -115 dBm
OK
```

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AT+TTONE

Description: Start RF tone test

This command is used to start the RF tone.

Command	Input Parameter	Return Value	Return Code
AT+TTONE?	-	AT+TTONE: start RF tone test	OK

Command	Input Parameter	Return Value	Return Code
AT+TTONE	-		OK AT_BUSY_ERROR

NOTE

- **AT_BUSY_ERROR** is returned when the start frequency tone process is already running.
- This command is used for the RF certification test.

Example:

```
AT+TTONE
```

```
Tx toneOK
```

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AT+TTX

Description: Start RF TX test

Set the number of packets sent for the RF TX test.

Command	Input Parameter	Return Value	Return Code
AT+TTX?	-	AT+TTX: set number of packets to be sent for PER RF TX test	OK
AT+TTX= <Input>	<integer>		OK AT_BUSY_ERROR

NOTE

- **AT_BUSY_ERROR** is returned when the start tx process is already running.

- This command is used for the RF certification test.
- <Input>: 1 decimal integer and the range of values is 0~(2³²-1).

Example:

```
AT+TTX=4
Tx Test
OK

Tx Test : Packet 1 of 4
OnTxDone
Tx Test : Packet 2 of 4
OnTxDone
Tx Test : Packet 3 of 4
OnTxDone
Tx Test : Packet 4 of 4
OnTxDone
```

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AT+TRX

Description: Start RF RX test

Set the number of packets sent for the RF RX test.

Command	Input Parameter	Return Value	Return Code
AT+TRX?	-	AT+TRX: set number of packets to be received for PER RF RX test	OK
AT+TRX=<Input>	<integer>		OK AT_PARAM_ERROR

NOTE

- AT_BUSY_ERROR is returned when the start tx process is already running.

- This command is used for the RF certification test.
- <Input>: 1 decimal integer and the range of values is 0~(2³²-1).

Example:

```
AT+TRX=4
```

```
OK
```

```
Rx 1 of 4 >>> PER= 100 %
Rx 2 of 4 >>> PER= 100 %
Rx 3 of 4 >>> PER= 100 %
Rx 4 of 4 >>> PER= 100 %
```

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AT+TCONF

Description: Configure LoRa RF test

This command is used to access the LoRa configuration test.

Command	Input parameter	Return value
AT+TCONF?	-	AT+TCONF: configure LoRa RF test
AT+TCONF=?	-	AT+TCONF=868000000:14:4:12:1:0:0:1:16:25000::

Command	Input parameter	Return value
AT+TCNF=	<Freq>:<Power>: <Bandwidth>: <SpreadingFactor>: <CodingRate>: <LNA>:<PABoost>: <Modulation>: <PayloadLen>: <FskDeviation>: <LowDRopt>: <BTproduct>	-

NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- This command is used for the RF certification test, and in this case, the default value is "868000000,14,0,71,0,0,1,4,25000,0,0".

Summary of parameters:

- 1 - Frequency
- 2 - Power
- 3 - Bandwidth parameter: (LoRa mode in Khz) 0=125, 1=250, 2=500, 3=7.8, 4=10.4, 5=15.63, 6=20.83, 7=31.25, 8=41.67, 9=62.5; (FSK mode in Hz): 4800-467000
- 4 - Spreading Factor (5-12)
- 5 - Coding Rate: 1=4/5, 2=4/6, 3=4/7, 4=4/8
- 6 - LNA State (not implemented)
- 7 - PA Boost State (not implemented)
- 8 - Modulation: 0=FSK, 1=LoRa
- 9 - Payload len
- 10 - Freq deviation (only fsk 600 - 200000 Hz)
- 11 - LowDRopt (not implemented)
- 12 - BT product (not implemented)

Example:

```
/* Example1: Set LoRa RF test configuration */
```

```
AT+TCONF=868000000:14:4:12:1:0:0:1:16:25000:2:3
```

```
OK
```

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AT+TTH

Description: RF TX hopping test

Starts RF TX hopping test from Start to Fstop, with Fdelta steps.

Command	Input Parameter	Return Value	Return Code
AT+TTH?	-	AT+TTH: start RF Tx hopping test from Fstart to Fstop, with Fdelta steps.	OK
AT+TTH=?	-	868000000:868500000:100000:6	OK
AT+TTH= <Input>	<Fstart>: <Fstop>: <FDelta>: <PacketNb>	-	OK AT_PARAM_ERROR



NOTE

- `AT_PARAM_ERROR` is returned when setting wrong or malformed value.
- This command is used for the RF certification test, and in this case, the default value is "868000000,868500000,100000,6".

Example:

```
/* Example: set TX hopping test from 868 to 868,5 MHz with 6 steps of 100 kHz
*/ #

AT+TTH=868000000:868500000:100000:6
OK

Tx Hop at 868000000 Hz
Tx Test : Packet 1 of 6
OnTxDone
Tx Hop at 868100000 Hz
Tx Test : Packet 2 of 6
OnTxDone
Tx Hop at 868200000 Hz
Tx Test : Packet 3 of 6
OnTxDone
Tx Hop at 868300000 Hz
Tx Test : Packet 4 of 6
OnTxDone
Tx Hop at 868400000 Hz
Tx Test : Packet 5 of 6
OnTxDone
Tx Hop at 868500000 Hz
Tx Test : Packet 6 of 6
OnTxDone
```

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AT+TOFF

Description: Stop Radio frequency test

This command is used to stop the ongoing RF test.

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

 **NOTE**

- This command is used for the RF certification test.

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AT+CERTIF

Description: Configure LoRaWAN Certification test

This command is used to start the RF Rx LoRa test.

Command	Input Parameter	Return Value	Return Code
AT+CERTIF?	-	AT+CERTIF: set the module in LoRaWAN Certification mode (0 = normal mode, 1 = certification mode)	OK
AT+CERTIF	-		OK AT_BUSY_ERROR

 **NOTE**

- **AT_BUSY_ERROR** is returned when the start frequency tone process is already running.
- This command is used for the RF certification test and the timer to handle data transmission equal to 5 s.

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AT+CW

Description: Send Continuous Wave

This command is used to enable continuous RF transmissions with configurable frequency, transmit power and duration. Also, you can get the RF transmission's details by using this command.

Command	Input Parameter	Return Value	Return Code
AT+CW?	-	AT+CW: start continuous wave	OK
AT+CW=?	-	<freq>:<power>: <time>:	OK
AT+CW= <Input>	<freq>:<power>: <time>:	-	OK AT_BUSY_ERROR

Example:

```
AT+CW?  
AT+CW: start continuous wave  
OK
```

```
AT+CW=?  
AT+CW=868000000:14:5  
OK
```

NOTE

- AT_BUSY_ERROR is returned when the start tx process is already running.
- <freq>: RAK3172(L) is needed to use the low frequency range 150000000 - 600000000; RAK3172(H) is needed to use the high frequency range 600000000 - 960000000
- <power>: 5-22 dBm
- <time>: 0-65535 ms

[Back](#)**AT+TRTH**

Description: RF Tx Hopping Test in Random Sequence

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

Command	Input Parameter	Return Value	Return Code
AT+TRTH?	-	AT+TRTH: start RF TX hopping test from Fstart to Fstop, with Fdelta interval in random sequence	OK
AT+TRTH=?	-	<Fstart>:<Fstop>:<Fdelta>: <PacketNb>	OK
AT+TRTH= <Input>	<Fstart>: <Fstop>: <Fdelta>: <PacketNb>	-	OK AT_BUSY_ERROR

Example:

AT+TRTH?

AT+TRTH: start RF TX hopping test from Fstart to Fstop, with Fdelta interval in random sequence

OK

AT+TRTH=?

AT+TRTH=868000000:868500000:100000:6

OK

NOTE

- AT_BUSY_ERROR is returned when the start tx process is already running.
- <Fstart>: start frequency
- <Fstop>: stop frequency
- <Fdelta>: frequency interval
- <PacketNb>: number of packets

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