

Lora AT Command Lists

(Version: DL761X&DL781X-AT-CMD-V1.7)

MAXIIOT R&D Department

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Background & Summary

The purpose of this document is to describe for DL7611, DL7612, DL7811 and DL7812 AT Command Lists. This document is intended for the programming or testing to implement Lora module.

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Revision History

Revision	Date	Author	Descriptions
V1.0	17.01.11	Michael Li	Created
V1.2	17.03.20	Michael Li	Add New Commands: SCFG,FWUP, RTFTY; Add “PASSTHROUGH” mode of “AT+ SM”.
V1.4	17.06.16	Michael Li	Add New Commands: ISMBAND,BW,RX2BW Modify Command: CH, RX2CH, DUTC
V1.5	17.11.03	Michael Li	Add New Commands: RXWIN2,ADR,MSG,HEXMSG,AMSG,HEXMSG Modify Command: CH
V1.6	17.12.13	Michael Li	Add New Commands: PORT Modify Command: OTA
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1 Introduction

1.1 Purpose

The purpose of this document is to describe the AT Commands to implement and test with MAXIIOT's Lora module. This document is intended for the programming or testing to implement Lora module as a guideline.

The main function of the specification shall be on the testing of Lora Module.

- AT Command List
- Description for using each command
- Checking the status of Lora Module.

1. 2 Definition, Abbreviations and Acronyms

No	Terminology/Abbreviation	Description
1	Lora	Long Range
2	NVM	Non Volatile Memory
3	EUI	Extended Unique Identifier

2 Command Architecture

2.1 System Context View



The above figure depicts an overall architecture for testing with AT command. The UART Program sends command with 115,200 baud rate.

2.2 UART Configuration

Baud Rate	115,200bps
Data bit	8bit
Stop bit	1bit
Parity bit	None

2.3 Definition

<CR>: Carriage return character;

<LF>: Line feed character;

<..>: Parameter name. Angle brackets do not appear on command line;

[..]: Optional parameter. Square brackets do not appear on the command line.

3 AT Command Overview

3.1 Product Basic Command Overview

Command	Description	R/W
AT	Check serial connection	R
AT+INFO	Display product identification information	R
AT+CGMI	Request manufacturer identification	R
AT+CLAC	List available commands	R
AT+NRB	Reboot the product	W
AT+RESTORE	Restore product factory parameters	W
AT+SLEEP	Put product into sleep mode	
AT+SAVE	Save product configuration parameters	W
AT+DEBUG	Enter or quit product debug mode	R/W

3.2 Device Activation Command Overview

Command	Description	R/W
Before Activation		
AT+DEVEUI	Get end-device identifier (DevEUI)	R
AT+APPKEY	Get or set application key (AppKey)	R/W
AT+CLASS	Get or set end-device class type	R/W
AT+ISMBAND	Get or set the ISM Band of Lora TM	R/W
AT+CHMASK	Get or set the mask of each channel	R/W
AT+CHSET	Get or set the configuration of each channel	R/W
AT+RXWIN2	Get or set rxwin2 parameter	R/W
AT+ACTIVATE	Get or set end-device activation way (Over-the-Air Activation, Activation by Personalization)	R/W
AT+CGATT	Queries device activation status.	R
After Activation		
AT+ADDR	Get or set end-device address (DevAddr)	
AT+APPEUI	Get or set application identifier (AppEUI)	R/W
AT+NWKSKEY	Get or set network session key (NwkSKey)	R/W
AT+APPSKEY	Get or set application session key (AppSKey)	R/W

3.3 Device General Command Overview

Command	Description	R/W
---------	-------------	-----

After Activation		
AT+NCONFIG	Request end-device configuration	R
AT+POWER	Get or set end-device radio TX power	R/W
AT+CSQ	Get Signal Strength Indicator	R
AT+PORT	Get or set end-device uplink message 's port	R/W
AT+ADR	Get or set adaptive data rate	R/W
AT+DR	Get or set end-device uplink message's data rate	R/W
AT+CFM	Get or set the confirm message mode	R/W
AT+NMGS	Send a message by hex format immediately	W
AT+NCMGS	Send a message by ascii format immediately	W
AT+NQMGS	Query the status of messages sent	R
AT+NSMI	Get or set indications of send message	R/W
AT+NMGR	Get a message by hex format	R
AT+NQMGR	Query the status of messages received	R
AT+NNMI	Get or set new message indications	R
AT+LCHECK	Send a link check request message (MAC Command)	W
AT+PMGS	Send a point to point message	W
AT+PMGR	Get a point to point message by hex format	R
AT+PNMI	Get or set new point to point message indications	R

4 Product Basic Commands

4.1 AT Check serial connection

The execution command can be used to check whether the serial connection is ok.

AT Check serial connection	
Execution Command AT<CR><LF>	Response OK If there is any error, response: +ERROR:<err>

Example

```
>>AT
```

```
OK
```


4.2 AT+INFO Display product identification information

The execution command returns product identification information.

AT+INFO Display product identification information	
Execution Command AT+INFO<CR><LF>	Response MAXIIOT <Object Id> Revision:<revision> Date:<date> OK If there is any error, response: +ERROR:<err>

Parameter

<Object Id>	Identifier of device type
<revision>	Revision of software release
<date>	date of software release XXXX-XX-XX (year-month-date)

Example

```
>>AT+INFO
MAXIIOT
DL7812
Revision:DL7812R01A01
Date:2018-09-21
OK
```

4.3 AT+CGMI Request manufacturer identification

The execution command returns manufacturer identification.

AT+CGMI Request manufacturer identification	
Execution Command AT+CGMI<CR><LF>	Response <manufacturer> OK If there is any error, response:

	+ERROR:<err>
--	--------------

Parameter

<manufacturer> Manufacturer information.

Example

>>AT+CGMI

MAXIOT

OK

4.4 AT+CLAC List available commands

The command lists the available AT commands.

AT+CLAC List available commands	
Execution Command AT+CLAC<CR><LF>	Response 1, <AT Command> ... N, <AT Command> OK If there is any error, response: +ERROR:<err>

Parameter

< AT Command > Defines the AT command including the prefix AT.

Example

>>AT+CLAC

AT

1, AT+INFO

...

40, AT+LCHECK

OK

4.5 AT+NRB Reboot the product

The command reboot the product.

AT+NRB Reset the product	
Execution Command AT+NRB<CR><LF>	Response REBOOTING If there is any error, response: +ERROR:<err>

Example

```
>>AT+NRB
REBOOTING
```

4.6 AT+RESTORE Restore product factory parameters

The command restore product to factory configuration parameters.

AT+RESTORE Restore product factory parameters	
Execution Command AT+RESTORE<CR><LF>	Response OK If there is any error, response: +ERROR:<err>

Example

```
>>AT+RESTORE
OK
```

4.7 AT+SLEEP Put product into sleep mode

The command put product into sleep mode. If you need to wake up the product, it can be waken up any AT commands. Wake-up time is just 4 ms.

AT+SLEEP Put product into sleep mode

Execution Command AT+SLEEP<CR><LF>	Response SLEEPING If there is any error, response: +ERROR:<err>
--	--

Example

```
>>AT+SLEEP
```

```
SLEEPING
```

```
>>AT (Any AT command is ok)
```

```
AWAKE
```

4.8 AT+SAVE Put product into sleep mode

The command saves product configuration parameters.

AT+SAVE Save product configuration parameters

Execution Command AT+SAVE<CR><LF>	Response OK If there is any error, response: +ERROR:<err>
---	--

Example

```
>>AT+SAVE
```

```
OK
```

4.9 AT+DEBUG Enter or quit product debug mode

The command put product enter or quit debug mode. In debug mode, it can show the working process of LORAWAN.

AT+DEBUG Enter or quit product debug mode

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Execution Command AT+DEBUG=<enable><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+DEBUG[?]<CR><LF>	Response +DEBUG:<enable> OK If there is any error, response: +ERROR:<err>

Parameter

< enable > Bool type. It put the product enter debug mode or not.
0 quit debug mode (default)
1 enter debug mode

Example

```
>>AT+DEBUG=1
```

```
OK
```

```
>>AT+DEBUG
```

```
+DEBUG:1
```

5 Device Activation Commands

5.1 AT+DEVEUI Get end-device identifier

The command returns end-device identifier. It is seen as DevEUI for LORAWAN server.

AT+DEVEUI Get end-device identifier	
Read Command AT+DEVEUI[?]<CR><LF>	Response +DEVEUI:<DevEUI> OK If there is any error, response: +ERROR:<err>

Parameter

< DevEUI > String type hexadecimal format indicating the DevEUI number
 The length must be 8 bytes.

Example

```
>>AT+DEVEUI
+DEVEUI:24c5d9e63257f347
OK
```

5.2 AT+APPKEY Get or set application key

The command set or get end-device application key. It is seen as AppKey for LORAWAN server.

AT+APPKEY Get or set application key	
Execution Command AT+APPKEY=<AppKey><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+APPKEY[?]<CR><LF>	Response +APPKEY:<AppKey> OK If there is any error, response: +ERROR:<err>

Parameter

< AppKey > String type hexadecimal format indicating the AppKey number
 The length must be 16 bytes.

Example

```
>>AT+APPKEY=2B7E151628AED2A6ABF7158809CF4F3C
OK
```

```
>>AT+APPKEY
+APPKEY:2B7E151628AED2A6ABF7158809CF4F3C
OK
```

5.3 AT+CLASS Get or set end-device class type

The command set or get end-device class type. They are Class-A or Class-C.

AT+CLASS Get or set end-device class type	
Execution Command AT+CLASS=<class><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+CLASS[?]<CR><LF>	Response +CLASS:<class> OK If there is any error, response: +ERROR:<err>

Parameter

< class > Char type.
A Class-A mode
C Class-C mode

Example

```
>>AT+CLASS=A
```

```
OK
```

```
>>AT+CLASS
```

```
+CLASS:A
```

```
OK
```

5.4 AT+ISMBAND Get or set the ISM Band of Lora TM

The command set or get end-device ISM band of Lora TM.

AT+ISMBAND Get or set the ISM Band of Lora TM	
Execution Command AT+ISMBAND=<band><CR><LF>	Response OK If there is any error, response:

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	+ERROR:<err>
Read Command AT+ISMBAND[?]<CR><LF>	Response +ISMBAND:<band> OK If there is any error, response: +ERROR:<err>

Parameter

< band > Integer type. The details of each ISM band reference to <<LoRaWAN Regional Parameters v1.0.2>>. When ISM band change, the frequency, data rate and mask of each channel will change too.

- 0 US902_928, include channel 0 to channel 71
- 1 AS923, include channel 0 to channel 15
- 2 EU863_870, include channel 0 to channel 15
- 3 CN779_787, include channel 0 to channel 15
- 4 CN470_510, include channel 0 to channel 95
- 5 EU433, include channel 0 to channel 15
- 6 CUSTOMIZE, include channel 0 to channel 15

Example

```
>>AT+ISMBAND=0
```

```
OK
```

```
>>AT+ISMBAND
```

```
+ISMBAND:0
```

```
OK
```

5.5 AT+CHMASK Get or set the mask of each channel

The command set or get end-device channel mask of current ISM band.

AT+CHMASK Get or set the mask of each channel	
Execution Command AT+CHMASK= <mask[0]>, <mask[1]>, <mask[2]>, <mask[3]>, <mask[4]>,	Response OK If there is any error, response: +ERROR:<err>

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<mask[5]><CR><LF>	
Read Command AT+CHMASK[?]<CR><LF>	Response +CHMASK:<mask[0]>, <mask[1]>, <mask[2]>, <mask[3]>, <mask[4]>, <mask[5]>, OK If there is any error, response: +ERROR:<err>

Parameter

< mask > uint16_t array type with 6 elements in hexadecimal format.

From the lowest bit to the highest bit, it represents channel 0 to channel 95. If the channel mask bit is 1, it means the corresponding channel is enabled. Otherwise it is disabled. The details of each channel configuration parameter reference to <<LoRaWAN Regional Parameters v1.0.2>>.

mask[0] bit0 to bit15: channel 0 to channel 15
mask[1] bit0 to bit15: channel 16 to channel 31
mask[2] bit0 to bit15: channel 32 to channel 47
mask[3] bit0 to bit15: channel 48 to channel 63
mask[4] bit0 to bit15: channel 64 to channel 79
mask[5] bit0 to bit15: channel 80 to channel 95

Note: If all channels are disabled, channel 0 will enable automatically.

Example

Enable channel 0 to channel 15:

```
>>AT+CHMASK=00FF,0000,0000,0000,0000,0000
```

OK

```
>>AT+CHMASK
```

```
+CHMASK:00FF,0000,0000,0000,0000,0000
```

OK

5.6 AT+CHSET Get or set the configuration of each channel

The command set or get the configuration of each channel.

This execution command “**AT+CHSET=...**” will only be useful when ISM band is “CUSTOMIZE”.

AT+CHSET Get or set the configuration of each channel

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Execution Command AT+CHSET=<channel>, <frequency>, <DRmin>, <DRmax> <CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+CHSET[?]<CR><LF>	Response +CHSET ISM Band:<band> +CH<n>:<frequency>,<DRmin>,<DRmax> ... +CH<m>:<frequency>,<DRmin>,<DRmax> OK If there is any error, response: +ERROR:<err>

Parameter

< band > Integer type. The details of each ISM band reference to <<LoRaWAN Regional Parameters v1.0.2>>.

- 0 US902_928, include channel 0 to channel 71
- 1 AS923, include channel 0 to channel 15
- 2 EU863_870, include channel 0 to channel 15
- 3 CN779_787, include channel 0 to channel 15
- 4 CN470_510, include channel 0 to channel 95
- 5 EU433, include channel 0 to channel 15
- 6 CUSTOMIZE, include channel 0 to channel 15

<frequency> Integer type. Current channel frequency of uplink message
Must more than 430000000

<DRmin> Integer type. Current channel minimum data rate
Range from 0 to 15

<DRmax> Integer type. Current channel maximum data rate
Range from 0 to 15
<DRmax> cannot be less than <DRmin>

Example

```
>>AT+ISMBAND=6
```

```
OK
```

```
>>AT+CHSET=0,433100000,0,5
```

```
OK
```

```
>>AT+CHSET
```

```
+CHSET ISM Band:4
```

```
+CH0: 470300000,0,5
+CH1: 470500000,0,5
+CH2: 470700000,0,5
.....
+CH15: 473300000,0,5
OK
```

5.7 AT+RXWIN2 Get or set rxwin2 parameter

The command set or get end-device rxwin2 parameter.

AT+RXWIN2 Get or set rxwin2 parameter	
Execution Command AT+RXWIN2=<frequency>,<DR><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+RXWIN2[?]<CR><LF>	Response +RXWIN2:<frequency>,<DR> OK If there is any error, response: +ERROR:<err>

Parameter

- <frequency>

Integer type. Rxwin2 frequency
Must more than 430000000
- <DR>

Integer type. Rxwin2 data rate. The details of data rate reference to <<LoRaWAN Regional Parameters v1.0.2>>.
Range from 0 to 15.

Example

```
>>AT+RXWIN2=923200000,0
OK

>>AT+RXWIN2
+RXWIN2:923200000,0
OK
```

5.8 AT+ACTIVATE Get or set end-device activation way

The command set or get end-device activation way. It can be “Over-the-Air Activation” or “Activation by Personalization”

When “**AT+ACTIVATE**” is set to 1, end-device will reactivate and send activation require to server every 10 second, until it activates successfully or has try more than 1 minute.

AT+ACTIVATE Get or set end-device activation way	
Execution Command AT+ACTIVATE=<way><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+ACTIVATE[?]<CR><LF>	Response +ACTIVATE:< way > OK If there is any error, response: +ERROR:<err>

Parameter

<way> Integer type.
0 “Activation by Personalization”
1: “Over-the-Air Activation” (default)

Example

```
>>AT+ACTIVATE=1
```

```
OK
```

```
>>AT+ACTIVATE
```

```
+ACTIVATE:1
```

```
OK
```

5.9 AT+CGATT Query device activation status

The command queries device activation status. The command will only be effective when activation way is “Over-the-Air Activation”.

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<status> can show whether end-device has activated. It will set to 1 when end-device has activated. when “AT+ACTIVATE” is set to 1 or device reboot, <status> will set to 0.

When device reboot, it will try to activate automatically until it activates successfully or has try more than 1 minute.

If activation way is “Activation by Personalization”, if will return nothing.

AT+CGATT Set attach, detach or query whether the end-device is activated	
Read Command AT+CGATT[?]<CR><LF>	Response +CGATT:<status> OK If there is any error, response: +ERROR:<err>

Parameter

<status> Integer type. Indicates the state of activation.

- 0 Detached
- 1 Attached
- 2 Trying

Example

```
>>AT+CGATT
+CGATT:1
OK
```

5.10AT+ADDR Get or set end-device address

The command gets or set end-device address (DevAddr)

AT+ADDR Get or set end-device address (DevAddr)	
Execution Command AT+ADDR=<address><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+ADDR[?]<CR><LF>	Response +ADDR:<address>

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	OK If there is any error, response: +ERROR:<err>
--	--

Parameter

<address> uint32_t type in hexadecimal format.
The length must be 4 bytes.

Example

>>AT+ADDR=3257F347

OK

>>AT+ADDR

+ADDR:3257F347

OK

5.11 AT+APPEUI Get or set application identifier

The command gets or set application identifier. It is seen as AppEUI for LORAWAN server.

AT+APPEUI Get or set application identifier	
Execution Command AT+APPEUI=<AppEUI><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+APPEUI[?]<CR><LF>	Response +APPEUI:<AppEUI> OK If there is any error, response: +ERROR:<err>

Parameter

< AppEUI > String type hexadecimal format indicating the AppEUI number
The length must be 8 bytes.

Example

>>AT+APPEUI=0102030405060708

OK

>>AT+APPEU

+APPEU:0102030405060708

OK

5.12 AT+NWKSKEY Get or set network session key

The command gets or set network session key. It is seen as NWKSKEY for LORAWAN server.

AT+NWKSKEY Get or set network session key	
Execution Command AT+NWKSKEY=<NwkSKey><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+NWKSKEY [?]<CR><LF>	Response +NWKSKEY:< NwkSKey > OK If there is any error, response: +ERROR:<err>

Parameter

< NwkSKey > String type hexadecimal format indicating the NWKSKEY number
 The length must be 16 bytes.

Example

>>AT+NWKSKEY=2B7E151628AED2A6ABF7158809CF4F3C

OK

>>AT+ NWKSKEY

+NWKSKEY:2B7E151628AED2A6ABF7158809CF4F3C

OK

5.13 AT+APPSKEY Get or set application session key

The command gets or set application session key. It is seen as APPSKEY for LORAWAN server.

AT+APPSKEY Get or set network session key	
Execution Command AT+APPSKEY=<AppSKey><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+APPSKEY [?]<CR><LF>	Response +APPSKEY:<AppSKey> OK If there is any error, response: +ERROR:<err>

Parameter

< AppSKey > String type hexadecimal format indicating the APPSKEY number
 The length must be 16 bytes.

Example

>>AT+APPSKEY=2B7E151628AED2A6ABF7158809CF4F3C

OK

>>AT+APPSKEY

+APPSKEY:2B7E151628AED2A6ABF7158809CF4F3C

OK

6 Device General Commands

6.1 AT+NCONFIG Request end-device configuration

The command Request end-device configuration.

AT+NCONFIG Request end-device configuration

Read Command AT+NCONFIG [?]<CR><LF>	Response +NCONFIG:<function>, <value> ... +NCONFIG:<function>, <value> OK If there is any error, response: +ERROR:<err>
---	---

Parameter

< function > String type, parameters are as follows

CLASS

ISMBAND

CHMASK

RXWIN2

ACTIVATE

POWER

PORT

ADR

DR

CFM

NNMI

PNMI

<value> The value of each function

Example

```
>>AT+NCONFIG
+NCONFIG:CLASS,A
+NCONFIG:ISMBAND,4
...
+NCONFIG:PNMI Enable,1
OK
```

6.2 AT+POWER Get or set end-device radio TX power

The command Get or set end-device radio TX power.
The default setting is 1.

AT+POWER Get or set end-device radio TX power

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Execution Command AT+POWER=<power><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+POWER [?]<CR><LF>	Response +POWER:<power> OK If there is any error, response: +ERROR:<err>

Parameter

< power > Integer type
0: 20dBm (default)
1: 14dBm
2: 11dBm
3: 8dBm
4: 5dBm
5: 2dBm

Note: Some end-device's biggest power is just 14dBm, like DL7611/DL7811. So the configuration need to depend on actual end-device.

Example

```
>>AT+POWER=1
```

```
OK
```

```
>>AT+POWER
```

```
+POWER:1
```

```
OK
```

6.3 AT+CSQ Get Signal Strength Indicator

The command gets signal strength indicator of the last received message.

AT+CSQ Get Signal Strength Indicator	
Execution Command AT+CSQ[?]<CR><LF>	Response +CSQ:<rssi>, <snr> OK

	If there is any error, response: +ERROR:<err>
--	---

Parameter

- < rssi > Integer type, Received signal strength. Unit: dBm.
- < snr > Integer type, Received signal SNR. Unit: dB.

Example

```
>>AT+CSQ
+CSQ:-66,10
```

6.4 AT+PORT Get or set uplink message ’s port

The command Get or set end-device uplink message ’s port.

AT+PORT Get or set end-device uplink message ’s port	
Execution Command AT+PORT=<port><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+PORT [?]<CR><LF>	Response +PORT:<port> OK If there is any error, response: +ERROR:<err>

Parameter

- < port > Integer type, from 1 to 255

Example

```
>>AT+PORT=5
OK

>>AT+PORT
+PORT:5
```

OK

6.5 AT+ADR Get or set adaptive data rate

The command Get or set adaptive data rate.
The default setting is 1,

AT+ADR Get or set adaptive data rate	
Execution Command AT+ADR=<enable><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+ADR [?]<CR><LF>	Response +ADR:<enable> OK If there is any error, response: +ERROR:<err>

Parameter

- < enable > Bool type
- 0 disable adaptive data rate
 - 1 enable adaptive data rate (default)

Example

>>AT+ADR=1

OK

>>AT+ADR

+ADR:1

OK

6.6 AT+DR Get or set uplink message data rate

The command Get or set uplink message data rate.
“AT+DR=LIST” can list all details about data rate in current ISM band. If adaptive data rate is

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enabled, data rate will change automatically.

“AT+DR=CUSTOM, ...” will only be useful when ISM band is “CUSTOMIZE”.

AT+DR Get or set uplink message data rate	
Execution Command AT+DR=<data rate><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Execution Command AT+DR=LIST<CR><LF>	Response +DRLIST ISM Band:<band> +DR<0>, < spread factor >, < bandwidth > ... +DR<n>, < spread factor >, < bandwidth > +DR<m>, DFU OK If there is any error, response: +ERROR:<err>
Execution Command AT+DR=CUSTOM, <data rate>, < spread factor >, < bandwidth >, < dr offset > <CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+DR [?]<CR><LF>	Response +DR:< data rate >, < spread factor >, < bandwidth >, < dr offset > OK If there is any error, response: +ERROR:<err>

Parameter

< data rate > Integer type, uplink message data rate. The details of each data rate reference to <<LoRaWAN Regional Parameters v1.0.2>>.

- 0 DR0
- 1 DR1
- 2 DR2
- 3 DR3
- 4 DR4
- 5 DR5
- 6 DR6
- 7 DR7

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- 8 DR8
- 9 DR9
- 10 DR10
- 11 DR11
- 12 DR12
- 13 DR13
- 14 DR14
- 15 DR15

< spread factor > Integer type, the spread factor of current uplink message data rate.
Range from 7 to 12.

Spread factor (at 125KHz)	Bitrate (unit bps)	Time on air (unit ms) (for 10 bytes app payload)
SF7	5470	56
SF8	3125	100
SF9	1760	200
SF10	980	370
SF11	440	740
SF12	290	1400

< bandwidth > Integer type, the bandwidth of current uplink message data rate.

- 0 125KHz
- 1 250KHz
- 2 500KHz

< dr offset > Integer type, data rate offset of rxwin1, default value is 0.
The details of data rate offset reference to <<LoRaWAN Regional Parameters v1.0.2>>.
Range from 0 to 5. This parameter will not be saved in flash. If reboot the device, this parameter will set to default value

Example

```
>>AT+DR=0
```

```
OK
```

```
>>AT+DR
```

```
+DR:0,12,0,0
```

```
OK
```

```
>>AT+DR=LIST
```

```
+DRLIST ISM Band:4
```

```
+DR0:12,0
```

```
+DR1:11,0
```

+DR2:10,0
+DR3:9,0
+DR4:8,0
+DR5:7,0
+DR6:7,1
+DR7:DFU
+DR8:DFU
+DR9:DFU
+DR10:DFU
+DR11:DFU
+DR12:DFU
+DR13:DFU
+DR14:DFU
+DR15:DFU
OK

>>AT+ISMBAND=6

OK

>>AT+DR=CUSTOM,0,12,1,0

OK

6.7 AT+CFM Get or set the confirm message mode

The command gets or set the confirm message mode.

If <enable> is set to 1, when an uplink message is sent to server, server will return an ACK message to device. The ACK message can help “**NSMI**” to know that uplink message has sent successfully.

If <enable> is set to 0, server will not send ACK message so that “**AT+NSMI**” will be useless.
The default setting is 1.

AT+CFM Get or set the confirm message mode	
Execution Command AT+CFM=<enable><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+CFM [?]<CR><LF>	Response +CFM:<enable> OK

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	If there is any error, response: +ERROR:<err>
--	---

Parameter

< enable > Bool type
0 unconfirm frame mode
1 confirm frame mode (default)

Example

```
>>AT+CFM=1
```

```
OK
```

```
>>AT+CFM
```

```
+CFM:1
```

```
OK
```

6.8 AT+NMGS Send a message by hex format

The command sends a message by hex format. The end-device needs to be activated before using this command.

AT+NMGS Send a message by hex format	
Execution Command AT+NMGS=<length>, <data><CR><LF>	Response +NMGS:<result> OK If there is any error, response: +ERROR:<err>

Parameter

< length > Integer type, decimal length of message
The maximum length of data to be sent is limited by “spreading factor” of uplink message data rate.

Reference is as follows

Spreading factor	Maximum payload (bytes)
12	60
11	73
10	115
9	242
8	242

7

242

< data > Integer type, data to be transmitted in hex string format.

< result > Integer type, result of the message

0 done

-1 busy

-2 no free channel

-3 no activation

-4 out of the maximum length

Example

```
>>AT+NMGS=5,AA112233BB
```

```
+NMGS:0
```

```
OK
```

6.9 AT+NCMGS Send a message by char format

The command sends a message by char format. The end-device needs to be activated before using this command.

AT+NCMGS Send a message by char format

Execution Command AT+NCMGS=<length>, <data><CR><LF>	Response +NCMGS:<result> OK If there is any error, response: +ERROR:<err>
---	--

Parameter

< length > Integer type, decimal length of message

The maximum length of data to be sent is limited by “spreading factor” of uplink message data rate.

Reference is as follows

Spreading factor	Maximum payload (bytes)
12	60
11	73
10	115
9	242
8	242
7	242

< data > Integer type, data to be transmitted in char string format.
< result > Integer type, result of the message
0 done
-1 busy
-2 no free channel
-3 no activation
-4 out of the maximum length

Example

```
>>AT+NCMGS=5,HELLO
```

```
+NCMGS:0
```

```
OK
```

6.10AT+NQMGS Query the status of messages sent

The command queries the status of messages sent.

AT+NQMGS Query the status of messages sent	
Execution Command AT+NQMGS<CR><LF>	Response +NQMGS:<send>, <error> OK If there is any error, response: +ERROR:<err>

Parameter

< send > Integer type, the total number of uplink messages
< error > Integer type, the number of messages that could not be sent

Example

```
>>AT+NQMGS
```

```
+NQMGS:30,0
```

```
OK
```

6.11AT+NSMI Get or set indications of send message

The command gets or set indications of send message.
This command will only be useful when confirm frame mode is opened.
If sent message indications are turned on, the unsolicited informational response: “+NSMI:<status>” will be issued when a new message is sent.
The default setting is 1, which indicates indications are sent.

AT+NSMI Get or set indications of send message	
Execution Command AT+NSMI=<enable><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+NSMI[?]<CR><LF>	Response +NSMI Enable:<enable> OK If there is any error, response: +ERROR:<err>
Uplink message has sent	If NSMI is enabled, response: +NSMI:<status>

Parameter

- < enable >

Bool type

0 No indications

1 Indications will be sent (default)
- < status >

Bool type

0 No ack form server

1 Receive ack from server

Example

>>AT+NSMI=1
OK

>>AT+NSMI
+NSMI Enable:1
OK

If NSMI is enabled, when an uplink message is sent and receive ACK:
+NSMI:1

6.12AT+NMGR Get a message by hex format

The command gets a message by hex format.

The command returns the oldest buffered message and deletes it from the buffer. If there are no messages, then no command response will be given. If new message indications (AT+NNMI=1) are turned on, then received messages will not be available via this command.
Cache up to 5 downlink messages.

AT+NMGR Get a message by hex format	
Execution Command AT+NMGR<CR><LF>	Response [+NMGR:<length>, <data>] OK If there is any error, response: +ERROR:<err>

Parameter

- < length > Integer type, decimal length of message
- < data > Integer type, data received in hex string format.

Example

```
>>AT+NMGR
+NMGR:5,AA112233BB
OK
```

```
>>AT+NMGR
OK
```

6.13AT+NQMGR Query the status of messages received

The command queries the status of messages received.
The default setting is 1, the <status> will restore to the default value (1 by default) after reboot.

AT+NQMGR Query the status of messages received	
Execution Command	Response

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AT+NQMGR<CR><LF>	+NQMSR:<buffered>, <received>, <not ack> OK If there is any error, response: +ERROR:<err>
------------------	--

Parameter

- < buffered > Integer type, the number of messages waiting to be read in the downstream buffer
Cache up to 5 downlink messages.
- < received > Integer type, the total number of messages received from network server
- < not ack > Integer type, the number of messages lost from network server

Example

```
>>AT+NQMGR
+NQMGR:0,30,0
OK
```

6.14AT+NNMI Get or set new message indications

The command gets or set new message indications.

AT+NNMI Get or set new message indications	
Execution Command AT+NNMI=<enable><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+NNMI[?]<CR><LF>	Response +NNMI Enable:<enable> OK If there is any error, response: +ERROR:<err>
downlink message detected	If indications only, response +NNMI:<status> If indications and message, response +NNMI:<length>, <data>

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Parameter

< enable >	Integer type
0	No indications
1	Indications and message (default)
2	Indications only
< status >	Bool type
1	Indications
< length >	Decimal length of message.
< data >	Data to be transmitted in hex string format

Example

```
>>AT+NNMI=1
```

```
OK
```

```
>>AT+NNMI
```

```
+NNMI Enable:1
```

```
OK
```

If NNMI is enabled, when a downlink message received:

```
+NNMI:1
```

Or

```
+NNMI:5,AA112233BB
```

6.15 AT+LCHECK Send a link check request message

The command sends a link check request message.

This is also an uplink message and belong to mac command of LORAWAN protocol. So that send message indication is useful too.

The end-device needs to be activated before using this command.

AT+LCHECK Get or set the confirm message mode

Execution Command AT+LCHECK<CR><LF>	Response +LCHECK:<result> OK If there is any error, response: +ERROR:<err>
---	---

Parameter

< result >	Integer type, result of the message
-------------------------	-------------------------------------

- 0 done
- 1 busy
- 2 no free channel
- 3 no activation
- 4 out of the maximum length

Example

```
>>AT+LCHECK
+LCHECK:0
OK
```

6.16 AT+PMGS Send a point to point message

The command sends a point to point message.

The RF configuration of point to point message will take the rxwin2 RF configuration as a reference.

AT+PMGS Send a point to point message t

Execution Command	Response
AT+PMGS=<length>, <data><CR><LF>	+PMGS:<result> OK
	If there is any error, response: +ERROR:<err>

Parameter

- < length >** Integer type, decimal length of message
The maximum length of data to be sent is limited by “spreading factor” of uplink message data rate.
Reference is as follows

Spreading factor	Maximum payload (bytes)
12	60
11	73
10	115
9	242
8	242
7	242

- < data >** Integer type, data to be transmitted in hex string format.
< result > Integer type, result of the message

- 0 done
- 1 busy
- 2 no activation
- 3 out of the maximum length

Example

```
>>AT+PMGS=5,AA112233BB
+PMGS:0
OK
```

6.17AT+PMGR Get a point to point message by hex format

The command gets a point to point message by hex format.

The command returns the oldest buffered message and deletes it from the buffer. If there are no messages, then no command response will be given. If new message indications (AT+PNMI) are turned on, then received messages will not be available via this command.
Cache up to 3 point to point message.

AT+PMGR Get a point to point message by hex format	
Execution Command AT+PMGR<CR><LF>	Response [+PMGR:<length>, <data>] OK If there is any error, response: +ERROR:<err>

Parameter

- < length > Integer type, decimal length of message
- < data > Integer type, data received in hex string format.

Example

```
>>AT+PMGR
+PMGR:5,AA112233BB
OK

>>AT+PMGR
OK
```


6.18AT+PNMI Get or set new point to point message indication

The command gets or set new point to point message indications.

AT+PNMI Get or set new point to point message indications	
Execution Command AT+PNMI=<enable><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+PNMI[?]<CR><LF>	Response +PNMI Enable:<enable> OK If there is any error, response: +ERROR:<err>
Point to point message detected	If indications only, response +PNMI:<status> OK If indications and message, response +PNMI:<length>, <data> OK

Parameter

- < enable >

Integer type

0 No indications

1 Indications and message (default)

2 Indications only
- < status >

Bool type

0 No indications

1 Indications
- < length >

Decimal length of message.
- < data >

Data to be transmitted in hex string format

Example

```
>>AT+PNMI=1
OK
```

>>AT+PNMI

+PNMI Enable:1

OK

If PNMI is enabled, when a point to point message received:

+PSMI:1

Or

+PSMI:5,AA112233BB

6.19AT+ASChOOSE Get or set the AS923 Frequency AS1 or AS2 mode

The command gets or set the AS923 Frequency select AS1 or AS2.

AT+CFM Get or set the confirm message mode	
Execution Command AT+ASCHOOSE=<enable><CR><LF>	Response OK If there is any error, response: +ERROR:<err>
Read Command AT+ASCHOOSE [?]<CR><LF>	Response +CFM:<enable> OK If there is any error, response: +ERROR:<err>

Parameter

Example

>>AT+ASCHOOSE =1

OK

>>AT+ASCHOOSE

+ASCHOOSE:1

OK

7 Error Values

This chapter introduces the error values related to product.
The error codes listed in the following table

Code of <err>	Description	Remarks
1	AT command timeout	lack of <CR><LF>
2	No such command	
3	Non-standard format	
4	Non-standard parameters	
5	Unallowed operation	The ISM band need to be "CUSTOMIZE"