Gemtek
Wireless Broadband Anywhere

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GIOT AT Command for LoRa Module

Table of Content

1 Purpose

1.1 Scope
This document is intended as a reference guide to the usage of the AT command set for the LoRa module unit. This document only applies to the Gemtek GIOT series.
The intended audiences for this document are the field test engineers, product and intelligent peripheral developers.

1.2 Terms and Abbreviations

Asynchronous
> A serial data transmission method that uses Start and Stop bits to synchronize reception.

AT Commands
> A group of commands that can be sent by a terminal or host computer to control the ISU in Command mode.

Baud
> One signaling element per second. This is a measure of the signaling rate on the telephone

LMU
> Lora module unit

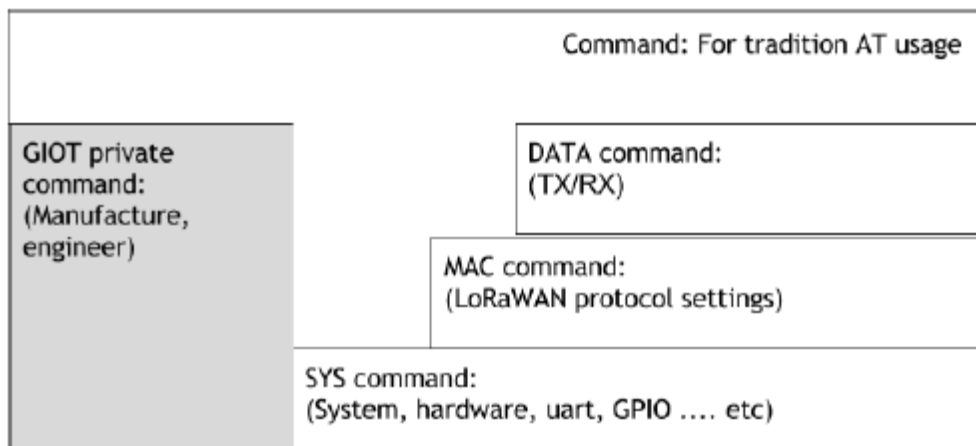**LoRaWAN**
> Long Range network protocol

1.3 Uart
Uart - Universal Asynchronous Receiver/Transmitter, the baud rate depends on the hw platform. We expect that the default baud is 9600.

2 Command Overview

2.1 Command groups

The LMU employs three principle types of AT commands group: common, data, mac, and sys. The two types have differing syntax used to query and update their settings. They also have unique reference standards.

2.1.1 Common commands

These commands are used to perform AT behavior or debug usage.

2.1.2 Data commands

A specific communication AT command is used to transmit and receive LoRaWAN message. It consist of all ASCII alpha character but below list is not accepted: "

2.1.3 MAC Configuration commands

Media access control command. Configuration of AT commands is for query and adjusts LoRaWAN^{TM} protocol settings. Most configuration commands include a prefix of + followed by a single alpha character.

2.1.4 SYS Configuration commands

Configuration of AT commands is for query and adjusts hardware (GPIO, Baud rate, etc). Most configuration commands include a prefix of + followed by a single alpha character.

2.2 Commands example
Example:

Enter:	AT+SGMR?	Display firmware version
LMU return:	+SGMR:"1.1.0"	Revision for the LUM
Enter:	AT+CSF=9	Set spreading factor to LMU
LMU return:	OK	SF was set correctly

2.3 Commands line
ATCMD1<CR>
ATCMD2=12<CR>
AT+CMD3=,,15;<CR>
AT+CMD4?<CR>
AT+CMD5=?<CR>

- <CR> command line termination character
- ,, subparameters may be omitted
- + extended command
- ; extended commands are delimited with semicolon

2.4 Information responses and result codes
<CR><LF>+CMD1:3,0,14,"GIOT"<CR><LF>
<CR><LF>+CMD2: (0-3),(0,1),(0-12,15),("GIOT","GEMTEK")<CR><LF>
<CR><LF>OK<CR><LF>

- +CMD1 is response of +CMD1?
- +CMD2 is response of +CMD2=?
  0-12 means range like 0~12
  "GIOT" as a string
- If the command line is performed successfully, the string "OK" is sent.

2.5 Error of responses
<CR><LF>+CMD ERROR:<reason><CR><LF>

- All command need to have ERROR reply
- If the command is not supported or unknown, either "+CMD ERROR: unknown" or "+CMD ERROR:operation not supported" is sent

2.6 Default value
If the command parameters are optional, they can be left out in the command line. If not otherwise specified, the default values are assumed as follows
- In case of Number type parameters, the default value is 0
- In case of String type parameters, the default value is an empty string

3 AT command list

- Command support list depends on each platform. Before development, please use *AT&H* to list down available commands for reference.

3.1 Common command list

Command	Description
AT	Attention command
A/	Repeat previous command line
ATZ	Reset peer client device
AT&F	Resets the current profile to factory-defined defaults.
AT&W	Save current configuration
AT&H	List all available AT commands

3.2 Data command list

Command	Description
AT+DTX	Transmit message to LoRa server
AT+DRX	Query the latest message from buffer of LMU
AT+DRXI	Clear and query indication of RX buffer status
AT+DTTX	Transmit dummy message to LoRa server

3.3 MAC Configuration command list

Command	Description
AT+CPIN	Query PIN code
AT+CSID	Query system ID
AT+CSQ	Signal strength indication
AT+CSYNC	Asynchronous and Synchronous with gateway's ack
AT+CRPTM	Set and query Reporter mode to enable or disable

AT+CQCH	Query channel frequency
AT+CAPORT	Set the port used for application data
AT+CBAP	Enable application port filter
AT+CDEVADDR	Set or query device address in ABP or GIOT mode
AT+CDEVMI	Query the device address in OTAA mode
AT+CAPPEUI	Set and query AppEUI
AT+CDEVEUI	Set and query DevEUI
AT+CAPPKEY	Set and query AppKey
AT+CJOIN	Do join flow for OTAA
AT+CMODE	Set and query mode for OTAA, ABP and GIOT mode
AT+CAPPSKEY	Set and query AppSkey
AT+CNWKSKEY	Set and query NwkSkey
AT+CLCR	Send out mac to validate its connectivity to a network
AT+CADR	Set Link ADR commands
AT+CDCYCLE	Set and query end-device transmit duty cycle
AT+CRXP	Set receive windows parameters
AT+CDEVS	Get end-device status
AT+CNCH	Create or Modification of a channel
AT+CCLASS	Modify LMU class mode
AT+CRXD	Setting delay between TX and RX
AT+CTXPS	Setting Tx parameters setup(olny for AS923,GIOT)
AT+CREJOIN	Re-Join Flow Settings
AT+CDLC	Setting downlink channel frequency (olny for AS923,GIOT)
AT+CQDCH	Query Rx1 downlink frequency, zero means using same frequency as uplink.(olny for AS923,GIOT)
AT+CPT	For ping pong test
AT+CISMB	Set and query ISM band
AT+CSLRM	Save LoRa Mac Command configurations
AT+CRLRM	Restore LoRa Mac Command configurations

3.4 SYS Configuration command list

Command	Description
AT+IBR	Specifies the data rate (baud rate) at which the DCE accepts commands on UART interface.
AT+ECHO	Enable or disable uart echo
AT+SPWMOD	Select power saving mode of LMU
AT+SLMR	Revision of LoRa module
AT+SGMR	Firmware version
AT+SGMI	Manufacture ID
AT+SGMM	Model identification
AT+SGMD	MAC and serial number of LMU
AT+STIMER	Enable timer for reporting GPIO status
AT+SIRQ	Enable IRQ trigger types
AT+SGPIO	Query GPIO status

4 Command Description

4.1 Definitions
GIOT AT is "GIOT's Attention" which is sent from TE(Terminal Equipment) or DTE(Data terminal equipment) to TA(Terminal Adapter) or DCE (Data Circuit Terminating Equipment).
There are four types:
1. **No variable command**: AT[+|&]<Command>
   Example: ATZ, AT+DTX, AT&H

2. **Read command:** AT[+|&]<Command>?
   Example: AT+CLMR?

3. **Test command:** AT[+|&]<Command>=?
   Example:AT+CLMR=?

4. **Execute/Set command:** AT[+|&]<Command>=<var1>,<var2>...
   Example:AT+CSF=9

4.2 Common command

■ AT
The AT commands are used to control the operation of your LMU. They are called AT
commands because the characters AT must precede each command to get the ATtention of
the device. This command always returns OK. It can use to wake-up device.

Type	Syntax	Response/Action
	AT	OK

■ A/
This command repeats the last command of the open session. Only the A/ command itself
cannot be repeated. If this command is the first one of the open session, the response is OK
without any treatment.

Type	Syntax	Response/Action
	A/	
Example	AT+SLMR? A/	+SLMR:"1.1.0" OK +SLMR:"1.1.0" OK

■ ATZ
This command restores the configuration profile from non-volatile memory (EEPROM) and
reset LMU.

Type	Syntax	Response/Action
	ATZ	none

■ AT&F
Restore factory-defined defaults to memory(EEPORM). The configurations of IBR, ECHO,
SPWMOD, CSF, CRPTM, SIRQ and STIMER will be reset.

Type	Syntax	Response/Action
	AT&F	OK

■ AT&W
This command saving the current profile to non-volatile memory (EEPROM)

Type	Syntax	Response/Action
	AT&W	OK

■ AT&H
List all available AT commands

Type	Syntax	Response/Action
	AT&H	... OK

Example:

AT&H   AT,A/,ATZ,AT&F,AT&W,
                          +IBR, +DTX,...
                          OK

4.3 Data command
■ AT+DTX
Transmit message through LMU. Transmitting mode supports two ways, asynchronous and
synchronous, depend on configuration command AT+CSYNC
   ●   Synchronous mode: Transmitting done with RF then return OK when it is in
       transmitting memory buffer. After transmit success, return "Receive ACK" means
       gateway has reveive success and ACK was get by LMU.
   ●   Asynchronous mode: Messages is ready in transmitting memory buffer, then return
       OK.

NOTE: In different data rate setting, the payload length would be also changed. It depends on channel assignment and channel hopping limitation. You can find this information from "LoRaWAN™ Regional Parameters".

NOTE:
Firmware version after v4.00.13:
- maximum length is 242

Type	Syntax	Response/Action
Set	AT+DTX=<length>,<val> NOTE: length of val is 11 with ASCII character in SF10 NOTE: length of val is 22 with Hex in SF10	OK When error: +DTX ERROR:<report>
Read	None	
Test/Help	AT+DTX=?	+DTX=length, payload OK

Example:
AT+DTX=11,"12345ABCdef"   OK
AT+DTX=22,0123456789abcdef012345   OK

Note: The char " can not be transmitted through ASCII mode

Note: The maximum length of AT command is 255 bytes. So the maximum length of ASCII mode is 242 bytes, and the maximum length of hex mode is 121 bytes.

Example:
The maximum length of ASCII
AT+DTX=242,"000123456789"

The maximum length of HEX
AT+DTX=242,000123456789

■ AT+DRX

Query message from buffer of LMU and clear by command. When message is in RX buffer, Pin PA8 will be indicated.

Pin	Indication	Remark
PA8	0/1	

Type	Syntax	Response/Action
Set	None	
Read	AT+DRX?	+DRX:<length>,<Hex> OK When error: +DRX ERROR:<report>
Test/Help	AT+DRX=?	+DRX=<length of Rx data>,<value of Rx data> OK

Example:

AT+DRX?   +DRX:12,012345abcdef
                                           OK

■ AT+DRXI

Clear and query status of pin PA8, this variable of +DRXI only can be set to 0 by this command

Type	Syntax	Response/Action
Action	AT+DRXI=<val>	OK
Read	AT+DRXI?	+DRXI=<status:0/1>
Test/Help	AT+DRXI=?	+DRXI=<status of pin>

Example:

AT+DRXI=0   OK

■ AT+DTTX
Transmit debug message through LMU to cloud server for testing purpose.

Content of message: MAC address of LMU.
EX: 04000001 will be transmitted to cloud server.

Type	Syntax	Response/Action
Action	AT+DTTX	OK
Read	None	
Test/Help	None	

Example:
AT+DTTX   OK

Note: The transmit error code can reference function of DTX

4.4 MAC command

■ AT+CPIN
Update and query PIN code of LMU

Type	Syntax	Response/Action
Set	None	
Read	AT+CPIN?	+CPIN:<value> OK
Test/Help	None	

Example:
AT+CPIN?   +CPIN:1234
                                      OK

■ AT+CSID

Update and query system ID of LMU

Type	Syntax	Response/Action
Set	None	
Read	AT+CSID?	+CSID:"System ID" OK
Test/Help	None	

Example:

AT+CSID?   +CSID:"04"
                                            OK

■ AT+CSQ

Scanning for signal strength indication

Type	Syntax	Response/Action
Set	None	
Read	AT+CSQ?	+CSQ: 1:<Channel 1 rssi> 2:<Channel 2 rssi> … 15:<Channel 15 rssi>
Test/Help	None	

Example:

AT+CSQ?   +CSQ:
                                           0:-157
                                           1:-157
                                           2:-157
                                           3:-157
                                           4:-157
                                           5:-157
                                           6:-157
                                           7:-157
                                           8:-164
                                           9:-164
                                           10:-164
                                           11:-157
                                           12:-157
                                           13:-157
                                           14:-157
                                           15:-157
                                           OK

■ AT+CSYNC

Query or change Asynchronous or Synchronous mode when transmitting. When it is in sync mode, the timeout value is default to 60s. Transmit will be terminated if new transmit task coming.

Type	Syntax	Response/Action
Set	AT+CSYNC=<0-1>	OK
Read	AT+CSYNC?	+CSYNC:<val> OK
Test/Help	AT+CSYNC=?	+CSYNC=<0-1>

AT+CSYNC?   +CSYNC:1
                                    OK

■ AT+CRPTM

Set and query Reporter mode to enable or disable

Type	Syntax	Response/Action
Set	AT+CRPTM=<0-1>	OK
Read	AT+CRPTM?	+CRPTM:<val> OK
Test/Help	AT+CRPTM=?	+CRPTM=<0-1>

AT+CRPTM?   +CRPTM:1
                                    OK

■ AT+CQCH

Query channel frequency

Type	Syntax	Response/Action
Set		
Read	AT+CQCH?	

```
AT+CQCH?                              +CQCH:
                                      Channel[i]: Frequency, DrRange, Band
                                      Channel[ 0]: 902300000, 48, 0
                                      Channel[ 1]: 902500000, 48, 0
                                      Channel[ 2]: 902700000, 48, 0
                                      Channel[ 3]: 902900000, 48, 0
                                      Channel[ 4]: 903100000, 48, 0
                                      Channel[ 5]: 903300000, 48, 0
                                      Channel[ 6]: 903500000, 48, 0
                                      …
                                      OK
```

■   AT+CAPORT

Set and query the port used for application data. This command will change the LoRaWAN packet which has an associated port value. Port 0 is reserved for MAC command and 1-223 are available. Default is 1.

Type	Syntax	Response/Action
Set	AT+CAPORT=<1-223>	OK
Read	AT+CAPORT?	+CAPORT:<val> OK
Test/Help	AT+CAPORT=?	+CAPORT=<1-223>

```
AT+CAPORT?                                        +CAPORT:1
                                                  OK
```

■   AT+CBAP

Set and query the port used for assigning which Rx port want to receive. Port value -1 is received all Rx port. Default is -1.

Type	Syntax	Response/Action
Set	AT+CBAP=<-1,1-223>	OK
Read	AT+CBAP?	+CBAP:<val> OK
Test/Help	AT+CBAP=?	+CBAP=<-1,1-223>

```
AT+CBAP=1                                         OK
AT+CBAP?                                          +CBAP:1
                                                  OK
```

■ AT+CDEVADDR

Set and query the device address in ABP or GIOT mode. In GIOT mode can only use query function.
Note: The set action will clean application session key and network session key if we modify device address.

Type	Syntax	Response/Action
Set	AT+CDEVADDR=<Device address>	OK
Read	AT+CDEVADDR?	+CDEVADDR:<val> OK
Test/Help	AT+CDEVADDR=?	+CDEVADDR=<Device address of ABP mode>

AT+CDEVADDR=00ffff04   OK
AT+CDEVADDR?   +CDEVADDR:00ffff04(Device address of ABP mode)
                                             OK

■ AT+CDEVMI

Query the device address in OTAA mode which is from server.

Type	Syntax	Response/Action
Set	None	
Read	AT+CDEVMI?	+CDEVMI:<val> OK
Test/Help	AT+CDEVMI=?	+CDEVMI=<Device address of OTAA mode>

AT+CDEVMI?   +CDEVMI:00ffff05
                                                                          OK

■ AT+CAPPEUI

Set and query AppEUI for OTAA mode useage

Type	Syntax	Response/Action
Set	AT+CAPPEUI=<val>	
Read	AT+CAPPEUI?	+CAPPEUI:<val> OK

| Test/Help | AT+CAPPEUI=? | +CAPPEUI=<AppEUI:length is 16> |

AT+CAPPEUI=1122334455667788   +OK
AT+CAPPEUI?   +CAPPEUI:1122334455667788
                                     OK

■ AT+CDEVEUI
Set and query DevEUI for OTAA mode useage

Type	Syntax	Response/Action
Set	AT+CDEVEUI=<val>	
Read	AT+CDEVEUI?	+CDEVEUI:<val> OK
Test/Help	AT+CDEVEUI=?	+CDEVEUI=<DevEUI:length is 16>

AT+CDEVEUI=3835383859357619   +OK
AT+CDEVEUI?   +CDEVEUI:3835383859357619
                                     OK

■ AT+CAPPKEY
Set and query AppKey for OTAA mode usage

Type	Syntax	Response/Action
Set	AT+CAPPKEY=<val>	
Read	AT+CAPPKEY?	+CAPPKEY:<val> OK
Test/Help	AT+CAPPKEY=?	+CAPPKEY=<AppKey:length is 32>

AT+CAPPKEY=53A6B13B1E372D384C577BA3F76B429C   +OK
AT+CAPPKEY?
        +CAPPKEY:53A6B13B1E372D384C577BA3F76B429C
                        OK

■ AT+CJOIN
Do join flow for OTAA mode

Type	Syntax	Response/Action
Set	None	

| Read | AT+CJOIN? | +CJOIN:<val>
OK |
| Test/Help | AT+CJOIN=? | +CJOIN: Do join flow for OTAA |

■　AT+CMODE

Set and query mode for OTAA, ABP and GIOT-ABP
0 - OTAA
1 - ABP
2 - GIOT-ABP

Type	Syntax	Response/Action
Set	AT+CMODE=<0-2>	
Read	AT+CMODE?	+CMODE:<val> OK
Test/Help	AT+CMODE=?	+CMODE=<0-2>

AT+CMODE=1   OK
AT+CMODE?   +CMODE:1
                                                OK

■　AT+CNWKSKEY

Set and query **Network Session Key**

Type	Syntax	Response/Action
Set	AT+CNWKSKEY=<val>	
Read	AT+CNWKSKEY?	+CNWKSKEY:<val> OK
Test/Help	AT+CNWKSKEY=?	+CNWKSKEY=<NetworkSesion key:length is 32>

AT+CNWKSKEY=53A6B13B1E372D384C577BA3F76B429C   +OK

AT+CNWKSKEY?   +CNWKSKEY:53A6B13B1E372D384C577BA3F76B429C
                             OK

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■   AT+CAPPSKEY

Set and query **Application session key**

Type	Syntax	Response/Action
Set	AT+CAPPSKEY=<val>	
Read	AT+CAPPSKEY?	+CAPPSKEY:<val> OK
Test/Help	AT+CAPPSKEY=?	+CAPPSKEY=<AppKey:length is 32>

AT+CAPPSKEY=53A6B13B1E372D384C577BA3F76B429C   +OK

AT+CAPPSKEY?   +CAPPSKEY:53A6B13B1E372D384C577BA3F76B429C
                               OK

■   AT+CLCR

Send out mac to validate its connectivity to a network

Type	Syntax	Response/Action
Action	AT+CLCR	
Read		
Test/Help	AT+CLCR=?	+CLCR=Send out mac to validate its connectivity to a network

AT+CLCR   OK
                               Radio Tx Done
                               RadioTxDelayDone
                               SRV_MAC_LINK_CHECK_ANS:(22,1)

■ AT+CADR
Set and query Link ADR

Type	Syntax	Response/Action
Set	AT+CADR=<DataRate>,<TxPower>,<ChMask>,<ChMaskCntl>,<NbRep>	
Read	AT+CADR? AT+CADR?<channel set>	+CADR:<DataRate>,<TxPower>,<ChMask>,<ChMaskCntl>,<NbRep> +CADR:<DataRate>,<TxPower>,<ChMask>,<Channel setl>,<NbRep>
Test/Help	AT+CADR=?	+CADR=<DataRate>,<TxPower>,<chMask>,<chMaskCntl>,<NbRep>

AT+CADR=1,1,FF,6,0   OK

AT+CADR?1   +CADR=1,1,FF,1,0

Note: This command has to use AT+CSLRM to save configuration.

■ AT+CDCYCLE
Set and query end- device transmit duty cycle

Type	Syntax	Response/Action
Set	AT+CDCYCLE=<MaxDCycle>	
Read	AT+CDCYCLE?	+CDCYCLE:<val>
Test/Help	AT+CDCYCLE=?	+CDCYCLE=<0-F>

AT+CDCYCLE=1   OK

Note: This command has to use AT+CSLRM to save configuration.

■   AT+CRXP

Set receive windows parameters

Type	Syntax	Response/Action
Set	AT+CRXP=<RX1DRoffest>,<RX2DataRate>, <Frequency>	
Read	AT+CRXP?	+CRXP:<RX1DRoffest>,<RX2DataRate>,<Frequency>
Test/Help	AT+CRXP=?	+CRXP=<Rx1DRoffset>,<Rx2DataRate>,<Frequency>

AT+CRXP=1,1,9020000   OK

Note: This command has to use AT+CSLRM to save configuration.

■   AT+CDEVS

Request status information from device

Type	Syntax	Response/Action
Set	AT+CDEVS	
Read		
Test/Help	AT+CDEVS=?	+CDEVS=Request status information from device

AT+CDEVS
OK

MOTE_MAC_DEV_STATUS_ANS:(255,0)

■ AT+CNCH
Set receive windows parameters

Type	Syntax	Response/Action
Set	AT+CNCH=<ChIndex>,<Freq>,<MaxDR>,<MinDR>	
Read		
Test/Help	AT+CNCH=?	+CNEWCH=<ChIndex>,<Freq>,<MaxDR>,<MinDR>

AT+CNCH=1,9020000,1,2   OK

Note: This command has to use AT+CSLRM to save configuration.

■ AT+CCLASS
Adjust LoRa class for A, B or C

Type	Syntax	Response/Action
Set	AT+CCLASS=<Class>	OK
Read	AT+CCLASS?	+CCLASS:<Class> OK
Test/Help	AT+CCLASS=?	+CCLASS=<A,B,C>

Example:
AT+CCLASS=C   OK
AT+CCLASS?   +CCLASS:C
                                                    OK

Note: This command has to use AT+CSLRM to save configuration.

■ AT+CRXD
Setting delay between TX and RX

Type	Syntax	Response/Action
Set	AT+CRXD=<Delay>	
Read	AT+CRXD?	+CRXD:<Delay>
Test/Help	AT+CRXD=?	+CRXD=<Delay>

AT+CRXD=1   OK

Note: This command has to use AT+CSLRM to save configuration.

■   AT+CISMB
Set and query ISM band

Type	Syntax	Response/Action
Set	AT+CISMB=<1-7>	
Read	AT+CISMB?	+CISMB:<val> OK
Test/Help	AT+CISMB=?	+CISMB=<1-7>

AT+CISMB=4   OK
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AT+CISMB=?   +CISMB=<1-8>
                                                       1:CN470
                                                       2:CN780
                                                       3:EU868
                                                       4:US915
                                                       5:US915H
                                                       6:AS923
                                                       7:Full Band
                                                       8:AU915
                                                       9:CN470
                                                       OK

Note: Change ISM band will restore LoRaMAC configurations to default then reboot.

■   AT+CTXPS (only for AS923 and GIOT band)
Setting Tx parameters setup

Type	Syntax	Response/Action
Set	AT+CTXPS=<DownLinkDwellTime>,<UplinkDwellTime,MaxEIRP>	
Read	AT+CTXPS?	+CTXPS:<DownLinkDwellTime>,<UplinkDwellTime,MaxEIRP>
Test/Help	AT+CTXPS=?	+CTXPS=<DownLinkDwellTime>,<UplinkDwellTime,MaxEIRP>

AT+CTXPS=1,0,7   OK

Note: This command has to use AT+CSLRM to save configuration.

■   AT+CREJOIN

Set Rejoin times and rejoin interval when boot up from OTAA mode.
Rejoin times: Maximum retry number of join flow.
ReJoin interval: Next join request time.

Type	Syntax	Response/Action
Set	AT+CREJOIN=<Rejoin times>,<Rejoin interval>	
Read	AT+CREJOIN?	+CREJOIN:<Rejoin times>,<Rejoin interval>
Test/Help	AT+CREJOIN=?	+CREJOIN=<rejoin times(0-255),0:loop>,<rejoin interval(10-65535 sec)>

AT+CREJOIN=3,10   OK

Note: This command have to use AT&W to save configuration.

■   AT+CDLC (only for AS923 and GIOT band)
Setting downlink channel frequency

Type	Syntax	Response/Action
Set	AT+CDLC=<ChIndex>,<Freq>	
Read		
Test/Help	AT+CDLC=?	+CDLC=<ChIndex>,<Freq>

AT+CDLC=1,9230000   OK
Note: This command has to use AT+CSLRM to save configuration.
Note: This command can use CQDCH to query all Rx1 downlink frequency.

■   AT+CQDCH
Query Rx1 downlink frequency, zero means using same frequency as uplink.

Type	Syntax	Response/Action
Set		
Read	AT+CQDCH?	+CQDCH:

		Channel[i]: Frequency Channel[0]: 0 Channel[1]: 924000000 ...
Test/Help		

AT+CQDCH?
+CQDCH:
Channel[i]: Frequency
Channel[0]: 0
Channel[1]: 924000000
Channel[2]: 0
Channel[3]: 0
Channel[4]: 0
Channel[5]: 0
Channel[6]: 0

■   AT+CPT
For ping pong test. (This command only can used in Class A mode)
Please reboot module after using this function.
.
TXPP(Master or slave ping pong for testing PER)
- Description:
>   For ping master or slave mode, could be used to test PER; sets one node to MASTER
>   and another to SLAVE, the slave side will prints out how many packets received in
>   configured time interval.

- Command:
> · **AT+CPT="TXPP,isMaster,NumOrInterval,freq,pwr,bwd,sf,coderate,fixLen,crcOn,iqIvt,
> TxOrRxTimeout,Symbol"**

Parameter	Description
isMaster	Sets to master or slave mode [0: Slave, 1: Master]
NumOrInterval	Number of packets to be transmitted or Rx time Interval in secs [0001 ~ 9999]
freq	Frequency to be used, 4 frequency intervals and accurate to the 3rd decimal from [902.000~928.000, 855.000~881.000, 457.000~483.000, 421.000~447.000]
pwr	Sets the output power in dBm [02 ~ 20]
bwd	Sets the bandwidth [0: 125kHz, 1: 250kHz, 2: 500kHz]
sf	Sets the data-rate [0: SF12, 1: SF11, 2: SF10, 3: SF9, 4: SF8, 5: SF7, 6: SF7H]
coderate	Sets the coding rate [1: 4/5, 2: 4/6, 3: 4/7, 4: 4/8] (Starts from 1, NOT 0)
fixLen	Fixed length packets [0: variable, 1: fixed]
crcOn	Enables disables the CRC [0: OFF, 1: ON]

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iqIvt	Inverts IQ signals [0: not inverted, 1: inverted]
TxOrRxTimeout	Sets the timeout in milliseconds for Tx or Rx [0001 ~ 9999]
Symbol	Set same symbol of master and slave.

- Result:

Response	Description
OK	Success
ERROR	Failed

- Example: Master
Ping mode, Master, 100 packets, 915.888MHz, 20dBm, BW 500kHz, SF7, Code Rate 4/5, Variable length, CRC on, Not inverted, Tx timeout 35 milliseconds, Symbol 1234

Input	Response
AT+CPT="TXPP,1,0100,915.888,20,2,5,1,0,1,0,0035,1234"	Start Master Ping Pong OK Packets already transmitted, now leaving TXPP mode.

- Example: Slave:
Ping mode, Slave, 90 seconds, 915.888MHz, 0dBm, BW 500kHz, SF7, Code Rate 4/5, Variable length, CRC on, Not inverted, Rx timeout 100 milliseconds, symbol 1234

Input	Response
AT+CPT="TXPP,0,0010,915.888,00,2,5,1,0,1,0,0100,1234"	Start Slave Ping Pong OK 100 packets including DONE message received in 2 seconds, now leaving TXPP mode.

Quit TXPP
- Description:
    Quit running test if TXPP is running

- Command:
    ．**AT+CPT="QUIT"**

- Example:

	Input	Response
1	AT+CPT="QUIT"	QUIT: Stop TXPP OK

- Result:

Response	Description
QUIT: Stop TXPP	Success Stop TXPP
Failed	Failed

■   AT+CSLRM
Save LoRa Mac configuration

Type	Syntax	Response/Action
Set	AT+CSLRM	OK
Read		
Test/Help	AT+CSLRM=?	+CSLRM=Save LoRaMac Configuration.

AT+CSLRM   OK

■   AT+CRLRM
Restore LoRa Mac configuration

Type	Syntax	Response/Action
Set	AT+CRLRM	OK
Read		
Test/Help	AT+CRLRM=?	+CRLRM=Restore LoRaMac Configuration.

AT+CRLRM   OK

4.5 SYS command

■   AT+IBR
Specifies the data rate (baud rate) at which the DCE accepts commands on UART interface. The default value is 9600.
Note:
1. Please make sure cable quality with device, if you want to select baud rate over 9600.
2. The working baud rate also depends on your cable quality and uart chipset of host.

Type	Syntax	Response/Action
Set	AT+IBR=<val> <val> 0 - Default 1 - 9600 bit/s 2 - 19200 bit/s 3 - 38400 bit/s 4 - 57600 bit/s 5 - 115200 bit/s	OK
Read	AT+IBR?	+IBR:<val> OK
Test/Help	AT+IBR=?	+IBR=<0-5> OK

Example:
AT+IBR=0   OK
AT+IBR?   +IBR:0
                                              OK

■   AT+ECHO
Enable or disable uart echo function

Type	Syntax	Response/Action
Set	AT+ECHO=<0-1>	OK
Read	AT+ECHO? <val> 0,1	AT+ECHO:<val> OK
Test/Help	AT+ECHO=?	+ECHO=<0-1> OK

Example:
AT+ECHO=1   OK
AT+ECHO?   +ECHO:1
                                      OK

■   AT+SPWMOD
Set time for entering power saving mode, when uart didn't receiving data from uart over this value it will enter low power mode. User can use IRQ1(PB7) to wake up LMU from low

power mode.

Type	Syntax	Response/Action
Set	AT+SPWMOD=<val> <val> Time for entering low power mode	OK
Read	AT+SPWMOD?	+SPWMOD:<val> OK
Test/Help	AT+SPWMOD=?	+SPWMOD=<0-255> OK

Example:
AT+SPWMOD=10   OK
AT+SPWMOD?   +SPWMOD: 10
                                                 OK

■   AT+SLMR
Displays the revised hardware version.

Type	Syntax	Response/Action
Set	None	
Read	AT+SLMR?	+SLMR:<val> OK
Test/Help	None	

Example:
AT+SLMR?   +SLMR:"0.1"
                                                 OK

■   AT+SGMR
Displays the firmware version of LMU

Type	Syntax	Response/Action
Set	None	
Read	AT+SGMR?	+SGMR:"val" OK
Test/Help	None	

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Example:

AT+SGMR?   +SGMR:"v1.08"
                 OK

■ AT+SGMI

Displays the manufacturer identification.

Type	Syntax	Response/Action
Set	None	
Read	AT+SGMI?	+SGMI:"val" OK
Test/Help	None	

Example:

AT+SGMI?   +SGMI:"GEMTEK"
           OK

■ AT+SGMM

Displays the Model identification.

Type	Syntax	Response/Action
Set	None	
Read	AT+SGMM?	+SGMM:"val" OK
Test/Help	None	

Example:

AT+SGMM?   +SGMM:"WMDS-203"
          OK

■ AT+SGMD

Query the MAC and serial number.

Type	Syntax	Response/Action
Set	None	
Read	AT+SGMD?	+SGMD:"mac","sn" OK
Test/Help	AT+SGMD=?	+SGMD="MAC:length is

		8","SN:length is 13"

Example:

AT+SGMD?   +SGMD:"00000179","GLN015430004D"
                                                 OK

■ AT+STIMER

Enable timer for reporting GPIO status. If val of day is set, val of minutes should be 0 otherwise val of day will be ignored. Double 0 in "minutes" and "days" mean disable timer.

● When LMU is in report mode, it upload data format as:

Example: 00040021002102

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0

Index:1 ex:00	GPIO Status:1 ex:04		ADC0 - PB0 ex:0021	ADC1 - PB1 ex:0021	IRQ Status:1 ex:02	
RFU			(Pin Voltage)*10 Ex: 21	(Pin Voltage)*10 Ex: 21		
	0	R2D (PB8)			0	IRQ0 (PB6)
	1	Status(PA8)			1	Timer (PB7)
	2	GPIn (PA11)			...	RFU
	3	GPIn (PA12)			7	RFU
	...	RFU				
	7	RFU				

Pin definition:

PIN	Type	Remark
PB6	IRQ0	0/1 trigger TX
PB8	R2D	0/1 Use to restore to default and back to normal mode
PA11	GPIn	0/1
PA12	GPIn	0/1
PB0	ADC	0x0~0x21

PB1	ADC	0x0~0x21

Type	Syntax	Response/Action
Set	AT+STIMER=<val of minutes>,<val of days>	OK
Read	AT+STIMER?	+STIMER:<val>, <val> OK
Test/Help	AT+STIMER=?	+STIMER="val of minutes: 1-1440","val of days: 1-365"

Example:

```
AT+STIMER=30              OK // trigger in every 30 minutes
AT+STIMER=0,5            OK // trigger in every five days
AT+STIMER=0,0           OK // Disable timer
AT+STIMER?              +STIMER:0,5
                        OK
```

■   AT+SIRQ

Enable/Disable IRQ0 and IRQ. IRQ0 is used to trigger LoRa frame sending in report mode. IRQ1 is used to wake-up MCU from power saving mode and it can not be disabled by command.

PIN	Type	Remark
PB6	IRQ0	0 - disable 1 - enable
PB7	IRQ1	Can't be disabled

Type	Syntax	Response/Action
Set	AT+SIRQ=<val>	OK
Read	AT+SIRQ?	+SIRQ:<val of IRQ0> OK
Test/Help	AT+SIRQ=?	+SIRQ=<0-1>

Example:

```
AT+SIRQ=1                        OK
AT+SIRQ?                         +SIRQ:1
                                 OK
```

■   AT+SGPIO
Query GPIO status through PIN list

PIN	Type	Remark
PB6	IRQ0	0/1
PB7	IRQ1/GPIn	0/1
PB8	GPIn	0/1
PA11	GPIn	0/1
PA12	GPIn	0/1
PB0	ADC	0~33
PB1	ADC	0~33

Type	Syntax	Response/Action
Set	None	
Read	AT+SGPIO?	+SGPIO:<PB6>,<PB7>,<PB8>,<PA11>,<PA12>,<PB0>,<PB1> OK
Test/Help	AT+SGPIO=?	+SGPIO="Display status of PINs:<PB6>,<PB7>,<PB8>,<PA11>,<PA12>,<PB0>,<PB1>"

Example:

AT+SGPIO?   +SGPIO:0,0,1,0,1,33,33
                                                   OK