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Created By	Bejo Li

GIOT AT command for Lora module

Modification History

Date	Change log	Author	Revision
2015/12/24	fork document	BeJo	0.1.0
2016/01/21	1. Add tx delay command 2. Update command group 3. Add channel assignment cmd	BeJo	0.1.1
2016/02/01	Update command group	Gavin	1.0.0
2016/02/18	1. Document official released	BeJo	1.0.0
2016/03/04	1. Add DTX with number format 2. Add baud rate description	Gavin BeJo	1.0.1
2016/03/22	1. Add I/O usage 2. 1.0.2 Released	BeJo	1.0.2
2016/05/05	1. Add LoRaWAN support	BeJo	1.1.0
2016/05/20	1. Update command status 2. Change default baudrate to 115200 3. Renew sync/async command 4. Limitation for MAX bytes in other SF 5. Removed +GSF and modified +CSF 6. 1.2.0 released	Gavin BeJo	1.2.0
2016/07/19	1. Modify name of CRXT to CRXD 2. Add GMTXP for controlling Maximum tx power 3. Add GSYSC for controlling LED and Report 4. Add GCHO function	Gavin	1.2.1
2016/08/04	1. Add PA2 and +DRXI feature 2. Add CQCH function 3. Remove +CSID	BeJo Gavin	1.2.2

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 audience 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 signalling element per second. This is a measure of the signalling rate on the telephone

LMU

Lora module unit
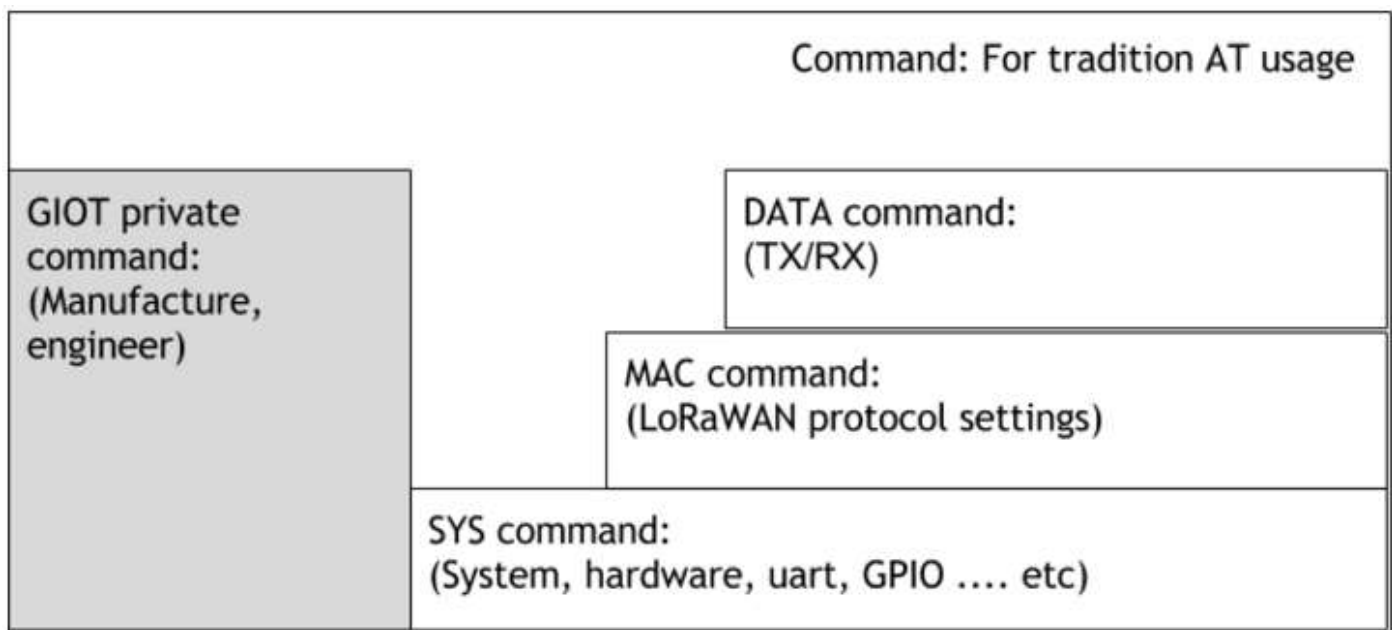
LoRaWAN

Long Range network protocol

1.3 Uart

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

2 Command Overview

2.1 Command groups
The LMU employs three principle types of AT commands group: common, data, mac, sys and GIOT private. 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 useage.

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 adjust LoRaWAN™ 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 adjust hardware(GPIO, Baud rate, etc). Most configuration commands include a prefix of + followed by a single alpha character.

2.1.5 GIOT private commands

This command type is only for engineer and manufacture useage. Before verify with password these command CANNOT be executed.

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 setted 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 using *AT&H* to list down available commands for reference.
- Remark version - example
  - "1.0.0 ~ " Support in 1.0.0 or higher
  - "~1.0.7" Support before 1.0.7 and drop in the feature
  - "~" will be released in the feature

3.1 Common command list

Command	Description	Remark	Status
AT	Attention command	v1.01 ~	
A/	Repeat previous command line	v1.01 ~	
ATZ	Reset peer client device	v1.01 ~	
AT&F	Resets the current profile to factory-defined defaults.	v1.01 ~	
AT&W	Save current configuration	v1.01 ~	
AT&H	List all available AT commands	v1.01 ~	

3.2 Data command list

Command	Description	Remark	status
AT+DTX	Transmit message to LoRa server	v1.01 ~	
AT+DRX	Query the latest message from buffer of LMU	v1.01 ~	
AT+DRXI	Clear and query indication of RX buffer status	~	
AT+DTTX	Transmit dummy message to LoRa server	v1.01 ~	

3.3 MAC Configuration command list

Command	Description	Remark	status
AT+CSF	Spreading factor	v1.07 ~v1.99	
AT+CPIN	Query PIN code	v1.01 ~	
AT+CSQ	Signal strength indication	v1.01 ~	
AT+CSYNC	Asynchronous and Synchronous with gateway's ack	~	Cooking
AT+CRPTM	Set and query Reporter mode to enable or disable	v1.07 ~	
AT+CQCH	Query channel frequency	v2.00~	
AT+CTXP	Set and query Tx power	v1.08 ~ v1.99	
AT+CAPPEUI	Set and query AppEUI	v2.00 ~	
AT+CDEVEUI	Set and query DevEUI	v2.00 ~	
AT+CAPPKEY	Set and query AppKey	v2.00 ~	
AT+CJOIN	Do join flow for OTAA	v2.00 ~	

AT+CMODE	Set and query mode for OTAA, ABP and GIOT mode	v2.00 ~	
AT+CAPPSKEY	Set and query AppSkey	v2.00 ~	
AT+CNWKSKEY	Set and query NwkSkey	v2.00 ~	
AT+CLCR	Send out mac to validate its connectivity to a network	v2.00 ~	
AT+CADR	Set Link ADR commands	v2.00 ~	
AT+CDCYCLE	Set and query end-device transmit duty cycle	v2.00 ~	
AT+CRXP	Set receive windows parameters	v2.00 ~	
AT+CDEVS	Get end-device status	v2.00 ~	
AT+CNCH	Create or Modification of a channel	v2.00 ~	
AT+CRXD	Setting delay between TX and RX	v2.00 ~	
AT+CSLRM	Save LoRa Mac Command configurations	v2.00 ~	
AT+CRLRM	Restore LoRa Mac Command configurations	v2.00 ~	

3.4 SYS Configuration command list

Command	Description	Remark	status
AT+IBR	Specifies the data rate(baud rate) at which the DCE accepts commands on UART interface.	v1.01 ~	
AT+ECHO	Enable or disable uart echo	v1.01 ~	
AT+SPWMOD	Select power saving mode of LMU	v1.07 ~	
AT+SLMR	Revision of LoRa module	v1.01 ~	
AT+SGMR	Firmware version	v1.01 ~	
AT+SGMI	Manufacture ID	v1.01 ~	

AT+SGMM	Model identification	v1.01 ~	
AT+SGMD	MAC and serial number of LMU	v1.01 ~	
AT+STIMER	Enable timer for reporting GPIO status	v1.07 ~	
AT+SIRQ	Enable IRQ trigger types	v1.07 ~	
AT+SGPIO	Query GPIO status	v1.01 ~	

4 Command Description

4.1 Definitions

GIOT AT is "GIOT's Attention" which sending 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, CTXP, 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. If LMU return "Tx timeout", it means this transmission does not arrive in gateway.
- Asynchronous mode: Messages is ready in transmitting memory buffer, then return OK

NOTE: In different SF setting, the payload length would be also changed. It depends on channel assignment and channel hopping limitation. You can query the limitation through command "AT+DTX=?"

For example in 0.4s limitation:

SF	Max length (bytes)	Remark
10	11	
9	50	
8	50	
7	50	

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: Different SF uses different length of payload

NOTE: The number of length MUST be even in Hex mode.

■ AT+DRX

Query message from buffer of LMU and clear by read. When message is in RX buffer, Pin PA2 will be indicated.

Pin	Indication	Remark
PA2	0/1	

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

Example:

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

■ AT+DRXI

Clear and query status of pin (PA2), 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?	AT+DRXI=\<status:0/1\>
Test/Help	AT+DRXI=?	AT+DRXI=\<0\>

Example:

AT+DTTX=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 transmit to cloud server.

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

Example:

AT+DTTX   OK

4.4 MAC command

■ AT+CSF

Change the spreading factor of LMU

Type	Syntax	Response/Action
Set	AT+CSF=<Tx val>,<Rx val>	OK
Read	AT+CSF?	+CSF:<Tx val>,<Rx val> OK
Test/Help	AT+CSF=?	+CSF=<7-10>,<7-10>

Example:

AT+CSF?   +CSF:9,10

                                  OK

■ 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+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?	
Test/Help	AT+CQCH=?	+CQCH=<0-1>

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+CTXP

Set and query Tx power [2, 5, 8, 11, 14, 20] dbm

Type	Syntax	Response/Action
Set	AT+CTXP=<2, 5, 8, 11, 14, 20>	OK
Read	AT+CTXP?	+CTXP:<val> OK
Test/Help	AT+CTXP=?	+CTXP=Tx Power [2, 5, 8, 11, 14, 20]. Max value is :%d

AT+CTXP?   +CTXP:20

                                                                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

AT+CAPPEUI?

+OK

+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

AT+CDEVEUI?

+OK

+CDEVEUI:3835383859357619

OK

■ AT+CAPPKEY

Set and query AppKey for OTAA mode useage

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

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

■ 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 have 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=<0-15>

AT+CDCYCLE=1   OK

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

■ 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

Select power saving mode of LMU. User can use IRQ1(PB7) to wake up LMU from low power mode.

Type	Syntax	Response/Action
Set	AT+SPWMOD=<val> <val> 0 - normal	OK

	1 - sleep	
Read	AT+SPWMOD?	+SPWMOD:<val> OK
Test/Help	AT+SPWMOD=?	+SPWMOD=<0-1> OK

Example:

AT+SPWMOD=0   OK
AT+SPWMOD?   +SPWMOD:0
                                     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	AT+SGMR=?	+SGMR:"LOW_POWER_MODE" OK

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?   +SGMI:"WSMS-116_BLKD"

                                   OK

■ AT+SGMD

Query the MAC and serial number.

Type	Syntax	Response/Action
Set	None	
Read	AT+SGMD?	+SGMD:"mac","snl" 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: 000401e804ed02

14   0

Index:1 ex:00	GPIO Status:1 ex:04	ADC0 - PB0 ex:01e8	ADC1 - PB1 ex:04ed	IRQ Status:1 ex:02
RFU		12 bits ADC Range: 0~4095	12 bits ADC Range: 0~4095	

GPIO Status breakdown:

0	Reset (PB8)
1	GPIn0 (PA8)
2	GPIn1 (PA11)
3	GPIn2 (PA12)
...	RFU
7	RFU

IRQ Status breakdown:

0	IRQ0 (PB6)
1	GPIn (PB7)
...	RFU
7	RFU

Pin definition:

PIN	Type	Remark
PB6	IRQ0	0/1 trigger TX
PB7	IRQ1, GPIn	0/1 trigger Wakeup, in Report mode is GPIn
PB8	RESET	0/1 Use to restore to default and back to normal mode
PA11	GPIn	0/1
PA12	GPIn	0/1
PB0	ADC	12 bits
PB1	ADC	12 bits

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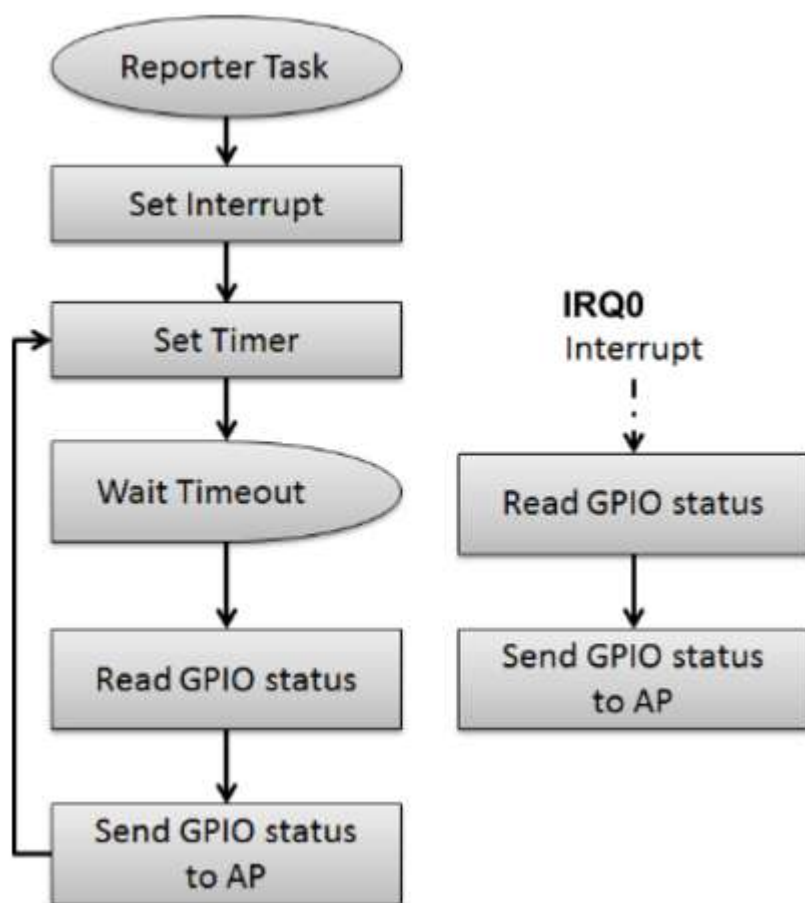
Type	Syntax	Response/Action
Set	AT+STIMER=\<val of minutes>,\<val of days>	OK
Read	AT+STIMER?	+STIMER:\<val>, \<val> OK
Test/Help	AT+STIMER=?	+STIMER="val of minutes: 1-1440","val of days: 1-365"

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	12 bits
PB1	ADC	12 bits

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:0,0,1,0,1,500,2055

                                             OK