Gemtek
Wireless Broadband Anywhere

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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
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2016/05/20	1. Update command status 2. Renew sync/async command 3. Limitation for MAX bytes in other SF 4. Removed +GSF and modified +CSF 5. 1.2.0 released	Gavin BeJo	1.2.0

1 Purpose

1.1 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 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 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

1.4 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.

1.5 2.1.1 Common commands

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

1.6 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: (TBD)

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, System timer, 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 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

1.7 3.1 Common command list

Command	Description	Remark	Status
AT	Attention command	v1.01 ~	Done
A/	Repeat previous command line	v1.01 ~	Done
ATZ	Reset peer client device	v1.01 ~	Done

AT&F	Resets the current profile to factory-defined defaults.	v1.01 ~	Done
AT&W	Save current configuration	v1.01 ~	Done
AT&H	List all available AT commands	v1.01 ~	Done

1.8 3.2 Data command list

Command	Description	Remark	status
AT+DTX	Transmit message to LoRa server	v1.01 ~	Done
AT+DRX	Query the latest message from buffer of LMU	v1.01 ~	Done
AT+DTTX	Transmit dummy message to LoRa server	v1.01 ~	Done

1.9 3.3 MAC Configuration command list

Command	Description	Remark	status
AT+CSF	Spreading factor	v1.07 ~v1.99	Done
AT+CSID	Query System ID	v1.01 ~	Done
AT+CPIN	Query PIN code	v1.01 ~	Done
AT+CSQ	Signal strength indication	v1.01 ~	Done
AT+CSYNC	Asynchronous and Synchronous with gateway's ack	~	Cooking
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+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+CRXT	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 ~	

1.10 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 ~	Done
AT+ECHO	Enable or disable uart echo	v1.01 ~	Done
AT+SPWMOD	Select power saving mode of LMU	v1.07 ~	Done
AT+SLMR	Revision of LoRa module	v1.01 ~	Done
AT+SGMR	Firmware version	v1.01 ~	Done

AT+SGMI	Manufacture ID	v1.01 ~	Done
AT+SGMM	Model identification	v1.01 ~	Done
AT+SGMD	MAC and serial number of LMU	v1.01 ~	Done
AT+SGPIO	Query GPIO status	v1.01 ~	Done

4 Command Description

1.11 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

1.12 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, STIMER, SIRQ and SPWMOD 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, + CSID,...
OK

1.13 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. means gateway has RX success and return an ACK
- Asynchronous mode: Messages store in LMU 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 NOTE: length of val is 22 with Hex	OK When error: +DTX ERROR:<report>
Read	None	
Test/Help	AT+DTX=?	+DTX=11,"char with 11 length" OK

Example:

AT+DTX=11,"12345ABCdef" OK

AT+DTX=22, 0123456789abcdef012345 OK

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

■ AT+DRX

Query message from buffer of LMU and clear by read.

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:11,"12345ABCdef"
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

1.14 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+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+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+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?	+CRPTM:<val> OK
Test/Help	AT+CTXP=?	+CRPTM=Tx Power [2, 5, 8, 11, 14, 20]. Max value is :%d

AT+CTXP? +CTXP:20

OK

■ AT+CAPPEUI

Set and query App EUI

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 DEV EUI

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

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+CMODE

Set and query mode for OTAA and ABP

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

AT+CMODE=1 OK

AT+CMODE? +CMODE:1

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=<App session key:length is 32>

AT+CAPPSKEY=11223344556677889900aabbccddeeff +OK

AT+CAPPSKEY? +CAPPSKEY:11223344556677889900aabbccddeeff

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=<Network session key:length is 32>

AT+CNWKSKEY=11223344556677889900aabbccddeeff +OK

AT+CNWKSKEY? +CNWKSKEY:11223344556677889900aabbccddeeff

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?	+CADR:<DataRate>,<TxPower>,<ChMask>,<ChMaskCntl>,<NbRep>
Test/Help	AT+CADR=?	+CADR=<DataRate>,<TxPower>,<chMask>,<chMaskCntl>,<NbRep>

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

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

■ 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+CRXT

Setting delay between TX and RX

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

AT+CRXT=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

1.15 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 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 to wake up LMU from low power mode.

Type	Syntax	Response/Action
Set	AT+SPWMOD=<val> <val> 0 - normal 1 - sleep	OK
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	None	

Example:

AT+SGMR? +SGMR:"1.1.0"
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+SGPIO

Query GPIO status through PIN list

PIN	Type	Remark
PB6	IRQ0	0/1
PB7	IRQ1	0/1
PB8	GPIO, RESET	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:<PB0>,<PB6>,<PB7>,<PA11>,<PA12>,<PB0>,<PB1> OK
Test/Help	AT+SGPIO=?	+SGPIO="Display status of PINs: <PB0>,<PB6>,<PB7>,<PA11>,<PA12>,<PB0>,<PB1>"

Example:

AT+SGPIO?

+SGPIO:0,0,1,0,1,fff,a01

OK