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## **Application Note 007**

**AT Command Reference Guide - ETH-M-LORA-AX**

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**AT Command Reference Guide for Ethertronics LoRa modules ETH-M-LORA-AX  
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# AT Command Reference Guide

## PREFACE

This document describes the AT commands of Ethertronics LoRa module series ETH-M-LORA-AX.

## DEFINITIONS

For the purposes of the present document, the following syntactical definitions are applied:

- **<CR>** “Carriage Return” character, its value is 0x0D.
- **<LF>** Linefeed character, its value is 0x0A.
- **<...>** Name enclosed in angle brackets is a syntactical element. Brackets themselves do not appear in the command line.
- **[...]** Optional sub-parameter of a command or a response is enclosed in square brackets. Brackets themselves do not appear in the command line. When sub-parameter is not given in parameter type commands, new value equals to its previous value. In action type commands, action should be done on the basis of the recommended default setting of the sub-parameter.

## AT COMMAND LINE SYNTAX

The AT command line is made up of four components:

- The prefix
- The body
- The trailing
- The termination characters

**NOTE:** The AT command is case insensitive

## AT COMMAND PREFIX

The AT command line prefix consists of the characters “**AT**” or “**at**” or, to repeat the execution of the previous command line, the characters “**A**” or “**a**”.

## PREFIX EXTENSION

“**AT+**” is firmly known as the AT prefix extension.

## AT COMMAND BODY

The body is composed of three elements:

- Module name
- Sub-module name
- Command name

## MODULE NAME

“**LORA**” is the AT command module’s name of **ETH-M-LORA-AX**.

## SUB-MODULE NAME

Sub-module name is used to clearly identify **ETH-M-LORA-AX**s section, and is prefixed with a @ symbol.

The **ETH-M-LORA-M-AX** is composed of five (5) sub-modules:

- Generic
- System (SYS)
- Antenna (MCD)
- LoRaWAN (MAC)
- LoRa Radio (SX127X)

# AT Command Reference Guide

## COMMAND NAME

There are two types of command:

- The executable commands
  - Function command is used to identify the execution action and is prefixed with a # symbol.
- The variable commands
  - Variable command is used to identify the write/read operation and is prefixed with a % symbol.

## THE TRAILING

Three trailing types are supported:

- Read operation ( ? )
- Write operation of Variable command or parameters of Function command ( = )
- Syntax information request ( =? )

NOTE: Please be aware that some commands can support all the three trailing types and some don't support any trailing type.

## THE TERMINATION CHARACTERS

The AT command is terminated with a "CARRIER RETURN" character <CR>.

## AT RESPONSE

The responses and process results of an AT Commands are under below format:

<CR><LF> <Response string> <CR><LF>.

### Examples:

- <CR><LF>OK<CR><LF>
- <CR><LF>ERROR\_NO\_SUBMODULE<CR><LF>
- <CR><LF>ERROR<CR><LF>

## RESULT CODES TABLE

Status	Value	Comments
OK	0	The operation is successful.
ERROR	30	The operation is failed.
ERROR_NOT_READY	31	The other command is processing.
ERROR_QUEUE_OVERFLOW	32	The internal command queue is overflow.
ERROR_NO_PREFIX	33	No prefix is given.
ERROR_NO_MODULE	34	No module is given.
ERROR_NO_SUB_MODULE	35	No sub-module is given.
ERROR_NO_COMMAND	36	Unknown command.
ERROR_RES_QUEUE_OVERFLOW	37	The internal result queue is overflow.

Table 1

# AT Command Reference Guide

## AT COMMANDS OF ETH-M-LORA-AX

Historically, the AT commands are used to control MODEMs. AT is the abbreviation for Attention. These commands come from Hayes commands that were used by the Hayes smart modems. The Hayes commands started with AT to indicate the attention from the Analog MODEM.

Now a day AT commands are the convenient way to address to any kind of Hardware modules to avoid deep intrusion and issues during integration process such source code merge operation, library linkage, ...

### GENERIC COMMANDS

#### AT - ATTENTION

Attention.

#### Syntax:

Command	Command Type
AT	Command to check if the module is ready

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	If the module is running and is ready to receive the AT commands.

#### Examples:

at
OK

# AT Command Reference Guide

## A/ - REPEAT THE PREVIOUS COMMAND

Repeat the execution of the previous AT command.

### Syntax:

Command	Command Type
A/	Execution

### Parameters and Values:

None

### Return:

Status	Comments
...	Depend on the previous AT command.

### Examples:

<pre> at+lora@mac#send HelloWorld HelloWorld  OK a/ HelloWorld  OK </pre>
---

# AT Command Reference Guide

## +++ - ESCAPE SEQUENCE

Escape Sequence to return to the command line prompt during a pending AT command.

Usually the escape sequence is used to abort a pending AT command (see AT+LORA#ABORT and AT+LORA#RESUME commands).

### Syntax:

Command	Command Type
+++	Execution

### Parameters and Values:

None

### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Ready for new AT command.  <b>NOTE:</b> The pending command is still running.  Use <b>AT+LORA#ABORT</b> to abort the pending command. Use <b>AT+LORA#RESUME</b> to resume back to the pending command.

### Examples:

<pre>at+lora@mac#join +++  OK at+lora#abort  OK</pre>
---



# AT Command Reference Guide

## AT+LORA#E OR ATE - ECHO

Enable or disable the command echo.

### Syntax:

Command	Command Type
AT+LORA#E[<flag>]	Execution

### Parameters and Values:

Parameters	Values	Comments
Flag	None	Return the current echo status.
	0	Set echo to OFF.
	1	Set echo to ON.

### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>ERROR<CR><LF>	Unknown flag value.
<0 .. 1>	Current echo flag. 0 = the echo is OFF. 1 = the echo is ON.

### Examples:

<pre> at+lora#e 0 OK  at+lora#e1 OK  at+lora#e 1 OK </pre>
--

# AT Command Reference Guide

## AT+LORA#I OR ATI - MODULE INFORMATION

Read the module Information

Syntax:

Command	Command Type
AT+LORA#I[<flag>]	Read

Parameters and Values:

Parameters	Values	Comments
Flag	None	Return the copyright of the module.
	0	Return the firmware version.
	1	Return the firmware release date.

Return:

Status	Comments
<CR><LF>Ethertronics LoRa Module v.1.0.0<CR><LF> Copyright (c) 2016, 2017 Ethertronics Inc<CR><LF> All rights reserved<CR><LF>	Flag = None (1.0.0 is the current version).
<CR><LF>1.0.0<CR><LF>	Flag = 0.
<CR><LF>MMM DD YYYY – HH:MM:SS<CR><LF>	Flag = 1.

Examples:

<pre> at+lora#i1 1.0.0  OK  at+lora#i  Ethertronics LoRa Module v.1.0.0 Copyright (c) 2016, 2017 Ethertronics Inc All rights reserved  OK </pre>
--

# AT Command Reference Guide

## AT+LORA#Q OR ATQ – QUIET RESULT CODES

Enable or disable the quiet result codes.

### Syntax:

Command	Command Type
AT+LORA#Q[<flag>]	Execution

### Parameters and Values:

Parameters	Values	Comments
Flag	None or 0 1 2	<p>Enables result codes (factory default) Every result code is replaced with a &lt;CR&gt;.</p> <p>Disables result codes.</p> <p><b>Note:</b> After issuing either ATQ1 or ATQ2 every information text transmitted in response to commands is not affected. If parameter is omitted, the command has the same behavior as ATQ0.</p>

### Examples:

<pre> at+lora#q0  OK at+lora#i  Ethertronics LoRa Module v.1.0.0 Copyright (c) 2016, 2017 Ethertronics Inc All rights reserved  OK at+lora#q1 &lt;CR&gt; at+lora#i &lt;CR&gt; Ethertronics LoRa Module v.1.0.0 Copyright (c) 2016, 2017 Ethertronics Inc All rights reserved &lt;CR&gt; at+lora#q2 at+lora#i Ethertronics LoRa Module v.1.0.0 Copyright (c) 2016, 2017 Ethertronics Inc All rights reserved </pre>
--

# AT Command Reference Guide

## AT+LORA#V OR ATV – RESPONSE FORMAT

Determines the contents of the header and trailer transmitted with result codes and information responses. It also determines if result codes are transmitted in a numeric form or an alphanumeric form.

### Syntax:

Command	Command Type
AT+LORA#V[<flag>]	Execution

### Parameters and Values:

Parameters	Values	Comments
Flag	None or 0	Limited headers and trailers and set the result codes to numeric format.
	1	Full headers and trailers and verbose format of result codes (factory default).

### Examples:

```

at+lora#v1

OK
at+lora#i1
1.0.0

OK
at+lora#v0

0
at+lora#i1
1.0.0

0
    
```

# AT Command Reference Guide

## AT+LORA#Z OR ATZ - RESET

Reset the LoRa module and loads the default profile.

### Syntax:

Command	Command Type
AT+LORA#V[<flag>]	Execution

### Parameters and Values:

None

### Example:

```

at

OK
at+lora#v0

0
at

0
at+lora#z

OK

```

# AT Command Reference Guide

## AT+LORA&F OR AT&F

This command is used to configure the module to:

- Boot from the factory FW (AT&F0)
- Boot from the upgrade FW (AT&F1)
- Reset the parameters of the module to the default factory. (AT&F)

### Syntax:

Command	Command Type
AT+LORA&F<mod>	Execution

### Parameters and Values:

Parameters	Values	Comments
<i>mod</i>	NE ant	Limited headers and trailers and set the result codes to numeric format.
	0	Full headers and trailers and verbose format of result codes (factory default).
	1	Boot the module from Upgraded Firmware

### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation Successful.

## AT Command Reference Guide

---

### AT+LORA&W OR AT&W

Permanently store the current configuration parameters of the device.

**NOTE:** The user can use the command AT&F to restore the parameters back from the factory values.

#### Syntax:

Command	Command Type
AT+LORA&W	Execution

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.

# AT Command Reference Guide

## AT+LORA&T OR AT&T

Module self-test.

### Syntax:

Command	Command Type
AT+LORA#RESUME	Execution

### Parameters and Values:

None

### Return:

Status	Comments
	Depend on the resumed AT command.

## AT+LORA#ABORT

Abort the last pending command after issuing +++ command.

### Syntax:

Command	Command Type
AT+LORA#ABORT	Execution

### Parameters and Values:

None

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.



# AT Command Reference Guide

## SYSTEM COMMAND

AT+LORA@SYS%REG

Registry Read/Write command.

Syntax:

Command	Command Type
AT+LORA@SYS%REG=<mode, length, reg_address>	Read/Write
AT+LORA@SYS%REG=?	Test

Parameters and Values:

Parameters	Values	Comments
<i>mode</i>	0	Registry Read Operation.
	1	Registry Write Operation.
<i>length</i>	1-64	Length in bytes
<i>reg_address</i>	0-1023	Registry start address

Examples:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	<i>mode, length or reg_address</i> values are incorrect.
001122334455...xx	Registry read values

AT+LORA@SYS%SN

Get the module serial number.

Syntax:

Command	Command Type
AT+LORA@SYS%SN?	Read

Parameters and Values:

None

Examples:

Status	Comments
<CR><LF>Serial Number: 0x.....<CR><LF> <CR><LF>OK<CR><LF>	Return the device serial number.

# AT Command Reference Guide

## AT+LORA@SYS#SOFTRESET

Perform soft Reset the System.

### Syntax:

Command	Command Type
AT+LORA@SYS#SOFTRESET	Execution

### Parameters and Values:

None

### Examples:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.

## AT+LORA@SYS%FWVERSION

Get the firmware version.

### Syntax:

Command	Command Type
AT+LORA@SYS%FWVERSION?	Read

### Parameters and Values:

None

### Examples:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<b>Major:</b> xx<CR><LF> <b>Minor:</b> xx<CR><LF> <b>Build:</b> xx<CR><LF>	The firmware version.

## AT Command Reference Guide

### AT+LORA@SYS%FWDATE

Get the firmware date.

**Syntax:**

Command	Command Type
AT+LORA@SYS%FWDATE?	Read

**Parameters and Values:**

None

**Examples:**

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>DD/MM/YYYY</b> <CR><LF>	The firmware date.

### AT+LORA@SYS%HOSTIFTYPE

Get the Host interface type

**Syntax:**

Command	Command Type
AT+LORA@SYS%HOSTIFTYPE?	Read

**Parameters and Values:**

Parameters	Values	Comments
Type	0	UART interface (default)
	1	SPI interface

**Return:**

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<0 .. 1>	Current Host interface

# AT Command Reference Guide

## AT+LORA@SYS%HOSTIFCONFIG

Get the current Host interface speed, the configuration values of this command is depending on the type of the host interface (see AT+LORA@@SYS%HOSTIFTYPE command)

### Syntax:

Command	Command Type
AT+LORA@SYS%HOSTIFCONFIG?	Read

### Parameters and Values:

None

### Return:

Status	Comments
0 .. 4	If the host interface has been set to SPI.  0 = 10MHz, 1 = 5MHz, 2 = 2Mhz, 3 = 1MHz, 4 = 500kHz
0x0100 0 00 0	If the host interface has been set to UART interface  <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>Stop: 0 = 1bit, 1 = 2bits.</p> <p>Parity: 00 = None, 01 = Even, 10 = Odd</p> <p>Word length: 0 = 8bits, 1 = 9bits</p> <p>Baud rate:</p> <p>000 = 9600 bps</p> <p>001 = 19200 bps</p> <p>010 = 38400 bps</p> <p>011 = 57600 bps</p> <p>100 = 115200 bps (default)</p> <p>101 = 230600 bps</p> <p>110 = 460800 bps</p> </div> <div style="margin-left: 10px;"> <p>→</p> <p>→</p> <p>→</p> <p>→</p> </div> </div>
<CR><LF>OK<CR><LF>	Operation successful.

## AT Command Reference Guide

### AT+LORA@SYS%SPI LORAIF

Read the LoRa chip (SX127x) SPI interface speed.

#### Syntax:

Command	Command Type
AT+LORA@SYS%HOSTIFCONFIG?	Read

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<0 .. 4>	Current SPI speed interface  0 = 10 MHz 1 = 5 MHz 2 = 2 MHz 3 = 1 MHz 4 = 500 kHz

# AT Command Reference Guide

## AT+LORA@SYS%LPMODE

ETH-M-LORA-M-AX module has been designed to exploit efficiently the Low Power STOP mode of the MCU, the module can wake up either by UART or via external GPIO's P11 (Refer to the pin diagram in the "Module ETH-LORA-M-AX-01 General Module Integration guide" document for the external P11 pin location).

**NOTE:** The most efficient way to avoid any communication error is systematically send a CARRIER RETURN (0x0d) and wait the module answers with a string "OK" before sending any AT command.

LPM Mode	Entry	Wake-up	Effect on V <sub>core</sub> domain clocks	Effect on V <sub>DD</sub> domain clocks	Voltage regulator
Normal Mode (0)	-	-	None	None	ON
LP Run (1)	After LPDelay expired	UART, GPIO'sP11 RTC Alarm			
DEEPSLEEP (2) (Factory default)			CPU CLK OFF no effect on other clocks or analog clock sources, Flash CLK OFF	In Low-Power Mode	
STOP Mode (3)		GPIO'sP11 RTC Alarm	All Vcore domain clock OFF	HIS and HSE and MSI oscillators OFF	In Low-Power Mode

### Syntax:

Command	Command Type
AT+LORA@SYS%LPMODE=<mode>[,<IM>]	Write
AT+LORA@SYS%LPMODE?	Read
AT+LORA@SYS%LPMODE=?	Test

### Parameters and Values:

Status	Values	Comments
mode	0	Low Power mode
	1	Disable Low Power mode.
	2	Enable Low Power Run mode.
	3	Enable Low Power DEEPSLEEP mode. (Factory Default mode)
IM	0	Enable Low Power STOP mode.
	0	Impedance matching circuit if used
	1	Disable (Both Internal and external IM circuit are ON)
	2	Enable only on Internal IM circuit.
	3	Enable only on External IM circuit.
	3	Enable on both internal and external IM circuit.

### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>ERROR<CR><LF>	Low Power mode unknown.
0..3	Values set (0, 1, 2 or 3)

## AT Command Reference Guide

### AT+LORA@SYS%LPDELAY

Set/Get the delay in milli-seconds after inactivity before the module goes into Low Power STOP mode. The default and minimum delay is 30000 milli-seconds.

#### Syntax:

Command	Command Type
AT+LORA@SYS%LPDELAY=<delay>	Write
AT+LORA@SYS%LPDELAY?	Read
AT+LORA@SYS%LPDELAY=?	Test

#### Parameters and Values:

Parameters	Values	Comments
delay	Delay before entering Low-Power mode	in milli-second. (The factory default value is set to 30000 milli-seconds)

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>ERROR<CR><LF>	Delay if less than the default value.
001122334455...xx	Values set previously (milli-seconds)

### AT+LORA@SYS%DATE

Set/Get the system Date.

#### Syntax:

Command	Command Type
AT+LORA@SYS%DATE=<date>	Write
AT+LORA@SYS%DATE?	Read
AT+LORA@SYS%DATE=?	Test

#### Parameters and Values:

Parameters	Values	Comments
date	dd, mm, yyy	dd = day of the month [1 ... 31]. mm = month of the year [1 ...12]. yyyy = year of the century [1900 ... 2089].

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>ERROR<CR><LF>	Date format unknown.
dd/mm/yyyy	Current date

# AT Command Reference Guide

## AT+LORA@SYS%TIME

Set/Get the system Date.

### Syntax:

Command	Command Type
AT+LORA@SYS%TIME=<time>	Write
AT+LORA@SYS%TIME?	Read
AT+LORA@SYS%TIME=?	Test

### Parameters and Values:

Parameters	Values	Comments
time	hh,mn,ss	hh = Hour of the day [0 ... 23]. mm = Minute [0 ...59]. ss = Second [0 ... 59].

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Time format unknown.
hh:mn:ss	Current time

## AT+LORA@SYS%STATUS

Read the Module status.

### Syntax:

Command	Command Type
AT+LORA@SYS%STATUS?	Read

### Parameters and Values:

None

### Return:

Status	Comments
Tics: ...	Number of system tic since power up
Rx_OK: ...	Number of LoRa packets received successfully.
Rx_MIC_Error: ...	Number of LoRa packets received with MIC error.
Rx_Error: ...	Number of LoRa RX error other than MIC error.
Rx_Timeout: ...	Number of LoRa RX timeout error.
Tx_OK: ...	Number of LoRa packets sent successfully.
Tx_Error: ...	Number of LoRa packets sent failed.
Tx_Media_Busy: ...	Number of LoRa collision packets during sent.
<CR><LF> <b>OK</b> <CR><LF>	



## AT Command Reference Guide

### AT+LORA@SYS%LED

Set/Get the system Date.

#### Syntax:

Command	Command Type
AT+LORA@SYS%LED=<mode>	Write

#### Parameters and Values:

Parameters	Values	Comments
<i>mode</i>	0	Set the test LED OFF.
	1	Set the test LED ON.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	LED is set successfully
<CR><LF> <b>ERROR</b> <CR><LF>	Set with unknown parameter.

### AT+LORA@SYS%ALGOMETRIC

Set or get the algorithm input's metric.

#### Syntax:

Command	Command Type
AT+LORA@SYS%LED=<mode>	Write
AT+LORA@SYS% ALGOMETRIC?	Read
AT+LORA@SYS% ALGOMETRIC =?	Test

#### Parameters and Values:

Parameters	Values	Comments
<i>metric</i>	0	SINR metric.
	2	RSSI metric.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Input value is expected.

## AT Command Reference Guide

### AT+LORA@SYS%ALGOAVG

Set or get the average number of input to feed the algorithm.

#### Syntax:

Command	Command Type
AT+LORA@SYS% ALGOAVG =<avg>	Write
AT+LORA@SYS% ALGOAVG?	Read
AT+LORA@SYS% ALGOAVG=?	Test

#### Parameters and Values:

Parameters	Values	Comments
avg	x	X must be greater than 4

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>ERROR<CR><LF>	Input value is expected.

# AT Command Reference Guide

## IMPEDANCE MATCHING RELATED COMMANDS

### AT+LORA@IM#INIT

Initialize the IM algorithm.

**Syntax:**

Command	Command Type
AT+LORA@IM#INIT	Execution

**Parameters and Values:**

None

**Return:**

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.

### AT+LORA@IM#RESET

Reset the IM algorithm without initialized its parameters.

**Syntax:**

Command	Command Type
AT+LORA@IM#RESET	Execution

**Parameters and Values:**

None

**Return:**

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.

# AT Command Reference Guide

## AT+LORA@IM#RUNDEBUB

Run the IM algorithm with new input value.

### Syntax:

Command	Command Type
AT+LORA@IM#RUNDEBUB=<input>	Execution
AT+LORA@IM#RUNDEBUB=?	Test

### Parameters and Values:

Parameters	Values	Comments
input	xx	Input value.

### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>ERROR<CR><LF>	Input value is expected.

## AT+LORA@IM%THR

Set or get Threshold for IM

### Syntax:

Command	Command Type
AT+LORA@IM%THR = <New MIN Th>,<New STEP Th>,<New MAX Th>	Write
AT+LORA@IM%THR?	Read
AT+LORA@IM%THR =?	Test

### Parameters and Values:

Parameters	Values	Comments
New MIN Th	xx	Minimum threshold
New STEP Th	xx	Threshold's Step
New MAX Th	xx	Maximum threshold

### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>UNKNOWN VALUE<CR><LF> <CR><LF>ERROR<CR><LF>	The parameters are wrong

## AT Command Reference Guide

### AT+LORA@IM%RESULT

Get the result of the IM

**Syntax:**

Command	Command Type
AT+LORA@IM%RESULT?	Read

**Parameters and Values:**

None

**Return:**

Status	Comments
<CR><LF>RF Selection: Xx<CR><LF>	Xx = Current RF selection of the IM
<CR><LF>OK<CR><LF>	Operation successful.

### AT+LORA@IM%VERSION

Read the IM version.

**Syntax:**

Command	Command Type
AT+LORA@IM%VERSION?	Read

**Parameters and Values:**

None

**Return:**

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
MM.mm	MM = Current major version value. mm = Current minor version value.

# AT Command Reference Guide

## AT+LORA@IM%CTRLFLAG

Set IM control flag.

### Syntax:

Command	Command Type
AT+LORA@IM%CTRLFLAG=<flag>	Write
AT+LORA@IM%CTRLFLAG=?	Test

### Parameters and Values:

Parameters	Values	Comments
Flag	One of the values in table below.	Control flag.

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## IM CONTROL FLAGS TABLE

Control Flag	Value
IM_CTRL_REG_RESET	0
IM_CTRL_REG_START	1
IM_CTRL_REG_PAUSE	2
IM_CTRL_REG_RESUME	3
IM_CTRL_REG_BYPASS_0	128
IM_CTRL_REG_BYPASS_1	129
IM_CTRL_REG_BYPASS_2	130
IM_CTRL_REG_BYPASS_3	131
IM_CTRL_REG_BYPASS_4	132
IM_CTRL_REG_BYPASS_5	133
IM_CTRL_REG_BYPASS_6	134
IM_CTRL_REG_BYPASS_7	135
IM_CTRL_REG_BYPASS_8	136
IM_CTRL_REG_BYPASS_9	137
IM_CTRL_REG_BYPASS_10	138
IM_CTRL_REG_BYPASS_11	139
IM_CTRL_REG_BYPASS_12	140
IM_CTRL_REG_BYPASS_13	141
IM_CTRL_REG_BYPASS_14	142
IM_CTRL_REG_BYPASS_15	143

Table 2

## AT+LORA@IM%STATUS

### AT+LORA@IM%STATUS

Read the IM status.

#### Syntax:

Command	Command Type
AT+LORA@IM%STATUS?	Read

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
Xx, Yy	Xx = Status value. Yy = RF vector value.

### AT+LORA@IM%ACTIVATE

Set or get IM activation

#### Syntax:

Command	Command Type
AT+LORA@IM% ACTIVATE = <activation>	Write
AT+LORA@IM% ACTIVATE?	Read
AT+LORA@IM% ACTIVATE =?	Test

#### Parameters and Values:

Parameters	Values	Comments
activation	0	IM is disabled
	1	IM is enabled

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>UNKNOWN VALUE<CR><LF> <CR><LF>ERROR<CR><LF>	The parameters are wrong

# AT Command Reference Guide

## STEERING ANTENNA RELATED COMMANDS

AT+LORA@MCD#INIT

Initialize the MCD algorithm.

Syntax:

Command	Command Type
AT+LORA@MCD#INIT=[<mode>]	Execution
AT+LORA@MCD#INIT=?	Test

Parameters and Values:

Parameters	Values	Comments
none	0	IM is disabled
	1	IM is enabled

Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>UNKNOWN VALUE<CR><LF> <CR><LF>ERROR<CR><LF>	The parameters are wrong



## AT Command Reference Guide

### AT+LORA@MCD#RESET

Reset the MCD algorithm without initialized its parameters.

#### Syntax:

Command	Command Type
AT+LORA@MCD#RESET	Execution

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.

### AT+LORA@MCD#RUNDEBUG

Run the MCD algorithm with new input value.

#### Syntax:

Command	Command Type
AT+LORA@MCD#RUNDEBUG=<input>	Execution
AT+LORA@MCD#RUNDEBUG=?	Test

#### Parameters and Values:

Parameters	Values	Comments
input	xx	Input value.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Input value is expected.

## AT Command Reference Guide

### AT+LORA@MCD%RFMAPCODE

Set or get the RF map code to be used by the MCD algorithm..

#### Syntax:

Command	Command Type
AT+LORA@MCD%RFMAPCODE=<m1>, <m2>, <m3>, <m4>	Write
AT+LORA@MCD%RFMAPCODE?	Read
AT+LORA@MCD%RFMAPCODE=?	Test

#### Parameters and Values:

Parameters	Values	Comments
m1	xx	Mode 1 input.
m2	xx	Mode 2 input.
m3	xx	Mode 3 input.
m4	xx	Mode 4 input.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Protected area.

### AT+LORA@MCD%PROTECTMODE

Set or get the protection mode of MCD parameters.

#### Syntax:

Command	Command Type
AT+LORA@MCD%PROTECTMODE=<mode>	Write
AT+LORA@MCD%PROTECTMODE?	Read
AT+LORA@MCD%PROTECTMODE=?	Test

#### Parameters and Values:

Parameters	Values	Comments
mode	0 1	Protected mode. Unprotected mode.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Protected area.

# AT Command Reference Guide

## AT+LORA@MCD%CTRLFLAG

Set MCD control flag.

### Syntax:

Command	Command Type
AT+LORA@MCD%CTRLFLAG=<flag>	Write
AT+LORA@MCD%CTRLFLAG=?	Test

### Parameters and Values:

Parameters	Values	Comments
Flag	One of the values in table 2 below	Control Flag

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Protected area.

## MCD CONTROL FLAGS TABLE

Control Flag	Value
MCD_CTRL_REG_RESET	0
MCD_CTRL_REG_START	1
MCD_CTRL_REG_PAUSE	2
MCD_CTRL_REG_RESUME	3
MCD_CTRL_REG_FORCE_MODE1	17
MCD_CTRL_REG_FORCE_MODE2	18
MCD_CTRL_REG_FORCE_MODE3	19
MCD_CTRL_REG_FORCE_MODE4	20
MCD_CTRL_REG_PAUSE_MCD_FORCE_MODE1	33
MCD_CTRL_REG_PAUSE_MCD_FORCE_MODE2	34
MCD_CTRL_REG_PAUSE_MCD_FORCE_MODE3	35
MCD_CTRL_REG_PAUSE_MCD_FORCE_MODE4	36
MCD_CTRL_REG_BYPASS_0	128
MCD_CTRL_REG_BYPASS_1	129
MCD_CTRL_REG_BYPASS_2	130
MCD_CTRL_REG_BYPASS_3	131
MCD_CTRL_REG_BYPASS_4	132
MCD_CTRL_REG_BYPASS_5	133
MCD_CTRL_REG_BYPASS_6	134
MCD_CTRL_REG_BYPASS_7	135
MCD_CTRL_REG_BYPASS_8	136
MCD_CTRL_REG_BYPASS_9	137
MCD_CTRL_REG_BYPASS_10	138
MCD_CTRL_REG_BYPASS_11	139
MCD_CTRL_REG_BYPASS_12	140
MCD_CTRL_REG_BYPASS_13	141
MCD_CTRL_REG_BYPASS_14	142
MCD_CTRL_REG_BYPASS_15	143

Table 3

## AT Command Reference Guide

### AT+LORA@MCD%STATUS

Read the MCD status.

#### Syntax:

Command	Command Type
AT+LORA@MCD%STATUS?	Read

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
Xx, Yy	Xx = Status value. Yy = RF vector value.

### AT+LORA@MCD%MODE

Get the selected mode of the MCD.

#### Syntax:

Command	Command Type
AT+LORA@MCD%MODE?	Read

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
Xx	Xx = Current mode value.

## AT Command Reference Guide

### AT+LORA@MCD%VERSION

Read the MCD status.

#### Syntax:

Command	Command Type
AT+LORA@MCD%VERSION?	Read

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
MM.mm	MM = Current major version value. mm = Current minor version value.

### AT+LORA@MCD%MCDDTYPE

Set or get MCD type used.

#### Syntax:

Command	Command Type
AT+LORA@MCD%MCDDTYPE=<type>	Write
AT+LORA@MCD%MCDDTYPE?	Read
AT+LORA@MCD%MCDDTYPE=?	Test

#### Parameters and Values:

Parameters	Values	Comments
type	0	Normal mode. <b>(Not Available anymore)</b>
	1	Slow Motion mode (SMD).

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.
<CR><LF>ERROR<CR><LF>	Protected area.
<0 .. 1>	Current MCD mode.  0 = Normal mode.  1 = Slow Motion mode.

## AT Command Reference Guide

### AT+LORA@MCD%FLUCT

Set or get MCD SMD Fluctuation to go back to scooting/training Mode, in dB.

#### Syntax:

Command	Command Type
AT+LORA@MCD%FLUCT=<fluctuation>	Write
AT+LORA@MCD%FLUCT?	Read
AT+LORA@MCD%FLUCT=?	Test

#### Parameters and Values:

Parameters	Values	Comments
<i>fluctuation</i>	xx	New fluctuation value in dB.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<xx>	Current fluctuation in dB.

### AT+LORA@MCD%ACTIVATE

Set or get MCD activation

#### Syntax:

Command	Command Type
AT+LORA@MCD%ACTIVATE=<activation>	Write
AT+LORA@MCD%ACTIVATE?	Read
AT+LORA@MCD%ACTIVATE=?	Test

#### Parameters and Values:

Parameters	Values	Comments
<i>activation</i>	0	MCD is disabled
	1	MCD is enabled

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>UNKNOWN VALUE</b> <CR><LF> <CR><LF> <b>ERROR</b> <CR><LF>	The parameters are wrong

# AT Command Reference Guide

## LORAWAN RELATED COMMANDS

### AT+LORA@MAC%PN

Set or get MCD SMD Fluctuation to go back to scooting/training Mode, in dB.

#### Syntax:

Command	Command Type
AT+LORA@MCD%PN=<mode>	Write
AT+LORA@MCD%PN?	Read
AT+LORA@MCD%PN=?	Test

#### Parameters and Values:

Parameters	Values	Comments
mode	0	Set to private Network mode.
	1	Set to public Network mode.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<0 .. 1>	Current LoRa Network mode. 0 = Private Network mode. 1 = Public Network mode.

### AT+LORA@MAC%NJM

Set or get the Network Join Mode.

#### Syntax:

Command	Command Type
AT+LORA@MAC%NJM=<mode>	Write
AT+LORA@MAC%NJM?	Read

#### Parameters and Values:

Parameters	Values	Comments
mode	0	Manual configuration mode, known as "Activation By Personalization" (ABP) in LoRaWAN specification document.
	1	Over The Air Activation, known as OTAA in LoRaWAN specification document.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## AT Command Reference Guide

### AT+LORA@MAC%D1

Write or read LoRa Device Identification EUI-64 (MSB) (unique, set at factory) (8 bytes).

#### Syntax:

Command	Command Type
AT+LORA@MAC%D1=<deviceID>	Write
AT+LORA@MAC%D1?	Read

#### Parameters and Values:

Parameters	Values	Comments
deviceID	1122334455667788	Eight digits of the device ID EUI-64 (MSB).

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

### AT+LORA@MAC%DC

Read or write LoRa Device class (A, B, C)

#### Syntax:

Command	Command Type
AT+LORA@MAC%DC=<class>	Write
AT+LORA@MAC%DC?	Read

#### Parameters and Values:

Parameters	Values	Comments
class	'A', 'B', 'C'	The device class 'A' or 'B' or 'C'.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.



## AT Command Reference Guide

### AT+LORA@MAC%AP

Set or get LoRa Port used for application data (1 - 223)

#### Syntax:

Command	Command Type
AT+LORA@MAC%AP=<port>	Write
AT+LORA@MAC%AP?	Read

#### Parameters and Values:

Parameters	Values	Comments
port	1 - 223	The device application port.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

### AT+LORA@MAC%NA

Set or get LoRa Network address. The Network address is known as "devAddr" in LoRaWAN specification.

#### Syntax:

Command	Command Type
AT+LORA@MAC%NA=<addr>	Write
AT+LORA@MAC%NA?	Read

#### Parameters and Values:

Parameters	Values	Comments
addr	11223344	4 digits of the Network address.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

# AT Command Reference Guide

## AT+LORA@MAC%NI

Set or get LoRa Network EUI/Name. ETH-M-LORA-AX supports 2 types of Network ID:

- Network EUI
- Network Name

**NOTE:** LoRaWAN supports only 8 digits Network EUI. The Network EUI is known as “AppEUI” in LoRaWAN specification document.

### Syntax:

Command	Command Type
AT+LORA@MAC%NI=<type>, <id>	Write
AT+LORA@MAC%NI?	Read

### Parameters and Values:

Parameters	Values	Comments
<i>type</i> <i>id</i>	0 1122334455667788	Use 8 digits as Network ID.
<i>type</i> <i>id</i>	1 TextString	Use text string as Network ID.

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## AT Command Reference Guide

### AT+LORA@MAC%NK

Set or get LoRa Network Key/passphrase. *ETH-M-LORA-AX* supports 2 types of Network Key:

- Network Key
- Network passphrase

**NOTE:** LoRaWAN supports only 16 digits Network Key. The Network Key is known as “AppKey” in LoRaWAN specification document.

#### Syntax:

Command	Command Type
AT+LORA@MAC%NK=<type>, <key>	Write
AT+LORA@MAC%NK?	Read

#### Parameters and Values:

Parameters	Values	Comments
type	0	Use 16 digits as Network Key.
key	1122334455.. ccddeeff	
type	1	Use text string as Network key.
key	TextString	

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

### AT+LORA@MAC%NSK

Set or get Network Session Key.

#### Syntax:

Command	Command Type
AT+LORA@MAC%NSK=<key>	Write
AT+LORA@MAC%NSK?	Read

#### Parameters and Values:

Parameters	Values	Comments
key	1122334455.. ccddeeff	16 bytes of the Network Session Key.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

# AT Command Reference Guide

## AT+LORA@MAC%DSK

Set or get LoRa Data Session Encryption Key (16 bytes). The Data Session Key is known as "Application Session Key" in LoRaWAN specification document.

### Syntax:

Command	Command Type
AT+LORA@MAC%DSK=<key>	Write
AT+LORA@MAC%DSK?	Read

### Parameters and Values:

Parameters	Values	Comments
key	1122334455..ccddeeff	16 bytes of the Data Session Key.

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## AT+LORA@MAC%DTC

Set or Get LoRa Duty cycle mode.

### Syntax:

Command	Command Type
AT+LORA@MAC%DTC=<mode>	Write
AT+LORA@MAC%DTC?	Read

### Parameters and Values:

Parameters	Values	Comments
mode	0	Duty cycle mode OFF.
	1	Duty cycle mode ON.

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## AT Command Reference Guide

### AT+LORA@MAC%JRX1D

Set or Get LoRaWAN class A Join delay for Window1.

#### Syntax:

Command	Command Type
AT+LORA@MAC%JRX1D=<delay>	Write
AT+LORA@MAC%JRX1D?	Read
AT+LORA@MAC%JRX1D=?	Test

#### Parameters and Values:

Parameters	Values	Comments
delay	1000 - 15000	From 1000 to 15000 milli-seconds.

#### Return:

Status	Comments
<CR><LF>OK<CR><LF> <delay>	Operation successful. Delay value previously set.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

### AT+LORA@MAC%JRX2D

Set or Get LoRaWAN class A Join delay for Window2.

#### Syntax:

Command	Command Type
AT+LORA@MAC%JRX2D=<delay>	Write
AT+LORA@MAC%JRX2D?	Read
AT+LORA@MAC%JRX2D=?	Test

#### Parameters and Values:

Parameters	Values	Comments
delay	1000 - 15000	From 1000 to 15000 milli-seconds.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF> <delay>	Operation successful. Delay value previously set.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

# AT Command Reference Guide

## AT+LORA@MAC%RX1D

Set or Get LoRaWAN class A Rx delay for Window1.

### Syntax:

Command	Command Type
AT+LORA@MAC%RX1D=<delay>	Write
AT+LORA@MAC%RX1D?	Read
AT+LORA@MAC%RX1D=?	Test

### Parameters and Values:

Parameters	Values	Comments
<i>delay</i>	1000 - 15000	From 1000 to 15000 milli-seconds.

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF> <delay>	Operation successful. Delay value previously set.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## AT+LORA@MAC%RX2D

Set or Get LoRaWAN class A RX delay for Window2.

### Syntax:

Command	Command Type
AT+LORA@MAC%RX2D=<delay>	Write
AT+LORA@MAC%RX2D?	Read
AT+LORA@MAC%RX2D=?	Test

### Parameters and Values:

Parameters	Values	Comments
<i>delay</i>	1000 - 15000	From 1000 to 15000 milli-seconds.

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF> <delay>	Operation successful. Delay value previously set.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## AT Command Reference Guide

### AT+LORA@MAC%RXD

Set or Get LoRaWAN class A RX Window duration.

#### Syntax:

Command	Command Type
AT+LORA@MAC%RXD=<delay>	Write
AT+LORA@MAC%RXD?	Read
AT+LORA@MAC%RXD=?	Test

#### Parameters and Values:

Parameters	Values	Comments
delay	1000 - 15000	From 1000 to 15000 milli-seconds.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF> <duration>	Operation successful. Duration value previously set.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

### AT+LORA@MAC#JOIN

OTAA to join LoRa network (acquire network address and session keys).

#### Syntax:

Command	Command Type
AT+LORA@MAC#JOIN=<force>	Execution
AT+LORA@MAC#JOIN?	Read
AT+LORA@MAC#JOIN=?	Test

#### Parameters and Values:

Parameters	Values	Comments
force	none or 0 1	From 1000 to 15000 milli-seconds. Force OTAA join procedure.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.
<CR><LF> <b>0</b> <CR><LF> <CR><LF> <b>1</b> <CR><LF>	Device has not joined the network. Device has joined the network.
<CR><LF> <b>Successfully join LoRa Network</b> <CR><LF> <CR><LF> <b>Failed to join LoRa network</b> <CR><LF> <CR><LF> <b>Please wait until duty cycle expired</b> <CR><LF>	Join status

# AT Command Reference Guide

## AT+LORA@MAC#SEND

Sends data to LoRaWAN gateway and returns the gateway response.

### Syntax:

Command	Command Type
AT+LORA@MAC#SEND=[<data>,<ack>,<iter>,<interval>]	Execution
AT+LORA@MAC#SEND=?	Test

### Parameters and Values:

Parameters	Values	Comments
<i>data</i>		Data to send to the gateway.
<i>ack</i>	0..1	Acknowledge requested.
<i>iter</i>	1..xx	Number of send iterations (-1 indefinite loop)
<i>interval</i>	15000 .. xxxx	Interval duration (must be higher than 15000 ms)
<p><b>NOTE:</b> issue the SEND command without parameters to stop the previous SEND loop.</p>		

### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter are expected.



## AT Command Reference Guide

### AT+LORA@MAC#DUMP

Start/Stop dumping Lora packet.

#### Syntax:

Command	Command Type
AT+LORA@MAC#DUMP=[<mode>]	Execution
AT+LORA@MAC#DUMP?	Read
AT+LORA@MAC#DUMP=?	Test

#### Parameters and Values:

Parameters	Values	Comments
<i>mode</i>	0	Stop dumping data.
	1	Dump only TX data.
	2	Dump only RX data.
	3	Dump both TX and RX (default: when no mode parameter is given).

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter are expected.

### AT+LORA@MAC%RFSB (AVAILABLE ONLY FOR US915)

Set/Read the Radio Frequency Sub-Band.

#### Syntax:

Command	Command Type
AT+LORA@MAC%RFSB=[<sub-band>]	Write
AT+LORA@MAC%RFSB?	Read

#### Parameters and Values:

Parameters	Values	Comments
<i>sub-band</i>	0	ALL 64 channels.
	1 – 8	Sub-band 0-7.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF> <duration>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## AT Command Reference Guide

### AT+LORA@MAC%CHN (AVAILABLE ONLY FOR US915)

Read the current Radio channels selected.

#### Syntax:

Command	Command Type
AT+LORA@MAC%CHN?	Read

#### Parameters and Values:

Parameters	Values	Comments
		Return the sub-band selected channels.

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.

### AT+LORA@MAC%RX1DROFS (AVAILABLE ONLY FOR US915)

Set/Read the RX1 data rate offset.

#### Syntax:

Command	Command Type
AT+LORA@MAC%RX1DROFS=[<ofs>]	Write
AT+LORA@MAC%RX1DROFS?	Read

#### Parameters and Values:

Parameters	Values	Comments
	0 - 3	Return the current RX1 Offset value.

#### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.

# AT Command Reference Guide

## LORA RADIO COMMANDS

### AT+LORA@SX127X#INIT

Initialize LoRa Radio Chip.

**Syntax:**

Command	Command Type
AT+LORA@SX127X#INIT=[<mode>]	Execution
AT+LORA@SX127X#INIT?	Read
AT+LORA@SX127X#INIT=?	Test

**Parameters and Values:**

Parameters	Values	Comments
<i>mode</i>	0	Uninitialized LoRa Radio.
	1	Initialized LoRa Radio.

**Return:**

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

### AT+LORA@SX127X%STATUS

Read LoRa Radio status.

**Syntax:**

Command	Command Type
AT+LORA@SX127X%STATUS?	Read

**Parameters and Values:**

None

**Return:**

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
0 = IDLE 1 = RX_RUNNING, 2 = TX_RUNNING, 3 = Channel Activity Detection	LoRa Radio Status.

## AT Command Reference Guide

### AT+LORA@SX127X%MODEM

Set or get LoRa Radio modulation mode.

#### Syntax:

Command	Command Type
AT+LORA@SX127X%MODEM=[<mode>]	Write
AT+LORA@SX127X%MODEM?	Read
AT+LORA@SX127X%MODEM=?	Test

#### Parameters and Values:

Parameters	Values	Comments
<i>mode</i>	0	FSK Modulation.
	1	LoRa modulation

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

### AT+LORA@SX127X%CHANNEL

Set or get LoRa radio channel.

#### Syntax:

Command	Command Type
AT+LORA@SX127X%CHANNEL=[<chn>]	Execution
AT+LORA@SX127X%CHANNEL?	Read
AT+LORA@SX127X%CHANNEL=?	Test

#### Parameters and Values:

Parameters	Values	Comments
<i>chn</i>	686100000	The LoRa channel can be one of the values beside. (686.1MHz, 686.3MHz or 686.5MHz)
	686300000	
	686500000	

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

## AT Command Reference Guide

### AT+LORA@SX127X#IS\_CHN\_FREE

Check if the given LoRa channel is free.

#### Syntax:

Command	Command Type
AT+LORA@SX127X#IS_CHN_FREE=[<mod, chn, rssi_thresh>]	Write
AT+LORA@SX127X%MODEM?	Read

#### Parameters and Values:

Parameters	Values	Comments
<i>mode</i>	0	FSK Modulation.
	1	LoRa modulation
<i>chn</i>	686100000	The LoRa channel (686.1MHz, 686.3MHz or 686.5MHz).
	686300000	
	686500000	
<i>rssi_thresh</i>		Rssi threshold value.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.
0 .. 1	0 = the given channel is not free. 1 = the given channel is free.

### AT+LORA@SX127X#IS\_CHN\_FREE

Check if the given LoRa channel is free.

#### Syntax:

Command	Command Type
AT+LORA@SX127X#IS_CHN_FREE=[<mod, chn, rssi_thresh>]	Write
AT+LORA@SX127X%MODEM?	Read

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.
XXXX	Random value.

# AT Command Reference Guide

## AT+LORA@SX127X#RX\_CONFIG

Configure LoRa Radio RX parameters.

### Syntax:

Command	Command Type
<b>AT+LORA@SX127X#RX_CONFIG=</b> <b>AT+LORA@SX127X%MODEM?</b> <mod>, <bw>, <dr>, <cr>, <bw_AFC>, <preamble_len>, <sym_timeout>, <fix_len>, <payload_len>, <crcON>, <freq_hopeON>, <hop_period>, <iq_inverted>, <rx_continuous>	Execution

### Parameters and Values:

Parameters	Values	Comments
<i>mod</i>	0	FSK modulation.
	1	LoRa modulation.
<i>bw</i>	[2600 .. 250000]	FSK: Bandwidth in Hz.
	0 = 125KHz	LoRa: Bandwidth range.
	1 = 250KHz	
	2 = 500KHz	
	3 = reserved	
<i>dr</i>	[600 .. 30000]	FSK: Data rate in bit/s.
	6 = 64	LoRa: Data rate in chip symbol.
	7 = 128	
	8 = 256	
	9 = 512	
	10 = 1024	
	11 = 2048	
	12 = 4096	
<i>cr</i>	0	FSK: Not used, set to 0.
	1 = 4/5	LoRa: Code Rate range.
	2 = 4/6	
	3 = 4/7	
	4 = 4/8	
<i>bw_AFC</i>	[2600..250000]	FSK: BW of the Automatic Frequency Control (AFC).
	0	LoRa: Not used, set to 0.
<i>preamble_len</i>	xx	FSK: Number of bytes.



## AT Command Reference Guide

Parameters	Values	Comments
	xx + 4	LoRa: Length in symbols + 4 more symbols by the Hardware.
<i>sym_timeout</i>	0 xxx	FSK: Not used, set to 0. LoRa: Timeout in symbols.
<i>fix_len</i>	0 1	The length is variable. The length is fixed.
<i>payload_len</i>	xxxx	Set the payload length when fixed length is used.
<i>crcON</i>	0 1	crc OFF crc ON
<i>freq_hopeON</i>	0 1	FSK: Not used set to 0. LoRa: 0 = OFF, 1 = ON
<i>hop_period</i>	0 xx	FSK: Not used, set to 0. LoRa: Number of symbols between each hop.
<i>iq_inverted</i>	0 1	FSK: Not used, set to 0. LoRa: Inverts IQ signal, 0 = Not inverted, 1 = Inverted.
<i>rx_continuous</i>	0 1	Single mode. Continuous mode.

Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameters are expected.

# AT Command Reference Guide

## AT+LORA@SX127X#TX\_CONFIG

Configure LoRa Radio TX parameters.

### Syntax:

Command	Command Type
<b>AT+LORA@SX127X#TX_CONFIG=</b> <mod>, <pwr>, <fdev>, <bw>, <dr>, <cr>, <preamble_len>, <fixlen>, <freq_hopON>, <hop_period>, <iq_inverted>, <rx_continuous>	Execution

### Parameters and Values:

Parameters	Values	Comments
<i>mod</i>	0 1	FSK modulation. LoRa modulation.
<i>pwr</i>	Xx dBm	Set output power [dBm]
<i>fdev</i>	xx	FSK: Sets frequency deviation in Hz. LoRa: Not used, set to 0.
<i>bw</i>	0 = 125KHz 1 = 250KHz 2 = 500KHz 3 = reserved	FSK: Not used, set to 0. LoRa: Bandwidth range.
<i>dr</i>	[600 .. 30000]  6 = 64 7 = 128 8 = 256 9 = 512 10 = 1024 11 = 2048 12 = 4096	FSK: Data rate in bit/s  LoRa: Data rate in chip symbol.
<i>cr</i>	1 = 4/5 2 = 4/6 3 = 4/7 4 = 4/8	FSK: Not used, set to 0. LoRa: Code Rate range.





## AT Command Reference Guide

Parameters	Values	Comments
<i>preamble_len</i>	xx	FSK: Number of bytes.
	xx + 4	LoRa: Length in symbols + 4 more symbols by the Hardware.
<i>fix_len</i>	0	The length is variable.
	1	The length is fixed.
<i>crcON</i>	0	crc OFF
	1	crc ON
<i>freq_hopeON</i>	0	FSK: Not used set to 0.
	1	LoRa: 0 = OFF, 1 = ON
<i>hop_period</i>	0	FSK: Not used, set to 0.
	xx	LoRa: Number of symbols between each hop.
<i>iq_inverted</i>	0	FSK: Not used, set to 0.
	1	LoRa: Inverts IQ signal, 0 = Not inverted, 1 = Inverted.
<i>rx_continuous</i>	0	Single mode.
	1	Continuous mode.

Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameters are expected.

## AT Command Reference Guide

### AT+LORA@SX127X#RF\_FREQ

Checks if the given RF frequency is supported by the hardware.

#### Syntax:

Command	Command Type
AT+LORA@SX127X#RF_FREQ=<freq>	Execution

#### Parameters and Values:

Parameters	Values	Comments
freq	xxxx	Frequency to be checked in Hz.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.
0..1	0 = the given frequency is not supported. 1 = the given frequency is supported.

### AT+LORA@SX127X#TIME\_OA

Computes the packet time on air in us for the given payload.

#### Syntax:

Command	Command Type
AT+LORA@SX127X#TIME_OA=<mod>, <pktlen>	Execution

#### Parameters and Values:

Parameters	Values	Comments
mod	0	FSK modulation.
	1	LoRa modulation.
pktlen	xx	Packet payload length.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameters are expected.
xxxx	Computed air time (us) of the given packet payload length.

## AT Command Reference Guide

### AT+LORA@SX127X#SEND

Send a given data over the air.

#### Syntax:

Command	Command Type
AT+LORA@SX127X#SEND=<buffer>, <size>	Execution

#### Parameters and Values:

Parameters	Values	Comments
<i>freq</i>	xxxx	Frequency to be checked in Hz.
<i>size</i>	xx	Length of the payload buffer.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.

### AT+LORA@SX127X#SLEEP

Put the Radio into Sleep mode.

#### Syntax:

Command	Command Type
AT+LORA@SX127X#SLEEP	Execution

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.

# AT Command Reference Guide

## AT+LORA@SX127X#STANDBY

Put the Radio into Standby mode.

### Syntax:

Command	Command Type
AT+LORA@SX127X#STANDBY	Execution

### Parameters and Values:

None

### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.

## AT+LORA@SX127X#RX

Activate Radio RX mode for a given time duration.

### Syntax:

Command	Command Type
AT+LORA@SX127X#RX	Execution

### Parameters and Values:

None

### Return:

Status	Comments
<CR><LF>OK<CR><LF>	Operation successful.

## AT Command Reference Guide

---

### AT+LORA@SX127X#TX

Activate Radio TX mode for a given time duration.

#### Syntax:

Command	Command Type
AT+LORA@SX127X#TX	Execution

#### Parameters and Values:

None

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.

# AT Command Reference Guide

## AT+LORA@SX127X#RX\_TST

Activate Radio RX mode for a given modem mode, frequency, data rate and duration.

### Syntax:

Command	Command Type
AT+LORA@SX127X#RX_TST=<modem, freq, datarate, duration>	Execution
AT+LORA@SX127X#RX_TST=?	Test

### Parameters and Values:

Parameters	Values	Comments
<i>modem:</i>	<b>FSK or LORA</b>	Type of modem mode
<p><b>freq:</b> Frequency of the Channel</p> <p><b>EU868:</b> from 863100000Hz to 869900000Hz incremented by 200kHz.            BW 125kHz, 250kHz for LORA mode. <b>(depend on the datarate parameter)</b>            BW 50kHz for FSK mode.</p> <p><b>US915:</b> Only LORA mode with full 72 channels.</p> <p>Divided into 8 sub-band, <b>Full band can take any of these frequencies.</b></p> <p>1: 902300000, 902500000, 902700000, 902900000, <b>903000000</b>, 903100000, 903300000, 903500000, 903700000</p> <p>2: 903900000, 904100000, 904300000, 903450000, 903470000, 903490000, 903510000, 903530000, <b>904600000</b></p> <p>3: 905500000, 905700000, 905900000, 906100000, <b>906200000</b>, 906300000, 906500000, 906700000, 906900000</p> <p>4: 907100000, 907300000, 907500000, 907700000, <b>907800000</b>, 907900000, 908100000, 908300000, 908500000</p> <p>5: 908700000, 908900000, 909100000, 909300000, <b>909400000</b>, 909500000, 909700000, 909900000, 910100000</p> <p>6: 910300000, 910500000, 910700000, 910900000, <b>911000000</b>, 911100000, 911300000, 911500000, 911700000</p> <p>7: 911900000, 912100000, 912300000, 912500000, <b>912600000</b>, 912700000, 912900000, 913100000, 913300000</p> <p>8: 913500000, 913700000, 913900000, 914100000, <b>914200000</b>, 914300000, 914500000, 914700000, 914900000</p> <p>xxxxxxxx: 125 kHz BW            xxxxxxxxxx: <b>500kHz BW / DR4 only</b></p>		



# AT Command Reference Guide

**datarate:** Data rate

**EU868:**

DR	Configuration	Bite Rate [bit/s]
0	LoRa: SF12 / 125kHz	250
1	LoRa: SF11 / 125kHz	440
2	LoRa: SF10 / 125kHz	980
3	LoRa: SF9 / 125kHz	1760
4	LoRa: SF8 / 125kHz	3125
5	LoRa: SF7 / 125kHz	5470
6	LoRa: SF7 / 250kHz	11000
7	FSK: 50kbps	50000
8..15	RFU	

**US915:**

DR	Configuration	Bite Rate [bit/s]
0	LoRa: SF10 / 125kHz	980
1	LoRa: SF9 / 125kHz	1760
2	LoRa: SF8 / 125kHz	3125
3	LoRa: SF7 / 125kHz	5470
4	LoRa: SF8 / 500kHz	12500
5:7	RFU	
8	LoRa: SF12 / 500kHz	980
9	LoRa: SF11 / 500kHz	1760
10	LoRa: SF10 / 500kHz	3900
11	LoRa: SF9 / 500kHz	7000
12	LoRa: SF8 / 500kHz	12500
13	LoRa: SF7 / 500kHz	21900
14:15	RFU	

duration	xxxxxx	Duration in millisecond.
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**Return:**

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameters are expected.

# AT Command Reference Guide

## AT+LORA@SX127X#TX\_TST

Activate Radio TX mode for a given modem mode, frequency, power and time duration.

### Syntax:

Command	Command Type
AT+LORA@SX127X#TX_TST=<modem, frequency, datarate, modulation, power, duration, [alternate, alt_duration], [alternate, alt_duration], [fcc_test_mode] >	Execution
AT+LORA@SX127X#TX_TST=?	Test

### Parameters and Values:

Parameters	Values	Comments
modem:	FSK or LORA	Type of modem mode
<p><b>freq:</b> Frequency of the Channel</p> <p><b>EU868:</b> from 863100000Hz to 869900000Hz incremented by 200kHz.            BW 125kHz, 250kHz for LORA mode. (<i>depend on the datarate parameter</i>)            BW 50kHz for FSK mode.</p> <p><b>US915:</b> Only LORA mode with full 72 channels.</p> <p>Divided into 8 sub-band, <b>Full band can take any of these frequencies.</b></p> <p>1: 902300000, 902500000, 902700000, 902900000, 903000000, 903100000, 903300000, 903500000, 903700000</p> <p>2: 903900000, 904100000, 904300000, 903450000, 903470000, 903490000, 903510000, 903530000, 904600000</p> <p>3: 905500000, 905700000, 905900000, 906100000, 906200000, 906300000, 906500000, 906700000, 906900000</p> <p>4: 907100000, 907300000, 907500000, 907700000, 907800000, 907900000, 908100000, 908300000, 908500000</p> <p>5: 908700000, 908900000, 909100000, 909300000, 909400000, 909500000, 909700000, 909900000, 910100000</p> <p>6: 910300000, 910500000, 910700000, 910900000, 911000000, 911100000, 911300000, 911500000, 911700000</p> <p>7: 911900000, 912100000, 912300000, 912500000, 912600000, 912700000, 912900000, 913100000, 913300000</p> <p>8: 913500000, 913700000, 913900000, 914100000, 914200000, 914300000, 914500000, 914700000, 914900000</p> <p>xxxxxxxx: 125 kHz BW            xxxxxxxxxx: 500kHz BW / DR4 only</p>		





# AT Command Reference Guide

**datarate:** Data rate

## EU868:

DR	Configuration	Bite Rate [bit/s]
0	LoRa: SF12 / 125kHz	250
1	LoRa: SF11 / 125kHz	440
2	LoRa: SF10 / 125kHz	980
3	LoRa: SF9 / 125kHz	1760
4	LoRa: SF8 / 125kHz	3125
5	LoRa: SF7 / 125kHz	5470
6	LoRa: SF7 / 250kHz	11000
7	FSK: 50kbps	50000
8..15	RFU	

## US915:

DR	Configuration	Bite Rate [bit/s]
0	LoRa: SF10 / 125kHz	980
1	LoRa: SF9 / 125kHz	1760
2	LoRa: SF8 / 125kHz	3125
3	LoRa: SF7 / 125kHz	5470
4	LoRa: SF8 / 500kHz	12500
5:7	RFU	
8	LoRa: SF12 / 500kHz	980
9	LoRa: SF11 / 500kHz	1760
10	LoRa: SF10 / 500kHz	3900
11	LoRa: SF9 / 500kHz	7000
12	LoRa: SF8 / 500kHz	12500
13	LoRa: SF7 / 500kHz	21900
14:15	RFU	

**modulation:** 0 or 1      W/o or with Data modulation required.

**power:**

### EU868

DR	Configuration (ERP)
0	20 dBm
1	14 dBm
2	11 dBm
3	8 dBm
4	5 dBm
5	2 dBm
6..15	RFU

### US915

DR	Configuration (ERP)
0	30 dBm – 2*PWR
1	28 dBm
2	26 dBm
3:8	...
9	12 dBm
10	10 dBm
11..15	RFU

**duration:** 0 = infinite continuous,  
1 – 3600000 seconds.

Whole TX continuous duration.

**alternate:** 0 or 1

TX mode alternatively ON/OFF.

**alt\_duration:** 1 to 60000 seconds

Duration of TX alternative ON/OFF phases.  
Should be at MAX **duration**/2.

**fcc\_test\_mode:** CC125  
CC500  
DW125  
DW500

125Khz BW channel count test (64 channels).  
500Khz BW channel count test (8 channels).  
125Khz BW DWELL test (64 channels).  
500Khz BW DWELL test (8 channels).

## AT Command Reference Guide

Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameters are expected.

### AT+LORA@SX127X#START\_CAD

Start a Channel Activity Detection.

Syntax:

Command	Command Type
AT+LORA@SX127X#START_CAD	Execution

Parameters and Values:

None

Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.

### AT+LORA@SX127X%RSSI

Read the Radio RSSI value of a given modulation.

Syntax:

Command	Command Type
AT+LORA@SX127X%RSSI=<mod>	Execution

Parameters and Values:

Parameters	Values	Comments
<i>mod</i>	0	FSK modulation.
	1	LoRa modulation.

Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.
xxxx dBm	Return the current RSSI value in dBm.

## AT Command Reference Guide

### AT+LORA@SX127X%REG

Set/Read Radio registers.

#### Syntax:

Command	Command Type
AT+LORA@SX127X%REG=<size>	Execution

#### Parameters and Values:

Parameters	Values	Comments
size	xx	Number of registers to be read.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.
xx, xx, xx, ..., xx	Return the registers value.

### AT+LORA@SX127X%MAX\_PAYLOAD

Set Radio maximum length for a given modulation.

#### Syntax:

Command	Command Type
AT+LORA@SX127X%MAX_PAYLOAD=<mod>, <max>	Write

#### Parameters and Values:

Parameters	Values	Comments
mod	0	FSK modulation.
	1	LoRa modulation
max	xxxx	Max payload length in bytes.

#### Return:

Status	Comments
<CR><LF> <b>OK</b> <CR><LF>	Operation successful.
<CR><LF> <b>ERROR</b> <CR><LF>	Parameter is expected.



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