

KG200Z AT Commands Manual

Short-Range Module Series

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About the Document

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1 Introduction

KG200Z module is embedded a set of AT commands for LoRa RF test and LoRaWAN communications. This document introduces related AT commands, also describes how to use LoRaWAN[®] interfaces and how to use AT commands manage LoRa[®] wireless link.

1.1. Definitions

The AT command set is a standard developed by Hayes to control modem. AT means attention. The command set consists of a series of short text strings for performing operations such as joining data exchange and parameters setting. In the context of LoRa modem, the Hayes command set is a variation of the standard AT Hayes commands. AT commands are used to drive the LoRa module and send data. AT commands are sent through the UART peripheral.

The default configurations of the UART of the KG200Z module are as follows: the input/output interface is Type-C, the baud rate is 9600, the stop bit is 1, the ByteSize is 8, parity is none, and flow control is none.

1.2. AT Command Syntax

All command lines must be **AT+<CMD>**, **<CMD>** is the content. All letters must be capitalized to be correctly identified.

Table 1: Types of AT Commands

Command Type	Syntax	Description
Help Command	AT+<CMD>?	Display the introduction of corresponding command (for example, AT+QDEUI?)
Execution Command	AT+<CMD>	Run the corresponding command (for example, AT+QCS)
Read Command	AT+<CMD>=?	Query information (for example, AT+QVER=?)
Write Command	AT+<CMD>=<value>	Set parameter(s) (for example, AT+QVL=2)

1.3. AT Command Responses

Information responses of AT commands are output through UART. The format is shown below:

```
<value><CR><LF>
<CR><LF><Status><CR><LF>
```

- <CR> Carriage return character
- <LF> Line feed character.
- <value><CR><LF> The return value when execute help command and read command.
- When no value is returned, <value><CR><LF> will not display.
- Except **ATZQ**, other commands have the following return values, which indicates the result of command execution. The strings are separated by line feed character and carriage return character.

Table 2: Return Value

Return Value	Description
OK	The command is executed normally.
ERROR	General error indication.
PARAM_ERROR	The parameter is error.
BUSY_ERROR	LoRa network is busy, the command cannot be completed.
TEST_PARAM_OVERFLOW	The parameter is too long.
NO_NETWORK_JOINED	LoRa network is not joined.
RX_ERROR	An error occurs when the module is receiving data
NO_CLASS_B_ENABLE	Class B mode is not enabled.
DUTYCYCLE_RESTRICTED	Duty Cycle restriction.
CRYPTO_ERROR	The error occurs during encryption and decryption.
UNKNOW	Unknown error.

1.4. Declaration of AT Command Examples

The AT command examples in this document are provided to help you learn about the use of the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendations or suggestions about how to design a program flow or what status to set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there is a correlation among these examples, or that they should be executed in a given sequence.

2 AT Commands Description

2.1. ATQ Check Module Operation and Communication Links

This command checks whether the module operation and communication links are normal.

ATQ Check Module Operation and Communication Links

Execution Command	Response
ATQ	OK

2.2. ATQ? Display Descriptions of All Current Commands

This command displays descriptions of all current commands.

ATQ? Display Descriptions of All Current Commands

Execution Command	Response
ATQ?	<List of all commands help>
	OK

Parameter

<List of all commands help>	Descriptions of all current commands.
-----------------------------	---------------------------------------

2.3. ATZQ Reset MCU

This command resets the MCU. That is, resets the entire system, including the radio and microprocessor.

ATZQ Reset MCU

Execution Command	
ATZQ	

2.4. AT+QCS Save LoRaWAN Configuration

This command saves the current LoRaWAN configuration to flash.

AT+QCS Save LoRaWAN Configuration

Execution Command
AT+QCS

Response

When flash has not saved the LoRaWAN configuration:
NVM DATA STORED

OK

When flash has saved the LoRaWAN configuration:
NVM DATA UP TO DATE

OK

When saving the LoRaWAN configuration is failed:
ERROR

2.5. AT+QRFS Restore Module to Factory Setting

This command deletes the LoRaWAN configuration in flash and resets the MCU, then restores the module to the factory setting.

AT+QRFS Restore Module to Factory Setting

Execution Command
AT+QRFS

2.6. AT+QLTIME Get Local Time in UTC Format

This command gets the local time in UTC format.

AT+QLTIME Gets Local Time in UTC Format

Read Command
AT+QLTIME=?

Response

QLTIME:<local_time>

OK

Parameter

<local_time>	String type without double quotes. Local time. For example: 02h00m02s on 01/01/1970.
--------------	--

NOTE

The module can operate in A mode or B mode

- A mode: Gets the local time starting from the default time. The default time starts at 00:00:00 on January 1, 1970.
- B mode: After receiving the beacon frame from the gateway, the module synchronizes the local time with the gateway. Execute **AT+QLTIME**, the module prints the time obtained from the gateway.

2.7. AT+QVL Query/Set Log Level of Application

This command queries or sets the log level of application.

AT+QVL Query/Set Log Level of Application

Read Command AT+QVL=?	Response QVL:<VERBOSE_LEVEL> OK
Write Command AT+QVL=<VERBOSE_LEVEL>	Response OK Or PARAM_ERROR

Parameter

<VERBOSE_LEVEL>	Integer type. Log level. 0 VLEVEL_OFF 1 VLEVEL_L 2 VLEVEL_M 3 VLEVEL_H
-----------------	--

2.8. AT+QAPPEUI Query/Set Identifier of Application

This command queries or sets the identifier of application.

AT+QAPPEUI Query/Set Identifier of Application	
Read Command AT+QAPPEUI=?	Response QAPPEUI:<id> OK
Write Command AT+QAPPEUI=<id>	Response OK Or ERROR Or PARAM_ERROR

Parameter

<id>	A hexadecimal string type separated by colons. Identifier. Length: 8 bytes.
------	---

NOTE

In 1.1 and later versions of the LoRa protocol, APPEUI is renamed JOINEUI to distinguish different network services.

2.9. AT+QNWKKEY Query/Set Network Root Key

This command queries or sets the network root key. The key is only used in OTTA mode.

AT+QNWKKEY Query/Set Network Root Key	
Read Command AT+QNWKKEY=?	Response When #define KEY_EXTRACTABLE = 1 is defined in <i>lorawan_conf.h</i> file: QNWKKEY:<key> OK When #define KEY_EXTRACTABLE = 0 is defined in <i>lorawan_conf.h</i> file:

	ERROR
Write Command AT+QNWKKEY=<key>	Response OK Or ERROR Or PARAM_ERROR

Parameter

<key>	A hexadecimal string type separated by colons. Network root key. Length: 16 bytes.
--------------------	--

2.10. AT+QAPPKEY Query/Set Application Root Key

This command queries or sets the application root key. The key is only used in OTTA mode.

AT+QAPPKEY Query/Set Application Root Key

Read Command AT+QAPPKEY=?	Response When #define KEY_EXTRACTABLE = 1 is defined in <i>lorawan_conf.h</i> file: QAPPKEY:<key> OK When #define KEY_EXTRACTABLE = 0 is defined in <i>lorawan_conf.h</i> file: ERROR
Write Command AT+QAPPKEY=<key>	OK Or ERROR Or PARAM_ERROR

Parameter

<key>	A hexadecimal string type separated by colons. Application root key. Length: 16 bytes.
--------------------	--

2.11. AT+QNWKSKEY Query/Set Network Session Key

This command queries or sets the network session key. The key is only used in OTTA and ABP modes.

AT+QNWKSKEY Query/Set Network Session Key	
Read Command AT+QNWKSKEY=?	Response When #define KEY_EXTRACTABLE = 1 is defined in <i>lorawan_conf.h</i> file: QNWKSKEY:<key> OK When #define KEY_EXTRACTABLE = 0 is defined in <i>lorawan_conf.h</i> file: ERROR
Write Command AT+QNWKSKEY=<key>	OK Or ERROR Or PARAM_ERROR

Parameter

<key>	A hexadecimal string type separated by colons. Network session key. Length: 16 bytes.
--------------------	---

2.12. AT+QAPPSKEY Query/Set Application Session Key

This command queries or sets the application session key. The key is only used in OTTA and ABP modes.

AT+QAPPSKEY Query/Set Application Session Key	
Read Command AT+QAPPSKEY=?	Response When #define KEY_EXTRACTABLE = 1 is defined in <i>lorawan_conf.h</i> file: QAPPSKEY:<key> OK When #define KEY_EXTRACTABLE = 0 is defined in <i>lorawan_conf.h</i> file:

	ERROR
Write Command AT+QAPPSKEY=<key>	OK Or ERROR Or PARAM_ERROR

Parameter

<key>	A hexadecimal string type separated by colons. Application session key. Length: 16 bytes.
--------------------	---

2.13. AT+QDADDR Query/Set Device Address

This command queries or set the device address.

AT+QDADDR Query/Set Device Address	
Read Command AT+QDADDR=?	Response QDADDR:<address> OK
Write Command AT+QDADDR=<address>	Response OK Or ERROR Or PARAM_ERROR

Parameter

<address>	A hexadecimal string type separated by colons. Device address. Length: 4 bytes.
------------------------	---

2.14. AT+QDEUI Query Device Identifier

This command queries the device identifier.

AT+QDEUI Query Device Identifier	
Read Command AT+QDEUI=?	Response QDEUI:<DEUI> OK

Parameter

<DEUI>	A hexadecimal string type separated by colons. Device identifier. Length: 8 bytes.
---------------------	--

2.15. AT+QNWKID Query/Set Network ID

This command queries or sets the network ID.

AT+QNWKID Query/Set Network ID	
Read Command AT+QNWKID=?	Response QNWKID:<id> OK
Write Command AT+QNWKID=<id>	Response OK Or ERROR Or PARAM_ERROR

Parameter

<id>	Decimal string type. Network ID. Range: 0–127. Length: 1 byte.
-------------------	--

2.16. AT+QJOIN Join LoRa network

This command is set to join the LoRa network.

AT+QJOIN Join LoRa network	
Write Command AT+QJOIN=<mode>	Response OK
	+QEVT:JOINED
	Or OK
	+QEVT:JOIN_FAILED
	Or PARAM_ERROR

Parameter

<mode>	Integer type.
0	Join to a network by ABP
1	Join to a network by OTAA

2.17. AT+QLINKC Request Link Check

This command adds Piggyback link check MAC command request to the next uplink. The DemodMargin and NbGateways output information is provided into the extended Rx events (**+QEVT:RX**).

AT+LINKC Request Link Check	
Execution Command AT+QLINKC	Response OK
	Or PARAM_ERROR

2.18. AT+QSEND Send Data to LoRa Network

This command sends application packets with specified port and payload to LoRa network.

AT+QSEND Send Data to LoRa Network

Write Command

AT+QSEND=<port>:<ack>:<payload>

Response

When <ack>=0,
OK

Or

PARAM_ERROR

Or

DUTYCYCLE_RESTRICTED

Or

NO_NET_JOINED

Or

BUSY_ERROR

Or

CRYPTO_ERROR

Or

ERROR

When <ack>=1,

OK

+QEVT:SEND_CONFIRMED

Or

PARAM_ERROR

Or

DUTYCYCLE_RESTRICTED

Or

NO_NET_JOINED

Or

BUSY_ERROR

	Or CRYPTO_ERROR
	Or ERROR

Parameter

<port>	Integer type. Application port to be transmitted. Range: 0–223.
<ack>	Integer type. Whether to confirm the received message from the gateway. 0 Unconfirmed message 1 Confirmed message
<payload>	String type in hexadecimal. Payload. The maximum length is 242 bytes.

2.19. AT+QVER Query LoRa Protocol Version and Module Firmware Version

This command queries the LoRa protocol version and the module firmware version.

AT+QVER Query LoRa Protocol Version and Module Firmware Version

Read command AT+QVER=?	Response <version> OK
----------------------------------	---

Parameter

<version>	String type without double quotes. LoRa protocol version and the module firmware version.
------------------------	---

2.20. AT+QADR Query/Set Adaptive Data Rate Functionality

This command queries or sets the adaptive data rate functionality.

AT+QADR Query Adaptive Data Rate Functionality

Read Command AT+QADR=?	Response QADR: <enabled>
----------------------------------	--

	OK
Write Command AT+QADR=<enabled>	Response OK Or PARAM_ERROR

Parameter

<enabled>	Integer type. Whether to enable the adaptive data rate functionality. 0 Disable the adaptive data rate functionality <u>1</u> Enable the adaptive data rate functionality
------------------------	---

2.21. AT+QDR Query/Set Tx Data Rate

This command queries or sets the Tx data rate. To be able to set data rate, the adaptive data rate functionality must be disabled.

AT+QDR Query/Set Tx Data Rate	
Read Command AT+QDR=?	Response QDR: <data_rate> OK
Write Command AT+QDR=<data_rate>	Response OK Or ERROR Or PARAM_ERROR

Parameter

<data_rate>	Integer type. Tx data rate. Range: 0–7.
--------------------------	---

2.22. AT+QBAND Query/Set Active Region

This command queries or sets the active region.

AT+QBAND Query/Set Active Region	
Read Command AT+QBAND=?	Response QBAND:<band> OK
Write Command AT+QBAND=<band>	Response OK Or PARAM_ERROR

Parameter

<band>	Integer type. Active region channel. 0:AS923 1:AU915 2:CN470 3:CN779 4:EU433 <u>5:EU868</u> 6:KR920 7:IN865 8:US915 9:RU864
---------------------	---

2.23. AT+QCLASS Query/Set LoRa Class

This command queries or sets the LoRa class.

AT+QCLASS Query/Set LoRa Class	
Read Command AT+QCLASS=?	Response QCLASS: <class> OK
Write Command AT+QCLASS=<class>	Response OK

	Or ERROR
	Or PARAM_ERROR
	Or AT_NO_CLASS_B_ENABLE
	Or NO_NET_JOINED

Parameter

<class>	LoRa class. The value must be A, B or C.
----------------------	--

2.24. AT+QDCS Query/Set Duty Cycle

This command queries or sets the duty cycle.

AT+QDCS Query/Set Duty Cycle	
Read Command AT+QDCS=?	Response QDCS: <dutyCycleEnable> OK
Write Command AT+QDCS=<dutyCycleEnable>	Response OK Or PARAM_ERROR

Parameter

<dutyCycleEnable>	Integer type. Whether to enable the duty cycle. 0 Disable the duty cycle <u>1</u> Enable the duty cycle
--------------------------------	---

2.25. AT+QJN1DL Query/Set Join Delay on Rx Window 1

This command queries or sets the join accept delay between the end of the Tx and the join of Rx window 1.

AT+QJN1DL Query/Set Join Delay on Rx Window 1	
Read Command AT+QJN1DL=?	Response QJN1DL: <delay> OK
Write Command AT+QJN1DL=<delay>	Response OK Or PARAM_ERROR

Parameter

<delay>	Integer type. Delay time. Unit: ms
----------------------	------------------------------------

2.26. AT+QJN2DL Query/Set Join Delay on Rx Window 2

This command queries or sets the join accept delay between the end of the Tx and the join of Rx window 2.

AT+QJN2DL Query/Set Join Delay on Rx Window 2	
Read Command AT+QJN2DL=?	Response QJN2DL: <delay> OK
Write Command AT+QJN2DL=<delay>	Response OK Or PARAM_ERROR

Parameter

<delay>	Integer type. Delay time. Unit: ms
----------------------	------------------------------------

2.27. AT+QRX1DL Query/Set Interaction Delay on Rx Window 1

This command queries or sets the interaction delay between the end of the Tx and the join of Rx window 1 in the data interaction process.

AT+QRX1DL Query/Set Interaction Delay on Rx Window 1	
Read Command AT+QRX1DL=?	Response QRX1DL: <delay> OK
Write Command AT+QRX1DL=<delay>	Response OK Or PARAM_ERROR

Parameter

<delay>	Integer type. Delay time. Unit: ms
---------	------------------------------------

2.28. AT+QRX2DL Query/Set Interaction Delay on Rx Window 2

This command queries or sets the interaction delay between the end of the Tx and the join of Rx window 2 in the data interaction process.

AT+QRX2DL Query/Set Interaction Delay on Rx window 2	
Read Command AT+QRX2DL=?	Response QRX2DL: <delay> OK
Write Command AT+QRX2DL=<delay>	Response OK Or PARAM_ERROR

Parameter

<delay>	Integer type. Delay time. Unit: ms
---------	------------------------------------

2.29. AT+QRX2DR Query/Set Data Rate of the Rx Window 2

This command queries or sets the data rate of the Rx window 2.

AT+QRX2DR Query/Set Data Rate of the Rx window 2	
Read Command AT+QRX2DR=?	Response QRX2DR: <data_rate> OK
Write Command AT+QRX2DR=<data_rate>	Response OK Or ERROR Or PARAM_ERROR

Parameter

<data_rate>	Integer type. Data rate of the Rx window 2. Range: 0–7.
--------------------------	---

2.30. AT+QRX2FQ Query/Set Frequency of the Rx Window 2

This command queries or sets the frequency of Rx window 2.

AT+QRX2FQ Query/Set Frequency of the Rx Window 2	
Read Command AT+QRX2FQ=?	Response QRX2FQ: <freq> OK
Write Command AT+QRX2FQ=<freq>	Response OK Or PARAM_ERROR

Parameter

<freq>	Integer type. Frequency of the Rx window 2. Unit: Hz.
---------------------	---

2.31. AT+QTXP Query/Set TX Power

This command queries or sets TX power.

AT+QTXP Query/Set TX Power	
Read Command AT+QTXP=?	Response QTXP: <TxPow> OK
Write Command AT+QTXP=<TxPow>	OK Or PARAM_ERROR

Parameter

<TxPow> TX power. Range: 0–15. Default value: 0. Unit: dBm.

NOTE

1. The TX power cannot exceed the maximum TX power permitted by the current region.
2. If the maximum TX power of the current region is x dBm, it indicates the TX power is x dBm when <TxPow> is 0. If <TxPow> is 1, it indicates the TX power is x - 2 dBm and so on.

2.32. AT+QPGSLOT Query/Set Ping Period

This command queries or sets Ping period. If the terminal device joins the network, you need to send PingSlotInfoReq again.

AT+QPGSLOT Query/Set Ping Period	
Read Command AT+QPGSLOT=?	Response QPGSLOT: <periodicity> OK
Write Command AT+QPGSLOT=<periodicity>	Response OK Or PARAM_ERROR

Parameter

<periodicity> Integer type. The exponent of Ping period. Range: 0–7. Default value: 4.

NOTE

1. The command only takes effect when LoRa working mode is Class B.
2. The Ping period is 2^n . Default value: 16. Unit: s. The “n” of 2^n is the value of **<periodicity>**.

2.33. AT+QTTONE Enable RF Test

This command enables RF test.

AT+QTTONE Enable RF test

Execution Command	Response
AT+QTTONE	[TimeDisplay]: QTTONE: Tx Test
	OK
	Or
	BUSY_ERROR

2.34. AT+QTRSSI Enable RSSI Test

This command enables RSSI test.

AT+QTRSSI Enable RSSI Test

Execution Command	Response
AT+QTRSSI	[TimeDisplay]: QRx Test
	[TimeDisplay]:>>> RSSI Value= <rssi_lvl> dBm
	OK
	Or
	BUSY_ERROR

Parameter

<rssi_lvl> Integer type. Received signal strength. Unit: dBm.

2.35. AT+QTCNF Query/Set LoRa RF Test Configuration

This command queries or sets LoRa RF test configuration.

AT+QTCNF Query/Set LoRa RF Test Configuration	
Read Command AT+QTCNF=?	Response QTCNF: 1: Freq= <freq> Hz 2: Power= <pow> dBm 3: Bandwidth= <bw> 4: SF= <sf> 5: CR= <cr> 6: LNA State= <lina> 7: PA Boost State= <pa> 8: Modulation <mod> 9: Payload len= <paylen> Bytes 10: <freqdev> 11: LowDRopt[0 to 2]= <lowdropt> 12: <BT> OK
Write Command AT+QTCNF=<freq>:<pow>:<bw>:<sf>:<cr>:<lina>:<pa>:<mod>:<paylen>:<freqdev>:<lowdropt>:<BT>	Response OK Or PARAM_ERROR

Parameter

<freq>	Integer type. Frequency. Unit: Hz.
<pow>	Integer type. TX power. Unit: dBm. Range: -11–20.
<bw>	Integer type. Band width. LoRa band width. Unit: kHz. 0 7.8125 1 15.625 2 31.25 3 62.5 4 125 5 250 6 500 Rx FSK band width. Range: 4800–467000. Unit: Hz.
<sf>	Integer type. Rate.

	LoRa SF: 5–12
	FSK DR: 600 bit/s–300000 bit/s
<cr>	Integer type. Code rate, which is only applicable for LoRa.
	1 4/5
	2 4/6
	3 4/7
	4 4/8
<lna>	Integer type. Whether to enable low noise amplifier.
	0 Disable the low noise amplifier.
	1 Enable the low noise amplifier.
<pa>	Integer type. Whether to enable power amplifier.
	0 Disable the low power amplifier.
	1 Enable the low power amplifier
<mod>	Integer type. Modulation mode.
	0 FSK
	1 LoRa
	2 BPSK(Tx)
	3 MSK
<paylen>	Integer type. Length of valid payload. Range: 1–255. Unit: byte.
<freqdev>	Integer type. Frequency offset, which is only applicable for FSK. Range: 4800–46700. Unit: Hz.
<lowdropt>	Integer type. Whether to enable low-rate optimization, which is only applicable for LoRa.
	0 Disable low-rate optimization
	1 Enable low-rate optimization
	2 Automatic (Enable low-rate optimization when SF is SF11 or SF12. Otherwise, disable low-rate optimization).
<BT>	Integer type. Gaussian filter configuration, which is only applicable for FSK.
	0 No Gaussian filter applied
	1 BT = 0.3
	2 BT = 0.5
	3 BT = 0.7
	4 BT = 1

2.36. AT+QTTX Test PER of Sent Packets

This command tests PER when a number of packets are sent.

AT+QTTX Test PER of Sent Packets	
Execution Command	Response
AT+QTTX=<nb_packets>	OK Or

	<p>PARAM_ERROR Or BUSY_ERROR</p>
--	--

Parameter

<nb_packets>	Integer type. Number of sent packets.
---------------------------	---------------------------------------

2.37. AT+QTRX Test PER of Received Packets

This command tests PER when a number of packets are received.

AT+QTRX Test PER of Received Packets	
<p>Execution Command AT+QTRX=<nb_packets></p>	<p>Response OK Or PARAM_ERROR Or BUSY_ERROR</p>

Parameter

<nb_packets>	Integer type. Number of received packets.
---------------------------	---

2.38. AT+QTTH Enable RF TX Hopping Test

This command enables RF TX hopping test of the start frequency to stop frequency when the band width is specified.

AT+QTTH Enable RF TX Hopping Test	
<p>Execution Command AT+QTTH=<Fstart>,<Fstop>,<FDelta>,<nb_packets></p>	<p>Response OK Or PARAM_ERROR Or BUSY_ERROR</p>

Parameter

<Fstart>	Integer type. Start frequency. Unit: Hz or MHz.
<Fstop>	Integer type. Stop frequency. Unit: Hz or MHz.
<FDelta>	Integer type. Frequency-hopping spread spectrum band width. Unit: Hz.
<nb_packets>	Integer type. Number of sent packets.

2.39. AT+QTOFF Stop RF Test

This command stops RF test.

AT+QTOFF Stop RF Test	
Execution Command	Response
AT+QTOFF	Test Stop
	OK

2.40. AT+QCERTIF Boot Module and Join Network

This command boots the module and joins the network in LoRaWAN certification.

AT+QCERTIF Boot Module and Join Network	
Execution Command	Response
AT+QCERTIF=<mode>	OK
	+QEVT:JOINED
	Or
	OK
	+QEVT:JOIN_FAILED
	Or
	PARAM_ERROR

Parameter

<mode>	Integer type. Ways of joining the network.
0	Join the network by ABP
1	Join the network by OTTA

2.41. AT+QBAT Query Power Voltage

This command queries the power voltage.

AT+QBAT Query Power Voltage	
Read Command AT+QBAT=?	Response QBAT: <level> OK

Parameter

<level>	Integer type. Power voltage. Unit: mV.
---------	--

2.42. AT+QSTATUS Query Whether Device Joins Network

This command queries whether the device joins the network.

AT+QSTATUS Query Whether Device Joins Network	
Read Command AT+QSTATUS=?	Response QSTATUS: <status> OK

Parameter

<status>	Integer type. Whether the device joins the network. 0 The device does not join the network 1 The device joins the network
----------	---

2.43. AT+QSN Query SN Code of Device

This command queries SN code of the device.

AT+QSN Query SN Code of Device	
Read Command AT+QSN=?	Response QSN: <code>

	OK
--	----

Parameter

<code>	String type without double quotes. SN code of the device. The length of SN code cannot exceed 16 characters.
---------------------	--

2.44. AT+QGMR Query Version Information

This command queries the version information.

AT+QGMR Query Version Information	
Read Command AT+QGMR=?	Response version information: <version>
	OK

Parameter

<version>	String type without double quotes. Version information.
------------------------	---

2.45. AT+CSUB Query V Version Number

This command queries V version number.

AT+CSUB Query V Version Number	
Read Command AT+CSUB=?	Response V version number: <number>
	OK

Parameter

<number>	String type without double quotes. V version number.
-----------------------	--

2.46. AT+QDISC Disconnect LoRa Network

This command disconnects LoRa network.

AT+QDISC Disconnect LoRa Network	
Execution Command AT+QDISC	Response Disconnect LoRaWAN network!
	OK
	Or
	Disconnect LoRaWAN network!
	BUSY_ERROR

2.47. AT+QTDA Set Content of Sent Data

This command sets the content of the sent data.

AT+QTDA Set Content of Sent Data	
Write Command AT+QTDA=<data>	Response OK
	Or
	[TimeDisplay]:TX data len(***) > max len(256)
	ERROR

Parameter

<data>	String type without double quotes. The content of the sent data. The length of the content cannot exceed 256 characters.
---------------------	--

2.48. AT+QP2P Query/Set Peer-to-Peer State

This command queries or sets peer-to-peer state.

AT+QP2P Query/Set Peer-to-Peer State	
Read Command AT+QP2P=?	Response P2P state is disabled! OK Or P2P state is enabled! OK Or ERROR
Write Command AT+QP2P=<state>	Response [TimeDisplay]:P2P disabled! OK Or [TimeDisplay]:P2P enabled! OK Or p2p state is not well set PARAM_ERROR

Parameter

<state>	Integer type. Whether to enable peer-to-peer. <u>0</u> Disable peer-to-peer. 1 Enable peer-to-peer.
----------------------	---

3 Example

3.1. Getting Local Time in UTC Format

```

AT+QLTIME=?
QLTIME:02h07m57s on 01/01/1970

OK
AT+QLTIME=? //In B mode, after receiving the beacon frame from the
              gateway, the module synchronizes the local time with the
              gateway, and prints the time obtained from the gateway.

QLTIME:10h59m31s on 16/01/2024

OK
    
```

3.2. Querying/Setting Identifier of Application

```

AT+QAPPEUI=? //Query the identifier of application.
QAPPEUI:01:01:01:01:01:01:01:01

OK
AT+QAPPEUI=01:01:01:01:01:01:01:01 //Sets the identifier of application.

OK
    
```

3.3. Querying/Setting Network Root Key

```

AT+QNWKKEY=? //Query the network root
              key.
QNWKKEY:2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
    
```

```

OK
AT+QNWKEY=2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C //Set the network root
key.

OK
    
```

3.4. Querying/Setting Application Root Key

```

AT+QAPPKEY=? //Query the application
root key.
QAPPKEY:2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C

OK
AT+QAPPKEY=2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C //Set the application root
key.

OK
    
```

3.5. Querying/Setting Network Session Key

```

AT+QAPPSKEY=? //Query the network
session key.
QAPPSKEY:2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C

OK
AT+QAPPSKEY=2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C //Set the network session
key.

OK
    
```

3.6. Querying/Setting Application Session Key

```

AT+QAPPSKEY=? //Query the application
session key.

QAPPSKEY:2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
    
```

```

OK
AT+QAPPSKEY=2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C //Set the application
                                                                    session key.

OK
    
```

3.7. Querying Device Identifier

```

AT+QDEUI=? //Query the device identifier.
QDEUI:00:80:E1:15:05:99:BA:88

OK
    
```

3.8. Joining LoRa Network

```

AT+QJOIN=1 //Join a network by OTAA
1041s686:TX on freq 868100000 Hz at DR 0

OK
1043s170:MAC txDone
1048s202:RX_1 on freq 868100000 Hz at DR 0
1050s012:MAC rxDone
+QEVT:JOINED
##### MCRotKey: 7D:F7:6B:0C:1A:B8:99:B3:3E:42:F0:47:B9:1B:54:6F
##### MCKEKey: 8C:B8:66:5E:0C:0E:0B:64:5B:2E:D9:E4:8A:19:27:7C
##### AppSKey: A2:7B:7C:38:CB:3B:B9:91:9E:A7:2D:C1:14:11:C1:02
##### NwkSKey: 30:2D:55:A6:A5:06:D0:97:D1:E4:59:99:CB:79:2B:F0
##### DBIntKey: 7A:C4:7C:65:FE:25:9B:B6:54:BD:26:35:19:F8:9C:8E
##### DevEUI: 00:80:E1:15:05:99:BA:88
##### AppEUI: 01:01:01:01:01:01:01:01
##### DevAddr: 02:1C:DF:67
    
```

3.9. Querying/Setting Active Region

```

//The default region channel is EU868. It cannot be changed in JOINED state.
AT+QBAND=8 //Set US915 as active region channel.
##### AppKey: 2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
    
```



```
##### NwkKey: 2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
##### AppSKey: 2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
##### NwkSKey: 2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
##### DevEUI: 00:80:E1:15:05:99:BA:88
##### AppEUI: 01:01:01:01:01:01:01:01
##### DevAddr: 05:99:BA:88
```

OK

```
AT+QBAND=? //Query active region.
```

```
QBAND:8:US915
```

OK

3.10. Querying/Setting LoRa Class

LoRa class cannot switch directly from B to C, or from C to B. The device must work in class A before switching to class B or C.

```
AT+QCLASS=C //Set class C on device.
```

```
431s592:RX_C on freq 869525000 Hz at DR 0
```

```
+QEVT:SWITCH_TO_CLASS_C
```

OK

```
AT+QCLASS=? //Query the LoRa class.
```

```
QCLASS: C
```

OK

3.11. Sending Data to LoRa Network

```
AT+QSEND=50:0:ABCD //Send hexadecimal value "ABCD" in unconfirmed mode to port 50.
```

```
988s088:TX on freq 868100000 Hz at DR 0
```

OK

```
989s245:MAC txDone
```

```
989s246:RX_C on freq 869525000 Hz at DR 0
```

```
990s273:RX_1 on freq 868100000 Hz at DR 0
```

```
991s594:MAC rxDone
```

```
+QEVT:RX_1, PORT 0, DR 0, RSSI -57, SNR 5
```

991s600:RX_C on freq 869525000 Hz at DR 0

AT+QSEND=50:1:ABCD //Send hexadecimal value "ABCD" in confirmed mode to port 50.

1044s562:TX on freq 867700000 Hz at DR 0

OK

1045s882:MAC txDone

1045s883:RX_C on freq 869525000 Hz at DR 0

1046s911:RX_1 on freq 867700000 Hz at DR 0

1048s396:MAC rxDone

+QEVT:SEND_CONFIRMED

+QEVT:RX_1, PORT 0, DR 0, RSSI -60, SNR 4

1048s402:RX_C on freq 869525000 Hz at DR

3.12. Transmitting Data Through Peer-to-Peer

//A device sends the data ABCD to B device.

AT+QP2P=1

//Enable peer-to-peer.

38s189:P2P enabled!

OK

AT+QTCNF=868000000:14:4:12:4/5:0:0:1:16:25000:2:3

//Set frequency, TX power, band width and so on.

OK

AT+QTDA=ABCD

//Set the content of the sent data to ABCD.

OK

AT+QTTX=1

//Sent the data once.

97s424:Tx Test

97s437:Tx 1 of 1

97s442:TX data len=4, buf: ABCD

98s273:OnTxDone

OK

AT+QP2P=0

//Disable peer-to-peer.

115s631:P2P disabled!

OK

//B device receives the data ABCD sent by A device.

AT+QP2P=1

//Enable peer-to-peer.

```

46s303:P2P enabled!

OK
AT+QTCNF=868000000:14:4:12:4/5:0:0:1:16:25000:2:3 //Set frequency, TX power, band width
and so on.

OK
AT+QTRX=1 //Receive the data once.
99s436:RX data len=4, buf: ABCD
99s438:OnRxDone
99s438:RssiValue=-13 dBm, SnrValue=4dB
99s438:OnRxError
99s438:Rx 1 of 1 >>> PER= 0 %

OK
AT+QP2P=0 //Disable peer-to-peer.
108s357:P2P disabled!

OK
    
```

3.13. Receiving Data Package

When +EVT:RX is received after sending the data, the data sent by the gateway can be obtained from the specified port.

```

AT+QSEND=50:0:ABCD //Send ABCD via port 50 (the gateway does not need to reply
to confirm)
1813s582:TX on freq 868300000 Hz at DR 1

OK
1814s243:MAC txDone
1815s250:RX_1 on freq 868300000 Hz at DR 1
1815s916:MAC rxDone
+QEVT:1:02:1234 //Port 1 receives 2-byte hexadecimal values "12" and "34".
+QEVT:RX_1, PORT 1, DR 1, RSSI -58, SNR 7
1815s927:TX on freq 868500000 Hz at DR 1
1816s588:MAC txDone
1817s596:RX_1 on freq 868500000 Hz at DR 1
1818s180:MAC rxDone
+QEVT:RX_1, PORT 0, DR 1, RSSI -58, SNR 8
    
```

4 Appendix References

Table 3: Terms and Abbreviations

Abbreviation	Description
ABP	Activation by personalization
APPEUI	Application Identifier
BPSK	Binary Phase Shift Keying
BT	Bandwidth-Bit period Product
DR	Data Rate
FSK	Frequency-shift keying
JOINEUI	Join Identifier
MSK	Minimum Shift Keying
OTTA	Over-the-air activation
PER	Packet Error Rate
RF	Radio Frequency
RSSI	Received Signal Strength Indication
SF	Spreading Factor
SN	Serial Number