

CubeCell™ Series

AT command user manual

Release notes

Edition	Modification item	Modification time
V0.1	- First public release	2019.10.21
V0.2	- Add user AT command; - Correction of clerical and presentation errors.	2019.12.16

Table of Contents

AT command user manual	1
Release notes	2
1. Summary	5
2. Serial port settings:	5
3. AT command syntax	6
3.1 Syntax overview	6
3.2 AT command list	7
Basic control commands	7
Wake device	7
Sleep device.....	7
Reset	7
Restore factory settings	7
Query the chip's Unique ID	8
Enter serial number to activate Arduino support	8
LoRaWAN mode / normal LoRa mode switching	9
User AT Command	10
User AT command execution logic	10
"LoRa Normal Mode" Proprietary Command	11
Set the sending frequency	11
Set the spreading factor	11
Set transmit power	12
Receive mode	12
Receive data output mode selection	13
LoRaWAN mode proprietary commands	13
Set DevEui	13
Set AppEui	14
Set AppKey	14
Set NwkSKey	15
Set AppSKey.....	15
Set DevAddr.....	16
Set OTAA / ABP mode	16
Configure ADR	16
Trigger OTAA access	17

Set communication cycle DutyCycle	17
Set communication mode Class A / C	18
Turn ACK on / off	18
Configure fport	19
Set the number of retransmissions (if the transmission fails)	19
Send data.....	21
Send Hex Data	21
Send string.....	22
4. Application examples	23
4.1 Sending data through LoRa normal mode.....	23
4.2 Sending data through LoRaWAN mode.....	23
Contact us	24

3. AT command syntax

3.1 Syntax overview

- All AT command lines must start with "AT+".
- **There is no ending character. Do not send a carriage return or a new line as the end.**
- **After reset, CubeCell will enter deep sleep mode after printing initial information and send "AT + XXX" wake-up device.**
- The return response usually follows the command:
 - Successful execution return "+OK";
 - If the execution fails or the syntax format is wrong, return "+ERROR" and the corresponding prompt content at the same time.

3.2 AT command list

Basic control commands

Wake device

Command	Response
AT+XXX	ASR is Waked, LowPower Mode Stopped
Description	After resetting, the device is in sleep state, and wakes up the device through the serial port interrupt. In theory, sending any data through the serial port can trigger the interrupt and wake up the device. For example "ABC".

Sleep device

Command	Response
AT+LPM=1	+OK LowPower Mode Stared.
Description	Put the device into sleep mode.

Reset

Command	Response
AT+RESET=1	Print power-on / reset information.
Description	Device reset

Restore factory settings

Command	Response
AT+DefaultSet=1	Print power-on / reset information..
Description	After restoring the factory settings, the parameters will enter the sleep mode after the response ends.

Query the chip's Unique ID

Command	Response
AT+ChipID=?	+OK +ChipID:13A*****622
Description	Read the unique number of the chip, which can be used to query the corresponding serial number (Query address)

Enter serial number to activate Arduino support

Command	Response
AT+CDKEY=A85****93****D	System activated +The board is activated, don't need to active again
DC3*****1F023EDE6	System not activated Activation successful:+The board is activated, Arduino is supported!
	Activation failed:+ERROR: please input correct CDKEY.
Description	<p>The content sent is not 32-bit capital characters, the character content is limited to 0 to F.</p> <ul style="list-style-type: none"> - The development board is activated by default all the factory; - Module is activated by default, but an inactive version can be provided and can be activated with this command if Arduino support is required at a later stage. <p>The serial number slyly queried from the website is as follows: 0x9CF2E059,0xFC613F26,0x174F6BAA,0xDC70F73B</p> <p>All "0x" and "Commas" need to be removed when using as an activation code.</p>

LoRaWAN mode / normal LoRa mode switching

Command	Response
AT+LORAWAN=?	+OK +LORAWAN=0
	+OK +LORAWAN=1
Description	Find current LoRaWAN support: <ul style="list-style-type: none">- The return value is 0, normal LoRa mode;- Return value is 1, LoRaWAN protocol mode .- The AT command supports the LoRaWAN protocol by default. You can switch the LoRaWAN protocol or the normal LoRa sending and receiving mode by changing the variables of this command.
AT+LORAWAN=0	<pre>1. +OK 2. +LORAWAN=0 3. Copyright @ 2019 Heltec Automation.All rights reserved 4. 5. +LORAWAN=0 6. 7. +FREQ=470000000 8. +SF=7 9. +TxPower=10</pre>
Description	When the response is complete, the system goes into hibernation. In this mode, the radio signal is transmitted via the SX1262 chip, and the operation of the pure hardware layer does not run any protocol stodgy and can be used for spectral debugging or simple transceiver testing.

AT+LORAWAN=1	Print power-up/reset information.
Description	When the response is complete, the system goes into hibernation and the device supports the LoRaWAN protocol.

User AT Command

Users may need special commands. Here's an example of adding user commands to CubeCell. In this example, we added a test command: "AT-test-abcd", if sending "AT-test-abcd" to CubeCell via serial port, the CubeCell returns "abcd".



```
*LORAWAN=1
*KeepNet=0
*OTAA=1
*Class=C
*ADR=1
*IsTxConfirmed=1
*AppPort=2
*DutyCycle=15000
*ConfirmedNbTrials=8
*DevEui=223233000888802 (For OTAA Mode)
*AppEui=0000000000000000 (For OTAA Mode)
*AppKey=8888888888888888888888888888886601 (For OTAA Mode)
*NwkSKey=072C78758CDCCABF55EE4A778D16EF67 (For ABP Mode)
*AppSKey=15B1D0EFA463DFBE3D11181E1EC7DA85 (For ABP Mode)
*DevAddr=007E6AE1 (For ABP Mode)

LoRaWan ClassC start!
joining...
ASR is Waked, LowPower Mode Stopped
hello
joined
confirmed uplink sending...
receive data: rssi = -31, snr = -1, datarate = 0
hello

单条发送 多条发送 协议传输 帮助
AT+test=hello
```

<https://github.com/HelTecAutomation/ASR650x->

[Arduino/blob/master/libraries/LoRa/examples/AT_Command/AT_Command.ino](https://github.com/HelTecAutomation/ASR650x-/blob/master/libraries/LoRa/examples/AT_Command/AT_Command.ino)

User-owned AT commands can be modified in the examples above.

User AT command execution logic

When the system receives each AT instruction, it prioritizes comparisons with user-defined fields within the AT_user_check function. If the return value of the function is **true**, the user-defined program within the function is executed. If the return value is **false**, the function is skipped to match the system's default AT commands.

"LoRa Normal Mode" Proprietary Command

Set the sending frequency

Command	Response
AT+FREQ=?	+OK +FREQ=470000000
Description	Query the current operating frequency in Hz; In this example, the device currently has a working frequency of 470MHz.
AT+FREQ=480000000	+OK +FREQ=480000000
Description	Set the operating frequency, decimal input, in Hz; In this example, set the operating frequency of the device to 480MHz; The set operating frequency to match the operating frequency of the hardware.

Set the spreading factor

Command	Response
AT+SF=?	+OK +SF=7
Description	Query the current spread factor; In this example, the current spread factor of the device is 7.
AT+SF=8	+OK +SF=8
Description	Set the spread factor, decimal input, range 7 to 12;

	In this example, set the spread factor of the device to 8;
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Set transmit power

Command	Response
AT+TxPower=?	+OK +TxPower=10
Description	Query the current transmit power in dB; In this case, the current transmit power of the device is 10dB.
AT+TxPower=15	+OK +TxPower=15
Description	Set transmit power, decimal input, range 0 to 22; In this example, set the transmit power of the device to 15 dB; Note: The transmit power is subject to the specifications of the country's or region's relevant laws on radio management.

Receive mode

Command	Response
AT+RX=0	+OK +RX=0
Description	The device is in receive mode with no timeout; Keep the device in a listening state, the listening frequency, the spread factor and the emission parameters are the same until the data is received and the listening state ends. To receive data again, you need to go from new to listening mode.

AT+RX=1000	+OK +RX=1000
Description	The device is in receive mode, timeout 1000ms; If no data is received within 1000ms, "RX Timeout" is output.

Receive data output mode selection

Command	Response
AT+PrintMode=?	+OK +PrintMode=0
Description	Query the current received data output mode: - Return value 0: string output; - Return value 1:hex output.
AT+PrintMode=1	+OK +PrintMode=1
Description	Set the device to hexadecimal output format, the data received in RX mode will be printed in hexadecimal form. The parameters are only 0 or 1.

LoRaWAN mode proprietary commands

Set DevEui

Command	Response
AT+DevEui=?	+OK +DevEui=2232330000888802(For OTAA Mode)
Description	Output DevEui in the current system, for OTAA mode;
AT+DevEui=8888888888888888	+OK +DevEui=8888888888888888(For OTAA Mode)

Set DevAddr

Command	Response
AT+DevAddr=?	+OK +DevAddr=007E6AE1(For ABP Mode)
Description	Output DevAddr in the current system for ABP mode;
AT+DevAddr=88888888	+OK +DevAddr=88888888(For ABP Mode)
Description	Set DevAddr to:88888888; Length 32-bit, parastatal hexadecimal characters from 0 to F only.

Set OTAA / ABP mode

Command	Response
AT+OTAA=?	+OK +OTAA=1
	+OK +OTAA=0
Description	Return value 1 (default): OTAA mode. Return value 0: ABP mode.
AT+OTAA=0	+OK +OTAA=0
Description	Switch to ABP mode with only 0 or 1 parameters.

Configure ADR

Command	Response
AT+ADR=?	+OK +ADR=1

	+OK +ADR=0
Description	Return value 1 (default): ADR function is on; Return value 0: ADR function is disabled.
AT+ADR=0	+OK +ADR=0
Description	Disable the ADR function, the parameter is only 0 or 1.

Trigger OTAA access

Command	Response	
AT+Join=1	Start getting into the net	+OK joining...
	Successful access to the network	+OK joining...joined
Description	After the equipment is powered off or reset, a new network is required from the new.	

Set communication cycle DutyCycle

Command	Response
AT+DutyCycle=?	+OK +DutyCycle=15000
Description	Return values in milliseconds, in this case, communication with the gateway every 15 seconds.
AT+DutyCycle=60000	+OK +DutyCycle=60000

Description	<p>In this example, set the communication period to 60 seconds.</p> <p>You can set a maximum of 65535000, per millisecond, and after setting it, it will take effect the next time the data is sent.</p>
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Set communication mode Class A / C

Command	Response
AT+Class=?	+OK +Class=A
Description	The return value is Class A or Class C, which represents the corresponding working mode.
AT+Class=C	+OK +Class=C
Description	Only AT + Class = A or AT + Class = C is valid. After setting up, the next time the data is sent takes effect.

Turn ACK on / off

Command	Response
AT+IsTxConfirmed=?	+OK +IsTxConfirmed=1
Description	The ACK receipt (communication confirmation) feature is turned on by default. After receiving the uplink, the gateway sends a Downlink to inform the node that the data has been received.

AT+IsTxConfirmed=0	+OK +IsTxConfirmed=0
Description	Turn off ACK receipt. Because of the ADR feature, there will still be Downlink data printing in this mode if parameters such as the node's rate are automatically adjusted.
AT+IsTxConfirmed=1	+OK +IsTxConfirmed=1
Description	Turn on the ACK receipt. After setting, it will take effect when the next data is sent.

Configure fport

Command	Response
AT+AppPort=?	+OK +AppPort=2
Description	Query the current upstream data port.
AT+AppPort=5	+OK +AppPort=5
Description	Set fport to 5, and the parameter range is 0 ~ 255. After setting up, the next time the data is sent takes effect.

Set the number of retransmissions (if the transmission fails)

Command	Response
AT+ ConfirmedNbTrials=?	+OK +ConfirmedNbTrials=8

Description	If communication fails, the system retransmits data to the gateway 8 times by default, changing the rate every 2 times to try to optimally transfer.
AT+ ConfirmedNbTrials=3	+OK +ConfirmedNbTrials=3
Description	Set the number of retransmissions to 3 and the parameter range is 3 ~ 8. After setting, it will take effect the next time data is sent.

Send data

The following commands can be used in "LoRa Normal Mode" and "LoRaWAN Mode".

- LoRa Normal Mode: Data will be sent directly;
- LoRa mode: The data is encapsulated in a format that conforms to the LoRaWAN protocol before being sent out.

Send Hex Data

Command	Response	
AT+SendHex=AABBCCDD012345	LoRaWAN Mode	+OK +Send Hex Data:AABBCCDD012345 confirmed uplink sending ... <i>The node communicates successfully with the gateway and receives the ACK issued by the gateway, which prints.</i> receive data: rssi = -xx, snr = -x, datarate = x
	LoRa Normal mode	+OK +Send Hex Data:AABBCCDD012345 TX done
Description	Send out hex strings,"0xAA, 0xBB, 0xCC, 0xDD, 0x01, 0x23, 0x45". Hex characters only 0 to F, must be even digits, two bits as one byte, and a maximum of 64 bytes.	

Send string

Command	Response	
AT+SendStr=abcdefghijk	LoRaWAN mode	+OK +Send String:abcdefghijk confirmed uplink sending ... <i>The node communicates successfully with the gateway and receives the ACK issued by the gateway, which prints</i> receive data: rssi = -47, snr = -1, datarate = 0
	LoRa Normal mode	+OK +Send String:abcdefghijk TX done
Description	Send the string, "abcdefghijk". ASCII characters only, up to 64 bytes.	

4. Application examples

4.1 Sending data through LoRa normal mode

- 1) Power on CubeCell (HTCC-AM0x module needs external low level to trigger reset);
- 2) Wake up the device: **AT + XXX**
- 3) Disable LoRaWAN protocol: **AT + LORAWAN = 0**
- 4) Set the working frequency to 470MHz: **AT + FREQ = 470000000**
- 5) [Spread](#) factor, [transmit power](#) to maintain default;
- 6) Send data: **AT+SendStr=abcdefghijkl**

4.2 Sending data through LoRaWAN mode

This mode needs to work with the [LoRa gateway](#).

- 1) Power on CubeCell (HTCC-AM0x module needs external low level to trigger reset);
- 2) Wake up the device: **AT + XXX**
- 3) Turn on LoRaWAN protocol support: **AT + LORAWAN = 1**
- 4) Switch to OTAA working mode: **AT + OTAA = 1**
- 5) [Parameters such as DevEui](#), [AppKey](#), etc. can remain default, but you need to ensure that they correspond to the parameters registered on the server;
- 6) Connect to the network (if the gateway is not powered off, connect to the network only once): **AT + Join = 1**
- 7) Send data after successful access to the internet, e.g. **AT-SendHex-AABBCCDD012345**
- 8) After sending the data, go into sleep mode if necessary: **AT-LPM=1**
- 9) If the device is woken up in the next cycle, the data can be sent directly without the need to access the network again.

Contact us

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