



Lorawan AT Command Reference Manual

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| Name | Lorawan AT Command Reference Manual |
| Version NO. | V2.1 |

Lorawan AT Command Reference Manual

History

| Date | Version No. | Discription | Author |
|------------|-------------|---|---------|
| 2018-01-19 | V2.0 | 1.Firmware V2.0.0 AT command 2.Support LoRaWAN 1.0.2 | Huayuan |
| 2018-01-25 | V2.1 | 1.Support sleep function | Huayuan |
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1. Brief

This document is created by Firmware V2.0.0

2. Interface

- UART, 9600bps, 8bit, No parity, 1 stop bit
- GPIO of Wake-up
- GPIO of Sleep indication
- GPIO of Reset

3. Reset

- GPIO of reset, low level effective. Keep low level status up to 1ms

4. Sleep/wake-up

- 芯片可通过指令 `AT+PM` 配置为手动休眠模式或者自动休眠模式
 - 在手动休眠模式下, 通过指令 `AT+SLEEP` 休眠芯片, 在 唤醒 GPIO 上产生下降沿唤醒芯片
 - 在自动功耗模式下, 每次发送指令前需在芯片串口 `RX` 脚上产生下降沿 (或向芯片发送任意 1 个字节) 唤醒芯片, 指令执行结束后芯片自动休眠
 - 芯片默认处于手动休眠模式的工作状态
 - 在休眠状态下, 串口关闭, 无法响应 `AT` 指令
 - 在 唤醒 GPIO 上产生下降沿唤醒模块时, 低电平维持 5ms, 唤醒后等待 5ms
 - 在 `RX` 脚上产生下降沿唤醒模块时, 低电平不超过 1ms, 唤醒后等待 5ms
 - 在休眠状态下, 状态指示 GPIO 输出低电平, 工作状态下, 状态指示 GPIO 输出高电平
- The chip can be configured as manual sleep mode or auto sleep mode by command `AT+PM`
 - In manual sleep mode, a falling edge wake-up chip is generated on the wake-up GPIO by commanding the `AT+SLEEP` sleep chip.
 - In the automatic power mode, a falling edge (or send any one byte to the chip) on the serial RX pin of the chip is required to wake up the chip before each command is sent. The chip automatically sleeps after the instruction execution ends.
 - The chip is in manual sleep mode by default
 - In sleep state, the serial port is closed and cannot respond to AT commands

- When the falling edge wake-up module is generated on the wake-up GPIO, the low level is maintained for 5ms, and after the wakeup, it is for 5ms.
- When a falling-edge wake-up module is generated on the RX pin, the low level does not exceed 1ms, waiting for 5ms after wake-up
- In sleep state, the status indicates that the GPIO output is low. In the working state, the status indicates that the GPIO output is high.

5. Frequency parameter

5.1. CN470

- default channel

| Channel | uplink | downlink | DR Range |
|------------|--------|----------|-----------|
| 80 | 486.3 | 506.7 | DR0 - DR5 |
| 81 | 486.5 | 506.9 | DR0 - DR5 |
| 82 | 486.7 | 507.1 | DR0 - DR5 |
| 83 | 486.9 | 507.3 | DR0 - DR5 |
| 84 | 487.1 | 507.5 | DR0 - DR5 |
| 85 | 487.3 | 507.7 | DR0 - DR5 |
| 86 | 487.5 | 507.9 | DR0 - DR5 |
| 87 | 487.7 | 508.1 | DR0 - DR5 |
| RX2 | | 505.3 | DR0 |

• The firmware supports 96 channels of the standard CN470. The channels 80 to 87 are enabled by default. Enable or disable other channels, see instruction inquiries/settings Channel Mask

- Data rate

| DR | Configuration | Air data rate[bit/s] |
|----------|----------------|----------------------|
| 0 | SF12 / 125 kHz | 250 |
| 1 | SF11 / 125 kHz | 440 |
| 2 | SF10 / 125 kHz | 980 |
| 3 | SF9 / 125 kHz | 1760 |
| 4 | SF8 / 125 kHz | 3215 |
| 5 | SF7 / 125 kHz | 5470 |

- TxPower

| TxPower | Configuration |
|---------|----------------|
| 0 | MaxEIRP |
| 1 | MaxEIRP – 2dB |
| 2 | MaxEIRP – 4dB |
| 3 | MaxEIRP – 6dB |
| 4 | MaxEIRP – 8dB |
| 5 | MaxEIRP – 10dB |
| 6 | MaxEIRP – 12dB |
| 7 | MaxEIRP – 14dB |

- Default parameter

| Parameter | Value |
|-----------------------|---------|
| TX Datarate | DR3 |
| TX Power | 1 |
| MaxEIRP | 20 dBm |
| RX1 delay | 1000 ms |
| RX2 delay | 2000 ms |
| Join RX1 delay | 5000 ms |
| Join RX2 delay | 6000 ms |
| ADR Enabled | False |

5.2. EU433

- default channel

| Channel | Uplink | Downlink | DR Range |
|------------|---------|----------|-----------|
| [0] | 433.175 | 433.175 | DR0 - DR5 |
| [1] | 433.375 | 433.375 | DR0 - DR5 |
| [2] | 433.575 | 433.575 | DR0 - DR5 |
| 3 | 433.775 | 433.775 | DR0 - DR5 |
| 4 | 433.975 | 433.975 | DR0 - DR5 |
| 5 | 434.175 | 434.175 | DR0 - DR5 |
| 6 | 434.375 | 434.375 | DR0 - DR5 |
| 7 | 434.575 | 434.575 | DR0 - DR5 |
| RX2 | -- | 434.665 | DR0 |

- Data rate

| DR | Configuration | Air data rate[bit/s] |
|----|----------------|----------------------|
| 0 | SF12 / 125 kHz | 250 |
| 1 | SF11 / 125 kHz | 440 |
| 2 | SF10 / 125 kHz | 980 |
| 3 | SF9 / 125 kHz | 1760 |
| 4 | SF8 / 125 kHz | 3215 |
| 5 | SF7 / 125 kHz | 5470 |
| 6 | SF7 / 250 kHz | 11000 |
| 7 | FSK 50 kbps | 50000 |

- TxPower

| TxPower | Configuration |
|----------|----------------|
| 0 | MaxEIRP |
| 1 | MaxEIRP – 2dB |
| 2 | MaxEIRP – 4dB |
| 3 | MaxEIRP – 6dB |
| 4 | MaxEIRP – 8dB |
| 5 | MaxEIRP – 10dB |

- Default parameter

| Parameter | Value |
|-----------------------|---------|
| TX Datarate | DR0 |
| TX Power | 0 |
| MaxEIRP | 12 dBm |
| RX1 delay | 1000 ms |
| RX2 delay | 2000 ms |
| Join RX1 delay | 5000 ms |
| Join RX2 delay | 6000 ms |
| ADR Enabled | False |

5.3. EU868

- Default Channel

| Channel | Uplink | Downlink | DR Range |
|------------|--------|----------|-----------|
| [0] | 868.1 | 868.1 | DR0 - DR5 |
| [1] | 868.3 | 868.3 | DR0 - DR5 |
| [2] | 868.5 | 868.5 | DR0 - DR5 |
| 3 | 867.1 | 867.1 | DR0 - DR5 |
| 4 | 867.3 | 867.3 | DR0 - DR5 |
| 5 | 867.5 | 867.5 | DR0 - DR5 |
| 6 | 867.7 | 867.7 | DR0 - DR5 |
| 7 | 867.9 | 867.9 | DR0 - DR5 |
| RX2 | -- | 869.525 | DR0 |

- Data rate

| DR | Configuration | Air data rate[bit/s] |
|----|----------------|----------------------|
| 0 | SF12 / 125 kHz | 250 |
| 1 | SF11 / 125 kHz | 440 |
| 2 | SF10 / 125 kHz | 980 |
| 3 | SF9 / 125 kHz | 1760 |
| 4 | SF8 / 125 kHz | 3215 |
| 5 | SF7 / 125 kHz | 5470 |
| 6 | SF7 / 250 kHz | 11000 |
| 7 | FSK 50 kbps | 50000 |

- TxPower

| TxPower | Configuration |
|---------|----------------|
| 0 | MaxEIRP |
| 1 | MaxEIRP – 2dB |
| 2 | MaxEIRP – 4dB |
| 3 | MaxEIRP – 6dB |
| 4 | MaxEIRP – 8dB |
| 5 | MaxEIRP – 10dB |
| 6 | MaxEIRP – 12dB |
| 7 | MaxEIRP – 14dB |

- Default parameter

| Parameter | Value |
|-----------------------|---------|
| TX Datarate | DR0 |
| Tx Power | 1 |
| MaxEIRP | 16 dBm |
| Rx1 delay | 1000 ms |
| RX2 delay | 2000 ms |
| Join RX1 delay | 5000 ms |
| Join RX2 delay | 6000 ms |
| ADR Enabled | False |

5.4. CN779

- Default channel

| Channel | Uplink | Downlink | DR Range |
|------------|--------|----------|-----------|
| [0] | 779.5 | 779.5 | DR0 - DR5 |
| [1] | 779.7 | 779.7 | DR0 - DR5 |
| [2] | 779.9 | 779.9 | DR0 - DR5 |
| 3 | 780.1 | 780.1 | DR0 - DR5 |
| 4 | 780.3 | 780.3 | DR0 - DR5 |
| 5 | 780.5 | 780.5 | DR0 - DR5 |
| 6 | 780.7 | 780.7 | DR0 - DR5 |
| 7 | 780.9 | 780.9 | DR0 - DR5 |
| RX2 | -- | 786 | DR0 |

- Data rate

| DR | Configuration | Air data rate[bit/s] |
|----|----------------|----------------------|
| 0 | SF12 / 125 kHz | 250 |
| 1 | SF11 / 125 kHz | 440 |
| 2 | SF10 / 125 kHz | 980 |
| 3 | SF9 / 125 kHz | 1760 |
| 4 | SF8 / 125 kHz | 3215 |
| 5 | SF7 / 125 kHz | 5470 |
| 6 | SF7 / 250 kHz | 11000 |
| 7 | FSK 50 kbps | 50000 |

- TxPower

| TxPower | Configuration |
|----------|----------------|
| 0 | MaxEIRP |
| 1 | MaxEIRP – 2dB |
| 2 | MaxEIRP – 4dB |
| 3 | MaxEIRP – 6dB |
| 4 | MaxEIRP – 8dB |
| 5 | MaxEIRP – 10dB |

- Default parameter

| Parameter | Value |
|-----------------------|---------|
| TX Datarate | DR0 |
| TX Power | 0 |
| MaxEIRP | 12 dBm |
| RX1 delay | 1000 ms |
| RX2 delay | 2000 ms |
| Join RX1 delay | 5000 ms |
| Join RX2 delay | 6000 ms |
| ADR Enabled | False |

5.5. US915_Hybrid

- Default channel

| Channel | Uplink | DR Range | Downlink | DR Range |
|------------|--------|-----------|----------|------------|
| 0 | 902.3 | DR0 - DR3 | 923.3 | DR8 - DR13 |
| 1 | 902.5 | DR0 - DR3 | 923.9 | DR8 - DR13 |
| 2 | 902.7 | DR0 - DR3 | 924.5 | DR8 - DR13 |
| 3 | 902.9 | DR0 - DR3 | 925.1 | DR8 - DR13 |
| 4 | 903.1 | DR0 - DR3 | 925.7 | DR8 - DR13 |
| 5 | 903.3 | DR0 - DR3 | 926.3 | DR8 - DR13 |
| 6 | 903.5 | DR0 - DR3 | 926.9 | DR8 - DR13 |
| 7 | 903.7 | DR0 - DR3 | 927.5 | DR8 - DR13 |
| RX2 | -- | -- | 923.3 | DR8 |

- Data rate

| DR | Configuration | Air data rate[bit/s] | Direction |
|--------------|----------------|----------------------|-----------|
| 0 | SF10 / 125 kHz | 980 | Uplink |
| 1 | SF9 / 125 kHz | 1760 | Uplink |
| 2 | SF8 / 125 kHz | 3215 | Uplink |
| 3 | SF7 / 125 kHz | 5470 | Uplink |
| 4 | SF8 / 500 kHz | 12500 | Uplink |
| 5 : 7 | RFU | | |
| 8 | SF12 / 500 kHz | 980 | Downlink |
| 9 | SF11 / 500 kHz | 1760 | Downlink |

- TxPower

| TxPower | Configuration |
|-----------|---------------|
| 0* | 30 dBm |
| 1* | 28 dBm |
| 2* | 26 dBm |
| 3* | 24 dBm |
| 4* | 22 dBm |
| 5 | 20 dBm |
| 6 | 18 dBm |
| 7 | 16 dBm |
| 8 | 14 dBm |
| 9 | 12 dBm |
| 10 | 10 dBm |

- Default Parameter

| Parameter | Value |
|-----------------------|---------|
| TX Datarate | DR1 |
| TX Power | 5 |
| RX1 delay | 1000 ms |
| RX2 delay | 2000 ms |
| Join RX1 delay | 5000 ms |
| Join RX2 delay | 6000 ms |
| ADR Enabled | False |

The chip support max 20 dBm, If configure TxPower at 0~4, the module will transmit at 20 dBm power output.

5.6. AS923

- Default Channel

| Channel | Uplink | Downlink | DR Range |
|------------|--------|----------|-----------|
| [0] | 923.2 | 923.2 | DR0 - DR5 |
| [1] | 923.4 | 923.4 | DR0 - DR5 |
| 2 | 923.6 | 923.6 | DR0 - DR5 |
| 3 | 923.8 | 923.8 | DR0 - DR5 |
| 4 | 924.0 | 924.0 | DR0 - DR5 |
| 5 | 924.2 | 924.2 | DR0 - DR5 |
| 6 | 924.4 | 924.4 | DR0 - DR5 |
| 7 | 924.6 | 924.6 | DR0 - DR5 |
| RX2 | -- | 923.2 | DR2 |

- Data rate

| DR | Configuration | Air data rate[bit/s] |
|----|----------------|----------------------|
| 0 | SF12 / 125 kHz | 250 |
| 1 | SF11 / 125 kHz | 440 |
| 2 | SF10 / 125 kHz | 980 |
| 3 | SF9 / 125 kHz | 1760 |
| 4 | SF8 / 125 kHz | 3215 |
| 5 | SF7 / 125 kHz | 5470 |
| 6 | SF7 / 250 kHz | 11000 |
| 7 | FSK 50 kbps | 50000 |

- TxPower

| TxPower | Configuration |
|----------|----------------|
| 0 | MaxEIRP |
| 1 | MaxEIRP – 2dB |
| 2 | MaxEIRP – 4dB |
| 3 | MaxEIRP – 6dB |
| 4 | MaxEIRP – 8dB |
| 5 | MaxEIRP – 10dB |
| 6 | MaxEIRP – 12dB |
| 7 | MaxEIRP – 14dB |

- Default parameter

| Parameter | Value |
|-----------------------|---------|
| TX Datarate | DR0 |
| TX Power | 0 |
| MaxEIRP | 16 dBm |
| RX1 delay | 1000 ms |
| RX2 delay | 2000 ms |
| Join RX1 delay | 5000 ms |
| Join RX2 delay | 6000 ms |
| ADR Enabled | False |

5.7. IN865

- Default Channel

| Channel | Uplink | Downlink | DR Range |
|---------|----------|----------|-----------|
| [0] | 865.0625 | 865.0625 | DR0 - DR5 |
| [1] | 865.4025 | 865.4025 | DR0 - DR5 |
| [2] | 865.9850 | 865.9850 | DR0 - DR5 |
| RX2 | -- | 866.550 | DR2 |

- Datarate

| DR | Configuration | Air data rate[bit/s] |
|----|----------------|----------------------|
| 0 | SF12 / 125 kHz | 250 |
| 1 | SF11 / 125 kHz | 440 |
| 2 | SF10 / 125 kHz | 980 |
| 3 | SF9 / 125 kHz | 1760 |
| 4 | SF8 / 125 kHz | 3215 |
| 5 | SF7 / 125 kHz | 5470 |
| 6 | RFU | RFU |
| 7 | FSK 50 kbps | 50000 |

- TxPower

| TxPower | Configuration |
|---------|----------------|
| 0 | MaxEIRP |
| 1 | MaxEIRP – 2dB |
| 2 | MaxEIRP – 4dB |
| 3 | MaxEIRP – 6dB |
| 4 | MaxEIRP – 8dB |
| 5 | MaxEIRP – 10dB |
| 6 | MaxEIRP – 12dB |
| 7 | MaxEIRP – 14dB |
| 8 | MaxEIRP – 16dB |
| 9 | MaxEIRP – 18dB |
| 10 | MaxEIRP – 20dB |

- Default parameter

| Parameter | Value |
|-----------------------|---------|
| TX Datarate | DR0 |
| TX Power | 5 |
| MaxEIRP | 30 dBm |
| RX1 delay | 1000 ms |
| RX2 delay | 2000 ms |
| Join RX1 delay | 5000 ms |
| Join RX2 delay | 6000 ms |
| ADR Enabled | False |

6. The format of AT command

All commands, acknowledges, and command execution results are listed in row. Every row end with character of of <CR><CF>(\r\n)

Command <CR><CF>

Acknowledge <CR><CF>

command execution result <CR><CF>

E.g:

AT+V?

1.1.0

OK

Rule of commands:

| command | Discription |
|-------------------------------------|---------------------------|
| AT? | List all the AT commands |
| AT+<CMD>=? | List all help information |
| AT+<CMD> | Execute the command |
| AT+<CMD>=<value> | Configurate the parameter |
| AT+<CMD>? | Query the parameters |

Error code:

| Error code | Discription |
|------------|--------------------------------------|
| 0 | Invalid command |
| 1 | Invalid parameter |
| 2 | Busy status when sending the command |
| 3 | Time out |
| 4 | No data |
| 5 | Invalid status |
| 6 | No join the network |

Event:

| Event | Discription |
|------------------|------------------------------------|
| +SEND:X | Complete sending the lora data. |
| +JOIN:X | Join the network successful/failed |
| +BLECONN | BLE connection complete |
| +BLEDISC | BLE disconnection complete |
| +BLEIDC:1 | Master listen BLE path |
| +BLEIDC:0 | Master cancel to listen BLE path |

7. List of AT command

| Command | Function |
|------------|--|
| AT | Enter AT mode |
| ATE | The acknowledge of AT command |
| ATZ | Restart |
| AT+SLEEP | Enter the Sleeping status |
| AT+V | Query the version of firmware |
| AT+BAUD | Query or set the UART baud rate. |
| AT+FRST | Reset the default parameter. |
| AT+PM | Enter Low power mode |
| AT+SN | Query SN number. |
| AT+TOKEN | Query TOKEN |
| AT+DEVEUI | Query/Set Device EUI |
| AT+APPEUI | Query/Set Application EUI |
| AT+APPKEY | Query/Set Application Key |
| AT+NWKSKEY | Query/Set Network Session Key |
| AT+APPSKEY | Query/Set Application Session Key |
| AT+DADDR | Query/Set Device address |
| AT+ADR | Query/Set ADR(Adaptive Data Rate) Status |
| AT+TXP | Query/Set output power level |
| AT+DR | Query/Set Data Rate |
| AT+DCS | Query/Set the status of ETSI Duty Cycle |
| AT+CHN | Query/Set the channel, and save the channel |
| AT+CHM | Query/Set Channel Mask |
| AT+RX2FQ | Query/Set frequency of receiving window 2 |
| AT+RX2DR | Query/Set Data Rate of receiving window 2 |
| AT+RX1DL | Query/Set delay of receiving window 1 |
| AT+RX2DL | Query/Set delay of receiving window 2 |
| AT+JN1DL | Query/Set delay of window 1 when joining network |
| AT+JN2DL | Query/Set delay of window 2 when joining network |
| AT+NJM | Query/Set the way of how to join the network |
| AT+NJS | Query the status of joining network |
| AT+JOIN | Join the network |
| AT+FCU | Query/Set the Frame Counter of uplink |
| AT+FCD | Query/Set the Frame Counter of downlink |
| AT+CLASS | Query/Set Class |

| | |
|-----------------|--------------------------------|
| AT+SENDB | Send the data by Hex format |
| AT+SEND | Send the data by ASCII |
| AT+RECVB | Display the data by Hex format |
| AT+RECV | Display the data by ASCII |

| | |
|-------------------|---|
| AT+RSSI | Query RSSI and SNR value of the last data packet. |
| AT+CERTIF | Enter the LoRaWAN certification mode |
| AT+BLEMAC | Query the MAC of BLE |
| AT+BLEINT | Query/set the interval of BLE Broadcast |
| AT+BLETXP | Query/set output power of BLE |
| AT+BLEADV | Query/set Broadcast packet of BLE |
| AT+BLEDTU | Send the transparent data of BLE |
| AT+BLEDISC | Disconnect BLE |

8. Details of AT command

8.1. AT

| | |
|-----------|---------------------------|
| AT | |
| AT | E.g : >>> AT <<< OK |

8.2. Set the acknowledge status.

| | |
|-------------|---|
| E | |
| ATE0 | Close the acknowledge E.g: >>> ATE0 <<< OK |
| ATE1 | Open the acknowledge E.g: >>> ATE1 <<< OK |

8.3. Reset

| | |
|------------|------------------|
| Z | |
| ATZ | E.g : >>> ATZ |

8.4. Sleep

| | |
|-----------------|--------------------------------|
| +SLEEP | |
| AT+SLEEP | E.g: >>> AT+SLEEP <<< OK |

8.5. Query/set sleep mode

| +PM | |
|---------------------------|--|
| AT+PM? | <p>Query Sleep mode</p> <p>Ack: +PM:<mode> < mode >: sleep mode 0: manual 1: automatic</p> <p>E.g: >>> AT+PM? <<< +PM:0 <<< OK</p> |
| AT+PM=<mode> | <p>Set Sleep mode</p> <p>Parameter: < mode >: sleep mode 0: manual 1: automatic</p> <p>In manual mode, users adopt AT+SLEEP to sleep chip. When wake-up GPIO is falling down, the module is waking up</p> <p>In automatic mode, a falling edge (or send any one byte to the chip) is required to wake up the chip on the RX pin of the serial port of the chip before each command is sent. The chip automatically sleeps after the end of the instruction execution.</p> <p>E.g: >>> AT+ PM=1 <<< OK</p> |

8.6. Reset the default parameter

| | |
|----------------|---------------------|
| +FRST | |
| AT+FRST | E.g: >>> AT+FRST |

8.7. Query the version of firmware.

| | |
|---------------|---|
| +V | |
| AT+V=? | <p>Ack: +V:version number</p> <p>E.g: >>> AT+V? <<< +V:1.1.0 <<< OK</p> |

8.8. Query/set baud rate of serial port

| | |
|-----------------------------|--|
| +BAUD | |
| AT+BAUD? | <p>Query serial baudrate</p> <p>Ack: +BAUD:<baud></p> <p><baud>: baudrate, [9600, 38400, 57600, 115200]</p> <p>E.g: >>> AT+BAUD? <<< +BAUD:9600 <<< OK</p> |
| AT+BAUD=<baud> | <p>Set the baudrate</p> <p>Parameter: <baud>: baudrate, range: [9600, 38400, 57600, 115200]</p> <p>E.g: >>> AT+BAUD=9600 <<< OK</p> |

8.9. Query SN

| | |
|----------------|--|
| +SN | |
| AT+SN=? | <p>Ack: +SN:<SN></p> <p><SN>: 16 characters of hex string</p> <p>E.g:</p> <pre>>>> AT+SN? <<< +SN:0011223344556677 <<< OK</pre> |

8.10. Query Token

| | |
|-------------------|---|
| +TOKEN | |
| AT+TOKEN=? | <p>Ack: +TOKEN:<token></p> <p><token>: 16 characters</p> <p>E.g:</p> <pre>>>> AT+TOKEN? <<< +TOKEN:h4aqsFGaYET6Osxy <<< OK</pre> |

8.11. Query/set Device EUI

| | |
|-------------------|---|
| +DEVEUI | |
| AT+DEVEUI? | <p>Query Device EUI</p> <p>Ack: +DEVEUI:<EUI></p> <p><EUI>: 8 bytes EUI</p> <p>E.g:</p> <pre>>>> AT+DEVEUI? <<< +DEVEUI:11:22:33:44:55:66:77:88 <<< OK</pre> |

| | |
|------------------------------|--|
| AT+DEVEUI=<EUI> | Set Device EUI Parameter: <EUI>: 8 bytes EUI |
|------------------------------|--|

| | |
|--|---|
| | <p>E.g :</p> <pre>>>> AT+ DEVEUI=11:22:33:44:55:66:77:88 <<< OK</pre> |
|--|---|

8.12. Query/set Application EUI

| | |
|-------------------------------|--|
| +APPEUI | |
| AT+APPEUI? | <p>Query ApplicationEUI</p> <p>Ack: +APPEUI:<EUI> <EUI>: 8 bytes EUI</p> <p>E.g :</p> <pre>>>> AT+ APPEUI? <<< +APPEUI:11:22:33:44:55:66:77:88 <<< OK</pre> |
| AT+ APPEUI=<EUI> | <p>Set Application EUI</p> <p>Parameter: <EUI>: 8 bytes of EUI</p> <p>E.g :</p> <pre>>>> AT+ APPEUI=11:22:33:44:55:66:77:88 <<< OK</pre> |

8.13. Query/set Application Key

| +APPKEY | |
|------------------------------|---|
| AT+APPKEY? | <p>Query Application Key</p> <p>Ack: +APPKEY:<key></p> <p><key>: 16 bytes key</p> <p>E.g :</p> <pre>>>> AT+ APPKEY? <<< +APPKEY:00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF <<< OK</pre> |
| AT+APPKEY=<key> | <p>Set Application Key</p> <p>Parameter:</p> <p><key>: 16 Bytes key</p> <p>E.g :</p> <pre>>>> AT+APPKEY=00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF <<< OK</pre> |

8.14. Query/set Network Session Key

| +NWKSKEY | |
|---------------------|---|
| AT+ NWKSKEY? | <p>Query Network Session Key</p> <p>Ack: +NWKSKEY:<key></p> <p><key>: 16 bytes key</p> <p>E.g:</p> <pre>>>> AT+ NWKSKEY? <<< +NWKSKEY:00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF <<< OK</pre> |

| | |
|--------------------------------|--|
| AT+ NWKSKEY=<key> | Set Network Session Key Parameter: <key>: 16 bytes key E.g : >>> AT+ NWKSKEY=00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF <<< OK |
|--------------------------------|--|

8.15. Query/set Application Session Key

| +APPSKEY | |
|-------------------------------|---|
| AT+APPSKEY? | <p>Query Application Session Key</p> <p>Ack: +APPSKEY:<key></p> <p><key>: 16 Bytes key</p> <p>E.g:</p> <pre>>>> AT+ APPSKEY? <<< +APPSKEY:00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF <<< OK</pre> |
| AT+APPSKEY=<key> | <p>Set Application Session Key</p> <p>Parameter:</p> <p><key>: 16 Bytes key</p> <p>E.g:</p> <pre>>>> AT+ APPSKEY=00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF <<< OK</pre> |

8.16. Query/set Device address

| +DEVADDR | |
|--------------------|--|
| AT+DEVADDR? | <p>Query Device address</p> <p>Ack: +DEVADDR:<address></p> <p><address>: 4 Bytes address</p> <p>E.g:</p> <pre>>>> AT+DADDR? <<< +DADDR:04:00:00:01 <<< OK</pre> |

| | |
|-----------------------------------|--|
| AT+DEVADDR=<address> | Set Device address Parameter: <address>: 4 bytes address E.g : >>> AT+ DEVADDR=04:00:00:01 <<< OK |
|-----------------------------------|--|

8.17. Query/set ADR status

| | |
|----------------------------|---|
| +ADR | |
| AT+ ADR? | <p>Query ADR status</p> <p>Ack: +ADR:<ADR> < ADR >: 0: Disabled 1: Enabled</p> <p>E.g: >>> AT+ADR? <<< +ADR:1 <<< OK</p> |
| AT+ ADR=<ADR> | <p>Set ADR status</p> <p>Set: <ADR>: 0: Disable 1: Enable</p> <p>E.g: >>> AT+ ADR=1 <<< OK</p> |

8.18. Query/set output power

| +TXP | |
|-----------------------------|--|
| AT+ TXP? | <p>Query output power</p> <p>Ack: +TXP:<power></p> <p>< power >: output power level</p> <p>E.g :</p> <pre>>>> AT+TXP? <<< +TXP:1 <<< OK</pre> |
| AT+TXP=<power> | <p>Set output power</p> <p>Parameter:</p> <p>< power >: Output power level</p> <p>E.g:</p> <pre>>>> AT+ TXP=1 <<< OK</pre> |

8.19. Query/set Data Rate

| +DR | |
|--------------------------|--|
| AT+ DR? | <p>Query DataRate</p> <p>Ack: +DR:<DR></p> <p>< DR >: Data Rate,</p> <p>E.g:</p> <pre>>>> AT+DR? <<< +DR:1 <<< OK</pre> |
| AT+ DR=<DR> | <p>Set Data Rate</p> <p>Parameter:</p> <p>< DR >: Data Rate</p> <p>E.g:</p> <pre>>>> AT+ DR=1 <<< OK</pre> |

8.20. Query/set Duty Cycle

| | |
|----------------------------|---|
| +DCS | |
| AT+ DCS? | <p>Query Duty Cycle</p> <p>Ack: +DCS:<DCS></p> <p>< DCS >: Duty Cycle status 0: Disabled 1: Enabled</p> <p>E.g: >>> AT+DCS? <<< +DCS:1 <<< OK</p> |
| AT+ DCS=<DCS> | <p>Set Duty Cycle, This parameter only available in EU433,EU868</p> <p>Parameter: < DR >: Duty Cycle 0: Disable 1: Enable</p> <p>E.g: >>> AT+ DCS=1 <<< OK</p> |

8.21. Query/Set the channel

| | |
|--|---|
| +CHN | |
| AT+CHN? | <p>Query the channel</p> <p>Ack: +CHN: <id>,<freq>,<rx1Freq>,<DRMax>,<DRMin> <id>: Channel id <frequency>: uplink frequency</p> <p><rx1Frequency>: the frequency of receiving channel 1, if it is '0',The receiving channel 1 has the same frequency as the uplink frequency. <DRMax>: The max air Data Rate <DRMin>: The minimum air Data Rate</p> <p>示例: >>> AT+CHN? <<< +CHN:<LF> 0, 865062500,0,5,0<LF> 1, 865402500,0,5,0<LF> 2, 865985000,0,5,0 <<< OK</p> |
| AT+CHN=<id>,<freq>,<rx1Freq>,<DRMax>,<DRMin> | <p>set and modify the channel</p> <p>If the setting is successful, the relative Channel Mask will be '1'</p> <p>Caution: This is available for ABP mode of joining the network</p> <p>Parameter: <id>: Channel id <frequency>: uplink frequency</p> <p><rx1Frequency>: the frequency of receiving channel 1, if it is '0',The receiving channel 1 has the same frequency as the uplink frequency. <DRMax>: The max air Data Rate <DRMin>: The minimum air Data Rate</p> <p>E.g : >>> AT+CHN=3,866500000,0,5,4</p> |

| | |
|---------------|---|
| | <<< OK |
| AT+CHN | Save the configuration of channel paramter E.g : >>> AT+CHN <<< OK |

Caution:

The following channels in the bands are not allowed to modify

| Band | The channels No allow to modify |
|---------------------|---------------------------------|
| CN470 | All channels |
| CN770 | Channel 0, 1, 2 |
| EU433 | Channel 0, 1, 2 |
| EU868 | Channel 0, 1, 2 |
| US915_HYBRID | All channels |
| AS923 | Channel 0, 1 |
| IN865 | Channel 0, 1, 2 |

8.22. Query/Set Channel Mask

| | |
|-------------|--|
| +CHM | |
|-------------|--|

| | |
|-------------------------------------|---|
| <p>AT+ CHM?</p> | <p>Query Channel Mask</p> <p>Ack: +CHM:<mask></p> <p>< mask>: 16 bits mask</p> <p>Caution:</p> <p>CN470 has 96 channels. There are only 6 mask values</p> <p>E.g :</p> <pre>>>> AT+ CHM? <<< +CHM:00FF <<< OK</pre> <p>CN470:</p> <pre>>>> AT+ CHM? <<< +CHM:0000,0000,0000,0000,0000,00FF <<< OK</pre> |
| <p>AT+ CHM =<mask></p> | <p>Set Channel Mask</p> |

| | |
|--|---|
| | <p>Parameter: <mask>: 16 bits mask</p> <p>Caution: CN470 has 96 channels. There are only 6 mask values</p> <p>E.g : >>> AT+ CHM=0007 <<< OK</p> <p>CN470, enable channel16 ~ 31 >>> AT+CHM=0000,FFFF,0000,0000,0000,0000 <<< OK</p> |
|--|---|

8.23. Query/set the frequency of receiving window 2

| | |
|-------------------------------|--|
| +RX2FQ | |
| AT+ RX2FQ? | <p>Query the frequency of receiving window 2</p> <p>Ack: +RX2FQ:<freq> < freq>: frequency of window 2</p> <p>E.g : >>> AT+ RX2FQ? <<< +RX2FQ:866550000 <<< OK</p> |
| AT+RX2FQ =<freq> | <p>Set the frequency of receiving window 2</p> <p>Parameter: <freq>: frequency of window 2</p> <p>E.g : >>> AT+ RX2FQ=866550000 <<< OK</p> |

8.24. Query/set Data Rate of receiving window 2

| +RX2DR | |
|----------------------------|--|
| AT+RX2DR? | <p>Query Data Rate of receiving window 2</p> <p>Ack: +RX2DR:<DR></p> <p><DR>: Data Rate of receiving window 2</p> <p>E.g :</p> <pre>>>> AT+RX2DR? <<< +RX2DR:2 <<< OK</pre> |
| AT+RX2DR=<DR> | <p>Set Data Rate of receiving window 2</p> <p>Parameter:</p> <p><DR>: Data Rate of receiving window 2</p> <p>E.g :</p> <pre>>>> AT+RX2DR=2 <<< OK</pre> |

8.25. Query/set the delay of receiving window 1

| +RX1DL | |
|------------------|---|
| AT+RX1DL? | <p>Query the delay of receiving window 1</p> <p>Ack: +RX1DL:<delay></p> <p><delay>: ms</p> <p>E.g:</p> <pre>>>> AT+RX1DL? <<< +RX1DL:1000 <<< OK</pre> |

| | |
|-------------------------------|--|
| AT+RX1DL=<delay> | Set the delay of receiving window 1 Parameter: <delay>: range from [1000 - 15000]ms E.g: >>> AT+RX1DL=1000 <<< OK |
|-------------------------------|--|

8.26. Query delay of receiving window 2

| | |
|------------------|--|
| +RX2DL | |
| AT+RX2DL? | <p>Query delay of receiving window 2</p> <p>Ack: +RX2DL:<delay></p> <p><delay>: unit: ms, It equal 'RX1DL + 1000'</p> <p>E.g:</p> <pre>>>> AT+RX2DL? <<< +RX2DL:2000 <<< OK</pre> |

8.27. Query/Set delay of window 1 when joining network

| | |
|-------------------------------|---|
| +JN1DL | |
| AT+JN1DL? | <p>Query delay of window 1 when joining network</p> <p>Ack: +JN1DL:<delay></p> <p><delay>: (unit: ms)</p> <p>E.g :</p> <pre>>>> AT+JN1DL? <<< +JN1DL:1000 <<< OK</pre> |
| AT+JN1DL=<delay> | <p>Set Query delay of window 1 when joining network</p> <p>Parameter:</p> <p><delay>: range: [1000 - 15000] ms</p> <p>E.g :</p> <pre>>>> AT+JN1DL=5000 <<< OK</pre> |

8.28. Query the delay of window 2 when joining network

| | |
|------------------|---|
| +JN2DL | |
| AT+JN2DL? | <p>Query the delay of window 2 when joining network</p> <p>Ack: +JN2DL:<delay></p> <p><delay>: unit: ms, It equal 'JN1DL + 1000'</p> <p>E.g :</p> <pre>>>> AT+ JN2DL? <<< +JN2DL:6000 <<< OK</pre> |

8.29. Query the way of joining the network

| | |
|----------------------------|---|
| +NJM | |
| AT+NJM? | <p>Query the way of joining the network, The default is ABP</p> <p>Ack: +NJM:<mode></p> <p><mode>: the way of joining the network, ABP or OTAA</p> <p>E.g :</p> <pre>>>> AT+NJM? <<< +NJM:ABP <<< OK</pre> |
| AT+NJM=<mode> | <p>Set the way of joining the network</p> <p>Parameter:</p> <p><mode>: the way of joining the network, ABP or OTAA</p> <p>E.g :</p> <pre>>>> AT+ NJM=OTAA <<< OK</pre> |

8.30. Query the status of joining network

| | |
|----------------|--|
| +NJS | |
| AT+NJS? | <p>Query the status of joining the network</p> <p>Ack: +NJS:<status></p> <p><status>: status of joining the network</p> <p>0: No entering the network</p> <p>1: Enter the network</p> <p>E.g :</p> <pre>>>> AT+NJS? <<< +NJS:1 <<< OK</pre> |

8.31. 入网

| | |
|----------------|--|
| +JOIN | |
| AT+JOIN | <p>Event: +JOIN:<code></p> <p>0: Failed</p> <p>1: Successful</p> <p>E.g :</p> <pre>>>> AT+JOIN <<< OK <<< +JOIN:1</pre> |

8.32. Query/set the Frame Counter of uplink

| | |
|-----------------------------|--|
| +FCU | |
| AT+FCU? | <p>Query the Frame Counter of uplink</p> <p>Ack: +FCU:<value></p> <p><value>: the Counter value of uplink</p> <p>E.g :</p> <pre>>>> AT+FCU? <<< +FCU:100 <<< OK</pre> |
| AT+FCU=<value> | <p>Set Frame Counter</p> <p>Parameter:</p> <p><value>: the Counter value of uplink</p> <p>E.g :</p> <pre>>>> AT+FCU=100 <<< OK</pre> |

8.33. Query/set the Frame Counter of downlink

| | |
|----------------|--|
| +FCD | |
| AT+FCD? | <p>Query the Frame Counter of downlink</p> <p>Ack: +FCD:<value></p> <p><value>: the Counter value of downlink</p> <p>E.g :</p> <pre>>>> AT+FCD? <<< +FCD:100 <<< OK</pre> |

| | |
|-----------------------------|--|
| AT+FCD=<value> | Set the Frame Counter of downlink Parameter: <value>: Counter value of downlink E.g : >>> AT+FCD=100 <<< OK |
|-----------------------------|--|

8.34. Query/set Class

| | |
|-------------------------------|--|
| +CLASS | |
| AT+CLASS? | <p>Query Class</p> <p>Ack: +CLASS:<class></p> <p><class>: Class of module A:ClassA C:ClassC</p> <p>E.g: >>> AT+CLASS? <<< +CLASS:A <<< OK</p> |
| AT+CLASS=<class> | <p>Set Class</p> <p>Parameter:</p> <p><class>: Class of module A:ClassA C:ClassC</p> <p>E.g : >>> AT+CLASS=A <<< OK</p> |

8.35. Send the data via HEX format

| | |
|---|--|
| +SENDB | |
| AT+SENDB=<type>, <port>, <maxTrials>, <data> | <p>Send the data via hex format</p> <p>Parameter:</p> <p><type>: The type of data packet: 0: Unconfirmed packet 1: Confirmed packet</p> <p><port>: data port, range:[1 - 223]</p> <p><maxTrials>: Max trial times, Only type 1 available, When maxTrials is 0, the program will add 1 automatically.</p> |

| | |
|--|-------------------------------|
| | <p><data>: Hex data</p> |
|--|-------------------------------|

Ack: +SEND:<code>

<code>: 0: send failed

1: Unconfirmed packet send successfully

2: Confirmed packet send successfully, and receive the acknowledge from Server.

3: Confirmed packet send successfully, But not receive the Acknowledge from the server.

When type is '1' , if module send the packet, but still don't receive ack. The module resends it with a maximum of maxTrials times.

E.g :

```
>>> AT+SENDB=1,5,3,112233
```

```
<<< OK
```

```
<<< +SEND:2
```

8.36. Send the data via Unicode format

| | |
|--|--|
| <p>+SEND</p> | |
| <p>AT+SEND=<type>,<port>,<maxTrials>,<data></p> | <p>Send the data via ASCII format</p> <p>Parameter:</p> <p><type>: The type of data packet:</p> <p>0: Unconfirmed packet 1: Confirmed packet</p> <p><port>: data port, range:[1 - 223]</p> <p><maxTrials>: Max trial times, Only type 1 available, When maxTrials is 0, the program will add 1 automatically.</p> <p><data>: Unicode data</p> <p>Ack: +SEND:<code></p> <p><code>: 0: send failed</p> <p>1: Unconfirmed packet send successfully</p> <p>2: Confirmed packet send successfully, and receive the acknowledge from Server.</p> <p>3: Confirmed packet send successfully, But not receive the Acknowledge from the server.</p> <p>When type is '1' , if module send the packet,but still don't receive ack. The module resends it with a maximum of maxTrials times.</p> <p>E.g :</p> <pre>>>> AT+SEND=1,5,3,hello <<< OK</pre> |

| | |
|--|-------------|
| | <<< +SEND:2 |
|--|-------------|

8.37. Display the data by Hex format

| | |
|-----------------|---|
| +RECVB | |
| AT+RECVB | <p>Ack: +RECVB:<port>,<data> <port>: Port of data, range:[1 - 223] <data>: Hex data format</p> <p>E.g : >>> AT+RECVB <<< +RECVB:2,11223344 <<< OK</p> |

8.38. Display the data by ASCII format

| | |
|----------------|---|
| +RECV | |
| AT+RECV | <p>Ack: +RECV:<port>,<data> <port>: Port of data, range:[1 - 223] <data>: ASCII data</p> <p>E.g: >>> AT+RECV <<< +RECV:2,hello <<< OK</p> |

8.39. Query RSSI and SNR value of the last data packet

| | |
|-----------------|--|
| +RSSI | |
| AT+RSSI? | <p>Ack: +RSSI:<RSSI>,<SNR> <RSSI>: RSSI value <SNR>: SNR value</p> <p>E.g : >>> AT+RSSI? <<< +RSSI:-50, 7 <<< OK</p> |

8.40. Enter LoRaWAN certification mode

| | |
|------------------|---|
| +CERTIF | |
| AT+CERTIF | <p>E.g : >>> AT+CERTIF <<< OK</p> |

8.41. Query BLE MAC address

| | |
|----------------|--|
| +BLEMAC | |
| | <p>Ack : +BLEMAC:<MAC> <MAC>: BLE MAC address</p> <p>E.g : >>> AT+BLEMAC? <<< 11:22:33:44:55:66</p> |

8.42. Query/set the broadcast interval of BLE

| | |
|-----------------------------------|---|
| +BLEINT | |
| AT+BLEINT? | <p>Query the broadcast interval of BLE</p> <p>Ack: +BLEINT:<interval> <interval>: the broadcast interval, range:[100 - 5000] ms</p> <p>E.g : >>> AT+BLEINT? <<< +BLEINT:400 <<< OK</p> |
| AT+BLEINT=<interval> | <p>Set the broadcast interval of BLE</p> <p>Parameter: <interval>: the broadcast interval, range: [100 - 5000] ms</p> <p>E.g : >>> AT+BLEINT=100 <<< OK</p> |

8.43. Query/set the output power of BLE

| | |
|----------------|--|
| +BLETXP | |
|----------------|--|

| | |
|-------------------|---|
| AT+BLETXP? | Query the output power of BLE Ack: +BLETXP:<power> <power>: output power, range: [-30, -20, -16, -12, -8, -4, 0, 4] dbm E.g : |
|-------------------|---|

| | |
|--------------------------------|--|
| | <pre>>>> AT+BLETXP? <<< +BLETXP:-8 <<< OK</pre> |
| AT+BLETXP=<power> | <p>Set the output power of BLE</p> <p>Parameter: <power>: [-30, -20, -16, -12, -8, -4, 0, 4] dbm</p> <p>E.g : >>> AT+BLETXP=0 <<< OK</p> |

8.44. Query/set the broadcast packet of BLE

| | |
|---------------------------------|---|
| +BLEADV | |
| AT+BLEADV? | <p>Query the broadcast packet of BLE</p> <p>Ack: +BLEADV:<packet> <packet>: BLE-compliant broadcast packets</p> <p>E.g : >>> AT+BLEADV? <<< +BLEADV: 02010603031122 <<< OK</p> |
| AT+BLEADV=<packet> | <p>Set the broadcast packet of BLE</p> <p>Parameter: <packet>: BLE-compliant broadcast packets. When it is null, it stops broadcast.</p> <p>E.g 1: >>> AT+BLEADV=02010604FFFFFFFF01 <<<OK</p> <p>E.g 2: >>> AT+BLEADV= <<< OK</p> |

8.45. Send the data of BLE DTU

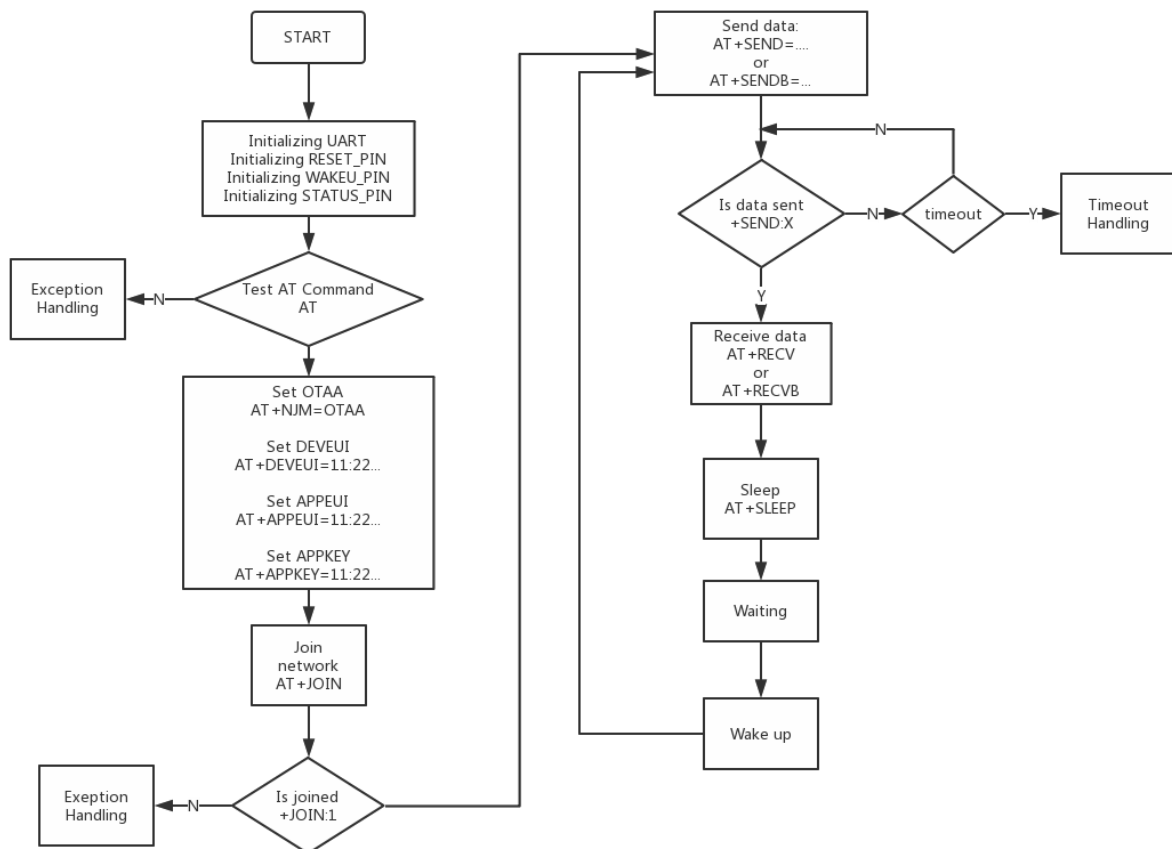
| | |
|-------------------------------|---|
| +BLEDTU | |
| AT+BLEDTU=<data> | <p>Send the data of BLE DTU</p> <p>Caution:</p> <p>This command is available when module connect the RX pin of master device.</p> <p>Parameter:</p> <p>< data >: Hex data, Maximum 255 Bytes</p> <p>E.g :</p> <pre>>>> AT+BLEDTU=112233445566</pre> <pre><<< OK</pre> |
| +BLEDTU:<data> | <p>When module input the DTU data via TX pin, the chip will output the DTU event. If the module is sleep, the chip will wake up and open the serial port.</p> <p>Parameter:</p> <p>< data >: Hex data</p> <p>E.g :</p> <pre><<< AT+BLEDTU=11223344</pre> |

8.46. Disconnect the BLE connection

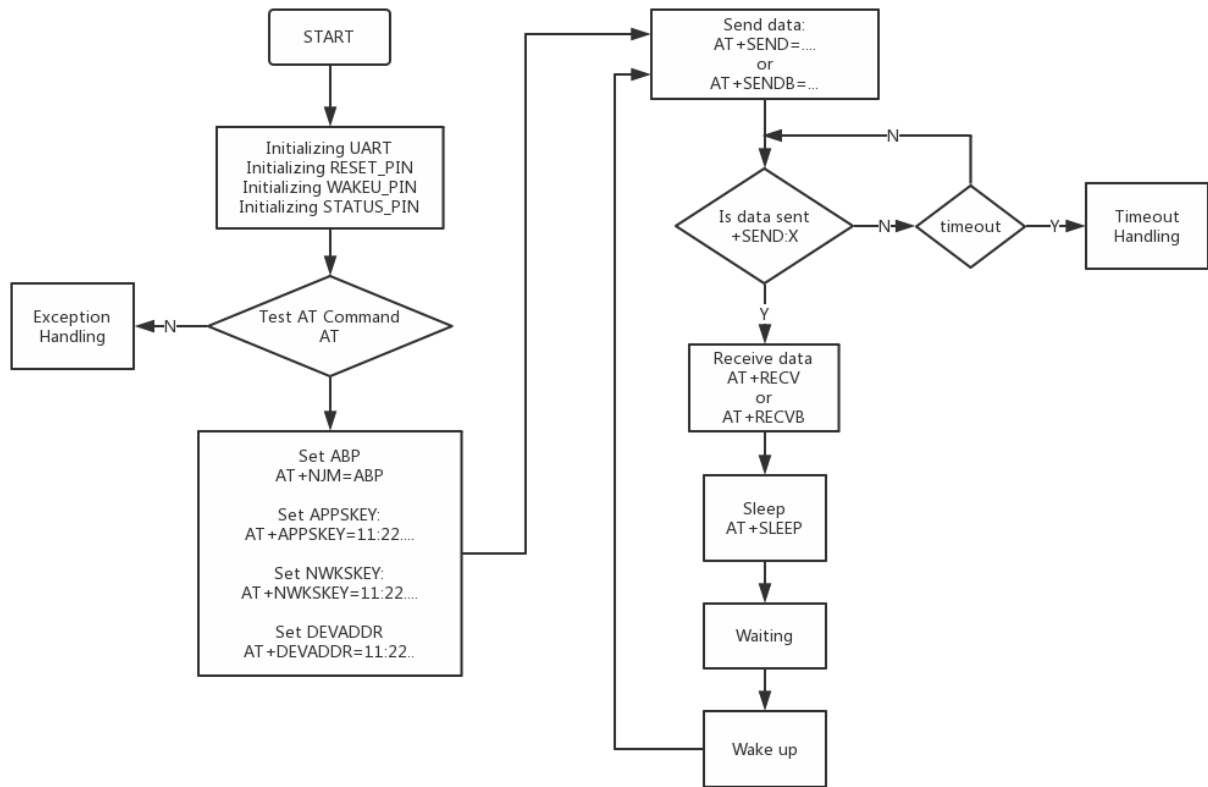
| | |
|-------------------|---|
| +BLEDISC | |
| AT+BLEDISC | <p>E.g :</p> <pre>>>> AT+BLEDISC</pre> <pre><<< OK</pre> <pre><<< +BLEDISC</pre> |

9. The flow of AT command

9.1. OTAA flow



9.2. ABP flow



10. The example of BLE broadcast packets

10.1. iBeacon

UUID: 00112233-4455-6677-8899AABBCCDDEEFF

Major: 0

Minor: 1

Mrssi: -59

command:

```
>>> AT+BLEADV= 0201061AFF4C00021500112233445566778899AABBCCDDEEFF00000001C5
<<< OK
```

10.2. Eddystone URL

URL: <https://www.google.com>

command:

```
>>> AT+BLEADV=0201060303AAFE0D16AAFE10EC01676F6F676C6507
<<< OK
```

10.3. Eddystone UID

ID Namespace: 0x00112233445566778899

ID Instance: 0xAABBCCDDEEFF

command:

```
>>> AT+BLEADV= 0201060303AAFE1716AAFE00EC00112233445566778899AABBCCDDEEFF0000
<<< OK
```


11. BLE DTU port

11.1. GATT

- Service: DEAE0500-7A4E-1BA2-834A-50A30CCAE0E4
- Characteristic for data writing/TX

| | |
|--------------------------|--------------------------------------|
| Characteristic TX | |
| UUID | DEAE0501-7A4E-1BA2-834A-50A30CCAE0E4 |
| Properties | Write Only |
| MaxLen | 20 Bytes |

- Data written by BLE master through this feature will be forwarded to UART
- Data format

Length+Version+Data

| | |
|----------------|--|
| Frame | Discription |
| Length | 2 bytes, it is Version + Data |
| Version | Format verison, This document is fixed to 0x01 |
| Data | Hex data |

E.g :

Written data: 05000111223344

Transfer to UART: +BLEDTU:11223344

- Characteristic for indication/RX

| | |
|--------------------------|--------------------------------------|
| Characteristic RX | |
| UUID | DEAE0502-7A4E-1BA2-834A-50A30CCAE0E4 |
| Properties | Indication |
| MaxLen | 20 Bytes |

The data sent by the AT+BLEDTU instruction is indicated by this characteristic to the BLE master

The master device must listen to this feature, otherwise it cannot receive data

The data format is the same as the Characteristic TX:

AT command to send the data: AT+BLEDTU=11223344

Receive: 05000111223344

11.2. DTU flow

