Represented by:
FIRST Components s.r.l.
www.first-components.com
technical@first-components.com
+39 0332 1888005

REYAX
TECHNOLOGY CORPORATION, LTD

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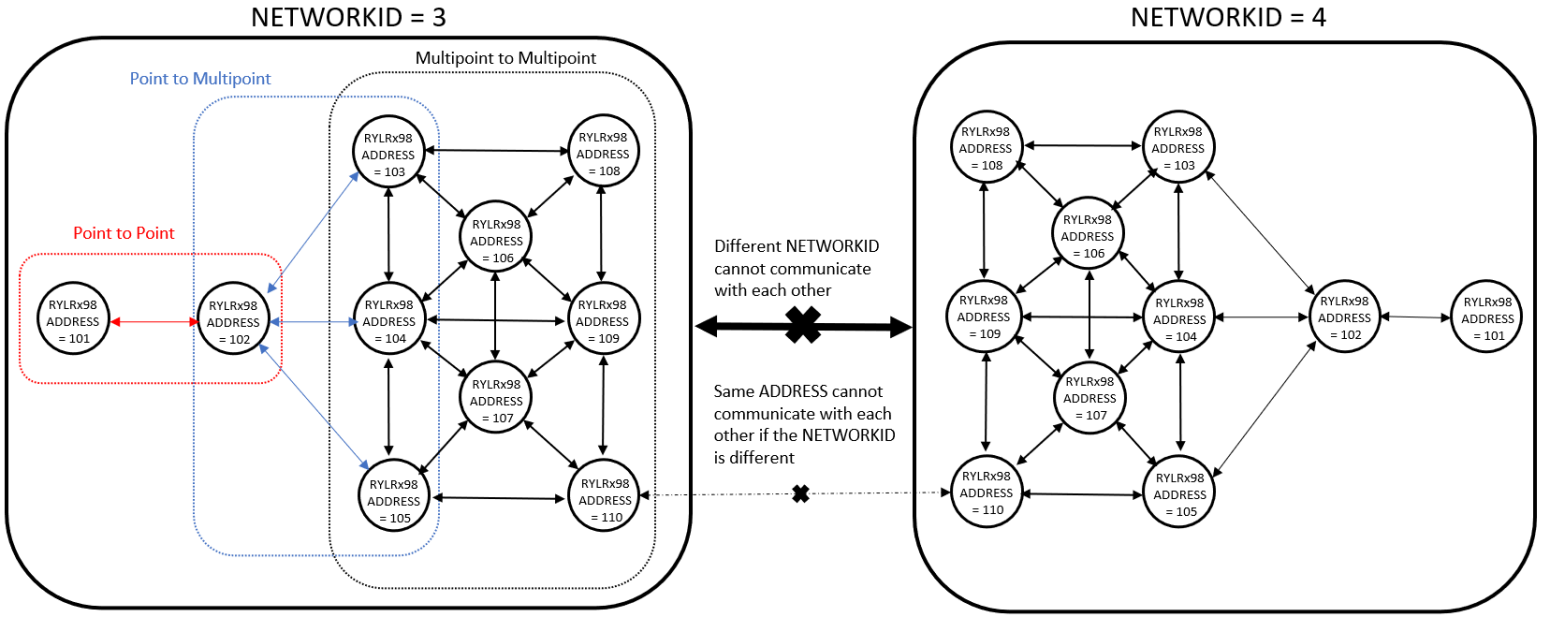
LoRa® AT COMMAND GUIDE

APPLY FOR:

1. RYLR998
2. RYLR498

RYLR998_RYLR498 NETWORK STRUCTURE

With the own LoRa® wireless transceiver function and the application program designed by customers, the RYLR998 and RYLR498 can achieve different network architectures such as "Point to Point", "Point to Multipoint" or " Multipoint to Multipoint ". The figure below shows that the modules can communicate with each other only by setting the same NETWORKID. If the ADDRESS of specified receiver belongs to different group, it is not able to communicate with each other.



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THE SEQUENCE OF USING AT COMMAND

1. Use "**AT+ADDRESS**" to set ADDRESS. The ADDRESS is regard as the identification of transmitter or specified receiver.
2. Use "**AT+NETWORKID**" to set the ID of LoRa® network. This is a Group function. Only by setting the same NETWORKID can the modules communicate with each other. If the ADDRESS of specified receiver is belong to different group, it is not able to communicate with each other.
3. Use" **AT+BAND**" to set the center frequency of wireless band. The transmitter and the receiver are required to use the same frequency to communicate with each other.

4. Use" **AT+PARAMETER**" to set the RF wireless parameters. The transmitter and the receiver are required to set the same parameters to communicate with each other. The parameters of which as follows:

   [1] <Spreading Factor>: The larger the SF is, the better the sensitivity is. But the transmission time will take longer.

   [2] <Bandwidth>: The smaller the bandwidth is, the better the sensitivity is. But the transmission time will take longer.

   [3] <Coding Rate>: The coding rate will be the fastest if setting it as 1.
   [4] <Programmed Preamble>: Preamble code. If the preamble code is bigger, it will result in the less opportunity of losing data. Generally preamble code can be set above 10 if under the permission of the transmission time. Recommend to set "**AT + PARAMETER = 9,7,1,12**"

   [5] When the Payload length is greater than 100Bytes, Recommend to set

   "**AT + PARAMETER = 8,7,1,12**"
5. Use "**AT+SEND**" to send data to the specified ADDRESS. Please use "LoRa® Modem Calculator Tool" to calculate the transmission time. Due to the program used by the module, the payload part will increase more 8 bytes than the actual data length.

AT Command Set

It is required to key in "enter" or "\r\n" in the end of all AT Commands.
Add" ? "in the end of the commands to ask the current setting value.
It is required to wait until the module replies +OK so that you can execute the next AT command.

1. AT Test if the module can respond to Commands.

Syntax	Response
AT	+OK

2. Software RESET

Syntax	Response
AT+RESET	+RESET +READY

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3. AT+MODE Set the wireless work mode.

Syntax	Response
AT+MODE=<Parameter>[,<RX time>,<Low speed time>] <Parameter>range 0 to 2 0：Transceiver mode (default). 1：Sleep mode. Example : Set to sleep mode. AT+MODE=1 2 : Smart receiving power saving mode The switch between receiving mode and low speed mode can be used to achieve the effect of power saving, and the appropriate transmission time must be adjusted by yourself to match this mode. <RX time>=30ms~60000ms, (default 1000) <Low speed time>=30ms~60000ms, (default 1000) When the correct LoRa® data format is received, it will return to the transceiver mode. When the received data is correct, +RCV format data will be output. Example : The Smart receiving power saving mode. AT+MODE=2,3000,3000 Set to turn on receiving mode for 3 seconds and then low speed mode for 3 seconds to cycle until the correct signal is received.	+OK
AT+MODE? ‘When MODE=0 AT+MODE? Or Any digital signal ‘When MODE=1 AT+MODE? Or Any digital signal ‘When MODE=2	+MODE=0 +MODE=0 +MODE=0

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4. AT+IPR Set the UART baud rate.

Syntax	Response
AT+IPR=<rate> <rate> is the UART baud rate： 300 1200 4800 9600 19200 28800 38400 57600 115200(default) Example: Set the baud rate as 9600, **The settings will be memorized in Flash.* AT+IPR=9600	+IPR=<rate>
AT+IPR?	+IPR=9600

5. AT+BAND Set RF Frequency.

Syntax	Response
AT+BAND=<Parameter>,<Frequency Memory> <Parameter>is the RF Frequency, Unit is Hz 490000000: 490000000Hz(default: RYLY498) 915000000: 915000000Hz(default: RYLY998) <Frequency Memory> M for memory Example: Set the frequency as 868500000Hz. AT+BAND=868500000 Example: Set the frequency as 868500000Hz and be memorized in Flash.(Only support after F/W version 1.2.0) AT+BAND=868500000,M	+OK
AT+BAND?	+BAND=868500000

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6. AT+PARAMETER Set the RF parameters.

Syntax	Response
AT+PARAMETER=<Spreading Factor>, <Bandwidth>,<Coding Rate>, <Programmed Preamble> <Spreading Factor>5~11 (default 9) **SF7to SF9 at 125kHz, SF7 to SF10 at 250kHz, and SF7 to SF11 at 500kHz* <Bandwidth>7~9, list as below： 7: 125 KHz (default) 8: 250 KHz 9: 500 KHz <Coding Rate>1~4, (default 1) <Programmed Preamble>(default 12) When NETWORKID=18, The value can be configured to 4~24. Other NETWORKID can only be configured to 12. Example: Set the parameters as below, <Spreading Factor> 7, <Bandwidth> 500KHz, <Coding Rate> 4, <Programmed Preamble> 15. AT+PARAMETER=7,9,4,15	+OK
AT+PARAMETER?	+PARAMETER=7,9,4,15

7. AT+ADDRESS Set the ADDRESS ID of module LoRa®.

Syntax	Response
AT+ADDRESS=<Address> <Address>=0~65535 (default 0) Example: Set the address of module as 120. **The settings will be memorized in Flash.* AT+ADDRESS=120	+OK
AT+ADDRESS?	+ADDRESS=120

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8. **AT+NETWORKID** Set the network ID.

Syntax	Response
AT+NETWORKID=<Network ID> <NetworkID>=3~15,18(default18) Example: Set the network ID as 6, *The settings will be memorized in Flash.* AT+NETWORKID=6	+OK
AT+NETWORKID?	+NETWORK=6

9. **AT+CPIN** Set the domain password

Syntax	Response
AT+CPIN=<Password> <Password>An 8 character long password From 00000001 to FFFFFFFF, Only by using same password can the data be recognized. After resetting, the previously password will disappear. Example：Set the password to EEDCAA90 AT+CPIN=EEDCAA90	+OK
AT+CPIN? (default) AT+CPIN? (After setting the password)	+CPIN=No Password! +CPIN=eedcaa90

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10. AT+CRFOP Set the RF output power.

Syntax	Response
AT+CRFOP=<power> <power>0~22 dBm 22: 22dBm(default) 21: 21dBm 20: 20dBm …… 01: 1dBm 00: 0dBm Example: Set the output power as 10dBm, AT+CRFOP=10 *** RF Output Power must be set to less than AT+CRFOP=14 to comply CE certification.**	+OK
AT+CRFOP?	+CRFOP=10

11. AT+SEND Send data to the appointed address by Command Mode.

Syntax	Response
AT+SEND=<Address>,<Payload Length>,<Data> <Address>0~65535, When the <Address> is 0, it will send data to all address (From 0 to 65535.) <Payload Length> Maximum 240bytes <Data>ASCII Format Example : Send HELLO string to the Address 50, AT+SEND=50,5,HELLO	+OK
Search last transmit data, AT+SEND?	+SEND=50,5,HELLO

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12. +RCV Show the received data actively.

Syntax	Response
+RCV=<Address>,<Length>,<Data>,<RSSI>,<SNR> <Address> Transmitter Address ID <Length> Data Length <Data> ASCll Format Data <RSSI> Received Signal Strength Indicator <SNR> Signal-to-noise ratio	
Example: Module received the ID Address 50 send 5 bytes data, Content is HELLO string, RSSI is -99dBm, SNR is 40, It will show as below. +RCV=50, 5, HELLO, -99, 40	

13. AT+UID? To inquire module ID. 12BYTES

Syntax	Response
AT+UID?	+UID=104737333437353600170029

14. AT+VER? To inquire the firmware version.

Syntax	Response
AT+VER?	+VER=RYLRxx8_Vx.x.x

15. AT+FACTORY Set all current parameters to manufacturer defaults.

Syntax	Response
AT+FACTORY Manufacturer defaults: BAND：915MHz UART：115200 Spreading Factor：9 Bandwidth：125kHz Coding Rate：1 Preamble Length：12 Address：0 Network ID：18 CRFOP：22	+FACTORY

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16. Other messages

Narrative	Response
After RESET	+RESET +READY

17. Error result codes

Narrative	Response
There is not “enter” or 0x0D 0x0A in the end of the AT Command.	+ERR=1
The head of AT command is not “AT” string.	+ERR=2
Unknown command.	+ERR=4
The data to be sent does not match the actual length	+ERR=5
TX is over times.	+ERR=10
CRC error.	+ERR=12
TX data exceeds 240bytes.	+ERR=13
Failed to write flash memory.	+ERR=14
Unknown failure.	+ERR=15
Last TX was not completed	+ERR=17
Preamble value is not allowed.	+ERR=18
RX failed, Header error	+ERR=19
The time setting value of the “Smart receiving power saving mode” is not allowed.	+ERR=20

REYAX TECHNOLOGY CORPORATION, LTD

first FC components

E-mail: technical@first-components.com
Website: http://first-components.com

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