LoRa Interface Converter & DI/DO Controller
EX9212LoRa-E/MTCP
EX9212LoRa-S
EX9212LoRa-U
EX9212LoRa-DIO

User Manual

Edition: 201909v1.1

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Table of Contents

1. Introduction

Thank you for using LoRa interface gateway in your system work. These LoRa gateways provide the way of connecting IoT remote units to a Local Area Network (LAN) or Host Computer from long distance. The data transmission via LoRa gateways mainly intended for the ISM (Industrial, Scientific, and Medical) frequency bands at 862-936 MHz.

The gateway has been built with the module integrated many RF functions and PA to make the maximum output power up to +20dBm.

LoRa Interface Gateways are packaged in a plastic case well suited for industrial environments. LoRa Interface devices have different models for converting to Ethernet/Modbus TCP, USB, Serial ports (RS-232(half-duplex)/485) and DI/DO controller. Configuration is easy to set up via web page and utility tool.

The following topics are covered in this chapter:

- **Applications**
- **Packaging**
- **Specifications**

1.1 Applications

- Automation and safety alarm in the community.
- Various automated smart meters, such as water meter, gas meter and electricity meter.
- Long range communication data collection and integration.
- Outdoor information monitoring and collection, such as temperature, humidity and air quality information.
- Electricity facilities measurement and management, such as smart street lighting.
- Agriculture and animal husbandry monitoring and management.

1.2 Packaging

LoRa Interface Gateway attached with the following items:
- ☐ 1 unit of Gateway device.
- ☐ 1 unit of Power Adaptor, 9V ~ 24V DC, 500mA (option)
- ☐ 1 unit of Antenna
- ☐ Documentation & Utility CD

NOTE: Inform your sales representative if any of the above items missing or damaged.

2. Product Specifications

2.1 EX9212LoRa-E/ MTCP : Ethernet To LoRa

- ➢ CPU : 32 bits MCU ,40 MHz , 16KB SRAM, 128KB Flash ROM
- ➢ Support: ModbusTCP(EX9212LoRa-MTCP) & Transparent(EX9212LoRa-E)

- ➢ **LoRa** : Semtech SX1272
  - ● Freq. : ISM band 862 ~ 936MHz
  - ● Receiver Sensitivity : -137 dBm
  - ● Transmit Output Power : 20 dBm
  - ● Sleep Current : 3uA (at power down state)
  - ● TX current < 140 mA@20 dbm , RX current < 10 mA
  - ● Security processor (128/192/256 bits AES)
  - ● Packet engine up to 256 bytes with CRC
  - ● Antenna : SMA Type , 2 dBi , changeable
  - ● Distance : Up To 1500~7500 Meters in free space
  - ● Data Rate : 0.244 ~ 18.2K bps (LoRa) / 300 K bps (FSK)
  - ● Application mode : Star

- ➢ **Ethernet Port**
  - ● Port Type：RJ-45 Connector
  - ● Speed：10 / 100 Mbps (Auto Detect)
  - ● Protocol：ARP , IP , ICMP , UDP , TCP , HTTP , DHCP
  - ● Mode：TCP Server / TCP Client / UDP
  - ● Setup：HTTP Browser Setup (IE)
  - ● Security：Login Password
  - ● Protection：Built-in 1.5KV Magnetic Isolation
  - ● Modbus TCP To RTU/ASCII Slave Mode
  - ● Modbus RTU/ASCII To TCP Slave Mode
- ➢ Setup Tool : Windows Utility
- ➢ Power : DC 9 ~ 24V / 150mA@ 9V , 60mA@ 24V
- ➢ Power consumption: 12VDC / 95mA, 9VDC / 120mA
- ➢ Led Lamp : SYS (green) , Rx(red) , Tx(green)
- ➢ Environment: Operating Temperature: -10℃～70℃

  　　　　　　　　Storage Temperature: -20℃～80℃
- ➢ Dimensions : 100 * 90 * 25 mm (W * D * H)
- ➢ Weight : 150 gm (not include power)

2.2 EX9212LoRa-S : RS232(half-duplex)/485 To LoRa

- ➢ CPU : 32 bits MCU ,40 MHz , 16KB SRAM, 128KB Flash ROM
- ➢ Support: Modbus & Transparent

- ➢ **LoRa** : Semtech SX1272
  - Freq. :   ISM band 862 ~ 936MHz
  - Receiver Sensitivity : -137 dBm
  - Transmit Output Power : 20 dBm
  - Sleep Current : 3uA (at power down state)
  - TX current < 140 mA@20 dbm , RX current < 10 mA
  - Security processor (128/192/256 bits AES)
  - Packet engine up to 256 bytes with CRC
  - Antenna : SMA Type , 2 dBi , changeable
  - Distance : Up To 5000 Meters in free space
  - Data Rate : 0.244 ~ 18.2K bps (LoRa) / 300 K bps (FSK)
  - Application mode : Star

- ➢ **Serial Port**
  - Port Type : RS-232/485 * 1 port
  - RS-232(half-duplex) : Rx , Tx , GND , RTS , CTS (DB9 female)
  - RS-485 : Data+ , Data- (Surge Protect)
  - Built –in RS-485 Terminal Resistor
  - Speed : 9600 bps～115.2K bps
  - Parity : None , Odd , Even
  - Data Bit : 7, 8 / Stop Bit : 1 , 2
  - Setup Tool : Windows Utility
  - Power : DC 9 ~ 24V / 150ma @ 9V , 60ma @ 24V
  - Power consumption: 12VDC / 20mA, 9V / 30mA.
  - Led Lamp : SYS (green) , Rx(red) , Tx(green)
  - Environment: Operating Temperature: -10℃～70℃
    Storage Temperature: -20℃～80℃
- ➢ Dimensions : 100 * 90 * 25 mm (W * D * H)
- ➢ Weight : 150 gm (not include power)

2.3 EX9212LoRa-U : USB To LoRa

- ➢ CPU : 32 bits MCU ,40 MHz , 16KB SRAM, 128KB Flash ROM
- ➢ Support: only transparent

- ➢ **LoRa** : Semtech SX1272
  - Freq. :   ISM band 862 ~ 936MHz
  - Receiver Sensitivity : -137 dBm
  - Transmit Output Power : 20 dBm
  - Sleep Current : 3uA (at power down state)
  - TX current < 140 mA@20 dbm , RX current < 10 mA
  - Security processor (128/192/256 bits AES)
  - Packet engine up to 256 bytes with CRC
  - Antenna : SMA Type , 2 dBi , changeable
  - Distance : Up To 5000 Meters in free space
  - Data Rate : 0.244 ~ 18.2K bps (LoRa) / 300 K bps (FSK)
  - Application mode : Star

- ➢ **USB Port**
  - Port of Type : USB * 1 port, Connector : USB type B
  - Chipset : Silicon Laboratories CP2102
  - Compliant : US1.0 , 1.1 , 2.0
  - Baud Rates : Full speed 12 M bps
  - Driver Support : Windows-98/ 2000/ XP/ 2003/ Vista /Win-7/Win-10
              Mac Osx / Os9 / Linux2.4 / 2.6
- ➢ Provide : USB driver
- ➢ Setup Tool : Windows Utility
- ➢ Power : DC 5V / 150mA @ 5V
- ➢ Led Lamp : SYS (red) , Pairing (green) , Rx(red) , Tx(green)
- ➢ Environment: Operating Temperature: -10℃～70℃
              Storage Temperature: -20℃～80℃
- ➢ Dimensions : 100 * 90 * 25 mm (W * D * H)
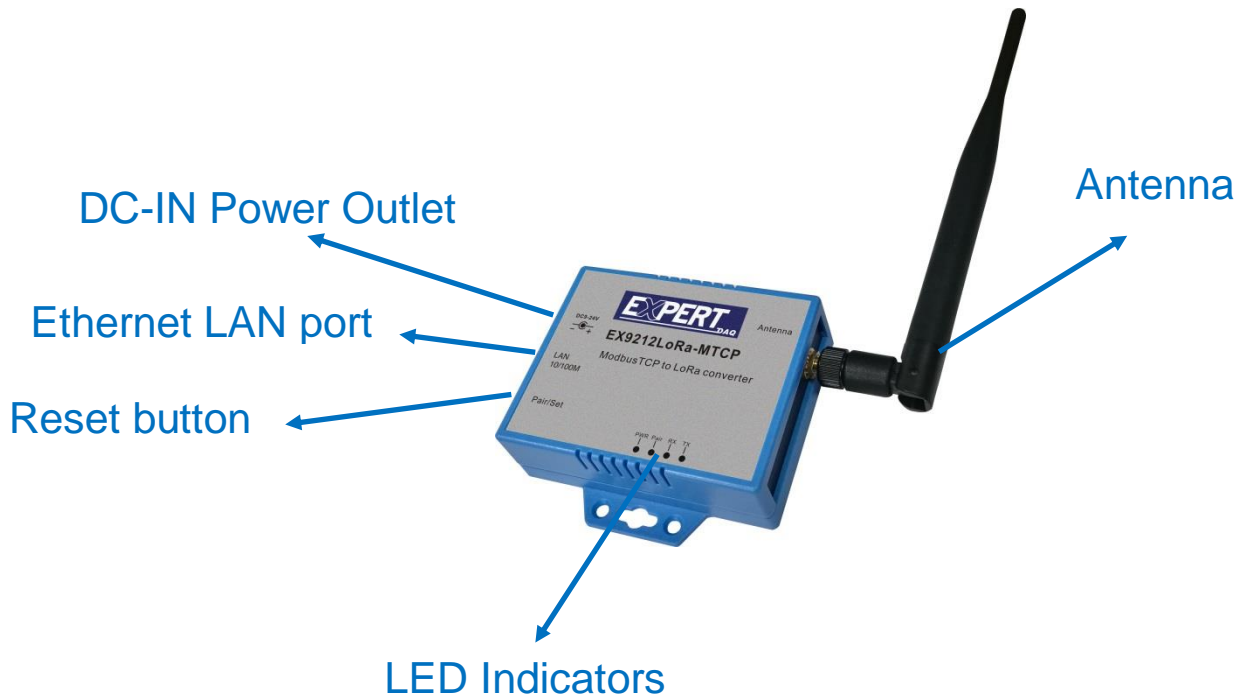- ➢ Weight : 150 gm (not include power)

2.4 EX9212LoRa-DIO : LoRa Digital I/O Controller

- ➢ CPU : 32 bits MCU ,40 MHz , 16KB SRAM, 128KB Flash ROM
- ➢ Support   Modbus Protocol

- ➢ **LoRa** : Semtech SX1272
  - ● Freq. :   ISM band 862 ~ 936MHz
  - ● Receiver Sensitivity : -137 dBm
  - ● Transmit Output Power : 20 dBm
  - ● Sleep Current : 3uA (at power down state)
  - ● TX current < 140 mA@20 dbm , RX current < 10 mA
  - ● Security processor (128/192/256 bits AES)
  - ● Packet engine up to 256 bytes with CRC
  - ● Antenna : SMA Type , 2 dBi , changeable
  - ● Distance : Up To 5000 Meters in free space
  - ● Data Rate : 0.244 ~ 18.2K bps (LoRa) / 300 K bps (FSK)
  - ● Application mode : Star

- ➢ **Digital I/O**
  - ● Digital Input * 2
    3000VDC Isolation Protect (Active High /Active Low Selectable)
    Dry contact : Logic level 0 : close to GND , Logic level 1 : open
    Wet contact : Logic level 0 : 0~3 V , Logic level 1 : 10 ~ 30 V
  - ● Digital Output * 2
    Relay (Active High /Active Low Selectable)
    120V AC@10A , 240V AC@7A , 24V DC@10A
- ➢ Setup Tool : Windows Utility
- ➢ Power : DC 9 ~ 24V / 150ma @ 9V , 60ma @ 24V
- ➢ Led Lamp : SYS (red) , Pairing (green) , Rx(red) , Tx(green)
- ➢ Environment: Operating Temperature:-10℃～70℃
  Storage Temperature:-20℃～85℃
- ➢ Dimensions : 160 * 90 * 25 mm (W * D * H)
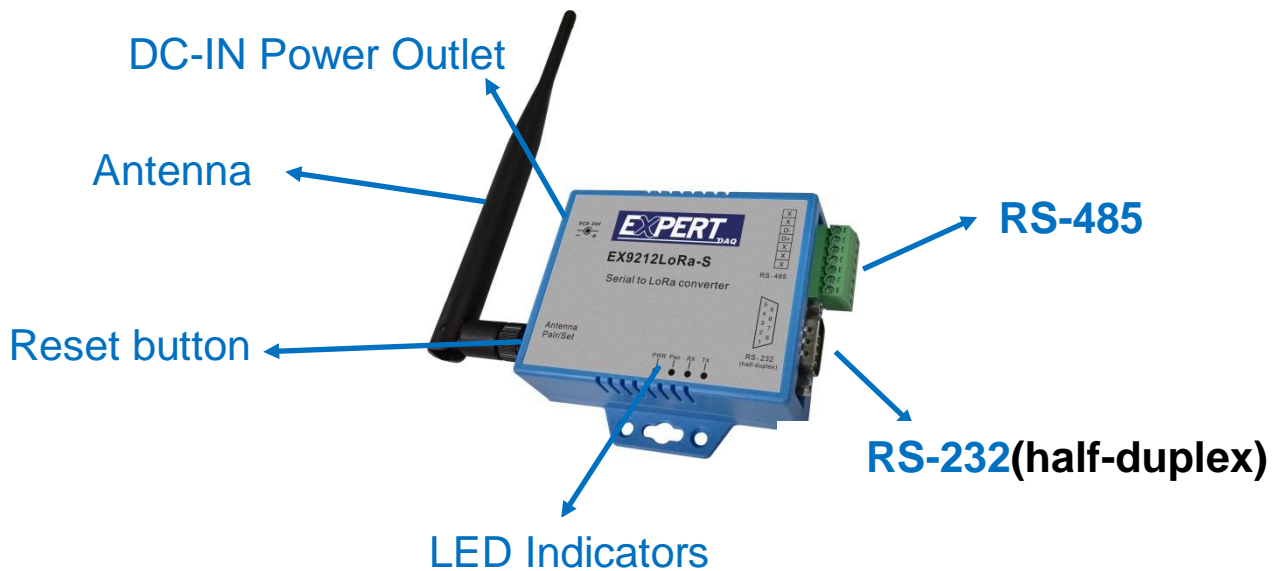- ➢ Weight : 350 gm (not include power)

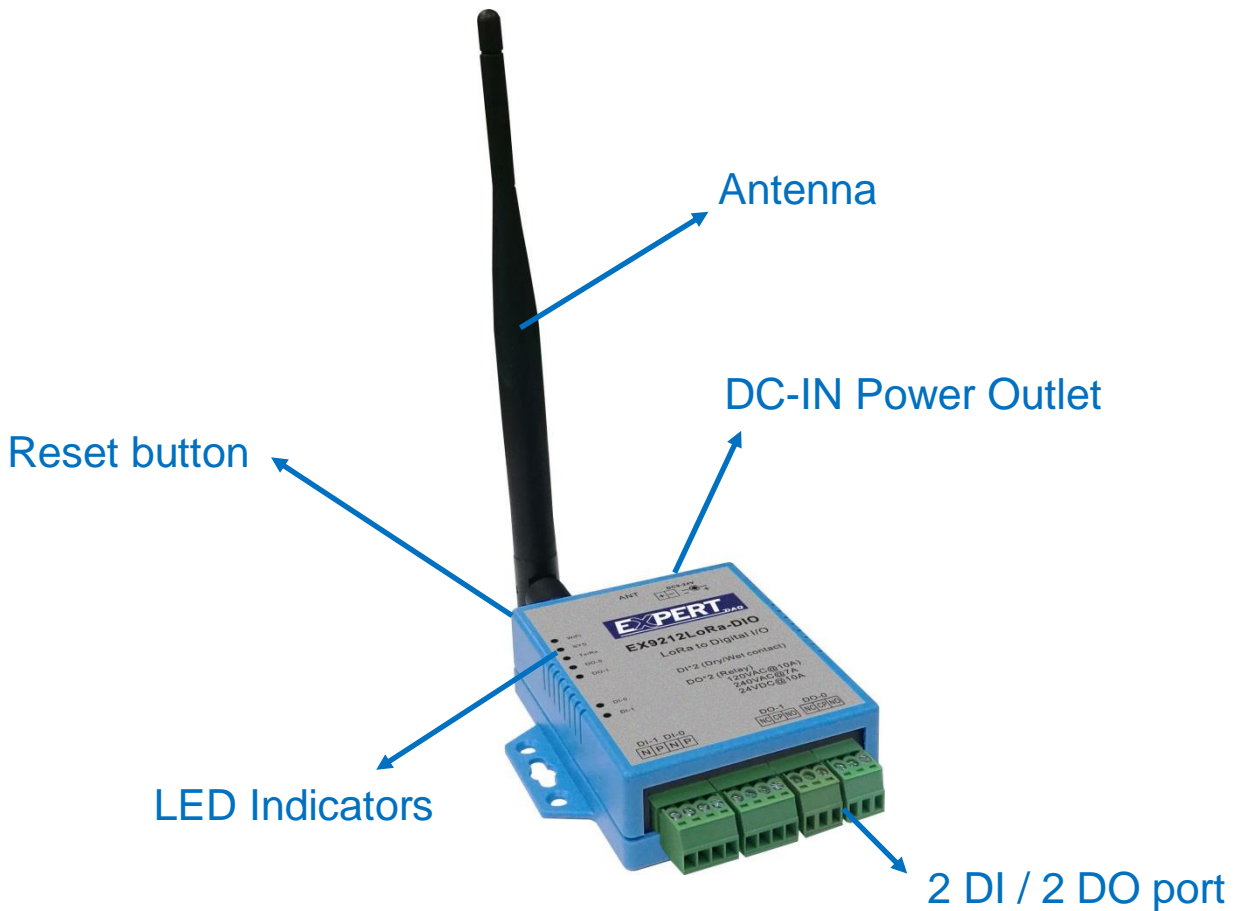# 3. Product Views

3.1 EX9212LoRa-E/MTCP : Ethernet To LoRa

DC-IN Power Outlet

Ethernet LAN port

Reset button

Antenna

LED Indicators

3.2 EX9212LoRa-S : RS-485 To LoRa

DC-IN Power Outlet

Antenna

Reset button

RS-485

RS-232(half-duplex)

LED Indicators

3.3 EX9212LoRa-U : USB To LoRa

Antenna

Reset button

USB port

LED Indicators

3.4 EX9212LoRa-DIO : LoRa to Digital I/O Controller

Antenna

DC-IN Power Outlet

Reset button

LED Indicators

2 DI / 2 DO port

3.5 Outlined Components

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3.5.1 DC-IN Power Outlet

LoRa Gateways are powered by a 9~24V DC (Inner positive, outer negative) power supply and 1.0A current.　Connecting the AC plug to the AC power socket and put the DC Jack plug into the outlet of device.　The "SYS" (or "PWR") red color LED will be ON when power properly supplied.　Terminal Block (2 wires) power supply is alternative.

3.5.2 Ethernet LAN Port

The connector for LAN connection is a general RJ45 socket.　Simply connect it to network Switch Hub.　When the connection is made, the LAN LED indicator light on.　When data start transmission, Tx/Rx LED indicator will blink during data transferring or receiving.

3.5.3 Serial Port (RS-232:half-duplex/485)

Connecting the Serial Port Cable from the LoRa Gateway to the Serial Interface device.　Follow the parameter setup procedures to configure the converter (see the following chapters).

3.5.4 2DI / 2DO port

Please refer the specs sheet of EX9212LoRa-DIO.

3.5.5 Reset Button

In any case you forgot the password or have incorrect settings must to set Converter back to default, use the Reset button.　At first, power on the Converter, then press Reset button as per below list to reboot or restore to the factory default.

  1 Second – no action

  2 ~ 4 Seconds -- reboot

  5 Seconds up -- restore factory default

3.6 LED Indicators

PWR (Red):
Power indicator.　When the power is on, the LED will be on.

Tx (Green):
Data sending indicator.　When data sending to the network, this LED will blink.

Rx (Red):
Data received indicator.　When data receiving from the network, this LED will blink.

4. Wiring Architecture

4.1 Ethernet + LoRa --- air ---- LoRa + Serial Interface ----- Machine

4.2 USB Interface + LoRa --- air ---- LoRa + Serial Interface ---- Machine

4.3 Ethernet + LoRa --- air ---- LoRa + Serial DI/DO Interface ----- DI/DO

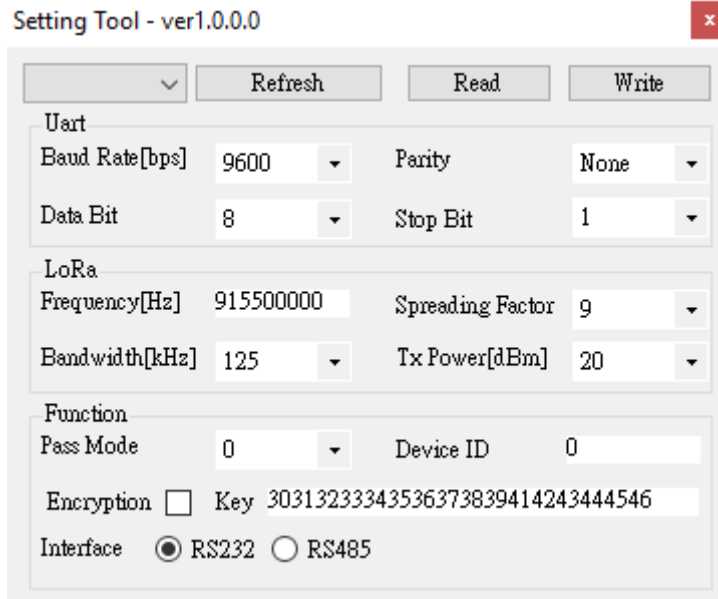## 4.4 Serial Interface + LoRa --- air ---- LoRa + Serial Interface ----- Machine

4.5 Star topology

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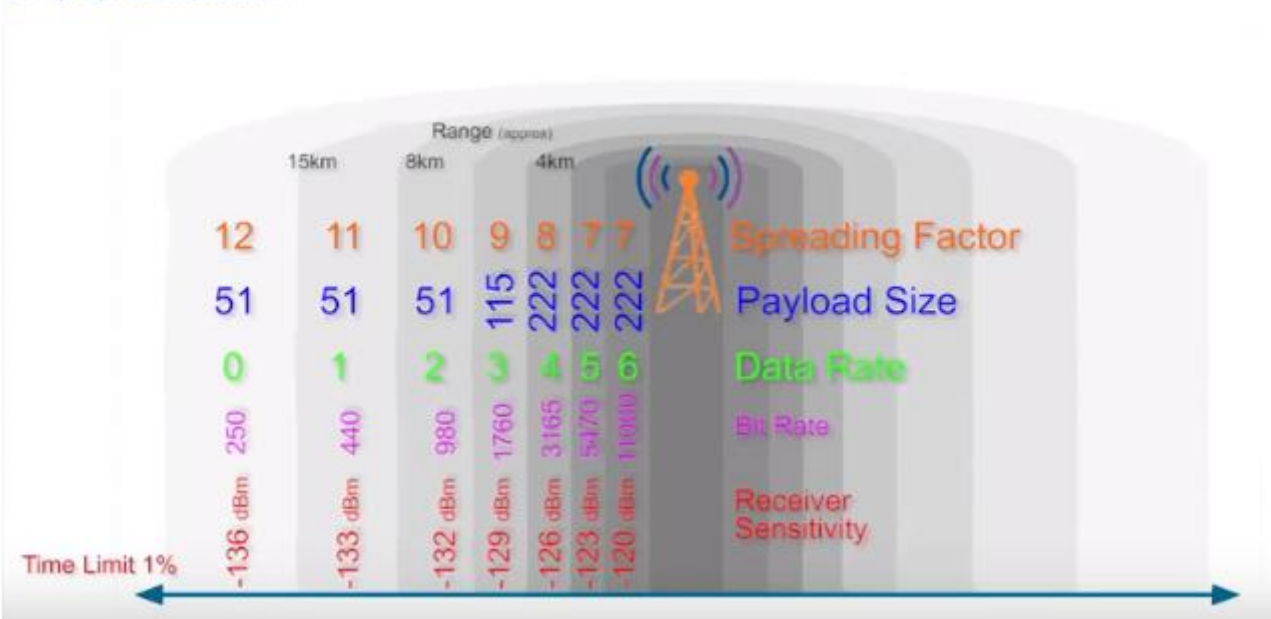# 5. LoRa module Setting Utility
5.1 LoRa Setting Tool factory default

Uart			
Baud Rate [bps]	9600	Parity	None
Date Bit	8	Stop Bit	1
LoRa			
Frequency [Hz]	915500000	Spreading Factor	9 **
Bandwidth [kHz]	125	Tx Power [dBm]	20
Encryption	303132333435363738394142434445 46		**

Spreading Factory (for reference only, not exactly to real device):

5.2 Dip Switch at top of casing:

1) Setting mode: #1~#4 pins all at up position to modify LoRa settings.
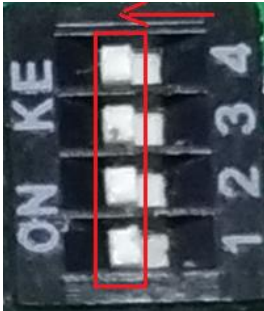
2) Operation mode: only #1 at down position to run data transmission.
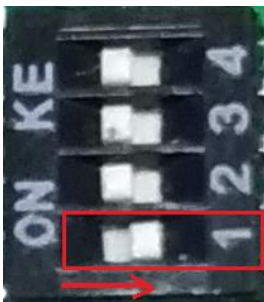
6. LoRa setting process

6.1 Pull power off:

6.1.1 For Ethernet to LoRa model: pull off power plug.

6.1.2 For Serial to LoRa model: pull off power plug, use a USB to RS-232 Converter to connect with the RS-232 port.   A crosslink RS-232 adaptor is necessary.

6.1.3 For USB to LoRa model: pull off USB plug from NB/PC USB host.

6.1.4 For DI/DO to LoRa model: pull off power plug.

6.2 Poke Dip Switch #1 to down position as setting mode.

6.3 Plug in the power plug or USB plug to turn power ON.

6.4 Recognize LoRa device's COM port

6.5 Running Setting Tool:
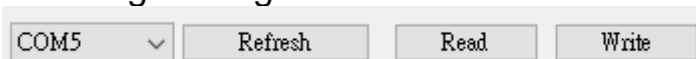
1) Press "Refresh" button, select right COM port number.

2) Press "Read" button to read existing parameters out.

3) Modify parameters as follows.

6.6 Setting UART parameters

Uart			
Baud Rate[bps]	9600 ▾	Parity	None ▾
Data Bit	8 ▾	Stop Bit	1 ▾

6.7 Setting LoRa parameters

LoRa			
Frequency[Hz]	925500000	Spreading Factor	9 ▾
Bandwidth[kHz]	250 ▾	Tx Power[dBm]	20 ▾

6.8 Function Pass Mode and Device ID: (pended)

Function			
Pass Mode	0 ▾	Device ID	0

6.9 Encryption value should be same on paring devices.   Encryption is optional for security purpose.

Encryption ☐ Key 3031323334353637383941424344454

6.10 Interface: (pended)

Interface ◉ RS232 ○ RS485

6.11 Press "Write" button to write parameters back to device.

COM5 ⌄ | Refresh | Read | Write

6.12 Pull off power plug or USB plug to turn power off.

6.13 Poke Dip Switch #1 back to down position enable operation mode.

6.14 Plug into the power plug or USB plug to turn power on.

7. Ethernet to LoRa settings

7.1 Installation of IP Search Tool

7.1.1 Find out "EXBrowser.EXE" in the CD ROM, copy the file to your host computer.

7.1.2 Double click to run "EXBrowser.EXE", a window will pop up as below.

7.2 Hardware Connection

7.2.1 Connect host computer and EX9212LoRa-E/MTCP to Switch Hub with RJ45 Ethernet cable.

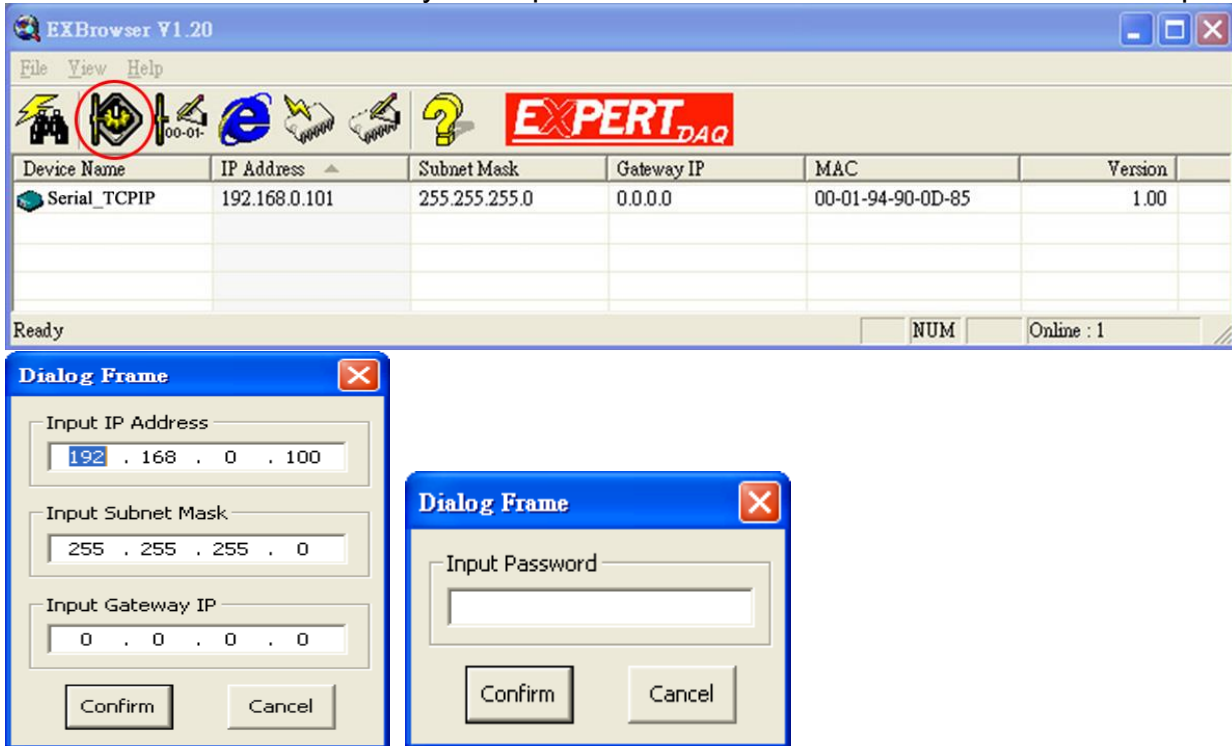7.2.2 Power on EX9212LoRa-E/MTCP.

7.2.3 Click the icon of Binocular as "Refresh", it will search and show up the IP of Converter (Default IP: 192.168.0.100).

7.2.6 IP of Converter changing subnet to match with host PC/NB.   Clicking "Serial_TCPIP" per below.

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7.2.7 Click on the icon of "Modify IP". Input IP and click "Confirm" twice. No need to input password.

7.3   Web configuration:
    Input Converter's IP to Web browser.   Configuration pate will show up. Click "Login" without password.
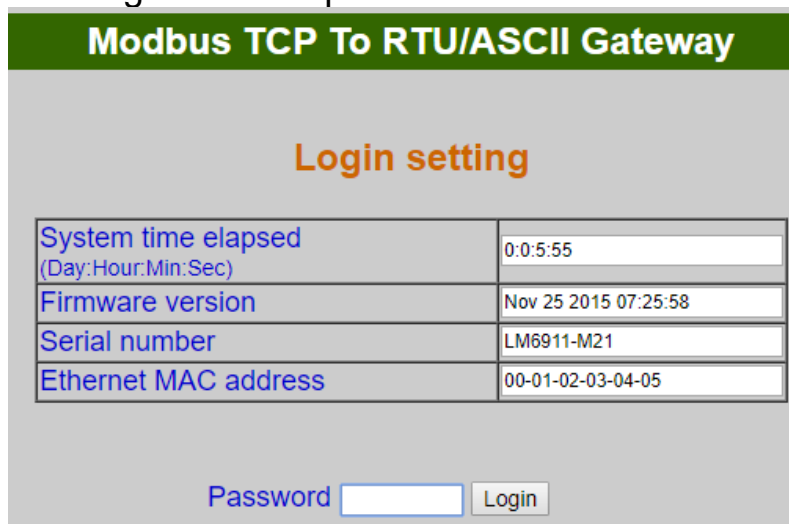
7.4   Serial port setting(Please don't change the parameters inside the red square.)

EX9212LoRa-MTCP:
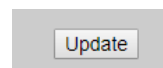Only use port #1 with default socket 501, Port #2 is not used.

EX9212LoRa-E:

Press "Update" to save new parameters and reboot.

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8. Serial Interface to LoRa setting
   Just follow above LoRa setting procedure.

9. USB to LoRa setting
   Just follow above LoRa setting procedure.

10.LoRa to DI/DO setting: Modbus codes
10.1 Digital Output port #1
10.1.1 port #1 ON : 01 06 00 00 00 01
10.1.2 port #1 OFF: 01 06 00 00 00 00

10.2 Digital Output port #2
10.2.1 port #2 ON : 02 06 00 00 00 01
10.2.2 port #2 OFF: 02 06 00 00 00 00

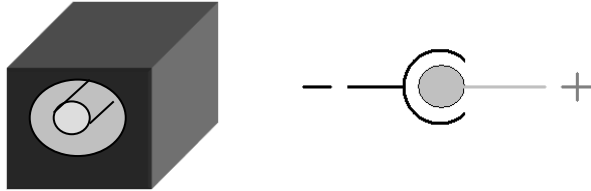10.3 Digital Input (read only)
10.3.1 port #1 : 01 03 00 00 00 01
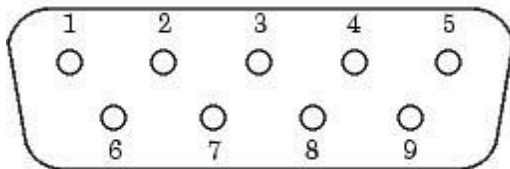10.3.2 port #2 : 02 03 00 00 00 01

Appendix A
Pin Assignment

□ **DC Power outlet**

□ **RS-232 Pin Assignment (half-duplex)**
The pin assignment scheme for a 9-pin male connector on a DTE is given below.

PIN 1 : DCD	PIN 2 : RXD	PIN 3 : TXD	PIN 4 : DTR
PIN 5 : GND	PIN 6 : DSR	PIN 7 : RTS	PIN 8 : CTS
PIN 9 : X			

□ **RS-232 Wiring Diagram**

Serial Device		Converter	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND
7	RTS	8	CTS
8	CTS	7	RTS

□ **RS-485 Pin Assignment**
The pin assignment scheme for a 2-pin RS-485 as given below.

□ **RS-485 Wiring Diagram**

Serial Device	Converter
D+	D+
D-	D-

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