Spec for SL300EU

LoRaWAN CO2 Sensor

Jiangsu Rejeee Intelligent Technology Co., Ltd

Address: No. 20,Xinghuo Road, Jiangbei District, Nanjing, China

Email: Jullie.zheng@rejeee.com

Tel: 0086 158 6180 7793

Web: http://www.rejeee.com/#/

SL300EU is long range low power CO2 sensor based on Semtech SX1262, which is standard LoRaWAN Class A compatible and is widely adopted in Environment Monitoring, Green House, Smart Agriculture etc.

Main features:

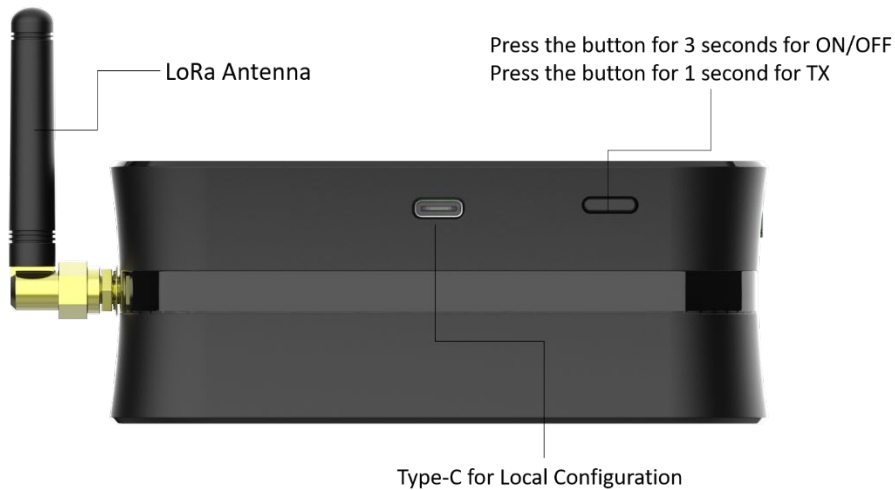NDIR Tech for CO2 Sensor

2.9 inch screen local display

Type-C for Local Configuration

Internal Battery Up to 2 Years

LoRa SX1262, Long Range Low Power

LoRaWAN Class A Compatible

1. **Details:**

Parameter	Feature
CPU	M0+
Wireless	LoRaWAN(SX1262)
Encryption	AES128 Optional
Power	Built-in Li-battery (Changeable, and No Recharge)
Working Temperature	-45℃~+ 85℃
Working Humidity	0-100%RH
Communication	Half duplex
Response Time	Less than 15 Seconds
CO2 Measuring Range	400ppm-10000ppm
CO2 Accuracy	±(30ppm+3%)
Power Capacity	38000mAh
Lifespan	2 Years, Data Uploading for Every 10 mins
Data Speed	300bps-62.5k bps
Size	115mm*80mm*45mm
TX Power	22dBm Max
RX Sensitivity	-140 dBm
Frequency	CH 470MHz~510MHz EU 868MHz US 915MHz

2. **Size: 123mm*778mm*48mm**

3. **Installation:**

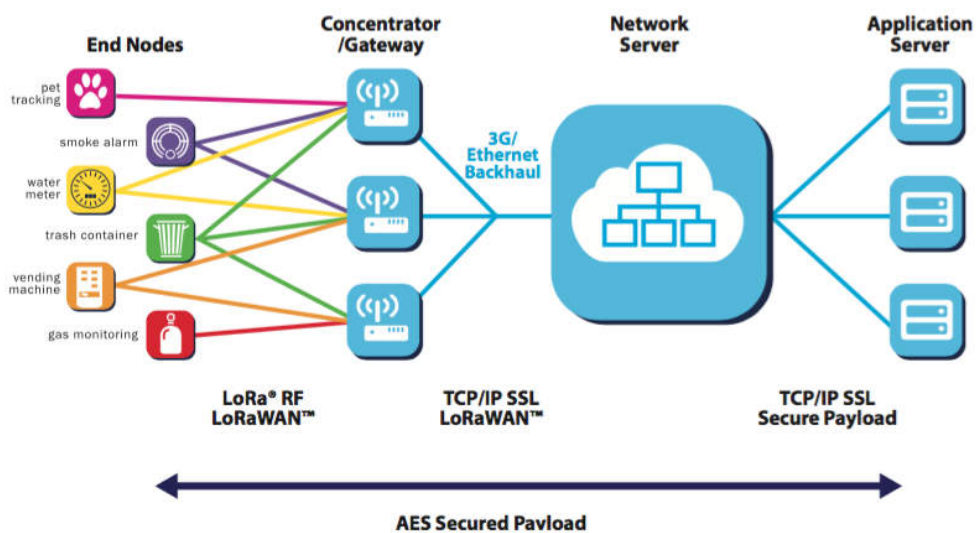**Lay the product flat on the table**
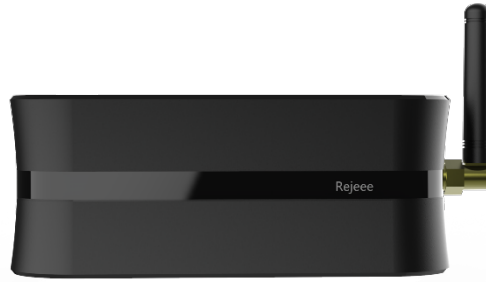
Hang on the wall

4. Connect to LoRaWAN Network

LoRaWAN Network Structure

SL300EU CO2 sensor is based on standard LoRaWAN Class A, so you can connect to any LoRaWAN network as below:

SL300EU sensor data uplink format with LoRaWAN by ABP, ABP parameter as below:

AppKey: 11223344556677889900aabbccddeeff

ADDR: Sensor ID as display on screen

DEVUI: Customer can add 4 bytes based on sensor ID displayed on screen, or customer can read 8 bytes ID through UART with Rejeee AT command.

Connecting to The Things Network, please make sure choose manually connect and ABP as below:

Register end device

From The LoRaWAN Device Repository   Manually

LoRaWAN version ⓘ *

MAC V1.0

Regional Parameters version ⓘ *

PHY V1.0

Frequency plan ⓘ *

Europe 863-870 MHz (SF12 for RX2)

Show advanced activation, LoRaWAN class and cluster settings ⌃

Activation mode ⓘ *

○ Over the air activation (OTAA)
● Activation by personalization (ABP)
○ Define multicast group (ABP & Multicast)

Additional LoRaWAN class capabilities ⓘ

None (class A only)

Network defaults ⓘ

☑ Use network's Rx and frequency defaults

Cluster settings ⓘ

☑ Use external LoRaWAN backend servers

Network Server address

eu1.cloud.thethings.network

5. Wireless LoraWAN Sensor Data Format

Header 1Byte	DevAddr 4Bytes	FCtrl 1Byte	SeqNo 2Bytes	Sensor Data			CRC 2 Bytes
				Data 1	...	Data N	
Header	DevAddr	FCtrl	SeqNo	Type+Data N Bytes	Type+Data N Bytes	Type+Data N Bytes	CRC16= Header to Body

LoRaWAN Format:

In order to connect to LoRaWAN network, the sensor support ABP data uploading.

AT+SIP=02(Start LoRaWAN format)

AT+AK=<32 Hex Chars>, which means AppKey, NwkSKey and AppSKey share the same secret key.

AT+ADDR=<8 Hex Char> or AT+ADDR? That means customers can set his own ADDR

or choose sensor ADDR as LoRaWAN DevAddr.

AT+TFREQ=<8 Hex Char> according to different zone to set the starting

frequency(By default, there are 8 frequencies), If the area standard frequency point is discontinuous, AT+NET=00 can be used to fix the transmission frequency point.

Picture as below, FRMPayload is sensor data, MIC replaces CRC.

PHYPayload:

| MHDR | MACPayload | MIC |

or

| MHDR | Join-Request | MIC |

or

| MHDR | Join-Response | MIC |

Figure 6: PHY payload structure

MACPayload:

| FHDR | FPort | FRMPayload |

Figure 7: MAC payload structure

MHDR	FHDR	FPort	FRMPayload=Sensor Data(Message)			MIC 4 Bytes
			Data 1	…	Data N	
			Type+Data N Bytes	Type+Data N Bytes	Type+Data N Bytes	

6. Sensor Data Definition

Device(0x00)

Type 1 Byte	Value 2 Byte		
Status	Version 3bit	Level 5bit	Reserve 1 bit
0x00	000 x xxxx yyyyyyy First 3 is version, last 5 is battery level		

CO2/CH4/CO etc.(0x30)

Type 1 Byte	Length 1 Byte	Value 1 Byte	Value 4 Byte
0x30	0x05	0x01 CH4 0X02 CO 0X03 HS 0X04 CO2 0X05 NH3	Resolution ratio is 0.01 CH4 is 0.01%LEL CO/HS/CO2/NH3 is 0.01ppm

For Example:

03 3D 36 01 CF 00 00 42 00 3F 24 30 05 04 00 00 C3 50 xx xx

30 is gas

05 is length

04 is CO2

00 00 C350 is the content of 500.00ppm

xx xx is CRC, The calculation shall be based on the actual content

7. CRC checkout

Here below is the CRC check algorithm for this document:

http://www.rejeee.com/#/

```
static uint16_t get_crc16(uint16_t inData, uint16_t outData) {
outData = (outData >> 8) | (outData << 8);
outData ^= inData;
outData ^= (outData & 0xff) >> 4;
outData ^= outData << 12;
outData ^= (outData & 0xff) << 5;
return outData;
}

static uint16_t cal_crc16(const uint8_t *pData, const uint32_t len)
{
uint32_t i = 0;
uint16_t crc16 = 0xFFFF;
for (i = 0; i < len; i++) {
crc16 = get_crc16(*(pData++), crc16);
}

return crc16;
}
```

8. Local Configuration:

Note: Factory reset data uploading is every 10 mins, customers can change data uploading frequency as below:

Connect sensor with a USB-C cable to computer for local configuration, through local configuration, you can change the packet frequency. Download config tool here: http://www.rejeee.com/#/w, unpack the document as below:
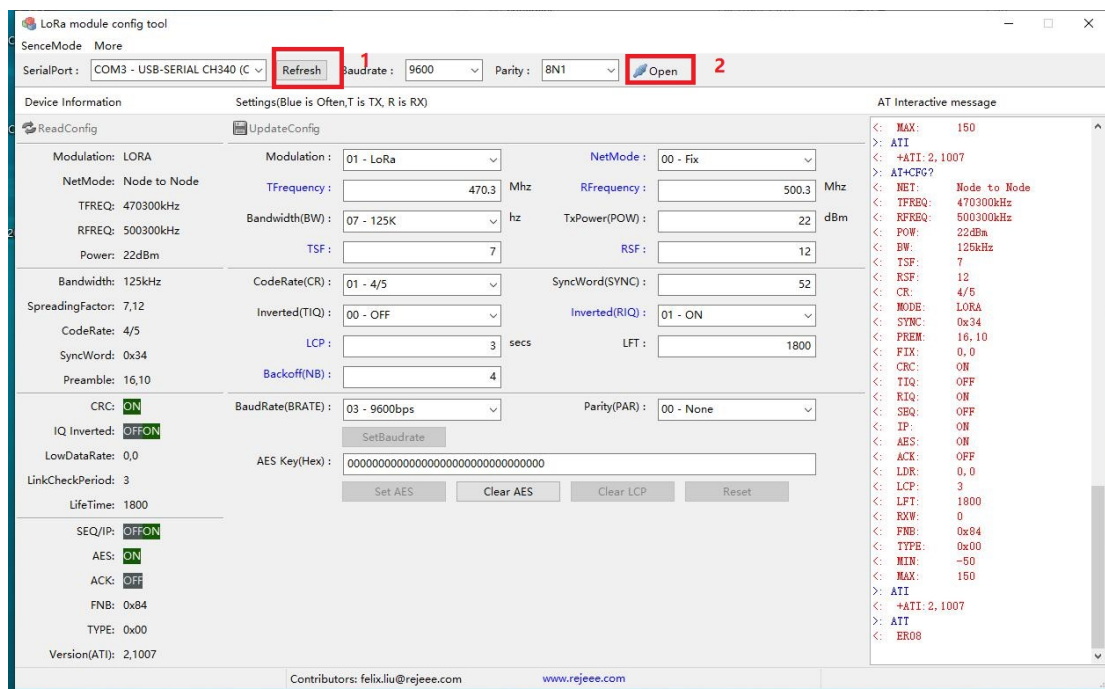

Double click ConfigTool.exe to the page below, this is the factory reset parameter, and you can change each one to connect to other network, but normally customer only need to change data uploading frequency.
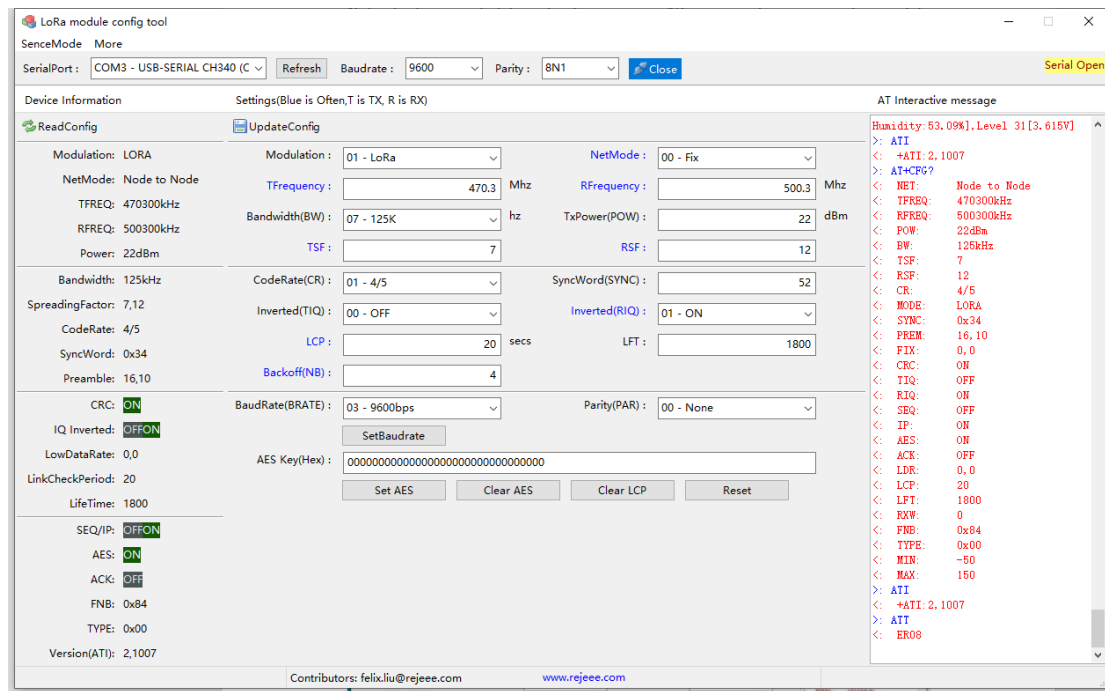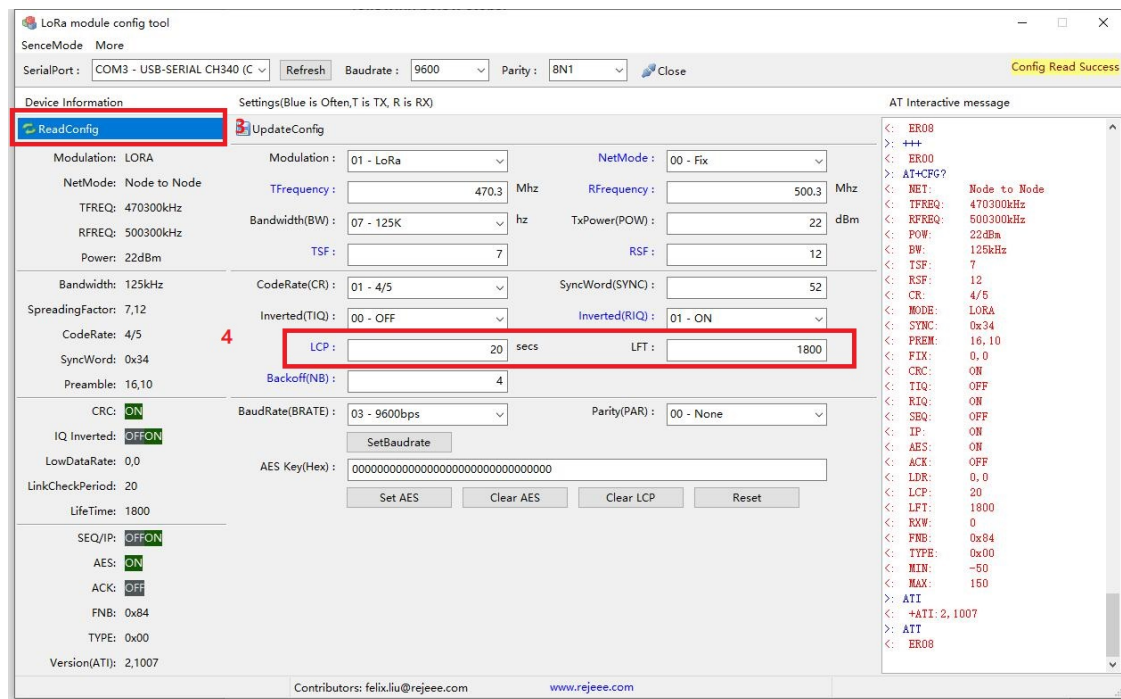
Following below steps to change packet uploading frequency:

1. Refresh
2. Open the serial port

3. Read config information
4. Update the date uploading frequency for LCP and LFT. LCP is the frequency for sensor data collecting, LTF is the frequency for data uploading.

5. Update config, and when configuration update successfully, close the config tool, and local configuration has been finished.