WES

LoRa/LoRaWAN Wireless Multi-IO Sensor Node WE-LRMSN

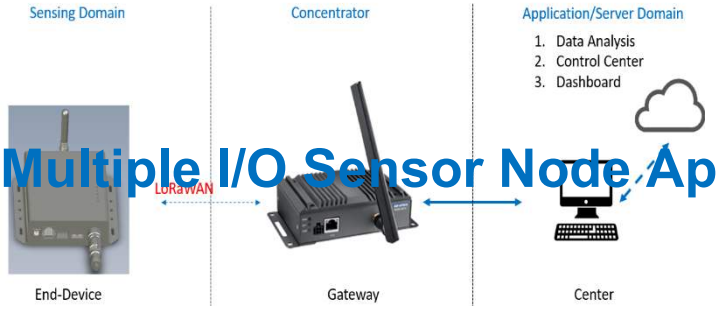
- Long-range wireless transmission
- Support for a variety of interfaces
- Receive data from multiple sensors simultaneously
- Powered 24V/1A input
- I/O Ethernet, USB, RS485

Introduction

WE-LRMSN is a type of wireless telecommunication wide area network designed to allow long range communications at a low data rate among IoT applications, such as environment sensors. Its benefits lie in offering multiple I/O interfaces to send small amounts of data over long distances a few times per hour, making it suitable for different environments. Private LoRa and LoRaWAN are one of category of WE-LRMSN which belong to the non-cellular WE-LRMSN wireless communication network protocols enable very long range transmissions with low power consumption, operating in the non-licensed spectrum.

System Structure

The communication between the sensor nodes and the gateway utilizes the wireless channel using the LoRa physical layer. On the other hand, the connection between the gateways and the central server is established through a backbone IP-based network.



Wireless Communication

- Standard LoRaWAN
- LoRa frequency US 902-928(MHz)
- Spreading factor 7-12
- Transmit power 22dB
- Data rates 21.9 kbps at SF7 mode US915
- Topology star
- Antenna 915MHz right-Angle 1x1

  VSWR<2

  Peak gain 4.8 dBi

  Efficiency: 69%

Interface

- 24V/1A power input
- 100Mbps Ethernet
- USB2.0 host mode
- Two RS485 ports(V+,A,B,V-)
- Modbus RTU
- Reset Key
- SMA type external antenna

Multiple I/O Sensor Node Application

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WE-LRMSN is a wireless communication technology that stands out for its ability to support up to four different sensor interfaces simultaneously, including USB, Ethernet, terminal, and M12 connector, all while utilizing LoRaWAN's long-range wireless transmission capabilities, reducing the need for extensive wiring.

for examples

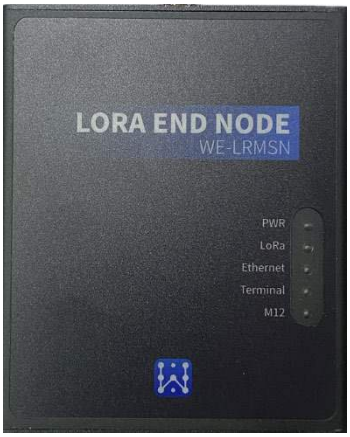
1. The WE-LRMSN USB port can support Omron 2JCIE-BU01 sensors, enabling connectivity for various environmental measurements. These sensors include temperature, humidity, light, barometric pressure, sound noise, 3-axis acceleration, and eTVOC (Total Volatile Organic Compounds).
2. The terminal connector supports Modbus RTU temperature sensor devices. The part number is SERIAL CAEL-S16B.
3. The sensor device is equipped with a four-pin cable, designed specifically for direct connection and soldering of bare wires onto the board.
4. The WE-LRMSN Ethernet port supports industrial PLC (Programmable Logic Controller) integration.

Pin Assignment

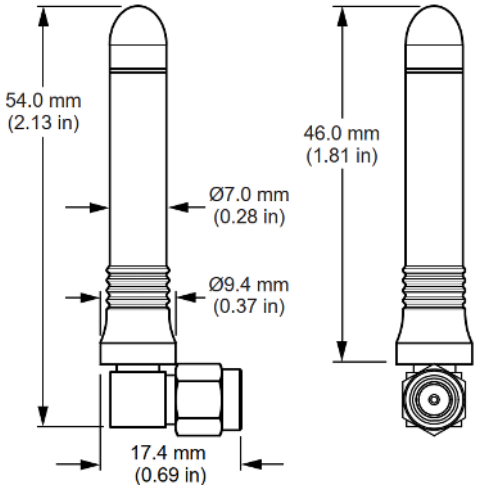
DC Jack	24V/1A
4p Terminal Connector (RS485 Modbus)	V- A B V+ (24V)
Ethernet	Support 100Mbps
USB	2.0 Host
4p Flexible Pins ((RS485 Modbus))	V- B A V+ (24V)
LEDs	Green, PWR,LoRa,Eth,T,M12

LED Indicator

LED	Color	State	Description
Power	Green	on	Plug in ADP power
		off	Plug out ADP power
LoRa	Green	on	Connected from Network
		off	Disconnected from Network
Ethernet	Green	on	Link
		off	Idle
		blinking	Searching for ethernet devices
Terminal	Green	on	The sensor has been successfully connected
		off	Idle
		blinking	Searching for sensor devices
M12	Green	on	The sensor has been successfully connected
		off	Idle
		blinking	Searching for sensor devices



Dimensions



Senser Modules

- USB Type Environmental Sensor Omron/2JCIE-BU01

Model	Appearance	Communication interface	Output data	Minimum packing unit (Unit: pcs)
2JCIE-BU01		Bluetooth®*1 low energy, USB communication	Temperature, Humidity, Light, Barometric pressure, Sound noise, 3-axis acceleration*2, eTVOC*3, Discomfort index*4, Heat stroke warning level*4, Vibration information*2 (No. of earthquakes, No. of vibrations, SI value*5)	1

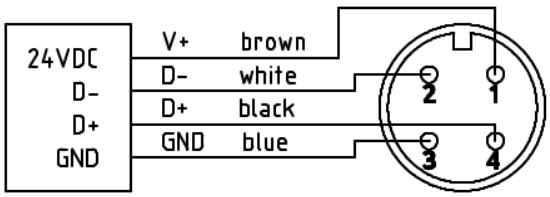
USB Sensor detail data

- Temperature and moisture industrial sensor module (PN:CAEL-S16)

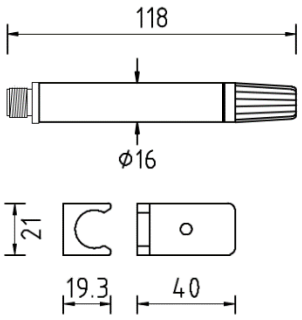
Full range measurement from 0 to 100%RH, with a temperature measurement range of up to +120°C (248 °F).

Protocol :RS485 Modbus

Circuit architecture:



Dimension:



Env snesor detail data

Field Test

- Purpose:

Testing the transmission distance and inter-floor transmission capability of LoRaWAN wireless technology.

WE-LRMSN Versus Advantech

- Parameter:

RSSI(Received Signal Strength Indicator): RSSI is typically used to evaluate the quality and reliability of a signal. It is a measurement of the strength or power level of a received wireless signal. RSSI is usually expressed in decibel-milliwatts (dBm)

SNR(Signal-to-Noise Ratio):It is a measure of the relative strength of a desired signal to the background noise level in a communication system. SNR is typically expressed in decibels (dB) and is a key parameter in evaluating the performance of wireless communication systems.

- Hardware configuration

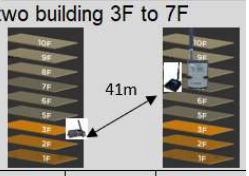
1. Advantech Node WISE4610 + Advantech Gateway WISE6610

*Advantech is a leading Taiwanese company.

2. WES Node WE-LRMSN + Advantech Gateway WSIE6610

- Summarize

WE-LRMSN has better RSSI and SNR values compared to Wise-4610. Wise-4610 has a probability of data loss in multi-floor data transmission.

Case Items	scenario 1_Two near rooms 				scenario 2_3F to 10F 				scenario 2_two building 3F to 7F 			
Parameter	RSSI-Node	RSSI-Gateway	SNR-Node	SNR-Gateway	RSSI-Node	RSSI-Gateway	SNR-Node	SNR-Gateway	RSSI-Node	RSSI-Gateway	SNR-Node	SNR-Gateway
Wise 4610 + Advantech Gateway	-77	-32	6	9.2	No ACK	No ACK	No ACK	No ACK	No ACK	No ACK	No ACK	No ACK
	-78	-30	6	10.2	No ACK	No ACK	No ACK	No ACK	No ACK	No ACK	No ACK	No ACK
	-76	-33	7	9.2	-133	-100	-13	2.5	-130	-84	-10	5
	-77	-30	6	7	-129	-95	-9	0.5	No ACK	No ACK	No ACK	No ACK
	-76	-31	6	10	-132	-90	-12	5	-129	-111	-9	3.8
WE-LRMSN + Advantech Gateway	-41	-29	7	8.5	-100	-93	4	1.8	No ACK	No ACK	No ACK	No ACK
	-41	-33	8	8.2	-98	-94	3	2	No ACK	No ACK	No ACK	No ACK
	-41	-35	8	10.5	-99	-89	1	4	-96	-95	0	3.5
	-41	-30	9	9.2	-96	-92	5	0	-89	-93	-14	2.2
	-41	-33	8	7.8	-96	-94	3	2.5	-93	-82	0	4.2

Accessory

- Adaptor 24V 1A

1800mm

LoRa/LoRaWAN Wireless Multi-IO Sensor Node WE-LRMSN

units: mm

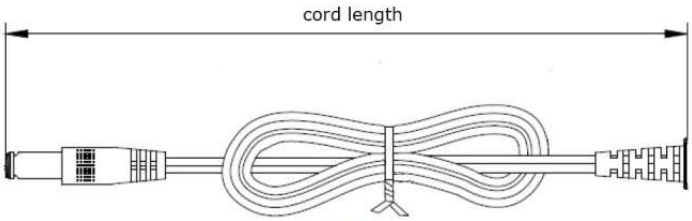


Table 1

- Terminal Connector_ Cable plug

2.5mm pitch

- ANT-916-CWRCS Right-Angle Antenna male pin

Performance at 902 MHz to 930 MHz

VSWR: ≤ 2.0

Peak Gain: 4.8 dBi

Efficiency: 69%

Compact size

54.0 mm x Ø9.4 mm