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netvox R718NL315 Light and 3 Phase Current Meter Sensor User Manual

Contents

netvox R718NL315 Light and 3 Phase Current Meter Sensor

Product Information

Model	R718NL3
Product Name	Wireless Light Sensor and 3-Phase Current Meter
Main Features	- Compatible with LoRaWAN protocol 2 sections ER14505 3.6V Lithium AA battery - Simple operating and setting - Protection level: Main body IP53, Sensor IP30 - Compatible with LoRaWANTM Class A - Frequency hopping spread spectrum technology - Configuration parameters can be configured through third-party software platforms, data can be read and alarms can be set via SMS text and email (optional) - Available third-party platforms: Actility / ThingPark, TTN, MyDevices/Cayenne - Low power consumption and long battery life

Product Usage Instructions

1. **Power On:**
   - Insert batteries (users may need a screwdriver to open them).
   - Press and hold the function key for 3 seconds until the green indicator flashes once.
2. **Power Off (Restore to factory setting):**
   - Press and hold the function key for 5 seconds until the green indicator flashes 20 times.
   - Remove batteries.
   - The device will be off after removing the battery and inserting it again.

- **Note:** It is suggested to wait for at least 10 seconds between turning the device on and off.
- **Note:** At 1st – 5th second after power on, the device will be in engineering test mode.

3. **Network Joining:**

- **If the device has never joined the network:**
  - Turn on the device, and it will search for the network to join.
  - The green indicator light stays on for 5 seconds: and joins the network successfully.
  - The green indicator light remains off: fails to join the network.
- **If the device has joined the network and it is not set to default:**
  - Turn on the device, and it will search for the previous network to join.
  - The green indicator light stays on for 5 seconds: and joins the network successfully.
  - The green indicator light remains off: fails to join the network.
- **If the device fails to join the network:**
  - It is suggested to check the device verification information on the gateway or consult your user manual for further assistance.

Introduction

The R718NL3 series is a Light Sensor and 3-Phase Current Meter device for Netvox ClassA type devices based on the LoRaWAN open protocol and is compatible with the LoRaWAN protocol. R718NL3 series have different measuring range for different variety of CT.

It is divided into:

- R718NL3 Wireless Light Sensor and 3-Phase Current Meter with 3 x 50A Solid Core CT (Range:100mA-50A , Accuracy ±1% within 300mA~50A)
- R718NL37 Wireless Light Sensor and 3-Phase Current Meter with 3 x 75A Clamp-On CT (Range: 100mA -75A ±1%, Accuracy ±1% within 300mA~50A)
- R718NL315 Wireless Light Sensor and 3-Phase Current Meter with 3 x 150A Clamp-On CT (Range:1A-150A ±1%)
- R718NL325 Wireless Light Sensor and 3-Phase Current Meter with 3 x 250A Clamp-On CT (Range:1A-250A ±1%)
- R718NL363 Wireless Light Sensor and 3-Phase Current Meter with 3 x630A Clamp-On CT (Range:10A-630A ±1%)
  - When the current of the device that is 75A or below is less than 100mA, the current is reported as 0.
  - When the current of the device that is above 75A is less than 1A, the current is reported as 0.

LoRa Wireless Technology
LoRa is a wireless communication technology famous for its long-distance transmission and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation technique greatly extend the communication distance. It can be widely used in any use case that requires long-distance and low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. It has features like small size, low power consumption, long transmission distance, strong anti-interference ability and so on.

LoRaWAN
LoRaWAN uses LoRa technology to define end-to-end standard specifications to ensure interoperability between devices and gateways from different manufacturers.

Appearance

R718NL3   R718NL37   R718NL315

R718NL325   R718NL363

Main Features

- Compatible with LoRaWAN protocol
- 2 sections ER14505 3.6V Lithium AA battery
- Simple operating and setting
- Protection level: Main body IP53, Sensor IP30
- Compatible with LoRaWANTM Class A
- Frequency hopping spread spectrum technology
- Configuration parameters can be configured through third-party software platforms, data can be read and alarms can be set via SMS text and email (optional)
- Available third-party platforms: Actility / ThingPark, TTN, MyDevices/Cayenne
- Low power consumption and long battery life

Note:
Battery life is determined by the sensor reporting frequency and other variables, please refer to **http://www.netvox.com.tw/electric/electric_calc.html** On this website, users can find battery life time for varied models at different configurations.

Set up Instruction

On/Off	
Power on	Insert batteries. (users may need a screwdriver to open)
Turn on	Press and hold the function key for 3 seconds till the green indicator flashes once.

Turn off (Restore to factory setting)	Press and hold the function key for 5 seconds till the green indicator flashes 20 times.
Power off	Remove Batteries.
Note	1. The device will be off after removing the battery and inserting it again. 2. It is suggested to wait for at least 10 seconds between turning the device on and off. 3.At 1st -5th second after power on, the device will be in engineering test mode.

Network Joining

If the device has never joined the network	Turn on the device, and it will search for the network to join. The green indicator light stays on for 5 seconds: and joins the network successfully The green indicator light remains off: fails to join the network
If the device has joined the network and it is not set to default	Turn on the device, and it will search for the previous network to join. The green indicator light stays on for 5 seconds: and joins the network successfully The green indicator light remains off: and fails to join the network
If the device fails to join the network (when the device is turned on)	It is suggested to check the device verification information on the gateway or consult your platform server provider when the device fails to join the network.

Function Key

Press the function key and hold the press for 5 seconds	The device will be set to default and turned off The green indicator light flashes 20 times: success The green indicator light remains off: fail
Press the function key once	The device is in the network: green indicator light flashes once and sends a report The device is not in the network: the green indicator light remains off

Sleeping Mode

The device is turned on and in the network	Sleep period: Min Interval. When the report change exceeds the setting value or the state changes: send a data report according to Min Interval.

Low Voltage Warning

Low Voltage	3.2V

Data Report

The device will immediately send a version packet report along with an uplink packet including current, illuminance and battery voltage.

The device sends data in the default configuration before any configuration is done.

Default setting:

- Max Interval = 0x0E10 (3600s)
- Min Interval = 0x0E10 (3600s)
- CurrentChange: 0x0064 (100 mA) // Subject to factory settings
- IlluminanceChange: 0x0064 (100 Lux) // Subject to factory settings

Current and Illuminance Detection:
When the function key is manually triggered, the CT needs a 5-second sampling time. After sampling, the device reports a three-phase current value and illuminance value. (An interval of 5 seconds is required to repeat the manual trigger so as to avoid operation failure. Or, please wait till the configured report time.)

Note:

1. The device report interval will be programmed based on the default firmware which may vary.
2. The interval between two reports must be the minimum time.

Please refer Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver **http://cmddoc.netvoxcloud.com/cmddoc** to resolve uplink data.

Data report configuration and sending period are as follows:

Min. Interval (Unit: second)	Max. Interval (Unit: second)	Reportable Change	Current Change≥ Reportable Change	Current Change Reportable Change
Any number between 30~65535	Any number between Min.~65535	Can not be 0.	Report per Min. Interval	Report per Max. Interval

Example of ReportDataCmd

FPort 0x06

Bytes	1	1	1	Var (Fix=8 Bytes)
	Version	DeviceType	ReportType	NetvoxPayLoadData

- Version– 1 byte –0x01——the Version of NetvoxLoRaWAN Application Command Version
- DeviceType– 1 byte – Device Type of Device
  The device type is listed in the Netvox LoRaWAN Application Devicetype doc
- ReportType – 1 byte –the presentation of the NetvoxPayLoadData, according the device type
- NetvoxPayLoadData– Fixed bytes (Fixed =8bytes)

Device	Device Type	Report Type	NetvoxPayLoadData				
R718NL3 series	0x99	0x01	Battery (1Byte) unit:0.1V	Current1 (2Bytes) Unit:1mA	Current2 (2Bytes) Unit:1mA	Current3 (2Bytes) Unit:1mA	Mulitplier1 (1Byte) the real current1 should convert with Current* Multiplier
		0x02	Battery (1Byte) unit:0.1V	Mulitplier2 (1Byte) the real current2 should convert with Current* Multiplier	Mulitplier3 (1Byte) the real current3 should convert with Current* Multiplier	Illuminance (4 Bytes) Unit:1 Lux	Reserved (1Byte) fixed 0x00

Example of Uplink:

- 1st byte (01): Version
- 2nd byte (99): Device Type 0x99   R718NL3 Series
- 3rd byte (01): Report Type
- 4th byte (24): Battery 3.6v , 24Hex=36 Dec 36*0.1v=3.6v
- 5th 6th byte (05DC): Current 1 1500mA , 05DC Hex=1500 Dec
- 7th 8th byte (07D0): Current 2 2000mA , 07D0Hex=2000 Dec
- 9th 10th byte (09C4): Current 3 2500mA , 09C4Hex=2500 Dec
- 11th byte (01): Multiplier1 1

Packet#2: 0199022401010000000300

- 1st byte (01): Version
- 2nd byte (99): Device Type 0x99   R718NL3 Series
- 3rd byte (02): Report Type
- 4th byte (24): Battery 3.6v , 24Hex=36 Dec 36*0.1v=3.6v
- 5th byte (01): Multiplier2 1
- 6th byte (01): Multiplier3 1
- 7th -10th byte (00000003): Illuminance 3Lux
- 11th byte (00): Reserved

Note:

1. When the current which is detected by the R718NL3 series exceeds 65535mA, the Multiplier column will be displayed as "10".(Because the current value of the payload is 2 bytes, it can be displayed up to 0xFFFF.)
2. The real current should convert with Current* Multiplier

Example of ConfigureCmd

FPort 0x07

Bytes	1	1	Var (Fix =9 Bytes)
	CmdID	DeviceType	NetvoxPayLoadData

- CmdID– 1 byte
- DeviceType– 1 byte – Device Type of Device
- NetvoxPayLoadData– var bytes (Max=9bytes)

Description	Device	Cmd ID	Device Type	NetvoxPayLoadData

|			MinTime (2bytes) Unit:s	MaxTime (2 bytes) Unit:s	Current Change (2 byte) Unit:1mA	Illuminance change (2bytes Unit:1Lux)	Reserved (1Byte) Fixed 0x00)
ConfigReport Req		0x01	MinTime (2bytes) Unit:s	MaxTime (2 bytes) Unit:s	Current Change (2 byte) Unit:1mA	Illuminance change (2bytes Unit:1Lux)	Reserved (1Byte) Fixed 0x00)
ConfigReport Rsp		0x81	Status (0x00_success)		Reserved (8Bytes,Fixed 0x00)		
ReadConfig ReportReq		0x02	Reserved (9Bytes,Fixed 0x00)				
	R718NL3 series	0x99					

ReadConfig ReportRsp	0x82	MinTime (2bytes) Unit:s	MaxTime (2bytes) Unit:s	Current Change (2byte) Unit: 1mA)	Illuminance change (2bytes Unit:1Lux)	Reserved (1Byte) Fixed 0x00)

1. Configure report parameters MinTime = 1min, MaxTime = 1min, CurrentChange = 100mA, IlluminanceChange = 100Lux
    - **Downlink:** 0199003C003C0064006400
    - **The device returns:** 819900000000000000000000 (Configuration succeeded) 8199010000000000000000 (Configuration failed)
2. Read device configuration parameters
    1. **Downlink:** 02990000000000000000000
    2. **The device returns:** 8299003C003C0064006400 (current device configuration parameters)

Example for MinTime/MaxTime logic
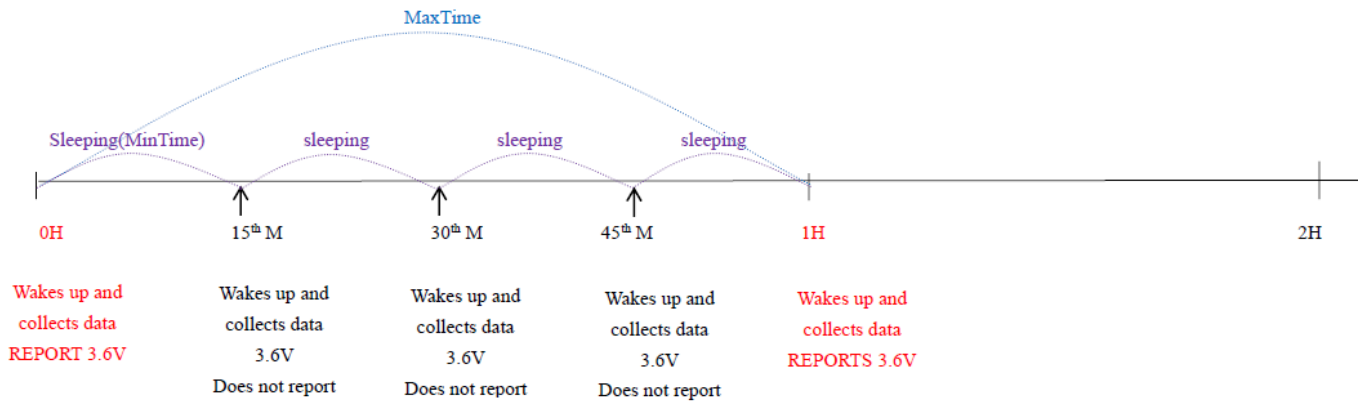Example#1 based on MinTime = 1 Hour, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange=0.1V
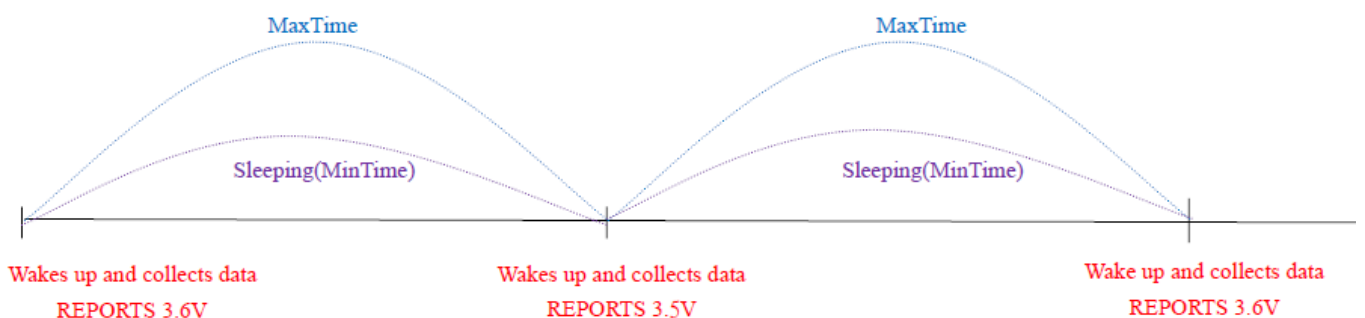
Note:
MaxTime=MinTime. Data will only be reported according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.
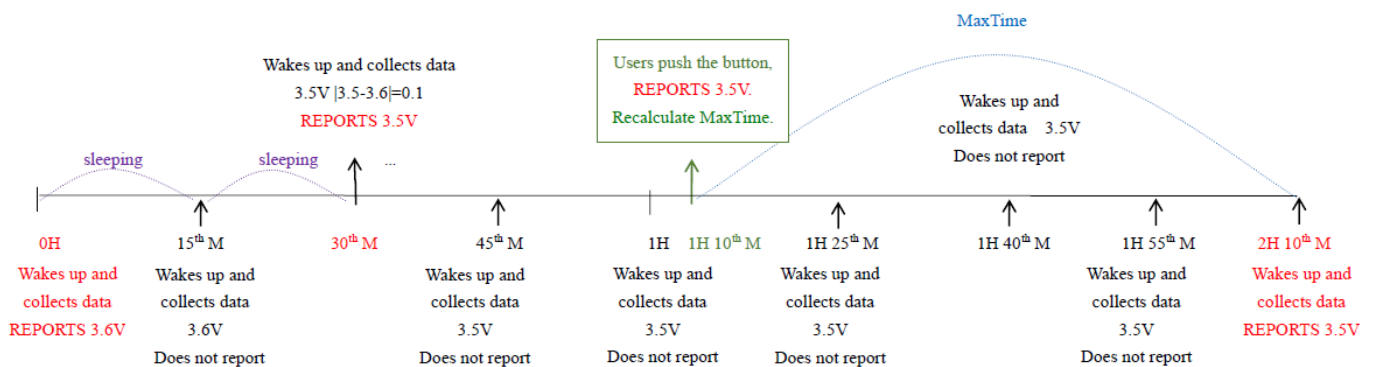
Example#2

based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.

Example#3
based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.


Note:

1. The device only wakes up and performs data sampling according to MinTime Interval. When it is sleeping, it does not collect data.
2. The data collected is compared with the last data reported. If the data variation is greater than the ReportableChange value, the device reports according to the MinTime interval. If the data variation is not greater than the last data reported, the device reports according to the MaxTime interval.
3. We do not recommend setting the MinTime Interval value too low. If the MinTime Interval is too low, the device wakes up frequently and the battery will be drained soon.
4. Whenever the device sends a report, no matter resulting from data variation, button pushed or MaxTime interval, another cycle of MinTime/MaxTime calculation is started.
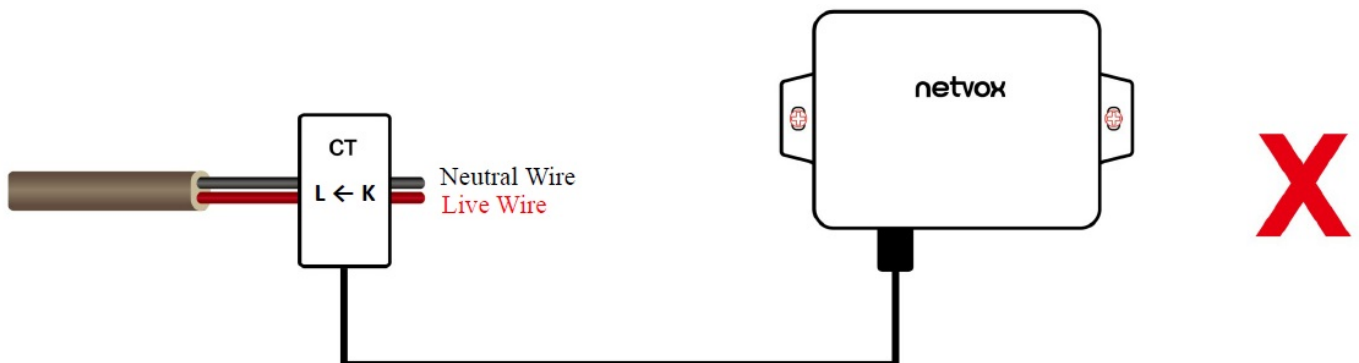
Installation

1. When using it, the back of it can be adsorbed on the iron surface, or the two ends can be fixed to the wall with screws.
2. When installing the R718NL3 series current transformer, please separate the live and neutral wires of the wire to be detected, and only take the live wire through the current transformer and start the measurement according to the wiring below:
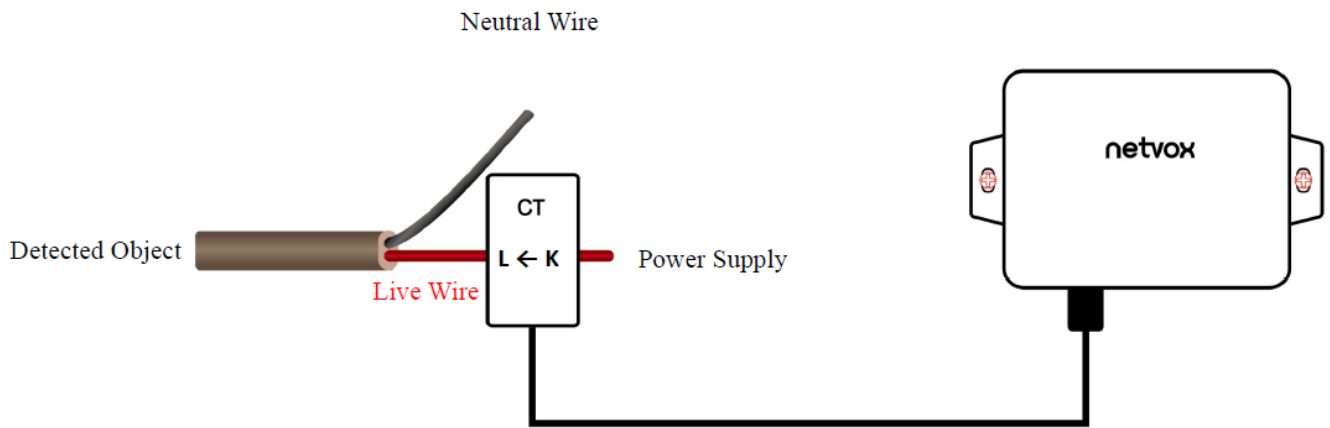
CT Wiring Schematic Diagram (Current direction K→L)
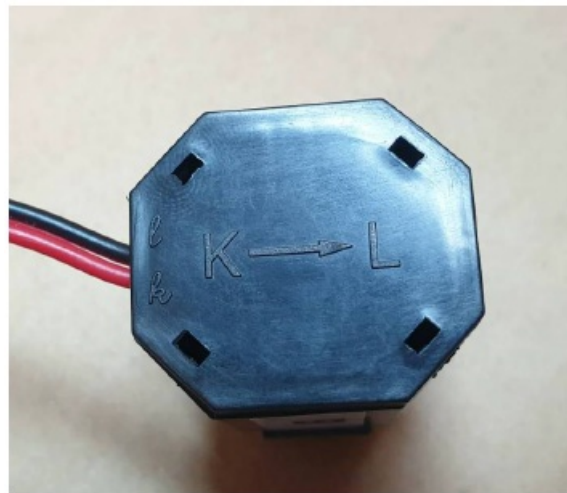
If the live wire and the neutral wire are connected together at the same time, they will offset each other and the measurement is 0.


1. The single-phase current detector (R718NL3) has a built-in magnet. It can be attached to the surface of an object with iron during installation, which is convenient and quick.

   To make the installation more secure, please use screws

   (purchased separately) to fix the device to the wall or other objects (such as the installation diagram).

   Note: Do not install the device in a metal-shielded box or in an environment surrounded by other electrical equipment to avoid affecting the wireless transmission of the device.

2. Open the split current transformer, and then pass the live wire through the current transformer according to the installation.

   Note: "L←K" is marked on the bottom of the CT.

3. **Precautions:**

- Before using, a user must check whether the appearance is deformed; otherwise, the test accuracy will be affected.
- The using environment should be kept away from strong magnetic fields, so as not to affect the test accuracy. It is strictly forbidden to use in humid and corrosive gas environments.
- Before installation, please confirm the current value of the load. If the current value of the load is higher than the measurement range, select a model with a higher measurement range.

4. The three-phase current detector (R718NL3) samples the current according to MinTime. If the current value sampled this time relatively exceeds the set value (the default is 100mA) more than the current value reported last time, the device will immediately report the current value sampled this time. If the current variation does not exceed the default value, the data will be reported regularly according to MaxTime. Press the [Key] of the device to start sampling data and report the data after 3 to 5 seconds.

Note: MaxTime must be set greater than Min Time.

The three-phase current detector (R718NL3) is suitable for the following scenarios:

- School
- Factory
- Shopping mall
- Office building
- Smart building

Where the electrical data of the equipment with the three-phase electricity needs to be detected.
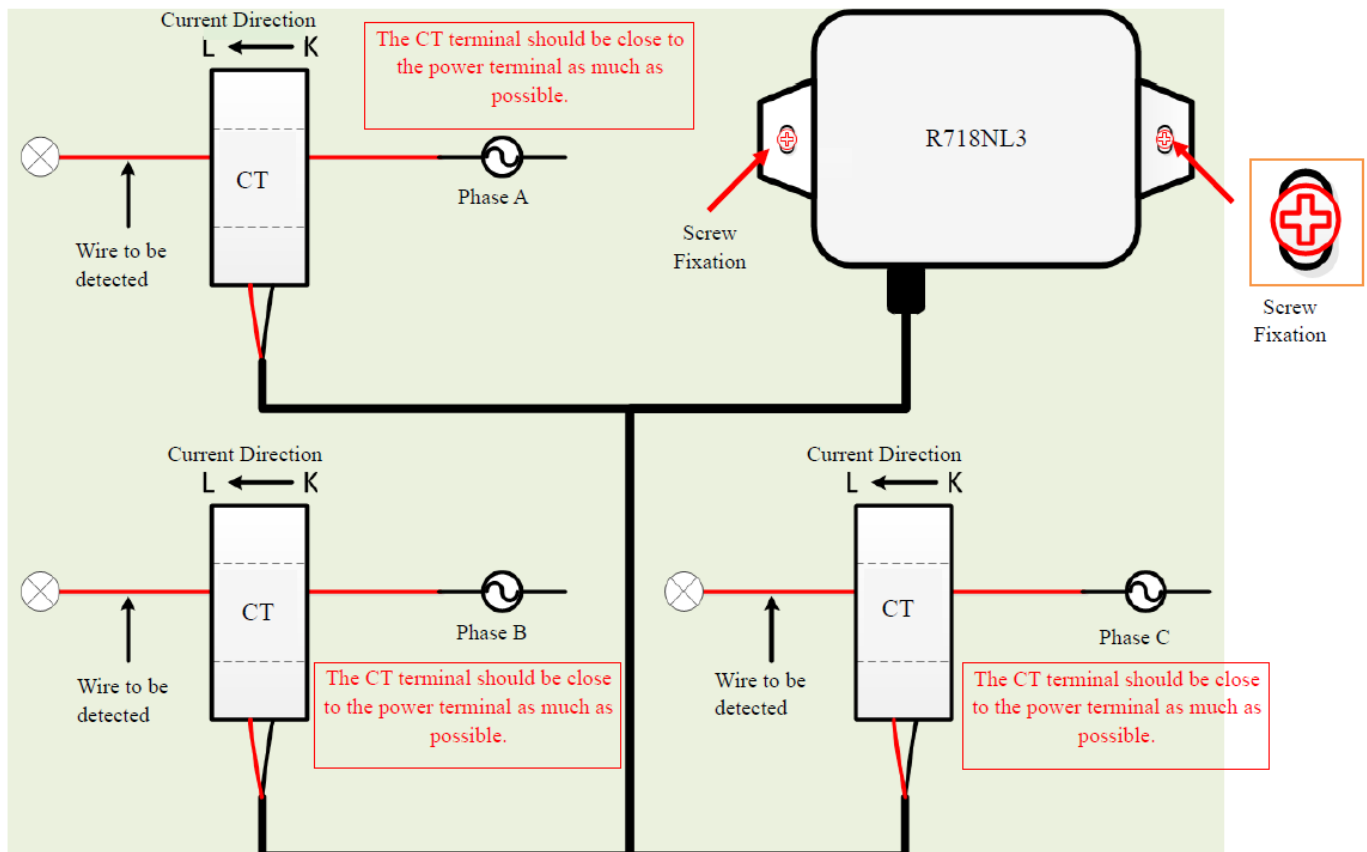
Note:

- Please do not disassemble the device unless it is required to replace the batteries.
- Do not touch the waterproof gasket, LED indicator light, or function keys when replacing the batteries.
- Please use a suitable screwdriver to tighten the screws (if using an electric screwdriver, it is recommended to set the torque as 4kgf) to ensure the device is impermeable.

Information about Battery Passivation

Many Netvox devices are powered by 3.6V ER14505 Li-SOCl2 (lithium-thionyl chloride) batteries that offer many advantages including low self-discharge rate and high energy density.

However, primary lithium batteries like Li-SOCl2 batteries will form a passivation layer as a reaction between the lithium anode and thionyl chloride if they are in storage for a long time or if the storage temperature is too high. This lithium chloride layer prevents rapid self-discharge caused by continuous reactions between lithium and thionyl chloride, but battery passivation may also lead to voltage delay when the batteries are put into operation, and our devices may not work correctly in this situation.

As a result, please make sure to source batteries from reliable vendors, and it is suggested that if the storage period is more than one month from the date of battery production, all the batteries should be activated.

If encountering the situation of battery passivation, users can activate the battery to eliminate the battery hysteresis.

ER14505 Battery Passivation:

1. To determine whether a battery requires activation
   Connect a new ER14505 battery to a resistor in parallel, and check the voltage of the circuit. If the voltage is below 3.3V, it means the battery requires activation.
2. **How to activate the battery**
   - Connect a battery to a resistor in parallel
   - Keep the connection for 5~8 minutes
   - The voltage of the circuit should be ≧3.3, indicating successful activation.

Brand	Load Resistance	Activation Time	Activation Current
NHTONE	165 Ω	5 minutes	20mA
RAMWAY	67 Ω	8 minutes	50mA
EVE	67 Ω	8 minutes	50mA
SAFT	67 Ω	8 minutes	50mA

Note:
If you buy batteries from other than the above four manufacturers, then the battery activation time, activation current, and required load resistance shall be mainly subject to the announcement of each manufacturer.

Important Maintenance Instruction

Kindly pay attention to the following in order to achieve the best maintenance of the product:

- Keep the device dry. Rain, moisture, or any liquid might contain minerals and thus corrode electronic circuits. If the device gets wet, please dry it completely.
- Do not use or store the device in a dusty or dirty environment. It might damage its detachable parts and electronic components.
- Do not store the device under excessive heat conditions. High temperatures can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.
- Do not store the device in places that are too cold. Otherwise, when the temperature rises to normal temperature, moisture will form inside, which will destroy the board.
- Do not throw, knock or shake the device. Rough handling of equipment can destroy internal circuit boards and delicate structures.
- Do not clean the device with strong chemicals, detergents, or strong detergents.
- Do not apply the device with paint. Smudges might block the device and affect the operation.
- Do not throw the battery into the fire, or the battery will explode. Damaged batteries may also explode.

All of the above applies to your device, battery, and accessories. If any device is not working properly, please take it to the nearest authorized service facility for repair.

Documents / Resources

netvox Model: R718NL3 Wireless Light Sensor and 3-Phase Current Meter **Wireless Light Sensor and 3-Phase Current Meter** **R718NL3 User Manual**	**netvox R718NL315 Light and 3 Phase Current Meter Sensor** [pdf] User Manual R718NL315 Light and 3 Phase Current Meter Sensor, R718NL315, Light and 3 Phase Current Meter Sensor, 3 Phase Current Meter Sensor, Current Meter Sensor, Meter Sensor, Sensor

References

- Ⓦ **Netvox LoRaWAN Application Command**
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