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# netvox R718IA Wireless 0-5V ADC Sampling Interface User Manual

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**netvox R718IA Wireless 0-5V ADC Sampling Interface**

**Wireless 0-5V ADC Sampling Interface**

**Model:** R718IA

## Product Introduction

The R718IA is a wireless 0-5V ADC Sampling Interface that can externally connect a device to measure ADC voltage within the measuring range of 0 to 5v. It uses LoRa Wireless Technology.

### Appearance

The R718IA has a red indicator function key for power and a black ADC sampling input. It also has a GND connection.

## product Main Features

- Compatible with LoRaWAN and Class A
- Uses 2 ER14505 lithium batteries in parallel power supply (3.6V / section)
- IP Rating: IP65
- Frequency hopping spread spectrum
- Applicable to third-party platforms: Actility/ThingPark, TTN, MyDevices/Cayenne
- Low power consumption and long battery life
- Battery life can be calculated using the following website:

  **http://www.netvox.com.tw/electric/electric_calc.html**

## Product Set up Instruction

## Power On/Off

- To power on, insert batteries and turn on by pressing and holding the function key for 3 seconds. The green indicator will flash once.
- To power off, remove batteries. The device is at off state by default when batteries are removed.
- The on/off interval is suggested to be about 10 seconds to avoid interference from capacitor inductance and other energy storage components.
- For the first 5 seconds after powering on, the device will be in engineering test mode.

## Network Joining

- If the device has never joined the network, turn it on to search the network to join. The green indicator stays on for 5 seconds for success and remains off for failure.
- If the device had previously joined the network, turn it on to search for the previous network to join. The green indicator stays on for 5 seconds for success and remains off for failure.
- If the device fails to join the network, check the device verification information on the gateway or consult your platform server provider.

## Function Key

- To restore to factory setting or turn off, press and hold the function key for 5 seconds. The green indicator flashes 20 times for success and remains off for failure.
- To check if the device is in the network, press the function key once. The green indicator flashes once and sends a report if the device is in the network. The green indicator remains off if the device is not in the network.

## Sleeping Mode

- The device is on and in the network during sleeping period.
- When the report change exceeds the setting value or the state changes, a data report is sent according to Min Interval.

## Low Voltage Warning

- A low voltage warning is triggered when battery voltage reaches 3.2V.

## Data Report

When the device is turned on, it immediately sends a version package and a report data with ADC sampling voltage and voltage value. Before any configuration, the device sends data according to the default configuration. Data is reported once per 15 minutes by default setting with a maximum time of 0x0384 (900s), a minimum time of 0x0384 (900s), a battery voltage change of 0x01 (0.1V), and an ADC Raw Value Change of 0x0064 (100mV).

## Introduction

R718IA is a Wireless 0-5V ADC Sampling Interface. It can externally connect a device to measure ADC voltage, and the measuring range is 0 to 5v.

### LoRa Wireless Technology:

LoRa is a wireless communication technology dedicated to long distance and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation method greatly increases to expand the communication distance. Widely used in long-distance, low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. Main features include small size, low power consumption, transmission distance, 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



## Main Features

- Compatible with LoRaWAN
- 2 ER14505 lithium batteries in parallel power supply (3.6V / section)
- IP Rating: IP65
- 0-5V ADC Sampling
- Compatible with LoRaWANTM Class A
- The base is attached with a magnet that can be attached to a ferromagnetic material object
- Frequency hopping spread spectrum
- Applicable to third-party platforms: Actility/ThingPark, TTN, MyDevices/Cayenne
- Low power consumption and long battery life

  Battery Life:

- Please refer to web: **http://www.netvox.com.tw/electric/electric_calc.html**
- At this website, users can find battery life time for variety 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 and the green indicator flash once. |
| Turn off (Restore to factory setting) | Press and hold the function key for 5 seconds and the green indicator flashes 20 times. |
| Power off | Remove Batteries. |
| Note: | 1.　Remove and insert the battery, the device is at off state by default.<br><br>2.　On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.<br><br>3.　For the first 5 second after powering on, the device will be in engineering test mode. |
| **Network Joining** | |
| Never joined the network | Turn on the device to search the network to join.<br><br>The green indicator stays on for 5 seconds: success The green indicator remains off: fail |
| Had joined the network | Turn on the device to search the previous network to join. The green indicator stays on for 5 seconds: success<br><br>The green indicator remains off: fail |
| Fail to join the network<br><br>(when the device is on) | Suggest to check the device verification information on the gateway or consult your platform<br><br>server provider. |
| **Function Key** | |
| Press and hold for 5 seconds | Restore to factory setting / Turn off<br><br>The green indicator flashes 20 times: success The green indicator remains off: fail |
| Press once | The device is in the network: the green indicator flashes once and sends a report<br><br>The device is not in the network: the green indicator remains off |
| **Sleeping Mode** | |
| The device is on and in the network | Sleeping period: Min Interval.<br><br>When the reportchange exceeds setting value or the state changes: send a data report according to Min Interval. |

**Low Voltage Warning**

| Low Voltage | 3.2V |
|---|---|

## Data Report

When the device is turned on, it will immediately send a version package and a report data with ADC sampling voltage and voltage value. Before any configuration, the device sends data according to the default configuration. Data will be reported once per 15 minutes by default setting.

### Default setting:

- Maximum time: 0x0384 (900s)
- Minimum time: 0x0384 (900s)
- Battery Voltage Change: 0x01 (0.1V)
- ADC Raw Value Change: 0x0064 (100mV)

### 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.
3. 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 following:

| Min. Interval (Unit:second) | Max. Interval (Unit:second) | Reportable Change | Current Change≥ Reportable Change | Current Change  Reportable Change |
|---|---|---|---|---|
| Any number between 1~65535 | Any number between 1~65535 | Can not be 0. | Report<br><br>per Min. Interval | Report<br><br>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 devicetype is listed in Netvox LoRaWAN Application Devicetype doc
**ReportType –** 1 byte –the presentation of the NetvoxPayLoadData according the devicetype
**NetvoxPayLoadData–** Fixed bytes (Fixed =8bytes)

**Tips**

1. **Battery Voltage:**

   The voltage value is bit 0 ~ bit 6, bit 7=0 is normal voltage, and bit 7=1 is low voltage.

   Battery=0xA0, binary=1010 0000, if bit 7= 1, it means low voltage.

   The actual voltage is 0010 0000 = 0x20 = 32, 32*0.1v =3.2v

2. **Version Packet:**

   When Report Type=0x00 is the version packet, such as 0120000A0B202005200000, the firmware version is 2020.05.20

3. **Data Packet:**

   When Report Type=0x01 is data packet.

| Device | Device Type | Report Type | Netvox Pay Load Data | | | |
|--------|-------------|-------------|----------------------|---|---|---|
| R718IA | 0x20 | 0x00 | Software Version(1Byte) Eg.0x0A—V1.0 | Hardware Version (1Byte) | Date Code (4Bytes,eg0x20170503) | Reserved (2Bytes,fixed 0x00) |
| | | 0x01 | Battery (1Byte, unit:0.1V) | ADCRawValue (2Bytes,unit:1mv) | Reserved (5Bytes,fixed 0x00) | |

**Uplink:** 0120012404E20000000000

1st byte (01): Version
2nd byte (20): Device Type 0x20 ,R718IA
3rd byte (01): Report Type
4th byte (24): Battery 3.6v , 24 Hex=36 Dec 36*0.1v=3.6v
5th 6th byte (04E2): ADC Raw Value = 1250mV, 4E2 Hex=1250 Dec
7th ~ 11th byte (0000000000): Reserved

**5.2 Example of Configure Cmd**

**FPort** 0x07

| Bytes | 1 | 1 | Var (Fix =9 Bytes) |
|-------|---|---|---------------------|
| | Cmd ID | Device Type | Netvox Pay Load Data |

- **Cmd ID–** 1 byte
- **Device Type–** 1 byte – Device Type of Device
- **Netvox Pay Load Data–** var bytes (Max=9bytes)

| Description | Device | CmdID | Device Type | Netvox Pay Load Data | | | | |
|---|---|---|---|---|---|---|---|---|
| Config ReportReq | | 0x01 | | Min Time (2bytes Unit:s) | Max Time (2bytes Unit:s) | Battery Change (1 byte Unit:0.1v) | ADC Raw Value Change (2bytes Unit: 1mV) | Reserved (2Bytes,Fixed 0x00) |
| Config Report Rsp | | 0x81 | | Status (0x00_success) | | Reserved (8Bytes,Fixed 0x00) | | |
| Read Config Report Req | | 0x02 | | Reserved (9Bytes,Fixed 0x00) | | | | |
| Read Config Report Rsp | R718IA | 0x82 | 0x20 | Min Time (2bytes Unit:s) | Max Time (2bytes Unit:s) | Battery Change (1byte Unit:0.1v) | ADC Raw Value Change (2bytes Unit: 1mV) | Reserved (2Bytes,Fixed 0x00) |

Configure device parameters MinTime = 1min, MaxTime = 1min, Battery Change = 0.1v, ADC Raw Value Change=100mV
**Downlink:** 0120003C003C0101640000 003C(Hex) = 60(Dec); 1F4(Hex) = 500(Dec)

**Device returns:**

8120000000000000000000 (configuration successful)
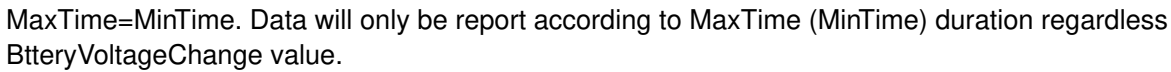8120010000000000000000 (configuration failed)

Read device parameters

Downlink: 0220000000000000000000
Device returns: 8220003C003C0101640000 (current device parameters)

**Example for MinTime/MaxTime logic**

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

MaxTime                                    MaxTime

Sleeping (MinTime)                    Sleeping (MinTime)

Wakes up and collects data        Wakes up and collects data        Wake up and collects data
REPORTS 3.6V                              REPORTS 3.6V                              REPORTS 3.6V

MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BtteryVoltageChange value.

**Example#2** based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.

MaxTime

Sleeping(MinTime)    sleeping    sleeping    sleeping

0H        15th M        30th M        45th M        1H        2H

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

MaxTime

Wakes up and collects data
3.5V |3.5-3.6|=0.1
REPORTS 3.5V

Users push the button,
REPORTS 3.5V.
Recalculate MaxTime.

Wakes up and collects data3.5V
Does not report

sleeping    sleeping

0H    15th M    30th M    45th M    1H 1H 10th M    1H 25th M

| Wakes up and collects data REPORT 3.6V | Wakes up and collects data 3.6V Does not report | Wakes up and collects data 3.5V Does not report | Wakes up and collects data 3.5V Does not report | Wakes up and collects data 3.5V Does not report | Wakes up and collects data 2.7V Does not report | Wakes up and collects data REPORT 2.7V |

Notes:

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 change value is greater than the ReportableChange value, the device reports according to MinTime interval.
   If the data variation is not greater than the last data reported, the device reports according to MaxTime interval.

3. We do not recommend to set 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.
   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. Wireless ADC Sampling Interface (R718IA) has the built-in magnet (as the figure below). When installed, it can be attached to the surface of an object with iron which is convenient and quick. To make the installation more secure, use screws (purchased) to secure the unit to a wall or other surface (as the figure below).

   Note:

   Do not install the device in a metal shielded box or in an environment with other electrical equipment around it to avoid af fecting the wireless transmission of the device.
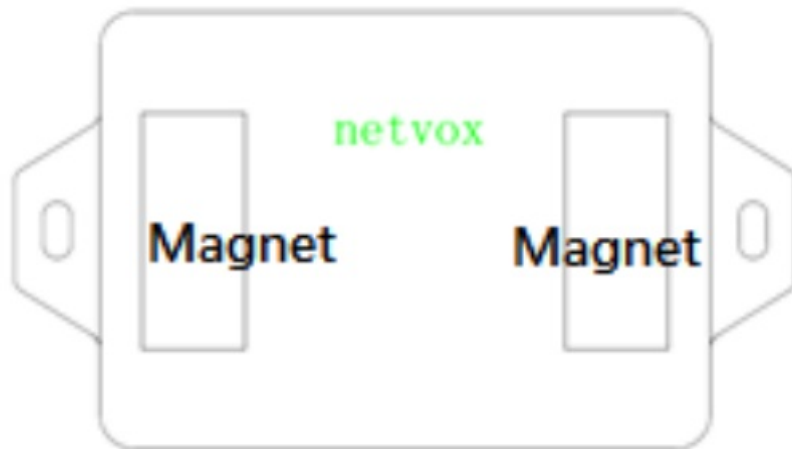




2. Connect the sampling line of the ADC sampling interface sensor to the transmitter according to the wiring method shown in figure. There are two connection modes, 2-wire and 3-wire.

3. When the ADC sampling interface sensor detects the current voltage according to the configured time or by pressing the button, it sends the data immediately
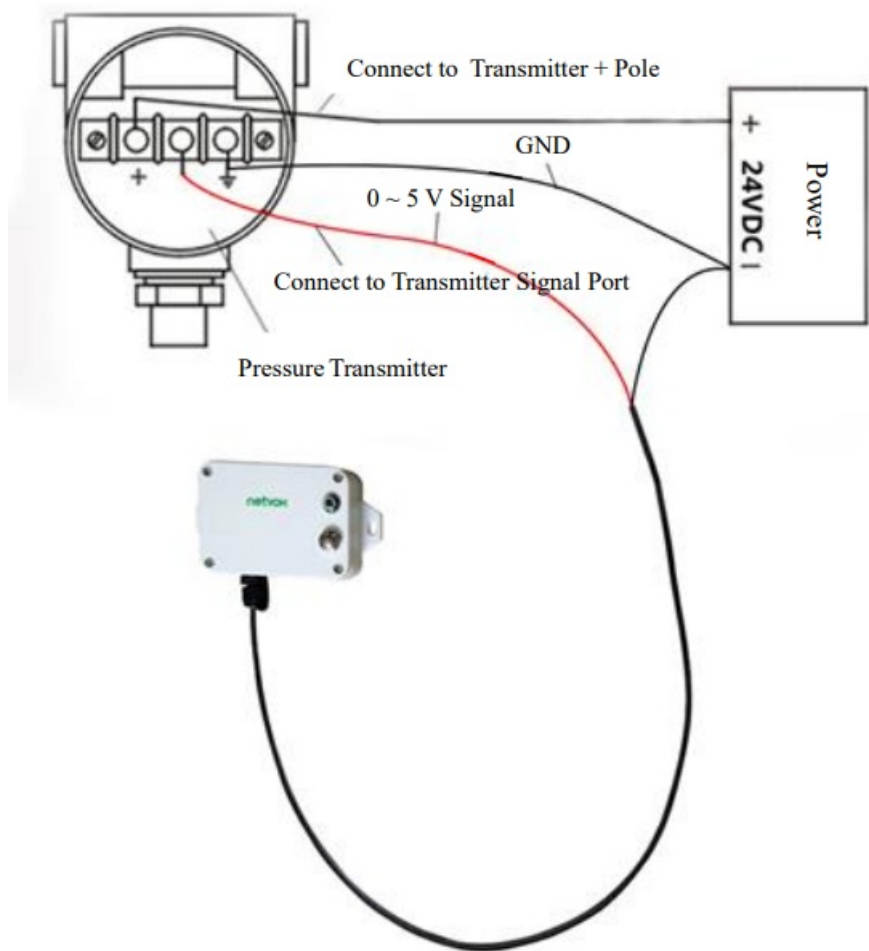
Wireless Sampling Interface (R718IA)
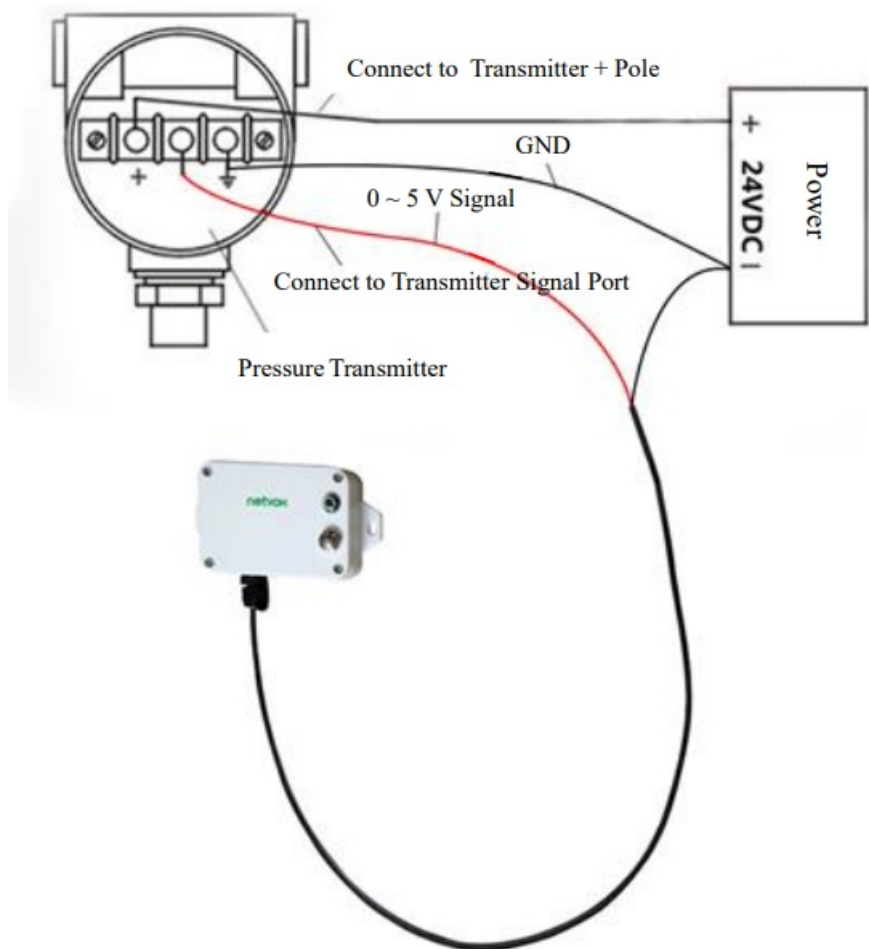It can also be applied to the following scenarios:

- Pressure transmitter
- Differential pressure transmitter
- Level transmitter

The transmitter with 0-5V output signal

**Figure1 2**-wire System Example Diagram (for wiring reference)

Connect to Transmitter + Pole
GND
0 ~ 5 V Signal
Connect to Transmitter Signal Port
Pressure Transmitter
+ 24VDC | Power

**Fig. 3**-wire System Example Diagram (for wiring reference)



Connect to Transmitter + Pole
GND
0 ~ 5 V Signal
Connect to Transmitter Signal Port
Pressure Transmitter
+ 24VDC | Power

## Information about Battery Passivation

Many of 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 reaction 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:

### 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.

### 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.
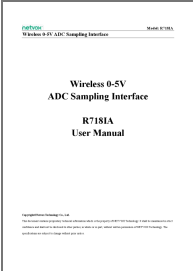
## Important Maintenance Instruction

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 dusty or dirty environment. It might damage its detachable parts and electronic components.

- Do not store the device under excessive heat condition. High temperature 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 in 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 R718IA Wireless 0-5V ADC Sampling Interface** [pdf] User Manual
R718IA Wireless 0-5V ADC Sampling Interface, R718IA, Wireless 0-5V ADC Sampling Interface, 0-5V ADC Sampling Interface, Sampling Interface, Interface

## References

- **Netvox LoRaWAN Application Command**
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