BatteryDAQ™
Monitoring Solutions
"It's Nice to Know"



# Sentry Battery Monitor

## Sentry-NB4

## Sentry-NB4T

## Sentry-NB8

Compatible with MyBattery Platform™

Installation and Service Guide

think before you print

**Voltage Hazard and High Energy Exist on**
**Battery Terminals, Sampling Leads, Connectors and Inside Circuits!**
**Do NOT Open the Unit!**

**Please read through this manual before installation**
Information in this document is subject to change without notice.


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# Notices

## Trademarks

All brands and product names are the trademarks of their respective owners. **BatteryDAQ™**, **MyBattery Platform™** and **Sentry Battery Monitor™** are the registered trademarks of **BatteryDAQ**.

## Copyright



## Liability

Neither **BatteryDAQ** nor any of its employees shall be liable for any direct, indirect, incidental, or consequential damages arising from the failure of the battery monitoring system or the use of data and/or prediction generated by the battery monitoring system, even if **BatteryDAQ** had been advised in advance except for as provided by law.

## Specification

**BatteryDAQ** makes every effort to ensure that the specifications and details in this manual are accurate and complete. **BatteryDAQ** reserves the right to alter or improve the specification, design or manufacturing process at any time, without notice.

## Warranty

**BatteryDAQ** warrants this system free from defects in material and workmanship in operation for one year from the date of commissioning or sale by **BatteryDAQ** or its authorized dealer.

For warranty service or repair, this product must be returned to the BatteryDAQ factory. Buyer shall pay shipping charges to send the product to BatteryDAQ, and BatteryDAQ shall pay shipping charges to return the product to the Buyer. However, Buyer shall pay all shipping charges, duties and taxes for products returned to BatteryDAQ from another country.

## Limitation of Warranty

This warranty does not apply to defects arising from system modification performed without **BatteryDAQ**'s written approval, or misuse of the system or any part of the system. The warranty excludes defects or malfunctions resulting from failure by the customer, or his designated personnel, to maintain and upkeep the batteries to which the system is fitted.

## Safety Notices

The following safety precautions should be observed before any work is performed.

**1. Sentry units are to be installed by trained personnel who are qualified to recognize the hazards associated with working on batteries and know the safety precautions required to avoid possible injury. The safety procedures and safe working practices as described in the appropriate battery manufacturers documentation should be followed at all times.**

**3. Never work on any system that threatens life or injury through hazardous voltages except when applying absolute safety precautions.**

**4. Never work on hazardous voltage system alone. Always ensure that you work with a properly trained colleague.**

**5. Never make unauthorized changes or modifications to equipment. This may create unsafe, or even hazardous, situations.**

**6. Where the battery bank is disconnected by switching off, the wire/cable(s) to battery monitor or any other circuit may also need to be unplugged or disconnected in order to fully isolate battery bank.**

**7. After replacing/servicing of the battery, any removed links must be fitted and reconnected before the modules are reconnected.**

## Tools and Equipment

1. Ensure all equipment and tools are proper, safe and in good working order.

2. Ensure electrical tools have been tested for proper insulation and grounding where appropriate.

3. Observe all **CAUTION**, **WARNINGS** and **DANGER** notices on equipment, tools, and building, whether internally or externally displayed.

## Service and Support

If during the use of the **BatteryDAQ™** product any cracks, breaks or defects are found in any of the units, please contact our customer service or the dealer.

# Content



* Drawings/pictures in this manual are for reference only.

# 1 Quick Guide

Please read through the manual to familiarize yourself with Sentry unit and software.

For simple test, prepare at least 1 string of 2x12V (24V) battery string. (1 string of 4x12V is recommended.)

| Step | Description | Reference | Check |
|---|---|---|---|
| 1 | Prepare battery connection cable/harness if not ordered from BatteryDAQ | | |
| 2 | Run Ethernet cable to battery cabinet/location | | |
| 3 | Secure Sentry unit next to battery bank | | |
| 4 | Install current sensor (CT) and temperature probe to battery string | Chapter 4 | |
| 5 | Wire battery cable/harness to battery posts | Chapter 4 | |
| 6 | Power on check | | |
| 7 | Connect Sentry unit to network | | |
| 8 | Set/check IP address for Sentry unit | IpSetup.exe | |
| 9 | Check settings and battery data with web browser | Chapter 3 | |
| 10 | Change settings for battery configuration | | |
| 11 | Change settings for communication host/port | | |
| 12 | Calibrate unit if necessary | Chapter 5 | |
| 13 | Perform discharge/charge to test high level functions | Test SOC, SOH and Runtime | |
| 14 | Install Battery Analyzer software if needed | | |
| 15 | Set alarm thresholds and delivery methods with Battery Analyzer | Chapter 6 | |
| 16 | Subscribe/login to MyBattery Platform™ | www.thisbattery.com | |
| 17 | Integrate to other management software/platform | Modbus-TCP<br>Contact tech support for Modbus table | |

# 2 Overview of Sentry NB

**SENTRY NB** battery monitoring unit is designed for ***telecommunication outside cabinet*** -48V and 24V systems with 2x12V, 4x12V or 8x6V, one or two strings. It utilizes our 3rd generation technologies for high performance and easy installation.

| NB4 | NB4T | NB8 |
|---|---|---|
| **1 string, 2 or 4 batteries** | **1 string with 2/3/4 batteries**<br>**Active battery voltage balancing** | **1 or 2 strings**<br>**Each string has 2 or 4 batteries** |

### *Main Features*

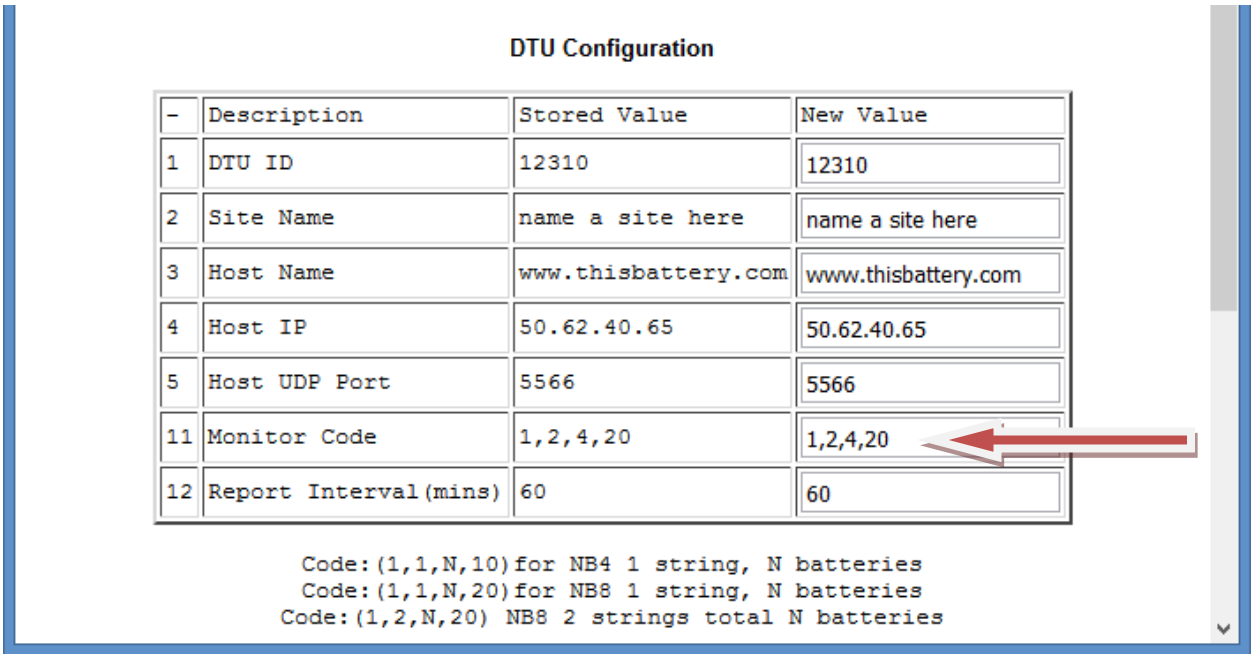
- Advanced precise IR (Internal Resistance) measurement technology
- Protection for over voltage input for each sampling channel
- High resolution data acquisition
- Real-time SOC, SOH and runtime estimation
- No mechanical scanning relays, resulting high reliability for telecom industry
- Compact design allows for easy installation into a cabinet or battery tray
- Industrial grade reliability for outdoor applications
- Integrated Ethernet connection
- Full support to networking battery management system
- Compatible with MyBattery Platform™ for web based remote monitoring for large scale deployment
- Support Modbus TCP integration
- Active Balancing [only available on NB4T model]

### *Main measurements*

- Individual battery voltage monitoring
- Individual battery Internal Resistance (IR) monitoring
- String voltage monitoring
- String float current and charge & discharge current monitoring (optional)
- Ambient or pilot temperature monitoring (Optional: individual battery temperature.)
- Discharge auto-detection and discharge curve recording (with MyBattery Platform™)

## *Configuration Code*

Unit can be configured by user for different battery applications.



DTU Configuration

| - | Description | Stored Value | New Value |
|---|---|---|---|
| 1 | DTU ID | 12310 | 12310 |
| 2 | Site Name | name a site here | name a site here |
| 3 | Host Name | www.thisbattery.com | www.thisbattery.com |
| 4 | Host IP | 50.62.40.65 | 50.62.40.65 |
| 5 | Host UDP Port | 5566 | 5566 |
| 11 | Monitor Code | 1,2,4,20 | 1,2,4,20 |
| 12 | Report Interval(mins) | 60 | 60 |

Code:(1,1,N,10)for NB4 1 string, N batteries
Code:(1,1,N,20)for NB8 1 string, N batteries
Code:(1,2,N,20) NB8 2 strings total N batteries

Monitor Code: ModbusID(1), String Number(1 or 2), Battery Number(2 to 8), Type Code(10 or 20).

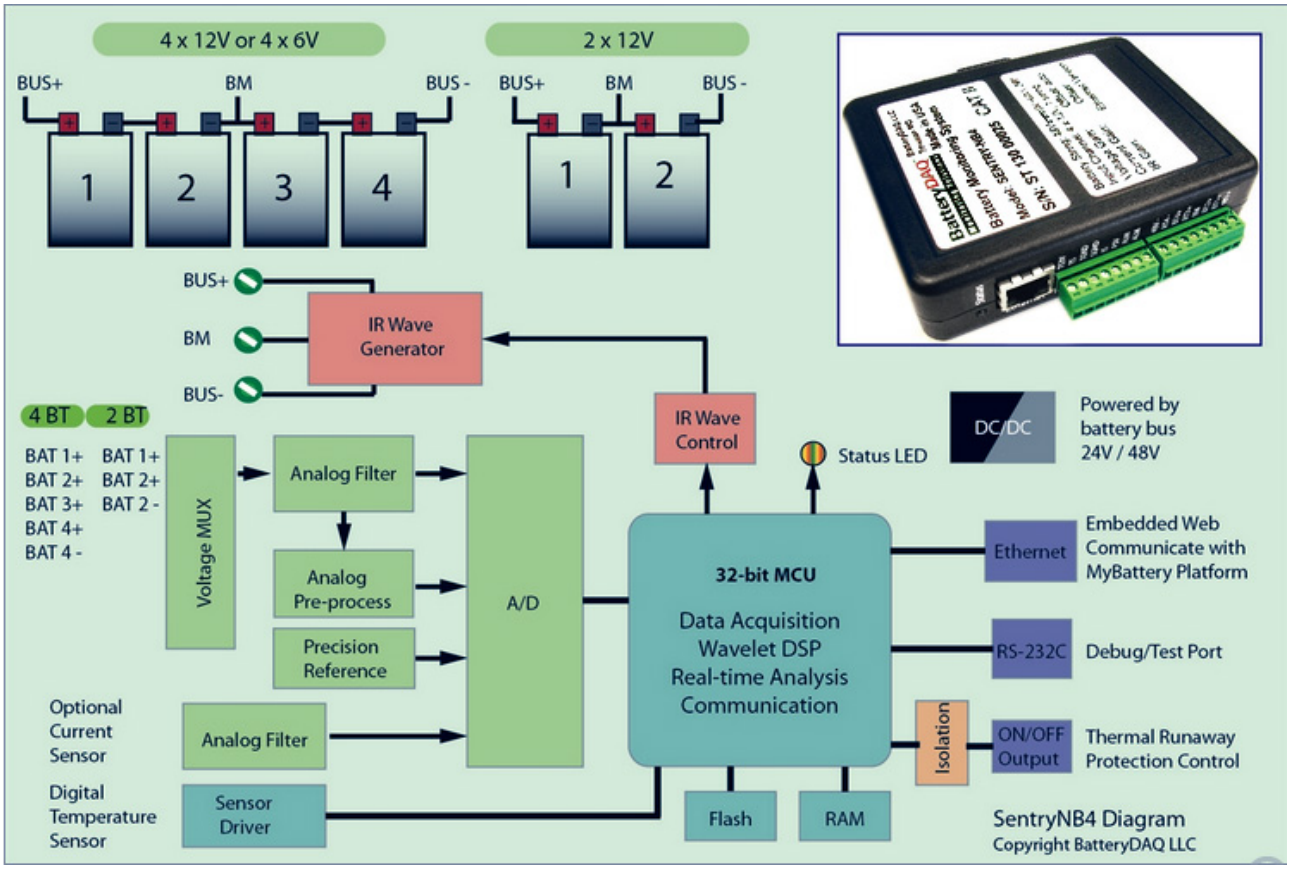
**Sentry-NB4** can be configured for one string of 4x12V, 4x6V or 2x12V. (NB4 – type code 10)

| NB4 Configuration Code | 1,1,4,10 | 1,1,2,10 | 1,1,4,10 |
|---|---|---|---|
| **Battery String** | 4x12V, 1 string | 2x12V,1 string | 4x6V,1 string |
| **String Voltage** | 48V | 24V | 24V |
| **Battery Block** | 12V | 12V | 6V |
| **Battery Number** | 4 | 2 | 4 |

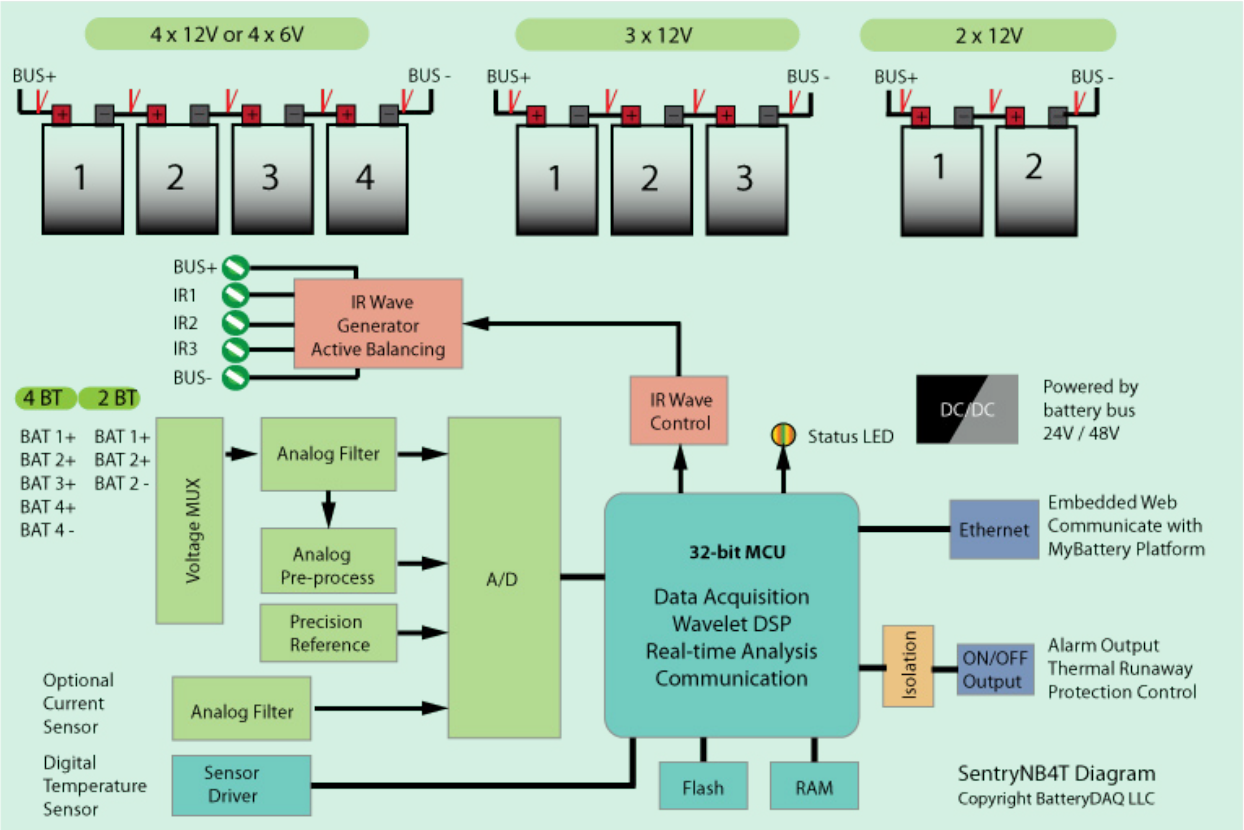
**Sentry-NB8** can be configured for one or two strings. (NB8 - type code 20)

| NB8 Configuration | 1,1,4,20 | 1,2,8,20 | 1,1,8,20 | 1,1,2,20 | 1,2,4,20 | 1,1,4,20 | 1,2,8,20 |
|---|---|---|---|---|---|---|---|
| **Battery String** | 4x12V 1 string | 4x12V 2 strings | 8x6V, 1 string | 2x12V, 1 string | 2x12V, 2 strings | 4x6V, 1 string | 4x6V, 2 strings |
| **String Voltage** | 48V | 48V | 48V | 24V | 24V | 24V | 24V |
| **Battery Block** | 12V | 12V | 6V | 12V | 12V | 6V | 6V |
| **Battery Number** | 4 | 8 | 8 | 2 | 4 | 4 | 8 |

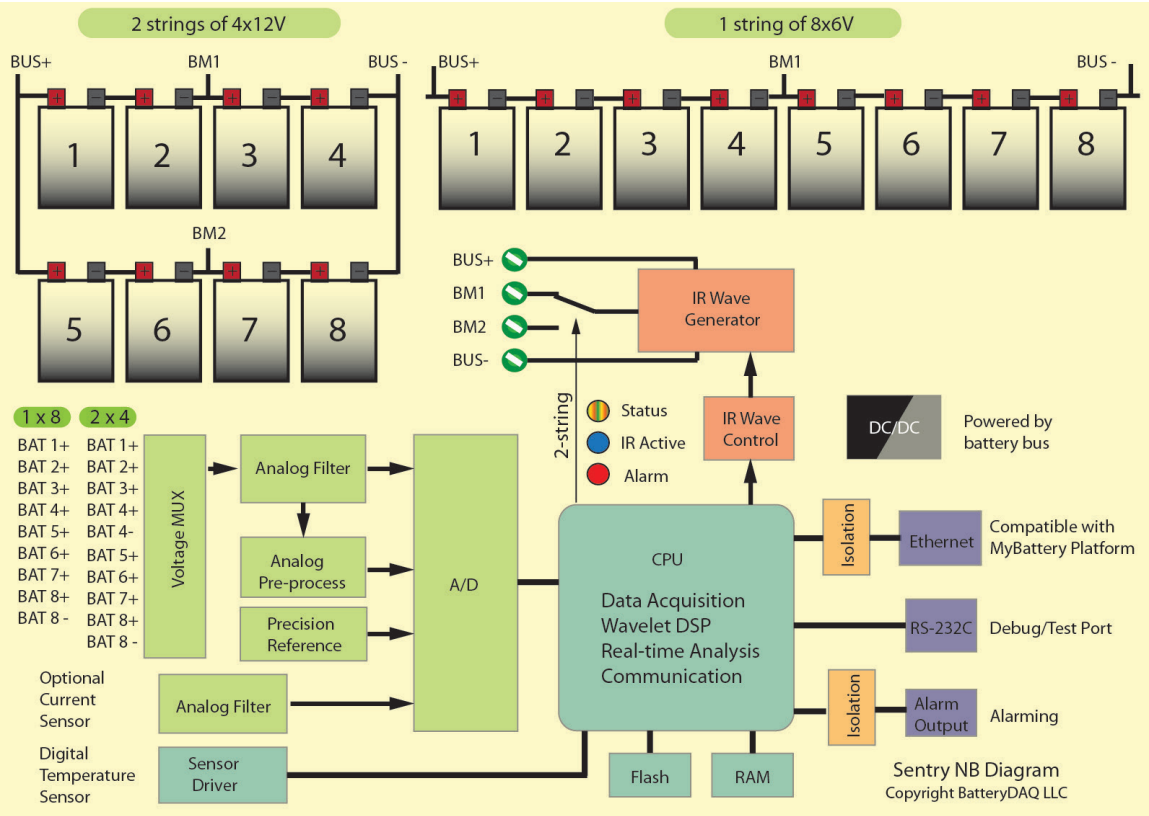
### *NB4 function blocks*




### *NB4T function blocks*




## *NB8 function blocks*





**Hazardous Voltage and High Energy Warning** – this monitor is designed for -48V/24V system, with a maximum battery string voltage of up to **60V**. Any shortage to battery terminals or wires may result in a high current burn or fire.

## 2.1 NB4 Specifications

| Model: NB4 | |
|---|---|
| **Power Supply** | |
| Power Input | Internal DC/DC converter, 18-60V input; Maximum Consumption: 3W |
| **Current/Temperature Measurement** | |
| Current Sensor (CT) | Support LEM HASS current sensor with internal +5V power supply<br>(Default range +/- 50A, window size 20mm x 10mm) |
| Temperature | 1 ambient/pilot temperature sensor<br>Measurement range: -40 to 65ºC, accuracy 1 ºC |
| **Voltage Measurement** | |
| Battery | 1 string, 2 x12V, 4 x 6V or 4 x 12V battery |
| Bus Voltage | Range: 18 – 60V; Accuracy: 0.1% |
| Battery Voltage | +/- 16V for 12V batteries; Accuracy: 0.1% |
| **Internal Resistance** | |
| Range and Resolution | 0 to 30mΩ, 0.01mΩ resolution |
| Wiring mode | Four-terminal sensing (separate current-carrying and voltage sensing wires) |
| **Communication** | |
| Ethernet | Onboard Ethernet, Modbus-TCP<br>Compatible with Battery Analyzer software and MyBattery Platform™ |
| **Indication and Alarm** | |
| LED indication | Dual-color LEDs for status |
| Alarm Outputs | Urgent Alarm (Normal Close, 0.1A capacity) |
| **Dimensions** | |
| Unit Dimensions | 115mm(H) x 90mm(D) x 32mm(W), 4.5” x 3.5” x 1.3” in. |
| Mounting | Default: Magnetic cup (50 lbs force)<br>DIN Rail optional |

***Specifications subject to change without notice**

## 2.2 NB4T Specifications

| Model: NB4T | |
|---|---|
| **Power Supply** | |
| Power Input | Internal DC/DC converter, 18-60V input; Maximum Consumption: 3W |
| **Current/Temperature Measurement** | |
| Current Sensor(CT) | Support LEM HASS current sensor with internal +5V power supply<br>(Default range +/- 50A, window size 20mm x 10mm) |
| Temperature | Default: 1 ambient and 1 pilot temperature sensor<br>Optional: 1 ambient and 4 battery temperature sensors on a pre-made bus cord<br>Measurement range: -40 to 65ºC, accuracy 1 ºC |
| **Voltage Measurement** | |
| Battery | 4 x12V, up to 300Ah<br>Compatible with 2x12V, 3x12V, 4x6V |
| Bus Voltage | Range: 18 – 60V; Accuracy: 0.1% |
| Battery Voltage | +/- 16V for 12V batteries; Accuracy: 0.1% |
| **Internal Resistance** | |
| Range and Resolution | 0 to 30mΩ, 0.01mΩ resolution |
| Wiring mode | Four-terminal sensing (separate current-carrying and voltage sensing wires) |
| **Communication** | |
| Ethernet | Onboard Ethernet, Modbus-TCP<br>Compatible with Battery Analyzer software and MyBattery Platform™ |
| **Indication and Alarm** | |
| LED indication | ▪ Dual-color LEDs for status<br>▪ LED for service alarm<br>▪ LED for urgent alarm |
| Alarm Outputs | Service Alarm (Normal Close, 0.1A capacity)<br>Urgent Alarm (Normal Close, 0.1A capacity) |
| **Dimensions** | |
| Unit Dimensions | 130mm(L) x 80mm(W) x 30mm(D)<br>5.2” x 3.2” x 1.2” in. |
| Mounting | Default: Magnetic cup (50 lbs force) |

***Specifications subject to change without notice**

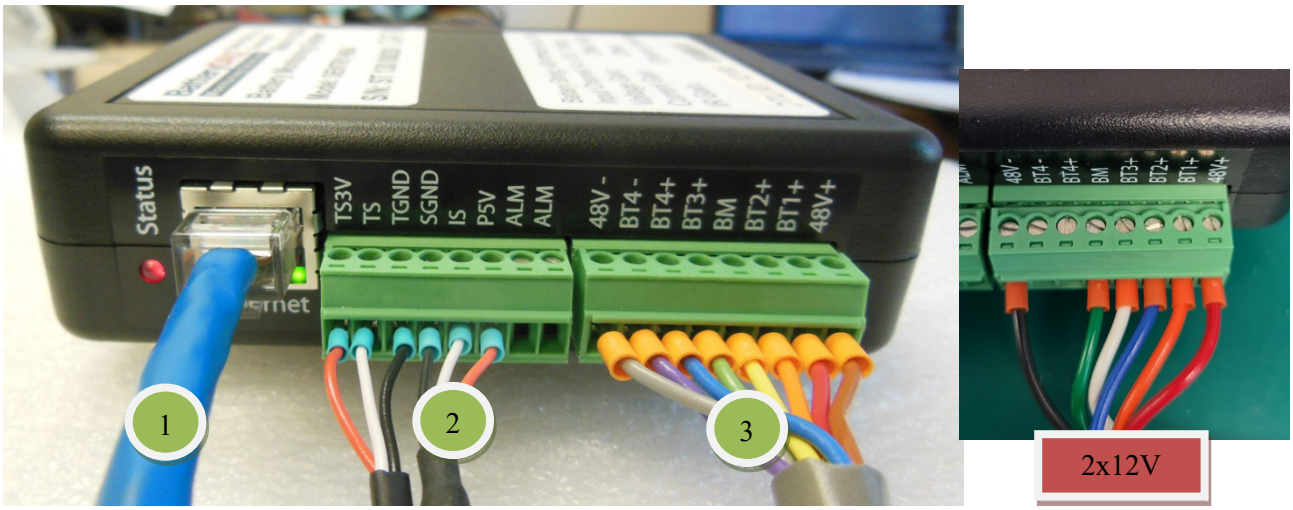
## 2.3 NB8 Specifications

| Model: NB8 | |
|---|---|
| **Power Supply** | |
| Power Input | Internal DC/DC converter, 18-60V input; Maximum Consumption: 3W |
| **Current/Temperature Measurement** | |
| Current Sensor (CT) | Support LEM HASS current sensor with internal +5V power supply<br>(Default range +/- 50A, window size 20mm x 10mm)<br>2 CTs can be utilized if the window size is not big enough for 2 strings.<br>0.1% + sensor accuracy |
| Temperature | 1 ambient/pilot temperature sensor<br>Measurement range: -40 to 65ºC, accuracy 1 ºC |
| **Voltage Measurement** | |
| Battery | 2x12V, 4 x12V or 8 x 6V battery<br>1 to 2 strings, maximum 8 batteries |
| Bus Voltage | Range: 18 – 60V; Accuracy: 0.1% |
| Battery Voltage | +/- 16V for 12V batteries; Accuracy: 0.1% |
| **Internal Resistance** | |
| Range and Resolution | 0 to 30mΩ, 0.01mΩ resolution |
| Wiring mode | Four-terminal sensing (separate current-carrying and voltage sensing wires) |
| **Communication** | |
| Ethernet | Onboard Ethernet, Modbus-TCP<br>Compatible with Battery Analyzer software and MyBattery Platform™ |
| **Indication and Alarm** | |
| LED indication | ▪ Dual-color LEDs for status<br>▪ LED for service alarm<br>▪ LED for urgent alarm |
| Alarm Outputs | Service Alarm (Normal Close, 0.1A capacity)<br>Urgent Alarm (Normal Close, 0.1A capacity) |
| **Dimensions** | |
| Unit Dimensions | 130mm(L) x 80mm(W) x 30mm(D)<br>5.2” x 3.2” x 1.2” in. |
| Mounting | Default: Magnetic cup (50 lbs force) |

***Specifications subject to change without notice**

## *2.4 Layout of Connection Terminals for NB4*

### 2.4.1 Panel Connection for NB4




**Connector 1**: Ethernet port, 10/100Mb RJ45

**Connector 2**: Current Sensors (CTs), Temperature Probe, and Alarm Output

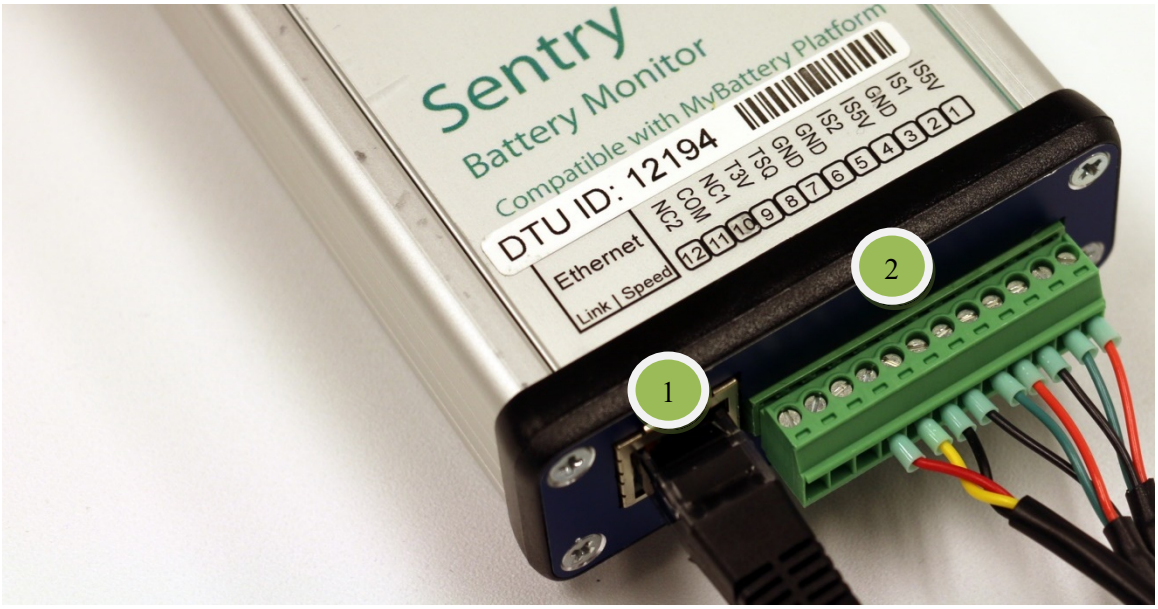
| Pin No | Signal Name | Note |
|---|---|---|
| 1 | ALM | Alarm Output (0.1A, 200V) |
| 2 | ALM | Alarm Output (0.1A, 200V) |
| 3 | P5V | Current Sensor Power Supply (+5V) |
| 4 | IS | Current Sensor Signal |
| 5 | SGND | Current sensor Ground |
| 6 | TGND | Temperature Sensor Ground |
| 7 | TS | Temperature Sensor Data Port |
| 8 | TS3V | Temperature sensor power supply (3.3V) |

**Connector 3: Battery String Connection**

| Pin No | Signal Name | Note | -48V (4x12V) | 24V (2x12V) |
|---|---|---|---|---|
| 1 | BUS+ | ***Always count #1 from positive*** Battery string POSITIVE bus | 0V (BATT#1+) | 24V+ |
| 2 | BT1+ | Battery #1 positive post | BATT#1+ | BATT#1+ |
| 3 | BT2+ | Battery #2 positive post | BATT#2+ | BATT#2+ |
| 4 | BT3+ | Battery #3 positive post | BATT#3+ | BATT#2- |
| **5** | **MID1** | **String-1 middle point** | **BATT#3+** | **BATT#2+** |
| 6 | BT4+ | Battery #4 positive post | BATT#4+ | - |
| 7 | BT4- | Battery #4 negative post | BATT#4- | - |
| 8 | BUS- | Battery string NEGATIVE bus | -48V (BATT#4-) | 0V (BATT#2-) |

## *2.5 Layout of Connection Terminals for NB8*

### 2.5.1 Front Panel Connection

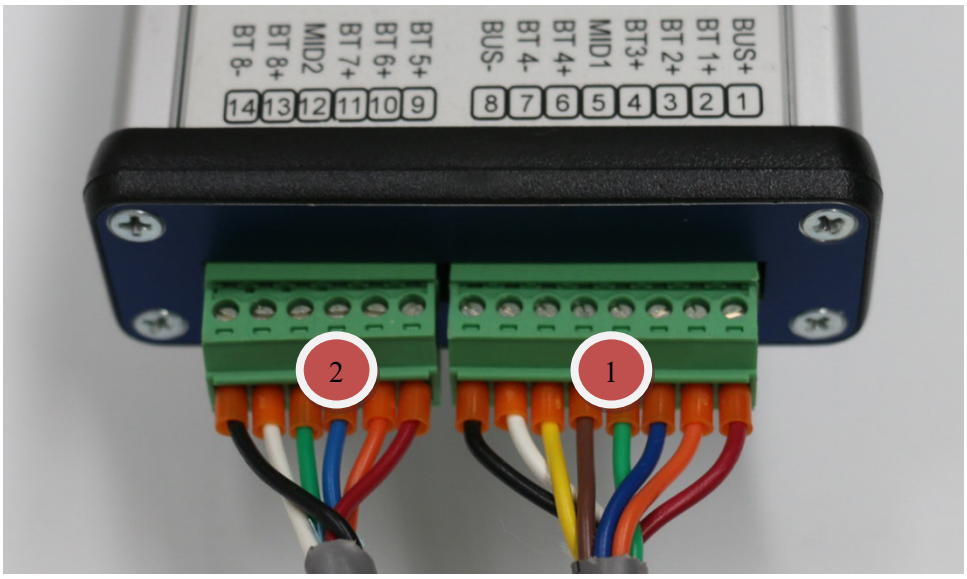



**Connector 1**: Ethernet port, 10/100Mb RJ45

**Connector 2**: Current Sensors (CTs), Temperature Probe, and Alarm Output

| Pin No | Signal Name | Note |
|---|---|---|
| 1 | IS5V | Current Sensor Power Supply (+5V) |
| 2 | IS1 | Current Sensor Signal-1 |
| 3 | GND | Current sensor Ground |
| 4 | IS5V | Current Sensor Power Supply (+5V) |
| 5 | IS2 | Current Sensor Signal-2 |
| 6 | GND | Current sensor Ground |
| 7 | GND | Temperature Sensor Ground |
| 8 | TSQ | Temperature Sensor Data Port |
| 9 | T3V | Temperature sensor power supply (3.3V) |
| 10 | NC1 | Urgent Alarm Output (0.1A, 200V) |
| 11 | COM | Alarm Common (0.1A, 200V) |
| **12** | NC2 | Service Alarm Output (0.1A, 200V) |

### 2.5.2 NB8 Battery Connection Terminals



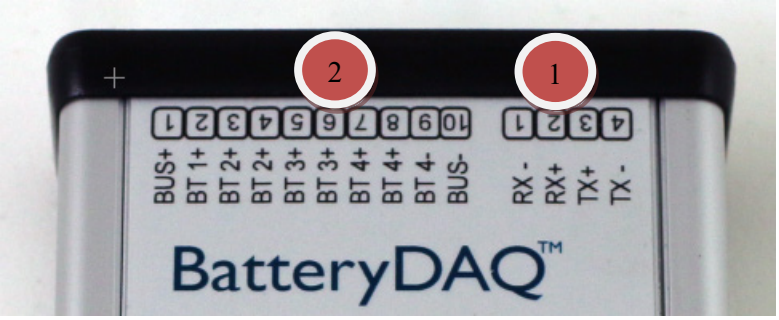

**Connector 1: Battery String-1**

| Pin No | Signal Name | Note | -48V (4x12V) | 24V (2x12V) |
|---|---|---|---|---|
| 1 | BUS+ | ***Always count #1 from positive*** Battery string POSITIVE bus | 0V (BATT#1+) | 24V+ |
| 2 | BT1+ | Battery #1 positive post | BATT#1+ | BATT#1+ |
| 3 | BT2+ | Battery #2 positive post | BATT#2+ | BATT#2+ |
| 4 | BT3+ | Battery #3 positive post | BATT#3+ | BATT#2- |
| **5** | **MID1** | **Sting-1 middle point** | **BATT#3+** | **BATT#2+** |
| 6 | BT4+ | Battery #4 positive post | BATT#4+ | - |
| 7 | BT4- | Battery #4 negative post | BATT#4- | - |
| 8 | BUS- | Battery string NEGATIVE bus | -48V (BATT#4-) | 0V (BATT#2-) |

**Connector 2: Battery String-2**

| Pin No | Signal Name | Note | -48V (4x12V) | 24V (2x12V) |
|---|---|---|---|---|
| 1 | BT5+ | Battery #5 positive post, sensing lead | (BATT#5+ | BATT#3+ |
| 2 | BT6+ | Battery #6 positive post | BATT#6+ | BATT#4+ |
| 3 | BT7+ | Battery #7 positive post | BATT#7+ | BATT#4- |
| **4** | **MID2** | **String-2 middle point** | **BATT#7+** | **BATT#4+** |
| 5 | BT8+ | Battery #8 positive post | BATT#8+ | - |
| 6 | BT8- | Battery #8 negative post, sensing lead | BATT#8- | - |

## *2.6 NB4T Battery Connection Terminals*




**Connector 1: Battery String**

| Pin No | Signal Name | Note | -48V (4x12V) | 36V (3x12V) | 24V (2x12V) |
|---|---|---|---|---|---|
| 1 | BUS+ | ***Always count #1 from positive*** Battery string POSITIVE bus | 0V (BATT#1+) | 36V+ | 24V+ |
| 2 | BT1+ | Battery #1+ sensing | BATT#1+ | BATT#1+ | BATT#1+ |
| 3 | BT2+ | Battery #2 balancing | BATT#2+ | BATT#2+ | BATT#2+ |
| 4 | BT2+ | Battery #2+ sensing | BATT#2+ | BATT#2+ | BATT#2+ |
| 5 | BT3+ | Battery #3 balancing | BATT#3+ | BATT#3+ | BATT#2- |
| 6 | BT3+ | Battery #3+ sensing | BATT#3+ | BATT#3+ | - |
| 7 | BT4+ | Battery #4 balancing | BATT#4+ | BATT#3- | - |
| 8 | BT4+ | Battery #4+ sensing | BATT#4+ | - | - |
| 9 | BT4- | Battery #4- sensing | BATT#4- | - | |
| 10 | BUS- | Battery string NEGATIVE bus | -48V (BATT#4-) | 0V (BATT#3-) | 0V (BATT#2-) |

**Connector 2: Daisy Chain Connector (Reserved)**

## *2.7 NB8 and NB4T panel indicators*

**NB8 and NB4T share the same front panel and indication design.**


**Urgent Alarm – Steady RED**

1) String Voltage High or Low
2) Battery Voltage High or Low
3) Temperature High

**Service Alarm – Flash Yellow**

1) String Voltage High or Low
2) Battery Voltage High or Low
3) Temperature High
4) Internal Resistance High

*Refer chapter 5.2 Calibration for alarm threshold settings.*

**IR Active – Flash Green**

Flash when unit is doing internal resistance measurement.

**Status – Red and Green**

Green indicates unit is powered on and no alarm.
Red flash indicates urgent or service alarm.

# 3 Network Management

## *3.1 Onboard Ethernet Connection*

The onboard Ethernet is utilized for multiple functions:

1) Web page for battery data, communication settings and calibrations.
2) Connect Sentry monitor(s) to MyBattery Platform™.
3) Connect to DAS software for Battery Analyzer software or other Modbus-TCP integration.
4) Direct Modbus-TCP data server.

The product will come with pre-configured DTU-ID and monitor configuration.

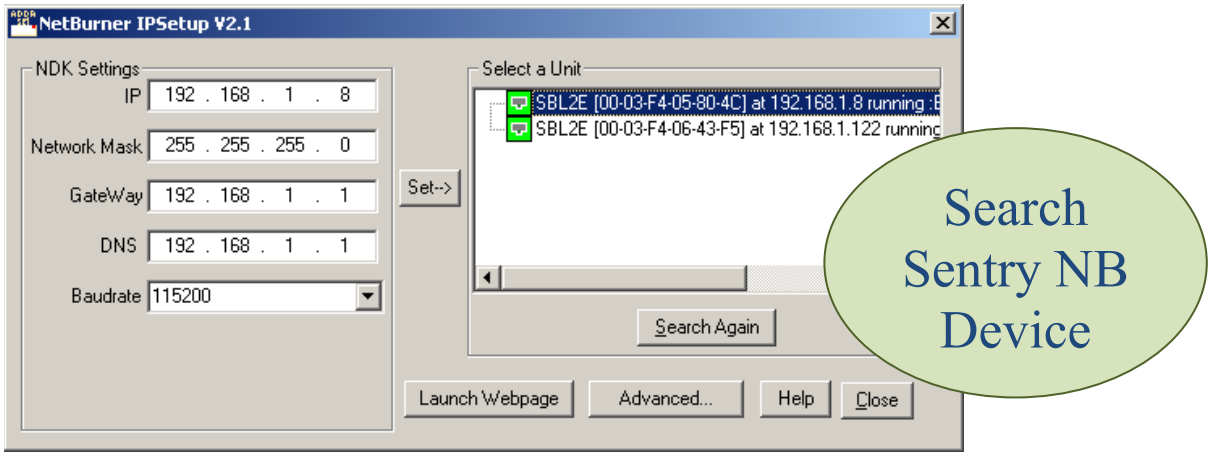
For **example**,

DTU-ID: 12501
Host: www.thisbattery.com
Monitor configuration: 1,1,4,10
(Modbus address 1, 1 string, 4 batteries, 10 for NB4 model).

In either case, if you need to change any configuration, you may find IPSetup.exe in the software disk. Or, download from this link:
http://batterydaq.com/tech/IPSetup.exe

In order to access the embedded web page, a static IP shall be assigned to the device, along with mask and gateway.

Use "IPSetup.exe" to seach for a device in the local network. The IP may sometimes be set to static. If dynamic is needed, set all numbers to "0" as below, DTU will reset back to DHCP.




Launch Webpage for configuration

Authorized user can obtain password from BatteryDAQ to update DTU configuration.
**Each time if the gateway is changed, the unit has to be rebooted. This can be done remotely with Reboot Passcode "77882".**

IPSetup.exe V2.1 or V2.2 may not work well in Win 8 or Win 10 when the unit doesn't have a static IP. In that case, find a Win XP or Win 7 computer to set static IP to unit.

## 3.2 DTU Settings

**BatteryDAQ™** Data | DTU Settings | Calibration

### DTU Configuration

| - | Description | Stored Value | New Value |
|---|---|---|---|
| 1 | DTU ID | 13273 | 13273 |
| 2 | Site Name | name a site here | name a site here |
| 3 | Host Name | www.thisbattery.com | www.thisbattery.com |
| 4 | Host IP | 50.62.40.65 | 50.62.40.65 |
| 5 | Host UDP Port | 5566 | 5566 |
| 6 | Report Interval(mins) | 60 | 60 |
| 7 | Disable(0)/Enable(1) Thermal Control | 1 | 1 |
| 8 | Disable(0)/Enable(1) **Active Balancing** | 1 | 1 |
| 9 | 0:Normal Open/1:Normal Close(NB4) | 1 | 1 |
| 10 | 0:Celsius/1:Fahrenheit | 1 | 1 |
| 11 | 0:Resistance/1:Conductance | 0 | 0 |
| 12 | 0:Standby/1:Deep Cycle | 0 | 0 |
| 13 | Monitor Code | 1,1,4,10 | 1,1,4,10 |

Code:(1,1,N,10)for NB4T, 1 string, N batteries

Enter Password: [ ] Update DTU

Only authorized person can make changes.
Click "Update" to send a packet of battery data to host server.

| | |
|---|---|
| IP Address | 192.168.1.103 |
| IP Mask | 255.255.255.0 |
| IP Gateway | 192.168.1.1 |

Use IPSetup.exe to config IP address.

***DTU ID is unique for each Sentry unit on MyBattery Platform. It can only be programmed in factory.***

# 4 Installation Guide


- Batteries can present a risk of electrical shock or burns from high short-circuit current. Observe proper safety precautions.
- Installation should be performed by qualified service personnel knowledgeable of batteries and required precautions.
- Keep unauthorized personnel away from batteries.
- This handbook must be read thoroughly before installation.
- Device location must be considered before installation.
- Ensure all equipment and tools are properly safe and in good working order.
- Ensure electrical tools have been tested for proper insulation and grounding.
- Observe all CAUTION, WARNINGS and DANGER notices on any equipment.

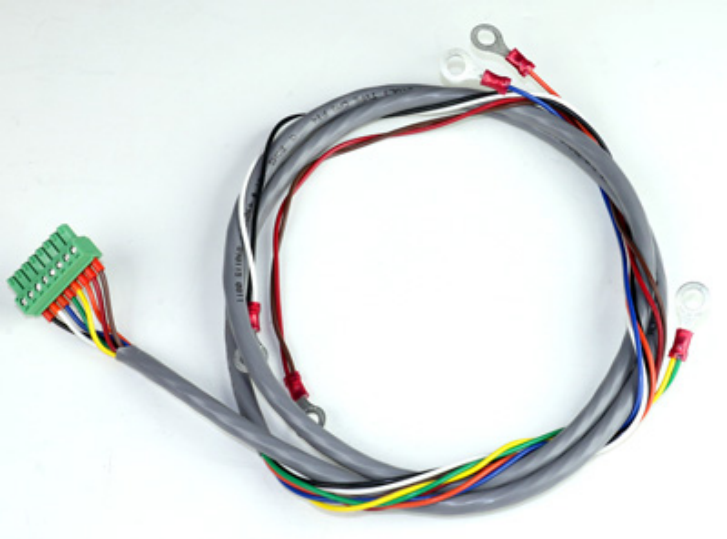
## *4.1 Installation Requirement and Procedure*

**CAUTION: 60V Voltage, High Battery Energy Hazard.**

**Basic Installation Steps**

| Step | Description | Check |
|---|---|---|
| 1 | Prepare battery connection cable/harness if not ordered from BatteryDAQ | |
| 2 | Locate/mount the Sentry unit | |
| 3 | Run Ethernet cable to Sentry unit | |
| 4 | Label the batteries with numbers | |
| 5 | Install current sensor and secure temperature sensor | |
| 6 | Connect harness to battery posts | |
| 7 | Verify connections | |
| 8 | Power on test | |
| 9 | Validation test | |

## 4.2 Essential Tools



Use ferrules to protect wire to ensure long term reliability.

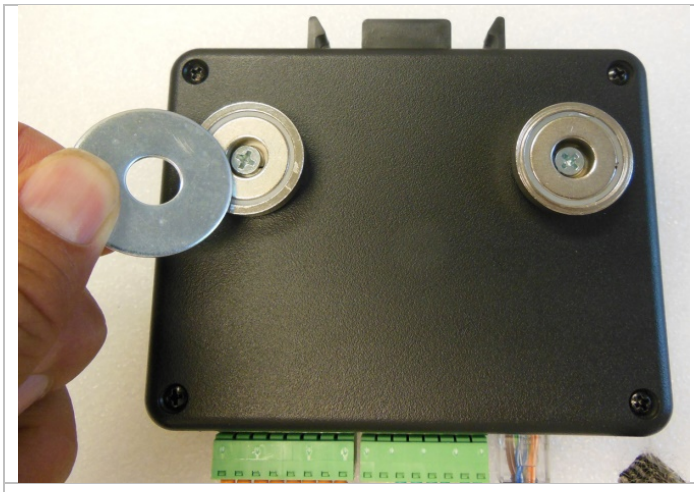
*Recommended clamping tool: Phoenix Contact CRIMPFOX 6 (PN: 1212034)*
*Mouser Part #: 651-1212034*

Use 2.5mm, isolated screwdriver for terminals.
*(a free screwdriver in your first order)*

Isolated wrench with proper size sockets. (11mm and 13mm are must-have for popular battery 6mm/8mm posts.)

## 4.3 Locate and Secure Sentry Unit

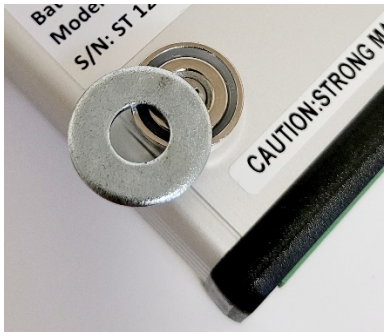
Both NB4 and NB8 come with strong magnetic cups for easy mounting.



When utilizing the magnetic cups, the unit can be placed on top of a steel surface.

**Strong magnet may hurt your finger or damage magnetic media like hard drive or credit card. Handle it carefully!**


**Do NOT attach Sentry to battery! Sentry generates heat which may affect battery service life.**




Magnetic cups are covered with washer for shipping protection.
Remove washer.

*For non-metallic cabinet, please contact BatteryDAQ for perfect mounting.*

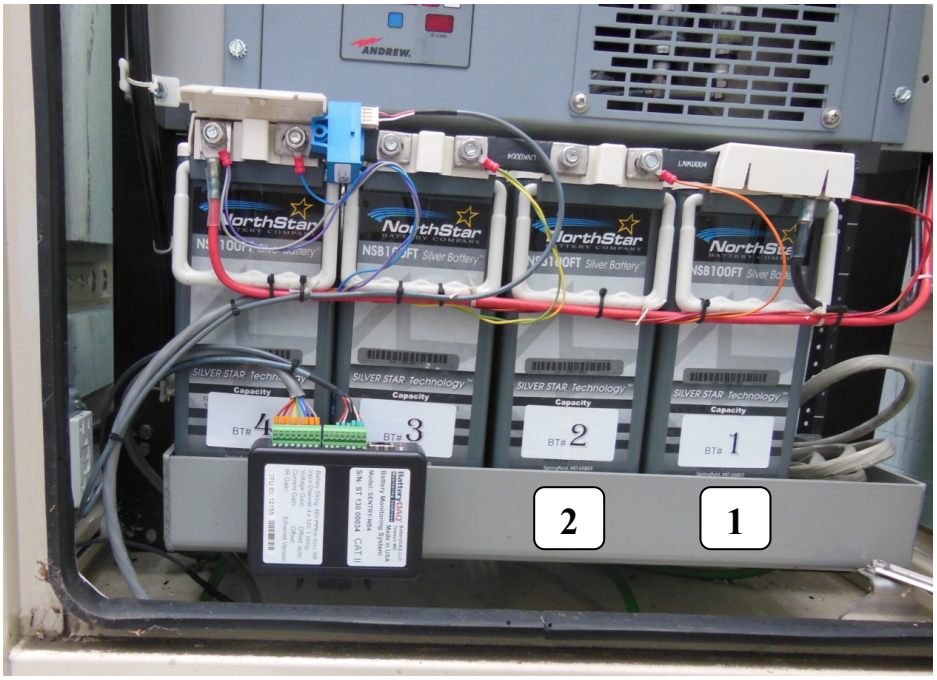
## 4.4 Label the batteries with number

Label all batteries with string number and battery number 1 to 4. The first one to POSITIVE bus is “1”. In the software, battery number will be displayed as 1 to 4, 5 to 8.

The principle of numbering the batteries is to define the battery which is connected to the **positive** bus of the string as NO.1 and to number sequentially.

The battery serial number and the battery interface number on the monitoring module are a one-to-one correspondence. The system/software display is relative to the battery serial number which is important to later battery alarm maintenance.

The battery number must be posted on a prominent position on the battery or on the shelf/rack.

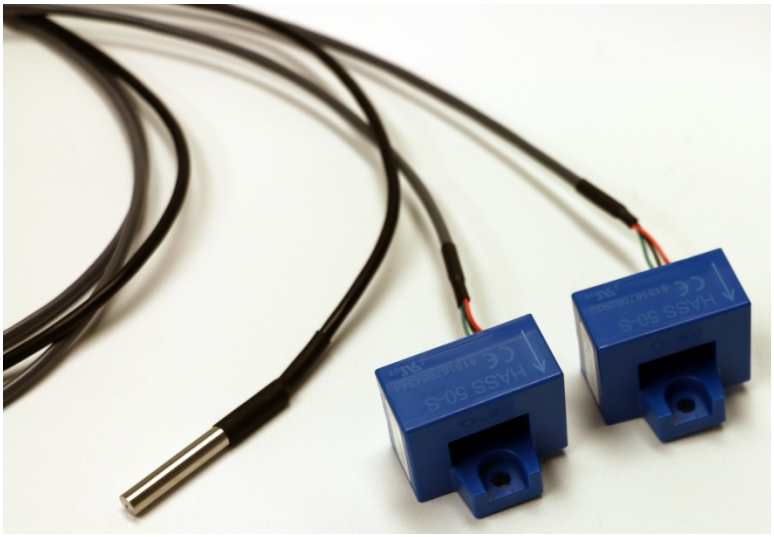


## 4.5 Install Current and Temperature Sensors

The current sensor can be installed at a convenient location in the string loop.

The direction arrow follows the direction of charging current.

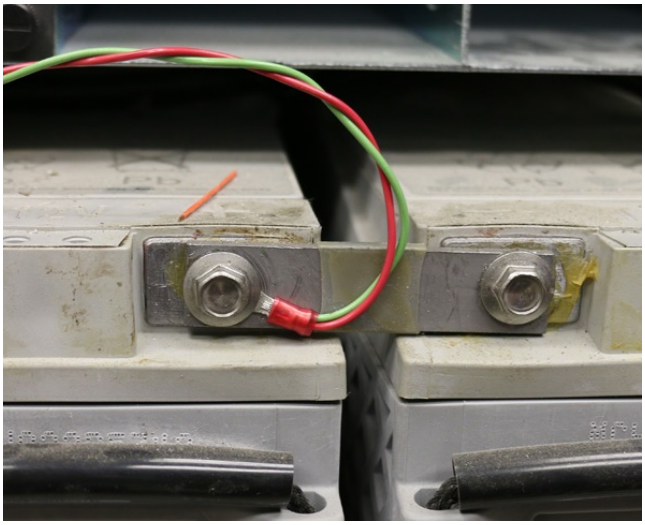
In the case of 2 strings, if the 2 bus cables cannot fit into 10mmx20mm window, 2 current sensors can be utilized.



Unit will automatically activate additional CT when it is connected.

The temperature sensor can be used for ambient or pilot temperature measurement.

## 4.6 Install Battery Sampling Harness



6mm, 8mm and 10mm O-rings are available for order.

*In our 20+ years, it is our experience that O-ring leads provide the most reliable connection.*
For the battery with tab for monitoring, please order WL-1T leads.

Apply thin layer coating grease such as NO-OX-ID to O-ring surface.
http://www.sanchem.com/docs/NO-OX-ID%20A-Special%20Electrical%20Grade.pdf

## 4.7 Individual Battery Temperature Probes

If the option for individual temperature is ordered, unit will come with an assembled bus cord with multiple sensor.
For 4x12V, there are 5 sensors in the cord. The last one is for ambient temperature.

Using the strong adhesive strip to mount the sensor to each battery surface. Clean the surface if necessary.

## 4.8 Verify Connection

1) Check all connections to confirm they are accurate and reliable.
2) Verify connection with multimeter at terminals.
3) Measure the string voltage between BUS+ and BUS-.
4) Measure BUS+ to MID and MID to BUS-.
5) Go through battery sampling connection at terminals to check voltage.

## 4.9 Validation Test

If connecting to network, PC software or MyBattery Platform™, check if the data is updating.

Unplug sampling connector, the voltage reading shall change.

Warm the temperature sensor with your finger tip. The temperature data shall change accordingly.

Most measurement parameters can be read and validated with the HMI.

| | Parameter | Description | Check |
|---|---|---|---|
| **1** | Temperature | Read temperature from screen.<br>*(Temperature cannot be re-calibrated.)* | |
| **2** | Current | If necessary, switch off battery from the main loop, read ZERO and calibrate to zero.<br>Current gain is factory calibrated and shall not be changed. | |
| **3** | Voltage | Use a reliable & accurate meter to measure voltage at the terminal or connector.<br>Verify there are no abnormal voltage readings. | |
| **4** | Internal Resistance | Internal resistance measurement will be automatically started 30 seconds after powering on. Use HMI to check the data. Wait for it to finish all channels. (Unfinished channel will show "-1".) | |

Fill out the installation report.

## 4.10 Troubleshooting Hints

1) If the unit is not powered on, check BUS+ and BUS- input. Make sure not reversed.
2) If voltage between BUS+ and BUS- is negative, you may have an incorrect order. **ALWAYS COUNT BATTERY ONE FROM POSITIVE OF BATTERY POWER.**
3) If the voltage between adjacent terminals is higher than 15V (12V battery), check the connection order.
4) If a channel registers no voltage, check the settings, make sure it is set for correct battery configuration.

# 5 Test and Calibration

## *5.1 Test with Internet Browser*

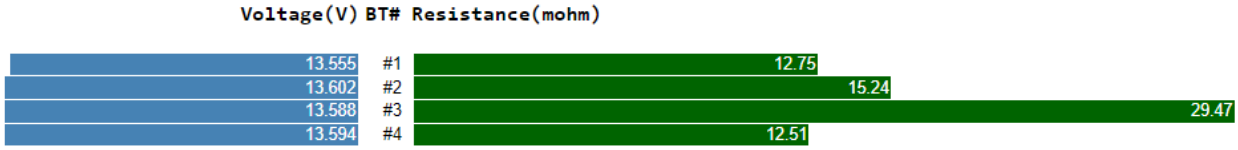
**BatteryDAQ™** Data | DTU Settings | Calibration

Sentry ID: 13273 **Site:name a site here**

9/1/2019, 11:55:37 AM Refresh

| | | | | | |
|---|---|---|---|---|---|
| String Voltage | **54.33 V** | String High | 54.36 V | String Low | 54.23 V |
| Remaining | **220 min** | Current | 0.1 A | Analog | 0.00 V |
| Total Runtime | 220 min | Ambient/Peak | 79.8 / 79.8°F | Pilot/Peak | 80.6 / 80.7°F |
| SOH(Health) | 45.9% | SOC(Charge) | 100.0% | ThermalRisk(Max) | 0 (0) |
| Discharge Counter | 0 | Deep Discharge | 0 | Full Discharge | 0 |

| Batt# | Voltage(V) | IR(mohm) | T(°F) |
|---|---|---|---|
| #1 | 13.555 | 12.75 | 79.7 |
| #2 | 13.602 | 15.24 | 79.8 |
| #3 | 13.588 | 29.47 | 80.6 |
| #4 | 13.594 | 12.51 | 79.8 |




BatteryDAQ LLC, USA

**Print/save a screenshot after installation.**

## 5.2 Calibration

Calibration can be done through web browser.

**BatteryDAQ™** Data | DTU Settings | Calibration

### Sentry ID: 13273 Calibration and Alarming Settings:

| - | Description | Stored Value | New Value |
|---|---|---|---|
| 1 | Calibration: Voltage Offset[8482] | -10 | -10 |
| 2 | Calibration: Voltage Gain | 10000 | 10000 |
| 3 | Calibration: Current Offset | -15 | -15 |
| 4 | Calibration: Current Gain(500 for 50A CT) | 500 | 500 |
| 5 | Calibration: IR Gain | 1425 | 1425 |
| 6 | Battery Capacity(Ah) | 100 | 100 |
| 7 | Battery Designed Runtime(min) | 480 | 480 |
| 8 | Battery SOH Compensation(x0.1%) | 0 | 0 |
| 9 | Internal Resistance Baseline(x0.01mohm) | 100 | 100 |
| 10 | Alarm: String Charge High(x0.1V) | 565 | 565 |
| 11 | Alarm: String Charge Low(x0.1V) | 525 | 525 |
| 12 | Alarm: String Discharge(x0.1V) Low | 432 | 432 |
| 13 | Alarm: Battery Charge High(x0.001V) | 14500 | 14500 |
| 14 | Alarm: Battery Charge Low(x0.001V) | 12900 | 12900 |
| 15 | Alarm: Battery Discharge Low(x0.001V) | 10800 | 10800 |
| 16 | Alarm: Temperature High (x0.1°C) | 450 | 450 |
| 17 | Alarm: Temperature Low(x0.1°C) | 50 | 50 |
| 18 | Alarm: Internal Res. Threshold(%) | 50 | 50 |
| 19 | Discharge: Depth of Discharge(%) | 50 | 50 |
| 20 | Discharge: Discharge Counter | 0 | 0 |

### 5.2.1 Temperature

Temperature reading is from laser calibrated digital sensor. No further calibration is required through its life time.

### 5.2.2 Current Calibration

Calibrate Gain if necessary. The rough gain is about CT's specified current x 10.

HASS-50 is a 50A CT, set gain to 500.

HASS-100 is a 100A CT, set gain to 1000.

If high precision is desired, use standard current source to calibrate gain.

Calibrate Zero:

1) Connect to current sensor/CT, (1 or 2 sensors) switch off battery or make sure there is no current passing through CT.
2) Adjust offset, until the reading is close to 0. (within +/-0.5A)

### 5.2.3 Voltage Calibration

**Voltage Gain**

String voltage is the sum of the battery voltage.

New gain = previous gain x actual string voltage / readout string voltage

**Voltage offset**

New offset = previous value - (actual voltage – readout )/2.33

### 5.2.4 Internal Resistance Calibration

Obtain standard/reference internal resistance from battery manufacturer datasheet or use a high performance internal resistance meter to conduct a manual measurement.

New value = previous value x (actual value / readout)

For example, actual value is 3.050mohm, readout is 2.751mohm, new calibration = previous calibration x (3.050/2.751=1.108)

### 5.2.5 Save to Onboard Flash

Type the passcode to save. Contact tech support to obtain passcode.

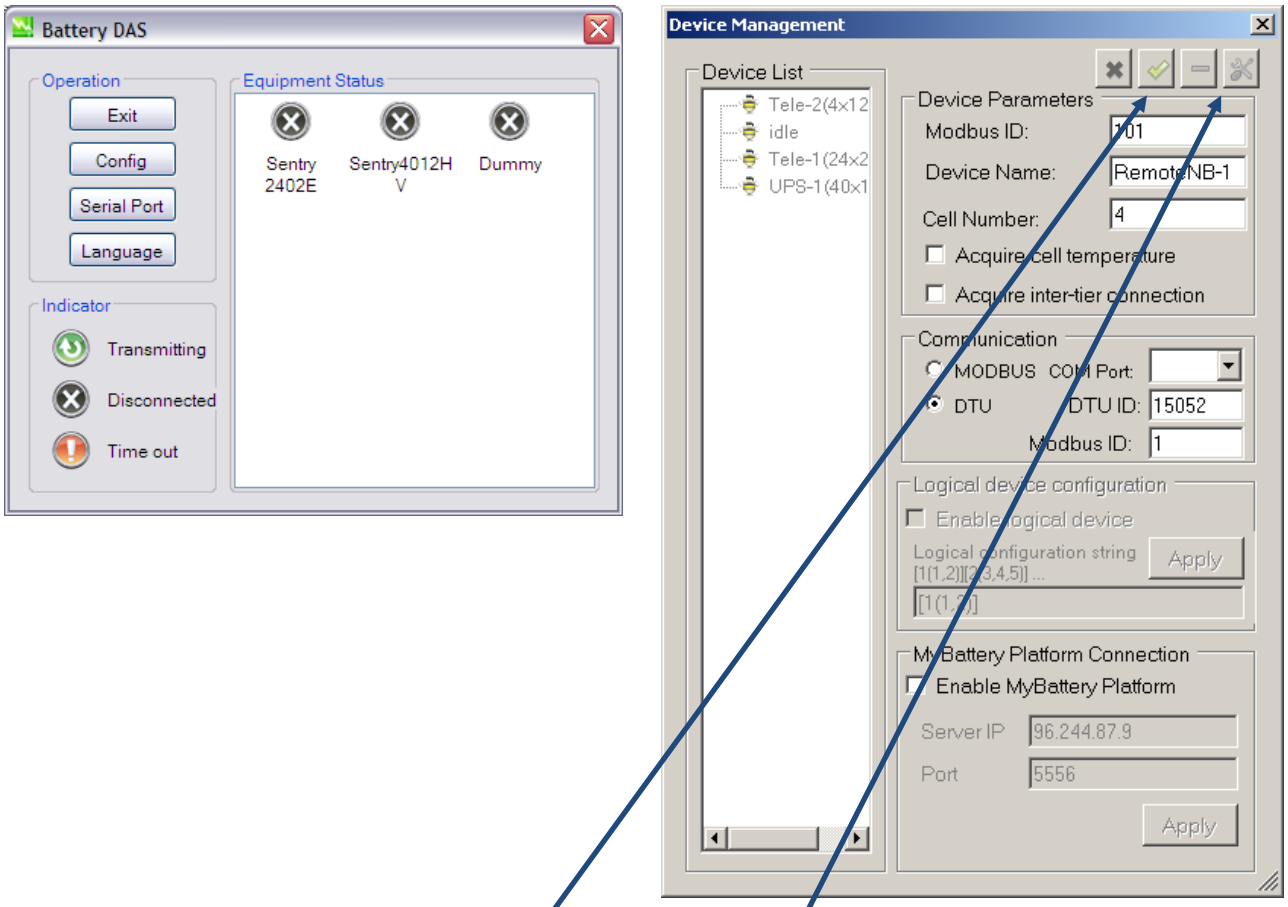
# 6 Battery Analyzer Software Setup

For software installation, please refer to software manual. Please note that the Analyzer and DAS can be installed in separate computers within the same network. The monitor devices connect to the computer which runs the DAS. Both Analyzer and DAS will need .NET framework.

## *6.1 DAS Configuration*

Sentry-NB4 and NB8 units support direct Modbus-TCP for up to 3 simultaneous connections.
**In the case of using direct Modbus-TCP, there is no need to run DAS software.**

After installation, run Battery DAS. Click “Config” to add device.




Click “+” to add new device or Click “Modify” to change selected device.

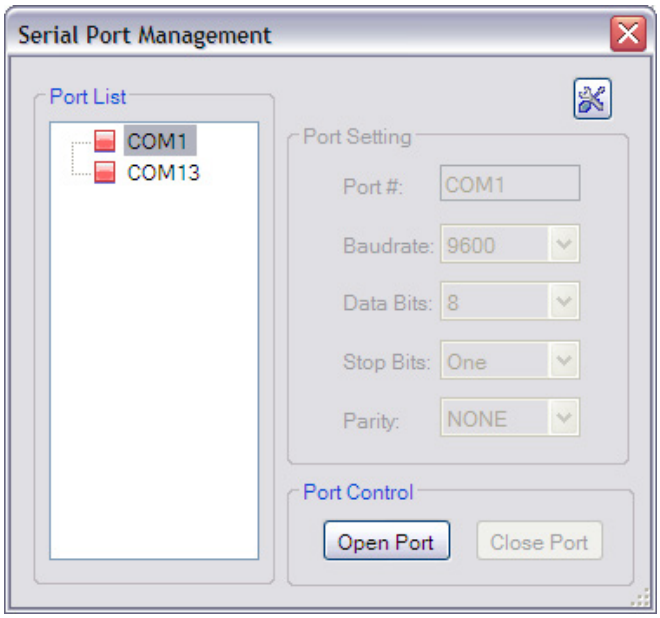
Give the unique Modbus ID (It is a virtual ID, not necessary the actual Modbus ID of that Sentry unit.)
Give the unit or power system a name for easy read and identification.
Set the correct battery number.
Uncheck “Acquire cell temperature” and “Acquire inter-cell connection”.

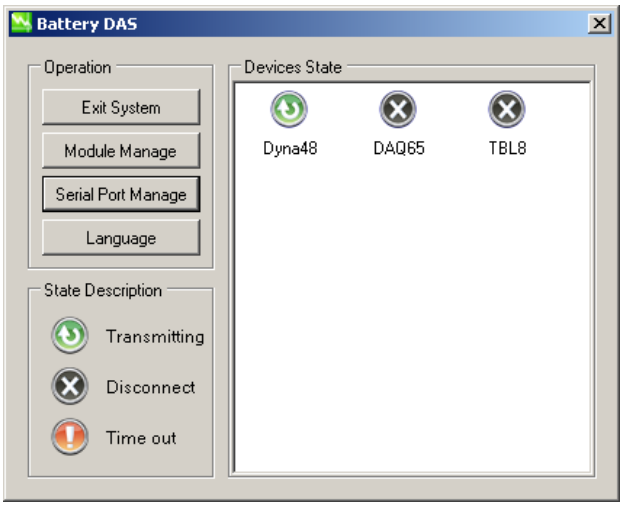
Select “DTU”, type the correct DTU ID and Modbus ID.
Click right/up corner to save.

When adding NB device, click DTU, type in DTU ID. **Assign a MODBUS ID to this DTU. (This Modbus ID can be different from the actual Modbus ID for that battery monitoring unit.)**

DAS can at the same time connect to other battery monitors with regular serial ports or remote serial ports.

Logical device can be used when one string is monitored by multiple units so the software will treat it as one large monitor. For example, a 240x2V battery string is monitored by 10 units of Sentry-2402W2, Modbus from 1 to 8, set to [1(1,2,3,4,5,6,7,8,9,10)].

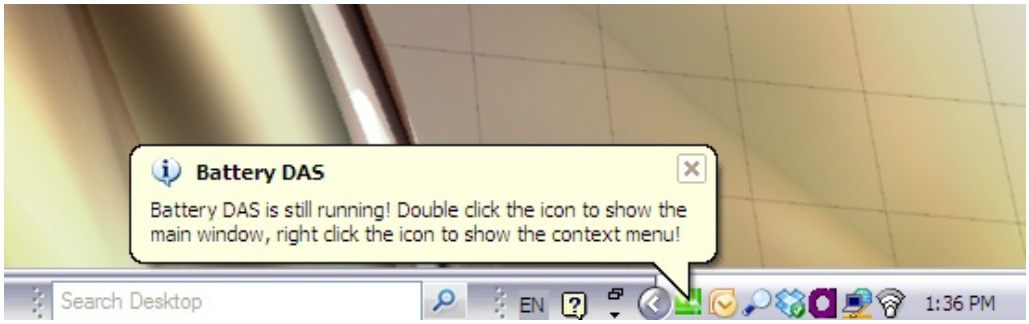



Click "Serial Port Manage" to set correct baud rate and others as above.
**By Default, Sentry is set in factory to 9600, 8, 1, NONE. No change shall be made here.**

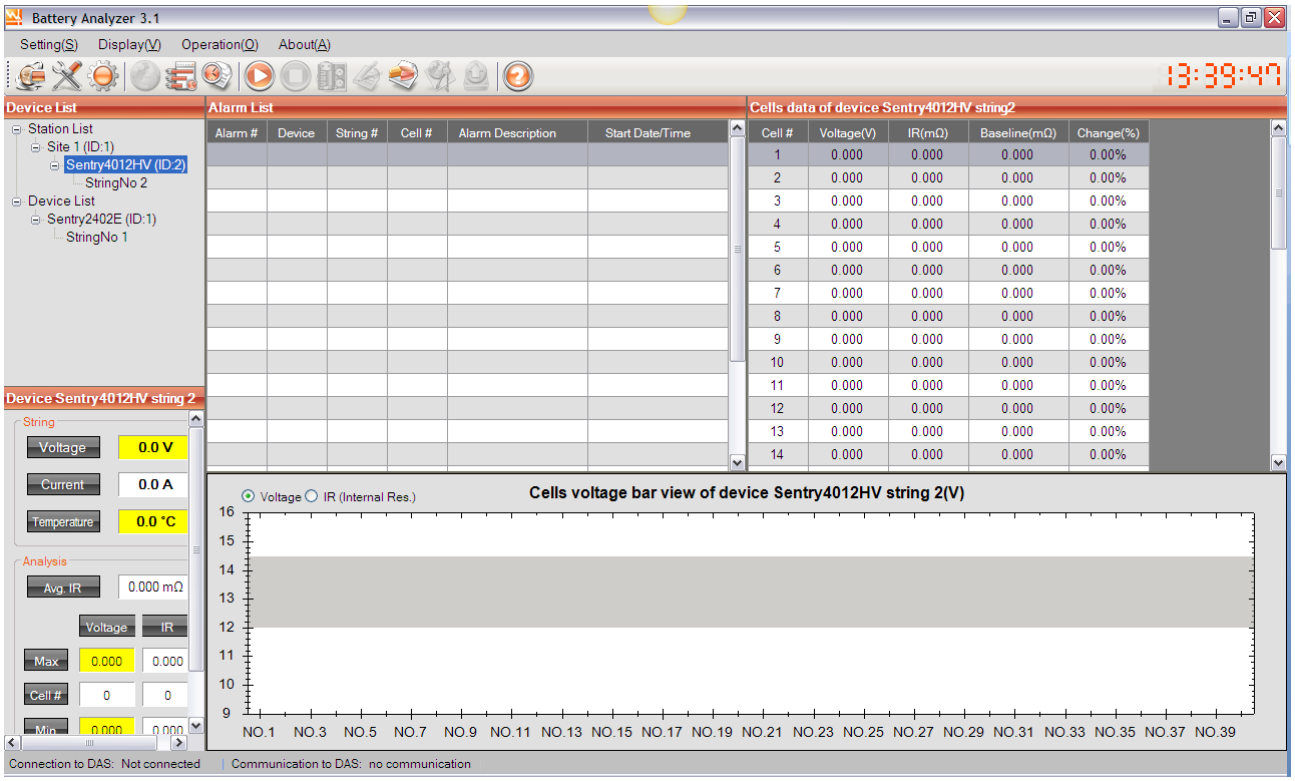
Click "Open Port" for **each serial port**, the DAS will run and the status should be GREEN.

When you close this application by clicking "X" on upper-right corner, DAS will continue to run in background.

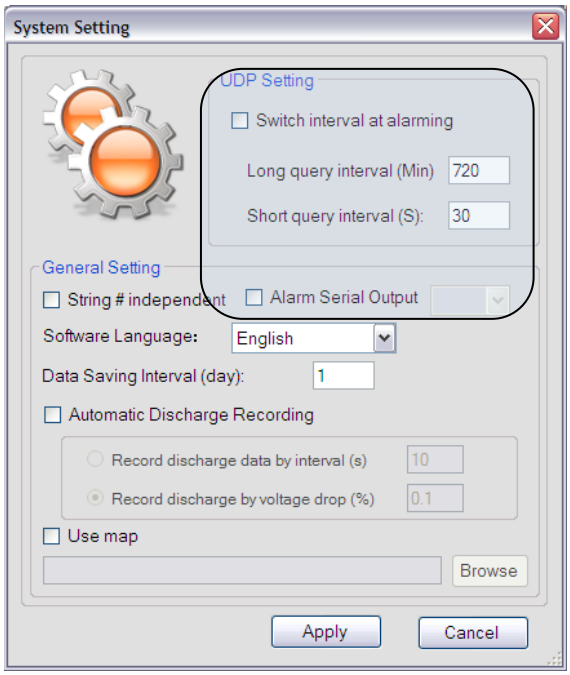


## 6.2 *Battery Analyzer configuration*

Run Battery Analyzer in the client computer.




### 6.2.1 System Setting



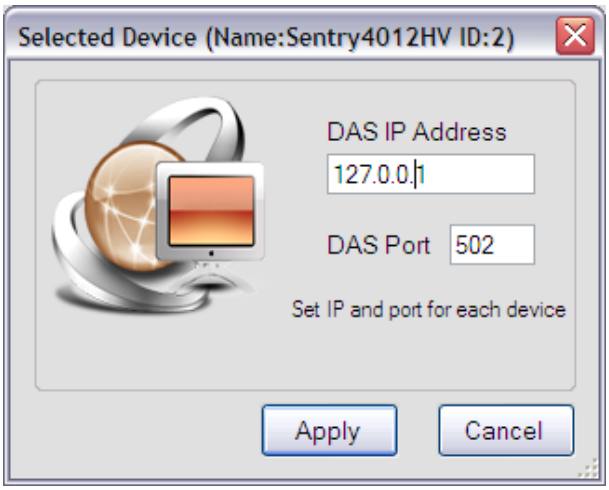

No need to set anything for “UDP Setting” and Alarm Serial Output.

For “Automatic Discharge Recording”, “Record discharge by voltage drop” is recommended.

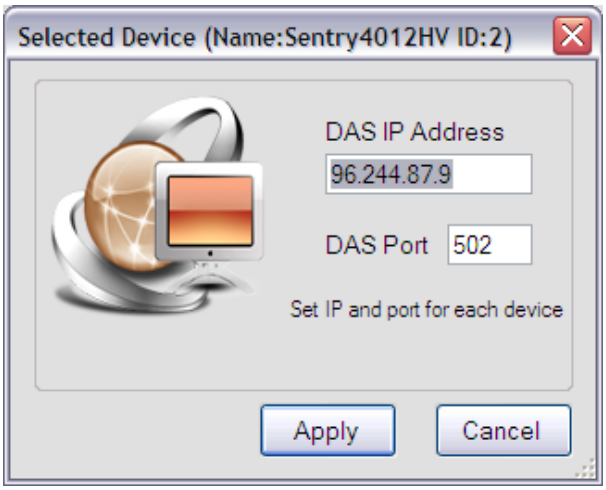
### 6.2.2 Server Setting

If the DAS and Analyzer are running in the same computer, set the IP as below. Otherwise, find out the IP for DAS computer.

When the DAS is running on the same computer, set IP to local 127.0.0.1




When DAS is running on a remote computer, set IP to the actual address.

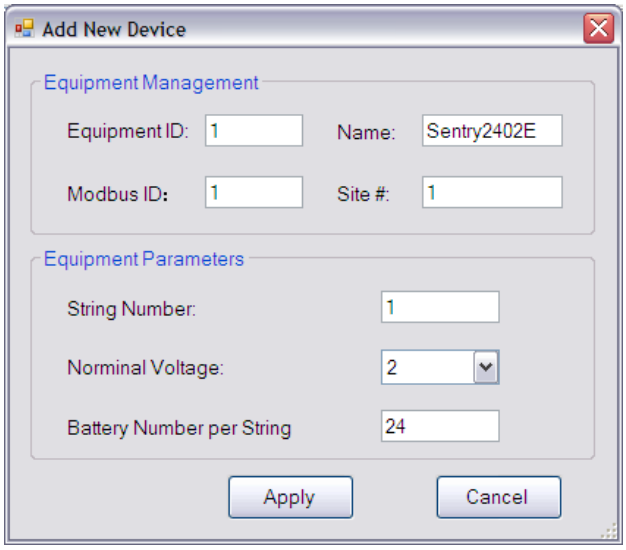



One DAS server can provide battery data to many clients, including Battery Analyzer software or other standard Modbus client using Modbus TCP.

Battery Analyzer software can manage data from multiple DAS sources.

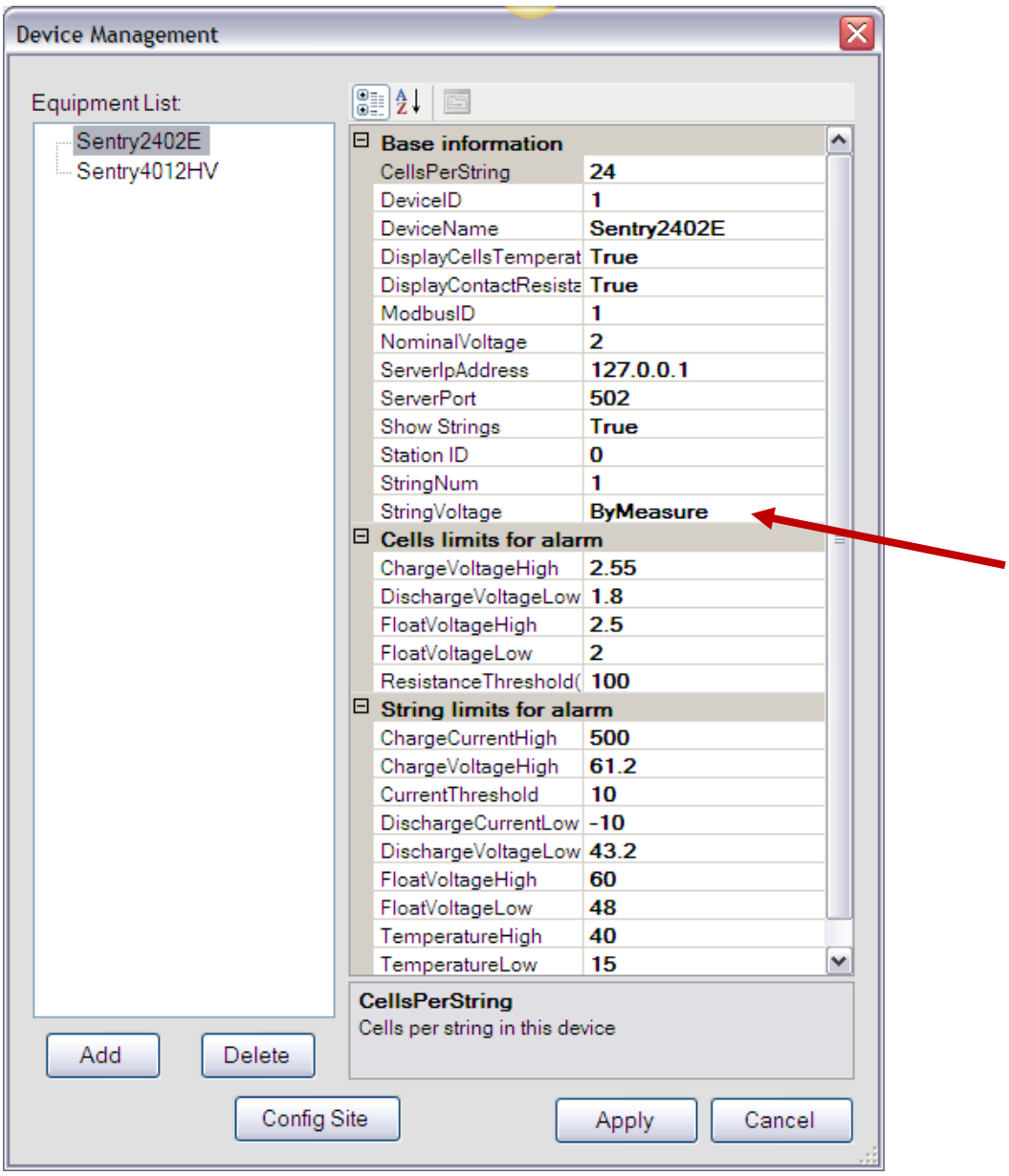
### 6.2.3 Equipment (Device) Management

In the Device Manager, you can modify the parameters for your batteries. The Device ID must match the Module Number in DAS.




Click “Add” on Device Management

Select 12V to automatically generate default parameters. Later you can make changes to those numbers/parameters.

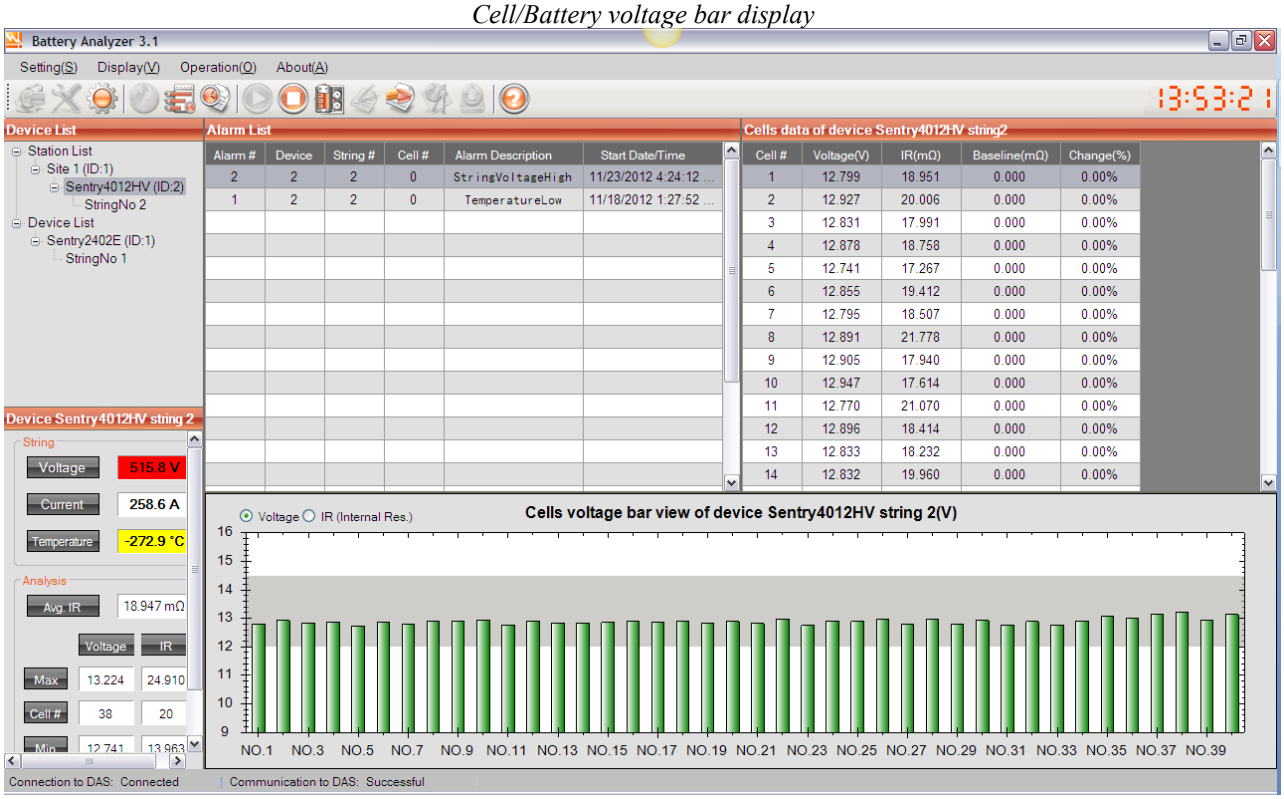



***Battery alarm parameters shall be adjusted for battery type and UPS/charger settings.***

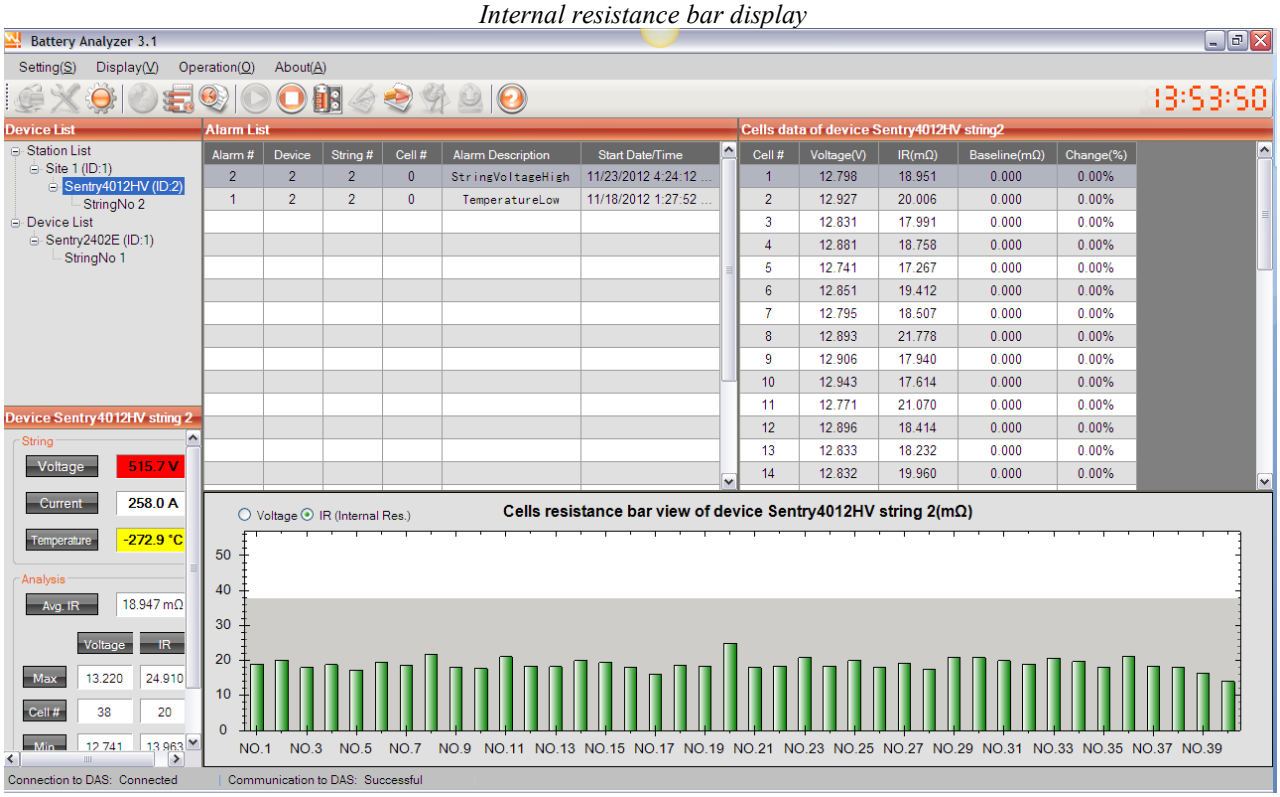
### 6.2.4 Data Viewer

If the setting is correct, select the device and start it. The real-time data should show on the screen.

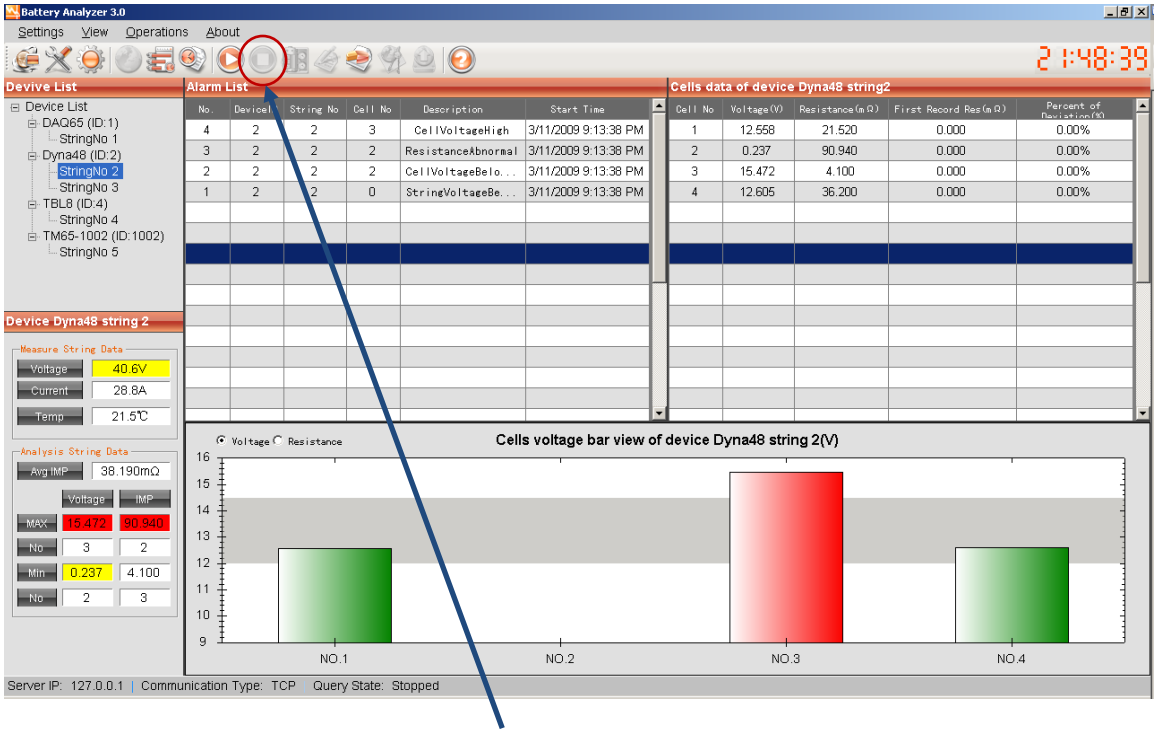
*Cell/Battery voltage bar display*




*Internal resistance bar display*



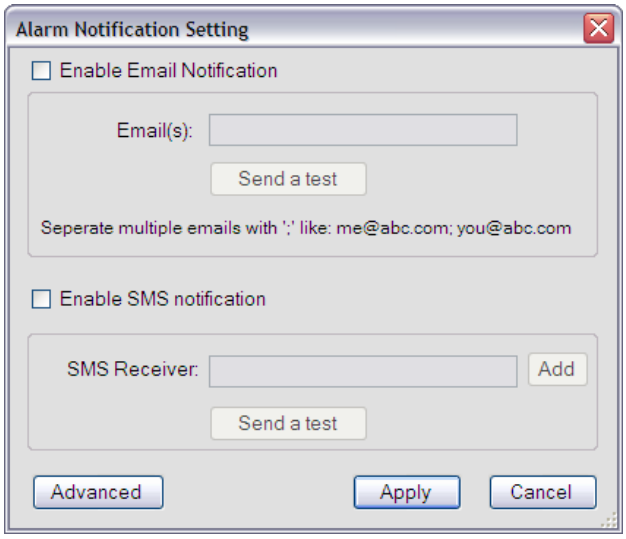
If the link is not correct, or battery data is out of range, the color will change with alarm highlighted.

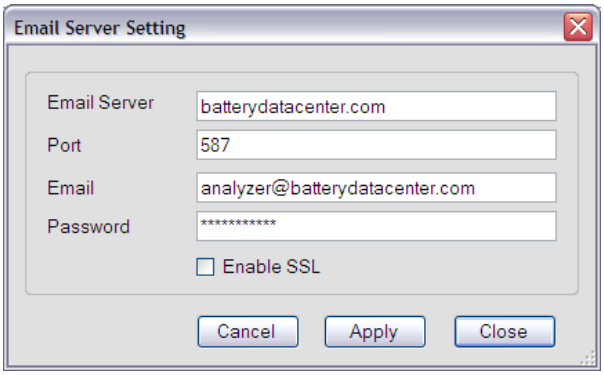



If you need to change any setting, click “Stop” to make the setting visible.

Right click data window to export data to Excel sheet. If you are not sure the data is within correct range, you can send the file to BatteryDAQ technical support.

### 6.2.5 Alarm Notification

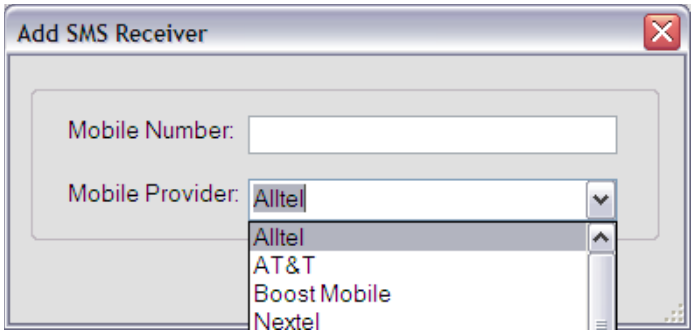



Click “Advanced” to config mail server. You may continue to use our server for email if you don’t have one. However, no performance or availability guaranty is made by BatteryDAQ.

SMS (mobile phone message) may only work for certain carriers. After setting, send a test to confirm.

.

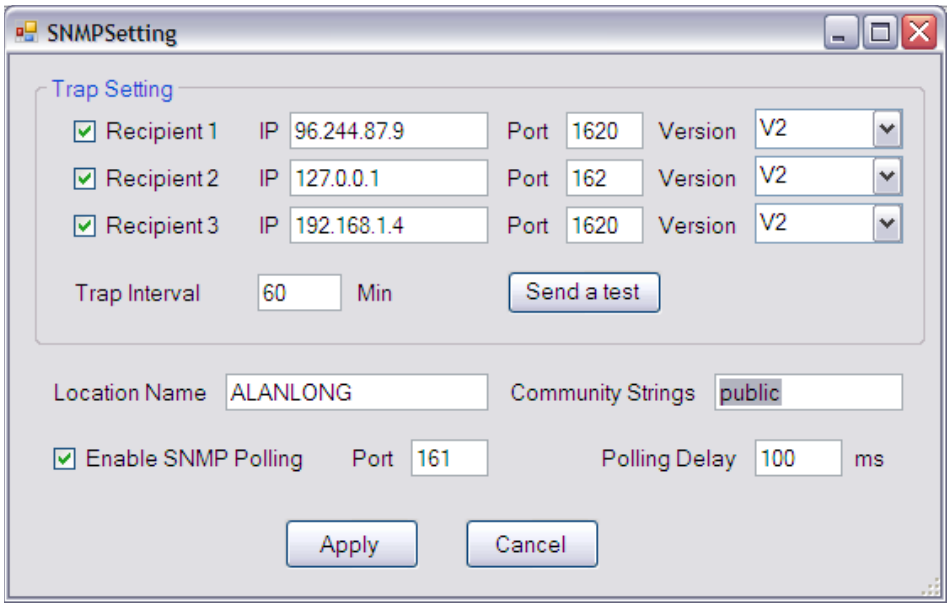



**Alltel**
**AT&T**
**Boost Mobile**
**Nextel**
**Sprint PCS (now Sprint Nextel)**
**T-Mobile**
**US Cellular**
**Verizon**
**Virgin Mobile**

### 6.2.6 SNMP Setting

You may set up to 3 SNMP recipients.

Please find MIB file in your software CD or contact us at tech@batterydaq.com




*For other functions not mentioned in this manual, please refer to Battery Analyzer software manual.*

# 7 Installation Record

**Measurement**

| Parameters | Value or Range | Note |
|---|---|---|
| Battery Capacity | | |
| Cell Number | | |
| Cell Voltage | | |
| Nominal Bus Voltage | | |
| Floating Charge Voltage: | | |
| Maximum Discharge Current | | |
| Maximum Charge Current | | |
| Temperature Range | | |

**Data Analysis**

| Parameters | Low Value | High Value | Note |
|---|---|---|---|
| Cell Voltage Abnormal | | | |
| Cell IR Threshold (Absolute setting to Sentry) | | | |
| Cell IR Abnormal (Percentage setting to PC software) | N/A | | |
| Bus Voltage Abnormal | | | |
| Discharge Current | N/A | | |
| Charge Current | N/A | | |
| Ambient Temperature | | | |
| Deep Discharge (Percentage or Voltage) | | | |

**Communication/Networking**

| | |
|---|---|
| Network Adapter IP Address (if set to static): | |
| Modbus Address (Default 01) | |
| DTUID | |
| Host: (www.thisbattery.com) | |

| **Other Notes** |
|---|
| |

# 8 Installation Acceptance Report

| | |
|---|---|
| Company Name: | Sentry Monitor Serial No: |
| Engineer: | DTU ID: |
| Site Name: | Address: |
| Installation Date: | |
| Battery type: | Capacity: Ah |
| Cell Voltage: V | Battery Number in This String: |
| Bus Voltage: V | Designed Maximum Current: A |

**Current and Temperature Measurement**

| | | |
|---|---|---|
| **Sensor model:** | **Calibration Offset:** | **Calibration Gain:** |

| | Current Test 1(open circuit) | Current Test 2 | Current Test 3 | Temperature |
|---|---|---|---|---|
| Measured Value | | | | |
| Readout | | | | |
| Difference | | | | |

**Voltage Measurement**

| | |
|---|---|
| **Calibration Offset:** | **Calibration Gain:** |

| Battery # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Reference | | | | | | | | |
| Readout | | | | | | | | |
| Percentage | | | | | | | | |

**Internal Resistance Measurement Comparing to Reference**

| | |
|---|---|
| **Instrument name/model:** | **IR Calibration:** |

| Battery # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Reference | | | | | | | | |
| Readout | | | | | | | | |
| Percentage | | | | | | | | |

| | |
|---|---|
| Signature | Date |

If there is any concern of accuracy, please send this report to customerservice@batterydaq.com

## Records

Note: