Sentry-FT User Guide

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BatteryDAQ LLC

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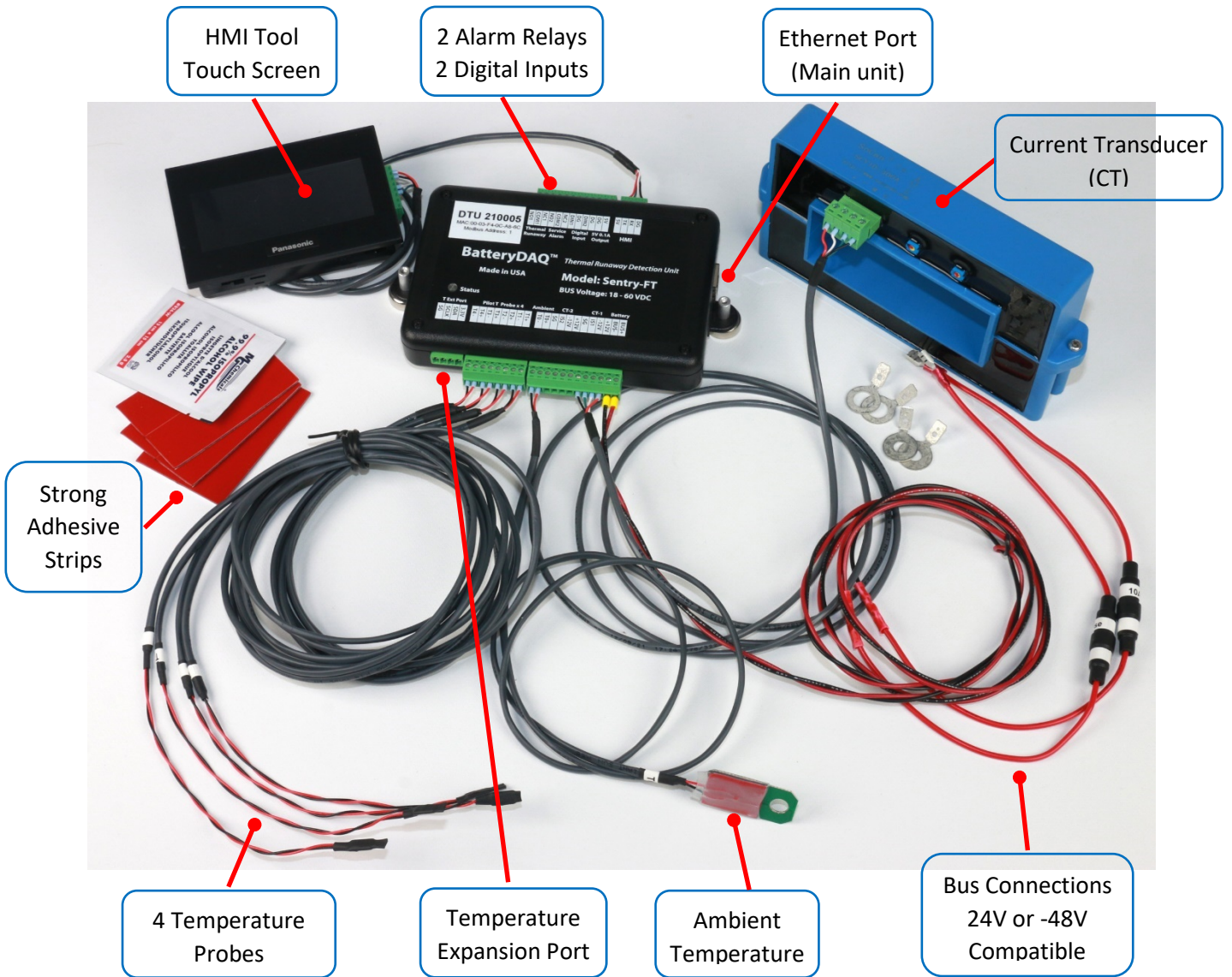
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1 System Functions

The **Sentry-FT** unit monitors bus voltage, battery bank floating current, ambient temperature, and multiple battery string temperature points. Utilizing embedded data analysis, the Sentry-FT provides reliable early-stage thermal runaway detection and immediate notification to a variety of user-desired site monitoring platforms.

The Sentry-FT performs these very important functions, without connecting to individual batteries. By connecting to the Bus, technicians will not touch the battery posts during installation, and can replace batteries, without having to remove/reconnect wiring for the battery monitor.
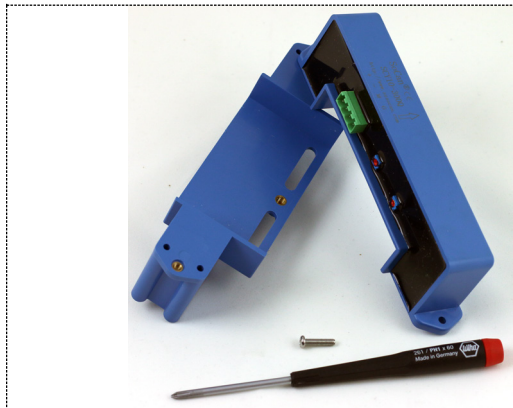
Real-time status can be viewed at local, regional, and NOC locations, and services can be scheduled accordingly.

- **Intelligent algorithm detects thermal runaway risk at its earliest stage**
- **Multi-point temperature monitoring**
- **Precise floating current monitoring**
- **String voltage monitoring**
- **No connection to individual batteries**
- **Risk alarms/dry contacts can be sent to the NOC or the rectifier, or both**
- **Secured wireless interconnection allows for communication between multiple Sentry monitors at a site**
- **Discharge events captured with date/time stamp**
- **Historical data (20+ years) stored on board and accessible for view/download via Ethernet**
- **Laptop connection for data downloads when the device is not in the network**
- **Plug and play HMI field service tool for the technician to perform installation and site visits**
- **Remote access to battery data using http/ftp**
- **Remote secured DTU firmware update via web page**
- **Modbus-TCP for integration**
- **IPv4 and IPv6 compatible**

Full kit with HMI Tool

HMI Tool
Touch Screen

2 Alarm Relays
2 Digital Inputs

Ethernet Port
(Main unit)

Current Transducer
(CT)

Strong
Adhesive
Strips

4 Temperature
Probes

Temperature
Expansion Port

Ambient
Temperature

Bus Connections
24V or -48V
Compatible

(HMI is a service tool, one for each technician. Please unplug from unit after use.)

High precision, low drift split core CT for easy installation.

Window size 104mm x 40mm.

(Kit Description Cont'd)

For sites with multiple battery banks, one "Primary" unit (Main Unit) and multiple "Dependent" units will be needed.

The main unit has an Ethernet port. It communicates with dependent units via secured wireless. Wireless distance will vary depending on cabinet material and construction. If the wireless signal is shielded by the cabinet, an optional external antenna is available.

Alarm(s) can be collected from the main unit, or from each individual unit if the setting "**Alarm via Main Unit**" is turned off.

4	Alarm via Main Unit 1:ON, 0:OFF	1	1

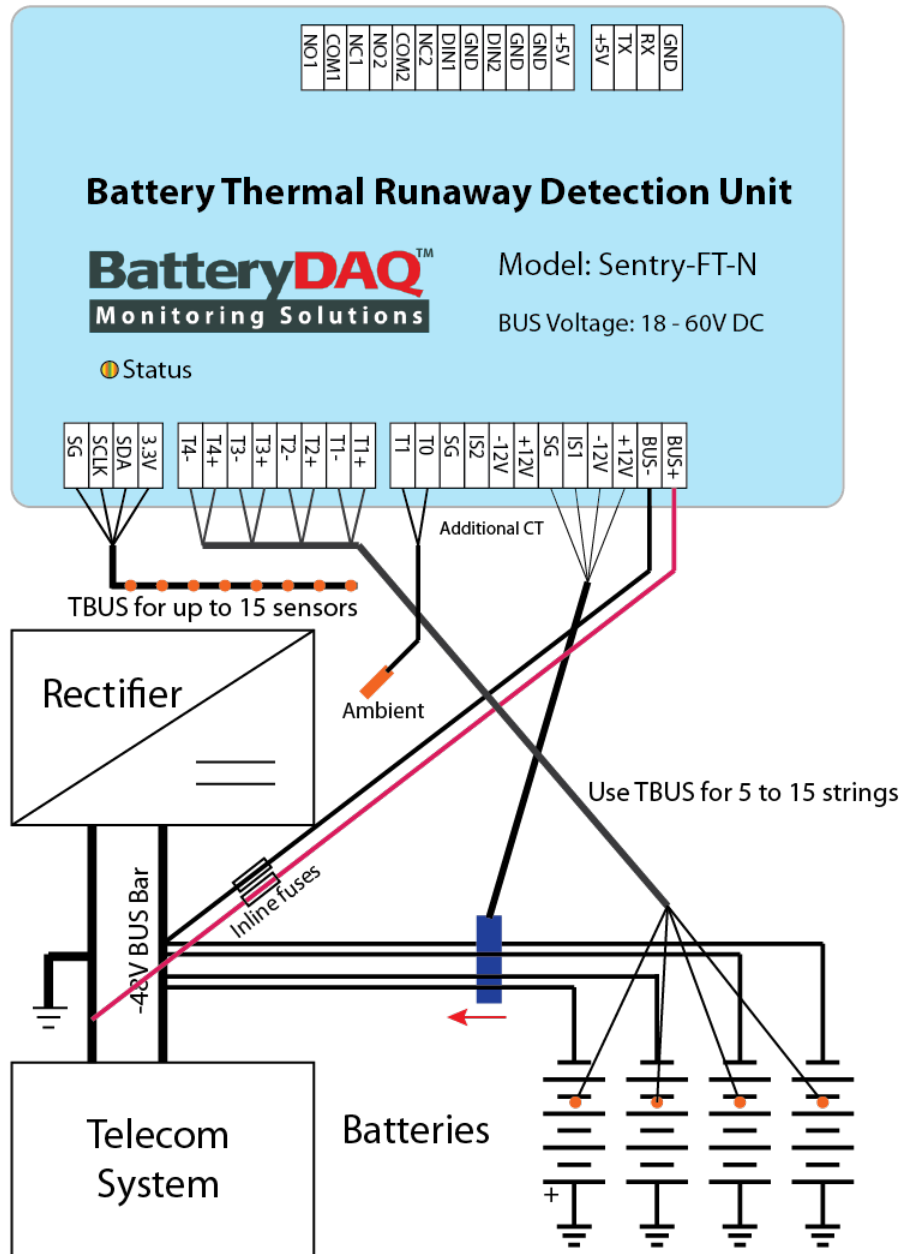On an aluminum battery enclosure, the mounting magnet(s) can be removed, in order to utilize the mounting holes.

Before attaching to the steel rack, the protective washer shall be removed.

1.1   Schematics for installation on a 48V system

When the battery bank has more than 4 strings, unplug T1-T4 terminals, and connect the T bus cord to the TBUS port. Attach one temperature probe/node to each battery string.
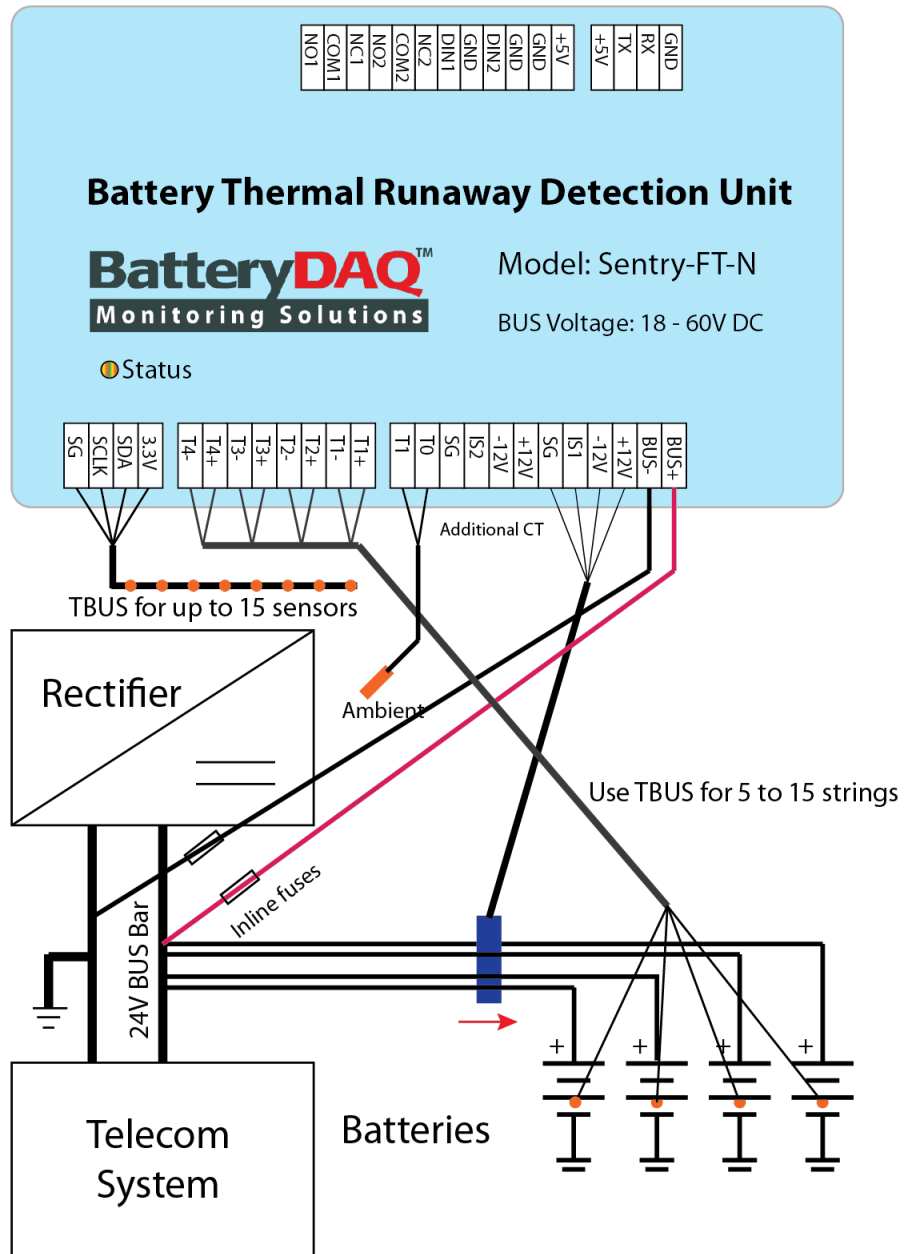
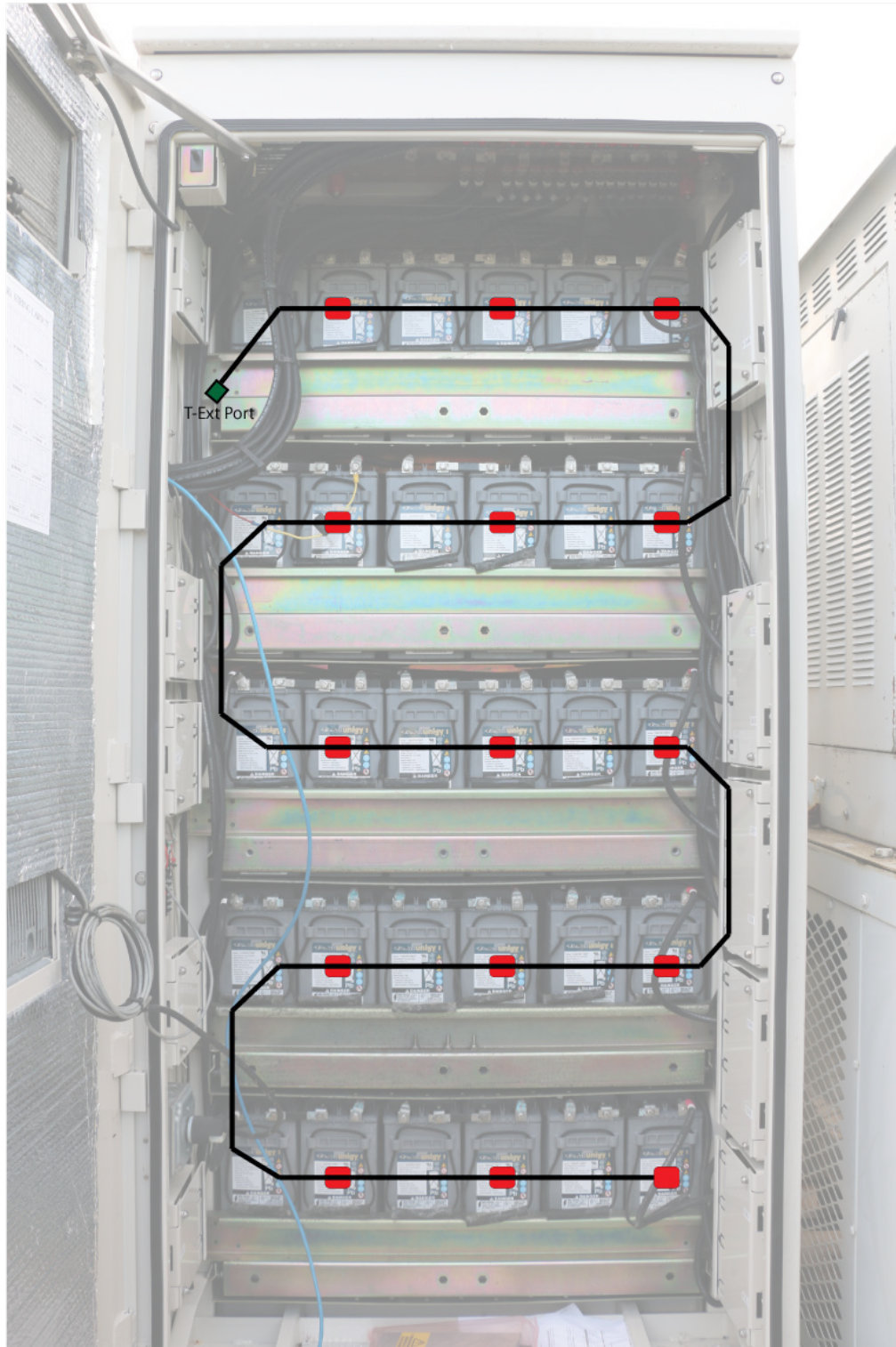## 1.2   Schematics for installation on a 24V system

When the battery bank has more than 4 strings, unplug T1-T4 terminals, and connect the T bus cord to the TBUS port. Attach one temperature probe/node to each string.

1.3 Diagram for TBUS installation

(Example, TBUS for 12 strings of 2x12V)

2   Specifications

Battery Bank	
Battery Configuration	24V or 48V cabinet/rack Lead Acid VRLA or Nickel Cadmium 1 to 15 strings per bank
Power Input	Internal DC/DC converter, 18-72V input; Maximum Consumption: 5W
Bus Voltage	Range: 18 – 72V; Measurement Accuracy: 0.1%
Float Current/Temperature Measurement	
Current Sensing	Current measurement for a battery bank Split core, window size 40x104mm Range: +/-450A, resolution: 0.1A
Temperature Sensing	1 ambient 4 pilot probes per unit (default, for 1 to 4 strings) T-Bus with up to 15 nodes/probes (for 5 to 15 strings) Intelligent thermal runaway detection algorithm
Temperature Range	Measurement range: -40 to 100°C (-40°F to 212°F)
Accuracy	1°C
Voltage Measurement	
Battery Configuration	24V or 48V cabinet/rack, with 1 to 15 strings per bank. Lead acid or Nickel Cadmium (Not tested for Lithium batteries)
Bus Voltage	Range: 18 – 60V; Accuracy: 0.1% +/-0.1V
Environmental Limits	
Operating range	-30°C to 75°C (-22°F to 167°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Relative Humidity	5 to 95% (non-condensing)
Altitude	2,000 M
Communication	
Ethernet	Onboard Ethernet DTU with HTTP and FTP. Embedded web pages for real-time data and historical file access Modbus-TCP for integration with 3rd party central management software
Wireless	Secured wireless connection to up to 7 additional units on a site
Indication and Output	
LED indication	Dual-color LEDs for status and alarm
Alarm/Control Output	Alarm-1: Normal Close/Open, 1A capacity, thermal alarm Alarm-2: Normal Close/Open, 1A capacity, service alarm
Dimensions	
Unit Dimensions	181mm(H) x 102mm(D) x 38mm(W), 7.14 x 4.01x 1.50 inch
Mounting	Dual magnetic cups that can be removed if mounting screws are preferred

*Specifications subject to change without notice

3   Unit Connection Terminals

Plug-1: BUS and Current Transducers				Plug-2: Temperature Probes		
Pin	Name	Function and cable color		Pin	Name	Function
1	BUS+	24 or 48 battery bus Positive (10A Fuse). RED		1	T1+	T probe-1
2	BUS-	Battery bus Negative (10A Fuse). BLACK wire		2	T1-	
3	+12V	CT power +12V (RED)	CT plug	3	T2+	T probe-2
4	-12V	CT power -12V (WHITE)		4	T2-	
5	IS1	CT Signal-1 (GREEN)		5	T3+	T probe-3
6	GND	CT signal ground (BLACK)		6	T3-	
7	+12V	Reserved +12V		7	T4+	T probe-4
8	-12V	Reserved -12V		8	T4-	
9	IS2	Reserved Signal-2, short to GND when not used.	N/C			
10	GND	Reserved signal ground				
11	T0+	Ambient T0 probe	T0 probe			
12	T0-	Ambient T0 probe				

*2-wire temperature probe has no polarity.

Plug-3: HMI Port			Plug-4: Digital I/O		
Pin	Name	Function	Pin	Name	Function
1	+5V	5V for HMI	1	NO1	Normal Open
2	TX	RS232 TX	2	COM1	Alarm-1, thermal risk high alarm
3	RX	RS232 RX	3	NC1	Normal Close
4	GND	GND for HMI	4	NO2	Normal Open
			5	COM2	Alarm-2, service alarms
			6	NC2	Normal Close
			7	DIN1	Digital Input-1
			8	GND	
			9	DIN2	Digital Input-2
			10	GND	
			11	GND	5V GND
			12	+5V	5V output (100mA)

4   Measurements and Data Processing

The Sentry-FT unit connects to the DC bus.

Depending on the installation preference, either **Positive** or **Negative** bus cables can be chosen for use with the current transducer.

Temperature probes will be attached to the battery surface using the provided strong adhesive strips. Replacement adhesive strips are available for reattaching probes, after battery replacement.

	Description	Notes
Battery Bank Voltage	Measured from the BUS connection. Charging state alarm: String Voltage High or Low Discharge state alarm: Discharge Voltage Low Dry contact output on ALARM#2	The measurement threshold can be changed with the HMI. Default Settings for 48V String Voltage High: 56.4V String Voltage Low:52.8V Discharge Voltage Low: 43.2V Default Settings for 24V String Voltage High: 28.2V String Voltage Low: 26.4V Discharge Voltage Low: 21.6V
	[Battery Bank Voltage alarm is disabled per VWZ instruction.]	
Current	Measure charge and discharge current. Float charge current is used for the thermal risk calculation.	A split core, low drift current transducer is utilized. Transducer direction arrow on the top of the CT matches the charging current direction. **For best performance, use the HMI to calibrate current offset/ZERO before install to bus cables.**
Ambient Temperature	1 ambient probe	The ambient temperature probe is usually placed near the bottom of the battery cabinet, or the ventilation inlet. Do NOT place the ambient probe close to the air conditioner outlet. **[Alarm settings are fixed.]**

(4 Measurements and Data Processing cont'd)

String Temperature	Multiple string temperature probes	For 1 string of either 24x2V or 12x2V battery bank, 2 pilot probes shall be used. For **1-4 strings of 4x12V or 2x12V** battery bank, each string shall have one temperature probe installed. For **more than 4 strings of 4x12V or 2x12V** battery bank, unplug 8-pin temperature probe terminal from the unit, connect the TBUS cable, and attach 1 probe for each battery string. Use included adhesive mounting strips to secure the pilot probes to the battery surface.

Alarm processing is based on the battery's status, temperature, and current.

Alarm Types

Note: All alarms will be suppressed for 24 hours after a discharge is detected (or 12 hours if a discharge is less than 5 minutes.)

Alarm	Condition	Thermal Alarm	Service Alarm
Thermal Runaway	Delta Temperature (battery minus ambient): > 6°C | 11°F **and** Float Current: >6 A	☒	☒
Float Current High	Float Current: >6 A		☒
High Temperature	Any temperature probe (batteries or ambient) > 65°C | 148°F		☒
High Delta Temperature	Delta Temperature (battery minus ambient): > 15°C | 27°F		☒
Temperature Sensor Failure	This alarm will activate when the temperature probe exceeds its operating range.		☒
Current Sensor Failure	When CT is not connected		☒
Communication Failure	If any "Dependent" unit fails, or is disconnected from the system. A service alarm is triggered on the main unit. Beeping interval will be 2 seconds on and 15 seconds off.		☒

Beeping Sound

Normal	Service Alarm	Urgent Alarm	Alarm via Main Unit
No beeping	Slow beeping	Fast beeping	Prolonged beep for 2 seconds, then silent for 15 seconds. Repeated.

5 Part List

A Sentry-FT kit will be prepared for each site based upon provided order information.

Each kit will include one Main Sentry-FT unit and any additional Dependent Sentry-FT units, Current Transducers, Temperature Probes, and other accessories for bus connection and mounting.

Kit Type	Site Type	Site Number	Main Battery Bank	Bank#2	Bank#3	Bank#4
K001	Shelter	100	24x2V, 1 string	4x12V, 4 strings	2x12V, 15 strings	-
K002	Outdoor	50	NiCad, 2 strings	NiCad, 3 strings	NiCad, 1 string	-
K003	-	-	-	-	-	-

The kit will be labeled with Kit Type and Battery Bank information on the package.

<table>
<tr>
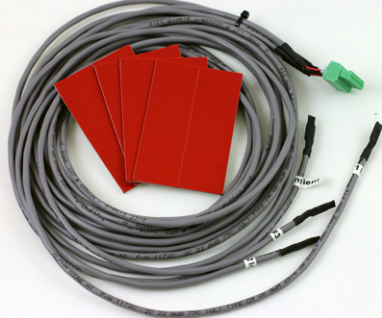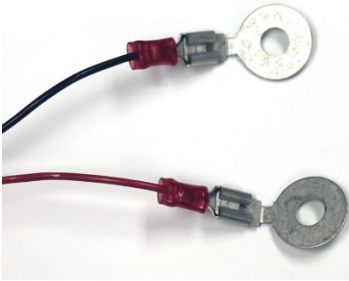<td align="center">

Kit Type: VZW-K001

Main Bank, 24x2V, 1 string

Bank#2, 4x12V, 4 strings

Bank#3, 2x12V, 15 strings

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<td align="center">

Kit Type: VZW-K002

Main Bank, NiCad, 2 string

Bank#2, NiCad, 3 strings

Bank#3, NiCad, 1 strings

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| Item	Part	Name	Quantity	Notes
1	Sentry-FT-M	Main Sentry-FT unit	1	Main unit with Ethernet network port and data storage Includes ambient probe (3FT), bus connection cable (5FT), tab washers.
2	Sentry-FT	Dependent Sentry-FT unit	N	Multiple dependent units can be installed on one site. Includes ambient probe, bus connection cable, tab washers.
3	CT-SCY10-300Q	Current transducer	1 per unit	Each Sentry-FT unit need one CT. Comes with 6FT cable to plug#1
4*	TS-PT1000-1	Temperature probe	4 per unit	4 pilot probes (default 5FT) for battery bank with **1 to 4** strings.
5*	TBS-P1075-N	Temperature bus	1 per unit	Temperature bus cable with **N** nodes/probes for battery bank with **5 to 15** strings. TBS-P1075-**6** for 6 strings of 4x12V TBS-P1075-**15** for 15 strings of 2x12V
6	HMI-GT02-FT	HMI display	Additional purchase	One for each technician. Plug & play service tool.

* Choose item **#4** for 1-4 strings per bank, or choose **#5** for 5 to 15 strings per bank.

(5 Parts list cont'd)

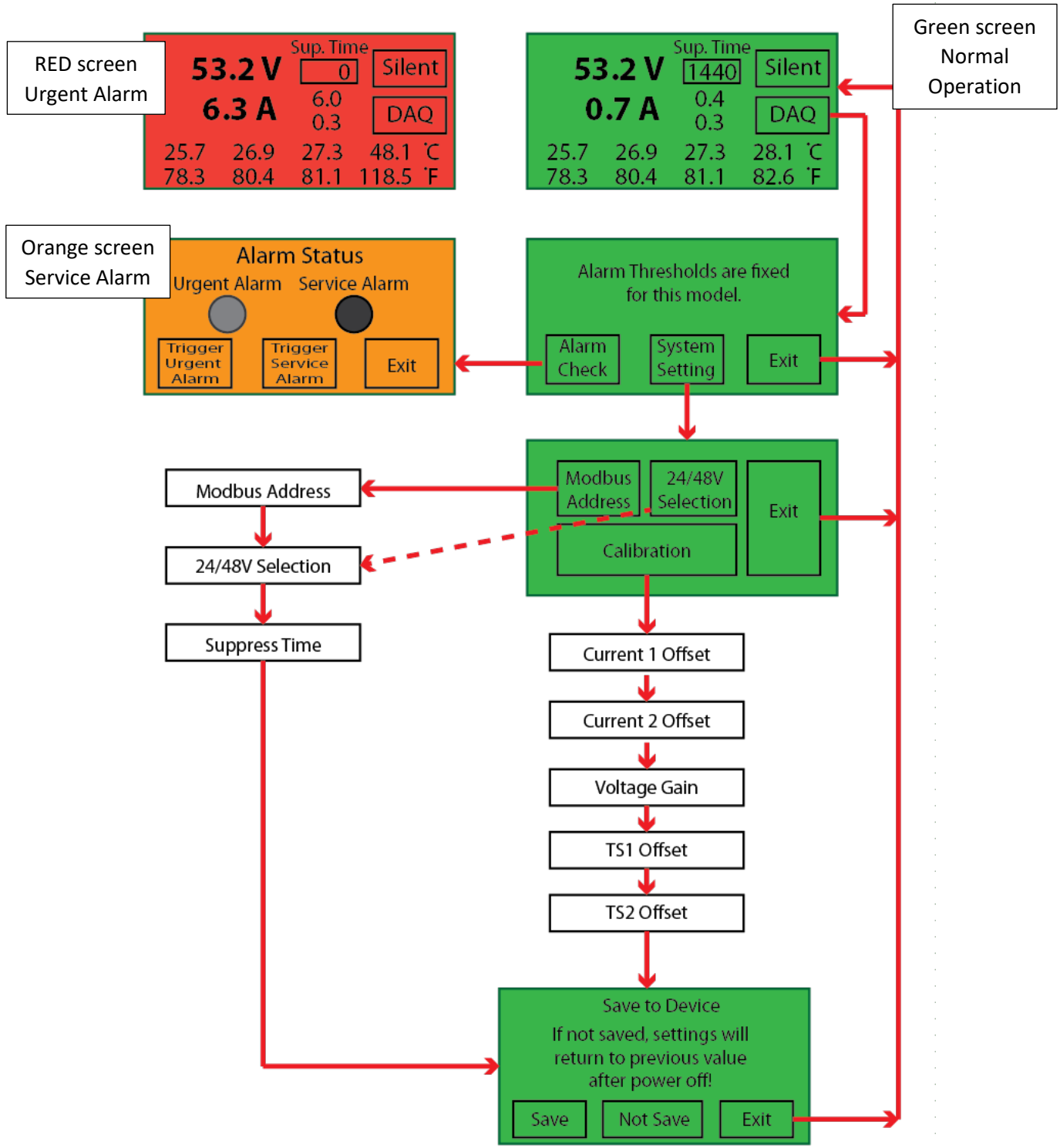|		
Attach temperature probes to the battery surface with included adhesive mounting strips (3M Scotch 1"x 3" Extremely Strong Mounting Strip, P/N: **414P-ST**)	Tab washers for BUS connection 6mm (1/4"), 8mm (5/16") and 10mm (3/8") **Bolts/nuts are not included**.	Magnet x 2 Ethernet port RJ45 cable is not included.

One Kit package contains 1 or more Sentry-FT units and accessories.

Example: Below photo shows a kit for 2 battery banks on a site.
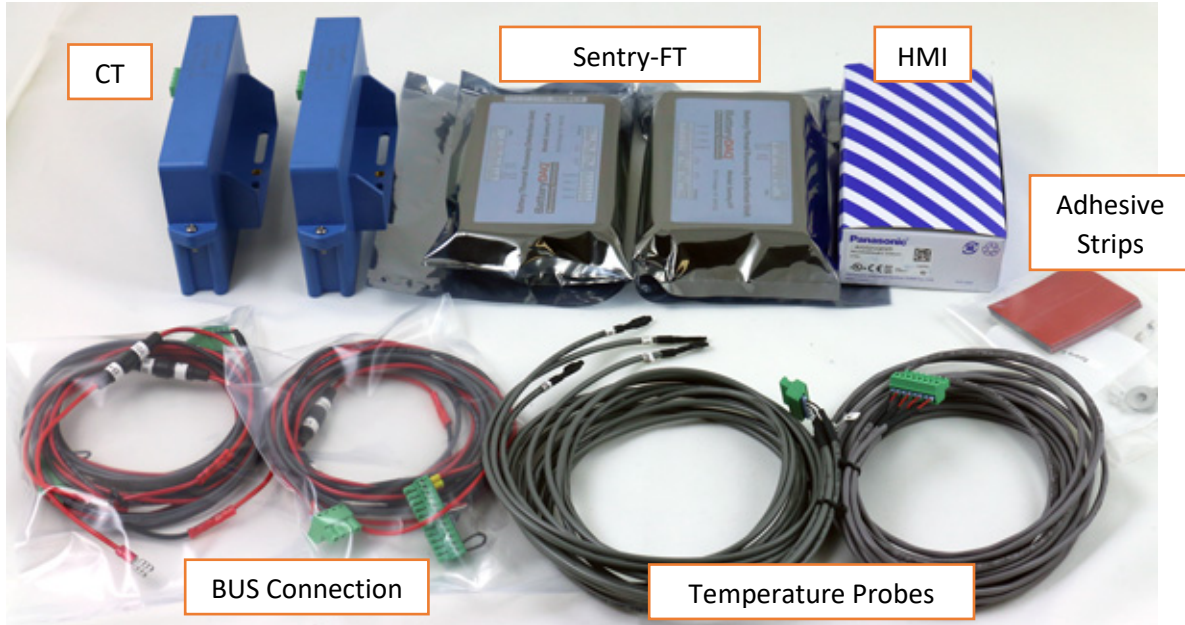
6 HMI Tool

The HMI touch screen is a tool to change/check settings and read out data/alarm during installations and field service.

RED screen
Urgent Alarm

Sup. Time		
53.2 V	0	Silent
6.3 A	6.0 / 0.3	DAQ
25.7	26.9	27.3	48.1 ℃
78.3	80.4	81.1	118.5 ℉

Sup. Time		
53.2 V	1440	Silent
0.7 A	0.4 / 0.3	DAQ
25.7	26.9	27.3	28.1 ℃
78.3	80.4	81.1	82.6 ℉

Green screen
Normal
Operation

Orange screen
Service Alarm

Alarm Status
Urgent Alarm   Service Alarm

Trigger Urgent Alarm | Trigger Service Alarm | Exit

Alarm Thresholds are fixed
for this model.

Alarm Check | System Setting | Exit

Modbus Address

Modbus Address | 24/48V Selection | Exit
Calibration

24/48V Selection

Suppress Time

Current 1 Offset

Current 2 Offset

Voltage Gain

TS1 Offset

TS2 Offset

Save to Device
If not saved, settings will
return to previous value
after power off!

Save | Not Save | Exit

(6 HMI Tool Cont'd)

HMI	Display/Settings
Main Screen	Main screen displays Voltage, Current (CT-1 and CT-2), and 4 temperatures in Celsius and Fahrenheit. Screen changes to RED for an Urgent Alarm (Thermal Runaway), or Orange for a Service Alarm. It also displays remaining alarm suppression time in minutes. Every time there is a discharge, the suppression time will reset to setting.
Alarm Status	Check alarm output. Urgent alarm is for Thermal Runaway. Service alarm is for temperature high, delta temperature high, floating current high. Alarm delivery can be verified manually by: Pressing "Trigger Urgent Alarm" will generate an urgent alarm for 5 seconds. Relay switches on/off. Pressing "Trigger Service Alarm" will generate a service alarm for 5 seconds. Relay switches on/off.
Modbus Address	The main unit will have the address 1. Subsequent units can be set to 2, 3, 4, 5 etc. Addresses must be different within a site. Set the DTU to match the addresses.
24/48V Selection	No need to set. Unit will automatically adjust to 24 or 48V system.
Suppression Time	Set in minute increments. Default is 1440 minutes (24 hours). *[For test convenience, the suppression time can be set to a shorter value beginning at 30 minutes. Once deployed, the time will be a fixed value of 1440 minutes.]*
Current-1 Offset	Fine adjustment for zero when no current is passing through the CT. (Gain is fixed.)
Current-2 Offset	Fine adjustment for zero when no current is passing through the CT. (Gain is fixed.)
Voltage Gain	Will be around 10000
TS1 Offset	For Ambient temperature
TS2 Offset	For Pilot temperature. (3 pilot probes will use the same offset.) System utilizes precise platinum probes, so there is no need to re-calibrate when replacing a sensor/probe.
Save Settings	Press "Save" if you wish to save. Otherwise, it will revert to the previous settings after power off/on.

6.1   Current Offset Calibration

Before installing the CT to bus cable, it is necessary to check the offset to ensure a zero current reading. Please follow the steps below:

1. Connect the CT to the Sentry-FT unit with the provided harness.
2. Set aside the CT from the battery cable. Keep the CT closed. (No cables passing through the detection window)
3. Navigate to the current offset page on the HMI.
   DAQ→SYSTEM SETTING→Calibration→Current 1 Offset
4. The HMI will display the previous offset setting and the current reading. Calculate the difference and make change to the offset setting. After that, HMI will display a compensated value close to 0.0A. (+/-0.2A is acceptable.)
   For example, when no current, HMI displays current as -0.3A, existing offset is -0.2, the difference is -0.2 - 0.3 = -0.5. Change the offset setting from -0.2 to -0.5. The current reading will be 0.0A.
5. Page down or ESC to save the value.
6. Open the CT and install the CT to the battery bus cable.

For most telecom power systems, the battery will have a dynamic current, depending on the load at the time the measurement is taken. The Sentry-FT calculates and displays both the realtime current and the average current for the past minute. The average current is utilized for the thermal runaway calculation.

6.2   Voltage Calibration

This function is for factory calibration. It is not necessary to calibrate the voltage before/after an installation.

6.3   Temperature Calibration

This function is for factory calibration. It is not necessary to calibrate the temperature before/after an installation. The temperature probes (Platinum RTD) are very accurate, and interchangeable. So even if a temperature probe is replaced, calibration is unneeded.

7   Installation Materials and Tools

#	Name	Description	Check
1	Laptop	Pre-install IPSetup.exe https://batterydaq.com/downloads/	☐
2	HMI Tool	HMI touch screen, to set/change address and check installation	☐
3	Multimeter	Fluke-87 multimeter with a temperature probe, to verify measurements	☐
4	5V Power Supply	Provided by BatteryDAQ as a tool for testing/troubleshooting purpose, not required for normal operation	☐
5	RJ45 patch cable	Cat-5 or Cat-6 patch cable, 10FT, to connect laptop to Sentry for data reviewing	☐
6	Network cable spool	Cat-6 PVC cable, to connect alarm two dry contacts (Service Alarm and Urgent Alarm) to Verizon panel [At this time point, Verizon is not ready to connect Sentry unit to its network. This may change down the road. 2022-08-22]	☐
7	Wire Stripper/Cutter	Klen Tools wire stripper/cutter 16-26AWG, to connect alarm signal to Verizon panel	☐
8	Screwdriver-1	Flathead 2.5mm, to work on terminals to add/remove probes, or to connect alarm signal	☐
9	Screwdriver-2	Phillips PH1, to open and close CT	☐
10	Waxed Lacing Cord	Waxed polyester cable lacing twine/cord, to secure CT, cables, probes.	☐
11	Scissors	To cut waxed lancing twine/cord	☐
12	Insulated Wrenches	To install/tighten bolts/nuts on bus bar	☐
13	Bolts and Nuts	To install tab washers onto bus bar **Bolts and Nuts are not included in Sentry-FT kit.**	☐
14	Extra cleaning pads	To clean surface for adhesive pads	☐
15	Spare fuses	10A spare fuses, x2	☐

8   Network and Web Pages

IPSetup.exe is needed for device searching and network configuration.

Download link:

https://www.netburner.com/download/ip-setup/

8.1   AutoIP

AutoIP is enabled for Sentry unit. Connect laptop and Sentry-FT unit with Ethernet cable (straight or crossover), Run IPSetup.exe, the program will find the AutoIP if the IP address has not been set.
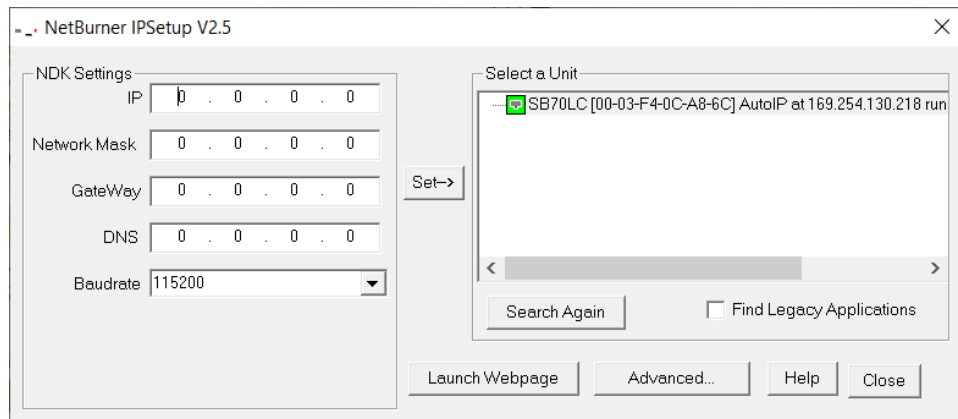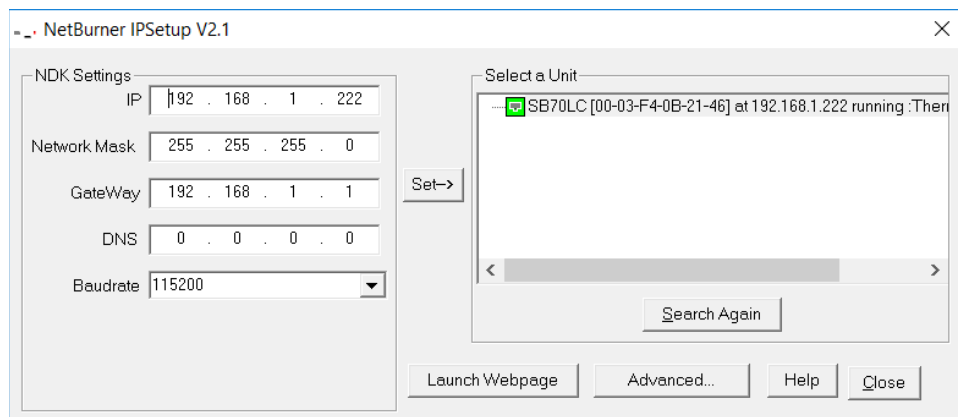
Click "Launch WebPage" to access battery data.

8.2   Network Setting for IPv4

Static IP/Mask/Gateway shall be set, in order to work in an IPv4 network.

The default IP address is 192.168.1.1xx. (xx is the last two digits of the Sentry unit serial number.)

Run IPSetup.exe to find the unit. Set the correct IP/Mask/Gateway. (Leave DNS as 0.0.0.0)

(*IP Address cannot be set with HMI.*)

(8.2 Network Setting for IPv4 Cont'd)

Without Ethernet connection, the system will still record historical data. The data is available during a site visit or remote download.

For some networks, if the UDP broadcast is blocked, IPSetup program will not be able to search and find any devices. In this case, please refer to 7.3 for using a **Direct Connection** between a laptop and Sentry.

8.3   Network Setting for IPv6

The MAC address is labeled on the unit with the Ethernet port. It is also displayed on web page when using a laptop to connect the Ethernet module via IPv4.

Please register the device's MAC to IPv6 network.

Within the same IPv6 subnet, the Sentry-FT unit can be accessed with the link-local address.
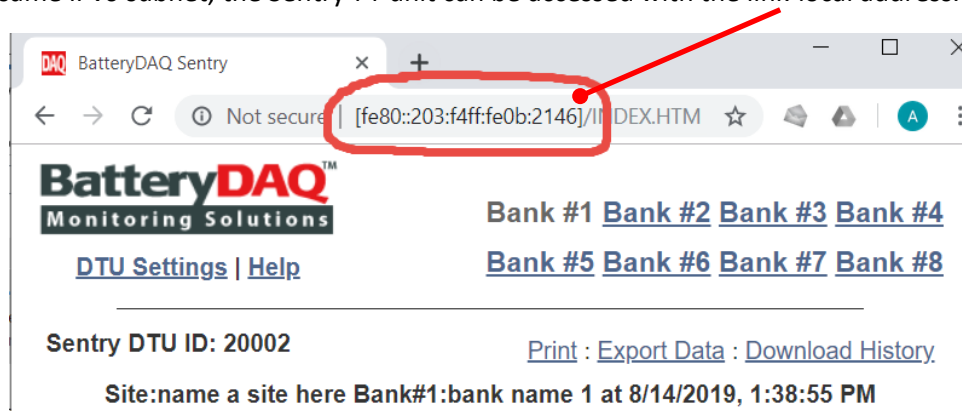
8.4 DTU Settings

The DTU is pre-configured with default values and can be changed via Ethernet.

The main unit has a date/time clock with battery backup. In case a calibration is needed, type the correct date/time in the specified format. Use code "**7778**" to save date/time.

[Use Passcode 7777 for other general settings such as Monitor Address and Bank Name.]

Content	Description	Note
DTU ID	DTU identification number	Not user changeable
Site Name	Name of the site	
0:Celsius / 1:Fahrenheit	Display as C or F	
Alarm via Main Unit 1:ON, 0:OFF	1: collect alarms from dependent unit and output via main unit dry contact	Set to 0 if alarm is connected by a dry contact to each unit
Date/Time [mm/dd/yy,hh:mm:ss]	Realtime date/time has backup battery data for 10+ years, but it may need to be calibrated for high accuracy	Example 04/23/19,09:35:30 (MM/DD/YY,HH:MM:SS, no space in between) Save with PASSCODE **7778**
Monitor 1 Address	Modbus address for the main unit	Leave it as default value 1
Battery Bank 1	Name of the main battery bank Example: MAIN Battery	
Monitor 2 Address	Modbus address for #1 dependent unit	
Battery Bank 2	Name of the 2nd battery bank Example: LTE Cabinet	
Monitor 3 Address	Modbus address for #2 dependent unit	
Battery Bank 3	Name of the 3rd battery bank Example: Microwave Cabinet	

(8.4 DTU Settings Cont'd)

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Bank #1 Bank #2 Bank #3 Bank #4
Bank #5 Bank #6 Bank #7 Bank #8

DTU Settings | Help

-	Description	Value	New Value
1	**DTU ID**	**15001**	15001
2	Site Name	name a site here	name a site here
3	0:Celsius/1:Fahrenheit	1	1
4	Alarm via Main Unit 1:ON, 0:OFF	1	1
5	Date/Time [mm/dd/yy,hh:mm:ss]	5/20/19,7:48:17	5/20/19,7:48:17
11	Monitor 1 Address	1	1
-	Battery Bank 1	bank name 1	bank name 1
12	Monitor 2 Address	2	2
-	Battery Bank 2	bank name 2	bank name 2
13	Monitor 3 Address	0	0
-	Battery Bank 3	bank name 3	bank name 3
14	Monitor 4 Address	0	0
-	Battery Bank 4	.	.
15	Monitor 5 Address	0	0
-	Battery Bank 5	.	.
16	Monitor 6 Address	0	0
-	Battery Bank 6	.	.
17	Monitor 7 Address	0	0

8.5   Historical Data

Historical data can be erased if the unit is switched to another bank/site, or if the batteries have been replaced.

Type the passcode "**75750**" to erase data for all 8 units. Or type "**7575x**" to clean data for a specific unit. E.g. **75751** for unit#1, **75752** for unit#2, etc.

Discharge events are stored in the main Sentry unit. It can be reset with the **HMI**, using code "**7575**".

8.6   Web Page Content

8.6.1   Summary Page
Home page displays a summary table for all battery banks on that site.

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Bank #1 Bank #2 Bank #3 Bank #4
Bank #5 Bank #6 Bank #7 Bank #8

DTU Settings | Help

Sentry DTU ID: 21001 Site: name a site here

10/9/2019, 6:42:24 PM

Battery Bank	#1	#2	#3	#4	#5	#6	#7	#8
Name	Bank 1 Name	-	-	-	-	-	-	-
Communication	OK	-	-	-	-	-	-	-
Suppression(h:mm)	0:0	-	-	-	-	-	-	-
Service Alarm	Alarm ON	-	-	-	-	-	-	-
Thermal Runaway	Normal	-	-	-	-	-	-	-
String Vol.	55.6	-	-	-	-	-	-	-
String High	55.6	-	-	-	-	-	-	-
String Low	55.6	-	-	-	-	-	-	-
Current	CT Fault	-	-	-	-	-	-	-
Current Peak	2.1	-	-	-	-	-	-	-
Delta T (°C)	0.5	-	-	-	-	-	-	-
Ambient (°C)	23.6	-	-	-	-	-	-	-
Ambient Peak	23.6	-	-	-	-	-	-	-
Pilot #1 (°C)	24.1	-	-	-	-	-	-	-
Pilot #1 Peak	24.1	-	-	-	-	-	-	-
Pilot #2 (°C)	23.7	-	-	-	-	-	-	-
Pilot #2 Peak	23.7	-	-	-	-	-	-	-
Pilot #3 (°C)	23.2	-	-	-	-	-	-	-
Pilot #3 Peak	23.3	-	-	-	-	-	-	-

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(8.6 Web Page Content Cont'd)

8.6.2   Individual Bank

Item	Data/Graph	Description
1	String Voltage	Real-time voltage, updated every minute
2	String High	String voltage highest peak during a day
3	String Low	String voltage lowest point during a day
4	Current	Floating charge current Charge or discharge current
5	Peak Current	Highest current during a day
6	Ambient (Max)	Ambient temperature and its peak during a day
7	Pilot (Max)	Pilot temperature and its peak during a day
8	Plot of Delta Temperature and Current	The delta value of the highest pilot and ambient temperature. Only value > 0 will be displayed. The display range window for floating current is set between 0 to 10.0A for optimal observation.
9	Plot of Temperature 72-hour historical	The left axis is for temperature, BLUE for ambient, and RED for pilot probes. The right axis is for current. Update occurs every 30 minutes and displays as graph for the past 3 days.
10	Plot for Voltage/Current 72-hour historical	Battery bank voltage and current for the past 3 days
11	Discharge History	Recorded discharge events. Maximum 11 events + realtime event Events are stored in individual Sentry units, not in the DTU Date/time stamp Duration minutes for each discharge event Max Power (kW) during the discharge course Discharged Ah T1, ambient, highest point in the discharge course T2, pilot/battery temperature, highest point in the discharge course End Voltage, string voltage lowest point, when the discharge ends.
12	Battery Service Log	Can be edited/added to record a battery information service log. Maximum of 2,000 characters. Password **7777**.

"Export Data" will generate a csv format file.

"Download Historical" will use FTP to access historical files from the SD card. Hover over on "Download Historical" field, then right click "Save Link As" to poll out the historical file.

(8.6 Web Page Content Cont'd)

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Bank #1 Bank #2 Bank #3 Bank #4
Bank #5 Bank #6 Bank #7 Bank #8

DTU Settings | Help

Sentry DTU ID: 21001   Print : Export Data : Download History

Site:name a site here Bank#1:bank name 1 at 5/2/2019, 11:58:24 AM

String-1 Vol.	27.7 V	High(Low)	27.8 V (24.8)
Current	3.2 A	Peak Current	33.5 A
Ambient(Peak)	Pilot#1(Peak)	Pilot#2(Peak)	Pilot#3(Peak)
97.7°F (111.3)	108.3°F (108.3)	103.1°F (104.1)	105.4°F (108.3)
Service Alarm	Normal	Thermal Runaway	Normal
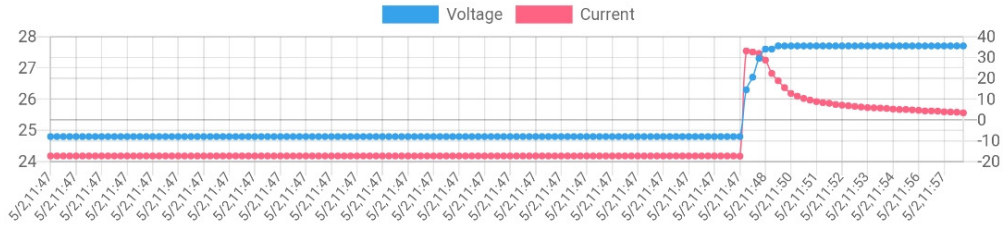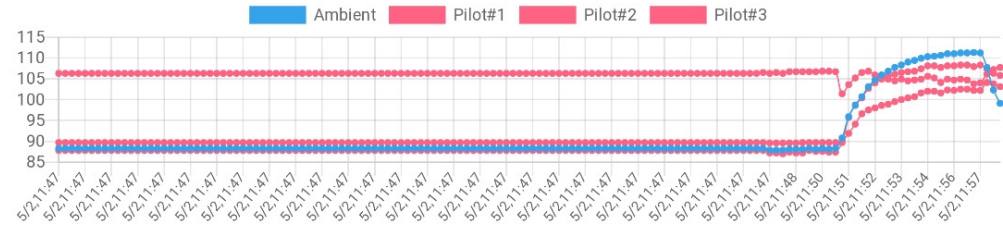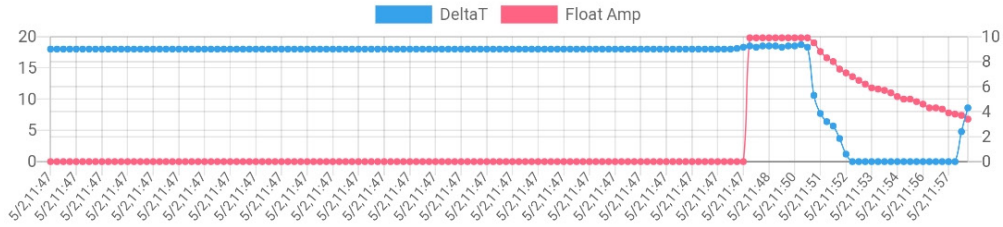
Discharge History

Event #	Start Time	Duration(min)	Max Power(kW)	Discharged(Ah)	T1(°F)	T2(°F)	End Voltage(V)
-	-	-	-	-	-	-	-
#1	5/2/19, 11:42	6	0.459	1.6	88.8	106.7	24.8
-	-	-	-	-	-	-	-

(8.6 Web Page Content Cont'd)

Using the 72-hour plot, the temperature and current dynamics can be viewed remotely to confirm thermal risk level.

Discharge events are listed for each battery bank.

Discharge History

Event #	Start Time	Duration(min)	Max Power(kW)	Discharged(Ah)	T1(°F)	T2(°F)	End Voltage(V)
-	-	-	-	-	-	-	-
#1	5/6/19, 12:7	85	0.075	4.2	92.3	111.0	24.0
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Battery information and the service log can be modified/edited using the passcode "**7777**".

Service Log

Battery Maker/Brand	EASTPE-1
Type/Model	12AVR170E-1
Installation Date	12/01/2001

Serial number, install/service log

```
up to 2000 chars for battery bank service information
GNB-1
```

Enter Password: [   ]   Save/Update

8.7   DTU Firmware Update

In case the DTU Firmware needs to be updated, it can be done remotely, within the same network.

On the web browser, go to the "Settings" page.

Scroll down to the bottom, and click on "Update Firmware".

This function is password protected. Please obtain password from BatteryDAQ.

(8.7 DTU Firmware Update Cont'd)

Sign in

http://192.168.1.26

Your connection to this site is not private

Username

Password

Sign in   Cancel

Choose the firmware file and click "Upload Firmware". Wait for a minute to finish the updating. Refresh the website to confirm the information is displayed correctly.

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Home | Settings | Help

Bank #1 Bank #2 Bank #3 Bank #4

Bank #5 Bank #6 Bank #7 Bank #8

Sentry-FT Firmware Update

Select firmware file with the "Choose File" button below.
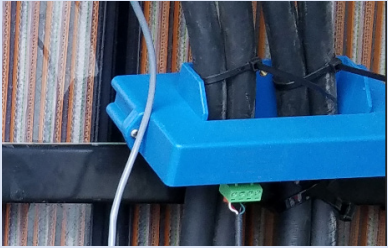
Click "Upload Firmware" and wait for it to finish uploading.

IMPORTANT: The filename must be **"ThermalSentry_APP.s19"**.
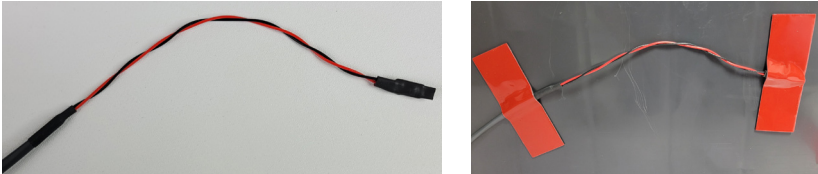
Select firmware file: Choose File   No file chosen

Upload Firmware

Only authorized person can update firmware!

9 Preparation for Installation

Preparation	Description	Notes	Check
1	Review the features of the Sentry-FT unit offline.	A +5V power supply is provided for testing, without hooking up to the battery bus.	☐
2	When connected to the network, make sure an Ethernet port and a static IP address are ready.	If connecting to a Westell, Asentria or another portal, ask provider to assign an IP address.	☐
3	With the HMI tool, set/change the Modbus address for dependent unit(s) Set/change DTU settings to match dependent unit(s)		☐
4	Decide the mounting method to be used (Magnets or using mounting holes). Unit comes with two magnetic cups. Remove magnets and prepare material/tool for different mounting method.		☐
5	To ensure floating current accuracy, Sentry-FT utilizes a high precision split core transducer.		☐
6	Prepare the bolts/nuts (1/4" 6mm, 5/16" 8mm or other size) to install two tab washers to BUS+ and BUS- plates.		☐

10 Installation Steps

Step	Description	Notes	Check
1	Mount unit	Two options: 1) Attach to rack with included magnets. 2) Mount to rack or wall with screws, or waxed strings.	☐
2	Install CT	Choose either Positive or Negative bus cables to install current transducer. CT Direction: arrow on CT points toward battery POSTIVE post. Same as charging current direction.	☐
3	Install tab washers	Install tab washer to the BUS+ and BUS- plates.	☐
4	Install temperature probes	Place the ambient probe to capture ambient temperature, use waxed twine or bolt/nut to secure it. For 1 string of 24x2V or 12x2V bank, 2 pilot probes will be installed. Place at least one probe close to the top of stack which is usually the highest temperature spot. For 2 to 4 strings of 4x12V or 2x12V, one pilot probe will be installed on each battery string. For more than 4 strings of 4x12V or 2x12V, a temperature extension bus will be utilized. A pre-made harness with multiple probes is provided. Each string should have its own probe. Secure the probe cable with adhesive pad or waxed cord first, then secure the sensing tip. 	☐
5	Connect to battery BUS	Plug the quick connector onto the tab washers. Now, the unit is powered on. Confirm by checking the LED light.	☐

(10 Installation Steps Cont'd)

6	**Verify with HMI**	**Plug in the HMI to Sentry unit.** **Check/set the Modbus address for the dependent unit(s).** **Check the data on the HMI screen:** **Battery bank voltage** **Current** **Temperature**	☐
7	Check web page and remote access	If there is no Ethernet available, use a laptop to connect directly to Sentry-FT, using the Ethernet port. If Sentry-FT is connected to the network, verify data with the web browser.	☐

10.1 Installation Case-1

Battery Bank: 48V system, 1 string of 24x2V, steel rack

Step-1: Mount the Sentry unit to the rack with magnets (or other preferred mounting method)
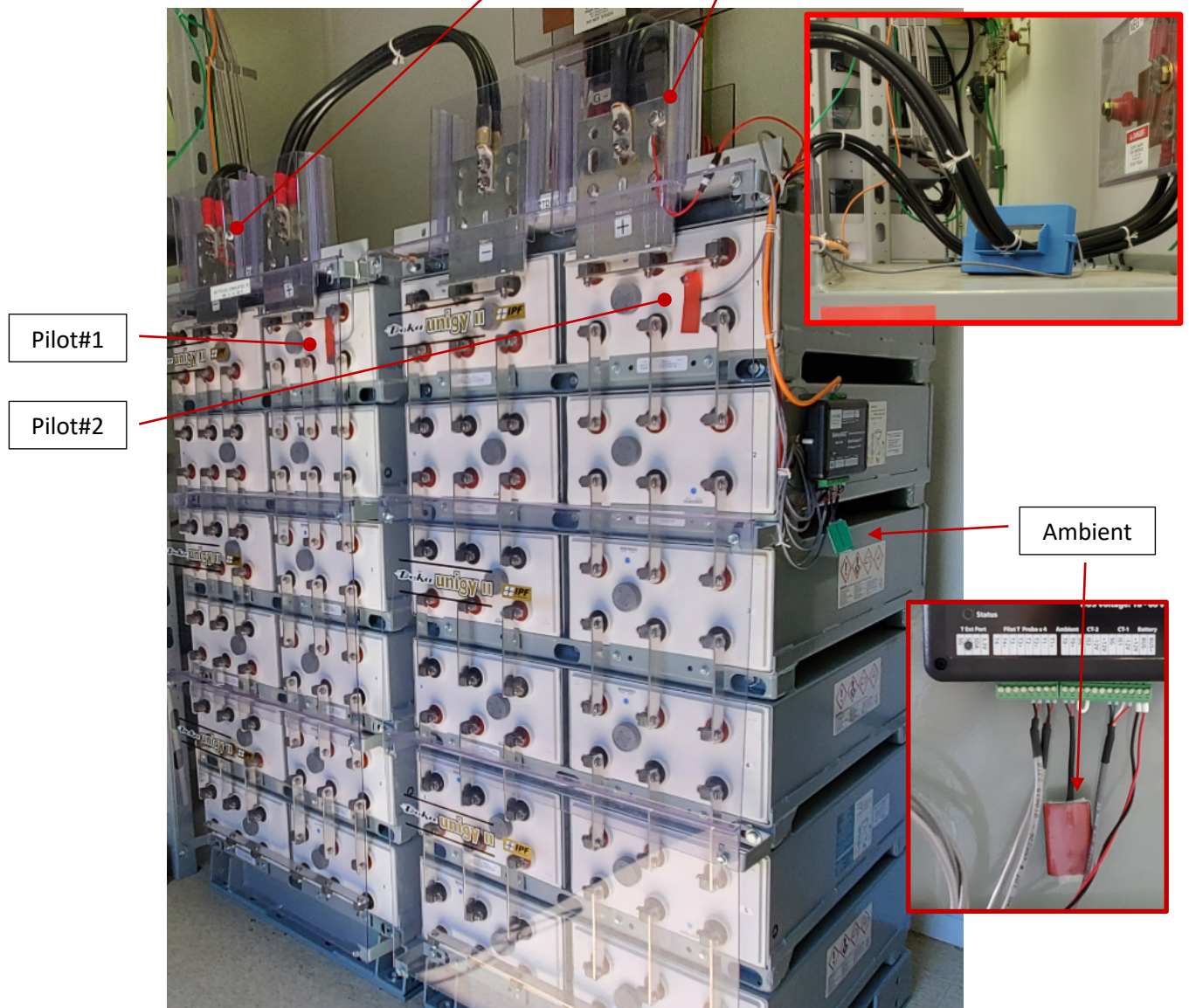
Step-2: Install the split core CT onto the bus cable.

Step-3: Place 2 tab washers onto the 6mm bolts on the bus bars (-48V and 0V), plug the bus harness to the tab washer.

Step-4: Use included adhesive strips to place two pilot probes on the top battery of each stack. Leave ambient probe in the air.

Step-5: Connect the Service/Urgent alarm dry contact output to the site alarm collector.

Step-6: Connect the Ethernet port to the network if available.

Pilot#1

Pilot#2

Ambient

10.2 Installation Case-2

Battery Bank: 24V system with 2 strings of 12x2V, steel rack

Step-1: Mount the Sentry unit to the rack with magnets (or other preferred mounting method).

Step-2: Install the split core CT on the bus plate.

Step-3: Place 2 tab washers on the 6mm bolts on the bus bars (0V and 24V), plug the bus harness to the tab washers.

Step-4: Use included adhesive strips to place two pilot probes on each side of the battery tack. Leave ambient probe in the air.

Step-5: Connect the Service/Urgent alarm dry contact output to the site alarm collector.

Step-6: Connect the Ethernet port to the network if available.
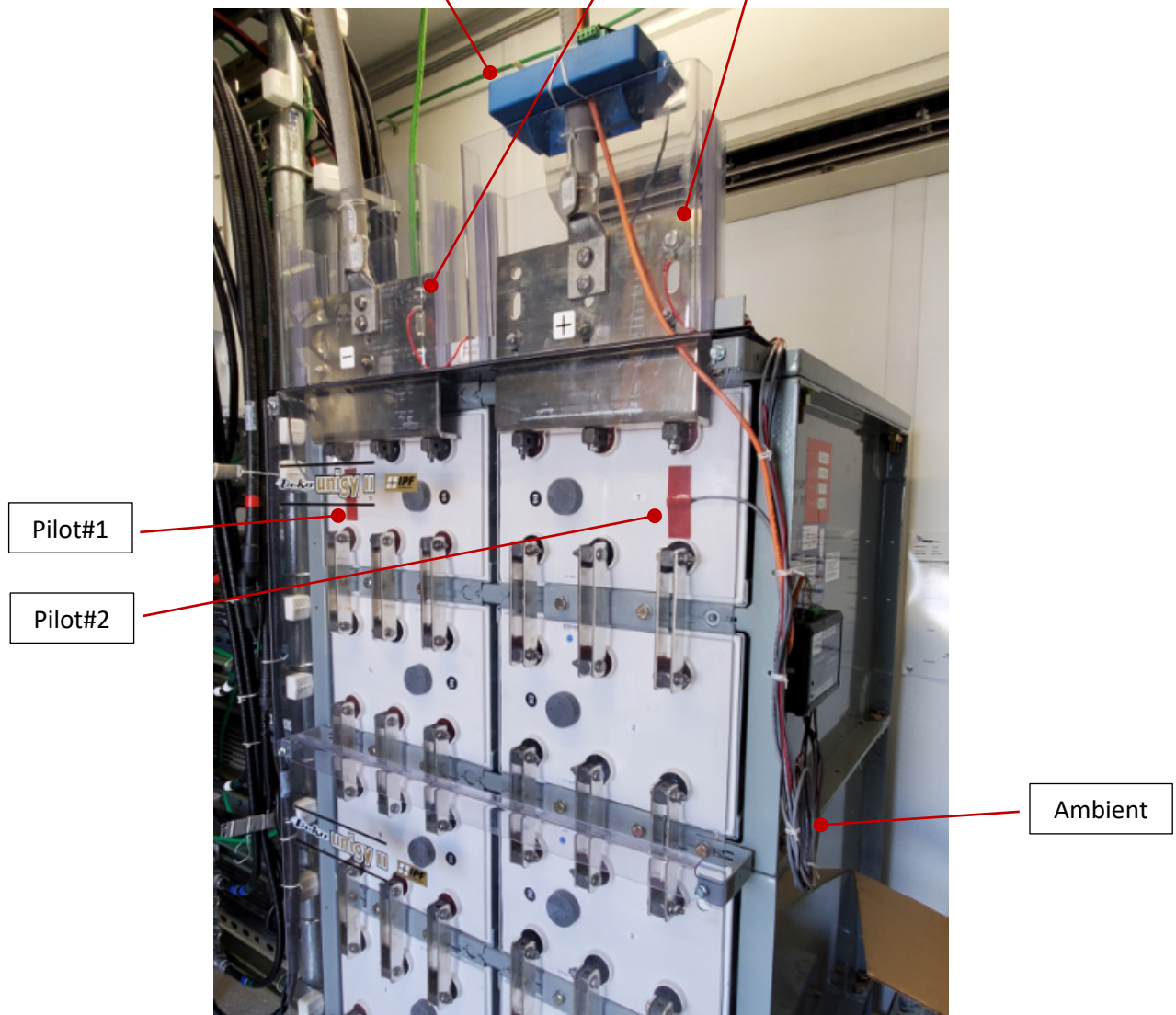
(10.2 Installation Case-2 Cont'd)

For sites with 2 banks of 24V (12x2V), a **Dependent Unit** will be installed on 2nd bank. The **Main Unit** communicates with the dependent unit via secured wireless. No communication hard wiring is needed. The Alarm from the dependent unit is collected by the main unit.

10.3 Installation Case-3

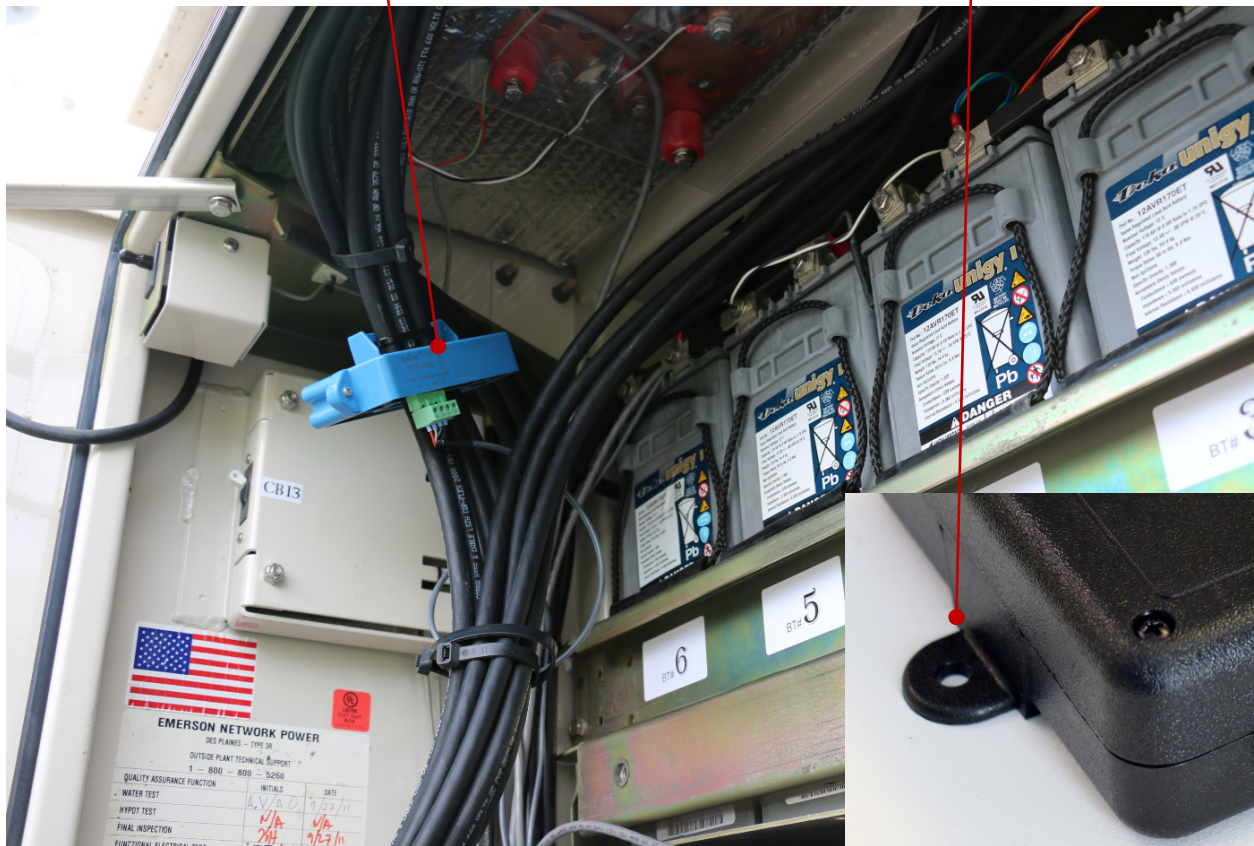**Battery Bank: 24V system with 12 strings of 2x12V, aluminum enclosure**

Step-1: Mount the Sentry unit to the rack with cable ties through the two **mounting holes** on the Sentry-FT unit.

Step-2: Install the **Split Core CT** to include ALL POSITIVE bus cables.

Step-3: Place tab washers onto the BUS+ and BUS- plates. Plug the bus harness to each tab washer to obtain 24V bus voltage measurement.

Step-4: Place the ambient temperature probe on the rack close to the floor. Arrange the 3 pilot temperature probes: (Pilot #1) Top string, (Pilot#2) Middle string, (Pilot#3) Bottom string.

Step-5: Set the unit to a dependent Modbus ID so it can communicate to the main unit within the same site, via internal wireless.

10.4 Installation Case-4

Battery Bank: 48V system with 5 strings of 4x12V, steel rack

Step-1: Mount the Sentry unit to the rack with magnets (or other preferred mounting method).

Step-2: Install the split core CT to include 3 cables.

Step-3: Install the tab washers to the BUS+ and BUS- plates. Plug the bus harness to each tab washer to obtain 48V bus voltage measurement.

Step-4: Place the ambient temperature probe on the rack close to the floor. Arrange 3 pilot temperature probes: (Pilot#1) string-1, (Pilot#2) string-3, (Pilot#3) string-5.

Step-5: Connect the unit to the Ethernet port, if this is the main unit.

Step-6: Set the Modbus IP address if this is a dependent unit.

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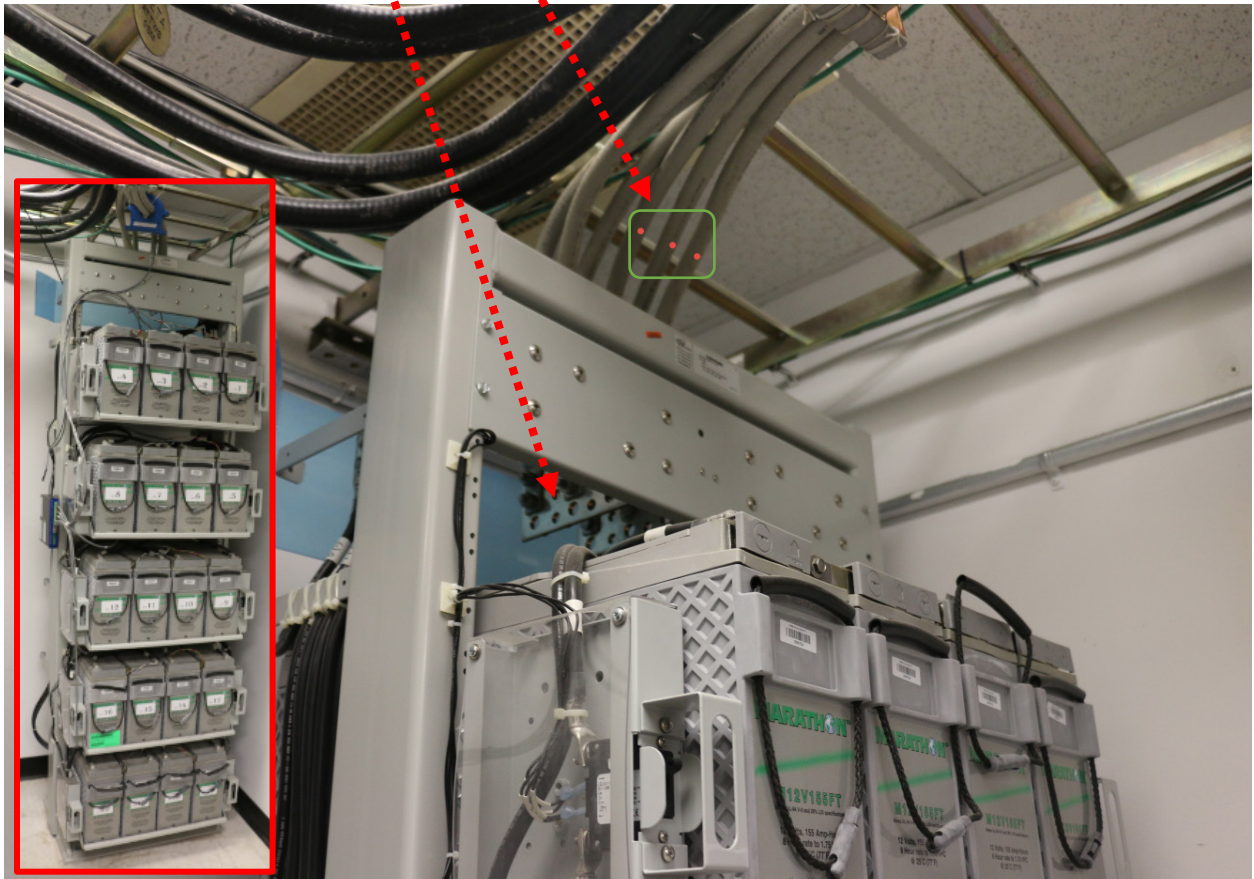
11 Multiple Systems at One Site

When installing the Sentry-FT for a site with multiple battery banks, choose one cabinet with an Ethernet port for the main unit: **Sentry-FT-M**.

Use the HMI to set different Modbus addresses, for each dependent unit: **Sentry-FT**.

The main unit communicates with the dependent units via a secured wireless module inside the Sentry-FT units.

Verify the connection and battery data from the main unit's web page.

Make sure to set the DTU correctly to match the dependent units.

11	Monitor 1 Address	1	1
-	Battery Bank 1	bank name 1	bank name 1
12	Monitor 2 Address	2	2
-	Battery Bank 2	bank name 2	bank name 2
13	Monitor 3 Address	3	3
-	Battery Bank 3	bank name 3	bank name 3

12 Troubleshooting

12.1 No communication to dependent unit

Communication success rate can be checked on web page. [100] means 100%. [0] means no communication.

When the success rate drops to below 80, the wireless signal is at marginal level. For long distance, it may need to change the antenna inside the unit. For metal enclosure, re-position unit may improve wireless performance.

Battery Bank	#1	#2
Name	bank name 1	bank name 2
Communication	OK[99]	Lost[0]

Check the DTU monitor setting,

Check the Sentry dependent unit Modbus address with the HMI. (**DAQ → SETTINGS → SYSTEM SETTING → ** Page down to Modbus ID. It should match the setting in DTU.)