OPTILINK ST

Ethernet/Fiber Status Monitoring Module

Installation and Operations Manual

Documented Models

The following Optilink ST models are documented by this instruction and operations manual. These power supply and their respective packages may be references using the part numbers listed below.

MODEL	PART NUMBERS	OPTIONS
OPTILINK ST 1G SFP	740-088-20	See Specifications
OPTILINK ST 10G SFP+	740-089-20	See Specifications

INSTALL AND OPERATION

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Introduction and Operation:

The Optilink ST is an Ethernet and Fiber-based status monitoring module used for the remote status monitoring of Multilink's EB1 series of HFC uninterruptible power supplies. The device has been designed for use in outside plant deployments where traditional DOCSIS-based monitoring networks may not be available as well as for FTTx outside plant applications.

Operating information collected by the Optilink ST is available via SNMP while conforming to the ANSI/SCTE 25-3 specification for power supply and transponder interface bus (originally known as HMS 022). This allows for the device to be compatible with existing network management software (NMS) and co-exist with DOCSIS-based power supply monitoring solutions. An embedded webpage also allows for remote access and configuration of each device and its respective power supply.

The Optilink ST is intended to be embedded in the Multilink EB1 power supply series and allows for easy upgrades. Existing EB1 power supplies without status monitoring or those utilizing DOCSIS-based transponder may be easily upgraded in the field with no special tools and no outside plant downtime through its plug-and-play design.

Features:

- 10/100/1000 BASE-T Ethernet Port (Model dependent)
- 10/100/1000/2.5G/10G BASE-X Open SFP or SFP+ Port (Model dependent)
- RS-485 Serial Port for additional options such as battery management systems and future expansion
- SNMPv1, v2, and v3 monitoring compatible with existing NMS for power supply monitoring
- Support for open-source power supply MIB information (SCTE-HMS-PS-MIB) and Multilink proprietary MIB
- Auto-configuration with DHCP options
- IPv4 and IPv6 supported with IPv4 as default
- Embedded webpage with remote configuration capability
- Support for remote firmware upgrade of EB1 power supply

Operation:

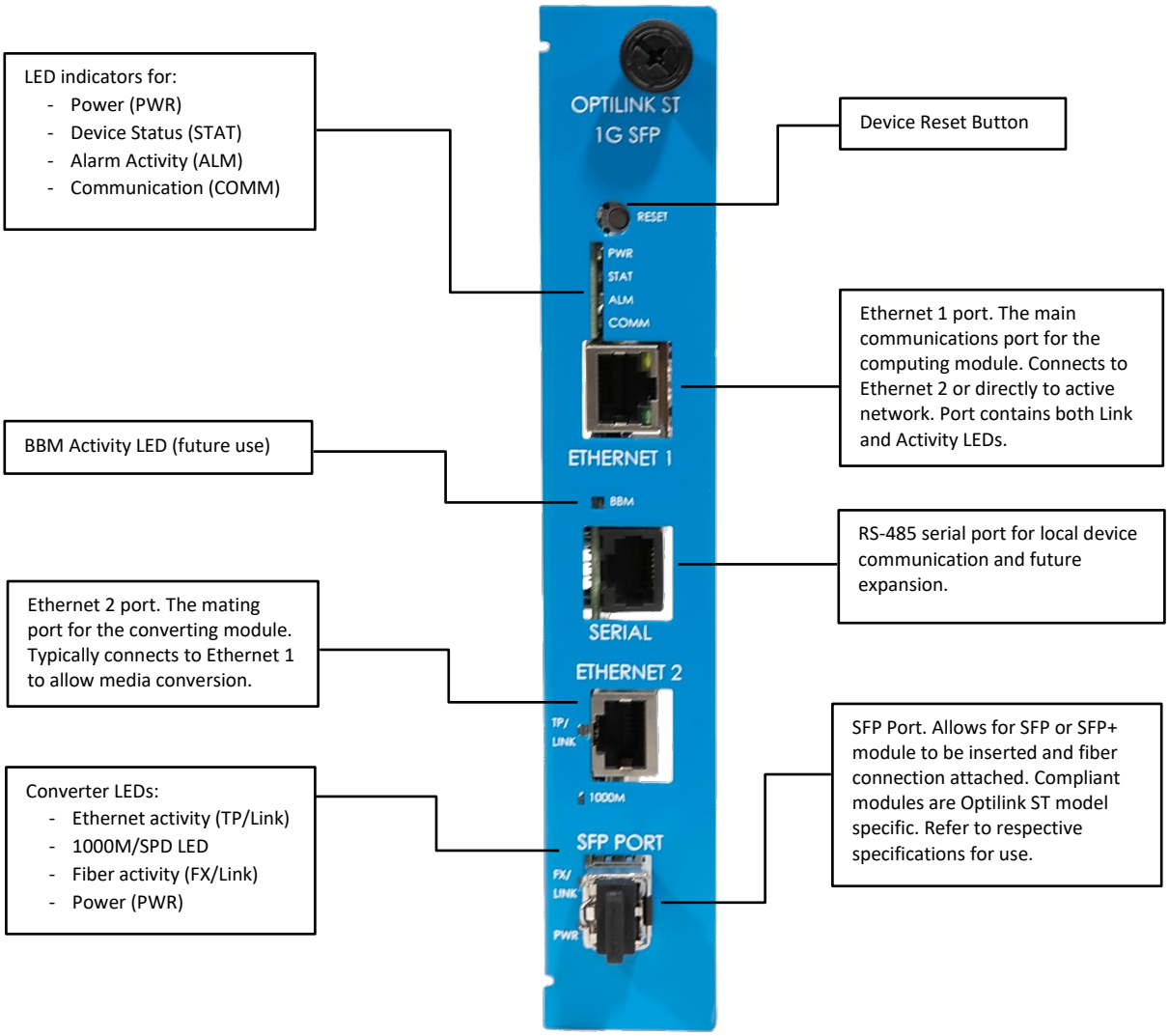
By default, both Ethernet and Fiber connections are available for use. The Optilink ST is modular in design and consists of a full-featured computing device paired with one of two available converting devices. A short Ethernet patch cable ships with each kit and is connected between the modules. The converting module provides an open SFP cage for an either an SFP or SFP+ compliant device to be inserted, depending on the Optilink ST model in use.

When the status monitoring module is installed within the EB1 power supply, the module is powered from the inverter module's internal power supply. After a brief start up period, the device begins bi-directional communication with the EB1 inverter module and stores information which is made available through SNMP or through the embedded webpage. DHCP is enabled by default. During initialization, if DHCP options have been established to configure the module for SNMP information, this information will be automatically applied to the embedded SNMP agent to allow communication. If options have not been configured, SNMP and additional information may be manually entered through the embedded webpage.

Power supply information that is described in the SCTE-HMS-PS-MIB (formally hms027) document allows for existing monitoring software tools to continue to monitor the operation of the power supply. Additional proprietary information is also available using Multilink's MIB documents. These documents provide expanded configuration and power supply data.

Connections, Controls, and Indicators:

The following section describes the connections, controls, and indicators on the Optilink ST. While two models of the Optilink ST exist, both share similar layout, connections, and indicators. The Optilink ST 1G SFP model is used in this example. Refer to the image and information table below for connection and operating information.



LED Operation			
Computing Module		Converting Module	
PWR	ON: device is powered OFF: no power available	TP/Link	ON: Connection active OFF: No Ethernet connection
STAT	ON: updating device status OFF: operating as normal	1000M/SPD	ON: 1G or greater speed in use OFF: less than 1G speed in use
ALM	ON: device alarm, serial comm. error OFF: no alarm	FX/Link	ON: Connection active OFF: No fiber connection
COMM	ON: serial comm. is active OFF: serial comm. is not active	PWR	ON: device is powered OFF: no power available

It is possible to modify the Ethernet 2 and SFP port operating states for both models of the Optilink ST. A set of DIP switches on the backside of the converting module allow for additional features of each port including TP/FX speed lock, link fault passthrough (LFP), FX reset, and automatic laser shutdown (ALS) to be enabled or disabled. Below are the descriptions for the DIP switch settings for both Optilink ST models.

NOTE: The DIP switch settings have factory configured defaults as noted below. Should a specific feature need to be enabled or disabled, ensure these DIP switch settings are set before installing or operating the Optilink ST.

No.	Function	Status	Description
1	LFP Function	OFF*	Disable
		ON	Enable
2	ALS Function	OFF*	Disable
		ON	Enable
3	FX Reset	OFF*	Disable
		ON	Enable
4	FX Speed Setting	OFF	FX 1000M
		ON*	FX 100M/1000M

Table 1: Optilink ST 1G DIP Switch Settings; Asterix denotes default setting

No.	Function	Status	Description
1	LFP Function	OFF*	Disable
		ON	Enable
2	ALS Function	OFF*	Disable
		ON	Enable
3	Media Converter Mode	ON	ON:TP=10G, FX=10G
		OFF*	OFF:TP=10/100/1000M, FX=1G
4		OFF	ON: TP=10/100/1000M
		ON*	/10G, FX=10G

Table 2: Optilink ST 10G DIP Switch Settings; Asterix denotes default setting

When the LFP feature is enabled, the converting device monitors the TP and Fiber connections. If either link is lost, the device will disconnect the link. This is useful for troubleshooting connection loss. When the ALS feature is enabled, the output power of the SFP/SFP+ transmitter will be automatically shut down in the event of a broken fiber. Additionally in the case of the 1G model, if FX Reset is enabled, the converting device monitors the Fiber link and will automatically restart the device if the link goes down. This is useful for when a previously damaged fiber has been repaired away from the location of the Optilink ST and the link may be automatically reestablished.

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Installation:

Installation of the Optilink ST, regardless of model, requires no special tools or plant downtime. The module comes with all required hardware to mount directly to an EB1 power supply inverter module. Peripheral items such as SFP modules, fiber pig tails, etc. are customer/application specific and not included. Whether upgrading from a DOCSIS-based transponder or installing a new module, refer to the following for recommended installation.

Prior to beginning installation, please verify the following:

- All items within the respective Optilink ST kit that has been received from Multilink are intact and accounted for.
- If installing within an actively operating power supply, the inverter module must be removed from operation prior to installation. This will not affect output power from the power supply to the plant.
- If installing an SFP or SFP+ module, verify that it will mate accordingly with the corresponding Optilink ST model and that the SFP module is installed before applying power to the inverter module.
    - The Optilink ST 1G SFP module only accepts 1G SFP style lasers.
    - The Optilink ST 10G SFP+ module accepts a wide variety of SFP+ style lasers.

To install the Optilink ST module:

1. If the power supply is currently operating, turn off the battery breaker and disconnect all attached harnesses and wiring from the inverter module only.
2. Using a Phillips screwdriver, unfasten the two black captive screws on the inverter module.
3. Remove the inverter module from the power supply using the handle near the battery breaker. Brace the chassis of the power supply while removing, if required.
4. If a DOCSIS-based transponder or a blank bracket is installed, remove the transponder kit and/or blank bracket from the inverter module using a Phillips screwdriver. If a DOCSIS 3.0 or 3.1 kit was previously installed, remove any attached adapter boards that may be used from the J10 connector on the inverter module.
5. Remove the Optilink ST module from its packaging and attach the black, 16 pin connector on the backside of the module to J10 on the inverter module.
6. Verify the mating connectors are properly seated before continuing.
7. Using a Phillips screwdriver, align the mounting bracket and captive hardware to the inverter module and secure each of the mounting screws.
8. If using an SFP or SFP+ module, install the laser in the open SFP port and secure retaining handle.
9. Reinstall the inverter module into the chassis by aligning the large PCB edges with the white PCB guides and fully insert the inverter into the chassis. Both inverter and Optilink ST modules will begin power up and initialization upon insertion.
10. Fasten the two black captive screws.
11. Reattach all harnesses and wiring.
12. Verify that either an Ethernet cable or fiber pig tail is connected to the respective port on the Optilink ST. If using fiber, ensure the Ethernet jumper is placed between Ethernet 1 and Ethernet 2.
13. Turn on the battery breaker and verify that all 6 status LEDs on the inverter module front panel are illuminated after 90 seconds.
14. Enter the EB1 LCD Main Menu and then enter the Transponder Menu. Verify that an addressable IP address has been established and the Optilink ST's TP/Link and FX LEDs are illuminating and/or flashing.

SNMP Operation and Configuration:

The SNMP agent embedded in each Optilink ST can be automatically or manually configured for operation with SNMP-based network management software and trap receivers. This information can be configured within DHCP options and applied to each Optilink ST upon successful DHCP discovery.

All three versions of SNMP are supported, with SNMPv2 set as the default. Traps for inverter status and any major or minor alarms are enabled and can be forwarded to a trap receiver, if configured. The SNMP agent supports commonly known power supply operating and configuration parameters along with Multilink's proprietary information. The standard set of SNMP's SMI MIBs are supported. The following MIB documents are also supported. SCTE MIBs may be downloaded from the SCTE website and Multilink proprietary MIB documents may be supplied upon requested.

- SCTE-HMS-ROOTS
- SCTE-HMS-PS-MIB
- MULTILINK-ROOT
- MULTILINK-EXTENDED-PROPERTIES-MIB

DHCP Options:

The Optilink ST can be automatically configured (i.e., provisioned) with the use of vendor-specific information. This information may be used to establish SNMP security and trap destination addressing, firmware filename and TFTP server addressing, and enable remote firmware updating. Vendor-specific information is encapsulated in a vendor-specific format. To establish DHCP options for the Optilink ST, please contact Multilink.

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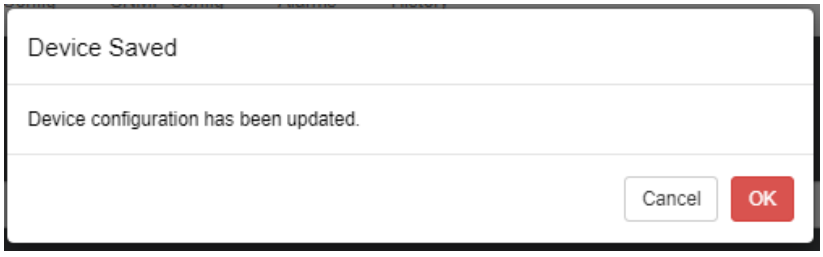
Webpage Use and Navigation:

Embedded in each Optilink ST is a standalone web server that contains a webpage to allow for both local and remote observation and configuration of the EB1 power supply. The embedded webpage is addressable by entering the assigned IP address into a web browser. All webpages are mobile device friendly. Several sub-sections existing within the webpage for viewing current operating information, power supply and charger information, SNMP configuration, active alarm status, and history statistics.

Several pages allow for the configuration of items. For these items, either a textbox or a dropdown list is provided for the user to view the current setting or to set a new value for each respective item. For items that are pre-configured or are not allowed to be configured, the textbox or dropdown list will be "greyed-out", and a red caution symbol will appear over each item when navigating around the webpage. These items are intended for informational purposes only.

On pages where the user may select a different value for one or more items, Submit/Cancel buttons are provided and should be used if any parameters are modified. After submitting changes, the user will be prompted to verify that is action has taken place. Saved changes will display on the webpage as well as on the respective LCD menu. Items that are modified but are not saved will be discard automatically when using the Cancel button or when navigating away from the page. Below is an example of a prompt that may appear after successfully submitting changes to any of the webpages:



Please refer to each of the sections below for a description of each webpage. Items may be briefly described. For further information regarding the items available for configuration, please refer to the EB1 user manual for parameter-specific details.

Summary Page:

The Optilink ST and UPS Summary Page provides the user with all pertinent operating parameters of the selected power supply. On the page, a menu list with several selectable options heads the top of the page. Selecting any one of these tabs displays a submenu the user may then select to view. Several tables containing device operating status, Input, Output, and Battery operating parameters are shown alongside a functional Google Maps API that may be user-configured for device location.

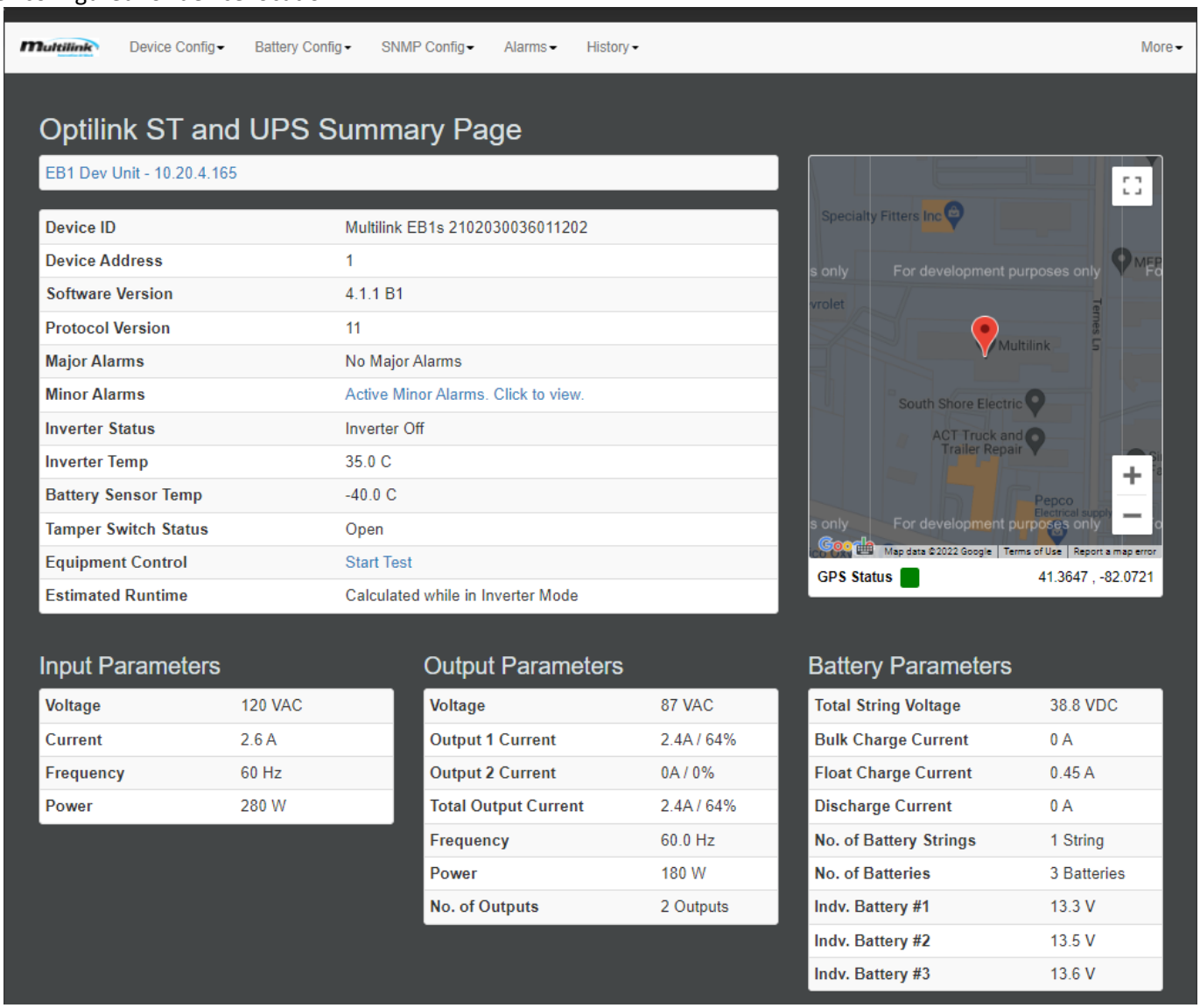


Image 1: Summary Page

Each of the tables on the Summary page are updated automatically to provide the latest information. If any of the configuration items within the power supply are changed, for example displaying the serial number in the Device ID or the number of battery strings, they are applied automatically, and tables update to reflect the new configuration.

As shown in the Summary Page image, links are provided for any currently active Major or Minor alarms. These links direct the user to the Alarms page. Another link for “Equipment Control” allows the user to manually start a battery self-test, remotely. This link will automatically change from “Start” to “Stop” if a self-test has been initiated and a successful battery self-test has begun. The “Estimated Runtime” item updates to show an estimate of the remaining battery runtime if the power supply has been operating in Inverter mode for longer than 5 minutes. This item can be configured for either a Range or Hours/Minutes.

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Device Config - Optilink ST Page:

This page provides network parameters, device information, and current configuration for the Optilink ST device. By default, several of the items are pre-configured, either by DHCP or at the factory. Those items are not user configurable, and a red caution symbol will display when navigating over these items. The user may configure the name of the device as well as enter the GPS coordinates for the device. Should the user modify any available option, be sure to click the Submit button to save changes. Click Cancel to reject any modifications.

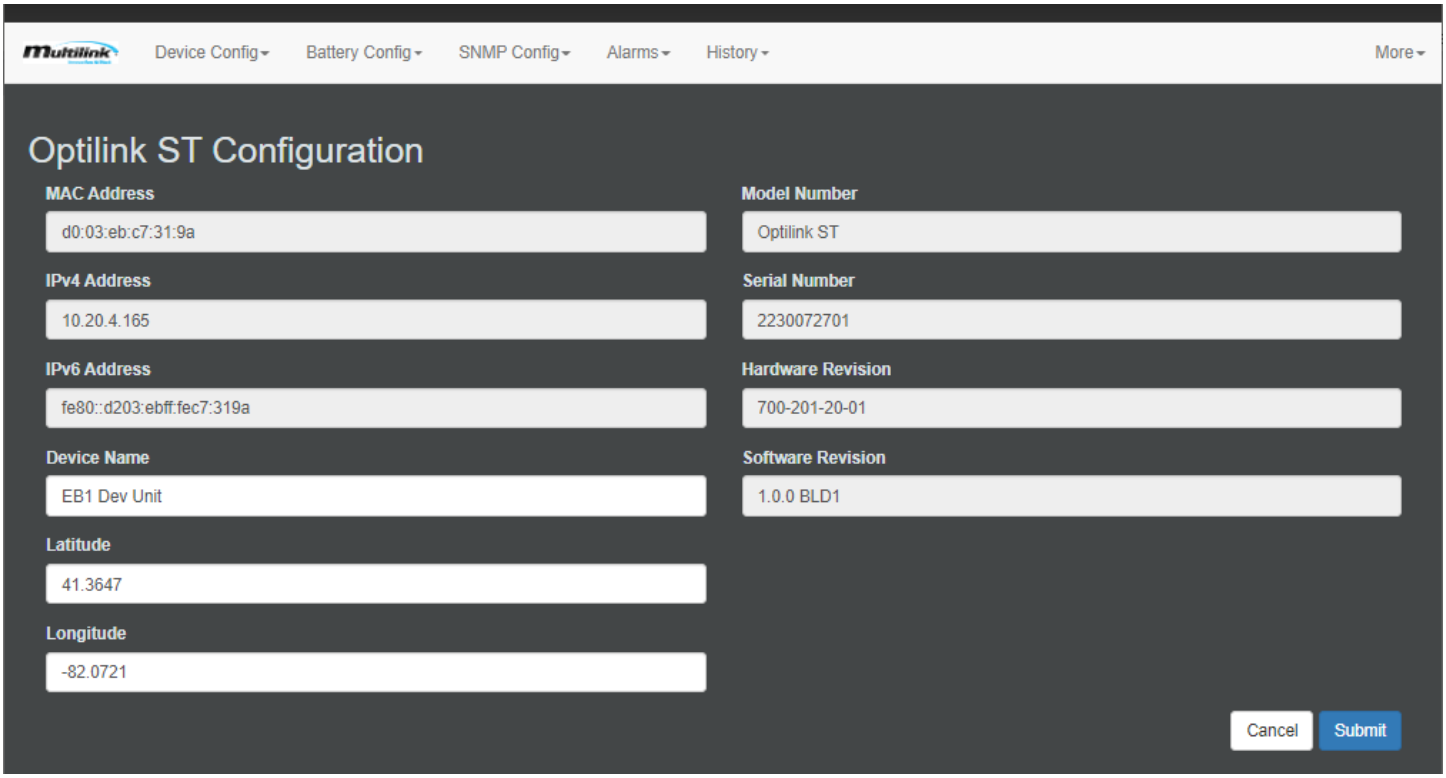

Image 2: Optilink ST Configuration Page

Device Config - EB1 Misc. Config:

This page allows the user to modify several miscellaneous options within the EB1 power supply. Tamper switch polarity, Input frequency tolerance, short circuit, etc. options are available. Should the user modify any available option, be sure to click the Submit button to save changes. Click Cancel to reject any modifications.

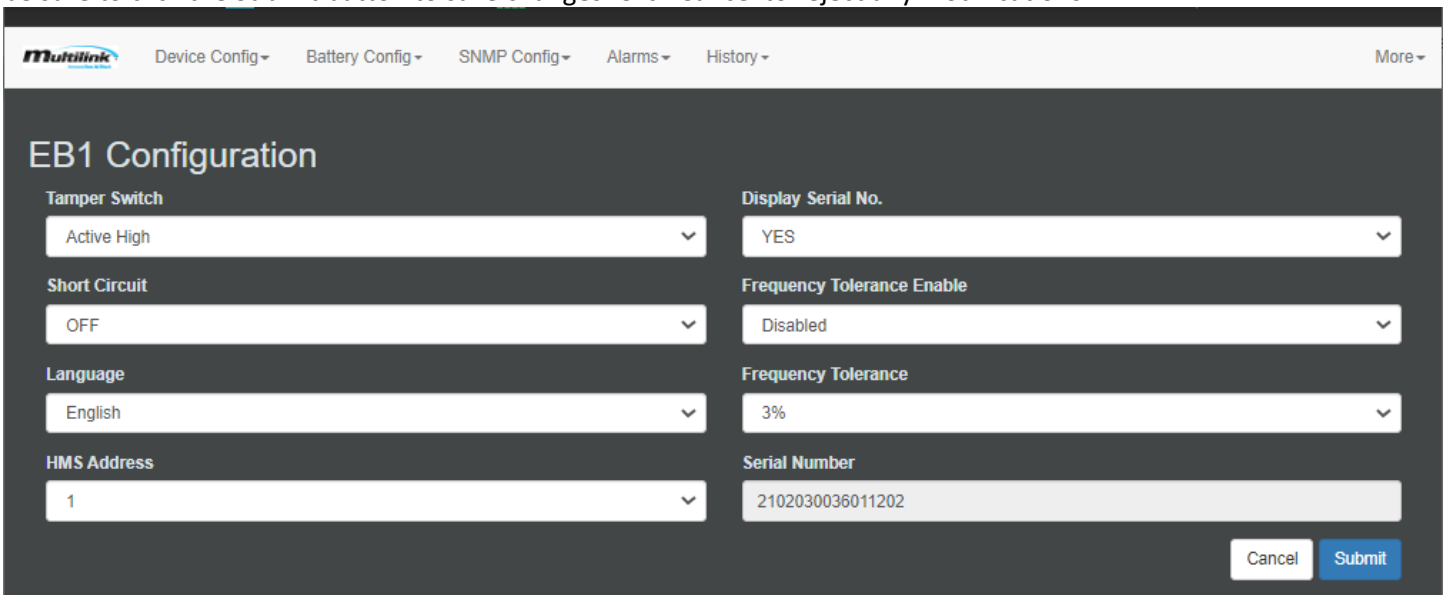

Image 3: EB1 Miscellaneous Configuration Page

Device Config - EB1 Charger:

This page allows the user to configure the EB1 power supply charger options. Modification of these items affects temperature compensations, float and equalize voltages, charger shutdown and start thresholds, and LiFePo charging profile characteristics. Should the user modify any available option, be sure to click the Submit button to save changes. Click Cancel to reject any modifications.

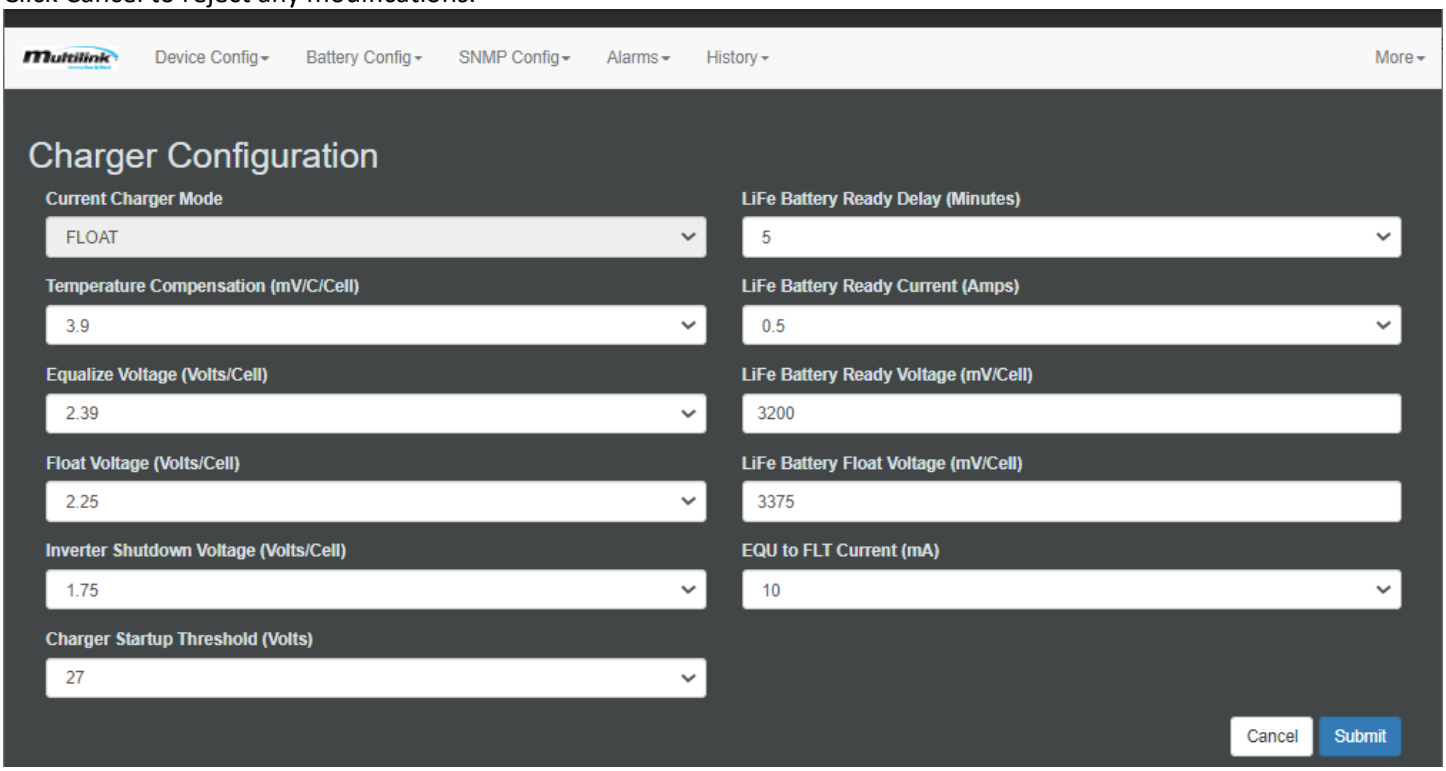

Image 4: EB1 Charger Configuration Page

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Device Config - Factory Info:

This page displays the EB1 power supply factory and operating information. Items as such serial and part numbers, utility line and battery configurations, transformer capacity, and output voltage configuration are displayed. These items are pre-configured at the factory and are shown for informational purposes only.

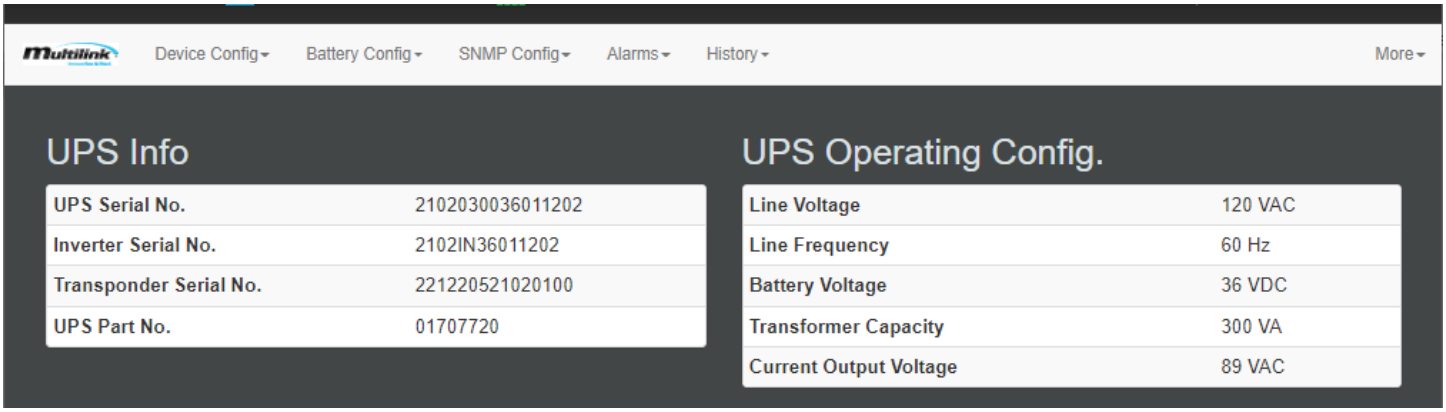

Image 5: Power Supply Factory and Operating Information Page.

Battery Config - Battery Capacity:

This page allows the user to configure the battery capacity and additional operating characteristics of the attached battery system. Modification of these items affects the EB1 charging profile, runtime estimates, type and level of discharge monitoring, and duration of missing battery tests. Should the user modify any available option, be sure to click the Submit button to save changes. Click Cancel to reject any modifications.

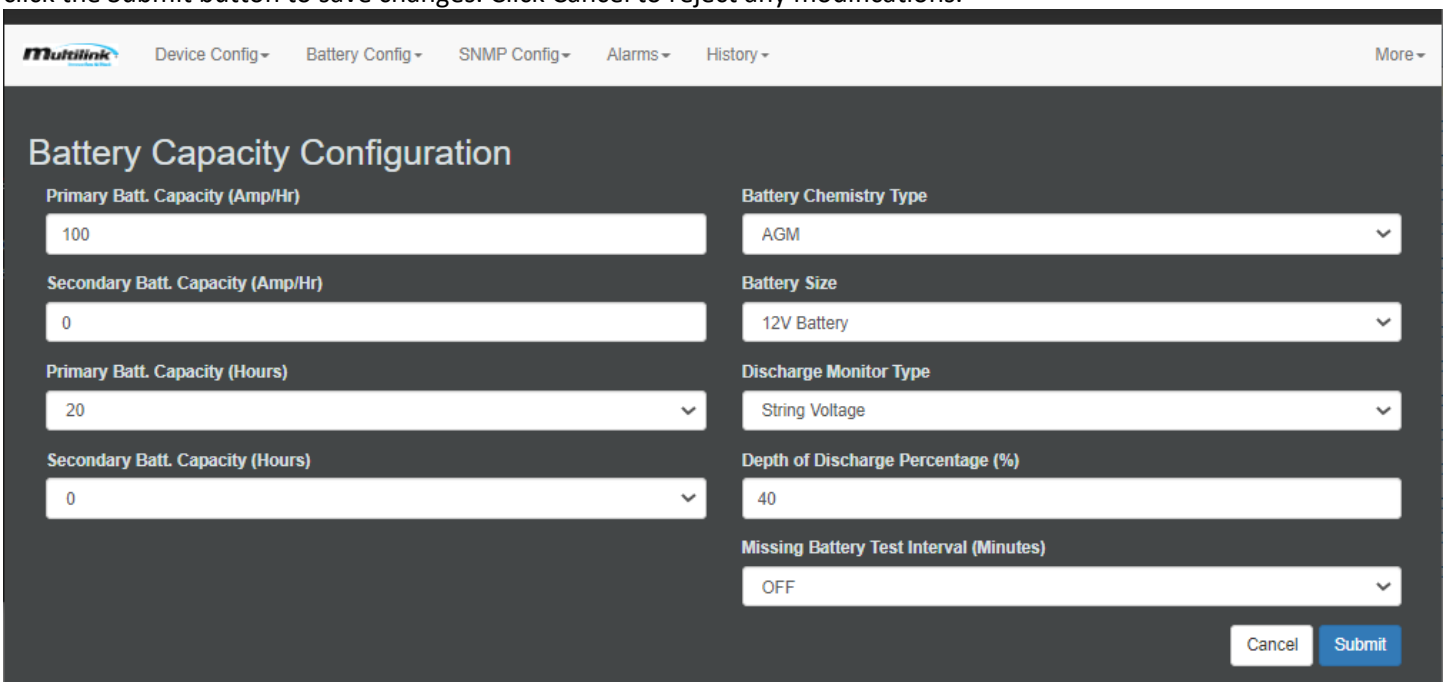

Image 6: EB1 Battery Capacity and Charger Profile Configuration

Battery Config – Battery Test:

This page allows for the configuration of the battery test parameters. The user may modify the duration of the test, interval at which tests occur, and whether the test is timed or not. Should the user modify any available option, be sure to click the Submit button to save changes. Click Cancel to reject any modifications.

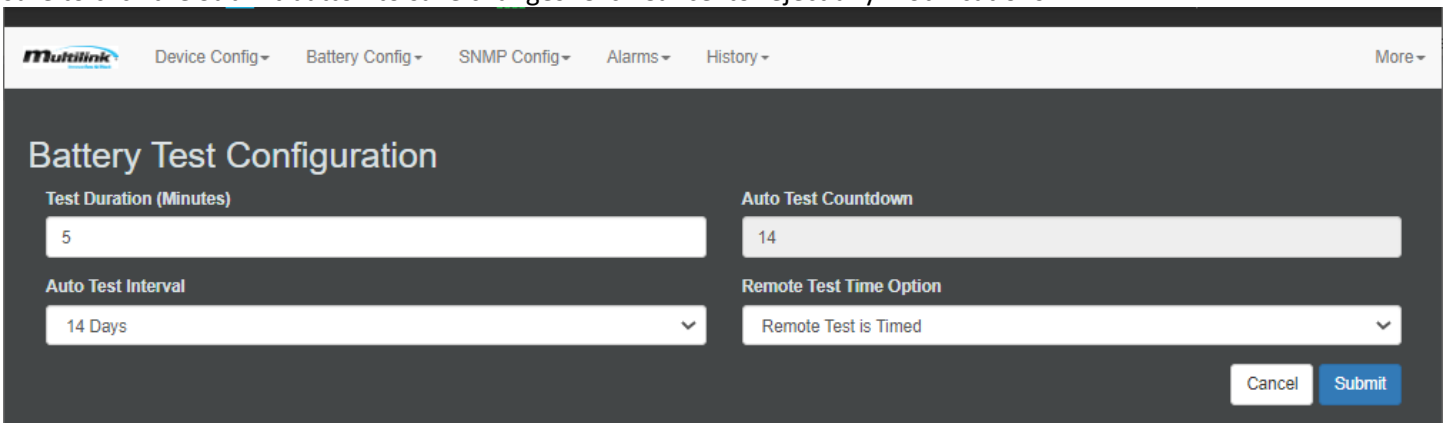

Image 7: EB1 Battery Test Configuration Page

Battery Config – Battery Dates:

This page allows for the configuration of both the installation and manufacturing group dates of the battery system. The user may select the month and year of the respective battery group. The selected month and year apply to all batteries configured for the system. Any batteries not configured for use with display "N/A". Should the user modify any available option, be sure to click the Submit button to save changes. Click Cancel to reject any modifications.

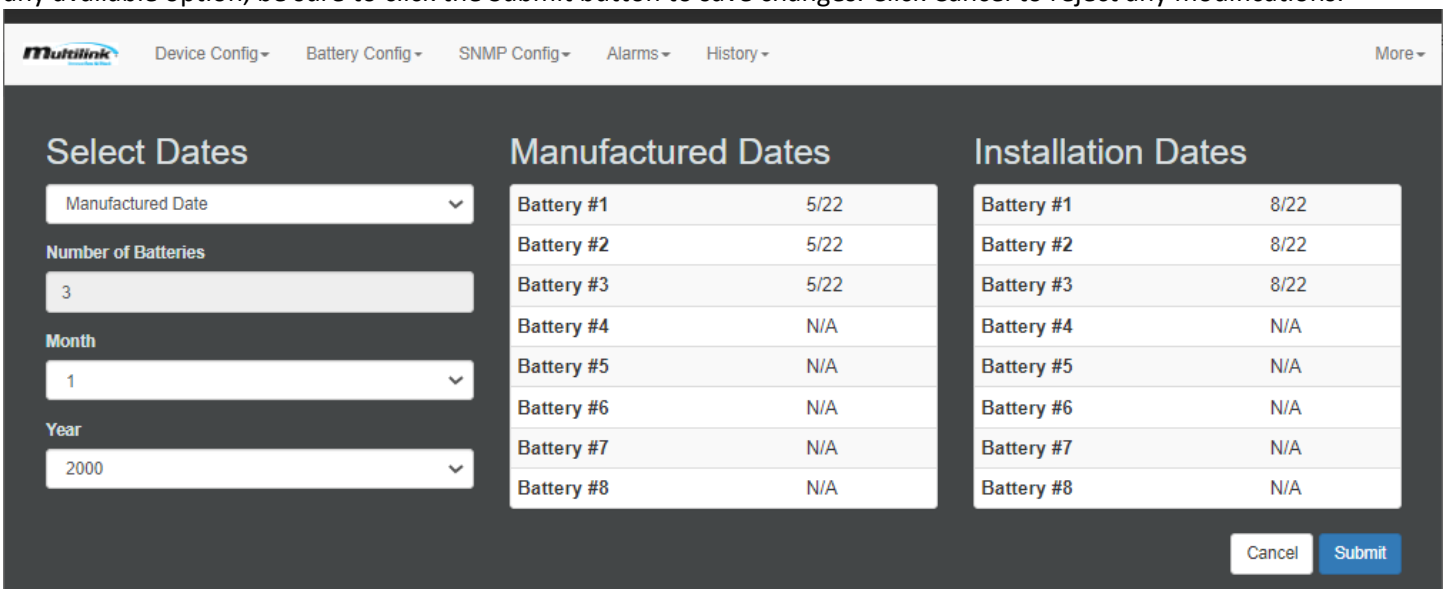

Image 8: EB1 Battery Dates Page

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SNMP Configuration:

This page allows for the manual configuration of the embedded SNMP agent. By default, SNMPv2 is the default protocol. Users may modify these items for additional security and trap destination information. Modification of these items are automatically applied to the SNMP agent and may affect adversely SNMP communication with the device if not properly configured. Should the user modify any available option, be sure to click the Submit button to save changes. Click Cancel to reject any modifications.

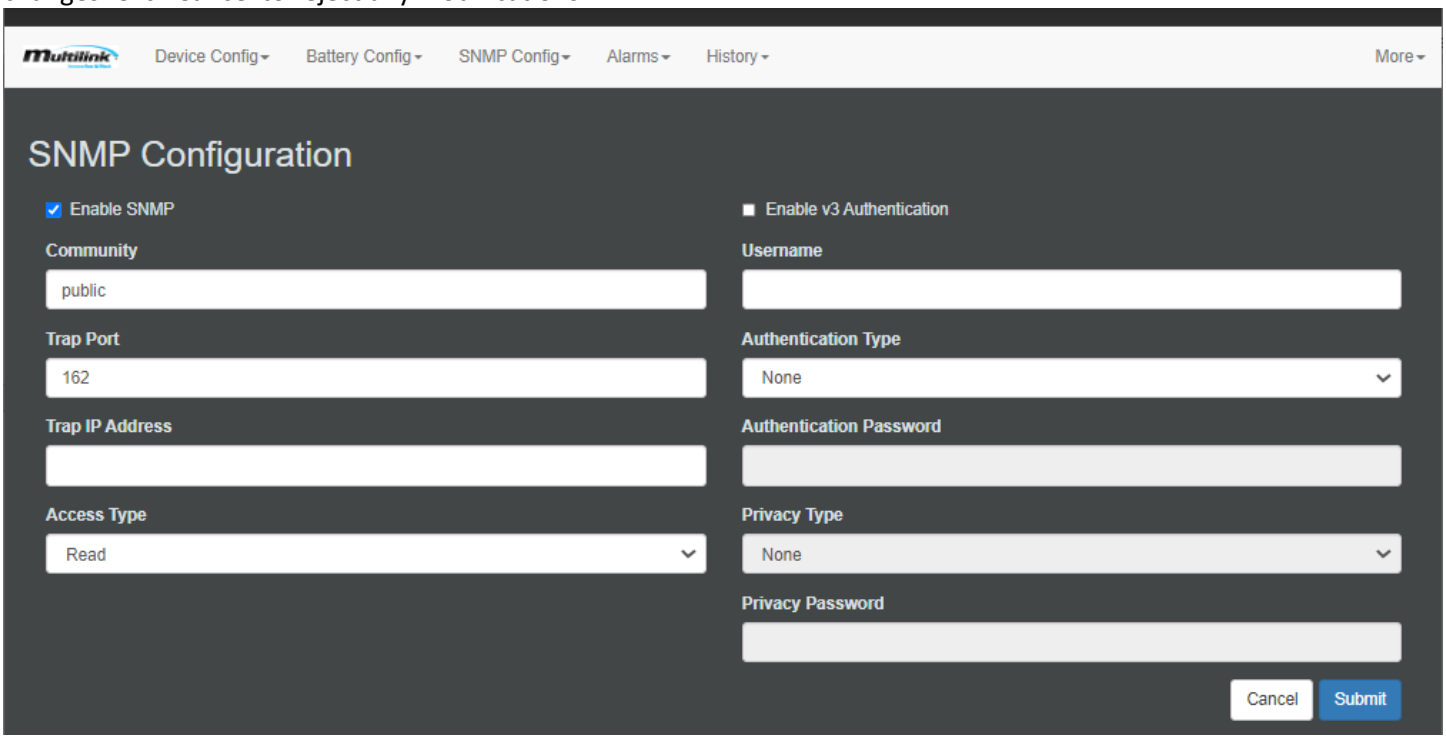

Image 9: Optilink ST SNMP Agent Configuration Page

Alarms Page:

This page lists and monitors all available Major and Minor alarms of the EB1 power supply. Should any of these items be currently active, the alarm will be marked as "ACTIVE" and the background color of the alarm will change according to severity. As shown below, a minor alarm is ACTIVE for a missing temperature probe, and the background is yellow to indicate a minor alarm. This page automatically updates to display any corrected or newly acquired alarm conditions.

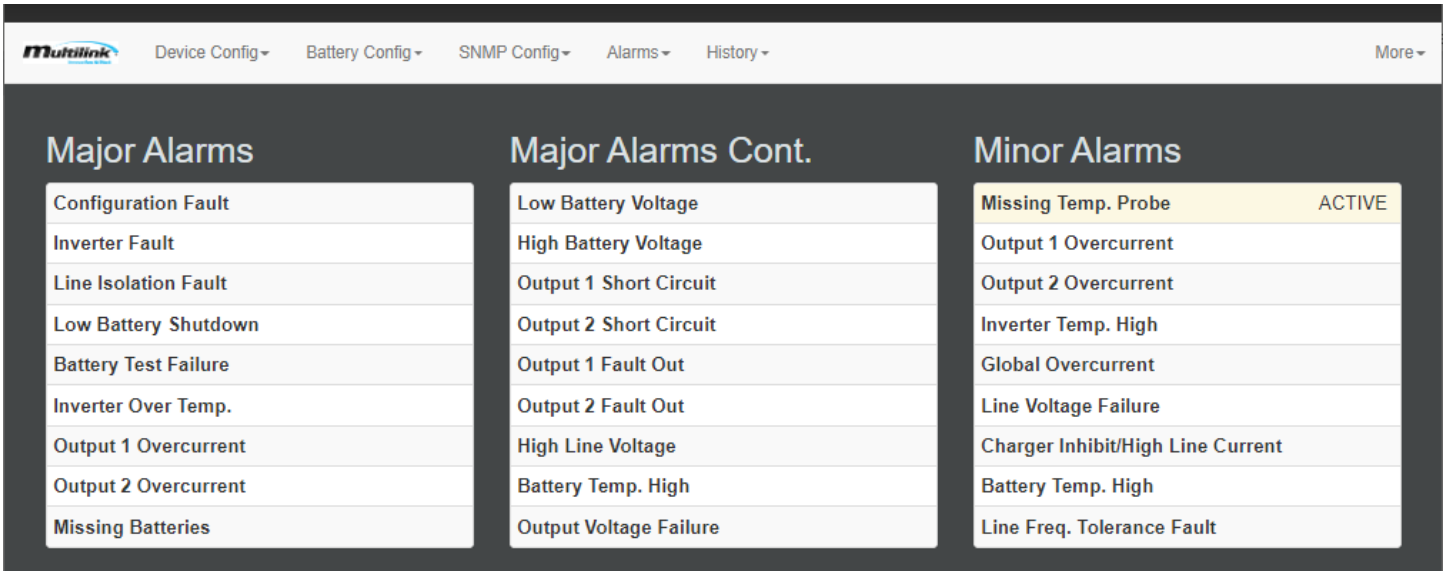

Image 10: EB1 Alarms Page

History Page:

This page displays all operating statistics and historical events recorded by the EB1 power supply. These counters and timers include standby and reset events, duration of events, and duration since change in operating condition. This page updates automatically to reflect any changes in events or timers.

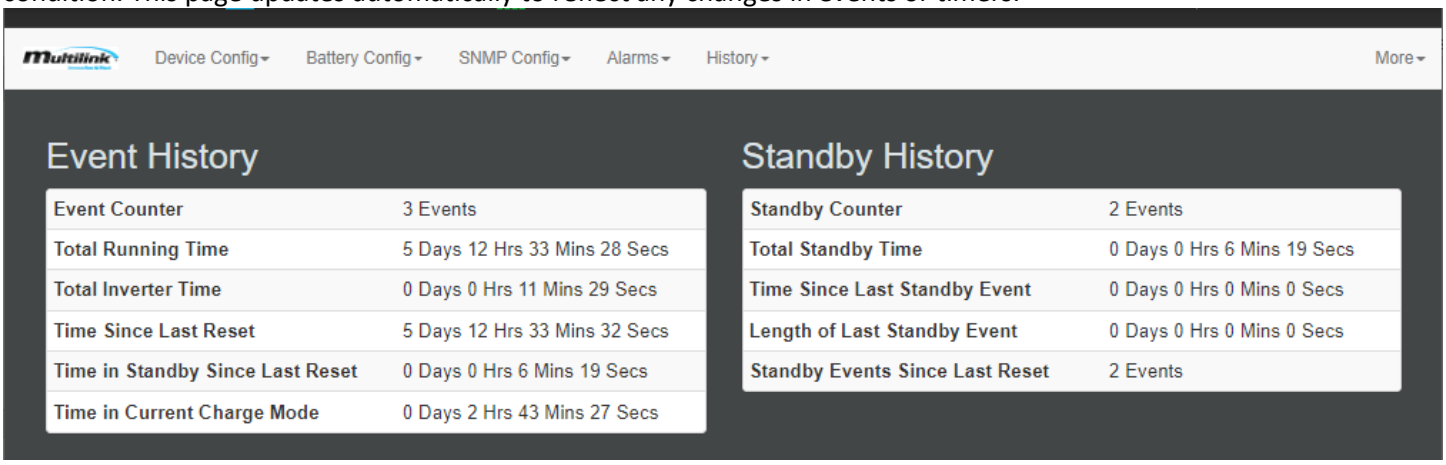

Image 11: EB1 History Page

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Troubleshooting:

Refer to the table below for common troubleshooting items and recommended solutions.

Issue	Description	Solution
IP address not assigned or addressable. IP address is within the range of 169.254.X.X.	An active DHCP server was not found through either the Ethernet 1 connection or the Fiber connection.	• Verify that all connections are correct. If using Ethernet ONLY, Ethernet 1 should be connected to an active network. If using Fiber, ensure the correct SFP or SFP+ module is in use for the respective Optilink ST model and verify the Ethernet Jumper is connected between Ethernet 1 and Ethernet 2. • Verify that both the TP/Link and FX/Link LEDs are ON and periodically flickering. • Verify the Activity LEDs on Ethernet 1 are active. • Verify device is connected to an Active DHCP network. • Verify that the upstream fiber transmitter is compatible with the currently installed SFP module.
SNMP communication is not functioning or returns no response.	SNMP settings are likely not configured correctly.	• Verify that the correct SNMP settings are configured for both the Agent and the NMS/MIB Browser. • Verify the correct SNMP protocol is in use. By default, the Optilink ST uses SNMPv2.

Optilink ST Specifications:

Specification for both models of the Optilink ST are shown below.

Operational Specifications			
Parameter	1G SFP Model	10G SFP+ Model	Notes
Processor	Sitara AM335X Arm processor		Additional Sitara and PHY variants are available for higher throughput up to 1000M Ethernet
Memory	4GB onboard flash		SD card expansion for additional storage and redundancy
Ethernet Connection	10/100 Base-T	10/100/1000 Base-T	RJ45 w/LEDs, auto-negotiation, auto-MDI/MDI-X
Fiber Interface	10/100/1000 Base-X SFP	10/100/1000/2.5G/10G Base-X SFP+	SFP and SFP+ ports are model dependent. Single/Multi-mode fiber support. Dip Switch settings allow for locking speed, link fault passthrough (LFP), automatic laser shutdown (ALS).
Serial Port	RS-485		Expandable for external device communications such as lithium batteries
Power	24VDC, 5W		Powered by EB1 inverter module
Temperature	-40°C to +65°C		
Humidity	5-90%		Non-condensing
Elevation	Up to 3000m		
Agency Approval	FCC Part B Sub 15		
Standards and Protocols	HTTP, TCP/IP, UDP, SNMP, SNTP		IEEE 802.3, 802.3u, 802.3ab, 802.3z, 802.3x

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INSTALL AND OPERATION