



DEFENDER SERIES+

User Manual



Switched IP Controllable Surge Protected PDU

SX-DSP-129 | SX-DSP-169 | SX-DSP-109i | SX-DSP-169i

AMETEK®

ADVANCED SERIES MODE®	ELIMINATOR SERIES™	ICE®	NEXT GEN®	SURGE ELIMINATION®
AXESS®	EMPOWER®	IMPEDANCE TOLERANT™	PCSTM	SURGEX®
COUVS®	ENVISION®	INRUSH CURRENT ELIMINATION®	POWERFRAME®	
DEFENDER SERIES®	ESP®	MULTIPAK®	REMOTE PORTAL®	
DIGITAL QC®	FLATPAK™	MULTI-STAGE®	SERIES MODE®	

This product may be covered by one or more claims of the following patents or published patent application:

U.S. Patent Nos.: RE39,446; 4,870,528; 4,870,534; 5,136,455; 6,040,969; 6,728,089; 6,744,613; 6,947,266; 7,068,487; 7,184,252; 7,511,934; 7,541,696; 7,551,412; 8,482,885; 8,520,349; 8,547,672; 8,614,866; 9,166,396; 9,225,534; 9,310,870; 9,489,026; 9,577,473; 9,787,081; 9,787,086; 9,831,662; 10,014,680; 10,090,662; 10,114,395; 10,184,963

U.S. Patent Application Publication Nos.:
2012/0221161; 2012/0265361; 2013/0073060 2013/0258538; 2013/0073232; 2017/0005963

Canadian Patent Nos.: 1,332,439; 1,333,191; 2,461,332 and 2,511,695

European Patent Nos.: EP2469554; EP2482085; EP2512092; EP2555004; EP2680014; EP3021441; EP3062409

China Patent Nos.: 102916388B

Table of Contents

- 1. Introduction 5
 - 1.1 Metering is performed at the system level, and includes: 5
 - 1.2 Physical Interfaces..... 5
 - 1.3 Rated & Maximum Current 6
 - 1.4 Voltage Requirements..... 6
- 2. Installation and Components 7
 - 2.1 AC Power: Output 7
 - 2.2 AC Power: Input 7
 - 2.3 Ethernet and Account Admin Password..... 7
 - 2.4 USB-Micro AB..... 7
 - 2.5 LED Indicators: 7
 - 2.6 Buttons..... 8
 - 2.6.1 Resettable fuse..... 8
 - 2.6.2 Hardware Reset..... 8
 - 2.6.3 Software Reset 8
- 3. Rack Installation 9
- 4. Web Server 11
 - 4.1 Login 11
 - 4.2 Power Management..... 11
 - 4.3 Reports 11
 - 4.4 Setup 13
 - 4.4.1 Device Setup..... 14
 - 4.4.2 Network Setup 18
 - 4.4.3 Network Advanced Setup..... 19
 - 4.4.4 Triggers Setup 22
 - 4.4.5 Users Setup 27
 - 4.4.6 Sequences Setup..... 27
 - 4.5 Utilities 28
 - 4.5.1 File Upload 28
 - 4.5.2 Backup/Restore 29
 - 4.5.3 Factory Reset 29
 - 4.5.4 Soft Reboot..... 29
- 5. Security..... 30

5.1 Authentication	30
5.1.1 802.1X	30
5.1.2 SSO (Single Sign-On).....	30
5.2 Interfaces	30
5.2.1 Network Interface	30
6. Application Programming Interfaces (APIs)	31
6.1 HTTP/HTTPS REST	31
6.2 Interfaces.....	31
7. Part Numbers	32
7.1 Part Number Scheme.....	32
8. Troubleshooting.....	33
9. Specifications.....	34

1. Introduction

The SurgeX Defender Series+ is an AC power distribution unit with power conditioning, control, and monitoring, with independently IP switchable AC receptacles and current monitoring for the inlet. Design for mounting on the rack. The internal web server provides configuration, output control, monitoring, and retrieval of data logs. Multiple security and communication interface options are supported.

Defender Series+ incorporates SurgeX Multistage surge suppression and EMI/RFI filtering technology. This protection safeguards the AC outlets.

The extensive programming capabilities of the Defender Series+ provides advanced sequencing and scheduling operations. Triggers can be programmed to activate on an “if X then do Y, then do Z when no longer X” basis. Trigger sources include various AC power measurements, scheduling, and AutoPing. Actions include turning receptacles on and off, cycling a receptacle, executing previously defined sequences, and putting a unit into shutdown. For example, an action can be created to power cycle a network appliance if it fails to respond to a series of pings.

1.1 Metering is performed at the system level, and includes:

- Line Voltage
- Neutral-Ground Voltage
- Current
- Power
- Line Frequency
- Power Factor
- Voltage Crest Factor
- Energy

1.2 Physical Interfaces

Model	Output	Input	Communication	Resettable Fuse
SX-DSP-129	(9) NEMA 5-15R	(1) NEMA 5-15P	(1) RJ45, (1) USB-Micro AB	(1) Push Button
SX-DSP-169	(7) NEMA 5-15R, (2) NEMA 5-20R	(1) NEMA 5-20P	(1) RJ45, (1) USB-Micro AB	(1) Push Button
SX-DSP-109i	(9) IEC 13	(1) IEC C14	(1) RJ45, (1) USB-Micro AB	(1) Push Button
SX-DSP-169i	(9) IEC 13	(1) IEC C20	(1) RJ45, (1) USB-Micro AB	(1) Push Button

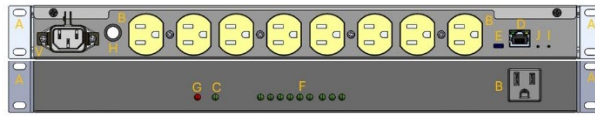
1.3 Rated & Maximum Current

Model	Rated Full Load Current	Maximum Current
SX-DSP-129	12A	15A
SX-DSP-169	16A	20A
SX-DSP-109i	10A	15A
SX-DSP-169i	16A	20A

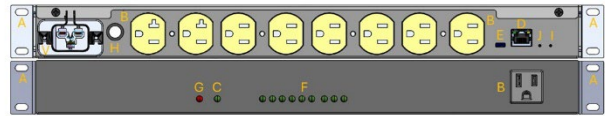
1.4 Voltage Requirements

Model	Input Voltage
SX-DSP-129	120V AC
SX-DSP-169	120V AC
SX-DSP-109i	240V AC
SX-DSP-169i	240V AC

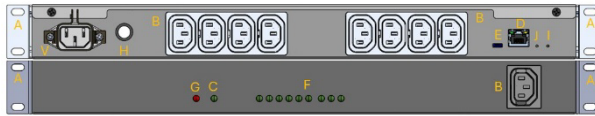
2. Installation and Components



SX-DSP-129



SX-DSP-169



SX-DSP-109i



SX-DSP-169i

Defender Series+ is designed to be installed horizontally on the equipment rack. The supplied nuts, bolts, and washers must be used to mount the Defender Series+ to the rack through the mounting holes **(A)** following the appropriate local regulations and requirements.

2.1 AC Power: Output

Plug the equipment cord **(B)** into the suitable receptacles as needed. Please review Introduction, Physical Interfaces, and Column Outputs for the suitable plugs for each model's receptacles.

2.2 AC Power: Input

Connect power to the Defender Series+ using an appropriately rated 3 wire grounding type power cord provided with the equipment in inlet **(V)**. Do not plug the unit into a relocatable power tap. Check the outlet for correct polarity and presence of a ground conductor before plugging the unit in.

2.3 Ethernet and Account Admin Password

The RJ45 connector for Ethernet **(D)** is situated on the front panel. The default IP Address is DHCP assigned. To find IP address of the device, please use the discovery tool at ametekesp.com. The mDNS protocol is supported for dynamic device discovery.

The default username is admin, and the default password is Adm1nXXXXXX where XXXXXX are the last six characters of the MAC address.

2.4 USB-Micro AB

The USB-Micro AB connector **(E)** is for diagnostics and troubleshooting IP connectivity issues and is only to be used for setup and debugging. To use, please use the discovery tool at ametekesp.com or manually enter the static IP address `https://169.254.10.100` into a supported browser. The web server will always be accessible at `https://169.254.10.100` through this USB port. The web server on this interface cannot be changed and will always be unsecured HTTP at port 80.

2.5 LED Indicators:

The receptacles have individual power indicator LEDs **(F)**. These are paralleled in the control interface. In addition, the unit has an LED indicating power **(G)**. Self -Test is indicated by **(C)**.

2.6 Buttons

2.6.1 Resettable fuse

The resettable fuse (**H**) is used to reset the Defender Series+ in case the fuse is tripped. This is a single push button to the bottom left of the Ethernet RJ45 jack. Also, there is a reset switch for hardware and another for software.

2.6.2 Hardware Reset

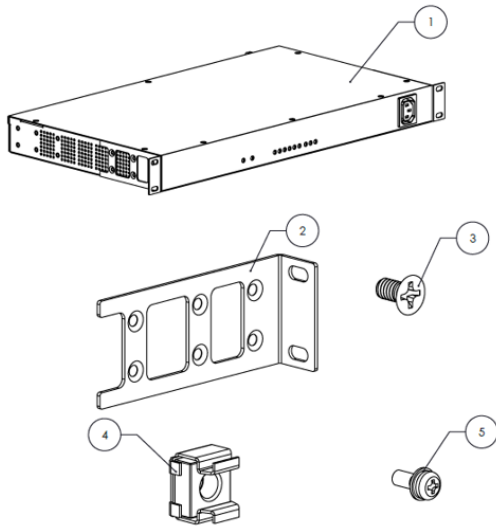
Hardware Reset (**I**): The Hardware Reset button performs a hard reboot of the processor. This hard reboot will immediately switch controlled outlets off, removing power to connected equipment on all outputs.

2.6.3 Software Reset

Software Reset (**J**): The Software Reset button is a multi-functional control depending on length of press. If the button is held for longer than 10 seconds, the unit resets itself to factory defaults, and all custom configurations are erased. If the button is held for less than 10 seconds, the unit will perform a software reset that will not reset any data or power cycle the connected equipment.

3. Rack Installation

Defender Series+ is designed to be installed horizontally in the equipment rack. The supplied nuts, bolts, and washers must be used to mount the Defender Series+ to the rack through the mounting holes (A) following the appropriate local regulations and requirements.



Inventory

SI. No	Items	Qty
1	Defender Plus Unit	1
2	Ear Mount Bracket	2
3	Flat head Screws	8
4	PAN Head Screws	4
5	Cage nut	4

Safety

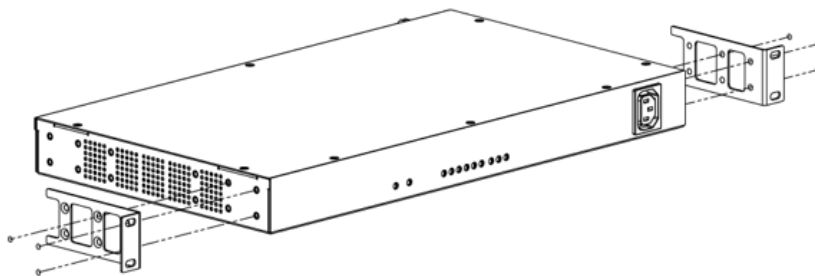
⚠ ⚠ **DANGER**

HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

- This Unit is intended to use indoor only.
- Do not install this Unit where excessive moisture or heat is present.
- Never install any wiring, equipment, or Units during a lightning storm.
- Plug this Unit into a three-wire, grounded power outlet only. The power outlet must be connected to appropriate branch circuit/mains protection (fuse or circuit breaker). Connection to other type of power outlet may result in a shock hazard
- Install the unit in such a way that the Wall socket-outlet should be readily accessible
- Use only the supplied brackets for mounting and use only the supplied hardware to attach the mounting brackets.
- Do not use extension cords or adapters with this Unit.
- If a socket-outlet is not accessible to the equipment, a socket-outlet shall be installed.
- Do not work alone under hazardous conditions.
- Check that the power cord, plug, and socket are in good condition.
- Disconnect the Unit from the power outlet before you install or connect equipment to reduce the risk of electric shock when you cannot verify grounding. Reconnect the Surge Unit to the power outlet only after you make all connections.
- Unit installation instructions that require verification of the Protective earthing connection of the socket-outlet by a Skilled person.
- This equipment is not suitable for use in locations where children are likely to be present.
- Use a protective earth connector with equipment. This type of connector carries the leakage current from the load devices (computer equipment).
- Do not exceed a total leakage current of 3.5 mA
- Do not handle any kind of metallic connector before the power has been removed
- Use one hand, whenever possible, to connect or disconnect signal cables to avoid a possible shock from touching two surfaces with different grounds.
- This unit does not have any user-serviceable parts. Repairs are to be performed only by factory-trained service personnel.
- The Unit is intended to be installed and operated by a skilled person in as controlled location with restricted access.
- The ambient operating temperature of a closed or multi-unit rack environment may be greater than the ambient temperature of the room. Ensure the ambient operating temperature of your rack environment does not exceed the rated ambient operating temperature for the device.
- Ensure the Unit is mounted securely and evenly.
- To avoid possible electrical shock and equipment damage, Use only the supplied hardware.

Failure to follow these instructions will result in death or serious injury

A

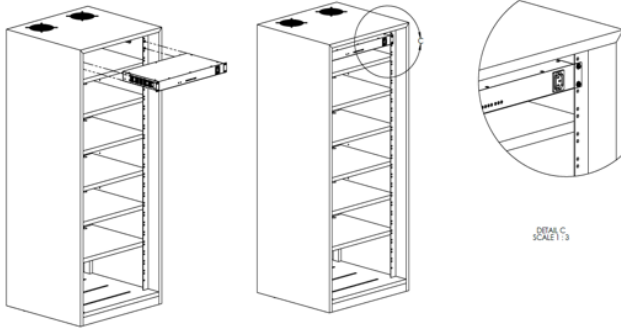


A

Secure the Ear Mount Bracket to Unit

Secure Ear Mount Brackets to the Unit using eight Flat head screws

B



B

Horizontal Mounting

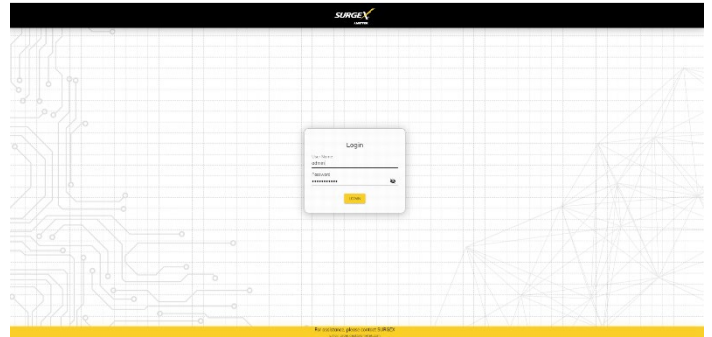
- Mount Unit on 19" rack holes provided in the channel and secure the Unit using four Flat head screws

4. Web Server

Defender Series+’s internal web server provides a comprehensive portal for configuration, monitoring, and control.

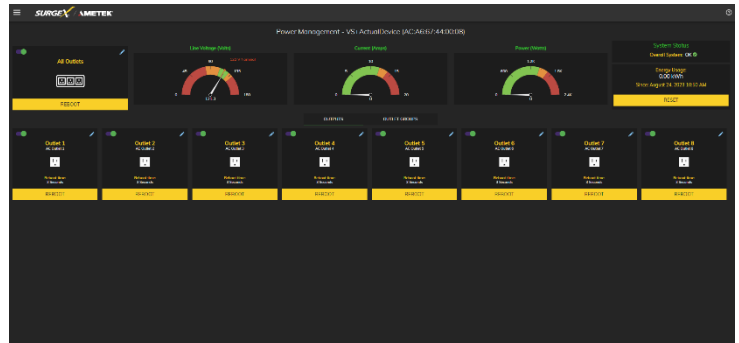
4.1 Login

The Login page is the first page displayed when a web browser makes a connection to the Defender Series+. Enter a valid username and password in the “User Name” and “Password” fields, and press “Login” to log in.



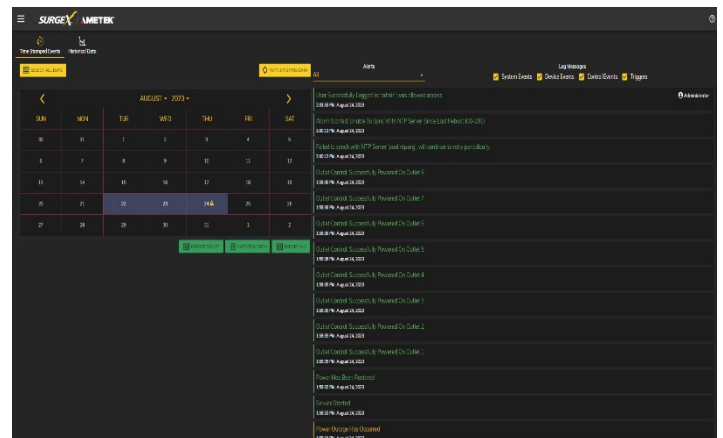
4.2 Power Management

The Power Management page provides information and status for the PDU and individual outlets, as well as basic control of each outlet. The top right section of the page provides system status.



4.3 Reports

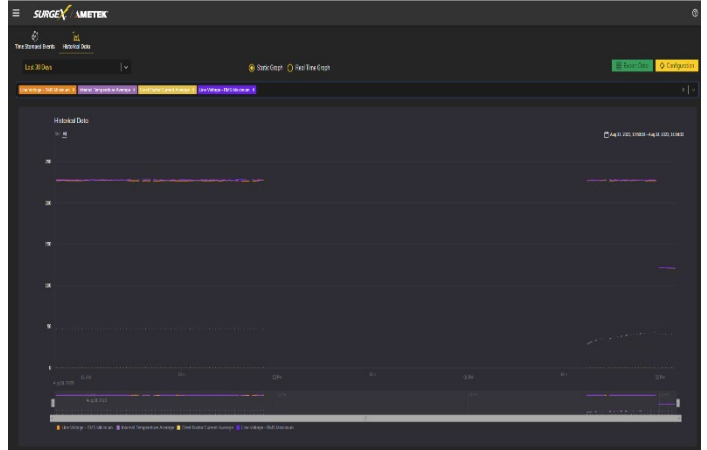
The Reports page displays data collected by the Defender Series+ and stored to its internal memory. The data is presented in two groups: Time Stamped Events and Historical Data. Time Stamped Events are recorded, with a date and time of occurrence when a condition meets established criteria. Defender Series+ uses a Real Time Clock (RTC) synced to an Internet time server and backed up by an internal battery. For the most accurate time stamps and to eliminate clock drift, we suggest verifying the NTP connection.



The types of events which may be recorded are:

- Triggers
- Power Outage
- Network Events
- Outlet Changes
- Shutdown Events
- Firmware Upgrades

Historical Data is a record of measured electrical parameters and may be adjusted to sample certain items at specific intervals. The available parameters are:



Historical Parameters		Description
Voltage Max	Line - Neutral	The maximum measured RMS voltage between the conductors during the measurement period.
	Neutral - Ground	
Voltage Min	Line - Neutral	The minimum measured RMS voltage between the conductors during the measurement period.
	Neutral - Ground	
Voltage Average	Line - Neutral	The average measured RMS voltage between the conductors during the measurement period.
	Neutral - Ground	
Voltage Peak Max	Line - Neutral	The maximum measured peak voltage between the conductors during the measurement period.
	Neutral - Ground	
Current Max	Total Device	The maximum measured RMS current during the measurement period.
Current Average	Total Device	The average measured RMS current during the measurement period.
Current Peak Max	Total Device	The maximum measured peak current during the measurement period.
Power Max	Total Device	The maximum measured average power during the measurement period.
Power Average	Total Device	The average measured average power during the measurement period.
Power Peak Max	Total Device	The maximum measured peak power during the measurement period.
Frequency Max		The maximum measured AC line frequency.
Frequency Min		The minimum measured AC line frequency.
Frequency Average		The average measured AC line frequency.
Power Factor Mode	Total Device	The most recorded power factor during the measurement period.
Crest Factor Max	Line Voltage	The maximum crest factor calculated during the measurement period.
	Neutral - Ground Voltage	
Crest Factor Min	Line Voltage	The maximum crest factor calculated during the measurement period.
	Neutral - Ground Voltage	

Energy Usage	Total Device	The accumulated energy consumed by connected equipment during the measurement period.
--------------	--------------	---

4.4 Setup

Complete setup and configuration of Defender Series+ is provided via 6 Setup web pages. Each setup page is described in the following sections. Each setup page has a save button at the bottom of the page which must be pressed to keep the configuration changes. A green success message will temporarily appear in the top right of the page when the settings are saved properly.

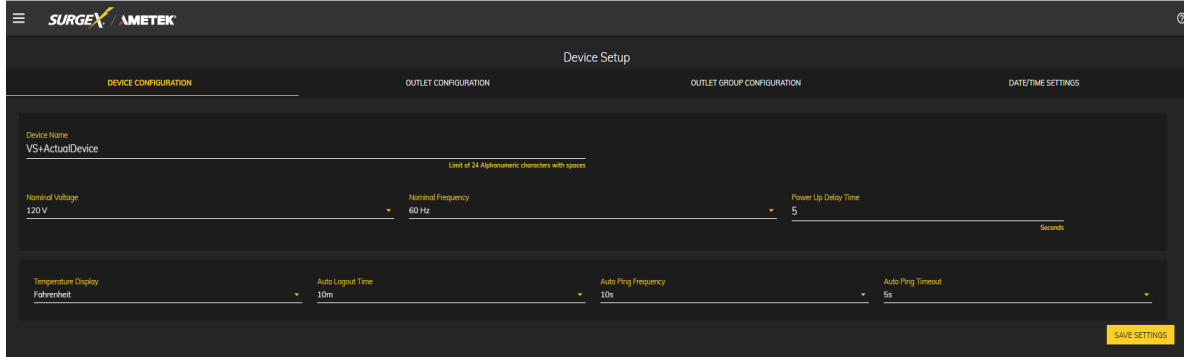
Setup	
Setup Page	Description
Device	Configure basic device parameters
Device Configuration	Configure settings for visual feedback and power up procedure
Outlet Configuration	Configure controllable outlet settings
Outlet Group Configuration	Create, Edit, or Delete outlet groups
Date/ Time Settings	Configure NTP server or set manual time
Network	Configure network settings, including the network adapter and time keeping
Network Advanced	Configure advanced monitoring and security settings
SNMP	Configure SNMP connection and communication settings
802.IX Settings	Configure authentication settings and/or view connection logs
LDAP Client Settings	Configure LDAP authenticator, options, and test connection
Users	Configure and modify user accounts
Triggers	Create and modify triggers
Threshold with Samples	Configure triggers based on measurements
AutoPing	Configure triggers based on pinging IP addresses
Schedule	Configure triggers based on time
Sequences	Create and modify custom sequences

4.4.1 Device Setup

The Device Setup page allows for the specification of basic device parameters.

4.4.1.1 Device Configuration

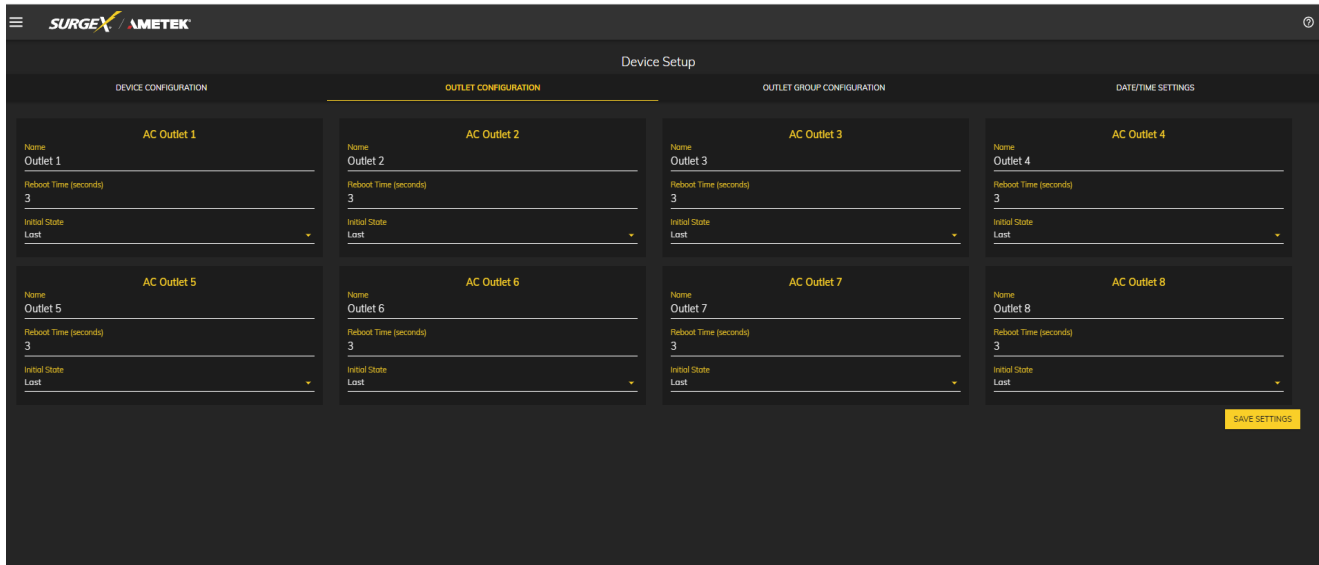
The Device Configuration tab allows for the specification of visual feedback and device initialization.



Device Configuration	
Item	Description
Device Name	Specifies the name label to be associated with this Defender Series+ device.
Nominal Voltage	Specifies the expected voltage on the input receptacle. This selection does NOT change any settings for over/under voltage shutoff. This is only for visual coloring on gauges.
Nominal Frequency	Specifies the expected frequency on the input receptacle. This selection does NOT change any settings for triggers. This is only for visual coloring on gauges.
Power Up Delay Time	Specifies the amount of time in seconds by which to stagger the manual turning on of multiple outlets when applying the initial state.
On Power Up	Specifies whether to set outlets to initial states run a predefined sequence when Defender Series+ device powers up or the hard reset button is pushed.
On Shutdown Clear	Specifies whether to set outlets to initial states run a predefined sequence when Shutdown state clear.
Temperature Display	Specifies whether to display temperature in degree Fahrenheit or Celsius.
Auto Logout	Specifies the web security timeout in minutes.
AutoPing Frequency	Specifies how frequent the Defender Series+ device will send pings to an IP Address or Hostname in an AutoPing trigger.
AutoPing Timeout	Specifies the amount of time the Defender Series+ device will wait for a ping response before calling the attempt a failure.

4.4.1.2 Outlet Configuration

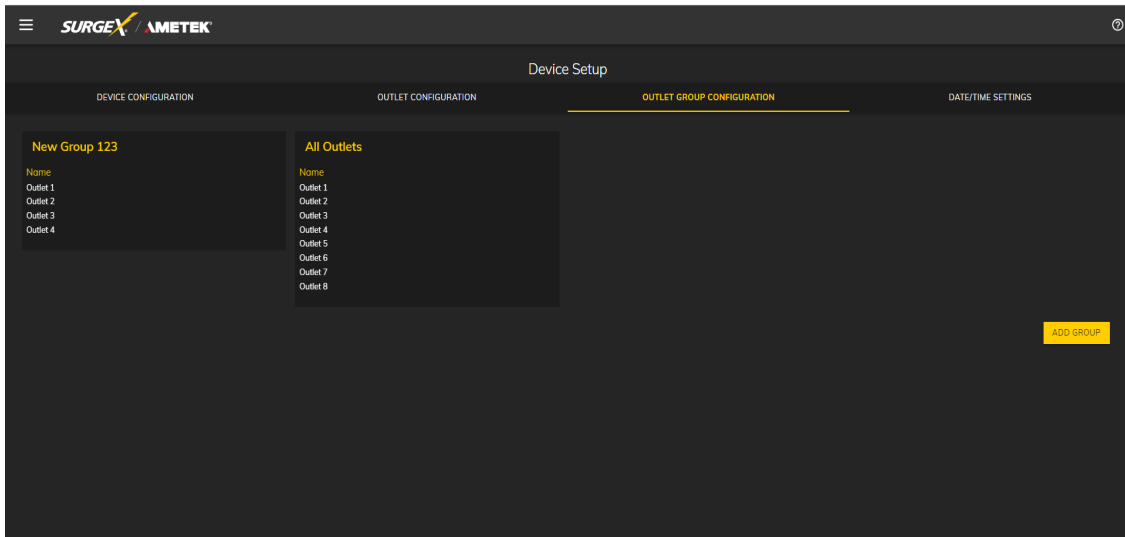
The Outlet Configuration tab allows for the specification of unique names and reboot times per outlet. The configuration for initial state per outlet is also here, if this option is selected in the Device Configuration tab for either On Power Up or On Shutdown Clear.



Outlet Configuration	
Item	Description
Outlet Description	A fixed short phrase that references a physical feature.
Outlet Name	Specifies the name label to be associated with this Outlet.
Reboot Time	Number of seconds that the device will wait in between turning an outlet off and turning the outlet back on during a reboot command.
Initial State	<p>The state that an outlet will assume during start up or after a shutdown clears, if the initial state setting is selected in the Device Configuration tab. Options are as follows:</p> <p>Always On Regardless of other settings, this outlet will always be on. Ignores Shutdown state and deselecting Initial State in the Device Configuration tab. Outlet ignores user commands to reboot or power off. The only thing that will kill power with this selected is a hard reboot or an power outage.</p> <p>Always Off The opposite of Always On, this setting will never allow an outlet to pass power.</p> <p>On The outlet will start in an On state.</p> <p>Off The outlet will start in an Off state.</p> <p>Last The outlet will assume the last state it was in. (Factory Default)</p> <p>Reboot Only The outlet will act like the On state but will ignore user commands to power off. This outlet will only respond to reboot commands. Useful for network appliances that may need to be rebooted, but otherwise want to be on all the time. Using this setting, the outlet will still turn off during Shutdown state.</p>

4.4.1.3 Outlet Group Configuration

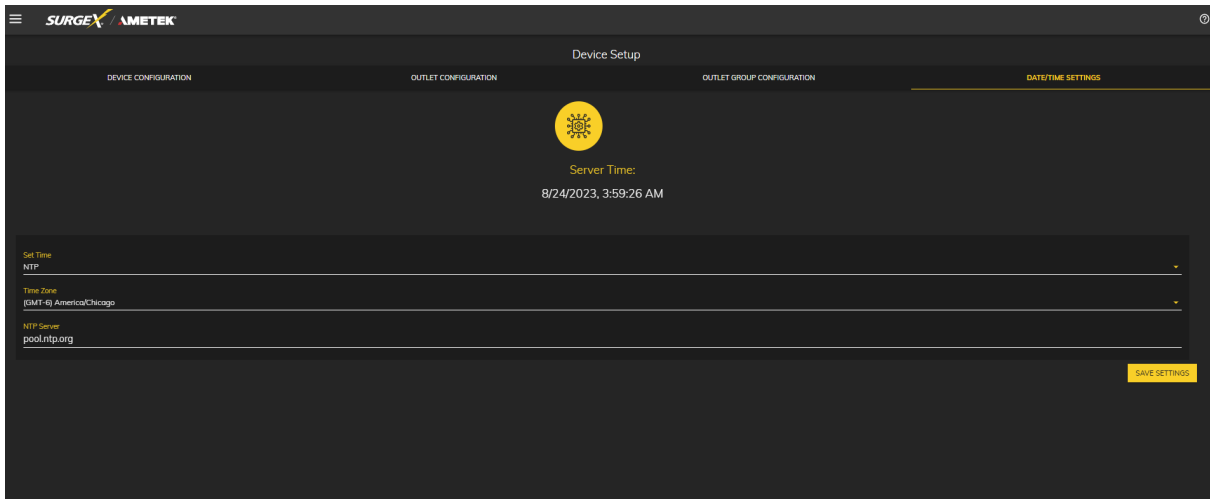
The Outlet Group Configuration tab allows for the specification of visual feedback and device initialization.



Outlet Group Configuration	
Item	Description
Group Name	Specifies the name label to be associated with the outlet group.
Member Name	Specifies the outlet members of this outlet group.

4.4.1.4 Date/Time Settings

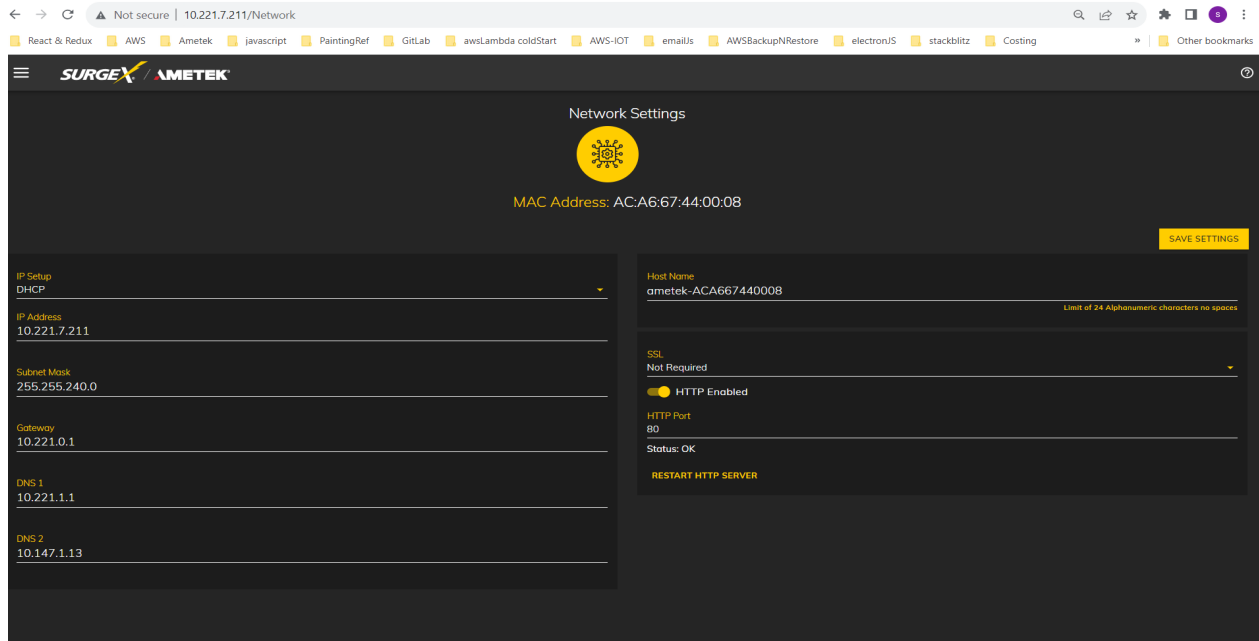
The Date/Time Settings tab allows for the specification of visual feedback and device initialization.



Date/Time Configuration	
Item	Description
Server Time	Returns the device's internal time based on the local time zone.
Set Time	Specifies the method for setting the time in the Defender Series+ device. Options for this setting are NTP or manual. NTP will use the NTP Server option to automatically sync the device time every day.
Time Zone	Specifies the desired time zone adjustment for the Defender Series+ device.
NTP Server	Specifies the hostname or IP address of the NTP server to use for time synchronization.

4.4.2 Network Setup

The Network Setup page allows for the specification of network settings, including the network interface and NTP time server.



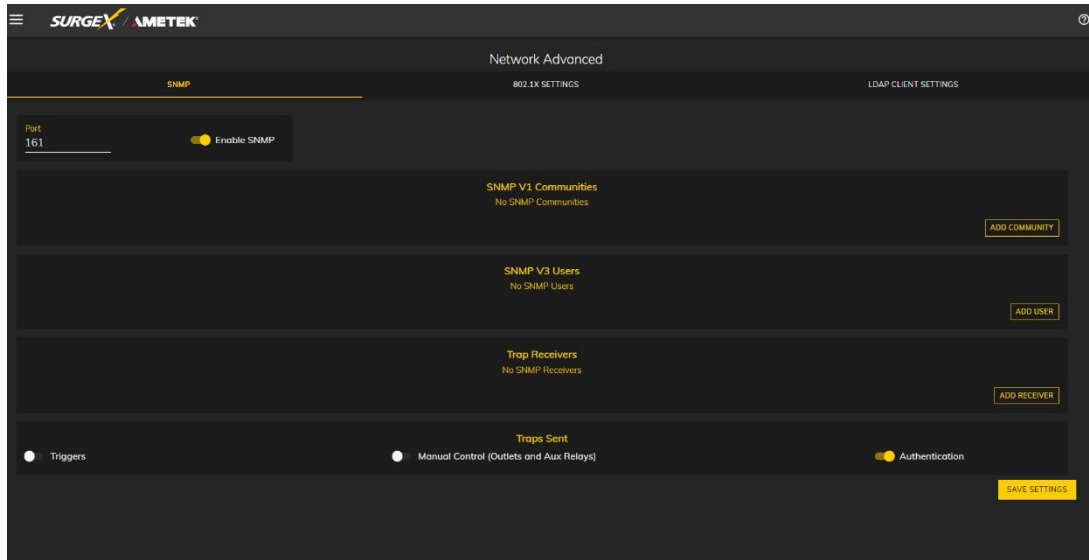
Network Configuration	
Item	Description
Setup	Specifies if the device will have a static IP Address or will dynamically be assigned network settings through DHCP.
Address	Current IP Address of the network interface on the RJ45 Ethernet port
Subnet Mask	Current Subnet Mask of the network interface on the RJ45 Ethernet port.
Gateway	Current Gateway of the network interface on the RJ45 Ethernet port
DNS 1	Current DNS1 of the network interface on the RJ45 Ethernet port.
DNS 2	Current DNS2 of the network interface on the RJ45 Ethernet port.
Hostname	A configurable unique name to be used to access the device instead of an IP Address.
SSL	Specifies whether the web server will be SSL encrypted (HTTPS) or not (HTTP). The default certificate is self-signed and will require the user to continue through a safety notification if a custom signed certificate is not uploaded to the device.
HTTP Enabled	Specifies if the web server is enabled or disabled. NOTE: If disabling the web server, the web interface end REST API will be disabled, only limited functionality over SNMP will remain enabled.
HTTP Port	Port number to use for the web server.

4.4.3 Network Advanced Setup

The Network Advanced Setup page allows for the specification of more advanced network security and monitoring options.

4.4.3.1 SNMP

The SNMP tab allows for the specification of parameters for the SNMP agent, supporting V1 through V3.

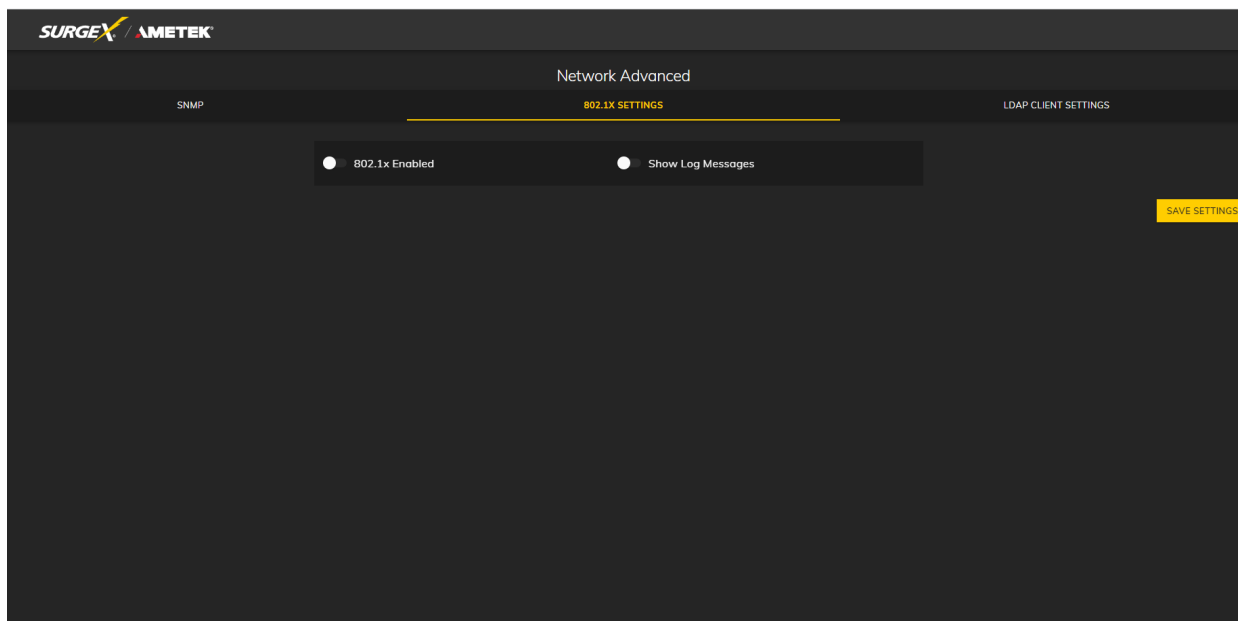


SNMP Setup	
Item	Description
Enable SNMP	Specifies whether to enable the SNMP agent.
Port	Specifies the port number for the SNMP agent. 161 is the standard SNMP port.
SNMP V1 Communities	Is a table of all SNMP communities, supporting SNMP V1 at a minimum.
Name	Specifies the Community name for read and/or write access.
Source	Specifies an unrequired whitelist. If requests are not to be filtered by hostname or IP Address, this field can be left blank.
Access	Specifies the type of access allowed by the community.
SNMP V3 users	Is a table of Users specifically for SNMP V3 authorization. Users here will not apply to the REST API, and REST API users will not be able to authenticate via SNMP V3 without redefining their credentials here. SNMP credentials cannot be authenticated using the LDAP Client.
Name	The name or username for authorization.
Authorization	Type of encryption used per user. Options are DES or MD5.
Access	Type of access per user. Options are Read Only or Read/Write.
Passphrase	Passphrase or password for the user.
Trap Receivers	Is a table of all the destinations for SNMP traps.
Name	The name of the community for traps.
Host Name	The hostname or IP address of the SNMP Manager that is going to receive traps.
Port	The port number that the SNMP Manager is listening for traps on.

Traps Sent	Specifies which specific traps are to be sent. Triggers send traps for Triggering and Clearing. Manual Control sends traps for outlet state changes, and Authentication sends traps for failed authentication attempts.
------------	---

4.4.3.2 802.1X Settings

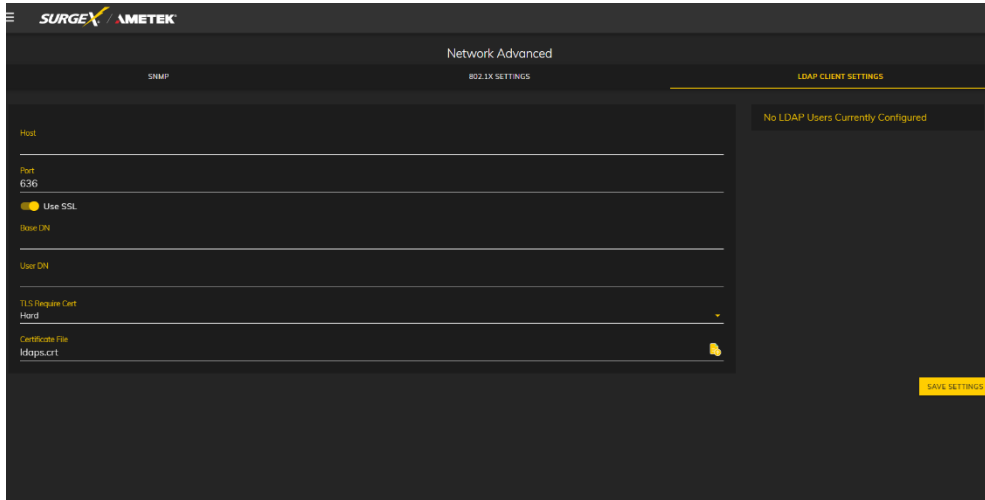
The 802.1X Settings tab allows for the specification of 802.1X authentication and debugging of errors as they may arise.



802.1X Settings Setup	
Item	Description
802.1x Enabled	Enables the 802.1x authentication client. This does not require the user to have a unique password for Defender Series+ device. Network login credentials can be used.
Show Log Messages	Opens and hides a table with date/time coded 802.1x related messages for debugging an authentication failure.
Authentication Type	Specify the authentication method used during the 802.1x negotiation. Different authentication options and settings will be displayed based on the selected Authentication Type.

4.4.3.3 LDAP Client Settings

The LDAP Client Settings tab allows for the specification of the LDAP Authentication server and authentication method and a test interface to test the server setup.

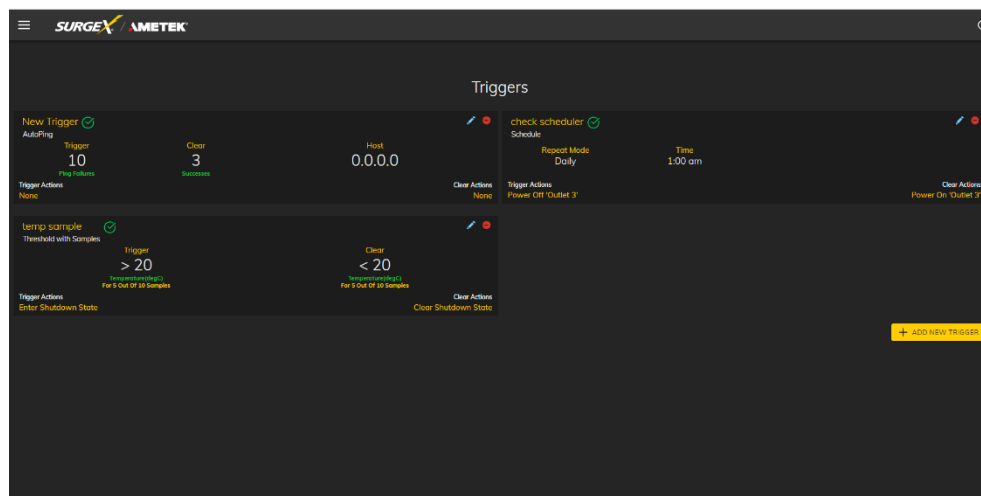


LDAP Client Settings Setup	
Item	Description
Host	The hostname or IP address of the LDAP server.
Use SSL	A switch that will enable or disable SSL when attempting to connect to the LDAP server. This is a separate option than the port number, in the case that a site is using a nonstandard port for authentication but still wants the ability to specify encryption. We always suggest using encryption when using LDAP.
Base DN	The base point in the directory tree where the user distinguished name search will begin.
User DN	The distinguished name of a user that will be used to authenticate. Multiple users are supported by using macros. For example, in the above image, the username test User attempts to log in, and the User DN pulls the name "Test User" from the user's definition for use in the authentication to replace the string %Full Name%.
TLS Require Cert	This specifies how to handle server certificates during TLS negotiations. Never: the client never asks the server for a certificate. Allow: the client will ask for a certificate; if none is provided, the session proceeds normally. If a certificate is provided but the client is unable to verify it, the certificate is ignored and the session proceeds normally, as if no certificate had been provided. Try: the certificate is requested, and if none is provided, the session proceeds normally. If a certificate is provided and it cannot be verified, the session is immediately terminated. Demand: the certificate is requested, and a valid certificate must be provided, otherwise the session is immediately terminated.
Certificate File	This is the certificate that will be sent to the LDAP Server when/if requested.
User Name	The information for a user that is defined in the Users page. The first part (name), is accessible by the %Full Name% macro, and the second part (username) is accessible with the %UserName% macro.
Password	The password for the given user to test the LDAP server configuration.

Test User	A button to send an authentication request using the given settings for the user and password above. NOTE: Settings should be saved using the "Save Settings" button at the bottom of the page before testing a configuration change.
-----------	---

4.4.4 Triggers Setup

The Triggers Setup page allows for the modification of triggers. Triggers define event logging parameters and allow configuration to automatically control and protect connected equipment. Triggers are categorized into three types: AutoPing, Threshold with Samples, and Schedule, but all have the same possible actions. Actions can either be on the onset (Trigger/Alarm Actions) or offset (Clear Actions) of a trigger. All Triggers are logged along with the associated actions.



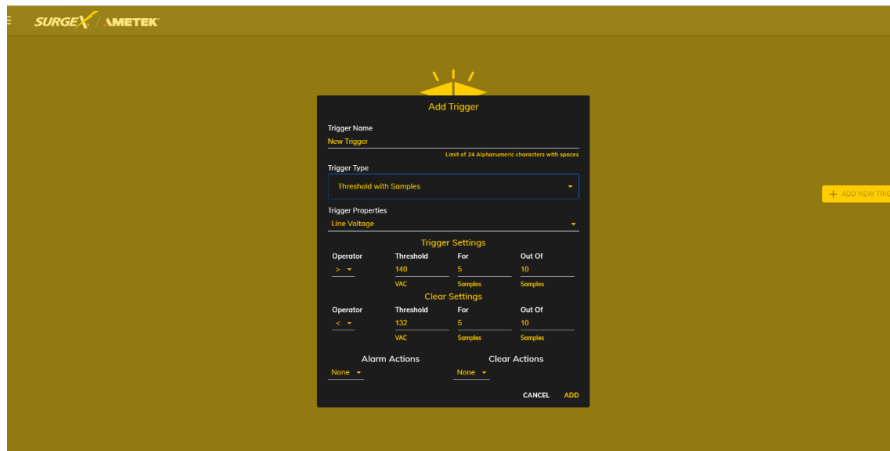
Trigger Types	
Item	Description
Threshold with Samples	Uses measurements over an allotted time to take an action. This trigger type is configurable to act very quickly or very slowly depending on environmental/system needs.
AutoPing	Issues a ping function on a periodic basis to determine if an IP asset is accessible.
Schedule	Uses the device time to issue a one time or periodic command. We suggest ensuring the NTP server is updating correctly to use the schedule trigger.

Action Types	
Item	Description
None	Do not take any action; only log the event. This is useful as a Clear Action when an action should persist, or for both Alarm and Clear actions when just logging the event is desired.
Power On	Power on a specific outlet if the outlet configuration allows it.
Power Off	Power off a specific outlet if the outlet configuration allows it.
Reboot	Reboot a specific outlet if the outlet configuration allows it. If an outlet is already off when this command is issued, the outlet will simply turn on after the outlet specific reboot delay time.

Run Sequence	Run a specific sequence.
Enter Shutdown State	Put the device into a shutdown state. This state turns off all outlets (unless they are configured for always on). The only way to clear a shutdown state, is another trigger, a button on the web interface, or a REST API command.
Clear Shutdown State	Clear the device's shutdown state. Clearing the device's shutdown state will cause the outlets to follow the logic defined by the On Shutdown Clear setting.

4.4.4.1 Threshold with Samples

The Threshold with Samples trigger uses several measurements to decide when to act. The trigger can be configured to act quickly or slowly, depending on the number of measurement samples used. A new sample is available every 50ms, with the minimum samples being used for a trigger being 1 sample and the maximum being 20 samples. Threshold with Samples triggers are evaluated every time a new sample is available. Based on the below “New Trigger” example below, the trigger will alarm or turn on after 5 of any consecutive 10 samples are above 140V.

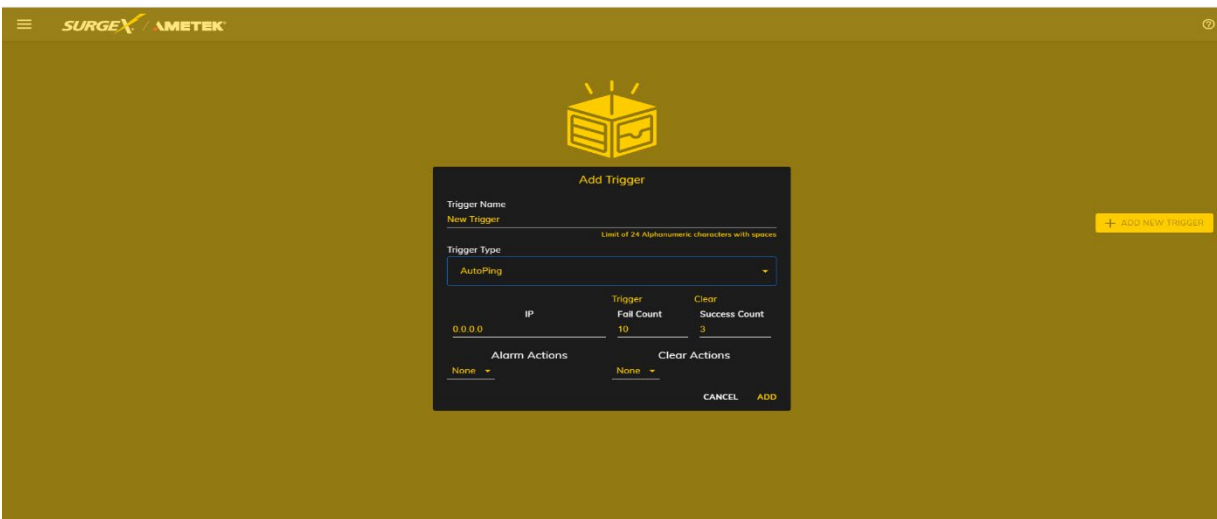


Item	Options	Description
Trigger Properties	Line Voltage	Uses the Line to Neutral voltage measurement. Measurement accuracy is between 90 VAC and 300 VAC.
	N-G Voltage	Uses the Neutral to Ground voltage measurement. Measurement accuracy is between 0.6 VAC to 300 VAC.
	Current	Uses the current measurement, which includes total product current. Measurement accuracy is between 0.1 A and 20 A.
	Temperature	Uses the internal temperature measurement. This should not be treated as an ambient temperature and will vary drastically based on loading.
	Frequency	Uses the frequency measurement. Measurement accuracy is between 45 Hz and 65 Hz.
	Average Power	Uses the average power measurement. Measurement accuracy is between 12W and 6000W.
	Crest Factor	Uses the Line to Neutral Voltage Crest Factor.
	Power Factor	Uses the Power Factor.
Operator	>	Requires "For" number of measurements to be greater than the threshold.
	<	Requires "For" number of measurements to be less than the threshold.
	=	Requires "For" number of measurements to be exactly equal to the threshold.
Threshold	Numerical Range	Is the number to be evaluated against all measurements to either trigger or clear the trigger.
For	1-20	The number of measurements out of the given number of samples being evaluated that must meet the criteria to trigger or clear the trigger.

Out Of	1-20	The number of consecutive measurements to be evaluated to trigger or clear the trigger.
--------	------	---

4.4.4.2 AutoPing

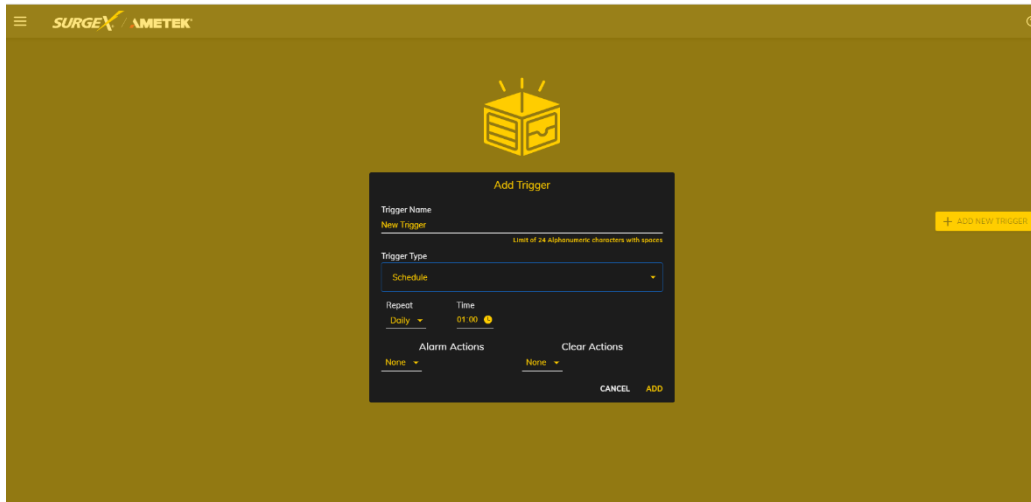
The AutoPing trigger uses a ping command on a periodic basis defined in the device settings to test if a specific IP address will respond. This trigger type is useful if there is a problematic piece of equipment that becomes unresponsive or if internet connectivity is inconsistent.



Item	Description
IP	IP address to be pinged at the period set on the device configuration page.
Fail Count	Number of consecutive failed ping responses needed to trigger the AutoPing trigger.
Success Count	Number of consecutive successful ping responses needed to clear the AutoPing trigger.

5.4.4.3 Schedule

The Schedule trigger uses the internal time of the SQUID to easily configure single and recurring events based on time. Only Alarm Actions are used for this trigger.



Item	Options	Description
Repeat	Never	The trigger will only fire when the time reaches the time shown in the configuration the next time.
	One Time	The trigger will only fire once on the specific date and time shown in the configuration.
	Daily	The trigger will fire every day at the given time.
	Weekly	The trigger will fire every week on the selected day(s) at the given time.
	Monthly	The trigger will fire every month on the given day of the month at the given time.
	Annually	The trigger will fire every year on the given day of the given month at the given time.
Date	Date Picker	A specific date to be used in the One-Time trigger.
Days	Sunday - Saturday	A set of day(s) that can be selected for use in the Weekly trigger.
Day	1-31	A day of the month to be used in the Monthly or Annually trigger.
Month	January - December	A month of the year to be used in the Annually trigger.
Time	12:00 AM - 11:59 PM	A given time to be used in all scheduling triggers.

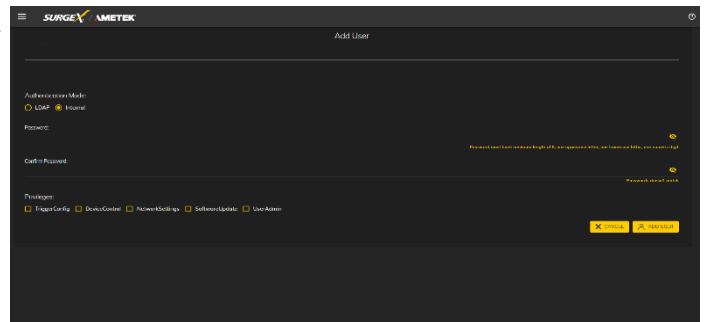
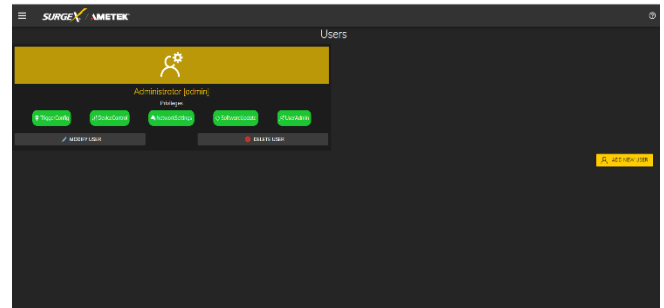
4.4.5 Users Setup

The Users Setup page allows for the creation, deletion, and editing of user accounts. Each user will have a unique name, username, authentication mode, and may be assigned access to specific features.

LDAP and Internal authentication modes are supported.

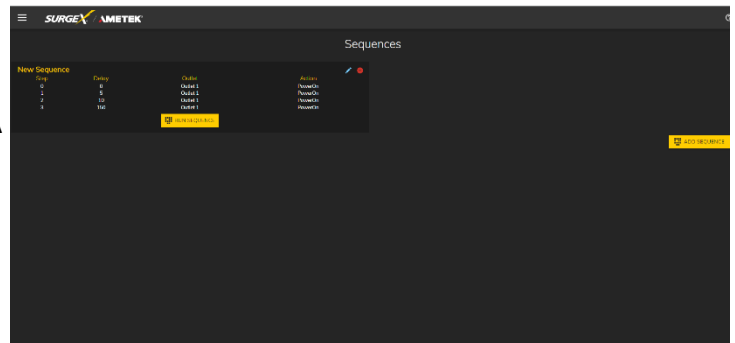
The following privileges may be assigned or revoked as necessary:

- Trigger Config
- Device Control
- Network Settings
- Software Update
- User Administration



4.4.6 Sequences Setup

The Sequences Setup page allows for the creation and modification of sequences. A sequence is a set of actions to be taken in a specific order and with a specified delay time between each step. Using sequences avoids manually performing each action or turning each outlet on or off individually.



A sequence, as defined for this product, is purely a one-way sequence. That is, you do not use the same sequence to turn outlets on as you use to turn the same outlets off in reverse order. One sequence must be created for the turn-on function and then a second sequence must be created for the turn-off function.

To create a new sequence, press the “Add Sequence” button. The new sequence must be given a unique name. This name should clearly indicate what the sequence will do, such as “All On”, “All Off”, or “Stage Equipment On”.

To run a sequence to test it, press “Run Sequence”. To edit an existing sequence, press the pencil icon. To delete a sequence, press the minus “-” icon.

After a sequence has been saved, it will be available at the Sequences page and when creating or editing a trigger when run sequence is selected as an action.

**Time delay is specified from the previous sequence item, not from the initial starting point. For example, creating a sequence with “Step 1, 1 second, Outlet 1, On” and “Step 2, 1 second, Outlet 2, On” will turn on Outlet 1 after 1 second, and Outlet 2 on 1 second after Outlet 1 has turned on. This sequence will not turn on both Outlets 1 and 2 at the same time.*

Sequence Actions:

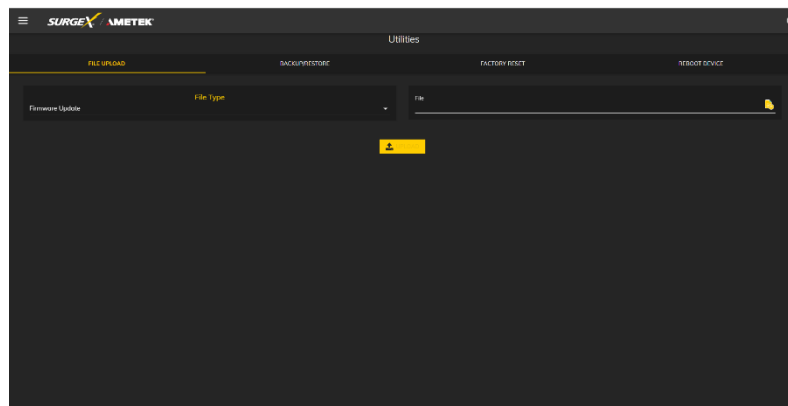
- None (useful for additional time delays)
- State Change
 - On, Off, or Reboot

4.5 Utilities

Defender Series+ contains several utilities to ease the configuration and deployment that may be performed on a per unit basis through several web pages.

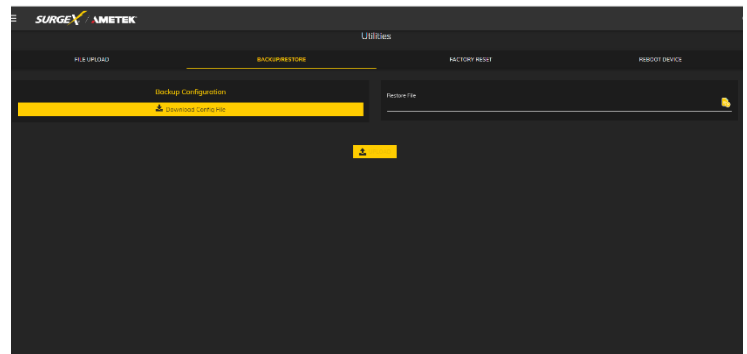
4.5.1 File Upload

Defender Series+ allows for a variety of files to be uploaded. This is also the method for upgrading the firmware. Current firmware versions can be obtained from the SurgeX website. Defender Series+ will not automatically contact SurgeX servers for new firmware. Other files that can be uploaded include a variety of certificates and configurations. By default, Defender Series+ ships with a self-signed HTTPS certificate if HTTPS is enabled. A different certificate can be uploaded for use by the HTTPS server by selecting “HTTPS SSL Certificate” under the File type drop down.



4.5.2 Backup/Restore

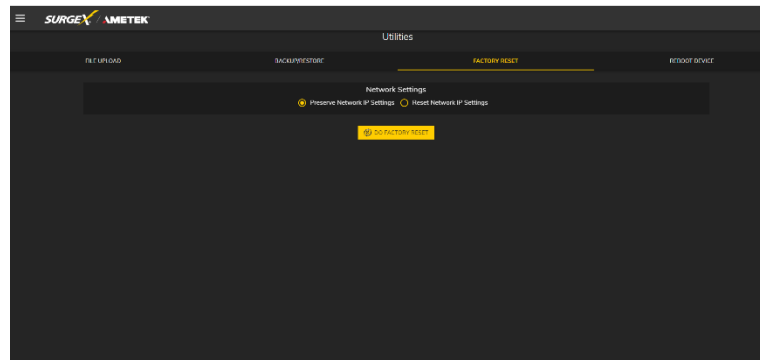
The current configuration may be saved to a file and downloaded for archival. Previously stored configurations may be applied to other units to easily mass configure a larger deployment. IP Settings will not be saved in the Backup Configuration.



4.5.3 Factory Reset

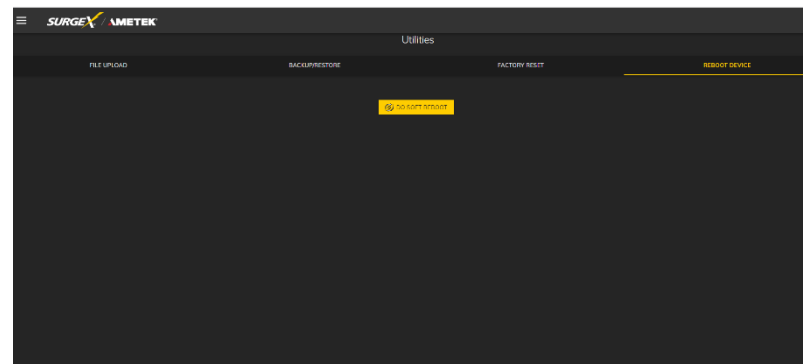
Factory default settings may be applied through the web interface.

- Option to keep or reset network IP settings. - Web Server settings will be reset. A custom port number will be reset to 80 and SSL will be disabled by default.



4.5.4 Soft Reboot

Adds the ability to reboot the Defender Series+ processor. A soft reboot will not change the outlet state or disconnect power from connected equipment. This request will add a message in the event log "Rebooting Adapter Due to User Request".



5. Security

Defender Series+ has been designed with security as a priority. All ports and features may be changed or disabled.

5.1 Authentication

Defender Series+ supports basic and secure authentication for users and network connections.

5.1.1 802.1X

802.1X network authentication may be enabled for networks requiring supplicant authentication.

5.1.2 SSO (Single Sign-On)

Defender Series+ users may be configured to use either Internal or SSO (Single Sign-On) authentication. Internal authentication uses basic usernames and passwords assigned by the administrator on a per-unit basis. SSO authentication uses LDAP (Lightweight Directory Access Protocol) to authorize users and determine their level of privileges using Microsoft® Active Directory. While it is possible to use LDAP to authorize users without SSL encryption, we suggest only configuring the connection to the authentication server using SSL encryption to plain text network traffic.

5.2 Interfaces

5.2.1 Network Interface

- Web Server: It is possible to enable and disable the internal web server, change the security from none (HTTP) to TLS 1.2 (HTTPS), as well as change its port. These settings also apply to the REST API.
- SNMP: SQUID supports SNMP V3 for secure communications with the ability to enable and disable.

6. Application Programming Interfaces (APIs)

Defender Series+ is designed for flexible communication and integration with diverse control and monitoring platforms.

6.1 HTTP/HTTPS REST

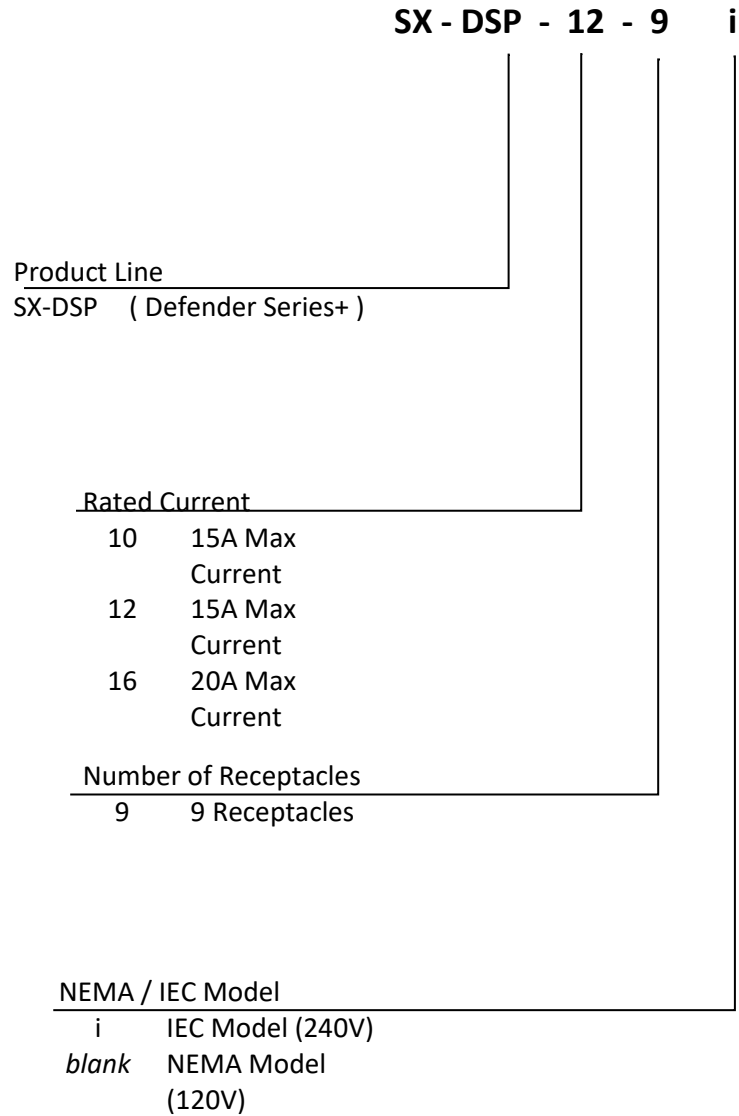
Defender Series+ includes an extensive HTTP API (HTTPS when security is enabled) in JSON format. Full protocol details are available at <https://www.ametekesp.com>.

6.2 Interfaces

SNMP V3 communications are intended to provide essential items for management. Read, Write, Table, and Trap objects will be included. Full protocol details, and the SNMP MIB, are available at <https://www.ametekesp.com>.

7. Part Numbers

7.1 Part Number Scheme



8. Troubleshooting

1) Checking for power input issues -

- a) Verify if the power source is functioning correctly and ensure that all connections are secure.
- b) Verify the circuit breaker.
- c) Verify the incoming line cord to the device is accidentally disconnected or if the mains plug is pulled out from the wall receptacle.

2) Diagnosing overloading issues - Check if the device is being overloaded by too many connected devices or if there is a problem with the power distribution unit. Please refer to the Overload current specification table.

Rated Current	Maximum Current
10A	15A
12A	15A
16A	20A

3) Inspecting for physical damage - Check for any signs of physical damage such as bent pins, frayed cords, or broken components.

4) Testing voltage levels - Verify that the voltage levels are within the appropriate range for the specific device and check for any voltage fluctuations or spikes. Improper mains voltage to the device may result in fire.

5) Checking for firmware or software issues - Ensure that the firmware or software of the device is up-to-date and functioning correctly.

6) Investigating environmental factors - Check for any environmental factors that may be affecting the device such as extreme temperature or humidity.

7) Replacing a component or subsystem in the device without a trained technician may lead to device malfunctionn.

8) Contacting customer support - If the above troubleshooting methods do not resolve the issue, the user may be advised to contact customer support for further assistance.

9. Specifications

Parameter		Item Number			
		SX-DSP-129	SX-DSP-169	SX-DSP-109i	SX-DSP-169i
AC Load Rating		12A @ 120V	16A @ 120V	10A @ 240V	16A @ 240V
No of Outlets - Back		8	8	8	8
No of Outlets - Front		1	1	1	1
Measurement Accuracy	Voltage	± 2%			
	Current	± 5%			
	Power	± 5%			
	Energy	± 5%			
Timestamp Accuracy		± 1%			
Network Port		10/100 Ethernet connection on Female RJ45, Auto Negotiating with 10/100 network connections with Link and Activity LEDs			
		USB RNDIS Device on micro-AB			
Weight		7.5 Lbs/3.4Kg	7.5 Lbs/3.4Kg	7.05 Lbs/3.2Kg	7.05 Lbs/3.2Kg
Dimensions (Enclosure)	Height	1.73"/44mm	1.73"/44mm	1.73"/44mm	1.73"/44mm
	Width	17.4"/442mm	17.4"/442mm	17.4"/442mm	17.4"/442mm
	Depth	9.85"/250mm	9.85"/250mm	9.85"/250mm	9.85"/250mm
Temperature Range: 100% Load		0 to 45 °C (32 - 113 °F)			
Humidity Range		5% to 95% R.H. Non-condensing			
Altitude		0 - 10000ft (0 - 3048meters)			
Agency Listings	Safety	Certified to UL 62368-1		Certified to UL 62368-1	
		Certified to CAN/CSA C22.2 No		CE Mark	
		RoHS: Compliant		WEEE	
		Prop 65		RoHS: Compliant	
				REACH: Compliant	
	EMC	FCC 47 CFR PART 15 SUBPART B (Using ANSI C63.4-2014)		EN 55035:2017+A11:2020	
		ICES-003 ISSUE 7		EN 55032:2015 + A1:2020	
				EN 61000-3-2:2019 + A1:2021	
				EN 61000-3-3:2013 + A2:2021	
Surge Protection		Multi Stage Surge Protection			
IP Protection Class		IPX0			
AC Power System Type		TN			
Pollution Rating		Pollution degree (PD) PD 2			