Supra 2020 MCS 3.1

Web Interface User Manual

Document Version 1.5.3

2024-08-13

Table of Contents

1. Introduction

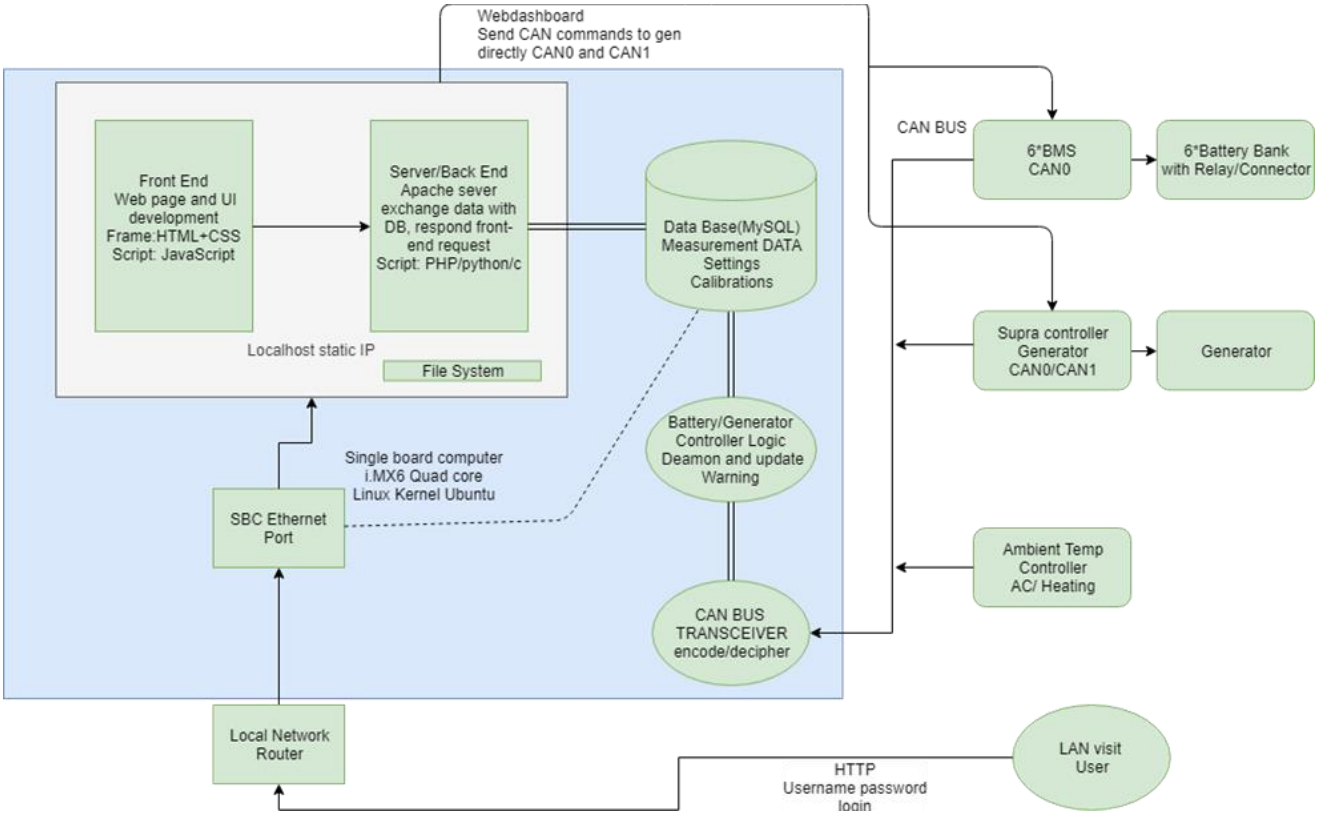
The Supra 2020 MCS, or Master Control System, is a robust web-based user interface for Polar Power Generator systems. It is hosted locally by a Single-Board Computer (SBC) physically housed within the unit and accessed via a web browser on a desktop or mobile device.

The MCS is used to control all features and functions of the attached hardware. This document will serve as a guide for users to the processes and features involved in using the MCS. It is intended for both End Users and Administrators of all system configurations. As such, it will reference features which may not be visible to all users.

This document is intended as an end-user manual for operation of the MCS. Note that due to rapid development, images in this document may vary from the current production version of the application.

2. System Overview

2.1 Physical Architecture



2.2 System Specifications

Item	Specification
Central Processing Unit (CPU)	i.MX 6 Quad core ARM processor @800MHz
Memory	2GB DDR3
Primary Hard Disk	Removable microSD/SD card
Network Adapter	Gigabit Ethernet
Operating System (OS)	Ubuntu 16.04.6 LTS
Database	MySQL
Webserver	Apache/2.4.18

3. Operation Procedures

3.1 User Requirements

Use of the MCS requires the following:

- An active network connection between the Generator and the User (internet or LAN)
- An Internet-ready device with a web browser

Note: Some users have reported poor speed and performance when viewing charts. This is due to limitations of certain web browsers, particularly **Mozilla Firefox**. Firefox also experiences slowdowns with infographics. Where possible, this has been compensated for. For best results, we recommend **Google Chrome**.

The MCS has not been extensively tested with Microsoft Edge, Safari, or branded browsers such as Samsung Internet. While they should not cause issues, they are known not to be completely standards-compliant.

Polar Power is not responsible for problems with outdated or non-standards-compliant web browsers. The MCS will not run on outdated browsers such as Internet Explorer.

3.2 MCS Login

The MCS uses a single-factor username/password for login. Anyone connecting to the site will be directed first to the login page. There is no limit to the number of users in the system's database, so best practice is for everyone to have their own unique username and password.

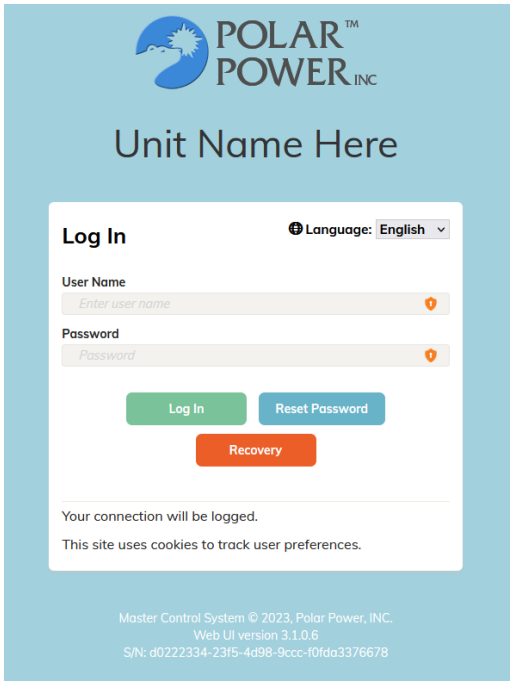


Figure 1: MCS Login

To log in, type our username in the **Username** field and your password in the **Password** field, then click **Log in**.

3.2.1 Language Options

The MCS has the capability to be localized to other languages. Select your display language using the dropdown on the login form.

The display language can be changed at any time. The system default presented before logging on can be changed by a Polar Power technician.

At this time, only a partial Spanish translation is available.

3.2.2 Connection Logging

Any successful login is recorded including time, IP address, username, and access level.

Any failed login is also recorded including time, IP address, username (if applicable), and error message.

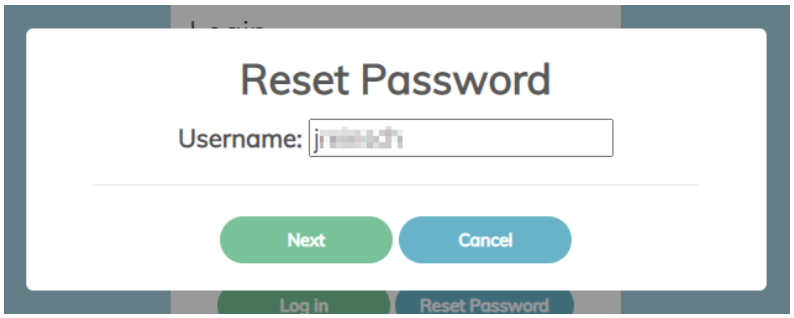
Logs can be viewed via User Activity, which will be shown further in this document.

3.2.3 User Lockouts

Too many failed attempts to log in to an account will result in that account being locked. The lockout time is 5 minutes. Future updates may add more control over this by Administrator users.

3.2.4 Self-Service Password Reset

The MCS includes a Self-Service Password Reset (SSPR) feature. To use the SSPR, click **Reset Password** on the login page. You will be presented with a series of prompts.



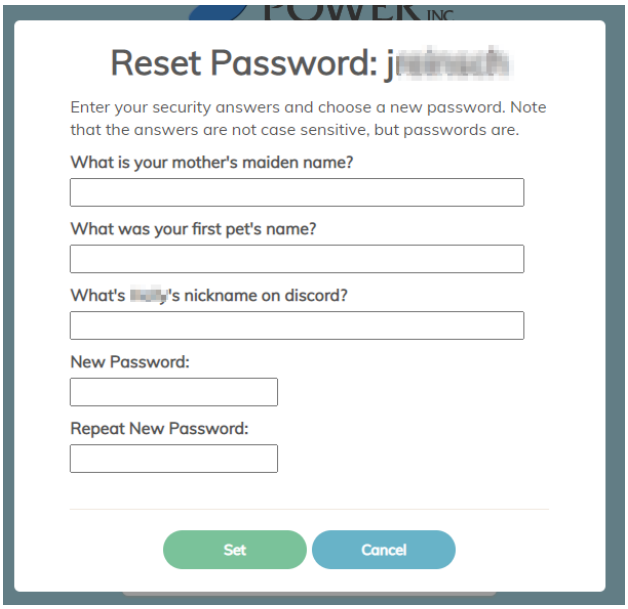


Figure 2: Security Questions

Providing your security questions and clicking **Set** will set your password to whatever is typed in the **New Password** and **Repeat New Password** fields.

NOTE: To do this, you must first set your security questions. This is recommended for all users and will be demonstrated further in this document.

3.2.5 Recovery

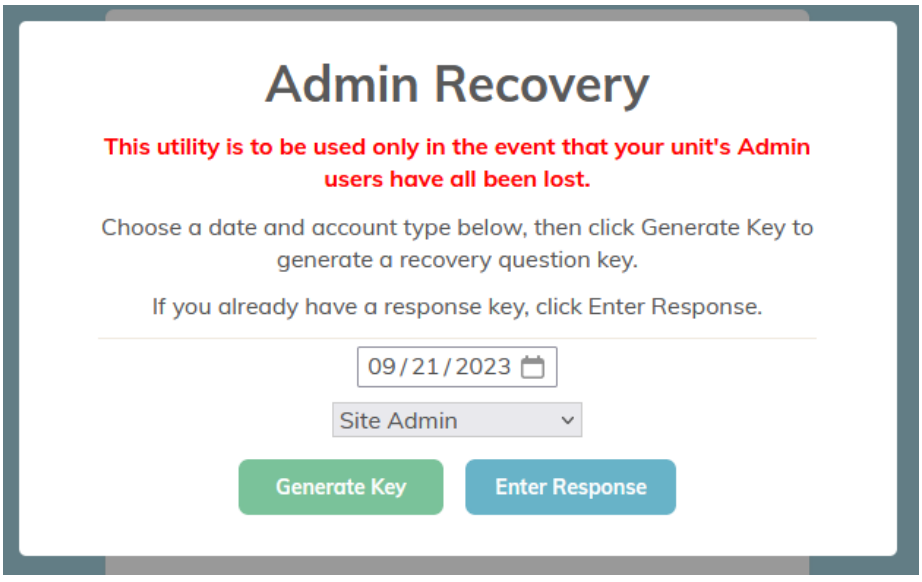


Figure 3: The Account Recovery utility

If all admin accounts have been lost, the **Recovery** feature can be used to generate a new Admin user. This is a two-step request/response process. Clicking **Recovery** will produce a prompt to select the required user type (Site Admin for end users, or Polar Power Admin for Polar staff) and to specify the date the key is to be used. **The response key will only work on the specified date**, so ensure it is correct if there is to be any delay between generating the

request and using the response. Once you have selected the appropriate information, click **Generate Key** to create your request key.

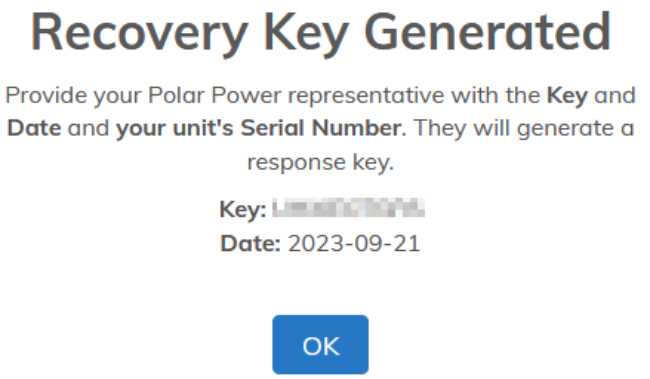


Figure 4: a recovery key has been created.

Once you have the recovery key, contact your Polar Power representative, and provide them with the key, the date shown, and your unit's serial number (visible at the bottom of the login screen). They will use your information to generate a **Response Key.** Return to the Recovery tool and click **Enter Response**. Enter the key and confirm the account type. If the system date matches the date used to generate the key and the account type is correct, you can now click on **Recover** to create a new generic Admin account.

Note: For security and audit purposes, it is **strongly** recommended that this account be used only to create a new, personalized account for your new Administrator user. Since operations are logged based on account names, we do not advise using generic or shared accounts. Once you have created a permanent user, the temporary Admin can be disabled to keep your system safe.

3.2.6 Browser Cookies

The MCS uses cookies to store user preferences, such as language selections and enabling/disabling audio alert sounds, and your login session ID. No personally identifiable information is ever stored in a browser cookie.

3.3 System Overview and Navigation

3.3.1 Overview Display

Unless another page is selected, users will be shown the **Overview** after logging on. The Overview page gives general information about the entire system. Its appearance will change based on whether the system has **DualGen** and **BMS** modules or not.

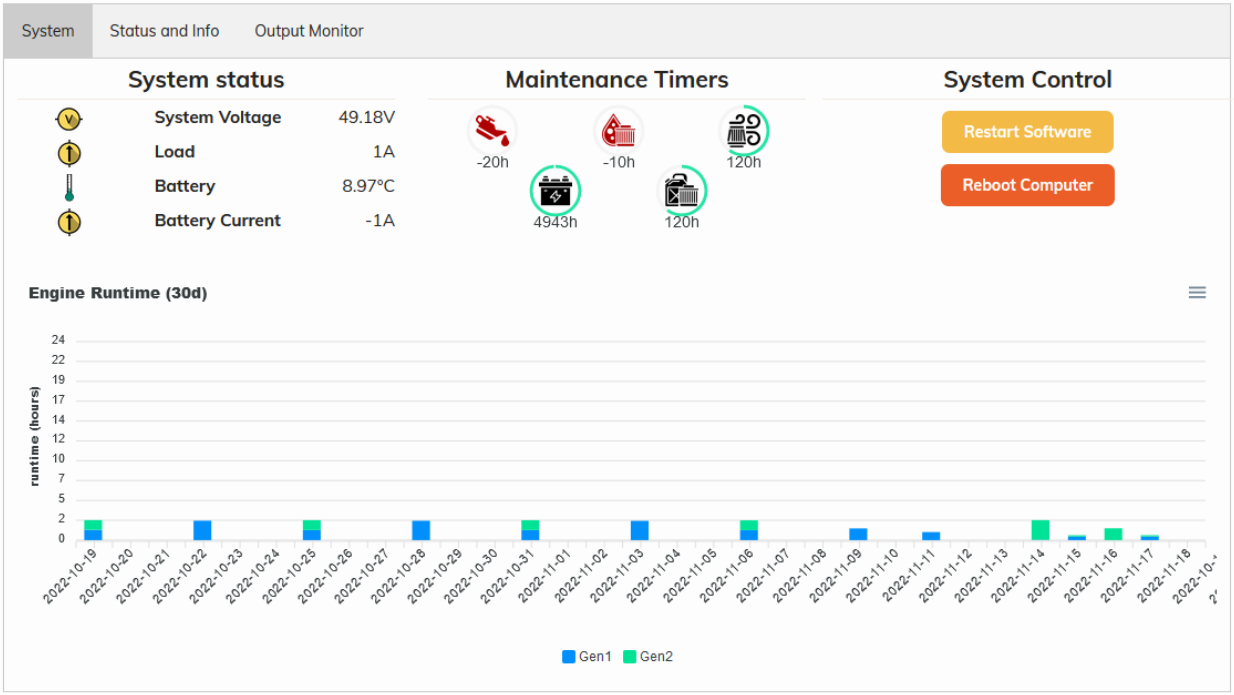


Figure 5: Example Overview Display

3.3.1.1 Location Nameplate

The **Location** nameplate on the Overview page contains specific information about the unit. This information can be edited by Admin users on the **System Settings** page.

3.3.1.2 System Reboot

The Overview page features a button to **Reboot the SBC**. By default, only Engineers and Admin users can use these controls. You will be prompted to provide a reason for the reboot, which will be logged.

3.3.2 Log out

In the **System** menu, a **Log out [username]** button will always be visible. Clicking this button will log out the user and return them to the **Login** page.

For security reasons, it is best to always log out as soon as you are finished using the MCS.

3.3.3 Automatic Logout

If a user is idle for too long, their login session will expire. Note that any page with live data, such as the Overview page, will keep the session active indefinitely while it is displayed.

If a session has expired, then any attempt to access new data will result in an error prompt and an immediate return to the Login page.

3.3.4 Navigation

The navigation panel allows a user to go to any page on the MCS to which they have access. Note that the navigation panel can be hidden and is by default hidden on smaller screens and mobile devices. The button to hide or show the navigation panel is on the top left on larger screens, and the top right on small/mobile screens.

The panel highlights the current page and an alert counter, and shows whether any updates are available if the user has access to the Update page.

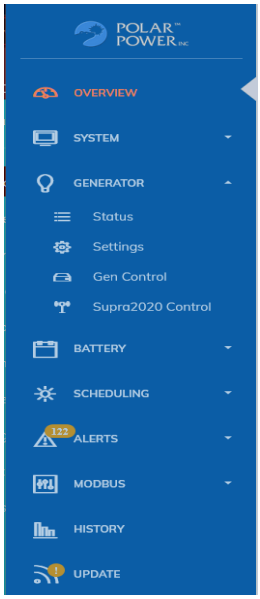


Figure 6: Navigation panel on a standard-sized screen.

The MCS also features its own **Back** and **Forward** capability. **Your browser's back and forward buttons will navigate between its pages.**

The MCS stores the current page ID in your browser's URL field. This can be used to bookmark and quickly return to a particular page.

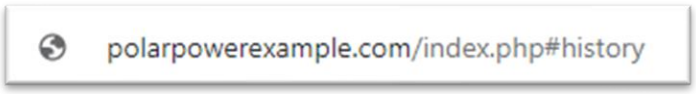


Figure 7: example of a page-specific MCS URL

3.3.5 Help Tips

Many locations on the MCS have a help icon  next to them. In most cases, this represents a pop-up tip. To view the tip, point your mouse at it. On mobile devices, help tips may appear if you tap or tap-and-hold on them, but support will vary based on your web browsing app.

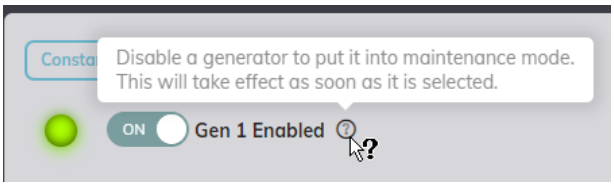


Figure 8: a help tip being displayed

3.3.6 Infographics

MCS uses custom graphics to display information in a readable format. In most cases, these graphics have a help tip to help understand their meaning. Hover your mouse (tap and hold on mobile) over the graphic to see the tip.

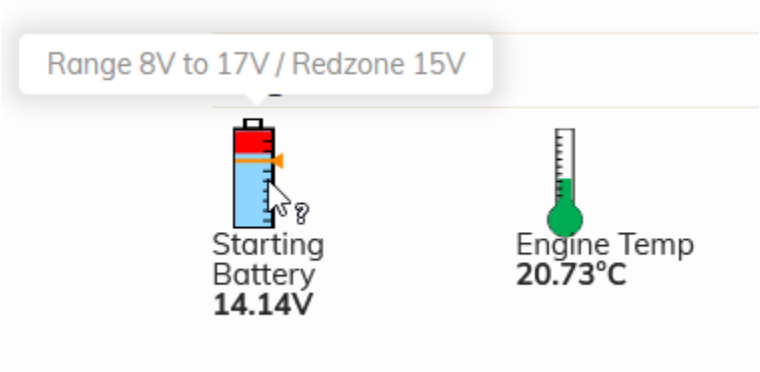


Figure 9: Infographics with a Help Tip

3.4 User Activity

The **User Activity** page can be accessed via the **System** menu on the navigation panel.

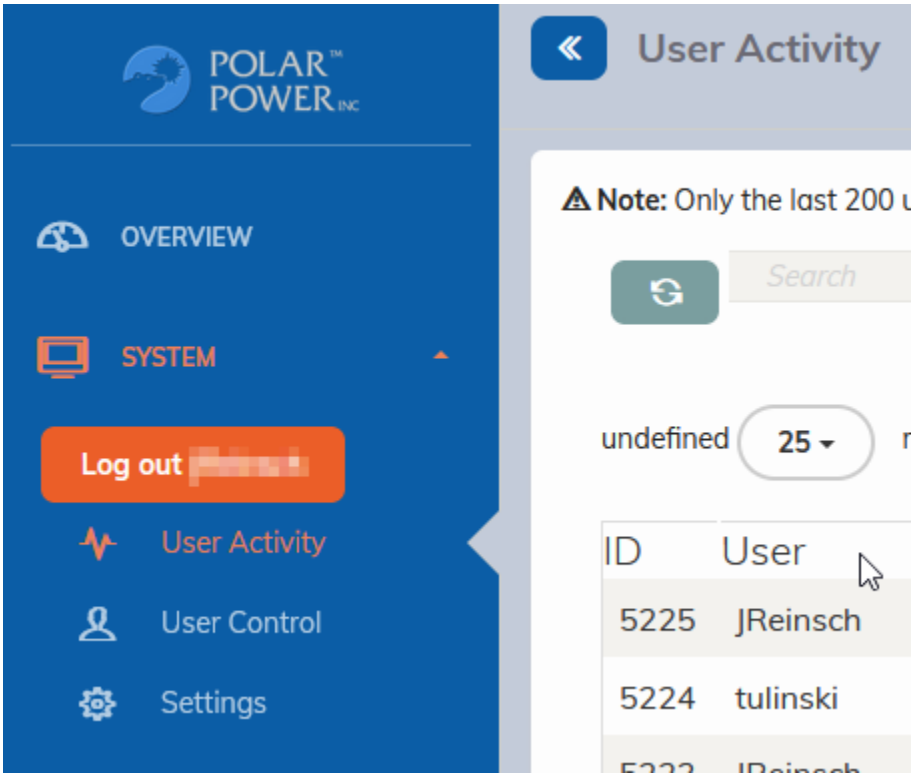
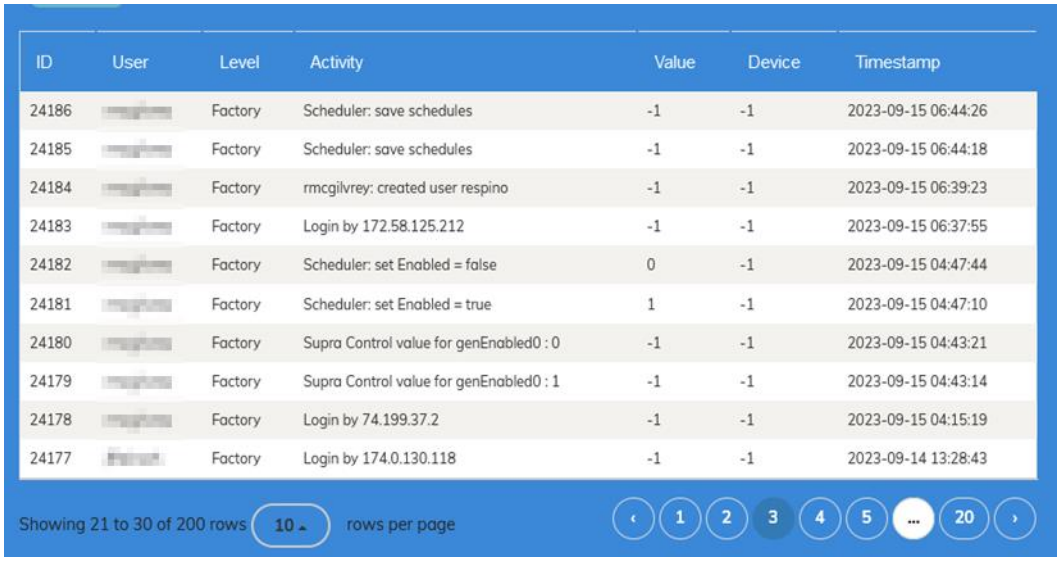


Figure 10: User Activity in the System menu

This page contains a display of up to 200 recent user log entries. To retrieve older entries, a CSV export is required (see below).

3.4.1 User Activity Table

The table is the main feature of the User Activity page. It displays a list of the last 200 entries in the user log. This will show all actions by all users, including any controls used, settings changed, and login attempts.



ID	User	Level	Activity	Value	Device	Timestamp
24186	[redacted]	Factory	Scheduler: save schedules	-1	-1	2023-09-15 06:44:26
24185	[redacted]	Factory	Scheduler: save schedules	-1	-1	2023-09-15 06:44:18
24184	[redacted]	Factory	rmcgilvrey: created user respino	-1	-1	2023-09-15 06:39:23
24183	[redacted]	Factory	Login by 172.58.125.212	-1	-1	2023-09-15 06:37:55
24182	[redacted]	Factory	Scheduler: set Enabled = false	0	-1	2023-09-15 04:47:44
24181	[redacted]	Factory	Scheduler: set Enabled = true	1	-1	2023-09-15 04:47:10
24180	[redacted]	Factory	Supra Control value for genEnabled0 : 0	-1	-1	2023-09-15 04:43:21
24179	[redacted]	Factory	Supra Control value for genEnabled0 : 1	-1	-1	2023-09-15 04:43:14
24178	[redacted]	Factory	Login by 74.199.37.2	-1	-1	2023-09-15 04:15:19
24177	[redacted]	Factory	Login by 174.0.130.118	-1	-1	2023-09-14 13:28:43

Figure 11: an example of entries in the User Activity table

3.4.2 User Activity Export – Recent Records

Below the table is a form for exporting user activity. Clicking **Save File** will cause the page to generate and download a .csv (comma-separated value) file with all recent entries. The number of entries to download can be customized.

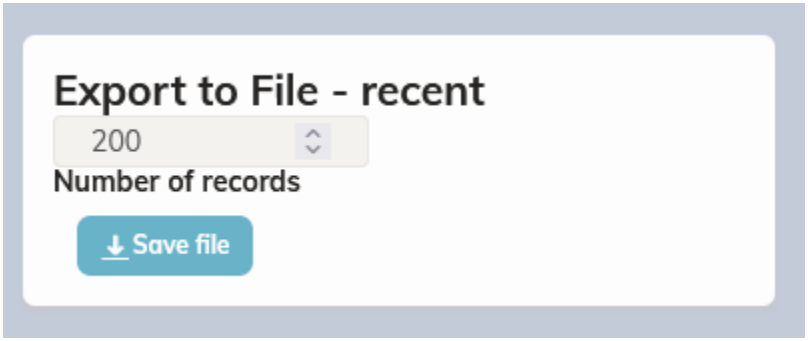


Figure 12: downloading recent activity logs

3.4.3 User Activity Export – Timeframe

Next to the “recent” card is a form for exporting user activity between two date/times. Clicking **CSV Export** will cause the page to generate and download a .csv (comma-separated value) file with all entries between the provided dates.

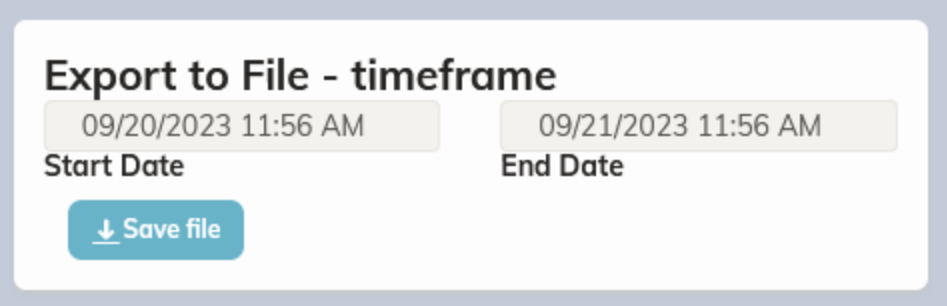


Figure 13: downloading logs between two dates

3.5 User Control

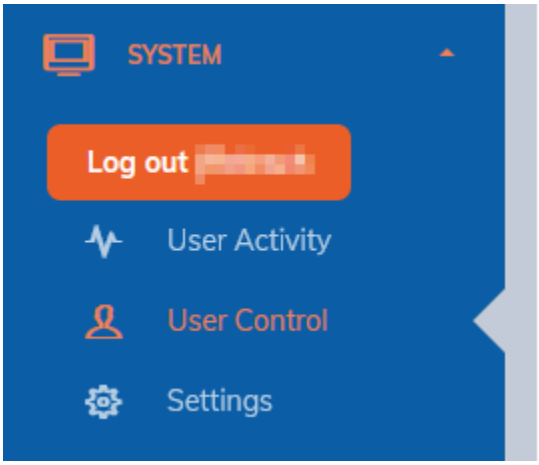


Figure 14: User Control in the System Menu

The User Control page allows an Administrator user to maintain and control access to the MCS. It contains a table of all users including their username, email address, and security level.

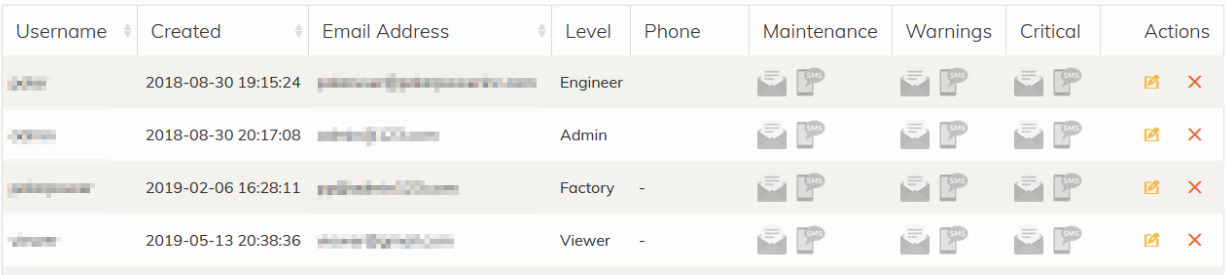


Figure 15: the User Control table

3.5.1 User Levels

There are four access levels on the MCS.

Note: Access to features can be customized. These descriptions apply only to the default configuration. **If you wish to add or remove access from a user group, contact your Polar Power support representative. The settings in the below screenshot are not accessible to end users.**

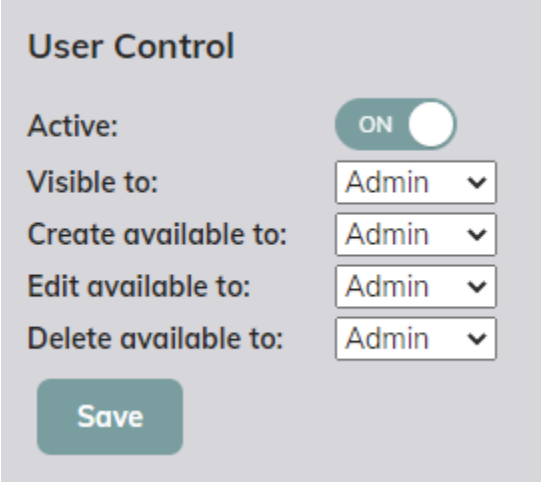


Figure 16: Default Factory settings for access to User Control

The levels and their default function are as follows:

- **Factory:** These users are Polar Power support technicians and have full access to Administration, Configuration, and Calibration functions. Factory users can only be created, edited, or removed by other Factory Users.
- **Admin:** These users have access to most features including system actions, settings configuration, and user access control.
- **Engineer:** These users have access to operational functions such as settings configuration and system actions but cannot by default access Admin functions like User Control and User Activity.
- **Viewer:** These users have read-only access to the MCS and cannot perform operations or change system settings.

It is worth noting that even if lower-level users are granted access to the User Control page, they will only be able to alter users of their own level and lower.

3.5.2 Adding a User

To add a new user, click the **Add User** button. There is no limit to the number of users.

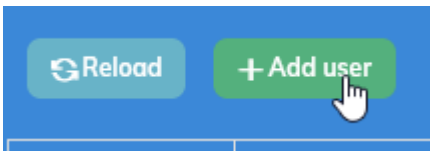


Figure 17: the Add User button

You will see a prompt for the user's information. Fill in all fields and click **Submit** to create the user. Note that the username and email address must be unique.

Figure 18: the Add User dialog

3.5.3 Editing a User

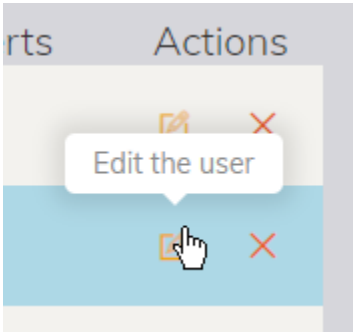


Figure 19: the Edit User button

Each user in the table has an **Edit User** button. Clicking this button will bring up a dialog prompt similar to **Add User**. By default, only an Administrator can edit another user. Users may not edit others who have a higher security level than themselves.

Figure 20: the Edit User dialog

Clicking **Submit** will commit any changes made on this dialog.

Note: If the **password** fields are left blank, the user's password will not be changed.

3.5.4 Removing a User

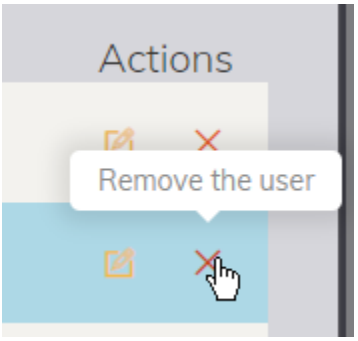


Figure 21: the Remove User button

Clicking the **Remove User** button will show a prompt for confirmation. Clicking **Submit** will result in the user's account being disabled. The account will be removed from the User Access table view. The account data will be preserved in the database for historical reasons. **There is no way to re-enable a user via the MCS.** If a user needs a new account (such as a re-hire), a new account with a unique username must be created.

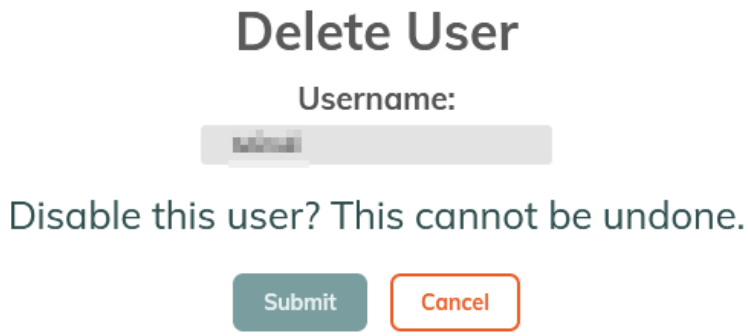


Figure 22: the Remove User dialog

3.6 User and System Settings

Clicking **Settings** in the **System** menu will show the **User and System Settings** page. By default, this page is visible to all users; however, only Admin users will see the System portion.

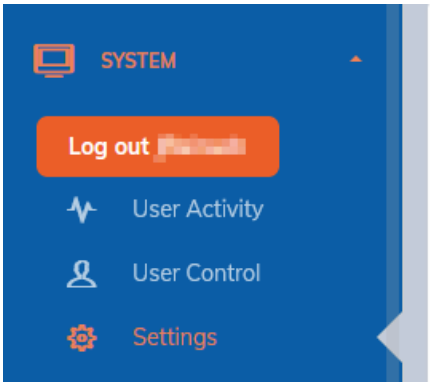


Figure 23: Settings in the System menu

3.6.1 User Settings

3.6.1.1 User Details

The **User Details** card shows account details and allows users to modify or remove their phone number, and to change their alert preferences.

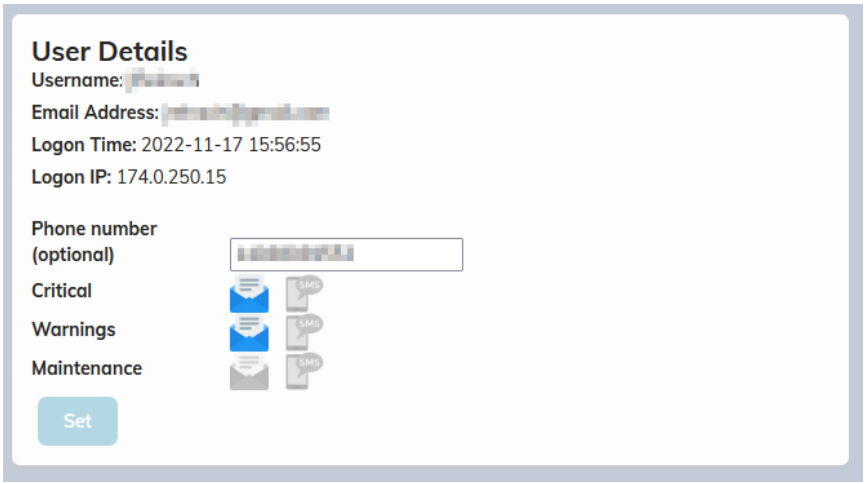


Figure 24: the User Details card

3.6.1.2 Preferences

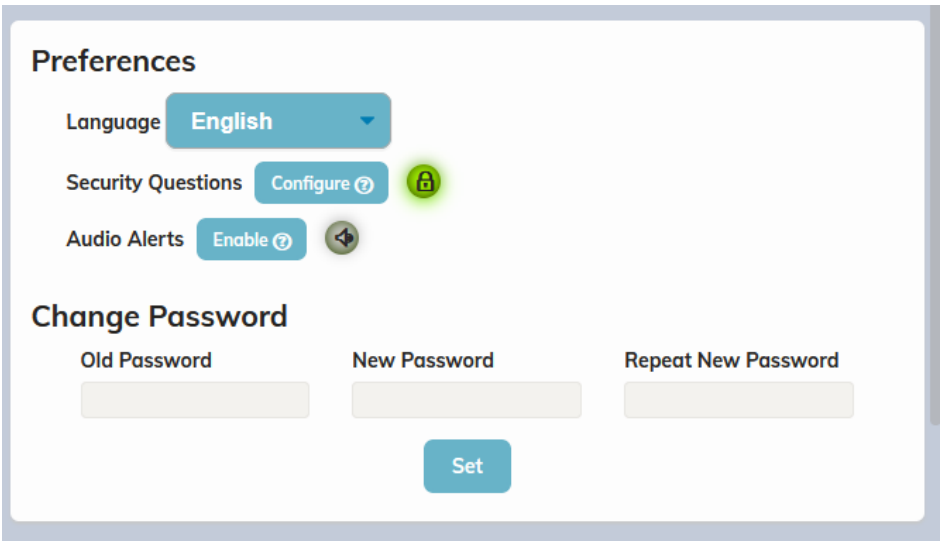


Figure 25: the Preferences card

3.6.1.2.1 Security Questions and Self-Service Password Reset configuration

The Preferences card contains a **Configure** button for Security Questions. Next to it is an indicator which will be green if the user has set their questions and red if they have not.

Clicking the **Configure** button will bring up the **Security Questions** dialog.

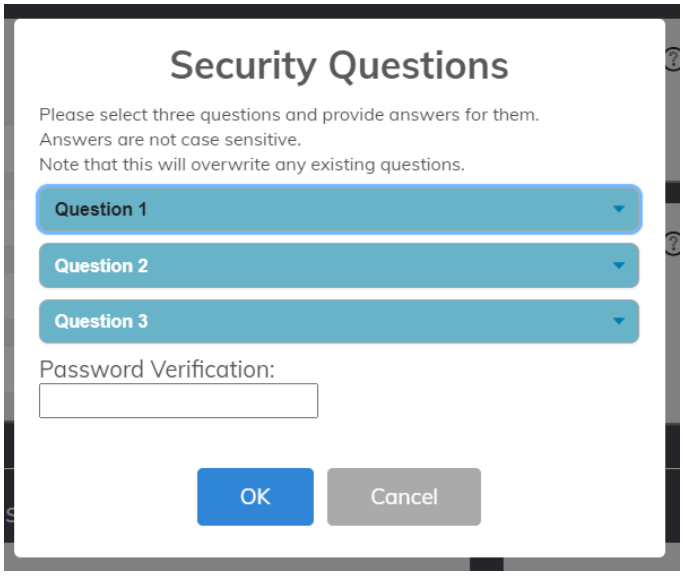


Figure 26: the Security Question dialog

To configure your **Self-Service Password Reset** (SSPR), select three questions and provide answers to them. Type your **current password** in the verification box and click **OK**.

The answers will be stored in lowercase-only format and will not be case-sensitive when used to reset your password. All three answers will be required to perform a password reset.

NOTE: It is strongly advised that all users configure the SSPR after their first login. Choose questions that someone else would not be able to answer, and do not write your answers or password down anywhere. Always remember that every employee is a member of the I.T. security team.

It is your users' responsibility to set their own security questions. Should a user fail to do so and lose access to their account, your Admin user(s) will have to reset their password for them using the **Edit User** dialog.

3.6.1.2.2 Audio Alerts

If your web browser's settings allow it, the MCS can emit an audible beep sound from your device when an alert condition is met. This beep may be disruptive to some users, so you can turn it off here.

To turn the alert sound on or off, use the Enable/Disable button to toggle the **Audio Alert** setting. The LED indicator will turn green, indicating that it has been turned on, or grey, indicating that it has been turned off.

This setting is not stored on the MCS itself. It instead creates a cookie in your web browser. Clearing your browser's temporary data may result in this setting being reset to its default (on).

3.6.1.3 Changing your Password

A user can choose to change their password at any time using the **Preferences** card. To do so, fill in all three fields and click **Set**.

Note for clarification: The **Old Password** field requires your **currently valid** password. If you do not know your old password, either log out and use the **Reset Password** feature, or ask your Administrator to reset your password by editing your account on the **User Control** page.

3.6.2 System Settings

3.6.2.1 Email Alert Sender

The MCS can send alerts via email and SMS to users. The settings for email alerts may be changed on the **Email Alert Sender** card.

Note: It is the responsibility of the customer to ensure proper settings. Some e-mail providers may not allow receipt of e-mails from SendMail.

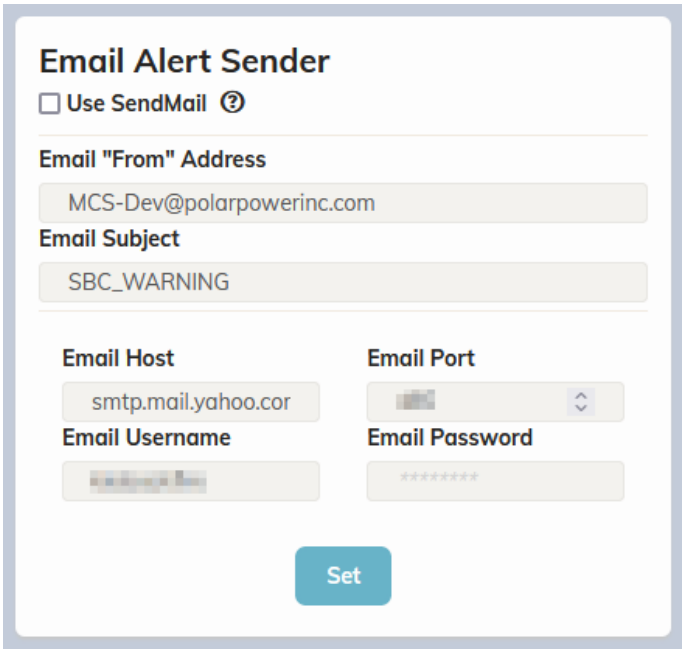


Figure 27: the Email Alert Sender card

3.6.2.2 Display Settings

The Display Settings are an optional feature. They allow an additional visual guide for the system voltage by displaying the generator's Alternator Voltage value on the Generator Status and Overview pages in red or orange instead of the default green. Orange should be used as the voltage approaches the safe high and low voltage of the batteries and red should be used when the extreme limits of the batteries are met or exceeded. Refer to the battery specification sheet for guidance on the system battery voltage limits.

- **Voltage Orange Under** – The alternator voltage will display in orange text when it is at or below this value (volts) and above the Voltage Red Under value.
- **Voltage Red Under** – The alternator voltage will display in red text when it is at or below this value (volts).
- **Voltage Orange Over** – The alternator voltage will display in orange text when it is at or above this value (volts) and below the Voltage Red Over value.
- **Voltage Red Over** – The alternator voltage will display in red text when it is at or above this value (volts).

3.6.2.3 System Nameplate

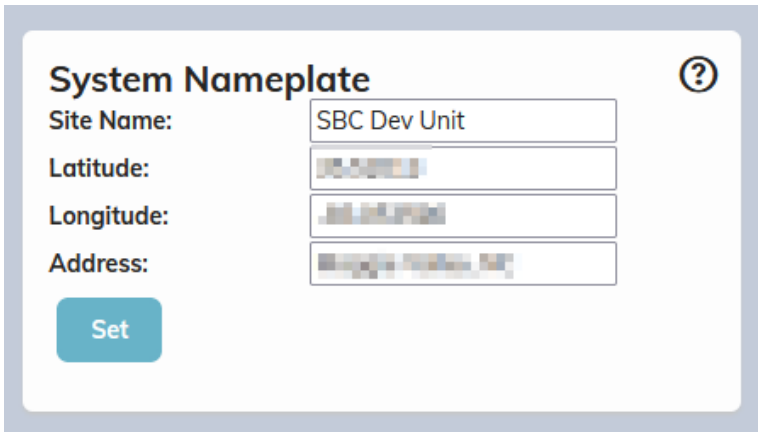


Figure 28: the System Nameplate card.

The System Nameplate information will be displayed on the Overview page and visible to all users. The Site name will also be used as the title of the page in your web browser after a user has logged in.

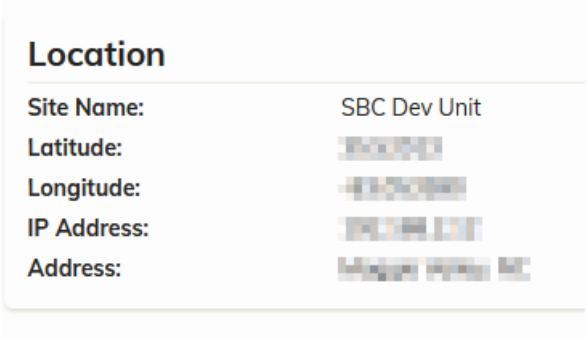


Figure 29: the System Nameplate on the Overview page

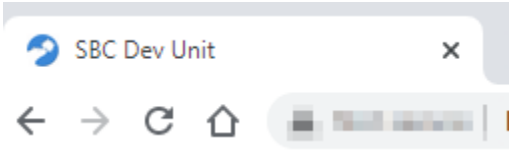


Figure 30: the page title as seen in a desktop web browser

3.7 Backup / Restore

The MCS has two available methods for backing up: Settings and Database. Both are accessed via the **Backup / Restore** link in the navigation panel.

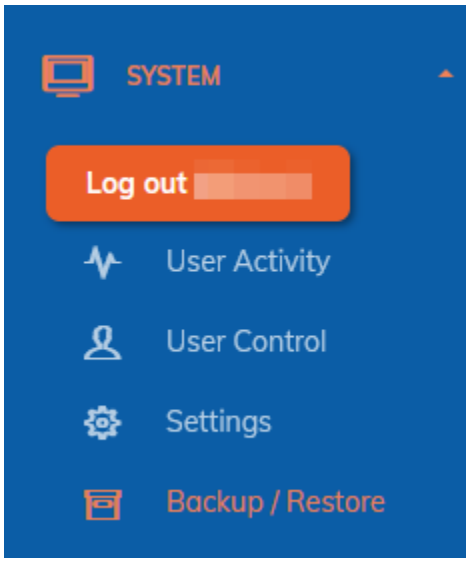


Figure 31: Backup / Restore in the navigation panel

3.7.1 Backing up and Restoring Settings

Settings should be backed up any time there is a change made. This can be done from the **Settings** tab on the **Backup / Restore** page.

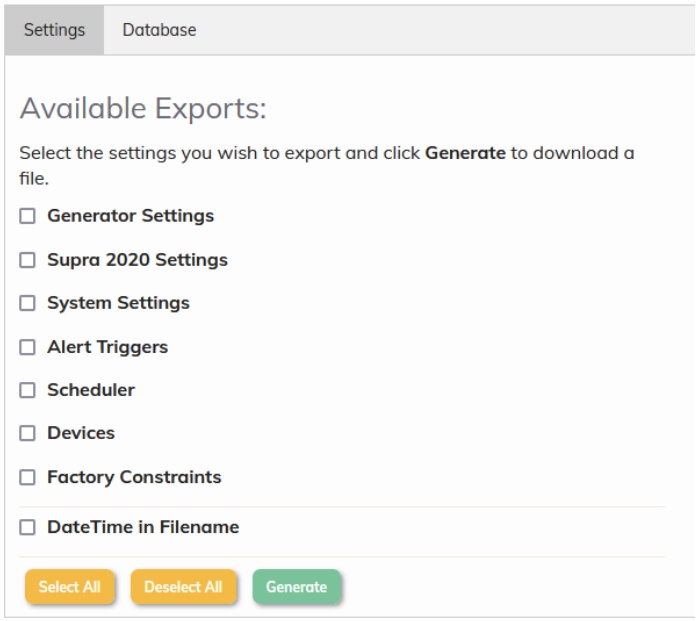


Figure 32: Backing up Settings

To back up the MCS' settings, simply check off the types of settings to be backed up. The **DateTime in Filename** box can be checked to add the date and time to the filename of the

backup file. Then click **Generate** to create a JSON-formatter text file, which will be downloaded by your web browser.

This file can be edited if desired and is useful in situations where multiple similar units need to be set up quickly. It contains only settings, and no other data.

To restore from a backed-up file, use the **Restore from Export** controls on the same page:

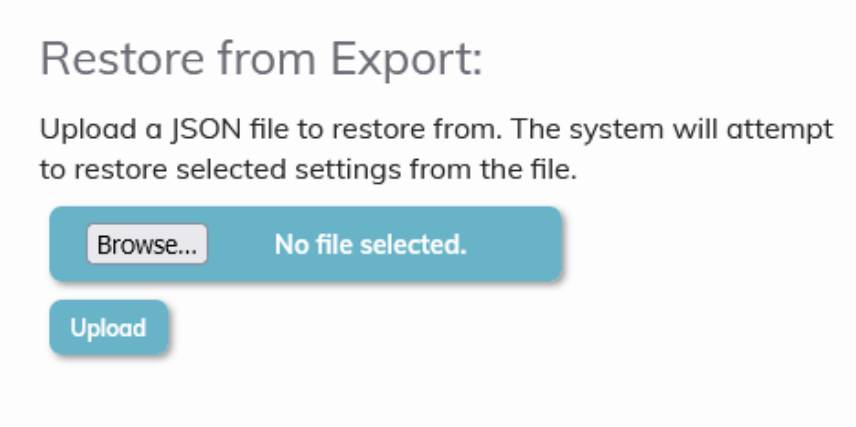


Figure 33: Restoring from a Settings file

This will immediately restore your unit to the settings in the file, overwriting any existing settings. **If the file has been modified to include out-of-range settings, parts of the restore will fail.**

3.7.2 Backing up and Restoring the Database

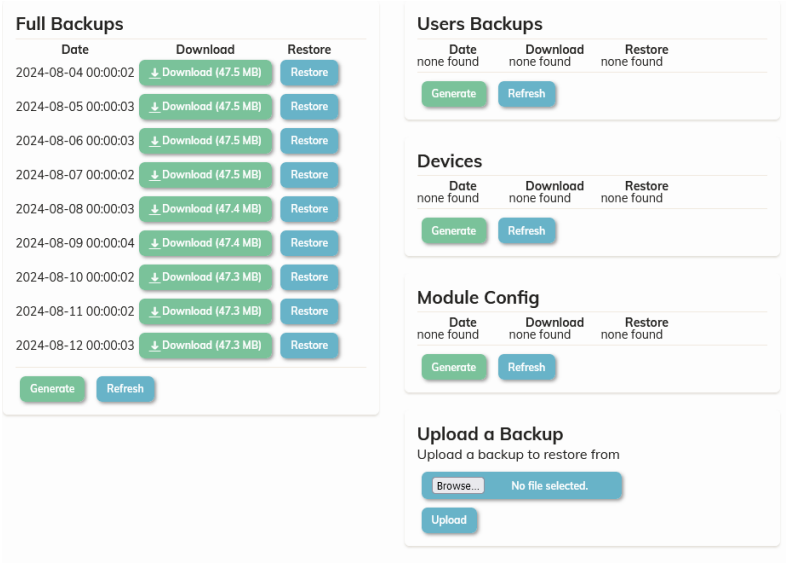


Figure 34: Backup / Restore database

The MCS automatically performs a nightly backup. This includes Users, Devices, Settings, and all historical data. You can see the most recent full backups on this page. **Only nine (9) days of backups will be kept on the system.** It is **strongly** recommended that you download the backup files regularly and keep them in secure storage elsewhere.

Partial backups are also available for Users, Device settings, and Module Configuration (Polar technicians only). To generate a full or partial backup, click the appropriate **Generate** button. The files can be downloaded or restored using the controls on the page.

Database backups are encrypted and compressed and cannot be opened, read, or edited outside of the MCS.

Figure 35: an example of a backed-up Users database, including a timestamp for when it was created.

A backup file can also be uploaded using the **Upload a Backup** controls. Note that the system uses the filename (**MCSBackup**, **MCSUsers**, **MCSDevices**, etc) to determine what type of backup is being restored. **Do not rename your backup files.** Note that restoring to a database backup will erase the existing database tables; use with caution to avoid data loss. When restoring a full backup, any historical data since the backup was created will be lost.

3.8 Generator Status

Clicking **Status** in the **Generator** menu will display the **Generator Status** page. This page is visible to all users, but only Engineer and Admin users can use the controls on the page.

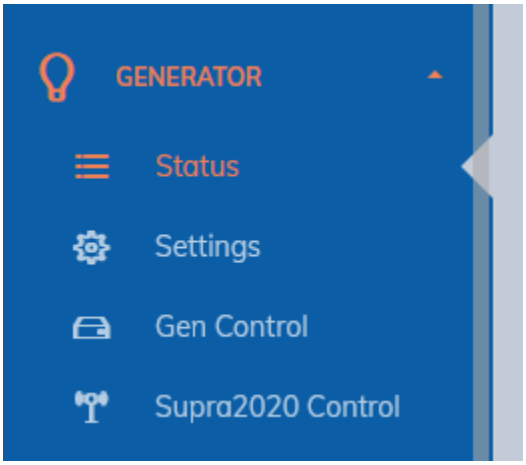


Figure 36: Generator Status in the navigation panel

Data on the page refreshes live every few seconds. There is a dropdown at the top of the page to change which Generator's data is displayed on systems with more than one.

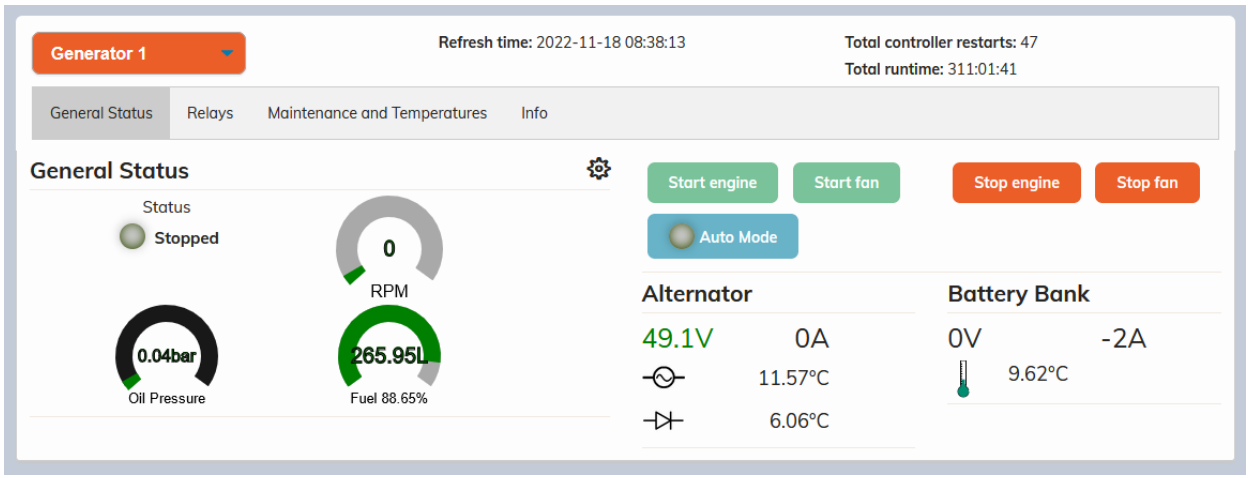


Figure 37: Generator Status (part 1)

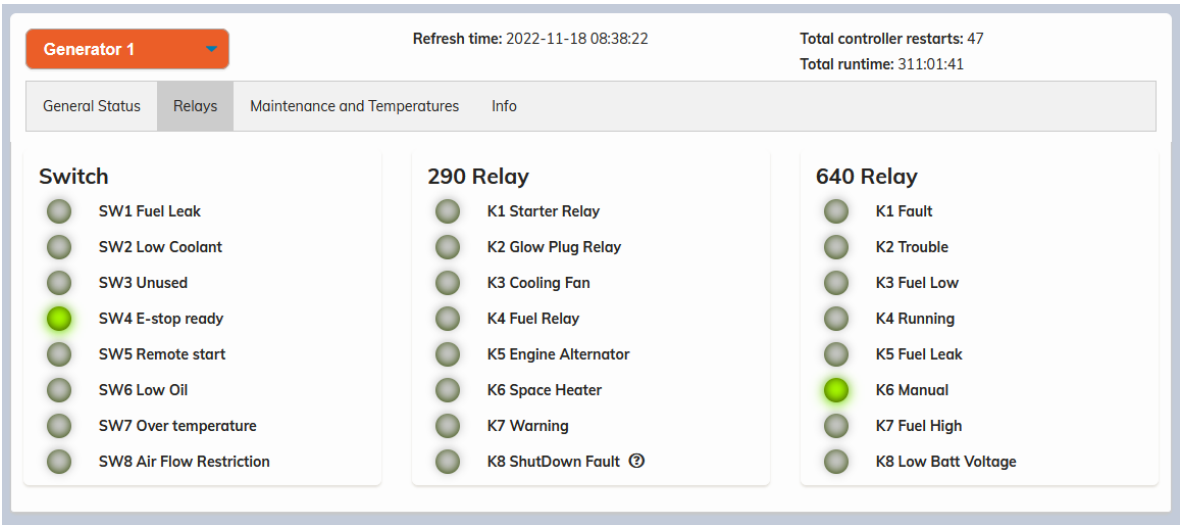


Figure 38: Generator Status (part 2)

3.8.1 Generator/Fan Control

While most of the Generator Status page is read-only data display, the generator and cooling fans can be turned on and off from this page.

- **Start Engine** – Clicking this button when the generator is in Manual mode will initiate the generator startup sequence. When in Automatic mode, this button is non-functional.
- **Stop Engine** – If the generator is running, clicking this button will stop the generator immediately and bypass the normal shutdown sequence. If the generator was in automatic mode when the Stop button was pushed, the generator will change to Manual mode.
- **Start Fan** – Clicking this button manually engages the Cooling Fan relay, turning on the cooling fan. If the generator is in a Running state, the fans will stay on. If the generator is in a Stopped state and the engine temperature is below the Auto Vent Temp, then the fans will turn back off automatically after a few seconds.

- **Stop Fan** – Clicking this button manually turns off the Cooling Fan relay and stops the cooling fans. The fans will turn back on automatically if the Engine Temperature rises above the Auto Vent Temp setting.
- **Toggle Auto to Manual** – The generator has two main operating states. Automatic mode means that the 250 Controller will start and stop the generator based on the settings input on the Generator Settings page. Manual Mode means that the generator will only start or stop when given a command to do so by the user or another source. If the Supra 2020 has either the Supra2020 Control's Managed Mode or the BMS Auto enabled, then those program features will start and stop the generator in Manual mode. **Switching the generator to Automatic mode and back to Manual mode is required to clear a generator fault on the 250 Controller.**

3.8.2 Run Logs

The 250 Controller records a data log at the end of every shutdown. Each log shows various data about the run cycle, such as run time, max voltage, shutdown current, faults, etc. The total number of logs recorded is shown at the top, and the user has the option to view one specific log by clicking the **+ button** in the table to expand its details. The log data may also be downloaded and saved to a .CSV file.

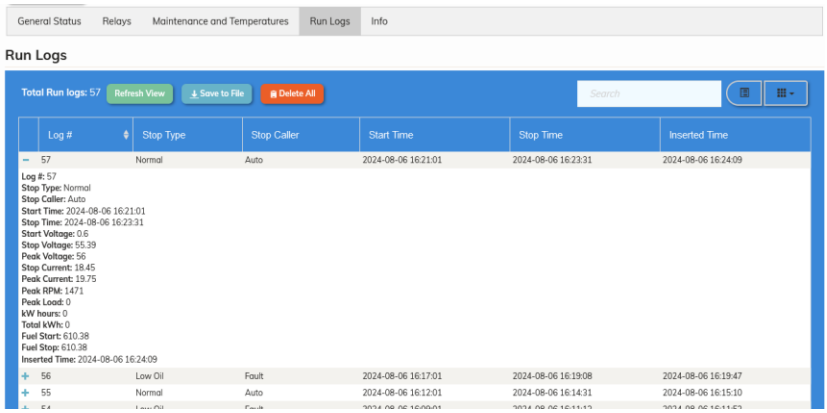


Figure 39: the Run Logs table

3.8.3 Maintenance Countdowns

The Maintenance Countdowns are displayed on the **Maintenance and Temperatures** tab on the Generator Status page. They are accompanied by an LED which will turn yellow and red when the countdowns get too low.

When maintenance is performed, the countdown should be reset on the **Generator Settings** page.

3.9 Generator Settings

Clicking **Settings** in the **Generator** menu will open the **Generator Settings** page. By default, this page is visible to all users.

Settings found here are those stored in the generator controller(s). See Section 3.10 Single/DualGen Supra2020 Control for Supra controller-specific settings.

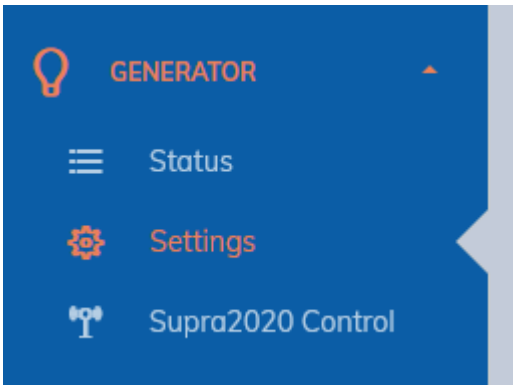


Figure 40: Generator Settings in the navigation panel

The page is divided into multiple tabs, each with a set of settings. There is a dropdown at the top of the page to change which Generator's data is displayed on systems with more than one. The data in the cards is filled when the page is first displayed, and again any time the Generator is selected from the dropdown.

By default, only **Engineer** and **Admin** users can edit the settings. To do so, change the value in a field, then click **Save all** at the bottom of the card.

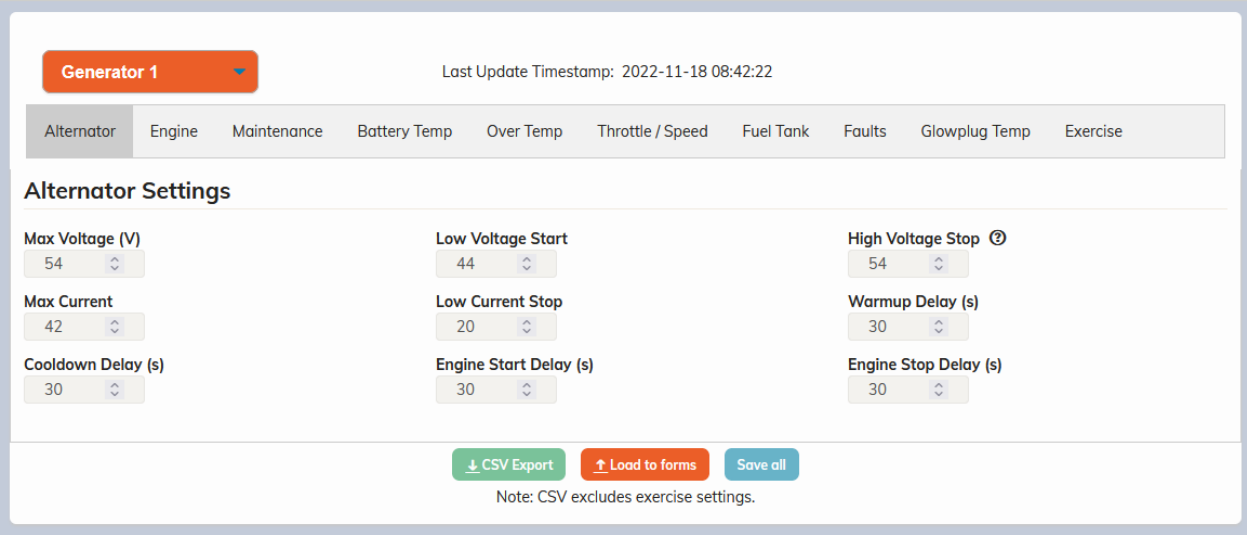


Figure 41: The Generator Settings page (part 1)

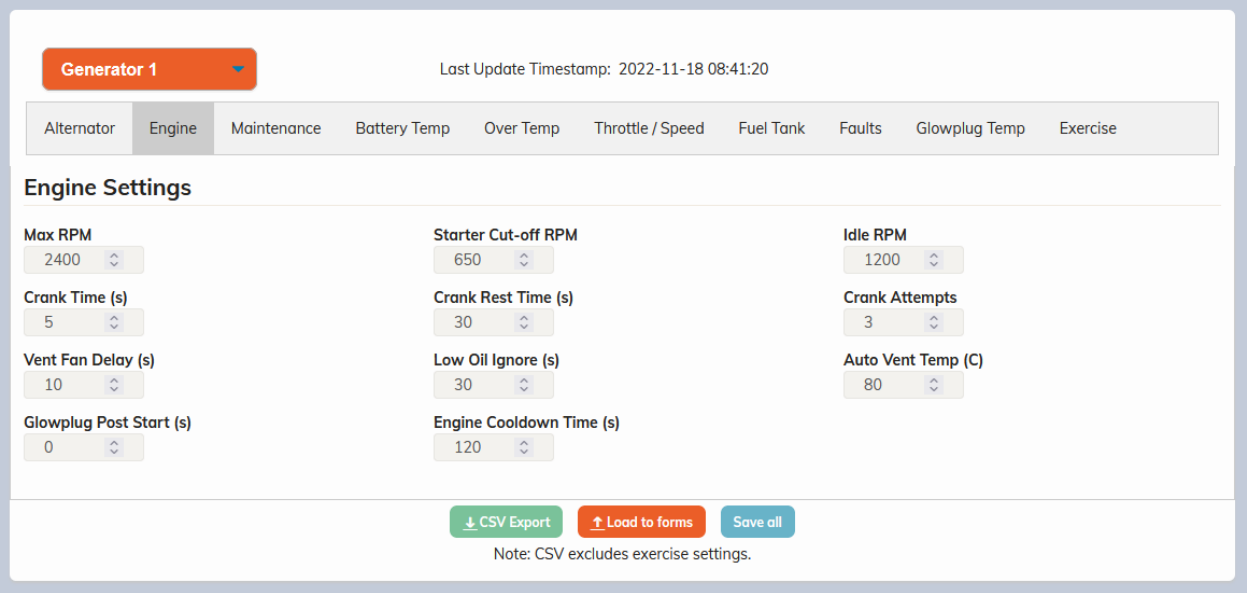


Figure 42: The Generator Settings page (part 2)

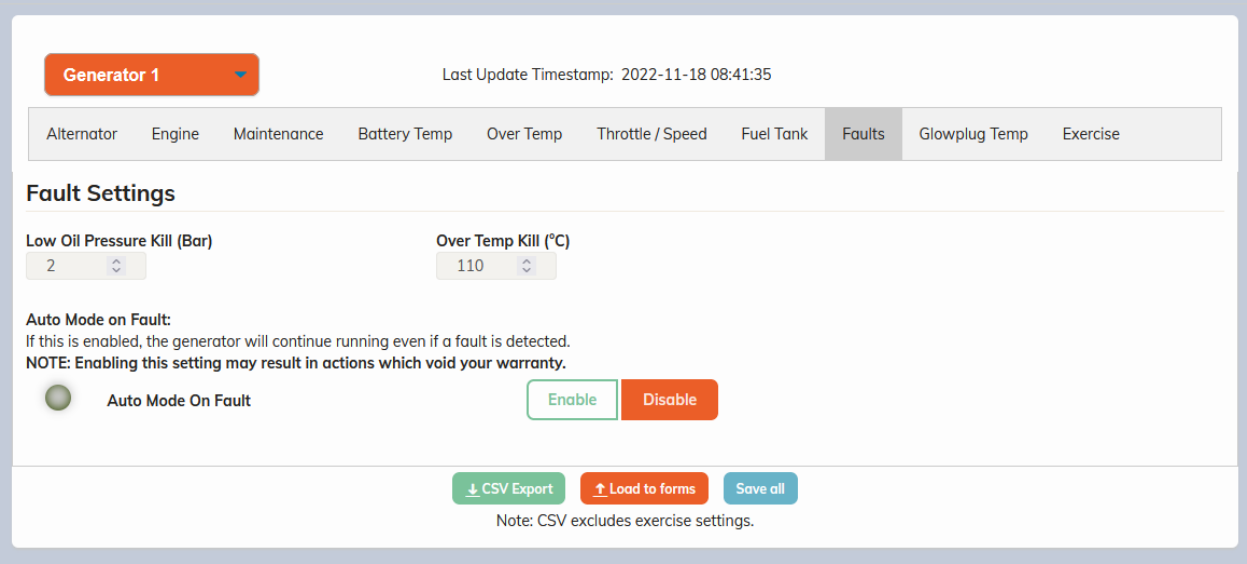


Figure 43: The Generator Settings page (part 3)

3.9.1 Alternator and Engine Settings Parameters

Alternator settings are only used when the generator controller is in Auto Mode. When the Supra2020 is controlling the generators, the generator controller is placed in Manual Mode and alternator settings are managed by the Supra2020. For information on these settings, see Section 3.10 Single/DualGen Supra2020 Control. The Alternator Settings control the power output limits of the generator and the Engine Settings control the physical operation of the engine for optimum performance. Guidance on how to set these values for a specific system can be found in the System Setup Guidelines section.

- **Max Voltage** – The maximum DC voltage (volts) produced by the generator. This value is read-only and replaced by the Battery Settings when the BMS Auto is enabled.
- **Max Current** – The maximum current (amps) produced by the generator. This value is read-only and replaced by the Battery Settings when the BMS Auto is enabled.
- **Low Voltage Start** - The voltage level to which the battery bank must discharge before triggering the countdown timer from the Engine Start Delay setting.

- **High Voltage Stop** – The voltage (Volts) that the output of the genset requires before engaging the Engine Stop Delay countdown timer. This value cannot be set above the Max Voltage. *****
- **Low Current Stop** – The current (Amps) that the Battery Current falls below before starting the countdown timer for Engine Stop Delay setting. *****

  ***The High Voltage Stop and Low Current Stop parameters must be met simultaneously to decrement the Stop Delay timer and begin the shutdown sequence.**

- **Warmup Delay** – The amount of time (0-255 seconds) the generator will run at the set idle speed after being started (Warmup Period) before it begins to produce power.

- **Cooldown Delay** – The amount of time (0-255 seconds) the generator will run at the set idle speed after the shutdown conditions have been met and before the engine turns off in Automatic mode. Note: The generator does not have a cooldown period when shut off manually.
- **Engine Cooldown Time** – The amount of time the engine will idle to allow it to cool down before shutting off.
- **Engine Start Delay** – The amount of time (0-32,767* seconds) that the battery voltage must be at or below the Low Voltage Start before initiating the start sequence.
- **Engine Stop Delay** – The amount of time (0-32,767* seconds) that the generator must meet BOTH the High Voltage Stop and the Low Current Stop conditions before it begins the shutdown sequence in Automatic Mode. *The factory settings may impose a limit lower than this value. Contact Polar Power for more information.
- **Starter Cut-off RPM** – The engine speed (RPM) at which the starter will disengage in the start sequence. If the engine RPM falls below this value while running, it will trigger a “Low RPM Fault.”
- **Idle RPM** – The engine speed (RPM) at which the engine will run during the warmup and cooldown periods, or if the set max voltage is below the battery voltage.
- **Max RPM** – The maximum engine speed (RPM) before triggering the “Over RPM fault”. Once this fault occurs the fuel supply and the ignition is then shut off and an “Overspeed” alarm is generated.
- **Crank Attempts** – The number of crank/rest sequences the generator will attempt without starting before triggering a “Failed Start” fault.
- **Auto Vent Temp** – The engine temperature (°C) above which the radiator/vent fans will be engaged to cool the engine whether the generator is running or stopped. If the generator is stopped, the fans will turn off once the temperature drops below this value.
- **Vent Fan Delay** – The amount of time (seconds) the fans will turn on before the generator starts and the amount of time they will stay on after the generator stops and the engine temperature is below the Auto Vent Temp.
- **Crank Time** – The maximum amount of time (seconds) that the starter will engage before resting during the start sequence. If engine RPM exceeds the Starter Cut-off RPM, it will override the crank time and disengage the starter.
- **Crank Rest Time** – The amount of time (seconds) the generator will wait between crank periods if the generator does not start.
- **Low Oil Ignore** – The amount of time (seconds) the controller will ignore the oil pressure switch or transducer after starting. If the sensor still reads low oil after this period, the controller will display a “Low Oil Fault” and shut down the generator.
- **Glowplug Post Start** – The amount of time (0-29 seconds) the glow plugs will remain on after the engine begins to crank. If the Glow Plug Temperature Compensation is disabled, this value will also be the amount of time the glow plugs are on before the engine begins to crank.

3.9.2 Maintenance Countdowns

On the Maintenance Countdowns card, the left column displays the time until next scheduled maintenance, and the right column has an input field to set the amount of time (lifespan) between maintenance events.

In addition to setting the lifespan for each type of maintenance, the user can also reset the current countdown time using the **Reset** buttons. There is no confirmation before processing the reset.

Ideally, this should be used when maintenance has just been performed. The time remaining is also displayed on the **Generator Status** page.

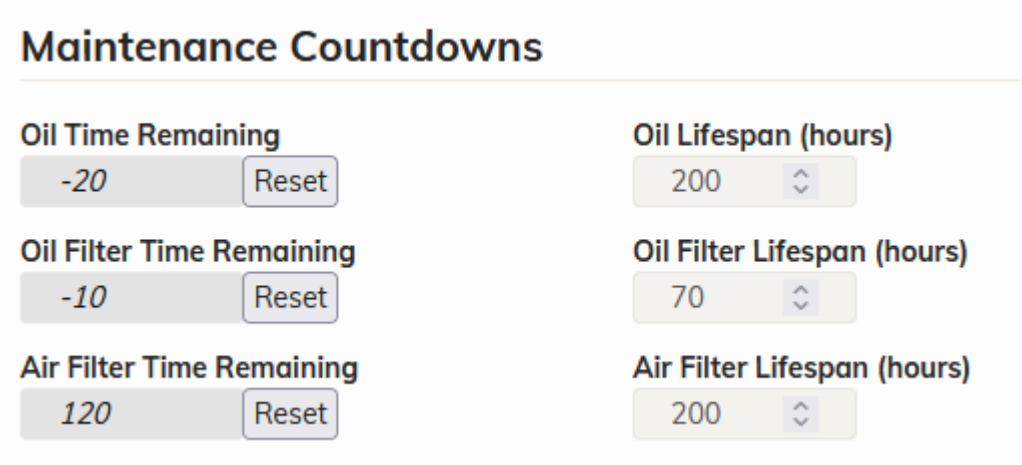


Figure 44: Maintenance countdown example

3.9.3 Battery Temperature Compensation

If the Remote Battery Monitor Cable is attached to the 250 Controller, then the user has the option to set the Battery Temperature Compensation feature. This feature will cause the controller to automatically vary the charging voltage for the batteries based on their temperature, allowing for better performance in extreme temperatures.

- **Battery Over Temp Start** – The temperature (°C) below which the battery temperature must fall before the generator will be allowed to restart.
- **Battery Over Temp Stop** – The battery temperature (°C) above which the generator will be forced to stop until the batteries cool below the Battery Over Temp Start.
- **Min Compensated Voltage –** The lowest battery voltage (Volts) that the compensation feature will be allowed to set.
- **Max Compensated Voltage –** The highest battery voltage (Volts) that the compensation feature will be allowed to set.
- **Volts per °C –** The voltage increment by which the charging voltage will be increased or decreased relative to the Reference Temp.
- **Battery Current Limit –** The maximum current (Amps) that will be allowed to go into the battery**. If the Battery Monitor Cable is not connected, then this value should be set to the same as the Max Current on the alternator.**
- **Reference Temp –** The temperature (°C) that all compensation values are based on. Battery temperatures above this value will cause a decrease in charging voltage, and battery temperatures below this value will cause an increase in charging voltage.
- **Battery Temperature –** The temperature reported by the Battery Temperature Sensor on the Remote Battery Monitor Cable.
- **Compensated voltage –** The calculated resulting voltage that the controller is set to charge to based on the parameters set by the user.

3.9.4 Over Temp Power Reduction

The Over Temperature Power Reduction feature is an automatic function of the 250 controller designed to continue providing power while protecting the generator components from excessive heat. If the measured value for any of the listed temperatures is read as above the corresponding set point in this section, the controller will limit power output to half the set Max Current from the alternator to allow the generator to cool off without losing power completely. Once all the temperatures have dropped below their set Power Reduction points, the generator output will be allowed to return to its set maximum.

- **Engine Temp** – The engine temperature (°C) over which power is reduced.
- **Alternator Temp** – The alternator temperature (°C) over which power is reduced.
- **Rectifier Temp** – The diode bridge temperature (°C) over which power is reduced.
- **Battery Temp** – The battery temperature (°C) over which power is reduced. This is only activated once the Remote Battery Monitor Cable is connected.
- **Internal Temp** – LEGACY FEATURE: FACTORY ACCESS ONLY. The Internal temp is no longer used and only visible for Factory level users. It should always be set at 605.

3.9.5 Throttle and Speed Settings

These settings control the throttle control during the engine start sequence. They are set at the factory and should not need adjustment. Contact Polar Power for more information.

- Throttle Start – The percentage (as a number, 0-1) the throttle will be open at the beginning of the engine cranking sequence.
- Throttle Stop – The maximum percentage (as a number, 0-1) the throttle will open during the engine cranking sequence.
- Throttle Rate – The rate during startup the throttle will advance each step between the start and stop values. **This property is Read-Only and cannot be changed**.

3.9.6 Fuel Tank Settings

The user can enter the fuel tank volume (liters) here. This value is used by the Supra 2020 to calculate the estimated volume of fuel remaining based on the fuel level sensor reading. The fuel level as a percentage and as a volume is displayed on the Overview and Generator Status pages.

3.9.7 Glowplug Temp Compensation

If enabled the Glow plugs will automatically enable at a certain temperature and be disabled at another. If this option is not enabled, the time specified by Glow plug Post Start will be used. **Factory recommendation is to leave this feature Disabled.**

3.9.8 Fault Settings

This section displays settings related to the fault triggers that are built into the 250 controller. These settings will control when the generator turns itself off based on the set fault condition.

- Low Oil Pressure Kill – The engine oil pressure (BAR) below which the engine may be damaged and the generator will turn off and display a “Low Oil” fault. This value is ignored during start up for the period determined by the Low Oil Ignore setting.
- Over Temp Kill – The temperature (°C) over which the generator will shut off and display an “Over Temp” fault.

Auto Mode on Fault: If enabled, this setting keeps the generator in automatic mode after a fault is tripped. It may allow the generator to continue to run despite the fault condition. CAUTION: Enabling this feature may cause damage to the generator.

3.9.9 Importing and Exporting

Like many MCS pages, the Generator Settings can be exported to or loaded from a .csv file.

NOTE: This does not include Time or Exercise data.

Clicking **Save to File** will generate and download a file containing the values **as they are displayed in your web browser.** This will include any unsaved changes.

Clicking **Load from File** will allow you to load data into the page from a file. **This does not send the data to the system.** You must click the **Save all** button on a card to send its data.

Clicking **Save all** will save the data on all cards and tabs.

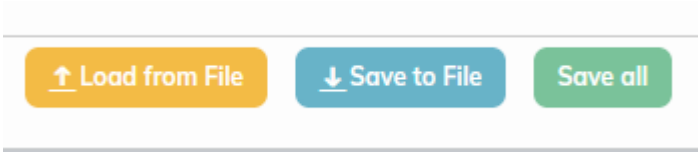


Figure 45: import/export controls

3.10 Single/DualGen Supra2020 Control

Supra2020 DualGen Control is presently available only on units with two generators. The settings on this page allow for various controlled operations of two Polar generators at the same site. To open the page, click **Supra2020 Control** in the **Generator** menu. By default, this page is visible to all users.

Settings in the Supra2020 Control will override those in Generator Settings.

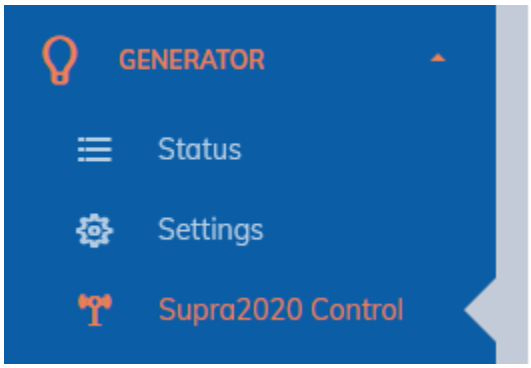


Figure 46: Supra2020 Control in the navigation panel

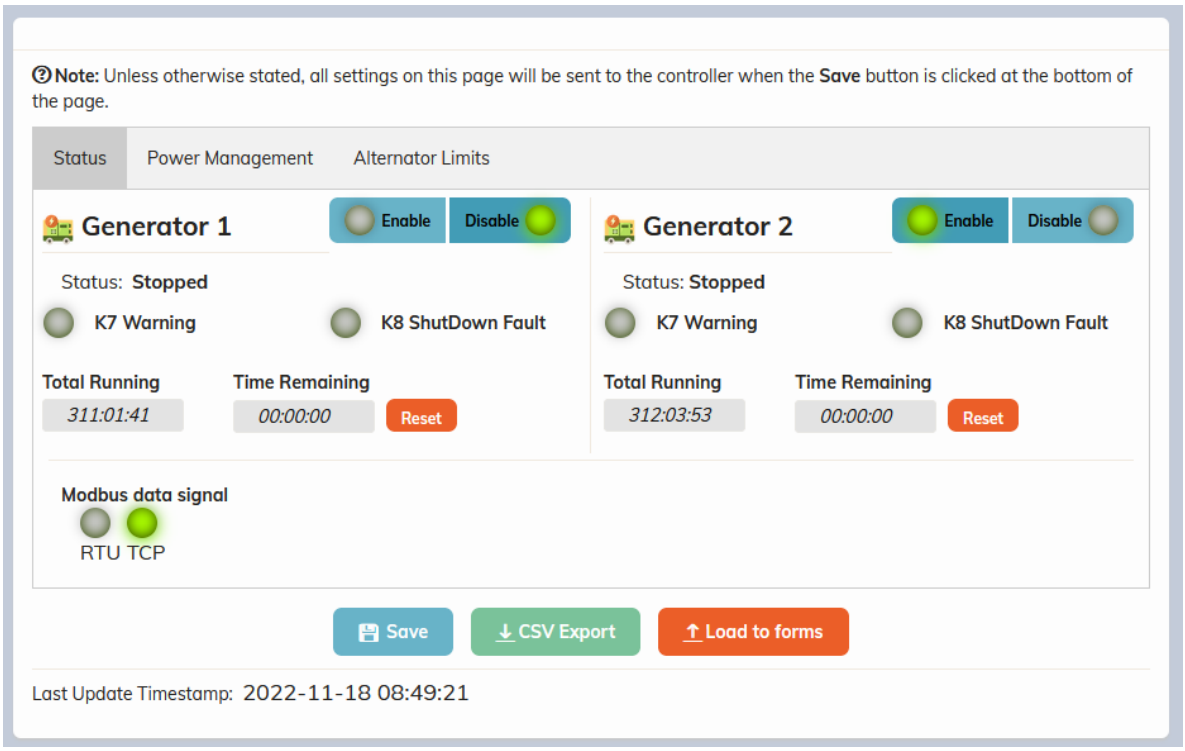


Figure 47: The DualGen Control Page

The page is separated into three tabs for readability. There are three different types of fields on the page: read-only, editable, and switches.

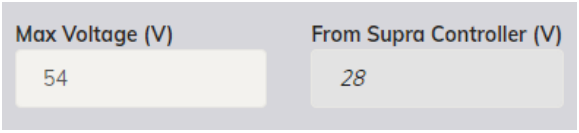


Figure 48: Editable (left) and Read-Only (right) data fields.

Read-only fields are used to display data from the system. They are greyed out and cannot be selected or changed by a user.

Editable fields are standard input boxes. They can be edited. Changes will not be sent to the system until the **Save** button is clicked at the bottom of the page. **The Save button will send all editable fields which have been changed.**

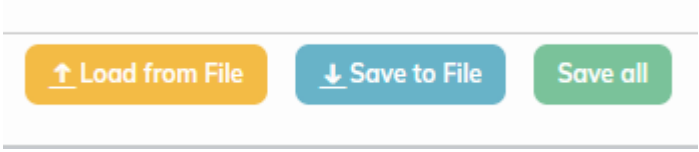


Figure 49: Save button

Switches are toggles between two values or between an On and Off state. They are changed by clicking on them. **Changes are sent to the unit as soon as a switch is clicked.**

Note: Switches are used on other pages as well. In most cases they are not sent until a **Save** or **Set** button is clicked. Supra2020 is a unique exception to this. Check the help tip next to a switch or by hovering over the switch itself for more information.

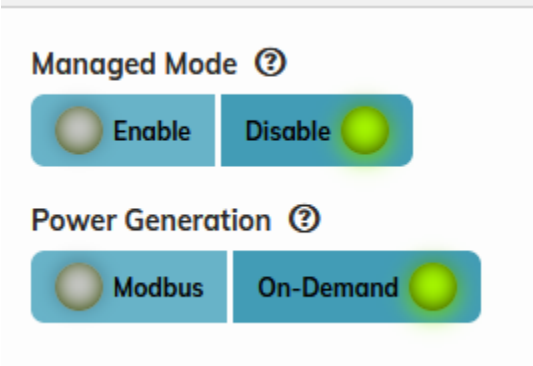


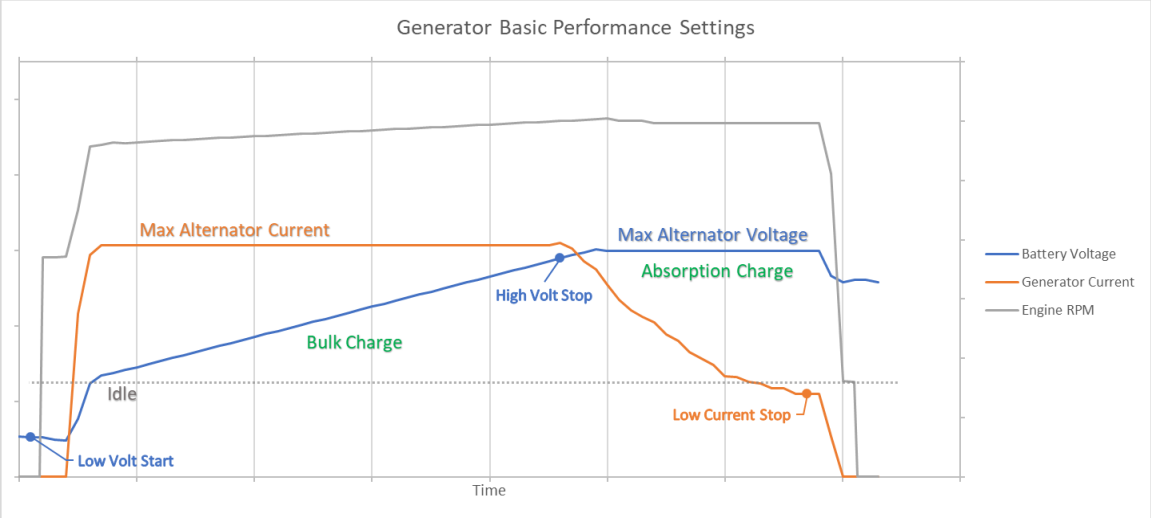
Figure 50: an example of the switches on the Supra2020 page

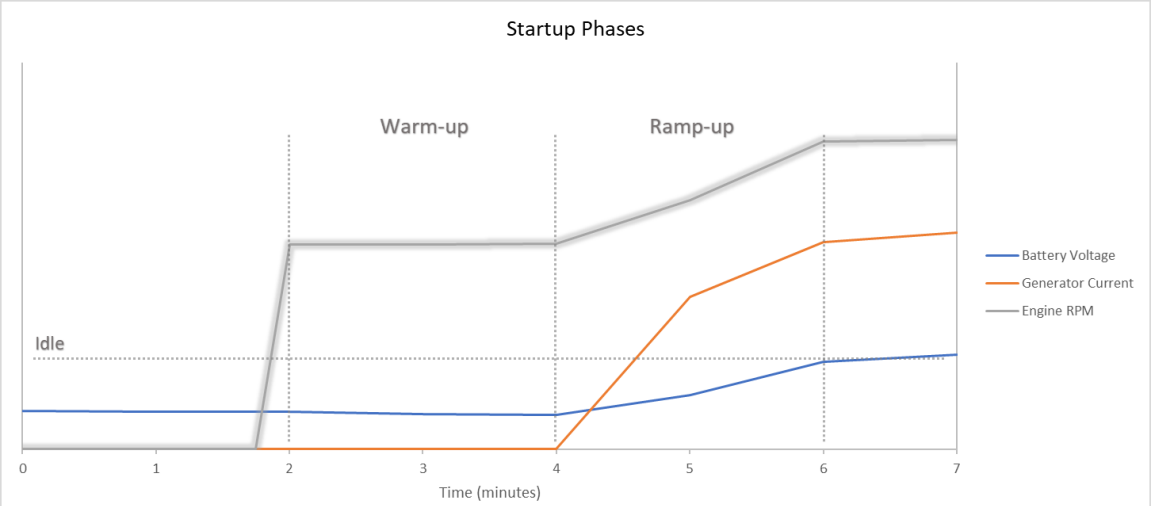
3.10.1 Power Management

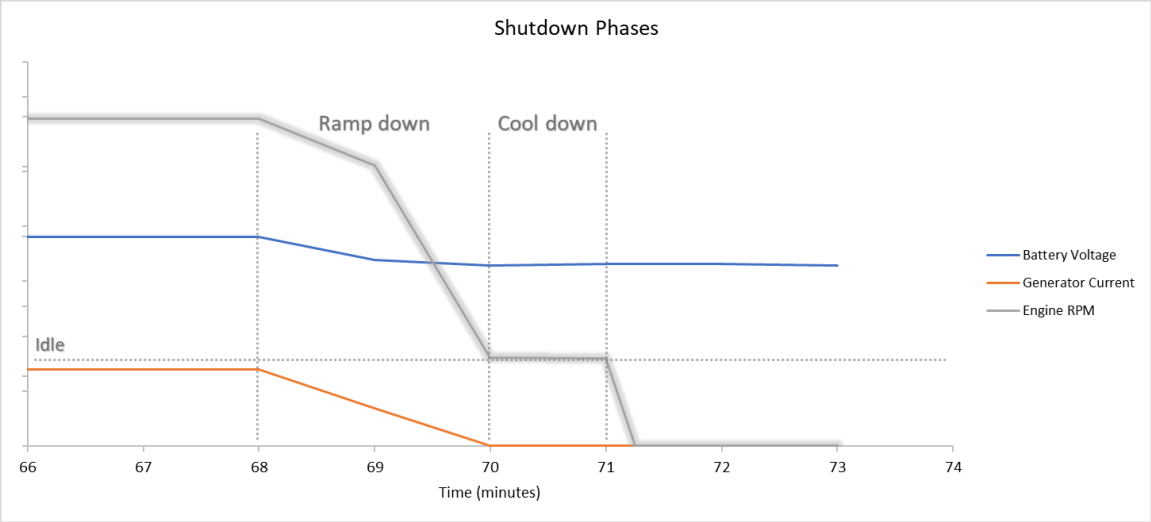
Many of the parameters on this page have the same names and serve the same purpose as those on the Generator Settings page, but the Supra2020 values override the generator settings when the Managed Mode operation is activated.

- **Managed Mode** – When enabled, the settings on the Supra2020 page will override those on the Generator Settings page and the generators will be controlled by the Supra2020 software.
- **Power Generation** – This offers two options for operation.
    - If Constant is selected and Managed Mode enabled, at least one generator will be running at all times and the software will switch which generator is taking the load (primary) after the Alternate Period has passed.
    - If On-Demand is selected and Managed Mode enabled, the generator(s) will run until the stop conditions are met, at which point they will turn off until the batteries drop below the Low Voltage Start. The software will switch the generator running when the Alternate Period time has expired. The Time Remaining before switching only counts down when at least one generator is running.
- **Low Voltage Start** – The voltage (Volts) to which the battery bank must discharge before triggering the countdown timer from the Start Delay setting in On-Demand mode.
- **Low Current Stop** – The current (Amps) from the generator to the battery must fall below before starting the countdown timer for the Stop Delay in On-Demand mode. *
- **Voltage / High Volt Stop –** Measured voltage from the Generator 1 250 controller / The voltage (Volts) that the output of the primary genset requires before engaging the Stop Delay countdown timer in On-Demand mode. **Note: The combination of the High Volt Stop and Low Current Stop parameters must be met at the same time to activate the shutdown sequence.**
- **Rotation Period –** The time (hours) that the primary generator must run before switching the other generator to primary and resetting the timers.
- **Start Delay –** The amount of time (seconds) that the battery voltage must be at or below the Low Voltage Start before initiating the start sequence in On-Demand mode. The left value is the actual value from the 250 controller and the right value is set by the user.
- **Minimum Runtime** – Minimum amount of time the generator must be run before it can be shut down automatically. **Note:** manual shutdown is still possible during this time.
- **Rampdown Delay** – The time during which engine speed will decrease (from load to idle) before shutting down

- **Cooldown Delay** - The amount of time (0-255 seconds) the generator will run at the set idle speed after the shutdown conditions have been met and before the engine turns off in Automatic mode. Note: The generator does not have a cooldown period when shut off manually.
- **Stop Delay –** The amount of time (seconds) that the generator must meet BOTH the High Volt Stop and the Low Current Stop conditions before it begins the shutdown sequence in On-Demand mode. The left value is the actual value from the 250 controller and the right value is set by the user.
- **Load Current** – The current (Amps) measured by the Load Current Sensor on the Battery Monitor Cable connected to Generator 1.
- **Battery Current** – The current (Amps) entering the battery (+) or leaving the battery (-). This value is calculated by subtracting the load current from the alternator current.
- **Battery Current Limit** – The maximum current (Amps) allowed to charge the battery.
- **Generator Enable/Disable** – This switch allows the generator to be disabled so that it will not be run even when Managed Mode is enabled. Both generators must be enabled for the load/run time to be shared equally between them.
- **Max Current –** The maximum current (Amps) allowed from the generator set by the user. From Supra Controller – The real-time Max Current setting in the 250 controller, adjusted by the Supra2020 software as needed.
- **Max Voltage –** The maximum DC voltage (volts) produced by the generator. From Supra Controller – The real-time Max Voltage setting in the 250 controller, adjusted by the Supra2020 software as needed.
- **Total Running –** The total generator runtime (HH:MM:SS) from the 250 Controller.
- **Time Remaining (Rotation) –** The generator runtime (HH:MM:SS) remaining until the generator stops being primary and transfers the load to the other generator. Only the timer on the current Primary generator is used by the software even though both generator timers will count down. The Reset button will reset the Time Remaining value to the amount of time stored in the Alternate Period box.


Generator Basic Performance Settings
Max Alternator Current
Max Alternator Voltage
Absorption Charge
High Volt Stop
Bulk Charge
Idle
Low Current Stop
Low Volt Start
Time
Battery Voltage
Generator Current
Engine RPM


Startup Phases
Warm-up
Ramp-up
Idle
0
1
2
3
4
5
6
7
Time (minutes)
Battery Voltage
Generator Current
Engine RPM


Shutdown Phases
Ramp down
Cool down
Idle
66
67
68
69
70
71
72
73
74
Time (minutes)
Battery Voltage
Generator Current
Engine RPM

3.10.2 Importing and Exporting

Like many MCS pages, the Supra2020 settings can be exported to or loaded from a .csv file.

NOTE: This does not include switches.

Clicking **Save to File** will generate and download a file containing the values **as they are displayed in your web browser.** This will include any unsaved changes.

Clicking **Load from File** will allow you to load data into the page from a file. **This does not send the data to the system.** You must click the **Save** button when you are ready to send the data.

3.11 Scheduling

The Scheduler is a powerful tool for controlling your hardware using time-based triggers. The status of the scheduler is always displayed at the top of the page.

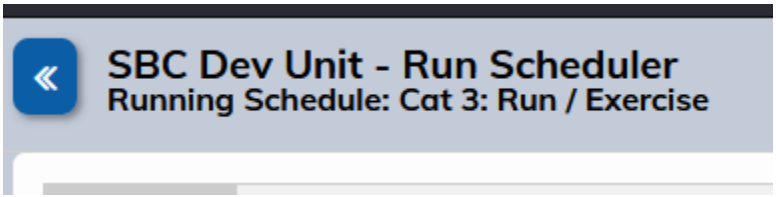


Figure 51: Scheduler Status in top banner area

The Scheduling page can be accessed from the navigation panel.

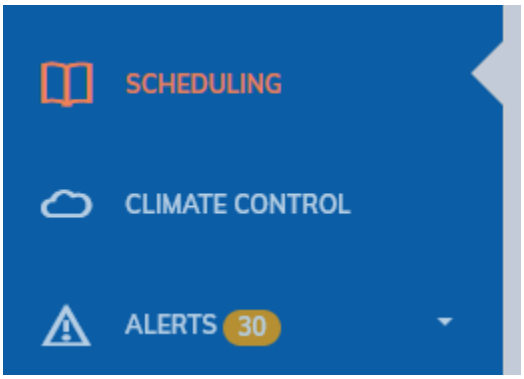


Figure 52: Scheduling on the navigation panel

3.11.1 Scheduler

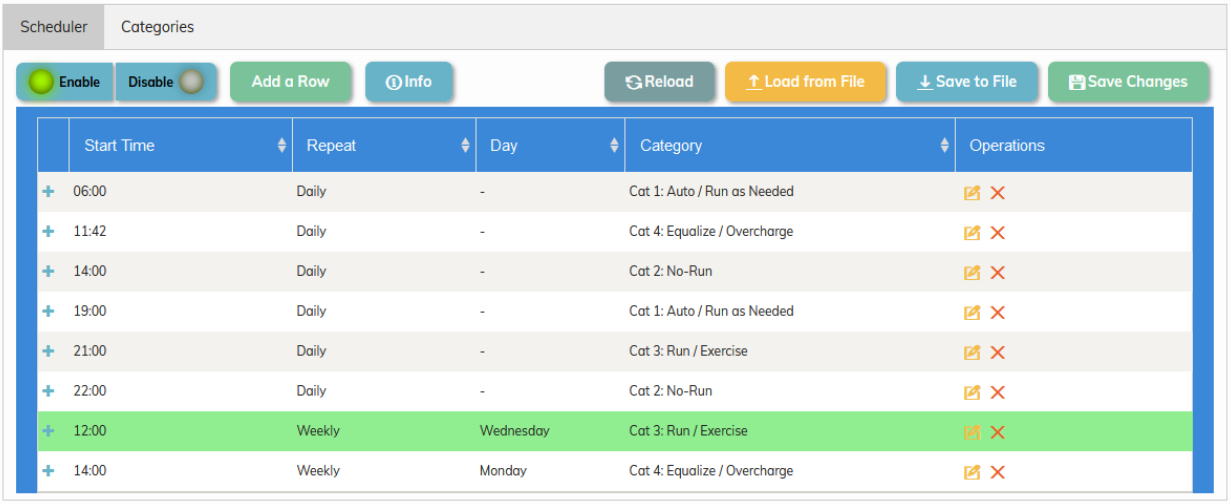


Figure 53: The Scheduler tab

The scheduler is where schedules can be defined and edited. The **(?) Info** button at the top will pop up a reminder of the scheduler's basic use if needed.

The **Enable/Disable** buttons will turn the scheduler on or off. While in the disabled state, the system will default to Category 1: Run as Needed.

Each row on the table represents a trigger. At the time of the trigger, **if the scheduler is enabled**, the system will change to the specified run category. New triggers can be added with the **Add a Row** button, and existing ones can be edited or removed using the buttons in the **Operations** column.

The **Green Line** indicates the currently running schedule. When changing the scheduler from **disabled** to **enabled**, the active schedule **will not change** until the next trigger is encountered.

3.11.2 Categories

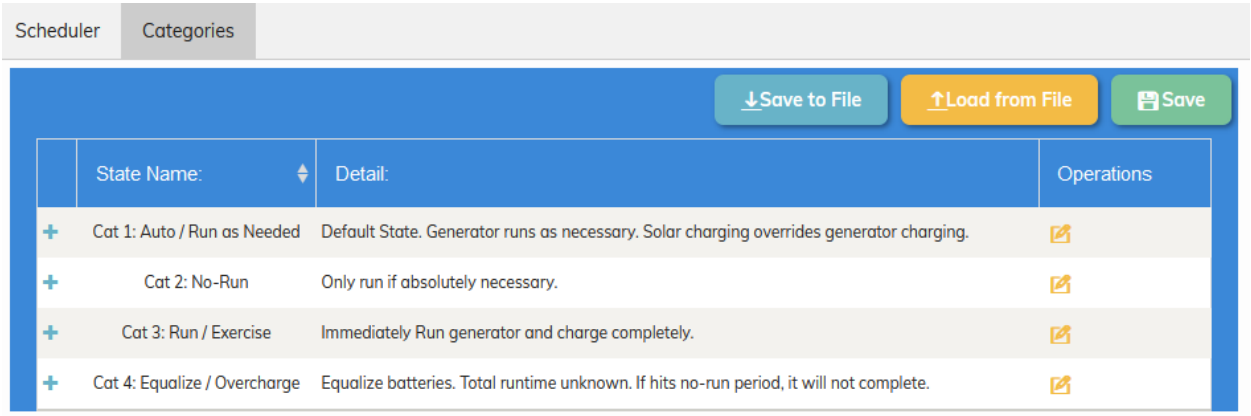


Figure 54: Schedule Categories

There are four categories available for scheduling. They are viewable on the **Categories** tab. An individual schedule can be expanded with the **+** button to show details, and altered using the edit button under **Operations**.

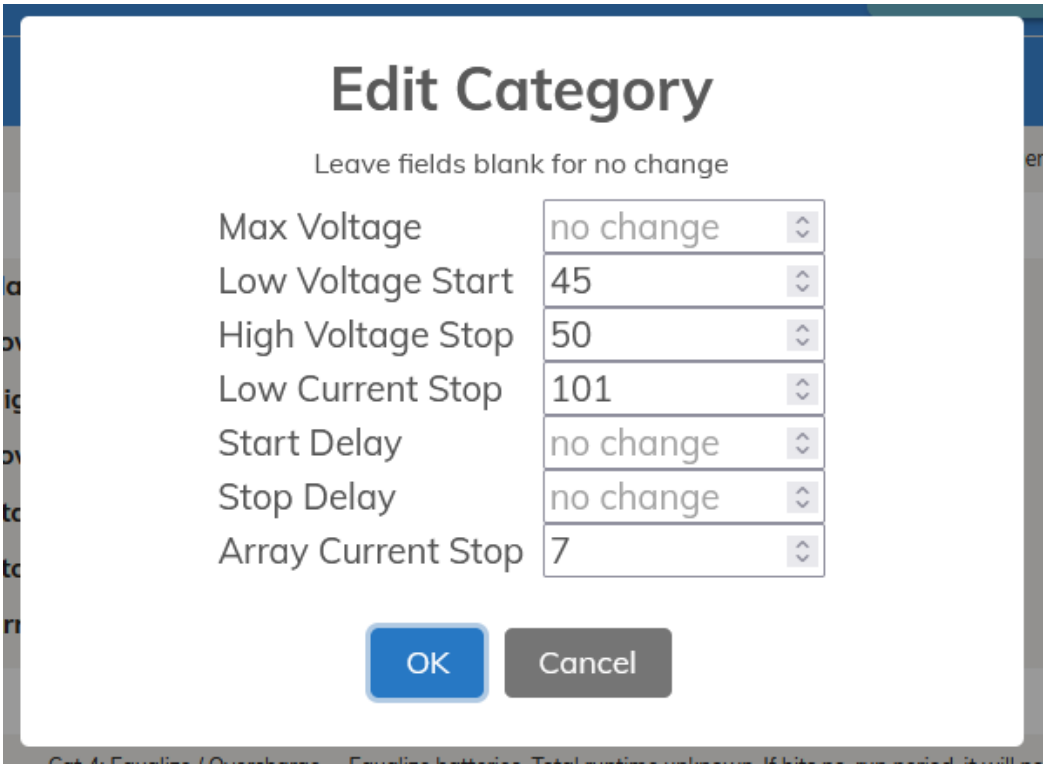


Figure 55: Editing a schedule

Remember to **click the Save button** after making changes to the schedule categories.

3.12 Alerts

The MCS can send alerts by SMS or by email. Settings to receive alerts are on a per-user basis and can be modified by the user. **Note: alerts may be filtered by spam/junkmail filters**. It is always a good idea to set up exceptions to your filters if possible.

3.13 Alert Log

The **Alert Log** page can be accessed via the **Alerts** menu in the navigation panel. A badge will also show the number of uncleared alerts.

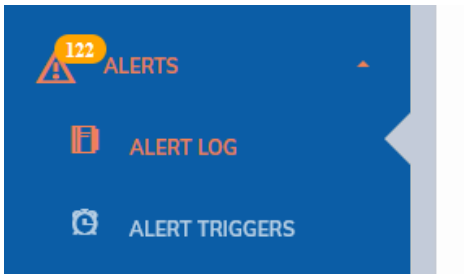
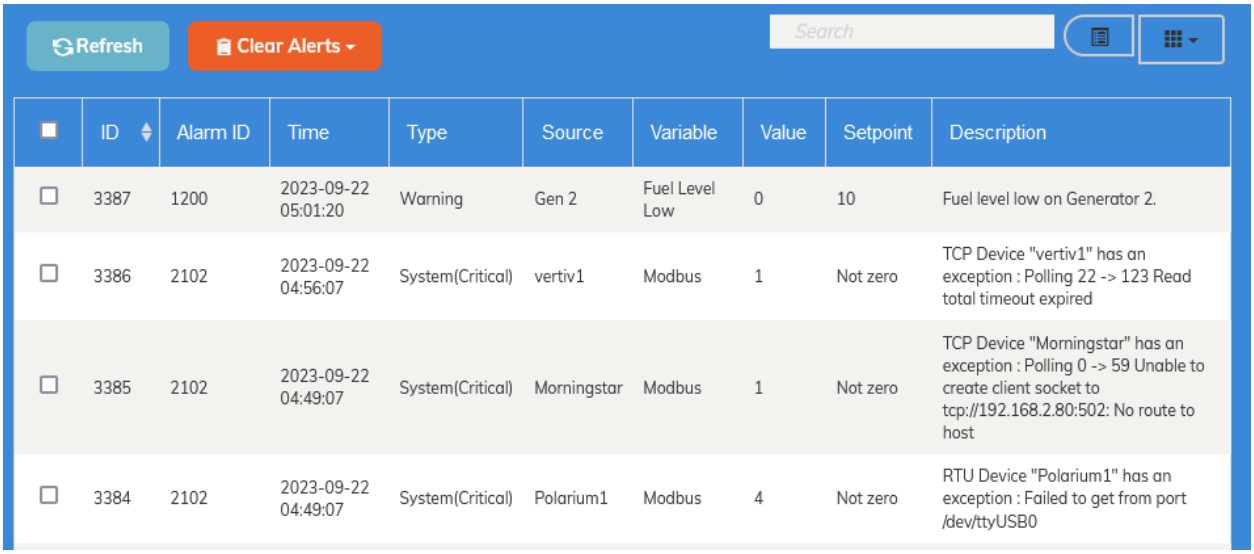


Figure 56: Alert Log on the navigation panel

3.13.1 Alert Log Table

The page will display a table of all uncleared alerts in the system database. To clear an alert, click to select it and click **Remove Selected**. It will be removed from the display but retained in the historical database.



	ID	Alarm ID	Time	Type	Source	Variable	Value	Setpoint	Description
☐	3387	1200	2023-09-22 05:01:20	Warning	Gen 2	Fuel Level Low	0	10	Fuel level low on Generator 2.
☐	3386	2102	2023-09-22 04:56:07	System(Critical)	vertiv1	Modbus	1	Not zero	TCP Device "vertiv1" has an exception : Polling 22 -> 123 Read total timeout expired
☐	3385	2102	2023-09-22 04:49:07	System(Critical)	Morningstar	Modbus	1	Not zero	TCP Device "Morningstar" has an exception : Polling 0 -> 59 Unable to create client socket to tcp://192.168.2.80:502: No route to host
☐	3384	2102	2023-09-22 04:49:07	System(Critical)	Polarium1	Modbus	4	Not zero	RTU Device "Polarium1" has an exception : Failed to get from port /dev/ttyUSB0

Figure 57: the Alert Log table with rows selected

3.13.2 Alert Logs Export

Below the table is a form for exporting logs. Clicking one of the **CSV Export** buttons will cause the page to generate and download a .csv (comma-separated value) file with either recent entries or entries between two time/date stamps.

If **Include cleared alerts** is checked, the downloaded file will include alerts which have been cleared already.

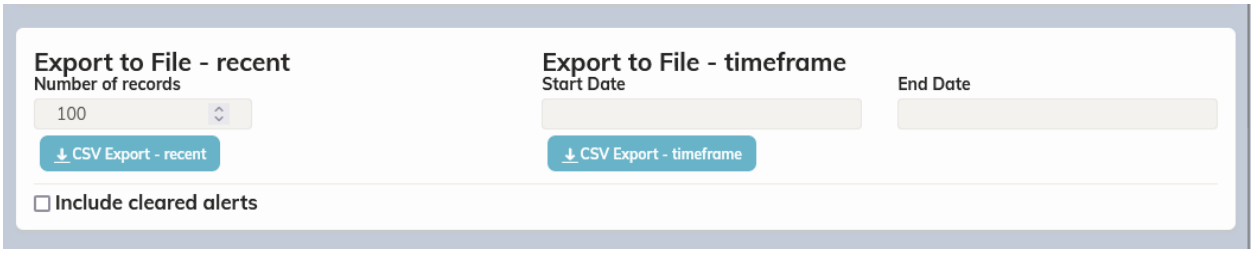


Figure 58: Exporting Alert Logs

3.14 Alert Triggers

Alert Triggers can be customized from the **Alert Triggers** page. It has tabs for **Generators, Devices, and Maintenance.** The Alert Triggers are used **only** by the SMS/Email alert system. They do not affect system operation. Users can opt into SMS/Email alerts on the **System Settings** page.

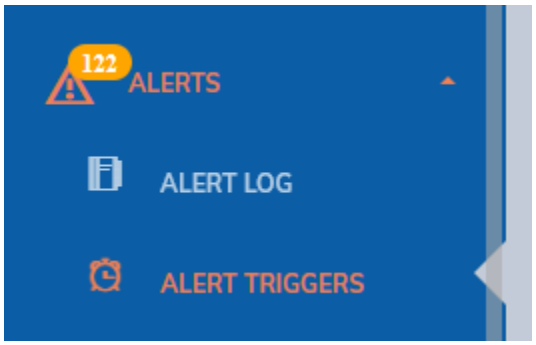


Figure 59: Alert Triggers in the navigation panel

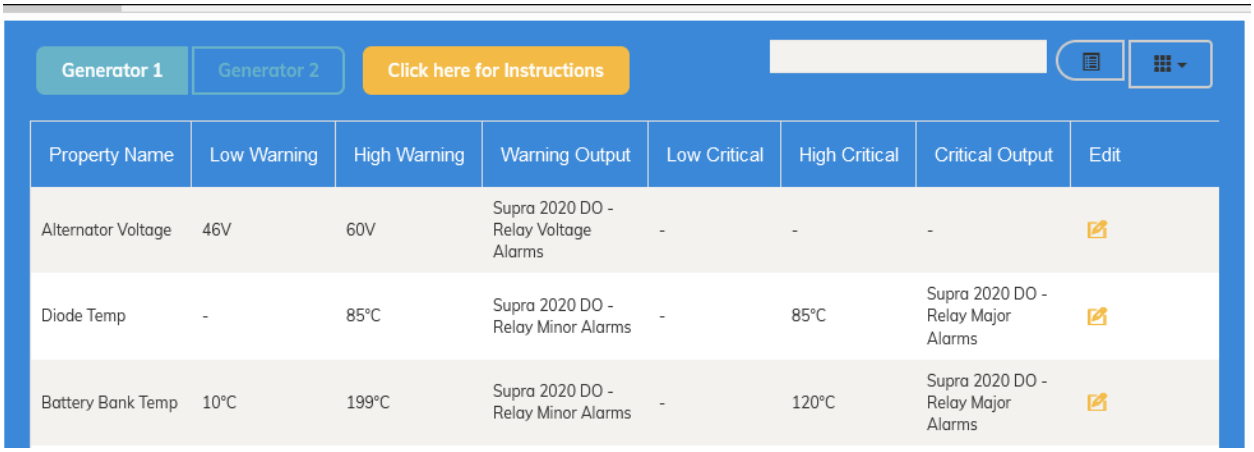


Figure 60: some configured alerts on Generator 1 of an example system

Each trigger has values for Low and High Warning and Critical alerts. Triggers can also be linked to Digital Output channels – see the **Device Configuration** section (below) for more information on configuring Devices and Digital I/O.

Note: Leaving a warning trigger blank may result in no warning being sent at all.

Some fields are read-only. These reflect either values set on the Generator Settings page or factory-managed constraints which cannot be changed.

Permissible value ranges for alerts may only be configured by a Polar Power technician. Any missing fields are not currently supported by the alert system.

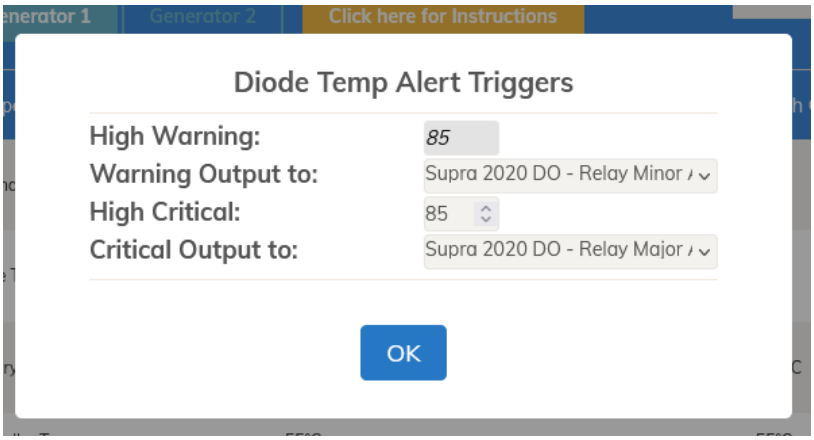


Figure 61: configuring a trigger with digital output

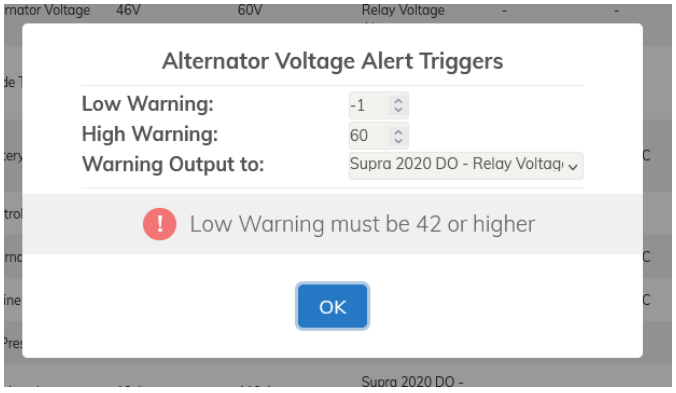


Figure 62: attempting to set an out-of-range Alert Trigger

Use the **Save Triggers** button at the bottom of the page to commit any changes. The **Save to File** button may be used to back up settings to a text (.json) file, and the **Load from File** button will fill all inputs from a previous backup file.

The **Devices** tab is used to configure alerts for devices configured In the **Devices** section (see below). There are no trigger values for devices; they use the masks in the devices' data connections to determine status. Instead, the controls on the Devices tab are used to link individual devices to digital outputs.

The **Maintenance** tab is used to configure values at which warnings will be sent for upcoming maintenance requirements.

3.15 External/Peripheral Device Configuration

Device settings can be modified on the **Device Config** page. Devices can be connected via TCP, RTU, or GPIO connections. The page is separated into tabs for **Devices, Data Connections, Networks, and GPIO Channels.**

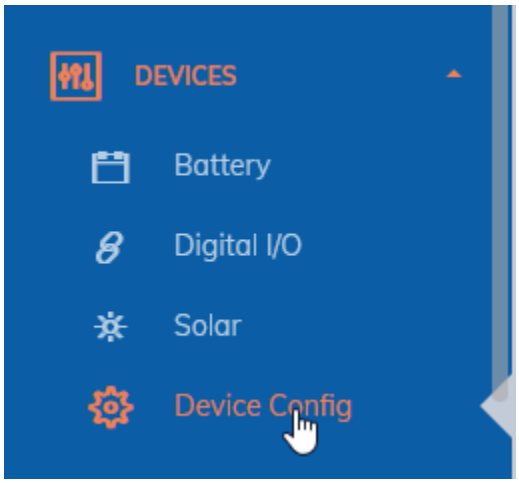


Figure 63 – Device Config icon in the navigation panel

3.15.1 Devices

On the **Devices** tab, you can configure a device to interface with the MCS and view all connected devices.

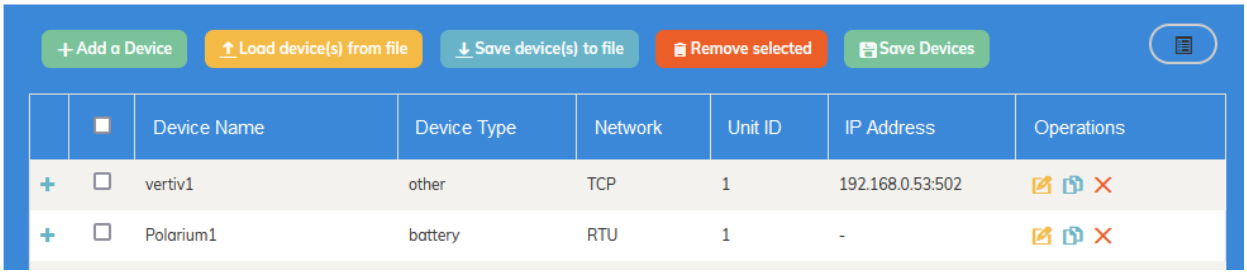


Figure 64: The Device table

3.15.1.1 Adding or Modifying a device

To add a device, click **Add a Device.** You will be prompted for the device settings. The **Device Name** is arbitrary, so choose one which is meaningful to your organization.

To edit, clone, or remove a device, use the controls on the right side of the row. Cloning is useful if you wish to set up multiple similar devices.

Devices can be exported to a file and imported from the same. This is useful for quick setup on a new unit.

3.15.1.2 Device Properties

Properties are the actual data to be read from a device. To view or edit the properties of a device, click the [+] icon to the left of the device name.

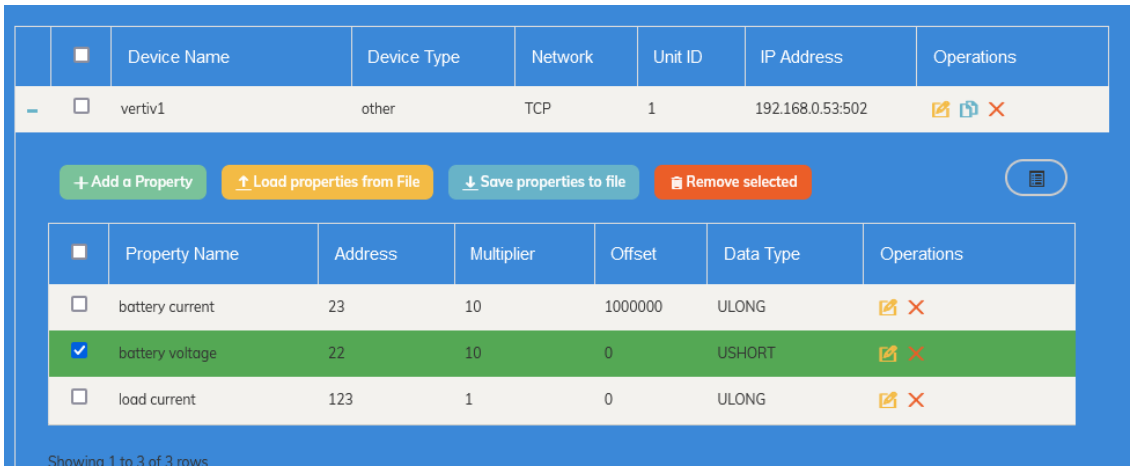


Figure 65: Device Properties

Properties can be added and modified the same way as devices are, using the buttons at the top and the controls to the right.

Figure 66: Editing a device property

Properties can be exported and imported the same way that devices can.

3.15.1.3 Data Connections

Data connections tell the MCS how to interpret data from devices.

NOTE: Changes to this tab will only take effect when the save button at the bottom of the screen is clicked.

In the **System Data Sources** section, properties configured on the **Devices** tab can be added to or subtracted from system readouts such as the System Voltage and Battery Current. The modified total will be displayed by each section.

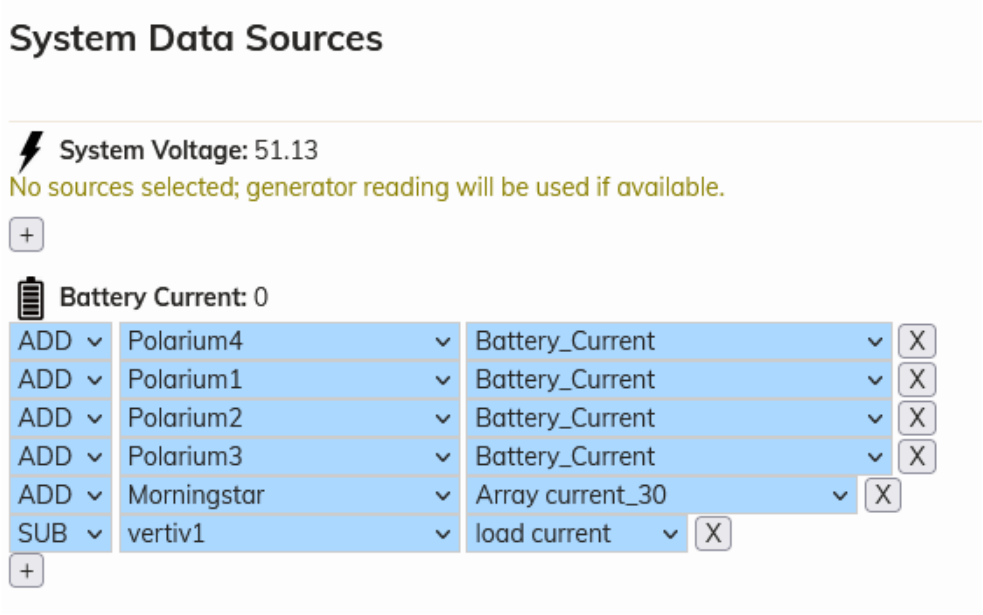


Figure 67: System Data Sources

The **Device Connections** are used to tell the system how to further interpret data from a device. For example: the below image shows a Battery device which has been configured to recognize the user-created Battery_Current property (from the **Devices** tab) as the source for the device's Current.

Some connections, such as Warning and Critical status, require a **mask**. The mask is used to interpret a single binary number as a series of 1/0 switches. In the below example, the Operating_status_1 property has been set as the Warning Status source with a mask of 57343. This will be used by MCS to determine whether a fault has occurred. A single connection may be linked to several masked properties.

Note: for Digital and Switch inputs, a mask of "1" represents "AND" and a mask of "0" represents "OR".

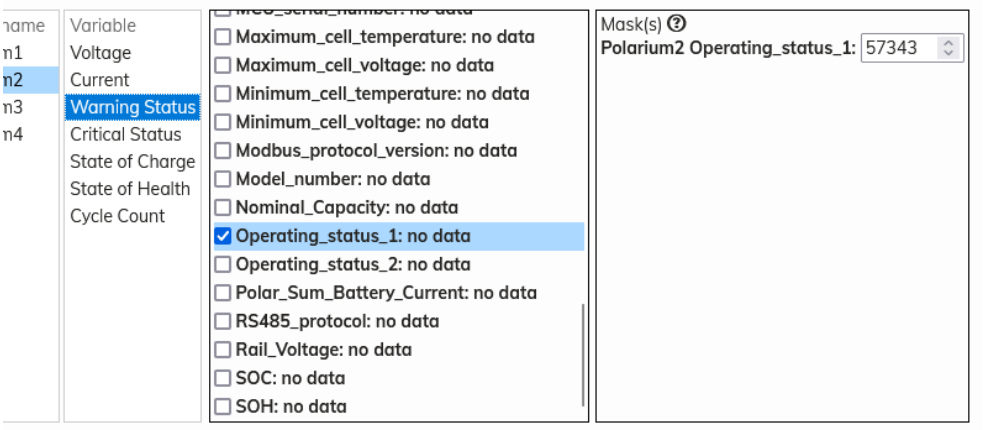


Figure 68: A masked connection

For more information on device-specific properties and masks, consult the device documentation from the manufacturer.

3.15.1.4 Networks

Network Communication settings can be set on this tab. A light by each network will indicate if there is a connection (green), no connection (grey), or a problem/fault (red).

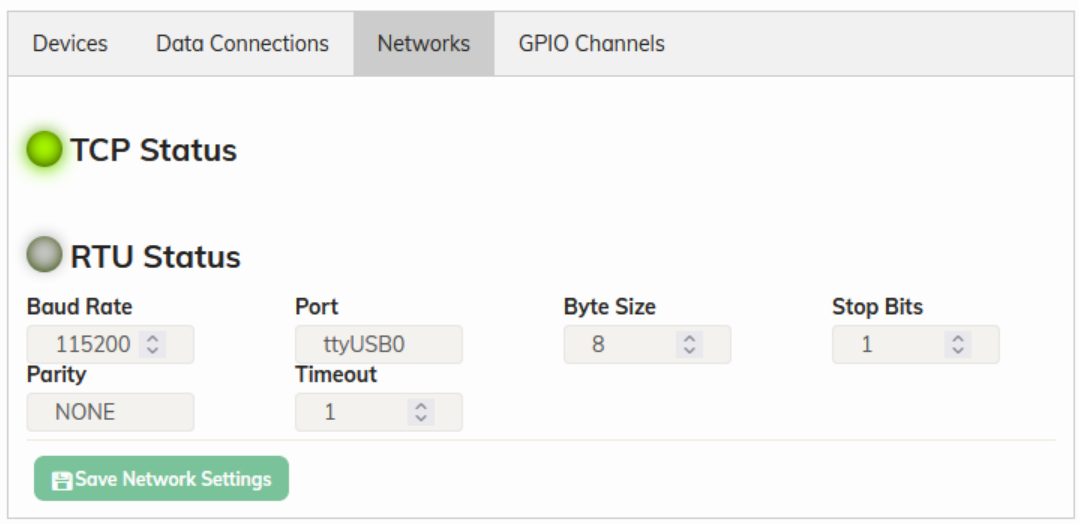


Figure 69 – Network Settings

3.15.1.5 GPIO Channels

The **GPIO Channels** tab displays information about the GPIO board configuration for GPIO-connected devices. The **Normal State** and **Indicator Color** can be configured here. Other properties can only be configured by a Polar Power technician, based on the GPIO hardware installed in your system.

The **Indicator Color** is used on the **Status Pages** (see below).

3.15.2 Status Pages

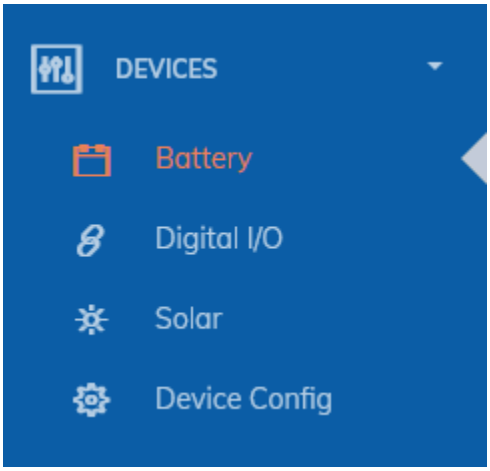


Figure 70: Device Settings Pages

Depending on the types of devices configured, your menu will show **battery, Digital I/O, and/or Solar** pages.

The **Battery** and **Solar** pages will show a page summary and a status card for each device.

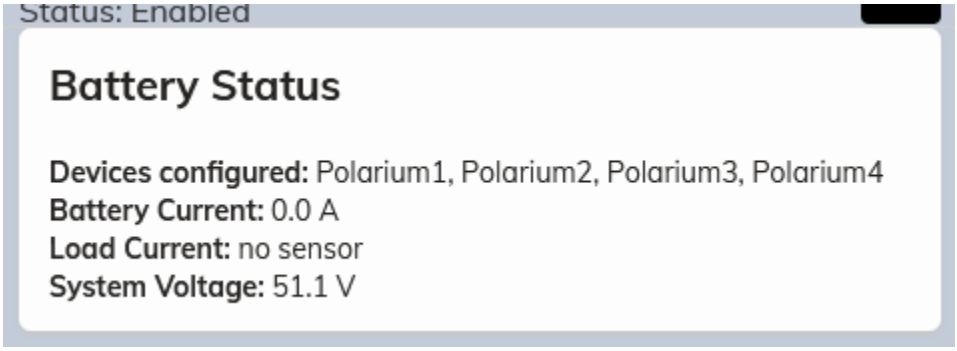
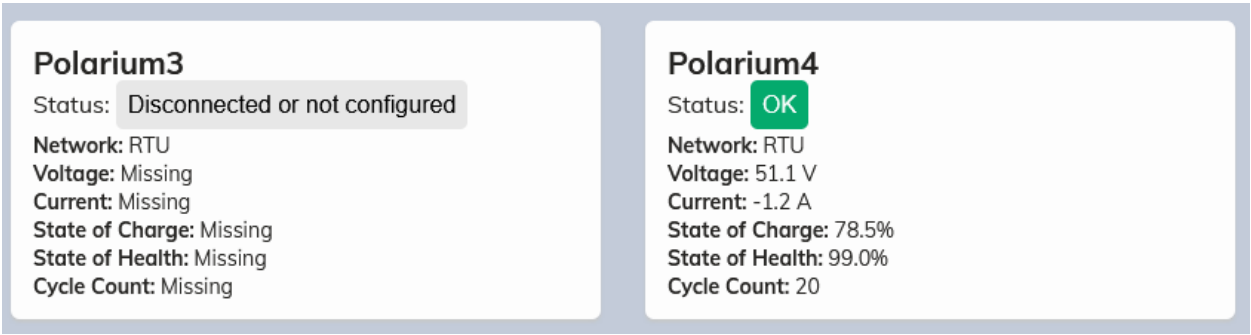


Figure 71: An example of a device status summary (Battery)

In the below example, tow devices are displayed. One is disconnected and no data has been received. The other is on an **OK** status. This status is based on the Warning and Critical connections configured on the **Data Connections** section (see previous pages).



The **Digital I/O** page is structured differently. It has two tabs (Digital Inputs and Digital Outputs). Status is shown based on the masked properties on the Device configuration, and channels are configured in the data connections section (see above sections).

The **Digital Inputs** tab displays graphically whether the switches are open or closed.

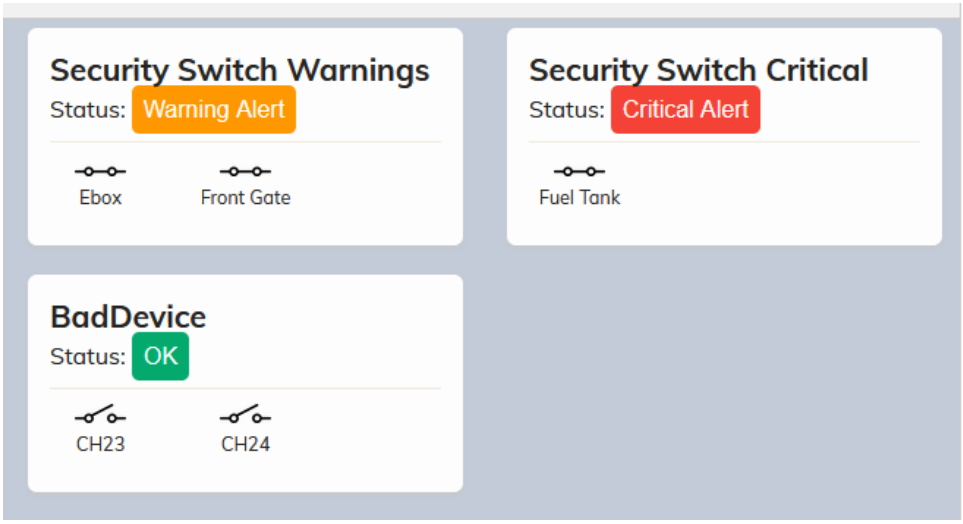


Figure 72: Digital Inputs

The **Digital Outputs** tab shows the status of the switch along with a button to toggle it for testing purposes.

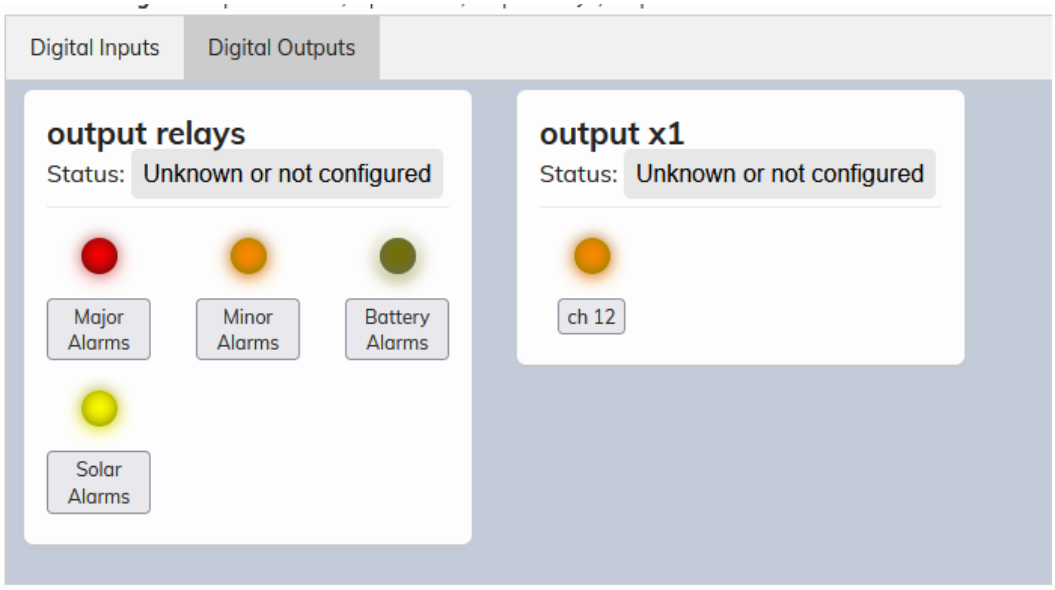


Figure 73: Digital Outputs, including user-configured indicator colors.

3.16 History

The MCS can be used to retrieve a large amount of historical data. To do so, open the **History** page from the navigation panel.

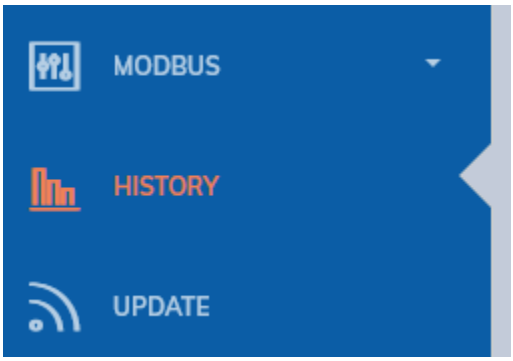


Figure 74: The History icon in the navigation panel

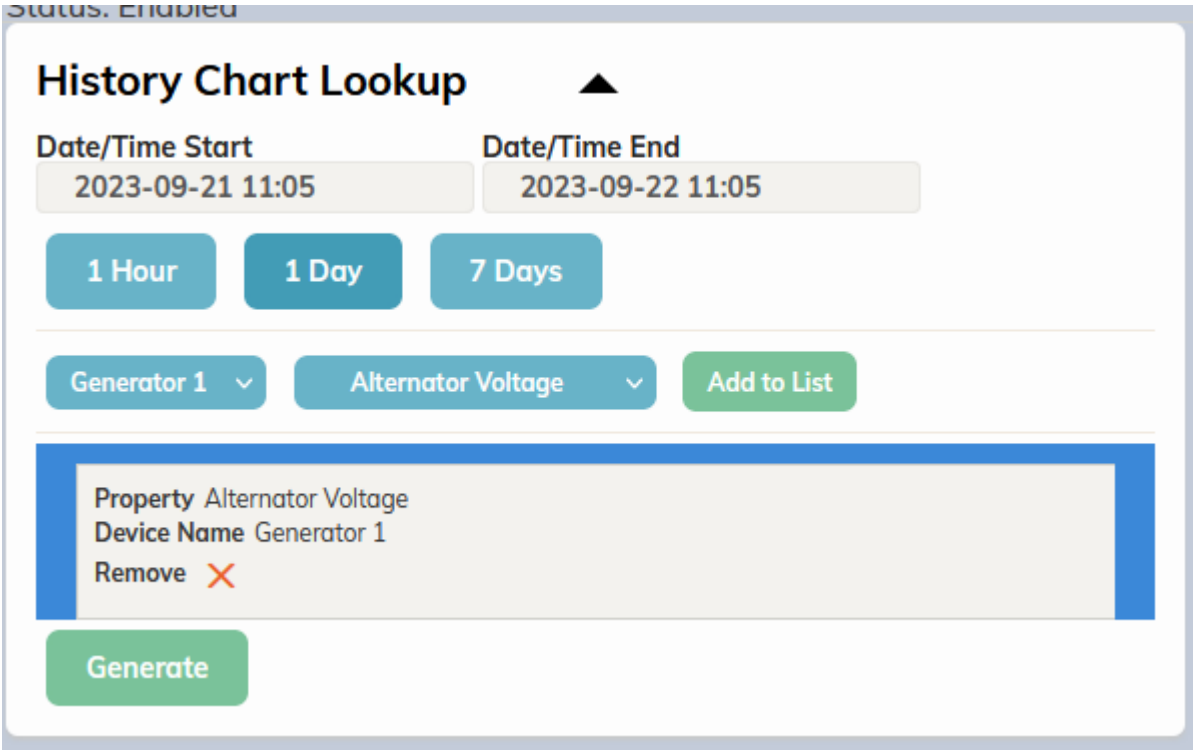


Figure 75: The History form

To retrieve historical data, follow the steps as given:

- Choose a time frame (Date/Time Start and Date/Time End)
- Select the properties to be displayed on the chart
- Click Generate Chart
- Wait for the data lookup and chart generation

3.16.1 Choosing a Timeframe

The Start and End times can be manually chosen or auto filled using the **1 Hour, 1 Day,** and **7 Days** buttons. The buttons will set the current time to be the Date/Time End and automatically populate the Date/Time Start field. **These dates are based on system time, not the time zone of the user.**

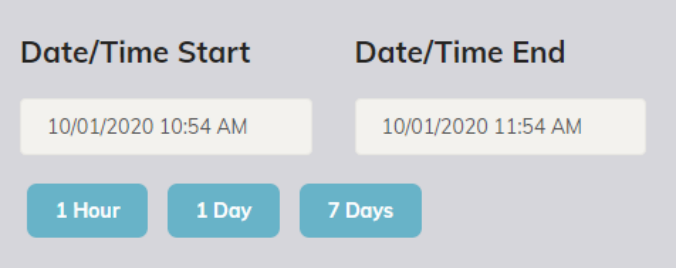


Figure 76: Choosing a Historical Timeframe

3.16.2 Configuring a Chart

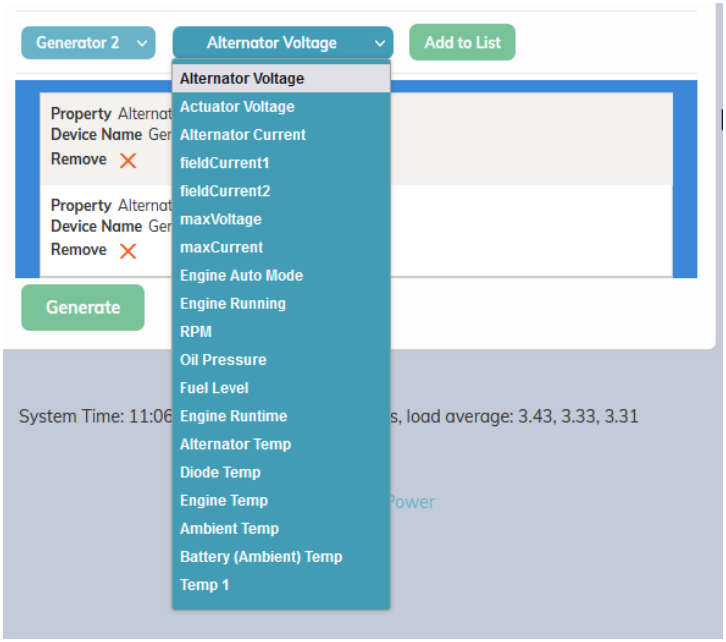


Figure 77: Chart Configuration

Charts can contain any number of data properties. Select the desired properties from the table. Click Battery to view Battery properties.

3.16.3 Low and High records

Data is stored once a minute. For each 1-minute period, the SBC stores the lowest, highest, and last value received. Low and High records will automatically be fetched along with the last value.

3.16.4 Viewing the Chart

When you are ready to view your data, click **Generate**. Note that generating large sets of data may take some time.

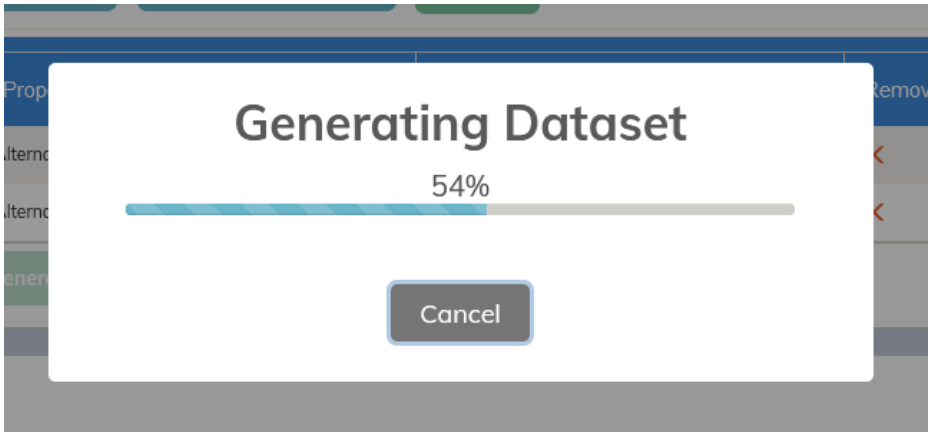


Figure 78: Generating a chart

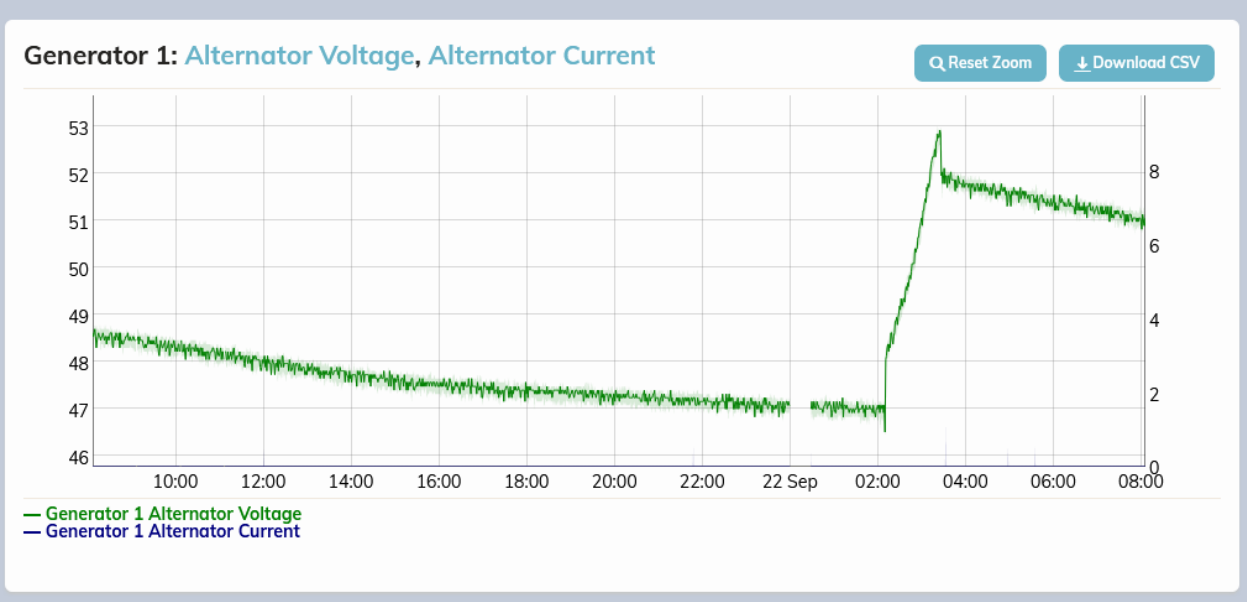


Figure 79: Completed Chart

The completed chart will be displayed below the form. It includes options **Export CSV** to export a spreadsheet of its data and **Reset Zoom** to zoom out on all the data. This is important because the chart can be zoomed using the mouse; clock and drag to highlight a section.

Figure 80: Zooming on a chart

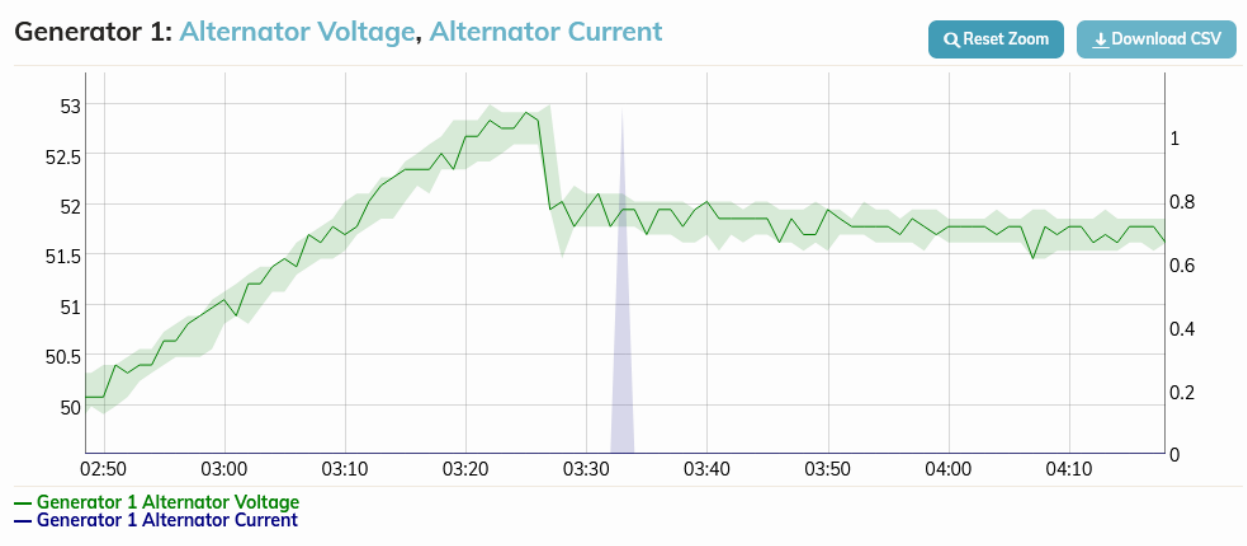


Figure 81: The zoomed data

In the above image, a zoomed section shows more detail. Note the shaded area representing the range between **high** and **low** values, and the line representing **last** value. This example demonstrates the value of **high** values as a shaded current spike is visible.

In some cases, zooming is unhelpful. In the following example, due to scale, the data is not readable. We can view the actual numbers by hovering the mouse over the chart (see the green highlight), but it is difficult to see what's happening over time.

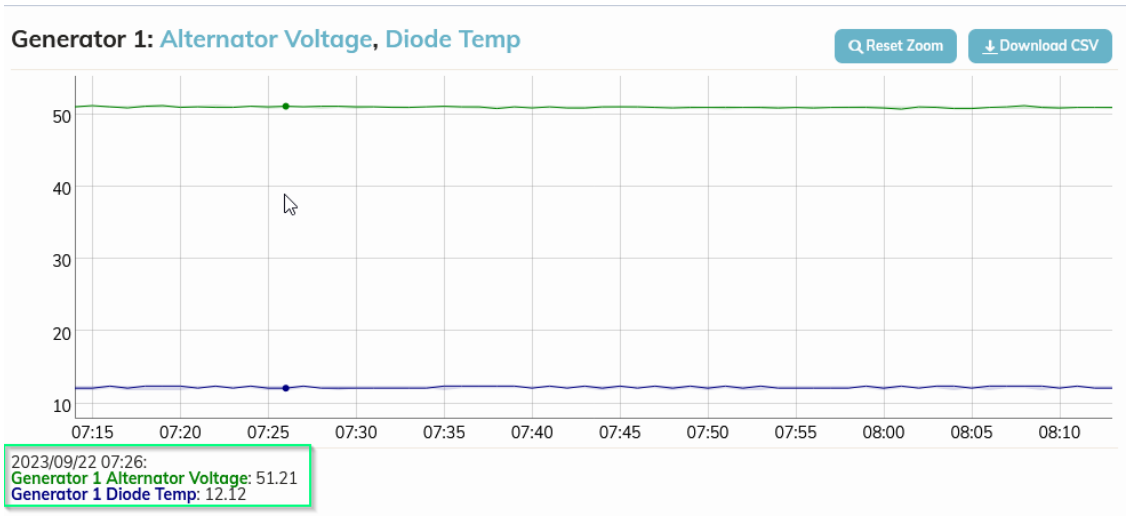


Figure 82: data with disparate scales

Some data, such as Current, is displayed on the Y2 (right side) axis to mitigate this, but in this example, we must narrow the data by hiding individual lines. Clicking the title at the top of the chart will hide an individual dataset.

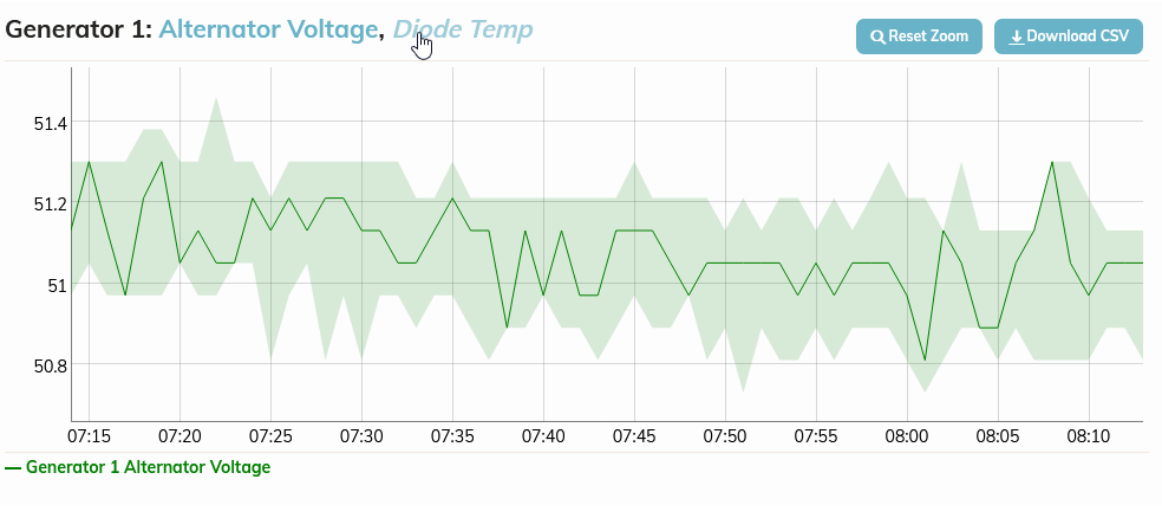
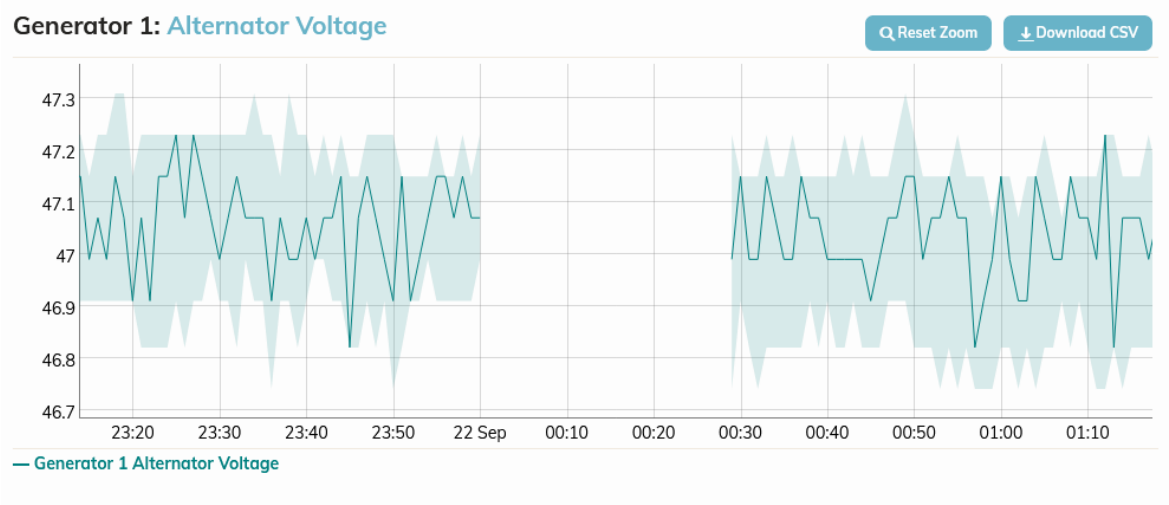


Figure 83: The same data, filtered to only show one set.

Note: Any gaps in the data (such as during a downtime where the system was not running, or during the daily backup) will show up as gaps in the History chart.



Nigure 84: no data is recorded during daily database backups.

3.16.5 Performance

The History page has been strongly optimized and can display millions of data points if necessary. However, it is important to note that very large datasets may impact user experience. Data is queried in 1-hour chunks, so fetching large sets of data can take some time. The read speed of the database is limited by the SD card used for storage.

3.17 Unit Update

The MCS supports live updates from the Polar Power update server. When the page loads, it checks for any available updates. If an update is available, a badge appears next to the Update icon in the navigation panel.

IMPORTANT: For the Updater to work, it must be able to download files from Polar Power's server. Your network firewall must whitelist downloads from "**https://polarpowerinc.net/***" or it will fail to download new update files.

Updates include rollouts of new features, optimizations, bugfixes, and security upgrades. **It is important to promptly update your unit to ensure security and support. For assistance updating units that do not connect to the Internet, please contact Polar Power.**

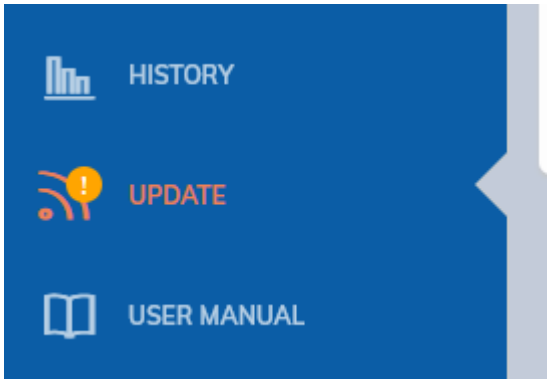


Figure 85: Unit Update in the navigation panel

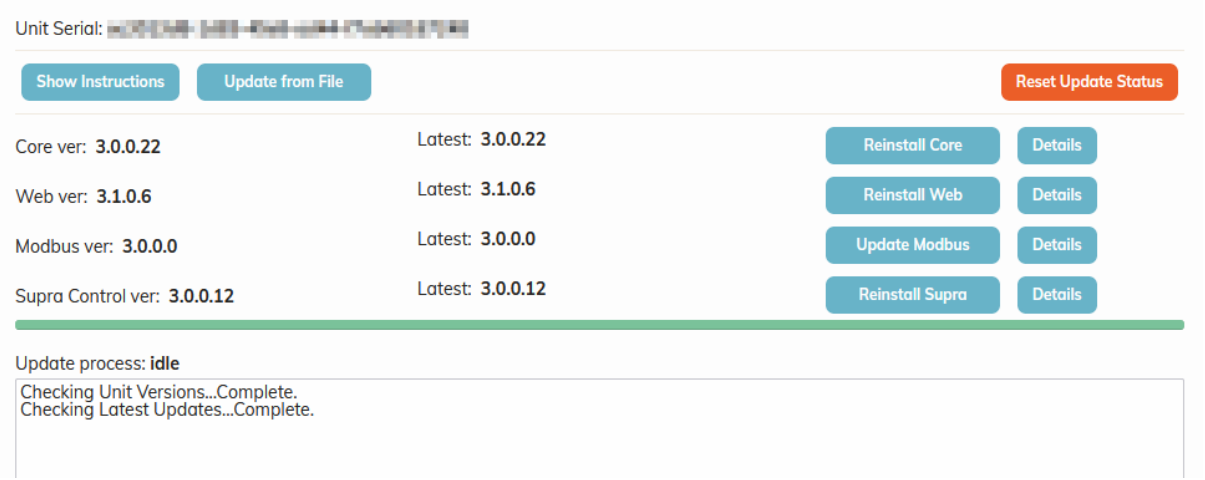


Figure 86: The Unit Update page

3.17.1 Beta Mode

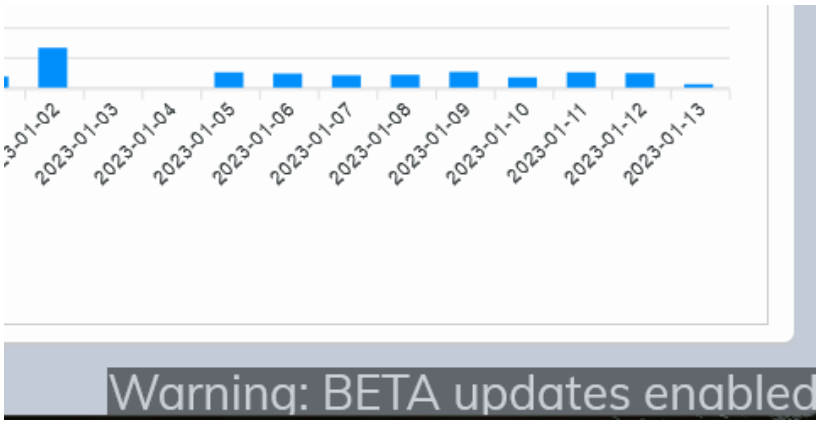


Figure 87: the MCS in Beta Mode

If you see a warning like the one above, your MCS is set to receive beta test updates. **DO NOT UPDATE YOUR MCS if this is unexpected.** Installing beta updates can lead to lost data and unexpected behavior, and should only be performed on designated test sites. The Beta setting can be changed by a Polar Power technician. See Section 7: FAQ and Troubleshooting for more information.

3.17.2 Updating a module

There are multiple modules on the SBC which may receive updates. All units should display **Core** and **Web** update status. Some may also include extra modules such as **Modbus** or **Supra Control**.

On the left, you can see the currently installed version of each module. Next to that, you can see the newest available version.

Clicking the info button next to an update version will show the patch notes for that update.

On the right are the **Update** and **Reinstall** buttons. If a newer version is available, click **Update** to begin downloading and installing it. If your modules are up to date, you can still trigger a

Reinstall. This can be useful for troubleshooting if you believe something went wrong with an update that was completed.

While the update is running, the text box at the bottom will show its status. A progress bar will also show the completion of the task.

Note: While the update will complete without any further interaction, it is best to keep the update page open to monitor its progress. Reloading or leaving the page will result in a loss of visibility of the update status. To avoid compatibility issues, it is advisable to perform all updates **before** refreshing the page.

When the update is completed, you may be prompted to reload your browser or reboot the SBC. Rebooting can be done from the **Overview** page.

3.17.3 Stopping an Update

On rare occasions, something can go wrong with an update, causing it to hang. An example of this might be if another user rebooted the SBC while an update was running. If you believe an update has frozen or otherwise failed, you can reset the system's update status using the **Reset Update Status** button at the bottom of the page. **Note that this will not stop the update's current step.** If a download or an install is in progress, the system will continue to attempt to complete that step. For this reason, it is a good idea to reboot the SBC after resetting the update status.

4. System Setup Guidelines

The Polar Power DC Generator's recommended settings vary based on application. This section contains a general overview of various applications and strategies for system integration. While not a substitute for service by a qualified Polar Power technician, it may provide improved understanding of how the Polar Generator is designed to operate.

4.1 Backup Power and Hybrid Applications

When a generator is used as backup power to a more reliable power source, such as an AC power plant, the generator should be set to allow the plant to take the load whenever possible. The priority for any DC power source taking the load is dependent on voltage. The higher voltage power source will provide the power to the load and/or batteries. Thus, for a backup generator in Automatic mode, the generator Max Voltage setting should be set slightly below the plant (battery float) voltage. For example, if the DC plant is set to provide power at 53 V, then the generator should be set to 52.0 V - 52.5 V; A difference of 0.5 V to 0.75 V is recommended for power systems below 72 V nominal.

In the case of a hybrid site with solar or wind power, the voltage outputs should be set in descending order of highest priority power source. Wind power, being intermittent, should be set at the highest voltage to ensure its power is stored, followed by solar ~0.5 V below wind, plant float voltage below solar, and generator below plant. This provides the best ability for the renewable and low-cost power to be utilized while saving the highest cost/maintenance power to be used as a last resort. **Note: All voltage settings should be kept within the acceptable operating range of the batteries. Refer to the battery manufacturer's specifications for more information.**

4.2 Single Generator Prime Power and Hybrid Applications

Prime power generator applications mean that the generator is the primary or sole source of power to the site. When there is no constant source of power available, the batteries are cycled through their working voltage range to provide site power without constantly running the generator. If a prime power site also has solar or wind sources connected, then the priority order remains with the renewable voltage set closest to the max voltage of the battery. The generator Max Voltage should be set just below the renewable voltage such that it will charge up the batteries close to full as well. Monitoring the system through several charging cycles may be necessary to optimize use of the battery working voltage range. Note: if a system utilizes the Polar BMS, then the generator start and stop settings on the Battery Settings page must be used instead of the Generator Settings.

5. Data and Database Administration

5.1 Data Administration

The MCS uses an internal database to store user and configuration info, as well as operational records. It is designed to run as-is with no direct user interaction. All alterations to the database will be done either via the MCS interface, or by update scripts from the Polar Power update server. Any attempt to directly edit or alter the database may result in loss of data or functionality and may void your warranty.

6. Configuration Management

Certain configurations can only be performed by Polar Power technicians. This includes:

- Modifying what pages and functions are available to Viewer, Engineer, and Admin users
- Enabling or disabling individual modules and pages
- Performing Generator Calibration
- Performing BMS Calibration
- Changing the Battery Nameplate values
- Setting minimum and maximum input constraints for the MCS

If you need any of these functions performed, contact your Polar Power representative for assistance.

7. FAQ and Troubleshooting

In this section are compiled common questions and issues with the MCS2020.

My MCS webpage locks up my browser or freezes / My browser says a script is slowing down performance / My password manager keeps freezing up

Due to its layout, the MCS2020 website does not work well with password manager plugins. This is because password managers are constantly scanning for fillable fields, and the MCS has many of these, although only certain ones may be visible at a given time.

If your password manager has an option to deactivate it for certain sites, you should use it. Since most password managers lack this feature, you may wish to temporarily disable the plugin while working in the MCS interface. **Note:** Your browser's native autofill function is not known to cause issues. Only 3rd party password manager plugins are affected.

It takes a long time for my MCS pages to populate with data or for my commands to complete.

The MCS is written to be as lightweight as possible while still preserving functionality. Unfortunately, due to restrictions of network communication, it still must negotiate many repeated communications in the background to do things like display live data. If you are connecting to hardware that is remote, has a poor network connection, or is behind a particularly aggressive firewall or anti-flood protection, this can lead to slowdowns.

The MCS' communication requests will only repeat once the previous request completes, so there should be no "traffic jams", but some firewalls may see repeated connections as an attack and throttle them anyway. Contact your network administrator or IT department for assistance if this is the case.

My MCS won't update. Downloads fail, or if the downloads complete there seems to be no change after installing.

To update itself, the MCS must download archive files from the Polar Power, Inc. server. With a very poor network connection, this download can fail. It can also be blocked by a particularly aggressive firewall. Unfortunately, under some circumstances the system may try to update from a failed download anyway. In this case, you will likely see a "version mismatch" error after updating.

Your network firewall must whitelist downloads from "**https://polarpowerinc.net/***" or it will fail to download new update files. Contact your network administrator or IT support if you do not have the ability to make this change.

Under certain circumstances, a Polar Power representative can perform a manual update using a file they have already obtained. However, this will require a technician to be connected remotely to your MCS page. Due to security concerns, update files cannot be provided to end users.

I got a "version mismatch" error after updating.

See the above entry regarding failed downloads.

The "Engine Runtime" graph is empty on the Overview page.

Due to the complexity of the data involved, the 30-day Engine Runtime graph can take a few minutes to compile. This is normally done in the background after midnight each day, but if for

some reason this process has not been completed, the act of loading the MCS will send a new request to populate the data. Data from the last 30 days must be fetched and compiled, so it may take some time to complete and display your graph. It is best to wait for this process to finish. You can still use other pages of the MCS as normal but avoid refreshing the page if possible as this will send a new request behind the existing one.

I cannot change a setting to the number I want; the MCS says it is too low/high.

The MCS has constraints built in for most settings, to prevent accidental damage or dangerous situations with your hardware. If you need to change a setting outside the factory range, you will have to engage a Polar Power representative, you can connect to your MCS and change the factory constraints. This will be a very rare occurrence as the constraints are set at the time of assembly to the acceptable safe range for your hardware.

My MCS says "Warning: BETA updates enabled". What does this mean?

The MCS is in ongoing development to meet the unique needs of Polar Power's discerning and diverse customers. Any MCS unit used for testing new software/drivers/features will be in "beta" mode. This means the MCS will be capable of updating to the newest test versions of each of its software modules. **Beta mode is not recommended for production environments.** The purpose of beta testing is to see if updated software works, and it is possible for the updates to cause issues which may be difficult to fix remotely.

If your unit is in Beta mode and you do not believe it should be, contact Polar Power immediately. **DO NOT UPDATE IN BETA MODE.** Rolling back a beta update can be difficult or in some cases impossible, as the updates sometimes make changes to the underlying architecture of the MCS. If you have updated in error, it is a good idea to back up your settings, as in rare cases a full wipe of your MCS' software may be required.

Appendix 8-A: Software Licensing

The Supra MCS 2020 and associated modules are the exclusive Intellectual Property of Polar Power Inc. Software is licensed on a per-unit basis. Copying, redistributing, or altering the software is strictly prohibited.

Appendix 8-B: Exporting, Importing, and Editing CSV files

Many pages on the MCS have the capability of exporting and importing sets of data to a file. Exporting settings to a file results in a .csv spreadsheet with two columns: variable and value.

	A	B
1	variable	value
2	BS_bmsmaxtotalvoltage	24.5
3	BS_bmsmaxchargingvolt	24.5
4	BS_bmsmaxbulkvolt	24.5
5	BS_bmsmaxcurrent	250
6	BS_bmsmintotalvoltage	18
7	BS_bmsLastBankOn	
8	BS_bmsmaxcellvolt	3.5
9	BS_bmsmaxcellvoltreconnect	3.65
10	BS_bmsmincellvolt	2.5
11	BS_bmsAhcountingThreshould	5
12	BS_bmsmintemp	0
13	BS_bmsmintempreconnect	0
14	BS_bmsmaxtemp	55
15	BS_bmsmaxtempreconnect	50
16	BS_bmstempResChar1	0
17	BS_bmstempResDischar1	0.1
18	BS_bmstempResChar2	0

Figure 88: Example of exported settings data

Usually (but not always) the variable names are in the format **XX_name** where XX is a two or three letter identifier for the specific page.

When the data is imported, the system looks for an input field with the same name as each variable and then populates it with the associated value. If a variable is not found, it is skipped.

Some newer sections of the MCS now support JSON-formatted export/import. If editing an exported JSON file, names will not include the XX_name format. However, formatting is delicate and names are case-sensitive. Use care when editing, and always back up the data before saving.

Appendix 8-C: Contact List

Table 1 - Contact List

Contact Sequence	Contact Name	Organization	Application	Phone	Cell/Pager	Email
1st Level						
2nd Level						
3rd Level						

Appendix 8-D: Glossary

Table 2 - Glossary

Term	Abbreviation	Definition
Alerts		Communications sent via email or SMS to alert users of issues or problems.
Battery Management System	BMS	The module which runs on the SBC to control and manage battery banks.
CAN bus		A communications device using the Common Area Network (CAN) communications protocol. Used to send instructions between the SBC and the running devices.
Core		The underlying software module which runs the entire system.
CSV file		“Comma-Separated Value”, a file format in which a simple spreadsheet of data can be saved in plain text.
Engine Runtime		The amount of time an individual generator has been running.
Maintenance Timers		Countdowns to when scheduled maintenance must be performed.
Managed Mode		Operational mode in which the Supra2020 Control module switches generators on and off as required by its settings.
Master Control System	MCS	The web-based interface for Polar Power generator/battery systems.
Modbus		Modbus is a data communications protocol similar to a CAN bus (used on our generators and relay boards). MCS2020 has ethernet port, RS232 port and USB ports for the modbus hardware interface. MCS2020 supports Modbus TCP and Modbus RTU.
Module		A piece or group of software which performs a particular set of functions. The MCS is made up of several modules working in concert, such as Core and Web.
Single-Board Computer	SBC	A compact computer with no moving parts or attached peripherals which runs both the internal control software for the Generator/BMS unit, and the user facing MCS software.
Supra2020 Control	DualGen SingleGen	The module which runs on the SBC to control and manage dual generator switching/balancing systems.
Web		The software module used to display the web-based MCS 2020 interface.

Appendix 8-E: Fault Table

Table 4 – Faults and Alerts

Alert ID#	Name	Description	Notes
0001	Oil Change	Oil Change Needed Soon	
0002	Oil Filter Change	Oil Filter Change Needed Soon	
0003	Air Filter Change	Air Filter Change Needed Soon	
0004	Fuel Filter Change	Fuel Filter Change Needed Soon	
1001	Bus Voltage Low	Bus Voltage on generator is below the Low Warning trigger amount	
1006	Bus Voltage High	Bus Voltage on generator is above the High Warning trigger amount	
1009	Battery Charge Current High	Battery Charge Current on generator is above High Warning trigger amount	
1010	Battery Discharge Current High	Battery Discharge Current on generator is above High Warning trigger amount	
1200	Fuel Level Low	Fuel Level is below Low Warning trigger amount	
1201	Fuel Level High	Fuel Level is above High Warning trigger amount	
1202	RPM Fault	RPM on generator is below the Low Warning trigger amount	
1203	RPM Fault	RPM on generator is above the High Warning trigger amount	
1204	Air Flow Restriction	Air flow is below expected levels	This may indicate a blockage in an air duct.
1205	Coolant Level	Coolant Level Switch triggered	The coolant level switch is an option not included on all units.
1206	Fuel Leak	Fuel Leak	
1300	Alternator Temp High (Derated)	Alternator Temp High (Derated)	
1301	Diode Temp High (Derated)	Diode Temp High (Derated)	
1302	Engine Temp High (Derated)	Engine Temp High (Derated)	
1303	Controller Temp High (Derated)	Controller Temp High (Derated)	
1304	Battery Temperature Low	Battery Temperature Low	
1305	Battery Temperature High	Battery Temperature High	
2000	from 640	DC Battery Bank Low Voltage (K8)	
2001	DC Battery Disconnected	DC Battery Disconnected	

Alert ID#	Name	Description	Notes
2002	Starting Battery Low	Starter battery Low Voltage	
2100	A/D Input Failure - Short	A/D Input Failure - Short	
2101	A/D Input Failure - Open	A/D Input Failure - Open	
2102	Comm Fault	Comm Fault	
2200	Gen Shutdown Fault (K8)	Gen Shutdown Fault (K8)	
2201	Low Oil Pressure Sensor	Low Oil Pressure Sensor	
2202	Low Oil Pressure Switch	Low Oil Pressure Switch	
2203	Crank Attempt Limit Reached	Crank Attempts exceeded the limit set in **Generator Settings**	
2300	Alternator Temp Max	Alternator Temp Max	Maximum temperature is a factory setting and cannot be changed by users.
2301	Diode Temp Max	Diode Temp Max	Maximum temperature is a factory setting and cannot be changed by users.
2302	Engine Temp Max	Engine Temp Max	Maximum temperature is a factory setting and cannot be changed by users.
2303	Controller Temp Max	Controller Temp Max	Maximum temperature is a factory setting and cannot be changed by users.
2304	Alternator Temp Low	Alternator Temp Low	
2305	Battery Temp High	Load Battery Temperature too High on generator	
2400	System Fault	System Fault	
2401	MCS Internal Fault	MCS Internal Fault	
2402	MCS Reset	The MCS software was reset	Usually this is performed by a user via the Overview screen.
2403	MCS Restarted	The MCS computer hardware was rebooted	Usually this is performed by a user via the Overview screen.
2404	Emergency Stop	Emergency Stop	

Appendix 8-F: Document Control Record

Table 3 - Record of Changes

Version Number	Date	Author/Owner	Description of Change
0.1	2020-09-30	JCR	Template and initial authorship
0.2	2020-10-01	JCR	Further initial authorship of content. Removed unnecessary template pages.
0.2.1	2020-10-02	JCR	Headers, footers, placeholder sections
0.3.0	2020-10-05	JCR	Generator and BMS sections expanded
0.4	2020-10-06	JCR	Added content. Formatted for web/pdf.
0.5	2020-10-06	JCR	Language options added Battery Settings – BMS Control added Climate Control added
0.5.1	2020-11-06	JCR	Updated User Settings (Preferences Card)
1.0	2021-01-04	JCR	Removed section 2. Publishing as first complete version.
1.1	2021-01-05	JCR	Updated screenshots and navigation information
1.1.1	2021-02-18	JCR	Updated History section for new features
1.2.0	2021-04-28	ATM	Added Generator and BMS Function Descriptions.
1.2.1	2021-04-29	JCR	Screenshots updated, added user requirements section
1.2.2	2022-09-02	JCR	Added data to Alert Triggers section
1.3.0	2022-09-29	JCR	Added Fault Table
1.3.1	2022-10-07	JCR	Updated screenshots
1.4.0	2022-11-18	JCR	Web Version 3.0 – initial update to reflect changes Alert Implementation
1.4.1	2022-11-18	RM	Edits to glossary

Version Number	Date	Author/Owner	Description of Change
1.5.0	2023-09-21	JCR	Full review/update, added Devices, new History/Alert sections
1.5.1	2023-10-19	JCR	Added graphs to Alternator and Engine Settings Parameters
1.5.2	2024-08-08	JCR	Added Scheduler section
1.5.3	2024-08-13	JCR	Added backup/restore and FAQ sections