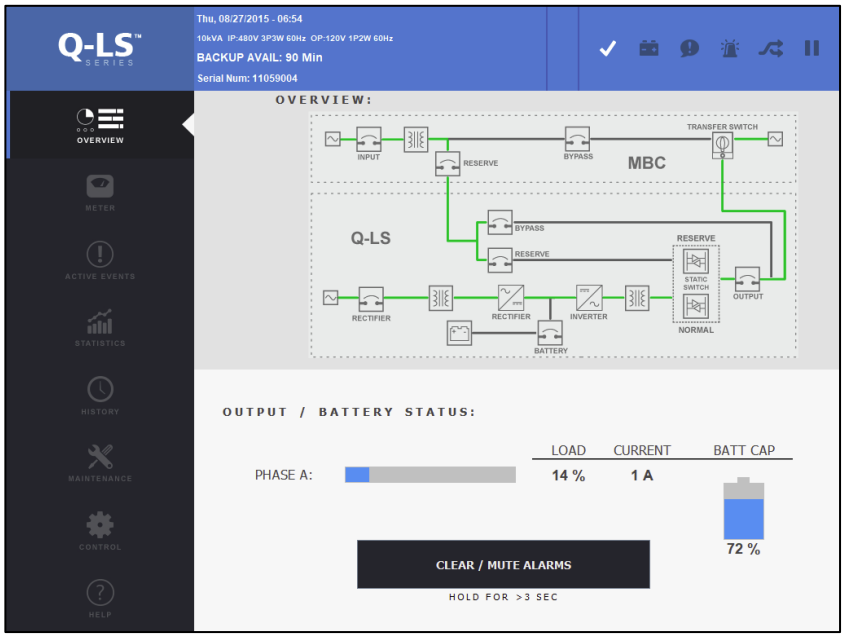
POWER INNOVATIONS INTERNATIONAL

LITEON GROUP

Q-LS™ TouchScreen



Installation and Operation Manual

MNL131

Rev 4.3

Export Classification EAR99

READ THIS AND OTHER MANUALS CAREFULLY
SAVE ALL INSTRUCTIONS

This manual contains important information that you will need to operate the *Q-LS* TouchScreen™ safely and efficiently.
Please read all instructions carefully before installing or operating equipment.
Keep this manual handy for easy reference.

Additional Manual

The *Q-LS TouchScreen User's Manual* references the *Q-LS 10–160 Installation and Operation Manual*, although customized manual versions that include content from the *Q-LS 10–160 Installation and Operation Manual* have been released for some customers.

Important Note about Manual Content

Such customized manuals have other titles but may include all relevant content from the *Q-LS 10-160 Installation and Operation Manual*, the *Q-LS Battery Module User's Manual*, and/or the *UPQNet-Agent9 User's Manual*, along with content for a customized system.

If *Q-LS 10–160 Installation and Operation Manual* does not appear to have been received, check the front-inside cover of each provided manual to see whether the *Installation and Operation Manual* has been included as part of a larger manual.

If the manual content has been provided as part of a customized document, the included manuals will be listed in a comprehensive list of included contents on the document's front-inside cover.

The *Q-LS* TouchScreen, *Q-LS* cabinet, and accompanying battery cabinets that constitute each complete *Q-LS*™ system are registered trademarks of Power Innovations International, Inc.

This manual may accompany other instructional addendums.
Please contact Power Innovations if additional manuals are needed and have not been received.

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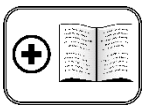
1 — Introduction

The *Q-LS* TouchScreen provides an easy-use interface for monitoring and managing the *Q-LS* Uninterruptible Power Quality (UPQ™) power management and backup system.

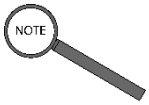
The TouchScreen provides an easy-to-read real-time status display for critical *Q-LS* functions, along with control for vital system operations.

Additional Manual



For more information about the display functions offered by the *Q-LS* itself, see the *Q-LS Installation and Operation Manual*.

Note



This manual will periodically provide references to the *Q-LS Installation and Operation Manual*. If a manual of that title did not come with the *Q-LS* system, check the front-inside cover of other included manuals for a listing of manual titles contained within the provided content.

1.1 — Using This Manual

This manual will show how to safely operate and troubleshoot Power Innovations International, Inc.'s *Q-LS* TouchScreen interface.

Read and understand this manual to make operating the interface as easy as possible.

1.1.1 — Conventions Used in This Manual

To make this manual easier to read, several formatting conventions have been adopted.

1.1.2 — Additional Advice

This manual will occasionally provide additional advice. When it is provided, this information will be enclosed by a set of lines to separate it from the rest of the text, like this:

This text does not belong with the rest.

Some of the information is very important, while other information may be good to know. To show the importance of each piece of information, the following safety symbols are used:

ELECTRICAL WARNINGS

Denotes advice that, if not followed, could cause severe bodily harm due to electrical shock.

WARNINGS

Denotes advice that, if not followed, could cause severe bodily harm due to other types of injury.

Cautions

Offers advice that, if not followed, may harm equipment or indirectly cause physical hazards.

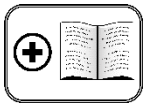
Usually these symbols will be listed in order of importance. Other information is provided merely to be helpful.

Notes

Offers practical advice that may be helpful but can be disregarded.

Manual Helps

Provides references to other sections in this manual that could also be helpful.



Provides references to other manuals that may also be provided with this system.

1.2 — Safety Warnings and Cautions

This section provides important information that you will need to remember in order to safely operate your *Q-LS* TouchScreen. Read it carefully.

1.2.1 — Electrical Warning

The *Q-LS* system contains high voltage. Always follow proper safety procedures when operating or managing the *Q-LS*.

1.2.2 — Cautions

Read and be familiar with the *Q-LS Installation and Operation Manual* before using the *Q-LS* TouchScreen.

The *Q-LS Installation and Operation Manual* contains important information about safe operation of the *Q-LS* system, including display operation.

2 — Display Basics

The *Q-LS* TouchScreen will start automatically when the *Q-LS* RESERVE and RECTIFIER breakers are switched ON.

Upon startup, the TouchScreen will show the **Overview** page.

2.1 — Sections of the Display

The TouchScreen display is divided into several sections. From the upper-left to lower-right side of the screen, the display sections are as follows (**Figure 1**):

- System Information
  - Q-LS™ Series logo
  - Time, Backup Time, and Serial Number
  - Status Summary Icons
- Management Interface tabs
- Management Interface page

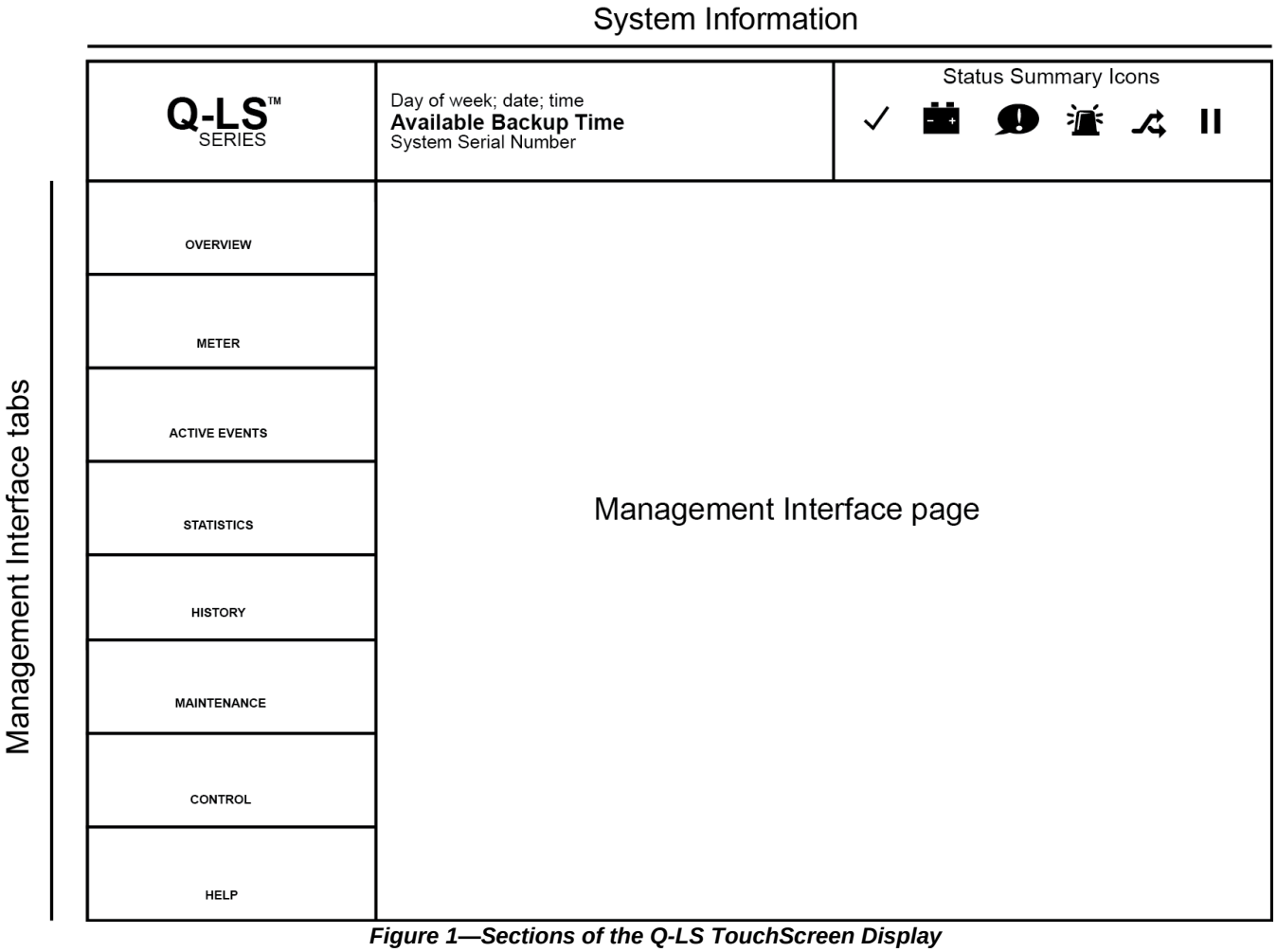


Figure 1—Sections of the Q-LS TouchScreen Display

2.2 — System Information

This section appears as a long bar, and it is always visible at the top of the *Q-LS* TouchScreen. It displays basic information about the *Q-LS* system, such as the date and time, available battery backup power time, and system serial number.

It also provides Status Summary Icons, which are a quick-reference method for evaluating *Q-LS* operating conditions.

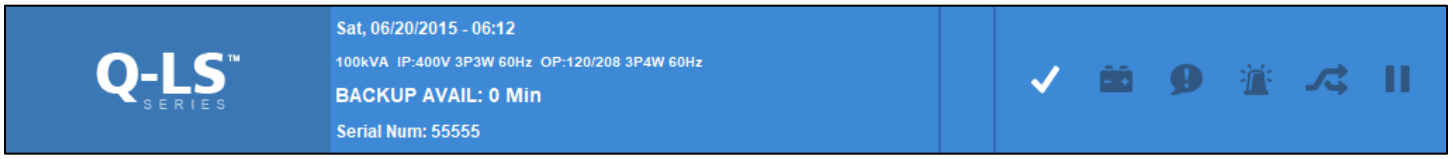


Figure 2—System Information Bar (Normal Status; Blue)

2.2.1 — Bar Colors

In general, the colors for the System Information bar indicate the following:

- A blue System Information bar indicates that the system needs no attention.
- A yellow System Information bar indicates that the system needs attention.
- A red System Information bar indicates an emergency to be addressed immediately.

These color changes may occur in conjunction with a glowing Status Summary Icon and one of two other types of icons that will be located between the date information and the Status Summary Icons.

2.2.2 — Icon Types

2.2.2.1 — Priority Icons

When the backup, notice, or alarm icons are glowing, a priority icon is displayed atop a yellow or red Status Information bar. The purpose of this priority icon is to express an urgency level, in conjunction with the corresponding Status Summary icon (explained in **Status Summary Icons**).

There are two priority levels, a Priority Notice and a Priority Alarm. An Alarm makes the Status Information bar red to indicate a Fault or other urgent alarm, while a Notice makes the Status Information bar yellow to indicate a less urgent item such as a new warning.

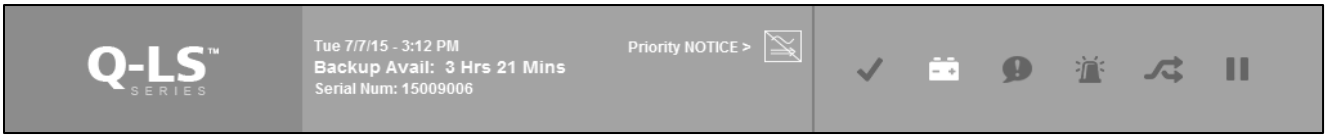


Figure 3—Priority Notice Icon Displayed (Backup Status; Yellow)

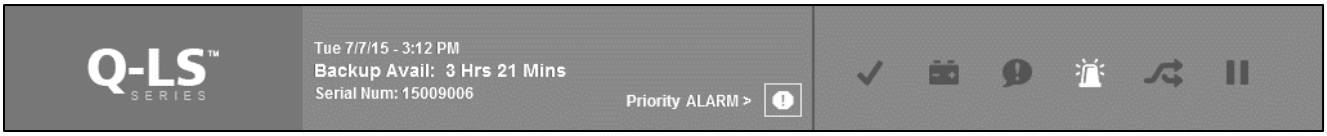


Figure 4—Priority Alarm Icon Displayed (Fault Status; Red)

2.2.2.2 — Maintenance Due! Icon

If it is time for the system's twice-yearly preventive maintenance, the System Information bar turns yellow. A Maintenance Due icon appears on the bar.

When these changes occur, the system is operating normally. The icon does not indicate any malfunction. Instead, it hints that soon the *Q-LS* should receive its regular Preventive Maintenance check.

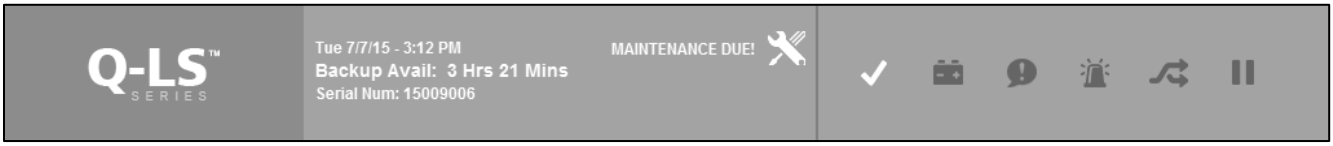


Figure 5—Maintenance Due! Icon on Yellow System Information

2.2.2.3 — Status Summary Icons

The meaning of each Status Summary Icon is as listed in **Table 1** below:

Table 1—Icon Overview

Icon	Meaning	System Information Bar	For More Information
✓	Glows in Normal Mode (Using Rectifier line; Input is available).	Blue	View the **Overview** page
	Glows in Battery (Backup) Mode (Using Rectifier line and battery power)	Yellow	View the **Overview** page
	Glows when system is displaying a new notice (status or warning)	Yellow	View the **Active Events** page
	Glows during a fault condition	Red	View the **Active Events** and **Overview pages**
	Glows in Maintenance Bypass Mode	Yellow	View the **Overview** page
	Glows in Standby (Reserve) Mode	Yellow	View the **Overview** page

2.3 — Management Interface Page Tabs and Displays

The eight Management Interface page tabs provide easy access for viewing and managing *Q-LS* status information not offered elsewhere on the screen. From top to bottom, these page tabs are **Overview**, **Meter**, **Active Events**, **Statistics**, **History**, **Maintenance**, **Control**, and **Help**.

Each of these eight (8) tabs each correspond to a page display located on the right side of the screen. Tap the appropriate tab to access the corresponding Management Interface display.

2.3.1 — Tab Selected

When each tab is selected, the text and icon on the tab glow, and the left side of the tab is highlighted in blue.

A triangular notch will also be cut out of the selected tab, indicating that the tab has been expanded into a full-page display.

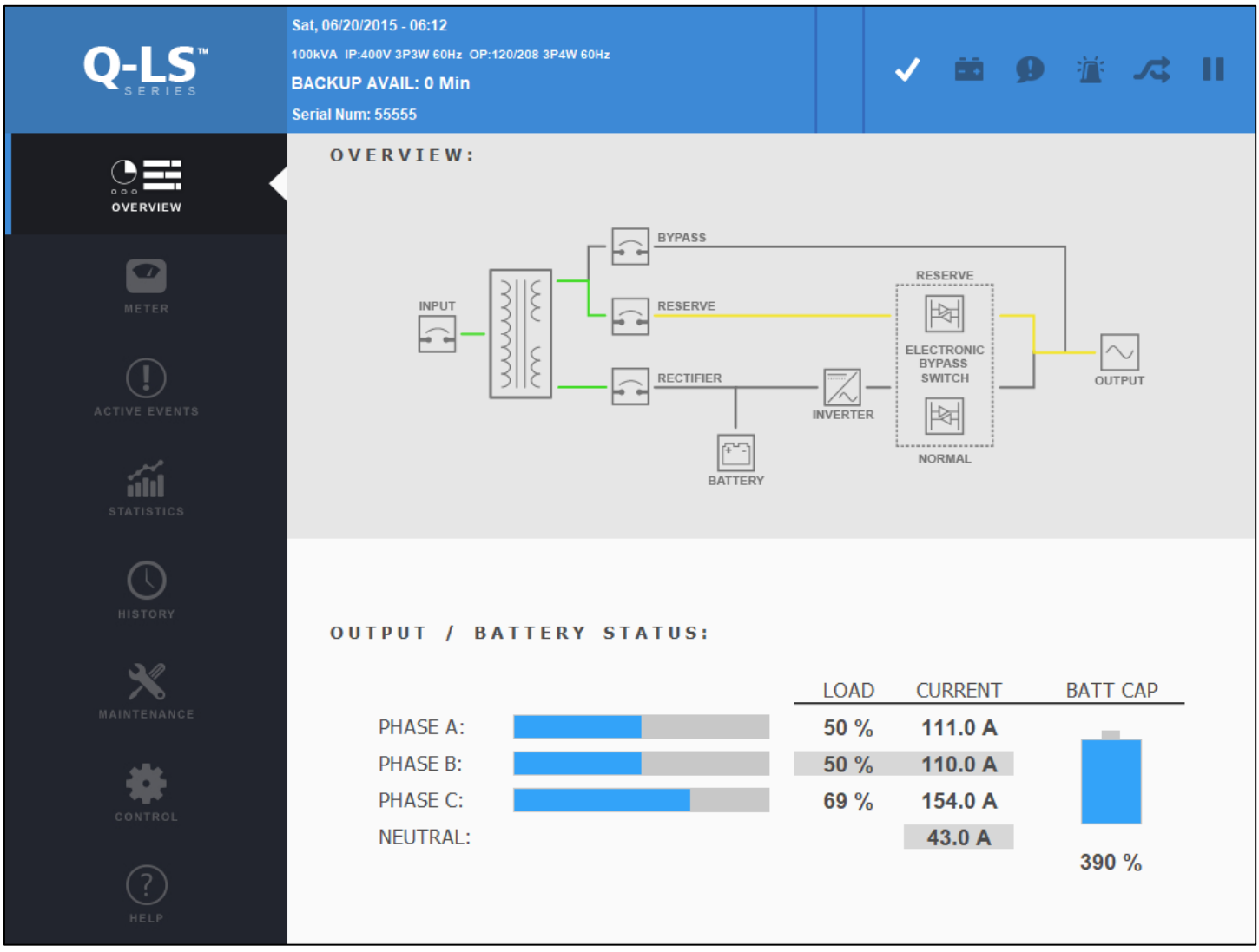


Figure 6—Overview Page Display with Tab Selected

Manual Helps

Each of these tabs and the corresponding pages will be shown and explained in **4—Management Interface Pages**.

3 — Management Interface Pages

As previously discussed, the Management Interface is divided into a set of eight tabs with corresponding pages. This chapter will discuss the content for each of these pages.

3.1 — Overview

When the **Overview** tab is tapped, when the TouchScreen starts, or after a period of inactivity on any other page, this page will appear.

It contains an overview of *Q-LS* system status. One of several possible statuses may be displayed on this screen.

These screen statuses will be discussed in **3—Overview Status Readings**.

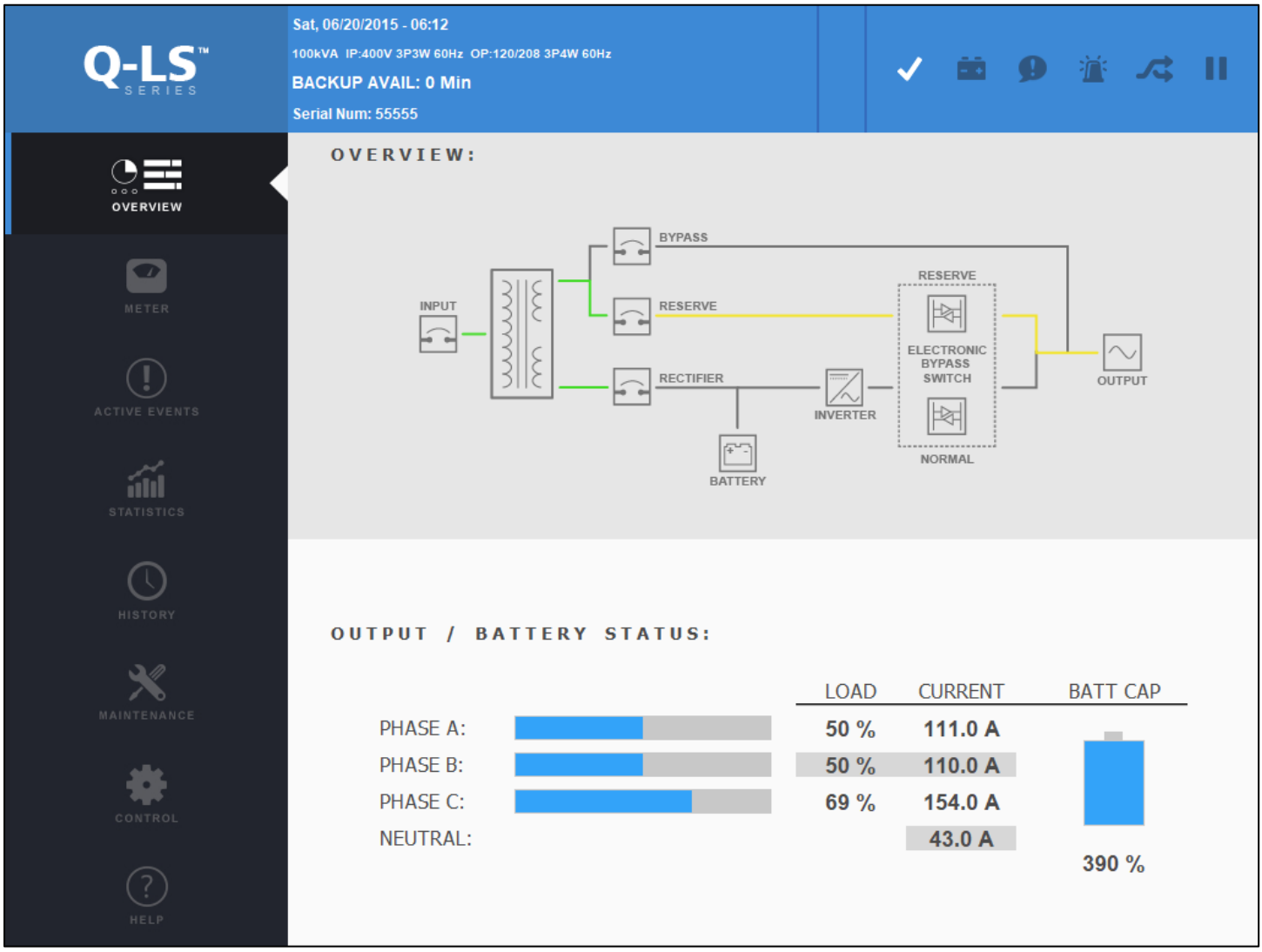


Figure 7—Overview Management Interface, Including Tab and Page

3.1.1 — Output / Battery Status

This section of the **Overview** page provides a visual representation of the load percentage on each individual phase of the output line. The percentage reading and current in Amps are also given on the right side of each phase load bar.

Phase A will be represented using blue, Phase B will be represented using yellow, and Phase C will be represented using red. Neutral will not display a percentage but will display a current.

The load and current are displayed next to the phase load bar.

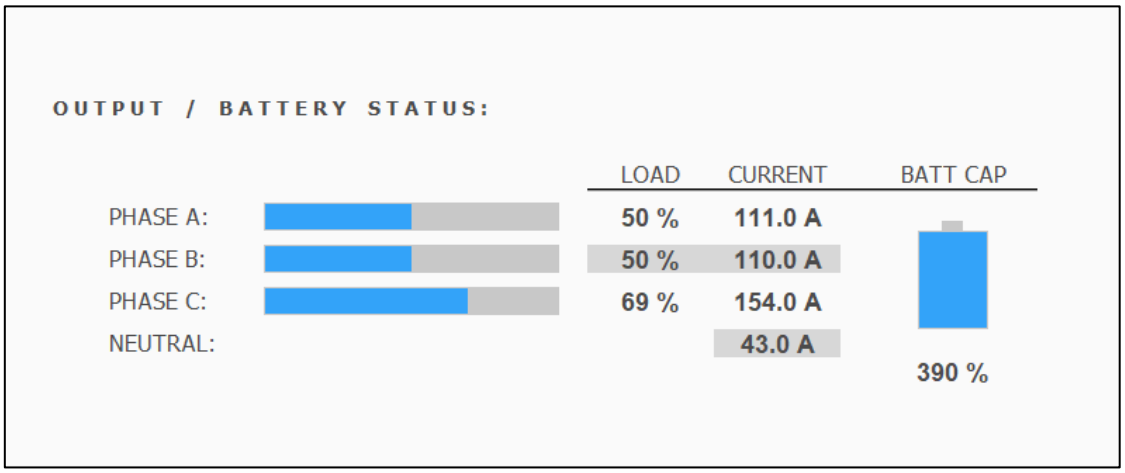


Figure 8—Output / Battery Status Section

Note

The *Q-LS* will continue to operate normally with a load of up to 110%. If the load remains above 110% rated capacity, the *Q-LS* will switch to Reserve Mode to protect the inverter and batteries.

Manual Helps

See **5—Possible Event Listings** for more information about system operation with loads above 110% capacity.

3.1.2 — Battery Capacity

This section of the **Overview** page provides a visual display of the battery charge level (%).

- A battery symbol filled with blue indicates battery levels above 50% capacity.
- A battery symbol partially filled with yellow indicates battery levels between 50 and 20% capacity.
- A battery symbol partially filled with red indicates battery levels below 20% capacity.

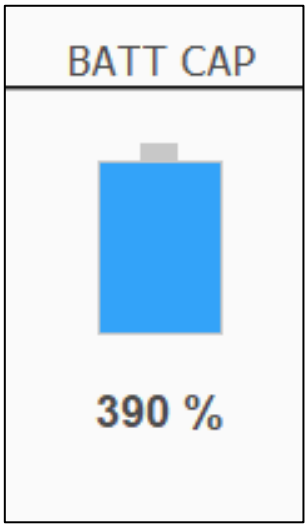
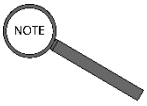


Figure 9—Battery Capacity Meter

Notes



During normal operation, the batteries should remain at or near 100% capacity (395 VDC). When rectifier input power is available, the system will automatically charge the batteries once a month or any time they drop below a preset charge.

When operating on battery power, the *Q-LS* will shut down the inverter if the battery capacity reaches 0% (290 VDC). Shutdown protects the batteries from permanent damage that would be inflicted if they continued to discharge.

Manual Helps

For more information about battery charge and discharge, see the *Q-LS Installation and Operation Manual*.

3.2 — Meter

This page provides information about each individual subsystem located within the *Q-LS*. On this page, the highest and lowest values in each field are represented by numbers at either end of a value bar.

As the actual value changes, the number inside each value bar will adjust. If the number has increased, the shaded portion of the value bar will increase, with its right edge moving toward the right side of the value bar.

If the number has decreased, the shaded portion will decrease, with its right edge moving toward the left side of the value bar.

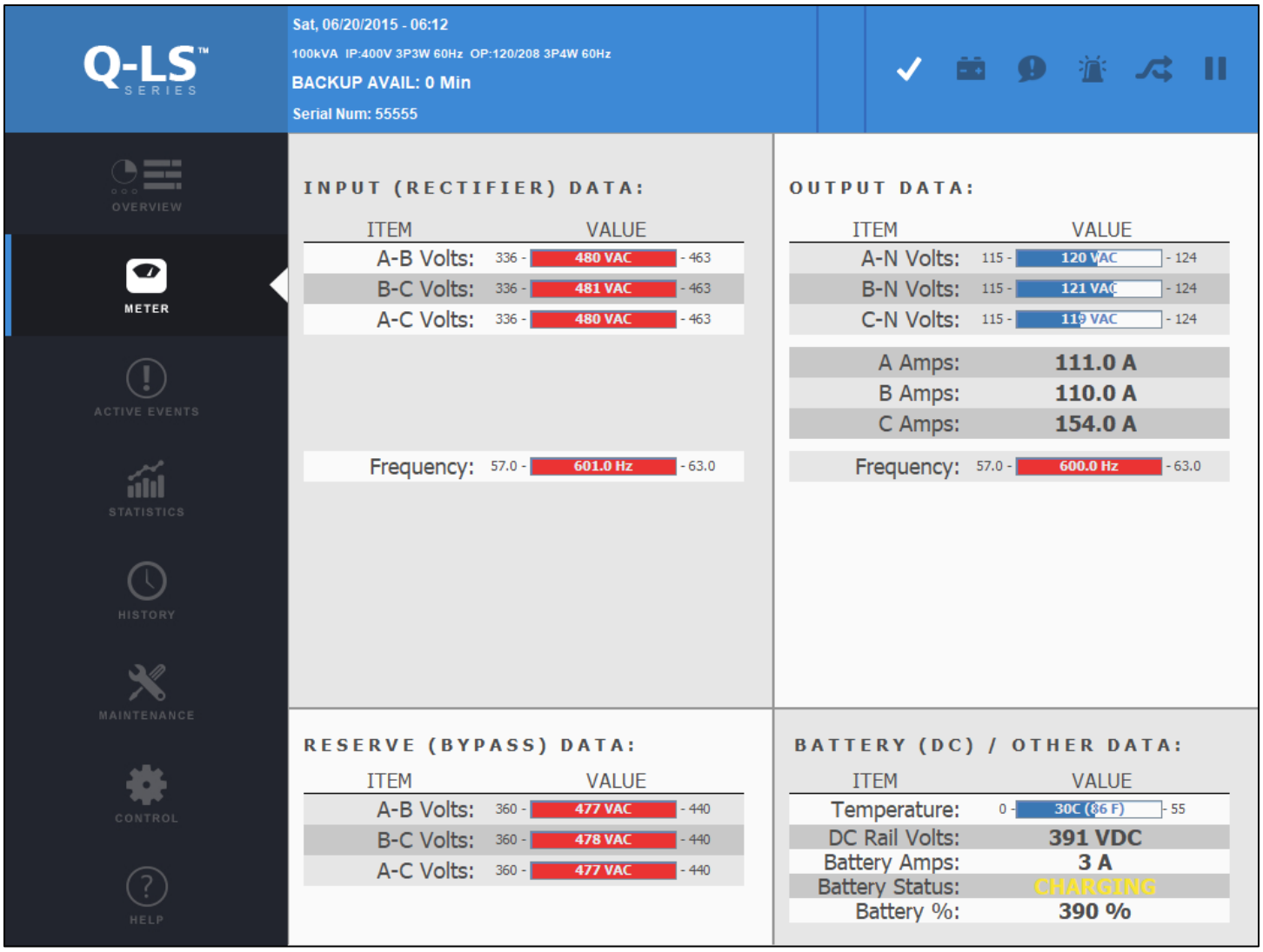


Figure 10—Meter Management Interface, Including Tab and Page

3.2.1 — Input (Rectifier) Data

This section of the **Meter** page provides information about the real-time status of the Rectifier input line. Here, the voltages for Phases A to B, B to C, and A to C are individually shown, along with the current for each phase.

The input frequency, real and apparent power, power factor, and total harmonic distortion for each phase are also shown.

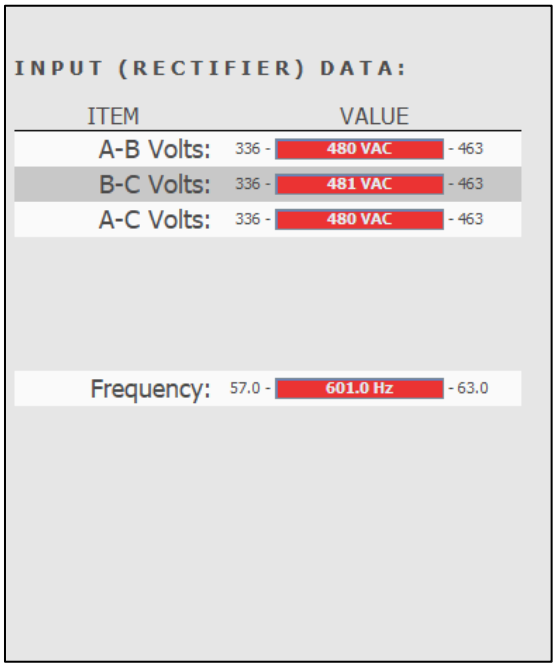


Figure 11—Input (Rectifier) Data Section

3.2.2 — Reserve (Bypass) Data

This section of the **Meter** page provides information about the status of the Reserve/Bypass input line.

Voltages for phases A to B, B to C, and A to C are shown.

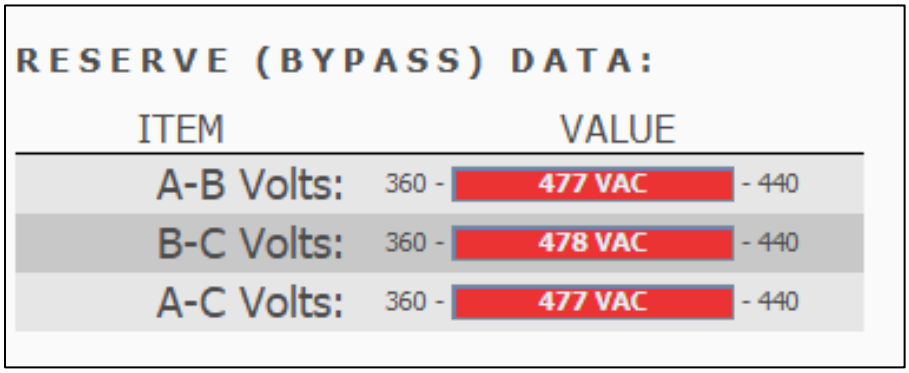


Figure 12—Reserve (Bypass) Data Section

3.2.3 — Output Data

This section of the **Meter** page provides information about inverter output status. The information in each column is the same information shown in Input (Rectifier) Data, but these measurements are instead taken from the inverter output.

Here, the voltages for Phases A, B, and C are individually shown, along with the current for each phase.

The output frequency, real and apparent power, power factor, and total harmonic distortion for each output phase are also shown.

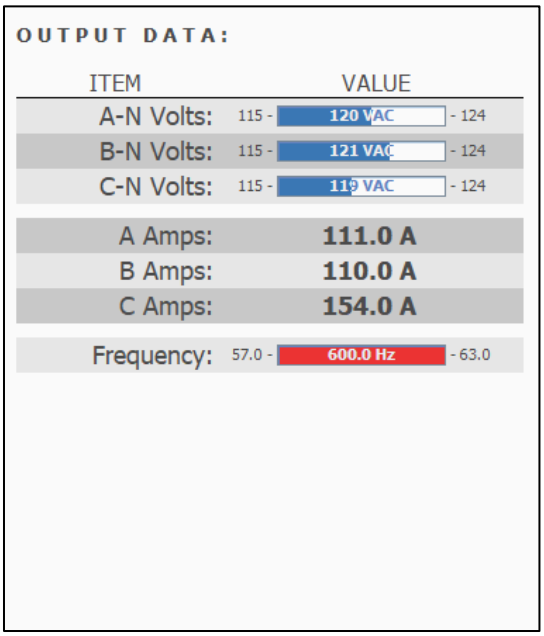


Figure 13—Output Data Section

Note

The screenshot above shows output voltage and current for a single-phase inverter (Phase A is the only phase). In a three-phase system, voltages and currents will be displayed for Phases A, B, and C.

3.2.4 — Battery (DC) / Other Data

This section of the **Meter** page provides power measurements for the DC Rail (battery circuit). The approximate battery temperature is shown, along with the present voltage on the DC Rail, the battery amperage, and the battery status.

If the BATTERY battery is turned ON, the ***Battery Status*** field should always read either *Charging* (in Normal mode) or *Discharging* (in Backup mode).

The battery percentage will also be displayed.

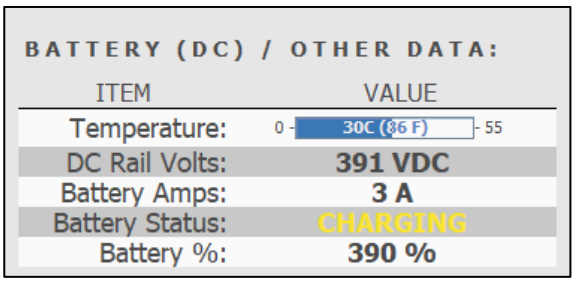


Figure 14—Battery (DC) / Other Data Section

3.3 — Active Events

This page contains three columns where active events are recorded. From left to right, the columns and associated colors are ***Status*** (green), ***Warning*** (yellow), and ***Fault*** (red).

- Status events indicate occurrences considered part of normal operation.
- Warning events are a cause for concern but are not urgent.
- Fault events constitute emergencies.

In each column, an icon will be shown for each current event, along with a short description of the event.

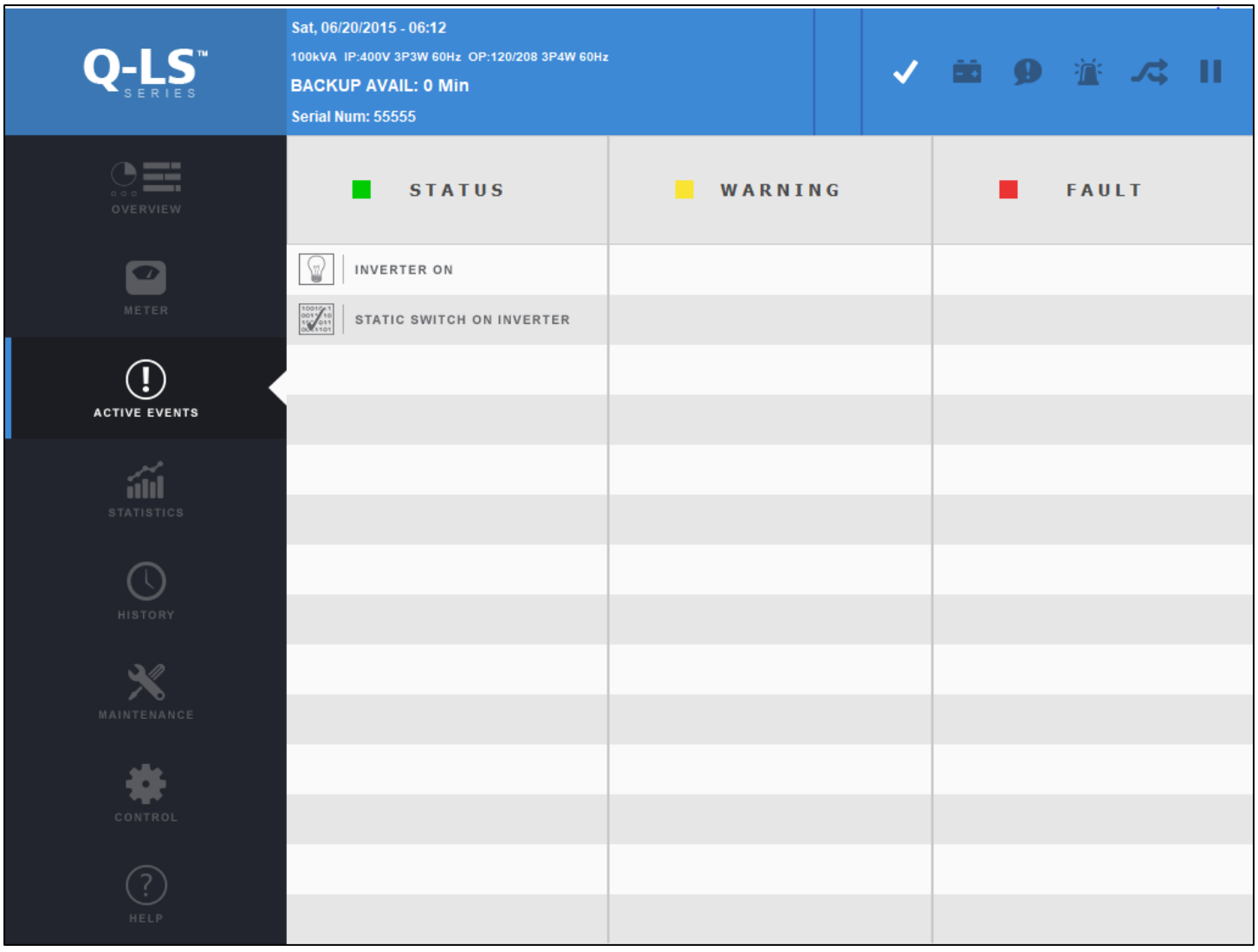


Figure 15—Active Events Management Interface, Including Tab and Page

Manual Helps

For a list of possible notices and alarms that may be displayed on the **Active Events** page, see **5—Possible Event Listings**

3.4 — Statistics

Two general categories of statistics are displayed on this page. Each set of statistics also includes a ***Reset*** button to its right.

Tap the ***Reset*** button to reset all specifications for the corresponding statistics category.

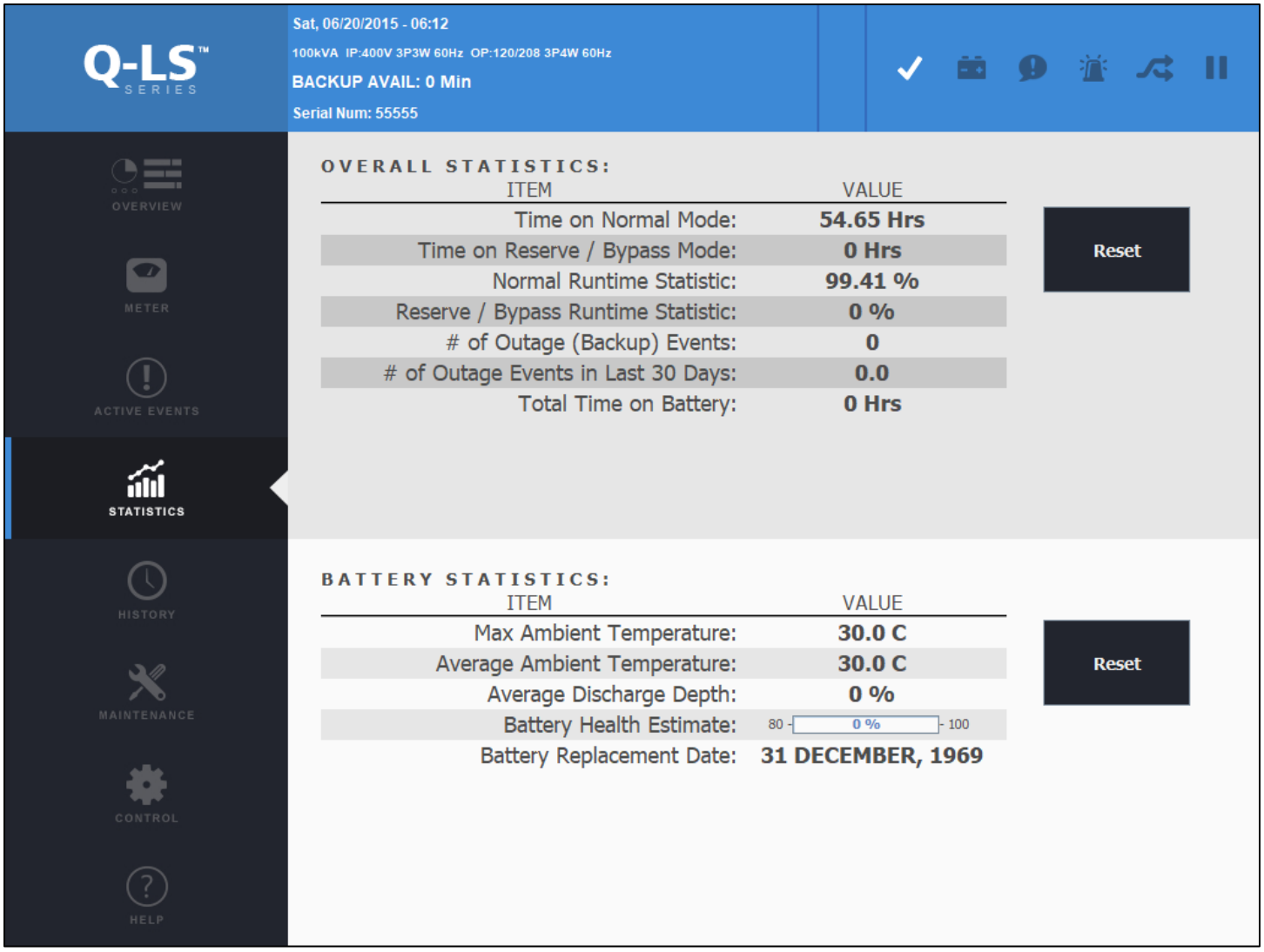


Figure 16—Statistics Management Interface, Including Tab and Page

3.4.1 — Overall Statistics

This section of the **Statistics** page displays run time in Normal and Reserve/Bypass modes, an availability percentage for each line, number of total and monthly outages, and total backup time for the *Q-LS*.

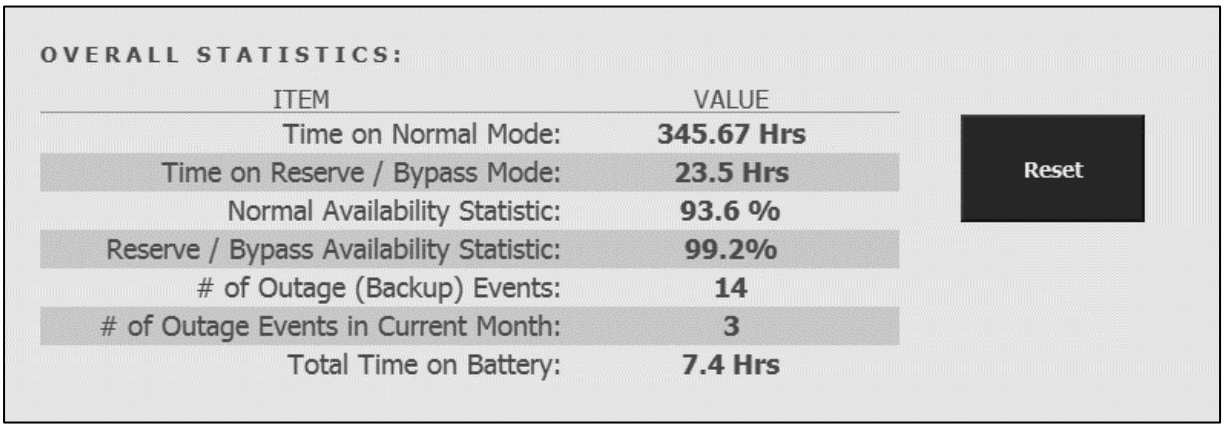


Figure 17—Overall Statistics Section

3.4.2 — Battery Statistics

This section of the **Statistics** page displays maximum and average ambient temperatures for the battery module, average discharge percentage, an estimate of battery health, and a projected battery replacement date.

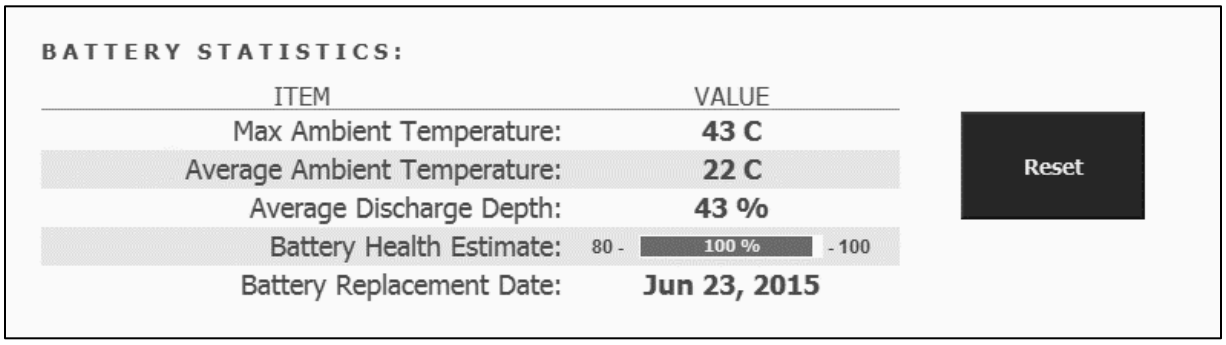


Figure 18—Battery Statistics Section

ELECTRICAL WARNING

The battery health estimate is intended as an estimate only. Visual battery checks and other preventive maintenance must still be conducted.

Failure to obey these recommendations may cause serious injury or facility damage due to battery degradation.

Caution

Visual battery checks must still be performed on a regular schedule. If a battery replacement appears to be necessary before the next projected battery replacement date, the batteries should be replaced according to recommendations made by a certified technician.

3.5 — History

Tap the **History** tab to view the event history page.

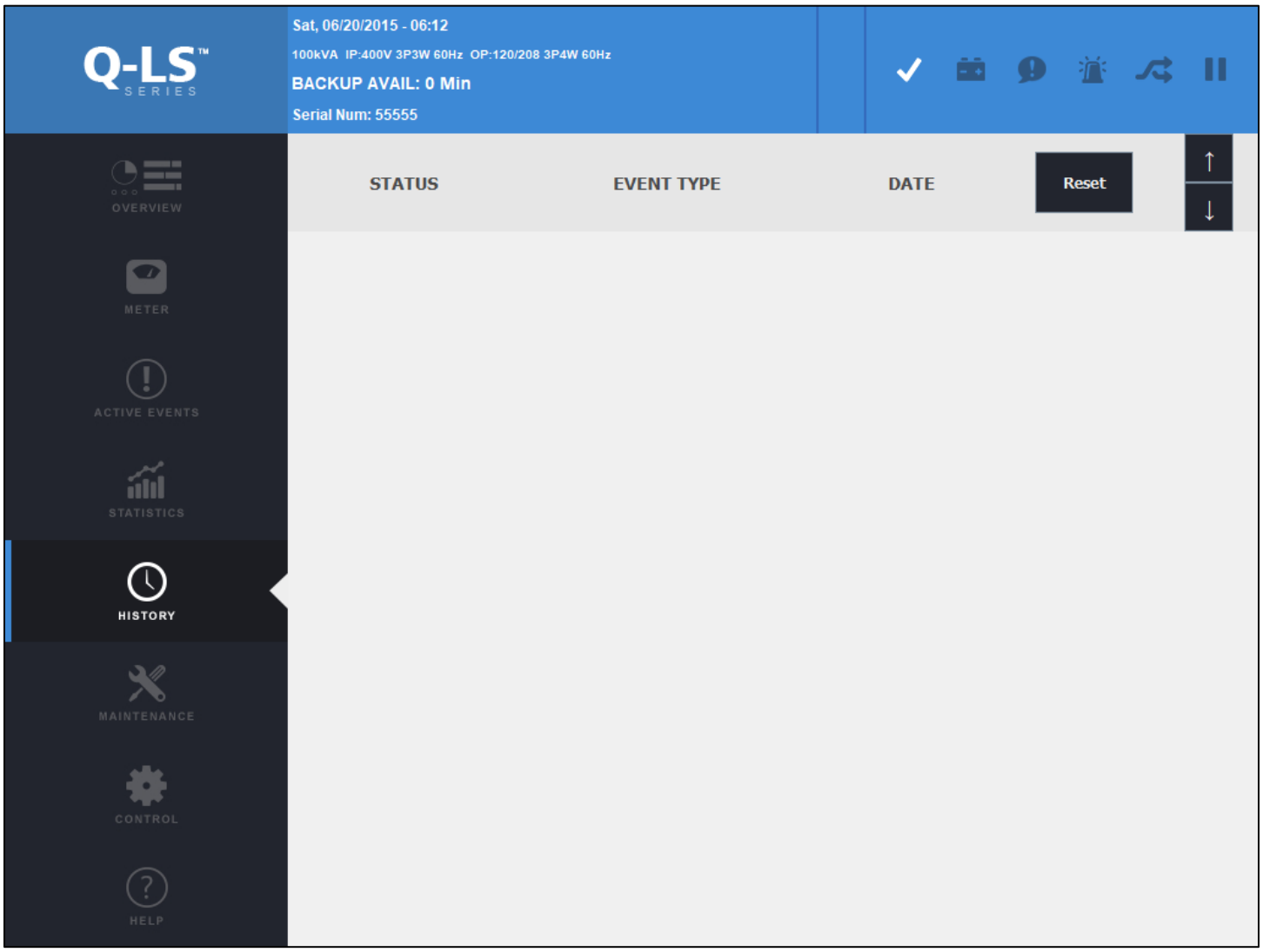


Figure 19—History Management Interface, Including Tab and Page

Page through the recorded events by tapping the ***Up*** and ***Down*** buttons.

Event entries with no Timestamp are empty.

Event entries with a Timestamp but no Event Type indicate a date rollover, meaning that another event began on one day and ended on another day.

Note

If a system enters Reserve at 11:58 pm and stays in Reserve until 12:05 am on the following morning, two (2) entries may be shown for the ongoing switch to Reserve. The second entry will list *12:01* for the event time but will not list the event type.

Manual Helps

For a list of possible notices and alarms that may be displayed on the **History** page, see **5—Possible Event Listings**.

3.6 — Maintenance

The **Maintenance** page is designed to help certified *Q-LS* technicians schedule preventive maintenance checks and battery replacements. It displays several maintenance schedules, including ***System Commissioning Information***, ***System Maintenance Information***, and ***Maintenance Status***.

It also includes some selectable maintenance options, including buttons and a dropdown ***PM Schedule*** menu.

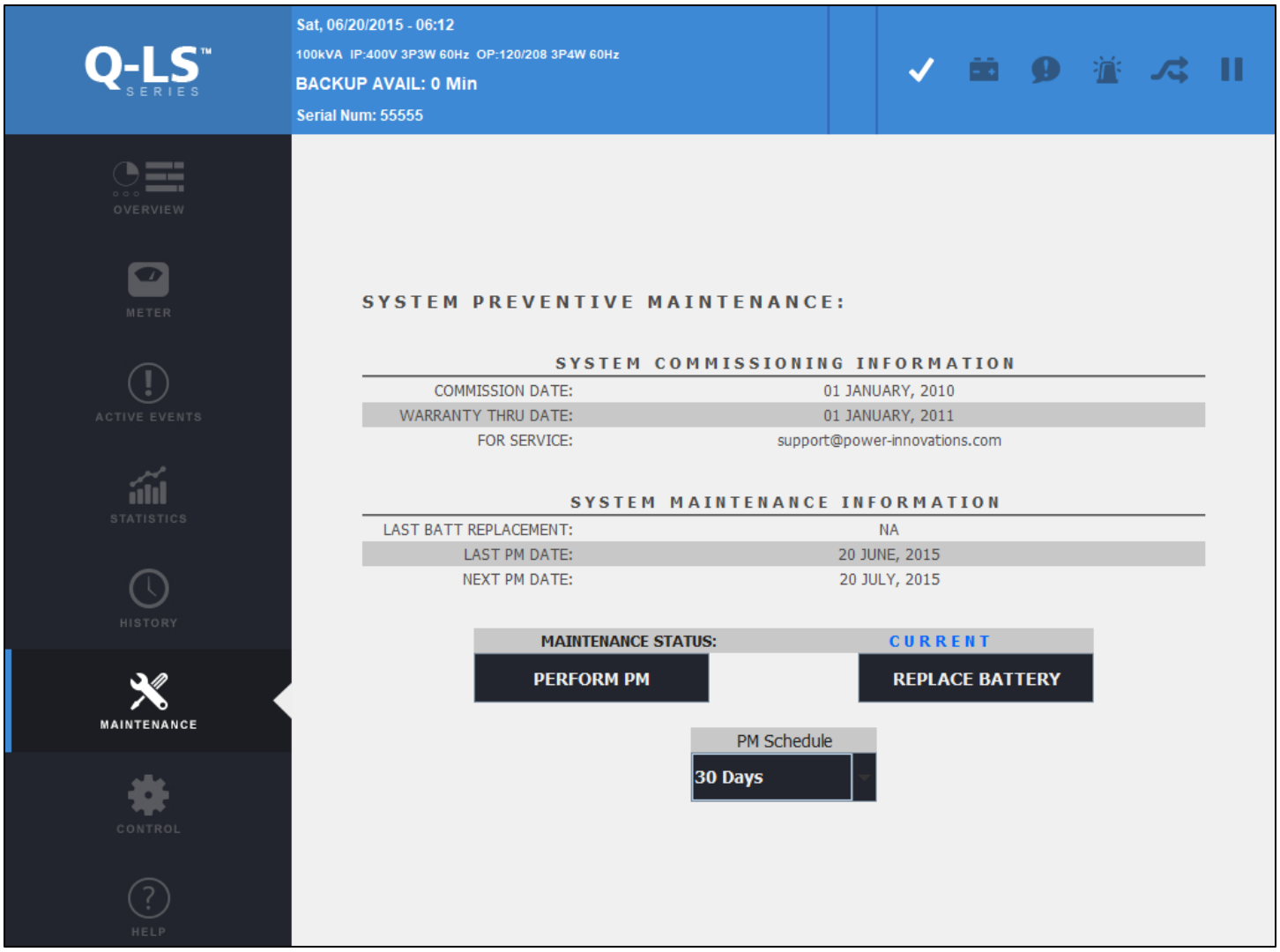


Figure 20—Maintenance Management Interface, Including Tab and Page

3.6.1 — System Commissioning Information

This section of the **Maintenance** page shows the commissioning and warranty thru dates for the system. Unless a nonstandard customer service warranty has been purchased from Power Innovations, the warranty thru date will usually be one (1) year after the date of system commissioning.

Using the listed email address, feel free to contact Power Innovations to schedule servicing or ask questions about the system.

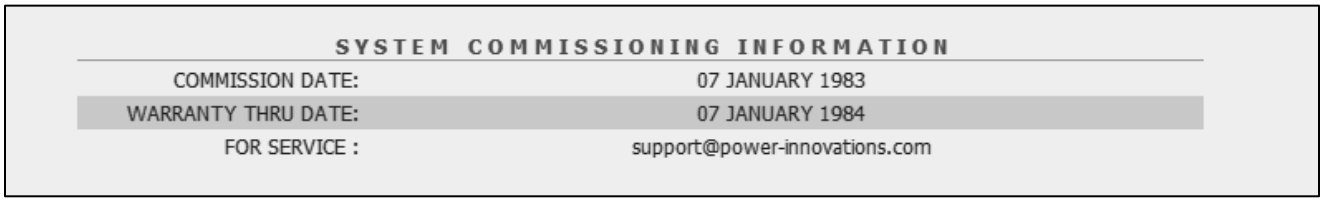


Figure 21—System Commissioning Information Section

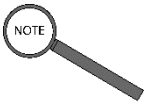
Note

Make sure when emailing Customer Service to include the model number for the system.

The email listed on this page is the same email listed on the **Maintenance** page.

3.6.2 — System Maintenance Information

This section of the **Maintenance** page shows the last battery replacement date for the system. If the batteries have never been replaced, the system will automatically show the commissioning date.



Note

Because batteries should be replaced every 5–10 years, an old date in this field provides one (1) indication that battery replacement may be necessary.

The last and next Preventive Maintenance (PM) dates will also be listed. The system will use the ***Last PM Date*** field to project the system's ***Next PM Date*** and fill in the field, according to the specified schedule.

If no previous PM has been conducted, the system will use the commissioning date.

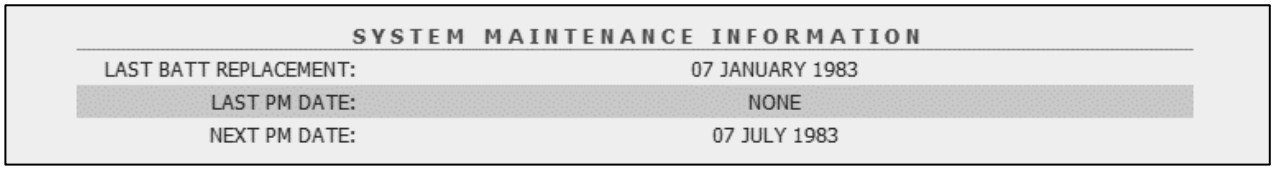


Figure 22—System Maintenance Information Section

3.6.2.1 — Maintenance Status

This section of the **Maintenance** page shows whether preventive maintenance checks are upcoming. The ***Maintenance Status*** field is shown in **Figure 24**.

The status will show as either *Current* or *Due*, depending on whether the projected date for commissioning has passed.

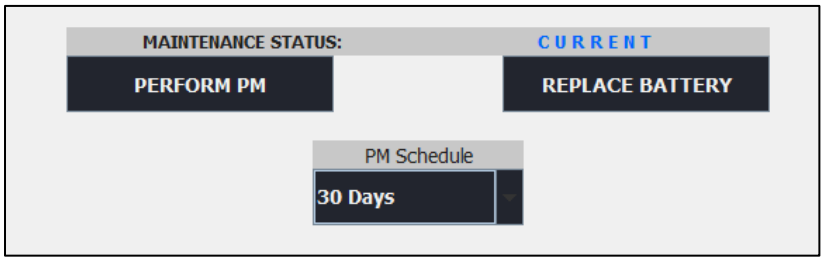


Figure 23—Maintenance Status and Maintenance Buttons

Note

If ***Maintenance Status*** is *Due*, a **Maintenance Due!** icon also appears on the **System Information** bar at the top of the screen.

Manual Helps

For more information about this icon, see **Maintenance Due! Icon**.

3.6.2.2 — Maintenance Buttons

This section of the **Maintenance** page allows dates and settings to be updated.

Two (2) interactive buttons, ***Perform PM*** and ***Replace Battery***, appear below the ***Maintenance Status*** bar. When either of these buttons is pressed, a control keypad will appear.

A certified *Q-LS* technician will enter the correct number combination on the keypad to confirm the change.

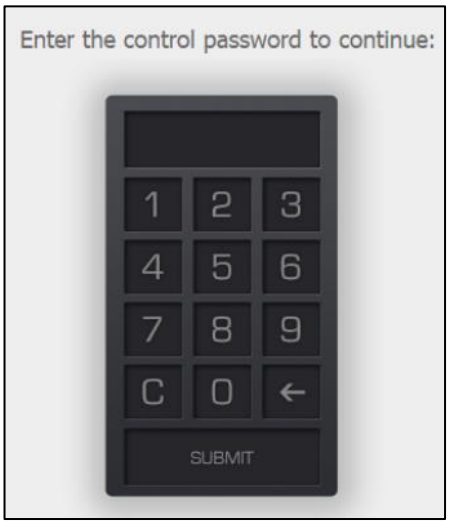


Figure 24—Control Keypad

3.6.2.3 — Perform PM Button

Perform PM is pressed by a certified *Q-LS* technician during maintenance. When the button is pressed, and the control code has been successfully entered, this button will reset the ***Last PM Date*** field.

Figure 25—Perform PM Button

It will be updated using the date displayed on the top line of the **Status Information** bar.

The ***Next PM Date*** field will also be projected from the date entered in the ***Last PM Date*** field.

3.6.2.4 — Replace Battery Button

Replace Battery is pressed by a certified *Q-LS* technician during battery replacement. When the button is pressed, and the control code has been successfully entered, this button will update the date listed in the ***Last Batt Replacement*** field.

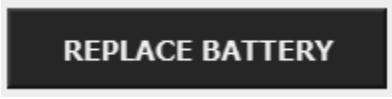


Figure 26—Replace Battery Button

The date used to update the field is the date displayed on the top line of the **Status Information** bar.

3.6.2.5 — PM Schedule

This section of the **Maintenance** page allows preventive maintenance to be scheduled more or less frequently.

Press the down arrow on this dropdown menu to change the frequency of projected preventive maintenance checks. Options include 30, 60, 90, and 180 days.

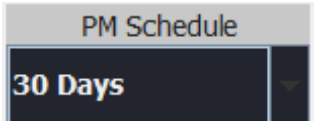


Figure 27—PM Schedule Dropdown Menu

Power Innovations recommends that preventive maintenance be performed at least every 180 days, although preventive maintenance may be performed as frequently as desired.

ELECTRICAL WARNING

Neglecting Preventive Maintenance reminders may cause serious system malfunction. In some cases, not regularly performing such maintenance may cause physical harm to system operators, technicians, or other personnel.

Caution

Not performing regular Preventive Maintenance checks may void the one-year warranty and other supplemental system warranties purchased from Power Innovations.

3.7 — Control

Tap the **Control** tab to manage inverter state, buzzer, battery charge, and other settings.

Figure 28—Control Management Interface, Including Tab and Page

3.7.1 — Inverter Control

This section of the **Control** page enables the inverter to be controlled via the TouchScreen.

Inverter State: The line below Inverter State will show either OFF or ON.

Output State: The line below Output State will show either ON Inverter or ON Reserve.

Switch the inverter ON or OFF by tapping the **Switch Inv** button. When the inverter is turned OFF, the Reserve line will be selected.

Trigger an Emergency Power OFF (EPO) condition by tapping the **Load OFF** button.

Caution

Using the TouchScreen to trigger an EPO condition may cause the TouchScreen to turn OFF. This is a normal result of EPO shunt trip function and is not cause for alarm.

Figure 29—Inverter Control Section

3.7.2 — Charger / Buzzer Settings

This section of the **Control** page allows the battery charge and buzzer settings to be changed.

3.7.2.1 — Charger Settings

Current settings determine how much current to draw for charging batteries. The charge current should be selected based on the number of battery packs connected to the *Q-LS*:

Table 2—Charge Current Settings by Batteries per String

Number of Batteries per String	Charge Setting
1-3	Low
4-6	Medium
7+	High

The ***Monthly Charge*** setting determines how long the batteries should charge during the monthly maintenance charge.

The ***Low Charge*** setting determines how long the batteries should charge after they drop below a preset charge limit. The charge time depends on the number of battery packs connected to the *Q-LS*:

Table 3 below provides the recommended charge time for both settings.

Table 3—Charge Time by Batteries per String

Number of Batteries per String	Suggested Charge Time (Hours)
1-3	4
4-6	8
7+	12

Caution

Greater charge times (16, 20, or 24 hours) should only be selected if advised by a certified *Q-LS* system support engineer.

3.7.2.2 — Buzzer Settings

The buzzer is an audible indicator of *Q-LS* status. The Buzzer State will be listed as either ON or OFF.

The buzzer can be turned **ON** or **OFF** by tapping **Switch Buzzer**.

Figure 30—Charger/Buzzer Section

3.7.3 — Battery Test Settings

This section of the **Control** page allows battery tests to be controlled from the TouchScreen.

The ***Battery Test Settings*** show the latest battery test results as either Pass or Fail.

The ***Test Batt*** button provides a way to manually test the batteries.

Use the buttons on the ***Test Schedule*** dropdown menu to select the desired frequency for automatic battery tests performed by the *Q-LS*.

Using ***Test Schedule***, the *Q-LS* will perform automatic battery tests according to the selected schedule instead of performing automatic daily battery tests. Available choices include daily, weekly, and monthly testing.

Figure 31—Battery Test Section

3.7.4 — Other Settings

The ***Other Settings*** section of the **Control** page displays other maintenance-level information such as the serial number, ***Radix*** and ***Version*** numbers (firmware information used by MODBUS), and the date for system commissioning.

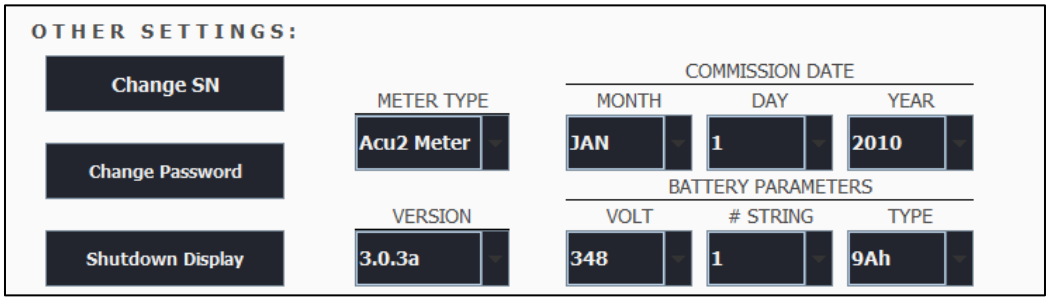


Figure 32—Additional Settings Section

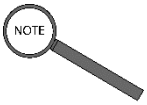
Note

The ***Radix*** and ***Version*** numbers do not matter for purposes of TouchScreen operation. Understanding the meaning of each word is not important.

These terms and the accompanying numbers don't need to be changed unless a certified technician is updating MODBUS firmware.

All options listed in the ***Other Settings*** section must accompany service-level adjustments and will only affect TouchScreen settings.

Note



Changing the SN for the system only changes that information on the TouchScreen display, not for the whole system. Likewise, updating Radix and Version numbers only changes the displayed TouchScreen numbers unless certain firmware changes have been made.

3.7.4.1 — System Number

The **System Number (or ID)** provides a unique number to identify multiple *Q-LS* systems.

The displayed SN on the TouchScreen can be changed by tapping the **Change SN** button.

1 Tap the **Change SN** button. A number pad will pop up.

2 Tap the keys to enter the new SN.

3 Tap **Submit**.

Figure 33—Control Keypad (for Change SN)

3.7.4.2 — Radix and Version Numbers

These numbers correspond to firmware numbers and will only be significant for a certified *Q-LS* technician who is updating MODBUS firmware.

Additional Manual

For more information about MODBUS settings, see the *Q-LS 10–160 Installation and Operation Manual*.

3.7.4.3 — Commission Date

After the system arrives, a certified *Q-LS* technician will use this dropdown menu to select and save the commission date.

This date will be used to project future preventive maintenance check and battery replacement dates.

Manual Helps

For more information about preventive maintenance and battery replacement, see **Maintenance**.

3.8 — Help

Tap the **Help** tab to view information about the *Q-LS* TouchScreen.

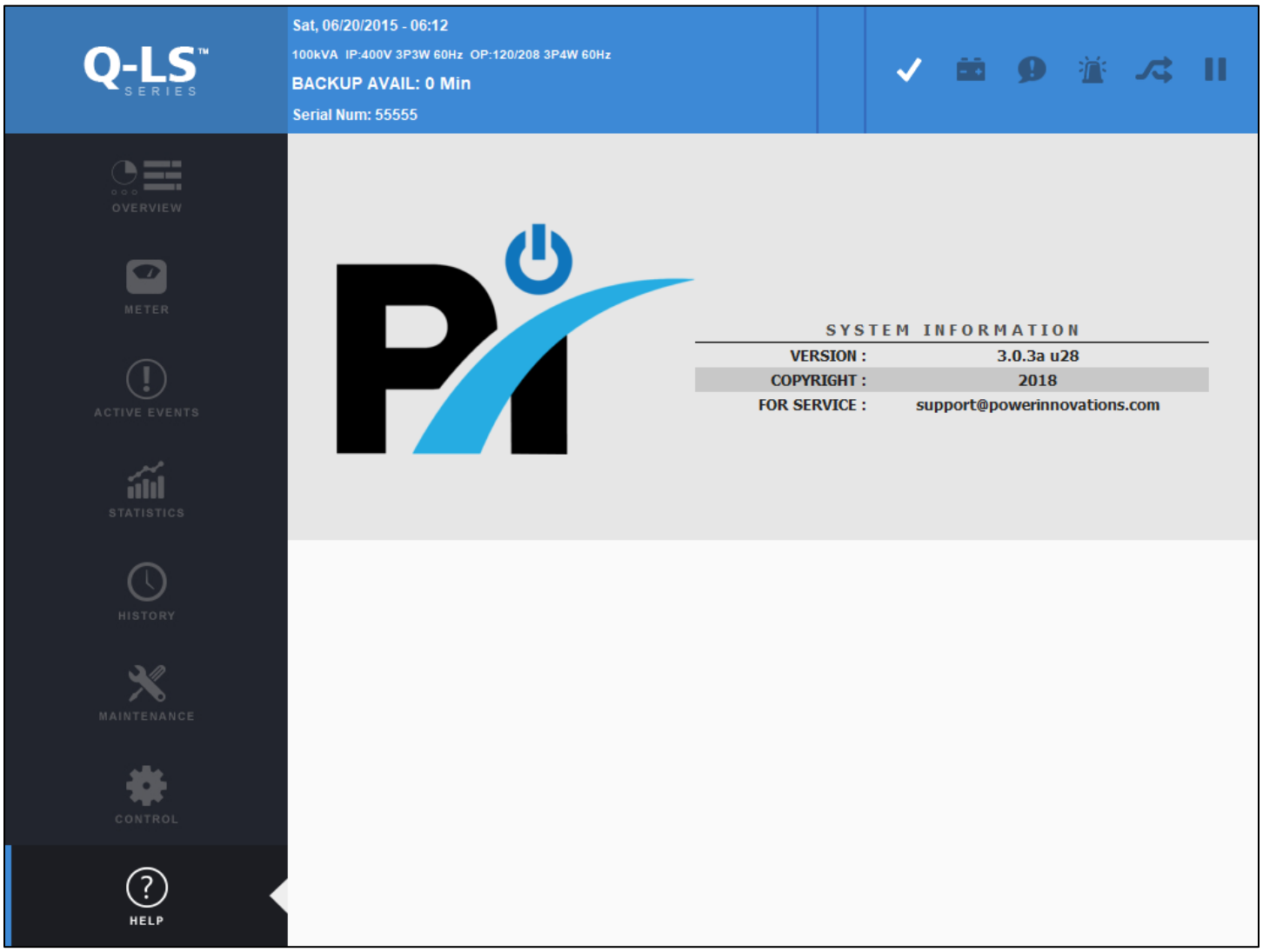
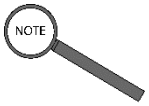


Figure 34—Help Management Interface, Including Tab and Page

3.8.1 — System Information

This section of the **Help** page contains information about the *Q-LS* TouchScreen Version and the copyright date. It also contains the email that should be used to submit questions about the *Q-LS* or servicing.



Note

The email listed on this page is the same email listed on the **Maintenance** page.

3.8.2 — Screen Saver Timeout

Use the ***Screen Saver Timeout*** section on the **Help** page to control when the screen saver will activate.

Tap one of the time interval buttons (***1 MIN***, ***10 MIN***, ***30 MIN***, **or** ***60 MIN***) to set the duration after which the screen will automatically switch to the screen saver.

Tap ***Disabled*** to disable the screen saver. This means that it will not appear when the screen is idle.

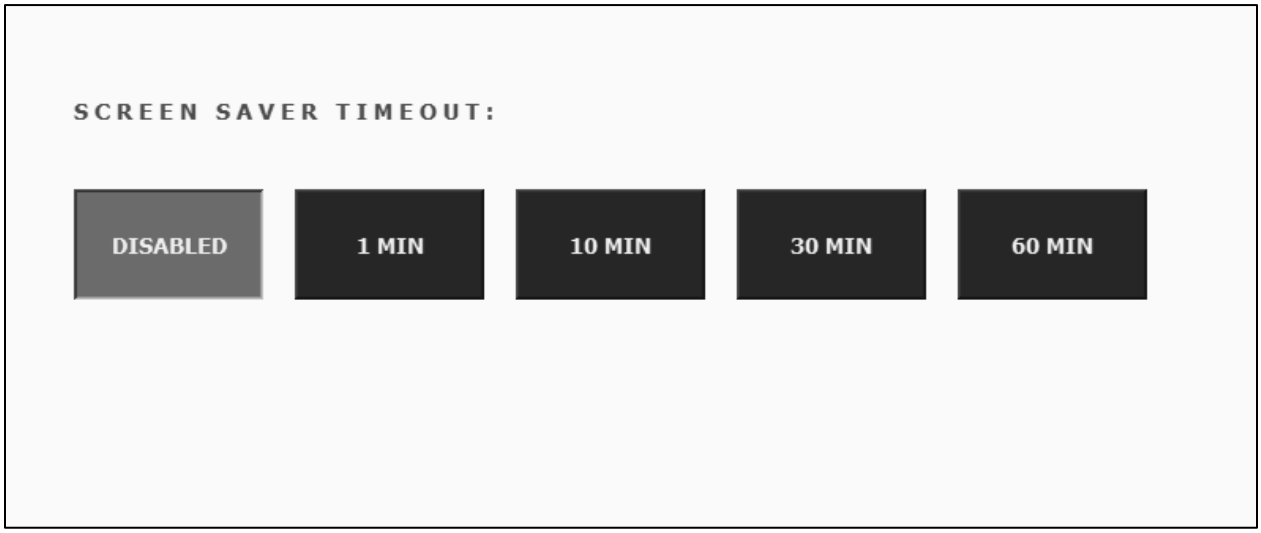


Figure 35—Screen Saver Timeout Section

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4 — Overview Status Readings

The **Overview** section visually represents the power flow through the *Q-LS* system. One of 16 possible states may be displayed in **Overview**.

4.1 — Normal during Startup

4.1.1 — RESERVE ON with Static Switch on Rectifier

The RESERVE breaker is ON and Reserve/Bypass input power is available, the RECTIFIER breaker is OFF or rectifier input power is not available, and the Static Switch is on the Rectifier line. No output power is available.

This may occur during normal startup or shutdown of the *Q-LS*. If this status occurs at any other time, check the **Active Events** page to determine what actions are necessary.

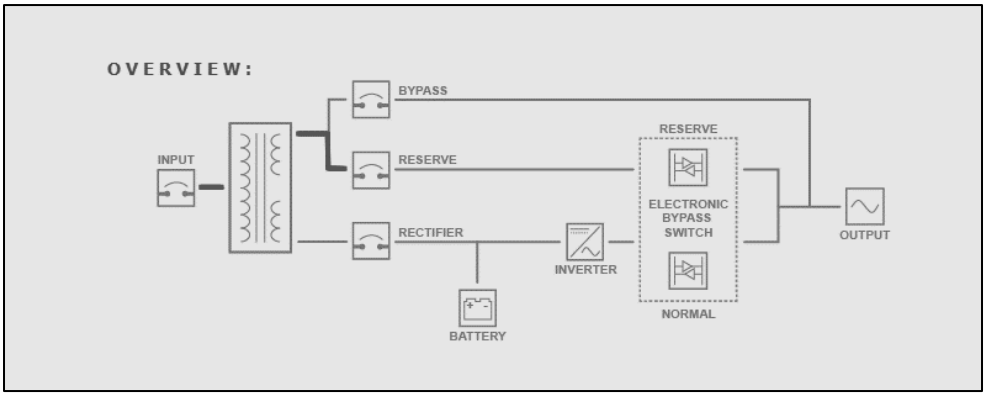

Figure 36—Overview Flowchart with RESERVE Breaker ON

4.1.2 — RESERVE ON with Static Switch on Reserve

The RESERVE breaker is ON and Reserve/Bypass input power is available, the RECTIFIER breaker is OFF or Rectifier input power is not available, and the Static Switch is on Reserve. Output power is available through the Reserve line without full power conditioning or battery backup.

This may occur during normal startup or shutdown of the *Q-LS*. If this status occurs at any other time, check the **Active Events** page to determine what actions are necessary.

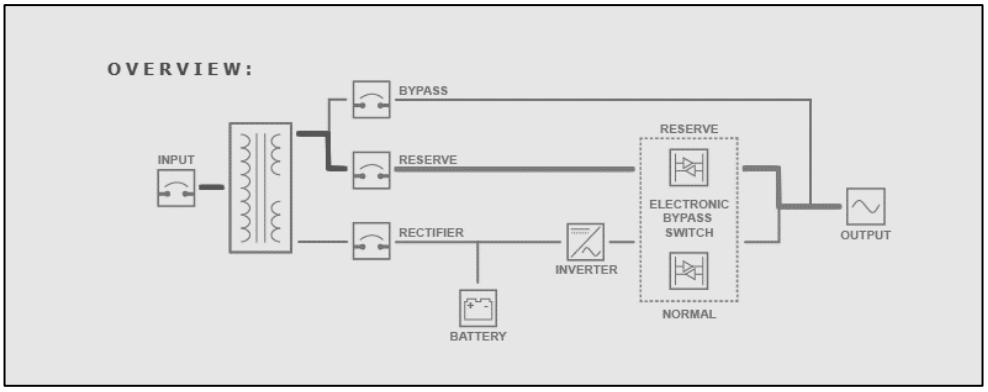

Figure 37—Overview Flowchart with Static Switch on Reserve

4.1.3 — RESERVE/RECTIFIER ON with Static Switch on Reserve

The RESERVE and RECTIFIER breakers are both ON and Reserve/Bypass and Rectifier input power are available. The inverter is OFF or has shut down, and the Static Switch is on Reserve. Output power is available through the Reserve line without full power conditioning or battery backup.

This may occur during normal startup or shutdown of the *Q-LS*. If this status occurs at any other time, check the **Active Events** page to determine what actions are necessary.

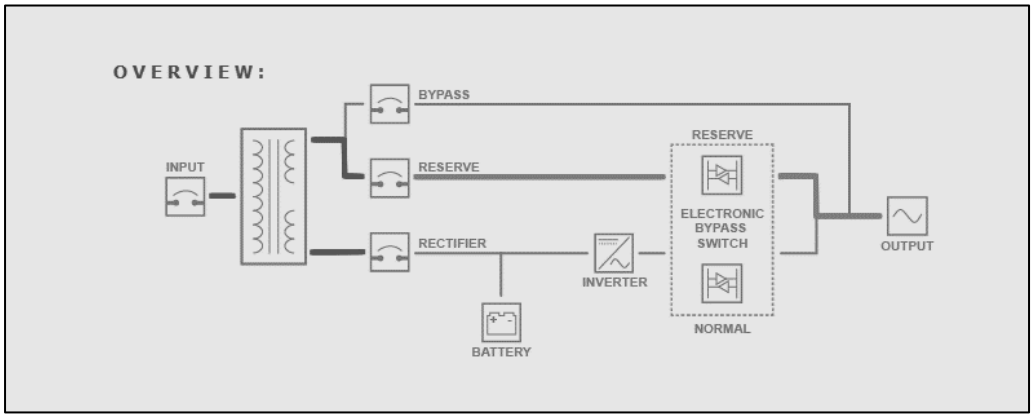

Figure 38—RESERVE and RECTIFIER Breakers ON; Static Switch on Reserve

4.2 — Normal Operation

The RESERVE and RECTIFIER breakers are both ON and Reserve/Bypass and Rectifier input power are available. The inverter is ON and operating normally, and the Static Switch is on Normal (Rectifier line is selected). Output power is being provided through the Rectifier line with full five-stage power conditioning and battery backup (if available).

This status will show if the system is operating normally.

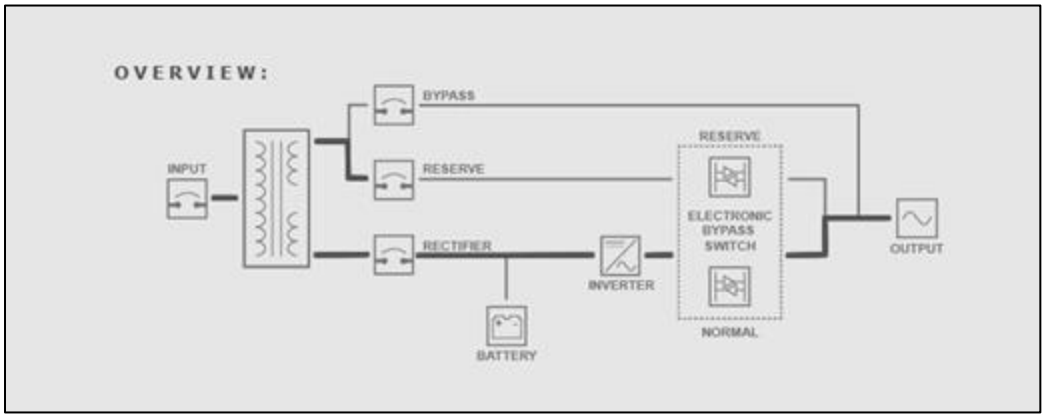

Figure 39—RESERVE and RECTIFIER Breakers ON; Static Switch on Rectifier

4.3 — Battery Operation

4.3.1 — RESERVE ON with Batteries Supplying Output

The RESERVE breaker is ON and Reserve/Bypass input power is available. The RECTFIER breaker is OFF or Rectifier input power is not available. The inverter is ON, and the Static Switch is on Normal (Rectifier line is selected).

Output power is being provided from the batteries.

This will occur if Rectifier input power is lost or the RECTIFIER breaker is switched OFF when the inverter is ON and the Static Switch is on Normal. The system will stay in this state until Rectifier input power is restored or the batteries are depleted.

If the batteries are depleted before Rectifier input power is restored, the Static Switch will switch to Reserve.

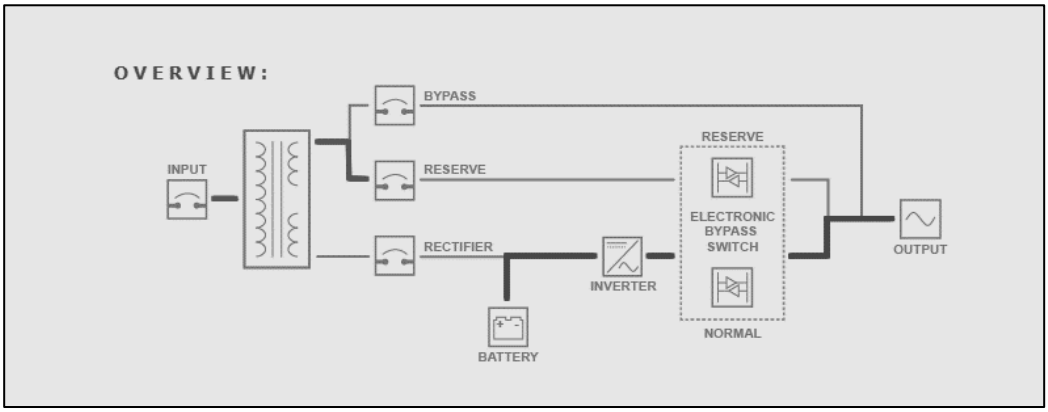

Figure 40—RESERVE Breaker ON; Backup Mode

4.3.2 — RESERVE OFF with Batteries Supplying Output

The RESERVE and RECTIFIER breakers are OFF or Reserve/Bypass and Rectifier input power are not available. The inverter is ON and the Static Switch is on Normal.

Output power is provided by the batteries.

This is the normal backup state during a power failure.

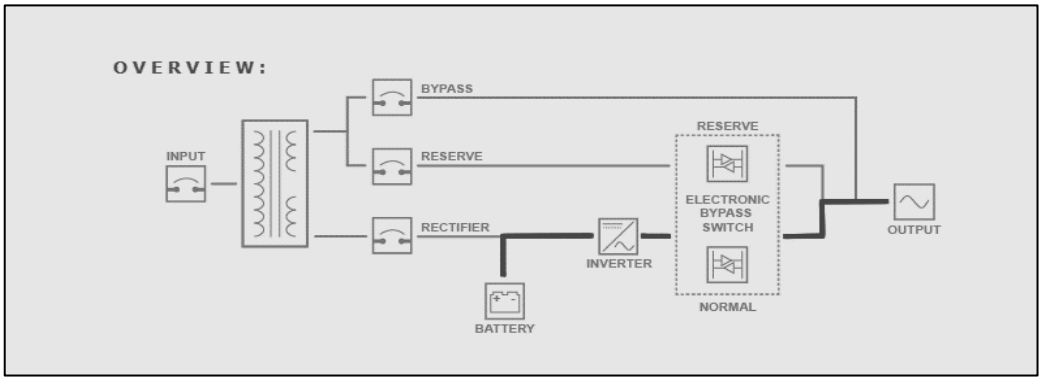

Figure 41—Input not Available; Backup Mode

4.4 — System Error or Maintenance Bypass

4.4.1 — RESERVE and RECTIFIER ON with No Output

The RESERVE and RECTIFIER breakers are both ON and Reserve/Bypass and Rectifier input power are available, the inverter is OFF or has shut down, and the Static Switch is on Normal.

Output power is not available. This state will occur if there is a fault on the system that prevents the Static Switch from switching to Reserve.

Check the **Active Events** page to determine what actions are necessary.

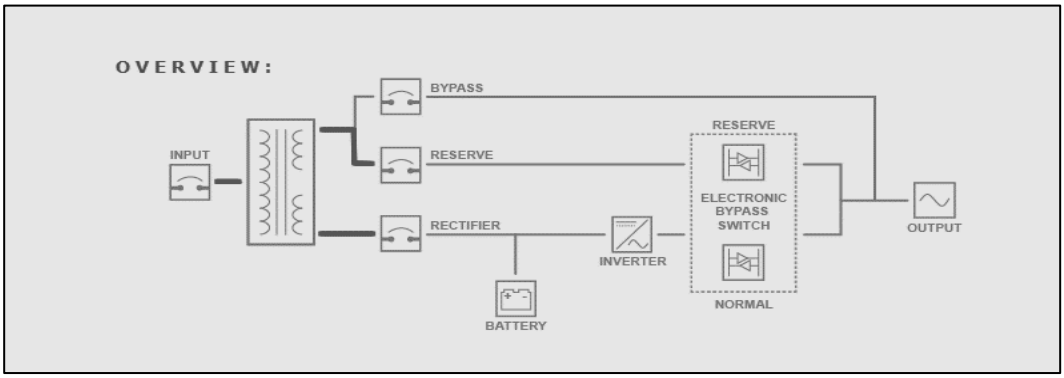

Figure 42—RESERVE and RECTIFIER ON; Inverter OFF

4.4.2 — RESERVE and BYPASS ON with Output on Reserve

The RESERVE breaker is ON and Reserve/Bypass input power is available. The RECTIFIER breaker is OFF or Rectifier input power is not available. The Static Switch is on Reserve.

The BYPASS breaker is also ON. Output power is available through the Reserve line without full power conditioning or battery backup.

This state will occur during the transition to Maintenance Bypass Mode.

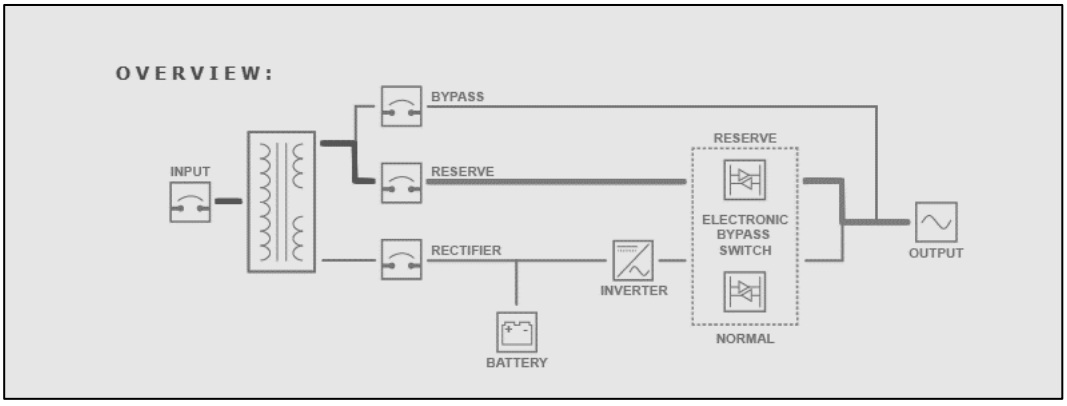

Figure 43—RESERVE ON; Static Switch on Reserve

Note

The BYPASS breaker should only be switched ON after the inverter has been turned OFF and the RECTIFIER breaker has been switched OFF.

Manual Helps

See the *Q-LS Installation and Operation Manual* for more information about Maintenance Bypass Mode.

4.4.3 — RESERVE, RECTIFIER, and BYPASS ON with Output on Reserve

The RESERVE and RECTIFIER breakers are both ON and Reserve/Bypass and Rectifier input power are available. The inverter is OFF or has shut down, and the Static Switch is on Reserve.

The BYPASS breaker is also ON. Output power is available through the Reserve line without full power conditioning or battery backup.

This state will occur if the BYPASS breaker is improperly turned ON while the system is operating normally. The inverter will shut down if the BYPASS breaker is switched ON.

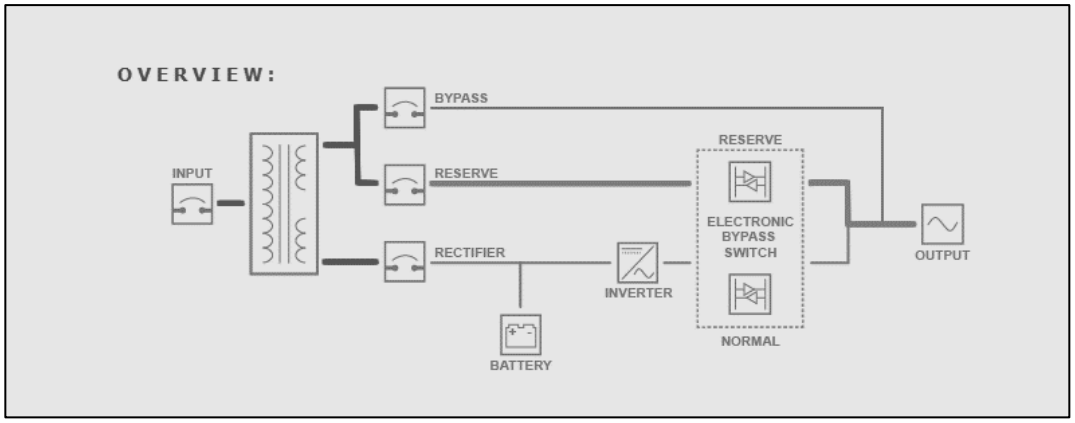

Figure 44—RESERVE and RECTIFIER Breakers ON; Static Switch on Reserve

Note

The BYPASS breaker should only be switched ON after the inverter has been turned OFF and the RECTIFIER breaker has been switched OFF.

Manual Helps

See the *Q-LS Installation and Operation Manual* for more information about Maintenance Bypass Mode.

4.4.4 — RESERVE, RECTIFIER, and BYPASS ON with System Unable to Use Reserve

The RESERVE and RECTIFIER breakers are both ON and Reserve/Bypass and Rectifier input power are available. The inverter is OFF or has shut down, and the Static Switch is on Normal.

The BYPASS breaker is also ON. Output power is not available.

This state will occur if the BYPASS breaker is improperly turned ON while the system is operating and the Static Switch is unable to switch to Reserve. The inverter will shut down if the BYPASS breaker is switched ON.

Check the **Active Events** page to determine why the Static Switch is unable to switch to Reserve.

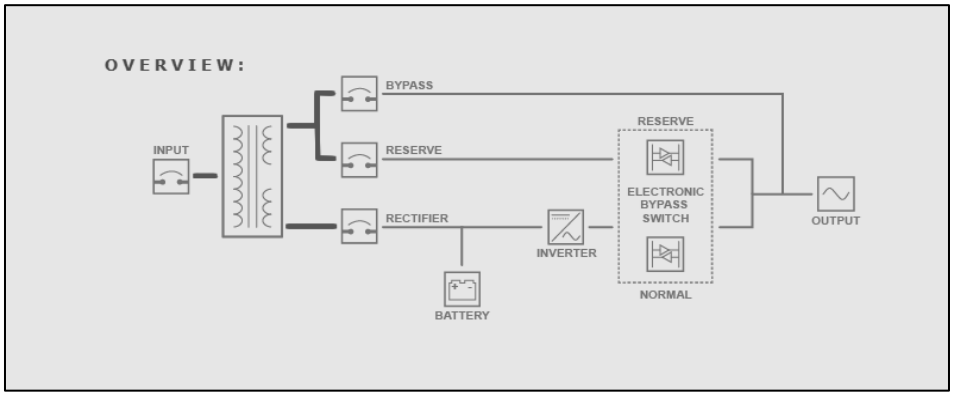

Figure 45—RESERVE, RECTIFIER, and BYPASS Breakers ON; No Output

4.4.5 — RESERVE OFF, RECTIFIER ON, Output on Bypass

The RESERVE breaker is OFF, the RECTIFIER breaker is ON, and Reserve/Bypass and Rectifier input power are available. The inverter is OFF or the Static Switch is on Reserve.

The BYPASS breaker is ON. Output power is available through the Bypass without power conditioning or battery backup.

This state will occur if the BYPASS breaker is improperly switched ON when the system is operating and the RESERVE breaker is OFF. The inverter will shut down if the BYPASS breaker is switched ON.

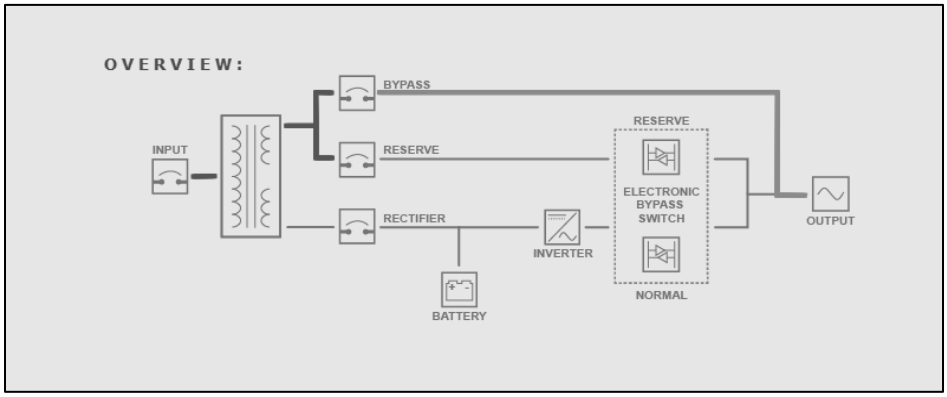

Figure 46—RECTIFIER Breaker ON; Output on Bypass

Notes

The TouchScreen will be OFF when the *Q-LS* is in this state.

The BYPASS breaker should not be switched ON until after the inverter has been turned OFF and the RECTIFIER breaker has been switched OFF.

The RESERVE breaker should be switched ON to avoid a power interruption during the switchover to Maintenance Bypass Mode.

4.4.6 — RESERVE OFF, RECTIFIER OFF, Output on Bypass

The RESERVE breaker is OFF, but Reserve/Bypass input power is available. The RECTIFIER breaker is OFF or Rectifier input power is not available, and the BYPASS breaker is ON.

This is normal Maintenance Bypass Mode status.

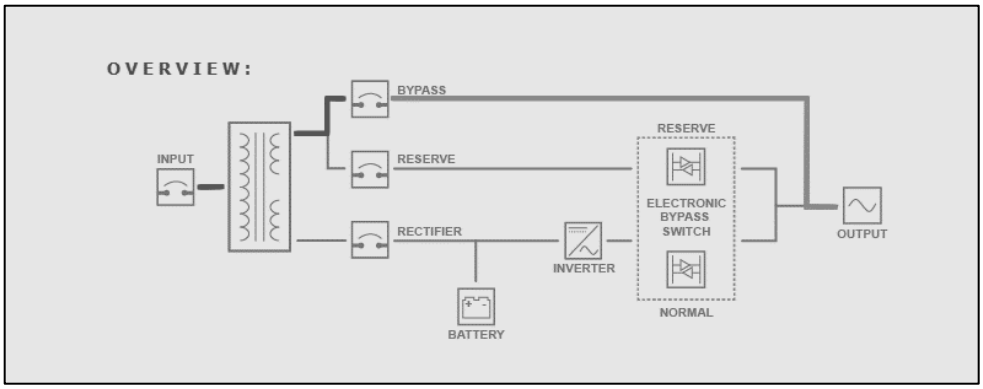

Figure 47—RESERVE and RECTIFIER Breakers OFF; Output on Bypass

Note

The TouchScreen will be OFF when the *Q-LS* is in this state.

4.4.7 — RESERVE OFF, RECTIFIER ON, Output on Rectifier

The RESERVE breaker is OFF or Reserve/Bypass input power is not available. The RECTIFIER breaker is ON and Rectifier input power is available. The inverter is ON, and the Static Switch is on Normal.

Output power is provided through the Rectifier line, with full five-stage power conditioning and battery backup (if available).

This is normal operating mode, except that Reserve power is not available. Typically, the RESERVE breaker should be ON to make Reserve/Bypass input power available in case the inverter shuts down.

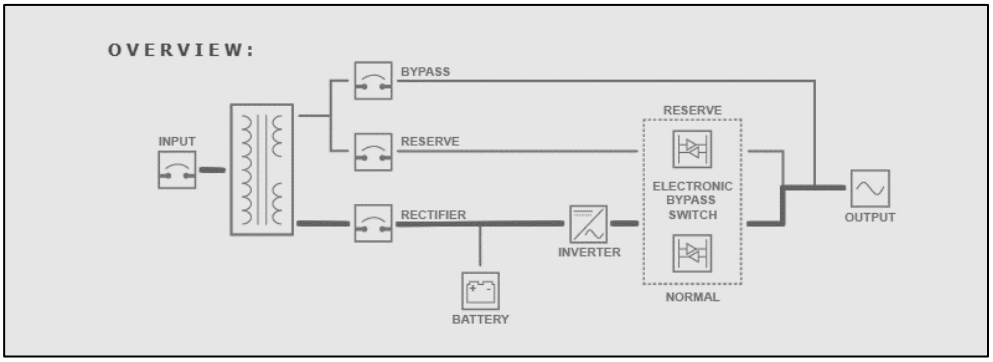

Figure 48—RECTIFIER Breaker ON; RESERVE Breaker OFF; Output on Rectifier

---

NOTE

Note

The TouchScreen will be OFF when the *Q-LS* is in this state.

4.4.8 — RESERVE OFF, RECTIFIER ON, No Output

The RESERVE breaker is OFF or Reserve/Bypass input power is not available. The RECTIFIER breaker is ON with Rectifier input power available. The inverter is OFF or the Static Switch is on Reserve.

No output power is available.

This may occur if the RESERVE breaker is OFF or Reserve/Bypass power is not available, and the inverter has shut down because of a fault condition. Reserve/Bypass power should be made available and the RESERVE breaker switched on so the problem can be diagnosed.

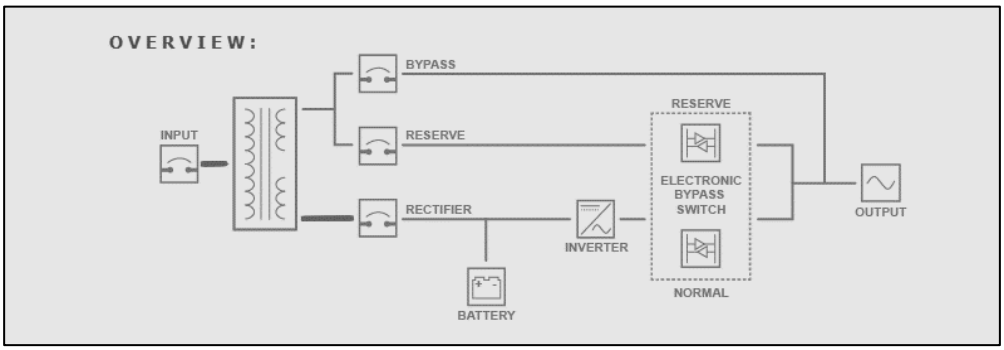

Figure 49—RESERVE Breaker OFF; RECTIFER Breaker ON; No Output

Note

The TouchScreen will be OFF when the *Q-LS* is in this state.

4.4.9 — RESERVE and RECTIFIER OFF, No Output

The RESERVE breaker is OFF or Reserve/Bypass input power is not available. The RECTIFIER breaker is OFF or Rectifier input power is not available.

No output power is available.

This state may occur during a power failure after the batteries have been exhausted, if the inverter has shut down, or if the *Q-LS* system has been shut down. The problem can be diagnosed when input power is available and RESERVE breaker is switched ON.

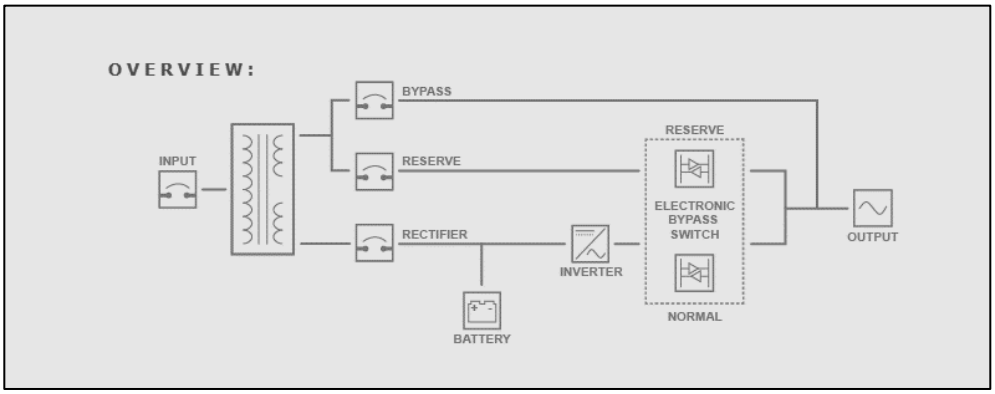

Figure 50—RESERVE and RECTIFIER Breakers OFF; No Output

Note

The TouchScreen will be OFF when the *Q-LS* is in this state.

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5 — Possible Event Listings

5.1 — Status (Green) Column

5.1.1.1 — Inverter ON

The inverter is ON. The inverter can be switched ON or OFF from the System Control page. When the inverter is ON and the Static Switch is on the inverter, the output load benefits from the full five stages of power conditioning and available battery backup.

INVERTER ON

5.1.1.2 — Static Switch on Inverter

The Static Switch is on the inverter. The Static Switch will automatically switch to Reserve if the system detects a problem or power failure on the inverter output or if the inverter is switched OFF.

If the inverter is putting out clean, steady power, the Static Switch will automatically switch to the inverter. When the inverter is ON and the Static Switch is on the inverter, the output load benefits from the full five stages of power conditioning and available battery backup.

STATIC SWITCH ON INVERTER

Warning (Yellow) Column

5.1.1.3 — 70% Load

The connected load is over 70% capacity on one or more output lines. This notification is a warning that the system load is high enough to reduce battery backup time significantly.

The system will continue to function normally in this state and there is no immediate need for action.

70% LOAD

5.1.1.4 — Battery Low

The DC Rail voltage is below 320VDC. This warning indicates that the charge on the batteries is nearly depleted.

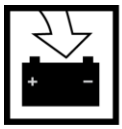
The inverter will shut down if the DC Rail voltage drops below 295VDC.

BATTERY LOW

5.1.1.5 — Battery Charging

The system is charging the batteries. This indicator is for information only and does not require any action.

When rectifier input is available, the batteries are automatically charged once a month or if the battery charge level drops below a specified limit. Charging the batteries does draw additional input power.



5.1.1.6 — Battery Testing

The system is running a battery test. This indicator is for information only and does not require any action.

Automated battery tests run regularly to confirm that the batteries are ready and able to provide power when needed.

5.1.2 — Fault (Red) Column

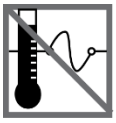
5.1.2.1 — Short Circuit on Output

A short circuit has occurred on the output line(s). When the *Q-LS* is in this condition, the Static Switch will automatically switch to Reserve to protect the batteries and inverter from damage.

5.1.2.2 — Inverter Shutdown—Fuse/Over Temperature

The inverter has shut down because of a blown fuse or over-temperature condition in the inverter, rectifier, or Static Switch.

The inverter will not restart until the fuse has been replaced or the temperature has come down to a safe level.



5.1.2.3 — Inverter Shutdown—Low Output Voltage

The inverter has shut down because of a low inverter output voltage.

The inverter can be restarted by turning it OFF and then ON again. With the inverter ON and the Static Switch on inverter, check the Output Data area of the display to determine which phase is experiencing the low-voltage condition.

The affected line(s) should be checked for damage or a bad connection.

LOW OUTPUT VOLTAGE

5.1.2.4 — Inverter Shutdown—Bypass ON

The inverter has shut down because the BYPASS breaker was switched ON while the inverter was running. The inverter will shut down whenever the BYPASS breaker is switched ON.

To clear this notification, follow the standard procedure for coming out of Maintenance Bypass Mode.

BYPASS ON

Note

To prevent this condition, the inverter should always be properly shut down, the inverter circuit discharged, and the RECTIFIER breaker switched OFF before the BYPASS breaker is switched ON.

5.1.2.5 — Inverter Shutdown—High DC Voltage

The inverter has shut down because the DC voltage exceeded the maximum safe threshold (over 445VDC). The DC Rail and batteries should be inspected to determine the cause of the high voltage.

HIGH DC VOLTAGE

5.1.2.6 — Inverter Shutdown—Overload

The inverter has shut because of an overload condition (more than 110% capacity) on one or more of the output lines.

The inverter will attempt to restart after 7 seconds.

5.1.2.7 — 110% Load

The connected load is over 110% capacity on one or more output lines. The inverter will shut down with an **Inverter Shutdown—Overload** status after staying in this state for 15 minutes.

The **Output Status** display can be used to determine which line is exceeding the threshold. Reduce the load by redistributing or shutting OFF unnecessary equipment.

5.1.2.8 — 125% Load

The connected load is over 125% capacity on one or more output lines. The inverter will shut down with an **Inverter Shutdown—Overload** status after staying in this state for 5 minutes.

The **Output Status** display can be used to determine which line is exceeding the threshold. Reduce the load by redistributing or shutting OFF unnecessary equipment.

5.1.2.9 — 150% Load

The connected load is over 150% capacity on one or more output lines. The inverter will shut down with an **Inverter Shutdown—Overload** status after staying in this state for 30 seconds.

The **Output Status** display can be used to determine which line is exceeding the threshold. Reduce the load by redistributing or shutting OFF unnecessary equipment.

5.1.2.10 — Reserve AC Out of Range

The Reserve input voltage is outside the acceptable range of the *Q-LS* system. The Static Switch will not switch to Reserve in this condition.

To resolve this condition, the input power source and connections should be checked.

5.1.2.11 — Reserve Hz Out of Range

The Reserve input frequency (Hz) is outside the acceptable range of the *Q-LS* system. The Static Switch will not switch to Reserve in this condition.

To resolve this condition, the input power source and connections should be checked.

RESERVE HZ OUT OF RANGE

5.1.2.12 — Battery Low Shutdown

The DC Rail voltage is below 295 VDC and the inverter has shut down. If Reserve input power is unavailable, output power from the *Q-LS* has been interrupted.

BATTERY LOW SHUTDOWN

5.1.2.13 — Rectifier AC Out of Range

Glows red to indicate the Rectifier input voltage is outside the acceptable range of the *Q-LS* system. The Static Switch will not switch to Normal (Rectifier line) in this condition.

The input power source and connections should be checked to resolve this condition.

RECTIFIER AC OUT OF RANGE

5.1.2.14 — Phase Rotation Error

The input phases have not been connected in the proper order.

The system should be shut down and the input connections corrected before the system is restarted.

PHASE ROTATION ERROR

5.1.2.15 — Rectifier Shutdown—DC Overvoltage

The rectifier has shut down because the DC Rail voltage exceeds 445 VDC. The rectifier will automatically restart 30 seconds after the voltage returns to safe range.

RECTIFIER SHUTDOWN--DC OVERVOLTAGE

5.1.2.16 — Battery Test Failed

The most recent battery test has failed. Remains until a successful battery test is completed.

When this indicator appears, check the batteries and battery connections to determine the cause of the test failure.

BATTERY TEST FAILED

5.1.2.17 — Emergency Power OFF Pressed

Glows red to indicate the EPO button has been pressed. When the EPO button is pressed, all output power is shut off until the EPO status has been cleared.

EMERGENCY POWER OFF PRESSED

Manual Helps

See the **Emergency Power OFF** section in the *Q-LS Installation and Operation Manual* for details about EPO function.

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6 — Troubleshooting and System Recovery

The *Q-LS* TouchScreen includes the TouchScreen display, the TouchScreen CPU, and the power supply for the display and CPU. The TouchScreen CPU and power supply locations vary, but the CPU and power supply can be found by tracing the cables from the TouchScreen.

ELECTRICAL WARNING

The UPQ cabinet contains high voltage. Always power down and discharge the UPQ before opening panels in the UPQ cabinet.

6.1 — TouchScreen Error Messages

The TouchScreen CPU communicates with the UPQ through a serial cable connected to the 3R board located inside the PCB panel.

If the TouchScreen does not detect a signal from the 3R board for 5 seconds, a notification will appear on the display. If this notification appears, check that the UPQ is operating properly, that the red power LED on the 3R board is illuminated, and that the 3R board serial cable is securely connected at both ends.

To dismiss the notification, tap **Clear** on the TouchScreen display.

6.2 — TouchScreen Startup Errors

If the TouchScreen fails to start, check that the RESERVE and RECTIFIER breakers are both switched ON (closed), that the power lines for the display and CPU are both connected, that the video and USB cables are connected to both the display and the CPU, and that the serial cable is connected to the CPU and the UPQ 3R board.

If it becomes necessary to change settings on the Linux operating system that runs the TouchScreen software, follow the instructions in the **System Recovery** section below to remove the right-side panel from the UPQ and plug a USB keyboard into the TouchScreen CPU. The username for the Linux operating system is *LSTS*, with the password *power*.

If the TouchScreen software produces errors or will not run, see the **System Recovery** section below.

For other problems or questions about the *Q-LS* TouchScreen, contact Power Innovations.

6.3 — System Recovery

The Recovery USB Flash Drive provided with the *Q-LS* TouchScreen includes system recovery and reinstallation software for the TouchScreen. To reinstall the TouchScreen software.

Note

To use or update the *Q-LS* TouchScreen, continue operating the *Q-LS* with at least the RESERVE and RECTIFIER breakers switched ON.

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1 Locate the TouchScreen CPU on the interior of the door of the *Q-LS*.

2 Connect a USB keyboard and the Recovery USB Flash Drive to the USB ports on the left side of the TouchScreen CPU.

3 Reset the TouchScreen CPU by pressing the red Reset button on the top left of the CPU. The CPU will reboot and perform a power-on self-test. A prompt will appear.

4 Select *Install—Start the Installer Directly*.

5 Select English for the installation language. Tap **Forward**.

6 Unselect all the checkboxes and tap **Forward**.

7 Select *Erase and re-install Q-LS* to re-install only the TouchScreen software, or *Erase Ubuntu and re-install Q-LS* to re-install the Linux operating system and TouchScreen software. **Tap Forward**.

8 Confirm that the main partition on the built-in hard drive are selected for the install location. Tap **Install Now**.

9 Select the local time zone. Tap **Forward**.

10 Select *USA* in both frames for the keyboard layout. Tap **Forward**.

11 Tap Restart Now when the installation completes. *Do not* remove the Recovery USB Flash Drive.

12 When prompted, remove the Recovery USB Flash Drive from the CPU.

13 Press **Enter** on the USB keyboard to reboot the system. The system will restart and run the TouchScreen software.

14 Update the TouchScreen software with the serial number of the UPQ:

A While the software is running, press **Alt + F4** on the USB keyboard.

B Select **Yes**.

C Tap the Power Innovations logo at the bottom-left of the screen to open the Program Menu.

D Select **Accessories>>File Manager**. When the window appears the file *SystemSettings.xml* should be visible.

E Touch (and hold) the *SystemSettings.xml* file until the pop-up menu appears.

F Select *Leafpad* to edit the file.

G Modify the serial number in the XML file to match the serial number of the UPQ system. For more information, see the *Q-LS Installation and Operation Manual*.

Note

The XML file also contains port numbers for the *Q-LS* and auxiliary (if present) communication serial ports, the firmware version number, and the MD5 hashed password for the TouchScreen **System Control** screen.

H Save the XML file. Close the text editor and File Manager windows.

I Restart the TouchScreen software by double-tapping the desktop icon *Launch_TouchScreen.sh*.

15 Unplug the USB keyboard and replace the side panel, making sure to re-attach the ground wire.

16 Switch ON the OUTPUT breaker (if present) and complete the UPQ system startup procedure.

6.4 — Setting the TouchScreen IP Address

The TouchScreen may be connected to the Internet via an Ethernet cable plugged into the TouchScreen CPU. If the local network uses static IP addresses, the TouchScreen must be configured to use the appropriate IP address.

1 Plug a USB keyboard and mouse into the USB ports on the TouchScreen CPU.

2 While the TouchScreen application is running, press **Alt + F4**.

3 Select **Yes** to exit the TouchScreen application.

4 Click the Networking icon () in the bottom-right corner of the screen.

5 Select **Edit Connections…**

6 Select *Auto eth0*.

7 Click **Edit…**

8 Click the **IPv4 Settings** tab.

9 Select *Automatic (DHCP)* or *Manual* for the method.

10 For a manual connection, click **Add** to add an IP address, Netmask, and Gateway for the local network.

11 Click **Save…**

12 Click **Close.**

13 Double-click the *Launch_Touchscreen.sh* icon to launch the TouchScreen application.

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7 — Warranty

Note

For warranty information, please refer to the accompanying Q-LS manual, e.g. MNL120.

Contacting Power Innovations

Customer Support

Questions concerning the operation, repair, or maintenance of this equipment should be directed to the Customer Support Department of PI. When making such an inquiry, please provide the model number, serial number, and detailed description of the issue. To service or repair any product, the customer must obtain Customer Support Ticket number from Customer Support.

Contacting Power Innovations

If there is any question or comment about this product, please feel free to contact us.

Power Innovations International, Inc.

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Fax: (801) 785-6999
Email: support@power-innovations.com