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I31 (Industrial Inverter)



Installation and Operation Manual

This manual is subject to change without notice. You may obtain the newest version of the manual at www.lamarchemfg.com

Important Safety Instructions

Before using this equipment, read all manuals and other documents related to this I31 Inverter and other equipment connected to this unit. Always have a copy of an I31's manual on file nearby, in a safe place; if a replacement copy of a manual is needed, it can be found at www.lamarchemfg.com.

Electrical Safety



WARNING: Hazardous voltages are present at the input of power systems. The output from I31 and batteries may be low in voltage but can have a very high current capacity that may cause severe or even fatal injury.

When working with any live battery or power system, follow these precautions:

- Never work alone on any live power system, someone should always be close enough to come to your aid
- Remove personal metal items such as rings, bracelets, necklaces, and watches.
- Wear complete eye protection (with side shields) and clothing protection.
- Always wear gloves and use insulated hand tools.



WARNING: Lethal voltages are present within the power system. Parts inside the unit may still be energized even when the unit has been disconnected from the input power. Check with a meter before proceeding. Do not touch any parts that are not insulated.

- A licensed electrician should be used in the installation of any unit.
- Always disconnect the unit from the supply, batteries, and loads before performing maintenance or cleaning.
- Always assume that an electrical connection is live and check the connection relative to the ground.
- Be sure that neither liquids nor any wet material come in contact with any internal components.
- Do not operate this unit outside the input and output ratings listed on the unit nameplate.
- Do not use this unit for any purpose not described in the operation manual.

Mechanical Safety

- This unit or parts of the unit may get very hot during normal operation, use care when working nearby.
- Do not expose equipment to rain or snow. Always install in a clean, dry location.
- Do not operate the equipment if it has received a sharp blow, been dropped, or otherwise damaged in any way.
- Do not disassemble this unit. Incorrect re-assembly may result in a risk of electric shock or fire.
- If modifications to the enclosure are necessary, such as drilling for conduit fitting, ensure the interior is protected from metal shavings and debris. Additional precautions should be taken to remove any remaining debris from interior of inverter prior to energizing.

Battery Safety



WARNING: Follow all of the battery manufacturer's safety recommendations when working with or around battery systems. DO NOT smoke or introduce a spark or open flame in the vicinity of a battery. Some batteries generate explosive gases during normal battery operation.

- To reduce the risk of arc, connect, and disconnect the battery only when the unit is off.
- If it is necessary to remove the battery connections, always remove the grounded terminal from the battery first.
- Remove personal metal items such as rings, bracelets, necklaces, and watches.
- Always wear rubber gloves, safety glasses, and a rubber-lined vest/apron when working near a battery.
- Have plenty of freshwater and soap nearby in case the battery electrolyte contacts skin, clothing, or eyes.
- If the battery electrolyte contacts skin or clothing, wash immediately with soap and water.
- If the electrolyte enters the eye, immediately flood the eye with running cold water for at least ten (10) minutes and seek medical attention immediately.
- Do not drop metal on a battery. A spark or short-circuit could occur and could cause an explosion.

Unit Location

- Allow at least 12 inches of free air on all vented surfaces for proper cooling.
- Do not operate this unit in a closed-in area or restrict ventilation in any way.
- Do not set any battery on top of this unit.
- Never allow battery electrolyte to drip on this unit when reading the specific gravity or filling the battery.
- Never place this unit directly above a standard flooded battery. Gases from the battery will corrode and damage equipment.
- A sealed maintenance-free or valve-regulated lead-acid (VRLA) battery may be placed below this equipment.

Check for Damages

Before unpacking the product, note any damage to the shipping container and take pictures. Unpack the product and inspect the exterior and interior of the product for damage. If any damage is observed, take pictures and contact the carrier immediately to file a damage claim. Contact La Marche for a Return Material Authorization number to have the inverter sent back for evaluation and repair.



CAUTION: Failure to properly file a claim for shipping damages or provide a copy of the claim to La Marche, may void warranty service for any physical damages reported for repair.

Returns for Service

Save the original shipping container. If the product needs to be returned for service, it should be packaged in its original shipping container. If the original container is damaged/unavailable, make sure the product is packed with at least three inches of shock-absorbing material to prevent shipping damage. La Marche is not responsible for damage caused by improper packaging of returned products.

Inspection Checklist

- Enclosure exterior and interior is not marred or dented
- There are no visibly damaged components
- All internal components are secure
- Printed circuit boards and their connections are firmly seated
- All hardware and connections are tight
- All wire terminations are secure
- All items on packing list have been included

Handling

Equipment can be very heavy with uneven distribution of weight. Use adequate manpower or equipment for handling. Until the equipment is securely mounted, care must be used to prevent equipment from being accidentally tipped over or dropped.

Table of Contents

| | |
|---|------------|
| Important Safety Instructions | i |
| Table of Contents | iii |
| Model Scope/General Description..... | 1 |
| Understanding the Model Number..... | 1 |
| Optional Accessories Included in The Inverter..... | 1 |
| 1 Equipment Handling..... | 2 |
| 1.1 Storing the I31 | 2 |
| 1.2 Moving the I31 | 2 |
| 2 Installation..... | 2 |
| 2.1 Mounting the I31..... | 2 |
| 2.2 Making the Battery Connections | 3 |
| 2.3 Making the DC Input, AC Bypass & AC Output Connections..... | 4 |
| 2.4 Making the Alarm Connections | 5 |
| 2.4.1 Standard Alarms | 5 |
| 3 User Interface | 7 |
| 3.1 Manual Bypass Switch (MBS) | 7 |
| 3.2 Breakers | 7 |
| 3.3 Display | 7 |
| 4 Operation | 8 |
| 4.1 Checking the Installation | 8 |
| 4.2 Starting/Stopping the I31 | 8 |
| 5 HMI Display..... | 9 |
| 5.1 Header | 9 |
| 5.1.1 Date and Time..... | 10 |
| 5.1.2 Event Log | 10 |
| 5.1.3 Communication Icon | 11 |
| 5.1.4 Inverter On/Off Switch | 11 |
| 5.1.5 Source Driving Load | 12 |
| 5.1.6 Sync Status..... | 12 |
| 5.1.7 Ambient Temperature | 12 |
| 5.2 Alarm & LED Status Window | 12 |
| 5.2.1 Alarm Window..... | 13 |
| 5.2.2 LED Status Window..... | 13 |
| 5.3 User Navigation Window | 15 |
| 5.3.1 Home Tab..... | 15 |
| 5.3.1.1 Module Icons | 15 |
| 5.3.1.2 Power Flow | 17 |
| 5.3.2 Monitoring Tab..... | 18 |
| 5.3.2.1 Battery Section | 18 |
| 5.3.2.3 Inverter Section..... | 19 |
| 5.3.2.4 Bypass Section | 19 |
| 5.3.2.5 UPS Output Section..... | 20 |
| 5.3.2.6 System Section..... | 20 |
| 5.3.3 Configuration Tab | 21 |
| 5.3.3.1 System Setting | 21 |
| 5.3.3.2 Alarm Setting | 25 |
| 5.3.3.3 Restore Default | 28 |
| 5.3.3.4 Upload/Download Setting | 28 |
| 5.3.4 Test Tab..... | 29 |
| 5.3.4.1 Test Individual Relays | 29 |
| 5.3.4.2 Test All Relays..... | 30 |
| 5.3.4.3 Transfer Test..... | 30 |
| 5.3.5 Support Tab | 31 |
| 5.3.5.1 About Company and Contacts | 31 |
| 5.3.5.2 User Manual..... | 31 |
| 6 Service | 32 |

| | |
|--|-----------|
| 6.1 Performing Routine Maintenance..... | 32 |
| Appendix A: I31 Specifications | 33 |
| Appendix B: Power Wiring Guide | 35 |
| Appendix C: Technical Specifications | 36 |
| Appendix D: Manufacturer’s Warranty..... | 37 |
| Appendix E: Document Control and Revision History | 38 |

Model Scope/General Description

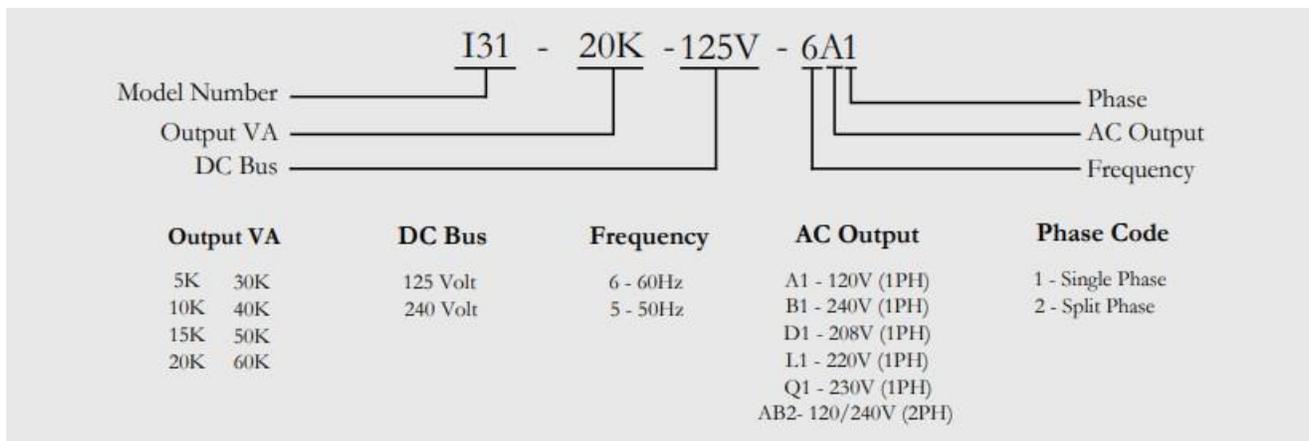
La Marche I31 Industrial Inverter System is designed using IGBT with digital control to ensure reliability. This I31 system maintains power to critical loads during power outages, brownouts, and power spikes. La Marche I31 Inverter system are highly customizable; kVA Rating, Single or Split Phase, Frequency, System and Battery Enclosure Protection, Distribution, and other features. The system's smart controller offers a dynamic color touchscreen mimic panel that displays the power flow through the system and provides visual Alarms and Status indications. This I31 system is equipped with Remote Monitoring, Data Logging, and Battery Test capabilities.



Figure 1 – I31 Overview

Understanding the Model Number

The I31 model number is coded to describe the features that are included. Find the model number on the nomenclature nameplate of the enclosure. Follow the chart below to determine the configuration of the I31.



Optional Accessories Included in The Inverter

This I31 may have been outfitted with a number of optional accessories or option packages. To determine the options included (if any) refer to the cover page of the manual package. If the manual package that is included with the I31 is no longer available, contact La Marche and provide the model or serial number to receive a list of the included accessories.

1 Equipment Handling

1.1 Storing the I31

If the I31 is to be stored for more than a few days after delivery, it should be stored within its shipping container. The location chosen for storage should be within an ambient temperature of 32 to 104° F (0 to 40°C) with a non-condensing relative humidity of 0 to 95%.

NOTE: Storage should not exceed **2 years due to the limited shelf life** of the filter capacitors when they are not in service.

1.2 Moving the I31

After careful inspection and upon verification that the I31 is undamaged, identify the enclosure style and weight of the I31. Refer to Table 1 below.

| | Output VA | Dimensions (inches) (W x D x H) | Dimensions (mm) (W x D x H) | Weight |
|-----|---------------|------------------------------------|--------------------------------|----------|
| I31 | 5kVA – 40kVA | 32" x 36" x 82" | 812.8 x 914.4 x 2082 | 1600 lb. |
| | 50kVA – 60kVA | 64" x 36" x 82" | 1625.6 x 914.4 x 2082 | 2000 lb. |

Table 1 – Case and Weight

2 Installation

2.1 Mounting the I31

When mounting the I31, consider the size and weight of the unit. The floor must be able to support the weight of the unit, as well as an additional safety factor. Verify the weight of the I31 using the table above. The following considerations should be taken:

- The location chosen for the system should be within an ambient temperature range of 32 to 104° F (0 to 40° C) with a non-condensing relative humidity no higher than 95%.
- The I31 should be mounted in an area free of explosive materials and away from drips and splatter.
- The I31 utilizes fan-assisted cooling, so a clearance of at least 6 in (152 mm) of free air must be maintained on the top and bottom for cooling air.
- Maintain 36 in (914 mm) or more of clearance at all sides of the system in order to allow for operation and maintenance.
- The bolts or screws used to secure the I31 should be sufficient length to assure a vibration-free mounting. The preferred fastener is a machine bolt backed with a flat washer, lock washer, and nut.
- All hardware should be corrosion-resistant.

2.2 Making the Battery Connections

Before beginning any work inside the I31, ensure that all incoming AC/DC power is de-energized and/or isolated. Verify that no voltage is present inside the case by using a voltmeter at all input and output terminals. Assure the I31 that is being used is the same number and type of cell as the I31 front nameplate specifications. Select wire size using the table below. This is based on an overload **current of 115%** of the input current listed on the I31 nameplate.

NOTE: Feeder breaker should be sized to match the size of the DC protection used in the I31.

| Breaker Size (Amps) | AWG Minimum Wire Size for AC/DC Connection | AWG Minimum Wire Size for Grounding |
|---------------------|--|-------------------------------------|
| 15 | #14 | #14 |
| 20 | #12 | #12 |
| 25 | #10 | #12 |
| 30 | #10 | #10 |
| 40 | #8 | #10 |
| 50 | #8 | #10 |
| 60 | #6 | #10 |
| 70 | #6 | #8 |
| 80 | #4 | #8 |
| 90 | #4 | #8 |
| 100 | #4 | #8 |
| 125 | #2 | #6 |
| 150 | #1 | #6 |
| 175 | #1/0 | #6 |
| 200 | #2/0 | #6 |
| 250 | #4/0 | #4 |
| 300 | 250 MCM | #4 |
| 400 | 400 MCM | #2 |
| 500 | 600 MCM | #2 |

**Table 2 – AC/DC & Ground Wire Size Minimum Requirements
(All wires specified in the table are rated at 90 °C or 194 °F)**

NOTE: These are recommended sizes per La Marche Standards. The National Electrical Code (NEC) and Local Wiring Codes must be followed.

DC Connection Procedure

Select proper size for the DC wires using the table above. If the distance between the inverter’s DC input and the battery/load exceeds 10 feet, use the Power Wiring Guide in Appendix B to minimize the voltage drop across the wire distance.

Assure all AC/DC circuit breakers are open/OFF. Check polarity of DC input cables and verify with multimeter. The positive battery wire should be connected to the BATTERY (+) terminal and the negative battery wire should be connected to the BATTERY (-) terminal.

NOTE: It is recommended to use a battery disconnect breaker between the I31 and battery bank; helpful during battery or I31 maintenance.

2.3 Making the DC Input, AC Bypass & AC Output Connections

A terminal strip is provided for the DC input, AC bypass line, and AC output. Before making any connections to the I31, ensure that all incoming AC/DC power is de-energized and/or isolated. Verify that no voltage is present inside the I31 by using a voltmeter at all input and output terminals. Check that the utility and bypass source voltage and frequency matches the voltage and frequency listed on the I31 nameplate for the utility source and bypass source.

NOTE: Feeder breakers should be sized to match the size of the AC protections used in unit.

Select wire size for all AC connections using Table 2 based on the circuit breaker size. Connect an adequate earth ground lead (use table on previous page for sizing) to the EARTH terminal.

For the DC Input, connect the DC Input line Positive to the Battery Positive (POS) terminal and the DC Input line Negative to the Battery Negative (NEG) terminal.

For the AC bypass line, connect the AC bypass line phase to the BYPASS (P) terminal and the AC bypass line neutral to the BYPASS (N) terminal.

For the AC load, connect the AC load phase to the OUTPUT (P) terminal and the AC load neutral to the OUTPUT (N) terminal.

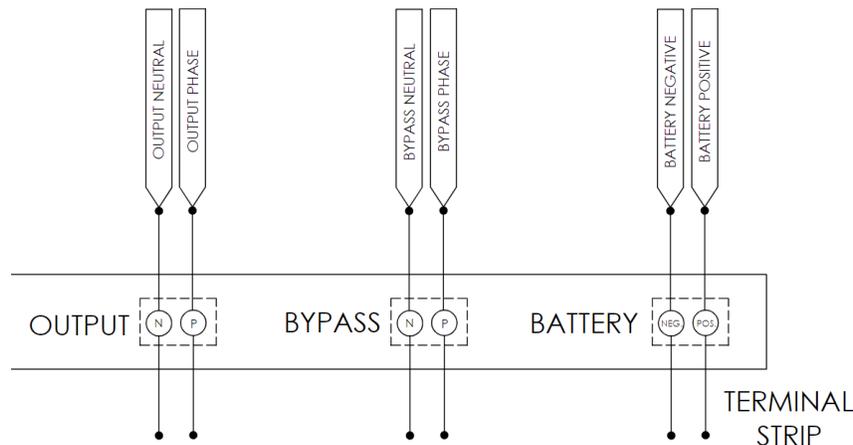


Figure 2 – Example I31 Terminals for 1-Phase Output

NOTE: Assure to perform the power configuration correctly for the incoming AC. Refer to the figures below.

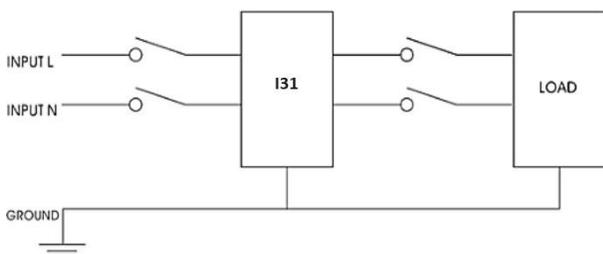


Figure 3 – Correct Power Configuration

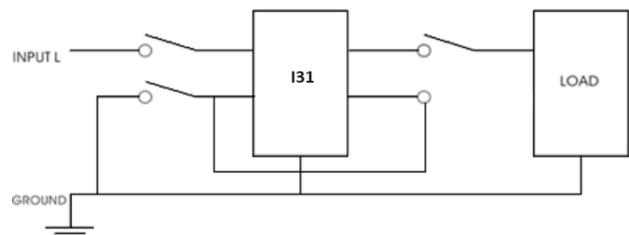


Figure 4 – Incorrect Power Configuration

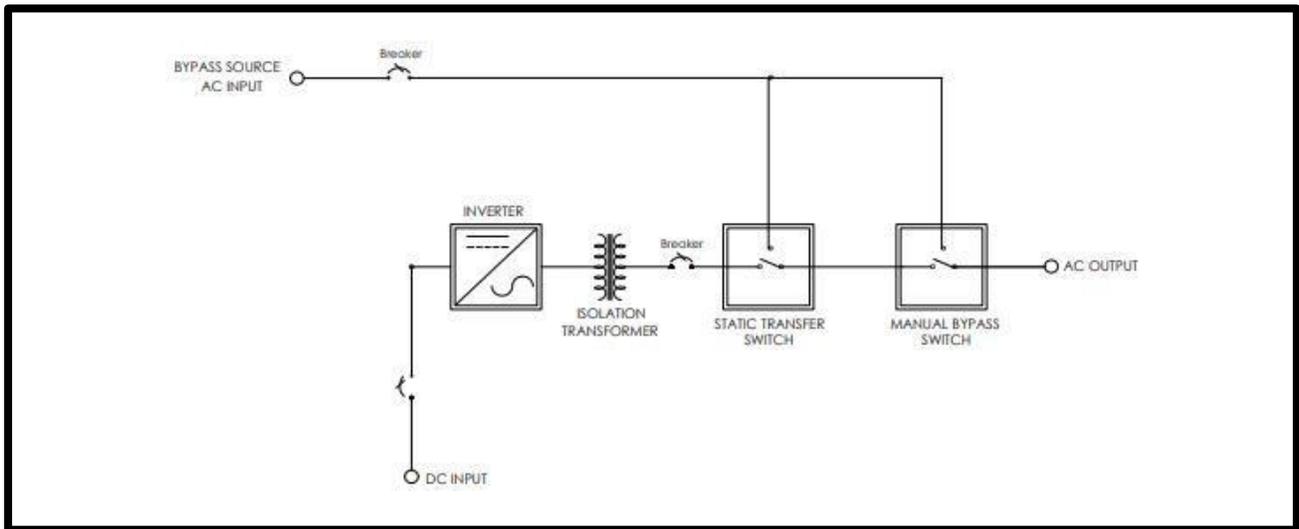


Figure 5 – Standard I31 Block Diagram

2.4 Making the Alarm Connections

2.4.1 Standard Alarms

The I31 includes an alarm relay package which allows additional monitoring for the status of the alarms via alarm contacts on the two S2A-198 relay boards. The relay boards each include 8 sets of form "C" contacts which are accessible on terminals 1 through 48. Each alarm is assigned one set of form "C" contacts, enabling the user to connect remote annunciators using the provided terminals. Refer to Figure 6.

If an alarm condition occurs for longer than 5 seconds, the respective alarm relay will activate. When an alarm activates, the specific indicator on the front panel will light, any connected remote annunciators will activate, and the HMI display will activate the respective alarms.

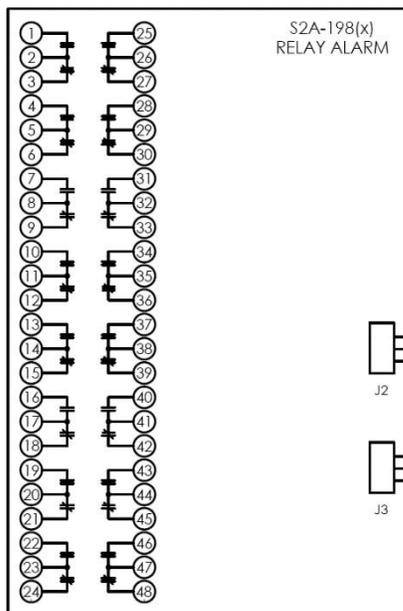


Figure 6 – User Connections to Alarm Contacts

| | |
|---|---------------------------|
| Load | Resistive Load (P.F. = 1) |
| Contact Material | Ag (Au clad) |
| Maximum Allowed Current | 2 A |
| Max. Operating Voltage and Current | 0.5 A at 125 VAC |
| | 0.25 A at 125 VDC |
| | 2 A at 30 VDC |
| Max. Switching Capacity | 62.50 VA |
| | 60 W |
| Min. Permissible Load | 10 μ A, 10 mVDC |

Table 3 – Alarm Contact Specifications

| <u>RELAY NO.</u> | <u>RELAY ALARMS PARAMETER</u> | <u>CONDITION</u> |
|------------------------|-----------------------------------|--------------------------------|
| RELAY 1 | BATTERY ALARM | BATTERY HIGH ALARM |
| | | BATTERY LOW ALARM |
| | | BATTERY OVER TEMP ALARM |
| RELAY 2 | UPS OVERLOAD ALARM | BYPASS OVERLOAD ALARM |
| | | INVERTER OVERLOAD ALARM |
| RELAY 3 | UPS OVER TEMP ALARM | INVERTER OVER TEMP ALARM |
| | | STATIC BYPASS OVER TEMP ALARM |
| RELAY 6 | INVERTER FAIL ALARM | INVERTER OUTPUT VOLTAGE HIGH |
| | | INVERTER OUTPUT VOLTAGE LOW |
| | | INVERTER OFF SHORT CIRCUIT |
| | | INVERTER OFF OPEN CIRCUIT |
| | | INVERTER OFF OVER LOAD |
| | | INVERTER OFF OVER TEMP |
| | | INVERTER OFF BATT LOW |
| INVERTER OFF BATT HIGH | | |
| RELAY 7 | BYPASS FAIL ALARM | BYPASS OFF VOLTAGE LOW |
| | | BYPASS OFF VOLTAGE HIGH |
| | | BYPASS FREQUENCY OUT |
| | | BYPASS OFF OVERLOAD |
| | | BYPASS ABSENT |
| RELAY 8 | BREAKER TRIP ALARM | BATTERY BREAKER TRIP |
| | | OUTPUT BREAKER TRIP |
| | | BYPASS BREAKER TRIP |
| RELAY 9 | COMMUNICATION FAIL | PERIPHERAL TO MAINS CARD COMM |
| | | PERIPHERAL TO STATIC CARD COMM |
| RELAY 10 | HMI FAIL | PERIPHERAL TO HMI COMM |
| RELAY 11 | SUMMARY FAIL | UTILITY/RECTIFIER FAIL ALARM |
| | | UPS OVERLOAD |
| | | BATT OVER TEMP |
| RELAY 13 | FAN FAIL ALARM | FAN 1 FAIL |
| | | FAN 2 FAIL |
| RELAY 14 | SYSTEM ON MANUAL BYPASS | MBS SWITCH |
| RELAY 15 | STATIC SWITCH FAIL | SCR FAIL |

Table 4 – Alarm Relay Assignment and Definitions

NOTE: The logic of all alarm relays is Energize on Failure.

Alarm Connection Procedure

Before making any connections to the I31, ensure that the AC/DC Power is off at the main breaker box and that all of the I31’s breakers are open/off. Verify that no voltage is present by using a voltmeter at all input and output terminals.

If it is desired that the annunciator be active until the alarm triggers, connect the annunciator leads to the **NC** and **C** contacts of the desired alarm. If it is desired that the annunciator be activated after the alarm triggers, connect the annunciator leads to the **NO** and **C** contacts of the desired alarm.

3 User Interface

3.1 Manual Bypass Switch (MBS)

Whenever it is required to run I31 on the bypass source; verify if the system is ready for manual bypass by checking the source sync state on the header of the HMI display. If the display reads "In Sync," the user may turn the manual bypass rotary switch (MBS) from the UPS position to the Bypass position. System running on manual bypass will power the load directly from the bypass and will not travel through the static switch. The load will not operate on the inverter or static switch until the operator turns the MBS to the UPS position. Below are the different MBS selections:

- **UPS Mode:** The I31 output is dependent on the static switch, prioritizing inverter over bypass.
- **Test Mode:** The I31 output is being supplied by the bypass source and allows for troubleshooting.
- **Bypass Mode:** The I31 output is being supplied by the bypass source and allows for servicing.

3.2 Breakers

All breakers in the system connect power from the different sources to the I31 system. The status of the breakers can be seen on the HMI display either from the alarm window or main screen. Below are the definitions of the provided breakers:

- **Battery Breaker:** The breaker which connects the battery to the rectifier and inverter.
- **Bypass Breaker:** The breaker which connects the bypass source to the MBS.
- **Inverter Output Breaker:** The breaker which connects the inverter output to the static switch.

3.3 Display

The display is a capacitive touch type which allows the user to perform the following:

1. Turn the inverter ON/OFF using a touch icon on the home page.
2. View important parameters like input/output/bypass voltage, frequency, power, load%, type of fault (if any trigger), the status of a system like I31 running on mains or bypass or battery source, etc.
3. Personalize (i.e. set their name and password, location, write a small note) the system.
4. Save and configure data logging (power output, power input, load%) of the last 30 days.
5. Set various parameters as desired.
6. Collect and view stored data logs using a USB drive.

For details on all the features, refer to Section 5.

4 Operation

4.1 Checking the Installation

All equipment is shipped from the factory fully checked and adjusted based on the model number. Do not make any adjustments unless the equipment has been powered-up and the settings have been determined to be incorrect.

Before attempting to start up the I31, check and verify that all connections are correct. Check that all terminations and contacts are tightened securely. Check that the battery voltage matches the DC input voltage on the nameplate of the system.

4.2 Starting/Stopping the I31

Once proper connections are established, the I31 may be energized. For proper starting and stopping of the I31, follow the procedures below:

Starting the I31 Procedure

STEP 1: Assure all connections are correctly wired.

STEP 2: Confirm all of the I31 circuit breakers are open/off and MBS is set to UPS.

STEP 3: Close the Battery Breaker.

STEP 4: I31 should ramp up and the HMI display should energize.

STEP 5: On the HMI display, set the Inverter ON/OFF switch to ON.

STEP 6: Close the Inverter Output Breaker.

STEP 7: Close the Bypass Breaker.

Stopping the I31 Procedure

STEP 1: On the HMI display, set the Inverter ON/OFF switch to OFF by navigating to the following menu:

Configuration → Inverter → Inverter OFF/RESET

STEP 2: Open all the I31 AC breakers.

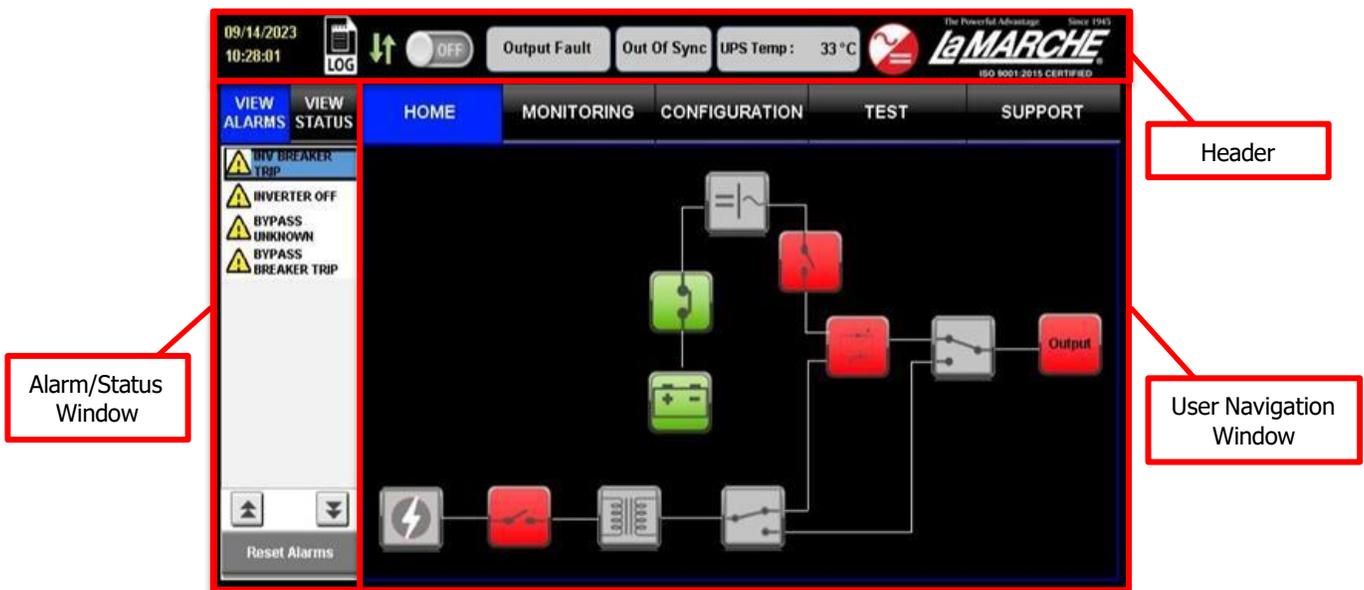
STEP 3: Open all the I31 DC breakers.

5 HMI Display

HMI display is used to run the UI of I31. When the I31 is powered up, the HMI starts with the logo of La Marche as shown below, followed by the main screen after 2 seconds:

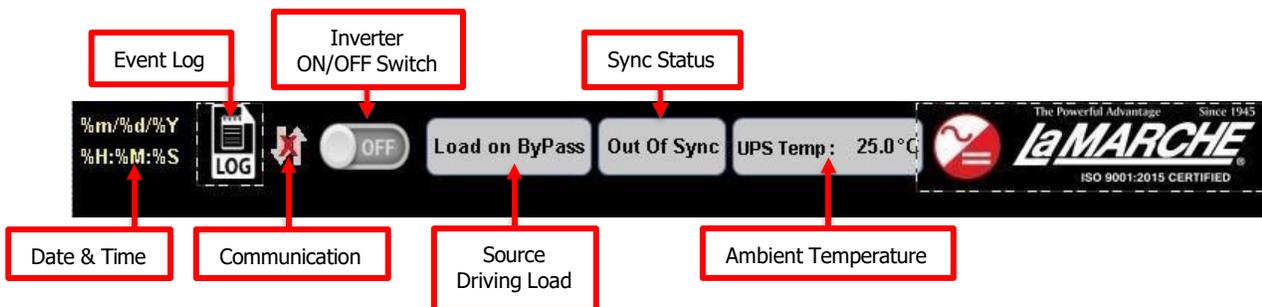


The main page is divided into 3 parts:



5.1 Header

The header is further divided into 7 components as explained below with functions:

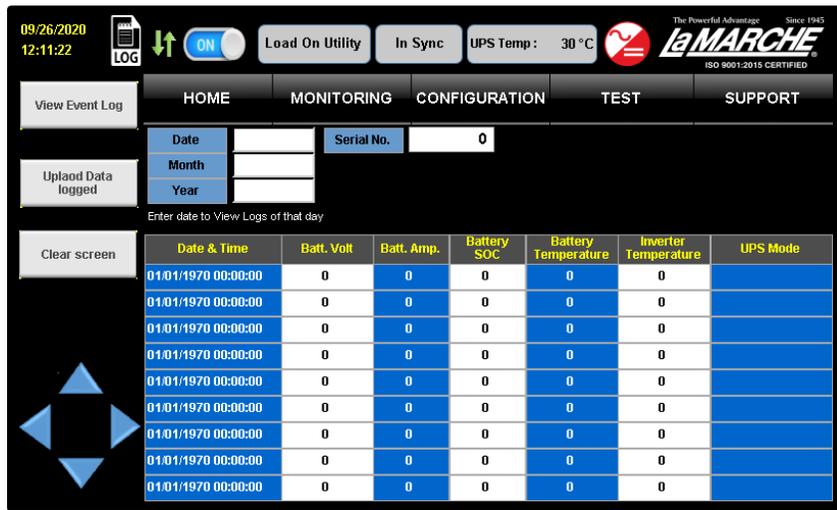


5.1.1 Date and Time

This shows the set current date and time. In case time is incorrect, it may be changed in the System Details under the Configuration tab. Refer to Section 5.3.3.1. As it is not connected to any network, it will not be updated to the standard time. It is advised to set the time when the I31 is powered up for the first time.

5.1.2 Event Log

The Event Log icon allows the user to view the occurring events. The I31 utilizes the user-installed USB drive to log the events, such as triggered alarms, state changes, or faults. Pressing the Event Log icon will open the data logging window, as shown below.



The data log will store the following information under a new Serial Number in the occurrence of an event:

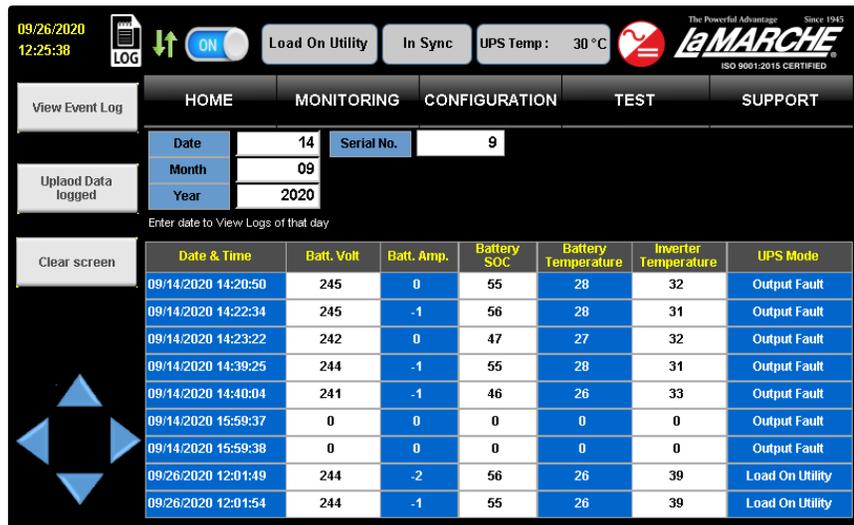
- Date & Time (Time Stamp)
- Battery Voltage
- Battery Amps
- Battery SOC
- Battery Temperature
- Inverter Temperature
- Inverter Mode (Source Driving Load)
- Inverter Voltage
- Inverter Current
- Inverter Frequency
- Bypass Voltage
- Bypass Frequency
- Event Name

NOTE: The USB drive must be installed before powering up the I31 in order for the data logging feature to function. Removing the USB drive will halt the data logging.

Below are the types of events which the I31 will create a data log:

- If inverter state has changed (EX: Inverter has been shut off due to user or fault).
- If bypass source status has changed (EX: Bypass source has been shut off due to user or fault).
- If state of manual bypass switch has changed.
- If state of inverter output breaker has changed.
- If state of battery breaker has changed.
- If fan becomes faulty.
- If load source has changed.

The data logging window displays the logs of the date entered in the text boxes by the user. In order to view the logs, the user must enter the Date, Month, Year, and Serial Number in the corresponding text boxes. Afterwards, the Upload Data Log icon must be pressed to load the data log on-screen. Below is an example of the data log and the information provided:



5.1.3 Communication Icon

The Communication Icon shows the communication status of the HMI display with the I31, it has 2 indications:

| Icon | Description |
|------|--------------------------|
| | Communication is absent |
| | Communication is present |

5.1.4 Inverter On/Off Switch

The Inverter On/Off Switch icon on the HMI header is a switch which has 2 states, ON or OFF. It indicates whether the inverter section of the I31 is on or off. This icon only allows the state of the switch to be changed from OFF to ON, which powers up the inverter in the I31.

To turn OFF the inverter, the user must enter the Configuration window, enter the password, press the Inverter icon under System Setting, and press the the ON icon.

| Icon | Description |
|------|-----------------|
| | Inverter is OFF |
| | Inverter is ON |

5.1.5 Source Driving Load

The Source Driving Load textbox provides information on which source is currently driving the AC load. The messages have a priority assigned in order to display the most critical information in the event of an output fault; 1 and 2. Messages with priority 1 will overwrite any priority 2 message on the textbox. Below are the different messages shown and their priority:

| Source of Load | Priority | Description |
|-----------------------|----------|---|
| Output Fault | 1 | Output Failure |
| Load On Manual Bypass | 2 | Load Is Being Driven by Bypass Source (MBS set to Bypass) |
| Load On Bypass | | Load Is Being Driven by Bypass Source (MBS set to UPS) |
| Load On Battery | | Load Is Being Driven by Battery Source |

5.1.6 Sync Status

The Sync Status textbox indicates the sync status of the inverter output and the bypass supply. It has two possible messages:

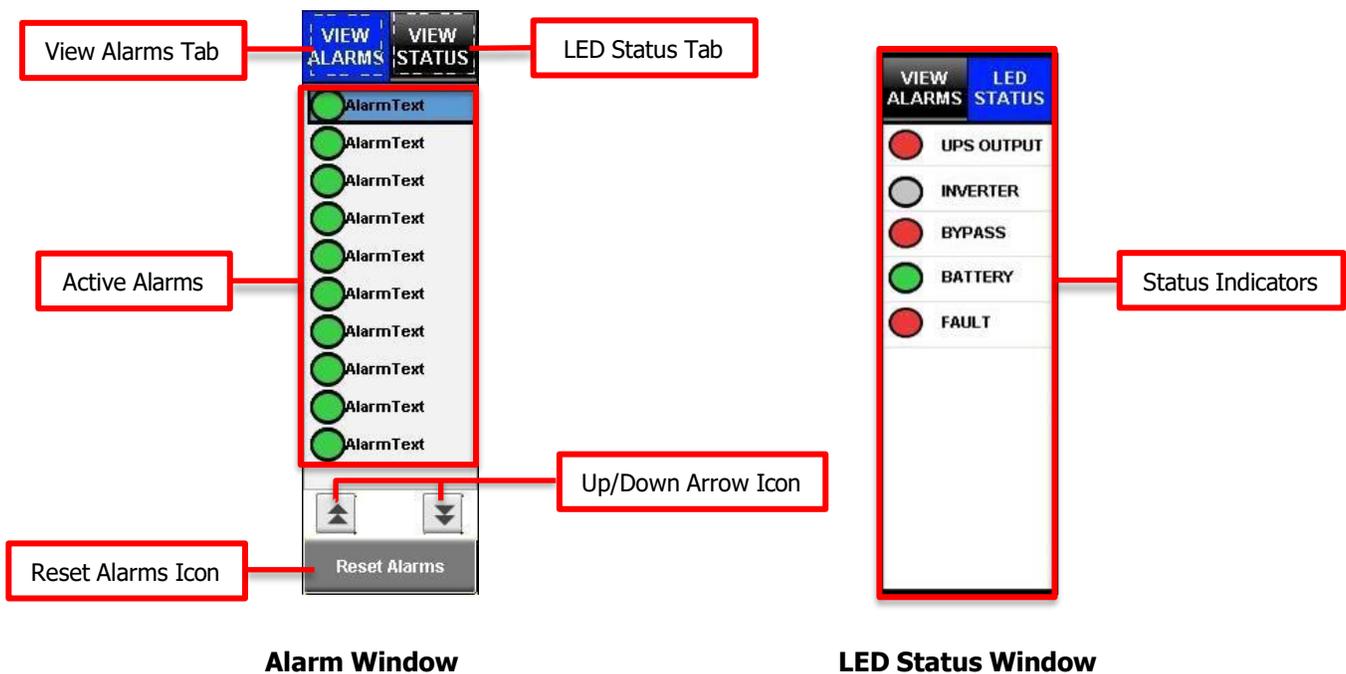
| Message | Description |
|-------------|--|
| In Sync | Inverter and Bypass Output are in Sync |
| Out of Sync | Inverter and Bypass Output are not in Sync |

5.1.7 Ambient Temperature

The Ambient Temperature textbox shows the ambient temperature of the I31 in degrees Celsius.

5.2 Alarm & LED Status Window

This section of the main page is divided into 2 parts: Alarm window and LED Status window.



5.2.1 Alarm Window

The Alarm window allows the user to view the alarms currently active in the I31, as well as reset all the alarms. To view the alarms, press the View Alarms tab and a list of the active alarms will be shown. The arrow icons may be pressed to scroll through the list of alarms if it exceeds the window area. Below is an example layout:

Alarms displayed in these windows have been listed below.

| Alarm Name | Description |
|--------------------------|--|
| Battery High | High Battery Voltage |
| Battery Low | Low Battery Voltage |
| Battery Over Temp | High Battery Temperature |
| Bypass Overload | High Bypass Current |
| Inverter Overload | High Inverter Current |
| Inverter Over Temp | High Inverter Temperature |
| Static Over Temp | High Static Switch SCR Temperature |
| Inverter Voltage High | High Inverter Output Voltage |
| Inverter Voltage Low | Low Inverter Output Voltage |
| Inverter Off Short CKT | Inverter Shutdown due to Short Circuit |
| Inverter Off Open CKT | Inverter Shutdown due to Open Circuit |
| Inverter Off Overload | Inverter Shutdown due to Overload |
| Inverter Off Over Temp | Inverter Shutdown due to Inverter Overtemperature |
| Inverter Off Batt Low | Inverter Shutdown due to Low Battery Voltage |
| Inverter Off Batt High | Inverter Shutdown due to High Battery Voltage |
| Bypass Voltage Low | Low Bypass Voltage |
| Bypass Voltage High | High Bypass Voltage |
| Bypass Freq Out | Bypass Frequency Out of Range |
| Bypass Overload | High Bypass Current |
| Bypass Absent | Bypass Source is Absent |
| Battery Breaker Trip | Battery Breaker tripped |
| Inv. Output Breaker Trip | Inverter Output Breaker tripped |
| Bypass Breaker Trip | Bypass Breaker tripped |
| Main Card Comm Error | Communication failure between mains & peripheral card |
| Static Card Comm Error | Communication failure between static & peripheral card |
| Fan1 Fail | Inverter upper fan is not working properly |
| Fan2 Fail | Inverter lower fan is not working properly |
| UPS on Manual Bypass | MBS set on Manual Bypass |
| Static Switch Fail | Static switch fault |
| Inverter Off Volt High | Inverter Shutdown due to High Inverter Voltage |
| Inverter Off Volt Low | Inverter Shutdown due to Low Inverter Voltage |

5.2.2 LED Status Window

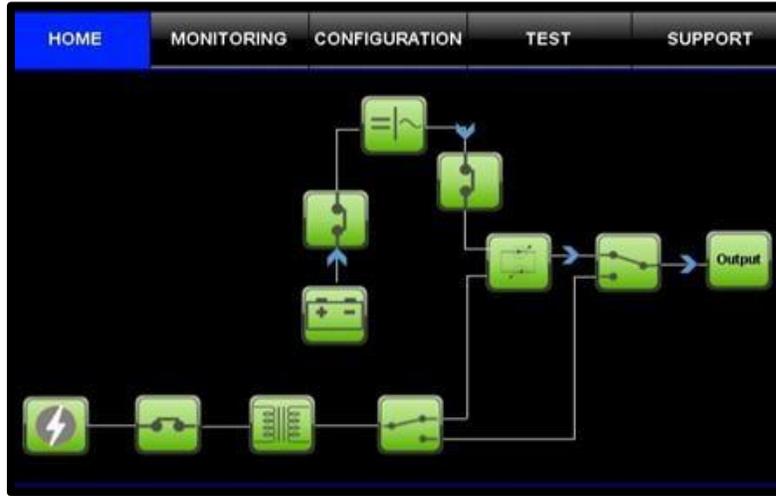
The LED Status window displays the status of various sections of the I31. Below is a table listing the available indicators and their description:

| LED Status Name | Color | Description |
|-----------------|-------|--|
| UPS ON | Green | Output voltage is under normal condition |
| | Red | I31 fault due to output load or source fault |
| | Grey | Communication fault |
| Inverter | Green | Inverter is under normal condition |
| | Red | Inverter output fault |

| | | |
|---------|----------------|---|
| | Grey | Inverter switch is OFF or Communication fault |
| Bypass | Green | bypass source is under normal condition |
| | Red | Bypass section issue |
| | Grey | Bypass source is absent or Communication fault |
| Battery | Green | Battery is fully charged |
| | Red | Low/high battery voltage |
| | Grey | Battery is not connected or Communication fault |
| | Blinking Green | Battery charging in process |
| Fault | Green | Communication is OK |
| | Red | Communication fault |

5.3 User Navigation Window

The User Navigation window is divided into 5 parts: Home, Monitoring, Configuration, Test, and Support. The User Navigation window also displays the status of the I31 in terms of the sources, breakers, and the power flow.



5.3.1 Home Tab

The Home Window shows the status of I31 in the form of different icons, as well as by animating Power Flow.

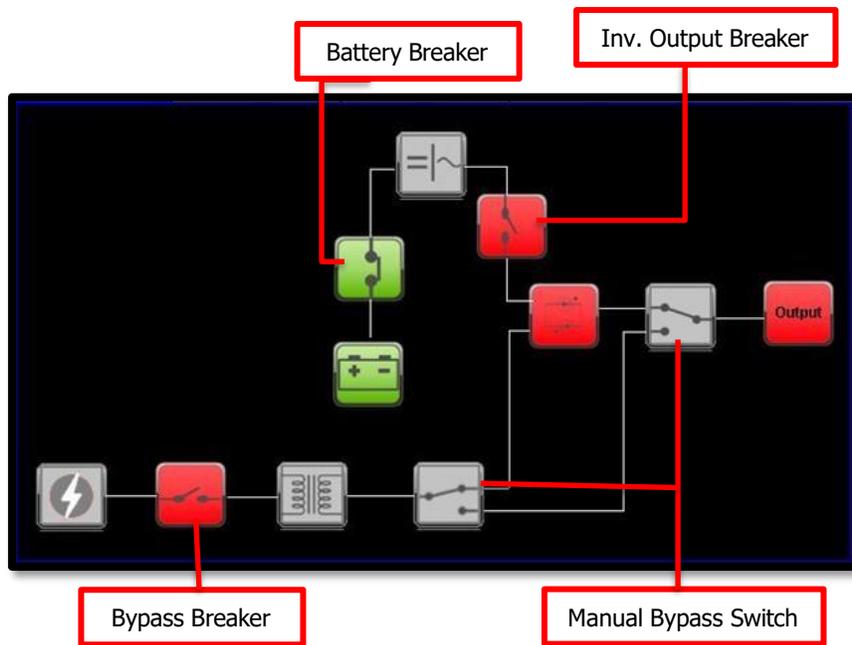
5.3.1.1 Module Icons

The module icons show the status of their respective module in the form of various colors. The module icons are as follows: Inverter, Static Switch, Output, Battery, Bypass Source, Bypass Isolation Transformer.

| Icon | Color | Description |
|------------------------------|---|--|
| Battery | Grey | HMI unable to read status (Communication Lost) or Open Battery Breaker |
| | Red | Low/High Battery Voltage or High Battery Temperature |
| |  | Battery Voltage within range, Closed Contactor & Closed Battery Breaker |
| Static Switch | Grey | HMI unable to read status (Communication Lost) |
| | Red | Static switch is turned OFF by Inverter |
| |  | Static Switch is ON |
| | Orange | If only either the inverter static switch drive or Bypass static switch drive is ON. |
| Bypass Source | Grey | HMI unable to read status (Communication Lost) |
| | Red | Low/High/Absent Bypass Voltage or Bypass frequency is out of range |
| |  | Bypass Voltage, Current & Frequency in range |
| Bypass Isolation Transformer | Grey | HMI unable to read status (Communication Lost) or Open Bypass Breaker |
| | Red | Bypass Source Icon is red and the Bypass breaker is closed |

| | | |
|----------|---|---|
| |  | Bypass Voltage, Current & Frequency in range |
| Inverter | Grey | HMI unable to read status (Communication Lost) or Inverter On/Off switch in the HMI header is OFF |
| | Red | Inverter switch in the HMI header is in ON state and the inverter is in OFF state |
| |  | Inverter is ON |
| | Orange | Inverter Overload, Inverter Overtemperature, Low/High Battery Voltage, High Battery Temperature alarm |
| Output | Grey | HMI unable to read status (Communication Lost) |
| | Red | Output Voltage fault or Open Output Breaker |
| |  | Output Voltage is within expected limits and the Output Breaker is closed |

Other icons left on the home screen are the breaker and switch icons which are described and explained below:

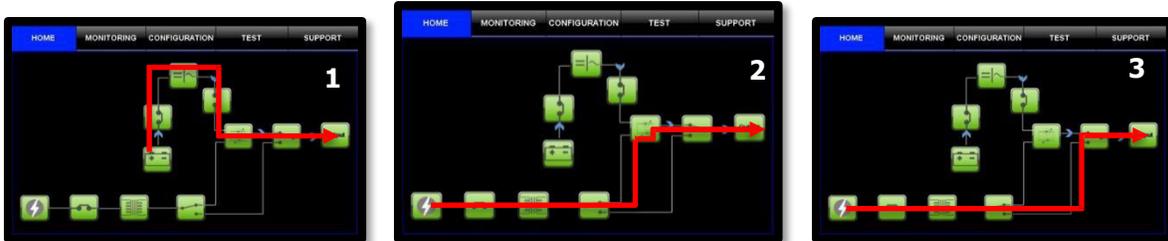


| Icon | Color | Description |
|---|---|--|
| Bypass Breaker / Inv. Output Breaker/ Battery Breaker | Red | Open Bypass Breaker |
| | Green | Closed Bypass Breaker |
| | Grey | HMI unable to read status (Communication Lost) |
| Manual Bypass Switch |  | MBS Switch on UPS |
| |  | MBS Switch on Manual Bypass |

| | | |
|----------------------|-------|---|
| Manual Bypass Switch | Green | Bypass Source is present |
| | Red | Bypass Source is absent |
| | Grey | HMI unable to read status (Communication Lost) or Open Bypass breaker |

5.3.1.2 Power Flow

The home screen also shows Power Flow with animation. The Power Flow is divided into 5 paths and below is the description.



| Path | Figure | Description |
|--|--------|--|
| Battery to Output | 1 | Battery Contactor is closed, Battery in range, Inverter is ON, Static switch on Inverter, MBS in UPS Mode, Output Breaker is closed and Output is OK |
| Bypass to Output Through Static Switch | 2 | Bypass in range, Static switch on Bypass, MBS in UPS Mode, Output Breaker is closed and Output is OK |
| Bypass to Output Through Manual Bypass | 3 | Bypass in range, MBS in Manual Bypass Mode, and Output is OK |

5.3.2 Monitoring Tab

The Monitoring tab allows the user to view important parameters of the I31. These parameters are broadly divided into 5 sections: Battery, Inverter, Bypass, UPS Output, and System.

| BYPASS | | | | BATTERY | | | INVERTER | | | | |
|----------------|-----------------|---|------|---------|-------------------|------------------|----------|----------|-------|------|---------|
| | PH1 | N | PH2 | Unit | | | | PH1 | N | PH2 | Unit |
| Voltage | 0 | 0 | 0 | Vac | Voltage | 120 | Volt | Voltage | 120 | 0 | 119 Vac |
| Current | 0 | | 0 | Amp. | Current | -27.8 | Amp | Current | 23 | 1 | Amp. |
| Freq. | 0.0 | | 0.0 | Hz. | Disch. Elap. time | 2 | min | Freq. | 60.0 | 60.0 | Hz. |
| Breaker | OPEN | | | | Removed Ah | 0.2 | | Temp. | 28 | | °C |
| | | | | | SOC | 51 | % | Bus Volt | 120 | | Vdc |
| | | | | | Ah Rating | 150 | | Breaker | CLOSE | | |
| | | | | | Battery Temp. | 28 | °C | | | | |
| | | | | | Breaker | CLOSE | | | | | |
| UPS OUTPUT | | | | | SYSTEM | | | | | | |
| Voltage | PH1 | N | PH2 | Unit | Model No. | SPLIT I31 | | | | | |
| Current | 120 | 0 | 119 | Vac | Name/ID | LaMARCHE | | | | | |
| Freq. | 23 | | 3 | Amp. | Location | USA | | | | | |
| Active Power | 60.0 | | 60.6 | Hz. | Serial No. | I31-15K-125V-6A2 | | | | | |
| Apparent Power | 2.7 | | 0.1 | KW | | | | | | | |
| Power Factor | 2.7 | | 0.3 | KVA | | | | | | | |
| Source | 0.99 | | 0.43 | | | | | | | | |
| | Load On Battery | | | | | | | | | | |

On the touch of any of the sections under the Monitoring tab, the respective pop up appears. Below are sections in detail.

5.3.2.1 Battery Section

The Battery screen displays parameters relating to the battery. Below is the Battery screen, which appears after pressing on the Battery box on-screen when in the Monitoring tab. The description of each parameter is also shown below:

| ← BATTERY | | |
|-------------------|-------|------|
| Voltage | 119 | Volt |
| Current | -27.8 | Amp |
| Disch. Elap. time | 1 | min |
| Removed Ah | 0.4 | |
| SOC | 49 | % |
| Ah Rating | 150 | |
| Battery Temp. | 27 | °C |
| Breaker | CLOSE | |

| Parameter | Description | Unit |
|------------------------|--|-------------|
| Voltage | Battery Voltage | Volts |
| Current | Battery Current (+ if Charging, – if Discharging) | Amps |
| Discharge Elapsed Time | Time since Battery began Discharging | Minutes |
| Removed AH | Amp-hours Used Since Full Charge | Ah |
| SOC | Battery State of Charge | % |
| Ah Rating | Battery Amp-hour Rating (Set in The Configuration) | Ah |
| Battery Temperature | Battery Temperature (via Temp Comp Probe) | °C |
| Breaker | Battery Breaker Status | Closed/Open |

5.3.2.3 Inverter Section

The Inverter screen displays parameters relating to the inverter. Below is the Inverter screen, which appears after pressing on the Inverter box on-screen when in the Monitoring tab. The description of each parameter is also shown below:

| ← INVERTER | | | |
|----------------|-------|-----|----------|
| Phase | PH1 | N | PH2 Unit |
| AC Voltage | 120 | 0 | 119 Vac |
| AC Current | 23 | | 1 Amp. |
| Freq. | 60.1 | | 60.1 Hz. |
| Inverter Temp. | | 28 | °C |
| DC Bus Voltage | | 119 | Vdc |
| Breaker | CLOSE | | |

| Parameter | Description | Unit |
|----------------------|---|-------|
| Voltage | Inverter Output Voltage | Volts |
| Current | Inverter Output Current | Amps |
| Frequency | Inverter Output Frequency | Hz |
| Inverter Temperature | Inverter Temperature (via internal probe) | °C |
| DC Bus Voltage | DC Operating Voltage | Volt |
| Breaker | Show status of Inverter Breaker | |

5.3.2.4 Bypass Section

The Bypass screen displays parameters relating to the bypass source. Below is the Bypass screen, which appears after pressing on the Bypass box on-screen when in the Monitoring tab. The description of each parameter is also shown below:

| ← BYPASS | | |
|-----------|-----|------|
| Voltage | 0 | Volt |
| Current | 0 | Amp |
| Frequency | 0.0 | Hz |
| Breaker | ABC | |

| Parameter | Description | Unit |
|-----------|-------------------------|-------------|
| Voltage | Bypass Source Voltage | Volts |
| Current | Bypass Source Current | Amps |
| Frequency | Bypass Source Frequency | Hz |
| Breaker | Bypass Breaker Status | Open/Closed |

5.3.2.5 UPS Output Section

The UPS Output screen displays parameters relating to the output. Below is the UPS Output screen, which appears after pressing on the UPS Output box on-screen when in the Monitoring tab. The description of each parameter is also shown below:

| UPS OUTPUT | | | | |
|----------------|-----------------|---|------|------|
| Phase | PH1 | N | PH2 | Unit |
| Voltage | 120 | 0 | 119 | Vac |
| Current | 23 | | 3 | Amp. |
| Freq. | 59.9 | | 60.6 | Hz. |
| Active Power | 2.7 | | 0.1 | KW |
| Apparent Power | 2.7 | | 0.3 | KVA |
| Power Factor | 1.00 | | 0.38 | P.F |
| Source | Load On Battery | | | |

| Parameter | Description | Unit |
|--------------|-------------------------|-------|
| Source | Source Driving the Load | |
| Voltage | Output Voltage | Volts |
| Current | Output Current | Amps |
| Frequency | Output Frequency | Hz |
| Active Power | Output Active Power | KW |
| Power Factor | Output Power Factor | |

5.3.2.6 System Section

The System screen displays parameters relating to the I31 system. Below is the System screen, which appears after pressing on the System box on-screen when in the Monitoring tab. The description of each parameter is also shown below:

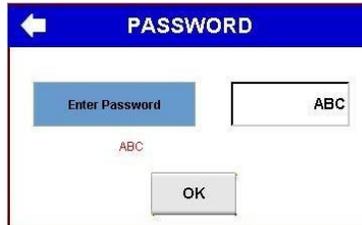
| SYSTEM | |
|------------|-----|
| Model No. | ABC |
| Name/ID | ABC |
| Location | ABC |
| Serial No. | ABC |

| Parameter | Description |
|---------------|---------------------------|
| Model Number | I31 Factory Model Number |
| Name/ID | System Name |
| Location | I31 Location Name |
| Serial Number | I31 Factory Serial Number |

5.3.3 Configuration Tab

The Configuration tab contains all the user settings for I31. The Configuration section of the I31 is password-protected. Once the Configuration tab is pressed, the password dialog box will appear as shown below and will request the password to gain access. The default password is 1188 and is customizable through the Configuration section.

To enter the password, press the blank text box and use the on-screen keyboard to type the password. Afterwards, press the Enter key on the on-screen keyboard and the OK icon.

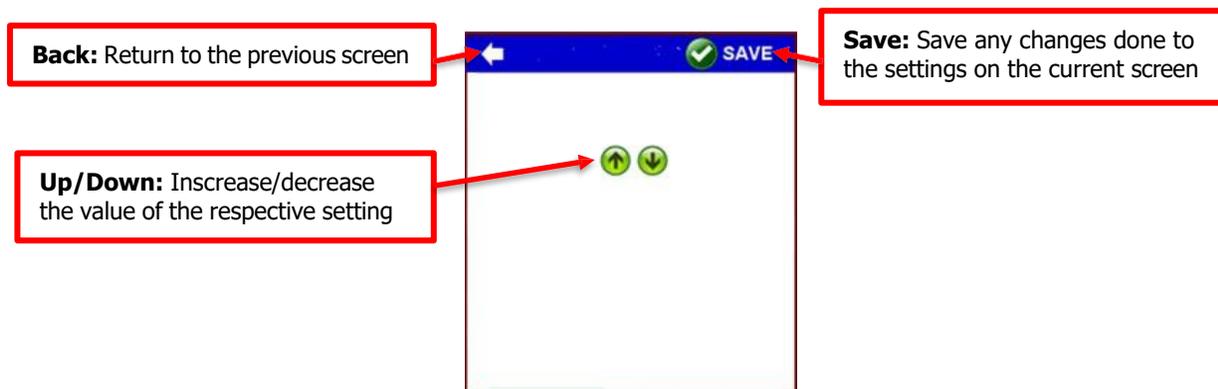


The Configuration tab is divided broadly into 4 parts: System Settings, Alarm Settings, Restore Default, and Upload/Download Settings.



5.3.3.1 System Setting

The System Setting section contains the user settings of I31. The System Setting has the following subsections: System Details, Inverter, Battery, Static Switch, Communication, and Log Window. Each section has a respective pop-up on touch and the settings would appear to the user. Each pop-up will have few functions in common which is explained below.



System Details

Pressing the System Details icon on the Configuration tab will have the below pop-up appear. It contains basic settings of the system as listed and explained in the table.

| Parameter | Unit | Valid Values | Default Value | Description |
|-----------------------|-----------------------------|---------------------------|---------------|--|
| Name/ID | NA | Char string | | System Name (displaying purposes) |
| Location | NA | Char string | | System Location (displaying purposes) |
| Date and Time | DD/MM/YYYY- HH:MM: AM/PM | -- | -- | HMI date and time |
| Display Timeout | Hours | 1-60 | 5 | Screen Saver Mode Time Delay At 0, screen saver is disabled |
| Password | NA | 4-Digit Numeric String | 1188 | Set Password for I31 configuration |
| Output Breaker Option | | Yes/No | | Select if Output Breaker is/isn't used in I31 |

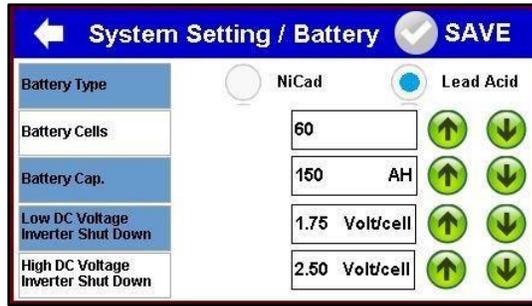
Inverter

Pressing the Inverter icon on the Configuration tab will have the below pop-up appear. It contains Inverter settings as listed and explained in the table.

| Parameter | Unit | Valid Values | Default Value | Steps | Description |
|--------------------|----------|--------------|---------------|-------|---|
| Output Voltage | AC Volts | 110-130 | 120 | 10 | Inverter Output Voltage |
| Inverter OFF/RESET | | OFF only | | | Inverter ON/OFF switch to power off inverter output |

Battery

Pressing the Battery icon on the Configuration tab will have the below pop-up appear. It contains Battery settings as listed and explained in the table below. It also contains the settings of High DC Shutdown and Low DC Shutdown alarm.

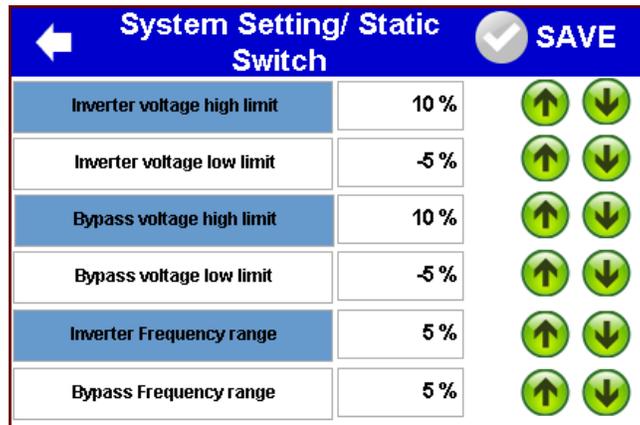


| Parameter | Unit | Valid Values | Default Value | Steps | Description |
|----------------------------------|-----------|---------------------------|-----------------|-----------|--|
| Battery Type | - | NiCad/LA | LA | Check box | Battery type |
| Battery Cell | - | 58-60L, 92-98N | 60L, 96N | 1 | Number of battery cells to be charged |
| Battery Capacity | Ah | 10-250 | 110 | 1 | Battery amp-hour rating |
| Low DC Voltage Inverter Shutdown | Volt/Cell | 1.60-1.85L, 0.95-1.10N | 1.75L, 1.00N | 0.01 | Minimum allowable DC voltage for inverter to shut down |
| High DC Voltage System Shutdown | Volt/Cell | 2.40-2.75L 1.45-1.80N | 2.50L, 1.65N | 0.01 | Maximum allowable DC voltage for inverter to shut down |

NOTE: L/LA – Lead Acid, N – NiCad.

Static Switch

Pressing the Static Switch icon on the Configuration tab will have the below pop-up appear. It contains Static Switch settings as listed and explained in the table below:

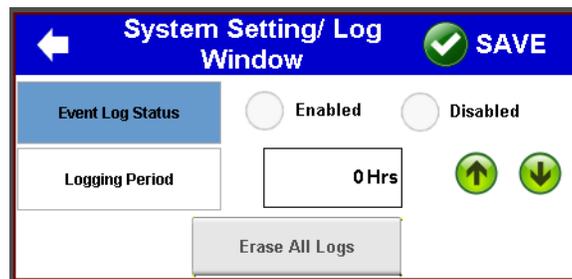


| Parameter | Unit | Valid Values | Default Value | Description |
|-----------------------------|-------|--------------|---------------|---|
| Inverter Voltage High Limit | %(+) | 0-10 | 10 | Maximum acceptable inverter voltage before it is deemed unavailable. Static switch will transfer to bypass source if available. |
| Inverter Voltage Low Limit | % (-) | -10-0 | -5 | Minimum acceptable inverter voltage before it is deemed unavailable. Static switch will transfer to bypass source if available. |

| | | | | |
|---------------------------|-------------|-------|----|---|
| Bypass Voltage High Limit | % (+) | 0-15 | 10 | Maximum acceptable bypass voltage before it is deemed unavailable. Static switch will transfer to inverter source if available. |
| Bypass Voltage Low Limit | % (-) | -20-0 | -5 | Minimum acceptable bypass voltage before it is deemed unavailable. Static switch will transfer to inverter source if available. |
| Inverter Frequency Range | % (\pm) | 1-5 | 5 | Acceptable inverter frequency range before it is deemed unavailable. Static switch will transfer to bypass source if available. |
| Bypass Frequency Range | % (\pm) | 1-5 | 5 | Acceptable bypass frequency range before it is deemed unavailable. Static switch will transfer to inverter source if available. |

Log Window

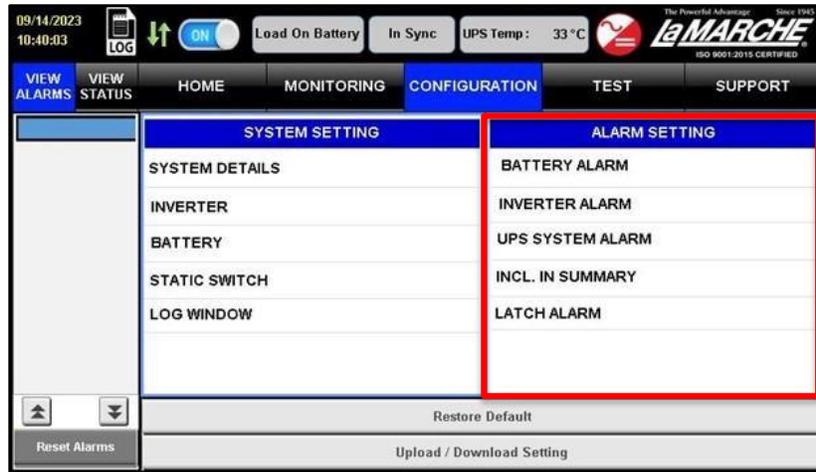
Pressing the Log Window icon on the Configuration tab will have the below pop-up appear. It contains Log Window settings as listed and explained in the table below:



| Parameter | Unit | Valid Values | Default Value | Steps | Description |
|------------------|------|----------------|---------------|-------|---|
| Event Log Status | | Enable/Disable | Enable | | Enable or disable event logging by timer |
| Logging Interval | Hrs. | 1-60 | 5 | 1 | Time interval after which data would be logged in the event log |
| Erase All Logs | | | | | Erase all event logs |

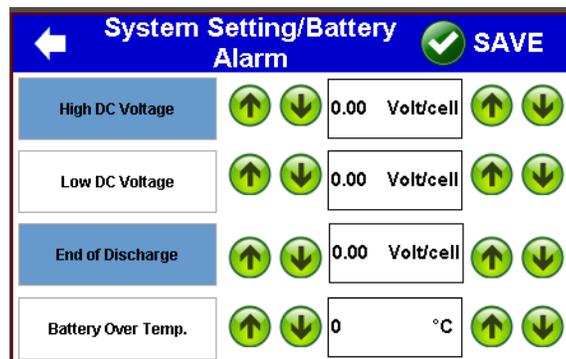
5.3.3.2 Alarm Setting

The Alarm Setting section includes all the configurable alarm settings. The Alarm Setting has the following subsections: Battery Alarms, Inverter Alarms, UPS System Alarms, and Included in Summary. Each section has a respective pop-up on touch and the settings would appear to the user as explained below.



Battery Alarm

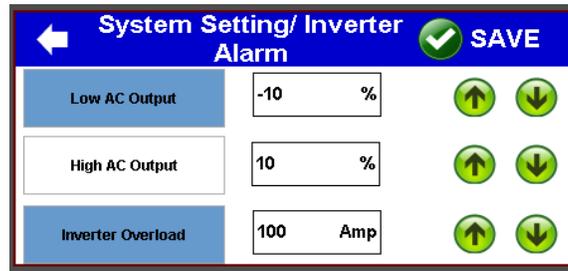
The Battery alarm section contains settings of alarms related to the Battery. On touch, a pop-up menu appears as below:



| Parameter | Unit | Valid Values | Default Value | Steps | Description |
|--------------------|-----------|---------------------------|---------------|-------|---|
| High Voltage | Volt/Cell | 2.20-2.70L 1.44-1.76N | 2.45L, 1.60N | 0.01 | Battery High Voltage Alarm Threshold (Rectifier and Inverter will shutdown) |
| Low Voltage | Volt/Cell | 1.78-2.18L, 1.08-1.78N | 1.98L-1.20N | 0.01 | Battery Low Voltage Alarm Threshold |
| End of Discharge | Volt/Cell | 1.60-1.85L, 0.95-1.10N | 1.75L, 1.00N | 0.01 | Battery End of Discharge Alarm Threshold (Rectifier and Inverter will shutdown) |
| Battery Over Temp. | °C | 50-90 | 60 | 1 | Battery Over Temperature Alarm Threshold |

Inverter Alarm

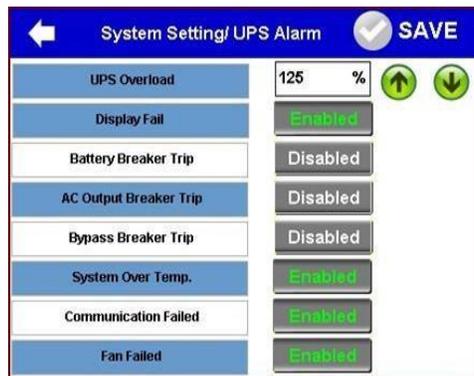
The Inverter Alarm section contains settings of alarms related to the Inverter. On touch, a pop up appears. The section is explained below.



| Parameter | Unit | Valid Values | Default Value | Description |
|-------------------|------|--------------|---------------|--|
| Low AC Output | % | -5 to -15 | -10 | Inverter Output Voltage Low Alarm Threshold |
| High AC Output | % | 5-10 | 10 | Inverter Output Voltage High Alarm Threshold |
| Inverter Overload | % | 70-115 | 100 | Inverter Current Overload Alarm Threshold |

UPS System Alarm

I31 System alarms contain the setting of relay alarms connected to UPS and are provided for external indicators or alarms to be connected. On touch, a pop up appears. The section is explained below.



| Parameter | Valid Values | Default Value | Description |
|------------------------|------------------|---------------|--|
| UPS Overload | 70-135% | 125% | UPS (Inverter/Bypass) Current Overload Alarm Threshold |
| Display Fail | Enable / Disable | Enable | HMI Display to I31 Communication Failure Alarm Enable |
| Battery Breaker Trip | Enable / Disable | Disable | Battery Breaker Open/Trip Alarm Enable |
| AC Output Breaker Trip | Enable / Disable | Disable | AC Output Breaker Open/Trip Alarm Enable |

| | | | |
|---------------------|------------------|---------|---|
| Bypass Breaker Trip | Enable / Disable | Disable | Bypass Breaker Open/Trip Alarm Enable |
| System Over Temp. | Enable / Disable | Enable | UPS (Inverter) Over Temperature Alarm Enable |
| Comm. Failed | Enable / Disable | Enable | Peripheral to Mains/Static Switch Board Comm. Fail Alarm Enable |
| Fan Failure | Enable / Disable | Enable | Fan 1 & 2 Failure Alarm Enable |

Incl. In Summary

The Include in Summary alarm section gives the setting of alarms to be added in the summary alarm (i.e. One of the relays alarms are Summary Alarm). If any of the selected alarm in this section will turn on then a summary alarm will turn ON.



| Parameter | Valid Values | Default Value | Description |
|--------------------------|--------------|---------------|--|
| Low DC Current | YES/NO | Yes | Activating the Low DC Current Alarm will activate the Summary Alarm |
| Overload | YES/NO | Yes | Activating the Overload Alarm will activate the Summary Alarm |
| Battery Over Temperature | YES/NO | Yes | Activating the Battery Over Temp Alarm will activate the Summary Alarm |

Latch Alarm

The Latch Alarm are some alarms which should be latch once triggered. On touch, a pop-up menu appears as below:



5.3.3.3 Restore Default

The Restore Default icon allows the user to reset the I31 system settings in the Configuration tab to its factory default.

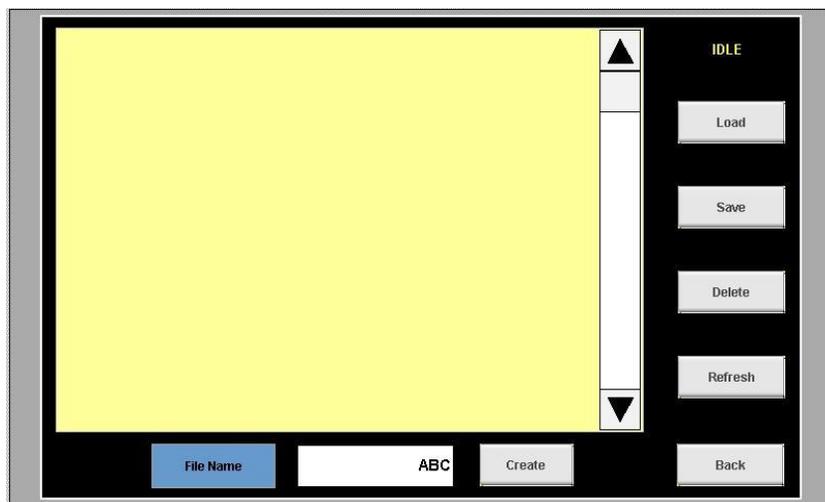


5.3.3.4 Upload/Download Setting

The Upload/Download Setting icon allows the user to load or save the configuration file. This allows for the user to copy and load the settings to multiple I31, as well as allowing to keep a copy/record of the current settings for back up purposes.



To access the Upload/Download Setting screen, press on the Upload/Download Setting icon. The screen shown on the next page will appear. The available functions of the screen are as follows:



- **Directory Display:** Displays a list of saved configuration files on the connected USB drive.
- **Load:** Loads the configuration file saved on the connected USB drive.
- **Save:** Creates a configuration file of the current settings and stores the file on the connected USB drive.
- **Delete:** Deletes the currently selected configuration file.
- **Refresh:** Refreshes the directory display to show a list of saved configuration files on the connected USB drive.
- **Back:** Closes the Upload/Download Setting screen.
- **File Name:** The name of the configuration file to be created.
- **Create:** Creates a configuration file of the current settings and stores the file in the connected USB drive.

Loading and saving configuration files can be done by connecting a USB drive to the back of the HMI display; accessible by opening the front panel. Once connected, press the Refresh icon and a list of all configuration files stored in the USC drive will appear on the Directory Display.

To load, save, or delete a configuration file, press the desired configuration file shown on the Directory Display and then press the desired function.

To create a configuration file of the current I31 settings, press the white textbox beside the File Name icon to type a name for the configuration file using the pop-up keyboard. Once the file name has been typed, press the Create icon to create the configuration file.

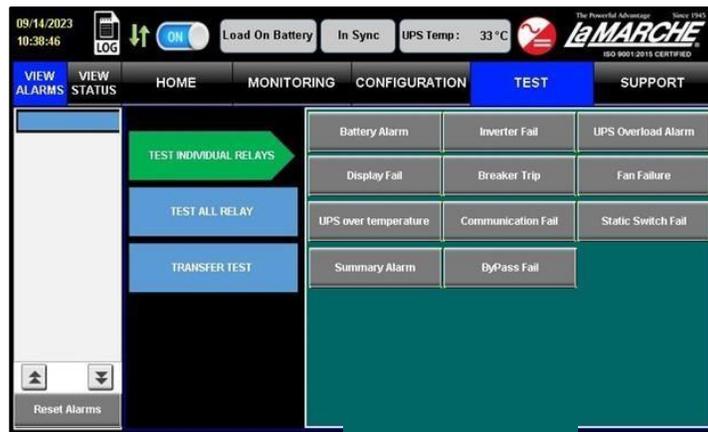
When interacting with the connected USB drive, one of the two following messages will appear:



The USB Error message will appear when there is an error with the USB drive (EX: Corrupted or faulty USB drive). The Data Saved/Loaded Successfully message will appear when the saving or loading process with the USB drive has been successful.

5.3.4 Test Tab

The Test Tab allows the user to perform test for the alarm relays, as well as a transfer test. The Test tab is further divided into 4 sections; Test Individual Relays, Test All Relays, Transfer Test, and Battery Test. Each section will be explained in further details below.



5.3.4.1 Test Individual Relays

The Test Individual Relays section is made to let the user check the individual relay alarm connected to the I31. On each relay, an alarm is printed with a name according to related connection. The list of individual relays is:

- Battery Alarm
- Display Fail
- UPS Overload Alarm
- UPS Over Temperature
- Inverter Fail
- Bypass Fail
- Breaker Trip
- Communication Fail
- Summary Alarm
- Fan Failure
- Static Switch Fail

The relay assignment and conditions to trigger are shown on Table 4 under Section 2.4.1 for reference. Pressing on one of the alarm icons will change the state of the selected relay, whether it will energize or de-energize, and the icon will become orange. To end the relay test, press on the orange alarm icon.

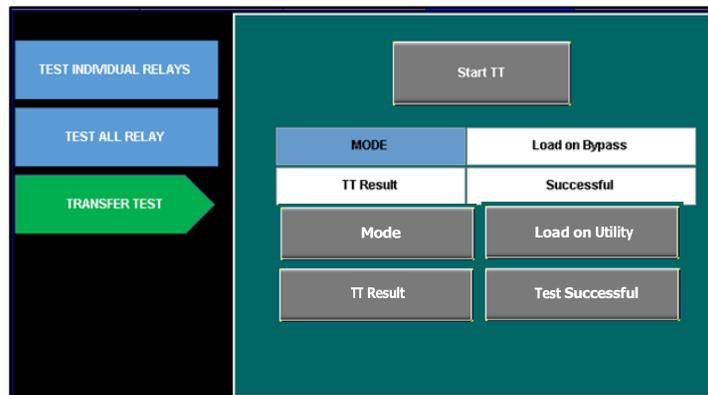
5.3.4.2 Test All Relays

The Test All Relays section allows the user to test all the alarm relays included in the I31. To test all relays, Press the All Relay Test icon. The state of all alarm relays will change, whether it will energize or de-energize, and the All Relay Test icon will become orange. To end the relay test, press on the All Relay Test icon once again.



5.3.4.3 Transfer Test

The Transfer Test section allows the user to transfer the load from inverter to Bypass or vice versa. It has 2 buttons.



The Mode field will display a message whether the load is on utility or bypass. The TT Result field will display the previous Transfer Test's result. On pressing Start TT, the transfer of source for the connected load will start. The load will be transferred from its current source to the other source, if available. The TT Result field will display one of the 3 following messages:

- **Test Successful:** Transfer test was successful.
- **Bypass Source Fail:** Transfer test has failed due to bypass source issue or absent bypass source.
- **Inverter Fail:** Transfer test has failed due to inverter source issue or absent inverter source.

If the transfer test is initiated without inverter source, the If the present load source is an inverter, then the system will transfer the connected load to Bypass and vice versa in other cases.

5.3.5 Support Tab

The Support tab gives information about La Marche Mfg Company and I31. The tab has only 2 sections: About Company & Contacts and User Manual. The sections will go into further detail below.



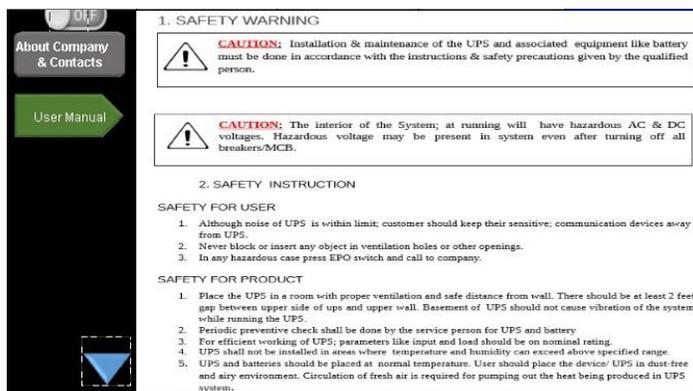
5.3.5.1 About Company and Contacts

The About Company and Contacts section provides a summary about the company La Marche, as well as contact information.



5.3.5.2 User Manual

The User Manual section to view general information regarding the system.



6 Service

All work inside the I31 system should be performed by qualified personnel. La Marche is not responsible for any damages caused by an unqualified technician.



Before working inside the I31, ensure the MBS is set to bypass, all power is off at the main breaker panel and the battery has been removed from the I31's battery terminals, either by removing the battery cables or exercising the battery disconnect.

6.1 Performing Routine Maintenance

Although minimal maintenance is required with the I31, routine checks and adjustments are recommended to ensure optimum system performance.

Yearly

- Confirm air vents are open. Remove dust and debris from interior of unit.
- Verify all connections are tight.
- Perform a visual inspection on all internal components.
- Check front panel meters for accuracy and LED operation.
- Review data logging for any alarm occurrences within the past months.

7th Year

- If the I31 is consistently operated in higher temperature environments, all capacitors are recommended to be replaced.

10th Year

- Check magnetics, components and wiring for signs of excessive heat.
- It is recommended to replace all capacitors if not done so at the 7-year interval.

Appendix A: I31 Specifications

| | | |
|------------------------|---|--|
| INVERTER OUTPUT | UPS kVA Rating | (Up to 60) kVA |
| | AC Output Voltage | 1 Phase: 120Vac, 208Vac, 220Vac, 230Vac & 240Vac Split Phase: 120/240Vac (2PH, 3W) |
| | Output voltage stability (0-100% load variation) | Static Balanced Load +/-1% Static Unbalanced Load +/-2% Dynamic Load +/- 3% |
| | Output Frequency | 60Hz +/-0.1% |
| | Frequency Stability | Free Running +/-0.1% Mains sync +/-3% |
| | Total Harmonic Distortion | With 100% linear load: <3% With 100% non-linear load: <7% (nonlinear load defined by IEC 62040) |
| | Efficiency | 80-85% |
| | Inverter Overload Capacity | 105% for 60 mins 125% for 10 mins 150% for 1 min >150% for 200mS |
| | Load Power Factor | 0.8 lagging to 0.8 leading |
| | Output Crest Factor Admissible | 3:1 |
| DC LINK | DC Voltage | 120Vdc 240Vdc |
| | DC Voltage Range | (105-150) Vdc (220-264) Vdc |
| | Inverter DC Input Voltage Range | -20% / 18% |
| STATIC SWITCH | kVA Rating | 125% of system Rating |
| | Transfer Time | <4mS |
| | Overload Capacity | 125% for Continuous 150% for 10 minutes 200% for 1 minute 1000% for 1 cycle |
| MANUAL BYPASS | Switch Type | Rotary Switch (3 Positions – UPS, Test and Bypass) |
| | Switching | Make Before Break |
| PROTECTION | Protection | Output Under Voltage, Output Over-Voltage, Battery Over Charging, Input in Rush Current Protection by soft start as well as pre-charge circuit, Output Over Load, Battery Under Voltage, DC Over Voltage, Output Short Circuit |

| | | |
|----------------------|-----------------------------|---|
| ENVIRONMENTAL | Ambient Temperature | 0 ⁰ to 40 ⁰ C (32 ⁰ to 104 ⁰ F) |
| | Relative Humidity | 0-95% non-condensing |
| | Operating Altitude | Up to 1000 meters without derating the output |
| | Noise Level | 65-70 dBA @ 1 meter |
| MECHANICAL | Enclosure Color | ANSI Grey or as Requested |
| | Cooling | Fan assisted (kVA rating dependent) |
| | External Protection | IP20 as standard (others available upon request) |
| | Dimensions | According to ratings and options |
| | Compliance (pending) | UL 1778 NEMA PE1 IEC 62040-1/-2/-3 FCC Part 15 Class A |

Appendix B: Power Wiring Guide

Use the following formulas and table to determine proper wire size for minimal voltage drop. At distances exceeding 10 feet, the DC wire size should be chosen to keep the voltage difference between the I31's DC input terminals and the battery at less than 1/2 volt when the I31 is fully loaded.

Table of Conventions:

CMA = Cross section of wire in circular MIL area

A = Ultimate drain in amps

LF = Conductor loop feet

MaxAmp= Maximum allowable amps for given voltage drop

AVD = Allowable voltage drop

K = 11.1 for commercial (TW) copper wire

= 17.4 for aluminum

Calculating Wire Size Requirements:

$$CMA = \frac{A \times LF \times K}{AVD}$$

| Size (AWG) | Area CIR.MILS | Size (MCM) | Area CIR.MILS |
|------------|---------------|------------|---------------|
| 18 | 1620 | 250 | 250000 |
| 16 | 2580 | 300 | 300000 |
| 14 | 4110 | 350 | 350000 |
| 12 | 6530 | 400 | 400000 |
| 10 | 10380 | 500 | 500000 |
| 8 | 16510 | 600 | 600000 |
| 6 | 26240 | 700 | 700000 |
| 4 | 41740 | 750 | 750000 |
| 3 | 52620 | 800 | 800000 |
| 2 | 66360 | 900 | 900000 |
| 1 | 83690 | 1000 | 1000000 |
| 0 | 105600 | 1250 | 1250000 |
| 00 | 133100 | 1500 | 1500000 |
| 000 | 167800 | 1750 | 1750000 |
| 0000 | 211600 | 2000 | 2000000 |

Table 5 – Wire Size/Area Table

Calculating Current Carrying Capacity of Wire:

$$MaxAmp = \frac{CMA \times AVD}{LF \times K}$$

Appendix C: Technical Specifications

| Model Number | KVA Rating | Inverter Output / Bypass Input | | | | | | DC Bus | | Approx. Weight | |
|--------------|------------|--------------------------------|--|-------|-------|-------|------------|--|--------|----------------|------|
| | | Phase | Output Current (A) @ Output Volts (V) | | | | Freq. (Hz) | Inverter Input Current (A) @ DC Input Voltage (V) | | | |
| | | | 120 | 208 | 220 | 240 | | 125VDC | 240VDC | lbs | Kg |
| I31-5K | 5 | 1PH | 41.7 | 24.1 | 22.8 | 20.9 | 60 | 56.1 | 28.1 | 993 | 450 |
| I31-10K | 10 | 1PH | 83.4 | 48.1 | 45.5 | 41.7 | 60 | 112.1 | 56.1 | 1081 | 490 |
| I31-15K | 15 | 1PH | 125 | 72.2 | 68.2 | 62.5 | 60 | 168.1 | 84.1 | 1125 | 510 |
| I31-20K | 20 | 1PH | 166.7 | 96.2 | 91 | 83.4 | 60 | 224.1 | 112.1 | 1246 | 565 |
| I31-30K | 30 | 1PH | 250 | 144.3 | 136.4 | 125 | 60 | 336.2 | 118.1 | 1599 | 725 |
| I31-40K | 40 | 1PH | 333.4 | 192.4 | 181.9 | 166.7 | 60 | 448.2 | 224.1 | 1709 | 775 |
| I31-50K | 50 | 1PH | 416.7 | 240.4 | 227.3 | 208.4 | 60 | --- | 280.2 | 2248 | 1110 |
| I31-60K | 60 | 1PH | 500 | 288.5 | 272.8 | 250 | 60 | --- | 336.2 | 2602 | 1180 |

Appendix D: Manufacturer's Warranty

All La Marche Manufacturing Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory and is warranted to be free from any defect in workmanship and material that may develop within one year from date of purchase. In addition to the standard one (1) year warranty, La Marche warrants its magnetics and power diodes on a parts replacement basis only for four (4) more years under normal use.

Any part or parts of the equipment (except fuses, DC connectors and other wear-related items) that prove defective within a one (1) year period shall be replaced without charge providing such defect, in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse, misapplication or improper installation. Magnetics and power diodes are warranted for five (5) years after date of purchase. During the last four (4) years of this five (5) year warranty period, the warranty covers parts replacement only and no labor or other services are provided by La Marche, nor is La Marche obligated to reimburse the owner or any other person for work performed.

Should a piece of equipment require major component replacement or repair during the first year of the warranty period, these can be handled in one of two ways:

1. The equipment can be returned to the La Marche factory to have the inspections, parts replacements and testing performed by factory personnel. Should it be necessary to return a piece of equipment or parts to the factory, the customer or sales representative must obtain authorization from the factory. If upon inspection at the factory, the defect was due to faulty material or workmanship, all repairs will be made at no cost to the customer during the first year. Transportation charges or duties shall be borne by purchaser.
2. If the purchaser elects not to return the equipment to the factory and wishes a factory service representative to make adjustments and/or repairs at the equipment location, La Marche's field service labor rates will apply. A purchase order to cover the labor and transportation cost is required prior to the deployment of the service representative.

In accepting delivery of the equipment, the purchaser assumes full responsibility for proper installation, installation adjustments and service arrangements. Should minor adjustments be required, the local La Marche sales representative should be contacted to provide this service only.

All sales are final. Only standard LaMarche units will be considered for return. A 25% restocking fee is charged when return is factory authorized. Special units are not returnable.

In no event shall La Marche Manufacturing Co. have any liability for consequential damages, or loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause. In addition, any alterations of equipment made by anyone other than La Marche Manufacturing Co. renders this warranty null and void.

La Marche Manufacturing Co. reserves the right to make revisions in current production of equipment, and assumes no obligation to incorporate these revisions in earlier models.

The failure of La Marche Manufacturing Co. to object to provisions contained in customers' purchase orders or other communications shall not be deemed a waiver of the terms or conditions hereof, nor acceptance of such provisions.

The above warranty is exclusive, supersedes and is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness. No person, agent or dealer is authorized to give any warranties on behalf of the Manufacturer, nor to assume for the Manufacturer any other liability in connection with any of its products unless made in writing and signed by an official of the manufacturer.

Appendix E: Document Control and Revision History

Part Number: 149559
Instruction Number: P25-LI31-1
Issue ECN: 23484

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|---------------------|--|--|--|
| 23484- 11/23 | | | |
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