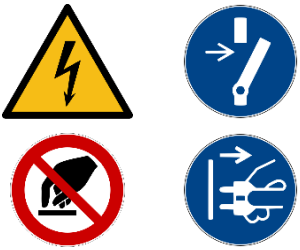
ECO970 Series Charger

Operator and Installer Manual

Warnings

Lead-acid batteries can emit explosive gasses during charging. Keep ignition sources and open flames away from batteries being charged.

Lead-acid batteries contain a corrosive electrolyte. Wear all appropriate PPE when working with lead-acid batteries.



Electrical hazards exist within the charger. Whenever possible isolate or disconnect the charger from the AC supply and disconnect battery before opening the side cover.

The exterior of the charger may become hot when in use. Keep the area around the charger clear of combustible materials.

Read and understand this manual before installing or operating the charger.

Table of Contents

Caution – Risk of Fire
Use only on circuits provided with brack circuit protection in accordance with the National Electric Code NFPA70, and local codes.

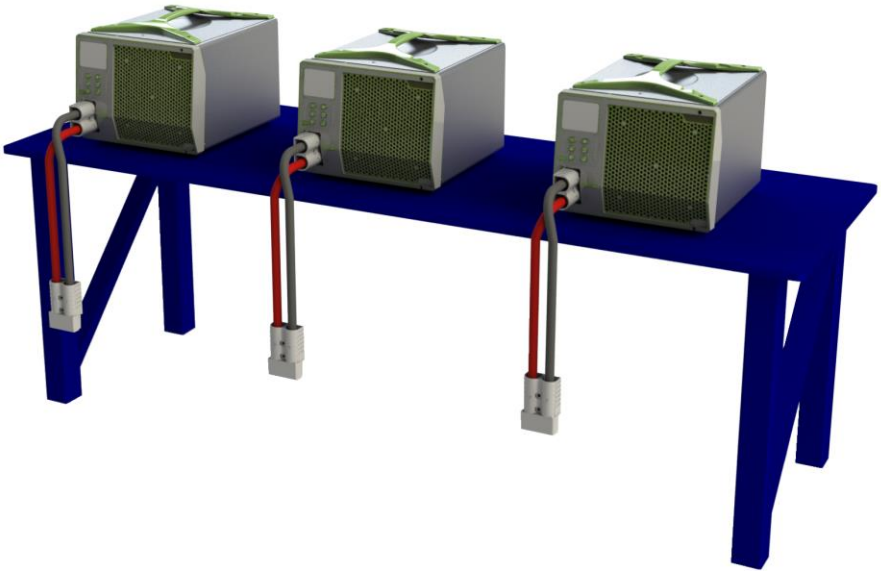
To determine the appropriate rating check the AC input current marked on the charger's ratings label. The table below shows suggested breaker ratings according to NFPA70:

AC Input Current	Suggested Rating	AC Input Current	Suggested Rating
up to 12A_{AC}	15A_{AC}	24.1 to 28A_{AC}	35A_{AC}
12.1 to 16A_{AC}	20A_{AC}	28.1 to 32A_{AC}	40A_{AC}
16.1 to 20A_{AC}	25A_{AC}	32.1 to 36A_{AC}	45A_{AC}
20.1 to 24A_{AC}	30A_{AC}	36.1 to 40A_{AC}	50A_{AC}

Installation – Location

The charger should be located in a position protected from a lift truck and its forks. A position above floor level is recommended to reduce the amount of dust ingested by the charger.

Ensure that 3" (75mm) of free space is left at the rear of the charger, and that 12" (300mm) of free space is left in front of, above and to each side of the charger. Also ensure that this space remains free, and is not used for materials or equipment storage. Never store combustible materials near the charger.



Always securely mount the charger to avoid damage to the charger and battery cables. Never place the charger directly on the floor.

Installation – Use of Mounting Bracket

A mounting bracket is supplied with both E973 and E976 charger cabinets. These can be used to mount the charger to a horizontal or vertical surface.

Base Mounting

Bench, shelf, stand or other horizontal surface.

ECO973 Cabinet

ECO976 Cabinet

Fix the mounting bracket to the shelf or other horizontal surface using fasteners appropriate for the material.

Remove the front and rear feet from the charger.

Place the charger onto the bracket so the bracket hooks fit into the slots in the bottom of the charger cabinet.

Tighten the two thumbscrews on the bracket into the charger cabinet.

Rear Mounting

Wall, stand or other vertical surface.

ECO973 Cabinet

ECO976 Cabinet

Fix the mounting bracket to a wall using fasteners appropriate for the material.

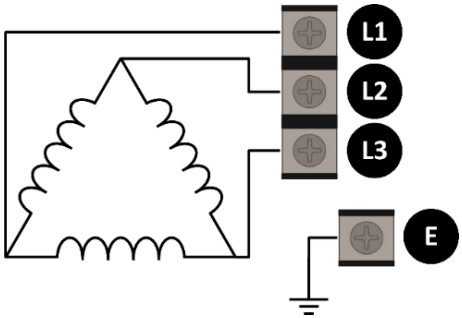
Place the charger onto the brackets so the bracket hooks fit into the slots in the rear of the charger cabinet.

Tighten the two thumbscrews on the bracket into the charger cabinet.

Installation – AC Supply Configuration

The ECO970 series charger requires a three phase AC supply within the AC input voltage range of the charger module type fitted (see the specifications page for details).

An earth (grounding) condutor is required, no neutral (grounding) conductor is required.



The supply conductors must be stranded or solid copper with insulation rated to at least 167°F (75°C). The conductors must be sized for the charger model and supply voltage.

The AC input current that the charger will draw is shown on the ratings label. Three currents are shown on this label:

AC INPUT VOLTAGE RANGE
380 – 480 VAC
AC INPUT FREQUENCY AND PHASE COUNT
50 – 60 Hz 3 PH
AC INPUT CURRENT (HARDWARE MAX)
8.3 AAC @ 380 VAC
6.6 AAC @ 480 VAC
AC INPUT CURRENT (AS CONFIGURED)
4.6 AAC @ 480 VAC

AC INPUT CURRENT (HARDWARE MAX) shows the AC input current drawn when the charger is set to the highest power configuration its hardware supports.

AC INPUT CURRENT (AS CONFIGURED) shows the AC input current drawn when chargintg the battery the charger is configured for.

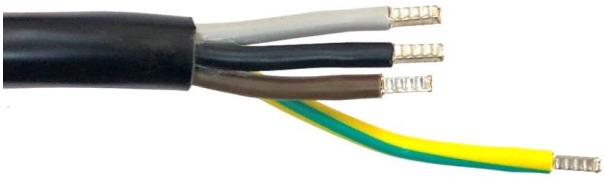
An updated ratings label should be printed if the configuration of the charger is changed. When changing a ratings label, ensure the AC supply is adequate for the revised current draw.

The maximum AC input current for each model of ECO970 charger is shown in the table below:

Charger Model	Charger Modules Fitted	Supply Voltage Range (ph to ph)	Supply Current (per ph)
E973-21	1 x E240	200 to 240V_{AC}	15.1A_{AC} at 208V_{AC} 13.1A_{AC} at 240V_{AC}
E973-22	2 x E240	200 to 240V_{AC}	30.1A_{AC} at 208V_{AC} 26.1A_{AC} at 240V_{AC}
E973-23	3 x E240	200 to 240V_{AC}	45.0A_{AC} at 208V_{AC} 39.0A_{AC} at 240V_{AC}
E973-41 E976-41	1 x E480	380 to 480V_{AC}	6.6A_{AC} at 480V_{AC}
E973-42 E976-42	2 x E480	380 to 480V_{AC}	13.1A_{AC} at 480V_{AC}
E973-43 E976-43	3 x E480	380 to 480V_{AC}	19.6A_{AC} at 480V_{AC}
E976-44	4 x E480	380 to 480V_{AC}	26.1A_{AC} at 480V_{AC}
E976-45	5 x E480	380 to 480V_{AC}	32.6A_{AC} at 480V_{AC}
E976-46	6 x E480	380 to 480V_{AC}	39.0A_{AC} at 480V_{AC}
E973-61 E976-61	1 x E600	480 to 600V_{AC}	6.6A_{AC} at 480V_{AC} 5.3A_{AC} at 600V_{AC}
E973-62 E976-62	2 x E600	480 to 600V_{AC}	13.1A_{AC} at 480V_{AC} 10.5A_{AC} at 600V_{AC}
E973-63 E976-63	3 x E600	480 to 600V_{AC}	19.6A_{AC} at 480V_{AC} 15.7A_{AC} at 600V_{AC}
E976-64	4 x E600	480 to 600V_{AC}	26.1A_{AC} at 480V_{AC} 20.9A_{AC} at 600V_{AC}
E976-65	5 x E600	480 to 600V_{AC}	32.6A_{AC} at 480V_{AC} 26.1A_{AC} at 600V_{AC}
E976-66	6 x E600	480 to 600V_{AC}	39.0A_{AC} at 480V_{AC} 31.3A_{AC} at 600V_{AC}

Installation – AC Supply Wiring

Before installation the cable should be prepared as shown below:



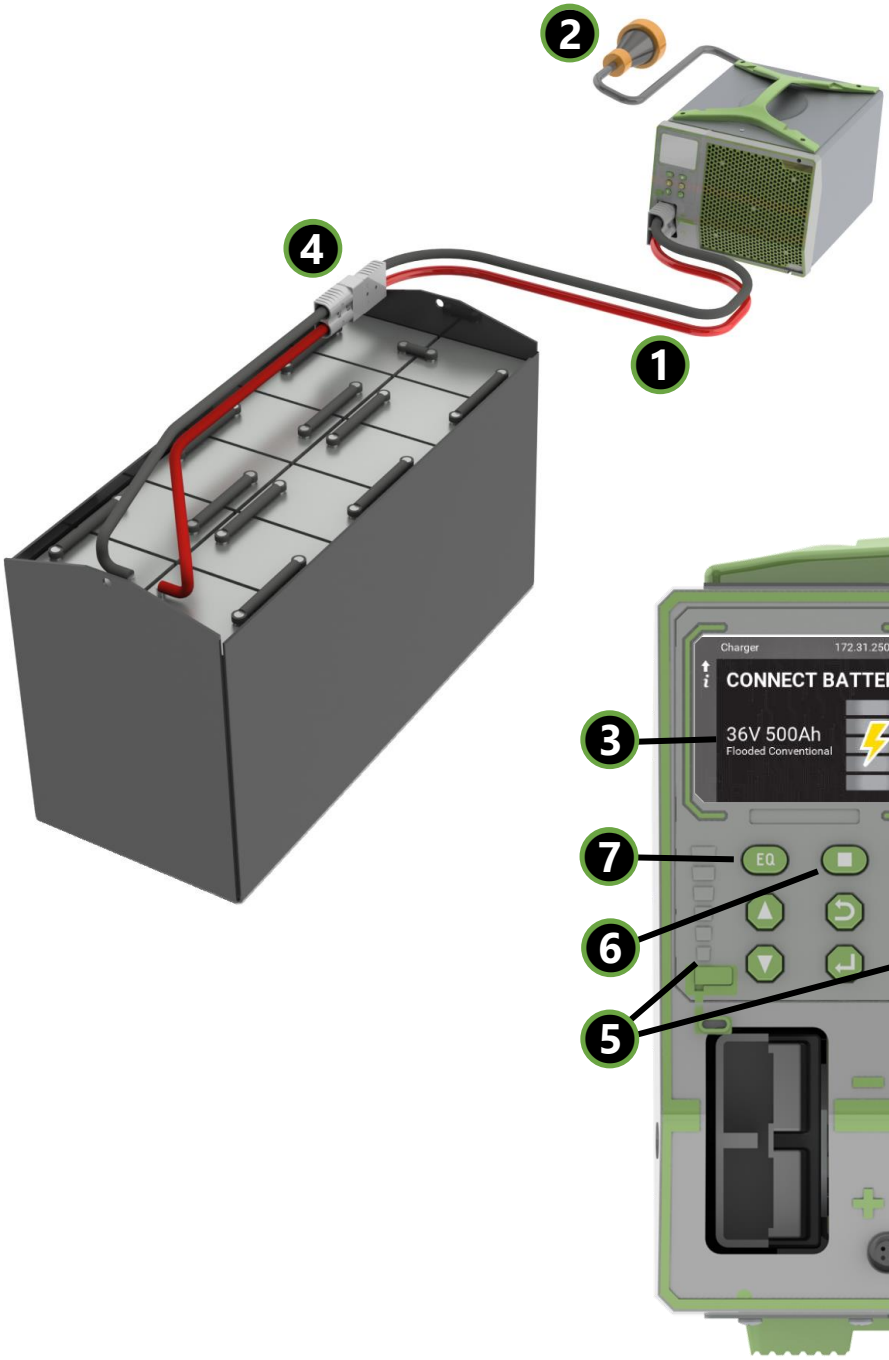
Each of the phase conductors should have 2" (50mm) free of the sheath. The earth conductor should have 3½" (90mm) free of the sheath. It is recommended that each conductor is fitted with a ferrule crimp when stranded conductors are used.

Only one conductor should be fitted to each terminal block position. Conductors should have an insulation rated to at least 67°F (75°C). Terminal blocks and the earth conductor clamp should be tightened to 10.6 to 13.3in·lbf (1.2 to 1.5N·m). A typical completed wiring installation is shown below:

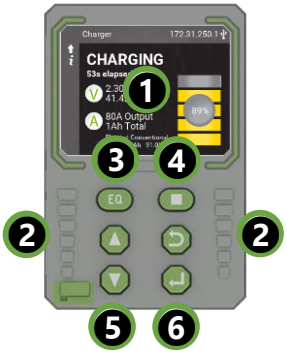
Knock outs are provided on the rear panel to suit strain relief glands or conduit fittings from ¾ to 1¼" (20 to 32mm).

Operating Instructions

1	Check the battery leads are in good condition and plugged into the charger DC output connector. If using the Advanced Battery Interface (ABI) connection for a Lithium Ion battery, check the ABI cable is in good condition and plugged into the charger ABI connector. *If using dual battery leads:* Make sure both leads are connected to the chargers two DC output connectors. *If using only one battery lead:* Make sure the lead is connected to the lower DC output connector.
2	Ensure the charger is connected to the AC supply, and the AC supply is energized. The charger may use a plug and socket or hardwired AC supply connection. An AC input cable is not included with all charger models.
3	Check the configuration shown on the charger display matches the voltage, capacity and chemistry of the battery.
4	Connect the charger cable to the battery.
5	The indicator bars will light red in a rising pattern pattern during charge. The display with show the time elapsed, profile stage, cell voltage and charge returned. The indicator bars will light solid green when the charge is completed.
6	*Stopping a Charge:* Press the stop (■) button before disconnecting the battery to interrupt a charge that has not yet completed.
7	*Setting an Equalize Charge:* During a charge using a profile with an equalize section press the *EQ* button.


2
4
1
Charger
172.31.250.1
CONNECT BATTERY
36V 500Ah
Flooded Conventional
3
7
EQ
6
5

Front Panel Interface



The front panel interface can be used to determine the status of the charger and the charge it is performing.

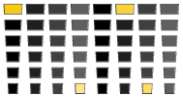
1. Display
2. Indicator bars
3. Equalize button
4. Stop button
5. *Up* and *Down* munu buttons
6. *Back* and *Enter* menu buttons

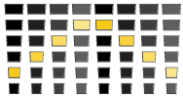

Charging

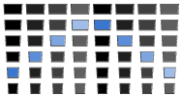

Equalizing

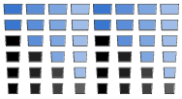

Charge Complete

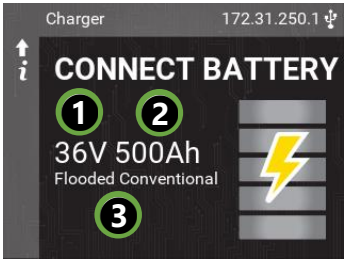

Idle


Identifying Battery


Start Delay

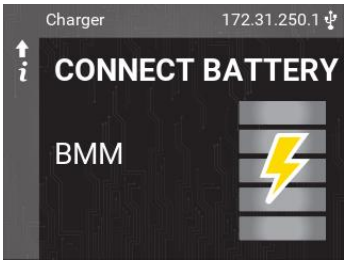

Cooldown Delay


Auto Watering

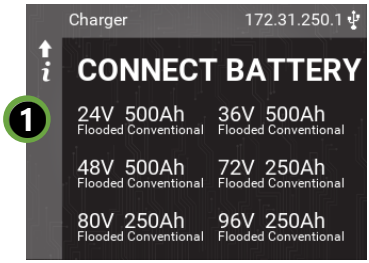


Idle (Fixed Configuration)
Shows *CONNECT BATTERY* and the type of battery the charger is configured for.

1. Battery voltage
2. Battery capacity
3. Charge profile



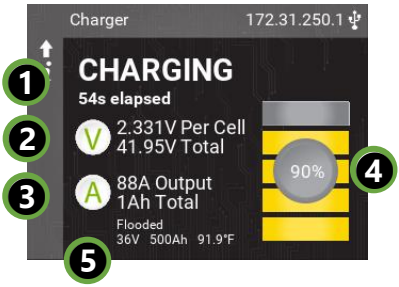
Idle (BMM Enabled or CAN Enabled Configuration)
Shows *CONNECT BATTERY* and either *BMM* or *CAN*.



Idle (Auto Voltage)

Shows *CONNECT BATTERY* and the types of battery the charger is configured for.

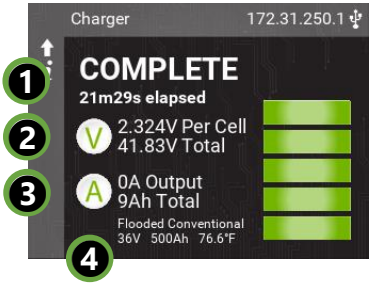
❶ Group showing voltage, capacity and charge profile for each voltage the charger is configured to charge.



Charging

Shows *CHARGING* and the progress of the charge.

❶ Elapsed time
❷ Battery voltage (per cell and overall)
❸ Output current and capacity returned during charge
❹ State of charge (only shown when reported by BMM or BMS)
❺ Battery configuration



Complete

Shows *COMPLETE* and information about the charge performed.

❶ Elapsed time
❷ Battery voltage (per cell and overall)
❸ Capacity returned during charge
❹ Battery configuration

Charger Configuration

The ECO970 series charger is configured using a web interface. For details on how to configure a charger see the *ECO970 Web Interface Technical Manual*.

Configuration Options

Configuration types:	*Fixed* – charger expects a single type of battery *Auto Voltage* – charger has a fixed configuration for two or more battery voltages and automatically selects the one that matches the connected battery *BMM Enabled* – charger recieves its configuration from a BMM battery module *CAN Enabled* – charger is controlled by instructions from battery BMS sent over CAN bus (optional ABI board required)
Battery types:	Lithium ion Lead acid (flooded, gel and AGM)
Auto equalize:	Simple delay, cycle based or time based
Auto watering:	Simple delay, cycle based, time based or after equalize charge (optional IO expansion board required)

Battery Capacity Ranges

Conventional start rate (16A/100Ah)

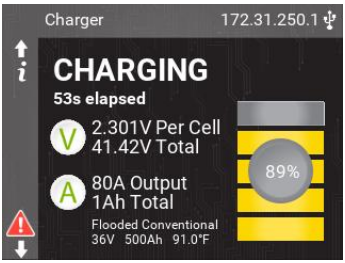
Modules	24V	36V	48V	72V	80V	96V
1	625Ah	625Ah	525Ah	300Ah	300Ah	250Ah
2	1250Ah	1250Ah	1050Ah	625Ah	625Ah	525Ah
3	1875Ah	1875Ah	1575Ah	925Ah	925Ah	775Ah
4	2500Ah	2500Ah	2125Ah	1250Ah	1250Ah	1050Ah
5	3125Ah	3125Ah	2650Ah	1550Ah	1550Ah	1325Ah
6	3750Ah	3750Ah	3175Ah	1875Ah	1875Ah	1575Ah

Opportunity start rate (25A/100Ah)

Modules	24V	36V	48V	72V	80V	96V
1	400Ah	400Ah	325Ah	200Ah	200Ah	150Ah
2	800Ah	800Ah	675Ah	400Ah	400Ah	325Ah
3	1200Ah	1200Ah	1000Ah	600Ah	600Ah	500Ah
4	1600Ah	1600Ah	1350Ah	800Ah	800Ah	675Ah
5	2000Ah	2000Ah	1700Ah	1000Ah	1000Ah	850Ah
6	2400Ah	2400Ah	2025Ah	1200Ah	1200Ah	1000Ah

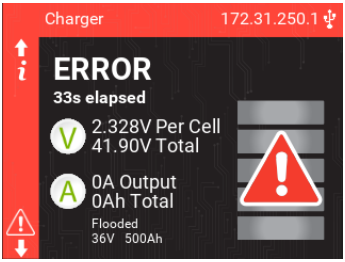
Alarms and Troubleshooting

The front panel display will indicate when an alarm has been triggered.



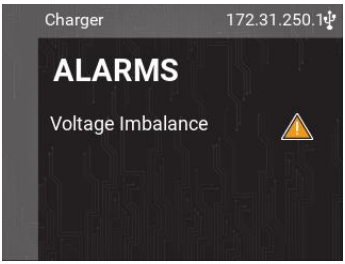
Non Urgent Alarms

When a non-urgent alarm has been triggered the charger will still start and continue charges.
A warning triangle will be shown at the bottom left of the screen.



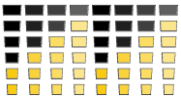
Urgent Alarms

When an urgent alarm is triggered the charger will stop a charge in progress, and will not start a new charge. A large warning triangle will be shown over the battery symbol.



To view which alarms are active, press the down arrow key.

The behaviour of the front panel indicator bars will also change when an alarm is triggered.



Non-Urgent Alarm (while charging)

Urgent Alarm

Each alarm is shown below, along with why it is triggered, and advice on troubleshooting the alarm. The response to each alarm is shown in brackets beside the alarm name. If no response is shown the alarm will not stop a charge or warn the operator, but may still appear in the alarm log or as a termination reason in the charge log.

Charger Alarms

Alarm Name and Description	Troubleshooting Advice
AC Current Limit (Urgent) The charger has a configuration that exceeds the limit set by the AC Current Limit jumpers.	Check that the current limit jumpers are set to a limit that is correct for the AC supply. If the limit is correct, reduce the configured start current or increase the AC supply capacity.
Arcless Disconnect / Postmate (Urgent) The postmate circuit of the charger is open.	Ensure that all charger modules are fully inserted into the charger backplane. If using an arcless disconnect system, ensure that it is in good condition, and that none of the connectors have failed. If the auxiliary power supply board has been replaced, ensure the arcless disconnect jumper or cable header has been fitted.
Auxiliary Power Fail (Urgent) The charger's auxiliary power supply is not providing the expected voltage to the charger modules.	Check that all charger modules are correctly installed in the charger. Contact your EcoCharge charger dealer for service.
BMM Communications Fail (Urgent) The charger is configured as BMM Enabled, but was unable to communicate with the BMM when a battery was connected, or lost communication during a charge.	Check that a BMM is fitted to the battery. Check that the BMM is in good condition and properly installed.
Both Cables Required (Urgent) A single battery cable has been connected to a dual output connector charger, and the modules in the connected half of the cabinet are not sufficient to perform the configured charge.	Either connect both battery cables to the charger, or ensure that the battery cable is plugged into the half of the cabinet which has the required module count for the charge.
CAN Battery Error (Urgent) A battery being charged using CAN bus control has encountered an error and has asked the charger to stop charging.	Contact your EcoCharge charger dealer if this is a common occurance.

Alarm Name and Description	Troubleshooting Advice
CAN Charge Error (Urgent) The charger has not met the requested charge of a battery using CAN bus control.	Contact your EcoCharge charger dealer if this is a common occurance.
CAN Communications Fail (Urgent) The charger is configured as CAN Enabled, but was unable to communicate with a battery either at the beginning of or during a charge.	Check that a CAN bus equipped battery is connected to the charger. Check that the charger supports the CAN bus protocol used by the charger. Check that the CAN bus auxiliary cable is connected and in good condition.
Connector Voltage Mismatch (Urgent) A dual connector charger has detected a significant difference in the output voltage at its two output connectors.	Check that both DC output cables and the battery cables are in good connection.
Customer Code Mismatch (Urgent) One of the charger modules installed in the charger was not supplied through the same distribution channel as the charger.	Ensure that the charger modules fitted were supplied through the same distribution channel as the charger.
Expansion Module Position (Non-Urgent) An expansion board has been installed in an unsuitable position in the charger, or has not been recognised.	Check that an ABI board has not been fitted to the upper expansion board position. Remove and replace the expansion board that causes this alarm to be triggered.
High Mains – Critical (Urgent) The AC supply is higher than the operating range of the charger.	Check that the AC supply nominal voltage is within the nominal input voltage range of the modules.
High Mains – Warning (Non-Urgent) The AC supply is higher than the nominal input voltage range of the charger, but still within the operating range. The charger can still operate, but its output will be reduced.	Check that the AC supply nominal voltage is within the nominal input voltage range of the modules. Frequent occurrences of this alarm may indicate an issue with the utility.
Invalid System Time (Non-Urgent) The charger controller's real time clock is not set.	Use the web interface to set the real time clock. Until this time is set the time stamps in logs will not be accurate, and schedule functions may not run at the correct times.
Low Mains – Critical (Urgent) The AC supply is lower than the operating range of the charger.	Check that the AC supply nominal voltage is within the nominal input voltage range of the modules. Check that the AC supply is of adequate capacity and in good condition.

Alarm Name and Description	Troubleshooting Advice
Low Mains – Warning (Non-Urgent) The AC supply is lower than the nominal input voltage range of the charger, but still within the operating range. The charger can still operate, but its output will be reduced.	Check that the AC supply nominal voltage is within the nominal input voltage range of the modules. Check that the AC supply is of adequate capacity and in good condition. Frequent occurrences of this alarm may indicate an issue with the utility.
Maximum Output Exceeded (Urgent) A configuration from a BMM has requested the charger deliver a current that exceeds the rating of the DC output cable connector it is using.	Check that the configured DC output connector matches what the charger is using. Change the DC output connector used to one with a higher current capacity.
Module Fail – Critical (Urgent) *Module Fail – Warning (Non-Urgent)* One or more charger modules have failed. If the number of failed modules has exceeded a pre-set value, the *Critical* alarm will trigger, otherwise only the *Warning* alarm will be triggered.	Replace the failed charger module or modules.
Module Fan Fail (Non-Urgent) One or more charger modules has a failed cooling fan. Check the module fans for obstructions.	Contact your EcoCharge charger dealer for service.
Module Over Temp – Critical (Urgent) One or more modules has overheated, and can no longer operate.	Check that the position of the charger allows adequate airflow at the front and rear of the charger. Check that ambient temperature is within the allowable range.
Module Over Temp – Warning (Non-Urgent) One or more modules has overheated, and can no longer operate at full power. Check that ambient temperature is within the allowable range.	Check that the position of the charger allows adequate airflow at the front and rear of the charger. Check that ambient temperature is within the allowable range.
Module Position (Urgent) One or more charger modules are unable to determine their position in the cabinet.	Check that all charger modules are correctly installed in the charger. Contact the distributor for charger service.
Module Service (Non-Urgent) The module has an issue that still allows it to operate.	Replace the affected charger module when practical.

Alarm Name and Description	Troubleshooting Advice
Module Voltage Range (Urgent) One or more of the charger modules is not compatible with the AC input voltage the charger is configured for.	Check that the AC Configuration the charger is configured with is correct. Check that the model of charger module installed is suitable for the AC supply voltage being used.
No Output Current (Urgent) The charger is measuring no output current during a charge.	This alarm is often triggered alongside other alarms where the charger stops outputting current, including *Module Fail, Battery Disconnected* and *Output Fuse*. Check which other alarms have been triggered for troubleshooting information.
Not Enough Modules (Urgent) The charger cannot provide enough output to meet the configured current and voltage with the number of charger modules fitted.	Install additional charger modules. Reduce the output required for the charge by lowering the start rate.
Scheduled Off Time (Urgent) This alarm occurs when the charger enters a time period where charging is not allowed by the Daily Charge Schedule.	This is usually intended behaviour. If not, check that the Daily Charge Schedule is set correctly.
Stop Switch (Urgent) The charge was interrupted by the operator using the stop switch on the front panel of the charger.	This alarm is for information only, no troubleshooting is needed.
Unknown Profile (Urgent) The charger has been configured to use a charge profile that does not exist on the charger.	When using a configuration file to configure a charger, check that the charge profile named in the file exists on the charger.
USB Power Only (Urgent) This alarm occurs when the charger controller is powered from the USB port.	The charger cannot charge when powered from the USB port only. Connect an AC supply to allow charging.

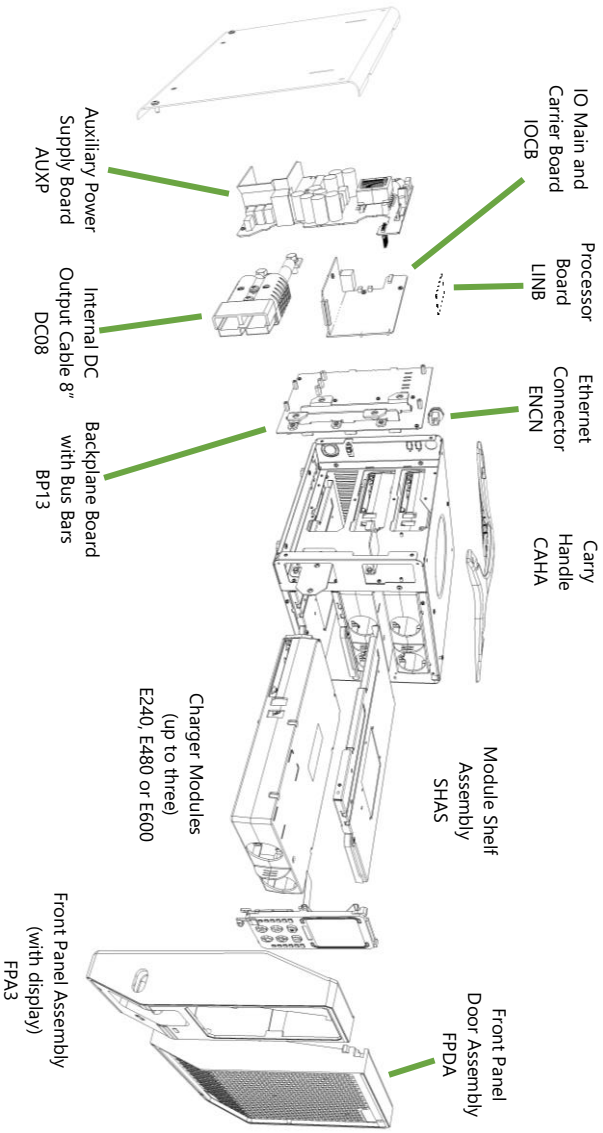
Battery Alarms

Alarm Name and Description	Troubleshooting Advice
Auto Watering Complete An automatic battery watering cycle was completed.	This alarm is for information only, no troubleshooting is needed.
Battery Disconnected (Urgent) A battery was disconnected during a charge. Disconnecting a battery without first stopping a charge can cause arcing, which damages the battery cable connectors and creates an explosion hazard.	Remind the operator to use the stop switch before disconnecting a battery.
Pre-Charge Timeout – Normal *Bulk Charge Timeout – Normal* *Finishing Timeout – Normal* *Equalize Timeout – Normal* *Mantenance Timeout – Normal* The charge reached the time limit of the named slot within the charge profile.	The *Normal* variety of this alarm means that reaching the time limit is expected, and the charge will be allowed to continue is there are further stages. No troubleshooting is needed.
Pre-Charge Timeout – Abnormal (Urgent) *Bulk Charge Timeout – Abnormal (Urgent)* *Finishing Timeout – Abnormal (Urgent)* *Equalize Timeout – Abnormal (Urgent)* *Mantenance Timeout – Abnormal (Urgent)* The charge reached the time limit of the named slot within the charge profile.	The *Abnormal* variety of this alarm means that reaching the time limit is not expected, and this alarm has ended the charge. Check the condition of the battery, and that the chargers configuration matches the battery.
Bulk Charge Complete A battery reached the end of bulk charge, but was disconnected before starting the delayed finishing charge.	This alarm is for information only, no troubleshooting is needed. This alarm will only be encountered when using a legacy XHF profile on a BMM that uses the delay to full charge option.
CAN Charge Complete A CAN bus controlled charge was successfully completed by a complete message from the battery.	This is a normal termination alarm for a battery charged using CAN bus control, no troubleshooting is needed.
Cooldown Time Violation A charger was configured with a cooldown period, and the battery was disconnected before the cooldown period had expired.	Remind the operator to wait for the cooldown period to expire before disconnecting a battery.
dV/dt Termination The voltage rate of change fell below the limit set in the charge profile.	This is a normal termination alarm for many charge profile types, no troubleshooting is needed.

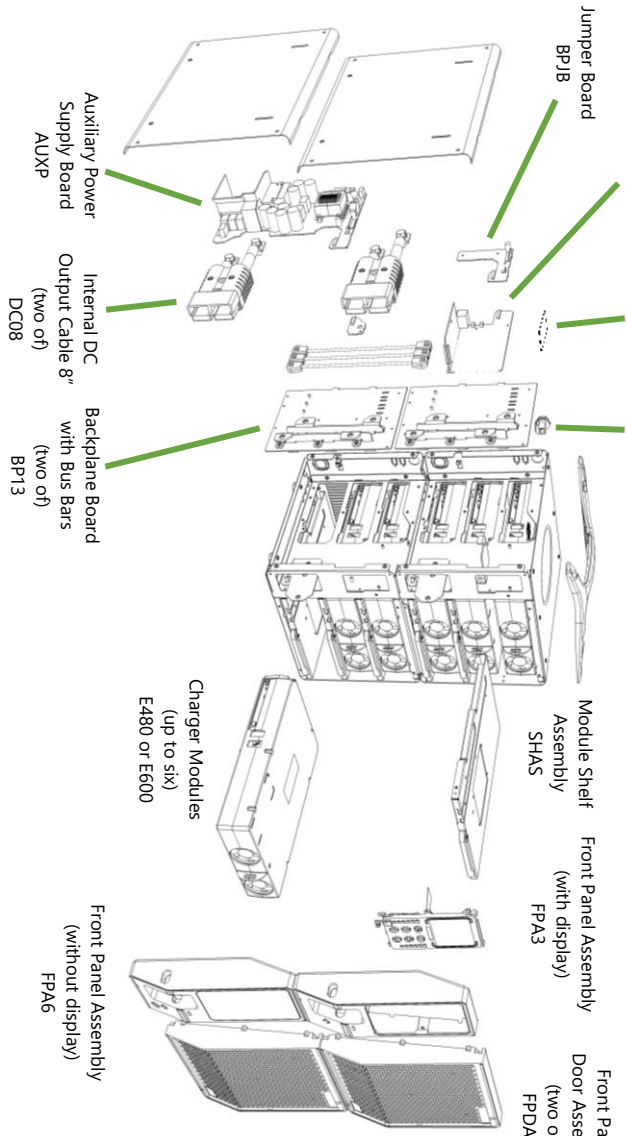
Alarm Name and Description	Troubleshooting Advice
Incorrect Battery (Urgent) The voltage of the connected battery did not match the charger's configured battery voltage.	Check that the battery has been plugged into the correct charger. If the charger is using a fixed configuration, check that the charger is configured correctly. If the battery is using a battery module, check that the BMM is correctly configured and matches the battery, and that the charger is configured as BMM Enabled.
Max Voltage Termination The cell voltage exceeded the limit set in the charge profile.	This is a normal termination alarm for many charge profile types, no troubleshooting is needed.
Min Current Termination The battery current fell below the limit set in the charge profile.	This is a normal termination alarm for many charge profile types, no troubleshooting is needed.
Negative dI/dt Termination During a constant voltage stage the battery current decreased at a rate exceeding the limit set in the profile.	This is a normal termination alarm for some charge profile types, no troubleshooting is needed.
Overdischarge – Critical (Urgent) When connected, the battery had a cell voltage below a threshold, and the cell voltage did not climb above this threshold after a period of charging.	Check the condition of the battery.
Overdischarge – Warning (Non-Urgent) When connected, the battery had a cell voltage below a threshold, but the cell voltage climbed above this threshold after a period of charging.	This may occur when a battery is connected for charge immediately after being discharged heavily. Frequent occurrences of this alarm may require an investigation of work practices and battery condition.
Over Temp – During Charge (Urgent) The battery temperature exceeded the charging temperature limit during a charge. The battery temperature measurement is sourced from the BMM, so this alarm will only occur when charging BMM equipped batteries.	Frequent occurrences of this alarm may require an investigation of work practices and battery condition.

Alarm Name and Description	Troubleshooting Advice
Over Temp – Start of Charge (Urgent) The battery temperature exceeded the charging temperature limit when connected to the charger. The battery temperature measurement is sourced from the BMM, so this alarm will only occur when charging BMM equipped batteries.	Frequent occurrences of this alarm may require an investigation of work practices and battery condition.
Positive dI/dt Termination (Urgent) During a constant voltage stage the battery current increased significantly. The battery current should fall during a constant voltage stage, a significant increase can indicate a serious fault.	Check the battery condition and operating temperature.
Reversed Battery (Urgent) A battery or battery cable with reversed polarity has been connected to the charger.	Correct the polarity of the battery or battery cable. The ECO970 series charger does not rely on fuses to protect against this fault, so no further action is required.
Voltage Imbalance (Non-Urgent) The attached battery has a cell voltage imbalance. The cell voltage imbalance measurement is sourced from the BMM, so this alarm will only occur when charging BMM equipped batteries.	Check that the battery does not have a damaged cell, and that the battery is regularly equalized. If the BMM's optional mid point voltage sensor is not installed, ensure that this option is disabled in its configuration, or this alarm will be triggered.
Water Level Low (Non-Urgent) The attached battery has a low water level. The water level measurement is sourced from the BMM, so this alarm will only occur when charging BMM equipped batteries.	Check the battery's electrolyte level, and water it if nessesary. If the BMM's optional electrolyte probe is not installed, ensure that this option is disabled in its configuration, or this alarm will be triggered.

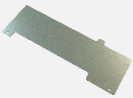
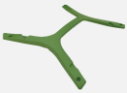
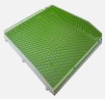
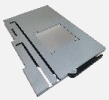
Exploded View – ECO973 Charger



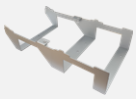
Exploded View – ECO976 Charger



Spare Parts List

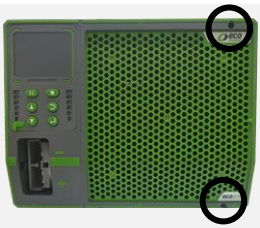
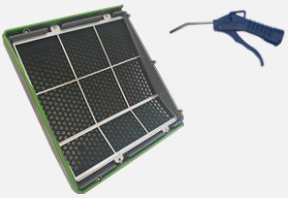
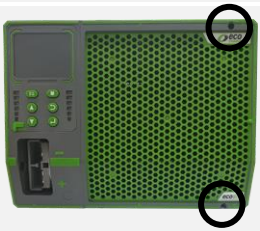
	Charger Module 200 to 240V_{AC} ❸ 6 E240		Charger Module 380 to 480V_{AC} ❸❻ E480
	Charger Module 480 to 600V_{AC} ❸❻ E600		Internal ABI Cable (E973) ❸ 6 ABL3
	Internal ABI Cable (E976) 3 ❻ ABL6		Auxiliary Power Supply Board ❸❻ AUXP
	Module Position Blanking Plate ❸❻ BLPL		Backplane Board with Bus Bars ❸❻ BP13
	Jumper Board 3 ❻ BPJB		Carry Handle ❸❻ CAHA
	IO Expansion Connector Screwlock ❸❻ DB9S		Internal DC Output Cable 8″ ❸❻ DC08
	DC Output Cable Retaining Bolt ❸❻ DCRB		Ethernet Connector ❸❻ ENCN
	Front Panel Assembly with Display ❸❻ FPA3		Front Panel Assembly without Display 3 ❻ FPA6
	Front Panel Door ❸❻ FPDA		IO Main and Carrier Board ❸❻ IOCB
	Processor Board ❸❻ LINB		Module Shelf Assembly ❸❻ SHAS
	Expansion Board Standoff ❸❻ XBSO		

Accessories List

	Mounting Bracket (E973) ❸ ❻ MTB3		Mounting Bracket (E976) ❸ ❻ MTB6
	Tower Light Kit (includes IOE Board) ❸ ❻ TLKT		Tower Light ❸ ❻ TLPT
	Remote Control Kit (includes IOE Board) ❸ ❻ WRKT		Remote Control ❸ ❻ WRPT

Maintenance

The only periodic maintenance the ECO970 charger requires in cleaning or the air intake filter. This should be performed every six months, or at shorter intervals if poor environmental conditions exist where the charger is installed. To clean the intake filter follow the instructions below:

1	Unfasten the two screws that secure the front panel door assembly using a №2 Phillips scredriver. Note that the screws are captive, and should remain in the door assembly.	
2	Take the door assembly away from the charger and blow compressed air through the filter from its inside surface.	
3	Refit the door to the charger, taking care to allign the three tabs on the left hand side of the door assembly with the three slots in the fixed part of the front panel.	
4	Refasten the two screws that secure the front panel door assembly using a №2 Phillips scredriver.	

Warranty

DC Power Technologies Inc. warrants that this product is free from defects in the material and workmanship and agrees to remedy any defect (or at its option replace the product). This warranty covers both parts and labor. Parts may be replaced under this warranty with new or remanufactured parts. Failure to submit parts and claims within 30 days may result in denial of that particular claim.

Products and Parts Warranted

Subject to the exceptions listed below each Industrial Battery Charger is warranted for a specific period of time commencing from the date of sale by DC Power Technologies Inc. provided the charger is used in accordance with DCPT's Installation manual and instruction booklet. Where products are covered under warranty, DCPT will pay the cost of shipping the repaired or replacement unit back to the customer; otherwise the customer is responsible for all shipping and handling chargers. Also, DCPT will require a charger diagnostic file and serial numbers associated, submitted with a warranty claim. Exceptions to this warranty are as follows:

- Improperly installed (as described in the installation manual)
- Misused, abused, used in the ways the product was not designed
- Altered or repaired in any way which may affect the performance of reliability of operation
- Sustained damage by power surges or electrical storms
- Sustained shipping damage
- Repaired by any unauthorized repair centre
- Not received proper care and regular maintenance by qualified personnel
- Been subjected to unreasonable physical, thermal or electric stress, misuse, negligence or accident
- Any breach of the user manual, installation manual, associated documentation, or instructions provided to the customer
- Identification or serial marks removed or altered in any way
- Been immersed in liquid of any kind
- Subjected to acts of God, which may include but are not limited to, fire, water, earthquake, vandalism, theft or any other cause beyond the range of intended use
- Has cosmetic shortcomings which do not affect normal operation

Terms and Conditions

- 2 Years Full Coverage (Includes labor at $75/hr, travel & parts replacemen, travel time limited to one service call. Travel time in excess of 3 hours must have prior approval from DCPT)
- 2 Additional Years Coverage for Electrical parts only
- 1 Year Coverage Accessories parts only

Warranty Expense Limitation

The maximum warranty expense DCPT will incur for any battery charger will be limited to the original purchase price of the battery charger.

AC Fuses, DC Fuses are not warranted unless found to be defective from the factory shipment.

Persons Covered By Warranty

DC Power Technologies Inc. extends this warranty only to the purchaser of the new equipment from DCPT or one of its authorized distributors. The products purchased under this agreement shall be used exclusively by the buyer and its employees and by no other persons: and therefore there shall be no third party beneficiary to this warranty.

Altered Equipment.

Exception as authorized in writing, the warranty specified does not cover any equipment that has been altered by any party other than DCPT or its authorized dealer.

Service

If the charger will not power on, or triggers and urgent alarm, contact your EcoCharge charger dealer. If the charger triggers a non-urgent alarm only contact your nearest EcoCharge charger dealer if this alarm regularly occurs.

Specifications

Charger cabinet specifications:

	ECO973	ECO976
Charger Module Model Supported	E240, E480, E600	E480, E600
DC Output Connector	SB350 x 1, up to 300A$_{DC}$	SB350 x 2, up to 600A$_{DC}$
Size	12.4W x 14.3D x 11.1H in 314W x 363D x 282H mm	12.4W x 14.3D x 20.5H in 314W x 363D x 520H mm
Weight	37.4 lbs 17 kg (three modules loaded)	71.5 lbs 32.5 kg (six modules loaded)
Ambient Temperature	-50 to +104°F -45 to +40°C	
Storage Temperature	-68 to +158°F -55 to +70°C	
Humidity	5 to 95%, non-condensing	
Compliances	c UL US LISTED BC ANSI/UL 1564: Industrial Battery Chargers CAN/CSA-C22.2 № 107.2: Battery Chargers CEC-400: California Energy Commission 2016 Appliance Efficiency Regulations – Large Battery Charger Systems	

Charger module specifications:

	E240	E480	E600
Nominal Voltage Range (phase to phase, 3 phase)	200 to 240V$_{AC}$	380 to 480V$_{AC}$	480 to 600V$_{AC}$
Frequency Range	45 to 65Hz	45 to 65Hz	45 to 65Hz
Maximum Efficiency	97.6%	97.6%	97.6%
	All Charger Module Types (E240, E480, E600)		
Battery Voltages	24, 36, 48, 72, 80 and 96V		
Current Range	100ADC @ 24V 100ADC @ 36V 85ADC @ 48V	50ADC @ 72V 50ADC @ 80V 42.5ADC @ 96V	
Short Circuit Protection	Current Foldback		

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ECO970 Series Operator and Installer Manual