



FS3 XHF Series Charger **Operator / Installer Manual**





WARNINGS



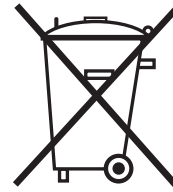
Keep open flames away from batteries on charge.



Risk of battery explosion.

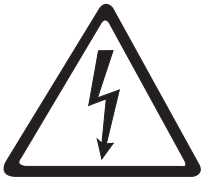


Be aware of battery fumes and electrolyte.



Pb

Do not dispose of batteries in the garbage.



Electrical hazard exists inside the charger, do not remove the side cover.



Pb

Always recycle lead acid batteries.



Battery electrolyte is highly corrosive.



Wear eye protection when working near batteries.

CAUTION

Risk of Fire

Use only on circuits with 35A branch circuit protection in accordance with the National Electric Code NFPA 70.

2. Warnings

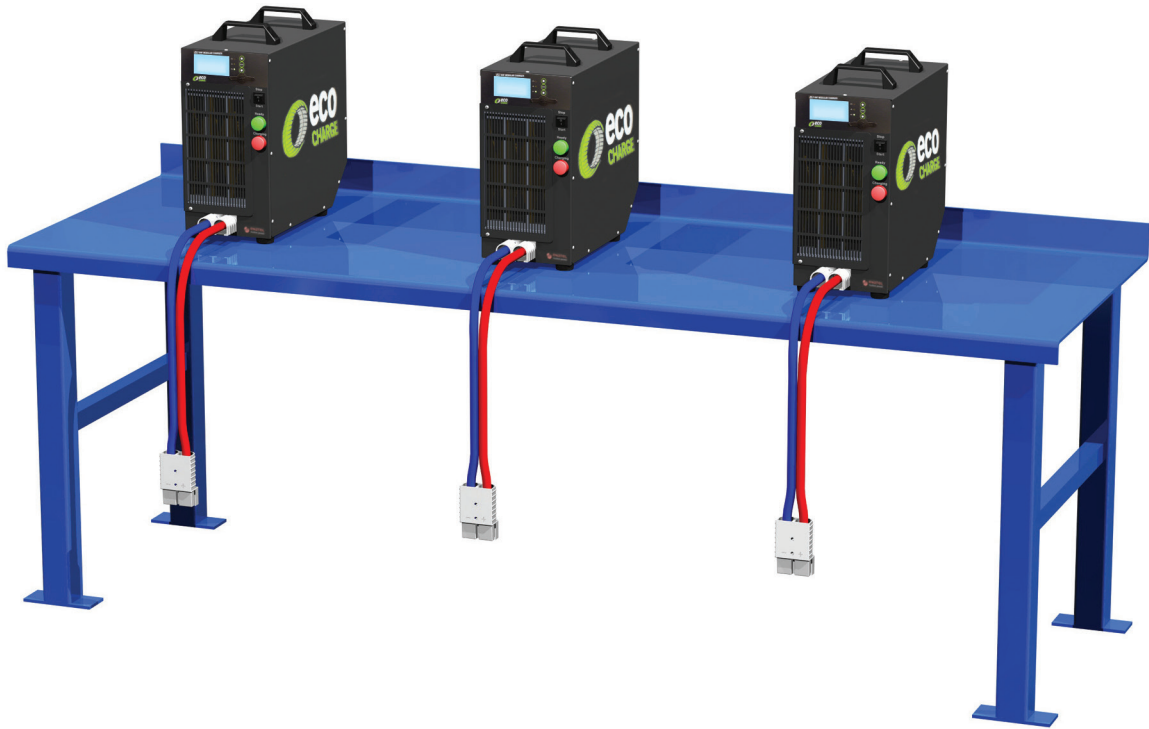
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Charger Serial Number	
Charger Part Number	
Date Supplied	
Vehicle Model	
Purchaser	
Purchase Invoice Number	
Fleet Number	

Location

The preferred installation is where the charger(s) can be located on a shelf, protected against accidental contact with the lift truck or its forks.



With the charger on a shelf the risk of damage to the charger or battery cables is greatly reduced.



Avoid just placing the charger on the floor next to the lift truck.

Mounting Bracket Options



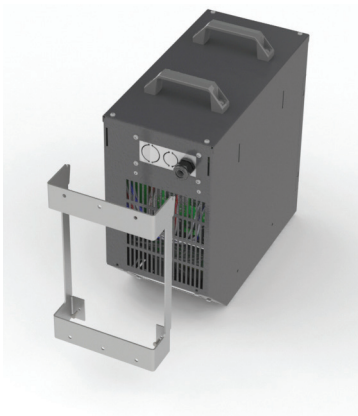
Base Mount

1. Fix the mounting bracket to a bench using a type of fastener that suits the bench material.
2. Remove the 2x front case feet.
3. Slide the base of the FS3 onto the mounting bracket.
4. With 2x M5x8 hex bolts (included with the mounting bracket) secure the front of the mounting bracket to the FS3.
5. When fitting the battery cable ensure the locking screw is installed.



Side Mount

1. Fix the mounting bracket to the wall using a type of fastener that suits the wall material.
2. Slide the side of the FS3 onto the mounting bracket.
3. With 2x M5x8 hex bolts (included with the mounting bracket) secure the front of the mounting bracket to the FS3.
4. When fitting the battery cable ensure the locking screw is installed.



Rear Mount

1. Fix the mounting bracket to the wall using a type of fastener that suits the wall material.
2. Slide the rear of the FS3 onto the mounting bracket.
3. With 2x M5x8 hex bolts (included with the mounting bracket) secure the front of the mounting bracket to the FS3.
4. When fitting the battery cable ensure the locking screw is installed.

Installation

AC Input & Busbar Connection

Charger Model Number	Charger Modules	Supply Phase	DC Output	Supply Voltage	AC Supply in Max. Amps. Per Phase	Aux. Plug	Busbar Selection	Config. Number
FS3LUE-512	2x MP130	Single Phase	24/36/48V	208-240	28-30*	J5		1/2
FS3LUE-512	2x MP130	Three Phase	24/36/48V	208-240	15.5-23.2**	J5		3
FS3LUE-513	3x MP130	Single Phase	24/36/48V	208-240	28-30*	J5		1/2
FS3LUE-513	3x MP130	Three Phase	24/36/48V	208-240	13.3-27**	J5		3
FS3LUE-532	2x MP330	Three Phase	24/36/48V	380-480	8-10	J6		4
FS3LUE-533	3x MP330	Three Phase	24/36/48V	380-480	12-15	J6		4

* in single phase mode the output power will reduce to maintain maximum AC current draw.

** in three phase mode the adding of the third charger module reduces the AC current draw to achieve the same DC output as for two modules.

Charger Model Number

FS3LUE-5xy

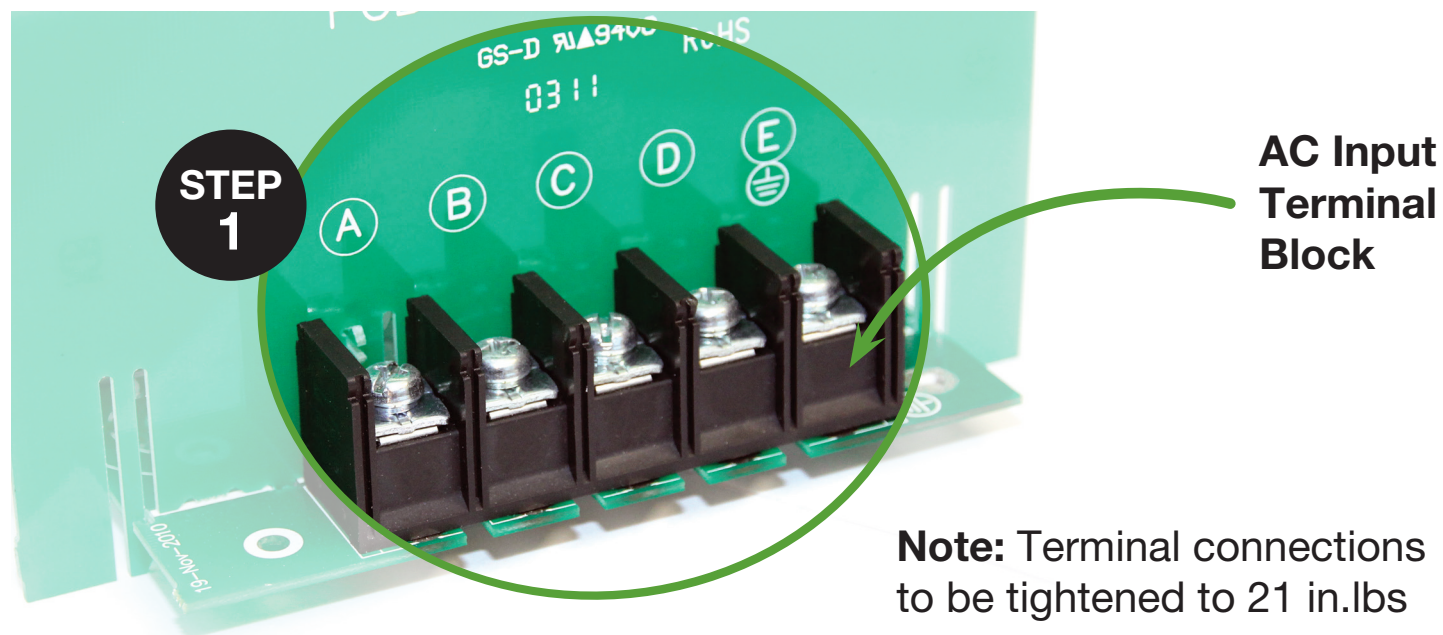
FS3 = Frame size.

MPx30 = 1 for MP130 or 3 for MP330.

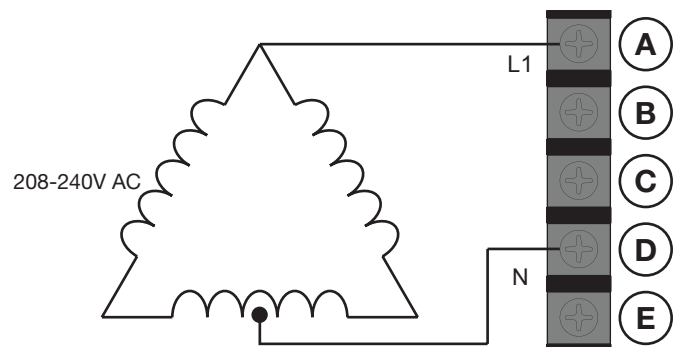
y = 2 or 3 modules installed.

6. Installation

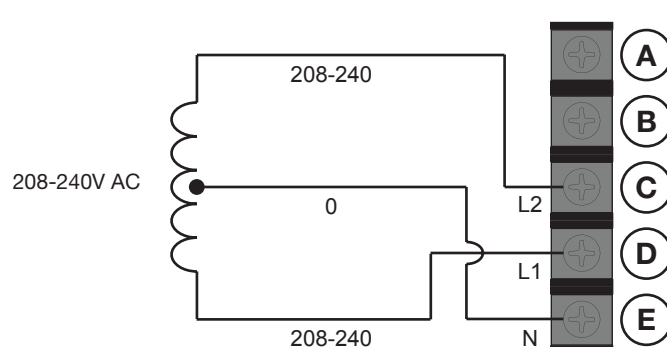
AC Filter Board Configuration - Step 1 of 3



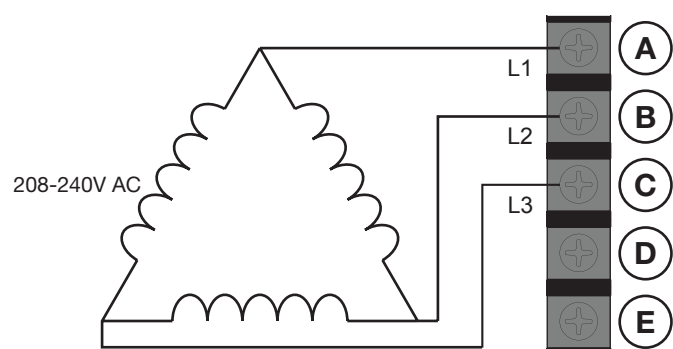
Configuration 1 - MP130 208-240V AC Single Phase.



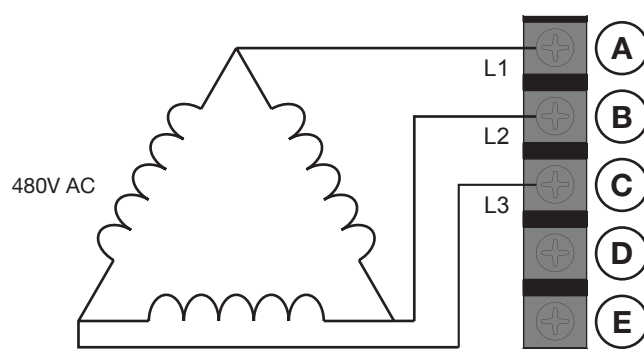
Configuration 2 - MP130 208-240V AC Single Phase Split Leg.



Configuration 3 - MP130 208-240V AC Three Phase.



Configuration 4 - MP330 480V AC Three Phase.

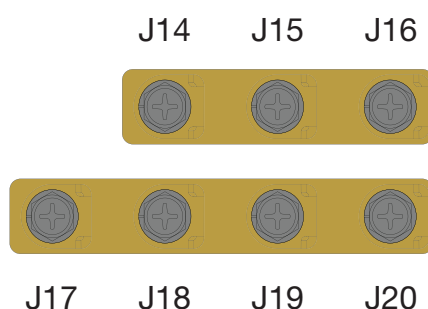


Note: It is common in the US that a fourth wire (neutral) be used in a triple phase circuit. If present, it should be attached to the "E" terminal.

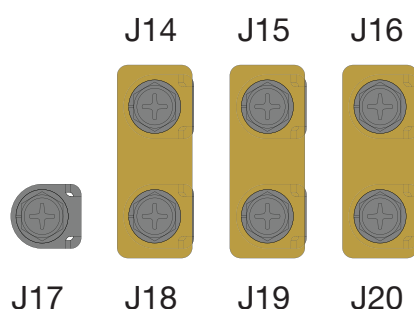
Installation

AC Filter Board Configuration - Step 2 of 3

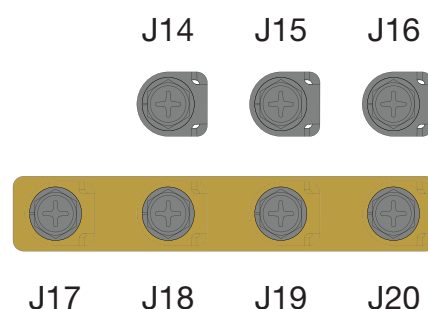
208-240V single phase configuration.



208-240V three phase configuration.



480V three phase configuration.

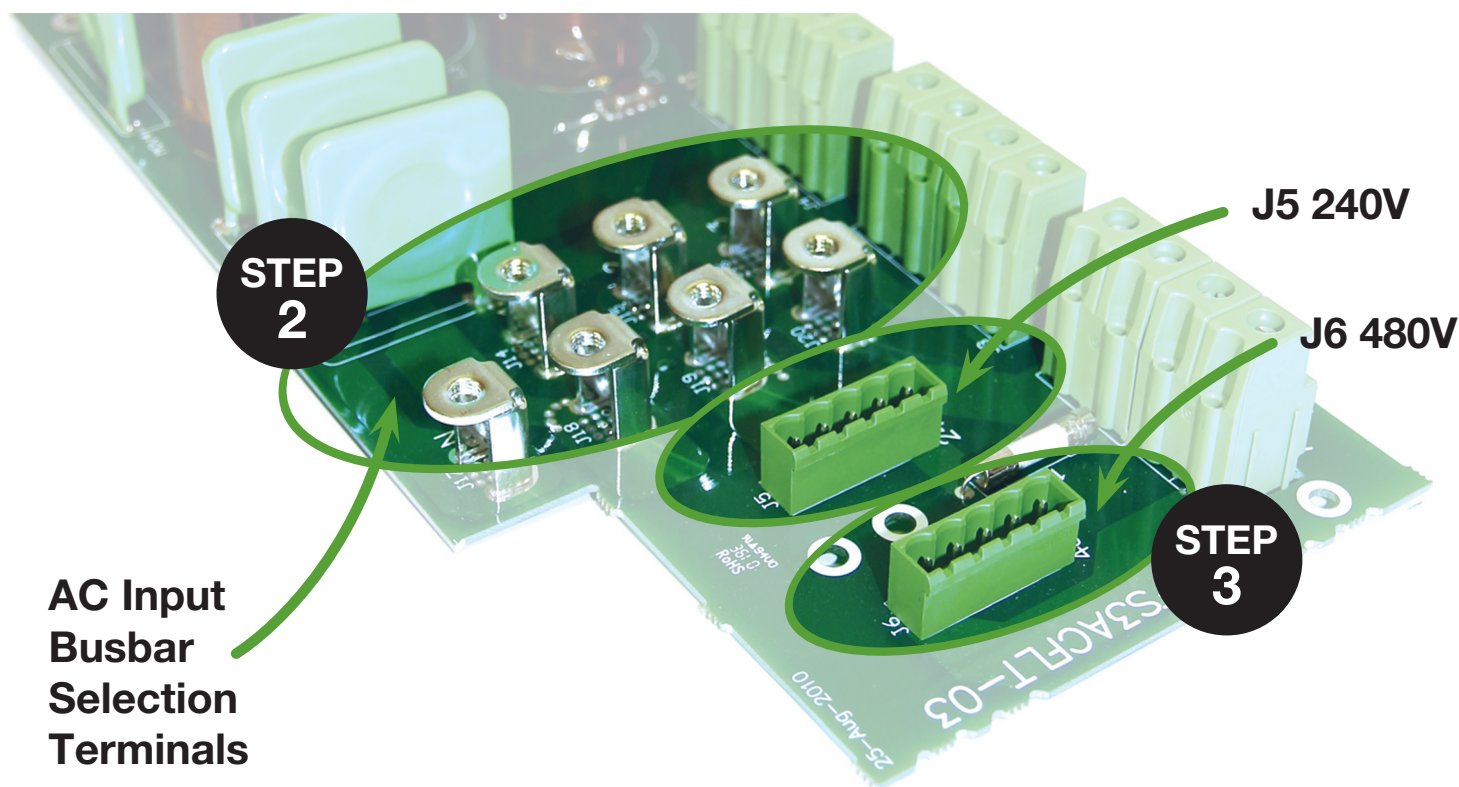


Use an 8mm socket on the M5 hex head bolts to secure the busbars in place. Unused busbar connections are bolted to the internal rear of the FS3 cabinet.

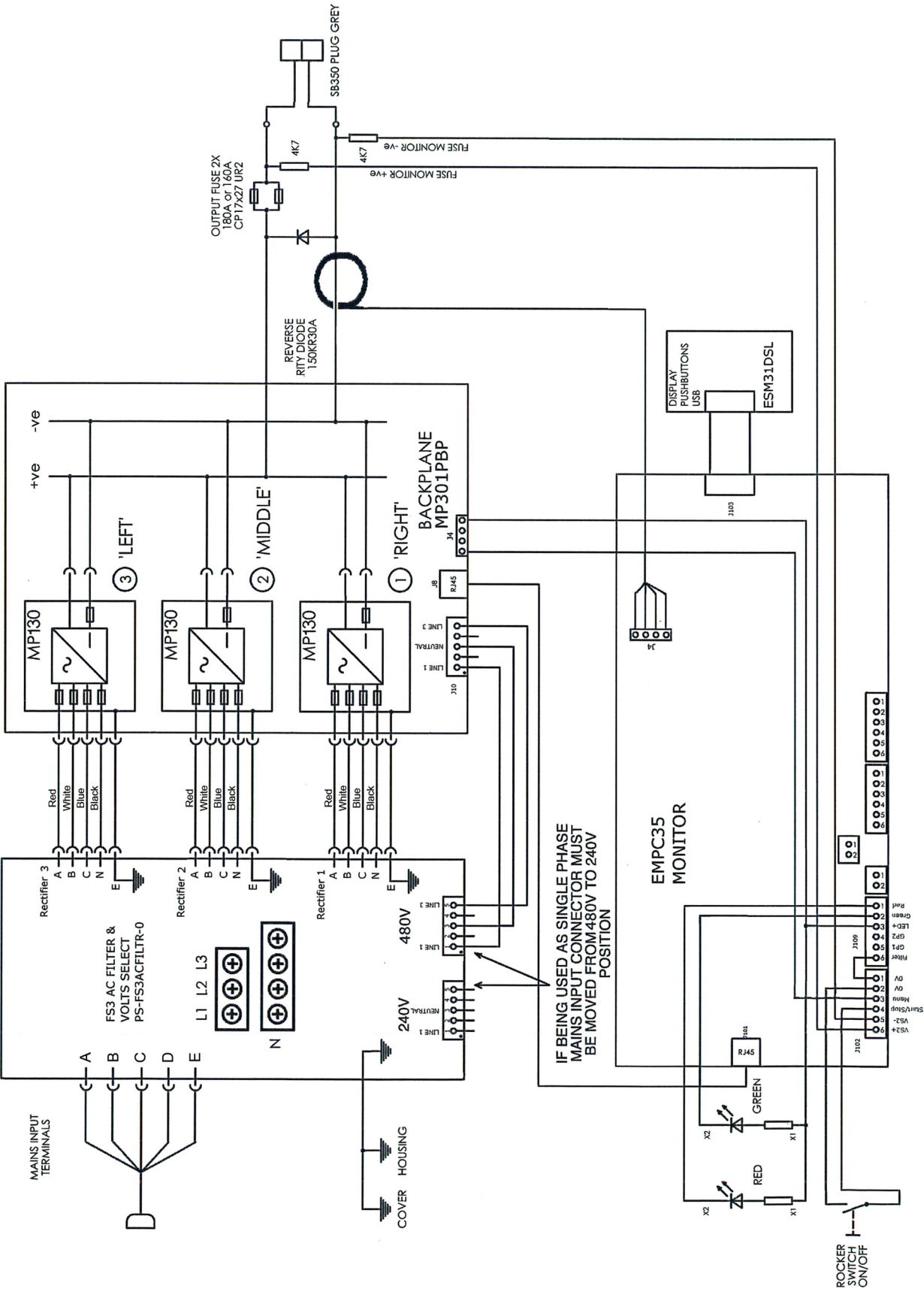
AC Filter Board Configuration - Step 3 of 3

AUX power supply connection to 208-240V outlet J5.

AUX power supply connection to 480V outlet J6.

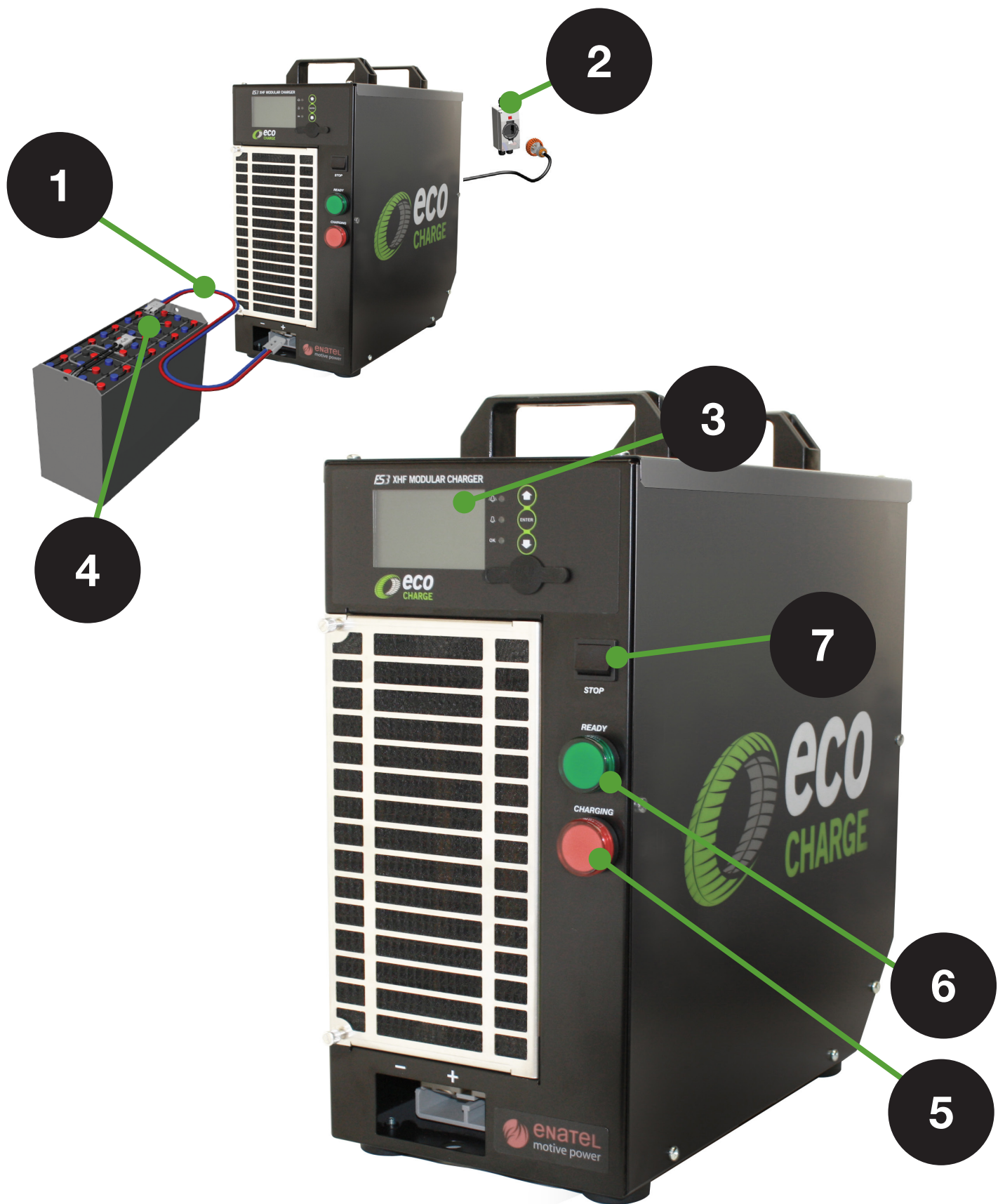


FS3 Block Diagram



Operating Instructions





- 1 Check the battery leads are in good condition before proceeding.
- 2 Plug the charger in and turn on the AC supply.
- 3 Check the voltage, amperage and battery type indicated on the charger's display matches the battery to be charged.
- 4 Connect the battery to the charger using the correct cable.
- 5 The red **CHARGING** light will illuminate to indicate charging has commenced.
- 6 When the green **READY** light illuminates, charging is complete.
- 7 Press the **STOP** switch at any time to stop the current charge.



Front Panel

1 **Controller display**
Displays information depending on the status of the charger.

2 **Controller push buttons (Set Equalize Charge)**
To enable equalize next cycle, plug in the battery but stop the charge by pressing the STOP Switch:

- Press  button to set equalize next cycle
- Press ENTER to allow changing
- Press  to select "Enable"
- Press ENTER to accept change
- Press  to select "Store"
- Press ENTER to accept
- Press  to return to "Connect Battery"
- Press the main switch to start the charge.

3 **Mini USB port**

4 **STOP momentary switch**
Press to Stop/Start.
Default position: Start.

5 **READY/CHARGING indicator lights**
RED steady on, GREEN off = Charging.
RED off, GREEN steady on = Charge complete.
RED flashing, GREEN off = Non-Urgent Alarm.
RED flashing, GREEN flashing = Urgent Alarm.



When a Non-Urgent Alarm is indicated the charge cycle has still completed and in most cases can be disregarded.

When a Urgent Alarm is indicated, the charge cycle has not been completed and the occurrence must be reported to a supervisor or charger dealer.



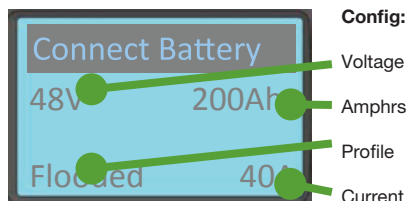
RED LED same as RED indicator.

AMBER LED same as GREEN indicator.

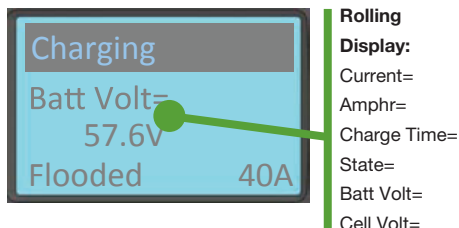
GREEN LED illuminates when charger is powered up.



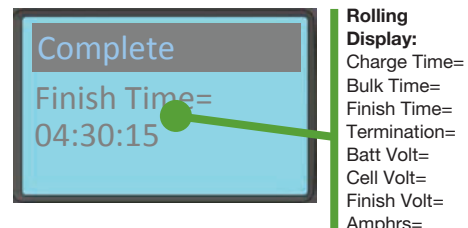
Display when no battery connected or charge has been stopped with switch.



Display when charging.



Display when charge complete.



Charger Configuration Settings

Charge Profiles Available:

Conventional Charge IU1a/IEI
Opportunity Charge
Fast Charge (battery module required)

Battery Types: Flooded, Sealed, Gel.

Environments: Standard, Freeze/cold condition.

Cable Length: Adjustable to any length.

Equalize Charge Settings:

Cycle count: Adjustable to any number. Default setting is to equalize charge after every 5 complete charge cycles.

Day/time: Select day and time of the week to trigger an equalize charge on the next charge cycle. Can also select to have it equalize charge every other week.

Manual equalize: Select to have an equalize charge run from the display panel.

Contact your local EcoCharge Dealer for assistance with the adjustment of these settings.

Ampere-Hour Ranges:

Conventional Profile:	
24V	(300-1200 Ah)
36V	(300-1200 Ah)
48V	(300-950 Ah)
72V	(300-560 Ah)
80V	(300-560 Ah)
Opportunity Profile:	
24V	(300-750 Ah)
36V	(300-750 Ah)
48V	(300-600 Ah)
72V	(300-360 Ah)
80V	(300-360 Ah)

Charger Alarms

Main Switch	Non-Urgent Module Fail	Configuration Error	APC Communications Fail
Inlet Filter	Urgent Module Fail	Output Fuse	APC Incorrect Voltage
Low Mains	Module Fan Fail	No Output Current	APC Unknown Charger
Mains Fail	Module Over Temperature	Monitor ADC Fail	

Charger Alarms

Main Switch. Urgent Alarm, shows the status of the front panel **STOP** switch.

Inlet Filter. Non-Urgent Alarm, can give warning as to when the inlet filter needs servicing but is not enabled by default.

Low Mains. Non-Urgent Alarm, gives a indication of variation in the input mains voltage without actually affecting the ability of the charger to provide rated output. Can also indicate a charger module being overloaded.

Mains Fail. Urgent Alarm, a mains loss situation and the charge cannot proceed.

Non-Urgent Module Fail. Non-Urgent Alarm, there is a charger module that is not providing output but the charger is still operating, but redundancy has been lost.

Urgent Module Fail. Urgent Alarm, if the number of charger modules not providing output equals or exceeds the setting for urgent module count in the monitor tab then the charger will stop. If urgent module count is set to one then the charger is configured without redundancy and a single fault will stop the charge.

Module Fan Fail. Non-Urgent Alarm, in the event of a complete fail of the cooling fans the effected module will back off the maximum output current available to level where natural convection of heat will allow the module to continue operating.

Module Over Temperature. Urgent Alarm, normally related to a blocked filter or

Charger Alarms

restricted exhaust air or installation in an inappropriate location.

Configuration Error. Urgent Alarm, the charger cannot meet the target current required by the controller even with all fitted charger modules operating or the configuration does not meet the limits set for a 10A mains input hardware limited charger.

Output Fuse. Urgent Alarm, a blown fuse in nearly all cases is caused by connecting a reverse polarity battery to the charger. When a fuse is blown, check all batteries for reverse cable connection. A common problem is with first charge of shift batteries that have not been previously tested in a lift truck. After replacing a battery or charger cable always closely check the polarity before plugging the battery onto the charger.

No Output Current. Urgent Alarm, the charger is not providing the expected output current. Generally related to a premature disconnection of the battery, but also could be an incorrectly inserted charger module.

Monitor ADC Fail. Urgent Alarm, internal watchdog of the controllers micro-controller indicating a major fault and potential unpredictable behaviour if the charger is left running.

APC Communications Fail. Urgent Alarm, the APC module has failed to communicate with the charger.

APC Incorrect Voltage. Urgent Alarm, the charger cannot produce the voltage required by the battery.

APC Unknown Charger. Urgent Alarm, the charger cannot find the required profile.

Battery Alarms

Over Discharged Battery	Bulk Charge Timeout	Minimum dV/dt	+dI/dt
Deeply Discharged Battery	Finishing Charge Timeout	Maximum Cell Voltage	Minimum Current
Sulphated Battery	Battery Disconnected	Batt Over Temp - Start	EQ/Refresh Timeout
Incorrect Battery	Reversed Battery	Batt Over Temp - Charge	

Battery Alarms

Over Discharged Battery. Urgent Alarm, the battery is still under 1.9Vpc after 30 seconds of charge which indicates a faulty battery that needs investigation.

Deeply Discharge Battery. Non-Urgent Alarm, the battery at start is under 1.9Vpc but recovers within 30 secs of charge, normally comes up when the battery is quickly unplugged from the lift truck and plugged into the charger.

Sulphated Battery. Urgent Alarm, deactivated by default.

Incorrect Battery. Urgent Alarm, the battery voltage is inappropriate for the configuration of the charger and cannot be charged without reconfiguring the charger to suit the battery.

Bulk Charge Timeout. Urgent Alarm, the battery has exceeded the maximum time allowed for the initial constant current bulk charge phase. Could indicate a faulty battery or the charger configuration is not correct for the size of battery to be charged. May need additional charger modules added to the charger.

Battery Alarms

Finishing Charge Timeout. Non-Urgent Alarm, the battery has exceeded the maximum time allowed for the finishing part of the charge cycle. Generally not a major problem and indicates the battery did not quite perform as expected. Not uncommon with new batteries that are still cycling up to full capacity (allow 10 cycles) however if the alarm is a regular occurrence it needs investigation and possible adjustment of the charger or service of the battery.

Battery Disconnected. Urgent Alarm, the battery has been unplugged before charge cycle has complete. This can damage the battery connector and increase risks of battery explosions as sparks around batteries at their top of charge whilst gassing can be very dangerous. If the battery needs to be disconnected during a charge cycle, the switch must be pressed to STOP. This will stop the charge and log a partial cycle in the charge log but allows safe disconnection of the battery.

Reversed Battery. Urgent Alarm, a battery with it plus and minus cables reversed has been connected to the charger. Generally this will also cause an output fuse alarm and the need to replace the chargers DC output fuse(s). Such a situation is not covered by warranty as new batteries should always first be checked for correct polarity BEFORE plugging onto the lift truck or a charger.

Minimum dV/dt . Non-Urgent Alarm, details the change in battery voltage over time. The alarm occurs when the change in voltage exceeds the value set in profile settings. This alarm also indicates the termination of a successful charge.

Maximum Cell Voltage. Non-Urgent Alarm, occurs when the voltage per cell exceeds the value set in the profile settings. Typically 2.7V per cell for lead acid batteries.

Batt Over Temp - Start. Urgent Alarm, occurs when the battery temperature measured before a charge profile starts exceeds the value set in the controller settings. This alarm will not allow the charge profile to continue.

Batt Over Temp - Charge. Non-Urgent Alarm, occurs when the battery temperature measured during a charge profile exceeds the value set in the controller settings. This alarm will allow the charge profile to complete.

+dI/dt. Urgent Alarm, occurs when the measured current in the constant voltage stage is rising instead of falling. This alarm will terminate the charge profile.

Minimum Current. Non-Urgent Alarm, occurs when using a IU profile and the current in the constant voltage stage falls below the value set in the profile settings. This alarm will not stop a profile and is considered normal for some types of batteries.

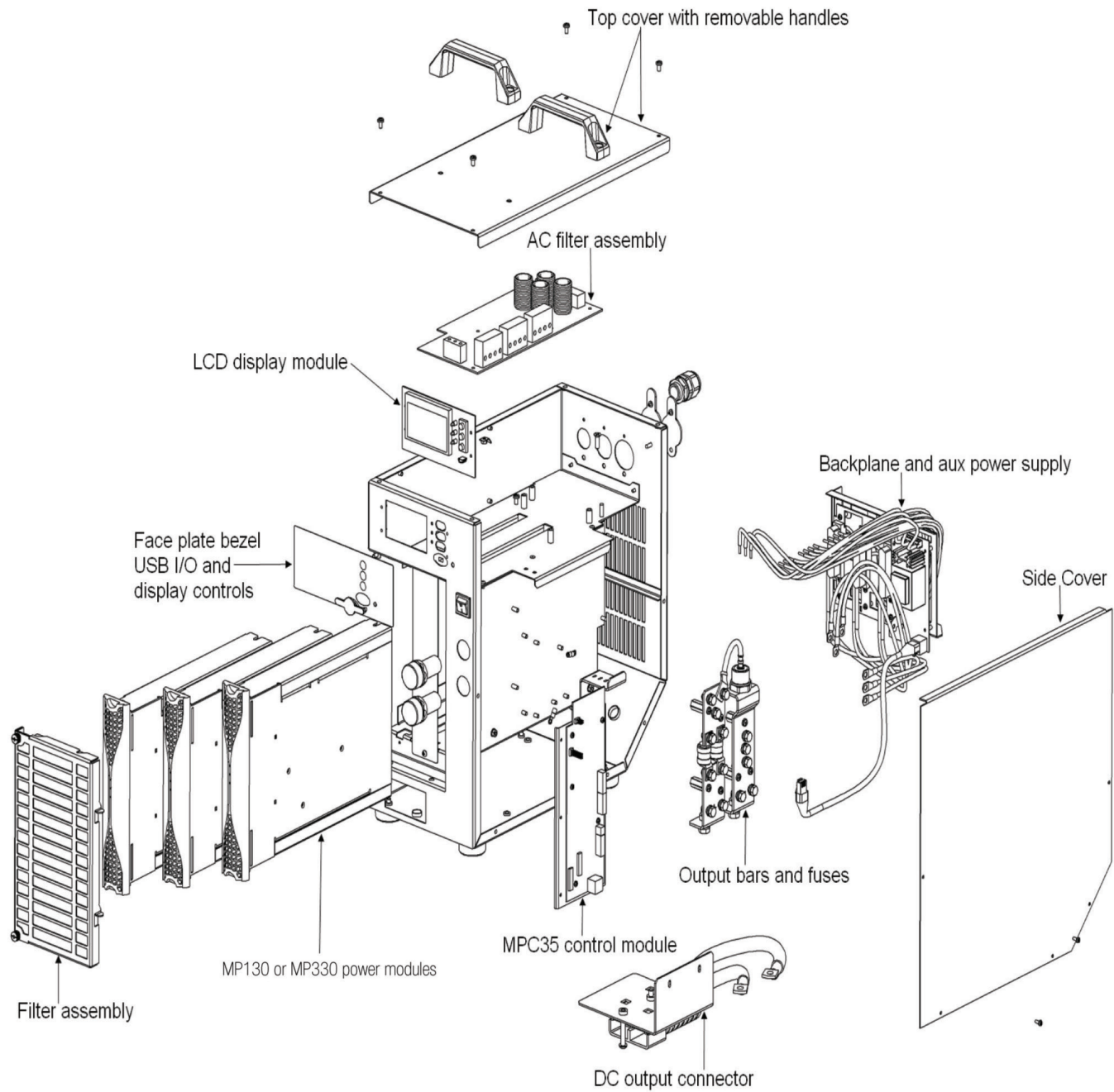
EQ/Refresh Timeout. Non-Urgent Alarm, occurs when the time in a given stage of the equalize profile has exceeded the value set for that stage of the profile. This alarm will terminate the equalize charge but is not considered an Urgent Alarm.

Troubleshooting



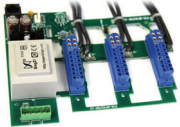









Problem	Possible Cause	Remedy
Inlet Filter Alarm.	Air inlet filter blocked.	Clean the filter.
Low Mains Alarm.	AC mains supply is low or charger modules may be overloaded.	Check configuration of the charger suits the application.
Non-Urgent Module Fail Alarm.	Charger module not providing output, there is capacity to charge at a reduced rate.	Replace the faulty charger module(s).
Urgent Module Fail Alarm.	Faulty charger modules are affecting the ability of the charger to charge the battery.	Replace the faulty charger module(s).
Module Fan Fail.	Faulty charger module fan.	Replace charger module.
Module Over Temperature.	Charger module is overheating.	Check air inlet filter is not blocked, check the charger is installed without any obstructions to air inlet and outlet.
Configuration Error.	Charger cannot provide the target output current.	Check the controller configuration matches the quantity of power modules installed, add charger modules if necessary.
Output Fuse.	Blown output fuse.	Check battery polarity. Replace blown fuse.
No Output Current.	Charger failing to provide the required current.	Check operator has not been unplugging battery mid charge cycle or the charge profile has allowed the battery current to fall below 0.7A.
Monitor ADC Fail.	Faulty MPC31 controller module.	Replace the MPC35 controller module ensuring the replacement is correctly configured.

Problem	Possible Cause	Remedy
Over Discharged Battery.	Battery is <1.9Vpc at connection but recovers within 30 seconds of charge.	Typically due to the battery being quickly unplugged from the truck and plugged onto the charger without allowing the battery to recover. Regular occurrences might need investigation of work practices.
Deeply Discharged Battery.	Battery is still <1.9Vpc after 30 seconds of charge.	Check battery for faults.
Incorrect Battery.	Battery is not the correct voltage for the charger.	Check the configuration matches the battery, check the operator is not trying to plug an incorrect battery type onto the charger.
Bulk Charge Timeout.	The bulk charge part of the cycle is longer than expected.	Check the charger configuration matches the battery, check the battery for problems.
Finishing Charge Timeout.	The finishing charge part of the cycle is longer than expected.	Check that the configuration matches the battery, regular timeouts may indicate a problem with the battery.
Battery Disconnected.	Battery has been disconnected during a charge cycle.	Remind the operator if there is a need to disconnect the battery during a charge cycle they must first press the front panel switch to STOP.
Reversed Battery.	A reverse polarity battery has been connected to the charger.	Correct the incorrect battery wiring and replace the blown charger output fuse(s).
Inability to set a 36V configuration to greater than 46A or a 48V config greater than 35A.	Charger only has a 10A AC input lead.	Upgrade the AC input circuit and remove the hardware AC current limit function.









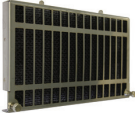




Exploded View



Spare Parts

Image	Description
	MP130 Module
	MP330 Module
	3 Across Backplane Assembly
	SM31 Large Display Assembly
	Voltage Sensor
	MPC35 Main Board Assembly
	FS3 AC Filter and Voltage Selection Assembly
	Stud Diode 150A 300V
	Fuse HRC180A 150VDC 240VAC
	Front Control Panel Membrane
	USB Hole Plug
	Carry Handle

Spare Parts

Image	Description
	Mounting Bracket
	Case Foot
	FS3 Cabinet
	FS3 Lid
	FS3 Side Panel
	DC Output Loom
	Blanking Plate Oval
	Blanking Plate Conduit
	Welded Filter Assembly
	Front Panel Green Indicator
	Front Panel Red Indicator
	Front Panel Switch - Momentary
	Front Panel Switch - Toggle

Maintenance

Provided it is correctly installed in an appropriate location and is not abused, the charger will require little maintenance. The only requirement is to monitor the air inlet filter at the front of the charger for dirt accumulation. The charger modules internal to the charger housing require a good supply of cooling air during the charge cycle and a blocked filter will affect the cooling. A blocked filter could lead to the charger turning down its maximum output to prevent overheating of the charger modules. An extremely blocked filter could cause longer charge times, inability to charge the battery correctly or premature wear of the charger modules.

Service Interval

The recommended service interval is 6 months but this will vary depending on the location of the charger and the number of charge cycles performed. The fans in the charger modules only run during charging and are speed controlled. If the charger output is small the fans will only be turning slowly. At full power there is a considerable requirement for cooling air and the fans will be working hard with considerable hot air being exhausted from the rear of the charger. The exhaust air from the rear of the charger should never be restricted. The intermittent nature of the fans results in a long fan service with no scheduled replacement of fans being required.

Intake Filter

The filter material is an electrostatic polypropylene type that is easy to clean with compressed air to blow out any accumulated dirt and dust. Before attempting to clean the filter it is necessary to remove it from the housing by unscrewing the two captive screws and unhinging the filter from the housing. The electrostatic filters provide a good compromise between filtering and clogging, but a small quantity of dust will enter the charger modules during normal operation. A small quantity of dust in the charger modules will generally not cause problems, however excessive accumulation or where the material ingested is corrosive, conductive or wet will cause issues, resulting in premature wear of the charger modules.

Removing the filter from the housing.

1. Unscrew the 2x captive screws and unhinge the filter from the housing.



2. Blow out any dirt & dust buildup with compressed air to clean the filter.

Service & Warranty

Service

If both the RED and GREEN indicators are flashing there has been an Urgent Alarm that has prevented the charge cycle from completing. Take note of the error displayed on the display and contact your nearest EcoCharge Dealer for instruction.

If the RED indicator is flashing, but the GREEN indicator is on steadily, the charge has completed satisfactorily but with a Non-Urgent Alarm. Contact your local EcoCharge Dealer only if this is occurring on a regular basis.

Warranty

EMP warrants that the product is free from defects in material and workmanship and agrees to remedy any defect (or at its option replace the product) for a period of one year from the date of purchase. This warranty covers both parts and labour. Parts may be replaced under this warranty with new or remanufactured parts.

This warranty will not apply to any product that has been improperly installed, misused, abused, used in ways the product was not designed, altered or repaired in any way which may affect the performance or reliability of operation, sustained damage by power surges or electrical storms, or sustained shipping damage, or repaired by any unauthorised repair centre.

Please contact EMP Customer Service to obtain a Returned Materials Authorisation (RMA) prior to shipping any products for repair. All shipments must be shipped prepaid and include proof of the date of your original purchase. Please include your name, address, phone number, email address and a brief description of the problem.

EMP makes no other warranties, express or implied, including any warranty of fitness for a particular purpose. In no event shall EMP be responsible for indirect or consequential damages or lost profits even if EMP Ltd has been advised of the possibility of such damages. EMP's sole obligation shall be the repair or replacement of a nonconforming product.

Specifications

FS3 Cabinet

Dimensions (in): 7.75W x 15.25D x 15.25H
Weight: 46 pounds (with 3 modules)

Charger Modules

	MP130	MP133	MP330	MP333
AC Input Voltage				
Single Phase, Nominal:	208/278V AC		-	
Three Phase, Nominal:	208/278V AC		380/480V AC	
Operating Voltage Range:	150-300V AC		340-580V AC	
Frequency Range:	45-65Hz >0.99PF		45-65Hz >0.94PF	
Maximum Efficiency:	93.5%		94.5%	

DC Output				
Range (VDC):	25-65	70-130	25-65	70-130
MP130/MP330:	60A DC output at 50V 52A DC output at 57.6V			
MP133/MP333:	30A DC output at 100V 26A DC output at 115.2V			

Environmental Requirements

Ambient Temp. Range: -50°F to 104°F
(max. output power is derated above 122°F)
Storage Temperature: -68°F to 158°F
Humidity: 5-95% RH
(non-condensing)

Compliances

UL Listed: E333392 - UL 1564
California Appliance Large Battery
Efficiency Program: Charger Systems*



* FS5L, FS9L models only. The Automatic Module Shutdown Control option must be set to Max Efficiency (this is a factory set default).

Contact Your Local Dealer:

Manufactured by:



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