CCL

Industrial battery chargers, power supplies and controls

Guardian FP series

Automatic Battery Chargers for NFPA20 Fire Pump System Applications

INSTALLATION AND OPERATION

THIS MANUAL REFERS TO THE FOLLOWING MODULES

Model Ref:	Order Code:
G1501210FP	GFP1501210
G3001220FP	GFP3001220
G3002410FP	GFP3002410
G6002420FP	GFP6002420
EG1501210FP	EGFP1501210
EG3001220FP	EGFP3001220
EG3002410FP	EGFP3002410
EG6002420FP	EGFP6002420

For safe and correct use of these chargers, read and save the safety information that precedes the installation and operation instructions.

This guide contains 8 pages (including this one). If any pages are missing, contact the battery charger supplier or manufacturer for replacement documentation.

Guardian, open frame: G series

Enclosed Guardian: EG series

COMPUTRONIC CONTROLS
A division of Frank W Murphy Ltd.

41 – 46 Railway Terrace, Nechells, Birmingham, B7 5NG, United Kingdom
tel: +44 121 327 8500
fax: +44 121 327 8501
email: sales@computroniccontrols.com
web: www.computroniccontrols.com

IMPORTANT SAFETY INFORMATION – READ AND SAVE THESE INSTRUCTIONS

This manual contains important safety and operating instructions for models G150, G300, G600, EG150, EG300 and EG600, with FP option designed for use in NFPA20 fire pump applications.

- Do not expose the battery charger to rain, snow or wet environments.
- The use of any attachment not recommended or sold by the battery charger manufacturer may result in risk of fire, electric shock or injury to persons.
- Do not operate charger if it has received a sharp blow, been dropped, or otherwise damaged in any way: return to supplier.
- Do not disassemble the charger: return to supplier when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.

WARNING – RISK OF EXPLOSIVE GASES

WORKING IN THE VICINITY OF A LEAD ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION.

To reduce the risk of battery explosion, follow these instructions and those published by the battery manufacturers and the manufacturer of any equipment you intend to use in the vicinity of the battery. Review cautionary marking on these products and any attached equipment.

PERSONAL PRECAUTIONS.

- (i) Someone should be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
- (ii) Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes.
- (iii) Wear complete eye protection and clothing protection. Avoid touching eyes whilst working near batteries.
- (iv) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eyes, immediately flood eyes with running cold water for at least 10 minutes and get immediate medical attention.
- (v) NEVER smoke or allow a spark or flame in vicinity of battery.
- (vi) Be extra cautious to reduce risk of dropping a metal tool on to the battery. It may spark or short-circuit the battery or other electrical part that may cause explosion.
- (vii) Remove personal metal items such as rings, bracelets, necklaces and watches when working with a lead-acid battery. A lead–acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burns.
- (viii) Use the charger only for charging batteries as stated on the charger. Do not use the battery charger for charging dry-cell batteries that are commonly used with home appliances. These batteries may burst and cause injury to persons and damage to property.
- (ix) NEVER CHARGE A FROZEN BATTERY

PRIOR TO INSTALLATION /COMMISSIONING

- Clean battery terminals. Be careful to keep corrosion from coming into contact with eyes.
- Add distilled water in each cell until the battery acid reaches a level specified by battery manufacturer. This helps purge excessive gas from the cell. Do not overfill. For a battery without cell caps, carefully follow manufacturer's recharging instructions.
- Study all battery manufacturer's specific precautions, such as removing or not removing cell caps while charging and recommended rates of charge.
- Determine the voltage of battery by referring to engine manual and ensure this matches the charger's output voltage.

CHARGER LOCATION AND CONNECTION

- Never place the charger directly above battery being charged: gases from the battery will corrode and damage the charger.
- Never allow battery acid to drip on to the charger when reading specific gravity or filling battery.
- Do not operate the charger in a closed-in area or restrict ventilation in any way.
- The battery charger should be connected to a grounded, metal, permanent wiring system; or an equipment–grounding conductor should be run with circuit conductors not connected to equipment-grounding terminal on the battery charger.
- Connections to the battery charger should comply with all local codes and ordinances.
- G150, G300 & G600 – these battery chargers should be installed so that they are not likely to be contacted by people.
- EG150, EG300 & EG600 – the AC wiring should be independent of the DC and alarm wiring. Use 2x 2.5mm (total wire Ø=5mm²) or larger wire for DC (charger to battery) leads. Use 2.5mm² or larger for input and ground connections.

For safe and correct use of the charger, follow the following steps. Should you have any problems or the unit does not function as expected, consult our troubleshooting guide at the end of these instructions.

- Visually inspect unit for any signs of damage, caused by transport or storage.
- Mount the charger as outlined above, paying attention to ambient temperature.
- Ensure the mains AC supply is isolated, and ensure the correct rated input voltage before connection.
- Ensure the charger is earthed at the marked earth stud.
- Check batteries in accordance with the manufacturer's guidelines.
- Check that the charger is correct for battery type and voltage.
- Connect the charger to the batteries, observing correct polarity and ensuring a secure and tight connection.
- Switch on charger at the mains AC supply.

GENERAL INFORMATION

Please read the following before installing. A visual inspection of this product for damage during shipping is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product. If in doubt, please contact your local Computronic representative.

The Guardian FP series provides automatic, current limited and voltage controlled charging of vented lead acid batteries. Guardian FP units are designed for controlling and maintaining the charge on batteries used to start engine-driven fire pump systems.

Each charger consists of a transformer, rectifier and thyristor control circuit. The units are available as either an open frame module for mounting in an enclosed panel, or as a wall-mounted enclosure with DC charge ammeter and voltmeter. *(Note: In the event of no AC supply to the charger, the voltmeter displays the DC voltage of the battery or connected DC equipment.)*

Electrical connection of the AC supply, battery and (boost/alarm) control circuits is via spring-clamp terminals. *(For more information on these terminals, see Computronic Controls Product Change Ref: CCL PC Release 1 – April 2003)*

Float charge operation

In normal charging mode, the Guardian maintains the battery at a pre-calibrated float voltage (see table right), while supplying any additional DC load up to the specified current limit (see Specification right).

When fully charged, a battery will only accept the charge required to replace internal losses (approx. 1mA per AH of battery). E.g. for a system with a 1 Amp standing load and a fully charged 50 AH lead acid battery, Guardian will typically supply 1.05 Amps.

Auto boost (equalising) operation

Auto boost operation gives a temporary increase in output voltage (see table right), equalising the charge between cells and maximising battery capacity and service life. Once the batteries have reached the boost voltage level, Guardian automatically reverts to its normal float charge mode, preventing battery over-charge and gassing.

Auto boost is triggered automatically when the battery falls below a preset voltage. An Auto Boost cycle can also be manually initiated (regardless of battery voltage) by linking two 'boost' terminals, e.g. via a panel switch or push-button.

Temperature compensation

The optimum charge voltage for lead acid batteries varies with ambient temperature. On all Guardian models, circuit board links allow output compensation to be disabled, or enabled with an on-board temperature sensor, or enabled with a remote sensor (RTC option, with 3 metre lead for mounting on or near the battery). With this feature enabled, output voltage decreases as ambient temperature increases at a rate of 3mV/°C/cell (see 'output calibration' table above for figures at 20°C).

Product specification

power supply:	
operating voltages	110 – 120 VAC ±6% or 230 VAC ±10% (specify)
operating frequency	50 or 60 Hz (specify)
DC charge output:	
nominal voltage	12 or 24 V DC
float / boost voltages	see 'output calibration' section
maximum current limit: (E)G150-12V, (E)G300-24V (E)G300-12V, (E)G600-24V	 10 A 20 A
voltage ripple	< 1%
alarm outputs:	
charge fail, low volts & high volts relays	SPDT volt free (dry) contacts
contact rating	1A @ 30 V DC (resistive load)
general:	
transformer	single phase 50-60Hz class 155 (F)
operating temperature	-10 to +55°C (14 to 131°F)
dimensions	see 'dimensions & assembly'
weight	see 'dimensions & assembly'
EMC emission / immunity	EN61000-6-4 / EN61000-6-2

Output calibration

The output voltages below are specific to FP option units and fire pump applications. FP option units **MUST NOT** be used in non-firepump applications.

Battery type	float volts (V DC)	boost volts (V DC)
12V vented lead acid (6 cells)	13.7	15.6
24V vented lead acid (12 cells)	27.4	31.2

Note: Calibration figures at 20°C (68°F). Output voltage automatically decreases by 3mV per cell per 1°C increase in temperature.

Alarm output

Guardian provides 3 x NFPA110 compliant alarm relay outputs: battery low volts and battery high volts (each with a 120 sec delay), and charge fail.

Warranty and servicing

Guardian chargers are supplied with a 2 year warranty on parts and workmanship.

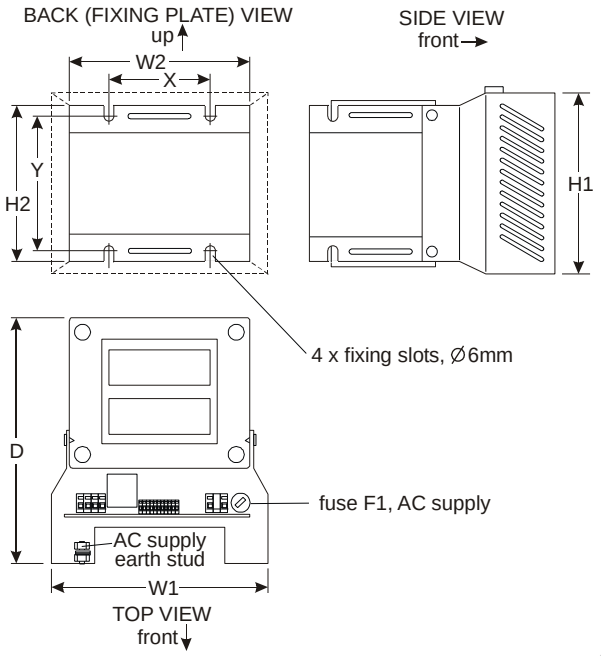
WARNING: Guardian battery chargers contain no user serviceable parts, and should be returned to the supplier in the event of failure.

No attempt should be made to repair the charger. Any attempt to do so may invalidate warranties, cause damage to the charger and equipment, and result in serious personal injury.

DIMENSIONS AND ASSEMBLY

CAUTION: When handling chargers, care should be taken not to place excessive weight or strain on either the heatsink, circuit boards, transformer or connecting wires. The units should be handled by the transformer frame (open frame models), or steel enclosure (enclosed models). Care should also be taken not to handle static sensitive components on the circuit board.

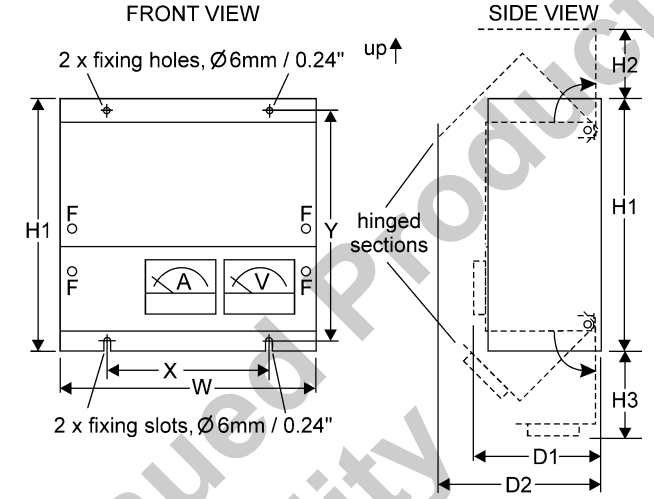
OPEN FRAME MODELS: G150, G300, G600



	G150, G300 series	G600 series
Overall:		
W1	152mm / 5.98”	152mm / 5.98”
H1	125mm / 4.92”	142mm / 5.59”
D	170mm / 6.69”	220mm / 8.66”
Fixing plate:		
W2	125mm / 4.92”	130mm / 5.12”
H2	110mm / 4.33”	130mm / 5.12”
X	70mm / 2.76”	95mm / 3.74”
Y	92mm / 3.62”	110mm / 4.33”
Weight	7.0 Kg / 15.4 lb	12.5 Kg / 27.5 lb

- These chargers are designed for mounting on a vertical facia or plate inside a control panel or housing. For safe heat dissipation, mount the product in the orientation shown with a minimum air-gap clearance of 40mm above/below and 25mm at sides. Consideration must be given to ventilation for proper heat dissipation.
- 4 chassis slots (Ø 6mm) are provided for mounting. Ensure that the mounting studs/bolts/nuts/screws adequately support the charger weight, and are tightened sufficiently to not to become loose during normal use (e.g. due to engine/equipment vibration).

WALL MOUNTED ENCLOSURE MODELS: EG150, EG300, EG600



	EG150, EG300 series	EG600 series
Overall:		
W	275mm / 10.83”	335mm / 13.19”
H1	280mm / 11.02”	310mm / 12.20”
H2	75mm / 2.95”	85mm / 3.35”
H3	90mm / 3.54”	100mm / 3.94”
D1	125mm / 4.92”	145mm / 5.71”
D2	190mm / 7.48”	210mm / 8.27”
Fixing holes:		
X	172mm / 6.77”	223mm / 8.78”
Y	255mm / 10.04”	285mm / 11.22”
Weight	10.0 Kg / 22.0 lb	17.5 Kg / 38.5 lb

- These chargers are designed for wall or frame mounting in the orientation shown above, with enclosure air vents uppermost. Adequate consideration should be given to ventilation for proper heat dissipation.
- Mounting is via the enclosure back-plate, using 2 slots (Ø 6mm) on the back-plate lower edge and 2 holes (Ø 6mm) on the upper edge. Ensure that the mounting studs/bolts/ nuts/screws adequately support the charger weight, and are tightened sufficiently to not to become loose during normal use (e.g. due to engine/equipment vibration).
- Access to the electrical connection terminals is via hinged sections on the front facia. Remove the 4 x securing screws (marked F above), and then rotate the upper and lower sections through 90 degrees.
- Electrical cable entry is via knock-outs on either side of the enclosure, which must be carefully removed from the enclosure sides. A suitable cable-gland (20 mm / 0.8” diam.) must be used to prevent damage to cables and stop unwanted entry into inner part of charger.
- Connect the charger wiring as detailed in the following section, “Electrical connection”. When wiring is complete, and before using the charger, re-secure the hinged sections using the 4 fixing screws.

ELECTRICAL CONNECTION

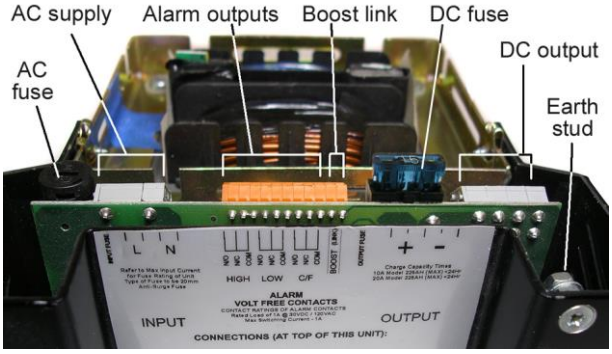
DANGER ! HIGH VOLTS

WARNING: DANGER OF INJURY OR DEATH. During normal operation, Guardian is connected to high voltage AC circuits. Before connection, disconnection or handling of these chargers, ensure isolation of all AC power supplies. Connection or disconnection with live wiring can also cause hazardous sparking and component damage.

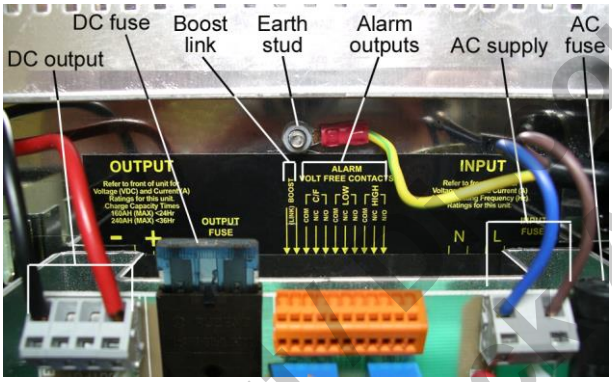
General

Electrical connection is via labelled spring-clamp terminals on the Guardian circuit board.

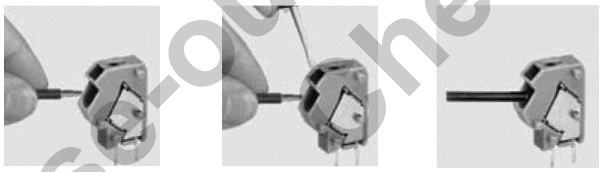
For G150/G300/G600 (open chassis) models:



For EG150/EG300/EG600 (enclosed) models, remove the upper 2 screws on the panel front facia (on the plate containing product labelling), then rotate the front plate upwards to expose the electrical terminals. Compared with the open-chassis versions above, note the reverse orientation of the EG series terminals:



Spring-clamp terminal connection is as follows:



Strip and position the wire just before the clamping unit.	Press down on the clamp spring and insert the wire into the clamp.	Release the clamp spring and check that the wire is secure.

DC Output

Before DC connection or disconnection:

- Ensure AC supply input is isolated. **Disconnecting the batteries while the AC supply is live can result in sparking at the battery terminals, ignition of battery gasses and serious personal injury.**
- Check that the charger output is compatible with battery type & voltage. **Incompatibility may result in damage to the charger, batteries and serious personal injury.**

Connect the Guardian output to the battery terminals, observing the warnings above and the correct DC polarity.

The Guardian DC charge output uses an automotive type fuse for protection of reverse polarity and short-circuit faults. In the event of these faults, isolate the AC supply and disconnect the output terminals. Ensure the external fault has been corrected, replace the fuse (see product labelling for the correct rating), then re-connect and switch on the charger. If the fuse continues to blow, return the charger to the supplier for evaluation.

Boost Initiate

The Guardian Auto Boost feature provides an automatic increase in output voltage, as described on page 3. In addition, the operator can manually initiate a single Auto Boost cycle (at any time, regardless of battery voltage), by linking the 2 terminals marked ‘boost’, e.g. using a momentary push button or panel switch.

Alarm outputs: Charge Fail, Low Volts, High Volts

Guardian is fitted with three alarm relay outputs, each with SPDT volt-free contacts, rated 1 Amp max. at 30V DC.

During normal operation:

- Charge fail and low volts relays are energised (COM closes to NO contact).
- The high volts relay is de-energised (COM closes to NC contact).

During fault conditions:

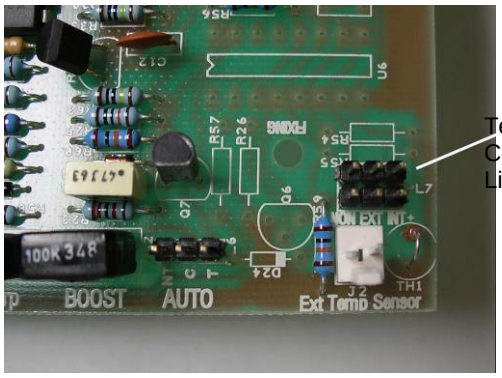
- The charge fail relay de-energises immediately following a charging fault, e.g. loss of mains supply.
- The low volts relay de-energises on low battery voltage, and the high volts relay energises on high battery voltage. A 120 second delay applies to both relays, allowing for normal battery voltage fluctuations (e.g. caused by engine cranking).

ELECTRICAL CONNECTION (cont.)

Temperature Compensation & RTC option

All Guardian models include circuit board pin-header links that allow configuration of the temperature compensation feature, i.e. the automatic adjustment of charge voltage according to measured ambient temperature.

When the circuit board is viewed component side up, with connectors and fuses uppermost, the 3 pairs of links (ident label “PL7”) are located at the lower right corner of the board:



Guardian is supplied with a link across one vertical pair of pin-headers (see default settings below). To reconfigure the temperature compensation, use small, long-nosed pliers to remove and refit the link:

Link position ident	Operation
NON	None. This is the default configuration for standard Guardians without the RTC option remote sensor. With this configuration, the charge output voltage does not vary with ambient temperature. Use this option if the batteries are maintained at a stable temperature around 20°C/68°F.
EXT	External. This is the default configuration for units supplied with the RTC option remote temperature sensor. In this mode, Guardian charge voltage automatically varies according to ambient temperature, as measured through the RTC remote sensor. For each °C increase in temperature, output voltage automatically decreases by 3mV per cell, e.g. by 18mV for a 12V (6 cell) lead acid battery pack. The RTC sensor should be connected as close as practicable to the battery being charged. The sensor is supplied with a 3 Meter lead, wired to the Guardian circuit board through a pin-header connector (white connector J2 shown left, located just below the PL7 configuration links). Use this option to give an optimum charge voltage when battery temperature deviates significantly from 20°C/68°F.
INT	Internal. This configuration gives automatic charge voltage compensation similar to EXT above, but with temperature measured by an on-board sensor (instead of the RTC remote sensor). Use this option if the battery temperature is likely to deviate significantly from 20°C/68°F, AND the charger remains at a similar temperature to the battery.

WARNING: DO NOT use this option if the charger (i.e. on-board sensor) and battery ambient temperatures are significantly different, e.g. batteries in a cool environment, with the charger in a warmer, enclosed panel. (Note: the charger itself may cause significant ambient warming.)

AC Input (power supply)

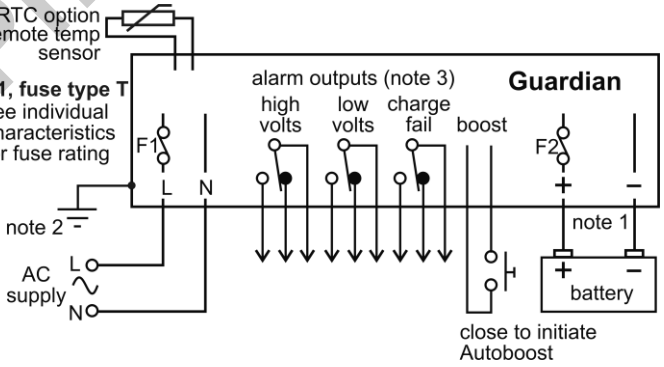
Before AC connection, disconnection or fuse replacement:

- Isolate the AC supply
- Ensure a good earth connection to the earth stud on the charger’s metal chassis.
- Ensure the AC supply voltage is compatible with the charger’s supply rating. **Exceeding the rated voltage may result in damage to the charger and connected equipment, and cause serious personal injury.**

All Guardian models are fitted with mains AC input fuses, with ratings as labelled on each charger.

Typical Connection

Note: terminal orientation shown for Guardian (open-board); reverse orientation applies for Enclosed Guardian models



Notes:

1) DC charge (battery) output is isolated from the Guardian chassis.
2) Chassis must be connected to AC supply ground.
3) Alarm relay outputs shown in de-energised (powered down) state.
   High (battery) volts relay energises 120 secs after fault condition.
   Low (battery) volts relay de-energises 120 secs after fault condition.
   Charge fail relay de-energises immediately on fault condition.

TROUBLESHOOTING FLOWCHART

START HERE

Are batteries charging?

YES → **PROBLEM SOLVED**

NO

MEASURING CHARGING VOLTAGE AND CURRENT

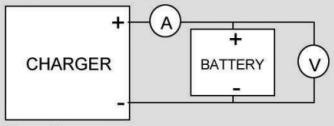


Figure (ii)

To check charger is working, follow these steps then consult expected conditions for relevant battery type below.

(1) VOLTAGE - Place voltmeter across battery terminals (V on fig ii)

(2) CURRENT - Break the positive line to the battery and place an ammeter between positive from charger and positive of battery (A on fig ii)

Lead Acid @ 20ºC

CURRENT FLOW FROM CHARGER TO BATTERY
If voltage at terminals is less than nominal battery voltage then the maximum rated charger current should be present.
Note: Once battery is fully charged, output current should be between 0/1% and 0.5% of battery's AH capacity plus any standing loads.

VOLTAGE RISE AT BATTERY TERMINALS
A gradual rise of voltage should be seen slowing as float voltage is reached. - batteries should NOT be boost charged continuously *(see page 3)*
Note: If the battery voltage increases rapidly during charge and no or minimum current is measured then the battery may have become sulphated and will not hold charge and may be unrecoverable

Is a battery charger connected?

NO → **Connect battery charger**

YES

Is correct mains supply present on terminals?

NO → **Check mains supply, fuses and wiring.**

YES

Is output voltage correct for batteries?

NO → **Replace with correct voltage charger.**

YES

	12V lead-acid	24V lead-acid
Float:	13.7V	27.4V
Boost:	15.6V	31.2V

These values apply for fire pump applications only (Guardian FP models)

Typical output with no battery or load connected (all Guardian models): 0 V

Is output voltage correct polarity on terminals?

NO → **Check fuses and wiring.**

YES

Is battery charger correct size for battery?

NO → **Replace with correct size charger.**

YES

Lead Acid

Refer to genset manual for sizing of battery chargers to generator set. If installing your own chargers, battery manufacturers recommend the following: -
Minimum charge current should be approximately 5% battery AH capacity
Maximum charge current to be equal to 25% battery AH capacity
NOTE: When batteries are normally charged by a charging alternator, a float battery charger rated at lower than the minimum charge current is sufficient to keep batteries in fully charged state.

Is there a standing load present?

NO → **Are electrolyte levels correct?**

YES → **Are batteries at end of life?**

YES → **Replace batteries**

YES

Is standing load current greater than charger output current?

NO → back to **Are electrolyte levels correct?**

YES

REMINDER
The battery charger will need to provide both the standing load and minimum charge current
I.e. if a charging current of 2A is required, and the standing load is 1A then the charger needs to be able to output a total of 3 amps

Replace charger with correct size unit.

Are electrolyte levels correct? NO →

FACTORS CONTRIBUTING TO ELECTROLYTE LOSS
- Physical damage to cells can cause electrolyte to leak or evaporate
- High charging voltages will evaporate electrolyte

Check charging voltage against battery type and voltage

WARNING: If the batteries are being used at above 20 DEGREES CELSIUS the chargers output voltage should be temperature compensated at -3mV/ºC/Cell

Top up batteries as per manufacturers recommendations

Are batteries at end of life? NO →

Lead Acid

Two possible methods:
(1) Using Hydrometer or (2) Using a digital DC voltmeter

Step 1. Fully charge the batteries
Step 2. Disconnect batteries and leads and leave for 24 hours
Step 3. Measure either specific gravity (hydrometer) or terminal voltage (voltmeter) and compare with table below.

% Charge	Specific Gravity	Voltage (DC) on a 12V battery
100	1.265	12.8
75	1.225	12.5
50	1.19	12.4
25	1.155	12.0
Discharged	1.12	11.5

If the voltage across the terminals shows around 10.5V, this may indicate a shorted cell is present.
Step 4. If time is limited due to on-site testing, remove surface charge by either applying a 20A load for 3 minutes or crank engine for 10 seconds, then disconnect batteries and leads and leave for minimum of 10 mins.
NOTE: On this method, providing batteries have been sized correctly for engine and charged correctly, an open terminal voltage of 12.5V or greater should be present.

Battery Charger may be faulty - Contact manufacturer

COMPUTRONIC CONTROLS
A division of Frank W Murphy Ltd.

41 – 46 Railway Terrace, Nechells, Birmingham, B7 5NG, United Kingdom
tel: +44 121 327 8500
fax: +44 121 327 8501
email: sales@computroniccontrols.com
web: www.computroniccontrols.com