Sentry Battery Chargers

Please review this manual before attempting to install this battery charger.

For the Marine Industry

Sentry™ Truisair

Owner's & Installation Manual

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WARNING

This manual contains essential safety information concerning the operation and maintenance of Sentry Battery Chargers. It is vitally important that you read and understand the contents of this manual thoroughly before using the equipment, and you should keep it on your boat for future reference. If there are any statements in this manual that you do not understand, contact Marine Development Corporation for technical assistance before proceeding.

Improper installation or operation of Sentry Battery Chargers could produce hazardous conditions, which could result in serious injury or death of the occupants and damage or destruction of the vessel.

Table Of Contents

List Of Illustrations

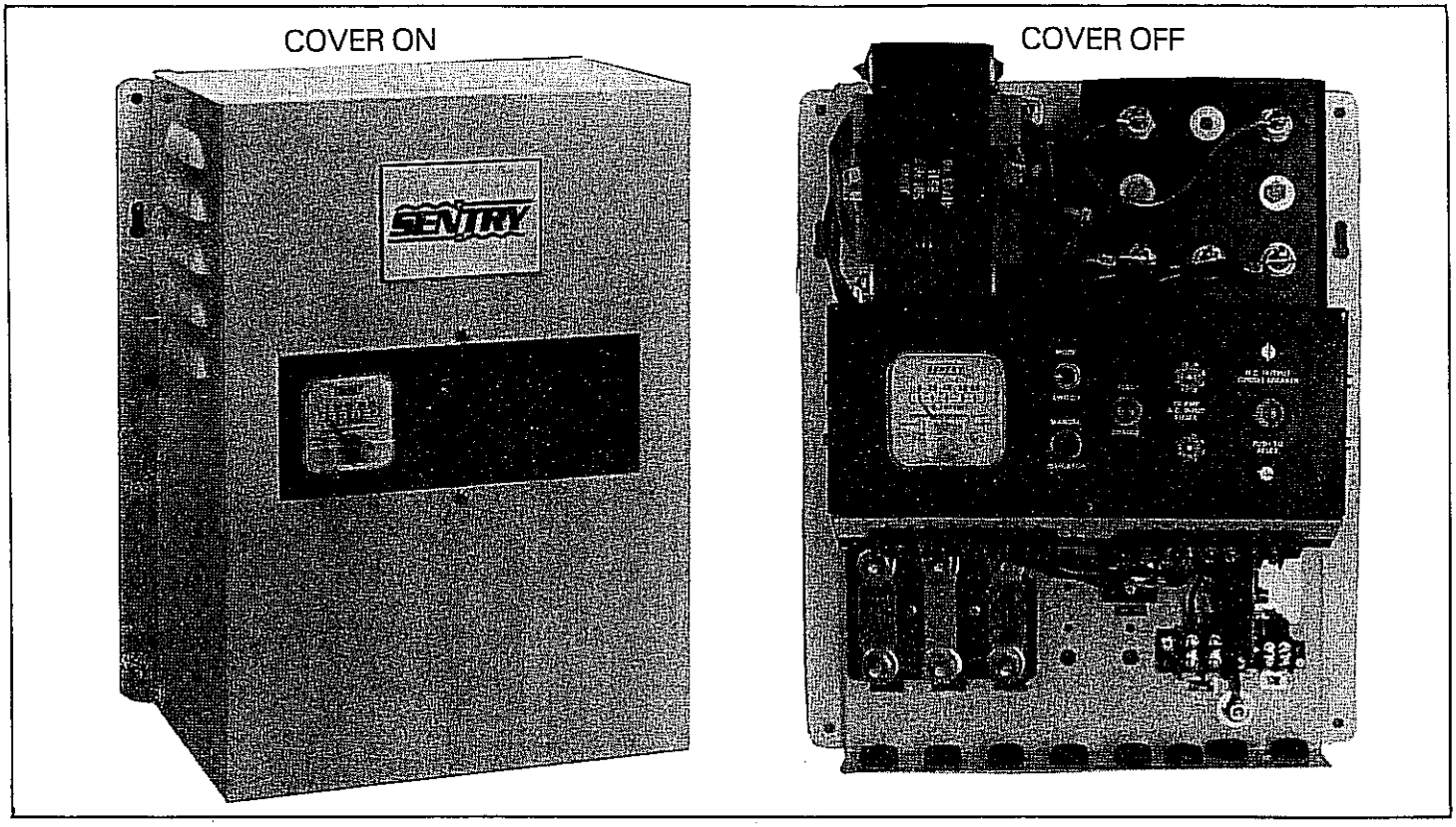


Figure 1. Series G Sentry Battery Chargers.

Sentry model numbers provide important information about the type and configuration of each charger. The diagram below shows the meaning of this coded information.

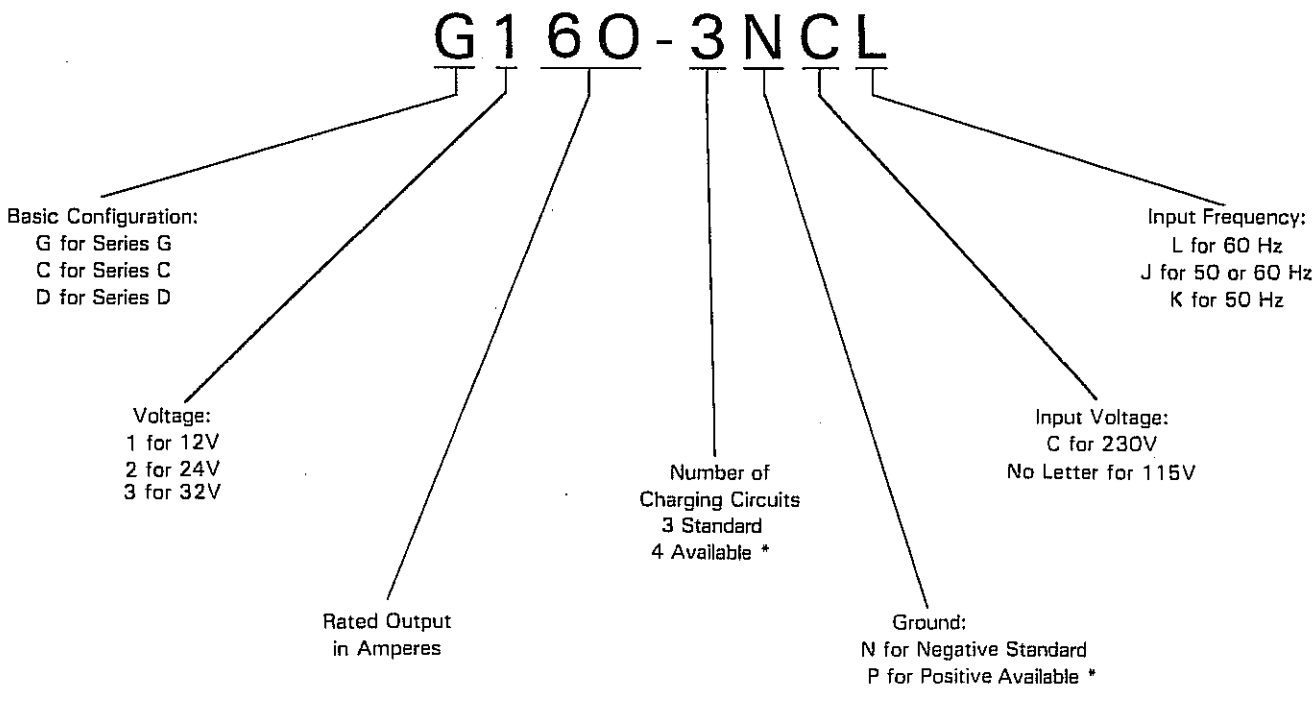


Figure 2. How To Interpret Your Sentry Model Number.

* Special Order

OPERATING INSTRUCTIONS

Sentry battery chargers are designed for fully automatic operation. Normally, once you have turned the charger on, you will not need to turn it off at all except for routine maintenance.

The following is a step-by-step sequence of system operation.

1. Turn on the vessel's circuit breaker for the line to which the Sentry charger is connected.

2. Set the automatic/manual selector switch to "automatic."(Manual indicator not lit).

3. Check whether the full-charge indicator light is on. If it is not lit, observe the ammeter, which should indicate the rate of charge to the batteries. If it is lit, the ammeter should read zero.

4. If a remote panel is installed with your Sentry charger, operation is the same as from the main unit.

CAUTION

Use of the "manual" setting is only recommended for short times, to give extra charge for starting engines or to revive a "dead" battery. The unit should remain in automatic at all other times. Overuse of the manual setting can result in overcharging and dehydrating your batteries.

INSTALLATION INSTRUCTIONS

WARNING

Owners should not attempt to install Sentry battery chargers without guidance from the factory. Whenever possible, the equipment should be installed by an authorized Sentry service representative.

1. Select a dry, well-ventilated area, near, but not above batteries. Mount in vertical position, to create a natural ventilation for cooling the unit. Note that the wire connections are at the bottom of the unit. Leave at least three (3) inches clearance above and below the unit for proper ventilation. **See Figure 3.**

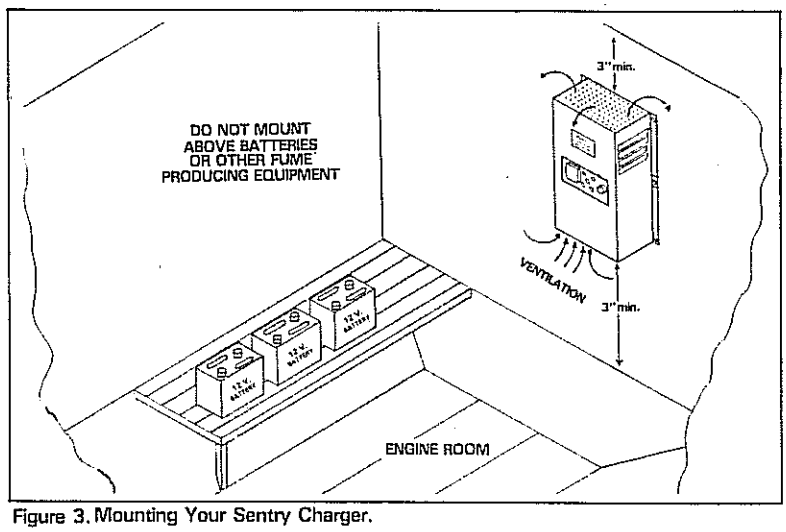


Figure 3. Mounting Your Sentry Charger.

IMPORTANT

Sentry Chargers are designed and calibrated specifically for marine grade deep cycle lead acid batteries. If you plan to use any other types of batteries, please contact the factory or an authorized Sentry representative first.

2. Make AC connections. All Sentry chargers except 115V G330 models require #14 AWG wire with 105 °C insulation for use on AC connections and should be protected by a 15 AMP circuit breaker or time delay fuse. On 115V G330 models use #12 AWG wire with 105 °C insulation protected by a 20 AMP circuit breaker or time delay fuse. Wire terminations should be locking forks or ring terminals. **See Figures 5 and 6.**

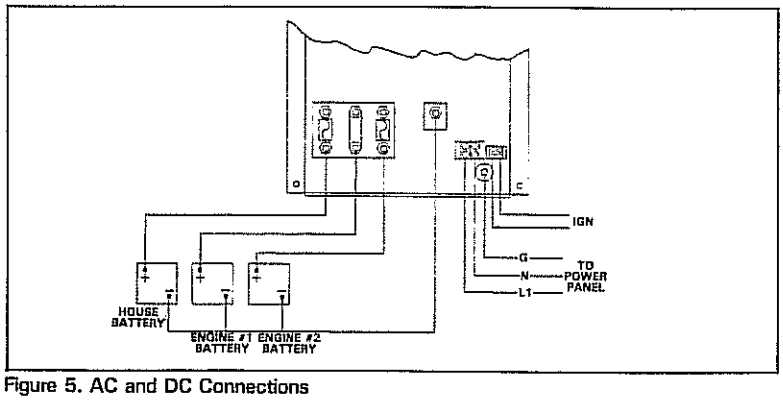


Figure 5. AC and DC Connections

Distance From Sentry to Batteries	0-10 Feet	10-25 Feet
G120	#10 AWG	#8 AWG
G225	10	8
G330	8	6
G140	6	4
G240	8	6
G160	6	2

For distances over 25 feet consult factory.
Figure 4. Wiring Gauge & Grade

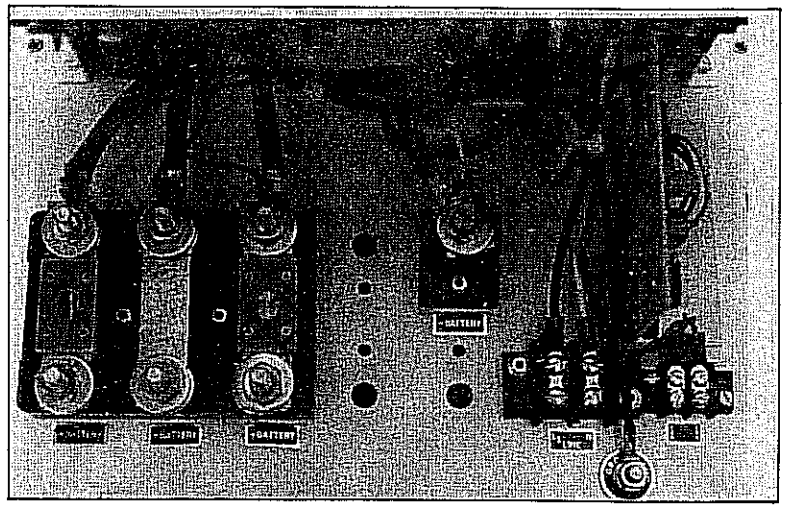


Figure 6. AC and DC Connections

3. Make battery connections. Connect the positive terminal of each battery to individual studs in the charger labeled "+ BATTERY." **See Figures 5 and 6.** Connect all battery negative terminals to the stud labeled "–BATTERY." Use ring terminals

WARNING

Although Sentry chargers are designed to minimize the danger of the unit case and other metal components from becoming electrically charged, good safety practice demands that the unit case be grounded. Marine Development Corporation considers any ungrounded electrical equipment to be potentially hazardous and strongly recommends that you ground the case of the Sentry charger with 14 AWG or larger wire.

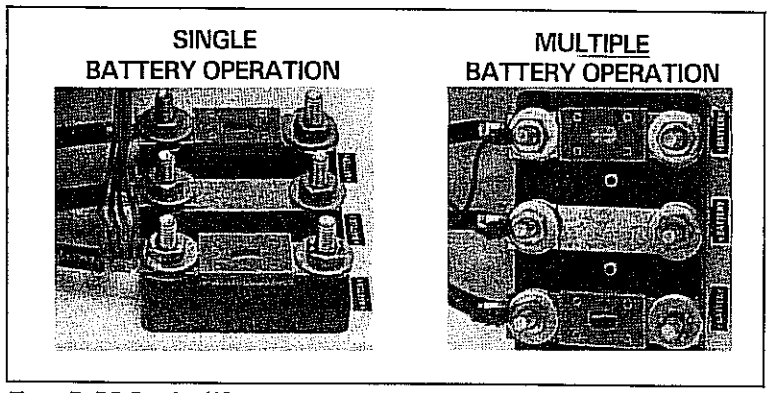


Figure 7. DC Sensing Wires.

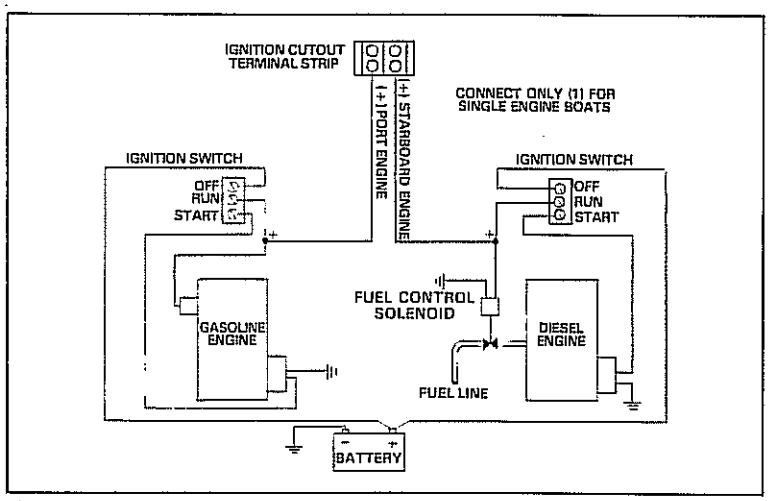


Figure 8. Ignition Cut-Off.

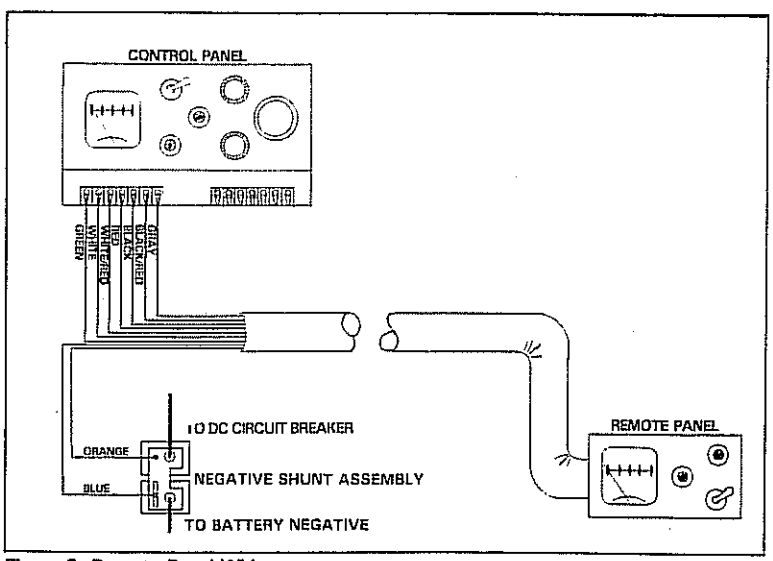


Figure 9. Remote Panel Wiring.

for all battery connections at the charger. **See Figure 4** for correct wire size; all wire insulation should be rated for 105 °C.

4. Locate the four red DC sensing wires, which are attached to a single "+BATTERY" stud. **(See Figure 7.)** If only one battery is to be charged, this should be the stud to which the battery is connected. If two batteries are to be charged, disconnect one of these red wires and attach to another "+BATTERY" stud where the second battery is connected. If three batteries are to be charged, shift two red wires to other "+BATTERY" studs. If a fourth battery is to be charged (available as an option on certain Sentry models), shift three red wires as shown.

CAUTION

All red DC sensing wires must be connected to "+BATTERY" studs. Do not allow any of these wires to dangle. Do not attach a DC sensing wire to any "+BATTERY" stud that is not connected to a battery.

5. Connect ignition cut-off, if desired. This is accomplished by connecting either or both of the ignition cut-off terminals to the positive output terminal of the ignition switch or the positive terminal of the fuel supply solenoid for the main engine. Use #16 AWG or larger wire with 105 °C insulation and terminate with locking forks or ring terminals. **See Figure 8.**

6. If a remote panel is to be installed, make connections as shown in **Figure 9.** When attaching wires for remote panel, remove the 2 jumpers on that terminal strip first.

YOUR SENTRY BATTERY CHARGER AND HOW IT WORKS

FUNDAMENTALS OF BATTERY CHARGERS

The basic function of a marine battery charger is to convert the high-voltage alternating current (AC), taken from shore electrical circuits or an onboard generator, to low-voltage direct current (DC), which is suitable for charging the boat's batteries.

This is a two-step process. First, the 120 or 240 volt AC power is lowered to match the boat's DC voltage (typically 12, 24 or 32 volts). This is accomplished by a device called a transformer. Second, the reduced alternating current (AC) must be converted to direct current (DC). This is done by a device called a rectifier. **See Figure 10.**

Once the power source is reduced to a compatible voltage and rectified to the DC format, the power can be applied to the battery allowing it to charge.

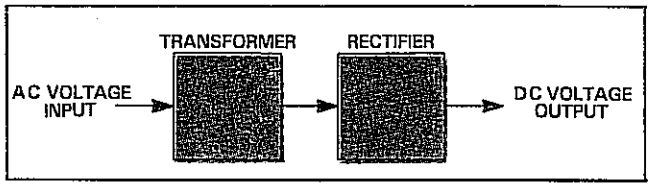


Figure 10. Simplified Block Diagram.

EXTERNAL COMPONENTS

The following is a description of the functions of the switches, indicators and other external components of your Sentry battery charger. **See Figure 11.**

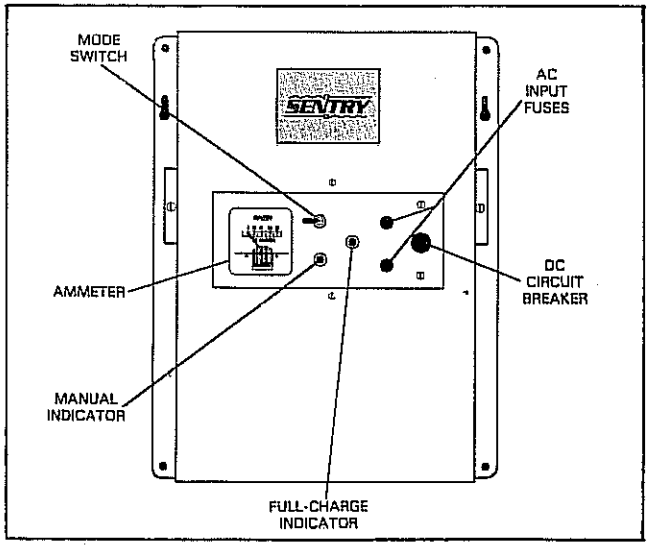


Figure 11. Sentry External Components.

CONTROLS. Since Sentry chargers are designed for fully automatic operation, the only user control on the unit is the **automatic/manual** selector switch. This is normally placed in the "automatic" position and should only be switched to "manual" for brief periods when continuous uninterrupted charging is desired. CAUTION: DO NOT LEAVE IN MANUAL POSITION FOR LONG PERIODS OF TIME. THIS CAN DEHYDRATE AND DAMAGE YOUR BATTERIES.

INDICATORS. There are two lights and an ammeter on the front panel of the standard Sentry charger. The **ammeter** indicates total current flow to the batteries. The **full-charge** light is off when the unit is charging and on when the batteries reach full charge, or when ignition disabling circuit has turned the unit off. The **manual** light is on when the **automatic/manual** switch is set in the "manual" position. Note that the **full-charge** light turns off when the charger is in the manual mode.

FUSES AND CIRCUIT BREAKERS. The **AC input fuses** protect the charger and wiring from AC overloads. **The DC circuit breakers** are rated ignition protected, and output fuses are not needed. These breakers protect wiring from DC overloads.

REMOTE PANEL. For Series G chargers, the remote panel is similar to the main control panel on the front of the unit and its operation is the same.

INTERNAL COMPONENTS

The following is a description of the basic internal components of Sentry battery chargers. **See Figure 12.**

TRANSFORMER. Sentry battery chargers use a ferro-resonant transformer, which has two secondary coils, one of which is connected to a capacitor. The capacitor and the secondary coil "resonate" at a specific frequency, in much the same way a violin string and sounding box of the violin resonate together. When too much or too little voltage is applied, this resonance is upset, and the transformer corrects itself, leaving the secondary voltage stable. Thus, the transformer compensates for incorrect dock-side input voltages, thereby protecting the batteries and charger from high or low voltages. In addition, the Sentry ferro-resonant transformer tapers its current output to the needs of its load. However, the Sentry is sensitive to its input frequency which must be within 3 % of name plate frequency.

RECTIFYING CIRCUIT. Sentry rectifying circuits convert AC power to DC power, and also supply current to up to three separate banks of batteries. (A fourth charging circuit is also available as an option on some models.) This is accomplished by a series of blocking diodes and rectifying diodes. A heat sink is incorporated to dissipate heat from the diodes, and to serve as an output power divider.

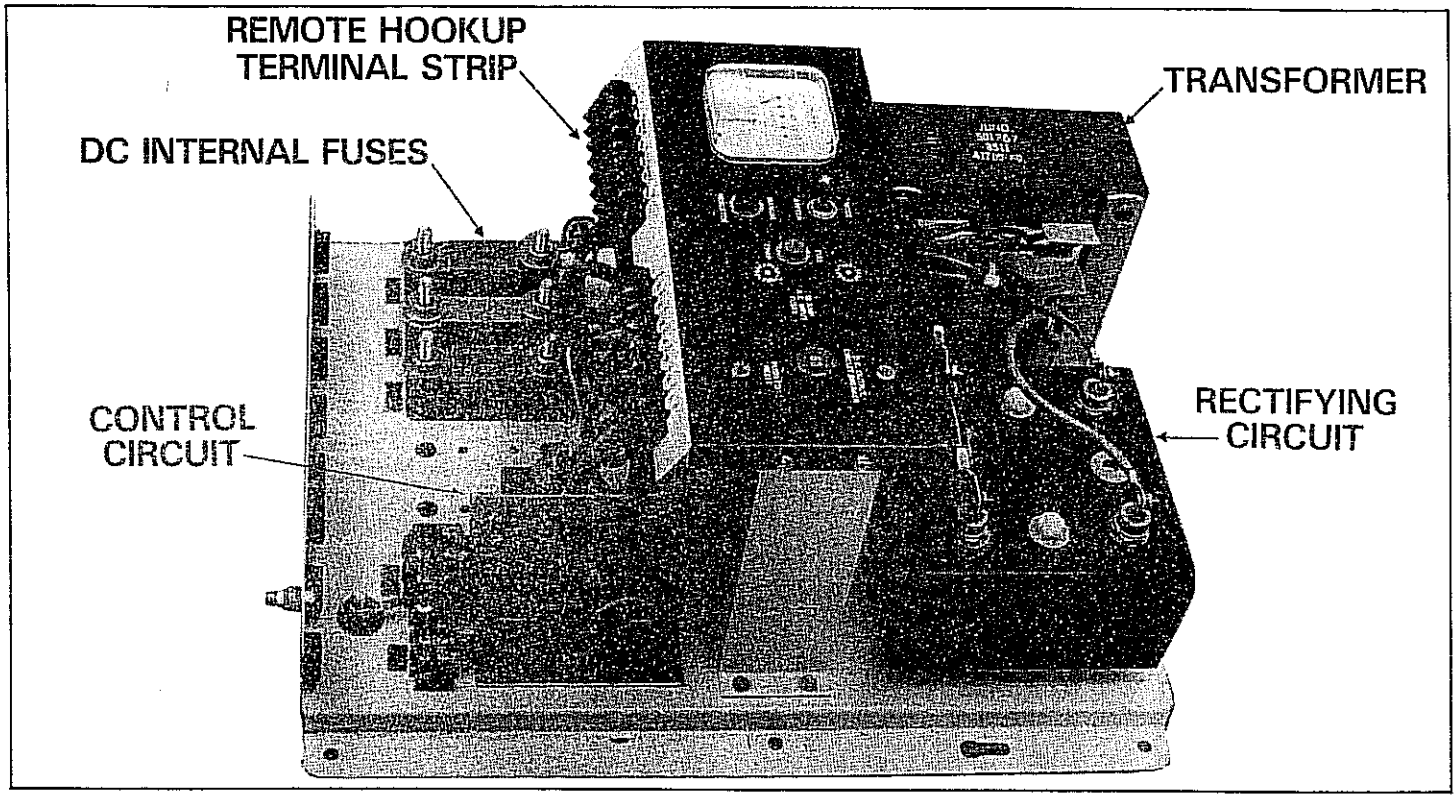


Figure 12. Sentry Internal Components.

CONTROL CIRCUIT. Your Series G Sentry charger uses a multi-sensing control circuit, which permits monitoring of all battery banks simultaneously. This control circuit switches the output current completely off when all batteries reach full charge. There is no output trickle to dehydrate or "boil" water out of the batteries. The control circuit continues to sense the condition of all batteries and turns the charger on again when any battery needs recharging.

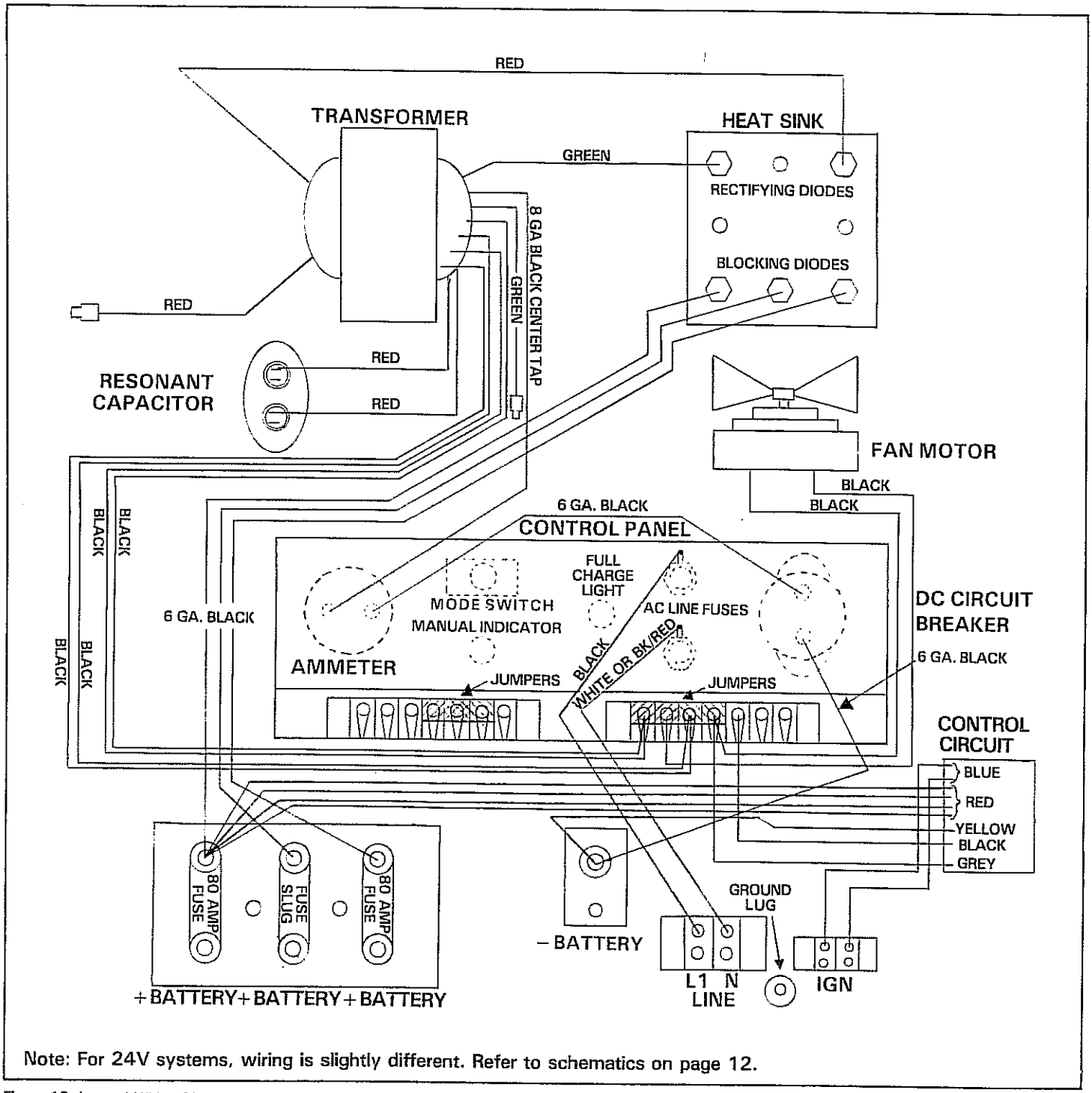
OTHER INTERNAL COMPONENTS. Other components include a cooling fan, which bathes the heat sink and transformer with fresh air; terminal strips, which are used to make all electrical connections; an ignition cut-off circuit, which de-energizes the unit automatically when the engines are started to minimize the possibility of damage to the alternator or generator regulators; and DC feedback fuses, which protect the connecting wiring from possible high current flow between batteries.

FUNCTIONAL SEQUENCE

The internal function of your Sentry battery charger is illustrated in **Figure 13.**

The AC input line voltage is fed through a pair of fuses to the automatic/manual switch, as well as to the ignition proof solid-state control circuit. When the automatic/manual switch is in the "automatic" position, the switch is open, and the AC power is fed directly to the control circuit, which feeds the AC power either to the primary coil of the transformer or to the full-charge indicator light. When the control circuit senses a low terminal voltage, indicating a low charge level for the battery, the AC input power is sent to the transformer, and the full-charge indicator light switches off. At the transformer, the line voltage AC power is reduced to a constant or stabilized low AC voltage and is then fed to the rectifying diodes in the heat sink. From there, full-wave rectified DC power is fed through an ammeter and through fuses or circuit breaker to the batteries to be charged. Blocking diodes are used to provide isolation between connected banks of batteries. The control circuit automatically responds to changes in terminal voltage to keep the battery at peak charge. When the control circuit senses a low terminal voltage, the transformer is energized and the full-charge indicator light switches off. This produces a DC output that starts to charge the battery to full output capacity. As the battery charges, the terminal voltage rises and the charger output tapers back correspondingly. When the battery terminal voltage reaches the control circuit's "drop-out" or "turn-off" voltage, the charge rate will be 10-25% of the rating of the charger. At this point, the electronic control circuit de-energizes the transformer, and the full-charge indicator light comes back on. The charger output remains completely off until the battery terminal voltage level drops, causing the control circuit to reenergize the transformer, repeating the whole process.

When the automatic/manual switch is in the "manual" position, the switch is closed. The control circuit is bypassed, and the AC power is fed directly and continuously to the primary coil of the transformer.



Note: For 24V systems, wiring is slightly different. Refer to schematics on page 12.

Figure 13. Internal Wiring Diagram

OWNER MAINTENANCE

WARNING

The following guidelines are given for various types of maintenace and repairs which can be performed by the owner. All other repairs should only be performed by an authorized Marine Development Corporation service representative.

SYMPTOM : The AC fuse is blown.

ACTION: Fuses may occasionally blow due to electrical overvoltage surges when other equipment is turned off and on or when shifting between ship and shore power. Fuses may be replaced as necessary. Refer to **Figure 14, Page 11.** If the problem persists, contact the factory or an authorized service representative for assistance.

SYMPTOM: The charger will not charge in the manual or automatic position, and the ammeter shows no current.

ACTION: The DC circuit breaker may be off, or the AC fuses may be blown. Check and reset or replace, as needed. Consult the fuse chart in **Figure 14, Page 11,** for replacement fuse sizes. If fuses continue blowing or the circuit breaker keeps tripping, contact the factory or an authorized service representative.

SYMPTOM: The charger turns on or off too soon or too late.

ACTION: The battery terminals may be loose or dirty. Clean and tighten terminals. The control circuit may be out of calibration, see calibration procedures, in **Figure 15, Page 11.** If this doesn't correct the problem, contact the factory or an authorized service representative for assistance.

SYMPTOM: The charger will not charge, but the transformer is humming.

ACTION: The battery terminals may be loose or dirty. Check and clean or tighten if necessary. The DC circuit breaker may be tripped. If so, reset. If these steps do not work, contact the factory or an authorized service representative.

SYMPTOM: The full-charge lamp will not light, but the charger turns off and on properly.

ACTION: The lamp is probably defective. Replace lamp.

SYMPTOM: The charger does not turn off, and the ammeter shows that it is still charging.

ACTION: You may have left the automatic/manual selector switch in the "manual" position. If so, switch it back to "automatic." Check the battery terminals for loose or dirty connections, and tighten or clean as necessary. Check for a dead or shorted cell in the battery, and replace the battery if needed. The control circuit may be out of calibration, see calibration procedures in **Figure 15, page 11.** If these steps do not solve the problem, contact the factory or an authorized service representative.

WARNING

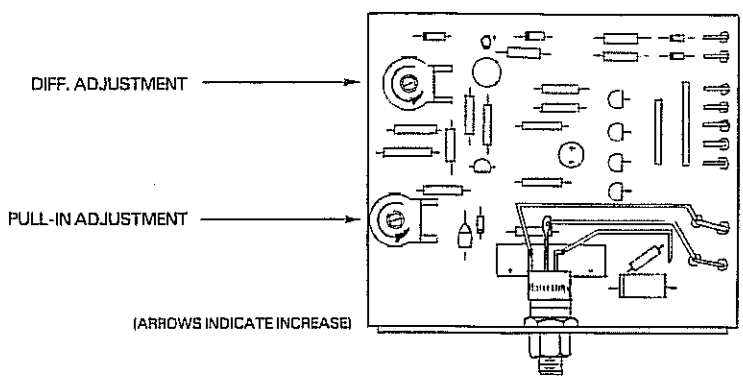
Always de-energize the charger by turning off its AC power supply at the boat's main circuit breaker panel before removing the charger cover or attempting to repair the charger.

CAUTION

The listed fuses and breakers insure the safety and performance of the battery charger. Do not use any other without written authorization from MDC.

MODELS	AC INPUT FUSES	DC OUTPUT BREAKER	DC INTERNAL FUSES
G120-3NL	3AB10	30	BAF30
G140-3NL	3AB15	50	ANL50
G140-3NCL	3AB10	50	ANL50
G140-3NCK	3AB10	50	ANL50
G140-3NJ	3AB15	50	ANL50
G140-3NCJ	3AB10	50	ANL50
G160-3NL	3AB15	80	ANL80
G160-3NCL	3AB10	80	ANL80
G225-3NL	3AB15	30	ANL35
G225-3NCL	3AB10	30	ANL35
G240-3NL	3AB15	50	ANL50
G240-3NCL	3AB10	50	ANL50
G330-3NL	3AB20	40	ANL40
G330-3NCL	3AB15	40	ANL40
G330-3NCK	3AB15	40	ANL40
G330-3NJ	3AB20	40	ANL40
G330-3NCJ	3AB15	40	ANL40

Figure 14. Fuse and Breaker Chart



	PULL IN	DIFF.	DROP OUT
12 VOLT CHARGERS	12.8	1.1	13.9
24 VOLT CHARGERS	25.5	2.5	28.0
32 VOLT CHARGERS	34.5	3.0	37.5

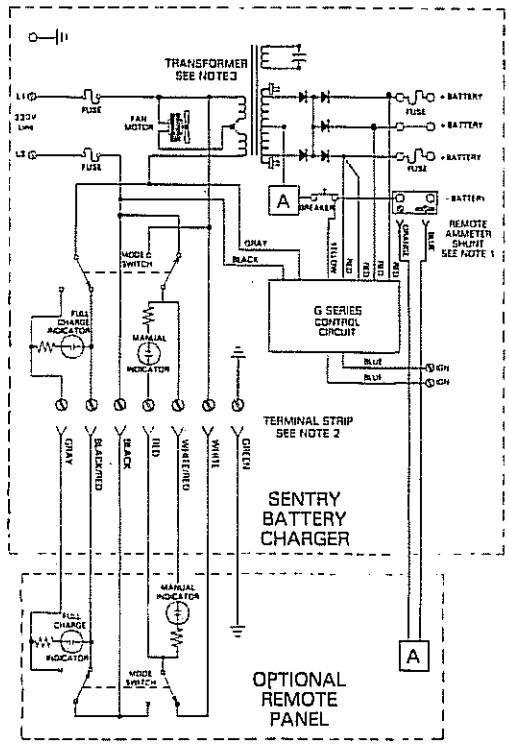
For Calibration, connect all 4 red voltage sensing wires from the control together to any single "+BATTERY" tab terminal to which a battery is also connected.
Read voltage between this terminal and the "−BATTERY" terminal with a voltmeter accurate to .1 volt.
Use table to determine correct "pull-in" and "drop-out" voltages.
Unlike other Sentry controls, the "G" Controls "pull-in" voltage must be set first. Apply a small load (lights, etc.) to the battery being monitored and note the pull-in voltage.
If too high, decrease by turning pull-in adjustment clockwise.
If too low, increase by turning pull-in adjustment counter-clockwise.
Allow the charger to raise the battery voltage and note the drop out reading.
If too high, decrease differential by turning differential adjustment clockwise.
If too low, increase differential by turning differential adjustment counter-clockwise.
Repeat procedure until satisfactory voltage settings are obtained.
Redistribute the 4 red voltage sensing wires to the tabs on the positive terminals of the DC output terminal strip to which a battery is connected.
Do not attach a red wire where a battery is not connected. Attach any remaining red wires, piggy-back fashion, on any already connected red wires.

CAUTION

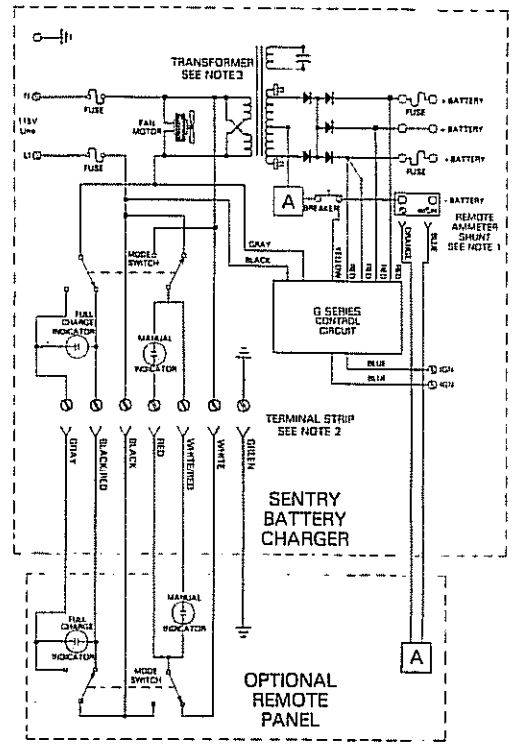
NOTE: All red wires must be connected to a battery being charged for the control to work; therefore if less than 4 batteries are used, some red wires must be piggy-backed on other red wires. See Page 6.

Figure 15. G Control Calibration

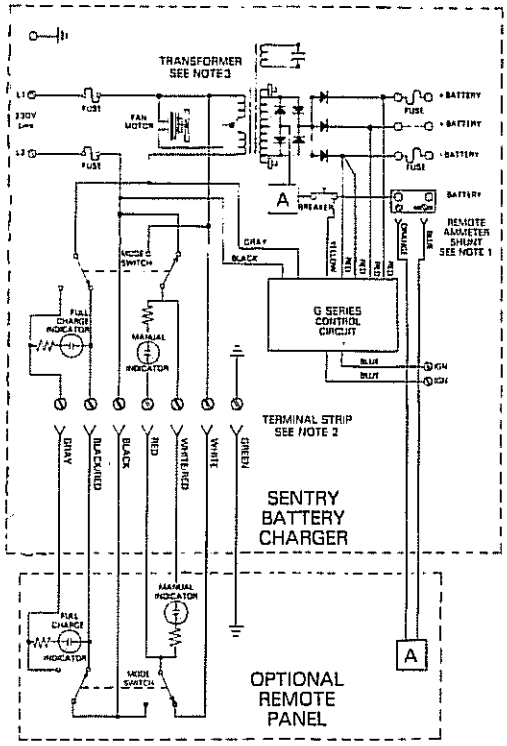
230 V input, 12 and 32 V output models



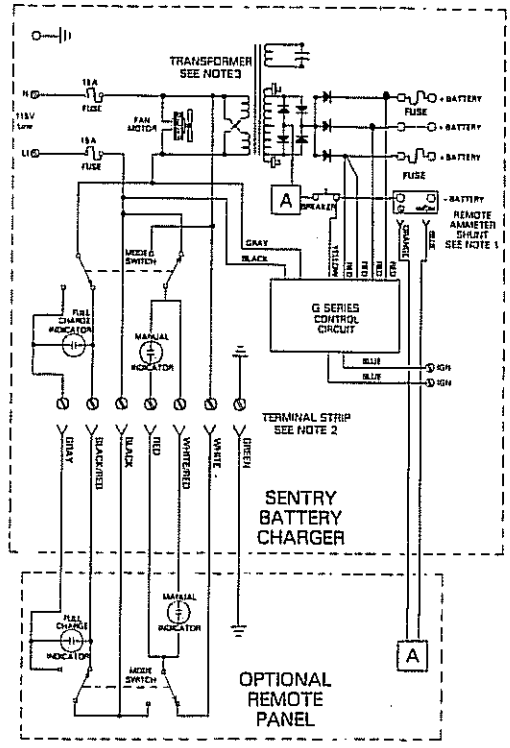
115 V input, 12 and 32 V output models



230 V input, 24 V output models



115 V input, 24 V output models

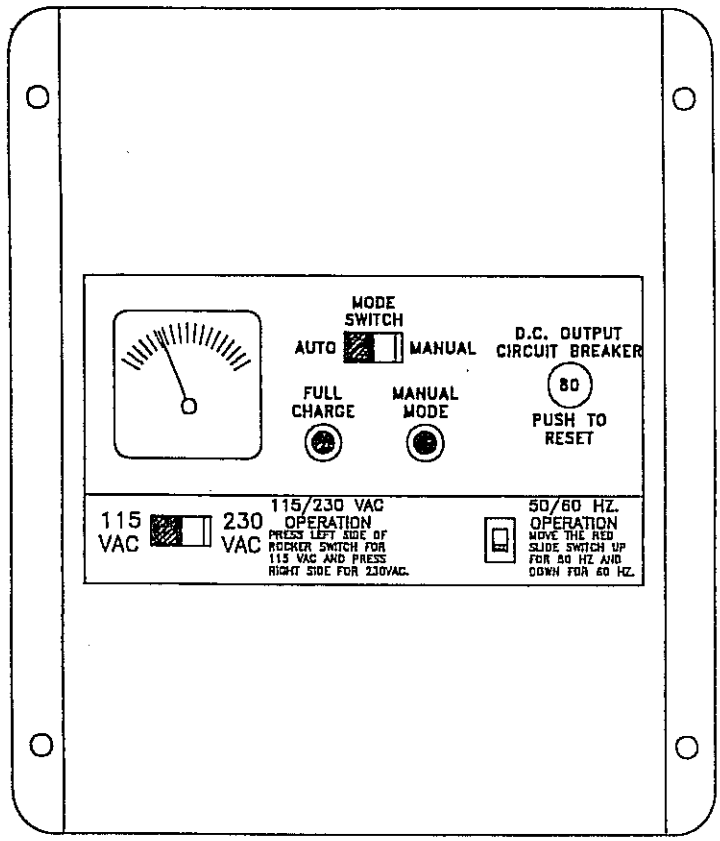


NOTES:

1. Remote ammeter shunt supplied with remote panel to be installed inside charger per remote panel instructions.
2. Chargers without remote have jumpers connecting red, black, and black/red together at terminal strip closest to ammeter.
3. Transformer output leads are selected at the factory for optimum performance; high leads are red, low leads are green.

Figure 16. Typical Schematics

FEATURES OF SENTRY GSA260-3NXJ



1) DC OUTPUT IS RATED 24 VOLTS, 60 AMPS.

2) 115/230 VAC ROCKER SWITCH IS LOCATED UNDER THE COVER AND CAN BE MANUALLY SWITCHED FOR 115 OR 230 VAC OPERATION.

3) 50/60 HZ SLIDE SWITCH IS LOCATED UNDER THE COVER AND CAN BE MANUALLY SWITCHED FOR 50 OR 60 HERTZ OPERATION.

4) FULL CHARGE LIGHT INDICATES BATTERIES ARE FULLY CHARGED AND CHARGER HAS SHUT COMPLETELY OFF.

5) MANUAL MODE LIGHT INDICATES MODE SWITCH IS IN MANUAL POSITION AND WILL CONTINUOUSLY CHARGE THE BATTERIES UNTIL THE MODE SWITCH IS SWITCHED TO THE AUTO POSITION. THE MANUAL MODE CAN BE USED TO BYPASS THE CONTROL CIRCUIT OR CHARGE THE BATTERIES TO A HIGHER VOLTAGE WHICH HELPS REMOVE LEAD SULFATE FROM THE BATTERIES PLATES. WHILE IN THIS MODE, BE CAREFUL NOT TO OVERCHARGE THE BATTERIES.

6) THE AMMETER SHOWS THE AMOUNT OF DC CURRENT, WHICH IS MEASURED IN AMPS, THAT THE CHARGER PRODUCES.

7) THE DC CIRCUIT BREAKER IS RATED 80 AMPS. THIS PROTECTS THE DC CIRCUIT FROM A DC CURRENT OVERLOAD. THIS BREAKER IS IGNITION PROTECTED AND WOULD NOT CAUSE AN EXPLOSION IN THE CASE OF A GAS LEAK.

8) THIS CHARGER REQUIRES THE FOLLOWING AC CIRCUIT PROTECTION:
A 25 AMP BREAKER OR FUSE FOR 115 VAC SUPPLY..
A 15 AMP BREAKER OR FUSE FOR 230 VAC SUPPLY.

9) THE DC CIRCUIT IS SET UP FOR CHARGING 3 BANKS OF BATTERIES WITH AN OPTIONAL FOURTH.

10) DIMENSIONS ARE: HEIGHT: 16.5" (41.9mm) DEPTH: 7.75" (19.7mm)
WIDTH: 15.5" (39.4mm) WEIGHT: 60 Lbs (27.2Kg)

Figure 17. Typical Schematics

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