



Model: INC-700A
Power Supply/Battery Charger



Voltage: 12

Amperage: 4, 20, 70

• **OWNER'S MANUAL**



- **READ THE ENTIRE MANUAL BEFORE USING THIS PRODUCT. FAILURE TO DO SO CAN RESULT IN SERIOUS INJURY OR DEATH.**

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IMPORTANT: READ AND SAVE THIS SAFETY AND INSTRUCTION MANUAL.

SAVE THESE INSTRUCTIONS – The INC-700A offers a wide range of features to accommodate your needs. This manual will show you how to use your charger safely and effectively. Please read, understand and follow these instructions and precautions carefully, as this manual contains important safety and operating instructions. The safety messages used throughout this manual contain a signal word, a message and an icon.

The signal word indicates the level of the hazard in a situation.

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or bystanders.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to the operator or bystanders.

⚠ CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in moderate or minor injury to the operator or bystanders.

IMPORTANT Indicates a potentially hazardous situation which, if not avoided, could result in moderate or minor injury to the operator or bystanders.

Safety messages in this manual contain two different type styles.

- Unnumbered type states the hazard.
- Numbered type states how to avoid the hazard.

The icon gives a graphical description of the potential hazard.

⚠ WARNING



Pursuant to California Proposition 65, this product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

1. IMPORTANT SAFETY INSTRUCTIONS



Risk of electric shock or fire.

- 1.1 Do not expose the charger to rain or snow.
- 1.2 Use only recommended attachments. Use of an attachment not recommended or sold by Schumacher® Electric Corporation may result in a risk of fire, electric shock or injury to persons or damage to property.
- 1.3 To reduce the risk of damage to the electric plug or cord, pull by the plug rather than the cord when disconnecting the charger.
- 1.4 An extension cord should not be used unless absolutely necessary. Use of an improper extension cord could result in a risk of fire and electric shock. If an extension cord must be used, make sure:
 - That the pins on the plug of the extension cord are the same number, size and shape as those of the plug on the charger.
 - That the extension cord is properly wired and in good electrical condition.
 - That the wire size is large enough for the AC ampere rating of the charger as specified in Section 8.2.
- 1.5 To reduce the risk of electric shock, unplug the charger from the outlet before attempting any maintenance or cleaning. Simply turning off the controls will not reduce this risk.
- 1.6 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 burn.
- 1.7 Do not operate the charger with a damaged cord or plug; take it to a qualified service person.
- 1.8 Do not operate the charger if it has received a sharp blow, been dropped or otherwise damaged in any way; take it to a qualified service person.
- 1.9 Do not disassemble the charger; take it to a qualified service person when service or repair is required. Incorrect reassembly may result in a risk of fire or electric shock.

2. PERSONAL PRECAUTIONS



Risk of explosive gases.

- 2.1 Working in the vicinity of a lead-acid battery is dangerous. Batteries generate explosive gases during normal battery operation. For this reason, it is of utmost importance that you follow the instructions each time you use the charger.
- 2.2 To reduce the risk of a battery explosion, follow these instructions and those published by the battery manufacturer and the manufacturer of any equipment you intend to use in the vicinity of the battery. Review the cautionary markings on these products and on the engine.
- 2.3 This charger employs parts, such as switches and circuit breakers, that tend to produce arcs and sparks. If used in a garage, locate this charger 18 inches or more above floor level.
- 2.4 NEVER smoke or allow a spark or flame in the vicinity of a battery or engine.
- 2.5 Be extra cautious to reduce the risk of dropping a metal tool onto the battery. It might spark or short-circuit the battery or other electrical part that may cause an explosion.
- 2.6 Use this charger for charging LEAD-ACID batteries only. It is not intended to supply power to a low voltage electrical system other than in a starter-motor application. Do not use this 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.
- 2.7 NEVER charge a frozen battery.
- 2.8 NEVER overcharge a battery.

3. PREPARING TO CHARGE



Risk of contact with battery acid. Battery acid is a highly corrosive sulfuric acid.

- 3.1 Consider having someone close enough by to come to your aid when you work near a lead-acid battery.
- 3.2 Have plenty of fresh water and soap nearby in case battery acid contacts your skin, clothing or eyes.
- 3.3 Wear complete eye and body protection, including safety goggles and protective clothing. Avoid touching your eyes while working near the battery.

- 3.4 If battery acid contacts your skin or clothing, immediately wash the area with soap and water. If acid enters your eye, immediately flood the eye with cold running water for at least 10 minutes and get medical attention right away.
- 3.5 If it is necessary to remove the battery from the vehicle to charge it, always remove the grounded terminal first. Make sure all of the accessories in the vehicle are off to prevent arcing.
- 3.6 Be sure the area around the battery is well ventilated while the battery is being charged.
- 3.7 Clean the battery terminals before charging the battery. During cleaning, keep airborne corrosion from coming into contact with your eyes, nose and mouth. Use baking soda and water to neutralize the battery acid and help eliminate airborne corrosion. Do not touch your eyes, nose or mouth.
- 3.8 Add distilled water to each cell until the battery acid reaches the level specified by the battery manufacturer. Do not overfill. For a battery without removable cell caps, such as valve regulated lead acid batteries (VRLA), carefully follow the manufacturer's recharging instructions.
- 3.9 Read, understand and follow all instructions for the charger, battery, vehicle and any equipment used near the battery and charger. Study all of the battery manufacturer's specific precautions while charging and recommended rates of charge.
- 3.10 Determine the voltage of the battery by referring to the vehicle owner's manual and make sure that the output voltage selector switch is set to the correct voltage. If the charger has an adjustable charge rate, charge the battery in the lowest rate first.
- 3.11 Make sure that the charger cable clips make tight connections.

4. CHARGER LOCATION



Risk of explosion and contact with battery acid.

- 4.1 Locate the charger as far away from the battery as the DC cables permit.
- 4.2 Never place the charger directly above the battery being charged; gases from the battery will corrode and damage the charger.
- 4.3 Do not set the battery on top of the charger.
- 4.4 Never allow battery acid to drip onto the charger when reading the electrolyte specific gravity or filling the battery.
- 4.5 Do not operate the charger in a closed-in area or restrict the ventilation in any way.

5. DC CONNECTION PRECAUTIONS

- 5.1 Connect and disconnect the DC output clips only after pressing the START/STOP (●) button to turn the output off and removing the AC plug from the electrical outlet. Never allow the clips to touch each other.
- 5.2 Attach the clips to the battery and chassis, as indicated in steps 6.5, 6.6 and 7.2 through 7.4.

6. FOLLOW THESE STEPS WHEN BATTERY IS INSTALLED IN VEHICLE.




A spark near the battery may cause a battery explosion. To reduce the risk of a spark near the battery:

- 6.1 Position the AC and DC cables to reduce the risk of damage by the hood, door and moving or hot engine parts.
- 6.2 Stay clear of fan blades, belts, pulleys and other parts that can cause injury.
- 6.3 Check the polarity of the battery posts. The POSITIVE (POS, P, +) battery post usually has a larger diameter than the NEGATIVE (NEG, N, -) post.
- 6.4 Determine which post of the battery is grounded (connected) to the chassis. If the negative post is grounded to the chassis (as in most vehicles), see step 6.5. If the positive post is grounded to the chassis, see step 6.6.
- 6.5 For a negative-grounded vehicle, connect the POSITIVE (RED) clip from the battery charger to the POSITIVE (POS, P, +) ungrounded post of the battery. Connect the NEGATIVE (BLACK) clip to the vehicle chassis or engine block away from the battery. Do not connect the clip to the carburetor, fuel lines or sheet-metal body parts. Connect to a heavy gauge metal part of the frame or engine block.
- 6.6 For a positive-grounded vehicle, connect the NEGATIVE (BLACK) clip from the battery charger to the NEGATIVE (NEG, N, -) ungrounded post of the battery. Connect the POSITIVE (RED) clip to the vehicle chassis or engine block away from the battery. Do not connect the clip to the carburetor, fuel lines or sheet-metal body parts. Connect to a heavy gauge metal part of the frame or engine block.
- 6.7 When disconnecting the charger, press the START/STOP (●) button to turn the output off, disconnect the AC cord, remove the clip from the vehicle chassis and then remove the clip from the battery terminal.
- 6.8 See CALCULATING CHARGE TIME for length of charge information.

7. FOLLOW THESE STEPS WHEN BATTERY IS OUTSIDE VEHICLE.



A spark near the battery may cause a battery explosion. To reduce the risk of a spark near the battery:

- 7.1 Check the polarity of the battery posts. The POSITIVE (POS, P, +) battery post usually has a larger diameter than the NEGATIVE (NEG, N, -) post.
- 7.2 Attach at least a 24-inch long 4 gauge (AWG) insulated battery cable to the NEGATIVE (NEG, N, -) battery post.
- 7.3 Connect the POSITIVE (RED) charger clip to the POSITIVE (POS, P, +) post of the battery.
- 7.4 Position yourself and the free end of the cable you previously attached to the NEGATIVE (NEG, N, -) battery post as far away from the battery as possible – then connect the NEGATIVE (BLACK) charger clip to the free end of the cable.
- 7.5 Do not face the battery when making the final connection.
- 7.6 When disconnecting the charger, press the START/STOP () button to turn the output off, disconnect the AC cord, remove the clip from the cable attached to the negative battery terminal and then remove the clip from the positive battery terminal.
- 7.7 A marine (boat) battery must be removed and charged on shore. To charge it onboard requires equipment specially designed for marine use.

8. BATTERY CHARGING - AC CONNECTIONS



Risk of electric shock or fire.

- 8.1 This battery charger, with auto line voltage select function, is for use on nominal 120 volt and 240 volt circuits.

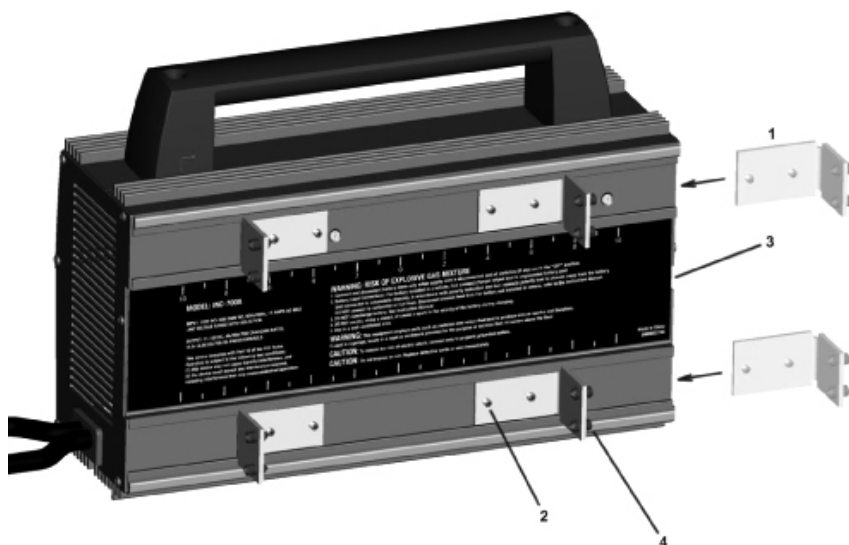
DANGER – Never alter AC cord or plug provided – if it does not fit the outlet, have proper outlet installed by a qualified electrician. Improper connection can result in a risk of an electric shock or fire.

- 8.2 Recommended minimum AWG size for extension cord:
 - 100 feet long or less - use an 12 gauge extension cord.
 - Over 100 feet long - use a 8 gauge extension cord.

8.3 Grounding Methods

This charger must be properly grounded. Make sure the AC outlet you are plugging it into is properly grounded per local codes and regulations. If it is not, have one installed by a qualified service person. Do not remove or bypass the grounding pin on the plug or receptacle.

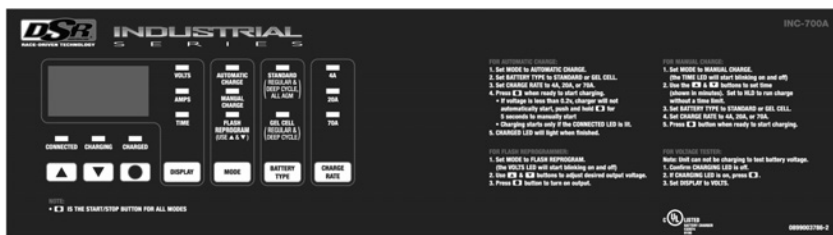
9. MOUNTING INSTRUCTIONS



This charger can be operated on a stable surface either upright or lying down (brackets not installed). Rubber strips have been provided to help prevent scratching and denting of the channels. If you would like to permanently mount the charger, use the following instructions:

- 9.1 Slide all 4 brackets (Item 1) into the track on the back, from the right side, as shown above. Make sure the set screws (Item 2) are unscrewed enough so they do not scratch the surface of the housing.
- 9.2 Measure what you are mounting the charger to before deciding where to locate the brackets (add an additional $\frac{1}{4}$ to $\frac{1}{2}$ inch). Use the ruler on the label (Item 3) to mount the brackets (Item 1) in the correct position (position each bracket an equal distance from the center of the charger). Note that the inches shown are for both bracket dimensions combined (meaning the dimensions are doubled), this is for easier reference. Make sure the $\frac{1}{4}$ -28 set screws (Item 4) are unscrewed enough so the pointed end is almost flush with the bracket. Mount the brackets (Item 1) by tightening all 8 set screws (Item 2) to 14 in/lb (1.6 n/m) of torque.
- 9.3 Lift the charger by its handle and set it against your mounting location, tighten the set screws (Item 4) to 66 in/lb (7.5 n/m) of torque to secure the brackets (Item 1) starting with the top two brackets first.

10. CONTROL PANEL



CONNECTED (yellow) LED

The CONNECTED (yellow) LED will light when the battery is properly connected.

CHARGING (yellow) LED

When charging begins, the CHARGING (yellow) LED will light.

CHARGED (green) LED

The CHARGED (green) LED will light when the charger has gone into maintain mode.

“UP” and “DOWN” (▲ and ▼) Buttons

Use these buttons to select the amount of time or voltage depending on the display function selected.

Start/Stop (●) Button

This is the start and stop button for all modes.

Digital Display

The Digital Display gives a digital indication of voltage, amperes or time, depending on the DISPLAY function chosen.

Display Button

Use this button to set the function of the digital display to one of the following:

• VOLTS (Voltmeter)

The voltmeter indicates the voltage at the battery terminals. If the reading is less than 10.5-volts, the battery may be bad or the connection at the charger may be poor. If the reading is 10.5 volts to 12.7 volts the battery is low – recharge it. If the reading is 12.8 volts or more the battery is charged.

• AMPS (Ammeter)

The Ammeter indicates the amount of current, measured in amps, that is being drawn by the battery (± 2 amps). For example, in a 20 amp charge rate, a typical discharged battery will initially draw approximately 20 amps. As the battery continues to charge, the current will taper down. At full charge, the battery may draw less than one amp.

NOTE: The 70 amp charge rate cycles between 20 amps and 70 amps during the charging process and the ammeter will show this. This is a normal condition.

- **TIME (Timer – Range: 10 min to 120 min)**

Used only in manual mode, the main function of the timer is to prevent over charging while allowing a battery time to obtain a satisfactory charge. To properly set the timer, you must know the size of the battery in ampere hours or reserve capacity in minutes and the state of charge. Often the state of charge is not known, this is one reason why the timer was limited to 2 hours. With the aid of a battery load tester, the state of charge can be obtained within a few seconds. For example, the average size automotive battery at a 50% state of charge will require 1 to 1½ hours of charging at a 40 amp rate to reach the full charge state. For the same battery with the timer set to its maximum, 2 hours, over charging will occur, but is not likely to cause harm to a battery that was otherwise in good condition. When the charge state is not known, start out with a timer setting of one hour or less.

- **Hold:** This position defeats the timer function, allowing for continuous operation. Use when you want to charge more than 2 hours. Be sure to monitor the charging procedure and stop it when the battery is charged. Not doing so may cause damage to your battery or may cause other personal property damage or personal injury

MODE Button

Use this button to select between the AUTOMATIC CHARGE, MANUAL CHARGE and FLASH REPROGRAM function. See Operating Instructions section for details of these functions.

Battery Type Button

Use this button to set the type of battery to be charged to STANDARD or GEL CELL.

- **Regular** – Set button to STANDARD. This battery type is usually used in cars, trucks and motorcycles. These batteries have vent caps and are often marked “Low Maintenance” or “Maintenance-free”. This type of battery is designed to deliver quick bursts of energy (such as starting engines) and have a greater plate count. The plates will also be thinner and have somewhat different material composition. Regular batteries should not be used for deep cycle applications.
- **Deep-Cycle** – Set button to STANDARD. Deep-cycle batteries are usually marked as “Deep-Cycle” or “Marine”. Deep-cycle batteries are usually larger than the other types. This type of battery has less instant energy but somewhat greater long-term energy delivery than regular batteries. Deep cycle batteries have thicker plates and can survive a number of discharge cycles.

- **AGM** – Set button to STANDARD. The Absorbed Glass Matt construction allows the electrolyte to be suspended in close proximity with the plate's active material. In theory, this enhances both the discharge and recharge efficiency. Actually, the AGM batteries are a variant of Sealed VRLA (valve regulated lead acid) batteries. Popular uses include high performance engine starting, power sports, deep cycle, solar and storage battery. AGM batteries are typically good deep cycle batteries and they deliver best life performance if recharged before the battery drops below a 50 percent charge. If these AGM batteries are completely discharged, the cycle life will be around 300 cycles. This is true of most AGM batteries rated as deep cycle batteries.
- **GEL** – Set button to GEL CELL. The Gel Cell is similar to the AGM style because the electrolyte is suspended, but different because technically the AGM battery is still considered to be a wet cell. The electrolyte in a GEL cell has a silica additive that causes it to set up or stiffen. The recharge voltages on this type of cell are lower than the other styles of lead acid battery. This is probably the most sensitive cell in terms of adverse reactions to over-voltage charging. Gel Batteries are best used in VERY DEEP cycle application and may last a bit longer in hot weather applications. If the incorrect battery charger is used on a Gel Cell battery, poor performance and premature failure is certain.

The Gel Cell and the AGM batteries are specialty batteries that typically cost twice as much as a premium wet cell. However they store very well and do not tend to sulfate or degrade as easily as a wet cell. There is little chance of a hydrogen gas explosion or corrosion when using these batteries; these are the safest lead acid batteries you can use. Gel Cell and some AGM batteries may require a special charging rate.

Charge Rate Button

Use this button to set the maximum charge rate to one of the following:

- **4A Charge Rate** – Intended for charging small batteries such as those commonly used in garden tractors, snow mobiles and motorcycles.
- **20A and 70A Charge Rate** – Use for charging automotive and marine batteries. Not intended for industrial applications.


11. OPERATING INSTRUCTIONS


Charger Operation

NOTE: Once automatic charging or flash reprogramming has started, the buttons will not work until you turn off the output, with the exception of the Start/Stop (●) button. (In MANUAL mode the "UP" and "DOWN" (▲ and ▼) buttons also still operate normally.) When the display shows OFF, no buttons will work for five seconds as the charger automatically goes back to the default settings.

Automatic Charging




1. Connect the battery and AC power following the precautions listed in sections 6, 7 and 8.

2. Set the MODE to AUTOMATIC CHARGE.
3. Set the BATTERY TYPE to STANDARD or GEL CELL.
4. Set the CHARGE RATE to 4A, 20A or 70A.
5. Press the Start/Stop () button when you are ready to start charging.
6. The CHARGING (yellow) LED will light.

NOTE: Automatic charging starts only if the CONNECTED (yellow) LED is lit and the battery has at least a 1V charge. If the battery is less than 1V, press and hold the Start/Stop () button for five seconds to start Automatic Charging, or charge it in Manual mode for five minutes then switch back to Automatic Charge.

7. The CHARGED (green) LED will light when charging is complete and the charger has gone into maintain mode.

Manual Charging

1. Connect the battery and AC power following the precautions listed in sections 6, 7 and 8.
2. Set the MODE to MANUAL CHARGE. (The TIME LED will start blinking.)
3. Use “UP” and “DOWN” ( and ) buttons to set the time (shown in minutes) you want the charger to charge the battery. Set to *HLd* to run the charger without a time limit.
4. Set the BATTERY TYPE to STANDARD or GEL CELL.
5. Set the CHARGE RATE to 4A, 20A or 70A.
6. Press the Start/Stop () button when you are ready to start charging.

NOTE: Be sure to monitor the charging procedure and stop it when the battery is charged. Not doing so may cause damage to your battery or may cause other personal property damage or personal injury.

Charging

If the charger does not detect a properly connected battery, the CONNECTED (yellow) LED will not light until such a battery is detected. Charging will not begin while the CONNECTED (yellow) LED is not on. When charging begins, the CHARGING (yellow) LED will light.

Battery Percent and Charge Time

This charger adjusts the charging time in order to charge the battery completely, efficiently and safely. The microprocessor automatically performs the necessary functions. This section includes guidelines that can be used to estimate charging times.

The duration of the charging process depends on these factors:

- **Battery State** – If a battery has only been slightly discharged, it can be charged in less than a few hours. The same battery could take up to 10 hours if very weak. The battery state can be estimated by using the built-in voltage tester. The lower the reading, the longer charging will take.

- **Battery Rating** – A higher rated battery will take longer to charge than a lower rated battery under the same conditions. A battery is rated in ampere hours (AH), reserve capacity (RC) and cold cranking amps (CCA). The lower the rating, the quicker the battery will charge.

Charge Rate – The charge rate is measured in amps. This charger provides charge rates of 4A, 20A and 70A. The 4A rate is for charging smaller batteries such as those used for motorcycles and garden tractors. Such batteries should not be charged using the 20A or 70A rate. The 20A and 70A rates are for charging larger batteries. In the 20A and 70A mode, the charger begins at a low-charge rate and increases the charge rate if it is determined that the battery can accept the higher rate. All charging modes will decrease the charge current as the battery approaches maximum charge.

Automatic Charging Mode

When an automatic charge is performed, the charger switches to the maintain mode automatically after the battery is charged. For a battery with a starting voltage under 1 volt, press and hold the START/STOP (●) button for five seconds to start Automatic Charging, or use manual mode to pre-charge the battery for five minutes to get additional voltage into the battery for the charger to analyze.

Aborted Charge

If charging can not be completed normally, charging will abort. When charging aborts, the charger's output is shut off, the CHARGING (yellow) LED will go out and the digital display will display *bAd bAt*. The charger ignores all buttons except the START/STOP (●) button in that state. Press the START/STOP (●) button to reset after an aborted charge.

Desulfation Mode

If the battery is left discharge for an extended period of time, it could become sulfated and not accept a normal charge. If the charger detects a sulfated battery, the charger will switch to a special mode of operation designed for such batteries. Activation of the special desulfation mode is indicated by the CHARGING (yellow) LED blinking. If successful, normal charging will resume after the battery is desulfated. The CHARGING (yellow) LED will then stop blinking and stay lit. Desulfation could take up to 10 hours. If desulfation fails, charging will abort and the charger will go into abort mode.

Completion of Charge

Charge completion is indicated by the CHARGED (green) LED. When lit, the charger has stopped charging and switched to the Maintain Mode of operation. If you are charging a deep cycle battery, the CHARGED (green) LED comes on when the battery is charged enough for normal use.

Maintain Mode

When the CHARGED (green) LED is lit, the charger has started Maintain Mode. In this mode, the charger keeps the battery fully charged by delivering a small current when necessary. The voltage is maintained at a level determined by the BATTERY TYPE selected

Flash Reprogramming

NOTE: Do not attempt to Flash Reprogram a vehicle that has a discharged or defective battery. Make sure that the vehicle battery is in good condition and fully charged before proceeding.

1. Set MODE to FLASH REPROGRAM. (The VOLTS LED will start blinking.)
2. Use “UP” and “DOWN” (▲ and ▼) buttons to adjust voltage to the voltage needed for the vehicle being programmed (refer to OEM specifications). Voltage selected is shown on the digital display. The unit has a voltage range of 13 to 14.8, with a default of 14.2.

NOTE: When the VOLTS LED stops blinking, the display shows the selected voltage.

3. Press Start/Stop (●) button to turn on the output.
4. When finished with Flash Reprogramming, press Start/Stop (●) button to exit this mode.

Using the Battery Voltage Tester

Overview

This battery charger has a built-in voltmeter to measure your battery's voltage. The charger does not have a built in load tester. As such, a recently charged battery could have a temporarily high voltage due to what is known as “surface charge”. The voltage of such a battery will gradually drop during the period immediately after the charging system is disengaged. Consequently, the tester could display inconsistent values for such a battery. For a more accurate reading, the surface charge should be removed by temporarily creating a load on the battery, such as by turning on lights or other accessories for a couple of minutes before you read the display. Read it a couple of minutes after you have shut the headlights off.

Testing Sequence: There are seven basic steps required to test the battery state of charge:

NOTE: The unit cannot be charging to test the battery voltage.

1. With the charger unplugged from the AC outlet, connect the charger to the battery following the instructions given in Sections 6 and 7.
2. Plug the charger AC power cord into the AC outlet.
3. The CONNECTED (yellow) LED will light if a properly connected battery is detected.
4. Confirm the CHARGING (yellow) LED is off.
5. Set the DISPLAY to VOLTS.

6. If the output is on, press the Start/Stop (●) button. If the output is already off, do not press the Start/Stop (●) button.
7. Read the voltage on the digital display.

General Charging Notes

Fans: The charger is designed to control its cooling fans for efficient operation. Consequentially, it is normal for the fans to start and stop when maintaining a fully charged battery. Keep the area near the charger clear of obstructions to allow the fans to operate efficiently. NOTE: The charger has thermal protection, and it will shut down if it gets too hot.

Voltage: The voltage displayed during charging is the charging voltage and is usually higher than the battery's resting voltage.

12. CALCULATING CHARGE TIME

Use the following table to more accurately determine the time it will take to bring a battery to full charge. First, identify where your battery fits into the chart.

NR means that the charger setting is NOT RECOMMENDED.

Find your battery's rating on the chart below and note the charge time given for each charger setting. The times given are for batteries with a 50 percent charge prior to recharging. Add more time for severely discharged batteries.

BATTERY SIZE/RATING			CHARGE RATE/CHARGING TIME		
			4 AMP	20 AMP	70 AMP
SMALL BATTERIES	Motorcycle, garden, tractor, etc.	6 - 12 AH	1 - 2 hrs	NR	NR
		12 - 32 AH	2 - 5 hrs	NR	NR
CARS/TRUCKS	200 - 315 CCA	40 - 60 RC	5 ¼ - 7 ¼ hrs	1 ¼ - 1 ½ hrs	20 - 25 min
	315 - 550 CCA	60 - 85 RC	7 ¼ - 9 ¼ hrs	1 ½ - 2 hrs	25 - 30 min
	550 - 1000 CCA	80 - 190 RC	9 ¼ - 17 ½ hrs	2 - 3 ½ hrs	30 min - 1 hr
MARINE/DEEP CYCLE		80 RC	8 ¾ hrs	1 ¾ hrs	30 min
		140 RC	13 ½ hrs	2 ¾ hrs	45 min
		160 RC	15 hrs	3 hrs	1 hr
		180 RC	16 ½ hrs	3 ½ hrs	1 ¼ hrs

13. MAINTENANCE INSTRUCTIONS

- 13.1 Before performing maintenance, unplug and disconnect the battery charger (see sections 6.7 and 7.6).
- 13.2 After use, unplug the charger and use a dry cloth to wipe all battery corrosion and other dirt or oil from the terminals, cords, and the charger case.

- 13.3** After every 100 hours or whenever you see dust accumulating on the fan blades, you should clean both fans using compressed air (as shown).

NOTE: Use the compressed air on the fan blades only. Do not blow dirt into the fan shaft or bearing.

These fans push a lot of air and are precision balanced. Excessive dirt and grime buildup will cause the fan to be unbalanced and wear

out quickly. If the fans fail, the charger may overheat and the thermal protection of the charger will shut it down.



- 13.4** Ensure that all of the charger components are in place and in good working condition, including the plastic boots on the battery clips.
- 13.5** Servicing does not require opening the unit, as there are no user-serviceable parts.

14. STORAGE INSTRUCTIONS

- 14.1** Store the charger unplugged, in an upright condition. The cord will still conduct electricity until it is unplugged from the outlet.
- 14.2** Store inside, in a dry, cool place (unless you're using an on-board Marine Charger).
- 14.3** Do not store the clips on the handle, clipped together, on or around metal, or clipped to cables.

15. TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REASON/SOLUTION
No display and the LED's are not lit.	Charger is not plugged in.	Plug the charger into an AC outlet.
	No power at the receptacle.	Check for open fuse or circuit breaker supplying AC outlet.
Display reads 0.0 volts.	Clamps are not making a good connection to the battery.	Check for poor connection to battery and frame. Make sure connection points are clean. Rock clamps back and forth for a better connection.
	Connections are reversed.	Unplug the charger and reverse the clips.
	Battery is defective (will not accept a charge).	Have battery checked.
AMPS reading on display reads less than selected charge rate when charging a discharged battery	Extension cord is too long or wire gauge is too small.	Use a shorter or heavier gauge extension cord.
	Weak cell or sulfated plate in battery.	A sulfated battery will eventually take a normal charge if left connected. If the battery will not take a charge, have it checked.
	The charger reached the maximum voltage and is reducing the current.	No problem, this is a normal condition. Continue to charge the battery and see BATTERY PERCENT AND CHARGE TIME section, CHARGE RATE subsection.
The battery is connected and the charger is on, but is not charging.	Battery is severely discharged (automatic mode only)	If your battery does not have 1 volt, you must press and hold the START/STOP (●) button for five seconds.
Charger has shut down or will not turn on when properly connected.	The charger has gotten too hot and it has shut down.	The charger has thermal protection, and it will shut down if it gets too hot. Unplug the AC cord and let the charger cool down. Make sure there is nothing obstructing the air flow to the fans, clean them as shown in MAINTENANCE INSTRUCTIONS.
The cooling fan is making a rattling noise.	The fan has a buildup of dirt and grime causing it to be unbalanced.	Blow the dirt and grime off the fan blades using compressed air as described in the MAINTENANCE INSTRUCTIONS