



# HAMMERHEAD CHARGER 48V



Electric Vehicle Operator's Manual

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## SAFETY INFORMATION

Thank you for purchasing Hammerhead electrical vehicle. For safe and enjoyable operation of your electric vehicle, be sure to follow the instructions and recommendations in this owner's manual. This manual has been designed to assist the owner-operator in operating and maintaining the vehicle in accordance with procedures developed by the manufacturer. Your manual includes instructions for minor maintenance, but major repairs should be performed only by a Certified Dealer Technician. Due to constant improvements in the design and quality of production components, some minor discrepancies may result between the actual vehicle and the information presented in this publication. Procedures in this publication are intended for reference use only. No liability can be accepted for omissions or inaccuracies.

Many vehicles are used for a variety of different tasks beyond the original intended use of the vehicle; therefore it is impossible to warn against every possible combination of circumstances that may occur. No warning can take place of good common sense and prudent driving practices.

With electric powered vehicles, be sure that all electrical accessories are grounded directly to the (-) post. Never uses chassis or body as a ground connection. Never modify the vehicle in any way that will alter the weight distribution of the vehicle, decrease its stability or increase the speed beyond the factory specification. Such modifications can cause serious personal injuries or death. Do not make any such modifications or changes. The manufacturer prohibits and disclaims responsibility for any such modifications or any other alternation which would adversely affect and safety of the vehicle.

Once again thank you for purchasing Hammerhead product, and we hope you will have an enjoyable experience.

## GENERAL OPERATION INSTRUCTIONS

- Always use the vehicle in responsible manner and maintain the vehicle in safe operation condition.
- Always read and observe all warning and operation instructions labels affixed to the vehicle.
- Always follow all safety rules established in area where the vehicle is being operated.
- Always reduce speed for bad terrain or road conditions.
- Always apply brake to controls ped on steep grades.
- Always maintain adequate distance between vehicles.
- Always reduce speed in wet areas.
- Always use extreme caution when approaching sharp or blind turns.

## MAINTENANCE SAFETY INSTRUCTIONS


- Always maintain your vehicle in accordance with manufacturer's periodic service schedule.
- Always follow the manufacturer's directions if you do any maintenance on your vehicle.
- Always insulate any tools used within the battery area in order to prevent sparks or battery explosion caused by shorting the battery terminals or associated wiring. Remove the batteries or cover exposed terminals with insulating materials.
- Always use specified replacement parts.
- Always test drive the vehicle after any repairs or maintenance. All tests must be conducted in a safe area that is free of both vehicles and pedestrian traffic.

## VENTILATION

- Hydrogen gas is generated in charging cycle of batteries and is explosive in concentrations as low as 4%. Because hydrogen gas is lighter than air, it will collect in the ceiling or buildings necessitating proper ventilation. Five air exchanges per hour is considered the minimum requirements.
- Never charge a battery in an area that is subject to flame or spark. Pay particular attention to natural gas or propane gas water heaters and furnaces.
- Battery charger must be operated according to manufacturer's instructions. Please refer to battery charger's separate operator's manual for further instructions.

## DISPLAY OF WARNING LABELS

Following are the warning labels affixed to the vehicles; read, observe and follow all warning and operation instructions carefully. Failure to follow these warnings can result in series injuries or death.

 <b>WARNING</b>	
<b>OBSERVE THE FOLLOWING INSTRUCTIONS</b>	
Failure to understand and follow Warnings and Instructions for the safe use and maintenance of this product may result in Death or Injury! This information is contained in the Warning Labels, Owner's Manuals & Supplements, Safety Video, and Engine Manual supplied with the product. Make sure that you understand and follow all Warnings and Instructions in this material.	
<ul style="list-style-type: none"> <li>- Always wear a D.O.T. - approved motorcycle helmet, eye protection, and protective clothing.</li> <li>- Check tire pressures before operating. Refer to Owner's Manual for proper operating pressure.</li> <li>- Do NOT operate the vehicle without the brush bars securely in place.</li> <li>- Keep all covers and shields properly installed.</li> <li>- Throttle and brake controls must work properly and freely before starting the vehicle.</li> <li>- Operator must be seated, safety belt must be fastened, and brake applied before operating the vehicle.</li> <li>- Never operate at speeds too fast for your skills or the conditions.</li> <li>- Never attempt jumps or other stunts.</li> <li>- Never ride after consuming alcohol, drugs, or other intoxicants.</li> </ul>	

<b>IMPORTANT NOTICE</b>	This vehicle does not conform to ANSI Z130.1 - "Standard for Golf Cars - Safety and Performance Requirements" because it is capable of speeds in excess of 15 miles per hour. Exercise caution.
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 <b>WARNING</b>	
	This vehicle is not to be operated by anyone under 16 years of age.

 <b>WARNING</b>	
<b>VEHICLE MAY ROLL</b>	
This vehicle will handle differently from any ordinary passenger car or truck. Sharp turns or abrupt maneuvers at high speeds may cause this vehicle to roll over or go out of control. Read and understand Owner's Manual before operating this vehicle.	

 <b>WARNING</b>	
<b>ALWAYS WEAR SEATBELT</b>	
Seatbelt must be properly fastened and adjusted for each occupant prior to operating the vehicle: See Owner's Manual	

## DISPLAY OF WARNING LABELS - 2

### **WARNING**

For the safety of yourself and others, please read the following guidelines before the installation or routine maintenance of batteries. **FIRST**, when installing the battery and cables, use insulated tools to avoid an explosion or arcing the current between terminals. **SECOND**, when maintaining and inspecting your batteries, wear protective glasses and gloves. The acid contents in the battery may cause serious injury to skin and eyes. **THIRD**, when dismantling and carrying the battery, use the proper carrying strap attached to the holders provided because the storage battery is heavy and contains caustic material, please take caution.

### **WARNING**

#### TO IMPROVE BATTERY LIFE:

- Keep batteries fully charged even after short trips.
- Keep connected to charger whenever possible.
- Limit the number of times of heavy discharge.

#### BATTERY MAINTENANCE -Consult owner's manual

- Always follow safety warnings, wear eye protection and proper clothing.
- Check battery electrolyte level monthly or more often during heavy use.
- Add only distilled water to batteries.
- Never charge when battery electrolyte level is below the battery plates.

### **WARNING**

Any changes, repairs or modifications to the controller, motor or electrical system outside the parameters set by the factory or the original design may be in violation of Federal Motor Vehicle Safety Standards. Additionally, this could void the warranty, cause damage to the vehicle, and/or serious bodily injury to the driver/passenger of the car.

**Maximum Bed  
Weight: 250 Lbs**



## DISPLAY OF CONTROLS

### DISPLAY OF CONTROLS



1. Steering Wheel
2. Combination Lever
3. Digital Speedometer
4. Key Switch / Light Switch
5. Directional Selector
6. State of Charging Meter
7. Hazard Switch
8. Radio (optional)
9. Glove Compartment
10. Brake Pedal
11. Accelerator Pedal
12. Front Batteries access panel



## BEFORE INITIAL USE

Read, understand and follow the safety label on the instrument panel. Be sure you understand how to operate the vehicle, its equipment and how to use it safely.

### **WARNING**

**Hydrogen gas is generated in charging cycle of batteries and is explosive in concentrations as low as 4%. Because hydrogen gas is lighter than air, it will collect in the ceiling or buildings necessitating proper ventilation. Five air exchanges per hour is considered the minimum requirements.**

**Never charge a battery in an area that is subject to flame or spark. Pay particular attention to natural gas or propane gas water heaters and furnaces.**

Before a new vehicle is put into operation, the “Initial Service Check List” below must be performed to ensure safety operation of the vehicle. Determine and record braking distance required to stop vehicle for future brake performance tests.

#### Initial Service Check List

- ✓ Fully charge batteries
- ✓ Check brake operation and adjust if necessary
- ✓ Check brake hydraulic brake fluid level
- ✓ Check parking brake and adjust if necessary
- ✓ Check accelerator pedal and brake pedal make sure they are not sticking
- ✓ Check tire pressure (see SPECIFICATION)
- ✓ Check head lights, turn signals, brake lights

## BATTERIES

This electric vehicle runs on a 48-Volts system. It uses six 8-Volts batteries connected in series. There are two batteries located under the front hood that can be accessed through an access panel below the dash. There are another four batteries located underneath the bench seat. (See location image below)



Four Batteries Under the Seat



Front access panel opens to two more batteries

## ON-BOARD CHARGER

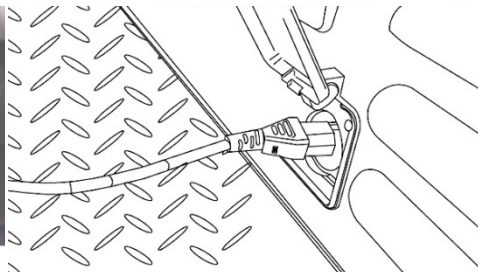
The 110-Volts Delta-Q onboard charger is located under the seat on the driver's side of the vehicle (see image below). It is wired directly to the batteries. There is also a charging port below the driver's seat that can be plugged directly into any 110 Volt wall outlets. (See location image below). For more information about Delta-Q Charger, please reference included copy of Delta-Q charger's operators manual.



Delta-Q battery charger is located under the seat



Charger Plug



## **⚠ WARNING**

The Delta-Q charger is programmed to run Trojan batteries. If batteries need to be changed, please contact your authorized dealer for compatibility questions.

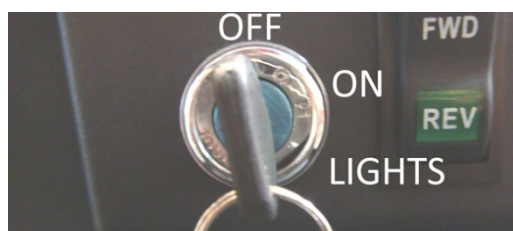
## CONTROLS AND INDICATORS

Vehicle controls and indicators consist of the followings:

- Key/ Lights switches
- Direction selector
- State of charge meter
- Combination lever (Lights/Horn/Turn Signals)
- Hazard light switch
- Speedometer
- Accelerator pedal
- Brake pedal
- Parking brake lever

### KEY / LIGHT SWITCH

Located on the dash panel, this switch enables the basic electric system of the vehicle to be turned on and off by turning the key. To prevent inadvertent operation of the vehicle when left unattended, the key should be turned to the 'OFF' position and removed. The key switch also has a position for turn on the head lights. (See image below)



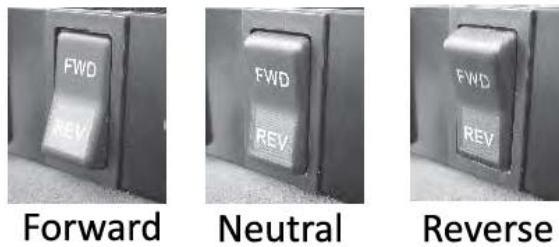
KEY / LIGHT SWITCH

## DIRECTION SELECTOR

Located on the control panel, this switch permits the select of either “FWD” for forward moving, “REV” for reverse, or Neutral (the position between forward and reverse). Vehicle should be left in neutral when unattended. (See Image Below)

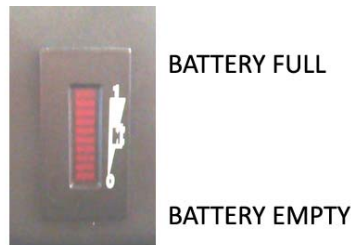
### **CAUTION**

To reduce the possibility of component damage, the vehicle must be completely stopped before moving the direction selector.



## STATE OF CHARGING METER

Located in the dash, the state of charging meter indicates the amount of usable power remaining in the batteries. (See image below)



STATE OF CHARGING METER

## COMBINATION LEVER (TURNING SIGNALS, HIGH BEAM LIGHTS, HORN)

Much like a car’s turning signal lever, this combination lever is located below the steering wheel on the steering column operates turning signals, high/low beam lights and horn. Push down on the combination lever to signal turning left, push up the lever to signal turning right. Push in on the lever to turn on high beam, pull back on the lever to turn on the high beam. Push in on the end of the lever to horn. (See image below)



COMBINATION LEVER

## HAZARD LIGHT SWITCH

Hazard light switch is located on the dash control cluster. Turn on this switch to activate hazardous lights.



Hazard Light Switch

## SPEEDOMETER

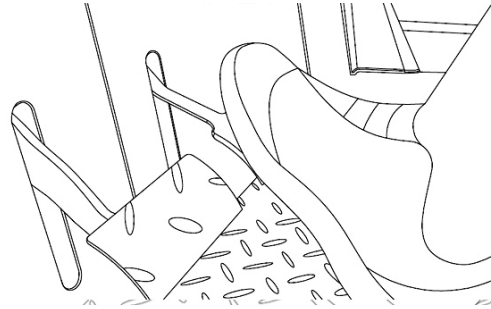
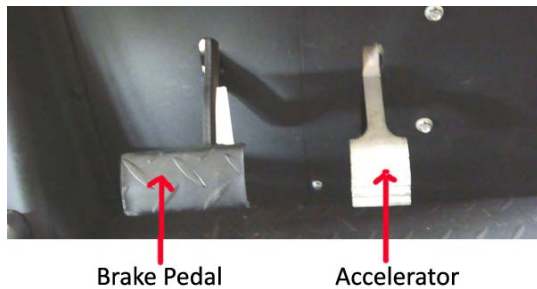
Digital speedometer is located in the middle of the console. It displays current speed information in MPH, as well as odometer in Miles. At the bottom of the speedometer are turning signal indicators, parking brake indicator and high beam indicator. (See image below)



DIGITAL SPEEDOMETER

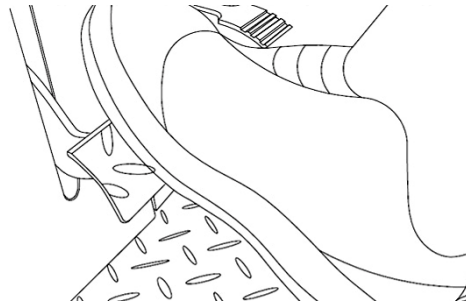
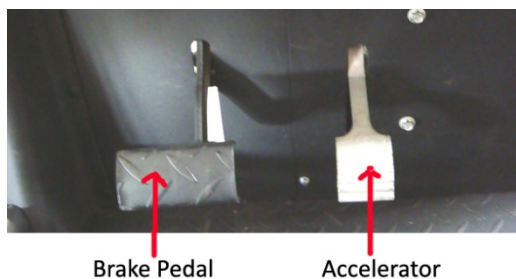
## ACCELERATOR PEDAL

With the key switch “ON”, release the parking brake, depressing the accelerator starts the motor. When pedal is released, the motor will stop. To stop the vehicle more quickly, depress the brake pedal. (See image below)



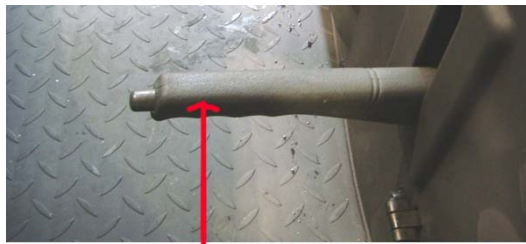
## BRAKE PEDAL

This vehicle is equipped with hydraulic brake system that controls a set of four brake discs; one on each wheel. To slow down the vehicle or to stop the vehicle, depress the brake pedal. Depressing the brake pedal further will increase the effectiveness of braking. (See Image Below)

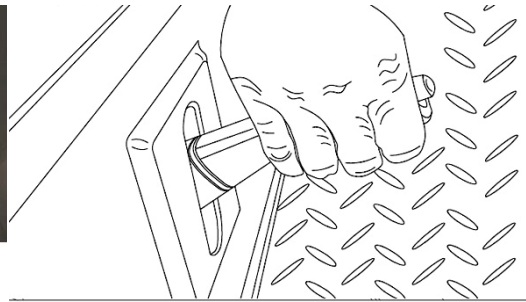


## PARKING BRAKE LEVER

This vehicle is equipped with parking brake lever. Push the release button and then pull the parking brake lever up to active parking brake. When parking the vehicle, pull up the parking brake and then turn the key to “OFF” position. (See image below) To release the parking brake, push the release button in and then push the parking brake lever down.



Parking Brake Lever



## BED USE

A manual lift bed is standard for the vehicle.

### **⚠ WARNING**

**Failure to follow these instructions may result in personal injury, damage the vehicle and/or cause the vehicle to tip over. Operate the vehicle with awareness of the load. Read, understand and follow the warning instructions on the front of the load bed.**

**DO NOT PERMIT ANYONE TO RIDE IN THE BED. Before operating, ensure no one is behind the vehicle.**

A load bed warning label is affixed to the inside front of the bed. This vehicle bed is rated at 250 Lbs. This label must be understood and observed at all times for safety operation of the vehicle. See the load bed warning label for maximum load capacity. The load must be positioned in the bed as far forward as possible and securely fastened down.

### **⚠ WARNING**

**Never fill a gas can in bed of a vehicle. Static discharge could ignite gasoline vapor and cause an explosion.**

Always place a gas can on the ground before filling. NEVER fill a gas can in the bed of the vehicle. Static electricity is build up during the fueling process and could discharge causing the gasoline vapor to ignite.



## MANUAL LIFT BED OPERATION

### **WARNING**

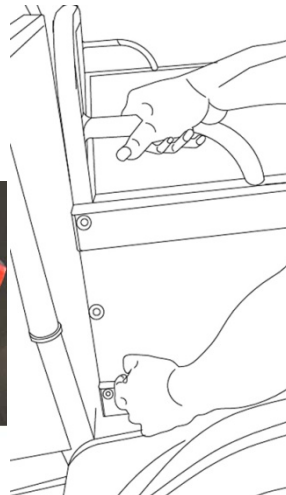
Exercise caution while operating the manual lift bed to ensure the bed is not released during lifting or lowering procedure. Severe injury could result if bed is released and traps finger or other body parts.

To lift the manual lift bed, push down on the latch release handle behind the seat. Raise the bed using handle on the side of the bed. The gas struts will assist in raising the empty load bed and will keep the bed raised.

To lower the manual lift bed, grasp the bed handle and lower the bed to the rest position. **Be sure fingers are not trapped by the bed.**

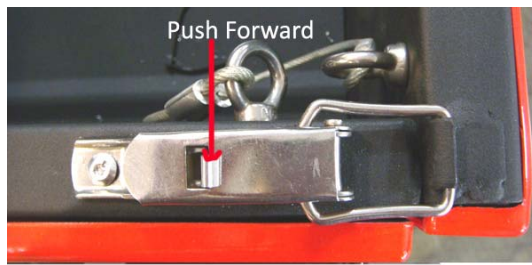


Latch Release Handle

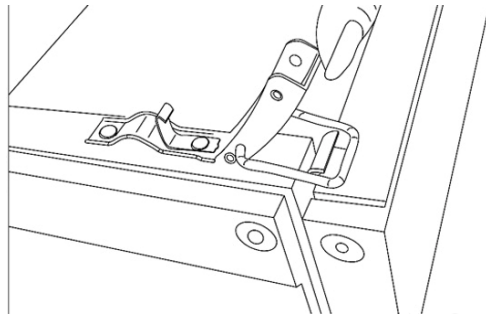
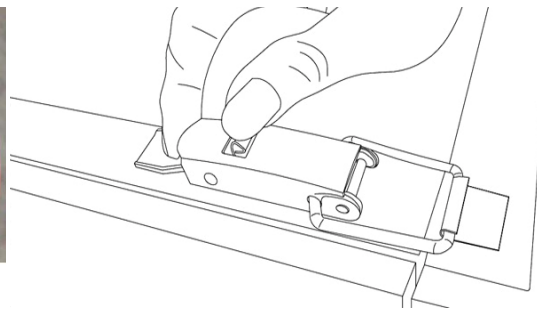


## TAIL GATE OPERATION

There are two tailgate switches located on the top side of the bed. To open the tailgate, push the small tab forward on the switch, and pull back the locking plate. (See image below) To close the tailgate, hook the tailgate latch and push down on the locking plate.



Tailgate Release Latch



## OPERATING THE VEHICLE

Read and understand the following warnings before attempting to operate the vehicle.

### **WARNING**

**To reduce the possibility of severe injury or death resulting from loss of vehicle control, the following warnings must be observed:**

**When driving vehicle, consider the terrain, traffic conditions and environmental factors which effect the terrain and the ability to control the vehicle.**

**Use extra care and reduced speed when driving on poor surfaces, such as loose dirt, wet grass, gravel, etc.**

**Stay in designated areas and avoid extremely rough terrains.**

**Maintain a safe speed when driving down hill. Use brake to control speed when traveling down an incline. A sudden stop or change of direction may result in loss of control.**

**To prevent loss of control, do not move the direction selector of a vehicle while the vehicle is in motion. Moving the selector will result in a sudden slowing of the vehicle and beeping of a warning device.**

**Slow down before and during turns. All turns should be proceed with reduced speed.**

**Never drive vehicle up, down or across an incline that exceeds 14 degrees.**

## STARTING AND DRIVING

### **WARNING**

**To avoid the possible of roll back which could result in severe injury or vehicle damage, do not release the brake until motor has started.**

Remove charger plug from vehicle receptacle and properly store the cables before moving the vehicle.

To operate vehicle:

- Apply the foot brake, place the key in the key switch and turn it to the “ON” position.
- Move the direction selector to the direction desired.
- Release the parking brake by pushing down the parking brake release button and push down the parking brake lever.
- Slowly depress the accelerator pedal to start the motor.
- When the accelerator pedal is released, the motor stops. To stop the vehicle more quickly, depress the foot brake pedal.

Note: When the direction selector is in the reserve position, a warning signal will sound to indicate that the vehicle is ready to run in reverse.

## STARTING VEHICLE ON A HILL

### **WARNING**

**To reduce the possibility of roll-back which could result in severe injury or vehicle damage, do not release the parking brake lever until motor has started.**

### **CAUTION**

**Do not hold the vehicle on a hill by using accelerator and motor. Leaving motor in a stalled condition for more than 3-4 seconds will cause permanent damage to the motor.**

To reduce the possibility of permanent damage to the drive system, it is important to prevent excessive roll-back when starting the vehicle on a hill.

Place left foot on foot brake and release the parking brake. Depress the accelerator with right foot and release the foot brake by lifting the left foot.

## VEHICLE CLEANING AND CARE

When cleaning the exterior of the vehicle, do not use pressure in excess of 700 psi. To reduce the possibility of cosmetic damage, do not use any abrasive or reactive solvents to clean plastic parts.

Normal cleaning of vinyl seats and plastic or rubber trim requires the use of a mild soap solution applied with a sponge or soft brush and wipe with damp cloth. Rinse with clear water.

## REPAIR

### **WARNING**

**To reduce the possibility of severe injury or death from a vehicle falling from a jack:**

**Be sure the vehicle is on a firm and level surface.**

**Never get under a vehicle while it is supported by a jack.**

**Use jack stands and test the stability of the vehicle on the stands**

**Always place chocks in front and behind the wheels not being raised.**

**Use extreme care since the vehicle is extremely unstable during the lifting process.**

## WHEELS AND TIRES

Use caution when inflating tires. Due to the low volume of the small tires, over inflation can occur in seconds. Over inflation could cause the tire to separate from the wheel or cause the tire to explode.

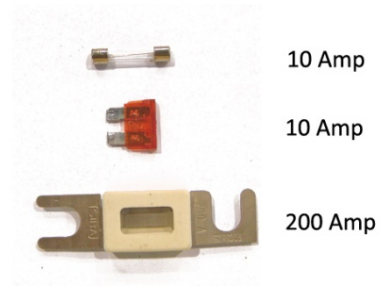
Tire inflation should be determined by the condition of the terrain. See GENERAL SPECIFICATIONS section for recommended tire inflation pressure. For outdoor applications with major use on grassy areas, the following should be considered. On hard turf, it is desirable to have a slightly higher inflation pressure. On very soft turf, a lower pressure reduces the possible of tire cutting into the turf. For vehicles being used on paved or hard surfaces, tire inflation pressure should be in the higher allowable range, but under no circumstances should inflation pressure be higher than recommended on the tire sidewall. All four tires should have the same pressure for optimum handling characteristics. Be sure to install the valve dust cap after checking or inflating.

The vehicle is fitted with low pressure tubeless tires mounted on one piece rims; therefore, the most cost effective way to repair a puncture in the thread is to use a commercial tire plug.

## FUSE REPLACEMENT

To replace fuses, locate the fuse block under the bench seat. Pull out old fuse and replace with new fuse. Fuses are available from local authorized repair center.

(See images below). There are three types of fuses used on this vehicle, see wiring diagram for details.



## **⚠ WARNING**

**Do not attempt any type of repairs beyond your technical skills; contact your local authorized repair center for help. Unauthorized repairs can cause serious safety hazard to the operator, as well as permanent damage to the vehicle.**



## SERVICE AND MAINTENANCE

### **WARNING**

To reduce the possibility of severe injury or death from improper servicing techniques:

**Do not attempt any type of servicing operating before reading and understanding all notes, cautions and warnings in this manual. Any servicing requiring adjustments to be made on the motor while the motor is running must be made with both drive wheels raised and vehicle properly supported on stands. To reduce the possibility of motor damage, never operate vehicle at full throttle for more than 4-5 seconds while vehicle is in a 'no load' condition.**

**To reduce the possibility of causing an electrical arc, which could result in a battery explosion, turn off all electrical loads from the battery before removing battery wires.**

**The electrolyte in a battery is an acid solution which can cause severe burns to the skin and eyes. Treat all electrolyte spills to the body and eyes with extended flushing with clear water. Contact a physician immediately.**

**Any electrolyte spills should be neutralized with a solution of 2 teaspoons (10ml) of sodium bicarbonate (baking soda) dissolved in 1 quart (1 liters) of water and flushed with water.**

It is in the best interest of vehicle owner to keep up with preventative maintenance schedule for keeping the vehicle both dependable and economical. This vehicle will give years of satisfactory service, providing it receives regular maintenance schedule listed below.

### VEHICLE IDENTIFICATION PLATE LOCATION

The vehicle Identification plate is on the vehicle behind the driver's seat. (See image below). Design changes take place on an ongoing basis. In order to obtain the correct components for the vehicle, the VIN number must be provided when ordering service parts.



VIN Number Location

## PERIODIC MAINTENANCE SCHEDULE

**To perform service that is in this schedule but not described in this manual, contact a local authorized service center for this vehicle.**

### Daily Service

Before Use:

- ✓ Check brake operation
- ✓ Check parking brake operation
- ✓ Check warning device function in reverse
- ✓ Check Lights, turning Signals, Horns
- ✓ Check tire condition
- ✓ Check overall vehicle condition
- ✓ Recharge battery to full state of charge after each day's use

### Weekly Service

- ✓ Tires: Exam for cuts, excessive wear and pressure
- ✓ Wheels: Check for bent rims, missing or loose lug nuts

### Monthly Service or Every 20 Hours (includes list in weekly service above)

- ✓ Front Axle: Check for damage to axle and loose or missing hardware
- ✓ Shock Absorbers: Check front and rear shock absorbers for oil leakage and loose fasteners
- ✓ Front Wheel Alignment: Check for unusual tire wear, align if required
- ✓ Parking Brake: Check for bent/binding linkage rod.
- ✓ Hardware and fasteners: Check for loose or missing hardware and components.

### Semi-Annual or Every 125 Hours (includes list in previous service above)

- ✓ Direction Selector: Check for wear and smooth movements
- ✓ Steering Assembly: Check for rack and pinion seal or damage or grease leakage
- ✓ Rod End ball Joints: Check for excessive play, Lubricate.
- ✓ Rear Axle: check for unusual noise and loose or missing mounting hardware

### Annual or Every 250 Hours (includes list in previous service above)

- ✓ Front wheel bearings: Check and adjust as required.
- ✓ Rear Axle: Check lubricant, add lubricant (SAE 30 oil) as required
- ✓ Brake: Clean and adjust. Check for brake pads linings. Check brake fluid.

## TIRE INSPECTION

Tire conditions should be inspected per the Periodic maintenance schedule above. Inflation pressure should be checked when the tires are cool. Be sure to install the valve dust caps after checking or inflating.

## BRAKES



**To reduce the possibility of severe injury or death, always evaluate pedal travel before operating a vehicle to verify some braking function is present.**

Check master cylinder fluid annually or if there is a decrease in braking effectiveness. Inspect components for damage or wear.

## REAR AXLE

The rear axle is provided with a lubricant level check/fill plug located on the bottom of the differential. Unless leakage is evident, the lubricant need only be replaced after five years.

## FASTENERS

Periodically, the vehicle should be inspected for loose fasteners.

## BATTERIES AND CHARGING

### BATTERIES

Flooded batteries need to be watered periodically. The frequency depends upon battery usage and operating temperature. Check new batteries every few weeks to determine the watering frequency for your application. It is normal for batteries to need more watering as they age.

- Fully charge the batteries prior to adding water. Only add water to discharged or partially charged batteries if the plates are exposed. In this case, add just enough water to cover the plates and then charge the batteries and continue with the watering procedures below.
- Remove the vent caps and place them upside down so that dirt does not get on the underside of the cap for batteries, simply flip open the cap. Check the electrolyte level.
- If the electrolyte level is well above the plates, then it is not necessary to add more water.
- If the electrolyte level is barely covering the plates, add distilled or de-ionized water to a level 1/8" (3mm) below the vent well (this is the plastic shield inside the vent hole) for standard batteries and to the maximum (MAX) level indicator for PLUS Series batteries.
- After adding water, secure vent cap back on batteries.

This vehicle uses Deep Cycle Deep Acid battery from Trojan. Please read "Trojan Battery Users Guide" for more information.

### CHARGER



**The Delta-Q charger is programmed to run Trojan batteries. If batteries need to be changed, please contact your authorized dealer for compatibility questions.**

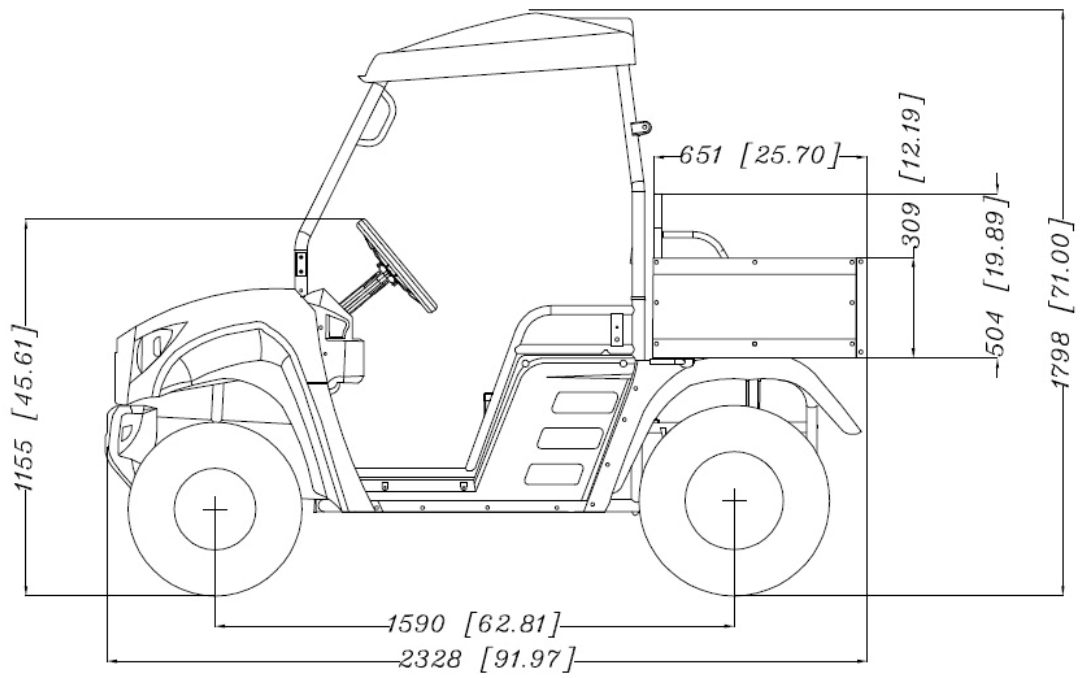
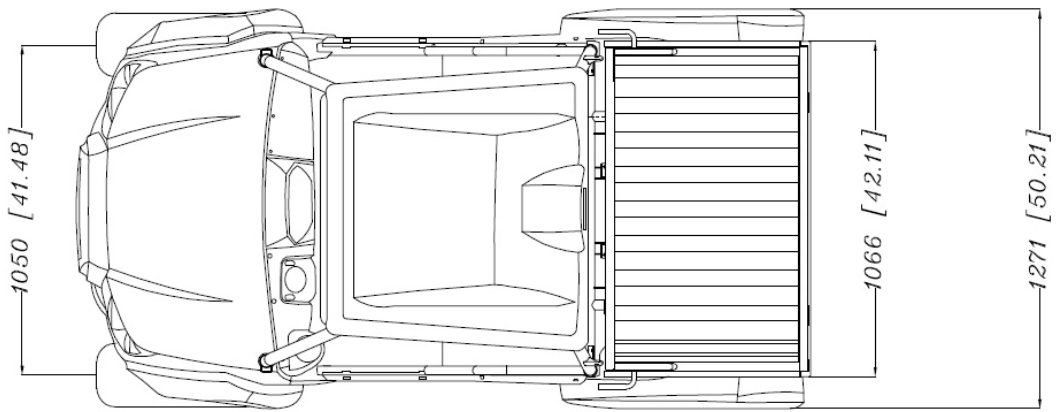
This vehicle uses a 48 Volt Delta-Q Charger. Please read included "Delta-Q Charger Owner's Manual" for more information.

## GENERAL SPECIFICATIONS

### STANDARD EQUIPMENT

Motor Type	48 Volt 4000 Watts 5.5 HP Motor
Frame	Power Coated Seamless Tube
Controller	Curtis 500 AMP Controller
Front Suspension	Independent A-Arm
Rear Suspension	Independent Rear Suspension
Steering	Rack and Pinion Steering
Brake	All Wheels Hydraulic Disc Brakes
Battery System	Six 8 Volts Deep Cycle Battery
Charger	220 Volt Delta-Q On Board Charger
Top Speed	25 MPH
Front Tire	Tubeless 21 x 8 -10
Front Tire Pressure	Maximum 36 PSI
Rear Tire	Tubeless 23 x 8.5 - 12
Rear Tire Pressure	Maximum 36 PSI
Weight	990 lbs (450 KG)
Length	85" (2330 mm)
Width	49" (1300 mm)
Height	71" (1750 mm)
Wheelbase	63" (1600 mm)
Ground Clearance	8.6" (220 mm)
Cargo Bed Capacity	39" x 23" x 11" (970 x 590 x 280 mm)
Vehicle Payload	1200 Lbs (550 KG)

\*Specification subject to change without notice



## LIMITED WARRANTY POLICY

This warranty policy only applies to vehicles set up and delivered by an authorized dealer, and that under normal use and service is found to have defects in parts or workmanship under the following terms and conditions.

This warranty does not apply to any part, which in opinion of seller was defective because of improper maintenance, improper assembly, alternation, abuse, negligence or accident.

Should warranty service be required on your electrical vehicle during the warranty period, please contact your nearest authorized dealer for repairs.

### **Vehicle Warranty Terms**

Vehicle Frame: 1 Year

Electric Motor: 1 Year

Controller and Electricals: 6 Months

Battery Charger: 6 Months

Batteries are warranties through Battery Original Manufacturer

Suspension Parts: 90 Days

Brake: 90 Days

### **What is not covered under this Warranty**

This warranty does not cover damage or faults caused by misuse, negligence, alternation, accidents or any abnormal use including the use of none genuine replace parts, renting or leasing, competition or racing. This warranty does not cover loss of use of the vehicle or loss of time, inconvenience. This warranty also does not cover normal wear and deterioration of consumable items such as tires, brakes, suspension parts, light bulbs, tires, batteries and etc.





## ***TROJAN BATTERY USER'S GUIDE***

Congratulations on your purchase from Trojan Battery Company, the manufacturer of the world's most trusted deep cycle batteries. The battery you purchased was engineered by Trojan to deliver superior power, performance, durability and reliability for use in a broad range of demanding applications.



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# TROJAN BATTERY USER'S GUIDE

This User's Guide was created by Trojan's applications engineers and contains vital information regarding proper care and maintenance of your new battery. Please read through this user's guide carefully and completely before using your battery. It will help you achieve optimum performance and long life from your new investment.

## 1. Equipment Needed

- Goggles and gloves
- Distilled or treated water (i.e. de-ionized, reverse osmosis, etc.)
- Rubber-handled wrench
- Baking soda
- Post protector (i.e. petroleum jelly, anti-corrosion spray, etc.)
- Voltmeter (for flooded/wet, gel and AGM batteries)
- Hydrometer (for flooded/wet batteries)
- Discharge tester (if available)
- Battery charger

## 2. Battery Installation

To ensure you install your batteries properly and safely please use the following guidelines:

### 2.1. Safety

- Always wear protective clothing, gloves and goggles when handling batteries
- Do not smoke near batteries
- Keep sparks, flames and metal objects away from batteries
- Use a wrench with a rubber handle when making battery connections
- The electrolyte is a solution of acid and water, so avoid skin contact
- If acid contacts your skin or eyes, flush with water immediately
- Check that all cable connections to the terminal are properly tightened; connections that are too tight or too loose could result in post breakage, meltdown or fire
- To avoid short circuits do not lay objects on top of battery
- Charge batteries in a well-ventilated area
- Never add acid to a battery

## 2.2. Battery Connections

Battery cables provide the link between the batteries, equipment and charging system. Faulty connections can lead to poor performance and terminal damage, meltdown or fire. To ensure proper connections, please use the following guidelines for cable size, torque values and terminal protection.

### 2.2.1. Cable Size

Battery cables should be sized to handle the expected load. Refer to *Table 1* for the maximum current carrying capacity (amps) based on the cable/wire gauge size.

*Table 1*

Wire Gauge Size (AWG)	Ampacity (amps)
14	25
12	30
10	40
8	55
6	75
4	95
2	130
1	150
1/0	170
2/0	265
4/0	360

Table values are for cable lengths less than 6 feet (1829 mm). In series/parallel battery banks, it is preferable for all series cables to be the same length and all parallel cables to be the same length.

For more information refer to the National Electric Code for correct cable/wire size, which can be located at [www.nfpa.org](http://www.nfpa.org).

### 2.2.2. Torque Values

Tighten all cable connections to the proper specification to make sure there is good contact with the terminals. Over-tightening the connection to the terminal can result in terminal breakage and loose connections which can result in meltdown or fire. Refer to *Table 2* for the proper torque values based on the type of terminal on your battery.

*Table 2*

Terminal Type	Torque (in lbs)
AP	50 - 70
LT	100 - 120
LPT, HPT, WNT, DWNT, UT	95 - 105
ST	120 - 180

*\* For DT (Automotive Post & Stud) refer to AP or ST type*

**WARNING: Use a wrench with a rubber handle when making battery connections.**

### 2.2.3. Terminal Protection

Corrosion can build up on terminals if they are not kept clean and dry. To prevent corrosion apply a thin coat of petroleum jelly or terminal protector that can be purchased through your local battery dealer.

## 2.3. Ventilation

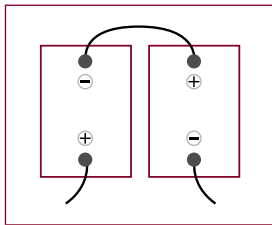
Flooded/wet lead acid batteries release small amounts of gas during usage, particularly during the charging process. Gel and AGM batteries generally do not release gas but can if too much pressure builds up during charging. It is critical to charge batteries in a properly ventilated area. For more assistance in calculating ventilation needs, please contact Trojan Battery Company's technical support engineers at 800-423-6569 or +1-562-236-3000.

## 2.4. Connecting Batteries to Increase System Power

### 2.4.1. Series Connections

To increase voltage, connect batteries in series. This will not increase the system capacity. Refer to *Diagram 1* for series connections.

*Diagram 1*



*Example :*

Two T-105, 6V Batteries rated at 225AH Connected in Series

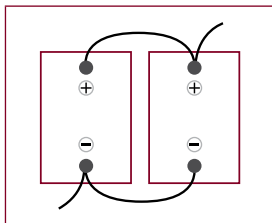
System Voltage:  $6V + 6V = 12V$

System Capacity = 225AH

### 2.4.2. Parallel Connections

To increase capacity, connect batteries in parallel. This will not increase the system voltage. Refer to *Diagram 2* for parallel connections.

*Diagram 2*



*Example :*

Two T-105, 6V Batteries rated at 225AH Connected in Parallel

System Voltage: 6V

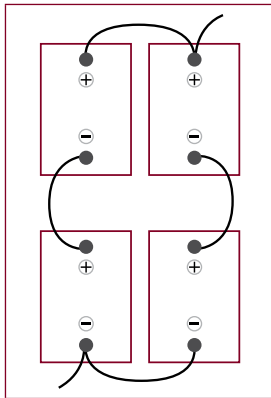
System Capacity =  $225AH + 225AH = 450AH$



### 2.4.3. Series/Parallel Connections

To increase both voltage and capacity, connect additional batteries in series and parallel. Refer to *Diagram 3* for series/parallel connections.

*Diagram 3*



*Example :*

Four T-105, 6V Batteries rated at 225AH  
Connected in Series/Parallel

System Voltage:  $6V + 6V = 12V$

System Capacity =  $225AH + 225AH = 450AH$

### 2.5. Battery Orientation

Flooded/wet batteries must be placed upright at all times. Fluid in the battery will spill if the battery is placed on its side or at an angle. Gel or AGM batteries are spill-proof so they can be placed either upright or on its side.



## 3. Preventative Maintenance

### 3.1. Inspection

- Examine the outside appearance of the battery. The tops of the batteries and terminal connections should be clean, free of dirt and corrosion, and dry. Refer to Cleaning [section 3.2](#)
- If fluids are on the top of a flooded/wet battery this may mean that the battery is being over-watered. Refer to Watering [section 3.3](#) for proper watering procedure. If fluid is on the top of a gel or AGM battery this means that the battery is being overcharged and the performance and life will be reduced
- Check battery cables and connections. Replace any damaged cables. Tighten any loose connections. Refer to Torque Values [section 2.2.2](#)

### 3.2. Cleaning

- Check that all vent caps are secured properly on the battery
- Clean the top of the battery, terminals and connections with a cloth or brush and a solution of baking soda and water. Do not allow cleaning solution to get inside the battery
- Rinse with water and dry with a clean cloth
- Apply a thin coat of petroleum jelly or terminal protector that can be purchased through your local battery dealer
- Keep the area around batteries clean and dry



### 3.3. Watering (flooded/wet batteries ONLY)

Water should never be added to gel or AGM batteries as they do not lose water during use. Flooded/wet batteries need to be watered periodically. The frequency depends upon battery usage and operating temperatures. Check new batteries every few weeks to determine the watering frequency for your application. It is normal for batteries to need more watering as they age.

- Fully charge the batteries prior to adding water. Only add water to discharged or partially charged batteries if the plates are exposed. In this case, add just enough water to cover the plates and then charge the batteries and continue with the watering procedure below
- Remove the vent caps and place them upside down so that dirt does not get on the underside of the cap or for Plus Series™ batteries, simply flip open the cap. Check the electrolyte level
- If the electrolyte level is well above the plates then it is not necessary to add more water
- If the electrolyte level is barely covering the plates, add distilled or de-ionized water to a level 1/8" (3 mm) below the vent well (this is the plastic shield inside the vent hole) for standard batteries and to the maximum (MAX) level indicator for Plus Series™ batteries
- After adding water, secure vent caps back on batteries
- Tap water may be used if the levels of impurities are within acceptable limits. Refer to [Table 3](#) for Water Impurity Limits



## TROJAN BATTERY USER'S GUIDE

Table 3

<b>Recommended Maximum Allowable Impurities In Water for Battery Use</b>		
<b>Impurity</b>	<b>Parts Per Million</b>	<b>Effects of Impurity</b>
Color	Clear and "White"	-
Suspended Matter	Trace	-
Total Solids	100.00	-
Organic and Volatile Matter	50.0	Corrosion of positive plate
Ammonia	8.0	Slight self-discharge of both plates
Antimony	5.0	Self-discharge by local action, reduces life, lower on-charge voltage
Arsenic	0.5	Self-discharge, can form poisonous gas at negative
Calcium	40.0	Increase of positive shedding
Chloride	5.0	Loss of capacity in both plates, greater loss in positive
Copper	5.0	Increased self-discharge, lower on-charge voltage
Iron	3.0	Increased self-discharge at both plates, lower on-charge voltage
Magnesium	40.0	Reduced life
Nickel	None Allowed	Intense lowering of on-charge voltage
Nitrates	10.0	Increased sulfation at negative
Nitrites	5.0	Corrosion at both plates, loss of capacity, reduced life
Platinum	None Allowed	Violent self-discharge, lower on-charge voltage
Selenium	2.0	Positive shedding
Zinc	4.0	Slight self-discharge at negative

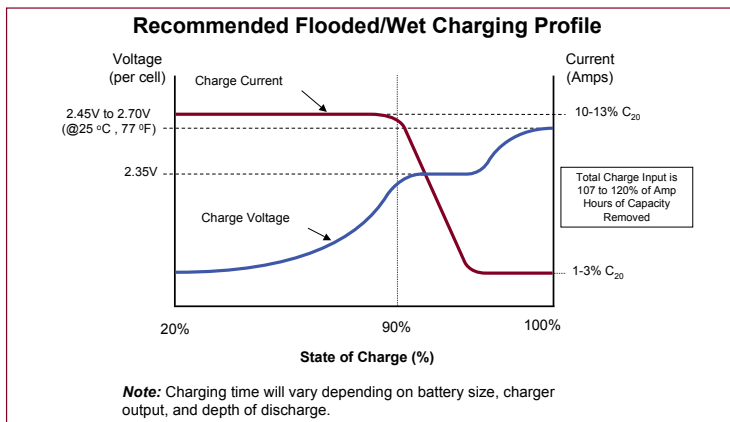
## 3.4. Charging and Equalizing

### 3.4.1. Charging

Proper charging is imperative to maximize battery performance. Both under- or over-charging batteries can significantly reduce the life of the battery. For proper charging, refer to the instructions that came with your equipment. Most chargers are automatic and pre-programmed. Some chargers allow the user to set the voltage and current values. Refer to *Diagram 4* for Trojan's recommended flooded/wet charging guidelines, *Diagram 5* for Trojan's recommended gel charging guidelines and *Diagram 6* for Trojan's recommended AGM charging guidelines.

- Make sure the charger is set to the appropriate program for flooded/wet, gel or AGM, depending on the type of battery you are charging
- Batteries should be fully charged after each use
- Lead-acid batteries (flooded/wet, gel and AGM) do not have a memory effect and therefore do not need to be fully discharged before recharging
- Charge only in well-ventilated areas
- Check electrolyte level to make sure plates are covered with water before charging (flooded/wet batteries only)
- Check that all vent caps are secured properly on the battery before charging
- Flooded/wet batteries will gas (bubble) towards the end of charge to ensure the electrolyte is properly mixed
- Never charge a frozen battery
- Avoid charging at temperatures above 120°F (49°C)

*Diagram 4*



# TROJAN BATTERY USER'S GUIDE

Diagram 5

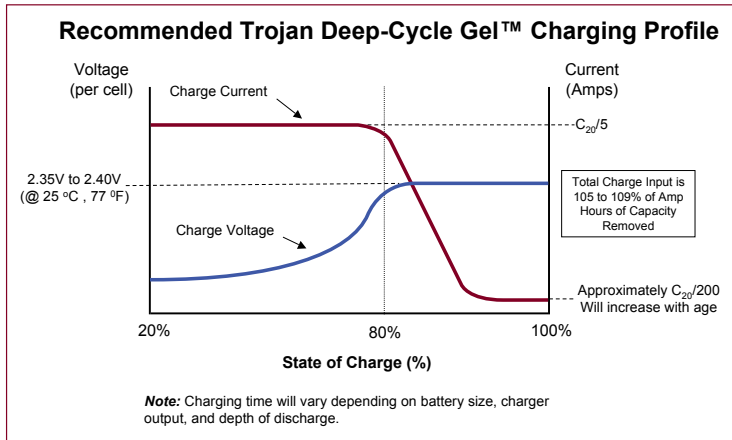
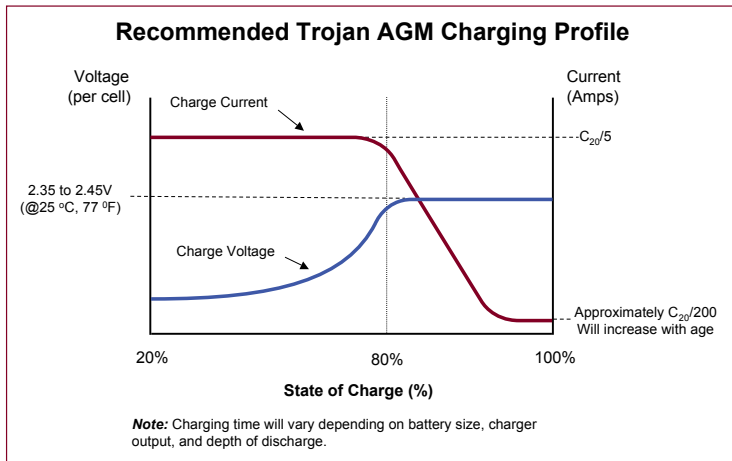


Diagram 6



### 3.4.2. Equalizing (flooded/wet batteries ONLY)

Equalizing is an overcharge performed on flooded/wet batteries after they have been fully charged. Trojan recommends equalizing only when batteries have low specific gravity, below 1.250 or wide ranging specific gravity, 0.030, after fully charging a battery. Gel or AGM batteries should never be equalized.

- Confirm that the batteries are flooded/wet
- Check electrolyte level to make sure plates are covered with water before charging
- Check that all vent caps are secured properly on the battery before charging
- Set charger to equalizing mode
- The batteries will gas (bubble) during the equalization process
- Measure the specific gravity every hour. Discontinue the equalization charge when the gravity no longer rises

**WARNING: Do not equalize gel or AGM batteries.**

## 4. Storage

- Charge battery before placing in storage
- Store in a cool, dry location, protected from the elements
- Disconnect from equipment to eliminate potential parasitic loads that may discharge the battery
- Batteries gradually self-discharge during storage. Monitor the specific gravity or voltage every 4-6 weeks. Stored batteries should be given a boost charge when they are at 70% state of charge (SOC) or less. Refer to *Table 4* for specific gravity and voltage measurements
- When batteries are taken out of storage, recharge before use



# TROJAN BATTERY USER'S GUIDE

Table 4

State of Charge as a measure of Specific Gravity and Open-Circuit Voltage					
Percentage Charge	Specific Gravity	Open Circuit Voltage			
		Cell	6 Volt	8 Volt	12 Volt
100	1.277	2.122	6.37	8.49	12.73
90	1.258	2.103	6.31	8.41	12.62
80	1.238	2.083	6.25	8.33	12.50
70	1.217	2.062	6.19	8.25	12.37
60	1.195	2.04	6.12	8.16	12.24
50	1.172	2.017	6.05	8.07	12.10
40	1.148	1.993	5.98	7.97	11.96
30	1.124	1.969	5.91	7.88	11.81
20	1.098	1.943	5.83	7.77	11.66
10	1.073	1.918	5.75	7.67	11.51





#### **4.1. Storage in Hot Environments (greater than 90°F or 32°C)**

Avoid direct exposure to heat sources, if possible, during storage. Batteries self-discharge faster in high temperatures. If batteries are stored during hot, summer months, monitor the specific gravity or voltage more frequently (approximately every 2-4 weeks).

#### **4.2. Storage in Cold Environments (less than 32°F or 0°C)**

Avoid locations where freezing temperatures are expected, if possible, during storage. Batteries can freeze in cold temperatures if they are not fully charged. If batteries are stored during cold, winter months, it is critical that they are kept fully charged.

### **5. How To Maximize the Performance of Your Trojan Battery**

- Follow all the procedures in this User's Guide for proper installation, maintenance and storage
- Do not discharge your battery more than 80%. This safety factor will eliminate the chance of over-discharging and damaging your battery
- If you have any questions or concerns about battery care, please contact Trojan Battery Company's technical support engineers at 800-423-6569 or +1-562-236-3000 before a problem develops

### **6. What to Expect from Your Trojan Battery**

- A new battery will not deliver its full rated capacity. This is normal and should be expected as it takes time to "work the battery up"
- Trojan's batteries take between 50 – 100 cycles to work up to providing full, peak capacity
- When operating batteries at temperatures below 80°F (27°C) they will deliver less than the rated capacity. For example at 0°F (-18°C) the battery will deliver 50% of its capacity and at 80°F (27°C) it will deliver 100% of its capacity
- When operating batteries at temperatures above 80°F (27°C) they will deliver more than the rated capacity but the battery life will be reduced
- The life of a battery is difficult to predict as it will vary with application, frequency of usage and level of maintenance

## 7. Trouble-Shooting

These battery testing procedures are guidelines only for identifying a battery that may need to be replaced. Unique situations may be observed that are not identified within this procedure. Please contact Trojan Battery Company's technical support engineers at 800-423-6569 or +1-562-236-3000 for help interpreting the test data.

### 7.1. Preparation for Testing

- Check that all vent caps are secured properly on the battery
- Clean the top of the battery, terminals and connections with a cloth or brush and a solution of baking soda and water. Do not allow cleaning solution to get inside the battery. Rinse with water and dry with a clean cloth
- Check battery cables and connections. Replace any damaged cables. Tighten any loose connections. Refer to Torque Values [section 2.2.2](#)
- For flooded/wet batteries, check the electrolyte level and add water if necessary. Refer to Watering [section 3.3](#)
- Fully charge batteries

### 7.2. On-Charge Voltage Testing

- Disconnect and reconnect DC plug to restart charger
- While the batteries are on-charge record the current in the last ½ hour of charge (if possible) and measure the battery set voltage
- If the current at the end of charge is below 5 amps and the battery set voltage is above: 56V for a 48V system; 42V for a 36V system; 28V for a 24V system; 14V for a 12V battery; 9.3V for a 8V battery or 7V for a 6V battery, then proceed to the next step. Otherwise check the charger for proper output and recharge the batteries if necessary. If the set voltages are still low, you may have a failed battery
- While the batteries are on-charge measure the individual battery voltages
- If any battery voltage is below: 7V for 6V battery, 9.3V for 8V battery and 14V for 12V battery, and a voltage variation is greater than 0.5V for 6V battery or 1.0V for a 12V battery, from any other battery in set, it may be a failed battery

### 7.3. Specific Gravity Testing (flooded/wet batteries ONLY)

- Fill and drain the hydrometer 2-3 times before drawing a sample from the battery
- Measure specific gravity readings for all battery cells
- Correct specific gravity readings for temperature by adding 0.004 for every 10°F (5°C) above 80°F (27°C) and subtract 0.004 for every 10°F (5°C) below 80°F (27°C)
- If every cell in the battery set is below 1.250 the batteries may be undercharged; recharge batteries
- If any battery has a specific gravity variation of more than 0.050 between cells equalize the set
- If there is still a variation there may be a failed battery

### 7.4. Open Circuit Voltage Testing

This is the least preferred method of evaluating the performance of a battery.

- For accurate voltage readings, batteries must remain idle at least 6 hours (but preferably up to 24 hours)
- Measure the individual battery voltages
- If any battery voltage is greater than 0.3V from any other battery in set, equalize the set (flooded/wet batteries ONLY). Refer to equalizing [section 3.4.2](#)
- Remeasure the individual battery voltages
- If any battery voltage is still greater than 0.3V from any other battery in set you may have a failed battery



## 7.5. Discharge Testing

- Connect and start discharger
- Record the runtime (minutes) when discharge is complete
- Correct runtime minutes for temperature using the following formula (valid between 24°C (75°F) and 32°C (90°F):
  - $M_c = M_r [1 - 0.009 (T - 27)]$  where  $M_c$  is the corrected minutes,  $M_r$  is the minutes recorded and  $T$  is the temperature at the end of discharge in °C
- If the discharge time is greater than 50% of the batteries' rated capacity then all the batteries are operational
- Reconnect the discharger to record the individual battery voltage while still under load (current being drawn)
- If the discharge runtime is less than 50% of the batteries' rated capacity, the batteries with a voltage that is 0.5V lower than the highest voltage may be a failed battery

There are other methods of testing batteries including internal resistance (i.e. CCA testers) and carbon-pile discharge testers. However these are not suitable testing methods for deep cycle batteries.



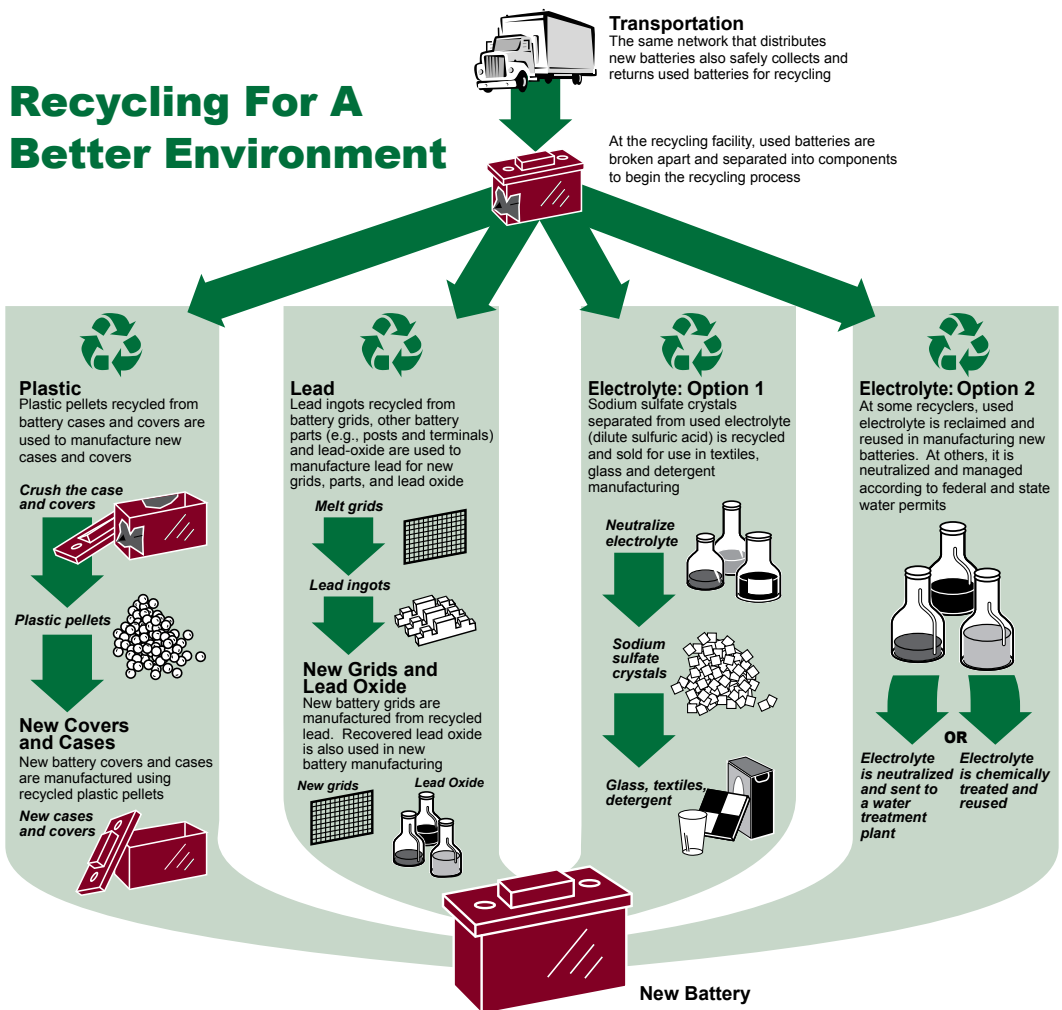
# TROJAN BATTERY USER'S GUIDE

## 8. Battery Recycling

Lead-acid batteries are the environmental success story of our time because more than 97 percent of all battery lead is recycled. In fact, lead-acid batteries top the list of the most highly recycled consumer products and Trojan Battery supports proper recycling of your battery to keep the environment clean.

Please contact your nearest Trojan Distributor, which can be located at [www.trojanbattery.com](http://www.trojanbattery.com), to properly recycle your batteries.

Below is the process in which your Trojan battery will be recycled:



\*Graphics provided by Battery Council International

# TROJAN BATTERY USER'S GUIDE

*Trojan Battery Company would like to thank you for selecting our battery. With over 80 years of experience, Trojan Battery is the world's most trusted name in deep cycle battery technology backed by our outstanding technical support. We look forward to serving your battery needs.*

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Santa Fe Springs, CA 90670 USA

Call 800-423-6569 or +1-562-236-3000

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For more information call 800-423-6569 or +1-562-236-3000  
[www.trojanbattery.com](http://www.trojanbattery.com)



# SAVE THESE IMPORTANT SAFETY INSTRUCTIONS



This manual contains important safety and operating instructions – read before using charger.

**Warning:** Use charger only with an algorithm selected that is appropriate to the specific battery type. Other usage may cause personal injury and damage. Lead acid batteries may generate explosive hydrogen gas during normal operation. Keep sparks, flames, and smoking materials away from batteries. Provide adequate ventilation during charging. Never charge a frozen battery. Study all battery manufacturers' specific precautions, ie. maximum charge rates and if cell caps should be removed while charging.

**Danger:** Risk of electric shock. Connect charger power cord to an outlet that has been properly installed and grounded in accordance with all local codes and ordinances. A grounded outlet is required to reduce risk of electric shock – do not use ground adapters or modify plug. Do not touch uninsulated portion of output connector or uninsulated battery terminals. Disconnect the AC supply before making or breaking the connections to the battery. Do not open or disassemble charger. Do not operate this charger if the AC supply cord is damaged or if the charger has received a sharp blow, been dropped, or otherwise damaged in any way – refer all repair work to the manufacturer, or qualified personnel. This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

# INFORMATIONS IMPORTANTES DE SÉCURITÉ



Ce manuel contient des instructions importantes concernant la sécurité et le fonctionnement.

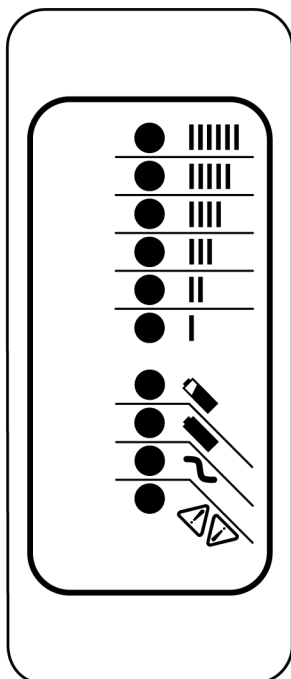
**Attention:** Utiliser le chargeur seulement avec un algorithme approprié au type spécifique de batterie. D'autres types de batteries pourraient éclater et causer des blessures ou dommages. Les batteries peuvent produire des gaz explosifs en service normal. Ne jamais fumer près de la batterie et éviter toute étincelle ou flamme nue à proximité des batteries. Fournissez une ventilation adéquate du chargement. Ne jamais charger une batterie gelée. Prendre connaissance des mesures de précaution spécifiées par le fabricant de la batterie, p. ex., vérifier s'il faut enlever les bouchons des cellules lors du chargement, et les taux de chargement.

**Danger:** Risque de chocs électriques. Ne pas toucher les parties non isolées du connecteur de sortie ou les bornes non isolées de la batterie. Toujours connecter le chargeur à une prise de courant mise à la terre. Déconnectez la source AC avant de faire ou défaire les connexions à la batterie en chargement. Ne pas utiliser le chargeur si le cordon d'alimentation AC est endommagé ou si le chargeur est abîmé suite à une chute ou autre incident. Ne pas ouvrir ni désassembler le chargeur – référer toute réparation aux personnes qualifiées. Cet appareil n'est pas destiné à un usage par des personnes (dont les enfants) avec des facultés motrices, sensorielles ou mentales réduites, ou ayant une expérience et des connaissances insuffisantes, à moins qu'elles sont sous la supervision ou reçoivent les instructions sur l'utilisation de l'appareil d'un répondant garant de leur sécurité. Les enfants devraient être surveillés afin qu'il ne jouent en aucun temps avec l'appareil.

## Operating Instructions

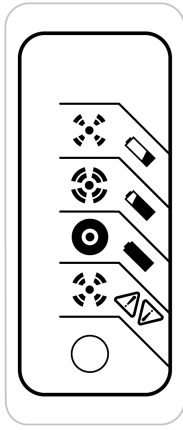
**CAUTION:** Charger enclosure may be hot during charging. Use hand protection if handling the charger while charging.





1. Extension cords must be 3-wire cord no longer than 30m(100') at 10AWG or 7.5m(25') at 16AWG per UL guidelines.
2. Only connect **ONE** QuiQ charger to a single 15A circuit or the circuit may become overloaded.
3. Charger 10-LED Display:



LED Colour	Indication (following "Power-On Self Test")
<b>Ammeter (Amber)</b>	<b>Solid:</b> Displays approximate scale of current output during bulk phase.
	<b>Flashing:</b> High internal charger temperature. Output reduced. Also displays algorithm #1-6 for 11 seconds if no battery is connected.
<b>80% Charge (Amber)</b>	<b>Solid:</b> Bulk charge phase complete, 80% charged. In Absorption phase.
	<b>Flashing:</b> With no battery connected, indicates algorithm # selected by number of flashes.
<b>100% Charge (Green)</b>	<b>Solid:</b> Charging complete. Charger in Maintenance Mode.
	<b>Flashing:</b> Absorption phase complete. In Finish phase
<b>AC On (Amber)</b>	<b>Solid:</b> AC Power good
	<b>Flashing:</b> Low AC Voltage, check voltage and extension cord length (see above for guidelines).
<b>Fault (Red)</b>	<b>Flashing:</b> Charger error. Reset charger power and refer to Troubleshooting Instructions below.

#### 4. Optional Charger Single-LED Display (internal or external)









LED Colour	Indication (following "Power-On Self Test")	
Green		<b>Solid:</b> Charging complete. Charger in Maintenance Mode.
		<b>Flashing:</b> <i>Short:</i> <80% Charge. <i>Long:</i> >80% Charge. <i>When battery is not connected:</i> Algorithm Number display.
Amber		<b>Flashing:</b> Reduced Power Mode: Low AC Voltage or High internal charger temperature.
Red		<b>Flashing:</b> Charger error. Reset charger power and refer to Troubleshooting Instructions below.

### Maintenance Instructions

- Do not expose charger to oil, dirt, mud or direct heavy water spray when cleaning vehicle.
- If the detachable input power supply cord set is damaged, replace with a cord that is:
  - for North America - UL or CSA listed/approved detachable cord, 3 conductor, 16AWG minimum, and rated SJT; terminating in a grounding type IEC 60320 C14 plug rated 250V, 13A minimum; or
  - for all other countries – a safety approved detachable cord, 3 conductor, 1.5mm<sup>2</sup> minimum, rated appropriately for industrial use. The cord set must be terminated on one end with a grounding type input connector appropriate for use in the country of destination and, on the other end, an output grounding type IEC 60320 C14 plug.
- The enclosure of the charger has been tested successfully to EN60529, meeting IP66. The AC supply inlet is rated to IP20, which is suitable for indoor use only. Keep all AC connections clean and dry.

### Troubleshooting Instructions

If a fault occurs, count the number of red flashes between pauses and refer to the table below:

Red Flashes	Cause	Solution
	Battery High Voltage	Check battery size and condition and reset charger (interrupt AC power for 15 seconds).
	Battery Low Voltage	Check battery size and condition and reset charger (interrupt AC power for 15 seconds).
	Charge Timeout caused by battery pack not reaching required voltage. Charger output was reduced due to high temperatures	Check connections. Operate charger at a lower ambient temperature.
	Check Battery: battery could not be trickle charged up to minimum voltage	Check for shorted or damaged cells.
	Over-Temperature: Charger shut down due to high internal temperature.	Ensure sufficient cooling air flow and reset charger (interrupt AC power for 15 seconds).
	Charger Internal Fault	Reset charger (interrupt AC power for 15 seconds). Return to qualified service depot if fault persists.

**Note:** This is a Class A product complying with United States Federal Communications Commission, Code of Federal Regulations; 47CFR part 15. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.