Battery Care and Maintenance

SAFETY - *ALWAYS OBSERVE THE FOLLOWING WARNINGS WHEN WORKING ON OR NEAR BATTERIES:*

⚠ WARNING

1. ***To prevent battery explosion that could result in severe personal injury or death, keep all smoking materials, open flame or sparks away from the batteries.***
2. ***Hydrogen gas is formed when charging batteries. Do not charge batteries without adequate ventilation.***
3. ***A 4% concentration of hydrogen gas is explosive.***
4. ***Be sure that the key switch is off and all electrical accessories are turned off before starting work on vehicle.***
5. ***Never disconnect a circuit under load at a battery terminal.***

6. ***Batteries are heavy. Use proper lifting techniques when moving them. Always lift the battery with a commercially available battery-lifting device. Use care not to tip batteries when removing or installing them; spilled electrolyte can cause burns and damage.***

7. ***The electrolyte in a storage battery is an acid solution that 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.***

8. ***Always wear a safety shield or approved safety goggles when adding water or charging batteries.***
9. ***Any electrolyte spills should be neutralized with a solution of 1/4 cup (60 ml) sodium bicarbonate (baking soda) dissolved in 1 1/2 gallons (6 liters) of water and flushed with water.***
10. ***Overfilling batteries may result in electrolyte being expelled from the battery during the charge cycle. Expelled electrolyte may cause damage to the vehicle and storage facility.***
11. ***Aerosol containers of battery terminal protectant must be used with extreme care. Insulate metal container to prevent can from contacting battery terminals which could result in an explosion.***

12. ***Wrap wrenches with vinyl tape to prevent the possibility of a dropped wrench from 'shorting out' a battery, which could result in an explosion and severe personal injury or death.***

Battery Care and Maintenance

⚠ CAUTION

To reduce the possibility of fire at each Charging Cycle, never attach a battery charger to a vehicle that is to be unattended beyond the normal charging cycle. Overcharging could cause damage to the vehicle batteries and result in extreme overheating. The charger should be checked after 24 hours and unplugged after the charge cycle is complete.

Before charging the batteries, inspect the plug of the battery charger and vehicle receptacle housing for dirt or debris.

NEW CARS

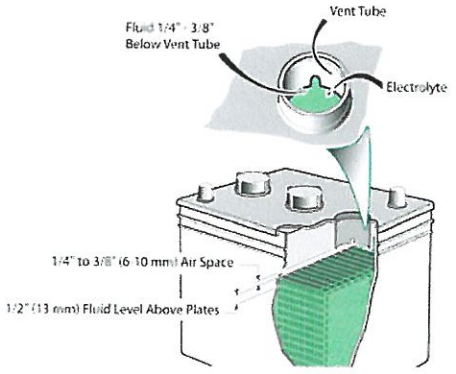
Prior to using new vehicles, a battery charge is required. This fully charges the batteries prior to use and reduces the risk of experiencing a vehicle failing on the course. Fully charge batteries after each days use. It is desirable to maintain a fully charged set of batteries when the vehicle is not in use.

MONTHLY INSPECTION

- Inspect all wiring for fraying, loose terminals, corrosion or deterioration of insulation.
- Check that the electrolyte level is correct and add suitable water as required.
- Clean the batteries and wire terminals.
- Use a battery terminal protectant.

ELECTROLYTE LEVEL AND WATER

The correct level of the electrolyte is 1/2" (13 mm) above the plates in each cell (Ref Fig. on page 2). This level will leave approximately 1/4" - 3/8" (6 - 10 mm) of space between the electrolyte and the vent tube. The electrolyte level is important since **any portion** of the plates exposed to air will be ruined beyond repair. Of equal importance is too much water, which will result in electrolyte being forced out of the battery due to gassing and the increase in volume of the electrolyte that results from the charging cycle.



Electrolyte level should be at least 1/2" (13 mm) above the plates and 1/4" to 3/8" (6-10 mm) below bottom of vent tube

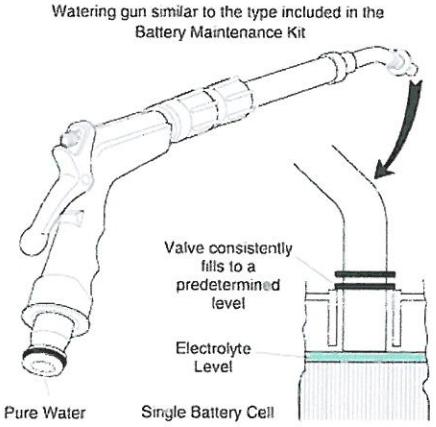
Do not overfill batteries. The charging cycle will expel electrolyte and result in component damage. A battery being charged will 'gas' with the majority of the gassing taking place at the end of the charging cycle. This gas is hydrogen, which is lighter than air. Water and sulfuric acid droplets will be carried out of the battery vents by the hydrogen gas; however, this loss is minimal. If the battery electrolyte level is too high, the electrolyte will block the vent tube and the gas will **force** it out of the vent tube and battery cap. The water will evaporate but the sulfuric acid will remain where it can damage vehicle components and the storage facility floor. Sulfuric acid loss will weaken the concentration of acid within the electrolyte and reduce the life of the battery. Over the life of the battery, a considerable amount of water is consumed. It is important that the water used be pure and free of contaminants that could reduce the life of the battery by reducing the chemical reaction.

Battery Care and Maintenance

The water must be distilled or purified by an efficient filtration system. Water that is not distilled should be analyzed and if required, filtration installed to permit the water to meet the requirements of the water purity table (Ref Fig. On page 3). Even if the water is colorless, odorless, tasteless and fit for drinking, the water should be analyzed to see that it does not exceed the impurity levels specified in the table. Automatic watering devices such as the one included in the Battery Maintenance Kit (P/N 25587-G01) can be used with an approved water source (Ref Fig. on page 3). These watering devices are **fast and accurate** to use and maintain the correct electrolyte level within the battery cells. The stop on the watering device should be checked periodically and clamped to prevent movement.

Impurity	Parts Per Million
Color	Clear
Suspended	Trace
Total Solids	100
Calcium & Magnesium Oxides	40
Iron	5
Ammonia	8
Organic & Volatile Matter	50
Nitrites	5
Nitrates	10
Chloride	5

Overfilling batteries will reduce battery life and promote corrosion, and may void battery warranty.



Flooded batteries need water. More importantly, watering must be done at the right time and in the right amount or else the battery's performance and longevity suffers.

Water should always be added after fully charging the battery. Prior to charging, there should be enough water to cover the plates. If the battery has been discharged (partially or fully), the water level should also be above the plates. Keeping the water at the correct level after a full charge will prevent having to worry about the water level at a different state of charge.

Depending on the local climate, charging methods, application, etc. it is recommended that batteries be checked once a month until you get a feel for how thirsty your batteries are.

⚠ CAUTION

The electrolyte is a solution of acid and water so skin contact should be avoided.

⚠ WARNING

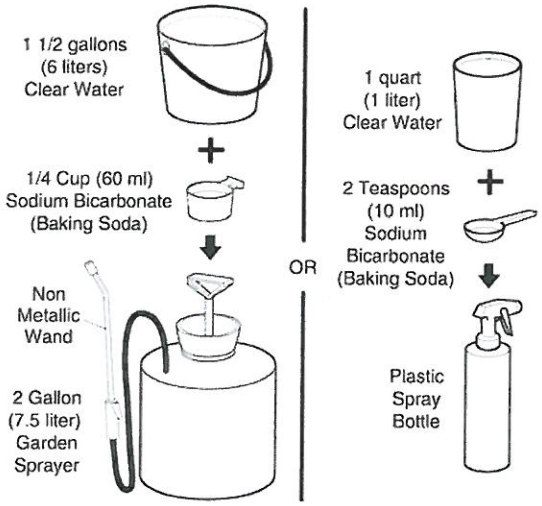
Never add acid to a battery.

Battery Care and Maintenance

BATTERY CLEANING

To prevent battery damage, be sure that all battery caps (if equipped) are tightly installed. To reduce the possibility of damage to vehicle or floor, neutralize acid before rinsing battery. To reduce the possibility of damage to electrical components while cleaning, do not use a pressure washer.

Cleaning should take place per the Periodic Service Schedule. When cleaning the outside of batteries and terminals, first spray with a solution of sodium bicarbonate (baking soda) and water to neutralize any acid deposits before rinsing with clear water. Use of a water hose without first neutralizing any acid will move acid from the top of batteries to another area of the vehicle or storage facility where it will attack the metal structure or the concrete/asphalt floor. Additionally, conductive residue will remain on the batteries and contribute to their self discharge.



PREPARING ACID NEUTRALIZING SOLUTION

⚠ WARNING

To reduce the possibility of battery explosion that could result in severe injury or death, do not use metallic spray wand to clean battery and keep all smoking materials, open flame or sparks away from the battery.

The correct cleaning technique is to spray the top and sides of the batteries with a solution of sodium bicarbonate (baking soda) and water. This solution is best applied with a garden type sprayer equipped with a **non-metallic spray wand or plastic spray bottle**. The solution should consist of the ingredients shown in the illustration (Ref Fig. on page 4). In addition, special attention should be paid to metal components adjacent to the batteries, which should also be sprayed with the solution. Allow the solution to sit for at least three minutes. Use a soft bristle brush or cloth to wipe the tops of the batteries to remove any conductive residue. Rinse the entire area with low pressure clear water. **Do not use a pressure washer.** All of the items required for complete battery cleaning and watering (electric vehicles only) are contained in the Battery Maintenance Kit (P/N 25587-G01).

BATTERY MAINTENANCE

Tool List Qty. Required

Insulated wrench, 9/16" 1
Battery carrier..... 1
Discharge Machine P/N 28251G02..... 1
Hydrometer..... 1
Battery maintenance kit P/N 25587-G01..... 1

Battery Care and Maintenance

BATTERY REPLACEMENT

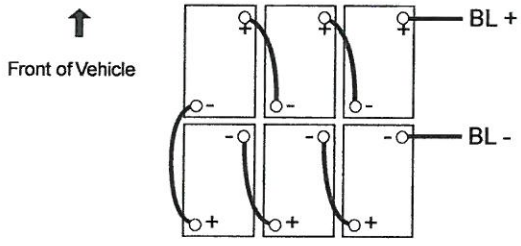
Before any electrical service is performed on **PDS** model vehicles, **the Run-Tow/Maintenance switch** must be placed in the 'Tow/Maintenance' position.

If a power wire (battery, motor or controller) is disconnected for any reason on the PDS model vehicle, the Run-Tow/Maintenance switch must be left in the 'Tow/Maintenance' position for at least 30 seconds after the circuit is restored.

Remove battery hold downs and cables. Lift out batteries with a commercially available lifting device. If the batteries have been cleaned and any acid in the battery rack area neutralized as recommended, no corrosion to the battery racks or surrounding area should be present. Any corrosion found should be immediately removed with a putty knife and a wire brush. The area should be washed with a solution of sodium bicarbonate (baking soda) and water and thoroughly dried before **priming and painting with a corrosion resistant paint.** The batteries should be placed into the battery racks and the battery hold downs tightened to 45 - 55 in. lbs. (5 - 6Nm) torque, to prevent movement but not tight enough to cause distortion of the battery cases. Inspect all wires and terminals. Clean any corrosion from the battery terminals or the wire terminals with a solution of sodium bicarbonate (baking soda) and brush clean if required. Battery wires that exhibit wire terminal degradation due to corrosion should be replaced with new wire assemblies. Improper terminal connections will result in reduced performance and could void the warranty on the drive and battery systems.

⚠ WARNING

To prevent battery explosion that could result in severe personal injury or death, extreme care must be used with aerosol containers of battery terminal protectant. Insulate the metal container to prevent the metal can from contacting battery terminals that could result in an explosion.



Battery Connections

Use care to connect the battery wires as shown (Ref Battery Connections on page 5). **Tighten the battery post hardware to 90-110 in. lbs. (6 - 8 Nm) torque.** *Do not over-torque the terminal stud nut; this will cause a "mushroom" effect on the battery post, which will prevent the terminal nut from being properly tightened.* Protect the battery terminals and battery wire terminals with a commercially available protective coating.

BATTERY WIRES

Battery wires are the conductors between the batteries in the vehicle that allow the batteries to charge and the vehicle to operate. They are as important as the batteries themselves in transferring power from the source. A poor connection causes the wires to work harder during normal use. The wire terminals on both ends of the cable allow the connection to the battery. The terminals are tin coated copper material and serves two purposes. The first is the mechanical connection caused by crimping the barrel end of the terminal to the wire. This connection is made utilizing specialized equipment to ensure a good electrical connection. **Do not crimp terminals to power wiring, purchase new battery wires to repair these types of**

failures. The ring terminal end is made to complete the connection to the battery. The second purpose is that the tin provides a protective coating for the copper to prevent corrosion. If this coating is compromised, the corrosion will begin to erode the copper base material and weaken the current carrying capabilities of the wire terminal. **Battery wires in poor condition may void battery warranty.**

BATTERY TERMINAL PROTECTANT

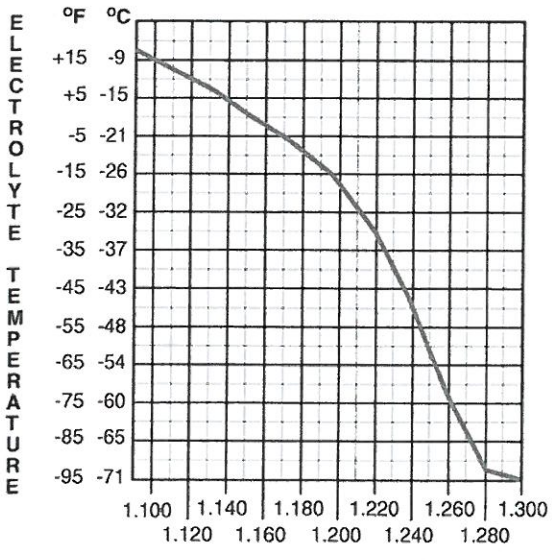
Battery terminal protectant is needed to help prevent corrosion from starting on terminals. This protectant should be applied to a clean dry surface, making sure not to capture moisture underneath the coating. Care should be exercised when washing the batteries to prevent the protectant from washing off, depending on the brand and type used.

Examples of Poor Maintenance

PROLONGED STORAGE

Battery charger, controller, run-tow maintenance switch and other electronic devices such as radios need to be disconnected since they will contribute to the premature discharge of batteries.

During periods of storage, the batteries will need attention to keep them maintained and prevent discharge. In high temperatures the chemical reaction is faster, while low temperatures cause the chemical reaction to slow down. A vehicle that is stored at 90° F (32° C) will lose .002 of specific gravity each day. If a fully charged battery has a specific gravity of 1.275, and the battery is allowed to sit unused, it will become partially discharged. When it reaches 1.240, which it will do in less than twenty days, it should be recharged. If a battery is left in a discharged state, sulfating takes place on and within the plates. This condition is not reversible and will cause permanent damage to the battery. In order to prevent damage, the battery should be recharged. A hydrometer can be used to determine the specific gravity and therefore the state of charge of a battery.



SPECIFIC GRAVITY ELECTROLYTE FREEZING POINT

In winter conditions, the battery must be fully charged to prevent the possibility of freezing (Ref Fig. on page 6). A fully charged battery will not freeze in temperatures above -75° F (-60° C). Although the chemical reaction is slowed in cold temperatures, the battery must be stored fully charged, and disconnected from any circuit that could discharge the battery.

Battery Care and Maintenance

For PDS vehicles, the controller should be disconnected from the batteries by setting the Run-Tow/Maintenance switch, located under the passenger seat, to the 'TOW/MAINTENANCE' position.
For portable chargers, disconnect the charging plug from the vehicle receptacle. For on-board chargers, disconnect the charging harness from the batteries. The batteries must be cleaned and all deposits neutralized and removed from the battery case to prevent self discharge. The batteries should be tested or recharged at thirty day minimum intervals.

BATTERY CHARGING

The battery charger is designed to fully charge the battery set. If the batteries are severely deep cycled, some automatic battery chargers contain an electronic module that may not activate and the battery charger will not function. Automatic chargers will determine the correct duration of charge to the battery set and will shut off when the battery set is fully charged. Always refer to the instructions of the specific charger used. Before charging, the following should be observed:

⚠ CAUTION

Do not overfill batteries. The charging cycle will expel electrolyte and result in component damage.

- The electrolyte level in all cells must be at the recommended level and cover the plates.
- The charging must take place in an area that is well ventilated and capable of removing the hydrogen gas that is generated by the charging process. A **minimum** of five air exchanges per hour is recommended.
- The charging connector components are in good condition and free from dirt or debris.
- The charger connector is fully inserted into the vehicle receptacle.
- The charger connector/cord set is protected from damage and is located in an area to prevent injury that may result from personnel running over or tripping over the cord set.
- The charger is automatically turned off during the connect/disconnect cycle and therefore no electrical arc is generated at the DC plug/receptacle contacts.

In some portable chargers, there will be a rattle present in the body of the charger DC plug. An internal magnet contained within the charger plug causes this rattle. The magnet is part of the interlock system that prevents the vehicle from being driven when the charger plug is inserted in the vehicle charging receptacle. Validate your vehicles for this interlock by plugging the charger DC plug and see if the vehicle will operate.

Equalize Charging
(Flooded batteries only)

Equalizing is an overcharge performed on flooded lead-acid batteries after they have been fully charged. It helps eliminate stratification and sulfation, two conditions that can reduce the overall performance of a battery. Trojan recommends equalizing only when low or wide ranging specific gravity (+/-.015) is detected after fully charging a battery.

Battery Care and Maintenance

Procedure:
After the batteries have completed a charge cycle:

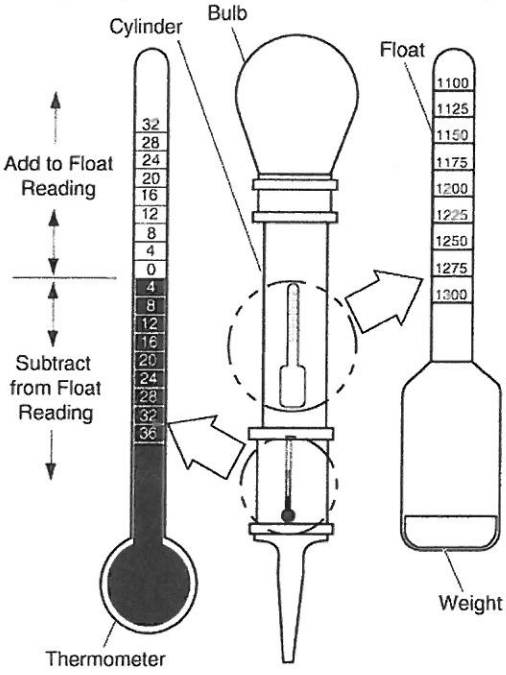
1. Restart the charger by disconnecting the DC Charger plug
2. Re-insert the DC charger plug into receptacle
3. The charger will begin to operate and will run until the program conditions are reached
4. Batteries will begin gassing and bubbling vigorously.
5. The charger will shut off.
6. **Disconnect** the DC Charger plug and re-plug **immediately**, repeat this process **five** (5) times.

AC Voltage

Battery charger output is directly related to the input voltage. If multiple vehicles are receiving an incomplete charge in a normally adequate time period, low AC voltage could be the cause and the power company should be consulted. See charger for input requirements (AC). Use a 15 Amp dedicated circuit breaker per charger.

TROUBLESHOOTING

In general, troubleshooting will be done for two distinct reasons. First, a battery that performs poorly and is outside of the manufacturers specification should be identified in order to replace it under the terms of the manufacturer's warranty. Different manufacturers have different requirements. Consult the battery manufacturer or a manufacturer representative for specific requirements. The second reason is to determine why a particular vehicle does not perform adequately. Performance problems may result in a vehicle that runs slowly or in a vehicle that is unable to operate for the time required. A new battery must **mature** before it will develop its maximum capacity. Maturing may take up to 100 charge/discharge cycles. After the maturing phase, the older a battery gets, the lower the capacity. The only way to determine the capacity of a battery is to perform a load test using a discharge machine following manufacturer's recommendations.



A cost effective way to identify a poorly performing battery is to use a hydrometer to identify a battery in a set with a lower than normal specific gravity. Once the particular cell or cells that are the problem are identified, the suspect battery can be removed and replaced. At this point there is nothing that can be done to salvage the battery; however, the individual battery should be replaced with a good battery of the same brand, type and approximate age.

Hydrometer

A hydrometer (P/N 50900-G1) is used to test the state of charge of a battery cell (Ref Fig. on page 8). This is performed by measuring the density of the electrolyte, which is accomplished by measuring the specific gravity of the electrolyte. The greater the concentration of sulfuric acid, the more dense the electrolyte becomes. The higher the density, the higher the state of charge.

Battery Care and Maintenance

⚠ WARNING

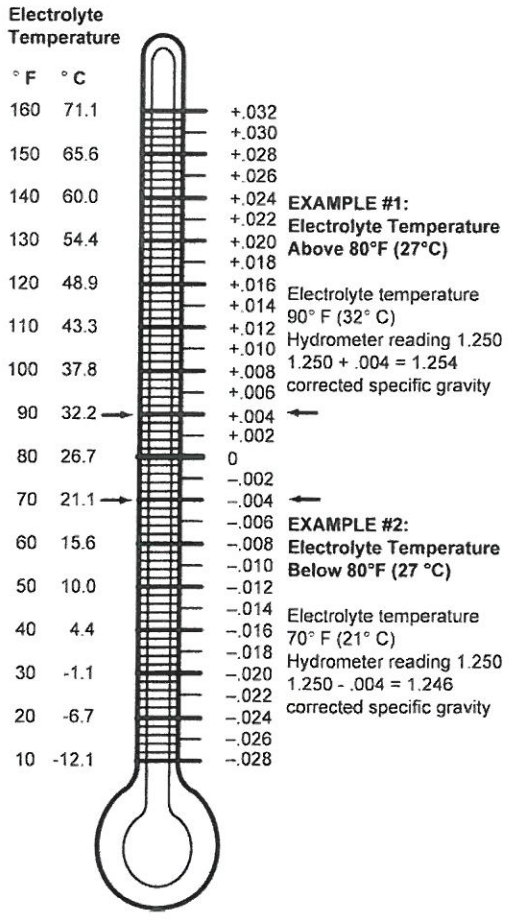
To prevent battery explosion that could result in severe personal injury or death, never insert a metal thermometer into a battery. Use a hydrometer with a built in thermometer that is designed for testing batteries.

Specific gravity is the measurement of a liquid that is compared to a baseline. The baseline is water which is assigned a base number of 1.000. The concentration of sulfuric acid to water in a new golf car battery is 1.280 which means that the electrolyte weighs 1.280 times the weight of the same volume of water. A fully charged battery will test at 1.275 - 1.280 while a discharged battery will read in the 1.140 range.

NOTE

Do not perform a hydrometer test on a battery that has just been watered. The battery must go through at least one charge and discharge cycle in order to permit the water to adequately mix with the electrolyte.

The temperature of the **electrolyte** is important since the hydrometer reading must be corrected to 80° F (27° C). High quality hydrometers are equipped with an internal thermometer that will measure the temperature of the electrolyte and will include a conversion scale to correct the float reading. It is important to recognize that the electrolyte temperature is significantly different from the ambient temperature if the vehicle has been operated.



Using A Hydrometer

1. Draw electrolyte into the hydrometer several times to permit the thermometer to adjust to the electrolyte temperature and note the reading. Examine the color of the electrolyte. A brown or gray coloration indicates a problem with the battery and is a sign that the battery is nearing the end of its life.
2. Draw the minimum quantity of electrolyte into the hydrometer to permit the float to float freely without contacting the top or bottom of the cylinder.
3. Hold the hydrometer in a vertical position at eye level and note the reading where the electrolyte meets the scale on the float.
4. Add or subtract four points (.004) to the reading for every 10° F (6°C) the electrolyte temperature is above or below 80° F (27° C). Adjust the reading to conform with the electrolyte temperature, e.g., if the reading indicates a specific gravity of 1.250 and the electrolyte temperature is 90° F (32° C), **add** four points (.004) to the 1.250 which gives a corrected

reading of 1.254. Similarly if the temperature was 70° F (21° C), **subtract** four points (.004) from the 1.250 to give a corrected reading of 1.246 (Ref Fig. on page 9).
5. Test each cell and note the readings (corrected to 80° F or 27° C). A variation of fifty points between any two cell readings (example 1.250 - 1.200) indicates a problem with the low reading cell(s). As a battery ages the specific gravity of the electrolyte will decrease at full charge. This is not a reason to replace the battery, providing all cells are within fifty points of each other. Since the hydrometer test is in response to a vehicle exhibiting a performance problem, the vehicle should be recharged and the test repeated. If the results indicate a weak cell, the battery or batteries should be removed and replaced with a good battery of the same brand, type and approximate age.

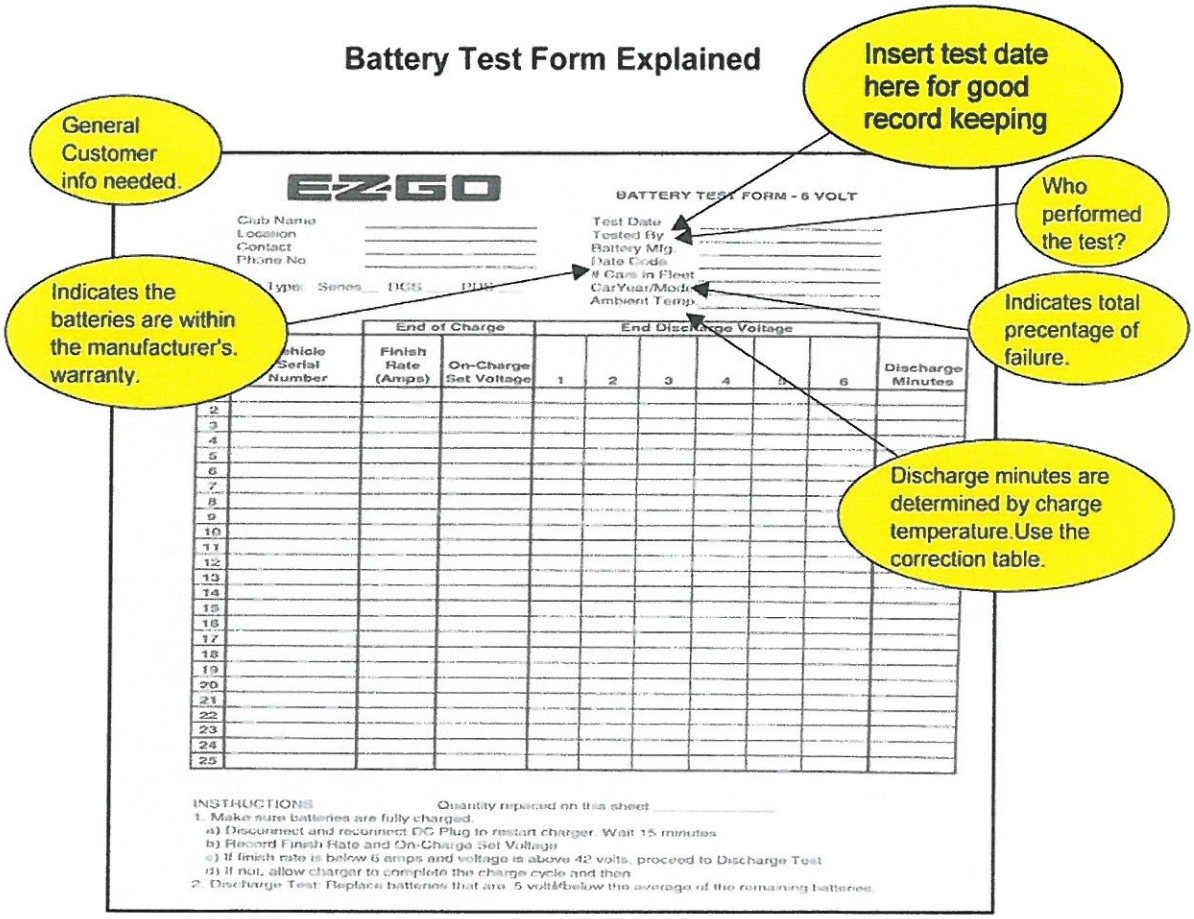
BATTERY CHARGER MAINTENANCE

The only maintenance required of the charger is the periodic cleaning of the DC connector auxiliary contact. To clean the auxiliary contact, slide an emery board between main contact and auxiliary contact located in the hole of the charger plug nearest the rounded corners (Ref Fig. on page 10). Press emery board down to apply pressure to the auxiliary contact and slide board in and out of plug approximately 10 to 20 times, keeping pressure applied to the auxiliary contact surface. Plug charger into vehicle receptacle and wait for relay to turn on. Check to see if charger turns off by moving plug back and forth in receptacle. If charger does turn off, repeat cleaning procedure once again. If, after re-cleaning and retesting, the charger still turns off while the handle is moved back and forth, check plug for a broken red wire in DC cord.

Discharge Testing

Discharge Testing should be performed by trained experienced personnel. Batteries should be fully charged before testing. Make sure the vehicle ignition switch is turned off and the key removed. Set the hill brake on the car to prevent the car from rolling. Connect the positive and negative leads to the batteries per the instructions provided with the discharge machine.

Battery Care and Maintenance



E-Z-GO recommends performing this discharge test every six months as preventive maintenance. This test will help to find bad or marginally low voltage batteries early before further damage can occur to the battery set.

Safety: Follow all safety practices outlined on page (1)

Vehicle Serial Number: Record here for good record keeping.

How to run the discharge machine part number 28251-G02:
1. Fully charge batteries over night.
2. Disconnect the charger DC plug from the car's receptacle and reconnect.
3. The ammeter needle should swing over to 21 amps. If not, check charger.
4. Wait 15 minutes
5. Record the ammeter needle reading in the space marked "finish rate" after waiting 15 minutes.
6. Record the total on charge voltage of the battery set while the charger is still running. Use a digital voltmeter.

Battery Care and Maintenance

7. Unplug battery charger from the DC receptacle on vehicle and store the cord properly.
8. Place the discharge machine in a safe area that will allow coolant air to flow without over-heating the machine or damaging the vehicle.
9. Place the positive battery clamp (Red) on the positive 36 volt battery terminal of battery number one.
10. Place the negative battery clamp (Black) on the negative 36 volt battery terminal of battery number six.
11. Depress the machine button one time. This will start the cooling fan as well as the electronic timer.
12. The discharge machine will turn off automatically when the total battery pack voltage drops to 31.5 volts.
13. Input the total run time in the space provided on the sheet.
14. Measure the voltage on every battery using a digital volt / ohm meter. Input voltage in the space provided.

Test explanation:

Finish Rate Amps: Determines if the vehicle was charged, life expectancy, or discharge duration. Finish rate amperages above 15A may indicate "Hot" batteries if the on-charge voltage falls below 42volts. Look for visual signs of thermal runaway such as black battery posts and a strong odor of hydrogen gas while being charged. The charger may not shut off in this condition. Replace all 6 batteries if this is the case. If the finish rate is higher than 15A and the on-charge voltage is 42V or above, then replace the low average battery.

On-charge Voltage: The battery charger is designed to output 40-45 volts. Voltages below this may indicate the charger is not working or the vehicle was not charged prior to testing.

End Discharge Voltage: Replace batteries that are .5 volts below the average of the remaining batteries if discharge minutes are below 60. If the minutes are above 60, and the low volt battery is above 4.5 volts, then group 4.5 volt and higher batteries into one vehicle and perform and equalization charge.

Discharge Minutes: Should run 60 minutes or higher for an average two rounds of golf. The exceptions to this rule are batteries in thermal runaway.

Equalization Charge: 3 to 5 repeat charge cycles made one after another to promote battery gassing and to reverse the effects of stratification.

Battery Care and Maintenance

EZGO

BATTERY TEST FORM - 6 VOLT

Club Name _____
Location _____
Contact _____
Phone No _____

Car Type: Series__ DCS ___ PDS ___

Test Date _____
Tested By _____
Battery Mfg. _____
Date Code _____
Cars in Fleet _____
CarYear/Model _____
Ambient Temp. _____

		End of Charge		End Discharge Voltage						
	Vehicle Serial Number	Finish Rate (Amps)	On-Charge Set Voltage	1	2	3	4	5	6	Discharge Minutes
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
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25										

INSTRUCTIONS Quantity repaced on this sheet _____

1. Make sure batteries are fully charged.
   a) Disconnect and reconnect DC Plug to restart charger. Wait 15 minutes.
   b) Record Finish Rate and On-Charge Set Voltage
   c) If finish rate is below 6 amps and voltage is above 42 volts, proceed to Discharge Test
   d) If not, allow charger to complete the charge cycle and then
2. Discharge Test: Replace batteries that are .5 volts below the average of the remaining batteries.

Battery Care and Maintenance

Battery Terms Explained from Trojan:

- **Active Material** - In the positive plates, the active material is lead dioxide. In the negative, it's metallic sponge lead. When a circuit is created, these materials react with sulfuric acid during charging and discharging.
- **Ampere (Amp)** - A unit of measurement for the electron flow or current through a circuit.
- **Ampere-Hour (Amp. Hr., AH)** - A unit of measure for a battery's electrical storage capacity, calculated by multiplying the current in amperes by the time in hours. (Example: A battery which delivers 5 amps for 20 hours provides 5 amps x 20 hours = 100 AH of capacity.)
- **Capacity Rating** - The time in minutes that a new, fully-charged battery will deliver 25 amperes or 75 amperes at 80° F and maintain a terminal voltage equal to or greater than 1.75 volts per cell.
- **Cell** - The basic current-producing unit in a battery. It consists of a set of positive plates, negative plates, electrolyte, separators and casing. A cell's nominal voltage is 2 volts. (Example: A 12-volt battery has 6 cells.)
- **Circuit** - The path followed by a flow of electrons. A closed, or short, circuit is a complete path. An open circuit has a broken path.
- **Cycle** - One discharge of a battery plus one recharge.
- **Depth of Discharge (DOD)** - The percentage of capacity actually removed from a battery compared to the total rated capacity.
- **Electrolyte** - In a deep cycle battery, it is a dilute solution of sulfuric acid and water.
- **Hydrometer** - A tool used to measure the specific gravity of the electrolyte solution.
- **Equalization** - An overcharge performed on flooded lead-acid batteries after they have been fully charged. This maintenance step helps eliminate stratification and sulfation.
- **Ohm (∧)** - A unit of measurement for electrical resistance within a circuit.
- **Open Circuit Voltage** - The voltage of a battery when there is no load attached (not receiving or delivering energy). This measurement is best taken when the battery has been at rest for at least 6 hours.
- **Power Inverter** - An electronic device that converts direct current (DC) power from a battery into standard alternating current (AC) house power.
- **Primary Battery** - An energy storage device that can deliver energy but cannot be recharged. (i.e., disposable flashlight battery)
- **Secondary Battery** - An energy storage device than can deliver energy and can be recharged. (i.e., automotive or deep cycle battery)
- **Separator** - A divider made of porous material that is placed between the positive and negative plates in a battery cell and allows current to flow through it, while preventing direct contact between the plates which would cause a short circuit.
- **Specific Gravity (S.G.)** - A measurement of the strength of battery electrolyte by comparing its density to that of pure water.
- **Stratification** - A condition where the concentration of acid is greater at the bottom of the battery than at the top.
- **Sulfation** - The formation of lead sulfate on the positive and negative electrodes.
- **Volt (V)** - A unit of measurement for electrical potential within a circuit.
- **Watt (W)** - A unit of measurement for electrical power.
- **Watt Hour (Wh)** - A unit of measurement for electrical power for a certain period of time.