



Deltran



High Frequency SMT Golf Car Chargers

Battery Tender Battery Charger® Models:

12 Volt 20 Amp, 24 Volt 20 Amp, 36 Volt 15 Amp, 48 Volt 10 Amp

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS: This manual contains important safety and operating instructions for the Battery Tender Battery Charger® High Frequency SMT Golf Car Chargers. **CAREFULLY READ THESE INSTRUCTIONS BEFORE USING THESE BATTERY CHARGERS.**

WARNING AND CAUTION LABEL DEFINITIONS:

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation that if not avoided, may result in property damage.

GENERAL PRECAUTIONS

⚠ WARNING

Battery posts, terminals and related accessories contain lead and lead components, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Always wash your hands after handling these devices.

⚠ WARNING

Do not operate the battery charger with damaged AC power cords or plugs or DC output cords or accessories – Replace damaged AC & DC cords or accessories before using the charger. Replacement items can be purchased from authorized Deltran charger product dealers.

392-0173-RA

CAUTION

WORKING WITH LEAD ACID BATTERIES AND BATTERY CHARGERS:

All lead acid batteries have the potential to emit gasses that may combine into a combustible or explosive mixture. In many cases, it is possible that lead acid batteries will emit these gasses during normal discharge and charging operations. Because of this potential danger, it is important that you follow the precautions recommended by both the battery and battery charger manufacturers before using either one.

USING MANUALS: Study all of the battery manufacturer's precautions and specific recommendations for safe operation such as not removing cell caps while charging and the recommended rates of charge (charger output current).

⚠ CAUTION

CHARGER VOLTAGE COMPATIBILITY: **NEVER** use a battery charger unless the battery voltage matches the output voltage rating of the charger. For example, do not use a 12-volt charger with a 6-volt battery and vice-versa.

CHARGER LOCATION: **LOCATE** the charger as far away from the battery as is allowed by the length of the output cable harness. **NEVER** set the charger above the battery. **NEVER** set the charger on a surface constructed from combustible material. **NEVER** place the battery, the charger, or any of the electrical connections between them in an area that is likely to become wet.

EXCESSIVE MOISTURE: Do not expose the battery charger or any of its electrical connections (either AC or DC) to rain, snow, or extremely high, condensing humidity.

CHARGER ATTACHMENTS: Do not use attachments that are not recommended or sold by the charger manufacturer. To do otherwise may result in the risk of electric shock, fire, or possibly some other unforeseen potential personal injury situations.

HANDLING POWER CORDS: When handling electric power cords, always pull by the plug rather than by the cord. This will reduce the risk of damage to both the plug and cord, and it will minimize the likelihood of electric shock resulting from that damage.

LOCATION OF POWER CORDS: Make sure all electric power cords are located so that they cannot be stepped on, tripped over, or otherwise subjected to damage or stress.

MONITORING SEALED & NON-SEALED BATTERIES: When leaving a battery charger connected to either a sealed (AGM or GEL) or non-sealed (flooded battery) for extended periods of time (weeks, months, etc.), periodically check the battery to see if it is unusually warm. This is an indication that the battery may have a weak cell and that it could go into a thermal runaway condition. If the battery releases an excessive amount of gas or if the battery gets hotter than 130°F (55°C) during charging, disconnect the charger and allow the battery to cool. Overheating may result in plate distortion, internal shorting, drying out or other damage. For flooded batteries, also check individual cell fluid levels against manufacturer's recommendations for safe operation.

⚠ WARNING

ELECTRIC SPARK & OPEN FLAME: NEVER smoke or allow a source of electric spark or open flame in the vicinity of the battery or engine. (For example: Don't charge the battery next to a gas water heater.)

VENTILATION: Do not operate the charger where ventilation is restricted. The intent here is to allow sufficient airflow to minimize and dissipate the heat generated by the charger and to diffuse the gasses that may be emitted by the battery.

CHARGER MAINTENANCE: NEVER disassemble the charger or attempt to do internal repairs. Take it to a qualified service technician. Assembling the charger incorrectly may result in the risk of electric shock or create a fire hazard.

⚠ WARNING

EXTENSION CORDS: An extension cord should not be used unless absolutely necessary. Using improper extension cord could result in a risk of fire and electric shock. If extension cord must be used, make sure that:

- The pins on the extension cord plug have the same number, size, and shape as those of the AC power cord plug on the charger;
- The extension cord is properly wired and is in good electrical condition; &
- The wire size is as specified in Table 1 below.

TABLE 1: EXTENSION CORD LENGTH & MINIMUM SAFE CONDUCTOR SIZE		
<i>Note: The smaller the AWG number, the larger the conductor diameter.</i>		
Length of Cord (feet)	6 to 99	100 to 150
Length of Cord (meters)	2 to 30	30 to 46
Size of Conductor (AWG)	12	10
Conductor Diameter (in / mm)	0.093 / 2.36	0.117 / 2.97

PERSONAL PRECAUTIONS

⚠ WARNING

WHEN YOU WORK NEAR LEAD-ACID BATTERIES:

1. Someone should be within range of your voice or close enough to come to your aid if you have an accident;
2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes;
3. Wear complete eye protection and protective clothing. Avoid touching your eyes while working near a battery. If battery acid contacts your skin or clothing, wash immediately with soap and water. If acid enters an eye, immediately flood the eye with running cold water for at least 10 minutes and get medical attention as soon as possible;
4. Be extra cautious when handling metal tools around a battery. If you drop

a metal tool near a battery it might spark or create a short circuit between the battery terminals and some other metal part. Either event may cause a dangerous electrical shock hazard, a fire, or even an explosion;

5. Remove all personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuited current high enough to weld a metal ring or other piece of jewelry, causing a severe burn;
6. Use **Battery Tender Battery Charger® High Frequency SMT Golf Car Chargers** for charging lead-acid batteries only. They are not intended to supply power to an extra low-voltage electrical system or to charge dry-cell batteries. Charging dry-cell batteries may cause them to burst and cause injury to persons and damage to property;

INFORMATION NOTE ABOUT DRY-CELL BATTERIES:

There are some wet, non-spillable, lead acid batteries on the market whose manufacturers' make the claim that they are dry-cell batteries. These batteries are sealed, gas-recombinant, starved electrolyte, possibly with AGM (Absorbed Glass Mat) type construction. It is perfectly safe to use **Battery Tender Battery Charger® High Frequency SMT Golf Car Chargers** to charge these types of batteries. The dry-cell battery warning is intended for non-rechargeable, alkaline and other similar types of batteries. If you have any doubt about the type of battery that you have, please contact the battery manufacturer before attempting to charge the battery.

7. **NEVER** charge a visibly damaged or frozen battery.

PREPARING TO CHARGE: First, follow all General & Personal Precautions as previously explained, and then continue.

⚠ WARNING

IF THE BATTERY MUST BE REMOVED FROM THE VEHICLE:

1. To avoid an electric arc (or spark), turn off or disconnect all of the accessories in the vehicle. Then always remove the cable that is connected to grounded terminal from battery first;
2. If necessary, clean the battery terminals. Be careful to keep the corrosion and other debris from coming in contact with your eyes;
3. If the battery is not a sealed battery, then if necessary, add distilled water to each cell until the battery acid solution reaches the level specified by battery manufacturer. Do not overfill;
4. Check the polarity of the battery posts.
5. Connect the AC power plug to the 120 VAC electrical service outlet. Then follow the normal start up procedures for the Battery Tender Battery Charger® High Frequency SMT Golf Car Charger.

⚠ WARNING

IF THE BATTERY REMAINS INSTALLED IN THE VEHICLE:

1. Place both the AC and DC power cords in the best position to avoid accidental damage by movable vehicle parts, i.e. hoods, doors, or moving engine parts (fan blades, belts, or pulleys).

2. Check the polarity of the battery posts. If the positive (pos, p, +) post is connected to the vehicle chassis, then the vehicle has a positive ground system. If the negative (neg, n, -) post is connected to the vehicle chassis, then the vehicle has a negative ground system. Negative ground systems are the most common.
3. Connect the AC power plug to the 120 VAC electrical service outlet. Then follow the normal start up procedures for the Battery Tender Battery Charger® High Frequency SMT Golf Car Charger.

⚠ WARNING

POSITIVE & NEGATIVE VEHICLE GROUND SYSTEMS:

1. If the positive (pos, p, +) battery post is connected to the vehicle chassis, then the vehicle has a positive ground system. If the negative (neg, n, -) battery post is connected to the vehicle chassis, then the vehicle has a negative ground system. Negative ground systems are the most common.
2. **For negative-grounded vehicle**, connect POSITIVE (RED) clip from battery charger to POSITIVE (POS, P, +) ungrounded post of battery. Connect NEGATIVE (BLACK) clip to vehicle chassis or engine block away from battery. Do not connect clip to carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or engine block.
3. **For positive-grounded vehicle**, connect NEGATIVE (BLACK) clip from battery charger to NEGATIVE (NEG, N, -) ungrounded post of battery. Connect POSITIVE (RED) clip to vehicle chassis or engine block away from battery. Do not connect clip to carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or engine block.

⚠ WARNING

**USING
UNGROUND
AC 120 VAC
SERVICE
OUTLETS:**

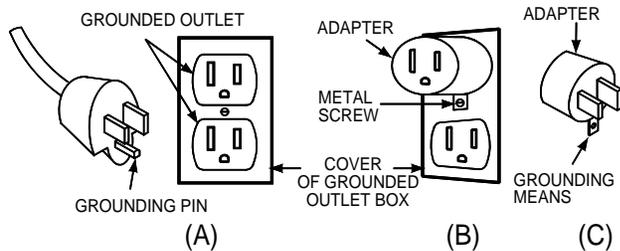


Figure 2

1. **FOR USE ONLY IN THE UNITED STATES, THE USE OF A 3 TO 2 PRONG GROUND ADAPTER PLUG IS NOT ALLOWED IN CANADA.** Your battery charger is designed for use on a nominal 120-volt circuit. It comes equipped with a grounding plug that looks like the one illustrated in Figure 2A. A temporary adaptor (Figure 2C), may be used to connect this plug to a two-pole receptacle as shown in Figure 2B if a properly grounded outlet is not available. The temporary adapter should be used only until a properly grounded outlet can be installed by a qualified electrician.
2. **DANGER** - Before using the adapter as illustrated, be certain that the center screw of outlet plate is grounded. The green-colored rigid ear or lug extending from the adapter must be connected to a properly grounded outlet - make certain that it is grounded. If necessary, replace original outlet cover plate with a longer screw that will secure adapter ear or lug to outlet cover plate and make ground connection to a grounded outlet.

ADDITIONAL CHARGER INFORMATION

AUTOMATIC CHARGING AND BATTERY STATUS

MONITORING: Battery Tender Battery Charger® High Frequency SMT Golf Car Chargers are completely automatic and may be left connected to both AC power and to the battery that it is charging for long periods of time. However, it is prudent to periodically check both the battery and the charger for normal operation during these extended charging periods.

Battery Tender Battery Charger® High Frequency SMT Golf Car Chargers have status lights that indicate the operating mode of the charger, and the condition of the battery that is connected to the charger. The charger output power, voltage, and current all depend on the charge algorithm and the condition of the battery that is being charged. The continuity of the AC power that is connected to the charger is also a significant factor.

⚠ WARNING

BATTERY CONNECTION OR AC POWER INTERRUPTED:

1. If the battery connection to either charger output channel is interrupted, the yellow & Green LED's turn off and the Red LED begins to flash.
2. If the AC power to the charger is interrupted, the yellow & Green LED's turn off and the Red LED begins to flash, and the charger program is reset.

The charger operates in one of the 4 primary charge modes: the BULK mode (full charge power, constant current, increasing battery voltage, battery is 0% to 75% or 80% charged), the ABSORPTION mode (high constant voltage, decreasing current, battery is 75% to 100% charged), the EQUALIZATION mode (higher constant voltage, with lower current limit), or the STORAGE / FLOAT MAINTENANCE mode (low constant voltage, minimal charge current, battery is fully charged, typically 100% to 103%).

SPECIAL FEATURES: Battery Tender Battery Charger® High Frequency SMT Golf Car Chargers have the following special features:

SPARKPROOF: The battery charger positive and negative DC output leads must be connected to a battery before any output voltage is developed.

SHORT CIRCUIT PROTECTION: The battery charger can sustain a short circuit connection directly across its DC output terminals indefinitely without any risk of either electric shock or excessive heat.

REVERSE POLARITY PROTECTION: The battery charger is protected internally against any damage due to the DC output leads being connected to the opposite polarity battery post. No damage will result to either the battery or the battery charger.

TIME REQUIRED TO CHARGE A BATTERY:

Battery Tender Battery Charger® High Frequency SMT Golf Car Chargers will charge at different maximum rates depending upon the nominal output voltage. 12V & 24V models charge at a maximum rate of 20 Amps. 36V models charge at 15 Amps and 48V models charge at 10 Amps. The time required to charge a battery depends on both the Amp-Hour capacity rating of the battery and the output current of the charger.



Installation Instructions for Permanent Vehicle Mounting

High Frequency SMT Golf Car Charger
 Battery Tender Battery Charger® Models:
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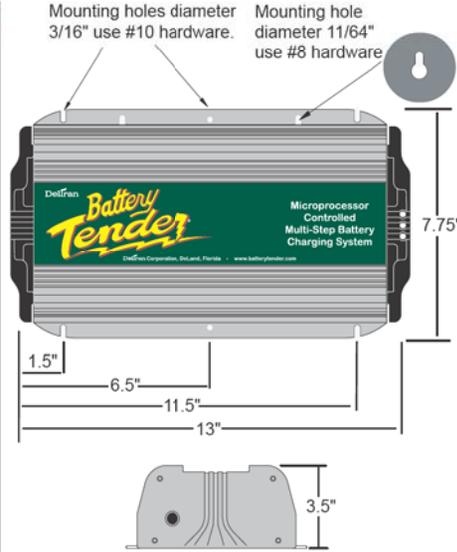
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GENERAL PRECAUTIONS

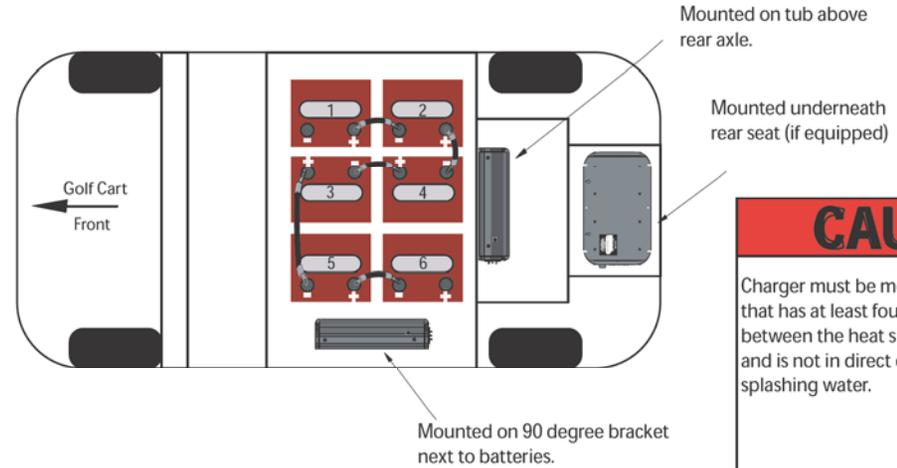
WARNING
 Battery posts, terminals and related accessories contain lead and lead components, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Always wash your hands after handling these devices.

WARNING-RISK OF EXPLOSIVE GASES
WORKING WITH LEAD ACID BATTERIES AND BATTERY CHARGERS:
 All lead acid batteries have the potential to emit gasses that may combine into a combustible or explosive mixture. In many cases, it is possible that lead acid batteries will emit these gasses during normal discharge and charging operations. Because of this potential danger, it is important that you follow the precautions recommended by both the battery and battery charger manufacturers before using either one.
USING MANUALS: Study all of the battery manufacturer's precautions and specific recommendations for safe operation such as not removing cell caps while charging and the recommended rates of charge (charger output current).

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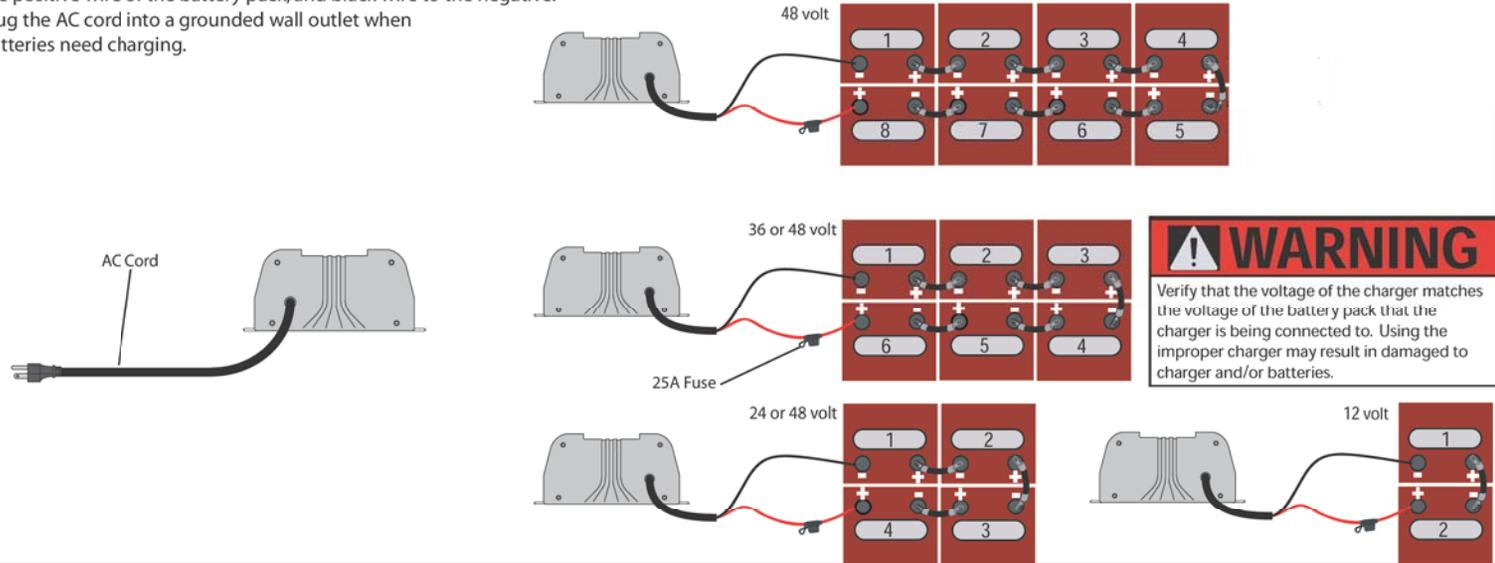
Suggested Permanent Mounting Locations.



CAUTION
 Charger must be mounted in a location that has at least four inches of clearance between the heat sink fins and golf cart, and is not in direct contact with rain or splashing water.

Wiring Instructions for Charger:

1. Verify that the battery pack voltage matches the chargers voltage, if uncertain check battery pack with a volt meter.
2. Mount the charger in a location that is not in direct contact with rain or splashing water, and has at least 4 inches of clearance for the cooling fins to function properly.
3. Connect the DC output cables large ring terminals to the battery pack, red wire to the positive wire of the battery pack, and black wire to the negative.
4. Plug the AC cord into a grounded wall outlet when batteries need charging.



Estimated Time to Recharge (Typical Values)				
Battery Type:	Group 31: 100 Ah Typical		8D: 200 Ah Typical	
Charger Output Current	80% Complete	Optimum Charge Cycle Complete	80% Complete	Optimum Charge Cycle Complete
20 Amps	4.0 Hours	12.0 Hours	8.0 Hours	22.0 Hours
15 Amps	5.5 Hours	15.5 Hours	11.0 Hours	29.5 Hours
10 Amps	8.0 Hours	22.0 Hours	16.0 Hours	42.0 Hours

WORKING WITH A DEAD BATTERY OR A BATTERY WITH A VERY LOW VOLTAGE:

If a 12 Volt, Lead-Acid battery has an output voltage of less than 9 volts when it is at rest, when it is neither being charged nor supplying electrical current to an external load, there is a good chance that the battery is defective. As a frame of reference, a fully charged 12-Volt, Lead-Acid battery will have a rest-state, no-load voltage of approximately 12.9 volts. A fully discharged 12-Volt, Lead-Acid battery will have a rest-state, no-load voltage of approximately 11.4 volts. That means that a voltage change of only 1.5 volts represents the full range of charge 0% to 100% on a 12-Volt, Lead-Acid battery. Depending on the manufacturer, and the age of the battery, the specific voltages will vary by a few tenths of a volt, but the 1.5-volt range will still be a good indicator of the battery charge %.

STATUS INDICATOR LIGHTS: The following describes the LED indicator light operation:

- **AMBER (Yellow) Flashing** - When the amber light is flashing, the AC power is applied to the charger and the microprocessor circuitry is functioning properly. There is no battery connected or there is a problem with the connections between the charger and the battery.
- **AMBER (Yellow)** - When the amber light is on, the charger is functioning normally and it is the process of fully charging the battery. The charger will automatically apply the optimum charging voltage and current values to the battery in the proper timing sequence.
- **GREEN Flashing** - When the green light is flashing, the battery charger is in the absorption mode of operation. In this mode the charger maintains constant voltage & charge current decreases to maintenance levels.
- **GREEN** - When the green light is on, the battery is either fully charged in the maintenance mode or nearly fully charged in the equalization mode. Either way, the battery may be used at this time.
- **RED** - When the red light is on, there is an internal charger malfunction or a battery malfunction preventing the charge cycle from being completed. If this condition persists, contact technical support for assistance.

WHEN YOU FIRST TURN ON THE AC POWER: All 3 Indicator Lights will Turn On in sequence: Green, then Green & Amber together, then Green, Amber & Red together for approx 1 second each. Also, a Safety Monitor Circuit verifies appropriate battery voltage levels and good electrical continuity between the battery and the charger DC output. Then the Amber light will come on and the normal battery charging program sequence will begin.

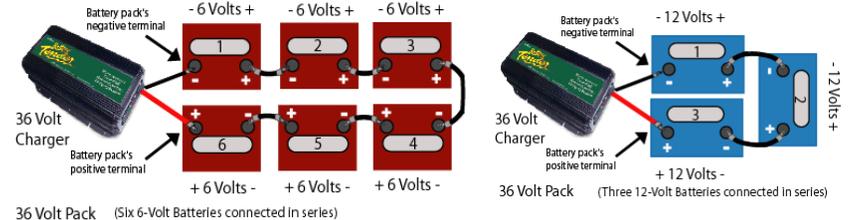
APPLICATION / TROUBLESHOOTING INFORMATION:

- Always operate the charger in a well ventilated area.
- If no indicator lights come on after you plug in the AC cord, then check the AC power receptacle.
- If the AC power is disconnected, the LED indication maybe delayed several seconds up to 1 minute due to AC filter cap storage state. After the AC power comes back on, the charger program will reset.
- If the green indicator light comes on in less than 2 minutes, check the battery and the output connections from the charger.
- It will take a long time (possibly more than 24 hours, or even 96 hours) for the green light to come on when charging a large battery or a very large battery bank. The theoretical maximum time to steady green light = 127 hours. That would occur when charging a 500 Amp Hour battery bank with a 10 amp charger.
- If the DC charger output connection to the battery is broken while the charger is operating normally with AC power applied, the Amber light will begin to flash, and the charger output voltage will be shut off. If the DC connection to the battery is restored, then the charger program will reset.

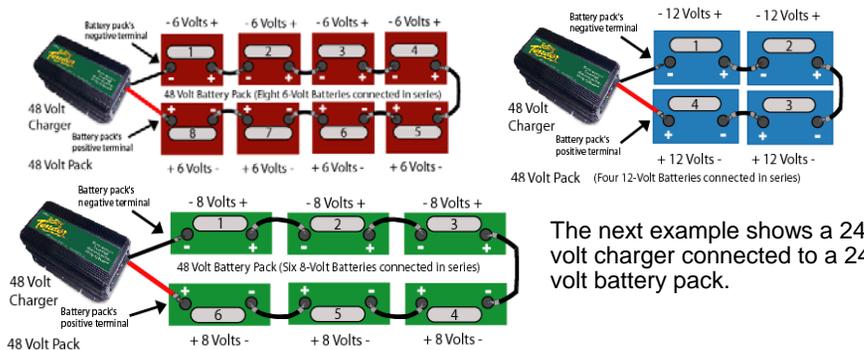
BATTERY CONNECTIONS TO THE CHARGER:

In each case the nominal battery pack voltage must match the charger voltage. Always exercise caution when connecting the charger to the battery pack.

In the first example, a 36 volt charger is connected to a 36 volt battery pack. One pack consists of 6 separate 6 volt batteries all connected in series. The other pack consists of 3 separate 12 volt batteries, all connected in series.

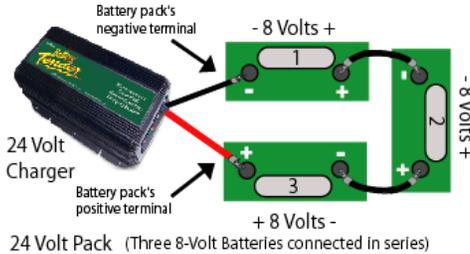
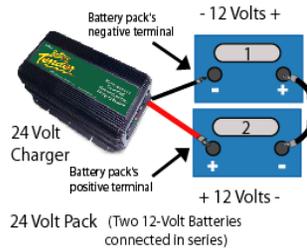
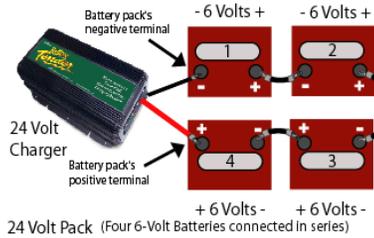


This second example shows a 48 volt charger connected to a 48 volt battery pack. Three packs are shown: 8 separate 6 volt batteries in series, 4 separate 12 volt batteries in series, and 6 separate 8 volt batteries in series.



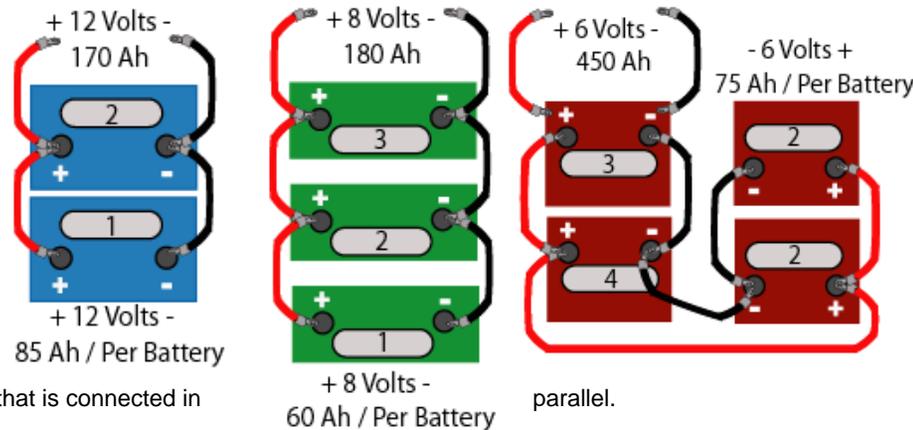
The next example shows a 24 volt charger connected to a 24 volt battery pack.

Three packs are shown: 4 separate 6 volt batteries in series, 2 separate 12 volt batteries in series, and 3 separate 8 volt batteries in series.



Each of the battery packs shown so far have only had batteries connected in series. Notice how the positive post (terminal) of one battery is connected to the negative post (terminal) of the next battery. The voltage of each battery adds to create a larger total battery pack voltage.

PARALLEL CONNECTIONS: When batteries are connected in parallel, the positive posts are connected together, and the negative posts are connected together. The result is that the battery voltage stays the same, but the total output capacity (amp-hours) of the battery pack is increased for each additional battery



Many combinations are possible. The 3 examples of batteries connected in parallel above show two 12-volt batteries, three 8-volt batteries, and four 6-volt batteries. Notice that each example shows the total battery pack voltage to be exactly the same as each individual battery. Also, the total battery pack amp-hour capacity is increased equally by the total number of batteries. $2 \times 85 \text{ Ah} = 170 \text{ Ah}$. $3 \times 60 \text{ Ah} = 180 \text{ Ah}$. $6 \times 75 \text{ Ah} = 450 \text{ Ah}$.

Technical Specifications	
Input Voltage / Frequency	100 to 132 VAC / 50 / 60 Hz
Input Current (Maximum)	9.0 Amps RMS (4.5 Arms on 12V only)
Output Current Typical	20 Amps, 20 Amps, 15 Amps, 10 Amps
Output Voltage	12 VDC, 24 VDC, 36 VDC, 48 VDC
Charger Output Voltage Amplitudes throughout the entire charge algorithm, including absorption, equalization, and float maintenance, are consistent with the optimum charging recommendations of the major lead-acid battery manufacturers.	
Maximum Operating Temperature	50 °C Typical
Charger Case Dimensions: 13.0 in (330 mm) L x 7.75 in (197 mm) W x 3.5 in (89 mm) H.	
Shipping Weight: with Accessories: Approx. 10 lbs (4.6 kg)	

Design Conformance & Revision: All charger products are 100% inspected and electrically tested prior to shipment. All battery charger designs are proprietary and subject to change without notice.

WARRANTY: 2 YEARS FROM DATE OF PURCHASE

DELTRAN CORPORATION, 801 INTERNATIONAL SPEEDWAY BLVD., DELAND, FLORIDA 32724 MAKES THIS LIMITED WARRANTY TO THE ORIGINAL PURCHASER. THIS WARRANTY IS NOT TRANSFERABLE.

Deltran warrants the High Frequency SMT Golf Car charger for 2 years from the date of purchase against defective material or workmanship only. If Deltran qualified service technicians determine that the likely cause of the battery charger product malfunction is due to either defective material or workmanship, then the battery charger will be repaired or replaced at the discretion of Deltran.

THIS LIMITED WARRANTY IS VOID under the following conditions:

- 1) The product is misused, subjected to careless handling, or operated under conditions of extreme temperature, shock, or vibration beyond Deltran's recommendations for safe and effective use.
- 2) The product is disassembled or repaired by anyone who is not a Deltran factory authorized service representative.
- 3) The electrical connections to either the AC input or the DC output of the charger are modified without the express written consent of the Deltran engineering department.

The manufacturer makes no warranty other than this limited warranty and expressly excludes any implied warranty including any warranty for consequential damages.

THIS IS THE ONLY EXPRESS LIMITED WARRANTY AND THE MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES ANYONE TO ASSUME OR MAKE ANY OTHER OBLIGATION TOWARDS THE PRODUCT OTHER THAN THIS EXPRESS LIMITED WARRANTY. THE MANUFACTURER MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE OF THIS PRODUCT AND EXPRESSLY EXCLUDES SUCH FROM THIS LIMITED WARRANTY. SOME STATES MAY NOT ALLOW THESE EXCLUSIONS.

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