CHARGING TIPS

Always leave filler caps in place, tight and secure to reduce the risk of battery explosion and serious injury! Always wear safety glasses when working around batteries. Batteries can explode! Protect your eyes.

Do not charge batteries without proper instruction.

1. Batteries should be charged if hydrometer reading is below 1.225 specific gravity, or open circuit voltage is below 12.4 volts, or if the first load test is below 9.6 volts as noted previously.

2. Carefully read and follow the instructions that came with the charger to avoid serious injury, property damage and/or battery damage.

3. Unplug the charger before connecting or disconnecting a battery to avoid dangerous sparks which can cause a battery to explode.

4. Do not leave a battery on charge for more than 48 hours to avoid damaging the battery by over-charging. If gassing or spewing of electrolyte occurs, or the battery case feels hot, reduce or temporarily halt charging to avoid damaging the battery.

5. Stop the charge when two hydrometer or voltage readings recorded two hours apart indicate no increase. Further charging would be useless and may damage the battery and shorten its life. If the battery won’t come up to full charge, replace it.

6. NEVER attempt to charge a frozen battery. To avoid explosion and serious injury, allow it to warm to 60°F (16°C) before charging.

7. NEVER leave a battery on a trickle charger longer than 48 hours. Serious damage to the battery WILL occur.

OFF-SEASON STORAGE

Batteries that are not in use during the off-season must be cared for as follows to extend battery life and reliability:

1. Disconnect the batteries to avoid self-discharge due to parasitic loads such as clocks, ground faults, etc.

2. Put into storage fully charged and keep them above 75% state-of-charge. Check state-of-charge every 90 days and recharge if necessary.

3. Ideally, store batteries in a cool, dry place with temperatures not below 32°F (0°C) or above 80°F (27°C). Typically, batteries will self-discharge at faster rates at higher temperatures. For example:

<table>
<thead>
<tr>
<th>TEMPERATURE</th>
<th>SELF-DISCHARGE RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>100°F (38°C)</td>
<td>. . . . . .3 Pts. Specific Gravity per day</td>
</tr>
<tr>
<td>80°F (27°C)</td>
<td>. . . . . .2 Pts. Specific Gravity per day</td>
</tr>
<tr>
<td>50°F (10°C)</td>
<td>. . . . . .1/2 Pt. Specific Gravity per day</td>
</tr>
<tr>
<td>30°F (–1°C)</td>
<td>. . . . . .1/10 Pt. Specific Gravity per day</td>
</tr>
</tbody>
</table>

NOTE: This is only an example. Self-discharge may be higher or lower depending upon battery chemistry, lead alloys, age and other factors.

12 VOLT BATTERY CHARGING TIME TO FULL CHARGE @ 80°F

<table>
<thead>
<tr>
<th>BATTERY VOLTAGE</th>
<th>SPECIFIC GRAVITY</th>
<th>STATE OF CHARGE</th>
<th>MAXIMUM RATE @ 80°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.6</td>
<td>1.265</td>
<td>100%</td>
<td>FULL CHARGE</td>
</tr>
<tr>
<td>12.4</td>
<td>1.225</td>
<td>75%</td>
<td>20 min. 35 min.</td>
</tr>
<tr>
<td>12.2</td>
<td>1.190</td>
<td>50%</td>
<td>45 min. 75 min.</td>
</tr>
<tr>
<td>12.0</td>
<td>1.155</td>
<td>25%</td>
<td>65 min. 115 min.</td>
</tr>
<tr>
<td>11.8</td>
<td>1.120</td>
<td>0%</td>
<td>85 min. 150 min.</td>
</tr>
<tr>
<td>12.6</td>
<td>1.265</td>
<td>75%</td>
<td>48 min. 90 min.</td>
</tr>
<tr>
<td>12.4</td>
<td>1.225</td>
<td>50%</td>
<td>60 min. 120 min.</td>
</tr>
<tr>
<td>12.2</td>
<td>1.190</td>
<td>25%</td>
<td>70 min. 150 min.</td>
</tr>
<tr>
<td>12.0</td>
<td>1.155</td>
<td>0%</td>
<td>85 min. 175 min.</td>
</tr>
</tbody>
</table>

NOTE: Times are approximate and depend upon battery condition, age and design, the efficiency of the charger, line voltage and other factors.

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California Proposition 65 Warning

Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.
Did you know lead-acid batteries are virtually 100% recyclable? They have a higher recycling rate than other waste products such as aluminum, paper, glass and plastic.

Be sure to return your lead-acid batteries to a dealer.

In most states it is illegal to discard a battery in the trash.

Types of flooded marine/RV batteries

The various types of batteries used in Marine and RV service are:
- Maintenance-Free Non-Accessible Engine Starting with no filler caps
- Low-Maintenance Accessible Starting with filler caps
- Dual Purpose (Starting/Cycling) with filler caps
- Deep Cycle with filler caps

You may have one or more of the same type or different types on board your boat or RV. Determine which type of battery or batteries you have and follow the correct set of instructions.

Service tips (continued)

Always wear safety glasses when working around batteries. Batteries can explode! Protect your eyes.

1. Perform a visual inspection. Inspect for defective or cracked case and cover, and loose or damaged terminal posts or cables. Replace battery and/or cables immediately if any damage is found.

2. Keep the batteries and battery compartment clean and corrosion free. Dirty, corroded batteries can self-discharge, which will affect performance and life.

3. Shine lead posts and terminal ends with a wire brush or steel wool to clean corrosion and assure a low resistance connection. Reassemble and coat lead parts with petroleum jelly or a terminal protection spray.

Check the state of charge

Always wear safety glasses when working around batteries. Batteries can explode! Protect your eyes.

1. Check the state-of-charge of the battery with a voltmeter. If the reading is above 12.4 volts, the battery is at least 75% charged and should be OK. If below 12.4 volts, see the Charging Tips section.

2. Using a hydrometer: Check the state-of-charge of the battery by taking a reading from one cell. Use a different cell each time. If the reading is above 1.225 specific gravity, the battery is at least 75% charged and should be OK. If below 75%, see the Charging Tips section.

WARNING: Batteries produce explosive gases. Keep sparks, flames, and cigarettes away from batteries at all times. Protect your eyes at all times. Never lean over battery when jumping or performing other maintenance. Remember... always wear safety glasses when working around batteries!

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Be careful of the sulfuric acid in the battery. It can burn eyes, clothing and damage paint and electronic equipment. FLUSH EYES IMMEDIATELY WITH LARGE QUANTITIES OF COOL WATER. GET MEDICAL HELP FAST.

Specific gravity readings need to be corrected to 80°F (27°C) to allow for temperature of the electrolyte and to insure accurate readings. For each 10 degrees above 80°F (27°C), add four points to the hydrometer reading.