

The Power Behind Performance



Before you push away from the dock or garage, Crown Starter, Dual Purpose and Deep Cycle Marine & RV batteries are there to power your recreation time. The chemistry and plate design of these batteries are different and formulated for specific applications and use. The purpose of this document is to help you understand the characteristics and best practices for operation and care of the batteries in your equipment so that all of their advantages may be fully realized.



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Marine & RV Starter, Dual Purpose & Deep Cycle Battery



Safety. First.

Battery Handling, Maintenance & Test Procedures

Safety Is Your Responsibility!

- ▶ Batteries produce hydrogen gas, which is highly flammable. Keep sparks, flames and cigarettes away from batteries at all times. Maintain good ventilation when working on or charging batteries.
- ▶ When working with batteries you need to wear proper protective gear such as safety glasses, protective footwear and gloves. Remove watches or jewelry and avoid causing sparks with tools.
- ▶ Do not tip a battery beyond a 45° angle in any direction. Keep vent caps tight and level. Do not operate or charge batteries without vent caps secured tightly to the battery.

Selecting the Right Battery

Crown Battery manufactures a complete line of flooded batteries for all marine and RV applications. Whatever your application, Crown offers the right battery for your specific needs.

- ▶ **Starter Batteries:** Crown's "MAR" series batteries are designed specifically for engine starting. Crown Marine Starter batteries utilize Calcium-lead plate construction and are designed for maintenance-free service – however – the batteries' CleanFit™ cover design allows for easy and safe cell inspection upon demand.
- ▶ **Deep Cycle Batteries:** Crown's "T" and "DC" series batteries are designed to power on-board electrical accessories such as trolling motors, fish-finders, GPS and the like. Crown's Marine Deep Cycle batteries utilize Antimony plate construction and are low maintenance batteries, so the batteries include removable POD vents to allow safe and easy periodic watering service. Crown deep cycle batteries are designed to withstand the rigors of constant discharge and recharge for optimal performance and longer service life.
- ▶ **Dual Purpose Batteries:** Crown's "DP" series batteries are designed to deliver deep cycling capabilities – coupled with engine starting power. DP-series batteries utilize a maintenance-free design and will not deliver the same number of cycles as a true deep cycle battery. However, DP batteries are a very good option for watercraft that use a single battery for both starting and running loads with the engine turned off, or for RV's that primarily rely on the battery for backup house power.

Care & Maintenance Best Practices

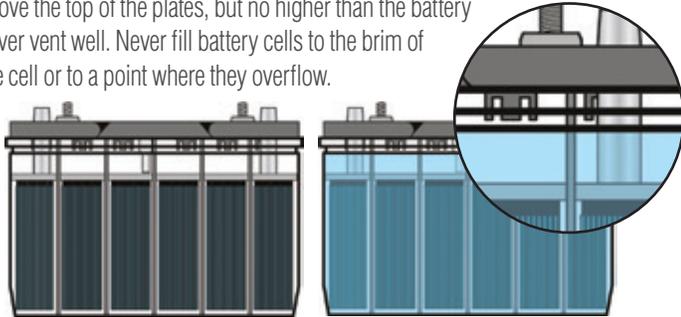
- ▶ Battery covers, containers and terminals should be kept clean, dry and free of corrosion. Battery vent caps must be secured to the batteries at all times – or removed only for cell or electrolyte inspection.
- ▶ When batteries, terminals or connectors require cleaning, use only biodegradable cleaner-neutralizer solutions that can be safely applied and disposed of through a common sanitary sewer. Clean connectors with a wire brush.
- ▶ If battery electrolyte is spilled onto batteries or the battery compartment area, neutralize it with a cloth moistened with a solution of baking soda and water mixed in the proportion of one pound of baking soda to one gallon of water. When the electrolyte is neutralized, wipe the affected area with a water-moistened cloth to remove all traces of soda.
- ▶ Inspect cable-to-terminal connections to ensure connections are tight and free of corrosion. Battery cables must be intact with no exposed or damaged wires. When connections are complete, clean and tight – apply corrosion preventative treatment materials to the cabled batteries.
- ▶ Preventative maintenance practices should include periodic inspection of fluid levels, battery specific gravity and open circuit voltage. An imbalance of specific gravity and open circuit voltage is usually a sign of improper charging, misapplication, poor maintenance, damaged cell conditions or age.

Watering Service

Equipment owners and users must be vigilant in performing regular watering service to ensure premium performance and life. There are two conditions when watering can be harmful to your batteries:

✔ Under-Watering ✔ Over-Watering

You can prevent watering-service related problems by using the illustration shown here as a reference point – making sure to maintain battery fluid levels above the top of the plates, but no higher than the battery cover vent well. Never fill battery cells to the brim of the cell or to a point where they overflow.



- ▶ USE ONLY DISTILLED or DE-MINERALIZED WATER
- ▶ Never add battery acid, commercial additives or other foreign material to the battery as doing so could damage the battery and void warranty.
- ▶ Watering service should occur only after charging service is completed. Watering before charging service can result in overflow of the battery's electrolyte – which is a dangerous condition.

Troubleshooting

When properly maintained, charged and sized to the application, Crown marine & RV batteries will provide many years of reliable service. However, failure to follow the operating and maintenance guidelines detailed in this best practice guide may result in poor performance or premature failure. The following addresses some of the typical errors in operation and maintenance:

Condition	Check For
Poor Battery Performance	Undercharged Battery
	Sulfated Battery
	Cold Operating Environment <i>(Less than 32°F / 0°C Temperature Reduces Usable Battery Capacity)</i>
	Defective Connectors or Cables
	Low Electrolyte
	Old Batteries
	Defective Charge-Level Gauge
Unequal/Low Specific Gravities	Over-filling
	Undercharging
Excessive Water Service	Overcharging
	Container Leak
	Old Batteries
Odor During Charging	Low Electrolyte
	Overcharging
High Temperature	Overcharging
	Battery Overworked
	Opportunity Charging

Offseason Storage

- ▶ Disconnect the battery's negative cable – or remove the battery from the equipment for indoor storage. Inspect fluid levels (to ensure the top of plates are covered), charge the battery to a full charge condition and verify charge condition using a hydrometer and voltmeter.

Test Procedures

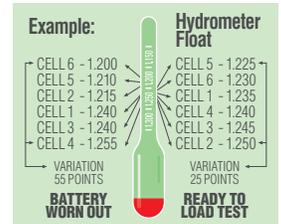
- 1. Visual Inspection:** Check battery age or length of service if available. Inspect battery for damage – when physical damage to the battery container or terminals is present, replace the battery. If none, check the battery's cell electrolyte levels. Fluid levels should be above the top of plates in all cells, and no higher than the top of the fluid level indicator:

If the battery is sufficiently filled with electrolyte – *proceed to step 2*. If the top of the battery's plates are not covered with liquid, add water only until the top of the plates are covered, replace vent caps and place the battery on charge. Be sure no open flame or spark is near while the battery's vent caps are removed from the battery. When charging service is complete – recheck fluid levels and add water as required

- 2. Specific Gravity Inspection:** Hydrometer reading of all cells should be at least 1.225 and show less than 50 points difference between high and low.

- ▶ More than 50 points difference: replace the battery.
- ▶ Less than 50 points, but some cells read less than 1.225: recharge the battery.

Replace the vent caps during recharge. Charge the battery using a rate less than 15-amps, until all cells measure a specific gravity of 1.265 to 1.275. If charging won't bring up specific gravity, replace the battery.



State of Charge Level	Specific Gravity
100%	1.265 or Greater
75%	1.225 - 1.235
50%	1.190 - 1.200
25%	1.150 - 1.175
Discharged	1.125 or Less

- 3. Open Circuit Voltage and Electrical Load Test:** Battery open circuit voltage is an effective indication of battery state of charge. Determine the approximate state of charge from the chart below.

State of Charge Level	12 Volt Battery Open Circuit Voltage
100%	12.6 or Greater
75% - 100%	12.4 - 12.6
50% - 75%	12.2 - 12.4
25% - 50%	12.0 - 12.2
0 - 25%	11.7 - 12.0
0%	11.7 or Less

Chart assumes a fully charged specific gravity of 1.265.

Ambient Temperature	15-Second Minimum Voltage
70°F / 21°C and Above	9.5 Volts
50°F / 10°C and Above	9.4 Volts
30°F / -1°C and Above	9.1 Volts
15°F / -9°C and Above	8.7 Volts
0°F / -18°C and Above	8.5 Volts
Below 0°F / -18°C and Above	8.0 Volts

Batteries with less than 75% state of charge should be charged before an electrical load test is applied to the battery. When load testing batteries, remove all battery cables, disconnecting the negative cables first. Make sure the battery terminals are free of corrosion or dirt.

For heavy-duty batteries with threaded stud terminals, attach a lead charging post to the threaded stud terminal before testing. Using a carbon pile load tester or heavy duty

adjustable load tester, apply a load test equivalent to 50% of the battery CCA Rating (0°F / -18°C) for 15 seconds; remove the load. Refer to the chart at the left to determine the minimum passing voltage.

If the test voltage is above the minimum, return the battery to service. If test voltage is below the minimum, replace the battery.