

Safety First.



BEST PRACTICES FOR SAFE & EFFECTIVE BATTERY HANDLING, TESTING & MAINTENANCE



When you pull away from the dock or garage, Crown Marine & RV batteries are there to power your recreation time. The designs and internal construction of these batteries are different and formulated for specific applications to maximize power and fun.

When working on or near batteries make sure to:

- ▶ Wear protective gear including safety glasses, footwear and gloves to prevent shocks and injury.
- ▶ Keep sparks, flames and cigarettes away from batteries at all times and maintain good ventilation when working on batteries.
- ▶ Always keep vent caps and terminal connections tight and secure.

A CENTURY OF POWER. A LEGACY OF PERFORMANCE.

CROWN BATTERY MFG COMPANY | FREMONT, OH | WWW.CROWNBATTERY.COM

CROWN
BATTERY

100 YEARS
SINCE 1926

SELECTING THE RIGHT BATTERY

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

- ▶ **STARTER BATTERIES:** “MAR” series batteries are designed specifically for engine starting. Crown’s “MAR” series batteries feature calcium-lead plate construction and are designed for maintenance-free service. Always verify that battery vent caps are secured tightly to the battery during use.
- ▶ **DEEP CYCLE BATTERIES:** Crown’s MDC & HDC series batteries are designed to power on-board electrical accessories such as trolling motors, fish-finders, GPS and the like. These specialized deep cycle batteries utilize advanced thick-plate construction and are low-maintenance with removable vent caps to allow safe and easy periodic watering service. Crown deep cycle batteries are engineered to withstand the rigors of constant discharge and recharge for optimal performance and longer service life.

CARE & MAINTENANCE BEST PRACTICES

- ▶ Batteries should be fully charged before seasonal storage and when your equipment is unused.
- ▶ Battery covers, containers and terminals should be kept clean, dry and free of corrosion. FLA battery vent caps must be always secured to the batteries — or removed only for cell or electrolyte inspection. AGM batteries are sealed and do not require cell inspection and should never be opened. Doing so damages the product and voids the warranty.
- ▶ 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.

BATTERY MANAGEMENT BEST PRACTICE:

Where possible — avoid mixing new batteries in applications with older batteries, particularly in a battery bank with parallel or series connections. New batteries should be replaced in complete packs to ensure the best success for equipment owners and operators.

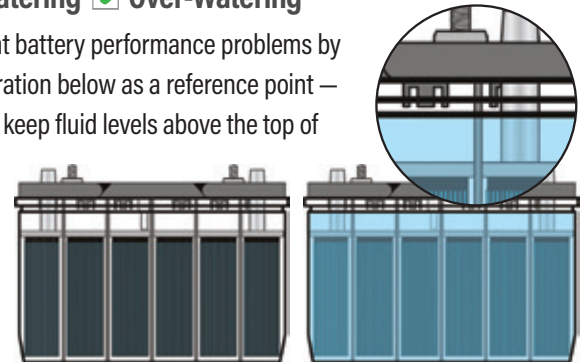
Contact Crown Battery for additional instructions via email at commercial@crownbattery.com.

WATERING SERVICE

There are two fluid level conditions that can be harmful to your batteries:

- ✔ Under-Watering
- ✔ Over-Watering

You can prevent battery performance problems by using the illustration below as a reference point — making sure to keep fluid levels above the top of plates, but no higher than the battery cover vent well.



Use only distilled or demineralized water for service. Do not add battery acid or foreign additives as doing so will damage your battery. Water batteries only after charging service has been completed

OFFSEASON STORAGE:

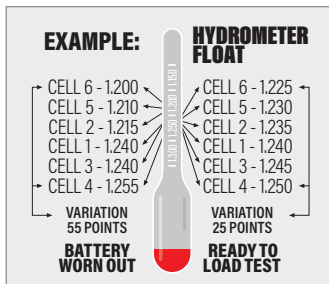
- ▶ Disconnect the battery's negative cable — or remove the battery from the equipment for indoor storage. For flooded batteries, inspect fluid levels to ensure the top of plates are covered. Charge the battery to a full charge condition and verify charge condition using a voltmeter.
- ▶ After charging, top off battery electrolyte with distilled water if needed. Clean and neutralize the battery container and terminal and store in a clean, dry and secure location. Deep Cycle batteries should not be maintained with offseason maintenance-charging without monthly inspection of battery fluid levels.

MARINE & RV BATTERY TESTING

1. VISUAL INSPECTION:

Check battery age or length of service. Expired battery life is the primary reason for battery failure or service issues.	If cells are accessible — check fluid levels. Fluid should be above the plates. If fluid levels are low — replace the battery.
Inspect battery for damage or leaks. If damage is observed — replace the battery.	For AGM batteries, look for evidence of bulging or concave battery containers.

2. STATE-OF-CHARGE INSPECTION:



STATE OF CHARGE LEVEL	SPECIFIC GRAVITY
100%	1.265 or Greater
75%	1.225 – 1.230
50%	1.190 – 1.205
25%	1.150 – 1.175
Discharged	1.125 or Less

AGM STATE OF CHARGE LEVEL *Refer to Section 3*

WARNING: Check battery fluid conditions only if your battery allows access via removable vent caps. Do not remove pressure relief valves on AGM Batteries as this will damage the product. For FLA batteries, if the electrolyte is accessible, verify battery state-of-charge by inspecting the specific gravity of the battery electrolyte after charging service is completed. 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 according to the practices shown on the following page until the battery specific gravities or open circuit voltage indicate a full charge condition. If charging won't restore the full state-of-charge, replace the battery.

3. OPEN CIRCUIT VOLTAGE & ELECTRICAL LOAD TEST:

If the battery is sealed (ex. AGM) or when its electrolyte is not accessible, or if inspection of the battery's fluid does not verify battery viability — check the battery's open circuit voltage to verify state of charge.

Determine the approximate state-of-charge from the chart below:

STATE OF CHARGE LEVEL	AGM BATTERY 12-VOLT OPEN CIRCUIT VOLTAGE	FLA BATTERY 12-VOLT OPEN CIRCUIT VOLTAGE
100%	12.80 >	12.60 >
75%	12.60	12.40
50%	12.30	12.20
25%	12.00	12.00
0%	11.80	11.70

Recharge if the Open-Circuit-Voltage is below 75% state-of-charge (SOC). Do not apply an electrical load test when SOC is lower than 75%. 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 below to determine the minimum passing voltage:

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	8.0 Volts

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

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 (Less than 32°F / 0°C Temperature Reduces Usable Battery Capacity)
	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
AGM Batteries with Severe Concave Cover or End Walls	Evidence of Severe Over-Discharge and Chronic Undercharge

LIMITED WARRANTY

- SCOPE OF LIMITED WARRANTY:** Free Replacement Period: All Crown batteries are warranted to be free from defects in material and workmanship. Any battery which demonstrates a defect in material and workmanship (discharged or sulfated batteries do not apply) within a Free Replacement Period specified by Crown Battery Manufacturing Company will be replaced or repaired at the option of Crown Battery, free of charge, except for the cost of transportation of the battery. Please reference your current Crown Battery Price Schedule to determine the Free Replacement Period available for Crown Battery's lineup of SLI battery products.
- LIMITATIONS:** In all sales other than direct retail sales by the seller of batteries considered to be consumer products to individual consumers, the foregoing warranty is in lieu of all other warranties not expressly set forth herein, whether express, implied or statutory, including those of merchantability or fitness for a particular purpose. The seller's liability for breach of this warranty or for any other purpose is limited, at seller's option, to the replacement of the battery or a refund of the purchase price of the battery. In any event, the seller's maximum liability shall be limited to the refund of the price paid for the battery. **THE SELLER IS NOT RESPONSIBLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL COSTS, INCLUDING ANY EXPENSES FOR INSTALLATION, TOWING, ELECTRICAL SYSTEMS TESTS, CHARGING A BATTERY OR LOSS OF TIME. PLEASE NOTE: SOME STATES DO NOT ALLOW LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS, OR EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY HAVE OTHER RIGHTS THAT VARY FROM STATE TO STATE.**
- EXCLUSIONS:** The limited warranty does not apply to batteries that are only discharged, have broken containers, covers or damaged terminals, have been frozen, overcharged, sulfated, have foreign material or additive put in the electrolyte, or when evidence of neglect or abuse is present. The warranty does not apply if Crown Battery's proprietary manufacturing code markings have been tampered with or destroyed, if the battery is used in applications for which it is not designed, or if it was installed or charged in reverse. Batteries installed in electric vehicle applications must not be used to run auxiliary loads that are unaccounted for by the battery charging system, and such use will void the warranty.
- WARRANTY SERVICE:** Return the suspect battery to any factory service center or factory authorized distributor, wholesaler or dealer. If an authorized representative cannot be located, contact Crown Battery's Customer Service Department via phone (+1.419.334.7181 / ext. 58110) or email (commercial@crownbattery.com). An authorized factory representative will be appointed to perform warranty service.

BATTERY DATE CODE KEY:

MONTH			YEAR		
A - January	E - May	I - September	24 - 2024	28 - 2028	32 - 2032
B - February	F - June	J - October	25 - 2025	29 - 2029	33 - 2033
C - March	G - July	K - November	26 - 2026	30 - 2030	34 - 2034
D - April	H - August	L - December	27 - 2027	31 - 2031	35 - 2035

AVAILABLE TERMINAL STYLE:

Standard



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1445 MAJESTIC DRIVE / P.O. BOX 990
FREMONT, OH 43420 USA
+1.419.334.7181 / EXT 58110
COMMERCIAL@CROWNBATTERY.COM

VISIT US:

WWW.CROWNBATTERY.COM

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