



MARINE/RV BATTERY MAINTENANCE



MAXIMIZING CYCLING PERFORMANCE



Outrageously Dependable®



HD24-DP



SRM-24



PRO-24M



GC2-XHD



Table of Contents

An Introduction to Marine/RV Deep-Cycle Batteries	2
Battery Terms	
Deep-Cycle Batteries	2
Flooded Lead-Acid Batteries	2
Sealed Lead-Acid Batteries	3
Proper Deep-Cycle Application	3
Cycles	3
Cycle Types: Shallow, Moderate, Deep	4
Cycle Life	4
Determining Depth of Discharge/State of Charge	5
Surface Charge	5
Ratings and Specifications	6
Charging	7
Don't Overcharge or Overheat	8
Choosing a Charger	8
Trickle Charging	9
Frequently Asked Questions	10
Types of Battery Connections	15
Interstate's Marine/RV Starting Batteries	17
Typical Applications	17





An Introduction to Marine/ RV Deep-Cycle Batteries

All batteries, even those marketed as “maintenance-free,” need some level of maintenance, whether it’s a periodic cleaning and tightening of the terminals, trickle charging after winter or a touch-up of the water level. This booklet is designed to help you understand how to get the most from your marine/RV deep-cycle batteries.

Battery Terms

Deep-Cycle Batteries

Deep-cycle batteries are designed discharge power at a slow rate for an extended period of time. For marine applications, they’re built to provide power for your trolling motor and other accessories, like fish-finders, whether or not your engine is running. In RV applications, deep-cycle batteries power the comforts of home, like your cooking appliances and lights.

Deep-Cycle vs. Starting or Cranking

Different kinds of batteries deliver different kinds of performance. A starting or cranking battery, for example, is made specifically to provide a quick burst of energy thousands of times in its lifetime while deep-cycle batteries are made to be discharged deeply hundreds of times. A starting battery will only handle about 50 deep-discharge cycles during its life. Any time an application indicates a need for batteries that can provide repeated deep discharging, you should choose a deep-cycle battery.

Flooded Lead-Acid Batteries

You’ll find two kinds of marine/RV lead-acid batteries: flooded and sealed. A flooded battery has a liquid electrolyte and vent caps to allow for maintenance. Maintenance on a flooded battery includes checking the electrolyte levels and adding distilled water when necessary. These batteries are best used when the battery bank is easily accessible.



Sealed Lead-Acid Batteries

You’ll see these batteries described as “maintenance-free” because there are no vent caps and no liquid levels to check. For electrolyte, these batteries use either gel cell or absorbed glass-mat technology, and they don’t expel gases such as hydrogen and oxygen during recharge. (They combine the gases internally). AGM and gel batteries are completely sealed and free of corrosion, and their design is ideal when the battery bank is hard to reach.

Proper Deep-Cycle Application

A marine/RV deep-cycle battery can be used for various applications including boats, motor homes, sailboats, travel trailers and tent campers. Remember, if you need repeated deep discharge, choose a marine/RV deep-cycle battery.

Cycles

The term “cycle” refers to one battery discharge and recharge of any depth. The term “depth of discharge” refers to the amount of the battery discharge (in percent) compared with its full capacity, and that percentage indicates the need for a shallow, moderate or deep cycle. For example, 40% depth-of-discharge indicates that a battery has been discharged by 40% of its total capacity and has a 60% state of charge remaining.

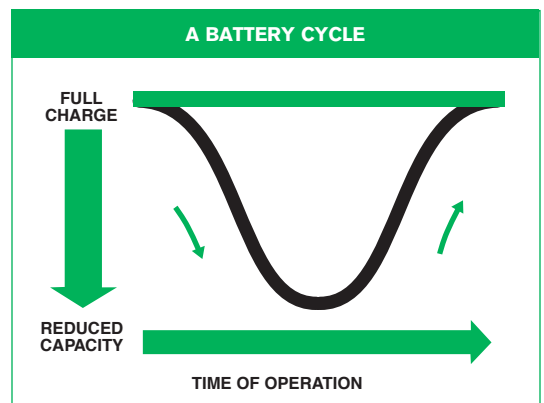


FIGURE 1





Cycle Types: Shallow, Moderate, Deep

There are three primary types of battery discharge cycles. Shallow cycles occur when only a small percentage of the total battery capacity is discharged. Moderate or deep cycles use a higher percentage of the battery's total capacity. (See Figure 2.)

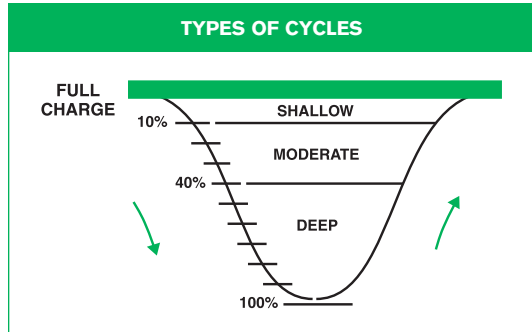


FIGURE 2

Cycle Life

A battery's cycle life is how many cycles the battery produces in its lifetime. Cycle life depends on many variables, including maintenance, proper recharge, depth of discharge, battery temperature, cycling use, vibration and overall care and consideration. Because of the variables, cycle life is difficult to calculate.

One of the more important factors is how deeply the battery gets discharged each cycle. As the depth of discharge increases, the battery's total cycle life decreases (See Figure 3). For example, if a battery is regularly discharged to 100% depth of discharge (assuming all other variables stay the same), the battery's total cycle life reduces to much less than half of a battery that's regularly discharged to only 50%.

APPROXIMATE LIFE CYCLE PERFORMANCE (DEEP-CYCLE BATTERY)	
% DEPTH OF DISCHARGE	CYCLES TO 50% CAPACITY
25	2200
50	1000
75	550
100	250

Typical performance at 80° F (cycles halved per 18° F rise). Discharged to 1.75 volts/cell. End of life at 50% capacity.

FIGURE 3



To optimize the performance of a marine/RV deep-cycle battery, we recommend that the consistent discharge level not fall below 50%. Of course, many other factors also affect battery cycle life. If your battery is used in a high heat environment (consistently above 90° F), the number of cycles it may provide in its total service life could be drastically reduced.

Determining Depth of Discharge/State of Charge

A battery's depth of discharge is the opposite of its state of charge. For example, a battery with a 30% depth of discharge has a 70% state of charge. The most efficient way to determine the state of charge on a flooded lead-acid battery with removable vent caps is to use a hydrometer. For maintenance-free batteries, we recommend you use an accurate digital voltmeter.

BATTERY STATE OF CHARGE VS. VOLTAGE/SPECIFIC GRAVITY			
VOLTAGE	SPECIFIC GRAVITY	STATE OF CHARGE	DEPTH OF DISCHARGE
12.75	1.275	100%	0%
12.45	1.225	75%	25%
12.25	1.190	50%	50%
12.05	1.145	25%	75%
11.90	1.100	0%	100%

FIGURE 4

Surface Charge

Surface charge refers to an inflated charge level immediately after the battery has been charged.

Lead-acid batteries charge slowly, and most of the charge activities occur on the surfaces of the plates. Immediately after charging and before things normalize, the plate surfaces will hold a higher state of charge than the rest of the battery. As a result, you're likely to see an inflated charge level if you use a voltmeter too soon after charging. Even though your voltmeter may tell you the battery measures 12.66-12.75 volts, it may not actually be fully charged. To remove battery surface charge, apply a load of 10-15 Amps for two to three minutes, then allow the battery to sit for one minute before retesting.





Ratings and Specifications

Marine/RV deep-cycle batteries have rating specifications that may look like alphabet soup. Here's a quick rundown of what those terms on the battery label mean.

Cold Cranking Amps (CCA)

CCA is the amount of current (in Amps) a battery at 0° F (-17.8° C) can deliver for 30 seconds while maintaining at least 1.2 volts per cell (7.2 volts for a 12-volt battery).

Marine Cranking Amps (MCA)

MCA is the amount of current (in Amps) a battery tested at 32° F (0° C) can deliver for 30 seconds and maintain at least 1.2 volts per cell (7.2 volts on a 12-volt battery).

Reserve Capacity (RC)

RC is the amount of time a battery can deliver 25 Amps at 80° F (26.7° C) without falling below 1.75 volts per cell (10.5 volts on a 12-volt battery).

Note: Interstate Batteries® uses the RC rating established by Battery Council International (BCI). Some manufacturers use a 15- or 23-Amp discharge rate rather than 25-Amp discharge. The lower discharge level means they can show a higher RC rating on the battery's label. Don't be fooled; those numbers do not reflect the true RC minutes at a 25-Amp discharge.

Ampere hours (Ah)

Tested at 80° F, it's the amount of current (in Amps) that a battery can deliver, multiplied by the amount of hours, without falling below 1.75 volts per cell (10.5 volts on a 12-volt battery). Most marine/RV deep-cycle batteries are rated on a 20-hour discharge rate. For example: A 100 Ah battery can deliver five Amps for 20 hours (Amps x hours = Ah).



APPROXIMATE HOURS AT AMPERE LOAD

	5 AMPS	10 AMPS	15 AMPS	20 AMPS	25 AMPS
HD-24-DP	11.6	5.0	3.2	2.4	1.7
SRM-24	16.4	7.4	4.6	3.5	2.5
PRO-24M	16.4	7.4	4.6	3.5	2.5
SRM-27	19.4	8.5	5.4	3.8	3.0
PRO-27M	20.4	9.0	5.7	4.0	3.1
SRM-29	21.4	9.4	5.9	4.3	3.2
PRO-29M	21.4	9.4	5.9	4.3	3.2
SRM-4D	38.0	18.2	11.5	8.5	6.5
GC2-XHD	45.0	22	12.5	9.1	7.0

FIGURE 5

Charging

One of the best ways to enhance the service life and performance of your battery is to follow proper charging methods. Always choose a charger specifically designed to match the charging requirements (voltage and current) of the battery or battery pack. If you have an onboard charger unit like an alternator, generator or converter, validate its compatibility with any new battery before you install.

Note: Flooded and sealed batteries often use different chargers. Make sure your charger is specifically designed for your battery type.





Don't Overcharge or Overheat

Always monitor your batteries when charging, whether your charger is automatic or not. Never allow a battery to become overcharged or overheated. If the battery casing feels hot to the touch, disconnect the charger immediately and let the battery cool down before you finish the charge.

Choosing a Charger

You'll find various types of chargers for marine/RV deep-cycle batteries. Most chargers, both onboard and external, are parallel-type chargers that have the ability to reduce or taper the current (in Amps) while regulating voltage.

Although almost any type of charger will recharge a marine/RV deep-cycle battery to some degree, you'll get the best results when your battery and charger are properly matched.

- Check the battery and charger type. Some chargers are designed specifically for liquid electrolyte (flooded) batteries while others are designed specifically for AGM or gel-cell batteries. Some are ideal for deep-cycle batteries while others are better suited for automotive starting batteries.
- Match the voltage. Using a 6-volt battery? Make sure your charger is designed for a 6 volt. The same goes for 12-, 24- and 36-volt setups.



- Watch the Amps. A charger should provide a maximum of 20 Amps for each 100 Ah of the battery.



- Pay attention to timing. Select a charger with a capacity sufficient to fully recharge the batteries within eight to 12 hours.
- Choose maintenance-free chargers when possible: A charger that automatically shuts off after a certain time or when the battery reaches a full state of charge can deliver optimal results.
- Read the instructions. Different charger manufacturers offer different features that may affect how you use their products. Always read and follow the instruction manual's safety and procedural recommendations.

TIP: Recharge your batteries as soon as possible after use. You can hamper your battery's recharge acceptance and ultimately its performance by allowing it to sit discharged for several days.

Trickle Charging

Batteries need a regular dose of fresh electricity to keep them in top condition. Find a trickle charger that matches your battery's chemistry, current and voltage. A trickle charger is a low-current, inexpensive option that gently feeds electricity to the battery over a period of time. It can prolong your battery's life through the seasons when it sits unused. Keep in mind, though, that some trickle chargers may lack the sophisticated electronics that properly regulate current and/or voltage. Without these electronics, prolonged charging could damage your batteries. Always monitor your battery during charge, whether it's on an automatic or manual setting.





Frequently Asked Questions

How important is the Ah rating?

The Ah rating helps you determine the type and amount of battery or batteries required to meet your specific component loads. The battery's reserve capacity rating is directly correlated with Ah. You can calculate an approximate Ah rating by multiplying the battery's RC rating by 0.6. Example: 180 RC x 0.6 = 108 Ah.

Should I completely discharge a deep-cycle battery the first few times I use it?

No. A marine/RV deep-cycle battery does not require a complete discharge at any time in its service life. For best results, we recommend a shallow or moderate discharge the first 5 to 20 cycles.

Do marine/RV deep-cycle batteries develop a memory?

No. Lead-acid batteries do not develop a memory effect. They have the ability to cycle to various amounts of depth-of-discharge during their service life.

Which is most detrimental to a battery: heat or cold?

Both extremes create battery problems. Extreme heat will allow the battery to increase its short-term performance. However, heat internally accelerates corrosion and other deterioration factors that reduce a battery's life. Extreme cold temperatures result in an immediate reduction of battery efficiency, which reduces short-term performance. For example, a fully charged battery at 80° F (26° C) should operate with 100% efficiency, at 32° F (0° C) with 65% efficiency and at 0° F (-17.8° C) with 40% efficiency.



How do I select the proper type and amount of batteries to fit my needs?

- Determine your total power requirements.
- Determine approximate time of use.
- Multiply hours by Amps.
- Divide total Ampere hours by 0.50 (50% depth of discharge) to maximize battery cycle life.

ESTIMATING BATTERY NEEDS			
Lights	5 amps	5 Hours =	25 Ah
Fish Locator	1 amp	5 Hours =	5 Ah
Trolling Motor	10 amps	5 Hours =	50 Ah
Minimum Requirement			80 Ah

80 Ah will supply the minimum requirements at 80° F.

To assure acceptable battery cycle life and performance, divide 80 ah by 0.50 = 180 Ah. Use a battery system rated for 180 Ah @ 20 hour discharge rate.

FIGURE 7



TYPE OF APPLIANCE	AC WATTS	APPROXIMATE BATT. AH (@ 12V)	
		30 MIN.	(1 HOUR)
13" Color TV	50	2.3	4.6
3 cu. ft. Refrig	150	7	14
Coffee Maker	1000	46	92
VCR	50	2.3	4.6
Light Bulb	100	4.6	9.2
Blow Dryer	1200	55	110

FIGURE 8

TIP: When choosing a battery or batteries for trolling motors, remember that a 12-volt system requires a minimum of 1.1 to 1.2 Amps per pound of thrust. A 24-volt system requires 0.85 to 0.95 Amps per pound of thrust. A 36-volt system requires 0.5 to 0.55 Amps per pound of thrust.





When do I need additional batteries?

When your power requirements exceed the capacity (measured in Ah) your battery system can provide, you will need to connect additional batteries to your system or increase the individual battery capacity. If you are consistently replacing the battery or batteries before the warranty has expired, the capacity in your system may not be adequate to supply your needs.

TIP: Once a year, re-evaluate your total battery needs and vehicle load requirements. If you have added any accessories over the last year or the hours of usage have increased, increase your total battery capacity.

As a battery ages, does efficiency decrease?

Normally, the efficiency of a properly charged marine/RV deep-cycle battery will improve slightly after the first 10 to 20 cycles. As a battery ages, its maintenance requirements change. Near the end of useful service life, the battery starts to lose efficiency, decreasing performance and increasing maintenance.

Is it best to slow charge a marine/RV deep-cycle battery?

Yes. A marine/RV deep-cycle battery should be charged at a slow current rate. Typically, a 10- to 20-Amp charger will be large enough to recharge a battery of 100 Ah within eight to 12 hours. A charge level of one to two Amps is often acceptable. However, you should monitor the battery periodically due to the extended charge time. Choose a charger that has an



automatic shut-off capability. This type of charger monitors the battery's charge level electronically then shuts off completely or maintains the battery's state of charge.

Are Interstate flooded marine/RV deep-cycle batteries maintenance-free?

Interstate marine/RV deep-cycle liquid-electrolyte batteries are "low maintenance," which means that you can perform maintenance as needed, but you'll seldom have to under normal conditions. Interstate also offers sealed lead-acid batteries, which are maintenance-free.

How do I know if my charger is correct for the battery's needs?

Check or test the battery every four to six weeks to determine whether your onboard or external charger is operating in harmony with your battery system. For example, if your batteries are using an excessive amount of water — meaning you've had to add water every two to three weeks — the charger may be overheating or overcharging your batteries. If your batteries are not performing as well as expected, the charger may be undercharging the batteries. If the batteries are low maintenance, test with a hydrometer. A low state of charge will hamper its performance and service life.

Do I need to equalize my batteries?

When the specific gravity of individual cells in a battery or bank of batteries become unequal by more than 15 points, or when the battery will not come up to full charge using normal charging methods, you may need to administer an equalization charge. An equalization charge is a battery charge at a slightly higher voltage than normal. On a 12-volt battery system, this may be 15.5 volts to 16.2 volts.





With normal use, starting batteries do not require any equalization throughout their service life. In some household or deep-cycle applications, an equalization charge may be necessary. Sealed lead-acid batteries do not require an equalization charge.

CAUTION: Due to the higher voltage required when equalizing, be sure to consult and follow your vehicle and battery manufacturers' guidelines. Some vehicle manufacturers require complete battery disconnection from the electrical system prior to an equalization charge. Always monitor the batteries during an equalization charge. If the batteries become hot to the touch or spew acid, disconnect immediately.

When do I need to add water to my batteries?

If your vehicle's charging system is working well and you're allowing adequate time to properly recharge, you may not have to add water.

Remember that all flooded lead-acid batteries emit water vapor during charging, so you should never add premixed electrolyte to your battery. Add distilled water when the electrolyte level falls below a half-inch above the plates. Do not overfill. Keep the water level an eighth of an inch below the battery's internal vent-well. Overfilling the battery can result in increased water loss and post corrosion. Remember, batteries often require more maintenance as they age.

Will I damage my batteries if I let them sit for weeks or months?

An unused battery can deteriorate faster than one that is used (recharged) daily. As a battery sits, the chemicals inside it react, causing it to self-discharge.



Depending on battery type and temperature, the rate of self-discharge varies. For example, a typical liquid-electrolyte marine/RV battery kept at a constant 80° F (26.7° C) may self-discharge approximately 25% of its capacity in three to four months. If the battery has any type of vehicle electrical discharge, like maintaining sensor voltage, the battery will discharge more quickly. The battery will not be damaged if it is recharged properly.

Types of Battery Connections

A SERIES CONNECTION

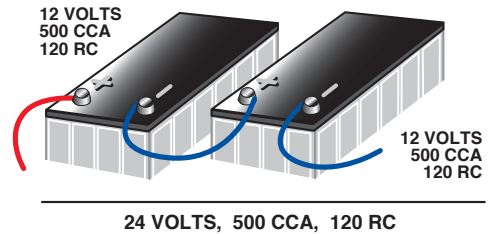


FIGURE 9

A PARALLEL CONNECTION

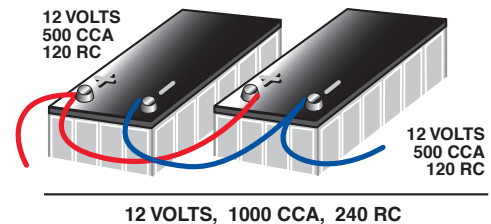


FIGURE 10





Types of Battery Connections (continued)

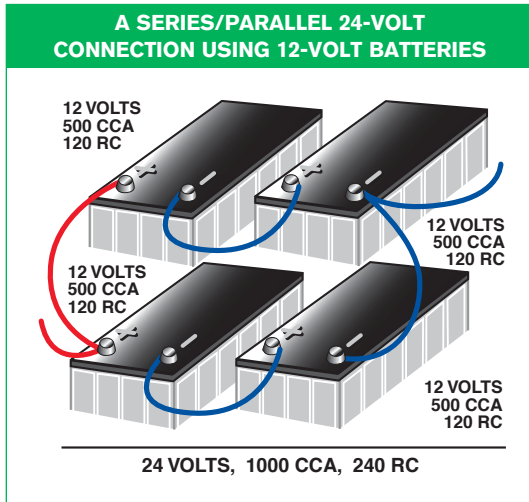


FIGURE 11

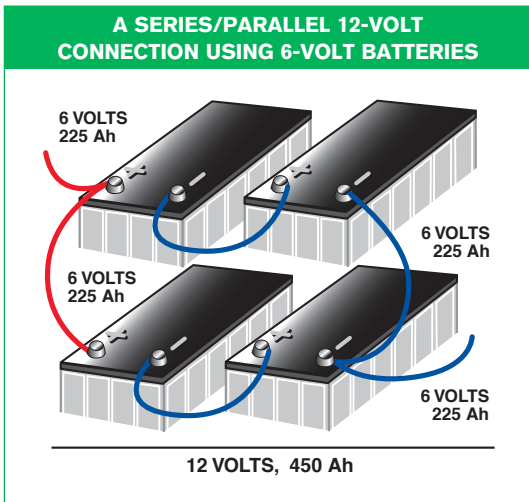


FIGURE 12



Interstate's Marine/RV Starting Batteries

Whether you're sailing the ocean or ripping it up in a motorboat, Interstate has a wide selection of starting batteries in various powers and sizes. They're built "Interstate tough" to withstand the most rugged conditions. So you can spend more time having fun and less time worrying about your battery.

Typical Applications

CHOOSE THE CORRECT INTERSTATE® PRODUCT TO FIT YOUR NEEDS				
IBS PART NO.	APPLICATION	CCA	MCA	RC@25A
24M-RD	Engine starting	400	500	75
24M-HD	Engine starting	500	625	95
24M-XHD	Engine starting	800	1000	135
27M-XHD	Engine starting	800	1000	180
SRM-24	Engine starting, trolling motors (24/36-volt), power accessories*	550	690	140
PRO-24M	Engine starting, trolling motors (24/36-volt), power accessories*	550	690	140
SRM-27	Engine starting (over 7000 watts at 0° F) trolling motors (12; 24-, 24/36-volt), full line power accessory options	600	750	160
SRM-29	Engine starting (over 8000 watts at 0° F), trolling motors (12; 24-, 24/36-volt), full line power accessory options	675	845	210
PRO-29M	Engine starting (over 8000 watts at 0° F), trolling motors (12; 24-, 24/36-volt), full line power accessory options	675	845	210
GC2-XHD	Deep cycle use only. Designed to operate full line power accessory options in 12-, 24- or 36-volt combinations	-	-	447

*Power accessories include fish finders, auto pilot, inverters, safety systems, blowers and lighting.

FIGURE 13



INTERSTATE KEEPS YOU MOVING

High-quality products and unparalleled service make Interstate Batteries® the preferred brand of Marine/RV batteries. Whether you need a battery for deep-cycling, cranking or a combination of the two, Interstate has you covered.



Call 1-800-CRANK-IT for a Dealer near you.
interstatebatteries.com