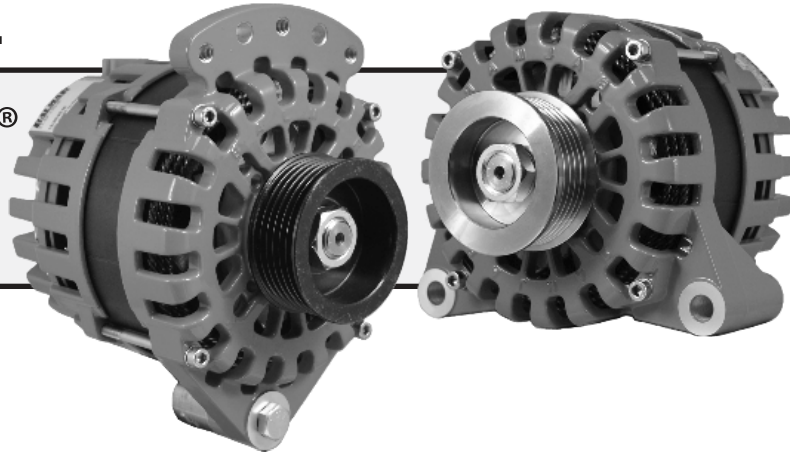


# XT-IR ALTERNATOR INSTALLATION AND OPERATION MANUAL

**BALMAR**<sup>®</sup>  
WWW.BALMAR.NET  
**DC CHARGING SOLUTIONS**



**XT-VT-170-IR**  
**XT-VT-170-IR-IG**  
**XT-SF-170-IR**  
**XT-SF-170-IR-IG**

## Introduction

Thank you for choosing a Balmar high-output alternator. This alternator is uniquely designed to provide the finest performance and durability for your application. Balmar alternators

## Safety Precautions

1. If you are unfamiliar with marine electrical and engine systems, consult with a qualified marine electrician and/or mechanic.
2. Take time to read the manual. Equipment damage and possible injuries may result from an incomplete understanding of the installation and operation of the XT-170 alternator. Always disconnect your battery banks and ensure that switches are “OFF” prior to installing the alternator.
3. Remove all metal jewelry while working on your alternator, engine or electrical system, to avoid any completing a circuit with these items, especially bracelets, rings or hanging necklaces.
4. Wear ANSI-approved safety eye-wear and protective gear.
5. DO NOT attempt to modify the alternator. Modifications could result in damage to your charging system and will void your warranty.
6. DO NOT attempt installation while using alcohol or medication that could impair your judgment or reaction time.
7. Always use the right tool for the job. Improper tool use may damage the alternator, engine or your vessel, and could result in personal injury.
8. If installing in an engine compartment with a gasoline engine, proper ventilation practices must be used to ensure no explosive gases exist before installation.
9. If installing in a compartment with batteries, the compartment must be properly ventilated to ensure no build-up of explosive gases prior to installation.
10. In all instances, adherence to ABYC guidelines or those of the applicable governing/regulating body should be followed.

## Alternator Installation Issues

While each alternator series may have some varied installation issues, the following guidelines should be considered when installing any Balmar alternator:

1. Prior to installation, ensure that the Balmar replacement alternator features a compatible mounting configuration to the alternator being replaced.
2. Ensure that the replacement alternator is adequately sized to meet the demands of your battery banks. As a rule of thumb, the alternator should be rated above the total average vessel power needs, preferably at idle. If an alternator's output is less than the loads at both idle and working RPM, then the alternator should be considered undersized. Operating any small-case alternator at a greater than 50% average duty cycle will shorten the maintenance period and in extreme cases could drastically shorten the life of the alternator.
3. Belt tension is a critical aspect of alternator performance. Monitor belt tension after every charge cycle for the first several weeks of engine operation. We recommend a belt tensioning gauge for accurate deflection measurement. Make belt tension monitoring and adjustment a part of regular maintenance.
4. Belt alignment is a significant contributor to alternators that overheat, and premature belt breakage.

## Sizing Battery Cables

If you are upgrading the alternator in an existing installation, you most likely will need to increase the size of the cables used. The table above illustrates this. For example, a 100A alternator may have only 2AWG wire installed. Wiring the New XT170 for the same run may require 2/0 AWG sized cables. The easiest method for determining the best cable size for your system is to compare your new alternator's rated amperage output and the ROUND TRIP length of the cable. Since the XT-170 is a case ground alternator, the length of cable running from your engine to the battery should be added to the length of positive cable when determining the correct cable length. If the alternative

Round-Trip Length	12-VOLT CABLE SIZE CHART									
	Length/Ft.	5	10	15	20	25	30	40	50	75
<b>Amps</b>										
<b>75</b>	8	6	4	2	2	1	1/0	2/0	4/0	
<b>100</b>	8	4	2	2	1	3/0	3/0	4/0		
<b>125</b>	6	4	2	1	1/0	3/0	4/0			
<b>150</b>	6	2	1	1/0	2/0	3/0	4/0			
<b>175</b>	6	2	1	1/0	2/0	3/0	4/0			
<b>Recommended for XT-170:</b>										
<b>200</b>	4	2	1/0	2/0	3/0	4/0				
<b>225</b>	4	1	1/0	2/0	3/0	4/0				
<b>250</b>	2	1	2/0	3/0	4/0					
<b>275</b>	2	1	2/0	3/0	4/0					

negative cable stud is used on the alternator, that length can be used instead.

Cable length requirements may also be calculated with the formula  $CM = K \times I \times L / E$  (whereas CM represents the circular mil area of the conductor, K represents the mil-foot resistance of copper, I represents current, and L represents the length, in feet, of the round-trip cable run and E represents voltage drop in volts). When using this equation, a K constant of 10.75 indicates copper's mil-foot resistance and voltage drop should be calculated at 3% (0.36V for 12V).

## Belt Tension

**WARNING:** Do not attempt to adjust belt tension while the engine is running.

Under or over-tensioned belts can result in belt slippage, premature belt wear, alternator overheating and belt failure. Typically, belt deflection should be between 1/4" and 3/8" when you push your thumb down on the back of the belt at mid-span between pulleys. For more precise tensioning adjustment, use a commonly available tensioning gauge. The use of a belt tensioner, or pulley jack, makes it easier to adjust the belt tension by using mechanical means to push the crank pulley and the alternator pulley apart. One such device, sold by MSC Industrial Supply 1-800-645-7270 (Part. # 35438209) is designed to provide "hands-free" tensioning for V-Belts.

## Fan rotation

XT-Series alternators feature dual internal cooling fans, and are designed to provide maximum cooling protection when rotated in a clockwise rotation (looking at the front of the alternator when mounted on engine). You should expect at least a 25% reduction in cooling efficiency if installed with a counter-clockwise rotation.

## Grounding

The XT-170 is available with either case ground or isolated ground. For the case ground models, they rely on a good connection between the engine and the mounting foot, or feet of the alternator. Ensure that the engine mounting surfaces are clean and without rust, etc that can impair a good electrical connection. For the isolated ground version, only use the designated connection point for grounding, or the case will be grounded to the engine.

## Pulleys

The XT-170 alternator is available with a K6 pulley. Ensure that the alternator to be installed has the same pulley configuration as your engine. Should your application require a different pulley than that provided as standard, Balmar may carry an optional pulley more suited to your needs. For a list of optional pulleys, visit <http://www.balmar.net/pulleymatrix.htm>, or call Balmar Customer Service at +1-360-435-6100.

**NOTE:** Do not attempt to use the XT-170 in a single Vee-belt configuration. A single Vee-belt will be unable to maintain grip on the pulley. Excessive squealing, belt dust and breakage will result.

## Alternator Heat

During operation, your alternator will become hot as a result of friction and the generation of inductive current. In some instances, particularly during extended periods of heavy load, alternator case temperature can exceed 200 degrees (F). Use extreme caution when handling the alternator or other engine components during or after use. Should your alternator become so hot that it emits a burning smell, or if there is indication of discoloration at the pulley or pulley shaft, shut off the alternator immediately and (once it becomes safe to inspect the alternator) check the tension of the drive belt. Under- and over-tensioned belts, and misalignment are the leading causes of overheating and alternator damage.

## Fusing

The American Boat and Yacht Council (ABYC), in its standards for safer boating, recommends that cable runs to your battery banks be fused to protect the boat and owner against damage and injury. Circuit protection, as described by ABYC standards, can be accomplished by installing either a resettable circuit breaker or a fuse. The fuse or breaker you choose will depend on both the amperage rating of the alternator and the size of cable used. The following considerations can be used to determine fusing:

1. The largest available circuit protection device smaller than the amperage capacity of the cable being protected.
2. Larger than the maximum continuous current that will flow in the circuit.

We find that a circuit protection device sized at approximately 125% of your alternator's rated amperage is typically suitable for the circuit being protected. For more info about circuit fusing, see [https://www.blueseas.com/support/articles/Circuit\\_Protection/95/Choosing\\_Circuit\\_Protection](https://www.blueseas.com/support/articles/Circuit_Protection/95/Choosing_Circuit_Protection)

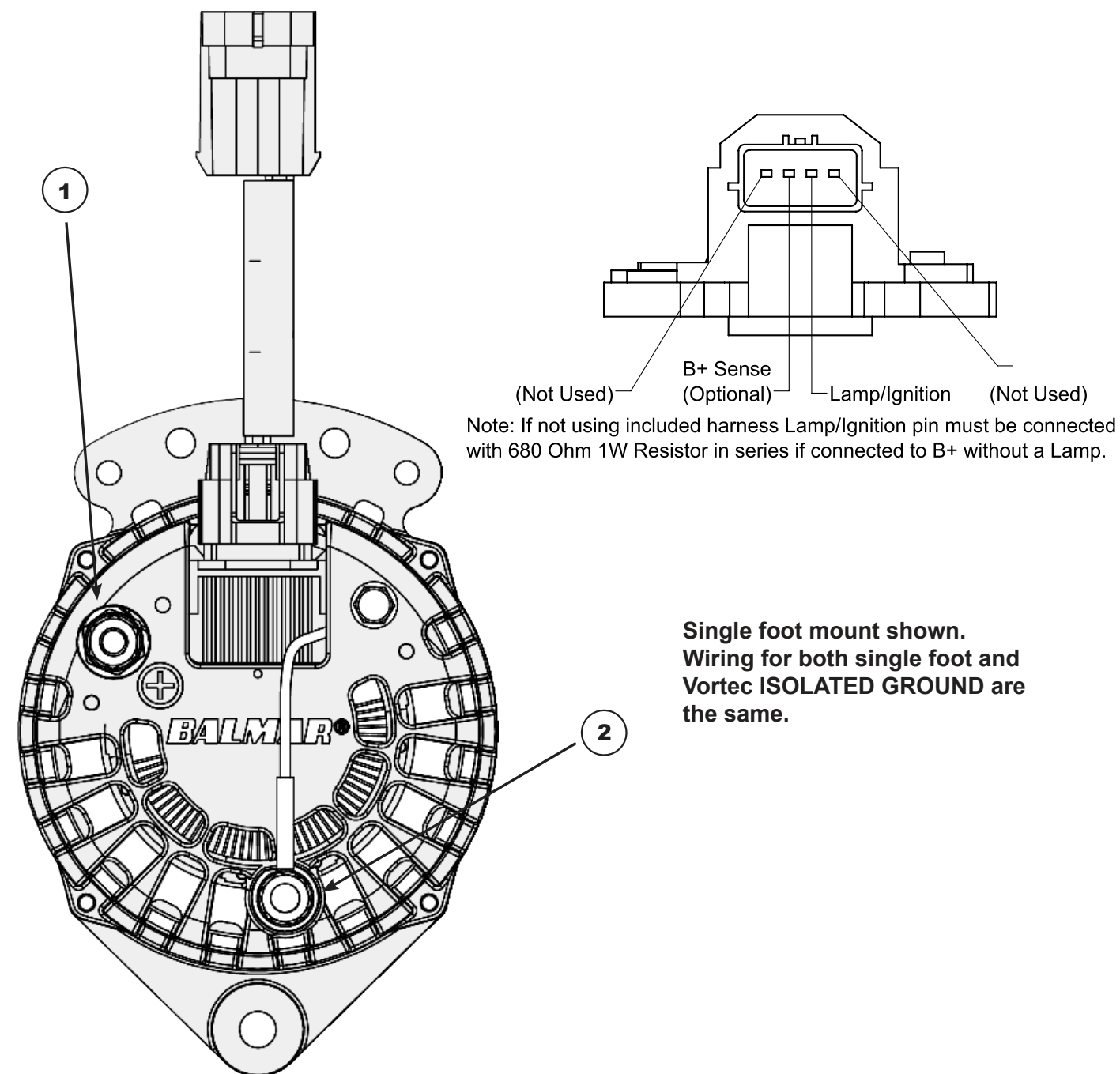
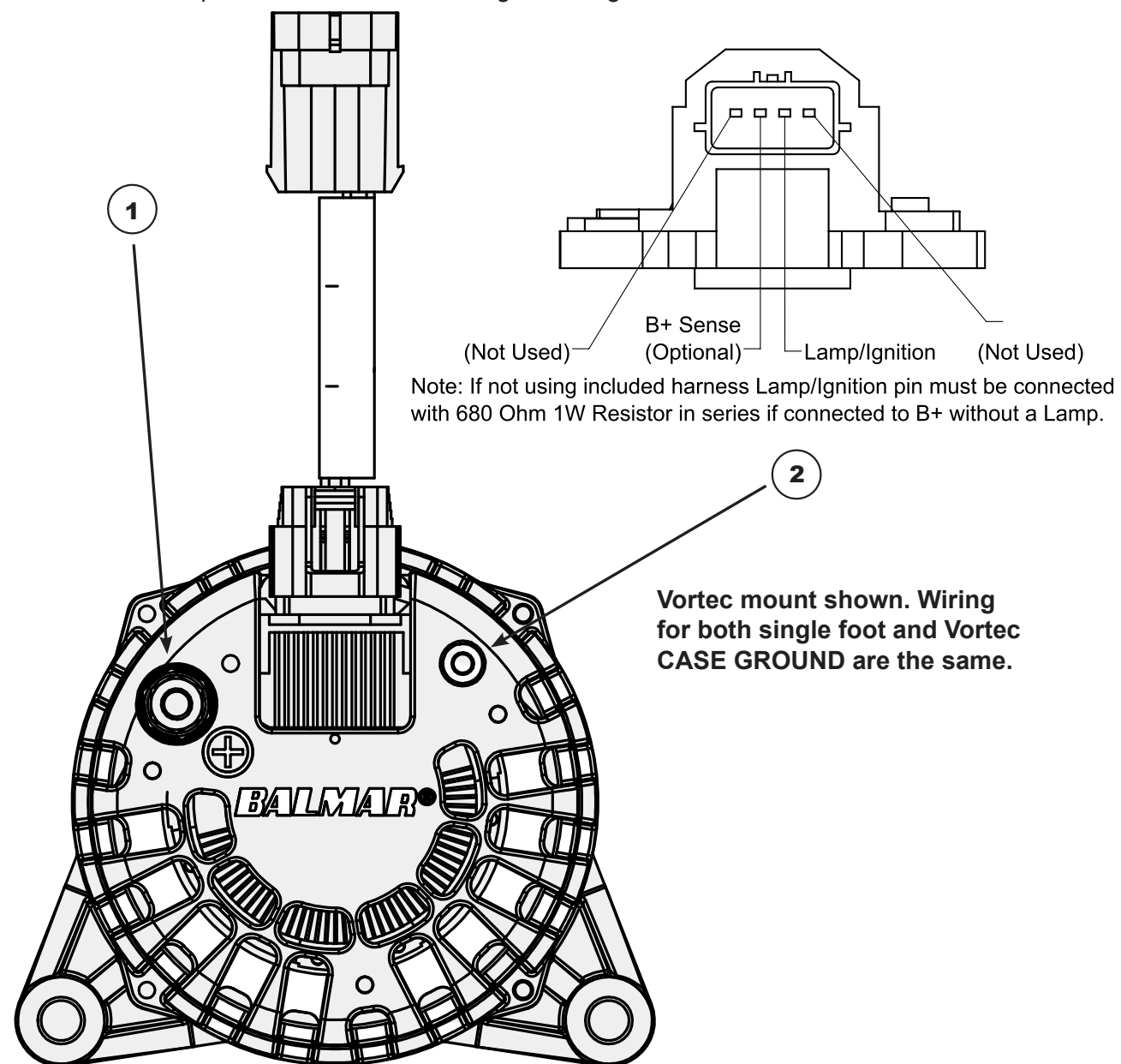
## Basic installation steps

**NOTE:** The engine manufacturer's instructions for alternator installation take precedence over these basic instructions.

1. Ensure the battery switch is in the off position.
2. Disconnect all cables and wires connected to the alternator, taking note of their position and function.
3. Remove existing alternator, by first loosening the tension arm bolt, and then removing the belt. Examine the belt for wear, and replace if necessary. If the belt is tensioned using an idler pulley, slack the belt using the tensioner spring mechanism.
4. Remove bolt(s) mounting alternator to the engine.
5. Examine all mounting hardware and wire connectors for rust, and other damage. Clean or replace as necessary.
6. Change battery cables as required to handle the additional current of the alternator.
7. Reverse the procedure to install the new alternator.
8. Check all electrical connections for continuity and ensure no cable or wire can touch the belt or other moving

parts of the engine.

- Secure heavy battery cables to the engine within 12 inches from the alternator. The cables MUST be attached to the engine first, before transitioning to the vessel or a surface that is not part of the engine. Failure to do this may work harden the alternator posts/connections, resulting in damage.



**NOTE:** XT-Series alternators are available in both internally regulated only and Smartready™ versions. This manual covers internally regulated (only) versions. The XT-IR alternators are NOT designed to work with Balmar external regulators. If you have a Smartready™ version of the Alternator, use SUP-207 installation manual instead.

**NOTE:** XT-Series alternators are available in both internally regulated only and Smartready™ versions. This manual covers internally regulated (only) versions. The XT-IR alternators are NOT designed to work with Balmar external regulators. If you have a Smartready™ version of the Alternator, use SUP-207 installation manual instead.

### XT-IR, Single foot and Vortec mount (Case Ground)

XT-SF-170-IR for single foot mount

XT-VT-170-IR for Vortec mount

- Positive Output Terminal (B+) - Must be connected via properly-sized cable to the battery or batteries being charged. Cable size is determined by alternator output and length of cable run. See Page 3 for wiring size chart.
- Negative (Ground) Terminal (B-) - While the alternator is grounded through its case, an additional ground terminal is provided. If grounding a heavy cable, it is better to ground at either the adjustment arm mount (Single foot) or one of the two case mounts (Vortec mount)

### XT-IR-IG Single foot and Vortec mount (Isolated Ground)

XT-SF-170-IR-IG for single foot mount

XT-VT-170-IR-IG for Vortec mount

- Positive Output Terminal (B+) - Must be connected via properly-sized cable to the battery or batteries being charged. Cable size is determined by alternator output and length of cable run. See Page 3 for wiring size chart.
- Negative (Ground) Terminal (B-) - Attach Battery Ground cable here. No other attachment point is isolated.

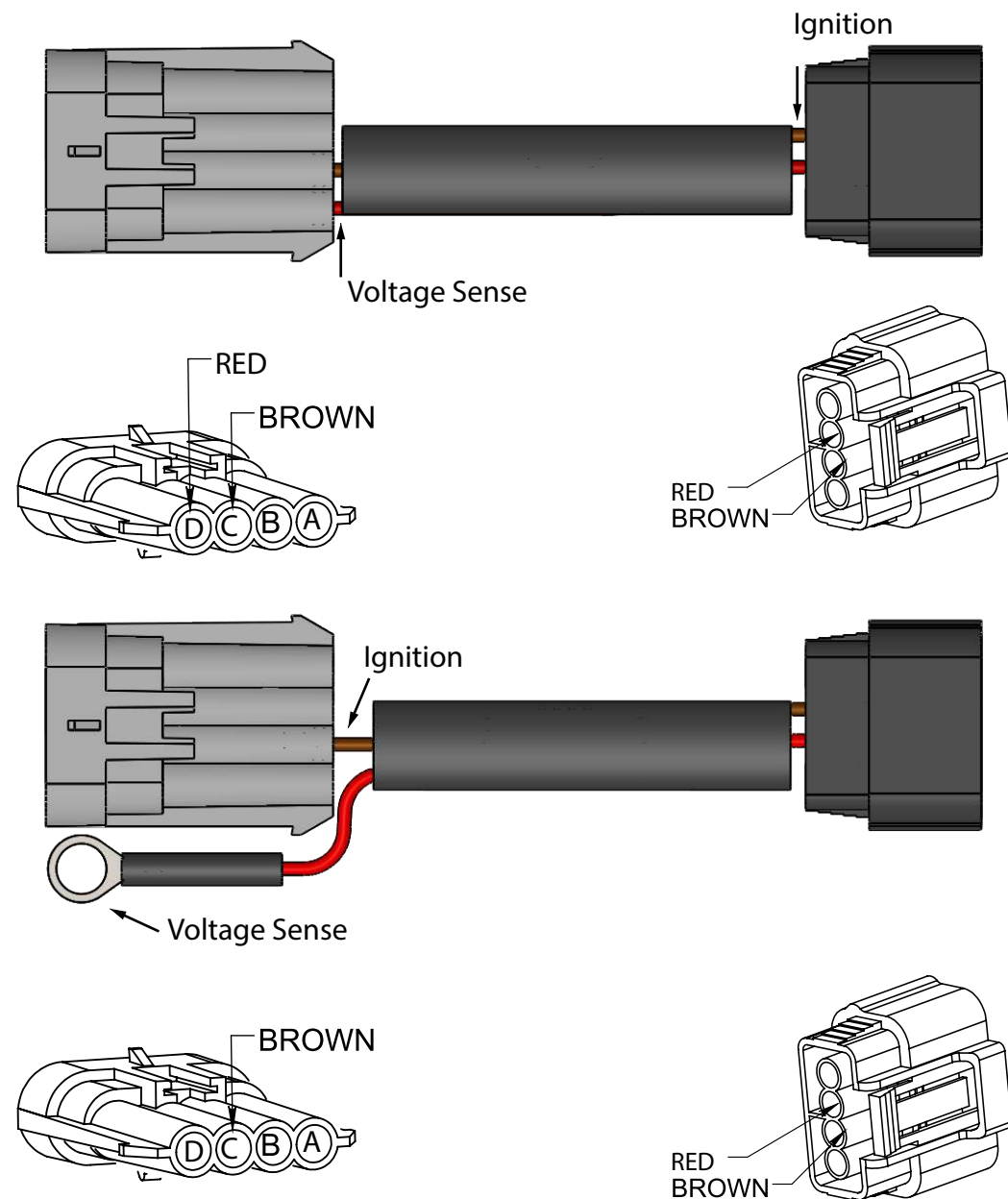


There are two versions of the wiring harness. The only difference is how the Voltage sense wire is terminated. in the second harness, the voltage sense wire is terminated in a ring terminal.

**Ignition Wire (BROWN)** - Provides switched source of voltage to the alternator's internal regulator.

**Voltage Sense Wire (RED)** - Provides sensing voltage for the internal regulator.

**NOTE:** While the harness with a ring terminal is design to be placed on the B+terminal, for best charging performance it is recommended that the voltage sense wire is extended to connected directly to the positive post of the battery being charged. Alternatively, it can be connected to the common post of a battery switch or the battery side of an isolator. Ensure that this wire is fused properly with a 5a-10a fuse.



### Balmar Limited Warranty

Balmar's Limited Warranty covers defects in material or workmanship on new Balmar products generally for a period of two (2) years from the purchase date. Only consumers or dealers purchasing Balmar products from authorized Balmar retailers or resellers and installed by a qualified installer may obtain coverage under Balmar's Limited Warranty. Components with a manufacturing date greater than ten (10) years old are not covered under the Balmar Warranty, even if the purchase date has been within the past two (2) years. Purchase from unauthorized resellers, which may include some online entities, may not guarantee the purchaser will receive a newly manufactured component, and therefore does not guarantee Warranty coverage.

### Warranty Resolution

If Balmar authorizes a product to be returned to Balmar or an authorized service provider, Balmar will repair the product or replace it without charge with a functionally equivalent replacement product. Balmar may replace the product with a product that was previously in service or repaired, but re-tested to meet Balmar specifications. Balmar will pay to ship the replacement product to the purchaser. By sending the product for replacement, ownership of the original product will be transferred to Balmar. Labor charges at the consumer's site are not covered under this Warranty. Balmar warrants that repaired or replaced products shall be covered under the Balmar Warranty for the remainder of the original product warranty, or 90 days, whichever is greater.

### Not Covered Under Warranty

Balmar's Warranty does not cover any problem that is caused by (a) an accident, abuse, neglect, exposure to shock, electrostatic discharge, heat or humidity beyond the product's specifications, improper installation, inappropriate operation/misapplication, maintenance or modification, or (b) any misuse contrary to the instructions provided with the product, or (c) loss, or (d) malfunctions caused by other equipment, or (e) acts of God. Examples of conditions not warranted: cracked or broken cases, parts damaged by fire, water, freezing, lightning, collision, theft, explosion, rust, corrosion, or items damaged in route to Balmar for repair. Balmar's Warranty is void if a product is returned with removed, damaged or tampered labels or any other alterations (including removal of any component or external cover) to the product. Balmar's Warranty does not cover labor charges or any direct, consequential, or incidental damages. Costs related to recovery removal or installation are not recoverable under the Balmar Limited Warranty.

### Applicable Laws

Balmar's Warranty is governed by the laws of the State of Alabama, USA. The Balmar Warranty provides the purchaser specific legal rights, and you may also have other rights that vary from state to state. Balmar's Warranty does not affect any additional rights consumers have under laws in their jurisdictions governing the sale of consumer goods, including, without limitation, national laws implementing EC Directive 44/99/EC. Some states do not allow the exclusion of limitation of incidental or consequential damages, so the limitation or exclusions of Balmar's Warranty may not apply in certain jurisdictions.

### Warranty Return Material Process

1. Contact Balmar Technical Support at +1 (360) 435-6100. Tech Support will review the troubleshooting steps with you to help determine if Balmar's product is defective.
2. Go to [www.balmar.net](http://www.balmar.net) and download the RMA request.
3. Once complete, you will receive an RMA number, at which point you should complete the forms and send them with the product and the original receipt showing the date of purchase to Balmar at the address listed below. Please include the RMA number on the outside of the package.
4. Please send the product postage prepaid via a carrier that can track the package. Note: If you have a 9-Series Alternator to return, please ship it to our Marysville, WA location.

**Balmar LLC**  
**353 James Record Road SW**  
**Huntsville, AL 35824**  
**Attention: Warranty Returns RMA#**

**Balmar LLC**  
**15201 39th Ave. NE**  
**Marysville, WA 98271**  
**Attention: Warranty Returns RMA#**

Once Balmar receives the product, we will test the product to determine if the problem is due to a defect in the product. If, at the sole discretion of Balmar, the problem is determined to be a manufacturer defect, Balmar will repair the product or send a new product to replace the defective product.

Balmar will not provide Warranty coverage unless Warranty claims are made in compliance with all the terms listed here, and the specified return procedures are followed.

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Balmar archives a comprehensive library of instructional manuals for nearly all current and out-of-production products on its website: <http://www.balmar.net/operation-manuals/>

# BALMAR<sup>®</sup>

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*Balmar Knows How To  
Charge Your Batteries*



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CDI Electronics designs and manufactures ignition components for outboard motors and diagnostic software for most Marine Engines. CDI enjoys relationships with 70 distribution partners around the world. To Find a CDI distribution partner, visit [www.cdielelectronics.com](http://www.cdielelectronics.com).

***Both Balmar and CDI Products are manufactured in our ISO 9001-Certified Factory in Huntsville, Alabama.***

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