

Alternator Installation And Owner's Manual

BALMAR®



I. INTRODUCTION

Your high-output BALMAR® Marine Alternator is uniquely designed and engineered to provide the finest performance and durability for your vessel. Unlike most automotive-type alternators found standard on the majority of pleasure craft, our Marine Alternators are specially designed to provide exceptional output at lower engine r.p.m.'s, so you can enjoy less noise and fumes, increased economy and shorter charge cycles.

II. SAFETY CONSIDERATIONS

Before installing your alternator, please take a moment to consider the following guidelines for safe alternator installation. Failure to follow these guidelines could result in injury or damage to your electrical system.

1. Always disconnect your batteries prior or turn your battery switch to its OFF position prior to installing your alternator.
2. Remove any loose-fitting clothing or jewelry, which could become entangled in your motor or other machinery.
3. Wear ANSI-approved safety glasses.
4. Do not attempt installation if tired or fatigued.
5. Ensure the engine has cooled sufficiently before initiating installation.
6. Drugs and alcohol do not mix with safe installation procedures. Do not attempt installation while using alcohol or any medication that could impair your judgment or reaction time.
7. Always use the right tool for the job. In addition to causing damage to the alternator or your boat, the use of incorrect or improperly-sized tools can result in personal injury.
8. Take time to read the manual. Equipment damage and possible injuries may result from an incomplete understanding of the installation and operation of the alternator.

CAUTION

The following instructions are intended for use by experienced marine electrical installers. If you are not experienced at installing electrical system components, we recommend a qualified marine electrician be used to install this alternator.

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BALMAR® 19009 61st Ave. NE #4, Arlington, WA 98223

Phone: 360-435-6100 Fax: 360-435-3210 E-Mail: balmar@balmar.net Web: <http://www.balmar.net>

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III. GENERAL INFORMATION

BALMAR small- and large-case alternators are available in a wide range of sizes, mounting configurations and amperage outputs to match the needs of most marine engines. Alternators are "P" type (positive on the field wire), with max field current demand 5.6 amps and 2.4 ohm rotors in 12/14 volt models. Our 24/28 volt models use a max. field current of 4 amps and have 4.8 ohm rotors.

Amperage Ratings

Alternators are rated in relation to their outputs at our test bench at specific pulley r.p.m. Circuit breakers and wire gauges should be engineered to meet indicated alternator amperage. Actual amperages produced by the alternators after installation may vary due to factors such as battery capacity, battery type, wiring capacity, engine room temperature, and other variables. In most cases, maximum output is determined by your batteries' absorption rates at their voltage set point.

Voltage Regulation

All BALMAR alternators require external regulation. We recommend multi-step charge controllers, such as our MAX CHARGE or ARS-series regulators, for optimum charge management.

Our single-stage BRS II regulator can also be used with our marine alternators. Matched wiring harnesses are available with our regulators, or can be purchased separately to provide a simple interface between the alternator and regulator. Each 54" harness features a four-prong inline connector at the regulator. Alternator plug style will vary by case size and style (see **Figure 1**). 7-Series, 8-Series and extra-large case manuals utilize standard ring terminals for wiring attachment.

Rotation

BALMAR alternators operate in a clockwise rotation. This clockwise rotation draws cool air from the back of the alternator across the internal components to maintain proper operating temperatures. Should the alternator be used in a secondary position (mounted in an opposing direction to the engine), or should the alternator be mounted on an "opposite-rotation" engine, the alternator's pulley must be keyed or pinned, and the alternator must be equipped with a bi-directional fan. Reverse Rotation Kits are available for most BALMAR alternators.

Grounding

Most BALMAR marine alternators are case ground. It is essential that the alternator is properly grounded. We strongly recommend you ground your alternator to the preferred engine ground or system ground bus with a cable that's the same size as your output cable. If your alternator is a dual post, isolated ground (IG) model, the negative ground must be established independent of the alternator case. The regulator's grounding wires must be attached to the alternator's negative terminal.

Mechanical and Electrical Noise

As part of normal operation, your BALMAR marine alternator will make a slight whining noise while under load. This whining noise provides an indicator that the alternator is charging. In addition to a mechanical whine, you may experience a small amount of sticking or drag when the alternator is new. This is caused by the wood separators in the stator. With use, the separators will wear and the sticking will be eliminated.

By nature, electricity producing instruments like alternators will create electrical noise or interference that can be transmitted to radios, radars and other voltage-sensitive electronics. Your BALMAR alternator has been designed to minimize electrical interference. If interference persists, we recommend adding noise reduction filters to your system. One provider of quality noise reducing filters is Marine Tech, Inc., at (800)772-0796.

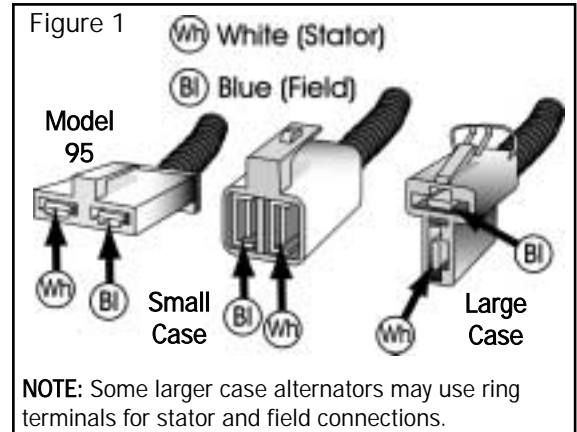
Alternator Heat

During operation, your alternator will become hot as a result of inductive currents. In some instances, particularly during extended periods of heavy load, temperatures can reach in excess of 200 degrees (F). If your system is operating with an ARS-4 or Max Charge regulator with optional alternator temperature sensing, the regulator will automatically reduce the alternator output by 50 percent if temperatures exceed set limits -- giving the alternator the ability to cool to normal temperatures before returning to full charge status. While this is an extremely effective device for alternator protection, it should not be used as part of alternator maintenance. Continual alternator overheating indicates ventilation or charging system problems and repair is advised.

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-tensioned belts are a leading cause of overheating and alternator damage. For more information, see the Maintenance section of this manual.

Pulleys and Belts

Our 75 and 100 amp small case units come with a 2.5" deep V pulley that will accommodate from 3/8" to 1/2" single belts or metric equivalents. Model 9400 (large case) can also use a 1/2" single belt. The small case 150 amp and all other 92, 94 and 96 series come standard with a 2.7" deep V pulley (multi-groove serpentine belts are also available). A variety of pulleys are available by request. Belts are not created equally, and in most instances you get what you pay for. Premium quality belts such as Gates' "Tri-Power" or green stripe, Dayco's "Topco", or similar industrial-quality belts will provide a better value over lesser quality belts in both dependability and durability. If your battery banks or your load capacity are extremely large, or if your engine cannot accommodate the proper size belts to adequately drive a High output alternator, a second alternator with an engine power takeoff (PTO) with dual dedicated belts or one of our Power Chargers or Charger / Aqua-PAC combinations may provide a solution to your charging and watermaking needs.



IV. BASIC INSTALLATION

CAUTION: Alternator installation requires substantial amount of mechanical and electrical understanding. If you are not experienced with alternator installations we strongly recommend you enlist the services of a qualified marine electrician. Keep in mind that alternator performance is only as good as the wiring and battery installation. If you are unsure of the condition of your boat's batteries or wiring, have them inspected by a qualified electrician before proceeding with the alternator installation.

Your BALMAR alternator is shipped with an assortment of spacers, a ground bolt, and an adjustment arm bolt. All BALMAR alternators are externally regulated. We recommend pairing your alternator with a BALMAR Max Charge or ARS-series regulator.

Alternator Mounting

Due to the many domestic and international configurations of engine/alternator mounts, and factors such as year and location of engine manufacture and marinization, BALMAR cannot guarantee a drop-in replacement in every circumstance. Choose the model that most closely fits your application. Your installer may have to adapt the basic mounts to fit your needs. The majority of marine engines are equipped with one of three alternator mounting styles. The following describes which alternator represents each specific mounting style:

1. **70 & 90-Series** (Dual Foot w/3.15" between legs) Series: Small Case. Fits many of the import styles. Hitachi 55 amp are often direct fit. Their 80 amp model requires a 10 mm bushing (\$5.00 net from BALMAR) and their 35 amp (6 mm) mounting is usually drilled out to accept a 5/16" hardened bolt. The Mitsubishi 50 amp requires a spacer approx. 1". **901** (Dual Foot w/3.15" between legs) Series: Small Case. 60 degree offset ear, only available with isolated ground. The 901 model has an offset adjustment ear and always DIG isolated ground. (See **Figure 2**.) **CAUTION:** Use care when mounting dual foot models. Overtightening can result in damage to the mounting feet.
2. **71, 81 & 91-Series** (1" Single Foot) (See **Figure 3**): Small Case. Replaces most domestic styles using a single 1" mounting foot (eg., Motorola, Prestolite).
3. **712, 812 & 912-Series** (2" Single Foot) (See **Figure 4**): Small Case. Replaces most domestic styles using a single 2" mounting foot (eg., Delco).
3. **94-Series** (2" Single Foot) Series: Large case. See case dimensions on our website at www.balmar.net to determine if your engine compartment can accommodate the large case (See **Figure 4**.)
4. **95-Series** (Dual Foot w/4" between legs) Series: Large case. See case dimensions on our website at www.balmar.net to verify if your engine compartment can accommodate the large case. (See **Figure 5**.)
5. **96 to 98-Series** (Dual Foot w/4" between legs) Series: Extra large case. See case dimensions on our website at www.balmar.net to determine if your engine compartment can accommodate the large case

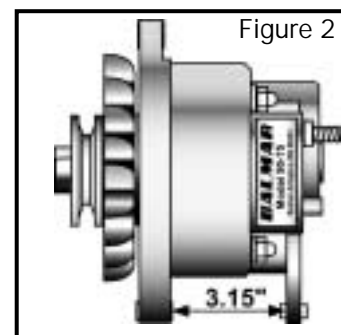
If, after selecting the most similar mounting, you determine that the desired size alternator will just not replace the existing alternator, one excellent option may be to leave the existing alternator in place and purchase a dual groove crank pulley for the front of the engine (in addition to the existing pulley). Then have a special mount fabricated, or use the BALMAR remote Alternator Bracket #5276, to accommodate the new larger alternator.

Once you have determined that the new alternator is the correct replacement for your existing model:

1. Disconnect the wiring from the existing alternator.
2. Loosen the mounting bolt and remove the existing alternator.
3. Once the alternator is disconnected from the engine, compare its mounting points to those on your new BALMAR alternator. In most applications, the new alternator will replace the old alternator without any modification. In some cases, a simple bracket can be fabricated by a local machine shop. BALMAR offers a universal mounting arm. Others can be obtained through your local auto or marine supply.
4. Attach the mounting foot of the new alternator to its engine mount. Some shimming may be necessary to ensure that the alternator is securely mounted within the engine mount. If your alternator is a dual foot style, use care when tightening the alternator in place that the two mounting ears are not compressed. The rear bushing is designed to slide to tighten the mount.
5. Once in place, inspect to ensure that the alternator pulley is properly aligned with the engine pulley. If your belt configuration includes the pulley for the water pump, make sure that all three pulleys are properly aligned. Some shimming or modification to the engine mount may be required to assure proper alignment.
6. Connect the output cable(s), ground, field wire, stator (tach) wire if needed and other necessary wiring. If you are using your alternator in conjunction with a BALMAR regulator, attach the duplex connector as shown in **Figure 6** on the following page.
7. If a new regulator is being installed along with the alternator, complete its wiring installation according to its instructions.

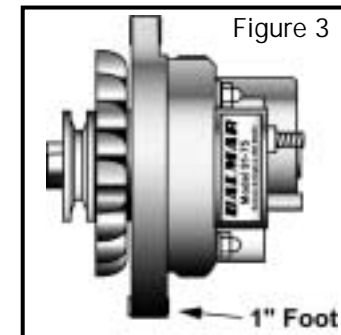
After the alternator is installed and the wiring connections are attached, inspect the pulley for proper tension. When changing pulleys or when using the factory-installed pulley, torque the shaft nut to 50-60 foot-pounds. The shaft nut measures 15/16". To install the belt:

1. Loosen the adjustment arm bolt and alternator pivot assembly bolt.
2. Fit a new, high-quality belt over the appropriate pulleys.



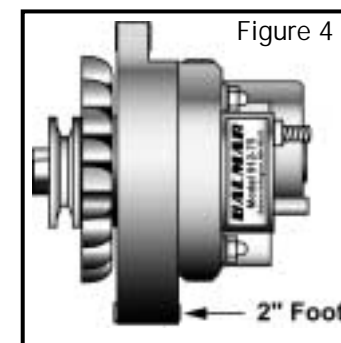
Dual Foot (3.15" ID)

Found on 70 & 90-Series Balmar alternators. Replaces Hitachi and other saddle-style import alternators.



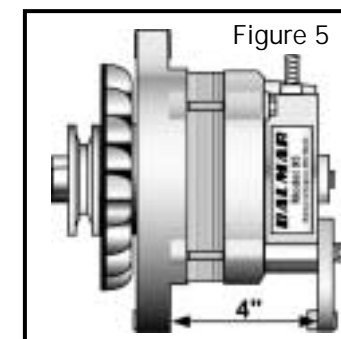
Single 1" Foot

Found on 71, 81 & 91-Series Balmar alternators. Replaces Motorola, Prestolite and other similarly configured models.



Single 2" Foot

Found on 712, 812, 912 & 94-Series Balmar alternators. Replaces Delco and other similarly configured models.



Dual Foot (4" ID)

Found on 95, 96, 97 & 98-Series Balmar alternators. Ideal for custom on-engine or off-engine brackets (eg., BALMAR 5276).

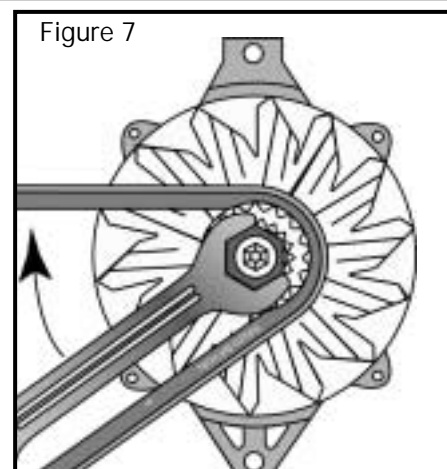
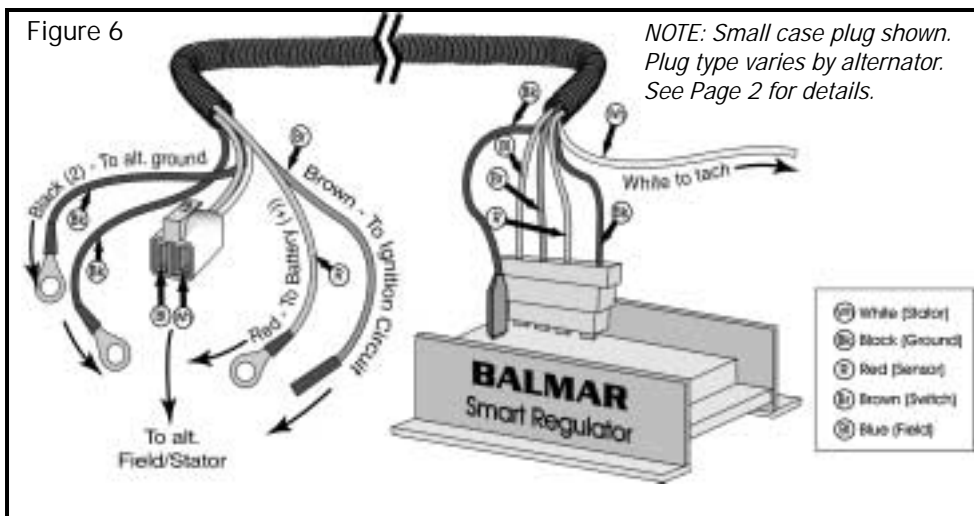
3. Tension the alternator until the belt is securely tightened in place. Re-tighten the pivot assembly and tension arm bolts. To test tension, place a 15/16" wrench on the alternator shaft nut and apply pressure. If the pulley rotates without moving the belt, re-loosen the bolts, apply additional pressure and re-tighten. Repeat until the belt is properly tensioned. (See **Figure 7**.)

When installation is complete, run the engine. Visually inspect the engine, while running, for evidence of poorly aligned pulleys and belts. Use caution to avoid hot or moving parts. Turn off the engine after approximately 15 minutes and re-inspect the belt tension as described above.

V. ADDITIONAL INSTALLATION INFO

While many BALMAR marine alternators are direct replacements for OEM models, some models may require special installation consideration. If installing one of the following alternators, please make note of the following special circumstances:

1. **SINGLE OUTPUT MODELS:** Case is ground. A 5/16" grounding bolt is provided. The same size wire as positive is recommended from this point back to the engine ground or negative buss.
2. **DD, DUAL DELTA STATOR MODELS:** One output only. If two terminals with bar across is used, leave bar in place. Some models may have just one output terminal: treat as single output.
3. **IG, DUAL POST, ISOLATED GROUND MODELS:** Single Output. One terminal is positive, one terminal is negative. Do not ground alternator or regulator to case. **Remember: the ground wire must be the same size as the positive wire.**
4. **D, DUAL OUTPUT MODELS:** Each terminal provides proper charging to a separate battery or bank. Each output terminal can charge up to the alternators max rating but both terminals together can not exceed the alternators maximum rating. Remember that the current (amps) flows to the battery with the least resistance or greatest need first. Once equal, both batteries will receive about the same charge. The regulator looks at one battery only, so we recommend that the house bank be used for sensing. Battery banks should be comparable in capacity and should be identical technology (ie., do not mix AGM with gel, thin plate starting battery with deep cycle house bank, etc.) Bridging or connecting the two terminals makes the output single. **DO NOT OPERATE** without each main output terminal connected to a battery or bridged. For extended storage periods, disconnect the alternator from the batteries. The voltage equalization circuit in the alternator allows a small (milli amp) flow between the batteries to prevent surface voltage buildup.



Battery Isolators

Battery isolators may be used. Its capacity must equal the maximum alternator output. To compensate for volt drop, sensing must be on the battery side. If a dual-output alternator is used each output must have its own dedicated isolator.

Meters

Most standard in-line Amp meters are **UNDER-RATED** for our alternators and, along with idiot lights, should be removed from the system. You may replace your existing amp meter with a standard volt meter. Should you wish to read output Amps, a high capacity 0-100 or 0-200 amp external shunt-type meter should be installed. Digital meters like the Link 10 or Link 20 by Heart Interface are excellent tools for charging system monitoring.

Tachometers

The alternator tachometer is energized by the pulse frequency generated by the alternator, which in turn is dependent on the alternator's rotor speed. Large case BALMAR alternators (94,95,96, series) have 12 poles and the small case (90/91/912 series) have 14 poles. Model 96-24-220 alternators, as well as all 97 and 98-Series alternators are configured for 16-pole operation. Most standard tachometers are engineered for engines with alternator pulley to crankshaft ratios of 1.8 to 2.8 to 1 on alternators with 12 poles.

The WHITE wire or stator terminal may be used for electric tachometers not having their own sending unit. Tachometers will have to be adjusted and calibrated as necessary. We suggest running the engine up to a cruise RPM (2000), marking the throttle position **BEFORE** the original alternator is disconnected. After the installation is complete, run throttle up to mark and set the tachometer to its appropriate RPM. If you cannot set your existing tachometer, a programmable tach like the Teleflex Model 82430P should be considered as a replacement. Should bouncing of the tachometer be observed when the batteries are fully charged, increasing the DC loads will often cure the problem.

Output Connections

The most efficient output connection is a direct wire between the alternator and the battery. DO NOT turn the battery switch off when the engine is running. Severe damage to the diodes and the regulator could result. If your battery switch is closer to the alternator than the batteries, you may connect the output cable to the common output terminal. On dual-output alternators, remove the bridge for isolated outputs and connect the cables directly to the batteries or the input terminals on the battery side of the battery switch.

Fusing

BALMAR recommends that the alternator outputs be protected by a fuse or manual reset circuit breaker. BALMAR 75, 100 and 150-amp circuit breakers are available at your local marine supply or by special order through BALMAR. (See **Figure 8**.) If the alternator is connected directly to the battery, the breaker should be located at the battery terminal.

Wire Size

Proper wire size is essential for safe and effective alternator operation. Refer to the wire chart on the last page of this manual to determine the proper wire gauge for your installation. Contact the ABYC, BIA or your marine electrician for additional information.

Alternator Temperature Sensors (MC-TS-A & MC-TS-B) - Optional

When connected to the alternator and the BALMAR MC-512 Max Charge regulator, the Alternator Temperature Sensor enables the regulator to sense when alternator temperature exceeds programmed limits. When limits are exceeded, the MC-512 responds by shutting down the voltage to the alternator and activating the alarm output. To install the Alternator Temperature Sensor:

1. Attach the positive and negative wires to the Alternator or Battery Temperature Sensor terminals on the ARS-4 or Max Charge.
2. When attaching the Alternator Temperature Sensor, connect the heavy lug terminal to the mid-case mount on your alternator. Due to the number of alternator configurations, some installations may vary. The following are standard installation details:
MID CASE MOUNT - Small Case Alternator - Remove (1) of (4) 5/32" Allen bolts, install probe, re-secure bolt.
MID CASE MOUNT - Large Case Alternator - Remove (1) of (4) 3/16" Allen bolts, install probe, re-secure bolt.
GROUND TERMINAL MOUNT - Small & Large Case - Install to 5/16" ground terminal bolt at rear of alternator.
3. If the Battery Temperature Sensor is being installed, connect the sensor lug to the negative battery terminal closest to the center of the battery bank being sensed.

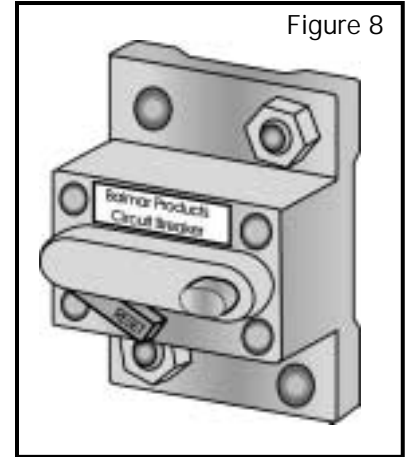


Figure 8

VI. TROUBLESHOOTING

Determining the causes of failures in an electrical system is a "step by step" process. We recommend that before you begin your search to determine if the failure can be attributed to one of the two main components of your charging system: the alternator, and/or the voltage regulator that you inspect and clean all system electrical connections first.

Most charging system problems will be corrected by performing the following steps.

1. Remove and clean all charging system electrical connections from the alternator through the batteries (this includes the ground side). Also, check the voltage regulator's harness for resistance. Wires and terminals can and will become corroded and need to be cleaned or replaced.
2. Charge all batteries to their proper fully charged state and determine if they are serviceable. If your batteries are flooded-type, use your hydrometer to determine their condition.
3. Check and tighten alternator belt. If the belt shows signs of wear or damage, now is an ideal time for replacement. Always replace existing belts with the finest quality replacements available.

After determining that your batteries and wiring are in suitable condition, use the following tests to determine if charging problems are a result of a faulty alternator or regulator. The following tests provide an opportunity to isolate the alternator, regulator and wiring harness in order to determine which component may be malfunctioning. In order to perform these tests, you will need an independent multimeter (preferably a digital type). In an emergency, a 12V light bulb can be used to help determine if power or working grounds exist. An amp meter and a battery hydrometer with a thermometer are also helpful diagnostic tools.

Voltage Regulator Test

When you have inspected and repaired any belts, wires and connections - and after you have determined that your batteries are properly charged, set your voltmeter to 12V and connect the voltmeter's negative lead to the BLACK ground wire at the regulator as shown in **Figure 9**. With the voltmeter securely connected to the regulator's ground, test for voltage at the points listed on the following page.

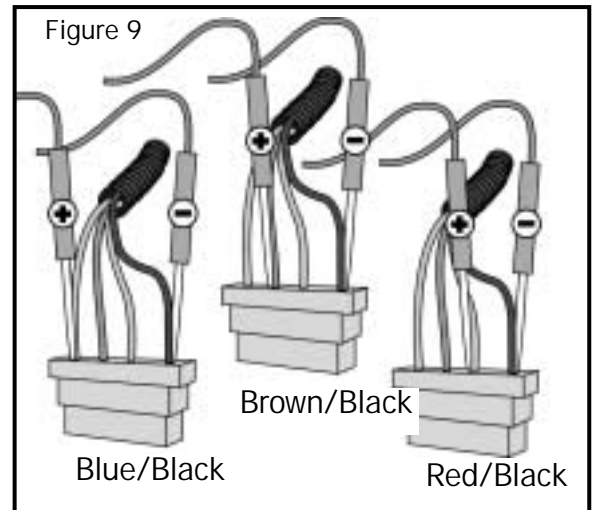


Figure 9

1. With the ignition in the OFF position and your voltmeter's ground wire connected to the regulator's ground, check for voltage on the RED (sensing), BLUE (field) and BROWN (ignition) wires in the regulator plug by inserting the positive lead of the voltmeter alongside each wire in the regulator harness plug. The voltmeter should read:

	Red Wire	Brown Wire	Blue Wire
Expected Reading	12 V *	0 V	0 V
Your Reading			

2. With the ignition in the ON position (engine not running) and your voltmeter's ground wire connected to the regulator's ground, check for voltage on the RED (sensing), BLUE (field) and BROWN (ignition) wires in the regulator plug. The voltmeter should read:

	Red Wire	Brown Wire	Blue Wire
Expected Reading	12 V*	12 V	7 - 12 V
Your Reading			

3. With the engine running at 1,400 rpm fast idle and your voltmeter's ground wire connected to the regulator's BLACK wire, check for voltage on the RED (sensing), BLUE (field) and BROWN (ignition) wires in the regulator plug. The voltmeter should read:

	Red Wire	Brown Wire	Blue Wire
Expected Reading	12 - 14V**	12 V	2 - 12 V
Your Reading			

* 11.5 - 12.8 VDC battery voltage at rest (no charging occurring). If your batteries are isolated and your RED (sensing) wire shows voltages other than those shown above, make sure that the wire is connected on the "battery" side of the isolator. The RED wire must "see" the battery directly.

** 13.5 - 14.5 VDC battery voltage when charging.

Alternator /Regulator Field Tests

Test A - The alternator and regulator can be tested for function by determining if a magnetic field exists at the alternator's pulley shaft or rear bearing. To test:

1. With the ignition in the OFF position, place the head of a steel screwdriver near the nut on the pulley shaft or near the rear bearing of the alternator. There should be no evidence of a magnetic field pulling the screwdriver toward the alternator.
2. Engage the ignition, without starting the engine, to activate the voltage regulator. If an oil pressure switch is used, a jumper across the switch will activate the regulator.
3. After allowing time for the regulator's start-up delay, place the head of a steel screwdriver near the nut on the pulley shaft or near the rear bearing of the alternator. There should be evidence of a magnetic field pulling the screwdriver toward the alternator. If a magnetic field is present, the voltage regulator, alternator brushes and rotor are likely to be working properly. If the system is not charging, remove the alternator and have it inspected by a qualified alternator shop.

Test B - If there is little or no magnetic pull at the pulley shaft or at the rear bearing, initiate the following test:

1. With the key off and the engine off, remove the large harness plug from the regulator.
2. Insert the end of a short length of electrical wire to the RED connector slot of the regulator harness and the other end of the wire to the BLUE connector slot. (See **Figure 10**.) This bypasses the regulator and tests the alternator and the harness.
3. Using your steel screwdriver, inspect for a magnetic field as described in Test A, Steps two and three.
4. If no magnetic field is present, check for voltage on the blue wire at the alternator. If voltage does not exist, the harness may be at fault. If voltage does exist at the harness, but charging is not occurring, the alternator is likely to be malfunctioning.
5. If magnetic pull does exist, proceed to Step 3 of the Voltage Regulator Test on the following page to determine if the regulator is at fault.

Test C - Testing the actual output of the alternator is known as "Full Field Testing". This can be accomplished by jumping a positive 12VDC current to the field terminal at the rear of the alternator.

CAUTION: Full field testing should **ONLY** be used if you are confident that the regulator and harness are working properly. There is a possibility that system damage could occur as a result of full field testing. Ensure that all voltage sensitive equipment is turned

Figure 10

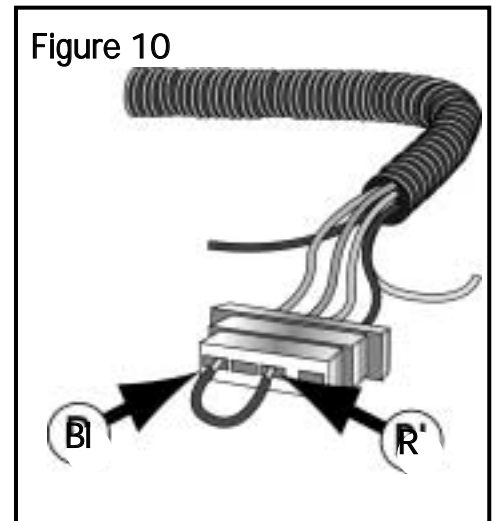
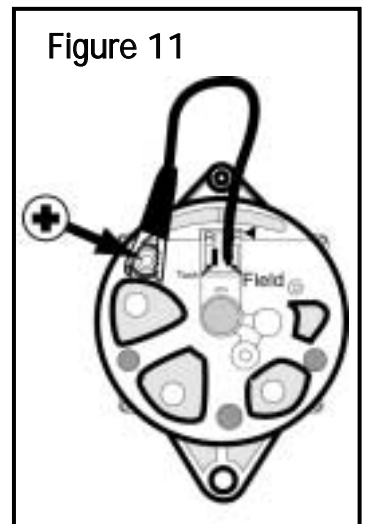


Figure 11



off prior to starting the engine. Voltage is unregulated during this test and could damage sensitive electronics. DO NOT let the engine run any longer than necessary to detect charging.

To test the alternator:

1. Disconnect the field/stator plug from the rear of the alternator and attach the end of the jumper wire to the alternator's Field terminal (F). Attach a female spade connector to the field end of the wire for a solid connection. **CAUTION:** Do not allow the wire to contact the case while it is attached to the positive post. The case is grounded and severe damage could occur.
2. Clip a jumper wire to the positive post of the alternator (see **Figure 11**), or on the battery side of the isolator, if an isolator is in use. Use a SHIELDED alligator clip for post attachment. The clip can be attached BEFORE or AFTER the engine is started. **CAUTION:** Unintentional contact between the alligator clip and the alternator case could result in damage to your electrical system.
3. The regulator is now bypassed. Voltage should rise and charging current should be present after the engine is started.
4. The motor should be run long enough to determine that charging voltage is present. Unregulated voltage can rise quickly. Do not allow extended unregulated charging to occur without carefully monitoring voltage levels.

If the alternator fails to generate voltage during field testing, a malfunction of the alternator is likely. Contact your local alternator repair shop or Balmar's technical service staff for recommendations. If readings differ substantially from those listed in the charts above, the regulator may be malfunctioning, or there may be a continuity problem. Contact our technical support staff at (360) 435-6100. Keep your recorded readings in the spaces provided below the "Expected Readings" so you can share them with the technical support person. If your readings match those listed in the charts, your regulator should be working correctly. Continue with tests below to determine if your alternator may be the source of charging difficulties. If the preceding tests do not prove the existence of a failure within the regulator or alternator, we recommend you contact a licensed marine electrician who can test your system for wiring and circuit damage or other system failures that could be responsible for charging difficulties. If you determine that repair service is necessary for either your alternator or regulator, please gather the following information before contacting our service technicians.

1. Model of alternator.
2. Model of voltage regulator.
3. Voltage readings on red, brown and blue wire at regulator with engine off, key on.
4. Voltage readings on red, brown and blue wire at regulator with engine running at a fast idle 1400 rpm.

VII. LIMITED PRODUCT WARRANTY

BALMAR warrants to the original consumer/purchaser the product is free from any defects in material or workmanship for a period of one year from the date of purchase. If any such defect is discovered within the warranty period, BALMAR will replace the regulator free of charge, subject to verification of the defect or malfunction upon delivery or shipping prepaid to BALMAR.

This warranty DOES NOT apply to defects or physical damage resulting from abuse, neglect, accident, improper repair, alteration, modification, or unreasonable use of the products resulting in breakdown, cracked or broken cases nor are parts damaged by fire, water, freezing, collision, theft, explosion, rust, corrosion or items damaged in shipment in route to BALMAR for repair. BALMAR assumes no responsibility for consequential damage or loss or expense arising from these products or any labor required for service or repair.

BALMAR WILL NOT repair or be held responsible for any product sent without proper identification and return address or RA number clearly marked on the package. You must include proof of date and place of purchase (photocopy of purchase invoice) or we cannot be responsible for repairs or replacement. In order to expedite warranty claims more efficiently, BALMAR asks that prior to returning a defective product for repair, you call their customer service department for a warranty return authorization number.

If factory service is required, you can contact our BALMAR Customer Service Department Monday through Thursday, 7:30 AM to 5:30 PM, (PST) 1-360 435-6100 ext "3".

Material required for the repair or replacement for the defective part or product is to be supplied free of charge upon delivery of the defective regulator to BALMAR, 19009 61st Ave. NE, Arlington, WA 98223. Customer is responsible for all return transportation charges and any air or rush delivery expense. BALMAR reserves the right to determine whether to repair or replace defective components.

THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS. NO PERSON, AGENT, DEALER IS AUTHORIZED TO GIVE ANY WARRANTY

BALMAR 19009 61st Ave. NE, Arlington, WA 98223 Ph: (360) 435-6100, Fx: (360) 435-3210

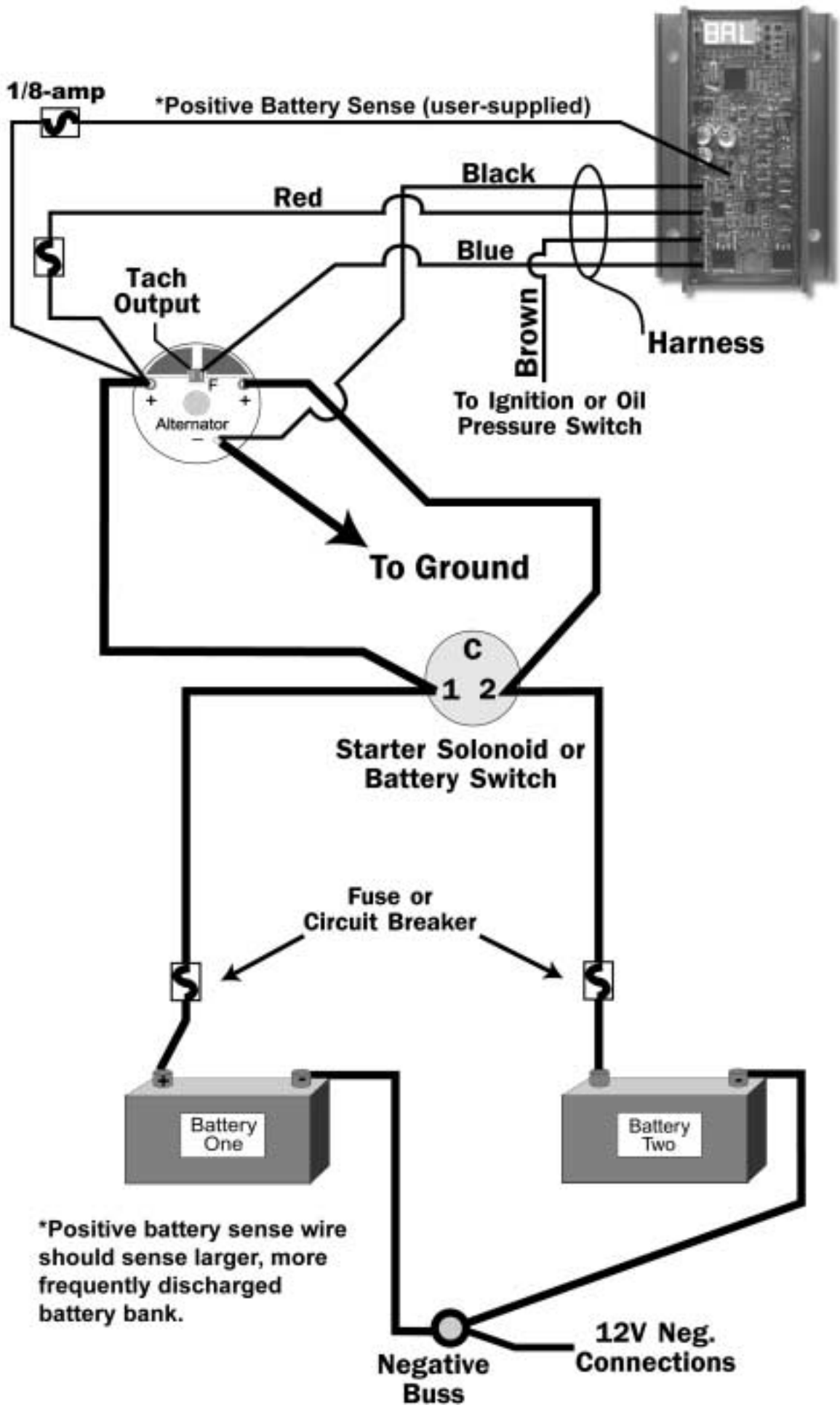
E-mail: balmar@balmar.net

Web: <http://www.balmar.net>

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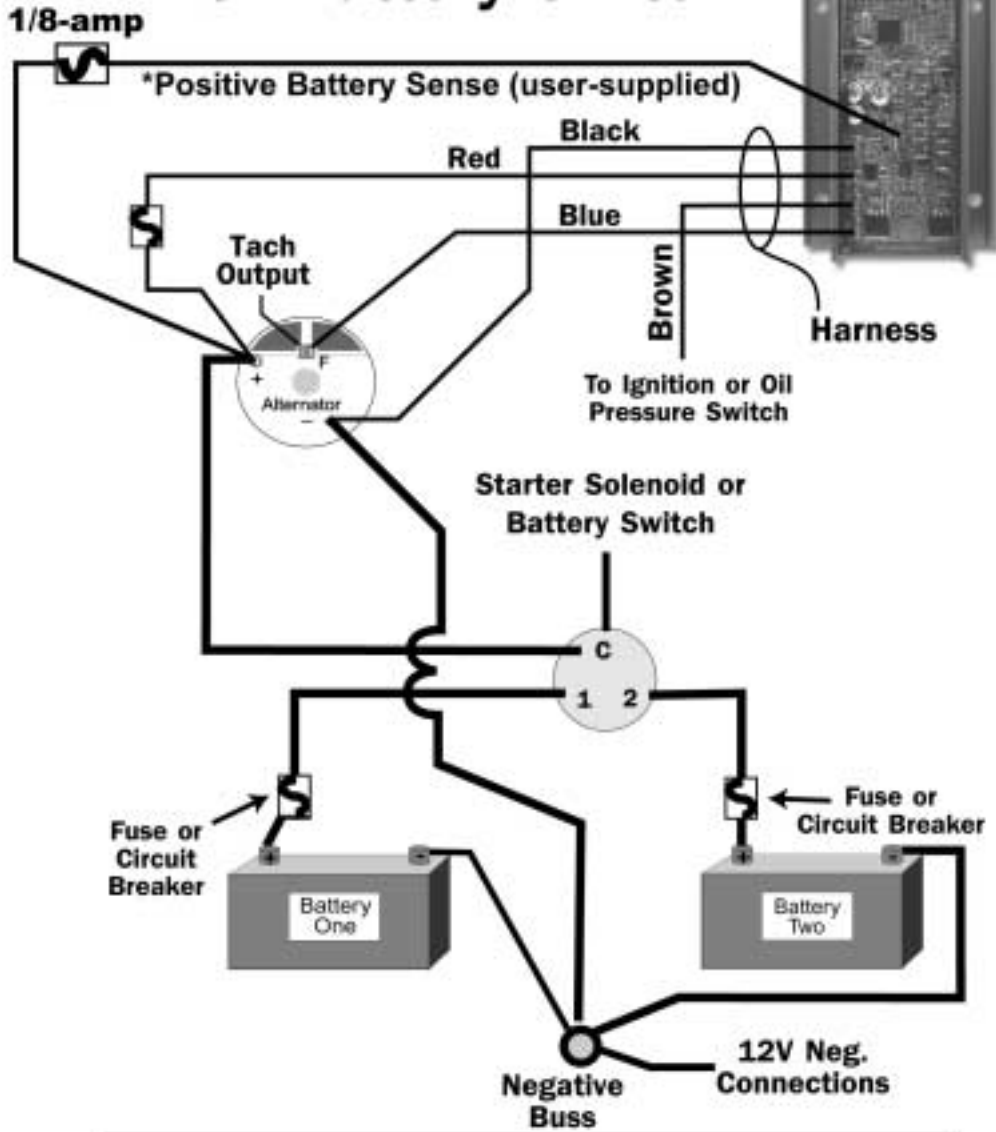
Max Charge MC-612 Regulator / Dual-Output Alternator Wiring

Battery banks must be equal in capacity and battery technology

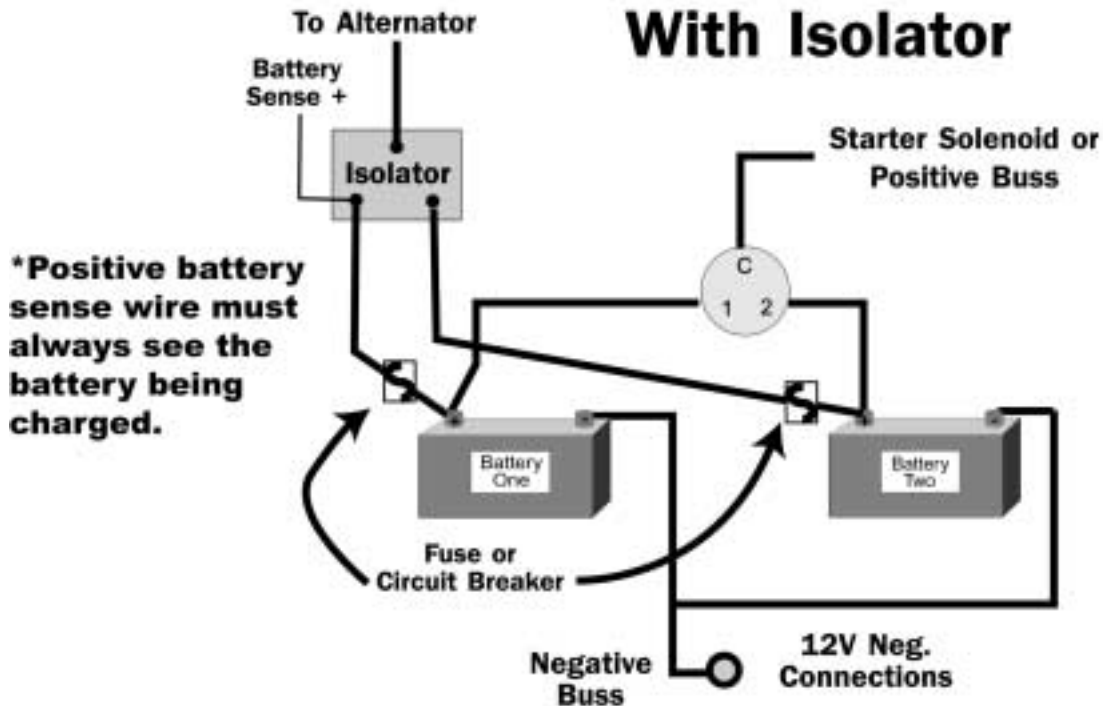


Max Charge MC-612 Regulator / Single-Output Alternator Wiring See 3% voltage loss wiring chart to determine proper cable size based on run and alternator amperage

With Battery Switch

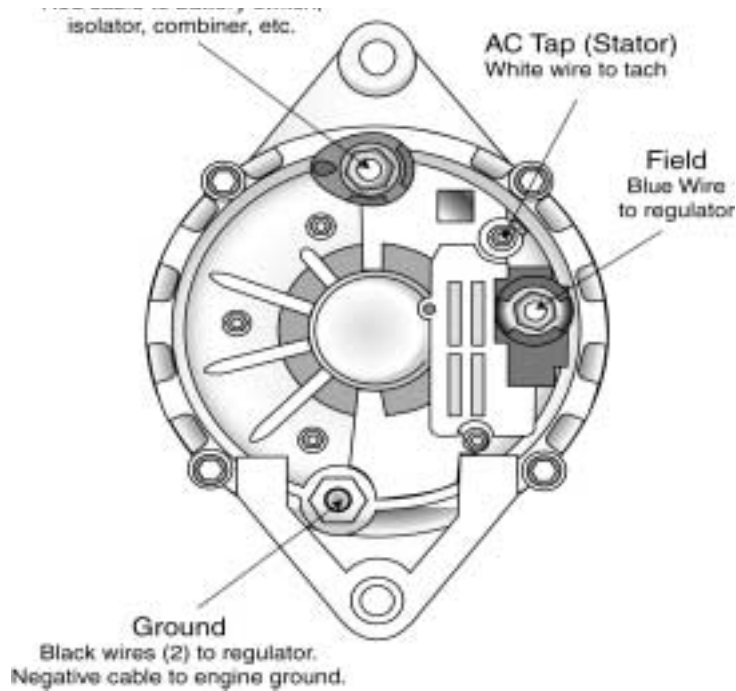


With Isolator

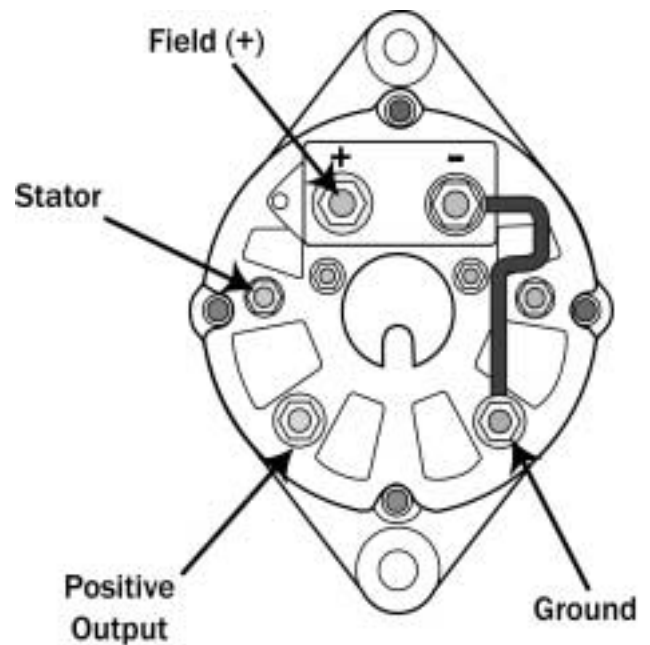


Typical Alternator Wiring Terminals

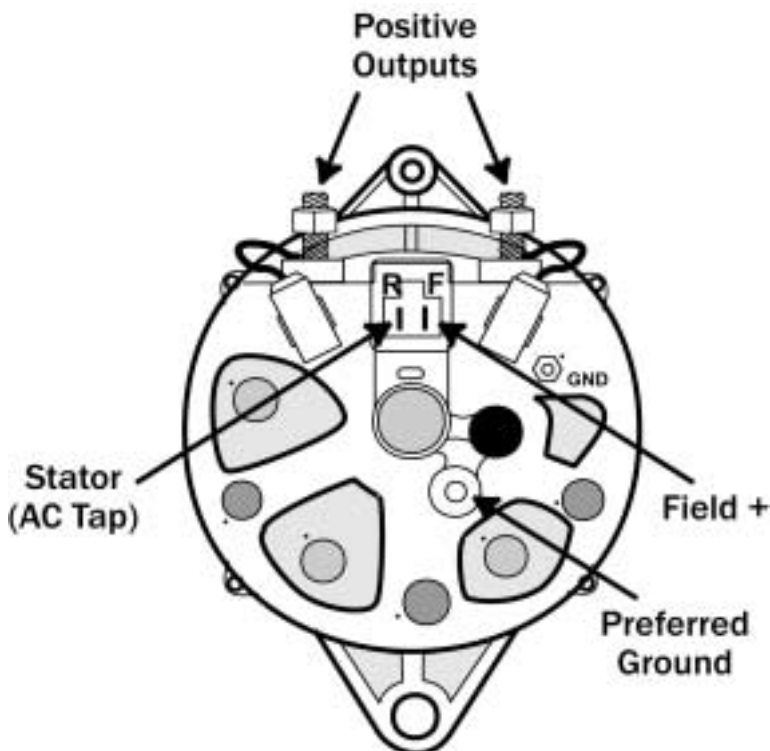
By Alternator Model (Some variations may apply)



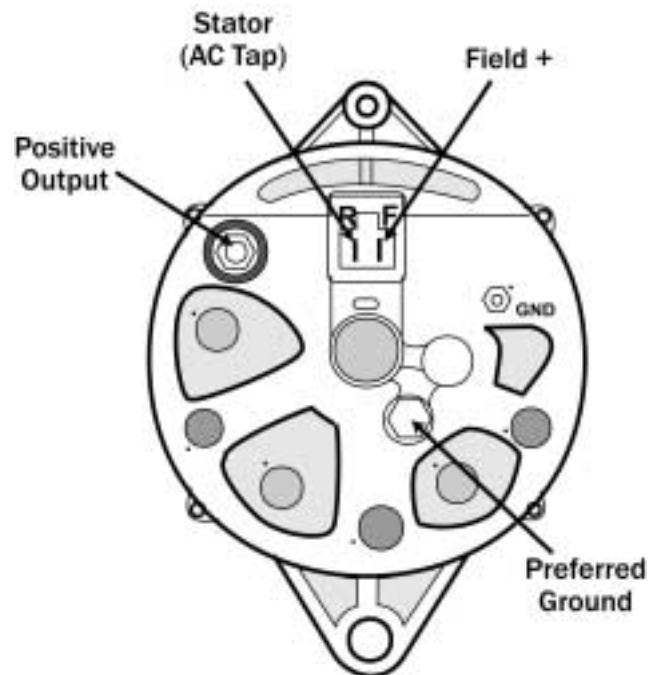
7-Series



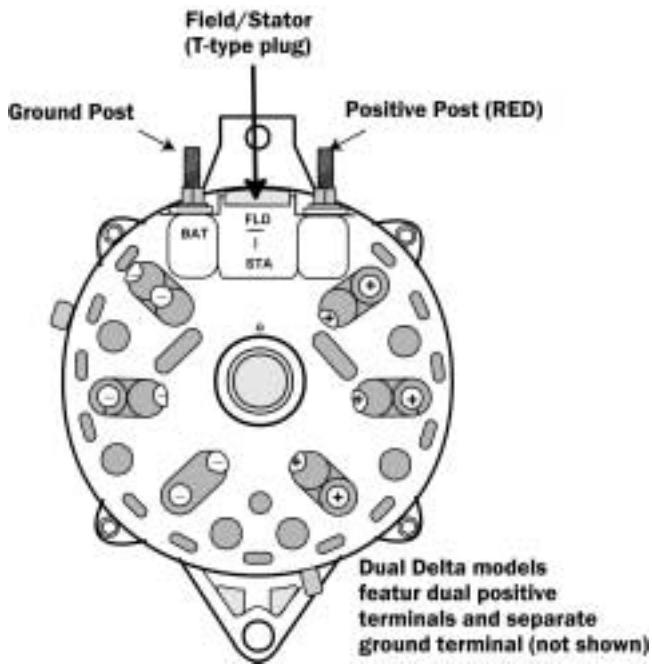
8-Series



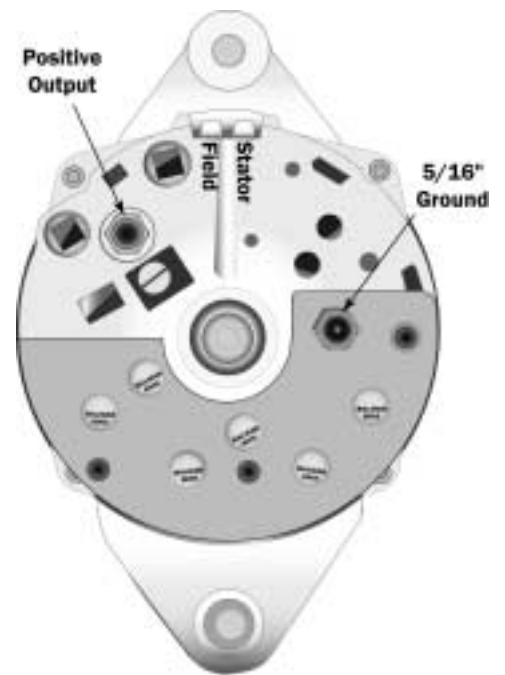
9-Series (Dual Output)



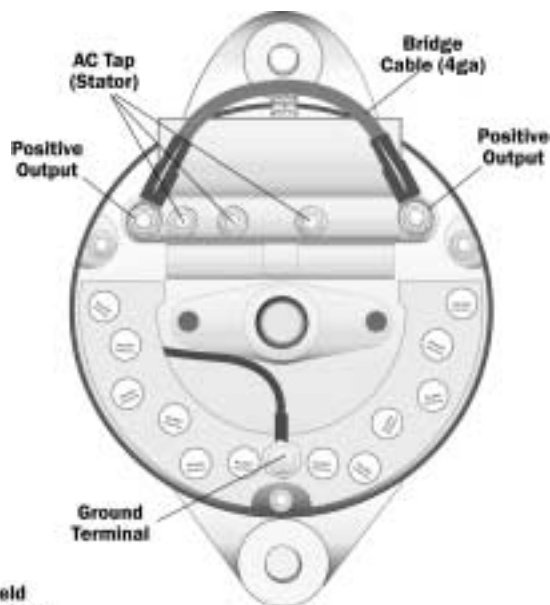
9-Series (Single Output)



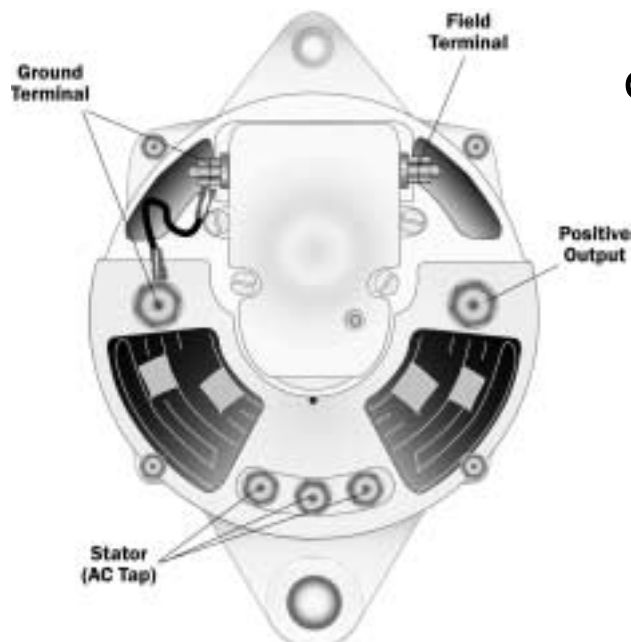
94-Series



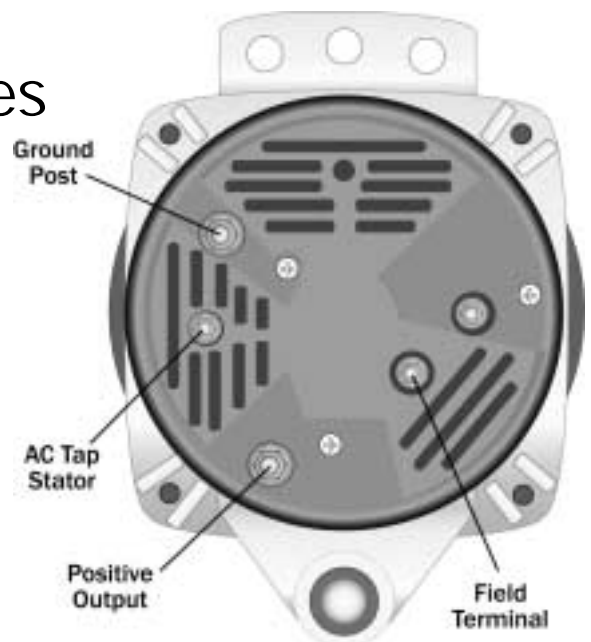
95-Series



96-Series



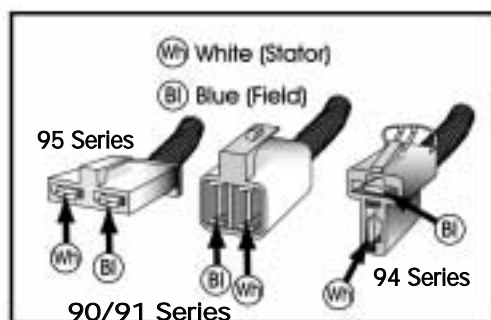
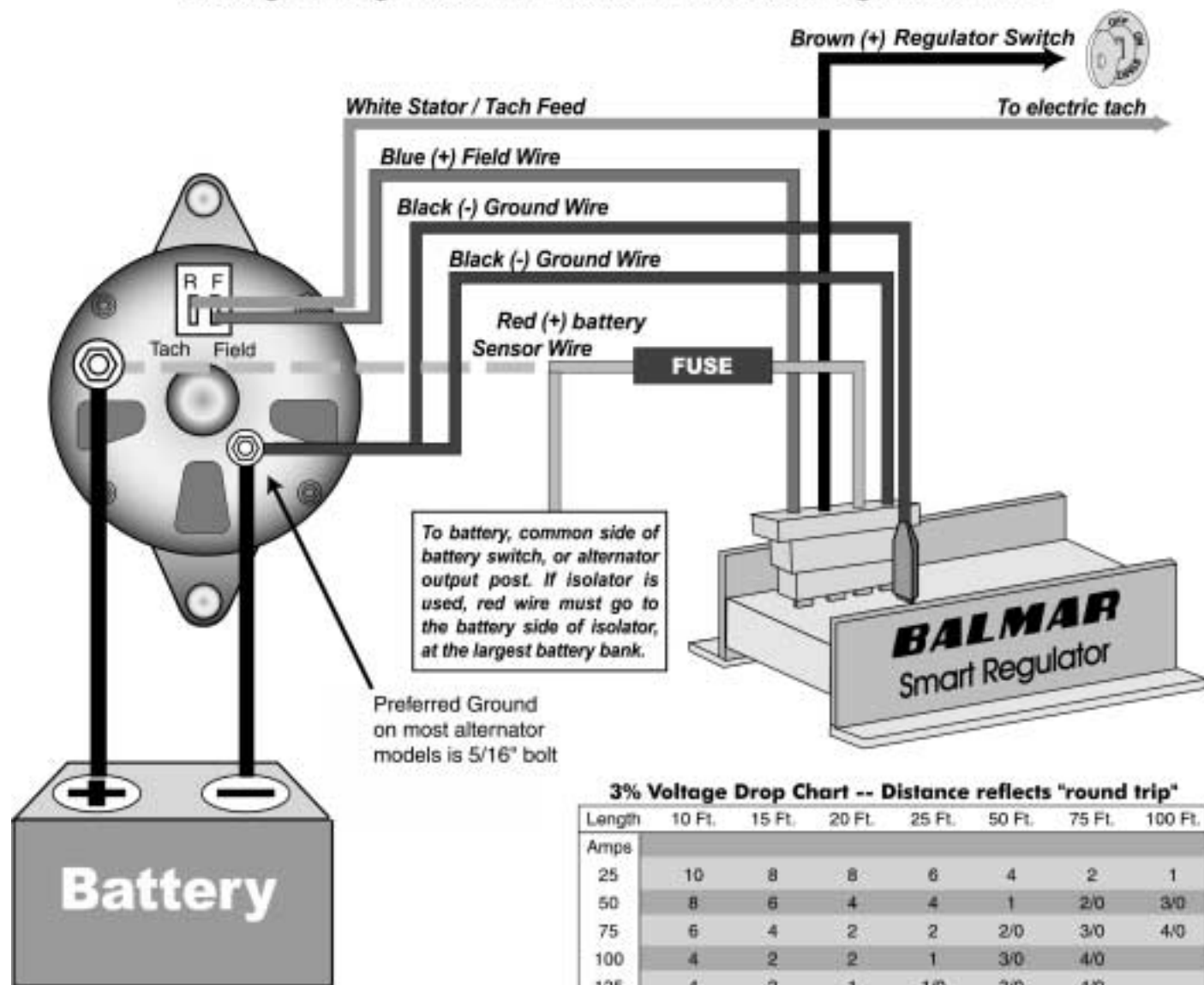
97-Series



98-Series

Balmar Alternator / Regulator Wiring

Standard wiring between alternator and regulator is shown. Actual wiring may vary by alternator or regulator model, optional connections such as temperature sensors, alarms, data outputs, etc. **Caution:** Never disconnect grounding wires from alternator or regulator while system is energized. Disconnect the battery and turn off battery switch during installation or maintenance of alternator and/or regulator unless otherwise indicated. If an Isolated Ground (IG) alternator is used, ensure that all grounding wires are connected to the isolated negative terminal.



Typical small & large case plugs

3% Voltage Drop Chart -- Distance reflects "round trip"

Length	10 Ft.	15 Ft.	20 Ft.	25 Ft.	50 Ft.	75 Ft.	100 Ft.
Amps							
25	10	8	8	6	4	2	1
50	8	6	4	4	1	2/0	3/0
75	6	4	2	2	2/0	3/0	4/0
100	4	2	2	1	3/0	4/0	
125	4	2	1	1/0	3/0	4/0	
150	2	1	1/0	2/0	4/0		
175	2	1/0	2/0	3/0			
200	2	1/0	2/0	3/0			
225	1	2/0	3/0	4/0			
250	1	2/0	3/0	4/0			
275	1/0	2/0	4/0				
300	1/0	3/0	4/0				
325	1/0	3/0	4/0				
350	2/0	3/0					
375	2/0	4/0					

Wire voltage drop chart (3%)