

3. With your voltmeter, 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 no magnetism is present, the alternator is likely to be malfunctioning.
4. If a magnetic field is present. Both harness and alternator brushes and rotor appear to be working properly. If no magnetic field is present, proceed with the next test.

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. This test eliminates both the regulator and the harness, making it easier to isolate your investigation to the alternator.

CAUTION: Ensure that all voltage sensitive equipment is turned 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. If the system is not charging, remove the alternator and have it inspected by a qualified alternator shop, or call Balmar for warranty evaluation.

To test the alternator:

1. Clip a jumper wire to the positive post of the alternator, or on the battery side of the isolator (if an isolator is in use). Use a SHIELDED alligator clip for post attachment. Unintentional contact between the alligator clip and the alternator case could result in damage to your electrical system.
2. Disconnect the field/stator plug from the rear of the alternator and attach the other 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.
3. The regulator is now bypassed. When the ignition is engaged and the motor is started, the voltage should rise and charging current should be present.
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.

Conclusion

If your readings differ substantially from the "Expected Readings" listed in the troubleshooting charts, the regulator may be malfunctioning, or there may be a continuity problem. Contact our technical support staff at (360) 435-6100. If you determine that repair service is necessary for either your alternator or regulator, please gather the following information before contacting our service technicians: Make and model of alternator. Model of voltage regulator and date of mfg. (date punched on rear side label of regulator). Voltage readings on red, brown and blue wire at regulator with engine off, key on. Voltage readings on red, brown and blue wire at regulator with engine running at a fast ideal 1400 rpm.

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, 18930 59 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 Phone: (360) 435-6100, Fax: (360) 435-3210 E-mail: balmar@balmar.net, Web: www.balmar.net

BALMAR

DC CHARGING SYSTEMS

BRS-2-12-T SINGLE-STAGE VOLTAGE REGULATOR



BALLARD COMMERCIAL INDUSTRIES, INC.
18930 59TH AVE., NE, ARLINGTON, WA 98223
ON THE INTERNET: WWW.BALMAR.NET
© COPYRIGHT 2010, BALMAR

INSTALLATION AND OPERATION MANUAL

Introduction

Recommended for use in commercial and recreational vessel applications where engines are frequently turned on and off, and battery banks are subject to infrequent deep discharge, the BRS-2-12-T voltage regulator provides a simple, single-stage source of control for all externally regulated P-type alternators.

Unlike most automotive voltage regulators, the BRS-2-12-T features a potentiometer that allows the user to increase or decrease maximum charging voltage to match the needs of most marine battery technologies. By turning the pot, the user can set the regulator for a desired target voltage.

Unpacking The Box

Your BRS-2-12-T regulator is packaged with the following items:

- BRS-2-12-T regulator
- Installation and operation manual

Your BRS-2-12-T-H regulator is packaged with the following items:

- BRS-2-12-T regulator
- 54" Wiring Harness
- Installation and operation manual

If any of the listed items is not included with your regulator kit, call our customer service department at 360-435-6100.

Locate And Mount The Regulator

Choosing a mounting location for your voltage regulator should be determined based on the following factors; distance from alternator, distance from inverters, transmitters and other sources of RF noise, convenient access and readability of the display. Ample airflow is essential for the regulator's proper operation. Ensure that the regulator is free from obstructions that restrict air movement around the regulator's aluminum heat sink. While the regulator is designed to operate safely in conditions typical of a marine engine compartment, the regulator may be better protected if mounted outside of the engine compartment.

Should it be necessary to install the regulator further than the harness's 54" length from the alternator, ensure that any wire extensions are properly connected, as resistance in the harness wiring can affect charging efficiency. If harness length must reach beyond approximately eight feet, replace the RED power and BLUE field wires with larger gauge wire that's sized to limit voltage drop to 3% or less.

Safety Considerations

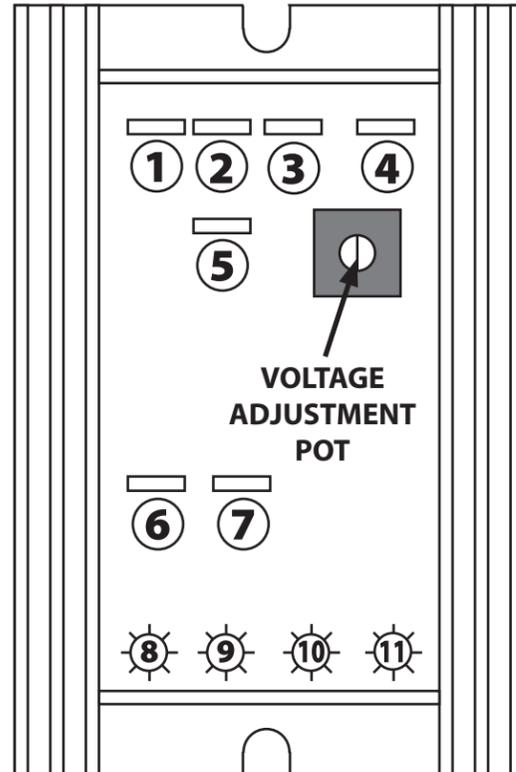
1. Always disconnect your battery banks and ensure that switches are "OFF" prior to installing your regulator.
2. Remove loose-fitting clothing or jewelry, which could become entangled in your motor or other machinery prior to installing regulator.
3. Wear ANSI-approved safety eye-wear and protective gear.
4. DO NOT attempt to modify the regulator. Modifications could result in damage to your charging system, and will void your warranty.
5. Do not attempt installation if you are tired or fatigued.
6. Ensure that the engine has cooled before initiating installation.
7. Do not attempt regulator installation while using alcohol or medication that could impair your judgment or reaction time.
8. Always use the right tool for the job. Improper tool use may damage regulator or your vessel, and could result in personal injury.
9. Take time to read the manual. Equipment damage and possible injuries may result from an incomplete understanding of the installation and operation of the MC-612 regulator. If you are unfamiliar with marine electrical systems, consult with a licensed marine electrician.

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 the use of a qualified marine electrical technician.

Basic Wiring Installation

The regulator's wiring harness includes six wires required for standard installation. Four of those wires are connected to the regulator via a Ford-style plug connector that's pre-installed on the regulator. These wires include the Stator (WHITE), Power (RED), Ignition (BROWN) and Field (BLUE). In addition, the harness includes a separate Ground. The proper terminal connection points for these, and additional wiring connections, are illustrated below.

1. **FIELD OUTPUT** - Provides external (P-type) alternator field control. BLUE wire in regulator wiring harness.
2. **STATOR INPUT** - Provides unrectified voltage input from the alternator's AC stator circuit. WHITE wire in regulator's wiring harness.
3. **POWER INPUT** - Supplies power to operate the regulator and provides battery voltage for sensing. RED wire included in wiring harness.
4. **IGNITION INPUT** - Connects to a switched source of battery voltage (to ignition switch or oil pressure switch). BROWN wire in regulator wiring harness.
5. **TACHOMETER OUTPUT** - AC voltage output to provide a signal for an electrical tachometer. User supplied wire is required.
6. **GROUND INPUT** - Connects regulator to system ground via alternator ground terminal. Loose BLACK wire included in regulator wiring harness or to second wiring harness.
7. **UNDERVOLTAGE SENSE** - Connects to positive battery voltage.
8. **GREEN INDICATOR LED** - Indicates that the regulator's power is on.
9. **RED INDICATOR LED** - Indicates that the alternator is providing stator output. Can be used as a signal that the alternator is providing charging output to the batteries.
10. **YELLOW INDICATOR LED** - Indicates that the regulator is providing field output to the alternator.
11. **ORANGE INDICATOR LED** - Illuminates if battery voltage is below 12.8 volts while the regulator is in operation.



Target Voltage Adjustment

The BRS-2-12-T provides the ability to adjust the maximum (target) charging voltage, making it possible to ensure that charging is tailored to the type of battery technology being charged. Before adjusting the maximum charging voltage, consult with the manufacturer of the batteries being charged to determine the recommended target charging voltage.

Once you have determined the proper target voltage for your battery type, be sure that your batteries are fully charged prior to adjustment. Once the engine is started, the voltage should climb to the factory-set target voltage of 14.1 volts. When the voltage has climbed to 14.1 volts and has stabilized at that voltage level, slowly turn the adjustment pot to raise or lower the target voltage value. Turn the pot counterclockwise to lower voltage. Turn the pot clockwise to raise voltage. Connecting an accurate digital multimeter, set on DC volts, between the RED power wire and ground will allow you to monitor changes in charging voltage as you make your adjustments.

Adjust the pot in small increments as you make your adjustments, and allow the system voltage to stabilize for a few moments to determine how much more adjustment is required to reach the desired target voltage. Continue adjustment until the desired voltage is indicated on your meter.

Voltage Regulator Testing

Set your voltmeter to 12VDC and connect the negative lead to system ground.

1. With the ignition turned OFF, check voltage on the RED (power), Secondary RED on Terminal #12 (voltage sense) BLUE (field) and BROWN (ignition) wires in the regulator plug.

Voltages should be as follow:

- RED wire equal to battery voltage
- Terminal #12 RED wire equal to battery voltage
- BLUE wire zero volts
- BROWN wire zero volts

2. With the ignition in the ON position (engine not running), check voltage on the RED (power), Secondary RED on Terminal #12 (voltage sense) BLUE (field) and BROWN (ignition) wires in the regulator plug:

- RED wire equal to battery voltage
- Terminal #12 RED wire equal to battery voltage
- BLUE wire between 4V and 11V
- BROWN wire equal to battery voltage

PLEASE NOTE: In systems where the ignition (BROWN) wire is supplied power via an oil pressure switch, jump directly from test #1 to test #3.

3. With the ignition in the ON position (with engine running at 1,400 rpm fastidle), check voltage on the RED (power), Secondary RED on Terminal #13 (voltage sense) BLUE (field) and BROWN (ignition) wires in the regulator plug. Voltages should be as follow:

- RED wire equal to battery voltage
- Terminal #12 RED wire equal to battery voltage
- BLUE wire between 4V and 11V
- BROWN wire equal to battery voltage

If voltage is not present on the RED, the BROWN and the Positive Battery Sense Wire, the regulator will not work. If voltage is as expected at the RED the BROWN and Positive Battery Sense wire, and there is zero, or an unexpected voltage reading at the BLUE wire, contact our technical support staff at (360) 435-6100, or e-mail us at balmar@balmar.net.

If all voltages at the regulator meet expectations, yet the alternator is not producing charging current, test the alternator. The following tests are recommended for determining alternator functionality.

Alternator Testing

TEST #1 The following test is used to isolate the alternator and determine if the failure is a result of the alternator. Once again, testing at either the alternator or regulator is only effective if the wiring, fusing and batteries have been determined to be in correct working order. 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 tip 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. (A slight amount of magnetism may be present, due to residual voltage in the alternator.)
2. Engage the ignition, without starting the engine, to activate the voltage regulator. If an oil pressure switch is used, a jumper between the RED and BROWN wires in the Ford-style plug 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 substantial magnetic pull. If a magnetic field is present, the voltage regulator, alternator brushes and rotor are likely to be working properly.

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

With the key off and the engine off, remove the large harness plug from the regulator.

1. 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. This bypasses the regulator and tests the alternator and the harness.
2. Using your steel screwdriver, inspect for a magnetic field as described above.