

BALMAR[®]

**ARS I
ALTERNATOR
&
REGULATOR**

**INSTALLATION/
OWNERS MANUAL**

BALMAR[®] 27010 12TH AVE N.W. STANWOOD, WA 98292
PHONE 360-629-6100 FAX 360-629-3210

6-93

A. GENERAL INFORMATION

If you are not experienced at this, a qualified marine electrician, who has done this before, may be a wise investment. An alternator is only as good as the wiring and battery installation.

1. THE **BALMAR** MARINE ALTERNATOR is engineered for superior performance and reliability over any comparable size stock alternator. Care must be taken during installation to provide adequate mounting strength and correct belt alignment to ensure proper output and service life.

2. RATING: The AMPERAGE output stamped on the alternator is the SAE cold (80°) rating. Hot or running rating may degrade output by 5-20%, depending on model and application.

3. VOLTAGE CALIBRATION:

All external regulated alternators are factory set about 14.00 volts, the proper charging voltage for lead acid and Gel-Cell type batteries. You may make adjustments to meet your battery mfg. recommendations. To do so locate the small plastic slotted screw on the top (**BRS**) or the right face of the (**ARS**) regulator. Using a small blade screw driver gently turn the screw clockwise to increase voltage and counter clockwise to decrease voltage.

Do not adjust past stops. After you finish your adjustment you may cover the screw area with a dab of silicone sealant (optional).

4. ROTATION: **BALMAR** alternators are designed to operate in a Clockwise rotation when looking at the pulley. If you are going to install the alternator as a second alternator facing the engine or on an opposite rotation (right hand) engine, the pulley SHOULD BE KEYED OR PINNED. We can provide a keyed unit, or key an existing one, and include bi-directional fan for \$ 50.00 net.

5. GROUNDING:

BALMAR alternators are case ground. **IT IS EXTREMELY** important that the alternator is properly grounded. We strongly recommend you run a cable (same size as output cable) from the rear of the alternator to the battery or ground buss. Some applications require a completely **isolated (floating) ground**. All 'D' (dual output) models are available in this configuration (one pos., one neg. terminal). NOTE: This now becomes a single output with the ground totally isolated from the case. Cost:

\$50.00 net

6. NOISE:

1. MECHANICAL. A slight whine from the alternator under load is normal. When you hear the whine, you will know the alternator is charging. When the alternator is producing High amperage, it will be very hot. A new alternator may drag when spun by hand, this is caused by the wood separators in the stator and will wear in as the alternator is used.

2. ELECTRICAL. The product has been designed to minimize electrical noise. However, in some cases noise or interference may persist. Filters are available for special problems.

7. MAINTENANCE: Your alternator is corrosion proofed and white powder coated to help prevent deterioration in a marine environment. Keep the alternator clean and dry. Check belt tension regularly, replacing any suspect belts. Check the mounting brackets for cracks or wear. Clean and tighten electrical connections periodically. CHECK YOUR GROUNDS.

8. What should I carry for spares?

We offer an offshore kit which includes brushes, bearings and diodes for each model alternator. You should also carry a couple of extra belts. For extended cruising, a spare regulator and perhaps a spare alternator is highly recommended. Check bearings for excessive noise after 1000 to 2000 hours of heavy use. Complete service overhaul is available at the factory.

9. MANUFACTURER: **BALMAR** High Output Marine Alternators are special marine models manufactured exclusively for **BALMAR** by Lestek Mfg. For warranty service call 1-800-433-7628. Designs of these alternators are protected under U.S. patents. For service on the voltage regulators contact **BALMAR** directly.

B. GENERAL MOUNTING TYPE INFORMATION

1. **90** series fits many of the import styles with double mounting foot. Hitachi 55 amp are often direct fit, their 80 amp model requires a 10mm bushing (\$5.00 net from **BALMAR**) and their 35 amp (6mm) mounting is usually drilled out to accept a 5/16 hardened bolt. The 35 amp Hitachi often requires bracket fabrication. The Mitsubishi 50 amp requires a spacer approx. 1". Due to the many domestic and international configurations, your installer may have to adapt the basic mounts to fit your needs.

2. 91 series replaces most domestic styles using a single mounting foot. The foot is machined to 1" and spacers are provided for other widths. A special 2" Delco style foot is available on special order.

C. GENERAL ALTERNATOR RECOMMENDATIONS PER BELT AND ENGINE SIZE

Use our model 90/91-75 75 amp. alternator if your engine uses one 3/8" V belt, or you have small engine.

Use our model 90/91-100 100 amp. alternator if your engine uses two 3/8" V belts or one 1/2" V belt and your engine is over 20 HP. Remember a smaller engine can be used, but less power will be available for propulsion.

Use our model 90/91-150 150 amp. alternator if your engine uses two 3/8" or two 1/2" belts and your engine is over 30 HP. Generally one 1/2" belt will suffice, but your belt life will be reduced and may require frequent tensioning.

You may use any of our alternators if your engine uses two (A) 1/2" or (B) 5/8" V belts, and your engine is over 40 HP.

Our 75 and 100 amp. small case units come with a deep V pulley that will accommodate from 3/8" to 1/2" single belts or metric equivalents. Dual deep V pulleys are available.

Sometimes after examination, it is determined 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.

Speaking of V Belts, as you may have noticed, we have emphasized belt sizes and how many. Belts are not created equal, and in most instances you get what you pay for. Buy a good belt like a Gates "Tri-Power", Dayco "Topco", or equivalent industrial rated type.

If your battery banks or your load capacity is extremely large, or your engine cannot accommodate the proper size belt or belts to run a High output alternator, you may consider one of our **Power Charger** or **Aqua-Pacs** to solve your charging requirements.

You may also want to turn the alternator off if your engine is

very small, or you will be motoring for long periods and you know your batteries are fully charged. On our externally regulated models you may turn the alternator off by installing a BRASS toggle switch, rated at 6 amps, in the Brown ignition wire of our regulator harness.

Call us for information or help with non standard installations.

D. INSTALLATION

1. MOUNTING: Remove the existing alternator and compare mounting points. Many alternators are directly replaceable. However, if your unit is not, a simple bracket can be fabricated at a local machine shop. A variety of adjustment arms are available from a local auto supplies. Make sure your belt alignment is correct.

2. PULLEY: Small case 75 and 100 amp models come standard with a single deep V 2.7" pulley. All other have dual 1/2" standard. Other sizes are available. The 92, 94, 95, and 96 series alternators should be generally used with dual belts. When changing pulleys or using your original pulley, tighten the shaft nut to 40-60 foot pounds. If a torque wrench is not available, insert a 15/16" hex wrench in the end of the shaft and tighten the nut until the spring washer is just flattened.

3. BELTS: Install a new belt of proper size. **THE BELT MUST BE TIGHT.** Run the engine for 15 minutes and retighten. To test for proper tension with the ENGINE OFF, use a 15/16" socket on the hex nut of the alternator pulley and try to turn it (clockwise). If the pulley turns, the belt can slip. A slipping belt will create heat and cause premature bearing failure (not covered by warranty). If possible check the belt tension EACH TIME the engine is first started, just as you would the oil and water. This is especially important on single belt installations. **ALWAYS CARRY SPARE BELTS.**

E. WIRING: BRS (standard) and ARS (optional)

1. REGULATOR AND PLUG: All alternators use an external regulator (**BRS** is standard). Install the regulator (wiring harness provided) on a flat surface near the engine. The area should be as cool and dry as possible. Regulator wires **MUST NOT** be extended to a length greater than 10 feet.

2. The DUPLEX PLUG plugs into rear of the alternator. Make sure both connectors are firmly seated. Pushing on the back of the female slip-on terminal with a small blade screw driver can be used to press them home. The FOURPLEX (one slot is not used)

plugs into the regulator with the blank closest to the single grd. terminal.

3. BROWN wire connects to the Ignition switch or an oil pressure activated switch. This wire **MUST** be connected to a switched + direct 12 VDC source. If this wire is not switched, you will have a constant 6 amp draw and a hot alternator. This wire also provides additional voltage sensing. **Do not connect to the coil of a gas engine, through an "Idiot lite", or in line with a diode, hour meter etc.**

4. BLACK ground wire connects to the alternator ground terminal

GROUND MUST BE GOOD TO REGULATE

5. RED wire (12v. power supply) is attached to an alternator output terminal. If a battery isolator is used, connect it to the positive terminal of the starter. A 6 amp in line fuse is recommended per ABYC.

6. BLUE wire is used to excite the alternator field. This called the F or field wire. A 6 amp in line fuse is recommended per ABYC.

7. BATTERY SENSE: These connections provide the regulator information about the batteries state of charge. At least one sense wire should be connected. This can be directly to the battery or to the common terminal of the battery selector switch. A 1 amp in line fuse is recommended per ABYC. Note: the brown wire is always sensing.

The **BRS** has one additional battery sense terminal .

The **ARS** has the ability to sense up to three battery banks.

These sense wires are connected directly to the battery positive terminals or to the common of the battery selector switch. Use # 16 red wire and standard 1/4 " electrical female connectors.

8. ISOLATION:

Dual output models: Each terminal provides proper charging to a separate battery or bank. Bridging or connecting the two terminals makes the output single. **DO NOT OPERATE** without each main output terminal connected to a battery or bridged. To charge a third or fourth separate battery, a two bank isolator (I-952, I-122 or larger) must be installed on each output terminal. The **D** models have two small terminals on top of the alternator. These power the optional PB (Power Boost) feature and are otherwise not used.

9. BATTERY ISOLATORS:

A battery isolator may be used with any single output model. Its capacity must equal the maximum load or alternator output at the maximum RPM operated. To compensate for the .5 to .8 volt drop, sensing must be on the battery side. **BALMAR** offers a full range of stand alone Isolators.

10 METERS:

Most standard in line Amp meters are UNDER RATED for our alternators and along with idiot lights, must be removed from the system. You may replace it 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 such as our DCA-100 or DCA-200 must be used.

11. 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 (92,94,95,95, series) have 12 poles and the small case alternators (90/91 series) have 14 poles.

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 to 14 poles.

The WHITE wire 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 tachometer to appropriate RPM.

12. OUTPUT WIRE SIZE: Proper wire size must be used due to increased amperage. Use fine stranded wire. For 75 amp models, runs under 12' may use #4, over 12' #2. For models 100 amps and over, from 0'- 12' use #2 wire; from 12' - 20' use #0 wire. Because heavy wire is used, it must be supported to prevent breakage or shorting of the alternator ring lug. A short run of #2 wire (2'-3') to a terminal block, then heavy wire to the batteries would be one installation method. Consult standard wire size tables, ABYC, BIA or your marine electrician for additional information

13. OUTPUT CONNECTIONS: The best choice is direct from the alternator to the battery. If the battery selector switch is closer, you may connect the wire (single output alternators) to the common output terminal. On **D** (dual output) alternators,

batteries have the least internal resistance, in the shortest period of time.

2. When one of the batteries reaches its max voltage, the voltage will be held constant, and the batteries which may not have reached max voltage will receive most of the current. (note there will be a slight drop in current as the voltage increases the last few tenths)

3. As the finish stage begins, current declines until just enough is available to maintain voltage. It is not necessary to hold voltage at a high level now, so it is allowed to vary between 13 to 13.8V This feature assures batteries will stay charged yet not cause excessive battery heat when engines are operated for longer periods. At this time the (B) L.E.D. may blink, indicating the field needs very little power to meet the system demands. When load is applied the voltage will naturally drop until there is a slight decrease in battery power, at which time the alternator will again pick up the load.

4. **SPECIAL GROUND SENSE:** The standard (black) systems ground wire attaches to the back of the alternator. This is sufficient for most installations. The sense ground is connected to the system ground by the short jumper wire on top of the *ARS*. The most accurate ground sense would be directly between the regulator sense and the battery negative. To do this simply remove the jumper and connect a new wire from the spade terminal closest to the heat sink directly to the negative terminal or negative buss. Use a #16 or larger wire.

5. **ARS ADJUSTMENTS:** Voltage adjustments should be made with the batteries fully charged. This is the trip point where the regulator changes from constant current to constant voltage (or voltage regulated), mode, and after all batteries are fully charged enters finish mode until again called into constant current mode by seeing discharged batteries.

CURRENT LIMIT ADJUSTING: This control allows you to limit the current (amps) to match the needs of the batteries, or other limitations such as horsepower available, belt size, etc. This is accomplished by adjusting the pot on the left as you face the regulator. Counter clockwise will limit current. Ideally the current available to the batteries should be about 20-25% of total battery capacity. You must also allow for house load plus a little extra for other losses. If you frequently run heavy house loads such as large inverters, refrigeration etc., allow sufficient power to drive them. This may mean leaving the adj. in the max. setting. When left in this max. current position, the unit will trip to constant voltage mode when the voltage trip point is met. This adjustment is pre-set at max. current at the factory. **Do not force the adj. pot past it's stops.**

H. TROUBLE SHOOTING

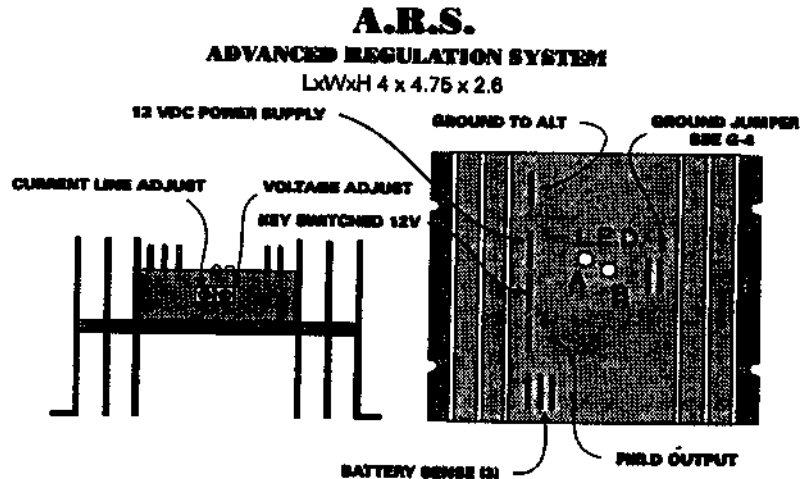
1. USING THE L.E.D. FOR DIAGNOSTICS:

a. The first light(A) is activated by switched 12 or 24 volts. IF the light does not turn on check both ends with a meter or light bulb. A jumper from a known dc + source, directly to the regulator brown wire connection, works if a oil pressure type switch is used.

b. The second (B) light indicates the regulator is energizing the field. Don't forget the *ARS* has a 30 second delay before the light turns on. Note on the *BRS*, both L.E.D.'s turn on at once.

If the (B) light fails to turn on,

1. Check all connections, particularly the red power supply
2. Check the grounds, on the *ARS*, the jumper must be in place, or a separate sense ground installed.



3. IF all connections prove good, call *BALMAR* customer service for additional help.

2. TEST EQUIPMENT:

- a. A good test quality volt meter (preferably digital).
- b. In an emergency, a light bulb can verify power available or a working ground
- c. A battery hydrometer with thermometer.
- d. An amp meter (not required but helpful).

3. GENERAL CHECK OUT PROCEDURE:

- a. Remove and clean all charging system electrical connections (this includes the ground side).
- b. Charge all batteries to their proper full charge state and determine if they are serviceable.
- c. Check and tighten fan belts.

MOST CHARGING SYSTEM PROBLEMS will be corrected by

CURRENT LIMIT ADJUSTING: This control allows you to limit the current (amps) to match the needs of the batteries, or other limitations such as horsepower available, belt size, etc. This is accomplished by adjusting the pot on the left as you face the regulator. Counter clockwise will limit current. Ideally the current available to the batteries should be about 20-25% of total battery capacity. You must also allow for house load plus a little extra for other losses. If you frequently run heavy house loads such as large inverters, refrigeration etc., allow sufficient power to drive them. This may mean leaving the adj. in the max. setting. When left in this max. current position, the unit will trip to constant voltage mode when the voltage trip point is met. This adjustment is pre-set at max. current at the factory. **Do not force the adj. pot past it's stops.**

H. TROUBLE SHOOTING

1. USING THE L.E.D. FOR DIAGNOSTICS:
 - a. The first light(A) is activated by switched 12or 24 volts. IF the light does not turn on check both ends with a meter or light bulb. A jumper from a known dc + source, directly to the regulator brown wire connection, works if a oil pressure type switch is used.
 - b. The second (B) light indicates the regulator is energizing the field. Don't forget the **ARS** has a 30 second delay before the light turnson. Note on the **BRS**, both L.E.D.'s turn on at once.
If the (B) light fails to turn on,
 1. Check all connections, particularly the red power supply
 2. Check the **grounds**, on the **ARS**, the jumper must be in place, or a separate sense ground installed.
 3. IF all connections prove good, call **BALMAR** customer service for additional help.
2. TEST EQUIPMENT:
 - a. A good test quality volt meter (preferably digital).
 - b. In an emergency, a light bulb can verify power available or a working ground
 - c. A battery hydrometer with thermometer.
 - d. An amp meter (not required but helpful).
3. GENERAL CHECK OUT PROCEDURE:
 - a. Remove and clean all charging system electrical connections (this includes the ground side).

- b. Charge all batteries to their proper full charge state and determine if they are serviceable.
- c. Check and tighten fan belts.

MOST CHARGING SYSTEM PROBLEMS will be corrected by performing the above checkout. Failing to do the above steps first, can cause you to waste valuable time in the other trouble shooting procedures which follow:

Most common electrical system problems.

- * **BAD GROUND SOMEWHERE IN SYSTEM**
- * Poor or dirty battery cable connections
- * Improper wire size
- * Loose fan belts
- * Sulfated or worn out batteries
- * Failed regulator

Batteries which have remained in a discharged state for long periods will often be sulfated and will NOT accept a charge from the alternator. See your battery expert.

90% of all Alternator front bearing failures are the result of a loose fan belt. A Discolored pulley and alternator shaft is evidence of this condition.

Test the BROWN wire at the regulator plug. Key OFF, no voltage. Key ON, approximately battery voltage (within 1 volt).

Test the RED (A) wire at the regulator. It must ALWAYS read battery voltage.

Test the BLUE (Leave connected) (F) wire at the Regulator and at the Alternator Plug. KEY ON & ENGINE OFF, 7-12 volts (24 VDC alternators, 14-24 Volts). KEY ON & ENGINE RUNNING, 4-12 volts, (24 VDC alternators, 2-28 Volts). This terminal supplies power to the alternator, and the voltage will vary depending on load.

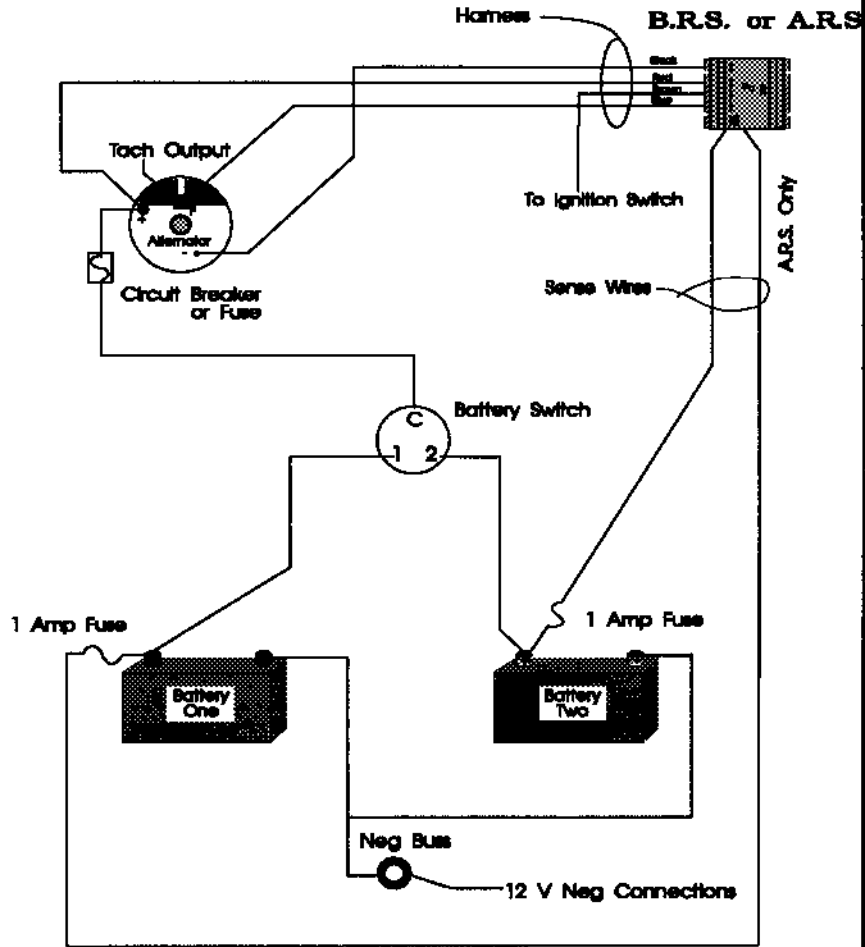
4. TESTING: ALL ALTERNATORS.

Test the ALTERNATOR FIELD. With the KEY ON and the ENGINE OFF, take a screw driver and hold it close (1/2") to the nut inside the pulley, or to the center of the rear of the alternator. You should feel a strong magnetic field (pulling the screw driver towards the alternator). If so, the alternator rotor and brushes are OK. If not, please contact the factory for instructions.

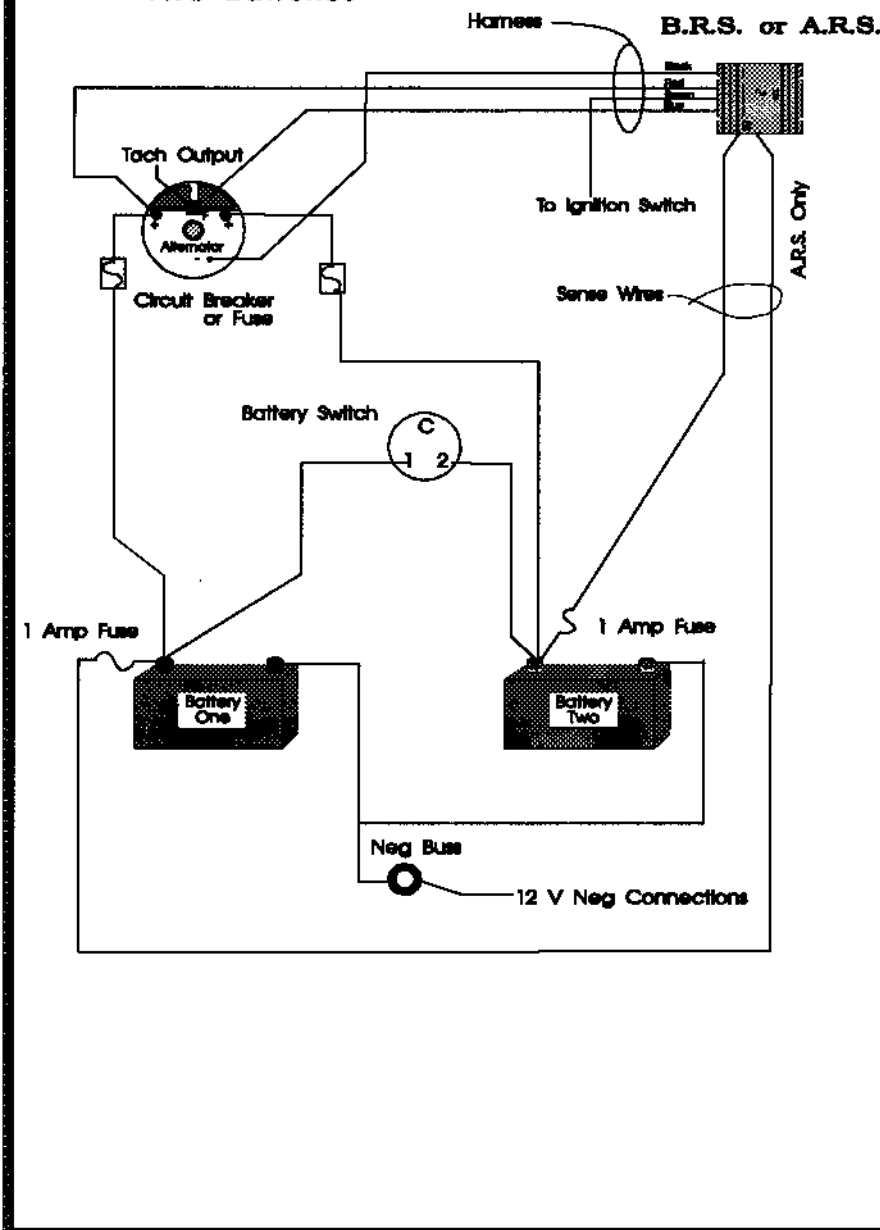
5. ASSISTANCE: If you have gone through the above procedure and cannot identify the problem, please have the following information handy, BEFORE you call us.

- * The model of the alternator.
- * The approximate age of the alternator.
- * The number and capacity of your battery banks.

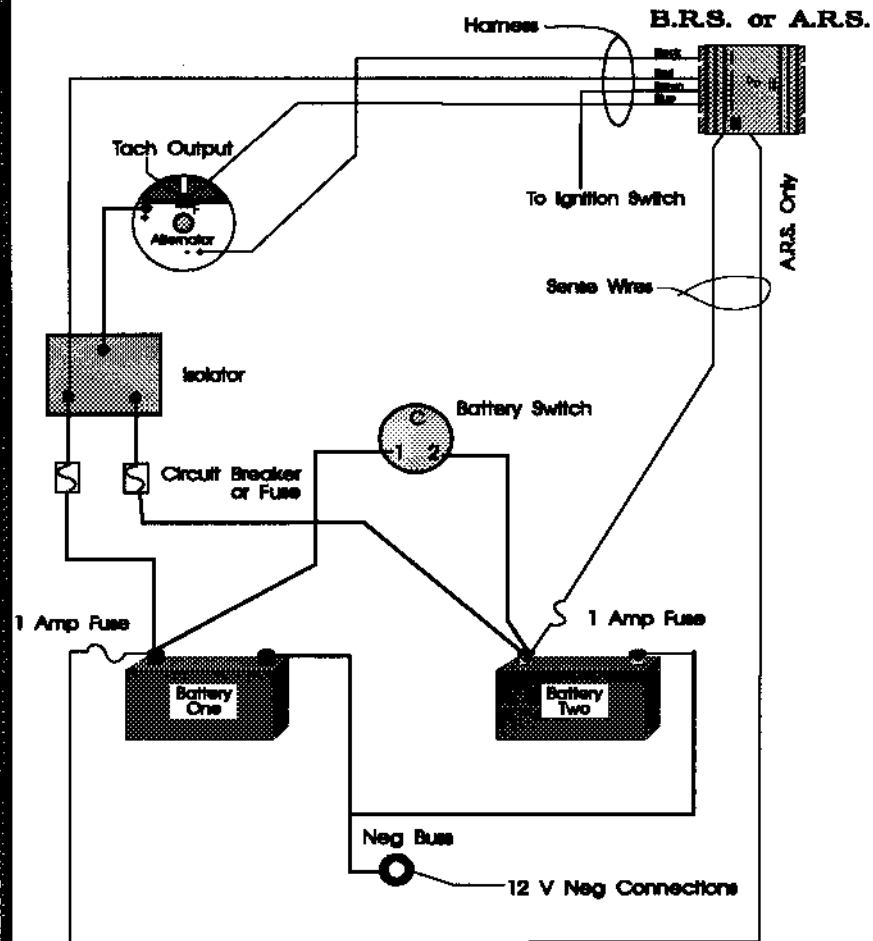
Single Output Alternator One or Two Batteries



Dual Output Alternator Two Batteries



Single Output Alternator and Isolator Two Bank Illustrated



NOTES:

MY ALTERNATOR

Serial # _____

Model# _____

Date of Purchase: _____

Purchased From: _____

Engine Make, Model & Horsepower _____

Belt
Size _____

Battery capacity _____

Isolator size _____

OPTIONS AND ACCESSORIES

TSP (transient spike protector) protects alternator diodes from voltage spikes usually caused by accidental battery switch turnoff. (two needed for dual output models)
list price \$12.95

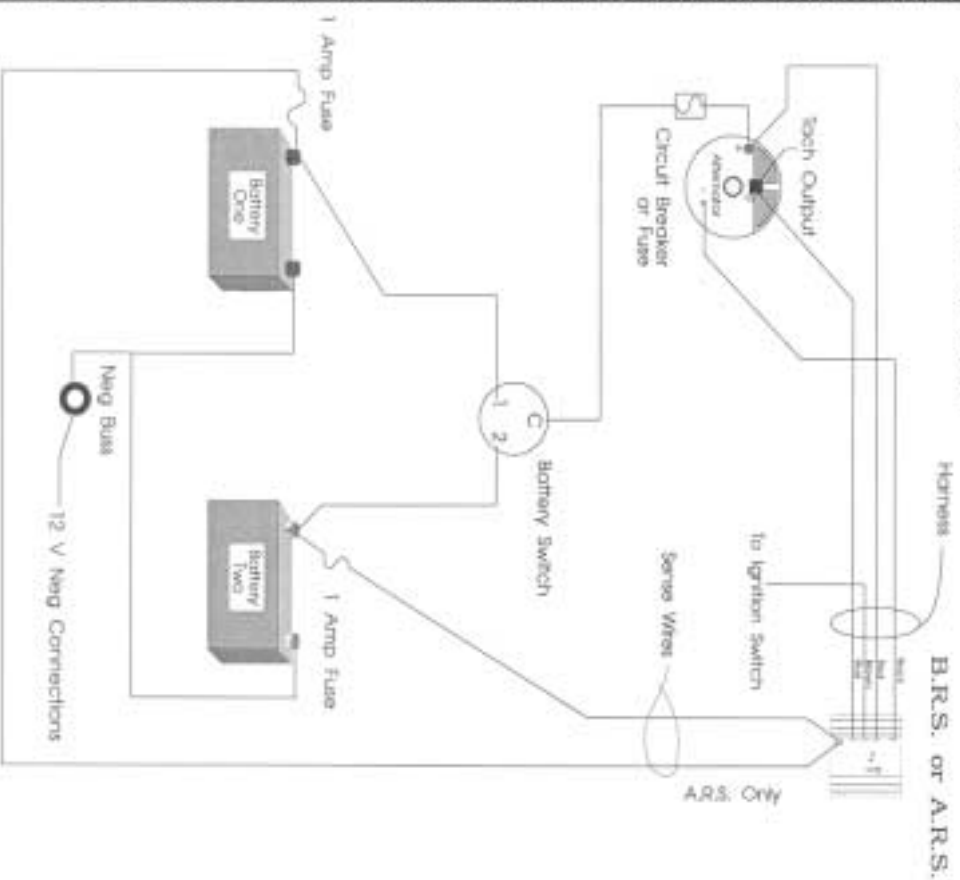
6226-H replacement harness with plugs.
list price \$16.95

7000 offshore spare parts kit. small case
list price \$99.95

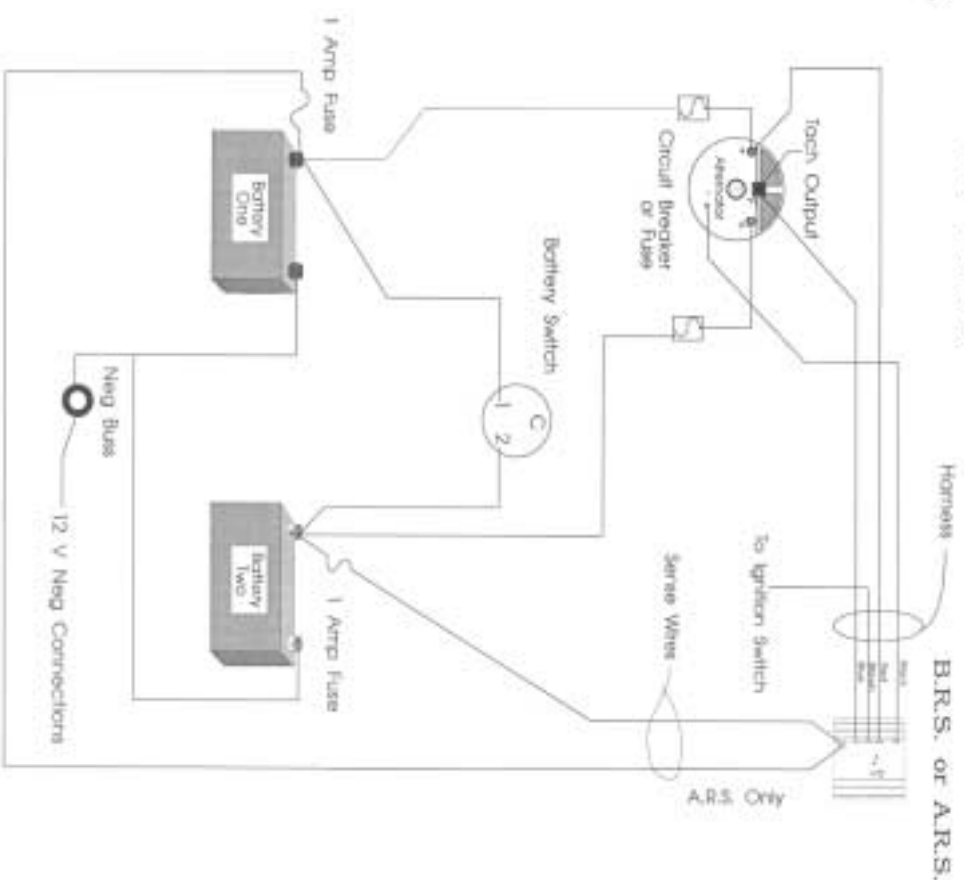
7000L offshore spare parts kit. large case
list price 139.95

TYPICAL WIRING DIAGRAM FOR ALTERNATOR WITH ARS/BRS/BRS REGULATOR

Single Output Alternator
One or Two Batteries

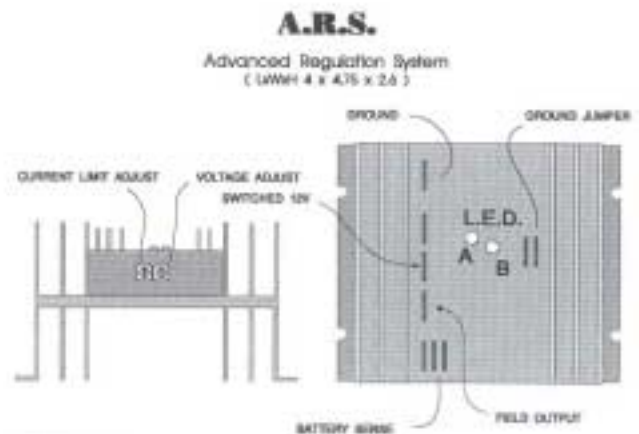


Dual Output Alternator
Two Batteries



BALMAR®

27010 12th Ave N.W.
Stanwood, WA 98292
360-629-6100 PHONE
360-629-3210 FAX



ARS INSTALLATION QUICK AND DIRTY

IF YOU DON'T READ ANYTHING ELSE READ THIS

1. Plug in harness provided *

One end to Alternator—small plug
Other end to Regulator—larger plug (long and skinny)

2. Attach single wires as tagged

Note: All wires except white tach wire must be attached to something.

The ground (black wire) goes to its own prong or stud.
Brown wire to switched 12V source (must be "off" when key is off)

3. Start Engine

- If Brown wire is properly connected the first light on the regulator will come on.
- After about 30 seconds the 2nd light should come on.
- If all the other wires are properly connected, you should be in business charging your batteries.

***If you are using an older harness or no harness read full instructions.**

