

Please Review
Before Proceeding

START HERE

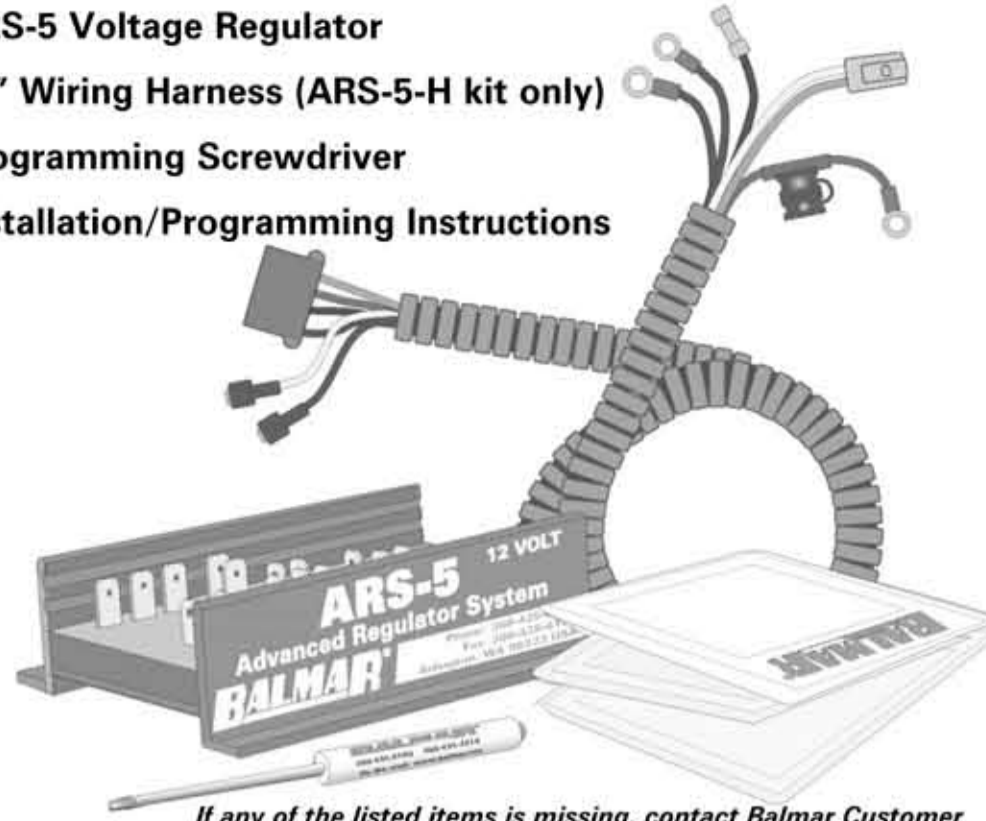
We strongly recommend you follow these step-by-step instructions to set up and quickly begin using your Balmar ARS-5 multi-stage voltage regulator.

The ARS-5 will be fully operational if the instructions on this side of the Quick Start Guide are completed. Instructions on the reverse side of the sheet explain programming for specific battery and belt loads.

1. Package Inventory

Your ARS-5 regulator package includes:

1. ARS-5 Voltage Regulator
2. 54" Wiring Harness (ARS-5-H kit only)
3. Programming Screwdriver
4. Installation/Programming Instructions



If any of the listed items is missing, contact Balmar Customer Service at 360-435-6100 or via e-mail at balmar@balmar.net.

2. Safety Reminders

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.
3. Wear ANSI-approved safety glasses.
4. DO NOT attempt to modify the regulator. Alterations could result in damage to your charging system, and will void your warranty.
5. Do not attempt installation if tired or fatigued.
6. Ensure the engine has cooled before initiating installation.
7. Do not attempt 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 boat, and could result in personal injury.
9. Take time to read instructions. Equipment damage and possible injuries may result from an incomplete understanding of the installation and operation of the ARS-5 regulator. If you are unfamiliar with marine electrical systems, consult with a licensed marine electrician.

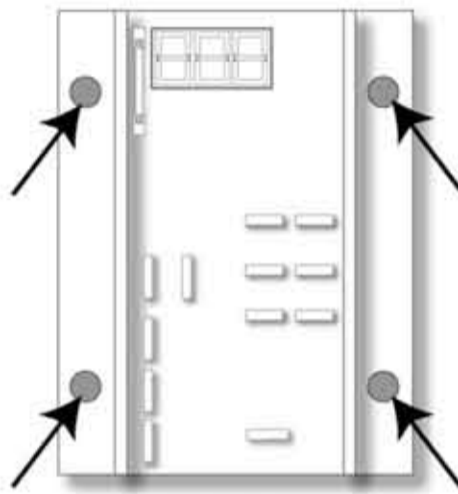
3. Installing Regulator

Consider the following when mounting your ARS-5 voltage regulator:

1. Is the regulator location convenient to view and access for programming and monitoring of the regulator's LED display?
2. Is the regulator location safely away from heat and vibration sources?
3. Is the regulator located away from coolant hoses or other sources that could subject the regulator to chemical or seawater exposure?
4. Is the regulator location safely away from the alternator, charger/inverter, transmitter/receivers, or any other potential source of magnetic or radio interference?

Mounting the Regulator

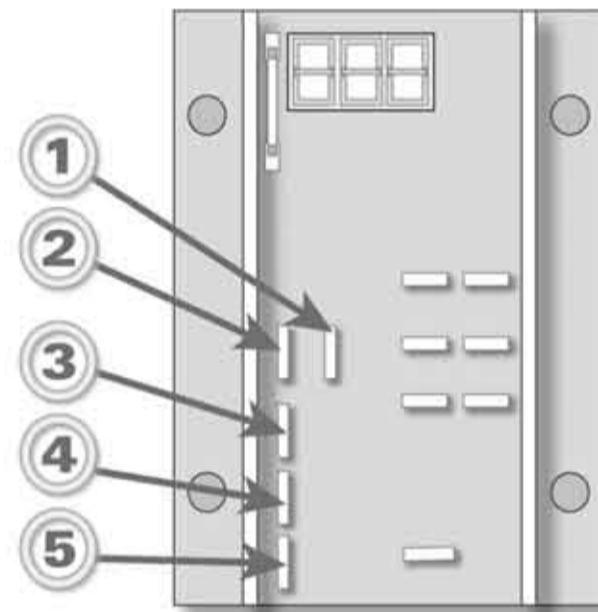
1. Once a suitable location for the voltage regulator is determined, attach the regulator to the location with appropriate fasteners. The four mounting holes are 3/16" diameter. Pan head #10 screws would be appropriate.
2. On ARS-5-H regulator kits, the wiring connections for the harness are pre-installed at the factory. If an existing harness is used, use the pin location diagram in Section 6 as a guide for connecting wires.



3/16" Mounting Holes (4)

4. Required Connections

The following wires MUST be connected to the recommended locations in the vessel's electrical system to ensure proper operation. When using the ARS-5-H voltage regulator (with wiring harness), the required wires will be connected to their appropriate connector terminals out of the packaging. Use the larger diagram (below) to identify the proper connection points for the opposite end of each wire. Be sure to disconnect the batteries from the system before installing your alternator or regulator.

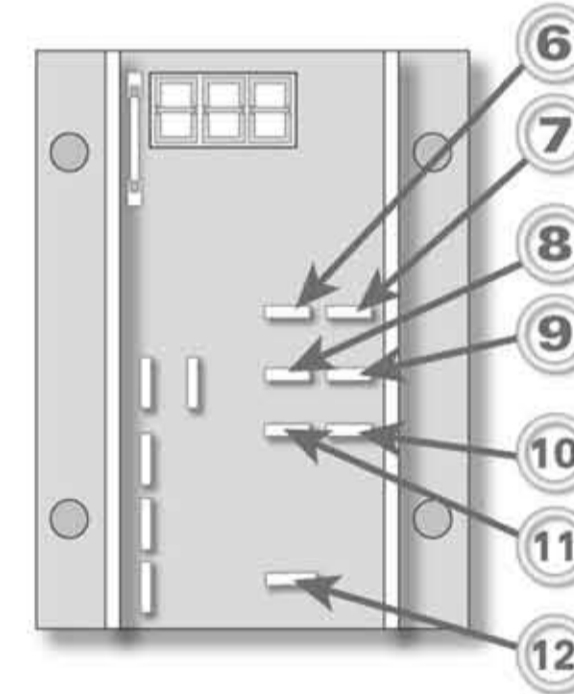


Required Connections

1. Ground (Black Wire).
2. Ground (Black Wire).
3. Power (Red Wire) (10-A fuse).
4. Ignition/Switch (Brown Wire).
5. Field (Blue Wire).

5. Optional Connections

The following terminal pins support advanced regulator functions. They ARE NOT required for basic regulator operation. Should you choose to include alternator or battery temperature sensing, or if a stator output is required to provide a sender pulse for an electrical tachometer, the following terminals will need to be connected to the appropriate sensors. The Dash Lamp terminal (12) can be connected to a dash light or audible alarm to provide warning if charging has been compromised.

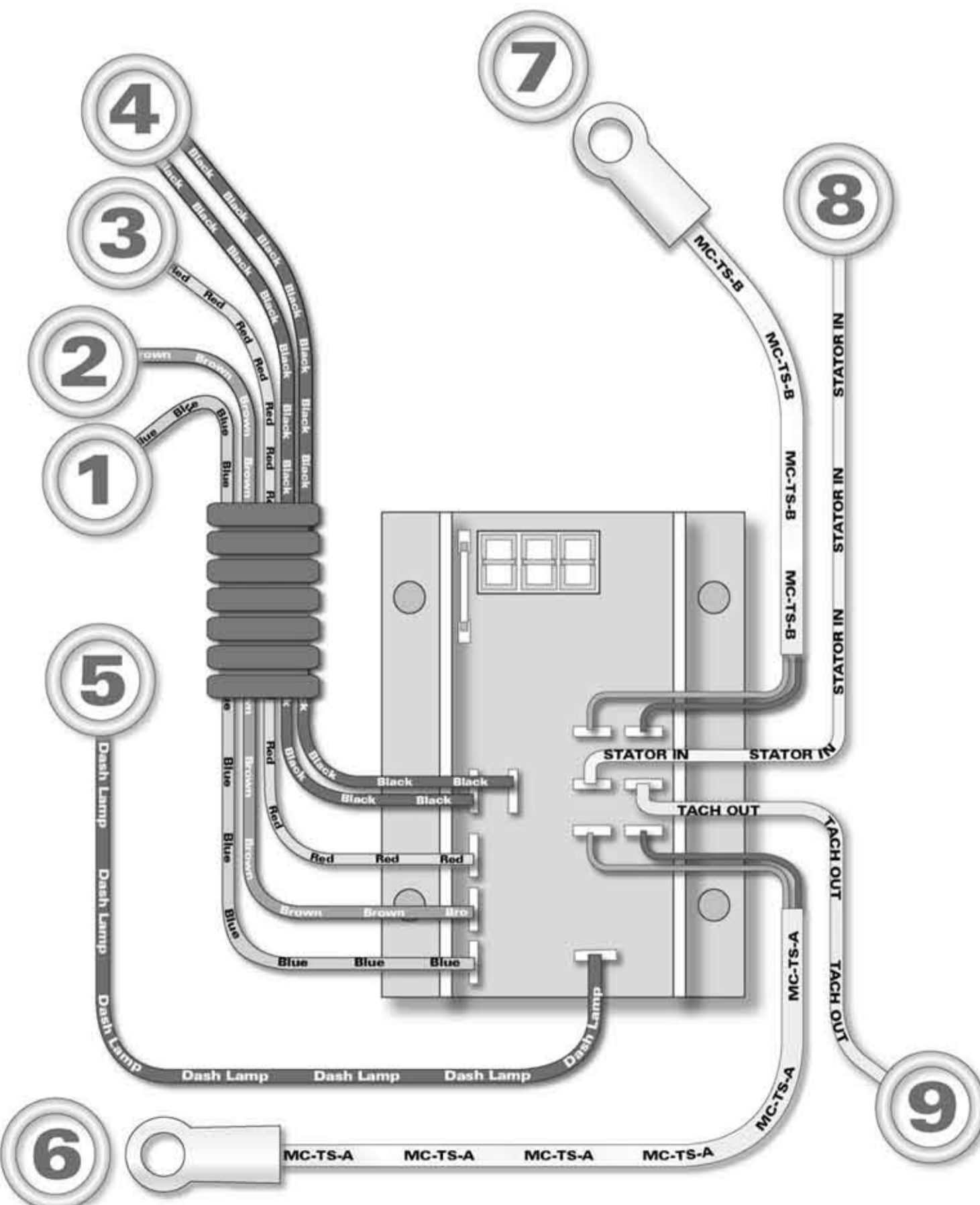


Optional Connections

6. Battery Temp Sense (Pos.)
7. Battery Temp Sense (Neg.)
8. Stator In (White Wire)
9. Tach Out (Typ. Gray)
10. Alt. Temp. Sense (Neg.)
11. Alt. Temp. Sense (Pos.)
12. Dash Lamp

6. Connecting Regulator Wiring To Vessel Charging System

The following diagram provides a list of recommended connection points for required and optional regulator wiring. Once connections one (1) through four (4) on the diagram below are properly installed, the regulator will be ready for operation. Connections five through nine are optional, and can be installed at any time. A description of each connection and its function is included at the right of the diagram. Diagrams showing terminal connection points for currently manufactured Balmar alternators are shown at far right. Refer to your alternator installation manual for further details.



- 1** **Field Wire (Blue)** - Delivers field/excite current to alternator. Connects to alternator field terminal. Connector type will vary based on alternator type. See chart at left. Standard harness features grey 6-Series plug. Alternator models requiring other connections may include required connectors.

Connect Wire To:
Alternator Field Terminal
- 2** **Ignition Wire (Brown)** - Serves as the ON/OFF switch for the ARS-5 regulator. This wire must see battery voltage when the ignition switch is in the ON position, and ZERO volts when the ignition switch is in the off position. May be run to an oil pressure switch, providing positive battery voltage for activation of the regulator.

Connect Wire To:
ON Side Of Ignition Switch
Oil Pressure Switch
Switched Voltage Wire In Original Alternator Wire Loom
- 3** **Power Wire (Red)** - Supplies voltage to power regulator, as well as voltage sensing input. Connects directly to positive battery voltage. In applications using an isolator to control charge flow, power wire must be mounted on the isolator output terminal supplying the main battery bank.

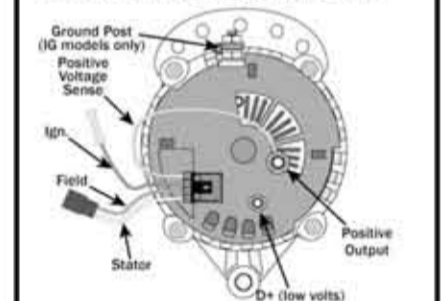
Connect Wire To:
Alternator Positive Battery Output
Common Side Of Battery Switch
Direct To Positive Post Of Battery Being Charged (Single bank only)
Isolator Terminal Supplying Main Battery Bank (Isolator Only)
- 4** **Ground Wires (2) (Black)** - Provides connection to system negative (ground). Both ground wires should be connected to the ground terminal on the alternator.

Connect Wire To:
Alternator Ground Terminal

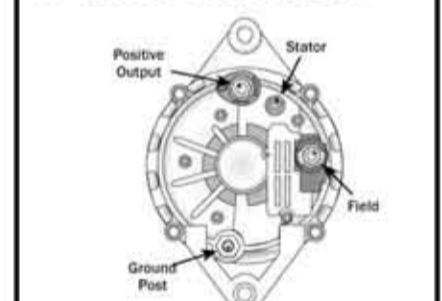
Wiring connections listed below this point are optional, and can be added at your convenience
- 5** **Dash Lamp** - Provides a negative .5A circuit when one of the following events occurs; low system voltage, high system voltage, battery over-temp or alternator over-temp. Connect to negative terminal of dash light or audible alarm. **Use is optional.**
- 6** **Alternator Temperature Sensor (MC-TS-A)** - Optional sensor mounts on one of the alternator's four mid-case mounting bolts (unless otherwise indicated in alternator installation manual). Regulator reduces field output and activates Dash Lamp when over-temperature condition is indicated. Observe polarity of sensor cable leads.
- 7** **Battery Temperature Sensor (MC-TS-B)** - Optional sensor mounts on the negative post closest to the center of the main battery bank. Regulator automatically increases or decreases charging voltage based on ambient battery temperature. Regulator ceases field output to alternator and activates Dash Lamp if battery temperature exceeds safe operating levels. Observe polarity of sensor cable leads.
- 8** **Stator Wire (White)** - Provides unrectified AC pulse from the stator. Can be used to provide a signal if an electric tachometer is used. Connect to alternator's Stator terminal. Connecting the stator wire to the tachometer's sending wire via the regulator's Stator In and Tach Out terminals reduces tachometer "drop out" when batteries are full.
- 9** **Tach Wire (User supplied)** - Completes the connection between the alternator's stator output and an electrical tachometer. Be sure that the tachometer is calibrated for the alternator's pole configuration. Most Balmar alternators are 12-pole construction.

BALMAR Alternator Terminal Connections

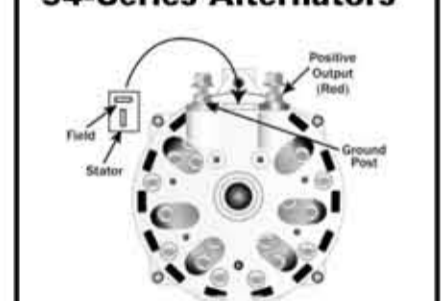
6-Series Alternators



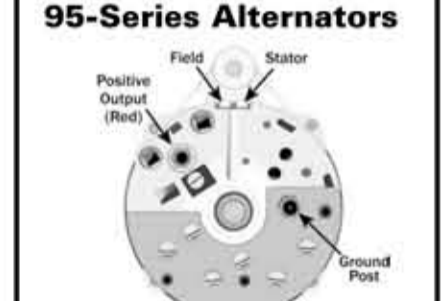
7-Series Alternators



94-Series Alternators



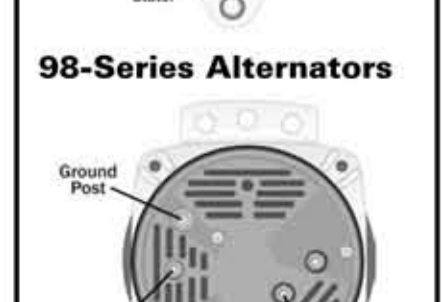
95-Series Alternators



97-Series Alternators



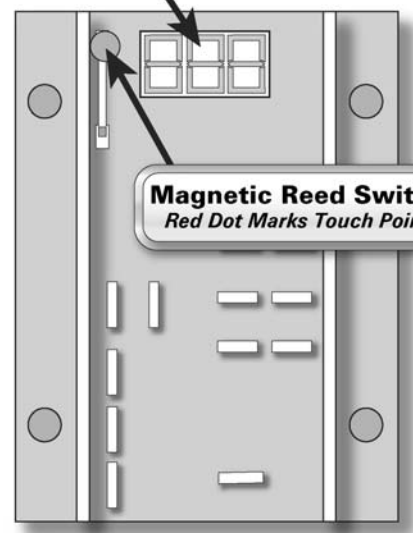
98-Series Alternators



7. Basic Regulator Display

Once the basic installation (as described on the reverse page) is completed, the regulator should be activated when the ignition is turned on and/or when the engine is running. When activated, the regulator will scroll through operational data on its alphanumeric LED display.

Numeric LED Display



Magnetic Reed Switch
Red Dot Marks Touch Point

	Indicates Balmar.
	Indicates ARS-5 voltage regulator.
	Battery program setting. Default setting shown. See Section 8 for additional info.
	Belt Load Management setting. Values are b-0 to b-7. See Section 9 for additional info.
	Charging Stage. "r-" is ramp, "b-" is bulk, "A-" is absorption, "F-" indicates float stage.
	Battery voltage. Following value (in tenths) matches voltage at battery being charged.
	Calculated volts. Indicates target voltage for each stage of charge. Based on program selected.
	Battery temperature. Followed by actual temp in celsius, or code "nc" if not connected.
	Alternator temp. Followed by actual temp in celsius, or code "nc" if not connected.

10. Belt Load Management

Your alternator's drive belt limits the size of the alternator amperage output. Typically, a high-output alternator will apply up to one horsepower of load to the drive belt for each 25 amps it creates, so a 100-amp alternator could place a 4 h.p. load on your belt.

The ARS-5 controls the load placed on the drive belt by limiting the regulator's maximum field potential. The chart at right provides a guideline for determining the appropriate Belt Load Management setting based alternator output and the width of the drive belt.

While the values shown in the chart are a fine starting place, it may be necessary to make further adjustments should you find that you are experiencing belt dusting or premature belt failure. The greater the Belt Load Management value, the lower the demand placed on the drive belt.

To adjust the Belt Model Management setting:

- During programming, the Belt Load Management mode is indicated by the code "bEL" on the LED display. When "bEL" is shown, hold the magnet to the RED DOT on the regulator's epoxy potting.
- The display will indicate a series of values ranging from "b-0" to "b-7". When the value that matches your belt width and alternator output is reached (see the chart above) release the switch. Boxes marked with "NR" indicate that the alternator output to belt width are not recommended.
- The Belt Load Management setting can be accessed and re-adjusted at any time that the regulator is active. If you find that the alternator load is causing black belt dust, access the Belt Load Management program by applying and holding the magnet to the RED DOT until "PRO" is indicated. Release the magnet until the "bEL" code is indicated. Re-activate and hold the switch until the desired value is indicated and release.

Enter your preferred setting here

8. Regulator Programming

Three simple programming choices are all the ARS-5 requires to maximize charging efficiency; select your battery type, set the Belt Load Management value, and select either the short display or the long display.

In order to make programming as easy as possible, we strongly recommend that you read the instructions before attempting to program the regulator. Each segment has a space to write down your desired setting prior to programming, so the information will be close at hand when you enter the regulator's programming mode.

To enter the regulator's programming mode:

- Make sure that the regulator is turned on and voltage is greater than 12 volts. If the display is scrolling, you're ready to go.
- Hold the magnetic tip of the Balmar programming screwdriver to the RED DOT located in the upper left corner of the voltage regulator (just to the left of the LED display, if the readout is right side up).
- When the code "Pro" is indicated on the LED display, release the magnet from the RED DOT by pulling the screwdriver away from the surface of the epoxy potting.
- The ARS-5 will begin to scroll through the programming selections, beginning with Battery Program Type (see Section 9).

NOTE: Any of the programming modes can be changed at any time. Simply follow the instructions in Sections 9 to 11 to make changes.

9. Set Program For Battery

Once you have entered into the programming mode as described in Section 8, the LED display will indicate "bA" indicating the battery program mode. When the display indicates "bA":

- Hold the magnetic tip of the Balmar programming screwdriver to the RED DOT. When the magnet is activated, the LED will begin to scroll through the battery program selections.
- When the code for the battery program you desire is indicated in the LED display, release the magnet from the RED DOT. The display will return to the "bA" code, at which time, you can re-apply the magnet to change your selection.
- If you are satisfied with your selection, keep the magnet away from the RED DOT. After a couple of seconds, the LED will indicate "bEL", indicating entry into the Belt Load Management mode. (See Section 10.)

UFP - Universal Factory Program. Default program is safe for all battery types.	
FDC - Flooded Deep Cycle. For thick plate flooded lead acid batteries.	
GEL - For silica gel filled battery technology.	
AGL - Absorbed Glass Mat battery technology.	
OPS - Spiral Wound AGM (Optima-type) battery technology.	

Enter your preferred setting here

11. Long Regulator Display

At the time that you program the regulator for battery type and belt load control, you have the option to select the amount of information the regulator displays during normal operation.

For most applications, the regulator's short display (see Section 7 above for details) will provide all of the information required to monitor normal operations. Should you prefer to see the longer, more detailed display, select the regulator's long display mode.

Following the Belt Load Management mode, the regulator will indicate "dSP" to note entry into the short-long display adjustment mode. To change from short to long display mode:

- Hold the magnetic tip of the screwdriver to the RED DOT when the "dSP" mode is indicated. The regulator display will scroll between "Sd" and "Ld". Release the switch when the desired mode is indicated.
- The regulator will scroll through the programming mode three times before saving programming changes. You can make changes to any of your desired settings during those three opportunities. The regulator will indicate "SAV" when programming is complete.

Enter your preferred setting here

"dSP" indicates entry into Short/Long display mode.	
Short Display	
Long Display	

	Indicates Balmar.		Field Output - Percentage of regulator field output. Followed by zero to 100% value.
	Indicates ARS-5 voltage regulator.		Software revision level.
	Battery program setting. Default setting shown. See Section 9 for additional info.		Regulator circuit board temp. Followed by actual circuit board temperature in degrees celsius.
	Belt Load Management setting modifies field current level. See Section 10 for additional info.		Factory use only.
	Charging Stage. "r-" is ramp, "b-" is bulk, "A-" is absorption, "F-" indicates float stage.		Indicates total regulator run time. Followed by time in two displays: tenths / hundreds
	Battery voltage. Following value (in tenths) must match voltage at battery being charged.		Factory use only.
	Calculated volts. Indicates target voltage for each stage of charge. Based on program selected.		Factory use only.
	Battery temperature. Followed by actual temp in celsius, or code "nc" if not connected.		Event Codes: Indicates events and advisories. Individual codes are shown in chart at right.
	Alternator temp. Followed by actual temp in celsius, or code "nc" if not connected.		Factory use only.

Alternator Rating - (See output rating on alternator)

Match your belt width to the output rating of your alternator. The Belt Management value can be found where the row and column meet.	70 Amps	80 Amps	100 Amps	120 Amps	140 Amps	150 Amps	165 Amps	210 Amps	310 Amps
Single 3/8" Belt	B-1	B-3	B-5	B-7	B-7	NR	NR	NR	NR
Single 1/2" Belt	B-0	B-1	B-1	B-3	B-3	B-5	NR	NR	NR
Single 5/8" Belt	B-0	B-0	B-0	B-0	B-3	B-4	B-5	NR	NR
Dual 3/8" Belt	B-0	B-0	B-0	B-0	B-2	B-3	B-4	B-5	NR
Dual 1/2" Belt	B-0	B-0	B-0	B-1	B-2	B-2	B-2	B-2	B-3
Dual 5/8" Belt	B-0	B-0	B-0	B-0	B-0	B-1	B-1	B-1	B-2
K-5 Serp. Belt	B-0	B-0	B-0	B-0	B-1	B-1	B-1	B-2	B-3
K-6 Serp. Belt	B-0	B-0	B-0	B-0	B-0	B-0	B-0	B-1	B-2
K-8 Serp. Belt	B-0	B-0	B-0	B-0	B-0	B-0	B-0	B-1	B-1

Belt Width

"bEL" indicates entry into Belt Load Management mode.	
"b-0" indicates 100% (un-governed) field output. Full power.	
"b-7" indicates maximum Belt Load Management (50%±).	

12. Alternator Temperature Sensor (MC-TS-A)

When the Alternator Temperature Sensor is installed, the ARS-5 monitors the alternator for safe temperatures and responds by reducing field output if the alternator exceeds safe working temperature. In addition, the regulator will activate the DASH LAMP circuit to indicate that a condition has occurred. To install the Alternator Temperature Sensor:

- Connect the lug end of the temperature sensor to the case mount bolt of the alternator, or alternate location indicated in your alternator installation instructions.
- Plug the positive and negative female spade terminals at the other end of the sensor cable into the Alternator Temperature Sensor terminals as indicated on the side of the regulator. Ensure that the positive (red) and negative (black) wires are connected to the correct terminal. Observe polarity.

13. Battery Temp. Sensor (MC-TS-B)

The Battery Temperature Sensor (MC-TS-B) enables the ARS-5 to automatically respond to increases and decreases in ambient battery temperature by increasing or decreasing charging voltage specific to each battery type. In the event of a thermal runaway event at the battery, the regulator will discontinue charging completely and activate the DASH LAMP circuit. To install the Battery Temp Sense cable:

- Connect the lug end of the temperature sensor to the negative post of the battery BEING CHARGED. If there are more than one battery in the bank, connect to the negative post closest to the center of the battery bank.
- Plug the positive and negative female spade terminals at the other end of the sensor cable into the Battery Temperature Sensor terminals as indicated on the side of the regulator. Ensure that the positive (red) and negative (black) wires are connected to the correct terminal. Observe polarity.

14. Dash Lamp Terminal

The Dash Lamp terminal provides a .5A negative output when one of the following events occurs: low battery voltage, high battery voltage, high battery temperature or high alternator temperature.

The Dash Lamp terminal can be used in conjunction with your choice of an indicator lamp or audible device requiring up to .5A to operate. Balmar's Model AAK (Audible Alert Kit) can be used in conjunction with the ARS-5 regulator.

Event/Advisory Codes	Description
E01	Factory use only.
E02	Factory use only.
E10	Wire short at battery #1 temperature sensor.
E11	Wire not found at battery #1 temperature sensor.
E12	Wire short at battery #2 temperature sensor.
E13	Factory use only.
E14	Wire short at alt. temperature sensor.
E15	Wire not found at alt. temperature sensor.
E16	Aux. #1 Pickup shorted.
E17	Aux. #1 Pickup open or not found.
E20	Battery #1 exceeds safe operating temperature.
E21	Factory use only.
E22	Alternator exceeds safe operating temperature.
E23	Aux. voltage too high.
E24	Factory use only.
E30	Charging voltage below program values.
E31	Factory use only.
E32	Factory use only.
E33	Factory use only.
E34	Battery voltage below standard levels.
E40	Voltage too high at battery.
E41	Factory use only.
E42	Factory use only.
E43	Factory use only.
E47	Advisory codes (E51 to E53) are in effect.
E51	Small Engine Mode.
E52	Factory use only.
E53	Factory use only.

15. Troubleshooting

The ARS-5 voltage regulator is designed to provide safe, dependable service. Should you find that the ARS-5 is not working properly, follow these instructions to identify potential sources of difficulties.

Most regulator failures can be traced to wiring issues. Please identify the symptom that best describes the problem your system is experiencing, and follow the instructions for troubleshooting:

System does not charge. No display on regulator.

- Check voltage on RED (power) wire in wiring harness. Voltage should match voltage at battery being charged, and must be above 12 volts DC.
 - If voltage at the RED wire is zero, inspect the wire at its source to ensure that it is properly connected. Measure voltage at the other end of the RED wire (source). Voltage should match the voltage at the battery being charged.
 - If the voltage at the source matches the voltage at the battery being charged, but the voltage at the regulator side of the RED wire is zero, check and/or replace the 10A ATC-type fuse found in line near the source. Re-measure voltage. If zero, inspect the length of the RED wire and connectors for damage.
- Check voltage on BROWN (ignition) wire in wiring harness. Voltage must measure greater than 11 volts.
 - If voltage at the BROWN wire is zero, inspect the wire at its source to determine if 11+ volts is present. If voltage is below battery voltage, trace the ignition circuit to its source and correct voltage loss.
- Check continuity between the regulator's BLACK (ground) wires and system ground. Most handheld multimeters feature an audible continuity circuit or ohm meter. If the BLACK ground wires indicate poor or no continuity, inspect and correct ground connections between the regulator and the alternator, as well as the connections between the alternator ground terminal and system ground.
- If all of the wiring connections at the regulator meet the expected values, but the ARS-5 display does not illuminate and the system does not charge, contact Balmar Customer Service at 360-435-6100 for technical assistance.

System does not charge. Display is illuminated.

(Note: When checking system, wait for start delay period to complete before checking regulator voltages. Stage code -b- should be indicated in the short display. Be sure that shore power charging IS NOT connected while testing.)

- Check voltages on RED and BROWN wires as described above.
- Check continuity on the BLACK wires as described above.
- Check voltage on BLUE (field) wire in wiring harness. Voltage should measure approximately three to eleven volts, depending on the charge level of the batteries. Field voltage increases as batteries are more deeply discharged.
 - If voltage on the BLUE wire measures less than one volt at the regulator plug, unplug and re-plug the black four-wire plug into the regulator. Re-check voltage.
- If voltage on the BLUE wire is still less than one volt, disconnect the Battery Temperature Sensor wire at the regulator. If the BLUE wire voltage increases to normal levels, shut the system down immediately and inspect the batteries for abnormal temperature levels (Battery temperature can also be determined by monitoring the B1 reading on the regulator display). If the temperature of all the batteries is normal, replace the Battery Temperature Sensor.
- If the voltage on the BLUE wire stays below one volt after all of the preceding steps, contact Balmar Customer Service at 360-435-6100 for assistance.

System voltage exceeds program target voltage levels

(Note: When checking system, wait for start delay period to complete before checking regulator voltages. Be sure that shore power charging IS NOT connected while testing the alternator and regulator.)

- Compare voltage on the regulator's RED wire with the voltage at the battery bank being charged. If voltage at the regulator end of the RED wire is lower than the voltage at the battery, trace the length of the RED wire to its source and correct any connections or wire damage which could be causing voltage drop. If the RED wire is connected to the alternator or the common side of a battery switch, trace positive cabling to the battery and correct faults causing voltage drop.
- If an isolator is being used to control charge flow, ensure that the RED wire from the regulator is connected to the battery side of the isolator at the terminal connected to the main (house) battery bank. If charging voltage at the battery banks being charged differs, a replacement isolator or an alternative charge control device may be required to remedy the problem. If the regulator is used with a 6-Series alternator, see www.balmar.net for details on required diodes.
- If the voltage is 14.8 volts or less, disconnect the Battery Temperature Sensor, if installed. If the voltage returns to normal levels, the change in voltage is due to temperature compensation based on ambient battery temperature.
- If high voltage at the battery is equal to the high voltage recorded at the regulator, and voltage exceeds 15+ volts, and no other charge sources are in use (solar, wind, etc.), shut down the system and contact our Customer Service department at 360-435-6100.

If you do contact Balmar Customer Service:

Have the following information available:

- Regulator Model and date of manufacture (stamped on side of regulator).
 - Record of voltage measurements taken.
 - Full list of Event Codes shown in the regulator's Long Display (if accessible).
 - Purchase location and date of purchase.
1. Manufacturer and model of alternator being used.