

Balmar Voltage Regulation Technology

High output alternators are an important part of your system for battery care, but they are definitely not the only part. Without proper voltage regulation, battery charging can be a slow process, or even worse, an ideal recipe for early battery failure.

All commercial alternators come with an internal rectifier/regulator circuit that:

- (1) converts AC current generated by the alternator to DC current, and
- (2) fixes the voltage output to a static level – typically 14.6 volts.

There are several deficiencies with internal regulators:

- (1) Not all battery technologies want to receive 14.6 volts.
- (2) All battery types have an optimal charging “profile”, which means they want different voltages and currents at different stages of their charging cycle, as well as variations when battery temperatures change.
- (3) Once fully charged, batteries can overheat if they are supplied with continuous current at a fixed charge voltage.

Balmar’s patented Max Charge and ARS-5 Voltage Regulators provide a dynamic method for monitoring battery condition and apply the correct level of alternator control (voltage and current) to ensure that your batteries are charged quickly and safely.

During engine operation, Balmar regulators step through the following stages to ensure proper battery charging:

Stage 1: Start Delay – After engine startup, the regulator waits for several seconds before applying field current to the alternator. This allows the engine and belts an opportunity to warm up before the alternator load is applied.

Stage 2: Soft Ramp – The regulator slowly increases field excitation of the alternator to reduce belt stress.

Stage 3: Bulk Charging – The regulator increases field output to the maximum safe level, allowing the alternator to reach maximum amperage output based on the target limits of the battery type being charged. Target voltage ranges from 14.1V to 14.6V depending on the battery type selected (24V bulk charging voltages range from 28.2V to 29.2V). Bulk time is a factory set at 18 minutes, and is fully adjustable in advanced programming mode.

Stage 4: Calculated Bulk - At the end of the set bulk time period, the regulator calculates the state of charging based on the alternators ability to reach and maintain target voltage, and the percentage of field output required to maintain that voltage. This stage will maintain bulk charging until all criteria are met, at which point the regulator will ramp down to absorption voltage.

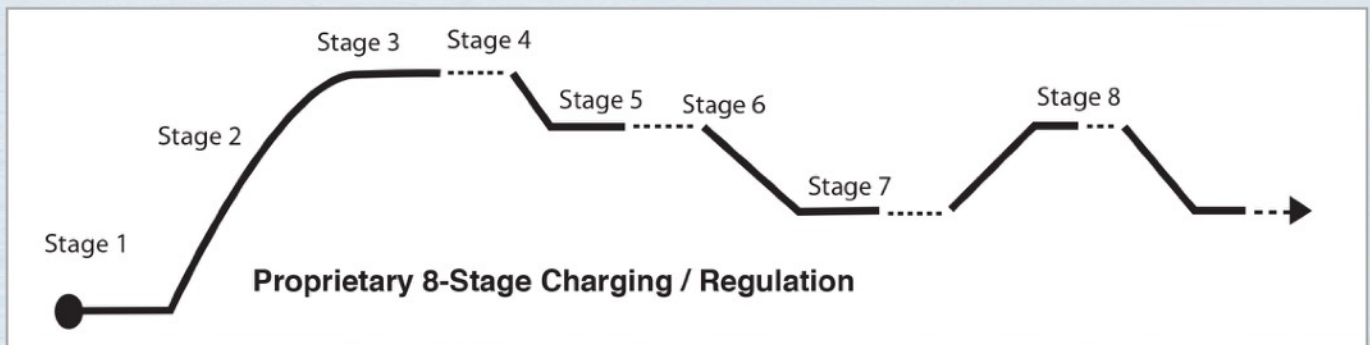
Stage 5: Absorption Voltage – Typically two tenths of a volt below bulk target voltage, absorption voltage allows the alternator to drive current into the almost fully charged batteries without overcharging. Absorption time is preset at 18 minutes, and is adjustable in the regulator’s advanced programming mode.

Stage 6: Calculated Absorption – At the end of the set absorption time period, the regulator calculates the state of charging based on the alternator’s ability to reach and maintain the target voltage and the percentage of field output required to maintain that voltage. This stage will maintain the absorption charging voltage until all criteria are met, at which point, the regulator will ramp down to float voltage.



Stage 7: Float Voltage – Typically one (1) volt below bulk target voltage, float voltage allows the alternator to drive current into fully charged batteries sufficient to replace any battery capacity used while under way. Float time is preset at 18 minutes, and is adjustable in the regulator’s advanced programming mode.

Stage 8: Calculated Float – At the end of the set float time period, the regulator calculates the state of charging based on the alternator’s ability to maintain the target float voltage and the percentage of field output required to maintain that voltage. If all of the calculation criteria are met, the regulator will continue to maintain float voltage. If the calculation indicates that the alternator is failing to maintain battery voltage, the regulator will return to absorption voltage.



Additional Features

User-Selectable Preset Battery Programs

Balmar provides multiple charge profiles to ensure optimal charging. Simply select the battery program that matches your battery technology. The Max Charge regulator family contains 8 preset charge profiles, including a new standard program for lithium batteries. The ARS-5 contains 5 preset profiles. See the chart on page 16 for a listing of battery programs.

Advanced Programming Modes

Balmar multi-stage regulators feature a broad range of advanced regulator adjustments. By accessing the advanced programming function, the user can modify charging times and voltages in all stages of charge, adjust start delay times, temperature compensation limits, temperature compensation slopes, and modify set points for alternator over-temperature response.

Alternator and Battery Temperature Sensing and Control

Balmar multi-stage regulators have the ability to automatically correct charging output to ensure that batteries are properly charged regardless of ambient temperature. If battery temperatures exceed safe operating levels, Max Charge and ARS-5 Voltage Regulators will automatically reduce charging outputs to avoid dangerous thermal runaway conditions.

Belt Load Management

Balmar multi-stage regulators can protect the engine and belt by enabling the user to de-rate the alternator’s output in small increments by adjusting the Belt Load Manager. Adjustable in 5% increments, the Belt Load Manager reduces the regulator’s field pulse bandwidth, thereby reducing load on the drive belt. The Belt Load Manager can also be used to protect the alternator in applications where battery capacity exceeds ideal charging ratios.

Balmar Max Charge and ARS-5 Voltage Regulators

Max Charge MC-614 Voltage Regulator

- 8 Selectable Programs for Marine Batteries
- 15 Amp Maximum Field Current
- Advanced Programming Modes (see page 19)
- Alternator & Battery Temperature Sensing & Control
- Exclusive Belt Load Manager Function
- Bright LED Display and Easy Programming Mode
- Can be Used in Twin-Engine Applications with Centerfielder II

**NOW
INCLUDES
LiFePO₄**



Max Charge MC-624 Voltage Regulator

- Designed for 24 Volt Applications
- 10 Amp Maximum Field Current
- Can be Used in Twin-Engine Applications
- All the Same Functions as the MC-614



Max Charge MC-612-Dual Voltage Regulator

- Designed to Control 2 Alternators on a Single Engine
- Dual Alternator & Battery Temperature Sensing
- Twin 54" Wiring Harnesses Provided
- All the Same Programming Functions as the MC-614



ARS-5 Voltage Regulator

- 5 Selectable Programs for Marine Batteries
- 9 Amp Maximum Field Current
- Appropriate for 6-Series Alternators (150A and below)
- Single Engine, Single Alternator Applications Only
- Similar Programming Functions as the MC-614



Preset, Multi-Stage Battery Programs	Balmar Regulators				Digital Duo Charge	Dual Engine Centerfielder
	12 Volt		24 Volt			
Part Number:	ARS-5	MC-614	MC-612-DUAL	MC-624	DDC-12/24	CFII-12/24
Universal Factory Program, Deep Cycle Flooded, Gel Cell, Absorbed Glass Mat (AGM) and Spiral Wound Flooded (Optima)	Yes	Yes	Yes	Yes	Yes	Yes
Standard Flooded, Halogen Systems, Lithium	-	Yes	Yes	Yes	Yes	Yes
Balmar Alternator Models						
6-Series Alternators (70A-150A)	Yes	Yes	Yes	Yes	Yes	Yes
AT-Series Alternator (165A-200A)	-	Yes	Yes	-	Yes	Yes
9-Series Large Case Alternators (140A-310A)	-	Yes	Yes	Yes	Yes	Yes
Multiple Alternator/Engine Configurations						
Dual Engine, One Alternator Each	-	Yes (qty 2)	-	Yes (qty 2)	Yes	Yes
Single Engine, Two Alternators	-	-	Yes	Yes (qty 2)	Yes	Yes

Complete part number listings and dimensional specifications are found on pages 30-38.

Single-Stage Regulators

For vessels with nominal battery loads and/or applications where charging times are too short to benefit from the intelligence of multi-stage regulators, a single-stage regulator may be satisfactory.

BRS-2T Single-Stage Voltage Regulator

- Available in 12 Volt and 24 Volt Models
- Adjustable Target Voltage to Address Battery Types
 - **BRS-2T-12-H** - Adjustable from 13.5V - 14.5V
 - **BRS-2T-24-H** - Adjustable from 26.5V - 29.5V



ERS-KIT Single Stage Regulator

- 14.1 Volts, Non-Adjustable
- Ideal Backup Regulator
- Kit includes Terminals to Connect to a Balmar 12V Regulator Harness

Regulator Accessories

Temperature Sensor Cables

- Provided with All Alternator/Regulator System Packages
- Interchangeable for 12 Volt and 24 Volt Systems
- For use with either Max Charge or ARS-5 Voltage Regulators
- Battery Sensor can be used with the Digital Duo Charge
 - **MC-TS-A** - Alternator Cable, 54" Length
 - **MC-TS-A80** - Alternator Cable, 82" Length
 - **MC-TS-B** - Battery Cable, 240" Length



Spike Protectors

- Transient Spike Protectors Add System Safety
- Fused Diodes Will Fail Prior to Alternator Diode Damage
- Install Between the Alternator "P" and "N" Terminals
 - **TSP-12** - 12 Volt, 10A Fuse
 - **TSP-24** - 24 Volt, 10A Fuse



Replacement Regulator Wiring Harnesses

All Balmar Regulators can be purchased with or without a wiring harness.

Replacement wiring harnesses can also be purchased separately.



Alternator Families	Length	Volts	Harness Number
6-Series, XT-Series, AT-Series & 9-Series	54"	12V	1010
		24V	1012
	120" NEW	12V	1020
		24V	1022
94-Series	54"	12V	1011
		24V	1013
7-Series, 97-Series & 98-Series	54"	12V	1014
		24V	1016

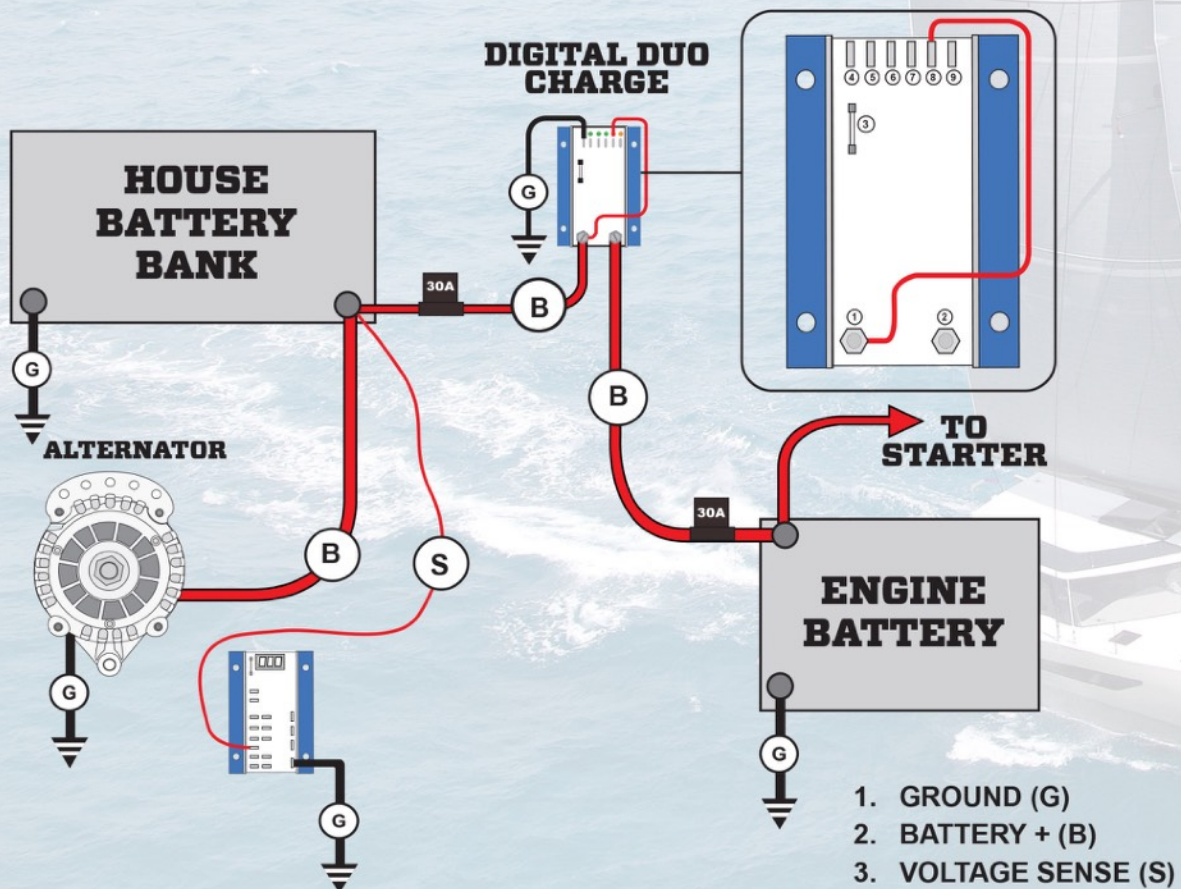
Digital Duo Charge: DDC-12/24 For Multi Bank Charging

- The DDC is a Solid State Battery Combiner
- Control Voltage and Current between House and Start Batteries
- Eliminates the Need for an Isolator, Relay or a Manually Operated Battery Switch
- Used in Concert with Max Charge or ARS-5 Regulators
- Can also be Employed without a Balmar Regulator
- Works in Both 12V and 24V Applications
- House and Start Batteries can be different technologies
- Start Battery Temperature Sensing Available with the MC-TS-B Sensor Cable
- 4 Battery Programs Supported for the Start Battery: Standard Flooded, Deep Cycle Flooded, AGM and Gel Cell



The **Digital Duo Charge** ("DDC") provides a "hands off" solution for charging two battery banks without the use of problematic isolators or manual battery switches.

During charging the DDC-12/24 monitors voltage at the house battery. When voltage exceeds the set minimum (typically 13.2V in a 12V system and 26.4V in a 24V system) the DDC automatically engages, providing up to 30A charge current to the starting battery. When no charge source is present, the DDC separates the batteries so the starting battery won't be accidentally discharged into the house battery. An optional solenoid control enables higher start battery charging output when required.



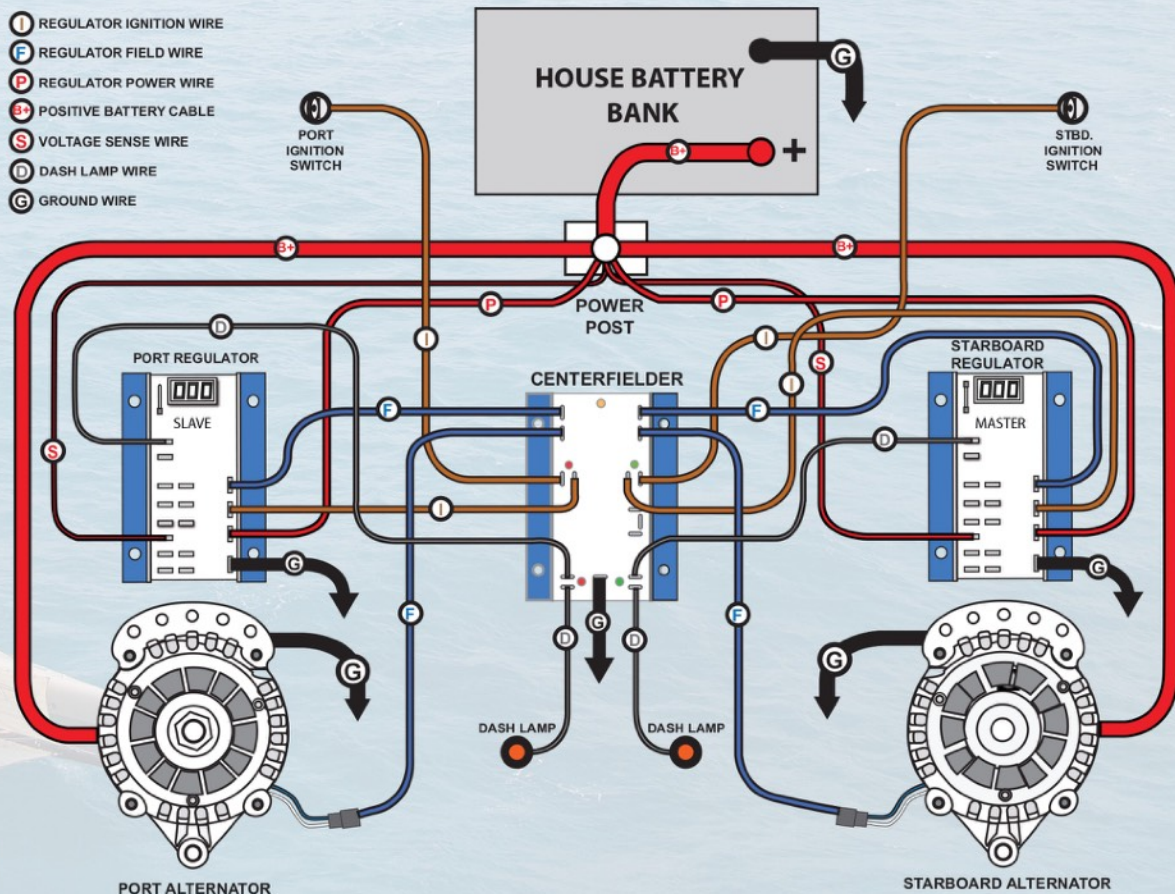
Centerfielder II: CFII-12/24 For Balanced Twin Engine Charging

- Balances Charging in Twin Engine Applications
- Eliminates Alternator Chatter by Unifying Field Current
- For Use with Max Charge Regulators Only
- Works in Both 12V and 24V Applications
- Includes Upgraded Regulator Power Wires and Fusing
- Isolates Alternators and Regulators when only One Engine is Running
- Can be Used with the Digital Duo Charge to charge a Second Battery



The **Centerfielder II**, when used with Max Charge Regulators, balances twin engine charging systems by monitoring the port and starboard voltage regulators. When both alternators and regulators are working, the Centerfielder II automatically designates the starboard regulator as dominant for both alternators – making it possible to charge a single house battery bank with the combined output of both alternators.

The **Centerfielder II** eliminates the “yo-yo effect” of two regulators repeatedly turning on and off as the battery approaches target voltage because the two systems are not working in concert.



Shown above is a 12V configuration using the MC-614.
Consult the user manual for a 24V configuration using the MC-624