



WS100/12 Product Manual



Thank you for purchasing Wakespeed Offshore's Model WS100/12 Multi-Stage Voltage Regulator. Designed by Michael Frost, one of the pioneers of smart, multi-stage battery charging systems, the Wakespeed WS100/12 voltage regulator provides optimal care for your batteries, when used in conjunction with a P-type, externally regulated alternator.

The WS100/12 was designed specifically to provide the user with an extremely simple interface — only two adjustments are required to deliver tailored charging to your batteries. A convenient five-position rotating switch enables the user to select one of five programs based on battery type: standard flooded/gel, standard AGM, Carbon Foam, deep cycle flooded and high-density AGM/TPPL.

In addition to the selectable programs for battery type, the WS100/12 provides the ability to adjust the maximum regulator field output, making it possible to reduce alternator horsepower load to the engine and belt. Four settings are available: 100% (no field reduction), 90%, 75% and 50% field output.

The WS100/12 can be used alone, or in conjunction with optional WS-100-ATS and WS-100-BTS alternator and battery temperature sensors. With the temperature sensors installed, the WS100/12 can monitor and respond to changes in ambient battery temperatures and reduce charging output if the alternator temperature exceeds safe operating temperatures.



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Regulator Wiring

REGULATOR WIRING

The Wakespeed WS100/12 is provided with a 5-wire harness, which provides wiring connections required for proper voltage regulator operation. Wires include Red (Power), Black (Ground), Blue (Field), Brown (Ignition) and Orange (Dash Lamp). Wiring identification and suggested mounting locations are as follows:

RED (POWER) WIRE –

The WS100/12 Power Wire provides DC current to support regulator functions and to provide field current to control alternator excitation (field) output – as well as providing the regulator with sensing voltage. The Power Wire must be fused at 10 amps. An ATC-type fuse holder and 10A ATC fuse are included with the regulator, and must be installed at the source of power (at the alternator or battery end of the wiring harness).

Possible connection locations for the RED Power Wire include:

1. The positive output post of the alternator (recommended).
2. The positive post of the battery being charged.
3. If a diode-type battery isolator is used, the RED power wire must be installed on the output side of the isolator, on the post connected to the larger battery bank.





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BLACK (GROUND) WIRE —

The WS100/12 Ground Wire provides a connection between the voltage regulator and system ground. Possible connection locations for the BLACK Ground Wire include:

1. The ground post of the alternator (recommended).
2. The ground post of the battery being charged.

BROWN (IGNITION) WIRE —

The WS100/12 Ignition Wire provides a switched source of DC system voltage which acts as the ON/OFF switch for the voltage regulator. Possible connection locations for the BROWN Ignition Wire include:

1. The ON side of the vessel's ignition switch. In most cases, a switched source of ignition voltage will already be established at your engine's alternator. Refer to your engine manual to identify your alternator's ignition wire. The wire should provide zero volts when the ignition is off and the engine is not running, and system voltage when the ignition switch is on and the engine is running (recommended).
2. The ON side of an oil pressure switch.

BLUE (FIELD) WIRE —

The BLUE field wire in the regulator's wiring harness provides field current to the alternator's positive brush, which enables the regulator to control excitation and alternator output. The BLUE field wire is connected to the field terminal of an externally regulated P-type alternator.

If your alternator is not designed for external voltage regulation (i.e., an internally-regulated alternator) it will be necessary to modify the alternator to provide access to the alternator's positive brush.

In some cases, this will require that the alternator must be opened up to disable the internal regulator and diode trio, and a direct pathway be created between the positive brush and a terminal on the outside of the alternator that's isolated from the alternator's grounded frame. This can be a difficult process.

We strongly recommend using a qualified alternator shop for any alternator modifications, including conversion to external regulation.



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ORANGE (DASH LAMP) WIRE —

The ORANGE Dash Lamp circuit is designed to provide a source of ground to complete a circuit at a warning light or audible alarm if one of the following conditions exists: low system voltage (alternator is not charging properly), high system voltage (alternator is charging above safe voltage), high alternator temperature (requires alternator temperature sensor), high battery temperature (potential thermal runaway at batteries). The Dash Lamp wire can be connected to the negative (ground) side of a user-installed warning lamp or audible alarm.



OPTIONAL TEMPERATURE SENSOR CABLES

When used in conjunction with its optional temperature sensor cables, the WS100 can use ambient temperatures at the batteries and at the alternator to provide additional safety and charging efficiency. Connection for temperature sensor cables is provided via built-in RJ45 terminals at the bottom of the regulator.

WS100-BTS-KIT — Battery Temperature Sensor Cable (BLUE)

WS100-ATS-KIT — Alternator Temperature Sensor Cable (GREEN)



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BLUE (BATTERY) CABLE —

The WS100/12 Battery Temperature Sensor cable connects the regulator to the battery via a temperature sensor IC that's mounted in a battery lug which can be connected directly to the battery's ground post. The Battery Temperature Sensor includes a 15-foot (BLUE) Cat5e data cable which connects to the Bat Temp RJ45 connector. When connected, the Battery Temperature Sensor will allow the regulator to make adjustments to charging voltage based on the ambient temperature of the batteries being charged.

When connected to a multiple battery bank, the Battery Temperature Sensor lug should be located on the ground terminal closest to the center of the battery bank. In addition to enabling the regulator to adjust for ambient battery temperature, the Battery Temperature Sensor will enable the regulator to shut down if battery temperature exceeds safe levels (>125°F).



NOTE: Do not install or remove battery or regulator temperature sensor cable while regulator is activated.

GREEN (ALTERNATOR) CABLE —

The WS100/12 Alternator Temperature Sensor cable enables the voltage regulator to reduce field (excitation) output to the alternator if temperatures at the alternator case exceed recommended temperature levels.

The lug containing the temperature sensor IC can be mounted on a rear case bolt, or to the ground post of the alternator. An RJ45 keystone jack located at the bottom of the regulator is provided to connect the 7-foot (GREEN) Cat5e data cable to the regulator.

NOTE: Do not install or remove battery or regulator temperature sensor cable while regulator is activated.



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Regulator Programming

PROGRAM ADJUSTMENT KNOB

REGULATOR PROGRAMMING

Programming the Wakespeed WS100/12 is remarkably simple. Five programs, listed below, can be selected by rotating the (GREEN) color-coded knob marked Program Select, located to the right of center at the top of the regulator.

As the knob is turned clockwise or counter-clockwise, the the lights marked one through five on the regulator's label will light up, indicating your program selection.

Note: the regulator must be turned on prior to programming. When turned on, the regulator will display the #1 green light, and the number of the existing program setting at start up. Program Select choices are as follows:

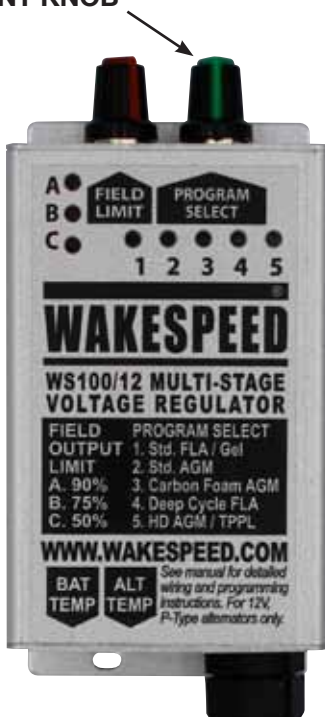
Program #1 Standard Flooded/Gel —

Designed to properly charge standard (thin plate) flooded and gel battery types. See chart on Page 6 for specific charging voltage values. Program #1 is indicated by the far left green light marked "1".

Program #2 Standard Absorbed Glass Mat —

Program #2 provides proper charging voltages for many common AGM-type batteries. See chart on Page 6 for specific charging voltage values. Program #2 is indicated when #1 and #2 green lights are illuminated.

NOTE: To provide protection from accidental program changes, any adjustments will only be implemented by turning off the ignition and disconnecting the regulator from its power source after changes have been made. The new program will initiate with the subsequent engine start up.





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Program #3 Carbon Foam AGM –

Program #3 provides proper charging voltages carbon foam AGM batteries (such as those marketed under the Firefly® brand). See chart on the last page for specific charging voltage values. Program #3 is indicated when #1 and #3 green lights are illuminated.

Program #4 Deep Cycle Flooded –

Program #4 provides proper charging voltages for traditional deep-cycle (thick plate) flooded batteries. See chart on the last page for specific charging voltage values. Program #4 is indicated when #1 and #4 green lights are illuminated.

Program #5 High Density Absorbed Glass Mat/TPPL –

Program #5 provides proper charging voltages for high-density AGM-type and TPPL (Thin Plate, Pure Lead) batteries. See chart on Page 6 for specific charging voltage values. Program #2 is indicated when #1 and #2 green lights are illuminated.

Time and voltage settings for each battery program are detailed at the end of this instruction book. Be sure to consult your battery manufacturer for recommendations prior to programming the regulator for your battery type.

NOTE: To provide protection from accidental program changes, any adjustments will only be implemented by turning off the ignition and disconnecting the regulator from its power source after changes have been made. The new program will initiate with the subsequent engine start up.



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Field Limit Programming

FIELD LIMIT ADJUSTMENT

FIELD LIMIT ADJUSTMENT

The Wakespeed WS100/12 provides four levels of field output control to allow the user to de-rate the alternator to limit engine horsepower load.

Controlled by the (RED) color-coded knob labeled Field Limit to the left of center at the top of the regulator, the field output can be adjusted by turning thumbscrew clockwise or counter-clockwise.

Output levels are broken down by percentages of maximum field output provided by the regulator. Limits will be indicated as follows:

- 1. 100% Field** — Indicated by no RED lights on the regulator, next to codes indicated by A, B, or C on the regulator's label.
- 2. 90% Field** — Indicated by the RED light illuminated by the letter A on the regulator's label.
- 3. 75% Field** — Indicated by the RED light illuminated by the letter B on the regulator's label.
- 4. 50% Field** — Indicated by the RED light illuminated by the letter C on the regulator's label.

NOTE: Adjustments to the Field Limit can be made "on the fly" and will immediately result in a decrease or increase to the value selected.

Wakespeed recommends setting the field limit at 90% to provide protection against saturation alternator output.





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Regulator Operation

USING THE WAKESPEED WS100 REGULATOR

Once the WS100 regulator is properly wired to the alternator and configured for your battery type, the regulator is ready to begin charging your batteries. Following a short delay, the regulator will begin to ramp up charging voltage to a bulk target voltage that's determined by your charging profile selection.

Once the regulator reaches bulk target voltage, the regulator will continue to hold at target until the field pulse width falls below its target level, and the regulator will advance to the acceptance target voltage (typically two-tenths of a volt below bulk target voltage). The regulator will continue to charge at acceptance target voltage until the field pulse width drops below minimum target, at which point, the regulator will advance to float voltage.

While at target voltage for float, the regulator will monitor the field pulse width. If the maximum float pulse width cannot maintain the target voltage for float charging, the regulator will return to acceptance charging voltage. During extended engine operation and under varying battery loads, the voltage may cycle between charge modes multiple times.

OPERATIONAL DISPLAY

During normal operation, the regulator will display a combination of green lights in positions marked one through five, indicating the progress of the charge program. A combination of lights, as described below will indicate charging activity status. Codes are as follows:

- 1. #1 Green Light** — Indicates regulator is turned on.
- 2. #1 & #2 Green Lights** — Indicates regulator is in bulk charge mode.
- 3. #1 & #3 Green Lights** — Indicates regulator is in absorption charge mode.
- 4. #1 & #4 Green Lights** — Indicates regulator is in float charge mode.
- 5. #5 Green Light** — Indicates Dash Lamp mode is active. May be active as a result of low system voltage, high system voltage, high alternator temperature (>225°F) or high battery temperature (>125°F).



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Data & Program Values

REGULATOR DATA

Model..... WS100/12	Alternator Temperature Sensing Yes*
Description..... Multi-Stage Regulator	Battery Temperature Sensing Yes*
System Voltage..... 12VDC	Baseline Battery Temperature 25°C
ExcitationPositive Field (P-Type)	Enclosure..... Anodized Aluminum Alloy
Processor Microchip 8 Bit	Dimensions..... 4-7/8" x 2-5/8" x 1"
Preset Programs.....5	Display.....Color-coded LED (8)
Field Output Levels.....4	Circuit Protection Conformal Coating

* Requires optional Battery and Alternator Temperature Sensor Cables

Regulator Program Values								
Prog. #	Battery Type	Bulk Volts	Acceptance Volts	Float Volts	Fixed Time	Flex Time (Min)	Float Time (Max)	Temp. Comp. mV/°C
1	Std.FLA/Gel	14.1	13.9	13.4	18m	18m	120m	24
2	Std. AGM	14.38	14.18	13.4	18m	18m	120m	24
3	Carbon Foam	14.4	14.2	13.4	18m	18m	120m	24
4	Deep Cycle FLA	14.6	14.4	13.5	18m	18m	120m	30
5	HD AGM/ TPPL	14.7	14.5	13.6	18m	18m	120m	24



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Limited Product Warranty

TWO-YEAR LIMITED PRODUCT WARRANTY

Wakespeed® warrants the original purchaser the product is free from any defects in material or workmanship for a period of two years from the original date of purchase. If any such defect is discovered within the warranty period, Wakespeed will repair or replace the product free of charge, subject to verification of the defect or malfunction upon delivery or shipping prepaid to Thomason Jones Company/Wakespeed, PO Box 1541, Anacortes, WA 98221.

Defects or physical damage resulting from abuse, neglect, accident, improper repair, alteration, modification, or unreasonable use of the products are not covered under warranty. Returned products showing evidence of tampering and/or unapproved access to internal components will not be supported under warranty.

Wakespeed cannot warranty Broken cases, parts damaged by fire, water, freezing, collision, theft, explosion, rust, corrosion, damaged cables or wiring harnesses, or items damaged in shipment in route to Wakespeed Warranty Services for repair. Thomason Jones Company/Wakespeed assumes no responsibility for consequential damage or loss or expense arising from these products or any labor required for service or repair.

Wakespeed will not repair or be held responsible for any product sent without proper identification and return address or Return Authorization 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, Wakespeed requires that a Return Authorization is completed prior to returning a defective product for repair.

If factory service is required, contact Wakespeed Warranty Service Monday through Thursday, 8:30 AM to 3:30 PM, (PST) at 360-299-1231, or via email at support@wakespeed.com. Repair or replacement of the defective part or product is to be supplied free of charge upon delivery of the defective product to Wakespeed Warranty Service. Customer is responsible for all return transportation charges and any air, international or rush delivery expense.