INSTALLATION MANUAL
incharge Alternator Regulator

The ***incharge*** is an automatic, multiple-cycle, fully adjustable, alternator regulator. It will regulate any externally regulated P-field alternator up to approximately 300 Amps that requires a positive voltage to turn on the rotor (field) winding. The maximum field current should not exceed 10 Amps at 100°F (38°C) or 8 Amps at 150°F (66°C) ambient. Using the optional wiring harness, it is plug compatible with many high-output alternators (Powerline, Balmar, Silver Bullet, Lestek, Amptek, etc.). The ***incharge*** is preset from the factory with Acceptance voltage, Float voltage, and Time-to-Float settings that will work for most systems. These settings may be adjusted to best fit your application. PORT ENG

S/N 127602 2/28/02
D/C 08-01

Multiple Cycle Charging WEST MARINE-MTH

Multiple-Cycle charging has two advantages. First, it allows deep-cycle, (liquid and gelled), lead-acid batteries to be charged as fast, and as fully, as possible. Second, it ensures long life by maintaining the batteries at a safe float voltage after they are charged. The ***incharge*** begins with a Charge cycle that supplies the maximum available output current of the alternator. When the batteries reach the upper voltage set point (14.1 to 14.3V typically) the Acceptance cycle begins and the batteries are held at this voltage. They will accept less and less current as they become charged. After the batteries have been held at the Acceptance voltage for two to three hours they are normally fully charged and the Float cycle begins. During the Float Cycle the batteries are maintained at a lower voltage (13.2 to 13.8V typically) where there is no water consumption or over-charging.

PME dash

WARNINGS

The *incharge* warranty does not cover the alternator, batteries, or any other devices, or equipment.

The ***incharge*** is not designed to regulate N-type alternators, that is alternators that supply regulation by switching in the negative supply to the field. This includes most Japanese and internally regulated alternators. If these alternators are to be converted to external regulation **you must disconnect the internal regulator and the diode trio in the alternator**. This should be performed by a well qualified alternator shop. **An improperly converted alternator may cause damaging high voltages! Please be sure to check the regulation voltage during initial operation.**

Do NOT exceed the recommended limits of voltage for your battery unless you are attempting to perform a mild "equalizing charge". If you do this, observe the battery current and electrolyte. Return the setting for acceptance to the proper point when finished.

Tachometer "Keep Alive" Function

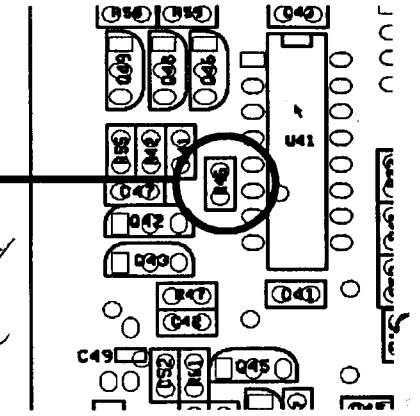
The ***incharge*** has a special circuit that supplies the alternator with a minimum field current sufficient to keep electronic tachometers operating during cycle transitions and when the battery is very full. It is possible under some circumstances for this minimum current to result in sufficient alternator output to cause the voltage to rise above the regulation setpoint.

This situation is very rare and will only occur with a small full battery, high output alternator and no DC loads. To check your system for this problem simply watch the voltage during charging. If the voltage normally remains at the Acceptance or Float regulation point but

slowly increases above it when the battery is very full then you will have to either turn on a small DC load or use the following procedure to defeat this function:

To defeat the tachometer "keep alive" function unplug the regulator from the wiring harness, remove one end plate, and slide the cover off to reveal the circuit board. Use a small pair of wire cutters and remove R46 located in the upper left hand corner of the circuit board. Replace the cover and end plate and reinstall.

Did this on both regulators



Installation Wiring

Refer to the installation wiring diagram. Wiring should be stranded #14AWG. There are four wires required for the ***incharge***. The color codes shown are for the (optional) wiring harness.

1) The Black wire is the GND (ground) connection. There are <u>two</u> possible GND connections on the regulator. One is through the plug-in wiring harness. The other is through the screw connection under the largest hole in the face of the unit. At least one of these must be connected to the alternator case or the negative terminal of the alternator. If you are using an existing plug compatible harness that has a separate black ground wire with a ring terminal, fasten it under the screw.

2) The Red wire is the + 12 V IN connection. It is wired to the battery positive bus that will be receiving the charge from the alternator. Typically this is the same point as the alternator positive terminal. As selected from the factory this wire supplies both voltage sensing for the regulator and field current for the alternator. If the alternator and battery wiring have excessive voltage drops you should consider using the REG ON wire for voltage sensing (see below) . You should fuse the RED +12V IN wire at the source end with a 15 A (or smaller) fuse.

NOTE: If a battery isolator is installed, connect the Red + 12 V IN wire to the **battery side** of the isolator, **NOT to the alternator output**. Use the SAME battery to supply REG ON (see below).

3) The Brown wire is the REG ON signal. It should be connected to an ignition switch, or normally open oil pressure switch, that delivers +12 Volts when the engine is running. If you select the REG ON wire to supply regulator voltage sensing (See Voltage Sense Selection on page 3) you must take special precautions. It **MUST** go through a normally open oil pressure switch or an ignition switch whose source is the **SAME** battery the alternator is charging. **This**

line should NOT be shared with other loads. The voltage of REG ON must be equal to the voltage of the battery being charged. Use #14 AWG wire for the installation. The BROWN REG ON wire should be fused with a 2 A fuse at its source end.

4) The Blue wire is the FIELD connection. It goes directly to the field terminal of the alternator. If you have an externally regulated alternator that uses a different plug than the one supplied with the regulator you may use an insulated spade terminal to make the connection.

5) The White wire is the TACHOMETER connection. It supplies the stator output to electronic tachometers, sometimes used with diesel engines.

Test Prior to Starting Engine

Before starting the engine you should make this simple test. First all LED indicator lights on the unit should be off. Energize the REG ON terminal by turning on the ignition switch, or by putting a jumper across the oil pressure switch (if that is how the regulator is being turned on). The green ON LED and the red CHG LED should come on. Verify the alternator field is energized by touching the shaft of the alternator with a screwdriver. It should be strongly magnetic. Now de-energize the REG ON terminal, both LEDs should go off and the field should no longer be strongly magnetic. If you cannot pass this test do not proceed. Double check your wiring and refer to the Trouble Shooting section.

Operation and Indicator Lights

To check for proper operation you will need a digital voltmeter. If you have installed a battery monitor, such as a Amp-Hour +, Link 200, or one of our other models, you can use it. Otherwise you will need a hand held digital Volt meter. **Be sure no other charging sources are on!** Discharge the battery about 10%. Start the engine. The green ON light should be lit. The red CHG light will also be on. Watch the battery voltage with your digital Volt meter. The voltage will rise until the yellow ACCEPT light comes on (the red CHG light will remain on). When the ACCEPT light comes on the voltage should be stable at 14.1 to 14.3 Volts as set by the factory. Before adjusting the ACCEPT voltage see the Adjustments section in this manual.

When the Acceptance voltage is reached a timer begins which keeps the regulator in the Acceptance mode. The factory setting is 2.5 hours. At the end of that time the regulator will go to the FLOAT mode and the green FLOAT light will come on. The ACCEPT light will go off.

If a heavy load comes on during the ACCEPT mode which causes the voltage to drop more than 1/2 Volt, the ACCEPT light will go out. If this condition persists for more than 5 minutes, the TIME function is reset. When the voltage rises back to the ACCEPT set-point the yellow ACCEPT light will come back on and the timer will start again. This extends the time spent in the ACCEPT mode to properly re-charge the battery.

If a heavy load comes on during the FLOAT mode which causes the voltage to drop more than 1/2 Volt below the Float voltage for more than 5 minutes, the FLOAT light will turn off and the CHARGE mode is entered until the ACCEPT voltage is again reached. The charge cycle is then repeated to recharge the battery.

Adjustments

Voltage Sense Selection

A jumper on the circuit board selects either the +12 V IN (RED wire) or the REG ON (BROWN wire) for voltage sensing. The regulator is shipped from the factory with the jumper installed in the RED wire position. This position is selected so you may directly replace existing regulators which use this wire for voltage sensing. Since the +12 V IN wire carries

field current and is connected directly to the alternator it cannot always supply true battery voltage. It is better to use the BROWN wire for voltage sensing but you must use special precautions. If you choose BROWN wire sensing, it must be supplied from a separate wire to the battery being charged. It must be turned on with a normally open oil pressure switch, ignition relay, or other switch **that has no other loads on it to cause a voltage drop** or "sag". Even small loads may do this. A good sense line, at the regulator end, will not differ from the battery voltage by more than 0.01 Volts under all conditions.

To change the jumper location, remove power from the leads to the regulator, remove the plug attaching the wire harness to the regulator, and remove one end-plate of the regulator. Slide out the cover to expose the circuit board and locate JP 46, about one inch above the REG ON terminal. Notice the black rectangular jumper above the RED label on the circuit board. Remove the jumper and push it back over the two pins located above the BROWN label. Reassemble and verify proper operation and calibration of the regulator as described on page 2.

Acceptance Voltage Adjustment

Acceptance and Float voltage adjustments are best made with a fully charged battery, particularly if you are using the RED +12V IN wire for voltage sensing. With a full battery there will not be much field current flowing to affect the accuracy of the voltage settings. When the yellow ACCEPT light is on check battery voltage with a digital voltmeter measuring DIRECTLY across the battery + and - terminals. Increase the engine r.p.m. slightly to verify that the voltage does not increase. If it does either wait for the battery to become more fully charged, or find a high enough r.p.m. where the voltage does not change with increasing r.p.m. Using a small screwdriver (one that fits) slowly rotate the ACCEPT control clockwise to increase, or counterclockwise to decrease the measured voltage until the desired value is set. With good wiring and good voltage sensing the settabilty will be within 0.03 Volts. (See table on page 4 for proper voltage settings.)

Float Voltage Adjustment

When the FLOAT light comes on, follow the above procedure except make the adjustment using the FLOAT control. You may choose to turn the time adjustment to the extreme counterclockwise position to minimize the time it takes to reach the Float mode. (BE SURE to return the time adjustment to the midpoint when finished.) If the float voltage is set near 13.0 Volts you may have to put some load on the battery to get the alternator to turn on because it takes some time for the voltage to settle from the higher Acceptance voltage. For this same reason an alternator driven tachometer may reduce its reading or flicker as the transition is made from Acceptance to Float. Turning on a 12 Volt light or two will solve the problem.

For Professional Installers: You may force an immediate transition to Float from Acceptance without waiting for the set TIME by locating JP3 on the circuit board (upper left-hand corner) and placing a temporary jumper between TP5 and TP6. If the regulator is in the FLOAT mode you may force a temporary ACCEPT mode by placing a jumper between TP6 and TP7. Remove the jumper to revert to the FLOAT mode. To use this method, remove the top end plate and remove the cover to expose the circuit board.

Time Adjustment

Many multiple-cycle regulators make the transition from Acceptance charging to the Float mode too early. The ***incharge*** allows you to set the best time for your system. The regulator is set at the factory with a 2.5 hour TIME. This is appropriate for most systems. Exceptions might be: Extending the time to do some intentional overcharging to regain lost

capacity. Or shortening the time if you stop and start the engine frequently. From the factory the slot on the control pot will be close to the 12 o'clock position . If you require a different time you may interpolate the scale and make a new setting. For example, if you want 1 hour then rotate the slot counter clockwise about 1/3 the distance from 12 o'clock towards the minimum 1/2 hour setting. The maximum setting is 4.5 hours.

For Professional Installers: If you have a frequency counter or a portable FLUKE 87 (in D.C. mV and Hz mode, see Fluke manual) you may make an exact calibration by attaching the leads to the test header JP3 (upper left corner) between terminal 1 (CLOCK) and terminal 7 (GROUND). Use the following formula to determine the frequency to be measured (and set) for the number of minutes desired for the Acceptance mode: Frequency (in Hz.) = 546/# minutes desired. For example: For 2 hours = 120 minutes, Frequency = 546/120 = 4.55 Hz. Adjust the pot until you read this frequency. To use this method, remove top end plate and slip the cover out of the case to expose the circuit board.

Recommended Settings For Acceptance and Float Voltages

High temperatures are destructive to batteries. If your batteries are regularly subjected to temperatures above 100°F you should relocate them or supply forced fresh air ventilation. Choose a voltage setting that is in the mid-range of the operating temperatures your battery will normally be at.

TEMPERATURE COMPENSATION TABLE

Caution! Do not adjust to extremes unless the battery is normally at that temperature. Destructive over or under charging may occur.

		LIQUID BATTERIES		GELLED BATTERIES	
	TEMP °F	ACCEPT	FLOAT	ACCEPT	FLOAT
SAME VARIANCE	120	13.4	12.5	13.9	13.3
	110	13.6	12.7	14.0	13.4
	100	13.8	12.9	14.1	13.5
X	90	14.0	13.1	14.2	13.6
	80	14.2	13.3	14.3	13.7
	70	14.4	13.5	14.4	13.8
	60	14.6	13.7	14.5	13.9
	50	14.8	13.9	14.6	14.0
	40	15.0	14.1	14.7	14.1
	30	15.2	14.3	14.8	14.2

NOTE: You may decrease the Acceptance values by 0.2 Volts or more if you repeatedly start and stop the engine over many hours of use (10 hours or more).

Troubleshooting

Troubleshooting is performed by observing the front panel indicators and by measuring the voltages between the GND terminal and the other terminals.

No alternator output:

1) Green ON light is lit, Red CHG light is lit, some voltage exists at FIELD terminal.

Problem: There is an alternator or wiring problem related to the FIELD wire or the alternator output path. **Solution:** Verify wiring.

2) Green ON light is lit, Red CHG light is off, no voltage at FIELD terminal, good voltage at +12V IN.

Problem: Check the fusable link, F1 on the circuit board. This fuse may open if the regulator has a reverse polarity applied between +12V IN and GND terminals or if an excessive load is attached to the FIELD terminal. The fuse may be replaced by soldering in a 3/4 inch length of AWG #26 solid, tinned wire bent at both ends to stand off of the circuit board when soldered. If the fuse is O.K. then the regulator is bad. **Solution:** Call the factory.

3) Green ON light is off, no voltage at REG ON terminal or, perhaps, no voltage at +12V IN. **Problem:** There is an external wiring or switch problem, or a problem with wires GND, +12 IN, or REG ON . **Solution:** Check external fuses and switches .

4) Green ON light is off, good voltage both at REG ON and +12V IN terminals.

Problem: The regulator is bad. **Solution:** Call Factory

High battery voltage or FIELD always energized:

1) The green ON light is off and the Red CHG light is on: **Problem:** Another regulator is still functioning, there is voltage applied to the FIELD terminal from another source, or the regulator is bad.

Ecetera

DO use the proper size flat blade screwdriver or adjustment tool that fits the slots of the adjustment controls. Do not attempt to drive the settings past the indicated limits, you will damage the controls. The pots move through 270° of rotation.

Under dark light conditions the ACCEPT light may be dimly lit when in FLOAT mode and when the voltage is sagging under a load. Be aware that the regulator may switch back to ACCEPT if the condition persists long enough.

The red CHG light may flicker or blink if the load is heavy or if the installation wiring is such that the voltage to the regulator is allowing excessive voltage drops.

An alternator driven tachometer may reduce its reading or flicker when the regulator makes a transition from acceptance to float if the battery is fully charged with no loads, and if the float voltage is set quite low. Turning on one or two 12 Volt lights will remedy the situation.

There is no limit on the size of the battery system.

Previous Versions

Earlier versions of the Heart Interface ***incharge*** and Cruising Equipment ***Alpha*** were limited to 5 Amps of field current. The higher field current rating (10 Amps at 100°F ambient) became effective on units with serial numbers greater than:

incharge 12V: 122250
Alpha 12V: 124025
incharge 24V: 241175
Alpha 24V: 240500

FOR 24 VOLT
Installations of incharge Regulators

The installation of the ***incharge*** is exactly the same for 24 Volt alternators as it is for 12 Volt alternators. Everywhere the text reads +12V you may substitute +24V. The Acceptance and Float voltage values may be doubled. For your convience please see the table below of Acceptance and Float voltages appropriate for 24V systems.

Recommended Settings For Acceptance and Float Voltages

High temperatures are destructive to batteries. If your batteries are regularly subjected to temperatures above 100°F you should relocate them or supply forced fresh air ventilation.

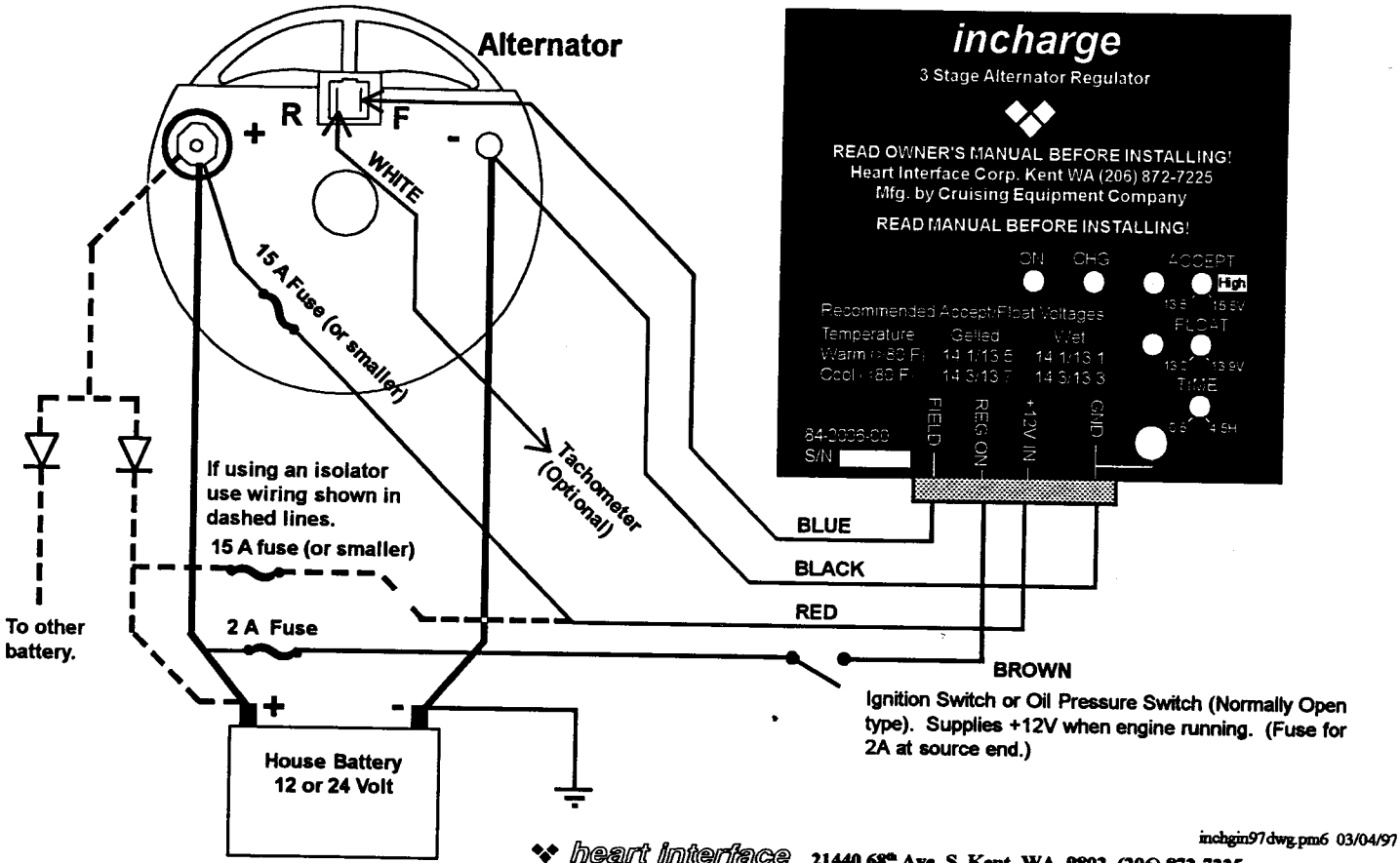
TEMPERATURE COMPENSATION TABLE

Caution! Do not adjust to extremes unless the battery is normally at that temperature. Destructive over or under charging may occur.

	LIQUID BATTERIES		GELLED BATTERIES	
TEMP °F	ACCEPT	FLOAT	ACCEPT	FLOAT
120	26.8	25.0	27.8	26.6
110	27.2	25.4	28.0	26.8
100	27.6	25.8	28.2	27.0
90	28.0	26.2	28.4	27.2
80	28.4	26.6	28.6	27.4
70	28.8	27.0	28.8	27.6
60	29.2	27.4	29.0	27.8
50	29.6	27.8	29.2	28.0
40	30.0	28.2	29.4	28.2
30	30.4	28.6	29.6	28.4

NOTE: You may decrease the Acceptance values by 0.4 Volts or more if you repeatedly start and stop the engine over many hours of use (10 hours or more).

incharge Installation Drawing



❖ heart interface 21440 68th Ave. S. Kent, WA 9802 (206) 872-7225

inchgin97dwg.pm6 03/04/97