PDAR
PDARRC

STERLING POWER PRODUCTS

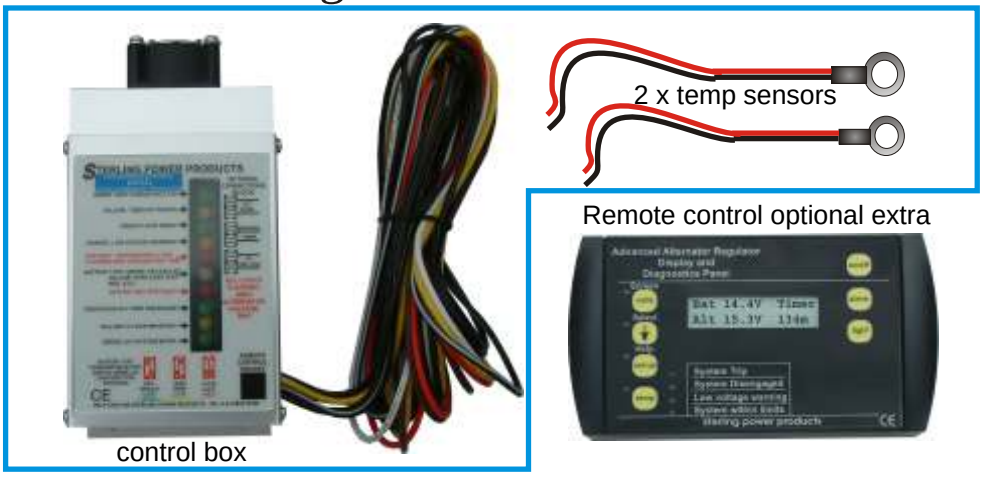
ADVANCED ALTERNATOR REGULATOR

PRO-DIGITAL

Advanced charging technology

Installations Instructions & manual

English and German.



HOCHLEISTUNGSREGLER

PRO-DIGITAL

Installations- und

Bedienungsanleitung

INSTALLATON MIT TRENNDIODE ODER RELAIS:

INSTALLATON WITH SPLIT CHARGE DIODE OR RELAY:

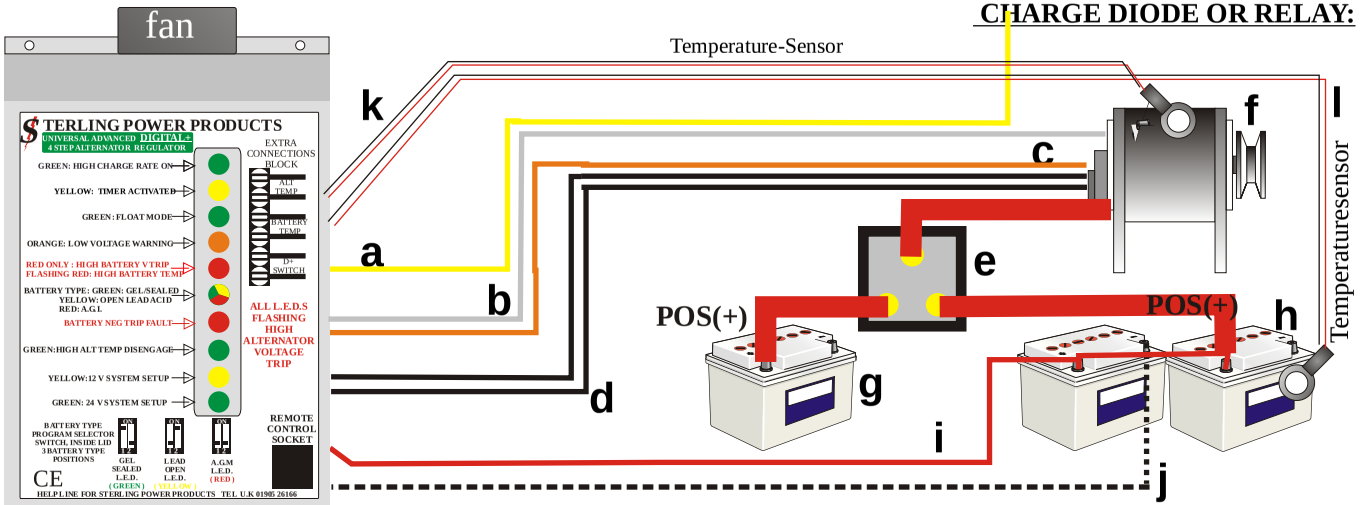
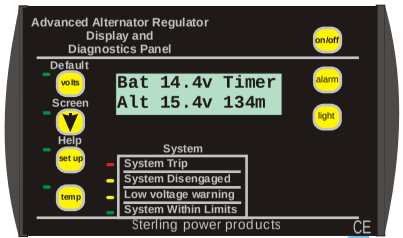
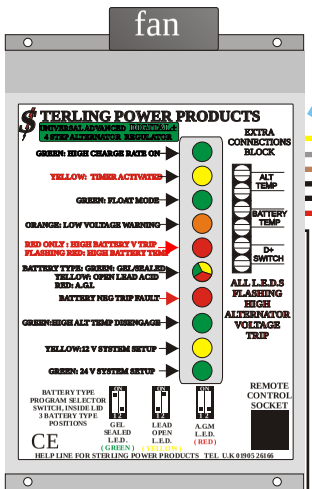


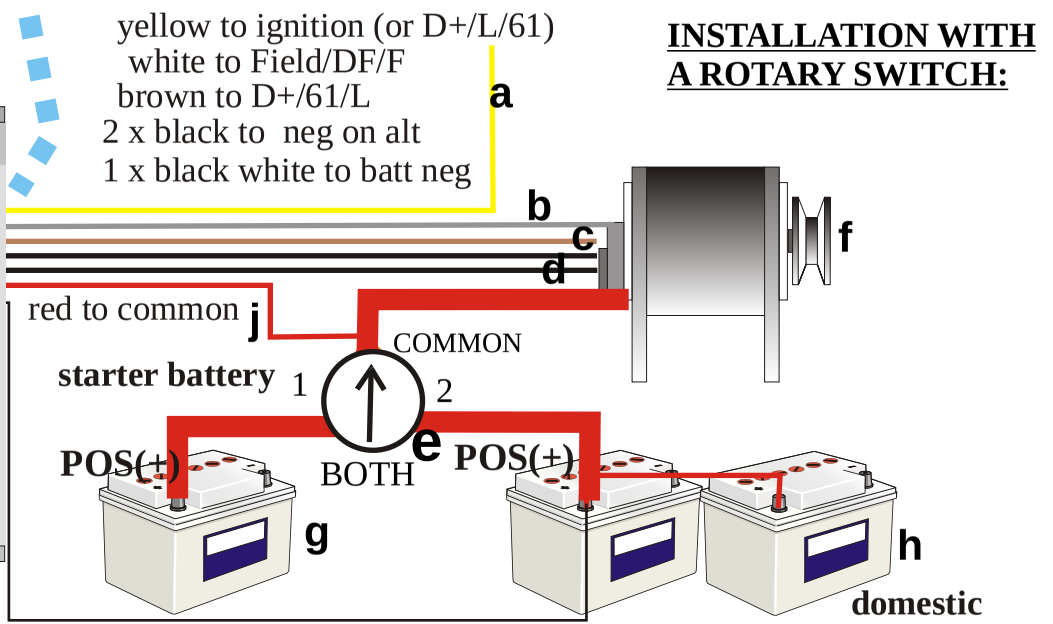
Fig 4

a = yellow to ignition (or D+/L/61)
b = white to field
c = brown to alt D+/62/L/DL
d = 2 x black to alternator neg.
e = split charge diode / relay
f = alternator
g = starter battery
h = domestic battery bank
i = red to domestic battery
j = black/white to battery negative
k = temperature sensor to alternator
l = temperature sensor to battery

a = gelb an Zündung+ oder (D+/R/L/DL)
b = weiss = Feld
c = braun an D+/62/L/DL
d = 2 x schwarz an Lima negativ-minus
e = Trenndiode oder Relais
f = Lichtmaschine
g = Starterbatterie
h = Verbraucherbatteriebank
i = rot an plus der Referenzbatterie
j = schwarz-weiss an minus der Referenzbatterie
k = Temperatursensor für die Lichtmaschine
l = Temperatursensor der Referenzbatterie







INSTALLATION WITH A ROTARY SWITCH:

Fig 5 temperature sensor cable to battery terminal

BATTERY SELECTOR Setup Up

Fig.1

		LED COLOUR	MAX. CHARGING VOLTAGE	ABSORBTION TIME	FLOATING VOLTAGE
1	OPEN LEAD ACID	YELLOW	14.8V / 20°C	1 - 3 HRS.	13.65V / 20°C
2	GEL-BATTERIES (EXIDE SPECIFICATION)	GREEN	14.4V / 20°C	10 - 12 HRS.	13.8V / 20°C
3	SEALED LEAD ACID & AGM	GREEN-YELLOW	14.4V / 20°C	4 - 8 HRS.	13.65V / 20°C
4	GEL & AGM (USA SPECIFICATION)	GREEN FLASHING FOR 5 SEC.	14.1V / 20°C	4 - 10 HRS.	13.5V / 20°C

Optional connections inside box on P.C.B

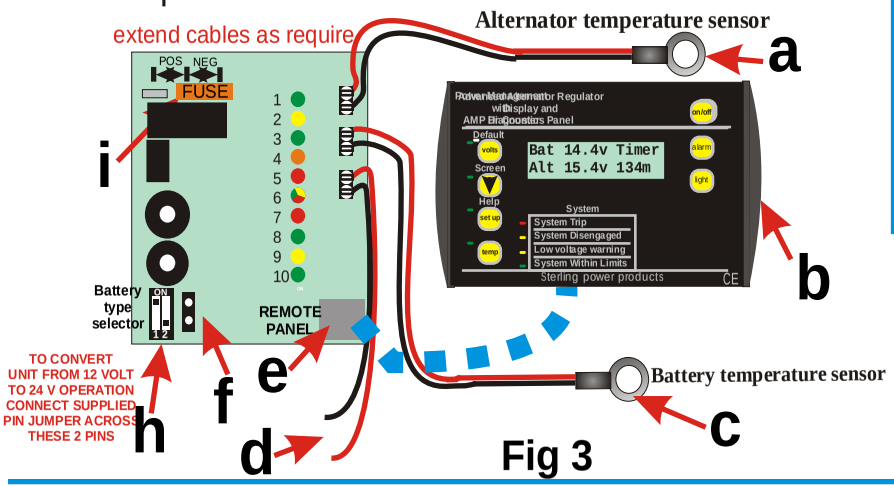


Fig 3

L.E.D. functions

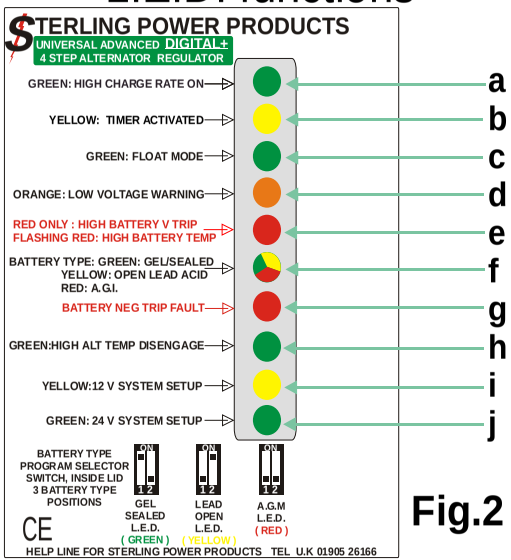


Fig.2

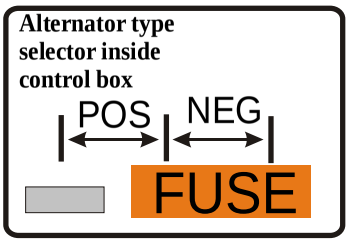
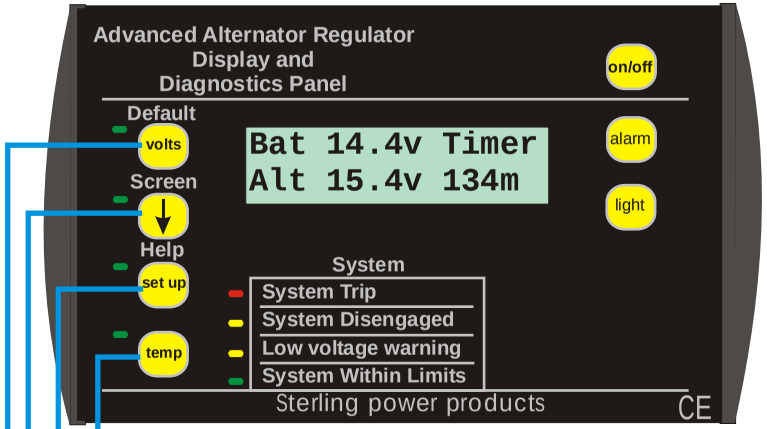
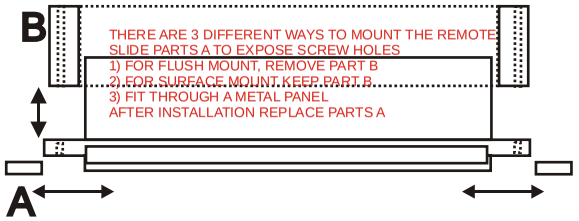


Fig 4

remote screen information





BAT 14.1V BULK
ALT 14.4V CALC.

Push the volts button.
this gives the battery voltage and the alternator voltage, this would be the main screen

BULK CHARGE
WET OPEN

Push the arrow button.
this give the charger stage , it bulk charger (high charger rate) or float charger (job done), the bulk charger will change to a count down timer (ie how long before the bulk charger is over and t will beguine) I it also gives you the type of battery the system is set up for, ie wet, gel, A.G.M. etc.

SYSTEM SET: 12V
xxx min. ACTIVE

Push button setup.
This gives the system set up information, ie it is set for 12 volt operation or 24 v , anh the time the system has been active (engine running time from start up)

BAT TEMP: 20C
ALT TEMP: 60C

Push button temp.
This gives the battery and alterbnator temperature (if the sensors are

UNIVERSAL *DIGITAL* ADVANCED REGULATOR FITTING INSTRUCTIONS. This new unit is suitable for 12 and 24 volt operation, obviously to set this unit up as 24 volt on a 12 volt system, would be catastrophic and all effort is made to ensure this does not happen. The unit comes preset to 12 volt operation as standard, a small electrical bridge must be made in order for the 24V function to be operated. (see fig 3 code f , for the bridge position)This bridge is not supplied in the regulator box but is Sellotaped to the centre of these instructions ensuring that it cannot accidentally be installed. For 24V installation please fit the bridge as shown on the diagram **now !!.**

Thank you for purchasing the most advanced and powerful alternator regulator currently available in the world today. Please do not underestimate the effect this device will have on a conventional charging system. It is important to understand that your existing cables and layout may not be up to dealing with the extra performance from the alternator but do not worry, the Advanced Regulator has many safety devices built in to protect your system from damage in the event of the installation being unable to handle the extra performance caused by this device. The software will pick up any problems and disengage the unit and give a warning.

PRE INSTALLATION:

This device is not difficult to install, if a logical, step-by-step approach is maintained. Please note: The STERLING HELP LINE NUMBER IS UK 01905 26166 and should be used in event of any problems.
Some basic tools, a voltmeter and soldering equipment are required for installation.
Because the new regulator has been made to be totally flexible for all battery and alternator types it is important for you to collect the following information about your system. This will enable you to set the Regulator correctly and obtain the maximum results from the device.
Please obtain the following information about your system and fill in the space provided, if nothing else it is about time you knew this information.

Alternator Voltage (12 or 24 volt type).....VOLTS

Alternator Current (35amp, 55amp etc).....AMPS

Alternator Type: There are two alternator types, negative and positive rotor field control. Do not worry at this stage, which you have, but it is vital that you identify the correct one before connecting the advanced reg ; this will be dealt with later.
My alternator type is: (Neg or Pos).....

Battery Type: There are four main battery types: all the settings for these 4 battery types are clearly marked on the Advanced Regulator label. There is a lot of conflicting settings for gel and A.G.M. we have shown the setting recommended by Exide (the major gel manufacturers) however there are other companies who disagree with this in the U.S.A. so we have a setting for them also, its best to check with your supplier.
Battery Type selector (fig 1)
1) Conventional lead acid batteries, where you have access to the liquid level to maintain and top up the batteries. These may be charged at a faster rate and as such, the high charge setting may be used. By far the fasted charging batteries and the lowest cost. setting. Open lead acid/ traction batteries are the best type for fast charging and long life. 14.8 volts max for up to 8 hrs
2) Sealed Lead acid and some A.G.M batteries, not good for fast charging as cannot replace the water loss associated with fast charging. as such the top voltage is reduced to reduce the water loss , 14.4 volts max 4-6 hrs
3)Gel batteries (Exide setting) require , 14.4 volts 10-12 hrs on the charge voltage to charge them , as recommended by Exide .
Gel / sealed /A.G.M batteries are not recommended where fast charging is a priority. This is due to there limited ability to absorb high charge currents fast effectively.
4) Gel / some A.G.M settings. Some gel companies in the U.S.A. recommend no more than 14.1 volts so we have a setting for this. some A.G.M. batteries also require this setting.

The new software in the digital regulator automatically calculates the battery bank size, charge state, and alternator output, then using the internal DIGITAL processor sets the timing sequence every time you start the engine.

INSTALLATION:

This is the only hard part, and this will also determine your alternator type, when you have identified the alternator type please fill in the space above. Because there are so many alternators and many are not identifiable, the installation instructions apply to all alternators.

To identify the field control wire: (do not panic about removing an alternator, they are simple devices).

1) Isolate the alternator from the batteries (to prevent any accidents with live cables)
2) Remove all the wires from the back of the alternator (note down on this sheet as you go through the instructions to ensure correct placement of the regulator set-up switches).
3) With all the cables removed, remove the alternator.
4) Not so bad? Now for the hard bit! We are trying to get to the two brushes, which supply the rotor its current; they are usually connected to the regulator. Remove the regulator from the back of the alternator (usually 2 or 4 screws holding a component onto the back of the alternator) when this is removed the regulator should come away with the brushes attached. This should be no problem for about 80% of you with Lucas, Bosch, Volvo, however, the following things could be different:

a) A brushless alternator, most common S.E.V. Marshell 35 amp alternator fitted to old Volvo/Buch engines, has special instructions. On the alternator regulator is an F or D/F connection, this is the field wire, i.e. where the WHITE wire goes. This alternator is a positive alternator field control; therefore, change the booster setting from negative to positive. (CONNECT THE BROWN WIRE TO THE D+/61 /L TERMINAL, THE REST AS PER STANDARD. The best advice is to use this alternator as a sea anchor, and buy a decent size alternator, a 35 amp high revving alternator is no use to anyone).

Other special instructions relate to the very old Bosch mechanical regulator (about 25 years old), this must not be used in conjunction with the Sterling Regulator, however, conduct the tests as above, you will find the alternator is a positive field control. When the correct field wire is obtained set the Advanced Regulator to positive and remove the old Bosch regulator this is not a common thing).

b) Remote regulators, some alternators have regulators fitted remotely and connected to the alternator via 3-5 small wires (usually on old alternators), advice: The wires are still connected to a brush box on the alternator, remember it is the brushes we are after, locate the brushes as per normal.

c) Yanmar, Hitachi alternators require the alternator case to be split (unbolted, not hit with a sledgehammer), this will reveal the brushes in the back part. Please note for reassembly the two small holes in the brush housing which enable a wire to hold the brushes up when trying to reassemble the alternator.

5) Having found the brushes solder a 100mm length of 10 amp cable to the top of each brush.
Problems: Lucas regulator connectors are made from stainless steel, and as such normal pre-fluxed solder is no use, use standard plumbers flux from a tub and the solder will stick with no problem.
6) Having connected a cable to each brush, reassemble the alternator and replace it on the engine.
Problems: Volvo engines with Valeo alternators require some cutting around the regulator seal. Use your common sense never nip wires between the regulator and alternator case.
7) Ensure the ends of the two new cables are not touching each other, the alternator, or the engine, and reconnect the alternator.
8) After the alternator is reconnected, run the engine as normal, ensure the alternator is working as standard, i.e. the ignition warning light on the dash should out when the alternator is charging as per normal.
WARNING: *GO NO FURTHER IF THE ALTERNATOR IS NOT WORKING. The alternator must be in normal working mode before continuing i.e. giving out about 14 volts from the output of the alternator (x 2 for 24V)*
I will say again for people who thing I am joking!
WARNING: *GO NO FURTHER IF THE ALTERNATOR IS NOT WORKING. The alternator must be in normal working mode before continuing i.e. giving out about 14 volts from the output of the alternator (x 2 for 24V)*
9) This is the most important part. With the engine running well on tick over, using the voltmeter, we require the voltage from both the cables you have just fitted to negative:
Cable 1 = ...volts **cable 2 =**.....volts
(Also make a note of the alternators output voltage while doing these tests, if the alternator is working then we would expect to see a voltage of between 13-14 volts, if below 13V then the alternator is not working, if above 14.5 then the alternators own regulator is defective or one or the wires you have connected have shorted to the negative).
For Alternator Type:
If the voltage on any of the cables is between 2-12 volts and the other is 14 volts then this is a negative rotor control, **go to the pre installation section and write NEG**
If the voltage on any of the cables are 2-10 volts and the other is 0 (zero) volts, the alternator is a positive rotor control, **go to the pre installation section and write POS**
(For reference only, 90% of alternators in Europe are negative, these include Bosch, Valeo (Volvo), Hitichi (Yanmar), Lucas. The only positive alternators tend to be old alternators with remote regulators and American alternators such as Motorola and AC Delco, (this information is to be used as a rough guide only)).
In either case, we keep the 2-10 volt cable and either remove or cut the 14 or 0 volt cable. (Ensure this cable cannot touch the alternator case).
10) Having found the field wire and identified the alternator type the hard work is over, now to install the

regulator.
Remember to replace the old regulator back into the alternator do not leave it out.

Set Up Advanced Regulator Before Installation

1) By now you should have completed the pre installation section, I will take you through the Regulator set up and also explain what you are doing.
2) Remove the Regulator lid, inside you will see the circuit board with a 2 pin dip switch and a large fuse: See **fig 3** , **i** = large fuse and **h** = dip switch
Battery Type: Identify the small 2-pin dip switch, and set the battery type as per your battery type, explained earlier . the settings are on **fig 1** , and also on the metal lid of the Advanced Regulator.
WARNING: Under no circumstances use the Regulator on gel or sealed batteries if the battery type L.E.D is yellow when on this will permentelly damage the batteries.
Alternator Type: You should have established what the alternator field type is by now , it should be a negative or positive field control, ensure you have the correct information.
To set the alternator type, see **fig 4.** for neg, the fuse should be inboard of the edge of the case, if a pos unit then it should be beside the case edge
There is a standard automotive 5 amp fuse in the Regulator, there are three legs which will hold that fuse, the fuse should come standard set to the neg position. In order to convert the Regulator to a pos remove the fuse and reposition it in the other slot. The negative and pos positions are clearly marked on the printed circuit board drawing and on the instructions **fig 4**. Failure to get this right will result in damage to the advanced regulator and maybe the alternator's standard regulator.

EQUALIZING TIME CYCLE:
The software in the new Digital Regulator automatically calculates the equalizing time cycle every time the engine is started. This will range between 1-12 hours depending on the rise time between engine on and time to reach 14 volts; this will be different every time the engine is started, and varies from battery type setting . The internal computer software will look after this function.
The cables positions are marked on **fig 4 and 5**
a: Yellow: This is a simple ignition feed and should be connected to the ignition switch or any 12/24 volt supply which is live when the engine is running i.e. if there is no ignition switch then any good 12 volt supply will do with a simple on/off toggle switch to switch the unit on or off, i.e. when the engine starts switch this cable on, and when the engine stops switch this off. **extend as long as you want**

b: White:(Previously Green - changed due to new C.E regulations) The white is the alternator control cable, and should be connected to the field wire you fitted to the alternator earlier. This wire can be connected or disconnected with the alternator running, there may be cases where the Advanced Regulator needs to be switched off (i.e. small engine on a boat and a fast current) the Regulator has been known to knock off 1.5 knots of small boats with a 10-15 hp engine, however, most people usually connect and disconnect this cable (out of curiosity) to see the difference the Advanced Regulator makes to their system (with the Pro Digital, this unit can be switched on and off using the remote control). **Extend as little as possible**

c: Brown: The brown goes to the D+ on the back of the alternator, this is the small cable which is usually marked on the alternator case as "D+" or "ING" or " L" or "61" it is the cable which feeds the warning light on the dash. Connect the brown to the same terminal leaving the existing cable in place *some modern alternators have no D+ in this case connect to the B+ (the main positive output).* **extend as little as possible**
d:Blacks x 2: There are two black cables, these cables, if extended must be extended as two cables and connected to the alternator B- (B negative) or to the alternator case. If these wires are extended then please extend as 2 x separate wires and join at the **negative** at the alternator, I know this sounds stupid but trust me. **Extend a little as possible**
i: Black/white stripe: This is a new cable, which connects to the main domestic battery bank negative rail. This cable measures the negative at the battery banks, and checks it to the true negative at the alternator and ensures there is not to big a voltage drop in the negative cables. Any voltage drop in excess of 1.5 volts will trigger an alarm and shut down the Advanced Regulator on high negative volt trip. **extend as long as you want**
j: Red: The red is the sense wire, wherever it is placed on the Regulator and will regulate the voltage of that spot, therefore, it is important that the end of the red cable and the alternator must never be isolated when the engine is running.
The position of the red wire varies depending on what your charging system is:
Split charge diode: If your alternator charging circuit has a split charge diode fitted, position the sense on the battery side of the diode, on the side with the largest battery bank, (in the event of only two identical batteries either side will do).
Split charge relays: Same as above, however be warned, most low cost relays in the marine industry are approx 25 mm cubed, these relays may have been good enough for your old poor charging system, but when an Advanced Regulator is used do not be surprised if after a short period of time the relay melts. Only use good relays.
Rotary switch: Most yachts are fitted with a rotary switch, i.e. a switch with bat 1, bat 2, and both. With this type of charging system, position the sense on the back of the switch on the common point, remember that the only batteries to be charged are then dictated by you i.e. 1 or 2 or both. Due to the limitations and the constant changing of the switch, it would be my personal recommendation that, at a later date, you separate the charge line from the common starter feed and charge through a split charge diode.
Boats that have their bow thrusters positioned some distance away from the two main battery banks should place the battery sense wire (red) at the main battery bank and not at the bow thrusters. This is because the increase in battery voltage caused by the excessive distance between the battery banks can be too much for the main battery to deal with. The bow thrusters' battery will still benefit from the Advanced Regulator even if the sense wire is placed at the main battery bank.
Special vehicles: with no split system, connect the sense to the vehicle battery positive. **extend as long as you want**
Testing the system:
Start the engine up as usual, the green boost light and the float light (yellow or green depending on booster settings) should be on,(the green boost light will flash for 2 mins on start up to show the slow start, this is to reduce belt slip) the battery voltage should be measured to ensure the voltage works its way up to 14.4/14.8 depending on its settings. This could take between 1 minute and many hours depending on the battery bank size.
The voltage may vary slightly from alternator ie +/- 0.1 of a volt,. DO NOT ALTER THE FACTORY

SETTINGS *the internal pots are set up reference voltages for the new software control system, and not external voltage adjustment pots (as in the older, non digital models were).*

A word of warning, the most likely fault (assuming the Regulator is correctly connected) will be the high alternator voltage trip warning (all lights flashing), This is a unique safety device to prevent you setting fire to your boat. The trip consists of two sensors; one is sensing the battery voltage and will trip if the batteries exceed 15.5 volts (this will only happen if the standard voltage regulator on the alternator is defective, or the Advanced Regulator is defective). The other sensor is connected to the alternators D+ (the brown wire), this trips the Regulator if the voltage exceeds 17.5 volts at the alternator (all L.E.D's will flash together) the reasons for this tripping are usually poor cable connections, long cable runs or too thin a cable to carry the current now being produced or simply a failure in the connection between the alternator and the batteries) or the most common cause is a inline amp metre. Please be aware of cable runs with amp metres in the system. A good question to ask yourself is what is the cable length between the alternator and the batteries, you may think about 4 ft, but on further investigation you could find that the alternator output goes up to a dash mounted amp metre, then back down to the engine room and then through a diode to the batteries, total length about 15 feet. This is totally unacceptable and will require doubling up the cable thickness or replacing the amp meter with a shunt type or induction type (see the Sterling Power Management Panel)

In order to find the fault, switch the engine on and increase the engine revs to just below where the high voltage trip is going on. Test the battery voltage (must not ever be above 14.5 volts gel, or 15 volts normal), now we must measure the voltage drops in the cable between the positive terminal on the largest battery bank and the alternator itself. Place the negative probe of your volt metre on the positive terminal of the batteries and measure the voltage between the posivtive of the batteries and the posivtive of the alternator. Under normal circumstances there should be a 1.2-1.5 voltage drop across the diode and about 1 volt max drop in the cables = 2.5 volts drop in the charging system, any more than this is excessive cable loss due to poor connections or thin cables. This will show itself as heat, the best thing to do find the fault, is to carefully feel all the connections on the positive (AND NEGATIVE) sides of the charging circuit, if the main cable is warm to the touch the or connections are hot, then double up on charging cable and re do battery connections.

In order to accurately monitor what is going on in your system I suggest you look at the Sterling Power Management Panel / Amp Hour Counter because without this, you have no way of knowing what is going on your system and will be unable to diagnose any other faults on the electrical system.

Battery Maintenance.

Up until now you may never have maintained your batteries but with the regulator on the high charge rate you would expect to use much more water out of your batteries. It is therefore very important to regularly inspect and refill your batteries water level. For fast, high charging use only conventional lead acid batteries, do not use gel, or sealed batteries unless the maintenance free aspect is a priority and performance is not. The term 'maintenance free' may be on the side of your lead acid battery but this is not true in marine work cycle mode. Please ignore any reference to maintenance free on any open lead acid battery; this is for automotive cycles only. ***Remember fast charging cost water, check your batteries water level regularly.***

Temperature sensing: see fig 3 a= alt temp sensor, c = bat temp sensor

Connect the temperature sensor to a domestic battery terminal and to the 2 x terminals inside the Regulator (see internal drawing) and extend the cables as required. There is no polarity to these cables so connect any way round. Ensure the sensor is not crushed or nipped, in the event or the sensor becoming broken then the unit will revert to a standard 20 deg setting, however, if the wire is nipped and a 12 volt feed is fed up the wires this will destroy the internal chips and the unit will fail (safe).

The new Advanced Regulator has in built temperature compensation based on the graphs supplied by the battery manufactures. There are three graph types programmed into the software and are automatically selected with the battery type choice. There is also an alarm/shut down function in the event of catastrophic failure of the batteries or the Advanced Regulator, it may be left off if not required or fitted. This device will reduce the charge voltage as the battery temperature increases and switches off the Regulator and gives an L.E.D. alarm in the event of the batteries over heating. This function is good in the following conditions A) defective battery, all other trips are catered for electrically, remember this will only trip the Sterling Advanced Regulator, your standard regulator could continue to boil the batteries in the event of a bad battery fault or a standard regulator fault. The Sterling can only look after problems relating to the Sterling system B) defective Regulator: in the event of a defective Sterling Regulator or standard regulator the batteries will start to over heat, the Regulator will pick this up and shut down the Sterling Regulator only, it cannot shut down the standard regulator in the event of it failing closed, however the alarm function will be on.

False readings: the temperature sensor is designed to fit on the battery terminal post to pick up the electrolytic temperature inside the battery case. In the event of the post having bad connections of very high current flow, the

post may increase in temperature due to electrical resistance caused by bad connections, which could result in misleading temperature readings by the sensor. This would result in the Regulator shutdown with no fault with the batteries, a simple visual check and touching the battery case and battery terminals should establish if the electrolyte and the terminal are the same temp or the terminal is much hotter than the electrolyte, in which case, the problem could be bad electrical connections at your battery. One of the limitations of battery temperature sensing is that you could have 6 batteries and 1 sensor. The battery the sensor is connected to could be OK but battery number 5 could fail and the sensor is on battery number 2, the sensor would not pick up that problem.
Other new features on this unit:
Dash warning light, some new alternators have a high voltage warning build into their alternators regulators, this switches on the ignition warning light in the event of fitting the Advanced Regulator (the Advanced Regulators higher voltage control makes the standard regulator think that it has failed).WARNING: TO DATE, THERE IS ONLY 1 MARINE ALTERNATOR WITH THIS PROBLEM (ON SOME FORD ENGINES) AND ONLY A FEW AUTOMOTIVE ALTERNATORS WITH THIS. SO PLEASE PHONE BEFORE ASSUMING THIS IS A PROBLEM. A small relay is built into the Regulator to disengage the D+ warning when the alternator has started up. This was a special function for a special vehicle where Sterling Power Products had a demand, however, it may become more common in the future.
This product also has a m.n.e.a.400 interface ability, but the protocol has currently not been confirmed by other manufacturers. (we live in hope). the problem is there are at least 3 large companies competing to be accepted as the industry standard, and as usual no one can make their mind up

WHAT TO EXPECT ON THE L.E.D. DISPLAY and what to do about it see fig 2 for the relevent l.e.d. .

a:Green High Charge Rate On: (top L.E.D. 1) This should be on form start up and shows that the alternator should be working at it's maximum. It should remain on until L.E.D. 3 comes on and shows the high charge rate is over.

b:Yellow Timer Activated: This comes on when the voltage reaches about 13.9 - 14 volts and depending on how long it takes to come on, the software will calculate the timing for the high charge rate. This will vary from 1 - 6 hours and the time will be displayed on the remote panel and a count down shown. This light will remain on until the high charge rate light goes out.

c:Green Float Mode: This indicates that all the high charge cycles are now over and should remain on after all the high charge lights are out. The system is now running at a standard charge rate only (about 14 volts) regulated on the battery.

d:Orange Low Voltage Warning: This is simply saying that there is a low voltage at the main battery bank and has no active function. For information only, this usually indicates a defective alternator.

e:Red Dual Information L.E.D: This L.E.D. Has two functions and as such, has two display modes.

Display Mode 1: Solid red L.E.D on indicates a high battery voltage trip, suggesting that the voltage exceeds 15.5 volts. There are three things that can cause this.

1) The alternator's own regulator has failed closed, if the voltage continues to climb after the trip light has come on then the alternator's own regulator is usually to blame (or there is an installation fault). STOP as soon as possible and disconnect the alternator wires. Then continue on your journey and fix the problem at the first opportunity. Sterling are unable to defend you against this fault other than warn you as it is on your basic system over which we have no control. Failure to react to this problem will result in your batteries boiling.

2) The Advanced Regulator's own regulator has failed closed. If the battery voltage returns to 14 volts after the trip light has gone off then the Sterling Regulator has failed and the unit should be returned for repair/replacement as soon as possible. It is, however, still safe to use in an emergency case only, as when the batteries are flat the unit will charge them to 15.5 volts and then switch off. It should be stressed that this is for emergency, get me to port use only!

3) Some other charging source has failed, ie: the battery charger/wind generator /solar panels etc. In this case, the voltage would continue to rise even when the engine is switched off.

Display Mode 2: Flashing L.E.D. This indicates that the temperature sensor has picked up the battery temperature exceeding 50 degrees C. This usually means that the battery is defective and on it's way to boiling. Check the voltage across the battery, if below 14 volts and 50 degrees C then the battery is defective. Replace as soon as possible.

f:Tri Coloured L.E.D: This simply displays the battery type that the processor has been set to. All information regarding this is on the label.

g:Red L.E.D Battery Negative Trip Fault: This alarm shows that there is a fault on the negative between the battery negative and the alternator negative. This is usually due a bad connection. Please clean all connections and check cable crimps etc.

h:Green High Alternator temperature disengage: This shows that the alternator temperature sensor has exceeded 90 degrees C and has automatically disengaged the Advanced Regulator. The regulator will automatically re-engage at 65 degrees C. This process is fully automatic and requires no intervention. If you find this trip working a lot of the time, I suggest you check your engine room cooling and I would recommend a fan cooling system, blowing cold air from outside onto the back of the alternator (alternators suck air from the back through themselves to the front).

i:Yellow 12 volt system setup: This shows the system is set to 12 volts, it cannot accidentally be set to 24 volts or jump to 24V itself as an internal link must be made. Please ensure this is on if your system is 12 volts.

j:Green 24 volt System Setup: This indicates that the system is set up to 24 volts only. Under no circumstances should the device be run in this mode if your system is 12 volts as all the trips will be set to 24 volts This will result in the destruction of your batteries with no warning given.

All L.E.D's flashing: The most common fault, this shows the alternators voltage has exceeded 17.5 (or 37 volts in the case of 24 volts). This happens for various reasons such as cables from the alternator to the battery are too long and not thick enough to carry the current or if there is an amp meter in the circuit then usually there is a problem with the connections to the amp meter. If an installation has been running satisfactorily for a period of a few weeks and this starts then check if the split charge relay or diode is OK and has not failed. Please note that when this, or any trip light is on the Advanced Regulator has been electrically totally isolated from the alternator and is no longer in use. If the alternator voltage continues to rise after this has tripped then please check the alternators own regulator .and stop and disconnect the alternator

Alternator Temperature sensor see fig 3 part a

This sensor connects to the alternator and in the event of the alternator case or diode pack (depending on where it is connected) exceeding 90 deg C then the Advanced Regulator will DISENGAGE (ie switch off the high charger rate) until the alternator reduces its temperature to below 65 deg C, then the Advanced Regulator will re-engage itself and continue, a warning will be displayed on the remote panel (if used) and a LED on the local display (number 8) will illuminate while the system is disengaged.

Where to fit.

The best place to fit this sensor is to connect it by a jubilee clip directly to the exposed stator of the alternator if possible however some modern alternators enclose the stator making access to the stator impossible, in that case the best you can do is connected it to the main B+ terminal which is usual connected by a copper bolt direct to the diode pack.

In a well ventilate engine room this feature is normally not required and was only added as a after though for sailing boats in hot climates with heavy sound insulation. Always remember that this only disengages the Advanced Regulator but cannot prevent your standard alternator's own regulator from over heating the alternator

The temperature sensor is isolated and also has no polarity preference, ie the red and black cables do not donate pos and neg.

The temperature sensor cables can be extended

Please note that in the interests of safety, (unlike other companies) if you do not wish to use any temperature sensor or if one of the cables become broken or disconnected, the software program will detect this within 2 seconds of the fault and default to the standard safe settings.

Battery Temperature sensor: see fig 3 part c
This sensor is the same type and configuration as the alternator temperature sensor, however, it should be placed on the battery terminal on one of the batteries in the domestic battery bank, as this is the battery bank most likely to have the lower life expectancy. The idea behind temperature sensing is to monitor the battery temperature and reduce the charger voltage as the battery temperature rises due to either high ambient temperature, excessive installation in the battery box, or a battery failure. In the event of the first two then the output voltage of the alternator will be reduced to prevent any unnecessary heat rise, however, in the event of a battery cell failing ad the battery exceeding 50 deg c then a alarm will be transmitted to the remote panel(if used) and the L.E,D number 5 (red) will flash on the local panel will come on. T**his is a fatal shutdown and can only be overridden by switching the engine off and on again. Always find out the cause of this alarm condition, do not simply reset the system and carry on regardless as this will cause excessive gassing and a possible fire The same safety protocol is built into this system as above, if you do not wish to use this sensor, or in the event of it becoming broken, then the software will pick up the fault and shut down its function and revert to a safe 20 deg C default setting.**

D+ disengage: see fig 3 part d.
Most alternators have a ignition warning light on there dash (the light which comes on when the ignition is switched on and then the light switches off when the engine starts and the alternator starts to work). In the event of the alternator failing in most circumstances the ignition warning light will come on warning the operator of a fault with the alternator. Some modern alternators bring this feature a little further (the butec and some of the new magnetic merellie alternators, less than 0.1% of alternators used) have a new feature, this is that in the event of the standard alternators own regulator failing then it also switches on the igintion warning light to show a fault in the system. The problem with this is that when a Advanced Alternator Regulator is used then the alternators voltage is increased (by the Advanced Regulator) the standard regulator thinks it has failed and sends out the signal. This makes the operator think there is a problem. The D+ circuit disengages the ignition warning light after checking that everything is OK so although the standard regulator sends out the warning signal, the Sterling system blocks its transmission to the dash and we take over the motoring. In the event of a fault we then disengage and show any faults.

Helpful hints to find the Faults indicated by the l.e.d.s

Fault on panel :All lights flashing.
High alternator voltage trip.
Once all these lights flash what has happened is the alternator voltage sensed via the brown wire on the D+ has exceeded 17.5 volts (x 2 for 24 v) . and the advanced reg has disconnected itself.
Remember that when any red warning lights come on the sterling unit, the sterling has 100% disconnected itself (it has a built in relay connected to the white wire). So the most important thing to check here is that when this alarm comes on, is whether or not the system reverts back to its own standard voltage (or in the event of its own regulator not being used the alternator should cease functioning). This is the most important thing to establish, because if the alarm lights on and the Advanced reg has disconnected itself , then the standard system should automatically take over and automatically drop the charger voltage back to the standard voltage setting (about 14 v at the alternator), if this does not happen and the voltage continues to rise then the standard alternator system is at fault.
There are a number of reasons for the high alternator trip activating, and it falls into 2 main headings:
A new installation where the advanced regulator has just been installed and so far has not worked correctly
1) due to the incorrect handling of the standard regulator when installing the field cables to fit the sterling alternator the standard regulator has failed closed, The only solution for this is to replace the standard regulator
2)the solder you put onto the brush to connect the field wire to has touch the alternator case and caused the field to go to earth (on neg field control only) , or the cable you connected has been nipped to the alt case when bringing the cable outside the alternator . To test for this, using a volt meter, turn the meter to ohms test (so that when the 2 x terminals are jointed the meter beeps) test the wire you connected to the neg of the case, there should be no beep, if a beep is herd, then investigate why this is going down to neg.
3) the red sense wire has been connect in the wrong place disconnected. this means the red wire is open circuited.
4)the unit works o.k. For a short period of time then if you increase the r.p.m. Of the engine it trips out. The most common thing that would cause this is if the cable between the alternator and the batteries being either to long for the current or to thin for the length. The first question i always ask is what is the cable distance between the alternator and the batteries, and the first answer is usually about 1.5 meters as the batteries are beside the engine (this of course i don't believe, so my next question is,) Do you have a amp meter on the dash , and i usually get yes, then my second question, is Now sir, taking into account that you have a amp meter on the dash, and the fact that the alternator cable will go via that, what is the cable length between the alternator and the batteries via the amp meter and the split charge diode , all of a sudden the 1.5. Meter run (which was no problem) becomes a 5 meter run, carrying 60 amps, which now becomes a problem.
The important thing to remember here is that voltage drop faults manifested themselves in heat (this is why the advanced regulator has this safety system built into it, because failure to detect this fault could easily result in a fire in your loom. So with this in mind then the correct way for a knowledgeably electrication is to check the voltage drop across the positive line, how the easy way to find this fault is to do the following:
Expose the dash so you can easily get to the amp meter, (or where ever it is) , expose the split diode or relay or rotary switch (where ever it may be) expose the alternator , and expose the battery terminalis. Now then simply switch on the engine, run the engine at as high a r.p.m. As possible (without the trip coming on, if the trip comes on then restart the engine and bring the r.p.m. up to below the last time , remember if the trip comes on the test is a waste of time) for about 5 mins. Then stop the engine and carefully do the following (remember the fault will show itself as heat.)
1) feel the alternator cable, if very warm. Solution: double its thickness, ie run another cable the same thickness along with the one alright there. or run a new much thicker cable, a rough guide is that for every 2 meters of cable run you need to double the size of the cable.
2) touch all the connectors on the cable, ie the connection on the back of the alt, and any other joins, if hot . Solution: re make the connections.
3) touch the back of the amp meter, check the connections and also the rating of the amp meter to ensure it is within the rating of the alternator , if it is very hot Solution: replace the amp meter with a shunt type (see the sterling power management panel) and reduce the cable length
A older installation where the system has been working correctly
Because we can assume certain things like the cable size is o.k. and the cable runs are not to long (however it is worth doing the above test incase cables have become lose in crimp connectors or the cable has frayed and in effect reduced its cross section of copper.) we can check for other problems.
1) with the engine running, check the voltage coming out of the alternator (before the alarm goes on, any tests

done after the alarm has gone off are pointless) , the voltage at the domestic battery and the voltage at the engine battery . if you get results on a split diode system like, alt volts 16 volts, eng batt 15 volts , domestic battery 12 volts, then the domestic battery is not connected to the alternator, the most likley cause of this is failure of the split charger diode, or failure of the split charger relay. check the relay or diode .
For a split charger relay, go to the 2 x main connectors on the relay, and ensure that the voltage into the relay is the same as the voltage coming out, if there is a difference of more that 0.2 volts then the relay is not working. Solution replace the relay .
With a split charger diode, check the input voltage of the diode and the out put voltage to the domestic battery, there should be a voltage drop of between 0.6 and 1.2 volts, if however there is more than this the diode has failed, Solution :replace the diode.

Fault on panel: Red high battery voltage trip light on
This trip has been activated because the battery voltage (at the end of the red sense wire) has exceeded 15.5 volts (x 2 for 24 volts). the max charge voltage from the advanced reg is 14.8 volts, therefore it is not possible for this trip to be activated under normal circumstances.
There are only 3 possibilities for this trip to come on :
1) the sterling advanced regulator has failed closed and has started to over charger the batteries
2) the standard alternator regulator has failed closed and gone to over charger the batteries
3) the red sense wire has been disconnected

How to determine which, and what to do about it
Put a volt meter on the domestic battery, (or where ever the red sterling sense wire goes to), start the engin up, watch the battery voltage climb up and up, once it gets to 15.5 volts and the unit trips, if the voltage continues to climb then the standard alternator regulator has failed and there is nothing we can do about this except warn you. This is the worst and most dangerous fault you can get on a alternator system, and the alternator must be fixed as soon as possible, if a long journey must be undertaken then remove the b+ (positive cable) from the back of the alternator, and get to port and repair the problem . Failure to fix this problem will result in the total loss of the batteries and other equipment on the boat and a possible fire as well.
If however after the voltage reaches 15.5 volts and the advanced reg warning light comes on and the voltage drops away down to 13-14 volts, then the sterling advanced regulator is 100% at fault and must be replaced or repaired. For emergency use only it is o.k. to motor to port with this condition as the Sterling regulator has automatically switched itself off

Fault on panel: Red High battery voltage light flashing
High battery temp trip
This has been activated because the thermal sensor provided with the advanced regulator has picked up a temperature in excess of 50 degc. There are a few very obviouse reasons fr this and a few subtle. The important thing to find out is where the temperature sensor is, and to expose where it is.
1) the most obvious fault is the fact that the batteries are actually very hot, ie 50 def c is just about to hot to touch, if this is the case the batteries will be on there way to boiling and are certainly in a major failure event . if this is the case then switch off the engine and find out why.
If all the batteries are presenting the same heat then you are overcharging the batteries, or are simply in a very hot environment where the batteries should not be. If however only 1 battery is hot and the rest are cooler then it is simply a scrap battery, take it out of circuit and replace it.
2) the temperature sensor should be connected to the lead post at the top of a battery, in the event of the terminals becoming lose, or a high current is being passed then it is possible for the battery terminal to over heat and set of the alarm, when in fact the batteries are o.k. . this should be very obvious, feel the temp of the post where the thermal sensor is, and feel the batteries, if the post is hot and the battery is cold the fix the bad connections in your battery terminal.

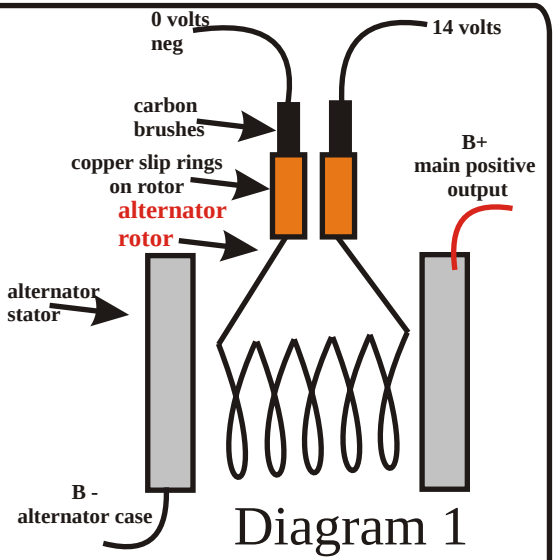


Diagram 1

Basic generatic alternator control system , Diagram 1

It is vital to understand in order to see what is going on and to help in fault finding

Diagram 1 shows the basic circuit for alternators. the rotor (as shown above) rotates inside a stator (the solid bit of the alternator that you can see) the rotor creates a magnetic field which is then converted into electric by the stator and sent to the batteries via the main positive output cable. In order to control the output voltage we must control the amount of magnetic flux being created by the rotor inside the alternator. The example in diagram 1, simply has 14 volts on one side and 0 volts on the other, this would result in the rotor creating its maximum amount of magnetic flux, and there fore charging the batteries at the max rate and will adventualy destroy the batteries by over charging them.

Understanding alternator field control

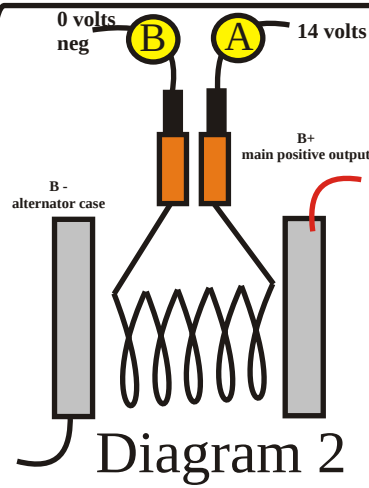


Diagram 2

Basic alternator control: Diagram 2

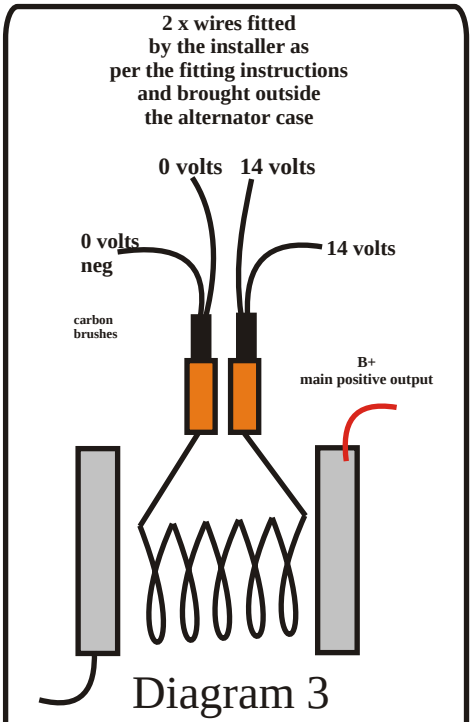
In order to control this process then we must introduce a regulator which looks at the battery voltage and controls the rotors voltage in order to reduce or increase the alternators performance. The regulator looks at the alternators output voltage and controls the rotor field current to increase or decrease the current of the alternator, to maintain a constant output voltage.

Now this is where things get a little bit difficult. With regard to controlling the rotor current (and as such the alternator output voltage) it does not matter if you control the voltage on the way into the rotor (point A) or on the way out of the rotor at (point B) . from the alternators point of view it does not matter which side the rotor is controlled , either side is equally effective, however it matters a lot to you when fault finding.

If the regulator was in position A then it is on the positive side of the rotor, and is controlling the positive going into the rotor, it is hence called a positive field control alternator.

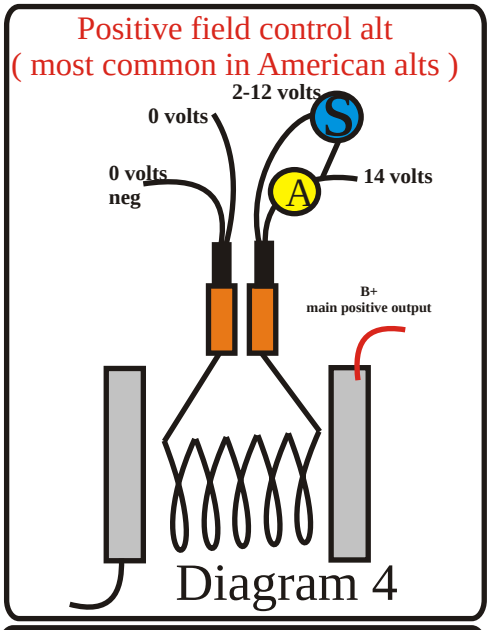
If the regulator was fitted into position B then it would be controlling the voltage coming out of the rotor on the negative side, down to negative, this would be referred to a negative field control alternator.

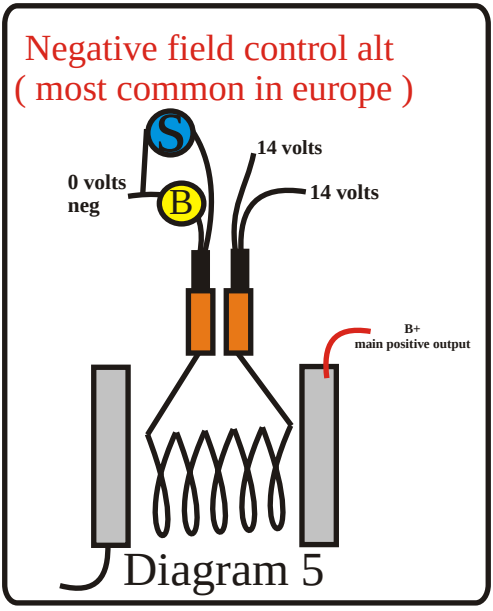
As explained in the fitting instructions, most European and Japanese alternators are negative field control, where as most American alternators are positive field



Confirming negative or positive field control
Diagram 3

Because the regulator is usually built into the back of the alternator, there is no way of knowing if it is a neg or a positive field control alternator from the outside. However if we were to fit a wire on each brush and bring them outside the alternator case, then we can check the voltage at the brushes, and make some deductions. In the above case there is no regulator, so one brush will be 14 volts and the other brush will be 0. In real life this would never happen,





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Explanation for Positive field control alternators

Let us assume that the system over leaf has a regulator on the positive side of the rotor. then there is one important fact, and that is because the regulator is between the brush and the positive then the other brush is connected directly to the negative. also the positive brush has the regulator between it and the 14 v input supply and can never reach 14 volts due to the 2 volt drop between the input voltage and the field brush
There fore the readings are very obvious, one brush will give between 2-12 volts(depending on the output voltage of the alternator). , and the other brush will give 0 volts
Hence in the instructions we come up with this voltage scenario. In this case the field control wire is the one with 2-12 volts on it
If we want to fit the sterling advanced regulator (s) on the drawing, then all we need to do is to introduce another 14 feed into the field brush. we acheive this by obtaining the voltage via our brown cable (d+) , bring it up to the regulator, then through the regulator down the white wire to the field brush, in effect by pass the standard regulator
This also shows 2 important things
1) if the sterling regulator was to fail open circuit, then the standard regulator simply takes over
2) no matter what you do to the sterling regulator you cannot stop the alternator from working. so if the alternator is not working it has nothing to do with the Sterling system

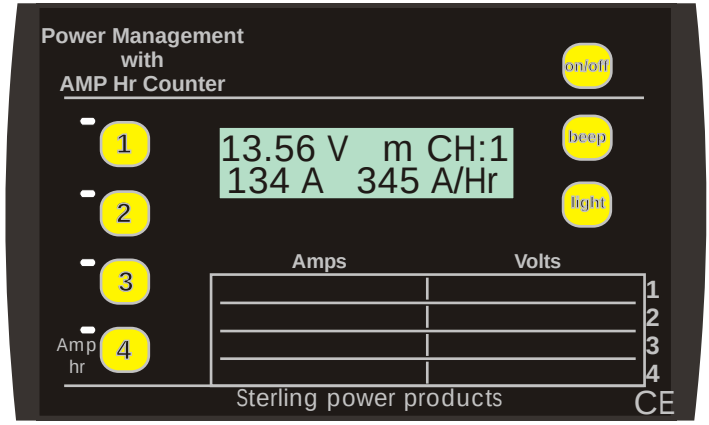
Explanation for Negative field control alternators

Let us assume that the system over leaf has a regulator on the negative side of the rotor. then there is on important fact, and that is because the regulator is between the brush and the negative, and there is always at least 1-1.5 volts drop across a regulator, the brush closest to the regulator can never reach 0 volts, it will always be between 2-about 10 volts. Also the other brush will never be the same voltage as the field brush, as the voltage must pass through the rotor coil , the end result will be at least another 2 volt drop. The other brush is connect directly to the output voltage of the alternator.
There fore the readings are very obvious, one brush will give between 2-12 volts, and the other brush will give about 14 volts (depending on the output voltage of the alternator.
Hence in the instructions we come up with this voltage scenario
In this case the field wire is the one with 2-12 volts on it
If we want to by pass the standard regulator, all we need to do is put the sterling advanced regulator on the end of the 2-12 volt wire and give the voltage another path through the sterling regulator to negative, in this case the standard regulator continues to work and tries to shut down the current, but the sterling simply offers the current a new route, via our whit wire, up to our regulator then down our black wires to negative.
This also shows 2 important things
1) if the sterling regulator was to fail open circuit, then the standard regulator simply takes over
2) no matter what you do to the sterling regulator you cannot stop the alternator from working. so if the alternator is not working it has nothing to do with the sterling system

Product to complement the advanced regulator

Amp hr counter, 4 x volt meters, 4 x amp meters

Can be used in negative and positive cables (un like anyone else)



Key Features:

1 X AMP HR COUNTER UP TO 8000 AMP/HRS
4 X D/C VOLT METER UP TO 199 VOLTS
4 X D/C AMP METER UP TO 199 AMPS WITH 2000 OVERLOAD
DIGITAL , SOFTWARE CONTROL SYSTEM
L.C.D SCREEN
BACK GROUND LIGHT
12 OR 24 V V INPUT VOLTAGE
EASY TO FIT
FLAT BUTTON OPERATION
SURFACE OR RECESS BOX
MEASURE CURRENT IN NEG OR POS CABLES

This product has a 2 year at factory warantee

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