

BOSCH AND NOSSO VOLTAGE REGULATORS

Bill Rogers

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The Bosch and Nosso regulators that are used in the Isetta and BMW 600 seem to be mysterious devices to many Isetta owners. This document is an attempt to reveal some of its mysteries.

The two regulators are the same device with the exception of the terminals nomenclature on the outside of the cases. Both regulators will provide the functions needed to start the engine and to regulate the output of the dynastart. This document will discuss the function of each of the internal parts and some lower cost substitutes that the Isetta / BMW 600 owner can use to replace this device.

In the photographs below, the Nosso unit is located on the left and the Bosch unit on the right.

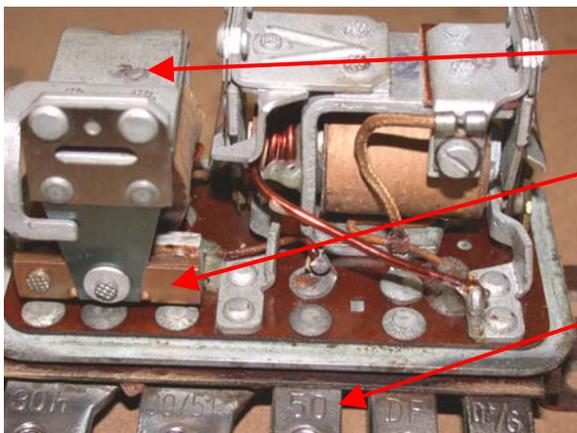


Nosso Terminals



Bosch Terminals

We will start by discussing the simplest part of the regulator box, the starter relay. This relay has two components, a coil and a set of contacts. The contacts are connected between terminals 30/51 (or B+/30) and 30h. The positive terminal of the battery is connected via the battery cable to terminal 30/51 (B+/30). Terminal 30h is connected to the dynastart main post (starter post). One end of the coil winding of the starter relay is connected to terminal 50, while the other end is attached to the metal case of the regulator. The case is grounded to the negative terminal of the battery through the body and chassis of the car.



Starter Relay

Relay contacts

Ignition switch control terminal

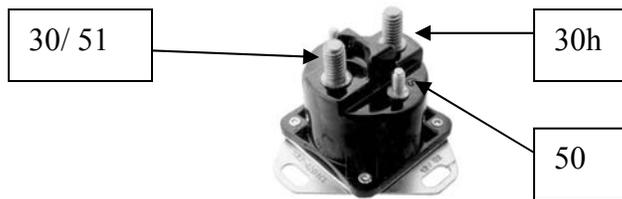
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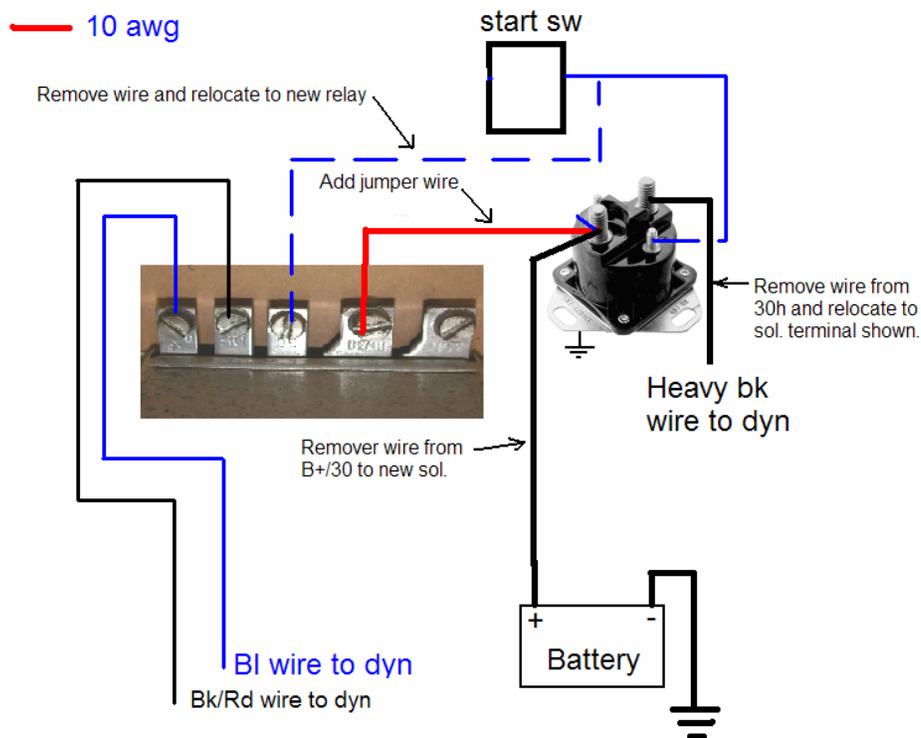
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When power from the ignition switch is applied to the coil terminal (terminal 50), the relay will be energized and the coil will pull in its contacts. This will allow power from the battery to flow through terminal 30/51 (B+/30) to the contacts, through the contacts, out of terminal 30h and to the dynastart. With a good dynastart connected to the regulator, the engine will turn over.

In the event that this relay becomes damaged, it can be replaced with a readily available Ford starter relay. This relay can be purchased from most automotive parts stores. I obtained a Ford relay for a 1992, F150 pickup for less than \$12.00. The unit I use is a Niehoff relay with an Advance Auto Parts number SD27701.



See diagram below on how to connect the Ford starter relay to the electrical circuit and replace a defective relay in the Bosch or Nosso regulator. The red jumper wire is required to provide a path for the regulator portion of the box to connect back to the battery.

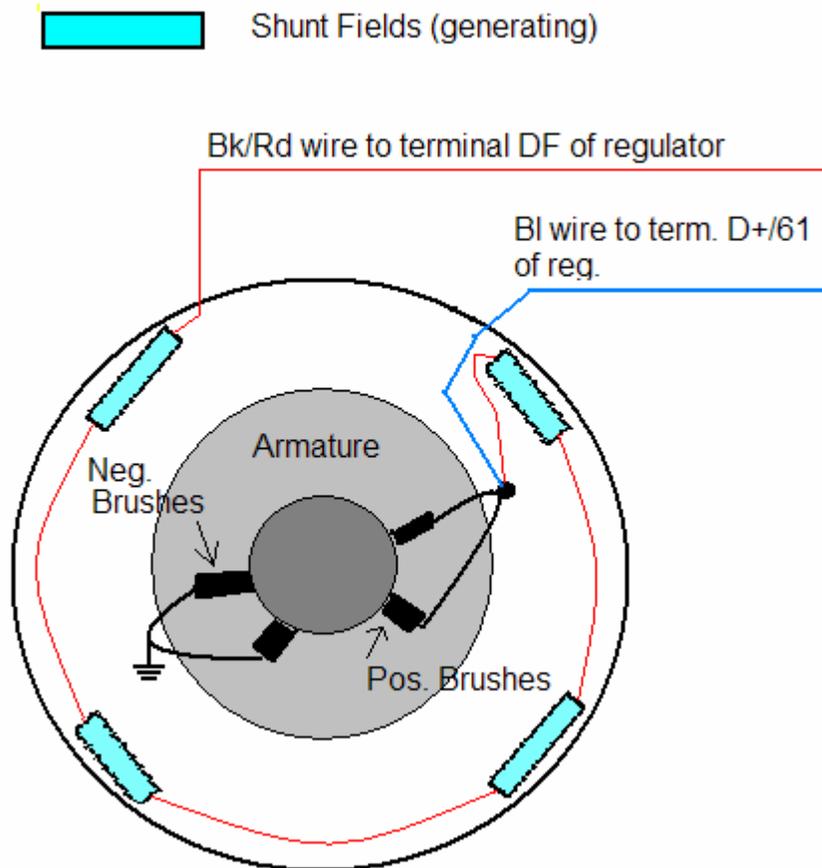


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The voltage regulator is composed of two separate relays, but they do act together to protect and regulate the dynastart's output. In order to understand the function of the regulator, it is necessary to understand the operation of the dynastart in the "generator" mode.



The drawing above shows only part of the dynastart components. I have omitted the breaker points, and series field, which have nothing to do with the generator operation. The drawing shows the shunt fields (the smaller set of the two sets of field coils), armature and brushes which will be controlled by the regulator to output 12 to 14 volts to the battery.

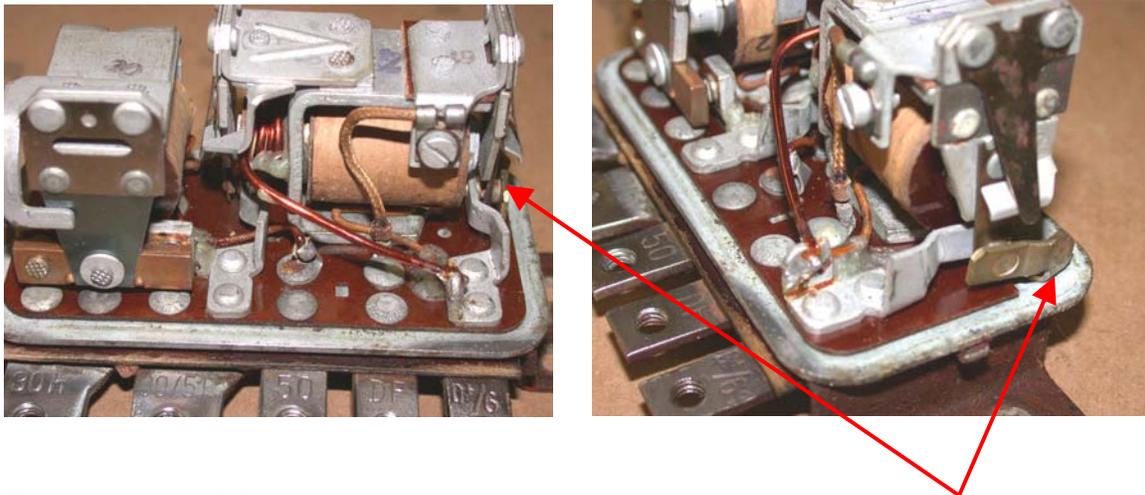
As the armature is rotating at idle, there is enough residual magnetism in the shunt fields to cause the armature to generate a small voltage at the output of the positive brushes. This output at idle is between 4 to 8 volts. Voltage at the positive terminal of the brushes flows through the shunt fields and goes to the regulator via the Bk/Rd wire to terminal DF. The power output from the dynastart flows from the positive brushes through the blue wire to the D+/61 terminal of the regulator. As long as the voltage on terminal D+/61 is less than about 14.5 volts, terminal DF is held at battery ground potential. With terminal DF on the regulator held at ground potential, the shunt field will be conducting current and generating a magnetic field allowing the generator to create an output voltage

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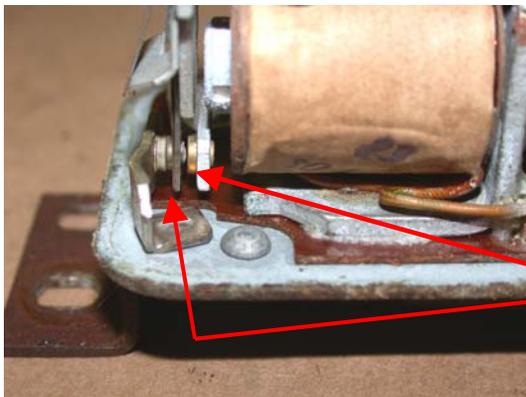
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proportional to engine speed. As the speed of the armature increases, the output of the generator will also increase. This will continue until an output voltage of approximately 14.5 to 15 volts is achieved. At this point, the regulator will open the contacts within the regulator that is providing the completed circuit for the shunt field. When this contact is opened, current will stop flowing in the shunt field causing its magnetic field to collapse. The collapse of this field will result in the output voltage of the generator to drop rapidly. Once the output of the generator drops below the threshold voltage of approximately 12 volts, the contact will once again close connecting the DF terminal to ground and the process will repeat. This will happen many times a second and the result will be an average output voltage of 14 to 15 volts.



Contact that the DF terminal is connected to that regulates the shunt field.

Many times when the generator is not charging the battery correctly, it can be traced to corrosion on the relay contacts pointed out in the pictures above and below. Using fine sandpaper such as 400 to 600 grit, these contacts can be polished and returned to good operation. Be very careful not to bend the fixed contacts as this will change the regulator setting and could result in over voltage on the system.



Using sandpaper polish all four contacts in this area.

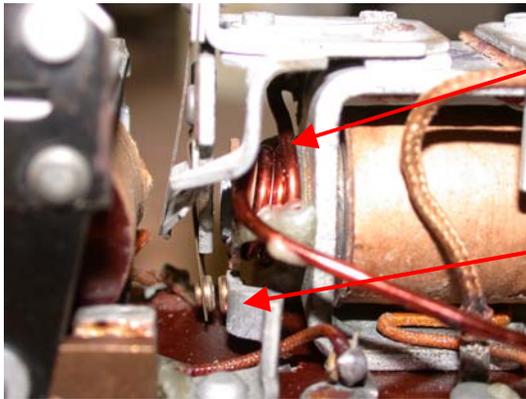
The second relay in the regulator is used to prevent current from flowing from the battery to the dynastart when the dynastart's output is less than the battery voltage. This relay is

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made as part of the shunt field control relay in the above picture, and is located next to the starter relay.



Reverse current relay

Reverse current relay contacts

This relay works in conjunction with the other relay to pull in its contacts when the output voltage of the dynastart reaches 13 to 13.6 volts. If the relay operates at a lower voltage, then current will be allowed to flow from the battery to the dynastart, discharging the battery. If the relay operates at a voltage higher than 13.6 volts, the high inrush of current when the contacts do close could damage the contacts. Normally, these contacts would not need to be “polished” with sandpaper to keep them in good operational condition.

To test the performance of the cut-in relay you should do the following:

- Install an ammeter in series with the output from the dynastart (disconnect dynastart wire from terminal D+/61 and connect the ammeter to this terminal and the other end of the ammeter to the disconnected wire).
- Connect a volt meter between terminal D+/61 and ground
- Start the engine and allow it to run at idle.
- Verify that no current is being measured by the ammeter and that the voltage on the voltmeter is below 13 volts (normally between 4 to 8 volts).
- Slowly raise the speed of the engine and watch the voltmeter and ammeter. When the ammeter first shows current flow, note the voltage on the voltmeter. This voltage should be between 13 and 13.6 volts.
- Now drop the engine speed until the current drops to zero, this is the point at which the relay cuts-out. The voltage on the voltmeter should be about 12.2 volts. If the meter is below 12 or above 12.7, the regulator is not operating correctly.

If you find your regulator is significantly outside of these specifications, I would replace the regulator. Adjustment of this relay is not something you can normally accomplish in the home shop and the BMW shop manual does not recommend any changes be made.

If you decide to replace the regulator portion of the device, there are a couple of options that you can use. Of course you can always replace the entire unit with the one supplied by the normal Isetta parts suppliers. These will range from \$150 to \$700 depending on

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whether you use an original Bosch unit or an after market replacement. If the starter relay is still operational, you could replace just the regulator with one of the following devices. I am sure other devices could also be used to make this replacement, but here are two devices that I have used and found to be adequate replacements.

The first device is a voltage regulator from a late 1960s to early 1970 Volkswagen. This regulator can be purchased at most automotive parts stores. The unit I used was from a 1969 Volkswagen Type III (Fastback or Squareback). I purchased mine from Advance Auto Parts and their part number is 265002. The manufacture of this regulator is GP Sorensen. The cost of this regulator is about \$30.00.

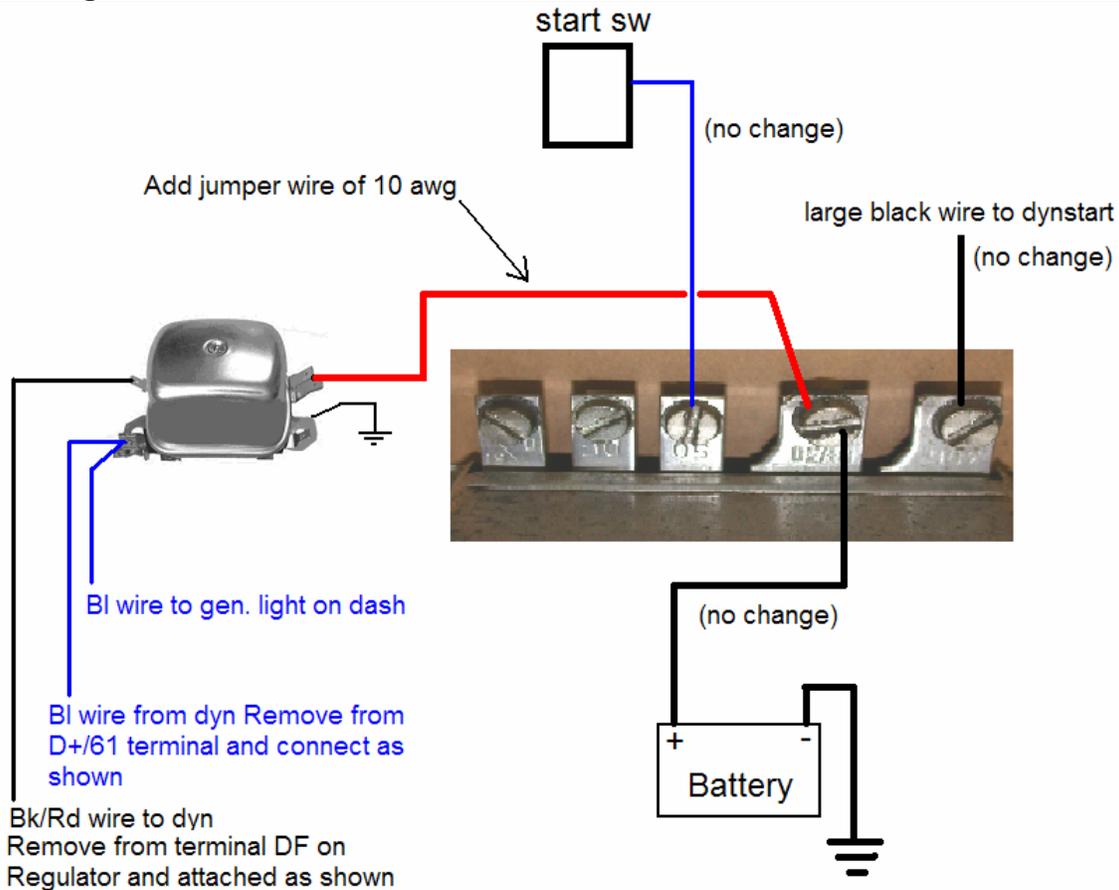
The diagram below shows how you would replace the regulator portion of the device while still using the starter relay.



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The second device that I have used to replace the regulator section of the Isetta's regulator is a solid-state device made by Podtronics. This device sells for around \$80.00 is quite small and does a good job. I have installed one on the "back" of the Isetta regulator housing and connected it to the terminals inside a "gutted" housing.



In the photos above, the pictures show the size of the Podtronics device and as it is mounted on the back of the Isetta regulator.

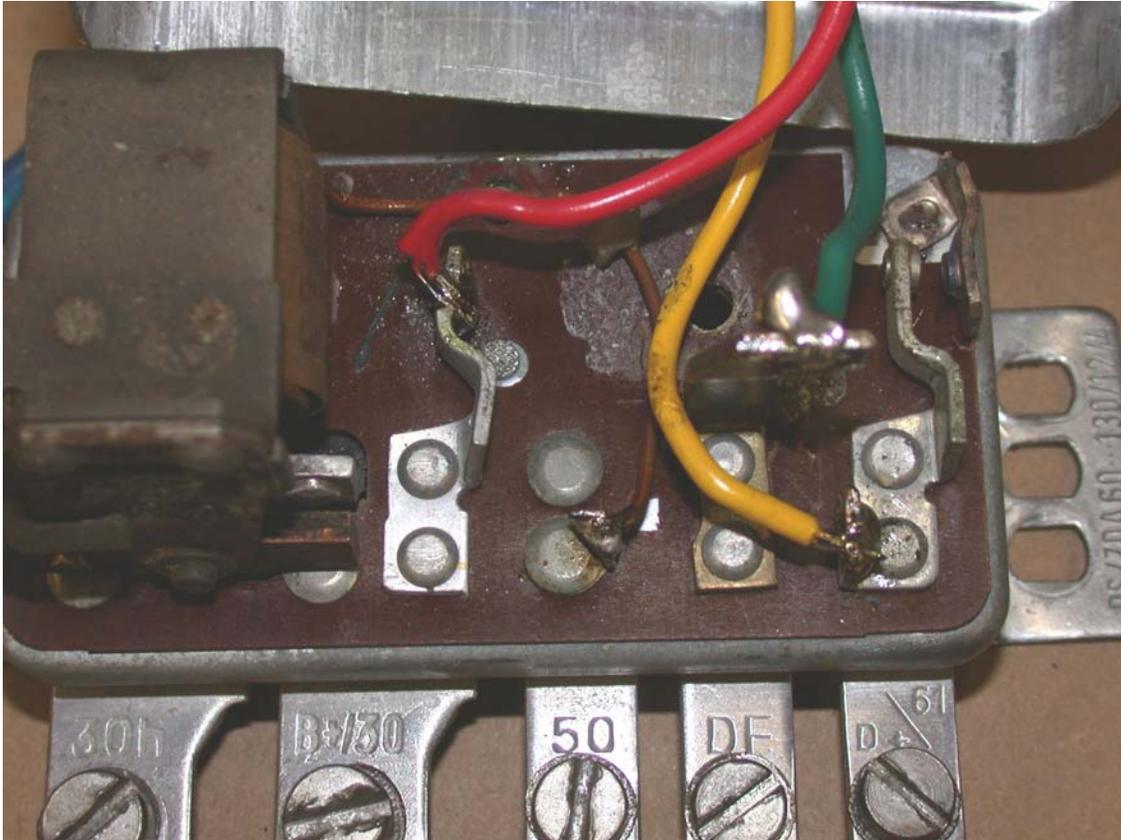
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This regulator is part number 12-NE. It is available from a number of distributors in the US or you can contact Podtronics directly at:

Bob Kizer
12718 Oak Plaza Dr.
Cypress, TX 77429-2825
Email: podtronics@aol.com



The above picture shows the connections made inside the Isetta regulator. The original regulator relay has been removed and the wires connected as follows:

Green wire connected to DF terminal

Yellow wire connected to the D+/61 terminal

Red wire connected to the B+/30 terminal.

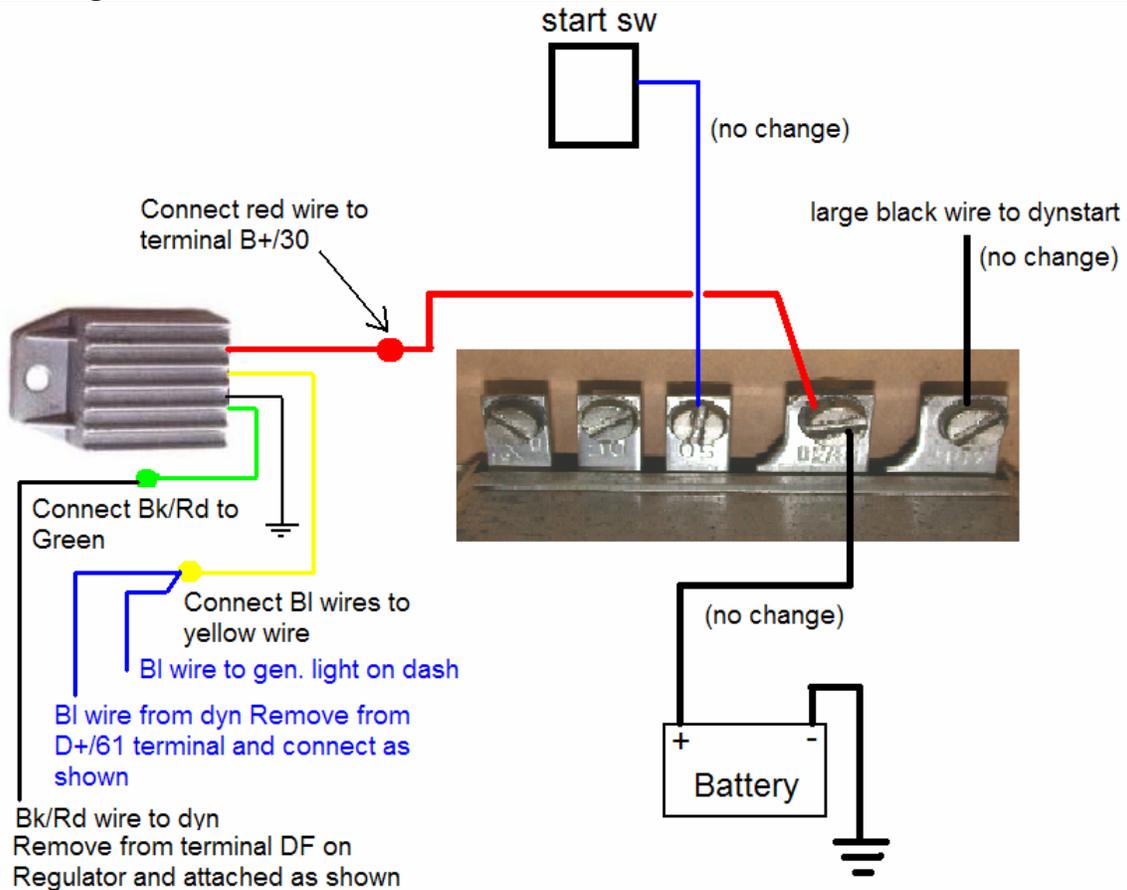
Black wire connected to the case (outside the enclosure)

See the diagram on the next page for a drawing on how to connect the unit to the existing regulator.

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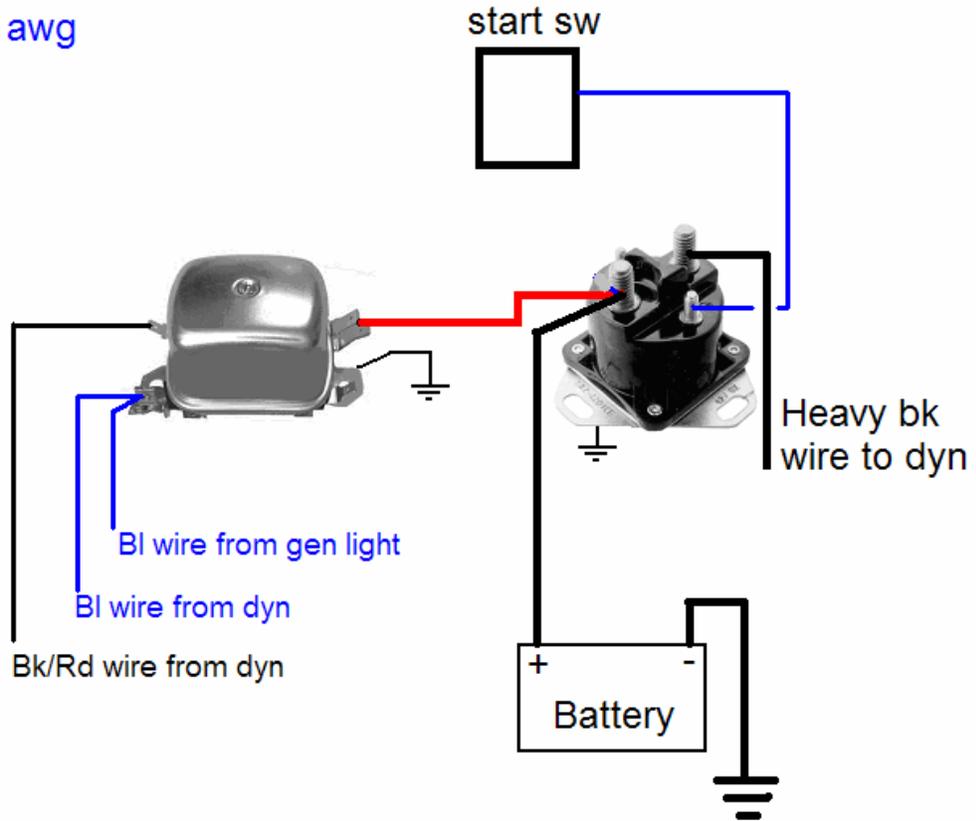
In the event you wish or need to replace both the regulator and starter relay the following diagram would show you how to hook-up the Ford relay and the VW regulator to the Isetta wiring system. It may be best to use a terminal block and attach all of the items to a single metal plate for mounting.

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— 10 awg



The next diagram also shows the complete replacement, but this time using the Podtronics electronic regulator.

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