How to determine what type of Electronic Regulator & Cut-out you need.

Introduction

A lot of enquires we get are of the form "I have a 1966 Ford Anglia what regulator do I need ". That question is relatively easy but a lot of dynamos are fitted to vehicles the answer to which is "don't know" or "it could be one of several types". Added to that, the complication that quite a few vehicles that started out with one dynamo are now fitted with a different one and may (or may not) have had their battery earths swapped. At ElectroDynamicSolutions (EDS) we manufacture some 16 different standard types of regulator. Add to that, the fact that these could be either 6 or 12 volt and throw in custom current ratings and you can see why we want to make sure our customers are giving us the correct information before they buy our products.

There are basically 2 different configurations for a dynamo (ignoring the old 3 brush dynamo's which can not be electronically regulated without modification)

1. The "field to live" sometimes referred to as type A or series field which has ground side regulation

OR

2. The "field to earth" sometimes referred to as type B or shunt field which has live side regulation.

Most dynamos' have the same internal's even if they look different on the outside. There will be the armature (that's the bit that is turned via the pulley by the engine) which has copper wire windings on it and a "commutator" which is basically a set of switches that make contact with two carbon brushes. This allows the electric current generated in the armature windings to flow out of one brush around the external circuit (the vehicles electrics) and back into the other brush to complete the circuit. If either brush is faulty or the commutator slots are not clean then the dynamo may be sparking and not producing full output. Fix this

issue before moving forward by cleaning the commutator and fitting new brush and if required brush springs.

The second common part is the field windings. Some very early dynamo's had fixed magnets to produce the magnetic field but these can not be regulated – we need a field winding in which the regulator can control the amount of current and hence the strength of the excitation field to control the output voltage from the armature winding.

So by working out how the armature windings and the field windings are connected together the type of dynamo and hence regulator can be deduced.

There are two simple methods by which you can determine what type of dynamo you have. One involves running the engine and doing some measurements the second does not need the engine running and can be used when the dynamo is on the vehicle or not. In both cases you will need a multimeter than can measure resistance and voltage on about a 200 ohm range and a 20 volt range.

With a simple multimeter on "volts DC" (method 1) or on "resistance" or "ohms" (method 2) and a bit of work the average owner can work out with some degree of confidence what type of dynamo the vehicle has and what regulator would be the correct type.

ENGINE RUNNING METHOD

In order to make these measurements there are several **VITAL** things that must be done before you start probing things.

1. Take a picture of how the of how the battery is connected.

2. **DISCONNECT THE EARTH** and get it out of the way so it can not make accidental connection again. It really will spoil your day if you short something – batteries can deliver 600 amps and that's enough to weld things at best and set them on fire at worst.

3. Take the keys out – really hurts your hands if they are in the engine bay when someone decides to crank it over when you reconnect things

4. Identify the dynamo and find the wires connecting to the terminals on the unit – usually there is a thin wire the F or field and the D fat wire which carries the power.

5. Take a picture of the wires before removing them from the tags (lugs, screw connectors, bolt posts) on the dynamo. You will want to make sure

they go back in the same place later. Get them out of the way where they will not short to anything or get caught in rotating parts

6. You will need a length of wire around 1.5 meters long. Strip back the insulation at both end to about 20mm. Then strip the insulation back for about 20mm about 150mm from one end. Now connect the end piece of wire (about 1mm cross sectional area is fine – no thinner as it may burn out) onto the F (field) tag. Make sure it is connected and if necessary secure it with electrical tape. Take the wire where the insulation is stripped back 150mm from the end that is connected to the F wire and wrap it around the D connection. That leaves you the end hanging out of the car ready for measurement.

Now reconnect the battery earth and start the engine at idle. On 20 volt DC setting connect one end of the meter to the wire hanging out from the dynamo and the other end of the meter to battery earth. Take a look at the meter – if it is reading a few volts slowly rev the engine. As the revs increase the volt reading should increase. Don't go above 12 volts.

If this works you have a type B or shunt field type – the DVR3 range.

If the voltage does not increase or there is no voltage do the following. STOP the Engine! Disconnect the wire from the F terminal and make sure it can not touch anything. Then take another piece of wire and connect it between the F terminal and battery ground. Start the engine and check the voltage. If it is now around 2 volts and increases with engine revs then you have a type A or series field type – the DVR4 range.

STOP the Engine and then reconnect everything as it was originally.

If neither test gives you 12 volts and more with rising RPM then you have a broken Dynamo.

STATIC MEASURMENT METHOD

This method is better if you are not happy with taking measurements when the engine is running or the dynamo is on the bench

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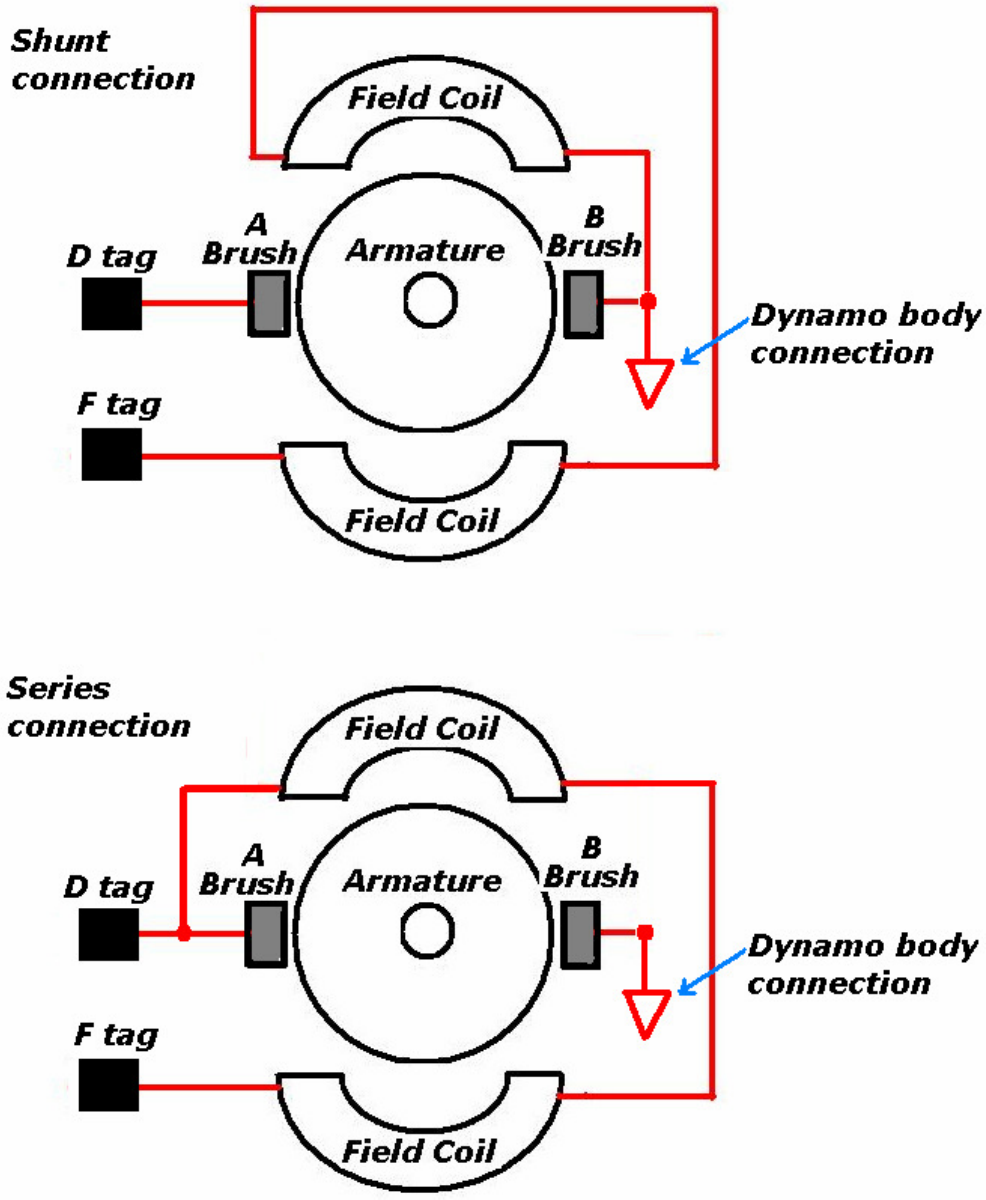
Look at figure 1 below – it shows how the two configurations look electrically. Most often (but not always) there is a rivet or screw internal to the dynamo that connects the body of the dynamo to the internal wiring. Sometimes this internal wiring is brought out on a tag and the body connection made externally. You may be able to see the connection



wire and work out if there are just one connection to a brush (in which case it's most likely a series connection) or if there are 2 wires in which case it's most likely a shunt connection.

You will need a multimeter that can read low ohms (usually there is a 200 ohm range). The problem in taking measurements is that the armature is wound with thick copper wire which has very low resistance and confuses any resistance reading. So the first thing to do is to isolate the armature winding. This can be done by sliding a very thin piece of paper in between one of the carbon brushes and the armature. Most dynamos allow you to get to the brushes as the ends are open for cooling air to flow through the windings. Some dynamos are sealed (particularly ones for agricultural or marine use) in which case you may need to undo a screw cap to remove the spring and the brush (carefully not pulling the wiring with it). It usually does not affect readings if you isolate the A or the B brush as the armature resistance is so low – a few tenths of an ohm maximum is expected)

Now take the multimeter and probe between the D terminal and the F terminal. If the reading comes out between 2.5 and 10 ohms you are measuring the field winding resistance which is wound with many turns of thin copper wire. You are looking at a series connection dynamo in which case you need the DVR4 range of regulators. This can be confirmed by measuring between the D tag and dynamo body – there should be an open circuit assuming that the brush has been correctly isolated.

If there is no meter reading (i.e. its stays at – or open circuit) you should have a shunt connection dynamo. This can be confirmed by measuring between the F terminal and the dynamo body (or sometimes the "third" tag). If you then get a reading of between 2.5 and 6 ohms you need a DVR3 type of regulator.

Then it's just a matter of removing the brush isolation paper, reconnecting the dynamo tags (you did take that picture right!) and then reconnecting the battery earth.

When contacting us it really helps to have the following information

1. Dynamo field connection type (As above!)
2. Battery positive or negative earth
3. System voltage 6 or 12 volts.
4. Any markings on the dynamo
5. The vehicle type

That at least narrows it down to one of 4 depending on the output current limit required. Here the meter reading of the field coil will help as we can check references to help us determine which model you have and recommend the correct current limit. It is important to get this right. If you have too high a limit the dynamo may over heat before the limit is reached, too low and you are not getting the full output for the electrical demand you have.

If in any doubt about testing your unit consult a competent auto-electrician or a marque expert.

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