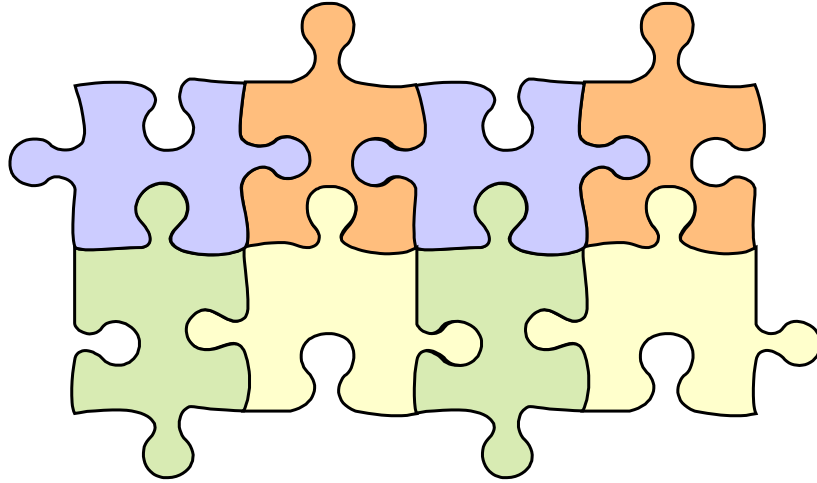


## Generators & Regulators

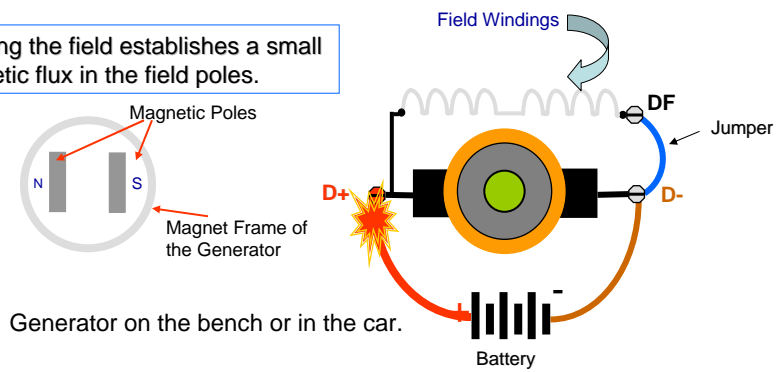


No longer to be a puzzle.

## Flashing The Field

1. Connect jumper from **DF** to **D-**
2. Battery minus to **D-**
3. Touch battery's **+** to the **D+** on the generator.
4. There will be a little spark.
5. May be done with generator mounted on the engine.
6. With the square T6C regulator, lift the **D+** from the regulator when flashing.

Flashing the field establishes a small magnetic flux in the field poles.



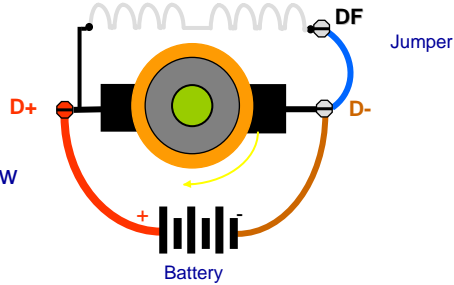
## Motoring the Generator

Motoring the generator is a check on the field connections. Motoring will also “flash” the field, if proper polarity is observed. A “must do” if the generator has been out for repairs.

1. Jumper DF to D-.
2. Apply battery to D- and D+

This may be done on the engine if the fan belt is removed.

The motoring generator will now run “clock-wise” when viewed from the pulley end of the generator. If the fields are correctly connected.



If the generator runs “counter clock-wise”, return the generator to the shop. The field’s connections must be reversed.

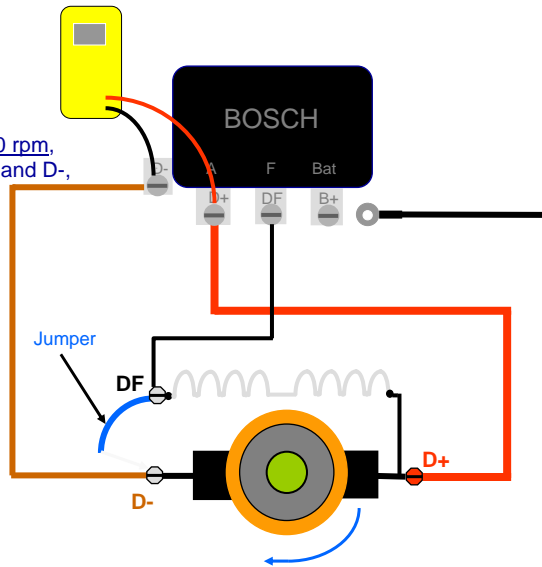
## Testing The Generator On The Car

When there is a question of generator or regulator not operating?

Lift B+ at regulator. With engine running about 1200 rpm, and voltmeter connected to D+ and D-, touch DF jumper wire to D-.

If the generator is “good”, the voltage will jump up to about 12 volts.

Don’t leave the jumper on more than time enough to read the meter.



## Trouble Shooting the Generator

First check the brushes for length and free to move in the brush box.

Brush length new is 0.74 inches.

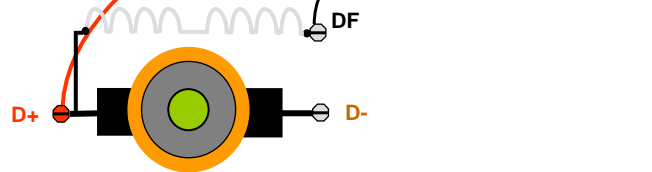
Brush springs are in place.

Measure the field resistance.

6 volt field will be 1 ohm, while the 12 volt field will be 3 ohms.

A generator from a four cam engine, 12v, measures less than 3 ohms.

To measure the field resistance, lift the DF wire from the generator, and ohmmeter from DF to D+.



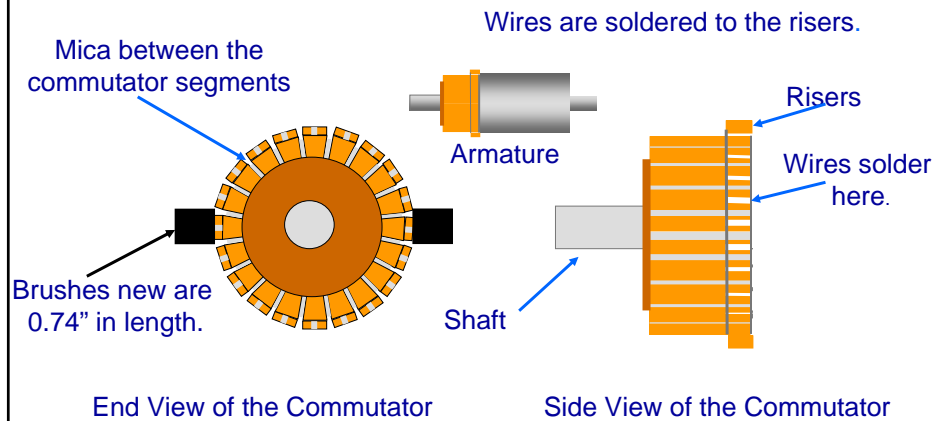
*A 12 volt generator will work when used on a 6 volt regulated car.*

*A 6 volt generator will work on a 12 volt regulated car, but not for long.*

*Do this only in an emergency, and minimize all electric loads.*

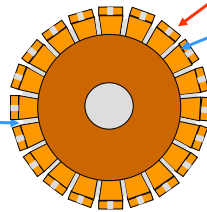
*The field currents will be high.*

## Commutator



## End View of the Commutator

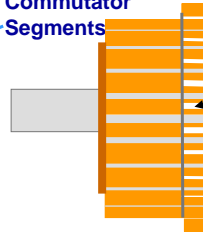
Mica is under-cut to a depth equal to the slot width.



This is the solder that is thrown because of over current. Resulting in the commutator bars disconnecting from the windings.

Commutator Segments

Wires solder here.



For proper commutation, a film is desirable on the surface of the copper commutator bars. When first "turned" and "under-cut" the commutator's surface will be as bright as a new penny. In time as the film develops, the brushes will work better, less wear, and less sparking. (Less radio noise as well.)

A warm brown film is desirable on the commutator's segments.

## Brushes

In "industry" a value of 60/70 amps per square inch of brush face area is recommended for good commutation.

In the 356 generators the brush's contact area is designed for good commutation with about **9 amps**. (optimum, good filming)

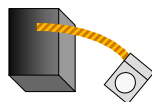
A dc generator can operate at 200% of its brush capability for periods of time. **(18 amps)**

Brushes contain metal along with the carbon and other materials and can handle some additional amps. **(27amps)**

The factory manual notes a value of 200 watts for the T6 car.

The "A" cars had 160 watt generators.

Doing some math where watts = volts x current we have:



200 watts = 7.3v X current  
Or current will be 27.4 amps



### Brushes continued

Therefore, generators marked 50 amps can not support this high level of current because of brush size.

The Cut-Out contacts in the Regulator can not handle 50 amps, simply too small.

There is a bottom to the barrel.

If the load of the 356 approaches 50 amps, the brushes and commutator get hot and solder will be thrown.

Not only is it important to set voltage, but the current limits must be set to a value equal to or less than 30 amps.

This 30 amps is a short time over-current value.  
Watts = 7.3volts X 30 amps =219 watts

**Current limit in the Regulator must be set, to avoid solder being thrown, during an over-current condition.**

### Watt Load On A T6 Car

Bosch RS/UA 200/6/23 Regulator  
LJ/GEG/200/6/2600 L19 Generator

#### T6 Electric Loads

Headlights 2 ea.	50/40 watts	80 watts
Fog Lights 2 ea.	35 watts	70 watts
Back-Up	25 watts	
Wiper	12 watts	12 watts
Brakes/Turns 2 ea.	18 watts	
Radio	12 watts	
Inst. Lights 5 ea.	0.6 watts	3 watts
Interior Lights 2 ea.	10 watts	
Front Park 2 ea.	4 watts	8 watts
Tail Lights 2 ea.	5 watts	10 watts
Turns Front	18 watts	
Turns Rear	18 watts	
License	5 watts	5 watts
Total Load		188 watts

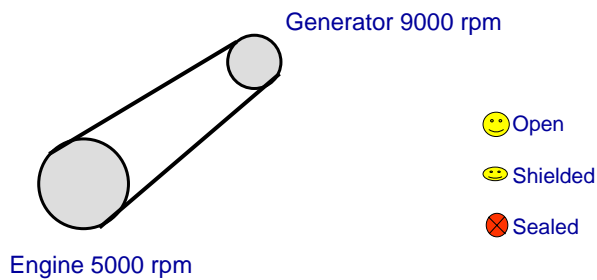
Regulator  
200 watts  
6 volts  
23 amps

Generator  
200 watts  
6 volts  
2600rpm

This calculation does not allow any current for charging the battery.

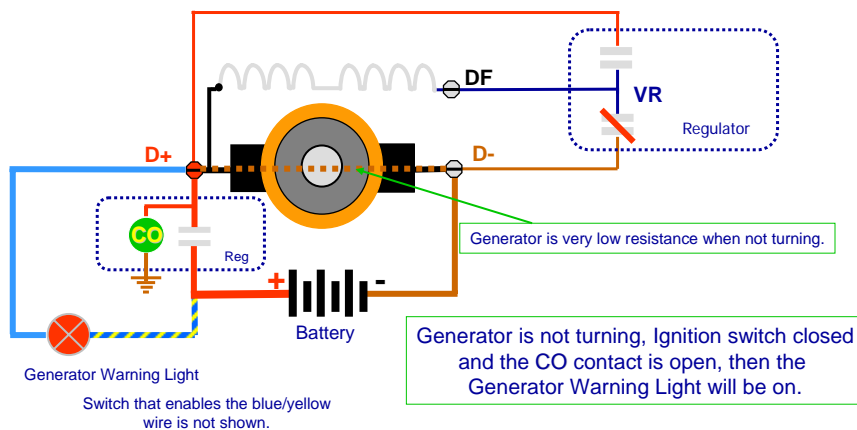
## Generator's Bearings

Insist on a brand name bearing for your generator.  
 A quality bearing will cost about \$10.00.  
 An example would be: SKF, FAG, Fafner, Timken, and others that you know.  
 The bearings specifications should rate the bearing to at least 9000 rpm.  
 Do not use or accept sealed bearings as there is too much friction and heat.  
 A shielded bearing is okay for street use, but for racing use the open bearing.  
 Shields can be picked out of a shielded bearing, making it an open bearing.  
 Then lubricate with electric motor grease.



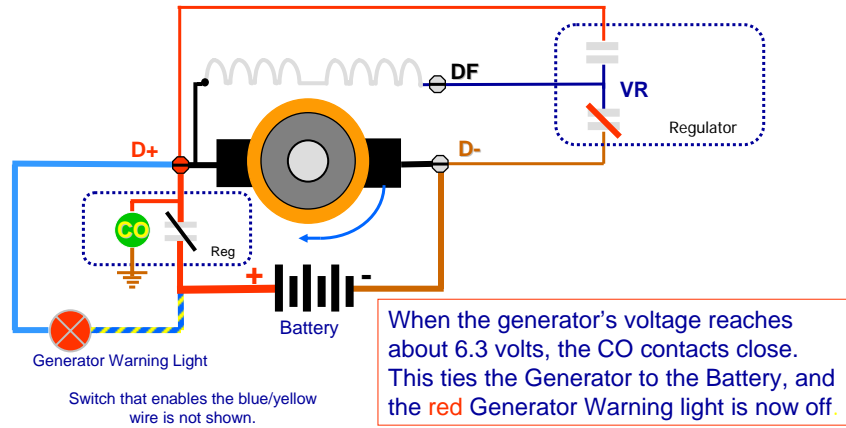
## How the Generator Connects to the Battery

CO = Cut-Out Relay

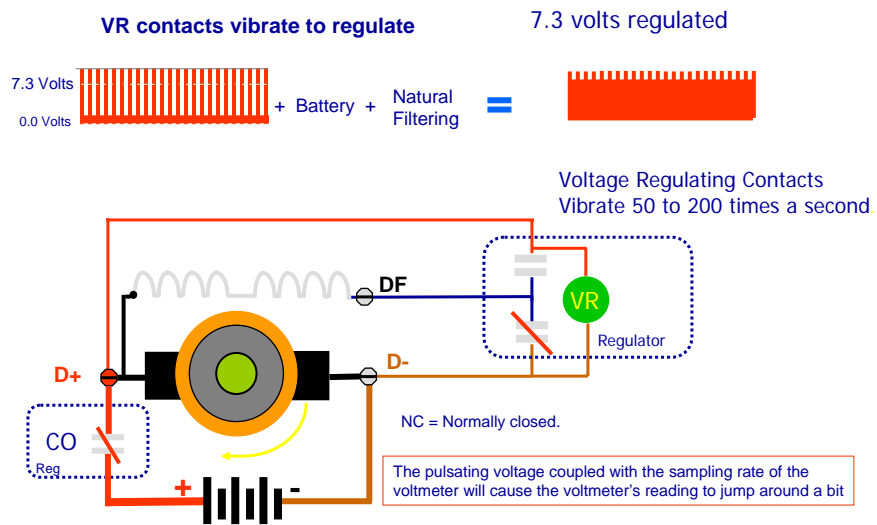


## How the Generator Connects to the Battery

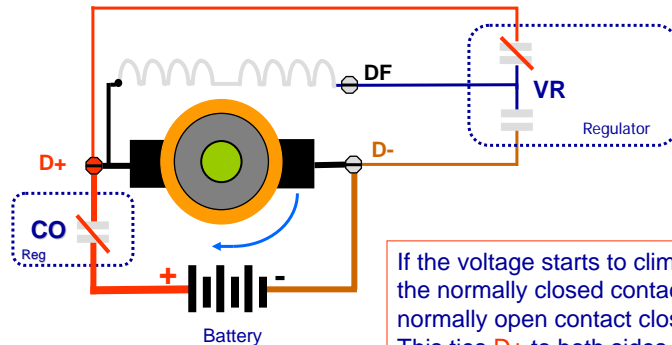
CO = Cut-Out Relay



## How the Generator is Regulated



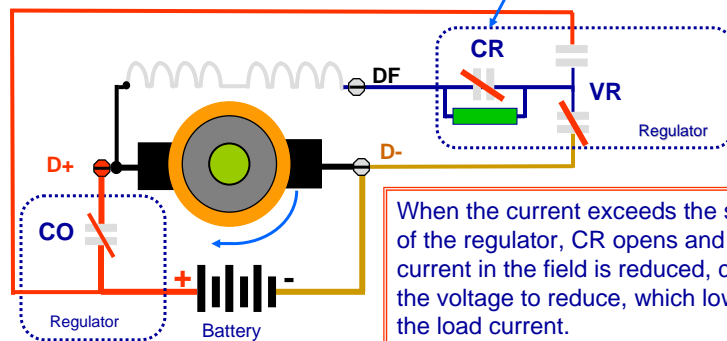
## How the Generator Voltage is Safeguarded



If the voltage starts to climb above 7.3 volts, the normally closed contact opens and the normally open contact closes. This ties D+ to both sides of the field, and the field current goes to zero. Voltage will fall to a minimum with zero field current.

## Limiting the Current

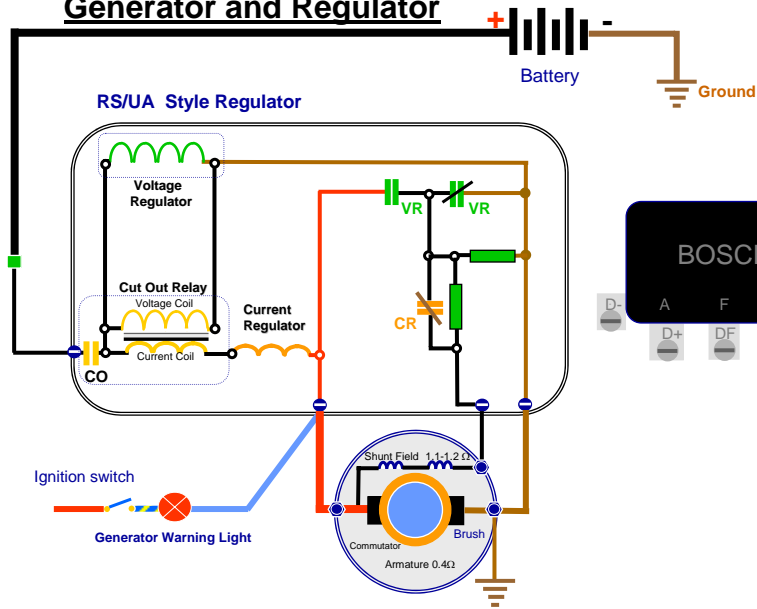
Because of high loads (usually extra lights, low battery, or faults) the generator may be called upon to supply a damaging current. This high current demand must be contained to a safe level by the regulator. The CR contacts performs this task.



When the current exceeds the settings of the regulator, CR opens and the current in the field is reduced, causing the voltage to reduce, which lowers the load current.

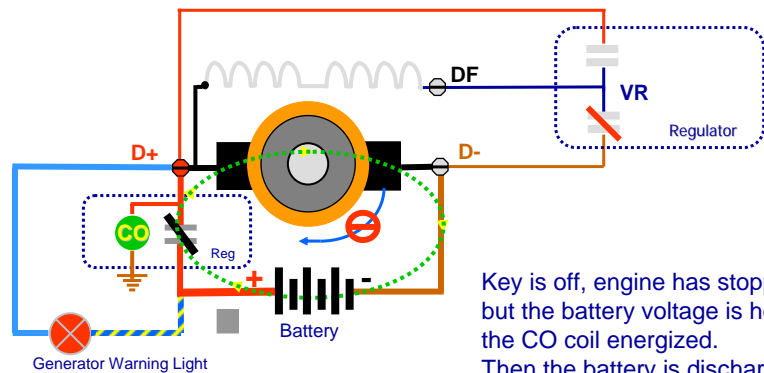
CR = Current Regulator (contact opens on high current) CO = Cut-Out (closes at or near 6.3 volts)

## Generator and Regulator



## How the Generator Disconnects From the Battery

CO = Cut-Out Relay



Key is off, engine has stopped, but the battery voltage is holding the CO coil energized. Then the battery is discharging through the generator to ground.

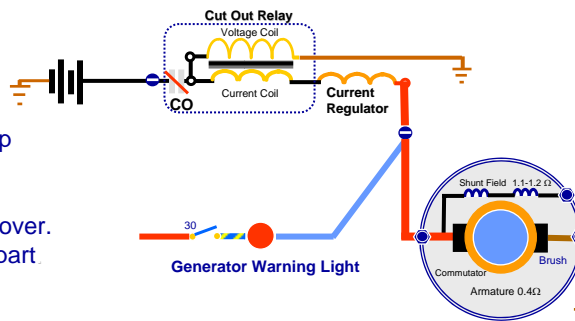
What to do???  
See next slide.

## Shutting Down

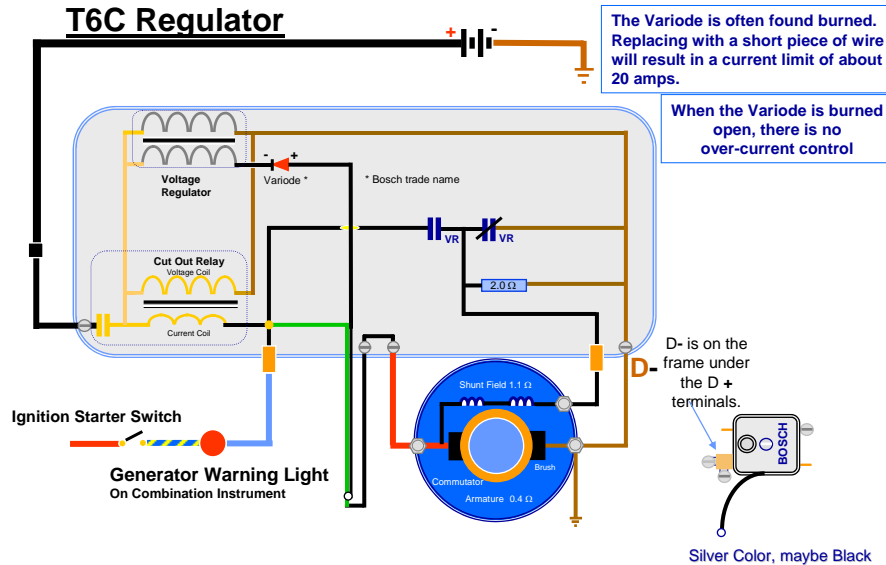
When the engine is shut down, the **CO** relay remains picked-up because of it's contacts being closed, and the battery voltage is holding the **CO** relay energized. Since the generator is no longer generating, it now appears as a low resistance. Now the battery pushes a reverse current through the heavy winding of the two winding **CO** relay. This reverse current is in opposition to the voltage coil, and the **CO** relay is deenergized opening the contacts. Here is the pit-fall: if the **CO** contacts are pushed close with the generator not turning, the contacts will weld together, and the battery will start to discharge. There may be damage to the armature as well. When driving and the ignition is shut down, if the Generator Warning light remains on, this is your indication that the **CO** contacts are welded.

What to do???

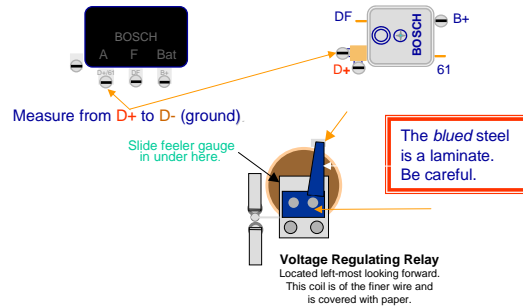
Start the engine.  
Pull the ground strap off of the battery.  
Engine stops.  
Remove the regulator cover.  
Pry the CO contacts apart.



## T6C Regulator



## Voltage Adjustment



Initial Gap Open	_____ inches	0.032" to 0.051" inches
Initial Gap Closed	_____ inches	0.008" inches
Initial Voltage	_____ volts	Work Shop Manual Values
Final Gap Open	_____ inches	* Converted from metric.
Final Gap Closed	_____ inches	
Final Voltage	_____ volts	

Factory voltage recommendations are 7.1 to 7.5 volts. Because of the "gel" type batteries a suggested voltage of 7.3 volts at the generator is recommended.

Lift the B+ wire at the regulator. This removes all loads while adjusting the voltage.

With the engine running at about 2000 rpm, measure the voltage D+ at the regulator.

If the voltage is low, < 7.3 volts, pull the rest post out a bit. If the voltage is high, carefully place a – bladed screw-driver on the exposed edge of the rest post. Then tap with a hammer. Just a bit is all that is required.

*The blue steel spring is made up of two pieces. Take care not to separate the laminations.*

The voltage will jump around some. This is because of the vibrating Voltage Regulating contacts and the sampling rate of the voltmeter.

Favor a lower voltage and then check again after some time on the new settings.

*You can't adjust away a trouble. Trouble shoot first, and adjust last.*