

VOLKSWAGEN

Volkswagen

CHANGES, CAUTIONS, CORRECTIONS

► **POLARIZING:** Before putting generator into operation, it must be polarized after being mounted on vehicle. This applies to new generators, as well as to generators being reinstalled after repair. To polarize generator, momentarily contact B+ (from battery) to D+ terminal on regulator (with belt removed). *NEVER polarize by connecting terminal B+ (on regulator) to terminal D+ on regulator. Damage may result to regulator, cutout and generator.*

DESCRIPTION

Volkswagen manufactures generators for both 6 and 12 volt vehicles. Volkswagen generators are of the shunt-wound type. The field windings are wired in parallel with the armature winding. The most frequently used type of regulator is the two-unit regulator with declining characteristic curve. This regulator consists of a voltage regulating unit and a cutout relay. Another type of regulator is the variode regulator. In this type, a second voltage winding is installed on the voltage regulating unit instead of the current winding. If voltage regulator is found defective, unit should be replaced. The test specifications for Volkswagen regulators are given in the generator specification chart.

TESTING

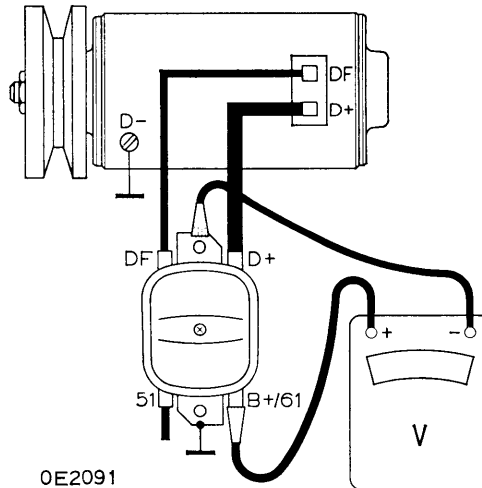
ON CAR TEST

No-Load Voltage Test – 1) Disconnect wire from regulator terminal B+ making certain not to ground lead. Connect voltmeter positive terminal to regulator terminal B+ and voltmeter negative terminal to ground.

2) Start engine. Slowly increase engine speed to approximately 2000 RPM. The voltmeter should show correct no-load voltage. See specifications.

3) When engine is turned off, the voltmeter reading should drop from battery voltage to zero volts just before the engine stops completely. This is an indication that the regulator points are not sticking.

NOTE – The cut-in speed of the early cut-in generator is so low that in some cases it may be necessary to adjust the engine to the slowest possible idle speed.



NO-LOAD VOLTAGE TEST

Testing Generator Without Regulator (Quick Check) – 1) Disconnect both leads (D+ and DF) from generator. Connect terminal DF of generator to ground (D-).

2) Connect positive lead of voltmeter to large connector (D+) of generator and the negative lead to the D- terminal.

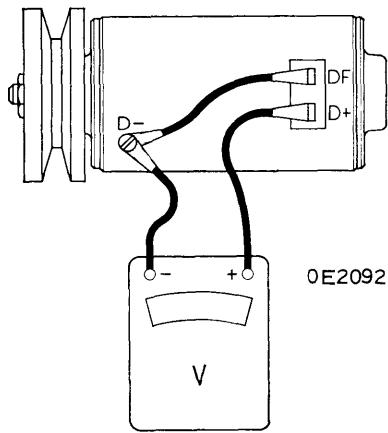
3) Run generator briefly at the following speeds. The voltage supplied by the generator must be as follows:

| RPM | 6V Units | 12V Units |
|------|----------|-----------|
| 1500 | 6V | 12V |
| 3000 | 18V | 36V |

| VOLKSWAGEN GENERATOR & REGULATOR SPECIFICATIONS | | | | | | | | | | |
|---|----------------------|--------------|-----------------|------------|------------------|----------------|----------------------|----------------------|-------------------|--------------------|
| VW Part No. | Reg. Part No. | Nominal Data | | | Cut-In Speed RPM | Cut-In Voltage | Return Current Amps. | No-Load Reg. Voltage | Load Reg. Voltage | Load Current Amps. |
| | | Max. Amps. | Mean Reg. Volts | Output RPM | | | | | | |
| 113 903 021C | 113 903 801C | 45 | 6.8 | 2400 | 1500 | 6.2-6.8 | 2.0-9.0 | 7.4-8.1 | 6.4-7.3 | 34 |
| 211 903 031 | 211 903 803 | 30 | 14 | 2000 | 1450 | 12.4-13.1 | 2.0-7.5 | 13.5-14.5 | 12.8-13.8 | 45 |
| 211 903 031A | 211 903 803B | 30 | 14 | 2000 | 1450 | 12.4-13.1 | 2.0-7.5 | 13.5-14.5 | 12.8-13.8 | 45 |
| 113 903 031G | 113 903 803E | 30 | 14 | 2000 | 1450 | 12.4-13.1 | 2.0-7.5 | 13.5-14.5 | 12.8-13.8 | 45 |
| 211 903 031 | 211 903 803 | 30 | 14 | 2000 | 1450 | 12.4-13.1 | 2.0-7.5 | 13.5-14.5 | 12.8-13.8 | 45 |
| 211 903 031A | 211 903 803B | 30 | 14 | 2000 | 1450 | 12.4-13.1 | 2.0-7.5 | 13.5-14.5 | 12.8-13.8 | 45 |
| 113 903 031G | 113 903 803E | 30 | 14 | 2000 | 1450 | 12.4-13.1 | 2.0-7.5 | 13.5-14.5 | 12.8-13.8 | 45 |
| 211 903 031D | 211 903 803E | 38 | 14 | 2000 | 1300 | 12.5-13.2 | 5.0-11.5 | 13.5-14.2 | 12.9-13.6 | 35 |
| 311 903 031E | 211 903 803 and B | 30 | 14 | 2000 | 1450 | 12.4-13.1 | 2.0-7.5 | 13.5-14.5 | 12.8-13.8 | 45 |
| 311 903 031F | 113 903 803E | 30 | 14 | 2000 | 1450 | 12.4-13.1 | 2.0-7.5 | 13.5-14.5 | 12.8-13.8 | 45 |

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4) If the generator supplies no voltage or too little voltage, it must be removed and checked.



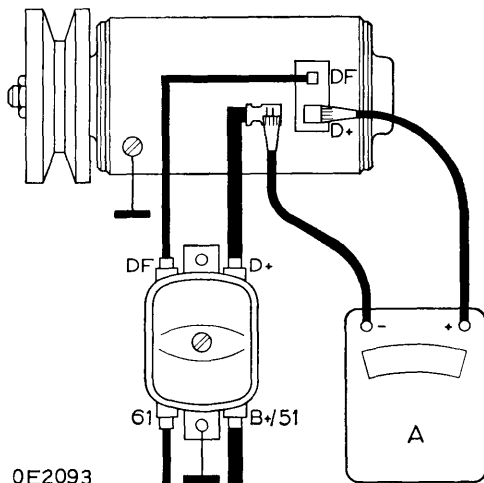
TESTING GENERATOR WITHOUT REGULATOR

Return Current – 1) Disconnect D+ lead from generator. Connect ammeter between lead and D+ terminal, the positive ammeter lead to terminal D+, the negative ammeter lead to disconnected wire.

2) Start engine and run at fast idle.

3) Reduce idle until ammeter moves to negative range (see specifications). Then turn the engine off. The ammeter must jump back to zero before the engine comes to a complete stop.

4) If ammeter does not return to zero when the engine is at a complete stop, the regulator is defective and must be replaced.

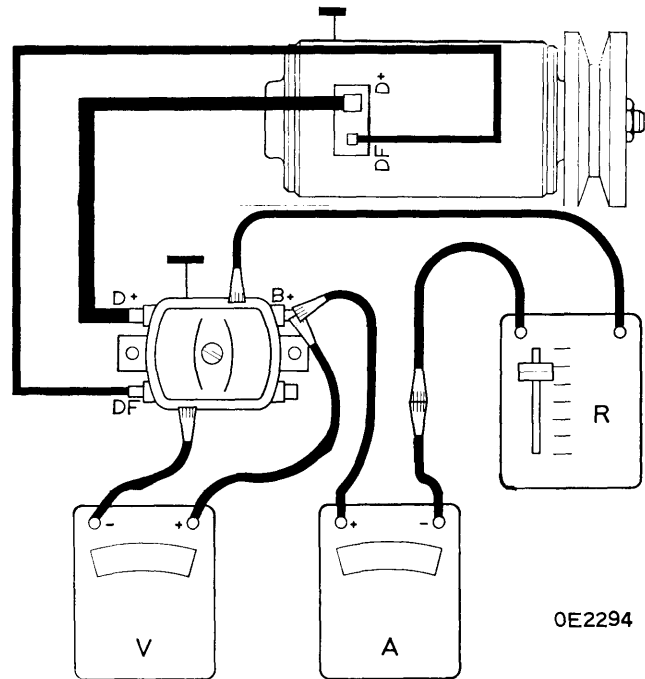


RETURN CURRENT TEST

Load Test – A quick test can be made to determine generator output. For this test a voltmeter (range 0-30 volts), an ammeter (range 10-0-50 amperes) and a rheostat (that can be loaded to 50 amperes) are required.

1) Connect leads to regulator terminal B+.

2) Connect voltmeter, ammeter and rheostat as shown in illustration.



LOAD TEST

3) Start engine, bring engine speed to approximately 1500 RPM. Adjust rheostat to proper load current setting (see test data chart). Now the regulating voltage (under load) can be measured.

Checking Brushes And Commutator – Examine brushes for wear. If they no longer protrude from the holder they must be replaced. To remove: Lift the retaining springs with a wire hook and pull the brushes out of the holders. Remove the brush leads making sure not to drop screws or lock washers into generator housing.

NOTE – If the commutator is oily or dirty it can be cleaned with a suitable solvent. If it is scarred or burnt disassemble the generator and recondition it. If the brush springs have to be replaced or the commutator has to be repaired, the generator must be removed.

OVERHAUL

DISASSEMBLY

1) Remove fan pulley and spacer washers (Type I & II). Remove fan nut with special wrench (VW 112 or equivalent) and take off fan with spacers, hub and woodruff key. The fan should be held in position by a second mechanic.

2) Remove fan cover and reinforcement flange (Type I & II). Remove regulator (if mounted on generator).

3) Disconnect field coil terminal from brush holder of the positive brush. Unscrew the two housing screws. Lift brushes and take off commutator end plate. Remove ball bearing spring ring.

4) Withdraw fan end plate and armature as a unit from the housing.

5) Press the ball bearing, splash shields and spacer ring off armature with a suitable press (VW 400) and suitable press adapters (VW 401, 408 – 6V units, 409, 439 & 686).

6) Remove end plate at the fan end (Types I & II) with suitable press and adapters (VW 402, 408a & 686).

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7) Remove ball bearing oil slinger from armature and take spacer ring out of end plate. The two circlips can be left on the armature shaft.

8) If necessary, remove field coils with special pressure type screw remover.

TESTING

Armature – Test for shorts between windings on a growler. Check armature for grounding using a test lamp. Check for open circuit on growler.

Fields – Check field coils for a ground using a test lamp. Use ohmmeter to test resistance.

PARTS REPLACEMENT

Brushes – If brushes are worn excessively, replace with new brushes. Check positive brush holder for a ground using a test lamp.

Field Coils – Mark location of pole shoes to avoid incorrect installation. Unsolder both windings ends from terminals. Unscrew pole shoe screws and remove pole shoes and windings. Install new windings on pole shoes. Install pole shoes. Align pole shoes carefully prior to final tightening of pole shoe screws.

Bearings – Carefully wash the bearings in cleaning solvent and pack them with high melting point grease. Replace bearings if worn.

REASSEMBLY

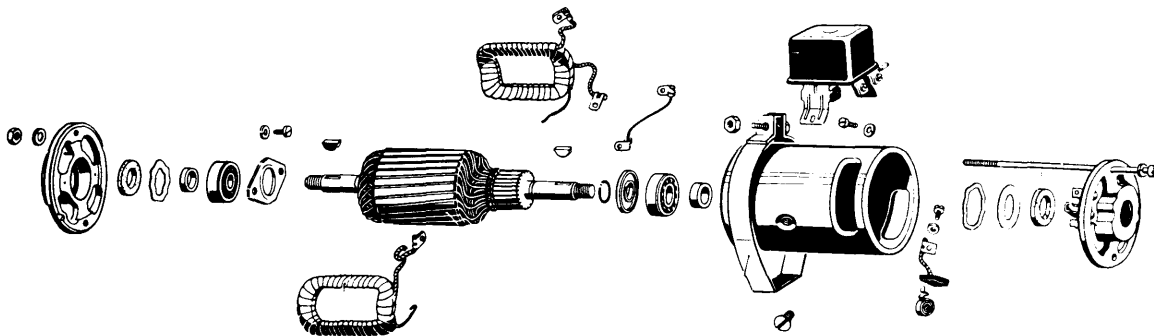
Clean and inspect all parts. Assemble parts in reverse order of disassembly, noting the following points:

1) After installing end plates on fan and commutator ends, install spacer rings with repair press and adapters (VW 401, 412, & 421 or equivalents). For Types I & II 12 volt only.

2) If cables on terminals D+ and D- are interchanged, even for a short time, the generator polarity will be reversed and this will damage the regulator.

3) Tighten fan nut with a torque wrench and 36 mm socket to a torque of between 40-70 ft. lbs. (5.5-6.5 mkg).

4) After assembling, especially after a new armature or new field coils have been installed, the generator must be polarized. This is done by letting the generator run briefly as a motor to give the pole shoes the necessary residual magnetism of the correct polarity. To do this, connect generator to a battery with positive battery lead connected to D+ and negative lead connected to DF and D-terminal of generator.



TYPE I & II GENERATOR (TYPICAL)

0E2095