

STARTER Article Text

1993 Volkswagen EuroVan
For Volkswagen Technical Site
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Saturday, March 18, 2000 10:37PM

ARTICLE BEGINNING

1993 ELECTRICAL
Volkswagen Starters - Bosch

Volkswagen; Cabriolet, EuroVan, Golf, GTI, Jetta

DESCRIPTION

Starter is a brush type, series-wound electric motor with an overrunning clutch. Field frame is enclosed by commutator end frame and drive bushing, and carries pole shoes and field coils. A splined armature shaft drive end carries drive assembly.

TROUBLE SHOOTING

NOTE: See TROUBLE SHOOTING - BASIC PROCEDURES article in GENERAL INFORMATION.

ON-VEHICLE TESTING

STARTER DOES NOT CRANK ENGINE

1) Ensure battery is fully charged. Make sure electrical and ground connections are clean and tight. With ignition switch in START position, measure voltage at spade terminal of starter solenoid. Reading should be at least 8 volts. If voltage is as specified, check engine for mechanical problems. If voltage is not as specified, go to next step.

2) Measure voltage at ignition switch. If reading is at least 8 volts, check wiring between ignition switch and starter solenoid. If voltage is not as specified, replace ignition switch.

3) Measure voltage at field (starter) terminal of starter solenoid. If reading is 8 volts or more, repair or replace starter. If reading is less than 8 volts, replace starter solenoid.

NOTE: On vehicles with automatic transmission, also check park/neutral switch.

STARTER CRANKS TOO SLOWLY

Ensure engine crankcase is filled with recommended viscosity oil. Check charging system to ensure battery is fully charged. Make sure electrical and ground connections are clean and tight. If starter still turns slowly, repair or replace starter.

VOLTAGE DROP TEST

Starter Main Terminal

Connect a voltmeter between starter main terminal and starter body. Disconnect ignition coil positive terminal and operate starter.

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Voltage reading should not be more than one volt less than battery voltage. If a larger voltage drop is indicated, circuit between battery and starter terminal may be defective.

Main Starter Case

Connect a voltmeter between positive battery terminal and starter motor "M" terminal. With ignition off, operate starter for 2-3 seconds. Battery voltage should be present, then drop to less than one volt. If voltage is greater than specification, high resistance may be present in circuit. Go to ACROSS SOLENOID SWITCH test.

Across Solenoid Switch

Connect a voltmeter between 2 starter solenoid terminal stud connections. With ignition disconnected, operate starter for 2-3 seconds and note meter reading. Initially, battery voltage should be present, then voltage should drop to less than .5 volt. If voltage is not as specified, check for damaged switch or loose or dirty connections. If high resistance is present, terminal may be loose or corroded.

Ground Return Line

Connect a voltmeter between battery ground terminal and starter main housing. With ignition off, operate starter for 2-3 seconds. If ground is okay, voltage reading should be less than .5 volt. If reading is .6 volt or more, high resistance is present in ground return side of circuit.

BENCH TESTING

STARTER SOLENOID

1) Remove bridge strap connecting solenoid to motor. Check windings by connecting a 12-volt self-powered test light between solenoid main terminal STA and solenoid body. If light illuminates, both windings are satisfactory.

2) Ensure that contacts open and close satisfactorily by connecting a 12-volt self-powered test light between starter solenoid main terminals. Test light should not illuminate.

NOTE: Step 3) uses a non-powered (standard) test light.

3) Connect a test light to STARTER terminal of solenoid and ground. Apply voltage to STA and BAT terminals of solenoid. Solenoid should be heard to operate as contacts close and test light should illuminate. When voltage is removed from STA terminal of solenoid, test light should go out.

STARTER LOAD (LOCK) TEST

With starter on test bench, lock starter drive pinion. Voltmeter should read 4.5 volts and ammeter should read 700-800 amps.

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STARTER NO-LOAD TEST

With starter on test bench, operate starter and check ammeter, voltage, and RPM. Readings should be within specification. See STARTER NO-LOAD TEST SPECIFICATIONS table.

STARTER NO-LOAD TEST SPECIFICATIONS TABLE

Volts	Amps	RPM
11.5	65-95	6500

REMOVAL & INSTALLATION

CABRIOLET, EUROVAN, GOLF, GTI & JETTA

Removal & Installation

Disconnect negative battery cable. Raise and support vehicle. Disconnect wiring and remove starter. To install, reverse removal procedure. Tighten starter mounting bolts/nuts to specification. See TORQUE SPECIFICATIONS table at end of article.

OVERHAUL

For overhaul, see exploded view of typical Bosch starter. See Fig. 1.

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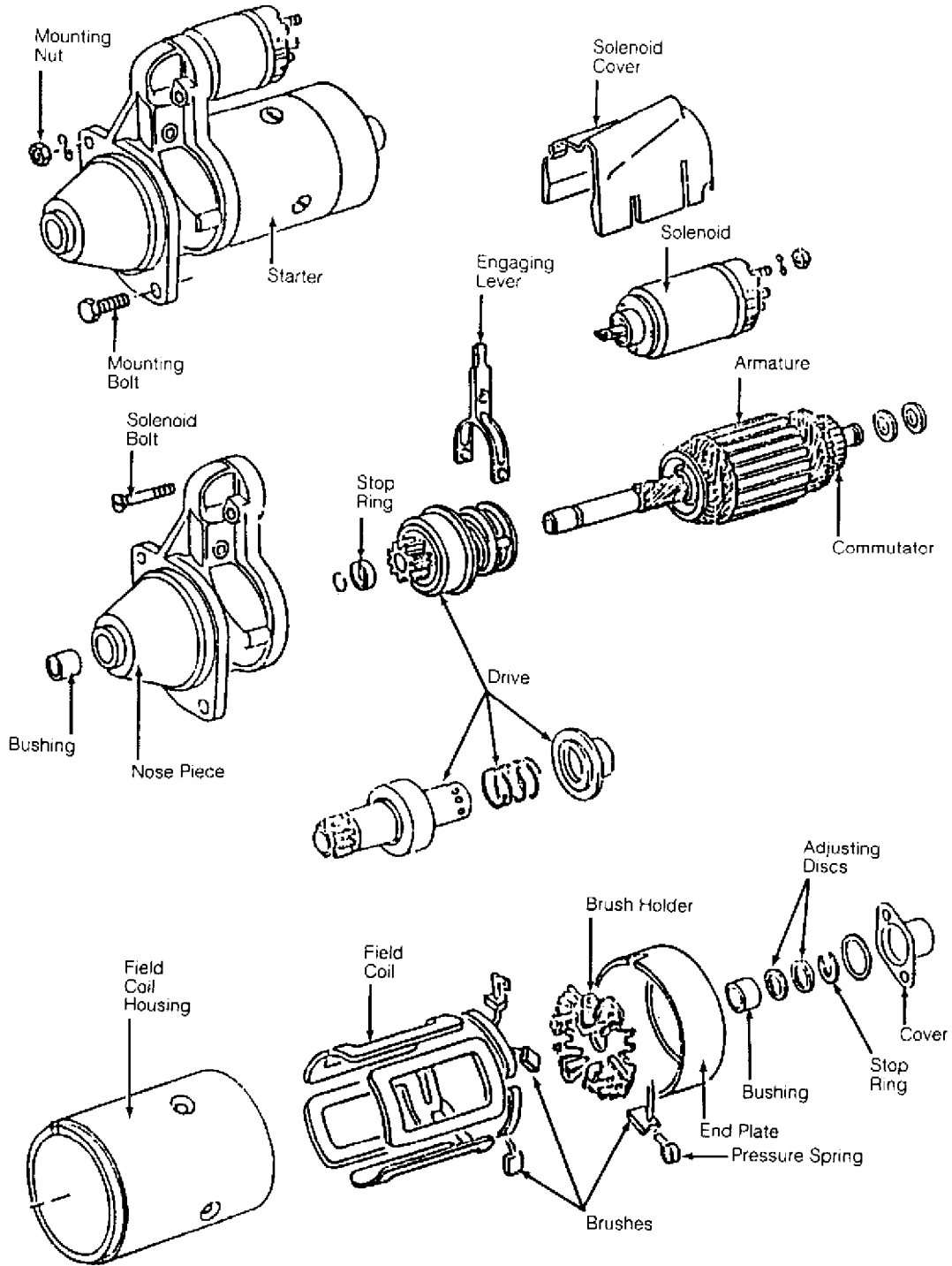


Fig. 1: Exploded View of Bosch Starter (Typical)
 Courtesy of Volkswagen United States, Inc.

STARTER SPECIFICATIONS

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STARTER SPECIFICATIONS TABLE

Application	Specification
Armature	
Runout002" (.05 mm)
End Play002" (.05 mm)
Cold Cranking	
Test Voltage	12
Minimum Voltage	9
Amps	90
Minimum RPM	1500
Solenoid Hold-In Winding Voltage	4 Volts Minimum
Solenoid Pull-In Winding Voltage	7 Volts
Commutator Runout0004" (.01 mm)
Cranking Voltage	9 Volts Minimum
Starter Current Draw	170 Amps Maximum

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Starter-To-Block Bolt/Nut	
Cabriolet, Golf, GTI & Jetta	
A/T	14 (19)
M/T	43 (58)
EuroVan	15 (20)
	INCH Lbs. (N.m)
Solenoid Bolts	96 (11)
Through Bolts	54 (6)

END OF ARTICLE