

# Distributors & Ignition Systems

## BOSCH HALL EFFECT ELECTRONIC IGNITION SYSTEM

Audi  
4000  
5000  
Volkswagen  
All Models with CIS  
Vanagon  
Calif. Only

### DESCRIPTION

The Bosch Hall Effect electronic ignition system consists of a breakerless Hall Effect distributor, an ignition control unit, ignition coil, ignition switch, and battery.

Closely allied with the ignition system is an idle stabilizer, a solid state control unit located between the ignition control unit and the distributor. It replaces the distributor in sending signals to the ignition control unit when engine speeds fall below 940 RPM.

The Hall Effect distributor has normal centrifugal and vacuum advance mechanisms. See Figs. 1 and 10.

**NOTE** — On Audi 4000 (with 5-cylinder engines) and 5000 models, an impedance transformer (gray colored) is installed in place of the idle stabilizer. When adjusting ignition timing, DO NOT disconnect the plugs from the impedance transformer.

### OPERATION

The Hall sending unit (pick-up coil) is mounted inside the distributor on a switch plate. A trigger wheel (segmented shutter) attached to the distributor shaft under the rotor, passes in and out of the air gap of the Hall sending unit.

At speeds greater than 940 RPM, the Hall sending unit signals the ignition control unit to make and break the primary circuit current flow in the ignition coil. There is one trigger wheel shutter or tooth for each cylinder of the engine. Shutter width determines dwell, which is not adjustable.

As the ignition control unit breaks the primary circuit through the coil, secondary voltage is released through high tension wiring, distributor cap and rotor to spark plugs. See Fig. 1.

If engine speed drops below 940 RPM, the idle stabilizer takes over the duty of producing the signal to the ignition control unit, instead of the Hall sending unit. Mounted between the distributor and the ignition control unit, the idle stabilizer senses engine speed earlier, causing ignition timing to advance. Advancing ignition timing causes idle speed to increase, and the Hall sending unit to resume its normal operation.

### SPECIFICATIONS

**Centrifugal & Vacuum Advance** — See Specifications Pages in this section.

### ADJUSTMENTS

**Hall Effect Air Gap** — Air gap is pre-set and cannot be adjusted.

### TESTING

**NOTE** — Be sure battery is at full charge and in good condition before making tests. Check all wiring harnesses, ignition switch, ignition coil, spark plug cables and connectors.

### TESTING PRECAUTIONS

**CAUTION** — Do not connect any 12 volt test instruments on terminal 15 of ignition coil, as this could damage electronic components. Do not connect any condenser/suppressor or powered test light to terminal 1 of ignition coil. Only connect and disconnect test instruments when ignition is turned "OFF".

### TACHOMETER ADAPTER

1) An adapter is necessary when attaching a conventional tachometer into the Hall Effect electronic ignition system. See Fig. 2. Tachometer black lead is attached to engine ground. Attach adapter to tachometer red lead.

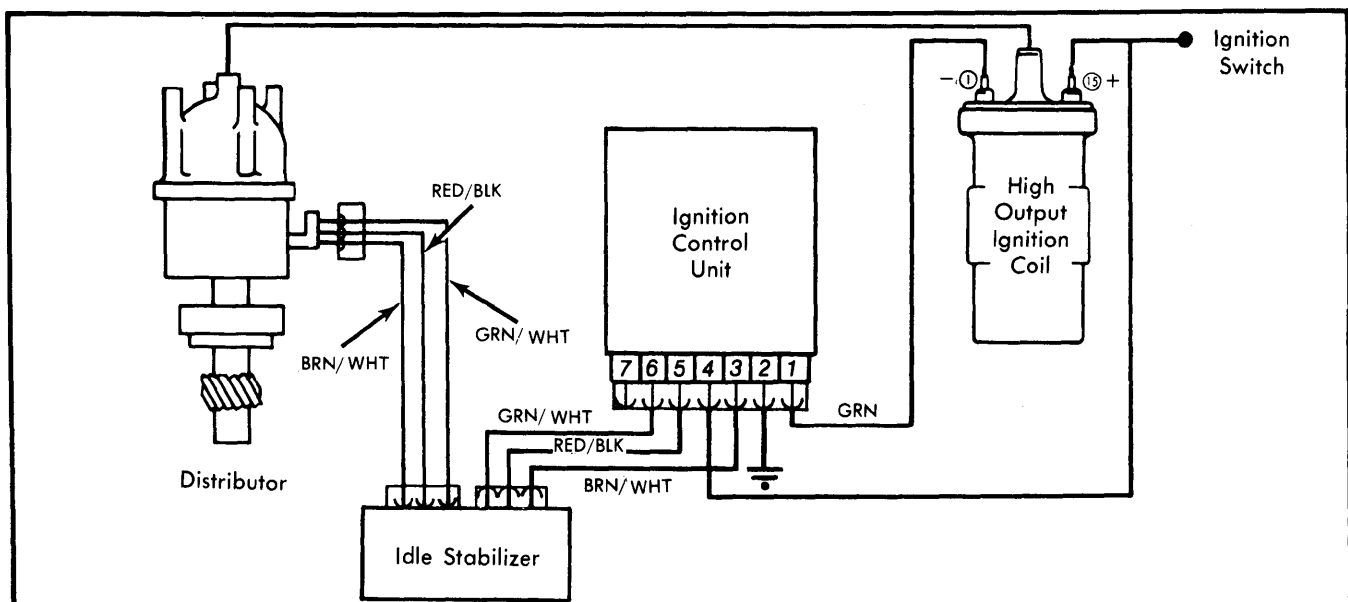
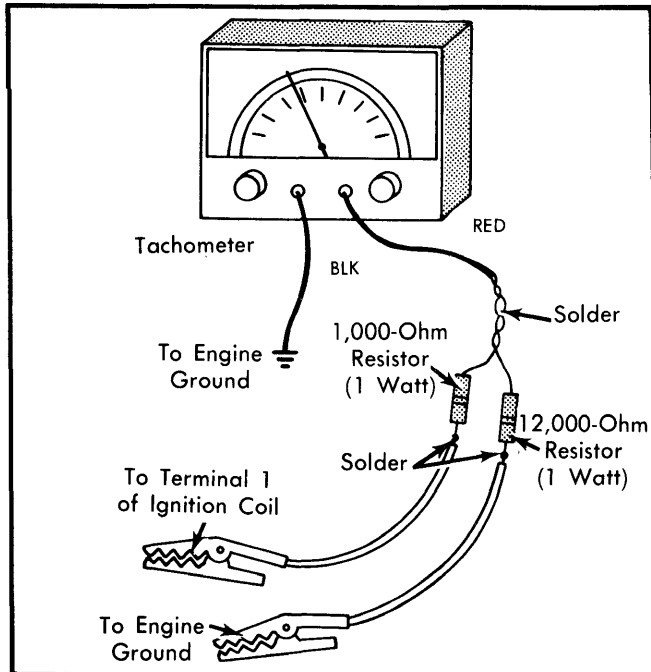


Fig. 1 Schematic Diagram of Bosch Hall Effect Electronic Ignition System

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2) Adapter is formed from 2 wires soldered together at one end. One wire (leading to coil terminal 1) must be equipped with a 1000 ohm, 1 watt resistor. The second wire (also leading to engine ground) must be equipped with a 12,000 ohm, 1 watt resistor. Both resistors should be soldered to attaching wires.



**Fig. 2 Assembling Tachometer Adapter**

### SYSTEM SPARK CHECK

1) If vehicle will not start, check for secondary voltage. Remove coil high tension wire from distributor cap. Hold wire approximately  $\frac{1}{4}$ " (6 mm) from engine ground, using insulated pliers.

2) Crank engine and check for a constant blue spark at gap to ground. If there is a good spark, check distributor cap, rotor, spark plug wires, spark plugs, fuel system and engine mechanical components. If there is no spark or only a very weak spark, perform the following checks.

### IDLE STABILIZER CHECK

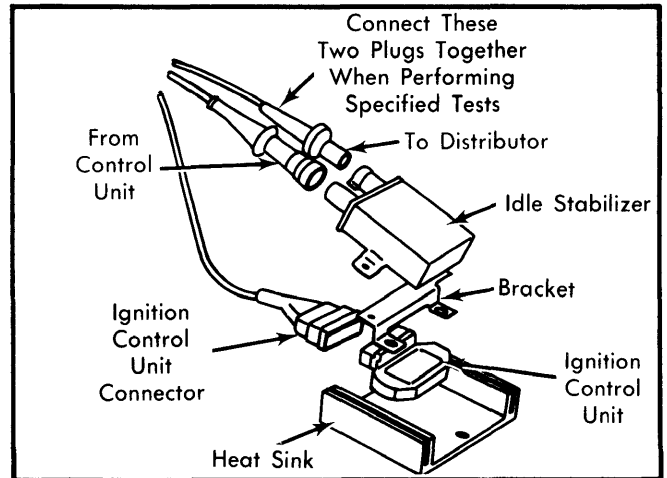
**NOTE** — On models equipped with the impedance transformer, testing procedures are performed in same way as with idle stabilizer.

1) If engine will not start, check idle stabilizer first. See Fig. 3. Remove both connectors from idle stabilizer and connect them together. This by-passes the idle stabilizer connecting the ignition control unit directly to the distributor. If engine now starts, idle stabilizer is defective.

2) In other cases where engine starts but idle stabilizer is suspected, by-pass the stabilizer by removing the 2 connectors and connecting them together. Turn off all electrical accessories and set idle speed and timing.

3) Then, reconnect the idle stabilizer. Ignition timing at idle may fluctuate, but should be about  $3^\circ$  ATDC ( $\pm 3^\circ$ ). Turn all


power accessories in step 2) back on. Ignition timing should be advanced to keep engine speed to specifications. If not, replace idle stabilizer.



**Fig. 3 Idle Stabilizer and Ignition Control Unit**

**NOTE** — An alternative manner of checking idle stabilizer can be used. With engine oil temperature above  $140^\circ$  F ( $60^\circ$  C), connect test equipment according to manufacturer's instructions. Start engine and slowly increase engine speed while applying foot brake. Let engine idle. On vehicles with manual transmission, engage 4th gear and release clutch slowly. On vehicles with automatic transmission, move selector into "DRIVE" position. As engine load increases, ignition timing must advance. If not, idle stabilizer control unit is defective and must be replaced.

### SPARK PLUG WIRE RESISTANCE

If spark plug connectors have sheet metal jackets carrying the following symbol (  ), they contain "air gap" resistors. Wires cannot then be checked for resistance using an ohmmeter. An oscilloscope must be used.

### ROTOR RESISTANCE CHECK

Connect leads of an ohmmeter set in x1000 scale to distributor rotor. Resistance should be approximately 1000 ohms. If not to specification, replace rotor.

**NOTE** — When replacing rotor, use rotors marked with "R1" only.

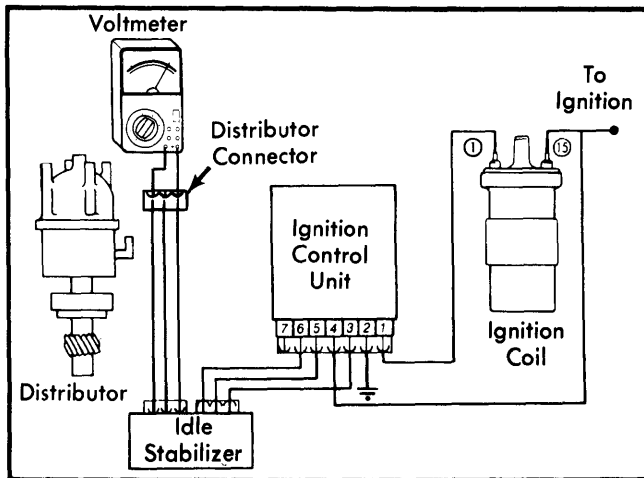
### DISTRIBUTOR VOLTAGE CHECK

1) Remove connector from distributor and connect voltmeter leads to each of the two outer terminals. See Fig. 4. Turn ignition switch "ON". Battery voltage should be read on voltmeter.

2) If there is no voltage, check wiring harness from distributor to control unit before proceeding to Control Unit Voltage Check.

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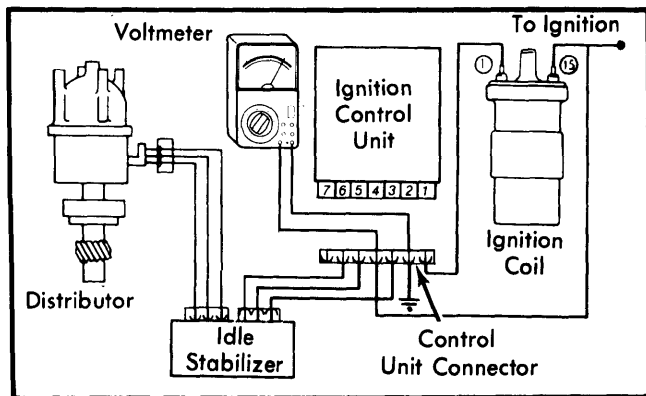
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**Fig. 4 Voltmeter Hookup for Distributor Voltage Check**

### CONTROL UNIT VOLTAGE CHECK

1) Disconnect connectors from idle stabilizer and connect them to each other. Reconnect connector to distributor. Remove connector from electronic ignition control unit. See Fig. 5. Connect positive voltmeter lead to terminal 4 of control unit harness connector. Attach negative lead to terminal 2 (ground).



**Fig. 5 Voltmeter Hookup for Control Unit Voltage Check**

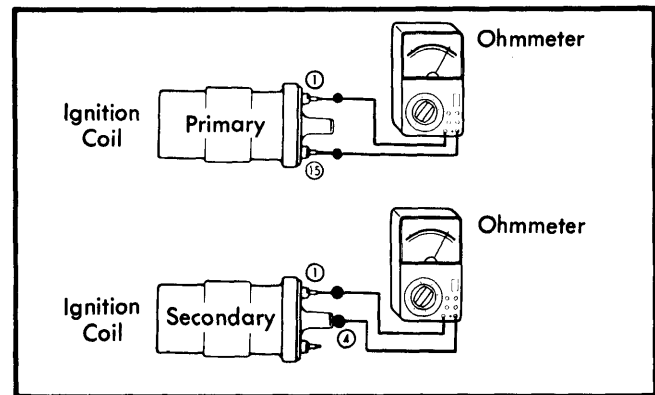
2) Turn ignition switch "ON". Voltmeter should register approximately 12 volts. If reading is not within specifications, check and repair wiring circuit.

### IGNITION COIL RESISTANCE CHECK

1) Remove all wires from ignition coil. Set an ohmmeter in the low scale and attach its leads to ignition coil primary terminals 1 and 15. See Fig. 6. Coil primary resistance should be .52-.76 ohm.

**NOTE** — It may be impossible to check primary resistance with ordinary shop equipment. If electronic ignition checks OK, but there is no spark available at high tension wire, replace ignition coil and retest.

2) Reset ohmmeter to x1000 scale and connect leads to primary terminal 1 and to coil tower, terminal 4. See Fig. 6. Resistance should read 2400-3500 ohms.

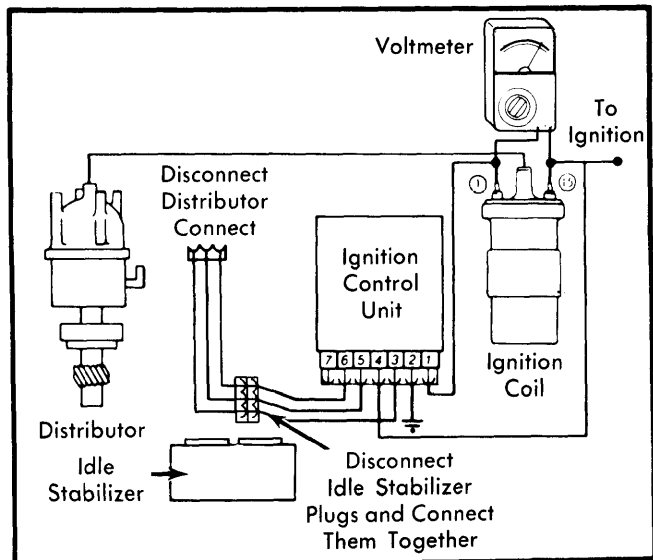


**Fig. 6 Ohmmeter Hookups for Coil Resistance Checks**

3) If either reading is not to specification, replace ignition coil.

### IGNITION CONTROL UNIT CHECK

**Vanagon Only** — 1) Disconnect both plugs at idle stabilizer control unit and connect plugs together. Remove connector from distributor. Connect positive lead of voltmeter to terminal 15 of ignition coil. Connect negative lead to terminal 1 of coil. See Fig. 7. Turn ignition switch "ON".



**Fig. 7 Voltmeter Hookup for Ignition Control Unit Operation Check on Vanagon Models**

2) Voltage should be approximately 5-6 volts. Voltage should drop to zero volts within 1 second. Briefly ground center pin on distributor connector. Voltage should read 5-6 volts briefly, then drop to zero.

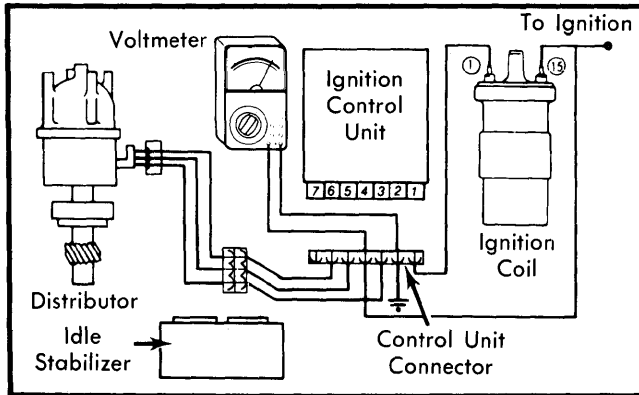
3) If control unit did not perform as specified, replace control unit.

**NOTE** — If voltage reading does not drop within 1 or 2 seconds, turn off ignition switch immediately.

**All Except Vanagon** — 1) Disconnect ignition control unit plug. Connect voltmeter leads between pins 2 and 4 on control

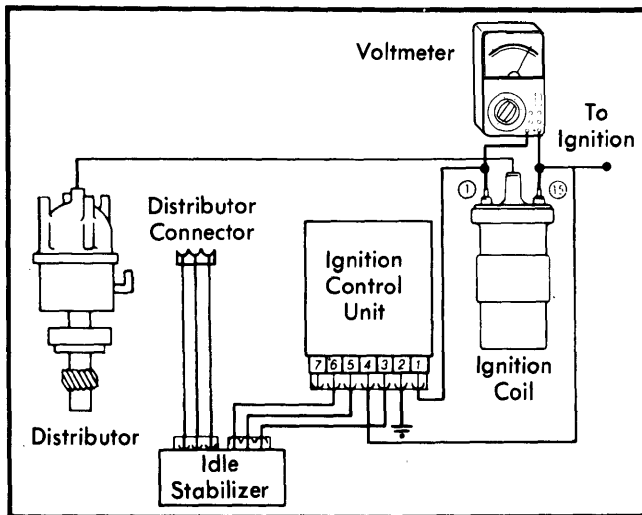
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unit plug. See Fig. 8. Turn ignition "ON". Battery voltage should be present. If not, check wiring circuit for breaks.



**Fig. 8 Voltmeter Hookup for Ignition Control Unit Operation Check on All Models Except Vanagon**

2) Turn ignition switch "OFF" and reconnect ignition control unit plug. Disconnect distributor connector plug. Connect the positive lead of voltmeter to terminal 15 of coil and the negative lead to terminal 1 of coil. See Fig. 9.



**Fig. 9 Voltmeter Hookup for Ignition Control Unit Operation Check at Ignition Coil on All Models Except Vanagon**

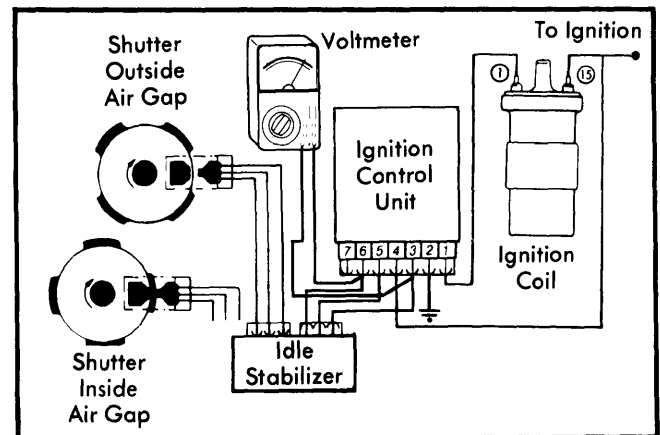
3) Turn ignition switch "ON". Voltage reading should be a minimum of 2 volts. Voltage reading should last for 1 to 2 seconds and then drop to zero volts.

4) Briefly ground the center pin on the distributor connector. Voltage reading should increase briefly to 5-6 volts. Turn ignition switch "OFF".

5) Connect voltmeter terminals to outer pins of distributor plug connector. Turn ignition switch "ON". Voltage reading should be a minimum of 5 volts. If ignition control unit does not perform as specified, check wiring circuit for broken wires. If wires are not broken, replace ignition control unit.

### HALL SENDING UNIT (GENERATOR) CHECK

1) Reconnect the control unit harness connector to control unit. See Fig. 10. Pull back rubber boot on connector. Attach voltmeter positive lead to connector terminal 6, and negative lead to terminal 3. Be sure connector is securely plugged into control unit.



**Fig. 10 Voltmeter Hookups for Hall Sending Unit Check**

2) Turn ignition switch "ON". With trigger wheel shutter outside Hall sending unit air gap, check voltage reading. It should be 0-.7 volts. See Fig. 10.

3) Now turn distributor until trigger wheel shutter is inside Hall sending unit air gap. See inset in Fig. 10. Voltmeter reading should increase to 1.8-12 volts.

4) If any of the above voltage readings are incorrect, replace the Hall sending unit.

### ALTERNATIVE HALL SENDING UNIT OPERATION CHECK

1) Disconnect high tension wire at distributor and connect it to ground. Connect a test light (4-24V) between terminal 1 and 15 of ignition coil. Crank engine with starter for approximately 5 seconds.

2) Test light must flicker. If not, replace Hall sending unit in distributor.

### OVERHAUL

**Disassembly** - 1) Loosen ground strap and remove static shield from distributor cap. See Fig. 11. Remove cap, rotor, carbon brush and spring. Remove dust cover.

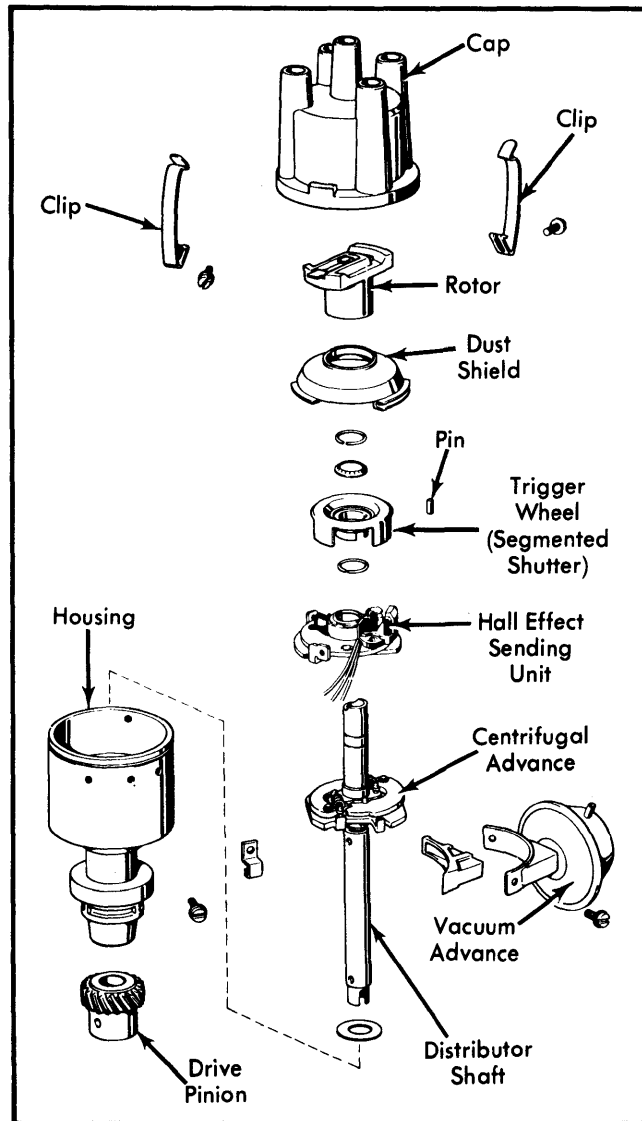
2) Remove connector from distributor (Hall generator connector and harness leading to idle stabilizer). Remove retaining snap ring and trigger wheel (segmented shutter). Remove washers. Remove screws and lift out Hall sending unit and connecting socket.

3) Remove base plate and vacuum unit. Remove pin and distributor drive pinion and shims.

**Reassembly** - To reassemble, reverse disassembly procedure. Replace seals and check components for cracks, corrosion and wear. Clean cap before installing.

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**Fig. 11 Disassembled View of Bosch Hall Effect Distributor**