## BOSCH ELECTRONIC IGNITION SYSTEM

**BMW**
**320i**
**528i**
**633CSi**
**733i**
**Fiat**
**Strada**
**X1/9**
**Mercedes-Benz**
**280 Series**
**380 Series**
**Porsche**
**911SC**
**928**
**Saab**
**900**
**900 Turbo**
**Volvo**
**DL**
**GL**
**GLT Turbo**
**GLE**
**Coupe**

### DESCRIPTION

The Bosch electronic ignition system consists of a control module, a breakerless distributor, a single or dual resistor (some models may use a resistor wire, Mercedes-Benz models do not use any resistors), a high output ignition coil, an ignition switch and battery. Standard centrifugal and vacuum advance/retard mechanisms are used. See *Figs. 1 and 2.*

NOTE – *Volvo MPG models are equipped with the Computer Controlled Electronic Ignition System. See appropriate article in this section.*

NOTE – *Some Strada models are equipped with the Marelli Electronic Ignition system.*

### OPERATION

Inside the distributor, a trigger wheel turns with the distributor shaft. The trigger wheel has one tooth or lug for each engine cylinder. As the trigger wheel rotates past the lugs of the magnetic pick-up coil, a magnetic field is built up that continually builds and collapses. This produces a low voltage electrical signal.

This signal passes to the control module, which controls the dwell angle and at the same time interrupts the ignition coil's primary current. This induces the high secondary coil output voltage that fires the spark plugs.

### SPECIFICATIONS

**Dwell Angle** – *Controlled by Electronic Control Module. Not adjustable. See table later in this article.*

**Centrifugal & Vacuum Advance (and/or Retard)** – *See Specifications Tables in this section.*

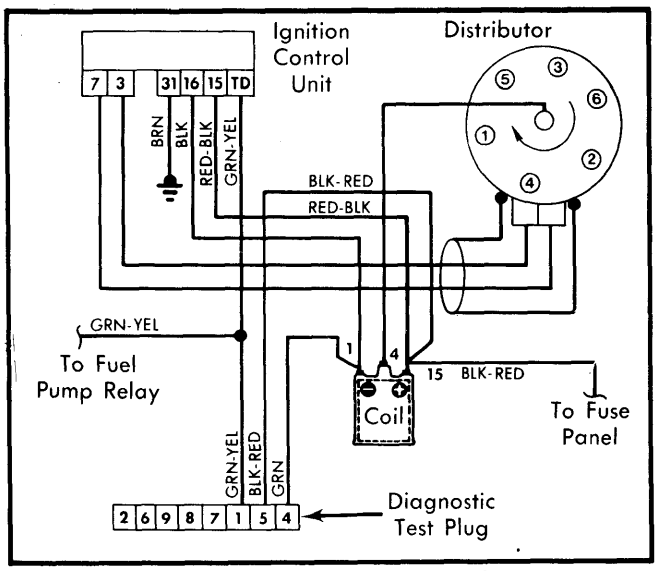


***Fig. 2 Wiring Diagram of Mercedes-Benz Bosch Electronic Ignition System***

### ADJUSTMENT

NOTE – *No adjustment should be attempted on ignition system except spark plug gap and ignition initial timing. Air gap should be visually checked when testing, but if specified clearance does not exist, replace components. Air gap is non-adjustable.*

### TESTING

NOTE – *Before testing ignition system, be sure battery is fully charged and in good condition, that all wires are sound and connections are good. Due to high voltage, use care when working on electronic ignition system.*

#### SYSTEM SPARK TEST

NOTE – *Do not perform this test on Mercedes-Benz vehicles. Use an oscilloscope to check spark results on Mercedes-Benz.*

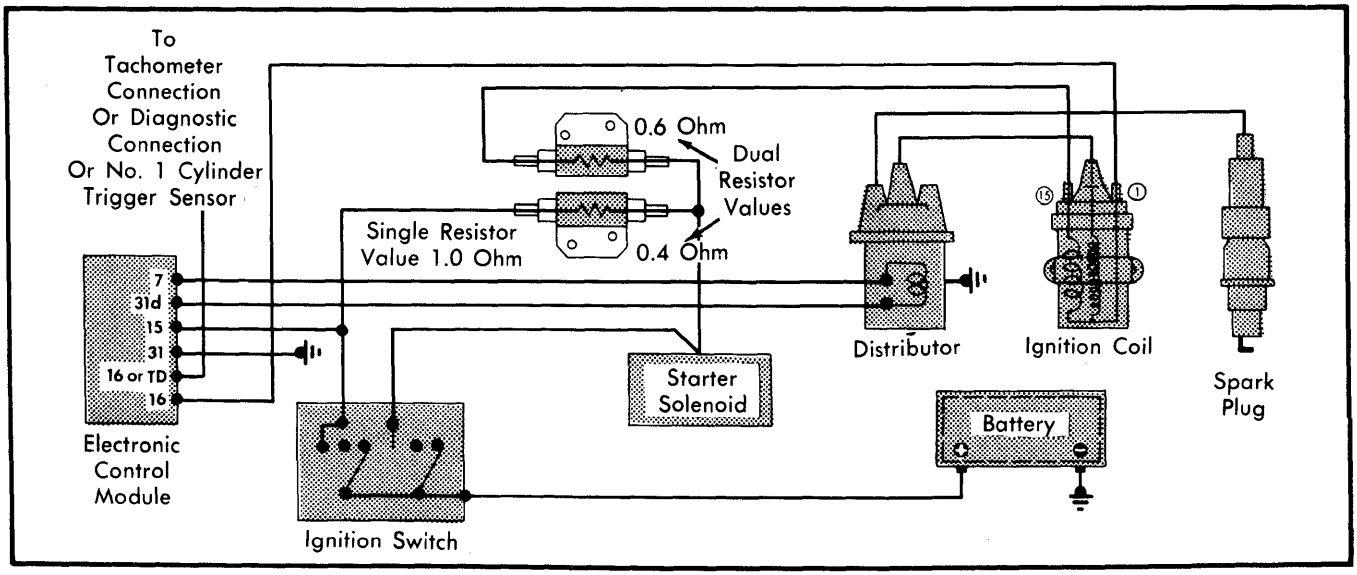


***Fig. 1 Wiring Diagram of Typical Bosch Electronic Ignition System***

## BOSCH ELECTRONIC IGNITION SYSTEM (Cont.)

**1)** If starter turns, but engine will not start or it fails to develop sufficient power, hold distributor end of coil wire about 3/8" (10 mm) from engine block and crank engine. *See Fig. 3.*

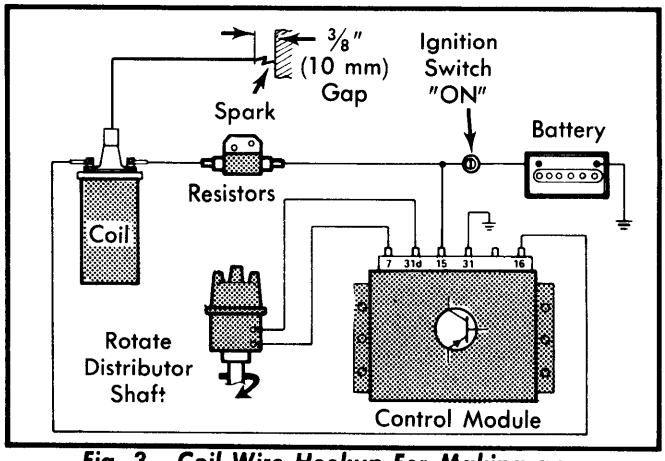


***Fig. 3 Coil Wire Hookup For Making an Ignition System Spark Test on All Models Except Mercedes-Benz***

**2)** If spark jumps gap, check distributor cap, rotor, cables and spark plugs. Be sure ignition timing and fuel system are OK. If no sparks occur, perform the following tests

### ROTOR RESISTANCE CHECK

Set an ohmmeter to the x1000 scale. With ignition switch off and distributor cap removed, attach ohmmeter leads to rotor. Resistance should be 1000 ohms for Mercedes-Benz or approximately 5000 ohms for all other models.

### 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.

### RESISTOR RESISTANCE CHECK

NOTE – *This test is not performed on Mercedes-Benz vehicles.*

Set an ohmmeter in the low scale. Be sure ignition switch is "OFF". Check resistance of each resistor in the primary circuit. *See Fig. 4.* Some manufacturers use resistor wires instead of ballast resistors. Most use 2 ballast resistors.

**Resistor Resistance Specifications**

| Application | Ohms |
|---|---|
| BMW | 0.4 and 0.6 |
| Fiat Strada & X1/9 | .85-.95 |
| Porsche | 0.4 and 0.6 |
| Saab | 0.4 and 0.6 |
| Volvo | 1.0 |

### IGNITION COIL RESISTANCE CHECK

**1)** Turn ignition switch "OFF". Using an ohmmeter set at the low scale, attach leads to ignition coil primary terminals 1 and 15 (wires removed). *See Fig. 4.* Take primary resistance reading.

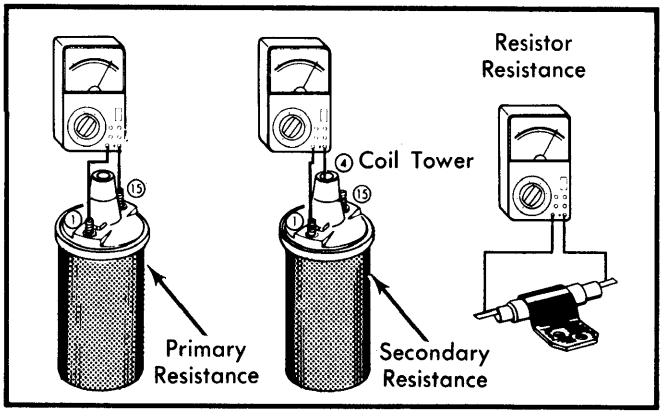


***Fig. 4 Ohmmeter Hookup for Ignition Coil Primary and Secondary Resistance Checks, Also Showing Ohmmeter Hookup for Ballast Resistor Check***

**2)** On Mercedes-Benz models, the coil has a pressure relief plug located on top of the coil. Make sure the plug has not popped out. If it has popped out, replace coil.

**3)** Set ohmmeter to x1000 scale, then connect ohmmeter leads to negative terminal 1 and coil tower terminal 4 (high tension). Take secondary resistance reading. If either the primary or the secondary reading was not within specifications, replace coil.

**Ignition Coil Resistance Specification**

| Application | Primary | Secondary |
|---|---|---|
| BMW | .4 | |
| Fiat Strada & X1/9 | 1.1-1.7 | 6000-10,000 |
| Mercedes-Benz | .7 | 8000-11,000 |
| Porsche | .33-.46 | 7000-12,000 |
| Saab | 1.05-1.35 | 5500-8500 |
| Volvo | 1.0-2.0 | |

### IGNITION COIL VOLTAGE CHECK

**1)** On Mercedes-Benz vehicles, connect voltmeter positive lead to diagnostic plug terminal 5 (terminal 15 on coil). Connect voltmeter negative lead to ground. Turn ignition switch "ON". Voltage reading should be the same as battery voltage. If voltage reading is not correct, check voltage readings back to battery (checking through ignition switch).

**2)** On Mercedes-Benz vehicles, connect voltmeter negative lead to diagnostic plug terminal 4 (terminal 1 on coil). Voltage reading should be zero. If reading is not zero, turn ignition switch "OFF" immediately. Replace electronic control unit.

**3)** On all other models, connect voltmeter negative to ground and positive lead to terminal 15 of coil. Turn ignition on. Voltage reading should be 4-7 volts. If less, check wires, connectors at ignition switch, resistors, coil and control unit to eliminate voltage drop. If more, check for defective resistors.

**4)** Connect voltmeter positive lead to negative coil terminal 1, and negative lead to a good ground. Reading should be 0.5-2.0 volts (maximum 2.0 volts). If previous tests and pick-up coil

## BOSCH ELECTRONIC IGNITION SYSTEM (Cont.)

resistance, starting voltage and control module voltage checks prove OK, substitute a known good control module. If system is now operative, install new module.

### STARTING VOLTAGE CHECK

NOTE – *This check is not performed on Mercedes-Benz vehicles.*

Disconnect line leading to starter terminal 15a at the .4 ohm resistor (most models). Attach voltmeter and crank engine. Voltage should be the same as battery voltage. If not, check for break in electrical supply line or contact 15a in starter relay.

### PICK-UP COIL RESISTANCE CHECK

**1)** On Mercedes-Benz vehicles, make sure ignition switch is "OFF". Disconnect pick-up plug connector (green cable) from control module. Attach ohmmeter leads (set to x1000 scale) to center pin (terminal 7) of cable and to larger circular pin (terminal 3) of green cable.

**2)** On all other models, turn ignition switch off and disconnect connector from control module. Connect ohmmeter leads (set in x100 scale) to terminals 7 and 31d of harness connector. See *Fig. 5*. Measure pick-up coil resistance.

**3)** If resistance readings are not to specifications, remove connector from distributor and take reading at pick-up coil pins at distributor. If readings are still not to secifications, replace pick-up coil.

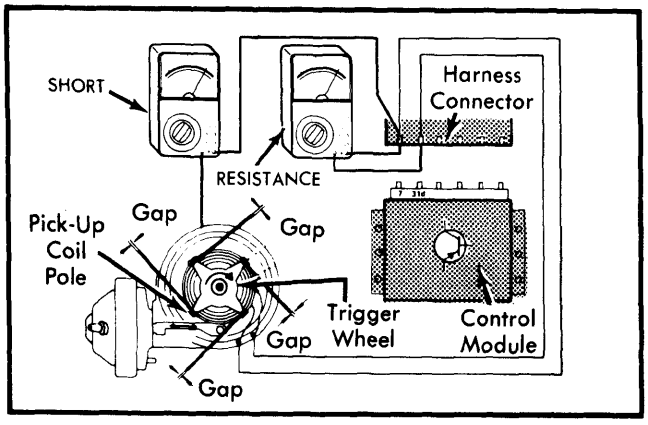


***Fig. 5 Ohmmeter Hookups for Pick-Up Coil Resistance and Short Checks***

**Pick-Up Coil Resistance Specifications**

| Application | Ohms |
|---|---|
| BMW | 520-700 |
| Fiat Strada & X1/9 | 890-1285 |
| Mercedes-Benz | 500-700 |
| Porsche 928 | 485-700 |
| Saab | 895-1285 |
| Volvo | |
| 4-Cylinder | 950-1250 |
| 6-Cylinder | 540-660 |

### PICK-UP COIL SHORT CHECK

**1)** On Mercedes-Benz vehicles, connect an ohmmeter to control module harness terminal 3 (then 7) and ground. On all other models, connect ohmmeter lead to terminal 7 then to terminal 31d. Resistance reading should be greater than 200K ohms for Mercedes-Benz vehicles or infinity for all other models.

**2)** If resistance reading was not correct, disconnect harness from distributor. Connect ohmmeter leads to pick-up coil pins in distributor and to ground. If readings are now correct, replace harness. If readings are still incorrect, replace pick-up coil.

### DWELL ANGLE CHECK AND VISUAL CHECK OF PICK-UP COIL ASSEMBLY

Check trigger wheel and pick-upsembly for damage. Also check visually for air gap between trigger wheel and pick-up coil. See *Fig. 5*. If damaged or if air gap is not to specifications, replace distributor (if components cannot be replaced individualy). Check dwell angle and compare with specifications. If not within specifications, repeat Pick-Up Coil Resistance, Short and Visual Checks. If OK, then replace control module.

**Dwell Angle & Air Gap Specifications**

| Application | Dwell Angle @ RPM | Air Gap In. (mm) |
|---|---|---|
| BMW | 32-53°@1500 | .014-.028 (.36-.72) |
| Fiat Strada & X1/9 | ① | .012-.019 (.3-.5) |
| Mercedes-Benz | 7-25°@② | ③ |
| Porsche | | |
| 911SC | ① | ① |
| 928 | 25-39°@1500 | ① |
| Saab | 60-80°@① | ① |
| Volvo | | |
| 4-Cylinder | 45-63°@1500 | ① |
| 6-Cylinder | 45-60°@1500 | ① |

① – Specification not available from manufacturer.
② – At cranking speed.
③ – Not adjustable.

### CONTROL MODULE VOLTAGE

NOTE – *Test not performed on Mercedes-Benz vehicles.*

Disconnect connector from control module and turn ignition switch "ON". Attach voltmeter positive lead to terminal 15 of control module harness connector. Connect negative lead to ground. Battery voltage should be shown. If not, check for voltage drop in harness between ignition switch and control module.

### CONTROL MODULE GROUND CHECK

NOTE – *Test not performed on Mercedes-Benz vehicles.*

Disconnect connector at control module. Connect one ohmmeter lead to terminal 31 of control module (not harness). Connect other lead to ground.

## BOSCH ELECTRONIC IGNITION SYSTEM (Cont.)

Reading should show continuity. If not, check module ground wire and repair as necessary.

### FINAL CONTROL MODULE OR IGNITION COIL CHECK

NOTE – *Test not performed on Mercedes-Benz vehicles.*

If ignition coil is suspected of being defective, substitute a known good coil and attempt to start vehicle. If it starts, reinstall old coil and start vehicle. If it then fails to start, replace with new coil. If control module is suspected, substitute a known good module and start vehicle. If it starts, reinstall original module. If vehicle fails to start now, install new control module. If system still fails to operate, disconnect tachometer connector at instrument cluster. Attempt to start engine. If engine now starts, replace tachometer.

### OVERHAUL

**Disassembly** – 1) Remove distributor cap, rotor and dust cover. Remove vacuum unit screws and lock clasp screws. Remove screws securing electrical leads and remove leads by carefully pulling straight out.

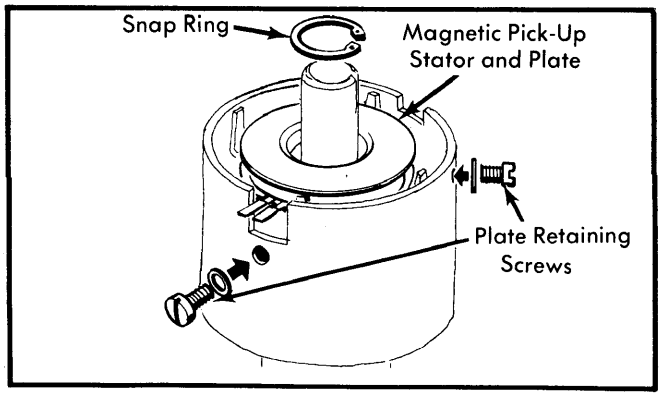


***Fig. 6 Removing or Installing Pick-Up Coil, Stator and Carrier Plate***

NOTE – *Keep screws with component they attach, as screws are different lengths and damage could result if installed in wrong location.*

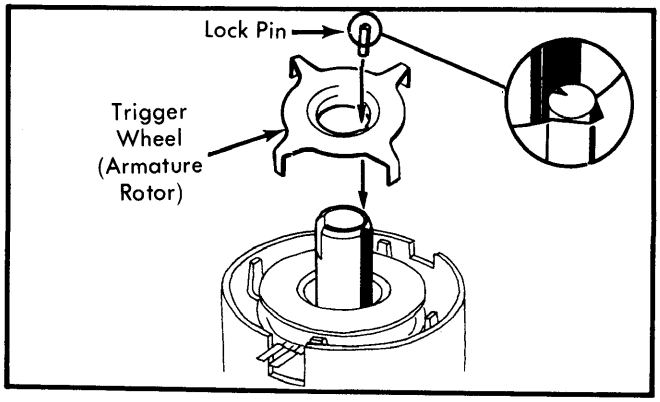


***Fig. 7 Installing Wheel and Lock Pin***

2) Remove trigger wheel snap ring and then shims. Using 2 screwdrivers, carefully pry upward on trigger wheel. Remove trigger wheel and lock pin. Remove screws securing pick-up coil and stator assembly carrier plate. Remove snap ring and retaining clips. Lift carrier plate and stator straight up off shaft. Remove 3 screws to separate stator winding from carrier plate.

3) Disconnect springs to centrifugal governor. Mark drive shaft relationship to distributor shaft and then secure drive shaft in a soft-jawed vise. Carefully tap on distributor housing with a plastic mallet until circlip releases. If equipped, remove triggering contacts and attaching screws.

4) Remove resilient ring. Mark location of flange to distributor shaft. Support distributor shaft and using a pin punch, remove pin. Remove flange and distributor shaft. Remove lock springs for centrifugal weights and then weights.

**Inspection** – Springs for weights must not be deformed or damaged. Holes in centrifugal governor weights must not be oval or deformed. Distributor shaft-to-cam clearance should not exceed .004" (.1 mm). Distributor shaft-to-housing clearance should not exceed .008" (.2 mm).

**Reassembly** – 1) To reassemble distributor, reverse disassembly procedure, while noting the following: Place a light coat of grease on weights and a couple of drops of oil on felt wick in center of shaft. Do not get grease or oil on pick-up coil and stator assembly.

2) When attaching stator to plate, the connector pins should be positioned opposite and above the attachment ear for carrier plate. Install lock pin with lift facing ridge on distributor shaft. Slot on trigger wheel should be aligned with groove on distributor shaft.

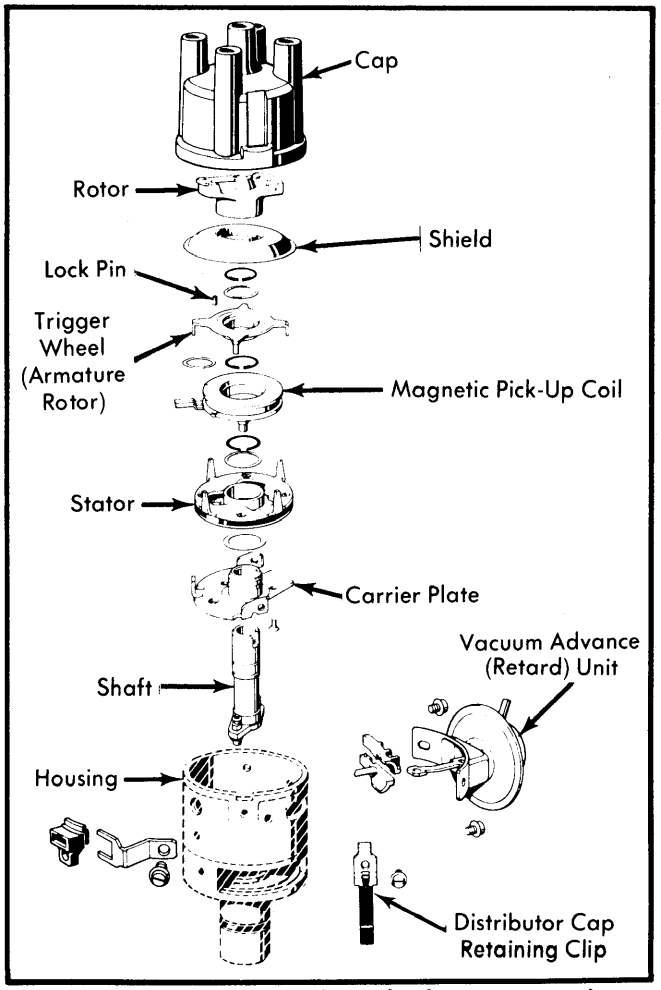


***Fig. 8 Exploded View of Bosch Electronic Distributor***