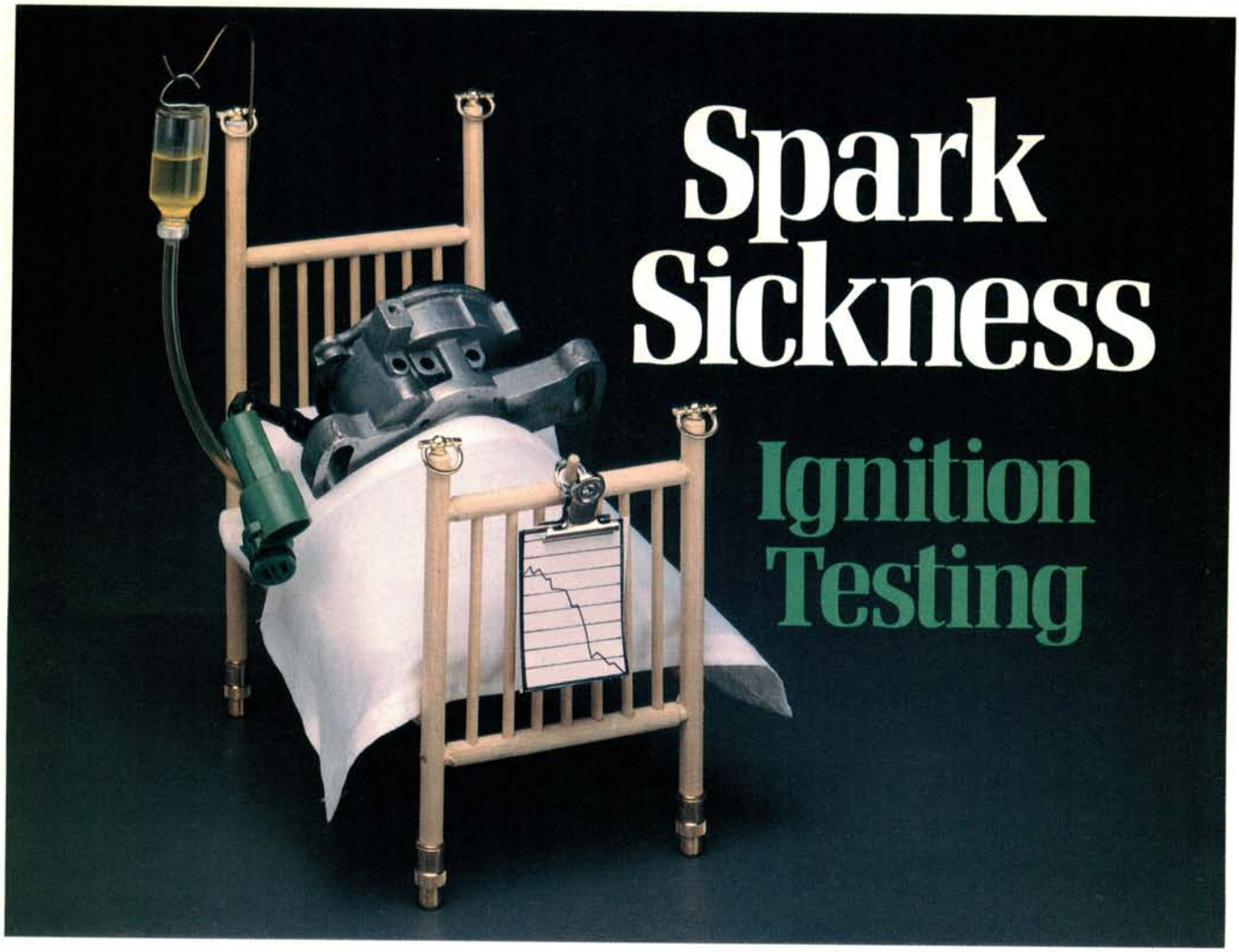


Spark Sickness

Ignition Testing

We promised you continuing coverage on ignition system repair techniques in our June 1989 feature, "Import Distributor Service". True to our word, we're back this month with more vehicle specific import ignition information. As we pointed out then, electronic ignition is very often taken for granted. Most people don't give their ignition a second thought until the day it calls in sick.

You'll find the three ignition systems we'll cover in this article listed below. Look for additional ignition system coverage in the coming year.

Bosch Hall Effect

- The distributor's Hall signal on Volkswagens may be sent to any one of three different components, depending on the year and model you're working on.
- Some cars, like our 1984 GTI, have the distributor Hall sender **connected directly to the ignition control unit**.
- Some earlier models routed the Hall signal through a **digital idle stabilizer**. The idle stabilizer sensed engine speed and adjusted the ignition timing to compensate for changes in engine load at idle. This system could advance base timing by up to an additional 20 degrees.
- On the third style, the Hall signal was sent through a **knock control unit** on its way to the ignition control unit. Signals were also sent to the knock control unit by the idle and wide open throttle switches, the knock sensor, and manifold vacuum through a tube connected directly to a vacuum transducer in the control unit.
- Amid these changes, Volkswagen has stayed with the same terminal numbering system on their ignition control units. The control unit terminals are:

1. Output to coil
2. Control unit ground
3. Output ground to distributor Hall unit
4. Voltage supply to control unit
5. Output voltage to distributor Hall unit
6. Input signal from distributor Hall unit

Toyota IIA

Several Toyota models as well as the Chevrolet/Toyota Nova have used Nippondenso's Integrated Ignition Assembly (IIA). This system also operates independent of other engine control systems. We found

diagnosis of the IIA system was made easier because all ignition components are contained inside the distributor.

Ignitor testing on the Toyota IIA system involves use of a 1.5 volt dry cell battery. To avoid damaging the ignitor's output transistor, never leave the dry cell battery leads connected to the ignitor for more than 5 seconds at any one time.

Nissan LED

This unusual system uses a distributor filled with LEDs, photodiodes, a wave forming circuit, and a shutter wheel. The distributor is part of an engine management system Nissan calls ECCS (short for Electronic Concentrated Engine Control System).

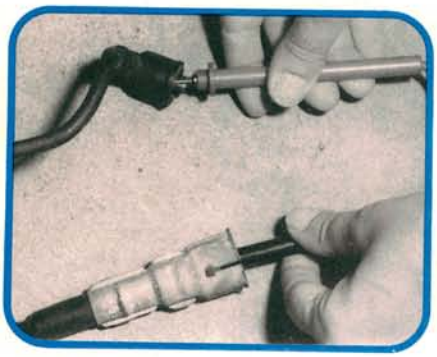
The system's ECU can store a code 21 (primary ignition) or a code 11 (crank angle sensor) if it detects a problem in the ignition system. Checking for stored codes can save you a few steps, especially with intermittent problems. We used a 1987 Sentra for our tests.

Early Warnings

Here are a few words of advice that should save you some aggravation. They might also save you from smoke testing your multimeter or the ignition system you're working on:

- To avoid damage to electrical components, always connect or disconnect wiring harness, or test lead connections with the ignition switched off.
- For the most accurate results, take all multimeter readings at ambient temperatures of 20 degrees C (68 degrees F).
- Never allow the ignition coil primary wiring to touch ground for any reason. This can cause damage to the ignitor, coil, or even the control unit itself.

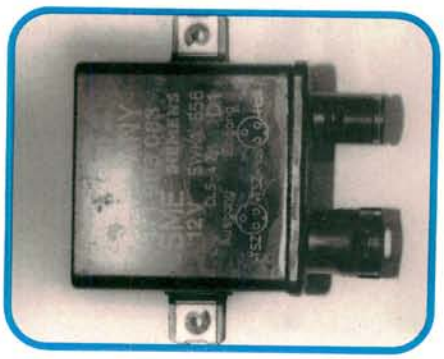
—By Karl Seyfert



1

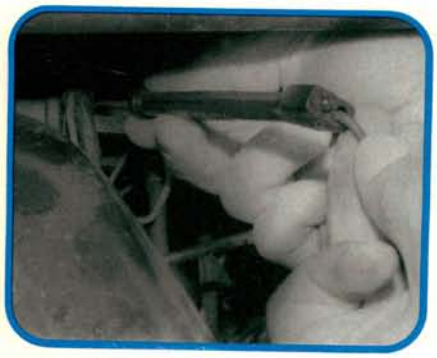
Volkswagen

Install a spark tester on a spark plug wire. Check for spark at the tester while cranking. Check the secondary wiring resistance if the spark is weak. VW uses copper wires with resistors at the ends. Plug wire resistance should be approximately 6000 ohms, the coil wire 2000 ohms, and the rotor 1000 ohms.



2

No spark? If the engine has a digital idle stabilizer (DIS), remove its connectors and plug them together. If you now have spark, replace the DIS. If there's still no spark, disconnect the DIS connectors and examine the pin terminals for damage or corrosion. Parts are available to repair damaged terminals.

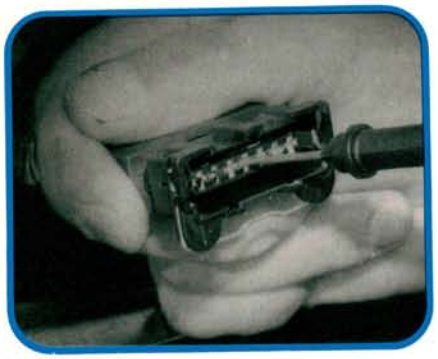


3

If there's still no spark, check for battery voltage at coil terminal 15 with the ignition on. Attach the negative lead of an LED test light to coil terminal 1 and the other lead to the battery positive terminal. If the LED flickers as you crank the engine but there's no spark, check the coil and secondary wiring.

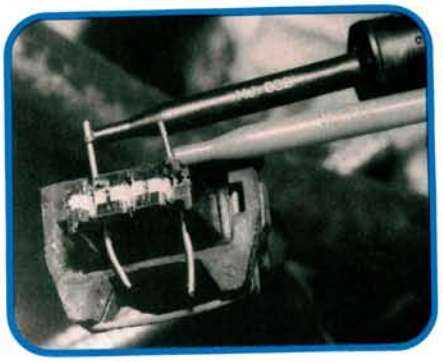
4

Remove the coil wiring and check coil resistances. Primary resistance (between terminals 1 and 15) should be less than one ohm. Secondary resistance (between terminals 1 and 4) should be 2400-3500 ohms. Check the coil carefully for leaks, corrosion, cracks, dirt, or carbon tracks.



5

If the LED didn't flicker, remove the ignition control unit connector. Check for battery voltage at terminal 4 with the key on. Also check for ground at terminal 2. Trace for wiring breaks between terminal 4 and coil terminal 15 or between terminal 2 and the cylinder head ground stud (1984 Rabbit).



6

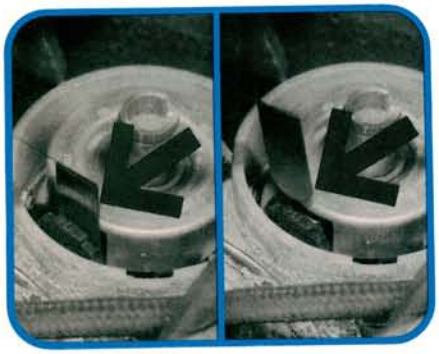
Check for power and ground to the Hall sender. Remove the distributor connector, then connect a positive voltmeter lead to terminal 3 and the negative lead to terminal 1. Check for a minimum of 5 volts with the ignition on. If not, check for wiring breaks, then repeat the test at control unit terminals 3 and 5.

7

If the wiring's okay, but there's still no voltage or ground signals from the control unit, the control unit is bad. To test its internal protection circuit, disconnect the distributor connector. Voltage across coil terminals 1 and 15 should reach 2 volts minimum (ignition on), then drop to zero in 1-2 seconds.

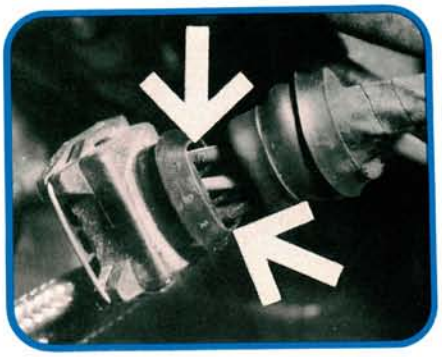
8

For another control unit test, connect an LED test light between coil terminal 1 and ground. Attach a spark tester to the coil wire and a jumper wire to the center distributor connector terminal. With the ignition on, touch the jumper wire briefly to ground. There should be spark and the LED must dim.



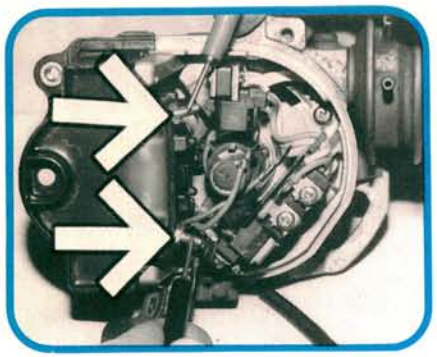
9

Check for continuity between distributor connector terminal 2 and control unit connector terminal 6. To test the Hall sender, reconnect the distributor connector and remove the distributor cap. Slide a feeler gauge between the opening in the Hall sender, then remove it. There should be a spark at the coil wire.



10

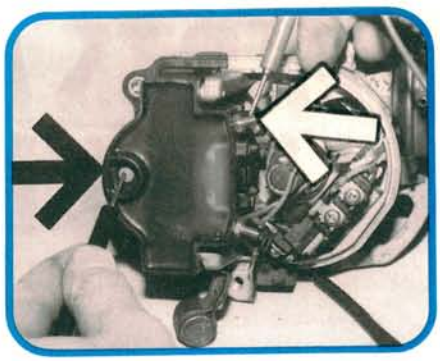
If continuity checks good and there's still no spark, the Hall sender is DOA. For a final test, backprobe distributor connector terminals 1 and 2 with a voltmeter. Turn the ignition on, then slowly rotate the engine. The meter should read 1.8-12 volts when the sender is covered and 0-0.7 volts when it's open.



11

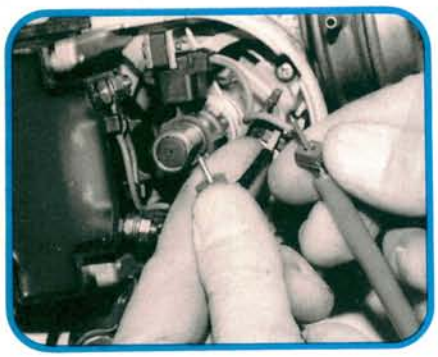
Toyota Ignition Assembly

Check the coil primary resistance. With the ignition off, remove the wiring from both coil primary terminals. Cold primary resistance (70 degrees F) must be no more than 0.38-0.48 ohms. Resistance at operating temperature may increase to 0.70-0.78 ohms.



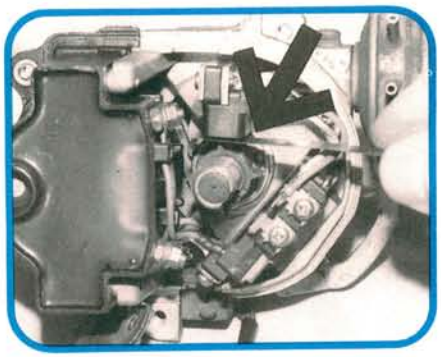
12

Check the coil secondary resistance. Leave the positive ohmmeter lead attached to the positive terminal. Switch the negative lead to the secondary terminal of the coil. Cold secondary resistance should be 7.7-10.4 K ohms. Resistance will rise to 9.5-11.2 K ohms at operating temperature.



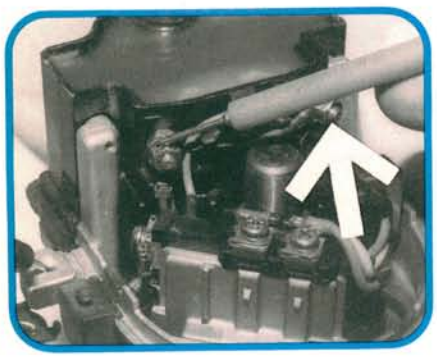
13

Check the pickup coil. Reinstall the coil wiring. Remove the pickup coil wiring from the ignitor, then attach your ohmmeter leads to the pickup coil wiring. Pickup coil resistance at all temperatures must be between 130 and 190 ohms. Reinstall the pickup coil wiring properly to prevent damage.



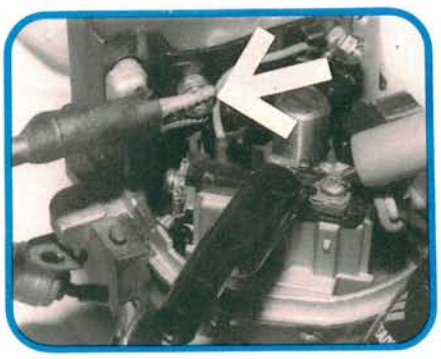
14

Check the pickup coil air gap. Pickup coil air gap measured with a non-magnetic feeler gauge must be 0.20-0.40 mm (.008-.016 in). Rough teeth on the reluctor are probably caused by worn distributor shaft bushings. A wider than normal air gap can reduce secondary voltage to the plugs by 3000 to 5000 volts.



15

Check the ignitor. Take an accurate battery voltage reading, then switch the ignition on. Voltage measured at the coil positive terminal (arrow) must be within 0.5 V of battery voltage. Voltage measured at the coil negative terminal must be 0.3-0.75 less than battery voltage (shown).



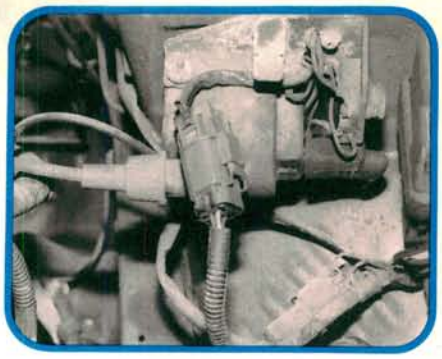
16

Check the ignitor. Leave the voltmeter leads attached (arrow) as in the previous test. Attach the positive lead of a 1.5 volt dry cell battery to the pink wire on the ignitor. Briefly touch the negative lead to the white wire. The voltmeter must now read 8.75-10.75 volts. If it doesn't, replace the ignitor.

17

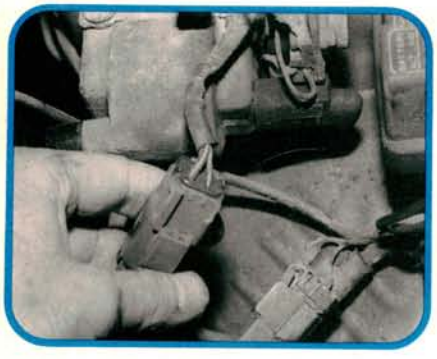
Nissan LED

Check the coil's primary resistance. Remove the ignition coil wiring. Resistance between the positive and negative terminals should be 0.84-1.02 ohms. This one reads a bit high. Secondary resistance must be 8200-12,400 ohms. These molded coils may crack near their mounting brackets. Check for carbon tracks.



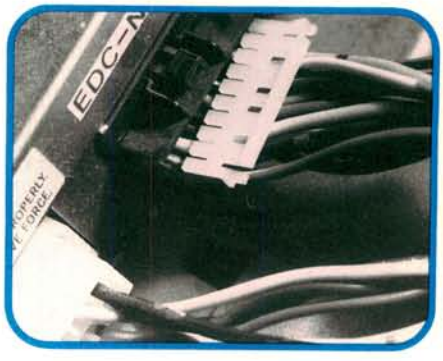
18

Check the voltage supply to the coil. If the coil checks out, we'll work backwards from there. Check for battery voltage at the black/white wire, then use a logic probe to check for a pulsed ground at the black/red wire while the engine is cranked.



19

Check the power transistor. Use the harness side of this four wire connector to check for battery voltage at the black wire and a pulsed ground at the green/black wire when the engine is cranked. If both check out and there's no pulsed ground signal from the power transistor, the power transistor is bad.

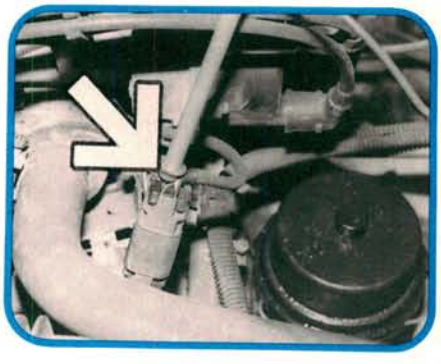


20

Check the wiring between the ECU and power transistor. Go to terminal 5 at the ECU (under the passenger seat) and backprobe the terminal with a logic probe. Crank the engine. A pulse here, but not at the power transistor, indicates a wiring problem. Read on if there's no pulse at the ECU.

21

Check the crank angle sensor. The ECU sends a pulsed ground signal to the power transistor based on signals from the crank angle sensor. Backprobe ECU terminal 8 for the 1 degree signal and terminal 17 for the 90 degree signal with a logic probe. If you've got input pulses, check the ECU, its power supply, or grounds.



22

If there are no input pulses, we've narrowed it down to the crank angle sensor or its wiring. Backprobe the distributor connector with a logic probe to check for pulses at the red/white and red/blue wires while cranking. Use a voltmeter to check the two remaining wires for battery voltage.