IGNITION SYSTEM

GENERAL

The ignition system is a breakerless inductive discharge ignition system. It has two circuits, the primary circuit and the secondary circuit. The primary circuit consists of the battery, switch, primary coil winding, computerized ignition timer and associated wiring. The secondary circuit consists of the secondary coil, the spark plugs and associated wiring.

The computerized ignition system consists of three assemblies, the rotor and sensor plate, the computerized microprocessor module, and the vacuum operated electric switch (V.O.E.S.). The rotor and sensor plate are located in the gearcase cover on the right side of the motorcycle. The computer module is mounted on the left side of the fairing mount on FLTC models on the left side of the steering head on FLHTC and FLHS models and under the right side cover on FXR models. The V.O.E.S. is located to the left of the intake manifold. The computer has two functions. First, it computes the spark advance for proper ignition firing. Second, it opens and closes the low voltage circuits between the battery and ignition coil to produce high voltage discharge to the spark plugs.

The vacuum operated electric switch (V.O.E.S.) senses intake manifold vacuum through an opening in the carburetor body. The V.O.E.S. is connected to the carburetor with a vacuum hose. The switch is open under acceleration and high engine load conditions (low vacuum) and closed under low engine load conditions

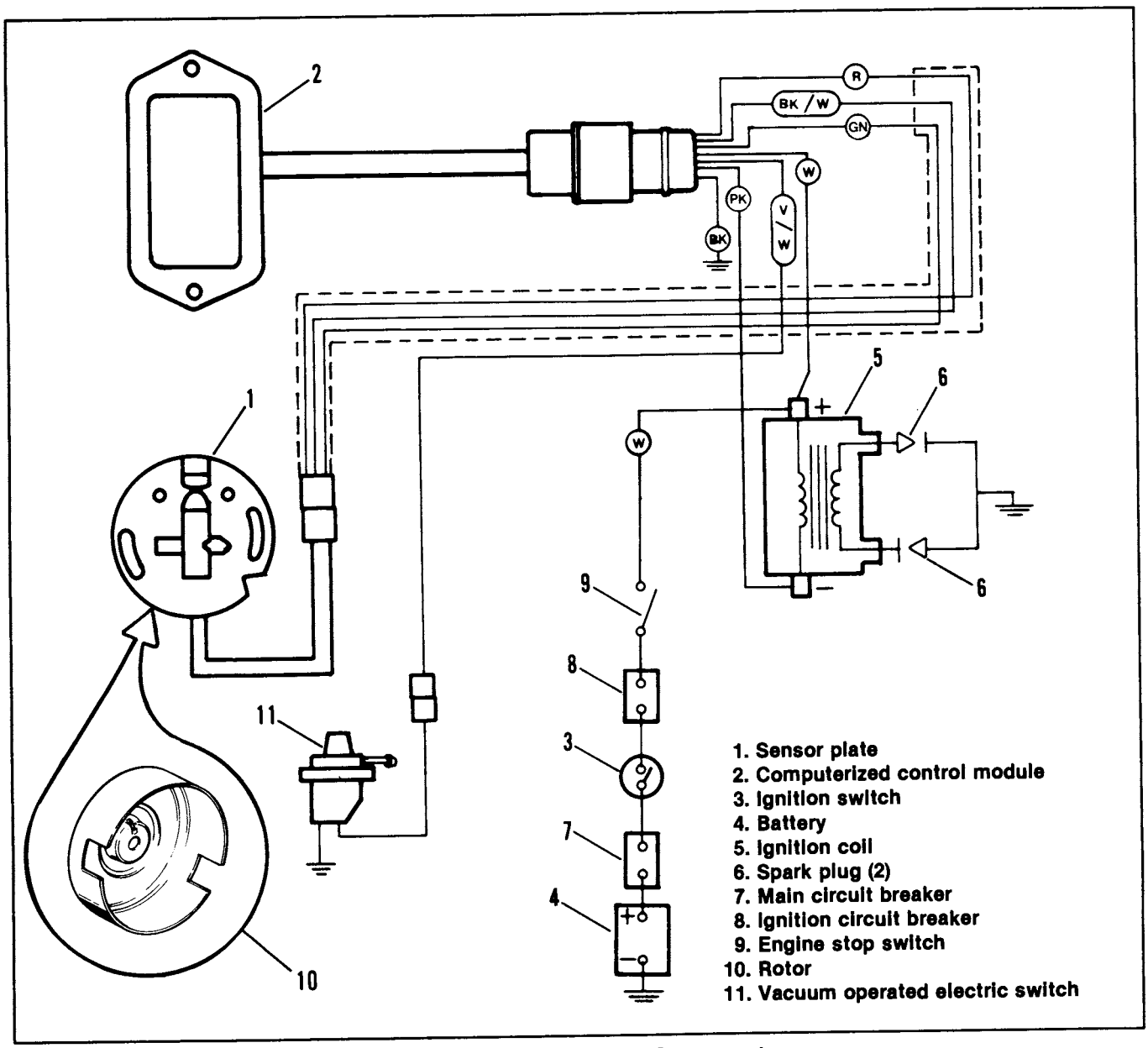


Figure 8-1. Ignition System Components

(high vacuum). The computer module is programmed with two spark advance curves to meet varying engine loads. The high vacuum curve selected for maximum spark advance under normal light load cruising conditions provides improved fuel economy and performance. The low vacuum curve (retarded spark) minimizes spark knock, while maintaining performance, under high load conditions (acceleration and highway driving).

The computer module selects the proper curve when it receives an open or closed electrical signal from the V.O.E.S. This system ensures correct timing to suit starting, low and high speed requirements.

The ignition timer includes a rotor, sensor plate, and a computerized microprocessor control module and a V.O.E.S. A single ignition coil fires both spark plugs at the same time, but one spark occurs with no effect during a noncompression stroke of one cylinder, while the other spark fires the combustible gasses in the other cylinder to produce the power stroke.

The rotor is bolted on to the camshaft and operates at one-half crankshaft speed. As the rotor turns, slots in its external edge break the magnetic field of a Hall-effect device mounted on the sensor plate. The output of the Hall-effect device is a logic-type signal that corresponds to the timing information from the spinning rotor. This technique gives accurate timing information down to "0" speed.

Basically, the system gives a spark near Top Dead Center (TDC) for starting, and at rpm's and loads above this gives a spark advance that varies between TDC and 35° Before Top Dead Center (BTDC) on 1340cc engines, or 5° to 45° BTDC on XLH 883 and 5° to 40° BTDC on XLH 1200 engines. The whole timing program can be shifted by mechanical rotation of the sensor plate. See Advance Timing.

The computerized control module contains all of the solid state components used in the ignition system. The dwell time for the ignition coil is also calculated in the microprocessor and is dependent upon engine speed. The programmed dwell is an added feature to keep battery drain to a minimum and yet gives adequate spark duration at all speeds.. (The microprocessor control module has added protection against transient voltages, continuous reverse voltage protection, and damage due to jump starts.) The system will operate down to 5.7 volts DC. The control module is fully enclosed in a polyurethane material to protect it from vibration, dust, water or oil. This unit is a non-repairable item. If it fails, it must be replaced.

TROUBLESHOOTING

When the engine will not start, or when hard starting or missing indicates a faulty ignition system, proceed with the following tests.

Check for Engine Spark

1. Disconnect spark plug cables from spark plugs. Check condition of plugs and cables. Clean or replace as necessary.
2. Insert a conductive adapter into spark plug cable nipple and establish a 3/16 in. gap between adapter and cylinder head. Turn on ignition and engine stop switches. Crank engine. Check to see if a spark is obtained across the gap. If a spark is obtained, the problem is not in the electronic system or coil. Check carburetion, choke and spark plugs.
3. If no spark is obtained, check battery voltage and battery connection condition. Battery voltage must be 11-13V DC.

   Check specific gravity of battery electrolyte with hydrometer. Specific gravity must be 1.250 (temperature corrected) or higher. If voltage and specific gravity are low, charge battery.
4. Check to make sure that ignition module ground (black lead) is securely fastened to the frame and that the ground wire from battery to frame is in good condition. On FLT and FXR model's check condition of transmission to frame ground strap and be sure it is attached securely. If there is still no spark at engine proceed to the test under No Spark at Engine.

No Spark at Engine

To conduct all the procedures in this test it will be necessary to assemble a set of jumper wires as shown in Figure 8-2. Cut two lengths of wire of ample length to reach from a good ground connection to the negative terminal of the coil primary. Use a known good condensor such as used in earlier breaker point ignition systems if a suitable capacitor is not readily available. When conducting the spark tests steps 3 and 5, use a spare plug and connect it to one of the plug wires or remove one of the engine spark plugs and lay it on the engine cylinder head with the plug wire connected. The spark is then checked jumping across the plug electrodes.

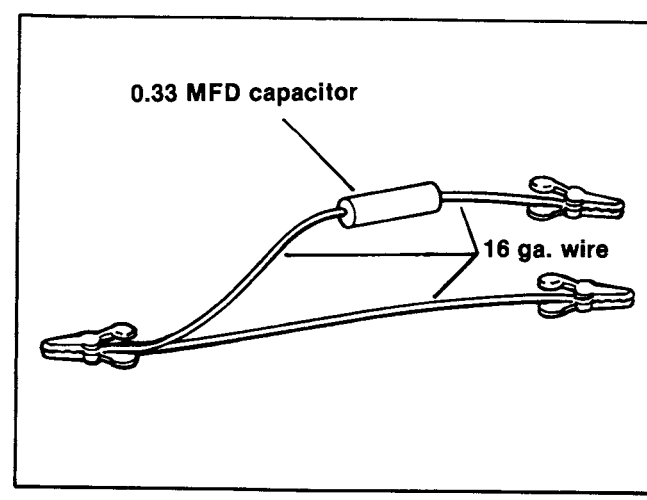


Figure 8-2. Test Jumper

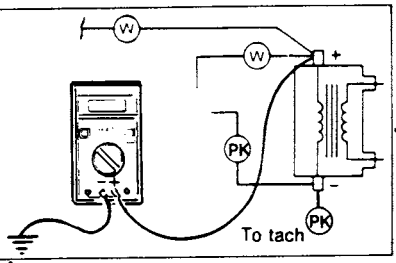
CONTINUOUS NO SPARK AT SPARK PLUG

1

A. Ignition switch on.

B. Multimeter red wire to white wire terminal, black wire to ground.

C. Meter should register 12V + or – one volt.



NO POWER → Check circuit breaker, loose wires, switches. See Troubleshooting Section 5.

YES ↓

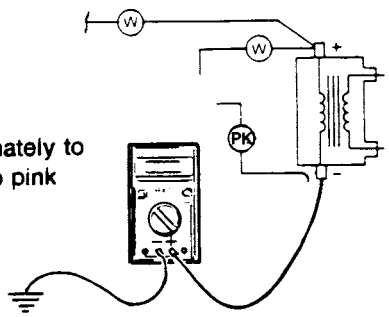
2

A. Remove pink (module) wire from coil terminal.

B. Ignition switch on.

C. Multimeter red wire alternately to white wire terminal and to pink wire terminal.

D. Meter should register 12V at both terminals.



NO POWER → Check coil resistance. See COIL later in this section. Resistance O.K. Check spark step 3.

YES ↓

3

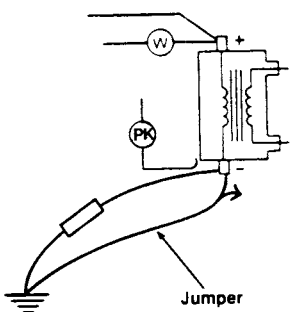
A. Pink (module) wire disconnected.

B. Ignition switch on.

C. Jumper wire -- connect capacitor wire to pink wire terminal.

D. Connect both wires to common ground.

E. Momentarily touch ground wire to pink wire terminal. When you remove the wire, there should be a spark at plug.



NO SPARK → Replace coil.

YES ↓

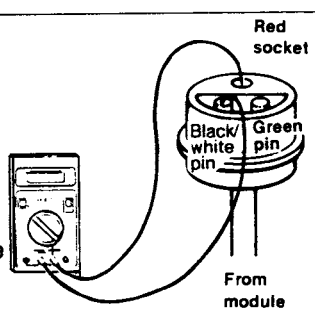
4

A. Reconnect pink wire to coil.

B. Ignition switch on.

C. Disconnect sensor.

D. Connector from module-multimeter red wire to red wire socket and multimeter black wire to black/white pin. Should register 12V ± 0.5 volts.



NO POWER → Check module ground and power wire to module for loose connections. (See resistance test, following.) Check spark, step 5.

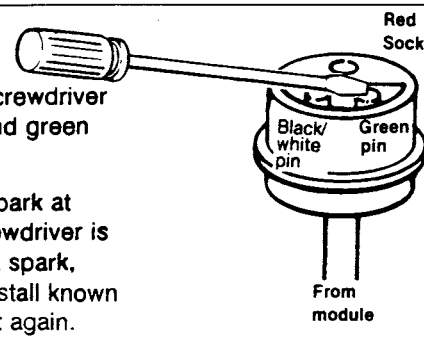
YES ↓

5

A. Ignition on.

B. Momentarily place screwdriver across black/white and green connector pins.

C. Strong evidence of spark at spark plug when screwdriver is removed. If there is a spark, sensor is suspect. Install known good sensor and test again.



NO SPARK →

Check module resistance. Replace module if resistance is bad. See Resistance Tests.

INTERMITTENT IGNITION PROBLEM — VIBRATION

A. Check battery connections. Disconnect module ground (scrape paint, add star washer).

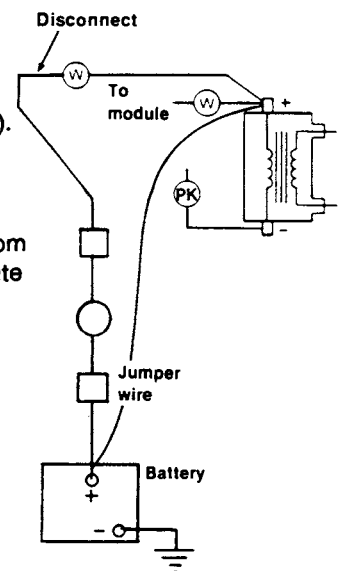
B. Disconnect white wire at coil terminal (not module feed).

C. Connect 16 ga. jumper wire from battery positive terminal to white wire terminal of coil.

D. Operate vehicle to see if problem is eliminated.

NOTE

Vehicle no longer has an engine stop switch. Engine must be stopped by removing jumper wire.



YES →

Problem is vibration, possibly loose connection at safety switches in starter circuit. See TROUBLESHOOTING section 5.

INTERMITTENT IGNITION PROBLEM — TEMPERATURE

A. Remove outer timing cover.

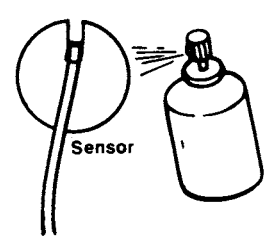
B. Remove inner timing cover and gasket.

C. Start-up vehicle.

D. Spray nose of sensor with coolant (obtainable at electronic supply houses) to see if engine kills.

E. With engine hot, at operating temperature and cover off, apply heat (blow dryer) to nose of sensor and see if engine kills.

F. Apply heat to module (blow dryer) and see if engine kills.



Yes →

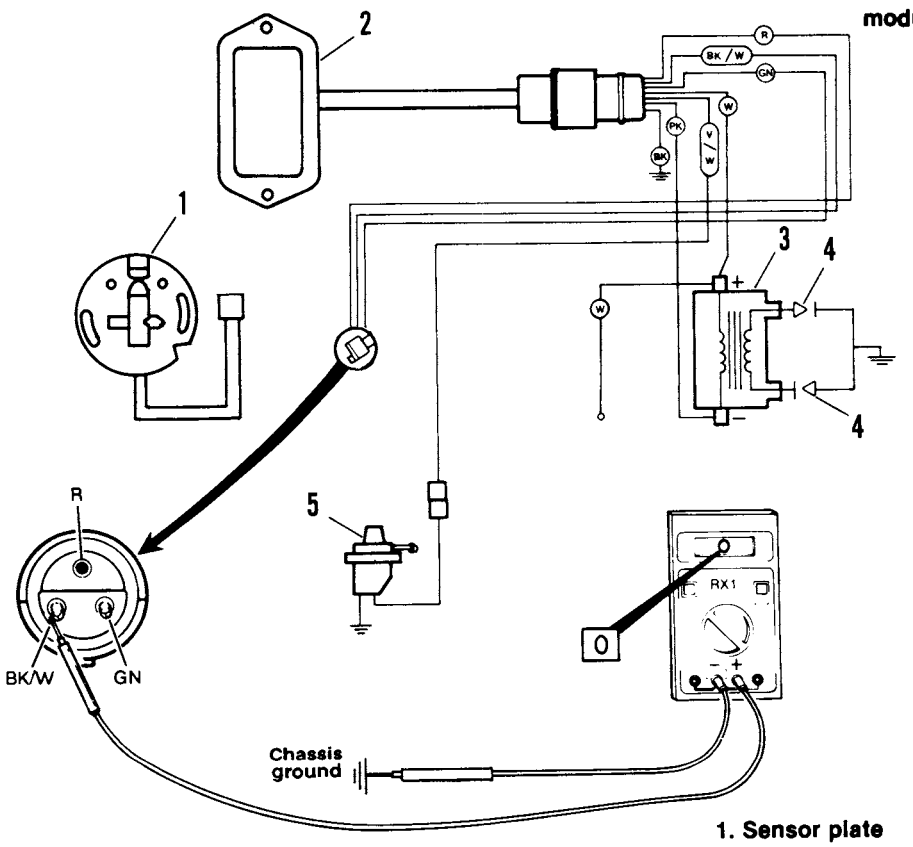
Problem is temperature sensitive sensor or module. Replace sensor or module.

Resistance Test

IGNITION RESISTANCE TEST

IGNITION MODULE

TEST	METER SETTING	PROBE 1	PROBE 2	METER READING
Check for grounds	RX1	To black/white wire in harness	To chassis ground	Module 0 - 1 ohm → Good More than 1 ohm → Check harness for opens. See next page. If harness checks OK, replace module.



1. Sensor plate
2. Computerized control module
3. Ignition coil
4. Spark plugs
5. Vacuum operated electric switch

CAUTION

If a resistance test is performed on a "live" circuit, the multimeter will be damaged. Turn off the ignition and disconnect the battery before conducting a resistance test.

IGNITION RESISTANCE TEST

IGNITION MODULE HARNESS

TEST CONDITIONS: **Engine Stop switch on right handlebar must be in "OFF" position and 7-place and sensor 3-place connectors must be unplugged for these tests. Shake or wiggle the harness to detect any breaks in the wiring.**

TEST	METER SETTING	PROBE 1	PROBE 2	METER READING
Check for grounds	RX1	To socket 4 in 7-place connector	To chassis ground	Harness → 0-1 ohm: Good; More than 1 ohm: Repair/clean ground connection.
Check for grounds	RX1	All socket terminals except 4	To chassis ground	Harness → Infinity: Good; Any resistance: Locate and repair short to ground
Continuity	RX1	All socket terminals except 4	Opposite end of each of the 6 leads	Harness → 0-1 ohm: Good; More than 1 ohm: Repair broken wire or loose/dirty connection.

