

MOTORCYCLE TROUBLESHOOTING

Every motorcycle engine requires an uninterrupted supply of fuel and air, proper ignition and adequate compression. If any of these are lacking, the engine will not run.

Diagnosing mechanical problems is relatively simple if you use orderly procedures and keep a few basic principles in mind.

The troubleshooting procedures in this chapter analyze typical symptoms and show logical methods of isolating causes. These are not the only methods. There may be several ways to solve a problem, but only a systematic approach can guarantee success.

Never assume anything. Do not overlook the obvious. If you are riding along and the bike suddenly quits, check the easiest, most accessible problem spots first. Is there gasoline *in* the tank? Has a spark plug wire fallen off?

If nothing obvious turns up in a quick check, look a little further. Learning to recognize and describe symptoms will make repairs easier for you or a mechanic at the shop. Describe problems accurately and fully. Saying "it won't run" isn't the same thing as saying "it quit at high speed and won't start." or, "it sat in my garage for 3 months and then wouldn't start."

Gather as many symptoms as possible to aid in diagnosis. Note whether the engine lost power gradually or all at once. Remember that the more

complicated a machine is the easier it is to troubleshoot because symptoms point to specific problems.

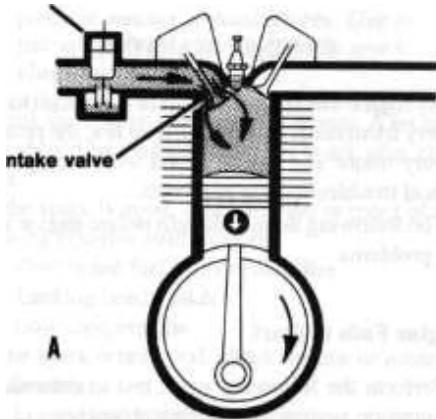
After the symptoms are defined, areas which could cause problems are tested and analyzed. Guessing at the cause of a problem may provide the solution, but it can easily lead to frustration, wasted time and a series of expensive, unnecessary parts replacements.

You do not need fancy equipment or complicated test gear to determine whether repairs can be attempted at home. A few simple checks could save a large repair bill and lost time while the bike sits in a dealer's service department. On the other hand, be realistic and don't attempt repairs beyond your abilities. Service departments tend to charge heavily for putting together a disassembled engine that may have been abused. Some won't even take on such a job--so use common sense and don't get in over your head.

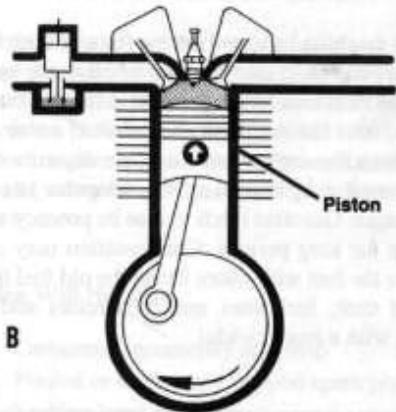
OPERATING REQUIREMENTS

An engine has 3 basic needs to run properly: correct fuel/air mixture, compression and a spark at the correct time. If one or more are missing, the engine will not run. Four-stroke engine operating principles are illustrated in Figure 1. The electrical

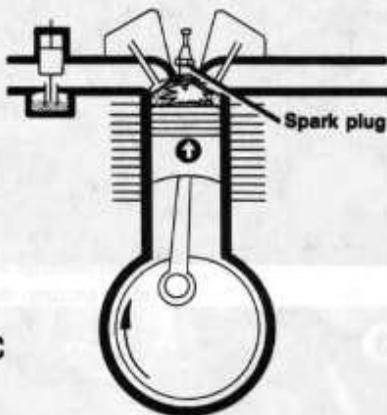
4-STROKE PRINCIPLES



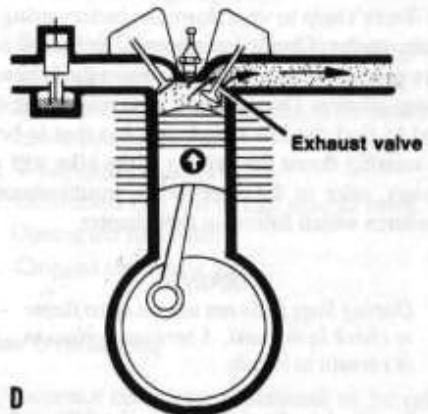
As the piston travels downward, the exhaust valve is closed and the intake valve opens, allowing the new air-fuel mixture from the carburetor to be drawn into the cylinder. When the piston reaches the bottom of its travel (BDC), the intake valve closes and remains closed for the next 1 1/2 revolutions of the crankshaft.



While the crankshaft continues to rotate, the piston moves upward, compressing the air-fuel mixture.



As the piston almost reaches the top of its travel, the spark plug fires, igniting the compressed air-fuel mixture. The piston continues to top dead center (TDC) and is pushed downward by the expanding gases.



When the piston almost reaches BDC, the exhaust valve opens and remains open until the piston is near TDC. The upward travel of the piston forces the exhaust gases out of the cylinder. After the piston has reached TDC, the exhaust valve closes and the cycle starts all over again.

system is the weakest link of the 3 basics. More problems result from electrical breakdowns than from any other source. Keep that in mind before you begin tampering with carburetor adjustments and the like.

If the machine has been sitting for any length of time and refuses to start, check and clean the spark plugs and then look to the gasoline delivery system. This includes the fuel tank, fuel shutoff valve and fuel line to the carburetor. Gasoline deposits may have formed and gummed up the carburetor jets and air passages. Gasoline tends to lose its potency after standing for long periods. Condensation may contaminate the fuel with water. Drain the old fuel from the fuel tank, fuel lines and carburetors and try starting with a fresh tankful.

TROUBLESHOOTING INSTRUMENTS

Chapter One lists the instruments needed and instruction on their use.

EMERGENCY TROUBLESHOOTING

When the bike is difficult to start, or won't start at all, it doesn't help to wear down the battery using the electric starter. Check for obvious problems even before getting out your tools. Go down the following list step by step. Do each one; you may be embarrassed to find the kill switch off, but that is better than wearing down the battery. If the bike still will not start, refer to the appropriate troubleshooting procedures which follow in this chapter.

WARNING

During Step 1, do not use an open flame to check in the tank. A serious explosion is certain to result.

1. Is there fuel in the tank? Open the filler cap and rock the bike. Listen for fuel sloshing around.
2. Is the fuel supply valve in the ON position? Turn the valve to the RESERVE position to be sure you get the last remaining gas.
3. Make sure the kill switch (Figure 2) is not stuck in the OFF position or that the wire is not broken and shorting out.
4. Are the spark plug wires on tight? Push both spark plug wires on (Figure 3) and slightly rotate them to

clean the electrical connection between the plug and the spark plug wire connector.

5. Is the choke in the right position?

ENGINE STARTING

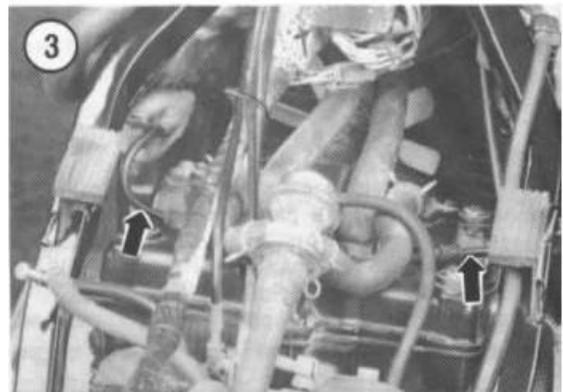
An engine that refuses to start or is difficult to start is very frustrating. More often than not, the problem is very minor and can be found with a simple and logical troubleshooting approach.

The following items will help isolate engine starting problems.

Engine Fails to Start

Perform the following spark test to determine if the ignition system is operating properly.

1. Remove one of the spark plugs.
2. Connect the spark plug wire and connector to the spark plug and touch the spark plug base to a good ground like the engine cylinder head. Position the spark plug so you can see the electrodes.



WARNING

During the next step, do not hold the spark plug, spark plug wire or connector with fingers. The high voltage generated by the ignition system could produce serious or fatal shocks. Use a pair of insulated pliers to hold the spark plug or wire.

3. Crank the engine over with the starter. A fat blue spark should be evident across the spark plug electrodes.
4. If the spark is good, check for one or more of the following possible malfunctions:
 - a. Obstructed fuel line or fuel filter.
 - b. Leaking head gasket
 - c. Low compression.
5. If the spark is not good, check for one or more of the following:
 - a. Loose electrical connections.
 - b. Dirty electrical connections.
 - c. Loose or broken ignition coil ground wire.
 - d. Broken or shorted high tension lead to the spark plug (Figure 3).
 - e. Discharged battery.
 - f. Disconnected or damaged battery connection.
 - g. Neutral, starter lockout or side stand switch trouble.

Engine is Difficult to Start

Check for one or more of the following possible malfunctions:

- a. Fouled spark plug(s).
- b. Improperly adjusted choke.
- c. Intake manifold air leak.
- d. Contaminated fuel system.
- c. Improperly adjusted carburetor.
- f. Weak ignition unit.
- g. Weak ignition coils.
- h. Poor compression.
- i. Engine and transmission oil too heavy.

Engine Will Not Crank

Check for one or more of the following possible malfunctions:

- a. Blown fuse.
- b. Discharged battery,
- c. Defective starter motor.
- d. Seized piston(s).

- e. Seized crankshaft bearings.
- f. Broken connecting rod.

ENGINE PERFORMANCE

In the following checklist, it is assumed that the engine runs, but is not operating at peak performance. This will serve as a starting point from which to isolate a performance malfunction.

The possible causes for each malfunction are listed in a logical sequence and in order of probability.

Engine Will Not Idle

- a. Carburetor incorrectly adjusted.
- b. Fouled or improperly gapped spark plug(s).
- c. Leaking head gasket.
- d. Obstructed fuel line or fuel shutoff valve.
- e. Obstructed fuel filter.
- f. Ignition timing incorrect due to defective ignition component(s).
- g. Valve clearance incorrect.

Engine Misses at High Speed

- a. Fouled or improperly gapped spark plugs.
- b. Improper carburetor main jet selection.
- c. Ignition timing incorrect due to defective ignition component(s).
- d. Weak ignition coil(s).
- e. Obstructed fuel line or fuel shutoff valve.
- f. Obstructed fuel filler.
- g. Clogged carburetor jets.

Engine Overheating

- a. Incorrect carburetor adjustment or jet selection.
- b. Ignition timing incorrect due to improper adjustment or defective ignition component(s).
- c. Improper spark plug heat range.
- d. Damaged or blocked cooling fins.
- e. Oil level low.
- f. OH not circulating properly.
- g. Valves leaking.
- b. Heavy engine carbon deposits.

ENGINE NOISES

Engine Overheating

(Water-cooling problems)

- a. Clogged radiator.
- b. Damaged thermostat.
- c. Worn or damaged radiator cap.
- d. Water pump worn or damaged.
- e. Fan relay damaged.
- f. Thermostatic fan switch damaged.
- g. Damaged fan blade(s)

Excessive Exhaust Smoke and Engine Runs Roughly

- a. Clogged air filter element.
- b. Carburetor adjustment incorrect-mixture too rich.
- c. Choke not operating properly.
- d. Water or other contaminants in fuel.
- e. Clogged fuel line.
- f. Ignition coil defective.
- g. Spark plugs fouled.
- h. IC igniter or pickup coil defective.
- i. Loose or defective ignition circuit wire.
- j. Short circuit from damaged wire insulation.
- k. Loose battery cable connection.
- l. Valve liming incorrect.
- m. Intake manifold or air cleaner air leak.

Engine Loses Power at Normal Riding Speed

- a. Carburetor incorrectly adjusted.
- b. Engine overheating.
- c. Ignition timing incorrect due to defective ignition component(s).
- d. Incorrectly gapped spark plugs.
- e. Obstructed muffler.
- f. Dragging brakes(s).

Engine Lacks Acceleration

- a. Carburetor mixture too lean.
- b. Clogged fuel line.
- c. Ignition timing incorrect due to defective ignition component(s).
- d. Dragging brakes(s).

Often the first evidence of an internal engine problem is a strange noise. That knocking, clicking or tapping sound which you never heard before may be warning you of impending trouble.

While engine noises can indicate problems, they are difficult to interpret correctly; inexperienced mechanics can be seriously misled by them.

Professional mechanics often use a special stethoscope (which looks like a doctor's stethoscope) for isolating engine noises. You can do nearly as well with a "sounding stick" which can be an ordinary piece of dowling, a length of broom handle or a section of small hose. By placing one end in contact with the area in which you want to listen and the other end near your ear, you can hear sounds emanating from that area. The first time you do this, you may be horrified at the strange sounds coming from even a normal engine. If possible, have an experienced friend or mechanic help you sort out the noises. Consider the following when troubleshooting engine noises:

1. *Knocking or pinging during acceleration*—caused by using a lower octane fuel than recommended. May also be caused by poor fuel. Pinging can also be caused by a spark plug of the wrong heat range. Refer to *Correct Spark Plug Heat Range* in Chapter Three.
2. *Slapping or rattling noises at low speed or during acceleration*—may be caused by piston slap, i.e., excessive piston-cylinder wall clearance.
3. *Knocking or rapping while decelerating*—usually caused by excessive rod bearing clearance.
4. *Persistent knocking and vibration*—usually caused by worn main bearing(s).
5. *Rapid on-off squeal*—compression leak around cylinder head gasket or spark plug(s).
6. *Valve train noise*—check for the following:
 - a. Valves adjusted incorrectly.
 - b. Loose valve adjuster.
 - c. Valve sticking in guide.
 - d. Low oil pressure.
 - e. Damaged rocker arm or shaft. Rocker arm may be binding on shaft.

ENGINE LUBRICATION

An improperly operating engine lubrication system will quickly lead to engine seizure. The engine

oil level should be checked weekly and the tank refilled, as described in Chapter Three. Oil pump service is described in Chapter Four.

problem. The troubleshooting chart in Figure 4 lists clutch troubles and checks to make. Refer to Chapter Five for clutch service procedures.

Oil Consumption High or Engine Smokes Excessively

TRANSMISSION

The basic transmission troubles are:

- a. Worn valve guides.
- b. Worn or damaged piston rings.
- a. Excessive gear noise.
- b. Difficult shifting.
- c. Gears pop out of mesh.
- d. Incorrect shift lever operation.

Excessive Engine Oil Leaks

Transmission symptoms are sometimes hard to distinguish from clutch symptoms. The troubleshooting chart in Figure 5 lists transmission troubles and checks to make. Refer to Chapter Six for transmission service procedures. Be sure that the clutch is not causing the trouble before working on the transmission.

- a. Clogged air cleaner breather hose.
- b. Loose engine parts.
- c. Damaged gasket sealing surfaces.

CLUTCH

The three basic clutch troubles are:

- a. Clutch noise.
- b. Clutch slipping.
- c. Improper clutch disengagement or dragging.

CHARGING SYSTEM

All clutch troubles, except adjustments, require partial clutch disassembly to identify and cure the

Charging system testing procedures are described in Chapter Eight.

CLUTCH TROUBLESHOOTING

Clutch slipping

Check:

- Weak clutch springs
- Worn clutch plates
- Damaged pressure plate
- Clutch release mechanism damage

Clutch dragging

Check:

- Incorrect clutch adjustment
- Clutch spring tension uneven
- Warped clutch plates
- excessive clutch lever play
- Clutch housing damage

excessive clutch noise

Check:

- Damaged clutch gear teeth
- Worn or warped clutch plates

STARTING SYSTEM

Starter does not crank

The basic starter-related troubles are:

- a. The starter does not crank.
- b. The starter cranks, but the engine does not start.

1. Turn on the headlight and push the starter button. Check for one of the following conditions.

2. *Starter does not crank and headlight does not come on:* The battery is dead or there is a loose battery connection. Check the battery charge as described in Chapter Three. If the battery is okay, check the starter connections at the battery, solenoid and at the starter switch. Clean and tighten all connections.

3. *Headlight comes on, but goes out when starter button is pushed:* There may be a bad connection at the battery. Wiggle the battery terminals and recheck. **If** the starter starts cranking, you've found the

Testing

Starting system problems are relatively easy to find. In most cases, the trouble is a loose or dirty electrical connection. Use the troubleshooting chart in Figure 6 with the following tests.

TRANSMISSION TROUBLESHOOTING

, excessive gear noise	Check: <ul style="list-style-type: none"> • Worn bearings * Worn or damaged gears • excessive gear backlash
, Difficult shifting	Check: <ul style="list-style-type: none"> • Damaged gears • Damaged shift forks • Damaged shift drum • Damaged shift lever assembly • Incorrect main shaft and countershaft engagement • Incorrect clutch disengagement
, Gears pop out of mesh	Check: <ul style="list-style-type: none"> • Worn gear or transmission shaft splines • Shift forks worn or bent • Worn dog holes in gears • Insufficient shift lever spring tension • Damaged shift lever linkage
, Incorrect shift lever operation	Check: <ul style="list-style-type: none"> • Bent shift lever • Bent or damaged shift lever shaft • Damaged shift lever linkage or gears
Incorrect shifting after engine reassembly	Check: <ul style="list-style-type: none"> • Missing transmission shaft shims • Incorrectly installed parts • Shift forks bent during reassembly • Incorrectly assembled crankcase assembly • Incorrect clutch adjustment • Incorrectly assembled shift linkage assembly

problem. Remove and clean the battery terminal clamps. Clean the battery posts also. Reinstall the terminal clamps and tighten securely.

4. *Headlight comes on, but dims slightly when the starter button is pushed:* The problem is probably in the starter. Remove and test the starter as described in Chapter Eight

5. *Headlight comes on, but dims severely when the starter button is pushed:* Either the battery is nearly dead or the starter or engine is partially seized. Check the battery as described in Chapter Three. Check the starter as described in Chapter Eight before checking for partial engine seizure.

6. *Headlight comes on and stays bright when the starter button is pushed:* The problem is in the starter button, side stand switch, starter button-to-solenoid wiring or in the starter itself. Check the starter switch, kill switch, side stand switch, starter relay and the starter circuit relay. Check each switch by bypassing it with a jumper wire. Check the starter as described in Chapter Eight.

Starter spins but engine does not crank

If the starter spins at normal or high speed but the engine fails to crank, the problem is in the starter drive mechanism.

NOTE

Depending upon battery condition, the battery will eventually run down as the starter button is continually pressed. Remember that if the starter cranks normally, but the engine fails to start, the starter is working properly. It's time to start checking other engine systems. Don't wear the battery down.

ELECTRICAL PROBLEMS

H bulbs burn out frequently, the cause may be excessive vibration, loose connections that permit sudden current surges or the installation of the wrong type of bulb.

Most light and ignition problems are caused by loose or corroded ground connections. Check these before replacing a bulb or electrical component.

IGNITION SYSTEM

The ignition system is of the breakerless inductive discharge type. See Chapter Eight. Most problems involving failure to start, poor driveability or rough running are caused by trouble in the ignition system.

Note the following symptoms:

- a. Engine misses.
- b. Stumbles on acceleration (misfiring).
- c. Loss of power at high speed (misfiring).

STARTER TROUBLESHOOTING

Starter does not work	Low battery Worn brushes Defective relay Defective awltch Defective wiring or connection Internal short circuit	Recharge battery Replace brushes Repair or replace Repair or replace Repair wire or clean connecUon Repair or replace defective component
Starter action is weak	Low battery Pitted relay contacts Worn brushes Defective connection Short circuit In commutator	Recharge battery Clean or replace Replace brushes Clean and tighten Replace annature
Starter runs continuously	Stuck relay	Replace relay
Starter turns; does not tum engine	Defective starter clutch	Replace starter clutch

d. Hard starting (or failure to start).

e. Rough idle.

Most of the symptoms can also be caused by a carburetor that is worn or improperly adjusted. Considering the law of averages, however, the odds are far better that the source of the problem will be found in the ignition system rather than the fuel system.

ELECTRONIC IGNITION TROUBLESHOOTING

The following basic tests are designed to pinpoint and isolate problems quickly in the primary circuit of the breakerless inductive discharge ignition system.

Spark Test

Perform the following test to determine if the ignition system is operating properly.

1. Remove one of the spark plugs.
2. Connect the spark plug wire and connector to the spark plug and touch the spark plug base to a good ground like the engine cylinder head. Position the spark plug so you can see the electrodes.

WARNING

During the next step, do not hold the spark plug, spark plug wire or connector. The high voltage generated by the ignition system could produce serious or fatal shocks. If necessary, use a pair of insulated pliers to hold the spark plug or wire.

3. Crank the engine over with the starter. A fat blue spark should be evident across the spark plug electrodes.

4A. If a spark is obtained in Step 3, the problem is not in the ignition or coil. Check the fuel system and spark plugs.

4B. If no spark is obtained, proceed with the following tests.

Testing

Test procedures for troubleshooting the ignition system are found in the diagnostic chart in Figure 7. A multimeter; as described in Chapter One, is required to perform the test procedures.

Before beginning actual troubleshooting, read the entire test procedure (Figure 7). When required, the diagnostic chart will refer you to a certain chapter for test procedures.

EXCESSIVE VIBRATION

Usually this is caused by loose engine mounting hardware. If not, it can be difficult to find without disassembling the engine. High speed vibration may be due to a bent axle shaft or loose or faulty suspension components. Vibration can also be caused by the following conditions:

- a. Broken frame.
- b. Severely worn primary chain.
- c. Worn drive chain.
- d. Primary chain links tight due to improper lubrication.
- e. Improperly balanced wheels.
- f. Defective or damaged wheels.
- g. Defective or damaged tires.
- h. Internal engine wear or damage.

FRONT SUSPENSION AND STEERING

Poor handling may be caused by improper tire pressure, a damaged or bent frame or front steering components, worn wheel bearings or dragging brakes. Possible causes of suspension and steering malfunctions are listed below.

Irregular or Wobbly Steering

- a. Loose wheel axle nuts.
- b. Loose or worn steering head bearings.
- c. Excessive wheel hub bearing play.
- d. Damaged cast wheel.
- e. Unbalanced wheel assembly.
- f. Worn hub bearings.
- g. Incorrect wheel alignment.
- h. Bent or damaged steering stem or frame (at steering neck).
- i. Tire incorrectly seated on rim.
- j. Excessive front end loading from non-standard equipment.

Stiff Steering

- a. Low front tire air pressure.

IGNITION SYSTEM DIAGNOSIS

PROBLEM: WEAK OR NO SPARK AT ALL

TEST 1: Perform the troubleshooting procedures in this chapter to isolate the system or systems which are causing engine malfunction.

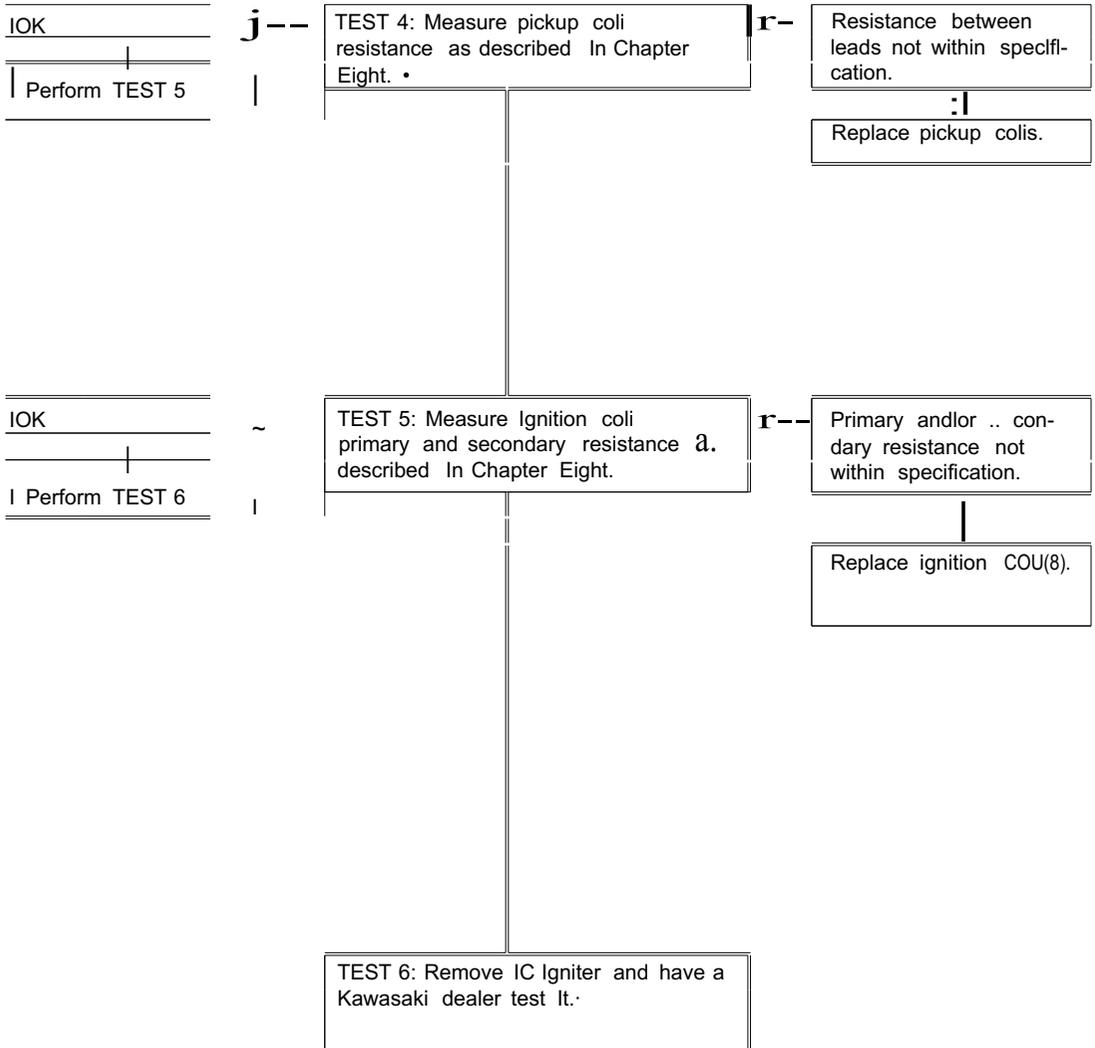
TEST 2: Perform the Ignition spark test as described in this chapter.

TEST 3: Perform Stator Test as described in Chapter Eight. •

Stator winding resistance not in specified range

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• Check wiring and connections that lead to components.

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- b. Bent or damaged steering stem or frame (at steering neck).
 - c. Loose or worn steering head bearings.
 - d. Steering stem nut too tight.

- c. Shock shaft worn or bent.
- d. Incorrect rear shock spring.
- e. Rear shock adjusted incorrectly.
- f. Heavy rear end loading from non-standard equipment.
- g. Incorrect loading.

Stiff or Heavy Fork Operation

- a. Incorrect fork springs.
- b. Incorrect fork oil viscosity.
- c. Excessive amount of fork oil.
- d. Bent fork tubes.

Poor Fork Operation

- a. Worn or damaged fork tubes.
- b. Fork oil level low due to leaking fork seals.
- c. Bent or damaged fork tubes.
- d. Contaminated fork oil.
- e. Incorrect fork springs.
- f. Heavy front end loading from non-standard equipment.

Poor Rear Shock Absorber Operation

- a. Weak or worn spring.
- b. Damper unit leaking.

BRAKE PROBLEMS

Sticking disc brakes may be caused by a stuck piston(s) in a caliper assembly or warped pad shim(s). See Figure 8 for disc brake troubles and checks to make.

A sticking drum brake may be caused by worn or weak return springs, dry pivot and cam bushings or improper adjustment. Grabbing brakes may be caused by greasy linings which must be replaced. Brake grab may also be due to an out-of-round drum. Glazed linings will cause loss of stopping power: See Figure 9 for drum brake troubles and checks to make.

CARBURETOR TROUBLESHOOTING

Basic carburetor troubleshooting procedures are found in Figure 10.

DISC BRAKE TROUBLESHOOTING

<u>Disc brake fluid leakage</u>	1 1 ----- 1	<p>Check:</p> <ul style="list-style-type: none"> * Loose or damaged line fittings • Worn caliper piston seals * Scored caliper piston and/or bore • Loose banjo bolts * Damaged all line washers • Leaking master cylinder diaphragm * Leaking master cylinder secondary seal • Cracked master cylinder housing • Too high brake fluid level • Loose master cylinder cover
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<u>Brake overheating</u>	1 ----- 1	<ul style="list-style-type: none"> • Warped brake disc • Incorrect brake fluid • Caliper piston and/or brake pads hanging up • Riding brakes during riding
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<u>Brake chatter</u>		<p>Check:</p> <ul style="list-style-type: none"> • Warped brake disc • Loose brake disc • Incorrect caliper alignment • Loose caliper mounting bolts • Loose front axle nut and/or clamps • Worn wheel bearings • Damaged front hub • Restricted brake hydraulic line • Contaminated brake pads
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<u>Brake locking</u>	1 1 ----- 1	<p>Check:</p> <ul style="list-style-type: none"> • Incorrect brake fluid • Plugged passages in master cylinder • Incorrect front brake adjustment • Caliper piston <i>and/or</i> brake pads hanging up • Warped brake disc
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<u>Insufficient brakes</u>	1 r ----- 1	<p>Check:</p> <ul style="list-style-type: none"> • Air in brake lines • Worn brake pads • Low brake fluid level • Incorrect brake fluid • Worn brake disc • Worn caliper piston seals • Glazed brake pads * Leaking primary cup seal in master cylinder * Contaminated brake pads and/or disc
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<u>Brake squeal</u>	1 1 ----- 1	<p>Check:</p> <ul style="list-style-type: none"> • Contaminated brake pads and/or disc • Dust or dirt collected behind brake pads • Loose parts
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DRUM BRAKE TROUBLESHOOTING

↓ Brakes do not hold

- Check:
- Worn brake linings
 - Glazed brake linings
 - Worn brake drum
 - Glazed brake drum
 - Incorrect brake adjustment
 - Worn or damaged brake cable
 - Worn or defective brake return springs

↓ Brakes grab

- Check:
- Worn or damaged brake return springs
 - Incorrect brake adjustment
 - Brake drum out-of-round
 - Warped brake lining web
 - Loose or worn wheel bearings

↓ Brakes squeal or scrape

- Check:
- Worn brake linings
 - Brake drum out-of-round
 - Contaminated brake linings and/or drum
 - Broken, loose or damaged brake component
 - Loose or worn wheel bearing
 - Loose brake drum-to-wheel mounting bolts

↓ Brakes chatter

- Check:
- Brake drum out-of-round
 - Brake linings worn unevenly
 - Warped brake lining web
 - Incorrect brake adjustment
 - Loose or worn wheel bearing
 - Worn or damaged brake return springs

CARBURETOR TROUBLESHOOTING

CONDITION	SYMPTOM	CONDITION	SYMPTOM
Rich mixture	Rough Idle Black exhaust smoke Hard starting, especially when hot Gas-fouled spark plugs Black deposits in exhaust pipe Poor gas mileage Engine performance worse as it warms up	Lean mixture	Backfiring Rough Idle Overheating Hesitation upon acceleration Engine speed varies at fixed throttle Loss of power White color on spark plug insulator Poor acceleration