FEATURES OF THE 2003 INDIAN SCOUT/SPIRIT MOTORCYCLES

The Indian Scout and Spirit motorcycles have a heritage going back to the beginning of the twentieth century. Today, the motorcycles carry forth the tradition and craftsmanship with three models each: the Scout with Standard, Deluxe and Springfield models, and the Spirit with Deluxe, Springfield and Roadmaster models.

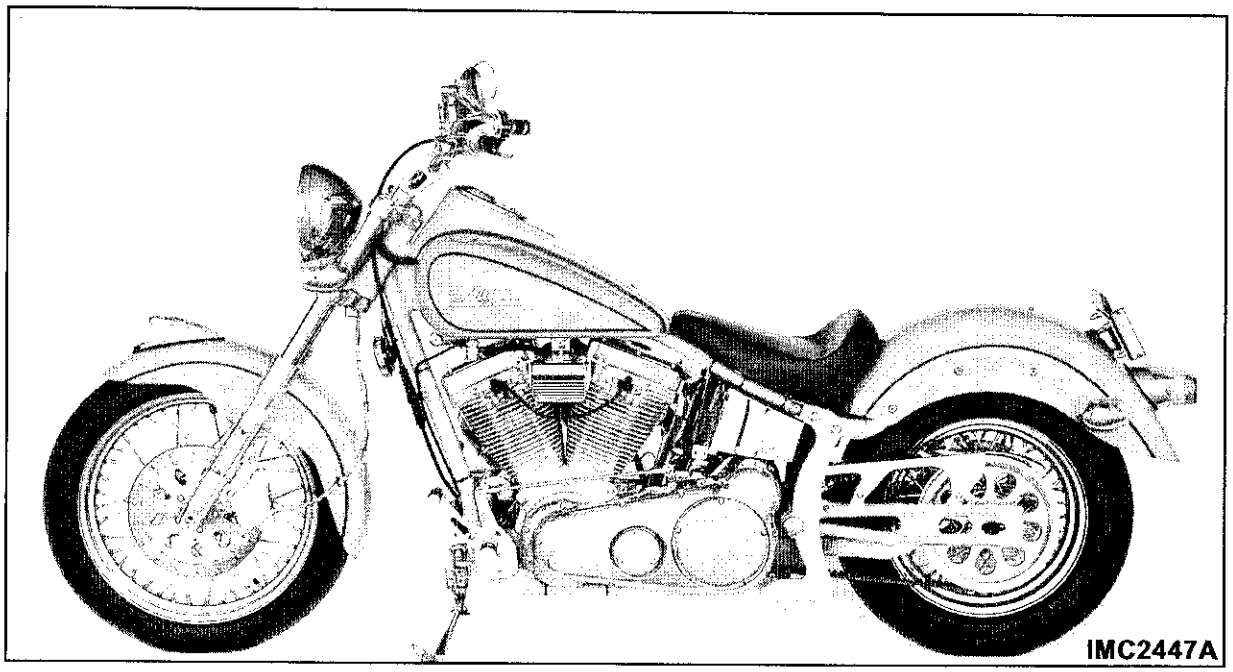


Figure 1 — Indian Scout Standard (left side)

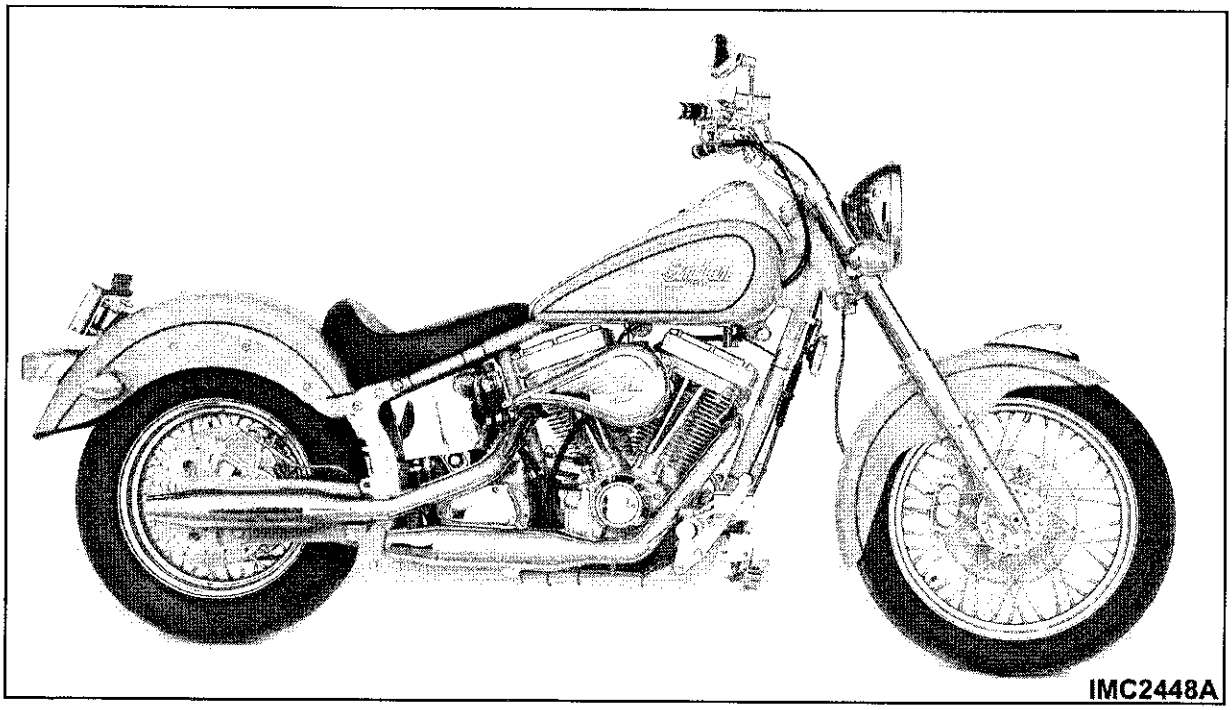


Figure 2 — Indian Scout Standard (right side)

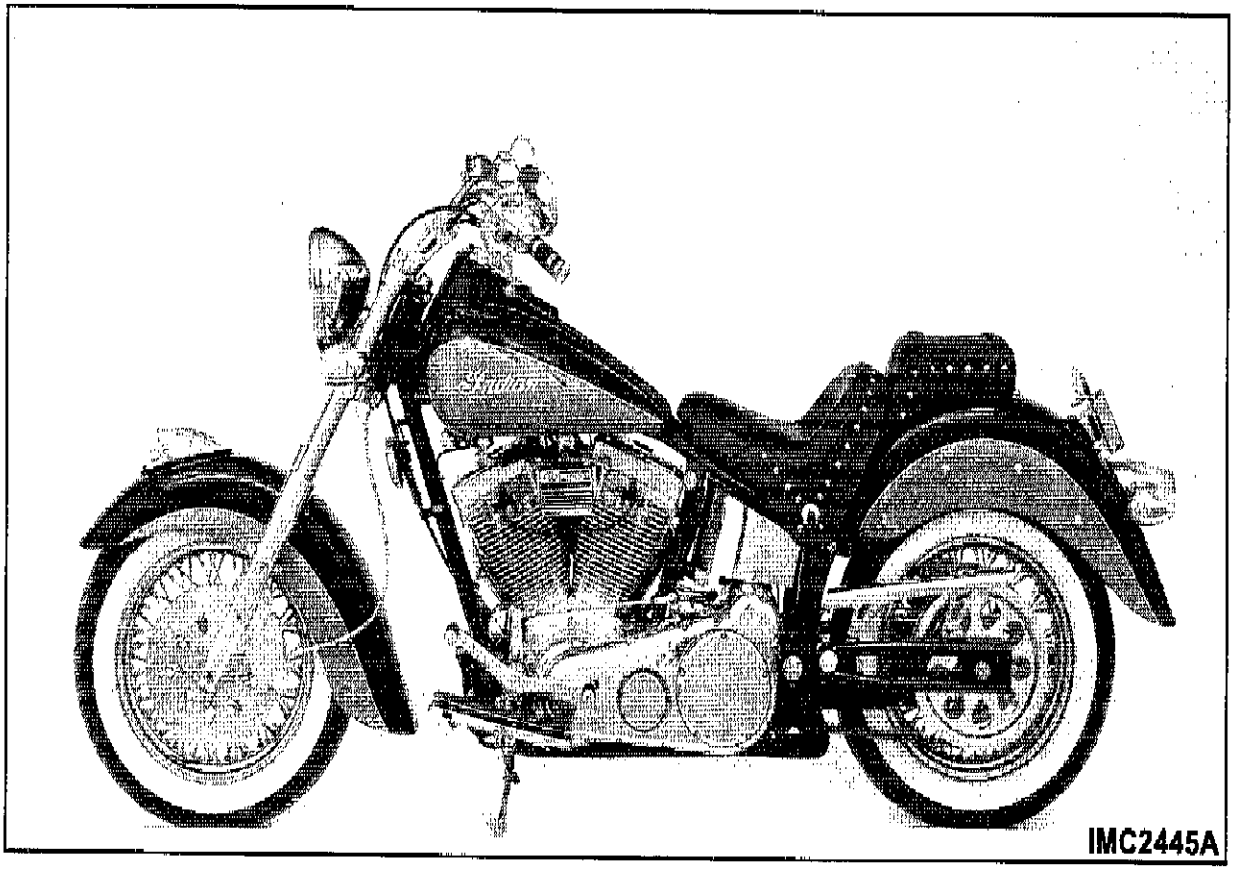
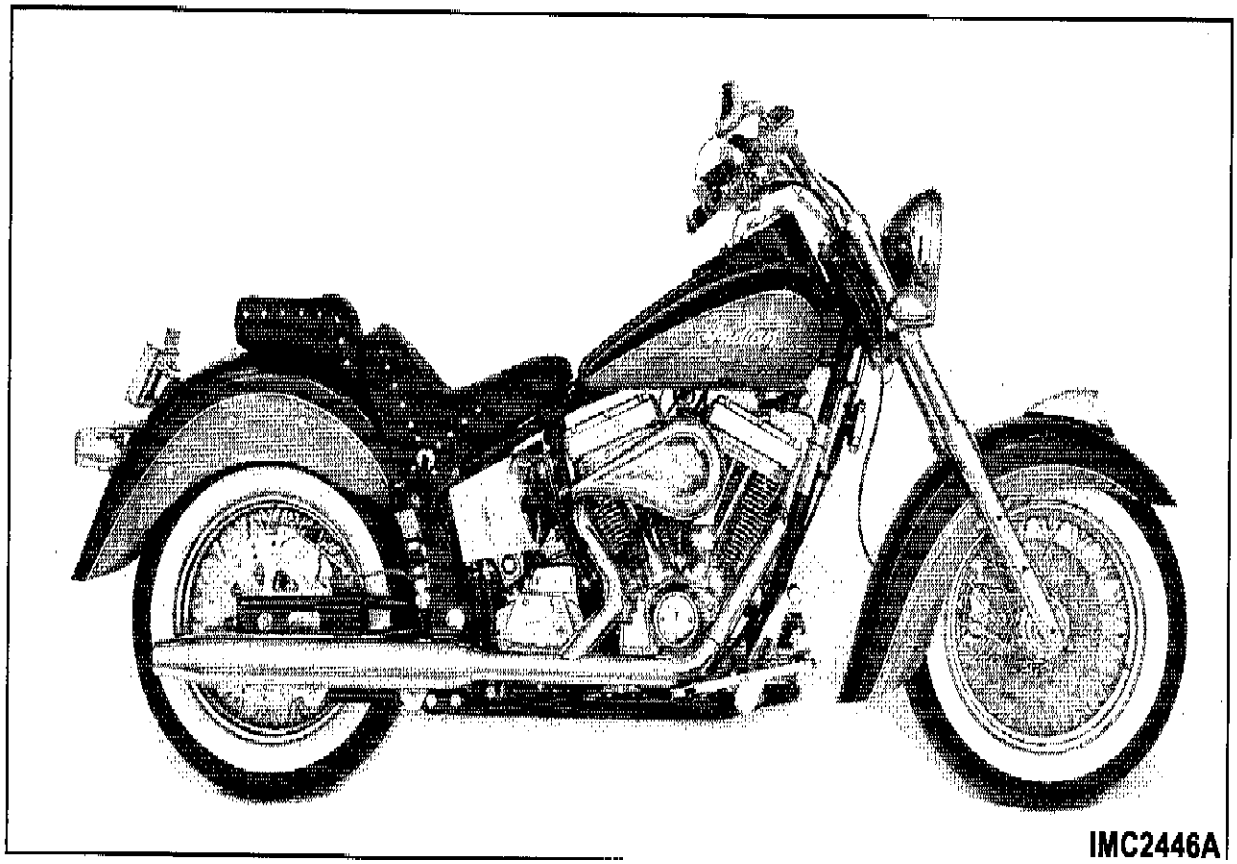


Figure 3 — Indian Spirit Deluxe (left side)



Component and System Descriptions

Chassis

Front suspension — Scout and Spirit models are fitted with a conventional-style front suspension with hydraulic compression and rebound damping. The upper fork tubes (stanchions) are 41 mm in diameter.

Steering — Both the Scout and Spirit models have a 32-degree rake for the front forks. This rake provides a front-wheel trail dimension of 5.25″ (Scout) and 5.42″ (Spirit) with the standard 100/90-19 and 130/90-16 sized tires, respectively.

Rear suspension — The rear swingarm is suspended at the bottom on dual shock absorbers. Spring preload for the shock absorbers is adjustable.

Brakes — Single-disc brakes are used on both the front and rear wheels at the left and right sides respectively. Both feature four-piston calipers in combination with 11.5″ rotors.

Wheels and tires — There are differences in the wheels and tires that are standard equipment on the models. Scout models come equipped with 40-spoke chrome steel wheels. A 19″ wheel with a 2.15″ rim and 100/90-19 tire is used at the front; whereas, at the rear, a 16″ wheel with a 3.5″ rim and 130/90-16 tire is used.

Spirit models are equipped with 60-spoke chrome steel wheels. These are 16″ wheels with 3.5″ rims and are fitted with 130/90-16 tires at both front and rear locations.

Frame — The frame is constructed of high-tensile steel and protected with a powder-coated finish. Fitted with the standard rear swingarm and front suspension, the frame provides a wheelbase of 67″ for all models.

Engine and Related Systems

Basic engine — The Scout and Spirit models are powered by the S&S Super Stock engine that is a four-cycle, two-cylinder engine with a 45-degree V-configuration. Its bore and stroke give it a displacement of 88 cubic inches. At a compression ratio of 9.4:1, the engine produces 57 hp (Scout) or 62 hp (Spirit).

The piston connecting rods are a fork-and-blade style connected to a common crank pin joining two flywheels. The crank pin is set between the pinion shaft flywheel to the right and the sprocket shaft flywheel to the left. The sprocket shaft drives the compensator sprocket in the primary case at the left side of the motorcycle. The sprocket shaft carries the alternator rotor, between the engine crankcase and the compensator. The pinion shaft drives the camshaft, oil pump and breather valve through gearing at the right side of the engine.

The camshaft actuates the intake and exhaust valves through a valve train that includes roller lifters, pushrods and rocker shaft assemblies. The roller lifters, following the cam lobes, raise the pushrods and rocker arms to open the intake and exhaust valves at the appropriate times in the intake and exhaust cycles.

Lubrication system — The lubrication system incorporates a spur gear oil pump located at the back of the cam housing. The pump, which is driven by a worm gear fitted on the pinion shaft, provides positive lubrication to the engine. Mounted on an adapter at the upper front of the crankcase is a full-flow, spin-on type filter to screen the lubricating oil as it circulates through the system.

Fuel system — The fuel system includes dual tanks with a total capacity of 5.5 gallons including the 1.2-gallon reserve. Fuel is gravity fed to a S&S Super E carburetor mounted at the right side of the engine between the cylinder heads. The carburetor features a 47.6 mm bore.

Ignition system — Combustion is controlled with a computerized electronic ignition system. The system's electronic module and timing sensor controls output to the spark plugs in the cylinders. The ignition rotor, attached to the end of the pinion shaft, in combination with the sensor in the ignition cover, provides the "trigger" signal for the electronic ignition system.

The computerized system simplifies service, eliminating the need for timing adjustments. Timing is preset and electronically controlled.

Emission controls — On California-only models, an evaporative system is used. The system consists of a vacuum solenoid (that works in combination with the enrichener valve), tank vapor valve, a carbon canister and interconnecting vent and purge lines. Together, these components effectively seal the air intake and fuel system, preventing the escape of hydrocarbons into the atmosphere.

Exhaust system — The Scout is equipped with a dual exhaust system with two chrome mufflers. The Spirit is equipped with a single chrome muffler with a dual inlet for the two pipes from the cylinders. Chrome heat shields cover the pipes between the cylinder heads and the muffler(s).

Engine Component Locations

The following views identify the location of major chassis and engine-related parts and accessories referenced in this manual.

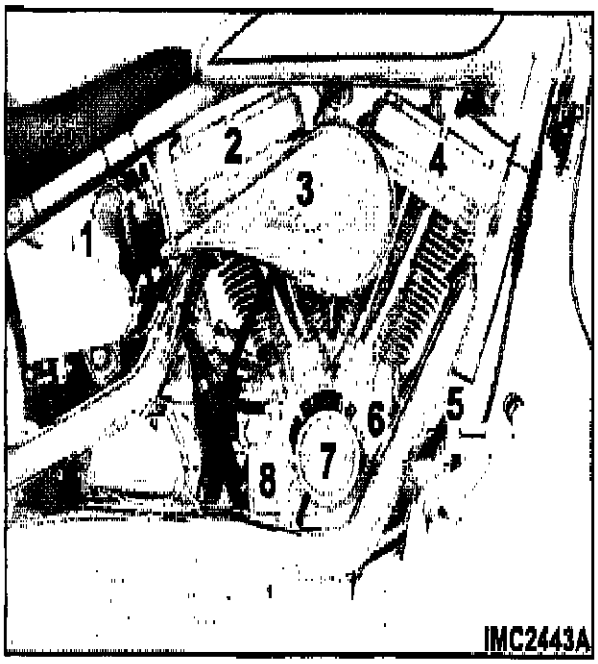


Figure 5 — Indian Scout motorcycle (right side)

1. Oil filler and dipstick
2. Rear cylinder
3. Air cleaner housing cover
4. Front cylinder
5. Oil filter (behind exhaust pipe)
6. Cam cover
7. Ignition cover
8. Oil pump

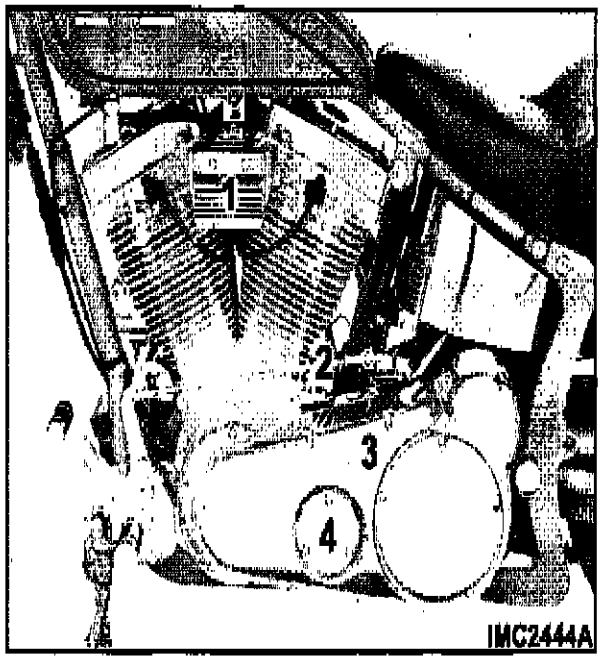


Figure 6 — Indian Scout motorcycle (left side)

1. Ignition coil and upper engine support
2. Transmission shift rod
3. Outer primary housing
4. Primary chain inspection cover

Transmission and Drive

Primary drive — A dual-track drive chain links the engine compensator sprocket with the clutch sprocket. The wet-type clutch utilizes 10 friction plates to transfer engine power smoothly to the transmission. The 24-tooth compensator sprocket, in combination with the 37-tooth clutch sprocket, provides a reduction of 1.54:1.

Transmission — The transmission is a proprietary single-countershaft design with input and output drives on the same side. The constant mesh, 5-speed gearing, provides a range of ratios, from 3.24:1 in first gear to 1:1 direct in fifth gear.

Rear drive — The rear drive uses a cogged, arimid-reinforced belt, 1-7/16″ wide, connecting the transmission output drive sprocket with the rear wheel sprocket. The combination of the 32-cog drive sprocket and 65-cog rear wheel sprocket provides

MOTORCYCLE IDENTIFICATION

There are three significant identification numbers on the motorcycle. The numbers include the chassis Vehicle Identification Number (VIN) along with individual serial numbers for the engine and transmission.

Chassis VIN

The primary number used to identify the motorcycle is the chassis VIN. This is a 17-position alphanumeric number conforming to governmental standards for identification of motorized vehicles.

Within the first 11 positions, the number provides information such as vehicle type, make, model, model year, engine, etc. The last six numeric positions identify the build sequence.

Location — The VIN is stamped into a plate welded to the front frame tube on the right side near the fork pivot. It is also printed on the mylar certification label affixed to the frame tube just below the VIN plate.

Use the following table to interpret the VIN example.

- Model: All
- Year: All
- VIN example: 5CDNNCAJ_3G000002

Position	Description	Code	Code Description
1	WMI	5	Supplied by SAE
2	WMI	C	Supplied by SAE
3	WMI	D	Supplied by SAE
4	Type	C N M	Motorcycle — Stretched and raked smoothtail (Chief 99–01) Motorcycle — Single downtube monoshock frame (Chief 02 +) Motorcycle — Single downtube smoothtail (Scout/Spirit 01 +)
5	Line (Model)	N 3 X R V T C 5 A	Chief Standard/Springfield Chief Centennial Chief Deluxe Chief Roadmaster Chief Vintage Scout Standard/Deluxe/Springfield Scout Centennial Spirit Standard/Deluxe/Roadmaster/Springfield Terminator 3, Chief
6	Engine Type	B C	Engine 88 CID Engine 100 CID
7	Horsepower	5 A	85 HP (S&S 88) 75 HP (Indian POWERPLUS™ 100)
8	Engine Make	1 J	S&S Indian
9	Check Digit	_	
10	Model Year	X Y 1 2 3	1999 2000 2001 2002 2003
11	Plant	G	Gilroy manufacturing plant
12–17	Production Sequence		Six-digit production sequence number

Engine Serial Number

Location — The six-character engine serial number is stamped into a pad on the left side of the engine crankcase, just above the primary housing and at the base of the front cylinder. A letter is used in the first position to designate the production model year which begins on October 1 of each year. The model year letter is followed by the production sequence number, for example, D00001. Model year production letter assignments are as follow:

A — 2000 model year (starting October 1, 1999)
B — 2001 model year (starting October 1, 2000)
C — 2002 model year (starting October 1, 2001)
D — 2003 model year (starting October 1, 2002)

Transmission Serial Number

Location — The transmission serial number is a seven-position alphanumeric number stamped into the transmission case on the top edge of the starter-mounting flange.

MAINTENANCE SERVICE, REPAIRS AND SAFETY

This is a complete manual, providing the information necessary to perform full overhaul and rebuild operations in addition to the very routine maintenance service and adjustments. Procedures are included for servicing components and subassemblies off the motorcycle from disassembly, cleaning and inspection to reassembly.

Generally, all specifications including torque values are given in English measurements. Where applicable, however, metric measurements and values are provided.

Note: *Indian Motorcycle Corporation continuously strives for improvements in product design, quality and performance. As a result of running changes made during the production cycle, the information, illustrations and descriptions in this manual may differ from the motorcycle that is in for service.*

For your own safety and proper service of the motorcycle, follow the instructions and warnings contained in this manual. Ignoring them could result in damage to the motorcycle or personal injury to you or others.

⚠ WARNING!

A "warning" indicates the possibility of personal injury to yourself or others if the instructions presented are not followed.

(!) CAUTION!

A "caution" indicates the possibility of damage to the motorcycle if the instructions presented are not followed.

Note: *A "note" (placed in italic type) indicates information that may be important in understanding the significance of a procedure or useful in performing the maintenance, adjustment or repair procedure.*

MAINTENANCE

Maintenance requirements for the Indian Chief motorcycle include three levels of service performed at specific mileage intervals. The three levels of service include the following:

Primary Service — at 500 miles, 5,000 miles and every 10,000 miles thereafter

Interval Service — at 2,500 miles and every 5,000 miles thereafter

Renewal Service — at 10,000 miles and every 10,000 miles thereafter

Primary Service

Perform the following 30 **Primary Service** checks and procedures at 500 miles, 5,000 miles, 15,000 miles and at every 10,000 miles thereafter.

1. Change the engine oil and replace the oil filter (*page 133*).
2. Change the transmission fluid and clean the magnetic drain plug.
3. Check the brake fluid level and condition (*page 76*).
4. Inspect the oil lines (*page 134*) and brake system for leaks (*page 76*).
5. Lubricate the front brake hand lever, throttle control cable, throttle control grip, clutch control cable and clutch control hand lever (*pages 108 and 201*).
6. Clean the magnetic speedometer sensor.
7. Lubricate the kickstand, gear shifter and brake lever bushings.
8. Check the rear brake pedal adjustment (*page 87*).
9. Inspect the brake pads and discs for wear (*pages 77 and 84*).
10. Inspect the inner primary chain (*page 185*).
11. Change the primary drive oil.
12. Check and adjust the rear drive belt (*page 197*).
13. Inspect the clutch control cable and adjust as required (*page 202*).
14. Inspect the air filter and replace it as required (*page 103*).
15. Inspect the fuel filter screen; clean or replace it as required (*page 106*).
16. Check the enrichener operation and adjust it as required (*page 115*).
17. Check the engine idle speed adjustment (*page 117*).
18. Inspect the fuel valve (petcock), fuel lines and fittings for leaks (*pages 106 and 108*).
19. Clean the battery connections (*page 247*).
20. Check the operation of electrical equipment and switches (*page 252*).
21. Check the condition of the spark plugs (*page 14*).
22. Check the ignition timing (*page 130*).
23. Check the tires for proper inflation pressure and for signs of wear (*page 63*).
24. Check wheel spoke tightness (*page 62*).
25. Check the rear shock absorbers and rubber bushings (*page 50*).
26. Check the swingarm pivot bolts for proper tightness (*page 53*).
27. Check the steering head bearing adjustment (*page 40*).
28. Check alignment.
29. Check the tightness of all fasteners, except the engine cylinder head bolts.
30. Conduct a road test.

Interval Service

Perform the following 14 **Interval Service** checks and procedures at 2,500 miles, 7,500 miles and at every 5,000 miles thereafter.

1. Change the engine oil and replace the oil filter (*page 133*).
2. Clean the tappet screen.
3. Check the level and condition of the transmission fluid (*page 213*).
4. Check the level and condition of the primary oil.
5. Check the battery and clean the battery terminal connections (*page 247*).
6. Inspect the fuel valve (petcock), fuel lines and fittings for leaks (*pages 106 and 108*).
7. Check the operation of the enrichener and throttle.
8. Check the operation of electrical equipment and switches (*page 252*).
9. Check the rear drive belt (*page 197*).
10. Check the brake fluid level and condition (*page 76*).
11. Clean the magnetic speedometer sensor.
12. Inspect the brake pads and discs for wear (*pages 77 and 84*).
13. Check the tires for proper inflation pressure and for signs of wear (*page 63*).
14. Conduct a road test.

Renewal Service

Perform the following 34 **Renewal Service** checks and procedures at 10,000 miles and at every 10,000 miles thereafter.

1. Change the engine oil and replace the oil filter (*page 133*).
2. Clean the tappet screen.
3. Change the transmission fluid and clean the magnetic drain plug.
4. Replace the brake fluid (*page 91*).
5. Inspect the oil lines and brake system for leaks (*page 76*).
6. Lubricate the front brake hand lever, throttle control cable, throttle control grip, clutch control cable and clutch control hand lever (*pages 108 and 201*).
7. Clean the magnetic speedometer sensor.
8. Lubricate the kickstand, gear shifter and brake lever bushings.
9. Check the rear brake pedal adjustment (*page 87*).
10. Inspect the brake pads and discs for wear (*pages 77 and 84*).
11. Inspect the primary chain for proper adjustment (*page 185*).
12. Change the primary drive oil.
13. Check and adjust the rear drive belt (*page 197*).
14. Inspect the clutch control cable and adjust as required (*page 202*).
15. Inspect the air filter and clean or replace it as required (*page 103*).
16. Inspect the fuel filter screen; clean or replace it as required (*page 106*).
17. Check the enrichener operation and adjust it as required (*page 115*).
18. Check the engine idle speed adjustment (*page 117*).
19. Inspect the fuel valve (petcock), fuel lines and fittings for leaks (*pages 106 and 108*).
20. Clean the battery and clean the battery connections (*page 247*).
21. Check the operation of electrical equipment and switches (*page 252*).
22. Replace the spark plugs (*page 127*).
23. Check the ignition timing (*page 130*).
24. Check the tires for proper inflation pressure and for signs of wear (*page 63*).
25. Check wheel spoke tightness (*page 62*).
26. Check the rear shock absorbers (*page 50*).
27. Check the swingarm pivot bolts for proper tightness (*page 53*).
28. Replace the front fork oil (*page 34*).
29. Lubricate the steering head bearings and check the bearing adjustment (*page 40*).
30. Repack the wheel bearings (*page 60*).
31. Check alignment.
32. Check the tightness of all fasteners, except the engine cylinder head bolts.
33. Inspect the fuel tank mount grommets.
34. Condu[illegible]

CHASSIS TROUBLESHOOTING

Brakes

Brakes Weak or Do Not Hold Normally

Problem	Remedy
Master cylinder(s) low on fluid.	Refill with recommended brake fluid.
Brake fade from heat build-up (excessive braking).	Let brakes cool. Downshift to cause engine braking.
Brake fade due to brake pad hang-up or dragging.	Inspect caliper/master cylinder. Check brake lever or pedal free-play. Adjust, repair or replace as necessary.
Air in hydraulic system.	Bleed brakes. Refill with recommended brake fluid.
Master cylinder/caliper pistons/bores worn or seized.	Repair or replace components as necessary.
Contaminated brake pads (grease/oil).	Clean and inspect rotors. Replace brake pads.
Brake pads excessively worn.	Clean and inspect rotors. Replace brake pads.
Brake rotors excessively worn or warped.	Clean, inspect and replace as necessary.

Chassis

Handling Irregularities

Problem	Remedy
Motorcycle improperly loaded with excessive equipment or luggage.	Eliminate excessive equipment and/or reduce luggage to below gross vehicle weight rating.
Damaged tire(s) or improper front/rear tire combination.	Replace front tire and/or rear tire with recommended size and type.
Irregular front or rear tire wear pattern.	Replace front tire and/or rear tire with recommended size and type.
Incorrect tire inflation pressure.	Fill tires to recommended inflation pressure.
Rear shock absorber and spring assembly damaged worn or spring rate incorrectly adjusted.	Clean, inspect, adjust, repair or replace components as necessary.
Loose wheel axle nuts.	Tighten to recommended torque specification.
Rear wheel out of alignment with front wheel or frame.	Adjust rear wheel to correct alignment.
Excessive wheel bearing end play.	Clean, inspect and adjust bearings as necessary.
Tire and wheel assemblies unbalanced.	Balance tire and wheel assemblies.
Steering head bearings improperly adjusted.	Clean, inspect and adjust bearings as necessary.
Wheel rims and/or tires out-of-round or eccentric with wheel hub.	True wheel rims (adjust spokes) and reposition or replace tires as necessary.
Excessive lateral runout of wheel rims and/or tires.	True wheel rims (adjust spokes) and reposition tires.
Rear swing arm pivots binding, damaged or seized.	Clean, inspect and repair as necessary.

ENGINE TROUBLESHOOTING

Symptom-Related Diagnostics

Carburetor

Engine floods:

- Excessive pumping of throttle before or while starting
- Fuel valve (petcock) left open while bike is parked

Electrical System

Alternator charge rate is below normal:

- Low battery voltage
- Loose or corroded connections
- Excessive periods of idling or low-speed riding

Alternator does not charge:

- Engine ground wire loose or broken
- Loose or broken wires in charging circuit
- Voltage regulator not grounded

Engine

Engine knocks or pings:

- Incorrect fuel (use 91 octane or higher)
- Incorrect spark plugs
- Incorrect ignition timing

Engine overheats:

- Insufficient air reaching the cylinders from slow operation
- Insufficient oil supply
- Oil not circulating due to restricted lines, filter or fittings
- Heavy carbon depositing from lugging the engine
- Incorrect ignition timing
- Fuel mixture to lean

Engine starts but runs irregularly or misses:

- Battery low on charge
- Spark plugs in bad condition, have improper gap or are partially fouled
- Incorrect spark plugs
- Spark plug cables in bad condition and shorting
- Damaged wire or loose connection at battery terminals or at coil
- Damaged wire insulation causing short circuit
- Fuel system clogged by water or dirt
- Fuel vent system plugged

Engine difficult to start:

- Battery low on charge
- Spark plugs in bad condition, have improper gap or are partially fouled
- Incorrect spark plugs
- Spark plug cables in bad condition and shorting
- Damaged wire or loose connection(s) at one of the battery terminals or at the coil
- Carburetor not adjusted correctly, especially the enrichener
- Improper engine oil
- Incorrect ignition timing

Engine turns over but does not start:

- Fuel tank empty
- Fuel valve (petcock) in OFF position
- Fuel valve or fuel filter clogged
- Discharged battery or loose battery terminal connections
- Fouled spark plugs
- Engine flooded with fuel from overuse of enrichener
- Throttle held open when enrichener was used
- Spark plug cable connections loose or in bad condition
- Loose or corroded wire or cable connection(s) at coil or battery
- Fuel tank vent plugged or fuel line closed off
- Fuel system clogged by water or dirt

Engine vibrates excessively or seems to vibrate:

- Front engine mount bolts loose
- Rear engine mount bolts loose
- Broken frame
- Rear drive belt badly worn
- Wheels and/or tires damaged or out-of-true
- Vehicle not properly aligned
- Top engine mount loose or broken

Spark plugs foul repeatedly:

- Incorrect spark plugs
- Fuel mixture too rich
- Enrichener used too much

Starter does not operate or does not turn engine over:

- Engine stop switch in OFF position
- Ignition switch not in ON position
- Discharged battery or loose or corroded connections
- Connector to starter loose
- Poor or loose starter ground connection

Lubrication System

Oil does not return to oil tank:

- Insufficient amount of oil in system
- Oil lines or fittings clogged
- Oil filter clogged
- Inoperative oil pump

Oil leaks from cases, pushrod covers and/or hoses:

- Loose parts
- Incorrect or imperfect seal at gaskets, pushrod cover, washers, etc.
- Restricted oil return line to tank
- Restricted crankcase vent

Basic Engine Tests

The cylinder leakage and compression checks are basic engine tests that will help determine the overall mechanical condition of the engine and identify problems that can prevent the engine from delivering peak performance.

Cylinder Leakage Test

With the cylinder leakage test, air pressure is applied to the cylinder. A drop in pressure indicates a leak.

Run the engine to attain normal operating temperature. Stop the engine.

Clean the area around the spark plug with compressed air and remove the spark plug.

Position the piston, in the cylinder being tested, at top dead center (TDC) on the compression stroke.

Remove the air filter and set the throttle and choke in the wide-open position.

Place the transmission in 5th gear and engage the rear brake to prevent the engine from turning over.

Using a cylinder leakdown tester, follow the manufacturer's instructions to perform a leak test on the cylinder (maximum acceptable leakdown rate is 15%). Listen for air escaping at the following locations:

- Exhaust pipe — indicates a defective exhaust valve
- Head gasket — indicates defective head gasket, cylinder head surface or cylinder surface
- Carburetor — indicates defective intake valve
- Crankcase vent — indicates worn piston rings

Air escaping through the valves may indicate incorrect pushrod length. Check that the correct length pushrods are installed in each location.

Engine Compression Test

The engine compression test provides a quick method to uncover engine faults.

Make sure the battery is fully charged.

Run the engine to attain normal operating temperature. Stop the engine.

Clean the areas around the spark plugs with compressed air and remove the spark plugs.

Remove the air filter and set the throttle in the wide-open position.

Install a compression gauge in the cylinder being tested.

Have an assistant crank the engine at least four complete compression strokes and record the compression readings. Repeat the test on the second cylinder, and compare the readings.

If the highest readings from both cylinders are within specification, 150-195 psi, the engine compression is satisfactory. If the engine compression is not to specification, the cause may be one of the following:

- Worn piston rings — If compression is low on the first stroke, increases on successive strokes, but never achieves specification, the piston rings may be worn. Add a tablespoon of heavy oil into the cylinder and crank the engine to distribute the oil. Repeat the compression test. If the compression readings increase considerably, the rings are worn.
- Faulty valve seating — If compression is uniformly low on all strokes, the valves may not be seated properly. Add a tablespoon of heavy oil into the cylinder and crank the engine to distribute the oil. Repeat the compression test. If the compression readings remain approximately the same, the valves are not seated properly (perform cylinder leakage test). Check that the correct length pushrods are installed in each location.
- Head gasket leak — If compression is uniformly low on all strokes, the head gasket may be leaking.

If the compression readings are below specification, perform the Cylinder Leakage Test.

EMISSION CONTROL SYSTEM TROUBLESHOOTING

Evaporative System Checks

Problems with the evaporative emission system are primarily the result from the failure of the air valve to open or close. This can affect the performance of the engine, resulting in poor acceleration and failure to reach highway cruising speeds.

The air valve door does not open or close:

- Check the operation of the vacuum solenoid. Replace it if it is malfunctioning.
- Check the vacuum lines to the solenoid for kinks, leaks or other damage. Repair the lines as necessary.
- Check the mechanical linkage between the solenoid and the air valve door for proper setup and operation. Replace any broken or damaged parts.

Problem conditions in the vapor lines and carbon canister are not so obvious and may not affect engine performance in any noticeable way. However, these components must be checked to ensure proper operation of the system. Refer to System Inspection in the EMISSION CONTROL SYSTEM SERVICE section.

IGNITION SYSTEM TROUBLESHOOTING

Spark Plug Condition

When removing the spark plugs to check their condition, make a note of the cylinder from which each plug is removed. This will be helpful in identifying a problem cylinder. Refer to the IGNITION SYSTEM SERVICE section for removal and installation instructions.

Tools required:

Small file

Wire brush

Inspection and Cleaning

Visually inspect the electrodes for erosion and both the electrodes and insulators for the nature of any accumulated deposits. A spark plug with light powder-like brown or tan deposits and very little erosion of the electrodes is a normal condition and the plugs can be reinstalled. However, the following conditions are indictors of problems that need to be corrected.

Wet sludge-like deposits — This is an indication of excessive oil entering the cylinder. The cause may be worn rings or valve guides.

Dry black powder-like deposits — Deposits of this type are an indicator of incomplete combustion. The cause may be an improper fuel-air mixture, a spark plug with the incorrect heat range or an ignition system that is not functioning properly.

Eroded electrodes and burned/blistered insulator tips — This condition indicates plugs that have been subjected to overheating. The cause is typically incorrect ignition timing, a spark plug that is loose or the use of low-grade fuel.

If the spark plugs are acceptable for reinstallation, lightly file the firing gap surfaces of the side and center electrodes, making sure they are clean, square and parallel. Adjust the firing gap to specification and then clean the threads of the plug shell of any dirt and debris. This will ensure good contact with the cylinder head and proper heat dissipation.

Electronic Ignition Diagnostics

The Indian Scout and Spirit motorcycles are equipped with an electronically controlled ignition system. As such, timing is programmed into the ignition module and does not require the routine adjustments required in past models. However, the following **Thunder Heart Performance Corp.** diagnostic checks can be performed to assess the performance of the system and the functioning of components within the system.

Tools required:

5/32″ hex bit

13/16″ deep-well socket

Pliers

Trigger plate and speedometer sensor tester, 98-056 (with adapter harness)

Ignition module simulator, 98-055

Diagnostic kit (software and cable), 88-990

Laptop/personal computer

Ignition Cover (Trigger Plate) Check

This test is used to determine if the sensor within the ignition cover is functioning without removing the cover from the motorcycle.

Check to make sure that both the ignition key and the engine stop switches are in the OFF position.

Disconnect the ignition cover (trigger plate) harness connector. This is the triangular-shaped, three-pin connector located between the frame rails under the engine.

Connect the trigger plate and speedometer sensor tester, 98-056, to the connector from the ignition cover, using the adapter harness supplied with the tester.

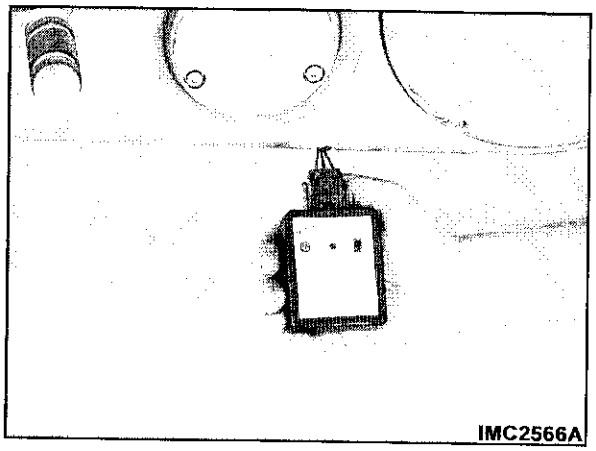


Figure 7 — Trigger plate test connection

Note: *Check to make sure that the location of the colored wire leads in the adapter harness connector correspond with the color indicators on the tester module. If not, change the wire locations in the adapter harness to match up with the tester.*

Turn the tester's power switch on. The power indicator light should be brightly lit. If not, replace the battery in the tester.

With the transmission in neutral, turn both the ignition key switch to the ON position and engine start switch to the RUN position.

Depress the start switch and observe the tester's SENSOR indicator light as the engine turns over.

- **Indicator light cycles on and off** — The sensor in the ignition cover is OK.
- **Indicator light does not cycle on and off** — The sensor in the ignition cover is malfunctioning or there is a problem with the ignition rotor. Replace the cover or rotor as necessary.

Disconnect and remove the tester from the ignition cover connector.

Connect the ignition cover (trigger plate) three-pin terminal to the chassis harness connector.

Speed Sensor Check

This test is used to determine if the speed sensor is functioning without removing the sensor from the motorcycle.

Check to make sure that both the ignition key and the engine stop switches are in the OFF position.

Connect the trigger plate and speedometer sensor tester, 98-056, to the connector from the speed sensor, using the adapter harness supplied with the tester. This is the flat-shaped, three-pin connector located at the right side of the transmission near the rear frame stanchion.

Note: *Check to make sure that the location of the colored wire leads in the adapter harness connector correspond with the color indicators on the tester module. If not, change the wire locations in the adapter harness to match up with the tester.*

Turn the tester's power switch on. The power indicator light should be brightly lit. If not, replace the battery in the tester. The SENSOR indicator may also be lit depending on the position of the sensor gear.

With the transmission in neutral, move the motorcycle forward slowly and observe the SENSOR indicator while doing so.

- **Indicator light cycles on and off** — The speed sensor is OK.
- **Indicator light does not cycle on and off** — The speed sensor is malfunctioning or it is improperly positioned in the transmission housing and not sensing gear rotation. Check the sensor installation to make sure that it is fully seated in the transmission housing; adjust as necessary. If the installation is OK, remove the sensor from the housing and pass a steel rod back and forth in front of the sensor pickup. The sensor is OK if the tester indicator light cycles on and off. If the indicator light does not cycle, replace the sensor.

Disconnect and remove the tester from the speed sensor connector.

Connect the speed sensor to the chassis harness connector.

Ignition Coil, Wires and Spark Plugs Operational Check

This operational check substitutes the ignition module tester in place of the motorcycle's ignition cover (trigger plate/cam sensor). The tester simulates the engine operating through a wide range to check the ignition coil, spark wires and spark plugs.

Procedure

Check to make sure that the ignition key and the engine stop switch are both in the OFF position.

Disconnect the ignition cover (trigger plate) harness connector. This is the triangular-shaped, three-pin connector located between the frame rails under the engine.

Connect the ignition module tester to the harness connector in place of the ignition cover.

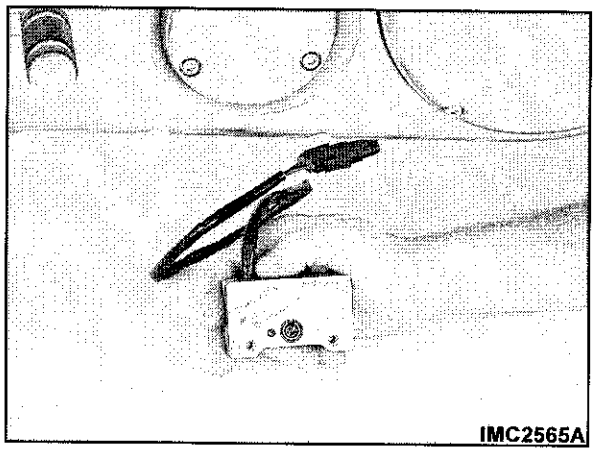


Figure 8 — Ignition module simulator connection

Gently pull the spark plug boots away from the spark plugs. Be very careful not to separate the boots from the wires while pulling.

Clean the spark plug area of the cylinder heads with compressed air.

Remove the spark plugs, using a 13/16″ deep-well socket.

Clean and inspect the spark plugs. Then, connect the removed plugs to the ignition wires and ground the plugs to the cylinder heads.

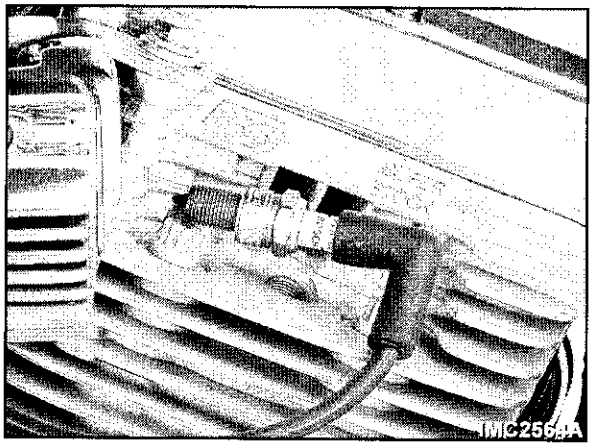


Figure 9 — Spark plug grounded to cylinder head

Turn the ignition key to the ON position and the engine stop switch to the RUN position. The tester will repeatedly cycle the ignition system up and down through a range of 0–6000 rpm.

⚠ WARNING!

DO NOT touch the ignition coil, the spark plugs or the spark plugs. An electrical shock and serious personal injury could result.

Observe the spark produced at the plugs grounded to the cylinder heads.

- **Weak or no spark** — indicates a faulty coil, ignition wire(s) or spark plug(s). The problem could also be a loss of power to the ignition coil.
- **Strong spark** — indicates that the coil, ignition wires or spark plugs are OK, and that a noted system problem may be a poor connection to the ignition cover or a malfunctioning ignition cover.

Turn the ignition key and the engine stop switch to the OFF position.

Disconnect the spark plugs from the plug wires. Apply a very small quantity of anti-seize to the threads of the plugs and install the plugs in the cylinder head, using a 13/16″ deep-well socket. Tighten the plugs to 18 foot-pounds. Make sure the threaded caps are tight on the plug terminal and connect the plug wires to the spark plugs.

Disconnect and remove the ignition module tester from the harness connector.

Connect the ignition cover (trigger plate) three-pin terminal to the chassis harness connector.

Ignition Module Operational Check

A laptop or personal computer and the SmartLink™ diagnostic software by Thunder Heart Performance Corp. can be used to evaluate how the motorcycle's ignition module and system is functioning.

Using the cable supplied with diagnostic kit 88-990, connect the computer to the diagnostic port at the center of the motorcycle's ignition module.

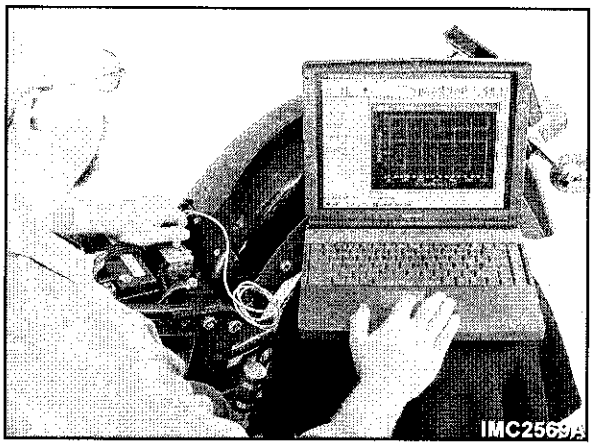
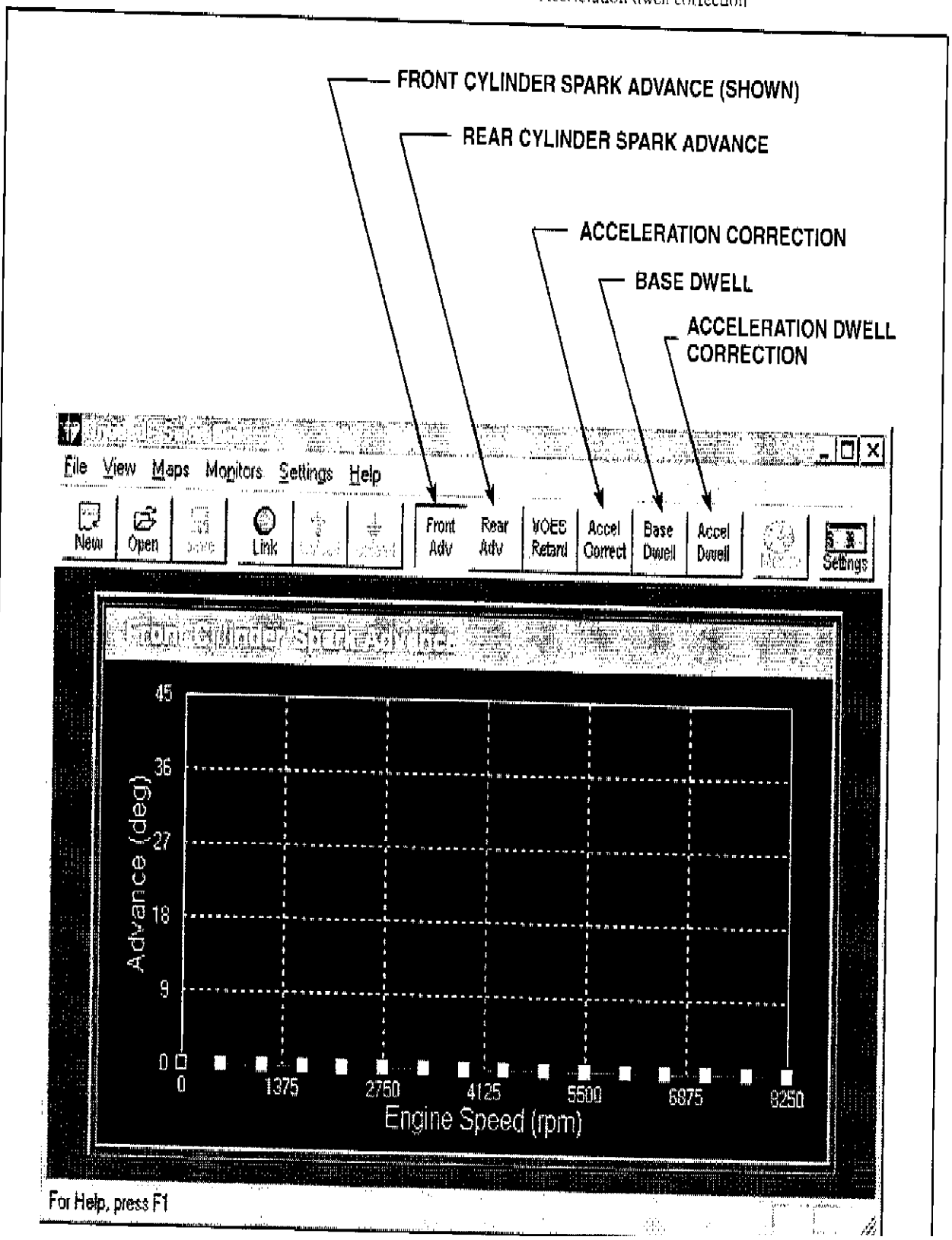


Figure 10 — Ignition module operational check

Load the SmartLink™ software provided with the diagnostic kit into the computer.

Start the engine and observe the operation of the ignition system through the engine's rpm range. System operational checks include:

- Front cylinder spark advance
- Rear cylinder spark advance
- Acceleration correction
- Base dwell
- Acceleration dwell correction



CARBURETOR TROUBLESHOOTING

Overflow or Flooding

Problem	Remedy
Loose float bowl or damaged float bowl seal ring.	Tighten float bowl screws. Replace seal ring as necessary.
Improper fuel level in float bowl.	Adjust needle actuating tab on float to correct fuel level.
Worn or dirty float needle valve or seat.	Clean or replace needle valve and seat.
Damaged, leaking or saturated float.	Replace float and adjust fuel level.
Deteriorated fuel causing sticky needle valve.	Drain fuel, replace with fresh fuel, clean or replace needle valve and seat. Adjust float level.
Damaged or leaking float bowl drain plug.	Tighten drain plug or replace as necessary.
Fuel runs from overflow tube (bottom of float bowl) or vent breather (side of carburetor).	Sticking, damaged or worn needle valve and seat. Clean or replace as necessary. Adjust float level.

Poor Fuel Economy

Problem	Remedy
Damaged or incorrectly seated enrichener control.	Replace or correctly seat enrichener control.
Incorrect main jet or intermediate jet for tuning set-up or altitude.	Replace with correct main jet or intermediate jet.
Loose intermediate or main jet.	Tighten intermediate or main jet.
Dirty air cleaner element.	Clean or replace as required.
Excessive accelerator pump output.	Adjust accelerator pump stroke. Replace accelerator pump nozzle with correct size.
Fuel level high in float bowl.	Adjust float level.
Enrichener valve not seating or is leaking.	Adjust, clean or replace.
Plugged air bleeds or passages.	Clean and clear bleeds and passages.

Poor Idle

Problem	Remedy
Damaged or restricted fuel tank vent system.	Repair or unclog vent system.
Loose float bowl or damaged float bowl seal ring.	Tighten float bowl screws. Replace seal ring as necessary.
Improper fuel level in float bowl.	Adjust needle actuating tab on float to correct fuel level.
Worn or dirty float needle valve or seat.	Clean or replace needle valve and seat.
Damaged, leaking or saturated float.	Replace float and adjust fuel level.
Deteriorated fuel causing sticky needle valve.	Drain fuel, replace with fresh fuel, clean or replace needle valve and seat. Adjust float level.
Damaged or leaking float bowl drain plug.	Tighten drain plug or replace as necessary.
Fuel runs from overflow tube (bottom of float bowl) or vent breather (side of carburetor).	Sticking, damaged or worn needle valve and seat. Clean or replace as necessary. Adjust float level.
Idle mixture screw setting incorrect.	Adjust idle mixture screw to specification.

Poor Part Throttle Performance

Problem	Remedy
Damaged or incorrectly seated enrichener control.	Replace or correctly seat enrichener control.
Damaged or restricted fuel tank vent system.	Repair or unclog vent system.
Air leak between carburetor and cylinder heads.	Replace gaskets or carburetor-to-manifold seal. Tighten clamp at carburetor base as required.
Dirty air cleaner element.	Clean or replace as required.
Little or poor accelerator pump output.	Verify operation and replace parts as required. Adjust accelerator pump stroke.
Loose main jet or intermediate jet.	Tighten main jet or intermediate jet.
Throttle cables misaligned or misrouted.	Adjust, clean or replace throttle cables.
Plugged air bleeds, jets or passages.	Clean and clear bleeds, jets and passages.
Restricted fuel supply passages or fuel supply valve.	Clean and clear as required. Clean screen in tank.
Fuel level too low in float bowl.	Adjust float level.
Idle mixture screw setting incorrect.	Adjust idle mixture screw to specification.

Poor Full Throttle Performance

Problem	Remedy
Leaks in intake between carburetor and cylinder heads.	Repair leaks or replace parts as required.
Damaged or restricted fuel tank vent system.	Repair or unclog vent system.
Dirty air cleaner element.	Clean or replace as required.
Clogged main jet.	Clean and clear the main jet.
Throttle cables misaligned or misrouted.	Adjust, clean or replace throttle cables.
Restricted fuel supply passages or fuel supply valve.	Clean and clear as required. Clean screen in tank and in-line filter.
Improper fuel level in float bowl.	Adjust float level.
Enrichener valve not seating or is leaking.	Adjust, clean or replace.
Worn, dirty or damaged float needle valve or seat.	Clean or replace needle valve and seat.
Little or poor accelerator pump output.	Verify operation and replace parts as required. Adjust pump stroke to specification.

Carburetor and Exhaust Backfire

Problem	Remedy
Backfire on cold engine with enrichener off.	Considered normal. Actuate enrichener until engine warms.
Backfire on warm engine.	Excessively lean air/fuel mixture. Check fuel flow to carburetor, blocked or restricted jets and clear or repair as required. Ignition timing incorrect. Adjust or replace components as required.
Incorrect accelerator pump adjustment (stroke begins too late).	Adjust accelerator pump stroke.
Exhaust backfire with closed throttle on deceleration.	Air entering exhaust pipes at cylinder head connections or air entering muffler at exhaust joints. Repair or replace components as required. Ignition timing incorrect. Adjust or replace components as required. Set idle mixture screw to factory

TRANSMISSION AND DRIVE TROUBLESHOOTING

Transmission

Shifts Hard

Problem	Remedy
Primary drive housing overfilled with lubricant.	Drain and refill with proper amount of lubricant.
Clutch dragging slightly.	Check and adjust clutch and clutch cable.
Transmission lubricant too heavy (operation in cold weather).	Run until transmission warms. Check for proper type and weight of transmission lubricant. Drain and refill.
Shifter return spring (in transmission) bent or broken.	Repair or replace as necessary.
Bent or misadjusted shifter rod.	Repair, replace or adjust as necessary.
Internal shift mechanisms damaged, bent or misadjusted.	Repair, replace or adjust as necessary.
Shift forks bent or damaged.	Replace as necessary.
Worn or damaged internal transmission components.	Repair, replace and adjust as necessary.

Jumps Out of Gear

Problem	Remedy
Shifter rod improperly adjusted.	Adjust as necessary.
Shift forks or shifter improperly adjusted.	Adjust as necessary.
Worn shifter dogs.	Replace or adjust as necessary.
Shift forks bent.	Replace as necessary.
Damaged or worn gears.	Replace as necessary.

Clutch

Clutch Chatters

Problem	Remedy
Friction or steel discs worn or warped.	Replace as necessary. Check and replace clutch springs.
Insufficient primary drive lubricant level.	Fill primary case with proper amount of lubricant.

Clutch Drags or Does Not Release

Problem	Remedy
Clutch controls improperly adjusted.	Adjust as necessary.
Primary case lubricant level too high.	Drain and refill with proper amount of lubricant.
Clutch discs warped.	Check and replace components as necessary.
Primary chain badly misaligned.	Verify proper alignment. Replace components as necessary.
Damaged clutch assembly.	Repair or replace components as necessary.

Clutch Slips

Problem	Remedy
Clutch controls improperly adjusted.	Adjust as necessary.
Friction discs worn.	Check and replace components as necessary.
Insufficient clutch spring tension.	Check and replace components as necessary.

ELECTRICAL TROUBLESHOOTING

Electrical Troubleshooting Charts

Alternator

Alternator Does Not Charge

Problem	Remedy
Voltage regulator not grounded.	Inspect and repair ground as necessary.
Engine ground wire loose or broken.	Inspect and repair ground as necessary.
Faulty voltage regulator.	Test and replace as necessary.
Loose or broken wires in charging circuit.	Repair or replace as necessary.
Faulty stator.	Test and replace as necessary.

Alternator Charge Rate Below Normal

Problem	Remedy
Weak or damaged battery.	Inspect, test, recharge or replace as necessary.
Low battery voltage.	Inspect, test, recharge or replace as necessary.
Loose or corroded connections.	Clean and tighten as necessary.
Faulty regulator.	Test and replace as necessary.
Faulty stator.	Test and replace as necessary.

Starter Motor

Starter Motor Does Not Operate or Does Not Turn Engine Over

Problem	Remedy
Engine stop switch in OFF position.	Place engine stop switch in RUN position.
Ignition switch in OFF position.	Place ignition switch in ON position.
Discharged battery.	Test, recharge or replace as necessary.
Loose or corroded battery or starter motor connections.	Clean and tighten connections as necessary.
Starter control circuit (a) Solenoid faulty (b) Starter relay (under dash) faulty	Replace as necessary.
Starter shaft pinion gear not engaging.	Inspect, clean or replace as necessary.
Starter overrunning clutch slipping.	Inspect and replace as necessary.

Battery Testing

General

Refer to CHARGING SYSTEM SERVICE for battery removal, installation and inspection procedures.

Battery Voltmeter Testing

Voltmeter testing provides a general indication of battery condition and calculated percent of charge. Measure the voltage of the battery to determine its charged level. If the Open Circuit Voltage (OCV) reading (battery disconnected) is below 12.6 volts, charge the battery and then recheck voltage after the battery has set for 1–2 hours. If the measured voltage reading is 12.8 volts or above, perform a load test on the battery to determine battery performance.

Voltmeter Testing for Battery Charge Condition

Open Circuit Voltage	State of Charge
13.0	100%
12.8	75%
12.5	50%
12.2	25%
11.8	0%

Battery Load Testing

The load test measures battery performance under full current load and is the best indicator of battery condition. Load test the battery as follows:

Remove the battery.

CAUTION!

Load testing a discharged battery can result in permanent damage.

Measure the OCV of the battery before load testing. Charge the battery as necessary and let stand for one hour before load testing.

Connect battery load tester leads to the terminals of the battery. Place inductive pickup over negative (black) lead.

WARNING!

Always turn the battery load tester OFF before connecting leads to battery terminals. Connecting leads with tester ON can cause a spark resulting in a battery explosion and result in serious personal injury.

Load the battery at 50% of the Cold Cranking Amperage (CCA) rating, using the load tester. The voltage reading after 15 seconds of load should be 9.6 volts or above, at 70°F (21°C).

CAUTION!

To avoid tester or battery damage, do not leave the tester load dial ON for more than approximately 20 seconds.

Battery Load Test

Battery CCA (12V, 24A)	50% of CCA
350	175

If the battery fails to maintain 9.6 volts for 15 seconds at 70°F (21°C), replace the battery.

Install the battery after testing is complete.

Battery Charging

Safety Precautions

Never charge a battery without first reading the battery charger instructions. In addition to the battery manufacturer's charging guidelines, follow these general safety precautions:

- Always wear proper eye, face and hand protection.
- Always charge batteries in a well-ventilated area.
- Make sure the battery charger is OFF before connecting any leads to avoid dangerous sparks.
- Never charge a damaged or frozen battery.
- Always disconnect the battery for charging purposes.
- Connect the red positive (+) lead of the charger to the positive (+) terminal of the battery. Connect the black negative (–) lead of the charger to the negative (–) terminal of the battery.
- Make sure the charger leads are in good condition.
- If the battery becomes HOT, reduce the charging rate or temporarily turn the charger OFF.
- Always turn the charger OFF before disconnecting the charger leads to avoid dangerous sparks.

Using the Battery Charger

Charge the battery if any of the following conditions exist:

- Vehicle lights are dim.
- Starter motor cranks slowly or sounds weak.
- Battery has not been used for an extended period of time.

⚠ WARNING!

Charge the battery in a well-ventilated area. Explosive hydrogen gas can escape the battery during charging. Keep open flames, electrical sparks and smoking materials away from the battery at all times. Failing safety precautions can result in serious personal injury.

Ⓘ CAUTION!

If the battery releases an excessive amount of gas during charging, decrease the charging rate. If the battery is excessively hot, discontinue charging until the battery has cooled. Overheating the battery can cause plate distortion, internal shorting or other damage.

Remove the seat. Refer to Seat Removal and Installation in the FRAME AND ACCESSORIES SERVICE section for procedures.

Perform a voltmeter test to determine the battery state of charge.

Remove the battery from the motorcycle.

Connect the battery charger red positive (+) lead to the positive (+) terminal of the battery.

Connect the battery charger black negative (–) lead to the negative (–) terminal of the battery.

⚠ WARNING!

Always turn the battery charger OFF before connecting leads to battery terminals. Connecting leads with charger ON could cause a spark resulting in a battery explosion and can result in serious personal injury.

Set the charging rate and voltage of the battery charger. Follow the charge rate and time recommendations of the battery manufacturer.

Battery Charging Rate

Battery Rating	Battery Voltage	2.1 Amp Charge Rate
24 Amp Hour	12.6	1.75 Hours
	12.3	3.5 Hours
	12.0	5 Hours
	11.8	5–10 Hours

Turn the battery charger ON.

When finished charging, turn the battery charger to OFF and disconnect the charger leads from the battery terminals.

⚠ WARNING!

Always unplug or turn the battery charger OFF before disconnecting the battery leads. Disconnecting the battery leads of the charger with the charger ON can cause a spark, resulting in battery explosion and possible personal injury.

Perform a battery load test as required.

If the battery is satisfactory, install the battery into the motorcycle.

Install the seat. Refer to Seat Removal and Installation in the FRAME AND ACCESSORIES SERVICE section for procedures.

Ground Path Tests

Tool required:

Ohm meter

Battery Ground Cable

Set your meter to ohms (resistance). Place a probe upon the negative post of the battery and the other probe on the bolt holding the battery ground cable to the frame. Resistance should be 0.2 ohms or less. If greater than 0.2 ohms, clean all the connections and test again. If test results are greater than 0.2 ohms, replace the batter cable and test again

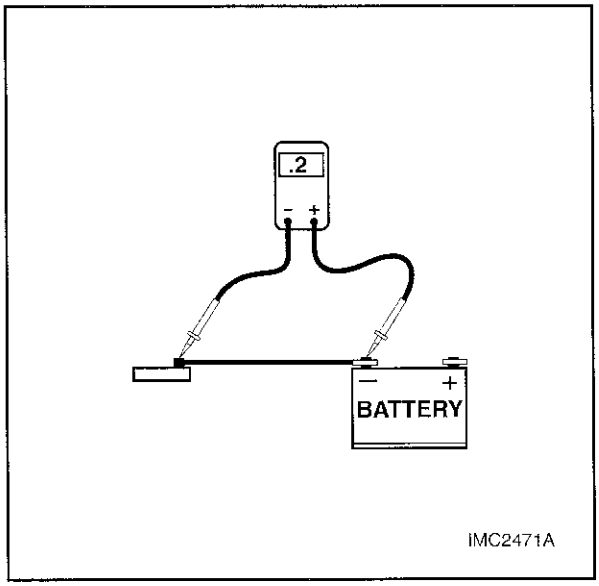


Figure 12 — Battery ground cable test

Battery to Starter

Set your meter to ohms (resistance). Place a probe upon the negative post of the battery and the other probe against the starter case. Resistance should be 0.2 ohms or less. A bad ground in the circuit is highly unlikely. If resistance is greater than 0.2 ohms, transfer the probe from the bolt to the transmission case. If higher than 0.2 ohms, clean the ground path between the starter and the transmission. If the connection is 0.2 ohms or less, then transfer the transmission probe to a non-painted area below the transmission. If higher than 0.2 ohms, check the ground path between the transmission and the frame. Be sure the frame is clean where the probe is placed.

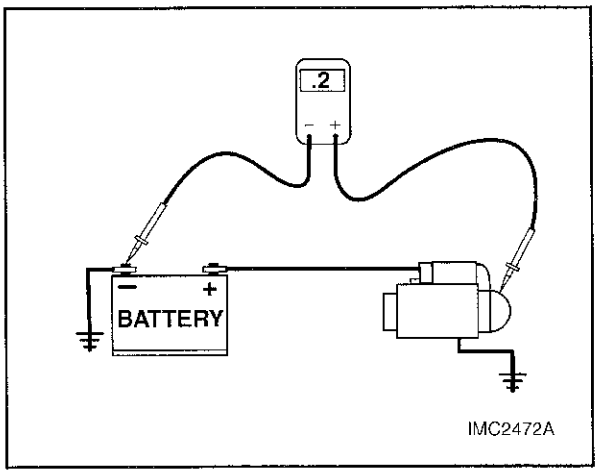


Figure 13 — Battery-to-starter ground test

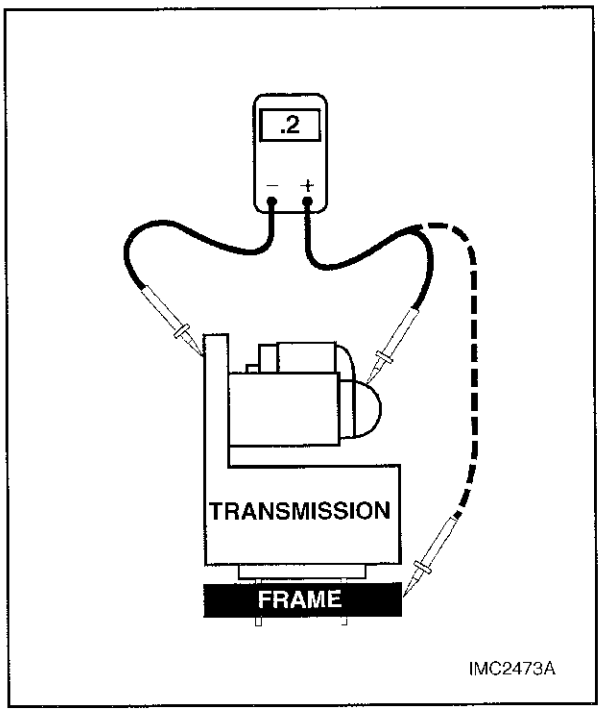


Figure 14 — Starter/transmission ground test

Current Draw/Leak Test

Perform a "Key-Off Battery Draw" test. With the key turned OFF, connect an ammeter in series between the battery negative terminal and the negative battery lead (with lead disconnected from battery). An alternative is to use an ammeter with an inductive pickup clamped around the negative battery cable (with cable connected).

Check for current flow on a scale that is safe for the ammeter. The ammeter should read zero current flow. If current flow reads zero on a higher scale, recheck on a milliampere scale of the ammeter. The meter should theoretically read zero. If the battery case is slightly contaminated and the meter is very sensitive, you might see a maximum reading of 50 milliamperes draw with a good system. Any current draw higher than 50 milliamperes is suspect, unless a DC power drawing device has been added. Two examples of DCV devices are a clock or alarm.

If DCV devices have been added to the bike, disconnect them and check the circuit.

If current greater than 50 milliamperes is detected and all DCV drawing devices have been disconnected, then perform a leak test on the regulator/alternator.

Rectifier/Regulator Current Leak Test

Check the battery voltage. To perform this test, the battery must have a charge. With the battery connected to the charging system and the ignition key in the OFF position, disconnect the regulator wire harness at the stator terminal. Place the ammeter on a scale sufficient to read 20 amperes. Place an ammeter probe on one side of the regulator terminal pins. Place the other probe on ground. The ammeter should read zero current flow. If current flow reads zero on the higher scale, recheck on a milliampere scale. There should be no current detected while using the milliampere scale. Transfer the probe to the second regulator terminal pin and perform the test again. If current is detected, the regulator is allowing current flow to ground and will discharge a fully charged battery over a few days. The regulator is defective and will require replacement.

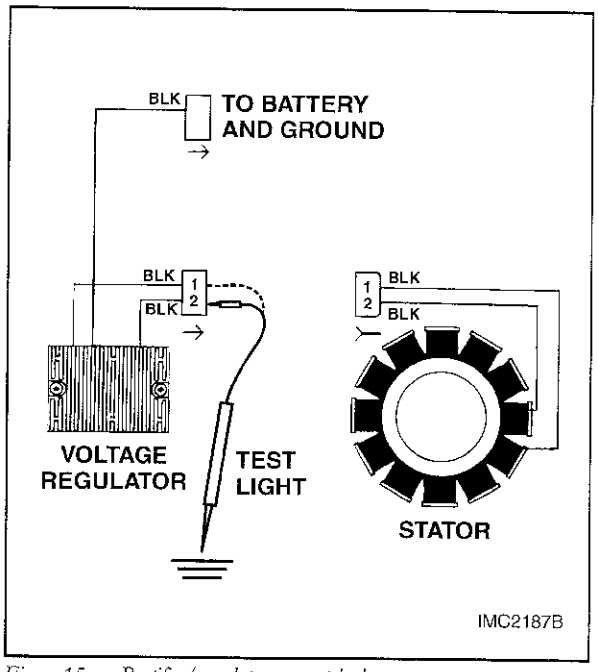


Figure 15 — Rectifier/regulator current leak test

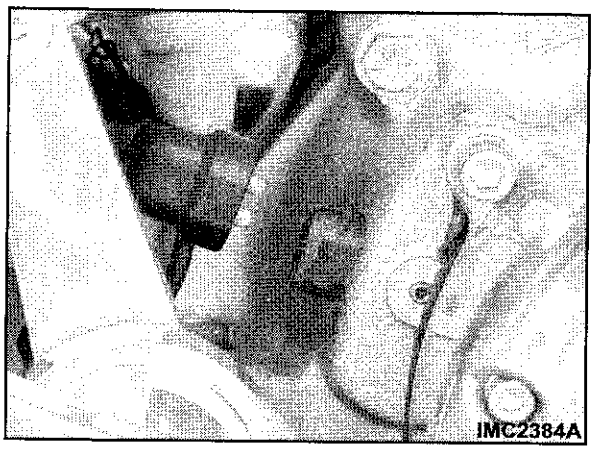


Figure 16 — Alternator stator terminal connection

Charging System Tests

Charging system tests are helpful in determining if the charging system, during normal motorcycle operation, is capable of meeting electrical power demands, which include ignition, lighting and the use of accessories. The tests are also helpful in isolating the problem to the regulator, the alternator or the circuit wiring.

Note: *The battery must be in good condition and at a full state of charge prior to conducting the following tests. If not, the results of the tests will be inaccurate and inconclusive.*

System Output Test

Measuring Current Output at Specified Voltage

A variation of the current draw test determines what current output the system is capable of producing at a specified 13.0 volts. The alternator is connected to the system for this test.

Locate the black wire (regulator battery supply) from the terminal of the main 30-ampere circuit breaker. Connect a load tester in the circuit with its control set at "no load." Clamp the inductive pickup on the black regulator supply wire. Be sure to follow the tester manufacturer's recommendations for making tester connections and for tester operation.

Conduct the test as follows:

- Make sure the tester control is set to the "no load" position.
- Start the engine and bring its speed up to 2000 rpm. With no load set on the tester, the voltage output reading should not be higher than 15 volts. If the reading is higher, the regulator is malfunctioning or the circuit wiring/connections are poor.