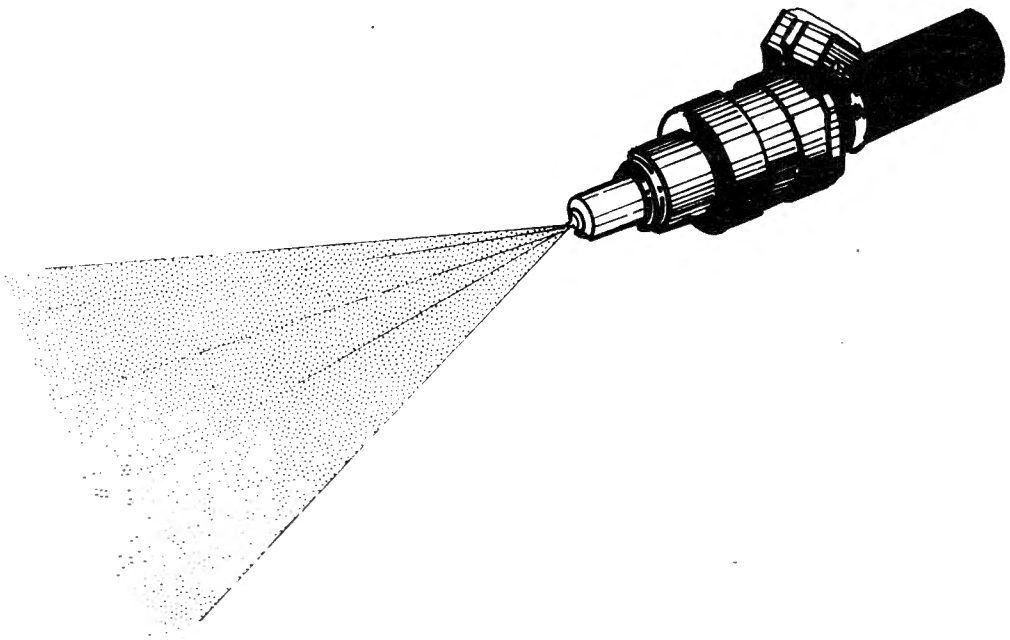
Kawasaki

ELECTRONIC FUEL INJECTION



TROUBLESHOOTING MANUAL

FOREWORD

This manual covers the recommended troubleshooting procedures for Kawasaki Electronic Fuel Injection. It contains no disassembly and assembly, repair, or other maintenance information and is designed to be used in conjunction with the service manual covering the model being worked on.

Remember that the operation of the Electronic Fuel Injection system is directly related to exhaust emissions and that the system must not be altered in any way.

READ THE EMISSIONS INFORMATION ON THE FRONT OF THE SERVICE MANUAL FOR THE MODEL BEING WORKED ON!

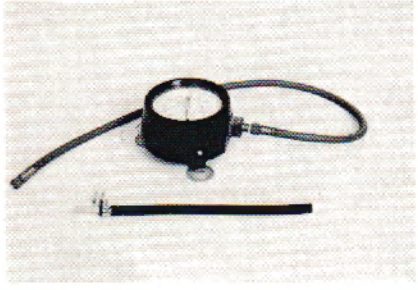
Before troubleshooting the Kawasaki Electronic Fuel Injection system, check the following, and replace, add, adjust, or repair if necessary.

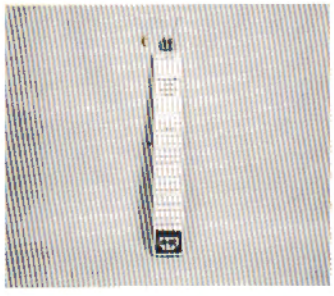
- There is sufficient fuel in the tank.
- Correct amount of specified engine oil is in the engine.
- Fuses are not blown out.
- The engine is cranked normally with the starter motor.
- Cylinder compression, spark plugs, valve clearance are normal, and items other than fuel-injection-system related items are normal.

NOTE: Measure the cylinder compression in the same way as for a carburetor model with the following exception. To stop fuel injector operation during the compression test, disconnect the white/red lead which connects the battery positive terminal to the fuel injection system harness under the left side cover.

- The oil filler cap, breather hose, and surge tank drain plug are installed correctly.
- All electrical connectors are clean and tight.
- The ignition system is normal.
- There is no external damage.

These are the special tools and instruments needed for troubleshooting the Kawasaki Electronic Fuel Injection system.





These symbols appear in the text.

means ignition switch "OFF"

means starter button is pushed

means ignition switch "ON"

means multimeter is connected as shown and switched to setting printed in meter symbol.

means clutch lever pulled (to activate starter switch)

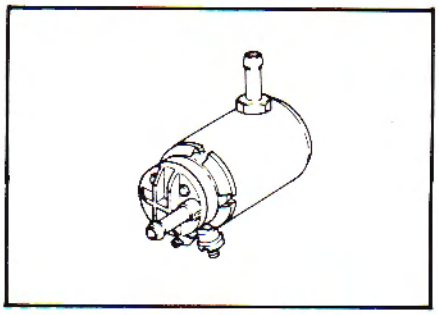
NOTE: For best results, start with TEST 1 and follow the instructions to the letter. This manual was designed to guide you through the Kawasaki Electronic Fuel Injection system in a careful and thorough examination of all its component parts.

ELECTRONIC FUEL INJECTION

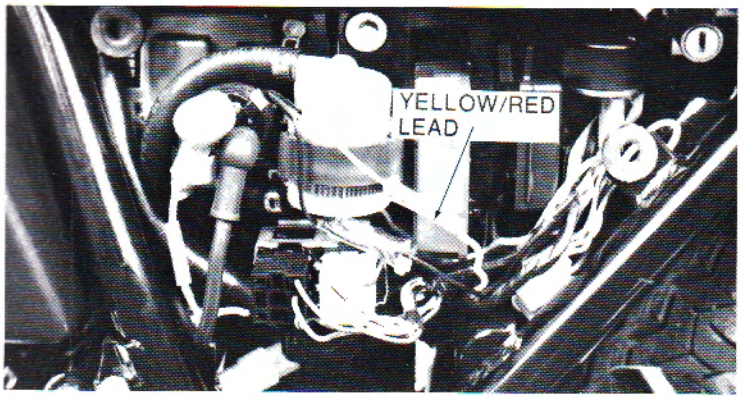
TROUBLESHOOTING MANUAL

FUEL PUMP IN-CIRCUIT INSPECTION

TEST 1



- Turn ignition switch "OFF".
- Disconnect the yellow/red lead of the starter motor relay under the left side cover. This is to prevent the starter motor from working during this inspection.

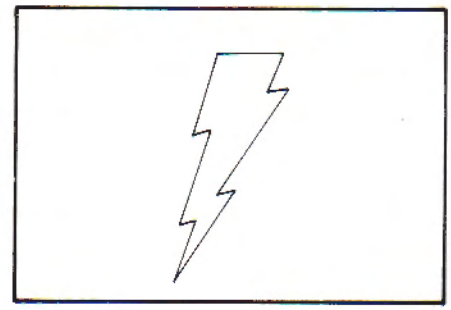


- Turn "ON" the ignition switch.
- Push the starter button.
- Pull in the clutch lever, and listen to the fuel pump.

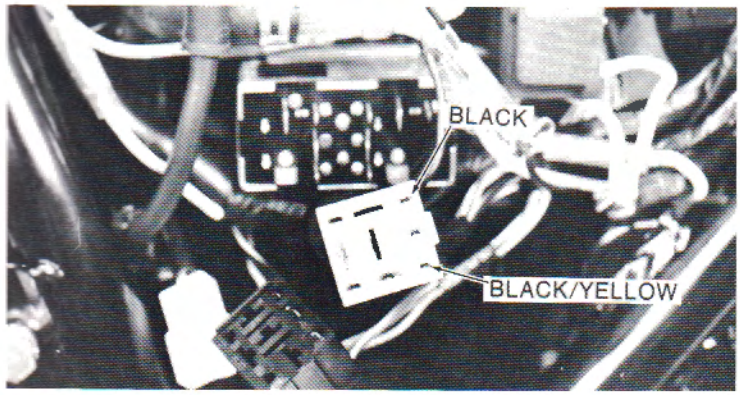
Pump runs	*Pump does not run*
Turn page to TEST 2.	Go to TEST 18, page 41.

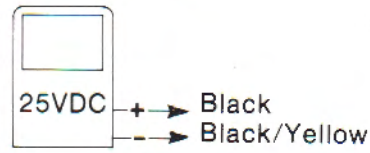
START SIGNAL INSPECTION

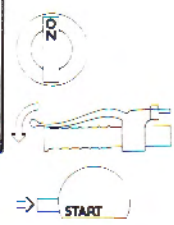
TEST 2



- Turn off the ignition switch.
- Disconnect the black and white 9-pin connectors from the relay under the left side cover, and connect a voltmeter to the connector to check the start signal.







7 to 10 volts

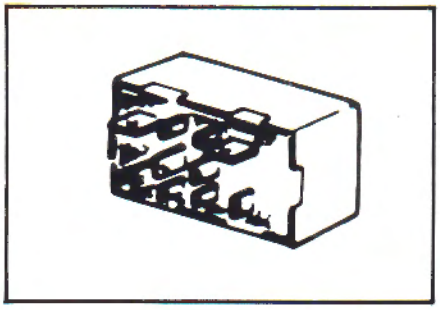
Turn page to TEST 3.

Less than 7 or more than 10 volts

Inspect all leads and connectors and repeat TEST 2.

TEST 3

RELAY INSPECTION



To save time, substitute a good relay for the suspected problem relay. If a good relay is not available, use TEST 23, page 50, to troubleshoot the suspect relay.

New relay does not cure problem

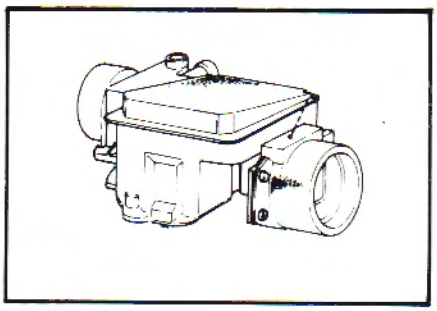
Replace original relay and turn page to TEST 4.

New relay cures problems

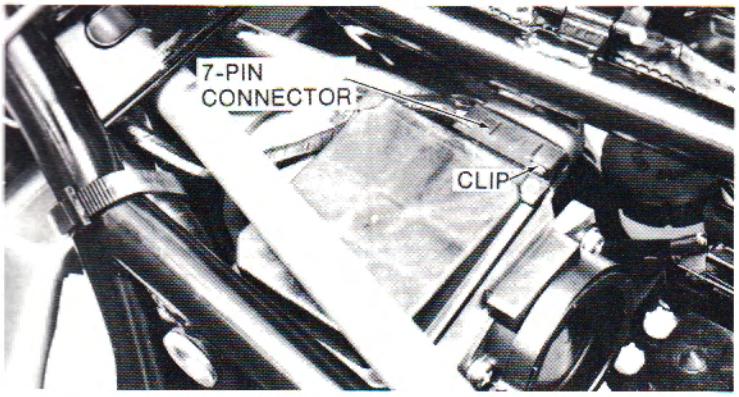
Discard original relay.

FUEL PUMP CONTACT INSPECTION

TEST 4

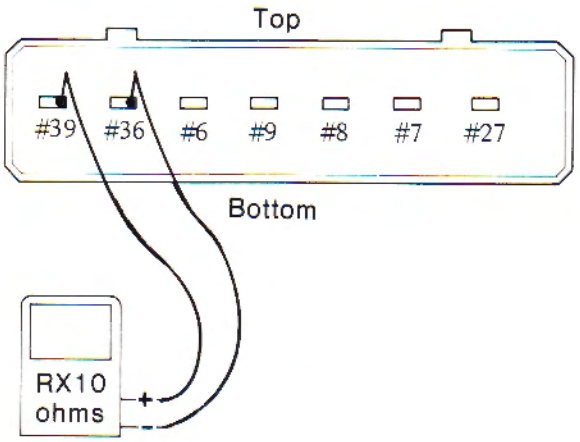


- Remove the air cleaner element.
- Pull off the right side cover.
- Turn off the ignition switch, and disconnect the 7-pin connector from the air flow meter.



- Connect an ohmmeter to the air flow meter terminals, as shown.

Air Flow Meter Terminals



Step 1
Push air flap

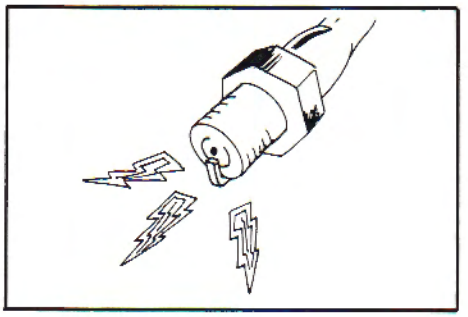
- 0 Ω RX10 ohms → Go to Step 2
- 1 or more Ω RX10 ohms → Replace the air flow meter

Step 2
Release air flap

- ∞Ω RX10 ohms → Turn page to TEST 5
- Less than ∞Ω RX10 ohms → Replace the air flow meter

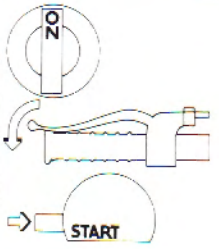
TEST 5

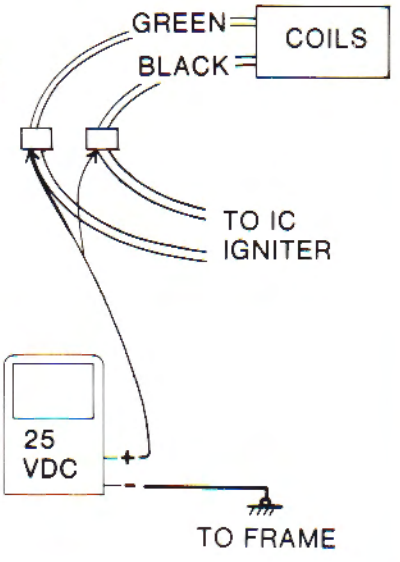
IGNITION SIGNAL INSPECTION



- Remove the fuel tank.
- Turn off the ignition switch.
- Disconnect the Electronic Control Unit.

STEP 1:
- Attach a voltmeter to the green coil primary lead, and then to the black.
- Turn on the ignition and activate the starter.

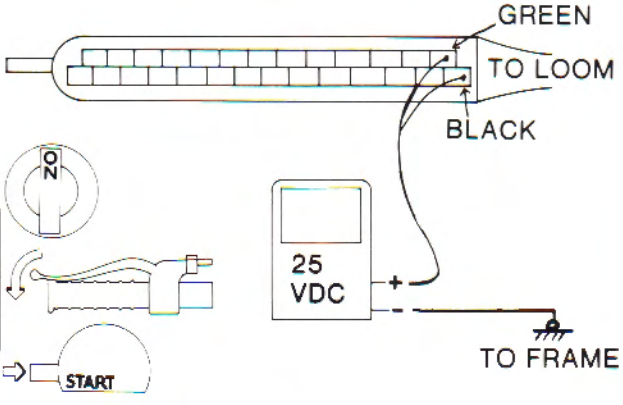




Meter shows battery voltage and flickers regularly on both wires

Meter shows zero volts on one or both wires

Troubleshoot Ignition System according to the Service Manual.



STEP 2:
- Attach a voltmeter to the green wire and then the black in the ECU connector.
- Turn on the ignition and activate the starter.

Meter shows battery voltage and flickers regularly on both wires.

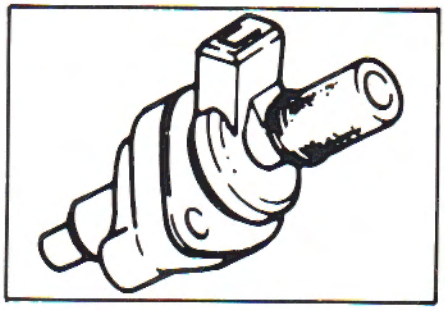
Meter shows zero volts on one or both wires.

Turn page to TEST 6.

Check the wiring to the IC Igniter from the ECU and troubleshoot the Ignition System according to the Service Manual.

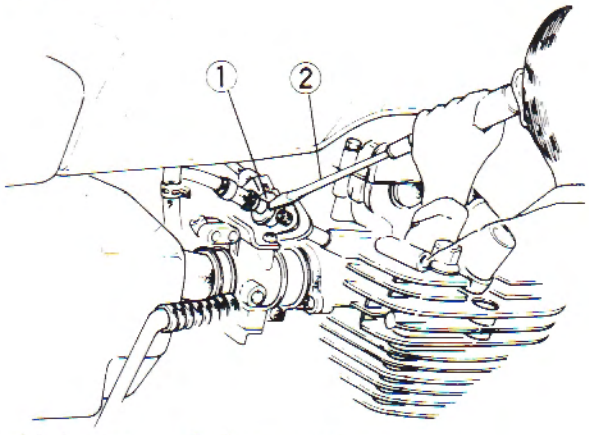
FUEL INJECTOR SOUND INSPECTION

TEST 6



- Start the engine.
- Place the tip of a screwdriver against one of the injectors. Put your ear on the grip end and listen to check whether the injector is clicking or not.
- Do the same for the other injectors.

Sound Inspection



1. Fuel Injector 2. Screw Driver

Injectors click regularly

Turn page to TEST 7.

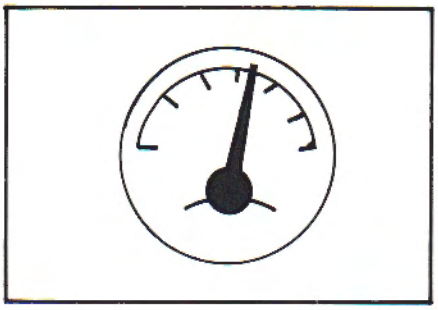
One or more injectors does not click regularly

Go to TEST 20, page 45.

NOTE: 1. The interval between clicking sounds becomes shorter as the engine speed rises.
2. If the engine does not start, perform this inspection while cranking the engine with the starter motor.

FUEL PRESSURE INSPECTION

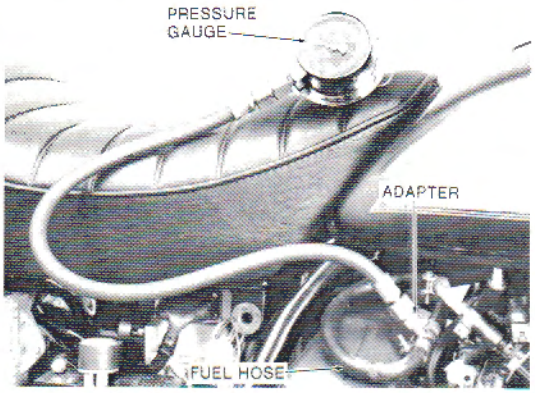
TEST 7

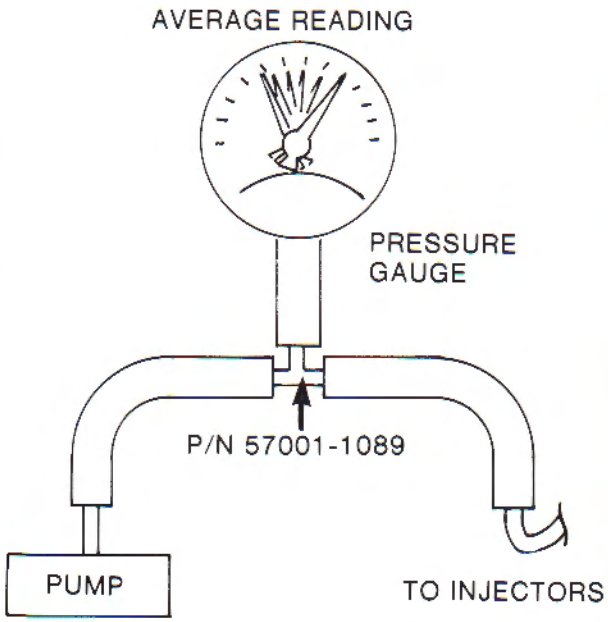


- Pull the right side cover off, and disconnect the high-pressure fuel hose from the fuel pump outlet.

WARNING **When the fuel hose is pulled off, a small amount of fuel may spout out because of residual pressure in the fuel line. Cover the hose connection with a clean cloth to prevent the fuel from flying about.**

- Install the pressure gauge (special tool) between the fuel pump and the hose disconnected using the adapter (special tool) and high-pressure fuel hose.
- Tighten the hose clamps in the correct position.





- Install the fuel tank.

WARNING **Do not attempt to start the engine while the fuel hoses are disconnected.**

- Start the engine, and read the gauge.

Engine idling, gauge reads 2.2 to 2.4 kg/cm^2 (31 to 34 psi)

The moment the throttle is fully opened, the gauge reads 2.4 to 2.6 kg/cm^2 (34 to 37 psi)

If engine will not start, remove air cleaner and push air flap. Pressure gauge reads 2.4 to 2.6 kg/cm^2 (34 to 37 psi)

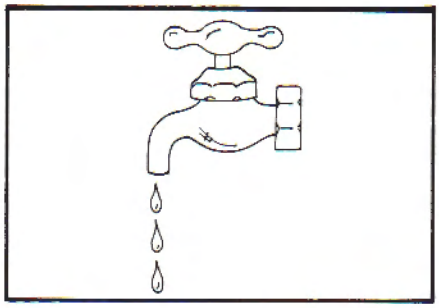
Pressure is too low or too high.

Turn page to TEST 8.

Go to TEST 21, page 47.

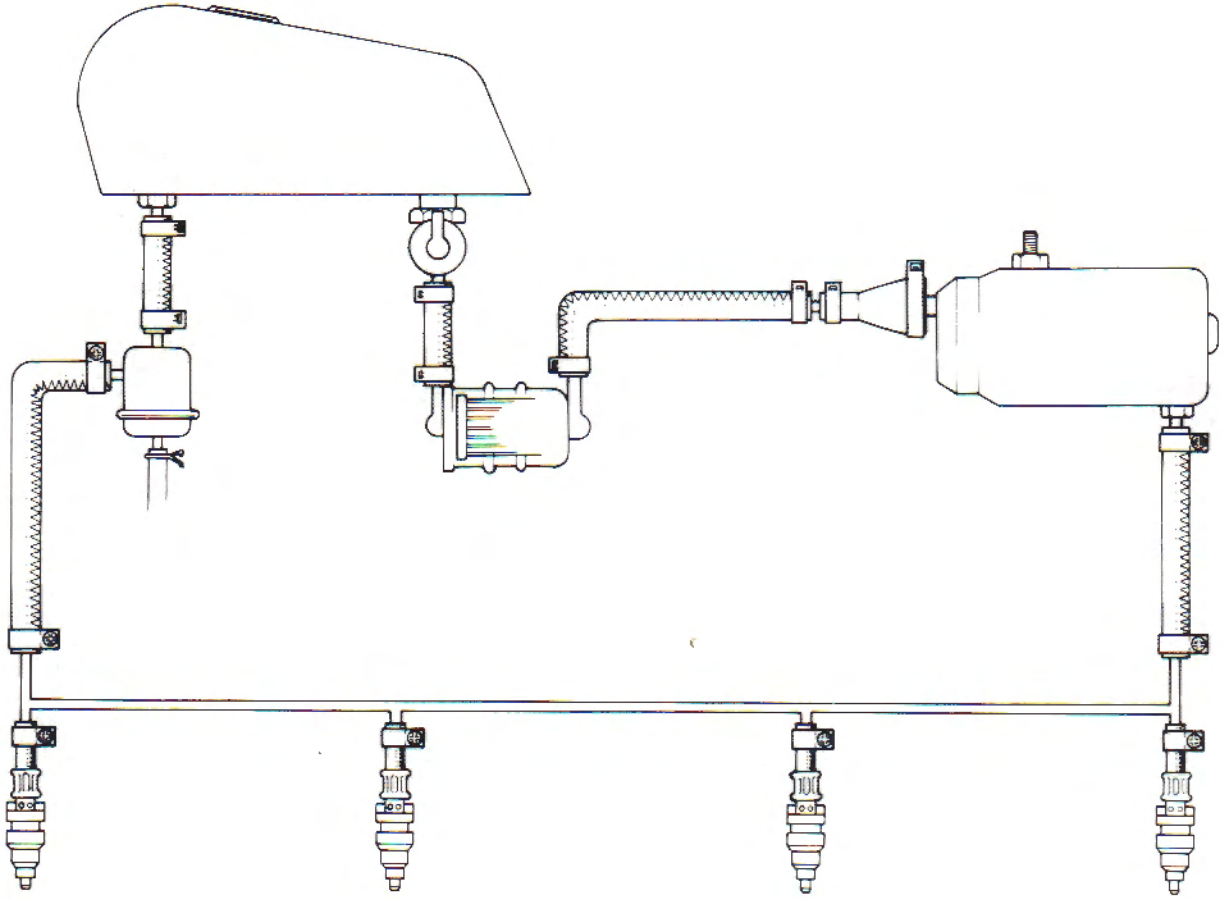
FUEL SYSTEM LEAK INSPECTION

TEST 8



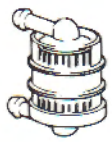
Inspect the connections between the parts shown below for leaks.

No leaks	*Leaks*
Turn page to TEST 9.	Repair leaks. NOTE: Use genuine Kawasaki parts or equivalent.



FUEL FILTER INSPECTION AND FUEL SYSTEM CLEANING

TEST 9



WARNING

1. **Clean the fuel system in a well-ventilated area, and take ample care there are no sparks or flame anywhere near the working area.**
2. **Never clean out the fuel system when the engine is still warm.**
3. **Wipe any fuel off the engine before starting it.**

Inspect the fuel filter for proper installation, water, debris, and damage.

No water, debris, or damage. Properly installed.

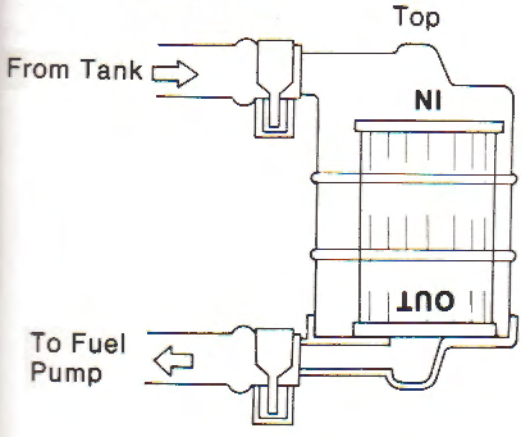
Turn page to TEST 10.

Water or debris in filter or filter damaged.

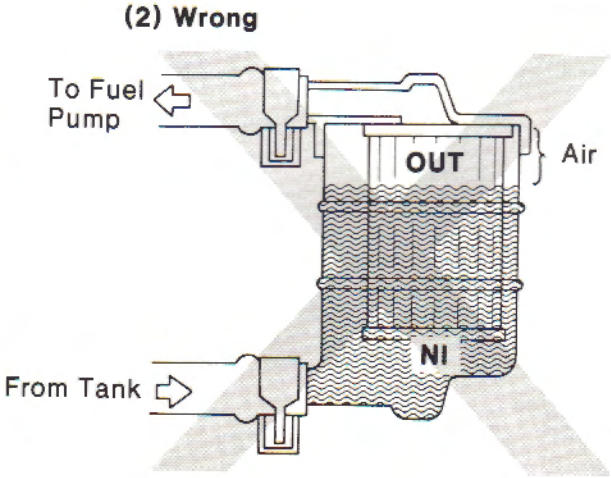
- Remove the fuel tank and drain it.
- Remove the fuel tap from the tank, and clean the fuel tap filter with a high flash-point solvent.
- Flush out the fuel tank with a high flash-point solvent.
- Clear the air vent in the tank cap with compressed air.
- Remove the fuel pump, fuel injectors, fuel distributing pipe, and pressure regulator; and clean them using a high flash-point solvent.
- Replace the fuel filter and hoses with new ones.
- Install the parts on the motorcycle. Use new hose clamps.

Fuel Filter Installation

(1) Good

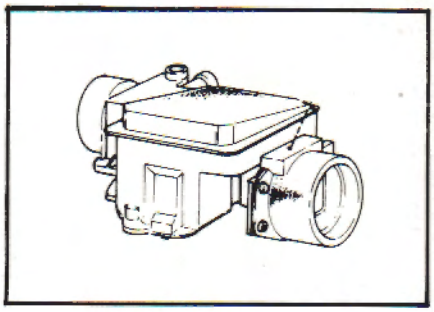


(2) Wrong

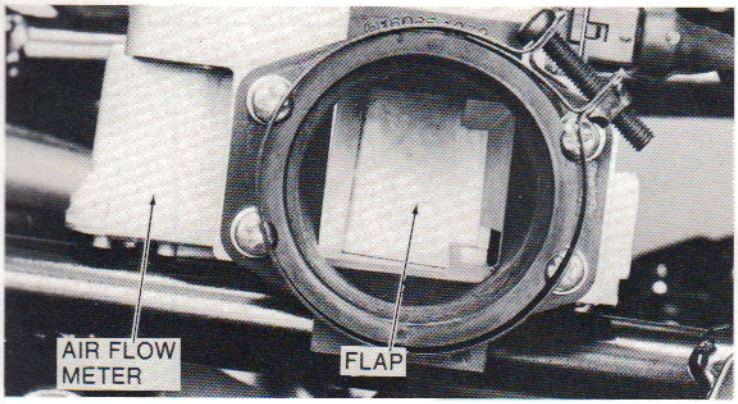


AIR FLOW METER FLAP INSPECTION

TEST 10



- Remove the air flow meter.
- Check the air flamp movement by pushing it from the air cleaner side.



Flap swings smoothly without binding, returns to rest position by itself.

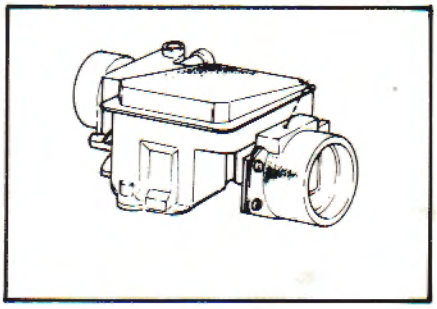
Turn page to TEST 11.

Flap does not move smoothly, or does not return to the closed position by itself.

Replace Air Flow Meter.

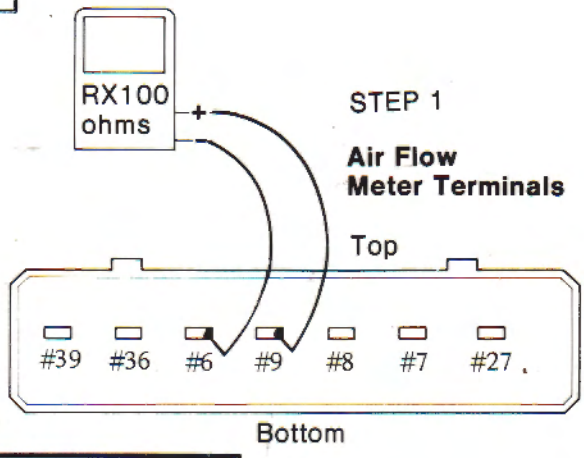
TEST 11

AIR FLOW METER POTENTIOMETER INSPECTION



- Turn off the ignition switch.
- Disconnect the 7-pin connector from the air flow meter.

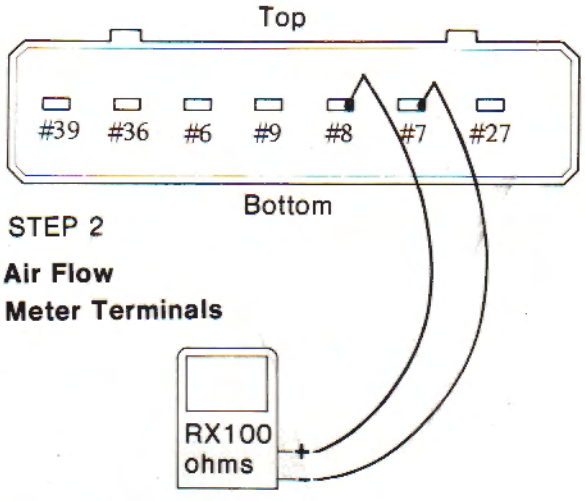
STEP 1. Make the connections shown at right.



350 to 400Ω

Less than 350 or more than 400Ω

Replace air flow meter.



STEP 2. Make the connections shown at right.

Any values other than 0 or ∞Ω with flap in any position.

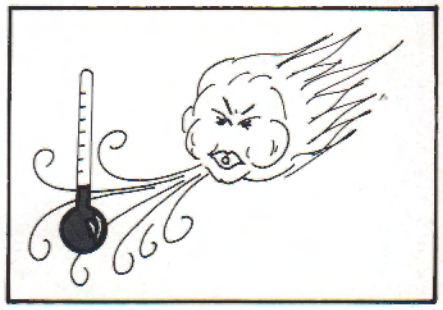
0 or ∞Ω flap in any position.

Turn page to TEST 12.

Replace air flow meter.

AIR TEMPERATURE SENSOR INSPECTION

TEST 12



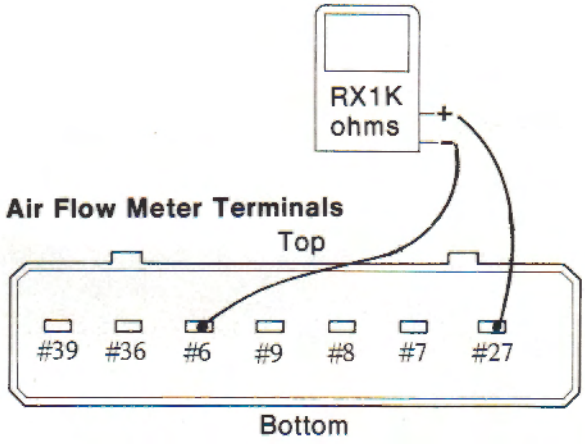
- Turn off the ignition switch, and disconnect the 7-pin connector from the air flow meter.
- Connect an ohmeter to the air flow meter terminals as shown at right.

2.1 to 2.9 KΩat 20°C (72°F)

Turn page to TEST 13.

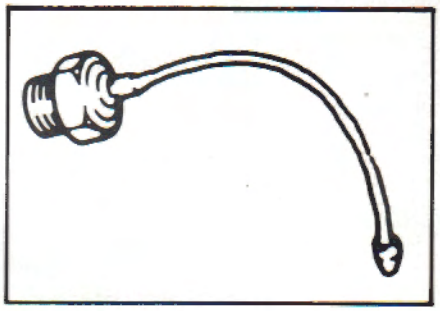
Less than 2.1 or greater than 2.9 KΩat 20°C (72°F)

Replace the Air Flow Meter.

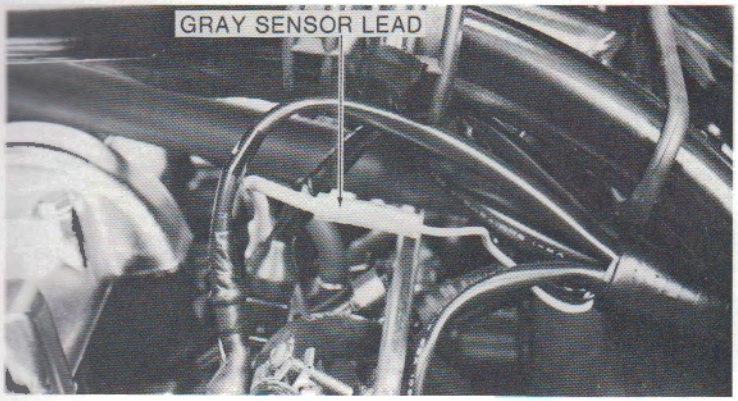


ENGINE TEMPERATURE SENSOR INSPECTION

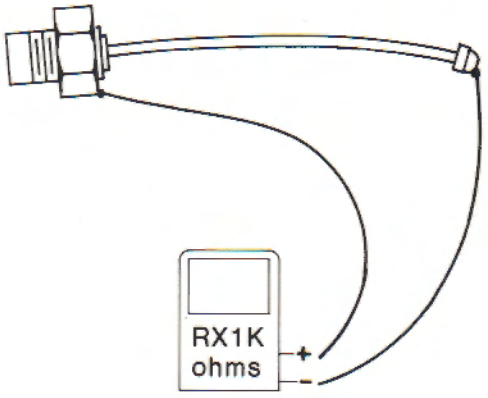
TEST 13



- Remove the fuel tank.
- Turn off the ignition switch, and disconnect the lead of the engine temperature sensor.



- Measure the resistance of the sensor with an ohmeter. Make the connections as shown at right.



2.1 to 2.9 KΩ at 20°C (72°F)

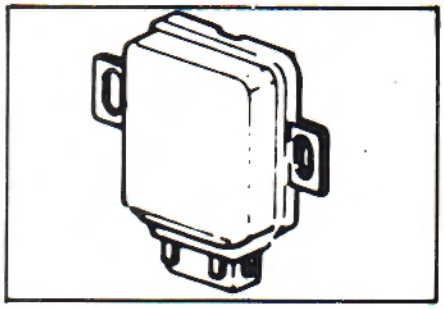
Turn page to TEST 14.

Less than 2.1 or more than 2.9 KΩ at 20°C (72°F)

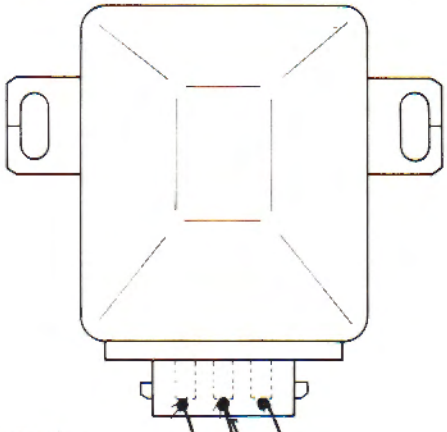
Replace Engine Temperature Sensor.

TEST 14

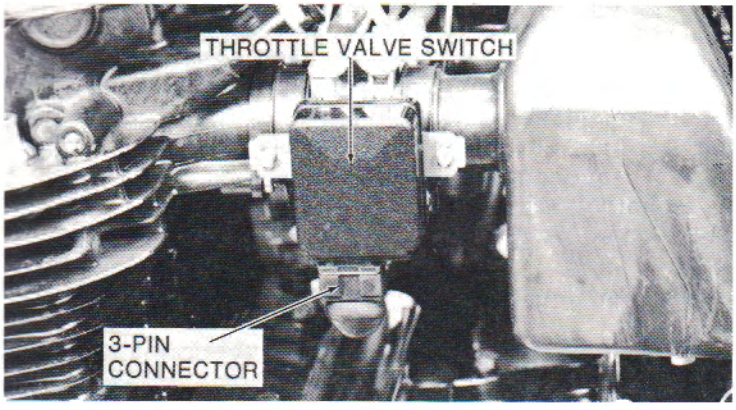
THROTTLE VALVE SWITCH INSPECTION



Throttle Valve Switch Terminals



- Turn off the ignition switch, and disconnect the 3-pin connector from the throttle valve switch.



- Connect an ohmeter to the throttle valve switch as shown at right.

STEP 1
Make connections shown at right. Move throttle.

Throttle Released = 0 Ω
Throttle fully open = ∞Ω

Go to STEP 2.

Throttle Released = greater than 0 Ω
Throttle fully open = less than ∞Ω

Replace Throttle Valve Switch.

STEP 2.
Make connections shown at right. Move throttle.

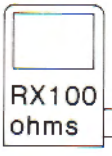
Throttle released = ∞Ω
Throttle fully open = 0 Ω

Turn page to TEST 15.

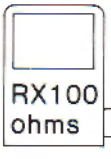
Throttle released = less than ∞Ω
Throttle fully open = greater than 0 Ω

Replace Throttle Valve Switch.

STEP 1

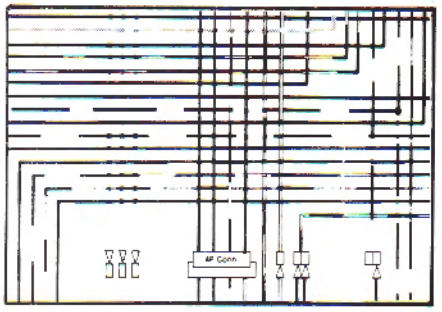


STEP 2



TEST 15

HARNESS INSPECTION



If each component checks out good upon individual inspection, but the system does not work well when they are connected together, inspect the harness for the Electronic Fuel Injection system as follows:

- Remove the harness.
- Make sure all connectors are clean and tight.
- Examine wires for signs of burning, fraying, etc.
- Check conductivity of the wires in the harness. Both ends of the same color wire should conduct.
- Check the O-ring in the multi-pin connectors for damage, and check the retaining clip of the connector for deformation.

Harness is in good condition.

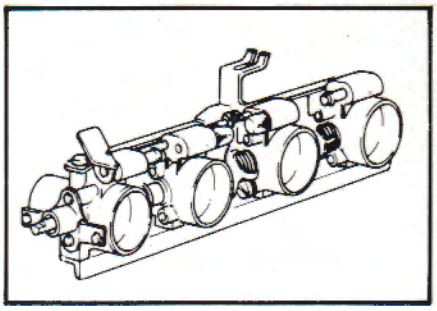
Turn page to TEST 16.

Harness is in poor condition.

Replace the Fuel Injection Wiring Harness.

THROTTLE VALVES LINK MECHANISM INSPECTION

TEST 16



- Check the throttle valve and the fast idle link mechanism for smooth operation.

Throttle valves and fast idle mechanism work smoothly.

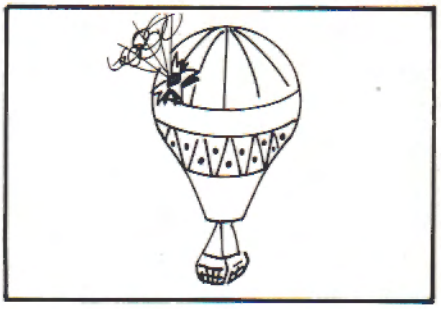
Turn page to TEST 17.

Throttle valves or link mechanism bind, or do not operate properly.

Replace the problem parts and go to TEST 22, page

AIR LEAK INSPECTION

TEST 17

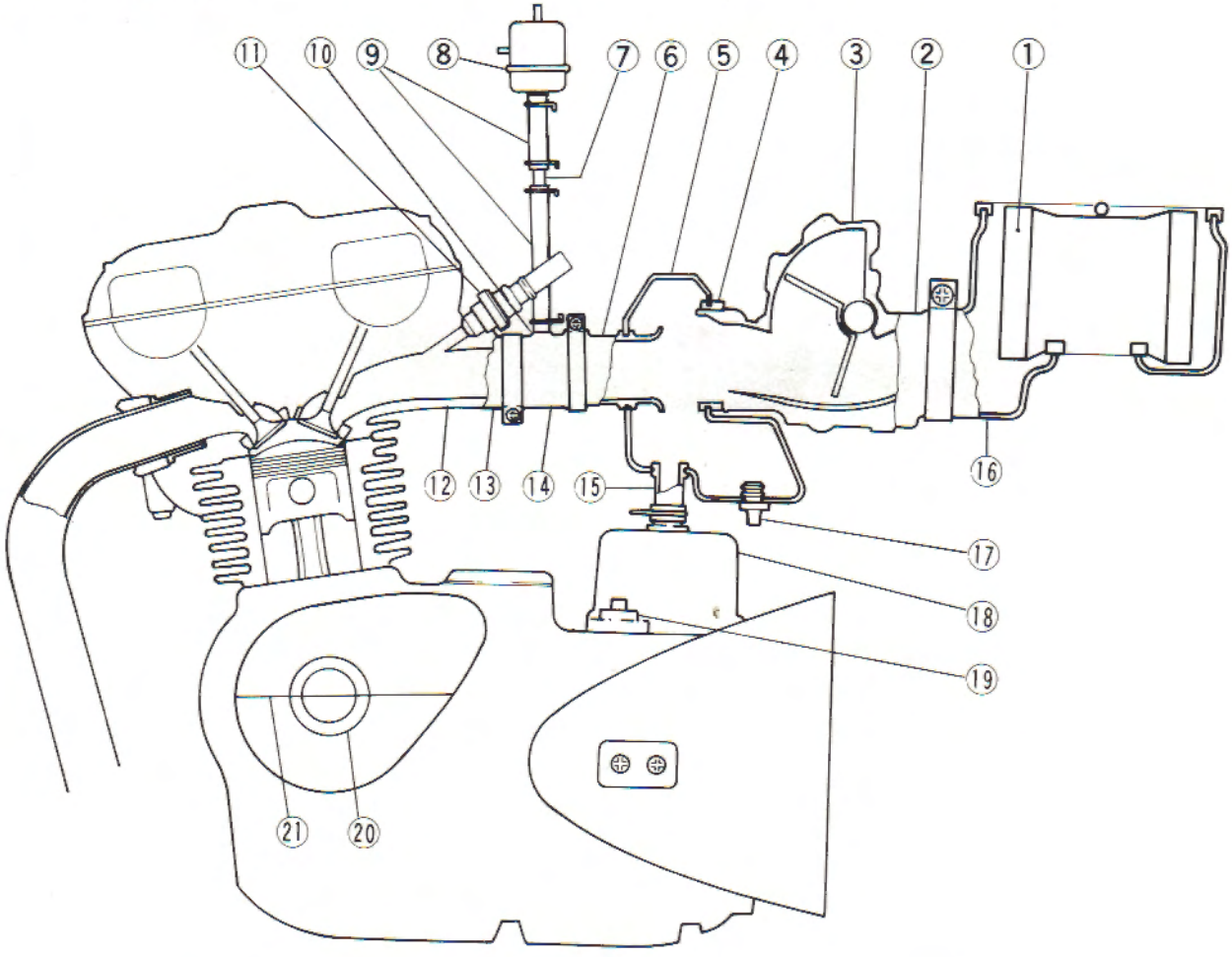


- Inspect the connections between the parts shown for air leaks.

No air leaks. → Replace Control Unit

Air leaks → Replace problem parts

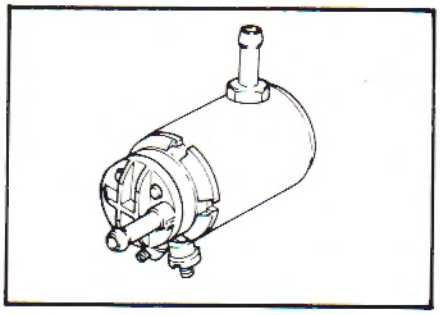
Air Leak Inspection



1. Air Cleaner Element
2. Rubber Fitting
3. Air Flow Meter
4. Rubber Seal
5. Surge Tank
6. Air Ducts
7. 3-Way Joint
8. Pressure Regulator
9. Vacuum Hoses
10. Rubber Caps (on hose fittings)
11. Fuel Injectors
12. Cylinder Head
13. Throttle Valve Holders
14. Throttle Valves
15. Breather Hose
16. Air Cleaner Housing
17. Drain Plug
18. Breather Cover
19. Oil Filler Cap
20. Oil Seal (on crankshaft right end)
21. Others (mating surfaces, etc.)

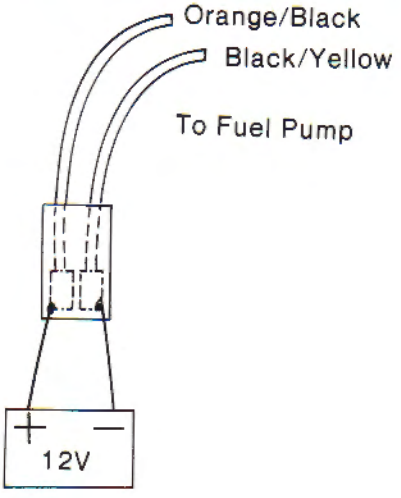
OUT-OF-CIRCUIT FUEL PUMP INSPECTION

TEST 18



- Disconnect the 2-pin connector of the fuel pump under the left side cover.

- Connect a 12-volt battery to the 2-pin connector (pump side), and check whether the pump operates.



Pump runs

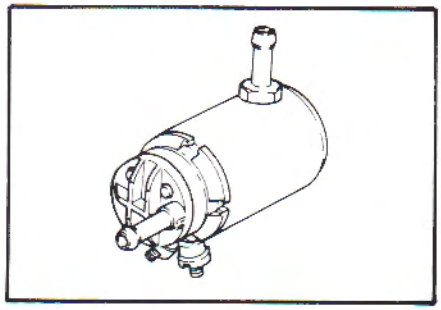
Turn page to TEST 19

Pump does not run

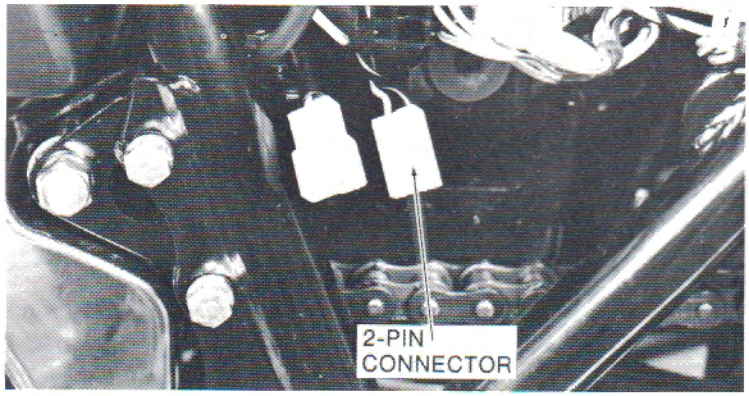
Check pump leads and replace problem parts. Repeat TEST 18.

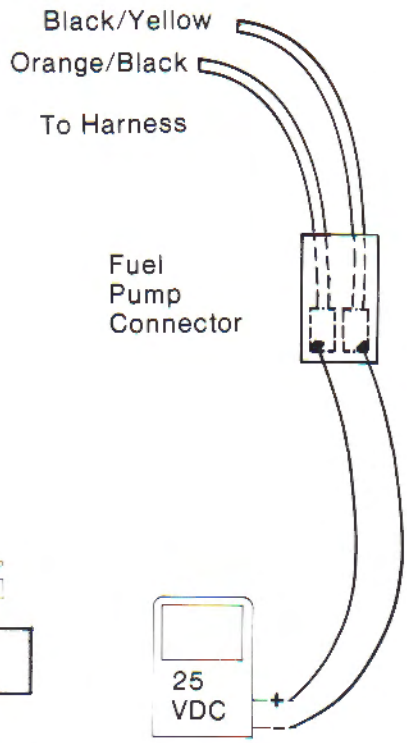
FUEL PUMP CIRCUIT INSPECTION

TEST 19



- Remove the air cleaner element.
- Connect a voltmeter to the 2-pin connector (harness side), as shown at right.





STEP 1
- Ignition switch "ON".
- Starter Button "Pushed".
- Clutch lever "Pulled".

Battery voltage (12 to 14 volts)

No battery voltage

Go to TEST 2, page 9, and TEST 3, page 11.

STEP 2
- Ignition Switch "ON".
- Air Flow Meter Flap "Pushed".

Battery voltage (12 to 14 volts)

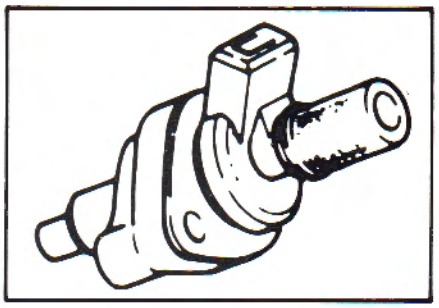
No battery voltage

Go to TEST 2, page 9.

Go to TEST 4, page 13, and TEST 3, page 11.

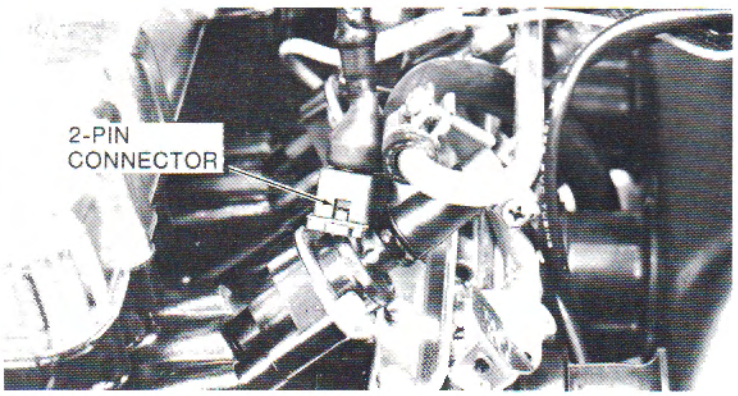
FUEL INJECTER SIGNAL INSPECTION

TEST 20



WARNING **Do not attempt to start the engine while the fuel hoses are disconnected. fuel will spout from the fuel line if you attempt to start the engine with the fuel hoses disconnected.**

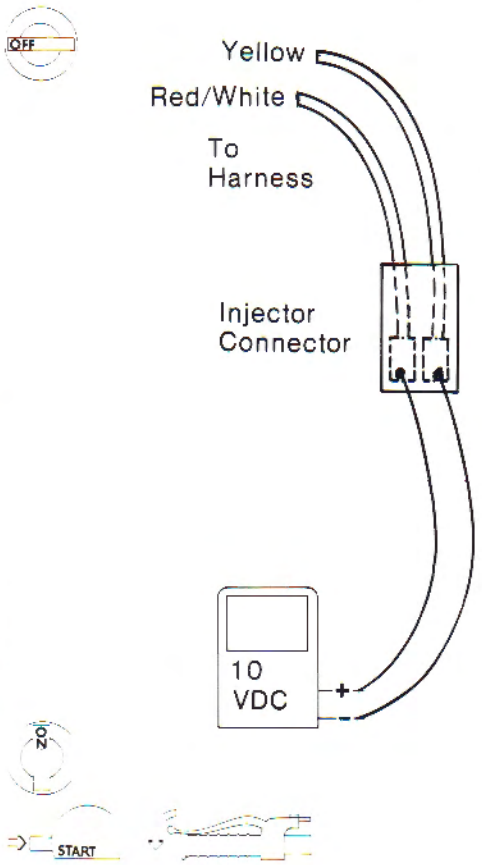
- Remove the fuel tank and disconnect all of the 2-pin connectors from all the injectors.



- Install the fuel tank, and connect the fuel hoses to the tank.
- Make the connections shown at right.

CAUTION **The white/red leads in the 2-pin connectors are connected directly to the battery positive (+) terminal even when the ignition siwtch is off, so take care not to short the test leads to the chassis ground.**

- Crank the engine with the starter motor and watch meter needle.



Meter needle flickers at regular intervals.

Replace injector.

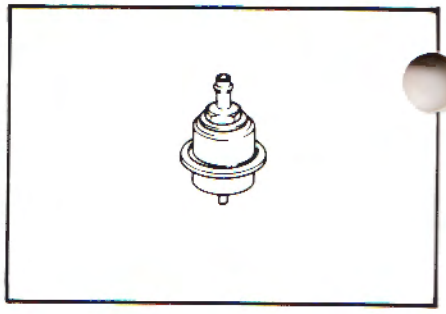
Meter needle does not flicker at regular intervals.

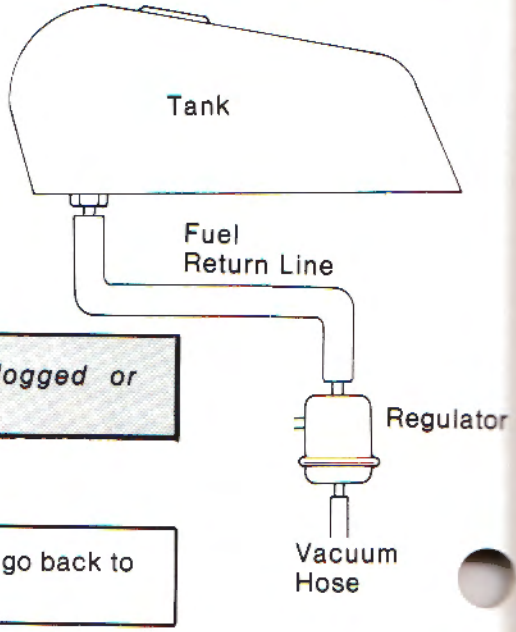
Check wiring and connectors.

REPEAT TEST FOR ALL INJECTORS!

TEST 21

PRESSURE REGULATOR INSPECTION



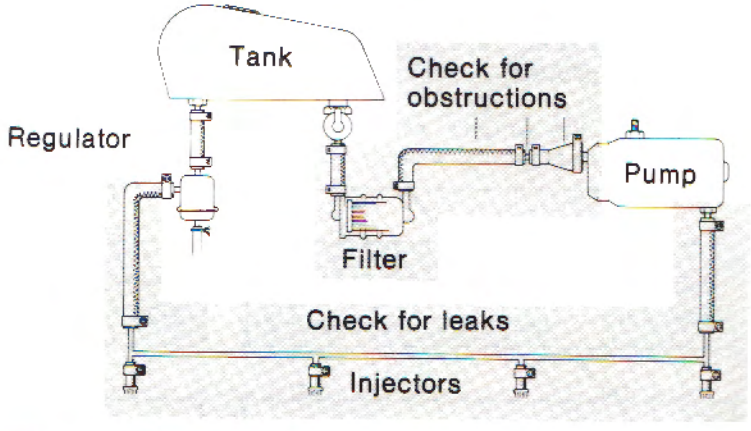


Pressure too high — start here.

- Check the fuel return line for obstructions.
- Check the vacuum hose for air leaks.

Fuel Return Line open and no air leaks → Replace pressure Regulator and go back to TEST 7, page 19.

Fuel Return Line clogged or Vacuum Hose leaking → Replace bad parts and go back to TEST 7, page 19.



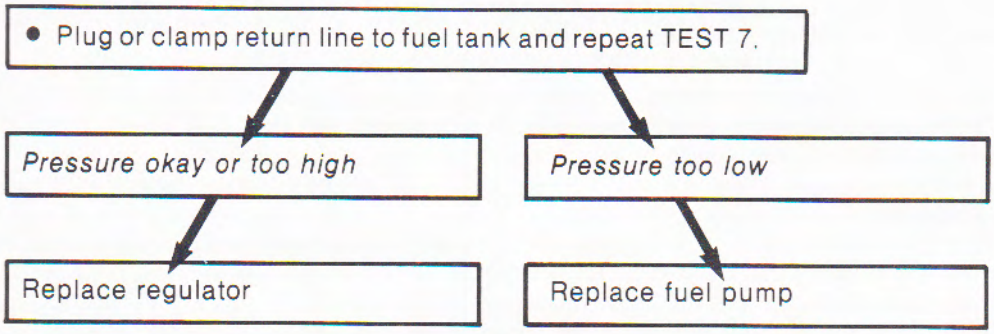
Pressure too low — start here.

- Check fuel hose from fuel tap to pump inlet for obstructions.
- Check high pressure fuel lines for leaks.

No leaks or obstructions → Go to top of page 47.

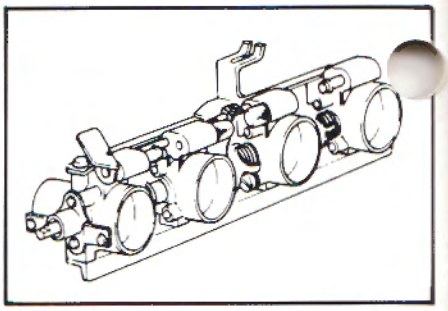
Leaks or obstructions → Replace problem parts and go back to TEST 7, page 19.

Pressure too low — continued.



TEST 22

THROTTLE VALVE SYNCHRONIZATION INSPECTION

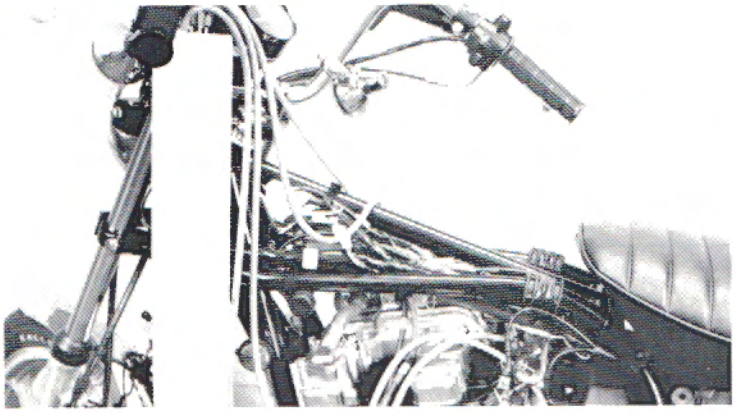


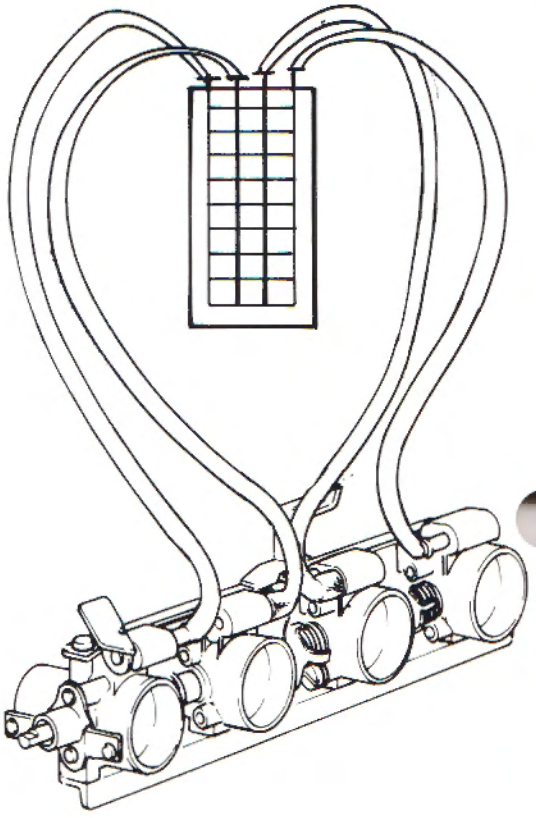
If one of the throttle valves is replaced, or if combustion varies from cylinder to cylinder, synchronize the throttle valves.

NOTE: These procedures are explained on the assumption that the intake and exhaust systems of the engine are in good condition.

Checking engine vacuum:

- Warm up the engine thoroughly.
- Remove the fuel tank and put it on the work bench near the motorcycle on the same level as the original position.
- Pull off the two vacuum hoses for the pressure regulator and the two rubber caps from the fittings on the throttle valves.
- Attach the vacuum gauge (special tool) to the fittings.





- Using suitable hoses, connect the fuel tap to the fuel filter, and the check valve to the pressure regulator.
- Start the engine, and let it idle.
- Adjust the idle speed.
- Note the gauge readings.

All cylinders are within 3 cm Hg of each other.

Throttles are synchronized.

One or more cylinders are more than 3 cm Hg away from the others.

Synchronize throttles, page 49.

THROTTLE VALVE SYNCHRONIZATION PROCEDURE

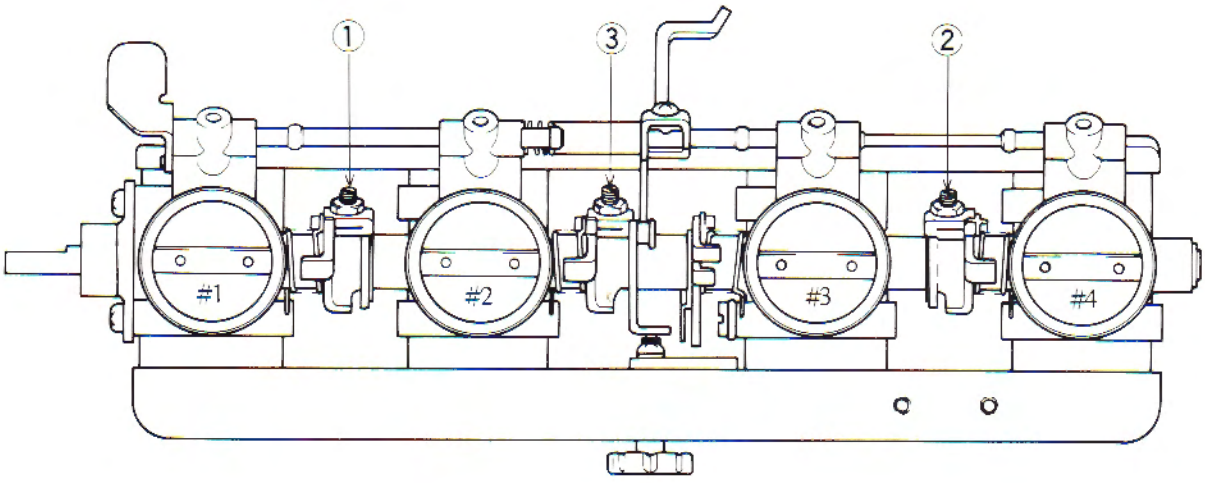
- Stop the engine.
- To change the vacuum, open the throttle, loosen the locknut, and turn the balance adjusting screw.

NOTE: 1. Loosen the locknut with the throttle valves opened.

NOTE: 2. First synchronize the left two or right two cylinders by means of the adjusting screw ① or ② between No. 1 and No. 2 cylinders, or No. 3 and No. 4 cylinders. Then synchronize the left two cylinders and the right two cylinders using the center adjusting screw ③. Adjust the idle speed as necessary.

- Tighten the locknuts.
- Open and close the throttle a few times to make sure that the throttle valves are synchronized. Readjust if necessary.
- Install all parts previously removed, and adjust the idle speed.

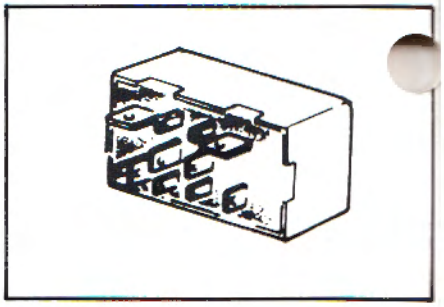
Adjusting Screw for Synchronization



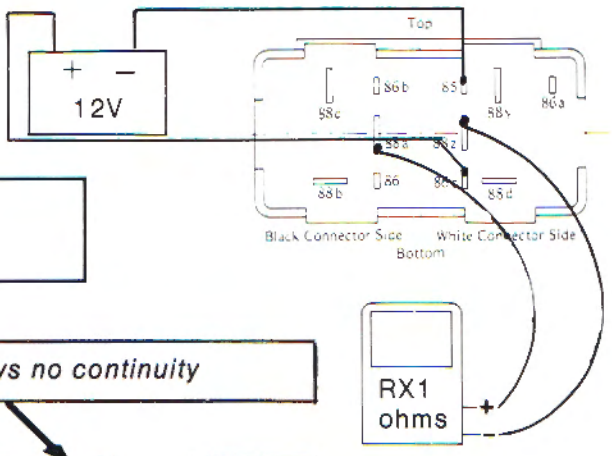
1. Left Adjusting Screw: Turn this screw clockwise to lower No. 1 cylinder vacuum.
3. Center Adjusting Screw: Turn this screw clockwise to lower No. 1 and No.2 cylinder vacuum simultaneously.
2. Right Adjusting Screw: Turn this screw clockwise to lower No. 4 cylinder vacuum.

TEST 23

RELAY INSPECTION



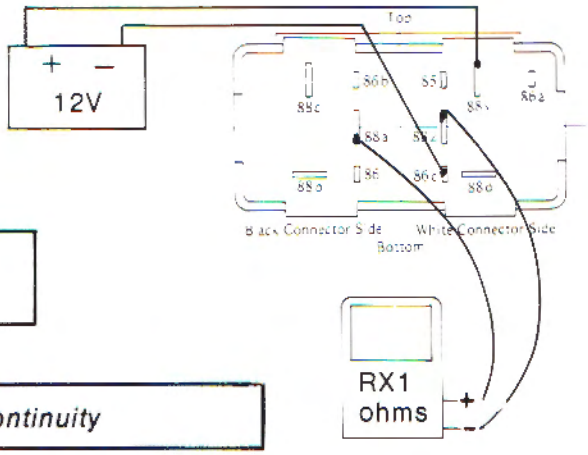
The relay is divided into two parts: the main relay and the fuel pump relay. The two parts are tested in eight separate steps. Before starting the inspection procedure, prepare a twelve volt battery with auxiliary leads, and remove the relay.



STEP 1
Make the connections shown at right.

Meter shows continuity → Go to STEP 2.

Meter shows no continuity → Replace relay

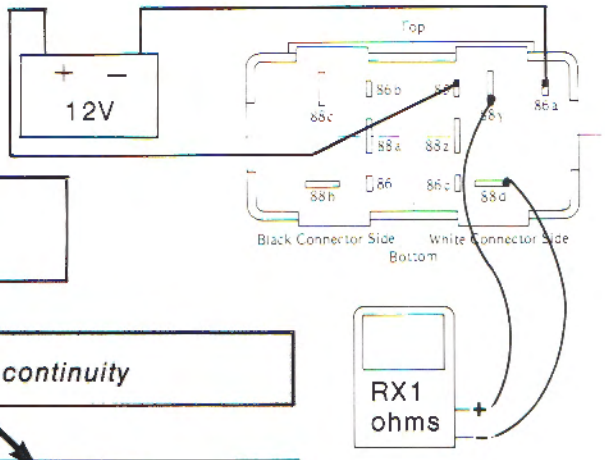


STEP 2
Make the connections shown at right.

Meter shows no continuity → Go to STEP 3.

Meter shows continuity → Replace relay

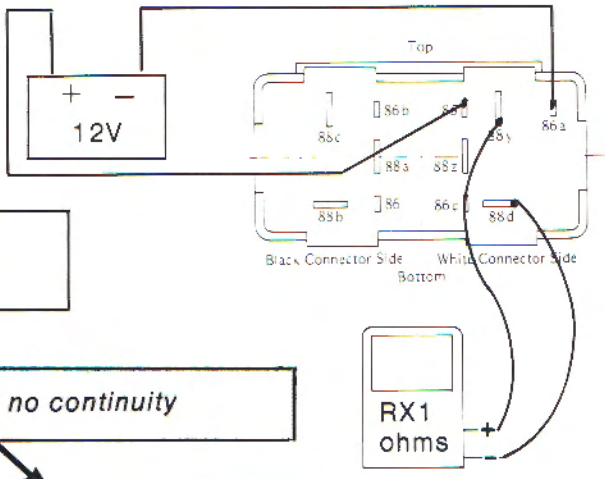
STEP 6
Make the connections shown at right.



Meter shows no continuity → Go to STEP 7

Meter shows continuity → Replace relay

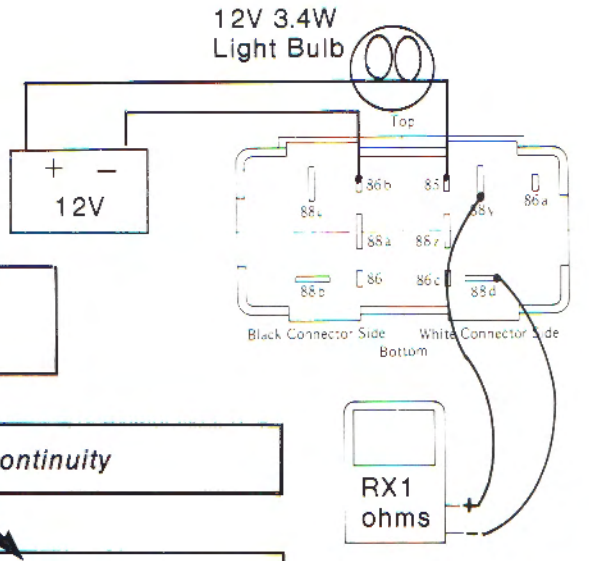
STEP 7
Make the connections shown at right.



Meter shows continuity → Go to STEP 8.

Meter shows no continuity → Replace relay

STEP 8
Make the connection shown at right.



Meter shows no continuity → Relay is okay. Check all connections and wiring.

Meter shows continuity → Replace relay