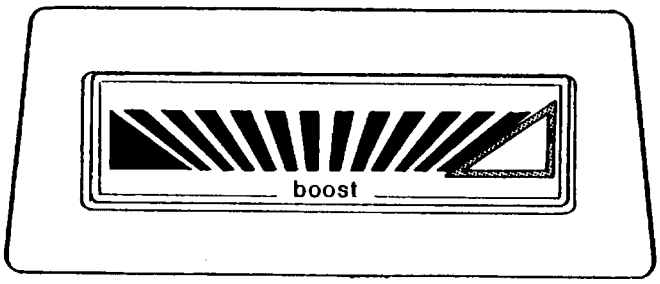
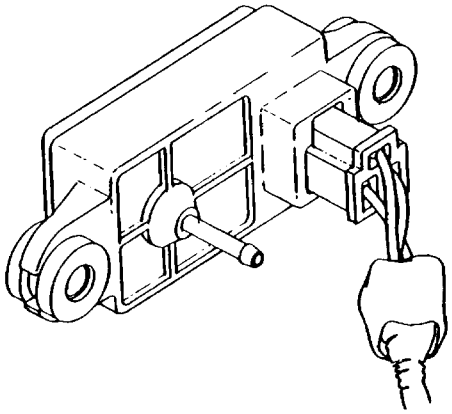
Kawasaki GPz750 Turbo Technical Training Manual

*This is Part II of the **Kawasaki GPz 750 Turbo** Technical Training Manual. Part I, featured in* Turbo News *#24, dealt with turbocharger theory and operation. Part II gets into the actual troubleshooting of this system. Thanks again to Jill A. Dunning of Kawasaki's Consumer Services Dept. for supplying the TMIOA with this manual.*

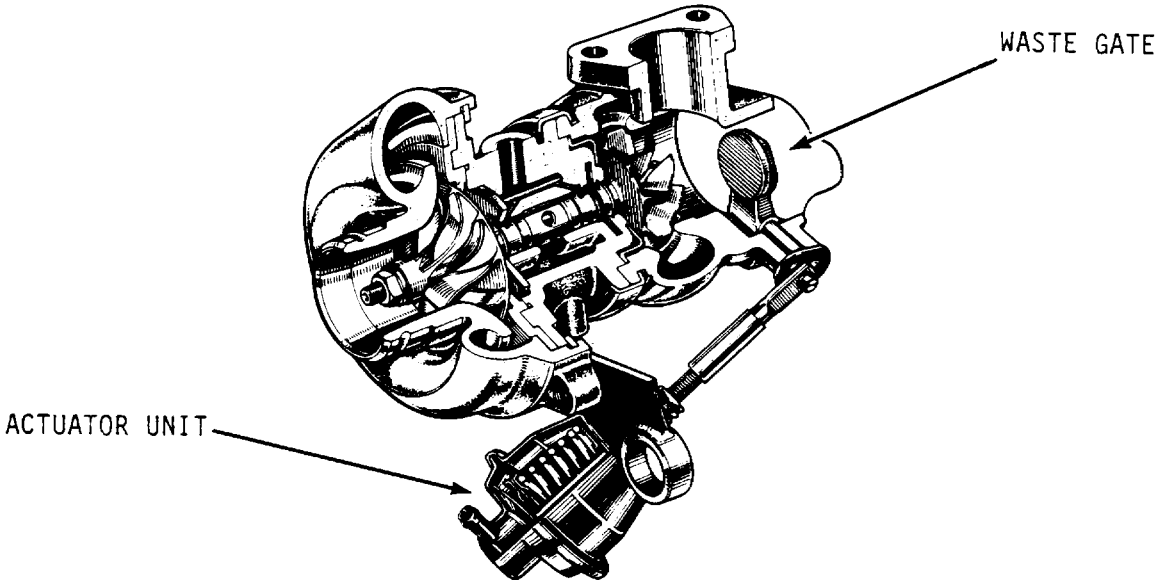
TABLE OF CONTENTS



BOOST GAUGE



BOOST SENSOR



INTRODUCTION

Failures in the turbocharger system could include:

- A damaged or seized turbocharger unit.
- Leaks in the pressurized passages, connectors or chambers.
- A leaking wastegate valve or failed wastegate actuator.
- A failed pressure sensor, or inaccurate boost gauge.

If a 750 Turbo exhibits poor top end performance and/or abnormal boost gauge readings, the customer and possibly the dealership technician will most likely suspect the turbocharger unit itself of causing the problem. However, unless there is other evidence that the turbocharger itself is the problem, there are other tests that should be performed before the turbocharger is inspected.

NOTE:

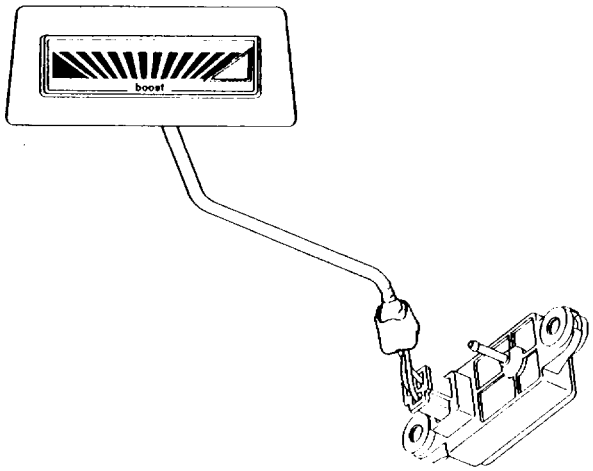
As in all 2-stroke and 4-stroke engines, when poor performance exists or is suspected, the condition of the engine (top end) should be checked with a compression test before any other time consuming diagnostic work is done. Once it is determined the top end of the engine is in good shape, the turbocharger system can be checked.

BOOST SENSOR PRESSURE TEST

If the turbocharger unit is not functioning properly, or if there is a substantial air leak in the pressurized part of the intake tract, or if the wastegate is leaking or opening prematurely, the boost gauge should indicate lower than normal readings. (However, if turbo performance is only slightly below normal, it may be difficult to detect this on the boost gauge while riding the motorcycle.)

If the boost gauge obviously reads lower than normal or higher than normal (higher than normal would be if the far right hand triangular section lights up), check the operation of the boost sensor as follows.

Remove boost sensor from the back of the surge tank, and pull it out disconnecting the small hose at the bottom of the sensor but leaving the wire harness connected.



Turn the ignition switch "ON." Using a standard crankcase pressure tester, pressurize the sensor through the small fitting on the bottom of the sensor and observe the LCD boost gauge. There are twelve segments on the boost gauge (not including the large triangular segment at the far right) all of which should be lit at about 10 psi.

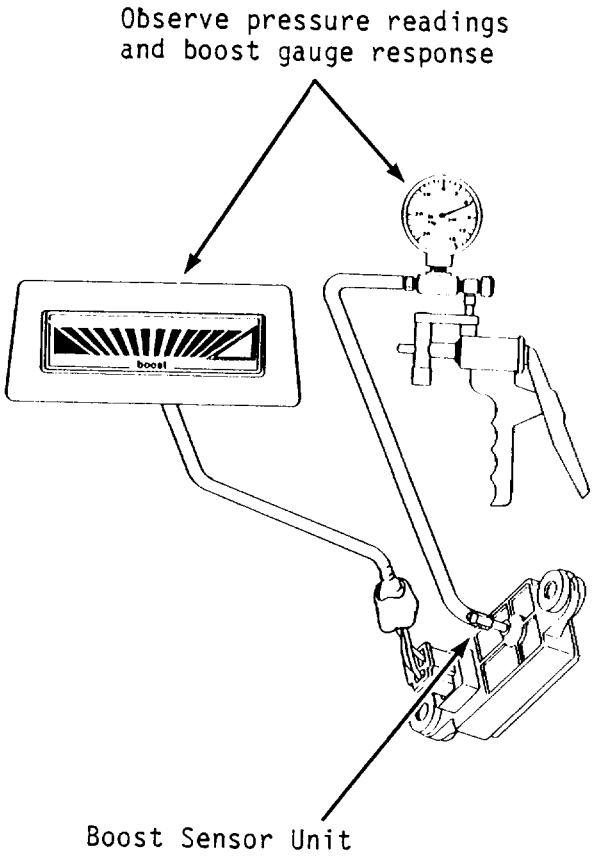
As pressure is increased from "0" boost (atmospheric), the segments should light up successively at approximately 0.8 - 1.0 psi increments. The final triangular segment which does not light during normal vehicle operation will light at about 12.0 - 12.5 psi.

If the gauge segments DO NOT follow these guidelines, perform the Boost Sensor Voltage Test. If the gauge segments DO follow these guidelines, perform the Turbo System Tests.

NOTE:

The first boost indicating segment (the first long thin segment) lights at very low pressure, usually less than 0.5 psi boost. Because of manufacturing tolerances and variations in atmospheric pressure, this segment will sometimes light as the ignition is turned on and/or when the engine is at very low RPM. This condition does not indicate a failure and does not necessitate replacement of parts.

BOOST SENSOR VOLTAGE TEST



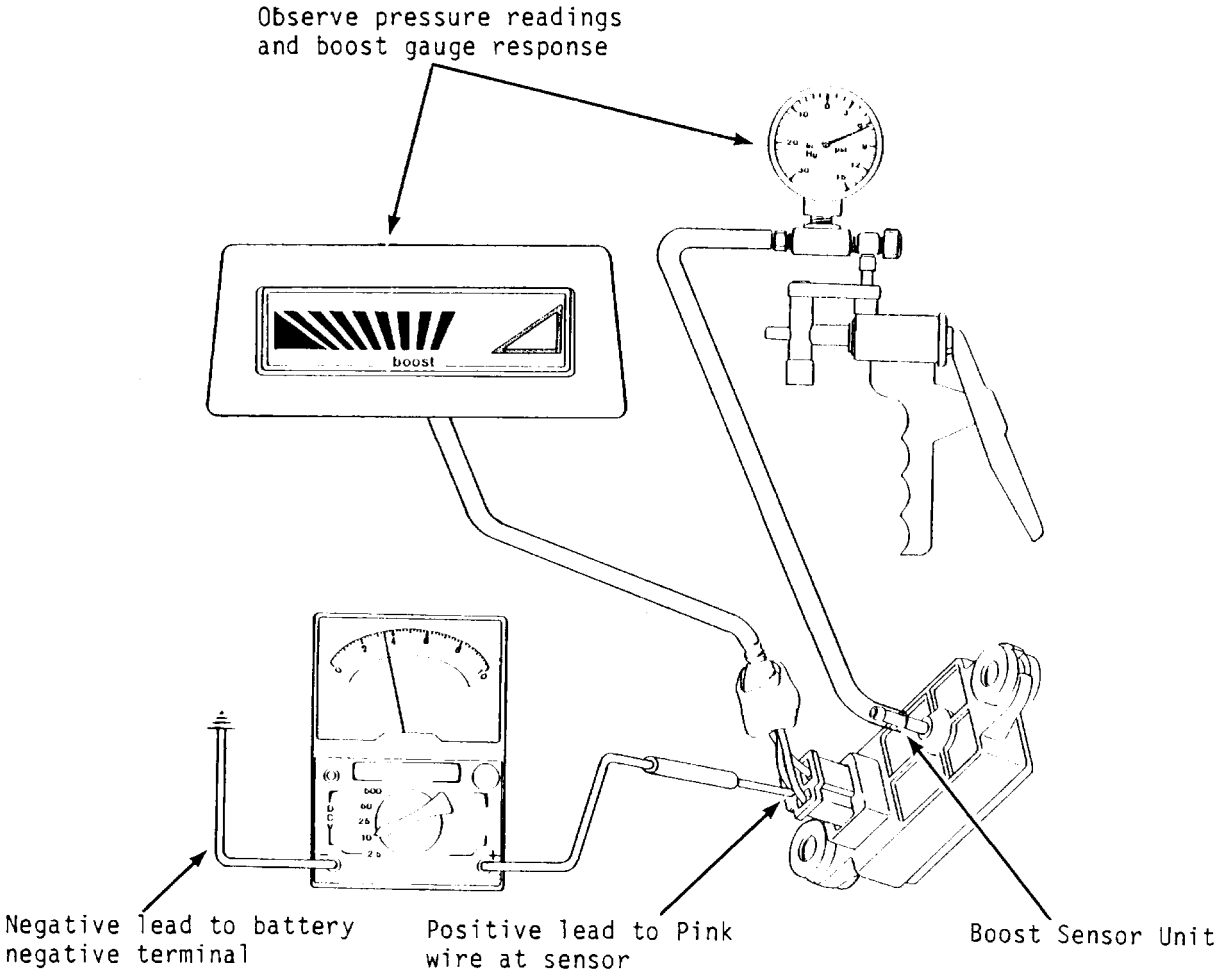
Check voltage at blue/orange wire.

Check the voltage on the pink wire with the positive meter lead to the pink wire, and negative lead to the negative battery terminal. This test is done with the ignition "ON", and all boost gauge wires connected. Voltage on the pink wire with no boost pressure should be approximately 2.4 volts (DC).

Now with the crankcase pressure tester still attached to the sensor, slowly pump pressure into the sensor and observe the voltage on the pink wire as the boost gauge segments light up (see illustration below). The voltage should rise in smooth progression as pressure is increased and reach about 4.0 volts as the pressure reaches the design limit of 10 psi.

NOTE:

Voltage will continue to rise as pressure is increased, and reach approximately 4.4 volts at 12.0 - 12.5 psi.



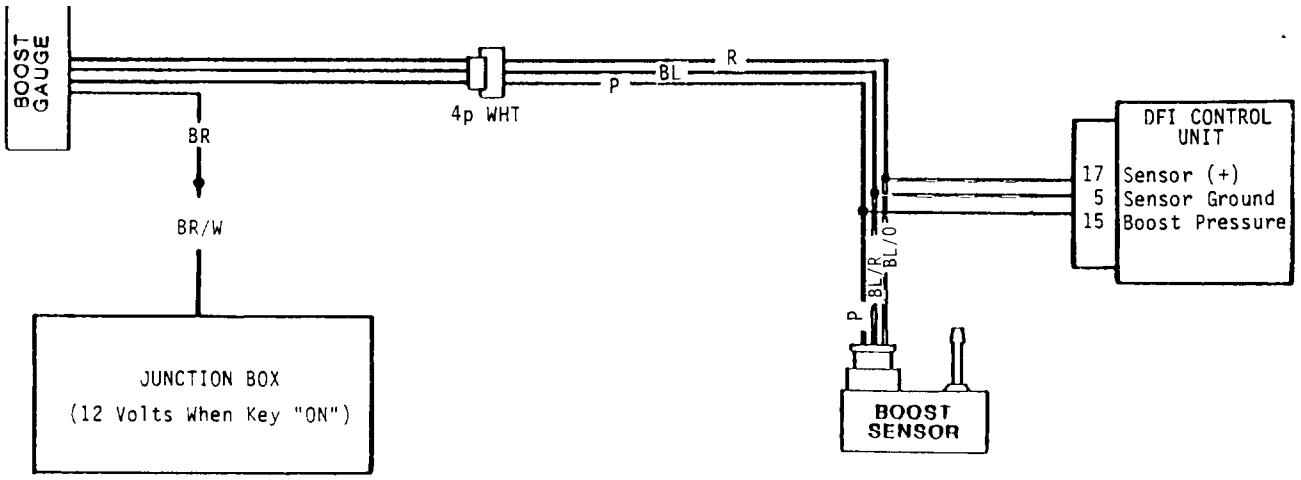
If this test proves good, but the Boost Sensor Pressure Test showed bad, check all the harness connections between the sensor and the gauge (see wiring diagram) and replace the gauge if all connections are good.

If this test proves bad but voltage on the blue/orange wire is as specified in the table below, replace the boost sensor.

TURBO SYSTEM TESTS

If the gauge segments DO follow the guidelines in the Boost Gauge Pressure Test, but the gauge does not operate normally under use (high or low readings), the turbocharger system should be checked as follows.

HIGH READINGS
(Far right hand triangular segment lights up during wide open throttle operation)



Wire Location	Connections	Meter Reading* (Criteria)	Test Items When Out of Criteria
o Boost Sensor Unit	o Meter (+) → Pink wire	o 0 V when ignition switch is OFF. **o 1.9-2.8 V when ignition switch is ON and 0 boost pressure.	o Blue/Orange wire o Replace Boost Sensor
	o Meter (+) → Blue/Red wire	o 0 V regardless of ignition switch positions.	o Blue/Red wire o Replace Control Unit
	o Meter (+) → Blue/Orange wire	o 0 V when ignition switch is OFF. o 7.2-8.8 V when ignition switch is ON.	o Blue/Orange wire o Boost Sensor (disconnect) o Control Unit power supply o Replace Control Unit

*Set the multimeter to 10 V DC range for this test.
**This is true when atmospheric pressure is 29.9 in. Hg (760 mm Hg)
1.7-2.5 V when atmospheric pressure is 26.5 in. Hg (674 mm Hg)
1.5-2.2 V when atmospheric pressure is 23.5 in. Hg (596 mm Hg)

This will happen if the system is producing more boost than the design limit of approximately 10 psi. It will actually take over 12 psi of boost to light the triangular segment if the sending unit and gauge are working correctly. Since the wastegate and actuator are responsible for limiting the boost pressure, these are the only items that need to be checked for this problem. Check as follows:

• Remove the lower exhaust system from the turbo unit exposing the turbine impeller and wastegate valve.

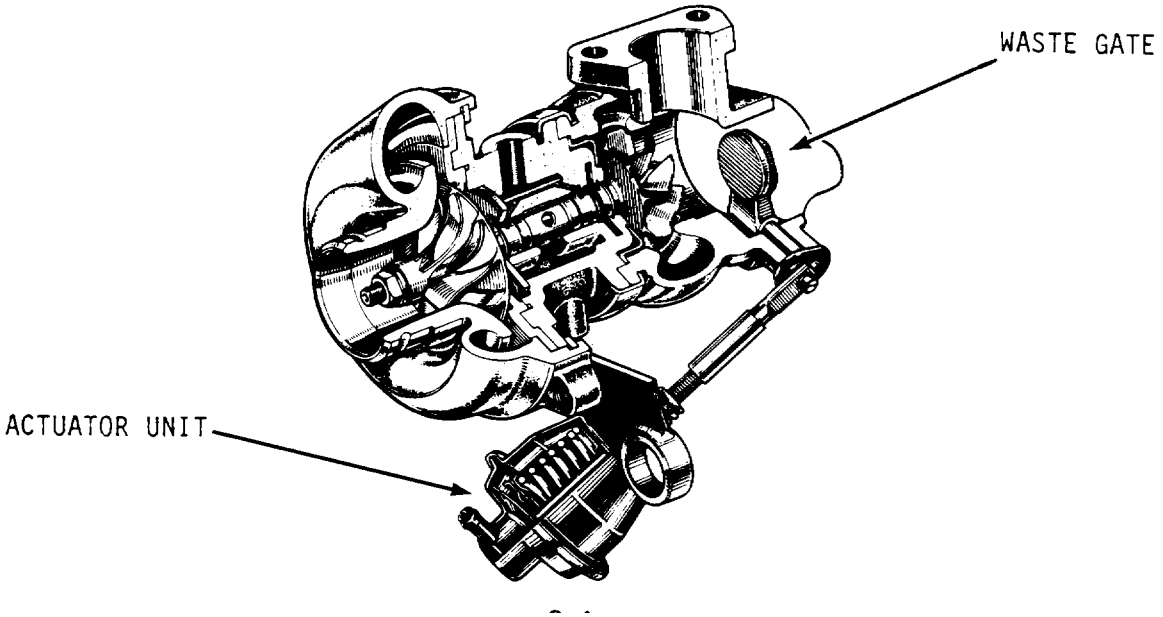
• Remove the actuator rod from the wastegate arm and check that the wastegate valve moves freely. Inspect the condition of the valve and seat for wear or excessive carbon build up.

• Remove the small pressure line from the wastegate actuator and attach a crankcase pressure tester to the fitting on the actuator.

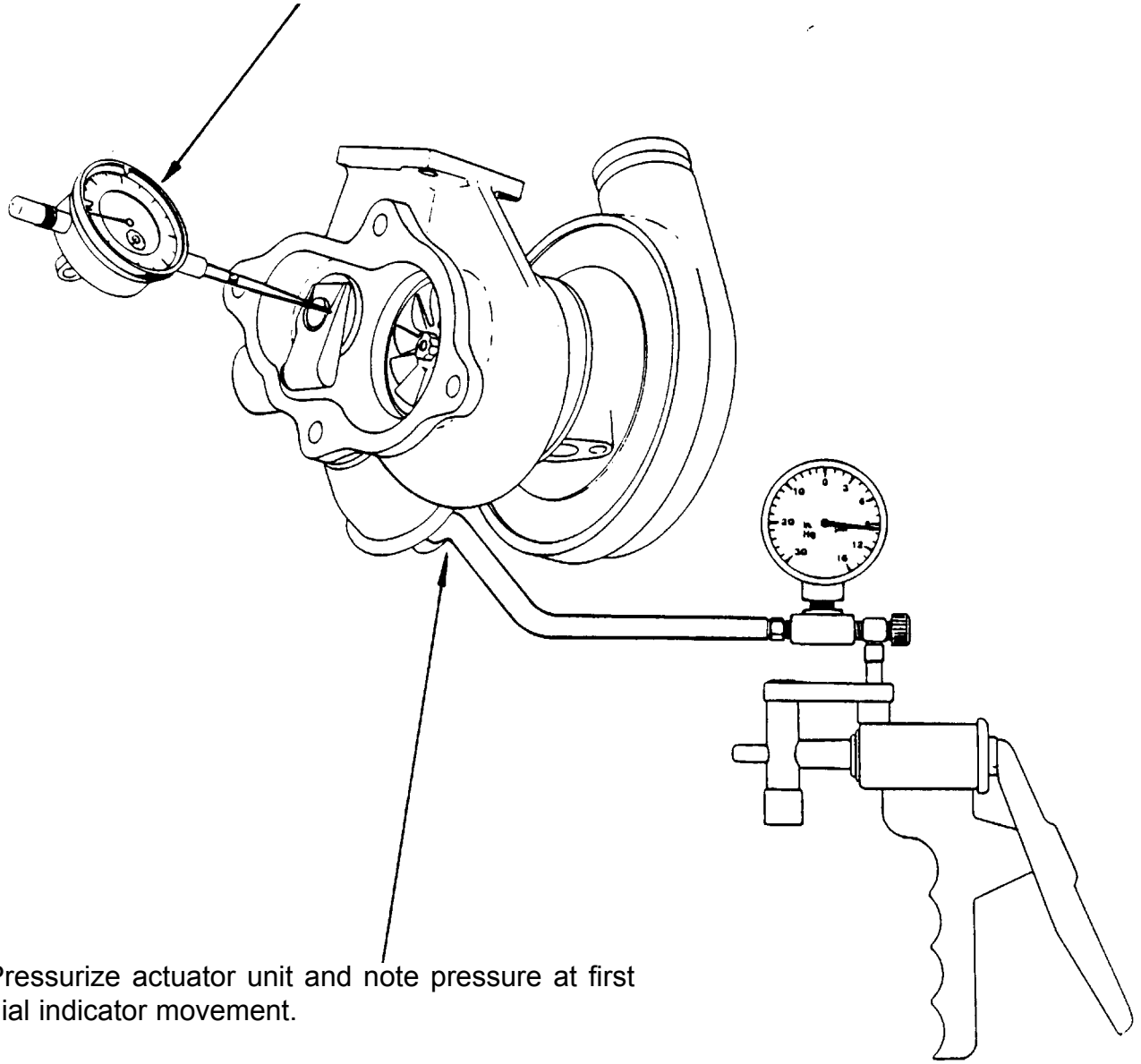
• Reattach the actuator rod to the wastegate arm and mount a dial indicator on the turbo housing in order to check movement of the wastegate valve. Pressurize the actuator with a crankcase tester until the wastegate shows movement.

At first movement of the valve, the pressure gauge should show approximately 7.5-10.5 psi. However, due to clearance in the wastegate valve pivot shaft, this quick test method is not extremely accurate but will suffice for diagnostic purposes. If absolute accuracy is required, the turbo unit must be removed from the vehicle in order to mount the dial indicator directly against the end of the actuator rod. When this method is used, check the pressure and dial gauge readings according to the following table.

Dial gauge read	Pressure gauge read
0.5 mm (0.02 in)	49-69 kPa (0.50 - 0.70 kg/cm^2, 7.1 - 10.0 psi)



Mount Dial indicator to show movement of wastegate valve. (Magnetic base mounts easily to gasket surface at turbine housing.)



Pressurize actuator unit and note pressure at first dial indicator movement.

If the valve does not move until pressure exceeds 10 psi, the wastegate actuator rod is probably adjusted too short resulting in too much preload on the actuator return spring (see Boost Control information in the Turbocharger System handout).

LOW READINGS
(The last segment(s) is slow to light up or doesn't light at all)

This condition can be caused by a serious leak anywhere in the pressurized part of the intake tract, a damaged turbocharger impeller, a seized turbo impeller shaft, a damaged wastegate valve, a failed wastegate actuator, or even an extremely dirty air cleaner. Most of these areas must be visually inspected for problems.

Check all clamps and connectors between the compressor outlet and the intake ports. Check all hoses and fittings in the throttle body assembly. Check to see that the surge tank is securely fastened together and that the air temperature sensor and drain plug are in place.

Visually inspect both turbocharger impellors for damage and make sure the shaft spins freely in the housing.

To check the wastegate valve and actuator, follow steps outlined under High Readings on previous page. If the wastegate valve opens before 7 psi, the actuator is not within the factory specifications.

The end of the actuator rod is threaded and adjustable. However, it is staked very heavily at the manufacturer to prevent tampering and cannot be adjusted without leaving evidence of tampering. Also, if not adjusted properly, vehicle reliability could be impaired by raising boost pressures above the design limit. Therefore, Kawasaki does not recommend adjustment of the wastegate actuator.

The turbocharger system is covered under the 5-year emissions warranty. All turbocharger system components are covered, however the warranty can be void if any component (especially the wastegate actuator) is tampered with. If the wastegate actuator is found to be out of specification on a motorcycle that is still under warranty, it should be replaced rather than attempting any adjustment.