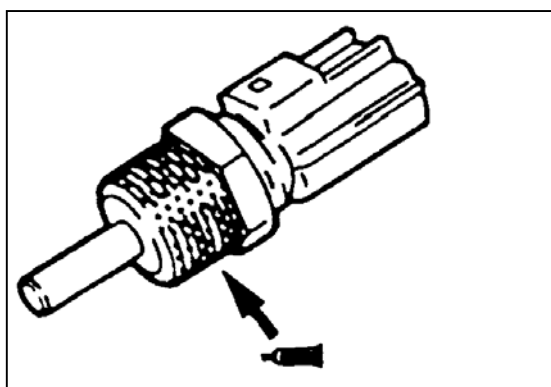
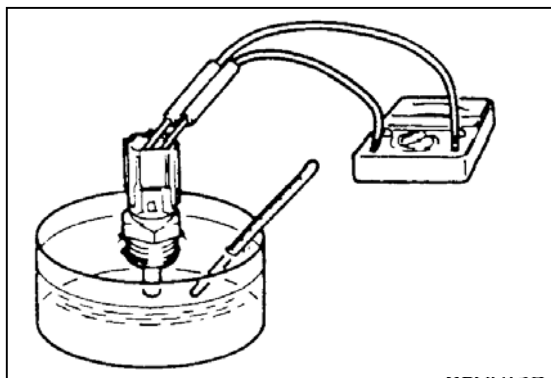
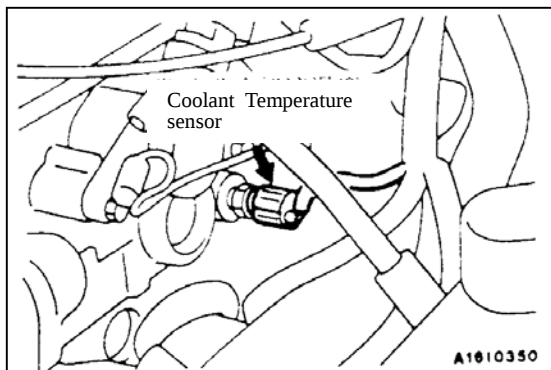




Chapter 3 Ignition control system

I. Engine coolant temperature sensor



Construction feature--It is a thermal resistance installed in the outflow terminal of engine cooling system, which will test the water temperature and turn it to a signal. The signal is transmitted to ECU. The signal is input to calculate and correct the injection driving time.

Check

Caution: Not to touch the connector (resin part) with tools when disassembling and installation.

(1) Disassemble the engine coolant temperature sensor.

(2) Place the temperature sensor part of the coolant temperature sensor in hot water to check resistance.

Standard value:

- 0 °C, resistance is 2.1—2.7K Ω ;
- 20 °C, resistance is 2.1—2.7K Ω ;
- 40 °C, resistance is 0.9—1.3K Ω ;
- 80 °C, resistance is 0.26~0.36K Ω

(3) If the resistance deviate off the standard value too much, the sensor should be replaced.

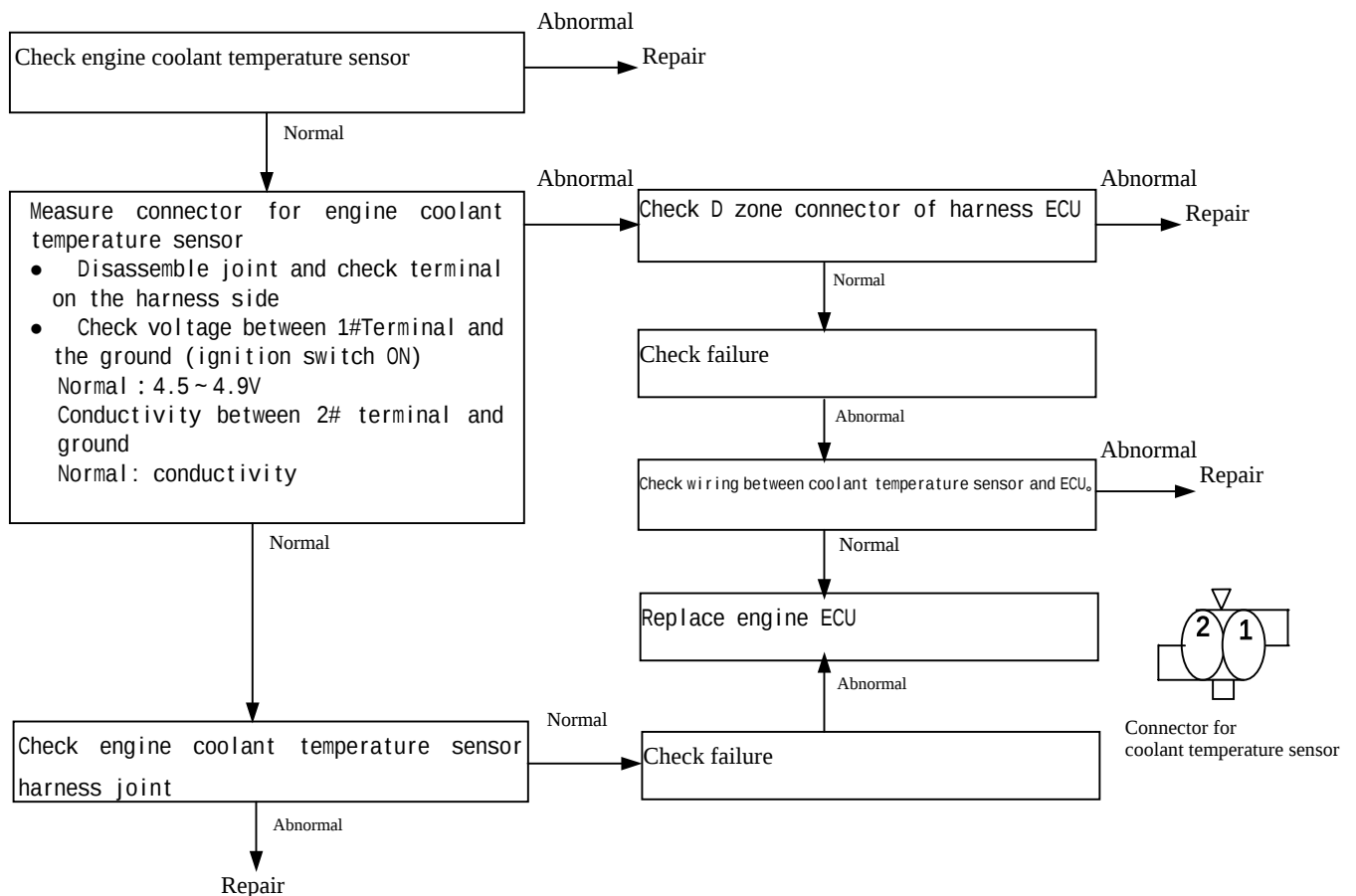
(4) Coat sealant on the rippling part.

Regulated sealant: 3M screw nut fastening NO.4171 or equivalent.

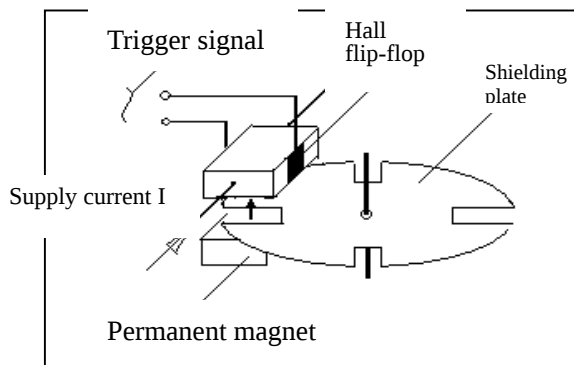
(5) Installation coolant temperature sensor and tighten to the assigned torque.

Fasten torque: 29N.m.

Error code NO.21 engine coolant temperature sensor system	Possible reasons
Check area - Ignition switch ON 60 seconds after ignition switch turned to On position or after engine start Setup condition - Sensor output voltage keeps above 4.6V for consecutive 4 seconds (equals to engine water temperature below - 45). - Sensor output voltage keeps below 0.1V for consecutive 4 seconds (equals to engine water temperature 145 or more)	- Engine coolant temperature sensor error - Connector of engine coolant temperature sensor contact defeat, wiring open loop or short wiring - Engine ECU error
Check area - Ignition switch ON - Engine speed approx. above 50rpm Setup condition - Sensor output voltage raises from below 1.6V (equals to engine water temperature above 40) to above 1.6V (equals to engine water temperature below 40) - Then the sensor output voltage keeps at above 1.6V for 5 minutes.	

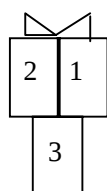


II. Crank angle sensor



Type—Hall type

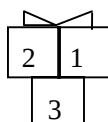
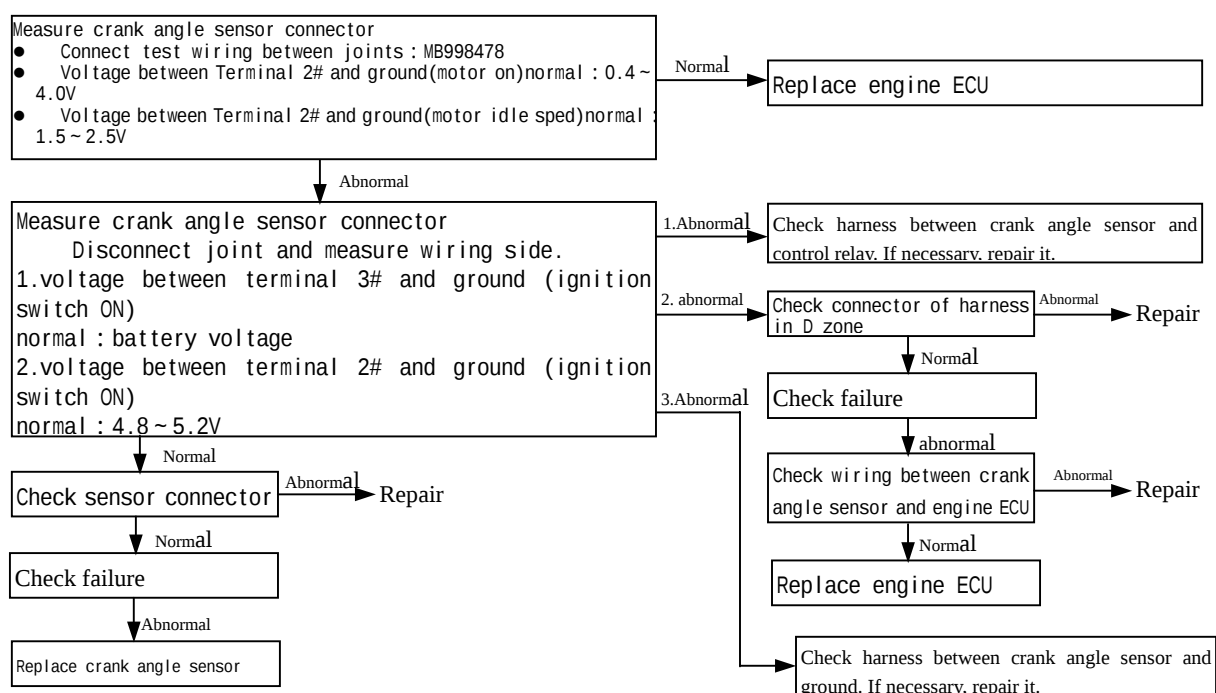
Crank angle sensor of B11 vehicle engine includes Hall flip-flop, permanent magnets, and shielding board, etc. A group of magnets are installed in the front of engine cylinder, one of which is embedded in the Hall flip-flop (electricity goes through current vertically as shown). Shielding board is installed in the front of crank and rotates with it, between the two magnets. On the flange, there are rectangular notches of same quantity as cylinders. The notches generates rectangular voltage wave by Hall flip-flop through flux and output to ECU through terminals and to control the working status (spray nozzle driving time, ignition time, idle airflow, connect and disconnect of EGR and vapour pollution and control system) of the executive devices by logic operation.



Crank angle sensor connector

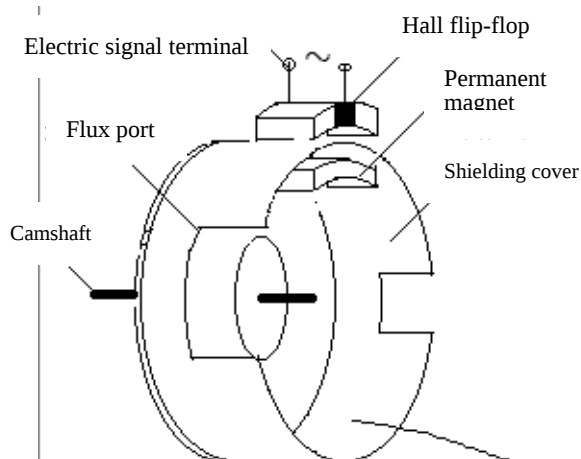
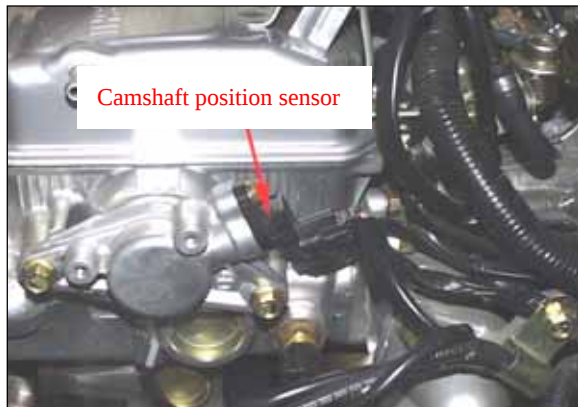
- 1—ground(normal conductivity)
- 2—connect to Pin D19 of ECU(IG: normal status 4.8—5.2V when switch on)
- 3—connect to ignition switch (IG: normal status is battery voltage when switch on)
- D19---when motor on the voltage is 0.4—4.0V;when idle the voltage is 1.5—2.5V.

Error code NO.22 crank angle sensor system	Possible reasons
Check area - Rotate engine (tap engine) Setup condition - Sensor output voltage has no variation for continuous 4 seconds (no input of pulse signal)	- Crank angle sensor error - Harness connector contact failure, sensor disconnect or short wiring - Engine ECU failure



Crank angle sensor connector

III. Camshaft position sensor

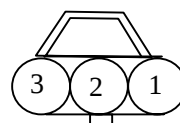


Type: Hall Type

Construction and principle--

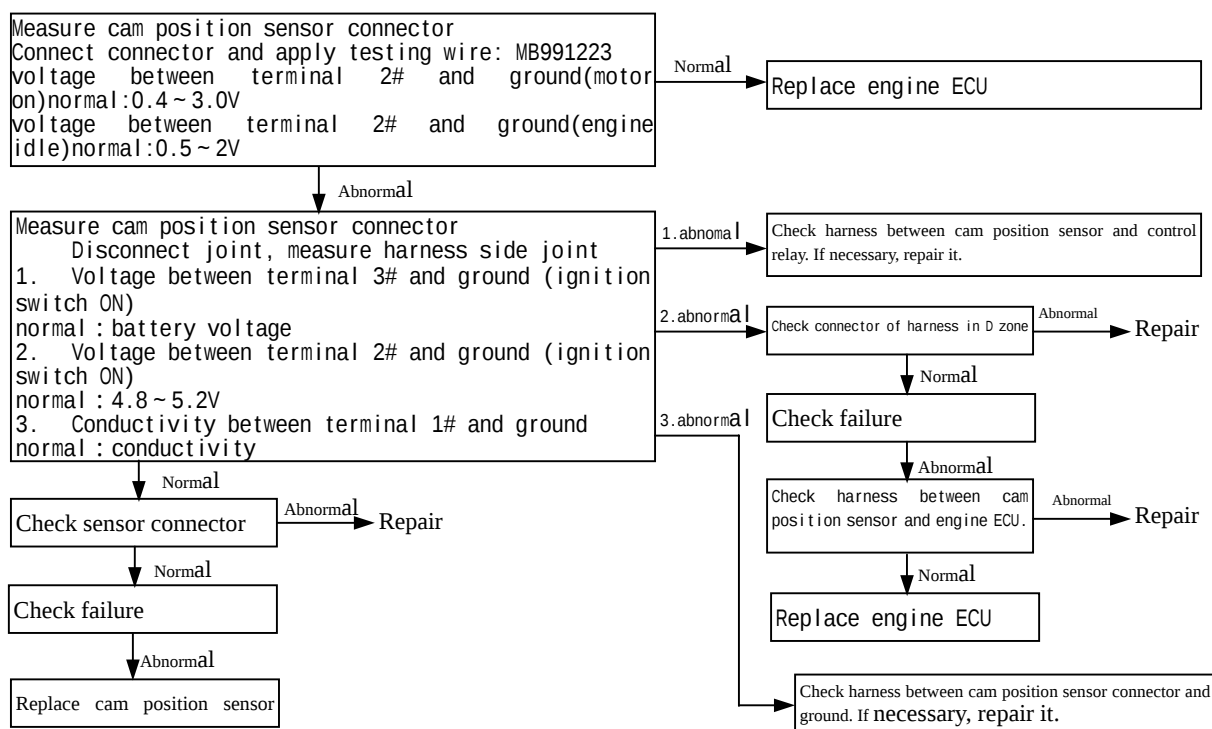
one-cylinder top dead center of B11 automobile engine includes Hall flip-flop, permanent magnets and shielding cover, one group of magnets are installed in the front cover of camshaft in the engine cylinder case, one of which is pressed to Hall flip-flop (electricity goes vertically through flux as shown). Shielding cover is installed in front of camshaft and rotates with it. It lies between the two magnets. There are two rectangular notches in the side cover, which will generate rectangular voltage wave by Hall flip-flop through flux. It is output to ECU by terminals and to confirm the accuracy of ignition time by logic operation.

- 1- conductivity when ground is normal
- 2- connect to Pin D19 of ECU(IG: normal voltage is 4.8-5.2V when On)
- 3- power(IG: normal voltage is battery voltage when On)

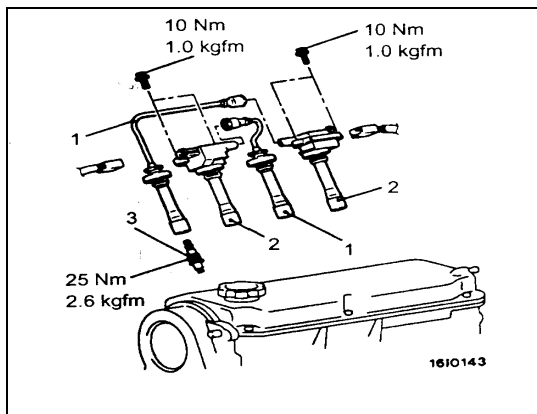


Cam position sensor connector

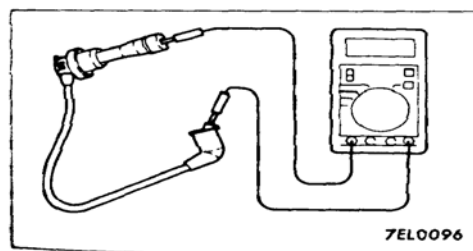
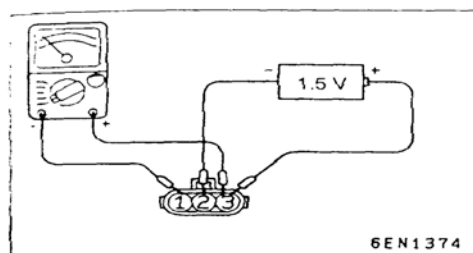
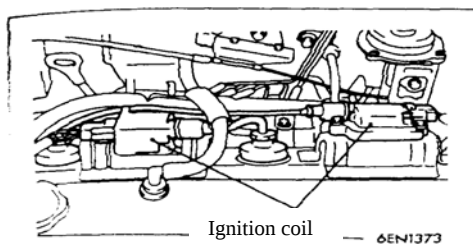
Error code NO.23 cam position sensor connector system	Possible reasons
Setup condition - Ignition switch ON - Engine speed above 50rpm Setup condition - Sensor output voltage keeps unchanged for continuous 4 seconds.	- Cam position sensor connector error - Harness joint contact failure, sensor disconnect or short wiring - Engine ECU failure



IV. Ignition coil



1. Spark plug cable
2. Ignition coil
3. Spark plug



The system includes two ignition coils (A and B) with powered transistor, which are respectively applied in No.1, No.4 cylinder and No.2, No.3 cylinder. Interrupting electricity in the primary side of ignition coil A will generate high -pressure electricity in its secondary side. The generated high- pressure electricity is put on the spark plugs in the cylinder No.1 and No. 4 and then they spark. When the two spark plugs generate sparks, if one cylinder is under compressing process while another is under the exhaust process, the compressed air/fuel mixture in the cylinder under compression will be ignited.

1、 check conductivity of power transistor remarks

- (1) Apply simulated resistance gauge.
- (2) Connect the cathode (-) of the multi-meter to the terminal.

Caution:Rapidly finish the test (in 10 seconds) in case of coil burning and damage of power transistor.

If error occurred,replace the ignition coil.

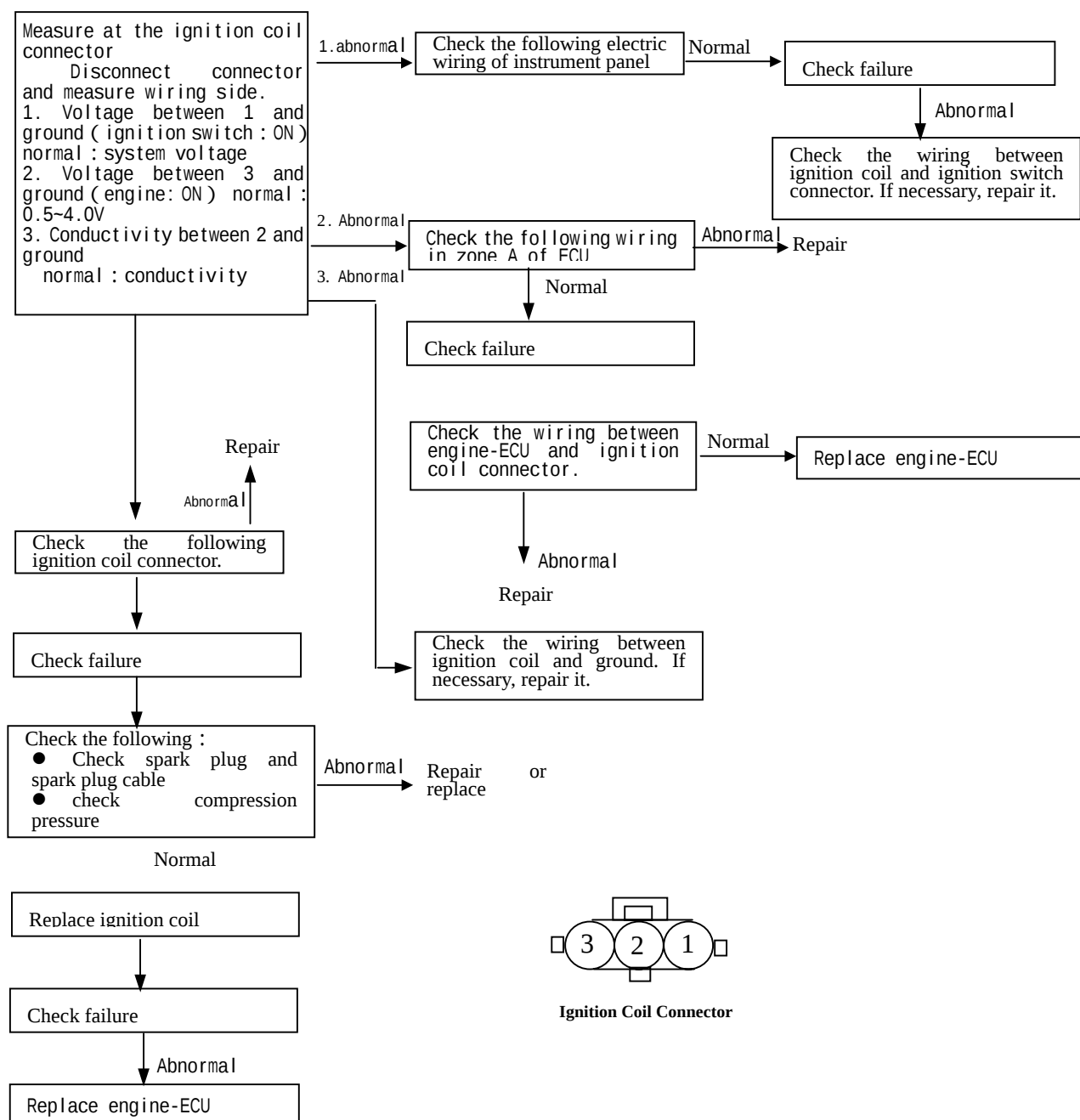
2、 check on the resistance wire

Measure resistance of all spark plug cables.

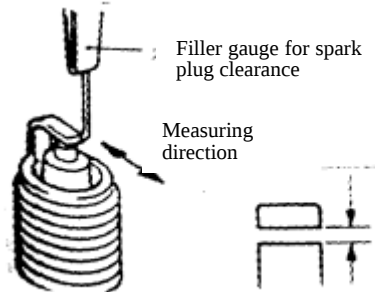
- (1) Check whether there is any crackle in the cover and the coating.
- (2) Measure resistance.

Limit value: 22kΩ

Error code NO.44 Ignition coil and power transistor component system	Possible reasons
Check area - Engine speed 50 ~ 4000rpm - Except deceleration and sudden acceleration or deceleration Setup condition - Ignition failure in cylinder No.1 and No.4 or cylinder No.2 and No. 3 exceeds every 1000rpm preset ignition failure	- Ignition coil error - Connector contact defeat of ignition primary circuit, wiring disconnect or short wiring - Error in spark plug and spark plug cable - Incorrect compression pressure - Engine-ECU failure



V. Spark plug



check and clean of spark plug

- 1、 Disconnect spark plug cable.

Caution:When pulling the spark plug cable from the spark plug,remember to pull it with hand holding the cable cover instead of cable itself.

- 2、 Disassemble spark plug.
- 3、 Check whether there is any burned electrode or damaged insulator.Check whether the burning trace is well-distributed.
- 4、 Clean the carbon accumulation with steel brush or special spark plug cleaning tool. Blow off grits from the rippling part of spark plug with compressed air.
- 5、 Check whether the spark plug clearance is in the range of standard value with spark plug clearance gauge.

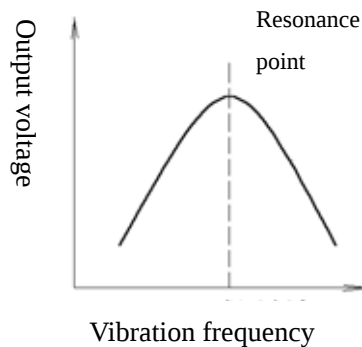
Standard value: 1.1mm.

If the spark plug clearance is not within the range of standard, bend ground eletrode to adjust.

- 6、 Clean the spark plug hole of engine.

Caution: Note not to have dirty things outside enter the cylinder.

- 7、 Install spark plug.



Knock sensor output voltage

VI. Knock sensor

Knock sensor is a sensor testing cylinder vibration frequency, which is constituted by vibration board and piezoelectric component. The vibration times of knocking cylinder varies with different engines. The vibration board of knock sensor vibrates with the vibration of cylinder block, while the output voltage of piezoelectric component varies with the change of vibration frequency of vibration board. When the knock occurs, the vibration board vibrates with the vibration of cylinder in a higher degree, while the piezoelectric component generates higher voltage. When the knock stops, the piezoelectric component generates lower voltage.

The relationship between output voltage of piezoelectric component and vibration frequency is showed as the left illustration.

The advance angle of ignition set value in the engine with knock sensor is bigger and the power is higher; while in the engine without knock sensor, the set value of advance angle of ignition is comparatively more conservative, and so is the power.