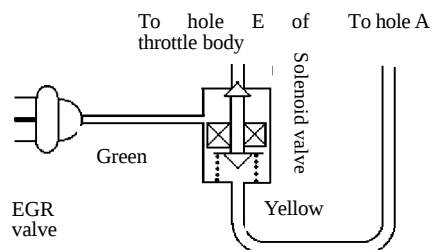


Chapter 4 Emission Control

System



EGR system

1. Exhaust Gas Recirculation (EGR) Control System

There are 3 joints in the air duct of EGR solenoid valve. The yellow-marked joint (lower joint) is connected to hole A joint of throttle body, the green-marked joint (middle joint) is connected to EGR valve joint and the white-marked joint (upper joint) is connected to hole E joint of throttle body. When solenoid valve is at power OFF, it is conductible between green joint and yellow joint, but not between green joint and white joint. When solenoid valve at is power ON, it is conductible between green joint and white joint, but not between green joint and yellow joint.

EGR solenoid valve controls EGR valve switch.

The standard value of EGR solenoid valve coil resistance is $36-44\Omega$ 20°C Ω

Exhaust Gas Recirculation (EGR) Control System Check

1. Remove vacuum tube (green stripe) from EGR valve, and use tee pipe to connect manual vacuum pump.
2. When engine is at cold/hot status, check vacuum status at engine high-speed idle running.

When engine is cold (Engine coolant temperature: below 20°C)

Vacuum status is as below

Throttle	Normal vacuum status
Start quickly	No vacuum (the same as barometer pressure)

When engine is hot (Engine coolant temperature : above 80°C), vacuum status is as below

Throttle	Normal vacuum status
Start quickly	Raising to exceed 13k temporarily

3. Disassemble tee pipe joint.
4. Connect manual vacuum pump to EGR valve.
5. Ensure 30KPa or more than 30KPa vacuum at idle speed running. Check if engine flameout may occur or idle speed is instable.

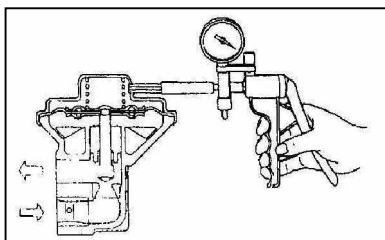
EGR Valve Check

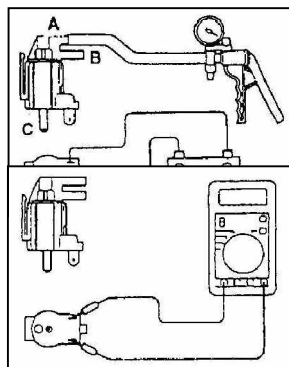
1. Disassemble EGR valve and check if any block or carbon deposit. If so, make valve seating clean with proper impregnant.
2. Connect manual vacuum pump to EGR valve.
3. **Implement** 67Kpa vacuum and check if vacuum can be kept.
4. Implement vacuum and blow air in from the side of EGR valve duct to check air duct.

5. Replace shim and tighten it to the specified tighten torque.

Tighten Torque: 22N.m

Vacuum	Air duct
Below 5.3 KPa	No air outflow
26 KPa	Air outflow





EGR Solenoid Valve Check

1. Disassemble vacuum tube on EGR solenoid valve (Yellow stripe, white stripe and green stripe).
2. Disassemble EGR solenoid valve harness joint.
3. Connect manual vacuum pump to vacuum tube of white stripe.
4. Check air tightness by implementing vacuum when charge/discharge battery voltage directly to EGR control solenoid valve.
5. Measure resistance between solenoid valve terminals.

Battery voltage	Tube joint B status	Normal status
Power OFF	Open	Keep vacuum
Power ON	Open	No vacuum kept
	Close	Keep vacuum

Standard Value: 36-44Ω (at 20℃)

2 Purge Control System

Canister solenoid valve is the switch to control fuel vapor desorption in canister. When engine speed exceeds 1500 rpm, the valve will open and intake fuel vapor into chamber.

Solenoid valve resistance standard value: 36-44 Ω
20℃

Purge control system check

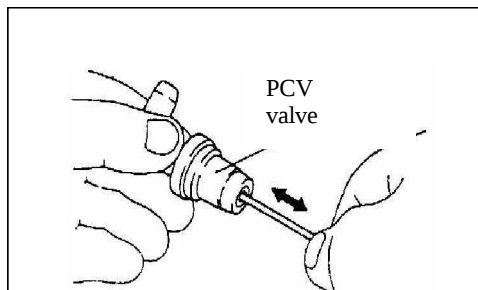
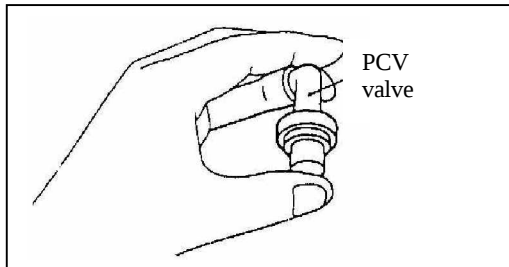
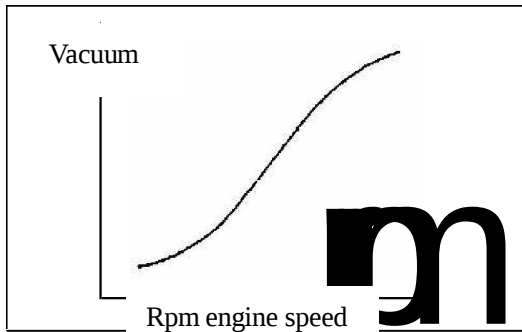
1. Disassemble vacuum tube (red stripe) from throttle body and connect it to manual vacuum pump.
2. Plug the disassembled vacuum tube joint.
3. Make it vacuumized at idle speed when engine cold and heated. And check engine and vacuum equipment status.

Engine is cold (Coolant temperature is 40℃ or less)

Vacuum	Engine Status
53KPa	3000rpm

Engine is heated (Coolant temperature is 80℃ or more)

Vacuum	Engine status	Normal Status
53KPa	Idle Speed	Keep vacuum
	3000rpm	Vacuum leakage will occur 3 minutes later when engine start. After 3 minutes, vacuum will keep a little period of time, and then continue to leak.*



1. Disassemble vacuum tube (red stripe) from purge vacuum equipment of throttle body. And then connect manual vacuum pump to joint.
2. Start engine and check the vacuum degree of purge vacuum equipment will increase with engine speed increasing.

Remarks:

If vacuum is not changed, the purge hole of throttle body may be jammed and it needs cleaning.

3. Positive Crankcase Ventilation System Check

1. Disassemble vent tube from positive crankcase ventilation valve (PCV valve).
2. Disassemble crankcase ventilation valve from rocker arm cover.
3. Re-connect crankcase ventilation valve and the disassembled vent tube.
4. Start engine and let it run at idle speed.
5. Press crankcase ventilation valve hatch with finger. Feel it and ensure manifold vacuum.

Remarks: The plunger of crankcase ventilation valve will move forwards and backwards at the moment.

6. If you fail to feel vacuum, please clean or replace crankcase ventilation valve.

Positive Crankcase Ventilation valve (PCV valve) Check

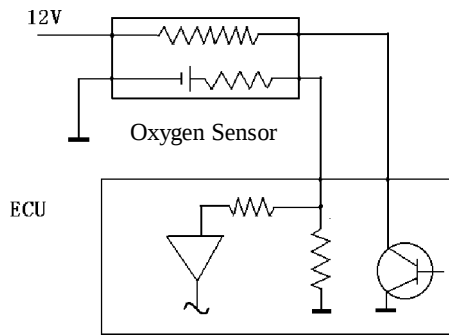
1. Thin stick is inserted into PCV valve from the position as shown in left figure (from rocker arm cover installation side). Move thin stick forwards and backwards to check plunger movement status.
2. If plunger fails to move, it represents that PCV is jammed and it needs cleaning or replacing PCV valve.

Remarks: * represents that if barometer pressure is below 77KPa or intake air temperature is above 50 °C, vacuum will continue to leak.

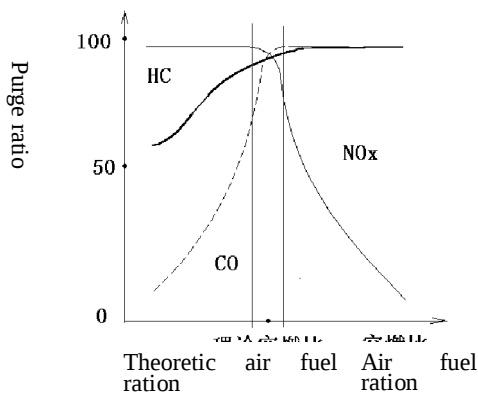
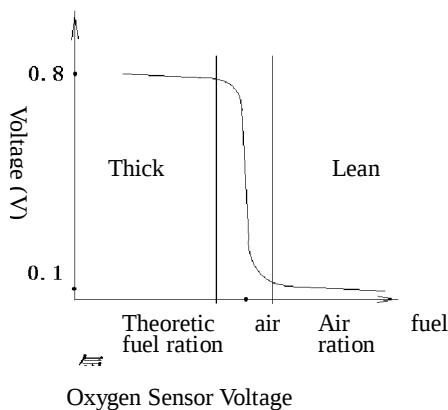
Purge hole vacuum check

Check status

Coolant temperature: 80-95 °C



Wiring diagram of oxygen sensor



3 Oxygen Sensor

Oxygen sensor is zirconia type sensor, which may check oxygen content in emission and is of hot-wire and 4-plug. 2 wires are hot wiring connecting cable and the other 2 wires are sensor signal transmission cables. The wiring layout of oxygen sensor is as below:

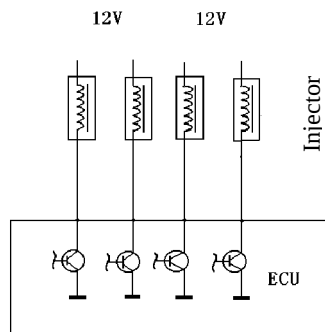
Bigger difference of oxygen content exists between emission and atmosphere, higher output voltage of oxygen sensor is. Contrarily, the output voltage is lower. Output voltage is about 0.45V at theoretic air fuel ration. The output voltage varies between 0.1V and 0.8V when feedback control working normally.

The heat source that will increase zirconia temperature is the exhaust heat of engine emission. There is no voltage output if zirconia temperature is low when engine starts. To make oxygen sensor at operation status soon after engine starting, hot-wiring heater is installed inside, which is controlled by ECU to make oxygen sensor reach working temperature in advance and at operation status.

ECU receives voltage signal from oxygen sensor and implement feedback control, which make engine air fuel ration close to theoretic air fuel ratio. Oxygen content in engine exhaust emission will be controlled efficiently by three-way catalytic converter, which will be purged. And at the same time the content of NOx, CO and HC will be reduced, which improve engine emission performance.

The purge ratio and air fuel ratio of three-way catalytic converter is as shown in left figure.

Injector wiring layout is as below



Injector wiring layout

4 Injector

Injector spray atomized fuel gas into intake tube. The oil supply is depended on the supply time. Injector solenoid valve consists of high resistance and low resistance. The heating value of high-resistance solenoid valve is low but its response speed is low. The response speed of low-resistance solenoid valve is high but its heating value is high, which needs to place resistance in return circuit in series to control maximum solenoid valve current, preventing coil from burning-out. Currently high-resistance solenoid valve is often applied. Injector valve consists of pin valve and plate valve. High-resistance and pin-valve injector is applied in Chery Oriental Son.

To ensure if injector is ok, the injection status of injector shall still be checked.

Injector Check

Measure resistance between terminals

- (1) Disassemble injector harness connector.
- (2) Measure resistance between injector terminals.

Standard Value 13-16k Ω (20 $^{\circ}$ C)

- 3 Mount injector harness connector.