


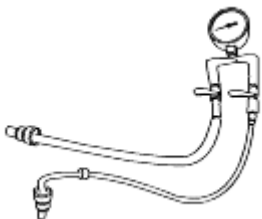


Fuel System


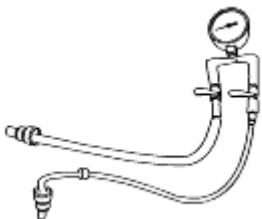
General Information



Emission control system special service tools

| Tool (Number and Name) | Illustration | Use |
|---------------------------------------|---|---|
| 0K2CA 089 HSP Hi-scan pro |  | Used for diagnosis and DTC retrieval and erasing. |
| 0K2A1 131 001A Fuel pressure gauge |  | Used for measuring fuel pressure. |

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Basic inspection

Ignition timing

1. Apply parking brake.
2. Warm up engine to normal operating temperature.
3. Turn OFF all electrical loads
4. Connect timing light to number one spark plug wire.

NOTICE

A rubber inspection plug has been provided in the plastic coil cover (center of the cylinder head cover) directly over the number one (1) spark plug wire.

Remove the inspection plug and connect the inductive pick-up of your tachometer or timing light to the number one (1) spark plug wire. If your tachometer/timing light inductive pick-up is too large, the coil cover will have to be removed.

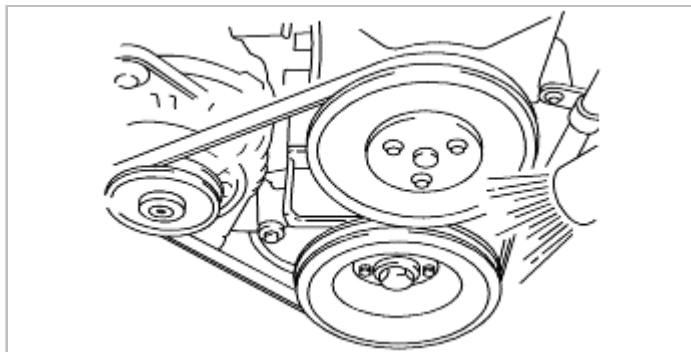
5. Verify that ignition timing marks on crankshaft pulley and timing mark on timing belt cover are aligned.

Ignition timing: BTDC $12^{\circ} \pm 5^{\circ}$ (at idle speed)

NOTICE

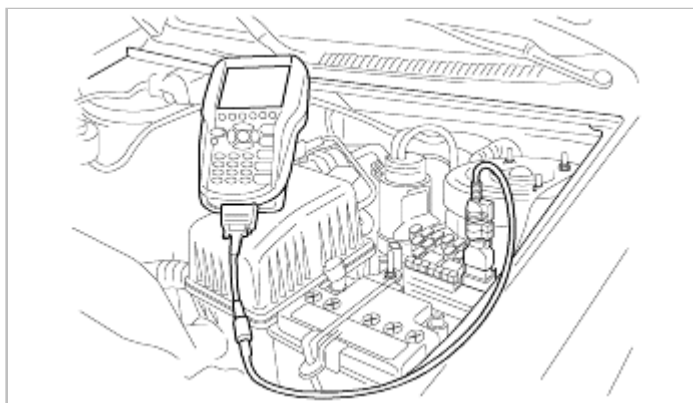
Ignition timing is not adjustable.

6. If timing is not within the specified range, replace the ECM.



Idle speed

1. Apply parking brake.
2. Warm up the engine to normal operating temperature.
3. Turn OFF all electrical loads.
4. Connect inductive tachometer to number one (1) spark plug wire or connect tachometer pick-up lead to terminal "O" in the data link connector (DLC).
In case of using scan tool connect Hi-scan pro to the DLC.



NOTICE

The base idle speed is not adjustable. The idle speed is automatically controlled by the engine control module. Incorrect idle speed indicates a potential problem with the IAC system or an intake manifold leak.

5. Check that idle speed is within specified range.

Idle speed (transaxle in "NEUTRAL" : 725 ± 50 rpm)

NOTICE

This is a "Wasted spark" ignition system, some tachometers will indicate twice the actual engine speed.

6. Disconnect tachometer from DLC or spark plug wire.
7. Turn off engine.



Specifications

| Item | | | Engine | GV6 Gasoline |
|--|------------------------------|-------------|---|--------------|
| Idle speed | | | rpm | 750±50 |
| Ignition timing | | | BTDC | 12°±5° |
| Throttle body | Type | | Horizontal draft | |
| | Throat diameter in (mm) | | 1.8 (42) x 2 | |
| | Type | | Rotary | |
| Idle air control valve | Resistance (at 68°F[20°C])Ω | Opening | 16.5~18.5 | |
| | | Closing | 14.5~16.5 | |
| Mass air flow sensor | | | Heated resistor (hot film) | |
| Air cleaner element | | | Dry, paper type | |
| EVAP canister purge valve | Resistance (at 68°F[20°C]) Ω | | 26 | |
| Engine coolant temperature sensor | Resistance KΩ | -4°F(-20°C) | 15.04 ^{+1.91} _{-1.60} | |
| | | 68°F(20°C) | 2.45±0.245 | |
| | | 176°F(80°C) | 0.318±0.0205 | |
| Fuel injector | Type of drive | | Electromechanical | |
| | Number of Spray ports | | 2 | |
| | Resistance (at 68°F[20°C]) Ω | | 14.5 | |
| Heated oxygen sensor | Resistance (at 68°F[20°C]) Ω | | 6 | |
| VICS valve | Resistance (at 68°F[20°C]) Ω | | 13.8±3.5 | |
| Main relay | Resistance (at 68°F[20°C]) Ω | | 85 | |
| Accelerator cable free play mm (in) | | | 3 (0.12) | |
| Fuel injection volume cu in/min (cc/min) | | | 11.8~13.3 (192~216) | |
| Fuel filter | Type | | Paper element | |
| Fuel pump pressure psi(kPa, kg/cm²) | Operating pressure | | 47.7(329, 3.35) | |
| | CUT-OFF Pressure | | 65~94(450~650, 4.5~6.6) | |
| Fuel pump output(ℓ/hr) | | | 103 at 12V | |
| | | | 20 at 8V | |
| Fuel specification | | | Unleaded | |
| Fuel tank capacity gal (liter) | | | 19.8 gal. (75 liter) | |
| Injector | Type | | High ohmic electra mechanical | |
| Resistance Ω | | | 14.5 | |
| 1 Fuel pressure with fuel pressure regulator (With vacuum hose disconnected) | | | | |
| 2 Minimum fuel pressure fifteen minutes after ignition key is switched "OFF" | | | | |



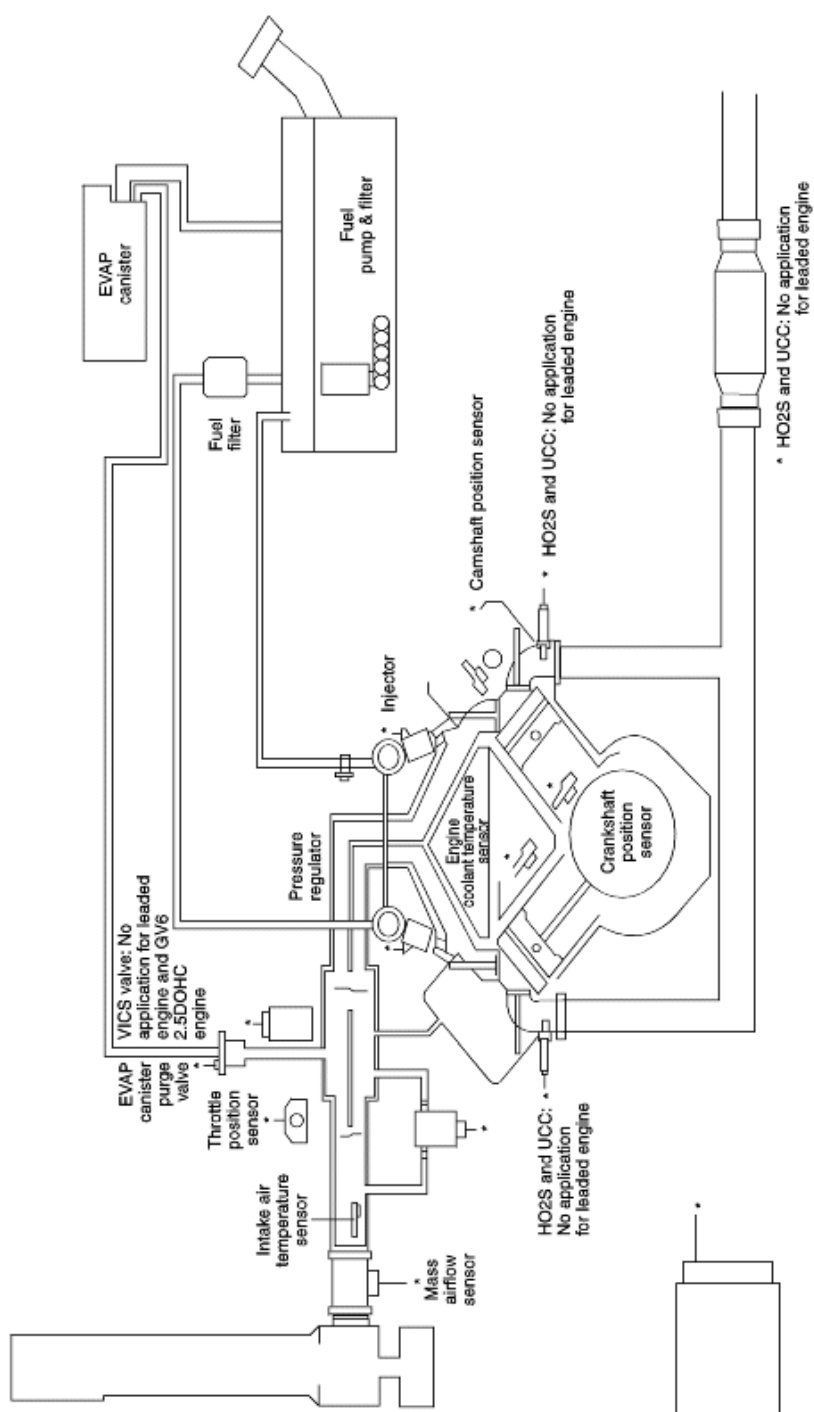
Fuel System

Engine Control System



System diagram

GV6 DOHC



Fuel System

Engine Control System - Mass Air Flow
Sensor (MAFS)



Removal

NOTICE

Do not drop or subject the sensor to shock. Do not put objects inside the sensor.

1. Disconnect mass air flow sensor connector.
2. Loosen air intake hose retaining clamps on both sides of mass air flow sensor.
3. Disconnect air intake hose from mass air flow sensor.
4. Remove two bolts attaching mass air flow sensor to mounting bracket.
5. Remove mass air flow sensor.

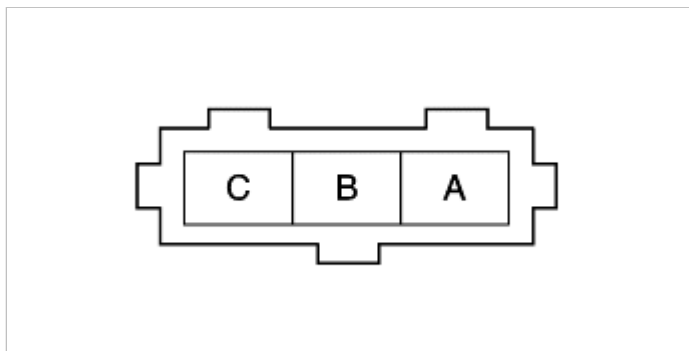
Installation

1. Attach mass air flow sensor to air intake hose and to mounting bracket.
2. Replace two bolts to retain mass air flow sensor to mounting bracket.

Tightening torque:

69~96.3 lb-in (7.8~10.8 N·m, 0.8~1 kg-m)

3. Reconnect air intake hose to the mass air flow sensor.
4. Tighten bolts of retaining clamps on both sides of mass air flow sensor.
5. Reconnect mass air flow sensor connector to sensor.
6. Warm up engine to normal operating temperature and let engine idle.
7. Connect voltmeter between terminal B wire and ground.
8. Verify that the voltage varies between 0.8V~1.2V.
9. Rev up engine and verify that voltage varies between 3.5V~4V.
10. If voltage is not within specification, replace mass air flow sensor.



Inspection

1. Check mass air flow sensor for damage, replace if necessary.

Fuel System

Engine Control System - Engine Coolant
Temperature Sensor



Removal

NOTICE

Engine coolant temperature sensor is located near thermostat.

1. Disconnect engine coolant temperature sensor connector.
2. Remove engine coolant temperature sensor.

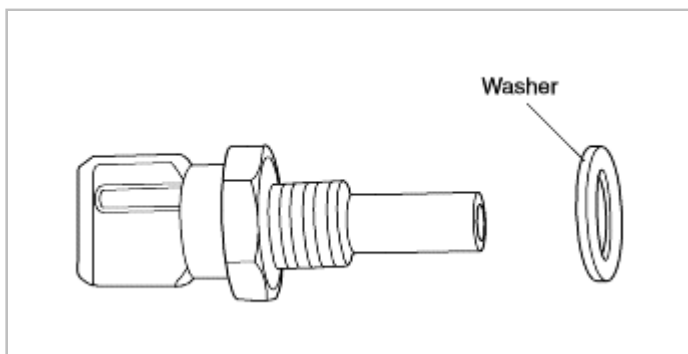
Installation

1. Install a new washer and engine coolant temperature sensor onto engine.

Tightening torque:

18-22 lb-ft (25-29 N·m, 2.5~2.9 kg-m)

2. Connect engine coolant temperature sensor connector.
3. Start engine and check for coolant leakage.

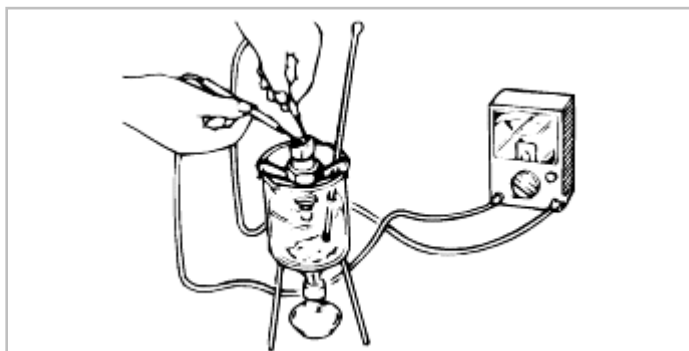


Inspection

1. Measure resistance of sensor using ohmmeter.

| Water temperature °F(°C) | Resistance (kΩ) |
|-----------------------------|-----------------|
| 68°F(20°C) | 2.45±0.245 |
| 176°F(80°C) | 0.318±0.0205 |

2. If resistances are not within specification, replace engine coolant temperature sensor.



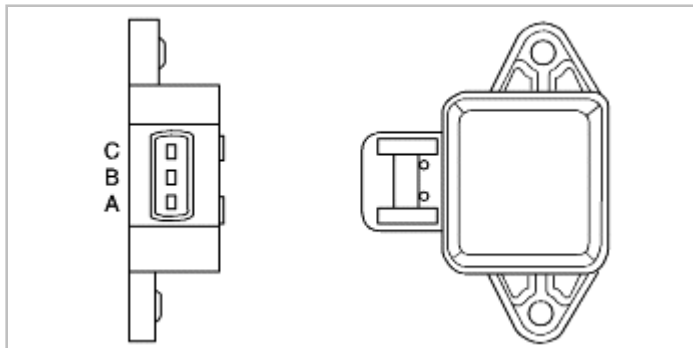
Fuel System

Engine Control System - Throttle Position
Sensor (TPS)



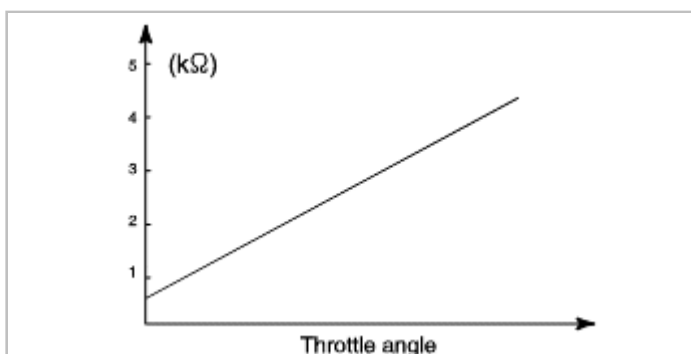
Inspection

1. Disconnect connector from throttle position sensor.
2. Connect ohmmeter between sensor terminals A and C.
3. Verify that resistance increases linearly according to throttle angle.



Specification: $2\text{ k}\Omega \pm 0.4\text{ k}\Omega$
(with throttle valve closed)

4. If resistance is not as specified, replace the throttle position sensor.
5. Connect throttle position sensor connector.

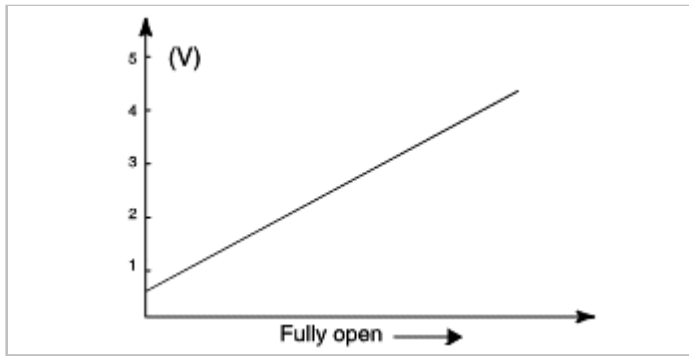


Voltage Inspection

1. Verify that throttle is at the closed throttle position.
2. Turn ignition switch ON.
3. Connect voltmeter between terminal A and C on throttle position sensor connector.
4. Verify that throttle valve is at closed throttle position.
5. Fully open throttle valve and verify that voltage at terminal A is within specification.
6. If not as specified, replace throttle position sensor.

Specification :

| Measuring condition | Voltage (V) |
|---------------------|-------------|
| Fully closed | 0.3~0.9V |
| Fully open | 4.0~4.4V |



Removal

NOTICE

The throttle position sensor is not adjustable or replaceable. The throttle position sensor is part of the throttle body assembly.

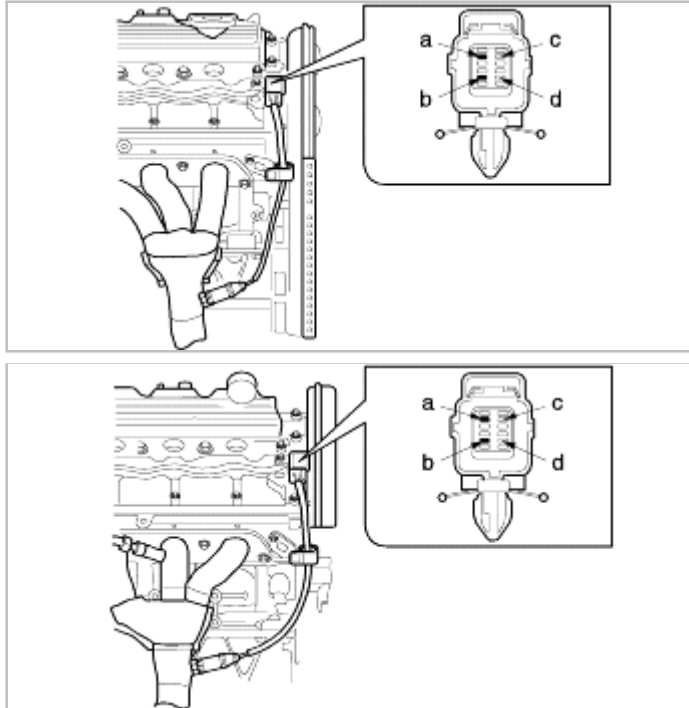
Fuel System

Engine Control System - Heated Oxygen
Sensor (HO₂S)



Inspection

1. Warm up the engine to normal operating temperature.
2. Run engine at idle speed.
3. Connect a voltmeter between terminal a and ground.



4. Increase and decrease engine speed quickly several times.
5. Verify that meter reading varies between 0~1.0V.

NOTICE

Rear oxygen sensor voltage does not fluctuate as quickly as front oxygen sensor.

6. If not as specified, inspect:
 - A. On-board diagnostic system
 - B. System inspection
 - C. Intake manifold vacuum
 - D. Fuel line pressure
7. If all systems are normal, replace the heated oxygen sensor.

Inspection of front oxygen sensor heaters

1. Ensure ignition switch is OFF.
2. Disconnect heated oxygen sensor connector.
3. Connect ohmmeter between terminals c and d and measure resistance.

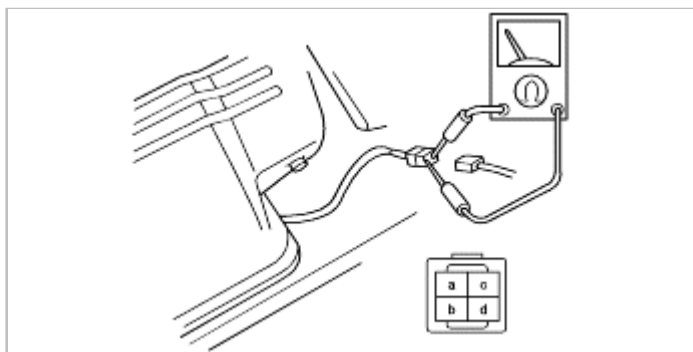
Specification: Approx. 6Ω (68°F{20°C})

4. If not as specified, replace heated oxygen sensor.

Tightening torque:

22-36 lb-ft (30~49 N·m, 3~5 kg-m)

5. Reconnect heated oxygen sensor connector.



Removal

1. Disconnect heated oxygen sensor connector.
2. With standard oxygen sensor socket, remove heated oxygen sensor and washer.

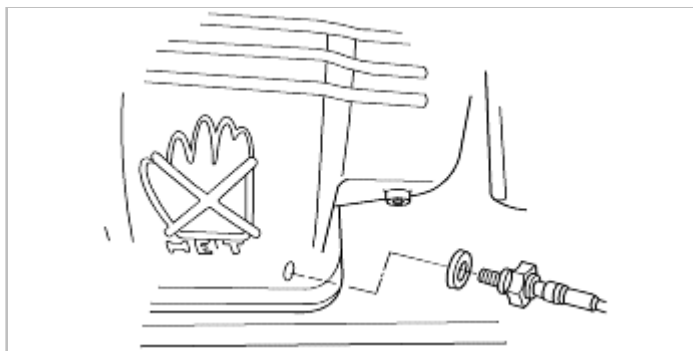
Installation

1. Install heated oxygen sensor and washer.

Tightening torque:

22-36 lb-ft (30~49 N·m, 3~5 kg-m)

2. Reconnect heated oxygen sensor connector.



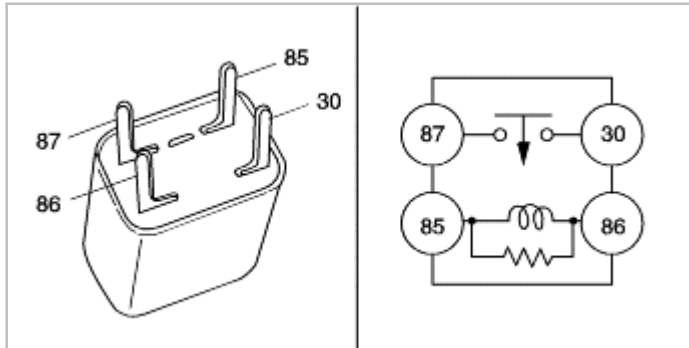
Fuel System

Engine Control System - Main Relay



Inspection

1. Remove cover from main fuse box.
2. Place a finger on main relay.
3. Verify that relay clicks when ignition switch is turned ON.



4. Verify that main relay clicks when ignition switch is turned ON and OFF.
5. Apply battery voltage (B+) to terminal 86 and ground terminal 85 of the relay.
6. Check continuity of relay as shown.

| Terminals | B+ applied | B+ not applied |
|-----------|------------|----------------|
| 87-30 | Continuity | No continuity |

7. If not as specified, replace main relay.
8. Turn ignition switch OFF.
9. Replace the cover on main fuse box.

Fuel System

Engine Control System - Fuel Pump Relay



Check operation

WARNING

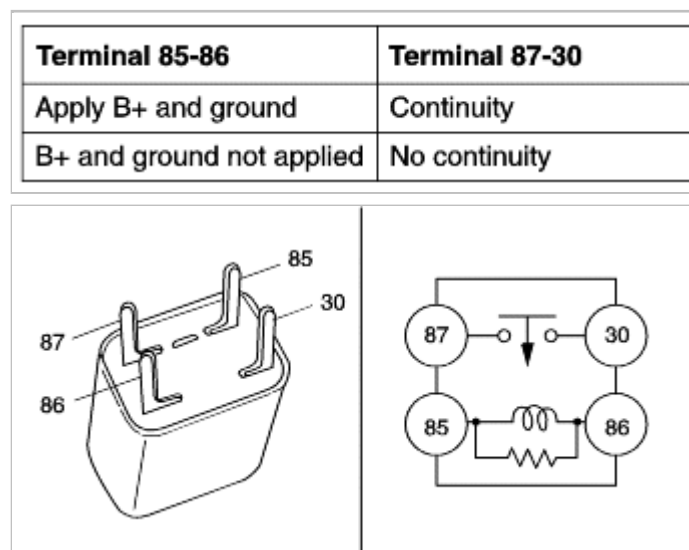
The fuel system remains under pressure when the engine is not running. Release fuel system pressure before disconnecting any fuel line to reduce the chance of personal injury or fire damage to vehicle components.

Listen for fuel pump relay clicking as ignition switch is turned "ON".

Continuity inspection

Check continuity between relay terminals.

B+: Battery positive voltage



Fuel System

Engine Control System - The Other Engine
Control System



Evaporative canister emission control system

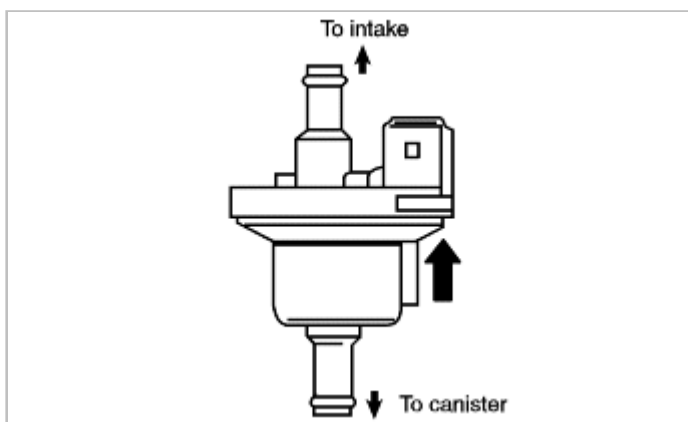
System check

1. Warm up engine to normal operating temperature.
2. Disconnect vacuum hose from EVAP canister purge valve side of hose.
3. Verify that no vacuum is felt at EVAP canister purge control solenoid valve.
4. If not as specified, check EVAP canister purge valve operation.
5. If valve is operating properly, reinstall vacuum hose.

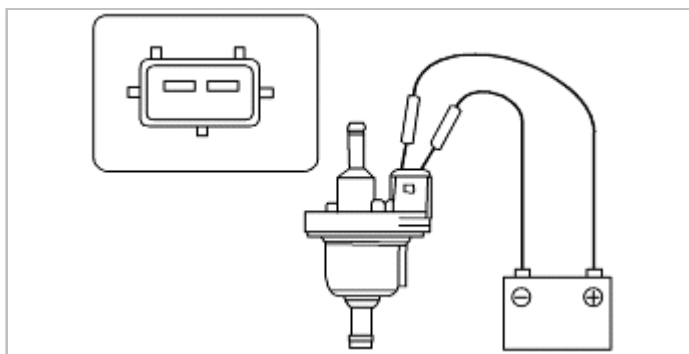
Evaporative (EVAP) canister emission purge valve

Inspection

1. Disconnect vacuum hoses from EVAP canister purge solenoid valve.
2. Verify that no air flows through valve.



3. Disconnect valve connector and apply 12 volt battery voltage as shown in figure.
4. Verify that air flows through valve.
5. If no air flows, replace the valve.
6. Reinstall valve connector.
7. Reconnect vacuum hoses.





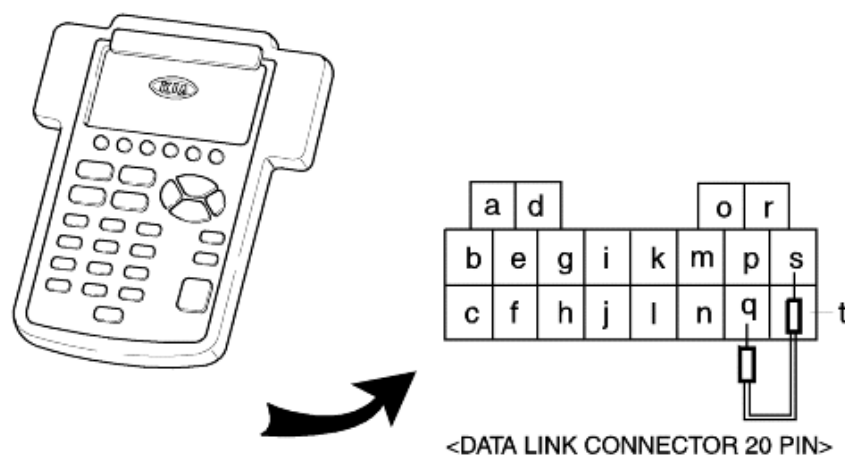
Diagnostic trouble codes

Diagnostic trouble codes retrieval procedure

1. Connect the Hi-scan pro to the Data Link Connector (DLC).
2. Turn the ignition switch ON.
3. Retrieve any DTC in ECM memory.

Clearing diagnostic trouble codes

1. Connect the Hi-scan pro to the Data Link Connector(DLC).
2. Turn the ignition switch ON.
3. Erase any DTC stored in ECM.



Data link connector 20 pin layout

| PIN No. | Terminal function |
|---------|---|
| a | Power supply for fuel pump test |
| b | Power supply for IG "ON" |
| d | Cooling fan test |
| f | Air bag unit |
| h | ABS unit |
| k | Communication diagnosis terminals for Hi-scan pro |
| m | Fail code output terminal for A/T vehicle |
| n | Test ground for A/T vehicle |
| o | Engine rpm check terminal |
| p | Engine fail code output terminal |
| q | Engine test |
| r | Ground |
| s | Ground |
| t | Engine monitor terminal |

Symptom related diagnostic procedure

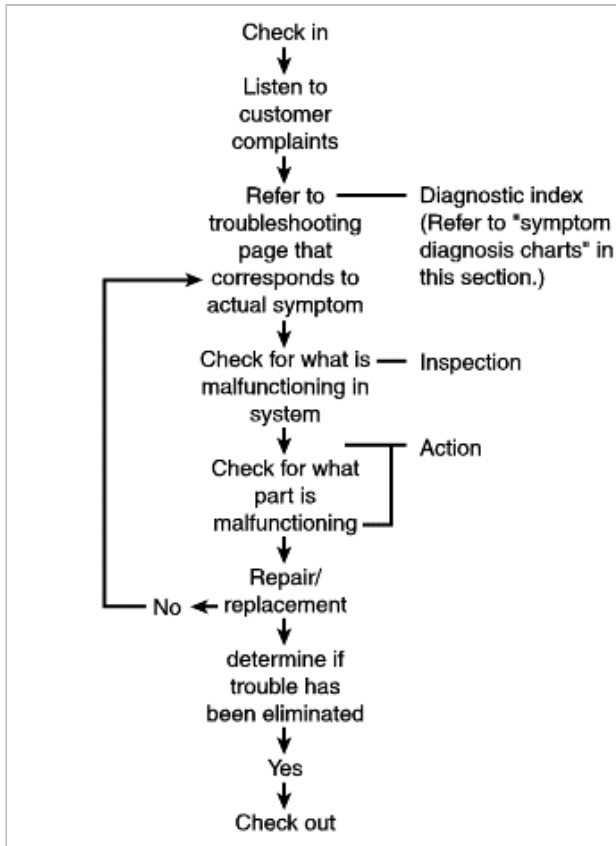
Using this section

Introduction

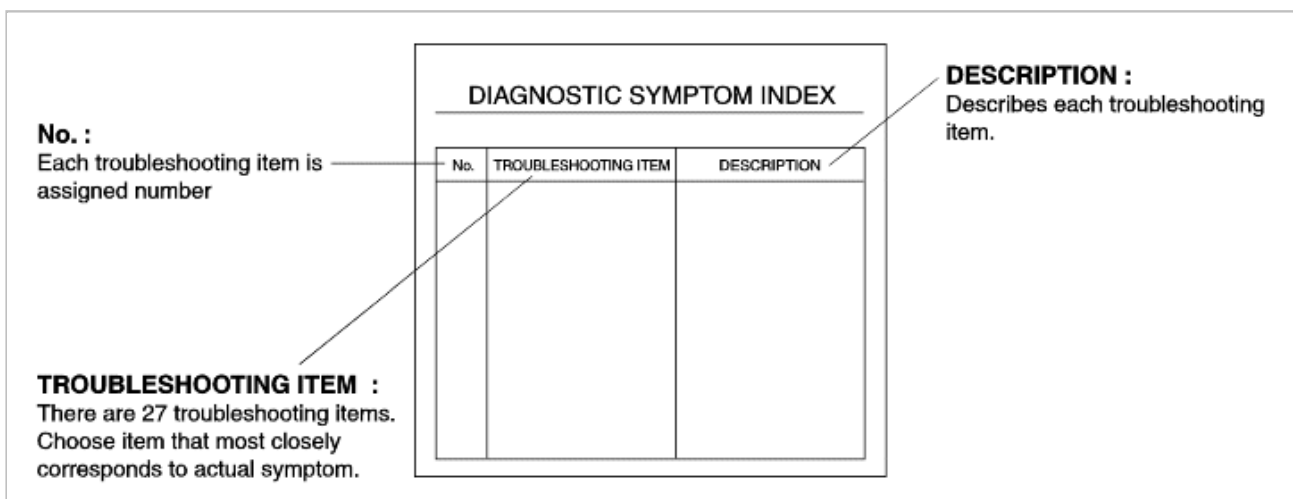
Most of the fuel and emission control system is electrically controlled, often making it difficult to diagnose problems in the system, especially intermittent problems.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer is often a good source of information on such problems, especially intermittent ones. Through talks with the customer, one can find out what the symptoms are and under what conditions they occur.

Work flow



Diagnostic symptom index



Symptom diagnosis charts

Description :

Further describes the symptom. Confirm that the chart addresses the actual symptom before beginning troubleshooting.

Troubleshooting hints:

This describes the possible point of malfunction.

Step :

This shows the order of troubleshooting. Proceed with troubleshooting as indicated.

Check :

This describes an inspection to determine the malfunction of parts quickly.

Remedy :

This recommends the appropriate action to take as a result (Yes/No) of the check.

Diagnostic symptom index

| No. | Troubleshooting item | | Description |
|-----|---|--|--|
| 1 | Will not crank or cranks slowly | | Refer to engine electrical system |
| 2 | Crank normally but will not start | No combustion | Engine cranks at normal speed but shows no sign of firing |
| 3 | | Partial combustion when engine is cold | Engine cranks at normal speed but shows only partial combustion and will not continue to run |
| 4 | | Partial combustion after engine is warm-up | Engine starts normally when cold, but will not start after running and hot soaked |
| 5 | Crank normally but hard to start | Always | Engine cranks at normal speed but requires excessive cranking time before starting |
| 6 | | When engine is cold | Same condition as No. 5 after running and cold : restarts normally after warm-up |
| 7 | | After engine is warm-up | Same condition as No. 5 after running and hot soaked: starts normally when cold |
| 8 | Rough idle/engine stop While idling | Always | Engine stalls or vibrates excessively at idle |
| 9 | | When engine is cold | Engine stalls or vibrates excessively at idle during warm-up |
| 10 | | After warm-up | Engine runs normally at idle during warm-up but vibrates excessively or stalls after warm-up |
| 11 | | When A/C is in operation | Engine stalls or vibrates excessively at idle when A/C ON |
| 12 | Rough idle/engine stalls just after starting | | Engine stalls or vibrates excessively only just after starting (acceleration from idle) |
| 13 | High idle speed after engine warm-up | | Idle speed excessive after warm-up |
| 14 | Idle moves up and down/idle hunting | | Engine speeds up and down periodically at idle |
| 15 | Engine stalls on deceleration | | Engine unexpectedly stops running while decelerating or after deceleration |
| 16 | Engine stalls suddenly (intermittent) | | Engine intermittently stops running |
| 17 | Stumble/hesitates on acceleration | | Flat spot occurs just after accelerator depressed or mild jerking occurs during acceleration |
| 18 | Surges while cruising | | Unexpected change in engine speed which is usually repetitive |
| 19 | Lack of power | | Performance poor under load when throttle valve wide open Maximum speed reduced |
| 20 | Poor acceleration/lack power | | Performance poor while accelerating |
| 21 | Rough engine running on deceleration/backfire | | Engine runs rough while decelerating and abnormal combustion occurs in exhaust system |
| 22 | Knocking | | Abnormal combustion accompanied by audible "pinging" noise |
| 23 | Fuel odor | | Gasoline odor in cabin |
| 24 | High oil consumption | | Oil consumption excessive |
| 25 | MIL on continuously | | Hi-Scan does not indicate diagnostic trouble code but MIL always ON |
| 26 | MIL does not light illuminate | | Hi-Scan indicates malfunction |
| 27 | Air conditioner does not operate | | Blower fan operates but magnetic clutch does not operate |

Driveability definitions

Stumble :

Mild jerking during acceleration.

Hesitation :

Delay in increase in engine speed occurring just after the accelerator pedal is depressed.

Surge :

Continuous soft jerking during cruise.

Precautions for symptom diagnosis

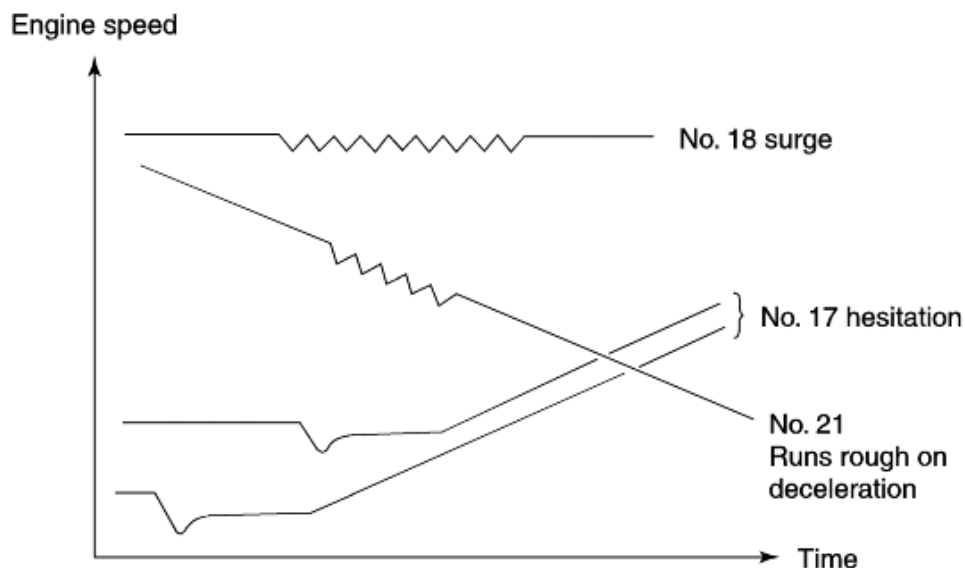
Fuel system pressure release

WARNING

The fuel system remains under pressure when the engine is not running. Release fuel system pressure before disconnecting any fuel line to reduce the chance of personal injury or fire damage to vehicle components.

Fuel is explosive. An empty fuel tank can still contain explosive gases.

Supply adequate ventilation to the work area. Do not smoke, and keep sparks and open flames away. Refer to section 22, fuel system for fuel system pressure release procedure.



Component description table

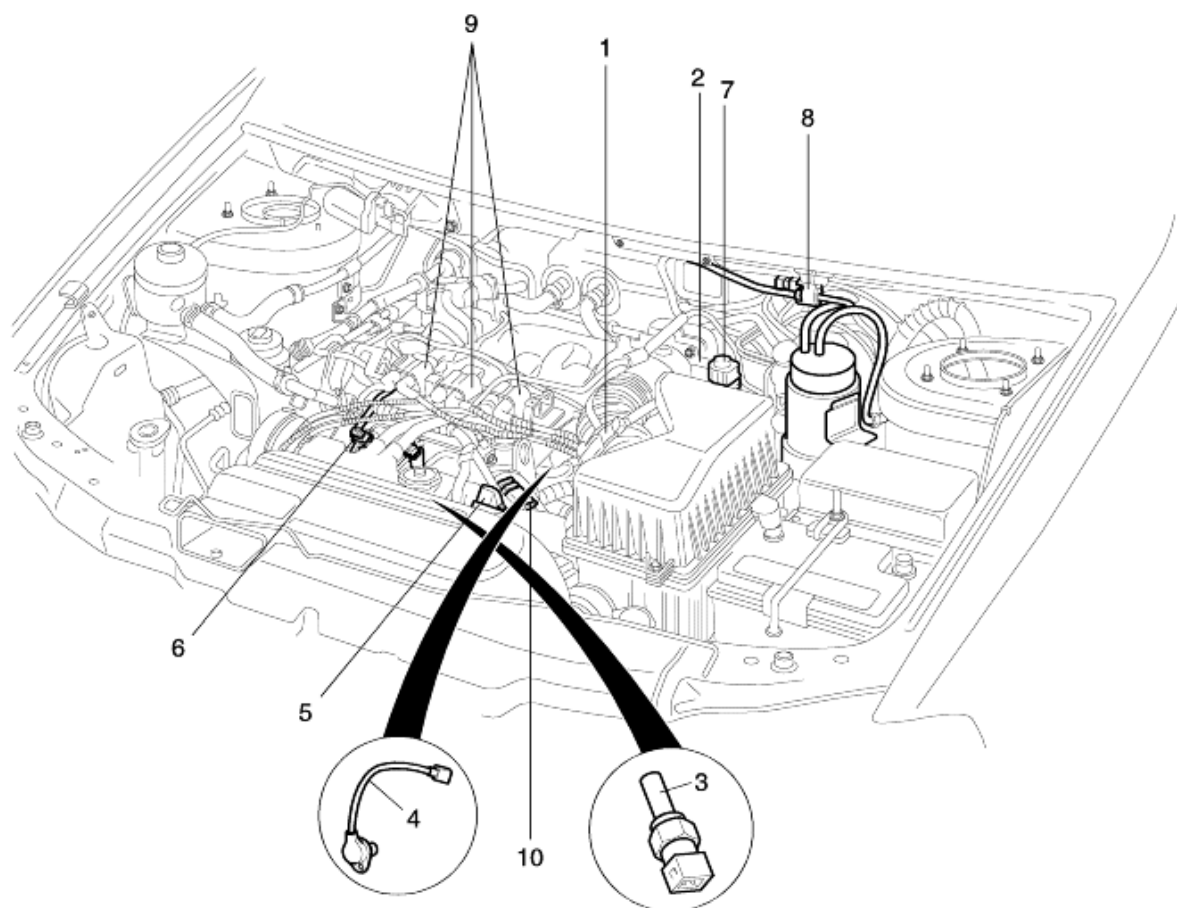
| Component | Function | Remark |
|---------------------------------|---|---|
| A/C cut relay | Controls A/C operation according to vehicle conditions and sends A/C operation condition signals to ECM | Controls condenser fan operation |
| A/C switch | Controls battery power to A/C relay | Normally open type |
| Air cleaner | Filters air entering throttle body | Dry type |
| Camshaft position# (CMP) sensor | Detects No.1 cylinder TDC: Sends signal to ECM | Installed at rear of cylinder head (bank 1) |

| | | |
|---|---|--|
| Check valve | Maintains pressure in the Fuel tank and regulates vapor flow to the evaporative emissions canister | Located in the evaporative system lines next to the fuel tank |
| Crankshaft position# (CKP)sensor | Detects crank shaft angle from flywheel rotation and sends signal to ECM | SGT signal |
| Data link connector#(DLC) | Centralized service connector for on-board board diagnosis | For on board diagnosis and service/inspection |
| EGL main relay | Supplies battery power to electrical devices | 1. Normally open type 2. Controlled by ECM |
| Engine control module (ECM) | <p>Detects the following:</p> <ol style="list-style-type: none"> 1. A/C operation 2. Air/Fuel ratio# (oxygen concentration) 3. Cranking signal 4. Engine coolant temperature 5. Engine speed 6. Ignition ON signal 7. In-gear condition(A/T only) 8. Intake air amount 9. Intake air temperature 10. No.1 piston TDC(compression stroke) 11. Throttle valve opening angle <p>Controls operation of following:</p> <ol style="list-style-type: none"> 1. A/C (cut-off) 2. Self-diagnosis function 3. Fuel injection system 4. Ignition control system 5. Idle speed control 6. Purge control system 7. Fuel pump control 8. Cooling fan control | <ol style="list-style-type: none"> 1. Air conditioning switch 2. Heated oxygen sensor 3. Ignition switch 4. Engine coolant temperature sensor 5. Crankshaft position#(CKP) sensor (SGT signal) 6. Ignition switch 7. Transmission range switch (A/T) 8. Mass air flow sensor 9. Intake air temperature 10. Camshaft position(CMP) sensor (SGC signal) 11. Throttle position sensor <ol style="list-style-type: none"> 1. A/C cut relay 2. Hi-Scan & MIL 3. Injector 4. Ignition coil 5. Idle air control valve 6. EVAP canister purge valve 7. Fuel pump relay 8. Cooling fan control relay (high, low) |
| Engine coolant temperature (ECT) sensor | Detects engine coolant temperature and sends signal to ECM | Installed at cylinder head (bank 1) |
| Evaporative emission canister | Stores fuel tank vapors(engine stopped) | - |
| Fuel filter(high pressure side) | Filters fine dirt particles in fuel discharged from the fuel pump | - |
| Fuel filter(low pressure side) | Filters fuel in fuel tank | - |
| Fuel injector | Injects fuel into intake port | Controlled by signals from ECM |
| Fuel pressure regulator | Adjusts fuel pressure supply to injectors | Controlled by intake manifold vacuum |
| Fuel pump | Supplies fuel from fuel tank to fuel under pressure | Actuated by fuel pump relay installed |
| Fuel pump relay | Controls battery power to fuel pump | 1. Normally open type 2. Actuated by ECM fuel pump control signal or by jumping data link connector terminal #1 to B+ |
| Heated oxygen sensor | Detects oxygen density in exhaust gas and sends signal to ECM | 1. Located in exhaust manifold 2. For air/fuel mixture adjustment |
| Idle air control(IAC) valve | Supplies intake air to engine, bypassing throttle valve | 1. For idle speed control 2. Actuated by ECM idle speed control signal |

| | | |
|-------------------------------|---|---|
| Ignition coils | Supplies secondary voltage to spark plugs | Mounted directly above spark plugs |
| Ignition control module | Controls operation of ignition coils | Incorporated into ECM |
| Ignition switch | Starts engine and controls battery power to electrical devices | - |
| Intake manifold | Supplies intake air to all cylinders | - |
| Main relay | Supplies current to output devices and ECM | - |
| Mass air flow(MAF) sensor | Detects amount of intake air and sends signal to ECM | Hot film type |
| EVAP canister purge valve | Controls fuel vapor from EVAP emission canister to intake manifold(dynamic chamber) | 1. For purge control 2. Actuated by ECM purge control signal |
| Resonance chamber | Reduces intake air suction noise and increases engine torque | - |
| Starter | Starts engine by rotating flywheel ring gear | - |
| Three way catalytic converter | Reduces HC, CO, and NOx in exhaust through chemical reaction | For exhaust gas emissions reduction |
| Throttle body | Controls intake air amount | - |
| Throttle position sensor | Detects throttle valve opening angle and sends signal to ECM | Installed on throttle body |
| Transaxle control module(A/T) | Controls functions of transaxle for better performance and shift quality | Located below instrument panel behind left lower trim panel |
| Transaxle range switch(A/T) | Detects shift lever position and sends to ECM | 1. For idle speed control 2. Load/no load determination |
| VICS valve | Controls shutter valve in dynamic chamber | - |



Engine control system components



- | | |
|--|---|
| 1. Mass airflow (MAF) sensor | 6. Injector |
| 2. Throttle position (TP) sensor | 7. Intake air control (IAC) valve |
| 3. Engine coolant temperature (ECT) sensor | 8. EVAP canister purge valve |
| 4. Crankshaft position (CKP) sensor | 9. Ignition coil |
| 5. Camshaft position (CMP) sensor | 10. Intake air temperature (IAT) sensor |



General diagnosis

| Problem | Possible cause | Action |
|---|---|--|
| Engine cranks but will not start | Fuel pressure problem | Replace fuel pressure regulator Replace leaking injector Replace injector O-ring |
| Hard to start (cold engine) | Idle air control valve not working Defective throttle position sensor Fuel pressure too low Engine coolant temperature sensor open circuit or out of range | Replace Replace throttle body Replace regulator, check fuel line leakage Repair harness Replace sensor |
| Rough idle (cold engine) | Fuel injector flow Throttle plate stuck open Throttle position sensor malfunction Idle air control valve inoperative Air intake duct disconnected between MAF sensor and throttle body Leaking injector Leaking injector O-ring seals | Replace injector Clean and adjust throttle plate Adjust throttle cable Replace TP sensor Replace Reconnect air duct Replace Replace |
| Stalling or hesitation (hot or cold engine) | Throttle position sensor malfunction | Replace TP sensor |
| Hard start (hot engine) | Incorrect fuel pressure | Check pressure regulator or fuel pump |
| Stalls on quick stops or deceleration | Mass air flow sensor open circuit or out of range | Replace MAF sensor Check electrical circuit |
| Poor performance/loss of power | Clogged injectors Air filter clogged | Check injector flow rate Replace |

Fuel gauge diagnosis

| Problem | Possible cause | Action |
|--|---|---|
| Fuel gauge shows empty at all fuel levels of fill | Loose or dirty wiring connections or short to ground wiring | Check wiring, connectors and sender assembly. Repair, clean or tighten as needed. |
| | Leaking sender float | Replace sender. |
| | Missing sender float | Install float. Make sure float is secured on sender arm. |
| | Short circuit in sender assembly | Test for correct resistance values and replace as needed. |
| | Sender assembly arm movement obstructed | Inspect fuel tank and sender for cause. Correct or replace faulty component. |
| Fuel gauge will not read full when tank is full | Wrong sender installed | Check part number. If incorrect, install correct part. |
| | Sender arm movement obstructed (float rod bent) | Inspect fuel tank and sender for cause. Correct or replace faulty component. |
| | Leaking float | Install new sender. |
| | Sender or gauge calibration | Test for correct resistance value and replace component as needed. |
| | Fuel tank not filling to rated capacity | Check fuel tank fill vent for kinks or obstructions. Correct as required and fill tank to verify proper capacity. |
| Fuel gauge shows full all fuel levels | Loose or dirty wiring connections or open circuit in wiring | Check wiring, connections and at sender terminals. Repair or clean if required. |
| | Open circuit in sending unit | Test for correct resistance values and replace if required. |
| | Sender arm movement obstructed | Inspect fuel tank and sender for cause. Gently bend float arm away from obstruction or replace component. |
| Fuel gauge reads incorrectly, but all fuel system components are running properly. | Fuel tank damage | Fuel sender mounting angle may have changed or the sender unit may be damaged. |

Symptom related diagnostic procedure

Symptom diagnosis chart

| | | | |
|--|---|--|--|
| 2 | Crank normally, but will not start (no combustion) | | |
| Description | <ul style="list-style-type: none">• Cranks normally, but no combustion• Battery is OK• Throttle valve closed while cranking | | |
| (Troubleshooting hint) No fuel injection to engine because of fuel shortage or no ignition in all cylinders. 1. No spark <ul style="list-style-type: none">• Ignition control malfunction• Malfunction of ignition system component 2. No fuel injection <ul style="list-style-type: none">• Malfunction of fuel pump• Malfunction of injector 3. Low fuel line pressure 4. Low engine compression pressure | | | |

| Step | Check | | Remedy |
|------|---|-----|--|
| 1 | Check for a strong blue spark plug with spark plug wire disconnected. Is blue spark present? | Yes | Go to step 5. |
| | | No | Go to next step. |
| 2 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does MIL stay on after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |

| | | | |
|----|---|-----|---|
| | | No | Go to next step. |
| 3 | Check ignition system. Check resistance of DLI coils. Primary: approx. 0.36~0.44Ω Secondary: 10.9~13.3 kΩ Check wiring harness between ECM and DLI coil. Is resistance within specification? | Yes | Go to next step. |
| | | No | Replace ignition coils or repair wiring harness. |
| 4 | Check spark plug wires. Resistance: 16 kΩ/m Check for damage to spark plug wires. Are spark plug wires OK? | Yes | Go to next step. |
| | | No | Replace spark plug wires. |
| 5 | Connect data link connector terminals fuel pump and B+ with a jumper wire and check operational sound of fuel pump. Does fuel pump operate? | Yes | Check if engine starts on this condition. - Check fuel pump relay or wiring harness if engine starts. - Go to step 7 if engine does not start. |
| | | No | Go to next step. |
| 6 | Check that battery voltage is applied on battery power wire of fuel pump connector when ignition switch is ON. | Yes | Check continuity of fuel pump - If there is continuity, replace fuel pump. - If there is no continuity, repair ground circuit. |
| | | No | Repair related wiring harness. |
| 7 | Crank engine and check operational sound of injector. | Yes | Go to step 10. |
| | | No | Go to next step. |
| 8 | Check that battery voltage is applied to injector connector when engine is running. | Yes | Go to next step. |
| | | No | Check wire between main relay and injector. |
| 9 | Check that the resistance of injector is 14.5Ω. | Yes | Go to next step. |
| | | No | Replace injector. |
| 10 | Connect data link connector terminals Fuel pump and B+ with a jumper wire and check fuel line pressure while ignition switch is ON. Fuel line pressure: 43~46 psi (296~317 kPa, 3.02~3.23 kg/cm²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max. pressure and replace as necessary. |
| 11 | Check engine compression pressure. Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm²) at 290 rpm Is engine compression pressure within specification? | Yes | Go to next step. |
| | | No | Check engine condition: - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve stuck to guide |
| 12 | Check condition of all spark plugs Spark plug gap: 0.039~0.043 in (1.0~1.1 mm) Check for excessive carbon deposit and correct contact with spark plug wires. Are spark plugs OK? | Yes | Go to next step. |
| | | No | Clean or replace. |
| 13 | Check crankshaft position sensor. Is crankshaft position sensor OK? | Yes | Go to next step. |
| | | No | Check crankshaft position sensor and related wire harness. |
| 14 | Replace ECM and check for proper operation. | | |

| | |
|--|--|
| 3 | Cranks normally, but won't start (partial combustion) - When engine is cold |
| Description | <ul style="list-style-type: none"> • Cranks normally, but partial, not continuous, combustion occurs • Battery is OK • Fuel present in tank |
| (Troubleshooting hint) 1. Overrich air/fuel ratio <ul style="list-style-type: none"> • Clogged air cleaner element • Malfunction of mass air flow sensor 2. Overlean air/fuel ratio <ul style="list-style-type: none"> • Incorrect fuel injection control (correction for engine coolant temperature) • Low fuel line pressure • Air leakage into intake system 3. Low engine compression pressure | |

| Step | Check | Remedy |
|------|---|--|
| 1 | Check that malfunction indicator light is illuminated. Does the MIL remain on after engine start-up? | Yes Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No Go to next step. |
| 2 | Disconnect spark plug. Crank engine and check for spark at plug wire terminal. Is spark OK? | Yes Go to next step. |
| | | No Replace ignition coil or repair wiring harness. |

| | | | |
|----|--|-----|--|
| 3 | Connect data link connector terminals fuel pump and B+ with a jumper wire and check fuel line pressure with ignition switch is ON. Fuel line pressure: 43~46 psi 296~317 kPa, 3.02~3.23 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary. |
| 4 | Do injectors operate while cranking engine? | Yes | Go to next step. |
| | | No | Check that battery voltage is applied to injector connector and check wire between main relay and injector. |
| 5 | Check resistance of injectors. Resistance: 14.5Ω Is resistance within specification? | Yes | Go to next step. |
| | | No | Replace injector. |
| 6 | Check condition of IAC valve. Check for open circuit between IAC valve and ECM. Check battery voltage is applied to battery power wire of IAC valve with engine running. Is IAC valve OK? | Yes | Go to next step. |
| | | No | Open circuit or incorrect voltage: - Repair wiring harness incorrect IAC valve resistance: - Replace IAC valve |
| 7 | Check terminal voltage of MAF sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors functioning properly? | Yes | Go to next step. |
| | | No | Repair as necessary. |
| 8 | Check if MAF sensor is OK. | Yes | Go to next step. |
| | | No | Replace MAF sensor. |
| 9 | Check that engine starts when engine coolant temperature sensor connector is disconnected. Does engine start? | Yes | Check engine coolant temperature sensor - If normal: check wiring harness between engine coolant temperature sensor and ECM - If not normal: replace engine coolant temperature sensor. |
| | | No | Go to next step. |
| 10 | Check air leakage at intake system components. | Yes | Repair or replace. |
| | | No | Go to next step. |
| 11 | Check engine compression pressure. Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm ²) at 290 rpm Is engine compression pressure within specification? | Yes | Go to next step. |
| | | No | Check engine condition: - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve stuck to guide |
| 12 | Check condition of spark plug. Spark plug gap: 0.039~0.043 in (1.0~1.1 mm) - Excessive carbon deposit - Contact with high spark plug wire Are spark plugs OK? | Yes | Go to next step. |
| | | No | Clean or replace. |
| 13 | Replace ECM and check for proper operation. | | |

| | | | |
|---|---|--|--|
| 4 | Cranks normally, but won't start (partial combustion) - After engine is warm-up | | |
| Description | <ul style="list-style-type: none">• After engine is left hot after running, cranking speed is OK• Battery is OK• Engine starts normally when engine is cold | | |
| (Troubleshooting hint) | | | |
| 1. Overrich air/fuel ratio | | | |
| <ul style="list-style-type: none">• Correction for coolant temperature• Fuel leakage at injector | | | |
| 2. Vapor lock occurs | | | |
| <ul style="list-style-type: none">• Fuel pressure decrease after engine stops | | | |

| Step | Check | Remedy | |
|------|---|--------|--|
| 1 | Warm up engine to normal operating temperature and stop engine. Connect data link connector terminal fuel pump and B+ with a jumper wire for 3 minutes while ignition switch is ON. Then check that engine starts. Does engine start? | Yes | Replace fuel with another brand. |
| | | No | Go to step 2. |
| 2 | Connect data link connector terminals fuel pump and B+ with a jumper wire and check fuel line pressure while ignition switch is ON. Fuel line pressure: 43~46 psi 296~317 kPa, 3.02~3.23 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. |

| | | | |
|---|--|-----|--|
| | | | If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary. |
| 3 | Plug fuel pressure regulator outlet and check that fuel pressure is retained while ignition switch is OFF. Fuel line pressure: 25 psi (180 kPa, 1.8 kg/cm ²) for 15 minutes Is fuel line pressure retention within specification? | Yes | Replace fuel pressure regulator. |
| | | No | Check fuel pump pressure is kept - If normal: check fuel leakage from injector - If not normal: replace fuel delivery module |
| 4 | Check that engine starts when engine coolant temperature sensor connector is disconnected. Does engine start? | Yes | Check engine coolant temperature sensor. - If normal: check wiring harness between engine coolant temperature sensor and ECM - If not normal: replace engine coolant temperature sensor |
| | | No | Go to next step. |
| 5 | Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 6 | Check terminal voltage of MAF sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensor terminals voltage correct? | Yes | Go to next step. |
| | | No | Check for causes. |
| 7 | Replace ECM and check for proper operation. | | |

| | |
|---|--|
| 5 | Cranks, normally, but hard to start - Always |
| Description | <ul style="list-style-type: none"> • Cranks normally, but cranking time up to starting is excessively long • Battery is OK • Engine is normal while engine is idling (Refer to "Rough Idling", if not in good idling condition) |
| (Troubleshooting hint) 1. Overrich air/fuel ratio <ul style="list-style-type: none"> • Incorrect fuel injection control (correction for engine coolant temperature) • Low fuel line pressure • Air leakage at intake system 2. Overrich air/fuel ratio <ul style="list-style-type: none"> • Clogged air cleaner element • Malfunction of manifold absolute pressure sensor 3. Spark plugs not in good condition | |

| Step | Check | | Remedy |
|------|---|-----|--|
| 1 | Check if malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check intake manifold vacuum while engine is idling. Vacuum: more than 18.9 inHg (480 mmHg) Is intake manifold vacuum within specification? | Yes | Go to next step. |
| | | No | Check air leakage at intake system. |
| 3 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Check air leakage at intake system. |
| 4 | Check if engine starts easily when throttle valve is held one quarter open. Does engine start easily? | Yes | Check carbon deposit on throttle valve and go to step 6. |
| | | No | Go to next step. |
| 5 | Check fuel line pressure while engine is idling. Fuel line pressure: 43~46 psi (296~317 kPa, 3.02~3.23 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary. |
| 6 | Check condition of IAC valve. Check for open circuit between IAC valve & ECM. Measure Battery voltage is applied to power wire engine running. Is IAC valve OK? | Yes | Go to next step. |
| | | No | Check for causes. |
| 7 | Connect data link connector terminals Fuel Pump and B+ with a jumper wire and check that engine starts. Does engine start? | Yes | Check fuel pump relay. - If normal, repair or replace wiring harness. - If not normal, replace relay. |
| | | No | Go to next step. |
| 8 | Check if map sensor is OK. | Yes | Clean or replace |
| | | No | Go to next step. |
| 9 | Check engine compression pressure Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm ²) at 290 rpm Is engine compression pressure within specification? | Yes | Go to next step. |
| | | No | Check engine condition. - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance |

| | | | |
|----|--|-----|------------------------|
| | | | - Valve stuck to guide |
| 10 | Check spark plug condition. Spark plug gap: 0.039~0.043 in (1.0~1.1 mm). Check for excessive carbon deposit and correct contact with spark plug wires. Are spark plugs OK? | Yes | Go to next step. |
| | | No | Clean or replace. |
| 11 | Replace ECM and check for proper operation | | |

| | | | |
|---|---|--|--|
| 6 | Crank normally, but hard to start - When engine is cold | | |
| Description | <ul style="list-style-type: none">• Cranks normally, but cranking time up to starting is excessively long• Battery is OK• Restart is normal after engine warmed up• Engine is normal while engine is idling(Refer to "Rough Idling" if not in good idling condition) | | |
| (Troubleshooting hint) | | | |
| 1. Overrich air/fuel ratio | | | |
| <ul style="list-style-type: none">• Malfunction of manifold absolute pressure sensor• Contaminated air cleaner element | | | |
| 2. Overlean air/fuel ratio | | | |
| <ul style="list-style-type: none">• Malfunction of injection control (correction for engine coolant temperature) | | | |

| Step | Check | Remedy | |
|------|--|--------|--|
| 1 | Check if malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check terminal voltage of MAF sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors OK? | Yes | Go to next step. |
| | | No | Check for causes. |
| 3 | Check if engine starts easily when throttle valve is held one quarter open. Does engine start easily? | Yes | Check carbon deposit on throttle valve and go to step 6. |
| | | No | Go to next step. |
| 4 | Check vacuum in intake manifold while engine is idling. Vacuum: more than 18.9 inHg (480 mmHg) Is intake manifold vacuum within specification? | Yes | Go to next step. |
| | | No | Check air leakage at intake air system compinent. |
| 5 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner element |
| 6 | Connect data link connector terminals fuel pump and B+ with a jumper wire and check fuel line pressure while ignition switch is ON. Fuel line pressure: 43~46 psi (296~317 kPa, 3.02~3.23 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary. |
| 7 | Replace ECM and check for proper operation. Is system operating correctly? | Yes | Road test and return vehicle to customer. |
| | | No | Replace fuel with another brand. |

| | | | |
|--|--|--|--|
| 7 | Crank normally, but hard to start - After engine is warm-up | | |
| Description | <ul style="list-style-type: none">• After engine is left hot after running, cranks normally, but cranking time up to starting is excessively long• Battery is OK• Starts normally when engine is cold• Engine is normal while engine is idling(Refer to "Rough Idling",if not in good idling condition) | | |
| (Troubleshooting hint) | | | |
| 1. Overrich air/fuel ratio | | | |
| <ul style="list-style-type: none">• Malfunction of fuel ratio calculation• Fuel leakage from injector | | | |
| 2. Vapor lock | | | |
| <ul style="list-style-type: none">• Fuel leakage from injector | | | |

| Step | Check | Remedy | |
|------|--|--------|--|
| 1 | Check if malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check terminal voltage of mass airflow sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors OK? | Yes | Go to next step. |
| | | No | Check for causes. |
| 3 | After engine idling and turn ignition switch OFF. Check that fuel line pressure is retained. Fuel line pressure: more than 25 psi (180 kPa, 1.8 kg/cm ²) for 15 minutes | Yes | Go to next step. |
| | | No | Plug outlet of fuel pressure regulator and turn ignition switch OFF. Then check that fuel line Pressure is retained. - If normal: replace fuel pressure regulator |

| | | | |
|---|---|-----|---|
| | Is fuel line pressure retention within specification? | | - If not normal: check fuel pump pressure kept If fuel pump is normal, check fuel leakage from injector. |
| 4 | Warm up engine to normal operating temperature and stop engine. Connect date link connector terminals fuel pump and B+ with a jumper wire for 3 minutes while ignition switch is ON. Then check that engine starts easily. Does engine start easily? | Yes | Replace fuel with another brand. |
| | | No | Go to next step. |
| 5 | Replace ECM and check for proper operation. Is system operating correctly? | Yes | Road test and return vehicle to customer. |
| | | No | Replace fuel with another brand. |

| | |
|--|---|
| 8 | Rough idling / engine stops while idling - always |
| Description | • Engine starts normally, but engine stops or vibrates while idling |
| (Troubleshooting hint) | |
| 1. Overrich air/fuel ratio | |
| • Air leakage | |
| • Malfunction if fuel injection control | |
| • Low fuel line pressure | |
| 2. Clogging or malfunction of one or more injector | |
| 3. Malfunction of manifold absolute pressure sensor | |
| 4. Malfunction of IAC valve or related wiring | |
| 5. Malfunction of spark plugs | |
| 6. Low engine compression pressure | |
| 7. Malfunction of throttle position sensor or related wiring | |

| Step | Check | Remedy | |
|------|--|--------|--|
| 1 | Check if malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check terminal voltage of mass airflow sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors OK? | Yes | Go to next step. |
| | | No | Check for causes. |
| 3 | Check operating sound of injectors while engine is idling. Are injectors operating? | Yes | Go to step 5. |
| | | No | Go to next step. |
| 4 | Check that voltage is applied to injector connectors while engine is running (approx. 12V). Is voltage within specification? | Yes | Go to next step. |
| | | No | Check wiring harness between ECM and injector. |
| 5 | Check resistance of injector. Resistance: 14.5Ω Is resistance within specification? | Yes | Go to next step. |
| | | No | Replace injector. |
| 6 | Ignition ON, throttle closed, measure voltage of throttle position sensor (0.3~0.9). Is voltage within specification? | Yes | Go to next step. |
| | | No | Replace throttle position sensor or repair wiring harness. |
| 7 | Check if MAF sensor is OK. | Yes | Go to next step. |
| | | No | Replace MAF sensor. |
| 8 | Check engine compression pressure. Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm ²) - 290 rpm Is engine compression pressure within specification? | Yes | Go to next step. |
| | | No | Check engine condition. - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Valve stuck to guide |
| 9 | Replace ECM and check for proper operation. | | |

| | |
|---|---|
| 9 | Rough idling / engine stops while engine is idling - when engine is cold |
| Description | • Engine speed is slow, engine stops or vibrates while warming up engine. |
| (Troubleshooting hint) | |
| 1. Insufficient intake air | |
| • Malfunction of MAFS | |
| • Clogged air cleaner element | |
| • Malfunction of IAC valve | |
| 2. Malfunction of fuel injection control | |
| • Malfunction of fuel injection control devices | |
| (correction for engine coolant temperature) | |

| Step | Check | Remedy | |
|------|--|--------|--|
| 1 | Check if malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check intake manifold vacuum at dynamic chamber while engine is idling. Vacuum: 18.9 inHg (480 mmHg) at idle Is intake manifold vacuum within specification? | Yes | Go to next step. |
| | | No | Check for air leakage in intake system. |
| 3 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner element. |
| 4 | Check terminal voltage of mass airflow sensor, throttle position sensor, ignition | Yes | Go to next step. |

| | | | |
|---|---|-----|--|
| | coils, engine coolant temperature sensor. Are sensors OK? | No | Check for causes. |
| 5 | Check resistance of engine coolant temperature sensor. <div style="border: 1px solid black; padding: 2px; margin: 5px 0;"> - At -4°F(-20°C) : $14.6^{+0.1}_{-0.05}$ kΩ - At 68°F(20°C) : 2.45 ± 0.245 kΩ - At 176°F(80°C) : 0.318 ± 0.205 kΩ </div> Is resistance within specification? | Yes | Go to next step. |
| | | No | Replace engine coolant temperature sensor. |
| 6 | Replace ECM and check for proper operation. Is system operating correctly? | Yes | Road test and return vehicle to customer. |
| | | No | Replace fuel with another brand. |

| | |
|---|--|
| 10 | Rough idling / engine stops while engine is idling - After engine is warm-up |
| Description | <ul style="list-style-type: none"> Engine operation is normal while warming up engine, but engine stops or vibrates after warm-up |
| (Troubleshooting hint) 1. Malfunction of IAC valve 2. Overlean air/fuel ratio <ul style="list-style-type: none"> Air leakage Low fuel line pressure 3. Malfunction of ignition system 4. Overrich air/fuel ratio <ul style="list-style-type: none"> Malfunction of fuel injection control (correction for coolant temperature) 5. Low engine compression pressure | |

| Step | Check | Remedy | |
|------|---|--------|--|
| 1 | Check if malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check terminal voltage of mass airflow sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors OK? | Yes | Go to next step. |
| | | No | Check for causes. |
| 3 | Check vacuum of intake manifold. Vacuum: more than 18.9inHg (480 mmHg) at idle | Yes | Go to next step. |
| | | No | Check for air leakage at intake system component. |
| 4 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner. |
| 5 | Check fuel line pressure while engine is idling. Fuel line pressure: 43~46 psi (294~314 kPa, 3.0~3.1 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary. |
| 6 | Disconnect engine coolant temperature sensor connector and check that engine condition improves. Does engine condition improve? | Yes | Replace engine coolant temperature sensor. |
| | | No | Go to next step. |
| 7 | Check operating sound of injector while engine is idling. Are injectors operating? | Yes | Go to step 10. |
| | | No | Go to next step. |
| 8 | Check resistance of injector Resistance: 14.5Ω Is resistance within specification? | Yes | Go to step 10. |
| | | No | Replace injector. |
| 9 | Check engine compression pressure. Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm ²) at 290 rpm Is engine compression pressure within specification? | Yes | Go to next step |
| | | No | Check engine. |
| 10 | Replace ECM and check for proper operation. | | |

| | |
|--|---|
| 11 | Rough idling / engine stops while engine is idling - When A/C is in operation |
| Description | <ul style="list-style-type: none"> Engine stops or vibrates excessively when A/C is operating Idling condition is normal when A/C is turned OFF |
| (Troubleshooting hint) 1. Malfunction of IAC control system 2. Malfunction of A/C operational switch | |

| Step | Check | Remedy | |
|------|---|--------|--|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |

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| 2 | Check air conditioner cut relay is ON/OFF when air conditioner switch is ON/OFF. Are A/C cut relay and A/C switch OK? | Yes | Go to next step. |
| | | No | Malfunction of air conditioner switch or air conditioner cut relay. |
| 3 | Check for continuity between terminal 24 and 81 of ECM. Does continuity exist? | Yes | Go to next step. |
| | | No | Repair wiring harness. |
| 4 | Replace ECM and check for proper operation. | | |

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| 12 | Abnormal idling / engine stops immediately after starting | | |
| Description | <ul style="list-style-type: none">Starting is normal, but engine vibrates excessively or stops immediately after starting (when accelerating from idling condition)Idling condition is normal on other conditions. | | |
| (Troubleshooting hint) 1. Malfunction of IAC system. 2. Air leakage at intake system. 3. Malfunction of MAFS. | | | |

| Step | Check | Remedy | |
|------|---|--------|--|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check if MAF sensor is OK. | Yes | Go to next step. |
| | | No | Repair MAF sensor or related wiring harness. |
| 3 | Check that voltage of throttle position sensor terminal is 0.3~0.9V and does not vary. Is voltage within specification? | Yes | Go to next step. |
| | | No | Replace throttle position sensor or wiring harness. |
| 4 | Check for air leakage at intake system and vacuum at dynamic chamber while engine is idling. Vacuum: more than 18.9 inHg (480 mmHg) Is intake manifold vacuum within specification? | Yes | Go to next step. |
| | | No | Check intake system and dynamic chamber. |
| 5 | Replace ECM and check for proper operation. | | |

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|---|--|
| 13 | High idle speed after engine warm- up |
| Description | • Excessively high idle speed after engine warmed up |
| (Troubleshooting hint) Excessive intake air flow 1. Throttle valve not closed completely 2. Malfunction of idle speed control <ul style="list-style-type: none">• IAC valve stuck• IAC valve connector disconnected• Incorrect input signal from engine coolant temperature sensor | |

| Step | Check | Remedy | |
|------|---|--------|--|
| 1 | Check that throttle valve is closed completely when accelerator pedal is released. Is throttle valve closed? | Yes | Go to next step. |
| | | No | Check correct installation and free operation of throttle linkage. If not normal, clean or adjust linkage. |
| 2 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 3 | Disconnect engine coolant temperature sensor connector and check if engine condition improves. Does engine condition improves? | Yes | Replace engine coolant temperature sensor. |
| | | No | Go to next step. |
| 4 | Check that voltage of throttle position sensor terminal is 0.3~0.9V and does not vary. | Yes | Replace throttle position sensor or wiring harness. |
| | | No | Go to next step. |
| 5 | Check following ECM terminal voltage - IAC valve control - A/C request input - Park/neutral input Are voltage correct? | Yes | Go to next step. |
| | | No | Replace as necessary. |
| 6 | Replace ECM and check for proper operation. | | |

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| 14 | Variation of idle speed / idle hunting |
| Description | • Periodic engine speed increase and decrease while engine is idling |
| (Troubleshooting hint) | |
| 1. Malfunction of throttle position sensor system | |
| 2. Air leakage | |
| 3. Malfunction of IAC control system | |
| 4. Fuel injection is irregular | |
| 5. Malfunction of ignition system | |

| Step | Check | Remedy | |
|------|---|--------|--|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |

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|----|--|-----|---|
| 2 | Check that voltage of throttle position sensor terminal is 0.4~0.8V and does not vary. Is voltage within specification? | Yes | Go to next step. |
| | | No | Replace throttle position sensor or wiring harness. |
| 3 | Check air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner element. |
| 4 | Disconnect high tension cord and check equal engine speed decrease in all cylinders. | Yes | Go to next step. |
| | | No | Go to step 7. |
| 5 | Check following ECM terminal voltage • IAC valve control • A/C request input • Park/neutral input Are voltage correct? | Yes | Go to next step. |
| | | No | Check for causes. |
| 6 | Check if MAF sensor is OK. | Yes | Go to next step. |
| | | No | Replace the MAF sensor. |
| 7 | Check operating sound of injector while engine is idling. Are injectors OK. | Yes | Go to step 9. |
| | | No | Go to next step. |
| 8 | Check that approx. battery voltage is applied to injector connector terminals. Is voltage within specification? | Yes | Go to next step. |
| | | No | Check the wiring harness between ECM and injector. |
| 9 | Check resistance of injector. Resistance : 14.5Ω Is resistance within specification? | Yes | Go to next step. |
| | | No | Replace injector. |
| 10 | Check spark plugs for proper operation. Are spark plugs OK? | Yes | Go to next step. |
| | | No | Clean or replace. |
| 11 | Check engine compression pressure Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm ²) at 290 rpm Is engine compression pressure within specification? | Yes | Go to next step. |
| | | No | Check for cause. |
| 12 | Check for fuel leakage from injectors. Do injectors leak? | Yes | Replace the injector. |
| | | No | Go to next step. |
| 13 | Replace ECM and check for proper operation. | | |

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| 15 | Engine stalls on deceleration |
| Description | <ul style="list-style-type: none"> Engine stops unexpectedly during or after deceleration Idling condition is normal |
| (Troubleshooting hint) Engine speed decreases abruptly when accelerator pedal is released, which can cause connectors to come loose. 1. Malfunction of idle air control 2. Malfunction of throttle position sensor system 3. Malfunction of fuel cut control | |

| Step | Check | Remedy | |
|------|--|--------|---|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to Troubleshooting with Diagnostic Trouble Codes. |
| | | No | Go to next step. |
| 2 | Check throttle position sensor, IAC valve terminal voltage and related wiring harness. Are sensors OK? | Yes | Go to next step. |
| | | No | Repair the wiring harness or replace defective component. |
| 3 | Check ECM terminal voltages for M20, M10, M19, M17, M22 and M1. Are voltage within specification? | Yes | Go to next step. |
| | | No | Check for cause and repair as necessary. |
| 4 | Check contact condition of following connectors: - Throttle position sensor, mass airflow pressure sensor, ignition coils, injector, crankshaft position sensor, ECM. Are terminal connections OK? | Yes | Go to next step. |
| | | No | Repair or replace. |
| 5 | Replace ECM and check for proper operation. | | |

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|--|---|
| 16 | Engine stalls suddenly (intermittent), sudden engine stop |
| Description | <ul style="list-style-type: none"> Engine stops suddenly and intermittently Engine is normal until engine stops |
| (Troubleshooting hint) 1. Malfunction of IAC control system 2. Malfunction of throttle position sensor system 3. Intermittent loosened electrical contact | |

| Step | Check | Remedy | |
|------|--|--------|--|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check contact condition of the following connectors: - Throttle position sensor, mass airflow sensor, ignition coils, injector, crankshaft position sensor, ECM. Are connections OK? | Yes | Go to next step. |
| | | No | Repair or replace as necessary. |
| 3 | Measure crankshaft position sensor and manifold absolute pressure sensor | Yes | Go to next step. |

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| | signals. Are sensor signals OK? | No | Repair or replace. |
| 4 | Check ECM terminal voltages for M20, M10, M19, M17, M22 and M1. Are voltages OK? | Yes | Go to next step. |
| | | No | Check for cause and repair as necessary. |
| 5 | Replace ECM and check for proper operation. | | |

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| 17 | Stumble / hesitation on acceleration |
| Description | • Vehicle seems to stop for a time immediately after pressing accelerator or rattles a little during acceleration. |
| (Troubleshooting hint) 1. Lean air/fuel ration on acceleration • Low fuel line pressure • Air leakage • Malfunction of fuel injection control | |

| Step | Check | | Remedy |
|------|---|-----|--|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check vacuum in intake manifold while engine idling. Vacuum: more than 18.9 inHg (480 mmHg) Is intake manifold vacuum within specification? | Yes | Go to next step. |
| | | No | Check air leakage at air intake system and repair. |
| 3 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner element. |
| 4 | Check if MAF sensor is OK. Is MAF sensor OK? | Yes | Go to next step. |
| | | No | Replace MAP sensor. |
| 5 | Check engine coolant temperature sensor. Is ECT sensors OK? | Yes | Go to next step. |
| | | No | Replace the engine coolant temperature sensor. |
| 6 | Check throttle position sensor. Voltage between terminals: Idling condition: 0.3~0.9V Throttle valve full open: 4.0~4.4V Is TP sensor OK? | Yes | Go to next step. |
| | | No | Replace throttle position sensor. |
| 7 | Disconnect injector connector one by one while engine in idling, and check equal engine speed decrease for each cylinder. Does engine speed decrease equally for all cylinders? | Yes | Go to next step. |
| | | No | Check injector. Refer to Fuel System, Section 22. |
| 8 | Check correct installation and free operation of throttle linkage. Is throttle linkage OK? | Yes | Go to next step. |
| | | No | Adjust or replace joint or damaged linkage and adjust deflection of throttle cable. |
| 9 | Check fuel line pressure while engine is idling. Fuel line pressure: 43~46 psi (296~317 kPa, 3.02~3.23 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary. |
| 10 | Check air passage and vacuum hose installation. Are vacuum hoses OK? | Yes | Go to next step. |
| | | No | Repair as necessary. |
| 11 | Check exhaust system clogging. Is exhaust system clogged? | Yes | Repair or replace necessary. |
| | | No | Go to next step. |
| 12 | Replace ECM and check for proper operation. | | |

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|--|---|
| 18 | Surging while cruising |
| Description | • Repeated engine speed variation occurs at all times |
| (Troubleshooting hint) 1. Malfunction of throttle position sensor system 2. Misfire 3. Intermittent electrical connection 4. Lean air/fuel ratio | |

| Step | Check | | Remedy |
|------|---|-----|--|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Check vacuum in intake manifold while engine idling. | Yes | Go to next step. |

| | | | |
|----|---|-----|---|
| | Vacuum: more than 18.9 inHg (480 mmHg) | No | Check air leakage at air intake system and repair. |
| | Is intake manifold vacuum within specification? | | |
| 3 | Check throttle position sensor Voltage between terminals: Idling condition: 0.3~0.9V Throttle valve full open: 4.0~4.4V Is TP sensor OK? | Yes | Go to next step. |
| | | No | Replace throttle position sensor. |
| 4 | Disconnect heated oxygen sensor connector and check for proper operation. Is HO2S OK? | Yes | Go to next step. |
| | | No | Replace front heated oxygen sensor. |
| 5 | Check that vehicle speed sensor signal input to ECM D22. Is correct. Is signal correct? | Yes | Go to next step. |
| | | No | Repair wiring harness or vehicle speed sensor. |
| 6 | Check ECM terminal voltages for M20, M10 and M19. Are voltages OK? | Yes | Go to next step. |
| | | No | Check for causes and repair. |
| 7 | Check correct installation and free operation of throttle linkage. Is throttle linkage OK? | Yes | Go to next step. |
| | | No | Adjust or replace joint or damaged linkage and adjust deflection of throttle body cable. |
| 8 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner element. |
| 9 | Check fuel line pressure while engine is idling. Fuel line pressure: 43~46 psi (296~317 kPa, 3.02~3.23 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max. pressure and replace as necessary. |
| 10 | Check exhaust system clogging. Is exhaust system clogged? | Yes | Repair as necessary. |
| | | No | Go to next step. |
| 11 | Replace ECM and check for proper operation. | | |

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|---|---|
| 19 | Lack of power |
| Description | <ul style="list-style-type: none"> • Lack of power at full throttle • Lower maximum vehicle speed • Idling speed is normal |
| (Troubleshooting hint) 1. Insufficient intake air • Throttle valve does not open fully • Clogged intake air system 2. Lean air/fuel ratio • Fuel line pressure decrease • Malfunction of fuel injection 3. Malfunction of ignition 4. Low engine compression pressure | |

| Step | Check | Remedy |
|------|---|--|
| 1 | Check following items. - Clutch slippage - Brake dragging - Lack of tire air pressure - Improper tire size Are these systems OK? | Yes Go to next step. |
| | | No Repair as necessary. |
| 2 | Is throttle valve open fully when depressing accelerator pedal fully? | Yes Go to step 5. |
| | | No Go to next step. |
| 3 | Check correct installation of throttle cable. Is throttle cable OK? | Yes Go to next step. |
| | | No Repair or adjust throttle cable. |
| 4 | Check correct operation of throttle body. Is throttle body OK? | Yes Go to next step. |
| | | No Repair or replace throttle body. |
| 5 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes Malfunction indicator light is illuminated. Check for causes. Refer to trouble shooting with diagnostic trouble codes. |
| | | No Go to next step. |
| 6 | Check the camshaft position sensor. Is CMP sensor OK? | Yes Go to next step. |
| | | No Replace camshaft position sensor or repair related wire harness. |
| 7 | Check throttle position sensor. Voltage between terminals: Idling condition: 0.3~0.9V Throttle valve full open: 4.0~4.4V Is TP sensor OK? | Yes Go to next step. |
| | | No Replace the throttle position sensor. |

| | | | |
|----|--|-----|---|
| 8 | Check vacuum in intake manifold while engine is idling. Vacuum: more than 18.9 inHg (480 mmHg) Is intake manifold vacuum within specification? | Yes | Go to next step. |
| | | No | Repair intake system or dynamic chamber. |
| 9 | Disconnect injector connector one by one while engine is idling, and check equal engine speed decrease for each cylinder. Does engine speed decrease equally for each cylinder? | Yes | Go to next step. |
| | | No | Check injector. Refer to fuel system. |
| 10 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner element. |
| 11 | Keep engine idling and turn ignition switch OFF. Check that fuel line pressure is retained. Fuel line pressure: more than 25 psi (180 kPa, 1.8 kg/cm ²) for 15 minutes Is fuel pressure retention within specification? | Yes | Go to next step. |
| | | No | Plug outlet of pressure regulator and turn ignition switch OFF. Then check fuel line pressure is retained. - If normal: replace pressure regulator - If not normal: check fuel pump If fuel pump is normal, check fuel leakage from injector |
| 12 | Does fuel line pressure increase when accelerating abruptly? Fuel line pressure: 48 psi (330 kPa, 3.3 kg/cm ²) | Yes | Go to next step. |
| | | No | Check fuel line and fuel filter clogging and repair if as necessary. |
| 13 | Check the MAF sensor. Is MAF sensor OK? | Yes | Go to next step. |
| | | No | Replace MAF sensor. |
| 14 | Check ignition system - Check resistance of DLI coil Primary: 0.36~0.44Ω Secondary: 10.9~13.3 kΩ - Check wiring harness between DLI coil and ECM. Is ignition system OK? | Yes | Go to next step. |
| | | No | Replace ignition coils or repair wiring harness. |
| 15 | Check spark plug wires. Are spark plug wires OK? | Yes | Go to next step. |
| | | No | Replace spark plug wires. |
| 16 | Check spark plug. Are spark plugs OK? | Yes | Go to next step. |
| | | No | Clean or replace. |
| 17 | Check engine compression pressure Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm ²) at 290 rpm Is engine compression pressure within specification? | Yes | Go to next step. |
| | | No | Check engine condition - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve guide stuck |
| 18 | Replace ECM and check for proper operation. Is system operating correctly? | Yes | Road test and return vehicle to customer. |
| | | No | Replace fuel with another brand. |

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|---|--|
| 20 | Poor acceleration / lack of power |
| Description | <ul style="list-style-type: none"> • Lack of power on acceleration • Lack of power at full throttle • Lower maximum vehicle speed • Idling speed is normal |
| (Troubleshooting hint) 1. Factors except engine malfunction <ul style="list-style-type: none"> • Clutch slippage • Brake dragging • Lack of tire air pressure • Improper tire size • Overload 2. Insufficient intake air <ul style="list-style-type: none"> • Throttle valve does not open fully • Intake system clogging 3. Overlean air/fuel ratio 4. Malfunction of ignition system 5. Low engine compression pressure | |

| Step | Check | | Remedy |
|------|--|-----|-----------------------------------|
| 1 | Are the following factors OK? - Clutch slippage - Brake dragging - Lack of tire air pressure - Improper tire size - Overload Are the items OK? | Yes | Go to next step. |
| | | No | Repair as necessary. |
| 2 | Is throttle valve open fully when depressing accelerator pedal fully? | Yes | Go to step 5. |
| | | No | Go to next step. |
| 3 | Check correct installation of throttle cable. Is throttle cable OK? | Yes | Go to next step. |
| | | No | Repair or replace throttle cable. |
| 4 | Check correct operation of throttle body. Is throttle body OK? | Yes | Go to next step. |
| | | No | Repair or replace throttle body. |

| | | | |
|----|---|-----|--|
| 5 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 6 | Check camshaft position sensor and connector. Is CMP sensor OK? | Yes | Go to next step. |
| | | No | Replace camshaft position sensor or repair related wire harness. |
| 7 | Check throttle position sensor. Voltage between terminals: Idling condition: 0.3~0.9V Throttle valve fully open: 4.0~4.4V Is TP sensor OK? | Yes | Go to next step. |
| | | No | Replace throttle position sensor. |
| 8 | Check vacuum in intake manifold while engine is idling. Vacuum: more than 18.9 inHg (480 mmHg) Is intake manifold vacuum within specification? | Yes | Go to next step. |
| | | No | Check air leakage into intake system and repair as necessary. |
| 9 | Disconnect injector connector one by one while engine is idling. Is there an equal engine speed decrease for each cylinder? | Yes | Go to next step. |
| | | No | Check injectors. Refer to fuel system. |
| 10 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner element. |
| 11 | Check fuel line pressure while engine is idling. Fuel line pressure: 43~46 psi (296~317 kPa, 3.02~3.23 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max. pressure and replace as necessary |
| 12 | Does fuel line pressure increase when accelerating abruptly. Fuel line pressure: 48 psi (330 kPa, 3.3 kg/cm ²) | Yes | Go to next step. |
| | | No | Check fuel line and fuel filter clogging and repair as necessary. |
| 13 | Check the MAF sensor. Is MAF sensor OK? | Yes | Go to next step. |
| | | No | Replace MAF sensor. |
| 14 | Check ignition system. Check resistance of DLI coils. Primary: 0.36~0.44Ω Secondary: 10.9~13.3 kΩ Check wiring harness between DLI coils and ECM. Is ignition system OK? | Yes | Go to next step. |
| | | No | Replace ignition coils or repair wiring harness |
| 15 | Check spark plug wires. Are spark plug wires OK? | Yes | Go to next step. |
| | | No | Replace spark plug wires. |
| 16 | Check spark plugs. - Spark plug gap: 0.034~0.043 in (1.0~1.1 mm) - Excessive carbon deposit - Contact with high tension cord Are spark plug OK? | Yes | Go to next step. |
| | | No | Clean or replace as necessary. |
| 17 | Check engine compression pressure Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm ²) at 290 rpm Is engine compression pressure within specification? | Yes | Go to next step. |
| | | No | Check engine condition - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve stuck to guide |
| 18 | Replace ECM and check for proper operation. Is system operating correctly? | Yes | Road test and return vehicle to customer. |
| | | No | Replace fuel with another brand. |

| | |
|--|---|
| 21 | Rough engine running on deceleration/ backfire |
| Description | <ul style="list-style-type: none"> • Rough engine running on deceleration and backfire • Transmission is normal |
| (Troubleshooting hint) 1. Overrich air/fuel ratio <ul style="list-style-type: none"> • Air cleaner element clogged • Malfunction of fuel injection system (fuel cut control) • Fuel leakage from injector • Malfunction of throttle position sensor | |

| Step | Check | Remedy |
|------|---|--|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes Malfunction indicator light is illuminated. Check of causes. Refer to troubleshooting with diagnostic trouble codes. |

| | | | |
|----|---|-----|---|
| | | No | Go to next step. |
| 2 | Check vacuum in intake manifold while engine is idling. Vacuum: more than 18.9 mmHg (480 mmHg) Is intake manifold vacuum within specification? | Yes | Go to next step. |
| | | No | Check air leakage into air intake system. |
| 3 | Check cleanness of air cleaner element. Is air cleaner element OK? | Yes | Go to next step. |
| | | No | Replace air cleaner element. |
| 4 | Check ECM terminal voltages for M1 and M17. Are terminal voltages OK? | Yes | Go to next step. |
| | | No | Check for cause and repair as necessary. |
| 5 | Check fuel injection system. Is fuel injection system OK? | Yes | Go to next step. |
| | | No | Repair injection system as necessary. |
| 6 | Check mass air flow sensor. Is MAF sensor OK? | Yes | Go to next step. |
| | | No | Replace MAF sensor. |
| 7 | Check throttle position sensor. - Voltage between terminals When idling: 0.3~0.9V When opening throttle valve fully: 4.0~4.4V - Check that idling voltage return to specified value when releasing after pulling accelerator cable. Is TP sensor OK? | Yes | Go to next step. |
| | | No | Replace throttle position sensor. |
| 8 | Check throttle body contamination. Is throttle body contaminated? | Yes | Clean or replace as necessary. |
| | | No | Go to next step. |
| 9 | Check fuel leakage from injector. Do fuel injectors leak? | Yes | Clean or replace as necessary. |
| | | No | Go to next step. |
| 10 | Replace ECM and check for proper operation. | | |

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| 22 | Knocking |
| Description | • Abnormal combustion occurs, accompanied by audible "pinging" noise |
| (Troubleshooting hint) 1. Improper ignition timing 2. Carbon deposit in cylinder 3. Engine overheat 4. Overlean air/fuel ratio • Incorrect fuel injection • Fuel line pressure decrease on acceleration | |

| Step | Check | | Remedy |
|------|--|-----|--|
| 1 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 2 | Is throttle valve open fully when depressing accelerator pedal fully? | Yes | Go to step 5. |
| | | No | Go to next step. |
| 3 | Check correct installation of throttle cable. Is throttle cable OK? | Yes | Go to next step. |
| | | No | Repair or replace throttle cable. |
| 4 | Check correct installation of throttle body. Is throttle body OK? | Yes | Go to next step. |
| | | No | Repair or replace throttle body. |
| 5 | Check engine compression pressure. Engine compression pressure: 193 psi (1360 kPa, 13.6 kg/cm ²) at 290 rpm Is engine compression pressure within specification? | Yes | Go to next step. |
| | | No | Check engine condition. - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve stuck to guide |
| 6 | Check camshaft position sensor. Is CMP sensor OK? | Yes | Go to next step. |
| | | No | Replace camshaft position sensor or repair related wire harness. |
| 7 | Check fuel line pressure while engine is idling Fuel line pressure: 43~46 psi (296~317 kPa, 3.02~3.23 kg/cm ²) (on condition that vacuum hose is disconnected from pressure regulator) Is fuel line pressure within specification? | Yes | Go to next step. |
| | | No | High pressure: Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. Low pressure: Block return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max. pressure and replace as necessary. |
| 8 | Check cooling system. Is cooling system OK? | Yes | Go to next step. |
| | | No | Repair or replace. |
| 9 | Replace ECM and check for proper operation. Is system operating correctly? | Yes | Road test and return vehicle to customer. |
| | | No | Replace fuel with another brand. |

| | |
|---|--------------------------------------|
| 23 | Fuel odor |
| Description | • Fuel odor in passenger compartment |
| (Troubleshooting hint) 1. Loose connection of fuel system or evaporative engine system 2. Malfunction of evaporative emissions system | |

| Step | Check | | Remedy |
|------|---|-----|---|
| 1 | Check damage or leakage of fuel system or evaporative emission system. Are system leaking or damaged? | Yes | Repair or replace as necessary. |
| | | No | Go to next step. |
| 2 | Check that malfunction indicator light is illuminated while ignition switch is ON. Does the MIL remain ON after engine start-up? | Yes | Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes. |
| | | No | Go to next step. |
| 3 | Warm up engine fully. After disconnecting vacuum hose from evaporative emissions canister to purge solenoid valve, check that vacuum is applied to it. Is vacuum applied? | Yes | Go to step 6. |
| | | No | Go to next step. |
| 4 | Check operational sound of EVAP canister purge solenoid valve is normal. Is EVAP canister purge valve OK? | Yes | Check vacuum hose clogging. |
| | | No | Go to next step. |
| 5 | Check that vacuum is applied to vacuum hose after applying battery voltage to EVAP canister purge valve. Is vacuum applied? | Yes | Check ECM terminal voltage. |
| | | No | Replace EVAP canister purge valve. |
| 6 | Replace ECM and check for proper operation. | | |

| | |
|---|------------------------|
| 24 | High oil consumption |
| Description | • High oil consumption |
| (Troubleshooting hint) 1. Malfunction of PCV valve 2. Malfunction of engine (oil leakage) | |

| Step | Check | | Remedy |
|------|--|-----|---|
| 1 | Check damage, removal, clogging or sticking of PCV hose, or ventilation hose fittings. Is PVC system OK? | Yes | Go to next step. |
| | | No | Repair or replace as necessary. |
| 2 | Check if there is air pressure or oil in ventilation hose. Is ventilation hose OK? | Yes | Check engine condition: - Wear of piston ring groove - Malfunction of piston ring - Wear of piston or cylinder |
| | | No | Check engine condition: - Oil leakage - Wear of valve seal - Wear of valve stem - Wear of valve guide |

| | |
|---|---|
| 25 | MIL on continuously |
| Description | • Scan tool does not display diagnostic trouble code, but MIL light on continuously |
| (Troubleshooting hint) 1. Short circuit of wiring harness 2. Malfunction of ECM | |

| Step | Check | | Remedy |
|------|---|-----|--|
| 1 | Disconnect wire(F20) from ECM and check that MIL remains illuminated. Is MIL illuminated? | Yes | Replace ECM. |
| | | No | Check short circuit from meter set to ECM. |

| | |
|--|--|
| 26 | MIL does not light illuminate |
| Description | • Scan Tool displays malfunction code, but MIL does not illuminate |
| (Troubleshooting hint) 1. Bulb is blown 2. Open circuit 3. Malfunction of ECM | |

| Step | Check | | Remedy |
|------|---|-----|--|
| 1 | Check MIL bulb is OK. Is bulb OK? | Yes | Go to next step. |
| | | No | Replace bulb. |
| 2 | Ground ECM terminal F20 with a jumper wire and check if MIL illuminates. Does MIL illuminate? | Yes | Go to next step. |
| | | No | Repair wiring harness from ECM to meter set. |
| 3 | Check ECM connections. Are ECM connections OK? | Yes | Replace ECM. |
| | | No | Repair or replace ECM connector. |

| | |
|--|--|
| 27 | Air conditioner does not operate |
| Description | • Description Blower motor operates, but magnetic clutch not engaged |
| (Troubleshooting hint) 1. Short or open circuit of wiring harness 2. Malfunction of air conditioner relay, air conditioner switch, magnetic switch | |

3. Malfunction of ECM

| Step | Check | Remedy |
|------|--|---------------------------------|
| 1 | Check voltage of ECM terminal F29. Is voltage OK? | Yes Go to next step. |
| | | No Check for causes. |
| 2 | Check voltage of ECM terminal F25. Is voltage OK? | Yes Check air condition system. |
| | | No Replace ECM. |

Diagnostic trouble codes diagnosis

| DTC | Diagnostic items | Trouble area | GV6 | |
|-------|--|---|-------|-----------|
| | | | Immo. | Non-Immo. |
| P0100 | Mass or Volume Air Flow Circuit Malfunction | <ul style="list-style-type: none"> • Open or short to battery between MAFS and ECM • Short to ground between MAFS and ECM • Poor connection at ECM, MAFS | Δ | ○ |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance Problem | <ul style="list-style-type: none"> • Dirty air cleaner • Air leak in intake system • Contaminated, deteriorated or damaged MAFS • Faulty mass air flow sensor or throttle position sensor • Poor connections at ECM, MAFS, or TPS | Δ | Δ |
| P0110 | Intake Air Temperature Circuit Low Input | <ul style="list-style-type: none"> • Open or short to battery between IATS in MAFS and ECM • Short to ground between IATS in MAFS and ECM • Short between wires • Faulty IATS in MAFS | Δ | Δ |
| P0115 | Engine Coolant Temperature Circuit Malfunction | <ul style="list-style-type: none"> • Open or short to battery between ECTS and ECM • Short to ground between ECTS and ECM • Short between ECTS wires • Faulty ECTS | Δ | ○ |
| P0120 | Throttle Position Sensor Circuit Range/Performance Problem | <ul style="list-style-type: none"> • Open or short to ground between TPS and ECM • Short to battery between TPS and ECM • Short between TPS wires • Poor connections between TPS and ECM • Misplaced, loose or corrodes terminals • Contaminated, deteriorated TPS • Faulty TPS | Δ | ○ |
| P0130 | HO2S Circuit Malfunction (Bank 1, Sensor 1) | <ul style="list-style-type: none"> • Open or short to battery between front HO2S and ECM • Short to ground between front HO2S and ECM • Short between front HO2S wires • Faulty front HO2S • Poor connections between front HO2S and ECM • Misplaced, bent, loose or corroded connector terminals | Δ1 | Δ1 |
| P0135 | HO2S Heater Circuit Malfunction (Bank 1, Sensor 1) | <ul style="list-style-type: none"> • Open or short to battery between front HO2S heater and ECM • Short to ground between front HO2S heater and ECM • Incorrect front HO2S heater resistance • Faulty front HO2S heater | Δ1 | Δ1 |
| P0150 | HO2S Circuit Slow Responsive (Bank 2, Sensor1) | <ul style="list-style-type: none"> • Abnormal combustion • Improper fuel pressure • Front and rear HO2S connections reversed • Faulty fuel delivery system • Leak in intake system • Leak in exhaust system • Faulty front HO2S | Δ1 | Δ1 |
| P0155 | HO2S Heater Circuit Malfunction (Bank 2, Sensor 1) | <ul style="list-style-type: none"> • Open or short to battery between front HO2S heater and ECM • Short to ground between front HO2S heater and ECM • Incorrect front HO2S heater resistance • Faulty front HO2S heater | Δ1 | Δ1 |
| P0201 | Cylinder 1 Injector Circuit Malfunction | <ul style="list-style-type: none"> • Open or short between main relay and injectors • Open or short between ECM and injectors • Short to battery between ECM and injectors • Faulty fuel injector | Δ | ○ |
| P0202 | Cylinder 2 Injector Circuit Malfunction | | Δ | ○ |
| P0203 | Cylinder 3 Injector Circuit Malfunction | | Δ | ○ |
| P0204 | Cylinder 4 Injector Circuit Malfunction | | Δ | ○ |
| P0205 | Cylinder 5 Injector Circuit Malfunction | | Δ | ○ |
| P0206 | Cylinder 6 Injector Circuit Malfunction | | Δ | ○ |
| P0230 | Fuel pump relay circuit malfunction | <ul style="list-style-type: none"> • Open or short between fuel pump relay and ECM • Open between fuel pump relay and ground • Faulty fuel pump relay | Δ | Δ |
| P0335 | Crankshaft Position Sensor Circuit Malfunction | <ul style="list-style-type: none"> • Open or short to ground between CKPS and ECM • Short to battery between CKPS and ECM • Short between CKPS wires • Out of allowable air gap • Faulty Target wheel tolerance • Faulty CKPS | Δ | Δ |
| P0340 | Camshaft Position Sensor Circuit Malfunction | <ul style="list-style-type: none"> • Open or short to ground between CMPS and ECM • Short to battery between CMPS and ECM • Short between CMPS wires • Faulty CMPS | Δ | Δ |

| | | | | |
|-------|--|--|----|----|
| P0443 | EVAP Emission Control System Purge Control Valve Circuit Malfunction | <ul style="list-style-type: none"> • Open or short between main relay and purge solenoid valve • Open or short between purge solenoid valve and ECM • Faulty purge solenoid valve | Δ | Δ |
| P0500 | Vehicle Speed Sensor Circuit Malfunction | <ul style="list-style-type: none"> • Open or short to battery between VSS and ECM • Short to ground between VSS and ECM • Open between fuse and vehicle speed sensor (VSS) • Open between VSS and GND • Faulty VSS | Δ | Δ |
| P0606 | ECU-Self-test Failed | <ul style="list-style-type: none"> • Internal fault ECM | Δ | Δ |
| P1166 | Fuel System Malfunction (Bank 1) | <ul style="list-style-type: none"> • Clogged fuel injectors • Faulty fuel injectors • Faulty ignition system • EVAP canister purge valve malfunction • Leak in intake system • Leak in exhaust system • Faulty fuel delivery system | Δ1 | Δ1 |
| P1167 | Fuel System Malfunction (Bank 2) | <ul style="list-style-type: none"> - Clogged fuel injectors - Faulty fuel injectors - Fuel pressure too high - Fuel pressure regulator failure • Faulty MAFS • Faulty front HO2S • Faulty TPS | Δ1 | Δ1 |
| P1505 | ISC Opening Coil Circuit Malfunction | <ul style="list-style-type: none"> • Open or short to battery between ISC and ECM • Short to GND between ISC and ECM | Δ | ○ |
| P1507 | ISC Closing Coil Circuit Malfunction | <ul style="list-style-type: none"> • Open between ISC and ECM • Faulty ISC | Δ | ○ |
| P1623 | Serial Communication Problem with TCU (Timeout) | <ul style="list-style-type: none"> • Open or short to ground between TCU signal and ECM • Short to battery between TCU and ECM • CAN message timeout from TCU • Faulty TCU | Δ | Δ |
| P1624 | TCU Request for MIL ON/Freeze Frame to ECU via CAN | <ul style="list-style-type: none"> • This is only a request from TCU to turn the MIL ON. The fault code is stored in the TCU. The freeze frame data is stored in the ECM under the P1624 request code. Be sure to retrieve freeze frame data before clearing code P1624 from ECM. | Δ | Δ |
| P1672 | Cooling Fan Relay Circuit Malfunction (low speed) | <ul style="list-style-type: none"> • Open or short to battery between fan relay and ECM • Short to GND between fan relay and ECM • Faulty fan relay | Δ | Δ |
| P1673 | Cooling Fan Relay Circuit Malfunction (high speed) | <ul style="list-style-type: none"> • Open or short to battery between fan relay and ECM • Short to GND between fan relay and ECM • Faulty fan relay | Δ | Δ |
| P1699 | Main Relay Circuit Malfunction | <ul style="list-style-type: none"> • Open or short to battery between fan relay and ECM • Short to GND between fan relay and ECM • Faulty fan relay | Δ | Δ |

○ : Means fault code memory and MIL ON

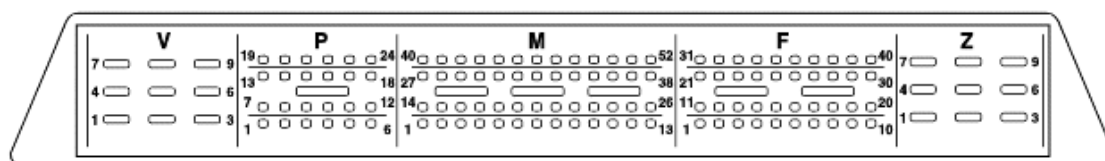
Δ : Means fault code memory and MIL OFF

- : No application

Δ1 : Means fault code memory and MIL OFF-unleaded engine No application-leaded engine



ECM terminal layout



Connector V

| Terminal | Signal | Connected to |
|----------|--------------------|---------------------|
| V1 | IG+ | Ignition switch |
| V2 | - | - |
| V3 | Diagnosis K-Line | Data link connector |
| V4 | Ground | Chassis ground |
| V5 | Ground | Chassis ground |
| V6 | Ground | Chassis ground |
| V7 | Battery | Battery |
| V8 | Main relay control | Main relay |
| V9 | Main relay control | Main relay |

Connector P

| Terminal | Signal | Connected to |
|----------|------------------------------------|---------------------|
| P1 | Front HO2S heater control (bank 1) | Front HO2S (bank 1) |
| P2 | - | - |
| P3 | - | - |
| P4 | - | - |
| P5 | - | - |
| P6 | - | - |
| P7 | - | - |
| P8 | Front HO2S shield | Front HO2S (bank 1) |
| P9 | - | - |
| P10 | - | - |
| P11 | - | - |
| P12 | - | - |
| P13 | Front HO2S heater control (bank 2) | Front HO2S (bank 2) |
| P14 | Front HO2S (+) (bank 1) | Front HO2S (bank 1) |
| P15 | Front HO2S (+) (bank 2) | Front HO2S (bank 2) |
| P16 | - | - |
| P17 | - | - |
| P18 | - | - |
| P19 | - | - |

| | | |
|-----|-------------------------|---------------------|
| P20 | Front HO2S (-) (bank 1) | Front HO2S (bank 1) |
| P21 | Front HO2S (-) (bank 2) | Front HO2S (bank 2) |
| P22 | - | - |
| P23 | Main relay signal (B+) | - |
| P24 | - | - |

Connector M

| Terminal | Signal | Connected to |
|----------|--|-----------------------|
| M1 | Mass air flow sensor signal input | MAFS |
| M2 | - | - |
| M3 | - | - |
| M4 | - | - |
| M5 | - | - |
| M6 | - | - |
| M7 | - | - |
| M8 | Crankshaft position sensor signal input | CKPS |
| M9 | - | - |
| M10 | Throttle position sensor reference voltage | TPS |
| M11 | - | - |
| M12 | - | - |
| M13 | - | - |
| M14 | - | - |
| M15 | - | - |
| M16 | - | - |
| M17 | Mass air flow sensor ground | MAFS |
| M18 | - | - |
| M19 | Throttle position sensor signal input | TPS |
| M20 | Throttle position sensor ground | TPS |
| M21 | Crankshaft position sensor ground | CKPS |
| M22 | Intake air temperature sensor signal input | IATS |
| M23 | Intake air temperature sensor ground | IATS |
| M24 | Engine coolant temperature sensor signal input | ECTS |
| M25 | Engine coolant temperature sensor ground | ECTS |
| M26 | Power steering load input | Power steering switch |
| M27 | - | - |
| M28 | - | - |
| M29 | - | - |
| M30 | - | - |
| M31 | - | - |
| M32 | - | - |
| M33 | Injector 1 control | Injector 1 |
| M34 | Injector 2 control | Injector 2 |

| | | |
|-----|---------------------------------------|-------------------------|
| M35 | Injector 3 control | Injector 3 |
| M36 | Injector 4 control | Injector 4 |
| M37 | Injector 5 control | Injector 5 |
| M38 | Injector 6 control | Injector 6 |
| M39 | - | - |
| M40 | - | - |
| M41 | - | - |
| M42 | Canister purge solenoid valve control | PSV |
| M43 | - | - |
| M44 | - | - |
| M45 | VICS | VICS(EX: 2.4L & LEADED) |
| M46 | Idle speed opening coil control | ISC |
| M47 | Idle speed closing coil control | ISC |
| M48 | - | - |
| M49 | - | - |
| M50 | - | - |
| M51 | - | - |
| M52 | - | - |

Connector F

| Terminal | Signal | Connected to |
|----------|---------------------------------------|-----------------------|
| F1 | - | - |
| F2 | - | - |
| F3 | - | - |
| F4 | - | - |
| F5 | - | - |
| F6 | - | - |
| F7 | Camshaft position sensor signal input | CMPS |
| F8 | Camshaft position sensor ground | CMPS |
| F9 | - | - |
| F10 | Fuel pump relay control | Fuel pump |
| F11 | - | - |
| F12 | - | - |
| F13 | - | - |
| F14 | - | - |
| F15 | - | - |
| F16 | - | - |
| F17 | Engine speed signal input | Instrument cluster |
| F18 | Cooling fan low control | Cooling fan relay low |
| F19 | - | - |
| F20 | MIL control | MIL |
| F21 | - | - |
| F22 | Vehicle speed signal input | Instrument cluster |
| F23 | - | - |

| | | |
|-----|--------------------------------|------------------------|
| F24 | - | - |
| F25 | A/C dual pressure switch input | DPS |
| F26 | - | - |
| F27 | - | - |
| F28 | - | - |
| F29 | A/C cut relay control | A/C cut relay |
| F30 | - | - |
| F31 | - | - |
| F32 | - | - |
| F33 | - | - |
| F34 | - | - |
| F35 | - | - |
| F36 | CAN-high | TCU |
| F37 | CAN-low | TCU |
| F38 | - | - |
| F39 | - | - |
| F40 | Cooling fan high control | Cooling fan high relay |

Connector Z

| Terminal | Signal | Connected to |
|----------|------------------------------------|-------------------------|
| Z1 | Ignition coil 3 (3 & 6) control | Ignition coil 3 (3 & 6) |
| Z2 | Ignition coil 2 (2 & 5) control | Ignition coil 2 (2 & 5) |
| Z3 | Ignition coil 1 (1 & 4) control | Ignition coil 1 (1 & 4) |
| Z4 | - | - |
| Z5 | Ignition power stage shield ground | Ignition coils harness |
| Z6 | - | - |
| Z7 | - | - |
| Z8 | - | - |
| Z9 | - | - |

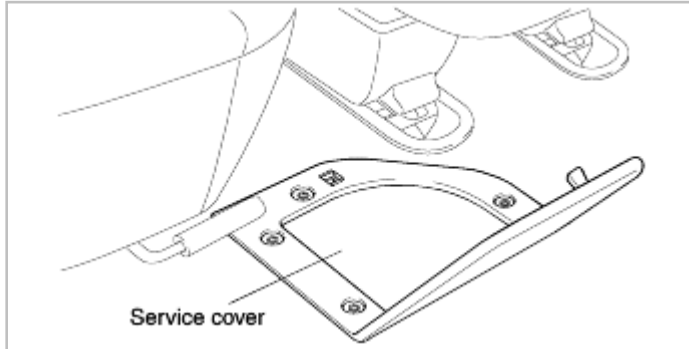
Fuel System

Fuel Delivery System - Fuel Tank



Removal

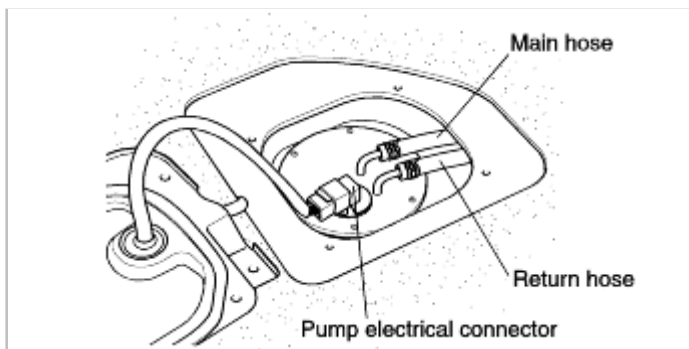
1. Release fuel system pressure. Refer to "Releasing fuel system pressure".
2. Disconnect the negative battery terminal.
3. Drain the fuel from the fuel tank.
4. Remove service cover under center floor carpet.



5. Disconnect the fuel pump electrical connector, main and return hose.

WARNING

When disconnecting fuel hose quick connectors, use shop towels to absorb fuel, protecting equipment and personnel.



6. Disconnect breather hose.
7. Disconnect joint hose.
8. Unfasten fuel tank straps.
9. Disassemble fuel tank.

Fuel System

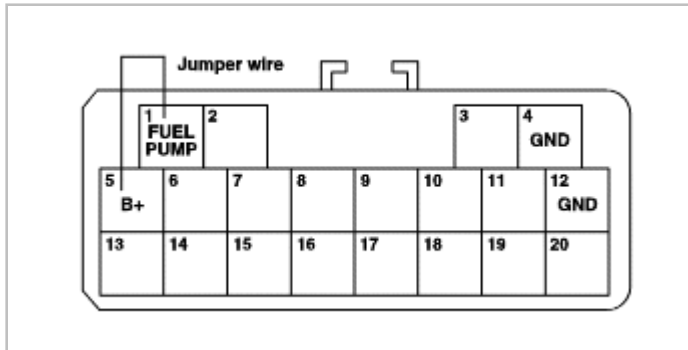
Fuel Delivery System - Fuel Pump



INSPECTION

Fuel Pump Operation Inspection

1. Connect terminal 1 (FUEL PUMP) and terminal 5 (Battery+) of data link connector with a jumper wire.



2. Remove fuel filler cap.
3. Turn IG ON.
4. Determine if fuel pump is running by listening for sound of it at fuel filler inlet.
5. Install fuel filler cap.
6. If no sound was heard, measure fuel pump supply-voltage.

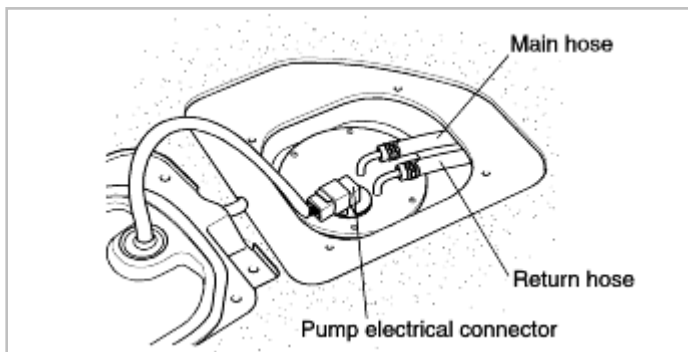
Voltage: Approx. 12 V

7. If voltage is not correct, check fuel pump relay or wiring harness.

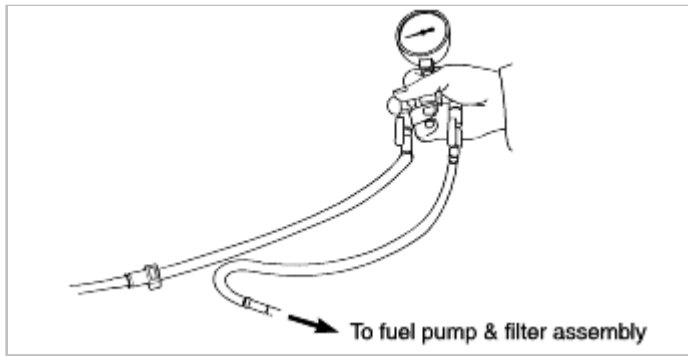
Fuel Pump Maximum Pressure

Perform pump operation inspection if regulated pressure is not as specified.

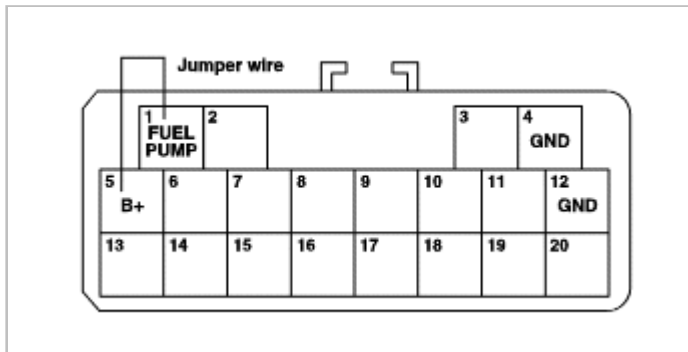
1. Disconnect negative battery terminal.
2. Release fuel system pressure. Refer to "Releasing fuel system pressure".
3. Remove service cover under center floor carpet.



4. Disconnect main hose and install SST (0K2A1 131 001A) between main hose and fuel pump& filter assembly. Lock the valve located between gauge and main hose.



5. Connect negative battery terminal.
6. Connect terminal 1 (FUEL PUMP) and terminal 5 (Battery+) of data link connector with a jumper wire.



7. Turn IG ON.
8. Inspect fuel line pressure.

Fuel Pump Maximum Pressure:
65~94 psi (450~650 kPa, 4.5~6.6 Kg/cm²)

9. If it is not within above specification, replace fuel pump.

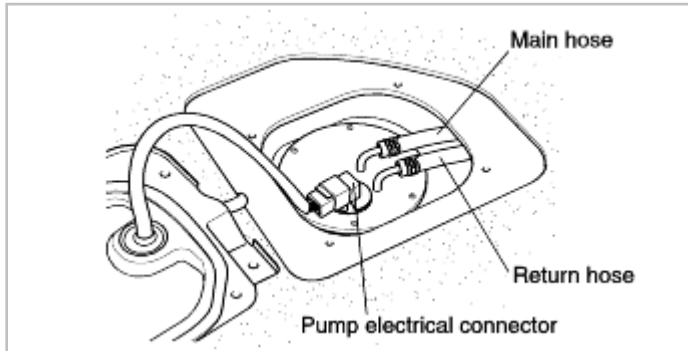
Fuel System

Fuel Delivery System - Fuel Filter

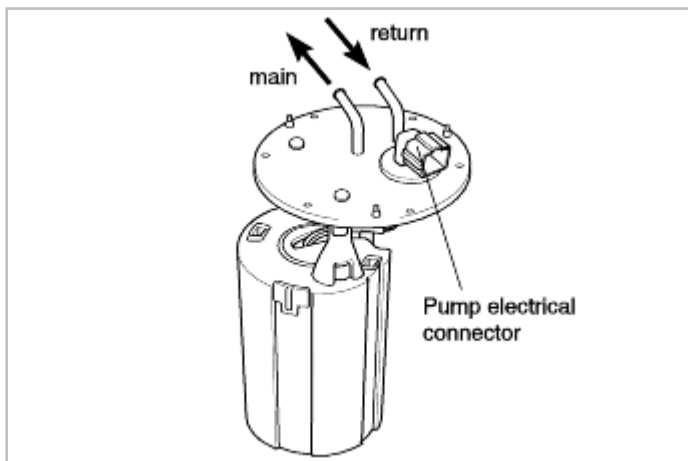


Removal

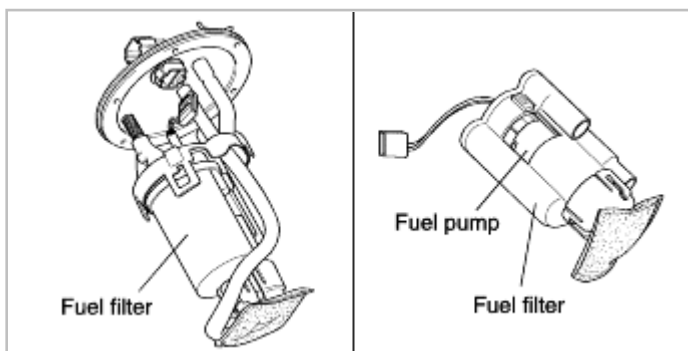
1. Release fuel system pressure. Refer to "Releasing fuel system pressure".
2. Disconnect the negative battery terminal.
3. Remove service cover under center floor carpet.
4. Disconnect fuel pump's electrical connector, main and return hose.



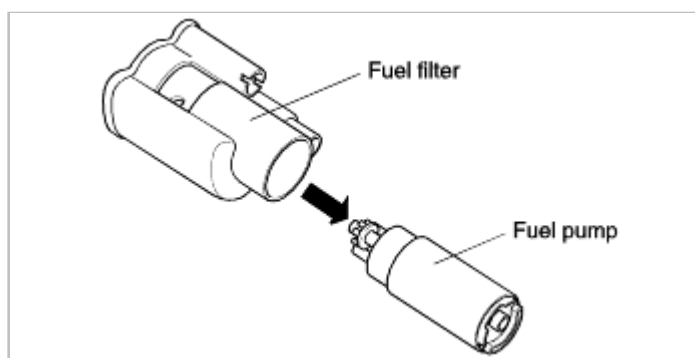
5. Unfasten fuel pump & filter assembly fixing-bolt (6 EA).
6. Extract fuel pump & filter assembly.



7. Remove the pump & filter assembly case.

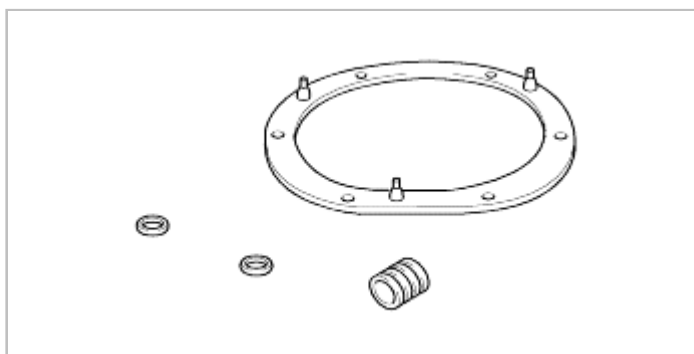


8. Disconnect fuel pump electrical connector and pull the fuel pump from the fuel filter.



NOTICE

Be careful not to lose O-RING (4 EA).





Fuel System

Fuel Delivery System - Injector



Check operation

1. Warm up engine and let engine idle.
2. Listen for sound of each injector running by using sound scope or screwdriver.

WARNING

Fuel is explosive. When working on fuel system, make sure to supply adequate ventilation to the work area. Do not smoke, and keep sparks and open flames away.

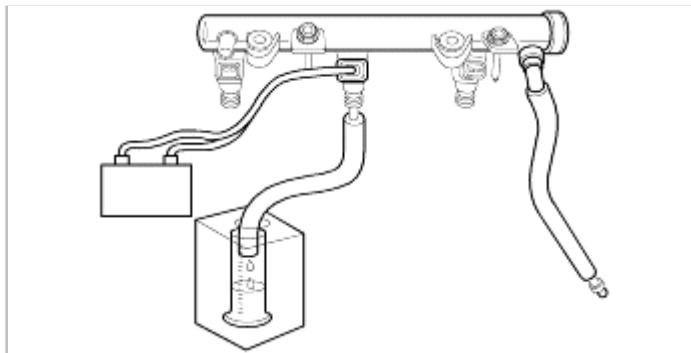
CAUTION

Make sure the fuel injectors are firmly seated on the fuel rail to prevent movement and possible damage.

3. If no sound is heard, measure injector resistance.
4. If injector is OK, check wiring to injector and voltages of ECM connector terminal 61, 87, 59, 96, 60 and 58.
5. If removal of injector system is needed, replace injector.

Fuel leakage test

1. Remove injectors together with fuel rail.
2. Verify that injector retaining clips are secured onto injectors.



3. Connect data link connector terminals FUEL PUMP and B+ with jumper wire.
4. Turn ignition switch ON.
5. Tilt injectors about 60 degrees and verify that no fuel leaks from the injector nozzles.
6. If fuel leaks, replace injector.
7. Turn ignition switch "OFF" and remove jumper wire.

Volume test

1. Remove injectors together with fuel rail.
2. Verify that injector retaining clips are secured onto injectors.
3. Reconnect injector connectors.
4. Apply a battery voltage to injector as shown figure.
5. Inspect injector volume with graduated container.

Injector volume:

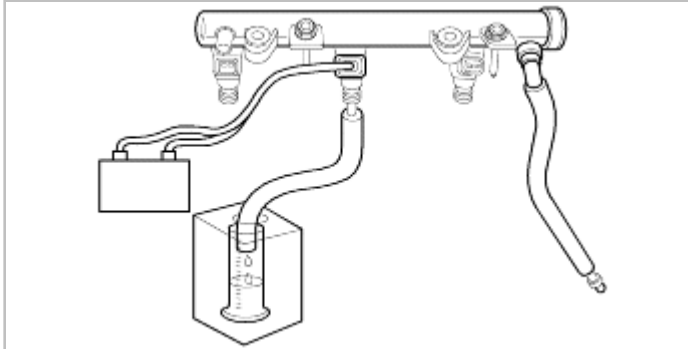
48~54 ml/15 seconds

6. If not as specified, replace injectors.

NOTICE

When reassembling fuel rail and injectors:

- A. Use new injector O-rings
- B. Apply a small amount of clean engine oil to each O-ring before installing



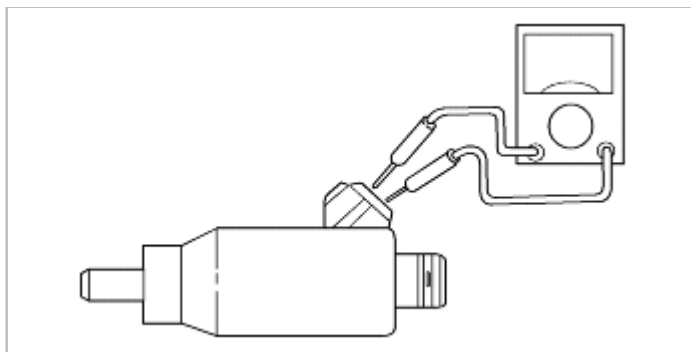
Injector resistance

- 1. Disconnect injector harness.
- 2. Measure resistance of each injector.

Resistance:

14.5Ω at 68°F (20°C)

3. If not within specification, replace injector.





Releasing Fuel System

Pressure

WARNING

The fuel system remains under pressure when the engine is not running. Release fuel system pressure before disconnecting any fuel line to reduce the chance of personal injury or fire damage to vehicle components.

1. Start engine.
2. Disconnect fuel pump connector located under center floor carpet.
3. Let engine stall, then turn IG OFF.
4. Reconnect fuel pump connector.

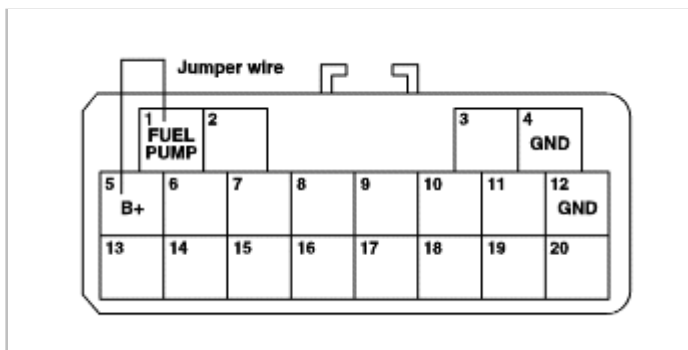
WARNING

- When removing the fuel tank, keep sparks, cigarettes, and open flames away from it.
- Before replace the fuel tank, clean it thoroughly with steam to remove all explosive.
- Drain the fuel from the fuel tank before removing the tank.

Priming the fuel system

After fuel pressure has been released, system must be primed to avoid excessive cranking to restart the engine.

1. Connect terminal 1 (FUEL PUMP) and terminal 5 (Battery+) of data link connector with a jumper wire.



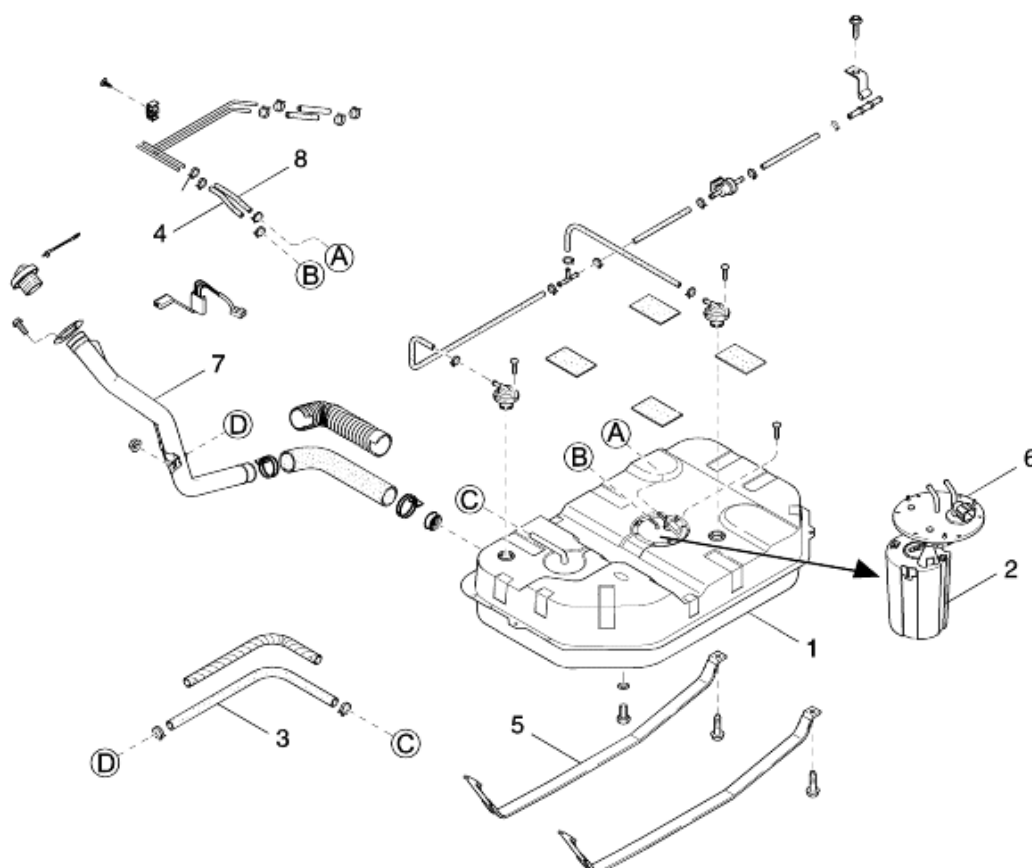
2. Turn IG ON for no longer than 10 seconds to pressurize system and check for fuel leaks. (Jumper wire gets if it is left in for longer than 10 seconds)
3. Turn IG OFF and remove jumper wire.



Fuel system

NOTICE

- Before performing the work about fuel system, release the fuel from the fuel system to reduce the possible of injury or fire.
- Fuel is explosive. When working on fuel system, make sure to supply adequate ventilation to the work area. Do not smoke, and keep sparks and open flames away.



1. Fuel tank
2. Fuel pump & Filter assembly
3. Breather hose
4. Main hose

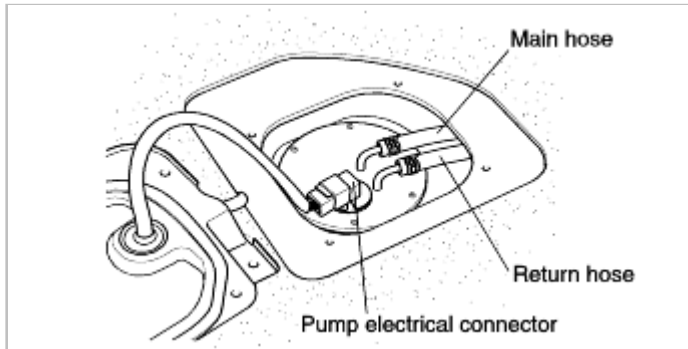
5. Fuel tank straps
6. Fuel pump connector
7. Joint hose
8. Return hose



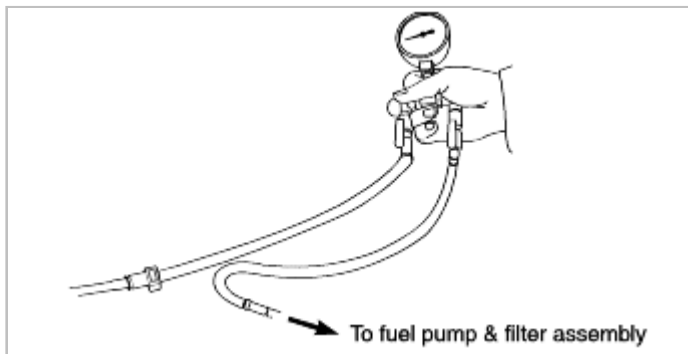
INPECTION

Fuel Pressure hold inspection

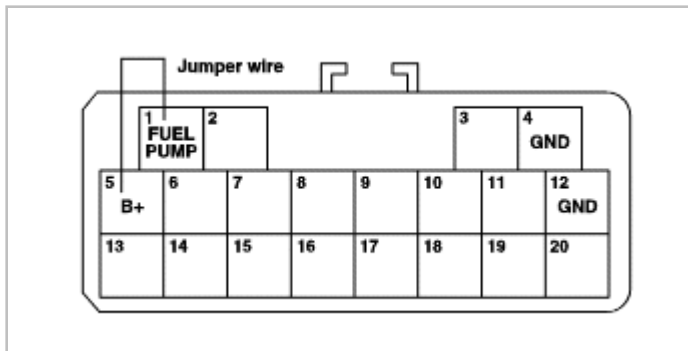
1. Disconnect negative battery terminal.
2. Release fuel system pressure. Refer to "Releasing fuel system pressure".
3. Remove service cover under center floor carpet.



4. Disconnect main hose and install SST (0K2A1 131 001A) between main hose and fuel pump& filter assembly.



5. Connect negative battery terminal.
6. Connect terminal 1 (FUEL PUMP) and terminal 5 (Battery+) of data link connector with a jumper wire.



7. Turn IG ON for 10 seconds to operate fuel pump.
8. Turn IG OFF and remove jumper wire.
9. Inspect fuel line pressure after 15 minutes.

Fuel pressure:

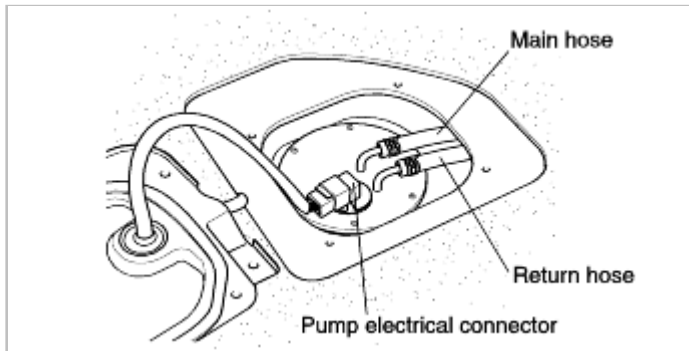
More than 25psi (180kPa, 1.8 kg/Cm²)

10. If not as specified, check the following components.

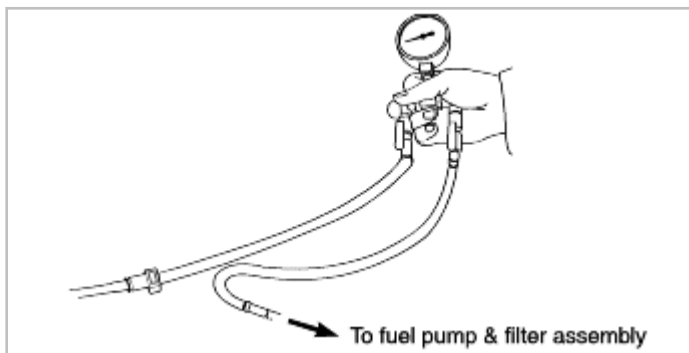
- A. Fuel pump
- B. Pressure regulator
- C. Injectors

Fuel Line Pressure Inspection

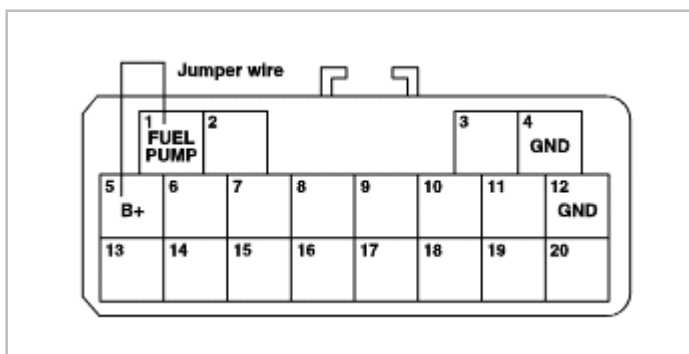
1. Disconnect negative battery terminal.
2. Release fuel system pressure. Refer to "Releasing fuel system pressure".
3. Remove service cover under center floor carpet.



4. Disconnect main hose and install SST (0K2A1 131 001A) between main hose and fuel pump& filter assembly.



5. Connect negative battery terminal.
6. Connect terminal 1 (FUEL PUMP) and terminal 5 (Battery+) of data link connector with a jumper wire.



7. Turn IG ON
8. Inspect fuel line pressure.

Fuel pressure:
Approx. 47.7 psi (329 kPa, 3.35 Kg/Cm²)

9. If not as specified, check the following components.
 - Pressure too HIGH

- A. Check for restricted fuel return line
 - B. If line is clean, replace pressure regulator
 - Pressure too LOW
 - A. Block return line and check if pressure rises
 - B. If pressure does rise, replace pressure regulator
 - C. If pressure does not rise, measure fuel pump maximum pressure
10. Turn IG OFF and remove jumper wire.