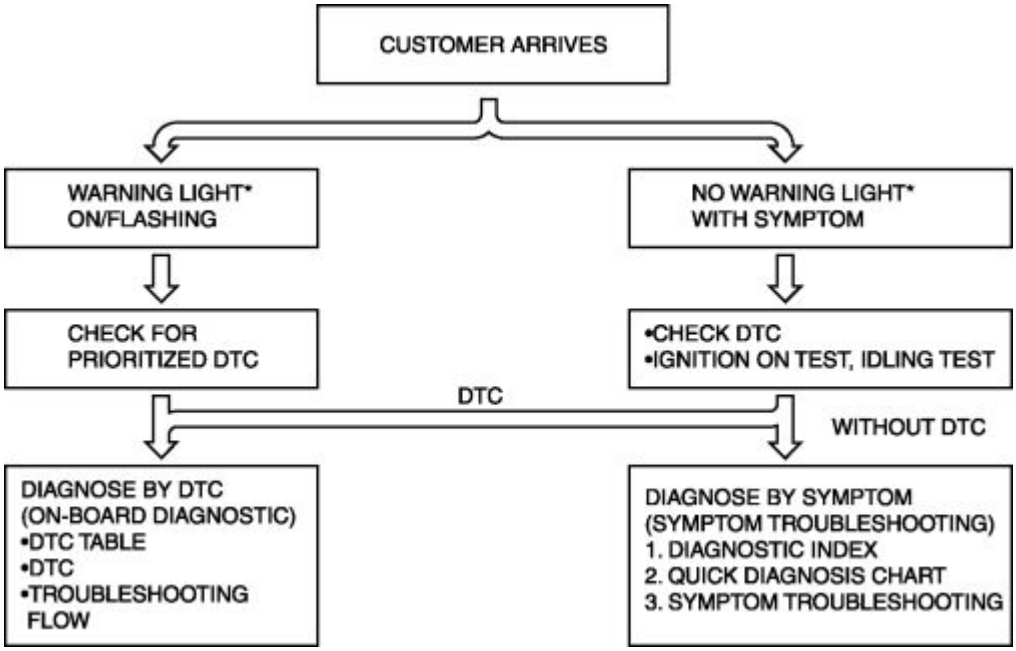
# ENGINE TROUBLESHOOTING

## FOREWORD (w)

- When the customer reports a vehicle malfunction, check the malfunction indicator lamp (MIL) indication and diagnostic trouble code (DTC), then diagnose the malfunction according to the following flowchart:
  - If a DTC exists, diagnose the applicable DTC inspection. (See DTC TABLE .)
  - If no DTC exists and the MIL does not illuminate or flash, diagnose the applicable symptom troubleshooting. (See QUICK DIAGNOSTIC CHART .)




*: Malfunction Indicator Lamp (MIL), Generator Warning Light, Security Light

Notes:

# INTERMITTENT CONCERN TROUBLESHOOTING

## Vibration Method

- If a malfunction occurs or becomes worse while driving on a rough road or when the engine is vibrating, perform the steps below.

  **NOTE:**

  - There are several reasons why vehicle or engine vibration could cause an electrical malfunction. Some of the things to check for are:
    - Connectors not fully seated.
    - Wiring harnesses not having full play.
    - Wires laying across brackets or moving parts
    - Wires routed too close to hot parts.
  - An improperly routed, improperly clamped, or loose wiring harness can cause wiring to become pinched between parts.
  - The connector joints, points of vibration, and places where wiring harnesses pass such as through the firewall and body panels are the major areas to be checked.

### Inspection Method for Switch Connectors or Wires

1. Connect the WDS or equivalent to the DLC-2.

2. Turn ignition switch to ON position (Engine OFF).

   **NOTE:**

   - If the engine starts and runs, perform the following steps at idle.

3. Access the PIDs for the switch you are inspecting.

4. Turn the switch on manually.

5. Shake each connector or wiring harness a bit vertically and horizontally while monitoring the PID.
   - If the PID value is unstable, check for poor connection.

### Inspection Method for Sensor Connectors or Wires

1. Connect the WDS or equivalent to the DLC-2.

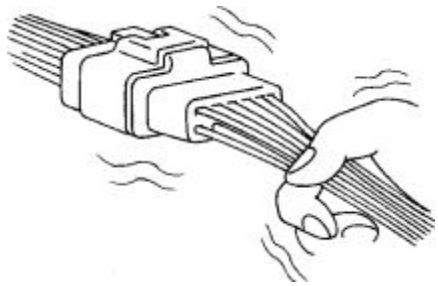
2. Turn the ignition switch to the ON position (Engine off).

   **NOTE:**

   - If the engine starts and runs, perform the following steps at idle.

3. Access the PIDs for the switch you are inspecting.

4. Shake each connector or wiring harness a bit vertically and horizontally while monitoring the PID.
   - If the PID value is unstable, check for poor connection.



### Inspection Method for Sensors

1. Connect the WDS or equivalent to the DLC-2.

2. Turn the ignition switch to the ON position (Engine off).

   **NOTE:**

   - If the engine starts and runs, perform the following steps at idle.

3. Access the PIDs for the switch you are inspecting.

4. Vibrate the sensor slightly with your finger.
    - If the PID value is unstable or malfunction occurs, check for poor connection or poorly mounted sensor or both.

### Inspection Method for Actuators or Relays

1. Connect the WDS or equivalent to the DLC-2.

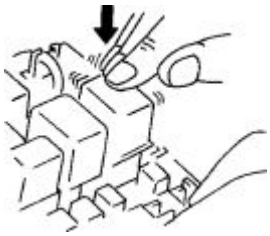
2. Turn the ignition switch to the ON position (Engine off).

   **NOTE:**

   - If the engine starts and runs, perform the following steps at idle.

3. Prepare the output state control function for actuators or relays that you are inspecting.

4. Vibrate the actuator or relay with your finger for **3 s** after output state control function is activated.
    - If a variable click sound is heard, check for poor connection or poorly mounted actuator or both, or the relay.



   **NOTE:**

   - Moving the relays too strongly may result in open relays.

## Water Sprinkling Method

**CAUTION:**

- Indirectly change the temperature and humidity by spraying water onto the front of the radiator.
- If a vehicle is subject to water leakage, the leakage may damage the control module. When testing a vehicle with a water leakage problem, special caution must be used.

If the malfunction occurs only during high humidity or rainy/snowy weather, perform the following steps:

1. Connect the WDS or equivalent to the DLC-2 if you are inspecting sensors or switches.

2. Turn the ignition switch to the ON position (Engine off).

   **NOTE:**

   - If the engine starts and runs, perform the following steps at idle.

3. Access the PIDs for sensors or switches if you are inspecting sensors or switches.

4. If you are inspecting the switch, turn it on manually.

5. Spray water onto the vehicle or run it through a car wash.
   - If the PID value is unstable or malfunction occurs, repair or replace the part if necessary.

# ENGINE SYMPTOM TROUBLESHOOTING

- Confirm trouble symptom using the following diagnostic index, then go to the applicable troubleshooting chart.

Diagnostic Index

| No. | TROUBLESHOOTING ITEM | | DESCRIPTION | PAGE |
|---|---|---|---|---|
| 1 | Melting of main or other fuses | | — | (See NO.1 MELTING OF MAIN OR OTHER FUSES .) |
| 2 | MIL comes on | | The MIL is illuminated incorrectly. (No DTC's) | (See NO.2 MIL COMES ON .) |
| 3 | Will not crank | | The starter does not work. | (See NO.3 WILL NOT CRANK .) |
| 4 | Hard to start/long crank/erratic start/erratic crank | | The starter cranks the engine at normal speed but the engine requires excessive cranking time before starting. | (See NO.4 HARD TO START/LONG CRANK/ERRATIC START/ERRATIC CRANK .) |
| 5 | Engine stalls. | After start/at idle | The engine stops unexpectedly at idle and/or after start. | (See NO.5 ENGINE STALLS-AFTER START/AT IDLE .) |
| 6 | Cranks normally but will not start | | The starter cranks engine at normal speed but the engine will not run. | (See NO.6 CRANKS NORMALLY BUT WILL NOT START .) |
| 7 | Slow return to idle | | The engine takes more time than normal to return to idle speed. | (See NO.7 SLOW RETURN TO IDL .) |
| 8 | Engine runs rough/rolling idle | | The engine speed fluctuates between the specified idle speed and lower speed and the engine shakes excessively. | (See NO.8 ENGINE RUNS ROUGH/ROLLING IDLE .) |
| 9 | Fast idle/runs on | | The engine speed continues at fast idle after warm-up.<br><br>The engine runs after the ignition switch is turned off. | (See NO.9 FAST IDLE/RUNS ON .) |

| | | | | |
|---|---|---|---|---|
| | | | Exhaust afterburn | |
| 10 | Low idle/stalls during deceleration | | The engine stops unexpectedly at the beginning of deceleration or recovery from deceleration.<br><br>Exhaust afterburn | (See NO.10 LOW IDLE/STALLS DURING DECELERATION .) |
| 11 | Engine stalls/quits. | Acceleration/cruise | The engine stops unexpectedly at the beginning of acceleration or during acceleration.<br><br>The engine stops unexpectedly while cruising. | (See NO.11 ENGINE STALLS/QUI ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES |
| | Engine runs rough. | Acceleration/cruise | The engine speed fluctuates during acceleration or cruising. | |
| | Misses | Acceleration/cruise | The engine misses during acceleration or cruising. | |
| | Buck/jerk | Acceleration/cruise/ deceleration | The vehicle bucks/jerks during acceleration, cruising, or deceleration. | |
| | Hesitation/stumble | Acceleration | A momentary pause at the beginning of acceleration or during acceleration. | |
| | Surges | Acceleration/cruise | A momentary minor irregularity in engine output. | |
| 12 | Lack/loss of power | Acceleration/cruise | The performance is poor under load (e.g. power down when climbing hills). | (See NO.12 LACK/LOSS OF POWE ACCELERATION/CRUISE .) |
| 13 | Knocking/pinging/detonation | Acceleration/cruise | Sound is produced when the air/fuel mixture is ignited by something other than the spark plug (e.g. hot spot in combustion chamber). | (See NO.13 KNOCKING/PINGING/DETONATI ACCELERATION/CRUISE .) |
| 14 | Poor fuel economy | | The fuel economy is | (See NO.14 POOR FUEL ECONOM |

| | | | | |
|---|---|---|---|---|
| | | | unsatisfactory. | .) |
| 15 | Emission compliance | | Fails emissions test. | (See NO.15 EMISSION COMPLIANCE .) |
| 16 | High oil consumption/leakage | | The oil consumption is excessive. | (See NO.16 HIGH OIL CONSUMPTION/LEAKAGE .) |
| 17 | Cooling system concerns | Overheating | The engine runs at higher than normal temperature/overheats. | (See NO.17 COOLING SYSTEM CONCERNS-OVERHEATING .) |
| 18 | Cooling system concerns | Runs cold | The engine does not reach normal operating temperature. | (See NO.18 COOLING SYSTEM CONCERNS-RUNS COLD .) |
| 19 | Exhaust smoke | | Blue, black, or white smoke from exhaust system | (See NO.19 EXHAUST SMOKE .) |
| 20 | Fuel odor (in engine compartment) | | Gasoline fuel smell or visible leakage | (See NO.20 FUEL ODOR (IN ENGI COMPARTMENT) .) |
| 21 | Engine noise | | Engine noise from under hood | (See NO.21 ENGINE NOISE .) |
| 22 | Vibration concerns (engine) | | Vibration from under hood or driveline | (See NO.22 VIBRATION CONCER (ENGINE) .) |
| 23 | A/C does not work sufficiently. | | The A/C compressor magnetic clutch does not engage when A/C is turned on. | (See NO.23 A/C DOES NOT WORK SUFFICIENTLY .) |
| 24 | A/C is always on or A/C compressor runs continuously. | | The A/C compressor magnetic clutch does not disengage. | (See NO.24 A/C IS ALWAYS ON C A/C COMPRESSOR RUNS CONTINUOUSLY .) |
| 25 | A/C does not cut off under wide open throttle conditions. | | The A/C compressor magnetic clutch does not disengage under wide open throttle. | (See NO.25 A/C DOES NOT CUT C UNDER WIDE OPEN THROTTLE CONDITIONS .) |
| 26 | Exhaust sulphur smell | | Rotten egg smell (sulphur) from exhaust | (See NO.26 EXHAUST SULPHUR SMELL .) |
| 27 | Fuel refill concerns | | The fuel tank does not fill smoothly. | (See NO.27 FUEL REFILL CONCERNS .) |
| 28 | Fuel filling shut off issues | | The fuel does not shut off properly. | (See NO.28 FUEL FILLING SHUT OFF ISSUES .) |
| 29 | Spark plug condition | | An incorrect spark plug condition. | (See NO.29 SPARK PLUG CONDITION .) |
| 30 | AT concerns | Upshift/downshift engagement | AT concerns not related to engine performance. | (See SYMPTOM TROUBLESHOOTING ITEM TABL |

# QUICK DIAGNOSTIC CHART

x: Applied

| Troubleshooting item | | | Possible factor | Vacuum leakage or blockage | Air leakage or air suction from intake-air system | Air cleaner restriction/improper installation | Improper operation of drive-by-wire control system | Drive-by-wire control system operates in fail-safe mode | SSV malfunction (stuck open or close) | SSV solenoid valve malfunction (stuck open or close) | APV malfunction* (stuck open or close) | APV motor malfunction* | APV position sensor malfunction* | VDI malfunction (stuck open or close) | VDI solenoid valve malfunction (stuck open or close) | Throttle body malfunction (stuck open or close, restriction) | Improper VFAD operation* | Poor fuel quality | Jet air mixing system malfunction (restriction or leakage) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Melting main or other fuses | | | | | | | | | | | | | | | | | | |
| 2 | MIL comes on | | | | | | x | | | x | | x | x | | | | | | |
| 3 | Will not crank | | | | | | | | | | | | | | | | | | |
| 4 | Hard start/long crank/erratic start/erratic crank | | | x | x | x | x | x | x | x | x | x | x | | | | | x | x |
| 5 | Engine stalls | After start/at idle | | x | x | x | x | | | | | | | | | | | x | x |
| 6 | Cranks normally but will not start | | | x | x | x | x | x | | | | | | | | | | x | |
| 7 | Slow return to idle | | | | x | | | | | | | | | | | x | | | |
| 8 | Engine runs rough/rolling idle | | | x | x | x | x | | x | x | x | x | x | | | | | x | x |
| 9 | Fast idle/runs on | | | | x | | x | | | | | | | | | x | | | |
| 10 | Low idle/stalls during deceleration | | | x | x | | x | x | | | | | | | | | | | |
| 11 | Engine stalls/quits | Acceleration/cruise | | x | x | x | x | | x | x | x | x | x | | | x | | x | |
| | Engine runs rough | Acceleration/cruise | | x | x | x | x | | x | x | x | x | x | | | x | | x | |
| | Misses | Acceleration/cruise/ deceleration | | x | x | x | x | | x | x | x | x | x | | | x | | x | |
| | Buck/jerk | Acceleration/cruise/ deceleration | | x | x | x | x | | x | x | x | x | x | | | x | | x | |
| | Hesitation/stumble | Acceleration | | x | x | x | x | | x | x | x | x | x | | | x | | x | |
| | Surges | Acceleration/cruise | | x | x | x | x | | x | x | x | x | x | | | x | | x | |
| 12 | Lack/loss of power | Acceleration/cruise | | x | x | x | x | x | x | x | x | x | x | x | x | x | | x | |
| 13 | Knocking/pinging/ detonation | Acceleration/cruise | | | x | | | | | | | | | | | | | x | |
| 14 | Poor fuel economy | | | | x | x | | | | | | | | | | | | x | |
| 15 | Emissions compliance | | | x | x | x | | | | | | | | | | x | | | x |
| 16 | High oil consumption/leakage | | | | | x | | | | | | | | | | | | | |
| 17 | Cooling system concerns | Overheating | | | | | | | | | | | | | | | | | |
| 18 | Cooling system concerns | Runs cold | | | | | | | | | | | | | | | | | |
| 19 | Exhaust smoke | | | | x | x | | | | | | | | | | | | | |
| 20 | Fuel odor (in engine compartment) | | | | | | | | | | | | | | | | | | |
| 21 | Engine noise | | | x | x | | | | | | | | | | | | x | | |
| 22 | Vibration concerns (engine) | | | | | | | | | | | | | | | | | | |
| 23 | A/C does not work sufficiently | | | | | | | | | | | | | | | | | | |
| 24 | A/C always on or A/C compressor runs continuously | | | | | | | | | | | | | | | | | | |
| 25 | A/C does not cut off under wide open throttle conditions | | | | | | | | | | | | | | | | | | |
| 26 | Exhaust sulphur smell | | | x | | | | | | | | | | | | | | x | |
| 27 | Fuel refill concerns | | | | | | | | | | | | | | | | | | |
| 28 | Fuel filling shut off issues | | | | | | | | | | | | | | | | | | |
| 29 | Spark plug condition | | | | | x | | | | | | | | | | | | | |
| 30 | AT concerns | Upshift/downshift engagement | | See Section 05-03, SYMPTOM TROUBLESHOOTING. | | | | | | | | | | | | | | | |

*: 13B-MSP (High Power)

x: Applied

| Troubleshooting item | | | Possible factor | Inadequate fuel pressure | Pressure regulator malfunction | Fuel injector (FP1) (RP1) clogged | Open or short fuel injector (FP1) (RP1) control circuit | Fuel leakage from fuel injector | Fuel injector clogging | Fuel line leakage, restriction or clogging | Fuel pump circuit malfunction | Fuel pump body mechanical malfunction | Fuel pump relay malfunction (stuck open or close) | Fuel pump resister malfunction | Fuel injector lack of or excessive injection amount | Restriction leakage in exhaust system | Purge solenoid valve malfunction | Improper evaporative emission control operation | Fuel tank ventilation system malfunction | Charcoal canister damage | Improper AIR system operation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Melting main or other fuses | | | | | | | | | | | | | | | | | | | | |
| 2 | MIL comes on | | | | | | | | | | | | | | | | | | | | |
| 3 | Will not crank | | | x | x | | | | | | | | | | | | | | | | |
| 4 | Hard start/long crank/erratic start/erratic crank | | | x | x | x | x | | | | | | | | | x | x | | | | |
| 5 | Engine stalls | After start/at idle | | x | x | x | | x | | x | x | | | x | | x | x | | | | |
| 6 | Cranks normally but will not start | | | x | x | x | x | x | x | | | x | | | | x | x | | | | |
| 7 | Slow return to idle | | | | | | | | | | | | | | | | | | | | |
| 8 | Engine runs rough/rolling idle | | | x | x | x | x | | | | x | x | | | | x | x | | | | |
| 9 | Fast idle/runs on | | | | | | | | | | | | | | | | | | | | |
| 10 | Low idle/stalls during deceleration | | | x | x | | x | | x | x | | x | | | | | | x | | | |
| 11 | Engine stalls/quits | Acceleration/cruise | | x | x | | | x | x | x | x | x | x | | x | x | x | | | | |
| | Engine runs rough | Acceleration/cruise | | x | x | | | x | x | x | x | x | x | | x | x | x | | | | |
| | Misses | Acceleration/cruise/ deceleration | | x | x | | | x | x | x | x | x | x | | x | x | x | | | | |
| | Buck/jerk | Acceleration/cruise/ deceleration | | x | x | | | x | x | x | x | x | x | | x | x | x | | | | |
| | Hesitation/stumble | Acceleration | | x | x | | | x | x | x | x | x | x | | x | x | x | | | | |
| | Surges | Acceleration/cruise | | x | x | | | x | x | x | x | x | x | | x | x | x | | | | |
| 12 | Lack/loss of power | Acceleration/cruise | | x | x | | | x | | x | x | x | x | | x | x | x | | | | |
| 13 | Knocking/pinging/ detonation | Acceleration/cruise | | x | x | | | x | x | | | | x | | x | | | | | | |
| 14 | Poor fuel economy | | | x | x | | | x | | | | | x | | | x | | | | | |
| 15 | Emissions compliance | | | x | | | | | | | | | | | | x | | | x | x | x |
| 16 | High oil consumption/leakage | | | | | | | | | | | | | | | | | | | | |
| 17 | Cooling system concerns | Overheating | | | | | | | | | | | | | | | | | | | |
| 18 | Cooling system concerns | Runs cold | | | | | | | | | | | | | | | | | | | |
| 19 | Exhaust smoke | | | x | | | | x | | | | | | | | | | | | | |
| 20 | Fuel odor (in engine compartment) | | | x | | | | x | | x | | | | | | | x | | x | x | |
| 21 | Engine noise | | | | | | | | | | | | | | | | | | | | |
| 22 | Vibration concerns (engine) | | | | | | | | | | | | | | | | | | | | |
| 23 | A/C does not work sufficiently | | | | | | | | | | | | | | | | | | | | |
| 24 | A/C always on or A/C compressor runs continuously | | | | | | | | | | | | | | | | | | | | |
| 25 | A/C does not cut off under wide open throttle conditions | | | | | | | | | | | | | | | | | | | | |
| 26 | Exhaust sulphur smell | | | x | | | | | | | | | | | | | | | | x | |
| 27 | Fuel refill concerns | | | | | | | | | | | | | | | | | x | | | |
| 28 | Fuel filling shut off issues | | | | | | | | | | | | | | | | | | | | |
| 29 | Spark plug condition | | | x | | | | | | | | | | | | x | | | | | |
| 30 | AT concerns | Upshift/downshift engagement | | See Section 05-03, SYMPTOM TROUBLESHOOTING. | | | | | | | | | | | | | | | | | |

x: Applied

| Troubleshooting item | | | Possible factor | Catalyst converter malfunction | Nonreturn valve malfunction | EVAP pipe clogging | Fuel shut-off valve malfunction | Improper air/fuel ratio control | ECT sensor malfunction (abnormal signal to PCM) | Erratic signal from eccentric shaft position sensor | No signal from eccentric shaft position sensor | MAF sensor malfunction (abnormal signal to PCM) | APP sensor malfunction | TP sensor malfunction | Improper fuel injection control operation | MAF sensor improper installation | IAT sensor malfunction (abnormal signal to PCM) | Improper load signal input (neutral/CPP switch, TR switch etc.) | Improper ignition timing | Brake switch malfunction (abnormal signal to PCM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Melting main or other fuses | | | | | | | | | | | | | | | | | | | |
| 2 | MIL comes on | | | x | | | | x | x | x | | x | x | x | x | | x | x | | x |
| 3 | Will not crank | | | | | | | | | | | | | | | | | x | | |
| 4 | Hard start/long crank/erratic start/erratic crank | | | | | | | x | x | x | | x | | | | x | | | | |
| 5 | Engine stalls | After start/at idle | | | | | | x | x | x | | | | | | x | x | | | |
| 6 | Cranks normally but will not start | | | | | | | x | | | x | | x | x | | | | | | |
| 7 | Slow return to idle | | | | | | | | x | | | | | | | | | | | |
| 8 | Engine runs rough/rolling idle | | | | | | | | x | x | | x | x | x | x | x | x | x | x | |
| 9 | Fast idle/runs on | | | | | | | | x | | | | x | | x | | | x | | |
| 10 | Low idle/stalls during deceleration | | | | | | | | | | | x | x | x | | x | x | x | | x |
| 11 | Engine stalls/quits | Acceleration/cruise | | | | | | x | x | x | | x | x | x | | x | x | x | | |
| | Engine runs rough | Acceleration/cruise | | | | | | x | x | x | | x | x | x | | x | x | x | | |
| | Misses | Acceleration/cruise/deceleration | | | | | | x | x | x | | x | x | x | | x | x | x | | |
| | Buck/jerk | Acceleration/cruise/deceleration | | | | | | x | x | x | | x | x | x | | x | x | x | | |
| | Hesitation/stumble | Acceleration | | | | | | x | x | x | | x | x | x | | x | x | x | | |
| | Surges | Acceleration/cruise | | | | | | x | x | x | | x | x | x | | x | x | x | | |
| 12 | Lack/loss of power | Acceleration/cruise | | | | | | | x | x | | x | x | x | x | x | x | | x | |
| 13 | Knocking/pinging/detonation | Acceleration/cruise | | | | | | | x | x | | x | | | x | x | x | | x | |
| 14 | Poor fuel economy | | | | | | | | x | | | x | | | x | x | x | | x | |
| 15 | Emissions compliance | | | x | | | | x | | x | | | | | | | | | | |
| 16 | High oil consumption/leakage | | | | | | | | | | | | | | | | | | | |
| 17 | Cooling system concerns | Overheating | | | | | | | | | | | | | | | | | | |
| 18 | Cooling system concerns | Runs cold | | | | | | | | | | | | | | | | | | |
| 19 | Exhaust smoke | | | | | | | | | | | | | | | | | | | |
| 20 | Fuel odor (in engine compartment) | | | | | | | | | | | | | | | | | | | |
| 21 | Engine noise | | | | | | | | | | | | | | | | | | | |
| 22 | Vibration concerns (engine) | | | | | | | | | | | | | | | | | | | |
| 23 | A/C does not work sufficiently | | | | | | | | | | | | | | | | | | | |
| 24 | A/C always on or A/C compressor runs continuously | | | | | | | | | | | | | | | | | | | |
| 25 | A/C does not cut off under wide open throttle conditions | | | | | | | | | | | | x | | | | | | | |
| 26 | Exhaust sulphur smell | | | | | | | | | | | | | | | | | | | |
| 27 | Fuel refill concerns | | | | x | x | | | | | | | | | | | | | | |
| 28 | Fuel filling shut off issues | | | | x | x | x | | | | | | | | | | | | | |
| 29 | Spark plug condition | | | | | | | x | x | | | x | | | | | | | | |
| 30 | AT concerns | Upshift/downshift engagement | | See Section 05-03, SYMPTOM TROUBLESHOOTING. | | | | | | | | | | | | | | | | |

x: Applied

| Troubleshooting item | | | Possible factor | Improper vehicle speed signal input | Main relay malfunction | Front HO2S malfunction (abnormal signal to PCM) | Rear HO2S malfunction (abnormal signal to PCM) | Knock sensor malfunction (abnormal signal to PCM) | Instrument cluster malfunction | Starting system malfunction | Low or dead battery | Charging system malfunction | Starter interlock switch malfunction (MT) | Improper engine compression | Engine internal parts malfunction | Excessive carbon built up in combustion chamber or intake port | Improper metering oil pump control operation | Metering oil pump malfunction | Oil nozzle malfunction (leakage/clogging) | Low oil pressure | Oil passage leakage/clogging | Air mixed in oil passage | Improper dipstick | No PCM power supply | Open PCM and/or vehicle GND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Melting main or other fuses | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | MIL comes on | | | | | x | x | x | x | | | | | | | | | | | | | | | | |
| 3 | Will not crank | | | | | | | | | x | x | x | x | x | x | | x | x | x | x | x | x | | | |
| 4 | Hard start/long crank/erratic start/erratic crank | | | | | | | | | x | | | | x | x | | x | x | x | x | x | x | | | |
| 5 | Engine stalls | After start/at idle | | | | | | | | | | | | x | x | | x | x | x | x | x | x | | x | |
| 6 | Cranks normally but will not start | | | | | | | | | | | | | x | x | | x | x | x | x | x | x | | x | x |
| 7 | Slow return to idle | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Engine runs rough/rolling idle | | | | | | | | | | | | | x | x | x | x | x | x | x | x | x | | | |
| 9 | Fast idle/runs on | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Low idle/stalls during deceleration | | | | | | | | | | | | | x | x | | x | x | x | x | x | x | | | |
| 11 | Engine stalls/quits | Acceleration/cruise | | x | x | x | x | | | | | | | x | x | | x | x | x | x | x | x | | | |
| | Engine runs rough | Acceleration/cruise | | x | x | x | x | | | | | | | x | x | | x | x | | x | x | x | | | |
| | Misses | Acceleration/cruise/ deceleration | | x | x | x | x | | | | | | | x | x | | x | x | | x | x | x | | | |
| | Buck/jerk | Acceleration/cruise/ deceleration | | x | x | x | x | | | | | | | x | x | | x | x | | x | x | x | | | |
| | Hesitation/stumble | Acceleration | | x | x | x | x | | | | | | | x | x | | x | x | | x | x | x | | | |
| | Surges | Acceleration/cruise | | x | x | x | x | | | | | | | x | x | | x | x | | x | x | x | | | |
| 12 | Lack/loss of power | Acceleration/cruise | | | | x | x | | | | | | | x | x | | x | x | x | x | x | x | | | |
| 13 | Knocking/pinging/ detonation | Acceleration/cruise | | | | | | x | | | | | | x | x | x | x | x | x | x | x | x | | | |
| 14 | Poor fuel economy | | | | | x | x | x | | | | | | x | x | | x | x | x | x | x | x | | | |
| 15 | Emissions compliance | | | | | | | | | | | | | x | x | x | x | x | x | x | x | x | | | |
| 16 | High oil consumption/leakage | | | | | | | | | | | | | | x | | x | x | | | | | x | | |
| 17 | Cooling system concerns | Overheating | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | Cooling system concerns | Runs cold | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | Exhaust smoke | | | | | | | | | | | | | x | x | | x | x | x | x | x | x | | | |
| 20 | Fuel odor (in engine compartment) | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | Engine noise | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | Vibration concerns (engine) | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | A/C does not work sufficiently | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | A/C always on or A/C compressor runs continuously | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | A/C does not cut off under wide open throttle conditions | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | Exhaust sulphur smell | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | Fuel refill concerns | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | Fuel filling shut off issues | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | Spark plug condition | | | | | x | | | | | | | | x | x | | x | x | x | x | x | x | | | |
| 30 | AT concerns | Upshift/downshift engagement | | See Section 05-03, SYMPTOM TROUBLESHOOTING. | | | | | | | | | | | | | | | | | | | | | |

x: Applied

| Troubleshooting item | | | Possible factor | Electrical connectors disconnected | Spark leakage from high-tension leads | Spark plug malfunction or improper heat range | Ignition coil malfunction | Seized/hydrolocked engine, flywheel or drive plate (excessive engine mechanical loss) | Immobilizer system and/or related circuit malfunction | Immobilizer system operating properly (key is not registered.) | A/C related parts malfunction (A/C compressor, magnetic clutch, A/C relay etc.) | Excessive or lack of A/C system pressure | Improper A/C system operation | Engine overheating | Thermostat stuck open or close | Improper cooling fans operation | Improper engine coolant level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Melting main or other fuses | | | | | | | | | | | | | | | | |
| 2 | MIL comes on | | | x | | | | | | | | | | | x | | |
| 3 | Will not crank | | | | | | | x | x | x | | | | | | | |
| 4 | Hard start/long crank/erratic start/erratic crank | | | | x | x | | | | | | | | | | | |
| 5 | Engine stalls | After start/at idle | | x | x | | x | | x | x | | | x | x | | | |
| 6 | Cranks normally but will not start | | | x | x | x | x | | x | x | | | | x | | | |
| 7 | Slow return to idle | | | | | | | | | | | | | | x | | |
| 8 | Engine runs rough/rolling idle | | | x | x | x | x | x | | | | | x | x | | | |
| 9 | Fast idle/runs on | | | | | | | | | | | | | | | | |
| 10 | Low idle/stalls during deceleration | | | | | | | | | | | | x | | | | |
| 11 | Engine stalls/quits | Acceleration/cruise | | | x | x | | | | | | | x | x | | | |
| | Engine runs rough | Acceleration/cruise | | | x | x | | | | | | | x | x | | | |
| | Misses | Acceleration/cruise/ deceleration | | | x | x | | | | | | | x | x | | | |
| | Buck/jerk | Acceleration/cruise/ deceleration | | | x | x | | | | | | | x | x | | | |
| | Hesitation/stumble | Acceleration | | | x | x | | | | | | | x | x | | | |
| | Surges | Acceleration/cruise | | | x | x | | | | | | | x | x | | | |
| 12 | Lack/loss of power | Acceleration/cruise | | | x | x | | | | | | | x | x | | | |
| 13 | Knocking/pinging/ detonation | Acceleration/cruise | | | x | x | | | | | | | | x | x | | |
| 14 | Poor fuel economy | | | | x | | | | | | | | x | | x | x | x |
| 15 | Emissions compliance | | | x | x | | | | | | | | | | | | |
| 16 | High oil consumption/leakage | | | | | | | | | | | x | | | | | |
| 17 | Cooling system concerns | Overheating | | | | | | | | | | | x | | x | x | x |
| 18 | Cooling system concerns | Runs cold | | | | | | | | | | | | | x | x | |
| 19 | Exhaust smoke | | | | x | x | x | | | | | | | | | | |
| 20 | Fuel odor (in engine compartment) | | | | | | | | | | | | | | | | |
| 21 | Engine noise | | | | | | | | | | | | | | | | |
| 22 | Vibration concerns (engine) | | | | | | | | | | | | | | | | |
| 23 | A/C does not work sufficiently | | | | | | | | | | x | x | x | | | | |
| 24 | A/C always on or A/C compressor runs continuously | | | | | | | | | | x | | x | | | | |
| 25 | A/C does not cut off under wide open throttle conditions | | | | | | | | | | | | | | | | |
| 26 | Exhaust sulphur smell | | | x | | | | | | | | | | | | | |
| 27 | Fuel refill concerns | | | | | | | | | | | | | | | | |
| 28 | Fuel filling shut off issues | | | | | | | | | | | | | | | | |
| 29 | Spark plug condition | | | | x | x | | | | | | | | | | | |
| 30 | AT concerns | Upshift/downshift engagement | | See Section 05-03, SYMPTOM TROUBLESHOOTING. | | | | | | | | | | | | | |

x: Applied

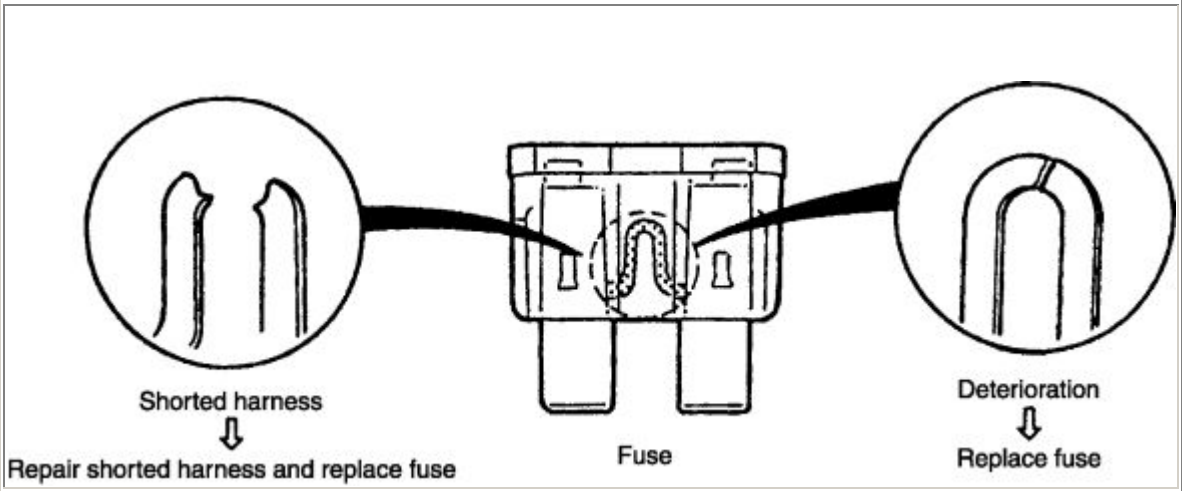
| | Troubleshooting item | | Possible factor | Cooling system malfunction | Eccentric shaft bypass valve stuck open or close | Improper engine oil viscosity/amount/deterioration | Clutch slippage (MT) | Improper TCC control operation (AT) | AT malfunction (AT) | Improper shift point (AT) | Brake dragging | Low line pressure | Improper cruise control system operation | Loose installation of engine mounts | Inadequate fuel filling speed | Improper use of fuel nozzle | Oil pump noise (gear and/drive chain) | Loose parts (exhaust, suspension, mounts etc.) | Drive belt malfunction (improper tension, damage) | Blown fuse |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Melting main or other fuses | | | | | | | | | | | | | | | | | | | | x |
| 2 | MIL comes on | | | x | | | | | | | | | | | | | | | | | |
| 3 | Will not crank | | | | | x | | | | | | | | | | | | | | | |
| 4 | Hard start/long crank/erratic start/erratic crank | | | | | x | | | | | | | | | | | | | | | |
| 5 | Engine stalls | After start/at idle | | | | x | | | | | | | | | | | | | | | |
| 6 | Cranks normally but will not start | | | | | x | | | | | | | | | | | | | | | |
| 7 | Slow return to idle | | | | x | | | | | | | | | | | | | | | | |
| 8 | Engine runs rough/rolling idle | | | | | x | | | | | | | | | | | | | | | |
| 9 | Fast idle/runs on | | | | | | | | | | | | x | | | | | | | | |
| 10 | Low idle/stalls during deceleration | | | | | x | | x | | | | | | x | | | | | | | |
| 11 | Engine stalls/quits | Acceleration/cruise | | | | x | x | x | x | x | | | | | | | | | | | |
| | Engine runs rough | Acceleration/cruise | | | | x | x | x | x | x | | | | | | | | | | | |
| | Misses | Acceleration/cruise/ deceleration | | | | x | x | x | x | x | | | | | | | | | | | |
| | Buck/jerk | Acceleration/cruise/ deceleration | | | | x | x | x | x | x | | | | | | | | | | | |
| | Hesitation/stumble | Acceleration | | | | x | x | x | x | x | | | | | | | | | | | |
| | Surges | Acceleration/cruise | | | | x | x | x | x | x | | | | | | | | | | | |
| 12 | Lack/loss of power | Acceleration/cruise | | | | x | x | x | x | | x | x | | | | | | | | | |
| 13 | Knocking/pinging/ detonation | Acceleration/cruise | | x | x | x | | | | | | | | | | | | | | | |
| 14 | Poor fuel economy | | | | x | x | x | | x | | x | x | | | | | | | | | |
| 15 | Emissions compliance | | | x | | x | | | | | | | | | | | | | | | |
| 16 | High oil consumption/leakage | | | | | | | | | | | | | | | | | | | | |
| 17 | Cooling system concerns | Overheating | | x | x | | | | | | | | | | | | | | | x | x |
| 18 | Cooling system concerns | Runs cold | | x | x | | | | | | | | | | | | | | | | |
| 19 | Exhaust smoke | | | x | | x | | | | | | | | | | | | | | | |
| 20 | Fuel odor (in engine compartment) | | | | | | | | | | | | | | | | | | | | |
| 21 | Engine noise | | | | | x | | | | | | | | | | | | x | x | x | |
| 22 | Vibration concerns (engine) | | | | | | | | | | | | | | | | | | x | | |
| 23 | A/C does not work sufficiently | | | | | | | | | | | | | | | | | | | | |
| 24 | A/C always on or A/C compressor runs continuously | | | | | | | | | | | | | | | | | | | | |
| 25 | A/C does not cut off under wide open throttle conditions | | | | | | | | | | | | | | | | | | | | |
| 26 | Exhaust sulphur smell | | | | | | | | | | | | | | | | | | | | |
| 27 | Fuel refill concerns | | | | | | | | | | | | | | x | x | | | | | |
| 28 | Fuel filling shut off issues | | | | | | | | | | | | | | x | x | | | | | |
| 29 | Spark plug condition | | | | | x | | | | | | | | | | | | | | | |
| 30 | AT concerns | Upshift/downshift engagement | | See Section 05-03, SYMPTOM TROUBLESHOOTING. | | | | | | | | | | | | | | | | | |

## NO.1 MELTING OF MAIN OR OTHER FUSES

| 1 | MELTING OF MAIN OR OTHER FUSES |
|---|---|

**[TROUBLESHOOTING HINTS]**

Inspect condition of fuse.




| Damaged fuse | Related wiring harness |
|---|---|
| MAIN | **MAIN fuse**<br>• AIR PUMP fuse<br>• BTN fuse<br>• FAN fuse |
| IG | **IG fuse**<br>• Ignition relay |
| IG KEY | **IG KEY fuse**<br>• Ignition relay |
| ETV | **ETV fuse**<br>• Main relay<br>• Drive-by-wire relay |
| EGI COMP 1 | **EGI COMP 1 fuse**<br>• Purge solenoid valve<br>• SSV solenoid valve<br>• A/C CVI<br>• Metering oil pump<br>• VDI<br>• MAF sensor<br>• Front/rear HO2S<br>• Fuel pump relay |

| | |
|---|---|
| EGI COMP 2 | **EGI COMP 2 fuse**<br>• EVAP system leak detection pump<br>• AIR pump relay<br>• Fuel pump relay<br>• MAF sensor<br>• VFAD<br>• Cooling fan relay No.1<br>• Cooling fan relay No.2<br>• Cooling fan relay No.3 |
| FUEL PUMP | **FUEL PUMP fuse**<br>• Fuel pump relay |
| AIR PUMP | **AIR PUMP fuse**<br>• AIR pump relay |
| BTN | **BTN fuse**<br>• ROOM fuse |
| ROOM | **ROOM fuse**<br>• PCM<br>• DLC |
| ENGINE | **ENGINE fuse**<br>• Steering angle sensor (with DSC)<br>• Keyless control module<br>• Condenser<br>• EPS control module<br>• SAS control module<br>• ABS HU/CM (without DSC)<br>• DSC HU/CM (with DSC) |
| WIPER | **WIPER fuse**<br>• Windshield wiper and washer switch<br>• Windshield wiper motor |
| FAN | **FAN fuse**<br>• Cooling fan relay No.1<br>• Cooling fan relay No.3 |

## NO.2 MIL COMES ON

| | |
|---|---|
| 2 | MIL COMES ON |
| **DESCRIPTION** | The MIL is illuminated incorrectly. |
| **POSSIBLE CAUSE** | • PCM illuminates for emission-related concern (DTC is stored in PCM)<br>• Instrument cluster malfunction<br>**NOTE:**<br>• If MIL blinks at steady rate, misfire condition could exist. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | Go to the next step. |
| 2 | Inspect between the following wiring harnesses.<br><br>• PCM terminal 4V—instrument cluster terminal 1J<br>• PCM terminal 4S—instrument cluster terminal 1L<br><br>Are they normal? | Yes | Inspect instrument cluster operation.<br><br>(See INSTRUMENT CLUSTER INPUT/OUTPUT CHECK MODE .) |
| | | No | Repair or the replace wiring harness. |
| 3 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform the repair or diagnosis. | | |

## NO.3 WILL NOT CRANK

| | |
|---|---|
| 3 | WILL NOT CRANK |
| **DESCRIPTION** | The starter does not work. |
| **POSSIBLE CAUSE** | • Open starter circuit between ignition switch and starter<br>• TR switch malfunction (AT)<br>• TR switch misadjustment (AT)<br>• Low or dead battery<br>• Charging system malfunction<br>• Starter interlock switch malfunction (MT)<br>• Starter malfunction<br>• Fuel injector improper operation<br>• Fuel injector malfunction (leakage, clogging, injection amount)<br>• Low engine compression<br>  ▪ Engine internal malfunction<br>  ▪ Abnormal engine oil condition (viscosity, deterioration)<br>  ▪ Low oil pressure<br>  ▪ Excessive fuel pressure<br>  ▪ Air mixed in oil passage<br>  ▪ Metering oil pump malfunction<br>  • Leakage or clogging in oil pipe<br>  • Leakage or clogging in oil nozzle<br>• Seized/hydrolocked engine, flywheel or drive plate (excessive mechanical loss)<br>• Air mixed in oil passage<br>• Abnormal engine oil condition (viscosity, amount, deterioration)<br>• Immobilizer system and/or circuit malfunction<br>• Immobilizer system operating properly (Key is not registered.)<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly |

| | |
|---|---|
| | cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Do the following conditions appear?<br><br>• The engine is not completely started.<br>• DTC B1260 is displayed. | Yes | **Both conditions appear:**<br><br>Go to Step 4. |
| | | No | **Either or other condition appears:**<br><br>Go to the next step. |
| 2 | Are the ignition coil connectors securely connected to the coil? | Yes | Go to the next step. |
| | | No | Connect the coil connectors securely.<br><br>Return to Step 1. |
| 3 | Does the security light illuminate? | Yes | Go to the next step. |
| | | No | Inspect the instrument cluster and the following wiring harnesses.<br><br>• Between PCM terminal 4V and instrument cluster terminal 1J<br>• Between PCM terminal 4S and instrument cluster terminal 1L |
| 4 | Connect the WDS or equivalent to the DLC-2 and retrieve DTC.<br><br>Are any of the following DTCs displayed?<br><br>**DTC**<br><br>o **B1213, B1341, B1600, B1601, B1602, B1681, B2103, B2139, B2431, U1147, U2510** | Yes | Go to the applicable DTC inspection.<br><br>(See DTC TABLE (IMMOBILIZER SYSTEM) .)<br><br>(See DTC TABLE [MULTIPLEX COMMUNICATION SYSTEM] .) |
| | | No | Go to the next step. |

| | | | |
|---|---|---|---|
| 5 | Inspect the following wiring harnesses and connectors for an open or short circuit:<br><br>• Between coil terminal A and keyless control module terminal 3F<br>• Between coil terminal B and keyless control module terminal 3E<br><br>Are there any malfunctions? | Yes | Repair or replace the wiring harnesses and connectors. |
| | | No | Go to the next step. |
| 6 | Inspect the following wiring harnesses and connectors for an open or short circuit:<br><br>• Between keyless control module terminal 3A and PCM terminal 4V<br>• Between keyless control module terminal 3B and PCM terminal 4S<br><br>Are there any malfunctions? | Yes | Repair or replace the wiring harnesses and connectors. |
| | | No | Go to the next step. |
| 7 | Is there continuity between PCM terminal 5A and the starter relay with the clutch pedal depressed (MT), P or N position (AT)? | Yes | Go to the next step. |
| | | No | Repair or replace the wiring harness. |
| 8 | Inspect the following:<br><br>• Battery connection<br>• Battery condition<br>• Transmission is in Park or Neutral. (AT)<br>• Clutch is fully depressed. (MT)<br>• Fuses<br><br>Are all the items normal? | Yes | Go to the next step. |
| | | No | Service if necessary.<br><br>Repeat Step 8. |
| 9 | Is a clicking sound heard from the starter when the ignition switch is turned to the START position? | Yes | Go to the next step. |
| | | No | Go to Step 14. |
| 10 | Inspect starting system.<br><br>(See STARTER INSPECTION .)<br><br>Is starting system normal? | Yes | Go to the next step. |
| | | No | Repair or replace components if required. |
| 11 | Install a wrench or equivalent to the eccentric pulley bolt.<br><br>Turn the eccentric shaft clockwise.<br><br>Will the eccentric shaft turn? | Yes | Go to Step 14. |
| | | No | Go to the next step. |

| | | | |
|---|---|---|---|
| 12 | Remove all accessory belts.<br><br>**CAUTION:**<br><br>• To prevent engine damage (overheat etc.), do not crank engine for a long time after removing accessory belts.<br><br>Crank the engine.<br><br>Does the engine crank? | Yes | Inspect the accessory parts for excessive mechanical resistance and repair or replace the malfunctioning parts. |
| | | No | Go to the next step. |
| 13 | Remove starter.<br><br>Install a wrench to the eccentric pulley bolt.<br><br>Turn the eccentric shaft clockwise.<br><br>Will the eccentric shaft turn? | Yes | Inspect internal parts of the starter for malfunction and repair or replace the malfunctioning parts.<br><br>(See Starter Inner Parts Inspection .) |
| | | No | Overhaul the engine and repair or replace the malfunctioning parts.<br><br>(See BATTERY INSPECTION .)<br><br>(See GENERATOR INSPECTION .) |
| 15 | **NOTE:**<br><br>• The following test should be performed on AT only. For MT, go to the next step.<br><br>Connect the WDS or equivalent to the DLC-2.<br><br>Access TR PID.<br><br>Turn the ignition switch to the ON position.<br><br>Does TR PID indicate P/N when selecting the P or N position? | Yes | Go to the next step. |
| | | No | Inspect the adjustment of the TR switch.<br><br>(See TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT .)<br><br>If the TR switch is adjusted properly, inspect for an open circuit between the TR switch and TCM terminal 1D, 2B or the starter. |
| 16 | Perform fuel injector operation inspection.<br><br>(See Fuel Injector Operation Inspection .)<br><br>Does fuel injector operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to inspection result. |
| 17 | | Yes | Go to the next step. |

| | | | | | |
|---|---|---|---|---|---|
| | Inspect the fuel injectors for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Leakage<br>• Clogging<br>• Injection amount<br><br>Are the injectors normal? | No | Replace suspected fuel injector. | | |
| 18 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Go to Step 25. | | |
| | | No | Go to the next step. | | |
| 19 | Apply the engine oil to front and rear rotors from plug hole **approx. 3—5 ml {3—5 cc, 0.11—0.16 fl·oz}** .<br><br>Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Go to the next step. | | |
| | | No | Go to Step 21. | | |
| 20 | Clean the spark plugs.<br><br>Crank the engine.<br><br>Does the engine start? | Yes | Remove carbon or foreign material inside the engine using the carburetor cleaner. | | |
| | | No | Go to the next step. | | |
| 21 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .)<br><br>Is fuel line pressure normal? | Yes | Go to the next step. |
| No | Replace the fuel pump unit. | | | | |

| | |
|---|---|
| | (See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See DTC TABLE .)<br><br>OR<br><br>**Communication error message is displayed :**<br><br>Inspect for the following:<br><br>• Open circuit between main relay and PCM terminal 5AC or 5AF<br>• Open circuit between main relay terminal E and PCM terminal 4E<br>• The main relay is stuck open.<br>• Open or poor GND circuit (PCM terminal 4A, 4J, 5T, 5D, 5O or 5R)<br>• Poor connection of vehicle body GND |
| No | **No DTC is displayed:**<br><br>Inspect the following:<br><br>• START circuit in ignition switch<br>• Open circuit between ignition switch and starter<br>• Starter interlock switch (MT)<br><br>(See STARTER INTERLOCK SWITCH (MT) INSPECTION .) |
| 27 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform the repair or diagnosis. |

## NO.4 HARD TO START/LONG CRANK/ERRATIC START/ERRATIC CRANK

| 4 | HARD TO START/LONG CRANK/ERRATIC START/ERRATIC CRANK |
|---|---|
| **DESCRIPTION** | • The starter cranks engine at the normal speed but the engine requires excessive cranking time before starting.<br>• The battery is in the normal condition. |
| **POSSIBLE CAUSE** | • Vacuum leakage<br>• Air leakage from intake-air system<br>• Air suction at intake-air system (between MAF sensor and intake ports)<br>• Air cleaner restriction<br>• Improper operation of drive-by-wire control system<br>• Drive-by-wire control system operates in fail-safe mode<br>• Throttle body malfunction (stuck open)<br>• SSV stuck open<br>• SSV solenoid valve malfunction (stuck open)<br>• APV stuck open*<br>• APV motor malfunction*<br>• APV position sensor malfunction*<br>• Poor fuel quality<br>• Jet air mixing system malfunction (restriction or leakage in air passage)<br>• Inadequate fuel pressure<br>• Pressure regulator malfunction (integrated in fuel pump)<br>• Fuel injector (FP1) (RP1) is clogged.<br>• Open or short in fuel injector (FP1) (RP1) control signal circuit<br>• Restriction in exhaust system<br>• Purge solenoid valve malfunction (stuck open)<br>• Improper air/fuel ratio control (abnormal ECT signal to PCM)<br>• Erratic signal form eccentric shaft position sensor<br>• MAF sensor contamination (abnormal signal to PCM)<br>• MAF sensor improper installation<br>• Low engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil line<br>▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br>• Starting system malfunction<br>• Spark leakage from high-tension leads<br>• Spark plug malfunction |

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| | **WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Does engine knock/ping/detonate? | Yes | Go to the symptom troubleshooting "No.13 Knocking/pinging/detonation-Acceleration/cruise".<br><br>(See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE .) |
| | | No | Go to the next step. |
| 2 | Inspect for the following: | Yes | Go to the next step. |

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| | • Vacuum leak<br>• Proper fuel quality (e.g. proper octane, contamination, winter/summer blend)<br>• Blockage at intake-air system (between MAF sensor and intake ports)<br>• Loose bands on intake-air system hoses<br>• Cracks in intake-air system<br>• Air cleaner restriction<br>• Jet air mixing system air passage (clogging or leakage)<br>• MAF sensor installation<br><br>Are all the items normal? | No | Service if necessary.<br><br>Repeat Step 2. |
| 3 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | Go to the next step. |
| 4 | Connect the WDS or equivalent to the DLC-2.<br><br>Access the ECT PID.<br><br>Inspect the readings on both the ECT PID and the temperature gauge on the instrument cluster readings.<br><br>Does the ECT PID indicate the same temperature as the gauge readings? | Yes | Go to the next step. |
| | | No | If temperature gauge is in the normal range but the ECT PID is not the same as the temperature gauge reading, inspect the ECT sensor.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>If the temperature gauge on instrument cluster indicates the cold range but the ECT PID is normal, inspect the temperature gauge and the sending unit.<br><br>(See Water temperature gauge .) |
| 5 | Is the engine overheating? | Yes | Go to the symptom troubleshooting "No.17 Cooling system concerns – Overheating".<br><br>(See NO.17 COOLING SYSTEM CONCERNS-OVERHEATING .) |

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| | | No | Go to the next step. |
| 6 | Inspect for cracks on high-tension leads.<br><br>Are there any cracks on high-tension leads? | Yes | Repair suspected high-tension leads. |
| | | No | Go to the next step. |
| 7 | Inspect the spark plug conditions.<br><br>Is the spark plug wet, covered with carbon or grayish white? | Yes | **Spark plug is wet or covered with carbon:**<br><br>Inspect for fuel leakage from fuel injector.<br><br>**Spark plug is grayish white:**<br><br>Inspect for clogging fuel injector (FP1) (RP1). |
| | | No | Install spark plugs in the original positions.<br><br>Go to the next step. |
| 8 | Visually inspect the eccentric shaft position sensor and the teeth of the pulse wheel.<br><br>Are the eccentric shaft position sensor and the teeth of the pulse wheel normal? | Yes | Go to the next step. |
| | | No | Replace the malfunctioning parts. |
| 9 | Attempt to start the engine at part throttle.<br><br>Does the engine run smoothly at part throttle? | Yes | Inspect the drive-by-wire control system operation.<br><br>(See Drive-by-wire Control System Inspection .) |
| | | No | Go to the next step. |
| 10 | | Yes | Go to the next step. |

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| | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Short check connector terminal F/P to the body GND using a jumper wire.<br><br>Turn the ignition switch to the ON position.<br><br>Is the fuel line pressure correct with the ignition switch ON?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 11 | Is the fuel line pressure held after the ignition switch is turned off?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | Inspect the fuel injector.<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>If the fuel injector is normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 12 | Disconnect the vacuum hose from the purge solenoid valve and plug the opening end of the vacuum hose. Attempt to start the engine.<br><br>Is the starting condition improved? | Yes | Inspect if the purge solenoid valve sticks open. |
| | | No | Go to the next step. |
| 13 | Inspect the MAF sensor for contamination.<br><br>Is there any contamination? | Yes | Replace the MAF sensor.<br><br>(See INTAKE-AIR SYSTEM REMOVAL/INSTALLATION .) |
| | | No | Go to the next step. |
| 14 | Visually inspect the exhaust system part.<br><br>Is there any deformed exhaust system part? | Yes | Replace the suspected part. |
| | | No | Go to the next step. |
| 15 | Inspect the starting system. | Yes | Go to the next step. |

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| | (See STARTER INSPECTION .)<br><br>Is the starting system normal? | No | Repair or replace components if required. | | |
| 16 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Go to Step 21. | | |
| | | No | Go to the next step. | | |
| 17 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See Fuel Injector Operation Inspection .)<br><br>Does fuel injector operate properly? | Yes | Go to the next step. | | |
| No | Repair or replace the malfunctioning part according to the inspection results. | | | | |
| 23 | Inspect the fuel injectors for the following: | Yes | Inspect the engine oil condition (viscosity, amount deterioration). | | |

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| | (See FUEL INJECTOR INSPECTION .)<br><br>• Leakage<br>• Clogging<br>• Injector amount<br><br>Are the injectors normal? | No | Replace the suspected fuel injector. |
| 24 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform the repair or diagnosis. | | |

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13B-MSP (High Power)

## NO.5 ENGINE STALLS-AFTER START/AT IDLE

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| 5 | ENGINE STALLS—AFTER START/AT IDLE |
| **DESCRIPTION** | • Engine stops unexpectedly. |
| **POSSIBLE CAUSE** | • No battery power supply to PCM or poor GND<br>• Vacuum leakage<br>• Air leakage from intake-air system parts<br>• Air suction at intake-air system (between MAF sensor and intake ports)<br>• Air cleaner restriction<br>• Improper operation of drive-by-wire control system<br>• Throttle body malfunction (stuck closed)<br>• Poor fuel pressure<br>• Inadequate fuel pressure<br>• Pressure regulator malfunction (integrated in fuel pump unit)<br>• Fuel pump body mechanical malfunction<br>• Fuel pump resister malfunction (open)<br>• Fuel leakage from fuel injector<br>• Fuel injector (FP1) (RP1) clogging<br>• Jet air mixing system malfunction (restriction or leakage at air passage)<br>• Open or short circuit in fuel pump body and related wiring harness<br>• Restriction in exhaust system<br>• Purge solenoid valve malfunction (stuck open)<br>• Improper air/fuel ratio control (abnormal signal from ECT sensor to PCM)<br>• MAF sensor improper installation<br>• No signal from eccentric shaft position sensor due to sensor, related wire or wrong installation<br>• Electrical connector disconnected<br>• Low engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil line<br>▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br>• A/C system operation is improper<br>• Engine overheating<br>• Abnormal engine oil condition (viscosity, amount, deterioration)<br>• Spark leakage from high-tension leads<br>• Ignition coil malfunction<br>• Immobilizer system and/or circuit malfunction |

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| | • Immobilizer system operates properly (Key is not registered.)<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• **Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material.** |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Do the following conditions appear?<br><br>• The engine is not completely started.<br>• DTC B1260 is displayed. | Yes | **Both conditions appear:**<br><br>Go to Step 3. |
| | | No | **Either or other condition appears:**<br><br>Go to the next step. |
| 2 | Does the engine stall after **approx. 2 s** after the engine is started? | Yes | Go to the next step. |
| | | No | The immobilizer system is normal.<br><br>Go to Step 9. |
| 3 | Is the coil connector securely connected to the coil? | Yes | Go to the next step. |
| | | No | Connect the coil connector securely.<br><br>Return to Step 2. |
| 4 | | Yes | Go to the next step. |

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| | Does the security light illuminate? | No | Inspect the instrument cluster and the following wiring harnesses.<br><br>• Between PCM terminal 4V and instrument cluster terminal 1J<br>• Between PCM terminal 4S and instrument cluster terminal 1L |
| 5 | Connect the WDS or equivalent to the DLC-2 and retrieve the DTC.<br><br>Are any of the following DTCs displayed?<br><br>**DTC**<br><br>o **B1213, B1341, B1600, B1601, B1602, B1681, B2103, B2139, B2431, U1147, U2510** | Yes | Go to the applicable DTC inspection.<br><br>(See DTC TABLE (IMMOBILIZER SYSTEM) .)<br><br>(See DTC TABLE [MULTIPLEX COMMUNICATION SYSTEM] .) |
| | | No | Go to the next step. |
| 6 | Inspect the following wiring harnesses and connectors for an open or short circuit:<br><br>• Between coil terminal A and keyless control module terminal 3F<br>• Between coil terminal B and keyless control module terminal 3E<br><br>Are there any malfunctions? | Yes | Repair or replace the wiring harnesses and connectors. |
| | | No | Go to the next step. |
| 7 | Inspect the following wiring harnesses and connectors for an open or short circuit:<br><br>• Between keyless control module terminal 3A and PCM terminal 4V<br>• Between keyless control module terminal 3B and PCM terminal 4S<br><br>Are there any malfunctions? | Yes | Repair or replace the wiring harnesses and connectors. |
| | | No | Go to the next step. |

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| 8 | Does the engine knock/ping/detonate? | Yes | Go to the symptom troubleshooting "No.13 Knocking/pinging/detonation-Acceleration/cruise".<br><br>(See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE .) |
| | | No | Go to the next step. |
| 9 | Verify the following:<br><br>• Vacuum connection<br>• Air cleaner element<br>• No air leakage from intake-air system<br>• Blockage at intake-air system (between MAF sensor and intake ports)<br>• No restriction of intake-air system<br>• Jet air mixing system passage (clogging or leakage)<br>• Proper sealing of intake manifold<br>• Ignition wiring<br>• MAF sensor installation<br>• Fuel quality: proper octane, contamination, winter/summer blend<br>• Electrical connections<br>• Smooth operation of throttle valve<br><br>Are all the items normal? | Yes | Go to the next step. |
| | | No | Service if necessary.<br><br>Repeat Step 9. |

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| 10 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .)<br><br>OR<br><br>**Communication error message is displayed:**<br><br>Inspect for the following:<br><br>• Open circuit between main relay and PCM terminal 5AC or 5AF<br>• Open main relay GND circuit<br>• The main relay is stuck open.<br>• Open or poor GND circuit (PCM terminal 4A, 4J, 5T, 5D, 5O or 5R)<br>• Poor connection of vehicle body GND |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 11 | Connect the WDS or equivalent to the DLC-2.<br><br>Access the APP1 and APP2 PIDs.<br><br>Crank the engine with the accelerator pedal released.<br><br>Are the APP1 and APP2 PIDs indicating that the accelerator pedal is in the released position? | Yes | Go to the next step. |
| | | No | Inspect for the following:<br><br>• APP sensor<br>• Wiring harnesses and connectors between PCM and APP sensor<br>▪ PCM terminal 4Y—APP sensor terminal D<br>▪ PCM terminal 5F—APP sensor terminal F<br>▪ PCM terminal 5AE—APP sensor terminal E<br>▪ PCM terminal 4X—APP sensor terminal A<br>▪ PCM terminal 5C—APP sensor terminal C<br>▪ PCM terminal 5AB—APP sensor terminal B |
| 12 | | Yes | Go to the next step. |

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| | Connect the WDS or equivalent to the DLC-2.<br><br>Access the TP_REL PID.<br><br>Crank the engine with the accelerator pedal released.<br><br>Does TP_REL PID indicate the closed throttle position? | No | Inspect for the following:<br><br>• TP sensor<br>• Wiring harnesses and connectors between PCM and throttle body<br>▪ PCM terminal 1Q—throttle body terminal E<br>▪ PCM terminal 1J—throttle body terminal F<br>▪ PCM terminal 2F—throttle body terminal C<br>▪ PCM terminal 1M—throttle body terminal D |
| 13 | Access the ECT PID.<br><br>Does ECT PID indicate the proper engine coolant temperature?<br><br>(See PCM INSPECTION .) | Yes | Go to the next step. |
| | | No | Inspect for the following:<br><br>• ECT sensor<br>• Open or short circuit between ECT sensor and PCM terminal 2K or 1U |
| 14 | Attempt to start the engine at part throttle.<br><br>Does the engine run smoothly at part throttle? | Yes | Inspect the drive-by-wire control system operation.<br><br>(See Drive-by-wire Control System Inspection .) |
| | | No | Go to the next step. |
| 15 | Connect the WDS or equivalent to the DLC-2.<br><br>Access the RPM PID.<br><br>Does the RPM PID indicate the engine speed during engine cranking? | Yes | Go to the next step. |
| | | No | Inspect for the following:<br><br>• Open or short circuit in eccentric shaft position sensor<br>• Open or short circuit between eccentric shaft position sensor and PCM terminal 2U or 2X<br>• Open or short circuit in eccentric shaft position sensor harnesses<br><br>If the eccentric shaft position sensor and the wiring harness are normal, go to the next step. |
| 16 | Visually inspect the eccentric shaft position sensor and the teeth of the pulse wheel.<br><br>Are the eccentric shaft position sensor and the teeth of the pulse wheel normal? | Yes | Go to the next step. |
| | | No | Replace the malfunctioning parts. |

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| 17 | Inspect for cracks on the high-tension leads.<br><br>Are there any cracks on the high-tension leads? | Yes | Repair the suspected high-tension leads. |
| | | No | Go to the next step. |
| 18 | Is a strong blue spark visible at each disconnected high-tension lead while cranking the engine? | Yes | Go to the next step.<br><br>If the symptom occurs with the A/C on, go to Step 23. |
| | | No | Inspect for the following:<br><br>• Open or short circuit in ignition coil<br>• Open circuit in high-tension leads<br>• Open circuit between ignition coil connector GND terminal and body GND<br>• Open circuit between ignition switch and ignition coil<br>• Open circuit between ignition coil terminal E and PCM terminal 2Z, 2AA, 2AC or 2AD |
| 19 | Inspect the spark plug condition.<br><br>Is the spark plug wet, covered with the carbon or grayish white? | Yes | **Spark plug is wet or covered with carbon:**<br><br>Inspect for fuel leakage from the fuel injector.<br><br>**Spark plug is grayish white:**<br><br>Inspect for clogged fuel injector (FP1) (RP1). |
| | | No | Install spark plugs on the original positions.<br><br>Go to the next step. |
| 20 | Perform the fuel pump speed control operation inspection.<br><br>(See Fuel Pump Speed Control Operation Inspection .)<br><br>Does the fuel pump speed control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel pump speed control operation inspection results. |
| 21 | | Yes | Go to the next step. |

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| | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Short the check connector terminal F/P to the body GND using a jumper wire.<br><br>Turn the ignition switch to the ON position.<br><br>Is the fuel line pressure correct with the ignition switch ON?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>Inspect the fuel pump resister.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 22 | Visually inspect for fuel leakage at the fuel injector, O-ring and fuel line. Service if necessary.<br><br>Is the fuel line pressure held after the ignition switch is turned off?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | Inspect the fuel injector.<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>If the fuel injector is normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 23 | | Yes | Go to the next step. |

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| | **NOTE:**<br><br>• The following test is for stall concerns with the A/C on. If other symptoms exist, go to the next step.<br><br>Connect pressure gauges to the A/C low and high pressure side lines.<br><br>Turn the A/C on and measure the low side and high side pressures.<br><br>Are pressures within the specifications?<br><br>(See REFRIGERANT PRESSURE CHECK .) | No | If the A/C is always on, go to the symptom troubleshooting "No.24 A/C is always on or A/C compressor runs continuously".<br><br>(See NO.24 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY .)<br><br>For other symptoms, inspect the following:<br><br>• Refrigerant charging amount<br>• Condenser fan operation |
| 24 | Disconnect the vacuum hose between the purge solenoid valve and intake manifold at the quick release connector.<br><br>Plug the opening end of the vacuum hose.<br><br>Start the engine.<br><br>Is the engine stall now eliminated? | Yes | Inspect if purge solenoid valve is stuck open.<br><br>Inspect evaporative emission control system. |
| | | No | Go to the next step. |
| 25 | Perform the SSV operation inspection.<br><br>(See Secondary Shutter Valve (SSV) Operation Inspection .)<br><br>Does the SSV operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the SSV operation inspection results. |
| 26 | | Yes | Go to the next step. |

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| | **NOTE:**<br>• The following test is for 13B-MSP (High Power). Go to the next step for 13B-MSP (Standard Power).<br><br>Perform the APV control inspection.<br><br>(See Auxiliary Port Valve (APV) Control Inspection .)<br><br>Does the APV control operate properly? | No | Repair or replace the malfunctioning parts, according to the APV control inspection results. |
| 27 | Is air leakage felt or heard at intake-air system components while racing the engine to a higher speed? | Yes | Repair or replace the malfunctioning parts. |
| | | No | Go to the next step. |
| 28 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there air and/or clogging in oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage at engine. |
| | | No | Go to the next step. |
| 29 | Perform the fuel injector operation inspection.<br><br>(See Fuel Injector Operation Inspection .)<br><br>Does the fuel injector operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the inspection results. |
| 30 | Inspect fuel injectors for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br>• Leakage<br>• Clogging<br>• Injector amount<br><br>Are injectors normal? | Yes | Inspect the engine oil condition (viscosity, amount deterioration). |
| | | No | Replace the suspected fuel injector. |
| 31 | Inspect the engine compression. | Yes | Visually inspect the exhaust system part. |

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| | (See COMPRESSION INSPECTION .)<br><br>Is it normal? | No | Go to the next step. | | |
| 32 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection result.<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |
| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | | | |
| 36 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there air and/or clogging in oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage at engine.<br><br>After that overhaul or replace engine.<br><br>(See Engine Workshop Manual.) | | |
| | | No | Overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | |
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| | • Verify test results.<br>  ▪ If normal, return to the diagnostic index to service any additional symptoms.<br>  ▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | |

## NO.6 CRANKS NORMALLY BUT WILL NOT START

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| 6 | CRANKS NORMALLY BUT WILL NOT START |
| **DESCRIPTION** | • The starter cranks the engine at normal speed but the engine will not run.<br>• Refer to the symptom troubleshooting "No.5 Engine stalls" if this symptom appears after engine stall.<br>• The fuel is in the tank.<br>• The battery is in normal condition. |
| **POSSIBLE CAUSE** | • No battery power supply to PCM<br>• Open PCM GND or vehicle body GND<br>• Air cleaner restriction<br>• Air leakage from intake-air system<br>• Vacuum leakage<br>• Improper operation of drive-by-wire control system<br>• Drive-by-wire control system operates in fail-safe mode (abnormal accelerator position and TP signal to PCM)<br>• Poor fuel quality<br>• Open or short circuit in fuel pump body and related wiring harness<br>• Inadequate fuel pressure<br>• Fuel pump relay malfunction (stuck open)<br>• Fuel pump mechanical malfunction<br>• Pressure regulator (integrated in fuel pump unit) malfunction<br>• Fuel injector malfunction (leakage, clogging, improper injection amount)<br>• Open or short in fuel injector control signal circuit<br>• Purge solenoid valve malfunction (stuck open)<br>• Restriction in exhaust system<br>• Disconnected electrical connector<br>• No signal from eccentric shaft position sensor, related wiring harness or incorrect installation<br>• Improper air/fuel ratio control at starting (abnormal ECT signal to PCM)<br>• APP sensor malfunction (de-chock control operating due to abnormal accelerator position signal to PCM)<br>• Low engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil line<br>▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br>• Engine overheating<br>• Spark leakage from high-tension leads |

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| | • Spark plug malfunction<br>• Ignition coil malfunction<br>• Immobilizer system and/or circuit malfunction<br>• Immobilizer system operates properly (Key is not registered.)<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Do any of the following conditions appear?<br><br>• The engine does not completely start.<br>• DTC B1260 is displayed. | Yes | **Both conditions appear:**<br><br>Go to Step 3. |
| | | No | **Either or other condition appears:**<br><br>Go to the next step. |
| 2 | Does the engine stall after **approx. 2 s** from when it is started? | Yes | Go to the next step. |
| | | No | The immobilizer system is normal.<br><br>Go to Step 8. |
| 3 | | Yes | Go to the next step. |

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| | Are the ignition coil connectors securely connected to the coils? | No | Connect the coil connectors securely.<br><br>Return to Step 2. |
| 4 | Does the security light illuminate? | Yes | Go to the next step. |
| | | No | Inspect instrument cluster and the following wiring harness.<br><br>• Between PCM terminal 4V and instrument cluster terminal 1J<br>• Between PCM terminal 4S and instrument cluster terminal 1L |
| 5 | Connect the WDS equivalent to the DLC-2 and retrieve the DTC.<br><br>Are any of the following DTCs displayed?<br><br>**DTC**<br><br>o **B1213, B1341, B1600, B1601, B1602, B1681, B2103, B2139, B2431, U1147, U2510** | Yes | Go to the applicable DTC inspection.<br><br>(See DTC TABLE (IMMOBILIZER SYSTEM) .)<br><br>(See DTC TABLE [MULTIPLEX COMMUNICATION SYSTEM] .) |
| | | No | Go to the next step. |
| 6 | Inspect the following wiring harnesses and connectors for an open or short circuit:<br><br>• Between coil terminal A and keyless control module terminal 3F<br>• Between coil terminal B and keyless control module terminal 3E<br><br>Are there any malfunctions? | Yes | Repair or replace the wiring harnesses and connectors. |
| | | No | Go to the next step. |
| 7 | Inspect the following wiring harnesses and connectors for an open or short circuit:<br><br>• Between keyless control module terminal 3A and PCM terminal 4V<br>• Between keyless control module terminal 3B and PCM terminal 4S<br><br>Are there any malfunctions? | Yes | Repair or replace wiring harnesses and connectors. |
| | | No | Go to the next step. |
| 8 | Verify the following: | Yes | Go to the next step. |

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| | • Vacuum connection<br>• External fuel shut off or accessory (such as kill switch, alarm.)<br>• Fuel quality: proper octane, contamination, winter/summer blend<br>• No air leakage from intake-air system<br>• Proper sealing of intake manifold<br>• Ignition wiring<br>• Electrical connections<br>• Fuses<br>• Smooth operation of throttle valve<br><br>Are all the items normal? | No | Service if necessary.<br><br>Repeat Step 8. |
| 9 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .)<br><br>OR<br><br>**Communication error message is displayed:**<br><br>Inspect for the following:<br><br>• Open circuit between main relay and PCM terminal 5AC or 5AF<br>• Open main relay GND circuit<br>• Main relay is stuck open.<br>• Open or poor GND circuit (PCM terminal 4A, 4J, 5T, 5D, 5O or 5R)<br>• Poor connection of vehicle body GND |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 10 | | Yes | Go to the next step. |

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| | Connect the WDS or equivalent to the DLC-2.<br><br>Access the APP1 and APP2 PIDs.<br><br>Crank the engine with the accelerator pedal released.<br><br>Do the APP1 and APP2 PIDs indicate that the accelerator pedal is in the released position? | No | Inspect for the following:<br><br>• APP sensor<br>• Wiring harnesses and connectors between PCM APP sensor<br>▪ PCM terminal 4Y—APP sensor terminal D<br>▪ PCM terminal 5F—APP sensor terminal F<br>▪ PCM terminal 5AE—APP sensor terminal E<br>▪ PCM terminal 4X—APP sensor terminal A<br>▪ PCM terminal 5C—APP sensor terminal C<br>▪ PCM terminal 5AB—APP sensor terminal B |
| 11 | Connect the WDS or equivalent to the DLC-2.<br><br>Access the TP_REL PID.<br><br>Crank the engine with the accelerator pedal released.<br><br>Does the TP_REL PID indicate the closed throttle position? | Yes | Go to the next step. |
| | | No | Inspect for the following:<br><br>• TP sensor<br>• Wiring harnesses and connectors between PCM and throttle body<br>▪ PCM terminal 1Q—throttle body terminal E<br>▪ PCM terminal 1J—throttle body terminal F<br>▪ PCM terminal 2F—throttle body terminal C<br>▪ PCM terminal 1M—throttle body terminal D |
| 12 | Access the ECT PID. | Yes | Go to the next step. |

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| | Does the ECT PID indicate the proper engine coolant temperature?<br><br>(See PCM INSPECTION .) | No | Inspect for the following:<br><br>• ECT sensor<br>• Open or short circuit between ECT sensor and PCM terminal 2K or 1U |
| 13 | Does the engine start with the throttle closed? | Yes | Go to Step 26. |
| | | No | Go to the next step. |
| 14 | Will the engine start and run smoothly at part throttle? | Yes | Inspect the drive-by-wire control system operation.<br><br>(See Drive-by-wire Control System Inspection .) |
| | | No | Go to the next step. |
| 15 | Connect the WDS or equivalent to the DLC-2.<br><br>Access the RPM PID.<br><br>Does the RPM PID indicate the engine speed when cranking engine? | Yes | Go to the next step. |
| | | No | Inspect for the following:<br><br>• Open or short circuit in eccentric shaft position sensor<br>• Open or short circuit between eccentric shaft position sensor and PCM terminal 2U or 2X<br>• Open or short circuit in eccentric shaft position sensor harnesses<br><br>If eccentric shaft position sensor and wiring harness are normal, go to the next step. |
| 16 | Visually inspect the eccentric shaft position sensor and the teeth of the pulse wheel.<br><br>Are the eccentric shaft position sensor and the teeth of the pulse wheel normal? | Yes | Go to the next step. |
| | | No | Replace the malfunctioning parts. |
| 17 | Inspect for cracks on the high-tension leads.<br><br>Are there any cracks on the high-tension leads? | Yes | Repair the suspected high-tension leads. |
| | | No | Go to the next step. |
| 18 | | Yes | Go to the next step. |

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| | Is a strong blue spark visible at each disconnected high-tension lead while cranking the engine? | No | Inspect for the following:<br>• Open or short circuit in ignition coil<br>• Open circuit in high-tension leads<br>• Open circuit between ignition coil connector GND terminal and GND<br>• Open circuit between ignition switch and ignition coil<br>• Open circuit between ignition coils terminal C and PCM terminal 2Z, 2AA, 2AC or 2AD |
| 19 | Inspect the spark plug condition.<br><br>Is the spark plug wet, covered with carbon or grayish white? | Yes | **Spark plug is wet or covered with carbon:**<br><br>Inspect for fuel leakage from the injector.<br><br>**Spark plug is grayish white:**<br><br>Inspect for clogged fuel injector (FP1) (RP1). |
| | | No | Install spark plugs in the original positions.<br><br>Go to the next step. |
| 20 | Perform the fuel pump speed control operation inspection.<br><br>(See Fuel Pump Speed Control Operation Inspection .)<br><br>Does fuel pump speed control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel pump speed control operation inspection results. |
| 21 | | Yes | Go to the next step. |

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| | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Short check connector terminal F/P to the body GND using a jumper wire.<br><br>Turn the ignition switch to the ON position.<br><br>Is the fuel line pressure correct when ignition switch is turned on/off **five times** ?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 22 | Visually inspect for fuel leakage at the fuel injector, O-ring and fuel line.<br><br>Service if necessary.<br><br>Is the fuel line pressure held after the ignition switch is turned off?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | Inspect the fuel injector.<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>If the fuel injector is normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 23 | Disconnect the vacuum hose between the purge solenoid valve and the intake manifold at the quick release connector.<br><br>Plug the opening end of vacuum hose.<br><br>Attempt to start the engine.<br><br>Is the starting condition improved? | Yes | Inspect if the purge solenoid valve sticks open mechanically.<br><br>Inspect the evaporative emission control system. |
| | | No | Go to the next step. |
| 24 | Perform the fuel injector operation inspection.<br><br>(See Fuel Injector Operation Inspection .)<br><br>Does the fuel injector operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel injector operation inspection results. |
| 25 | | Yes | Go to the next step. |

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| | Inspect the fuel injectors for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Leakage<br>• Clogging<br>• Injection amount<br><br>Are injectors normal? | No | Replace the suspected fuel injector. | | |
| 26 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Visually inspect the exhaust system part. | | |
| | | No | Go to the next step. | | |
| 27 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |
| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) | | | | |

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| | After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | |
| 31 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there air and/or clogging in oil pipe? | Yes | Inspect and repair for leakage and/or clogging in oil the passage at engine.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| | | No | Overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 32 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

Notes:

## NO.7 SLOW RETURN TO IDLE

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| 7 | SLOW RETURN TO IDLE |
| **DESCRIPTION** | The engine takes more time than normal to return to idle speed. |
| **POSSIBLE CAUSE** | • ECT sensor malfunction<br>• The thermostat is stuck open.<br>• Throttle body malfunction<br>• Air leakage from intake-air system<br>• Eccentric shaft bypass valve stuck open |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 2 | Remove the thermostat and inspect operation. | Yes | The ECT and the thermostat are normal.<br><br>Go to the next step. |

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| | ○ (See THERMOSTAT REMOVAL/INSTALLATION .)<br><br>○ (See THERMOSTAT INSPECTION .)<br><br>Is the thermostat normal? | No | Access the ECT PID on the WDS or equivalent.<br><br>Inspect the readings on both ECT PID and the temperature gauge on the instrument cluster.<br><br>If the temperature gauge on the instrument cluster indicates the normal range but the ECT PID is not the same as the temperature gauge reading, inspect the ECT sensor.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>If the temperature gauge on the instrument cluster indicates the cold range but the ECT PID is normal, inspect the temperature gauge and the sending unit.<br><br>(See Water temperature gauge .) |
| 3 | Is the throttle body free of contamination? | Yes | Go to the next step. |
| | | No | Clean or replace the throttle body. |
| 4 | Inspect for air leakage from the intake-air system components while racing the engine to a higher speed.<br><br>Is there air leakage from intake-air system? | Yes | Repair or replace the malfunctioning parts according to the inspection results. |
| | | No | Inspect the eccentric shaft bypass valve.<br><br>(See Engine Workshop Manual.) |
| 5 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

## NO.8 ENGINE RUNS ROUGH/ROLLING IDLE

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| 8 | ENGINE RUNS ROUGH/ROLLING IDLE |
| **DESCRIPTION** | • The engine speed fluctuates between the specified idle speed and a lower speed, and the engine shakes excessively.<br>• The idle speed is too slow and the engine shakes excessively. |
| **POSSIBLE CAUSE** | • Vacuum leakage<br>• Air leakage from intake-air system parts<br>• Air suction at intake-air system (between MAF sensor and intake ports)<br>• Air cleaner restriction<br>• Air cleaner improper installation<br>• Improper operation of drive-by-wire control system (abnormal signals from APP sensor, TP sensor and load signal to PCM)<br>• SSV stuck open<br>• SSV solenoid valve malfunction (stuck open)<br>• APV stuck open*<br>• APV motor malfunction*<br>• Carbon or foreign materials on primary intake port<br>• APV position sensor malfunction*<br>• Poor fuel quality<br>• Inadequate fuel pressure<br>• Pressure regulator (integrated in fuel pump unit) malfunction<br>• Fuel pump body mechanical malfunction<br>• Fuel line restriction or clogging<br>• Fuel leakage from fuel injector<br>• Fuel injector (FP1) (RP1) malfunction (leakage, clogging, improper injector amount)<br>• Jet air mixing system malfunction (restriction or leakage in air passage)<br>• Restriction in exhaust system<br>• Improper operation of AIR system<br>• Purge solenoid valve malfunction (stuck open)<br>• Improper fuel injection control operation (abnormal signals from MAF, ECT and IAT sensors to PCM)<br>• Erratic signal from eccentric shaft position sensor<br>• Damaged or improper installed eccentric shaft position sensor pulse wheel<br>• Disconnected electrical connectors<br>• Improper load signal input<br>• Engine overheating<br>• Low engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil line |

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| | ▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br>• Excessive engine mechanical loss<br>• Metering oil pump improper operation (in fail-safe mode)<br>• A/C system operation is improper<br>• Spark leakage from high-tension leads<br>• Spark plug malfunction<br>• Improper spark plug heat range<br>• Ignition coil malfunction<br>• Improper ignition timing<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Does the engine knock/ping/detonate? | Yes | Go to the symptom troubleshooting "No.13 Knocking/pinging/detonation-Acceleration/cruise".<br><br>(See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE .) |
| | | No | Go to the next step. |
| 2 | Verify the following: | Yes | Go to the next step. |

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| | • External fuel shut off or accessory (such as kill switch, alarm.)<br>• Fuel quality (e.g. proper octane, contamination, winter/summer blend)<br>• No air leakage from intake-air system<br>• Air cleaner element (restriction, improper installation)<br>• Blockage at intake-air system (between MAF sensor and intake ports)<br>• MAF sensor installation<br>• Ignition wiring<br>• Electrical connections<br>• Fuses<br>• Smooth operation of throttle valve<br><br>Are all the items normal? | No | Service if necessary.<br><br>Repeat Step 2. |
| 3 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 4 | Is the engine overheating? | Yes | Go to the symptom troubleshooting "No.17 Cooling system concerns - Overheating".<br><br>(See NO.17 COOLING SYSTEM CONCERNS-OVERHEATING .) |
| | | No | Go to the next step. |
| 5 | | Yes | Go to the next step. |

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| | **NOTE:**<br>• The following test is for an engine running at rough idle with the A/C on. If other symptoms exist, go to the next step.<br><br>Connect the pressure gauge to the A/C low and high pressure side lines.<br><br>Start the engine and run it at idle.<br><br>Turn the A/C switch on.<br><br>Measure the low side and high side pressures.<br><br>Are the pressures within the specifications?<br><br>(See REFRIGERANT PRESSURE CHECK .) | No | If the A/C is always on, go to the symptom troubleshooting "No.24 A/C is always on or A/C compressor runs continuously".<br><br>(See NO.24 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY .)<br><br>For other symptoms, inspect the following:<br>• Refrigerant charging amount<br>• Cooling fans operation |
| 6 | **NOTE:**<br>• The following test is for an engine running rough with the P/S on. If other symptoms exist, go to the next step.<br><br>Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs for EPS CM.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 7 | | Yes | Go to the next step. |

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| | Visually inspect the eccentric shaft position sensor and the teeth of the pulse wheel.<br><br>Are the eccentric shaft position sensor and the teeth of the pulse wheel normal? | No | Replace the malfunctioning parts. |
| 8 | **WARNING:**<br><br>• High-voltage in ignition system can cause strong electrical shock which can result in serious injury. Avoid direct contact to the vehicle body during the rotor balance test.<br>• High-voltage spark will negatively effect the engine control. To prevent this, ground the high-tension leads and keep away from sensors and wiring harnesses.<br><br>**CAUTION:**<br><br>• Rotor balance test can overheat and damage the three-way catalytic converter.<br><br>Perform rotor balance test.<br><br>(See Rotor Balance Test .)<br><br>Is the engine speed drop value the same for each rotor? | Yes | Go to Step 13. |
| | | No | Go to the next step. |
| 9 | Inspect the high-tension lead for the rotor where the engine speed did not drop in Step 8 for cracks.<br><br>Are there any cracks on high-tension lead? | Yes | Repair the suspected high-tension lead. |
| | | No | Go to the next step. |
| 10 | | Yes | Go to the next step. |

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| | Is a strong blue spark visible while cranking at each disconnected high-tension lead for the rotor where the engine speed does not drop in Step 8? | No | Inspect for the following:<br>• Open or short circuit in ignition coil<br>• Open circuit in high-tension leads<br>• Open circuit between ignition coil connector GND terminal and GND<br>• Open circuit between ignition switch and ignition coil<br>• Open circuit between ignition coils terminal C and PCM terminal 2Z, 2AA, 2AC or 2AD |
| 11 | Inspect the spark plug for the rotor where the engine speed did not drop in Step 8.<br><br>Is the spark plug wet, covered with carbon or grayish white? | Yes | **Spark plug is wet or covered with carbon:**<br><br>Inspect for fuel leakage from the injector.<br><br>**Spark plug is grayish white:**<br><br>Inspect for clogged fuel injector (FP1) (RP1). |
| | | No | Go to the next step. |
| 12 | Perform the drive-by-wire control system operation inspection.<br><br>(See Drive-by-wire Control System Inspection .)<br><br>Does the drive-by-wire control system work properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the drive-by-wire control system operation inspection results. |
| 13 | Inspect for cracks on the high-tension leads.<br><br>Are there any cracks on the high-tension leads? | Yes | Repair suspected high-tension leads. |
| | | No | Go to the next step. |
| 14 | Is a strong blue spark visible at each disconnected high-tension lead while cranking engine? | Yes | Go to the next step. |
| | | No | Inspect for the following:<br>• Open or short circuit in ignition coil<br>• Open circuit in high-tension leads<br>• Open circuit between ignition coil connector GND terminal and GND<br>• Open circuit between ignition switch and ignition coil<br>• Open circuit between ignition coils terminal C and PCM terminal 2Z, 2AA, 2AC or 2AD |

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| 15 | Inspect the spark plug condition.<br><br>Is the spark plug wet, covered with carbon or grayish white? | Yes | **Spark plug is wet or covered with carbon:**<br><br>Inspect for fuel leakage from the fuel injector.<br><br>**Spark plug is grayish white:**<br><br>Inspect for clogged fuel injector (FP1) (RP1). |
| | | No | Install the spark plugs in the original positions.<br><br>Go to the next step. |
| 16 | Perform the SSV operation inspection.<br><br>(See Secondary Shutter Valve (SSV) Operation Inspection .)<br><br>Does the SSV operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the SSV operation inspection results. |
| 17 | **NOTE:**<br><br>• The following test is for 13B-MSP (High Power). Go to the next step for 13B-MSP (Standard Power).<br><br>Perform the APV control inspection.<br><br>(See Auxiliary Port Valve (APV) Control Inspection .)<br><br>Does the APV control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the APV control inspection results. |
| 18 | | Yes | Go to the next step. |

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| | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Start the engine and run it at idle.<br><br>Measure the fuel line pressure at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | No | **Zero or low:**<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 19 | Visually inspect for fuel leakage at the fuel injector, O-ring, and fuel line.<br><br>Service if necessary.<br><br>Does the fuel line pressure hold after the ignition switch is turned off?<br><br>(See FUEL LINE PRESSURE INSPECTION ) | Yes | Go to the next step. |
| | | No | Inspect the fuel injector.<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>If the fuel injector is normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 20 | Access the ECT PID.<br><br>Does the ECT PID indicate the proper engine coolant temperature?<br><br>(See PCM INSPECTION .) | Yes | Go to the next step. |
| | | No | Inspect for the following:<br><br>• ECT sensor<br>• Open or short circuit between ECT sensor and PCM terminal 2K or 1U |
| 21 | | Yes | Go to the next step. |

| | | | |
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| | Connect the WDS or equivalent to the DLC-2.<br><br>Start the engine and run it at idle.<br><br>Access the LONG FT1 PID.<br><br>Measure the LONG FT1 PID at idle.<br><br>Is the PID value between **–14% and +14%** ? | No | The LONG FT1 PID is out of the specification.<br><br>LONG FT1 PID **less than –14%** (too rich):<br><br>• Inspect the EVAP control system.<br>▪ If the system is normal, go to Step 27.<br><br>LONG FT1 PID **more than +14%** (too lean):<br><br>• Inspect for air leakage at intake-air system components.<br>▪ If the system is normal, go to the next step. |
| 22 | Visually inspect the exhaust system part.<br><br>Is there any deformed exhaust system part? | Yes | Repair or replace the suspected part. |
| | | No | Go to the next step. |
| 23 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the inspection results. |
| 24 | Perform the fuel injector (FP1) (RP1) operation inspection.<br><br>(See Fuel Injector Operation Inspection .)<br><br>Are the fuel injectors (FP1) (RP1) operating properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel injector (FP1) (RP1) operation inspection results. |
| 25 | Inspect the fuel injectors (FP1) (RP1) for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Leakage<br>• Clogging<br>• Injector amount<br><br>Are the fuel injectors (FP1) (RP1) normal? | Yes | Go to the next step. |
| | | No | Replace the fuel injector (FP1) (RP1).<br><br>(See FUEL INJECTOR REMOVAL/INSTALLATION .) |

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| 26 | Perform the AIR inspection.<br><br>(See Secondary Air Injection (AIR) System Inspection .)<br><br>Does the AIR system operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning parts, according to the inspection results. | | |
| 27 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Go to Step 33. | | |
| | | No | Go to the next step. | | |
| 28 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |
| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | | | |

| | | | |
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| 32 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there any air and/or clogging in oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage at engine.<br><br>After that overhaul or replace engine.<br><br>(See Engine Workshop Manual.) |
| | | No | Overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 33 | Disconnect the vacuum hose between the purge solenoid valve and the intake manifold at the quick release connector.<br><br>Plug the opening end of vacuum hose. Start the engine.<br><br>Does the engine condition improve? | Yes | Check if the purge solenoid valve sticks open mechanically.<br><br>Inspect the EVAP control system. |
| | | No | Inspect for the following:<br><br>• Jet air mixing system (clogged or leakage)<br>• Primary intake port (deposited carbon or foreign materials)<br>• Eccentric shaft position sensor pulse wheel (damaged, improper installation) |
| 34 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

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13B-MSP (High Power)

## NO.9 FAST IDLE/RUNS ON

| 9 | FAST IDLE/RUNS ON |
|---|---|
| **DESCRIPTION** | • The engine speed continues at fast idle after warm-up.<br>• The engine runs after the ignition switch is turned off. |
| **POSSIBLE CAUSE** | • ECT sensor malfunction<br>• Air leakage from intake-air system<br>• Throttle body malfunction (stuck open)<br>• APP sensor malfunction<br>• Cruise control system operation improperly<br>• Improper load signal input<br>• Improper operation of drive-by-wire control system |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Access the ECT PID.<br><br>Start and warm up the engine to normal operating temperature.<br><br>Is the ECT PID reading between **82—112°C {180—234°F}** ? | Yes | Go to the next step. |
| | | No | **ECT PID is higher than 112°C {234°F}:**<br><br>Go to the symptom troubleshooting "No.17 Cooling system concerns - Overheating".<br><br>(See NO.17 COOLING SYSTEM CONCERNS-OVERHEATING .)<br><br>**ECT PID is less than 82°C {180°F}:**<br><br>Go to the symptom troubleshooting "No.18 Cooling system concerns - Runs cold".<br><br>(See NO.18 COOLING SYSTEM CONCERNS-RUNS COLD .) |

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| 2 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs for the PCM, TCM, ABD HU/CU and the EPS CM.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 3 | | Yes | Go to the next step. |

Notes:

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| | Measure voltages at PCM terminal 4W, 4Z, 4F (MT), 2O (MT) and TCM terminal 2E (AT).<br><br>(See PCM INSPECTION .)<br><br>(See TCM INSPECTION .)<br><br>Is the voltage normal? | No | **If PCM terminal 4W voltage is not as specified:**<br><br>Inspect the A/C switch, refrigerant pressure switch and the fan switch.<br><br>(See REFRIGERANT PRESSURE SWITCH INSPECTION .)<br><br>(See CLIMATE CONTROL UNIT INSPECTION .)<br><br>**If PCM terminal 4Z voltage is not as specified:**<br><br>Inspect the refrigerant pressure switch (medium pressure).<br><br>(See REFRIGERANT PRESSURE SWITCH INSPECTION .)<br><br>**If PCM terminal 4F voltage is not as specified (MT):**<br><br>Inspect the CPP switch.<br><br>(See CLUTCH PEDAL POSITION (CPP) SWITCH INSPECTION .)<br><br>**If PCM terminal 2O voltage is not as specified (MT):**<br><br>Inspect the neutral switch.<br><br>(See NEUTRAL SWITCH INSPECTION .)<br><br>**If TCM terminal 2E voltage is not as specified (AT):**<br><br>Inspect the TR switch.<br><br>(See TRANSMISSION RANGE (TR) SWITCH INSPECTION .) |
| 4 | | Yes | Repair or replace parts if necessary. |

| | | | |
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| | Is there air leakage felt or heard at the intake-air system components while the racing engine to a higher speed? | No | Inspect the following:<br>• Drive-by-wire control system operation<br>(See Drive-by-wire Control System Inspection .)<br>• APP sensor |
| 5 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

Notes:

## NO.10 LOW IDLE/STALLS DURING DECELERATION

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|---|---|
| 10 | LOW IDLE/STALLS DURING DECELERATION |
| **DESCRIPTION** | • The engine stops unexpectedly at the beginning of deceleration or recovery from deceleration. |
| **POSSIBLE CAUSE** | • Vacuum leakage<br>• Air leakage from intake-air system<br>• Air suction at intake-air system (between MAF sensor and intake part)<br>• Improper operation of drive-by-wire control system (abnormal accelerator position and TP signals to PCM)<br>• Drive-by-wire control system operates in fail-safe mode (abnormal accelerator position and TP signal to PCM)<br>• Throttle body malfunction (restriction, stuck closed)<br>• Evaporative emission control system malfunction<br>• Improper operation of fuel cut control<br>• Fuel injector improper operation<br>• Fuel injector malfunction (leakage, clogging, improper injection amount)<br>• Inadequate fuel pressure<br>• Pressure regulator (integrated in fuel pump unit)<br>• Fuel pump mechanical malfunction<br>• Fuel line restriction or clogging<br>• MAF sensor improper installation<br>• MAF sensor or related circuit malfunction (abnormal signal to PCM)<br>• Brake switch or related circuit malfunction (abnormal signal to PCM)<br>• Neutral/CPP switch or related circuit malfunction (abnormal signal to PCM)<br>• TR switch or related circuit malfunction (abnormal signal to PCM)<br>• Low engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil line<br>▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br>• Improper A/C magnetic clutch malfunction<br>• Misfire<br>• Improper operation of torque converter clutch control (AT)<br>• Loose installation of engine mounts<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system: |

| | |
|---|---|
| | • Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Does the engine idle roughly? | Yes | Go to the symptom troubleshooting "No.8 Engine runs rough/rolling idle".<br><br>(See NO.8 ENGINE RUNS ROUGH/ROLLING IDLE .) |
| | | No | Go to the next step. |
| 2 | Turn off the A/C switch and the fan switch.<br><br>Does the A/C magnetic clutch engage? | Yes | Go to the symptom troubleshooting "No.24 A/C is always on or A/C compressor runs continuously."<br><br>(See NO.24 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY .) |
| | | No | Go to the next step. |
| 3 | Does the engine knock/ping/detonate? | Yes | Go to the symptom troubleshooting "No.13 Knocking/pinging/detonation-Acceleration/cruise".<br><br>(See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE .) |
| | | No | Go to the next step. |
| 4 | Verify the following: | Yes | Go to the next step. |

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| | • Proper routing of and no damage to vacuum lines<br>• No air leakage from intake-air system<br>• Engine mount installation condition (loose)<br><br>Are all the items normal? | No | Service if necessary.<br><br>Repeat Step 4. |
| 5 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | Go to the next step. |
| 6 | Perform the drive-by-wire control system operation inspection.<br><br>(See Drive-by-wire Control System Inspection .)<br><br>Does the drive-by-wire control system work properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the drive-by-wire control system operation inspection results. |
| 7 | Disconnect the vacuum hose between the purge solenoid valve and the intake manifold at quick release connector.<br><br>Plug the opening end of the vacuum hose.<br><br>Drive the vehicle.<br><br>Does the engine condition improve? | Yes | Inspect evaporative emission control system. |
| | | No | Go to the next step. |
| 8 | | Yes | Go to the next step. |

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| | Connect the WDS or equivalent to the DLC-2.<br><br>Access APP1, APP2, TP_REL, MAF and VSS PIDs.<br><br>Monitor each PID while driving vehicle.<br><br>(See PCM INSPECTION .)<br><br>Are the PIDs normal? | No | **If the APP1, APP2 PIDs are not as specified:** Inspect the APP sensor.<br><br>(See ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION .)<br><br>**If the TP_REL PID is not as specified:** Inspect the TP sensor.<br><br>(See THROTTLE POSITION (TP) SENSOR INSPECTION .)<br><br>**If the MAF PID is not as specified:** Inspect the MAF sensor.<br><br>(See MASS AIR FLOW (MAF) SENSOR INSPECTION .)<br><br>**If the VSS PID is not as specified:** Inspect the ABS or DSC system.<br><br>(See DTC Table .)<br><br>(See DTC Table .) |
| 9 | | Yes | Go to the next step. |

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|---|---|---|---|
| | Measure the voltage at the PCM terminal 4P, 2O (MT), 4F (MT) and TCM terminal 2E (AT).<br><br>(See PCM INSPECTION .)<br><br>Are the voltages normal? | No | **If the PCM terminal 4P voltage is not as specified:**<br><br>Inspect the brake switch.<br><br>(See BRAKE SWITCH INSPECTION .)<br><br>**If the PCM terminal 2O voltage is not as specified (MT):**<br><br>Inspect the neutral switch.<br><br>(See NEUTRAL SWITCH INSPECTION .)<br><br>**If the PCM terminal 4F voltage is not as specified (MT):**<br><br>Inspect the CPP switch.<br><br>(See CLUTCH PEDAL POSITION (CPP) SWITCH INSPECTION .)<br><br>**If the TCM terminal 2E voltage is not as specified (AT):**<br><br>Inspect the TR switch.<br><br>(See TRANSMISSION RANGE (TR) SWITCH INSPECTION .) |
| 10 | Turn the ignition switch off.<br><br>Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Inspect the fuel line pressure while the engine running.<br><br>(See FUEL LINE PRESSURE INSPECTION .)<br><br>Is the fuel line pressure normal? | Yes | Go to the next step. |
| | | No | **Zero or low:**<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 11 | | Yes | Go to the next step. |

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|---|---|---|---|---|---|
| | Perform the fuel injector operation inspection.<br><br>(See Fuel Injector Operation Inspection .)<br><br>Are the fuel injectors operating properly? | No | Repair or replace the malfunctioning parts, according to the fuel injector operation inspection results. | | |
| 12 | Inspect the fuel injectors for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Leakage<br>• Clogging<br>• Injection amount<br><br>Are the injectors normal? | Yes | Go to the next step. | | |
| | | No | Replace the suspected fuel injector. | | |
| 13 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Go to step 19. | | |
| | | No | Go to the next step. | | |
| 14 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |

| | | | |
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| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See ROAD TEST .)<br><br>Does the torque converter clutch control operate properly? | Yes | Inspect for the following:<br><br>• Blockage at intake-air system (between MAF sensor and intake ports)<br>• MAF sensor installation |
| No | Repair or replace the malfunctioning parts, according to the torque converter clutch control inspection results. | | |
| 20 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

## NO.11 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES

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|---|---|
| 11 | ENGINE STALLS/QUITS — ACCELERATION/CRUISE<br><br>ENGINE RUNS ROUGH — ACCELERATION/CRUISE<br><br>MISSES — ACCELERATION/CRUISE<br><br>BUCK/JERK — ACCELERATION/CRUISE/DECELERATION<br><br>HESITATION/STUMBLE — ACCELERATION<br><br>SURGES — ACCELERATION/CRUISE |
| **DESCRIPTION** | • The engine stops unexpectedly at the beginning of acceleration or during acceleration.<br>• The engine stops unexpectedly while cruising.<br>• The engine speed fluctuates during acceleration or cruising.<br>• The engine misses during acceleration or cruising.<br>• The vehicle bucks/jerks during acceleration, cruising, or deceleration.<br>• The momentary pause at the beginning of acceleration or during acceleration<br>• The momentary minor irregularity in the engine output |

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| **POSSIBLE CAUSE** | • Vacuum leakage<br>• Air leakage from intake-air system<br>• Air cleaner restriction<br>• Air suction at intake-air system (between MAF sensor and intake ports)<br>• Improper operation of drive-by-wire control system (abnormal accelerator position and TP signals to PCM)<br>• Throttle body malfunction (stuck close)<br>• Improper SSV operation<br>• Improper APV operation*<br>• Poor fuel quality<br>• Inadequate fuel pressure<br>• Fuel pump mechanical malfunction<br>• Fuel leakage from fuel injector<br>• Fuel injector clogging<br>• Fuel line restriction or clogging<br>• Pressure regulator (integrated in fuel pump unit) malfunction<br>• Intermittent open or short in fuel pump body circuit<br>• Fuel pump relay malfunction (stuck open)<br>• Restriction in exhaust system<br>• Purge solenoid valve malfunction<br>• Improper air/fuel ratio control<br>• MAF sensor improper installation<br>• Intermittent open or short of MAF sensor, TP sensor, APP sensor and VSS<br>• Erratic signal from eccentric shaft position sensor | • Improper ignition timing control (abnormal ECT, IAT, MAF and knock signals to PCM)<br>• Improper fuel injection control (abnormal MAF, ECT, and front/rear HO2S signals to PCM)<br>• Improper load signal (neutral/CPP switch (MT), TR switch (AT)) to PCM<br>• Main relay intermittent malfunction<br>• Low engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel injector<br>▪ Air mixed in oil line<br>▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br>• Metering oil pump malfunction<br>• Improper metering oil pump control operation<br>• Engine overheating<br>• Spark leakage from high-tension leads<br>• Spark plug malfunction<br>• Improper A/C system operation<br>• Improper torque converter clutch control operation (AT)<br>• Improper shift point (AT)<br>• AT malfunction (AT)<br>• Clutch slippage (MT) |

| | |
|---|---|
| | **WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br>(See BEFORE REPAIR PROCEDURE .)<br>(See AFTER REPAIR PROCEDURE .)<br>**CAUTION:**<br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Does the engine knock/ping/detonate? | Yes | Go to the symptom troubleshooting "No.13 Knocking/pinging/detonation-Acceleration/cruise".<br>(See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE .) |
| | | No | Go to the next step. |
| 2 | Verify the following: | Yes | Go to the next step. |

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|---|---|---|---|
| | • Vacuum connection<br>• Air cleaner element<br>• No air leakage from intake-air system<br>• No restriction of intake-air system<br>• Blockage of intake-air system (between MAF sensor and intake ports)<br>• Ignition wiring<br>• Fuel quality (e.g. proper octane, contamination, winter/summer blend)<br>• MAF sensor installation<br>• Electrical connections<br>• Smooth operation of throttle valve<br><br>Are all the items normal? | No | Service if necessary.<br><br>Repeat Step 2. |
| 3 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 4 | Is the engine overheating? | Yes | Go to the symptom troubleshooting "No.17 Cooling system concerns - Overheating".<br><br>(See NO.17 COOLING SYSTEM CONCERNS-OVERHEATING .) |
| | | No | Go to the next step. |
| 5 | | Yes | Go to the next step. |

| | | | |
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| | Connect the WDS or equivalent to the DLC-2.<br><br>Access APP1, APP2, RPM, VPWR, MAF, TP_REL, O2S11, O2S12 and VSS PIDs.<br><br>Drive the vehicle while monitoring PIDs.<br><br>Are the PIDs within the specifications?<br><br>(See PCM INSPECTION .) | No | **APP1, APP2 PIDs:**<br><br>Inspect if the output signal from the APP sensor changes smoothly.<br><br>**RPM PID:**<br><br>Inspect the eccentric shaft position sensor and the related wiring harness for vibration or an intermittent open/short circuit. If normal, go to Step 7.<br><br>**VPWR PID:**<br><br>Inspect for an intermittent open circuit.<br><br>**MAF PID:**<br><br>Inspect for an intermittent open circuit of the MAF sensor and the related wiring harness.<br><br>**TP_REL PID:**<br><br>Inspect if the output signal from the TP sensor changes smoothly.<br><br>**O2S11 PID:**<br><br>Inspect the front HO2S and the related wiring harness for vibration or an intermittent open or short circuit or both. If normal, go to Step 8.<br><br>**O2S12 PID:**<br><br>Inspect the rear HO2S and the related wiring harness for vibration or an intermittent open or short circuit or both. If normal, go to Step 8.<br><br>**VSS PID:**<br><br>Inspect ABS or DSC system.<br><br>(See DTC Table .)<br><br>(See DTC Table .) |
| 6 | Inspect the knock sensor.<br><br>(See KNOCK SENSOR (KS) INSPECTION .)<br><br>Is the knock sensor normal? | Yes | Go to the next step. |
| | | No | Replace the knock sensor.<br><br>(See KNOCK SENSOR (KS) REMOVAL/INSTALLATION .) |

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| 7 | Visually inspect the eccentric shaft position sensor and the teeth of the pulse wheel.<br><br>Are the eccentric shaft position sensor and the teeth of the pulse wheel normal? | Yes | Go to the next step. |
| | | No | Replace the malfunctioning parts. |
| 8 | Is the strong blue spark visible at each disconnecting high-tension lead while cranking the engine? | Yes | Inspect for the following:<br><br>• Spark plugs malfunction<br>• Spark plugs heat range<br>• Pulse wheel damaged on eccentric shaft<br>• Open or short circuit on eccentric shaft position sensor<br>• Open or short between eccentric shaft position sensor and PCM terminal 2U or 2X<br><br>If they are normal, go to the next step. |
| | | No | Inspect for the following:<br><br>• High-tension leads<br>• Ignition coils or connectors |
| 9 | Inspect the spark plug conditions.<br><br>Is the spark plug wet, covered with carbon or grayish white? | Yes | **Spark plug is wet or covered with carbon:**<br><br>Inspect for fuel leakage from the fuel injector.<br><br>**Spark plug is grayish white:**<br><br>Inspect for clogged fuel injector. |
| | | No | Install the spark plugs on original positions.<br><br>Go to the next step. |
| 10 | Perform the drive-by-wire control system operation inspection.<br><br>(See Drive-by-wire Control System Inspection .)<br><br>Does the drive-by-wire control system work properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the drive-by-wire system operation inspection results. |
| 11 | Visually inspect the exhaust system part.<br><br>Is there any deformed exhaust system part? | Yes | Replace the suspected part. |
| | | No | Go to the next step. |
| 12 | | Yes | Go to the next step. |

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| | Perform the fuel pump speed control operation inspection.<br><br>(See Fuel Pump Speed Control Operation Inspection .)<br><br>Do the fuel injectors operate properly? | No | Repair or replace the malfunctioning parts, according to the fuel pump speed control operation inspection results. |
| 13 | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Short the check connector terminal F/P to the body GND using a jumper wire.<br><br>Turn the ignition switch to the ON position.<br><br>Is the fuel line pressure correct with the ignition switch in the ON position?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 14 | Visually inspect for fuel leakage at the fuel injector, O-ring and fuel line.<br><br>Service if necessary.<br><br>Is the fuel line pressure held after the ignition switch is turned off?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | Inspect the fuel injector.<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>If the fuel injector is normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 15 | Perform the fuel injector operation inspection.<br><br>(See Fuel Injector Operation Inspection .)<br><br>Are the fuel injectors operating properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel injector operation inspection results. |
| 16 | | Yes | Go to the next step. |

| | | | |
|---|---|---|---|
| | Inspect the fuel injectors for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Leakage<br>• Clogging<br>• Injection amount<br><br>Are the injectors normal? | No | Replace the fuel injector.<br><br>(See FUEL INJECTOR REMOVAL/INSTALLATION .) |
| 17 | **NOTE:**<br><br>• The following test is for an engine stalling with the A/C on. If other symptom exists, go to the next step.<br><br>Connect a pressure gauge to the A/C low and the high pressure side lines.<br><br>Turn the A/C on and measure the low side and high side pressure.<br><br>Are the pressures within the specifications?<br><br>(See REFRIGERANT PRESSURE CHECK .) | Yes | Go to the next step. |
| | | No | If A/C is always on, go to the symptom troubleshooting "No.24 A/C is always on or A/C compressor runs continuously".<br><br>(See NO.24 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY .)<br><br>For other symptoms, inspect the following:<br><br>• Refrigerant charging amount<br>• Condenser fan operation |
| 18 | **NOTE:**<br><br>• The following test should be performed for a symptom with the cruise control on. If other symptoms exist, go to the next step.<br><br>Inspect the cruise control system.<br><br>Is cruise control system normal? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts. |
| 19 | | Yes | Go to the next step. |

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|---|---|---|---|
| | Perform the SSV operation inspection.<br><br>(See Secondary Shutter Valve (SSV) Operation Inspection .)<br><br>Does the SSV operate properly? | No | Repair or replace the malfunctioning parts, according to the SSV operation inspection results. |
| 20 | **NOTE:**<br><br>• The following test is for 13B-MSP (High Power). Go to the next step for 13B-MSP (Standard Power).<br><br>Perform the APV control inspection.<br><br>(See Auxiliary Port Valve (APV) Control Inspection .)<br><br>Does the APV control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the APV control inspection results. |
| 21 | Disconnect the vacuum hose between the purge solenoid valve and the intake manifold at the quick release connector.<br><br>Plug the opening end of the vacuum hose.<br><br>Drive the vehicle.<br><br>Does the engine condition improve? | Yes | Go to the next step.<br><br>Inspect if the purge solenoid valve sticks open mechanically.<br><br>Inspect the evaporative emission control system. |
| | | No | Go to the next step. |
| 22 | Inspect the ignition timing.<br><br>(See Ignition Timing Inspection .)<br><br>Does the ignition timing operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the ignition timing inspection results. |
| 23 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the metering oil pump control inspection results. |

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| 24 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Inspect the following:<br><br>• Internal transmission components (AT)<br>• Torque converter clutch control (AT)<br>• Shift point (AT)<br>• Clutch (MT)<br>• Brake system for dragging<br>• Engine mounts<br>• Knock sensor |
| | | No | Go to the next step. |
| 25 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 26 | Check the engine oil condition.<br><br>Are the engine oil low viscosity and/or is there a gasoline odor? | Yes | Replace the engine oil.<br><br>Inspect the ECT sensor and the related wiring harnesses.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| | | No | Go to the next step. |
| 27 | Inspect the oil pressure.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 28 | Turn the ignition switch off. | Yes | Go to the next step. |

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| | Disconnect the fuel line quick release connector and the release fuel gauge to the fuel line.<br><br>Start the engine and run it at idle.<br><br>Measure the fuel line pressure at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 29 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there air and/or clogging in the oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage at engine.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| | | No | Overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 30 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect related the Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

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13B-MSP (High Power)

## NO.12 LACK/LOSS OF POWER-ACCELERATION/CRUISE

| 12 | LACK/LOSS OF POWER — ACCELERATION/CRUISE | |
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| **DESCRIPTION** | The performance is poor under a load (e.g., power loss when climbing hills). | |
| **POSSIBLE CAUSE** | • Vacuum leakage<br>• Air leakage from intake-air system<br>• Air cleaner restriction<br>• Air suction at intake-air system (between MAF sensor and intake ports)<br>• Throttle body malfunction<br>• Improper SSV operation<br>• Improper APV operation*<br>• Improper VDI operation<br>• Improper operation of drive-by-wire control system (abnormal accelerator position and TP signals to PCM)<br>• Drive-by-wire control system operates in fail-safe mode (abnormal accelerator position and TP signal to PCM)<br>• Poor fuel quality<br>• Inadequate fuel pressure<br>• Pressure regulator (integrated in fuel pump unit)<br>• Fuel pump mechanical malfunction<br>• Fuel line restriction or clogging<br>• Fuel injector improper operation<br>• Fuel injector malfunction (leakage, clogging, improper injection amount)<br>• Intermittent open or short in fuel pump related circuit<br>• Restriction in exhaust system<br>• Leakage or damaged exhaust manifold<br>• Purge solenoid valve malfunction (stuck open)<br>• Erratic signal from eccentric shaft position sensor | • Improper ignition timing control (abnormal ECT, IAT, MAF and knock sensor signals to PCM)<br>• Improper fuel injection control (abnormal MAF, ECT, front/rear HO2S and knock sensor signals to PCM)<br>• MAF sensor improper installation<br>• Spark leakage from high-tension leads<br>• Spark plug malfunction<br>• Incorrect spark plug heat range<br>• Engine overheating<br>• Low engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil line<br>▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br>• Metering oil pump malfunction<br>• Improper metering oil pump control operation<br>• Improper A/C system operation<br>• Brake dragging<br>• Low tire pressure<br>• AT malfunction (AT)<br>• Improper operation of torque converter clutch control (AT)<br>• Clutch malfunction (MT) |

**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:

- Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.

  (See BEFORE REPAIR PROCEDURE .)

  (See AFTER REPAIR PROCEDURE .)

**CAUTION:**

- Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material.

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Does the engine knock/ping/detonate? | Yes | Go to the symptom troubleshooting "No.13 Knocking/pinging/detonation-Acceleration/cruise".<br><br>(See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE .) |
| | | No | Go to the next step. |
| 2 | Verify the following: | Yes | Go to the next step. |

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| | • Vacuum connection<br>• Air cleaner element<br>• Fresh air duct<br>• Air cleaner<br>• No air leakage from intake-air system<br>• No restriction of intake-air system<br>• Blockage of intake-air system (between MAF sensor and intake ports)<br>• MAF sensor installation<br>• Exhaust manifold (leakage, damaged)<br>• Fuel quality (e.g. proper octane, contamination, winter/summer blend)<br>• Tire pressure<br><br>Are all the items normal? | No | Service if necessary.<br><br>Repeat Step 2. |
| 3 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 4 | Is the engine overheating? | Yes | Go to the symptom troubleshooting "No.17 Cooling system concerns - Overheating".<br><br>(See NO.17 COOLING SYSTEM CONCERNS-OVERHEATING .) |
| | | No | Go to the next step. |
| 5 | | Yes | Go to the next step. |

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| | Connect the WDS or equivalent to the DLC-2.<br><br>Access the APP1, APP2, RPM, MAF, O2S11, O2S12, TP_REL and VSS PIDs.<br><br>Drive vehicle while monitoring the PIDs.<br><br>Are the PIDs within the specifications?<br><br>(See PCM INSPECTION .) | No | **APP1, APP2 PIDs:**<br><br>Inspect if the output signal APP sensor changes smoothly.<br><br>**RPM PID:**<br><br>Inspect the eccentric shaft position sensor and the related wiring harness for vibration or an intermittent open/short circuit or both. If normal, go to Step 7.<br><br>**MAF PID:**<br><br>Inspect for an intermittent open circuit of the MAF sensor and the related wiring harness.<br><br>**O2S11 PID:**<br><br>Inspect the front HO2S and the related wiring harness for vibration or an intermittent open or short circuit or both. If normal, go to Step 8.<br><br>**O2S12 PID:**<br><br>Inspect the rear HO2S and the related wiring harness for vibration or an intermittent open or short circuit or both. If normal, go to Step 8.<br><br>**TP_REL PID:**<br><br>Inspect if the output signal TP sensor changes smoothly.<br><br>**VSS PID:**<br><br>Inspect ABS or DCS.<br><br>(See DTC Table .)<br><br>(See DTC Table .) |
| 6 | Inspect the knock sensor.<br><br>(See KNOCK SENSOR (KS) INSPECTION .)<br><br>Is the knock sensor normal? | Yes | Go to the next step. |
| | | No | Replace the knock sensor.<br><br>(See KNOCK SENSOR (KS) REMOVAL/INSTALLATION .) |
| 7 | | Yes | Go to the next step. |

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| | Visually inspect the eccentric shaft position sensor and the teeth of the pulse wheel.<br><br>Are the eccentric shaft position sensor and the teeth of the pulse wheel normal? | No | Replace the malfunctioning parts. |
| 8 | Is a strong blue spark visible at each disconnected high-tension lead while cranking the engine? | Yes | Inspect for the following:<br><br>• Spark plugs malfunction<br>• Spark plugs heat range<br>• Pulse wheel damaged on eccentric shaft<br>• Open or short circuit on eccentric shaft position sensor<br>• Open or short between eccentric shaft position sensor and PCM terminal 2U or 2X<br><br>If they are normal, go to the next step. |
| | | No | Inspect for the following:<br><br>• High-tension leads<br>• Ignition coils or connectors |
| 9 | Inspect the spark plug condition.<br><br>Is the spark plug wet, covered with carbon or grayish white? | Yes | **Spark plug is wet or covered with carbon:**<br><br>Inspect for fuel leakage from the fuel injector.<br><br>Inspect the spark plug and the high-tension lead.<br><br>**Spark plug is grayish white:**<br><br>Inspect for clogged fuel injector. |
| | | No | Install the spark plugs on original rotors.<br><br>Go to the next step. |
| 10 | Perform the drive-by-wire control system operation inspection.<br><br>(See Drive-by-wire Control System Inspection .)<br><br>Does the drive-by-wire control system work properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the drive-by-wire control system operation inspection results. |

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| 11 | Visually inspect the exhaust system part.<br><br>Is there any deformed exhaust system part? | Yes | Replace the suspected part. |
| | | No | Go to the next step. |
| 12 | Perform the fuel pump speed control operation inspection.<br><br>(See Fuel Pump Speed Control Operation Inspection .)<br><br>Does the fuel pump speed control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel pump speed control operation inspection results. |
| 13 | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Short the check connector terminal F/P to the body GND using a jumper wire.<br><br>Turn the ignition switch to the ON position.<br><br>Is the fuel line pressure correct with the ignition switch at the ON position?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 14 | Perform the fuel injector operation inspection.<br><br>(See Fuel Injector Operation Inspection .)<br><br>Are the fuel injectors operating properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel injector operation inspection results. |
| 15 | | Yes | Go to the next step. |

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| | Inspect the fuel injectors for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Leakage<br>• Clogging<br>• Injection amount<br><br>Are the injectors normal? | No | Replace the fuel injector.<br><br>(See FUEL INJECTOR REMOVAL/INSTALLATION .) |
| 16 | Perform the SSV operation inspection.<br><br>(See Secondary Shutter Valve (SSV) Operation Inspection .)<br><br>Does the SSV operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the SSV operation inspection results. |
| 17 | Perform the VDI operation inspection.<br><br>(See Variable Dynamic Effect Intake-air (VDI) Operation Inspection .)<br><br>Does the VDI operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the VDI operation inspection results. |
| 18 | **NOTE:**<br><br>• The following test is for 13B-MSP (High Power). Go to the next step for 13B-MSP (Standard Power).<br><br>Perform the APV control inspection.<br><br>(See Auxiliary Port Valve (APV) Control Inspection .)<br><br>Does the APV control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the APV control inspection results. |
| 19 | | Yes | Go to the next step. |

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| | **NOTE:**<br>• The following test is for engine stalling with A/C on concern. If other symptoms exist, go to the next step.<br><br>Connect the pressure gauge to the A/C low and high side pressure lines.<br><br>Turn the A/C on and measure the low side and high side pressures.<br><br>Are pressures within the specifications?<br><br>(See REFRIGERANT PRESSURE CHECK .) | No | If the A/C is always on, go to symptom troubleshooting "No.24 A/C is always on or A/C compressor runs continuously".<br><br>(See NO.24 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY .)<br><br>For other symptoms, inspect the following:<br>• Refrigerant charging amount<br>• Condenser fan operation |
| 20 | Inspect for A/C cut-off operation.<br><br>(See A/C Cut-off Control System Inspection .)<br><br>Does the A/C cut-off work properly? | Yes | Go to the next step. |
| | | No | Inspect A/C cut-off system components. the |
| 21 | Disconnect the vacuum hose between the purge solenoid valve and the intake manifold at the quick release connector.<br><br>Plug the opening end of the vacuum hose.<br><br>Drive the vehicle.<br><br>Does the engine condition improve? | Yes | Inspect if the purge solenoid valve is stuck open mechanically.<br><br>Inspect the evaporative emission control system. |
| | | No | Go to the next step. |
| 22 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the metering oil pump inspection results. |

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| 23 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Inspect the following:<br><br>• Ignition timing<br>• Internal transmission components (AT)<br>• Torque converter clutch control (AT)<br>• Clutch (MT)<br>• Brake system for dragging<br>• Knock sensor | | |
| | | No | Go to the next step. | | |
| 24 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |
| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | | | |
| 28 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there any air and/or clogging in the oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage at engine.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | |

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| | | No | Overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 29 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

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13B-MSP (High Power)

## NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE

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| 13 | KNOCKING/PINGING/DETONATION - ACCELERATION/CRUISE |
| **DESCRIPTION** | A sound is produced when the air/fuel mixture is ignited by something other than the spark plug (e.g., hot spot in combustion chamber). |
| **POSSIBLE CAUSE** | • Air suction at intake-air system<br>• Poor fuel quality<br>• Inadequate fuel pressure<br>• Pressure regulator (integrated in fuel pump unit) malfunction<br>• Fuel pump relay stuck closed<br>• Fuel injector malfunction (clogging, lack of injection amount)<br>• Erratic signal from eccentric shaft position sensor<br>• Improper ignition timing control (ECT, IAT, MAF and knock signals to PCM)<br>• Incorrect spark plug heat range<br>• Improper operation of eccentric shaft bypass valve<br>• Engine overheating due to cooling system malfunction<br>• Excessive carbon is built up in combustion chamber<br>• Inadequate engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil malfunction<br>▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of |

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| | foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Inspect air suction between the MAF sensor and intake-port.<br><br>Is there any air suction? | Yes | Repair or replace the air suction at the intake-air system. |
| | | No | Go to the next step. |
| 2 | Connect the WDS or equivalent to the DLC-2.<br><br>Access the ECT PID.<br><br>Verify that the ECT PID is **less than 116°C {241°F}** during driving.<br><br>Is the ECT PID less than the specification? | Yes | Go to the next step. |
| | | No | Inspect the cooling system for the cause of overheating. |
| 3 | Connect the WDS or equivalent to the DLC-2.<br><br>Access the IAT and the MAF PIDs.<br><br>Monitor each PID.<br><br>(See PCM INSPECTION .)<br><br>Are PIDs normal? | Yes | Go to the next step. |
| | | No | **IAT PID** : Inspect IAT sensor.<br><br>(See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION .)<br><br>**MAF PID** : Inspect MAF sensor.<br><br>(See MASS AIR FLOW (MAF) SENSOR INSPECTION .) |
| 4 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 5 | Perform the fuel pump speed control operation inspection.<br><br>(See Fuel Pump Speed Control Operation Inspection .)<br><br>Does the fuel pump speed control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel pump speed control operation inspection results. |

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| 6 | Is the strong blue spark visible at each disconnected high-tension lead while cranking the engine? | Yes | Inspect for the following:<br><br>• Spark plugs malfunction<br>• Spark plugs heat range<br>• Pulse wheel damaged on eccentric shaft<br>• Open or short circuit on eccentric shaft position sensor<br>• Open or short circuit between eccentric shaft position sensor and PCM terminal 2U or 2X<br><br>If they are normal, go to the next step. |
| | | No | Inspect for the following:<br><br>• High-tension leads<br>• Ignition coils or connectors |
| 7 | Inspect the knock sensor.<br><br>(See KNOCK SENSOR (KS) INSPECTION .)<br><br>Is the knock sensor normal? | Yes | Go to the next step. |
| | | No | Replace the knock sensor.<br><br>(See KNOCK SENSOR (KS) REMOVAL/INSTALLATION .) |
| 8 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Go to Step 14. |
| | | No | Go to the next step. |
| 9 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 10 | Check the engine oil condition.<br><br>Is the engine oil low viscosity and/or is there a gasoline odor? | Yes | Replace the engine oil.<br><br>Inspect the ECT sensor and the related wiring harnesses.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| | | No | Go to the next step. |
| 11 | Inspect the oil pressure. | Yes | Go to the next step. |

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| | (See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 12 | Turn the ignition switch off.<br><br>Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Start the engine and run it at idle.<br><br>Measure the fuel line pressure at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 13 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there any air and/or clogging in the oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage at the engine.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| | | No | Overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 14 | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Start the engine and run it at idle.<br><br>Measure the fuel line pressure at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |

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| 15 | Inspect the fuel injectors for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Clogging<br>• Injection amount<br><br>Are the injectors normal? | Yes | Go to the next step. |
| | | No | Replace the fuel injector.<br><br>(See FUEL INJECTOR REMOVAL/INSTALLATION .) |
| 16 | Inspect the knock sensor.<br><br>(See KNOCK SENSOR (KS) INSPECTION .)<br><br>Is the knock sensor normal? | Yes | Go to the next step. |
| | | No | Replace the knock sensor.<br><br>(See KNOCK SENSOR (KS) REMOVAL/INSTALLATION .) |
| 17 | Inspect the ignition timing.<br><br>(See Ignition Timing Inspection .)<br><br>Does the ignition timing operate properly? | Yes | Inspect the eccentric bypass valve operation and carbon build-up in the combustion chamber.<br><br>(See Engine Workshop Manual.) |
| | | No | Repair or replace the malfunctioning parts, according to the ignition timing inspection results. |
| 18 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

# NO.14 POOR FUEL ECONOMY

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| 14 | POOR FUEL ECONOMY |
| **DESCRIPTION** | The fuel economy is unsatisfactory. |
| **POSSIBLE CAUSE** | • Contaminated air cleaner element<br>• Air suction at intake-air system (between MAF sensor and intake ports)<br>• Poor fuel quality<br>• Inadequate fuel pressure<br>• Pressure regulator (integrated in fuel pump unit) malfunction<br>• Fuel pump relay stuck closed<br>• Fuel leakage from fuel injector<br>• Restriction in exhaust system<br>• Erratic signal from eccentric shaft position sensor<br>• Improper MAF sensor installation<br>• Improper fuel injector control operation (abnormal signals from MAF, ECT, front/rear HO2S and IAT sensors to PCM)<br>• Knock sensor malfunction (abnormal signal to PCM)<br>• Contaminated MAF sensor<br>• Improper engine compression<br>  ▪ Engine internal malfunction<br>  ▪ Abnormal engine oil condition (viscosity, deterioration)<br>  ▪ Low oil pressure<br>  ▪ Excessive fuel pressure<br>  ▪ Metering oil pump malfunction<br>  • Leakage or clogging in oil pipe<br>  • Leakage or clogging in oil nozzle<br>• Eccentric shaft bypass valve malfunction (stuck open)<br>• Improper cooling fan control system operation<br>• Thermostat malfunction (stuck open)<br>• Improper engine coolant level<br>• Improper ignition timing<br>• Weak spark<br>• Spark plug malfunction<br>• Brake dragging<br>• Low tire pressure<br>• Clutch slippage (MT)<br>• Improper ATF level (AT)<br>• Improper A/C operation (A/C cut-off control does not operate)<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries |

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| | or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Does the engine knock/ping/detonate? | Yes | Go to the symptom troubleshooting "No.13 Knocking/pinging/detonation-Acceleration/cruise".<br><br>(See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE .) |
| | | No | Go to the next step. |
| 2 | Inspect for the following:<br><br>• Air cleaner element for contamination<br>• Air suction at intake-air system (between MAF sensor and intake ports)<br>• ATF level (AT)<br>• Fuel quality<br>• Coolant level<br>• Brake dragging<br>• Clutch slippage (MT)<br>• MAF sensor installation<br><br>Are all the items normal? | Yes | Go to the next step. |
| | | No | Service if necessary.<br><br>Repeat Step 2. |
| 3 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off) | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |

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| | position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 4 | Access the ECT PID.<br><br>Drive the vehicle while monitoring the PID.<br><br>(See PCM INSPECTION .)<br><br>Is the PID within the specification? | Yes | Go to the next step. |
| | | No | Inspect for coolant leakage, cooling fan operation or thermostat operation. |
| 5 | Is a strong blue spark visible at each disconnected high-tension lead while cranking the engine? | Yes | Inspect for the following:<br><br>• Spark plugs malfunction<br>• Eccentric shaft position sensor is improperly installed.<br>• Pulse wheel damaged on eccentric shaft<br>• Open or short circuit on eccentric shaft position sensor<br>• Open or short circuit between eccentric shaft position sensor and PCM terminal 2U or 2X<br><br>Repair or replace the malfunctioning parts.<br><br>If normal, go to the next step. |
| | | No | Inspect for the following:<br><br>• High-tension leads<br>• Ignition coils and connectors |
| 6 | Perform the fuel pump speed control operation inspection.<br><br>(See Fuel Pump Speed Control Operation Inspection .)<br><br>Does the fuel pump speed control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the fuel pump speed control operation inspection results. |
| 7 | Inspect the MAF sensor for contamination.<br><br>Is there any contamination? | Yes | Replace the MAF sensor. |
| | | No | Go to the next step. |
| 8 | | Yes | Go to the next step. |

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| | Connect the WDS or equivalent to the DLC-2.<br><br>Access the MAF, O2S11, O2S12 and IAT PIDs.<br><br>Are the PIDs values normal?<br><br>(See PCM INSPECTION .) | No | **If the MAF PID is not as specified:**<br><br>Inspect the MAF sensor.<br><br>(See MASS AIR FLOW (MAF) SENSOR INSPECTION .)<br><br>**If the O2S11 PID is not as specified:**<br><br>Inspect the front HO2S.<br><br>(See FRONT HEATED OXYGEN SENSOR (HO2S) INSPECTION .)<br><br>**If the O2S12 PID is not as specified:**<br><br>Inspect the rear HO2S.<br><br>(See REAR HEATED OXYGEN SENSOR (HO2S) INSPECTION .)<br><br>**If the IAT PID is not as specified:**<br><br>Inspect the IAT sensor.<br><br>(See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION .) |
| 9 | Inspect the knock sensor.<br><br>(See KNOCK SENSOR (KS) INSPECTION .)<br><br>Is the knock sensor normal? | Yes | Go to the next step. |
| | | No | Replace the knock sensor.<br><br>(See KNOCK SENSOR (KS) REMOVAL/INSTALLATION .) |
| 10 | Visually inspect the exhaust system part.<br><br>Is there any deformed exhaust system part? | Yes | Replace the suspected part. |
| | | No | Go to the next step. |
| 11 | | Yes | Go to the next step. |

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| | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Start the engine and run it at idle.<br><br>Measure the fuel line pressure at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 12 | Inspect the fuel injectors for the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Leakage<br>• Injection amount<br><br>Are the injectors normal? | Yes | Go to the next step. |
| | | No | Replace the fuel injector.<br><br>(See FUEL INJECTOR REMOVAL/INSTALLATION .) |
| 13 | **NOTE:**<br><br>• The following test is for A/C equipped models. Go to the next step for the A/C non-equipped models.<br><br>Perform the A/C Cut-off Control inspection.<br><br>(See A/C Cut-off Control System Inspection .)<br><br>Does the A/C cut-off control operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts, according to the A/C cut-off control inspection result. |
| 14 | Inspect the engine compression. | Yes | Inspect the eccentric shaft bypass valve. |

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| | (See COMPRESSION INSPECTION .)<br><br>Is it normal? | No | Go to the next step. | | |
| 15 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |
| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | | | |
| 19 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there air and/or clogging in the oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage at the engine.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | |
| | | No | Overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | |
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| | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | |

Notes:

## NO.15 EMISSION COMPLIANCE

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| 15 | EMISSION COMPLIANCE |
| **DESCRIPTION** | Fails emissions test. |
| **POSSIBLE CAUSE** | • Vacuum lines leakage or blockage<br>• Cooling system malfunction<br>• Spark plug malfunction<br>• Leakage from intake manifold<br>• Erratic signal from eccentric shaft position sensor<br>• Inadequate fuel pressure<br>• Exhaust system clogging<br>• Fuel tank ventilation system malfunction<br>• Charcoal canister damage<br>• Air cleaner element clogging or restriction<br>• Throttle body malfunction<br>• Jet air mixing system line blockage<br>• Spark leakage from high-tension leads<br>• Improper air/fuel mixture ratio control operation<br>• Catalyst converter malfunction<br>• Engine internal parts malfunction<br>• Excessive carbon is built up in combustion chamber<br>• Improper engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil line<br>▪ Metering oil pump malfunction<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .) |

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| | **CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Inspect for the following:<br><br>• Vacuum lines for leakage or blockage<br>• Jet air mixing system line blockage<br>• Electrical connections<br>• Proper maintenance schedule followed<br>• Intake-air system and air cleaner element concerns: obstructions, leakage or dirtiness<br><br>Are all the items normal? | Yes | Go to the next step. |
| | | No | Service if necessary.<br><br>Repeat Step 1. |
| 2 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 3 | Is any other drivability concern present? | Yes | Go to the applicable symptom troubleshooting.<br><br>(See ENGINE SYMPTOM TROUBLESHOOTING .) |
| | | No | Go to the next step. |
| 4 | | Yes | Go to the next step. |

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| | Connect the WDS or equivalent to the DLC-2.<br><br>Access the ECT PID.<br><br>Warm up the engine and run it at idle.<br><br>Verify the ECT PID is correct.<br><br>(See PCM INSPECTION .)<br><br>Is the ECT PID correct? | No | Inspect for coolant leakage, cooling fan operation or thermostat operation. |
| 5 | Is a strong blue spark visible at each disconnected high-tension lead while cranking the engine? | Yes | Inspect for the following:<br><br>• Spark plugs malfunction<br>• Improperly installed eccentric shaft position sensor<br>• Damaged trigger wheel on eccentric shaft<br>• Open or short circuit on eccentric shaft position sensor<br>• Open or short circuit between eccentric shaft position sensor and PCM terminal 2U or 2X<br><br>Repair or replace the malfunctioning parts.<br><br>If normal, go to the next step. |
| | | No | Inspect the following:<br><br>• High-tension leads<br>• Ignition coil and connector |
| 6 | Disconnect the t fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Start the engine and run it at idle.<br><br>Measure the fuel line pressure at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | **Zero or low:**<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |

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| 7 | Inspect for fuel saturation inside the charcoal canister.<br><br>Is there an excess amount of liquid fuel present in the canister? | Yes | Replace the charcoal canister. | | |
| | | No | Inspect the fuel tank vent system.<br><br>Then, go to the next step. | | |
| 8 | Inspect for restriction and leakage at the three-way catalytic converter.<br><br>Is there any restriction or leakage at the three-way catalytic converter? | Yes | Go to the next step. | | |
| | | No | Replace the three-way catalytic converter. | | |
| 9 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Visually inspect the exhaust system part. | | |
| | | No | Go to the next step. | | |
| 10 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | | | |
| 13 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there air and/or clogging in the oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage a the t engine.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | |

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| | | No | Overhaul or replace engine.<br><br>(See Engine Workshop Manual.) |
| 14 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

Notes:

# NO.16 HIGH OIL CONSUMPTION/LEAKAGE

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| 16 | HIGH OIL CONSUMPTION/LEAKAGE |
| **DESCRIPTION** | The oil consumption is excessive. |
| **POSSIBLE CAUSE** | • Air cleaner element malfunction (damage, poor installation)<br>• Improper dipstick<br>• Improper engine oil viscosity<br>• Engine internal parts malfunction<br>• Metering oil pump malfunction<br>• Improper operation of metering oil pump control system<br>• Oil leakage from lubrication system parts and them joints (oil pump, oil filter, oil cooler, housing oil nozzle, manifold oil nozzle etc.) |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Inspect for the following:<br>• External leakage (lubrication system parts and their joints.)<br>• Proper dipstick<br>• Proper engine oil viscosity<br>• Damaged and/or poor installation of air cleaner element<br>Are all the items normal? | Yes | Go to the next step. |
| | | No | Service if necessary.<br>Repeat Step 1. |
| 2 | Perform the metering oil pump control inspection.<br>(See Metering Oil Pump Control Inspection .)<br>Does the metering oil pump control properly? | Yes | Overhaul the engine and repair or replace the malfunctioning parts. |
| | | No | Repair or replace the malfunctioning parts, according to the metering oil pump control inspection results. |
| 3 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair | | |

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| | Information and perform the repair or diagnosis. |

Notes:

# NO.17 COOLING SYSTEM CONCERNS-OVERHEATING

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| 17 | COOLING SYSTEM CONCERNS -OVERHEATING |
| **DESCRIPTION** | The engine runs at higher than normal temperature/overheats. |
| **POSSIBLE CAUSE** | • Improper coolant level<br>• Blown fuses<br>• Coolant leakage<br>• Excessive A/C system pressure<br>• A/C system operation is improper<br>• Improper water/anti-freeze mixture<br>• Fans reverse rotation<br>• Cooling air passage to radiator blockage<br>• Poor radiator condition<br>• Thermostat malfunction<br>• Radiator hose damage<br>• Improper or damaged radiator cap<br>• Cooling fans are inoperative.<br>• Coolant overflow system malfunction<br>• Improper tension of drive belt<br>• Drive belt damage<br>• Eccentric shaft bypass valve malfunction (stuck closed) |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Inspect the following:<br>• Engine coolant level<br>• Coolant leakage<br>• Water and anti-freeze mixture<br>• Radiator condition<br>• Collapsed or restricted radiator hoses<br>• Radiator pressure cap<br>• Overflow system<br>• Fan rotational direction<br>• Cooling air passage to radiator<br>• Fuses<br>Are all the items normal? | Yes | Go to the next step. |
| | | No | Service if necessary.<br>Repeat Step 1. |

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| 2 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 3 | Start the engine and run it at idle speed.<br><br>Turn the A/C switch on and the set blower fan to any speed.<br><br>Does the A/C compressor engage? | Yes | Go to Step 5. |
| | | No | Inspect for the following and repair or replace if necessary:<br><br>• Refrigerant charging amount<br>• Open circuit between A/C relay and PCM terminal 5AA<br>• Seized A/C magnetic clutch<br>• A/C magnetic clutch malfunction<br><br>If all the items are normal, go to the next step. |
| 4 | Start the engine and run it at idle speed.<br><br>Turn the A/C switch on and the set blower fan to any speed.<br><br>Measure the voltage at PCM terminal 4W.<br><br>(See PCM INSPECTION .)<br><br>Is the voltage normal? | Yes | Go to the next step. |
| | | No | Inspect the following:<br><br>• Refrigerant pressure switch operation<br>• A/C switch is stuck open.<br>• Open or short circuit between refrigerant pressure switch and PCM terminal 4W<br>• Open circuit of blower motor fan switch and resistor (if blower motor does not operate)<br>• Evaporator temperature sensor and A/C amplifier |
| 5 | Inspect the cooling fan control system operation.<br><br>(See Cooling Fan Control System Inspection .)<br><br>Does the cooling fan control system work properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts. |
| 6 | Is the drive belt normal?<br><br>(See DRIVE BELT DEFLECTION/TENSION INSPECTION .) | Yes | Go to the next step. |
| | | No | Replace the drive belt.<br><br>(See DRIVE BELT REPLACEMENT .) |
| 7 | Is there any leakage around the heater unit in the passenger compartment? | Yes | Inspect and service the heater for leakage. |
| | | No | Go to the next step. |

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| 8 | Is there any leakage from coolant hoses and/or radiator? | Yes | Replace the malfunctioning part. |
| | | No | Go to the next step. |
| 9 | Cool down the engine.<br><br>Remove the thermostat and inspect operation.<br><br>(See THERMOSTAT REMOVAL/INSTALLATION .)<br><br>(See THERMOSTAT INSPECTION .)<br><br>Is the thermostat normal? | Yes | Go to the next step. |
| | | No | Replace the thermostat. |
| 10 | Access the ECT PID.<br><br>Inspect readings on both the ECT PID and the temperature gauge on i the instrument cluster.<br><br>Is the ECT PID indication the same as the temperature gauge readings? | Yes | Inspect the eccentric shaft bypass valve.<br><br>(See Engine Workshop Manual.) |
| | | No | If the temperature gauge is in the normal range but the ECT PID is not the same as the temperature gauge reading, inspect the ECT sensor.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>If the temperature gauge on the instrument cluster indicates the cold range but the ECT PID is normal, inspect the temperature gauge and the sending unit.<br><br>(See Water temperature gauge .) |
| 11 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

# NO.18 COOLING SYSTEM CONCERNS-RUNS COLD

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| 18 | COOLING SYSTEM CONCERNS -RUNS COLD |
| **DESCRIPTION** | The engine takes excessive time to reach the normal operating temperature. |
| **POSSIBLE CAUSE** | • Thermostat malfunction<br>• Eccentric shaft bypass malfunction (stuck open)<br>• Cooling fan system malfunction |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Is the customer complaint "Lack of passenger compartment heat" only? | Yes | Inspect the A/C and heater system. |
| | | No | Go to the next step. |
| 2 | Does the engine speed continue at fast idle? | Yes | Go to the symptom troubleshooting "No.9 Fast idle/runs on".<br><br>(See NO.9 FAST IDLE/RUNS ON .) |
| | | No | Go to the next step. |
| 3 | Remove the thermostat and inspect operation.<br><br>(See THERMOSTAT REMOVAL/INSTALLATION .)<br><br>(See THERMOSTAT INSPECTION .)<br><br>Is the thermostat normal? | Yes | Go to the next step. |
| | | No | Replace the thermostat. |
| 4 | Inspect the cooling fan control system operation.<br><br>(See Cooling Fan Control System Inspection .)<br><br>Does the cooling fan control system work properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part. |

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| 5 | Access the ECT PID.<br><br>Inspect readings on both the ECT PID and the temperature gauge on the instrument cluster.<br><br>Is the ECT PID indication the same as the temperature gauge readings? | Yes | Inspect the eccentric shaft bypass valve.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>If the temperature gauge on the instrument cluster indicates the cold range but the ECT PID is normal, inspect the temperature gauge and the sending unit.<br><br>(See Water temperature gauge .) |
| | | 6 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect related the Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. |

## NO.19 EXHAUST SMOKE

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| 19 | EXHAUST SMOKE |
| **DESCRIPTION** | Blue, black, or white smoke from the exhaust system |
| **POSSIBLE CAUSE** | **Blue smoke (Burning oil):**<br>• Engine internal oil leakage (Oil seal, side seal, apex seal etc.)<br>**White smoke (Water in combustion):**<br>• Cooling system malfunction (coolant loss)<br>• Engine internal coolant leakage<br>**Black smoke (Rich fuel mixture):**<br>• Air cleaner restriction<br>• Intake-air system is collapsed or restricted.<br>• Excessive fuel pressure<br>• Improper engine compression<br>▪ Engine internal malfunction<br>▪ Abnormal engine oil condition (viscosity, deterioration)<br>▪ Low oil pressure<br>▪ Excessive fuel pressure<br>▪ Air mixed in oil line<br>▪ Metering oil pump clogging in oil pipe<br>• Leakage or clogging in oil pipe<br>• Leakage or clogging in oil nozzle<br>• Injector fuel leakage<br>• Ignition system malfunction<br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing fuel system:<br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br>(See BEFORE REPAIR PROCEDURE .)<br>(See AFTER REPAIR PROCEDURE .)<br>**CAUTION:**<br>• Disconnecting/connecting quick release connector without cleaning it may possibly |

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| | cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | What color is the smoke coming from the exhaust system? | Blue | Burning oil is indicated.<br><br>Go to the next step. |
| | | White | Water in combustion is indicated.<br><br>Go to Step 3. |
| | | Black | Rich fuel mixture is indicated.<br><br>Go to Step 4. |
| 2 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control properly? | Yes | Overhaul the engine and repair or replace the malfunctioning part. |
| | | No | Repair or replace the malfunctioning parts, according to the metering oil pump control inspection results. |
| 3 | Does the cooling system hold pressure? | Yes | Inspect for the following:<br><br>• Gasket leakage<br>• Intake manifold gasket leakage<br>• Cracked or porous rotor housing<br><br>If other drivability symptoms are present, return to the diagnostic index to service any additional symptoms. |
| | | No | Inspect for the cause. |
| 4 | Inspect for the following:<br><br>• Air cleaner restriction<br>• Collapsed or restricted intake-air system<br><br>Are all the items normal? | Yes | Go to the next step. |
| | | No | Service if necessary.<br><br>Repeat Step 4. |

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| 5 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) | | |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. | | |
| 6 | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Start the engine and run it at idle.<br><br>Measure the fuel line pressure at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |
| | | No | **Zero or low:**<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) | | |
| 7 | Inspect the engine compression.<br><br>(See COMPRESSION INSPECTION .)<br><br>Is it normal? | Yes | Visually inspect the exhaust system part. | | |
| | | No | Go to the next step. | | |
| 8 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according | | | | |

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| | to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) | | |
| 11 | Check the oil pipe between the metering oil pump and the metering oil nozzle.<br><br>Is there air and/or clogging in the oil pipe? | Yes | Inspect and repair for leakage and/or clogging in the oil passage at engine.<br><br>After that overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| | | No | Overhaul or replace the engine.<br><br>(See Engine Workshop Manual.) |
| 12 | Is a strong blue spark visible at each disconnected high-tension lead while cranking the engine? | Yes | Inspect the spark plugs and the eccentric shaft position sensor. |
| | | No | Inspect the following:<br><br>• High-tension leads<br>• Ignition coil and connector |
| 13 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

# NO.20 FUEL ODOR (IN ENGINE COMPARTMENT)

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| 20 | FUEL ODOR (IN ENGINE COMPARTMENT) |
| **DESCRIPTION** | Gasoline fuel odor or visible leakage |
| **POSSIBLE CAUSE** | • Excessive fuel pressure<br>• Purge solenoid valve malfunction<br>• Fuel tank vent system blockage/restriction or opening<br>• Charcoal canister malfunction<br>• Charcoal canister improper installation<br>• Fuel leakage from fuel system<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | | Yes | Replace the vacuum hose. |

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| | Inspect for blockage/restriction or opening between the engine vacuum port and the charcoal canister.<br><br>Inspect for blockage/restriction or opening in the fuel tank vent system.<br><br>Is fault indicated? | No | Go to the next step. |
| 2 | Inspect the purge solenoid valve.<br><br>(See PURGE SOLENOID VALVE INSPECTION .)<br><br>Is the solenoid operating properly? | Yes | Go to the next step. |
| | | No | Replace the purge solenoid valve. |
| 3 | Visually inspect for fuel leakage at the fuel injector, O-ring and the fuel line.<br><br>Service if necessary.<br><br>Install the fuel pressure gauge between the fuel pipe and the fuel distributor.<br><br>Start engine and run it at idle.<br><br>Measure the fuel line pressure at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 4 | Verify that the charcoal canister is installed properly.<br><br>Is the charcoal canister installed properly? | Yes | Go to the next step. |
| | | No | Install the charcoal canister properly. |
| 5 | Inspect for air leakage from charcoal canister.<br><br>(See CHARCOAL CANISTER INSPECTION .)<br><br>Is there air leakage from the charcoal canister? | Yes | Replace the charcoal canister. |
| | | No | Go to the next step. |
| 6 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off) | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |

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| | (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | No | **No DTC is displayed:**<br><br>Inspect the charcoal canister for fuel saturation.<br><br>If there is an excess amount of liquid fuel present, replace the charcoal canister. |
| 7 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

Notes:

## NO.21 ENGINE NOISE

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| 21 | ENGINE NOISE |
| **DESCRIPTION** | Engine noise from under the hood |
| **POSSIBLE CAUSE** | **Squeal, click or chirp noise:**<br>• Improper engine oil level<br>• Improper drive belt tension<br>**Rattle sound noise:**<br>• Loose parts<br>**Hissing noise:**<br>• Vacuum leakage<br>• Loose spark plug<br>• Air leakage from intake-air system<br>• Improper variable fresh air duct (VFAD) control system operation (13B-MSP (High Power))<br>**Rumble or grind noise:**<br>• Improper drive belt tension<br>**Rap or roar noise:**<br>• Exhaust system looseness<br>**Other noise:**<br>• Oil pump drive gear noise<br>• Oil pump drive chain noise |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Is squeal, click or chirp sound present? | Yes | Inspect the engine oil level or drive belts. |
| | | No | Go to the next step. |
| 2 | Is rumble or grinding noise present? | Yes | Inspect the drive belts. |
| | | No | Go to the next step. |
| 3 | Is rattle noise present? | Yes | Inspect the location of rattle for loose parts. |

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| | | No | Go to the next step. |
| 4 | Is hissing noise present? | Yes | Inspect for the following:<br>• Vacuum leakage<br>• Spark plug looseness<br>• Intake-air system leakage<br>• Variable fresh air duct (VFAD) control system operation (13B-MSP (High Power))<br><br>(See Variable Fresh Air Duct (VFAD) Control System Operation Inspection (13B-MSP (High Power)) .) |
| | | No | Go to the next step. |
| 5 | Is rap or roar noise present? | Yes | Inspect the exhaust system for loose parts. |
| | | No | Go to the next step. |
| 6 | Is knocking noise present? | Yes | Go to the symptom troubleshooting "No.13 Knocking/pinging/detonation-Acceleration/cruise".<br><br>(See NO.13 KNOCKING/PINGING/DETONATION-ACCELERATION/CRUISE .) |
| | | No | If the noise comes from engine internally, inspect for oil pump drive gear or chain noise. |
| 7 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

# NO.22 VIBRATION CONCERNS (ENGINE)

| 22 | VIBRATION CONCERNS (ENGINE) |
|---|---|
| **DESCRIPTION** | • Vibration from under hood or driveline |
| **POSSIBLE CAUSE** | • Loose installation bolts or worn parts<br>• Components malfunction such as worn parts |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Inspect the following components for loose installation bolts or worn parts:<br>• Cooling fan No.1<br>• Cooling fan No.2<br>• Drive belt and pulleys<br>• Engine mounts<br>Are all the items normal? | Yes | Inspect the following systems:<br>• Wheels<br>• AT<br>• Driveline<br>• Suspension |
| | | No | Readjust or retighten the engine mount installation position.<br>Service if necessary for other parts. |
| 2 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

# NO.23 A/C DOES NOT WORK SUFFICIENTLY

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| 23 | A/C DOES NOT WORK SUFFICIENTLY. |
| **DESCRIPTION** | The A/C compressor magnetic clutch does not engage when the A/C switch is turned on. |
| **POSSIBLE CAUSE** | • Improper refrigerant charging amount<br>• Open A/C magnetic clutch<br>• Open circuit between A/C relay and A/C magnetic clutch<br>• Poor GND of A/C magnetic clutch<br>• Refrigerant pressure switch is stuck open.<br>• A/C relay is stuck open.<br>• Seized A/C compressor<br>• Open circuit between A/C switch and PCM through both refrigerant pressure switch and A/C amplifier |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 2 | Disconnect the A/C compressor connector.<br><br>Start the engine and turn the A/C switch on.<br><br>Is there correct voltage at the terminal of the A/C compressor magnetic clutch connector?<br><br>**Specification**<br><br>o **10.5 V or more** | Yes | Inspect for GND condition of magnetic clutch on the A/C compressor.<br><br>If the GND condition is normal, inspect for an open circuit in the magnetic clutch coil. |
| | | No | Go to the next step. |
| 3 | Disconnect the refrigerant pressure switch connector. | Yes | Inspect the refrigerant pressure switch operation.<br><br>If the switch is normal, go to the next step. |

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| | Connect the jumper wire between the terminals of the A/C high pressure switch connector.<br><br>Connect the jumper wires between the terminals of the refrigerant pressure switch connector.<br><br>Turn the ignition switch to the ON position.<br><br>Turn the A/C switch on and set the blower fan to any speed.<br><br>Does the A/C work? | No | Inspect for the following:<br><br>• The A/C switch is stuck open.<br>• Open circuit between refrigerant pressure switch and PCM terminal 4W<br>• Open circuit between blower motor fan switch and resistor (if blower motor does not operate)<br>• Evaporator temperature sensor and A/C amplifier |
| 4 | Remove the jumper wire from the switch connector.<br><br>Reconnect the connector to the refrigerant pressure switch.<br><br>Start the engine and turn the A/C switch on.<br><br>Does the fan operate? | Yes | Inspect whether the A/C relay is stuck open.<br><br>Replace if necessary. |
| | | No | Inspect the following and repair or replace if necessary:<br><br>• Refrigerant charging amount<br>• A/C compressor for seizure |
| 5 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

# NO.24 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY

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|---|---|
| 24 | A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY. |
| **DESCRIPTION** | The A/C compressor magnetic clutch does not disengage. |
| **POSSIBLE CAUSE** | • A/C compressor magnetic clutch engagement is stuck.<br>• A/C relay is stuck closed.<br>• Short to GND between A/C switch and PCM<br>• Short to GND circuit between A/C relay and PCM<br>• A/C relay to magnetic clutch circuit shorted to battery power |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 2 | Start the engine and run it at idle.<br><br>Turn the A/C switch on.<br><br>Remove the A/C relay.<br><br>Does the A/C magnetic clutch disengage? | Yes | Inspect for the following:<br><br>• The A/C relay is stuck closed.<br>• Short to GND circuit between the A/C relay and PCM terminal 5AA.<br><br>If both items normal, go to the next step. |
| | | No | Inspect if the circuit between A/C relay and the magnetic clutch shorts to the battery power circuit.<br><br>If the circuit is normal, inspect the magnetic clutch for stuck engagement or clearance. |
| 3 | Disconnect the refrigerant pressure switch connector. | Yes | Inspect for short to GND circuit between refrigerant pressure switch and PCM terminal 4W. |

| | | | |
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| | Start the engine and turn the A/C switch on.<br><br>**NOTE:**<br><br>• The A/C should not work when disconnecting the connector. If the A/C remains working, a short to GND circuit may be present.<br><br>Does the A/C remain working? | No | Go to the next step. |
| 4 | Reconnect refrigerant pressure switch connector.<br><br>Turn off the A/C switch.<br><br>**NOTE:**<br><br>• The A/C should not work when turning the A/C switch off. If the A/C remains working, a short to GND circuit may be present.<br><br>Does the A/C remain working? | Yes | Inspect the following:<br><br>• Short to GND circuit between the A/C switch and the A/C amplifier<br>• Short to GND circuit between the A/C amplifier and the refrigerant pressure switch |
| | | No | Inspect whether the A/C switch is stuck closed. |
| 5 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

# NO.25 A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE CONDITIONS

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|---|---|
| 25 | A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE CONDITIONS. |
| **DESCRIPTION** | The A/C compressor magnetic clutch does not disengage under wide open throttle. |
| **POSSIBLE CAUSE** | • APP sensor malfunction |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Does the A/C compressor disengage when the A/C switch is turned off? | Yes | Go to the next step. |
| | | No | Go to the symptom troubleshooting "No.24 A/C is always on or A/C compressor runs continuously".<br><br>(See NO.24 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY .) |
| 2 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | **No DTC is displayed:**<br><br>Inspect the APP sensor.<br><br>(See ACCELERATOR PEDAL POSITION (APP) SENSOR INSPECTION .) |
| 3 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

## NO.26 EXHAUST SULPHUR SMELL

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| 26 | EXHAUST SULPHUR SMELL |
| **DESCRIPTION** | Rotten egg smell (sulphur) from exhaust |
| **POSSIBLE CAUSE** | • Electrical connectors are disconnected or connected poorly<br>• Charcoal canister malfunction<br>• Vacuum lines are disconnected or connected improperly.<br>• Improper fuel pressure<br>• Poor fuel quality<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Are any drivability or exhaust smoke concerns present? | Yes | Go to the applicable flow chart.<br><br>(See ENGINE SYMPTOM TROUBLESHOOTING .) |
| | | No | Go to the next step. |
| 2 | Inspect the following: | Yes | Go to the next step. |

| | | | |
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| | • Electrical connections<br>• Vacuum lines<br>• Fuel quality<br><br>Are all the items normal? | No | Service if necessary.<br><br>Repeat Step 2. |
| 3 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Retrieve any DTCs.<br><br>Are there any DTCs displayed? | Yes | Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |
| | | No | Go to the next step. |
| 4 | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Start the engine and run it at idle.<br><br>Is the fuel line pressure correct at idle?<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. |
| | | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 5 | Inspect the charcoal canister for fuel saturation.<br><br>Is there an excess amount of liquid fuel present in the canister? | Yes | Replace the charcoal canister. |
| | | No | Inspect the fuel tank vent system.<br><br>If the fuel tank vent system is normal, suggest trying a different brand since the sulfur content can vary in different fuels.<br><br>If the fuel tank vent system is not normal, repair or replace the malfunctioning parts. |
| 6 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

## NO.27 FUEL REFILL CONCERNS

| 27 | Fuel refill concerns |
|---|---|
| **DESCRIPTION** | • The fuel tank does not fill smoothly. |
| **POSSIBLE CAUSE** | • Clogged EVAP pipes<br>• Nonreturn valve malfunction<br>• Improper use of fuel nozzle<br>• Inadequate fuel filling speed<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off). | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |

| | | | |
|---|---|---|---|
| | Retrieve any DTCs.<br><br>Are there any DTCs displayed? | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 2 | Remove the fuel-filler pipe.<br><br>Make sure the nonreturn valve is installed properly.<br><br>Inspect the nonreturn valve operation.<br><br>Is the nonreturn valve normal? | Yes | Inspect for the following:<br><br>• Improper use of fuel nozzle<br>• Inadequate fuel filling speed |
| | | No | **Nonreturn valve is installed improperly:**<br><br>Reinstall the nonreturn valve to the proper position.<br><br>**Nonreturn valve does not operate properly:**<br><br>Replace the nonreturn valve. |
| 3 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

# NO.28 FUEL FILLING SHUT OFF ISSUES

| 28 | **Fuel filling shut off issues** |
|---|---|
| **DESCRIPTION** | • The fuel does not shut off properly. |
| **POSSIBLE CAUSE** | • Clogged EVAP pipes<br>• Nonreturn valve malfunction<br>• Fuel shut-off valve malfunction<br>• Fuel nozzle malfunction<br>• Fuel nozzle is not inserted correctly.<br><br>**WARNING:** The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read the following warnings before servicing the fuel system:<br><br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br><br>(See BEFORE REPAIR PROCEDURE .)<br><br>(See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | | ACTION |
|---|---|---|---|
| 1 | Connect the WDS or equivalent to the DLC-2.<br><br>Turn the ignition switch to the ON position (Engine off). | Yes | **DTC is displayed:**<br><br>Go to the applicable DTC inspection.<br><br>(See DTC TABLE .) |

| | | | |
|---|---|---|---|
| | Retrieve any DTCs.<br><br>Are there any DTCs displayed? | No | **No DTC is displayed:**<br><br>Go to the next step. |
| 2 | Remove the fuel-filler pipe.<br><br>Make sure the nonreturn valve is installed properly.<br><br>Inspect the nonreturn valve operation.<br><br>Is the nonreturn valve normal? | Yes | Inspect for the following:<br><br>• Improper use of fuel nozzle<br>• Fuel is not inserted correctly.<br>• Inspect fuel shut-off valve. |
| | | No | **Nonreturn valve is installed improperly:**<br><br>Reinstall the nonreturn valve to the proper position.<br><br>**Nonreturn valve does not operate properly:**<br><br>Replace the nonreturn valve. |
| 3 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. | | |

## NO.29 SPARK PLUG CONDITION

| | |
|---|---|
| 29 | SPARK PLUG CONDITION |
| **DESCRIPTION** | Incorrect spark plug condition |
| **POSSIBLE CAUSE** | **NOTE:**<br>• Inspecting the spark plugs condition can determine whether the problem is related to a specific spark plug or possibly all spark plugs.<br>**Wet/carbon stuck on specific plug:**<br>• Spark—Weak, not visible<br>• Air/fuel mixture—Excessive fuel injection volume<br>• Compression—No compression, low compression<br>• Faulty spark plug<br>**Grayish white with specific plug:**<br>• Air/fuel mixture—Insufficient fuel injection volume<br>• Faulty spark plug<br>**Wet/carbon is stuck on all plugs:**<br>• Spark—Spark weak<br>• Air/fuel mixture—Too rich<br>• Compression—Low compression<br>• Clogging in intake/exhaust system<br>**Grayish white with all plugs:**<br>• Air/fuel mixture—Too lean<br>**WARNING: The following troubleshooting flow chart contains fuel system diagnosis and repair procedures.** Read the following warnings before servicing the fuel system:<br>• Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.<br>• Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.<br>(See BEFORE REPAIR PROCEDURE .) |

| | |
|---|---|
| | (See AFTER REPAIR PROCEDURE .)<br><br>**CAUTION:**<br><br>• Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material. |

Diagnostic procedure

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Remove all the spark plugs.<br><br>Inspect the spark plug condition.<br><br>Is the spark plug condition normal? | Yes | Troubleshooting completed. |
| | | No | **Specific plug is wet or covered with carbon:**<br><br>Go to the next step.<br><br>**Specific plug looks grayish white:**<br><br>Go to Step 13.<br><br>**All plugs are wet or covered with carbon:**<br><br>Go to Step 15.<br><br>**All plugs look grayish white:**<br><br>Go to Step 27. |
| 2 | Is the spark plug wet/covered with carbon by engine oil? | Yes | Working up and down inspect all the areas related to the oil. |
| | | No | Go to the next step. |
| 3 | Inspect the spark plug for the following:<br><br>• Cracked insulator<br>• Heat range<br>• Air gap<br>• Worn electrode<br><br>Is the spark plug normal? | Yes | Go to the next step. |
| | | No | Replace the spark plug. |
| 4 | Inspect the engine compression. | Yes | Go to Step 10. |

| | | | | | |
|---|---|---|---|---|---|
| | (See COMPRESSION INSPECTION .)<br><br>Is it normal? | No | Go to the next step. | | |
| 5 | Perform the Metering Oil Pump Control Inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |
| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or the replace engine.<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Open or short in injector<br>• Leakage<br>• Injection volume | | | | |
| No | **Zero or low:**<br><br>Inspect the fuel pump relay and the | | | | |

| | | | |
|---|---|---|---|
| | fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) | | |
| 13 | Inspect the spark plug for the following.<br><br>• Heat range<br>• Air gap<br><br>Is the spark plug normal? | Yes | Go to the next step. |
| | | No | Replace the spark plug. |
| 14 | Remove the suspected fuel injector.<br><br>Inspect the following:<br><br>(See FUEL INJECTOR INSPECTION .)<br><br>• Resistance<br>• Fuel injection volume<br><br>Are all the above items normal? | Yes | Inspect for an open circuit between the suspected fuel injector connector terminal and the PCM connector at the following terminals:<br>**Front rotor:**<br><br>• **For FP1: 2M**<br>• **For FP2*: 3A**<br>• **For FS: 2G**<br><br>**Rear rotor:**<br><br>• **For RP1: 2J**<br>• **For RP2*: 3D**<br>• **For RS: 2D** |
| | | No | Replace the fuel injector.<br><br>(See FUEL INJECTOR REMOVAL/INSTALLATION .) |
| 15 | Is the air cleaner element free of restrictions? | Yes | Go to the next step. |
| | | No | Replace the air cleaner element. |
| 16 | Perform the spark test.<br><br>Is a strong blue spark visible at each spark plug? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts. |

| | | | |
|---|---|---|---|
| 17 | Perform the fuel pump control system inspection.<br><br>Does the fuel pump control system operate properly? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning part according to the inspection results. |
| 18 | Disconnect the fuel line quick release connector and install the fuel gauge to the fuel line.<br><br>Short the check connector terminal F/P to the body GND using a jumper wire.<br><br>Turn the ignition switch to the ON position (Engine off).<br><br>Is the fuel line pressure correct with the ignition switch at ON?<br><br>(See FUEL LINE PRESSURE INSPECTION .)<br><br>**Fuel line pressure**<br><br>o **375—450 kPa {3.9—4.5 kgf/cm$^2$ , 55—65 psi}** | Yes | Go to the next step. |
| | | No | **Zero or low:**<br><br>Inspect the fuel pump relay and the fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 19 | Inspect the following PIDs:<br><br>• ECT<br>• O2S11 (When the engine can be started.)<br>• O2S12 (When the engine can be started.)<br>• MAF<br><br>(See PCM INSPECTION .)<br><br>Are the PIDs normal? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts. |
| 20 | Perform the purge control inspection.<br><br>(When engine can be started)<br><br>(See Purge Control System Inspection .)<br><br>Is the purge control correct? | Yes | Go to the next step. |
| | | No | Repair or replace the malfunctioning parts. |
| 21 | Inspect the engine compression. | Yes | Go to Step 27. |

| | | | | | |
|---|---|---|---|---|---|
| | (See COMPRESSION INSPECTION .)<br><br>Is it normal? | No | Go to the next step. | | |
| 22 | Perform the metering oil pump control inspection.<br><br>(See Metering Oil Pump Control Inspection .)<br><br>Does the metering oil pump control operate properly? | Yes | Go to the next step. | | |
| | | No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)<br><br>After that overhaul or replace the engine.<br><br>(See OIL PRESSURE INSPECTION .)<br><br>Is the oil pressure within the specification? | Yes | Go to the next step. |
| No | Repair or replace the malfunctioning part according to the inspection results.<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .) | Yes | Go to the next step. | | |
| No | Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>After that overhaul or replace the engine.<br><br>(See FUEL LINE PRESSURE INSPECTION .)<br><br>**Fuel line pressure**<br><br>o **375—450 kPa {3.9—4.5 kgf/cm$^2$ , 55—65 psi}** | Yes | Inspect the following PIDs:<br><br>• ECT<br>• O2S11<br>• O2S12<br>• MAF<br><br>(See PCM INSPECTION .)<br><br>Inspect the PCM GND condition. | | |
| No | **Zero or low:**<br><br>Inspect the fuel pump relay and the | | | | |

| | |
|---|---|
| | fuel pump circuit.<br><br>Inspect for clogged fuel line.<br><br>If normal, replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .)<br><br>**High:**<br><br>Replace the fuel pump unit.<br><br>(See FUEL PUMP UNIT REMOVAL/INSTALLATION .) |
| 30 | • Verify test results.<br>▪ If normal, return to the diagnostic index to service any additional symptoms.<br>▪ If the malfunction remains, inspect the related Service Bulletins and/or the On-line Repair Information and perform the repair or diagnosis. |

*

13B-MSP (High Power)

## A/C Cut-off Control System Inspection

1. Start the engine.
2. Turn the A/C switch and fan switch on.
3. Verify that the A/C compressor magnetic clutch actuates.
    - If it does not actuate, go to the symptom troubleshooting "No.23 A/C does not work sufficiently".

      (See NO.23 A/C DOES NOT WORK SUFFICIENTLY .)

4. Fully open the throttle valve and verify that the A/C compressor magnetic clutch does not actuate for **2—5 s** .
    - If it actuates, inspect as follows:
        - A/C relay
        - Open or short to GND circuit in wiring harness and connectors (Ignition switch—A/C relay—PCM terminal 5AA)
        - A/C related parts
        - APP1, APP2 PIDs

| Notes: |
| --- |

## Auxiliary Port Valve (APV) Control Inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Verify DTC P2004, P2006, P2008 or P2017 is not displayed.
   - If DTC P2004, P2006, P2008 or P2017 are displayed, perform DTC inspection.

     (See DTC TABLE .)

3.
4. Access the ECT and RPM PIDs.

5. Start the engine and warm-up it above the ECT PID **70 °C {158 °F}** .

6. Verify that PCM terminal 3B voltage is **1.5 V or more** during idle and decreases to **less than 1.5 V** when the engine speed is increased.

7. If not as specified, proceed to next step.

8. Inspect and repair or replace the following wiring harnesses and connectors for an open or short circuit.
   - APV motor terminal A—PCM terminal 3B
   - APV motor terminal B—PCM terminal 3J
   - APV motor terminal D—PCM terminal 3G

9. Remove APV motor and APV.

10. Inspect for the following:
    - APV motor (See AUXILIARY PORT VALVE (APV) MOTOR INSPECTION (13B-MSP (HIGH POWER)) .)
    - APV (stuck open or closed)

### Cooling Fan Control System Inspection

Cooling fan system operation (at idle)

| Engine condition | | Cooling fan relay No.1 | Cooling fan relay No.2 | Cooling fan relay No.3 | Cooling fan No.1 | Cooling fan No.2 |
|---|---|---|---|---|---|---|
| Engine coolant temperature 97°C {208°F} or less | | OFF | OFF | OFF | OFF | OFF |
| Engine coolant temperature 97°C {208°F} or more (until 94°C {201°F} or less) | | ON | OFF | OFF | Low speed | Low speed |
| Engine coolant temperature 101°C {213°F} or more (until 98°C {209°F}) | | ON | ON | ON | High speed | High speed |
| A/C and fan switches are on. | The refrigerant pressure switch (medium pressure) is off. | ON | OFF | OFF | Low speed | Low speed |
| | Engine coolant temperature 101°C {213°F} or more or the refrigerant pressure switch (medium pressure) is on. | ON | ON | ON | High speed | High speed |
| ECT sensor malfunction | | ON | ON | ON | High speed | High speed |

1. Connect the WDS or equivalent to the DLC-2.

2. Verify that DTC P0480 or P0481 is not displayed.
   - If DTC P0480 and/or P0481 are displayed, perform DTC inspection.

3. Access the ECT PID.

4. Verify that the ECT PID is **97°C {208°F} or less** .

5. Verify that the A/C switch and fan switch are off.

6. Start the engine and let it idle.

7. Verify that the cooling fans are not operating.
    - If the cooling fans are operating at low speed, inspect for the following:
        - Cooling fan relay No.1 (stuck closed)
        - Wiring harnesses and connectors (cooling fan relay No.1—PCM terminal 5X) (short to GND)
    - If the cooling fan No.1 is not operating, but cooling fan No.2 is operating, inspect for the following:
        - Cooling fan relay No.3 (stuck closed)
        - Wiring harnesses and connectors (cooling fan relay No.3—PCM terminal 5AD) (short to GND)

8. Warm up engine **97°C {208°F} or more** and verify that the cooling fans are operating at low speed.
    - If cooling fans are not operating, inspect for the following:
        - Cooling fan relay No.1 (stuck open)
        - Wiring harnesses and connectors (battery —cooling fan relay No.1—cooling fan relay No.2) (open)
        - Wiring harnesses and connectors (main relay—cooling fan relay No.1 PCM terminal 5X) (open)
    - If cooling fan relay No.1 is operating at high speed, inspect for the following:
        - Cooling fan relay No.2 (stuck close)

9. Stop the engine.

10. Disconnect the ECT sensor.

    **NOTE:**

    - When the ECT sensor connector is disconnected, the PCM stores DTC P0118.

11. Start the engine and let it idle.

12. Verify that the cooling fans are operating at high speed.
    - If the cooling fans are operating at low speed, inspect for the following:
        - Cooling fan relay No.2 (stuck open)
        - Cooling fan relay No.3 (stuck open)
        - Wiring harnesses and connectors (open circuit at battery—cooling fan relay No.3—cooling fan No.2—GND)
        - Wiring harnesses and connectors (open circuit at main relay—cooling fan relay No.2 —PCM terminal 5AD)
        - Wiring harnesses and connectors (open circuit at main relay—cooling fan relay No.3 —PCM terminal 5AD)

- If cooling fan No.1 is operating at high speed, but cooling fan No.2 is not operating, inspect for the following:
  - Cooling fan relay No.3 (stuck open)
  - Wiring harnesses and connectors (open circuit at main relay—cooling fan relay No.3 —PCM terminal 5AD)
- If cooling fan No.2 is operating at high speed, but cooling fan No.1 is not operating, inspect for the following:
  - Cooling fan relay No.2 (stuck open)
  - Wiring harnesses and connectors (open circuit at main relay—cooling fan relay No.2 —PCM terminal 5AD)

13. Clear the DTC from the PCM memory.

| Notes: |
| --- |

## Drive-by-wire Control System Inspection

### Engine coolant temperature compensation inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Select the following PIDs:
   - ECT
   - IAT
   - RPM

3. Verify that the engine is cold, then start the engine.

4. Verify that the engine speed decreases as the engine warms up.
   - If the engine speed does not decrease or decreases slowly, inspect the following:
     - ECT sensor and related wiring harness

       (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION .)

     - Throttle body and related wiring harness

       (See THROTTLE BODY INSPECTION .)

**Load compensation inspection**

1. Start the engine and run it at idle.

2. Connect the WDS or equivalent to the DLC-2.

3. Verify that P0506 or P0507 is not displayed.
   - If P0506 or P0507 are displayed, perform DTC inspection.

     (See DTC TABLE .)

4. Select the RPM PID.

   **NOTE:**

   - Excludes temporary idle speed drop just after the loads are turned on.

5. Verify that the engine speed is within the specification under each load condition.
   - If load condition is not as specified, inspect the following:
     - A/C switch and related wiring harness

       (See CLIMATE CONTROL UNIT INSPECTION .)

     - Fan switch and related wiring harness

       (See CLIMATE CONTROL UNIT INSPECTION .)

     - CAN signal and related wiring harness (P/S operation signal)

Engine speed

| Load condition | | Engine speed (rpm)*1 | |
|---|---|---|---|
| | | MT | AT |
| No load | | 750—850 | 760—860 |
| E/L operating*2 | | 750—850 | 780—880 |
| A/C operating*3 | Refrigerant pressure low*4 | 760—860 | 780—880 |

| | | | |
|---|---|---|---|
| | Refrigerant pressure high[*5] | 790—890 | 800—900 |
| A/C operating (refrigerant pressure low[*4] ) and E/L operating[*2] | | 790—890 | 780—880 |

*1

Neutral or P position

*2

Headlight switch and rear window defroster switch is turned on. Blower motor is operating (fan switch 2nd or above).

*3

A/C switch and fan switch are on.

*4

Refrigerant pressure switch (medium pressure) is off.

*5

Refrigerant pressure switch (medium pressure) is on.

### Throttle position (TP) sweep inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Turn the ignition switch to the ON position.

3. Verify that none of the following DTC are displayed:
   - P0122, P0123, P0222, P0223, P2101, P2106, P2107, P2108, P2109, P2112, P2119, P2122, P2123, P2127, P2128, P2135, P2136, P2138
     - If any one DTC is displayed, perform DTC inspection.

4. Access the TP_REL PID.

5. Verify that the PID reading is within the CTP value. (See PCM INSPECTION .)
   - If the PID reading is out of range, perform the following:
     - Remove the air duct from throttle valve body.
     - Verify that the throttle valve opens when accelerator pedal is depressed.
       - If the throttle valve opens, inspect the throttle position sensor and the related wiring harness.
       - If the throttle valve does not open, inspect the throttle actuator control motor and the related wiring harness.

6. Gradually depress the throttle pedal and verify that the PID reading increases lineally.
   - If the PID reading drops momentarily, inspect the following:
     - Throttle position sensor

7. Fully depress the throttle pedal and verify that the PID reading is within the WOT value. (See PCM INSPECTION .)
   - If the PID reading is out of range, perform the following:
     - Remove the air duct from throttle valve body.
     - Verify that the throttle valve opens when throttle pedal is depressed.
       - If the throttle valve opens, inspect the throttle position sensor and the related wiring harness.
       - If the throttle valve does not open, inspect the throttle actuator control motor and the related wiring harness.

## Evaporative System Test

### Evaporative system test outline

- To verify that the problem has been fixed properly after repairs, the run Drive Cycle or evaporative system test must be performed.

### Evaporative system leak inspection using leak tester

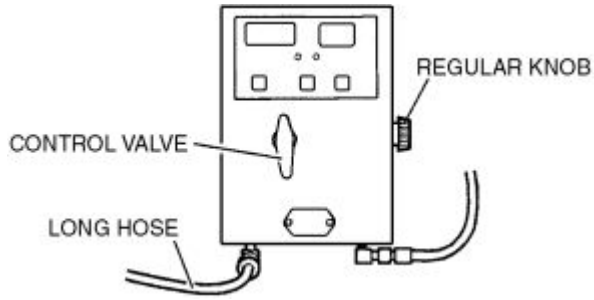
1. Perform the following **SST** (Evaporative Emission System Tester MZ254AT3641) self-test:

   **NOTE:**

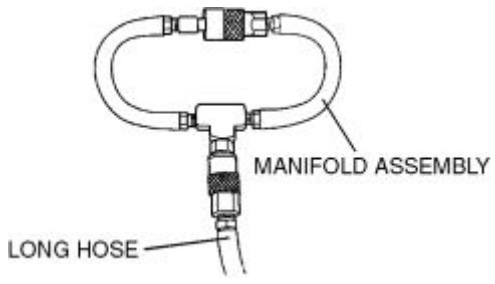
   - If the tester does not work correctly during the self-test, refer to the tester operators manual for more detailed self test procedures.

   b. Verify that the gas cylinder valve is closed and the control valve located on the tester is in the TEST position. All tester displays should be off at this time.

   c. Connect the long hose (part of **SST** ) to the tester.




   d. Connect the manifold assembly (part of **SST** ) to the long hose as shown.




   e. Open the gas cylinder valve and verify the gas cylinder regulator left gauge reads **69.0 to 82.6 kPa {0.71 to 0.84 kgf/cm$^2$ , 10 to 12 psi}** (preset at factory).
      - If not, refer to the tester operators manual to contact tester manufacturer.

f. Press the ON/OFF switch to turn on the **SST** and make sure the left display reads **0.0** .

g. Turn the control valve on the tester to the FILL position.

h. Verify the left display reading is within **35.4 to 35.5 cm {13.9 to 14.0 in}** of water.
   - If not, adjust the pressure using the regulator knob located on the right side of the tester.

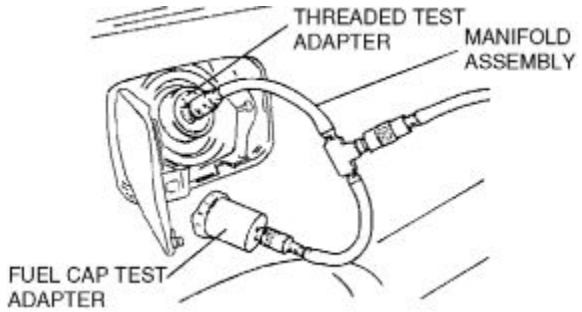
i. Turn the control valve to TEST position and press the START switch.

j. After the **2-min** countdown (left display) is completed, the right display shows the total pressure loss for that period. A **0.2 cm {0.5 in}** of water loss is acceptable on the self-test.
   - If the loss is **0.2 cm {0.5 in} or more** of water, do one or more self-tests. If the test repeatedly fails, check for leaks using the ultrasonic leak detector (part of **SST** ).

2. Press the RESET switch to set the left display reading to **0.0** .

3. Connect the fuel cap test adapter (part of **SST** ) to the manifold assembly and fuel-filler cap from the vehicle.
   - If the fuel-filler cap is not a genuine part, replace it.

4. Connect the threaded test adapter (part of **SST** ) to the manifold assembly and fuel-filler neck.



5. Connect the WDS or equivalent to the DLC-2.

6. Turn the ignition switch to the ON position (Engine off).

7. Request the PCM for on-board device control (Mode 08) using the WDS or equivalent to close the change-over valve (COV) in the EVAP system leak detection pump.

   **NOTE:**

   - The COV closes for **10 min unless** any of the following any actions are done:
     - The engine is started.
     - The ignition switch is turned off.

8. Turn the control valve to the FILL position.

9. Wait ( **maximum 40 s** ) until the left display reads **34.3 to 35.5 cm {13.5 to 14 in}** of water.
   - If the reading is slightly below, adjust it using the regulator knob.
   - If the reading is far below, the EVAP system has a large leak. Check for leaks (using the ultrasonic leak detector if necessary) and repair.

10. Turn the control valve to the TEST position and press the START switch.

11. After the **2 min** countdown (left display) is completed, check the test result (the failed/passed light on the tester).
    - If the green light illuminates, the EVAP system is OK.
    - If the red light illuminates, the EVAP system has leakage. Check for leaks using the ultrasonic leak detector and repair.

12. Close the gas cylinder valve.

13. Turn the control valve to the FILL position.

14. Press the ON/OFF switch to turn off the tester.

## Fuel Injector Operation Inspection

### Fuel injector (FP1) (RP1) operation inspection

1. Start the engine and let it at idle.

2. Inspect fuel injector control signal wave profile at the following PCM terminals.

   (See PCM INSPECTION .)

   - Terminal 2M (front rotor)
   - Terminal 2J (rear rotor)

3. If not as specified, inspect the following and repair or replace defective parts.

   **Front rotor:**

   - Open circuit in wiring between fuel injector (FP1) terminal A and main relay terminal C
   - Open or short circuit in wiring between fuel injector (FP1) terminal B and PCM terminal 2M
   - Open or short internal circuit or fuel injector (FP1)

   **Rear rotor:**

   - Open circuit in wiring between fuel injector (RP1) terminal A and main relay terminal C
   - Open or short circuit in wiring between fuel injector (RP1) terminal B and PCM terminal 2J
   - Open or short internal circuit of fuel injector (RP1)

### Fuel injector (FS) (RS) operation inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Start the engine and let it at idle.

3. Access the RPM PID.

4. Verify that the fuel injector control wave is not outputted at the following PCM terminal.

   (See PCM INSPECTION .)

   - Terminal 2G (front rotor)
   - Terminal 2D (rear rotor)

5. If the fuel injector control signal is outputted, inspect the following and repair or replace defective parts.
   - MAF sensor
   - TP sensor
   - IAT sensor

6. Inspect the fuel injector control signal wave profile at the following PCM terminals while the RPM PID is **5,000 rpm or over** .

   (See PCM INSPECTION .)

   - Terminal 2G (front rotor)
   - Terminal 2D (rear rotor)

7. If not as specified, inspect the following and repair or replace defective parts.

   **Front rotor:**

   - Open circuit in wiring between fuel injector (FS) terminal A and main relay terminal C
   - Open or short circuit in wiring between fuel injector (FS) terminal B and PCM terminal 2G
   - Open or short internal circuit of fuel injector (FS)

   **Rear rotor:**

- Open circuit in wiring between fuel injector (RS) terminal A and main relay terminal C
- Open or short circuit in wiring between fuel injector (RS) terminal B and PCM terminal 2D
- Open or short internal circuit or fuel injector (RS)

Notes:

### Fuel injector (FP2) (RP2) operation inspection (13B-MSP (High Power))

1. Connect the WDS or equivalent to the DLC-2.

2. Start the engine and let it at idle.

3. Access the RPM PID.

4. Verify that the fuel injector control wave is not outputted at the following PCM terminals.

   (See PCM INSPECTION .)

   - Terminal 3A (front rotor)
   - Terminal 3D (rear rotor)

5. If the fuel injector control signal is outputted, inspect the following and repair or replace defective parts.
   - MAF sensor
   - TP sensor
   - IAT sensor

6. Inspect the fuel injector control signal wave profile at the following PCM terminals while RPM PID is **5,000 rpm or more** .

   (See PCM INSPECTION .)

   - Terminal 3A (front rotor)
   - Terminal 3D (rear rotor)

7. If not as specified, inspect the following and repair or replace defective parts.

   **Front rotor:**

   - Open circuit in wiring between fuel injector (FP2) terminal A and main relay terminal C
   - Open or short circuit in wiring between fuel injector (FP2) terminal B and PCM terminal 3A
   - Open or short internal circuit of fuel injector (FP2)

   **Rear rotor:**

   - Open circuit in wiring between fuel injector (RP2) terminal A and main relay terminal C
   - Open or short circuit in wiring between fuel injector (RP2) terminal B and PCM terminal 3D

- Open or short internal circuit or fuel injector (RP2)

| Notes: |
| --- |

## Fuel Pump Control System Inspection

1. Crank the engine and verify that the fuel pump relay operation sound is heard.

2. If the operation sound is not heard, inspect the following:
    - Fuel pump relay
    - Wiring harness and connectors (Main relay— fuel pump relay—PCM terminal 5P)

| Notes: |
| --- |

## Fuel Pump Operation Inspection

**CAUTION:**

- Connecting the wrong check connector terminal may possibly cause malfunction. Carefully connect the specified terminal only.

1. Short the check connector terminal F/P to the body GND using a jumper wire.

2. Remove the fuel-filler cap.

3. Turn the ignition switch to the ON position.

4. Verify that the fuel pump operation sound is heard.
    - If no operation sound heard, proceed to next step.

5. Measure the voltage at the wiring harness side fuel pump connector terminal B.

    **Specification**

    - 8.0 — 11.5 V (Ignition switch at on)
    - If the voltage is as specified, inspect the following:
        - Fuel pump continuity
        - Fuel pump GND
        - Wiring harness between fuel pump relay and PCM terminal 5P
    - If not as specified, inspect the following:
        - Fuel pump relay
        - Fuel pump resister
        - Wiring harness and connector (Main relay —fuel pump relay—fuel pump resister — fuel pump)

### Fuel Pump Speed Control Operation Inspection

1. Perform the fuel pump operation inspection.

2. Verify that fuel pump relay operation sound is heard, while cranking the engine.
    - If operation sound is not heard, inspect the following:
        - Fuel pump relay
        - Wiring harnesses and connectors (Main relay—fuel pump relay—PCM terminal 4M)

3. Remove the fuel-filler cap.

4. Verify that the fuel pump unit operation sound frequency at cranking is higher than during idle.
    - If it cannot verified, inspect for the following:
        - Fuel pump resister
        - Fuel pump relay
        - Wiring harnesses and connectors (open circuit at fuel pump relay terminal C—fuel pump terminal B)

## Input Signal System Investigation Procedure

1. Find an unusual signal. (See Finding unusual signals .)

2. Locate its source. (See Locating the source of unusual signals .)

3. Repair or replace the defective part.

4. Confirm that the unusual signal has been erased.

### Finding unusual signals

While referring to ON-BOARD DIAGNOSTIC TEST , use the PID/DATA monitor and record function to inspect the input signal system relating to the problem.

1. Start the engine and idle the vehicle. You can assume that any signals that are out of the specifications by a wide margin are unusual.

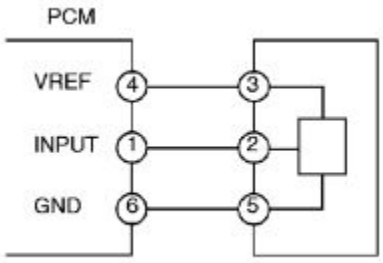
2. When recreating the problem, any sudden change in monitor input signals that is not consciously created by the driver can be judged as unusual.

### Locating the source of unusual signals

**CAUTION:**

- Compare the WDS or equivalent monitor voltage with the measurement voltage using the digital measurement system function. If you use another tester, misreading may occur.
- When measuring voltage, attach the tester GND to the GND of the PCM that is being tested, or to the engine itself. If this is not done, the measured voltage and actual voltage may differ.
- After connecting the pin to a waterproof coupler, confirming continuity and measuring the voltage, inspect the waterproof connector for cracks. If there are any, use sealant to fix them. Failure to do this may result in deterioration of the wiring harness or terminal from water damage, leading to problems with the vehicle.

### Hall or piezo-electric type (TP sensor, APP sensor, APV position sensor and BARO sensor)




### Investigate the input signal system for hall or piezo-electric type

1. When you get an unusual signal, measure the #1 PCM terminal voltage.
    - If the #1 terminal voltage and the WDS or equivalent monitor voltage are the same, proceed to the next step.
    - If there is a difference of **0.5 V or more** , inspect for the following points concerning the PCM connector:
        - Female terminal opening is loose.
        - Coupler (pin holder) damage
        - Pin discoloration (blackness)
        - Wiring harness/pin crimp is loose or disconnected.

2. Measure the #2 sensor terminal voltage.
    - If there is a **0.5 V or more** difference between the sensor and the WDS or equivalent voltages, inspect the wiring harness for an open or short circuits.
    - If the sensor and the WDS or equivalent voltages are the same, inspect for the following points concerning the sensor connector:
        - Female terminal opening is loose.
        - Coupler (pin holder) damage
        - Pin discoloration (blackness)
    - If there are no problems, proceed to next investigation.

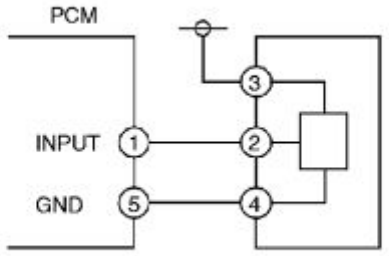
### Investigate the standard power supply system for hall or piezo-electric type

- Confirm that the #3 terminal is at **5 V** .
    - If the measured voltage on the #3 terminal is **5 V** , inspect the following points on the sensor connector.
    - If there is no problem, inspect for the following:
        - Female terminal opening loose
        - Coupler (pin holder) damage
        - Pin discoloration (blackness)
    - If the #3 terminal measures other than **5 V** , inspect for the following:
        - Open or short circuit in wiring harness
        - Wiring harness/pin crimp is loose or disconnected.

**Investigate the GND system for hall or piezo-electric type**

- Confirm that terminal sensor #5 is at **0 V** .
  - If it is at **0 V** , inspect the sensor.
    - If necessary, replace the sensor.
  - If not, inspect for the following:
    - Open or short circuit in wiring harness
    - Female terminal opening is loose causing an open or short circuit in wiring harness
    - Coupler (pin holder) damage
    - Pin discoloration (blackness)
    - Wiring harness/pin crimp is loose or disconnected.

**Hot wire type (fuel tank level sensor and mass air flow (MAF) sensor)**




**Investigate the GND system for hot wire type**

- Confirm that terminal sensor #4 is at **0 V** .
  - If it is at **0 V** , inspect the sensor.
    - If necessary, replace the sensor.
  - If not at **0 V** , inspect for the following:
    - Open circuit in wiring harness
    - Female terminal opening is loose.
    - Coupler (pin holder) damage
    - Pin discoloration (blackness)
    - Wiring harness/pin crimp is loose or disconnected.

**Investigate the input signal system for hot wire type**

1. When you get an unusual signal, measure the #1 PCM terminal voltage.
   - If the #1 terminal voltage and the WDS or equivalent monitor voltage are the same, proceed to the next step.
   - If there is a difference of **0.5 V or more** , inspect for the following points concerning the PCM connector:
     - Female terminal opening is loose.
     - Coupler (pin holder) damage
     - Pin discoloration (blackness)
     - Wiring harness/pin crimp is loose or disconnected.

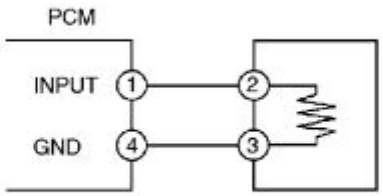
2. Measure the #2 sensor terminal voltage.

- If there is a **0.5 V or more** difference between the sensor and the WDS or equivalent voltages, inspect the wiring harness for an open or short circuits.
- If the sensor and the WDS or equivalent voltages are the same, inspect the following points concerning the sensor connector:
  - Female terminal opening is loose.
  - Coupler (pin holder) damage
  - Pin discoloration (blackness)
  - Wiring harness/pin crimp is loose or disconnected.
- If there are no problems, proceed to next investigation.

#### Investigate the electrical supply system for hot wire type

- Confirm that the sensor #3 terminal is **B+** .
  - If the measured voltage on the #3 terminal is **B+** , inspect the following points on the sensor connector.
  - If there is no problem, inspect for the following:
    - Female terminal opening is loose.
    - Coupler (pin holder) damage
    - Pin discoloration (blackness)
  - If the #3 terminal measures other than **B+** , inspect the following:
    - Open or short circuit in wiring harness
    - Wiring harness/pin crimp is loose or disconnected.

#### Thermistor type (IAT sensor and ECT sensor)



### Investigate the input signal system for thermistor type

1. When you get an unusual signal, measure the #1 PCM terminal voltage.
    - If the #1 terminal voltage and the WDS or equivalent monitor voltage are the same, proceed to the next step.
    - If there is a difference of **0.5 V or more** , inspect the following points concerning the PCM connector:
        - Female terminal opening loose
        - Coupler (pin holder) damage
        - Pin discoloration (blackness)
        - Wiring harness/pin crimp is loose or disconnected.

2. Measure the #2 sensor terminal voltage.
    - If there is a **0.5 V or more** difference between the sensor and the WDS or equivalent voltages, inspect the wiring harness for an open or short circuits.
    - If the sensor and the WDS or equivalent voltages are the same, inspect the following points concerning the sensor connector:
        - Female terminal opening is loose.
        - Coupler (pin holder) damage
        - Pin discoloration (blackness)
        - Wiring harness/pin crimp is loose or disconnected.
    - If there are no problems, proceed to next investigation.

### Investigate the GND system for thermistor type

- Confirm that terminal sensor #3 is at **0 V** .
    - If it is at **0 V** , inspect the sensor. If necessary, replace the sensor.
    - If not, inspect for the following:
        - Open circuit in wiring harness
        - Female terminal opening is loose.
        - Coupler (pin holder) damage
        - Pin discoloration (blackness)
        - Wiring harness/pin crimp is loose or disconnected.

## Intake Manifold Vacuum Inspection

1. Verify air intake hoses are installed properly.

2. Start the engine and run it at idle.

3. Disconnect the vacuum hose between the intake manifold and purge solenoid valve from the intake manifold side.

4. Connect a vacuum gauge to the intake manifold and measure the intake manifold vacuum.
   - If not as specified, inspect the following:
     - Air suction at throttle body and intake manifold installation points
     - Fuel injector insulator
     - Engine compression

       (See COMPRESSION INSPECTION .)

5. **Specification**
   - MT: −66.7— −56.0 kPa {−500.24— −420.1 mmHg, −19.6— −16.6 inHg}
   - AT: −67.3— −53.4 kPa {−504.7— −400.6 mmHg, −19.8— −15.8 inHg}

**NOTE:**

- Air suction can be located by engine speed change when lubricant is sprayed on the area where suction is occurring.

## Main Relay Operation Inspection

1. Verify that the main relay clicks when the ignition switch is turned to the ON position and off.
    - If there is no operation sound, inspect the following:
        - Main relay (See RELAY INSPECTION .)
        - Wiring harness and connector between battery and main relay terminal A.
        - Wiring harness and connector between PCM terminal 5AC, 5AF and main relay terminal C.
        - Wiring harness and connector between PCM terminal 4E and main relay terminal E.
        - Wiring harness and connector between PCM terminal 4Q and engine fuse.

| Notes: |
| --- |

## Metering Oil Pump Control Inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Verify that DTC P1686, P1687 or P1688 is not displayed.
   - If DTC P1686, P1687, P1688 are displayed, perform DTC inspection.

     (See DTC TABLE .)

3.
4. Verify that the metering oil pump motor coil resistance is as specified.

   (See Metering Oil Pump Resistance Inspection .)

5. Verify that there is continuity between the metering oil position switch terminal A and C.

6. Measure the voltage of PCM terminal 2N at idle.

   **Specification**

   - 0 V
   - If not as specified, inspect for the following wiring harnesses and connectors:
     - Between PCM terminal 2N and metering oil pump position switch terminal A
     - Between PCM terminal 1U and metering oil pump position switch terminal C

7. Inspect for the following and repair or replace according to inspection results.
   - Oil pipe (leakage or crack between metering oil pump and oil nozzle)
   - Oil nozzle
   - Air bleed hose (leakage, clogged, damage or poor connection)

## Purge Control System Inspection

1. Start the engine.

2. Disconnect the vacuum hose at quick release connector.

3. Put a finger to the purge solenoid valve and verify that there is no vacuum applied when the engine is cold.
   - If there is vacuum, inspect the following:
     - Wiring harness and connectors (Purge solenoid valve—PCM terminal 2P)
     - Purge solenoid valve

4. Warm up the engine to the normal operating temperature.

5. Stop the engine.

6. Connect the WDS or equivalent to the DLC-2 and verify that the DTC P0443 is shown. Perform the DTC inspection. (See DTC TABLE .)

7. Turn the ignition switch to the ON position.

8. Select the ECT PID.

9. Verify that the engine is warmed up completely.
   - If the engine is not warmed up completely, perform the ECT sensor inspection.

10. Set the vehicle on the dynamometer or chassis roller.

    **WARNING:**

    - When the dynamometer or chassis roller is operating, there is a possibility that the operator may come into contact with or be caught up in the rotating parts, leading to serious injuries or death.

When performing work while the dynamometer or chassis roller is operating, be careful not to come into contact with or be caught up in any of the rotating parts.

11. Drive the vehicle at an engine speed of **approx. 2000 rpm** for **30 s or more.**

12. Put a finger to the purge solenoid valve and verify that there is no vacuum applied during above step 2.
    - If there is no vacuum, inspect the following:
        - Wiring harness and connector (Main relay – purge solenoid valve—PCM terminal 2P)
        - Purge solenoid valve
        - MAF, APP1, APP2, TP_REL and LOAD PIDs
    - If there is vacuum, inspect the following:
        - Vacuum hose (Purge solenoid valve—charcoal canister)

Notes:

## Rotor Balance Test

**WARNING:**

- High-voltage in ignition system can cause strong electrical shock which can result in serious injury. Avoid direct contact to the vehicle body during the rotor balance test.
- High-voltage spark will negatively effect the engine control. To prevent this, ground the high-tension leads and keep away from sensors and wiring harnesses.

**CAUTION:**

- Rotor balance test can overheat and damage the three-way catalytic converter.

**NOTE:**

- The purpose of the rotor balance test is to find weak or non-contributing rotors. In this test, the high-tension leads are disconnected one by one to shut off the ignition on each rotor with the engine running. By carrying out the rotor balance test, a total determination of the compression pressure, air/fuel mixture, and ignition is possible.

1. Connect the WDS or equivalent to the DLC-2.

2. Access the RPM PID.

3. Start the engine.

4. Remove high-tension lead from each rotor and monitor the RPM PID value.

5. If the RPM PID does not drop, inspect the following:
    - Fuel injector (FP1) (RP1)
    - Spark plugs
    - High-tension leads
    - Ignition coil
    - Compression pressure

## Secondary Air Injection (AIR) System Inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Verify that DTC P2257, P2258, P2259 or P2260 is not displayed.
   - If DTC P2257, P2258, P2259 or P2260 are displayed, perform DTC inspection.

     (See DTC TABLE .)

3.
4. Access the ECT PID.

5. Start the engine and warm it up to the normal operating temperature.

6. Cool down the engine to that the ECT PID is **30°C {86°F} or less** .

7. Turn the ignition switch to the ON position.

8. Verify that the PCM terminal 1O voltage is **B+** and the AIR pump is not operating.
   - If the PCM terminal 1O voltage is not B+, inspect and repair or replace open or short circuit between PCM terminal 1O and AIR solenoid valve connector B.
   - If the AIR pump is operating inspect for the following:
     - AIR pump relay (stuck closed)
     - Wiring harnesses and connectors (Main relay terminal C—AIR pump relay—PCM terminal 4O/AIR PUMP fuse—AIR pump relay—AIR pump)

9. Start the engine.

10. Verify that the AIR pump is operating and the PCM terminal 1O voltage is **0 V** after the engine is started.
    - If the AIR pump does not operate, inspect for the following:
      - AIR pump relay (stuck open)
      - AIR pump (internal malfunction)
      - Wiring harnesses and connectors (Main relay terminal C—AIR pump relay—PCM terminal 4O/AIR PUMP fuse—AIR pump relay—AIR pump—GND)
    - If PCM terminal 1O voltage is not **0 V** , inspect and repair or replace open or short circuit between PCM terminal 1O and AIR solenoid valve connector B.

- If the AIR pump operates and PCM terminal 1O is **0 V** , inspect for the following:
  - AIR pump (pressure)
  - AIR solenoid valve (stuck or closed)
  - Vacuum hose (Intake manifold—vacuum tank—AIR solenoid valve – AIR control valve)
  - Secondary air passage (AIR pump—AIR control valve—exhaust manifold)

Notes:

### Secondary Shutter Valve (SSV) Operation Inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Access the RPM PID.

3. Start the engine.

4. Inspect rod operation under the following conditions: Rod operation

| **Engine speed** | **6,000 rpm** | |
|---|---|---|
| | **Below** | **Above** |
| **Shutter valve actuator** | Not operate | Operate |

- If the rod operation is not specified, inspect as follows:

b. Verify that DTC P0661, P0662 or P2070 is not displayed.
   - If DTC P0661, P0662 or P2070 are shown, perform DTC inspection.

     (See DTC TABLE .)

c.
d. Inspect the SSV solenoid valve.

   (See SECONDARY SHUTTER VALVE (SSV) SOLENOID VALVE INSPECTION .)

   - If the SSV solenoid valve is not normal, replace the SSV solenoid valve.
   - If the SSV solenoid valve is normal, inspect the following:
     - Vacuum hose and vacuum chamber for looseness or damage
     - Shutter valve actuator

       (See SECONDARY SHUTTER VALVE (SSV) ACTUATOR INSPECTION .)

     - Shutter valve stuck open or closed

### Spark Test

1. Release the fuel line pressure. (See BEFORE REPAIR PROCEDURE .)

2. Remove the fuel pump relay pump relay.

3. Verify that each high-tension lead and the connector is connected properly.

4. Inspect the ignition system using the following procedure:

   **WARNING:**

   - High voltage in the ignition system can cause strong electrical shock which can result in serious injury. Avoid direct contact to the vehicle body during the following spark test.

| STEP | INSPECTION | RESULTS | ACTION |
|---|---|---|---|
| 1 | Disconnect the high-tension lead from the spark plugs.<br><br>Remove the spark plugs.<br><br>Reconnect the spark plugs to the high-tension lead.<br><br>Ground the spark plugs to the engine.<br><br>Is a strong blue spark visible at each spark plug while cranking? | Yes | Ignition system is normal. |
| | | No | **Some spark plugs do not spark:**<br><br>Go to the next step.<br><br>**All spark plugs do not spark:**<br><br>Go to Step 5. |
| 2 | Inspect the spark plugs for damage, wear, carbon deposits and proper plug gap.<br><br>Are the spark plugs normal? | Yes | Go to the next step. |
| | | No | Replace the spark plugs, then go to Step 1. |
| 3 | Inspect the high-tension leads for insulation damage, looseness, shorting or other damage.<br><br>Are the high-tension leads normal? | Yes | Go to the next step. |
| | | No | Replace the high-tension leads, then go to Step 1. |
| 4 | Inspect the following wiring harnesses for an open or short circuit: | Yes | Inspect and replace the ignition coil.<br><br>(See IGNITION COIL INSPECTION .) |

| | | | |
|---|---|---|---|
| | • Front trailing ignition coil terminal A—PCM terminal 2AD<br>• Front leading ignition coil terminal A—PCM terminal 2AA<br>• Rear trailing ignition coil terminal A—PCM terminal 2AC<br>• Rear leading ignition coil terminal A—PCM terminal 2Z<br><br>Are the wiring harnesses normal? | No | Repair or replace the malfunctioning parts, then go to Step 1. |
| 5 | Measure the voltage at terminal C in ignition coil.<br><br>Is the voltage reading **B+** ? | Yes | Go to the next step. |
| | | No | Inspect the power supply circuit of ignition coil. |
| 6 | Does the PCM connector or the ignition coil connector have poor connection? | Yes | Repair or replace the connector, then go to Step 1. |
| | | No | Go to the next step. |
| 7 | Are the following items normal?<br><br>• Eccentric shaft position sensor and drive belt pulley<br>• PCM terminal 2Z/2AA/2AC/2AD voltage<br><br>**Specification**<br><br>○ **Approx. 1.5 V** | Yes | Inspect for an open or short circuit in the wiring harness and the connector of the eccentric shaft position sensor. |
| | | No | Repair or replace the malfunctioning parts, then go to Step 1. |

5. Install the fuel pump relay.

### Variable Dynamic Effect Intake-air (VDI) Operation Inspection

1. Connect the WDS or equivalent to the DLC-2.

2. Access the RPM PID.

3. Start the engine.

4. Inspect the rod operation under the following condition: Rod operation

| **Engine speed** | **7,250 rpm** | |
|---|---|---|
| | **Below** | **Above** |
| **Shutter valve actuator** | Not operate | Operate |

- If the rod operation is not as specified, inspect as follows:

b. Stop the engine.

c. Connect the WDS or equivalent to the DLC-2.

d. Verify that DTC P0076 or P0077 is not displayed.
   - If DTC P0076 or P0077 is shown, perform DTC inspection.

     (See DTC TABLE .)

e.
f. Inspect the VDI solenoid valve.

   (See VARIABLE DYNAMIC EFFECT INTAKE-AIR (VDI) SOLENOID VALVE INSPECTION .)

   - If the VDI solenoid valve is not normal, replace the VDI solenoid valve.
   - If the VDI solenoid valve is normal, inspect the following:
     - Vacuum hose and vacuum chamber for looseness or damage
     - Shutter valve actuator

(See VARIABLE DYNAMIC EFFECT INTAKE-AIR (VDI) ACTUATOR INSPECTION .)

- Shutter valve stuck open or closed

| Notes: |
| --- |

## Variable Fresh Air Duct (VFAD) Control System Operation Inspection (13B-MSP (High Power))

1. Connect the WDS or equivalent to the DLC-2.

2. Access the RPM PID.

3. Start the engine.

4. Inspect shutter valve operation under the following conditions.VFAD shutter valve operation

| | | |
|---|---|---|
| Engine speed | 5,000 rpm | |
| | Below | Above |
| Shutter valve | Close | Open |

- If the shutter valve operation is not as specified, inspect as follows:

b. Verify that DTC P1410 is not displayed.
   - If DTC P1410 is shown, perform DTC inspection.

     (See DTC TABLE .)

c.
d. Inspect VFAD solenoid valve.

   (See VARIABLE FRESH AIR DUCT (VFAD) SOLENOID VALVE INSPECTION (13B-MSP (HIGH POWER)) .)

   - If the VFAD solenoid valve is not normal, replace VFAD solenoid valve.
   - If the VFAD solenoid valve is normal, inspect the following:
     - Vacuum hose looseness or damage
     - Vacuum chamber cracked or damaged
     - Shutter valve actuator

       (See VARIABLE FRESH AIR DUCT (VFAD) ACTUATOR INSPECTION (13B-MSP (HIGH POWER)) .)

     - Shutter valve is stuck open or closed.