FOREWORD

This repair manual has been prepared to provide information covering general service repairs for the Emission Control System of the 2F Engine.

Applicable models:
1981 FJ40L series
1981 FJ40LV series
1981 FJ60LG series

For service of the 2F Engine, refer to the following repair manual.

2F Engine Repair Manual (Pub. No. 98126E)

All information contained in this manual is the most up-to-date at the time of publication. However specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION
GENERAL PRECAUTIONS

1. Know the importance of periodic maintenance.
   (a) Every service item in the periodic maintenance list must be performed.
   (b) Failing to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. Listen to the customer's comments carefully.
   Always determine exactly what the customer complaint is, if any, and verify it before proceeding with repairs.

3. Determine if you have an engine or emission system problem.
   (a) Engine problems are usually not caused by the emission control systems.
   (b) When troubleshooting, always check the engine and the ignition system first.

4. Check hose and wiring connections first.
   The most frequent cause of problems is simply a bad connection in wiring or vacuum hoses. Always make sure the connections are secure and correct.

5. Observe the following precautions to avoid damage to the parts:
   (a) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
   (b) To pull apart electrical connectors, pull on the connector itself, not the wires.
   (c) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
   (d) When steam cleaning an engine, protect the distributor, coil, air filter, carburetor intake, air pump and EGR vacuum modulator from water.
   (e) Never use an impact wrench to remove or install thermo switches or thermo sensors.
   (f) When checking for continuity at a wire connector, insert the tester probe carefully to prevent terminals from bending.
   (g) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter instead. Once the hose has been stretched, it may leak.

6. Tag hoses before disconnecting them:
   (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
   (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

PRECAUTIONS FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

WARNING: If large amounts of unburned gasoline flow into the catalytic converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. Use only unleaded gasoline.

2. Avoid prolonged idling.
   Avoid running the engine at fast idle speed for more than 10 minutes or at idle speed for more than 20 minutes.

3. Avoid spark jump test.
   (a) Spark jump only when absolutely necessary. Perform this test as rapidly as possible.
   (b) While testing, never race the engine.

4. Avoid prolonged engine compression measurement.
   Engine compression tests must be made as rapidly as possible.

5. Do not run engine when fuel tank is nearly empty.
   This may cause the engine to misfire and create an extra load on the catalytic converter.

6. Avoid coating with ignition turned off and prolonged engine braking.

7. Do not dispose of used catalytic converter along with parts contaminated with gasoline or oil.
ABBREVIATIONS USED IN THIS MANUAL

ABV  Air Bypass Valve
ACV  Air Control Valve
AI   Air Injection
ASV  Air Switching Valve
BTDC Before Top Dead Center
BVS V Bi-metal Vacuum Switching Valve
CS   Choke Breaker
EGR  Exhaust Gas Recirculation
EVAP Evaporative (Emission Control)
EX   Exhaust (manifold or valve) or Except
HAC  High Altitude Compensation
HAI  Hot Air Intake
HIC  Hot Idle Compensation
IN   Intake (manifold or valve) or Inch
IG   Ignition
MAS  Mixture Adjusting Screw
OC   Oxidation Catalyst
PCV  Positive Crankcase Ventilation
SC   Spark Control
SST  Special Service Tool
S/W  Switch
T/M  Transmission
VCV  Vacuum Control Valve
VSV  Vacuum Switching Valve
VTV  Vacuum Transmitting Valve
W/   With
W/O  Without
# ENGINE OVERHEATING

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine overheats</td>
<td>Cooling system faulty</td>
<td>Troubleshoot cooling system</td>
<td>4-2</td>
</tr>
<tr>
<td></td>
<td>Incorrect ignition timing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## HARD STARTING

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine will not crank or cranks slowly</td>
<td>Starting system faulty</td>
<td>Troubleshoot starting system</td>
<td></td>
</tr>
<tr>
<td>Engine will not start/ Hard to start</td>
<td>No fuel supply to carburetor</td>
<td>Check fuel line</td>
<td></td>
</tr>
<tr>
<td>(cranks okay)</td>
<td>Carburetor problems</td>
<td>Repair as necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Choke operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Flooding</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Needle valve sticking or clogged</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Vacuum hose disconnected or damaged</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition problems</td>
<td>Ignition coil</td>
<td>Inspect coil</td>
<td>3-4</td>
</tr>
<tr>
<td></td>
<td>Igniter</td>
<td>Inspect igniter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distributor</td>
<td>Inspect distributor</td>
<td></td>
</tr>
<tr>
<td>Spark plugs faulty</td>
<td>Spark plugs</td>
<td>Inspect plugs</td>
<td></td>
</tr>
<tr>
<td>Ignition wirings disconnected or</td>
<td>Ignition wirings</td>
<td>Repair as necessary</td>
<td>3-13</td>
</tr>
<tr>
<td>broken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum leaks</td>
<td>PCV line</td>
<td>Repair as necessary</td>
<td>3-4</td>
</tr>
<tr>
<td></td>
<td>EGR line</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intake manifold</td>
<td>Check compression</td>
<td></td>
</tr>
<tr>
<td>Compression low</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## ROUGH IDLING

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough idle or stalls</td>
<td>Spark plugs faulty</td>
<td>Inspect plugs</td>
<td>4-2</td>
</tr>
<tr>
<td></td>
<td>Ignition wirings faulty</td>
<td>Inspect wiring</td>
<td></td>
</tr>
<tr>
<td>Ignition problems</td>
<td>Ignition coil</td>
<td>Inspect coil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Igniter</td>
<td>Inspect igniter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distributor</td>
<td>Inspect distributor</td>
<td></td>
</tr>
<tr>
<td>Incorrect ignition timing</td>
<td>Reset timing</td>
<td>Repair as necessary</td>
<td>3-4</td>
</tr>
<tr>
<td>Vacuum leaks</td>
<td>PCV line</td>
<td>Repair as necessary</td>
<td>3-13</td>
</tr>
<tr>
<td></td>
<td>EGR line</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HAC line</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HIC line</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intake manifold</td>
<td>Check compression</td>
<td></td>
</tr>
<tr>
<td>Compression low</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## ROUGH IDLING (CONT'D)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough idle or stalls</td>
<td>Incorrect valve clearance</td>
<td>Adjust valve clearance</td>
<td>4-3</td>
</tr>
<tr>
<td>Carburetor problems</td>
<td>Idle speed incorrect</td>
<td>Repair as necessary</td>
<td>4-6</td>
</tr>
<tr>
<td></td>
<td>Slow jet clogged</td>
<td></td>
<td>3-44</td>
</tr>
<tr>
<td></td>
<td>Idle mixture incorrect</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuel cut solenoid valve not open</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fast idle speed setting incorrect</td>
<td>(cold engine)</td>
<td></td>
</tr>
<tr>
<td>Hot air intake system faulty</td>
<td></td>
<td>Check HAI system</td>
<td>3-36</td>
</tr>
<tr>
<td>Engine overheats</td>
<td></td>
<td>Check cooling system</td>
<td></td>
</tr>
<tr>
<td>EGR valve faulty</td>
<td></td>
<td>Check EGR valve</td>
<td>3-13</td>
</tr>
<tr>
<td>Compression low</td>
<td></td>
<td>Check compression</td>
<td></td>
</tr>
</tbody>
</table>

## ENGINE HESITATES/POOR ACCELERATION

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine hesitates/ Poor</td>
<td>Spark plugs faulty</td>
<td>Inspect plugs</td>
<td>3-4</td>
</tr>
<tr>
<td>acceleration</td>
<td>Ignition wirings faulty</td>
<td>Inspect wiring</td>
<td></td>
</tr>
<tr>
<td>Vacuum leaks</td>
<td>PCV line</td>
<td>Repair as necessary</td>
<td>3-13</td>
</tr>
<tr>
<td></td>
<td>EGR line</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HAC line</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HIC line</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intake manifold</td>
<td>Reset timing</td>
<td>4-2</td>
</tr>
<tr>
<td>Incorrect ignition timing</td>
<td></td>
<td>Check air cleaner</td>
<td></td>
</tr>
<tr>
<td>Air cleaner clogged</td>
<td></td>
<td>Check fuel line</td>
<td></td>
</tr>
<tr>
<td>Fuel line clogged</td>
<td></td>
<td>Check fuel line</td>
<td></td>
</tr>
<tr>
<td>Carburetor problems</td>
<td>Float level too low</td>
<td>Repair as necessary</td>
<td>3-38</td>
</tr>
<tr>
<td></td>
<td>Accelerator pump faulty</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power valve faulty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emission control system problem</td>
<td></td>
<td>Check HAI system</td>
<td>3-36</td>
</tr>
<tr>
<td></td>
<td>HAI system always on (hot engine)</td>
<td>Check EGR system</td>
<td>3-13</td>
</tr>
<tr>
<td></td>
<td>EGR system always on (cold engine)</td>
<td>Check cooling system</td>
<td></td>
</tr>
<tr>
<td>Engine overheats</td>
<td></td>
<td>Check compression</td>
<td></td>
</tr>
<tr>
<td>Compression low</td>
<td></td>
<td>Check compression</td>
<td></td>
</tr>
</tbody>
</table>
## ENGINE DIESELING

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
</table>
| Engine diesel (Continuous running after ignition switch is turned off) | Carburetor problems  
• Linkage sticking  
• Idle speed or fast idle out of adjustment  
• Fuel cut solenoid faulty  
• Incorrect ignition timing | Repair as necessary | 4-3, 4-4 |
| | | Reset timing | 3-44 |
| | | | 4-2 |

## AFTER FIRE, BACKFIRE

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
</table>
| Muffler explosion (after fire) on deceleration only | A1 system faulty  
Deceleration fuel out system always off | Check A1 system  
Check fuel out system | 3-19 |
| | | | 3-44 |
| Muffler explosion (after fire) all the time | Air cleaner clogged  
Incorrect ignition timing  
Incorrect valve clearance | Check air cleaner  
Reset timing  
Adjust valve clearance | 4-2 |
| Engine backfires | Carburetor vacuum leak  
Insufficient fuel flow  
Incorrect ignition timing  
Incorrect valve clearance  
Carbon deposits in combustion chambers | Check hoses and repair as necessary  
Troubleshoot fuel system  
Reset timing  
Adjust valve clearance  
Inspect cylinder head | 4-2 |

## EXCESSIVE OIL CONSUMPTION

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
</table>
| Excessive oil consumption | Oil leak  
PCV line clogged  
Piston ring worn or damaged  
Valve stem oil seal worn or damaged  
Valve stems and guide worn | Repair as necessary  
Check PCV system  
Check rings  
Check oil seal  
Check valves and guides | 3-4 |

## POOR GASOLINE MILEAGE

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
</table>
| Poor gasoline mileage | Fuel leak  
Air cleaner clogged  
Incorrect ignition timing | Repair as necessary  
Check air cleaner  
Reset timing | 4-2 |
| | Carburetor problems  
• Idle speed too high  
• Deceleration fuel out system faulty  
• Power valve always open  
Spark plugs faulty  
EGR system always on  
Compression low  
Tires improperly inflated  
Clutch slips  
Brakes drag | | 4-3 |
| | | Repair as necessary  
Inspect plugs  
Check EGR system  
Check compression  
Inflate tires to proper pressure  
Troubleshoot clutch  
Troubleshoot brakes | 3-44 |
| | | | 3-13 |
EMISSION CONTROL SYSTEM

SYSTEM PURPOSE .................................................. 3-2
COMPONENT LAYOUT AND SCHEMATIC
  DRAWING ......................................................... 3-3
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM .................. 3-4
FUEL EVAPORATIVE EMISSION CONTROL
  (EVAP) SYSTEM ................................................. 3-6
SPARK CONTROL (SC) SYSTEM .................................... 3-10
EXHAUST GAS RECIRCULATION (EGR)
  SYSTEM .......................................................... 3-13
AIR INJECTION (AI) SYSTEM ..................................... 3-19
OXIDATION CATALYST (OC) SYSTEM ............................... 3-28
HIGH ALTITUDE COMPENSATION (HAC)
  SYSTEM .......................................................... 3-31
AUXILIARY SYSTEMS .................................................. 3-36
  1. Automatic Hot Air Intake (HAI) System ..................... 3-36
  2. Hot Idle Compensation (HIC) System on the Cleaner ......... 3-38
  3. Choke Breaker (CB) System .................................. 3-40
  4. Choke Opener System ........................................ 3-42
  5. Deceleration Fuel Cut System ............................... 3-44
  6. Heat Control Valve ......................................... 3-47
### SYSTEM PURPOSE

<table>
<thead>
<tr>
<th>System</th>
<th>Abbreviation</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive crankcase ventilation</td>
<td>PCV</td>
<td>Reduces blow-by gas (HC)</td>
</tr>
<tr>
<td>Fuel evaporative emission control</td>
<td>EVAP</td>
<td>Reduces evaporative HC</td>
</tr>
<tr>
<td>Spark control</td>
<td>SC</td>
<td>Reduces NOx and HC</td>
</tr>
<tr>
<td>Exhaust gas recirculation</td>
<td>EGR</td>
<td>Reduces NOx</td>
</tr>
<tr>
<td>Air injection</td>
<td>AI</td>
<td>Reduces HC and CO</td>
</tr>
<tr>
<td>Oxidation catalyst</td>
<td>OC</td>
<td>Reduces HC and CO</td>
</tr>
<tr>
<td>High altitude compensation</td>
<td>HAC</td>
<td>Insures air-fuel mixture at high altitude</td>
</tr>
<tr>
<td>Auxiliary systems:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic hot air intake</td>
<td>HAI</td>
<td>Improves driveability—cold</td>
</tr>
<tr>
<td>Hot idle compensation</td>
<td>HIC</td>
<td>Controls air-fuel mixture—hot</td>
</tr>
<tr>
<td>Choke breaker</td>
<td>CB</td>
<td>Improves driveability—cold</td>
</tr>
<tr>
<td>Choke opener</td>
<td></td>
<td>Improves driveability—hot</td>
</tr>
<tr>
<td>Deceleration fuel cut</td>
<td></td>
<td>Prevents overheating OC and after burning</td>
</tr>
<tr>
<td>Heat control valve</td>
<td></td>
<td>Improves driveability—cold</td>
</tr>
</tbody>
</table>

### COMPONENT LAYOUT AND SCHEMATIC DRAWING

[Diagram of emission control system components]
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

<table>
<thead>
<tr>
<th>Engine not Running or in Case of Backfire</th>
<th>Normal Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Intake Manifold</td>
<td></td>
</tr>
<tr>
<td>○ PCV VALVE IS CLOSED.</td>
<td>○ PCV VALVE IS OPEN, ○ VACUUM PASSAGE IS LARGE.</td>
</tr>
<tr>
<td>To Push Rod Cover</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Idling or Decelerating</th>
<th>Acceleration or High Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ PCV VALVE IS OPEN.</td>
<td>○ PCV VALVE IS FULLY OPEN.</td>
</tr>
<tr>
<td>○ VACUUM PASSAGE IS SMALL.</td>
<td></td>
</tr>
</tbody>
</table>

INSPECTION OF PCV VALVE
1. REMOVE PCV VALVE
2. ATTACH A CLEAN HOSE TO PCV VALVE
3. BLOW FROM PUSH ROD COVER SIDE
   Check that air passes through easily.
   CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.
4. BLOW FROM INTAKE MANIFOLD SIDE
   Check that air passes through with difficulty.
   If the PCV valve fails either of the checks, replace it.
5. INSTALL PCV VALVE

INSPECTION OF PCV HOSES AND CONNECTIONS
VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS
Check for cracks, leaks or damage.
FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM

To reduce HC emissions, evaporated fuel from fuel tank and float chamber is routed through the charcoal canister to the carburetor for combustion in the cylinders.

<table>
<thead>
<tr>
<th>IG SW</th>
<th>Outer Vent Control Valve</th>
<th>Coolant Temp.</th>
<th>BVSV</th>
<th>Vacuum at Advance Port</th>
<th>VCV</th>
<th>Check Valve</th>
<th>Safety Valve in Cap</th>
<th>Evaporated Fuel (HC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OPEN</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>CLOSED</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Below 35°C (95°F)</td>
<td>CLOSED</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>HC from tank is absorbed into the canister.</td>
</tr>
<tr>
<td>ON</td>
<td>CLOSED</td>
<td>Above 44° (111°F)</td>
<td>OPEN</td>
<td>Below 50 mmHg (1.97 in. Hg)</td>
<td>CLOSED</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Above 70 mmHg (2.76 in. Hg)</td>
<td>OPEN</td>
<td>---</td>
<td>---</td>
<td>HC from canister is led into exhaust manifold.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High pressure in tank</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>HC from tank is absorbed into the canister.</td>
</tr>
<tr>
<td></td>
<td>High vacuum in tank</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>CLOSED</td>
<td>OPEN</td>
<td>(Air is fed into the tank)</td>
</tr>
</tbody>
</table>
INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP
1. VISUALLY INSPECT LINES AND CONNECTIONS
   Look for loose connections, sharp bends or damage.

2. VISUALLY INSPECT FUEL TANK
   Look for deformation, cracks or fuel leakage.

3. VISUALLY INSPECT FUEL FILLER CAP
   (a) Remove four screws and protector.
   (b) Look for damaged or deformed gasket.
   (c) Look for stuck safety valve.
   (d) Install the protector.
   If the safety valve is stuck, repair or replace the cap.

INSPECTION OF CHARCOAL CANISTER
1. REMOVE CHARCOAL CANISTER
2. VISUALLY INSPECT CHARCOAL CANISTER CASE
   Look for cracks or damage.

3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE
   (a) Using low pressure compressed air, blow into the tank pipe and check that the air flows without resistance from the other pipes.
   (b) Blow into the purge pipe and check that the air flows without resistance from the other pipes.
   If a problem is found, replace the charcoal canister.

4. CLEAN FILTER IN CANISTER
   Clean the filter by blowing 3 kg/cm² (43 psi) air into the pipe to the outer vent control valve, while holding the other upper canister pipes closed.
   NOTE:
   • Do not attempt to wash the canister.
   • No activated carbon should come out.

5. INSTALL CHARCOAL CANISTER

INSPECTION OF OUTER VENT CONTROL VALVE
CHECK OUTER VENT CONTROL VALVE OPERATION
(a) Disconnect the hoses from the valve.
(b) Check that the valve is open when the ignition switch is “OFF”.
(c) Check that the valve is closed when the ignition switch is “ON”.
(d) Reconnect hoses to proper locations. If the valve does not operate, check the fuse and the wiring connections.

INSPECTION OF BSVS
CHECK BSVS BY BLOWING AIR INTO PIPES
(a) With coolant temperature below 30°C (86°F), blow air into a pipe and check that the BSVS is closed.
(b) After warming up the engine, blow air into a pipe and check that the BSVS is open.
If a problem is found, replace the BSVS.

INSPECTION OF VCV
CHECK VCV BY BLOWING AIR INTO PIPE
(a) Apply vacuum above 70 mmHg (2.76 in.Hg) to pipe S.
(b) Blow air into pipe Y and check that air comes out of pipe Z.
(c) Stop the applied vacuum.
(d) Blow air into pipe Y and check that air does not come out of pipe Z.
If a problem is found, replace the VCV.
SPARK CONTROL (SC) SYSTEM

To reduce NOx and HC emissions, this system delays the vacuum advance for a given time and lowers the maximum combustion temperature.

<table>
<thead>
<tr>
<th>Coolant Temp.</th>
<th>BSBV</th>
<th>Throttle Valve Opening</th>
<th>Vacuum Ignition Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Below 30°C (86°F)</td>
<td>CLOSED</td>
<td>—</td>
<td>NOT ADVANCED</td>
</tr>
<tr>
<td>Hot Above 44°C (111°F)</td>
<td>OPEN</td>
<td>Positioned below advance port</td>
<td>NOT ADVANCED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positioned above advance port</td>
<td>DELAYED by VTV</td>
</tr>
</tbody>
</table>

To reduce NOx and HC emissions, this system delays the vacuum advance for a given time and lowers the maximum combustion temperature.

**INSPECTION OF SC SYSTEM**

1. **CONNECT VACUUM GAUGE TO DISTRIBUTOR MAIN DIAPHRAGM HOSE**

2. **CHECK BSBV WITH COLD ENGINE**
   - a. The coolant temperature should be below 30°C (86°F).
   - b. Start the engine.
   - c. Check that the vacuum gauge indicates zero regardless of whether the throttle valve is open or closed.

3. **LET ENGINE WARM UP TO NORMAL OPERATING TEMPERATURE**

4. **CHECK BSBV AND VTV WITH HOT ENGINE**
   - a. With the engine warm and idling, pinch the hose between the VTV and the vacuum pipe.
   - b. Increase the engine speed to 2,500 rpm.
   - c. Within 2–5 seconds after the hose is released, check that the vacuum gauge indicates high vacuum.
   - d. With the engine at 2,500 rpm, check that the vacuum gauge indicates zero quickly when the hose is disconnected between the VTV and vacuum pipe at the VTV side.

5. **DISCONNECT VACUUM GAUGE AND RECONNECT HOSES**
6. CHECK OPERATION OF DISTRIBUTOR VACUUM ADVANCER
   (a) Remove the distributor cap and rotor.
   (b) Apply vacuum to the diaphragms, and check that the vacuum advancer moves in accordance with the vacuum.
   (c) Reinstall the rotor and distributor cap.

   IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART.

INSPECTION OF BVSV
CHECK BVSV BY BLOWING AIR INTO PIPE
   (a) Drain the coolant from the radiator into a suitable container.
   (b) Remove the BVSV.
   (c) Cool the BVSV to below 30°C (86°F) with cool water.
   (d) Blow air into pipe and check that the BVSV is closed.

   (e) Heat the BVSV to above 44° C (111° F) with hot water.
   (f) Blow air into pipe and check that the BVSV is open.
   (g) Apply liquid sealer to the threads of the BVSV and reinstall.
   (h) Fill the radiator with coolant.
      If a problem is found, replace the BVSV.

INSPECTION OF VTV
CHECK VTV BY BLOWING AIR INTO EACH SIDE
   (a) Check that air flows without resistance from B to A.
   (b) Check that air flows with difficulty from A to B.
      If a problem is found, replace the VTV.
INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR
   (a) Check the filter for contamination or damage.
   (b) Using compressed air, clean the filter.

2. PREPARATION
   Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum modulator.

3. CHECK SEATING OF EGR VALVE
   Start the engine and check that the engine starts and runs at idle.

4. CHECK BVSV WITH COLD ENGINE
   (a) The coolant temperature should be below 30°C (86°F).
   (b) Check that the vacuum gauge indicates zero at 2,500 rpm.

5. CHECK BVSV AND EGR VACUUM MODULATOR
   WITH WARM ENGINE
   (a) Warm up the engine.
   (b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm.
   (c) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.
   (d) Check that the vacuum gauge indicates high at 2,500 rpm.

NOTE: As a large amount of EGR gas enters, the engine will misfire slightly at this time.
(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.

---

### To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

<table>
<thead>
<tr>
<th>Coolant Temp.</th>
<th>BVSV</th>
<th>Throttle Valve Opening Angle</th>
<th>Pressure in EGR Valve Pressure Chamber</th>
<th>EGR Vacuum Modulator</th>
<th>EGR Valve</th>
<th>Exhaust Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 30°C (86°F)</td>
<td>CLOSED</td>
<td>—</td>
<td>—</td>
<td>CLOSED</td>
<td>NOT</td>
<td>RECIRCULATED</td>
</tr>
<tr>
<td>Above 44°C (111°F)</td>
<td>OPEN</td>
<td>Positioned above adv. port</td>
<td>(1) LOW Pressure constantly alternating between low and high</td>
<td>OPENS passage to atmosphere</td>
<td>CLOSED</td>
<td>NOT RECIRCULATED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>** Positioned above adv. port</td>
<td>(2) HIGH High pressure</td>
<td>CLOSES passage to atmosphere</td>
<td>OPEN</td>
<td>RECIRCULATED</td>
</tr>
</tbody>
</table>

Remarks: * Pressure increase → Modulator closes → EGR valve opens → Pressure drops → Modulator opens → EGR valve closes ** When the throttle valve is positioned above the EGR R port and the engine speed is above 1,500 rpm, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is low.
6. CHECK EGR VALVE
   (a) Apply vacuum directly to the EGR valve with the engine idling.
   (b) Check that the engine runs rough or dies.
   (c) Reconnect the vacuum hoses to the proper location.

7. CHECK COMPUTER TO VSV
   (a) Disconnect the vacuum hoses from pipe E and pipe F of the VSV.
   (b) With the engine idling, blow air into pipe F and check that the VSV is closed.
   (c) Increase the engine speed to above 1,500 rpm.
   (d) Blow air into pipe F and check that the VSV is open.
   (e) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART.
(c) Disconnect the battery connections.
(d) Blow air into pipe E and check that air comes out of pipe G.
If a problem is found, replace the VSV.

2. CHECK FOR SHORT CIRCUIT
Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV body.
If there is continuity, replace the VSV.

3. CHECK FOR OPEN CIRCUIT
Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminal as shown.
Specified resistance: 38 – 43 ohms at 20°C (68°F)
If the resistance is not within specification, replace the VSV.
INSPECTION OF AI SYSTEM

1. VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTIONS

2. DISCONNECT AIR BYPASS HOSE FROM AIR CLEANER

3. START ENGINE

4. CHECK VTG AND ASV
   (a) With the engine idling, check that air is not discharged from the air bypass hose.
   (b) Disconnect the vacuum hose from the VTG at the blue side. Check that air is discharged from the air bypass hose within 3–10 seconds.
   (c) Reconnect the vacuum hose to the VTG. Check that air stops quickly.

5. CHECK ABV
   (a) Disconnect the air hose between the ABV and exhaust pipe at the ABV side.
   (b) Disconnect the vacuum hose between the ABV and VSV(2) at the ABV side, and plug the ABV.
   (c) Race the engine and quickly close the throttle valve. Check that air is discharged momentarily from the ABV.
   (d) Reconnect the vacuum hose to the ABV.

6. CHECK OC THERMO SENSOR TO VSV(1)
   (a) With the engine idling, connect a wire to both OC thermo sensor terminals.
   (b) Check that air is discharged from the air bypass hose.
   (c) Disconnect the wire from the OC thermo sensor terminals.

7. CHECK DECELERATION FUEL CUT SYSTEM TO VSV(2)
   (a) Pinch the vacuum hose to the vacuum switch at idle.
   (b) Gradually increase the engine speed to 2,000 rpm.
   (c) Check that air is discharged from the ABV.

**NOTE:**
- Perform this inspection in as short a time as possible.
- The engine will misfire slightly at the same time.
INSPECTION OF ACV

1. CHECK ABV OPERATION
   (a) Disconnect the air hose between the ABV and exhaust pipe at the ABV side.
   (b) Disconnect the vacuum hose between the ABV and VSV (2) at the ABV side, and plug the ABV.
   (c) With the engine idling, disconnect the vacuum hose between the ABV and vacuum pipe at the ABV side and reconnect it.
   (d) Check that compressed air comes out temporarily from the ABV.
   (e) Reconnect the air hose to the ABV.

2. CHECK ASV OPERATION
   (a) Disconnect the air hose from the check valve.
   (b) Disconnect the vacuum hose from the ASV.
   (c) With the engine idling, apply vacuum directly to the ASV.
   (d) Check that compressed air comes out of the air hose to the check valve.

3. CHECK OPENING PRESSURE OF RELIEF VALVE
   (a) Disconnect the air bypass hose from the air cleaner.
   (b) Connect the air pump tester* to the air hose to check valve.
   *SST 00268-14010
   (c) Close the orifice on the SST with your finger.
   (d) Increase the engine speed gradually and measure the relief valve opening pressure.
   Opening pressure: 0.40 - 0.60 kg/cm² (5.37 - 8.45 psi)
   (a) Remove the SST.
   (f) Reconnect the vacuum hoses and air hoses to the proper locations.

INSPECTION OF VTV

CHECK VTV BY BLOWING AIR FROM EACH SIDE
   (a) Check that air flows without resistance from B to A.
   (b) Check that air flows with difficulty from A to B.
   If a problem is found, replace the VTV.

INSPECTION OF CHECK VALVES

CHECK VALVES BY BLOWING AIR FROM EACH SIDE
   (a) Check that air flows from the ACV side to manifold (or exhaust pipe) side.
   (b) Check that air does not flow from the manifold (or exhaust pipe) side to ACV side.
   If a problem is found, replace the valve.

INSPECTION OF VSV (1)

1. CHECK VACUUM CIRCUIT CONTINUITY IN THE VSV(1) BY BLOWING AIR INTO PIPE
   (a) Connect the VSV(1) terminal to the battery terminals as illustrated.
   (b) Blow into pipe E and check that air comes out of pipe F.
   (c) Disconnect the battery.
   (d) Blow into pipe E and check that air comes out of the air filter.
   If a problem is found, replace the VSV(1).

2. CHECK FOR SHORT CIRCUIT
   Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV(1) body.
   If there is continuity, replace the VSV(1).

3. CHECK FOR OPEN CIRCUIT
   Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminal as shown.
   Specified resistance: 36 - 43 ohms at 20°C (68°F)
   If the resistance is not within specification, replace the VSV(1).

INSPECTION OF VSV (2)

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV(2) BY BLOWING AIR INTO PIPE
   (a) Connect the VSV(2) terminals to the battery terminals as shown.
   (b) Blow into the pipe, and check that the VSV(2) is open.
(c) Disconnect the battery positive (+) terminal.
(d) Blow into the pipe and check that the VSV(2) is closed.
If a problem is found, replace the VSV(2).

2. CHECK FOR SHORT CIRCUIT
Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV(2) body.
If there is continuity, replace the VSV(2).

3. CHECK FOR OPEN CIRCUIT
Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.
Specified resistance: 38 – 43 ohms at 20°C (68°F)
If the resistance is not within specification, replace the VSV(2).

INSPCTION OF OC THERMO SENSOR
1. MEASURE RESISTANCE
   (a) Unplug the wiring connector.
   (b) Using an ohmmeter, measure the resistance between both terminals at idling.
   Resistance: 2 – 200 kilohms
   CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.
   (c) Plug in the wiring connector.

2. CHECK SENSOR WIRING
   (a) Look for damage.
   (b) Check for loose connection.

4. UNPLUG WIRING CONNECTOR FROM COMPUTER
   The location of computer is on the left cowl.

5. CHECK ON-OFF CYCLES OF SPEED SENSOR
   (a) Place (+) terminal of the ohmmeter on the wiring connector terminal and (-) terminal on ground.
   (b) Turn the rear wheel slowly.
   (c) Check that the ohmmeter needle deflects consistently.
   CAUTION: The ohmmeter needle should be inserted from the rear side of the connector.
   If the ohmmeter needle does not deflect, check that the speed sensor terminals at the back side of the speedometer are properly connected. If the connection is OK, replace the speedometer assembly.

6. RECONNECT WIRING CONNECTOR TO COMPUTER

INSPCTION OF DECELERATION FUEL CUT SYSTEM
See page 3-44.
**OXIDATION CATALYST (OC) SYSTEM**

- To reduce HC and CO emission, HC and CO are oxidized and converted to water (H₂O) and carbon dioxide (CO₂) in the oxidation catalyst.
- If the catalyst is overheated (above 786°C or 1,445°F), the thermo sensor in the catalyst turns the AI system OFF.

<table>
<thead>
<tr>
<th>Exhaust Port</th>
<th>Catalyst</th>
<th>Exhaust Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNBURNET HC, CO AND AIR</strong></td>
<td>OXIDATION Temperature is increased.</td>
<td>H₂O, CO₂</td>
</tr>
<tr>
<td>Proper Temperature</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**INSPECTION OF EXHAUST PIPE ASSEMBLY**

1. CHECK CONNECTIONS FOR LOoseness OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRacks OR DAMAGE

**INSPECTION OF CATALYTIC CONVERTER**

1. CHECK OUTER SURFACE FOR DENTS OR DAMAGE
   - Dent limit: 20 mm (0.79 in.)

2. SHAKE CATALYTIC CONVERTER, AND CHECK FOR EXCESSIVE RATTLING
   - If there is an excessive rattling noise, replace the converter.

**INSPECTION OF HEAT INSULATOR**

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

**INSPECTION OF THERMO SENSOR (IN CATALYST)**

1. MEASURE RESISTANCE
   - (a) Unplug the wiring connector.
   - (b) Using an ohmmeter, measure the resistance between both terminals at idling.
     - Resistance: 2 - 200 kilohm
   - CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.
   - (c) Plug in the wiring connector.

2. CHECK SENSOR WIRING
   - (a) Look for damage.
   - (b) Check that connections are tight.

**REMOVAL OF CATALYTIC CONVERTER**

1. UNPLUG THERMO SENSOR WIRING CONNECTOR INSIDE VEHICLE
2. REMOVE WIRING GROMMET FROM FLOOR, AND PULL CONNECTOR FROM INTERIOR
3. REMOVE CATALYTIC CONVERTER WITH THERMO SENSOR
   (a) Jack up the vehicle.
   (b) Check that the converter is cool.
   (c) Remove the bolts at the front and rear of the converter.
   (d) Remove the rubber rings.
   (e) Remove the converter and gaskets.

4. REMOVE THERMO SENSOR
   (a) Hold the converter with the thermo sensor positioned upward.
   (b) Remove the thermo sensor and gasket from the converter.

INSTALLATION OF CATALYTIC CONVERTER

1. INSTALL THERMO SENSOR
   (a) Place a new gasket on the thermo sensor.
   
   NOTE: Service replacement converters are fitted with a plastic thermo sensor guide. Insert the sensor into this guide.
   
   (b) Push the sensor into the converter and tighten two bolts.
   
   Torque: 0.6 – 0.9 kg-m (53 – 78 in.-lb)

2. INSTALL CATALYTIC CONVERTER WITH THERMO SENSOR
   (a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.
   
   (b) Tighten the bolts.
   
   Torque: 3.5 – 4.5 kg-m (26 – 32 ft-lb)

   (c) Secure the converter to the body with the rubber rings.
   
   (d) Plug in the thermo sensor connector, and install the floor grommet.
   
   NOTE: After installing, check the sensor wire to see that it is not excessively bent and that it is not interfering with other parts.

As altitude increases, the air-fuel mixture becomes richer. This system issues proper air-fuel mixture by supplying additional air to the primary low and high speed circuits of the carburetor, and advances the ignition timing to improve driveability at high altitude (above 1,198 m (3,930 ft)).

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Ballast in HAC Valve</th>
<th>Part A in HAC Valve</th>
<th>Distributor Sub-diaphragm</th>
<th>Part B in HAC Valve</th>
<th>Air from HAC Valve</th>
<th>Sub vacuum Advancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH Above 1,198 m (3,930 ft)</td>
<td>EXPANDED</td>
<td>CLOSED</td>
<td>PULLED</td>
<td>OPEN</td>
<td>Led into primary low and high speed circuits</td>
<td>ADVANCED (HE)</td>
</tr>
<tr>
<td>LOW Below 763 m (2,500 ft)</td>
<td>CONTRACTED</td>
<td>OPEN</td>
<td>NOT PULLED</td>
<td>CLOSED</td>
<td>STOPPED</td>
<td>NOT/ADVANCED</td>
</tr>
</tbody>
</table>
INSPECTION OF HAC SYSTEM

PRECHECK:
Before checking the HAC system, determine the position of the HAC valve. This can be done by blowing into any one of the three ports on top of the HAC valve with the engine idling. If the passage is open, the valve is in the HIGH ALTITUDE position.

If it is closed, the valve is in the LOW ALTITUDE position. (See page 3-33)

A. AT HIGH ALTITUDE
1. CHECK IGNITION TIMING AT IDLE
(a) Warm up the engine.
(b) Disconnect the hose from the distributor sub-diaphragm, and plug the hose end.
(c) Check the ignition timing.
Ignition timing: 7° BTDC (Mark on flywheel)
(d) Reconnect the hose to the sub-diaphragm.

2. CHECK THE CHECK VALVE
(a) Disconnect the vacuum hose from the check valve at the black side and plug the hose end.
(b) Check that the ignition timing remains stationary for more than one minute.
(c) Stop the engine and reconnect the hose to the check valve.

3. CHECK CARBURETOR
(a) Disconnect three hoses from the pipes on top of the HAC valve.
(b) Blow air into each hose and check that air flows into the carburetor.
(c) Reconnect the hoses to the proper locations.

B. AT LOW ALTITUDE
1. CHECK IGNITION TIMING AT IDLE
(a) Warm up the engine.
(b) Check the ignition timing.
Ignition timing: 7° BTDC (Mark on flywheel)
(c) Disconnect the vacuum hose from lower port of the HAC valve and plug the hose end.
2. CHECK THE CHECK VALVE
   (a) Disconnect the vacuum hose from the check valve at the black side and plug the hose end, in the condition described in 1-(c) above.
   (b) Check that the ignition timing remains stationary for more than one minute.
   (c) Stop the engine and reconnect the hoses to the proper locations.

3. CHECK CARBURETOR
   (a) Disconnect three hoses from the pipes on top of the HAC valve.
   (b) Blow air into each hose and check that air flows into the carburetor.
   (c) Reconnect the hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF HAC VALVE
VISUALLY CHECK AND CLEAN AIR FILTER IN HAC VALVE

INSPECTION OF CHECK VALVE
CHECK VALVE BY BLOWING AIR INTO EACH PIPE
   (a) Check that air flows from the white pipe to the black pipe.
   (b) Check that air does not flow from the black pipe to the white pipe.
**AUXILIARY SYSTEMS**

1. Automatic Hot Air Intake (HAI) System

   ![Diagram of HAI System]

   **Temperature in Air Cleaner** | **HIC Valve** | **Air Control Valve** | **Intake Air**
   ---|---|---|---
   Cool Below 37°C (99°F) | Atmospheric port is CLOSED | Hot air passage OPEN | HOT
   Hot Above 35°C (95°F) | Atmospheric port is OPEN | Cool air passage OPEN | COOL

---

**INSPECTION OF HAI SYSTEM**

1. **CHECK AIR CONTROL VALVE OPERATION**
   (a) Remove the air cleaner cap.
   (b) Cool the HIC valve by blowing compressed air on it.
   (c) Check that the air control valve closes the cool air passage at idle.
   (d) Reinstall the air cleaner cap and warm-up the engine.
   (e) Check that the air control valve opens the cool air passage at idle.

2. **CHECK HOSES AND CONNECTIONS**

   Visually check the hoses and connections for cracks, leaks and damage.
2. Hot Idle Compensation (HIC) System on the Air Cleaner

**INSPECTION OF HIC SYSTEM**

**CHECK HIC VALVE BY BLOWING AIR**

(a) Close the pipe to the intake manifold with your finger.
(b) Below 27°C (81°F), check that air does not flow from the HAI diaphragm side to the atmospheric port.

(c) Heat the HIC valve to 27–50°C (81–122°F).

**CAUTION:** Do not allow water inside the HIC valve.

(d) Close the pipe to HAI diaphragm with your finger.
(e) Check that a small amount of air flows from the intake manifold side to the atmospheric port.

(f) Heat the HIC valve above 85°C (185°F).

(g) Close the pipe to HAI diaphragm with your finger.

(h) Check that a large amount of air flows from the intake manifold side to the atmospheric port.

**IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART**

---

**This system allows the air controlled by the HIC valve to enter the intake manifold to maintain proper air-fuel mixture during high temperatures at idle.**

<table>
<thead>
<tr>
<th>Temperature in Air Cleaner</th>
<th>HIC Valve Atmospheric Port</th>
<th>HIC Valve Vacuum Port Opening</th>
<th>HIC System</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOT [1] Between 23°C (81°F) and 50°C (122°F)</td>
<td>OPEN</td>
<td>MINIMUM</td>
<td>OFF</td>
</tr>
<tr>
<td>HOT [2] Between 50°C (122°F) and 85°C (185°F)</td>
<td>OPEN</td>
<td>PARTIAL</td>
<td>ON Air volume is controlled by HIC valve</td>
</tr>
<tr>
<td>HOT [3] Above 85°C (185°F)</td>
<td>OPEN</td>
<td>MAXIMUM</td>
<td>ON</td>
</tr>
</tbody>
</table>
3. Choke Breaker (CB) System

INSPECTION OF CB SYSTEM

CHECK VTV AND DIAPHRAGM OPERATION
(a) Start the engine.
(b) Disconnect the vacuum hose between the carburetor and the VTV at the carburetor side.
(c) Check that the choke breaker linkage returns quickly by spring tension.
(d) Reconnect the hose.
(e) Check that the choke breaker linkage is pulled into the diaphragm within 5-15 seconds after reconnecting the hose.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF VTV

CHECK VTV BY BLOWING AIR INTO EACH SIDE
(a) Check that air flows without resistance from B to A.
(b) Check that air flows with difficulty from A to B.
If a problem is found, replace the VTV.

INSPECTION OF CB DIAPHRAGM

CHECK THAT CHoke LINKAGE MOVES IN ACCORDANCE WITH APPLIED VACUUM
If a problem is found, replace the diaphragm.

This system opens the choke valve slightly to prevent too rich a mixture just after engine starting. However, the choke valve opening is delayed by the VTV.
4. Choke Opener System

**INSPECTION OF CHoke OPENER SYSTEM**

1. **CHECK SYSTEM OPERATION WITH COLD ENGINE**
   (a) The coolant temperature should be below 5°C (41°F).
   (b) Start the engine.
   (c) Disconnect the hose from the choke opener diaphragm and reconnect it.
   (d) Check that the choke linkage does not move.

2. **LET ENGINE WARM-UP TO NORMAL OPERATING TEMPERATURE**

3. **CHECK SYSTEM OPERATION WITH HOT ENGINE**
   (a) With the engine warm and idling, disconnect the hose from the choke opener diaphragm and check that the choke linkage returns.
   (b) Reconnect the hose and check that the choke linkage is pulled by choke opener diaphragm.

   **IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART**

**INSPECTION OF CHoke OPENER DIAPHRAGM**

CHECK THAT CHoke OPENER LINKAGE MOVES IN ACCORDANCE WITH APPLIED VACUUM

If a problem is found, replace the diaphragm.

**INSPECTION OF BVSV**

**CHECK BVSV BY BLOWING AIR INTO PIPE**

   (a) Drain the coolant from the radiator into a suitable container.
   (b) Remove the BVSV.
   (c) Cool the BVSV to below 5°C (41°F) with cool water.
   (d) Blow air into pipe and check that the BVSV closes.

   (e) Heat the BVSV to above 19°C (66°F) with hot water.
   (f) Blow air into pipe and check that the BVSV opens.
   (g) Apply liquid sealer to the threads of the BVSV and reinstall.
   (h) Fill the radiator with coolant.

---

<table>
<thead>
<tr>
<th>Coolant Temp.</th>
<th>BVSV</th>
<th>Diaphragm</th>
<th>Choke Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 5°C (41°F)</td>
<td>CLOSED</td>
<td>Released by spring tension.</td>
<td>CLOSED</td>
</tr>
<tr>
<td>Above 19°C (66°F)</td>
<td>OPEN</td>
<td>Pulled by intake manifold vacuum.</td>
<td>OPEN</td>
</tr>
</tbody>
</table>
5. Deceleration Fuel Cut System

This system cuts off part of the fuel in the slow circuit of the carburetor to prevent overheating and afterburning in the exhaust system during deceleration.

<table>
<thead>
<tr>
<th>Engine RPM</th>
<th>Vacuum in the Slow Circuit</th>
<th>Vacuum S/W</th>
<th>Computer</th>
<th>Fuel Cut Solenoid Valve</th>
<th>Slow Circuit in Carburetor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1,330 rpm</td>
<td>Low vacuum below 300 mmHg (11.42 in.Hg)</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OPEN</td>
</tr>
<tr>
<td></td>
<td>High vacuum above 305 mmHg (13.97 in.Hg)</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OPEN</td>
</tr>
<tr>
<td>Above 1,800 rpm</td>
<td>Low vacuum below 300 mmHg (11.42 in.Hg)</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OPEN</td>
</tr>
<tr>
<td></td>
<td>High vacuum above 305 mmHg (13.97 in.Hg)</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>CLOSED</td>
</tr>
</tbody>
</table>

INSPECTION OF DECELERATION FUEL CUT SYSTEM

CHECK SYSTEM OPERATION
(a) Connect a tachometer to the engine.
(b) Start the engine.
(c) Check that the engine runs normally.
(d) Pinch off the vacuum hose to the vacuum switch.
(e) Gradually increase engine speed to 2,000 rpm. Check that the engine misfires slightly between 1,200 and 2,000 rpm.
CAUTION: Perform this inspection quickly to avoid overheating the catalytic converter.
(f) Release the pinched hose. Again gradually increase the engine speed to 2,000 rpm and check that the engine operation returns to normal.
(g) With the engine idling, unplug the wiring connector to the solenoid valve. Check that the engine idles rough or dies.
CAUTION: Perform this inspection quickly to avoid overheating the catalytic converter.
(h) Stop the engine, and reconnect the wiring. Remove the tachometer.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART.
**INSPECTION OF FUEL CUT SOLENOID VALVE**

(a) Remove the solenoid valve.
(b) Connect two terminals and the battery terminals as shown.
(c) Check that you can feel the “click” from the solenoid valve when the battery is connected and disconnected.
(d) Check the O-ring for damage.
(e) If a problem is found, replace the solenoid valve or O-ring.
(f) Reinstall the valve and reconnect the wiring connector.

**INSPECTION OF VACUUM SWITCH**

(a) Using an ohmmeter, check for continuity between the switch terminal and switch body.

(b) Start the engine.
(c) Using an ohmmeter, check that there is no continuity between the switch terminal and the body.

If a problem is found, replace the vacuum switch.

---

### 6. Heat Control Valve

**COLD ENGINE**

- Intake Manifold

**HOT ENGINE**

- Exhaust Manifold

When cold, this device improves fuel vaporization for better driveability by quickly heating the intake manifold.
After warm-up, it keeps the intake manifold at the proper temperature.

<table>
<thead>
<tr>
<th>Engine</th>
<th>Bimetal</th>
<th>Exhaust Gas Passage</th>
<th>Intake Manifold</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLD</td>
<td>EXPANDED</td>
<td>Above the heat control valve.</td>
<td>Heated quickly.</td>
</tr>
<tr>
<td>HOT</td>
<td>CONTRACTED</td>
<td>Under the heat control valve.</td>
<td>Heated to a suitable temperature.</td>
</tr>
</tbody>
</table>
IGNITION TIMING

INSPECTION AND ADJUSTMENT OF IGNITION TIMING

1. CONNECT A TACHOMETER AND TIMING LIGHT TO ENGINE
   Connect the tachometer (+) terminal to the ignition coil (-) terminal.
   **CAUTION:**
   (a) NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
   (b) As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.

2. WARM UP ENGINE
   Allow the engine to reach full operating temperature.

3. DISCONNECT VACUUM HOSES FROM DISTRIBUTOR, AND PLUG HOSE ENDS

4. CHECK IGNITION TIMING
   Ignition timing: 7° BTDC @ Max. 950 rpm
   (a) With the engine idling as specified, use a timing light to check the timing.
   (b) If necessary, loosen the distributor bolt and turn the distributor to align the marks. Recheck the timing after tightening the distributor.

5. FURTHER CHECK IGNITION TIMING AS FOLLOWS
   (a) Reconnect the vacuum hoses to the distributor.
   (b) Pinch the vacuum hose between the HAC valve and the distributor sub-diaphragm at the HAC valve side. Check that the timing mark on the flywheel moves toward advance.
   **NOTE:** Leave the tachometer connected until engine adjustments are completed.

IDLE SPEED

ADJUSTMENT OF IDLE SPEED

1. VISUALLY INSPECT CARBURETOR
   (a) Check for loose screws or loose mounting to the manifold.
   (b) Check for wear in the linkage, missing snap rings or excessive looseness in the throttle shaft. Correct any problems found.

2. INITIAL CONDITIONS
   (a) Air cleaner installed
   (b) Normal operating coolant temperature
   (c) Choke fully open
   (d) All accessories switched off
   (e) All vacuum lines connected
   (f) Ignition timing set correctly
   (g) Transmission in N range
   (h) Fuel level should be about even with the dot in the sight glass.

3. BREAK IDLE LIMITER CAP ON IDLE SPEED ADJUSTING SCREW, IF INSTALLED

4. ADJUST IDLE SPEED
   Adjust the idle speed by turning the idle speed adjusting screw.
   Idle speed: 650 rpm

5. INSTALL NEW LIMITER CAP (BLUE) ON IDLE SPEED ADJUSTING SCREW, IF ONE WAS INSTALLED
FAST IDLE SPEED

ADJUSTMENT OF FAST IDLE SPEED
1. WARM UP AND STOP ENGINE
2. PULL OUT CHOKE KNOB FULLY

3. CUT OPERATION OF DISTRIBUTOR VACUUM ADVANCER
   Disconnect the vacuum hoses from the distributor and plug the hose ends.

4. CUT OPERATION OF EGR AND EVAP SYSTEMS
   Disconnect the vacuum hoses from port S of the VCV for EVAP, and EGR valve, and plug the hose ends.

5. START ENGINE

6. ADJUST FAST IDLE SPEED
   (a) Adjust the fast idle speed by turning the fast idle adjusting screw.
   Fast idle speed: 1,800 rpm
   (b) When the choke button is pushed in all the way, check that the engine speed returns to normal idle speed.

7. RECONNECT HOSES TO PROPER LOCATIONS

IDLE HC/CO CONCENTRATION CHECK METHOD

NOTE: This check method is used only to determine whether or not the idle HC/CO complies with the state or city regulations.

MEASUREMENT
1. INSERT TESTING PROBE OF HC/CO METER INTO TAILPIPE AT LEAST 60 cm (2ft)

PRECHECK

INITIAL CONDITIONS
(a) Normal engine operating temperature
(b) Choke fully open
(c) Air cleaner installed
(d) All accessories switched off
(e) All vacuum lines properly connected

NOTE: All vacuum hoses for air injection, EGR systems, etc., should be properly connected.
(f) Ignition timing set correctly
(g) Transmission in N range
(h) Carburetor fuel level about even with the dot in the sight glass
(i) Tachometer and HC/CO meter at hand and calibrated

TROUBLESHOOTING

<table>
<thead>
<tr>
<th>HC</th>
<th>CO</th>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Normal</td>
<td>Rough idle</td>
<td>1. Faulty ignition:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Fouled, shorted or improperly gapped plugs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Open or crossed ignition wires</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Cracked distributor cap</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Incorrect air/fuel mixture</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Leaky EGR valve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Leaky exhaust valves</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. Leaky cylinder</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>Rough idle</td>
<td>1. Vacuum leak:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Vacuum hose</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Intake manifold</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• PCV line</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Carburetor base</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td>Rough idle</td>
<td>1. Restricted air filter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Plugged PCV valve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Air system problem</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Faulty carburetion:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Faulty choke action</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Incorrect float setting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Leaking needle or seat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Leaking power valve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Black smoke from exhaust</td>
<td>1. Restricted air filter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Plugged PCV valve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Air system problem</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Faulty carburetion:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Faulty choke action</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Incorrect float setting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Leaking needle or seat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Leaking power valve</td>
</tr>
</tbody>
</table>

NOTE: If the HC/CO concentration cannot be corrected by above troubleshooting table, adjust the idle mixture.
IDLE MIXTURE
ADJUSTMENT OF IDLE MIXTURE

NOTE:
- To conform with Fed. and Calif. regulations, the idle mixture adjusting screw is adjusted and plugged with a steel plug by manufacturer. Normally, this steel plug should not be removed.
- When troubleshooting rough idle, check all other possible causes before attempting to adjust the idle mixture (see TROUBLESHOOTING on page 2-2). Only if no other factors are found to be at fault, should the idle mixture be adjusted and, when doing so, remove the plug and follow the procedure described below.

1. REMOVE CARBURETOR
   (a) Before disconnecting the vacuum hoses, use tags to identify how they should be reconnected.
   (b) Remove the carburetor from the engine.
   (c) After removing the carburetor, cover the intake manifold with a clean rag.

2. REMOVE MIXTURE ADJUSTING SCREW PLUG (MAS PLUG)
   (a) Plug each carburetor vacuum port to prevent entry of steel particles when drilling.
   (b) Mark the center of the plug with a punch.
   (c) Drill a 8.5 mm (0.335 in.) hole in the center of the plug.
   NOTE:
   - As there is only 1 mm (0.04 in.) clearance between the plug and screw, drill carefully and slowly to avoid drilling onto the screw.
   - The drill may force the plug off at this time.

3. INSPECT MIXTURE ADJUSTING SCREW
   (a) Blow off any steel particles with compressed air.
   (b) Remove the screw and inspect it.
   If the drill has gnawed into the screw top or if the tapered position is damaged, replace the screw.

4. REINSTALL MIXTURE ADJUSTING SCREW
   Fully screw in the idle mixture adjusting screw and then unscrew it about 2 turns.
   NOTE: Be careful not to damage the screw tip by tightening the screw too tight.

5. REINSTALL CARBURETOR
   (a) Reinstall the carburetor on the engine.
   (b) Reconnect the vacuum hoses to the proper locations. Refer to the Vacuum Hose Information label.

6. REINSTALL AIR CLEANER
7. **ADJUST IDLE SPEED AND IDLE MIXTURE**

(a) Initial conditions:
- Air cleaner installed.
- Normal operating coolant temperature.
- Choke fully open.
- All accessories switched off.
- All vacuum lines connected.
- Ignition timing set correctly.
- Transmission in N range.
- Fuel level should be about even with the dot in the sight glass.

(b) Break the idle limiter cap on the idle speed adjusting screw, if installed.

(c) Start the engine.

(d) Using the long screwdriver, set to the maximum speed by turning the IDLE MIXTURE ADJUSTING SCREW.

(e) Set to the idle mixture speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle mixture speed: 600 rpm

(f) Before moving to the next step, continue the adjustments (d) and (e) until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.

(g) Set to the idle speed by screwing in the IDLE MIXTURE ADJUSTING SCREW.

Idle speed: 650 rpm

This is the Lean Drop Method for setting idle speed and mixtures.

8. **PLUG IDLE MIXTURE ADJUSTING SCREW**

(a) Remove the air cleaner.

(b) Tap in new plug until it is even with carburetor surface.

(c) Reinstall the air cleaner.

(h) Install new limiter cap (Blue) on the idle speed adjusting screw, if one was installed.
<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGINE</td>
<td>5-2</td>
</tr>
<tr>
<td>MAINTENANCE AND TUNE-UP</td>
<td>5-3</td>
</tr>
</tbody>
</table>
**ENGINE**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine model</td>
<td>2F</td>
</tr>
<tr>
<td>Displacement</td>
<td>4,230 cc</td>
</tr>
<tr>
<td>Bore and stroke</td>
<td>94.0 x 101.6 mm</td>
</tr>
<tr>
<td>Number of cylinders</td>
<td>6</td>
</tr>
<tr>
<td>Type of cylinder head</td>
<td>OHV</td>
</tr>
<tr>
<td>Nominal compression ratio</td>
<td>8.3 : 1</td>
</tr>
<tr>
<td>Maximum horsepower (SAE-Net)</td>
<td>125 HP/3,600 rpm</td>
</tr>
<tr>
<td>Maximum torque (SAE-Net)</td>
<td>27.7 kg-m/1,800 rpm</td>
</tr>
<tr>
<td>Recommended fuel</td>
<td>Regular (unleaded only)</td>
</tr>
<tr>
<td>Research octane number (Anti-knock index)</td>
<td>91 (87)</td>
</tr>
</tbody>
</table>

**MAINTENANCE AND TUNE-UP**

<table>
<thead>
<tr>
<th>Specication</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive belt tension (w/Borroughs drive belt tension gauge No. BT-33-73F)</td>
<td></td>
</tr>
<tr>
<td>For Air Con. Compressor</td>
<td>New belt 126 ± 25 lb</td>
</tr>
<tr>
<td></td>
<td>Used belt 80 ± 20 lb</td>
</tr>
<tr>
<td>For others</td>
<td>New belt 145 ± 25 lb</td>
</tr>
<tr>
<td></td>
<td>Used belt 100 ± 20 lb</td>
</tr>
<tr>
<td>Battery specific gravity</td>
<td>1.25 – 1.27</td>
</tr>
<tr>
<td>When fully charged at 20°C (68°F)</td>
<td></td>
</tr>
<tr>
<td>Coolant capacity w/thermostat or air conditioner</td>
<td>16.0 liters 16.9 US qts 14.1 Imp. qts</td>
</tr>
<tr>
<td></td>
<td>16.5 liters 17.4 US qts 14.5 Imp. qts</td>
</tr>
<tr>
<td>Engine oil capacity</td>
<td>18.0 liters 8.5 US qts 7.0 Imp. qts</td>
</tr>
<tr>
<td></td>
<td>7.8 liters 8.2 US qts 6.9 Imp. qts</td>
</tr>
<tr>
<td>Spark plug</td>
<td>NGK</td>
</tr>
<tr>
<td>Type</td>
<td>W14 EXR-U</td>
</tr>
<tr>
<td>Distributor air gap</td>
<td>0.8 mm 0.031 in.</td>
</tr>
<tr>
<td>Ignition timing</td>
<td>0.2 – 0.4 mm 0.008 – 0.016 in.</td>
</tr>
<tr>
<td>Distributor gap</td>
<td>7° BTDC @ Max. 960 rpm (w/vacuum advance cut)</td>
</tr>
<tr>
<td>Firing order</td>
<td>1 – 5 – 3 – 6 – 2 – 4</td>
</tr>
<tr>
<td>Valve clearance (hot)</td>
<td>Intake 0.20 mm 0.008 in.</td>
</tr>
<tr>
<td></td>
<td>Exhaust 0.35 mm 0.014 in.</td>
</tr>
<tr>
<td>Idle speed</td>
<td>650 rpm</td>
</tr>
<tr>
<td>Intake manifold vacuum</td>
<td>at T/M in N range</td>
</tr>
<tr>
<td>Fast idle speed</td>
<td>at Idle speed</td>
</tr>
<tr>
<td>Compression pressure</td>
<td>at 250 rpm STD Limit</td>
</tr>
<tr>
<td>Difference of pressure between each cylinder</td>
<td>More than 10.5 kg/cm² (149 psi) 8.0 kg/cm² 114 psi</td>
</tr>
<tr>
<td></td>
<td>Less than 1.0 kg/cm² (14 psi)</td>
</tr>
</tbody>
</table>