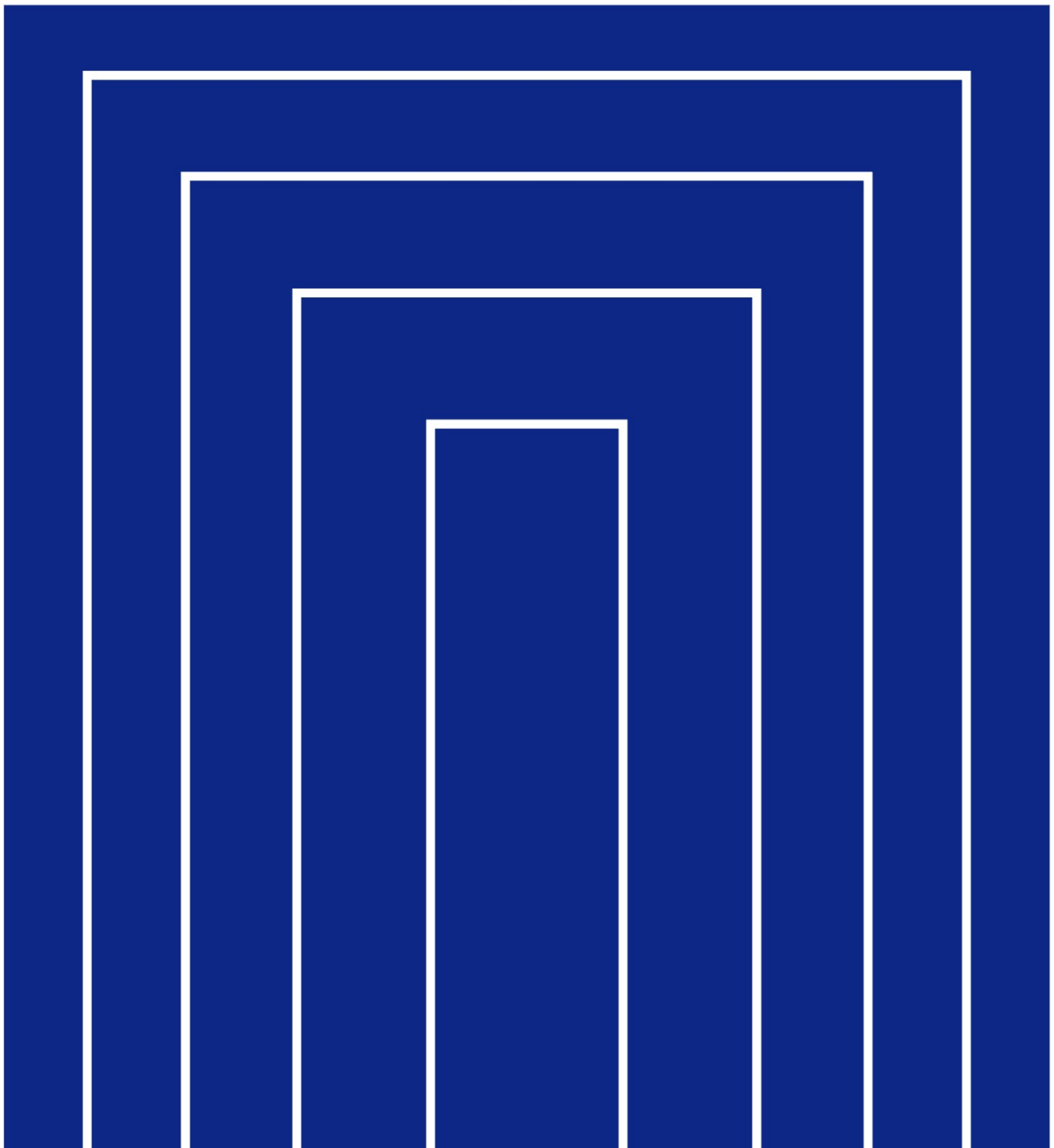
# TOYOTA

# 3Y, 22R, 3F ENGINE

# REPAIR MANUAL FOR EMISSION CONTROL

Nov., 1984



Pub. No. 36380E

# FOREWORD

This repair manual has been prepared to provide information covering general service repairs for the Emission Control System of the 3Y, 22R and 3F engines.

Applicable models:
YU60 series
RJ70 series
RB20 series
FJ62, 70, 73, 75 series

For service of the 3Y, 22R and 3F engines, refer to the following repair manuals.

| | |
|---|---|
| Y Series Engine Repair Manual | (Pub. No. 36235E) |
| 21R, 22R Engine Repair Manual | (Pub. No. 36056E) |
| 3F Engine Repair Manual | (Pub. No. 36253E) |

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**

# TOYOTA 3Y, 22R, 3F ENGINE EMISSION CONTROL REPAIR MANUAL


INTRODUCTION 1
TROUBLESHOOTING 2
3Y ENGINE 3
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SPECIFICATIONS A



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# INTRODUCTION

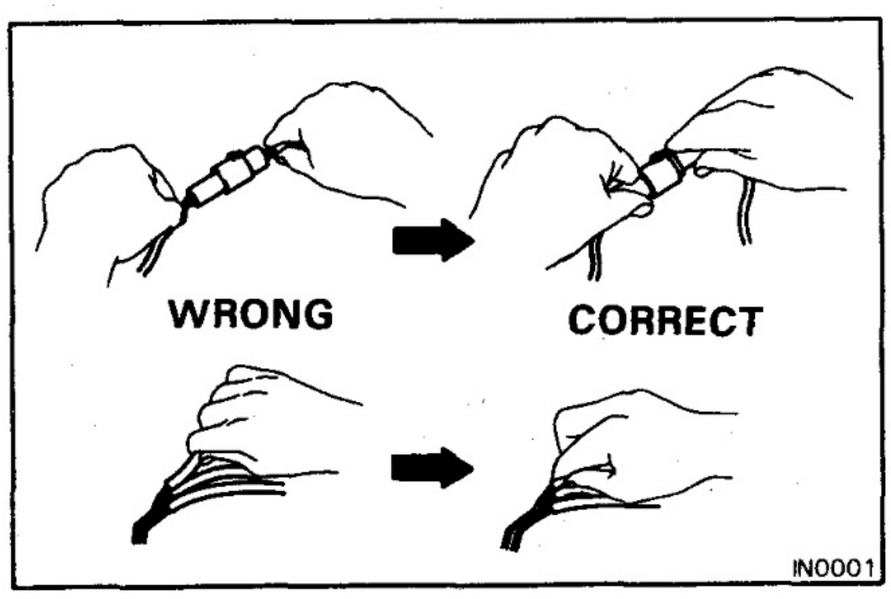

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# GENERAL PRECAUTIONS

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.

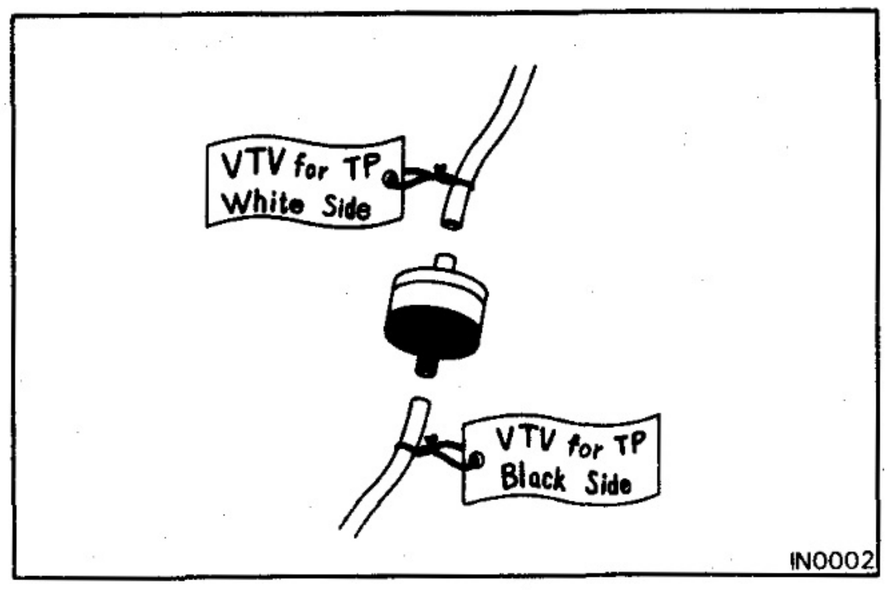
2. **Listen to the customers comments carefully.**
   Always determine exactly what the customer complaint is, if any, and verify it before proceeding with repairs.

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 that 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 continuity at the 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.

**7. Use genuine parts.**

**8. Observe safty proceedures.**

(a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels.

(b) After the vehicle is jacked up, do not fail to support it on stands. It is extremely dangerous to do any work on the vehicle raised on one jack alone, even for a small job that can be finished quickly.

(c) Disconnect the battery cable from the negative (–) terminal of the battery to make work safer when replacing electrical parts or working on parts near an electrical source.

# ABBREVIATIONS USED IN THIS MANUAL

| | |
|---|---|
| AAP | Auxiliary Acceleration Pump |
| ABV | Air By-pass Valve |
| ACV | Air Control Valve |
| AI | Air Injection |
| ASV | Air Switching Valve |
| A/T | Automatic Transmission |
| BTDC | Before Top Dead Center |
| BVSV | Bimetal Vacuum Switching Valve |
| CB | Choke Breaker |
| CMH | Cold Mixture Heater |
| EGR | Exhaust Gas Recirculation |
| EVAP | Evaporative (Emission Control) |
| EX | Exhaust (manifold or valve) |
| Ex. | Except |
| HAI | Hot Air Intake |
| IN | Intake (manifold or valve) |
| IG | Ignition |
| M/T | Manual Transmission |
| OVCV | Outer Vent Control Valve |
| PCV | Positive Crankcase Ventilation |
| PS | Power Steering |
| SC | Spark Control |
| SST | Special Service Tools |
| S/W | Switch |
| T/M | Transmission |
| TP | Throttle Positioner |
| VSV | Vacuum Switching Valve |
| VTV | Vacuum Transmitting Valve |
| w/ | With |
| w/o | Without |

# TROUBLESHOOTING


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| ENGINE OVERHEATING | 2-2 |
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| ENGINE DIESELING | 2-4 |
| AFTER FIRE, BACKFIRE | 2-4 |
| EXCESSIVE OIL CONSUMPTION | 2-4 |
| EXCESSIVE FUEL CONSUMPTION | 2-5 |

# ENGINE OVERHEATING

| Problem | Possible cause | Remedy |
|---|---|---|
| Engine overheats | Cooling system faulty<br>Incorrect ignition timing | Troubleshoot cooling system<br>Reset timing |

# HARD STARTING

| Problem | Possible cause | Remedy |
|---|---|---|
| Engine will not crank or cranks slowly | Starting system faulty | Troubleshoot starting system |
| Engine will not start/ hard to start (cranks okay) | No fuel supply to carburetor | Check fuel line |
| | Carburetor problems<br>● Choke operation<br>● Flooding<br>● Needle valve sticking or clogged<br>● Vacuum hose disconnected or damaged<br>● Fuel cut solenoid valve not open | Repair as necessary |
| | Ignition problems<br>● Ignition coil<br>● Igniter<br>● Distributor | Inspect coil<br>Inspect distributor |
| | Spark plugs faulty | Inspect plugs |
| | Ignition wiring disconnected or broken | Inspect wiring |
| | Vacuum leaks<br>● PCV line<br>● EGR line<br>● Intake manifold | Repair as necessary |
| | Compression low | Check compression |

# ROUGH IDLING

| Problem | Possible cause | Remedy |
|---|---|---|
| Rough idle or stalls | Spark plugs faulty | Inspect plugs |
| | Ignition wiring faulty | Inspect wiring |
| | Ignition problems<br>● Ignition coil<br>● Igniter<br>● Distributor | Inspect coil<br>Inspect distributor |
| | Incorrect ignition timing | Reset timing |
| | Vacuum leaks<br>● PCV line<br>● EGR line<br>● Intake manifold | Repair as necessary |

# ROUGH IDLING (Cont'd)

| Problem | Possible cause | Remedy |
|---|---|---|
| Rough idle or stalls (cont'd) | Carburetor problems<br>• Idle speed incorrect<br>• Slow jet clogged<br>• Idle mixture incorrect<br>• Fuel cut solenoid valve not open<br>• Fast idle speed setting incorrect (cold engine)<br>• Choke system faulty | Repair as necessary |
| | HAI system faulty | Check HAI system |
| | Engine overheats | Troubleshoot cooling system |
| | EGR valve faulty | Check EGR valve |
| | Compression low | Check compression |

# ENGINE HESITATES/POOR ACCELERATION

| Problem | Possible cause | Remedy |
|---|---|---|
| Engine hesitates/ poor acceleration | Spark plugs faulty | Inspect plugs |
| | Ignition wiring faulty | Inspect wiring |
| | Vacuum leaks<br>• PCV line<br>• EGR line<br>• Intake manifold | Repair as necessary |
| | Incorrect ignition timing | Reset timing |
| | Air cleaner clogged | Check air cleaner |
| | Fuel line clogged | Check fuel line |
| | Carburetor problems<br>• Float level too low<br>• Accelerator pump faulty<br>• Power valve faulty<br>• Choke system faulty | Repair as necessary |
| | Emission control system problem<br>• EGR system always on (cold engine)<br>• AAP system faulty (cold engine) | Check EGR system<br>Check AAP system |
| | Engine overheats | Check cooling system |
| | Compression low | Check compression |

# ENGINE DIESELING

| Problem | Possible cause | Remedy |
|---|---|---|
| Engine dieseling (turns when ignition switch is turned off) | Carburetor problems<br>• Linkage sticking<br>• Idle speed or fast idle speed out of adjustment<br>• Fuel cut solenoid faulty | Repair as necessary |
| | Incorrect ignition timing | Reset timing |
| | EGR system faulty | Check EGR system |

# AFTER FIRE, BACKFIRE

| Problem | Possible cause | Remedy |
|---|---|---|
| Muffler explosion (after fire) on deceleration only | AI system faulty | Check AI system |
| | TP system always off | Check TP system |
| Muffler explosion (after fire) all the time | Air cleaner clogged | Check air cleaner |
| | Choke system faulty | Check choke system |
| | Incorrect ignition timing | Reset timing |
| Engine backfires | Choke valve open (cold engine) | Check choke system |
| | Carburetor vacuum leak | Check hoses and repair as necessary |
| | Insufficient fuel flow | Troubleshoot fuel system |
| | Incorrect ignition timing | Reset timing |
| | Carbon deposits in combustion chambers | Inspect cylinder head |

# EXCESSIVE OIL CONSUMPTION

| Problem | Possible cause | Remedy |
|---|---|---|
| Excessive oil consumption | Oil leak | Repair as necessary |
| | PCV line clogged | Check PCV system |
| | Piston ring worn or damaged | Check rings |
| | Valve stem oil seal worn or damaged | Check oil seals |
| | Valve stem and guide worn | Check valves and guides |

# EXCESSIVE FUEL CONSUMPTION

| Problem | Possible cause | Remedy |
|---|---|---|
| Excessive fuel consumption | Fuel leak | Repair as necessary |
| | Air cleaner clogged | Check air cleaner |
| | Incorrect ignition timing | Reset timing |
| | Carburetor problems<br>● Choke faulty<br>● Idle speed too high<br>● Power valve always open | Repair as necessary |
| | Spark plugs faulty | Inspect plugs |
| | SC system faulty | Check SC system |
| | EGR system always on | Check EGR system |
| | Compression low | Check compression |
| | Tires improperly inflated | Inflate tires to proper pressure |
| | Clutch slips | Troubleshoot clutch |
| | Brakes drag | Troubleshoot brakes |

# 3Y ENGINE

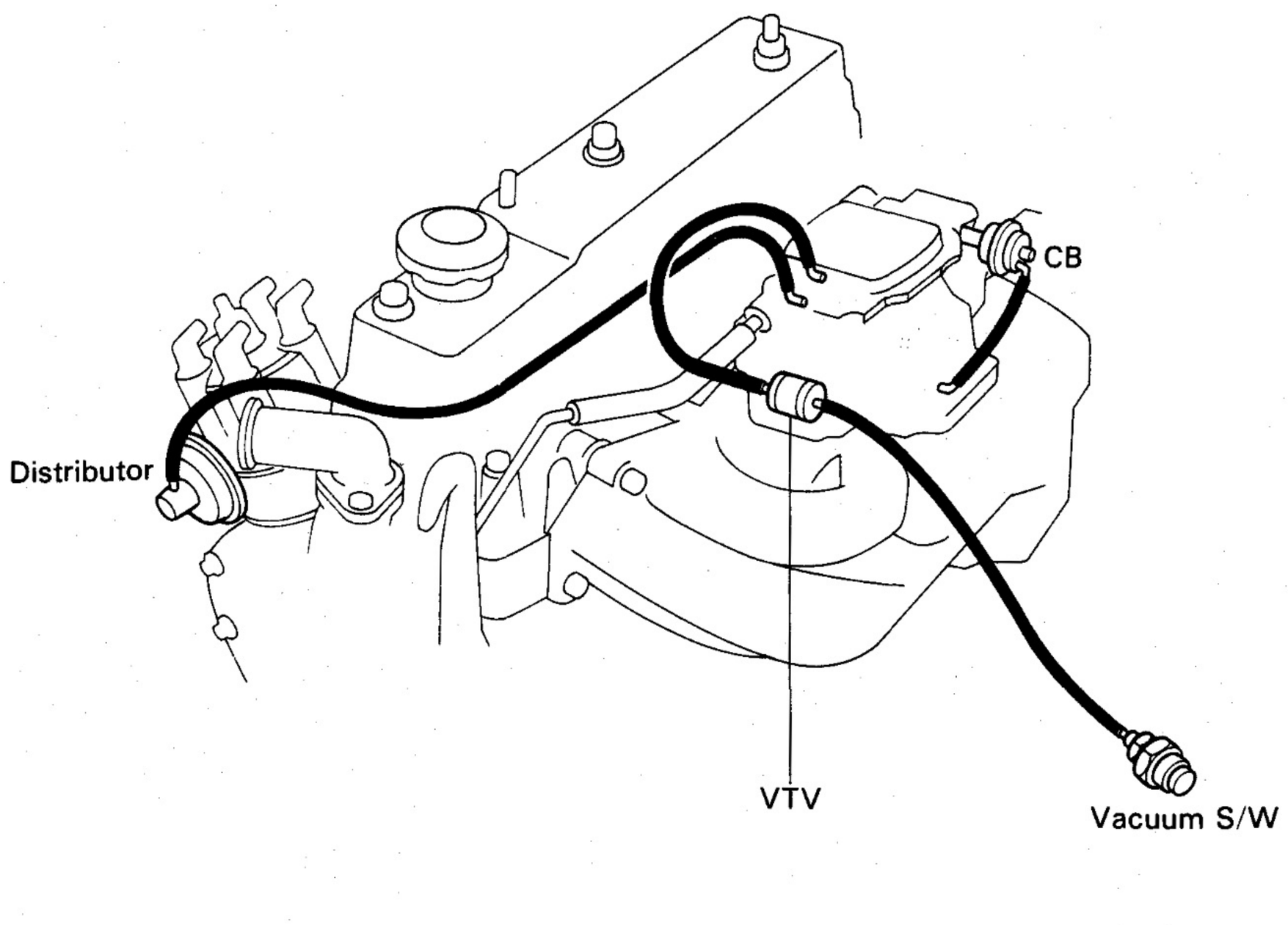
## Vehicle Model:
## DYNA (YU60 Series)

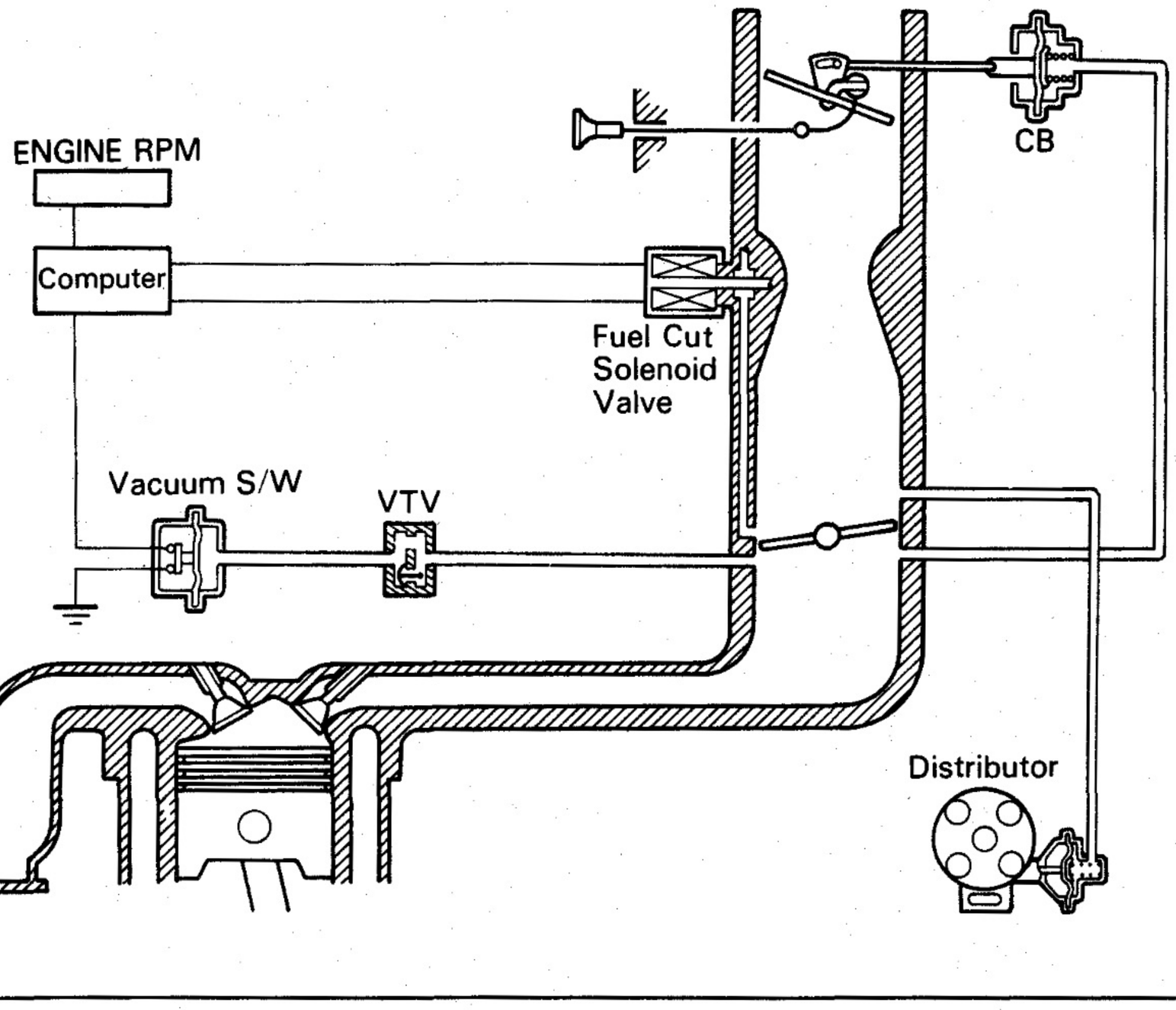

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# SYSTEM PURPOSE

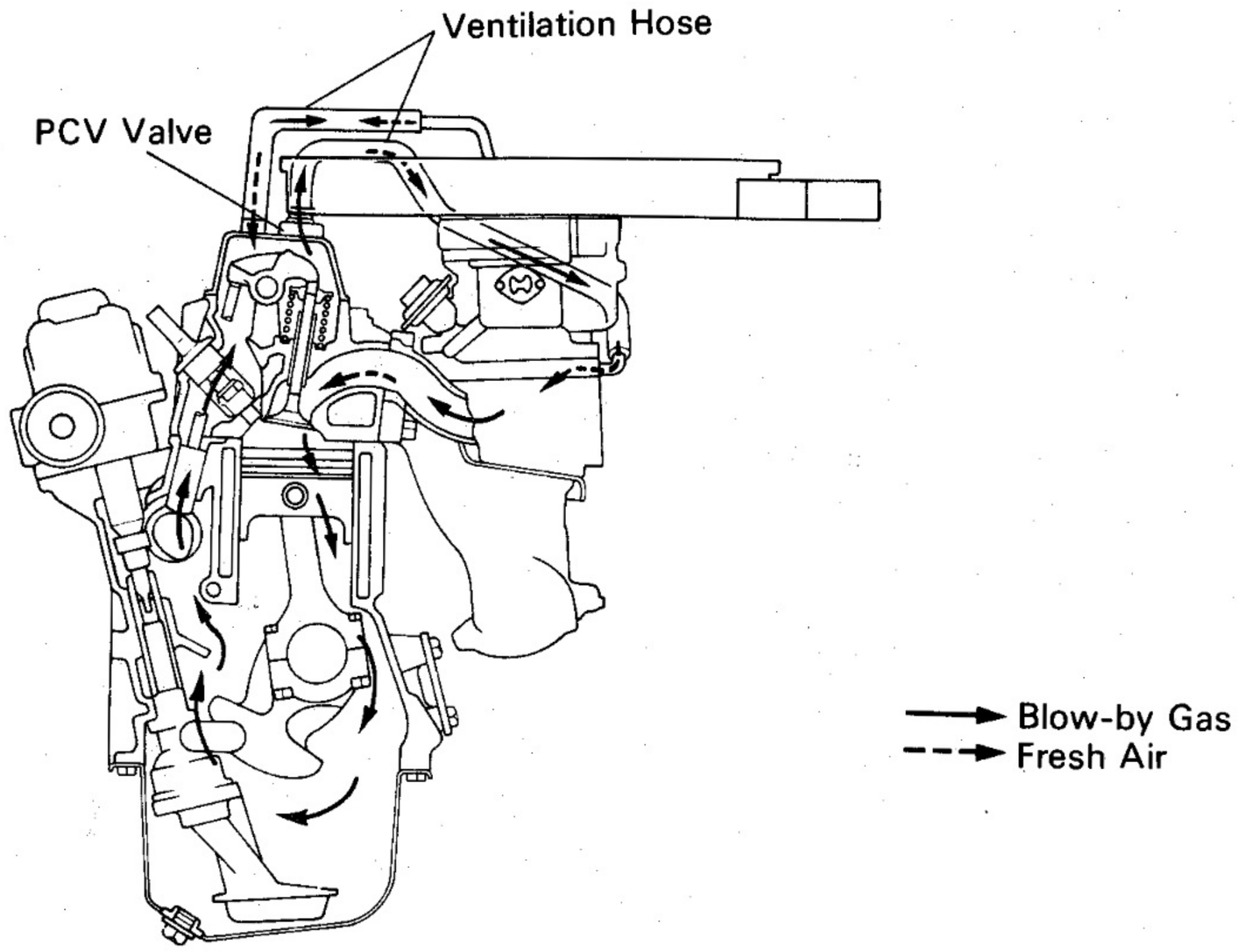
| System | Abbreviation | Purpose |
|---|---|---|
| Positive crankcase ventilation | PCV | Reduces blow-by gas (HC) |
| Auxiliary system: | | |
| Choke breaker | CB | Improves driveability–cold |
| Deceleration fuel cut system | — | Reduces HC and prevents after burning |

# COMPONENT LAYOUT AND SCHEMATIC DRAWING



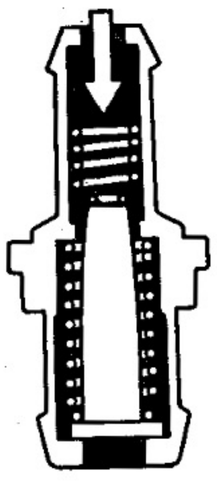
# POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM




EC1028

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

**Engine not Running or Backfiring**



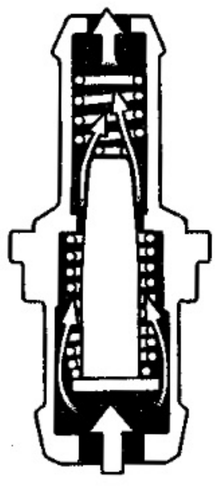
Intake Manifold Side

○ PCV VALVE IS CLOSED.

Cylinder Head Side

EC1001

**Normal Operation**

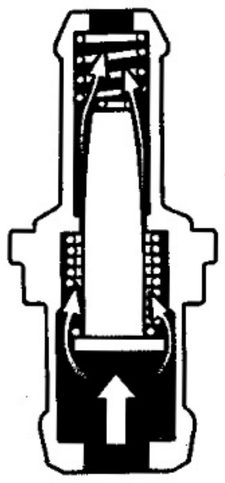


○ PCV VALVE IS OPEN.

○ VACUUM PASSAGE IS LARGE.

EC1002

**Idling or Decelerating**

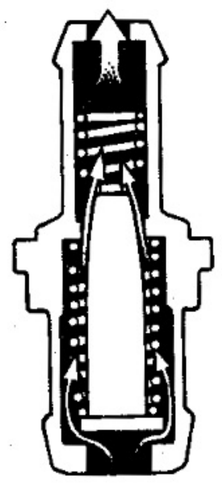


○ PCV VALVE IS OPEN.

○ VACUUM PASSAGE IS SMALL.

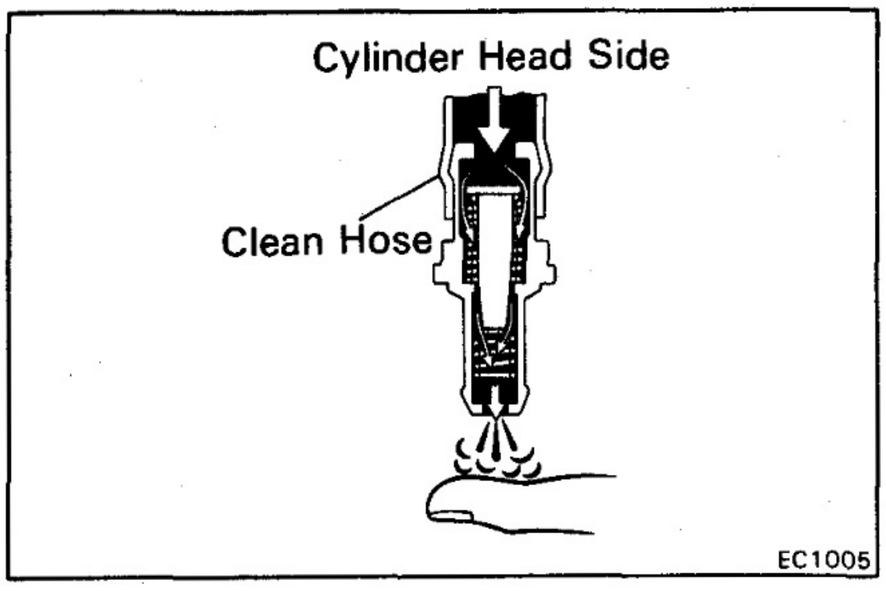
EC1003

**Acceleration or High Load**



○ PCV VALVE IS FULLY OPEN.

EC1004

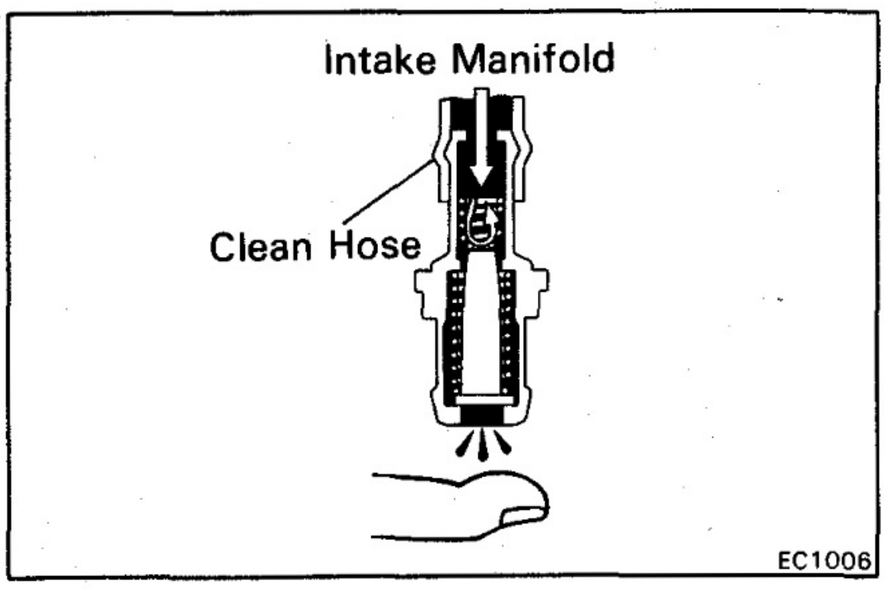



## INSPECTION OF PCV VALVE

1. **REMOVE PCV VALVE**
2. **ATTACH CLEAN HOSE TO PCV VALVE**
3. **BLOW FROM CYLINDER HEAD SIDE**

   Check that air passes through easily.

   **CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.**

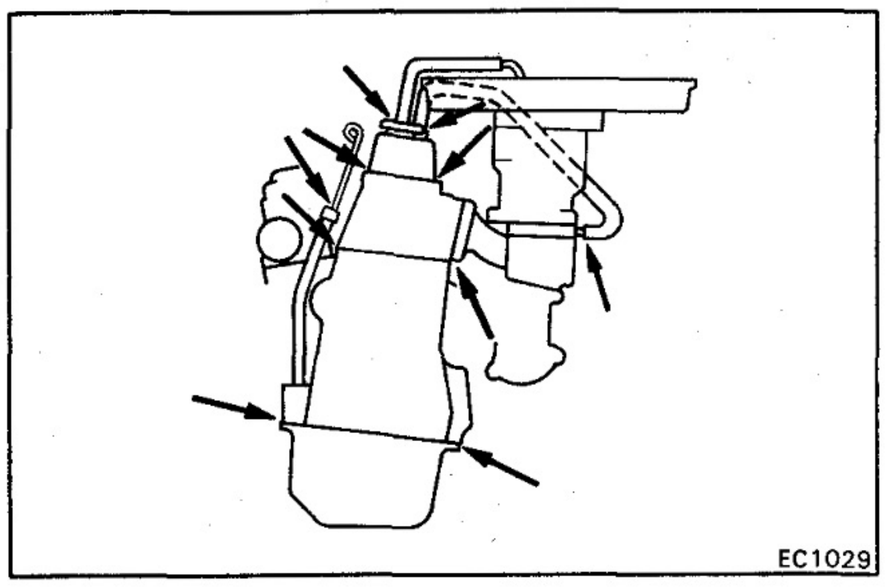



4. **BLOW FROM INTAKE MANIFOLD SIDE**

   Check that air passes through with difficulty.

   If the PCV valve fails either of the checks, replace it.

5. **REINSTALL PCV VALVE**



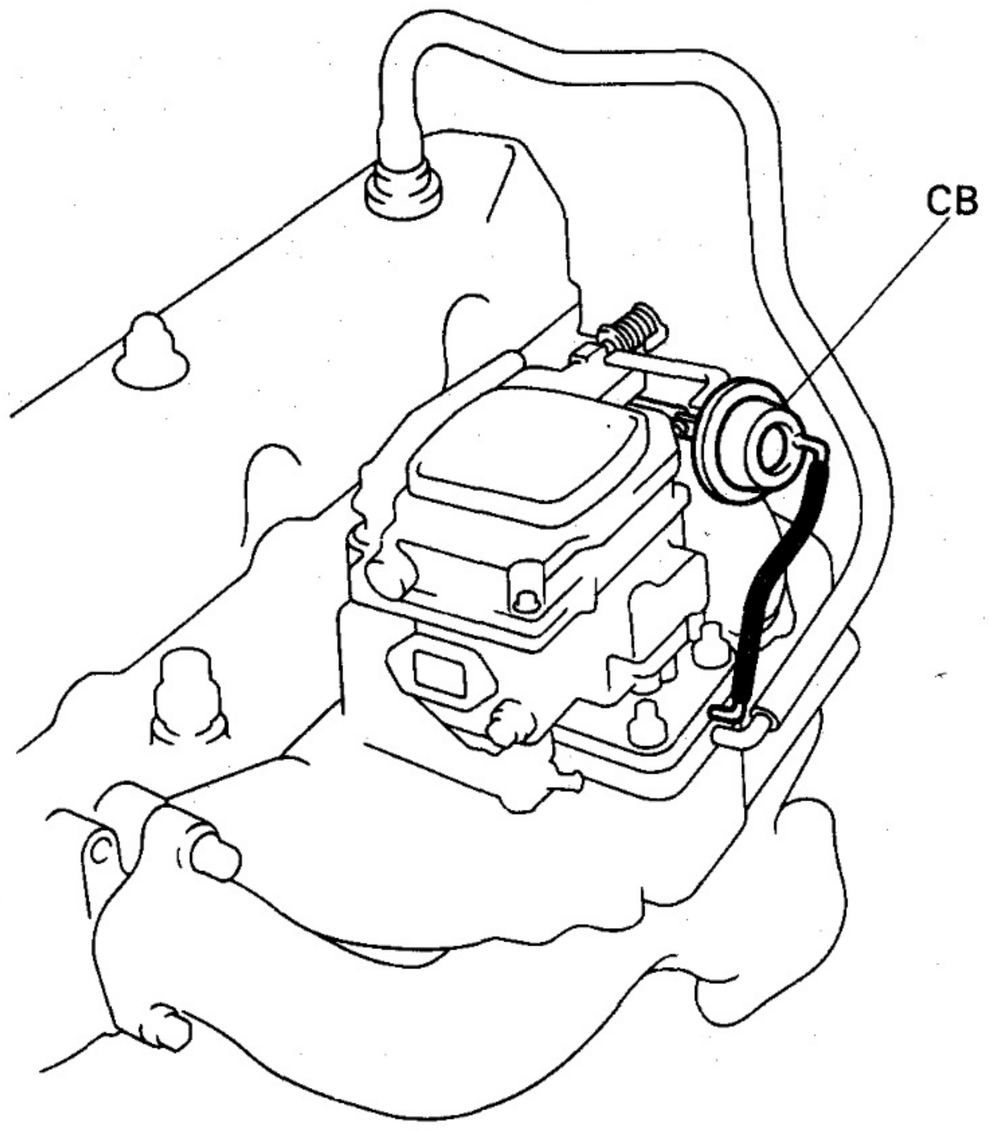

## INSPECTION OF PCV HOSES AND CONNECTIONS

### VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

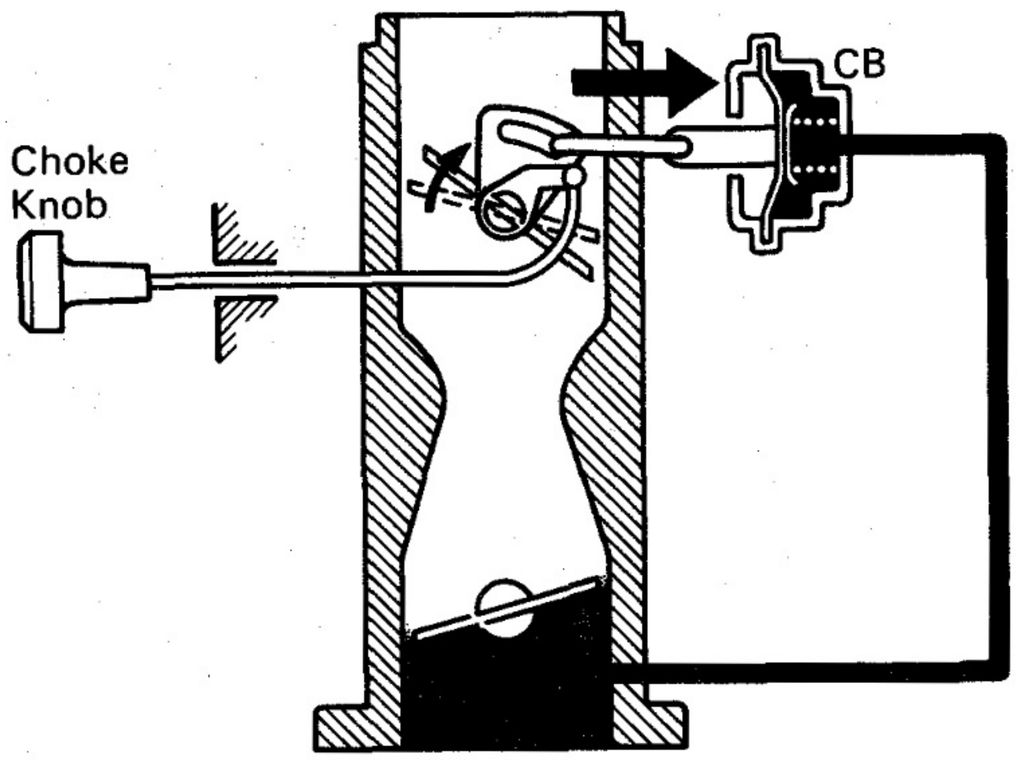
Check for cracks, leaks or damage.

# AUXILIARY SYSTEMS

## 1. Choke Breaker (CB) System

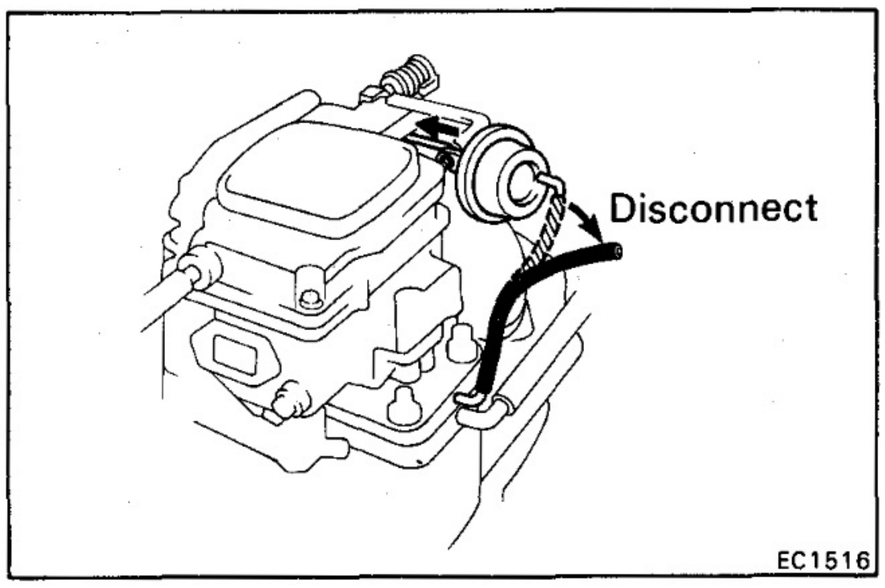



EC1515




EC3526

This system slightly opens the choke valve to prevent too rich a mixture after firing when the choke is closed.



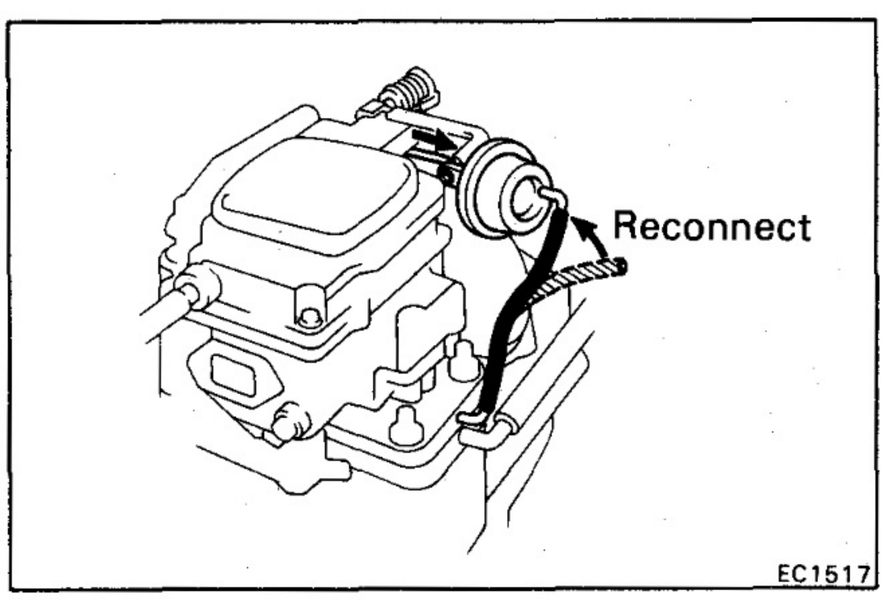

EC1516

## INSPECTION OF CB SYSTEM

### CHECK CHOKE LINKAGE AND DIAPHRAGM

(a) Start the engine.

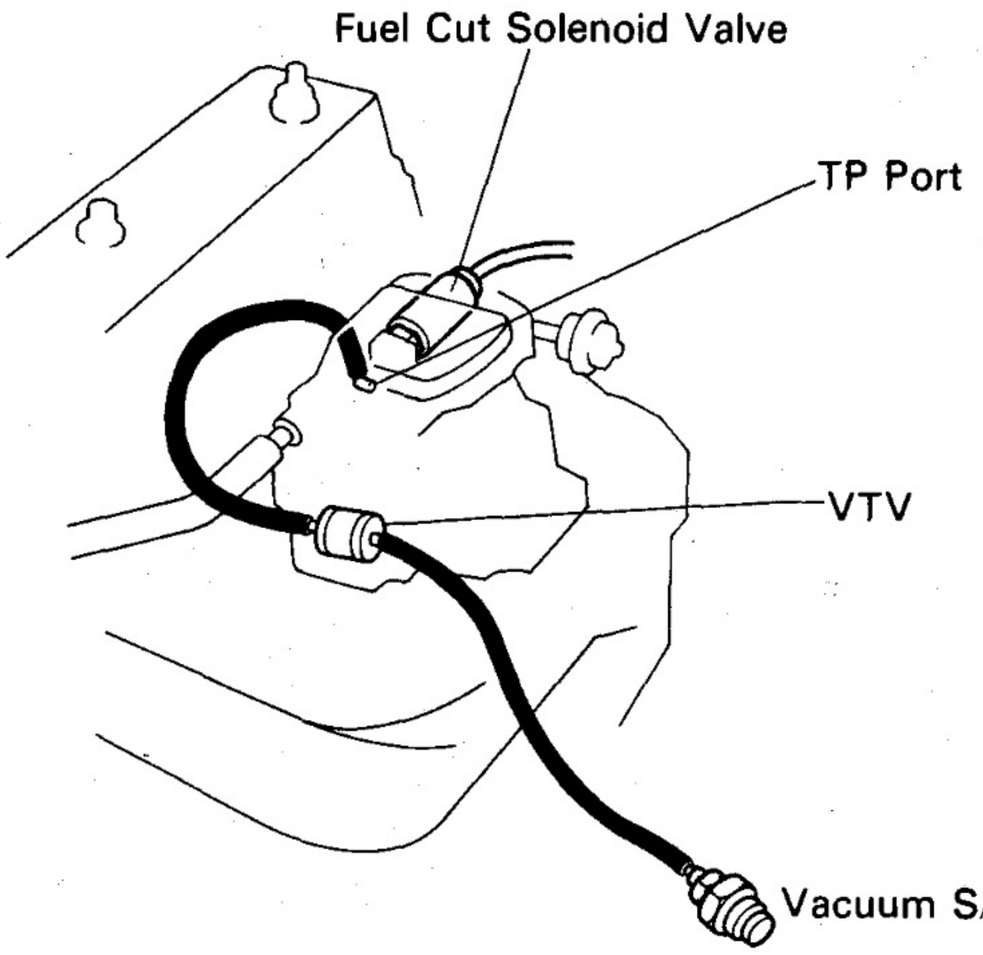
(b) Disconnect the hose from the CB diaphragm and check that the choke linkage return.



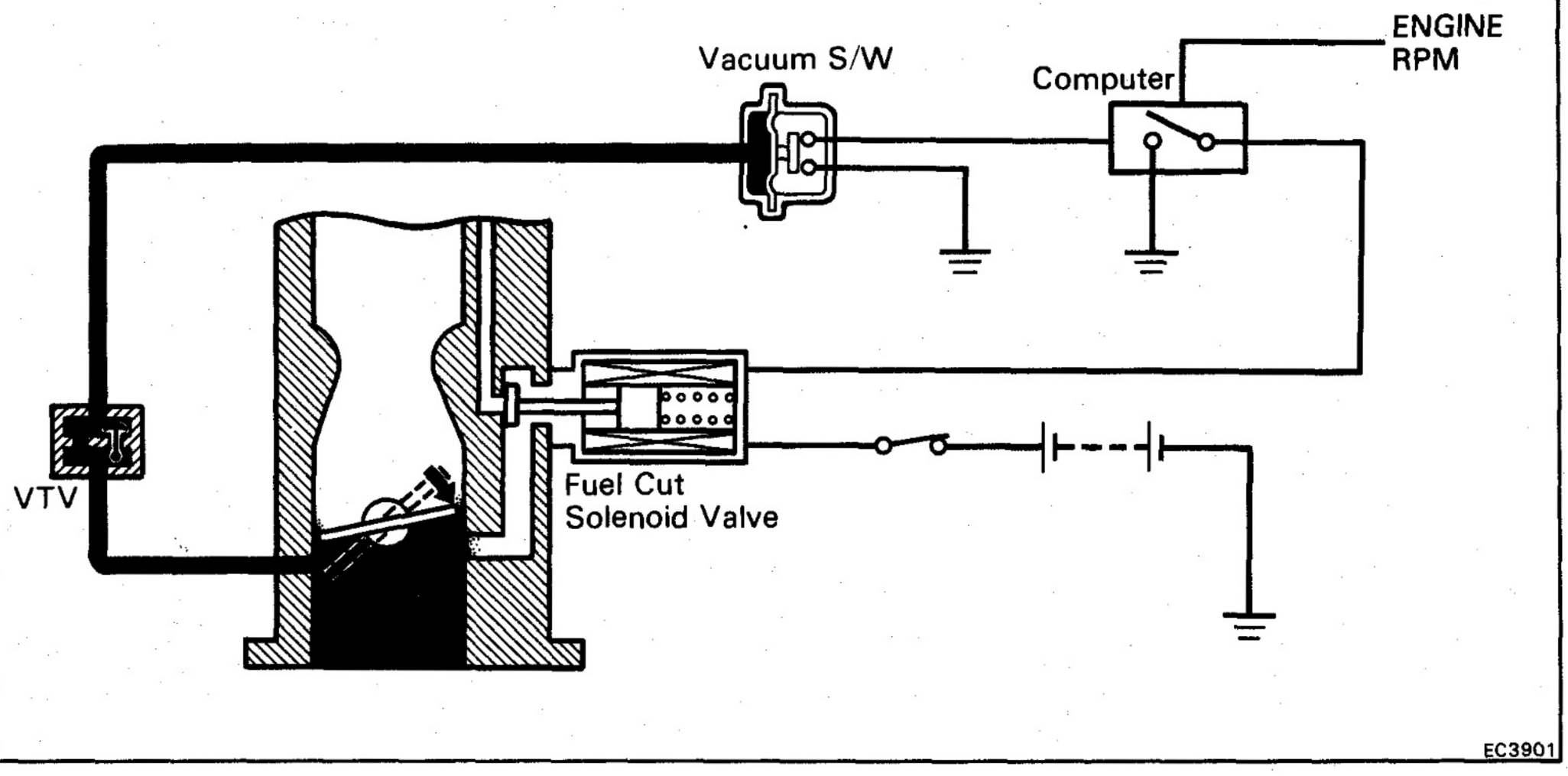

EC1517

(c) Reconnect the hose to the diaphragm and check that the choke linkage is pulled by the diaphragm.

# 2. Deceleration Fuel Cut System



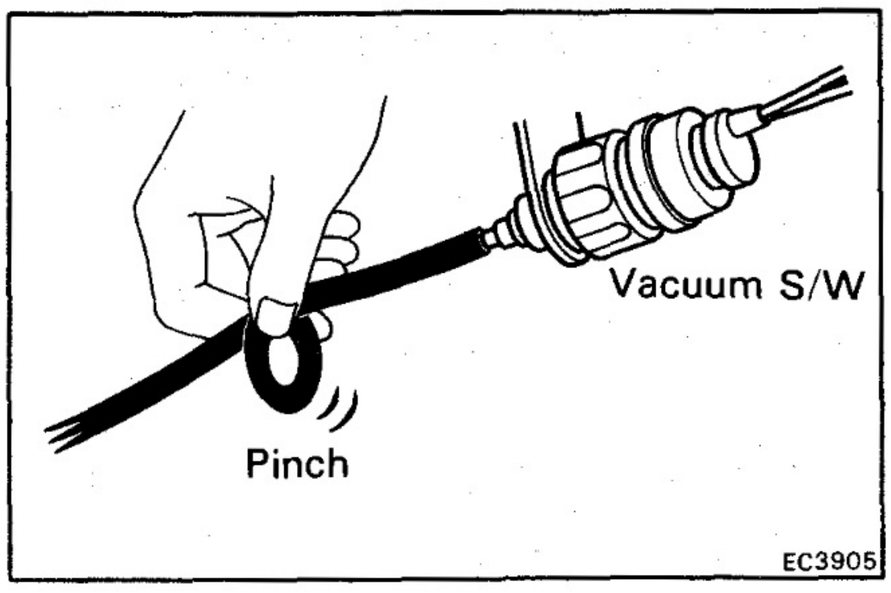

EC1518




EC3901

This system cuts off part of the fuel in the slow circuit of the carburetor to reduce HC and to prevent afterburning in the exhaust system.

| Engine PRM | Vacuum in the Vacuum S/W | Vacuum S/W | Computer | Fuel Cut Solenoid Valve | Slow Circuit in Carburetor |
|---|---|---|---|---|---|
| Below 1,700 rpm (Others) | Below 295 mmHg (11.61 in.Hg, 39.3 kPa) | ON | ON | ON | OPEN |
| | Above 345 mmHg (13.58 in.Hg, 46.0 kPa) | OFF | ON | ON | OPEN |
| Above 2,090 rpm (Others) | Below 295 mmHg (11.61 in.Hg, 39.3 kPa) | ON | ON | ON | OPEN |
| | Above 345 mmHg (13.58 in.Hg, 46.0 kPa) | OFF | OFF | OFF | CLOSED |




# INSPECTION OF DECELERATION FUEL CUT SYSTEM

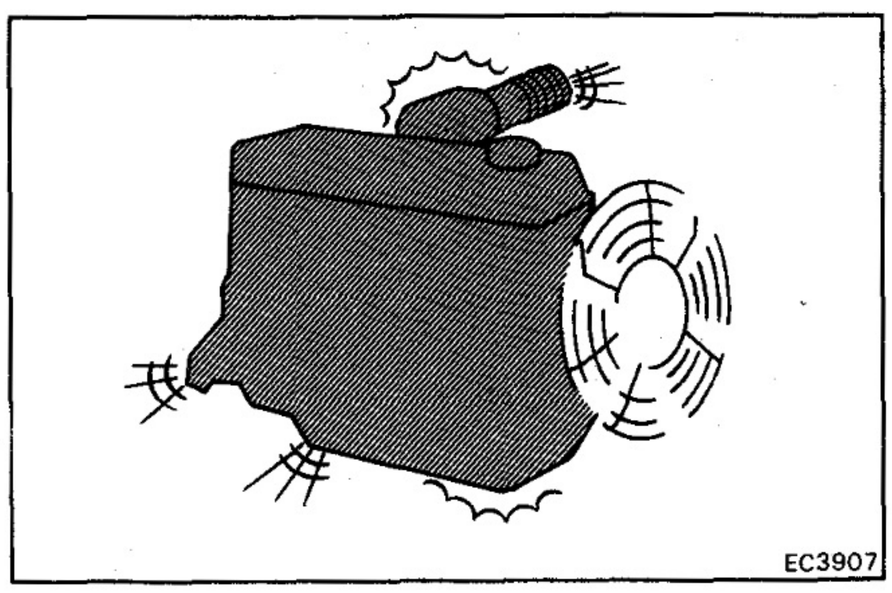
## CHECK SYSTEM OPERATION

(a) Connect a tachometer to the engine.

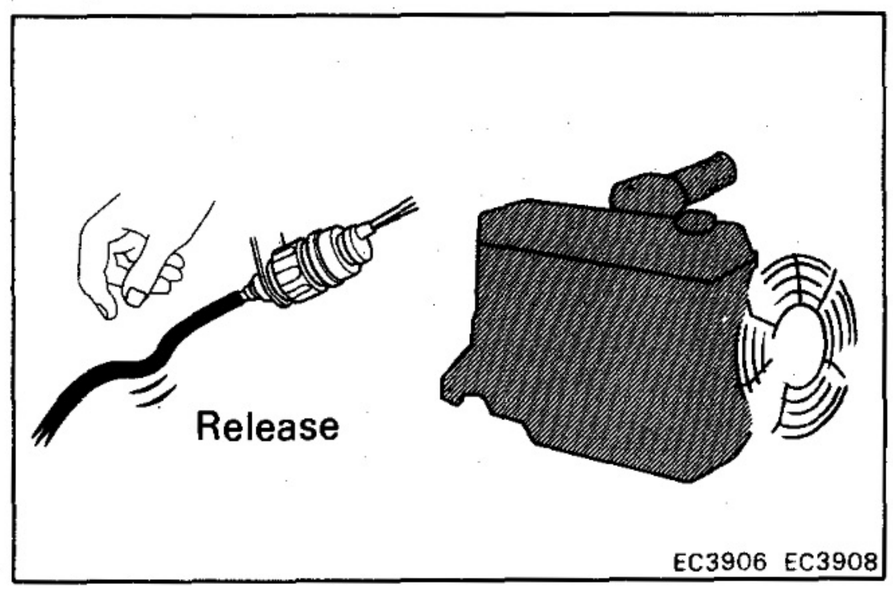
(b) Start the engine.

(c) Check that the engine runs normally.

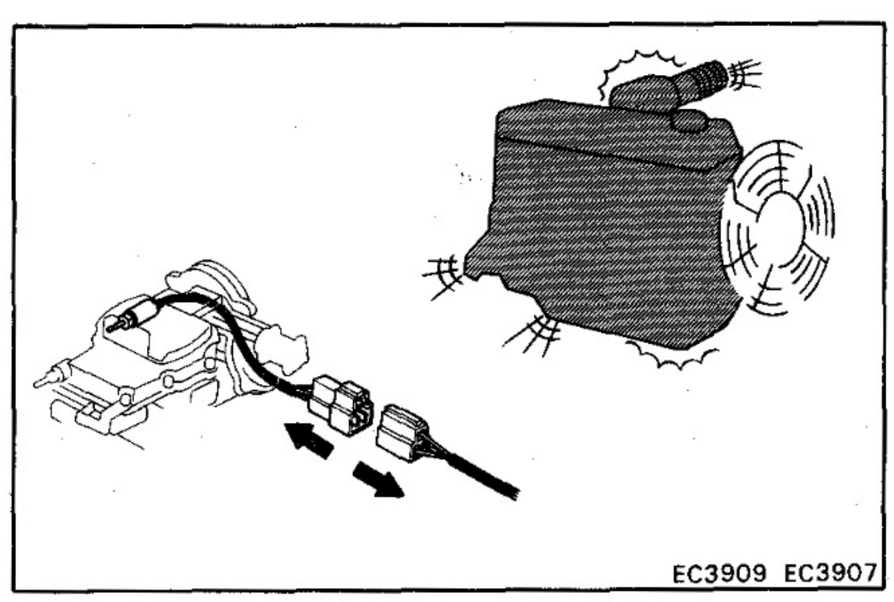
(d) Pinch off the vacuum hose to the vacuum switch.




(e) Gradually increase the engine speed. Check that the engine misfires slightly.




(f) Release the pinched hose. Again gradually increase the engine speed and check that the engine operation returns to normal.

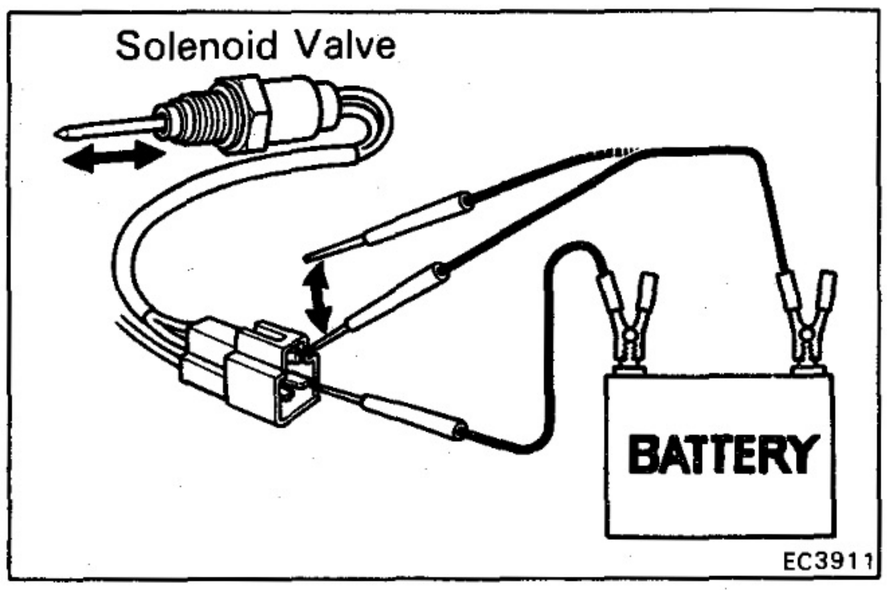



(g) With the engine idling, unplug the wiring connector to the solenoid valve. Check that the engine dies.

(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



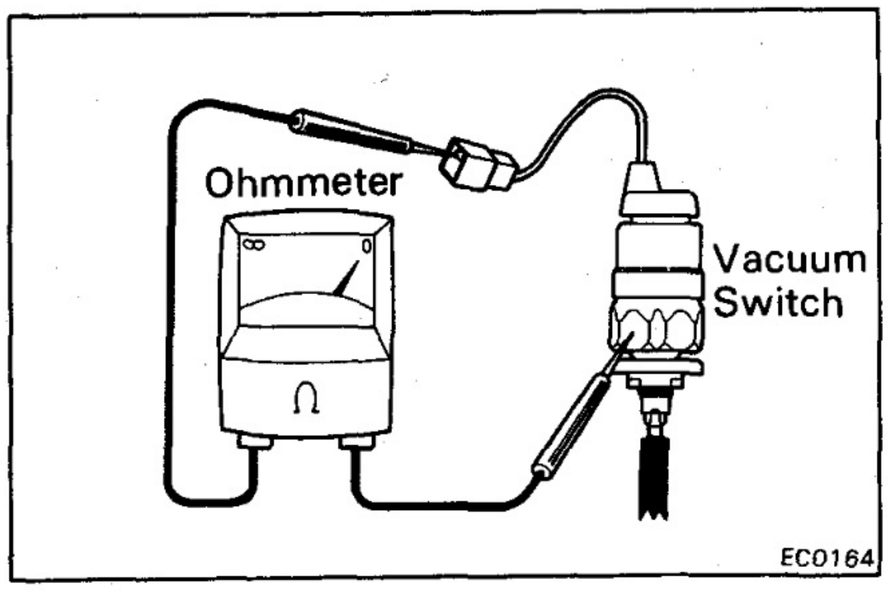

(a) Remove the solenoid valve.

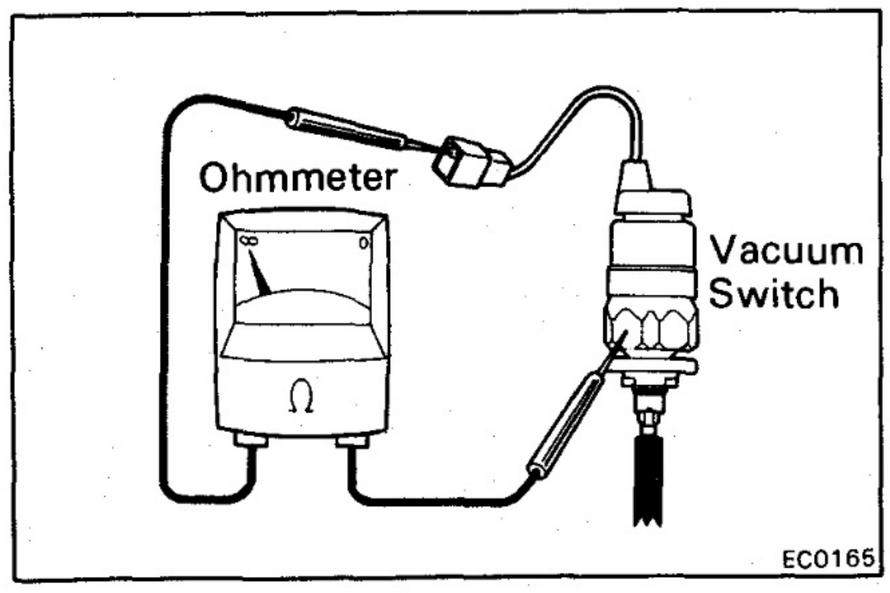
(b) Connect the two terminals and the battery terminals as shown.

(c) Check that you can feel a "click" from the solenoid valve when the battery is connected and disconnected.

(d) Reinstall the valve and reconnect the wiring connector.

If a problem is found, replace the solenoid valve or O-ring.



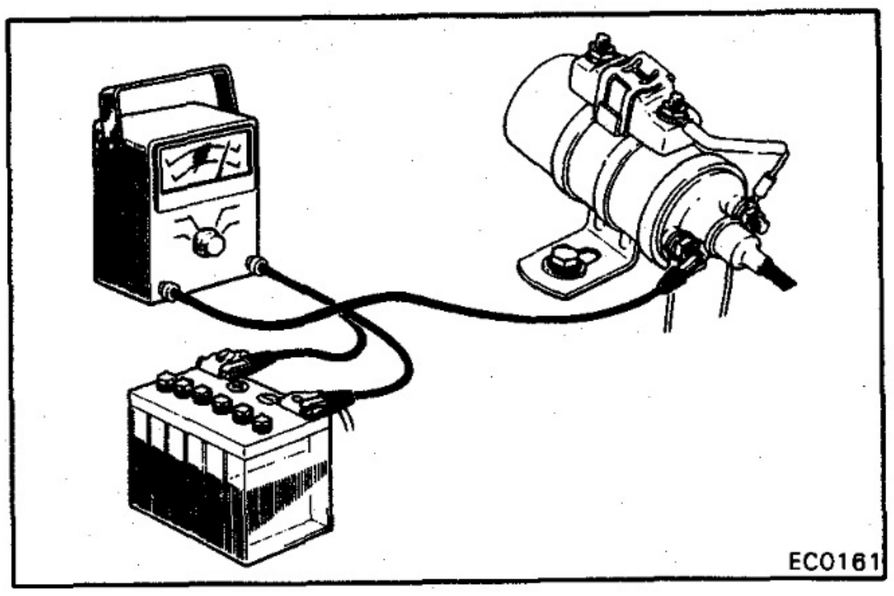

## INSPECTION OF VACUUM SWITCH

(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.



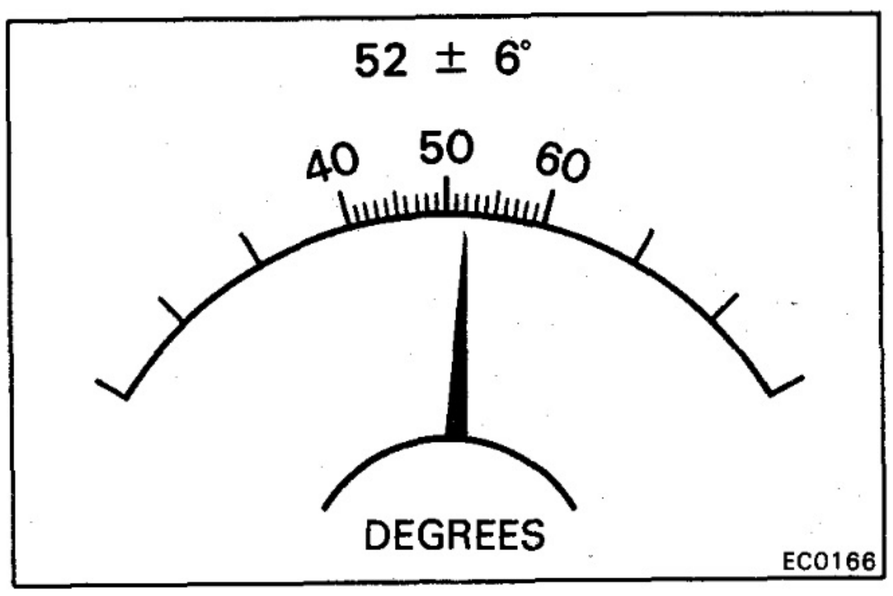

# ENGINE ADJUSTMENT

## 1. Ignition Timing and Dwell Angle

### INSPECTION AND ADJUSTMENT OF IGNITION TIMING AND DWELL ANGLE

**1. CONNECT TACHOMETER AND TIMING LIGHT**

Connect the tachometer positive (+) terminal to the ignition coil negative (–) terminal.




**2. WARM UP ENGINE**

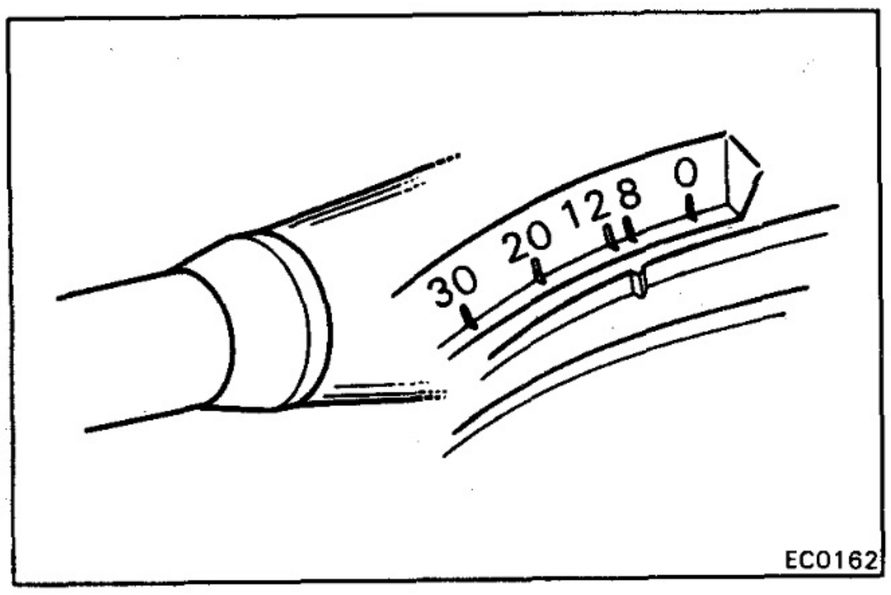
Allow the engine to reach full operating temperature.

**3. CHECK DWELL ANGLE**

**Dwell angle: 52 ± 6°**

(a) With the engine idling as specified make sure the dwell angle is within the specified range.

(b) If the angle is too small, increase the rubbing block gap. If it is too large, decrease the gap.




**4. CHECK IGNITION TIMING**

**Ignition timing: 8 ± 2° BTDC @ Max. 850 rpm (T/M in "N" range)**

(a) With the engine idling as specified, use a timing light to check the timing.

(b) If necessary, loosen the distributor bolts and turn the distributor to align the marks. Recheck the timing after tightening the distributor.

**Torque: 185 kg-cm (13 ft-lb, 18 N·m)**

# 2. Idle Speed and Idle Mixture

## CHECK AND ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE

### 1. CONNECT A TACHOMETER TO ENGINE

### 2. WARM UP ENGINE

Allow the engine to reach full operating temperature.

### 3. CHECK IDLE SPEED

**Idle speed: 650 ± 50 rpm**

If not as specified, adjust according to the following procedure.

## A. METHOD WITH CO METER

### 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

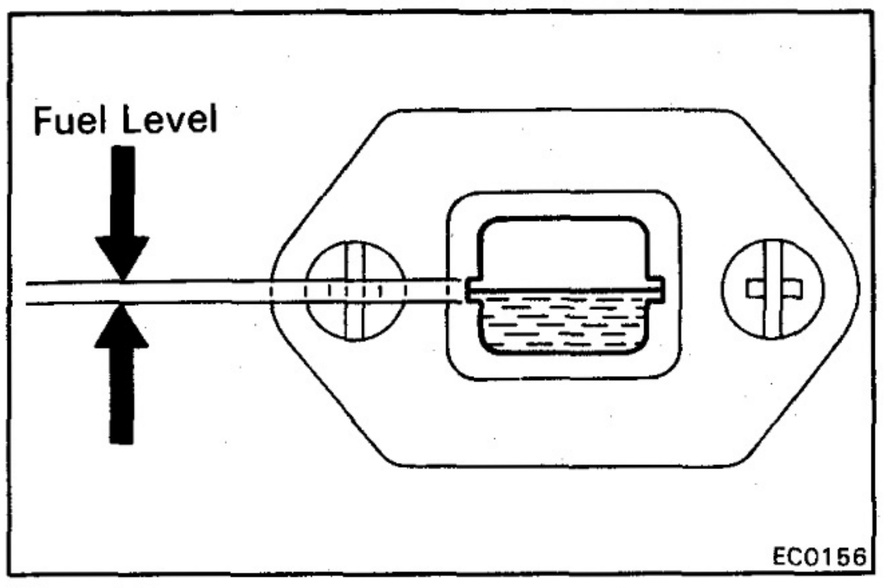
(f) Ignition timing set correctly

(g) Transmission in N range

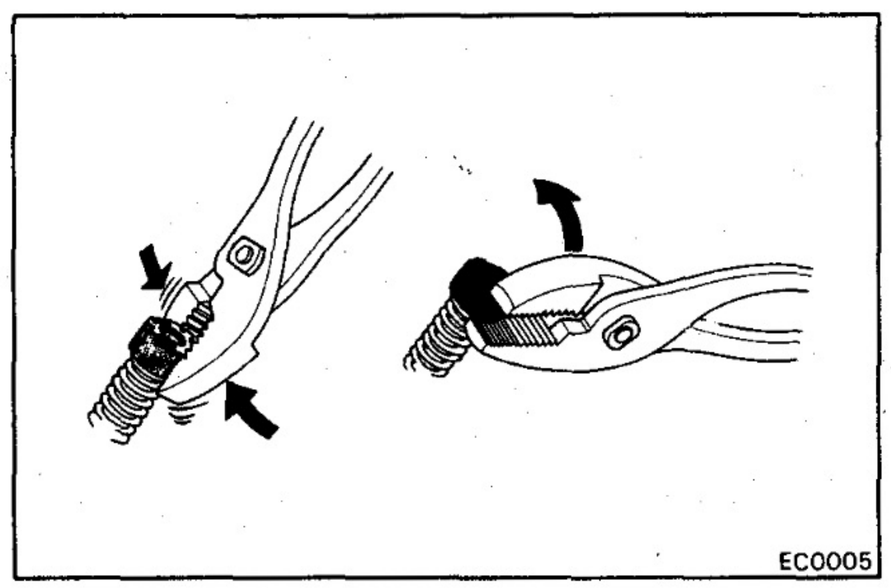
(h) Fuel level should be about even with the correct level in the sight glass

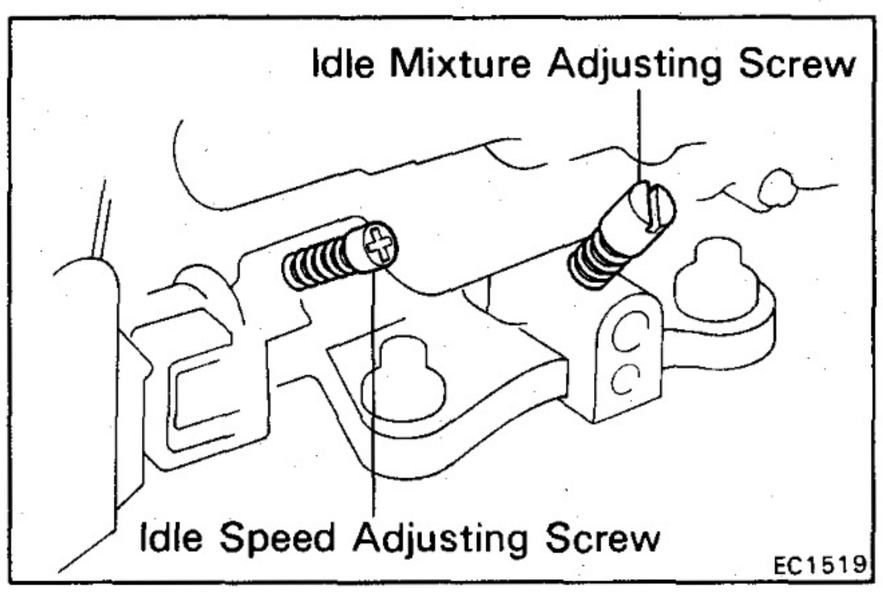
(i) CO meter operates normally

(j) Vacuum gauge installed




### 3. BREAK OFF IDLE LIMITER CAP, IF INSTALLED



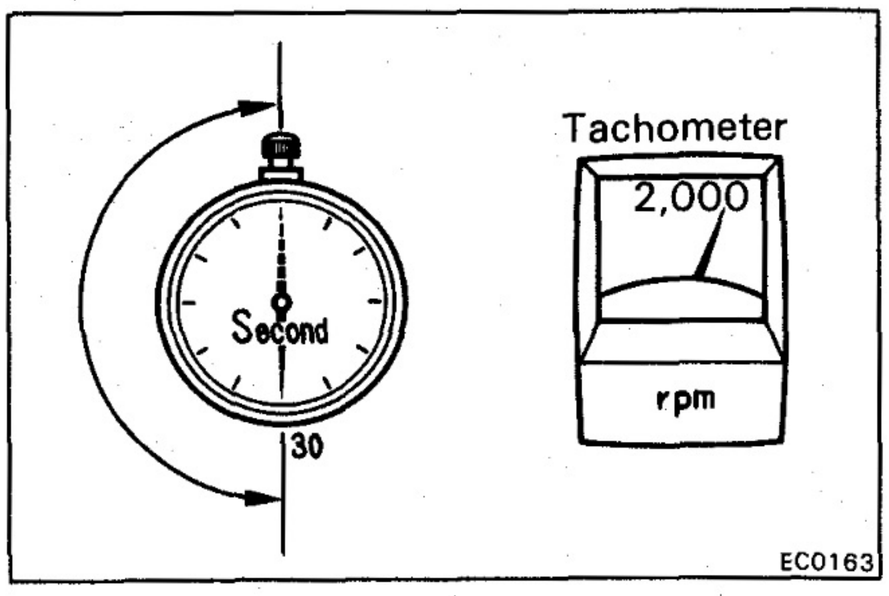



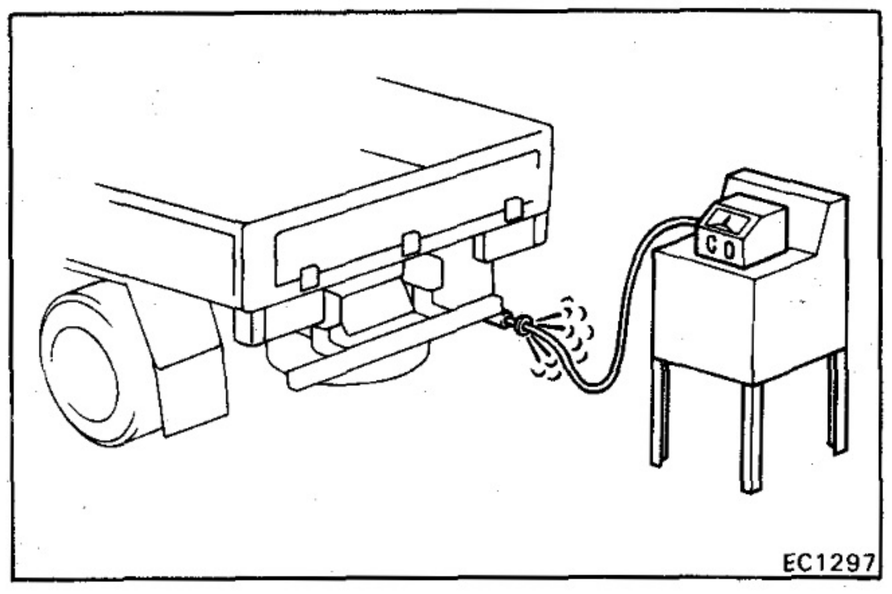

### 4. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Start the engine.

(b) Using a CO meter to measure the CO concentration in the exhaust, turn the idle speed and idle mixture adjusting screws to obtain the specified concentration value at idle speed.

**Idle speed: 650 rpm**




## 5. MEASURE CO CONCENTRATION

(a) Make sure the CO meter is properly calibrated.

(b) Race the engine for 30 – 60 seconds at about 2,000 rpm before measuring the concentration.

(c) Insert a testing probe at least 60 cm (2.0 ft) into the tailpipe.

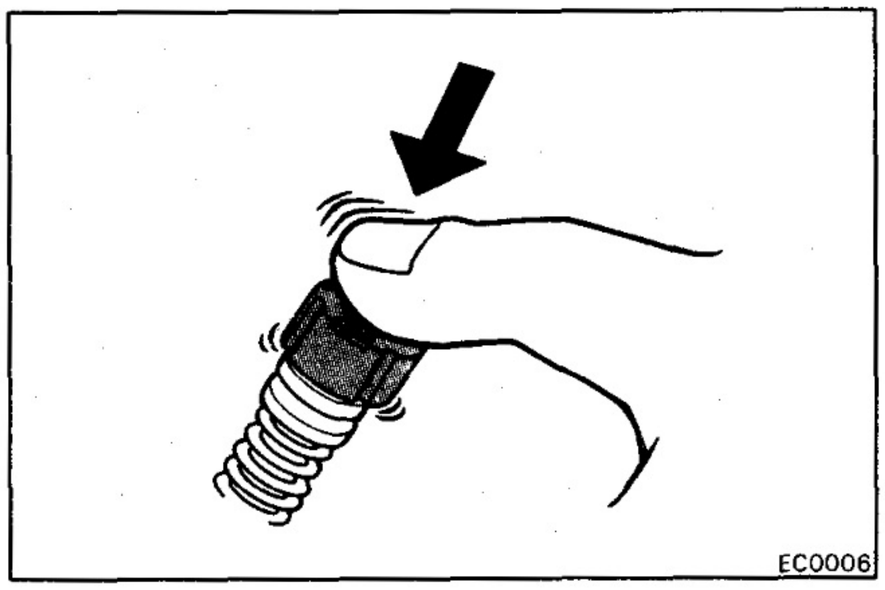
(d) Measure the concentration 1 – 3 minutes after racing the engine to allow the concentration to stabilize.

**Idle CO concentration: 1.5 ± 0.5%**

- If the CO concentration is within specification, this adjustment is complete.
- If the CO concentration exceeds specification, or if the engine loses smoothness of operation, repeat the above adjustment.
- If the CO concentration cannot be corrected by idle mixture adjustment, see the table below for other possible causes.

### TROUBLESHOOTING

| HC | CO | Problems | Causes |
|---|---|---|---|
| High | Normal | Rough idle | 1. Faulty ignition:<br>● Incorrect timing<br>● Fouled, shorted or improperly gapped plugs<br>● Open or crossed ignition wires<br>● Cracked distributor cap<br>2. Leaky exhaust valves<br>3. Leaky cylinder |
| High | Low | Rough idle<br><br>Fluctuating HC reading | 1. Vacuum leak:<br>● Vacuum hose<br>● Intake manifold<br>● PCV line<br>● Carburetor base |
| High | High | Rough idle<br><br>Black smoke from exhaust | 1. Restricted air filter<br>2. Plugged PCV valve<br>3. Faulty carburetion:<br>● Faulty choke action<br>● Incorrect float setting<br>● Leaking needle or seat<br>● Leaking power valve |




## 6. INSTALL NEW LIMITER CAP

After this adjustment is completed, install the idle limiter cap (blue) on the idle mixture adjusting screw.

**CAUTION: After completing adjustment, perform a road test to make certain engine performance has not changed.**

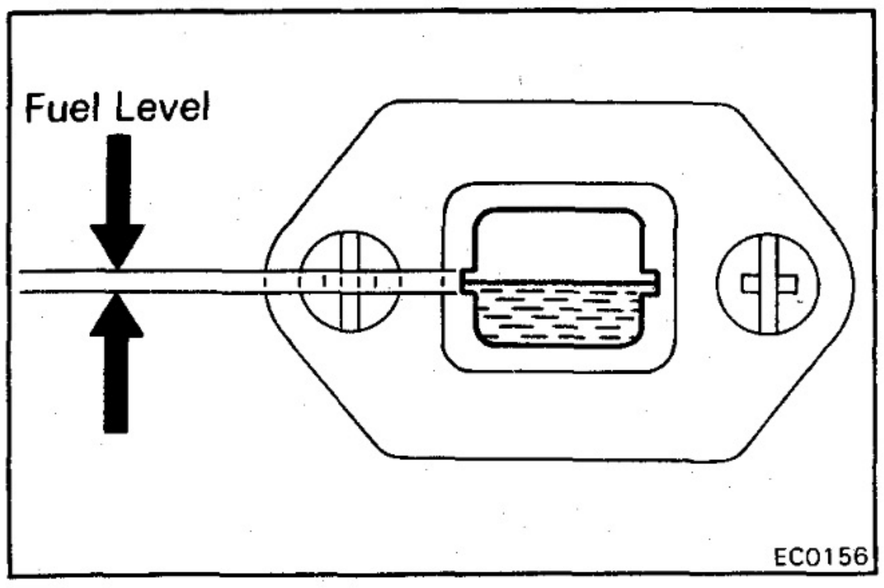
## B. ALTERNATIVE METHOD

**To be used only if CO meter is not available.**

### 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

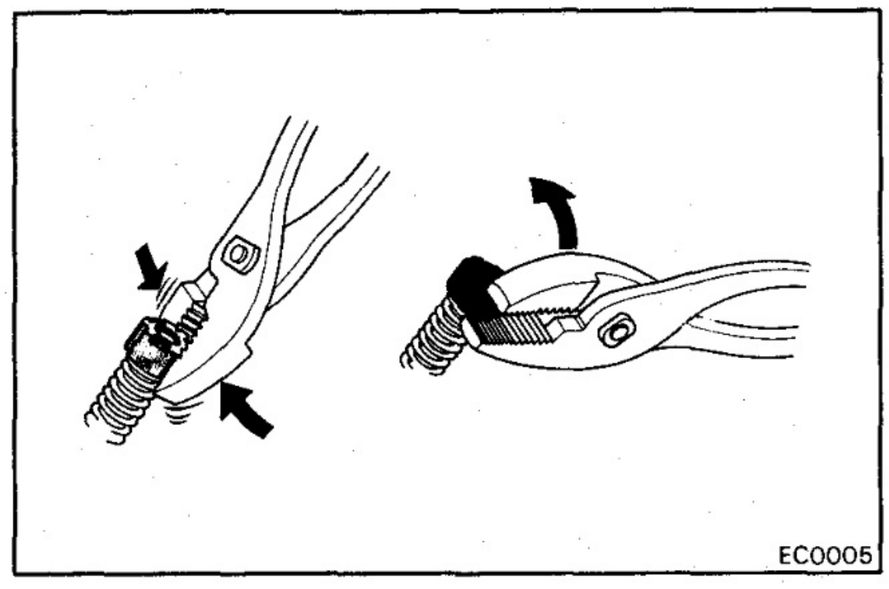
(d) All accessories switched off

(e) All vacuum lines connected

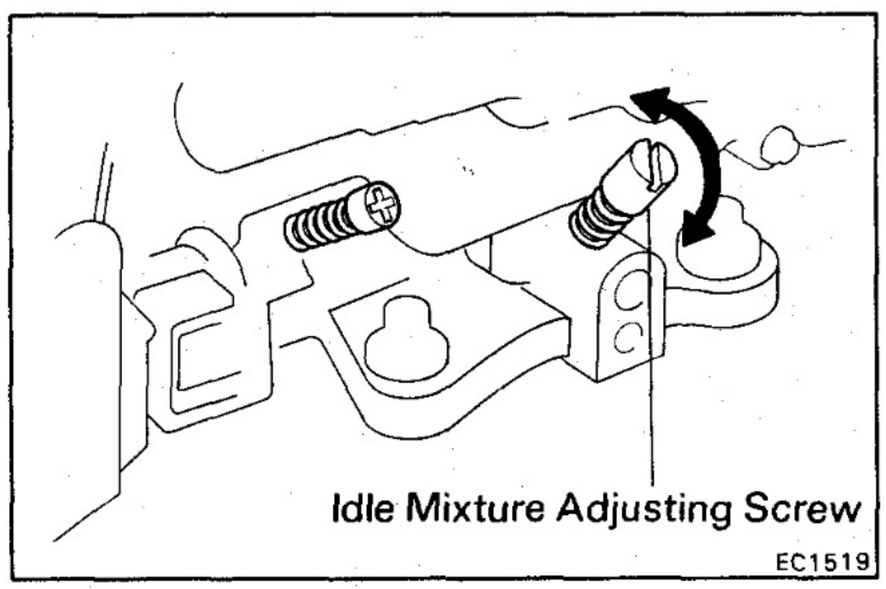
(f) Ignition timing set correctly

(g) Transmission in "N" range

(h) Fuel level should be about even with the correct level in the sight glass



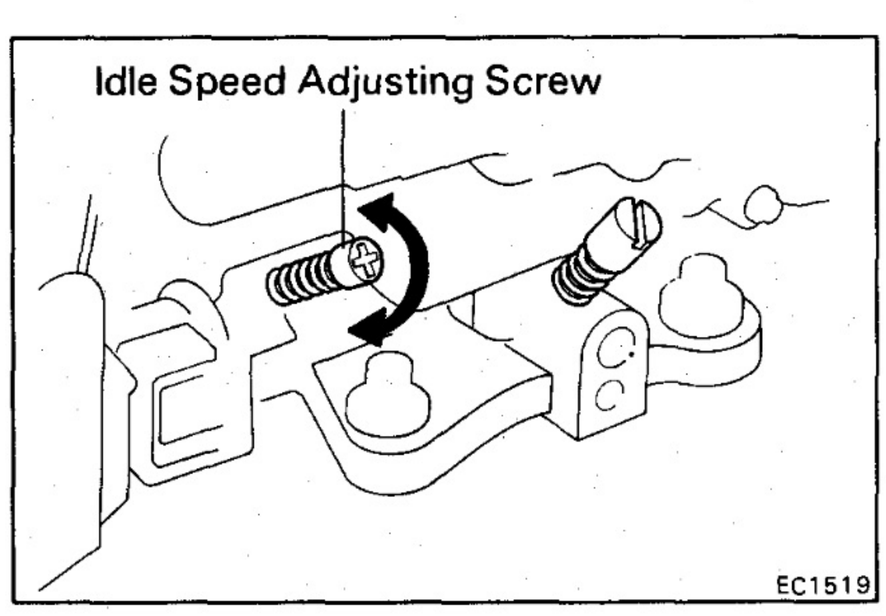

### 3. BREAK OFF IDLE LIMITER CAP, IF INSTALLED




### 4. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Start the engine.

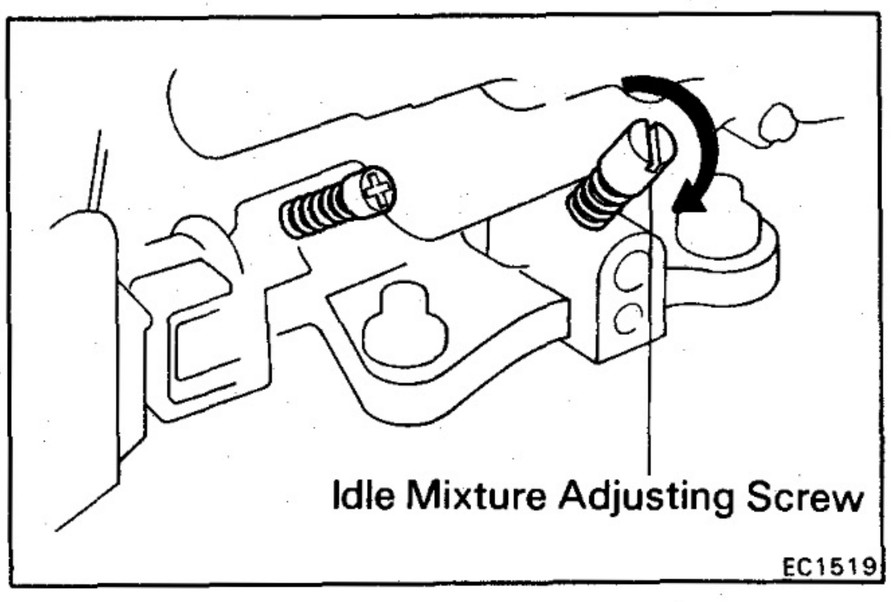
(b) Set to the maximum speed by turning the IDLE MIXTURE ADJUSTING SCREW.




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

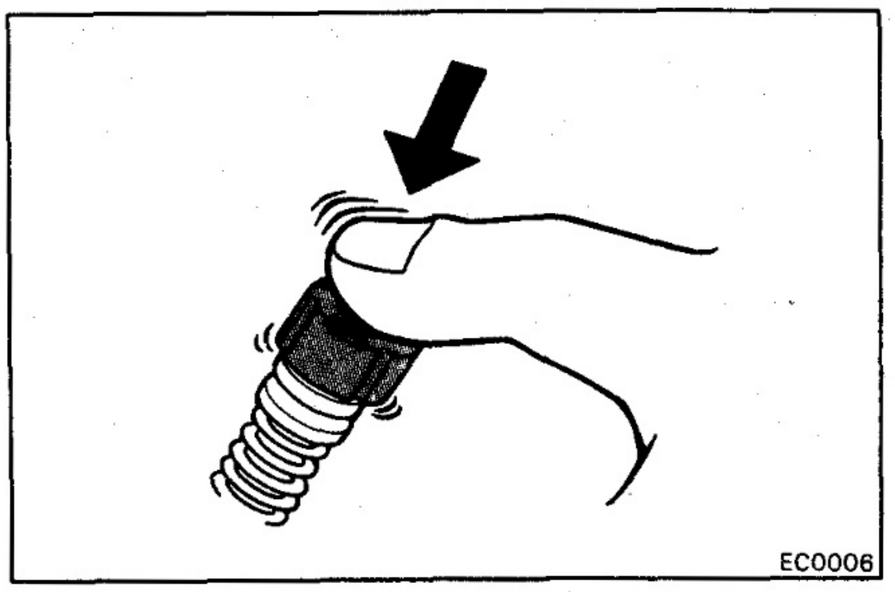
**Idle mixture speed: 700 rpm**

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




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

**Idle speed: 650 rpm**




**5. INSTALL NEW LIMITER CAP**

After this adjustment is completed, install the idle limiter cap (blue) on the idle mixture adjusting screw.

**CAUTION: After completing adjustment, perform a road test to make certain engine performance has not changed.**

# 3. Fast Idle Speed

## INSPECTION AND ADJUSTMENT OF FAST IDLE SPEED

### 1. CONNECT TACHOMETER TO ENGINE

### 2. WARM UP ENGINE

Allow the engine to reach full operating temperature.

### 3. CHECK IDLE SPEED

**Idle speed: 650 ± 50 rpm**

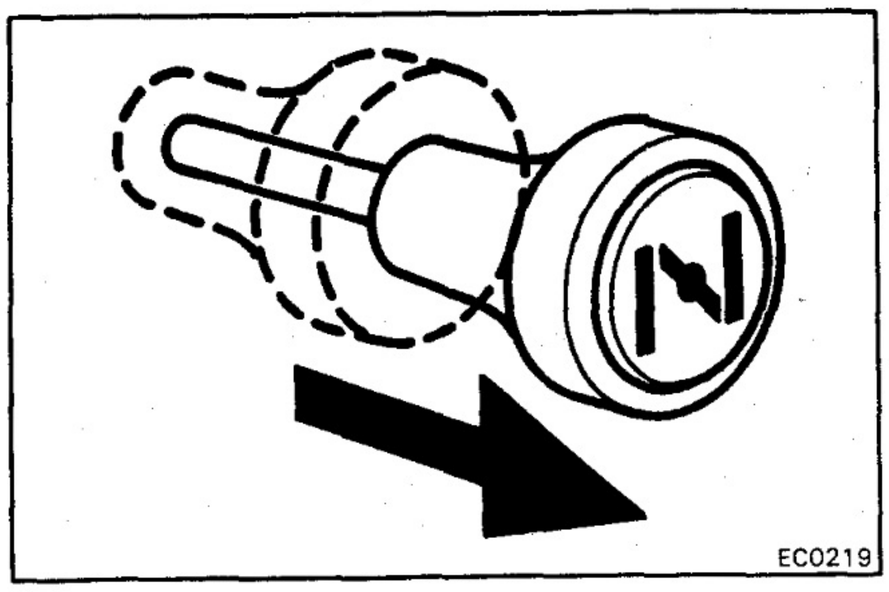
### 4. STOP ENGINE

### 5. CHECK FAST IDLE SPEED

(a) Pull out the choke knob fully.

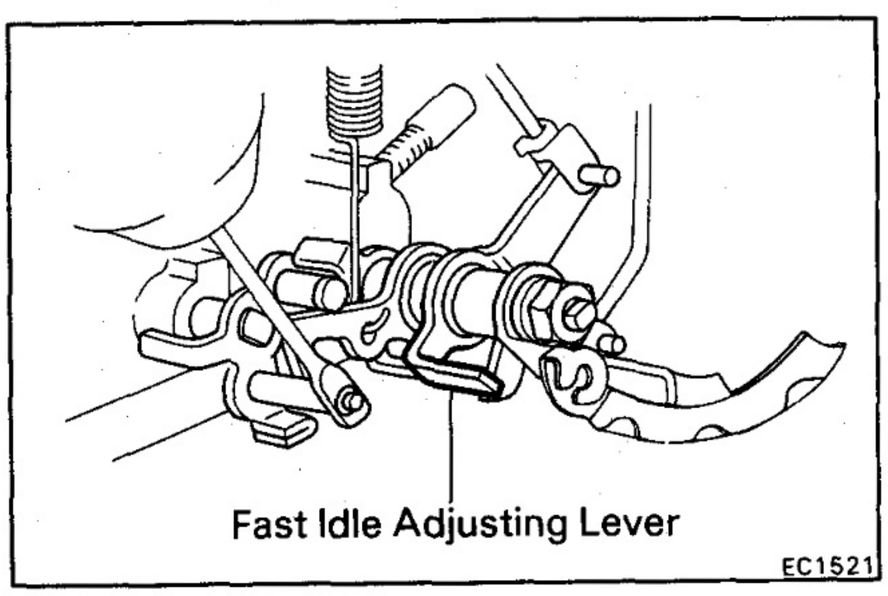
(b) Start the engine, fully open the choke valve and check that the fast idle speed is as specified.

**Fast idle speed: 2,600 ± 200 rpm**




(c) Release the choke knob, check that the engine speed returnes to idle.

If not as specified, adjust by bending the fast idle adjusting lever.



# 22R ENGINE

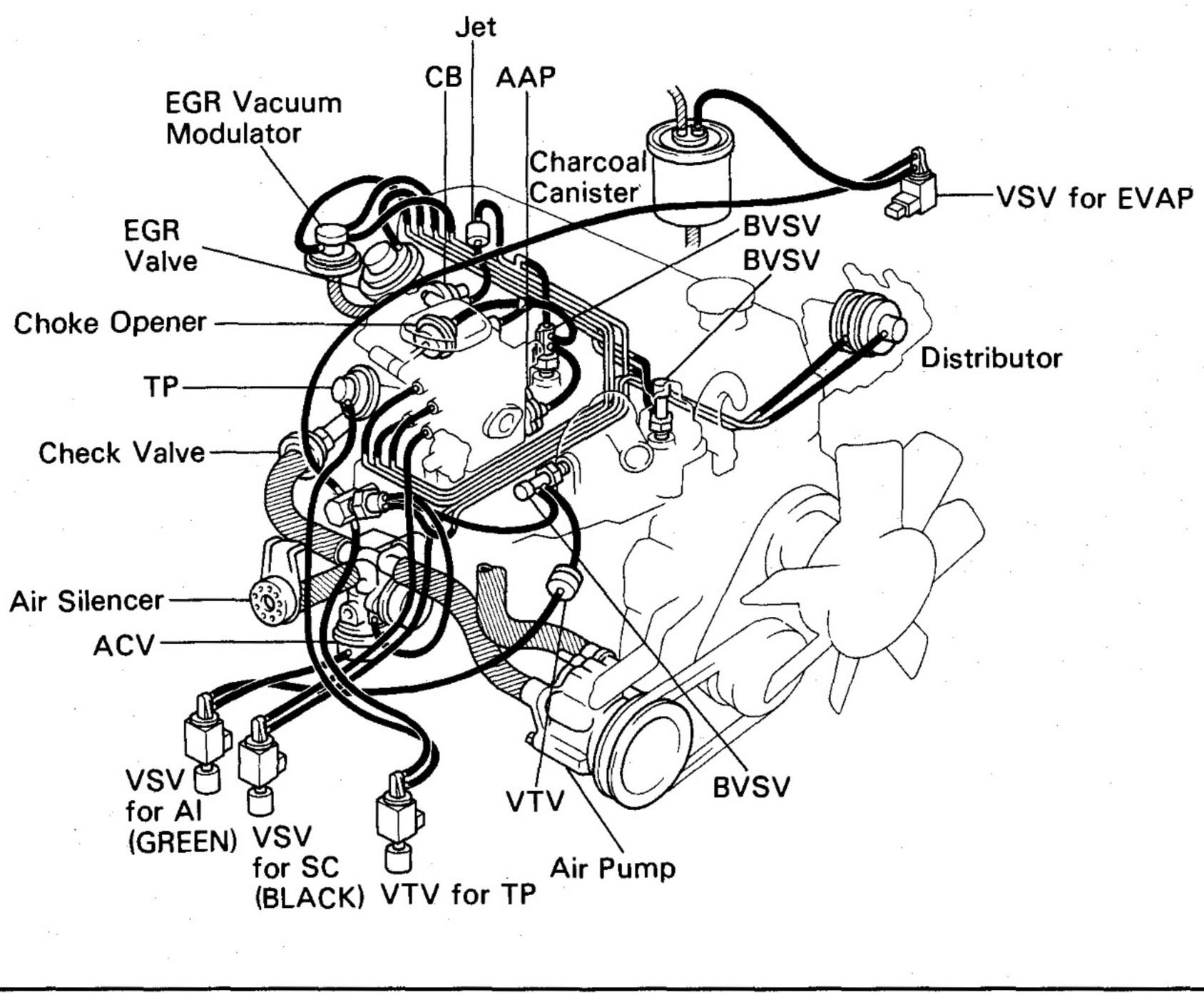
## Vehicle Model:
## LAND CRUISER (RJ70 Series)
## COASTER (RB20 Series)

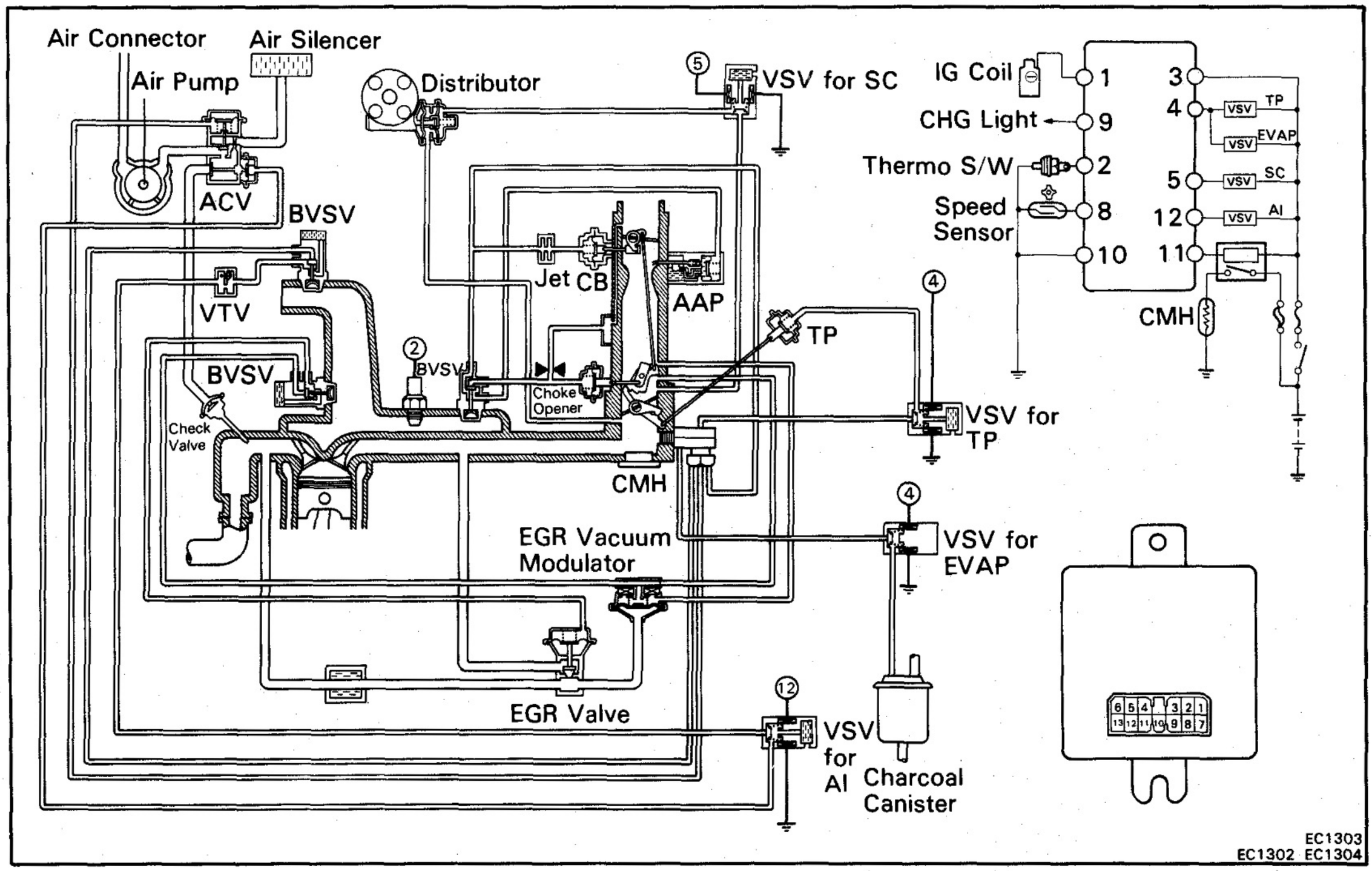

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# SYSTEM PURPOSE

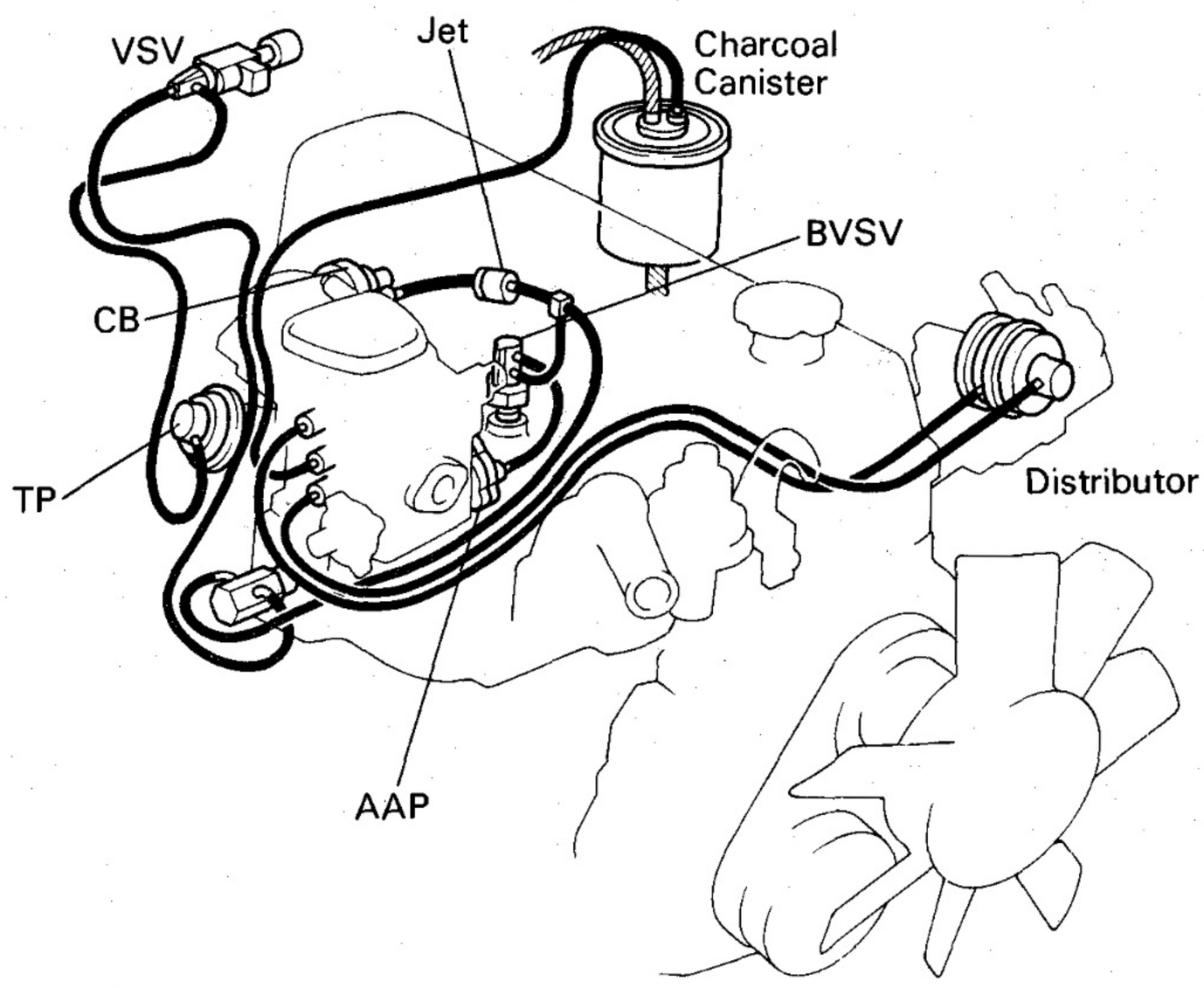
| System | Abbre-viation | Purpose | LAND CRUISER | COASTER |
|---|---|---|---|---|
| Positive crankcase ventilation | PCV | Reduces blow-by gas (HC) | ● | ● |
| Fuel evaporative emission control | EVAP | Reduces evaporative HC | ● | ● |
| Throttle positioner | TP | Reduces HC and CO | ● | ● |
| Spark control | SC | Reduces NOx and HC | ● | |
| Exhaust gas recirculation | EGR | Reduces NOx | ● | |
| Air injection | AI | Reduces HC and CO | ● | |
| Auxiliary system: | | | | |
| Automatic choke | — | Improves driveability–cold | ● | ● |
| Choke breaker | CB | Improves driveability–cold | ● | ● |
| Choke opener | — | Improves driveability–hot | ● | |
| Auxiliary acceleration pump | AAP | Improves driveability–cold | ● | ● |
| Cold mixture heater | CMH | Improves driveability–cold | ● | |

# COMPONENT LAYOUT AND SCHEMATIC DRAWING (LAND CRUISER)

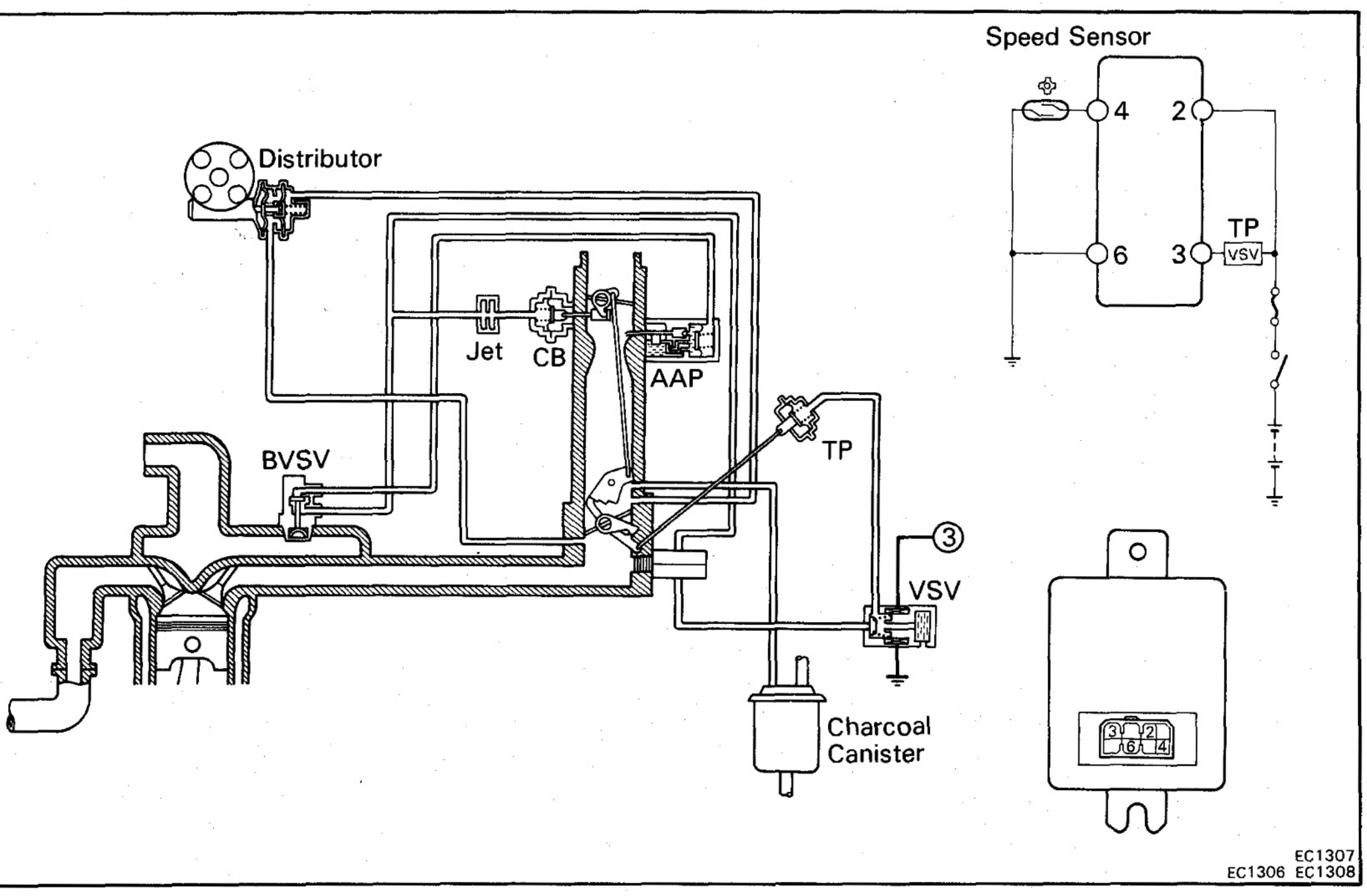


# COMPONENT LAYOUT AND SCHEMATIC DRAWING (COASTER)

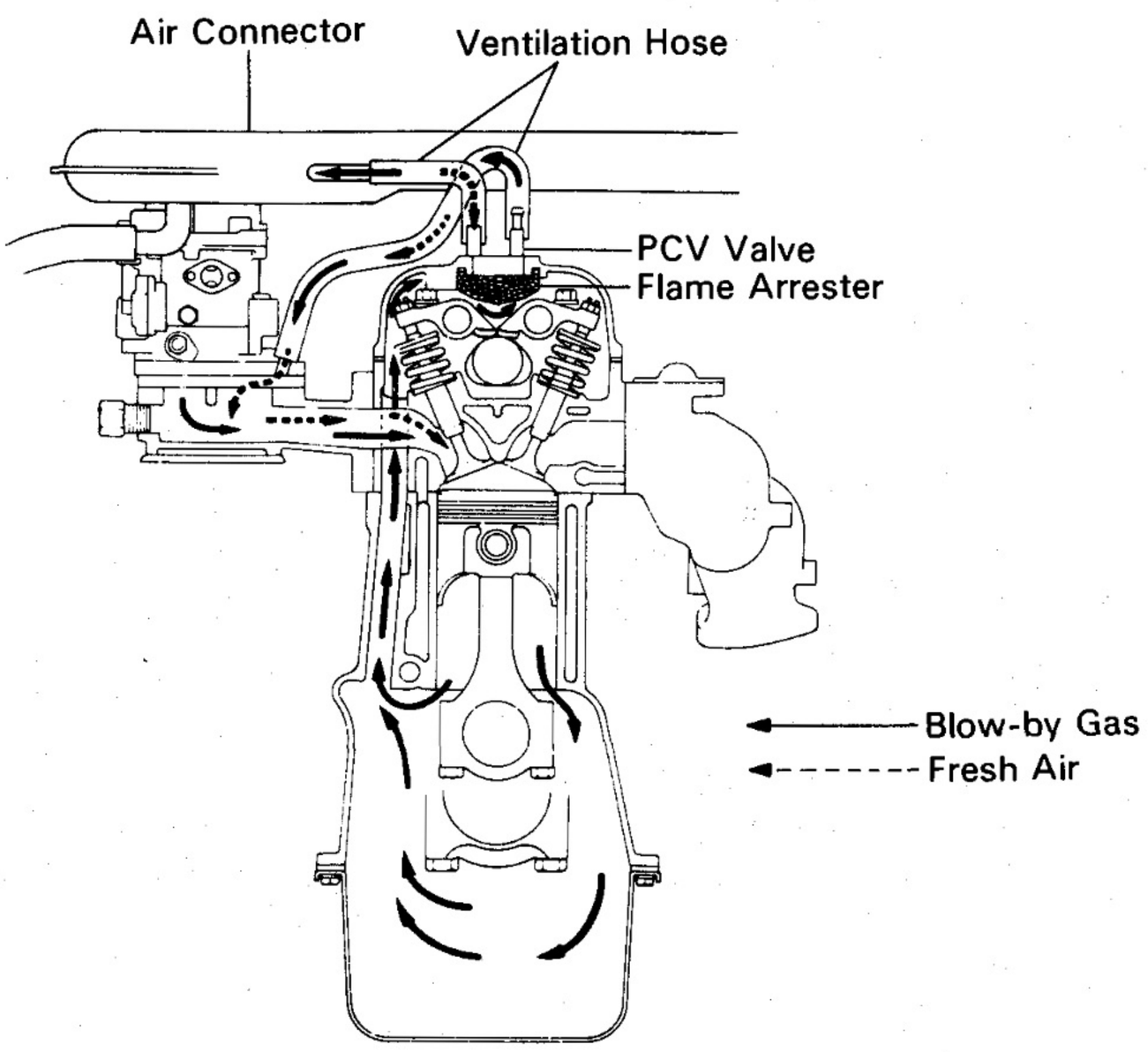



EC1305




EC1307
EC1306 EC1308

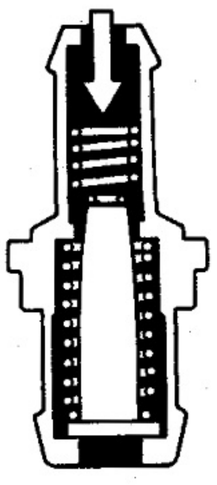
# POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM




EC1309

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

**Engine not Running or Backfiring**



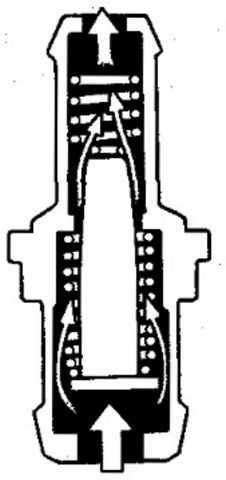
Intake Manifold Side

○ PCV VALVE IS CLOSED.

Cylinder Head Side

EC1001

**Normal Operation**

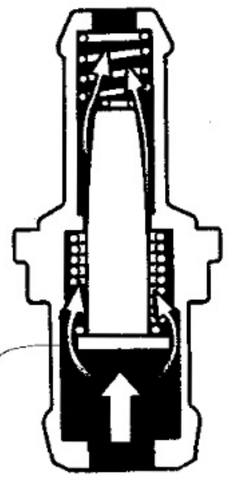


○ PCV VALVE IS OPEN.

○ VACUUM PASSAGE IS LARGE.

EC1002

**Idling or Decelerating**

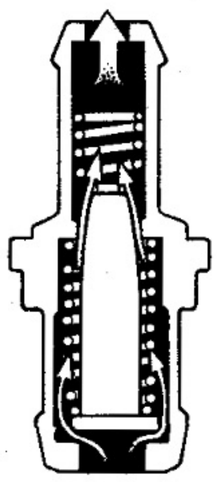


○ PCV VALVE IS OPEN.

○ VACUUM PASSAGE IS SMALL.

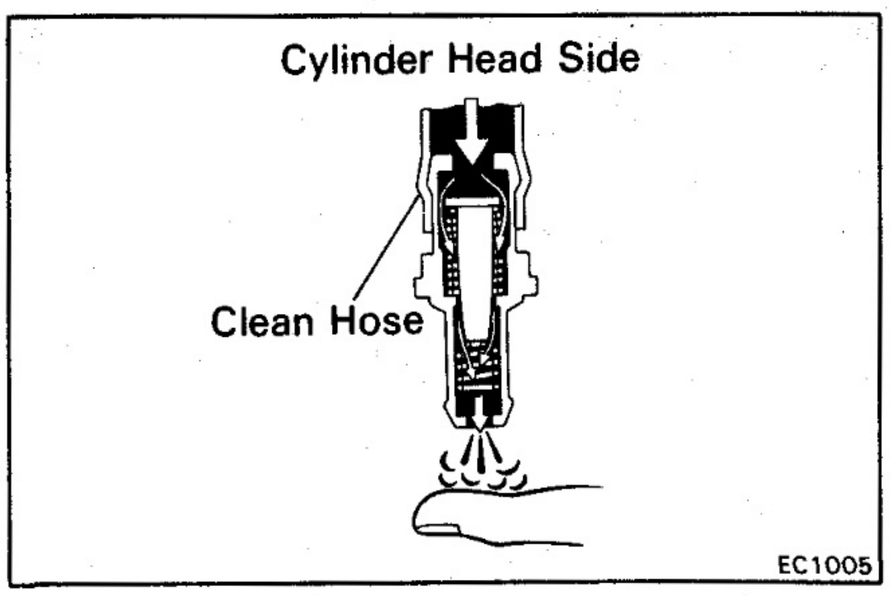
EC1003

**Acceleration or High Load**



○ PCV VALVE IS FULLY OPEN.

EC1004

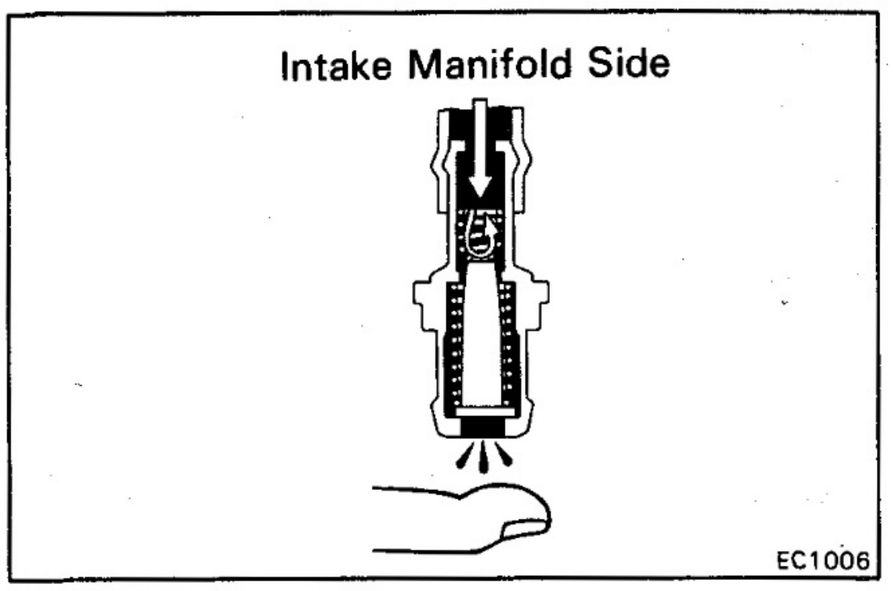



## INSPECTION OF PCV VALVE

1. **REMOVE PCV VALVE**
2. **ATTACH CLEAN HOSE TO PCV VALVE**
3. **BLOW FROM CYLINDER HEAD SIDE**

   Check that air passes through easily.

   **CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.**

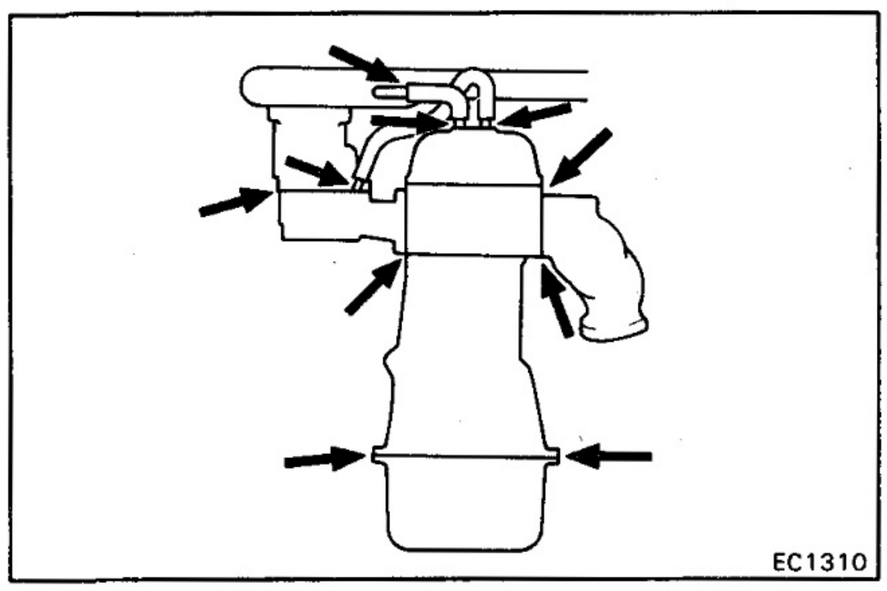



4. **BLOW FROM INTAKE MANIFOLD SIDE**

   Check that air passes through with difficulty.

   If the PCV valve fails either of the checks, replace it.

5. **REINSTALL PCV VALVE**



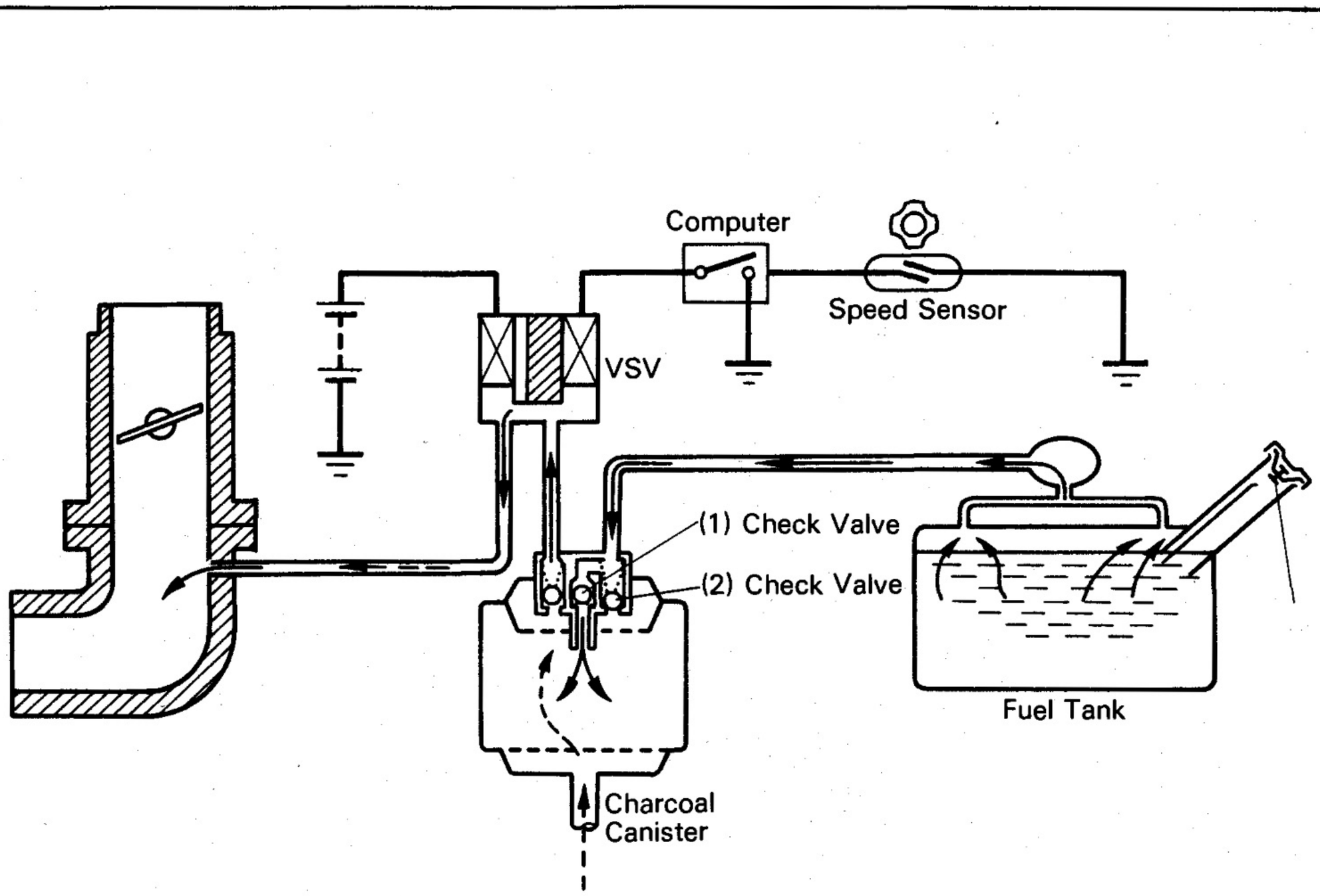

## INSPECTION OF PCV HOSES AND CONNECTIONS

### VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

Check for cracks, leaks or damage.

# FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM

## [LAND CRUISER]

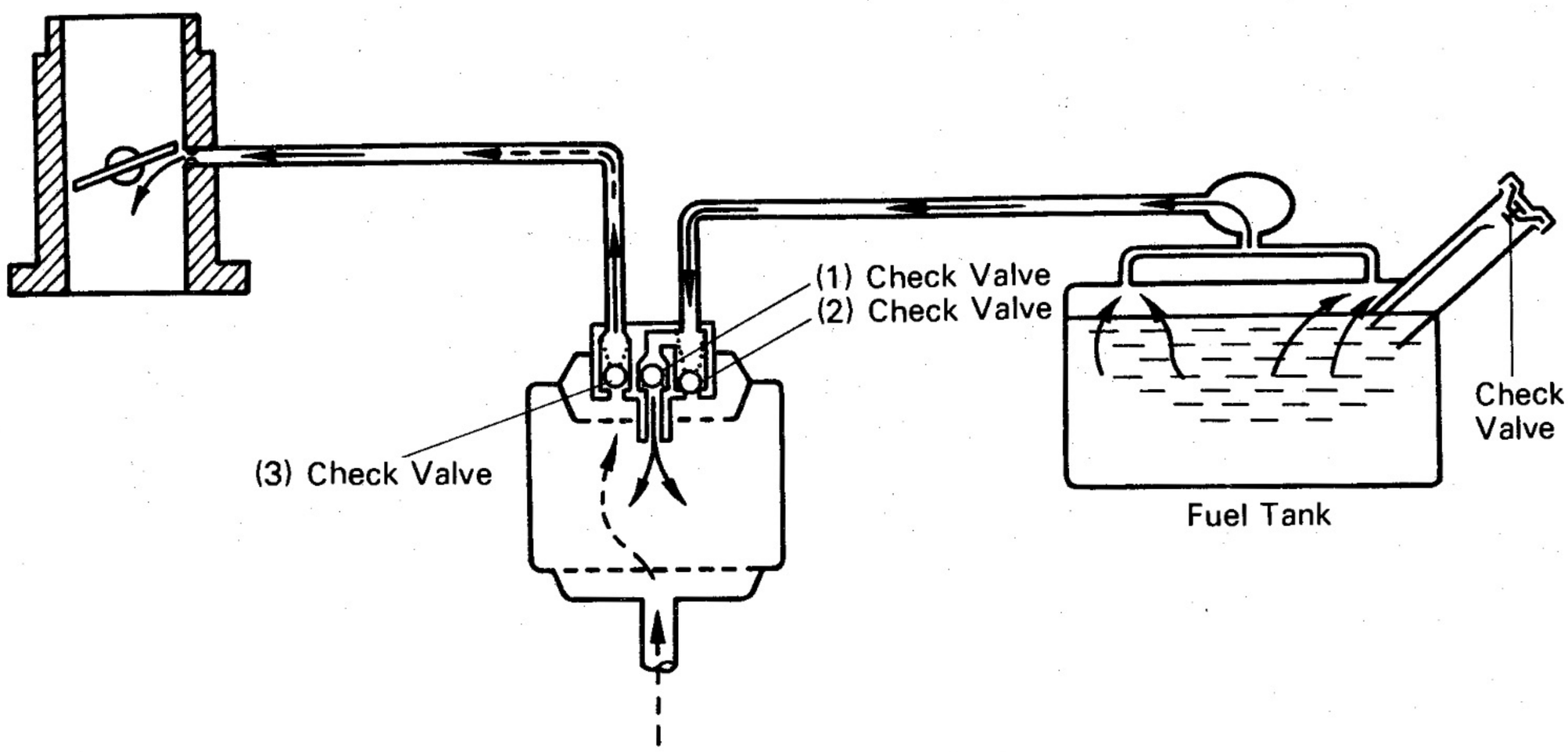



To reduce HC emission, evaporated fuel from the fuel tank and float chamber is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

| IG S/W | Engine | Vehicle Speed | Computer | VSV | Check Valve (1) | Check Valve (2) | Check Valve in Cap | Evaporated Fuel (HC) |
|---|---|---|---|---|---|---|---|---|
| OFF | Not running | — | — | — | — | — | — | HC from tank and float chamber is absorbed into the canister. |
| ON | Running | Below 15 km/h | OFF | CLOSED | — | — | — | HC from tank is absorbed into the canister |
| | | Above 28 km/h | ON | OPEN | — | — | — | HC from canister is led into the intake manifold. |
| High pressure in tank | | — | — | — | OPEN | CLOSED | CLOSED | HC from tank is absorbed into the canister. |
| High vacuum in tank | | — | — | — | CLOSED | OPEN | OPEN | (Air is led into the tank.) |

# FUEL EVAPORTATIVE EMISSION CONTROL (EVAP) SYSTEM (Cont'd)

## [COASTER]




| Engine | Throttle Valve Opening | Check Valve | | | Check Valve in Cap | Evaporated Fuel |
|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | | |
| Not running | – | – | – | – | – | HC from tank is absorbed into the canister. |
| Running | below purge port | – | – | CLOSED | – | HC from tank is absorbed into the canister. |
| | above purge port | – | – | OPEN | – | HC from canister is led into the intake manifold. |
| High pressure in tank | – | OPEN | CLOSED | – | CLOSED | HC from tank is absorbed into the canister. |
| High vacuum in tank | – | CLOSED | OPEN | – | OPEN | Air is led into the tank. |

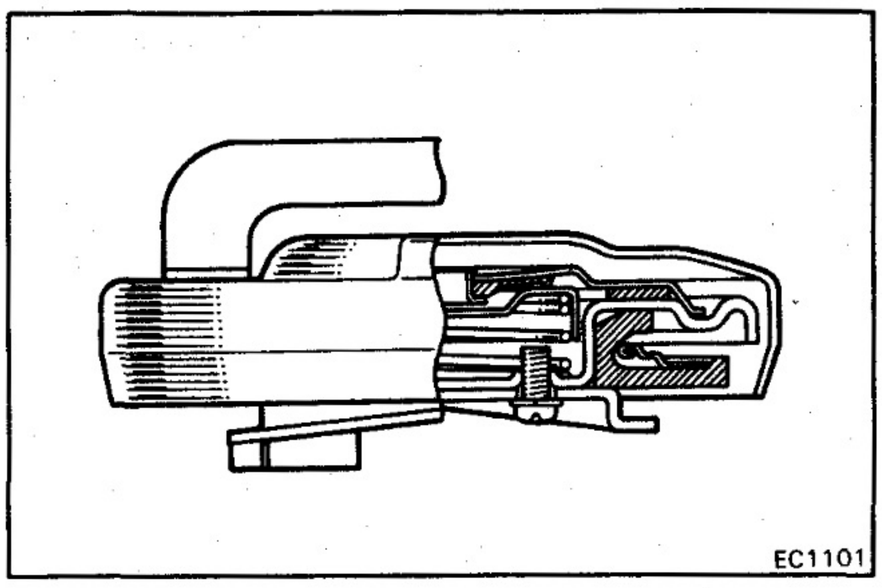
## INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

**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 TANK CAP**

(a) Remove four screws and retainer.

(b) Look for damaged or deformed gasket.

(c) Reinstall the retainer.

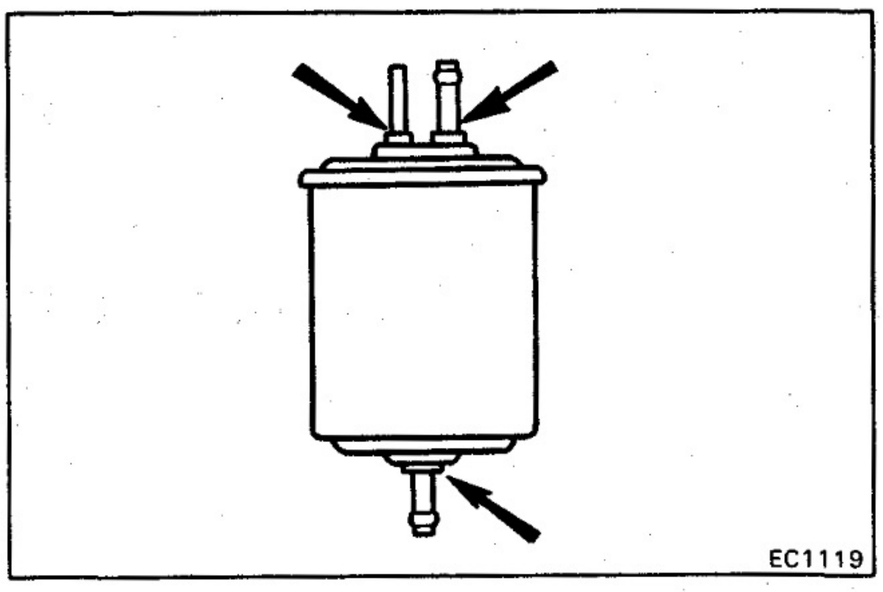
If a problem is found, repair or replace the cap.

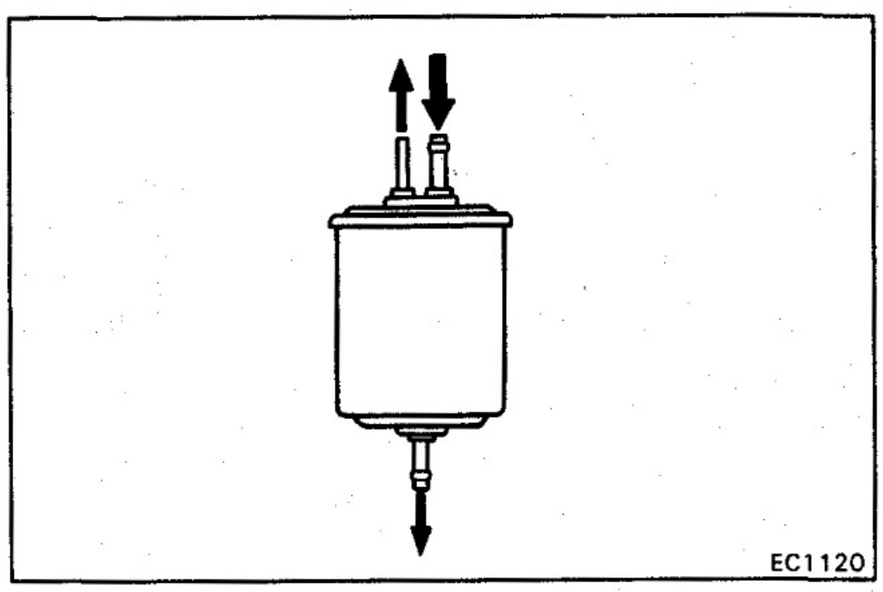
## INSPECTION OF CHARCOAL CANISTER

**1. REMOVE CHARCOAL CANISTER**

**2. VISUALLY INSPECT CHARCOAL CANISTER**

Look for cracks or damage.



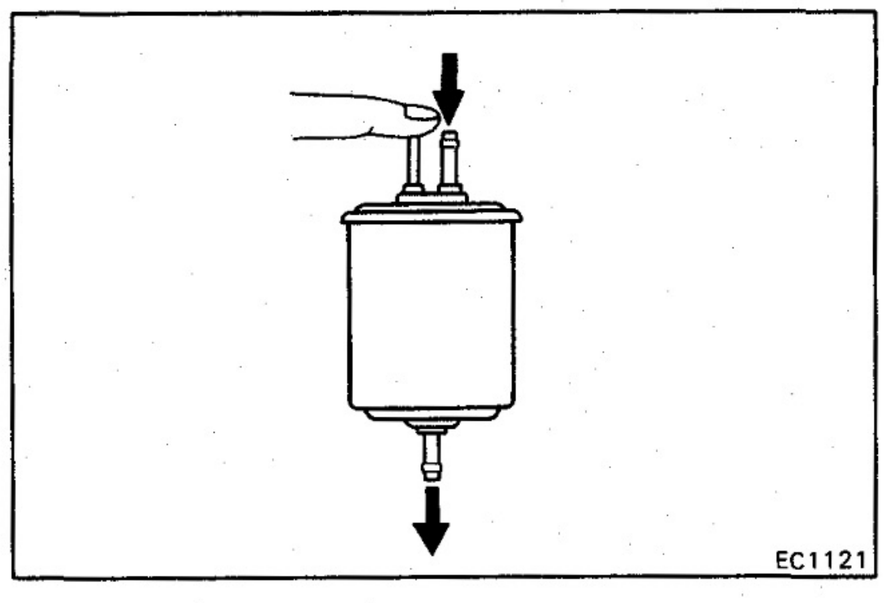




**3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**

(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 does not flows from the other pipes.

If a problem is found, replace the charcoal canister.



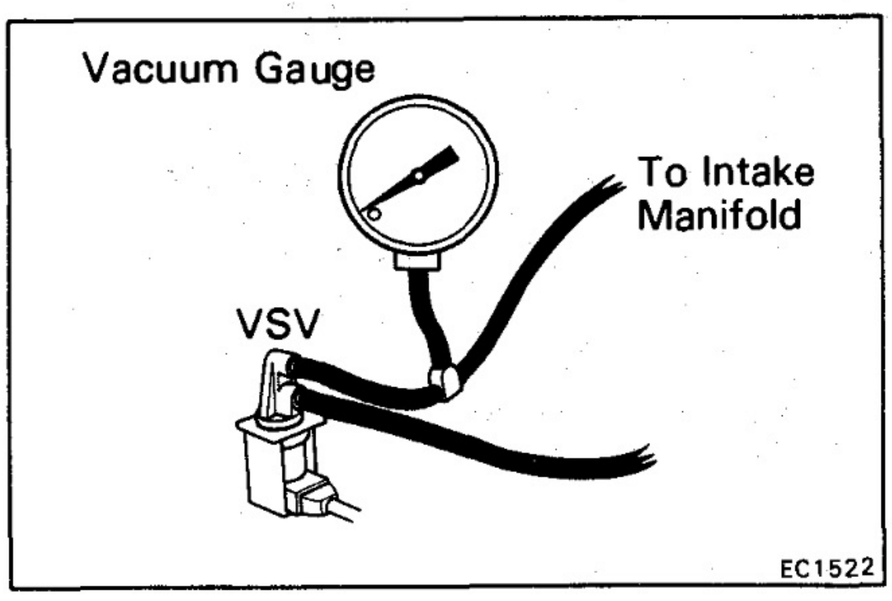

**4. CLEAN FILTER IN CANISTER**

Clean the filter by blowing 3 kg/cm² (43 psi, 294 kPa) of compressed air into the tank pipe, while holding the other upper canister pipes closed.

NOTE:

- Do not attempt to wash the canister.
- No activated carbon should come out.

**5. REINSTALL CHARCOAL CANISTER**

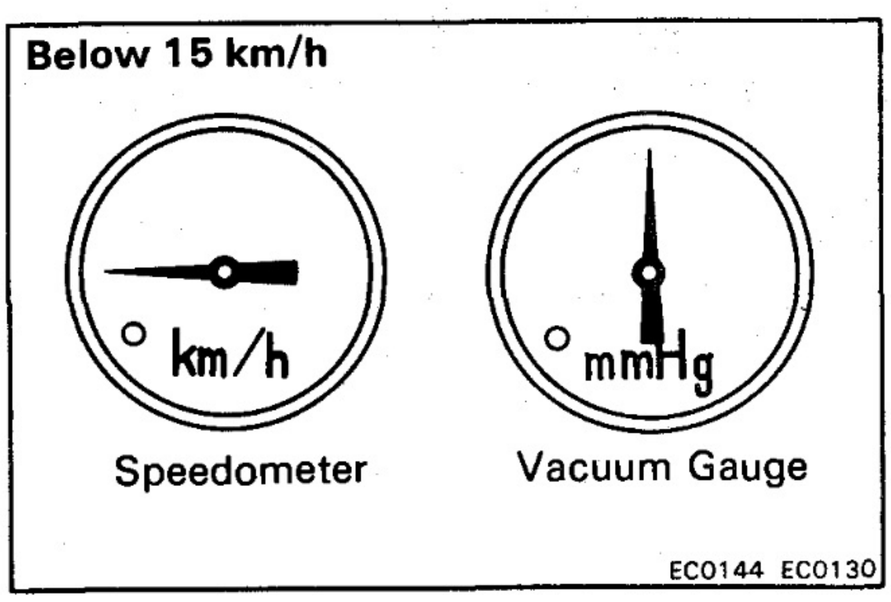



## INSPECTION OF SPEED SENSOR TO VSV (LAND CRUISER only)

### 1. CONNECT VACUUM GAUGE

(a) Using a 3-way connector, connect the vacuum gauge to the hose between the VSV and intake manifold.

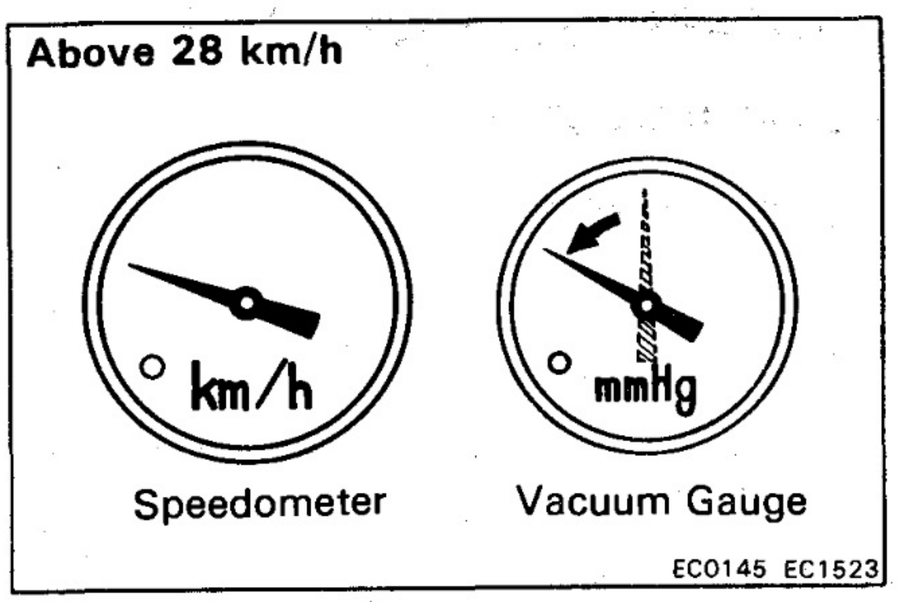
(b) Set the gauge at the driver's seat.




### 2. PERFORM ROAD TEST, OBSERVING SPEEDOMETER AND VACUUM GAUGE

(a) Warm up the engine.

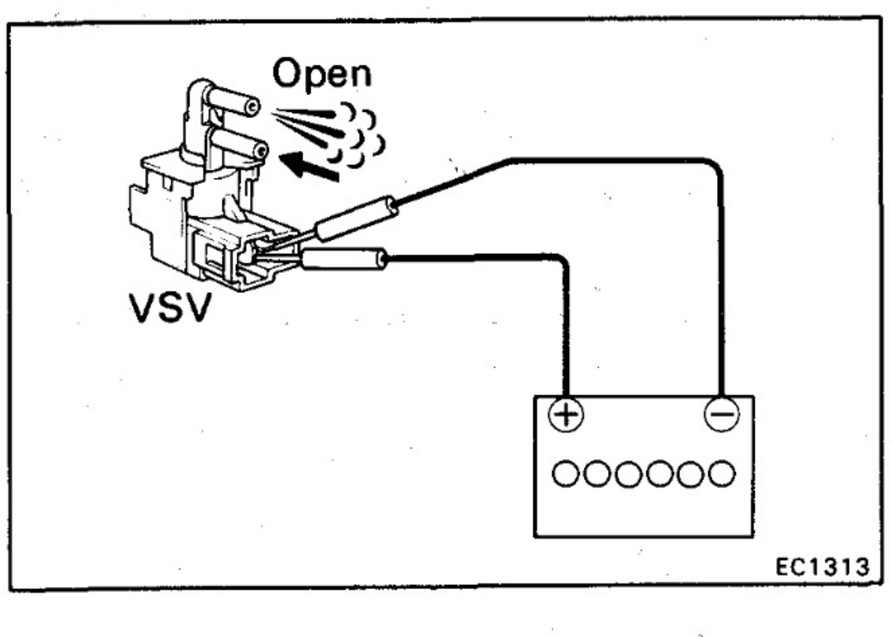
(b) Check that the vacuum gauge indicates intake manifold vacuum at low speed driving (below 15 km/h).




(c) Check that the vacuum gauge indicates lower than the intake manifold vacuum at middle and high speed driving (above 28 km/h).

If a problem is found, inspect speed sensor and VSV.

### 3. REMOVE VACUUM GAUGE AND RECONNECT HOSE

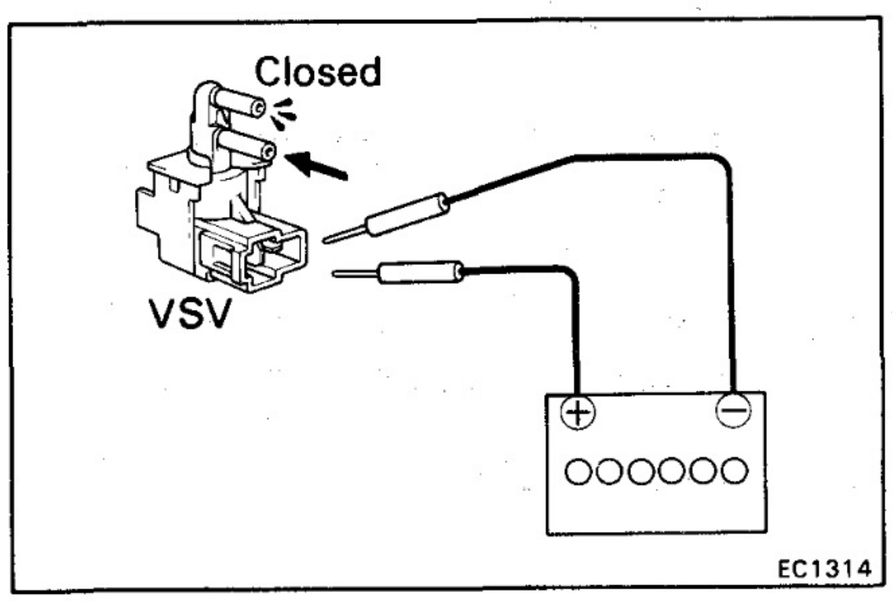



## INSPECTION OF VSV (LAND CRUISER only)

### 1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

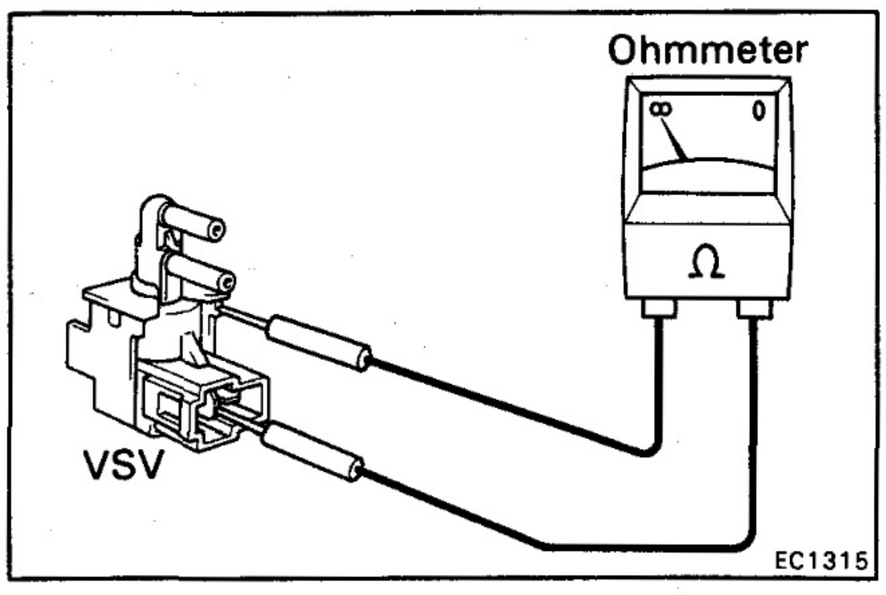
(a) Connect the VSV terminals to the battery terminal as shown.

(b) Blow into a pipe, and check that the VSV is open.



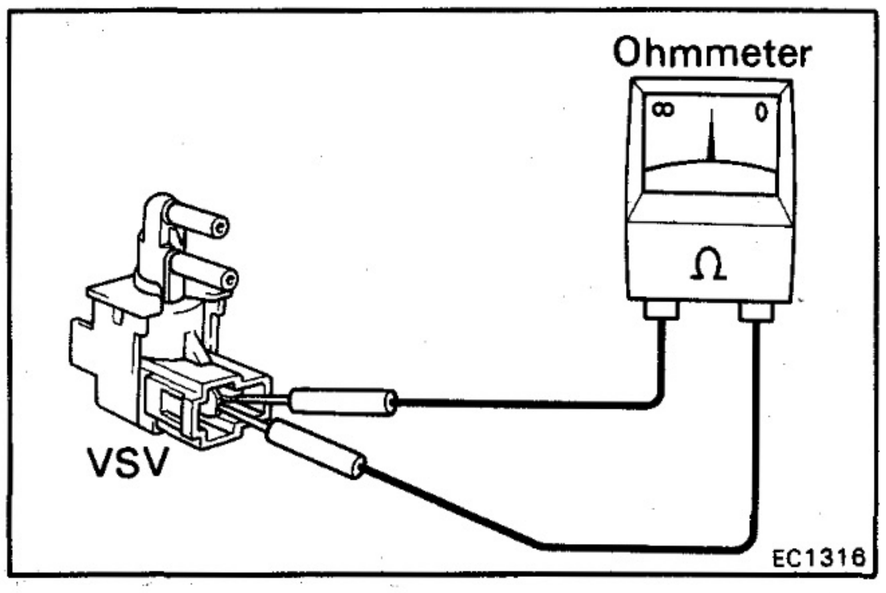

(c) Disconnect the battery positive (+) terminal.

(d) Blow into a pipe and check that the VSV is closed.




**2. CHECK FOR SHORT CIRCUIT**

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV body. If a short circuit is found, repair or replace the VSV.




**3. CHECK FOR OPEN CIRCUIT**

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.

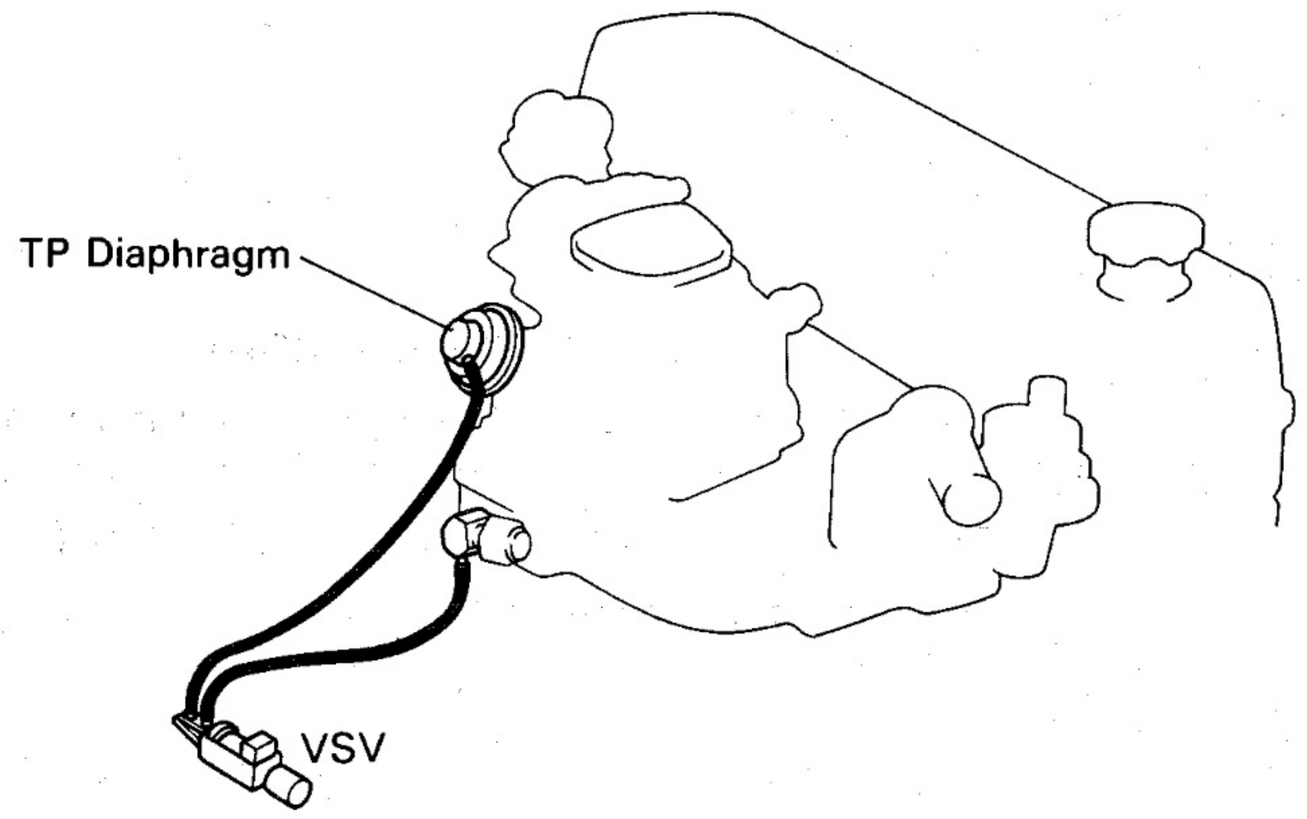
**Specified resistance: 33 – 39 Ω at 20°C (68°F)**

If the resistance is not within specification, replace the VSV.

## INSPECTION OF SPEED SENSOR (LAND CRUISER only)

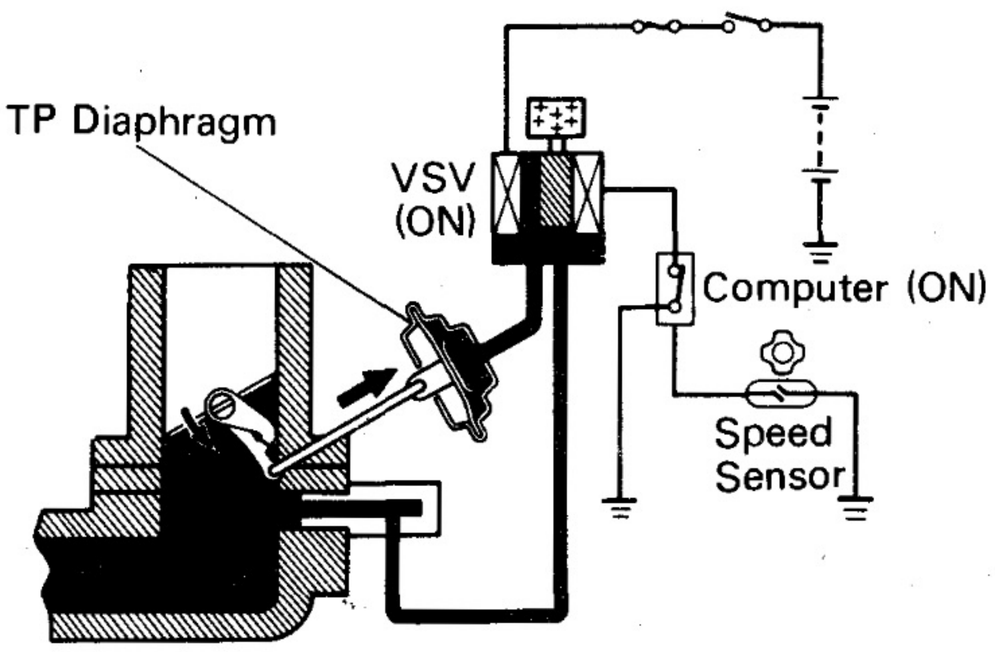
**(See page 4-15)**

# THROTTLE POSITIONER (TP) SYSTEM



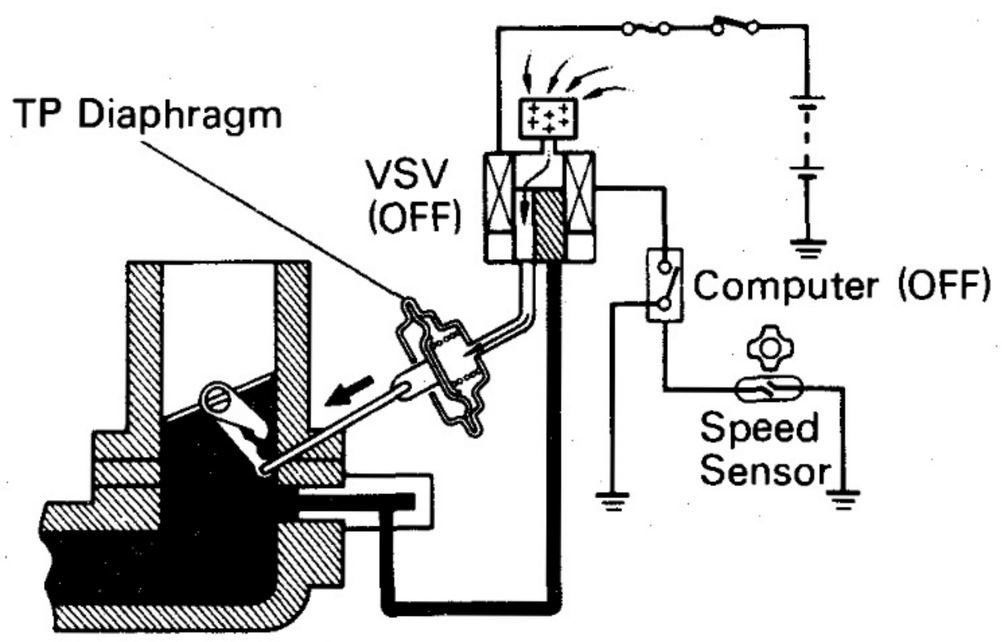

EC0890

**DECELERATION (1)**




EC1317

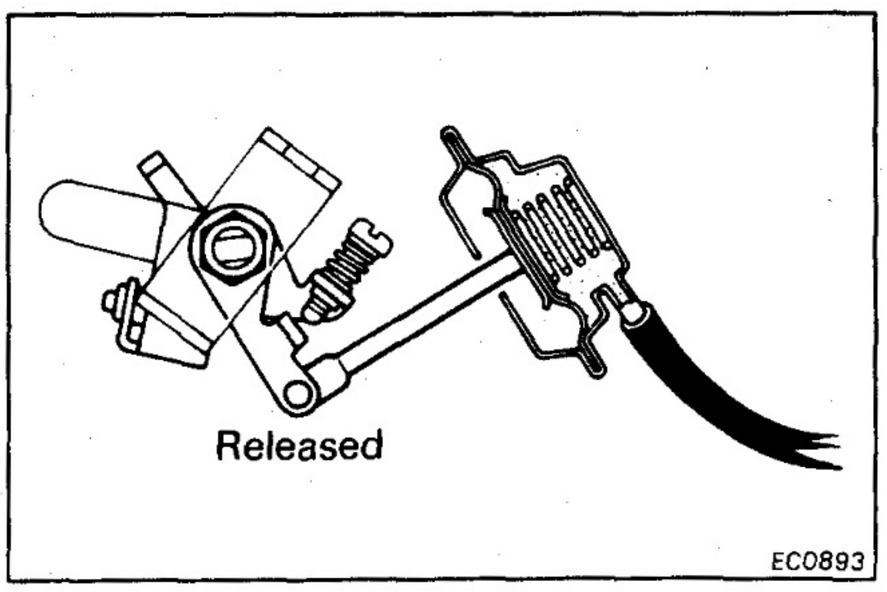
**DECELERATION (2)**




EC1318

To reduce HC and CO emissions, the TP opens the throttle valve slightly more than at idle position when decelerating. This causes the air-fuel mixture to burn completely.

| Vehicle Speed | Computer | VSV | Throttle Positioner | Throttle Valve |
|---|---|---|---|---|
| Medium or high speeds<br>above 28 km/h (RJ)<br>above 20 km/h (RB) | ON | ON<br>(Open) | TP IS SET.<br>(Intake manifold vacuum acts on TP diaphragm.) | Medium or high speed position |
| Deceleration (1)<br>above 20 km/h (RJ)<br>above 19 km/h (RB) | | | | Throttle valve is held in a position that is slightly more opened than at idle. |
| Deceleration (2)<br>below 15 km/h (RJ)<br>below 8 km/h (RB) | OFF | OFF<br>(Closed) | TP IS RELEASED.<br>(Atmospheric pressure acts on TP diaphragm.) | Throttle valve is returned to the idle position. |




# INSPECTION OF THROTTLE POSITIONER

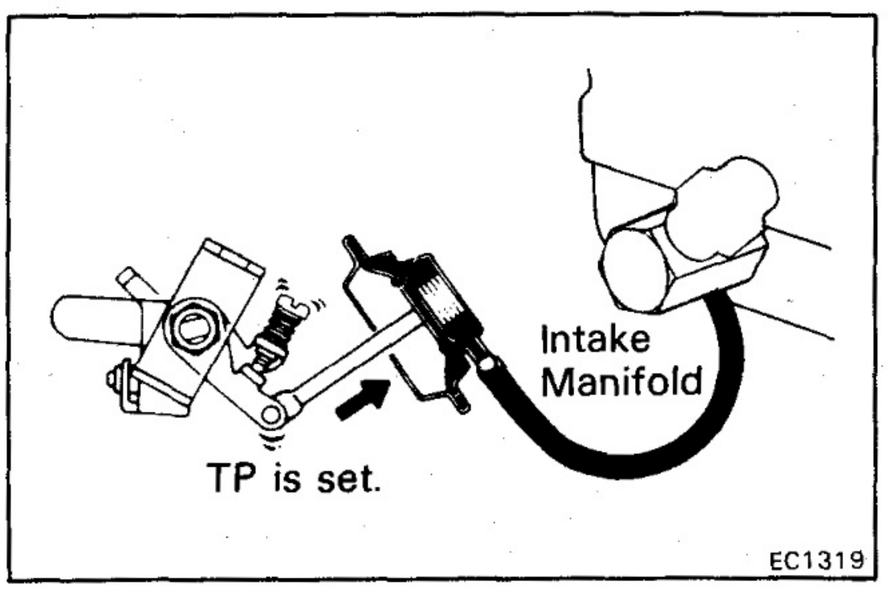
**1. WARM UP ENGINE**

**2. CHECK AND, IF NECESSARY, ADJUST IDLING SPEED**

NOTE: Turn off the air conditioner, if equipped.

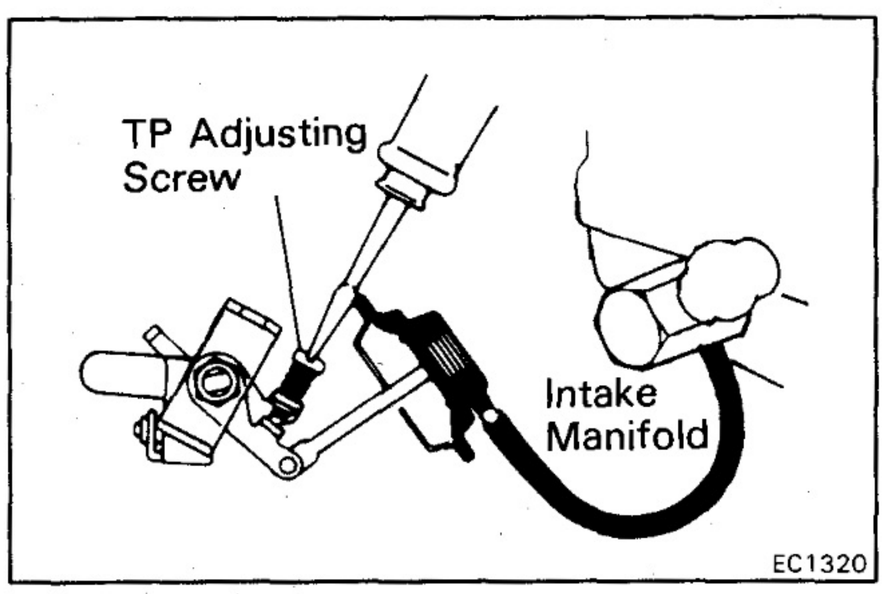
**3. CHECK OPERATION OF THROTTLE POSITIONER**

(a) Check that the throttle positioner is released at idle.




(b) Connect the TP diaphragm hose directly to the intake manifold.

(c) Check that the throttle positioner is set.



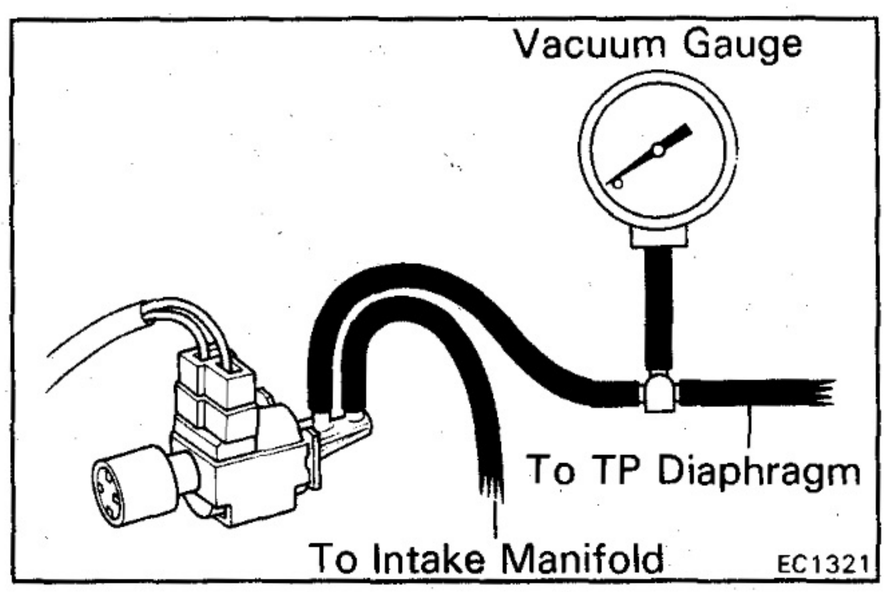

**4. CHECK TP SETTING SPEED**

After the TP is set, check that the engine speed is correct.

**TP setting speed: RJ 1,200 ± 100 rpm**
**RB 1,400 ± 100 rpm**

If not at specified speed, adjust with the TP adjusting screw.

**5. RECONNECT VACUUM HOSE TO PROPER LOCATION**

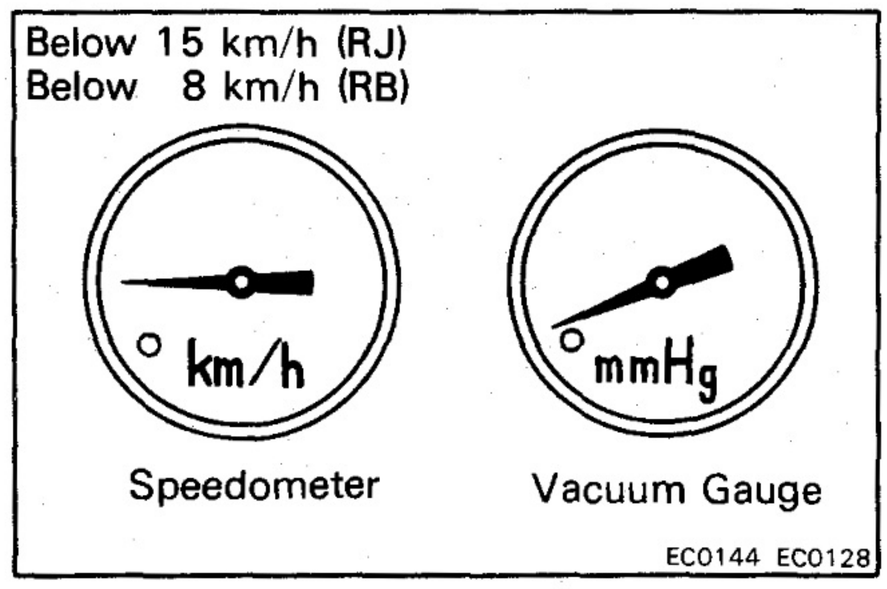



# INSPECTION OF SPEED SENSOR TO VSV

**1. SET VACUUM GAUGE**

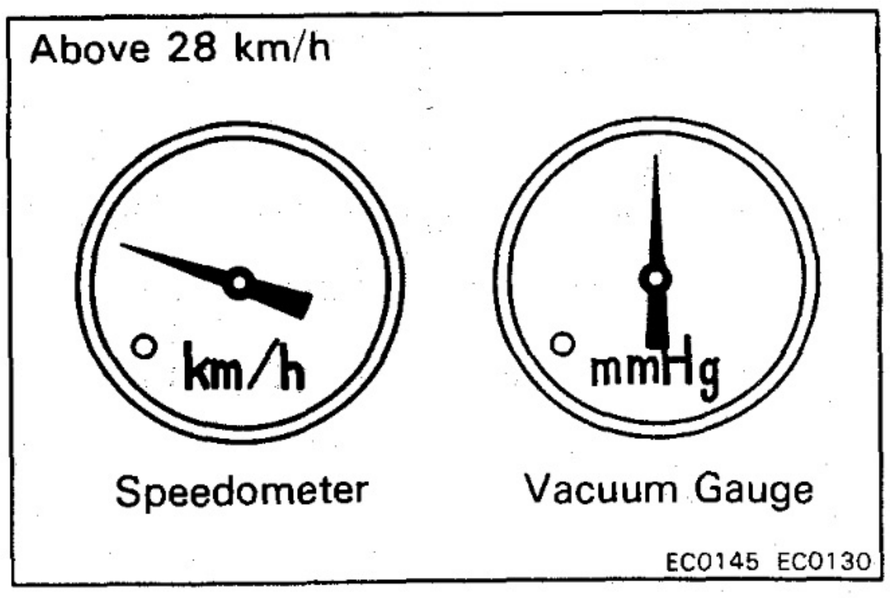
(a) Using a 3-way connector, connect the vacuum gauge to the hose between the VSV and the TP diaphragm.

(b) Set the gauge on your lap.




**2. PERFORM ROAD TEST OBSERVING SPEEDOMETER AND VACUUM GAUGE**

(a) Check that the vacuum gauge indicates zero at low speed driving (below 15 km/h for RJ or 8 km/h for RB).




(b) Check that the vacuum gauge indicates intake manifold vacuum at middle and high speed driving (above 28 km/h for RJ or 20 km/h for RB).

If problem is found, inspect the VSV and speed sensor.

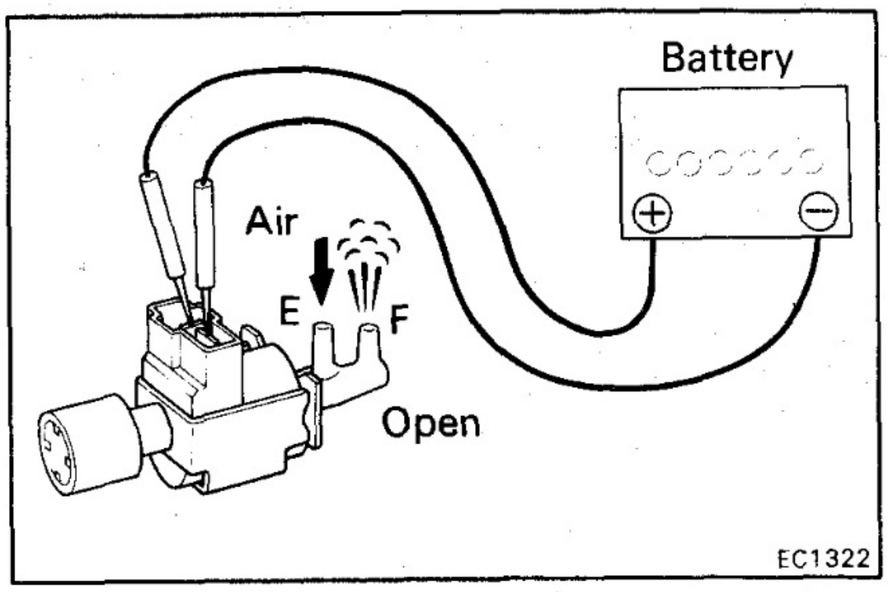
**3. DISCONNECT VACUUM GAUGE AND RECONNECT VACUUM HOSE TO PROPER LOCATION**

## INSPECTION OF VSV

**1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE**

(a) Connect the VSV terminals to the battery terminals as illustrated.

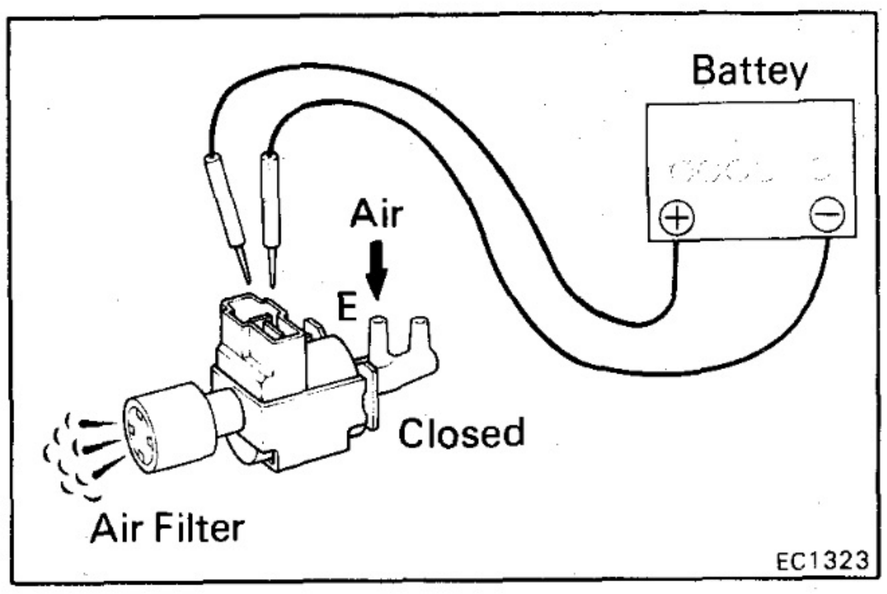
(b) Blow into pipe E and check that air comes out of pipe F.




(c) Disconnect the battery.

(d) Blow into pipe E and check that air comes out of the air filter.

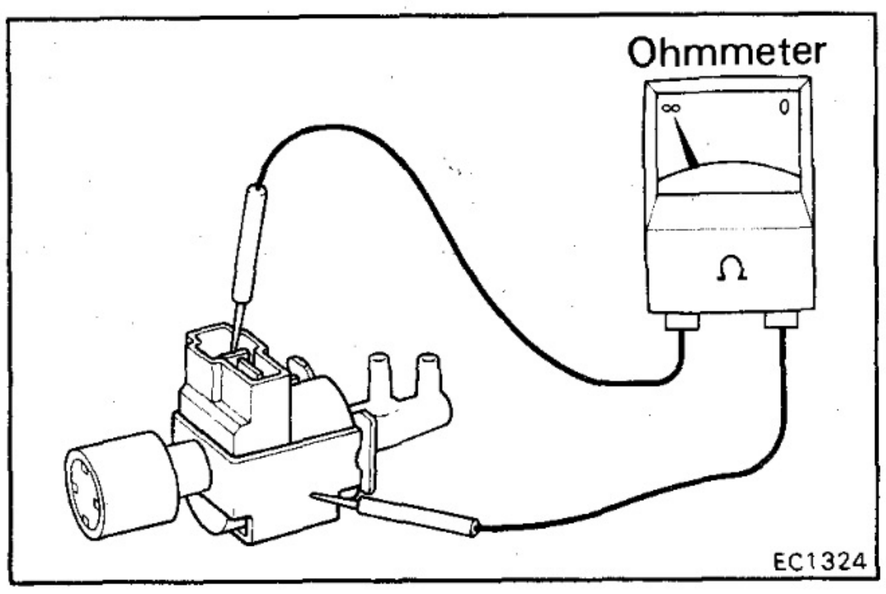
If a problem is found, repair or replace the VSV.




**2. CHECK FOR SHORT CIRCUIT**

Using an ohmmeter, check that there is no continuity between the terminal and the VSV body as shown.

If there is continuity, replace the VSV.

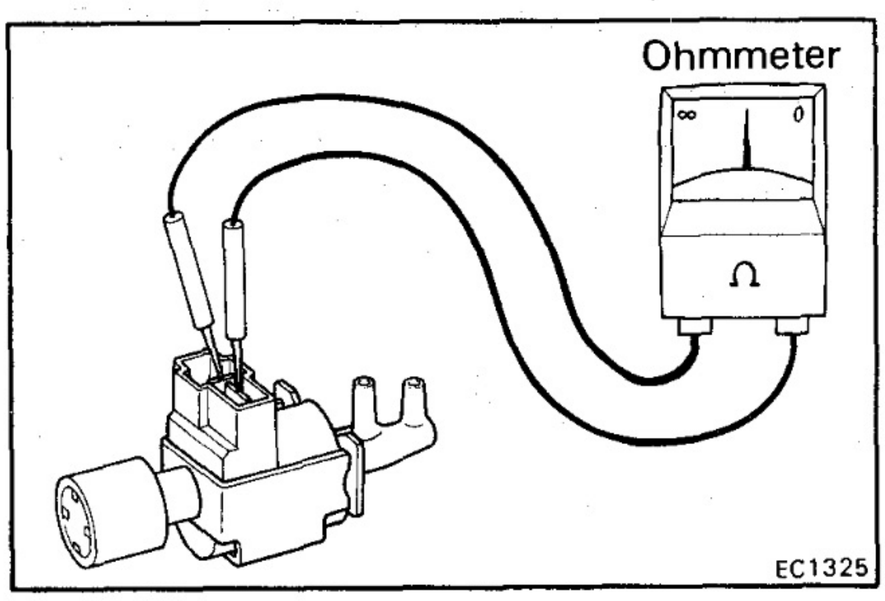


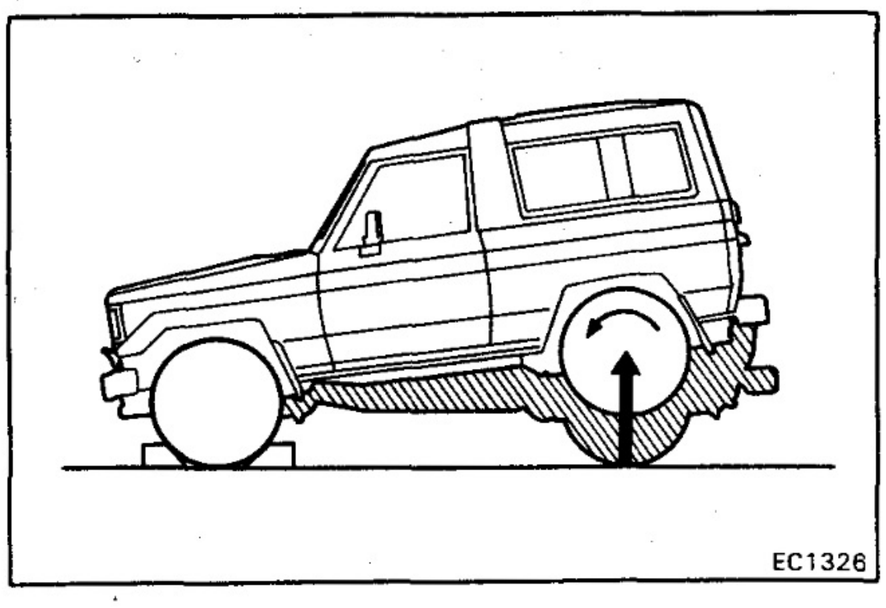

**3. CHECK FOR OPEN CIRCUIT**

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.

**Specified resistance: RJ 33 – 39 Ω at 20°C (68°F)**
**RB 38 – 43 Ω at 20°C (68°F)**

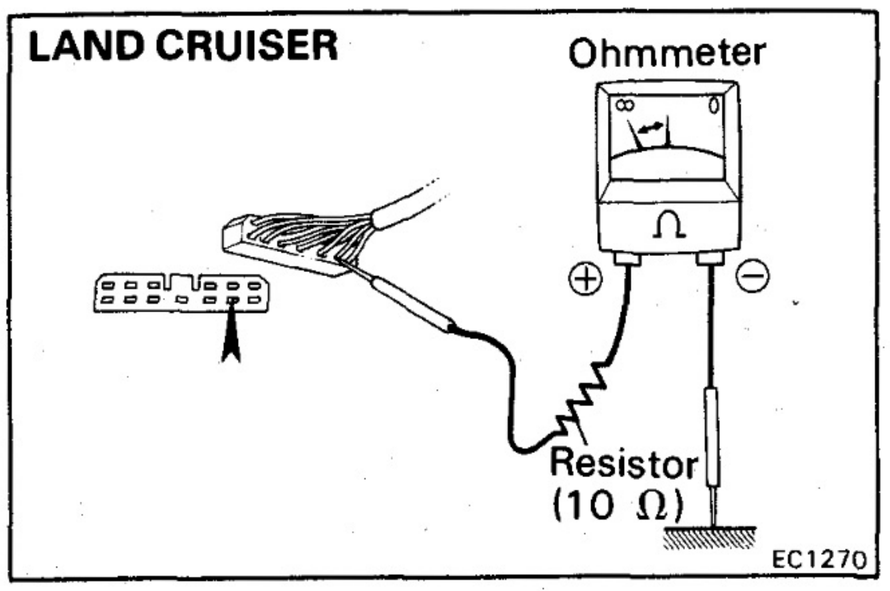
If resistance is not within specification, replace the VSV.

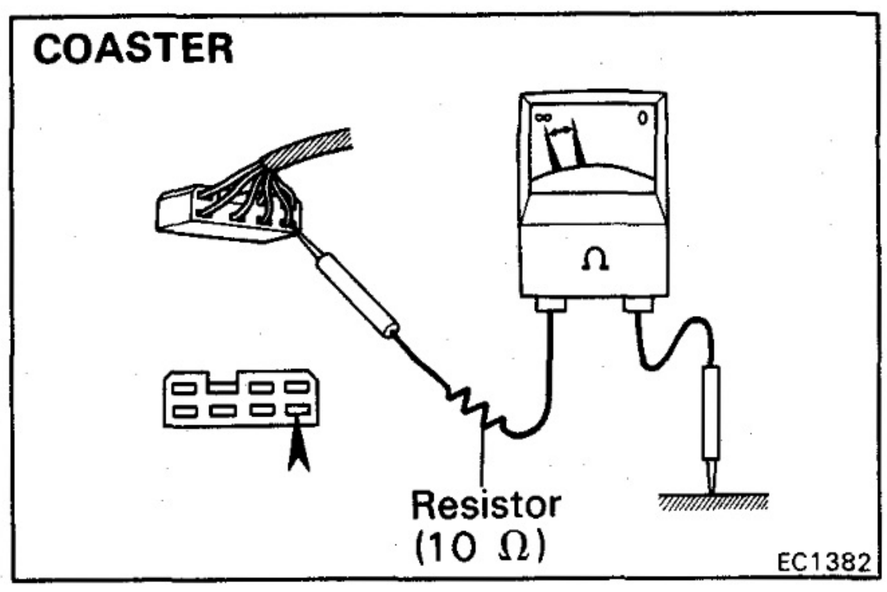





## INSPECTION OF SPEED SENSOR

1. **JACK UP ONE REAR WHEEL TO CLEAR GROUND AND CHOCK FRONT WHEELS**
2. **RELEASE PARKING BRAKE**
3. **SET SHIFT LEVER INTO NEUTRAL**
4. **UNPLUG WIRING CONNECTOR FROM COMPUTER**
   **Computer location: Left Cowl Side**



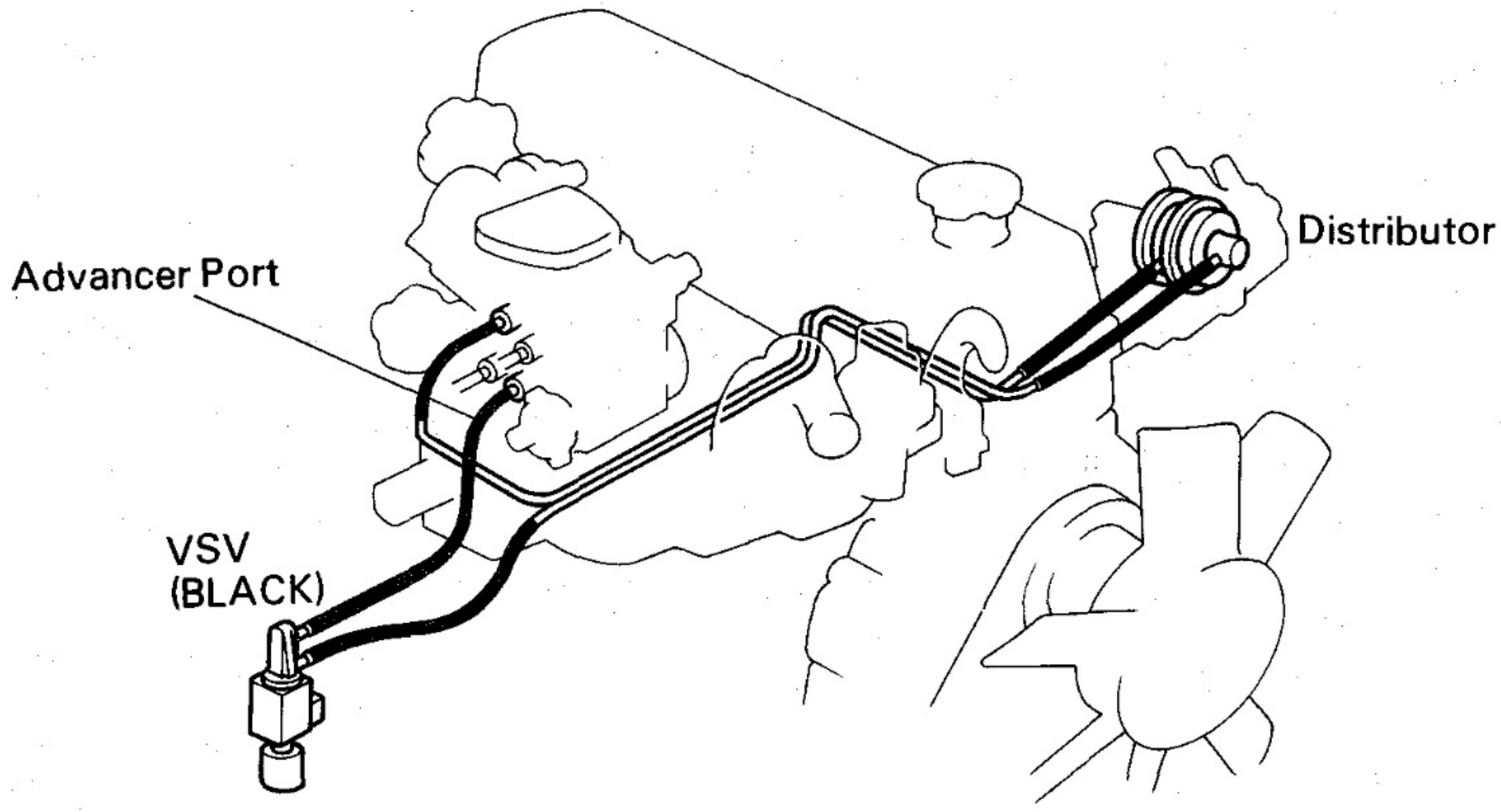

5. **CHECK ON-OFF CYCLES OF SPEED SENSOR**
   (a) Place the positive (+) terminal of the ohmmeter on the wiring connector terminal and the negative (–) terminal on a ground.
   (b) Turn the rear wheel slowly.
   (c) Check that the ohmmeter needle deflects consistently.

**CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.**

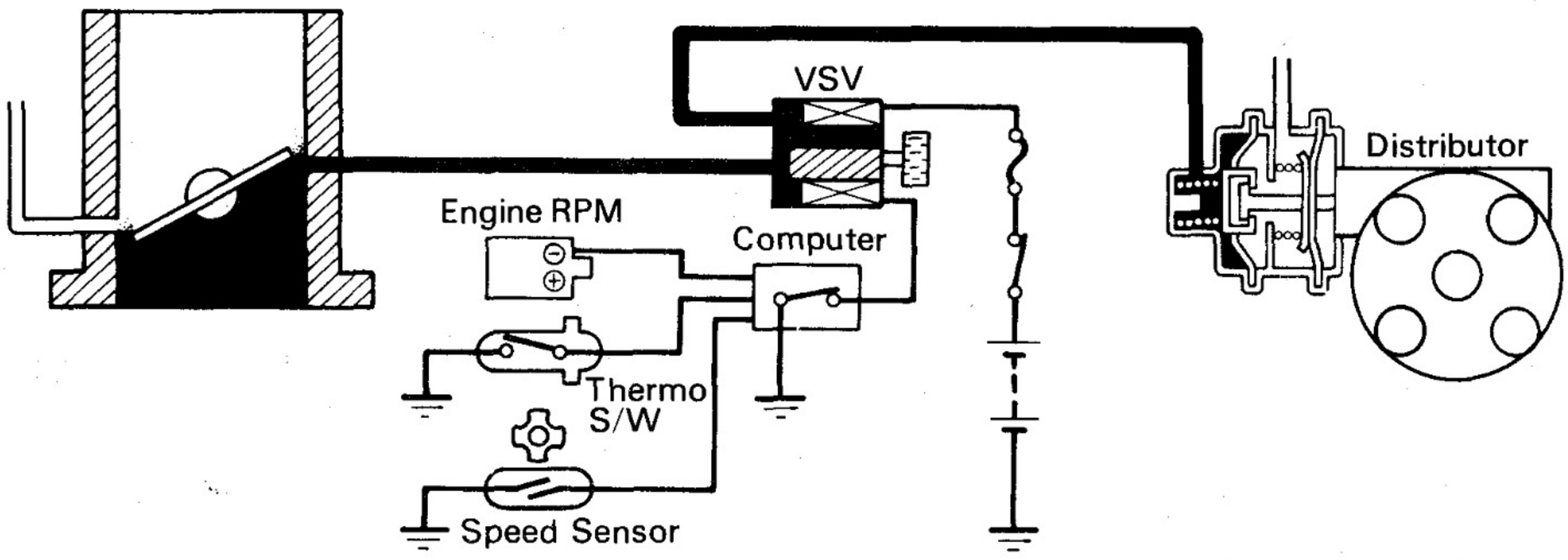
If the ohmmeter needle does not deflect, check that the speed sensor terminals at the back side of the speedometer air are properly connected. If the connection is OK, replace the speedometer assembly.

6. **RECONNECT WIRING CONNECTOR TO COMPUTER**

# SPARK CONTROL (SC) SYSTEM (LAND CRUISER only)



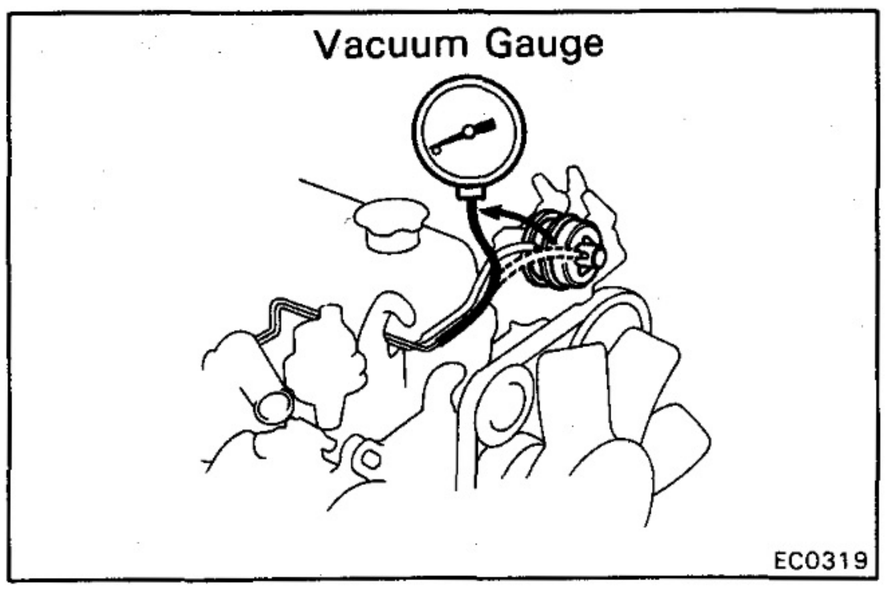

EC1327




EC1328

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

| Coolant Temp. | Thermo Switch | Vehicle Speed | Engine RPM | VSV | Main Vacuum Advance |
|---|---|---|---|---|---|
| COLD<br>Below 43°C (109°F) | Continuity | — | — | ON | NORMALLY OPERATES |
| HOT<br>Above 55°C (131°F) | No Continuity | Below 57 km/h | Below 3,200 rpm | OFF | NOT OPERATES |
| | | | Above 3,900 rpm | ON | NORMALLY OPERATES |
| | | Above 80 km/h | — | ON | NORMALLY OPERATES |




# INSPECTION OF SC SYSTEM

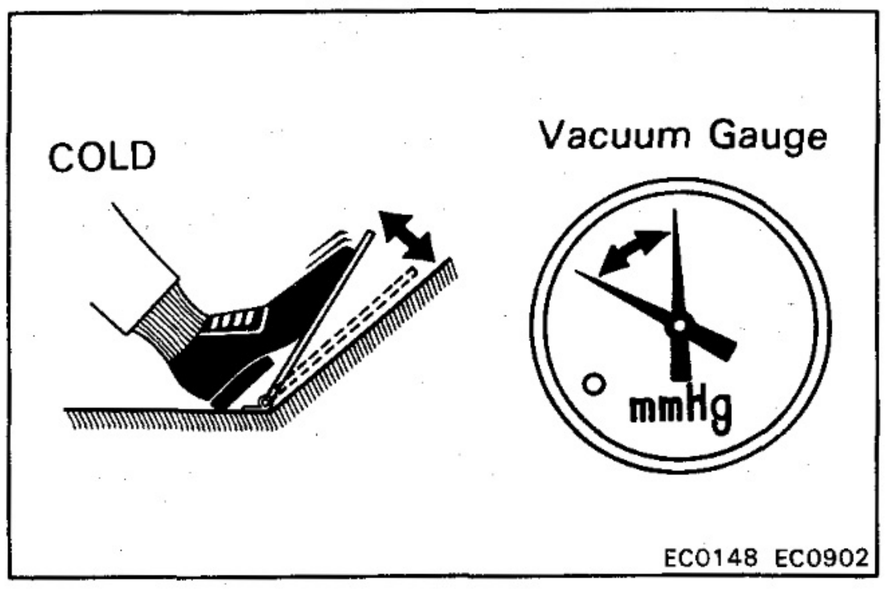
## 1. CONNECT VACUUM GAUGE

(a) Using a 3-way connector, connect the vacuum gauge to the hose between the distributor main diaphragm and vacuum pipe.

(b) Set the gauge at the driver's seat.

## 2. CONNECT A TACHOMETER TO ENGINE

**(See page 4-35)**

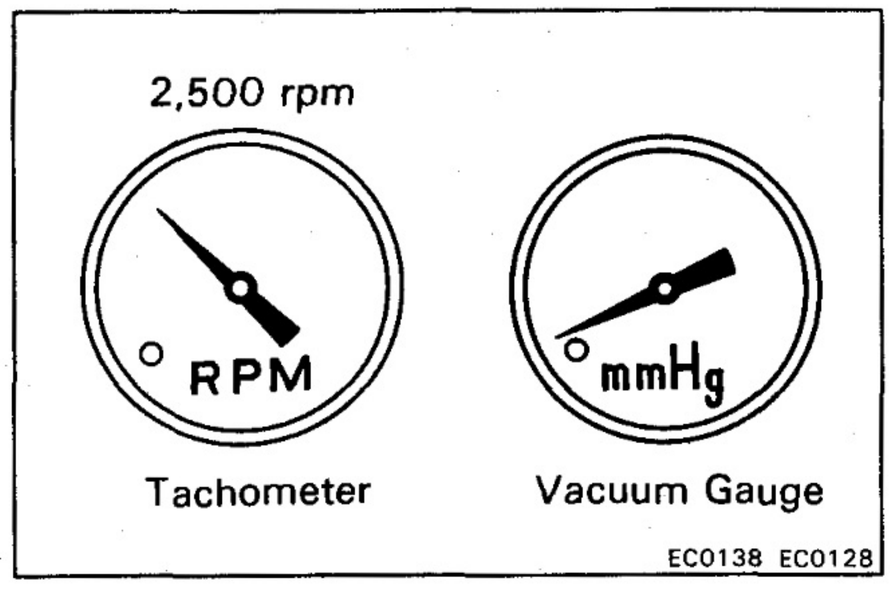



## 3. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 43°C (109°F).

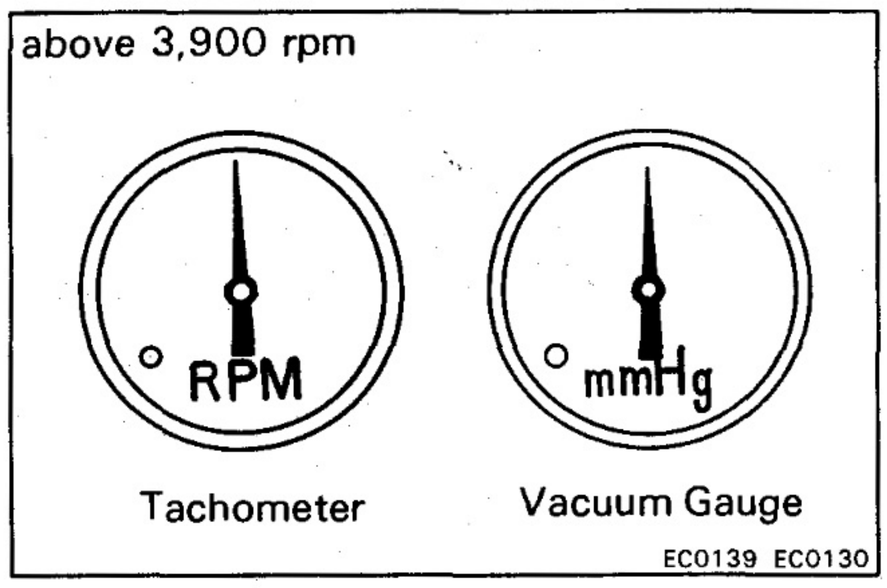
(b) Start the engine.

(c) Check that the vacuum changes quickly when the throttle valve is opened and closed.



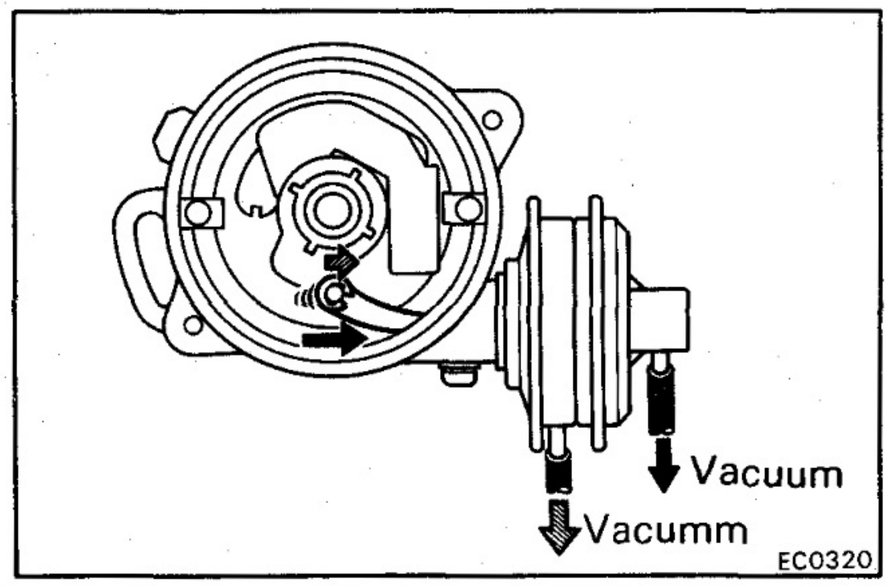

## 4. LET ENGINE WARM UP TO NORMAL OPERATING TEMPERATURE

(a) Increase the engine speed to 2,500 rpm at the neutral position of transmission.
Check that the vacuum gauge indicates zero.




(b) Increase the engine speed more 3,900 rpm at the neutral position of transmission.
Check that the vacuum gauge indicates high vacuum.

## 5. DISCONNECT A TACHOMETER FROM ENGINE



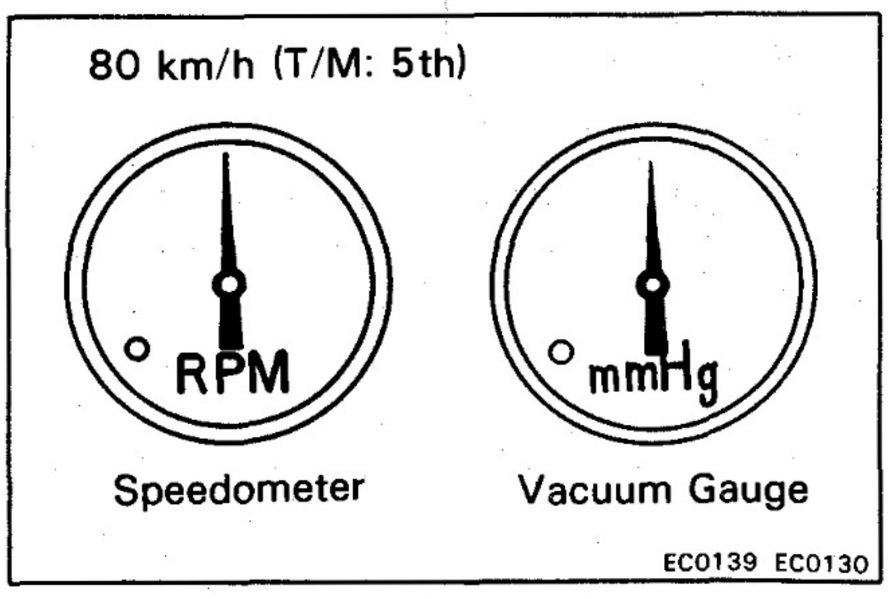

## 6. CHECK OPERATION OF DISTRIBUTOR VACUUM ADVANCER

(a) Remove the distributor cap and rotor.

(b) Apply vacuum to the diaphragm, and check that the vacuum advancer moves in accordance with the vacuum.

(c) Reinstall the rotor and distributor cap.

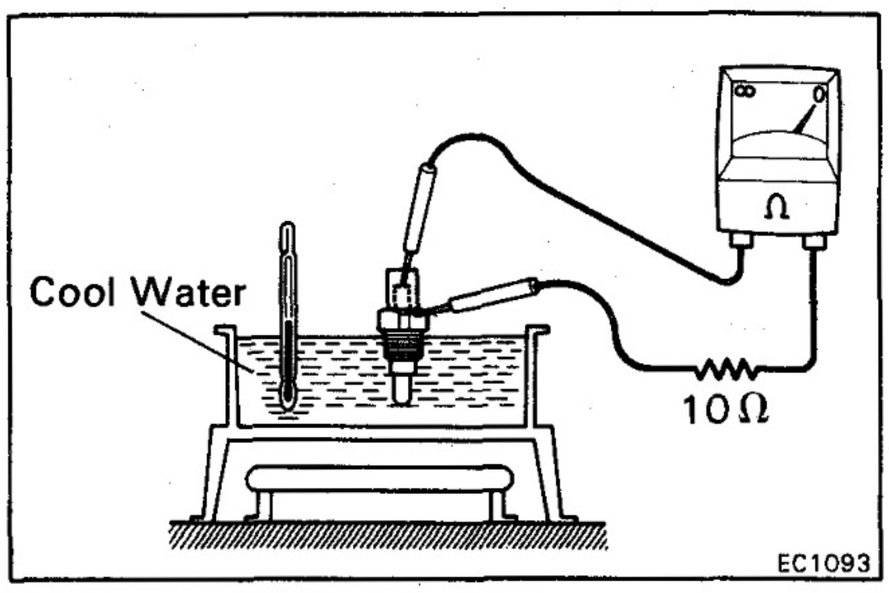
**IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART**

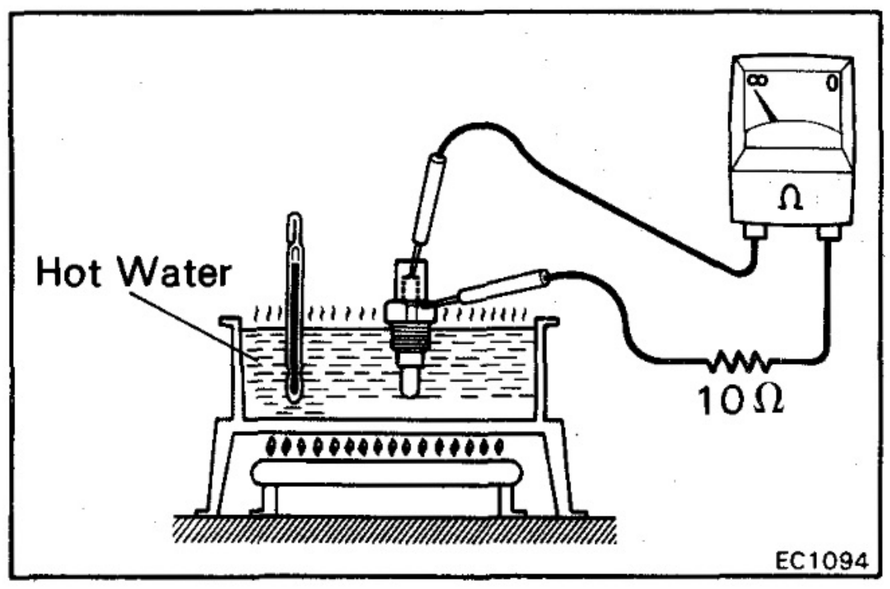



**7. PERFORM ROAD TEST OBSERVING SPEEDOMETER AND VACUUM GAUGE**

Check that the vacuum gauge indicates high vacuum when cruising over 80 km/h in the 5th position of transmission.

If a problem is found, inspect speed sensor.




## INSPECTION OF THERMO SWITCH

### CHECK THERMO SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the thermo switch from the intake manifold.

(c) Cool the thermo switch to below 43°C (109°F).

(d) Using an ohmmeter, check that there is continuity.

(e) Heat the switch to above 55°C (131°F) with hot water.

(f) Check that there is no continuity.

(g) Apply liquid sealer to the threads of the switch and reinstall.

(h) Fill the radiator with coolant.

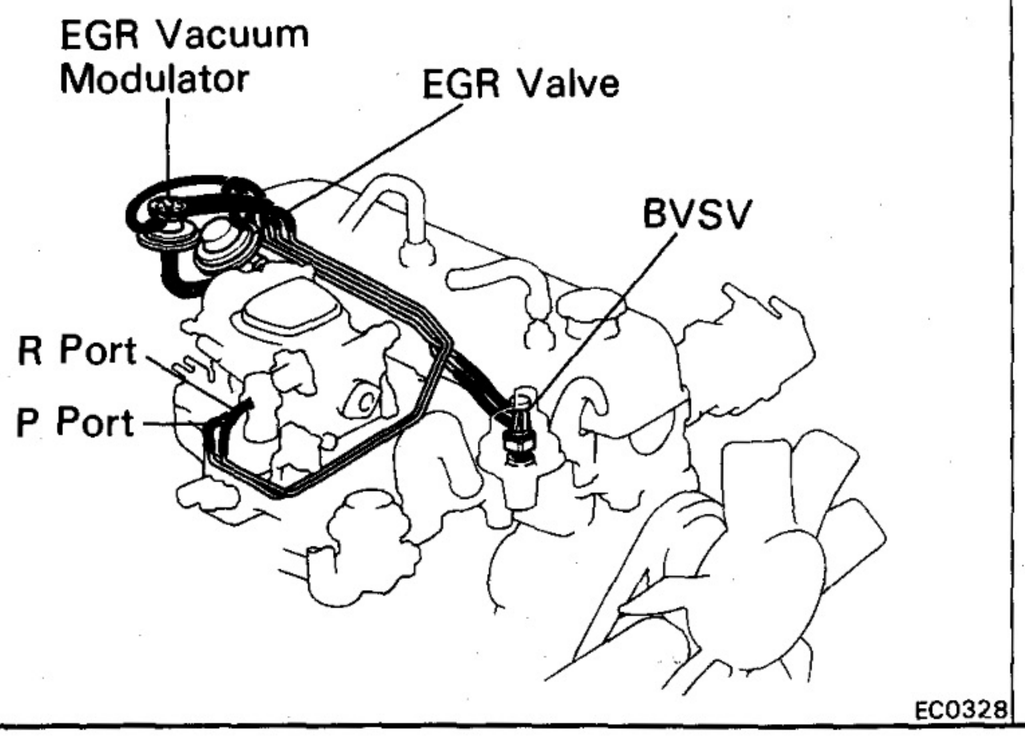
## INSPECTION OF VSV

**(See page 4-14)**

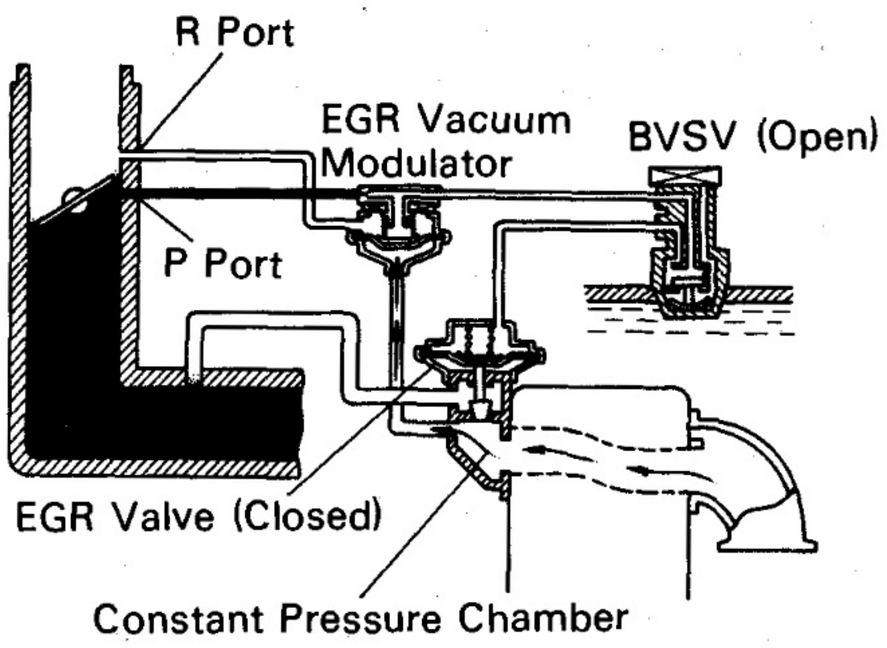
## INSPECTION OF SPEED SENSOR

**(See page 4-15)**

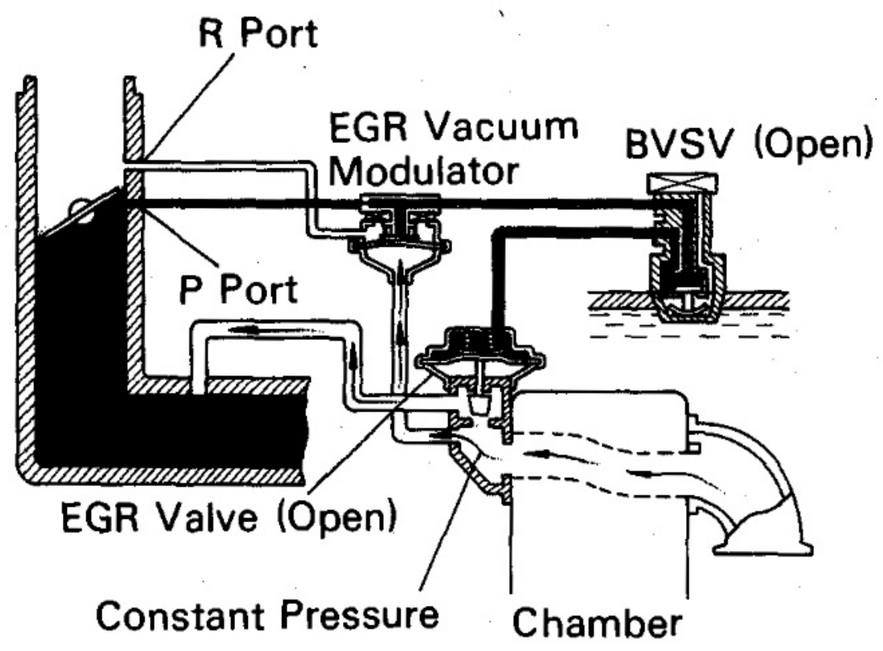
# EXHAUST GAS RECIRCULATION (EGR) SYSTEM (LAND CRUISER only)



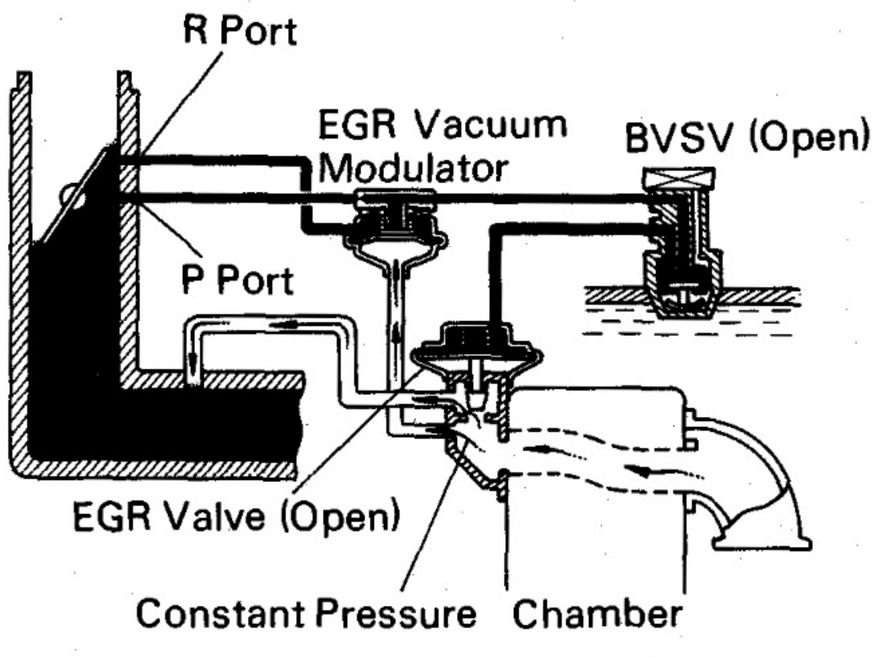

(1)




(2)




(3)

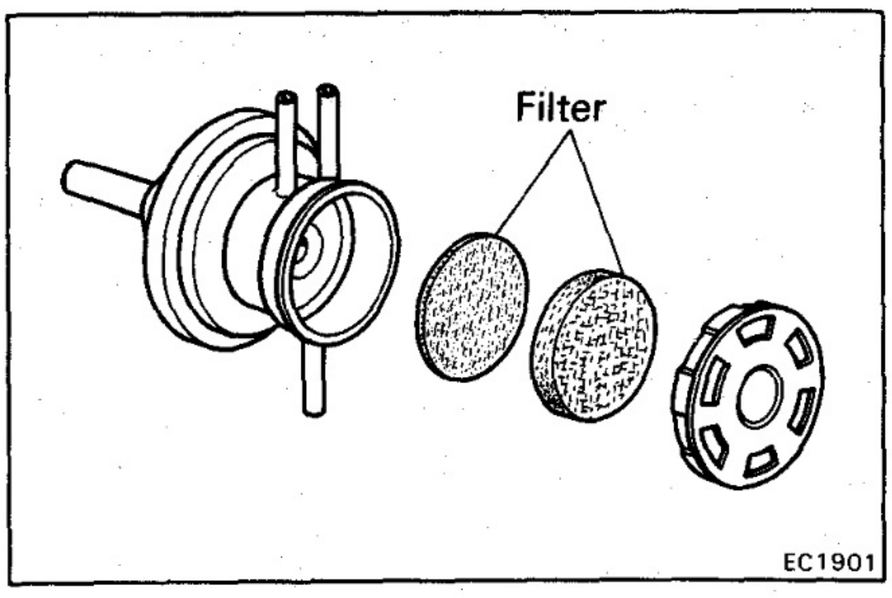



To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

| Coolant Temp. | BVSV | Throttle Valve Opening Angle | Pressure in the EGR Valve Pressure Chamber | | EGR Vacuum Modulator | EGR Valve | Exhaust Gas |
|---|---|---|---|---|---|---|---|
| Below 30°C (86°F) | CLOSED | — | — | | — | CLOSED | Not recirculated |
| Above 44°C (111°F) | OPEN | Positioned below EGR port | — | | — | CLOSED | Not recirculated |
| | | Positioned between P port & R port | (1) LOW | *Pressure constantly alternating between low and high | OPENS passage to atmosphere | CLOSED | Not recirculated |
| | | | (2) HIGH | | CLOSES passage to atmosphere | OPEN | Recirculated |
| | | Positioned above EGR R port | (3) HIGH | ** | CLOSES passage to atmosphere | OPEN | Recirculated (increase) |

Remarks: * Pressure increases → Modulator closes → EGR valve opens → Pressure drops
→ EGR valve closes ← Modulator opens ←

** When the throttle valve is positioned above the R port, 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 insufficiently low.

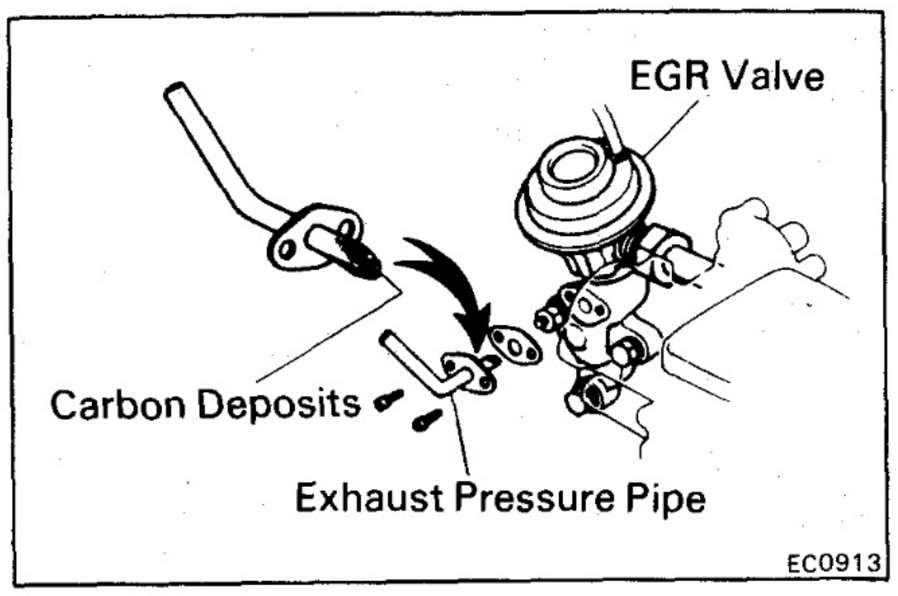



# INSPECTION OF EGR SYSTEM

## 1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination of damage.

(b) Using compressed air, clean the filters.

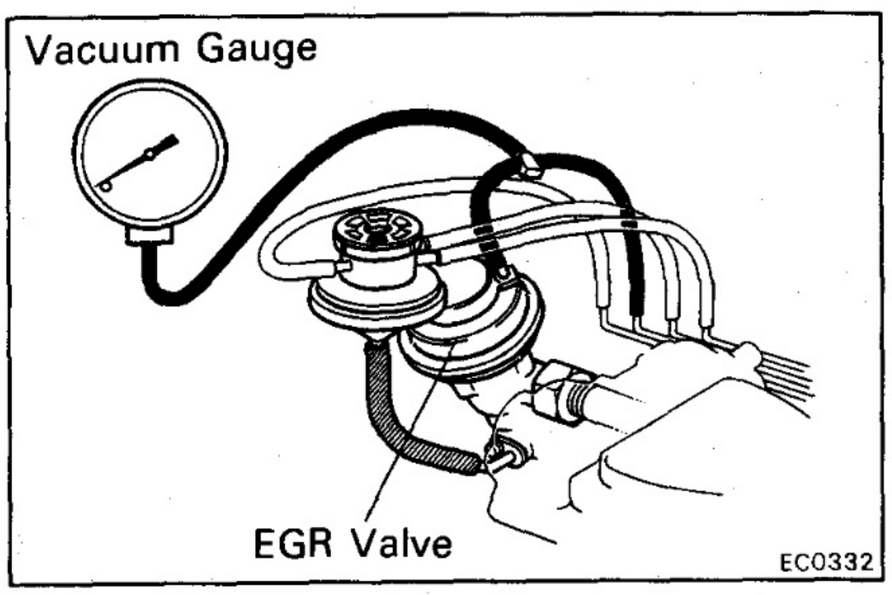



## 2. CLEAN EXHAUST PRESSURE PIPE OF EGR VALVE

(a) Remove the exhaust pressure pipe from the EGR valve.

(b) Clean any carbon deposits off the pipe.

(c) Reinstall the pipe with a new gasket.

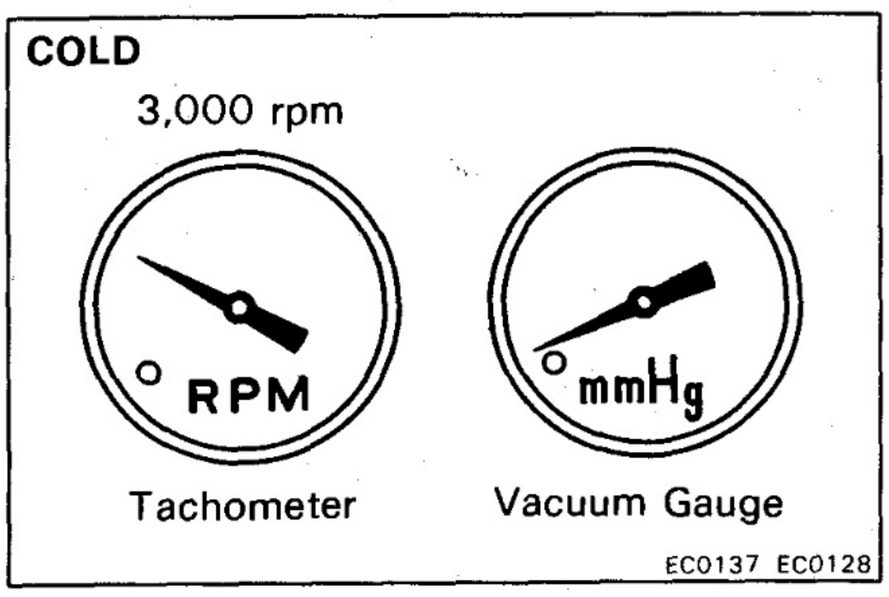



## 3. PREPARATION

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

## 4. CHECK SEATING OF EGR VALVE

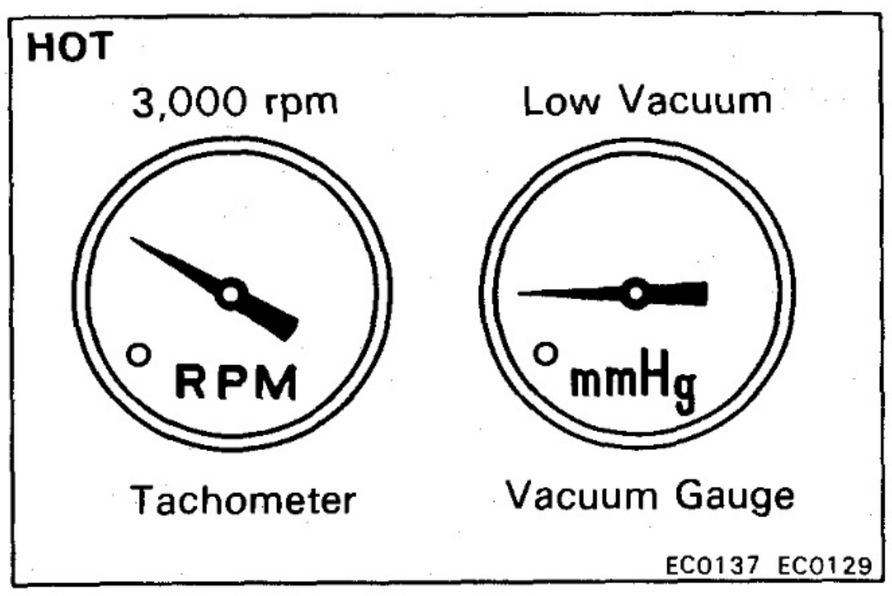
Start the engine and check that the engine starts and runs at idle.




## 5. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C (86 °F).

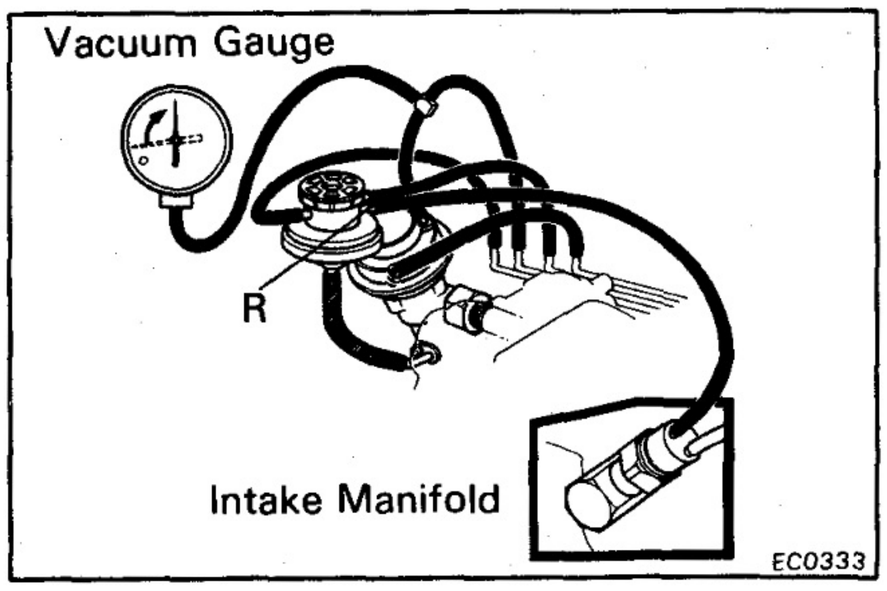
(b) Check that the vacuum gauge indicates zero at 3,000 rpm.




## 6. CHECK BVSV, VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 3,000 rpm.

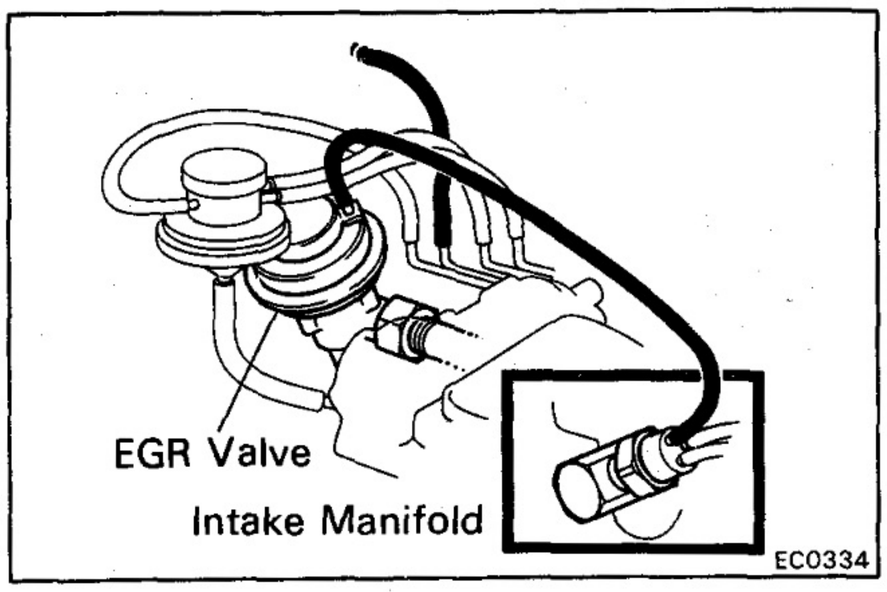



(c) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.

NOTE: As a large amount of EGR gas enters, the engine will misfire slightly.

(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.



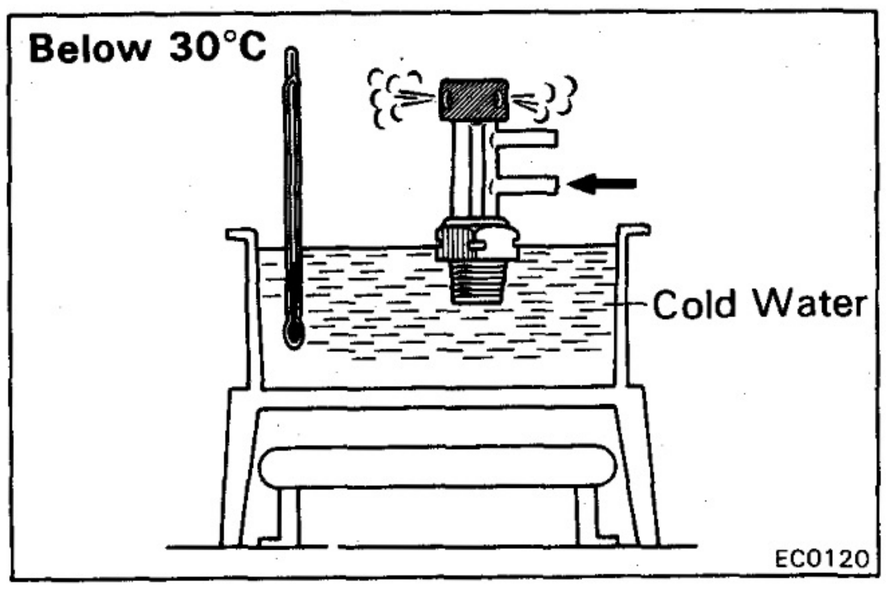

### 7. CHECK EGR VALVE

(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 locations.

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




## INSPECTION OF BVSV

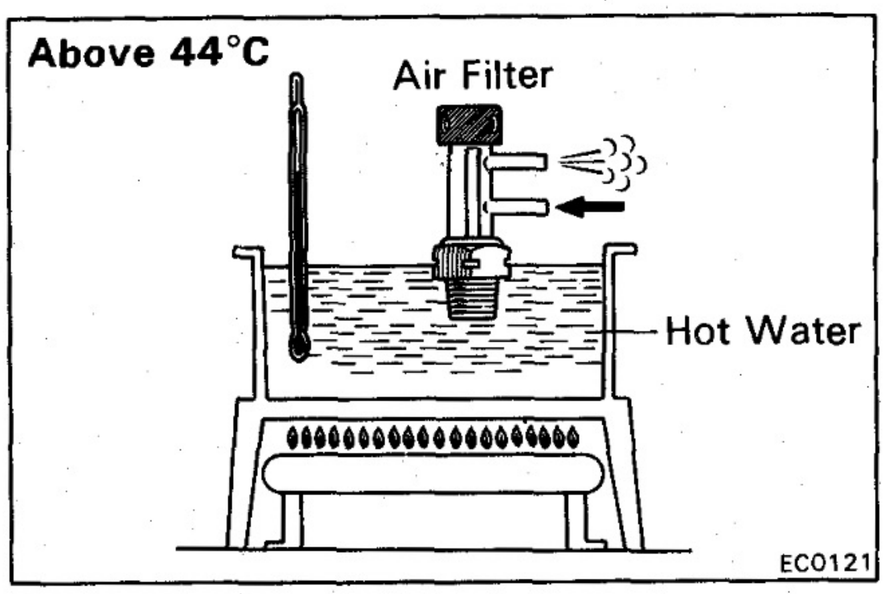
### CHECK BVSV BY BLOWING AIR INTO PIPE

(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 a pipe and check that the BVSV is closed.



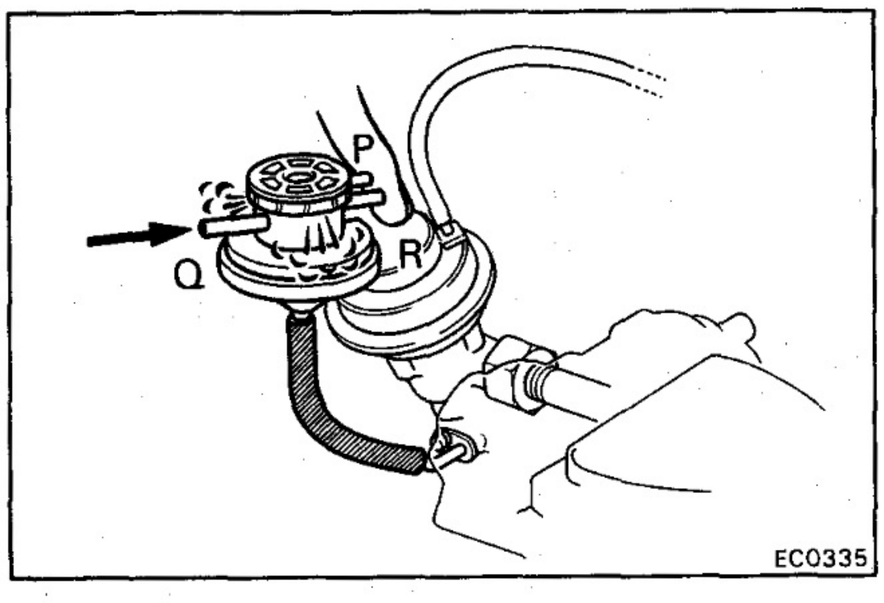

(e) Heat the BVSV to above 44°C (111°F) with hot water.

(f) Blow air into a pipe and check that the BVSV is open.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Hill the radiator with coolant.

If a problem is found, replace the BVSV.



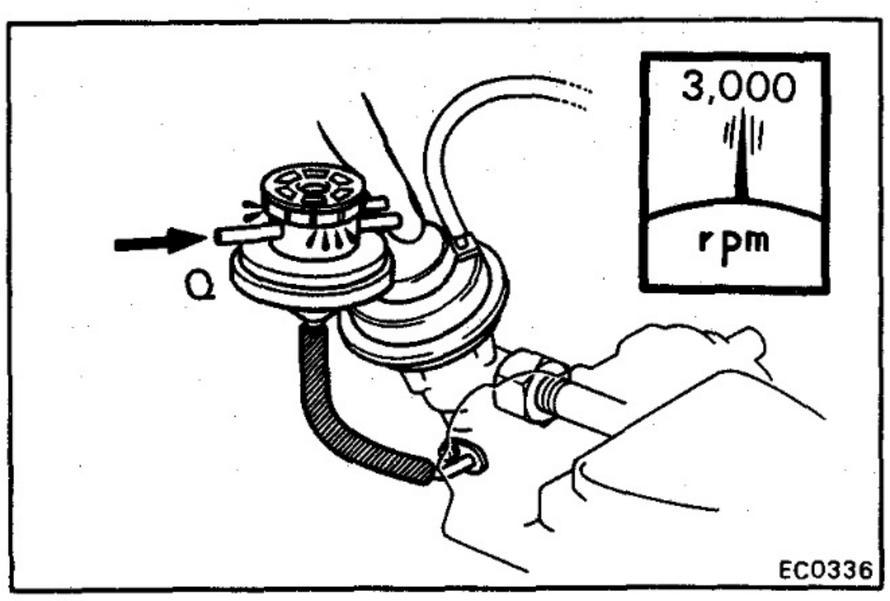

## INSPECTION OF EGR VACUUM MODULATOR

### CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from port P, Q and R of the EGR vacuum modulator.

(b) Plug port P and R with your finger.

(c) Blow air into port Q. Check that the air passes through to the air filter side freely.




(d) Start the engine and maintain the speed at 3,000 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

(f) Reconnect the vacuum hoses to the proper locations.

## INSPECTION OF EGR VALVE

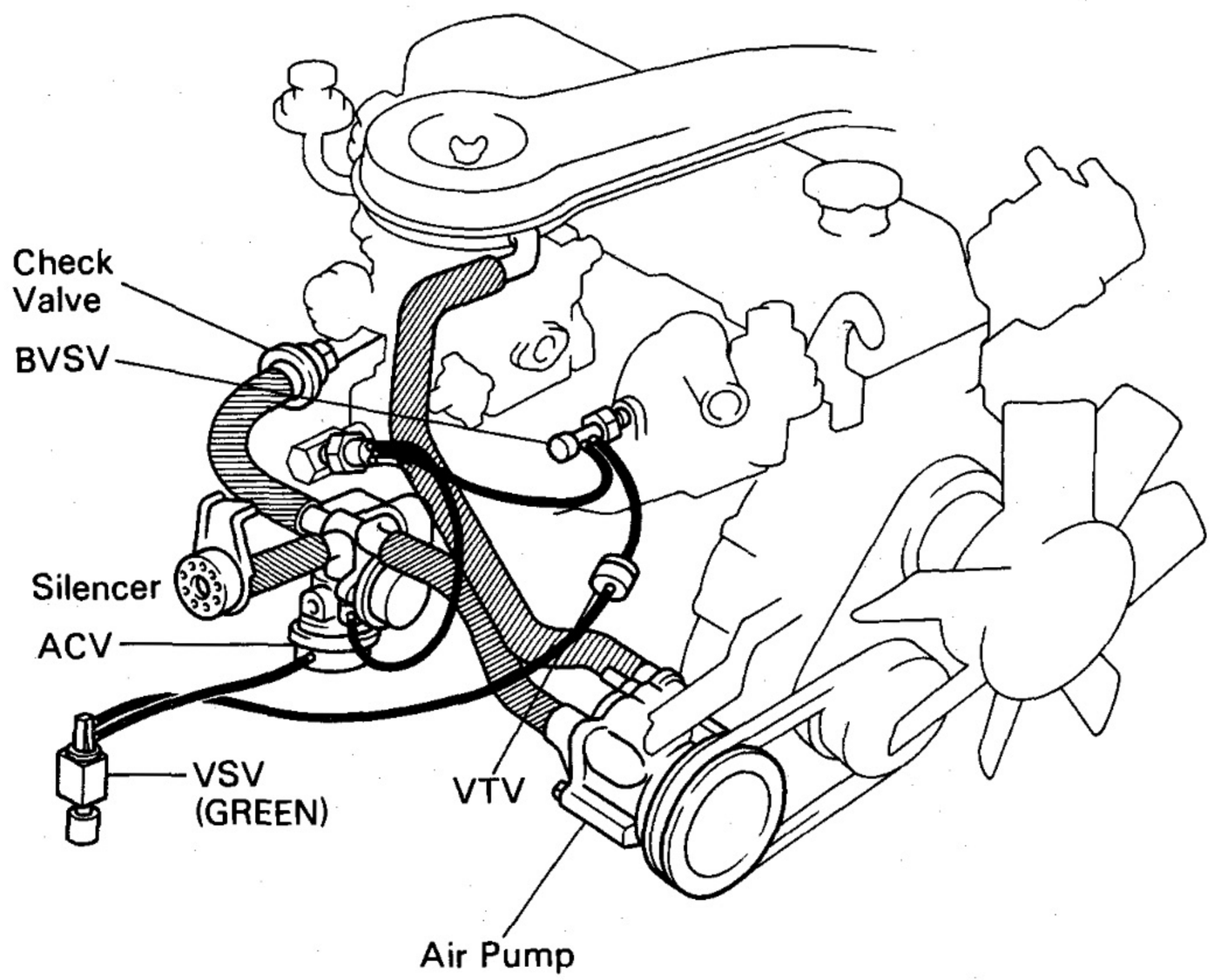
### 1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon deposits.

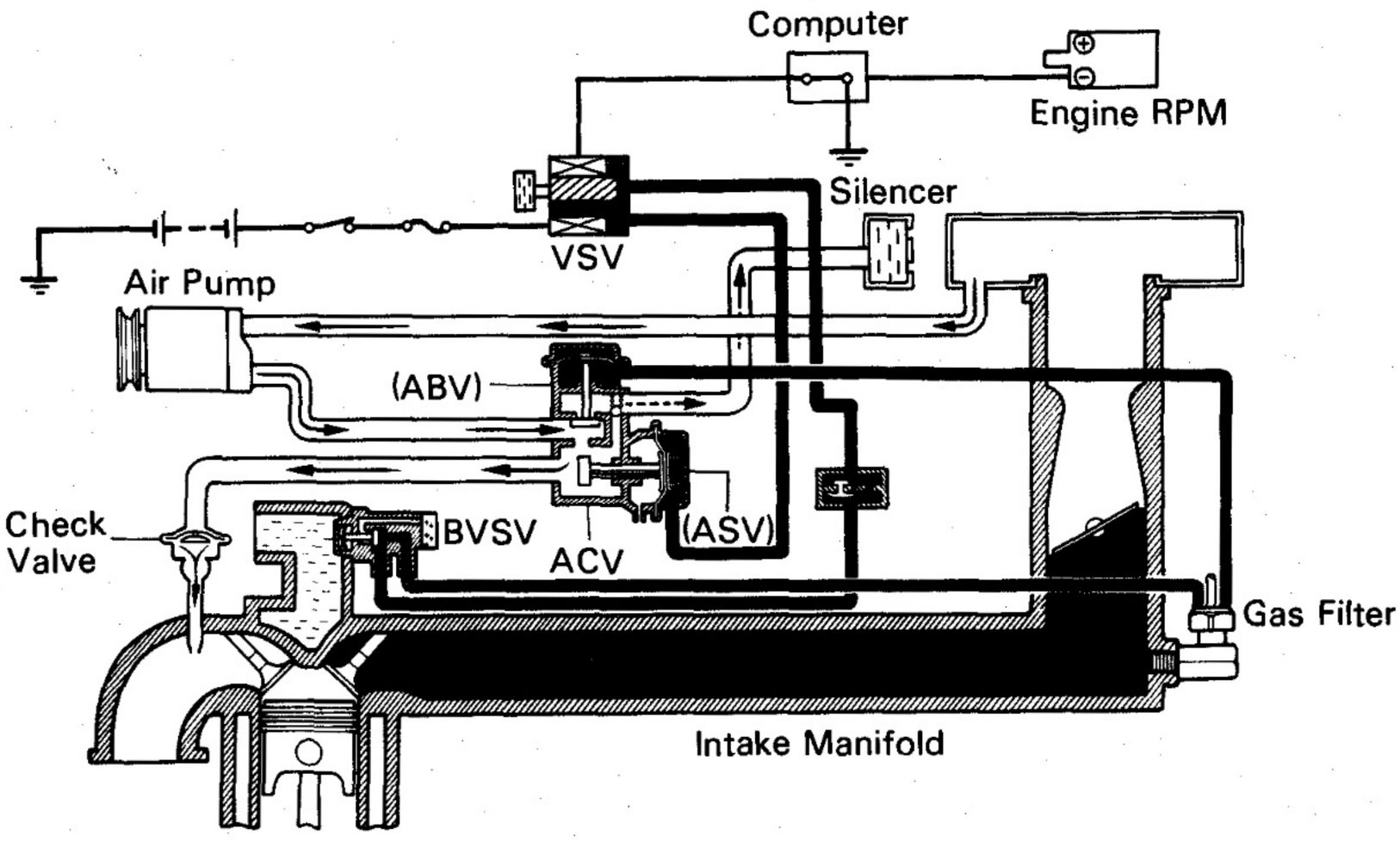
If a problem is found, replace it.

### 2. INSTALL EGR VALVE WITH A NEW GASKET

# AIR INJECTION (AI) SYSTEM (LAND CRUISER only)




EC1329

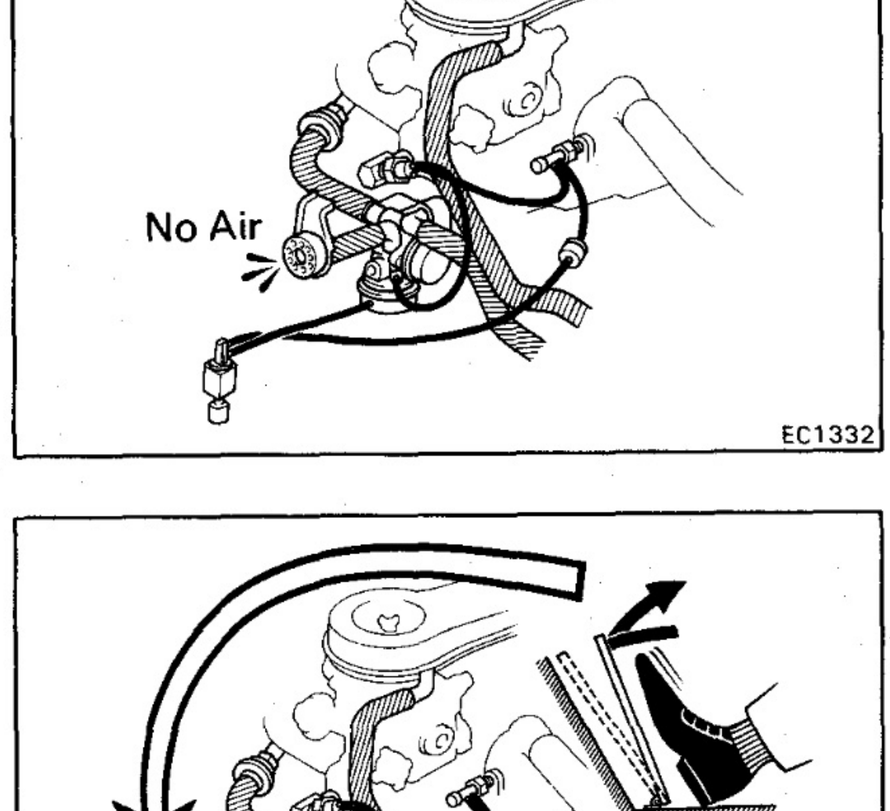


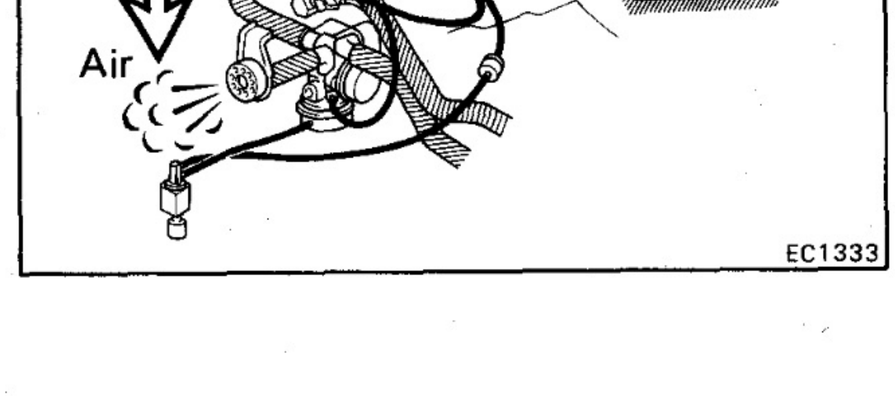

EC1330

For reburning the unburnt HC and CO in the exhaust port, compressed air from the air pump is blown into the exhaust port.

| Coolant Temp. | BVSV | Engine RPM | VSV | Driving Condition | ACV | | Air from Air Pump | AI System |
|---|---|---|---|---|---|---|---|---|
| | | | | | ABV | ASV | | |
| Below 5°C (41°F) | CLOSED | — | — | — | OPEN | CLOSED | Blow out from the silencer | OFF |
| Above 21°C (70°F) | OPEN | Below 3,200 rpm | OPEN | Idling, low and medium speed | OPEN | OPEN | Injected to the exhaust port | ON |
| | | | | Hight speed | OPEN | CLOSED | * Blow out from the silencer | OFF |
| | | | | Sudden deceleration | Momentarily CLOSED | OPEN | Momentarily blow out from the silencer | Momentarily OFF |
| | | Above 3,900 rpm | CLOSED | — | — | — | Blow out from the silencer | OFF |

Remark: * This action is delayed by VTV.







## INSPECTION OF AI SYSTEM

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

**2. CHECK ASV WITH COLD ENGINE**

(a) The coolant temperature should be below 5°C (41°F).

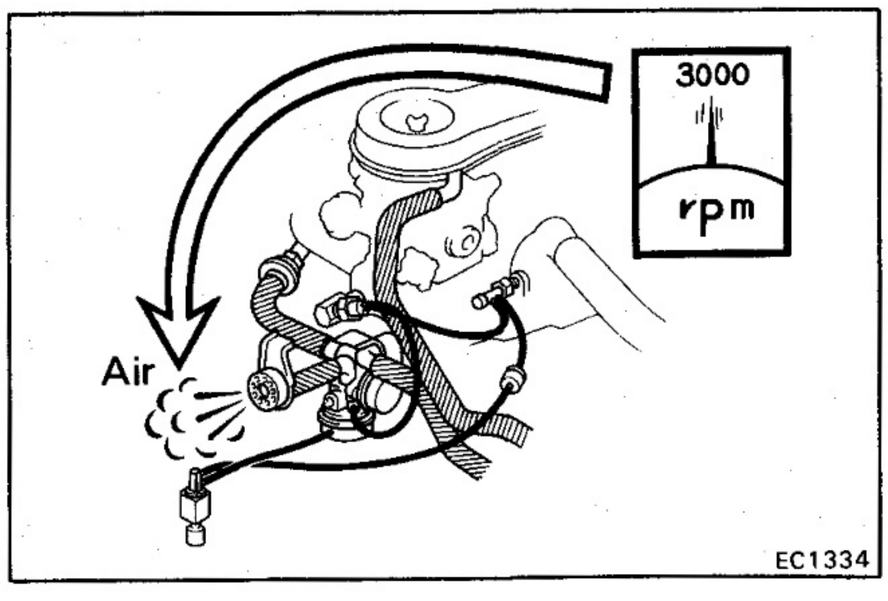
(b) Start the engine and check that air is discharged from the silencer.

**3. CHECK ASV AND ABV WITH WARM ENGINE**

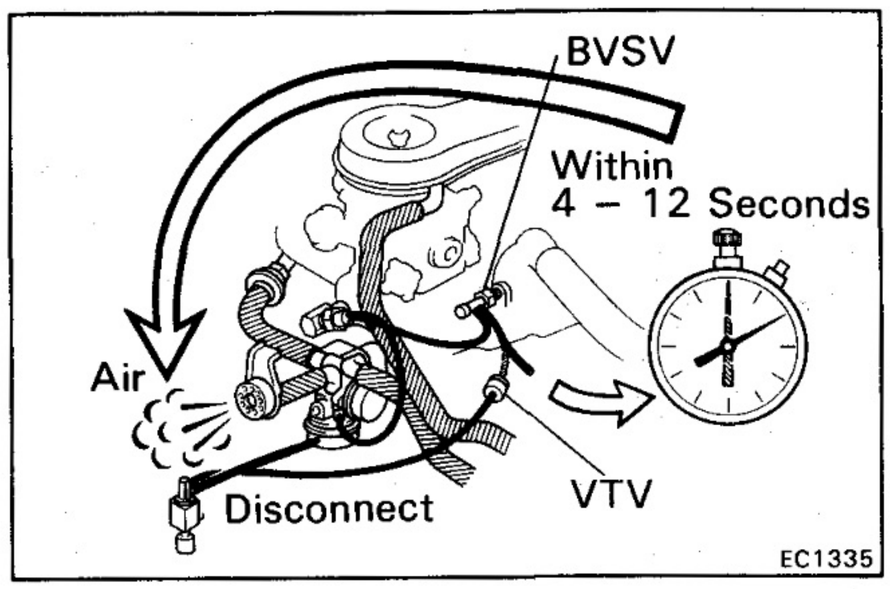
(a) Warm up the engine to normal operating temperature.

(b) With the engine idling, check that air is not discharged from the silencer.

(c) Race the engine and quickly close the throttle valve, check that air is discharged momentarily from the silencer.



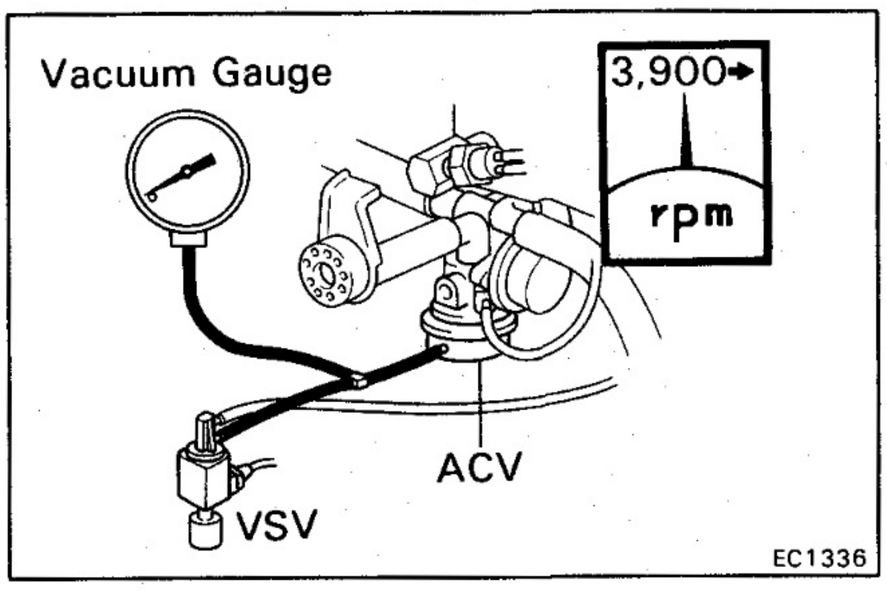

(d) Increase the engine speed to 3,000 rpm and check that air is discharged from the silencer.




**4. CHECK VTV**

(a) Disconnect the hose between the VTV and BVSV at the VTV side. Check that air is discharged from the silencer within 4 – 12 seconds.

(b) Reconnect the hose to the VTV.

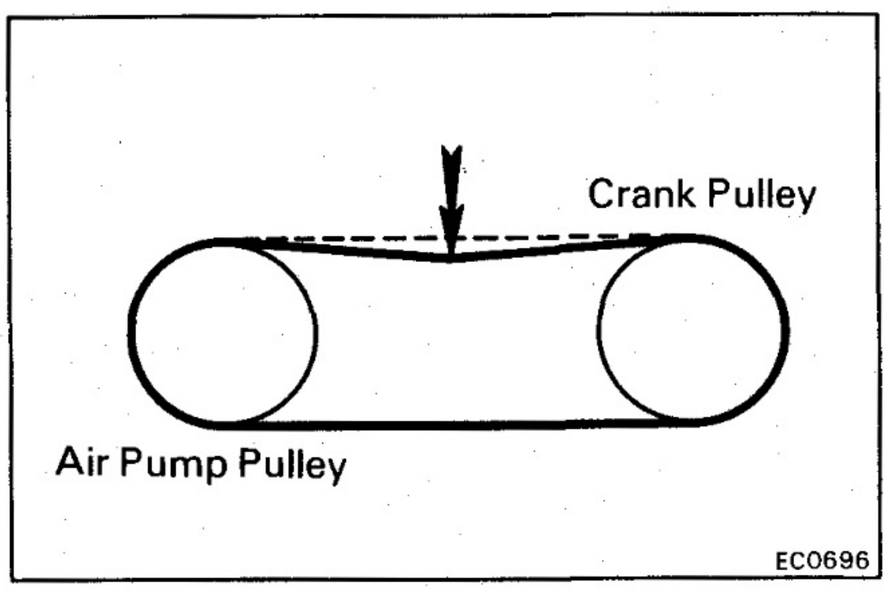



**5. CHECK VSV**

(a) Disconnect the hose between the VSV and ACV at the VSV side. Check that there is no vacuum at the port of VSV with the engine rpm above 3,900.

(b) Reconnect the hose to the VSV.

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




## INSPECTION OF AIR PUMP DRIVE BELT

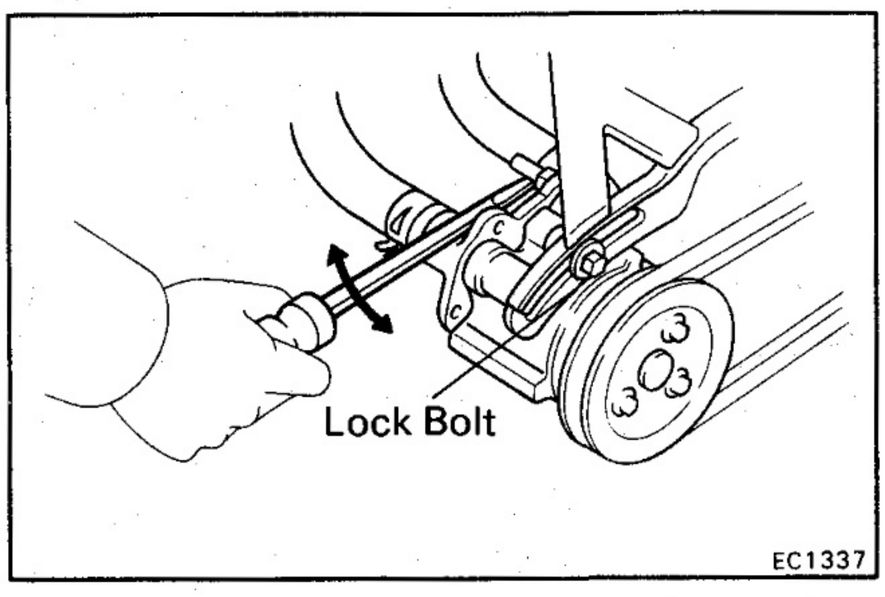
**1. VISUALLY CHECK DRIVE BELT FOR CRACKS, OILINESS OR WETNESS**

The belt should not touch the bottom of the pulley groove.

**2. CHECK AND ADJUST DRIVE BELT TENSION**

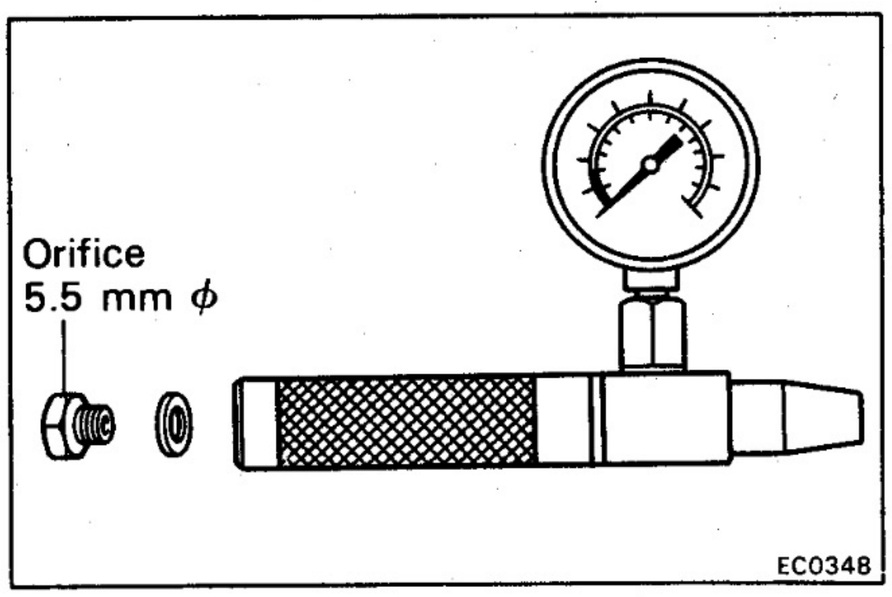
(a) Press the drive belt with 10 kg (22.0 lb, 98 N) pressure and check the amount of deflection.

**Belt deflection:**
**New belt 8 – 10 mm (0.31 – 0.39 in.)**
**Used belt 10 – 14 mm (0.39 – 0.55 in.)**
**(Air pump pulley to crank pulley)**




(b) To adjust, loosen the adjusting lever bolt and pivot bolt, shift the air pump toward the direction of belt tension, and retighten the bolts.

**CAUTION: Do not attempt to shift the air pump by prying the die cast part with a lever. Pry the rear cover when making the adjustment.**




## INSPECTION OF AIR PUMP

### 1. CHECK AIR PUMP FOR ABNORMAL NOISE

### 2. CHECK AIR PUMP DISCHARGE PRESSURE

(a) Connect the air pump tester (SST) to the hose at the air pump outlet.

SST 09258-14010

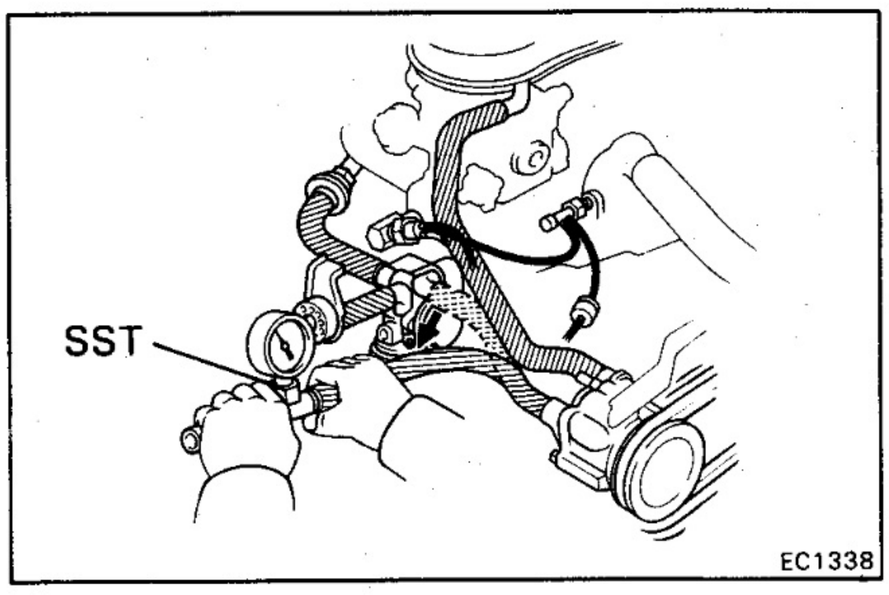
(b) Select and use a specified orifice (5.5 mm dia. or 0.217 in. dia.) on the SST.

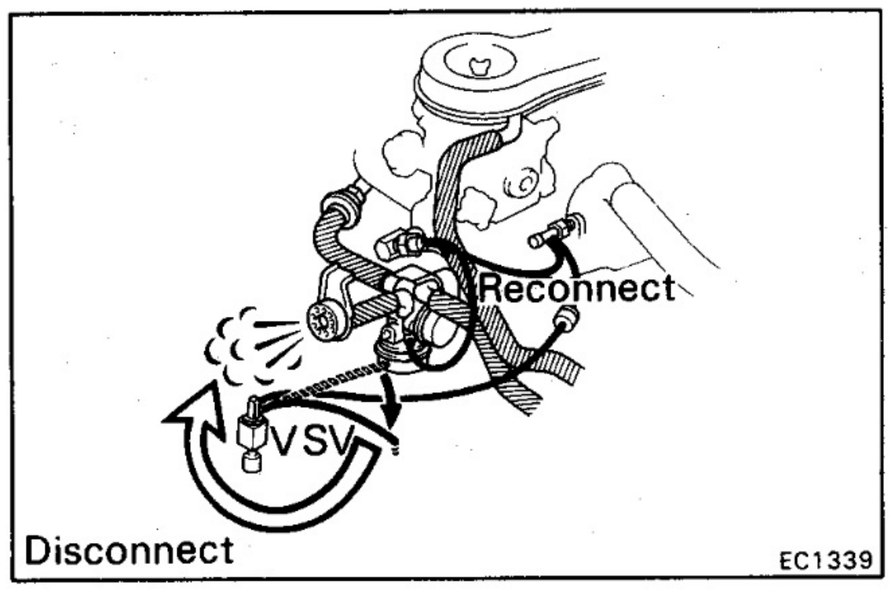
(c) Set the engine speed at 1,800 rpm.

(d) The gauge of the SST should indicate in the green zone.

If the SST indicates in the red zone, replace the pump assembly.

(e) Reconnect the hose to the proper location.




## INSPECTION OF ACV

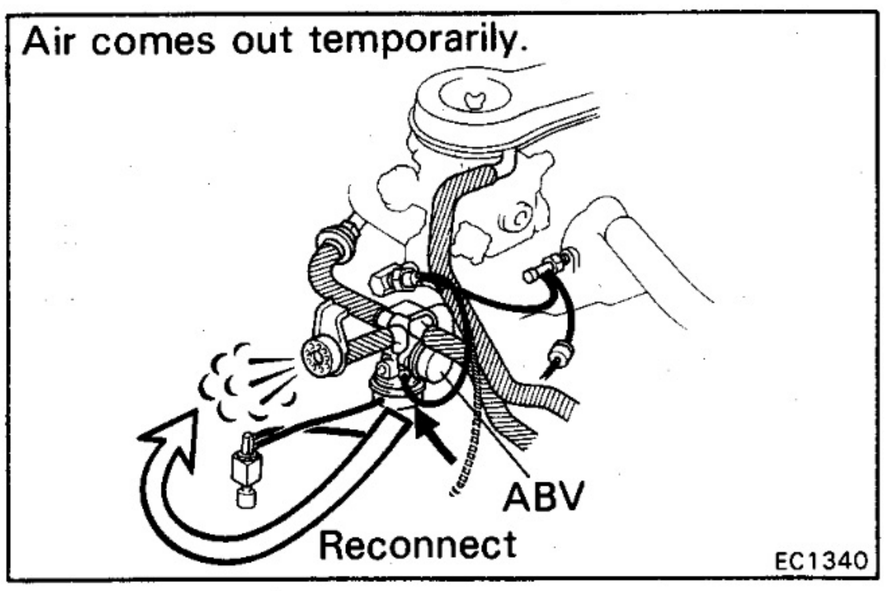
### 1. CHECK ASV OPERATION

(a) Disconnect the air hose from the check valve, and air by-pass hose from the silencer.

(b) Disconnect the vacuum hose from the ASV.

(c) Check that compressed air comes out of the air by-pass hose at idle.

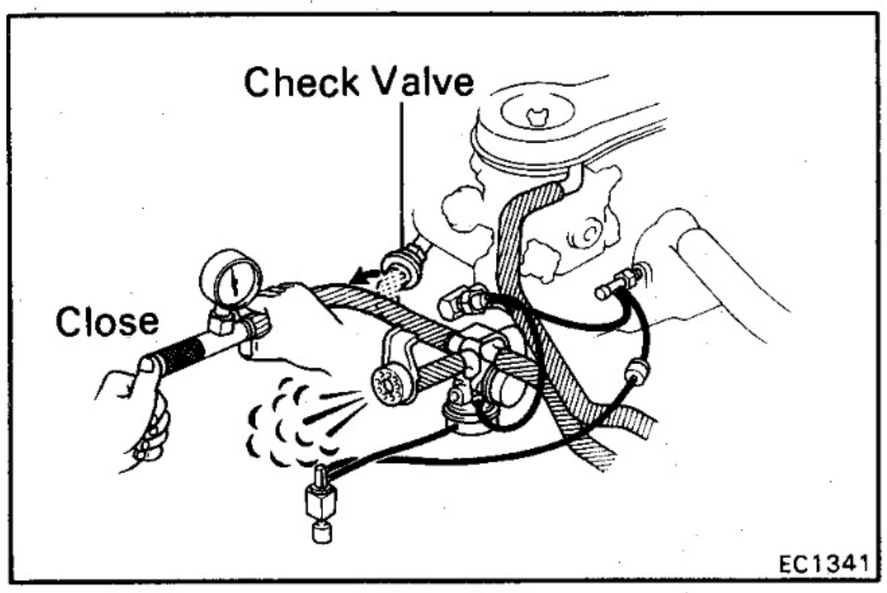
(d) Reconnect the vacuum hose to the ASV.




### 2. CHECK ABV OPERATION

(a) Disconnect the vacuum hose from the ABV.

(b) Reconnect the hose and check that compressed air momentarily comes out from the by-pass hose at idle.




### 3. CHECK OPENING PRESSURE OF RELIEF VALVE

(a) Connect the air pump tester (SST) to the air hose to check valve.

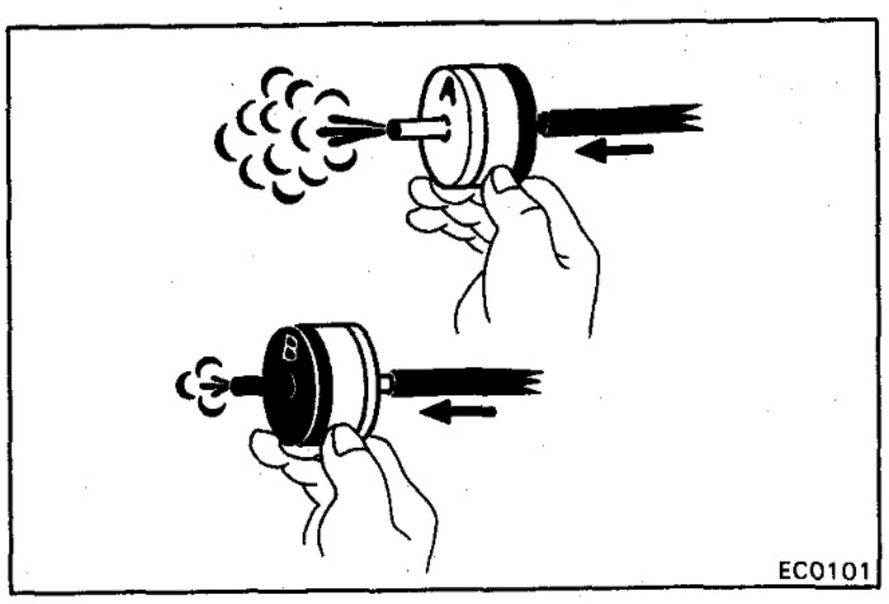
SST 09258-14010

(b) Close the orifice on the SST with your finger.

(c) Increase the engine speed gradually and measure the relief valve opening pressure.

**Opening pressure: 0.23 – 0.39 kg/cm$^2$ (3.3 – 5.5 psi, 23 – 38 kPa)**

(d) Remove the SST and reconnect the air hoses and vacuum hoses to the proper locations.



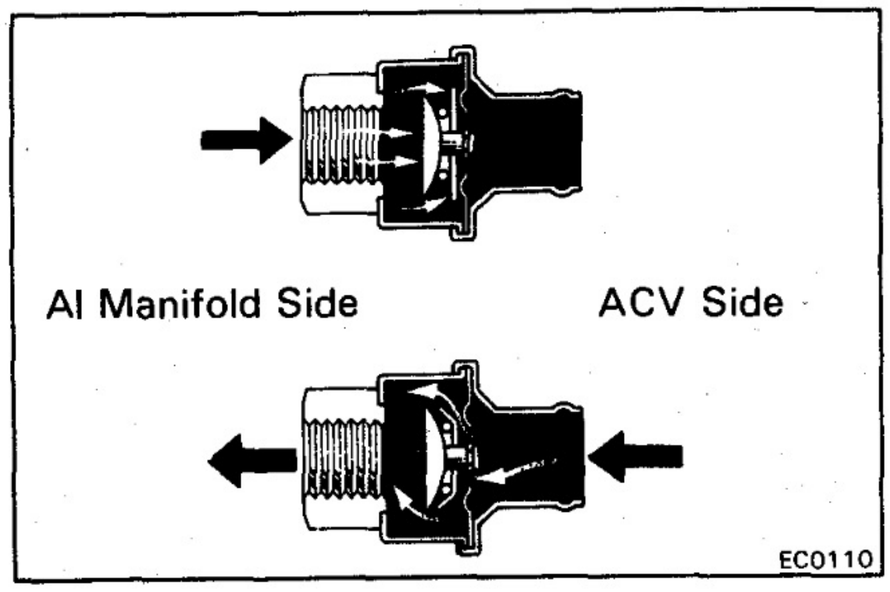

## INSPECTION OF VTV

### 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.



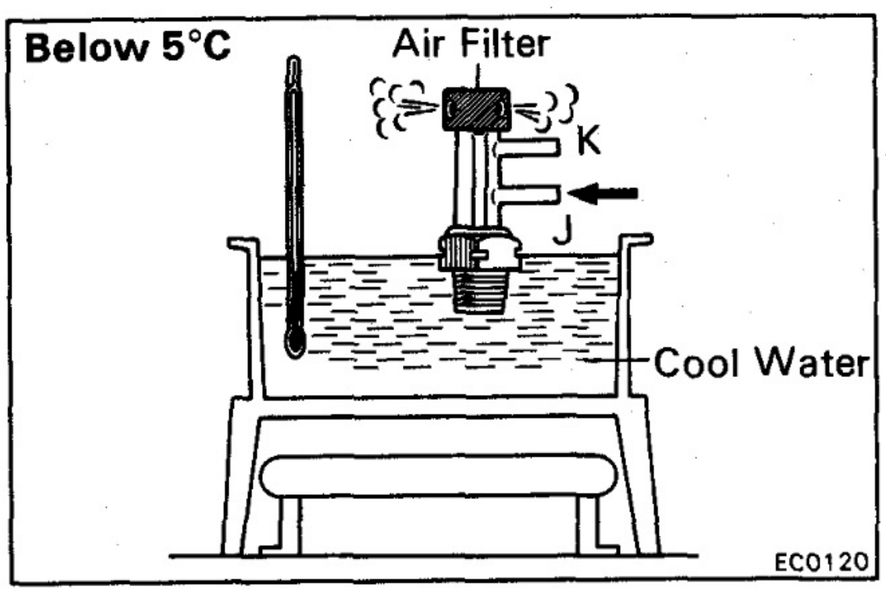

## INSPECTION OF CHECK VALVE

### CHECK VALVE BY BLOWING AIR FROM EACH SIDE

(a) Check that air does not flow from manifold side to ACV side.

(b) Check that air flows from ACV side to manifold side.

If a problem is found, replace the valve.




## INSPECTION OF BVSV

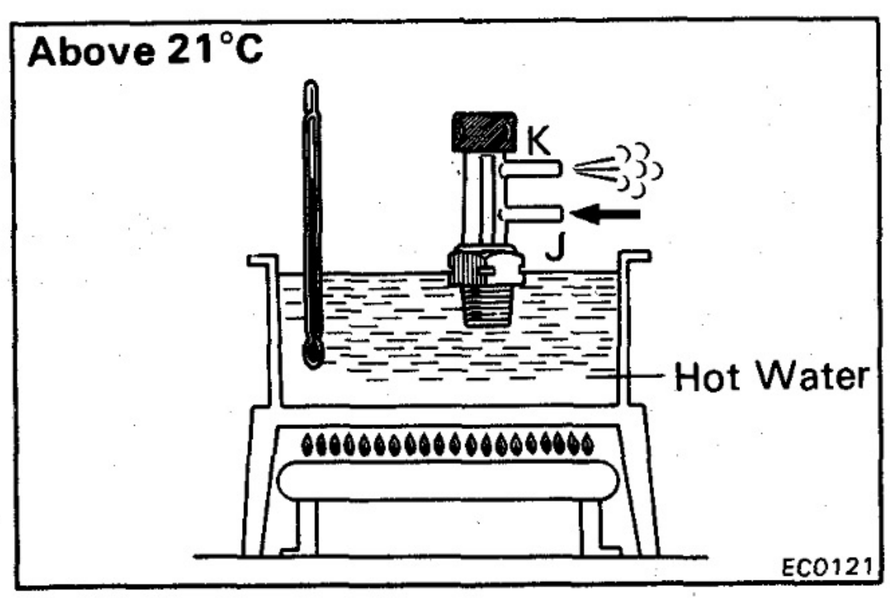
### CHECK BVSV BY BLOWING AIR INTO PIPE

(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 cold water.

(d) Check that air does not pass between K and J, and that J is opened to the air filter.




(e) Heat the BVSV to above 21°C (70°F) with hot water.

(f) Check that air passes between K and J.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

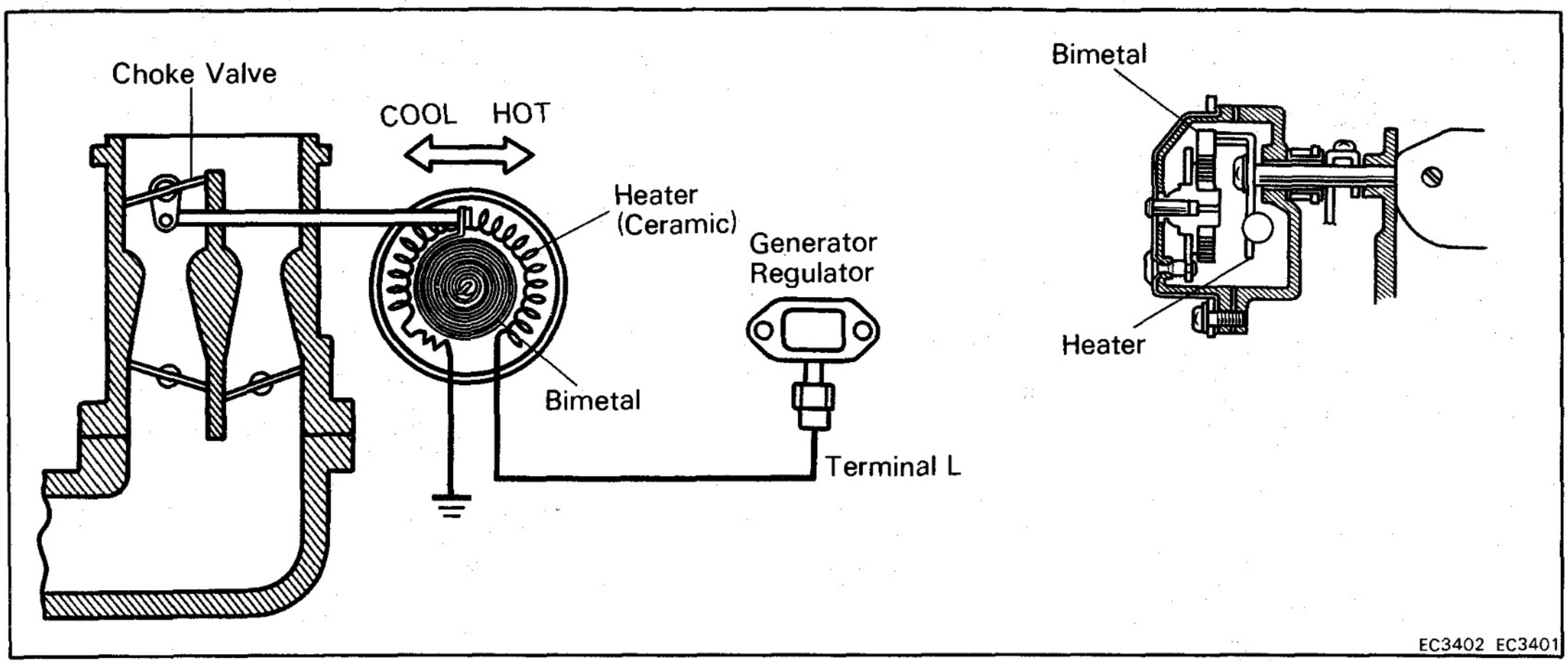
(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.

## INSPECTION OF VSV

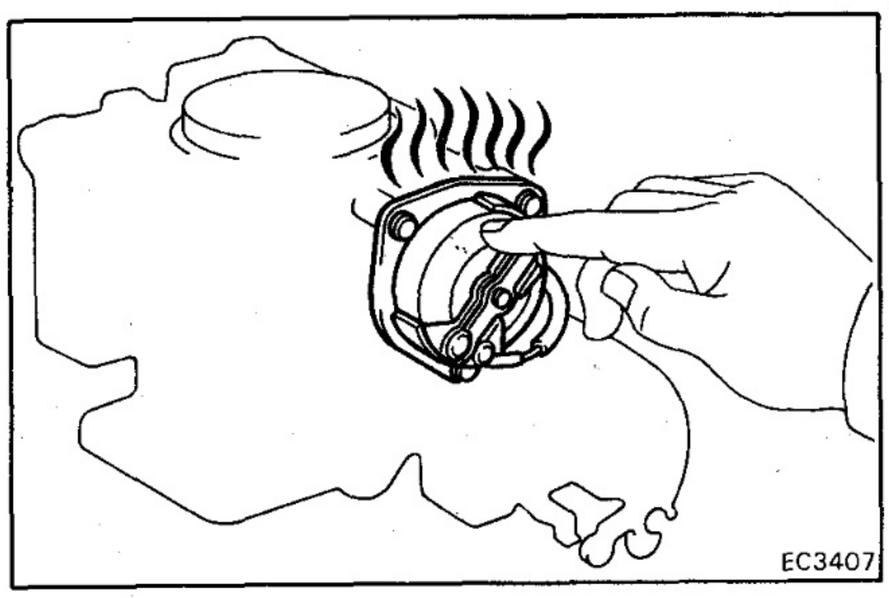
**(See page 4-14)**

# AUXILIARY SYSTEMS
## 1. Automatic Choke System



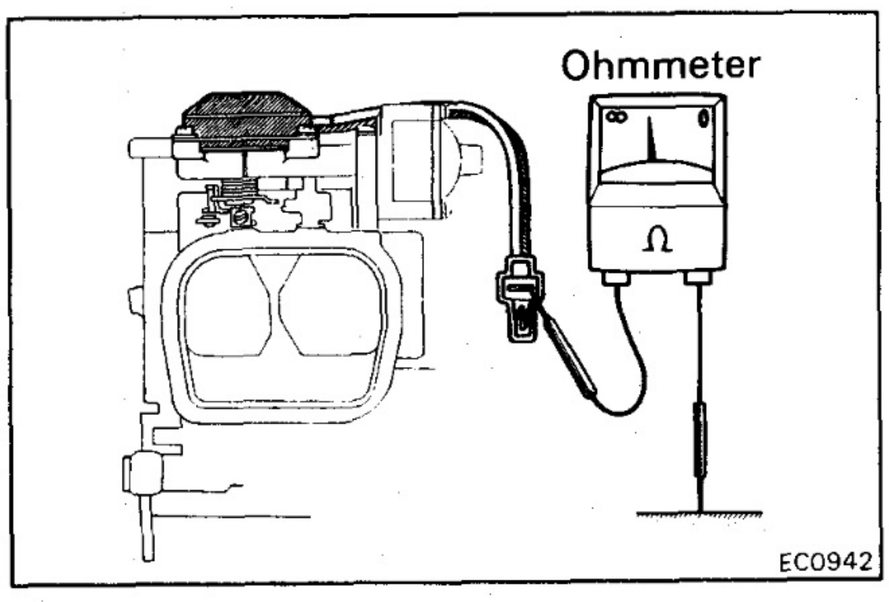

This system temporarily supplies a rich mixture to the engine by closing the choke valve when the engine is cold.

| IG S/W | Engine | Current from Terminal L to Heater | Bimetal | Choke Valve |
|---|---|---|---|---|
| OFF | Not running | Not flowing | Expanded | CLOSED |
| ON | Not running | Not flowing | Expanded | CLOSED |
| | Running | Flowing | Heated up and contracted | OPEN |




## INSPECTION OF AUTOMATIC CHOKE SYSTEM

1. START ENGINE
2. SHORTLY AFTER, CHECK THAT CHOKE VALVE BEGINS TO OPEN AND CHOKE HOUSING IS HEATED



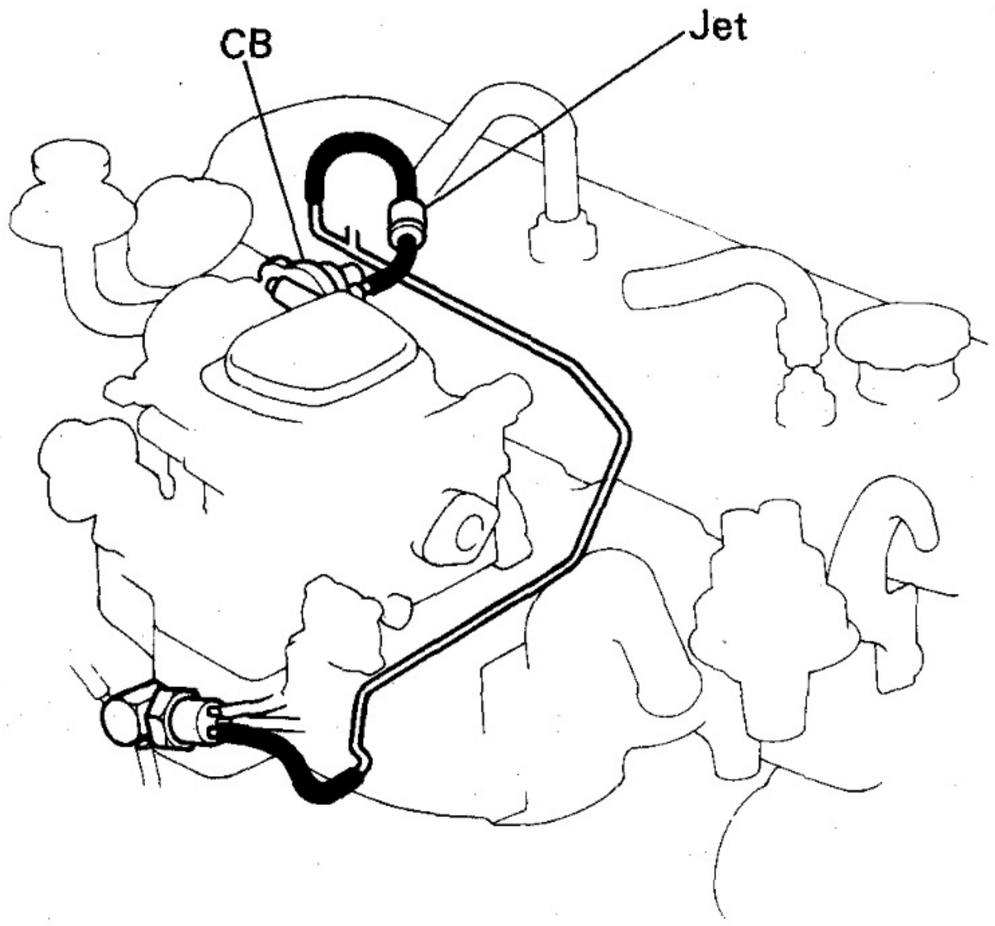

## INSPECTION OF HEATER (Ceramic)

1. UNPLUG WIRING CONNECTOR
2. MEASURE RESISTANCE WITH OHMMETER

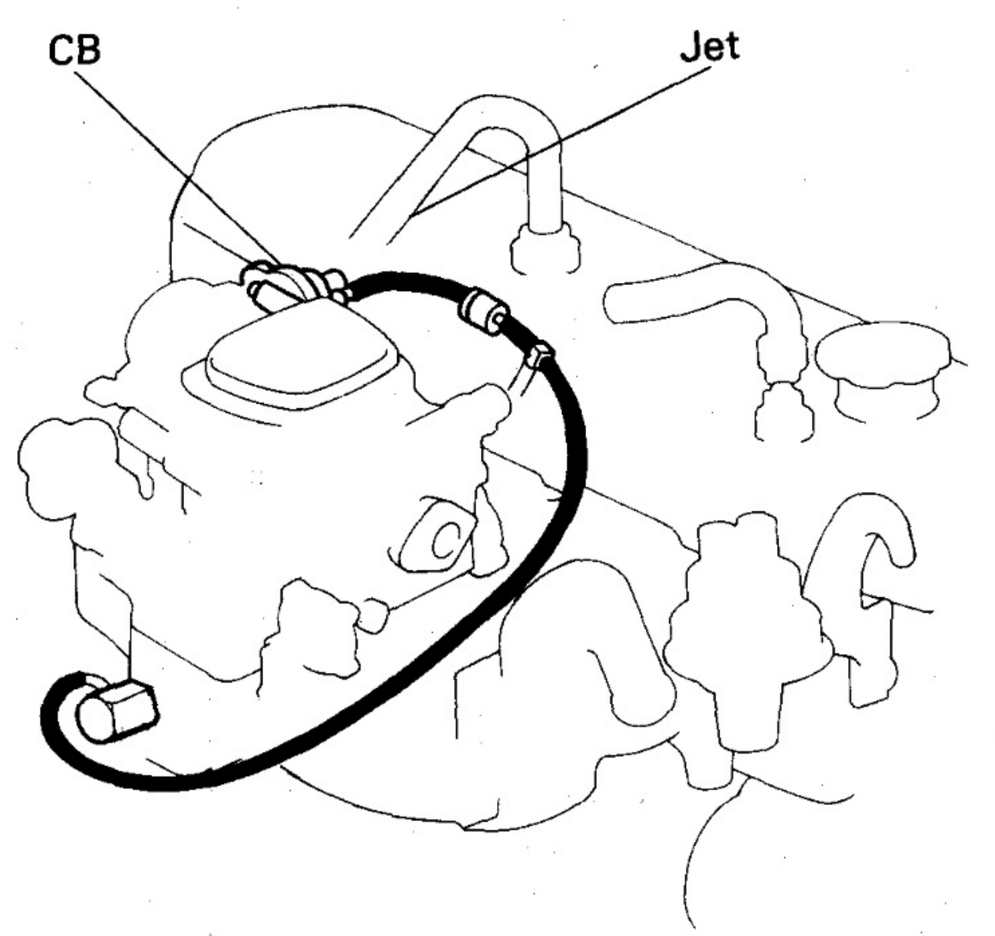
Resistance: RJ 20 – 22 Ω at 20°C (68°F)
RB 16 – 20 Ω at 20°C (68°F)

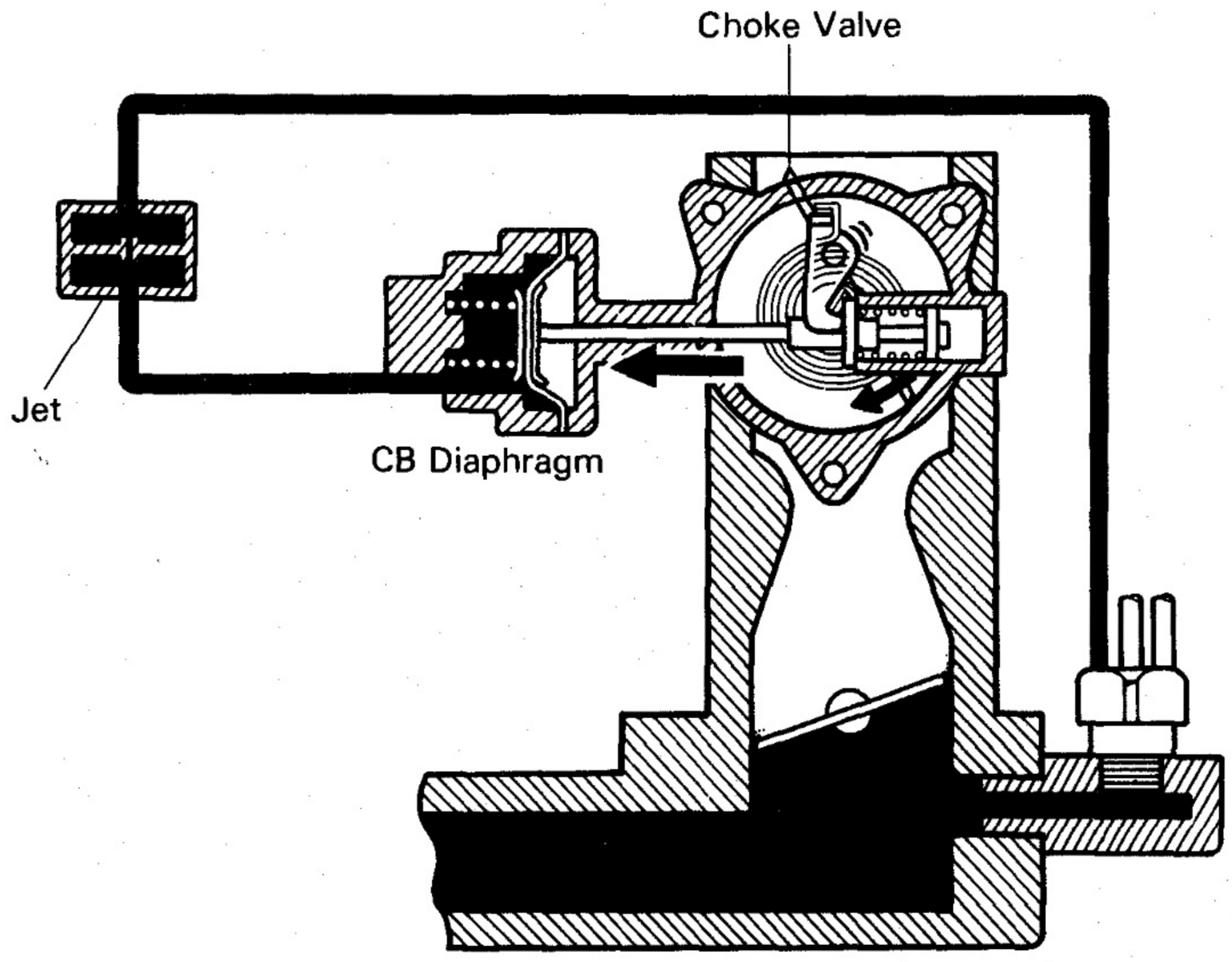
# 2. Choke Breaker (CB) System

**LAND CRUISER**

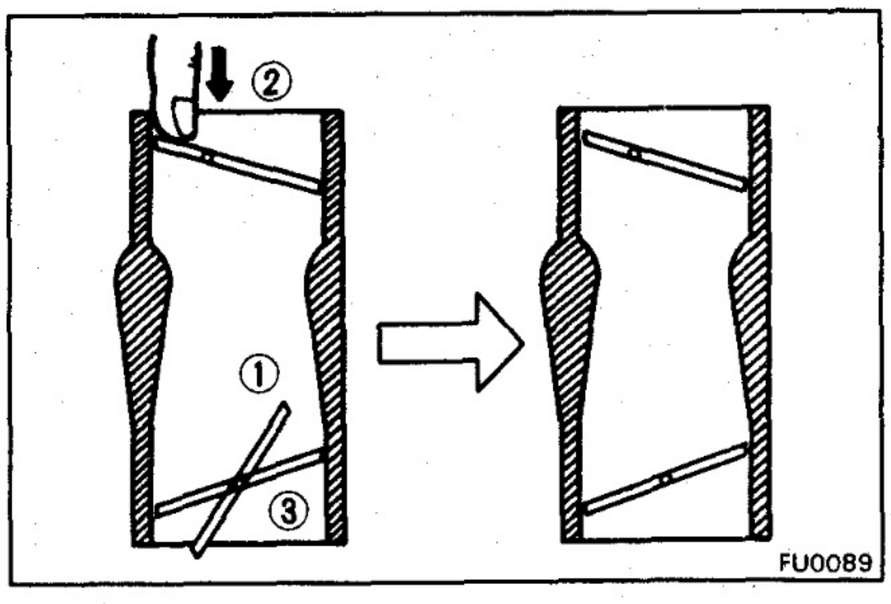


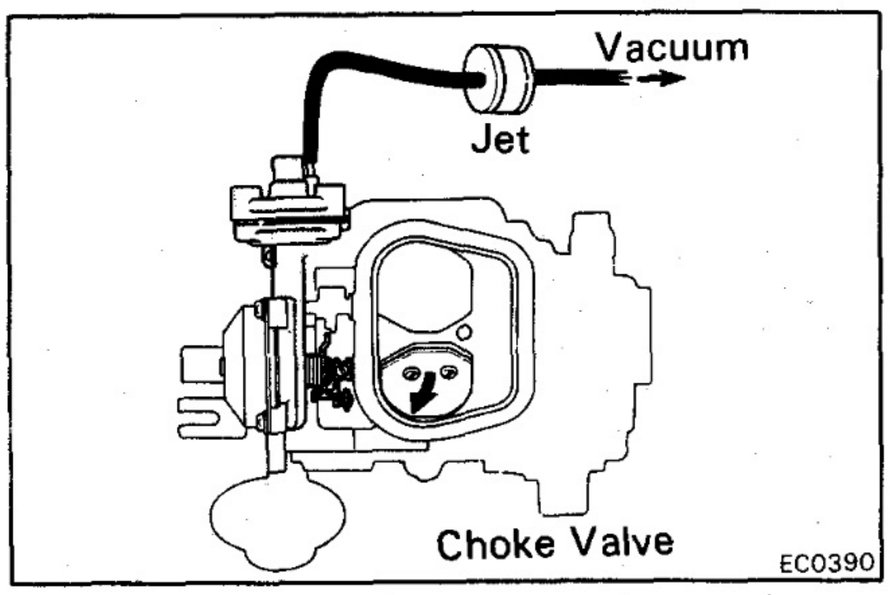

**COASTER**




This system slightly opens the choke valve to prevent a too rich mixture after firing when the choke is closed.




# INSPECTION OF CB SYSTEM

## CHECK CHOKE LINKAGE AND DIAPHRAGM WITH COLD ENGINE

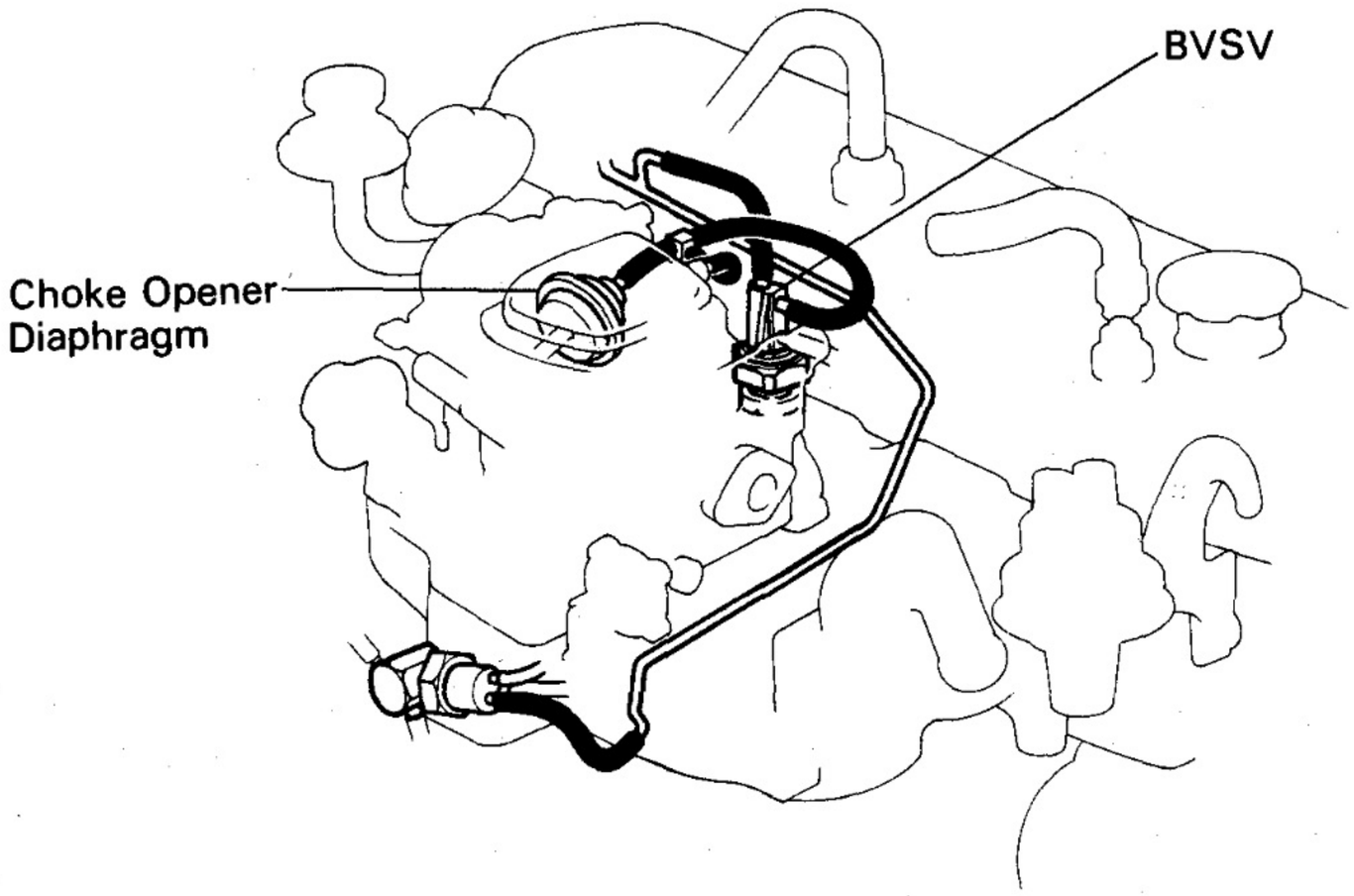
(a) While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

(b) **[LAND CRUISER]**
Disconnect the vacuum hose between the jet and vacuum pipe at the jet side.

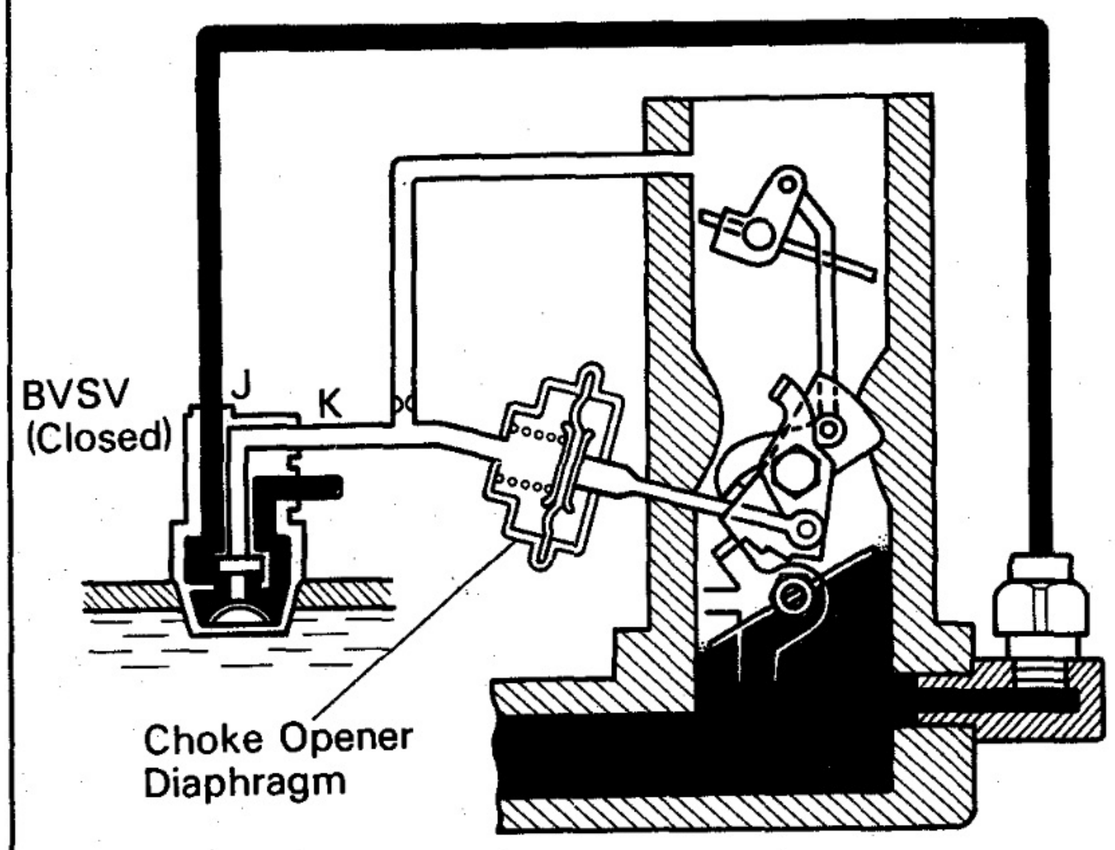
**[COASTER]**
Disconnect the vacuum hose between the jet and 3-way at the jet side.

(c) Apply vacuum to the jet and check that the choke valve slightly opens.

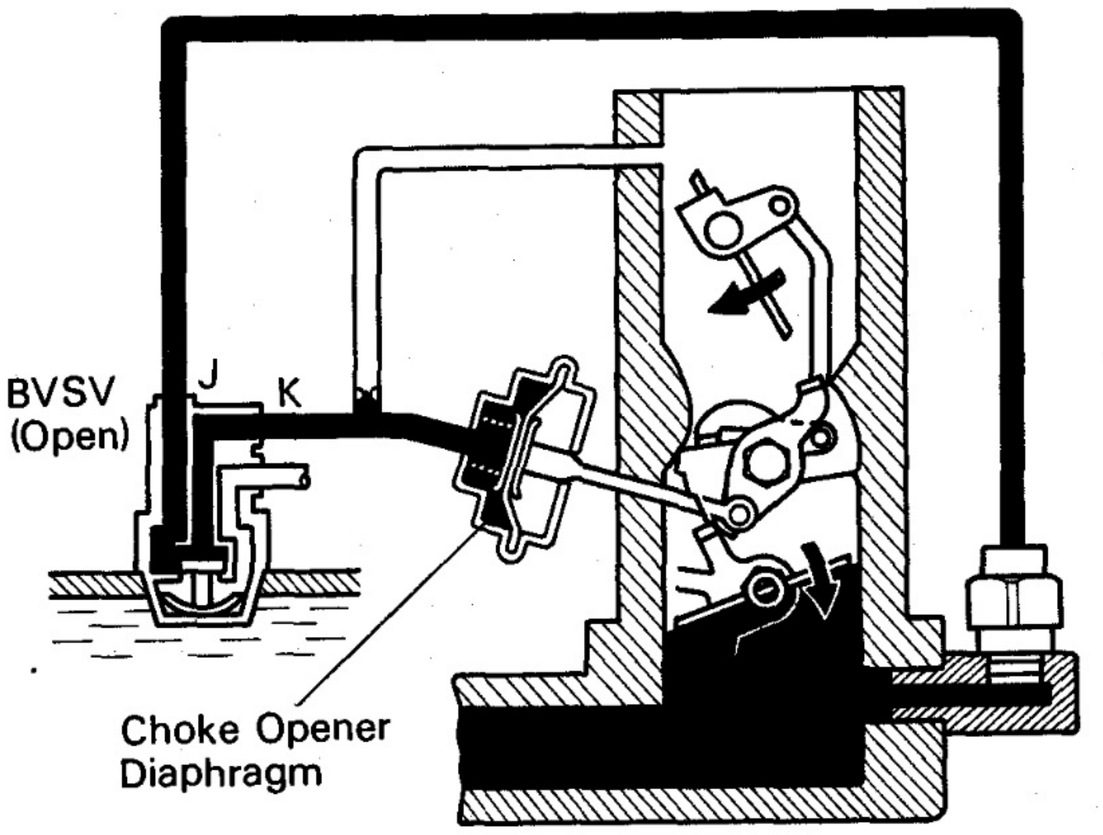
# 3. Choke Opener System (LAND CRUISER only)




EC1343



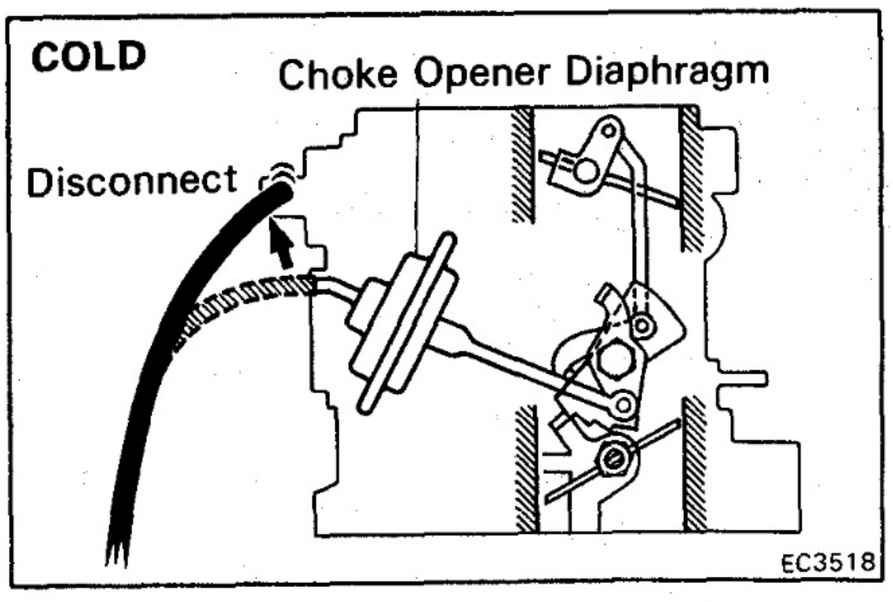

EC0392

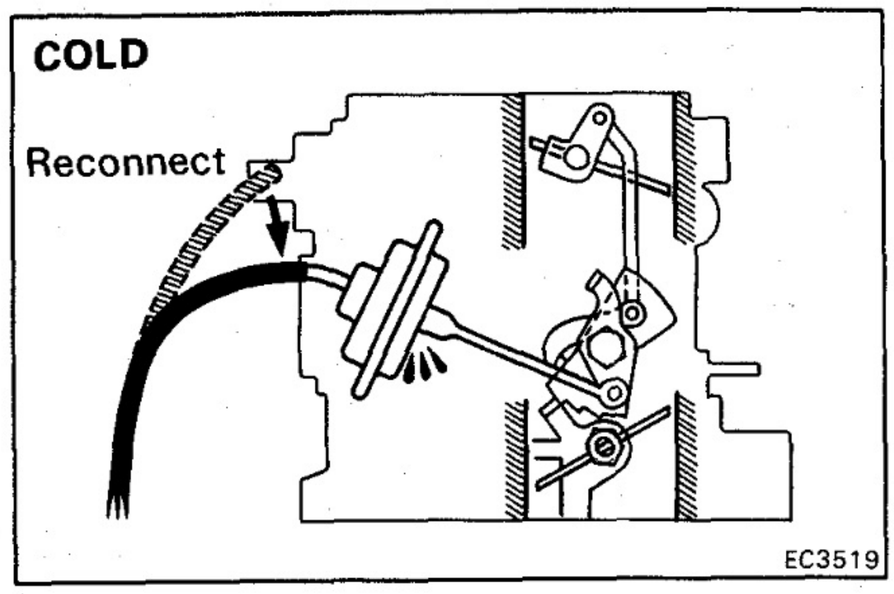


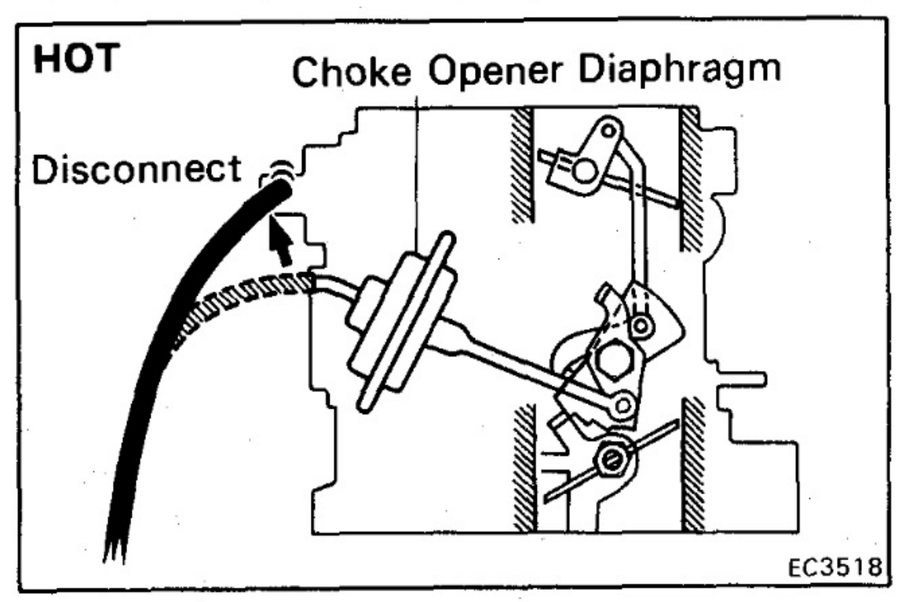

EC0393

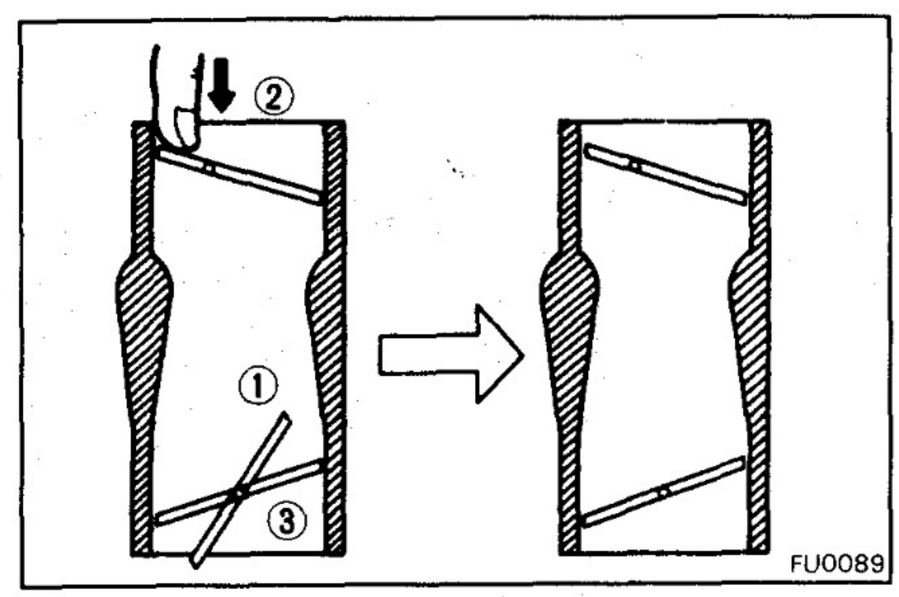
After warm-up, this system forcibly holds the choke valve open to prevent an over-rich mixture and release the fast idle cam to the 4th step to lower the engine rpm.

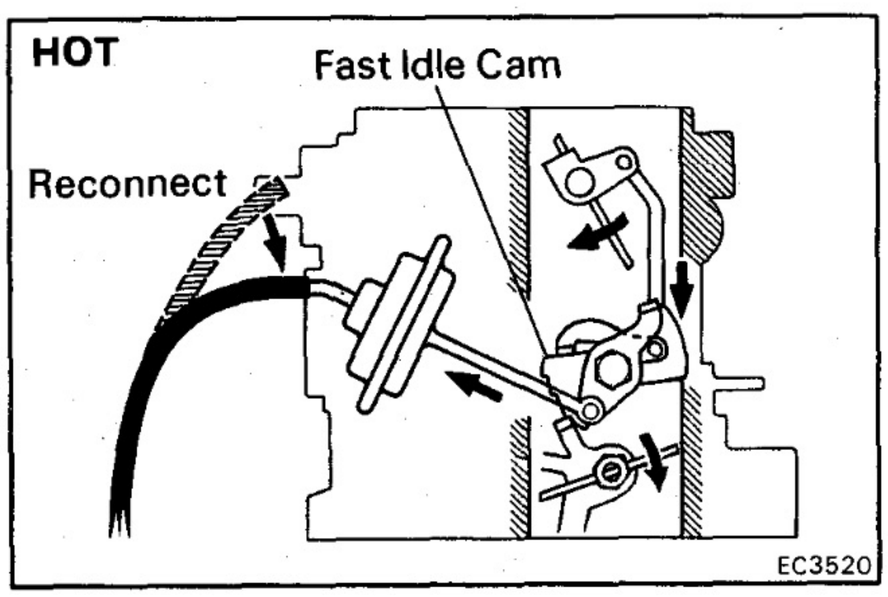
| Coolant Temp. | BVSV | Diaphragm | Choke Valve | Fast Idle Cam | Engine RPM |
|---|---|---|---|---|---|
| Below 55°C (131°F) | CLOSED (J–K) | Released by spring tension | Closed by automatic choke | Set at 1st or 2nd step | HIGH |
| Above 76°C (169°F) | OPEN (J–K) | Pulled by manifold vacuum | OPEN | Released to 3rd step | LOW |




# INSPECTION OF CHOKE OPENER SYSTEM

## 1. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 55°C (131°F).

(b) Disconnect the vacuum hose from the choke opener diaphragm.

(c) Step down on the accelerator pedal and release it. Then start the engine.

(d) Reconnect the vacuum hose and check that the choke linkage does not move.

## 2. CHECK BVSV, DIAPHRAGM AND LINKAGE WITH WARM ENGINE

(a) Warm up the engine to normal operating temperature.

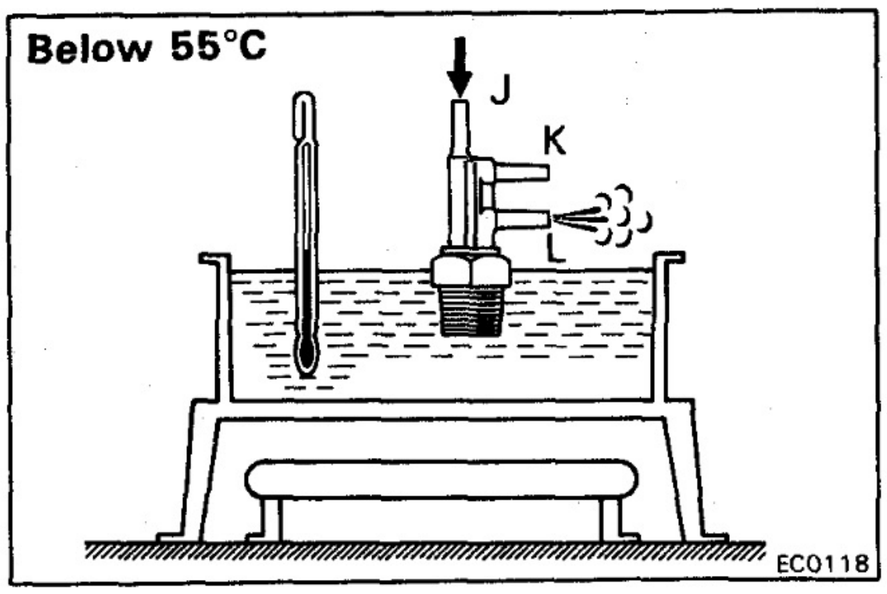
(b) Stop the engine and disconnect the vacuum hose from the choke opener diaphragm.

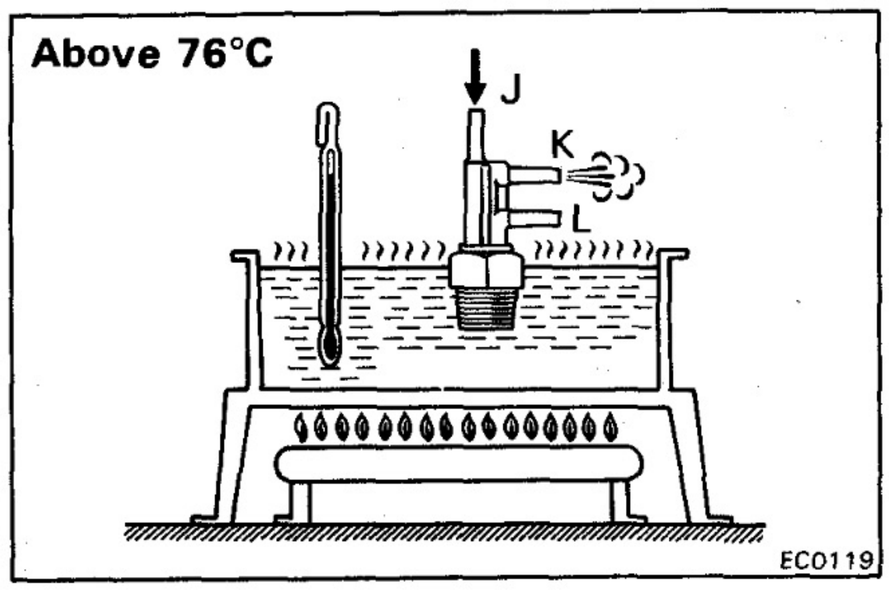
(c) Set the fast idle cam.
While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

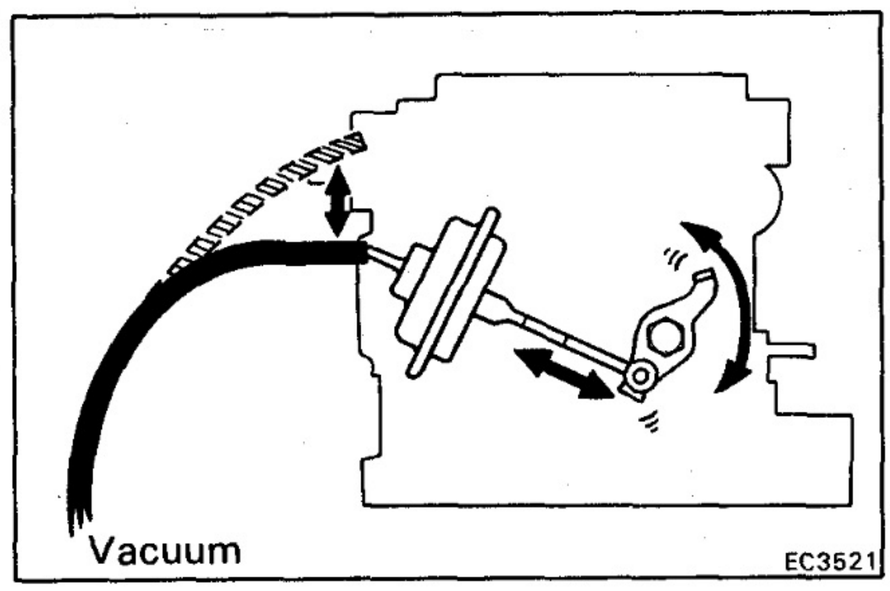
(d) Start the engine, but do not touch the accelerator pedal.

(e) Reconnect the vacuum hose, and check that the choke linkage moves, and that the fast idle cam is released to the 3rd step.

**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 from the intake manifold.

(c) Cool the BVSV to below 55°C (131°F).

(d) Check that air flows from pipe J to pipe L.

(e) Heat the BVSV to above 76°C (169°F).

(f) Check that air flows from pipe J to pipe K.

(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.

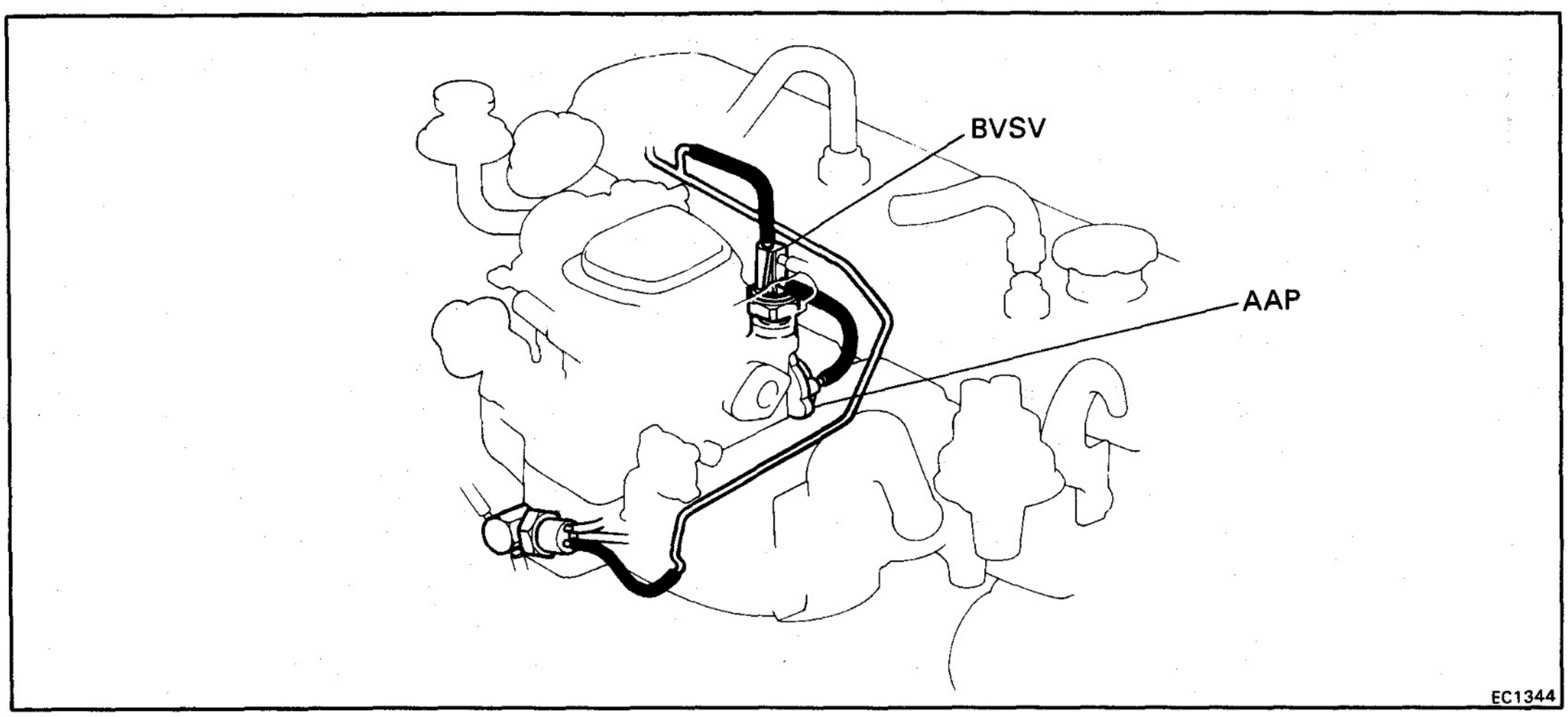
## INSPECTION OF DIAPHRAGM

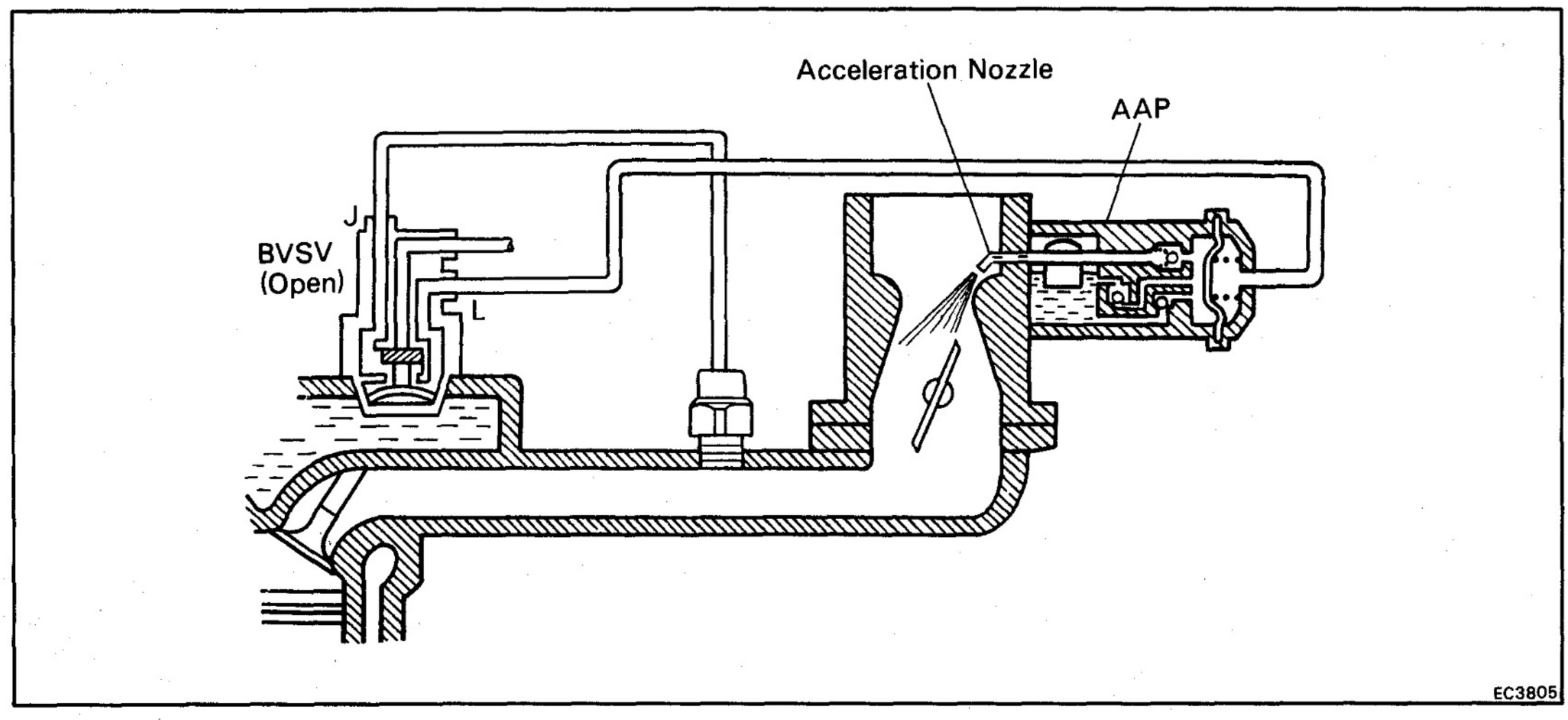
### CHECK THAT CHOKE LINKAGE MOVES IN ACCORDANCE WITH APPLIED VACUUM

If a problem is found, replace the diaphragm.

# 4. Auxiliary Acceleration Pump (AAP) System

## [LAND CRUISER]



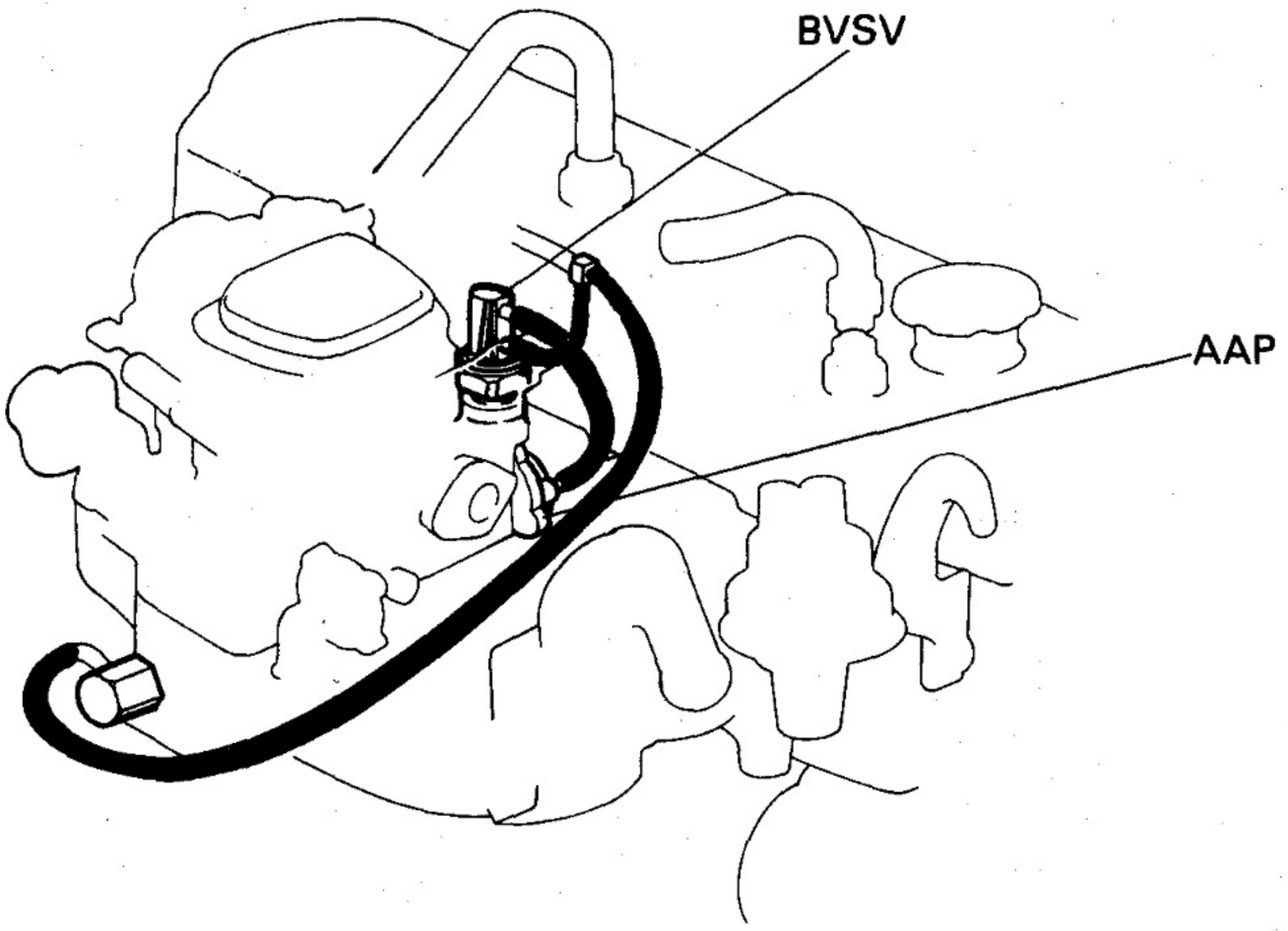




The carburetor air-fuel mixture is very lean. When accelerating with a cold engine, the main acceleration pump capacity is insufficient to provide good acceleration. The AAP system compensates for this by forcing more fuel into the acceleration nozzle to obtain better cold engine performance.

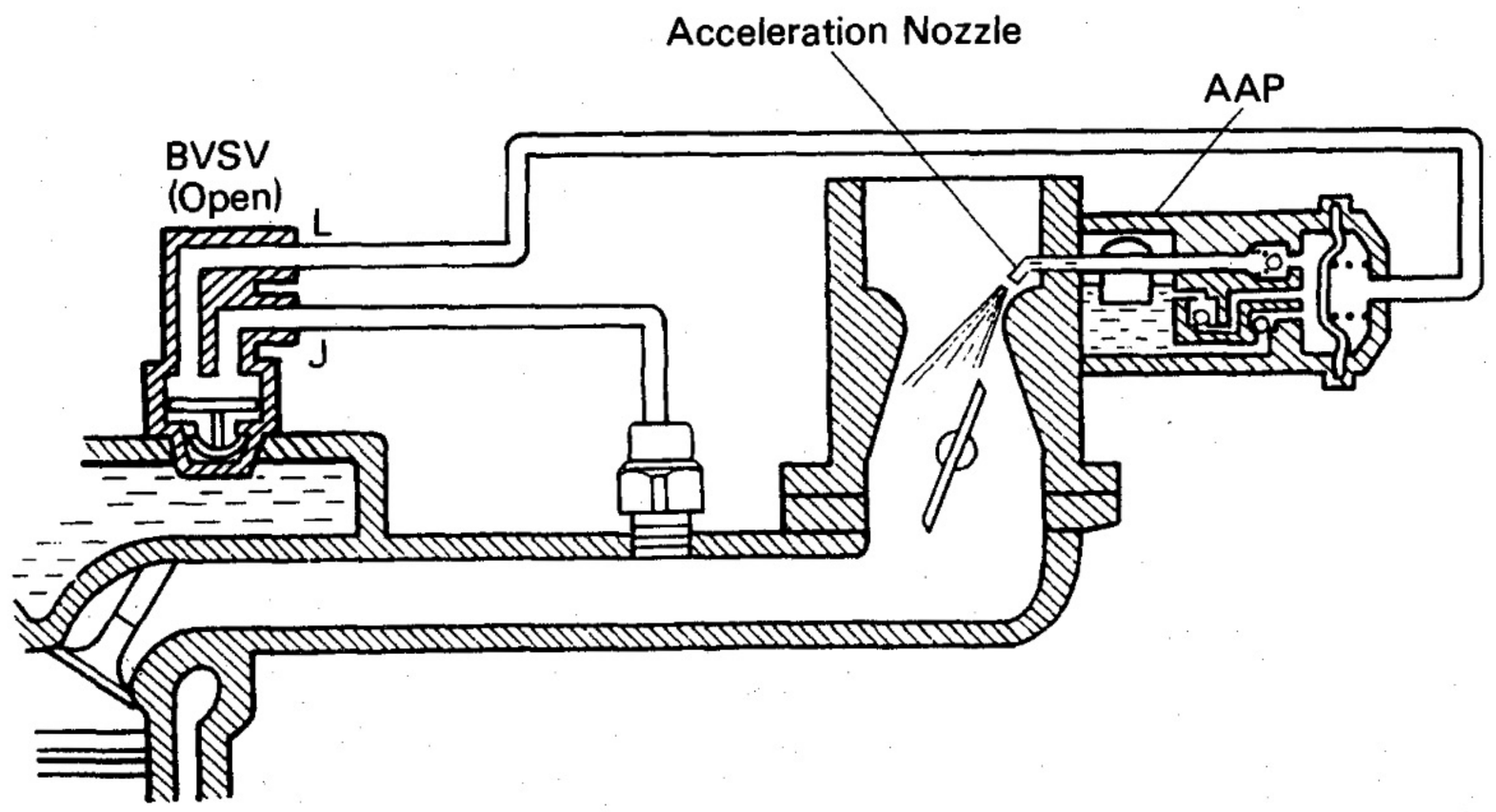
| Coolant Temp. | BVSV | Engine | Intake Vacuum | Diaphragm in AAP | Fuel |
|---|---|---|---|---|---|
| Below 55°C (131°F) | OPEN (J–L) | Constant RPM | HIGH | Pulled by vacuum | Drawn into AAP chamber |
| | | Acceleration | LOW | Returned by spring tension | Forced into acceleration nozzle |
| Above 74°C (165°F) | CLOSED (J–L) | — | — | No operation | — |

# 4. Auxiliary Acceleration Pump (AAP) System (Cont'd)

## [COASTER]



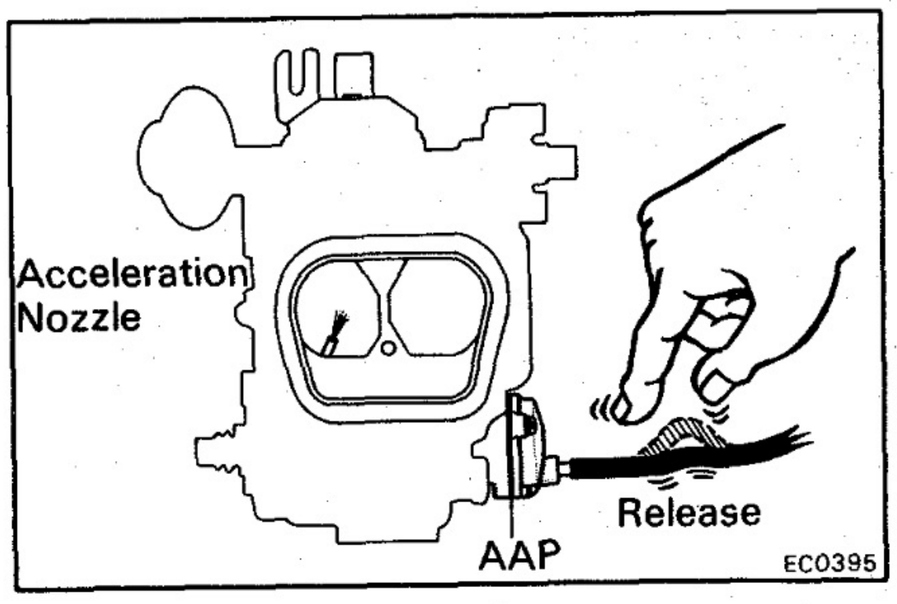

EC1531




EC1532

The carburetor air-fuel mixture is very lean. When accelerating with a cold engine, the main acceleration pump capacity is insufficient to provide good acceleration. The AAP system compensates for this by forcing more fuel into the acceleration nozzle to obtain better cold engine performance.

| Coolant Temp. | BVSV | Engine | Intake Vacuum | Diaphragm in AAP | Fuel |
|---|---|---|---|---|---|
| Below 60°C (140°F) | OPEN (J–L) | Constant RPM | HIGH | Pulled by vacuum | Drawn into AAP chamber |
| | | Acceleration | LOW | Returned by spring tension | Forced into acceleration nozzle |
| Above 74°C (165°F) | CLOSED (J–L) | — | — | No operation | — |




# INSPECTION OF AAP SYSTEM

## 1. CHECK SYSTEM WITH COLD ENGINE

(a) Check that the coolant temperature is below 55°C (131°F) for RJ or 60°C (140°F).

(b) Remove the air cleaner.

(c) Start the engine.

(d) Pinch the AAP hose, and stop the engine.

(e) Release the hose.

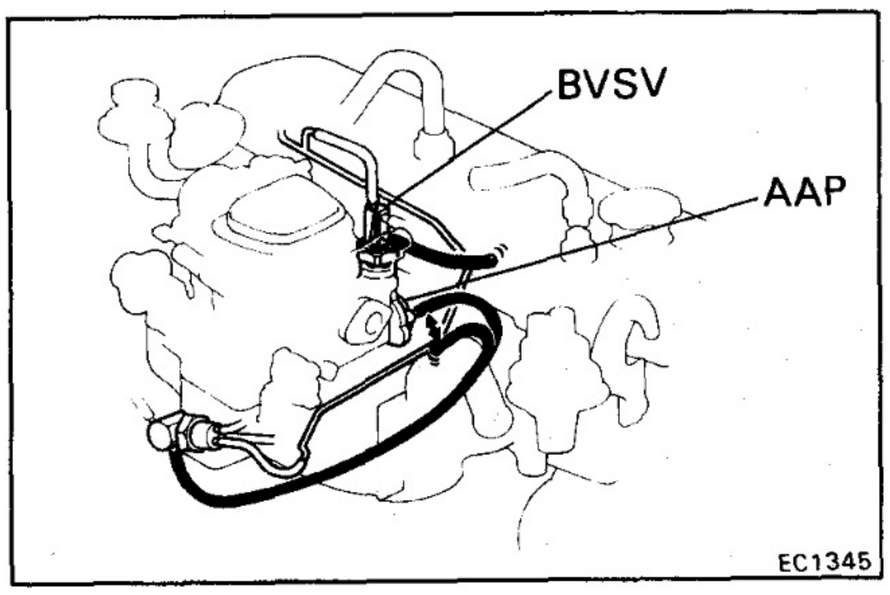
(f) Check that gasoline spurts out from the acceleration nozzle.

## 2. REPEAT (c), (d) AND (e) ABOVE AFTER WARM-UP

(a) Check that gasoline does not spurt out from the acceleration nozzle.

(b) Reinstall the air cleaner.

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




# INSPECTION OF AAP DIAPHRAGM

**CHECK DIAPHRAGM OPERATION AT IDLE**

(a) Start the engine.

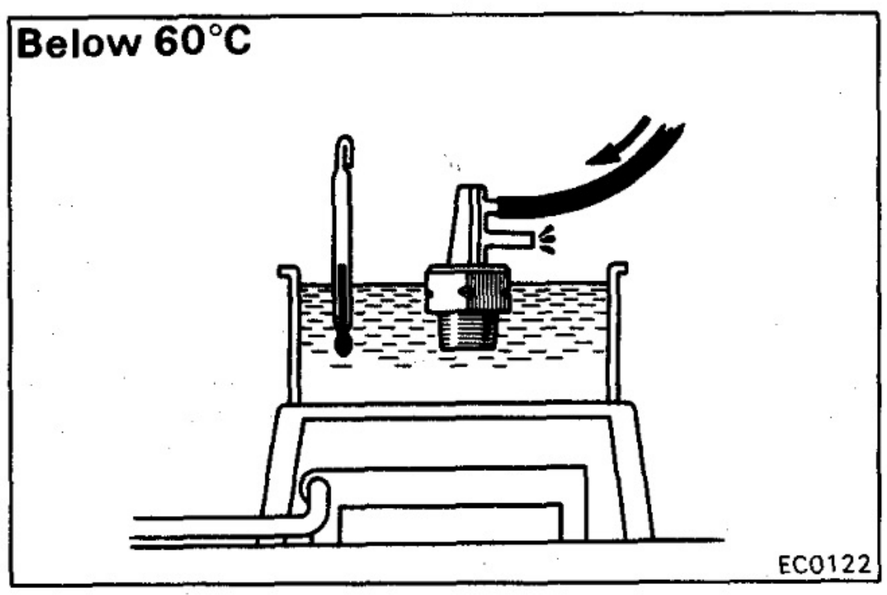
(b) Disconnect the vacuum hose from the AAP.

(c) Apply and release vacuum to the diaphragm at idle.

(d) Check that the engine rpm changes by releasing vacuum.

(e) Reconnect the AAP hose.

If a problem is found, replace the diaphragm.




# INSPECTION OF BVSV

**(for RJ see page 4-32)**

**(for RB)**

**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 60°C (140°F) with cold water.

(d) Blow air into a pipe and check that the BVSV is closed.

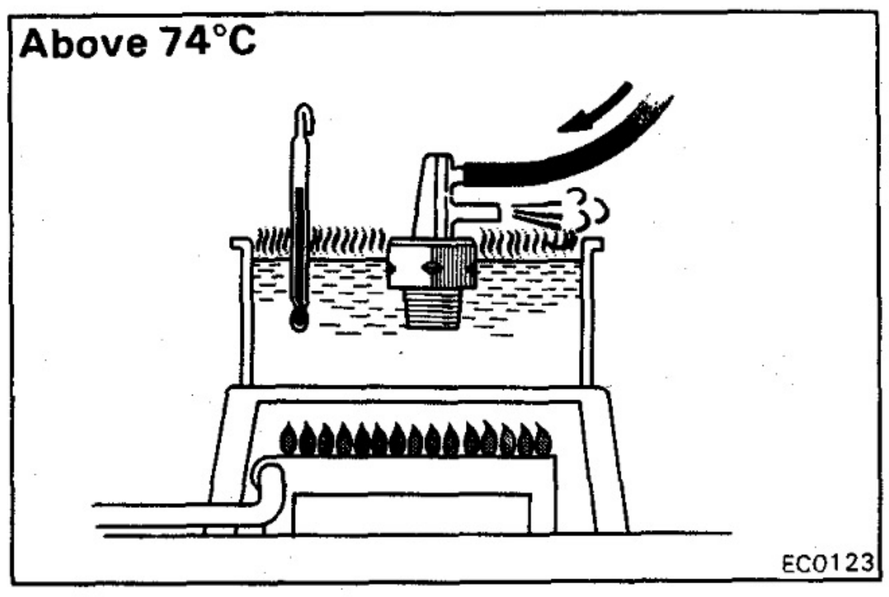
(e) Heat the BVSV to above 74 °C (165°F) with hot water.

(f) Blow air into a pipe and check that the BVSV is open.

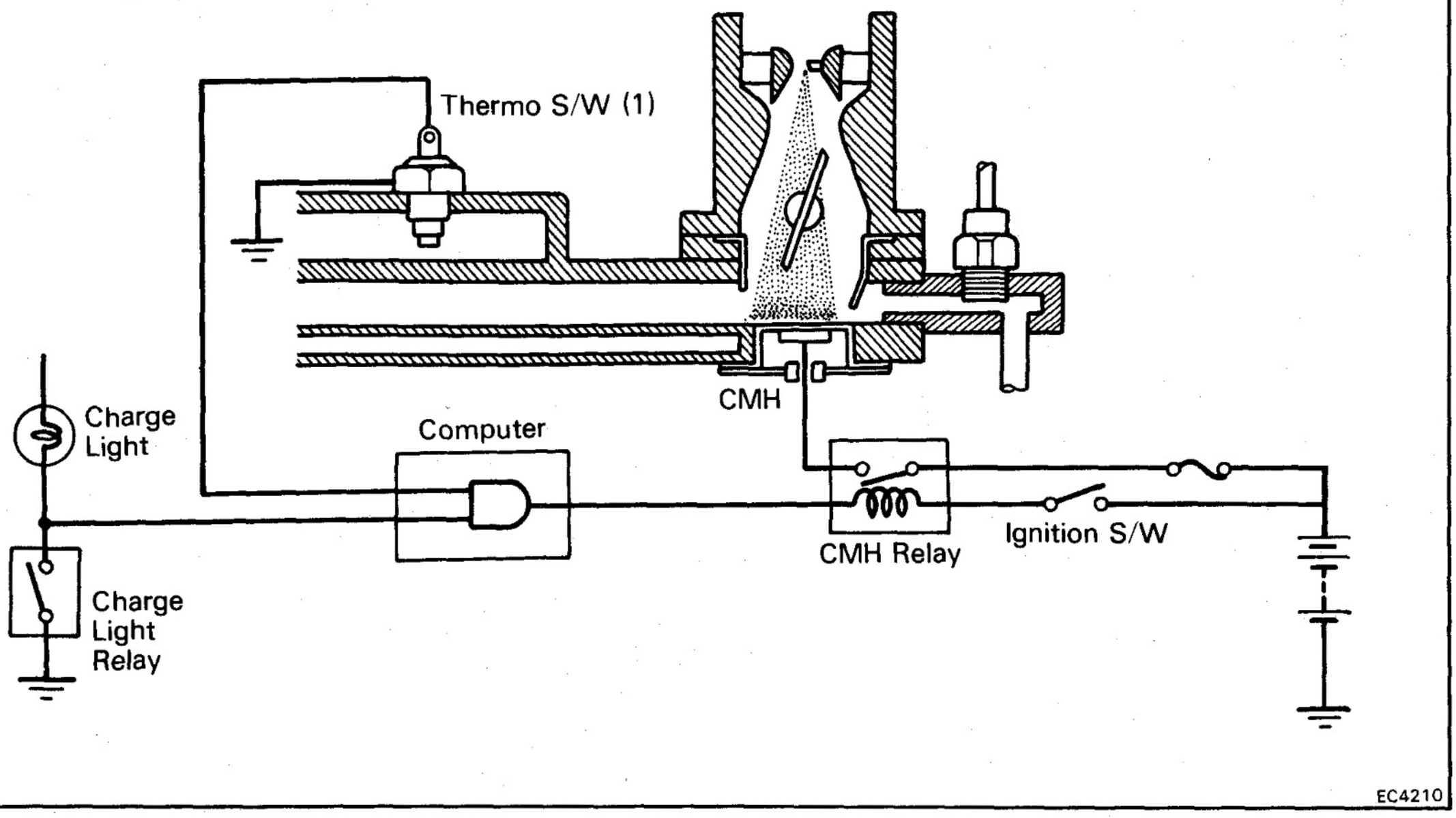
(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.

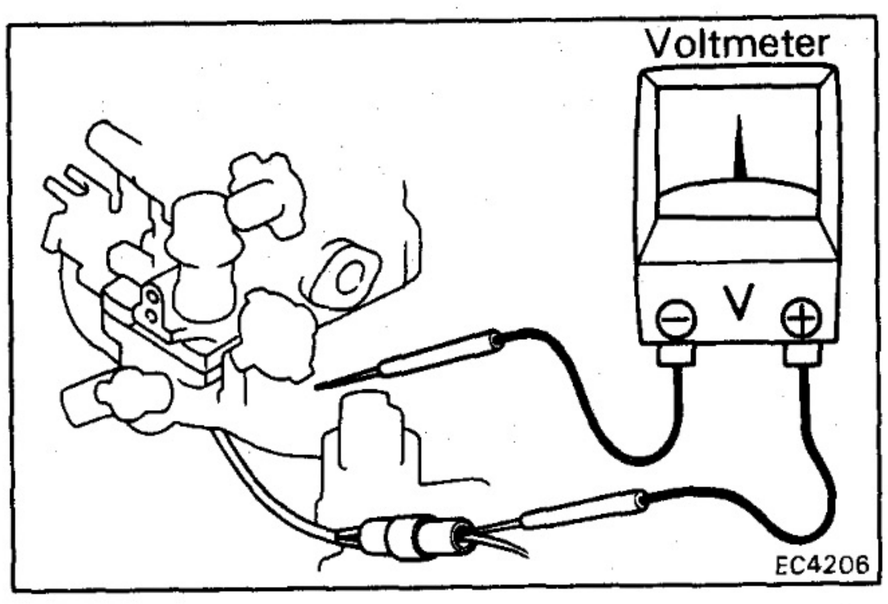


# 5. Cold Mixture Heater (CMH) System (LAND CRUISER only)




To reduce cold engine emission and improve driveability, the intake manifold riser is heated during cold engine operation to accelerate vaporization of the liquid fuel.

| IG S/W | Engine | Coolant Temp. | Thermo S/W (1) | Computer | CMH Relay | CMH |
|---|---|---|---|---|---|---|
| OFF | Not running | — | — | — | OFF | OFF |
| ON | Not running | — | — | OFF | OFF | OFF |
| | Running | Below 43°C (109°F) | ON | ON | ON | ON (Heated) |
| | | Above 55°C (131°F) | OFF | OFF | OFF | OFF |




## INSPECTION OF CMH SYSTEM

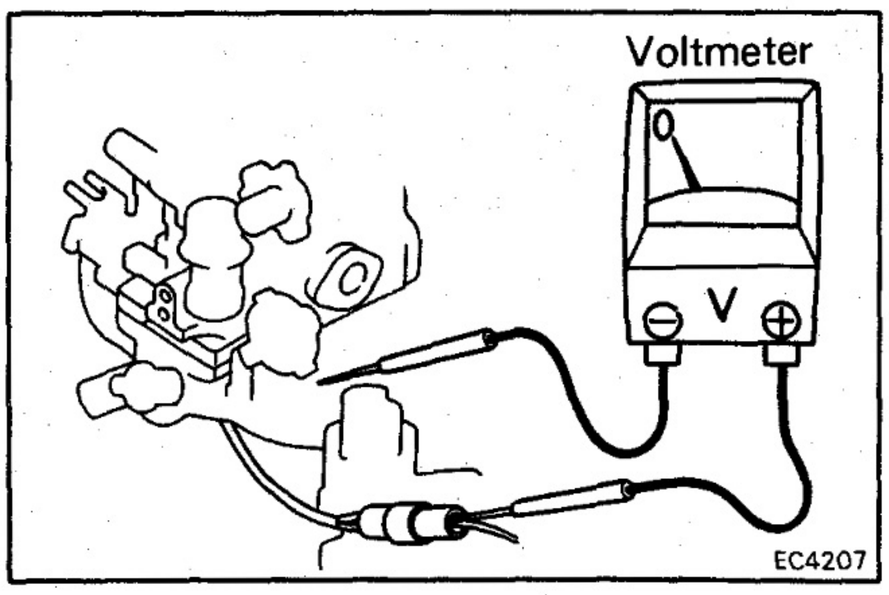
1. **START ENGINE**

2. **CHECK CMH WITH COLD ENGINE**

   (a) The coolant temperature should be below 43°C (109°F).

   (b) Using a voltmeter check that there is voltage between the positive (+) terminal and intake manifold.

   **CAUTION: The voltmeter probe should be inserted from the rear side of the connector.**




### 3. CHECK CMH WITH WARM ENGINE

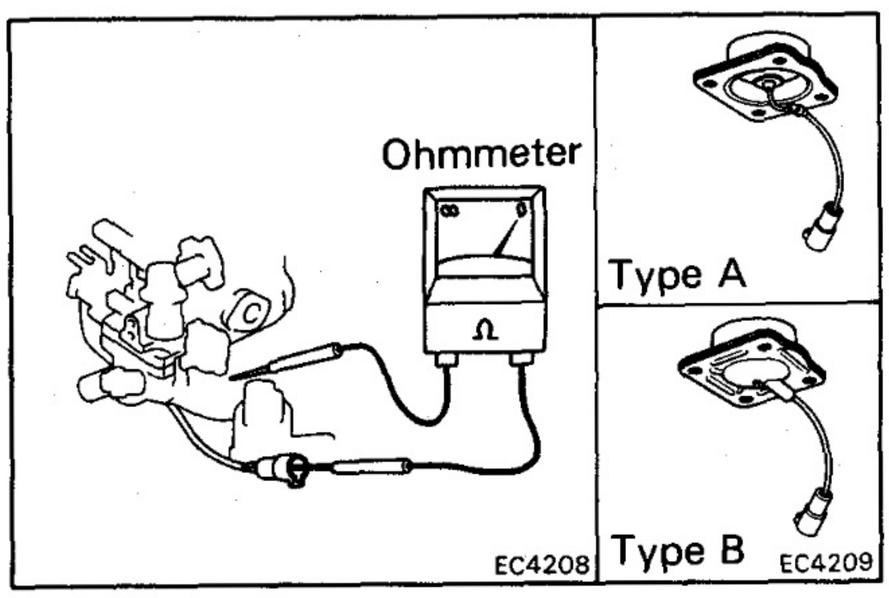
(a) Warm up the engine to above 55°C (131°F).

(b) Check that there is no voltage.

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

## INSPECTION OF THERMO SWITCH

**(See page 4-18)**




## INSPECTION OF CMH

### MEASURE RESISTANCE

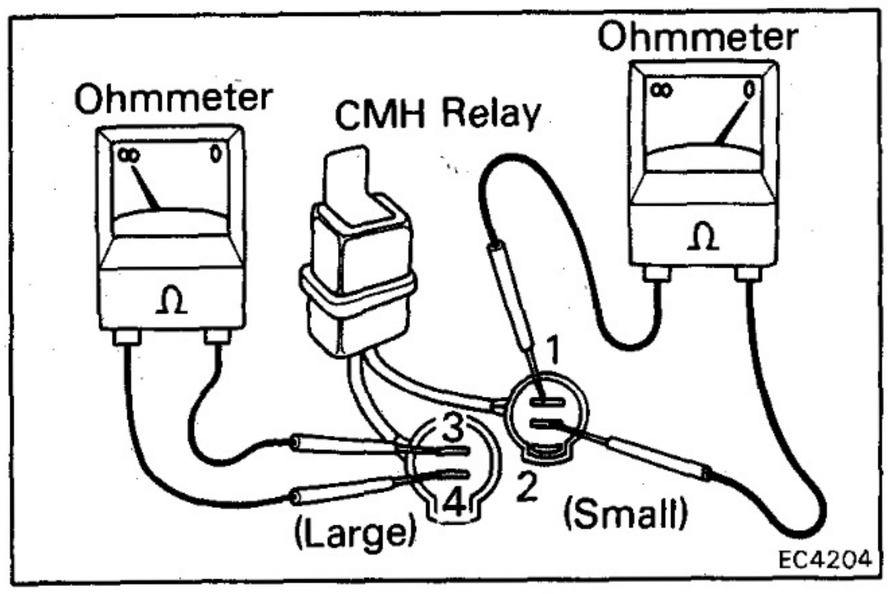
(a) Unplug the wiring connector.

(b) Using an ohmmeter, measure the resistance between the positive (–) terminal and intake manifold.

**Resistance at 20°C (68°F):**

**Type A (ND) 0.35 – 1.0 Ω**
**Type B (TDK) 0.5 – 2.0 Ω**

(c) Plug in the wiring connector.

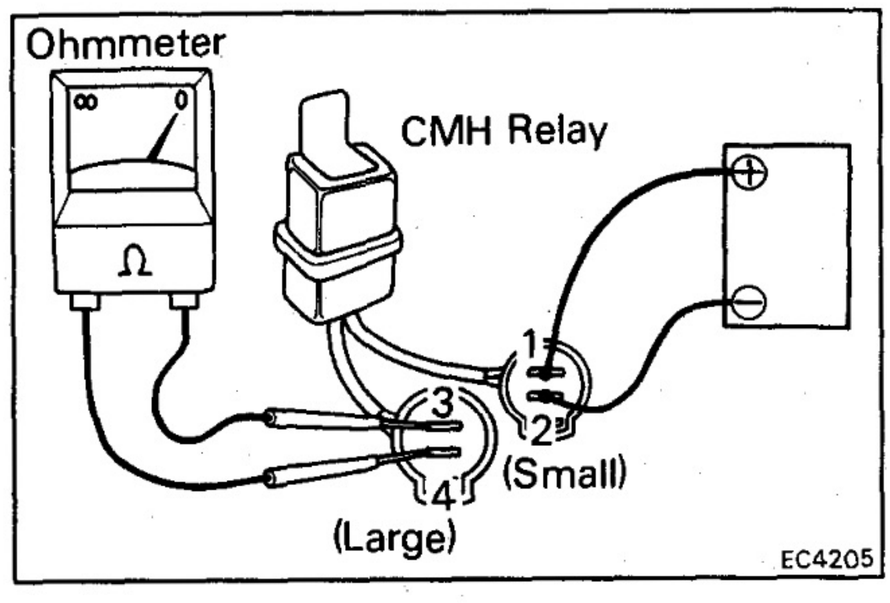



## INSPECT CMH RELAY

### 1. INSPECT RELAY CONTINUITY

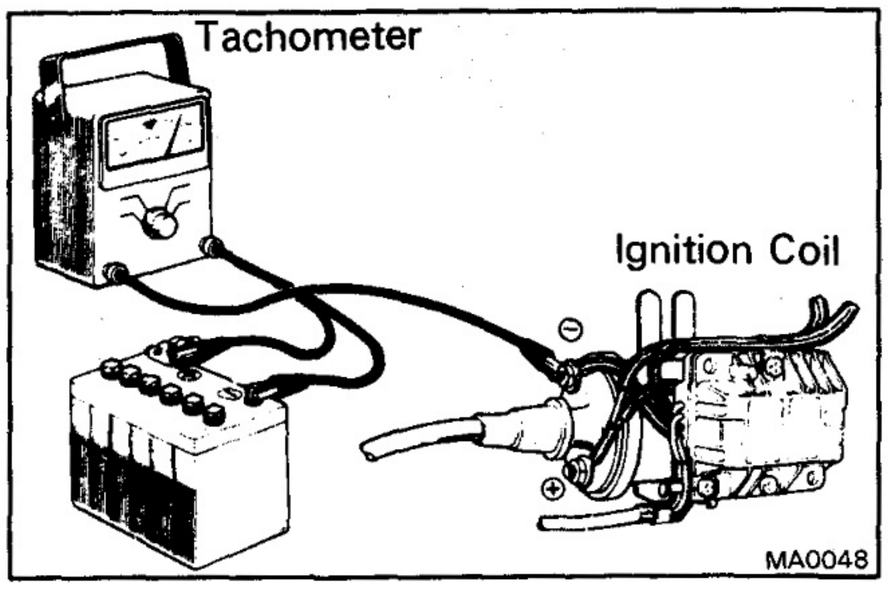
Check that there is continuity between terminals 1 and 2. Check that there is no continuity between terminals 3 and 4.

**Relay location: Right fender apron**




### 2. INSPECT RELAY OPERATION

Check the continuity between terminals 3 and 4 with battery voltage applied between terminals 1 and 2.




# ENGINE ADJUSTMENT

## 1. Ignition Timing

### INSPECTION AND ADJUSTMENT OF IGNITION TIMING

**1. CONNECT A TACHOMETER AND TIMING LIGHT TO ENGINE**

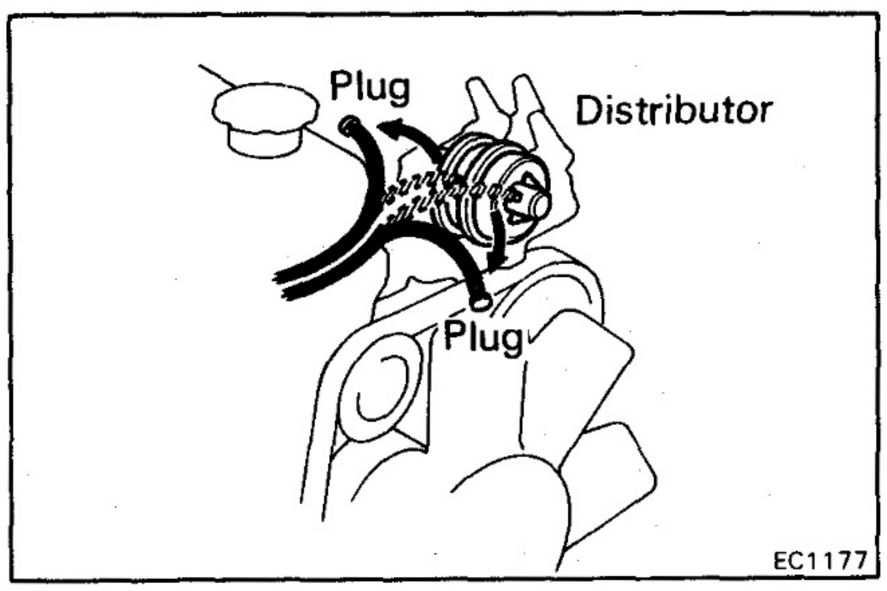
Connect the tachometer ⊕ terminal to the ignition coil ⊖ terminal.

**CAUTION:**

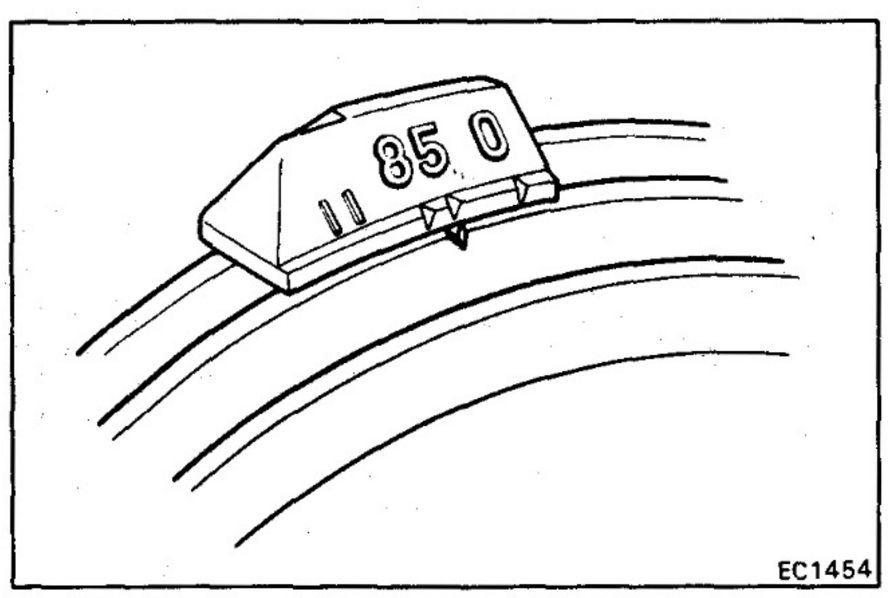
1. **NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
2. **As some tachometers are not compatible with this ignition system, it is recommended that you consult with the manufacturer.**

**2. WARM UP ENGINE**

Allow the engine to reach full operating temperature.




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

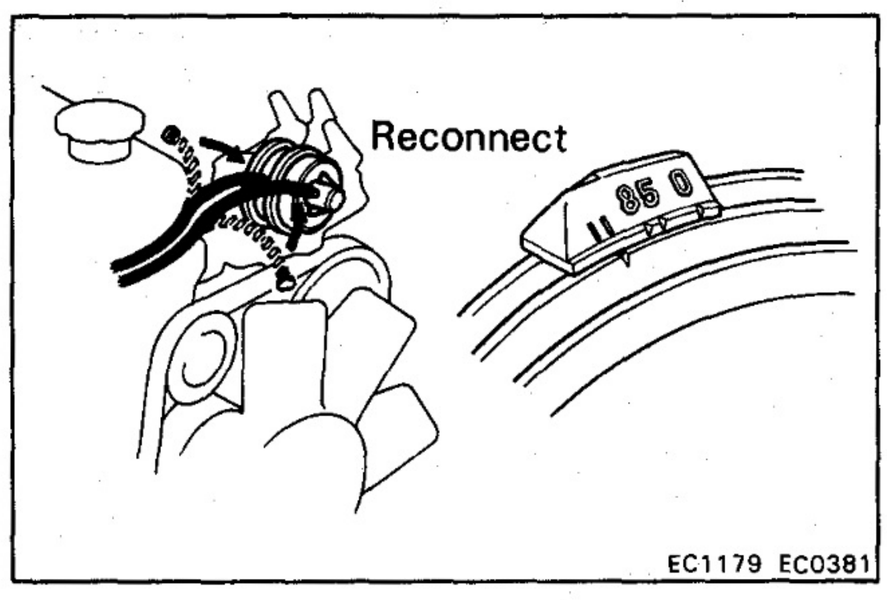



**4. CHECK IGNITION TIMING**

**Ignition timing: 5 ± 2° BTDC @ Max. 850 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) Check that the ignition timing advances.

**Ignition timing: About 12° BTDC**

# 2. Idle Speed and Idle Mixture

## CHECK AND ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE

### 1. CONNECT A TACHOMETER TO ENGINE

### 2. WARM UP ENGINE

Allow the engine to reach full operating temperature.

### 3. CHECK IDLE SPEED

**Idle speed: 800 rpm**

If not as specified, adjust according to the following procedure.

## A. METHOD WITH CO METER

### 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

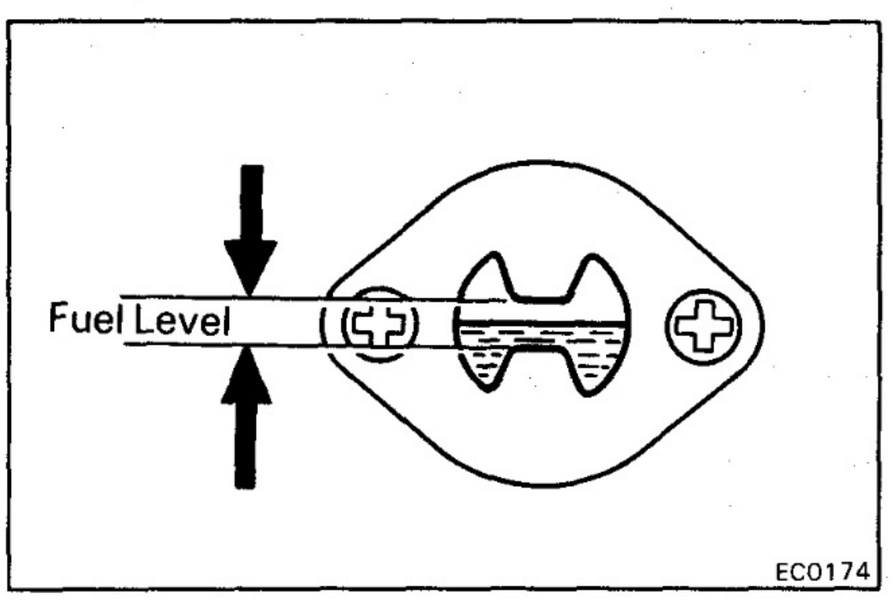
(f) Ignition timing set correctly

(g) Transmission in neutral

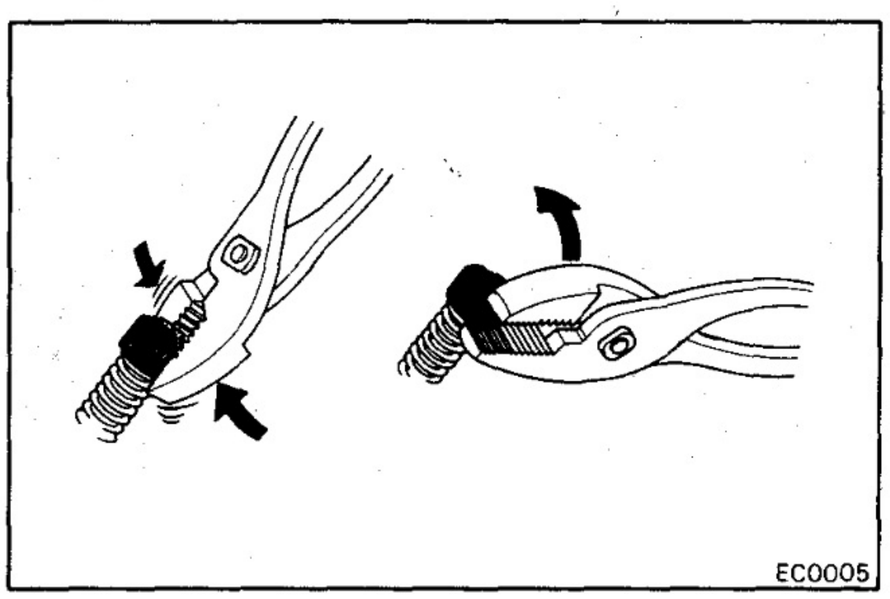
(h) Fuel level should be about even with the correct level in the sight glass

(i) CO meter operates normally

(j) Vacuum gauge installed

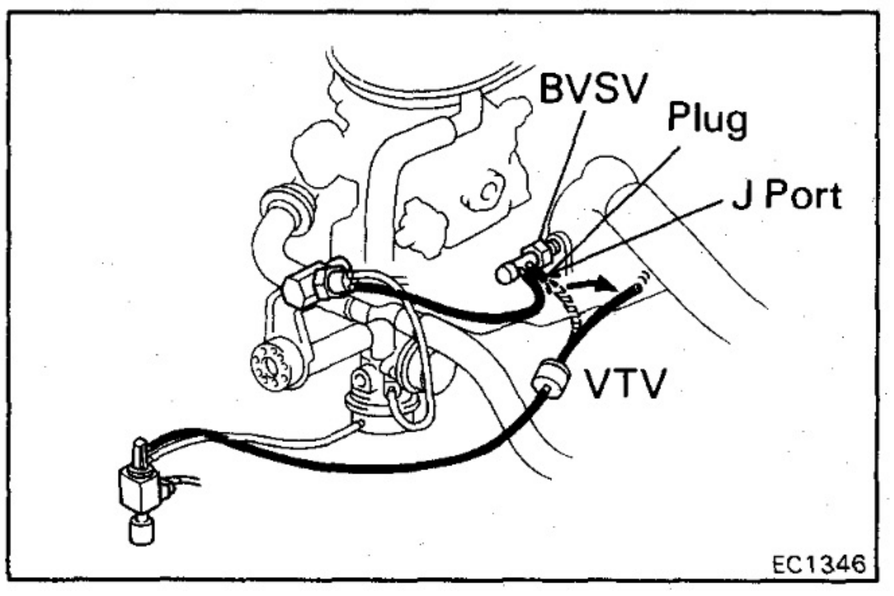


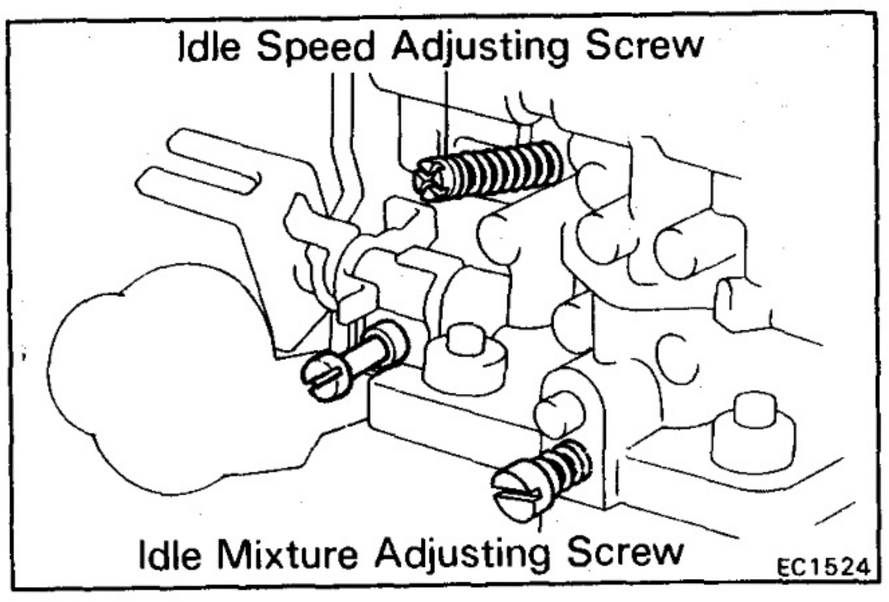

### 3. BREAK OFF IDLE LIMITER CAP




### 4. DISCONNECT HOSE FROM PORT J OF BVSV FOR AI SYSTEM AND PLUG PORT J (LAND CRUISER only)

(This will shut off the AI system.)



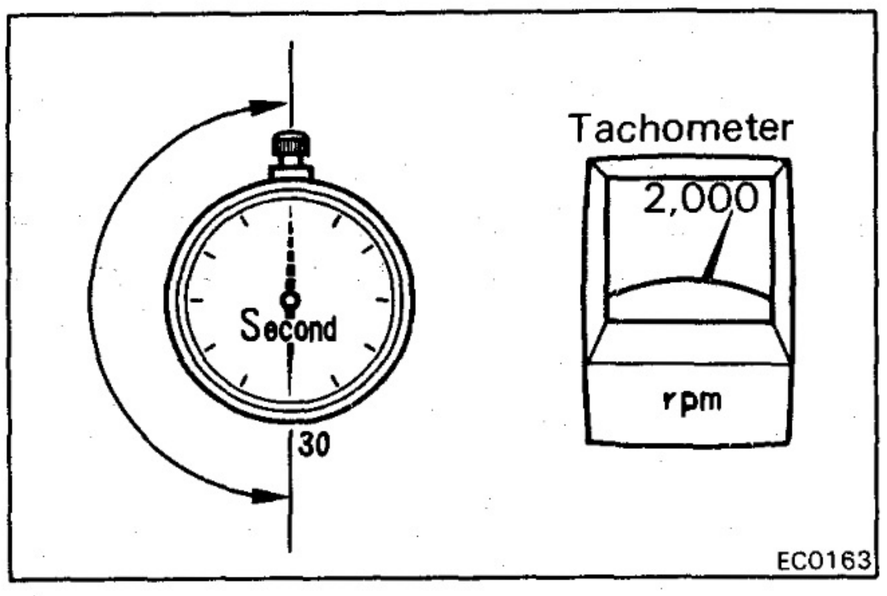


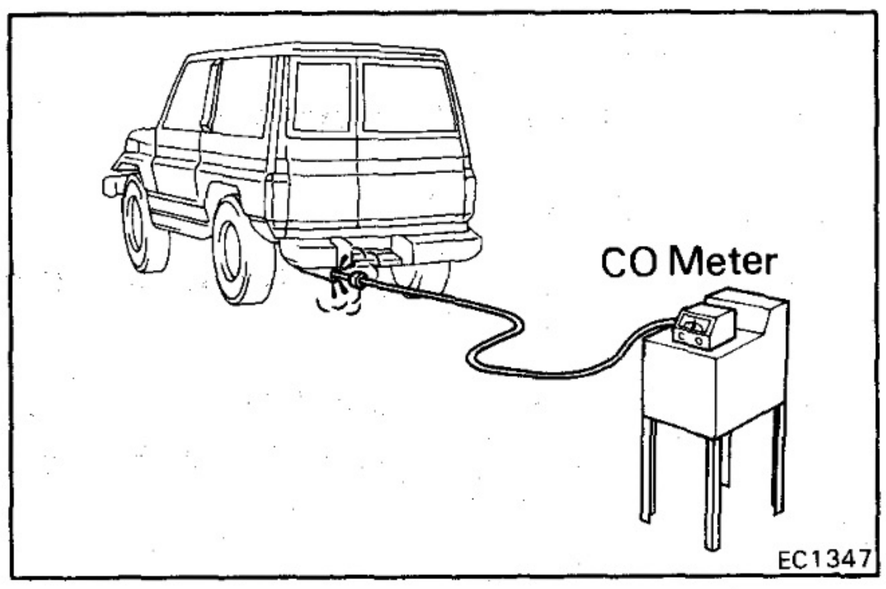

## 5. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Start the engine.

(b) Using a CO meter to measure the CO concentration in the exhaust, turn the idle speed and idle mixture adjusting screws to obtain the specified concentration valve at idle speed.

**Idle speed: 800 rpm**




## 6. MEASURE CO CONCENTRATION

(a) Make sure the CO meter is properly calibrated.

(b) Race the engine for 30 – 60 seconds at about 2,000 rpm before measuring concentration.

(c) Insert a testing probe at least 60 cm (2.0 ft) into tailpipe.

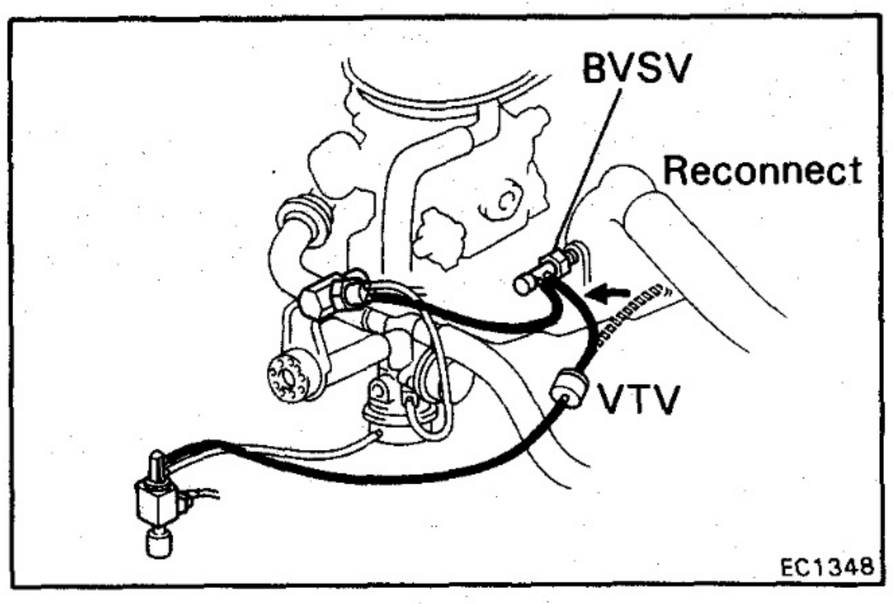
(d) Measure the concentration within 1 – 3 minutes after racing the engine to allow the concentration to stabilize.

**Idle CO concentration: 1.5 % (w/Al system off)**

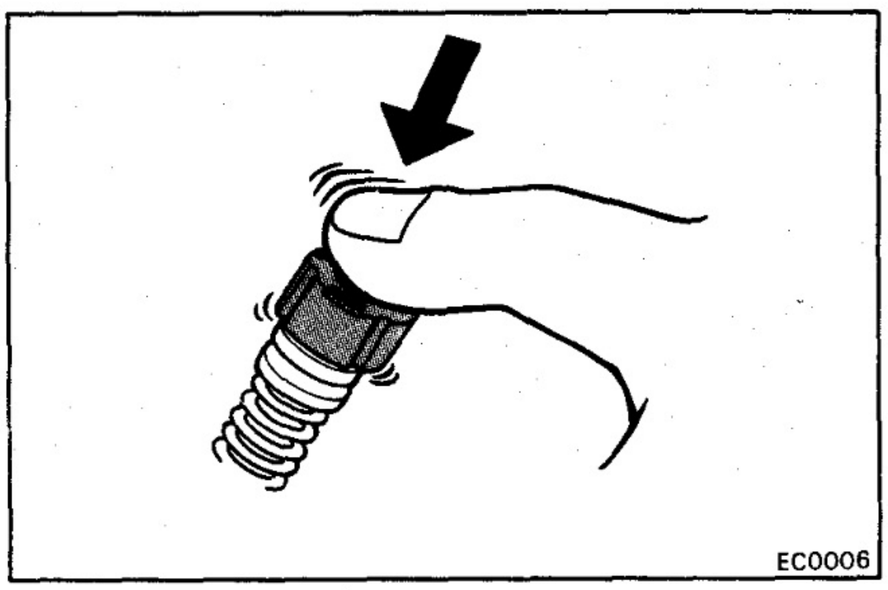
- If the CO concentration is within specification, this adjustment is complete.
- If the CO concentration exceeds specification, or if the engine loses smoothness of operation, repeat the above adjustment.
- If the CO concentration cannot be corrected by idle mixture adjustment, see table below for other possible causes.

## TROUBLESHOOTING

| HC | CO | Problems | Causes |
|---|---|---|---|
| High | Normal | Rough idle | 1. Faulty ignition:<br>● Incorrect timing<br>● Fouled, shorted or improperly gapped plugs<br>● Open or crossed ignition wires<br>● Cracked distributor cap<br>2. Incorrect valve clearance<br>3. Leaky exhaust valves<br>4. Leaky cylinder |
| High | Low | Rough idle<br><br>Fluctuating HC reading | 1. Vacuum leak:<br>● Vacuum hose<br>● Intake manifold<br>● PCV line<br>● Carburetor base |
| High | High | Rough idle<br><br>Black smoke from exhaust | 1. Restricted air filter<br>2. Plugged PCV valve<br>3. Faulty carburetion:<br>● Faulty choke action<br>● Incorrect float setting<br>● Leaking needle or seat<br>● Leaking power valve |




**7. RECONNECT HOSE TO BVSV PORT J (LAND CRUISER only)**




**8. INSTALL NEW LIMITER CAP**

After this adjustment is completed, install the idle limiter cap on the idle mixture adjusting screw.

**CAUTION: After completing adjustment, perform a road test to make certain engine performance has not changed.**

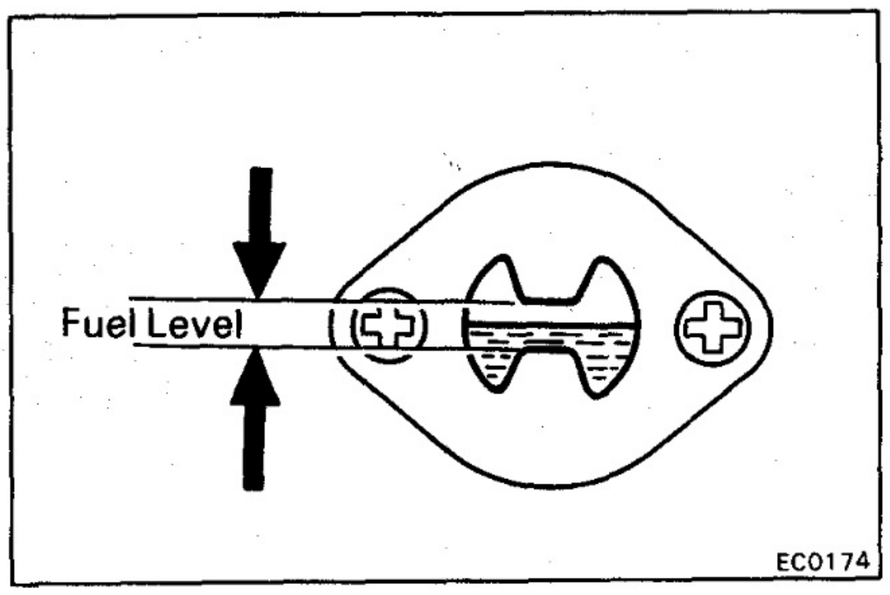
## B. ALTERNATIVE METHOD

**To be used only if CO meter is not available.**

**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

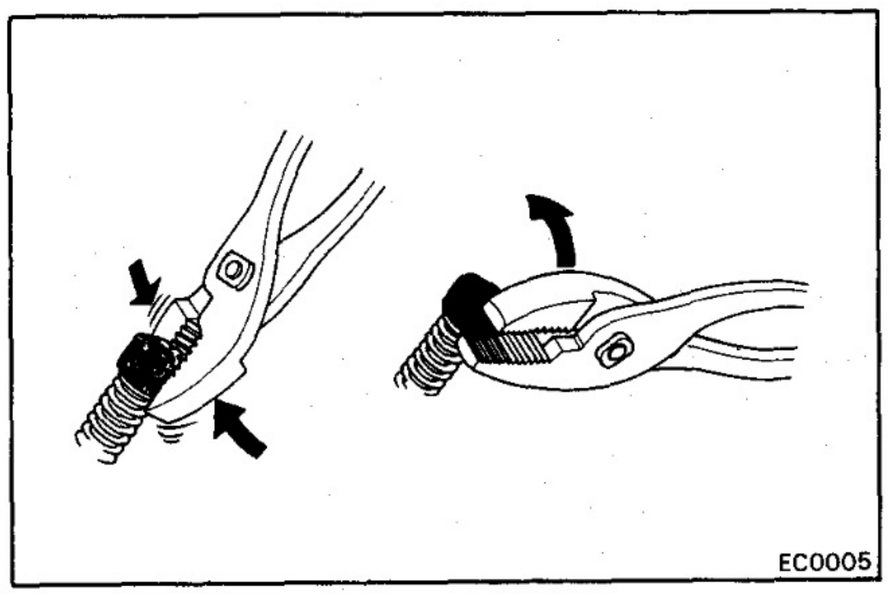
(d) All accessories switched off

(e) All vacuum lines connected

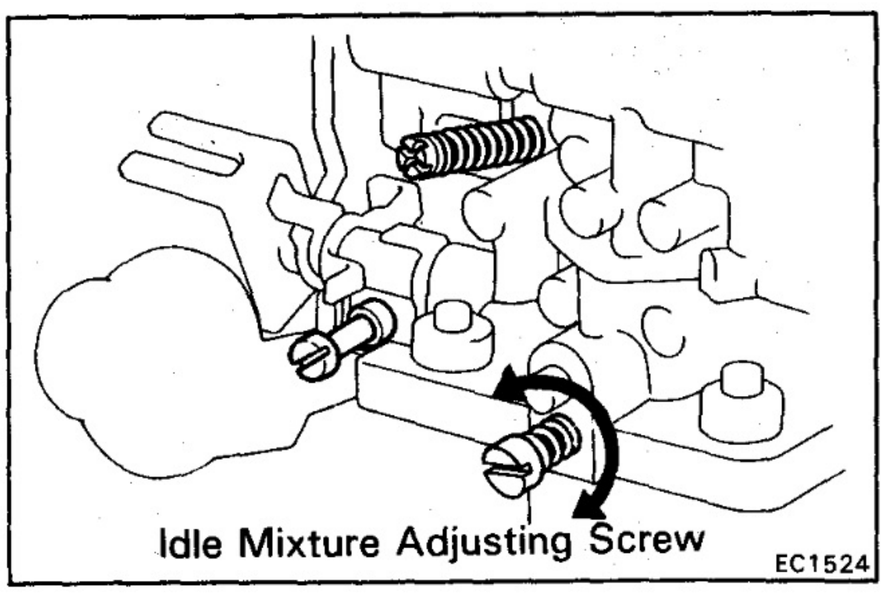
(f) Ignition timing set correctly

(g) Transmission in N range

(h) Fuel level should be about even with the correct level in the sight glass



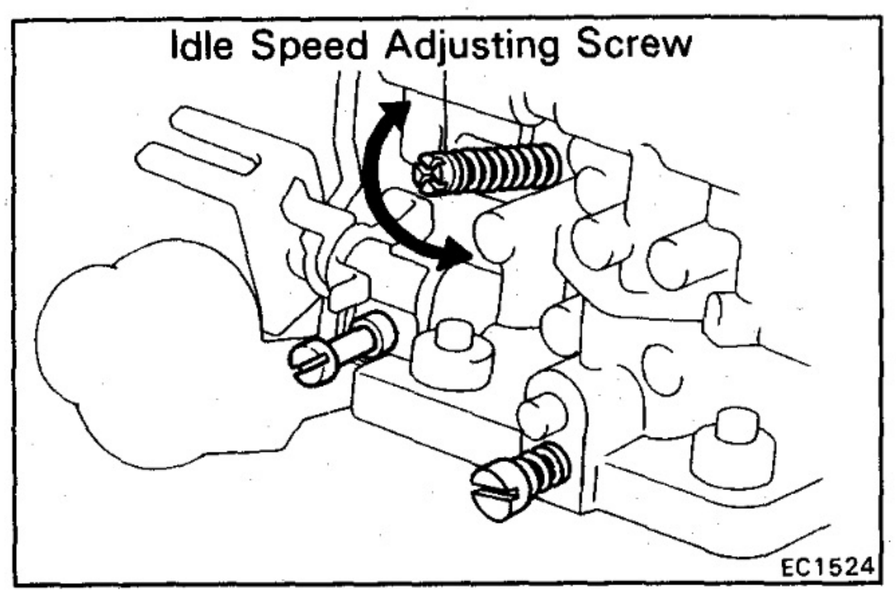

**3. BREAK OFF IDLE LIMITER CAP**




## 4. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Start the engine.

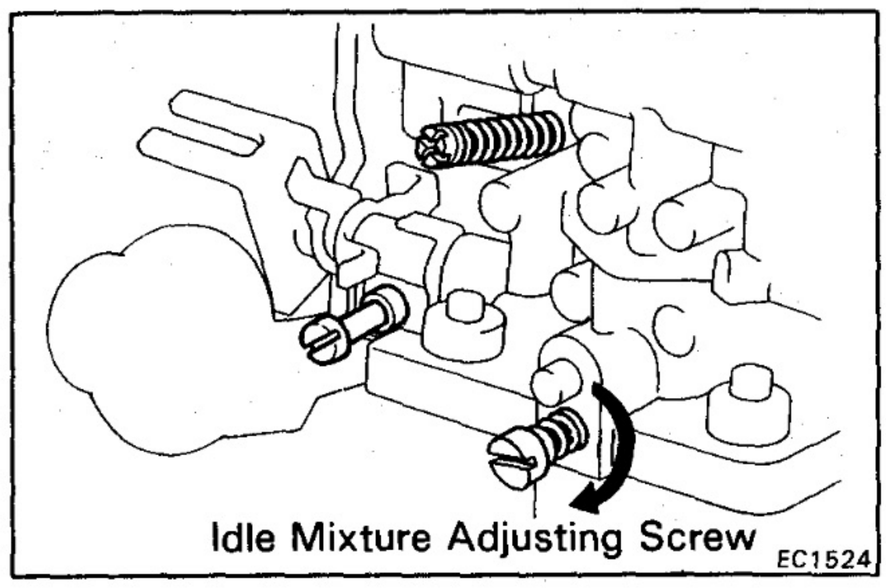
(b) Set to the maximum speed by turning the IDLE MIXTURE ADJUSTING SCREW.




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

**Idle mixture speed: 850 rpm**

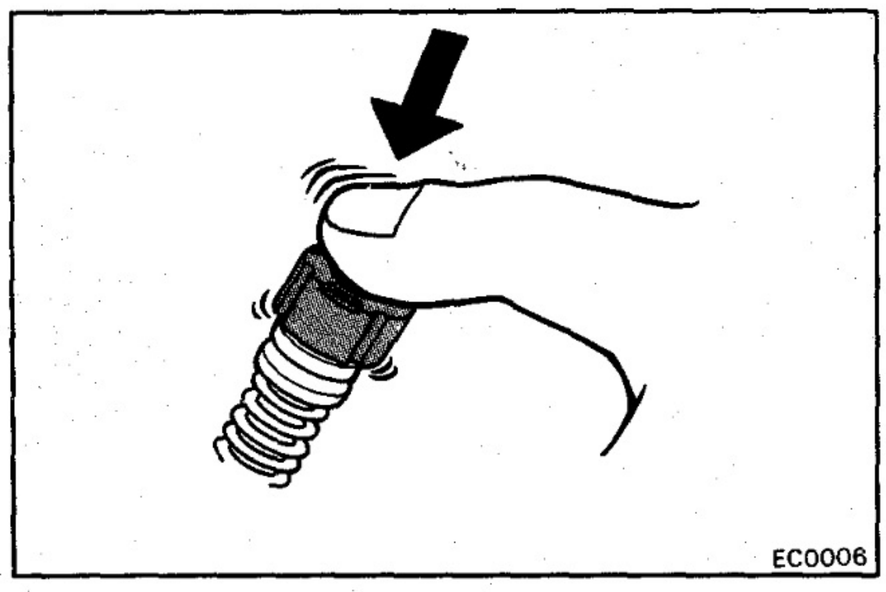
(d) Before moving to the next step, continue adjustments (b) and (c) until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.




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

**Idle speed: 800 rpm**

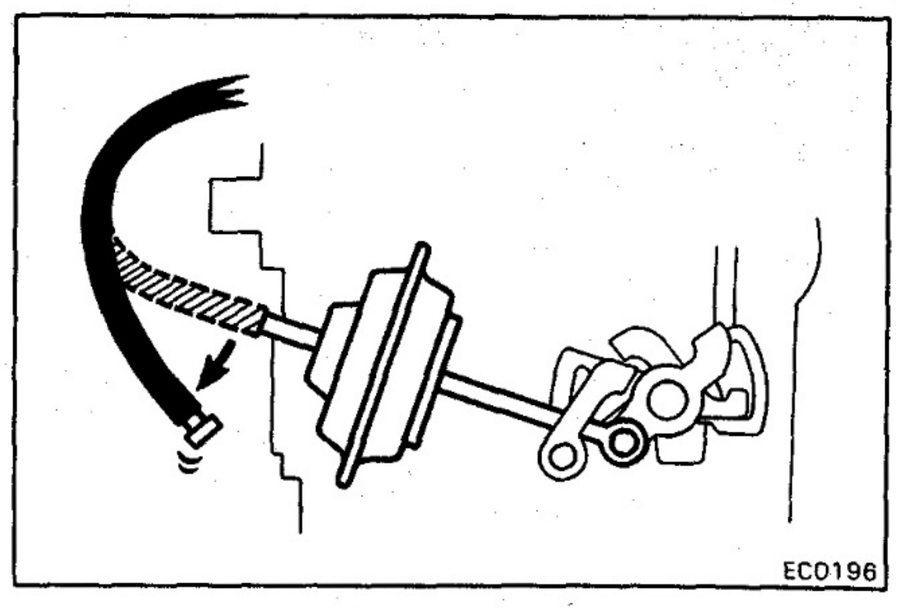
This is the Lean Drop Method for setting idle speed and mixture.




## 5. INSTALL NEW LIMITER CAP

After this adjustment is completed, install the idle limiter cap on the idle mixture adjusting screw.

**CAUTION: After completing adjustment, perform a road test to make certain engine performance has not changed.**




# 3. Fast Idle Speed

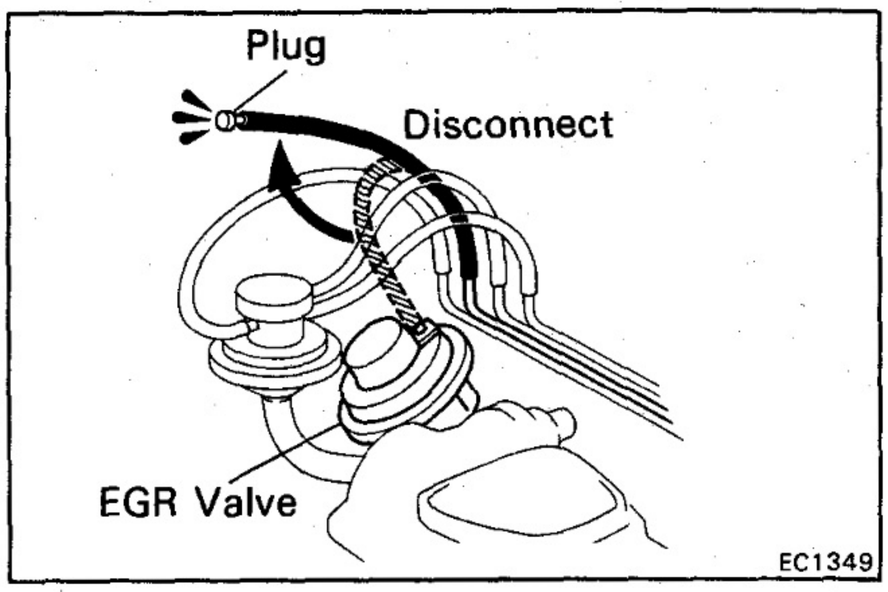
## ADJUSTMENT OF FAST IDLE SPEED

**1. REMOVE AIR CONNECTOR**

**2. WARM UP AND STOP ENGINE**

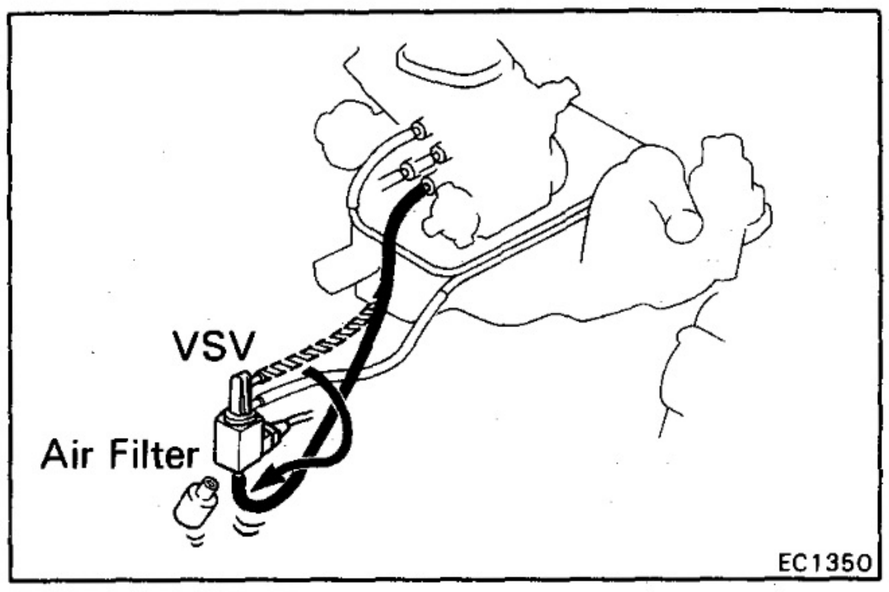
**3. CUT OPERATION OF CHOKE OPENER SYSTEM (LAND CRUISER only)**

Disconnect the vacuum hose from the choke opener diaphragm, and plug the hose end.




**4. CUT OPERATION OF EGR SYSTEM (LAND CRUISER only)**

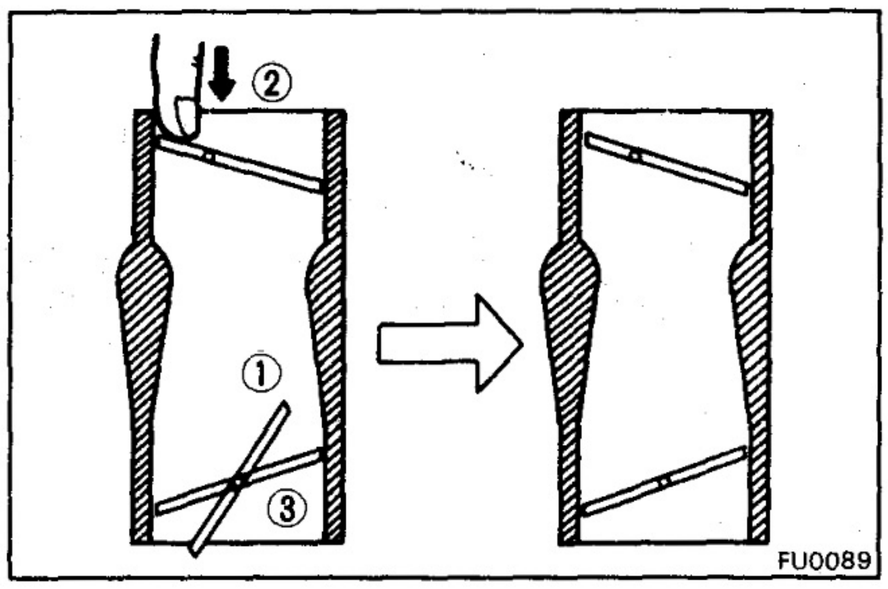
Disconnect the vacuum hose from the EGR valve, and plug the hose end.




**5. CUT OPERATION OF SC SYSTEM (LAND CRUISER only)**

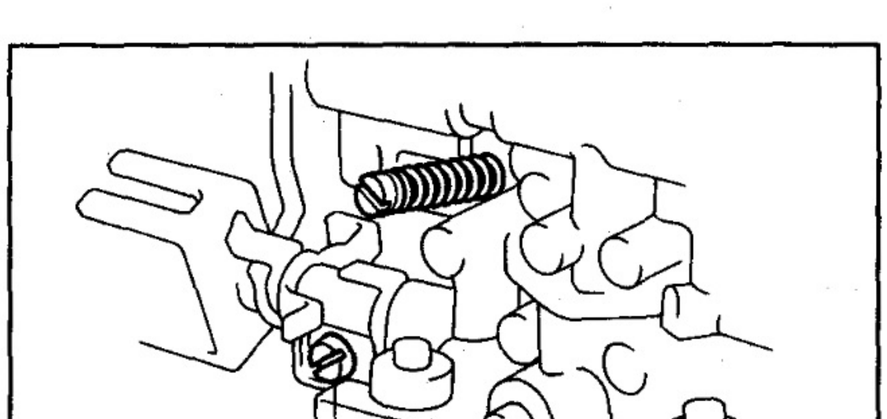
(a) Remove the air filter from the VSV for the SC system.

(b) Replace the vacuum hose from the F port to the air filter installed port at the VSV for SC system.




**6. SET FAST IDLE CAM**

While holding the throttle valve slightly open, push the choke valve closed and hold it closed as you release the throttle valve.




**7. START ENGINE, BUT DO NOT DEPRESS ACCELERATOR PEDAL**

**8. ADJUST FAST IDLE SPEED**

Adjust the fast idle speed by turning the fast idle adjusting screw.

**Fast idle speed:**

| | |
|---|---|
| **LAND CRUISER** | **2,600 ± 200 rpm** |
| **COASTER** | **2,400 ± 200 rpm** |

**9. RECONNECT VACUUM HOSES TO PROPER LOCATIONS**

# 3F ENGINE

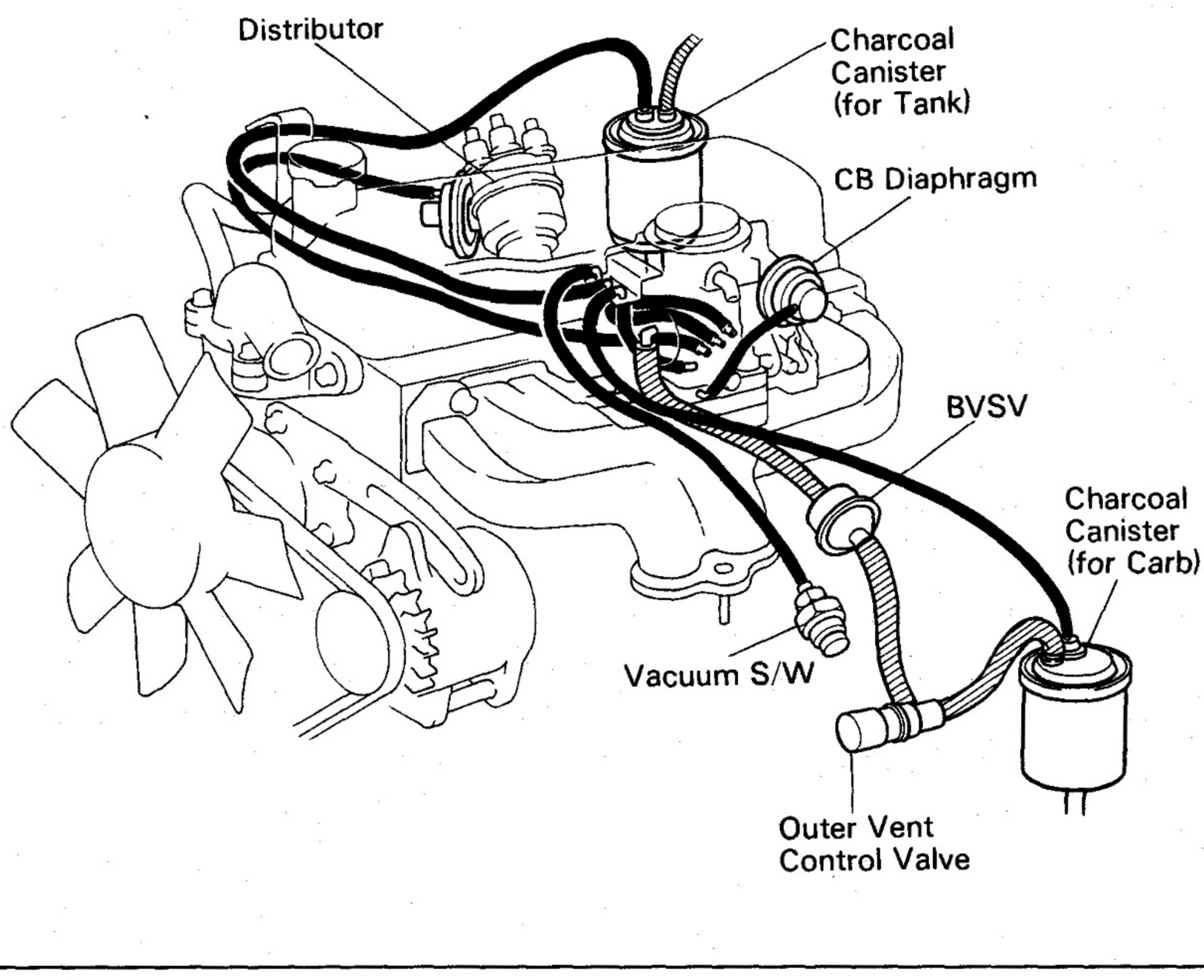
## Vehicle Model:
## LAND CRUISER
## (FJ62, 70, 73, 75 Series)

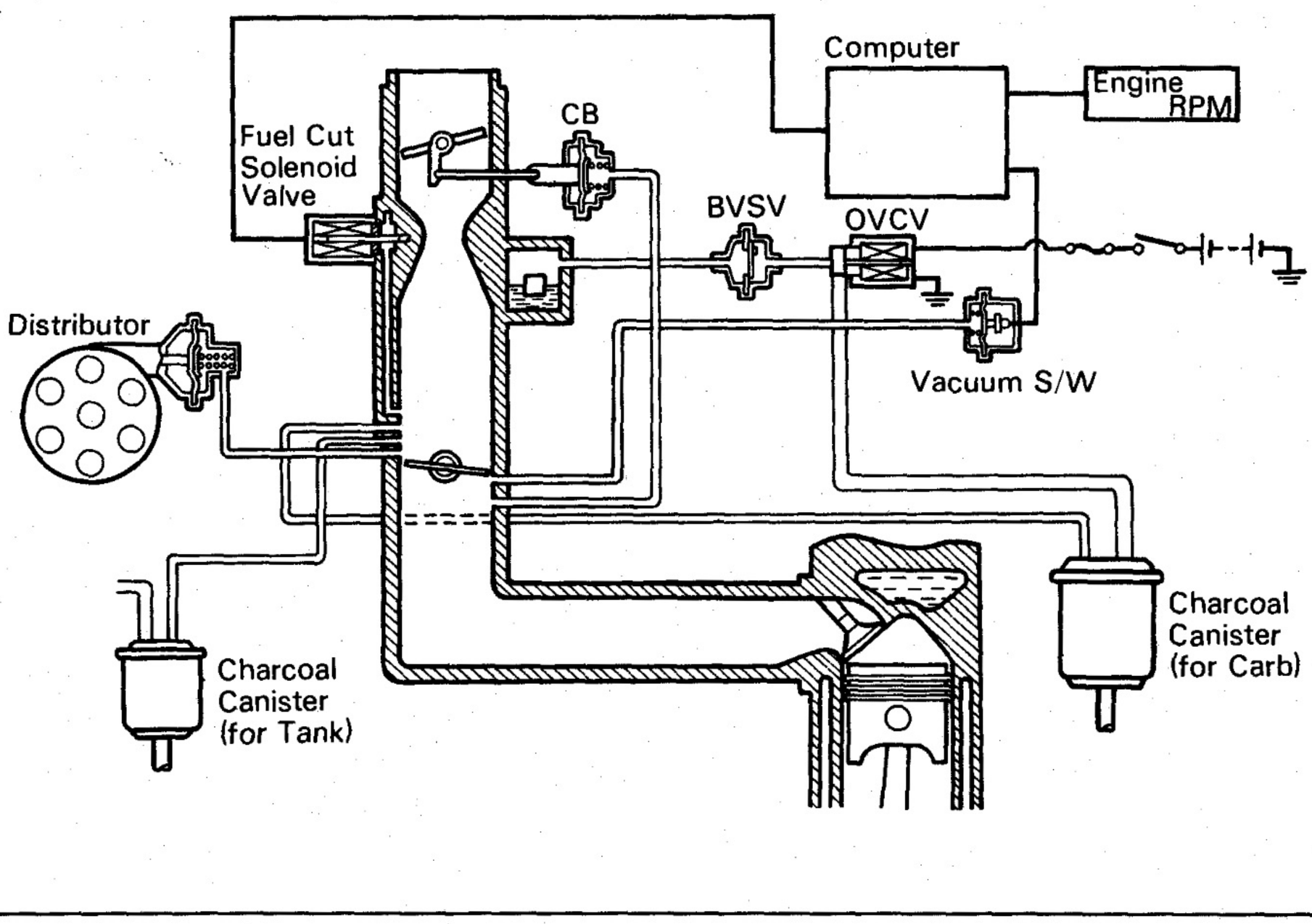

| | Page |
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| COMPONENT LAYOUT AND SCHEMATIC DRAWING | 5-3 |
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| 1. Ignition Timing and Dwell Angle | 5-13 |
| 2. Idle Speed and Idle Mixture | 5-14 |
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# SYSTEM PURPOSE

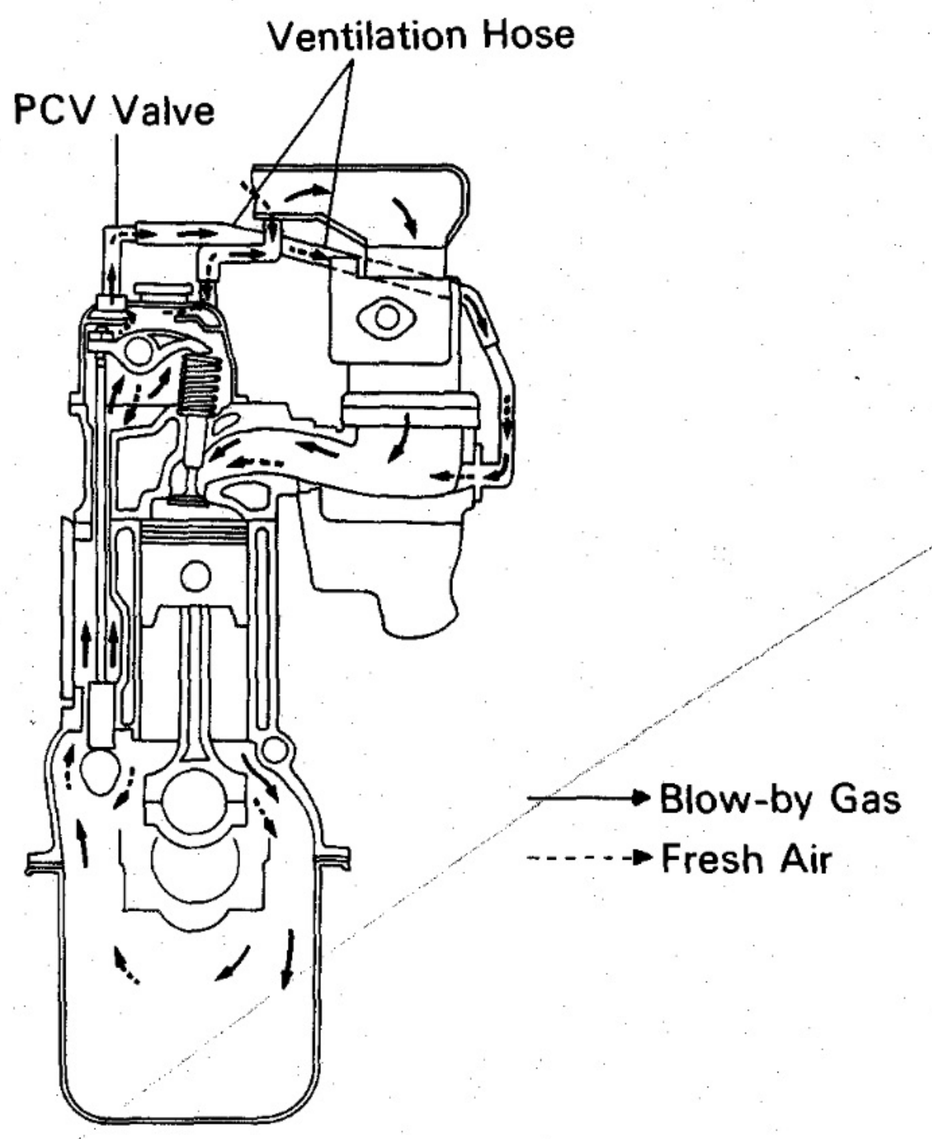
| System | Abbreviation | Purpose |
|---|---|---|
| Positive crankcase ventilation | PCV | Reduces blow-by gas (HC) |
| Fuel evaporative emission control | EVAP | Reduces evaporative HC |
| Auxiliary system: | | |
| Choke breaker | CB | Improves driveability–cold |
| Deceleration fuel cut system | — | Reduces HC and prevents after burning |

# COMPONENT LAYOUT AND SCHEMATIC DRAWING



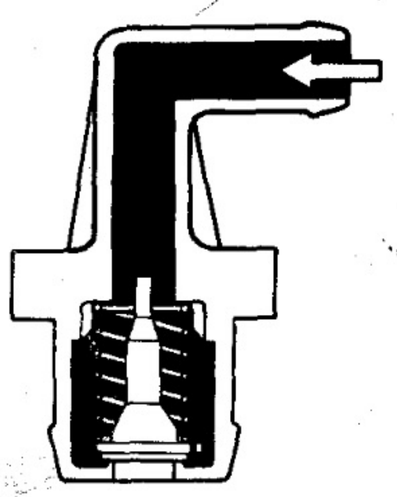
# POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM




EC1300

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

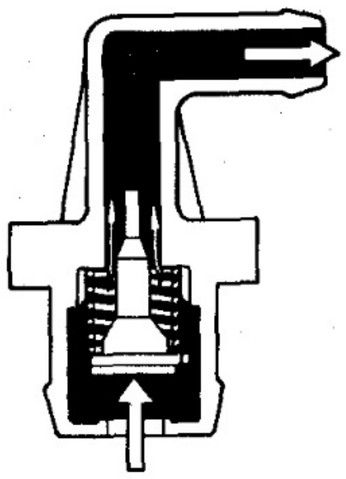
**Engine not Running or Backfiring**




○ PCV VALVE IS CLOSED.

EC1367

**Normal Operation**

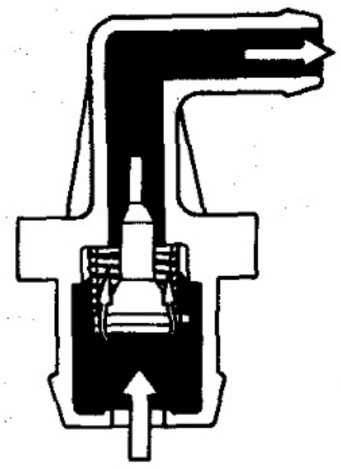


○ PCV VALVE IS OPEN.

○ VACUUM PASSAGE IS LARGE.

EC1200

**Idling or Decelerating**

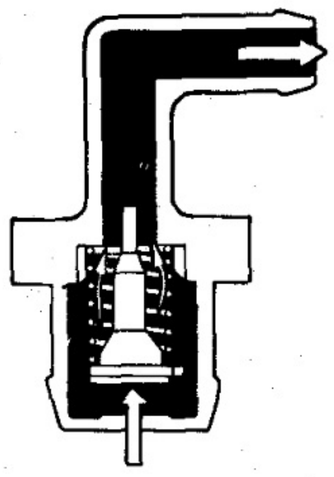


○ PCV VALVE IS OPEN.

○ VACUUM PASSAGE IS SMALL.

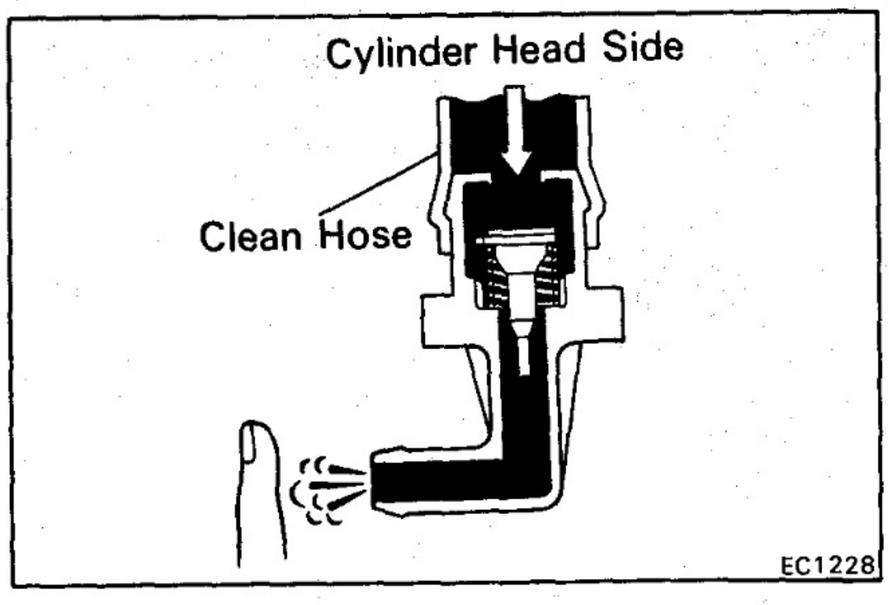
EC1226

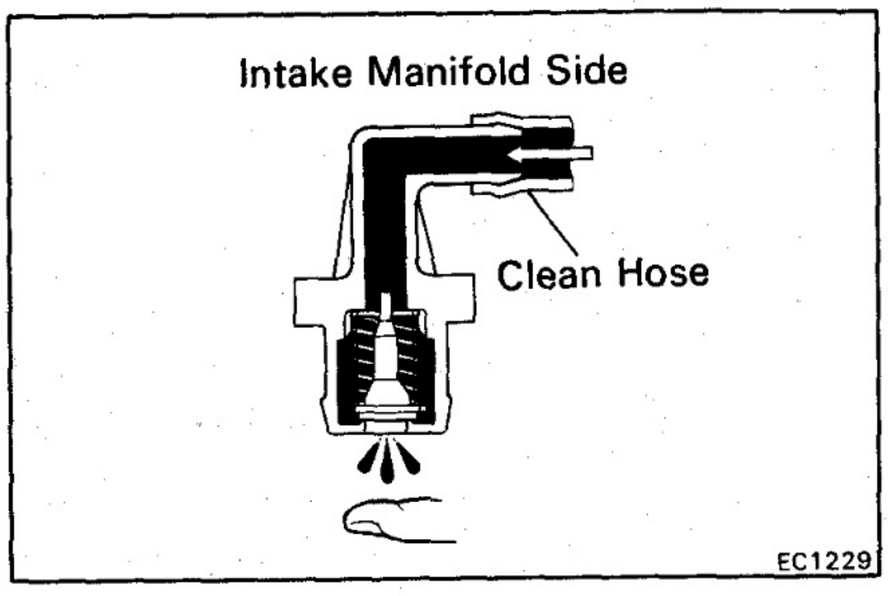
**Acceleration or High Load**

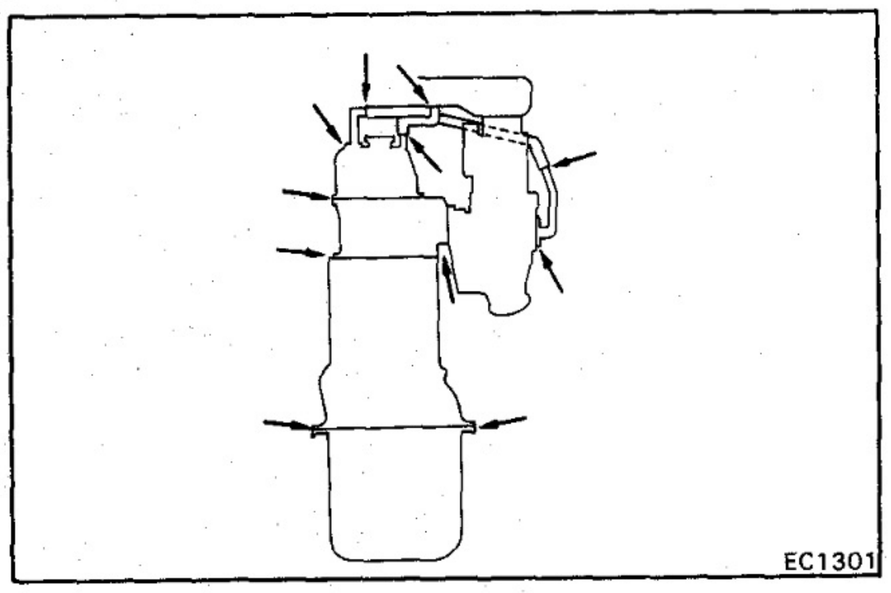


○ PCV VALVE IS FULLY OPEN.

EC1227




## INSPECTION OF PCV VALVE

1. **REMOVE PCV VALVE**
2. **ATTACH CLEAN HOSE TO PCV VALVE**
3. **BLOW FROM CYLINDER HEAD 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.

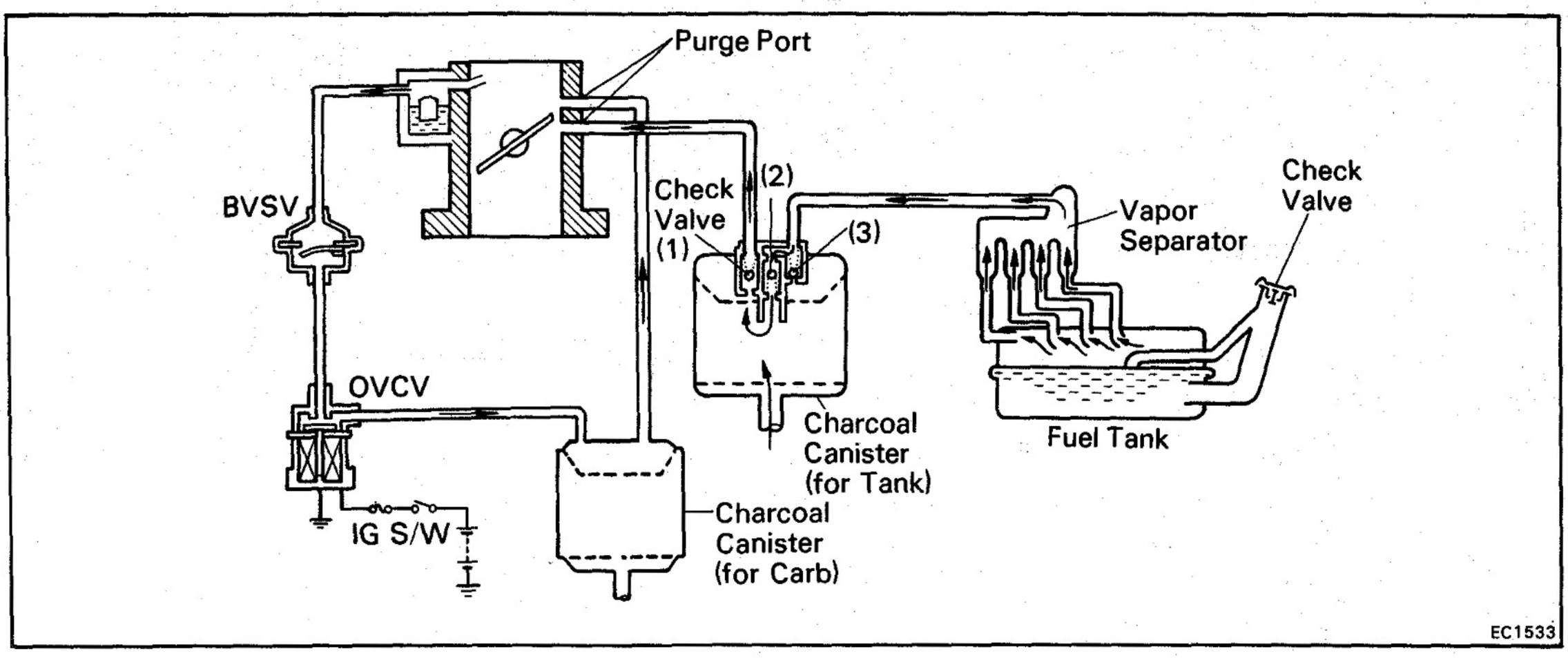
   If the PCV valve fails either of the checks, replace it.
5. **REINSTALL PCV VALVE**

## INSPECTION OF PCV HOSES AND CONNECTIONS

### VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

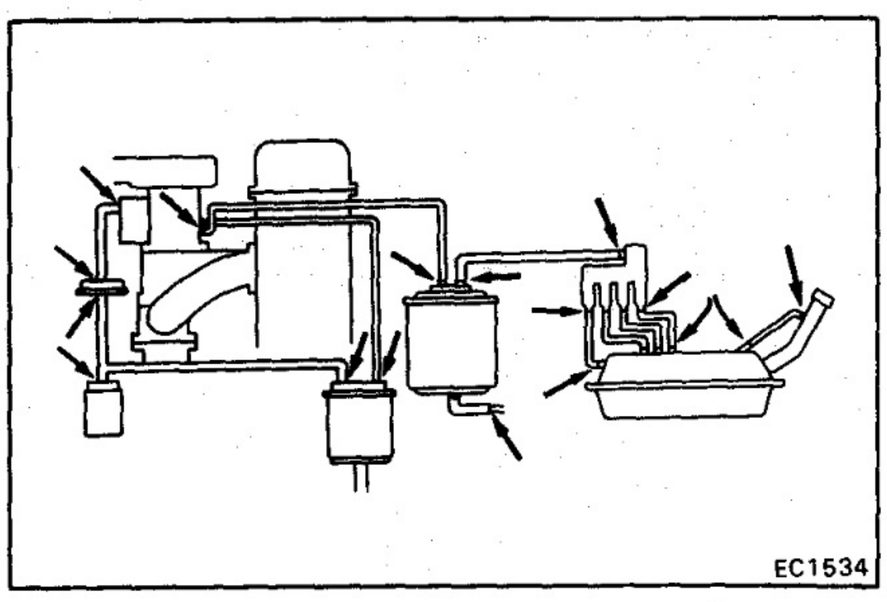
Check for cracks, leaks or damage.

# FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM




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

| IG S/W | Outer Vent Control Valve | Under Hood Temp. | BVSV | Throttle Valve Opening | Canister Check Valve (1) | (2) | (3) | Check Valve in Fuel Tank | Evaporated Fuel (HC) |
|---|---|---|---|---|---|---|---|---|---|
| OFF | OPEN | Below 41°C (106°F) | CLOSED | — | — | — | — | — | HC from tank is absorbed into the canister. |
| | | Above 55°C (131°F) | OPEN | — | — | — | — | — | HC from tank and float chamber is absorbed into the canister. |
| ON | CLOSED | — | — | Positioned below purge port | — | — | — | — | HC from tank is absorbed in the canister. |
| | | | | Positioned above purge port | — | — | — | — | HC from canister is led into carburetor. |
| High pressure in tank | | — | — | — | — | OPEN | CLOSED | CLOSED | HC from tank is absorbed in the canister. |
| High vacuum in tank | | — | — | — | — | CLOSED | OPEN | OPEN | (Air is led into the tank.) |


EC1534

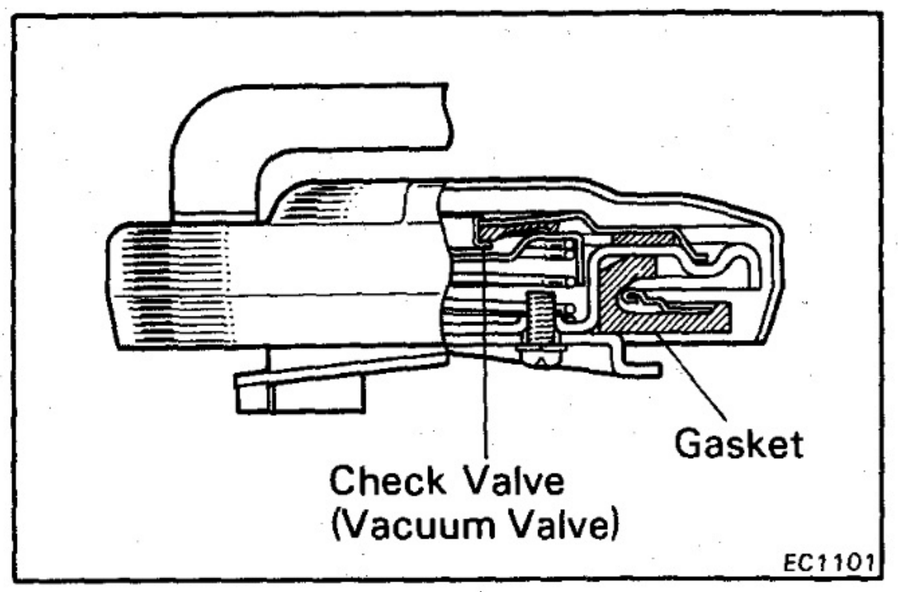
## INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

**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.



EC1101

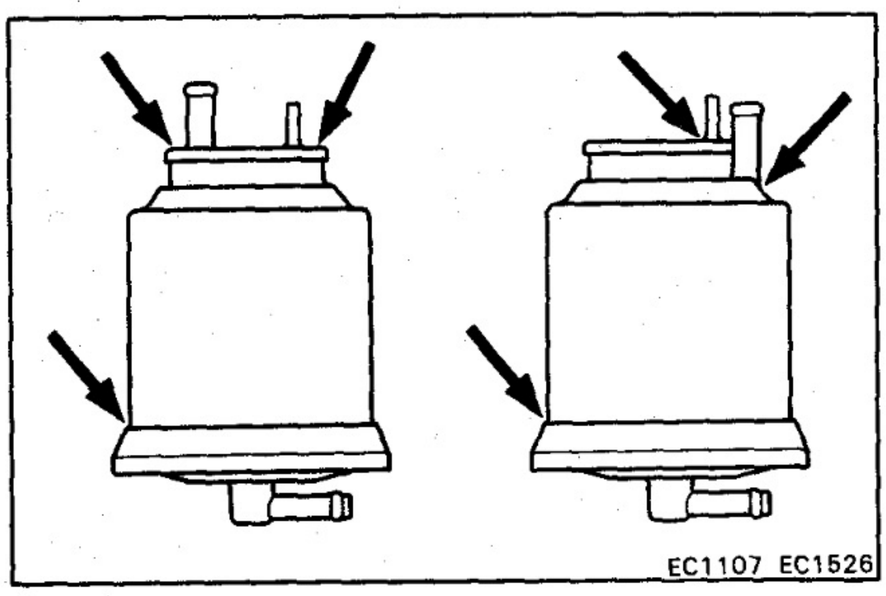
**3. VISUALLY INSPECT FUEL FILLER CAP**

(a) Remove the four screws and retainer.

(b) Look for a damaged or deformed gasket.

(c) Reinstall the retainer.

If a problem is found, repair or replace the cap.

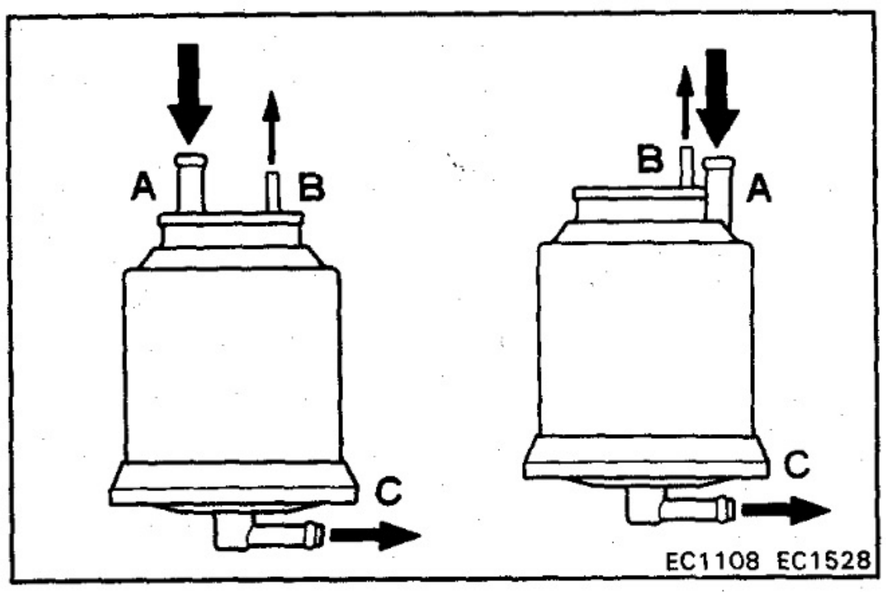

EC1107 EC1526

## INSPECTION OF CHARCOAL CANISTER

**1. REMOVE CHARCOAL CANISTER**

**2. VISUALLY INSPECT CHARCOAL CANISTER CASE**

Look for cracks or damage.



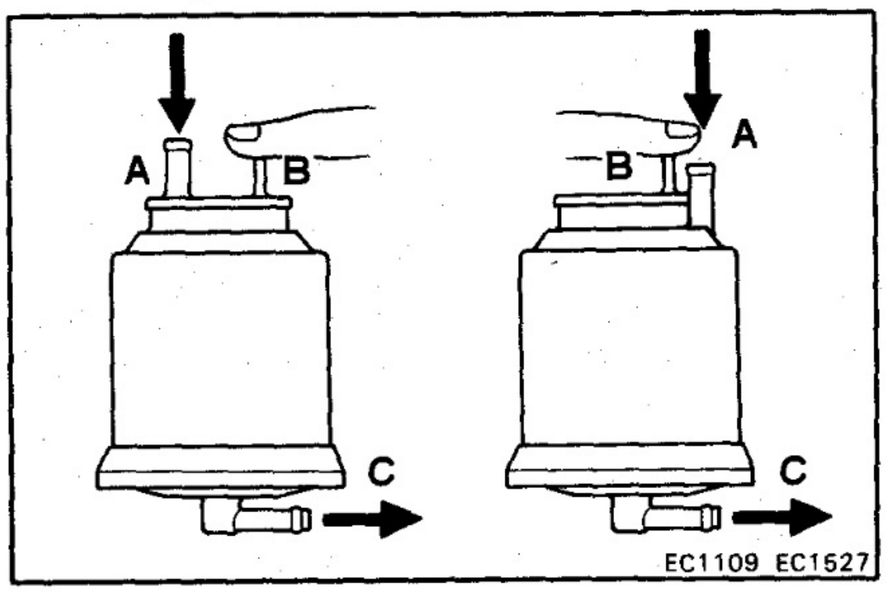
EC1108 EC1528

**3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**

(a) Using low pressure compressed air, blow into the pipe A and check that the air flows without resistance from the other pipes.

(b) Blow into the pipe B and check that the air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



EC1109 EC1527

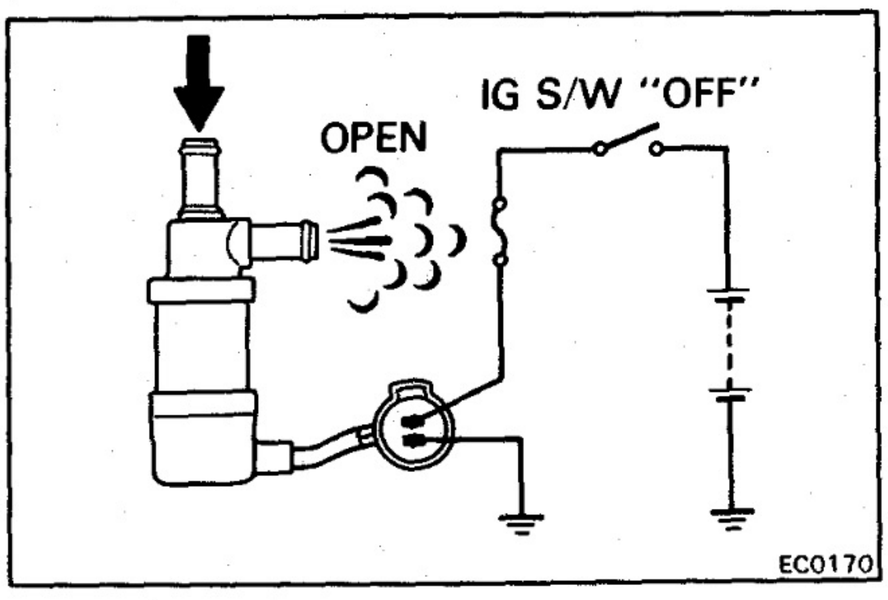
**4. CLEAN FILTER IN CANISTER**

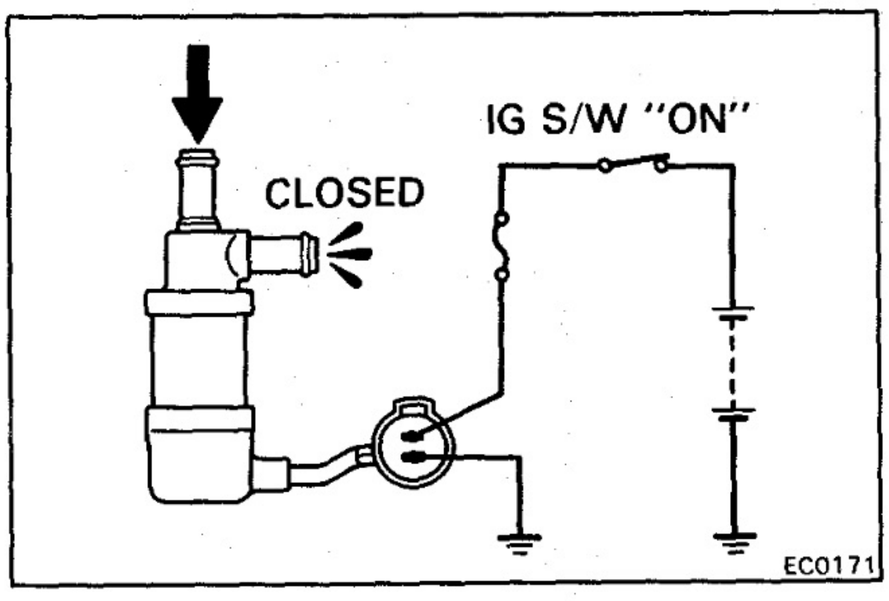
Clean the filter by blowing 3 kg/cm² (43 psi, 294 kPa) of compressed air into the pipe A, while holding the pipe B closed.

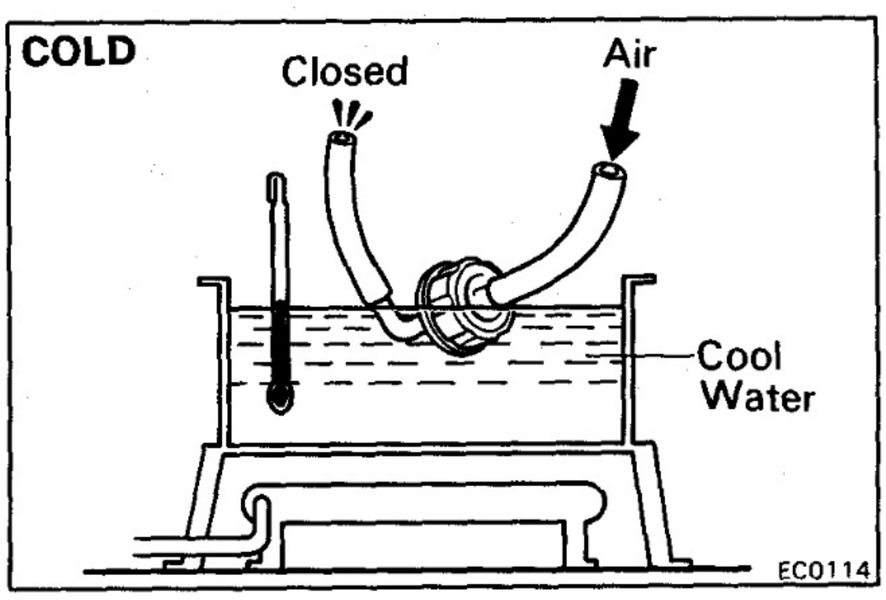
NOTE:

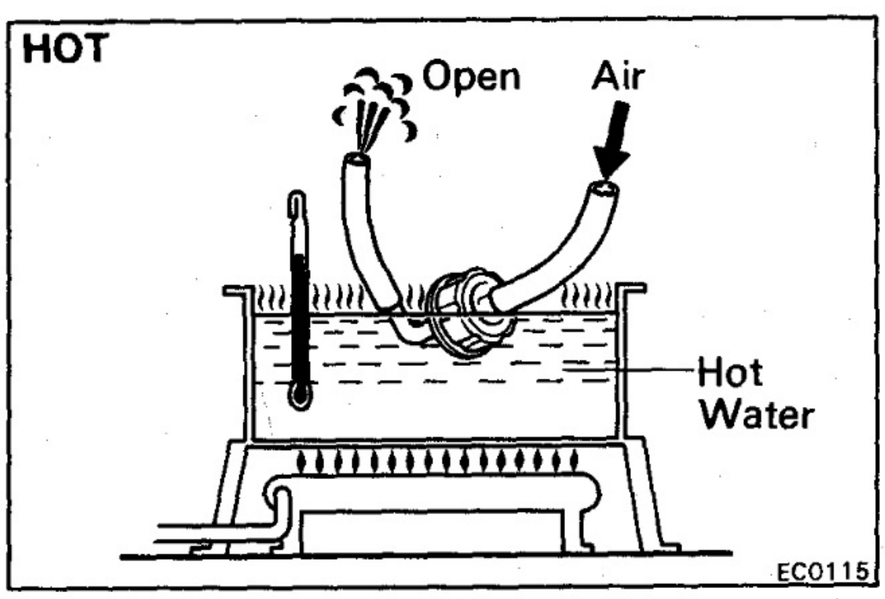
- Do not attempt to wash the canister.
- No activated carbon should come out.

**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 the hoses to the proper locations.

If the valve does not operate, check the fuse and the wiring connections.

## INSPECTION OF BVSV

### CHECK BVSV BY BLOWING AIR INTO IT

(a) Cool the BVSV to below 41°C (106°F) with cool water.

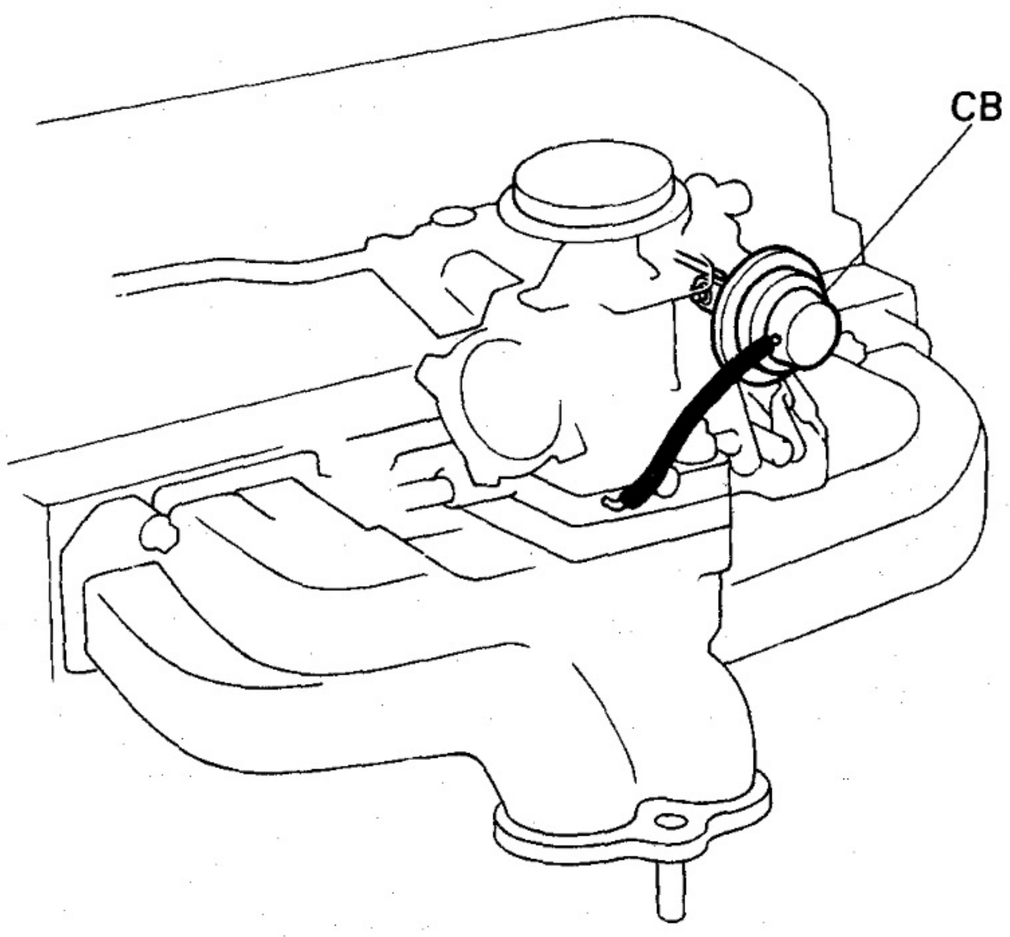
(b) Check that the BVSV is closed.

(c) Heat the BVSV to above 55°C (131°F) with hot water.

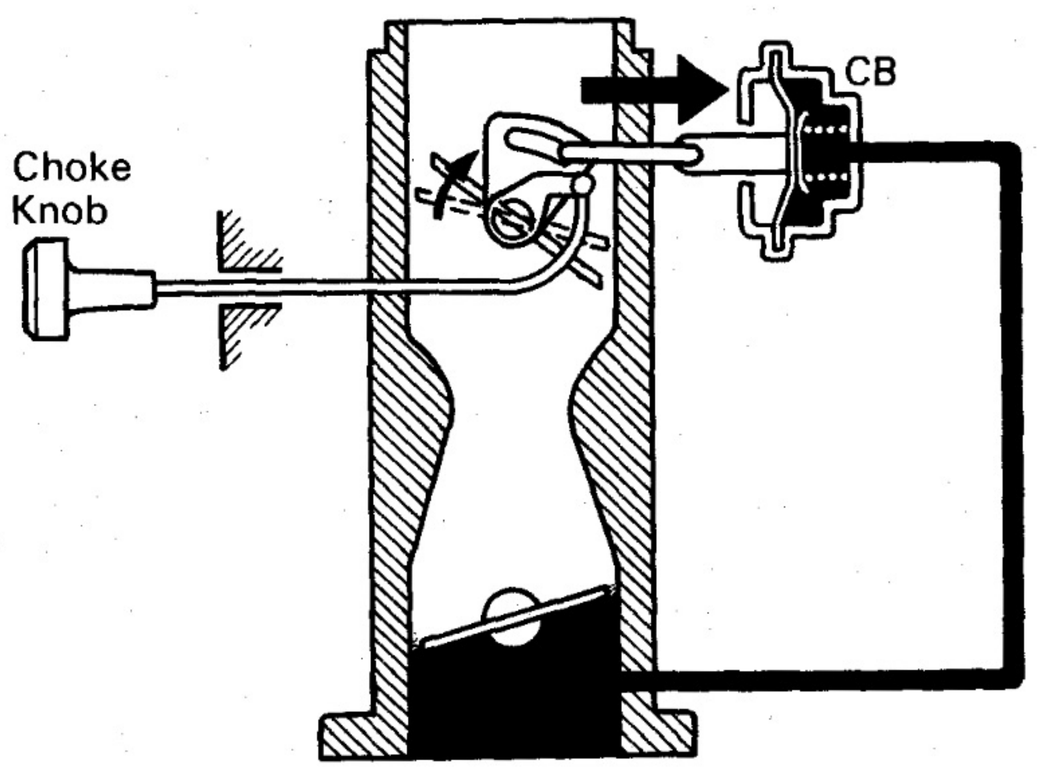
(d) Check that the BVSV is open.

# AUXILIARY SYSTEMS

## 1. Choke Breaker (CB) System

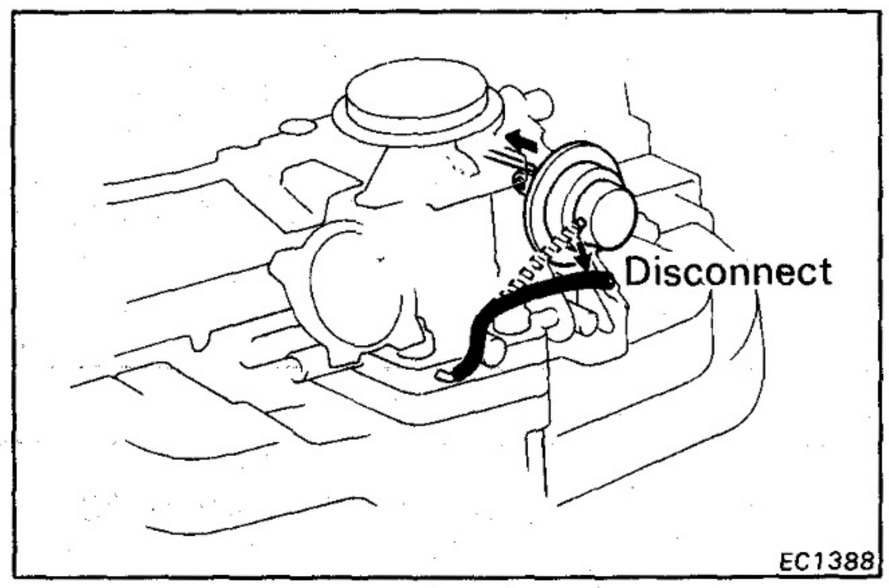



EC1387

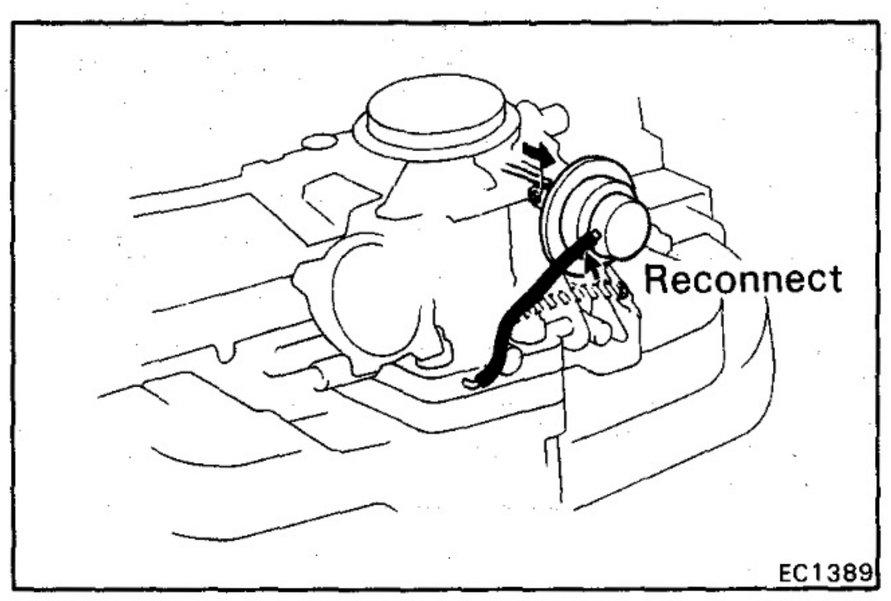



EC3526

This system slightly opens the choke valve to prevent too rich a mixture after firing when the choke is closed.




EC1388




EC1389

## INSPECTION OF CB SYSTEM

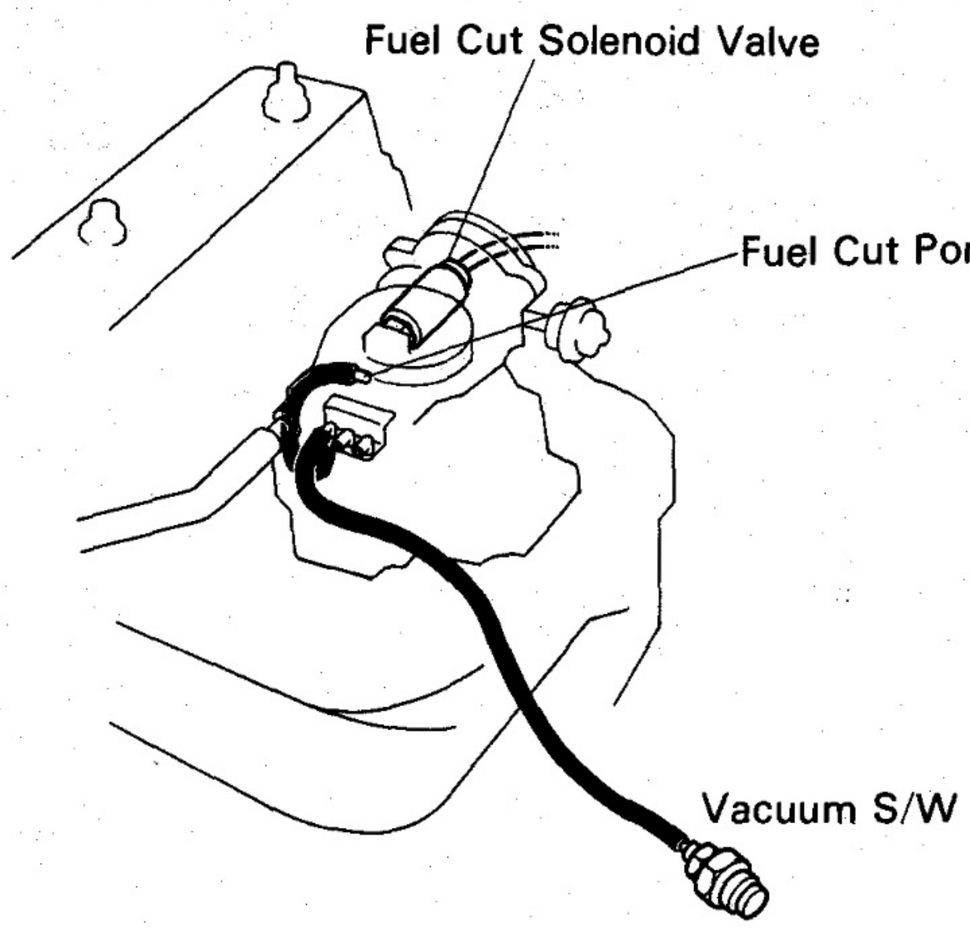
### CHECK CHOKE LINKAGE AND DIAPHRAGM

(a) Start the engine.

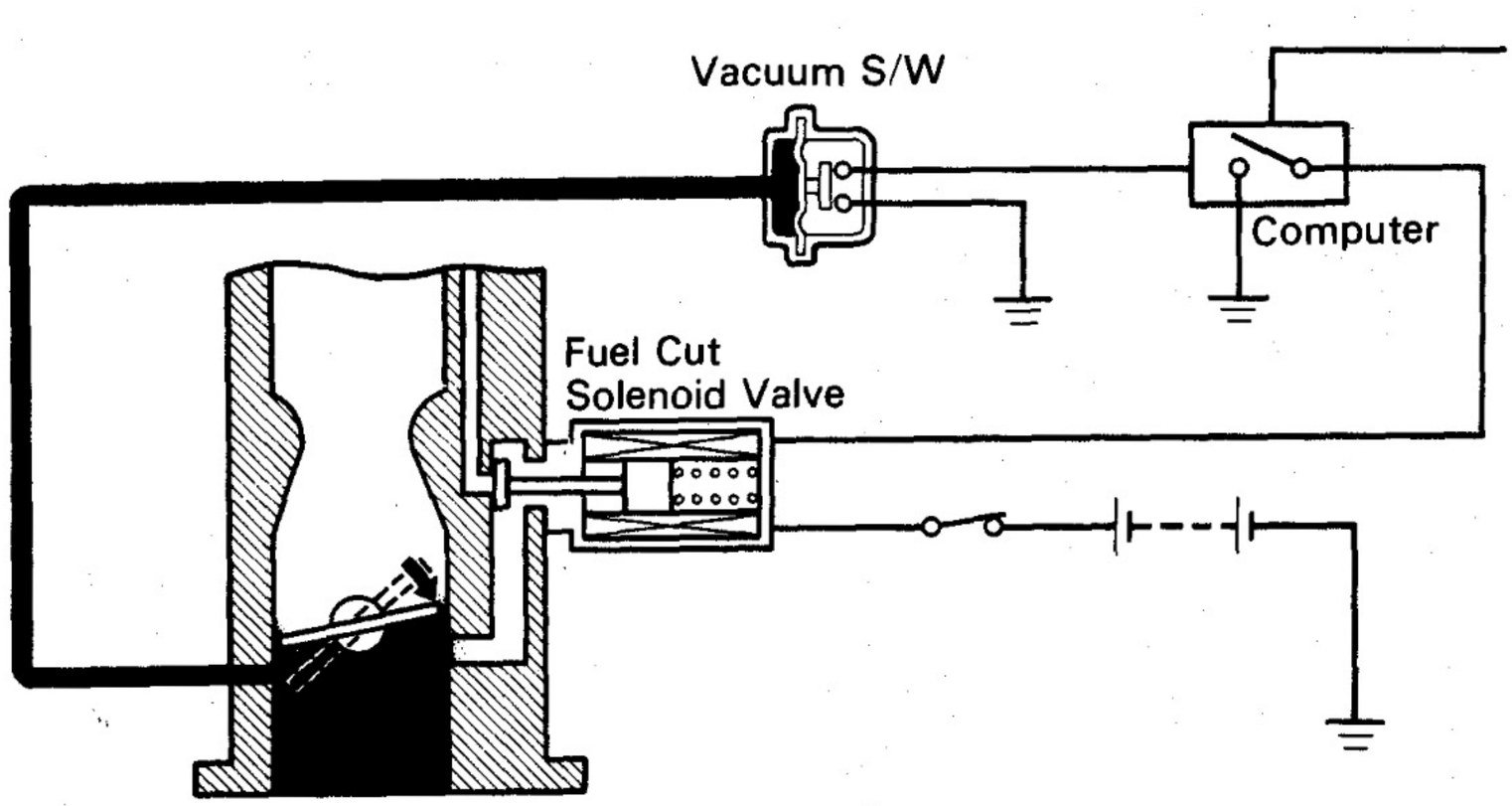
(b) Disconnect the hose from the CB diaphragm and check that the choke linkage return.

(c) Reconnect the hose to the diaphragm and check that the choke linkage pulled by the diaphragm.

# 2. Deceleration Fuel Cut System



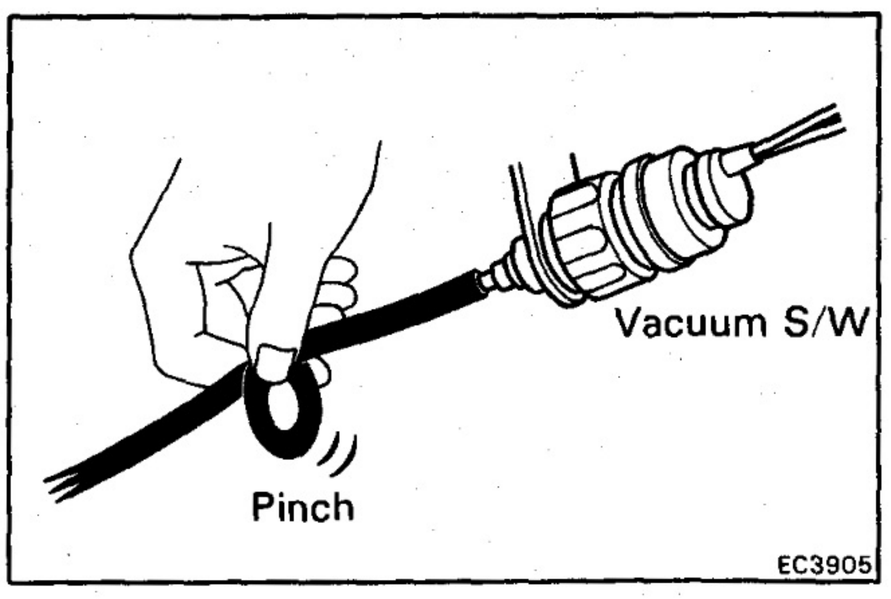

EC1362




EC1299

This system cuts off part of the fuel in the slow circuit of the carburetor to reduce HC and to prevent afterburning in the exhaust system.

| Engine RPM | Vacuum in the Vacuum S/W | Vacuum S/W | Computer | Fuel Cut Solenoid Valve | Slow Circuit in Carburetor |
|---|---|---|---|---|---|
| Below 1,700 rpm | Below 365 mmHg (14.37 in.Hg, 48.7 kPa) | ON | ON | ON | OPEN |
| | Above 415 mmHg (16.34 in.Hg, 55.3 kPa) | OFF | ON | ON | OPEN |
| Above 2,090 rpm | Below 365 mmHg (14.37 in.Hg, 48.7 kPa) | ON | ON | ON | OPEN |
| | Above 415 mmHg (16.34 in.Hg, 55.3 kPa) | OFF | OFF | OFF | CLOSED |




# INSPECTION OF DECELERATION FUEL CUT SYSTEM

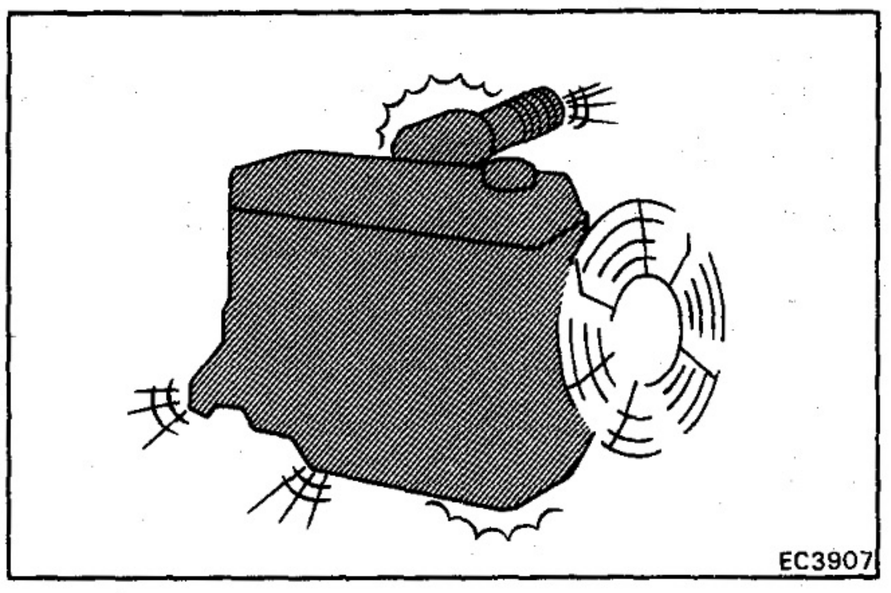
## CHECK SYSTEM OPERATION

(a) Connect a tachometer to the engine.

(b) Start the engine.

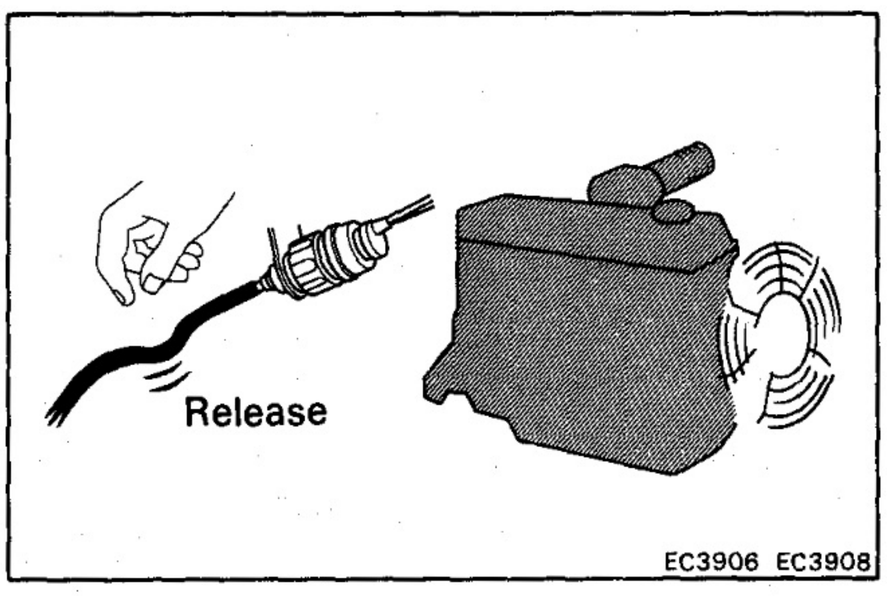
(c) Check that the engine runs normally.

(d) Pinch off the vacuum hose to the vacuum switch.

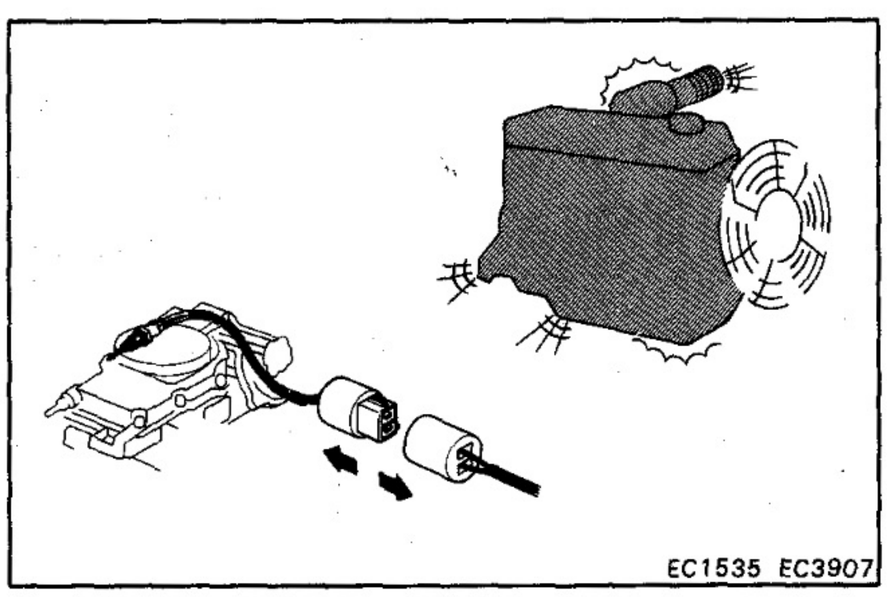



(e) Gradually increase the engine speed.
Check that the engine misfires slightly at the following engine speed.

**Engine speed: 1,700 – 2,090 rpm**



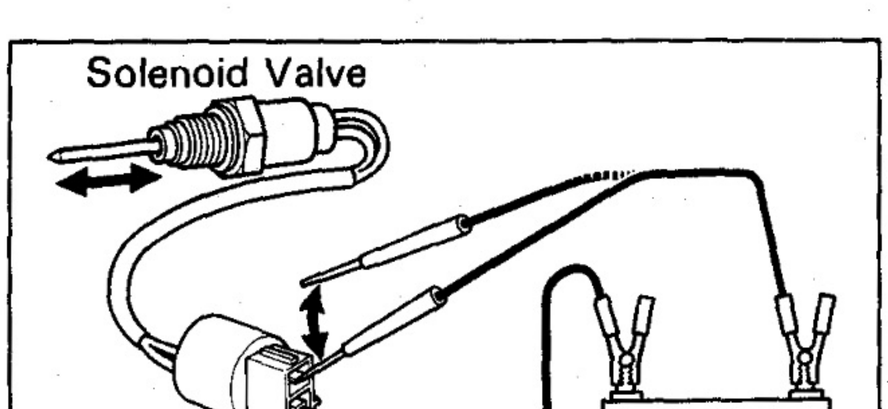

(f) Release the pinched hose. Again gradually increase the engine speed and check that the engine operation returns to normal.




(g) With the engine idling, unplug the wiring connector to the solenoid valve. Check that the engine dies.

(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

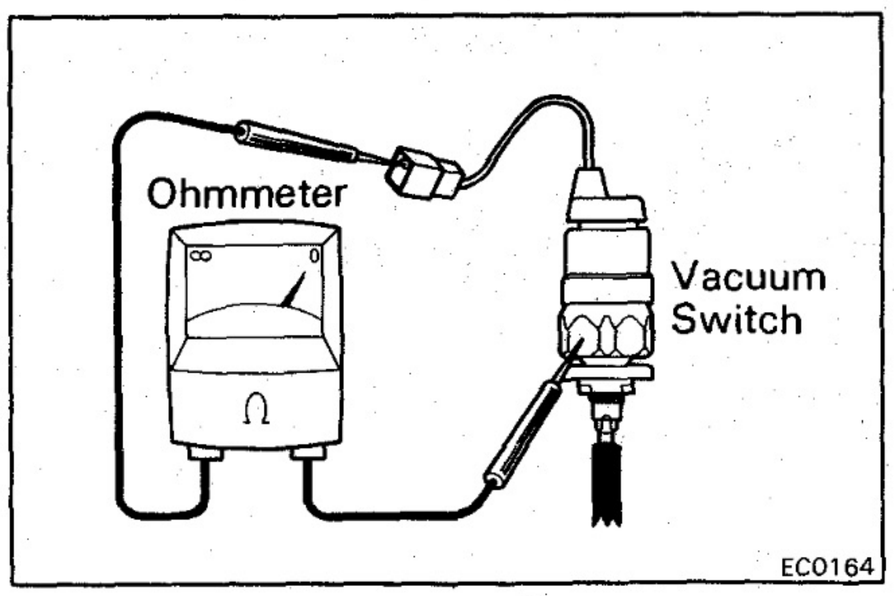
(a) Remove the solenoid valve.

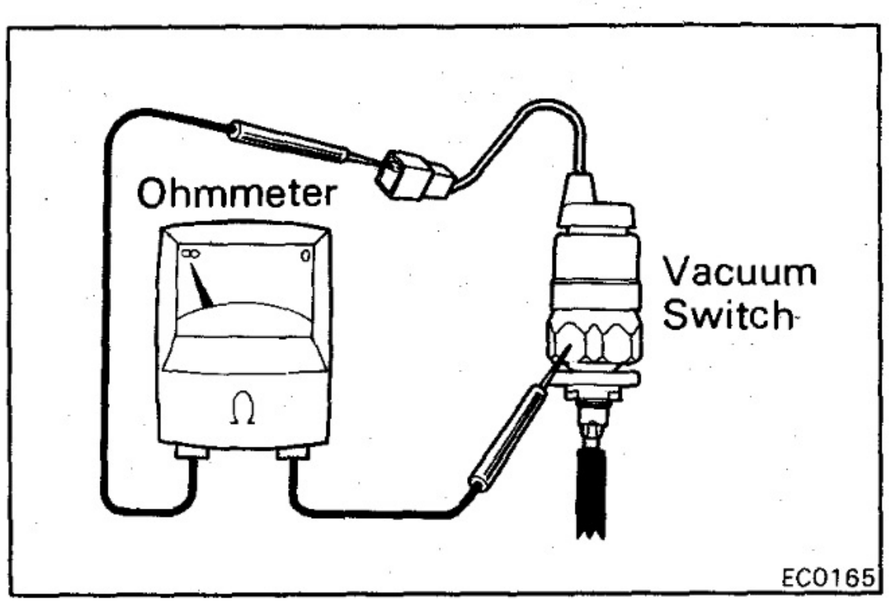
(b) Connect the two terminals and the battery terminals as shown.

(c) Check that you can feel a "click" from the solenoid valve when the battery is connected and disconnected.

(d) Reinstall the valve and reconnect the wiring connector.

If a problem is found, replace the solenoid valve or O-ring.



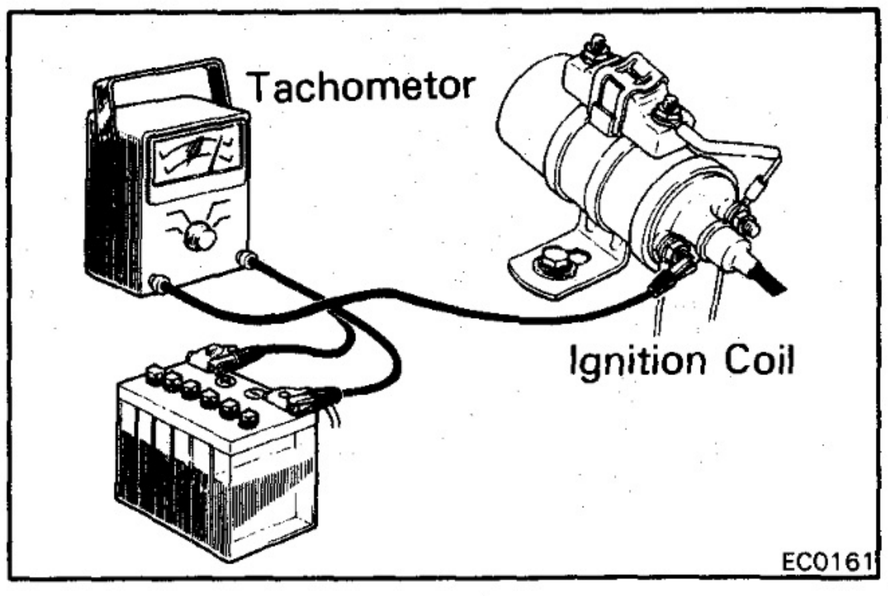

## INSPECTION OF VACUUM SWITCH

(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.




# ENGINE ADJUSTMENT

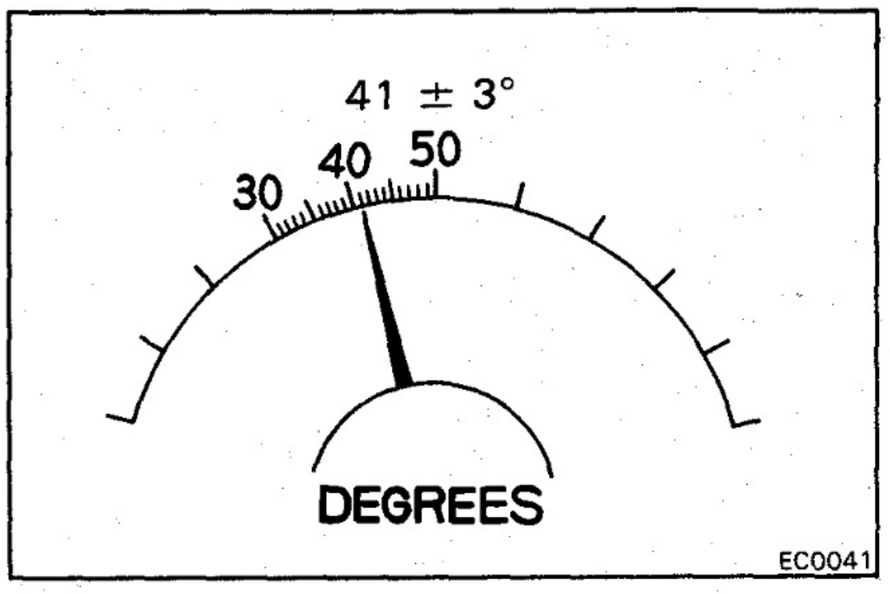
## 1. Ignition Timing and Dwell Angle

### 1. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the tachometer positive (+) terminal to the ignition coil negative (−) terminal.

### 2. WARM UP ENGINE

Allow the engine to reach full operating temperature.

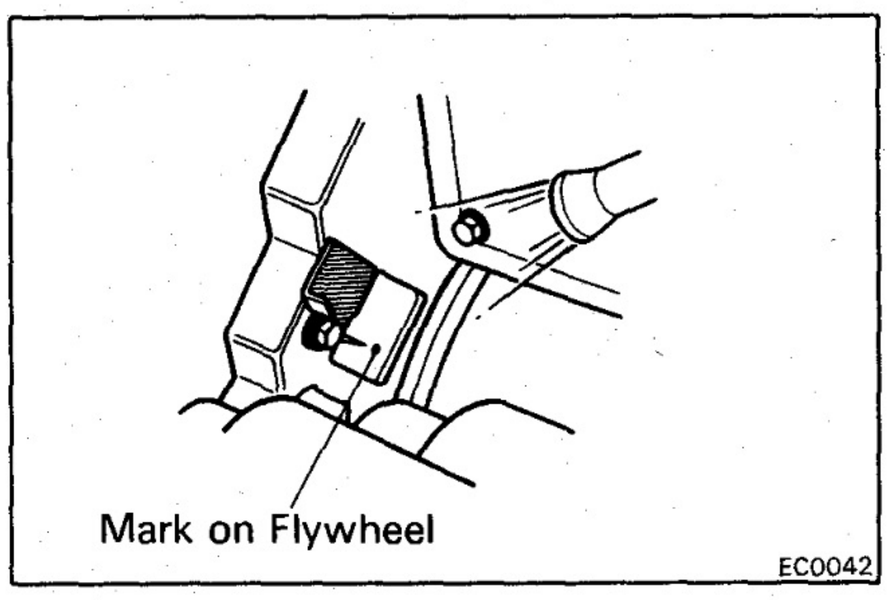



### 3. CHECK DWELL ANGLE

**Dwell angle: 41 ± 3°**

With the engine idling as specified, make sure the dwell angle is within specified range.

If angle is too small, increase the rubbing block gap, if too large decrease the gap.




### 4. CHECK IGNITION TIMING

**Ignition timing: 7 ± 2° BTDC @ Max. 900 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.

**Torque: 100 − 160 kg-cm**
**(8 − 11 ft-lb, 10 − 15 N·m)**

# 2. Idle Speed and Idle Mixture

## CHECK AND ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE

### 1. CONNECT A TACHOMETER TO ENGINE

### 2. WARM UP ENGINE

Allow the engine to reach full operating temperature.

### 3. CHECK IDLE SPEED

**Idle speed: M/T 650 ± 50 rpm**
**A/T 750 ± 50 rpm**

If not as specified, adjust according to the following procedure.

## A. METHOD WITH CO METER

### 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

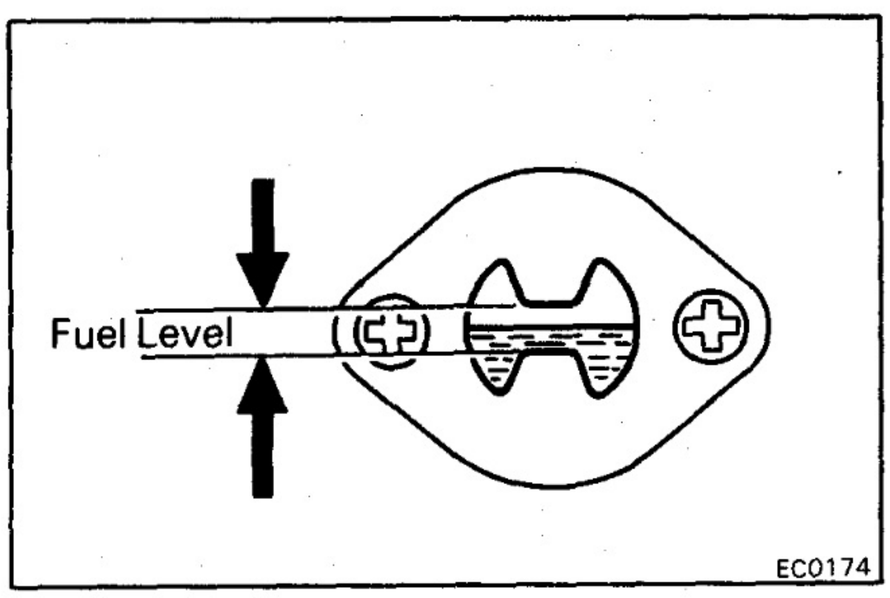
(f) Ignition timing set correctly

(g) Transmission in "N" range

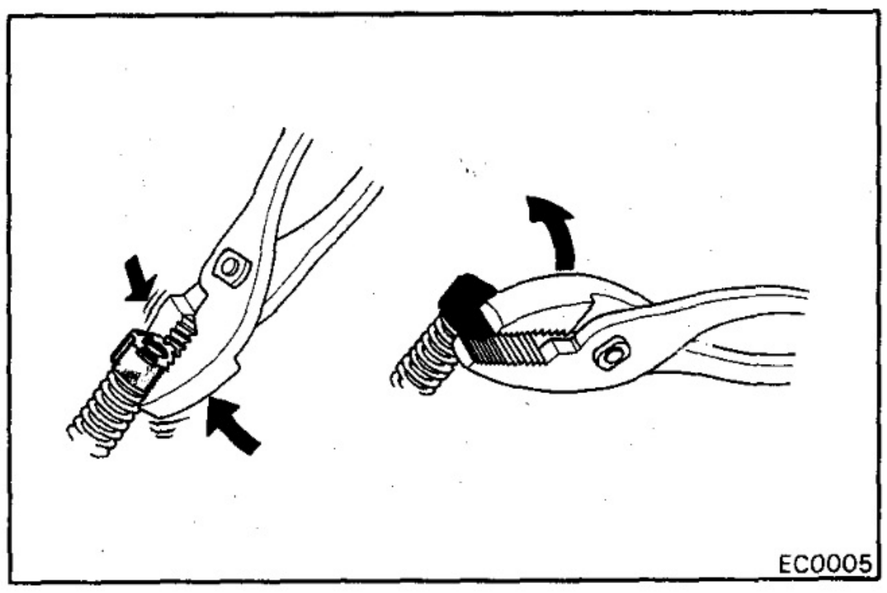
(h) Fuel level should be about even with the correct level in the sight glass

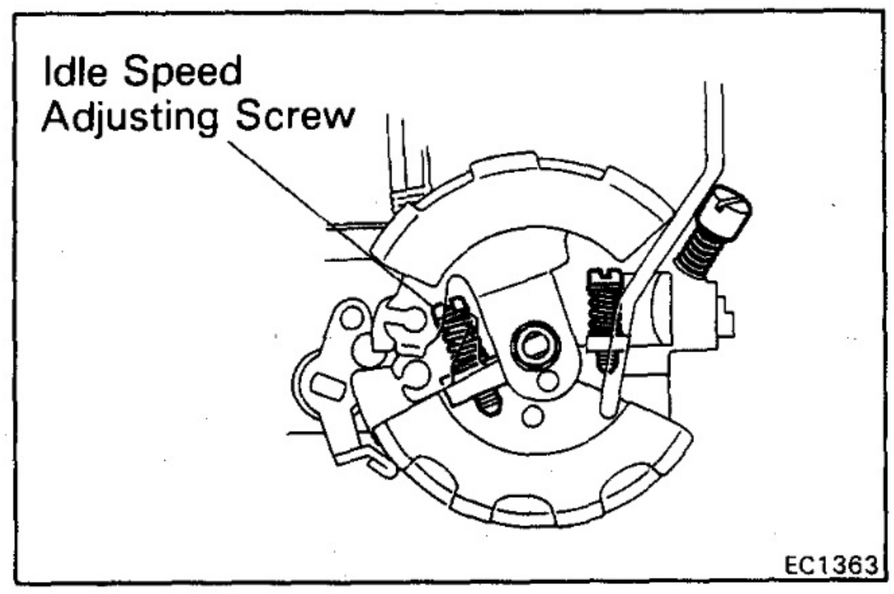
(i) CO meter operates normally

(j) Vacuum gauge installed




### 3. BREAK OFF IDLE LIMITER CAP, IF INSTALLED



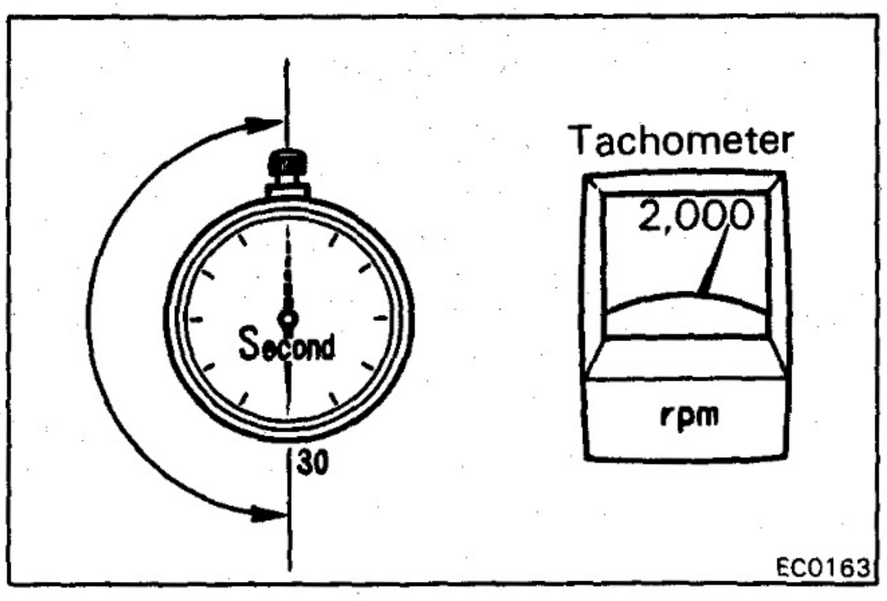




### 4. ADJUST IDLE SPEED

(a) Start the engine.

(b) Turn the idle speed adjusting screw to obtain the specified idle speed.

**Idle speed: M/T 650 rpm**
**A/T 750 rpm**




## 5. MEASURE CO CONCENTRATION

(a) Make sure the CO meter is properly calibrated.

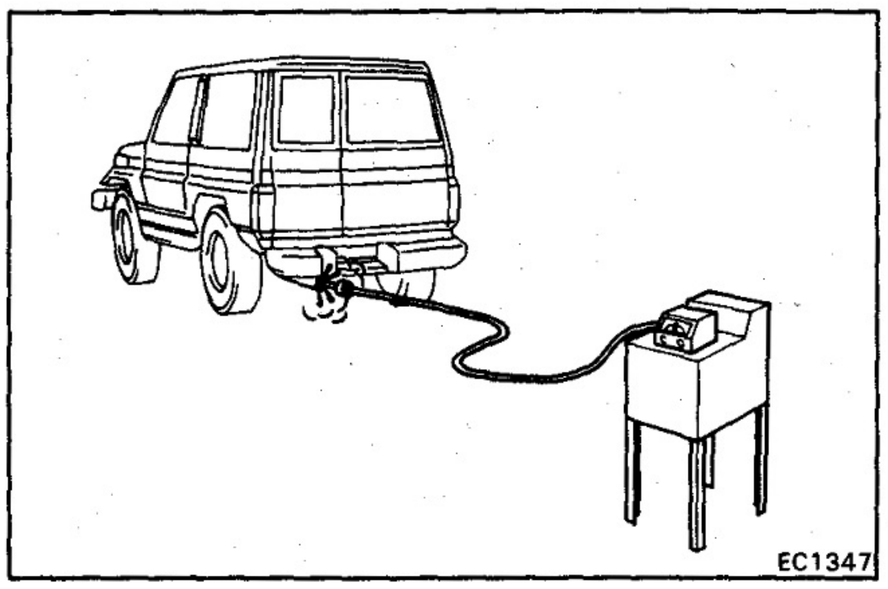
(b) Race the engine for 30 – 60 seconds at about 2,000 rpm before measuring the concentration.

(c) Insert a testing probe at least 40 cm (1.3 ft) into the tailpipe.

(d) Measure the concentration 1 – 3 minutes after racing the engine to allow the concentration to stabilize.

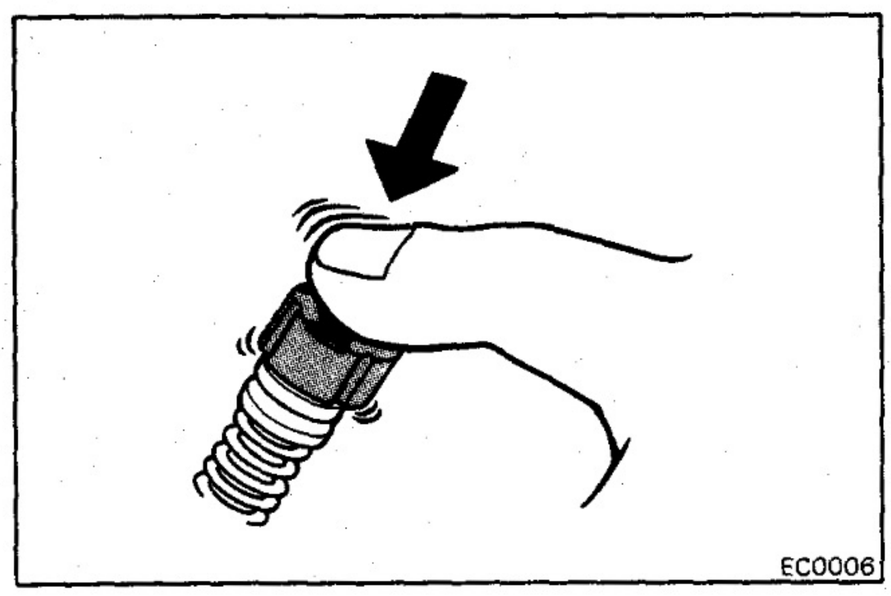
**Idle CO concentration: 1.5 ± 0.5%**

- If the CO concentration is within specification, this adjustment is complete.
- If the CO concentration exceeds specification, or if the engine loses smoothness of operation, repeat the above adjustment.
- If the CO concentration cannot be corrected by an idle mixture adjustment, see the table below for other possible causes.




### TROUBLESHOOTING

| HC | CO | Problems | Causes |
|---|---|---|---|
| High | Normal | Rough idle | 1. Faulty ignition:<br>● Incorrect timing<br>● Fouled, shorted or improperly gapped plugs<br>● Open or crossed ignition wires<br>● Cracked distributor cap<br>2. Leaky exhaust valves<br>3. Leaky cylinder |
| High | Low | Rough idle<br><br>Fluctuating HC reading | 1. Vacuum leak:<br>● Vacuum hose<br>● Intake manifold<br>● PCV line<br>● Carburetor base |
| High | High | Rough idle<br><br>Black smoke from exhaust | 1. Restricted air filter<br>2. Plugged PCV valve<br>3. Faulty carburetion:<br>● Faulty choke action<br>● Incorrect float setting<br>● Leaking needle or seat<br>● Leaking power valve |




## 6. INSTALL NEW LIMITER CAP

After this adjustment is completed, install the idle limiter cap (blue) on the idle mixture adjusting screw.

**CAUTION: After completing adjustment, perform a road test to make certain engine performance has not changed.**

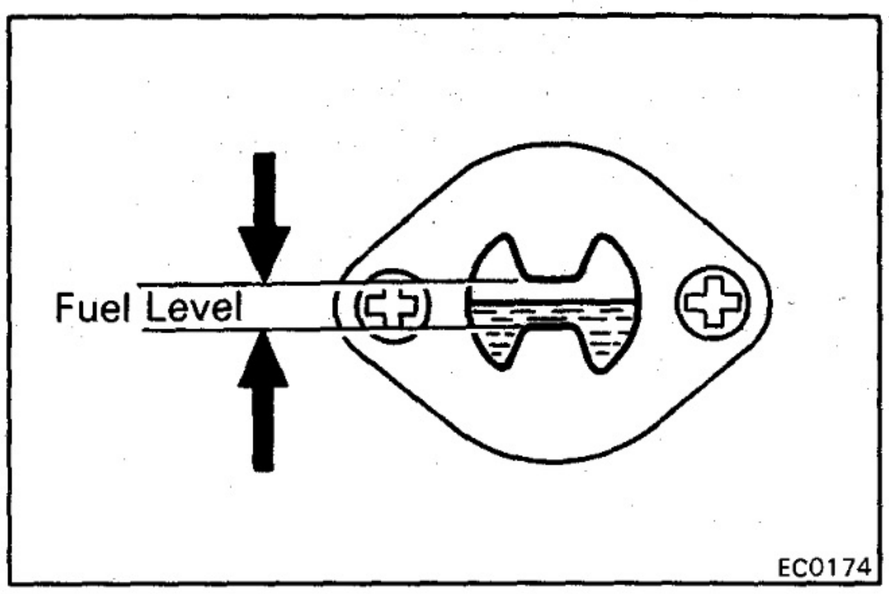
## B. ALTERNATIVE METHOD

**To be used only if CO meter is not available.**

### 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

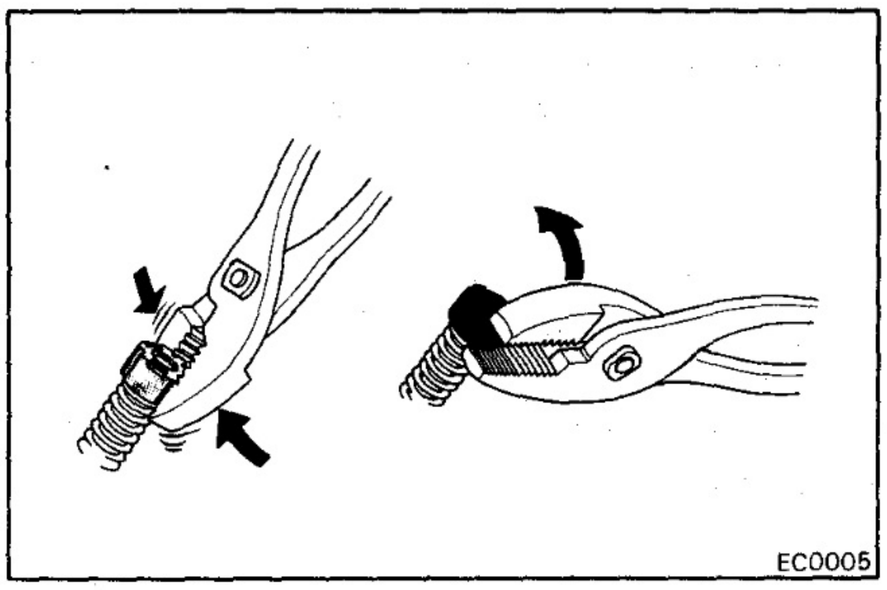
(d) All accessories switched off

(e) All vacuum lines connected

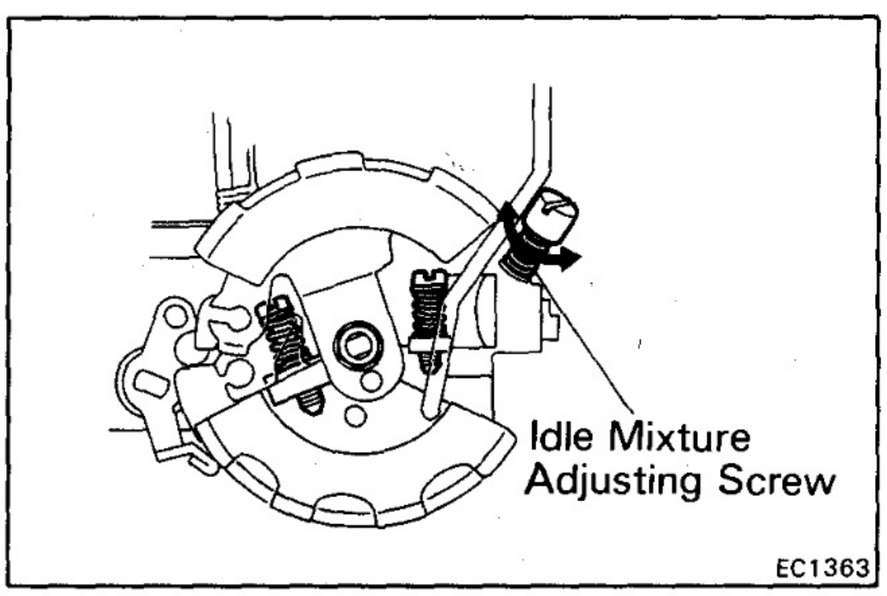
(f) Ignition timing set correctly

(g) Transmission in "N" range

(h) Fuel level should be about even with the correct level in the sight glass



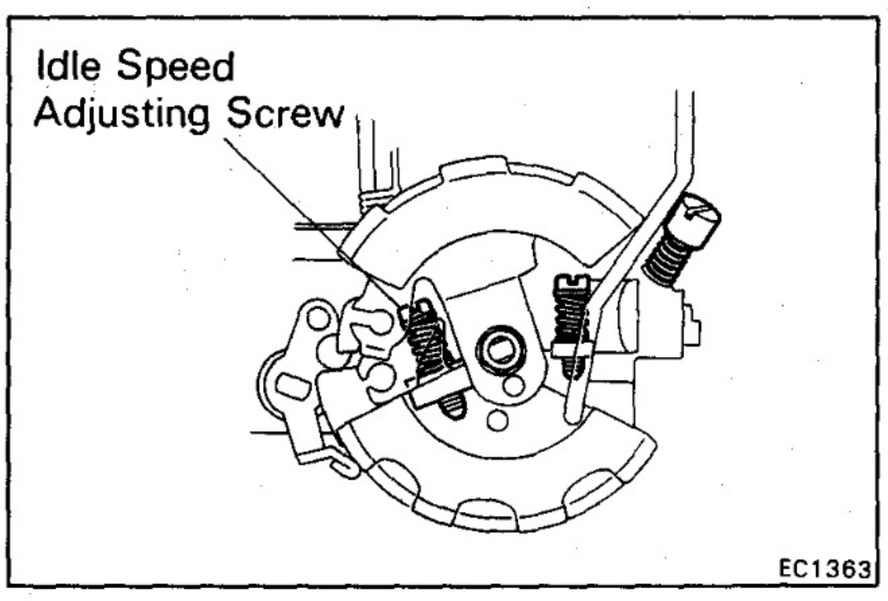

### 3. BREAK OFF IDLE LIMITER CAP, IF INSTALLED




### 4. ADJUST IDLE SPEED AND IDLE MIXTURE

(a) Start the engine.

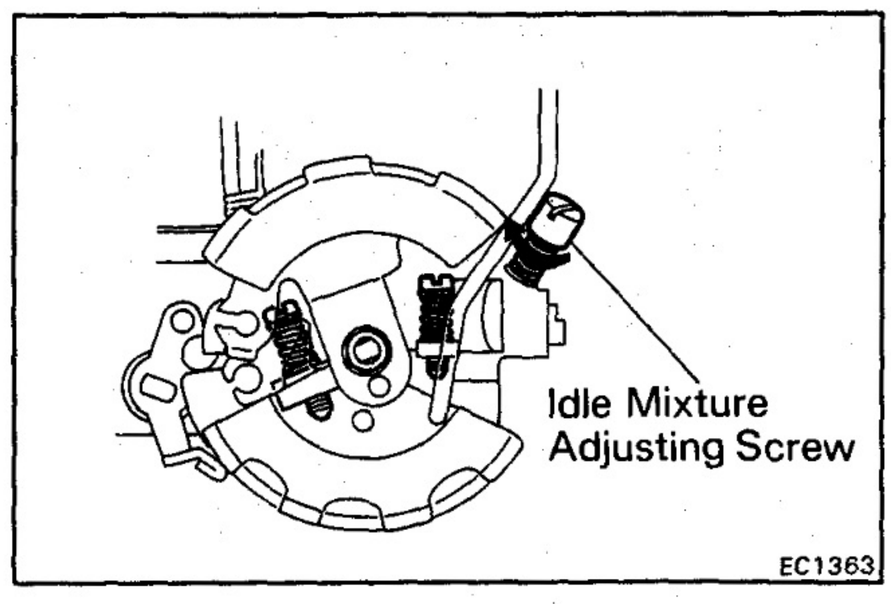
(b) Set to the maximum idle speed by turning the IDLE MIXTURE ADJUSTING SCREW.




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

**Idle mixture speed: M/T 690 rpm**
**A/T 790 rpm**

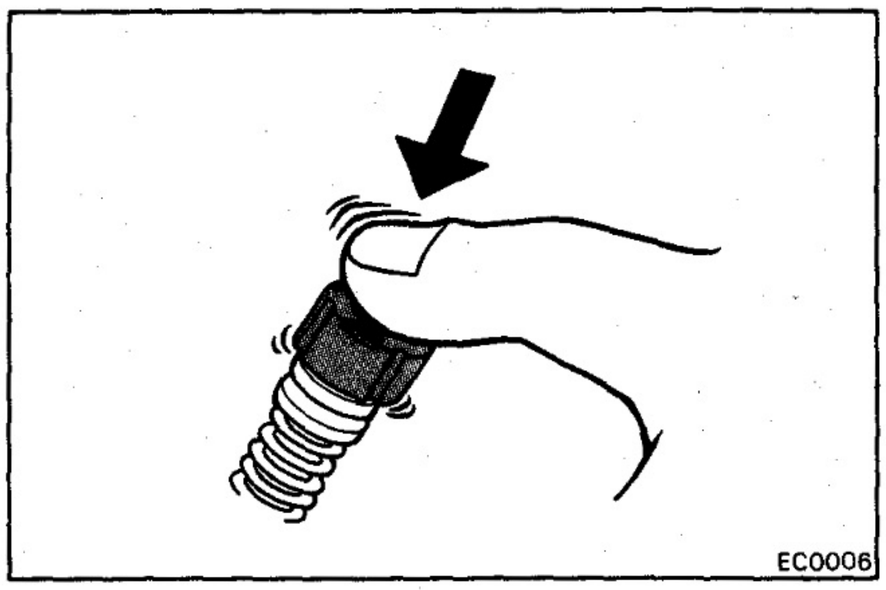
(d) Before moving to the next step, continue adjustments (b) and (c) until the maximum idle speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.




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

**Idle speed: M/T 650 rpm**
**A/T 750 rpm**

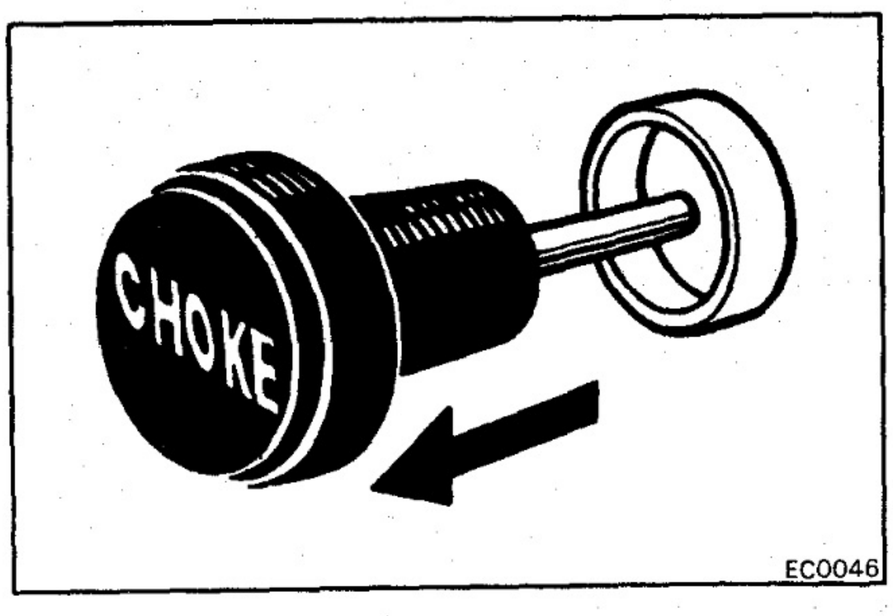
This is the Lean Drop Method for setting idle speed and mixture.




## 5. INSTALL NEW LIMITER CAP

After this adjustment is completed, install the idle limiter cap (blue) on the idle mixture adjusting screw.

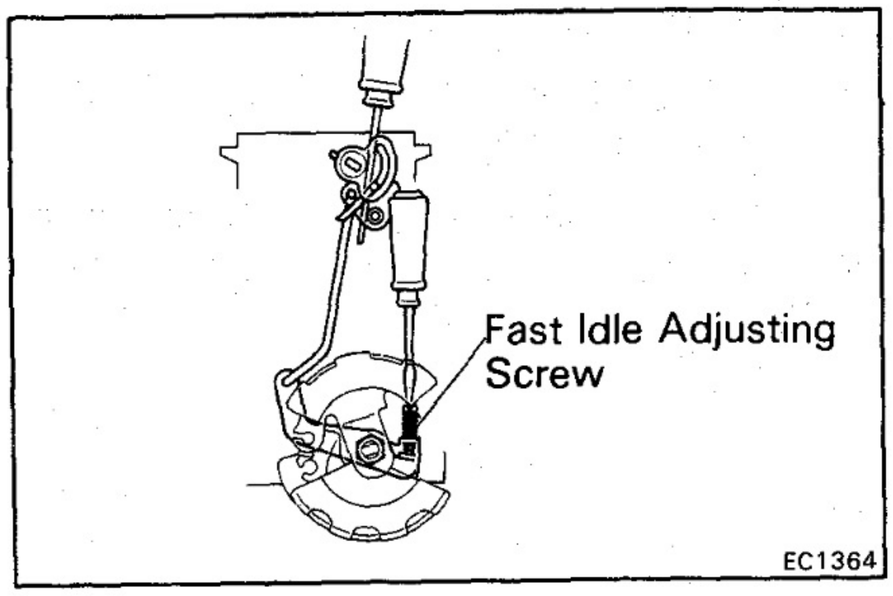
**CAUTION: After completing adjustment, perform a road test to make certain engine performance has not changed.**




# 3. Fast Idle Speed

## ADJUSTMENT OF FAST IDLE SPEED

1. **WARM UP AND STOP ENGINE**
2. **REMOVE AIR CLEANER COVER**
3. **FULLY PULL OUT CHOKE KNOB**




4. **OPEN CHOKE VALVE WITH SCREWDRIVER AND START ENGINE**
5. **ADJUST FAST IDLE SPEED**

   Adjust the fast idle speed by turning the fast idle adjusting screw.

   **Fast idle speed: 1,800 rpm**
6. **INSTALL AIR CLEANER COVER**

# SPECIFICATIONS


| | Page |
|---|---|
| 3Y ENGINE | A-2 |
| 22R ENGINE | A-4 |
| 3F ENGINE | A-6 |

# 3Y ENGINE

| | | |
|---|---|---|
| Engine model | 3Y | |
| Displacement | 1,998 cc | 121.9 cu in. |
| Bore and stroke | 86.0 x 86.0 mm | 3.386 x 3.386 in. |
| Number of cylinders | 4 | |
| Type of cylinder head | OHV | |
| Nominal compression ratio | 8.8 : 1 | |
| Maximum horsepower (EEC) | 65 kw/4,000 rpm | |
| Maximum torque (EEC) | 157 N·m/3,000 rpm<br>(16.0 kg-m/3,000 rpm, 116 ft-lb/3,000 rpm) | |
| Recommended fuel | Regular | |
| Research octane number | 90 | |

# ENGINE TUNE-UP DATA

| | | | | |
|---|---|---|---|---|
| Drive belt deflection with 10 kg (22.0 lb, 98 N) | | | | |
| Fan – Alternator | | New belt | 5 – 7 mm | 0.20 – 0.28 in. |
| | | Used belt | 7 – 8 mm | 0.28 – 0.31 in. |
| Crank – Air conditioner | | New belt | 7 – 9 mm | 0.28 – 0.35 in. |
| | | Used belt | 9 – 13 mm | 0.35 – 0.51 in. |
| Idler – Power steering | | | 7 – 9 mm | 0.28 – 0.35 in. |
| Battery specific gravity | | | | |
| When fully charged at 20°C (68°F) | | | 1.25 – 1.27 | |
| Coolant capacity | w/Front and rear heater | | 10.5 liters | 11.1 US qts 9.2 Imp. qts |
| Engine oil capacity | Dry fill | | 4.2 liters | 4.4 US qts 3.7 Imp. qts |
| | Drain and refill | | | |
| | w/ Oil filter change | | 3.5 liters | 3.7 US qts 3.1 Imp. qts |
| | w/o Oil filter change | | 3.0 liters | 3.2 US qts 2.6 Imp. qts |
| Spark plug | | | | |
| Type | | ND | W16EX-U | |
| | | NGK | BP5EY | |
| Gap | | | 0.7 – 1.0 mm | 0.028 – 0.039 in. |
| Distributor | | | | |
| Dwell angle | | | 52 ± 6° | |
| Rubbing block gap | | | 0.45 mm (reference only) | 0.018 in. |
| Ignition timing | | | 8° BTDC @ Max. 850 rpm | |
| Firing order | | | 1 – 3 – 4 – 2 | |
| Idle speed (at T/M in "N" range) | | | 650 ± 50 rpm | |
| Idle mixture speed (at T/M in "N" range) | | | 700 rpm | |
| TP setting speed | | | 1,200 ± 100 rpm | |
| Fast idle speed | | | 2,600 ± 200 rpm | |
| Idle CO concentration | | | 1.5 ± 0.5 % | |
| Intake manifold vacuum | | at Idle speed | More than 450 mmHg (17.72 in. Hg, 60.0 kPa) | |
| Compression pressure | at 250 rpm | STD | More than 12.5 kg/cm² (178 psi, 1,226 kPa) | |
| | | Limit | 9.0 kg/cm² 128 psi 883 kPa | |
| Difference of pressure between each cylinder | | | Less than 1.0 kg/cm² (14 psi, 98 kPa) | |

NOTE:

- "New belt" refers to a new belt which has never been used.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.

# 22R ENGINE

| | | | |
|---|---|---|---|
| Engine model | | 22R | |
| Displacement | | 2,366 cc | 144.4 cu in. |
| Bore and stroke | | 92.0 x 89.0 mm | 3.622 x 3.504 in. |
| Number of cylinders | | 4 | |
| Type of cylinder head | | OHC | |
| Nominal compression ratio | | 9.0 : 1 | |
| Maximum horsepower (DIN) | RJ | 74 kw/4,800 rpm | |
| | RB | 80 kw/4,800 rpm | |
| Maximum torque (DIN) | RJ | 186 N·m/3,200 rpm<br>(19.0 kg-m/3,200 rpm, 137 ft-lb/3,200 rpm) | |
| | RB | 190 N·m/3,200 rpm<br>(19.4 kg-m/3,200 rpm, 140 ft-lb/3,200 rpm) | |
| Research octane number | | 90 | |

# ENGINE TUNE-UP DATA

| | | | | | |
|---|---|---|---|---|---|
| Drive belt deflection with 10 kg (22.0 lb, 98 N) | | | | | |
| Fan – Alternator | | New belt | 5 – 7 mm | 0.20 – 0.28 in. | |
| | | Used belt | 7 – 10 mm | 0.28 – 0.39 in. | |
| Crank – Air pump | | New belt | 8 – 10 mm | 0.31 – 0.39 in. | |
| | | Used belt | 10 – 14 mm | 0.39 – 0.55 in. | |
| Battery specific gravity | | | | | |
| When fully charged at 20°C (68°F) | | | 1.25 – 1.27 | | |
| Coolant capacity w/Heater or air conditioner | | | | | |
| | RJ | w/ Heater | 10.3 liters | 10.9 US qts | 9.0 Imp. qts |
| | | w/o Heater | 8.1 liters | 8.6 US qts | 7.1 Imp. qts |
| | RB | | 12.0 liters | 12.7 US qts | 10.6 Imp. qts |
| Engine oil capacity | Dry fill | | 4.8 liters | 5.1 US qts | 4.2 Imp. qts |
| | Drain and refill | | | | |
| | w/ Oil filter change | | 4.6 liters | 4.9 US qts | 4.0 Imp. qts |
| | w/o Oil filter change | | 4.0 liters | 4.2 US qts | 3.5 Imp. qts |
| Spark plug | | | | | |
| Type | RJ | ND | W16EXR-U | | |
| | | NGK | BPR5EY | | |
| | RB | ND | W16EX-U | | |
| | | NGK | BP5EY | | |
| Gap | | | 0.8mm | 0.031 in. | |
| Ignition timing | | | 5 ± 2° BTDC @ Max. 850 rpm (w/Vacuum advance cut) | | |
| Firing order | | | 1 – 3 – 4 – 2 | | |
| Valve clearance (hot) | | Intake | 0.20 mm | 0.008 in. | |
| | | Exhaust | 0.30 mm | 0.012 in. | |
| Idle speed | | | 800 rpm | | |
| Idle mixture speed | | | 850 rpm | | |
| Fast idle speed | | RJ | 2,600 ± 200 rpm (w/EGR system, SC system and Choke Opener system OFF) | | |
| | | RB | 2,400 ± 200 rpm | | |
| TP setting speed | | RJ | 1,200 ± 100 rpm | | |
| | | RB | 1,400 ± 100 rpm | | |
| Idle CO concentration | | | 1.5% (w/AI system OFF) | | |
| Intake manifold vacuum | | at Idle speed | More than 400 mm Hg (15.75 in. Hg, 53.3 kPa) | | |
| Compression pressure | at 250 rpm | STD | More than 12.0 kg/cm² (171 psi, 1,177 kPa) | | |
| | | Limit | 10.0 kg/cm² | 142 psi | 981 kPa |
| Difference of pressure between each cylinder | | | Less than 1.0 kg/cm² (14 psi, 98 kPa) | | |

# 3F ENGINE

| | | |
|---|---|---|
| Engine model | 3F | |
| Displacement | 3,955 cc | 241.3 cu in. |
| Bore and stroke | 94.0 x 95.0 mm | 3.701 x 3.740 in. |
| Number of cylinders | 6 | |
| Type of cylinder head | OHV | |
| Nominal compression ratio | 8.1 : 1 | |
| Maximum horsepower (DIN) | 110 kw/4,200 rpm | |
| Maximum torque (DIN) | 284 N·m/2,200 rpm<br>(29.0 kg-m/2,200 rpm, 209 ft-lb/2,200 rpm) | |
| Recommended fuel | Regular | |
| Minimum research octane number | 91 | |

# ENGINE TUNE-UP DATA

| | | | | | |
|---|---|---|---|---|---|
| Drive belt deflection with 10 kg (22.0 lb, 98 N) | | | | | |
| Fan – Alternator | | New belt | 7 – 9 mm | | 0.28 – 0.35 in. |
| | | Used belt | 9 – 12 mm | | 0.35 – 0.47 in. |
| Battery specific gravity | | | | | |
| When fully charged at 20°C (68°F) | | | 1.25 – 1.27 | | |
| Engine oil capacity | | | | | |
| Dry fill | | | 8.0 liters | 8.5 US qts | 7.0 Imp. qts |
| Drain and refill | w/ Oil filter change | | 7.8 liters | 8.2 US qts | 6.9 Imp. qts |
| | w/o Oil filter change | | 7.0 liters | 7.4 US qts | 6.2 Imp. qts |
| Coolant capacity | w/ Heater | FJ7_series | 17.0 liters | 18.0 US qts | 15.0 Imp. qts |
| | | FJ62series | 17.5 liters | 18.5 US qts | 15.4 Imp. qts |
| Spark plug | | | | | |
| Type | | ND | W14EX-U | | |
| | | NGK | BP4EY | | |
| Gap | | | 0.8 mm | | 0.031 in. |
| Distributor | | | | | |
| Dwell angle | | | 41 ± 3° | | |
| Rubbing block gap | | | 0.30 mm (reference only) | | |
| Firing order | | | 1 – 5 – 3 – 6 – 2 – 4 | | |
| Ignition timing | | M/T | 7° BTDC @ 650 rpm | | |
| | | A/T | 7° BTDC @ 750 rpm | | |
| Valve clearance (Hot) | | Intake | 0.20 mm | | 0.008 in. |
| | | Exhaust | 0.35 mm | | 0.014 in. |
| Idle speed | | M/T | 650 ± 50 rpm | | |
| | | A/T | 750 ± 50 rpm | | |
| Idle CO concentration | | | 1.5 ± 1.0 % | | |
| Fast idle speed | | | 1,800 ± 200 rpm | | |
| Intake manifold vacuum | at Idle speed | | More than 420 mmHg (16.54 in. Hg, 56.0 kPa) | | |
| Compression pressure | at 250 rpm | STD | More than 10.5 kg/cm² (149 psi, 1,030 kPa) | | |
| | | Limit | 8.0 kg/cm² | 114 psi | 785 kPa |
| Difference of pressure between each cylinder | | | Less than 1.0 kg/cm² (14 psi, 98 kPa) | | |