

HOW TO USE THIS MANUAL

IN002-09

INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

GENERAL DESCRIPTION

At the beginning of each section, a General Description is given that pertains to all repair operations contained in that section.

Read these precautions before starting any repair task.

TROUBLESHOOTING

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause.

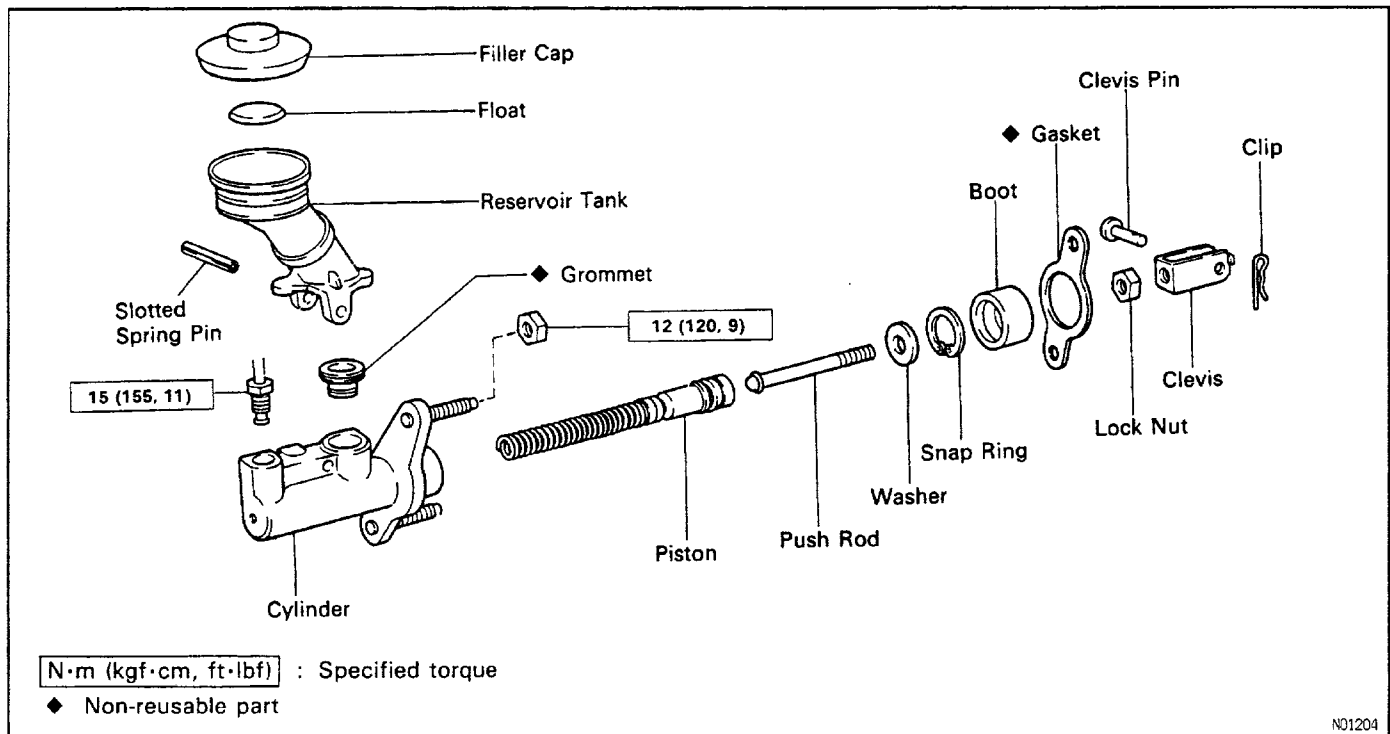
PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

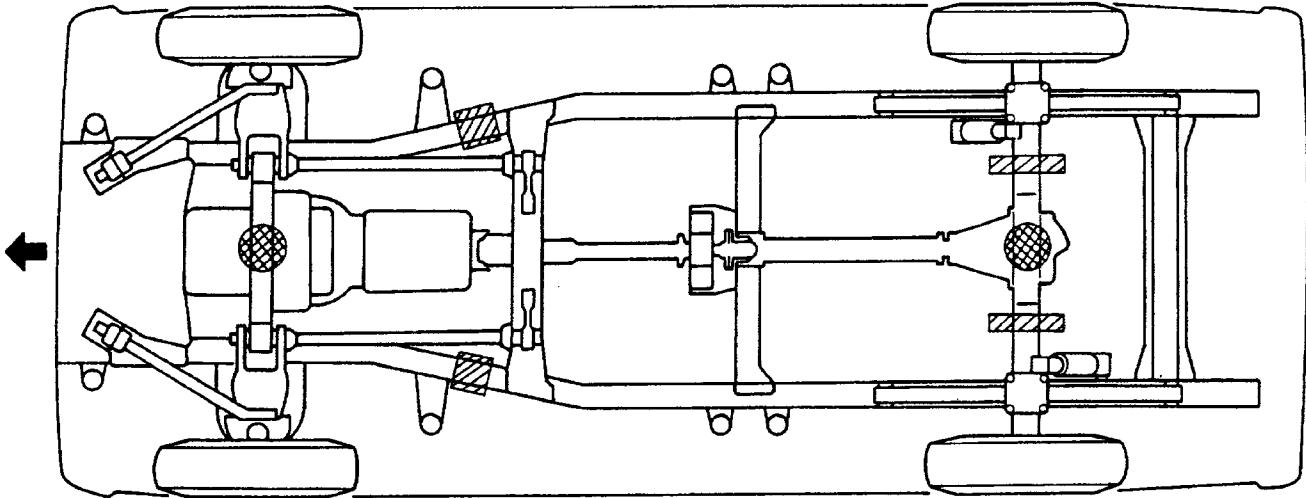
Example:



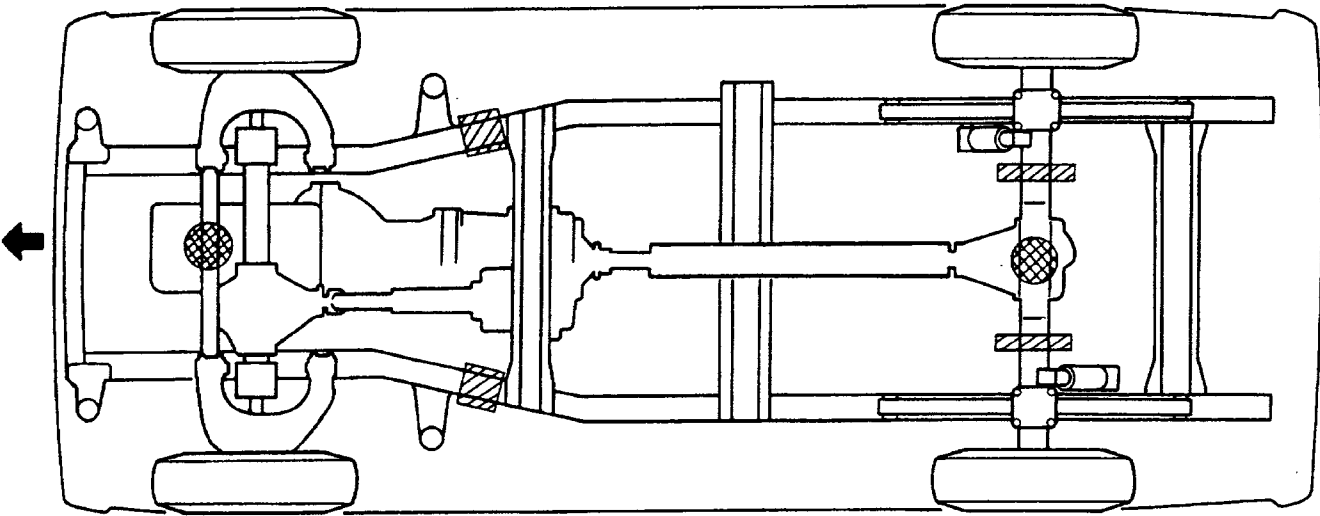
VEHICLE LIFT AND SUPPORT LOCATIONS


IN007-01

[2WD]



[4WD]



JACK POSITION 

Front Center of crossmember

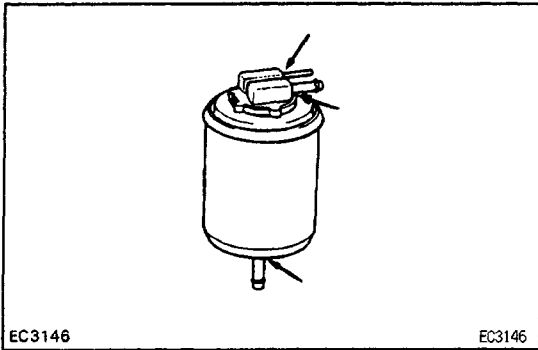
Rear Under the rear differential

SUPPORT POSITION

Safety stand 

IN0012
IN0108

Z04590

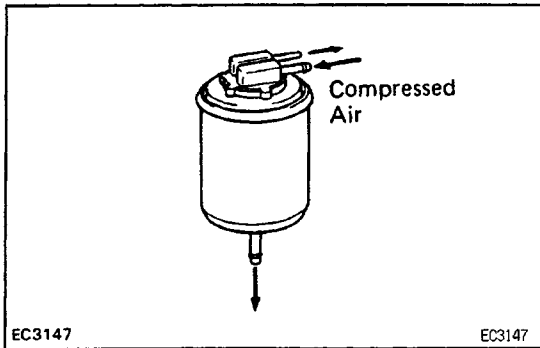


8. INSPECT CHARCOAL CANISTER

(a) Remove charcoal canister.

HINT: Label hoses for correct installation.

(b) Visually inspect canister case.

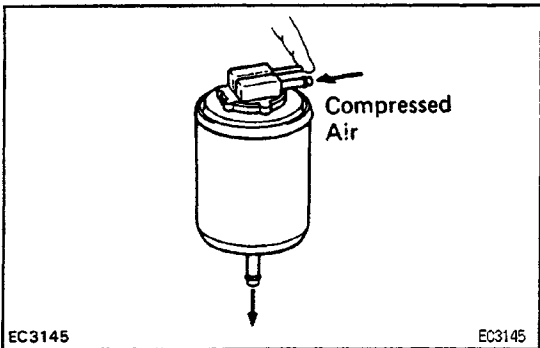


(c) Check for clogged filter and stuck check valve.

(1) Using low compressed air (4.71 kPa (48 gf/cm², 0.68 psi), blow into the tank pipe and check that air flows without resistance from the other pipes.

(2) Blow air (4.71 kPa (48 gf/cm², 0.68 psi) into the purge pipe and check that air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



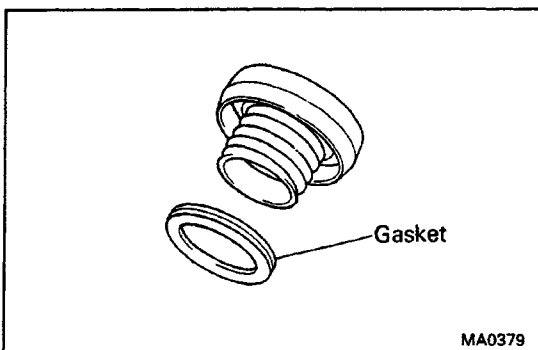
(d) Clean filter in canister.

(1) Clean the filter by blowing 294kPa (3 kgf/cm², 43 psi) of compressed air into the tank pipe while holding the purge pipe closed.

NOTICE:

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

(e) Install charcoal canister.



9. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket (O-ring) from the tank cap.

Do not damage the cap.

(b) Install a new gasket by hand.

(c) Inspect the cap for damage or cracks.

(d) Install the cap and check the torque limiter.

10. INSPECT FUEL LINES AND CONNECTIONS

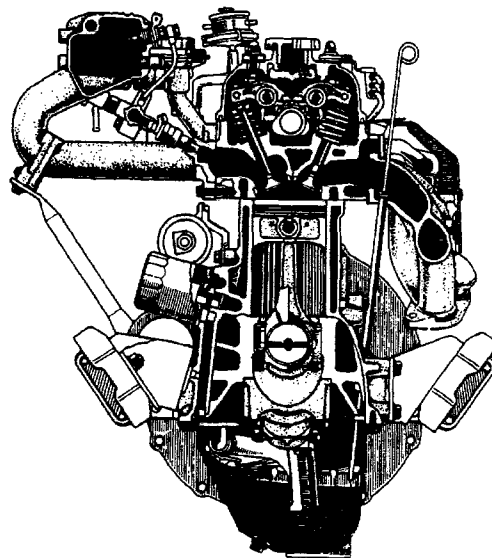
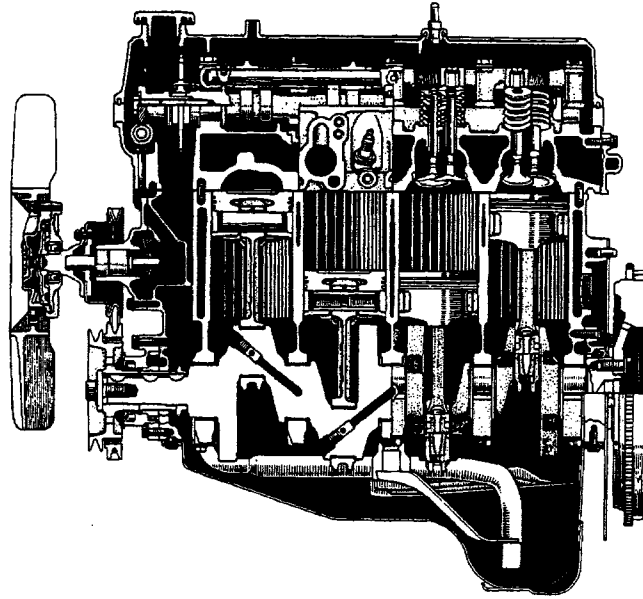
Visually inspect the fuel lines for cracks, leakage loose connections, deformation or tank band looseness.

ENGINE MECHANICAL

DESCRIPTION

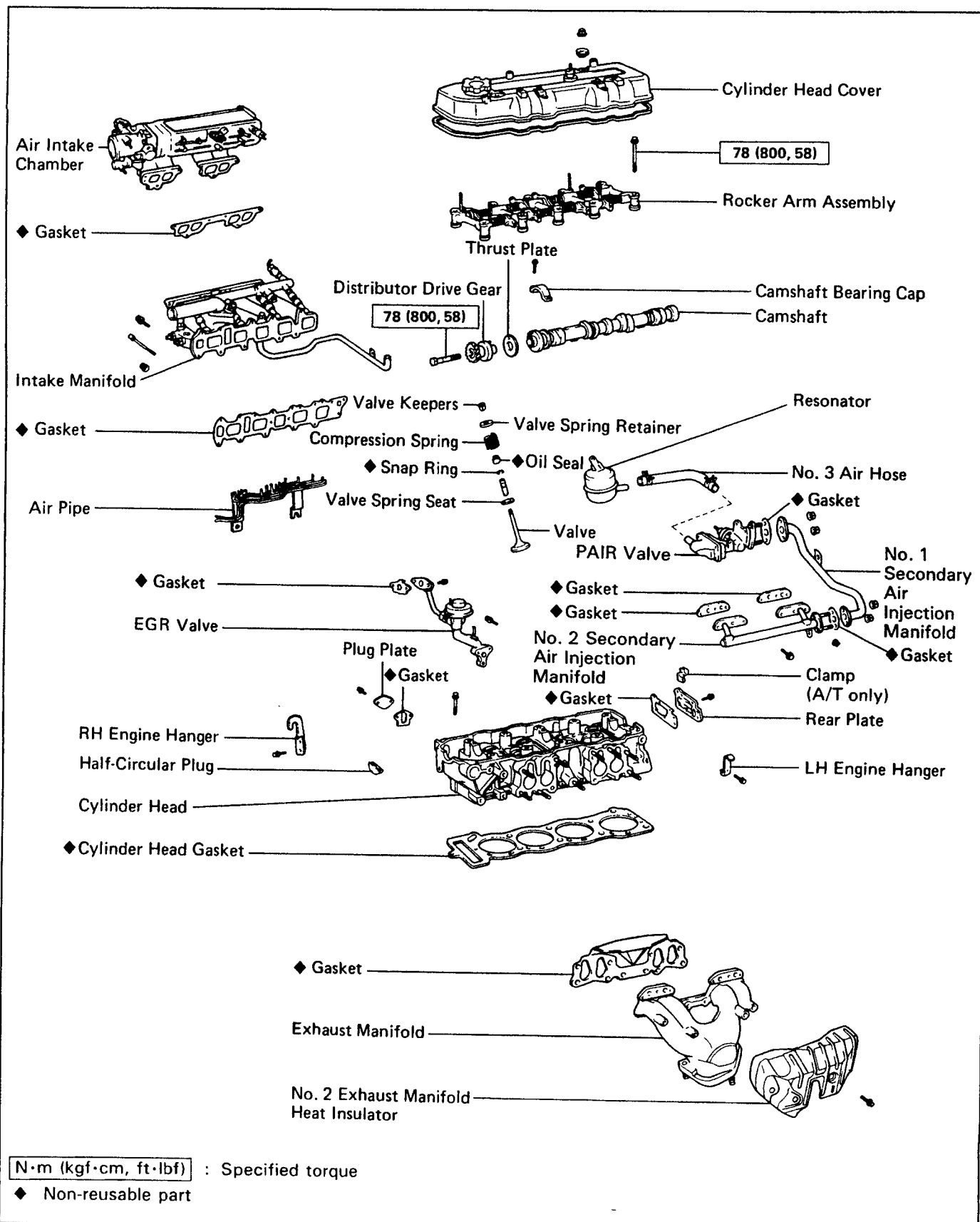
The 22R-E engine is an in-line 4 cylinder 2.4 liter OHC 8 valve engine.

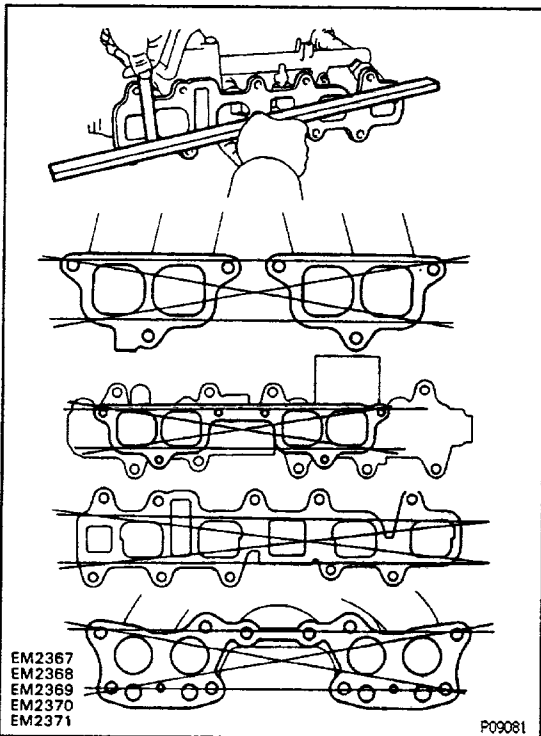
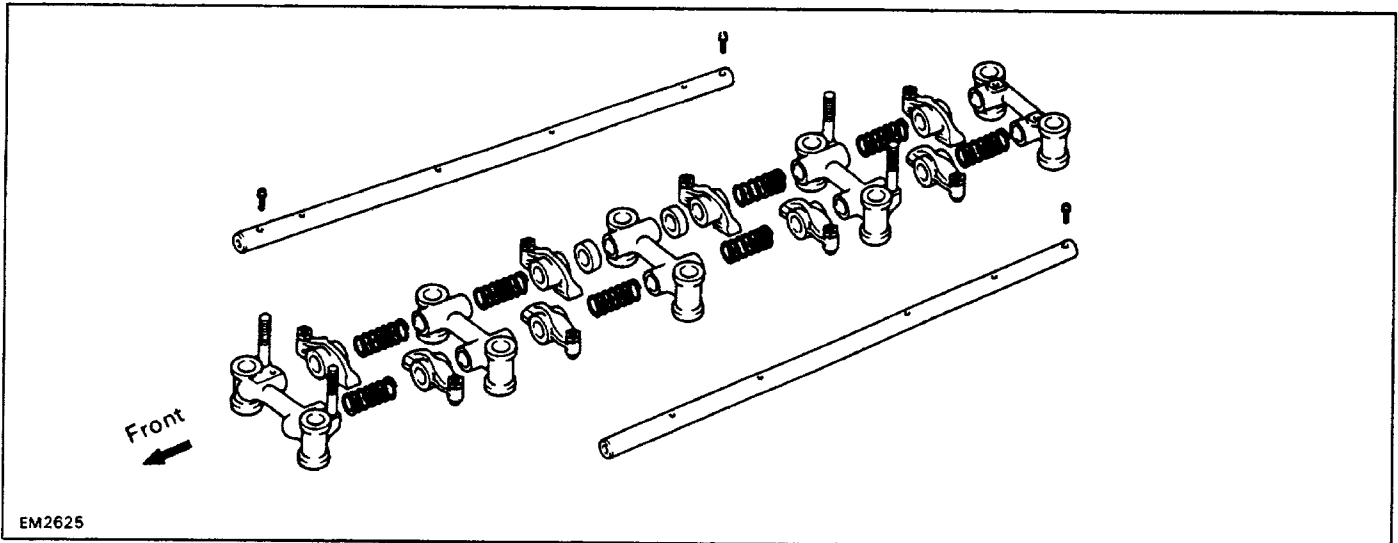
EG1UV-01



CYLINDER HEAD COMPONENTS

EG1VA-01





17. INSPECT INTAKE, EXHAUST MANIFOLDS AND AIR INTAKE CHAMBER

Using a precision straight edge and thickness gauge, check the surface contacting the cylinder head or intake manifold for warpage.

Maximum intake warpage: 0.2 mm (0.008 in.)

Maximum exhaust warpage: 0.7 mm (0.28 in.)

**Maximum air intake chamber warpage:
0.2 mm (0.008 in.)**

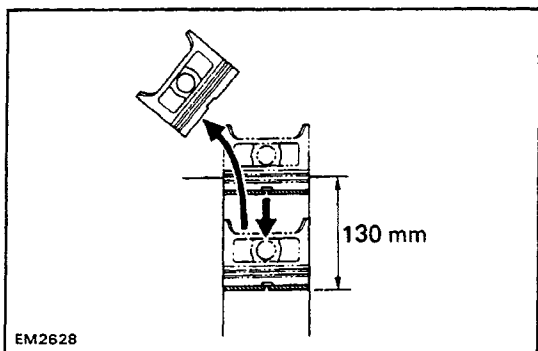
If warpage is greater than maximum, replace the manifold and/or air intake chamber.

CYLINDER HEAD ASSEMBLY

(See page [EG1-15](#))

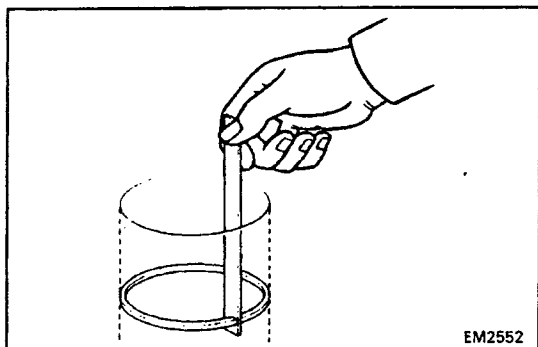
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.



4. MEASURE RING END GAP

- (a) Insert the piston ring into the cylinder.
 (b) Using a piston, push the ring a little beyond the bottom of the ring travel.
 (130 mm (5.12 in.) from top surface of cylinder block)



- (c) Using a thickness gauge, measure the end gap.

Ring end gap:

Standard No.1 0.25 – 0.47 mm

(0.0098 – 0.0185 in.)

No-2 0.60 – 0.82 mm

(0.0236 – 0.0323 in.)

Oil 0.20 – 0.57 mm

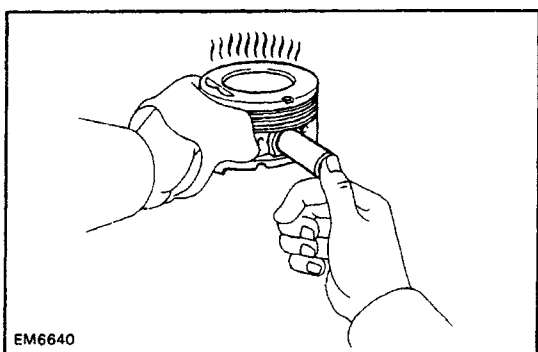
(0.0079 – 0.0224 in.)

Maximum No.1 1.07 mm (0.0421 in.)

No.2 1.42 mm (0.0559 in.)

Oil 1.17 mm (0.0461 in.)

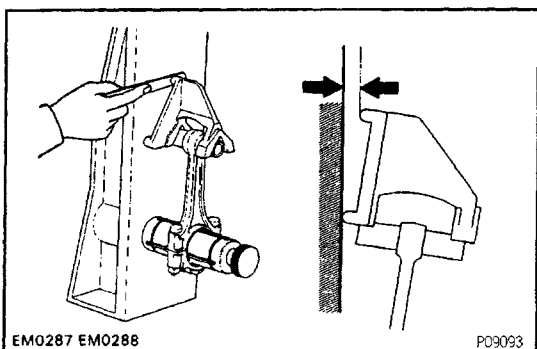
If the gap is greater than maximum, replace the ring.
 Do not file the ring end.



5. INSPECT PISTON PIN FIT

At 80°C (176°F), you should be able to push the pin into the piston with your thumb.

If the pin can be installed at a lower temperature, replace it and the piston.



6. INSPECT CONNECTING RODS

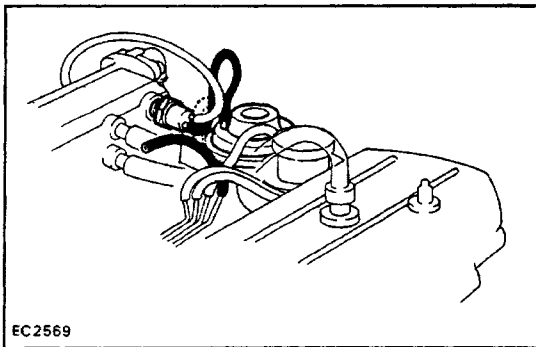
(a) Using a rod aligner, check the connecting rod alignment.

If the rod is bent or twisted, replace the connecting rod.

- Check that the rod is not bent.

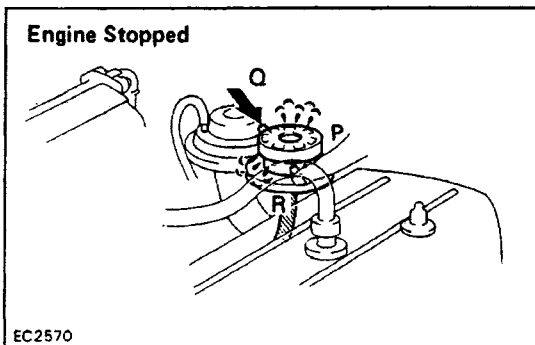
Maximum bend:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)



6. CHECK EGR VALVE

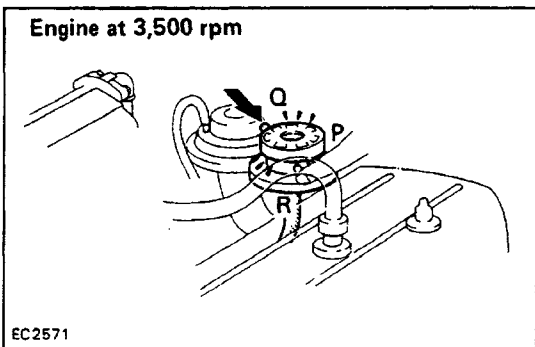
- Apply vacuum directly to the EGR valve with the engine idling.
 - Check that the engine runs rough or dies.
 - Reconnect the vacuum hoses to the proper locations.
- IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART**



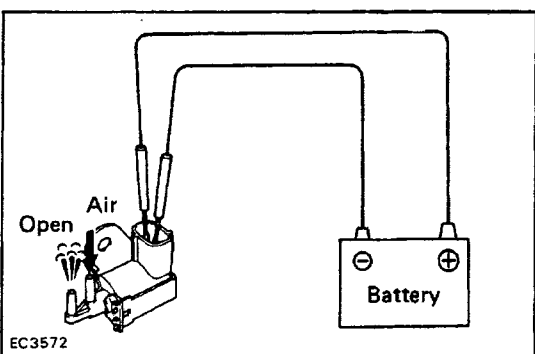
EGR VACUUM MODULATOR INSPECTION

CHECK EGR VACUUM MODULATOR OPERATION

- Disconnect the two vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
- Plug ports P and R with your finger.
- Blow air into port Q. Check that the air passes through to the air filter side freely.



- Start the engine and maintain the speed at 3,500 rpm.
- Repeat the above test. Check that there is a strong resistance to air flow.
- Reconnect the vacuum hoses to the proper locations.

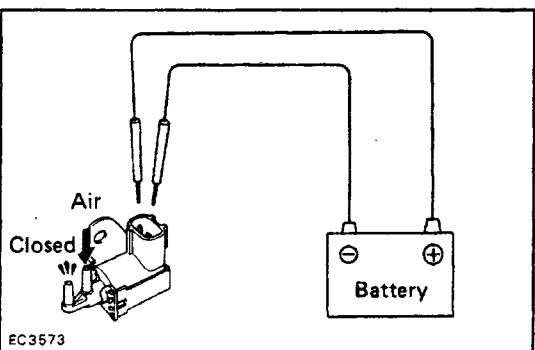


VSV INSPECTION

EG1WQ-01

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

- Connect the VSV terminals to the battery terminals as illustrated.
- Blow air into a pipe and check that the VSV is open.



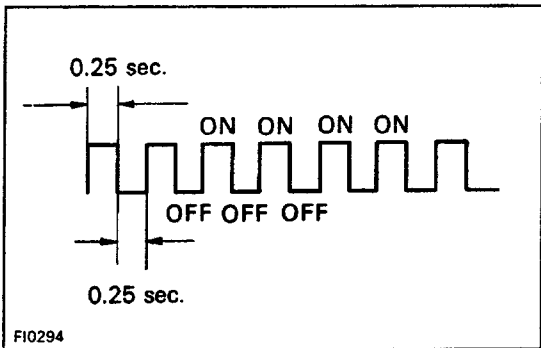
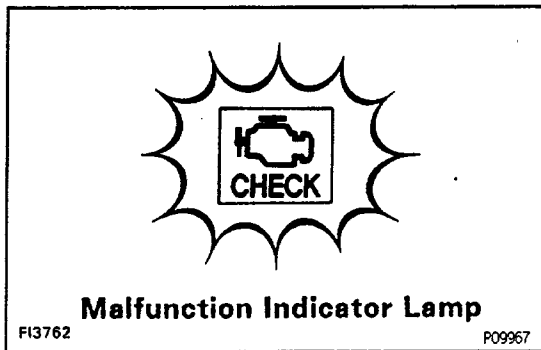
- Disconnect the battery.
- Blow air into a pipe and check that VSV is closed. If a problem is found, replace the VSV.

- (d) Accessories switched OFF.
 (e) Engine at normal operating temperature.
2. Turn the ignition switch ON. Do not start the engine.
3. Using SST, connect terminals TE, and E, of the DLC

1.
 SST 09843-18020

HINT: The DLC1 is located near the No. 2 relay block.

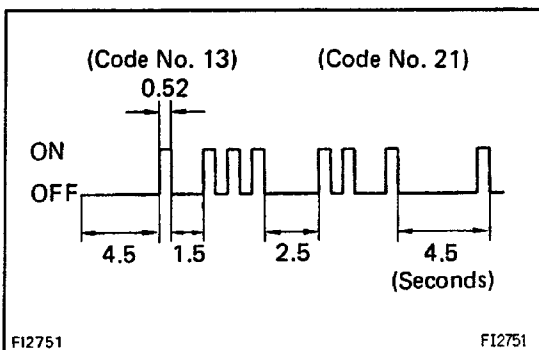
- 4. Read the diagnostic trouble code as indicated by the number of flashes of the Malfunction Indicator Lamp.**



Diagnostic trouble code (See page [EG1-114](#) and 115)

- (a) Normal System Operation

The lamp will blink 2 times per second.



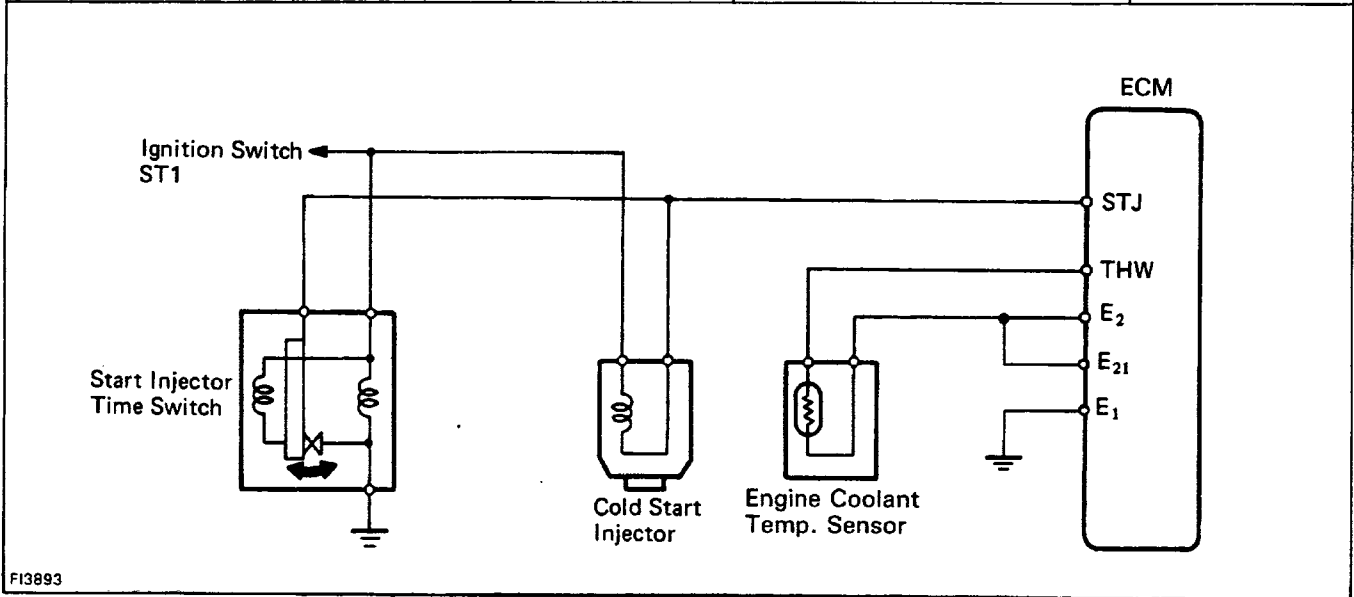
- (b) Malfunction Code Indication

- The lamp will blink a number of times equal to the malfunction code with pauses as follows: 1. Between the first digit and second digit, 1.5 seconds. 2. Between code and code, 2.5 seconds. 3. Between all malfunction codes, 4.5 seconds.

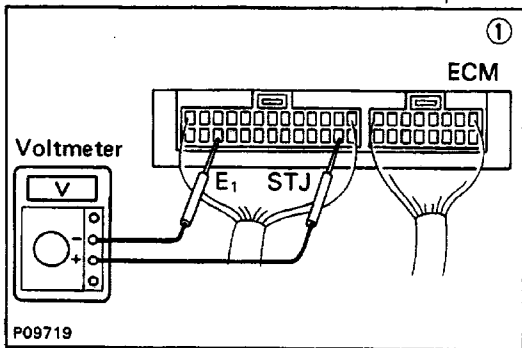
The diagnostic trouble code series will be repeated as long as the DLC1 terminals TE1 and E1 are connected.

HINT: In the event of a number of trouble codes, indication will begin from the small value and continue to the larger in order.

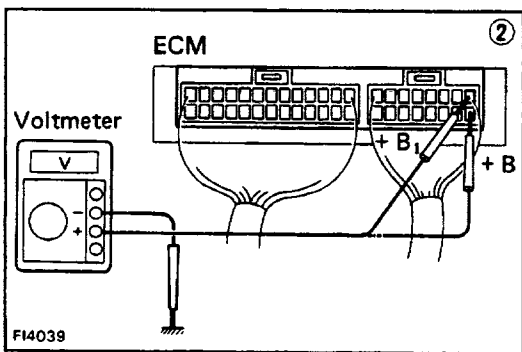
No.	Terminal	Trouble	Condition		STD Voltage
9	STJ - E 1	No voltage	Ignition switch . START position	Coolant temperature 80°C (176° F)	6 -12V



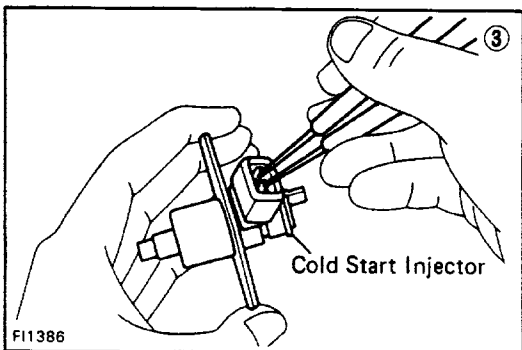
FI3893



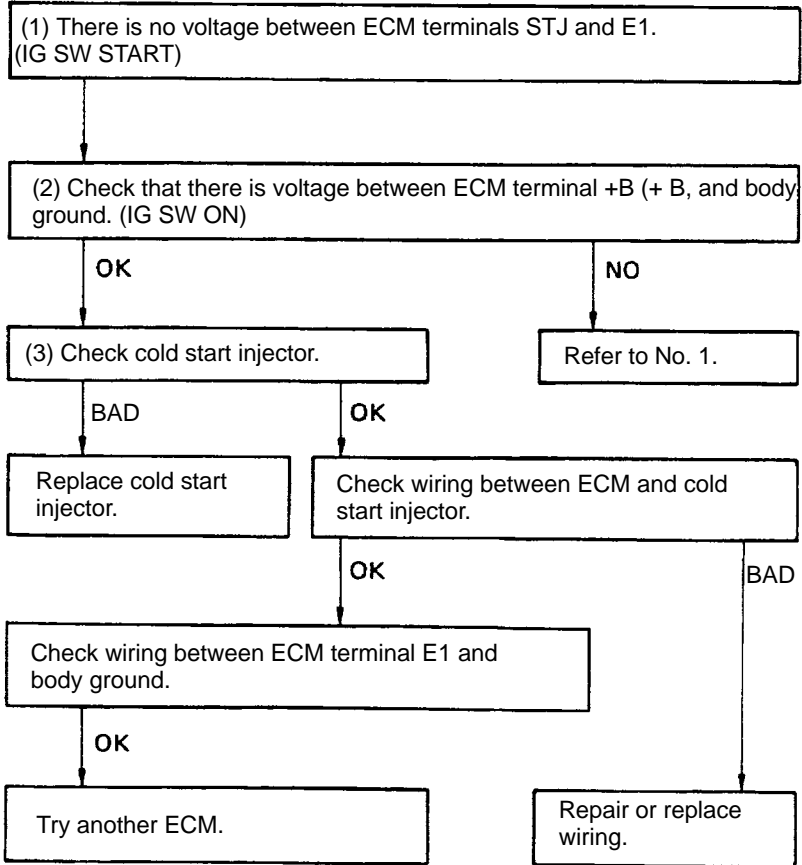
P09719



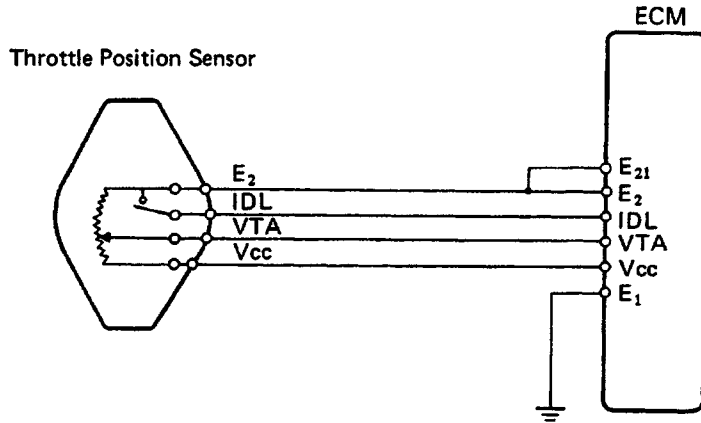
FI4039



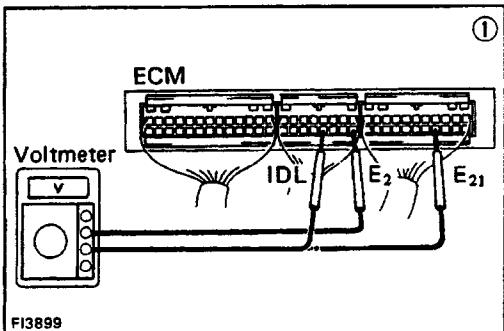
FI1386



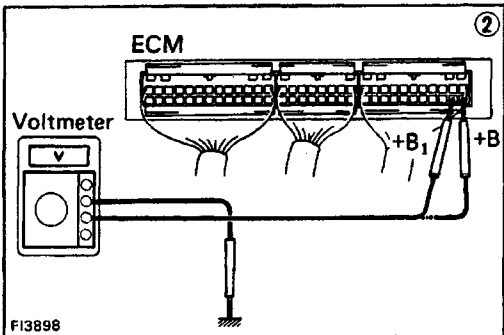
No.	Terminals	Trouble	Condition	STD Voltage	
2	IDL - E ₂ (E ₂₁)	No voltage	Ignition switch ON	Throttle valve open	9 - 14V
	Vcc - E ₂ (E ₂₁)			-	4.5 - 5.5 V
	VTA - E ₂ (E ₂₁)			Throttle valve fully dosed	0.3 - 0.8 V
				Throttle valve fully open	3.2 - 4.9 V



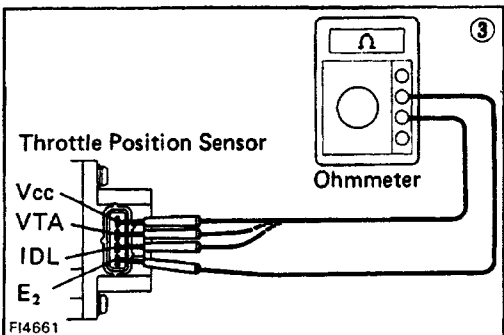
F13877



F13899



F13898



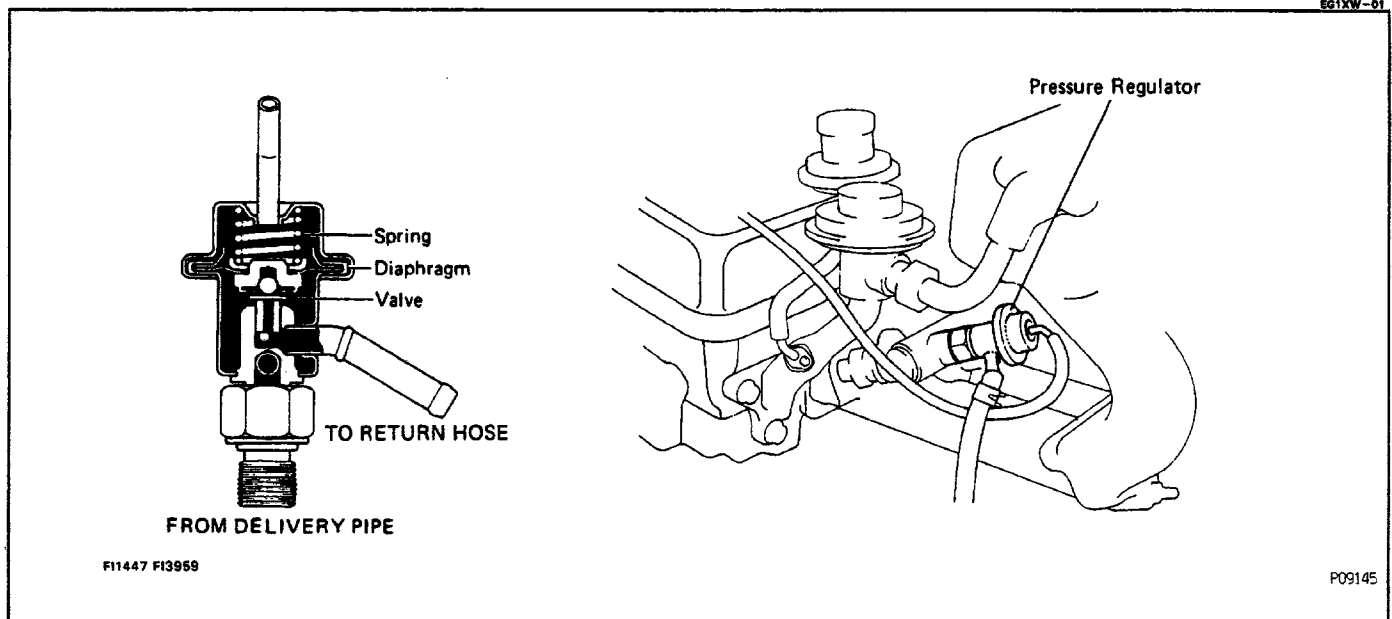
F14661

• IDL - E2 (E21)

```

    graph TD
      A["(1) There is no voltage between ECM terminals IDL and E2 (E21).  
(IG SW ON) (Throttle valve open)"] --> B["(2) Check that there is voltage between ECM terminal + B (+ B1)  
and body ground. (IG SW ON)"]
      B -- NO --> C["Refer to No. 1."]
      B -- OK --> D["Check wiring between ECM terminal E1 and body ground."]
      C -- BAD --> E["Replace or repair."]
      C -- OK --> F["(3) Check throttle position sensor."]
      D -- OK --> F
      D -- BAD --> G["Replace or repair."]
      F -- BAD --> H["Replace or repair throttle position sensor."]
      F -- OK --> I["Check wiring between ECM and throttle position sensor."]
      I -- OK --> J["Try another ECM."]
      I -- BAD --> G
  
```

FUEL PRESSURE REGULATOR



ON-VEHICLE INSPECTION

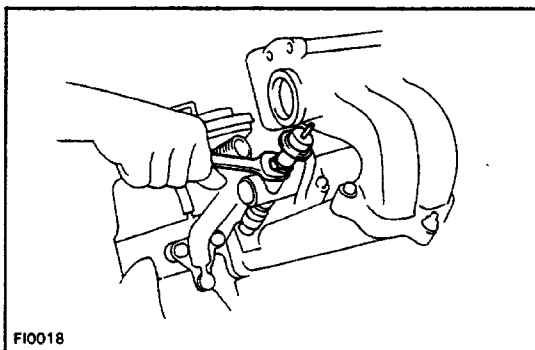
CHECK FUEL PRESSURE (See page [EG1-178](#))

EG1XK-0

PRESSURE REGULATOR REMOVAL

1. DISCONNECT VACUUM SENSING HOSE
2. REMOVE NO. 1 EGR PIPE

EG1XY-01



3. DISCONNECT FUEL HOSE

(a) Put a suitable container or shop towel under the pressure regulator.

(b) Disconnect the fuel hose the pressure regulator.

4. REMOVE PRESSURE REGULATOR

Loosen the lock nut, and remove pressure regulator.

PRESSURE REGULATOR INSTALLATION

1. INSTALL PRESSURE REGULATOR

Install the pressure regulator. Torque the lock nut.

Torque: 29 N-m (300 kgf-cm. 22 ft-lbf)

2. CONNECT FUEL HOSE

3. INSTALL NO. 1 EGR PIPE

Install a new gasket and No. 1 EGR pipe.

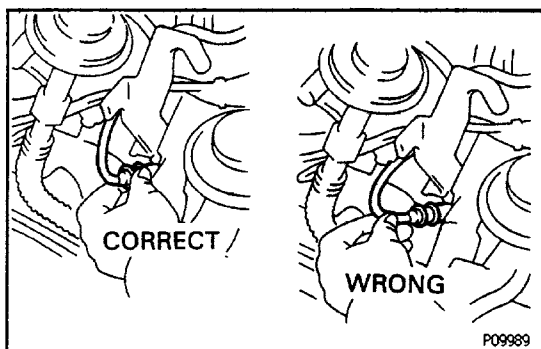
4. CONNECT VACUUM SENSING HOSE

SERVICE SPECIFICATIONS

SERVICE DATA

EG120-01

Pressure regulator	Fuel pressure at No vacuum	265 – 304 kPa 2.7 – 3.1 kgf/cm ² 38 – 44 psi	
Cold start injector	Resistance Fuel leakage	2 – 4 Ω One drop or less per minute	
Injector	Resistance Injection volume Difference between each injector Fuel leakage	13.4 – 14.2 Ω 45 – 55 cm ³ /15 sec. (2.7 – 3.4 cu in.) 6 cm ³ (0.37 cu in.) or less One drop or less per minute	
Volume Air Flow Meter	Resistance $E_2 - V_s$ $E_2 - V_c$ $E_2 - V_b$ $E_1 - F_c$ $E_2 - THA$	20 – 400 Ω (Measuring plate fully closed) 20 – 1,200 Ω (Measuring plate fully open) 100 – 300 Ω 200 – 400 Ω ∞ (Measuring plate fully closed) 0 Ω (Measuring plate open) 10 – 20 k Ω (–20°C, –4°F) 4 – 7 k Ω (0°C, 32°F) 2 – 3 k Ω (20°C, 68°F) 0.9 – 1.3 k Ω (40°C, 104°F) 0.4 – 0.7 k Ω (60°C, 140°F)	
Throttle body	Throttle valve fully closed angle	6°	
Throttle position sensor	Clearance between lever and stop screw	Between terminals	Resistance
	0 mm 0 in.	VTA – E_2	0.47 – 6.1 k Ω
	0.57 mm 0.0224 in.	IDL – E_2	2.3 k Ω or less
	0.85 mm 0.0335 in.	IDL – E_2	Infinity
	Throttle valve fully open position	VTA – E_2	3.1 – 12.1 k Ω
	–	Vcc – E_2	3.9 – 9.0 k Ω
Start injector time switch	Resistance STA – STJ STA – Ground	30 – 50 Ω (below 10°C, 50°F) 65 – 90 Ω (above 30°C, 86°F) 30 – 90 Ω	
Engine coolant temp. sensor	Resistance	10 – 20 k Ω (–20°C, –4°F) 4 – 7 k Ω (0°C, 32°F) 2 – 3 k Ω (20°C, 68°F) 0.9 – 1.3 k Ω (40°C, 104°F) 0.4 – 0.7 k Ω (60°C, 140°F) 0.2 – 0.4 k Ω (80°C, 176°F)	
VSV (FPU)	Resistance at 20°C (68°F)	30 – 50 Ω	

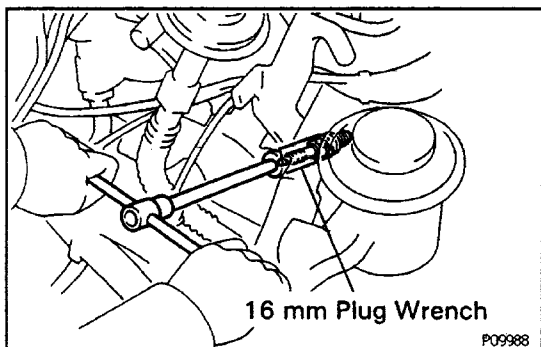


SPARK PLUGS INSPECTION

1. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

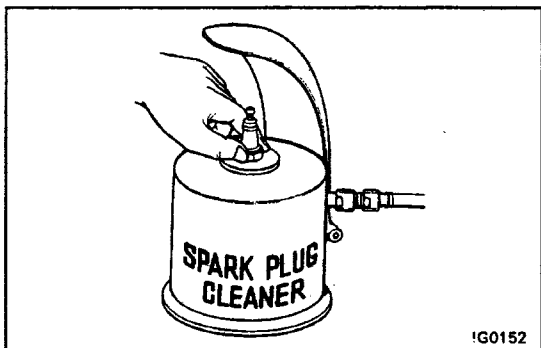
Disconnect the high - tension cords at the rubber boot. Do not pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



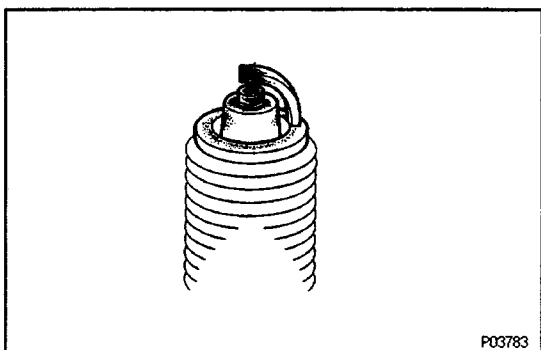
2. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the six spark plugs.



3. CLEAN SPARK PLUGS

Using a spark plug cleaner or wire brush, clean the spark plug.



4. VISUALLY INSPECT SPARK PLUGS

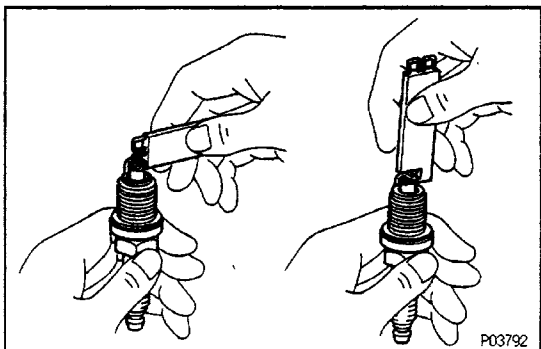
Check the spark plug for electrode wear, thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

K16R- U for ND

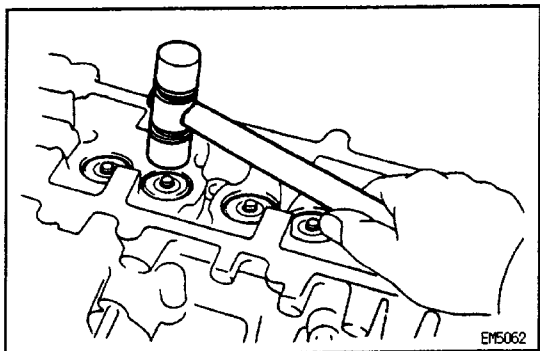
8KR5EYA for NGK



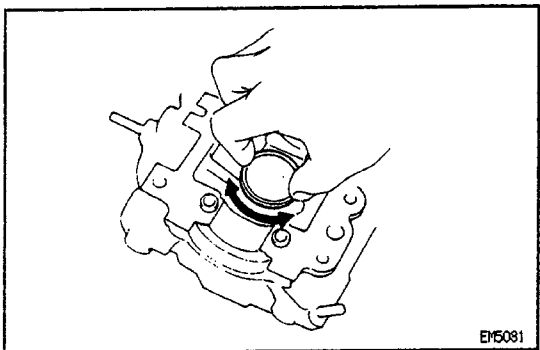
5. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the correct electrode gap.

Correct electrode gap: 0.8 mm (0.031 in.)

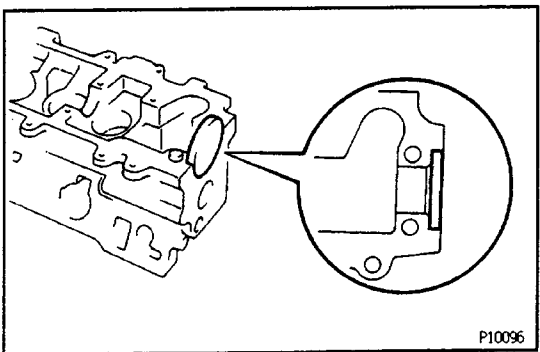


- (d) Using a plastic-faced hammer, lightly tap the valve stem tip to assure proper fit.



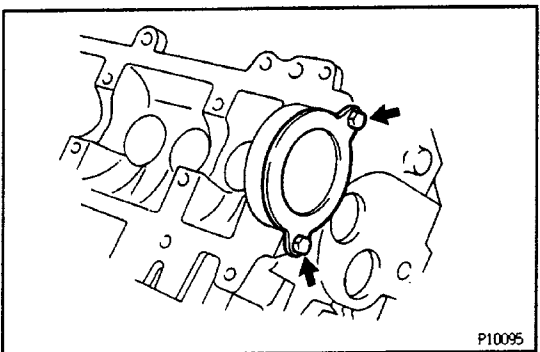
2. INSTALL VALVE LIFTERS AND SHIMS

- (a) Install the valve lifter– and shim.
 (b) Check that the valve lifter rotates smoothly by hand.



3. INSTALL CAMSHAFT HOUSING PLUGS

- (a) Place a new housing plug in position on the cylinder head, facing the cup side inward.



- (b) Install the housing rear plate with the two bolts.
Torque: 4.9 N–m (50 kgf–cm, 43 in.–lbf)