

HOW TO USE THIS MANUAL

To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

An **INDEX** is provided on the first page of each section to guide you to the item to be repaired.

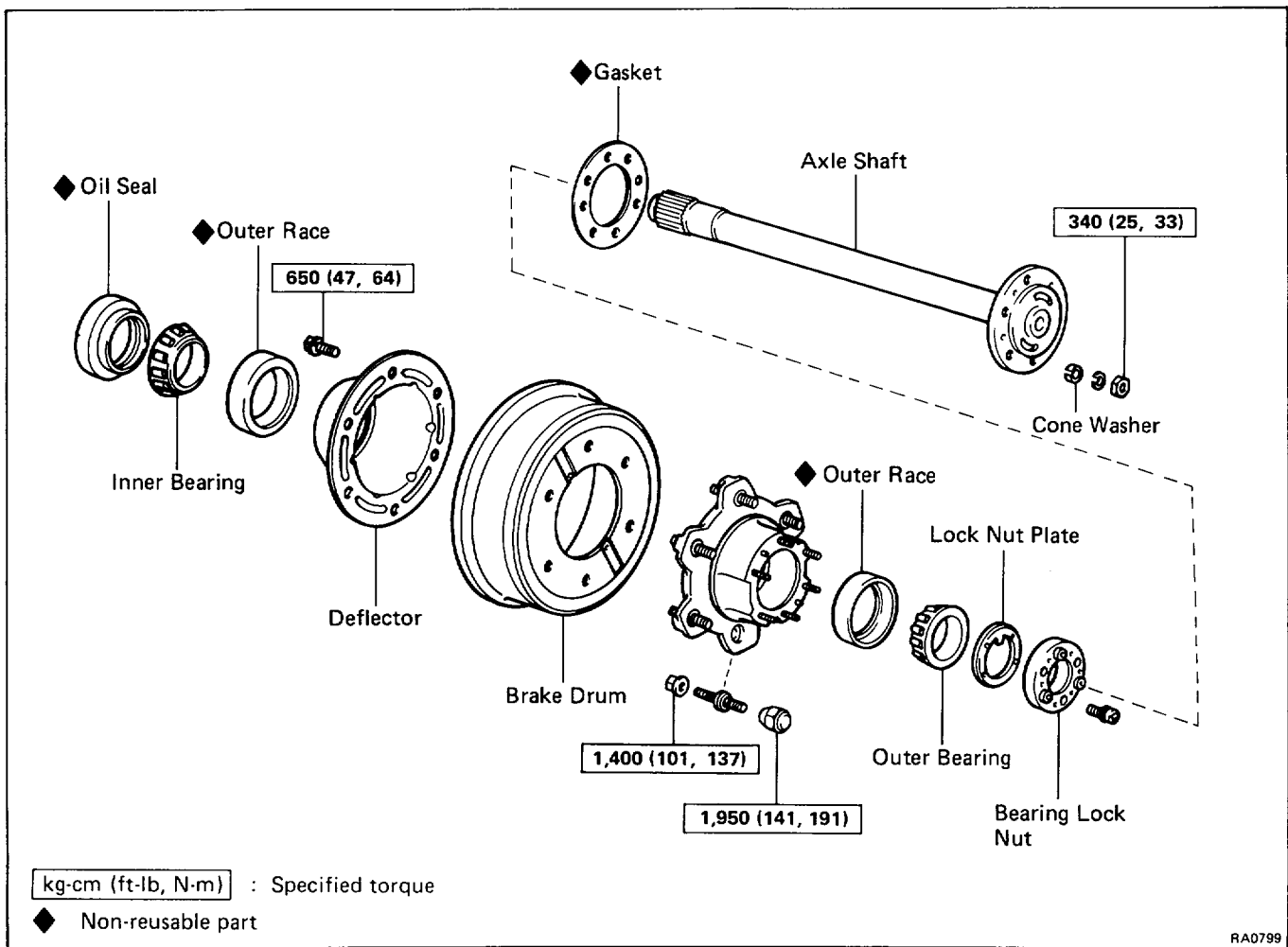
At the beginning of each section, **PRECAUTIONS** are given that pertain to *all* repair operations contained in that section. *Read these precautions before starting any repair task.*

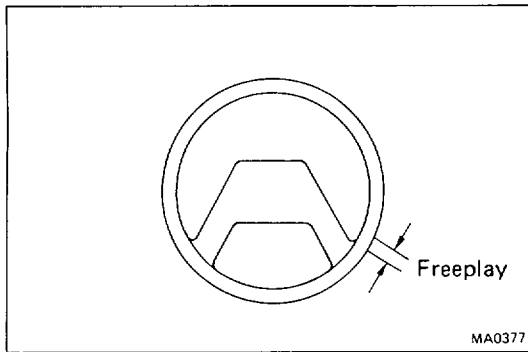
TROUBLESHOOTING tables are included for each system to help you diagnose the system problem and find the cause. The repair for each possible cause is referenced in the remedy column to quickly lead you to the solution.

REPAIR PROCEDURES

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

Example:





CHASSIS

18. INSPECT STEERING LINKAGE

- (a) Check that the steering wheel freeplay is:

Maximum: 30 mm (1.18 in.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

If incorrect, adjust or repair.

- (b) Check the steering linkage for looseness or damage. Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.

19. INSPECT STEERING GEAR HOUSING OIL

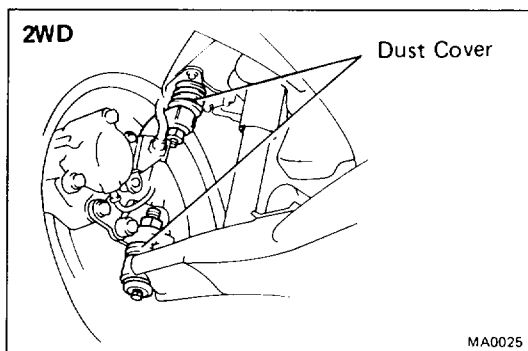
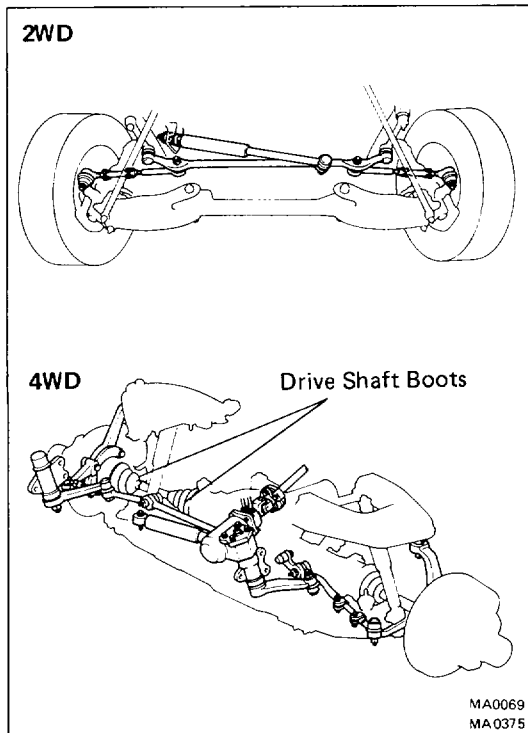
Check the steering gear housing for oil leaks.

If leakage is found, check for cause and repair.

20. (4WD)

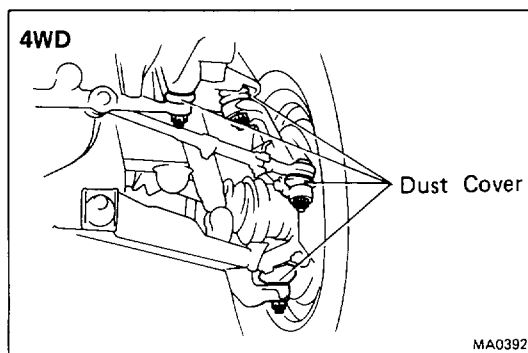
INSPECT DRIVE SHAFT BOOTS

Inspect the drive shaft boots for clamp looseness, grease leakage or damage.



21. INSPECT BALL JOINTS AND DUST COVERS

- (a) Inspect the ball joints for excessive looseness. (See page FA-13)
- (b) Inspect the dust cover for damage.

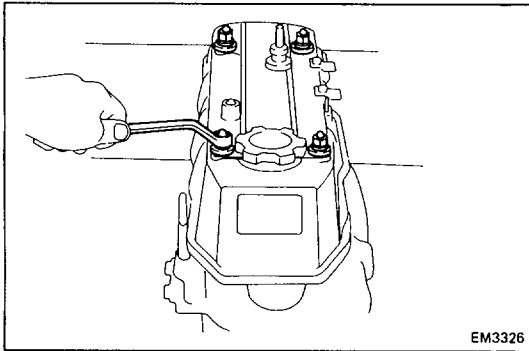


ROUGH IDLING (CONT'D)

Problem	Possible cause	Remedy	Page		
Rough idle or stalls	Carburetor problems	Perform on-vehicle inspection of carburetor	FU-3		
	<ul style="list-style-type: none"> • Idle speed incorrect • Slow jet clogged • Idle mixture incorrect • Fuel cut solenoid valve not open • Fast idle speed setting incorrect (cold engine) • Choke system faulty 				
	HAI system faulty			Check HAI system	EC-59
	Engine overheats			Troubleshoot cooling system	CO-2
	EGR valve faulty			Check EGR valve	EC-36
	MC valve faulty			Check MC valve	EC-34
	Incorrect valve clearance			Adjust valve clearance	MA-8
Low compression	Check compression	EM-12			

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ Poor acceleration	Spark plugs faulty	Inspect plugs	IG-6
	High-tension cords faulty	Inspect cords	IG-6
	Vacuum leaks	Repair as necessary	
	<ul style="list-style-type: none"> • PCV line • EGR line • HAC line • Intake manifold • CMH • MC line 		
	Incorrect ignition timing	Reset timing	IG-15
	Air filter clogged	Check air filter	MA-5
	Fuel line clogged	Check fuel line	
	Carburetor problems	Repair as necessary	FU-4
	<ul style="list-style-type: none"> • Float level too low • Accelerator pump faulty • Power valve faulty • Choke valve closed (hot engine) • Choke system • Secondary throttle stopper operation faulty (cold engine) 		
	CMH system faulty (cold engine)		
	Emission control system problem		
	<ul style="list-style-type: none"> • HAI system always on (hot engine) • AAP system faulty • EGR system always on (cold engine) • HAC system faulty 	Check HAI system	EC-59
	Engine overheats	Check AAP system Check EGR system	EC-66 EC-36
	Low compression	Check HAC system Check cooling system Check compression	EC-54 CO-2 EM-12

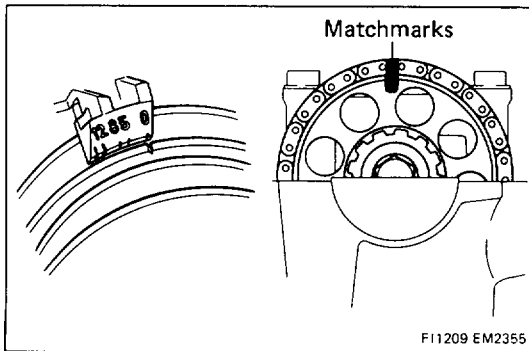


REMOVAL OF CYLINDER HEAD

1. REMOVE HEAD COVER

- (a) Remove the ground strap from the body.
- (b) Remove the four nuts and seals.
- (c) Remove the head cover.

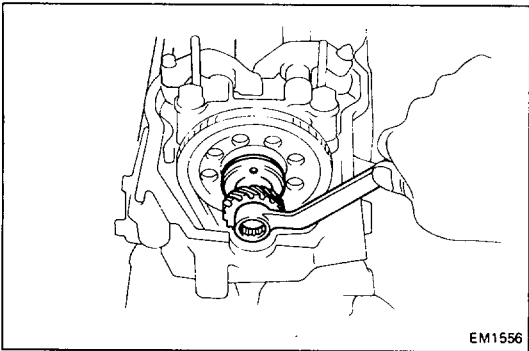
CAUTION: Cover the oil return hole in the head with a rag to prevent objects from falling in.



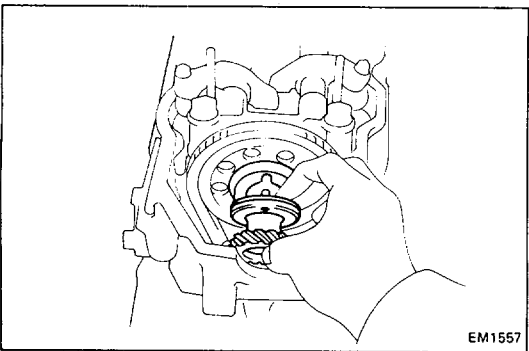
2. REMOVE CAM SPROCKET BOLT

- (a) Turn the crankshaft until the No.1 cylinder position is set at T.D.C. compression.
- (b) Place matchmarks on the sprocket and chain.
- (c) Remove the half-circular plug.

- (d) Remove the cam sprocket bolt.

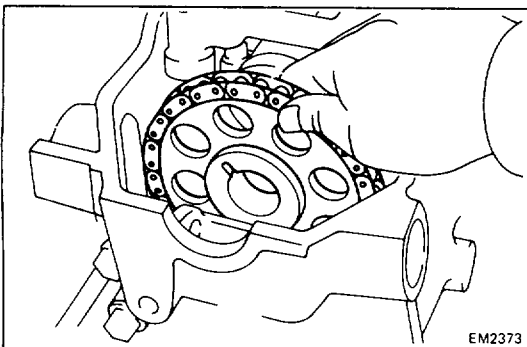


3. REMOVE DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM (22R) OR CAMSHAFT THRUST PLATE (22R-E, 22R-TE)

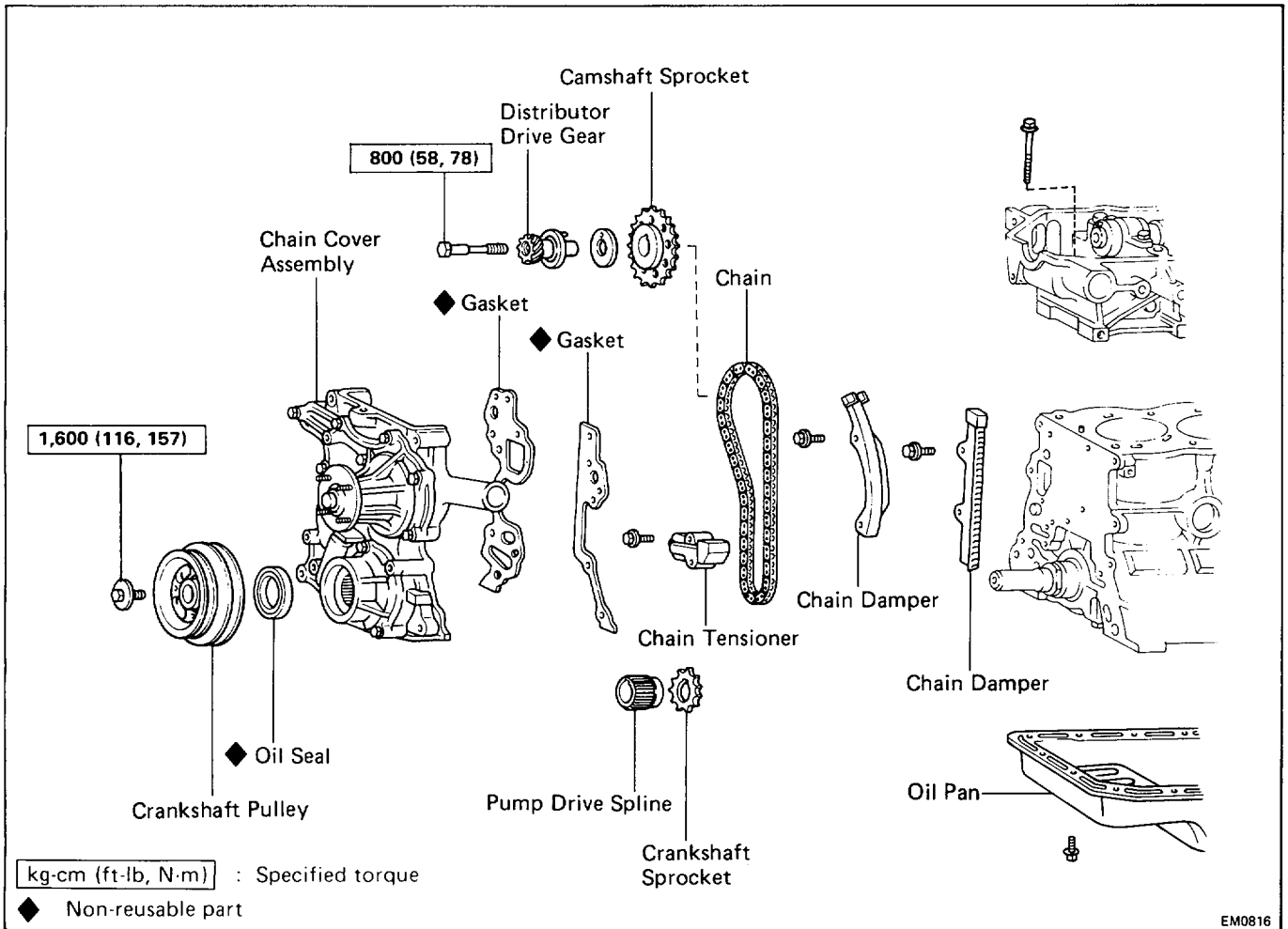


4. REMOVE CAM SPROCKET

Remove the cam sprocket and chain from the camshaft and leave on the vibration damper.



TIMING CHAIN COMPONENTS

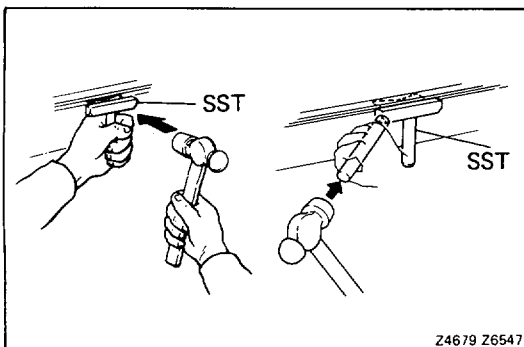


PREPARATION OF REMOVAL

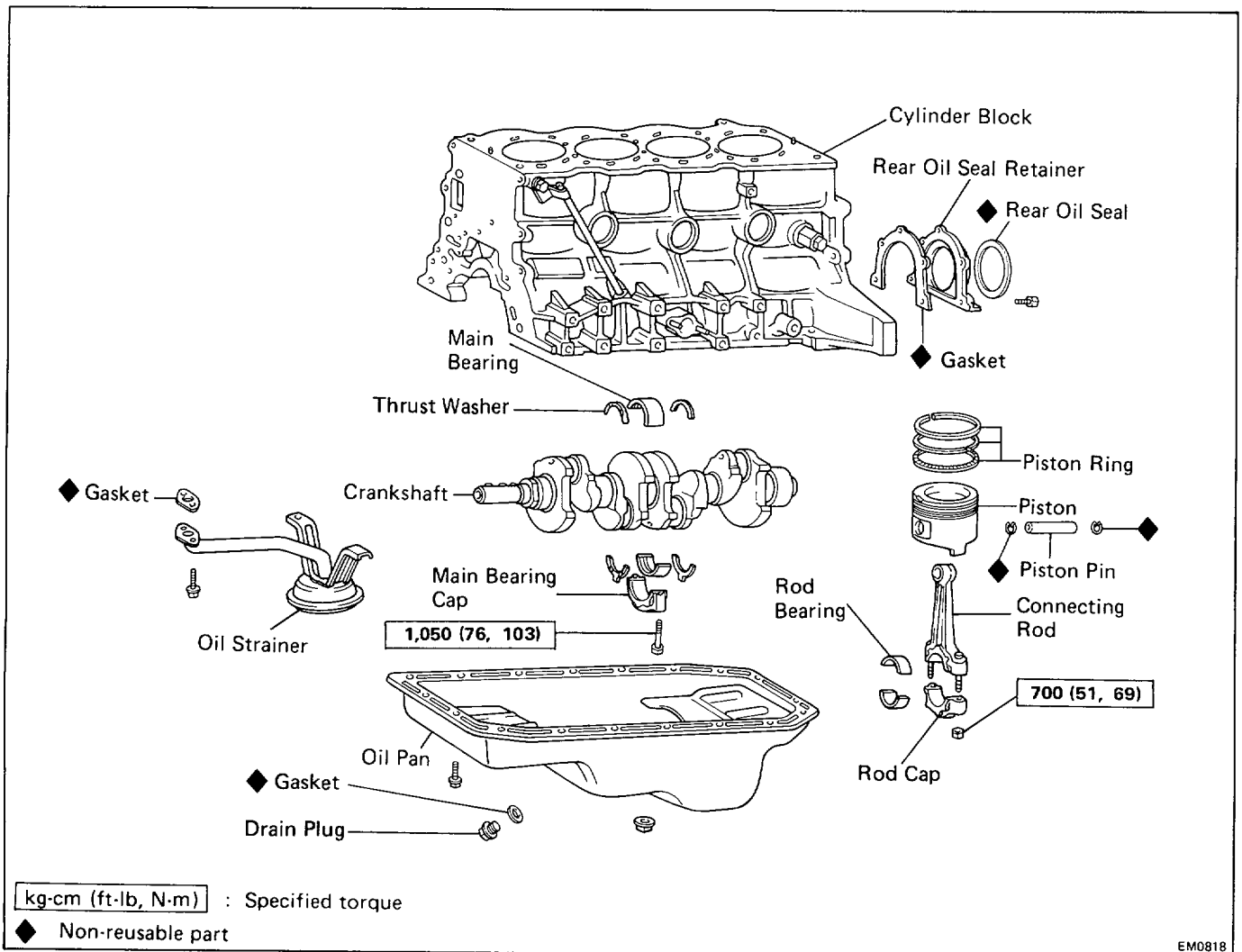
1. REMOVE CYLINDER HEAD
(22R-E, 22R-TE See page EM-14)
(22R See page EM-38)
2. REMOVE RADIATOR
(See page CO-8)
3. REMOVE OIL PAN
 - (a) Remove the engine undercover.
 - (b) Remove the engine mounting bolts.
 - (c) Place a jack under the transmission and raise the engine approx. 25 mm (0.98 in.).
 - (d) Remove the sixteen bolts and two nuts.
 - (e) Using SST and brass bar, separate the oil pan from the cylinder block.

SST 09032-00100

NOTE: When removing the oil pan, be careful not to damage the oil pan flange.

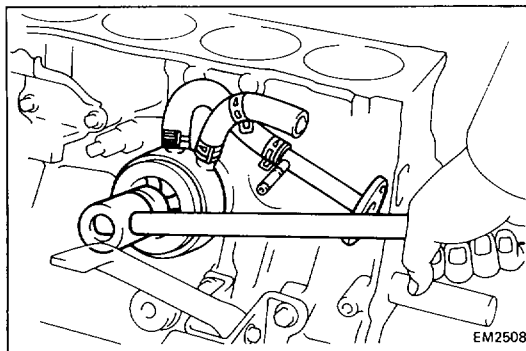
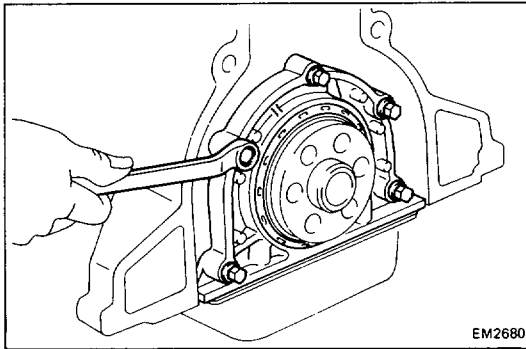
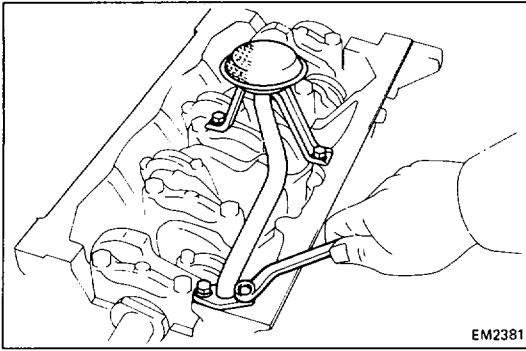


COMPONENTS



PREPARATION FOR DISASSEMBLY

1. (M/T)
REMOVE CLUTCH COVER AND DISC
(See page CL-10)
2. REMOVE FLYWHEEL (M/T) OR DRIVE PLATE (A/T) AND REAR END PLATE
3. INSTALL ENGINE STAND FOR DISASSEMBLY
4. REMOVE CYLINDER HEAD
(See page EM-14)
5. REMOVE TIMING CHAIN (See page EM-45)
6. REMOVE ALTERNATOR (See page CH-5)

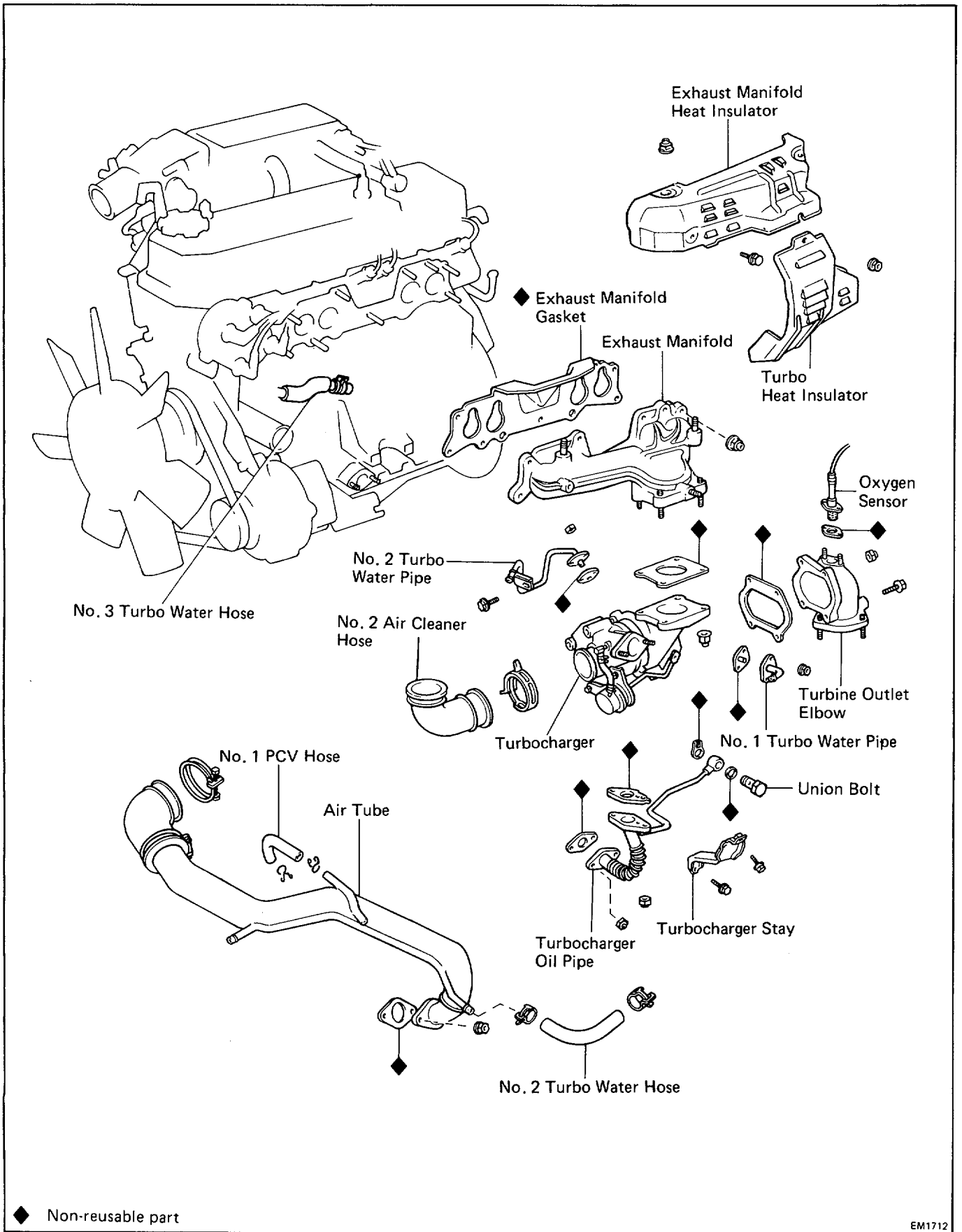


ASSEMBLY OF CYLINDER BLOCK

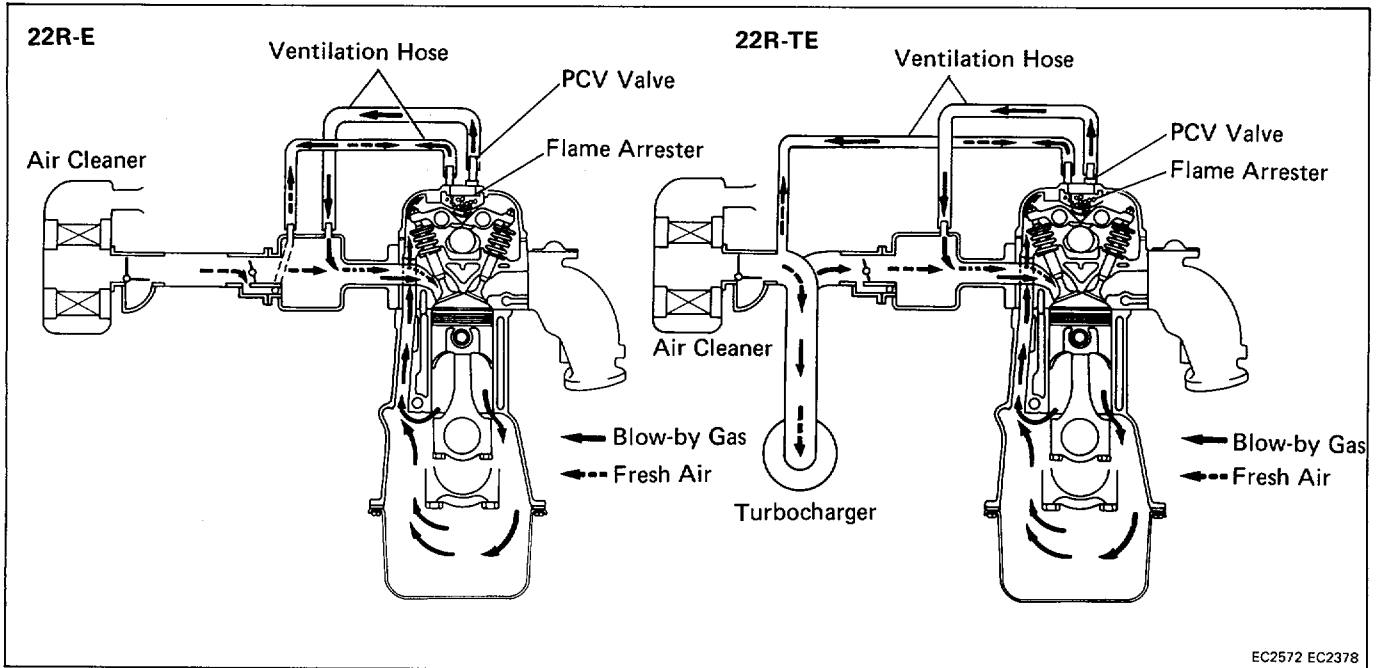
(See page EM-57)

1. **INSTALL OIL STRAINER**
 - (a) Clean the oil strainer.
 - (b) Place the gasket in place and install the oil strainer assembly with four bolts. Torque the bolts.
Torque: 130 kg-cm (9 ft-lb, 13 N·m)
2. **INSTALL REAR OIL SEAL RETAINER**
Install a new gasket and the retainer with the four bolts, Torque the bolts.
Torque: 180 kg-cm (9 ft-lb, 13 N·m)
3. **INSTALL FUEL FILTER BRACKET AND FILTER**
4. **INSTALL KNOCK CONTROL SENSOR**
5. **INSTALL OIL PRESSURE SENDER GAUGE OR SWITCH**
6. (A/T)
INSTALL FLEXIBLE HOSE CLAMP
7. **INSTALL RH ENGINE MOUNTING BRACKET, CHAMBER STAY AND GROUND STRAP**
8. (22R-TE)
INSTALL OIL COOLER
 - (a) Replace the O-ring.
 - (b) Install a new gasket on the oil cooler relief valve.
 - (c) Install the oil cooler with the oil cooler relief valve.
Torque: 450kg-cm (33 ft-lb, 44 N·m)
9. **INSTALL OIL FILTER**
(See page LU-3)
10. **INSTALL CHAIN TENSIONER**
11. **INSTALL CHAIN DAMPERS**
12. **INSTALL ALTERNATOR BRACKET AND LH ENGINE MOUNTING BRACKET**
13. **INSTALL TIMING CHAIN** (See page EM-49)
14. **INSTALL ALTERNATOR**
15. **INSTALL CYLINDER HEAD** (See page EM-32)
16. **REMOVE ENGINE STANDS**
17. **INSTALL REAR END PLATE**
18. **INSTALL FLYWHEEL OR DRIVE PLATE ON CRANKSHAFT**
Install the flywheel or drive plate on the crankshaft with the six bolts. Torque the bolts.
Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)
19. (M/T)
INSTALL CLUTCH DISC AND COVER TO FLYWHEEL
(See page CL-13)

TURBOCHARGER COMPONENTS



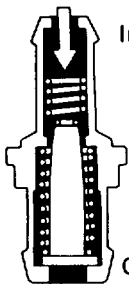
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



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

Engine not Running or Backfiring

22R-E : Engine not running or backfiring.
 22R-TE : Engine not running, backfiring, acceleration or heavy load.



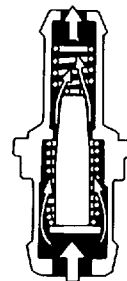
Intake Manifold Side

○PCV VALVE IS CLOSED.

Cylinder Head Side

EC1001

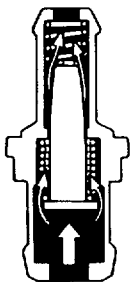
Normal Operation



○PCV VALVE IS OPEN.
 ○VACUUM PASSAGE IS LARGE.

EC1002

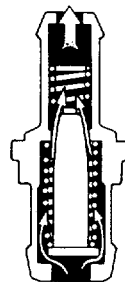
Idling or Decelerating



○PCV VALVE IS OPEN.
 ○VACUUM PASSAGE IS SMALL.

EC1003

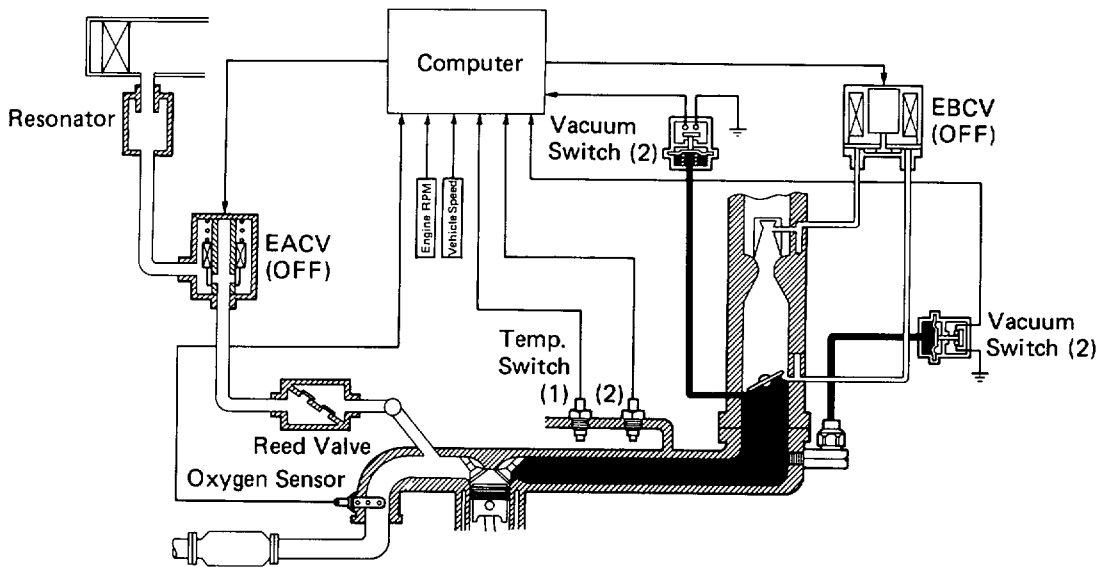
Acceleration or Heavy Load (Ex. 22R-TE)



○PCV VALVE IS FULLY OPEN.

EC1004

FEEDBACK OFF



EC2484

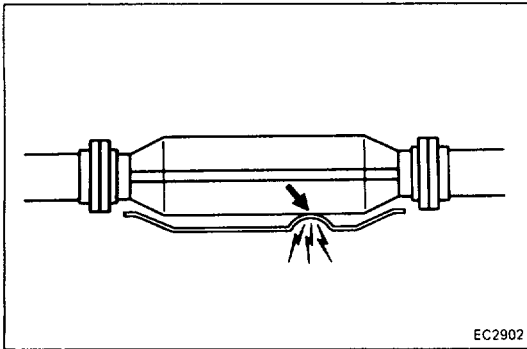
To maintain a stoichiometric air/fuel ratio in order to simultaneously reduce HC, CO and NO_x emissions by the three-way catalyst, consist of the fuel system feedback control system and air suction feedback system.

	*Vacuum Switch		Coolant Temp.	Temp. Switch		Engine RPM	Vehicle Speed	**Oxygen Sensor Signal	EACV		AS		
	(1)	(2)		(1)	(2)								
AS System Feedback Control System	ON	OFF	—	—	—	—	—	—	CLOSED		OFF		
		ON	ON	Below 6°C (43°F)	ON	ON	—	—	—	Always OPEN		Always ON	
				Between 18 – 43°C (64 – 109°F)						OFF	OFF	Below 1,000 rpm	Below 7 mph (11 km/h)
	Above 55°C (131°F)	Above 1,390 rpm	Above 16mph (26km/h)	LEAN	CLOSED	OFF							
	OFF	ON	—	—	—	—	—	—	OPEN		ON		
Fuel System Feedback Control System	*Vacuum Switch		**Oxygen Sensor Signal			EBCV		Fuel Control System					
	OFF		—			CLOSED		OFF					
	ON		RICH			OPEN		ON		***Feedback			
		LEAN			CLOSED		OFF						

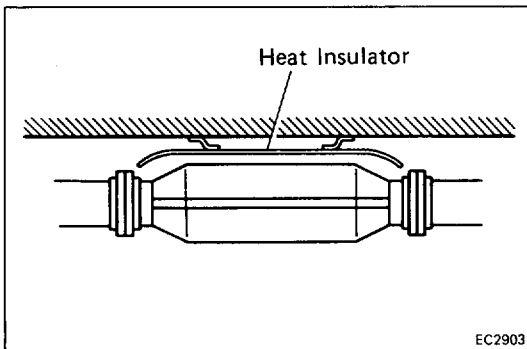
Remarks: * By means of vacuum switch (1), detects deceleration condition.
 By means of vacuum switch (2), detects heavy load driving condition.
 ** Signal of air-fuel ratio of inlet gas for TWC.
 *** By means of Oxygen sensor, detects oxygen concentration in exhaust manifold after combustion.
 If air-fuel ratio is rich for TWC, opens EACV and EBCV. If lean, closes EACV and EBCV.
 Air-fuel ratio RICH → Oxygen sensor RICH → EACV, EBCV open
 EACV, EBCV close ← Oxygen sensor LEAN ← Air-fuel ratio LEAN

INSPECTION OF EXHAUST PIPE ASSEMBLY

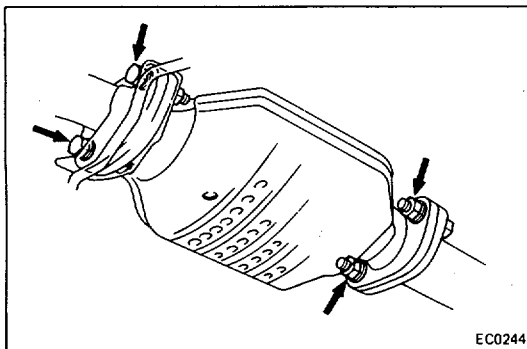
1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

**INSPECTION OF CATALYTIC CONVERTER****CHECK FOR DENTS OR DAMAGE**

If any part of protector is damaged or dented to the extent that it contacts the catalyst, repair or replace it.

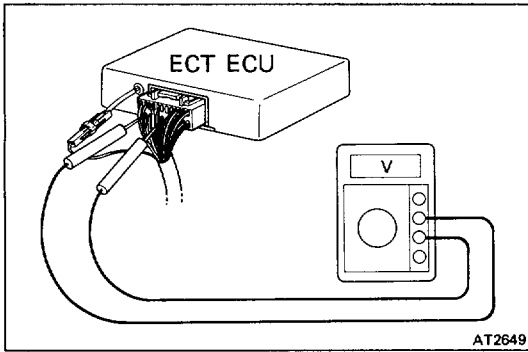
**INSPECTION OF HEAT INSULATOR**

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

**REPLACEMENT OF CATALYTIC CONVERTER**

1. REMOVE CATALYTIC CONVERTER
 - (a) Jack up the vehicle.
 - (b) Check that the converter is cool.
 - (c) Remove the bolts at the front and rear of the converter.
 - (d) Remove the converter and gaskets.
2. INSTALL CATALYTIC CONVERTER
 - (a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.
 - (b) Torque the bolts.

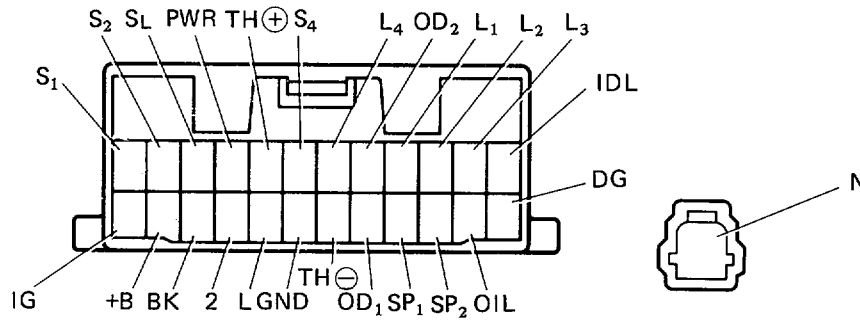
Torque: Catalyst — Exhaust pipe
 440 kg-cm (32 ft-lb, 43 N·m)



INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT VOLTAGE OF ECT ECU CONNECTOR

- (a) Remove the center console box.
- (b) Turn on the ignition switch.
- (c) Measure the voltage at each terminal.



R-24-2 GA-1-2

Terminal	Measuring condition	Voltage (V)	
		DENSO type ECU	AISIN type ECU
L ₁ – GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0	12 to 0
	Throttle valve fully open	0	0
L ₂ – GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0 to 5	12 to 0 to 12
	Throttle valve fully open	5	12
L ₃ – GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0 to 5 to 0 to 5	12 to 0 to 12 to 0 to 12
	Throttle valve fully open	5	12
IDL – GND	Throttle valve fully closed	0	0
	Throttle valve opening above 1.5°	12	12
SP ₁ – GND	Standing still (Cruise control OFF)	5 or 0	12 or 0
	Engine running, vehicle moving (Cruise control OFF)	2.5	6
BK – GND	When brake pedal is depressed	12	12
	When brake pedal is not depressed	0	0
2 – GND	“2” range	10 – 16	10 – 16
	Except “2” range	0 – 2	0 – 2
L – GND	“L” range	10 – 16	10 – 16
	Except “L” range	0 – 2	0 – 2
N – GND	“N” range	10 – 16	10 – 16
	Except “N” range	0 – 2	0 – 2

CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height:

Truck 4WD 144 — 149 mm (5.67 — 5.87 in.)

Truck 2WD and 4 Runner

150 — 155 mm (5.91 — 6.10 in.)

If incorrect, adjust the pedal height.

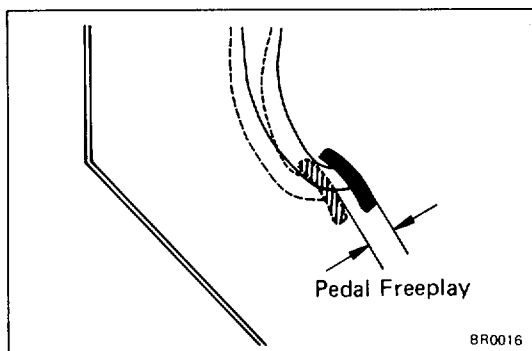
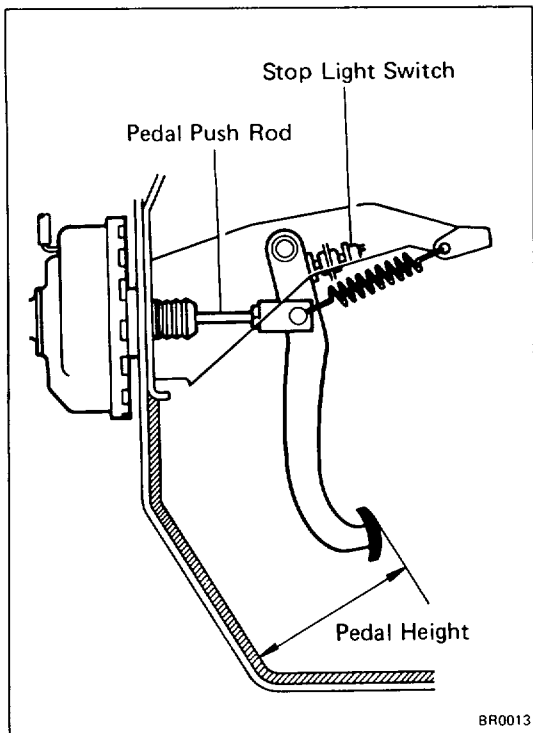
2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Sufficiently loosen the stop light switch.

(b) Adjust the pedal height by turning the pedal push rod.

(c) Return the stop light switch until its body lightly contacts the pedal stopper.

NOTE: After adjusting the pedal height, check and adjust the pedal freeplay.



3. CHECK AND ADJUST PEDAL FREEPLAY

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) Push in the pedal until the beginning of resistance is felt. Measure the distance, as shown.

Pedal freeplay: 3 — 6 mm (0.12 — 0.24 in.)

NOTE: The pedal freeplay is the amount of the stroke until the booster air valve is moved by the pedal push rod.

(c) If incorrect, adjust the pedal freeplay by turning the pedal push rod.

(d) Start the engine and confirm that the pedal freeplay exists.

NOTE: After adjusting the pedal freeplay, check the pedal height.

4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT

Depress the pedal and measure the pedal reserve distance, as shown.

Pedal reserve distance from asphalt sheet at 50 kg (110.2 lb, 490 N):

(2WD)

1/2 ton More than 65 mm (2.56 in.)

22R-TE engine More than 75 mm (2.95 in.)

1 ton, C&C More than 55 mm (2.17 in.)

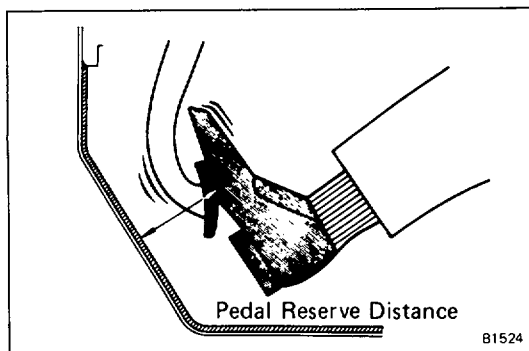
(Include double tire vehicle)

(4WD)

22R series engine More than 55 mm (2.17 in.)

22R-TE engine More than 50 mm (1.97 in.)

If incorrect, troubleshoot the brake system.



A43D HYDRAULIC CIRCUIT

A43D "P" RANGE CIRCUIT

