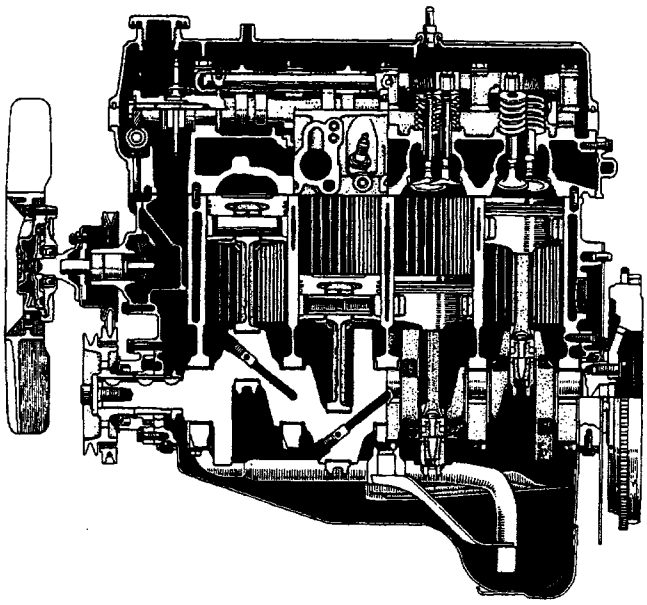
22R–E ENGINE

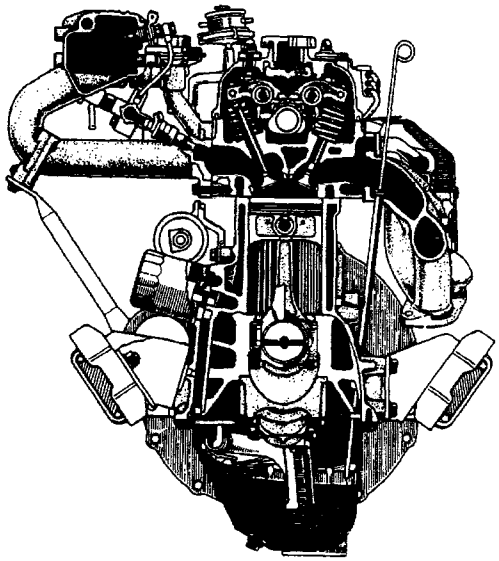
ENGINE MECHANICAL

DESCRIPTION

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

EG1UV–01





EM5984
EM5985

P09078

The 22R–E engine is in–line 4–cylinder engine with the cylinders numbered 1–2–3–4 from the front. The crankshaft is supported by 5 bearings inside the crankcase. These bearing are made of kelmet.

The crankshaft is integrated with 4 weights which are cast with it for balance. Oil holes are made in the center of the crankshaft to supply oil to the connecting rods, bearing, pistons and other components.

The firing order is 1–3–4–2. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent roof type combustion chambers. The spark plugs are located to the left of the combustion chambers.

Coolant is introduced into the intake manifold, improving drivability during engine warm up.

Exhaust and intake valves are equipped with springs made, of special valve spring carbon steel which are capable of following no matter what the engine speed.

The camshaft is driven by a timing chain. The cam journal is supported at 3 places, located at the center and the front and rear of ends of each cylinder head. Lubrication of the cam journal gear is accomplished by oil supplied through the oil passage in the cylinder head.

Adjustment of the valve clearance is done by means of an adjusting screw on the rocker arm for easy adjustment.

The timing chain cover is made of aluminum alloy, with a water pump and oil pump on the outside.

Pistons are made of highly temperature–resistant aluminum alloy, and a depression is built into the piston head to prevent interference with valves.

Piston pins are the full–floating type, with the pins fastened to neither the connecting rods nor the piston boss, but with a snap ring fitted to both ends of each pin to prevent it from slipping out.

The No. 1 compression ring is made of stainless steel and the No. 2 compression ring is made of cast iron. The oil ring is made of stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. No. 1 and No. 2 compression rings work to prevent leakage of gas from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chambers.

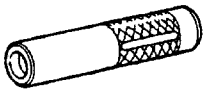
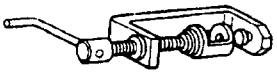
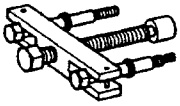
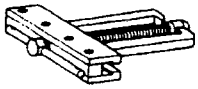
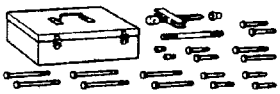
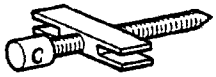
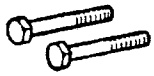
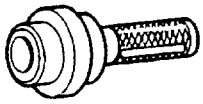
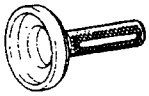
The cylinder block is made of cast iron. It has 4 cylinders which are approximately 2 times the length of the piston stroke. The top of each cylinder is closed off by the cylinder head and in the lower end of the cylinders the crankshaft is installed, supported by 5 journals. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

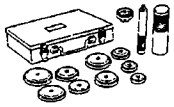
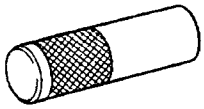
The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. The dividing plate prevents the intake of air and allows oil circulation to be maintained even if the oil forms waves when the vehicle brakes suddenly.

PREPARATION

EGOAY–0A

SST (SPECIAL SERVICE TOOLS)

	09201–41020 Valve Stem Oil Seal Replacer	
	09201 –60011 Valve Guide Bushing Remover & Replacer	
	09202–43013 Valve Spring Compressor	
	09213–31021 Crankshaft Pulley Puller	
	09213–36020 Timing Gear Remover	
	09213–60017 Crankshaft Pulley & Gear Puller Set	
	(09213–00020) Body With .Bolt	
	(00213–00030) Handle	
	(09213–00060) Bolt Set	
	09222–30010 Connecting Rod Bushing Remover & Replacer	
	09223–50010 Crankhaft Front oil Seal Replacer	Camshaft oil seal
	09223–41020 Crankshaft Rear Oil Seal Replacer	
	09213–70010 Crankshaft Pulley Holding Tool	

 09606–35014 Axle Hub & Drive Pinion Bearing Tool Set	
 (09608–06040) Front Hub Inner Bearing Cone Replacer	
 09330–00021 Companion Flange Holding Tool	Crankshaft pulley
 09843–18020 Diagnosis Check Wire	

EG0AZ–08

RECOMMENDED TOOLS

 09090–04010 Engine Sling Device	For suspension engine
 09200–00010 Engine Adjust Kit	
 09258–00030 Hose Plug Set	Plug for the vacuum hose, fuel hose etc.
 09904–00010 Expander Set	

EG0BC–07

EQUIPMENT

Battery specific gravity gauge	
Belt tension gauge	
Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	

Dye penetrant	
Engine tune–up tester	
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	

EG0B1–0C

SSM (SERVICE SPECIAL MATERIALS)

08826–00080 Seal packing or equivalent	Camshaft bearing cap Cylinder head cover Rear oil sear retainer
08833–00070 Adhesive 1324, THREE BOND 1324 or equivalent	Flywheel or drive plate mounting bolt

TROUBLESHOOTING

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still cannot be confirmed in the basic inspection, then proceed to this step and perform troubleshooting to the numbers in the order given in the table below.

	See page	IG–5	IG–5	EG1–212	EG1–131, 149 or 167	EG1–129, 147 or 165	EG1–129, 147 or 165	EG1–127, 145 or 163	EG1–132, 150 or 168	—	—	—	EG1–177	EG1–186	EG1–192	EG1–187	EG1–183 or 208	—
	Suspect area / Symptom	RPM Signal Circuit	Ignition Circuit	Main Oxygen Sensor Circuit	Engine Coolant Temp. Sensor Circuit	Intake Air Temp. Sensor Circuit	Volume Air Flow Meter Circuit	Throttle Position Sensor Circuit	STA Signal Circuit	Knock Sensor Circuit	PNP Switch Signal Circuit	A/C Signal Circuit	Fuel Pump	Fuel Pressure Regulator	Fuel Lines	Injectors	Cold Start System	Idle Air Control Valve
Does not start	Engine does not crank																	
	Starter runs – engine does not crank																	
	No initial combustion	12	2				5						6				13	8
	No complete combustion				4		1							3		9	10	2
Difficult to start	Engine cranks slowly											2						
	Under normal condition	12	13		4	14							7	6	8	16	17	3
	Cold engine				1	6			2				8	7	9	10	5	4
	Hot engine				1	5							8	7	9	10	6	3
Poor idling	Incorrect first idle				3													4
	High engine idle speed				4	6		7			9	8				10	11	5
	Low engine idle speed				1		4									5		2
	Rough idling		18		2		12						7	6	8	16	17	9
	Misfire		4		6		8									9	10	
Poor drivability	Hesitation Poor acceleration			12	10	11	9	8					14	13	15	18	19	
	Back fire			6	3	7	5	4					9	8	10	11		
	Muffler explosion (after fire)			8	3	7	5	6						4		9	10	
	Serging													1		4		
	Knocking									1								
Engine stall	Soon after starting				8		7						3	2	4	9	10	6
	After accelerator pedal depressed						1	3						5	6	7		
	After accelerator pedal released						3											1
	During A/C operation											1						2
	When N to D shift										1							2
Others	Poor fuel economy			21	16	22	18	17			19	20				14	15	
	Engine overheat									9								
	Engine overcool																	
	Excessive oil consumption																	
	Low oil pressure																	
	High oil pressure																	
	Starter keeps running																	
	Battery often discharges																	

HINT: When inspecting a wire harness or circuit, the electrical wiring diagrams at the end of repair manual should be referred to and the circuits of related systems also should be checked.

V01853

	See page	EG1–198	EG1–199	CL section	EG1–14	MA–11	EG1–39	EG1–39	EG1–226	EG1–23	EG1–238	EG1–51	EG1–54	EG1–21	EG1–58	–	EG1–229
	Suspect area / Symptom	Dash Pot	Throttle Opener	Clutch	Compression	Valve Clearance	Valve Timing	Timing Belt	Water Pump	Valve Stem Guide Bushing	Oil Pump	Connecting Rod Bearing	Crankshaft Bearing	Cylinder Head	Piston Ring	Flywheel or Drive Plate	Radiator and Radiator Cap
Does not start	Engine does not crank																
	Starter runs – engine does not crank															2	
	No initial combustion				9		10	11									
	No complete combustion				5		7	8							6		
Difficult to start	Engine cranks slowly											3	4				
	Under normal condition				9		11								10		
	Cold engine																
	Hot engine																
Poor idling	Incorrect first idle	2	3														
	High engine idle speed	2															
	Low engine idle speed																
	Rough idling				10	13	14	15						20	11		
	Misfire				7												
Poor drivability	Hesitation Poor acceleration			1	7	16	17										
	Back fire						2										
	Muffler explosion (after fire)						2										
	Serging																
	Knocking						5		9								6
Engine stall	Soon after starting																
	After accelerator pedal depressed																
	After accelerator pedal released																
	During A/C operation																
	When N to D shift																
Others	Poor fuel economy	4		5	11		13								12		
	Engine overheat						7	5	6		10			11			3
	Engine overcool																
	Excessive oil consumption				3					2				5	4		
	Low oil pressure										2	3	4				
	High oil pressure										1						
	Starter keeps running																
	Battery often discharges																

V01854

Thermostat	Drive Belt	Engine Coolant Temp. Sender Gauge	Oil Pressure Switch	Generator	Cylinder Block	EFI Main Relay	Circuit Opening Relay	Fuel Cut System	Fuel Pressure Control System	ECM	Fuel Quality	Fuel Leakage	Coolant Leakage	Oil Leakage	Starter Relay	PNP Switch or Clutch Start SW	Starter	Spark Plug	Distributor	EGR System	Accelerator Pedal Link	Brakes drag even when released
EG1–228	CH section	BE section	BE section	CH section	EG1–55	EG1–206	EG1–207	EG1–219	EG1–210	EG1–215	—	—	EG1–225	EG1–235	ST section	AT or CL section	ST section	IG–6	IG–7	EG1–88 or 92	—	—
															1	3	2					
																	1					
						3	4			14	7								1			
										11												
																	1					
										18	1							2	15	5		
										11	3											
									4	11	2											
										5											1	
										12											1	
										6										3		
										19	1							4	5	3		
										11	1							3	5	2		
										20	3							5	6	4		2
										12										1		
								1		11												
										5								2	3			
8										10	2							3		4		
										11	1									5		
										8								4		2		
										4										2		
										3												
										3												
								8			2	1						9	10	7	3	6
4		13			12								1					8				
2		3																				
					6									1								
			5											1								
			2																			
															1		2					
	1			2																		

V01855

TUNE–UP

EG1UX–01

ENGINE COOLANT INSPECTION

(See steps 1 and 2 on page EG1–225)

EG1UY–01

ENGINE OIL INSPECTION

(See steps 1 and 2 on page EG1–235)

EG1UZ–01

AIR FILTER INSPECTION

(See step 4 on page MA–7)

EG1V0–02

BATTERY INSPECTION

(See CM section)

EG1V1–01

HIGH–TENSION CORD INSPECTION

(See page IG–6)

EG1V2–01

SPARK PLUGS INSPECTION

(See page IG–8)

EG1V3–01

DRIVE BELTS INSPECTION

(See step 2 on page MA–6)

EG1V4–01

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

(See step 14 on page MA–11)

EG1V5–01

IGNITION TIMING INSPECTION AND ADJUSTMENT

(See step 5 on page IG–10)

EG1V6–01

IDLE SPEED INSPECTION AND ADJUSTMENT

(See step 15 on page MA–11)

HINT: Adjust idle mixture as necessary.

IDLE AND OR 2500 RPM CO HC CHECK

HINT: This check method is used only to determine whether or not the idle and/or 2,500 rpm CO/HC complies with regulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air intake system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT: All vacuum hoses for the air suction, EGR sys–tems, etc. should be properly connected.

(f) MFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral
(i) Idle speed set correctly
(j) Tachometer and CO/HC meter calibrated and at hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX.3 MINUTES

4. INSERT CO / HC METER TESTING PROBE INTO TAILPIPE AT LEAST 40 cm (1.3 ft)

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT:
When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

EG1V8–01

TROUBLESHOOTING

If the HC/CO concentration does not comply with regulations, perform troubleshooting in the order given below.

1. Check oxygen sensor operation
(See page EG1–212)

2. See the table below for possible cause, and then inspect and correct the applicable causes if neces–sary.

HC	CO	Symptoms	Causes
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky exhaust valves 5. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leak: • Vacuum hose • Intake manifold • Intake chamber • PCV line • Throttle body
High	High	Rough idle (Black smoke from exhaust)	1. Clogged air filter 2. Plugged PCV valve 3. Pulsed Secondary Air Injection (PAIR) system problems 4. Faulty MFI system: • Faulty pressure regulator • Clogged fuel return line • Faulty volume air flow meter • Defective engine coolant temp. sensor • Defective intake air temp. sensor • Faulty ECM • Faulty injector • Faulty cold start injector

V01856

COMPRESSION CHECK

HINT: If there is lack of power, excessive oil con–sumption or poor fuel mileage, measure the cylinder compression pressure.

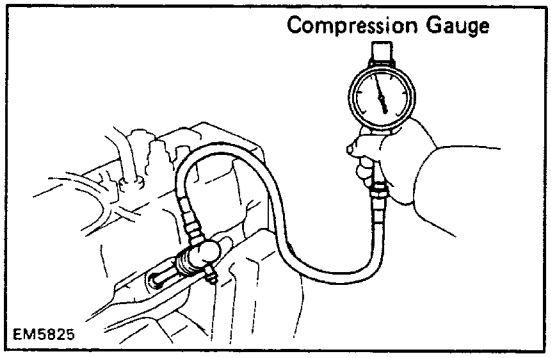
1. WARM UP ENGINE

2. REMOVE SPARK PLUGS

3. DISCONNECT DISTRIBUTOR CONNECTOR

4. DISCONNECT COLD START INJECTOR CONNEC–TOR

5. MEASURE CYLINDER COMPRESSION PRESSURE



(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine with the starter motor, measure the compression pressure.

NOTICE: This test must be done for as short a time as possible to avoid overheating of the catalytic converter.

HINT: A fully charged battery must be used to obtain at least 250 rpm.

(d) Repeat steps (a) through (c) for each cylinder.

Compression pressure:
1,177 kPa (12.0 kgf/cm^2, 171 psi)

Minimum pressure:
981 kPa (10.0 kgf/cm^2, 142 psi)

Difference between each cylinder:
98 kPa (1.0 kgf/cm^2, 14 psi) or less

(e) If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylin–der through the spark plug hole and repeat steps (a) through (c) for the low compression cylinder.

- If adding oil helps the compression, chances are that the piston rings and /or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating improperly, or there may be leakage past the gasket.

6. CONNECT COLD START INJECTOR CONNECTOR

7. CONNECT DISTRIBUTOR CONNECTOR

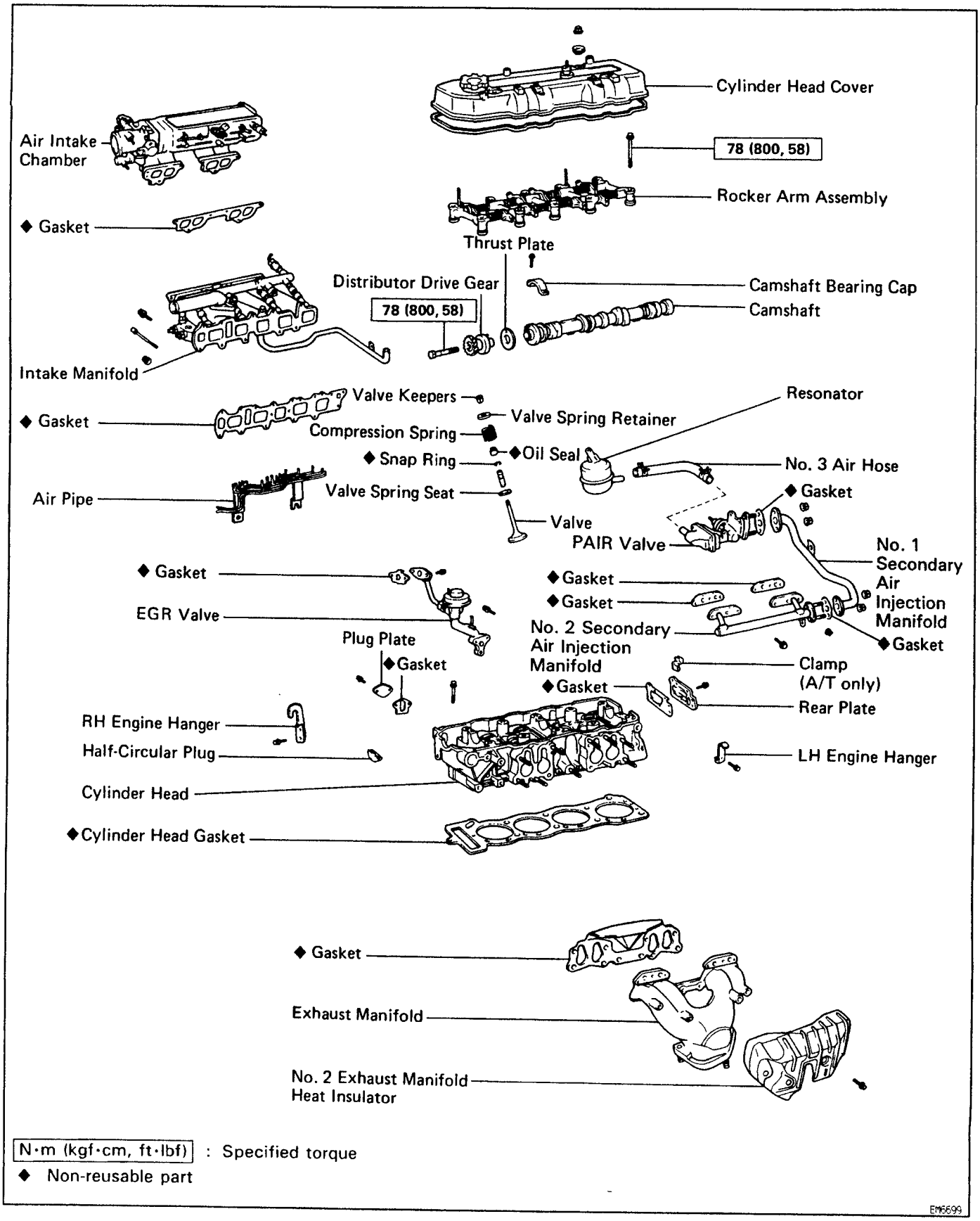
8. INSTALL SPARK PLUGS

Torque: 18N–m (180 kgf–cm, 13ft–lbf)

CYLINDER HEAD

EG1VA–01

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

EM6699

EG1Vb–01

PREPARATION FOR REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN COOLANT FROM RADIATOR AND CYLIN– DER BLOCK

(See step 3 on page EG1–225**)**

3. REMOVE INTAKE AIR CONNECTOR

4. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD

(a) Remove the exhaust pipe clamp.

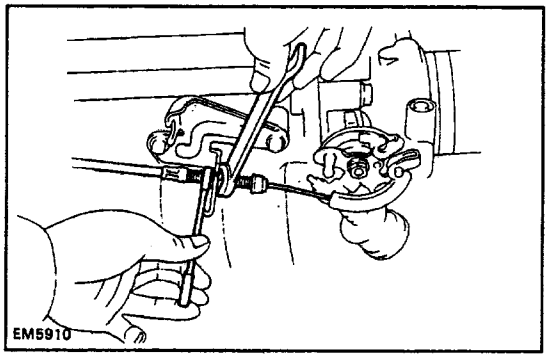
(b) Remove the three nuts, and disconnect the exhaust pipe.

5. REMOVE OIL DIPSTICK

6. REMOVE DISTRIBUTOR AND SPARK PLUGS

7. REMOVE RADIATOR INLET HOSE

8. DISCONNECT HEATER WATER INLET HOSE FROM HEATER WATER INLET PIPE



9. DISCONNECT ACCELERATOR CABLE

10. (A/T)

DISCONNECT THROTTLE CABLE

Disconnect the throttle cable from the bracket and clamp. .

11. DISCONNECT GROUND STRAP FROM ENGINE REAR SIDE

12. DISCONNECT FOLLOWING PARTS:

(a) No.1 and No. 2 PCV hoses

(b) Brake booster hose

(c) (w/PS)

Air control valve hoses

(d) (with A/C)

VSV hoses

(e) EVAP hose

(f) EGR vacuum modulator hose

(g) EGR valve hose

(h) Fuel pressure up hose

(i) PAIR valve hose

(j) Pressure regulator hose

(k) Vacuum hoses from throttle body

(l) No. 2 and No. 3 water by–pass hoses from the thr– ottle body

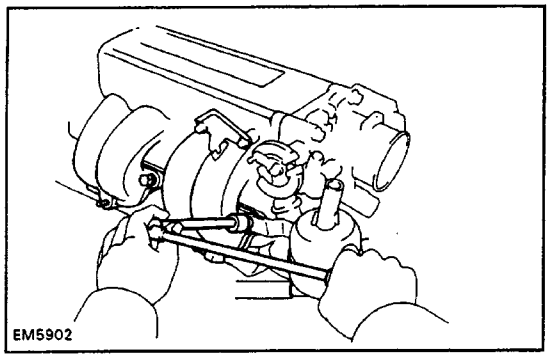
(m) (w/Oil cooler)

Disconnect the No. 1 oil cooler hose from the intake manifold.

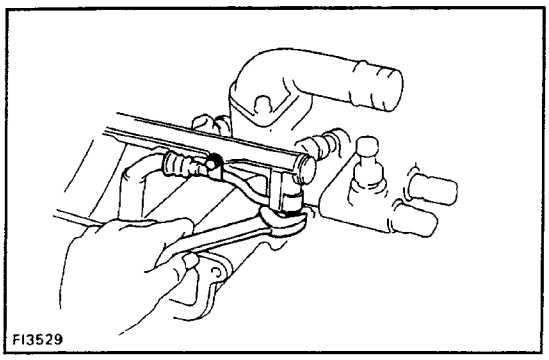
(w/o Oil cooler)

Disconnect the No. 1 water by–pass hose from the intake manifold. ‘

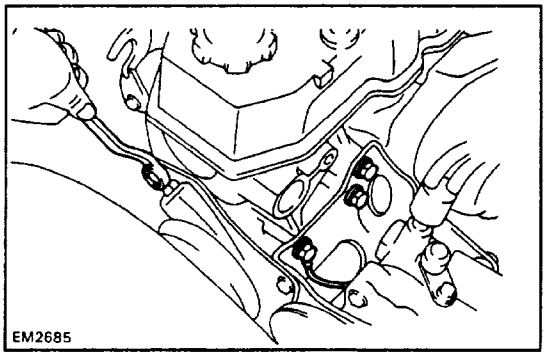
13. REMOVE EGR VACUUM MODULATOR
14. DISCONNECT FOLLOWING WIRES:
(a) Cold start injector wire
(b) Throttle position wire
(c) (California only)
EGR gas temp. sensor wire



15. REMOVE CHAMBER WITH THROTTLE BODY
(a) Remove the union bolt holding the cold start injector pipe to the chamber.
(b) Remove the bolts holding the No. 1 EGR pipe to the chamber.
(c) Remove the bolts holding the manifold stay to the chamber.
(d) Remove the four bolts, two nuts, bond strap and fuel hose clamp.
(e) Remove the chamber with the throttle body, resona–tor and gasket.
16. DISCONNECT FUEL RETURN HOSE
17. DISCONNECT FOLLOWING WIRES:
(a) Knock sensor wire
(b) Oil pressure sender gauge wire
(c) Starter wire (terminal 50)
(d) Transmission wires
(e) (with A/C)
Compressor wires
(f) Injector wires
(g) Engine coolant temp. sender gauge wire
(h) (A/T)
OD temp. switch wire
(i) Igniter wire
(j) VSV wires
(k) Start injector time switch wire
(l) Engine Coolant temp. sensor wire



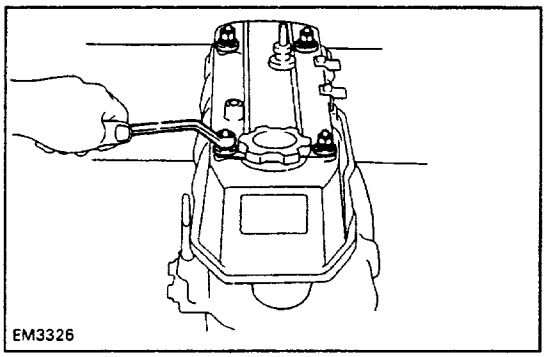
18. DISCONNECT FUEL HOSE FROM DELIVERY PIPE
Remove the bolt, union bolt and two gaskets.
19. DISCONNECT BY – PASS HOSE FROM INTAKE MANIFOLD
20. (w/PS)
REMOVE PS BELT



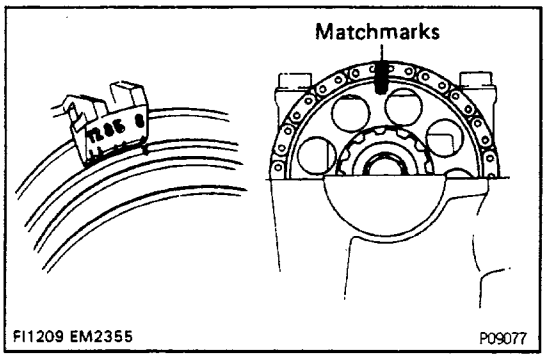
21. (w/PS)
DISCONNECT PS BRACKET FROM CYLINDER HEAD
Remove the four bolts, disconnect the ground strap and bracket.

EG1VC–01

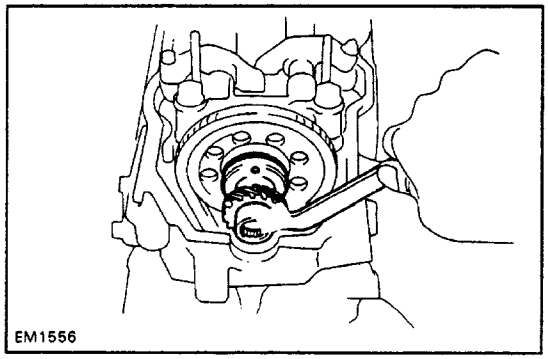
CYLINDER HEAD REMOVAL



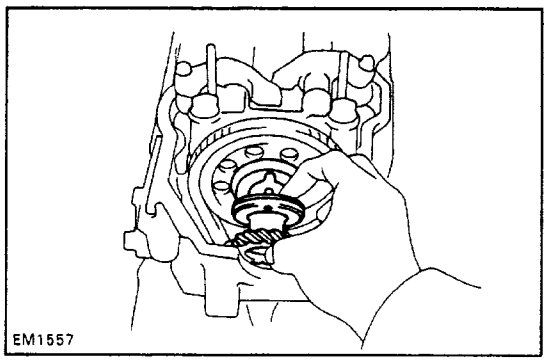
1. REMOVE HEAD COVER
(a) Remove the ground strap from the body.
(b) Remove the four nuts and seals.
(c) Remove the head cover.
NOTICE: Cover the oil return hole in the head with a rag to prevent objects from falling in.



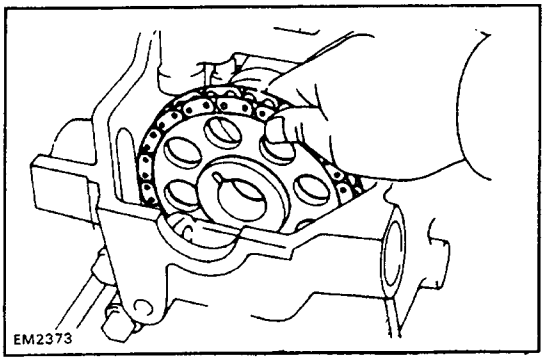
2. REMOVE CAM SPROCKET BOLT
(a) Turn the crankshaft until the No. 1 cylinder position is set at TDC compression.
(b) Place matchmarks on the sprocket and chain.
(c) Remove the half–circular plug.



(d) Remove the cam sprocket bolt.

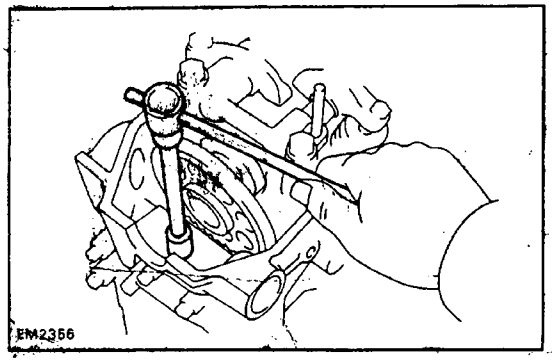


3. REMOVE DISTRIBUTOR DRIVE GEAR AND CAM–SHAFT THRUST PLATE



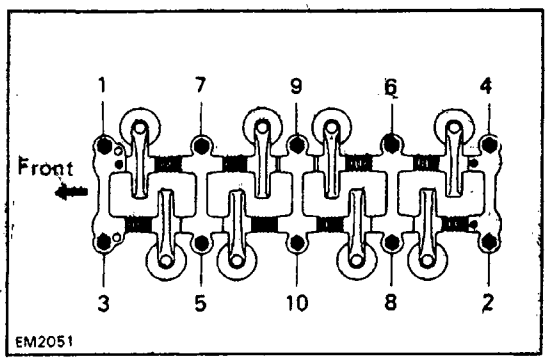
4. REMOVE CAM SPROCKET

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



5. REMOVE CHARY COVER BOLT

Remove the bolt in.–front of the head before the other head bolts are removed.



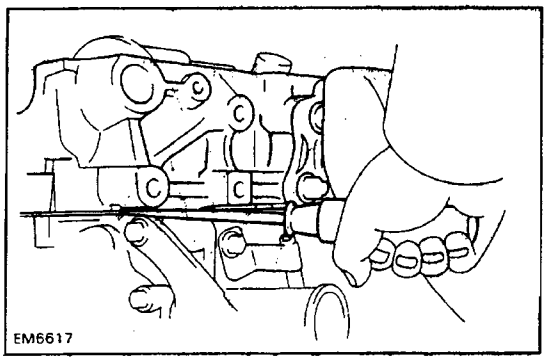
6. REMOVE CYLINDER HEAD BOLTS

Remove the head bolts gradually in two or three passes and in the numerical order shown.

NOTICE: Head warpage or cracking could result from removing bolts incorrect order.

7. REMOVE ROCKER ARM ASSEMBLY

If may be necessary to use a pry bar on the front and rear of the rocker arm assembly to separate it from the head.

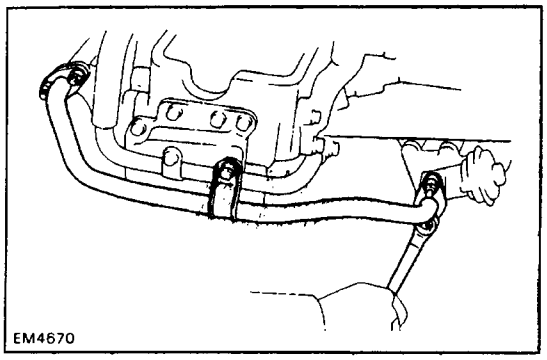


8. REMOVE CYLINDER HEAD

Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.

HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the head and block sa–liences.

NOTICE: Be careful not to damage the cylinder head and block surfaces of the cylinder head gasket.



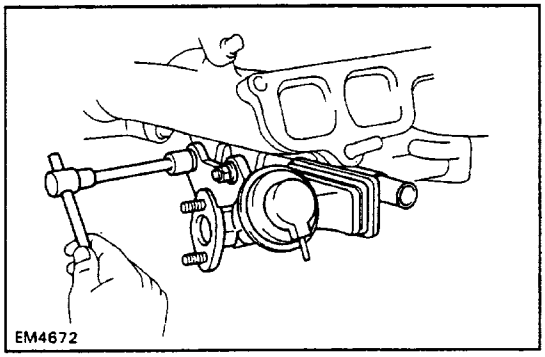
CYLINDER HEAD DISASSEMBLY

EG1VD–01

(See page EG1–15)

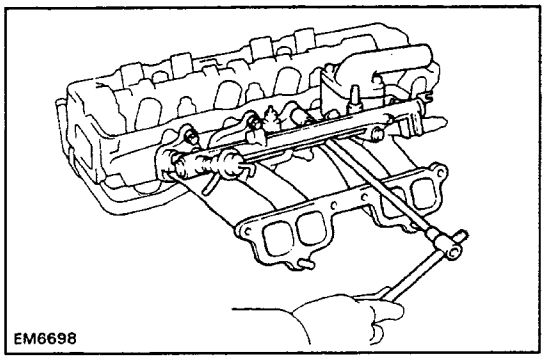
1. REMOVE NO. 1 SECONDARY AIR INJECTION MANIFOLD

Remove the bolt, four nuts, No. 1 secondary air in–jection manifold and two gaskets.

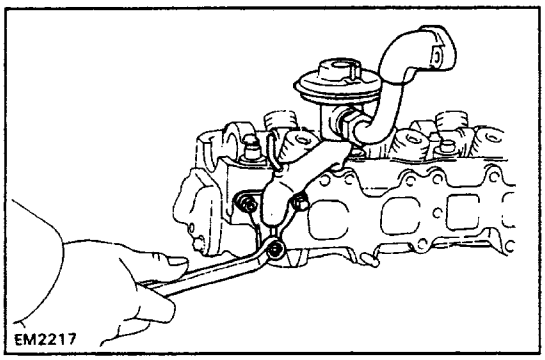


2. REMOVE INTAKE MANIFOLD WITH DELIVERY PIPE AND INJECTORS

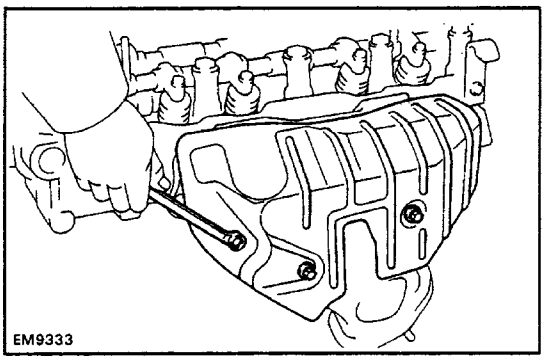
(a) Remove the two nuts and reed valve.



(b) Remove the bolt and the heater inlet pipe from the cylinder head.
(c) Remove the seven bolts, one hexagon bolt, two nuts and No. 1 air pipe.
(d) Remove the intake manifold together with the delivery pipe, injectors and heater water inlet pipe.

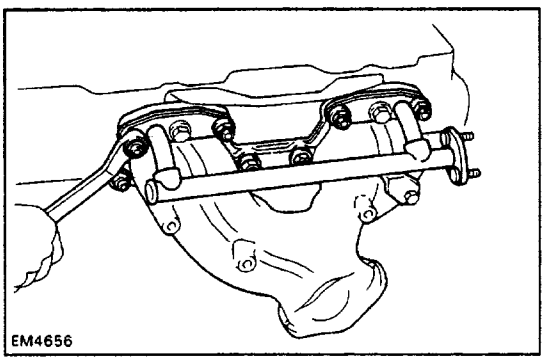


3. REMOVE EGR VALVE



4. REMOVE EXHAUST MANIFOLD WITH NO. 2 SECONDARY AIR INJECTION MANIFOLD

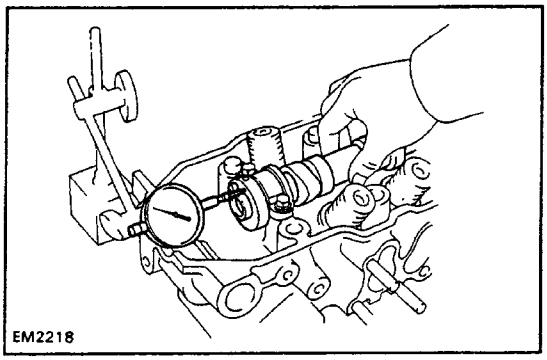
(a) Remove the three bolts and No. 2 exhaust manifold heat insulator.



(b) Remove the eight nuts, exhaust manifold and No. 2 secondary air injection manifold.

5. REMOVE TWO ENGINE HANGERS AND GROUND STRAP

6. REMOVE CYLINDER HEAD REAR OVER



7. MEASURE CAMSHAFT THRUST CLEARANCE

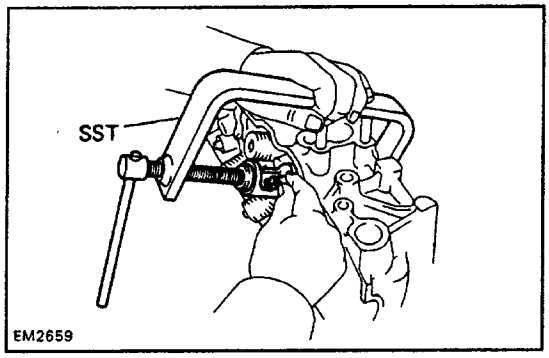
Using a dial gauge, measure the camshaft thrust clearance.

Standard clearance: 0.08 – 0.18 mm (0.0031–0.0071 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

If clearance is greater than maximum, replace the head.

8. REMOVE CAM BEARING CAPS AND SHAFT



9. REMOVE VALVES

(a) Using SST, compress the valve retainer until the two keepers can be removed.

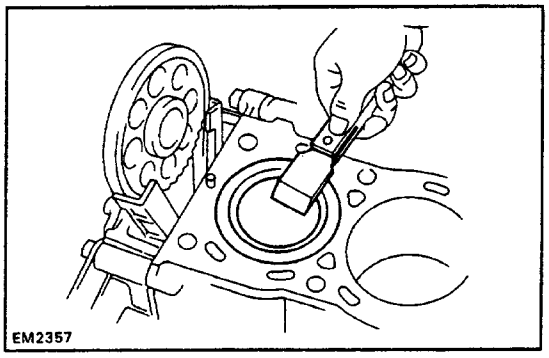
SST 09202–43013

(b) Remove the valve keepers, retainer, spring and valve.

(c) Pry out the oil seal.

(d) Using a small screwdriver or magnet, remove the valve spring seat.

HINT: Keep the valves arranged so they can be ins–talled in the same order as removed.



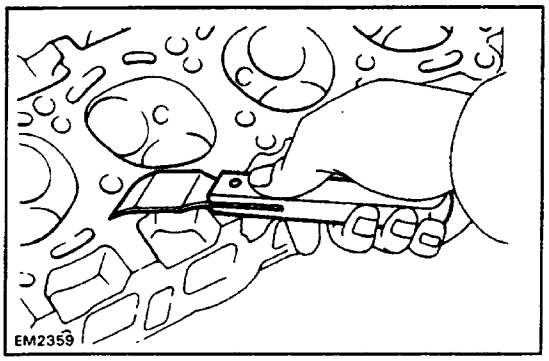
INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF CYLINDER BLOCK

(a) Turn the crankshaft and bring each piston to top dead center. Using a gasket scraper, remove all the carbon from the piston tops.

(b) Using a gasket scraper, remove all gasket material from the top of the block. Blow carbon and oil from the bolt holes.

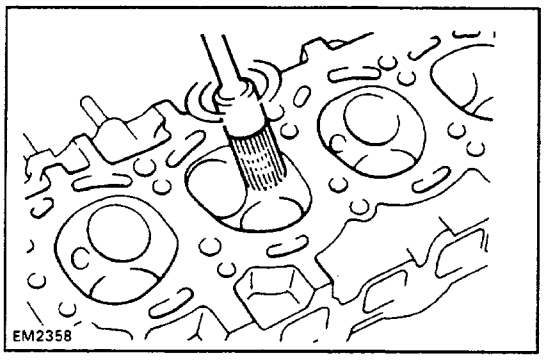
CAUTION: Protect your eyes when using high pressure sir.



2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from the head and manifold surfaces.

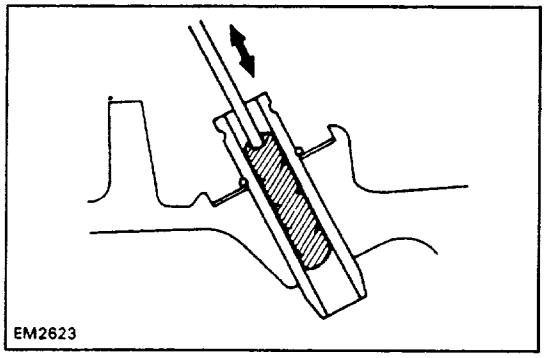
NOTICE: Be careful not to scratch the surfaces.



3. CLEAN COMBUSTION CHAMBERS

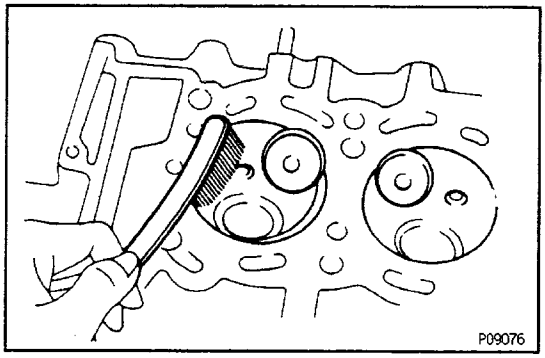
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the head gasket con–tact surface.



4. CLEAN VALVE GUIDE BUSHINGS

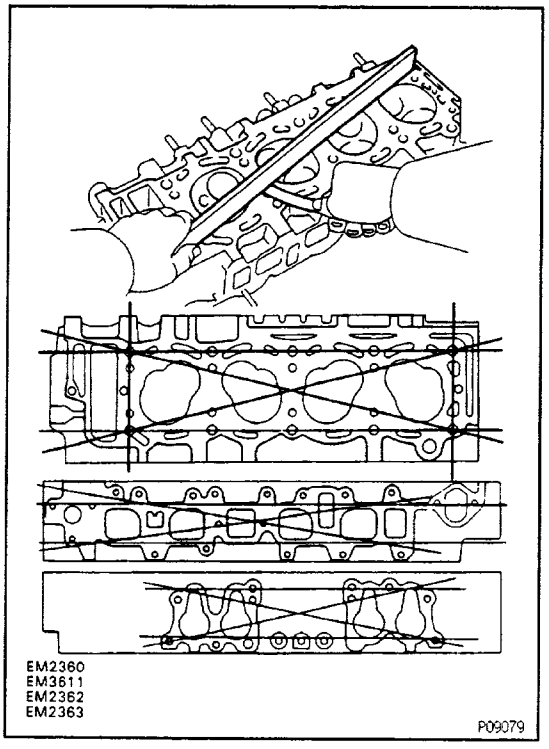
Using a valve guide brush and solvent, clean all the valve guide bushings.



5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, clean the head.

NOTICE: Do not clean the head in a hot tank as this will seriously damage it.



6. INSPECT CYLINDER HEAD FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder block and manifold for warpage.

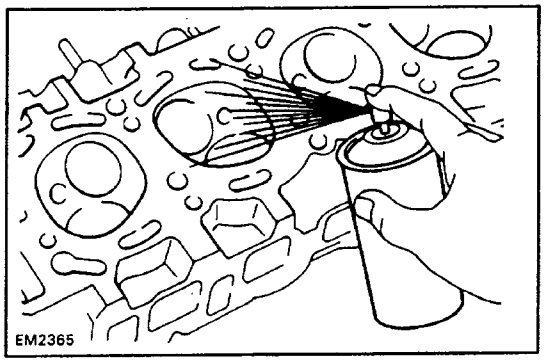
Maximum head surface warpage:

0.15 mm (0.0059 in.)

Maximum manifold surface warpage:

0.20 mm (0.0079 in.)

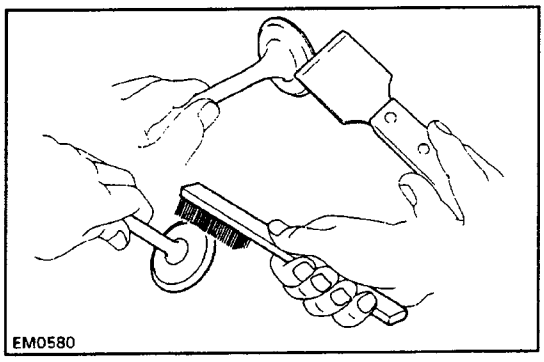
If warpage is greater than maximum, replace the cyl–inder head.



7. INSPECT CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion cham–bers, intake and exhaust ports, head surface and the top of the head for cracks.

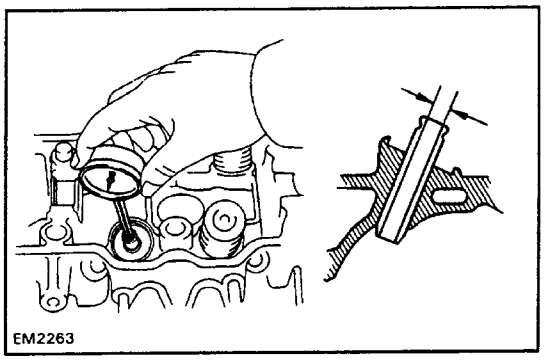
If a crack is found, replace the head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

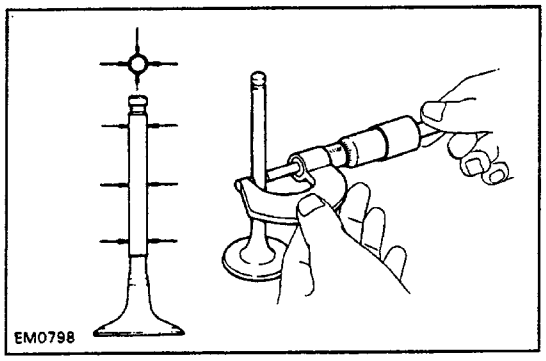
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the valve guide bushing.

Standard inside diameter: 8.01 – 8.03 mm
(0.3154 – 0.3161 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

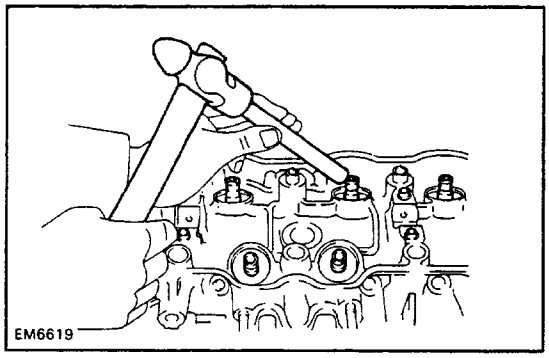
Standard valve stem diameter:
Intake 7.970 – 7.985 mm
(0.3138 – 0.3144 in.)
Exhaust 7.965 – 7.980 mm
(0.3136 – 0.3142 in.)

(c) Subtract the valve stem diameter measurement from the valve guide bushing diameter measurement.

Standard oil clearance:
Intake 0.025 – 0.060 mm
(0.0010 – 0.0024 in.)
Exhaust 0.030 – 0.650 mm
(0.0012 – 0.0026 in.)

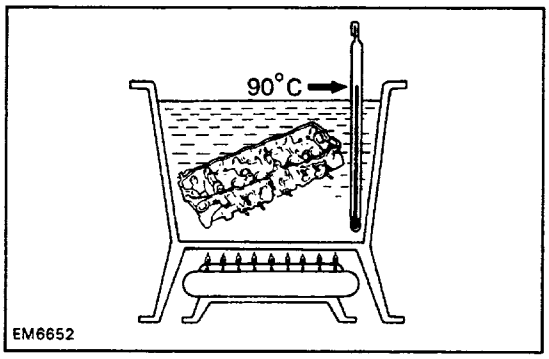
Maximum stem oil clearance:
Intake 0.08 mm (0.0031 in.)
Exhaust 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.

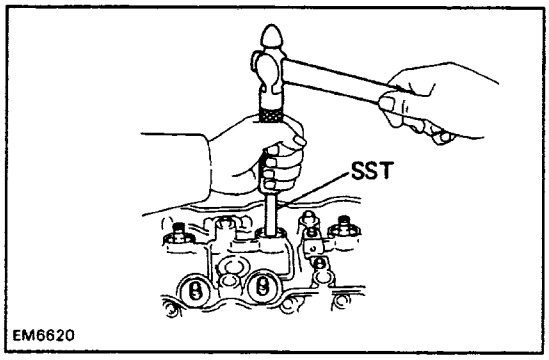


10. IF NECESSARY, REPLACE VALVE GUIDE BUSH–INGS

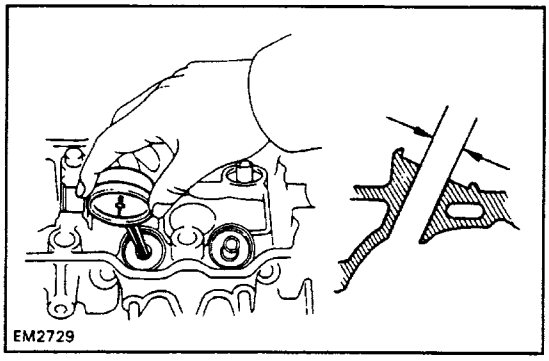
(a) Using a brass bar and hammer, break the valve –guide bushing.



(b) Gradually heat the cylinder head to approx. 90•C (194•F).



(c) Using SST and a hammer, drive out valve guide bus–hing.
SST 09201–60011

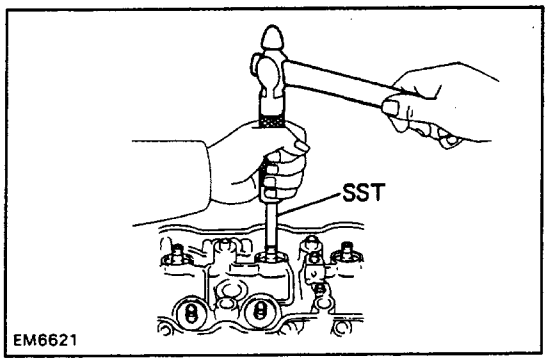


(d) Using a caliper gauge, measure the valve guide bus–hing bore of the cylinder head.

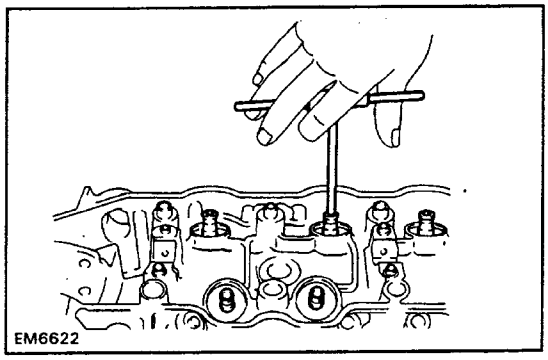
Bore intake and exhaust

Bushing bore mm (in.)	Bushing size
13.000 – 13.018 (0.5118 – 0.5125)	Use STD
Over 13.018 (0.5125)	Use O/S 0.05

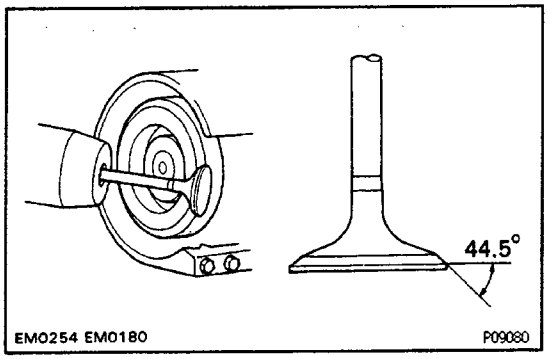
(e) Select a new valve guide bushing.
If the valve guide bushing bore of the cylinder head is more than 13.018 mm (0.512 in.), machine the bore to the following dimension.
Rebored valve guide bushing bore dimension (cold):
13.050 – 13.068 mm (0.5138 – 0.5145 in.)



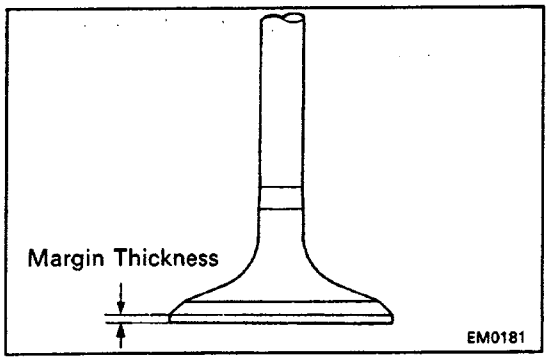
(f) Gradually heat the cylinder head to approx. 90•C (194• F).
(g) Using SST a and hammer, drive in a new valve guide bushing unit the snap ring makes contact with the cylinder head.
SST 09201–6001 1



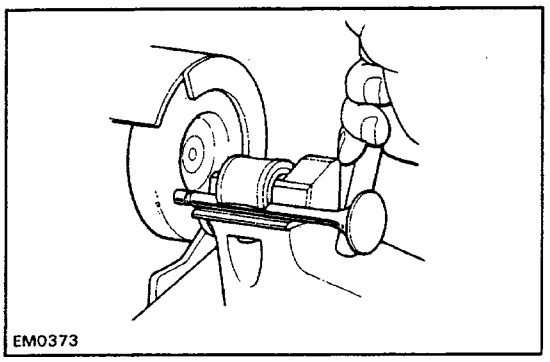
(h) Using a sharp 8 mm (0.31 mm) reamer, ream the valve guide bushing to obtain standard specified clearance (See page EG1–23) between the valve guide bushing and new valve.



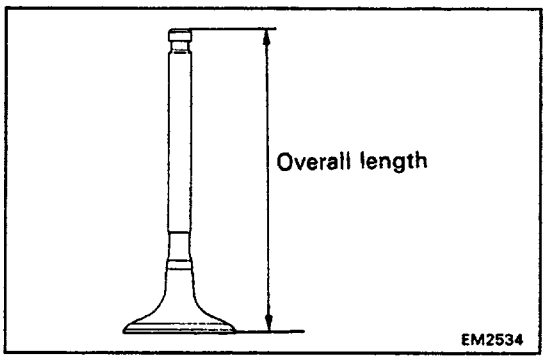
11. INSPECT AND GRIND VALVES
(a) Grind the valve only enough to remove pits and carbon.
(b) Check that valve is ground to the correct valve face angle.
Valve face angle: 44.5•



(c) Check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.6 mm (0.024 in.)
If the valve head margin thickness is less than mini–mum, replace the valve.



(d) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, regrind it with grinder or replace the valve if necessary.
NOTICE: Do not grind off more than minimum overall length.
Minimum overall length:
Intake 113.0 mm (4.449 in.)
Exhaust 111.9 mm (4.406 in.)



(e) Check the valve overall length.

Standard overall length:

Intake 113.5 mm (4.468 in.)

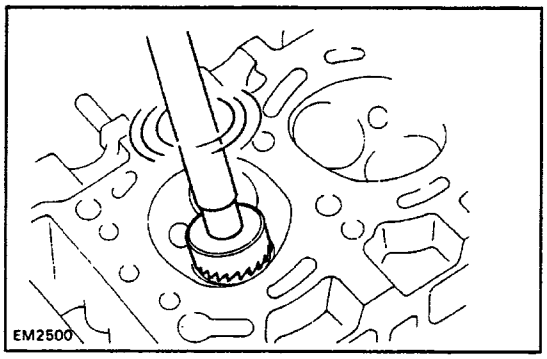
Exhaust 112.4 mm (4.425 in.)

Minimum overall length:

Intake 113.0 mm (4.449 in.)

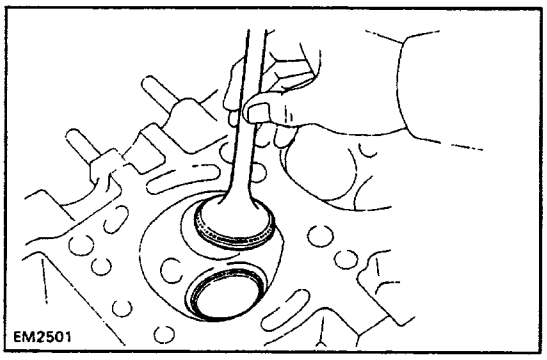
Exhaust 111.9 mm (4.406 in.)

If the valve overall length is less than minimum, re–place the valve.



12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45• carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



(b) Check the valve seating position.

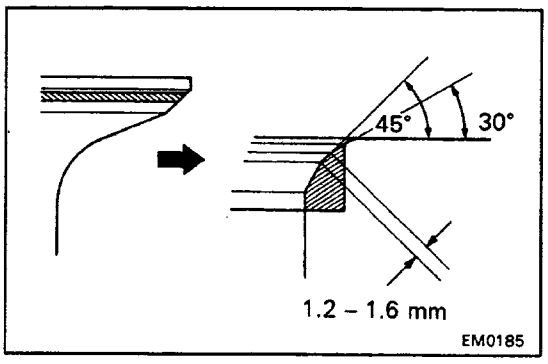
Apply a light coat of prussian blue (or white lead) to the valve face. Install the valve. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

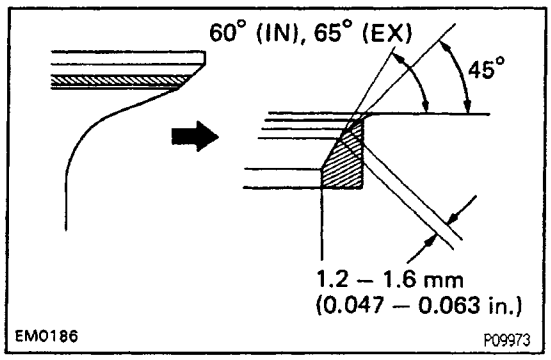
- If blue appears 360• around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360• around the valve seat, the guide and seat are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width:

1.2 – 1.6 mm (0.047 – 0.063 in.)

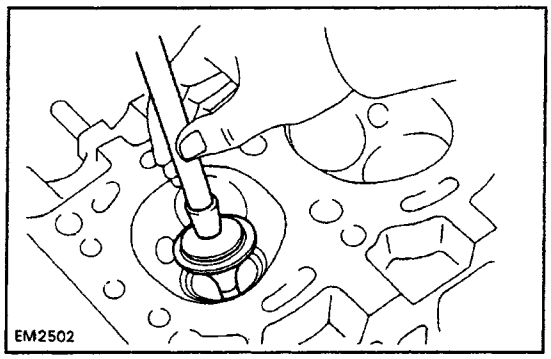
If not, correct the valve seat as follows:



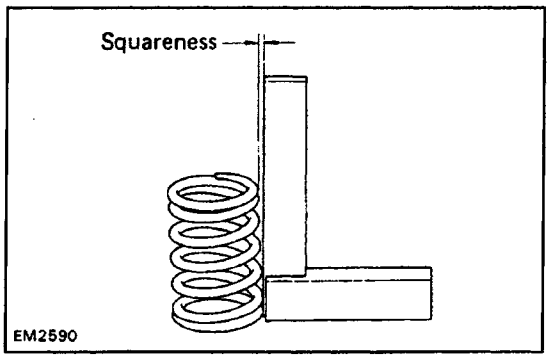
- If seating is too high on the valve face, use 30• and 45• cutters to correct the seat.



- If seating is too low on the valve face, use 60• (IN) or 65• (EX) and 45• cutters to correct the seat.



(d) Hand–lap the valve and valve seat with abrasive compound.

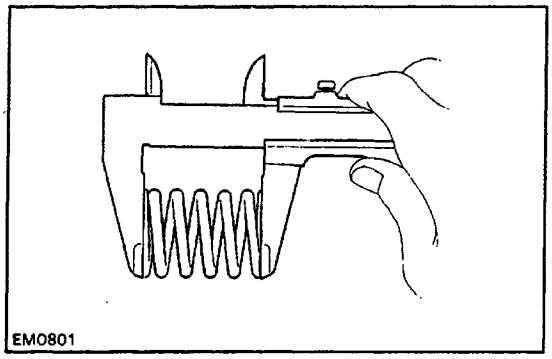


13. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness: 1.6 mm. (0.063 in.)

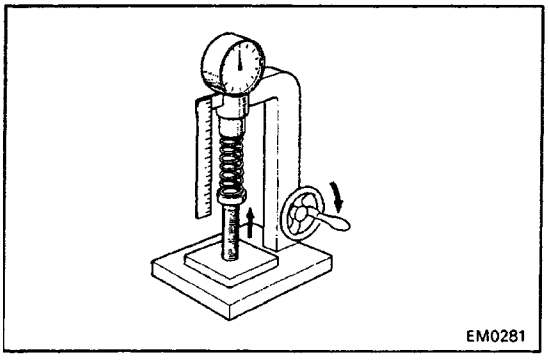
If squareness is greater than maximum, replace the valve spring.



(b) Using vernier calipers, measure the free length of the valve spring.

Free length: 48.5 mm (1.909 in.)

If the free length is not within specification, replace the valve spring.



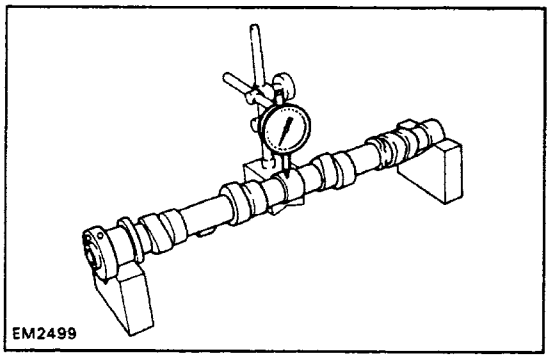
(c) Using a spring tester, check the tension of each spring at the specified installed height.

Installed height: 40.5 mm (1.594 in.)

Standard installed tension: 294 N (30.0 kgf, 66.1 lbf)

Minimum installed tension: 279 N (28.5 kgf, 62.8 lbf)

If the installed tension is less than minimum, replace the spring.

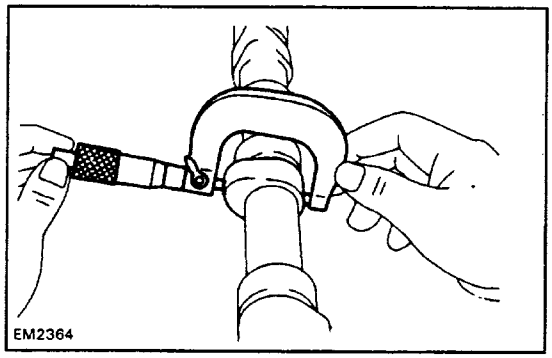


14. INSPECT CAMSHAFT AND BEARING CAPS

(a) Place the cam shaft on V – blocks and , using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.2 mm (0.008 in.)

If the circle runout is greater than maximum, replace the camshaft.



(b) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake 42.63 – 42.72 mm (1.6783 – 1.6818 in.)

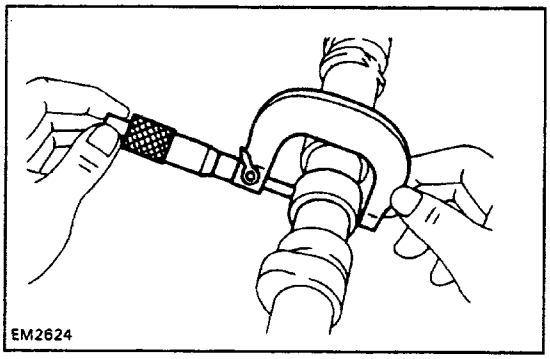
Exhaust 42.69 – 42.78 mm (1.6807 – 1.6842 in.)

Maximum cam lobe height:

Intake 42.25 mm (1.6634 in.)

Exhaust 42.30 mm (1.6654 in.)

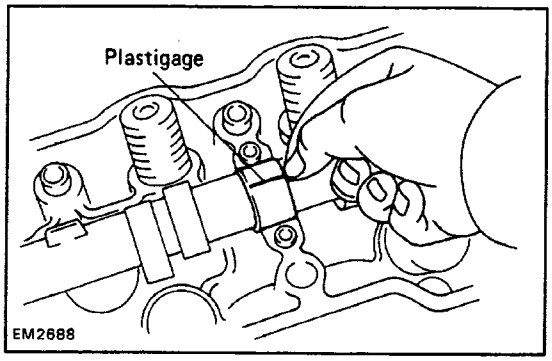
If the lobe height is less than ,minimum, replace the camshaft.



(c) Using a micrometer, measure the journal diameter.

Standard diameter: 32.98 – 33.00 mm (1.2984 – 1.2992 in.)

If the journal diameter is less than specified, replace the camshaft.

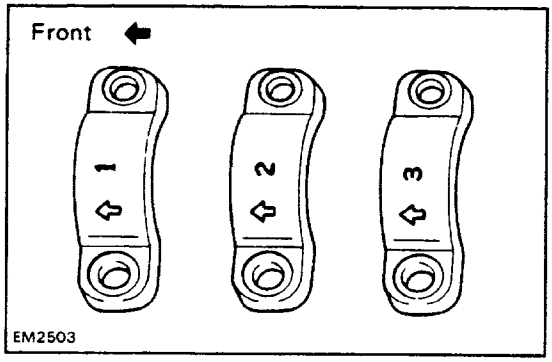


15. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journal.

(b) Place the camshaft in the cylinder head.

(c) Lay a strip of Plastigage across each journal.

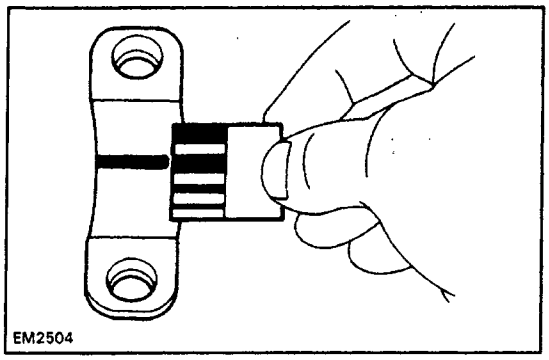


(d) Install the correct numbered bearing cap on each journal with the arrows pointing toward the front.

Torque each bolt.

Torque: 20 N–m (200kgf.–cm, 14ft–lbf)

HINT: Do not turn the camshaft while the Plastigags is in place.


EM2504

(e) Remove the caps and measure the Piastigage at its widest point.

Standard clearance: 0.01 – 0.05 mm (0.0004 – 0.0020 in.)

Maximum clearance: 0.1 mm (0.004 in.)

!f clearance is greater than maximum, replace the cylinder head and/or camshaft.

(f) Clean out the pieces of Plastigage from the bearing and journal.

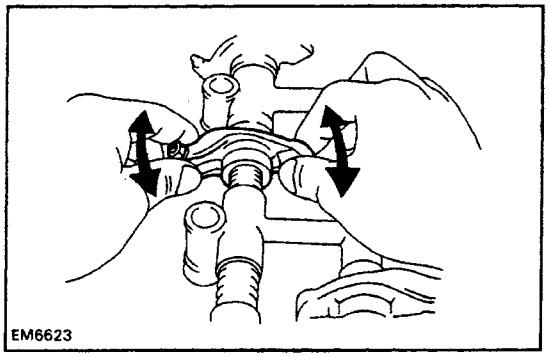
16. INSPECT ROCKER ARMS

Check the clearance between the rocker arms and shaft by moving the rocker arms as shown. Little or no movement should be felt.

If movement is felt, disassemble the rocker arm as–sembly and measure the oil clearance as follows:

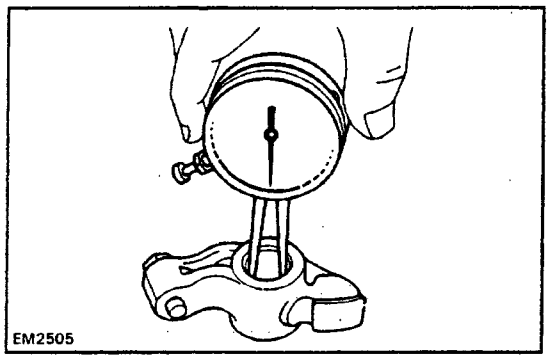
(a) Disassemble rocker arm assembly.

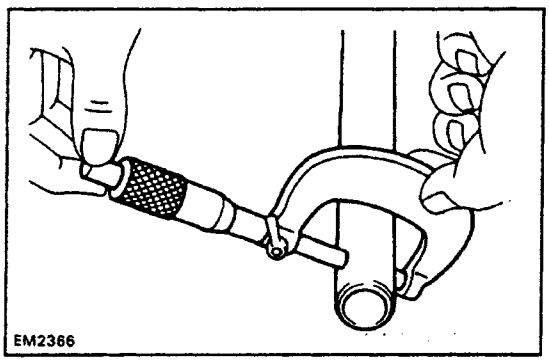
- Remove the three screws.
- Slide the rocker stands, spring and rocker arms off the shafts.


EM6623

(b) Using a dial indicator or telescoping gauge, measure the inside diameter of the rocker arm.

Standard inside diameter: 16.000 – 16.018 mm. (0.6299 – 0.6306 in.)


EM2505


EM2366

(c) Using a micrometer, measure the outside diameter of the shaft.

Standard diameter: 15.97 –15.99 mm (0.6287 – 0.6295 in.)

(d) Subtract the shaft diameter measurement from the rocker arm diameter measurement.

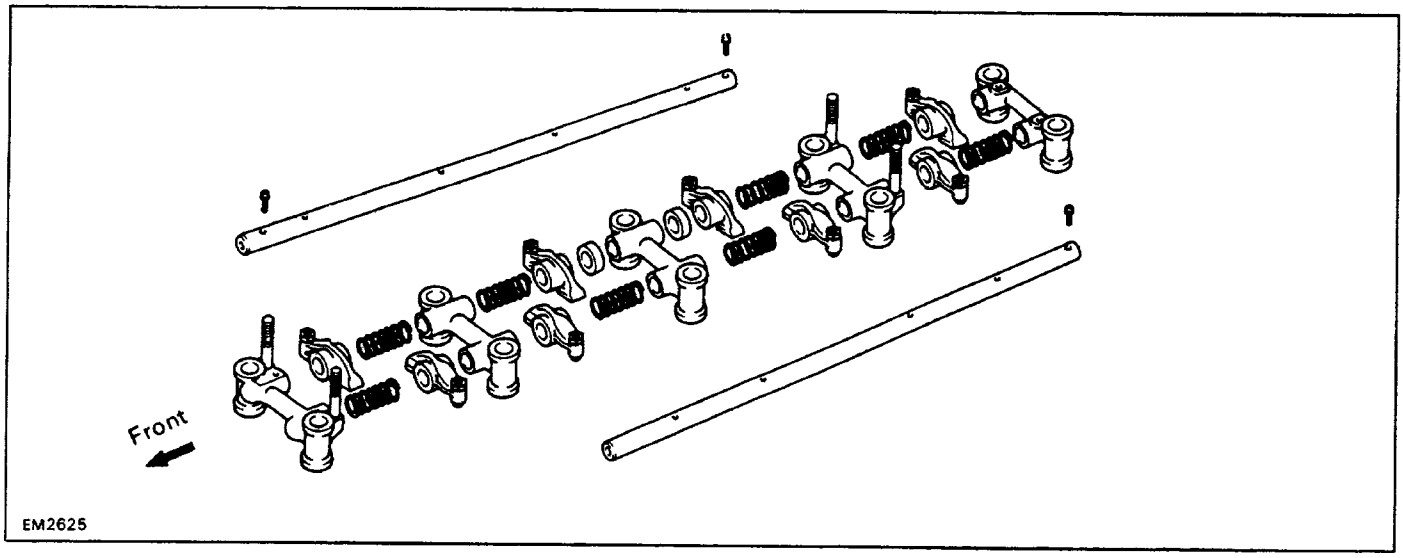
Standard oil clearance: 0.01 – 0.05 mm (0.0004 – 0.0020 in.)

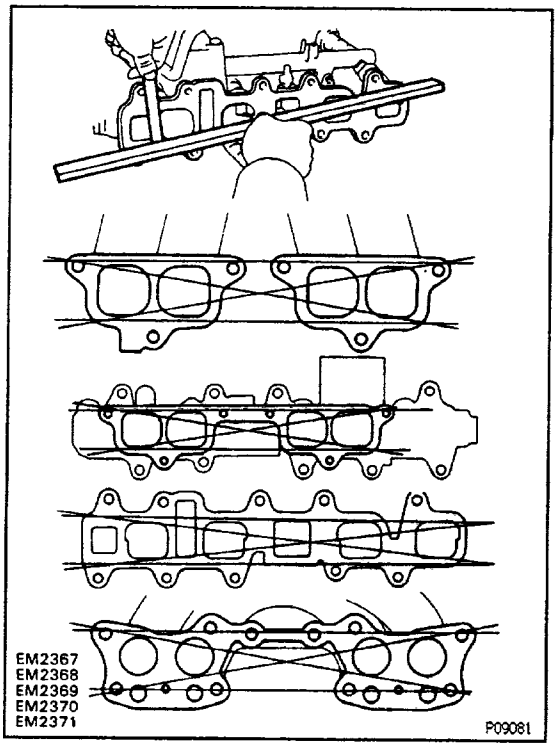
Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is grater than maximum, replace the rocker arm and/or shaft.

(e) Assemble the rocker arm assembly as shown, and install the three screws.

HINT: All rocker arms are the same but all rocker stands are different and must be assembled in the correct order.





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.

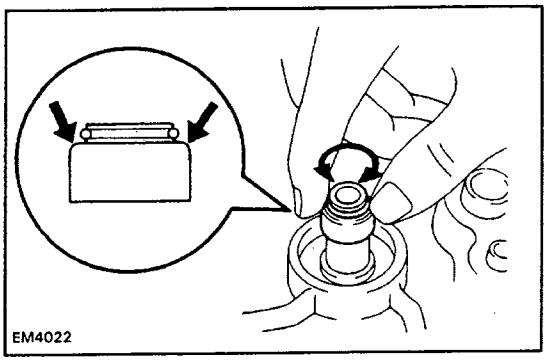
CYLINDER HEAD ASSEMBLY

EG1VF–02

(See page EG1–15**)**

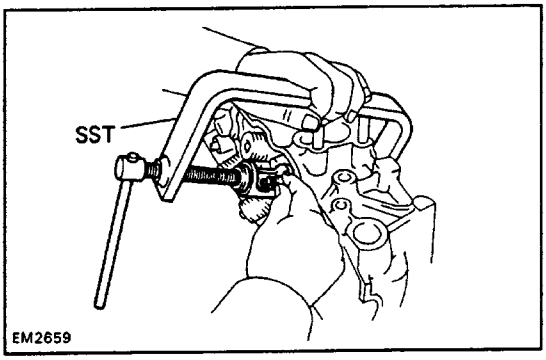
HINT:

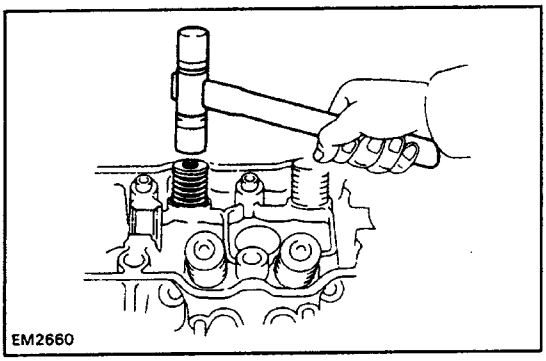
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.



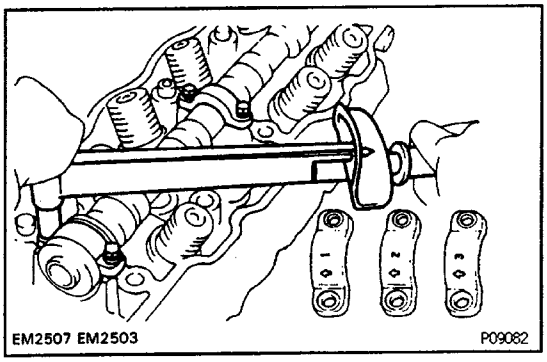
1. INSTALL VALVES

(a) Install a new oil seal on the valve guide bushing.
HINT Pushing down at the place shown in the illus–tration.
(b) Rotate the oil seal to check that it is firmly installed.
(c) Lubricate and insert valve in the valve guide bushing.
Check that valves are installed in the correct order.
(d) Install spring seat, spring and spring retainer on the cylinder head.
(e) Using SST, compress valve retainer and place two keepers around the valve stem.
SST 09202–43013



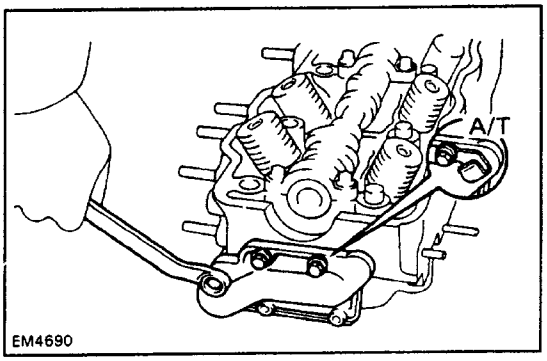


(f) Tap the stem lightly to assure proper fit.



2. INSTALL CAMSHAFT

(a) Place the camshaft in the cylinder head and install the bearing caps in numbered order from the front with arrows pointed toward the front.
(b) Install and torque the cap bolts.
Torque: 20N–m (200kgf–cm, 14ft–lbf)
(c) Turn the camshaft to position the dowel at the top.

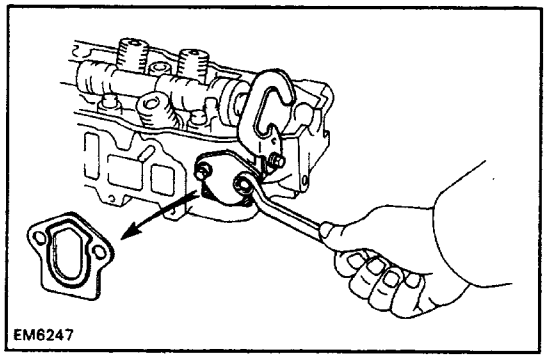


3. INSTALL CYLINDER HEAD REAR COVER

Install a new gasket, cylinder head rear cover and throttle cable clamp (for A/T) with the four bolts.

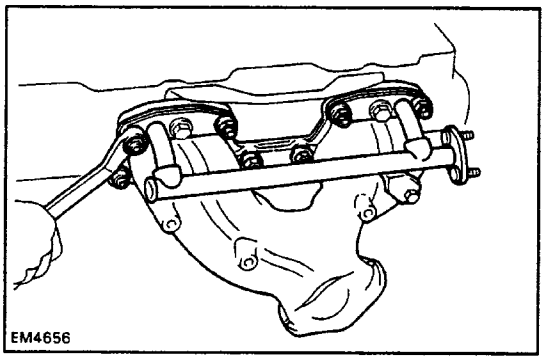
4. INSTALL LH ENGINE HANGER AND GROUND STRAP

5. INSTALL RH ENGINE HANGER



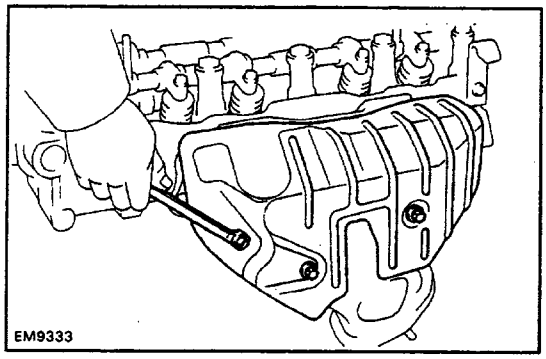
6. INSTALL PLUG PATE

Install a new gasket and plug plate with the two bolts.
HINT: Attach the flat side of the gasket to the cylinder head.

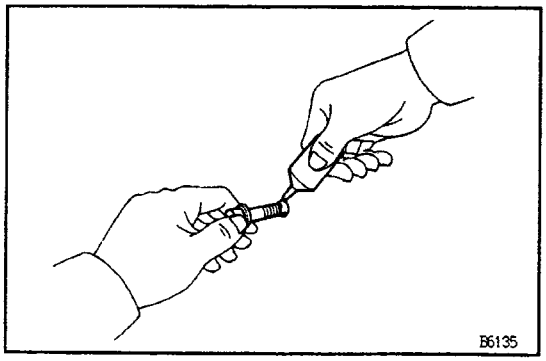


7. INSTALL EXHAUST MANIFOLD

(a) Position a new gasket on the cylinder head.
(b) Install the exhaust manifold with the eight nuts.
Torque the nuts.
Torque: 44N–m (450kgf–cm, 33ft–lbf)



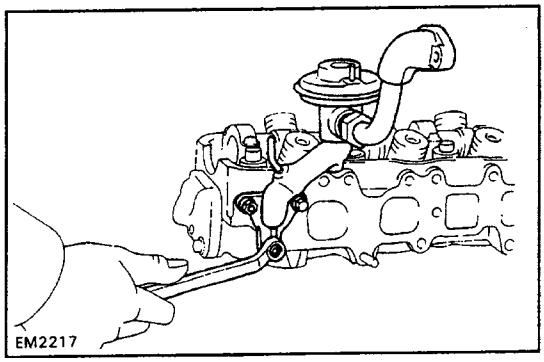
(c) Install the No. 2 exhaust manifold heat insulator with the three bolts.
Torque: 19N–m (195kgf–cm, 14ft.–lbf)



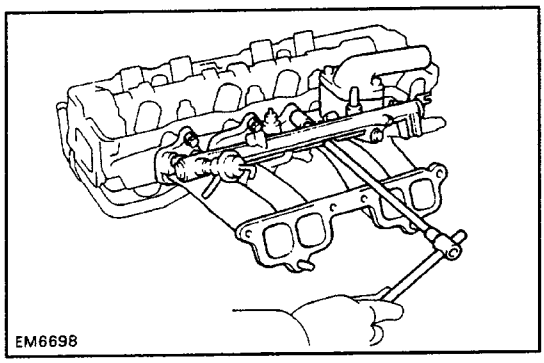
8. INSTALL EGR VALVE

(a) Clean the set bolt (closest to the front) threads and cylinder head bolt holes of any sealer, oil or foreign particles.
Remove any oil with kerosene or gasoline.
(b) Apply sealant to 2 or 3 threads of the bolt end.
Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

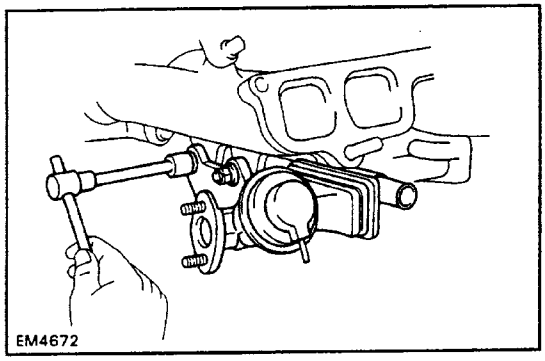
- This adhesive will not harden while exposed to air. It will act as a sealer or binding agent only when applied to threads, etc. and air is cut off.



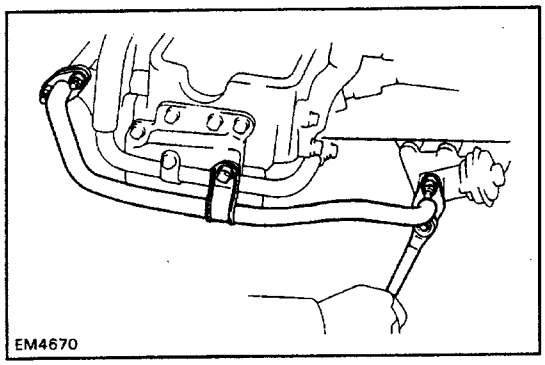
(c) Install the EGR valve with the two bolts and nut.



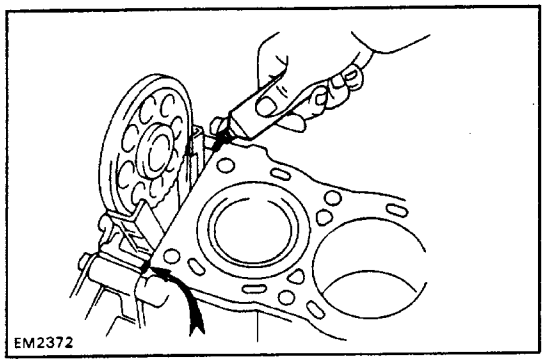
9. INSTALL INTAKE MANIFOLD
(a) Position a new gasket on the cylinder head.
(b) Install the intake manifold with the delivery pipe and injectors and No. 1 air pipe.
(c) Install the seven bolts, one hexagon bolt and two nuts. Torque the bolts and nuts.
Torque: 19Nm (195kgf–cm, 14ft–lbf)
(d) Install the heater inlet pipe to the cylinder head with the bolt.



(e) Install the PAIR valve with the two nuts.
Torque: 13N–m (130kgf–cm, 9 ft–lbf)



10. INSTALL NO. 1 SECONDARY AIR INJECTION MANIFOLD
(a) Position new gaskets on the PAIR valve and No. 1 secondary air injection pipe.
(b) Install the No. 1 secondary air injection pipe with the four nuts and bolt.
Torque: 13Nm (130kgf–cm. 9ft–lbf)



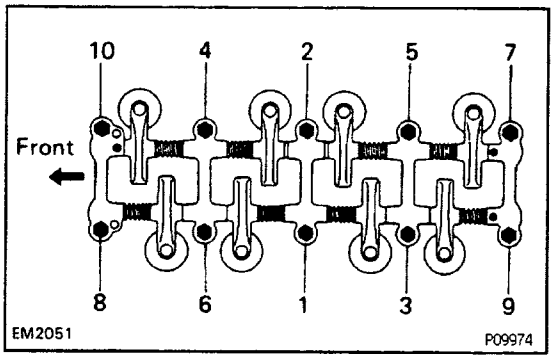
EG1VG–02

CYLINDER HEAD INSTALLATION

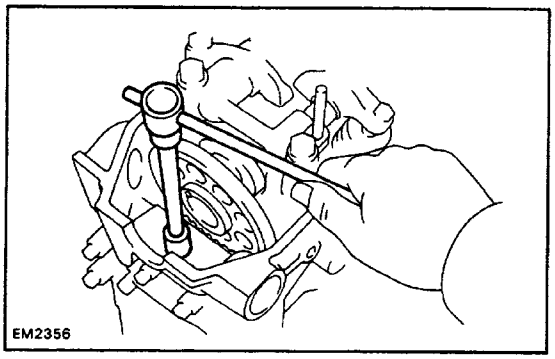
(See page EG1–15)

1. APPLY SEAL PACKING TO CYLINDER BLOCK
(a) Apply seal packing to two locations as shown.
Seal packing: Part No. 08826–00080 or equivalent
(b) Place a new head gasket over dowels on the cylinder block.
2. INSTALL CYLINDER HEAD

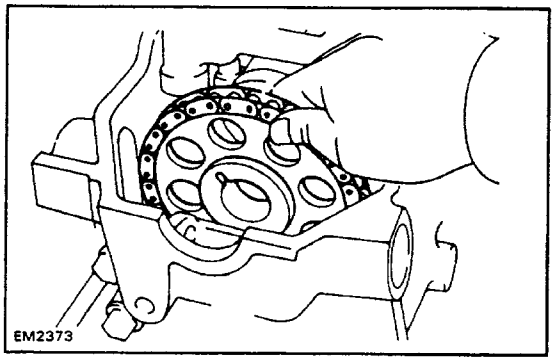
(a) If the sprocket was removed, align the alignment marks placed on the sprocket and chain during re–moval.
(b) position the cylinder head over dowels on the block.



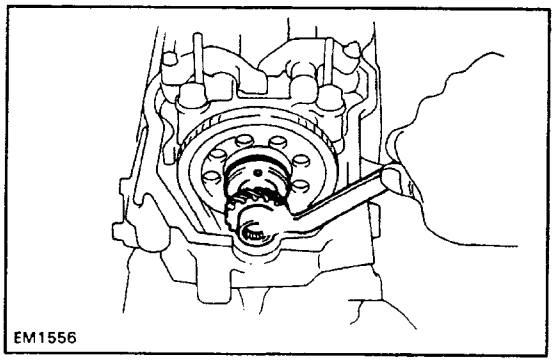
3. INSTALL ROCKER ARM ASSEMBLY
(a) Place the rocker arm assembly over the dowels on the cylinder head.
(b) Install and tighten the head bolts gradually in three passes in the sequence shown. Torque the bolts on the final pass.
Torque: 78N–m (800kgf–cm, 58ft–lbf)



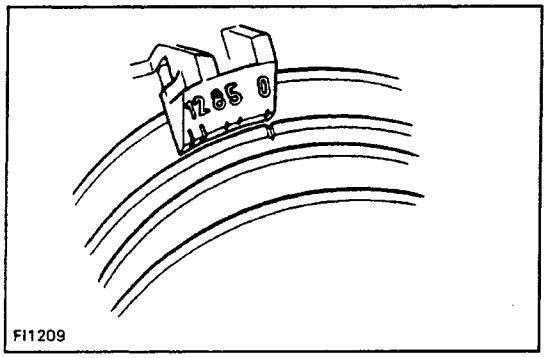
4. INSTALL CHAIN COVER BOLT
Torque the bolt.
Torque: 13N–m (130kgf–cm, 9ft–lbf)



(a) While holding up on the sprocket and chain, turn the crankshaft until the No. 1 and No. 4 cylinders are at top dead center.
(b) Place the chain sprocket over the camshaft dowel.
HINT: If the chain does not seem long enough,turn the crankshaft back and forth while pulling up on the chain and sprocket.



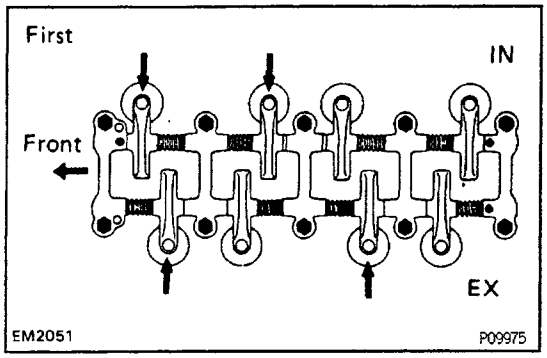
5. INSTALL DISTRIBUTOR DRIVE GEAR AND CAM–SHAFT THRUST PLATE
Place the distributor drive gear and camshaft thrust plate over the chain sprocket. Torque the bolt.
Torque: 78N–m (800kgf–cm, 58ft–lbf)



6. ADJUST VALVE CLEARANCE

(a) Set the No. 1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing, marks at TDC. Set the groove on the pulley at the ”0” mark position of the chain cover.
- Check that the rocker arms on the No. 1 cylinder are loose and the rocker arms on No. 4 cylinder are tight.
  If not, turn the crankshaft one complete revolution and align the marks as above.



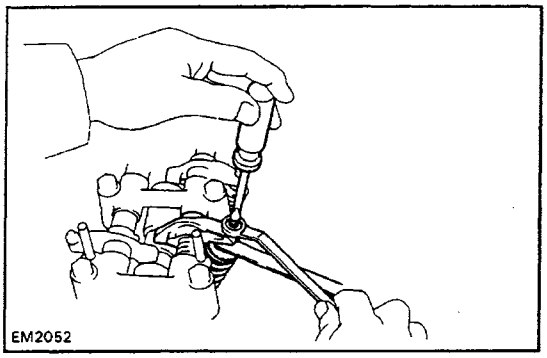
(b) Adjust the clearance of half of the valves.
Adjust only the valves indicated by arrows as shown.

Valve clearance (Cold):

Intake 0.20 mm (0.008 in.)

Exhaust 0.30 mm (0.012 in.)

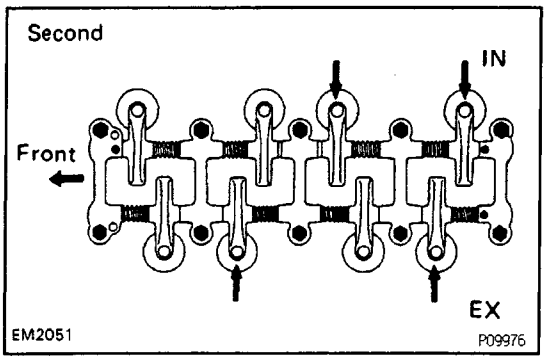
HINT: After installing the cylinder head, warm up the engine and adjust the valve clearance.



Use a thickness gauge to measure between the valve stern and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position and tighten the lock nut.

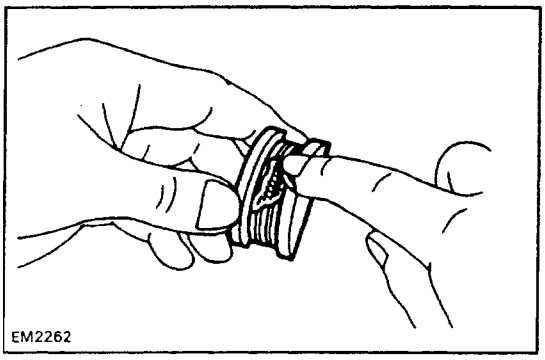
Torque: 25N–m (250kgf–cm, 18ft–lbf)

Recheck the clearance. The thickness gauge should move. with a very slight drag.



(c) Turn the crankshaft one revolution and adjust the other valves.

(d) Set the No. 1 cylinder to TDC/compression.

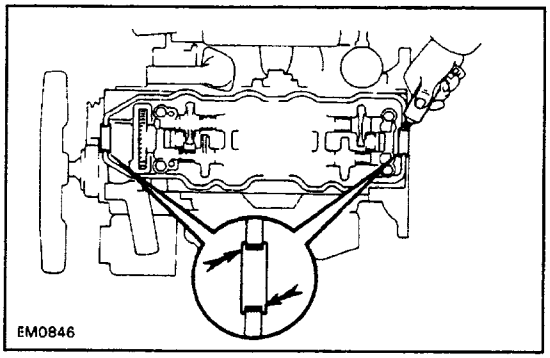


7. INSTALL HALF–CIRCULAR PLUGS

(a) Apply seal packing to the cylinder head installation surface of the plug.

Seal packing: Part No. 08826–00080 or equivalent

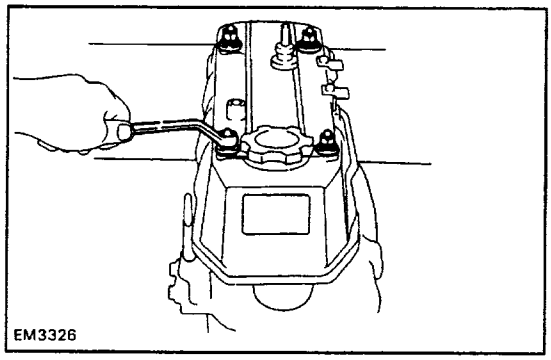
(b) Install the half–circular plugs to the cylinder head.



8. INSTALL HEAD COVER

(a) Apply seal packing to the four locations shown.

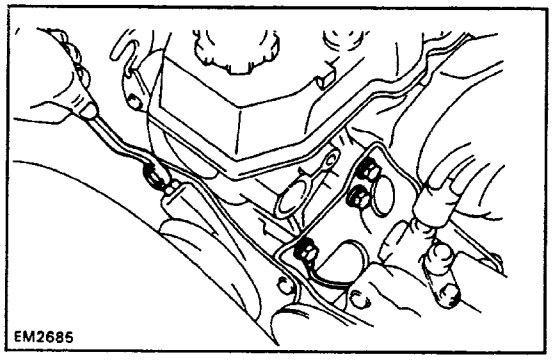
Seal packing: Part No. 08826–00080 or equivalent



(b) Install the gasket to the cylinder head.

(c) Place the head cover on the cylinder head and install the four seals and nuts.

Torque: 5.9N–m (60kgf–cm, 52in.–lbf)



EG1VH–02

POST INSTALLATION

1. (w/PS)

CONNECT PS BRACKET TO CYLINDER HEAD

Install the four bolts and bond strap. Torque the bolts.

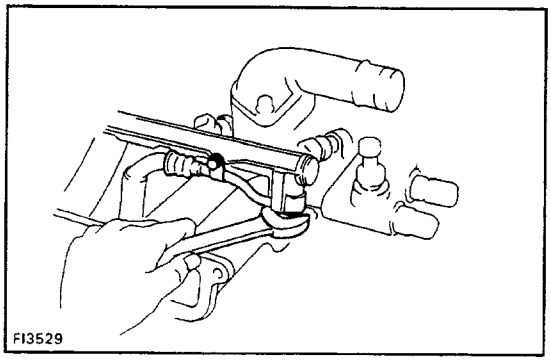
Torque: 44N–m (450kgf–cm, 33ft–lbf)

2. (w/PS)

INSTALL DRIVE BELT AND ADJUST BELT TEN–SION

(See step 2 on page MA–6)

3. CONNECT BY–PASS HOSE TO INTAKE MANIFOLD



4. CONNECT FUEL HOSE TO DELIVERY PIPE

Install new gaskets and the fuel hose with union bolt.

Torque: 44N–m (450kgf–cm, 33ft–lbf)

5. CONNECT FOLLOWING WIRES:

(a) Engine coolant temp. sensor wire

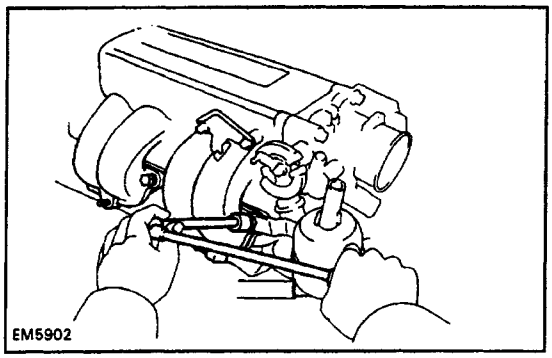
(b) Cold start injector time switch wire

(c) VSV wires

(d) Igniter wire

(e) (A/T)
OD temp. switch wire
(f) Engine coolant temp. sender gauge wire
(g) Injector wires
(h) (with A/C)
Compressor wires
(i) Transmission wires
(j) Starter wire (terminal 50)
(k) Oil pressure sender gauge wire
(l) Knock sensor wire

6. CONNECT FUEL RETURN HOSE



7. INSTALL CHAMBER WITH THROTTLE BODY

(a) Position new gaskets on the intake manifold and No. 1 EGR pipe.
(b)– Install the chamber, throttle body, fuel hose clamp, resonator and bond strap with the four bolts and two nuts.
(c) Connect the chamber and stay with a bolt.
(d) Install the bolts holding the EGR valve to the chamber.
(e) Install the new gaskets and cold start injector pipe.

8. CONNECT FOLLOWING WIRES:

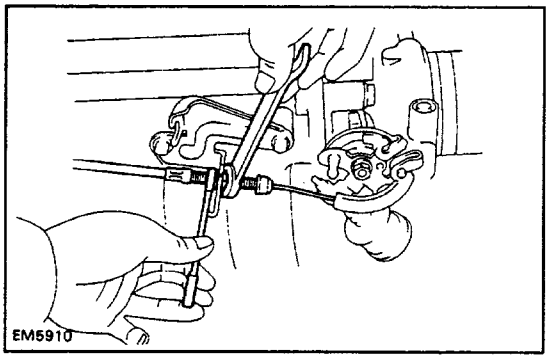
(a) (California only)
EGR gas temp. sensor wire
(b) Throttle position wire
(c) Cold start injector wire

9. INSTALL EGR VACUUM MODULATOR

10. CONNECT FOLLOWING PARTS:

(a) (w/ Oil cooler)
Connect the No. 1 oil cooler hose to the intake man–ifold.
(w/o Oil cooler)
Connect the No. 1 water by–pass hose to the intake manifold.
(b) No. 2 and No. 3 water by–pass hoses to the throttle body
(c) Vacuum hoses to throttle body
(d) Pressure regulator hose
(e) Fuel pressure up hose
(f) PAIR valve hose
(g) EGR valve hose

(h) EGR vacuum modulator hose
(i) EVAP hose
(j) (with A/C)
VSV hoses
(k) (w/PS)
Air control valve hoses
(l) Brake booster hose
(m) No. 1 and No. 2 PCV hoses

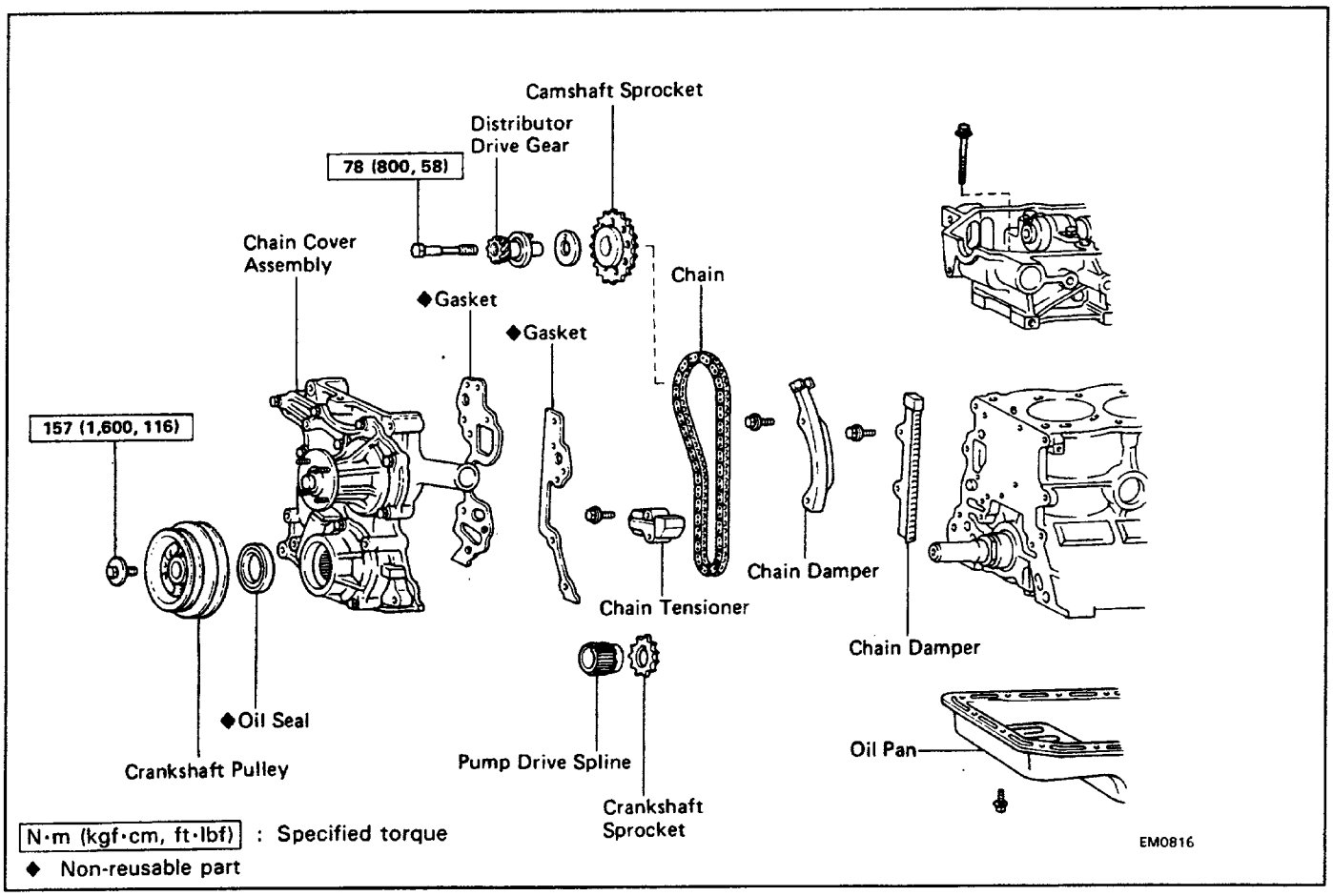


11. CONNECT GROUND STRAP TO ENGINE REAR SIDE
12. (A/T)
CONNECT THROTTLE CABLE
Connect the throttle cable to the clamp and bracket.
13. CONNECT ACCELERATOR CABLE
14. CONNECT HEATER WATER INLET HOSE TO HEATER WATER INLET PIPE
15. INSTALL RADIATOR INLET HOSE
16. INSTALL SPARK PLUGS AND DISTRIBUTOR
(See pages IG–6**, 9)**
17. INSTALL OIL DIPSTICK
18. CONNECT EXHAUST PIPE TO EXHAUST MANI–FOLD
(a) Install the new gaskets, and connect the exhaust pipe to the exhaust manifold with the three nuts.
(b) Install the exhaust pipe clamp.
19. INSTALL INTAKE AIR CONNECTOR
20. FILL WITH ENGINE OIL
(See step 3 on page EG1–236**)**
21. FILL WITH COOLANT
(See step 3 on page EG1–225**)**
22. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
23. START ENGINE
Warm up the engine and inspect for leaks.
24. PERFORM ENGINE ADJUSTMENT
(See page EG1–10**)**
25. RECHECK COOLANT AND ENGINE OIL LEVEL
26. ROAD TEST
Road test the vehicle.
27. RECHECK COOLANT AND ENGINE OIL LEVEL

TIMING CHAIN

EG1VJ–01

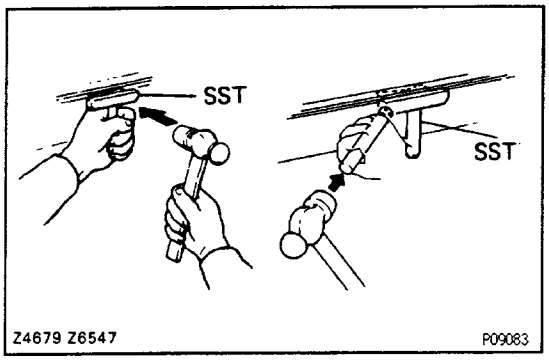
COMPONENTS



EG1VK–02

PREPARATION OF REMOVAL

1. REMOVE CYLINDER HEAD
(See page EG1–16)
2. REMOVE RADIATOR
(See page EG1–230)
3. (4WD)
REMOVE FRONT DIFFERENTIAL
(See SA section)



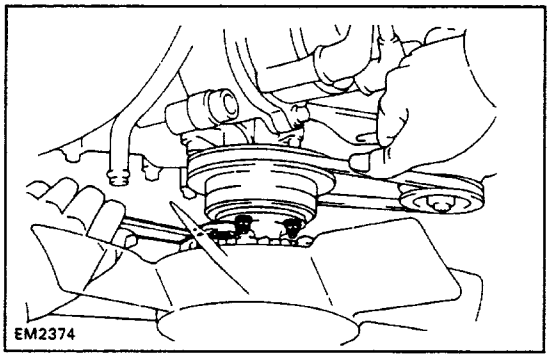
4. REMOVE OIL PAN
(a) Remove the engine undercover.
(b) Remove the engine mounting bolts.
(c) (2WD)
Place a jack under the transmission and raise the engine approx. 25 mm (0.98 in.)
(d) Remove the sixteen bolts and nuts.
(e) Using SST and brass bar, separate the oil pan from the cylinder block.

SST 09032 – 00100
HINT: When removing the oil pan, be careful not to damage the oil pan flange.

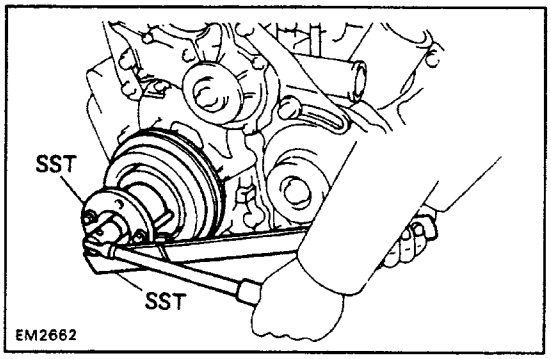
EG1VL–02

TIMING CHAIN REMOVAL

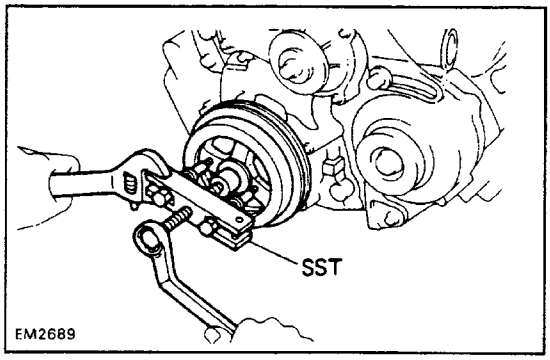
1. (W/PS)
REMOVE PS BELT
2. (with A/C)
REMOVE A/C BELT, COMPRESSOR AND BRACKET



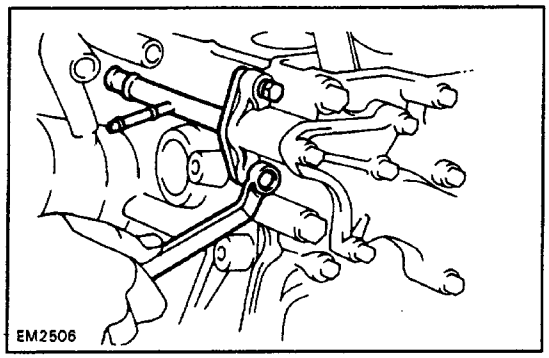
3. REMOVE FLUID COUPLING WITH FAN AND WATER PUMP PULLEY
(a) Loosen the water pump pulley set bolts.
(b) Loosen the belt adjusting bolt and pivot bolt of the generator, and remove the drive belt.
(c) Remove the set nuts, fluid coupling with fan and water pump pulley.



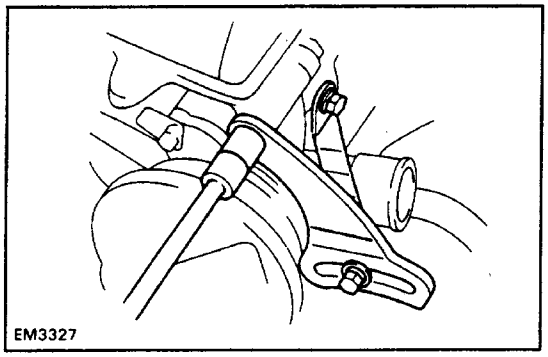
4. REMOVE CRANKSHAFT PULLEY
(a) (with A/C (w/o Air pump) or w/PS (w/ Air pump)) Remove the No. 2 crankshaft pulley.
(b) Using SST to hold the crankshaft pulley, loosen the pulley bolt.
SST 09213–70010 and 09330–00021



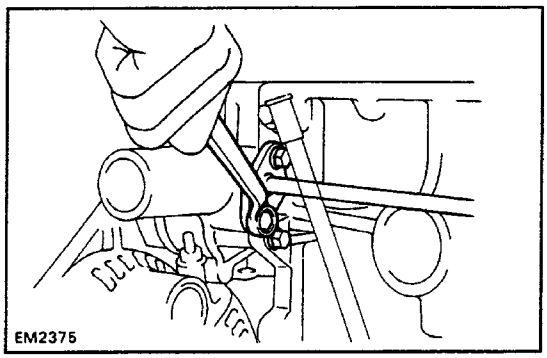
(c) Using SST, remove the crankshaft pulley.
SST 09213–310231
HINT: If the front seal is to be replaced, see page EG1–236.



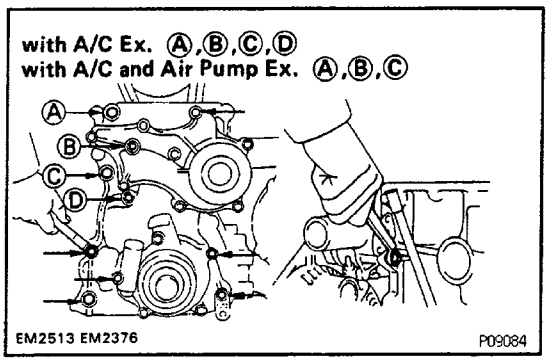
5. REMOVE NO. 1 WATER BY–PASS PIPE
Remove the two bolts and pipe.



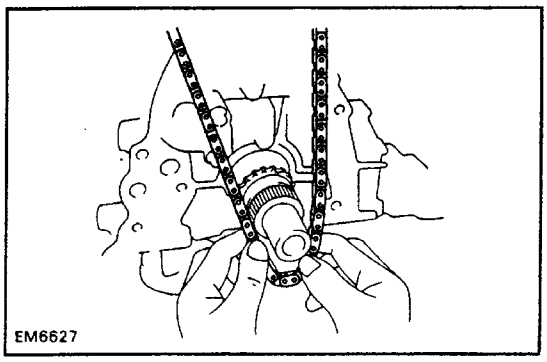
6. REMOVE FAN BELT ADJUSTING BAR
(a) (w/ PS)
Remove the bolt and PS lower bracket.
(b) Remove the three bolts and bar.



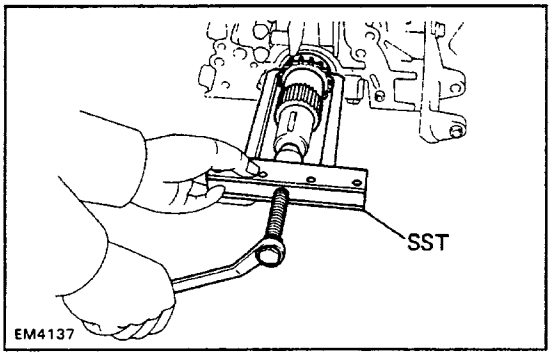
7. DISCONNECT HEATER WATER OUTLET PIPE
Remove the two bolts, and disconnect heater water outlet pipe.



8. REMOVE CHAIN COVER ASSEMBLY
(a) Remove timing chain cover bolts shown by the arrows.
(b) Using a plastic faced hammer, loosen the chain cover and remove it.



9. REMOVE CHAIN AND CAMSHAFT SPROCKET
(a) Remove the chain from the damper.
(b) Remove the cam sprocket and chain together.



10. REMOVE PUMP DRIVE SPLINE AND CRANKSHAFT SPROCKET

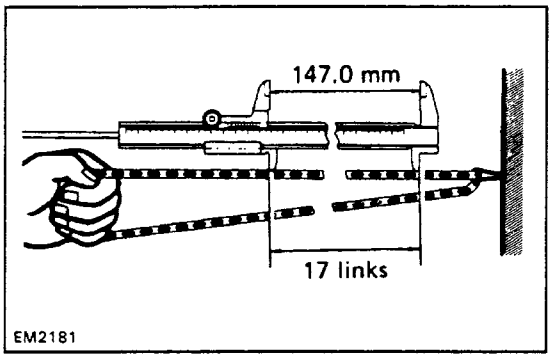
If the oil pump drive spline and sprocket cannot be removed by hand, use SST to remove them together.

SST 09213–36020

11. REMOVE GASKET MATERIAL ON CYLINDER BLOCK

EG1VM–01

COMPONENTS INSPECTION



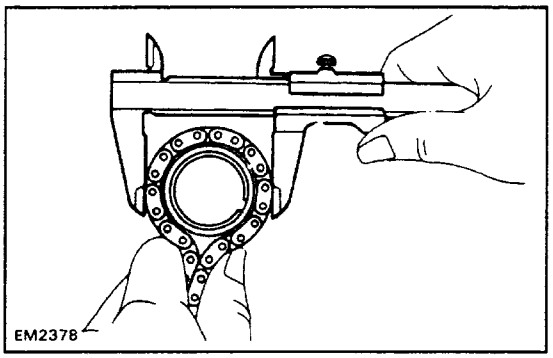
1. MEASURE CHAIN AND SPROCKET WEAR

(a) Measure the length of 17 links with the chain fully stretched.

(b) Make the same measurements at least three other places selected at random.

Chain elongation limit at 17 links: 147.0 mm (5.787 in.)

If over the limit at any one place the chain.



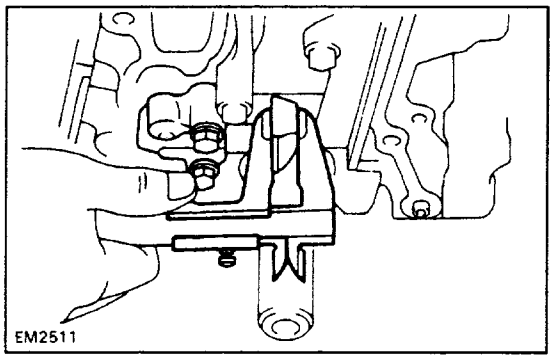
(c) Wrap the chain around the sprocket.

(d) Using a caliper gauge, measure the outer sides of the chain rollers as shown. Measure both sprockets.

Crankshaft sprocket minimum: 59.4 mm (2.339 in.)

Camshaft sprocket minimum: 113.8 mm (4.480 in.)

If the measurement is less than minimum, replace the chain and two sprockets.

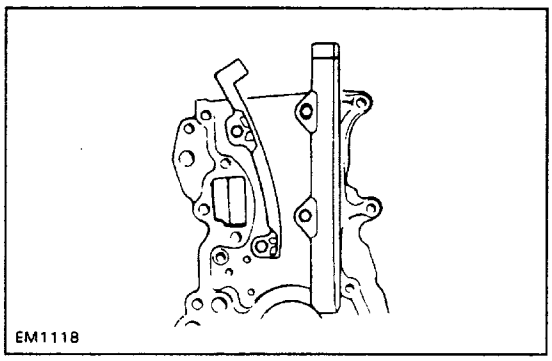


2. MEASURE CHAIN TENSIONER

Using a caliper gauge, measure the tensioner as shown.

Tensioner minimum: 11.0 mm (0.433 in.)

If the tensioner is worn or less than minimum, replace the chain tensioner.



3. MEASURE CHAIN DAMPERS

Using a micrometer, measure each damper.

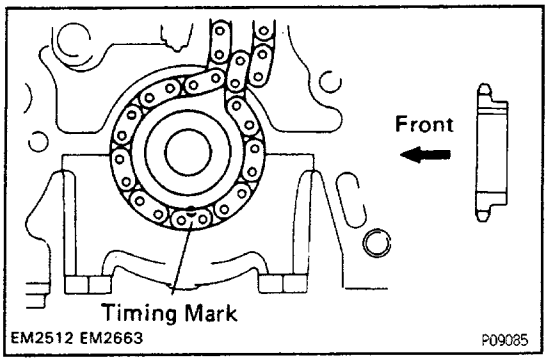
Damper wear limit: 0.5 mm (0.020 in.)

If either damper is worn or less than minimum, replace the damper.

EG1VN–03

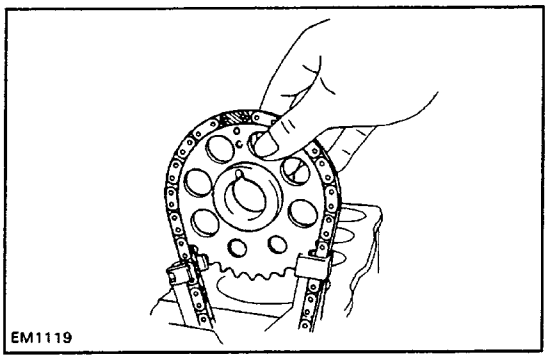
TIMING CHAIN INSTALLATION

(See page EG1–39)



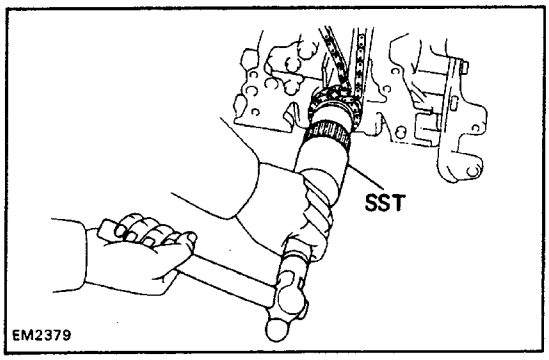
1. INSTALL CRANKSHAFT SPROCKET AND CHAIN

(a) Turn the crankshaft until the shaft key is on top.
(b) Slide the sprocket over the key on the crankshaft.
(c) Place the timing chain on the sprocket with the single bright chain link aligned with the timing mark on the sprocket.



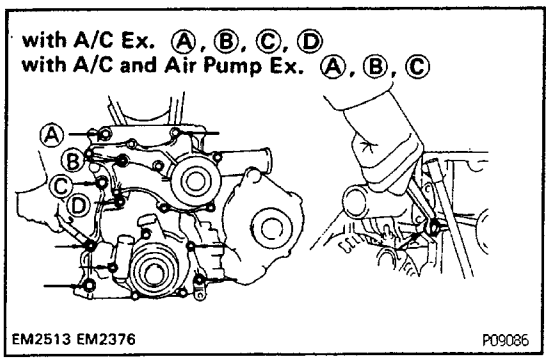
2. PLACE CHAIN ON CAMSHAFT SPROCKET

(a) Place the timing chain on the sprocket so that the bright chain link is aligned with the timing mark on the sprocket.
(b) Make sure the chain is positioned between the dam–pers.
(c) Turn the camshaft sprocket counterclockwise to take the slack out of the chain.



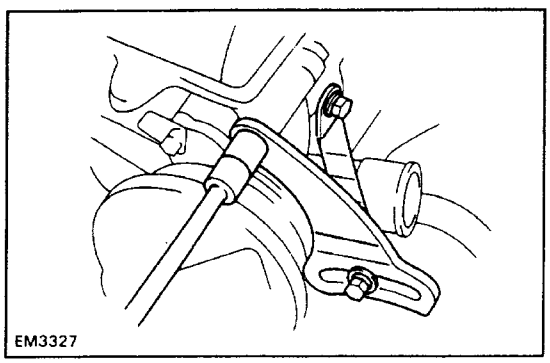
3. INSTALL OIL PUMP DRIVE SPLINE

Slide the oil pump drive spline over the crankshaft key.
HINT: If the oil pump drive spline is difficult to install by hand, install using SST.
SST 09608–35014 (09608–06040)



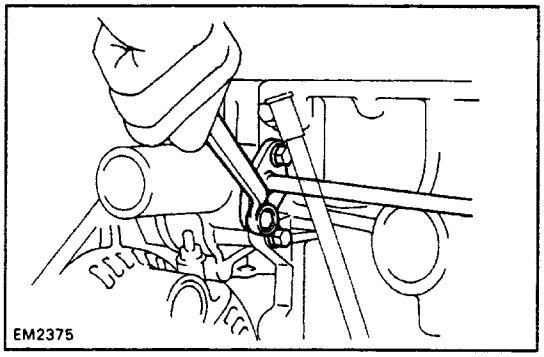
4. INSTALL TIMING CHAIN COVER ASSEMBLY

(a) Remove the old cover gaskets. Clean the gasket sur–face. Install new gaskets over the dowels.
(b) Slide the cover assembly over the dowels and pump spline.
(c) Insert the bolts as shown and torque them.
Torque: 8 mm bolt 13 N–m(130kgf–cm, 9ft–lbf)
10 mm bolt 13 N–m(400kgf–cm, 29ft–lbf)

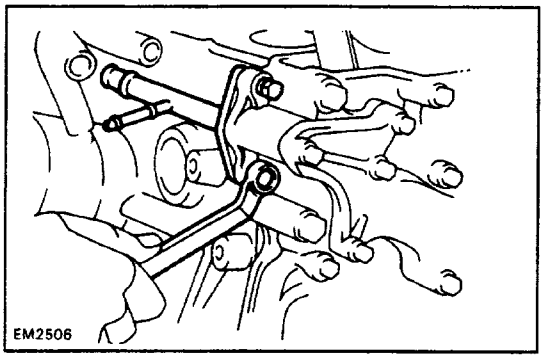


5. INSTALL FAN BELT ADJUSTING BAR

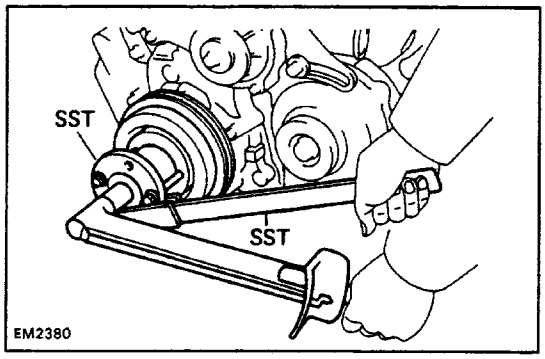
(a) Temporarily install the adjusting bar to the alternator.
(b) Install the adjusting bar to the chain cover and cylin–der head.
Torque: 13N–m(130kgf–cm, 9ft–lbf)



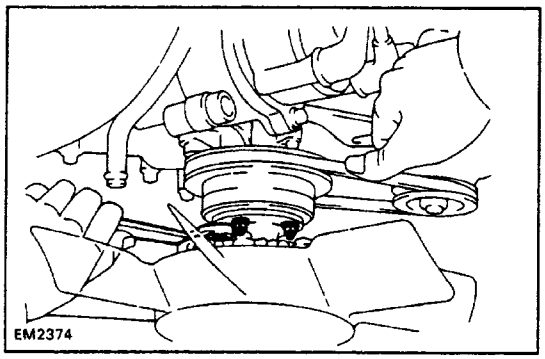
6. INSTALL HEATER WATER OUTLET PIPE
Connect the heater water outlet pipe to the timing chain cover with the two bolts.



7. INSTALL NO.1 WATER BY–PASS PIPE
Install the pipe with the two bolts.

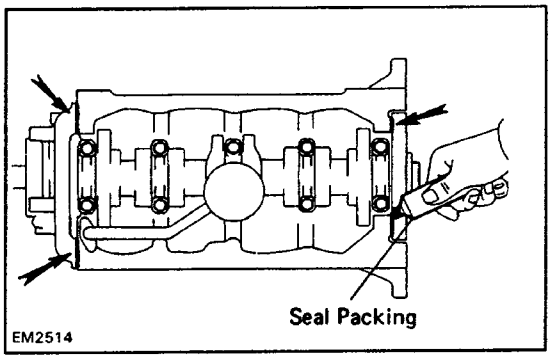


8. INSTALL CRANKSHAFT PULLEY
(a) Install the crankshaft pulley and bolt.
(b) Using SST to hole the crankshaft pulley, torque the. bolt.
SST 09213–70010 and 09660–00021
Torque: 157N–m(1,600kgf–cm, 116ft–lbf)
(c) (with A/C) Install the NO.2 crankshaft pulley.



9. INSTALL WATER PUMP PULLEY AND FLUID COUPLING WITH FAN
(a) Temporarily install the water pump pulley and fluid coupling with fan with the four nuts.
(b) Place the drive belt onto each pulley.
(c) Stretch the belt tight and tighten the four nuts.
10. ADJUST DRIVE BELT TENSION
(See page MA–6)
11. (with A/C) INSTALL A/C COMPRESSOR BRACKET, COMPRESSOR AND BELT
(See page MA–6)
12. (w/PS) INSTALL PS BELT
(See page MA–6)
13. INSTALL OIL PAN
(a) Remove any old packing material and be careful not to drop any oil on the contacting surfaces of the oil pan and cylinder block.

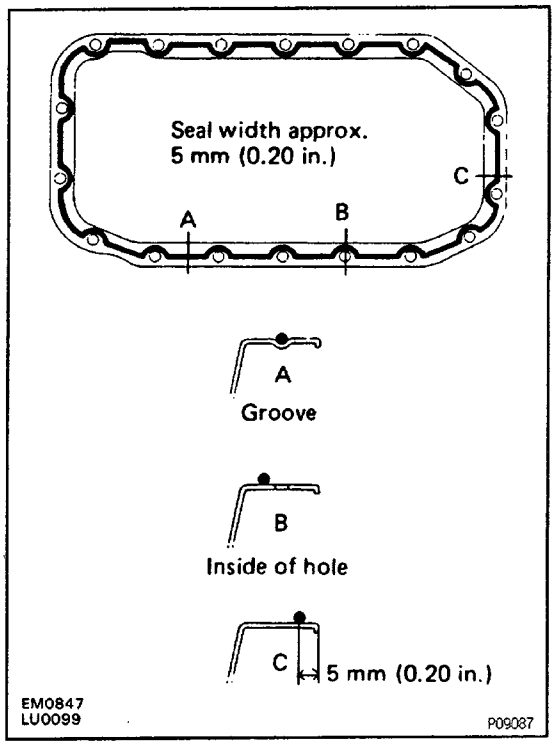
- Using a razor blade and gasket scraper, remove all the packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.



NOTICE: Do not use a solvent which will affect the pai–nted surfaces.

(b) Apply seal packing to the joint part of the cylinder block and chain cover, cylinder block and rear oil seal retainer.

Seal packing: Part No.08826–00080 or equivalent



(c) Apply seal packing to the oil pan as shown in the illustration.

Seal packing: Part No.08826–00080 or equivalent

Install a nozzle that has been cut to a 5–mm (0.20 in.) opening.

HINT: Avoid applying an excess amount to the sur–face. Be especially careful near oil passages.

- If parts are not assembled within 5 minutes of applying the seal packing, the effectiveness of the seal packing is lost and the seal packing must be removed and reapplied.
- Immediately remove the nozzle from the tubs and reinstall the cap after using the seal packing.

(d) Install the oil pan over the studs on the block with the sixteen bolts and two nuts. Torque the bolts and nuts.

Torque: 13N–m(130kgf–cm, 9ft–lbf)

(e) Lower the engine and install the engine mounting bolts.

(f) Install the engine under cover.

EG1VP–02

POST INSTALLATION

1. INSTALL RADIATOR

2. INSTALL CYLINDER HEAD

(See page EG1–34**)**

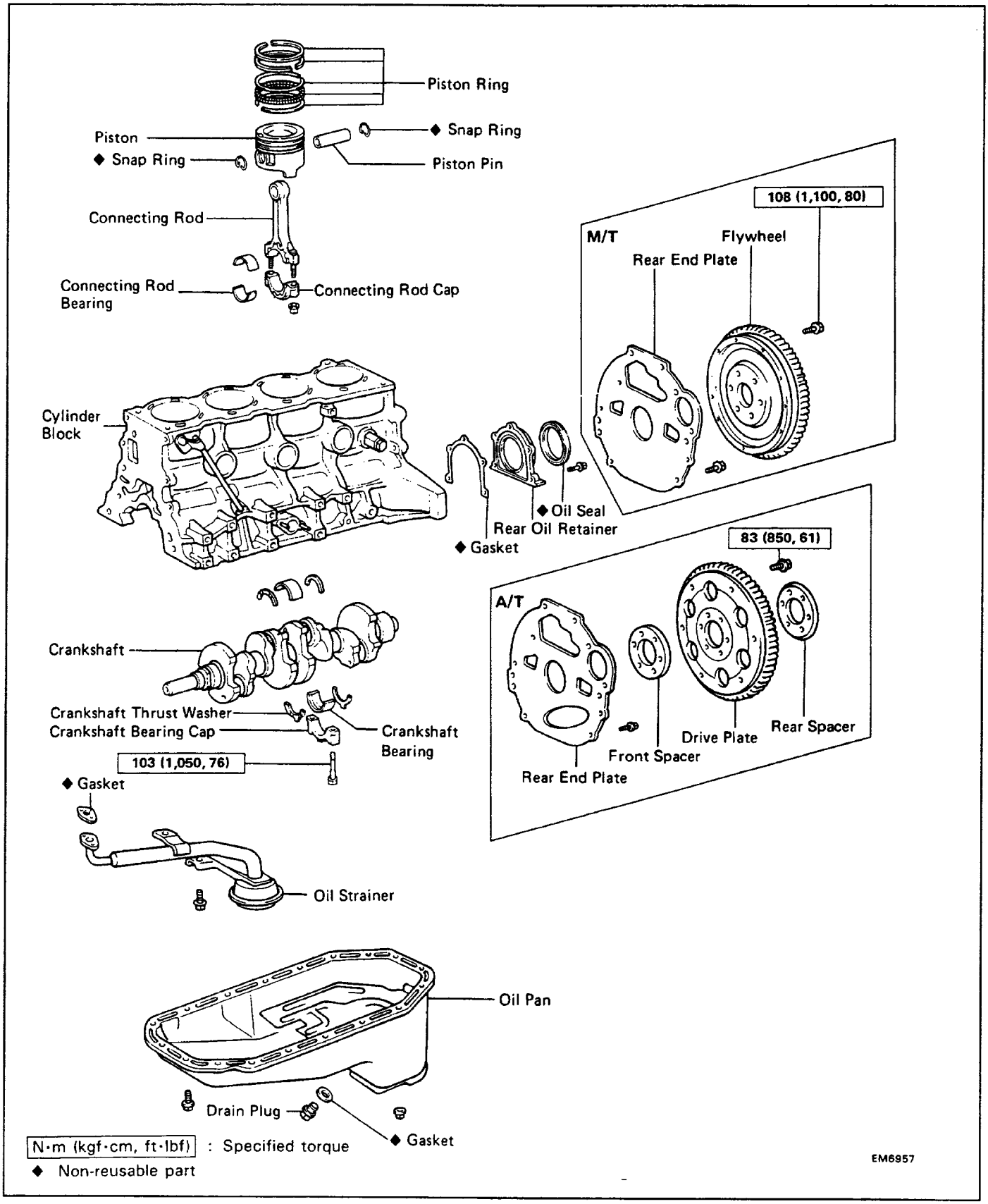
3. (4WD) INSTALL FRONT DIFFERENTIAL

(See SA section)

CYLINDER BLOCK

EG1VQ–01

COMPONENTS



EG1VR–02

ENGINE REMOVAL

1. REMOVE HOOD

2. REMOVE BATTERY

3. REMOVE ENGINE UNDER COVER

4. DRAIN COOLANT FROM RADIATOR AND CYLIN–DER BLOCK

(See step 3 on page EG1–225**)**

5. DRAIN ENGINE OIL

(See step 1 on page EG1–236**)**

6. REMOVE AIR CLEANER CASE AND INTAKE AIR CONNECTOR

7. REMOVE RADIATOR

(See page EG1–230**)**

8. REMOVE PS PUMP BELT

(a) Stretch the belt tight and loosen the PS pump pulley lock nut.

(b) Remove the PS belt.

9. (with A/C)

REMOVE A/C BELT

10. REMOVE GENERATOR DRIVE BELT, FLUID COU–PLING AND FAN PULLEY

(See step 3 on page EG1–40**)**

11. DISCONNECT FOLLOWING WIRES AND CONNEC–TORS:

(a) Ground strap from LH fender apron

(b) Generator connector and wire

(c) Igniter connector

(d) Generator wires

(e) High–tension cord for ignition coil

(f) Distributor wire from igniter

(g) Ground strap from engine rear side

(h) ECM connectors

(i) (M/T)

Starter relay connector

(j) Check connector

(k) (with A/C)

A/C compressor connector

12. DISCONNECT FOLLOWING HOSES:

(a) PS air hoses from gas filter and air pipe

(b) Brake booster hose

(c) (w/Cruise control)

Cruise control vacuum hose

(d) Charcoal canister hose from canister

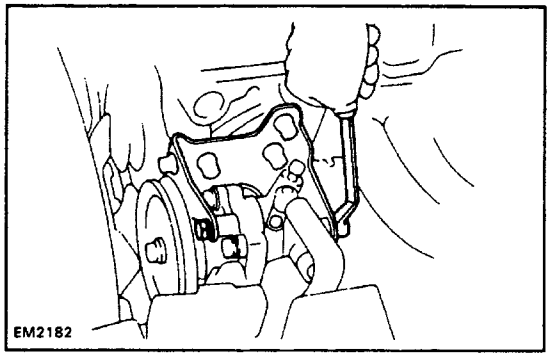
13. DISCONNECT FOLLOWING CABLE:

(a) Accelerator cable

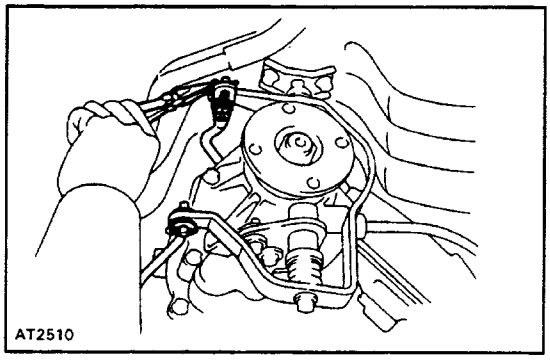
(b) (A/T)

Throttle cable

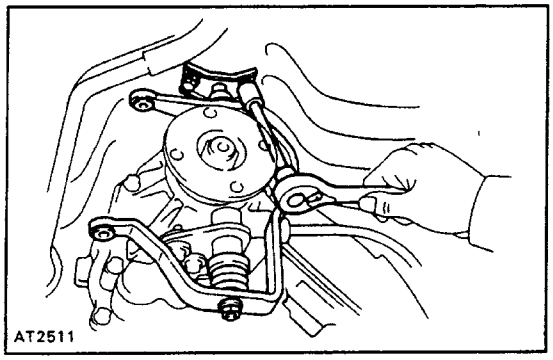
(c) (w/Cruise control)
Cruise control cable



14. (w/PS)
REMOVE PS PUMP FROM BRACKET
(a) Remove the drive belt.
(b) Remove the four bolts.
(c) Remove the PS pump.
HINT: Lay the PS pump to one side without disconn–ecting the hoses.
15. DISCONNECT GROUND STRAP FROM PS PUMP BRACKET
16. (with A/C)
REMOVE COMPRESSOR FROM BRACKET
(a) Loosen the drive belt adjusting bolt and remove the drive belt.
(6) Remove the compressor on the front side without disconnecting the hoses.
17. DISCONNECT GROUND STRAPS FROM ENGINE REAR SIDE AND RH SIDE
18. (M/T)
REMOVE SHIFT LEVER(S) FROM INSIDE OF VEHI–CLE
19. REMOVE REAR PROPELLER SHAFT
(See PR section)
20. (2WD A/T)
DISCONNECT MANUAL SHIFT LINKAGE FROM PNP SWITCH



21. (4WD A/T)
DISCONNECT TRANSFER SHIFT LINKAGE
(a) Disconnect the No.1 and No.2 transfer shift linkages from the cross shaft.



(b) Remove the cross shaft from the body.

22. DISCONNECT SPEEDOMETER CABLE

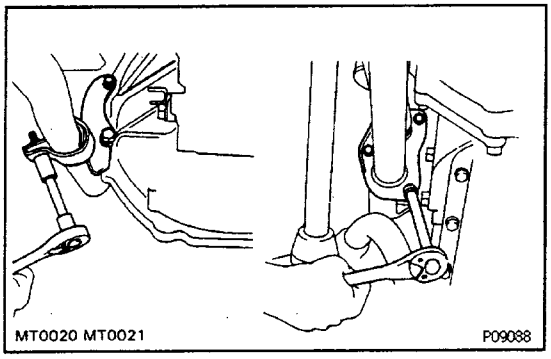
NOTICE: Do not lose the felt dust protector and washers.

23. (4WD)
REMOVE TRANSFER UNDER COVER

24. (4WD)
REMOVE STABILIZER BAR

25. (4WD)
REMOVE FRONT PROPELLER SHAFT
(See PR section)

26. REMOVE NO.1 FRAME CROSSMEMBER



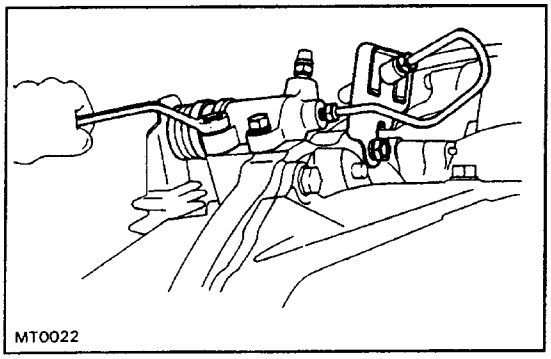
27. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the oxygen sensor connector.

(b) Disconnect the exhaust pipe from the exhaust mani–fold.

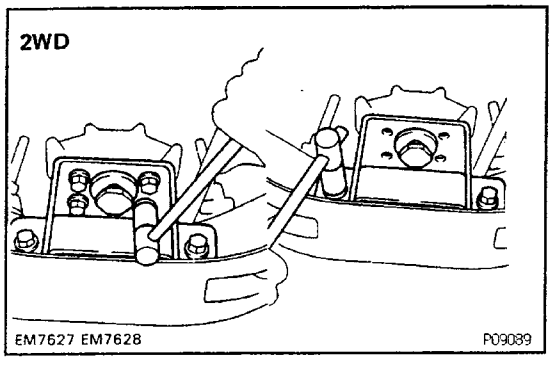
(c) Remove the exhaust pipe clamp from the clutch housing.

(d) Remove the exhaust pipe from the catalytic converter.



28. (M/T)
REMOVE CLUTCH RELEASE CYLINDER WITH BRACKET FROM TRANSMISSION

29. (4WD)
REMOVE NO.1 FRONT FLOOR HEAT INSULATOR AND BRAKE TUBE HEAT INSULATOR

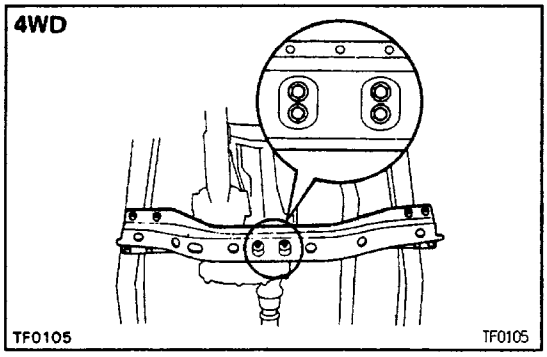


30. (2WD)
REMOVE ENGINE REAR MOUNTING AND BRACKET

(a) Remove the four bolts from the engine rear mounting.

(b) Raise the transmission slightly by raising the engine with a jack.

(c) Remove the four bolts from the support member.



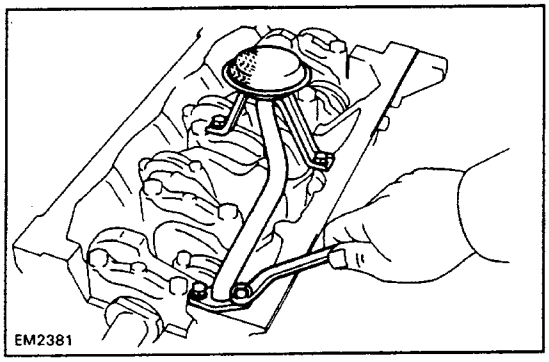
31. (4WD)
REMOVE NO.2 FRAME CROSSMEMBER FROM SIDE FRAME
(a) Remove the four bolts from the engine rear mounting.
(b) Raise the transmission slightly with a jack.
(c) Remove the four bolts from the side frame and remove the No.2 frame crossmember.
32. REMOVE ENGINE WITH TRANSMISSION FOR VE–HICLE
(a) Attach the engine hoist chain to the lift brackets of the engine.
(b) Remove the mounting nuts and bolts.
(c) Lift engine out of the vehicle slowly and carefully.

HINT: Make sure the engine is clear of all wiring and hoses.
33. REMOVE TRANSMISSION FROM ENGINE
(a) (A/T)
Remove the A/T oil cooler pipes.
(b) Remove the starter.
(c) Remove the two stiffener plates and exhaust pipe bracket from engine.
(d) Remove the transmission from the engine.
34. (M/T)
REMOVE CLUTCH COVER AND DISC

EG1VS–02

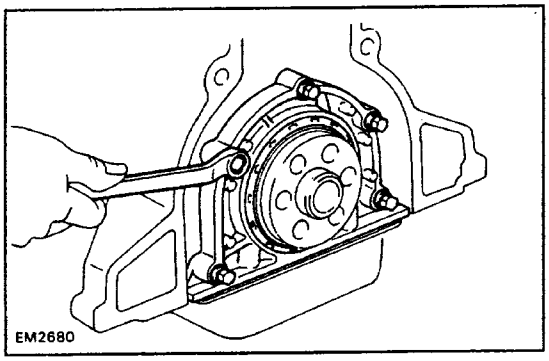
CYLINDER BLOCK DISASSEMBLY

(See page EG1–46**)**
1. REMOVE FLYWHEEL OR DRIVE PLATE
2. REMOVE REAR END PLATE
3. INSTALL ENGINE STAND FOR DISASSEMBLY
4. REMOVE CYLINDER HEAD
(See page EG1–18**)**
5. REMOVE TIMING CHAIN (See page EG1–40)
6. REMOVE GENERATOR (See CH section)
7. REMOVE LH ENGINE MOUNTING BRACKET AND GENERATOR BRACKET
8. REMOVE CHAIN DAMPERS
9. REMOVE CHAIN TENSIONER
10. REMOVE OIL FILTER
(See step 2 on page EG1–236**)**
11. REMOVE RH ENGINE MOUNTING BRACKET, CHA–MBER STAY AND GROUND STRAP
12. (A/T)
REMOVE FLEXIBLE HOSE CLAMP
13. REMOVE OIL PRESSURE SENDER GAUGE OR SWITCH
14. REMOVE KNOCK CONTROL SENSOR
15. REMOVE FUEL–FILTER AND BRACKET



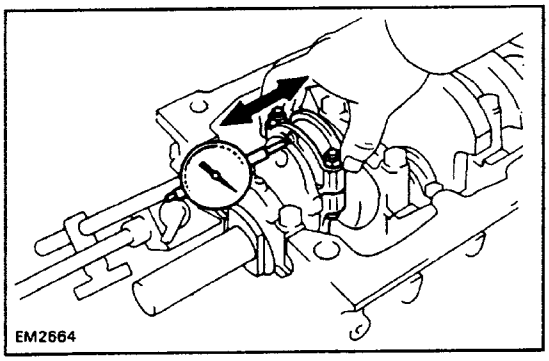
16. REMOVE OIL STRAINER

Remove the four bolts, strainer and gasket.



17. REMOVE REAR OIL SEAL RETAINER

Remove the five bolts, rear oil seal retainer and gasket.



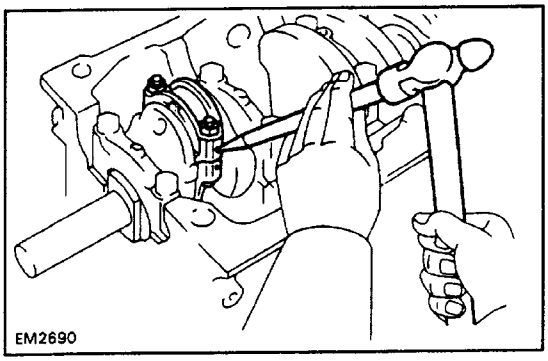
18. MEASURE CONNECTING ROD THRUST CLEARANCE

Using a dial gauge, measure the thrust clearance.

Standard clearance: 0.16 – 0.26 mm
(0.063 – 0.0102 in.)

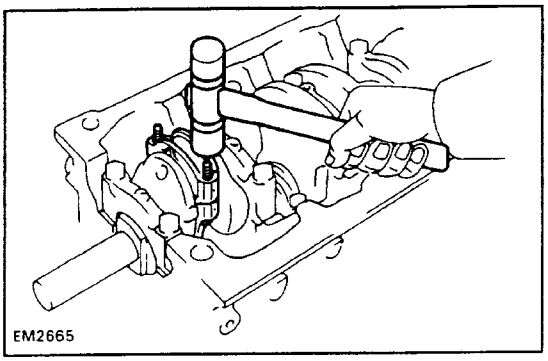
Maximum clearance: 0.3 mm(0.012 in.)

If clearance is greater than maximum, replace the connecting rod and/or crankshaft.



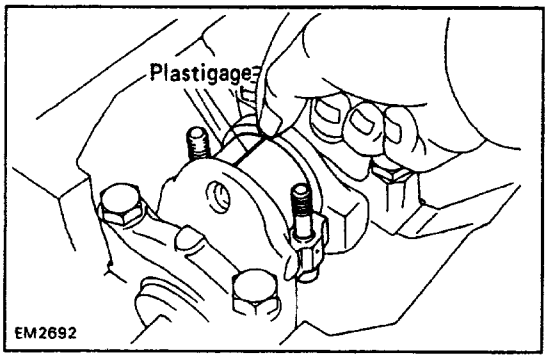
19. MEASURE CONNECTING ROD OIL CLEARANCE

(a) Using a punch or numbering stamp, mark connecting rods and caps to ensure correct reassembly.
(b) Remove the rod cap nuts.

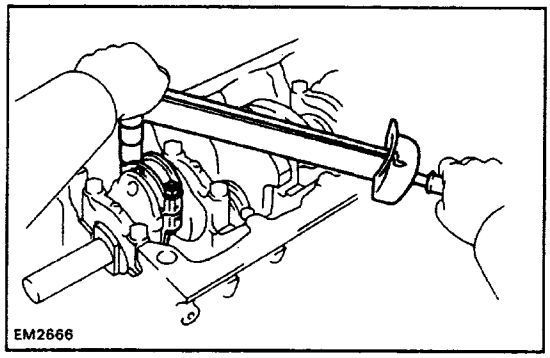


(c) Using a plastic–faced hammer, tap the rod bolts lightly and lift off the rod cap.

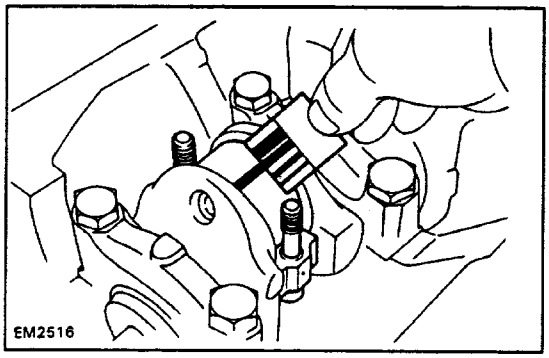
HINT: Keep the bearing inserted in the cap.
(d) Clean the bearing and crankshaft pins.
(e) Inspect each bearing for pitting and radial scratches.
If bearing are damaged, replace the bearings.



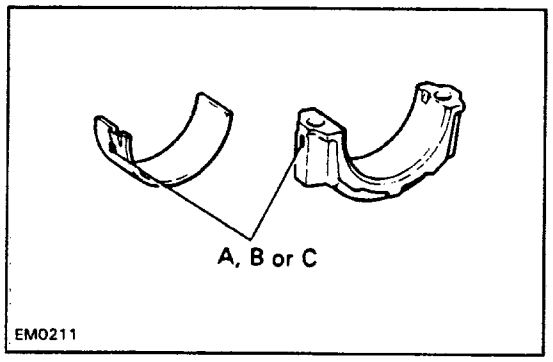
(f) Lay a strip of Plastigage across the crankshaft pin.



(g) Align the rod and cap marks and fit on the cap. Install and torque the cap nuts.
Torque: 69 N–m(700 kgf–cm, 51 ft–lbf)
HINT:
- Do not turn the crankshaft.
- Apply a light coat of engine oil on the nut threads and under the nut before installation.



(h) Remove the rod cap.
(i) Measure the Plastigage at its widest point.
Standard clearance: 0.025 – 0.055 mm
(0.0010 – 0.8022 in.)
Maximum clearance: 0.10 mm (0.0039 in.)
If the clearance is greater than maximum, replace the bearings and/or grind the crank pins.
Undersized bearing: U/S 0.25
Clean any Plastigage from bearing and crankshaft pin.

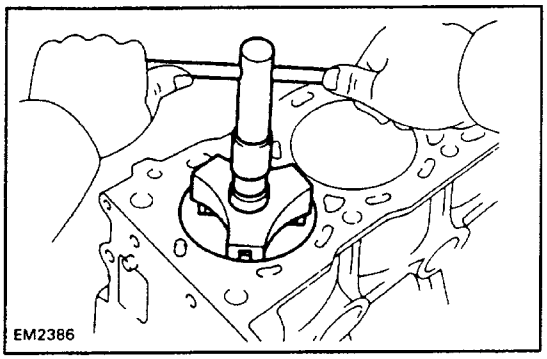


HINT: If replacing a standard size bearing, replace with one having the same letter as marked on the bearing cap. There are three sizes of standard bear–ings supplied, marked A, B or C respectively.

mm (in.)

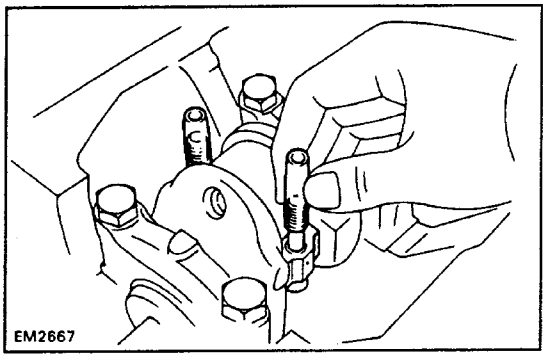
Size	Big End Inner Diameter	Crank Pin Diameter	Bearing Center Wall Thickness
A	56.000 – 56.006 (2.2047 – 2.2050)	52.988 – 53.000 (2.0861 – 2.0866)	1.484 – 1.488 (0.0584 – 0.0586)
B	56.006 – 56.012 (2.2050 – 2.2052)		1.488 – 1.492 (0.0586 – 0.0587)
C	56.012 – 56.018 (2.2052 – 2.2054)		1.492 – 1.496 (0.0587 – 0.0589)
U /S 0.25	56.000 – 56.018 (2.2047 – 2.2054)	52.701 – 52.711 (2.0748 – 2.0752)	1.626 – 1.636 (0.0640 – 0.0644)

V01858

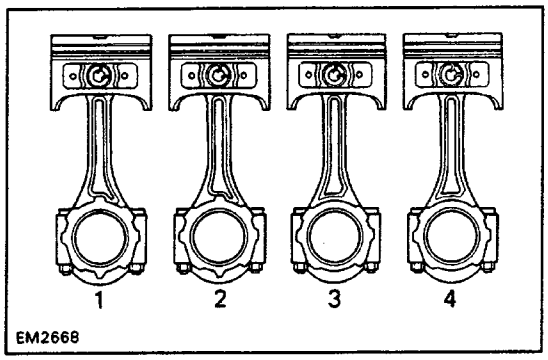


20. PUSH OUT PISTON AND CONNECTING ROD ASSEMBLY

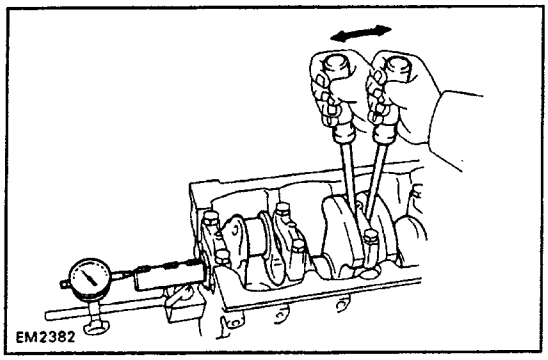
(a) Remove all the carbon from top of the bore to the top of the cylinder.



(b) Cover the rod bolts with a short piece of hose to protect the crank pin from damage.
(c) Push the piston and connecting rod assembly out through the top of the cylinder block.



(d) Arrange the piston and connecting rod caps in order.



21. MEASURE CRANKSHAFT THRUST CLEARANCE

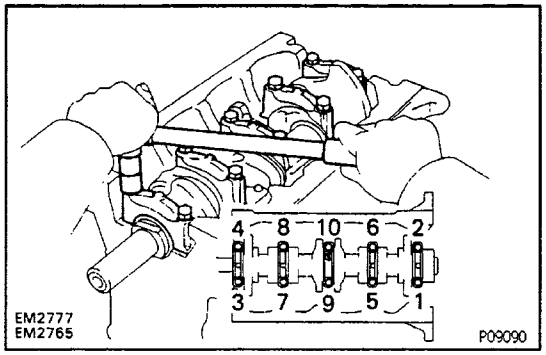
Using a dial gauge, measure the crankshaft thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard clearance: 0.02 – 0.22 mm
(0.0008 – 0.0087 in.)
Maximum clearance: 0.3 mm (0.012 in.)

If the clearance is greater than maximum, replace the thrust washers as a set and/or crankshaft.

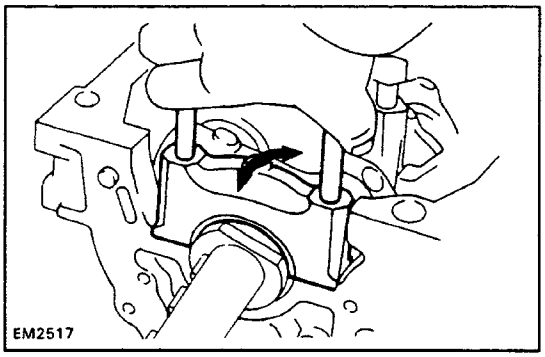
Thrust washer thickness:

Standard
2.690 – 2.740 mm (0.1059 – 0.1079 in.)
0/S 1.25
2.753 – 2.803 mm (0.1084 – 0.1104 in.)
4/S 2.50
2.815 – 2.865 mm (0.1108 – 0.1128 in.)



22. MEASURE CRANKSHAFT OIL CLEARANCE

(a) Gradually loosen and remove the bearing cap bolts in three passes and in numerical order shown.



(b) Using the removed bearing cap bolts, pry the bearing cap fore and aft, and remove it with the lower bearing and thrust washers (No.3 journal only).

HINT:

- Keep the lower bearing inserted in the cap.
- Arrange the caps and lower thrust washers in correct order.

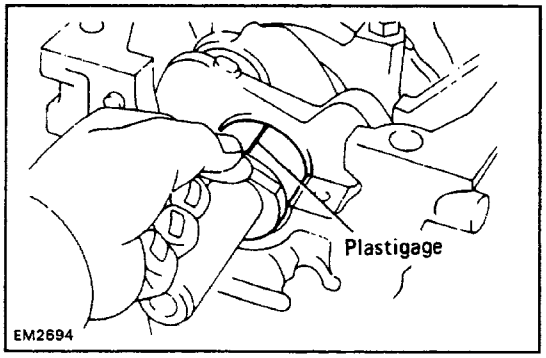
(c) Lift off the crankshaft.

HINT: Keep the upper bearings and upper thrust washers (for the No.3 journal only) inserted in the cylinder block.

(d) Clean the journals and bearings.

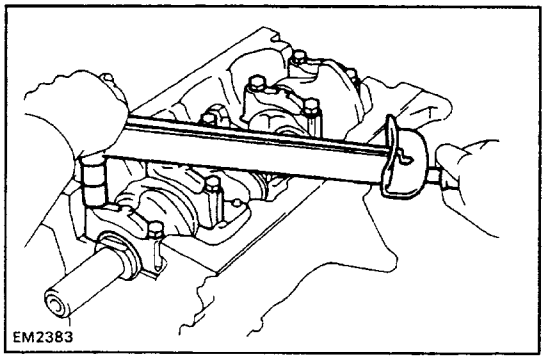
(e) Check the journals and bearings for pitting and scr–atches.

If the journal or bearing is damaged, grind or replace the crankshaft and replace the bearing.



(f) Install the upper main bearings on the cylinder block and crankshaft.

(g) Lay a strip of Plastigage across the main journals.



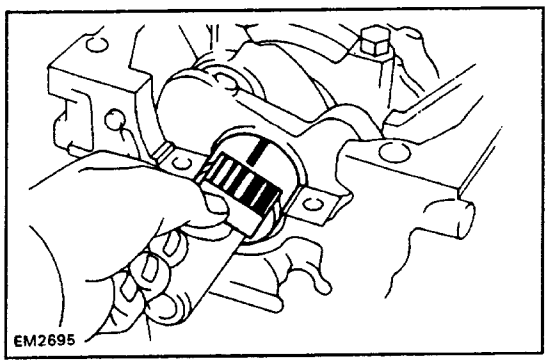
(h) Install the main bearing caps with the front mark facing forward. Install and torque the cap bolts.

Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

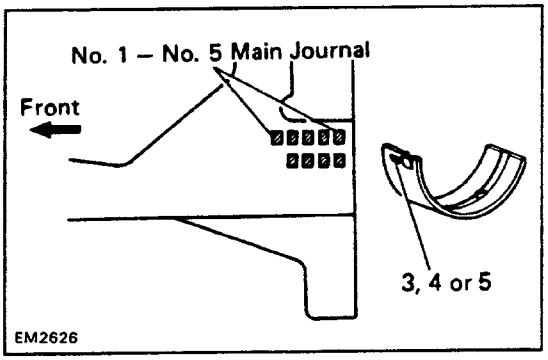
HINT:

Do not turn the crankshaft.

Apply a light coat of engine oil on the bolt threads before installation.


EM2695

(i) Remove the main bearing caps.
(j) Measure the Plastigage at its widest point.
Standard clearance: 0.025 – 0.055 mm (0.0010 – 0.0022 in.)
Maximum clearance: 0.08 mm (0.0031 in.)
If the clearance is greater than maximum, replace the bearings and/or grind the main journals.
Undersized bearing: U/S 0.25
(k) Clean out the pieces of Plastigage from the bearings and journals.
HINT: If using a standard bearing, replace with one having the same number as marked on the cylinder block. There are three sizes of standard bearings, marked 3, 4, 5 accordingly.



EM2626

mm (in.)

Size	Cylinder Block Main Journal Bore	Main Journal Diameter	Bearing Center Wall Thickness
3	64.004 – 64.010 (2.5198 – 2.5201)	59.984 – 60.000 (2.3616 – 2.3622)	1.988 – 1.992 (0.0783 – 0.0784)
4	64.010 – 64.016 (2.5201 – 2.5203)		1.992 – 1.996 (0.0784 – 0.0786)
5	64.016 – 64.022 (2.5203 – 2.5205)		1.996 – 2.000 (0.0786 – 0.0787)
U /S Q.25	64.004 – 64.022 (2.5198 – 2.5205)	59.701 – 59.711 (2.3504 – 2.3508)	2.126 – 2.136 (0.0837 – 0.0841)

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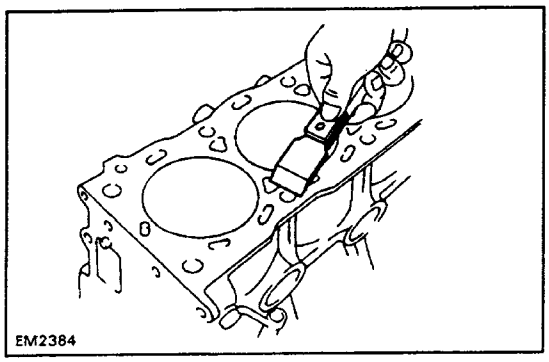
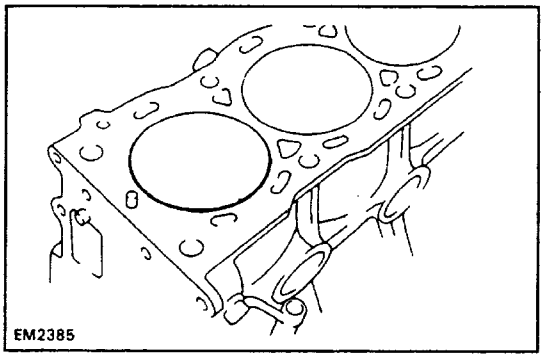
23. REMOVE CRANKSHAFT ,
(a) Lift out the crankshaft.
(b) Remove the upper main bearings from the cylinder block.
(c) Arrange the caps and bearings in order.


EM2384

EG1VT–01

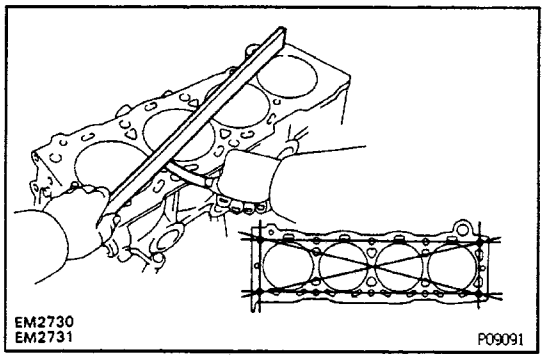
CYLINDER BLOCK INSPECTION

1. REMOVE GASKET MATERIAL
Using a gasket scraper, remove all gasket material from cylinder block surfaces.
2. CLEAN CYLINDER BLOCK
Using a soft brush and solvent, clean the block.



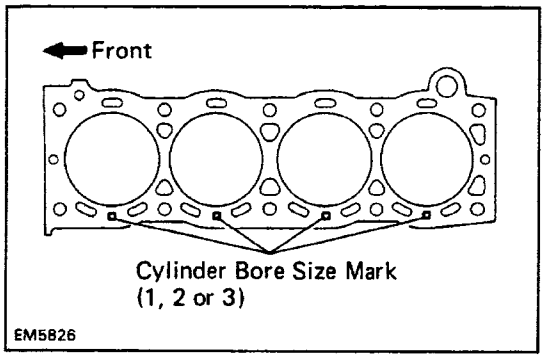
3. INSPECT CYLINDERS

Visually inspect cylinders for vertical scratches.
If deep scratches are present, rebore all four cylinders.
(See page EG1–66**)**



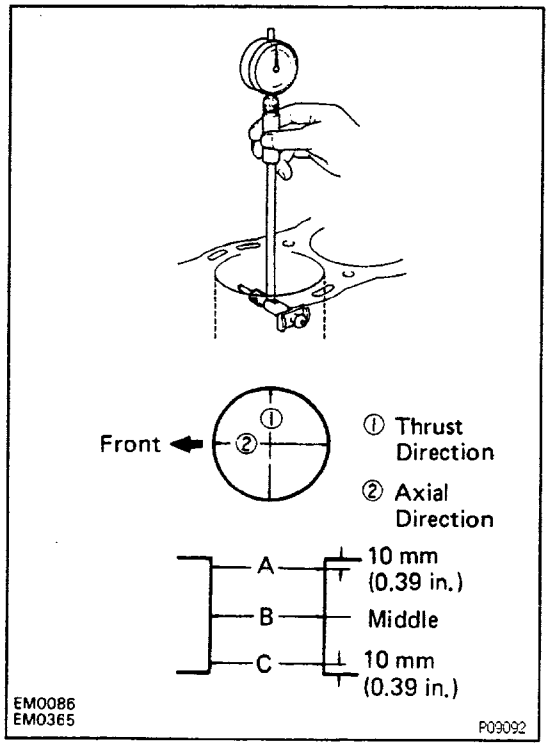
4. INSPECT CYLINDER BLOCK WARPAGE

Warpage limit: 0.5 mm (0.0020 in.)
If warpage is greater than specified value, replace the cylinder block.



5. MEASURE CYLINDER BORE

HINT: There are three sizes of the standard cylinder bore diameter, marked ”1’, ”2”, and ”3”, accordingly. The mark is stamped on the cylinder block.



Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

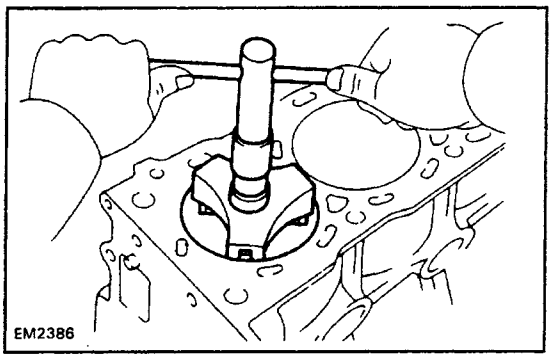
Standard diameter:

STD Mark ’1’
92.00 – 92.01 mm
(3.6220 – 3.6224 in.)
Mark ’2’
92.01 – 92.02 mm
(3.6224 – 3.6228 in.)
Mark ’3’
92.02 – 92.03 mm
(3.6228 – 3.6232 in.)
O/S 0.50
92.50 – 92.53 m m
(3.6417 – 3.6429 in.)
1.00
93.00 – 93.03 mm
(3.6614 – 3:6626 in.)

Maximum diameter:

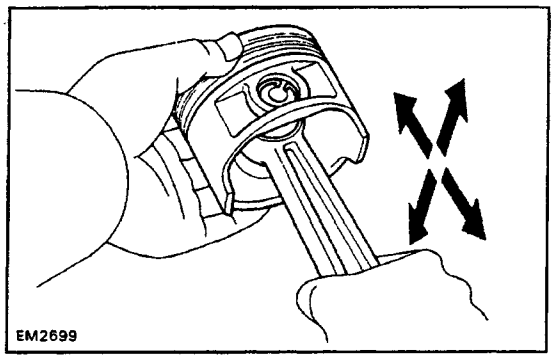
STD 92.23 mm (3.6311 in.)
0/S 0.50 92.73 mm (3.6508 in.)
0/S 1.00 93.23 mm (3.6705 in.)

If the diameter is greater than maximum, rebore all four cylinders, or replace the cylinder block.



6.REMOVE CYLINDER RIDGE

If wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the top of the cylinder.

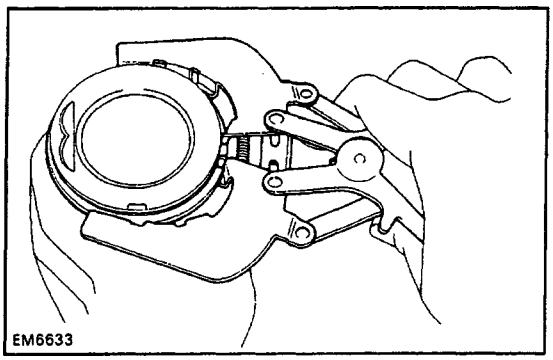


EG1VU–01

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

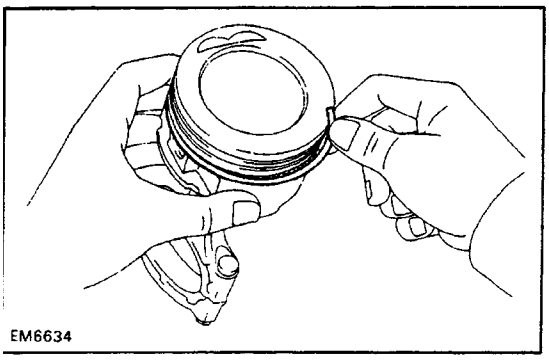
1. CHECK FIT BETWEEN PISTON AND PIN

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin.



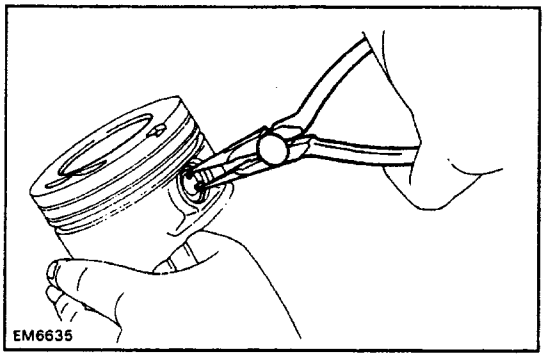
2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the compression rings.



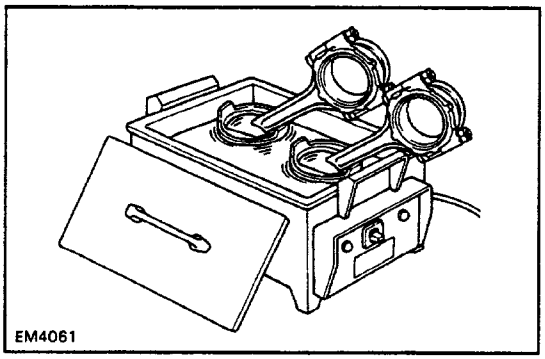
(b) Remove the two side rails and oil ring expander by hand.

HINT: Keep the rings for each cylinder separated.

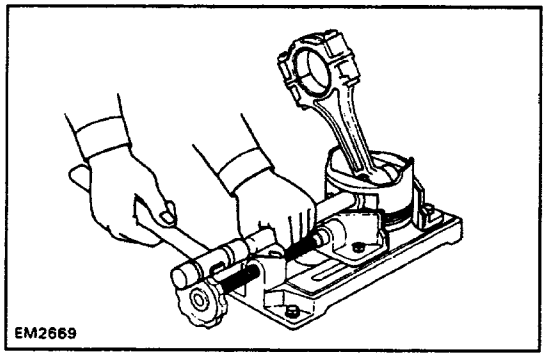


3. DISCONNECT CONNECTING ROD FROM PISTON

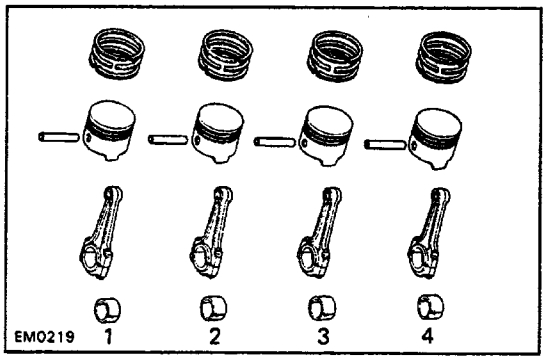
(a) Using needle – nose pliers, remove the snap rings from the piston.



(b) Heat the piston in hot water approx. 60•C(140•F).

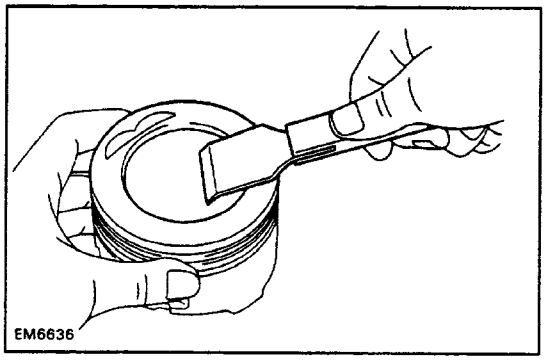


(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin from the piston.



HINT:

- The piston and pin are a matched set.
- Keep the piston, pin, rings and connecting rod together for each cylinder.

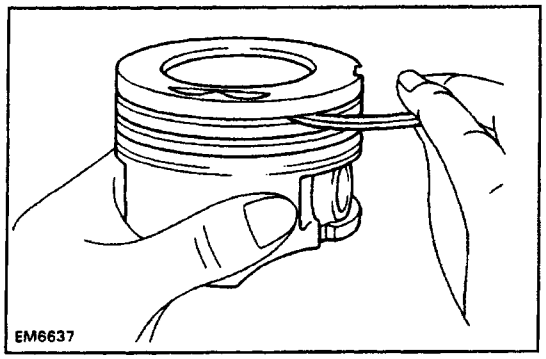


EG1VV–02

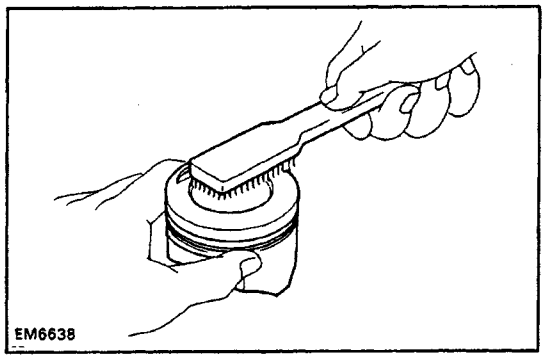
INSPECTION OF PISTON AND CONNECTING ROD

1. CLEAN PISTON

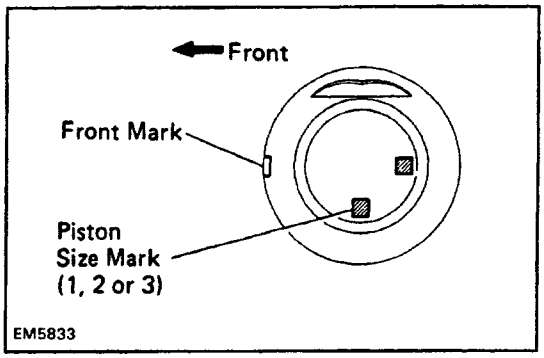
(a) Using a gasket scraper, remove the carbon from the piston top.



(b) Using a groove cleaning tool or broken ring, clean the ring grooves.

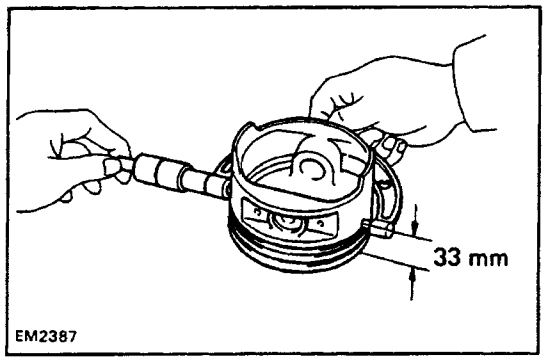


(c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



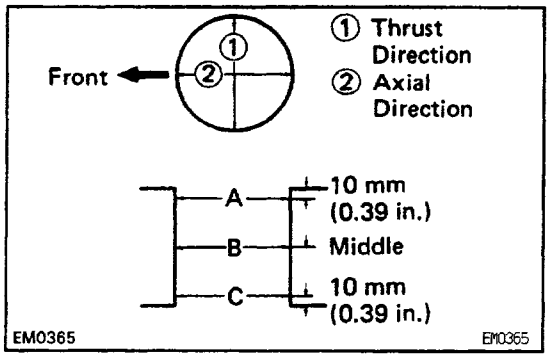
2. INSPECT PISTON DIAMETER AND OIL CLEARANCE

HINT: There are three sizes of the standard piston diameter, marked "'1", "2", and "3", accordingly. The mark is stamped on the top of the piston.

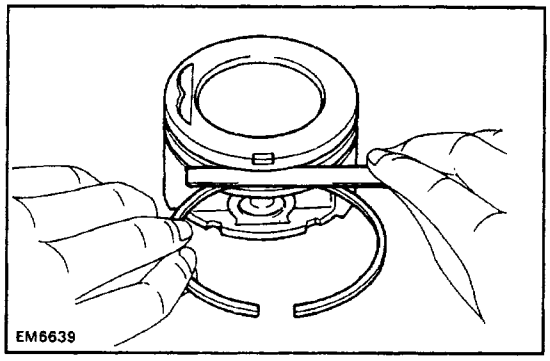


(a) Using a micrometer and with the piston upside down, measure the piston diameter at right angles to 'the piston pin hole center line, at the indicated distance from the piston head.
Distance: 33 mm (1.30 in.)

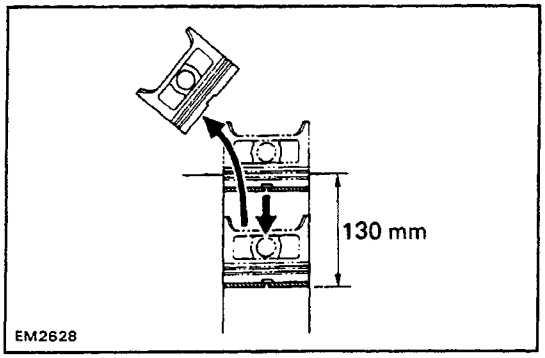
Piston diameter:
STD Mark ”
91.975 – 91.985 mm
(3.6211 – 3.6214 in.)
Mark ”2’
91.985 – 91.995 mm
(3.6214 – 3.6218 in.)
Mark ’3”
91.995 – 92.005 mm
(3.6218 – 3.6222 in.)
0/S 0.50
92.475 – 92.505 mm
(3.6407 – 3.6419 in.)
1.00
92.975 – 93.005 mm
(3.6604 – 3.6616 in.)



(b) Measure the cylinder bore diameter in thrust direc–tions (See page EG1–56) and subtract the piston di–ameter measurement from the cylinder bore diameter measurement.
Piston clearance: 0.015 – 0.035 mm
(0.0006 – 0.0014 in.)
If not within specification, replace the pistons. If necessary, rebore or replace the cylinder block.
HINT: (Use cylinder block sub–assembly)
When installing a standard piston, install one with the same mark as the standard bore diameter mark on the cylinder block.



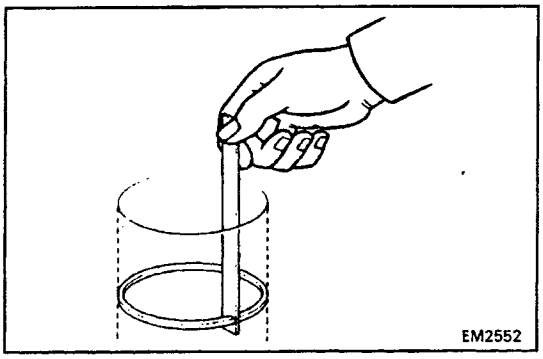
3. MEASURE CLEARANCE BETWEEN PISTON GROOVE AND PISTON RING
Using a thickness gauge, measure the clearance be–tween the piston ring and the ring land.
Standard ring groove clearance: 0.03 – 0.07 mm
(0.0012 – 0.0028 in.)
Maximum ring groove clearance: 0.2 mm (0.008 in.)
If the clearance is greater than maximum, replace the piston ring and/or piston.



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)

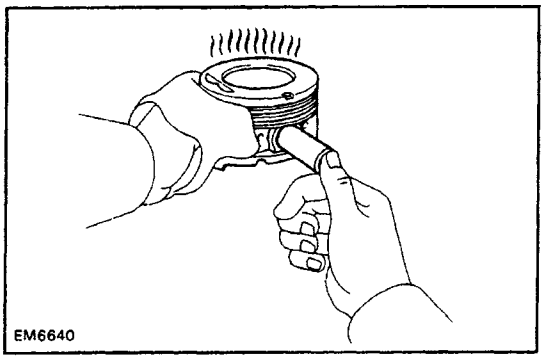


(c) Using a thickness gauge, measure the end gap.

Ring end gap:

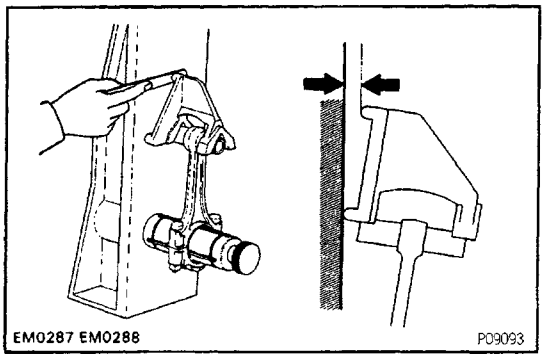
Standard No.1 0.25 – 0.47 mm
(0.0098 – 0.0185 in.)
No–2 0.60 – 0.82 mm
(0.0236 – 0.0323 in.)
Oil 0.20 – 0.57 mm
(0.0079 – 0.0224 in.)
Maximum No.1 1.07 mm (0.0421 in.)
No.2 1.42 mm (0.0559 in.)
Oil 1.17 mm (0.0461 in.)

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 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.



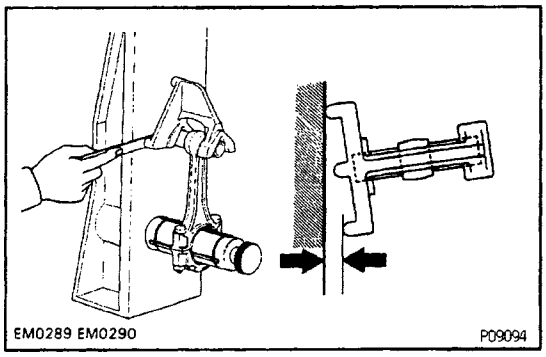
6. INSPECT CONNECTING RODS

(a) Using a rod aligner, check the connecting rod align–ment.
If the rod is bent or twisted, replace the connecting rod.

- Check that the rod is not bent.

Maximum bend:

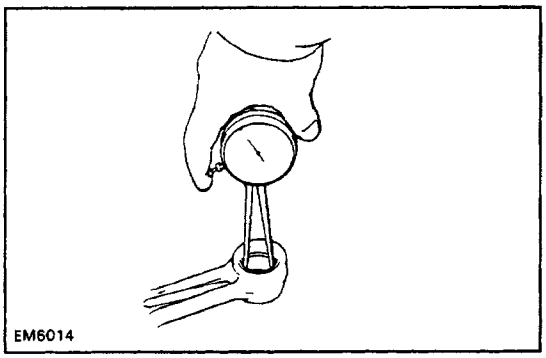
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)



- Cheek that the rod is not twisted.

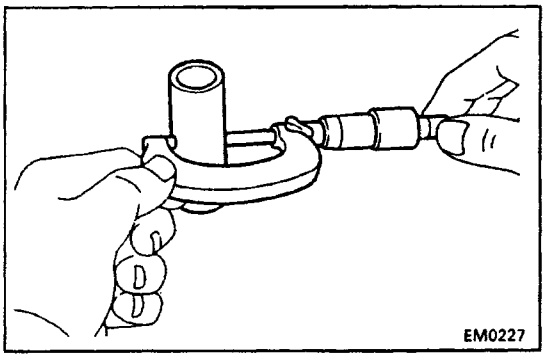
Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)



(b) Measure the oil clearance between the rod bushing and piston pin.

- Using an inside dial indicator, measure the inside diameter of the rod bushing.



- Using a micrometer, measure the diameter of the piston pin.
- Check that the difference between the meas–urements is less than the oil clearance limit.

Standard oil clearance: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

Maximum oil clearance: 0.015 mm (0.0006 in.)

If the clearance is greater than maximum, replace the rod bushing.

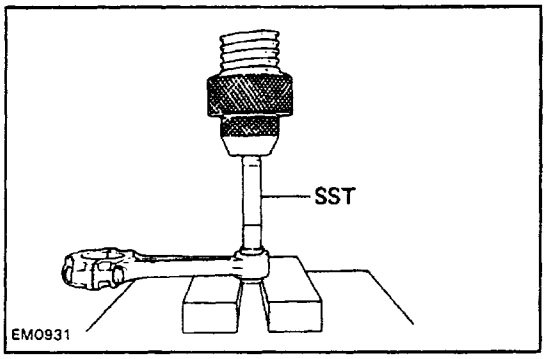
EG1VW–01

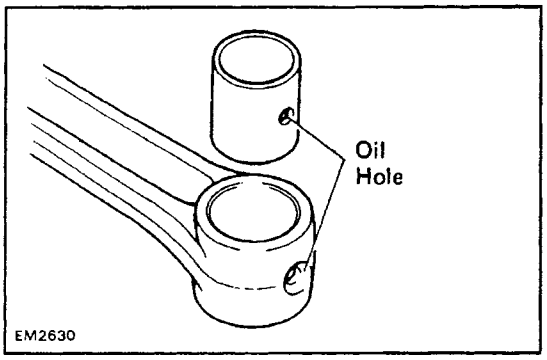
ROD BUSHING REPLACEMENT

1. REMOVE ROD BUSHING

Using SST, remove the rod bushing from the conne–cting rod.

SST 09222–30010



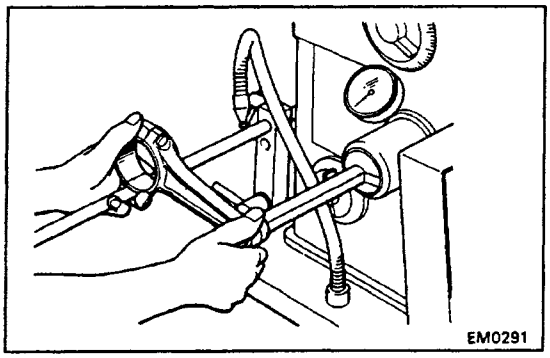


2. INSTALL NEW ROD BUSHING

Using SST, install the rod bushing to the connecting rod.

SST 09222 – 30010

HINT: Align the bushing oil hole with the connecting rod oil hole.

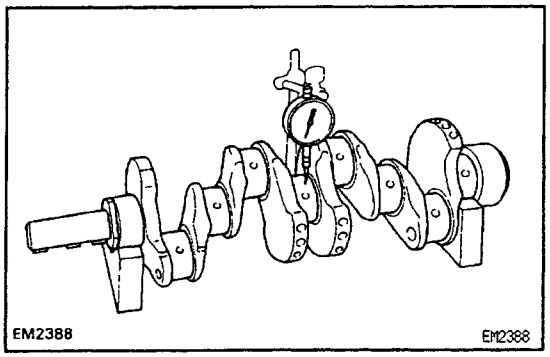


3. HONE NEW BUSHING AND CHECK PIN FIT IN CONNECTING ROD

(a) Hone the new bushing and check that the oil clearance is within standard specification.

Standard oil clearance: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

(b) Check the pin fit at the normal room temperature. Coat the pin with engine oil and push the pin into the rod with thumb pressure.



CRANKSHAFT INSPECTION AND REPAIR

1. MEASURE CRANKSHAFT FOR RUNOUT

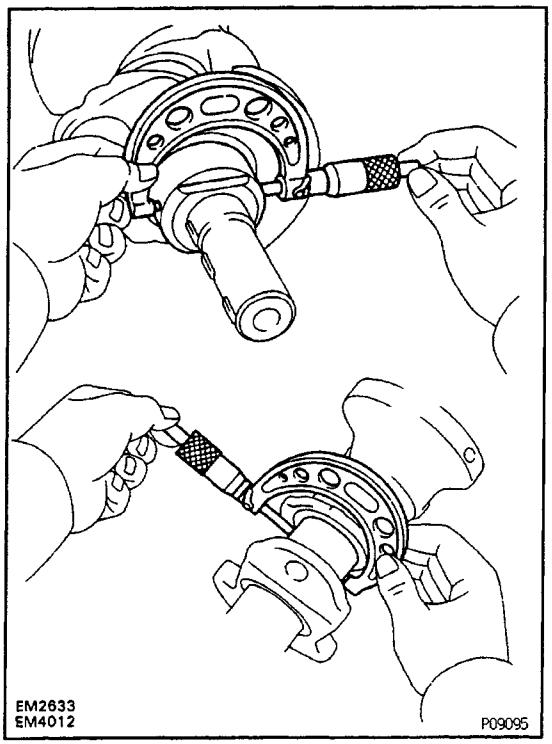
(a) Place the crankshaft on V–blocks.

(b) Using a dial gauge, measure the runout at the center journal.

Maximum circle runout: 0.1 mm (0.004 in.)

If the runout is greater than maximum, replace the crankshaft.

HINT: Use a long spindle on the dial gauge.



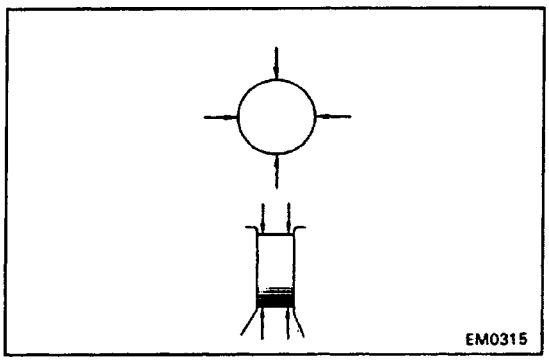
2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of the main journal and crank pin.

Main journal diameter: 59.984 – 60.000 mm (2.3616 – 2.3622 in.)

Crank pin diameter: 52.988 – 53.000 mm (2.0861 – 2.0866 in.)

If journals are worn, regrind or replace the crankshaft.



(b) Measure the journals for out–of–round and taper as shown.

Maximum taper: 0.01 mm (0.0004 in.)

Maximum out–of–round: 0.01 mm (0.0004 in.)

If taper and out–of–round are greater than maximum, regrind and/or replace the crankshaft.

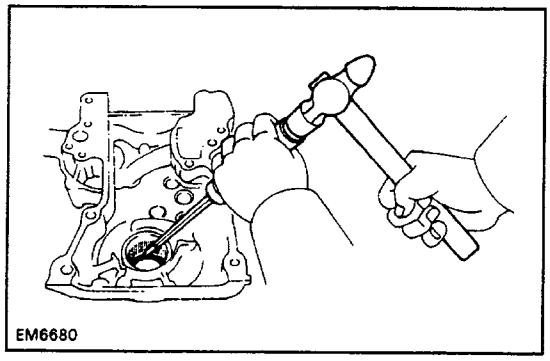
3. GRIND CRANK PIN AND/OR MAIN JOURNAL, IF NECESSARY

(a) Grind the crank pins and/or main journals to the undersized finished diameter.
Bearing size (U/S 0.25)
Main journal finished diameter:
59.701 – 59.711 mm (2.3504 – 2.3508 in.)
Crank pin finished diameter:
52.701 – 52.711 mm (2.0748 – 2.0752 in.)
(b) Install a new pin and/or main undersized bearings.

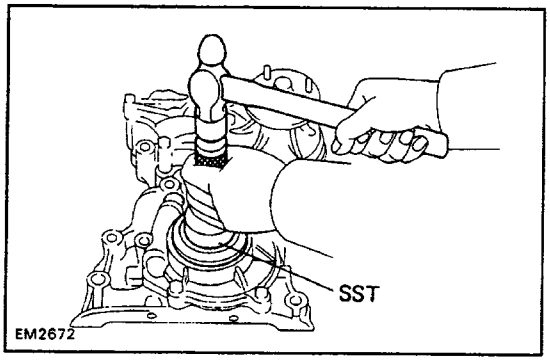
EG1VY–01

OIL SEALS REPLACEMENT

HINT: There are two ways of oil seal replacement in accordance with the timing chain cover or rear oil seal retainer condition.

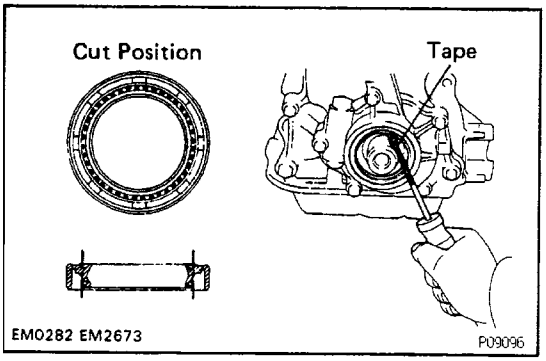

EM6680

1. IF TIMING CHAIN COVER IS REMOVED FROM CYLINDER BLOCK (Replacement of front oil seal)
(a) Using a screwdriver, remove the oil seal.



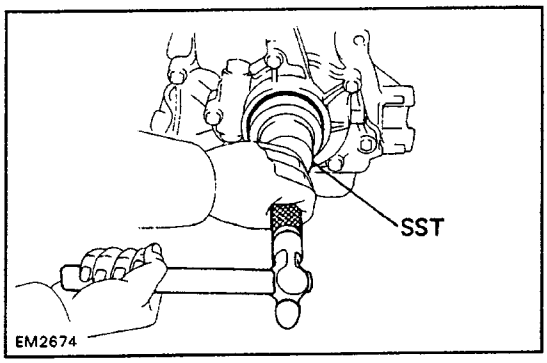
EM2672

(b) Apply MP grease to a new oil seal lip.
(c) Using SST, install the oil seal.
SST 09223–50010

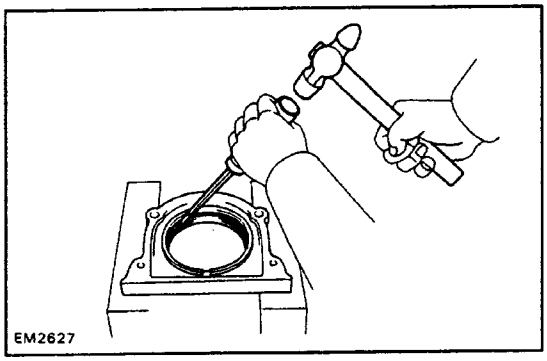


EM0282 EM2673 P09096

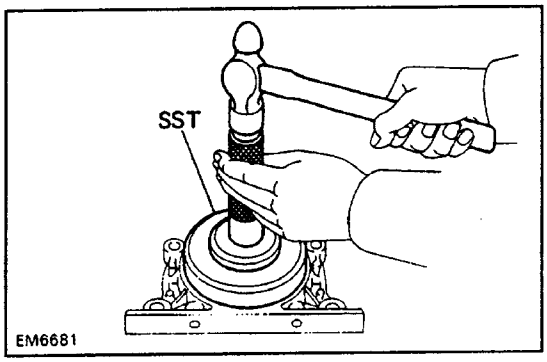
2. IF TIMING CHAIN COVER IS INSTALLED ON CYL–INDER BLOCK (Replacement of front oil seal)
(a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



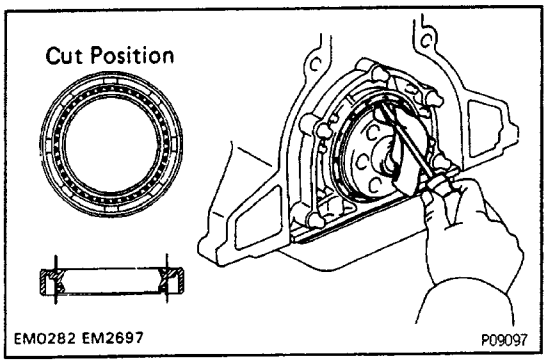
(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.
SST 09223 – 50010



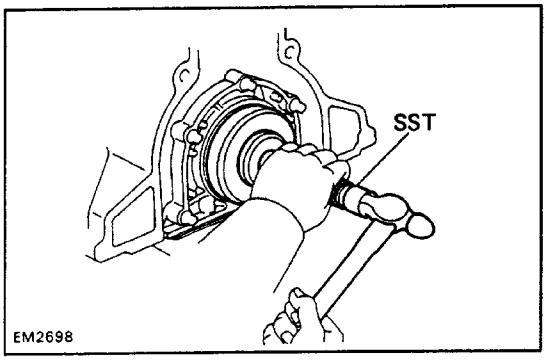
3. IF REAR OIL SEAL RETAINER IS REMOVED FROM CYLINDER BLOCK (Replacement of rear oil seal)
(a) Using a screwdriver, remove the oil seal.



(b) Apply MP grease to a new oil seal lip.
(c) Using SST, install the oil seal.
SST 09223–41020



4. IF REAR OIL SEAL RETAINER IS INSTALLED ON CYLINDER BLOCK (Replacement of rear oil seal)
(a) Using a knife, cut off lip of oil seal.
(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–41020

EG1VZ–01

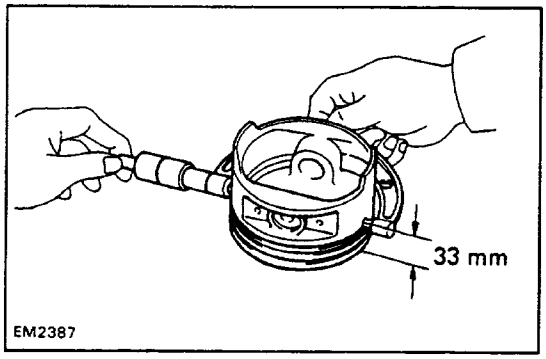
Size	Outside Diameter mm 0 n.)
O/S 0. 50	92.475 – 92.505 (3.6407 – 3.6419)
O/S 1.00	92.975 – 93.005 (3.6604 – 3.6616)

V01771

CYLINDERS BORING

1. SELECT OVERSIZED PISTON

O/S pistons with pins are available in the sizes listed. Replace pistons in matched sets. Take the largest bore measured and select the oversized piston for that bore. Bore all cylinders for the oversized piston sel–ected.



2. CALCULATE DIMENSION TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 33 mm (1.30 in.) from the piston head.

(b) Calculate the size each cylinder is to be rebored as follows:

Size to be rebored = P + C – H

P = piston diameter

C = piston clearance

0.015 – 0.035 mm (0.0006 – 0.0014 in.)

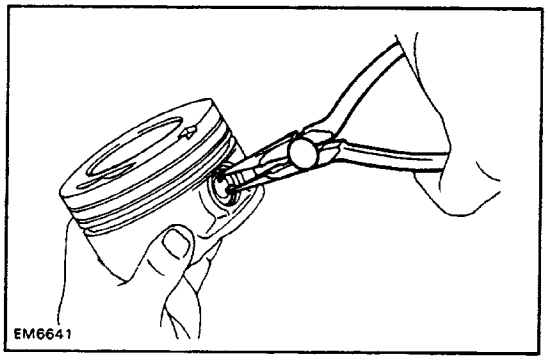
H = allowance for honing

0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Maximum honing: 0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished round–ness.

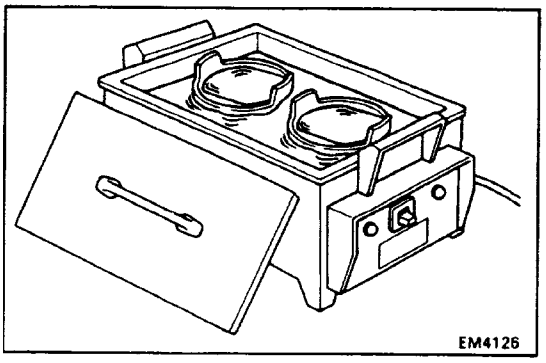


EG1WO–01

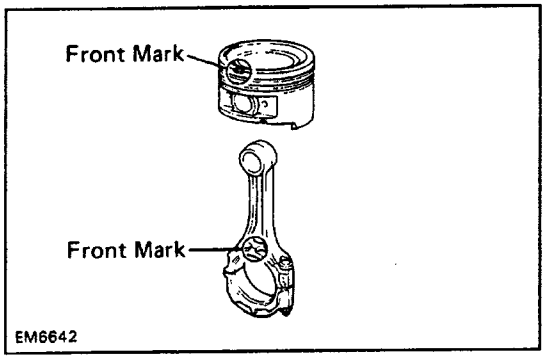
PISTON AND CONNECTING ROD ASSEMBLY

1. ASSEMBLE PISTON AND CONNECTING ROD

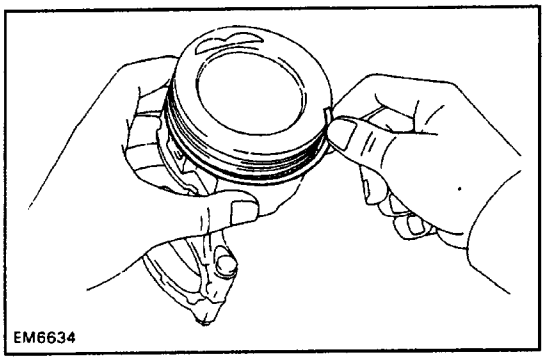
(a) Install a new snap ring on one side of the piston pin hole.



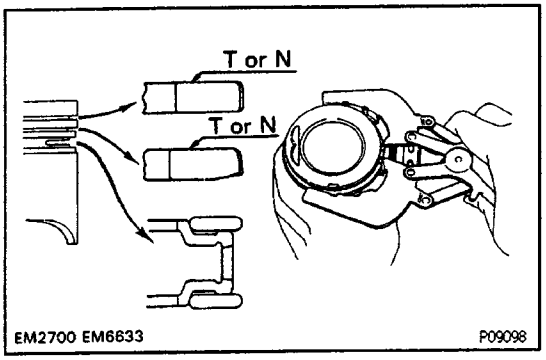
(b) Heat the piston in hot water to approx. 80•C(176•F).



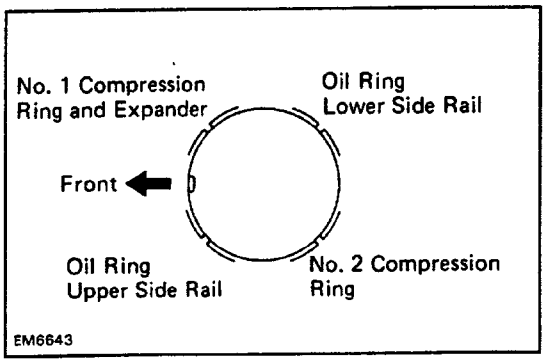
(c) Align the notch on the piston with the mark on the rod and push the piston pin in with your thumb.
(d) Install a new snap ring on the other side of the pin.



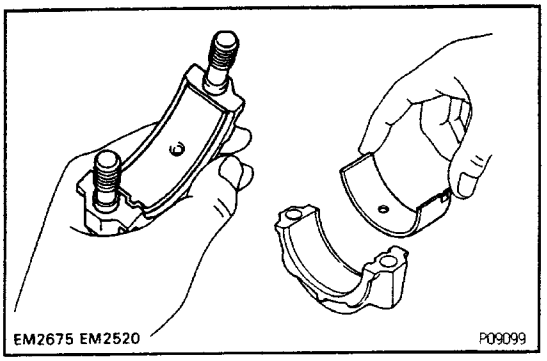
2. PLACE RINGS ON PISTON
(a) Install the oil ring expander and two side rails by hand.



(b) Using a ring expander, install the two compression rings with the code marks facing upward.



(c) Position the piston rings so that the ring end gaps are as shown.
NOTICE: Do not align the end gaps.



3. INSTALL BEARINGS
(a) Install the bearing in the connecting rod and rod cap.
(b) Lubricate the face of the bearings with engine oil.
NOTICE: Install the bearings with the oil hole in the connecting rod.

E61W1_0

INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLY

(See page EG1–46)

GENERAL ASSEMBLY

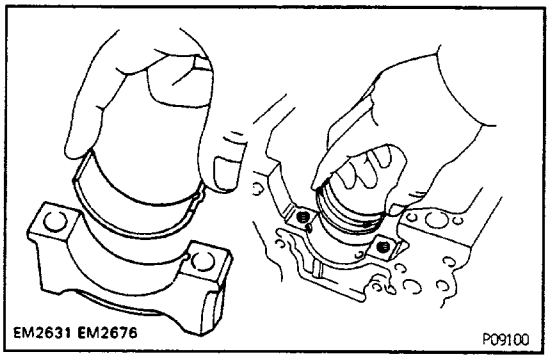
HINT:

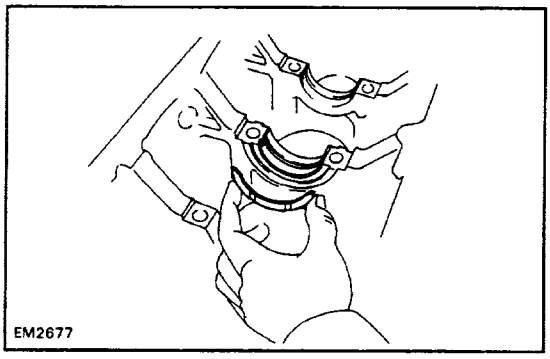
- Thoroughly clean all parts to be assembled.
- Before installing parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, 0–ring and oil seals with new parts.

1. INSTALL MAIN BEARINGS

Install the bearing in the cylinder block and bearing caps.

NOTICE: Install the upper bearing with the oil hole in the block.

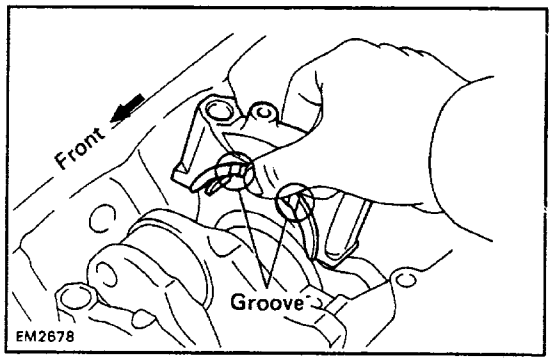




2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No.3 main bearing cap position of the block with the oil grooves facing outward.

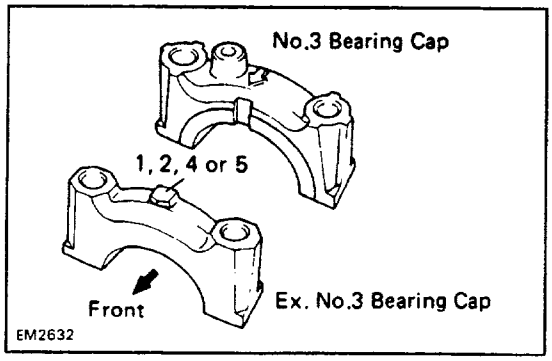
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



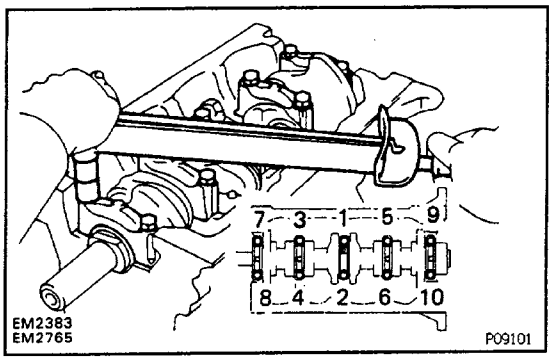
4. INSTALL MAIN BEARING CAPS WITH LOWER THRUST WASHERS

HINT: Each bearing cap is numbered.

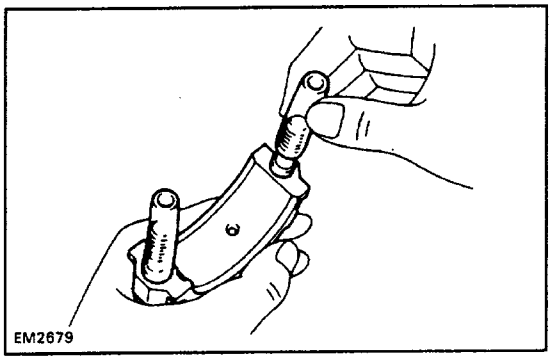
(a) Install the thrust washers on the No.3 bearing cap with the grooves facing outward.



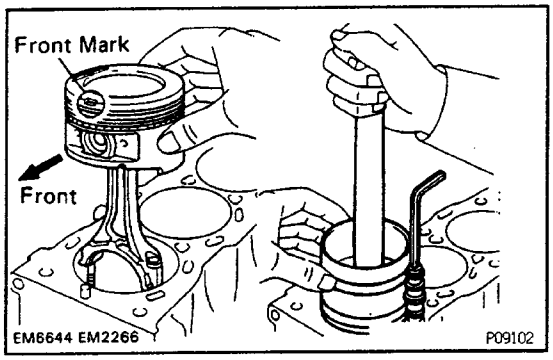
(b) Install the bearing caps in their proper locations.



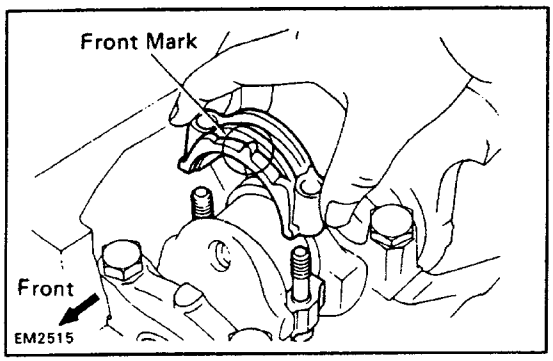
(c) Apply a light coat of engine oil on the threads and under the cap bolt heads.
(d) Install and tighten the cap bolts in two or three passes and in the sequence shown.
Torque: 103 N–m(1,050 kgf–cm, 76 ft–lbf)
(e) Check that the crankshaft turns smoothly.
(f) Check the crankshaft thrust clearance.
(See page EG1–53



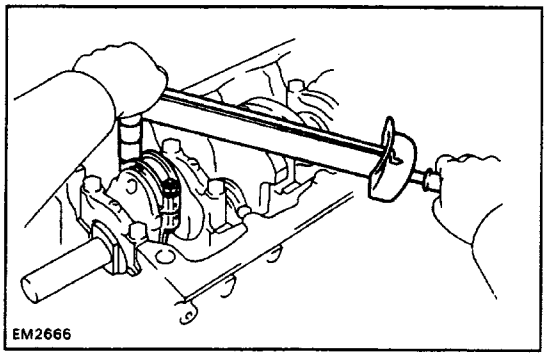
5. INSTALL PISTON AND CONNECTING ROD ASSEMBLY
(a) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.



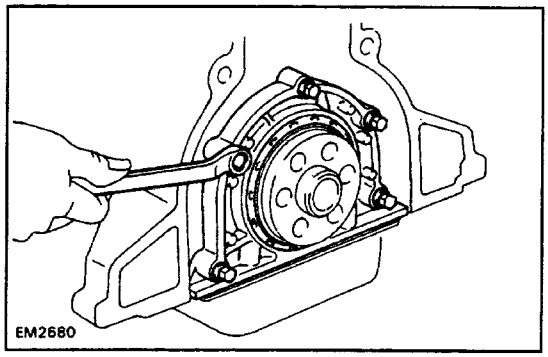
(b) Lubricate the cylinder bore and rod journal with clean engine oil.
(c) Using a ring compressor, tighten the compressor snugly but NOT tightly against the piston and gently tap the correctly numbered piston and rod assembly into its cylinders with a wooden hammer handle or like object. Make sure the notch and mark are facing forward.
HINT: If the ring compressor is wound too tightly around the piston, the bottom edge of the ring compressor will catch against the beveled surface at the top of the cylinder when tapping the piston in.



6. INSTALL CONNECTING ROD CAPS
(a) Match the numbered cap with the numbered rod.
(b) Install the cap with the front mark facing forward.



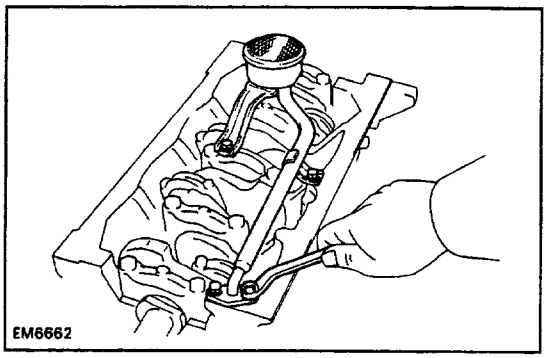
(c) Apply a light coat of engine oil on the threads and under the rod nuts.
(d) Install and tighten the rod nuts alternately and in two or three passes.
Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)
(e) Check that the crankshaft turns smoothly.
(f) Check the rod thrust clearance.
(See page EG1–51)



EG1W2–01

CYLINDER BLOCK ASSEMBLY

(See page EG1–46)
1. INSTALL REAR OIL SEAL RETAINER
Install a new gasket and the retainer with the four bolts. Torque the bolts.
Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)



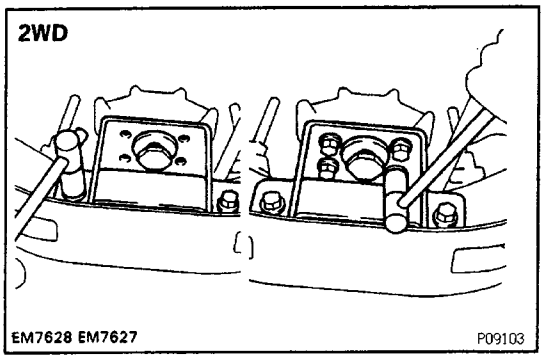
2. INSTALL OIL STRAINER
(a) Clean the oil strainer.
(b) Place the gasket in place and install the oil strainer assembly with the four bolts. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
3. INSTALL FUEL FILTER BRACKET AND FILTER
4. INSTALL KNOCK CONTROL SENSOR
5. INSTALL OIL PRESSURE SENDER GAUGE
6. (A/T)
INSTALL FLEXIBLE HOSE CLAMP
7. INSTALL RH ENGINE MOUNTING BRACKET, CHA–MBER STAY AND GROUND STRAP
8. INSTALL OIL FILTER
(See step 2 on page EG1–236)
9. INSTALL CHAIN TENSIONER
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
10. INSTALL CHAIN DAMPERS
Torque: 22 N–m (220 kgf–cm, 16 ft–lbf)
11. INSTALL GENERATOR BRACKET AND LH ENGINE MOUNTING BRACKET
12. INSTALL TIMING CHAIN (See page EG1–43)
13. INSTALL GENERATOR
14. INSTALL CYLINDER HEAD (See page EG1–34)
15. REMOVE ENGINE STAND
16. INSTALL REAR END PLATE
17. INSTALL FLYWHEEL OR DRIVE PLATE
Install the flywheel (M / T) or spacer, drive plate, spacer (A/T) on the crankshaft with the six bolts. Torque the bolts.

Torque: M/T 108 N–m (1,100 kgf–cm, 80 ft–lbf)
A/T 83 N–m (850 kgf–cm, 61 ft–lbf)

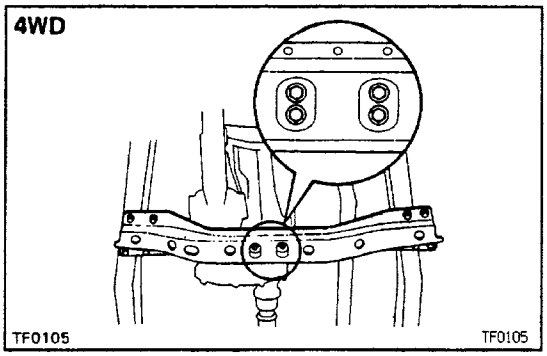
EG1W3–04

ENGINE INSTALLATION

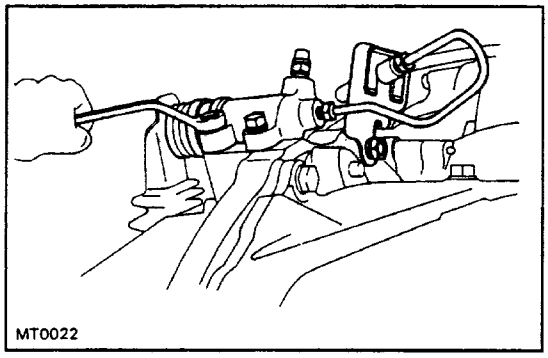
1. (M/T)
INSTALL CLUTCH DISC AND COVER TO FLY–WHEEL
(See CL section)
2. CONNECT TRANSMISSION TO ENGINE
3. PLACE ENGINE WITH TRANSMISSION IN VEHICLE
(a) Attach the engine hoist chain to the lifting brackets on the engine.
(b) Lower the engine with transmission into the engine compartment.
4. (4WD)
PLACE JACK UNDER TRANSMISSION
Be sure to put a wooden block between the jack and the transmission pan.
5. JACK UP AND PUT TRANSMISSION ONTO MEMBER
6. INSTALL ENGINE MOUNTING TO FRAME BRACK–ET
(a) Align the engine mounting and frame bracket.
(b) Install the engine mounting bolts on each side of the engine.
(c) Remove the hoist chain.
7. (2WD)
INSTALL ENGINE REAR MOUNTING AND BRACKET
(a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmis–sion.



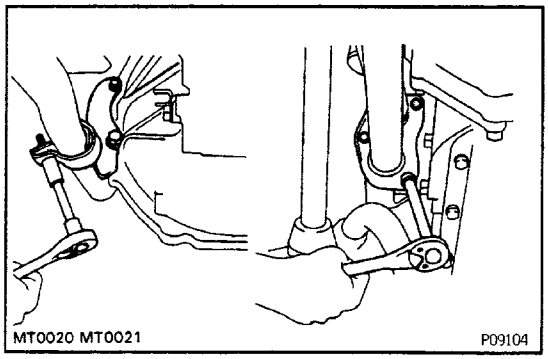
(b) Install the engine rear mounting bracket to the sup–port member. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(c) Lower the transmission and rest it on the extension housing.
(d) Install the bracket to the mounting. Torque the bolts.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)



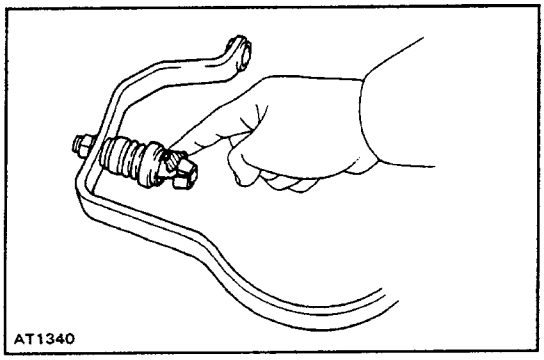
(4WD)
INSTALL NO.2 FRAME CROSSMEMBER
(a) Raise the transmission slightly with a jack.
(b) Install the No.2 frame crossmember to the side frame with the bolts. Torque the bolts
Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)
(c) Lower the transmission and transfer.
(d) Install the four mounting bolts to the engine rear mounting. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
8. (4WD)
INSTALL BRAKE TUBE HEAT INSULATOR AND NO. 1 FRONT FLOOR HEAT INSULATOR



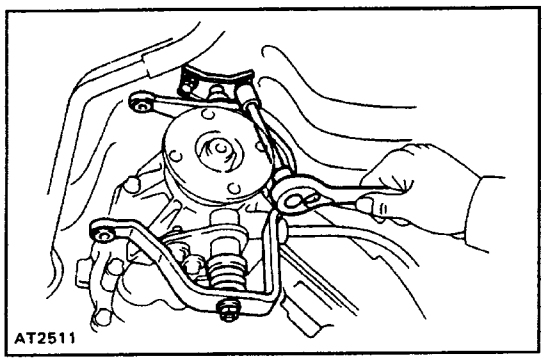
9. (M/T)
INSTALL CLUTCH RELEASE CYLINDER WITH BRACKET TO TRANSMISSION
Torque:
Bracket 39 N–m (400 kgf–cm, 28 ft–lbf)
Release cylinder 12 N–m (120 kgf–cm, 9 ft–lbf)



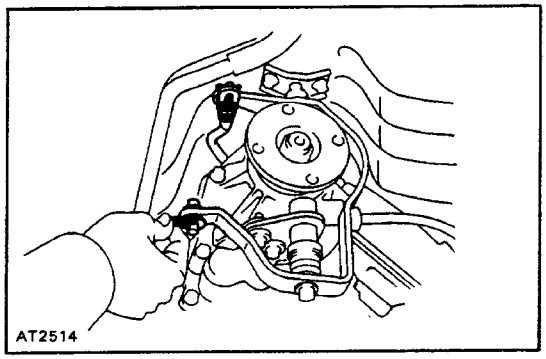
10. INSTALL EXHAUST PIPE
(a) Connect the exhaust pipe to the catalytic converter.
(b) Connect the exhaust pipe to the exhaust manifold.
(c) Install the exhaust pipe clamp.
(d) Connect the oxygen sensor connector.
11. INSTALL NO.1 FRAME CROSSMEMBER
12. (4WD)
INSTALL FRONT PROPELLER SHAFT
(See PR section)
13. (4WD)
INSTALL STABILIZER BAR
(See SA section)
14. (4WD)
INSTALL TRANSFER UNDER COVER
15. CONNECT SPEEDOMETER CABLE



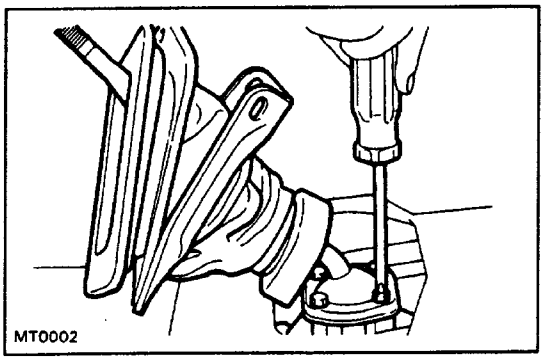
16. (4WD A/T)
CONNECT TRANSFER SHIFT LINKAGE
(a) Apply MP grease to the cross shaft joint.



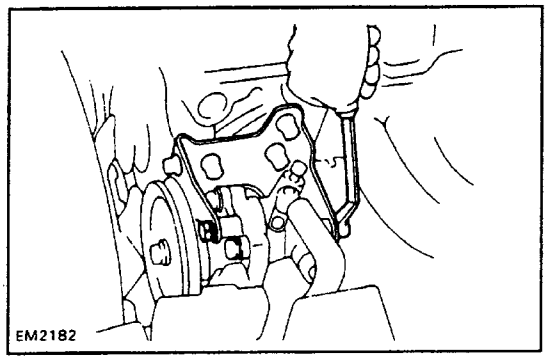
(b) Install the cross shaft to the body.



(c) Connect the No.1 and No.2 transfer shift linkage to the cross shaft.
17. (A/T)
CONNECT MANUAL SHIFT LINKAGE TO PNP SWITCH
18. INSTALL PROPELLER SHAFT
(See PR section)
19. (R150)
INSTALL SHIFT LEVER RETAINER



20. (M/T)
INSTALL SHIFT LEVER
(a) Apply MP grease to the shift lever.
(b) Instal) the shift lever to the transmission.
21. CONNECT GROUND STRAPS TO ENGINE REAR SIDE AND RH SIDE
22. (with A/C)
INSTALL COMPRESSOR TO BRACKET
(a) Install the compressor with the four bolts.
(b) Install the drive belt and adjust the belt tension.



23. CONNECT GROUND STRAP FOR PS PUMP BRA–CKET
24. (w/PS)
INSTALL PS PUMP WITH PS PUMP BRACKET
Install the PS pump with the four bolts.
25. CONNECT FOLLOWING CABLES:
(a) (A/T)
Throttle cable

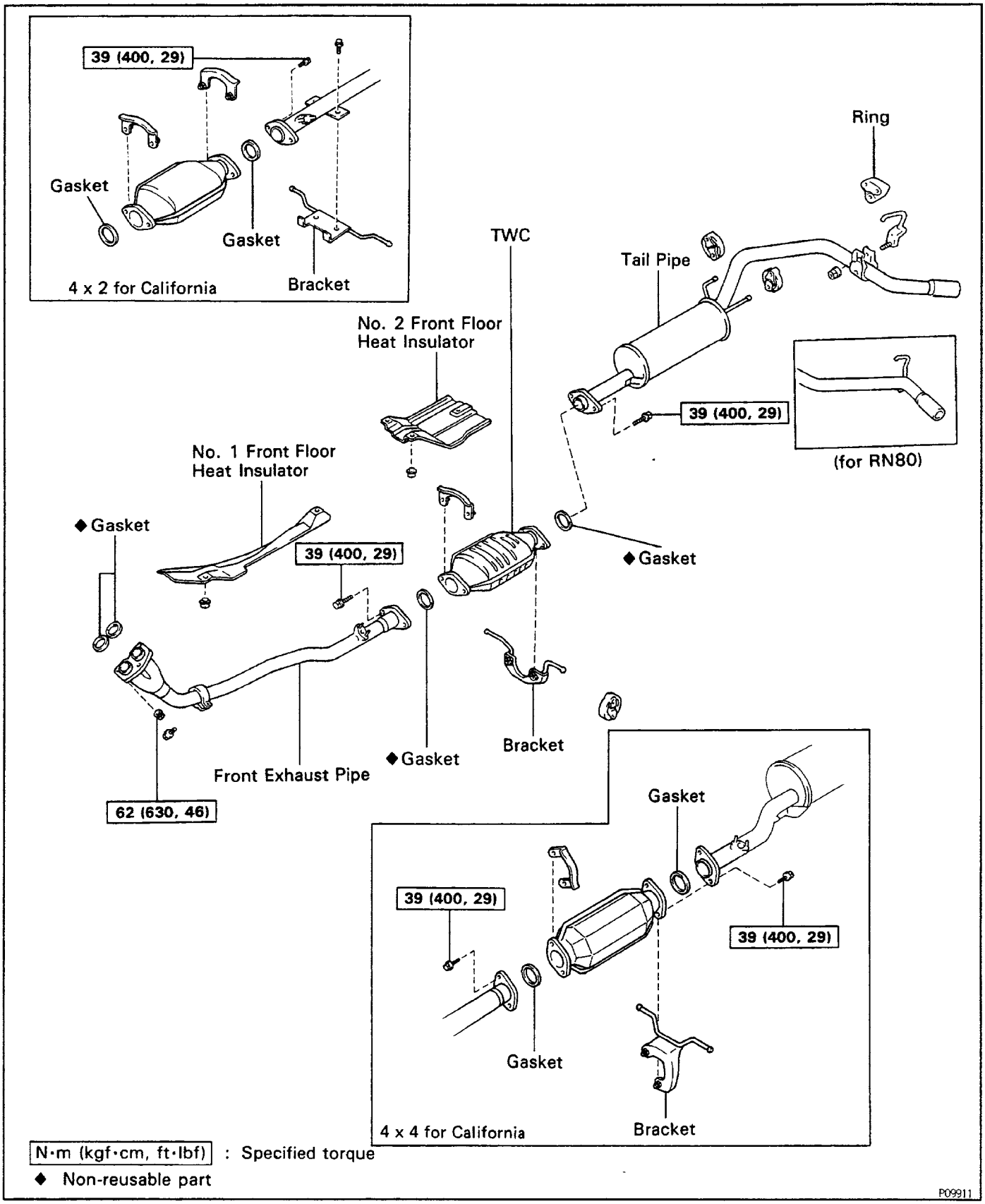
(b) (w/Cruise control)
Cruise control cable
(c) Accelerator cable
26. CONNECT FOLLOWING HOSES:
(a) Charcoal canister hose to canister
(b) (w/Cruise control)
Cruise control vacuum hose
(c) Brake booster hose
(d) PS air hoses to gas filter and air pipe
27. CONNECT FOLLOWING WIRES AND CONNEC–TORS:
(a) (with A/C)
A/C compressor connector
(b) Check connector
(c) (M/T)
Starter relay connectors
(d) ECM connectors
(e) Ground strap to engine rear side
(f) Distributor wire
(g) High–tension cords
(h) Generator wires
(i) Igniter connector
(j) Generator connector and wire
(k) Ground strap to LH fender apron
28. INSTALL FAN PULLEY, BELT GUIDE, FLUID COU–PLING AND GENERATOR DRIVE BELT
(See step 9 on page EG1–44**)**
29. (with A/C)
INSTALL A/C BELT
(see step 2 on page MA–6**)**
30. INSTALL PS PUMP AND BELT
(a) Place the PS drive belt onto each pulley.
(b) Stretch the belt tight and tighten the nuts.
(c) Torque the PS pump pulley lock nut.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)
(d) adjust the belt tension.
(See step 2 on page MA–6)
31. INSTALL RADIATOR
32. INSTALL AIR CLEANER CASE AND INTAKE AIR CONNECTOR
33. FILL WITH ENGINE OIL
(See step 3 on page EG1–236**)**
34. FILL WITH COOLANT
(See step 3 on page EG1–225**)**
35. INSTALL ENGINE UNDER COVER
36. INSTALL BATTERY
37. INSTALL HOOD
38. START ENGINE
Warm up the engine and inspect for leaks.

39. PERFORM ENGINE ADJUSTMENT
(See page EG1–10)
40. ROAD TEST
Road test the vehicle.
41. RECHECK COOLANT AND ENGINE OIL LEVEL

EXHAUST SYSTEM

EG1W4–01

COMPONENTS



SERVICE SPECIFICATIONS

EG1WS–01

SERVICE DATA

Compression pressure		STD	1,177 kPa	12.0 kgf/cm²	171 psi
		Limit	981 kPa	10.0 kgf/cm²	142 psi
	Difference between each cylinder		980 kPa (1.0 kgf/cm², 14 psi) or less		
Cylinder head	Head surface warpage	Limit	0.15 mm		0.0059 in.
	Manifold surface warpage	Limit	0.20 mm		0.0079 in.
	Valve seat Refacing angle	Intake	30°, 45°, 60°		
		Exhaust	30°, 45°, 65°		
		Contacting angle	45°		
		Contacting width	1.2 – 1.6 mm		0.047 – 0.063 in.
Valve guide bushing	Inner diameter	Intake	8.01 – 8.03 mm		0.3154 – 0.3161 in.
		Exhaust	8.01 – 8.03 mm		0.3154 – 0.3161 in.
	Outer diameter	STD	13.040 – 13.051 mm		0.5134 – 0.5138 in.
		O/S 0.05	13.090 – 13.101 mm		0.5154 – 0.5158 in.
	Replacing temperature (cylinder head side)		Approx. 90°C (194°F)		
Valve	Valve overall length	STD Intake	113.5 mm		4.468 in.
		Exhaust	112.4 mm		4.425 in.
	Valve face angle		44.5°		
	Stem diameter	STD Intake	7.970 – 7.985 mm		0.3138 – 0.3144 in.
		Exhaust	7.965 – 7.980 mm		0.3136 – 0.3142 in.
	Stem end refacing	Limit	0.5 mm		0.020 in.
	Stem oil clearance	STD Intake	0.025 – 0.06 mm		0.0010 – 0.0024 in.
		Exhaust	0.03 – 0.065 mm		0.0012 – 0.0026 in.
		Limit Intake	0.08 mm		0.0031 in.
		Exhaust	0.10 mm		0.0039 in.
	Valve head edge thickness	STD	1.0 mm		0.039 in.
		Limit	0.6 mm		0.024 in.
Valve spring	Free length		48.5 mm		1.909 in.
	Installed load at 40.5 mm (1.594 in.)				
		STD	294 N	30.0 kgf	66.1 lbf
		Limit	279 N	28.5 kgf	62.8 lbf
	Squareness	Limit	1.6 mm		0.063 in.
Rocker arm and shaft	Rocker arm inside diameter		16.000 – 16.018 mm		0.6299 – 0.6306 in.
	Rocker shaft diameter		15.97 – 15.99 mm		0.6287 – 0.6295 in.
	Shaft to arm oil clearance	STD	0.01 – 0.05 mm		0.0004 – 0.0020 in.
		Limit	0.08 mm		0.0031 in.
Intake, exhaust manifolds and air intake chamber	Manifold surface warpage				
	Limit Intake		0.2 mm		0.008 in.
	Exhaust		0.7 mm		0.028 in.
	Air intake chamber		0.2 mm		0.008 in.
Chain and sprocket	Crankshaft sprocket wear	Limit	59.4 mm		2.339 in.
	Camshaft sprocket wear	Limit	113.8 mm		4.480 in.

Tension and damper	Tensioner head thickness	Limit		11.0 mm	0.433 in.
	No. 1 damper wear	Limit		0.5 mm	0.020 in.
	No. 2 damper wear	Limit		0.5 mm	0.020 in.
Camshaft	Thrust clearance	STD		0.08 – 0.18 mm	0.0031 – 0.0071 in.
		Limit		0.25 mm	0.0098 in.
	Journal oil clearance	STD		0.01 – 0.05 mm	0.0004 – 0.0020 in.
		Limit		0.1 mm	0.004 in.
	Journal diameter	STD		32.98 – 33.00 mm	1.2984 – 1.2992 in.
	Circle runout	Limit		0.2 mm	0.008 in.
	Cam height	STD	Intake	42.63 – 42.72 mm	1.6783 – 1.6891 in.
			Exhaust	42.69 – 42.78 mm	1.6807 – 1.6842 in.
		Limit	Intake	42.25 mm	1.6634 in.
			Exhaust	42.30 mm	1.6654 in.
Cylinder block	Cylinder head surface warpage		Limit	0.05 mm	0.0020 in.
	Cylinder bore STD		No. 1	92.00 – 92.01 mm	3.6220 – 3.6224 in.
			No. 2	92.01 – 92.02 mm	3.6224 – 3.6228 in.
			No. 3	92.02 – 92.03 mm	3.6228 – 3.6232 in.
	Cylinder bore wear		Limit	0.02 mm	0.008 in.
	Cylinder block main journal bore				
		STD	No. 3	64.004 – 64.010 mm	2.5198 – 2.5201 in.
			No. 4	64.010 – 64.016 mm	2.5201 – 2.5203 in.
			No. 5	64.016 – 64.022 mm	2.5203 – 2.5205 in.
		U/S 0.25		64.004 – 64.022 mm	2.5198 – 2.5205 in.
Piston and piston ring	Piston diameter	STD	No. 1	91.975 – 91.985 mm	3.6211 – 3.6214 in.
			No. 2	91.985 – 91.995 mm	3.6214 – 3.6218 in.
			No. 3	91.995 – 92.005 mm	3.6218 – 3.6222 in.
		O/S 0.50		92.475 – 92.505 mm	3.6407 – 3.6419 in.
		O/S 1.00		92.975 – 93.005 mm	3.6604 – 3.6616 in.
	Piston to cylinder clearance			0.015 – 0.035 mm	0.0006 – 0.0014 in.
	Ring to ring groove clearance				
		STD		0.03 – 0.07 mm	0.0012 – 0.0028 in.
		Limit		0.2 mm	0.008 in.
	Piston ring end gap	STD	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.
		Limit	No. 1	1.07 mm	0.0421 in.
			No. 2	1.42 mm	0.0559 in.
			Oil	1.17 mm	0.0461 in.
	Piston pin installing temperature			80°C	176°F
Connecting rod and bearing	Thrust clearance	STD		0.16 – 0.26 mm	0.0063 – 0.0102 in.
		Limit		0.3 mm	0.012 in.
	Bearing oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.10 mm	0.0039 in.

Connecting rod and bearing (cont'd)	Big end inner diameter	STD	A	56.000 – 56.006 mm	2.2047 – 2.2050 in.
			B	56.006 – 56.012 mm	2.2050 – 2.2052 in.
			C	56.012 – 56.018 mm	2.2052 – 2.2054 in.
		U/S 0.25		56.000 – 56.018 mm	2.2047 – 2.2054 in.
	Connecting rod bearing center wall thickness				
		STD	A	1.484 – 1.488 mm	0.0584 – 0.0586 in.
			B	1.488 – 1.492 mm	0.0586 – 0.0587 in.
			C	1.492 – 1.496 mm	0.0587 – 0.0589 in.
		U/S 0.25		1.626 – 1.636 mm	0.0640 – 0.0644 in.
	Pin to bushing oil clearance				
		STD		0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit		0.015 mm	0.0006 in.
	Rod bend per 100 mm (3.94 in.)				
		Limit		0.05 mm	0.0020 in.
	Rod twist per 100 mm (3.94 in.)				
		Limit		0.15 mm	0.0059 in.
Crankshaft	Thrust clearance	STD		0.02 – 0.22 mm	0.0008 – 0.0087 in.
		Limit		0.3 mm	0.012 in.
	Thrust washer thickness	STD		2.690 – 2.740 mm	0.1059 – 0.1079 in.
		O/S 1.25		2.753 – 2.803 mm	0.1084 – 0.1104 in.
		O/S 2.50		2.815 – 2.865 mm	0.1108 – 0.1128 in.
	Main journal oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.08 mm	0.0031 in.
	Main journal diameter	STD		59.984 – 60.000 mm	2.3616 – 2.3622 in.
	Main journal finished diameter				
		U/S 0.25		59.701 – 59.711 mm	2.3504 – 2.3508 in.
	Main bearing center wall thickness				
	STD		No. 3	1.988 – 1.992 mm	0.0783 – 0.0784 in.
			No. 4	1.992 – 1.996 mm	0.0784 – 0.0786 in.
			No. 5	1.996 – 2.000 mm	0.0786 – 0.0787 in.
		U/S 0.25		2.216 – 2.136 mm	0.0837 – 0.0841 in.
	Crank pin diameter	STD		52.988 – 53.000 mm	2.0861 – 2.0866 in.
	Crank pin finished diameter				
	U/S 0.25			52.701 – 52.711 mm	2.0748 – 2.0752 in.
	Circle runout Limit			0.1 mm	0.004 in.
	Main journal taper and out–of–round				
	Limit			0.01 mm	0.0004 in.
	Crank pin journal taper and out–of round				
	Limit			0.01 mm	0.0004 in.

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TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder head x Cylinder head cover	5.9	60	52 in.·lbf
Cylinder head x Camshaft bearing cap	20	200	14
Cylinder head x Spark plug	18	180	13
Cylinder head x Intake manifold	19	195	14
Cylinder head x No. 1 secondary air injection manifold	13	130	9
Cylinder head x EGR valve	13	130	9
Cylinder head x Exhaust manifold	44	450	33
Cylinder head x Cylinder head rear cover	13	130	9
Cylinder block x Cylinder head	78	800	58
Cylinder block x Chain damper	22	220	16
Cylinder block x Chain tensioner	19	195	14
Cylinder block x Engine mounting	39	400	29
Cylinder block x Rear oil seal retainer	18	180	13
Cylinder block x Fuel filter bracket	19	195	14
Oil cooler relief valve x Cylinder block	69	700	51
Cylinder block x Crankshaft bearing cap	103	1,050	76
Cylinder block x Oil strainer	13	130	9
Cylinder block x Oil pan	13	130	9
Cylinder block x Engine mounting bracket	44	400	33
Valve clearance adjusting screw	25	250	18
Camshaft x Distributor drive gear	78	800	58
Crankshaft pulley x No. 2 crankshaft pulley	19	195	14
Air intake chamber x EGR pipe	13	130	9
Air intake chamber x Intake manifold	19	195	14
Air intake chamber x Accelerator control cable bracket	13	130	9
Intake manifold x Water outlet	19	195	14
Intake manifold x PAIR valve	13	130	9
No. 1 secondary air injection manifold x PAIR valve	13	130	9
No. 1 secondary air injection manifold x No. 2 secondary air injection manifold	13	130	9
Exhaust manifold x No. 2 exhaust manifold heat insulator	19	195	14
Exhaust manifold x No. 2 secondary air injection manifold			
10 mm bolt	44	450	33
8 mm bolt	22	220	16
Connecting rod x Connecting rod cap	69	700	51
Crankshaft x Crankshaft pulley	157	1,600	116
Crankshaft x Flywheel	108	1,100	80
Crankshaft x Drive plate	83	850	61
Oil pan x Drain plug	25	250	18