ENGINE MECHANICAL

TROUBLESHOOTING

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty	Troubleshoot cooling system	CO-2
	Incorrect ignition timing	Reset timing	IG-14

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ Hard to start (cranks OK)	No fuel supply to carburetor	Check fuel line	
	No fuel supply to injector ● No fuel in tank ● Fuel pump not working ● Fuel filter clogged ● Fuel line clogged or leaking	Troubleshoot EFI system	FI-9
	EFI system problems	Repair as necessary	
	Ignition problems ● Ignition coil ● Igniter ● Distributor	Perform spark test	IG-4
	Spark plugs faulty	Inspect plugs	IG-5
	High-tension cord disconnected or broken	Inspect cords	IG-5
	Vacuum leaks ● PCV hoses ● EGR valve ● Intake manifold ● Air intake chamber ● Throttle body ● Brake booster line	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Compression low	Check compression	EM-8

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plug faulty	Inspect plugs	IG-5
	High-tension cord faulty	Inspect cords	IG-5
	Ignition problems ● Ignition coil ● Igniter ● Distributor	 Inspect coil Inspect igniter Inspect distributor	
	Incorrect ignition timing	Reset timing	IG-14

ROUGH IDLING (Cont'd)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Vacuum leaks ● PCV hoses ● EGR valve ● Intake manifold ● Air intake chamber ● Throttle body ● Brake booster line	Repair as necessary	
	Pulling in air between air flow meter and throttle body		
	Incorrect idle speed	Adjust idle speed	MA-7
	EFI system problems	Repair as necessary	
	HAI system faulty	Check HAI system	
	Engine overheats	Troubleshoot cooling system	CO-2
	EGR valve faulty	Check EGR valve	
	Compression low	Check compression	EM-8

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ poor acceleration	Spark plug faulty	Inspect plugs	
	High tension cord faulty	Inspect cords	
	Vacuum leaks ● PCV hoses ● EGR valve ● Intake manifold ● Air intake chamber ● Throttle body ● Brake booster line	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-14
	Fuel system clogged	Check fuel system	
	Air cleaner clogged	Check air filter	MA-5
	EFI system problems	Repair as necessary	
	Emission control system problem ● EGR system always on (cold engine)	Check EGR system	
	Engine overheats	Check cooling system	CO-2
	Compression low	Check compression	EM-8

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine diesels (runs after ignition switch is turned off)	EFI system problems	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-14
	EGR system faulty	Check EGR system	

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	
Muffler explosion (after fire) all the time	Air cleaner clogged	Check air filter	MA-5
	EFI system problem	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-14
Engine backfires	EFI system problem	Repair as necessary	
	Vacuum leak • PCV hoses • EGR valve • Intake manifold • Intake air control valve • Throttle body • Brake booster line	Check hoses and repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	FI-9
	Incorrect ignition timing	Reset timing	IG-14
	Carbon deposits in combustion chambers	Inspect cylinder head	EM-14

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak	Repair as necessary	
	PCV line clogged	Check PCV system	
	Piston ring worn or damaged	Check rings	EM-52
	Valve stem and guide worn	Check valves	EM-15
	Valve stem seal worn	Check seals	

EXCESSIVE FUEL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive fuel consumption	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air filter	MA-5
	Incorrect ignition timing	Reset timing	IG-14
	EFI system problems ● Injector faulty ● Decerelation fuel cut system faulty	Repair as necessary	
	Idle speed too high	Adjust idle speed	MA-7
	Spark plug faulty	Inspect plugs	IG-5
	EGR system always on	Check EGR system	
	Compression low	Check compression	EM-8
	Tires improperly inflated	Inflate tires to proper pressure	
	Clutch slips	Troubleshoot clutch	
	Brakes drag	Troubleshoot brakes	

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Unpleasant odor	Incorrect idle speed	Adjust idle speed	MA-7
	Incorrect ignition timing	Reset timing	IG-14
	Vacuum leaks ● PCV hoses ● EGR valve ● Intake manifold ● Air intake chamber ● Throttle body ● Brake booster line	Repair as necessary	
	EFI system problems	Repair as necessary	

ENGINE TUNE-UP

INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page CO-3)

INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page LU-3)

INSPECTION OF BATTERY

(See steps 1 and 2 on page CH-3)

Standard specific gravity:
1.25 – 1.27 when fully charged at 20°C (68°F)

CLEANING OF AIR FILTER

(See page MA-5)

INSPECTION OF HIGH-TENSION CORDS

(See page IG-5)

Maximum resistance: 25 kΩ per cord

INSPECTION OF SPARK PLUGS

(See page IG-5)

Maximum electrode gap: 1.3 mm (0.051 in.)
Correct electrode gap of new plug:
1.1 mm (0.043 in.)

INSPECTION OF ALTERNATOR DRIVE BELT

(See page CH-3)

Drive belt tension: New belt 175 ± 5 lb
Used belt 115 ± 20 lb

ADJUSTMENT OF IGNITING TIMING

(See page IG-14)

Ignition timing: 12° BTDC @ idle
(w/ Terminals T and E1 short-circuited)

ADJUSTMENT OF IDLE SPEED

(See page MA-7)

Idle speed: M/T 700 rpm
A/T 750 rpm

IDLE HC/CO CONCENTRATION CHECK METHOD

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

1. INITIAL CONDITIONS

(a) Air cleaner installed

(b) Normal engine operating temperature

(c) All pipes and hoses of air intake system connected

(d) All accessories switched off

(e) All vacuum lines properly connected

NOTE: All vacuum hoses for EVAP, etc. should be properly connected.

(f) EFI system wiring connectors fully plugged

(g) Ignition timing set correctly

(h) Idle speed set correctly

(i) Transmission in N range

(j) Tachometer and HC/CO meter calibrated and at hand

2. **RACE ENGINE AT 2,500 PRM FOR ABOUT 2 MINUTES**

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

4. **CHECK HC/CO CONCENTRATION AT IDLE**

   Wait at least one minute before measuring to allow the concentration to stabilize.
   Complete the measuring within three minutes.
   If the HC/CO concentration does not conform to your regulations, see the table following for possible causes:

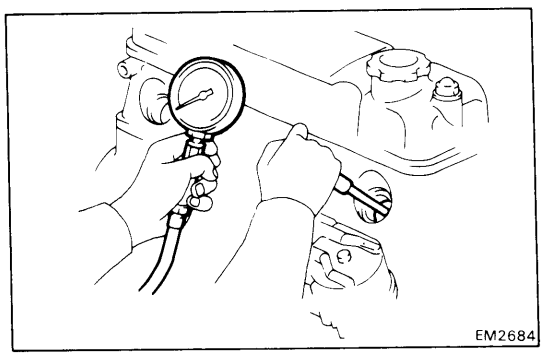
TROUBLESHOOTING

HC	CO	Problems	Causes
High	Normal	Rough idle	1. Faulty ignition: ● Incorrect timing ● Fouled, shorted or improperly gapped plugs ● Open or crossed high tension wires ● Cracked IIA cap 2. Leaky EGR valve 3. Leaky exhaust valves 4. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leak: ● Vacuum hose ● EGR valve ● Intake manifold ● Throttle body 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty EFI system: ● Faulty pressure regulator ● Clogged fuel return line ● Faulty air flow meter ● Defective water thermo. sensor ● Faulty ECU ● Faulty injector ● Faulty cold start injector ● Faulty throttle position sensor

COMPRESSION CHECK

NOTE: If there is lack of power, excessive oil consumption or poor fuel economy, measure the cylinder compression pressure.

1. **WARM UP AND STOP ENGINE**
2. **DISCONNECT SOLENOID RESISTOR CONNECTOR**
3. **DISCONNECT COLD START INJECTOR CONNECTOR**
4. **REMOVE SPARK PLUGS**
5. **DISCONNECT DISTRIBUTOR CONNECTOR**
6. **CHECK CYLINDER COMPRESSION PRESSURE**



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

(b) Fully open the throttle valve.

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

NOTE: Always use a fully charged battery to obtain engine revolution of 250 rpm or more.

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

Compression pressure:
12.5 kg/cm^2 (178 psi, 1,226 kPa) or more
Minimum pressure:
9.0 kg/cm^2 (128 psi, 883 kPa)
Difference between each cylinder:
1.0 kg/cm^2 (14 psi, 98 kPa) or less

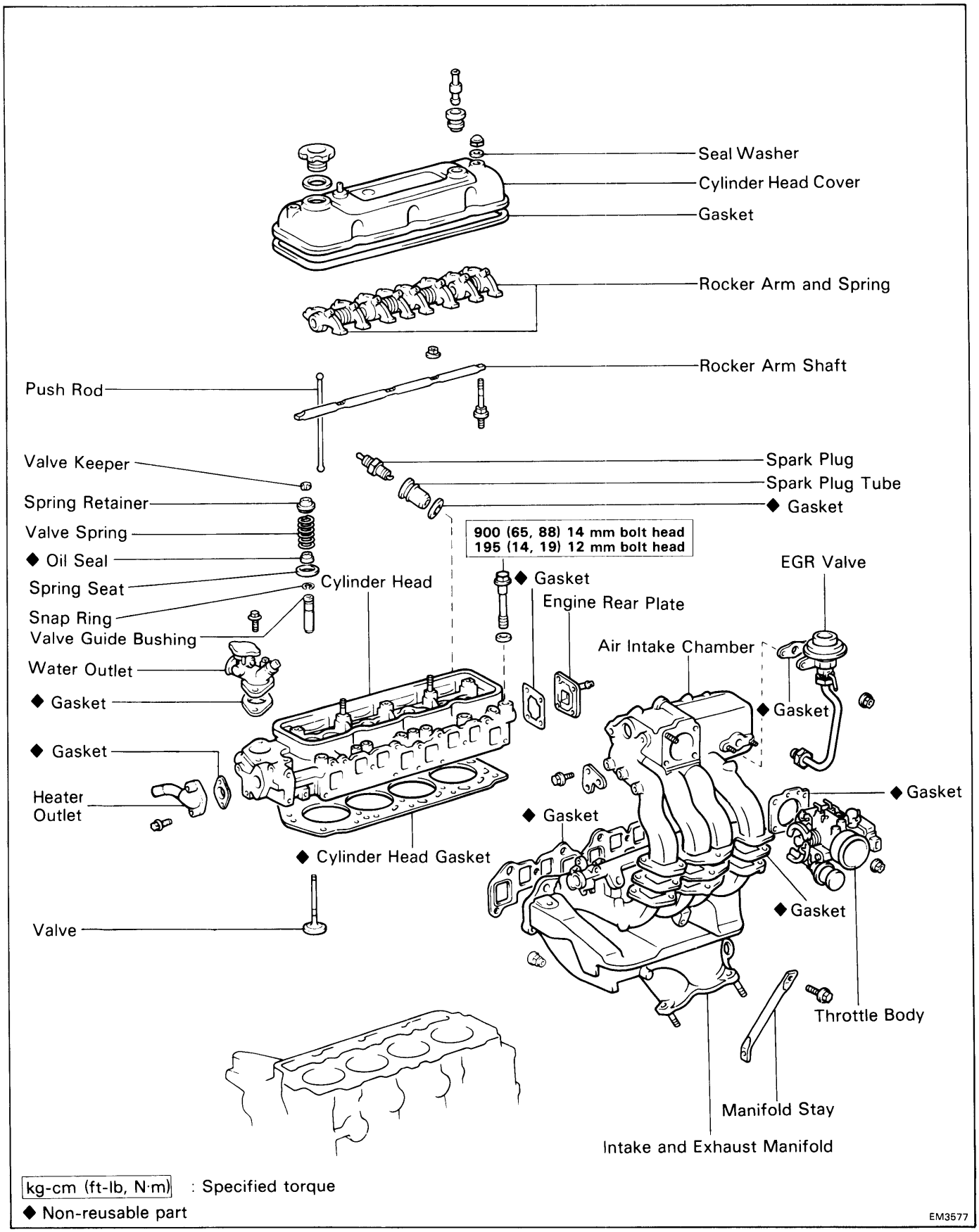
(e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for the cylinder with low compression.

- 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.

7. **RECONNECT DISTRIBUTOR CONNECTOR**
8. **REINSTALL SPARK PLUGS**
   Torque: 180 kg-cm (13 ft-lb, 18 N·m)
9. **RECONNECT COLD START INJECTOR CONNECTOR**
10. **RECONNECT SOLENOID RESISTOR CONNECTOR**

CYLINDER HEAD

COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

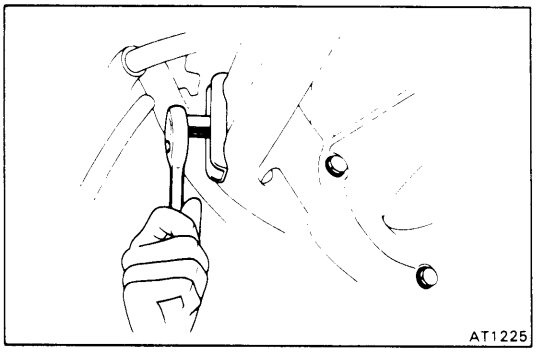
EM3577

PREPARATION FOR REMOVAL

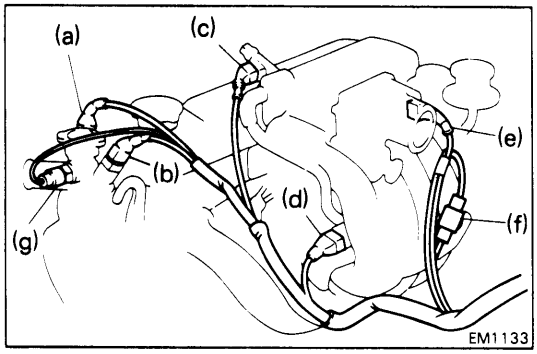
(See page EM-9)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE RIGHT SEAT
3. REMOVE ENGINE SERVICE HOLE COVER
4. DRAIN COOLANT

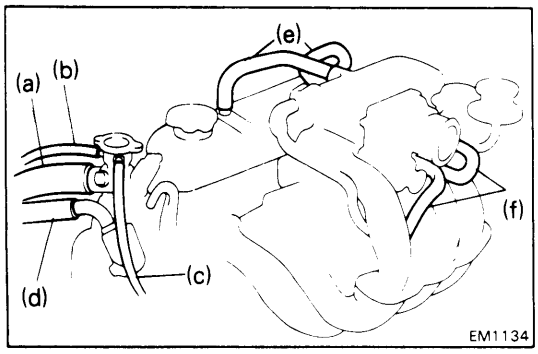
   Open the radiator and engine drain cocks, and allow coolant to drain into a clean container.
5. DRAIN ENGINE OIL
6. [w/ PS]
   REMOVE POWER STEERING PUMP
   (See page SR-29)



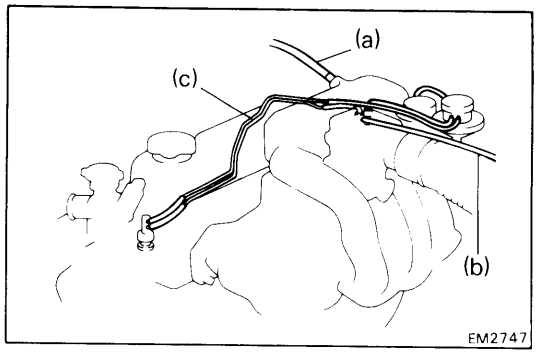
7. REMOVE EXHAUST PIPE AND BRACKET
8. DISCONNECT ACCELERATOR CABLE WITH BRACKET FROM THROTTLE BODY
9. REMOVE AIR CLEANER PIPE AND HOSES
10. DISCONNECT WATER TEMPERATURE SENDER GAUGE CONNECTOR FROM CYLINDER HEAD



11. DISCONNECT EFI CONNECTORS
    - (a) Water thermo sensor connector
    - (b) Cold start injector time switch connector
    - (c) Cold start injector connector
    - (d) Air valve connector
    - (e) Throttle position sensor connector
    - (f) [2WD M/T]
      Oxygen sensor connector
    - (g) [w/ A/C]
      Water temperature switch connector



12. DISCONNECT HOSES
    - (a) Radiator inlet hose
    - (b) Radiator breather hose
    - (c) Reserve tank hose
    - (d) Heater outlet hose
    - (e) PCV hoses
    - (f) Water by-pass hoses

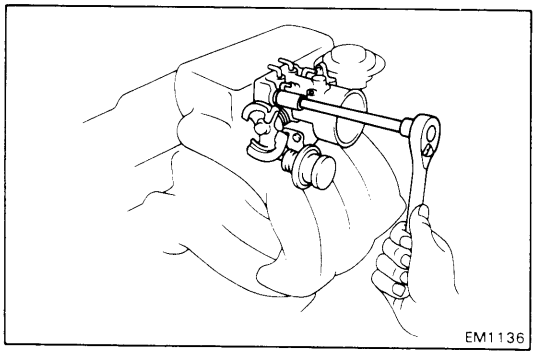


13. DISCONNECT VACUUM HOSES

(a) Brake booster vacuum hose

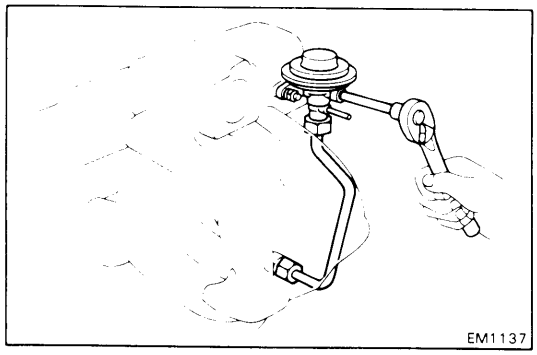
(b) Charcoal canister hose

(c) Label and disconnect emission control hoses



14. REMOVE THROTTLE BODY

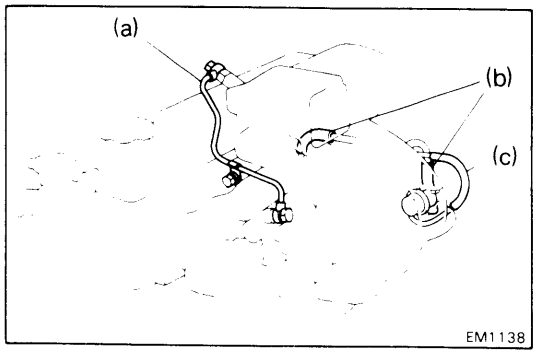
Remove the throttle body from the air intake chamber.



15. REMOVE EGR VALVE

(a) Remove the two nuts from the air intake chamber.

(b) Remove the union nut from exhaust manifold and EGR valve.

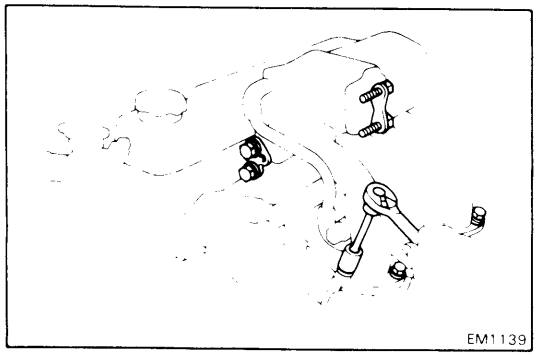


16. DISCONNECT PIPE AND HOSES

(a) Cold start injector pipe

(b) Water by-pass hoses

(c) Pressure regulator hose



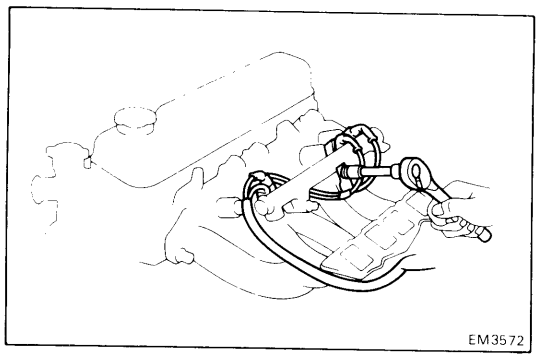
17. REMOVE AIR INTAKE CHAMBER

(a) Remove the air intake chamber brackets.

NOTE: Use a 12 mm socket wrench to remove the rear chamber bracket.

(b) Remove the air intake chamber with the air valve.

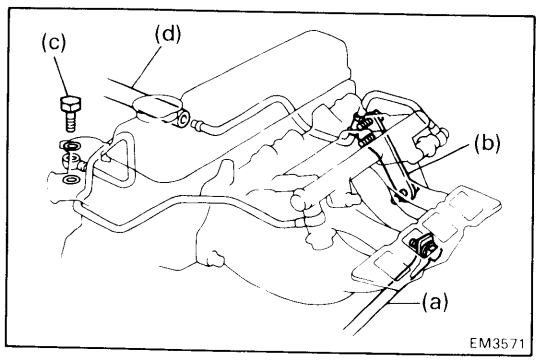
NOTE: Use 10 mm and 12 mm socket wrenches to remove the air intake chamber with the air valve.



18. DISCONNECT INJECTOR CONNECTOR

(a) Remove the wire clamp bolt.

(b) Disconnect the injector connectors from the injectors.



19. REMOVE PARTS

(a) Exhaust manifold bracket

(b) Heater pipe bracket

(c) Fuel inlet pipe union bolt from fuel filter

(d) Fuel outlet hose

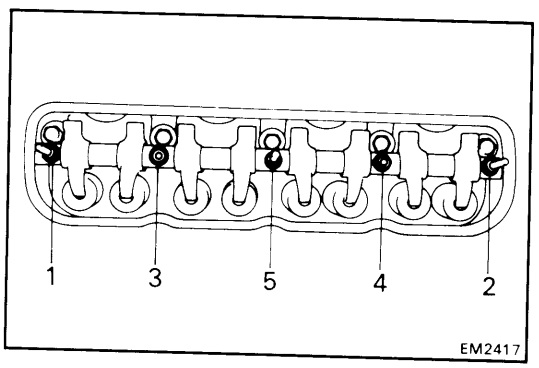
REMOVAL OF CYLINDER HEAD

(See page EM-9)

1. REMOVE SPARK PLUGS AND TUBES

2. REMOVE CYLINDER HEAD COVER

Remove the cap nuts, seal washers, cylinder head cover and gasket.



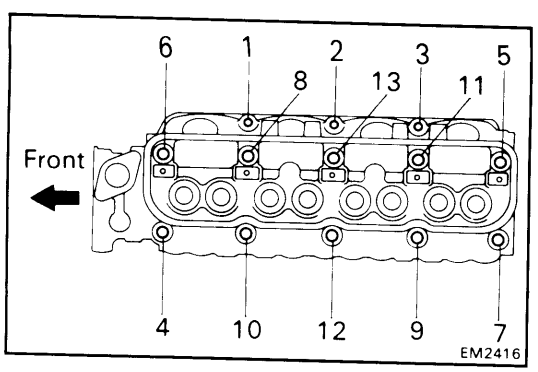
3. REMOVE ROCKER ARM SHAFT ASSEMBLY

(a) Uniformly loosen and remove the three bolts and two nuts in several passes, in sequence shown.

(b) Remove the rocker shaft assembly.

4. REMOVE PUSH RODS

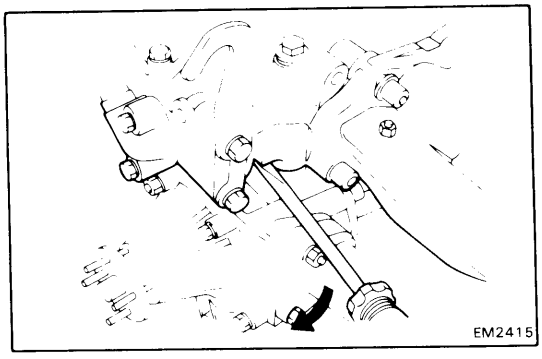
NOTE: Keep the push rods in correct order.



5. REMOVE CYLINDER HEAD

(a) Uniformly loosen and remove the thirteen head bolts in several passes, in the sequence shown.

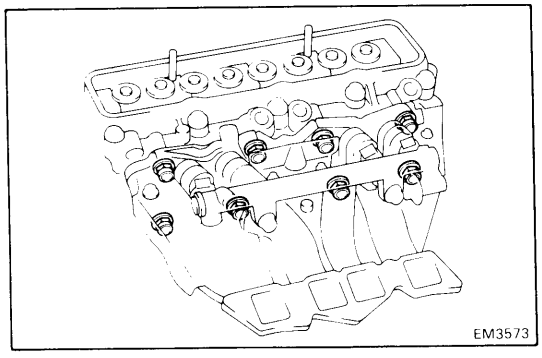
CAUTION: Head warpage or cracking could result from bolts removing in incorrect order.



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

If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block projection.

CAUTION: Be careful not to damage the cylinder head and block surface of the cylinder and head gasket.



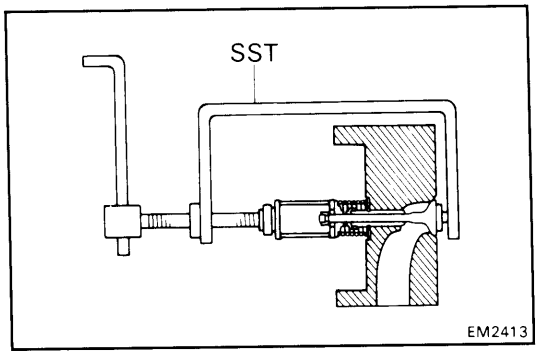
DISASSEMBLY OF CYLINDER HEAD

(See page EM-9)

1. REMOVE INTAKE AND EXHAUST MANIFOLDS

(a) Remove the inlet and outlet fuel pipes.

(b) Remove the intake and exhaust manifolds from the cylinder head.

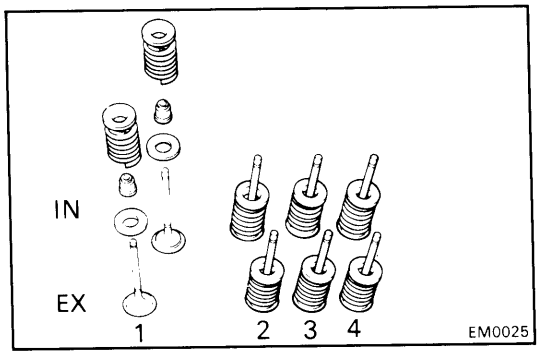


2. REMOVE VALVES

(a) Using SST, press the valve spring and remove the two keepers.

SST 09202-43013

(b) Remove the spring retainer, spring, seat, valve and oil seal.



NOTE: Arrange the disassembled parts in correct order.

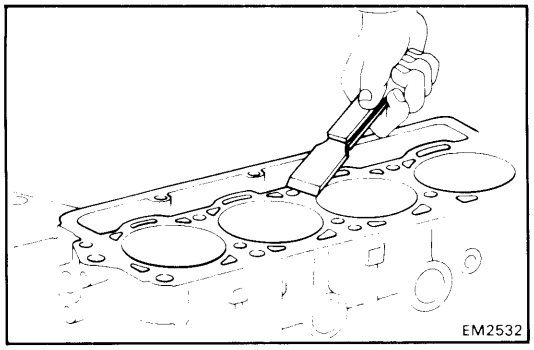
3. IF NECESSARY, REMOVE PARTS

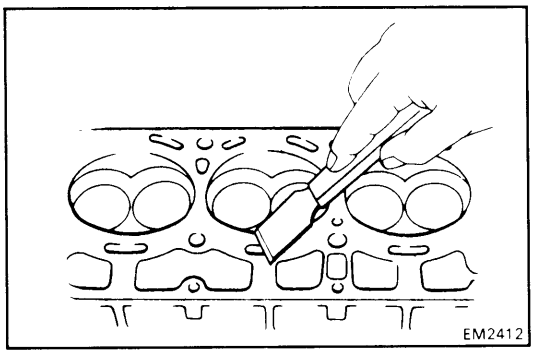
(a) Water outlet

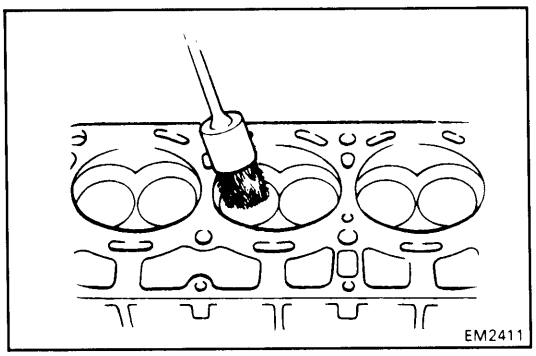
(b) Heater outlet

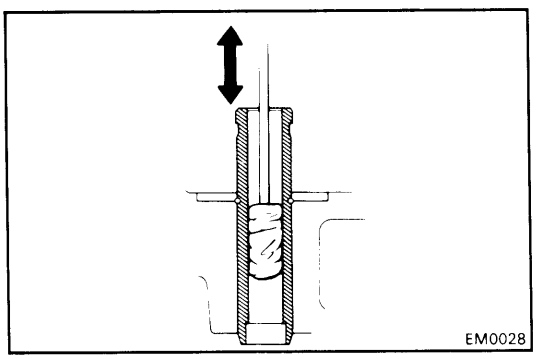
(c) Engine rear plate

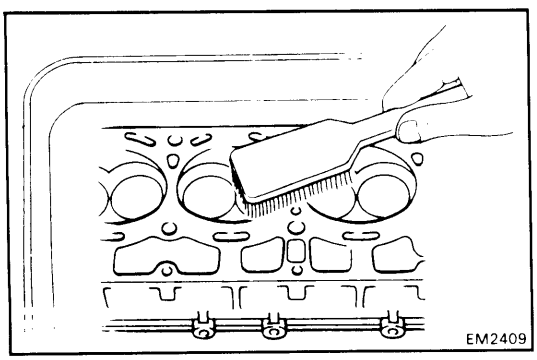
(d) Engine hanger











INSPECTION AND CLEANING OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF BLOCK

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

(b) Remove all the gasket material from the top of the block.

(c) Blow carbon and oil from the bolt holes.

WARNING: Protect your eyes when using compressed air.

2. REMOVE GASKET MATERIAL

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

CAUTION: Be careful not to scratch the surfaces.

3. CLEAN COMBUSTION CHAMBERS

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

CAUTION: Be careful not to scratch the head gasket contact surface.

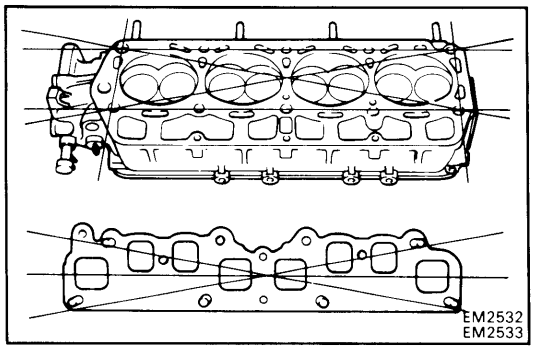
4. CLEAN VALVE GUIDE BUSHINGS

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

5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, thoroughly clean the head.

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



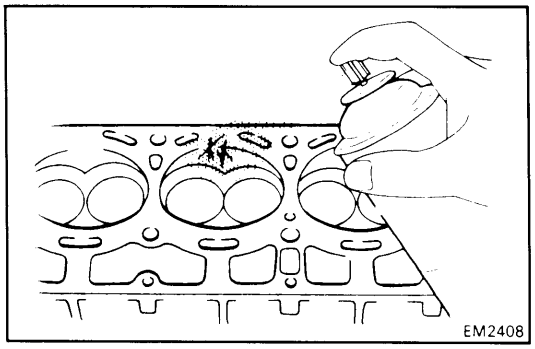
6. INSPECT HEAD FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and manifolds for warpage.

Maximum warpage:

Cylinder block side	**0.15 mm (0.0059 in.)**
Manifold side	**0.10 mm (0.0039 in.)**

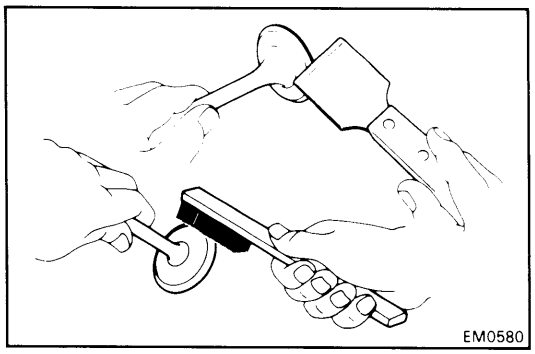
If warpage is greater than maximum, replace the head.



7. INSPECT CYLINDER HEAD FOR CRACKS

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

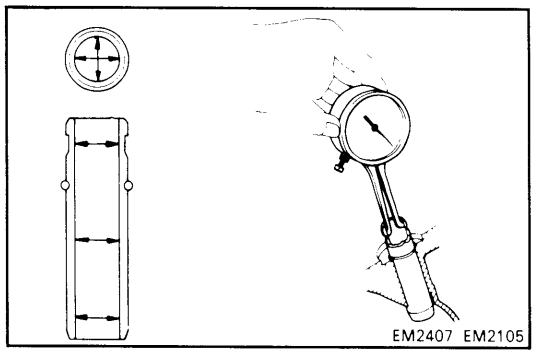
If cracked, replace the head.



8. CLEAN VALVES

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

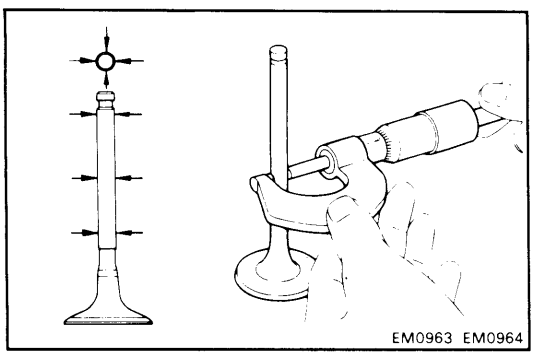
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND VALVE GUIDE BUSHINGS

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

Bushing inside diameter:
8.010 – 8.030 mm (0.3154 – 0.3161 in.)



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

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 measurement from the valve guide bushing measurement.

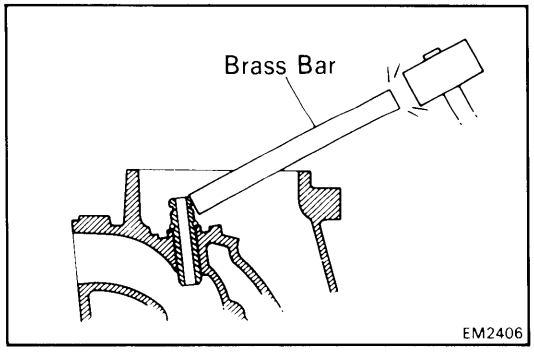
Standard oil clearance:

Intake	**0.025 – 0.060 mm (0.0010 – 0.0024 in.)**
Exhaust	**0.030 – 0.065 mm (0.0012 – 0.0026 in.)**

Maximum oil clearance:

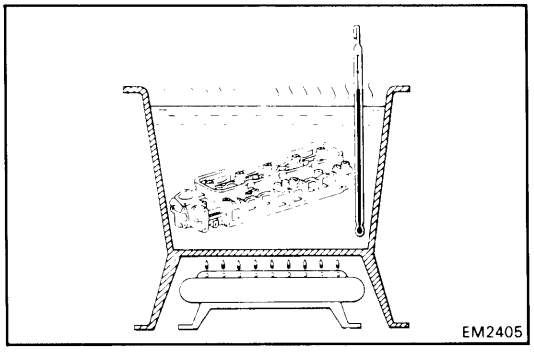
Intake	**0.10 mm (0.0039 in.)**
Exhaust	**0.12 mm (0.0047 in.)**

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

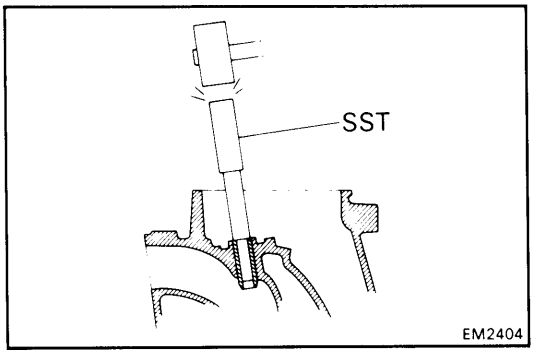


10. IF NECESSARY, REPLACE VALVE GUIDE BUSHING

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



(b) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



(c) Using SST and a hammer, tap out the valve guide bushing.

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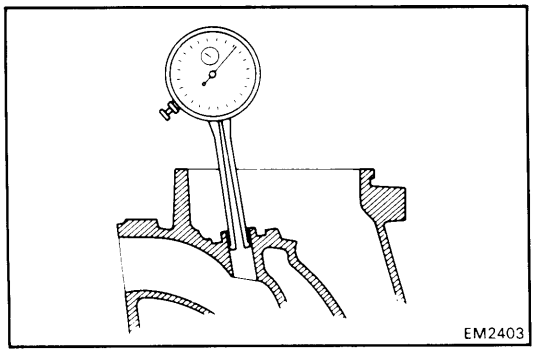


(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Both intake and exhaust

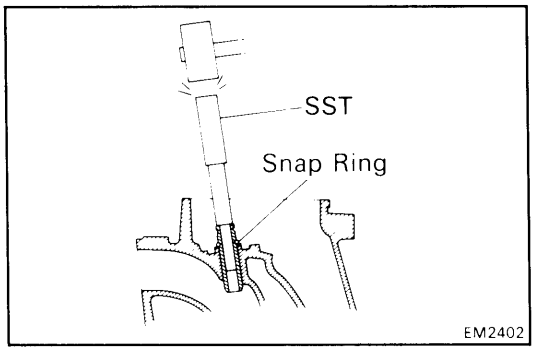
Bushing bore diameter mm (in.)	Bushing size
13.000 – 13.027 (0.5118 – 0.5129)	Use STD
Over 13.027 (0.5129)	Use O/S 0.05

(e) Select a new valve guide busing. (STD size or O/S 0.05)

If the bushing bore diameter of the cylinder head is more than 13.027 mm (0.5129 in.), machine the bore to the following dimensions.

Rebored cylinder head bushing bore dimensions:
13.050 – 13.077 mm (0.5138 – 0.5148 in.)

If the bushing bore diameter of the cylinder head exceeds 13.077 mm (0.5148 in.), replace the cylinder head.



(f) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

(g) Using SST and a hammer, tap in a new valve guide bushing until the snap ring makes contact with the cylinder head.

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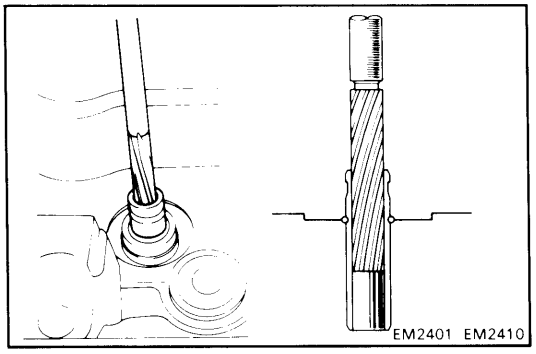


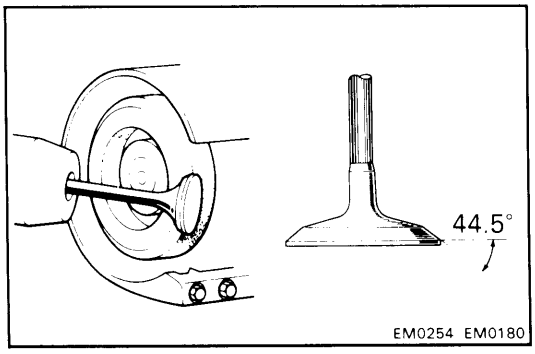
(h) Using a sharp 8 mm reamer, ream the valve guide bushing to obtain the standard specified clearance (See page EM-16) between the valve guide bushing and new valve stem.

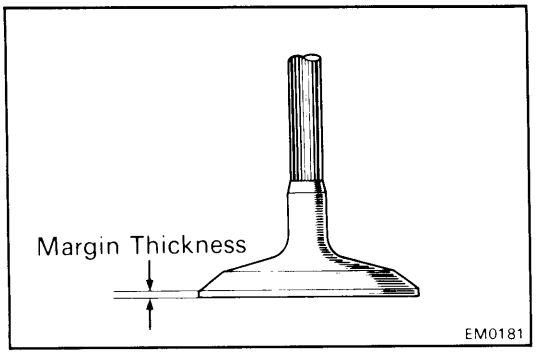
11. INSPECT AND GRIND VALVES

(a) Grind the valve only enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°

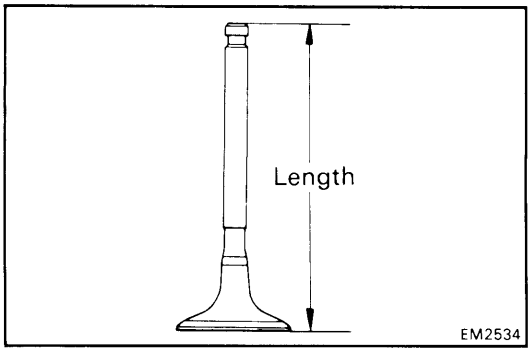




(c) Check the valve head margin thickness.

Standard margin thickness
Intake 1.0 – 1.4 mm (0.039 – 0.055 in.)
Exhaust 1.3 – 1.7 mm (0.051 – 0.067 in.)
Minimum margin thickness:
Intake 0.5 mm (0.020 in.)
Exhaust 0.8 mm (0.031 in.)

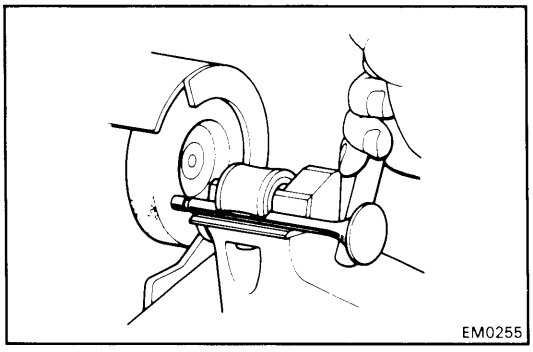
If the valve head margin thickness is less than minimum, replace the valve.



(d) Check the valve overall length.

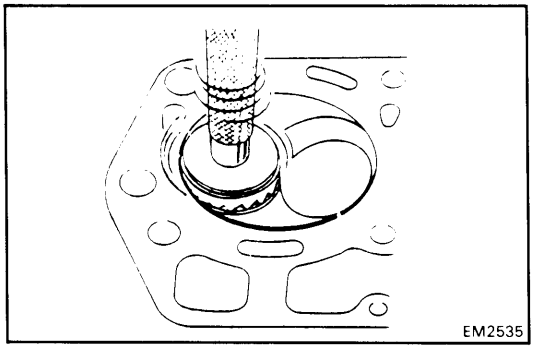
Standard overall length:
Intake 108.2 mm (4.260 in.)
Exhaust 108.5 mm (4.272 in.)
Minimum overall length:
Intake 107.7 mm (4.240 in.)
Exhaust 108.0 mm (4.252 in.)

If the overall length is less than minimum, replace the valve.



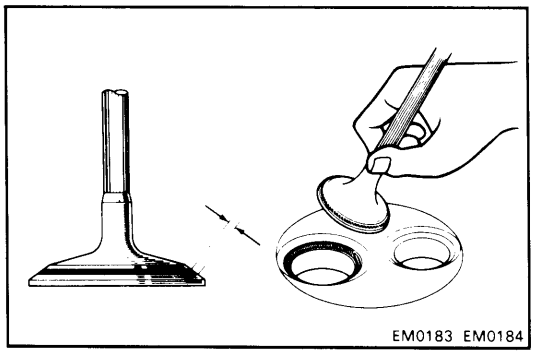
(e) If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

CAUTION: Do not grind off more than the minimum amount.



12. INSPECT AND CLEAN VALVE SEATS

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



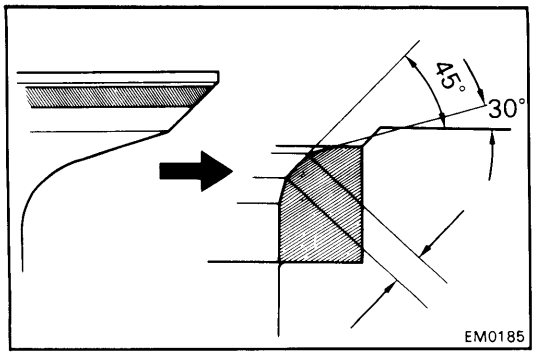
(b) Check the valve seating position.

Apply a thin coat of prussian blue (or white lead) to the valve face. Install the valve. While applying light pressure to the valve, rotate the valve against the seat.

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

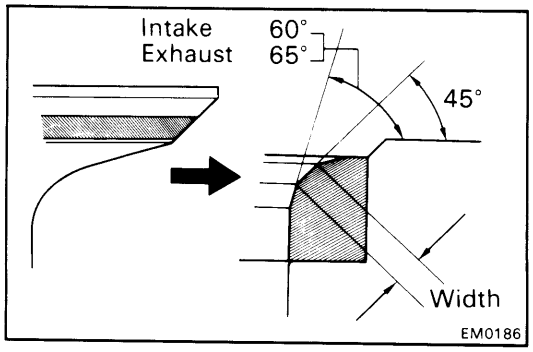
- If blue appears 360° round the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and seat are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width:

1.2 – 1.6 mm (0.047 – 0.063 in.)

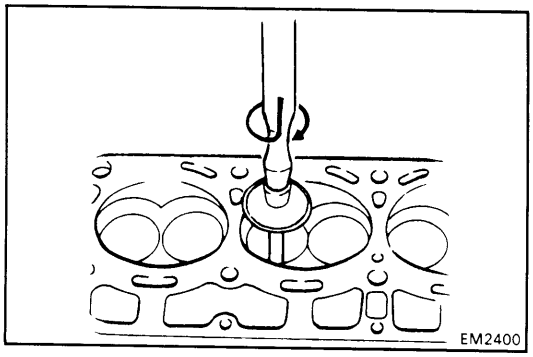


If not, correct the valve seat as follows:

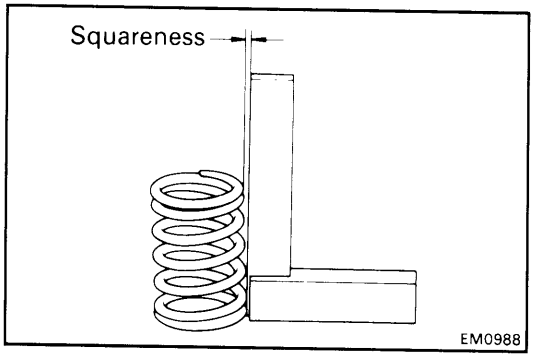
(1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



(2) [Intake]
If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.
(3) [Exhaust]
If the seating is too low on the valve face, use 65° and 45° cutters to correct the seat.



(d) Hand-lap the valve and valve seat together with an abrasive compound.
(e) After hand-lapping, clean the valve and valve seat.

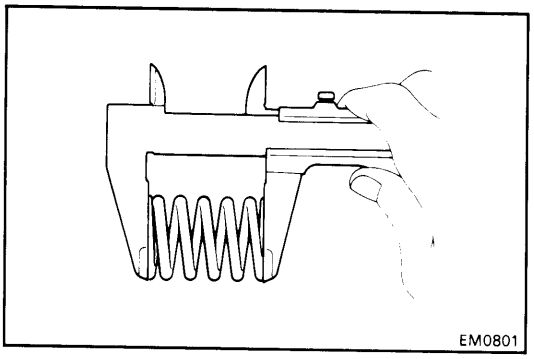


13. INSPECT VALVE SPRINGS

(a) Using a steel square, check the squareness of the valve springs.

Maximum squareness: 2.0 mm (0.079 in.)

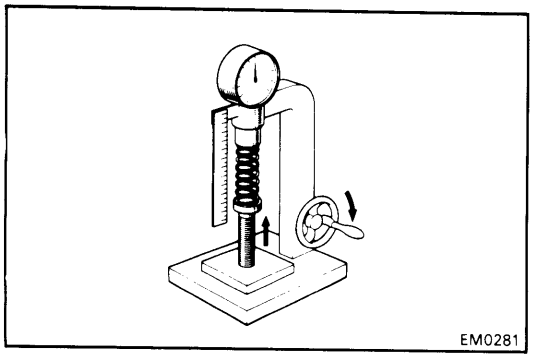
If squareness is greater than maximum, replace the valve spring.



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

Free length: 47.0 mm (1.850 in.)

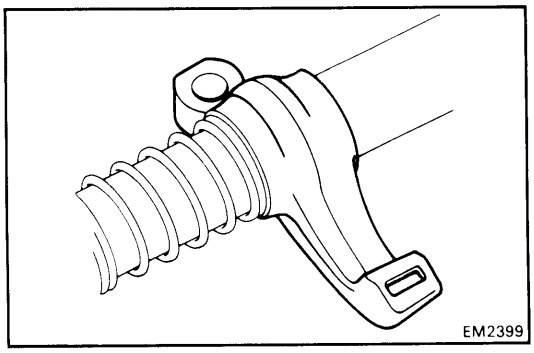
If the free length is not as specified, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

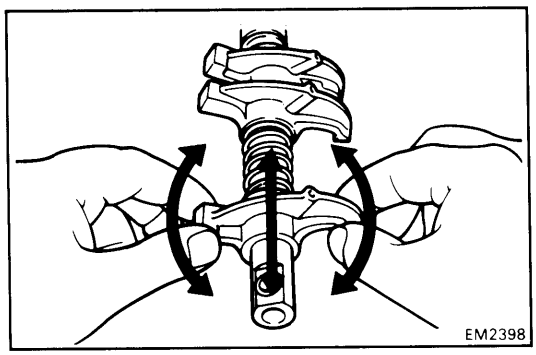
Installed tension:
28.8 – 35.2 kg (63.5 – 77.6 lb, 282 – 345 N) at 40.6 mm (1.598 in.)

If the installed tension is not within specification, replace the valve spring.



14. INSPECT ROCKER ARM AND SHAFT

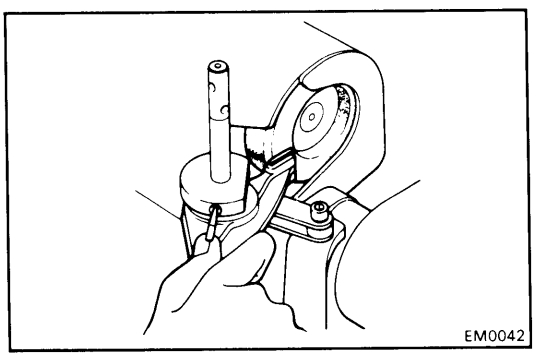
(a) Inspect the valve contacting surface of the rocker arm for wear.



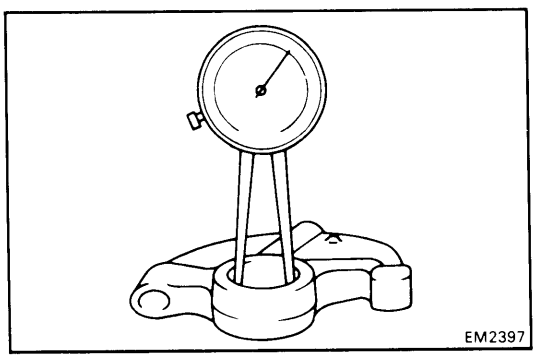
(b) Inspect the rocker arm-to-shaft clearance by moving each rocker arm as shown in the figure. If movement is felt, disassemble and inspect.

(c) Disassemble the valve rocker shaft assembly.

NOTE: Arrange the rocker arms in correct order.



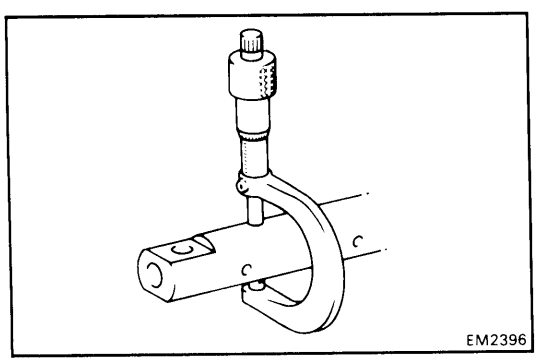
If the contacting surface of the rocker arm is worn, resurface it with a valve refacer and oil stone, or replace the rocker arm.



(d) Inspect the oil clearance between the rocker arm and shaft.

- Using a caliper gauge, measure the inside diameter of the rocker arm.

Rocker arm inside diameter:
18.500 – 18.515 mm (0.7283 – 0.7289 in.)



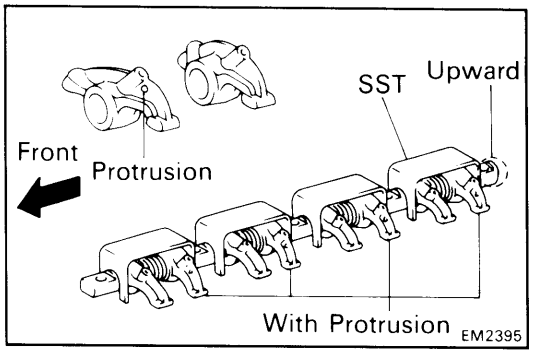
- Using a micrometer, measure the diameter of the rocker shaft.

Rocker shaft diameter:
18.474 – 18.487 mm (0.7273 – 0.7278 in.)

- Subtract the rocker shaft diameter measurement from the inside diameter measurement of the rocker arm.

Standard oil clearance: 0.013 — 0.041 mm (0.0005 — 0.0016 in.)
Maximum oil clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than maximum, replace the rocker arm and shaft.



(e) Assemble the valve rocker shaft assembly.
Confirm the correct direction of the rocker arm shaft rear end, assemble the rocker arms and springs as shown and hold them with SST.

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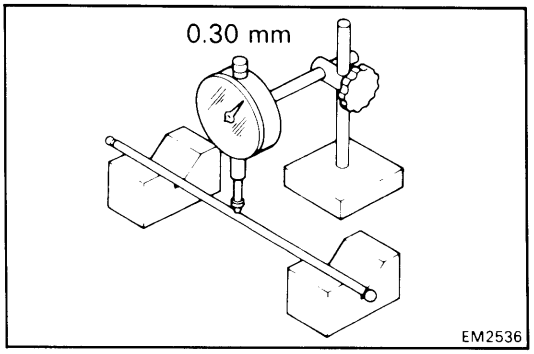


15. INSPECT PUSH RODS

(a) Place the push rod on V-blocks.

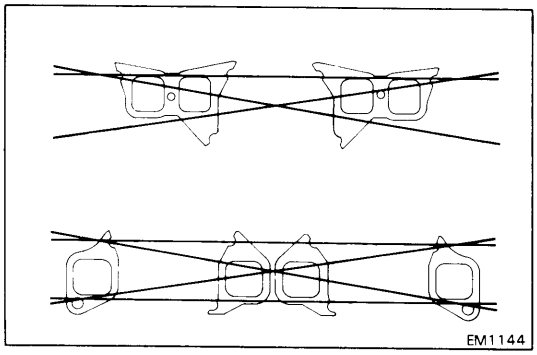
(b) Using a dial indicator, measure the circle runout at the center of the push rod.

Maximum circle runout: 0.30 mm (0.0118 in.)

If the circle runout is greater than maximum, replace the push rod.

(b) Check that the push rod oil hole is not clogged.

If clogged, clear it with compressed air.

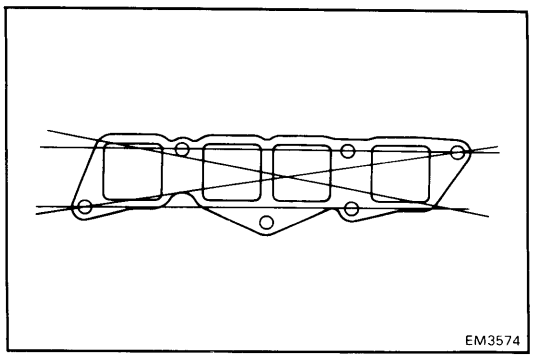


16. INSPECT INTAKE AND EXHAUST MANIFOLDS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head for warpage.

Maximum warpage: 0.40 mm (0.0157 in.)

If warpage is greater than maximum, replace the manifold.



17. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and feeler gauge, check the surfaces contacting the intake manifold for warpage.

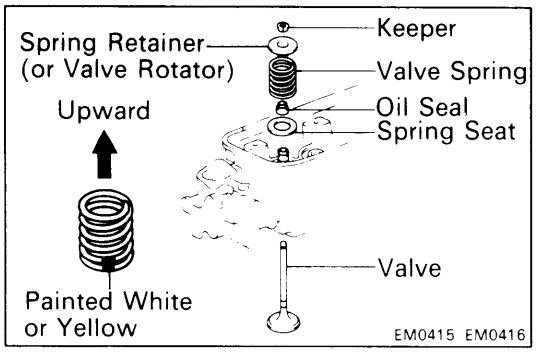
Maximum warpage: 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the air intake chamber.

ASSEMBLY OF CYLINDER HEAD

(See page EM-9)

NOTE:
- 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 ones.

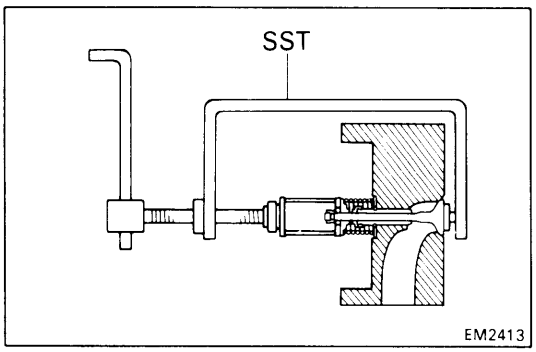


1. INSTALL VALVES

(a) Insert the valves in the cylinder head valve guide bushing. Make sure the valves are installed in the correct order.

(b) Install the valve spring seat and a new seal.

(c) Install the spring and spring retainer on the valve.



(d) Using SST, compress the valve spring and place two keepers around the valve stem.

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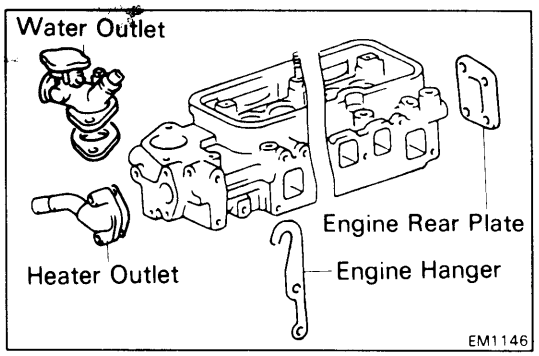
(e) Using a plastic-faced hammer, tap the stem lightly to assure proper fit.



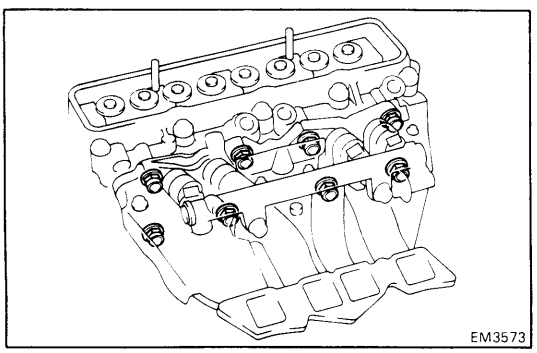
2. INSTALL PARTS

(a) Engine hanger

(b) Engine rear plate

(c) Heater outlet

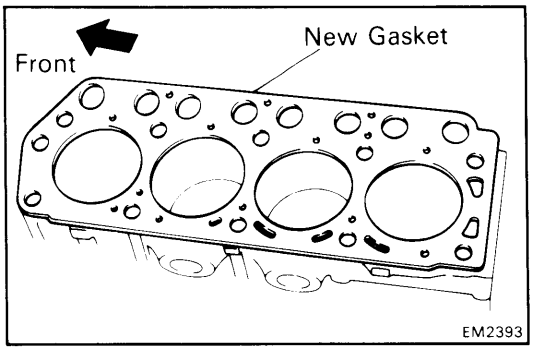
(d) Water outlet



3. INSTALL INTAKE AND EXHAUST MANIFOLDS

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

4. INSTALL FUEL PIPES



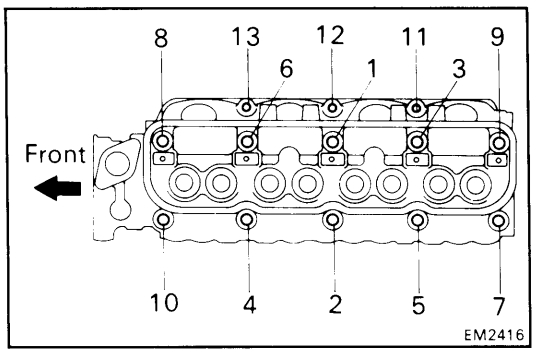
INSTALLATION OF CYLINDER HEAD

(See page EM-9)

1. INSTALL CYLINDER HEAD

(a) Install a new cylinder head gasket on the cylinder block.

NOTE: Be careful of the installation direction.

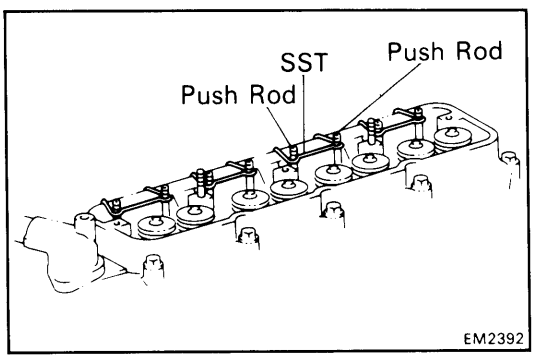


(b) Place the cylinder head on the cylinder head gasket.

(c) Apply a light coat of engine oil on the threads and under the cylinder head bolts.

(d) Install and uniformly tighten the thirteen cylinder head bolts in several passes, in the sequence shown.

Torque:
14 mm bolt head 900 kg-cm (65 ft-lb, 88 N·m)
12 mm bolt head 195 kg-cm (14 ft-lb, 19 N·m)



2. INSTALL PUSH RODS AND ROCKER SHAFT ASSEMBLY

(a) Make sure the push rods are installed in the correct order.

(b) Hold the push rod with SST until the rocker shaft assembly is completely installed.

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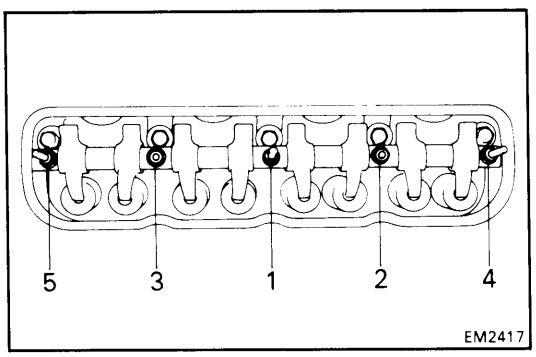


(c) Install the rocker shaft assembly on the cylinder head.

NOTE: Do not keep the push rods apart from the rocker arms while tightening the bolts and nuts.

(d) Install and uniformly tighten the two bolts and three nuts in the several passes, in the sequence shown.

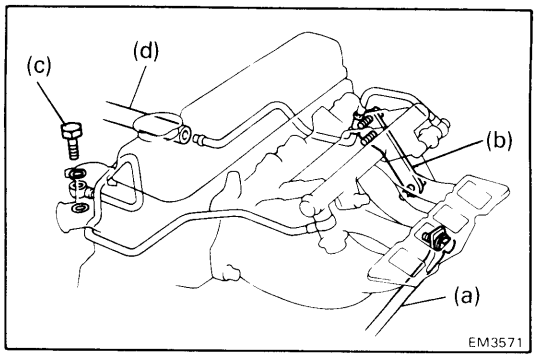
Torque: 240 kg-cm (17 ft-lb, 24 N·m)

(e) Remove the SST from the push rods and rocker shaft assembly.

3. INSTALL CYLINDER HEAD COVER

4. INSTALL TUBES AND SPARK PLUGS

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

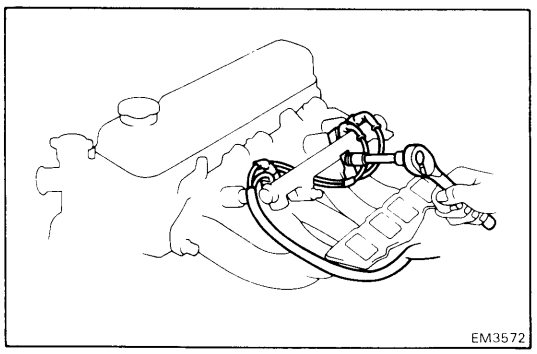


POST INSTALLATION

(See page EM-9)

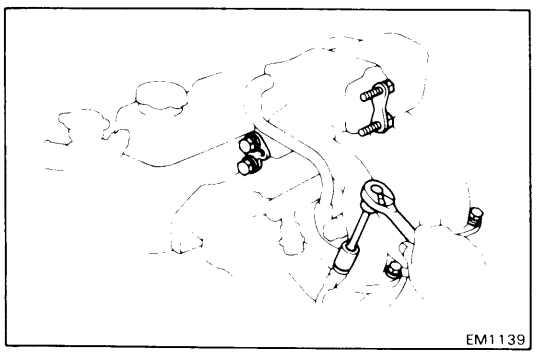
1. INSTALL PARTS

(a) Exhaust manifold bracket
(b) Heater pipe bracket
(c) Fuel pipe union bolt with new gaskets
(d) Fuel outlet hose



2. CONNECT INJECTOR CONNECTOR

(a) Connect the injector connector to the injector.
(b) Install the wire clamp bolt.

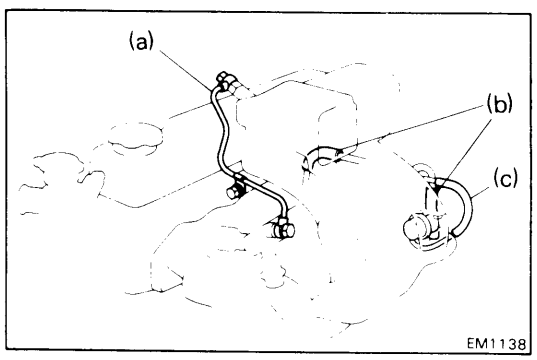


3. INSTALL AIR INTAKE CHAMBER

(a) Place on a new gasket and install the air intake chamber with the air valve.
(b) Install the bolt with the bond cable and nuts.

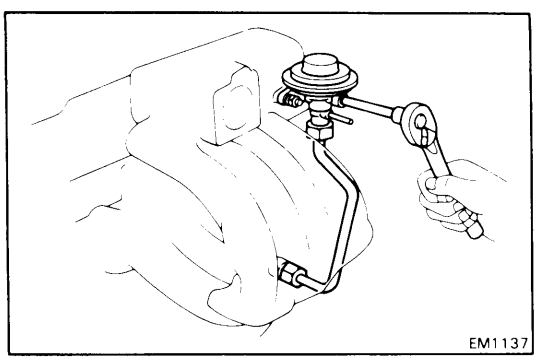
Torque: 120 kg-cm (9 ft-lb, 12 N·m)

(c) Install the air intake chamber bracket.



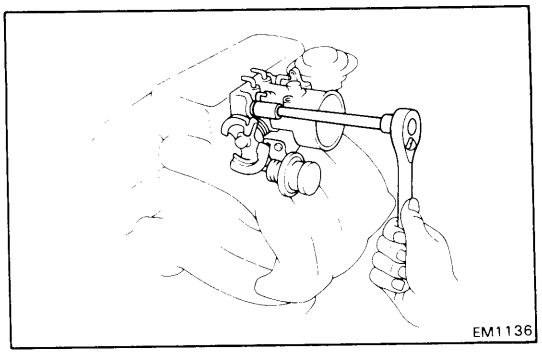
4. CONNECT PIPE AND HOSES

(a) Cold start injector pipe with new gaskets
(b) Water by-pass hoses
(c) Pressure regulator hose



5. INSTALL EGR VALVE

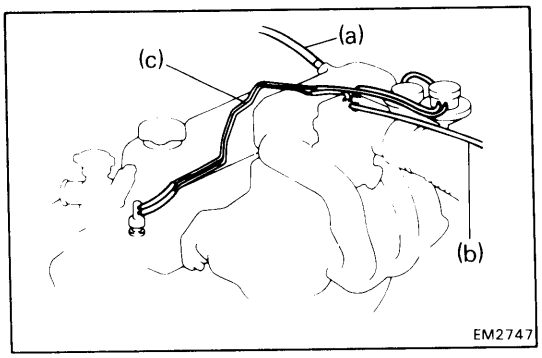
(a) Install a new gasket and the EGR valve with the two nuts.
(b) Install the union nut to the exhaust manifold.



6. INSTALL THROTTLE BODY

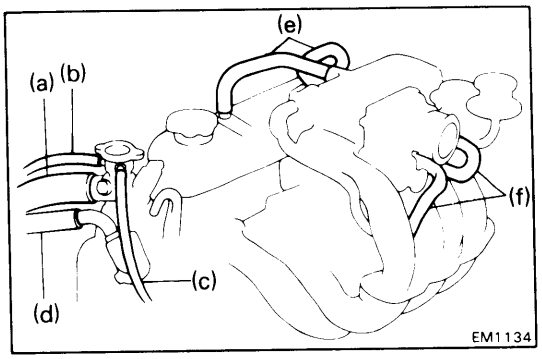
Install a new gasket and the throttle body with the nuts.

Torque: 120 kg-cm (9 ft-lb, 12 N·m)



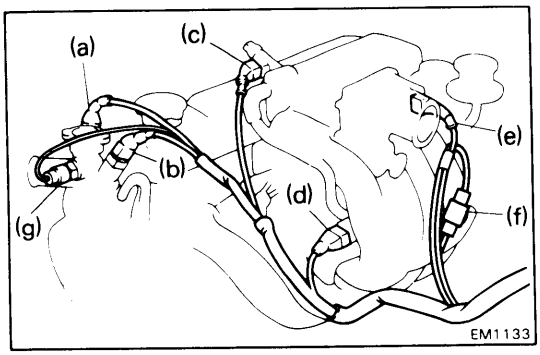
7. CONNECT VACUUM HOSES

(a) Brake booster vacuum hose
(b) Charcoal canister hose
(c) Emission control hoses



8. CONNECT HOSES

(a) Radiator inlet hose
(b) Radiator breather hose
(c) Reserve tank hose
(d) Heater outlet hose
(e) PCV hoses
(f) Water by-pass hoses



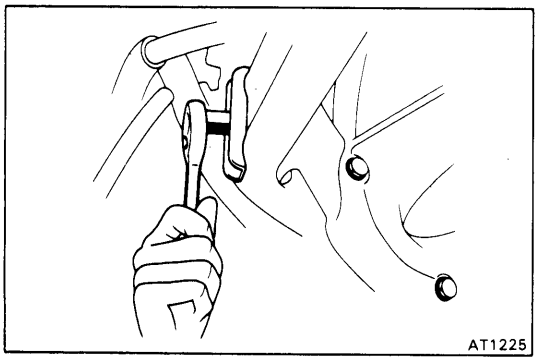
9. CONNECT EFI CONNECTORS

(a) Water thermo sensor connector
(b) Cold start injector time switch connector
(c) Cold start injector connector
(d) Air valve connector
(e) Throttle position sensor connector
(f) [2WD M/T]
Oxygen sensor connector
(g) [w/ A/C]
Water temperature switch connector

10. CONNECT WATER TEMPERATURE SENDER GAUGE CONNECTOR

11. INSTALL AIR CLEANER PIPE AND HOSES

12. CONNECT ACCELERATOR CABLE WITH BRACKET TO THROTTLE BODY



13. INSTALL EXHAUST PIPE AND BRACKET

Torque the nuts holding the exhaust pipe to the exhaust manifold.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

14. [w/ PS]
INSTALL POWER STEERING PUMP
(See page SR-37)

15. FILL WITH ENGINE COOLANT (See page CO-3)

16. FILL WITH ENGINE OIL (See page LU-3)

17. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

18. START ENGINE AND CHECK FOR LEAKS

19. PERFORM ENGINE AND ADJUSTMENT

Adjust the idle speed. (See page MA-7)

Idle speed: M/T 700 rpm
A/T 750 rpm

20. INSTALL ENGINE SERVICE HOLE COVER

21. INSTALL RIGHT SEAT

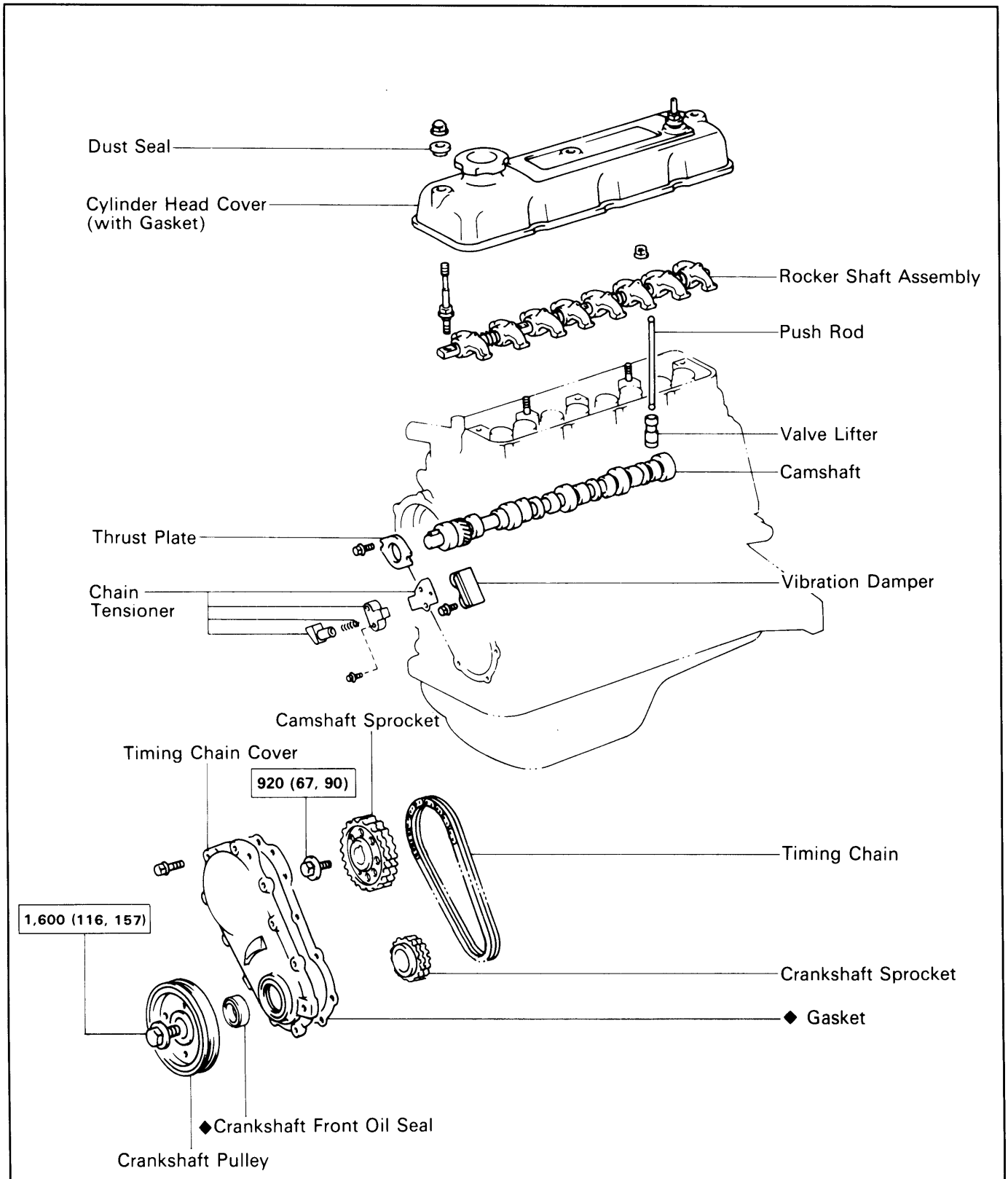
22. ROAD TEST

Road test the vehicle.

23. RECHECK COOLANT AND ENGINE OIL LEVELS

TIMING CHAIN AND CAMSHAFT

COMPONENTS



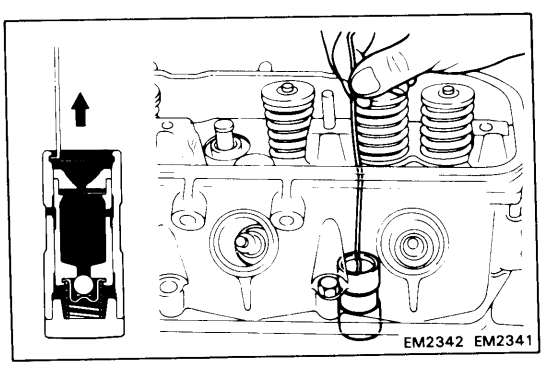
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

EM1404

PREPARATION FOR REMOVAL

1. REMOVE RADIATOR (See page CO-8)
2. REMOVE DRIVE BELTS
3. REMOVE FAN AND WATER PUMP PULLEY (See page CO-4)
4. REMOVE DISTRIBUTOR (See page IG-9)
5. REMOVE COLD START INJECTOR (See page FI-46)
6. REMOVE ROCKER SHAFT ASSEMBLY AND PUSH RODS (See steps 2 to 4 on page EM-12)

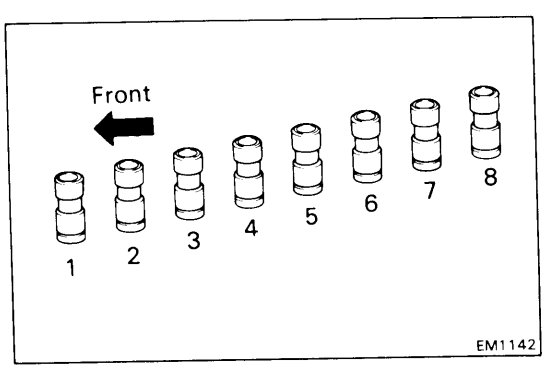


REMOVAL OF TIMING CHAIN AND CAMSHAFT

(See page EM-27)

1. REMOVE VALVE LIFTERS

Remove the eight valve lifters with a piece of wire or magnetic finger.

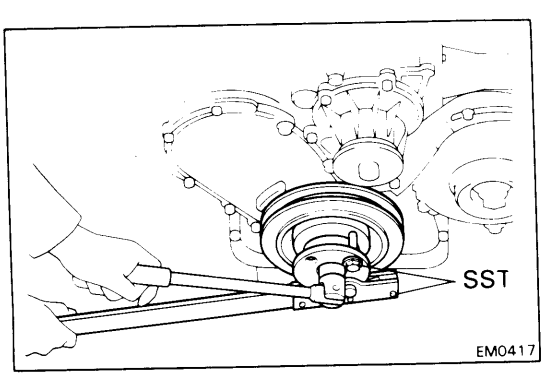


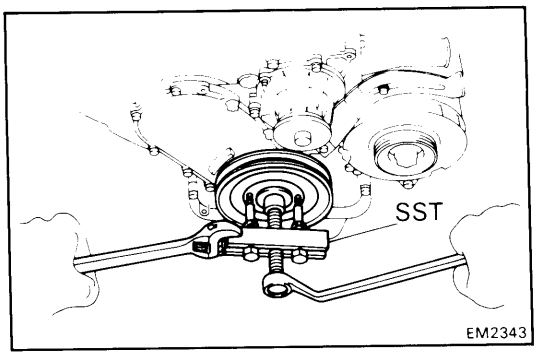
CAUTION: Always keep the valve lifters upright, and in correct order.

2. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the pulley bolt.

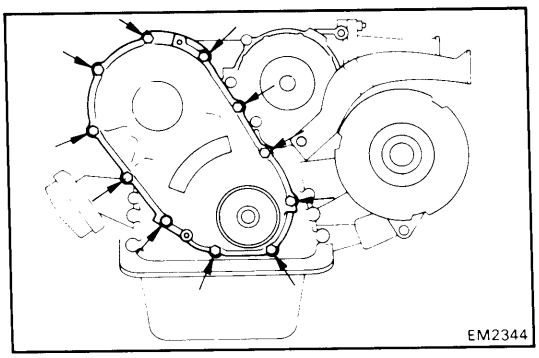
SST 09213-70010 and 09330-00021





(b) Using SST, remove the crankshaft pulley.

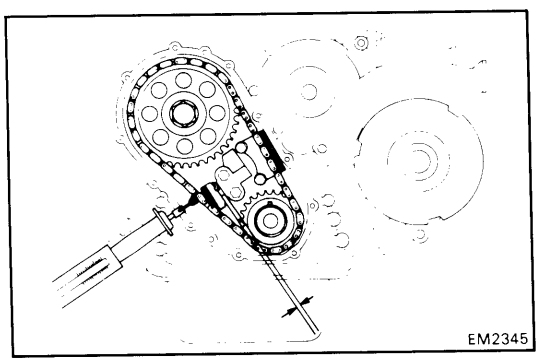
SST 09213-31021



3. REMOVE TIMING CHAIN COVER

(a) Remove the eleven bolts as shown in the figure.

(b) Using a screwdriver, pry out the chain cover.



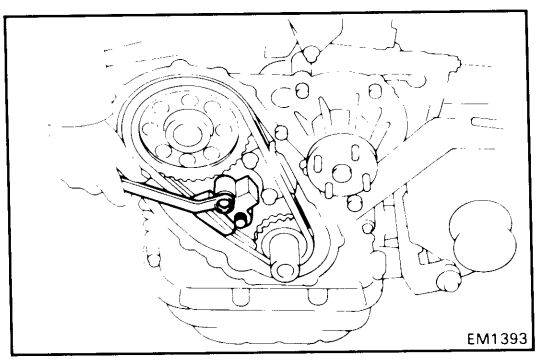
4. CHECK TIMING CHAIN SLACK

Using a tension gauge, measure the slack of the timing chain.

Maximum slack:

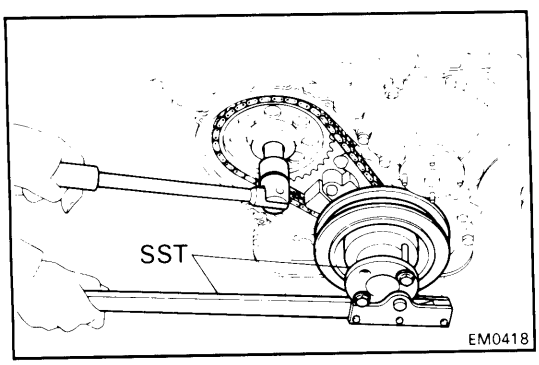
13.5 mm (0.531 in.) at 10 kg (22.0 lb, 98 N)

If the slack is greater than maximum, replace the timing chain and sprockets.



5. REMOVE CHAIN TENSIONER

Remove the two bolts and chain tensioner.



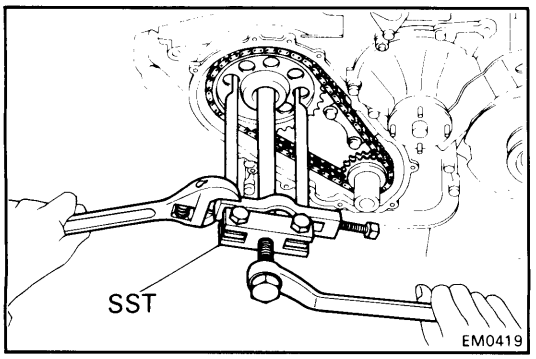
6. REMOVE TIMING CHAIN AND SPROCKETS

(a) Install the crankshaft pulley to the crankshaft.

(b) Using SST, remove the camshaft sprocket bolt.

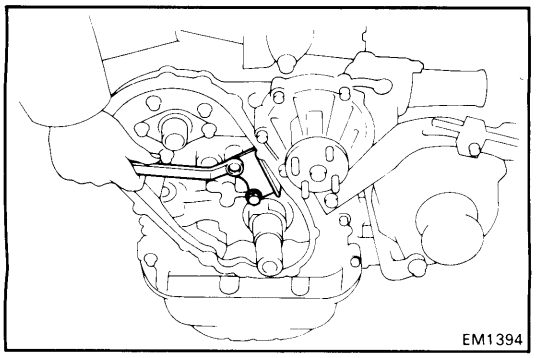
SST 09213-70010 and 09330-00021

(c) Remove the crankshaft pulley.



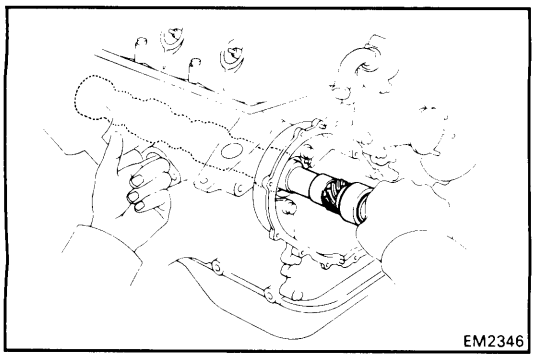
(d) Using SST, uniformly remove the camshaft sprocket together with the crankshaft sprocket and chain.

SST 09950-20017



7. REMOVE VIBRATION DAMPER

Remove the two bolts and vibration damper.

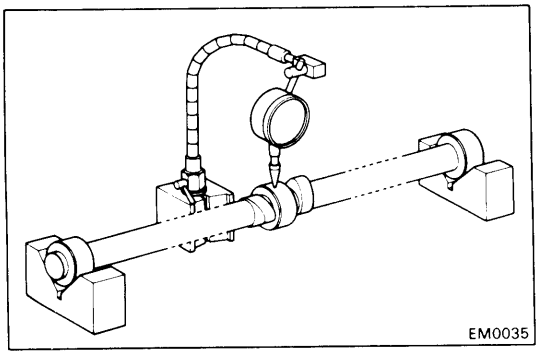


8. REMOVE THRUST PLATE AND CAMSHAFT

(a) Remove the two bolts and thrust plate.

(b) Carefully pull out the camshaft.

CAUTION: Be careful not to damage the camshaft bearings.



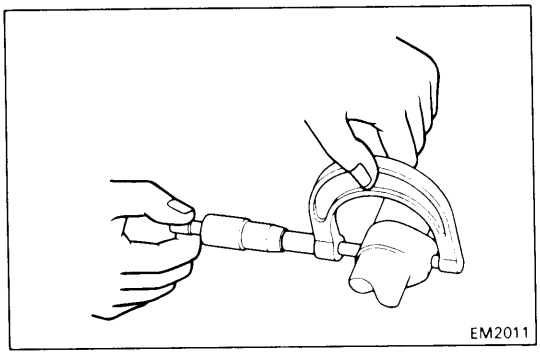
INSPECTION AND REPAIR OR TIMING CHAIN AND CAMSHAFT COMPONENTS

1. INSPECT CAMSHAFT

(a) Place the camshaft on V-blocks and measure the runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

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



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

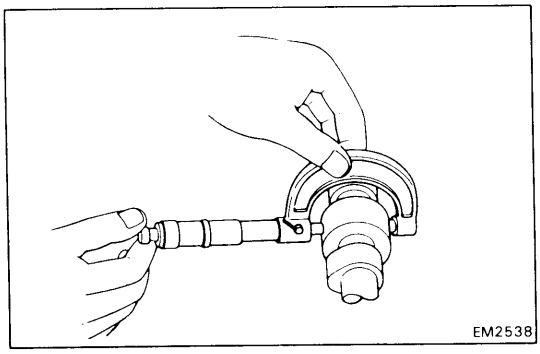
Standard lobe height:

Intake	**38.620 – 38.720 mm (1.5205 – 1.5244 in.)**
Exhaust	**38.629 – 38.729 mm (1.5208 – 1.5248 in.)**

Minimum lobe height:

Intake	**38.26 mm (1.5063 in.)**
Exhaust	**38.27 mm (1.5067 in.)**

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

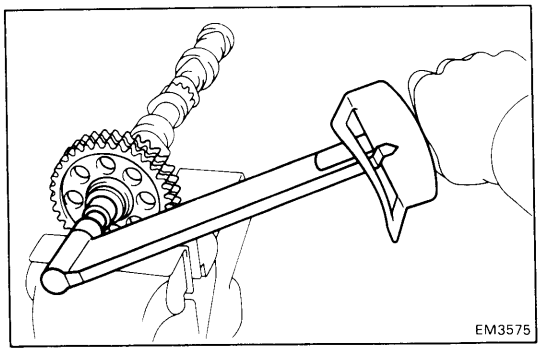


(c) Using a micrometer, measure the journal diameter.

Standard diameter (from front side):

No. 1	**46.459 – 46.475 mm (1.8291 – 1.8297 in.)**
No. 2	**46.209 – 46.225 mm (1.8192 – 1.8199 in.)**
No. 3	**45.959 – 45.975 mm (1.8094 – 1.8100 in.)**
No. 4	**45.709 – 45.725 mm (1.7996 – 1.8002 in.)**
No. 5	**45.459 – 45.475 mm (1.7897 – 1.7904 in.)**

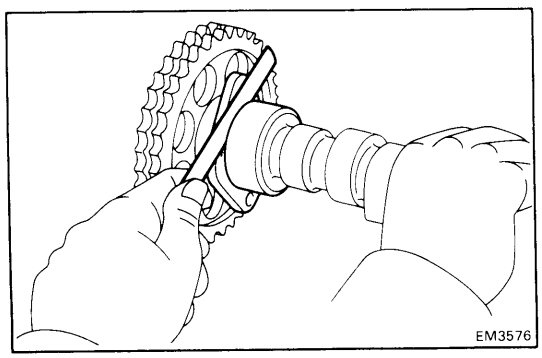
If the journal diameter is not within specification, check the oil clearance, (See page EM-56)



(d) Install the thrust plate and camshaft sprocket to the camshaft.

(e) Install and torque the camshaft sprocket mount bolt.

Torque: 920 kg-cm (67 ft-lb, 90 N·m)

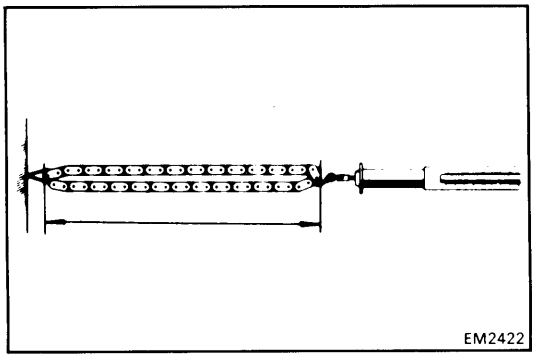


(f) Using a thickness gauge, measure the thrust clearance between the thrust plate and camshaft.

Standard thrust clearance: 0.07 – 0.22 mm (0.0028 – 0.0087 in.)

Maximum thrust clearance: 0.3 mm (0.012 in.)

If the clearance is greater than maximum, replace the thrust plate. If necessary, replace the camshaft.


EM2422

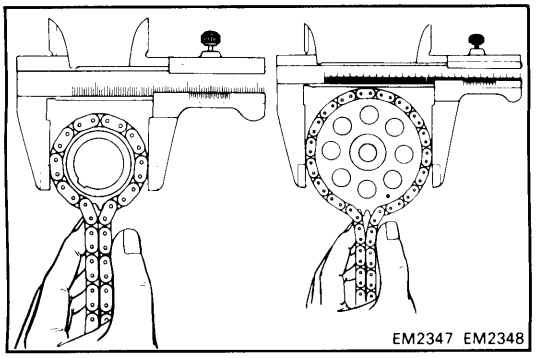
2. INSPECT CHAIN AND SPROCKET

(a) Measure the chain length with the chain fully stretched.

(b) Make the same measurements pulling at three or more places selected at random.

Maximum chain elongation:
291.4 mm (11.472 in.)
at 5kg (11.0 lb, 49 N) tension

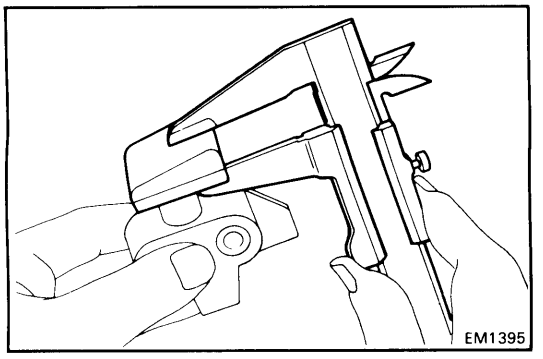
If the elongation is greater than maximum, replace the chain.


EM2347 EM2348

(c) Using calipers, measure the sprocket diameter with the chain.

Minimum sprocket diameter (w/ chain):
Crankshaft 59 mm (2.32 in.)
Camshaft 114 mm (4.49 in.)

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

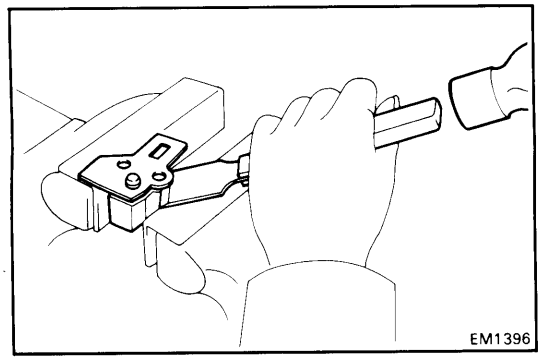

EM1395

3. INSPECT CHAIN TENSIONER

Using calipers, measure the tensioner thickness.

Standard thickness: 15.0 mm (0.591 in.)
Minimum thickness: 12.5 mm (0.492 in.)

If the thickness is less than minimum, replace the tensioner.

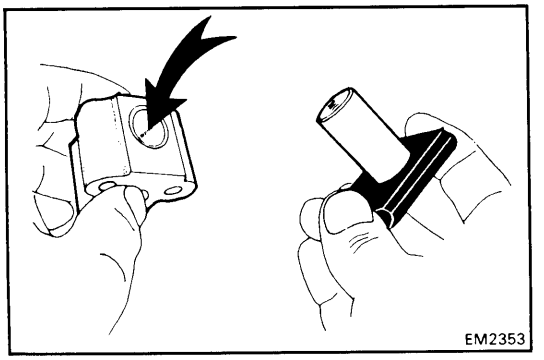

EM1396

4. IF NECESSARY, REPLACE CHAIN TENSIONER PLUNGER

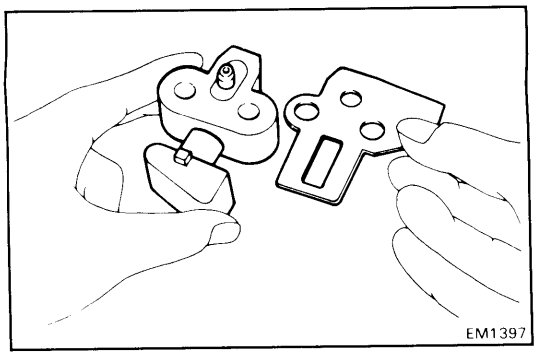
(a) Using a gasket scraper and hammer, remove the plate.

CAUTION: Do not bend the plate.

(b) Remove the chain tensioner plunger and spring.


EM2353

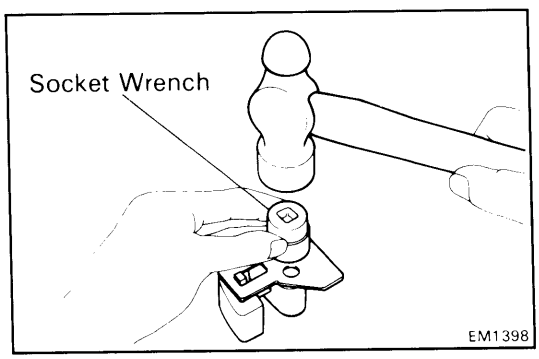
(c) Apply engine oil to the chain tensioner body and plunger sliding surface.



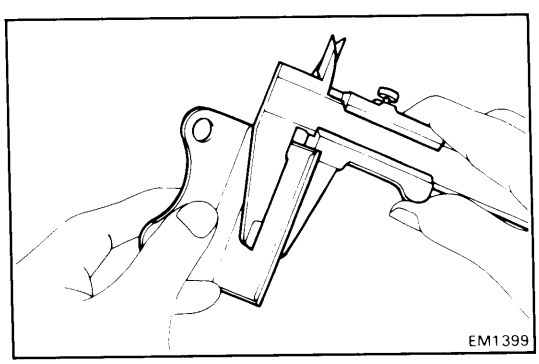
(d) Install the spring and a new chain tensioner plunger to the chain tensioner body.

(e) Place the plate in position.

NOTE: Be careful of the installation direction.



(f) Using a socket wrench and hammer, tap in the plate.

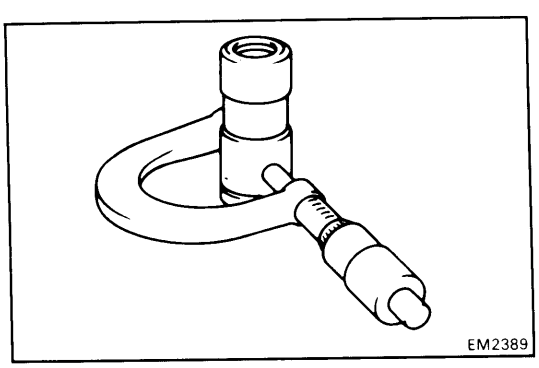


5. INSPECT CHAIN VIBRATION DAMPER

Using calipers, measure the damper thickness.

Standard thickness: 6.6 mm (0.260 in.)
Minimum thickness: 5 mm (0.20 in.)

If the thickness is less than minimum, replace the damper.

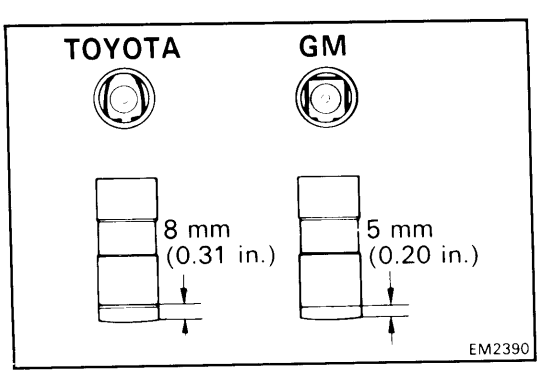


6. INSPECT VALVE LIFTERS

Using a micrometer, measure the valve lifter diameter.

Lifter diameter: 21.387 – 21.404 mm (0.8420 – 0.8427 in.)

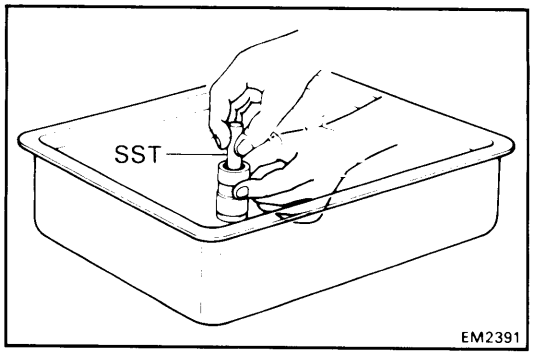
If the diameter is not within specification, check the oil clearance. (See page EM-57)



7. IF NECESSARY, BLEED VALVE LIFTERS

(a) There are two types of valve lifters; Toyota and GM types, and each has a different method of bleeding.

(b) Immerse the valve lifter into diesel fuel.



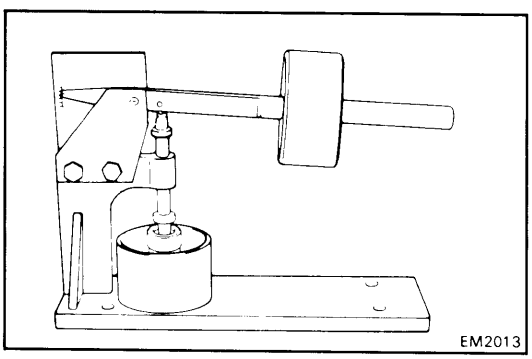
[TOYOTA Type]

Using SST, pump the plunger several times to bleed the air from the lifter.

SST 09276-71010

[GM Type]

Disassemble and reassemble the lifter while immersed in diesel fuel. Use a leak down tester to install the snap ring and the push rod seat.



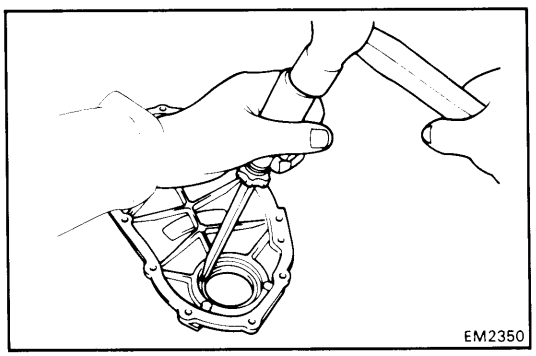
8. INSPECT LEAK DOWN TEST

Using a leak down tester, apply 20 kg (44.1 lb, 196 N) of pressure to the plunger and measure its slide down time for 1 mm (0.04 in.) after it has slid down about 2 mm (0.08 in.).

Leak down time: 7 — 50 seconds/1 mm (0.04 in.) at temperature 20°C (68 °F)

REPLACEMENT OF CRANKSHAFT FRONT OIL SEAL

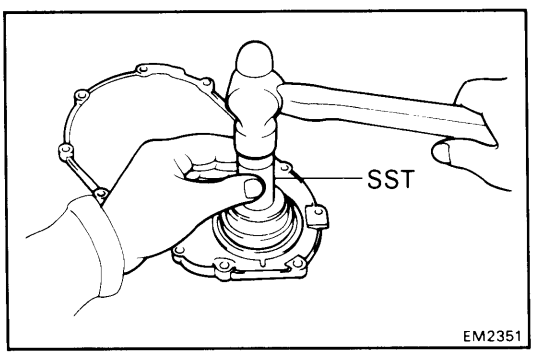
NOTE: There are two methods (A and B) to replace the oil seal.



REPLACE CRANKSHAFT FRONT OIL SEAL

A. If timing chain cover is removed from timing chain case:

(a) Using a screwdriver and hammer, tap out the oil seal.

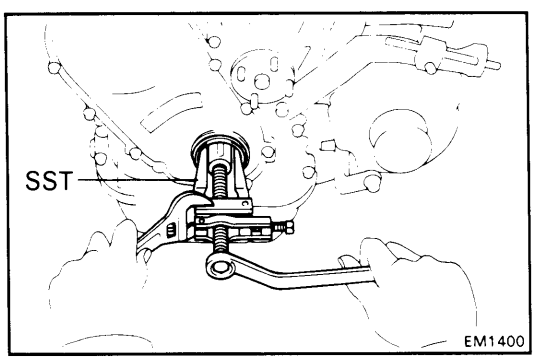


(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.

SST 09223-22010

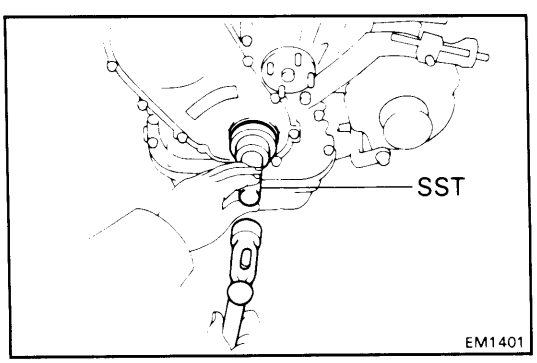
(c) Apply MP grease to the oil seal lip.

B. If timing chain cover is installed to timing chain case:



(a) Using SST, remove the oil seal.

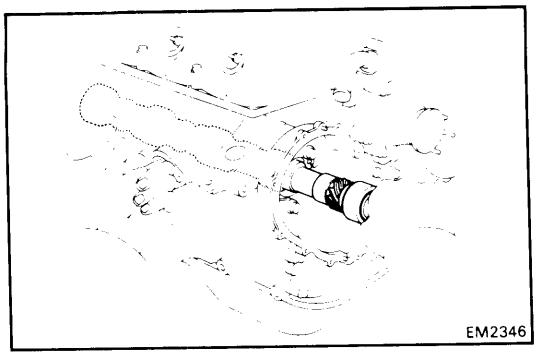
SST 09308-10010



(b) Apply MP grease to a new oil seal lip.

(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain case edge.

SST 09223-22010


EM2346

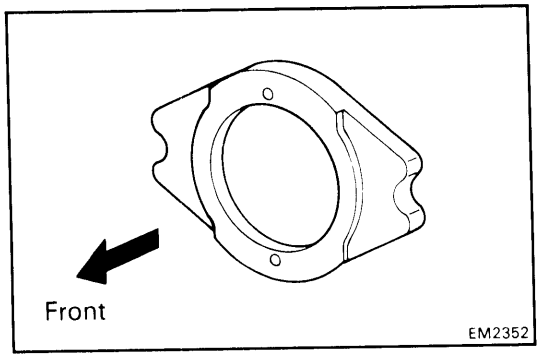
INSTALLATION OF TIMING CHAIN AND CAMSHAFT

(See page EM-27)

1. INSTALL CAMSHAFT

(a) Carefully insert the camshaft into the cylinder block.

CAUTION: Be careful not to damage the camshaft bearings.

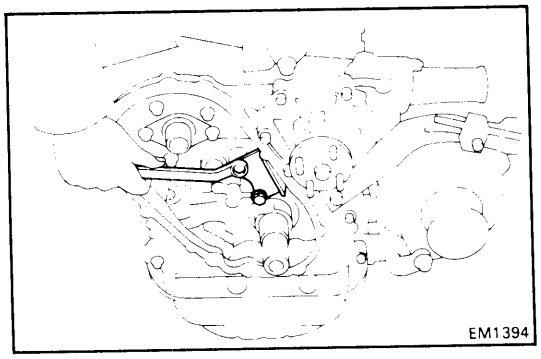


EM2352

(b) Install the thrust plate with the two bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

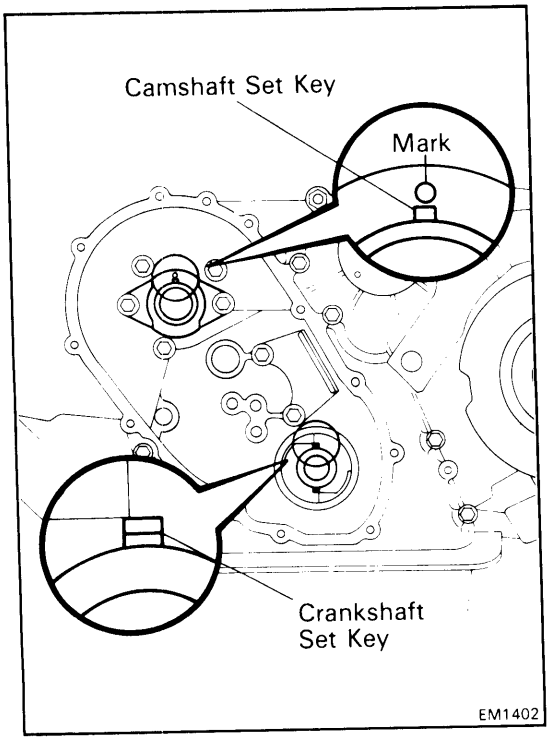
NOTE: Be careful of the installation direction.


EM1394

2. INSTALL VIBRATION DAMPER

Install the vibration damper with the two bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

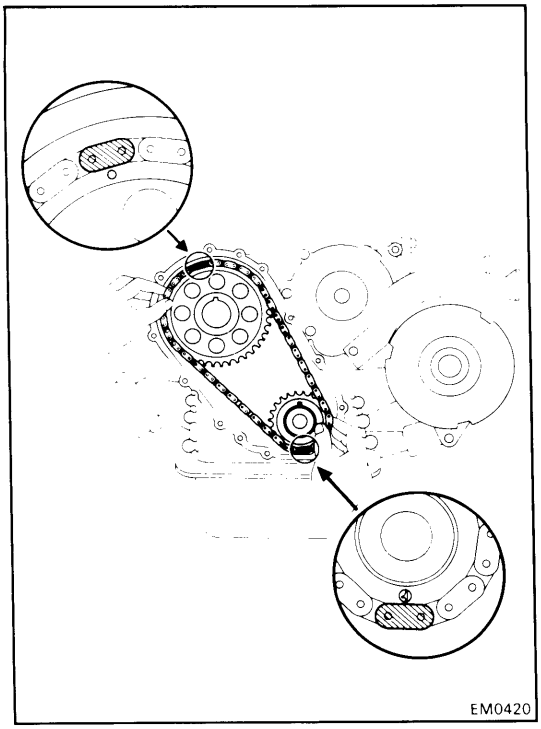


EM1402

3. INSTALL TIMING CHAIN AND SPROCKETS

(a) Set the set key of the crankshaft sprocket facing upward.

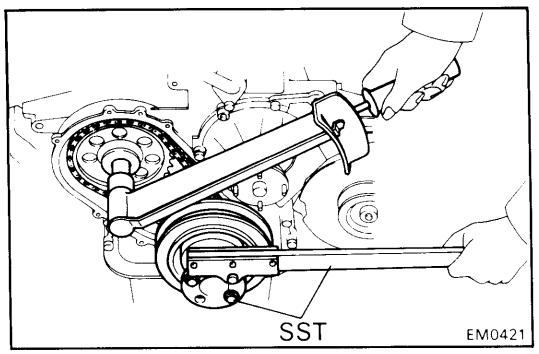
(b) Align the set key of the camshaft sprocket with the mark of the thrust plate.



(c) Install the sprockets to the timing chain.

NOTE: Align the timing marks of the timing chain and sprocket.

(d) Uniformly install the chain together with the sprockets.



(e) Install the crankshaft pulley to the crankshaft.

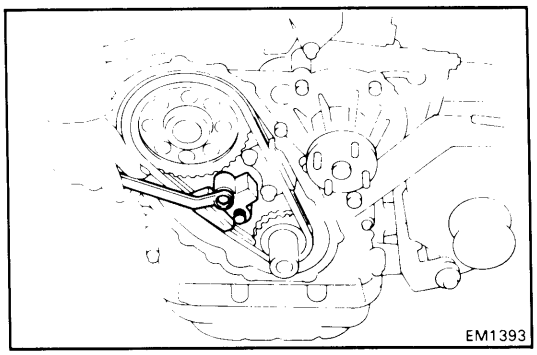
(f) Apply a light of engine oil on the threads and under the bolt head of the camshaft sprocket bolt.

(g) Using SST, install and torque the camshaft sprocket bolt.

SST 09213-70010 and 09330-00021

Torque: 920 kg-cm (67 ft-lb, 90 N·m)

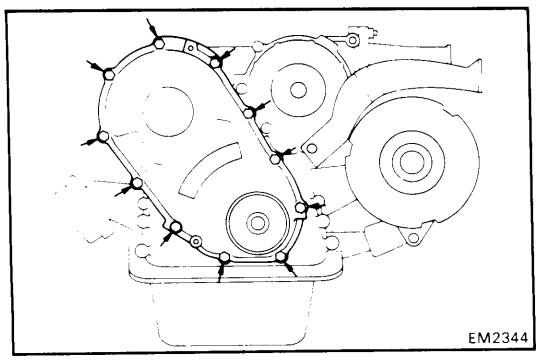
(h) Remove the crankshaft pulley.



4. INSTALL CHAIN TENSIONER

Install the chain tensioner with the two bolts.

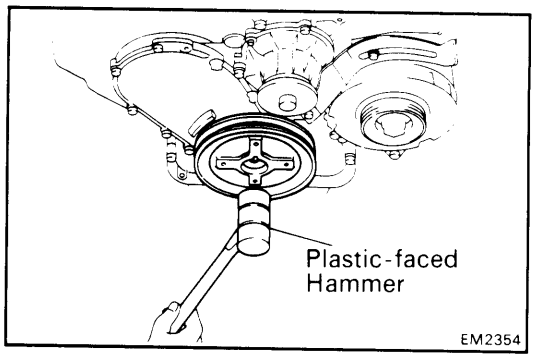
Torque: 185 kg-cm (13 ft-lb, 18 N·m)



5. INSTALL TIMING CHAIN COVER

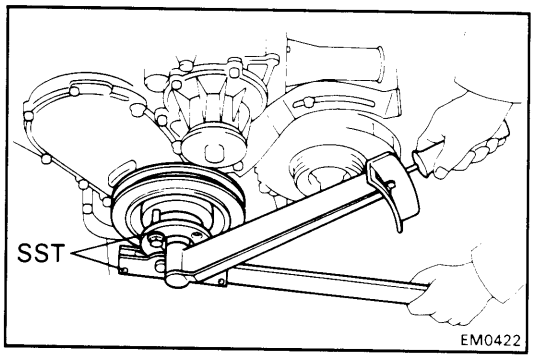
Install a new gasket and the timing chain cover with the eleven bolts.

Torque: 60 kg-cm (52 in.-lb, 5.9 N·m)



6. **INSTALL CRANKSHAFT PULLEY**

(a) Using a plastic-faced hammer, tap in the crankshaft pulley.

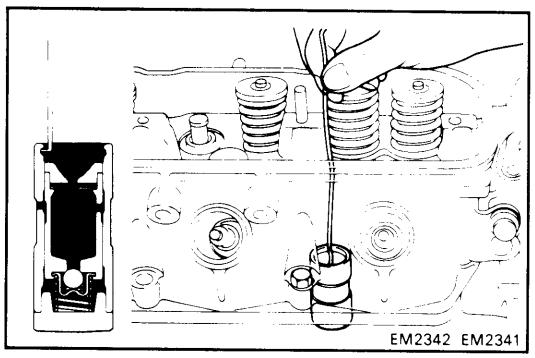


(b) Apply a light coat of engine oil on the threads and under the bolt heads of the pulley bolt.

(c) Using SST, install and torque the pulley bolt.

SST 09213-70010 and 09330-00021

Torque: 1,600 kg-cm (116 ft-lb, 157 N·m)



7. **INSTALL VALVE LIFTERS**

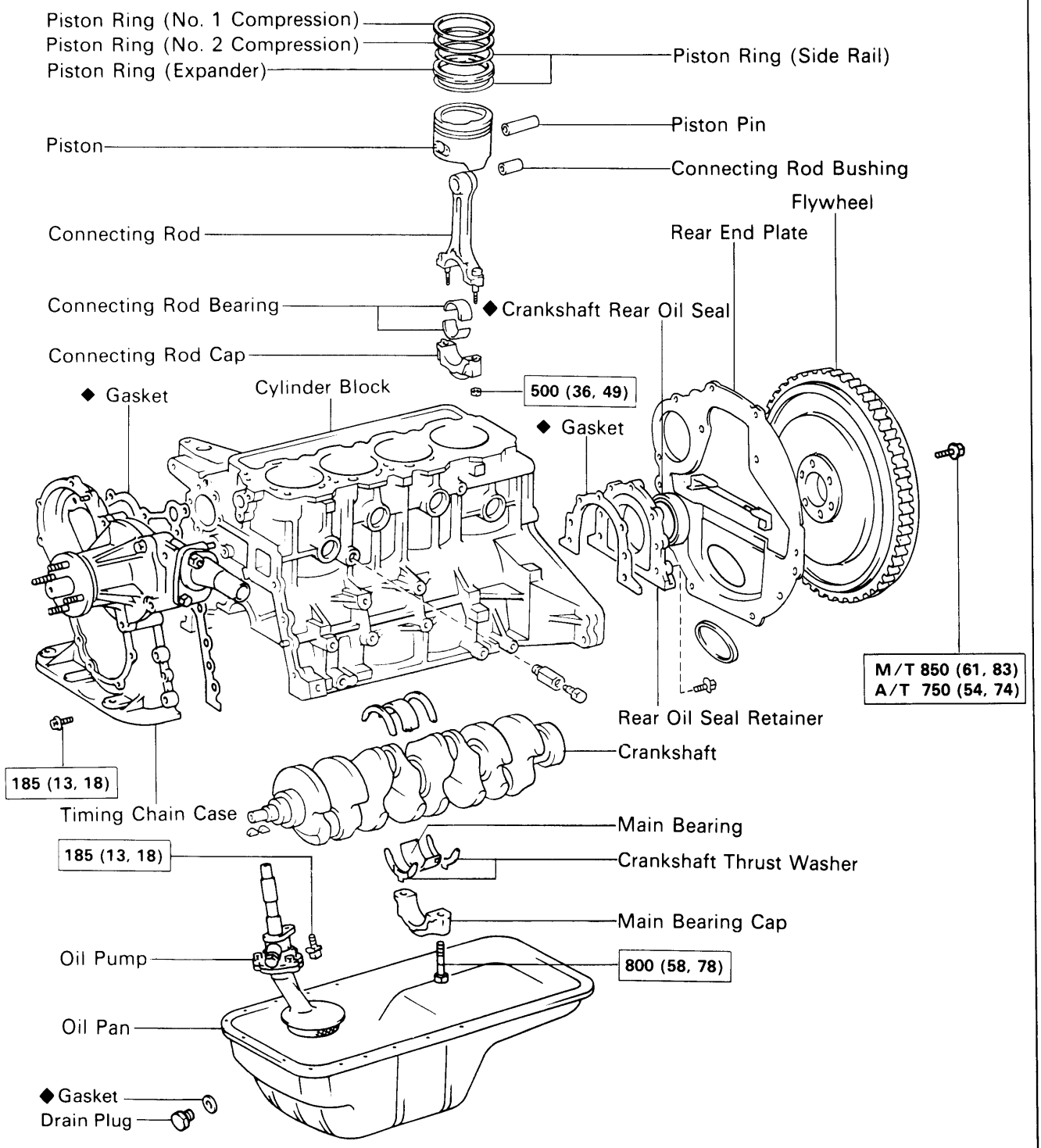
Using a wire or magnetic finger, carefully insert the valve lifters into the valve lifter bore without dropping them.

POST INSTALLATION

1. **INSTALL PUSH RODS AND ROCKER SHAFT ASSEMBLY (See steps 2 and 3 on pages EM-23)**
2. **INSTALL COLD START INJECTOR (See page FI-47)**
3. **INSTALL DISTRIBUTOR (See page IG-15)**
4. **INSTALL WATER PUMP PULLEY AND FAN (See step 2 on page CO-6)**
5. **INSTALL AND ADJUST DRIVE BELTS**
   Alternator (See page CH-13)
   PS pump (See page SR-37)
   A/C compressor (See page AC-30)
6. **INSTALL RADIATOR (See page CO-9)**
7. **ADJUST IGNITION TIMING (See page IG-14)**

CYLINDER BLOCK

COMPONENTS



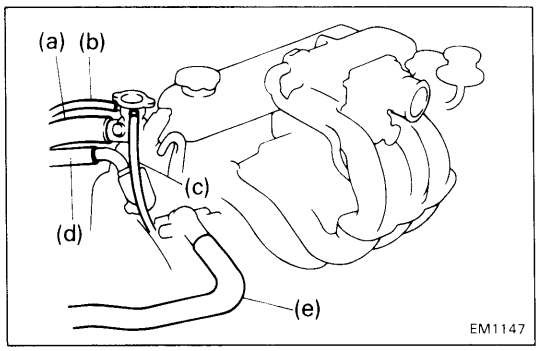
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

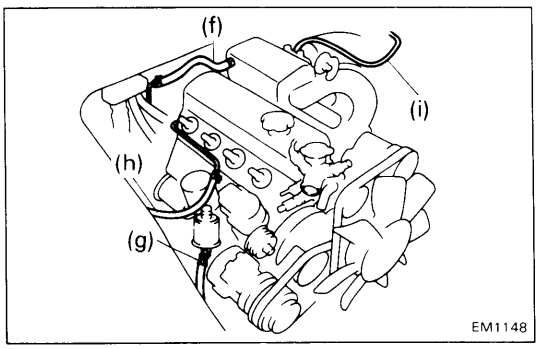
EM3578

REMOVAL OF ENGINE

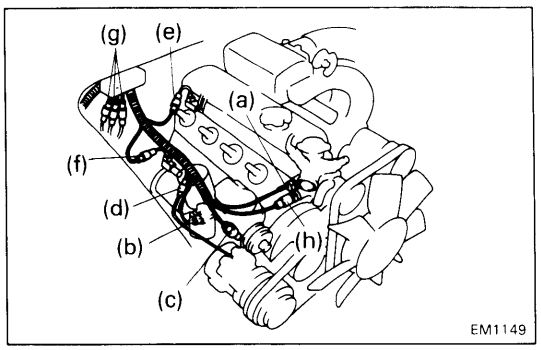
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
2. **REMOVE RIGHT SEAT**
3. **REMOVE ENGINE SERVICE HOLE COVER**
4. **DRAIN ENGINE COOLANT (See page CO-3)**



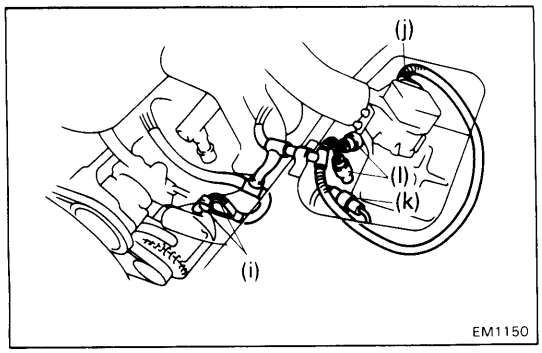
5. **DISCONNECT HOSES**
   - (a) Radiator inlet hose
   - (b) Radiator outlet hose
   - (c) Radiator breather hose
   - (d) Radiator reservoir tank hose
   - (e) Heater outlet hose



   - (f) Brake booster hose
   - (g) Fuel inlet hose
   - (h) Fuel outlet hose
   - (i) Charcoal canister hose



6. **DISCONNECT CONNECTORS AND WIRES**
   - (a) Water temperature sender gauge connector
   - (b) Oil pressure switch connector
   - (c) Distributor connectors
   - (d) [w/ A/C]
     A/C compressor connector
   - (e) [w/ A/C]
     A/C idle-up VSV connector
   - (f) [w/A /C]
     EFI VSV connector
   - (g) [A/T]
     Three connectors
   - (h) Water temperature switch connector
   - (i) Alternator connector and wire
   - (j) Air flow meter connector
   - (k) Solenoid resistor connectors
   - (l) Two connectors

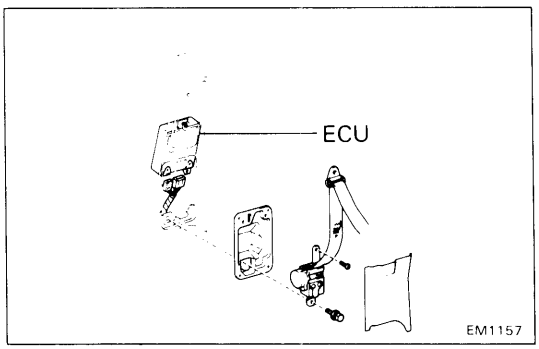


7. REMOVE AIR CLEANER HOSE

8. [w/ PS]
REMOVE POWER STEERING (PS) PUMP
(See page SR-29)

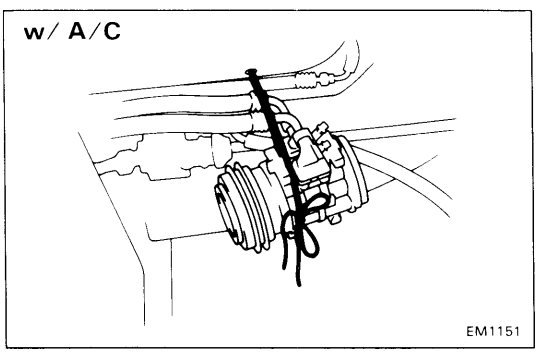
9. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE

10. [A/T]
DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

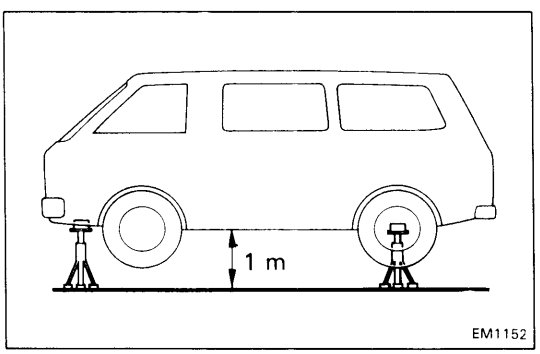


11. REMOVE RADIATOR (See page CO-8)

12. DISCONNECT ECU CONNECTORS
(a) Remove the center pillar garnish.
(b) Remove the seat belt retractor and cover.
(c) Disconnect the connectors from the ECU.



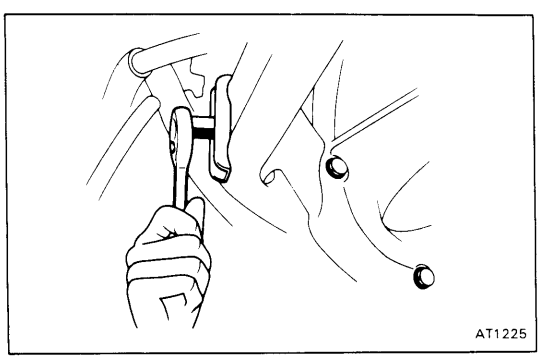
13. [w/ A/C]
REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES
(a) Loosen the adjusting bolt and remove the drive belt.
(b) Remove the four compressor mount bolts.
(c) Suspend the compressor with string.



14. RAISE VEHICLE ABOUT 1 m (3.28 ft) OF FLOOR
CAUTION: Be sure the vehicle is securely supported.

15. DRAIN ENGINE OIL

16. REMOVE PROPELLER SHAFT (S) (See page PR-3)

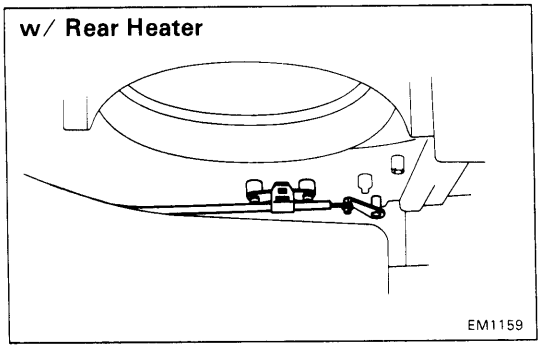


17. REMOVE FRONT EXHAUST PIPE

18. DISNNECT TRANSMISSION CONTROL CABLES
M/T (See page MT-4)
A/T 2WD (See page AT-30)
A/T 4WD (See page AT-33)

19. REMOVE CLUTCH RELEASE CYLINDER

20. REMOVE STARTER
(a) Disconnect the connector and wire from the starter.
(b) Remove the two bolts and starter.

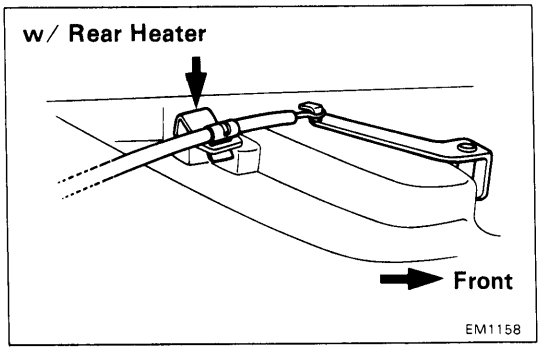


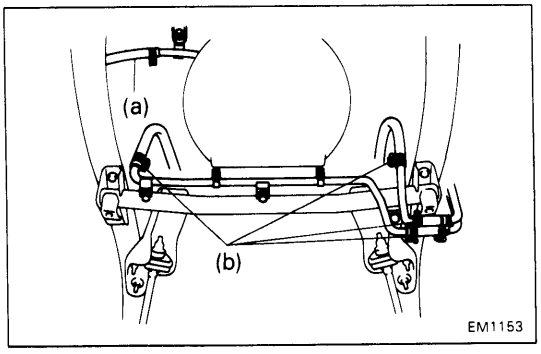
21. DISCONNECT SPEEDOMETER CABLE AND GROUND STRIP

22. DISCONNECT BACK-UP LIGHT SWITCH CONNECTOR

23. [4WD]
DISCONNECT TRANSFER INDICATOR SWITCH CONNECTOR

24. [w/ REAR HEATER]
DISCONNECT REAR HEATER CONTROL CABLES
(a) Disconnect the mode sector cable from the damper.
(b) Disconnect the air mix damper cable from the damper.





25. DISCONNECT HEATER HOSES
(a) Heater outlet hose
(b) [w/ Rear Heater]
Rear heater hoses

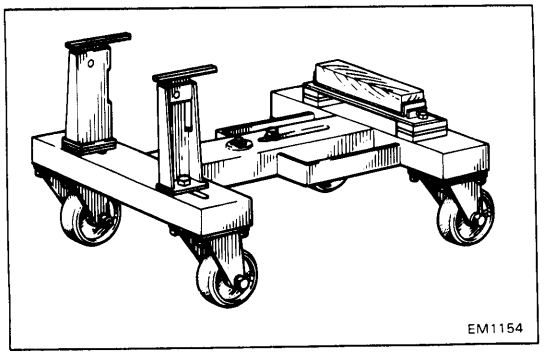
26. DISCONNECT GROUND STRAP FROM ENGINE MOUNTING

27. REMOVE ENGINE UNDER COVER

28. DISCONNECT CONNECTOR OF OIL LEVEL SENSOR

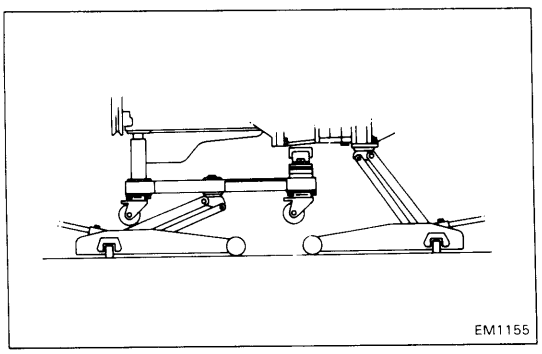
29. [A/T]
DISCONNECT OIL COOLER HOSES

30. [2WD]
REMOVE STRUT BAR (See page FA-27)

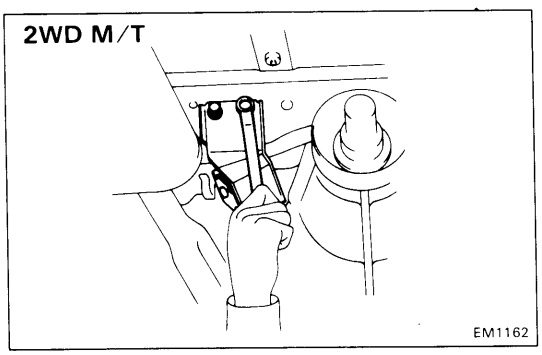


31. [4WD]
REMOVE STABILIZER BAR (See page FA-110)

32. REMOVE ENGINE AND TRANSMISSION ASSEMBLY
NOTE: In advance, prepare an engine saddle as shown.

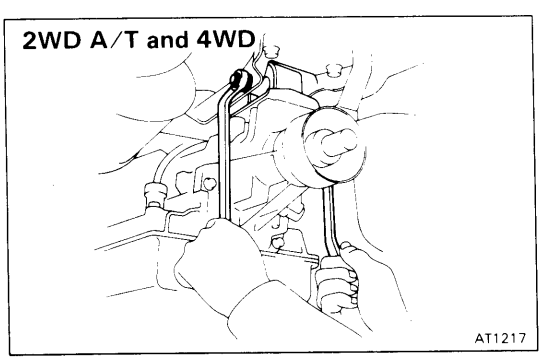

EM1155

(a) Support the engine and transmission with engine saddle and jacks.



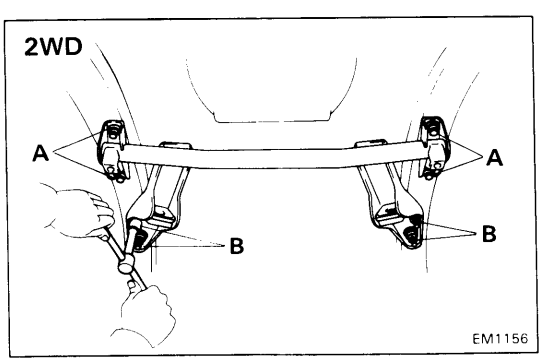
EM1162

(b) [2WD M/T]
Remove the bolts holding the engine rear mounting bracket to the body.



AT1217

(c) [2WD A/T and 4WD]
Remove the through bolt holding the engine mounting insulator to the transmission.



EM1156

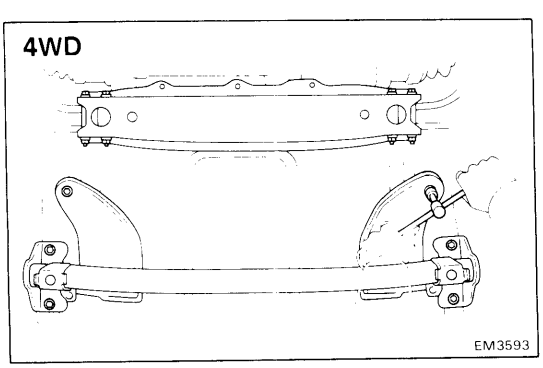
(d) Remove the bolts and nuts holding the engine front member to the body.

(e) [4WD]
Remove the bolts, nuts and front suspension rear crossmember.

(f) Lower the engine and transmission.

(g) Remove the engine mounting member from the engine.

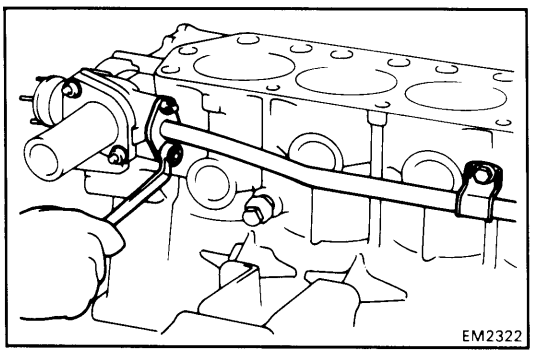
33. SEPARATE ENGINE AND TRANSMISSION



EM3593

PREPARATION FOR DISASSEMBLY

1. [M/T]
   REMOVE CLUTCH COVER AND DISC
2. [M/T]
   REMOVE FLYWHEEL
3. [A/T]
   REMOVE DRIVE PLATE
4. REMOVE REAR END PLATE
5. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
6. REMOVE ALTERNATOR AND BRACKET
7. REMOVE OIL FILTER BRACKET AND OIL FILTER
8. REMOVE CYLINDER HEAD ASSEMBLY
   (See pages EM-12)
9. REMOVE TIMING CHAIN AND CAMSHAFT
   (See pages EM-28 to 30)
10. REMOVE ENGINE OIL PAN AND OIL PUMP
    (See pages LU-5 and 6)

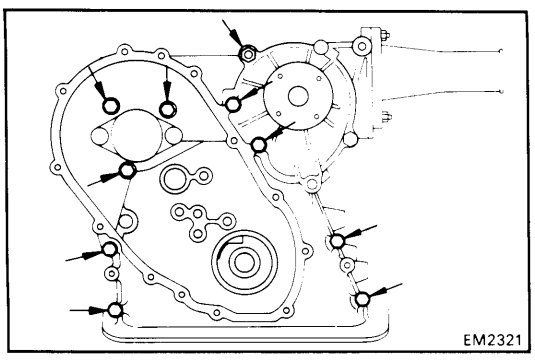


DISASSEMBLY OF CYLINDER BLOCK

(See page EM-39)

1. REMOVE WATER BY-PASS PIPE

   Remove the two nuts and holding bolt, and remove the water by-pass pipe with the gasket.

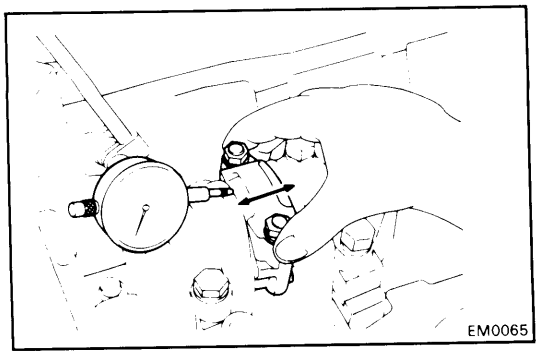


2. REMOVE TIMING CHAIN CASE

   Remove the nine bolts and one nut, and remove the timing chain case and gasket.

3. REMOVE REAR OIL SEAL RETAINER

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


EM0065

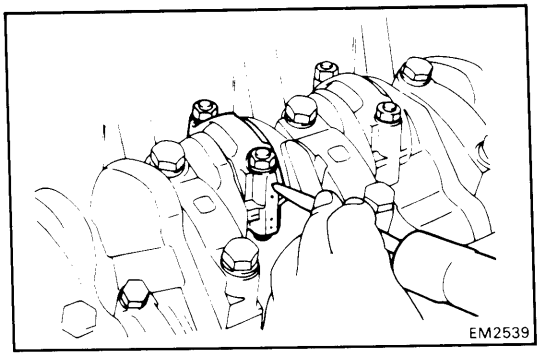
4. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance: 0.160 — 0.312 mm (0.0063 — 0.0123 in.)

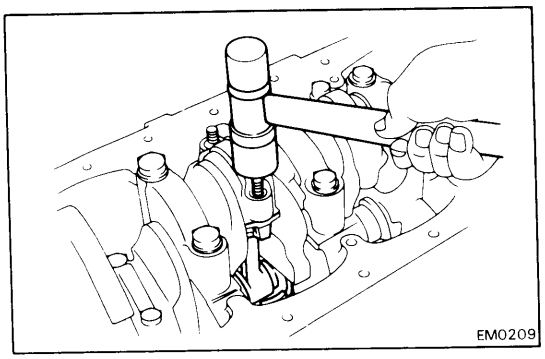
Maximum thrust clearance: 0.35 mm (0.0138 in.)

If the clearance is greater than maximum, replace the connecting rod assembly.


EM2539

5. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

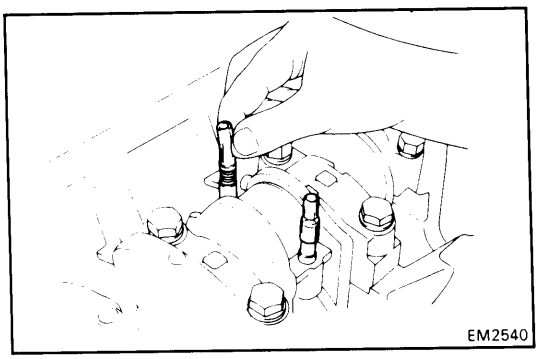
(a) Using a punch or numbering stamp, place the matchmarks on the connecting rods and caps to ensure correct reassembly.


EM0209

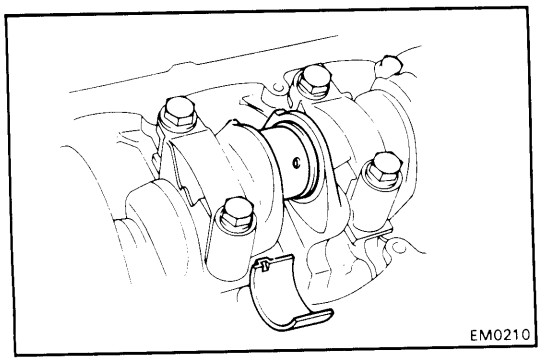
(b) Remove the connecting rod cap nuts.

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

NOTE: Keep the lower bearing insert with the connecting rod cap.


EM2540

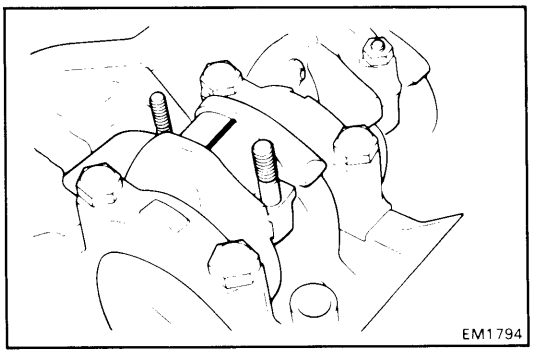
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.


EM0210

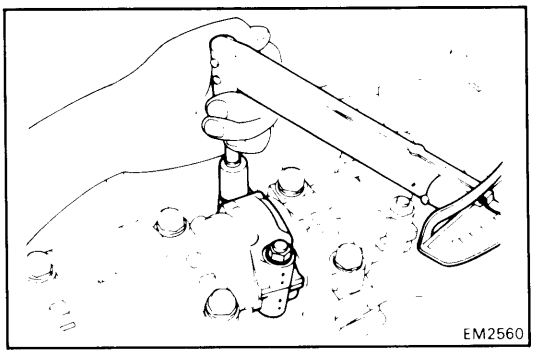
(e) Clean each crank pin and bearing.

(f) Check each crank pin and bearing for pitting and scratches.

If the crank pin or bearing are damaged, replace the bearings. If necessary, replace the crankshaft.



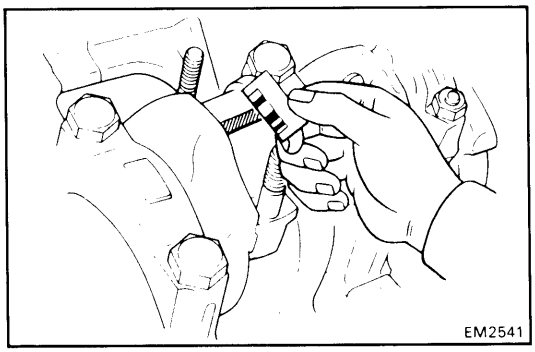
(g) Lay a strip of Plastigage across the crank pin.



(h) Install the connecting rod cap. (See page EM-61)

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

NOTE: Do not turn the crankshaft.



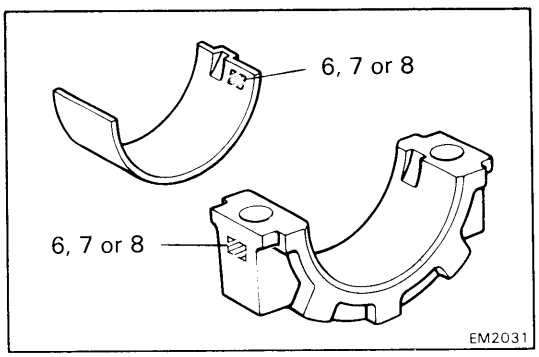
(i) Remove the connecting rod cap.

(j) Measure the Plastigage at its widest point.

Standard clearance: 0.020 — 0.051 mm (0.0008 — 0.0020 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the bearing. If necessary, replace the crankshaft.



NOTE: If using a standard bearing, replace with one having the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked "6", "7" and "8" accordingly.

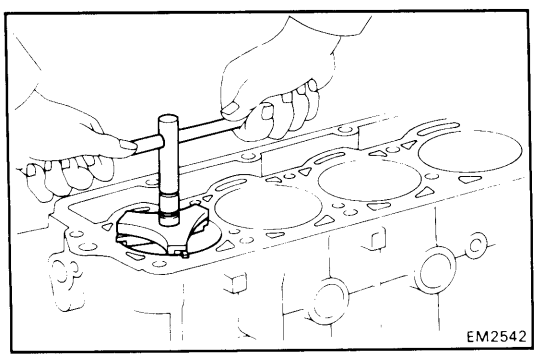
Standard sized bearing thickness (at center wall):

Mark "6" 1.486 — 1.490 mm (0.0585 — 0.0587 in.)

Mark "7" 1.490 — 1.494 mm (0.0587 — 0.0588 in.)

Mark "8" 1.494 — 1.498 mm (0.0588 — 0.0590 in.)

(k) Completely remove the Plastigage.

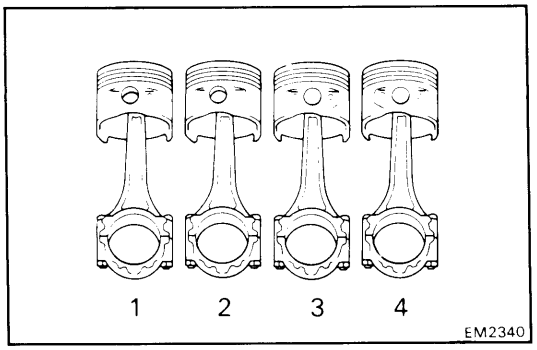


6. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

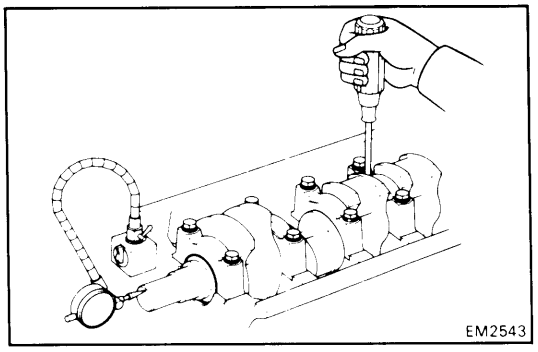
(a) Remove all the carbon from the piston ring ridge.

(b) Cover the connecting rod bolts. (See page EM-45)

(c) Push the piston, connecting rod assembly and upper bearing out through the tap of the cylinder.



NOTE:
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



7. CHECK CRANKSHAFT THRUST CLEARANCE

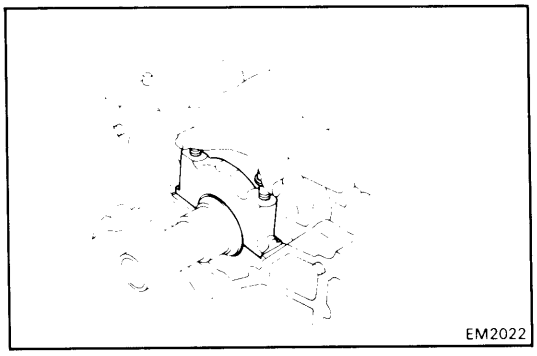
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance: 0.020 — 0.220 mm (0.0008 — 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the clearance is greater than maximum, replace the thrust washers as a set.

Oversize thrust washer: O/S 0.125, 0.250



8. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

(a) Remove the main bearing cap bolts.

(b) Using the removed main bearing cap bolts, pry the cap back and forth, and remove the main bearing caps, lower bearings and lower thrust washers (No. 3 main bearing cap only.)

NOTE:
- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.

(c) Lift out the crankshaft.

NOTE: Keep the upper bearing and upper thrust washers together with the cylinder block.

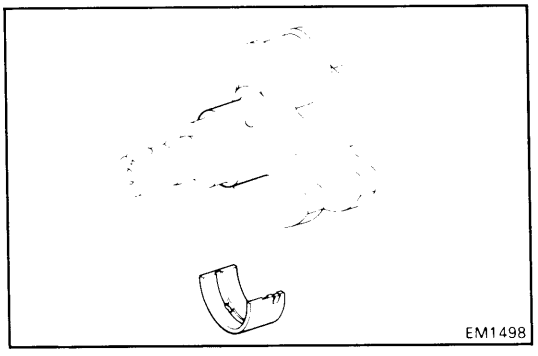
(d) Clean each main journal and bearing.

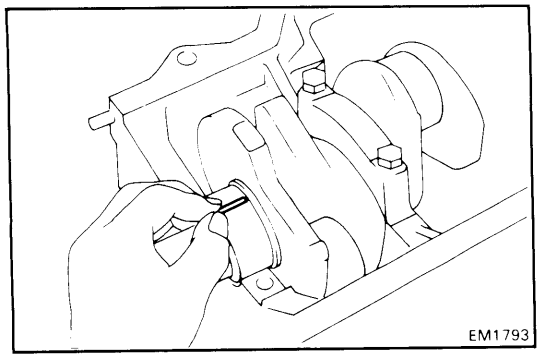
(e) Check each main journal and bearing for pitting and scratches.

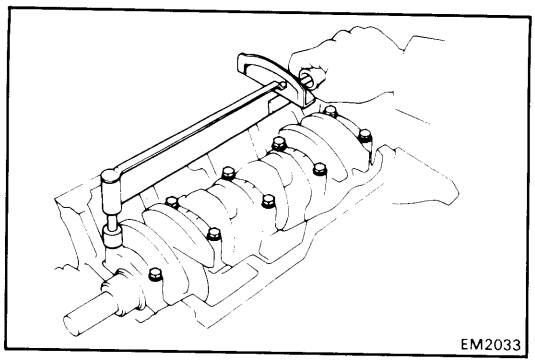
If the journal or bearing are damaged, replace the bearing. If necessary, replace the crankshaft.

(f) Place the crankshaft on the cylinder block.

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



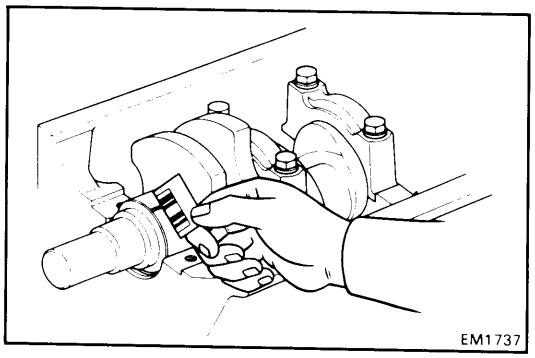




(h) Install the main bearing caps. (See page EM-60)

Torque: 800 kg-cm (58 ft-lb, 78 N·m)

NOTE: Do not turn the crankshaft.



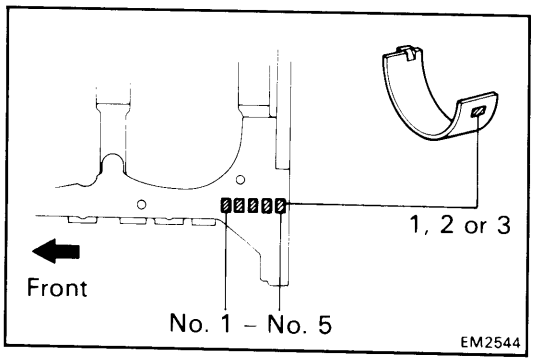
(i) Remove the main bearing caps.

(j) Measure the Plastigage at its widest point.

Standard clearance: 0.020 — 0.051 mm (0.0008 — 0.0020 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the main bearing. If necessary, replace the crankshaft.



NOTE: If using a standard bearing, replace with one having the same number marked on the cylinder block. There are three sizes of standard bearings, marked "1," "2" and "3" accordingly.

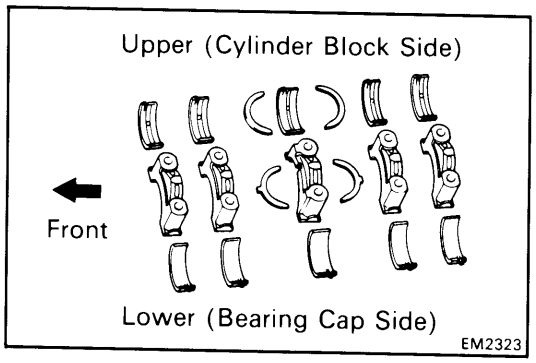
Standard sized bearing thickness (at center wall):

Mark "1" 1.986 — 1.990 mm (0.0781 — 0.0783 in.)

Mark "2" 1.990 — 1.994 mm (0.0783 — 0.0785 in.)

Mark "3" 1.994 — 1.998 mm (0.0785 — 0.0787 in.)

(k) Completely remove the Plastigage.

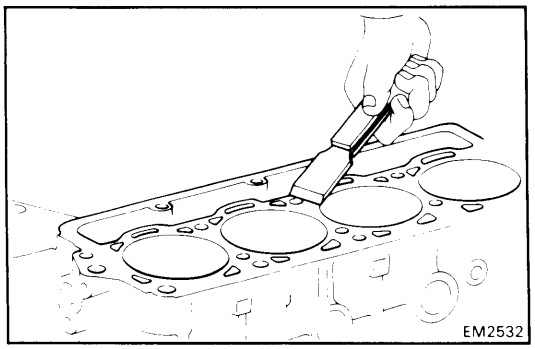


9. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper bearings and upper thrust washers from the cylinder block.

NOTE: Arrange the main bearing caps, bearings and thrust washers in correct order.



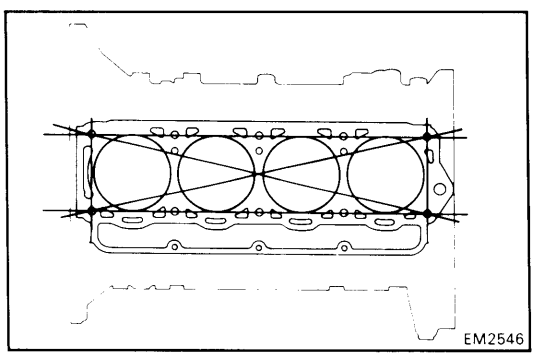
INSPECTION OF CYLINDER BLOCK

1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block surface.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the block.

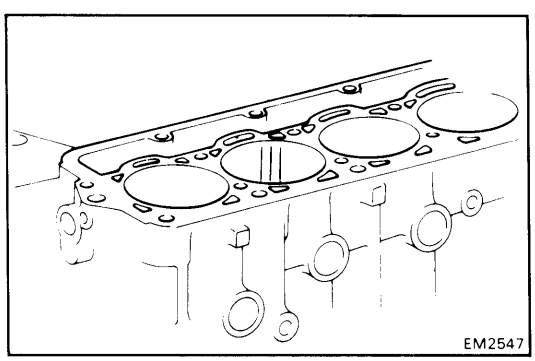


3. INSPECT TOP OF CYLINDER BLOCK FOR FLANTNESS

Using a precision straight edge and feeler gauge, check the surface contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

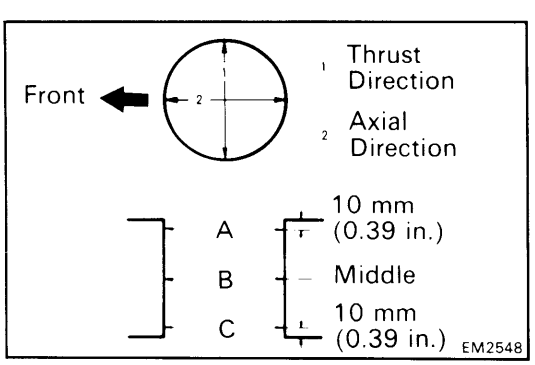
If warpage is greater than maximum, replace the cylinder block.



4. INSPECT CYLINDERS FOR VERTICAL SCRATCHES

Visually check the cylinders for vertical scratches.

If deep scratches are present, rebore all four cylinders. (See page EM-54)



5. INSPECT CYLINDER BORES

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

Standard diameter:

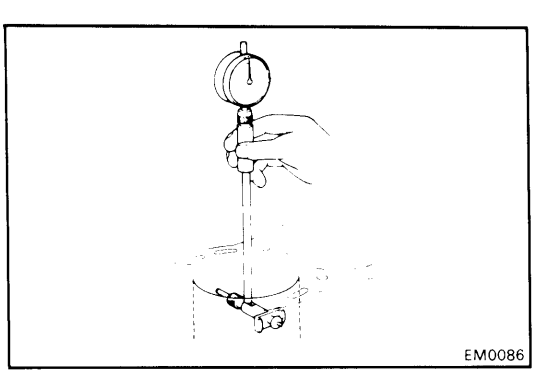
STD size 91.000 — 91.030 mm (3.5827 — 3.5839 in.)

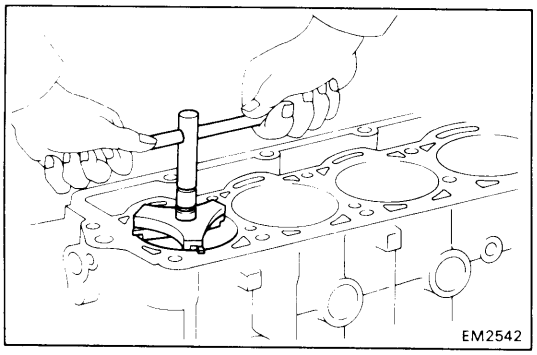
Maximum diameter:

STD size 91.23 mm (3.5917 in.)

O/S 0.50 91.73 mm (3.6114 in.)

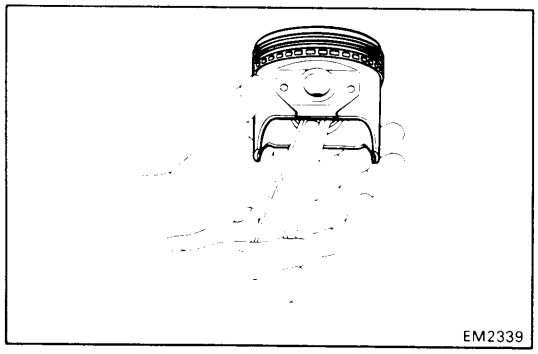
If the diameter is greater than maximum, rebore all four cylinders. If necessary, replace the cylinder block.





6. REMOVE CYLINDER RIDGE

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

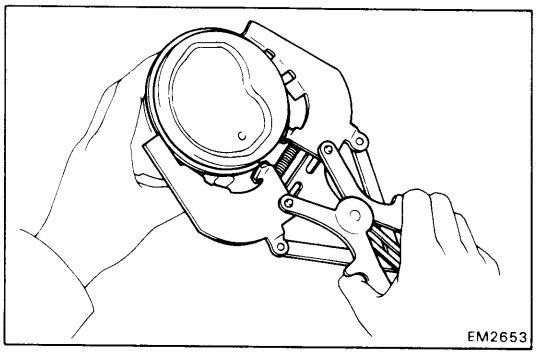


DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CHECK FIT BETWEEN PISTON AND PIN

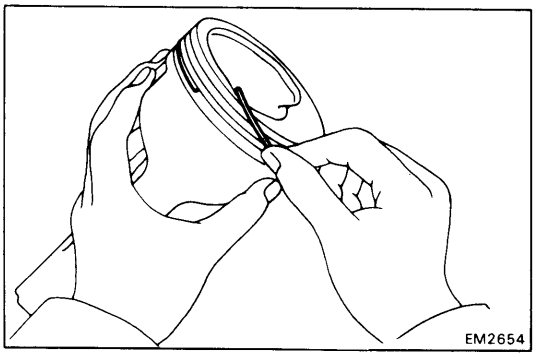
Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin.



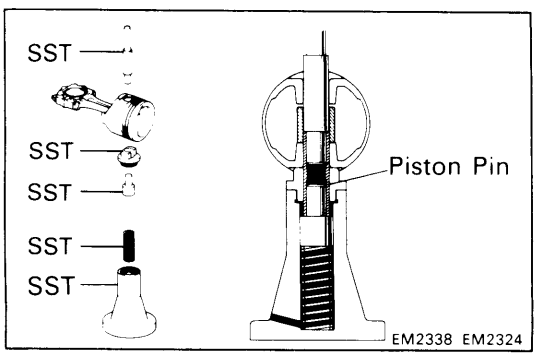
2. REMOVE PISTON RINGS

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



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

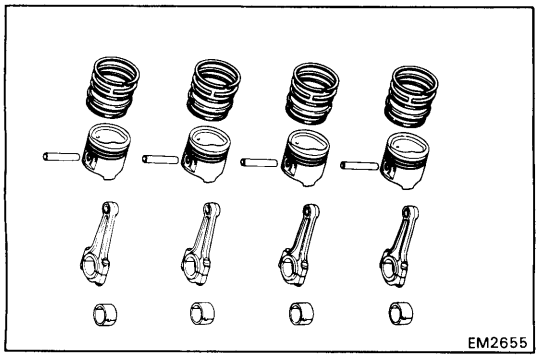
NOTE: Arrange the rings in correct order.



3. DISCONNECT CONNECTING ROD FROM PISTON

Using SST, press the pin out of the piston.

SST 09221-25022 (09221-00020, 09221-00030, 09221-00040, 09221-00071, 09221-00081)

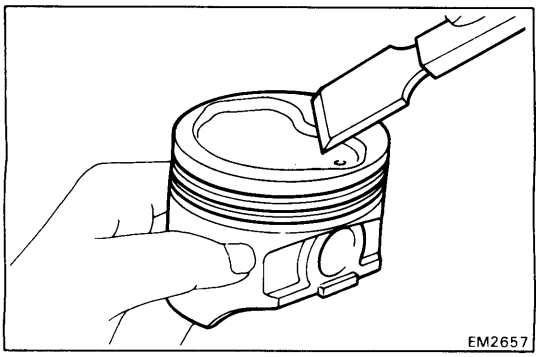

EM2655

NOTE:
- The piston and pin are a matched set.
- Arrange the pistons, pins, connecting rods and bearings in correct order.

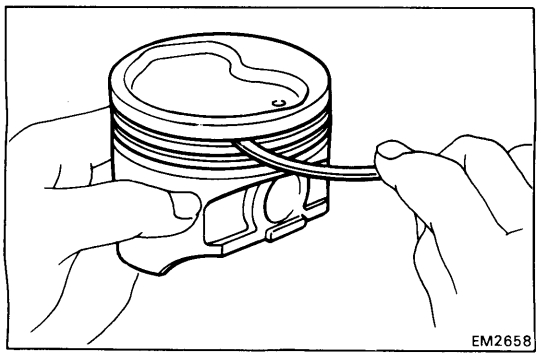
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTON

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

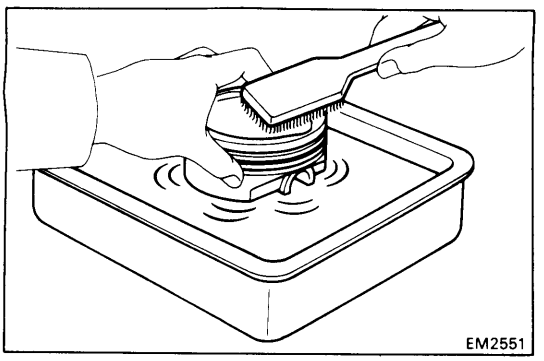

EM2657

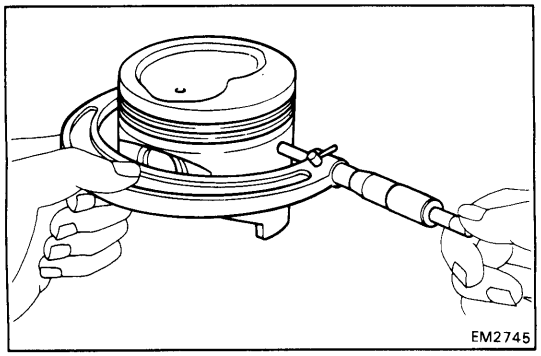
(b) Using a groove cleaning tool or broken ring, clean the ring grooves.


EM2658

(c) Using solvent and a brush, thoroughly clean the piston.

CAUTION: Do not use a wire brush.


EM2551



2. INSPECT PISTON DIAMETER AND OIL CLEARANCE

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 24 mm (0.94 in.) from the piston head.

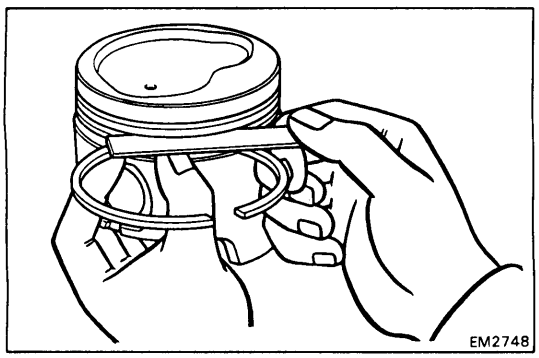
Standard diameter:

STD size	**90.925 – 90.955 mm (3.5797 – 3.5809 in.)**
O/S 0.50	**91.425 – 91.455 mm (3.5994 – 3.6006 in.)**

(b) Measure the cylinder bore diameter in the thrust directions (See page EM-49) and subtract the piston diameter measurement from the cylinder bore diameter measurement.

Oil clearance: 0.065 – 0.085 mm (0.0026 – 0.0033 in.)

If the clearance is not within specification, replace the piston, or rebore all four cylinders and replace all four pistons.

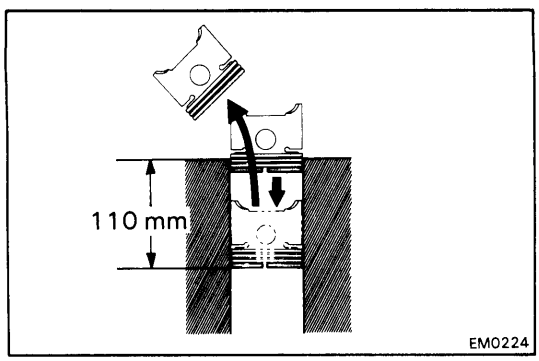


3. INSPECT CLEARANCE BETWEEN WALL OF PISTON RING GROOVE AND NEW PISTON RING

Using a feeler gauge, measure the clearance between the ring land and wall of new piston ring groove.

Ring groove clearance: 0.03 – 0.07 mm (0.0012 – 0.0028 in.)

If the clearance is not within specification, replace the piston.



4. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.

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

Standard end gap:

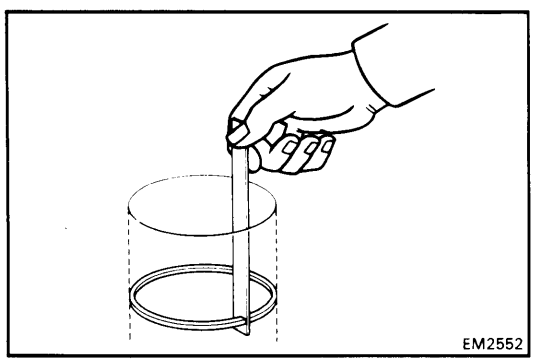
No. 1	**0.23 – 0.48 mm (0.0091 – 0.0189 in.)**
No. 2	**0.16 – 0.44 mm (0.0063 – 0.0173 in.)**
Oil (Side rail)	**0.13 – 0.47 mm (0.0051 – 0.0185 in.)**

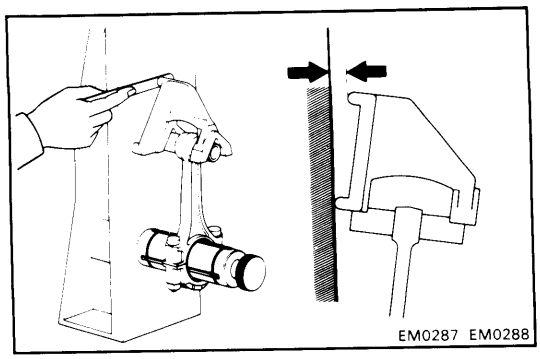
Maximum end gap:

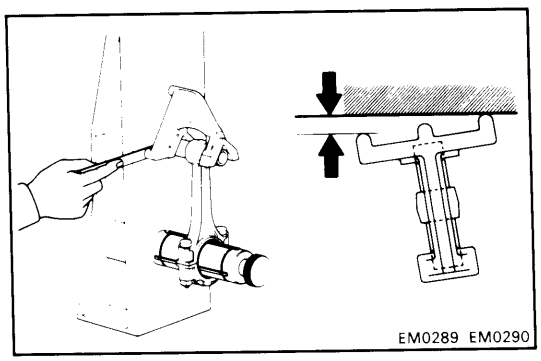
No. 1	**1.08 mm (0.0425 in.)**
No. 2	**1.04 mm (0.0409 in.)**
Oil (Side rail)	**1.07 mm (0.0421 in.)**

If the gap is greater than maximum, replace the piston ring.

If the gap is greater than maximum even with a new piston ring, rebore all four cylinders and use O/S piston rings.




EM0287 EM0288


EM0289 EM0290

5. INSPECT CONNECTING RODS

Using a rod aligner and thickness gauge, check the connecting rod alignment.

- Check for bend.

Maximum bend:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bend is greater than maximum, replace the connecting rod assembly.

- Check for twist.

Maximum twist:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.

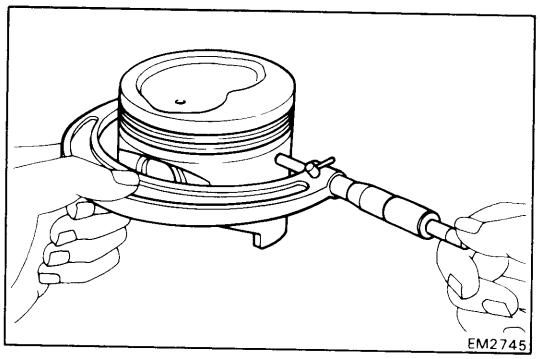
NOTE: If replacing the connecting rods, replace the same number of connecting rod bearings as that of new connecting rod caps.

BORING OF CYLINDERS

NOTE:
- Bore all four cylinders for the oversized piston's outside diameter.
- Replace the piston rings with ones to match the oversized pistons.

1. KEEP OVERSIZIED PISTONS

Oversized piston diameter.
O/S 0.50 91.415 — 91.445 mm
(3.5990 — 3.6001 in.)



2. CALCULATE DIMENSION FOR BORING CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 24 mm (0.94 in.) from the piston head.

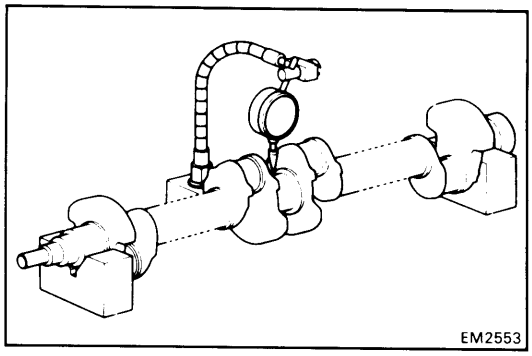
(b) Calculate the size each cylinder is to be rebored as follows:

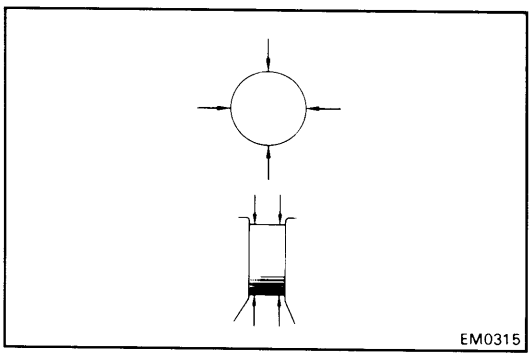
Size to be rebored = P + C — H
P = piston diameter
C = piston clearance
0.065 — 0.085 (0.0026 — 0.0033 in.)
H = allowance for honing
0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Amount of housing: 0.02 mm (0.0008 in.) maximum

CAUTION: Excess honing will destroy the finished roundness.


EM2553


EM0315

INSPECTION AND REPAIR OF CRANKSHAFT

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V-blocks.

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

Maximum circle runout: 0.06 mm (0.0024 in.)

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

2. INSPECT MAIN JOURNALS AND CRANK PINS

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

Main journal diameter:

STD size	**57.985 – 58.000 mm (2.2829 – 2.2835 in.)**
O/S 0.25	**57.745 – 57.755 mm (2.2734 – 2.2738 in.)**

Crank pin diameter:

STD size	**47.985 – 48.000 mm (1.8892 – 1.8898 in.)**
O/S 0.25	**47.745 – 47.755 mm (1.8797 – 1.8801 in.)**

If the diameter is not within specification, check the oil clearance.

(b) Check each main journal and crank pin for taper and out-of-round as shown.

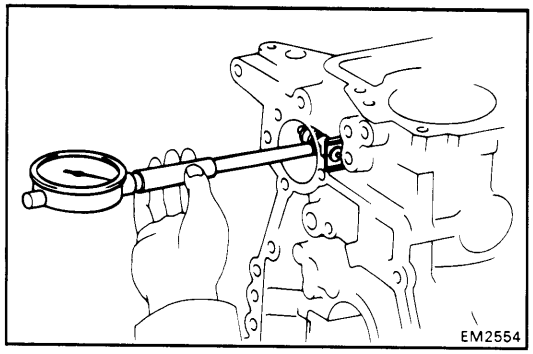
Maximum taper and out-of-round: 0.02 mm (0.0008 in.)

If taper and out-of-round is greater than maximum, replace the crankshaft.

3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the undersized finished diameter.

Install new main journal and/or crank pin undersized bearings.



INSPECTION AND REPAIR OF CAMSHAFT BEARINGS

1. INSPECT CAMSHAFT OIL CLEARANCE

(a) Using a cylinder gauge, measure the inside diameter of the camshaft bearing.

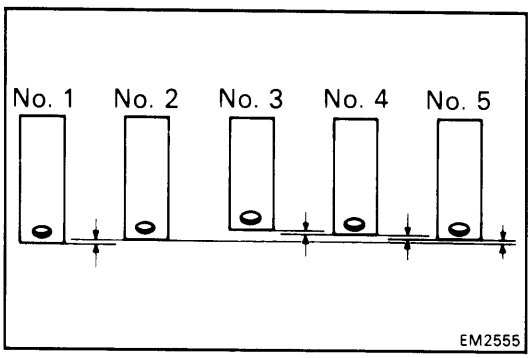
Bearing inside diameter (from front side):

No. 1 46.500 – 46.540 mm (1.8307 – 1.8323 in.)
No. 2 46.250 – 46.290 mm (1.8209 – 1.8224 in.)
No. 3 46.000 – 46.040 mm (1.8110 – 1.8126 in.)
No. 4 45.750 – 45.790 mm (1.8012 – 1.8028 in.)
No. 5 45.500 – 45.540 mm (1.7913 – 1.7929 in.)

(b) Subtract the journal diameter measurement (See page EM-31) from the bearing inside diameter measurement.

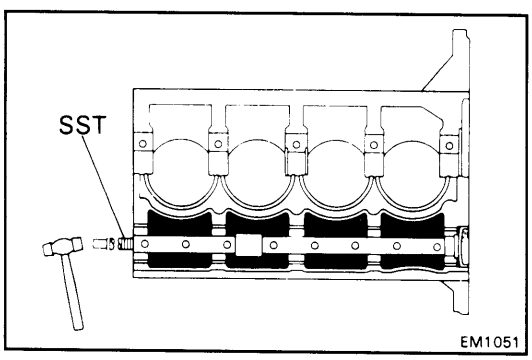
Standard oil clearance: 0.025 – 0.081 mm (0.0010 – 0.0032 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the camshaft bearings. If necessary, grind or replace the camshaft.



2. IF NECESSARY, REPLACE CAMSHAFT BEARINGS

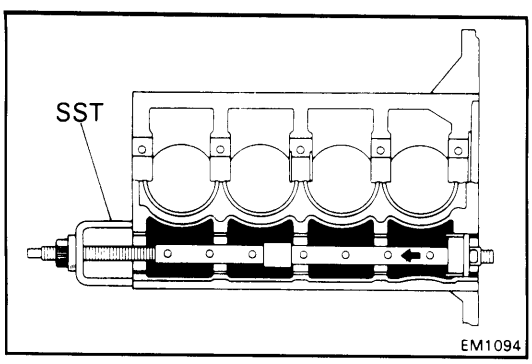
NOTE: The outer diameter varies with each bearing.



A. Remove expansion plug

Using SST and a hammer, tap out the expansion plug.

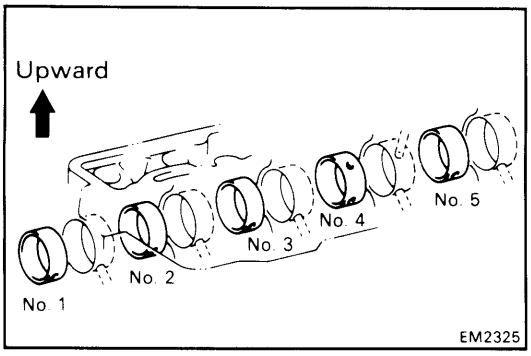
SST 09215-00100 (09215-00130, 09215-00150, 09215-00210)



B. Remove the camshaft bearings

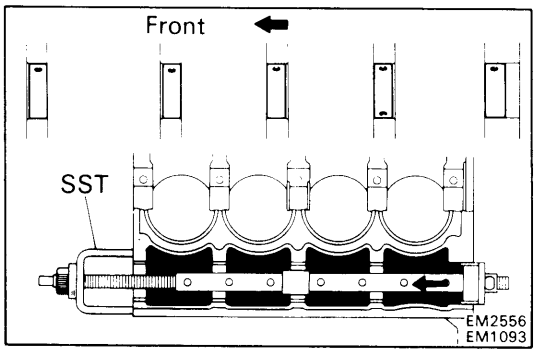
Using SST, remove the bearings.

SST 09215-00100 (09215-00120, 09215-00130, 09215-00140, 09215-00150, 09215-00160, 09215-00250)



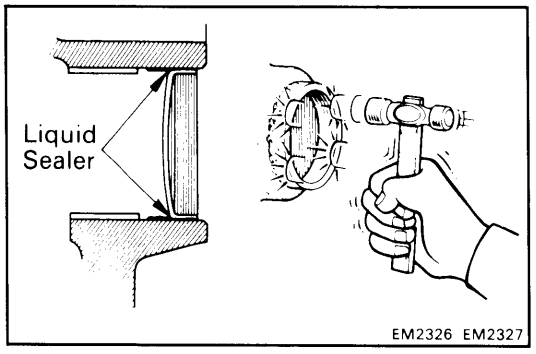
C. **Install new camshaft bearing**

(a) Align the oil holes of the bearing and cylinder block.



(b) Using SST, install the bearings.

SST 09215-00100 (09215-00120, 09215-00130, 09215-00140, 09215-00150, 09215-00160, 09215-00250)

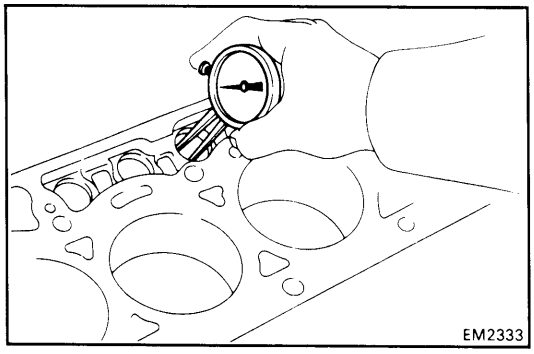


D. **Check camshaft oil clearance (See page EM-56)**

E. **Install new expansion plug**

(a) Apply liquid sealer to the expansion plug surface of the cylinder block.

(b) Using a hammer, tap in a new expansion plug until its surface is flush with the cylinder block edge.



INSPECTION OF VALVE LIFTER BORES

INSPECT VALVE LIFTER OIL CLEARANCE

(a) Using calipers, measure the valve lifter bore diameter.

Bore diameter: 21.417 – 21.443 mm (0.8432 – 0.8442 in.)

(b) Subtract the valve lifter diameter measurement (See page EM-33) from the valve lifter bore diameter measurement.

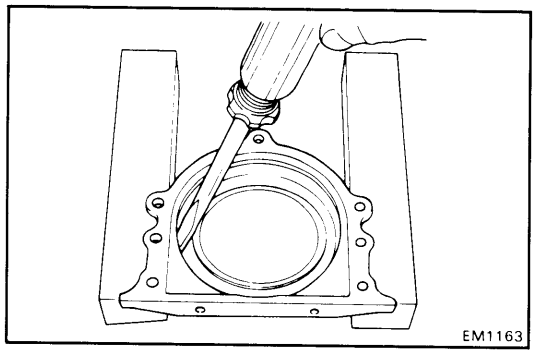
Standard oil clearance: 0.013 – 0.056 mm (0.0005 – 0.0022 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve lifters.

REPLACEMENT OF CRANKSHAFT REAR OIL SEAL

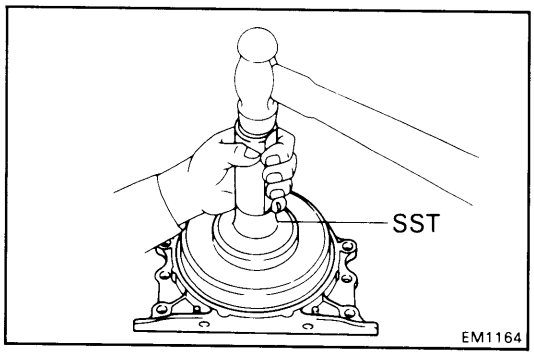
NOTE: There are two methods (A and B) to replace the oil seal.



REPLACE CRANKSHAFT REAR OIL SEAL

A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-63010

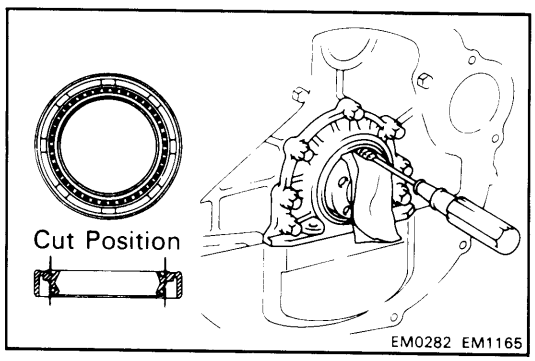
(c) Apply MP grease to the oil seal lip.

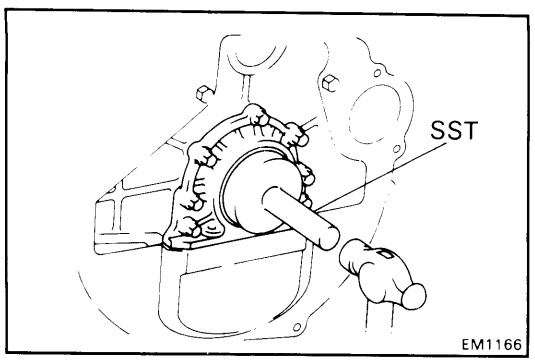
B. If rear oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

CAUTION: Be careful not to damage the crankshaft. Tape the screwdriver.

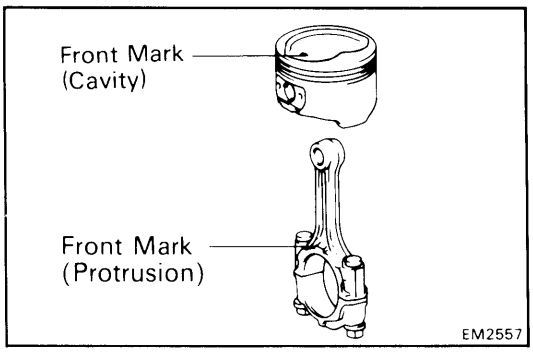




(c) Apply MP grease to a new oil seal.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

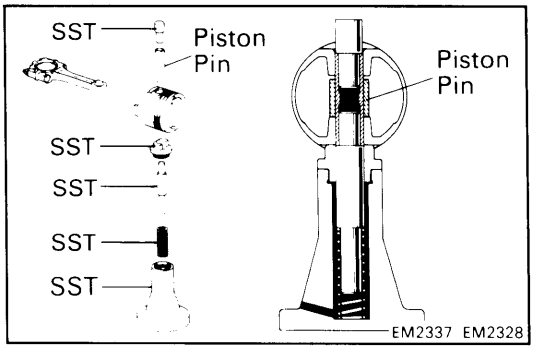
SST 09223-63010



ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. ASSEMBLE PISTON AND CONNECTING ROD

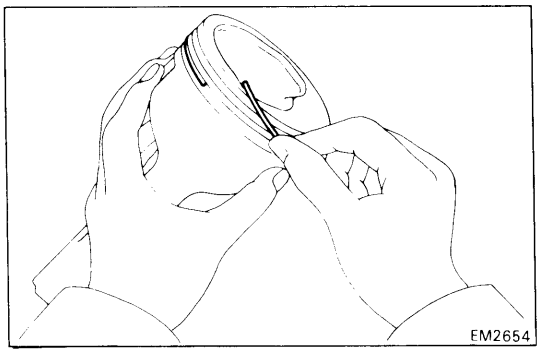
(a) Align the front marks of the piston and connecting rod.



(b) Coat the piston pin and the piston pin hole of the piston with engine oil.

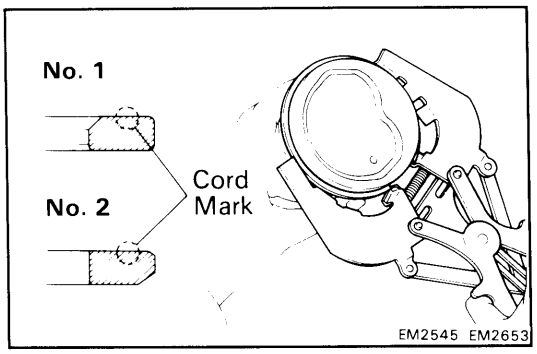
(c) Using SST, press in the piston pin.

SST 09221-25022 (09221-00020, 09221-00030, 09221-00040, 09221-00071, 09221-00081)

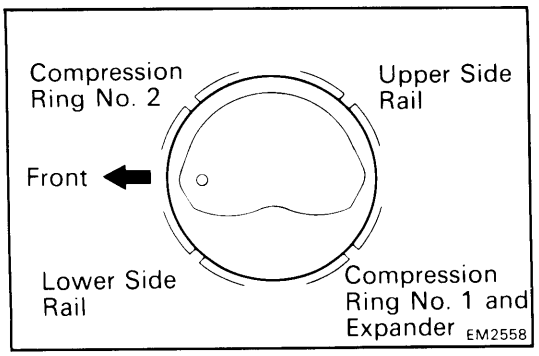


2. PLACE PISTON RINGS ON PISTON

(a) Install the oil ring expander and two side rails by hand.

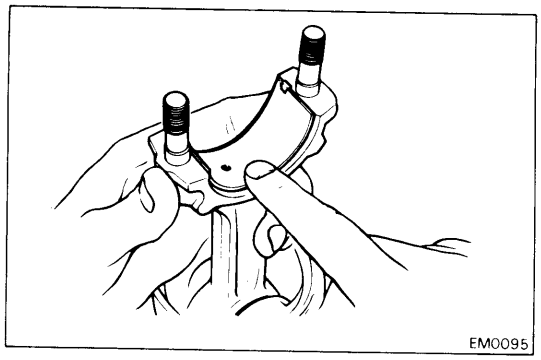


(b) Using a piston ring expander, install the two compression rings with the cord mark facing upward.



(c) Position the piston rings so that the ring ends are as shown.

CAUTION: Do not align the ends.


EM0095

3. INSTALL BEARINGS

Install the bearings in the connecting rods and rod caps.

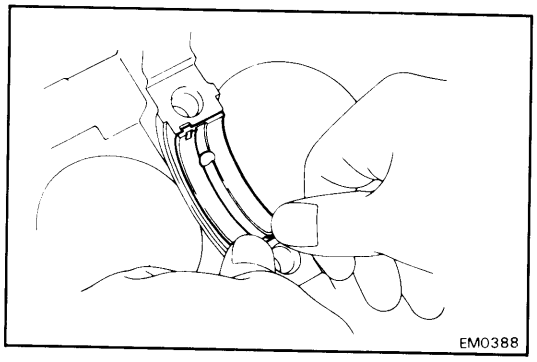
CAUTION: Install the bearing with the oil hole in the connecting rod.

ASSEMBLY OF CYLINDER BLOCK

(See page EM-39)

NOTE:

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

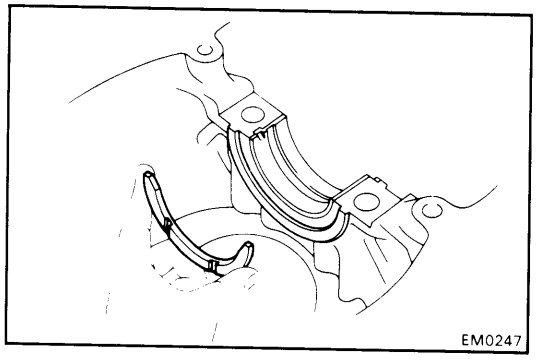

EM0388

1. INSTALL MAIN BEARINGS

(a) Place the upper main bearings in the cylinder block.

(b) Place the lower main bearings in the main bearing caps.

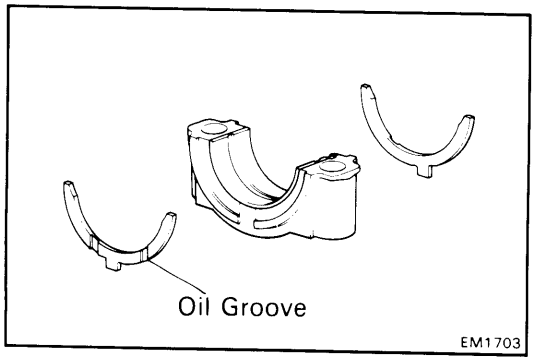
CAUTION: Install the bearing with the oil hole in the block.


EM0247

2. INSTALL UPPER THRUST WASHERS

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

3. PLACE CRANKSHAFT ON CYLINDER BLOCK

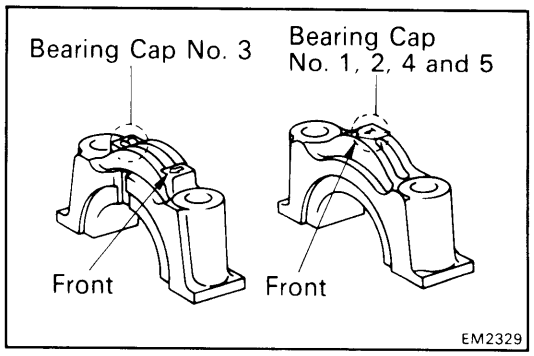


EM1703

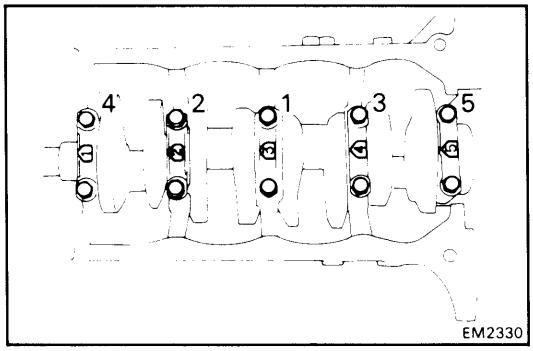
4. INSTALL MAIN BEARINGS CAPS AND LOWER THRUST WASHERS

NOTE: Each main bearing cap is numbered.

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



(b) Install the main bearing caps in their proper location.



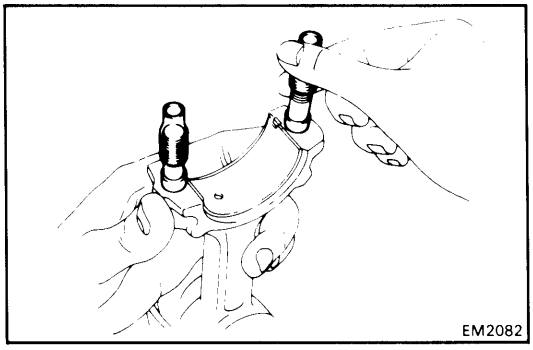
(c) Apply a light coat of the engine oil on the threads and under the bolt heads of the main bearing caps.

(d) Install and uniformly tighten the ten bolts of the main bearing caps in sevral pass, in the sequence shown.

Torque: 800 kg-cm (58 ft-lb, 78 N·m)

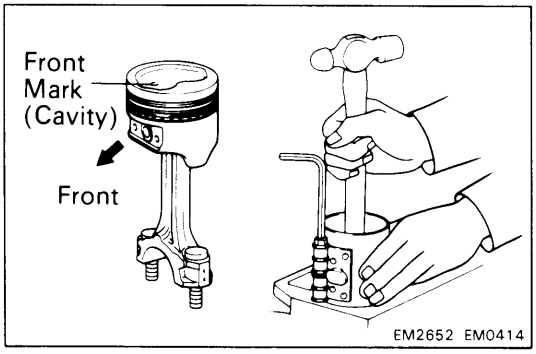
(e) Check that the crankshaft turns.

(f) Check the crankshaft thrust clearance. (See page EM-47)

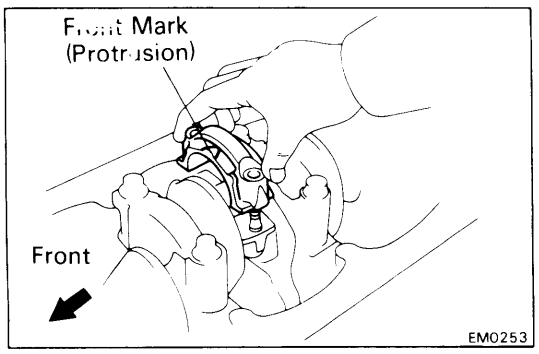


5. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft and cylinder bore from damage.



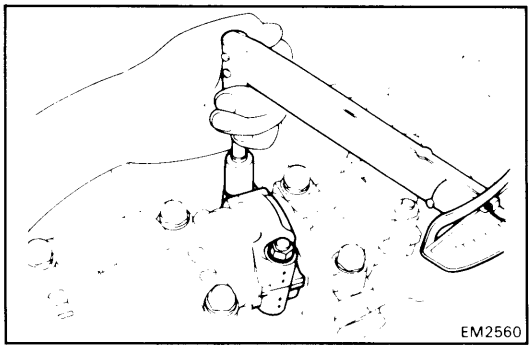
(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into each cylinder with the front mark of the piston facing forward.



6. INSTALL CONNECTING ROD CAPS

(a) Match the numbered connecting rod cap with the numbered connecting rod.

(b) Install the connecting rod caps with the front mark facing forward.



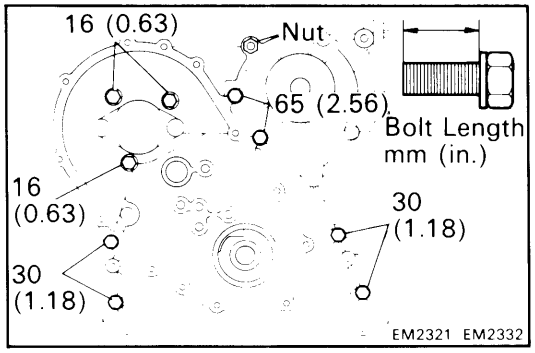
(c) Apply a light coat of the engine oil on the threads and under the connecting rod nuts.

(d) Install and alternately tighten the connecting rod nuts and is several passes.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

(e) Check that the crankshaft turns smoothly.

(f) Check the connecting rod thrust clearance. (See page EM-45)



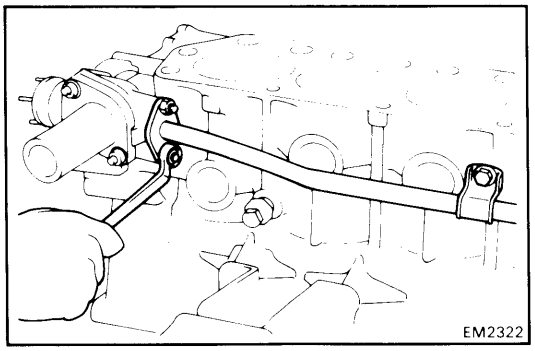
7. INSTALL REAR OIL SEAL RETAINER

Torque: 120 kg-cm (9 ft-lb, 12 N·m)

8. INSTALL TIMING CHAIN CASE

Install a new gasket and the timing chain case with the nine bolts and one nut.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

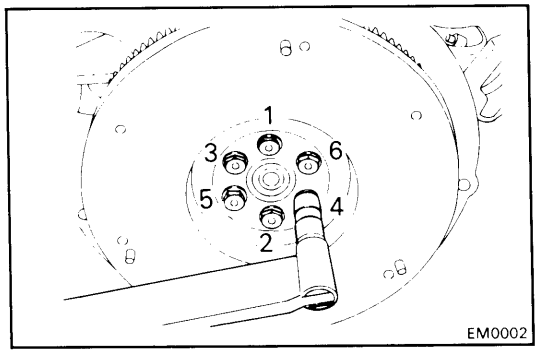


9. INSTALL WATER BY-PASS PIPE

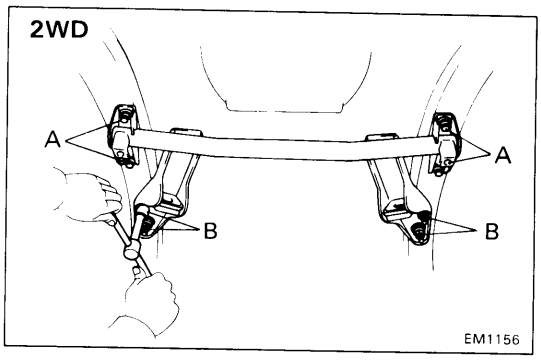
Install a new gasket and the water by-pass pipe.

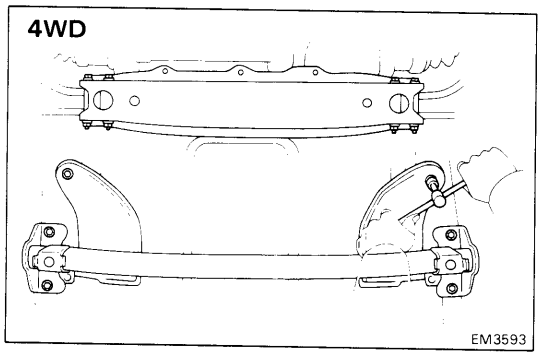
POST ASSEMBLY

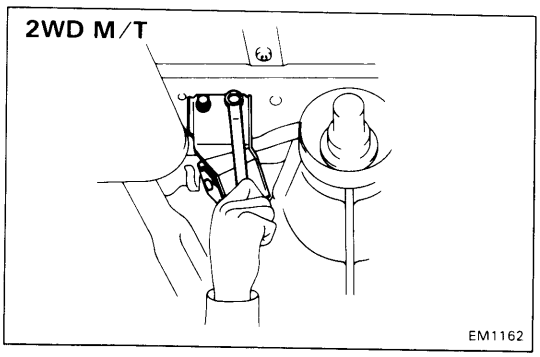
1. INSTALL OIL PUMP AND ENGINE OIL PAN
   (See page LU-7)
2. INSTALL TIMING CHAIN AND CAMSHAFT
   (See pages EM-36 to 38)
3. INSTALL CYLINDER HEAD
   (See pages EM-23)
4. INSTALL OIL FILTER BRACKET AND OIL FILTER
   Torque: 185 kg-cm (13 ft-lb, 18 N·m)
5. INSTALL ALTERNATOR AND BRACKET
6. REMOVE ENGINE FROM ENGINE STAND
7. INSTALL REAR END PLATE

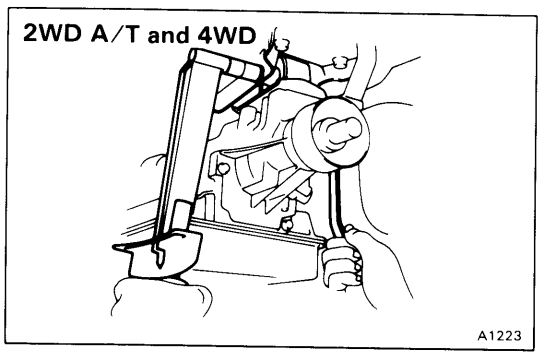


8. [M/T]
   INSTALL FLYWHEEL
   Torque: 850 kg-cm (61 ft-lb, 83 N·m)
9. [A/T]
   INSTALL DRIVE PLATE
   Torque: 750 kg-cm (54 ft-lb, 74 N·m)
10. [M/T]
    INSTALL CLUTCH DISC AND COVER
11. INSTALL TRANSMISSION TO ENGINE









INSTALLATION ENGINE

1. **ASSEMBLE ENGINE AND TRANSMISSION**

2. **INSTALL ENGINE AND TRANSMISSION ASSEMBLY**

   (a) Install the engine front member to the engine.

   (b) Raise the engine, and install and torque the bolts and nuts holding the engine front mounting member to the body.

   Torque:
   Bolts A 400 kg-cm (29 ft-lb, 39 N·m)
   Bolts B 900 kg-cm (65 ft-lb, 88 N·m)

   (c) [4WD]
   Install the front suspension rear crossmember with the bolt and nuts.

   Torque: 970 kg-cm (70 ft-lb, 95 N·m)

   (d) [2WD M/T]
   Install the bolts holding the engine rear mounting bracket to the body. Torque the bolt.

   Torque: 130 kg-cm (9 ft-lb, 13 N·m)

   (e) [2WD A/T and 4WD]
   Install the bolt and nut holding the engine rear mounting insulator to the body. Torque the nut.

   Torque: 500 kg-cm (36 ft-lb, 49 N·m)

3. **[2WD]**
   INSTALL STRUT BAR (See page FA-27)

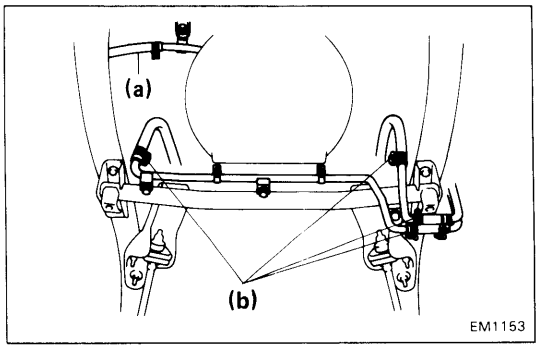
4. **[4WD]**
   INSTALL STABILIZER BAR (See page FA-110)

5. **[A/T]**
   INSTALL OIL COOLER HOSES

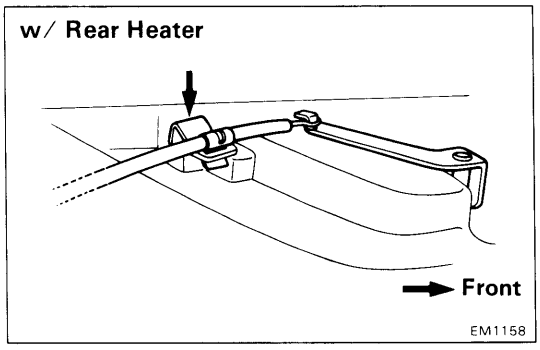
6. **CONNECT CONNECTOR OF OIL LEVEL SENSOR**

7. **INSTALL ENGINE UNDER COVER**

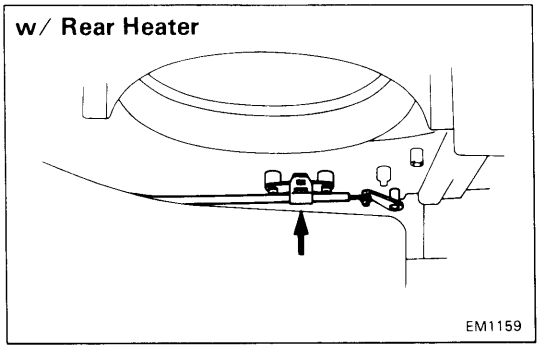
8. **CONNECT GROUND STRAP TO ENGINE MOUNTING**



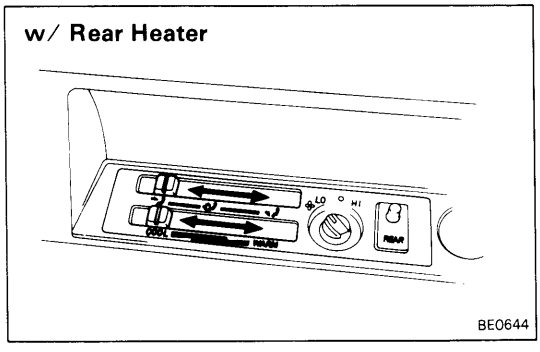
9. CONNECT HEATER HOSES
   (a) Heater outlet hose
   (b) [w/ Rear Heater]
   Rear heater hoses



10. [w/ REAR HEATER]
CONNECT REAR HEATER CONTROL CABLES
   (a) Connect the air mix damper cable to the damper.



   (b) Connect the mode selector cable to the damper.



   (c) Move the control levers back and forth, and check for stiffness and binding through full range of operation.

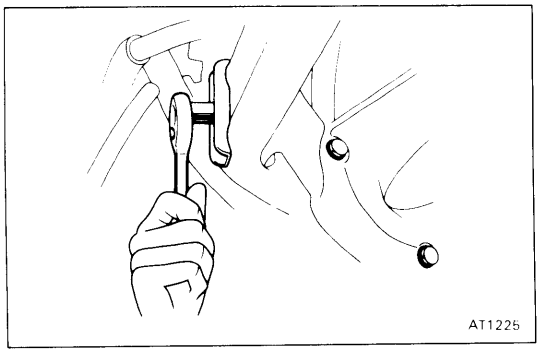
11. CONNECT SPEEDOMETER CABLE AND GROUND STRAP

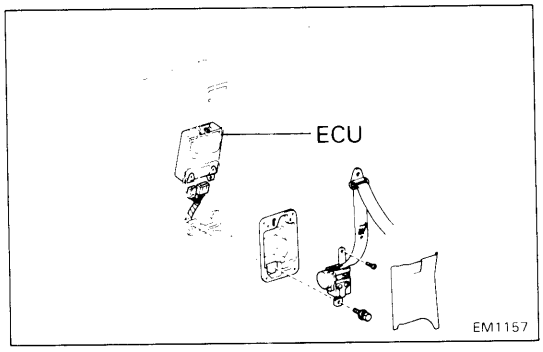
12. CONNECT BACK-UP LIGHT SWITCH CONNECTOR

13. [4WD]
CONNECT TRANSFER INDICATOR SWITCH CONNECTOR

14. INSTALL STARTER

15. INSTALL CLUTCH RELEASE CYLINDER





16. INSTALL EXHAUST PIPE

Torque the nuts holding the exhaust pipe to the exhaust manifold.

17. CONNECT TRANSMISSION CONTROL CABLES

M/T (See page MT-37)
A/T 2WD (See page AT-116)
A/T 4WD (See page AT-121)

18. INSTALL PROPELLER SHAFT(S) (See page PR-7)

19. LOWER VEHICLE

20. [w/ A/C]
INSTALL A/C COMPRESSOR

(a) Install the compressor with the four bolts.

(b) Install the drive belt.

21. CONNECT ECU CONNECTORS

(a) Connect the connectors to the ECU.

(b) Install the cover and seat belt retractor with the bolt and screw.

(c) Install the center pillar garnish.

22. INSTALL RADIATOR (See page CO-9)

23. CONNECT ACCELERATOR CABLE AND ADJUST IT

24. [A/T]
CONNECT THROTTLE CABLE AND ADJUST IT

25. [w/ PS]
INSTALL POWER STEERING (PS) PUMP
(See page SR-37)

26. INSTALL AIR CLEANER HOSE

27. CONNECT CONNECTORS AND WIRES

(a) Water temperature sender gauge connector

(b) Oil pressure switch connector

(c) Distributor connectors

(d) [w/A /C]
A/C compressor connector

(e) [w/ A/C]
A/C idle-up VSV connector

(f) [w/ A/C]
EFI VSV connector

(g) [A/T]
Three connectors

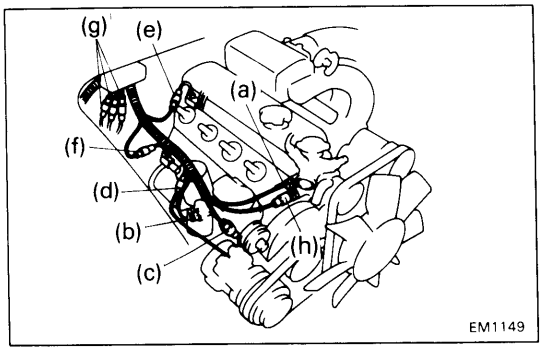
(h) Water temperature switch connector

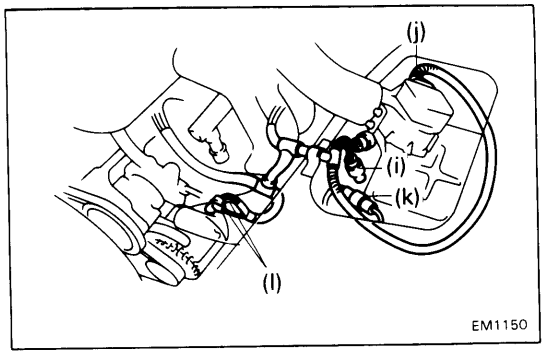
(i) Alternator connector and wire

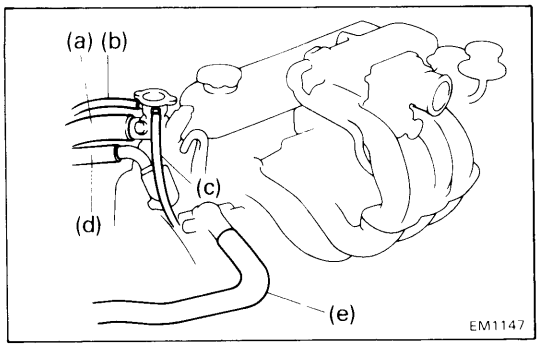
(j) Air flow meter connector

(k) Solenoid resistor connector

(l) Two connectors

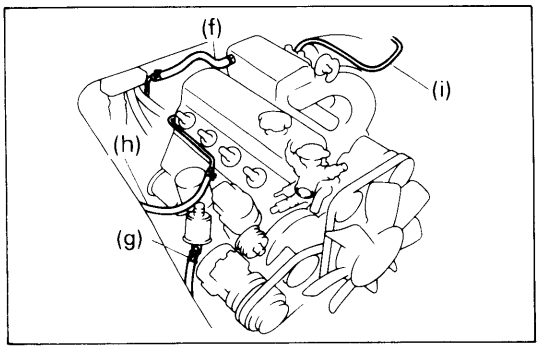






28. CONNECT HOSES

(a) Radiator inlet hose
(b) Radiator outlet hose
(c) Radiator breather hose
(d) Radiator reservoir tank hose



(e) Heater outlet hose
(f) Brake booster hose
(g) Fuel inlet hose
(h) Fuel outlet hose
(i) Charcoal canister hose

29. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

30. FILL WITH ENGINE COOLANT (See page CO-3)

31. FILL WITH ENGINE OIL (See page LU-4)

32. START ENGINE AND CHECK FOR LEAKS

33. PERFORM ENGINE ADJUSTMENT

(a) Adjust drive belt tension.
(See page CH-3, SR-37 or AC-13)

(b) Adjust ignition timing. (See page IG-14)

Ignition timing: 12° BTDC @ idle (w/ Terminals T and E1 short-circuited)

(c) Adjust idle speed. (See page MA-7)

Idle speed: M/T 700 rpm
A/T 750 rpm

34. INSTALL ENGINE SERVICE HOLE COVER

35. INSTALL RIGHT SEAT

36. ROAD TEST

Road test vehicle.

37. RECHECK COOLANT AND ENGINE OIL LEVELS