

ENGINE MECHANICAL

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TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Engine hesitates/ Poor acceleration	Vacuum leaks • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body • ISC valve	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	FI-58, 63
	Incorrect ignition timing	Reset timing	IG-10
	Emission control system problem (cold engine) • EGR system always on	Check EGR system	
	Ignition wiring faulty	Inspect wiring	
	Fuel system clogged	Check fuel system	FI-44
	Air cleaner clogged	Check air cleaner	
	EFI system problems	Repair as necessary	
	Spark plugs faulty	Inspect plugs	IG-5
	Engine overheats	Check cooling system	CO-2
	Low compression	Check compression	EM-6
Engine diesels (runs after ignition switch is turned off)	EFI system problems	Repair as necessary	
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	FI-79
Muffler explosion (after fire) all the time	Air cleaner clogged	Check air cleaner	
	EFI system problem	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-10
Engine backfires	Vacuum leak • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body • ISC valve	Check hoses and repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	FI-58, 63
	EFI system problem	Repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	
	Incorrect ignition timing	Reset timing	IG-10
	Carbon deposits in combustion chambers	Inspect cylinder head	EM-18
Excessive oil consumption	Oil leak	Repair as necessary	LU-4
	PCV line clogged	Check PCV system	EC-4
	Piston rings worn or damaged	Check rings	EM-38

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Valve stem and guide worn Valve stem seal worn	Check valves Check seals	EM-18 EM-18
Poor gasoline mileage	Fuel leak Air cleaner clogged Incorrect ignition timing EFI system problems • Injector faulty • Deceleration fuel cut system faulty Idle speed too high Spark plugs faulty EGR system always on Low compression Tires improperly inflated Clutch slips Brakes drag	Repair as necessary Check air cleaner Reset timing Repair as necessary Check ISC system Inspect plugs Check EGR system Check compression Inflate tires to proper pressure Troubleshoot clutch Troubleshoot brakes	IG-10 FI-60 IG-5 EM-6
Unpleasant odor	Incorrect idle speed Incorrect ignition timing Vacuum leaks • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body EFI system problems	Check ISC system Reset timing Repair as necessary Repair as necessary	FI-60 IG-10

IDLE HC/CO CONCENTRATION

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

PRECHECK

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 EGR systems, etc. should be properly connected.

- (f) EFI system wiring connectors fully plugged
- (g) Ignition timing set correctly
- (h) Transmission in N range
- (i) Tachometer and HC/CO meter calibrated and at hand

MEASUREMENT

1. **RACE ENGINE AT 2,500 RPM FOR ABOUT 2 MINUTES**

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

3. **MEASURE 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 below for possible causes.

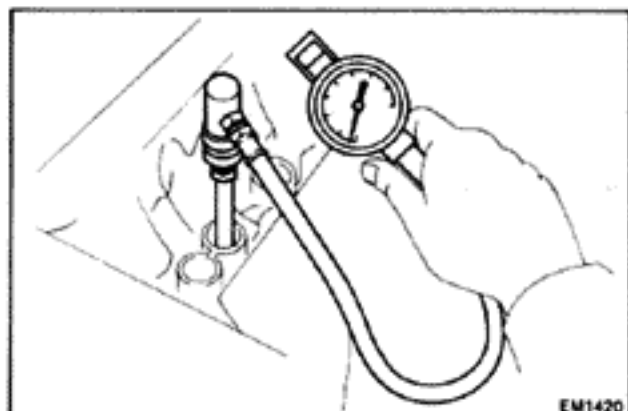
TROUBLESHOOTING

HC	CO	Symptoms	Causes
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed ignition wires • Cracked distributor cap 2. Faulty EGR system • EGR valve 3. Leaky exhaust valves 4. Leaky cylinder
High	Low	Rough idle Fluctuating HC reading	1. Vacuum leak: • Vacuum hose • Intake manifold 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 temp. sensor • Defective air temp. 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 mileage, measure the cylinder compression pressure.

1. **WARM UP ENGINE**
2. **REMOVE SPARK PLUGS**
3. **DISCONNECT HIGH-TENSION CORD FROM DISTRIBUTOR**



4. **MEASURE CYLINDER COMPRESSION PRESSURE**

- (a) Insert a compression gauge into the spark plug hole.
- (b) Fully open the throttle valve.
- (c) While cranking the engine with the starter motor, measure the compression pressure.

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

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

Compression pressure:

11.5 kg/cm² (164 psi, 1,128 kPa)

Minimum pressure:

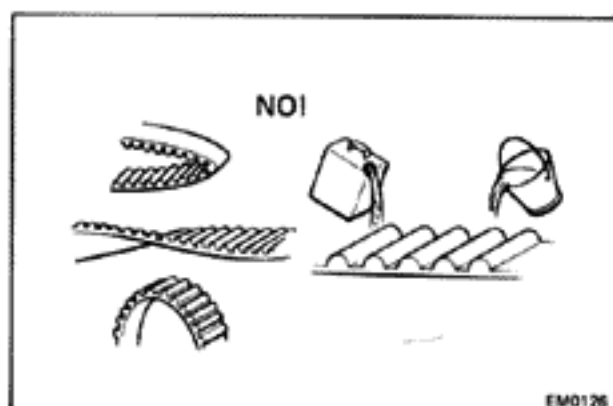
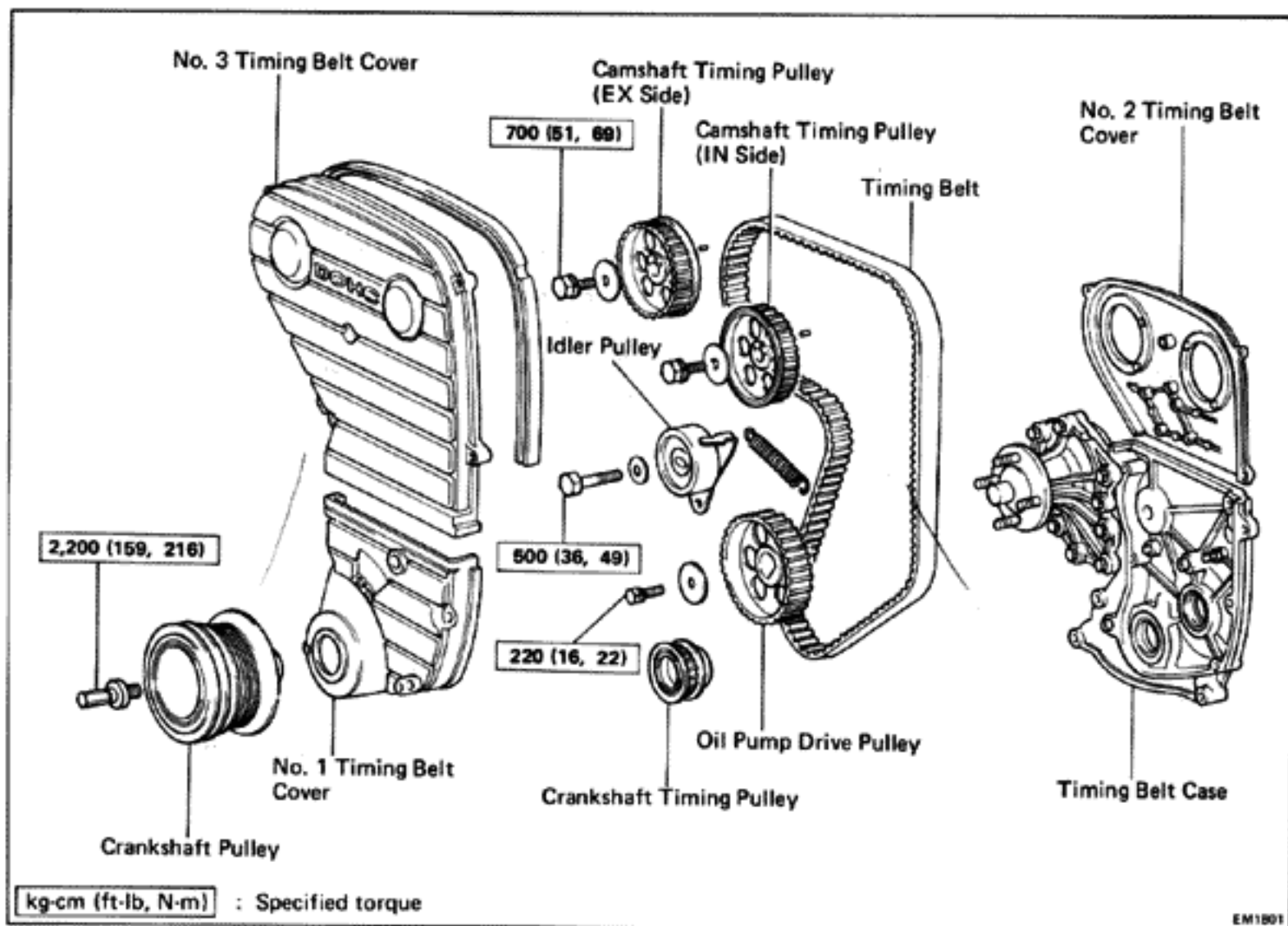
9.0 kg/cm² (128 psi, 883 kPa)

Difference between each cylinder:

Less than 1.0 kg/cm² (14 psi, 98 kPa)

- (e) If 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, changes are that the piston rings and/or cylinder bore are worn or damaged.
 - If pressure stays low, a valve may be sticking or seated improperly, or there may be leakage past the gasket.

TIMING BELT COMPONENTS



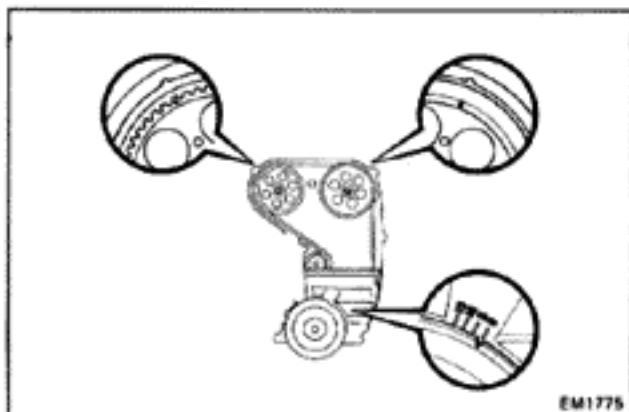
CAUTIONS

1. Do not bend, twist or turn the belt inside out.
2. Do not allow the belt to come into contact with oil, water or steam.

INSPECTION AND ADJUSTMENT OF VALVE TIMING

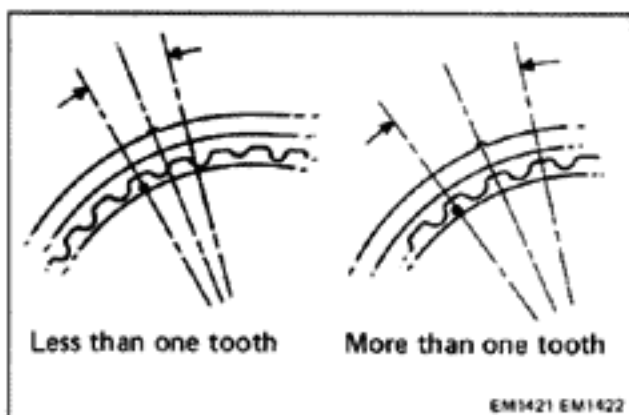
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE NO.2 FAN SHROUD
3. REMOVE AIR INTAKE CONNECTOR

4. REMOVE NO. 3 TIMING BELT COVER
5. REMOVE OIL FILLER CAP AND CYLINDER HEAD COVER OF EXHAUST SIDE

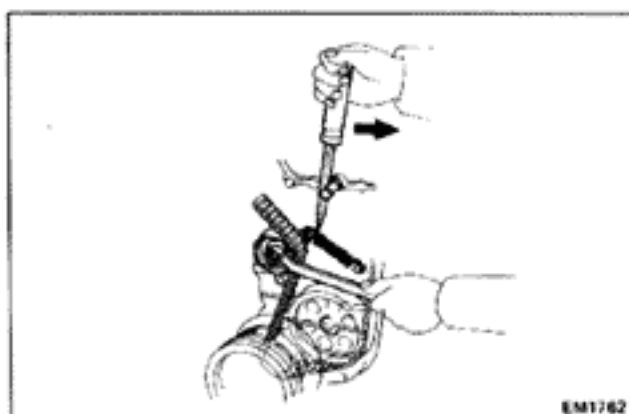


6. CHECK CAMSHAFT TIMING PULLEY MARKS

- (a) Turn the crankshaft clockwise and set the No. 1 cylinder to TDC/compression.
- (b) Check that the matchmarks of the camshaft timing pulleys are aligned with those of the No. 2 timing belt cover.

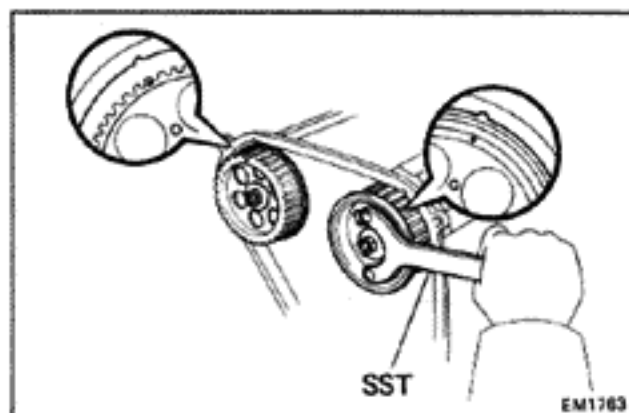


- If there is more than timing pulley one tooth between the matchmarks, realign the matchmarks in accordance with step 7.
- If the matchmarks are aligned or the difference is less than one timing pulley, tooth proceed to step 8.



7. ADJUSTMENT OF CAMSHAFT TIMING PULLEY MARKS

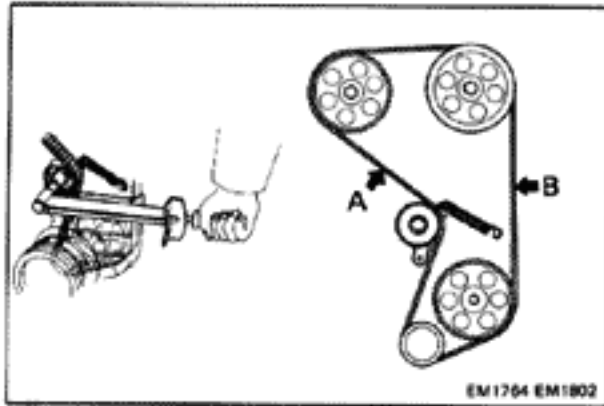
- (a) Loosen the idler pulley set bolt a little and shift the idler pulley to the alternator side with a screwdriver and wrench.
- (b) Finger tighten the idler pulley set bolt.
- (c) Remove the timing belt from the camshaft timing pulleys.



- (d) Using SST, rotate the camshaft timing pulley with the camshaft and align the matchmarks.

SST 09278-54012

- (e) Install the timing belt while the engine is cold.

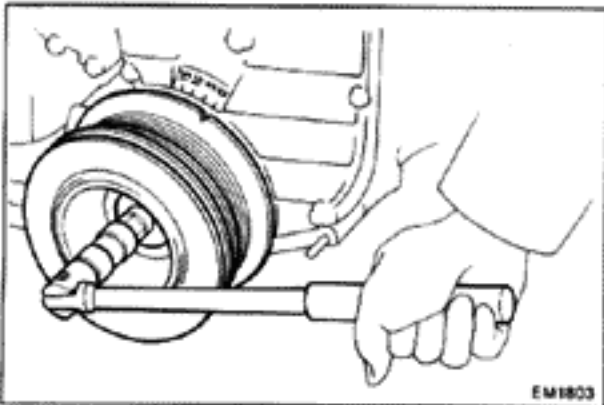


(f) Loosen the idler pulley set bolt stretch the timing belt.

(g) Tighten the idler pulley set bolt.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

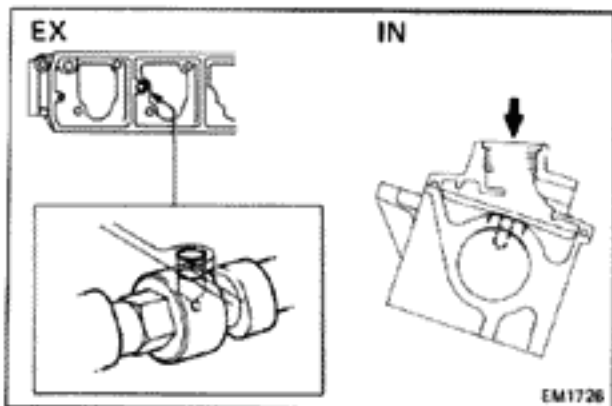
NOTE: Make sure that the timing belt tension at A is equal to that at B. If not, retighten the idler pulley set bolt.



(h) Turn the crankshaft clockwise two times and set the No. 1 cylinder to TDC/compression.

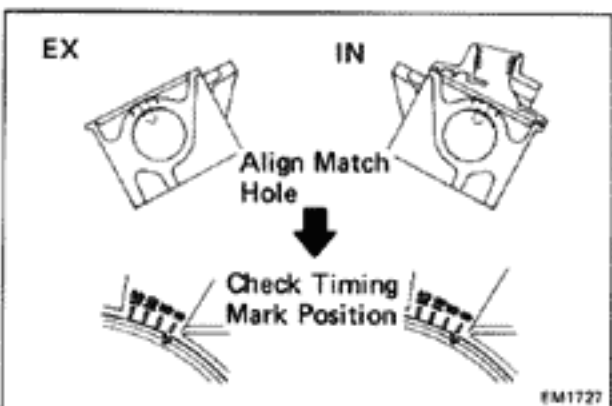
NOTE: Recheck the timing belt tension.

(i) Recheck the camshaft timing pulley marks.



8. CHECK MATCH HOLE OF CAMSHAFT

(a) Clean the camshaft match holes with compressed air.



(b) Align the match hole of the camshaft with that of the camshaft housing by turning the crankshaft pulley.

(c) After alignment, make a note of the crankshaft pulley angle on the No. 1 timing belt cover.

NOTE: Match hole alignment should be done separately for the IN and EX sides.

If the crankshaft pulley angle is within $TDC \pm 5^\circ$, it is correct.

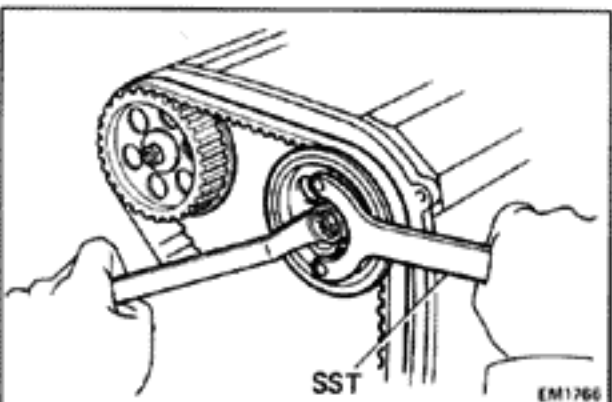
If it exceeds $TDC \pm 5^\circ$, proceed to step 9.

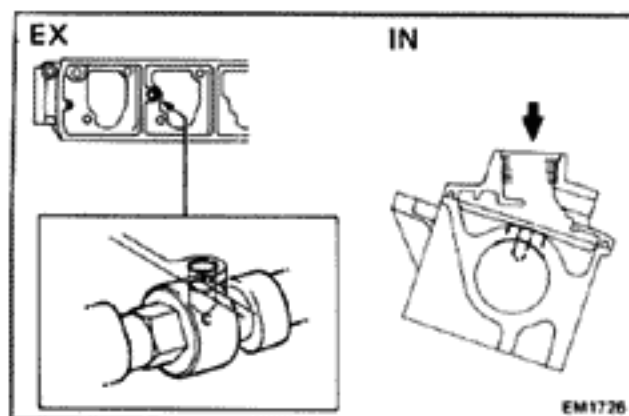
9. ADJUSTMENT OF CAMSHAFT MATCH HOLES

(a) Using SST to hold the camshaft timing pulley, remove the pulley set bolt.

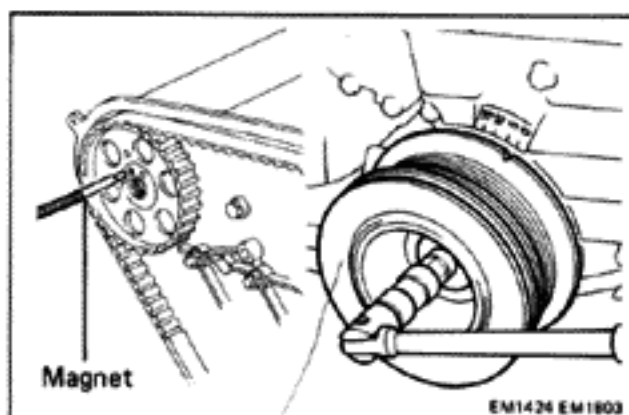
SST 09278-54012

CAUTION: Do not make use of the timing belt tension when loosening the bolt.

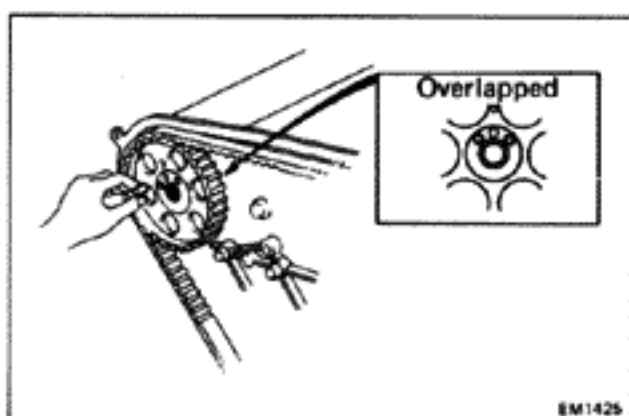




- (b) Make sure that the match hole of camshaft housing is aligned with that of the camshaft.



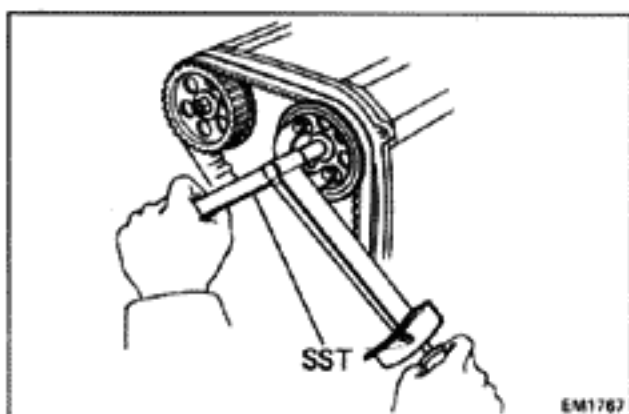
- (c) Using a magnet, remove the match pin from the pin hole of the camshaft timing pulley.
(d) Set the No. 1 cylinder to TDC/compression.



- (e) There are three pin holes on the camshaft and timing pulley. Select one overlapped hole and insert the match pin into it.

NOTE:

- If there is no overlapping hole, find one that is nearly overlapped and rotate the crankshaft slightly to overlap it, and then insert the pin.
- The crankshaft pulley angle can be adjust approximately 3° by changing the pin hole to the next one.

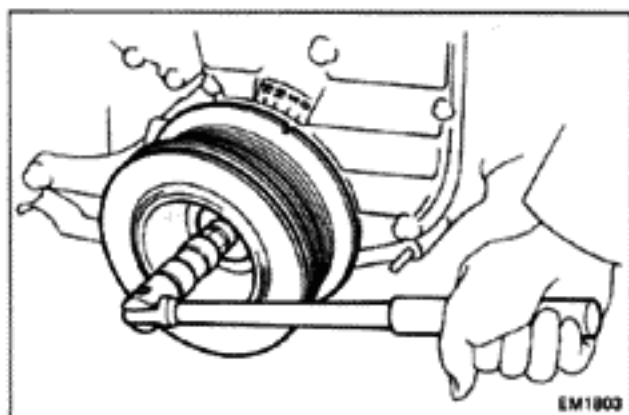


- (f) Using SST to hold the camshaft timing pulley, install the pulley set bolt.

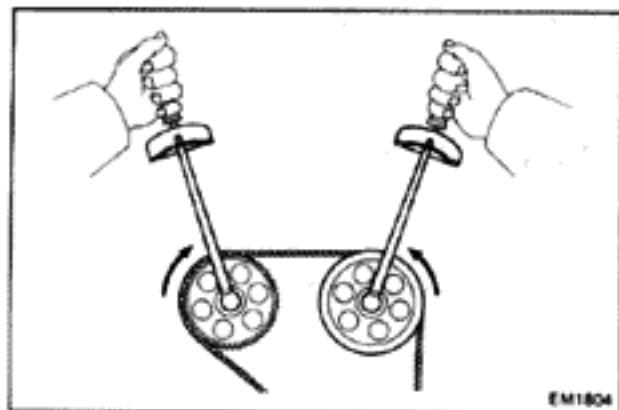
SST 09278-54012

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

CAUTION: Do not make use of the timing belt tension when tightening the bolt.



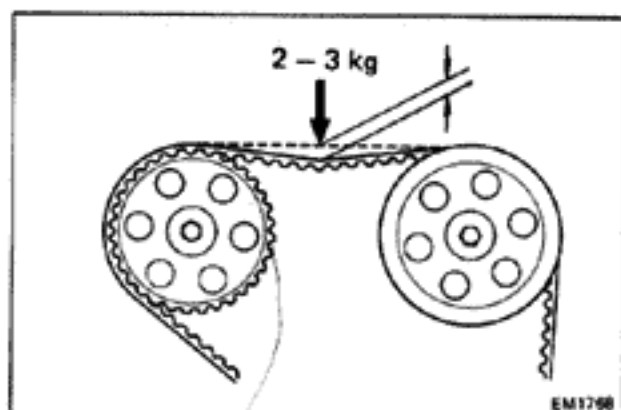
- (g) Turn the crankshaft clockwise two times and set the No. 1 cylinder to TDC/compression.
(h) Recheck the crankshaft pulley angle on the No. 1 timing belt cover after alignment of the camshaft match hole.



10. CHECK TIMING BELT TENSION

- (a) Turn both the intake and exhaust camshaft pulleys inward at the same time to slacken the timing belt at position A.

Turning torque: 200 kg-cm (14 ft-lb, 20 N·m)



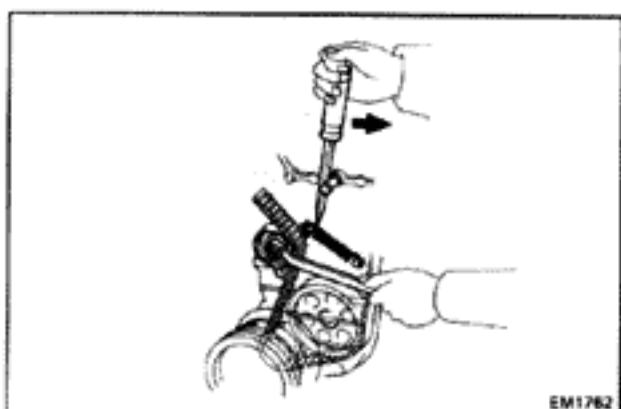
- (b) Measure the timing belt tension as shown.

Belt deflection at 2 - 3 kg (4.4 - 6.6 lb, 20 - 29 N):

Cold Used belt 5 - 7 mm (0.20 - 0.28 in.)

New belt 4 - 6 mm (0.16 - 0.24 in.)

Hot (Reference) 3 - 5 mm (0.12 - 0.20 in.)



- (c) If the measurement is not within specification, adjust with the idler pulley.

11. INSTALL NO. 3 TIMING BELT COVER

12. INSTALL OIL FILLER CAP AND CYLINDER HEAD COVER OF EXHAUST SIDE

13. INSTALL AIR INTAKE CONNECTOR

14. INSTALL NO.2 FAN SHROUD

15. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

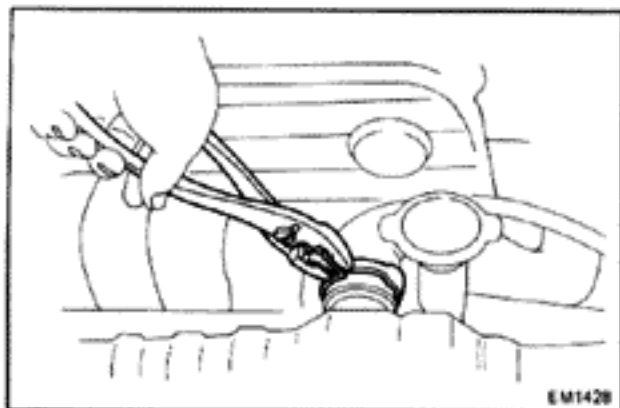
REMOVAL OF TIMING BELT

(See page EM-7)

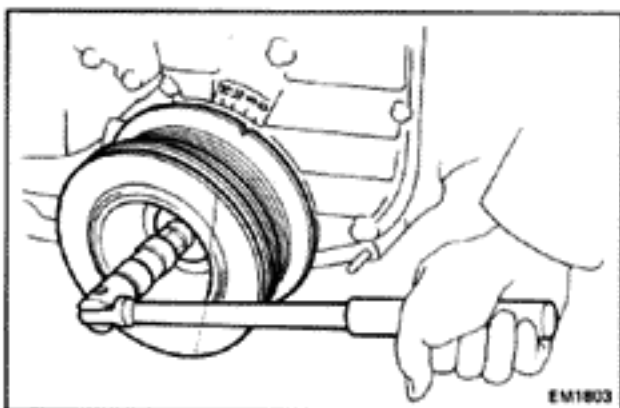
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN COOLANT

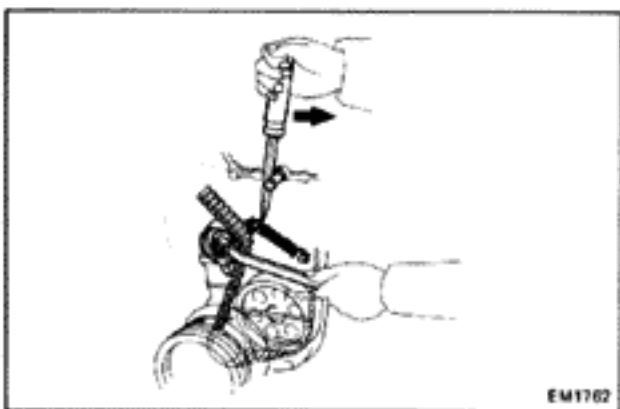
3. REMOVE AIR CLEANER CASE



4. REMOVE RADIATOR UPPER HOSE
5. LOOSEN DRIVE BELTS
6. REMOVE FLUID COUPLING WITH FAN SHROUD
7. REMOVE DRIVE BELTS
8. REMOVE AIR INTAKE CONNECTOR

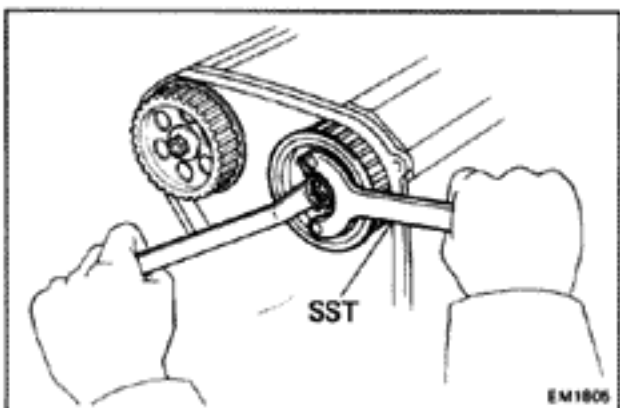


9. SET NO. 1 CYLINDER TO TDC/COMPRESSION
10. REMOVE NO. 3 TIMING BELT COVER
Remove the five bolts and remove the cover and gasket.



11. RELIEVE TIMING BELT TENSION
 - (a) Loosen the idler pulley set bolt a little and shift the idler pulley to the alternator side with a screwdriver and wrench.
 - (b) Finger tighten the set bolt and then relieve the timing belt tension.

12. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEYS



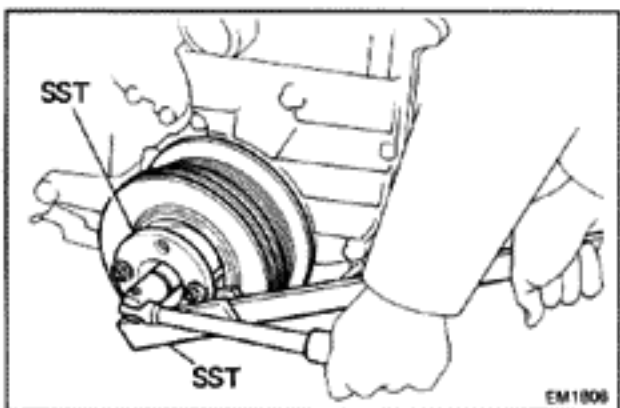
13. REMOVE CAMSHAFT TIMING PULLEYS

Using SST to hold the pulley, remove the pulley set bolt, timing pulley, and match pin.

SST 09278-54012

CAUTION: Do not make use of the timing belt tension when removing and installing the pulley set bolts.

NOTE: The exhaust and intake sides each use a different type of pulley — they are not interchangeable.

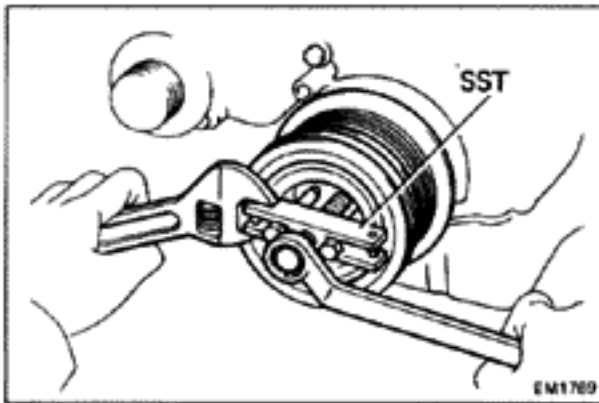


14. REMOVE CRANKSHAFT PULLEY

- (a) Using SST to hold the crankshaft pulley, loosen the pulley bolt.

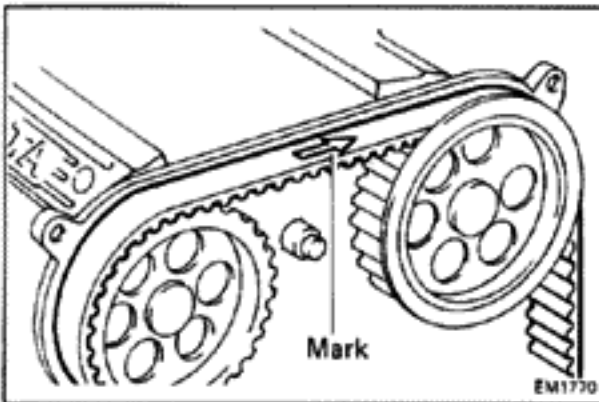
SST 09213-70010 and 09330-00021

- (b) Remove the SST and pulley bolt.



- (c) Using SST, remove the pulley.
SST 09213-31021

15. REMOVE BRACKET OF COOLER COMPRESSOR

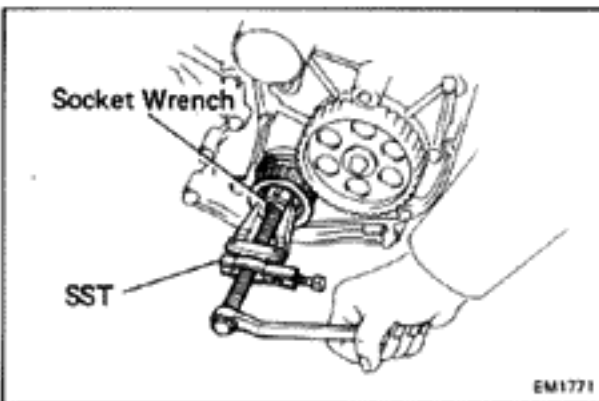


16. REMOVE NO. 1 TIMING BELT COVER AND TIMING BELT

- (a) Using chalk, place a rotation direction mark on the timing belt.

NOTE: Install the timing belt in the same direction when reassembling.

- (b) Remove the No. 1 timing belt cover.
(c) Remove the timing belt.

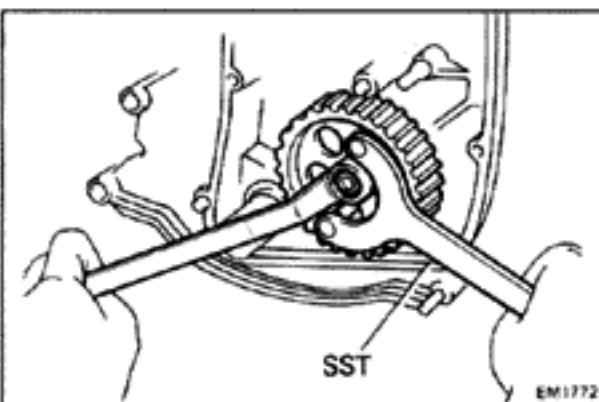


17. REMOVE IDLER PULLEY AND TENSION SPRING

18. REMOVE CRANKSHAFT TIMING PULLEY

Using SST and socket wrench, remove the crankshaft timing pulley.

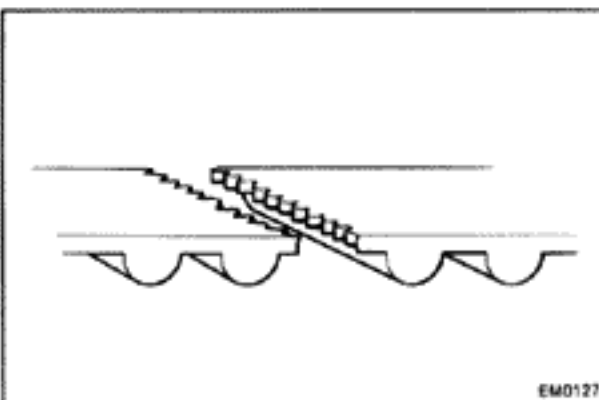
SST 09308-10010



19. REMOVE OIL PUMP DRIVE SHAFT PULLEY

Using SST to hold the pulley, remove the set bolt and pulley.

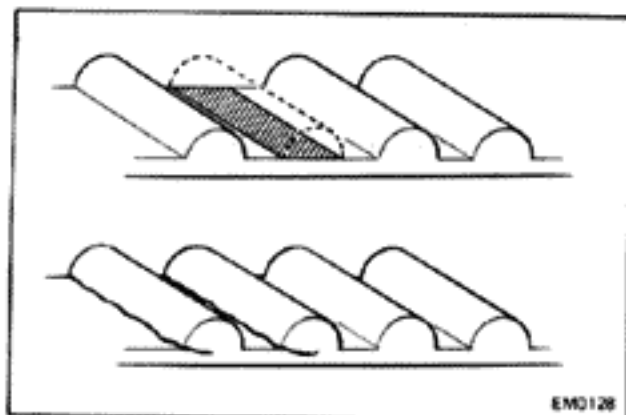
SST 09278-54012



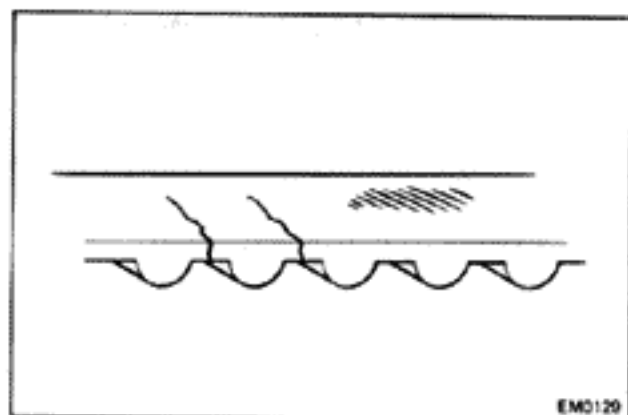
INSPECTION OF COMPONENTS

1. INSPECT TIMING BELT

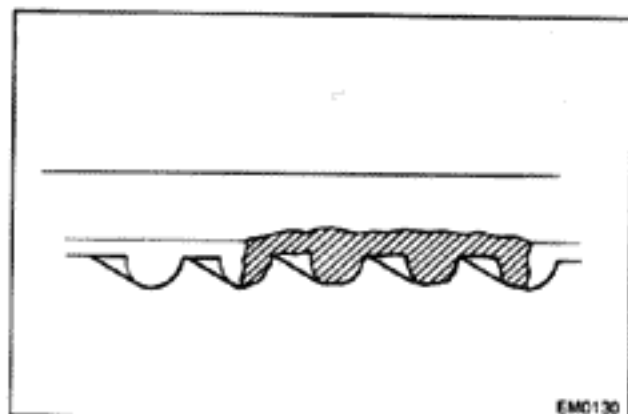
- (a) Premature parting
- Check for proper installation.
 - Check the timing belt cover gasket for damage, and check the installation.



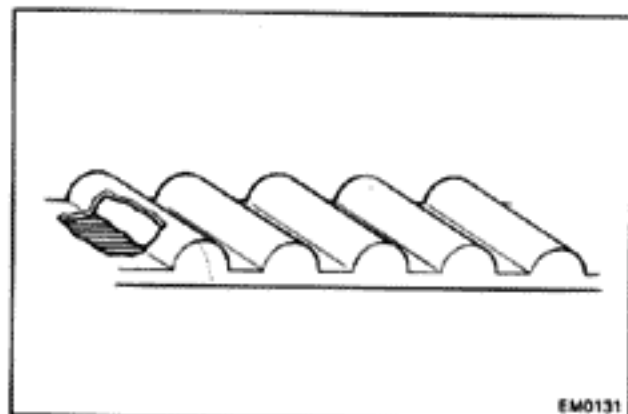
- (b) If the belt teeth are cracked or damaged, check to see if the camshaft is locked.



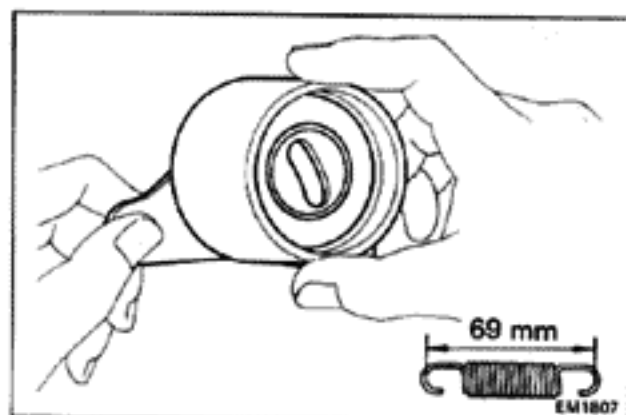
- (c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on one side of the idler pulley lock.



- (d) If there is wear or damaged on only one side of the belt, check the belt guide and the alignment of each pulley.



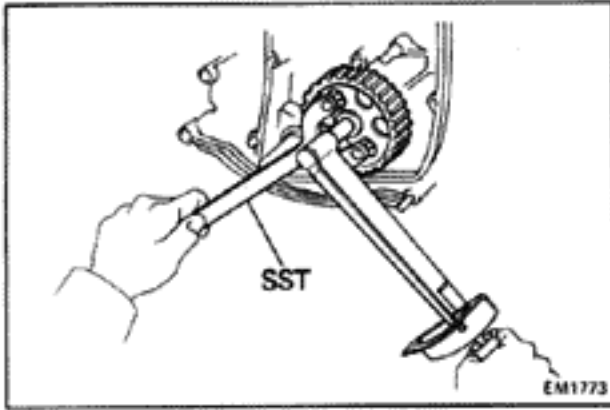
- (e) If there is noticeable wear on the belt teeth, check the timing belt cover gasket for damage and check for correct gasket installation. Check for foreign material on the pulley teeth.



2. INSPECT IDLER PULLEY AND TENSION SPRING

- (a) Check the turning smoothness of the timing belt idler pulley.
- (b) Check the free length of the tension spring. If not as specified, use a new one.

Free length: 69 mm (2.72 in.)



INSTALLATION OF TIMING BELT

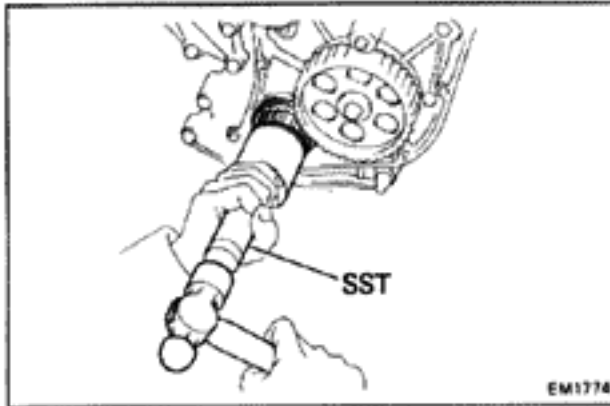
(See page EM-7)

1. INSTALL OIL PUMP DRIVE PULLEY

Using SST to hold the pulley, install and torque the pulley bolt.

SST 09278-54012

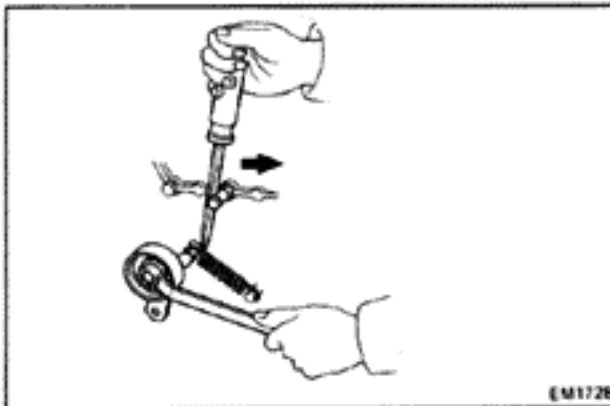
Torque: 220 kg-cm (16 ft-lb, 22 N·m)



2. INSTALL CRANKSHAFT TIMING PULLEY

Using SST and hammer, drive in the pulley.

SST 09214-60010



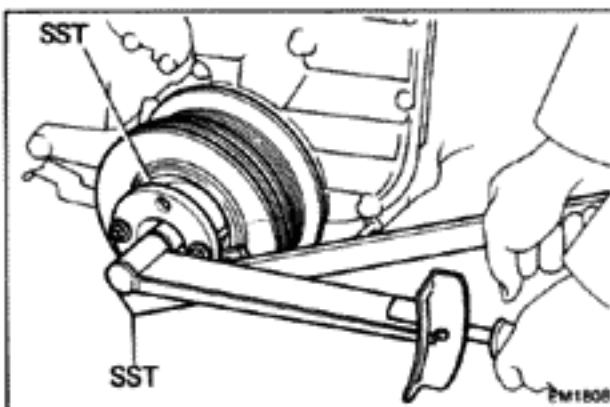
3. TEMPORARILY INSTALL IDLER PULLEY AND TENSION SPRING

Push the idler pulley toward the alternator side as far as it will go and temporarily tighten it.

4. TEMPORARILY INSTALL TIMING BELT ON CRANKSHAFT TIMING PULLEY

(a) Check the rotation direction mark placed on the timing belt during disassembly.

(b) Install the timing belt on the crankshaft timing pulley.



5. INSTALL NO. 1 TIMING BELT COVER

6. INSTALL BRACKET OF COOLER COMPRESSOR

7. INSTALL CRANKSHAFT PULLEY

(a) Install the crankshaft pulley and pulley bolt.

(b) Using SST to hold the crankshaft pulley, torque the pulley bolt.

SST 09213-70010 and 09330-00021

Torque: 2,200 kg-cm (159 ft-lb, 216 N·m)

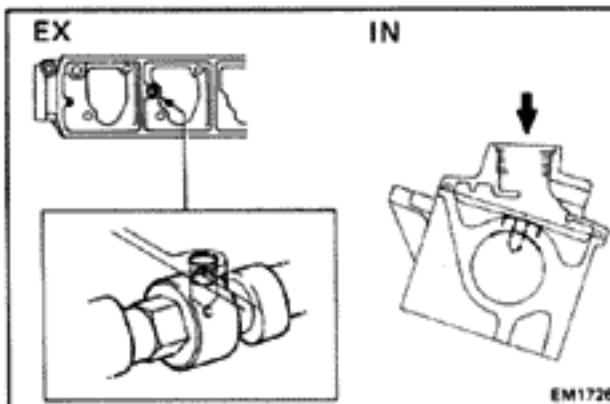
8. REMOVE OIL FILLER CAP AND CYLINDER HEAD COVER OF EXHAUST SIDE

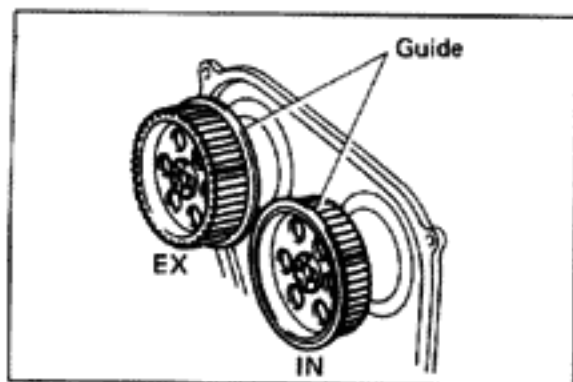
9. INSTALL CAMSHAFT TIMING PULLEY AND TIMING BELT

(a) Make sure that the match hole on the No. 2 journal of the camshaft housing is aligned with that of the camshaft.

If not aligned, temporarily install the camshaft timing pulley and insert the match pin into the pin hole.

Then, align the match holes by turning the camshaft timing pulley.

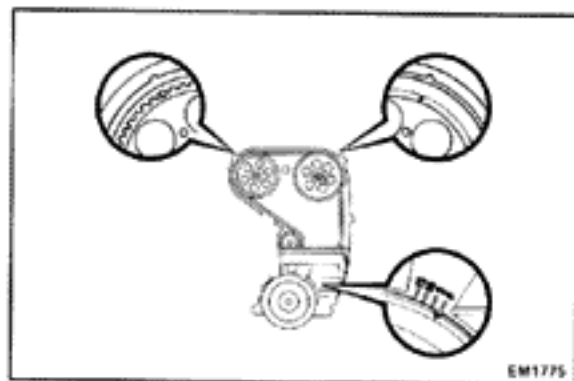




- (b) Install the camshaft timing pulleys with the guides facing the directions indicated below.

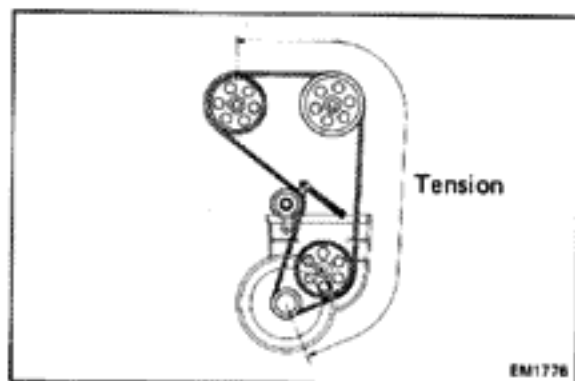
EX side With the pulley guide facing the No. 2 timing belt cover side

IN side With the pulley guide facing the front side



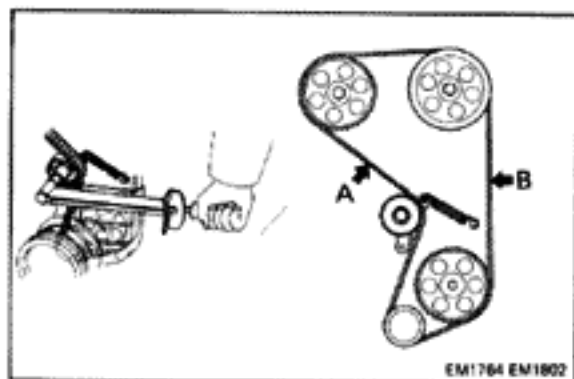
- (c) Align the matchmarks of the No. 2 timing belt cover with those of the camshaft timing pulleys and of the crankshaft pulley.

NOTE: Make sure that the No. 1 cylinder is set to TDC/compression.



- (d) Install the timing belt with the belt having proper tension between the crankshaft timing pulley and the camshaft timing pulley on the exhaust side.

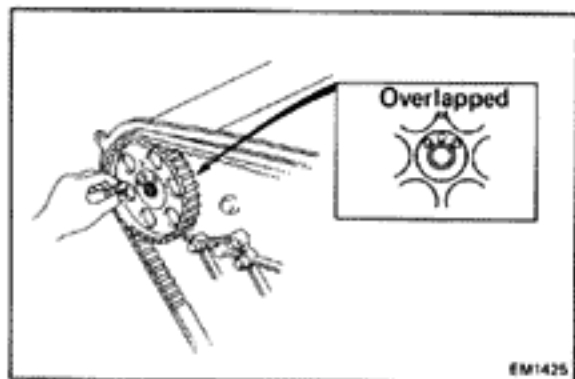
NOTE: Install the timing belt while the engine is cold.



- (e) Loosen the idler pulley set bolt and stretch the timing belt. Torque the idler pulley set bolt.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

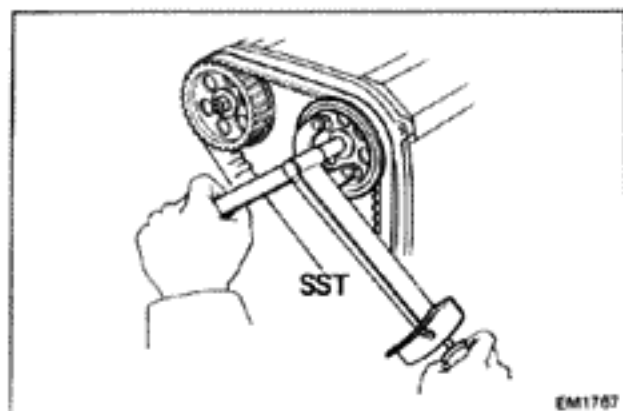
NOTE: Make sure that the timing belt tension at A is equal to that at B.



- (f) There are three pin holes on the camshaft and timing pulleys. Select one overlapped hole and insert the pin into it.

NOTE:

- If there is no overlapping hole, find one that is nearly overlapped and rotate the crankshaft slightly to overlap it and insert the pin.
- The crankshaft pulley angle can be adjusted approximately 3° by changing the pin hole to the next one.



(g) Using SST to hold the pulley, install the bolt.
SST 09278-54012

Torque: 700 kg-cm (51 ft-lb, 69 N-m)

CAUTION: Do not make use of the timing belt tension when tightening the bolt.

- (h) Loosen the idler pulley set bolt.
- (i) Turn the crankshaft clockwise two times.
- (j) Retighten the idler pulley set bolt.

10. CHECK TIMING MARKS

- (a) Rotate the crankshaft two times clockwise.
- (b) Check the timing marks. (Refer to the section of INSPECTION AND ADJUSTMENT OF VALVE TIMING —See page EM-7)

11. CHECK TIMING BELT TENSION (See step 10 on page EM-11)

12. INSTALL CYLINDER HEAD COVER AND GASKET ON EXHAUST SIDE

13. INSTALL OIL FILLER CAP

14. INSTALL NO. 3 TIMING BELT COVER AND GASKET

15. INSTALL FLUID COUPLING WITH FAN SHROUD

16. INSTALL RADIATOR UPPER HOSE

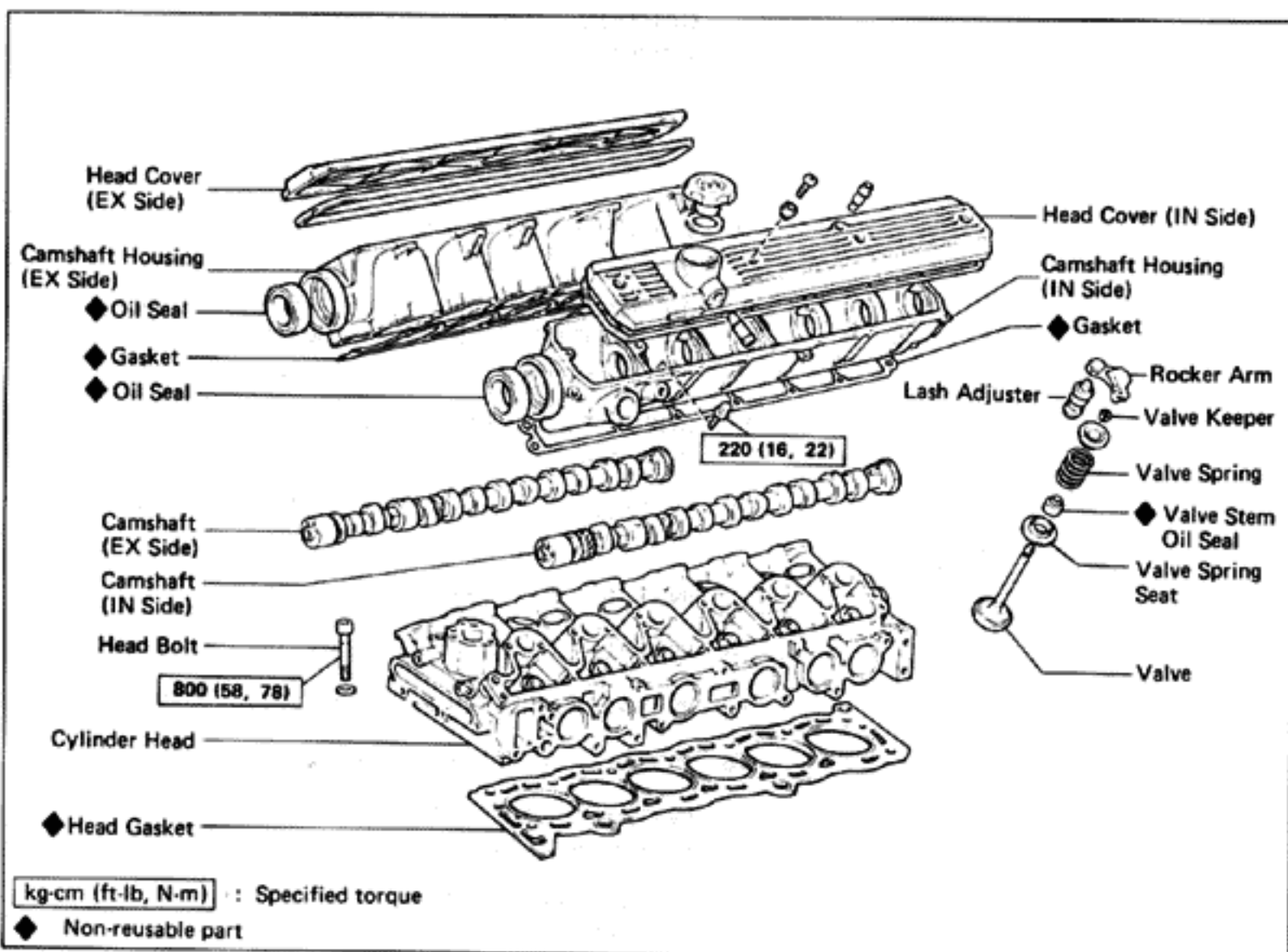
17. INSTALL DRIVE BELTS (See page MA-4)

18. INSTALL AIR CLEANER CASE WITH AIR INTAKE CONNECTOR

19. FILL WITH COOLANT

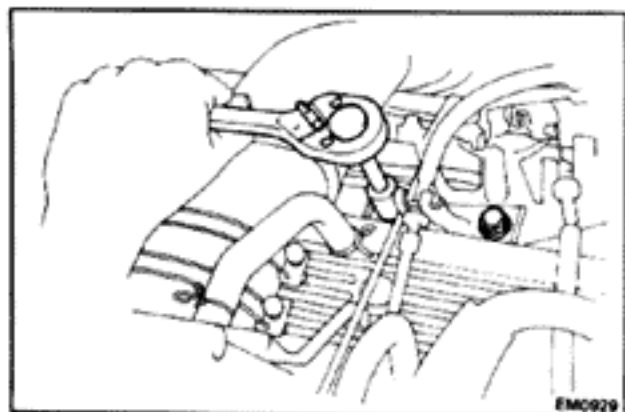
20. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

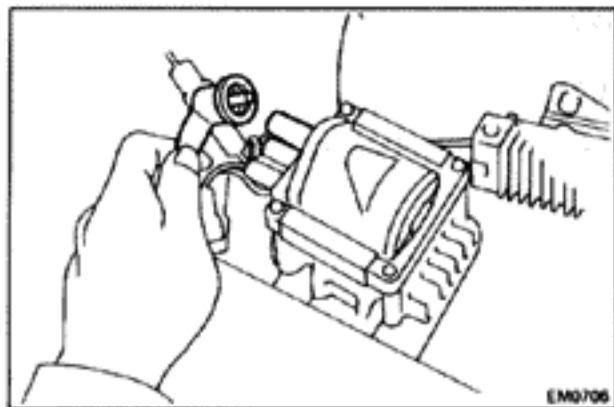
CYLINDER HEAD COMPONENTS



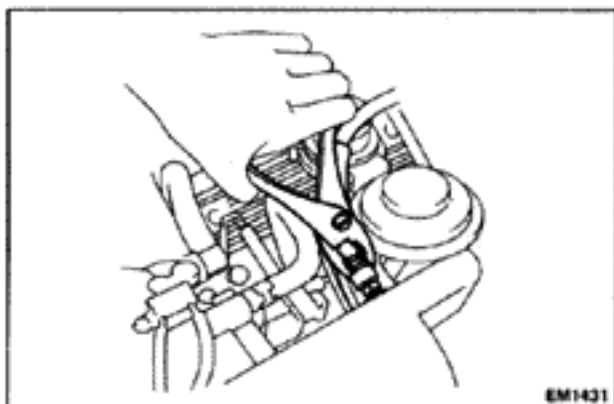
PREPARATION FOR REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN COOLANT
3. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD
4. REMOVE THROTTLE CABLE BRACKET FROM CYLINDER HEAD COVER (for A/T)
5. REMOVE ACCELERATOR AND ACTUATOR CABLE BRACKET FROM CYLINDER HEAD COVER

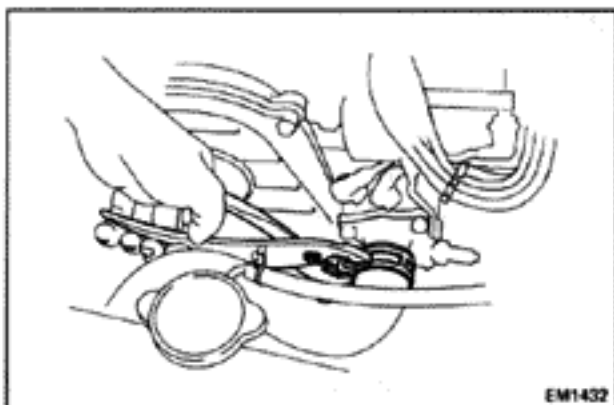
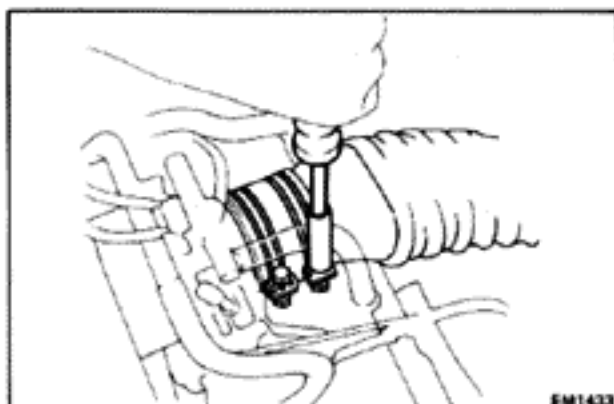


**6. DISCONNECT FOLLOWING WIRES AND CABLES:**

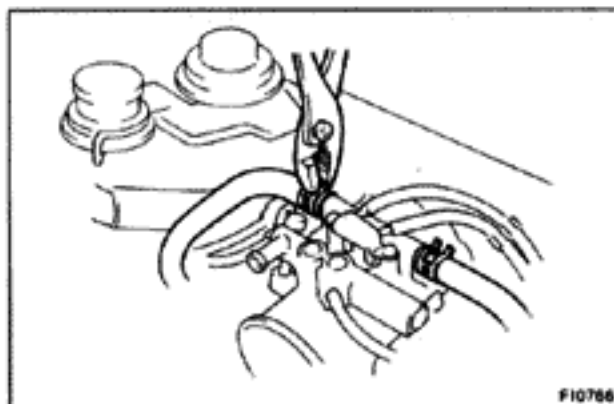
- (a) Ground strap from the cylinder head
- (b) Oxygen sensor wire
- (c) High-tension cord from the ignition coil
- (d) Distributor connector
- (e) Temp. switch wire (for A/T)
- (f) Solenoid resistor wire connector
- (g) Knock sensor wire connector

**7. DISCONNECT FOLLOWING HOSES:**

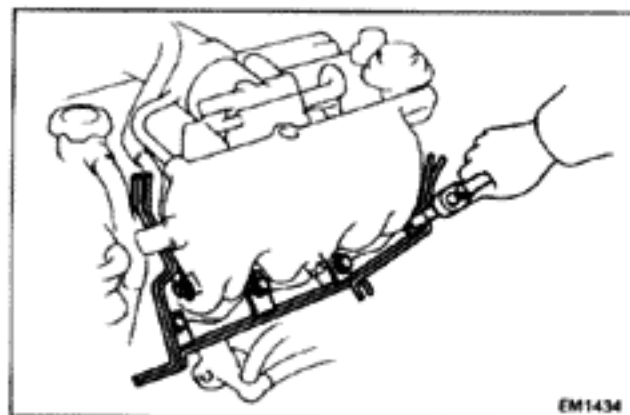
- (a) Brake booster vacuum hose
- (b) Actuator vacuum hose (with cruise control system)
- (c) Fuel hose from the intake manifold
- (d) EGR valve vacuum hose

**8. DISCONNECT RADIATOR UPPER HOSE FROM THERMOSTAT HOUSING****9. DISCONNECT TWO HEATER HOSES****REMOVAL OF CYLINDER HEAD****1. REMOVE AIR INTAKE CONNECTOR**

- (a) Disconnect the No. 1 air hose from the air intake connector.
- (b) Remove the two clamp bolts.
- (c) Loosen the throttle body hose clamp and remove the air intake connector and the connector pipe.

**2. DISCONNECT FOLLOWING HOSES:**

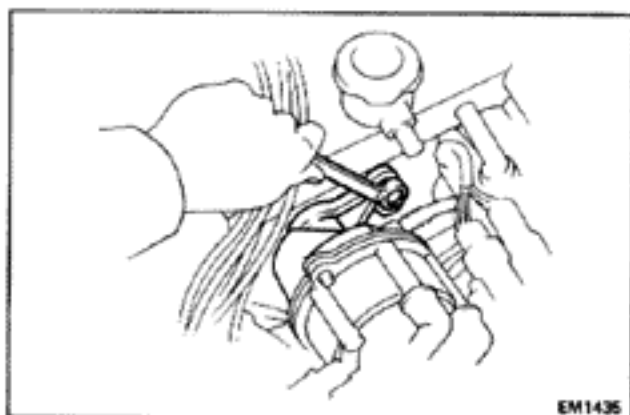
- (a) No. 1 water by-pass hose from ISC valve.
- (b) No. 2 water by-pass hose from throttle body.
- (c) Two PCV hoses from the cylinder head cover.
- (d) Fuel hose from the fuel hose support.
- (e) Label and disconnect the emission control hoses from the throttle body and air intake chamber to allow removal of the cylinder head.



3. REMOVE AIR INTAKE CHAMBER STAY

4. REMOVE VACUUM PIPE SUBASSEMBLY

Remove the bolts and remove the vacuum pipe and ground strap.



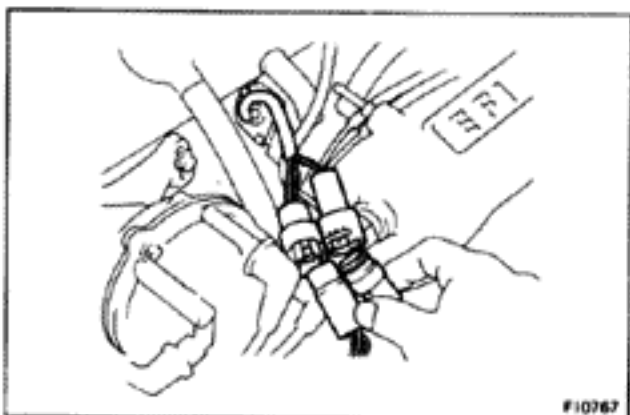
5. REMOVE DISTRIBUTOR FROM CYLINDER HEAD

- Remove the high-tension cord clip bolt, leaving the wires attached to the clips.
- Disconnect the high tension cord by pulling on the plug boot.
- Remove the distributor holding bolt.
- Remove the distributor from the cylinder head with the cap and wires.

6. REMOVE SPARK PLUGS

7. DISCONNECT FOLLOWING WIRES:

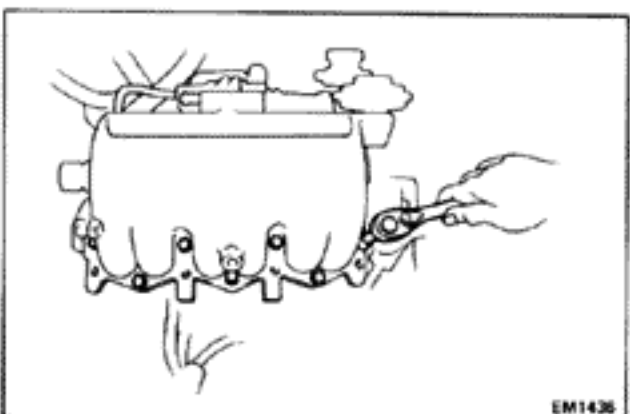
- Cold start injector wire
- Water temp. sensor wire
- Start injection time switch wire
- Water temp. sending unit wire
- Throttle position sensor wire connector
- ISC valve wire connectors



8. DISCONNECT COLD START INJECTOR FUEL HOSE FROM DELIVERY PIPE

9. REMOVE AIR INTAKE CHAMBER

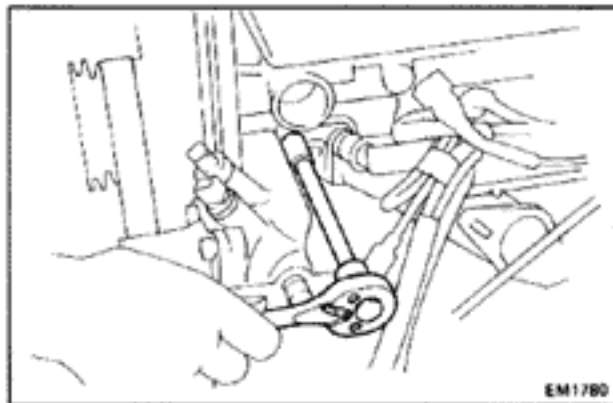
- Remove the five bolts and two nuts.
- Loosen the nut of the EGR pipe.
- Remove the air intake chamber and gasket.



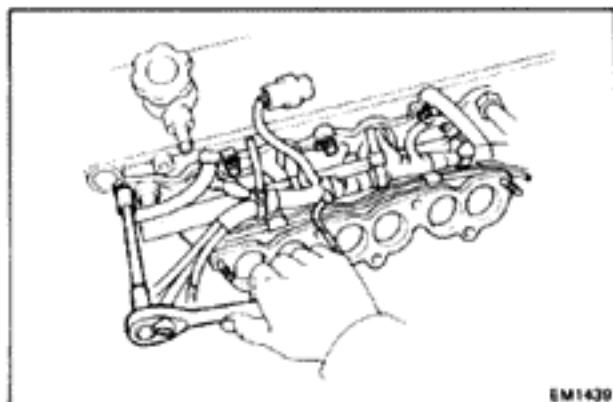
10. DISCONNECT EFI WIRE HARNESS FROM ECU

- Remove the glove box.
- Remove the ECU.
- Disconnect the three connectors.
- Pull out the EFI wire harness out through the cowl panel.



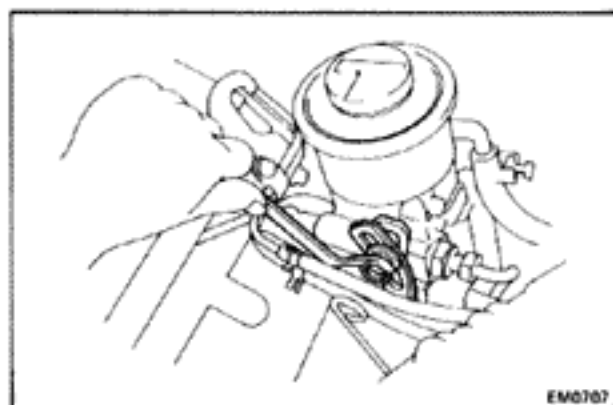


- 11. REMOVE PULSATION DAMPER AND NO. 1 FUEL PIPE**
- 12. REMOVE WATER OUTLET HOUSING**
 - (a) Loosen the clamp and disconnect the water by-pass hose.
 - (b) Remove the two bolts and remove the outlet housing.

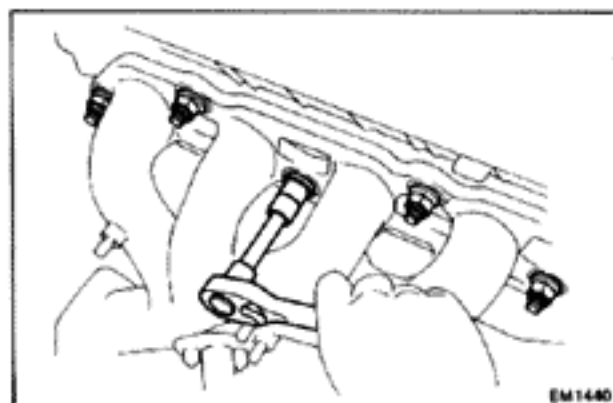


- 13. REMOVE INTAKE MANIFOLD**

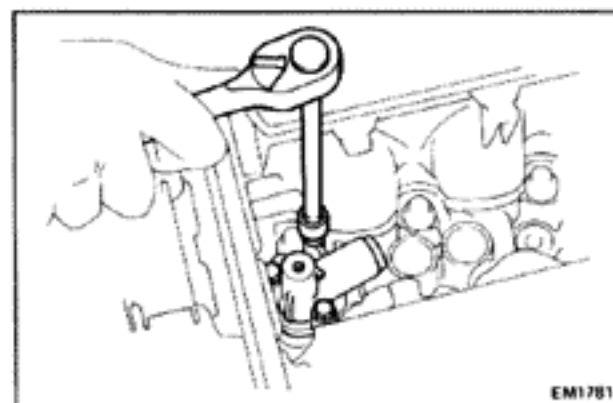
Remove the eight bolts and two nuts holding the intake manifold and remove the intake manifold and gasket.



- 14. REMOVE POWER STEERING PUMP FROM BRACKET**
 - (a) Remove the PS pump pulley with the drive belt.
 - (b) Remove the PS pump stay.
 - (c) Remove the PS pump from the bracket.
 - (d) Lay the PS pump to one side without disconnecting the hoses.

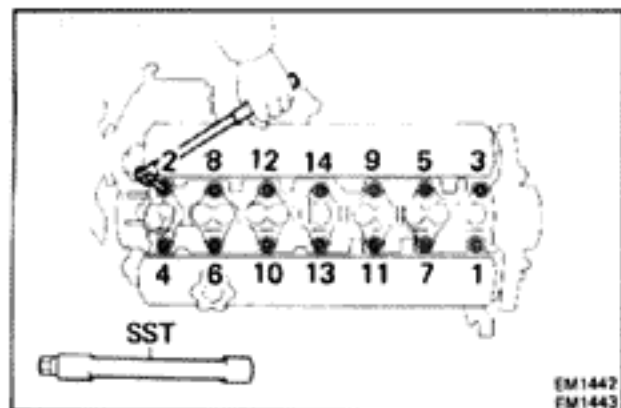


- 15. REMOVE EXHAUST MANIFOLD**
 - (a) Remove the five nuts and the two heat insulators.
 - (b) Remove seven nuts and the exhaust manifold.
- 16. REMOVE TIMING BELT AND CAMSHAFT TIMING PULLEYS (See steps 9 to 13 on page EM-12)**



- 17. REMOVE OIL PRESSURE REGULATOR**
 - (a) Remove the two bolts and the timing belt cover stay.
 - (b) Remove the three bolts and the oil pressure regulator and gasket.
- 18. REMOVE NO. 2 TIMING BELT COVER**

Remove the three bolts and two nuts and the No. 2 timing belt cover and gasket.

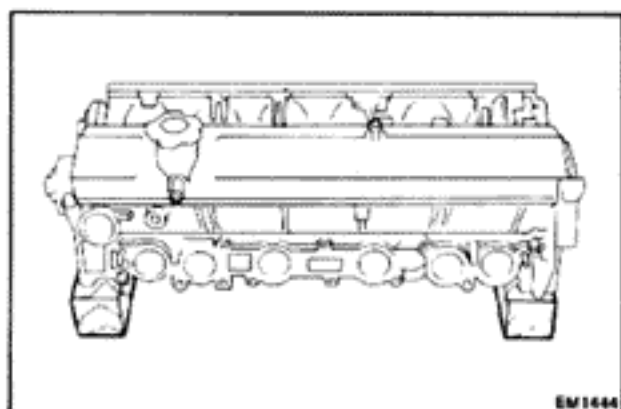


19. REMOVE CYLINDER HEAD BOLTS

Using SST, remove the fourteen head bolts gradually in two or three passes and in the numerical order shown.

SST 09043-38100

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



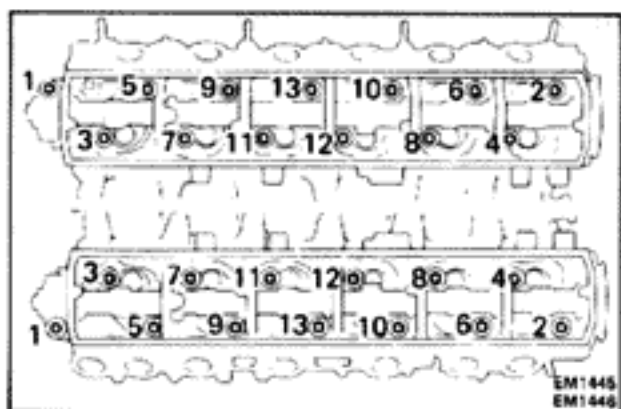
20. REMOVE CYLINDER HEAD

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 head and block saliences.

CAUTION: Be careful not to damage the cylinder head and block surfaces on the cylinder head gasket side.

21. REMOVE EGR COOLER



DISASSEMBLY OF CYLINDER HEAD

(See page EM-18)

1. REMOVE CYLINDER HEAD COVERS

Remove the two cylinder head covers by loosening the screws.

2. REMOVE NO. 1 AND NO. 2 CAMSHAFT HOUSINGS WITH CAMSHAFT

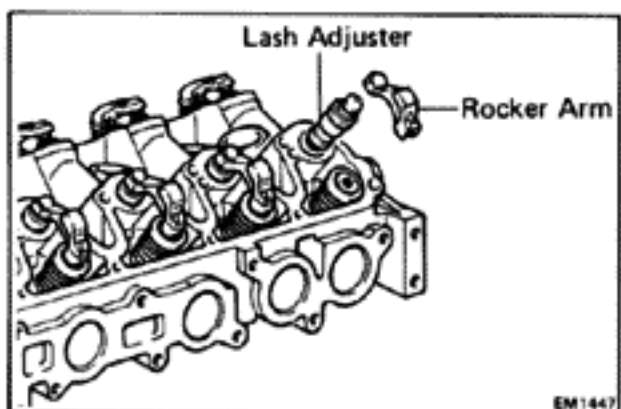
Remove No. 1 and No. 2 camshaft housings by loosening the nuts (front side) and bolts.

CAUTION: Loosen each camshaft housing nut and bolt a little at a time in the sequence shown in the figure.

3. REMOVE ROCKER ARMS AND LASH ADJUSTERS

Remove the rocker arms and lash adjusters from the cylinder head.

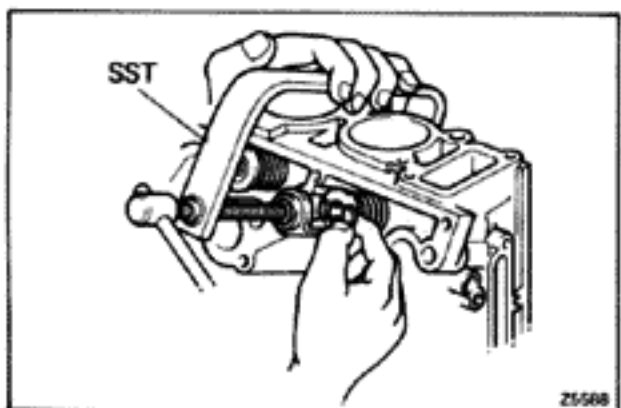
NOTE: Arrange the rocker arms and lash adjusters in order.

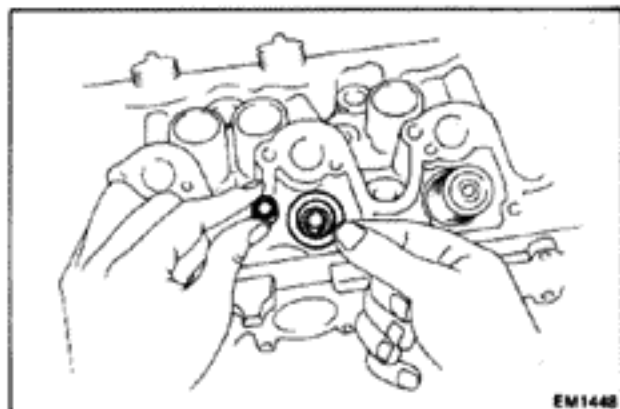


4. REMOVE VALVES

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

SST 09202-43013

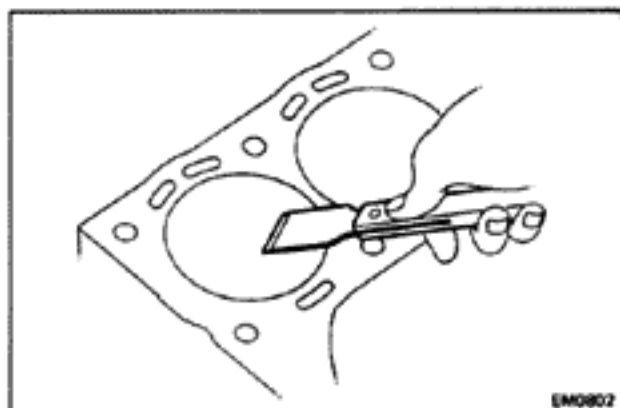




- (b) Remove the valve keepers, retainers, springs and valves.

NOTE: Keep valves in order for reinstallation in the same manner.

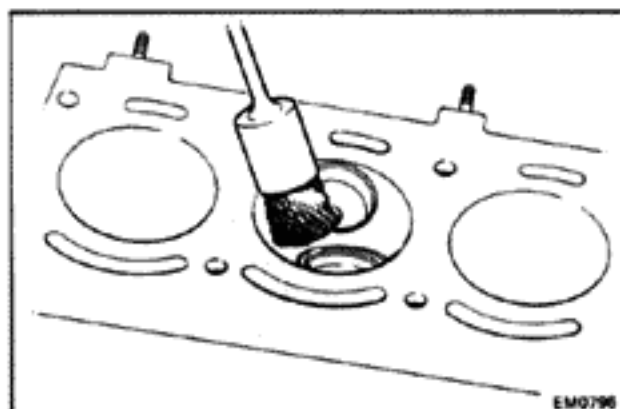
- (c) Remove the valve stem oil seals.
- (d) Using a small screwdriver or magnet, remove the valve spring seats.



INSPECTION AND CLEANING OF COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF BLOCK

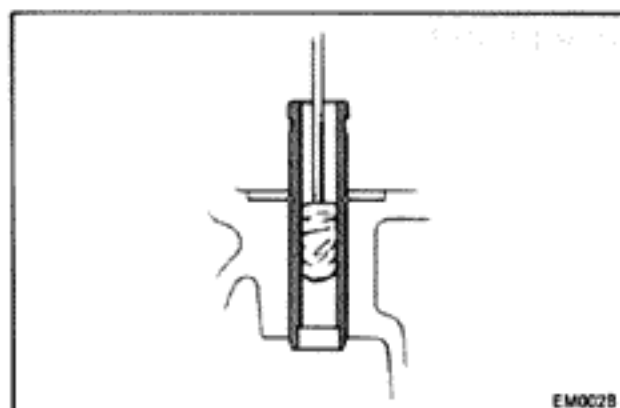
- (a) Turn the crankshaft and bring each piston to top dead center. Scrape the carbon from the piston top.
- (b) Remove all gasket material from the top of the block. Blow carbon and oil from the bolt holes.



2. CLEAN COMBUSTION CHAMBERS

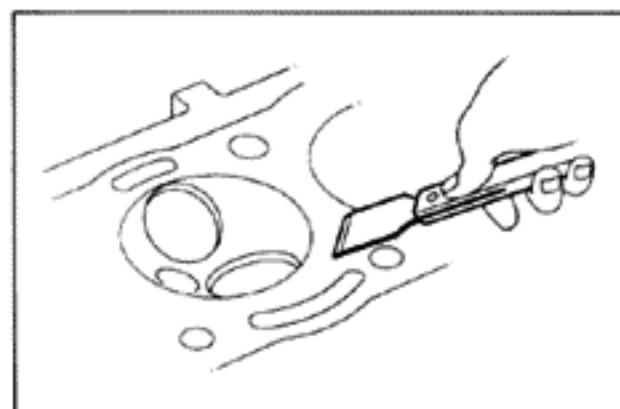
Using a wire brush, remove all the carbon from the combustion chambers.

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



3. CLEAN VALVE GUIDES

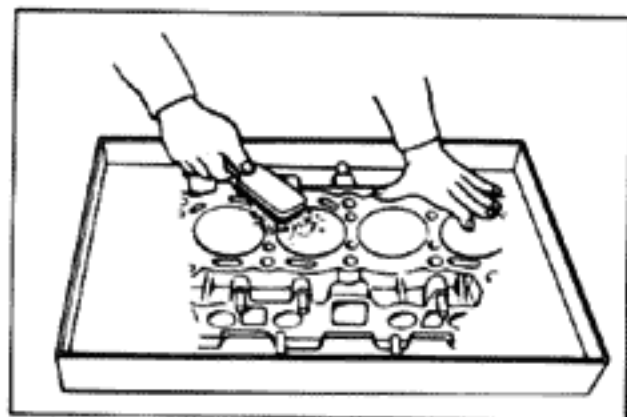
Using a valve guide brush and solvent, clean all the valve guides.



4. REMOVE GASKET MATERIAL

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

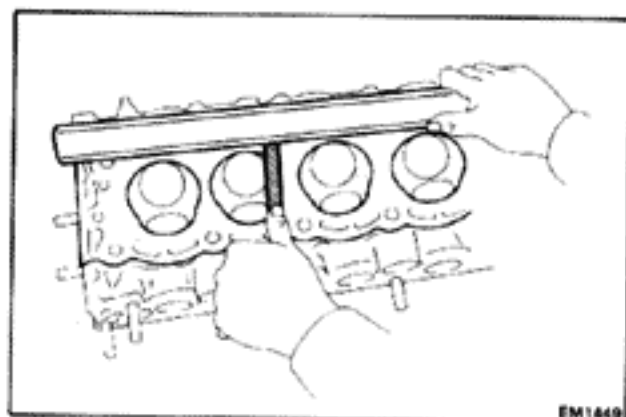
CAUTION: Do not scratch the surface.



5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, clean the head.

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



6. CHECK HEAD FOR FLATNESS

(a) Using a precision straight edge and feeler gauge, check that neither the head nor manifold surface is warped.

(b) Measure warpage at the four sides and diagonally as illustrated.

Maximum head surface warpage:

0.10 mm (0.0039 in.)

Maximum intake manifold surface warpage:

0.10 mm (0.0039 in.)

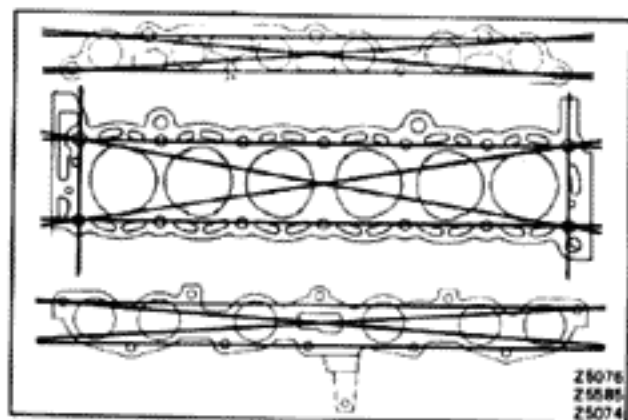
Maximum exhaust manifold surface warpage:

0.10 mm (0.0039 in.)

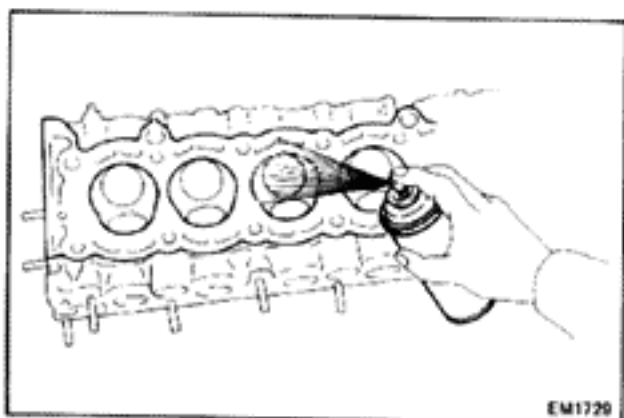
Maximum camshaft housing surface warpage:

0.10 mm (0.0039 in.)

If warpage is greater than specified value, replace the head.



Z5076
Z5085
Z5074



EM1729

7. INSPECT CYLINDER HEAD FOR CRACKS

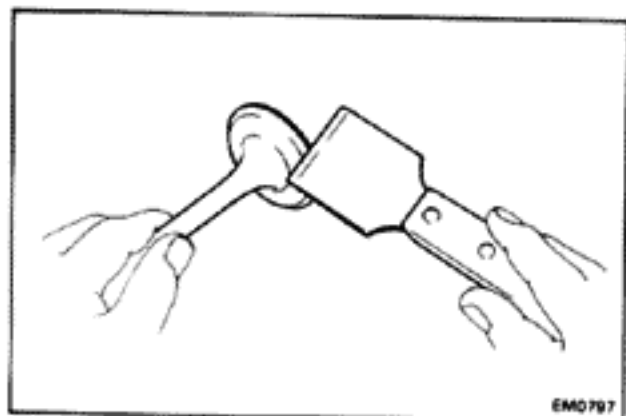
Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

If a crack is found, replace the head.

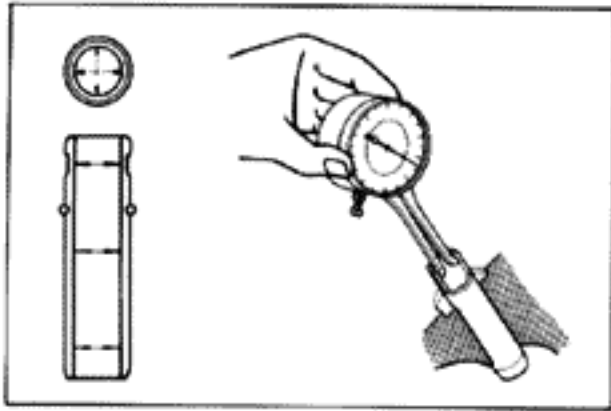
8. CLEAN VALVES

Use a gasket scraper to chip any carbon from the valve head.

Using a wire brush, clean the valve thoroughly.



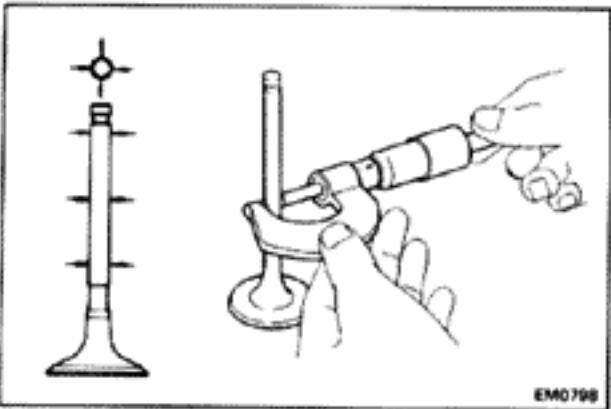
EM0797



9. INSPECT VALVE STEM GUIDE WEAR

- (a) Using a dial indicator or telescoping gauge, measure the inside diameter of the valve guide.

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



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

Standard valve stem diameter:

Intake 7.970 – 7.985 mm
(0.3138 – 0.3144 in.)

Exhaust 7.965 – 7.980 mm
(0.3136 – 0.3142 in.)

- (c) Subtract the valve stem measurement from the valve guide measurement.

Standard oil clearance:

Intake 0.025 – 0.060 mm
(0.0010 – 0.0024 in.)

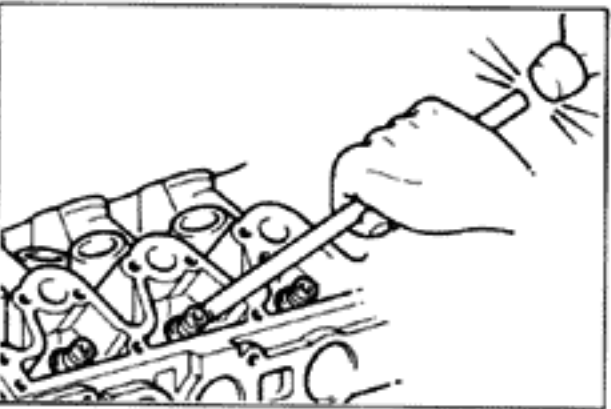
Exhaust 0.030 – 0.065 mm
(0.0012 – 0.0026 in.)

Maximum oil clearance:

Intake 0.08 mm (0.0031 in.)

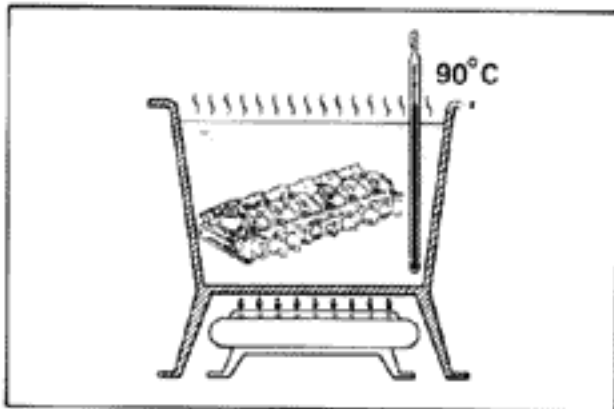
Exhaust 0.10 mm (0.0039 in.)

If the clearance is greater than following values, replace the valve and guide:

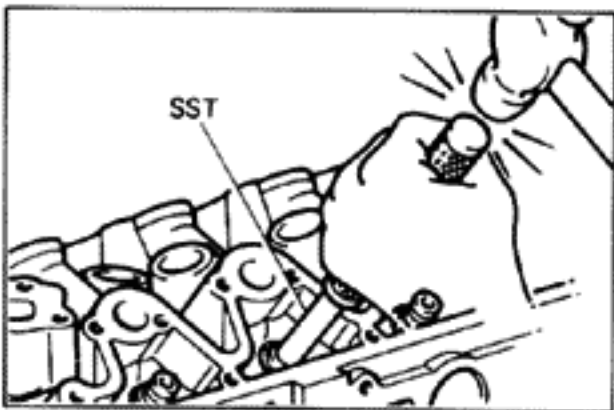


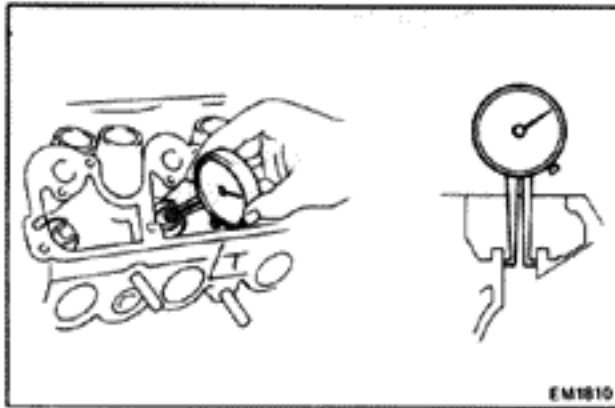
10. IF NECESSARY, REPLACE VALVE GUIDE

- (a) Brake the valve guide using a brass bar and hammer.
(b) Heat the cylinder head to approx. 90°C (194°F).



- (c) Using SST and a hammer, drive out the valve guide.
SST 09201-60011





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

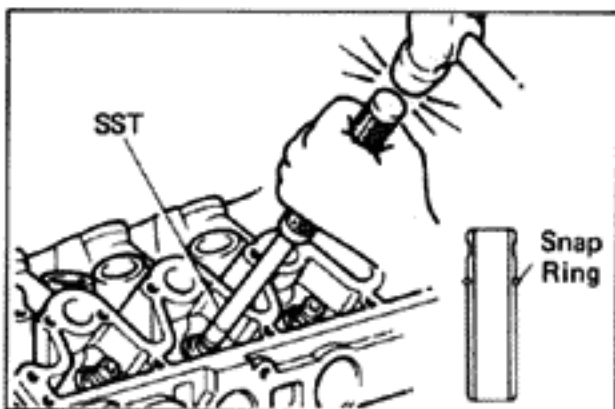
Both intake and exhaust

Guide bore mm (in.)	Guide 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.

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

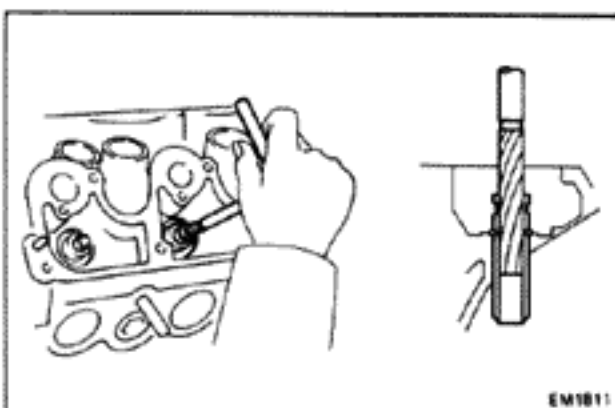
Rebored valve guide bushing bore dimension (cold):
13.05-13.077 mm (0.5138-0.5148 in.)



- (f) Heat the cylinder head to about 90°C (194°F).

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

SST 09201-60011



- (h) Using a sharp 8-mm reamer, ream the valve guide to obtain specified clearance between the guide and new valve.

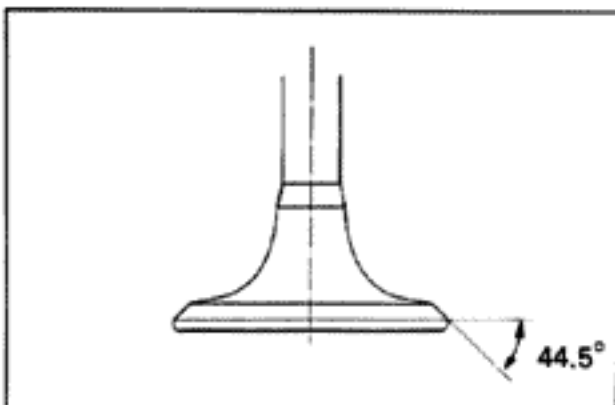
Standard oil clearance:

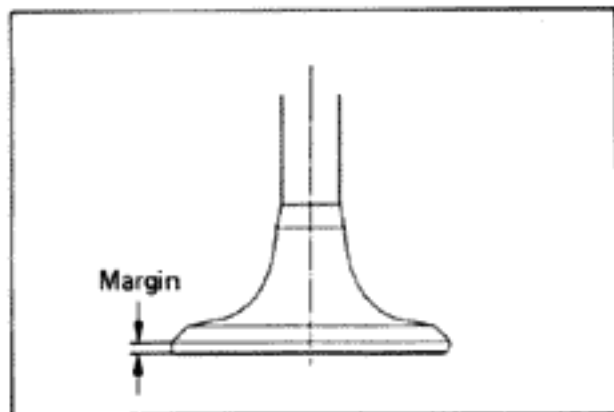
Intake: 0.025 — 0.060 mm
(0.0010 — 0.0024 in.)
Exhaust: 0.030 — 0.065 mm
(0.0012 — 0.0026 in.)

11. INSPECT AND GRIND VALVES

- (a) Grind valves only enough to remove pits and carbon. Make sure the valves are ground at the correct valve face angle.

Valve face angle: 44.5°



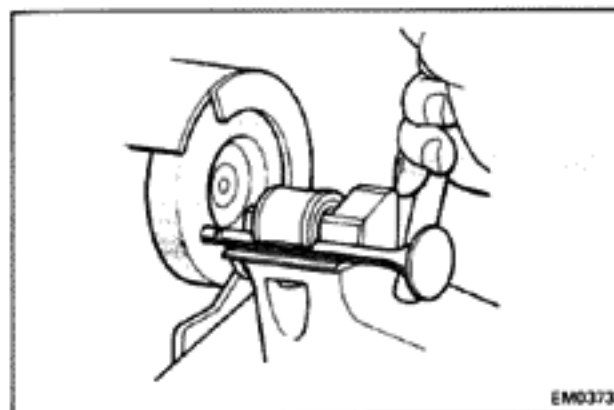


(b) Check the valve head margin.

Minimum margin: Intake 0.5 mm (0.020 in.)

Exhaust 1.0 mm (0.039 in.)

If the valve head margin is less than specified, replace the valve.



(c) Check the surface of the valve stem tip for wear.

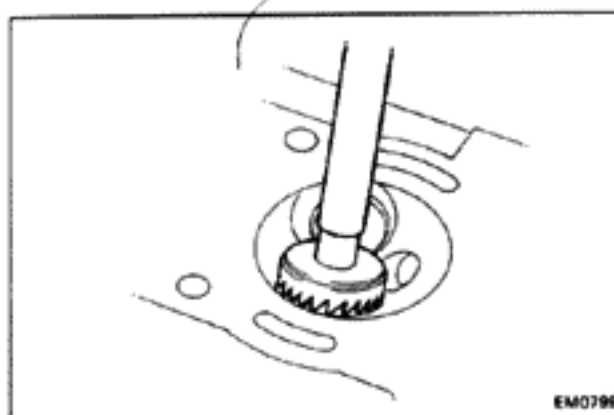
Standard overall length:

Intake 107.5 mm (4.232 in.)

Exhaust 109.7 mm (4.319 in.)

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

CAUTION: Do not grind more than 0.5 mm (0.020 in.).

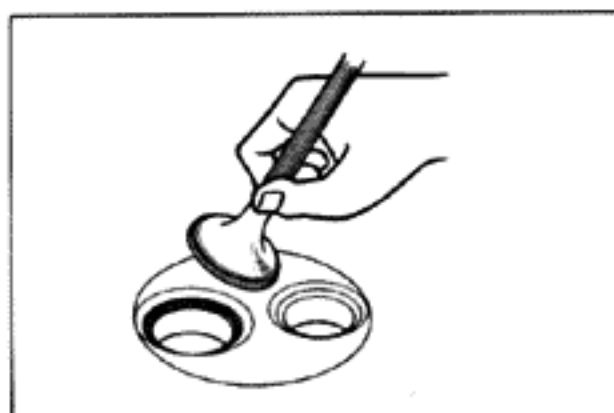


12. INSPECT AND CLEAN VALVE SEATS

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

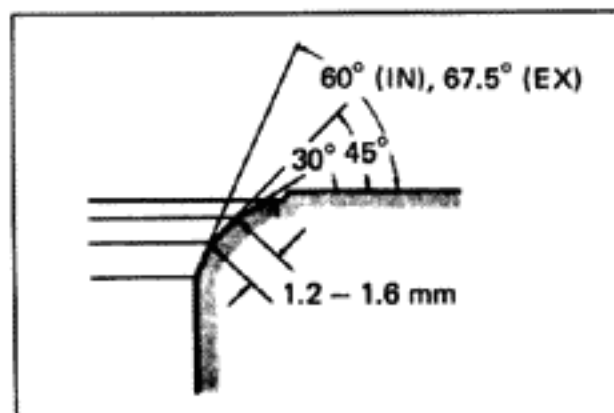
(b) Check the valve seating position.

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° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and seat are concentric. If not, resurface the seat.



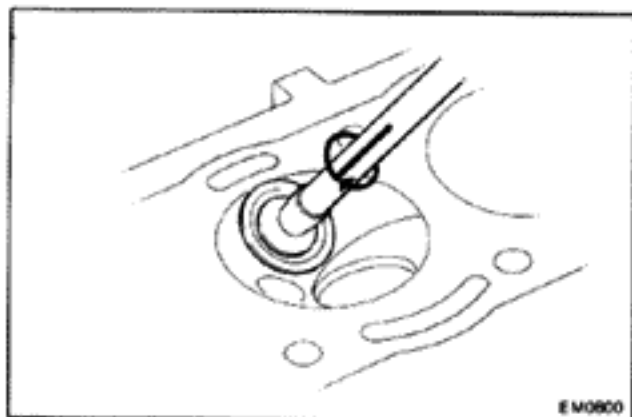
- Check that the seat contact is on the middle of the valve face with the following width:

1.2 — 1.6 mm (0.047 — 0.063 in.)

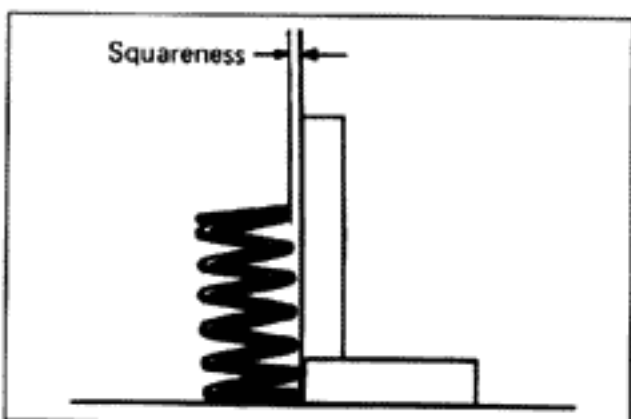
If not correct the valve seat as follows:

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

If seating is too low on the valve face, use 60° (IN) or 67.5° (EX) and 45° cutters to correct the seat.



- (d) Hand-lap the valve and valve seat together with abrasive compound.
- (e) Clean the valve and valve seat after hand-lapping.

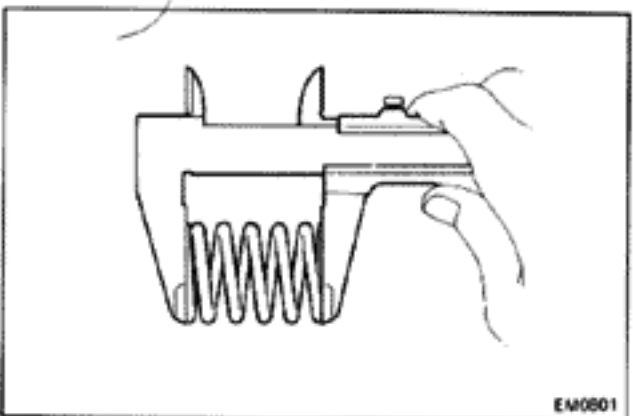


13. INSPECT VALVE SPRINGS

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

Maximum allowable: 2.0 mm (0.079 in.)

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



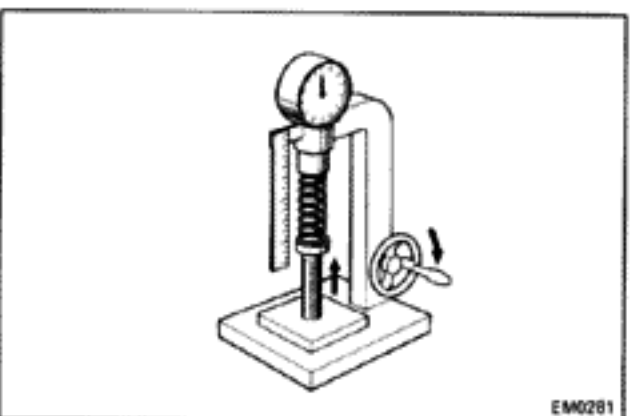
- (b) Measure the free height of all springs.

Free height:

Intake side 49.1 mm (1.933 in.)

Exhaust side 52.5 mm (2.067 in.)

Replace any spring that is not correct.



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

Installed height:

Intake side 40.0 mm (1.575 in.)

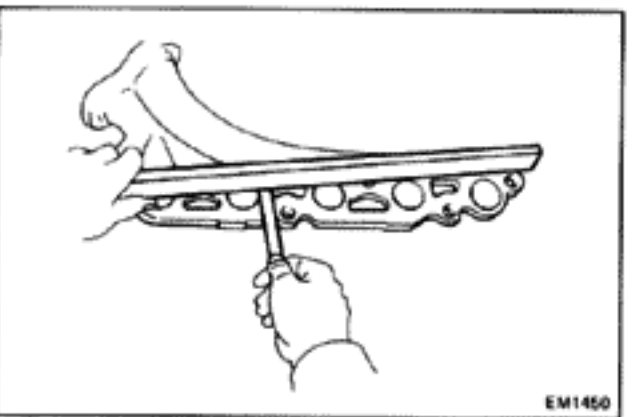
Exhaust side 43.0 mm (1.693 in.)

Installed tension:

**Intake side 34.7 — 38.3 kg
(76.5 — 84.4 lb, 340 — 376 N)**

**Exhaust side 33.3 — 36.7 kg
(73.4 — 80.9 lb, 327 — 360 N)**

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



14. INSPECT INTAKE, EXHAUST MANIFOLDS AND AIR INTAKE CHAMBER

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

Maximum intake warpage: 0.1 mm (0.004 in.)

Maximum exhaust warpage: 0.75 mm (0.0295 in.)

**Maximum air intake chamber warpage: 0.1 mm
(0.004 in.)**

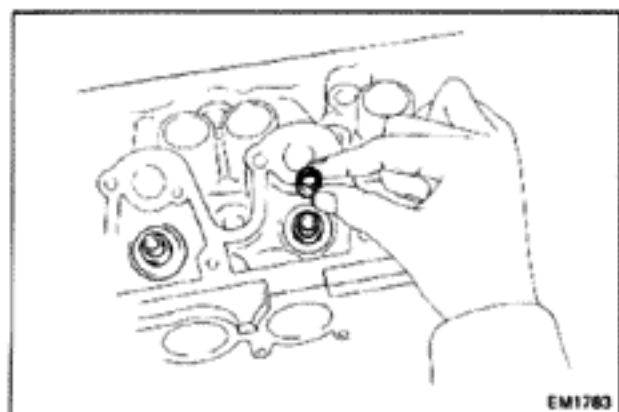
If warpage is greater than maximum, replace the manifold or air intake chamber.

ASSEMBLY OF CYLINDER HEAD

(See page EM-18)

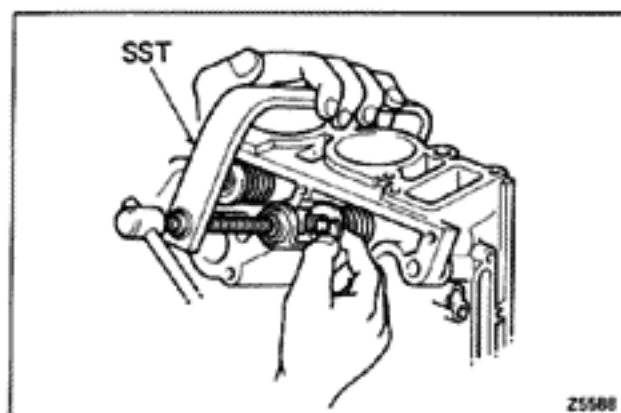
NOTE:

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



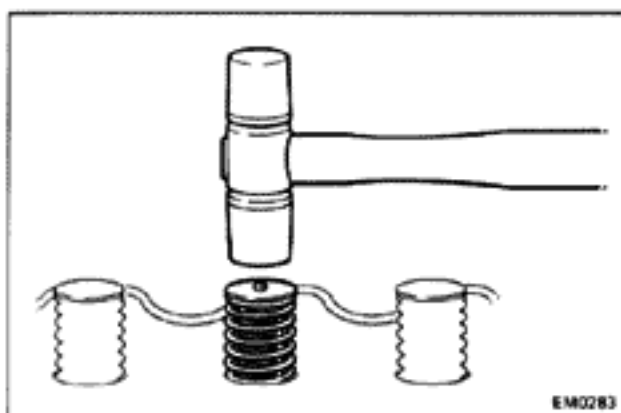
INSTALL VALVES

- Insert valves in the cylinder head valve guides. Make sure the valves are installed in the correct order.
- Install the valve spring seats and new seals.

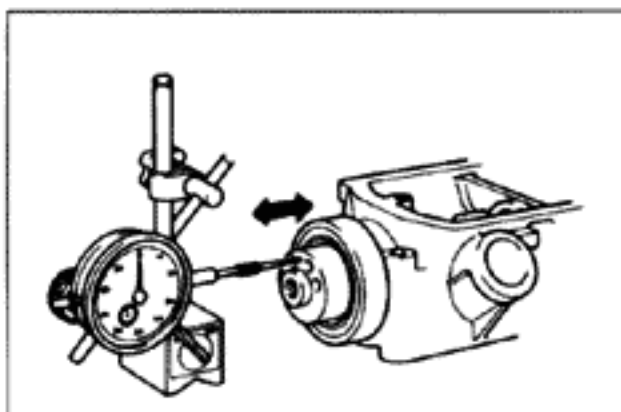


- Install springs and spring retainers on the valves.
- Using SST, compress the valve springs and place two keepers around the valve stem.

SST 09202-43013



- Tap the stem lightly to assure proper fit.



INSPECTION OF CAMSHAFT

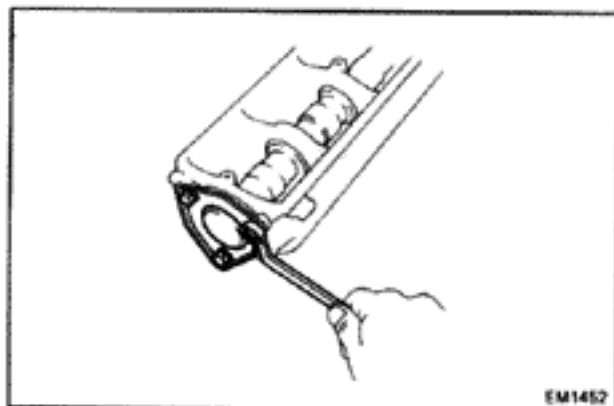
1. MEASURE CAMSHAFT THRUST CLEARANCE

Using a dial gauge, measure the camshaft thrust clearance.

Standard clearance: 0.05 – 0.25 mm
(0.0020 – 0.0098 in.)

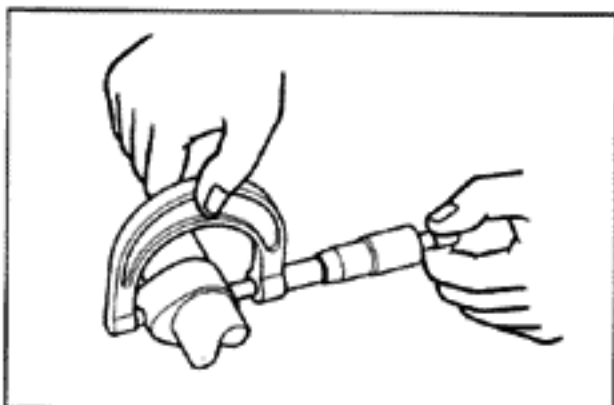
Maximum clearance: 0.30 mm (0.0118 in.)

If clearance is greater than maximum, replace the camshaft and/or camshaft housing.



2. REMOVE CAMSHAFTS FROM CAMSHAFT HOUSINGS

- (a) Remove camshaft housing rear covers by loosening the bolts.
- (b) While turning the camshaft, slowly pull it out so as not to damage the camshaft housing.



3. INSPECT CAMSHAFTS AND CAMSHAFT HOUSINGS

- (a) Using a micrometer, measure the cam lobes.

Standard lobe height

Intake 35.660 — 35.670 mm (1.4039 — 1.4043 in.)

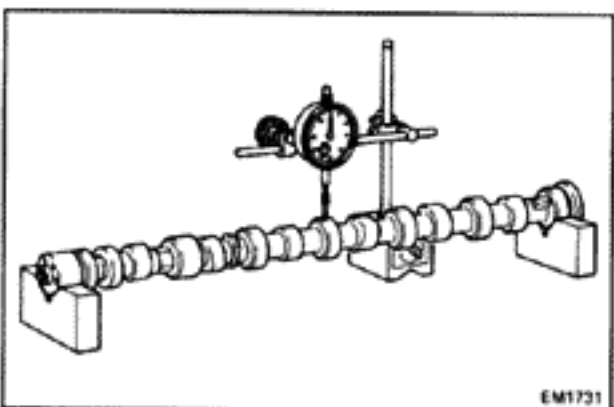
Exhaust 35.662 — 35.672 mm (1.4040 — 1.4044 in.)

Minimum lobe height

Intake 35.465 mm (1.3963 in.)

Exhaust 35.467 mm (1.3963 in.)

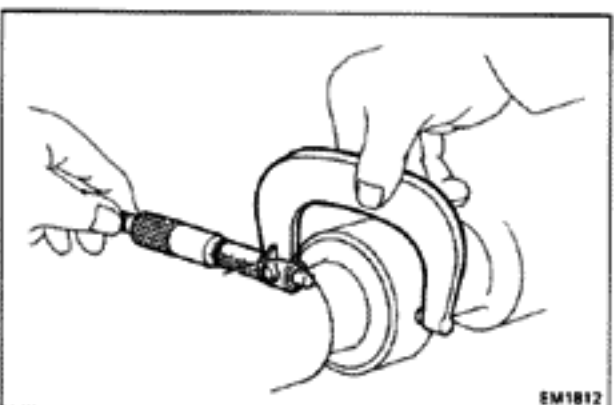
If the lobe height is less than the minimum allowable, the camshaft is worn and must be replaced.



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

Maximum circle runout: 0.04 mm (0.0016 in.)

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



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

Standard journal diameter:

No. 1 37.959 — 37.975 mm (1.4944 — 1.4951 in.)

No. 2 42.959 — 42.975 mm (1.6913 — 1.6919 in.)

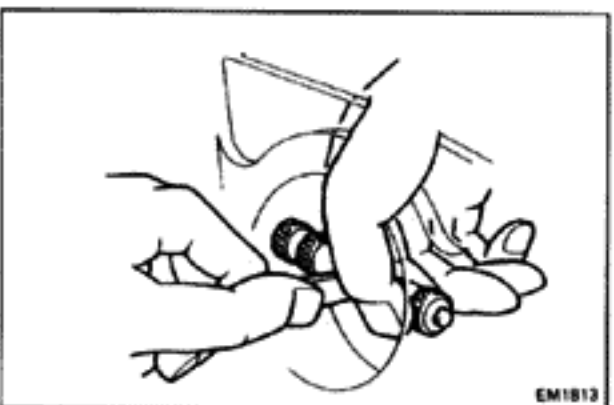
No. 3 43.459 — 43.475 mm (1.7110 — 1.7116 in.)

No. 4 43.959 — 43.975 mm (1.7307 — 1.7313 in.)

No. 5 44.459 — 44.475 mm (1.7504 — 1.7510 in.)

No. 6 44.959 — 44.975 mm (1.7700 — 1.7707 in.)

No. 7 45.459 — 45.475 mm (1.7897 — 1.7904 in.)



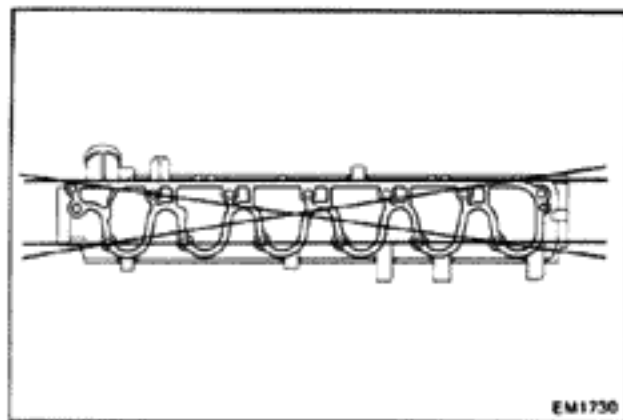
- (d) Using an inside micrometer, measure the housing bore.

- (e) Subtract the journal diameter measurement from the housing bore measurement.

Standard clearance: 0.025 — 0.066 mm
(0.0010 — 0.0026 in.)

Maximum clearance: 0.1 mm (0.004 in.)

If the clearance is greater than maximum, replace the camshaft and if necessary, the housing.



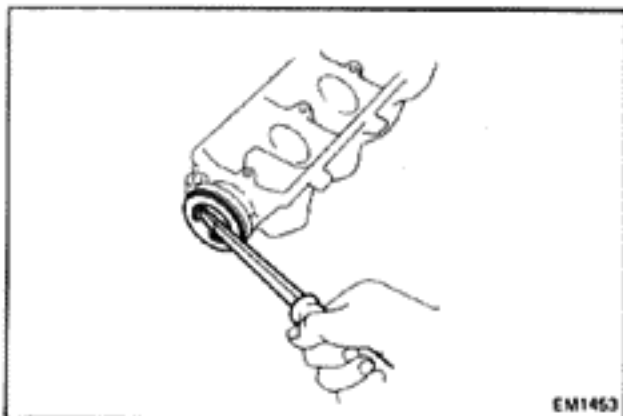
4. INSPECT CAMSHAFT HOUSINGS FOR FLATNESS

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

Maximum cylinder head surface warpage:

0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the housing.



REPLACEMENT OF CAMSHAFT HOUSING OIL SEAL

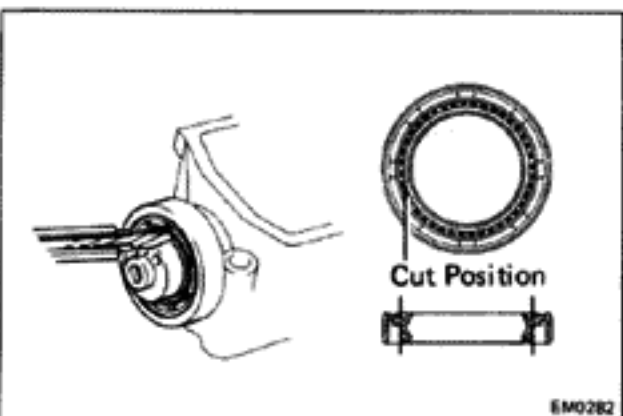
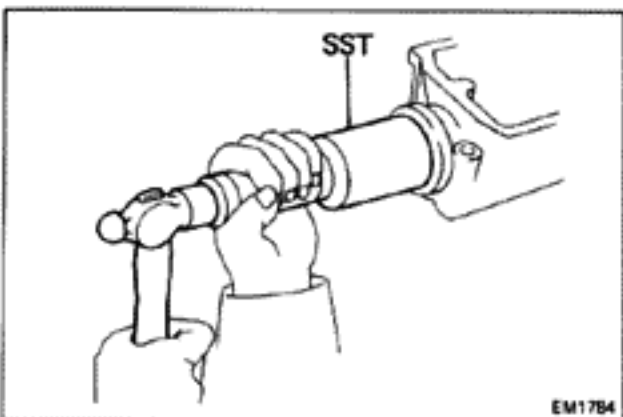
NOTE: There are two ways of oil seal replacement.

1. IF CAMSHAFT IS REMOVED FROM CAMSHAFT HOUSING:

- (a) Remove the oil seal from the camshaft housing.
 - Using a screwdriver, pry out the oil seal.

- (b) Install the new oil seal on the camshaft housing.
 - Apply MP grease to the oil seal.
 - Using SST, install the new oil seal.

SST 09214-60010



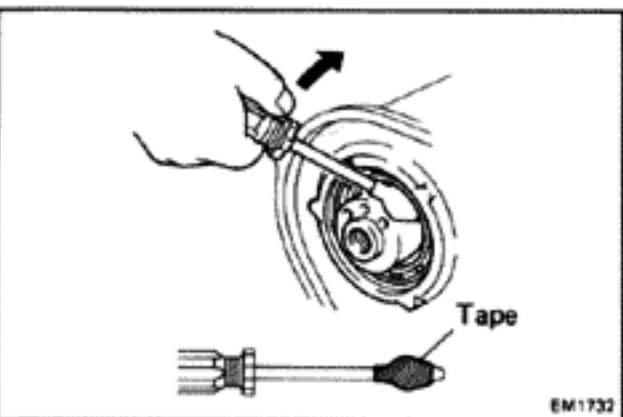
2. IF CAMSHAFT HOUSING IS INSTALLED ON CYLINDER HEAD:

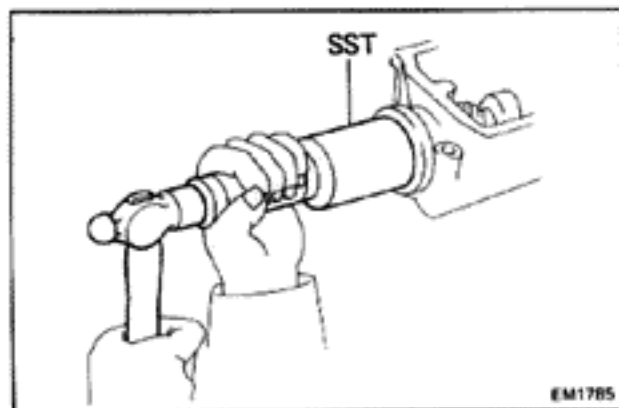
- (a) Cut the oil seal.
 - As shown in the figure, cut off the oil seal lips.

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

NOTE: Be careful not to damage the camshaft. Tape the screwdriver.

- (c) Inspect the camshaft.
 - Check the contact surface of camshaft oil seal lip for cracks or damage.

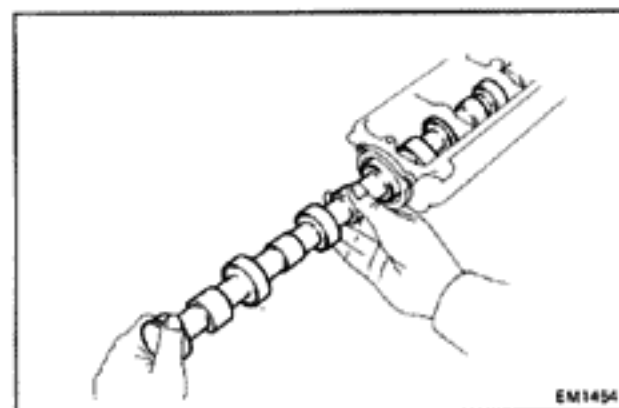




(d) Install the oil seal in the camshaft housings.

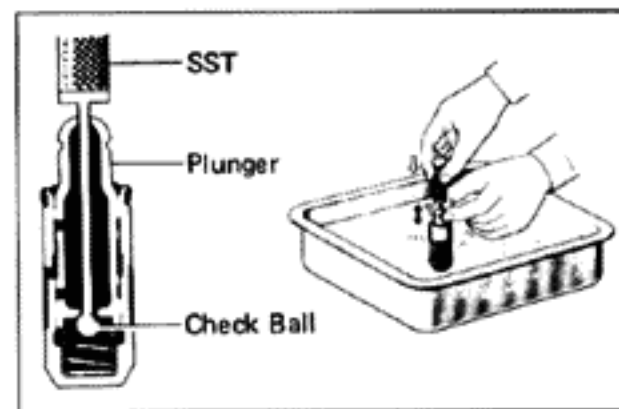
- Apply MP grease to the oil seal.
- Using SST, install the new oil seal.

SST 09214-60010



3. INSTALL CAMSHAFTS IN CAMSHAFT HOUSINGS

- Insert the camshafts into each camshaft housing.
- Install the O-rings and rear end covers.



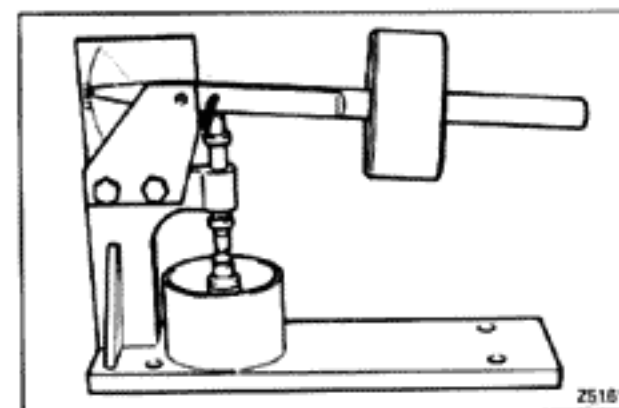
4. BLEED LASH ADJUSTER

- Immerse the lash adjuster into light oil.
- Insert SST into the plunger hole and slide the plunger up and down several times while pushing down lightly on the check ball.

SST 09276-70010

- Repeat steps (a) and (b) when the plunger stroke is beyond about 0.5 mm (0.020 in.).
- Replace the lash adjuster with a new one if the plunger stroke exceeds 0.5 mm (0.020 in.) even after repeating steps (a) and (b) several times.

NOTE: Do not disassemble the lash adjuster.



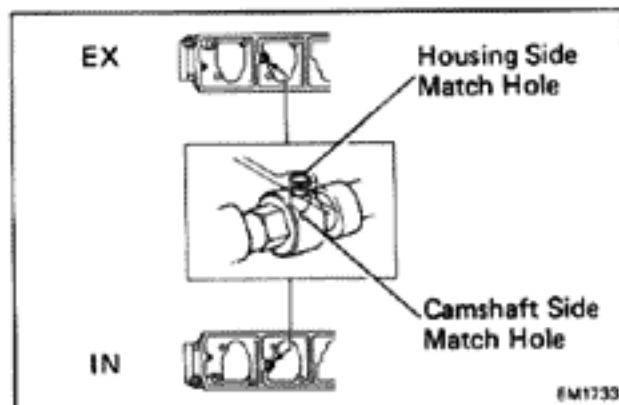
5. LASH ADJUSTER LEAK DOWN TEST

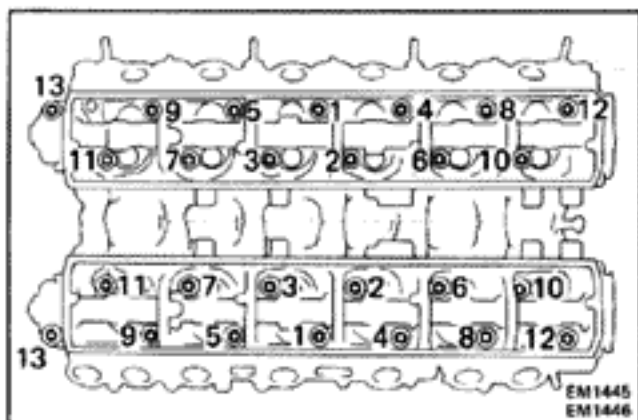
- Bleed the lash adjuster.
- Using a leak down tester, apply 20 kg (44.1 lb, 196 N) of pressure to the plunger and measure its slide down speed after it has slid down about 2 mm (0.08 in.).

Leak down time: 2 — 7 seconds per 1 mm (0.04 in.)

- Make sure that the match hole on the No. 2 journal of the camshaft housing is aligned with that of the camshaft.

6. CHECK OIL PRESSURE REGULATOR FOR LASH ADJUSTER (See page LU-9)



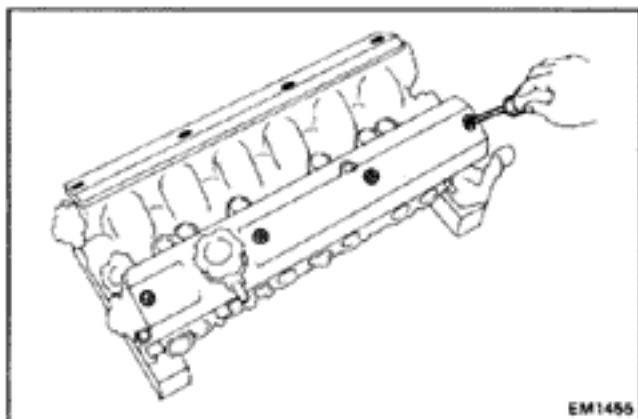
**7. INSTALL LASH ADJUSTERS AND ROCKER ARMS****8. INSTALL CAMSHAFT HOUSINGS WITH CAMSHAFTS**

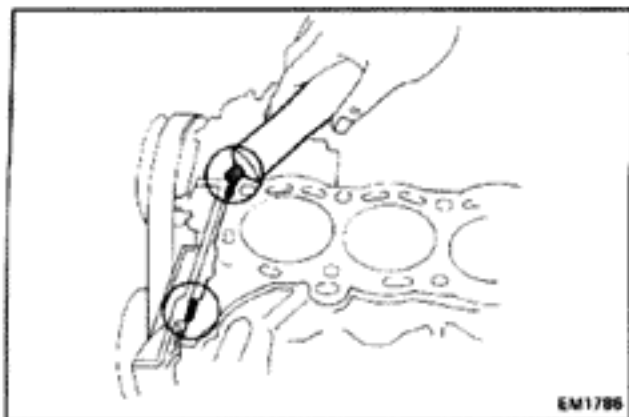
- Place new gaskets over dowels on the cylinder head.
- Position the camshaft housing over dowels on the cylinder head.
- Install and tighten the housing nuts and bolts gradually in three passes in the sequence shown. Torque the nuts and bolts on the final pass.

Torque: 220 kg-cm (16 ft-lb, 22 N·m)

9. INSTALL CYLINDER HEAD COVERS

- Install the gaskets to the cylinder heads.
- Place head covers on the camshaft housing and install the seals and screws.





EM1786

INSTALLATION OF CYLINDER HEAD

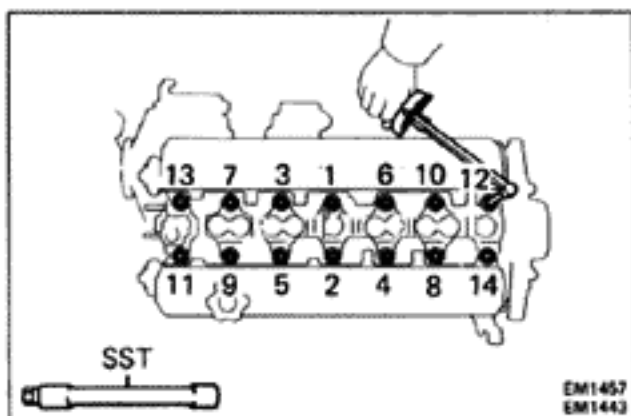
1. INSTALL EGR COOLER

2. APPLY SEALER TO CYLINDER BLOCK

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

Seal packing: Part No. 08826-00080 or equivalent

(b) Place a new head gasket over the dowels on the cylinder block.

EM1457
EM1443

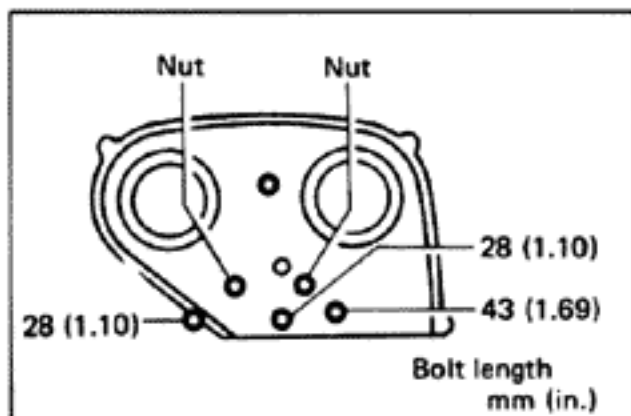
3. INSTALL CYLINDER HEAD

(a) Position the cylinder head over dowels on the block.

(b) Using SST, install and tighten the head bolts gradually in three passes and in the sequence shown. Torque the bolts on the final pass.

SST 09043-38100

Torque: 800 kg-cm (58 ft-lb, 78 N·m)

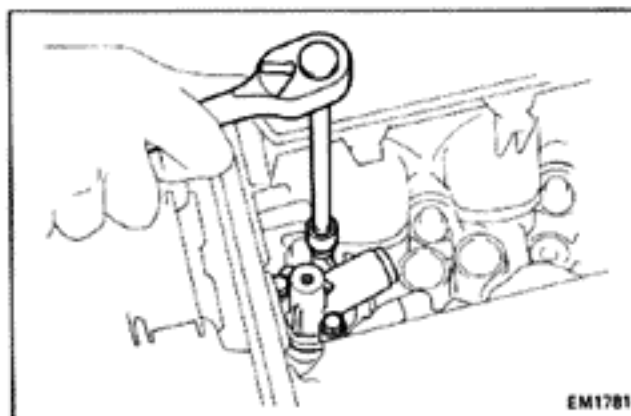


4. INSTALL NO. 2 TIMING BELT COVER

(a) Position a new gasket on the cylinder head.

(b) Install the No. 2 timing belt cover with three bolts and two nuts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)



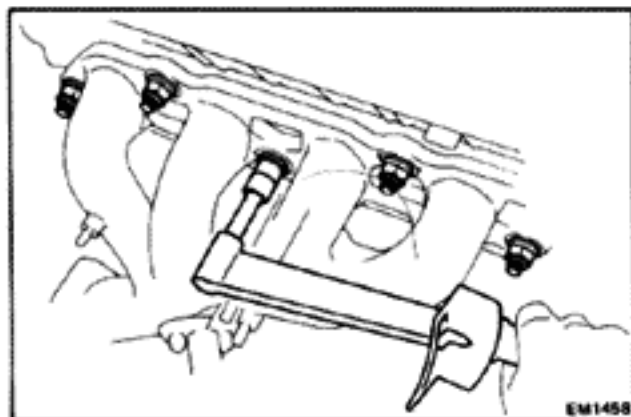
EM1781

5. INSTALL OIL PRESSURE REGULATOR

(a) Position a new gasket on the cylinder head.

(b) Install the oil pressure regulator with three bolts.

(c) Install the timing belt cover stay with two bolts.



EM1458

6. INSTALL CAMSHAFT TIMING PULLEYS AND TIMING BELT (See steps 9 to 14 on pages EM-15 to 17)

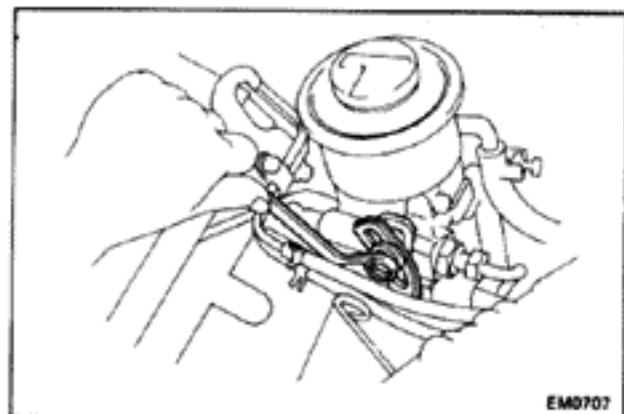
7. INSTALL EXHAUST MANIFOLD

(a) Position a new gasket on the cylinder head.

(b) Install the exhaust manifold with seven nuts. Torque the nuts.

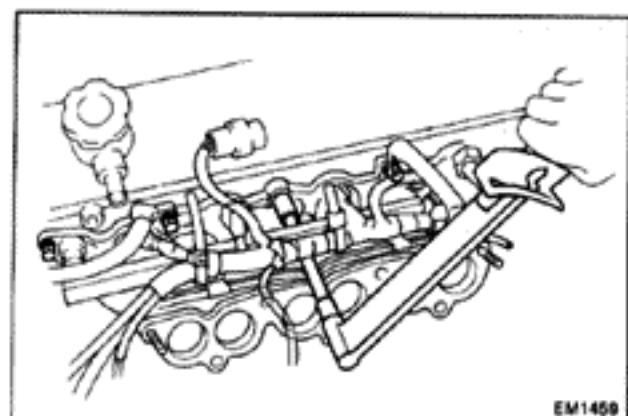
Torque: 400 kg-cm (29 ft-lb, 39 N·m)

8. INSTALL TWO INSULATORS



9. INSTALL POWER STEERING PUMP ONTO BRACKET

- (a) Install the PS pump and stay.
- (b) Install the PS pump pulley with the drive belt.
- (c) Adjust the belt tension by prying until the specified belt tension is obtained. (See page MA-4)
- (e) Tighten the idler pulley nut and adjusting bolt.

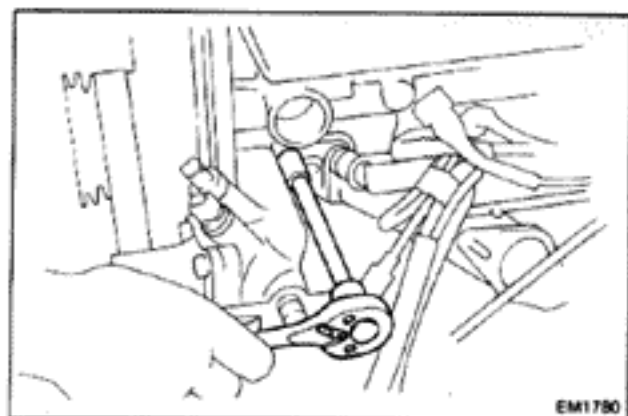


10. INSTALL INTAKE MANIFOLD

- (a) Position a new gasket on the cylinder head.
- (b) Install the intake manifold with eight bolts and two nuts. Torque the bolts and nuts.

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

11. CONNECT EFI WIRE HARNESS TO ECU

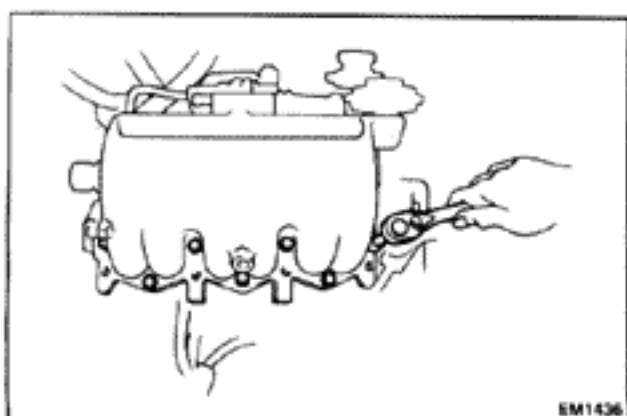


12. INSTALL WATER OUTLET HOUSING

- (a) Install the water outlet housing with two bolts.
- (b) Connect the water by-pass hose and tighten the clamp.

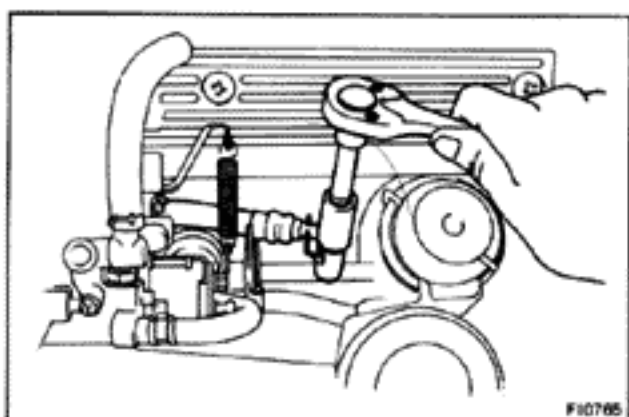
13. INSTALL NO. 1 FUEL PIPE AND PULSATION DAMPER

- (a) Finger tighten the pulsation damper and union bolt with new gaskets on the fuel pipe.
- (b) Tighten the fuel pipe, being careful not to bend it.



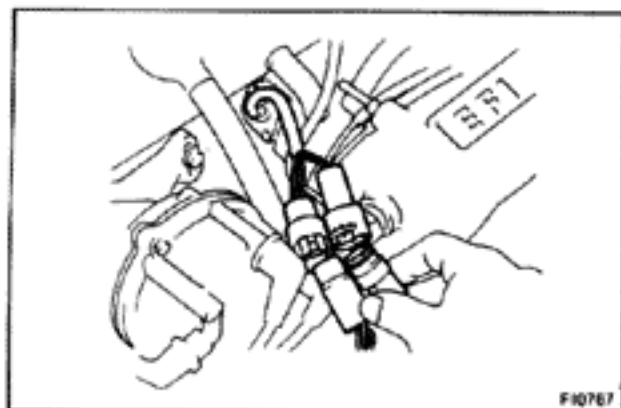
14. INSTALL AIR INTAKE CHAMBER

- (a) Position a new gasket on the intake manifold.
- (b) Install the air chamber with five bolts and two nuts. Torque the bolts and nuts.
- (c) Tighten the nut of the EGR valve connecting pipe.

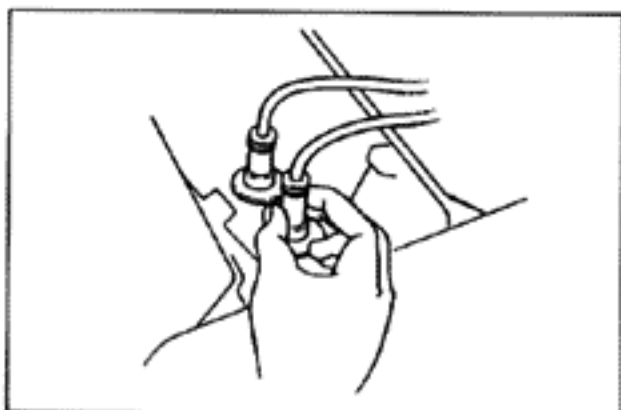


15. CONNECT COLD START INJECTOR FUEL HOSE TO DELIVERY PIPE

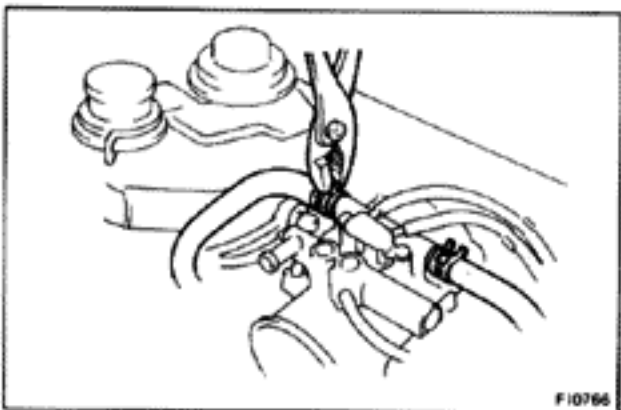
Install the new gasket, fuel hose, another gasket and union bolt to the delivery pipe.

**16. CONNECT FOLLOWING WIRES:**

- (a) Cold start injector wire
- (b) Water temp. sensor wire
- (c) Start injection time switch wire
- (d) Water temp. sending unit wire
- (e) Throttle position sensor wire connector
- (f) ISC valve wire connectors

**17. INSTALL DISTRIBUTOR AND SET TIMING**
(See pages IG-8, 9)**18. INSTALL SPARK PLUGS AND WIRES**

- (a) Install the six spark plugs. Torque the plugs.
Torque: 170 kg-cm (12 ft-lb, 17 N·m)
- (b) Install the spark plug wire clips with the bolt.
- (c) Connect the wires to the plugs.

**19. INSTALL VACUUM PIPE SUBASSEMBLY**

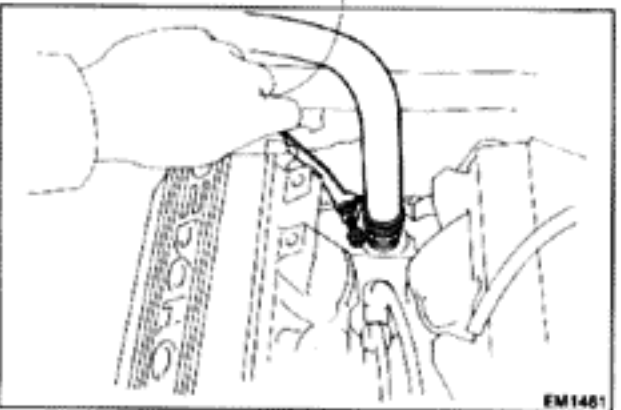
Install the vacuum pipe with bond cable and three bolts.

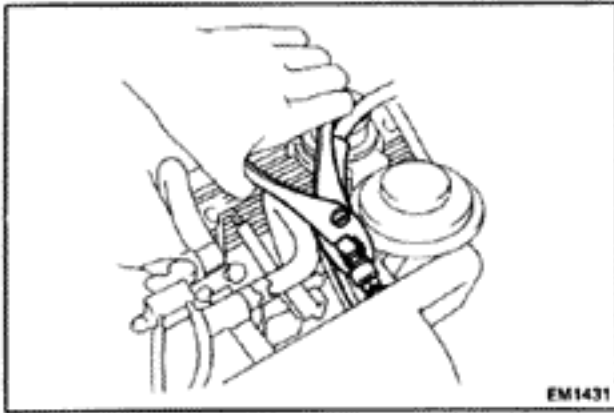
20. CONNECT FOLLOWING HOSES:

- (a) Emission control hoses to the throttle body and air intake chamber
- (b) Fuel hoses to the fuel hose support
- (c) Two PCV hoses to the cylinder head cover
- (d) No. 2 water by-pass hose to throttle body
- (e) No. 1 water by-pass hose to ISC valve

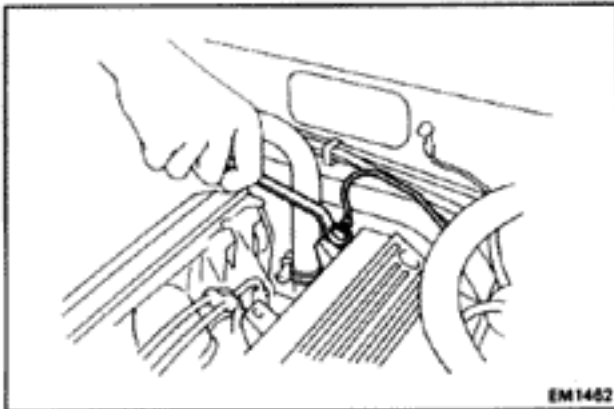
21. INSTALL AIR INTAKE CONNECTOR PIPE**22. INSTALL AIR INTAKE CONNECTOR**

- (a) Connect the throttle body hose to the throttle body and tighten the clamp.
- (b) Install the two bolts.
- (c) Connect the No. 1 air valve hose to the air intake connector.

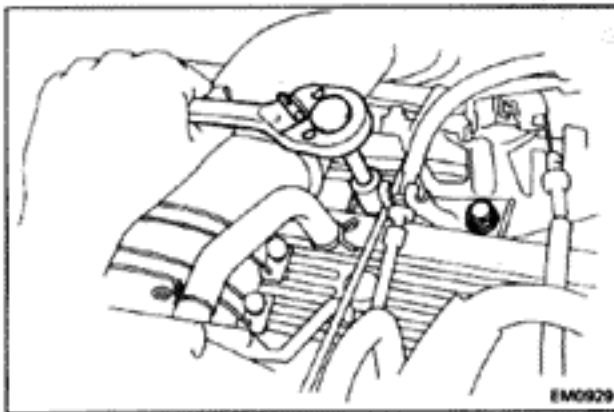
23. INSTALL TWO HEATER HOSES**24. INSTALL RADIATOR UPPER HOSE**

**25. CONNECT FOLLOWING HOSES:**

- (a) EGR vacuum hose
- (b) Fuel hose
- (c) Actuator vacuum hose
- (d) Brake booster vacuum hose

**26. CONNECT FOLLOWING WIRES AND CABLES:**

- (a) Distributor connector
- (b) High-tension cord from the ignition coil
- (c) Oxygen sensor wire connector
- (d) Ground strap to cylinder head cover
- (e) Temp. switch wire (for A/T)
- (f) Solenoid resistor wire connector
- (g) Knock sensor wire connector

**27. INSTALL ACCELERATOR AND ACTUATOR CABLE BRACKET TO CYLINDER HEAD COVER****28. INSTALL THROTTLE CABLE BRACKET TO CYLINDER HEAD COVER (for A/T)****29. FILL WITH COOLANT**

Close the radiator and engine drain cocks and fill with coolant.

Total capacity: Dry fill

M/T 8.0 liters (8.5 US qts, 7.0 Imp. qts)

A/T 7.9 liters (8.3 US qts, 7.0 Imp. qts)

30. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**31. START ENGINE**

Warm up the engine and check for leaks.

32. PERFORM ENGINE ADJUSTMENT

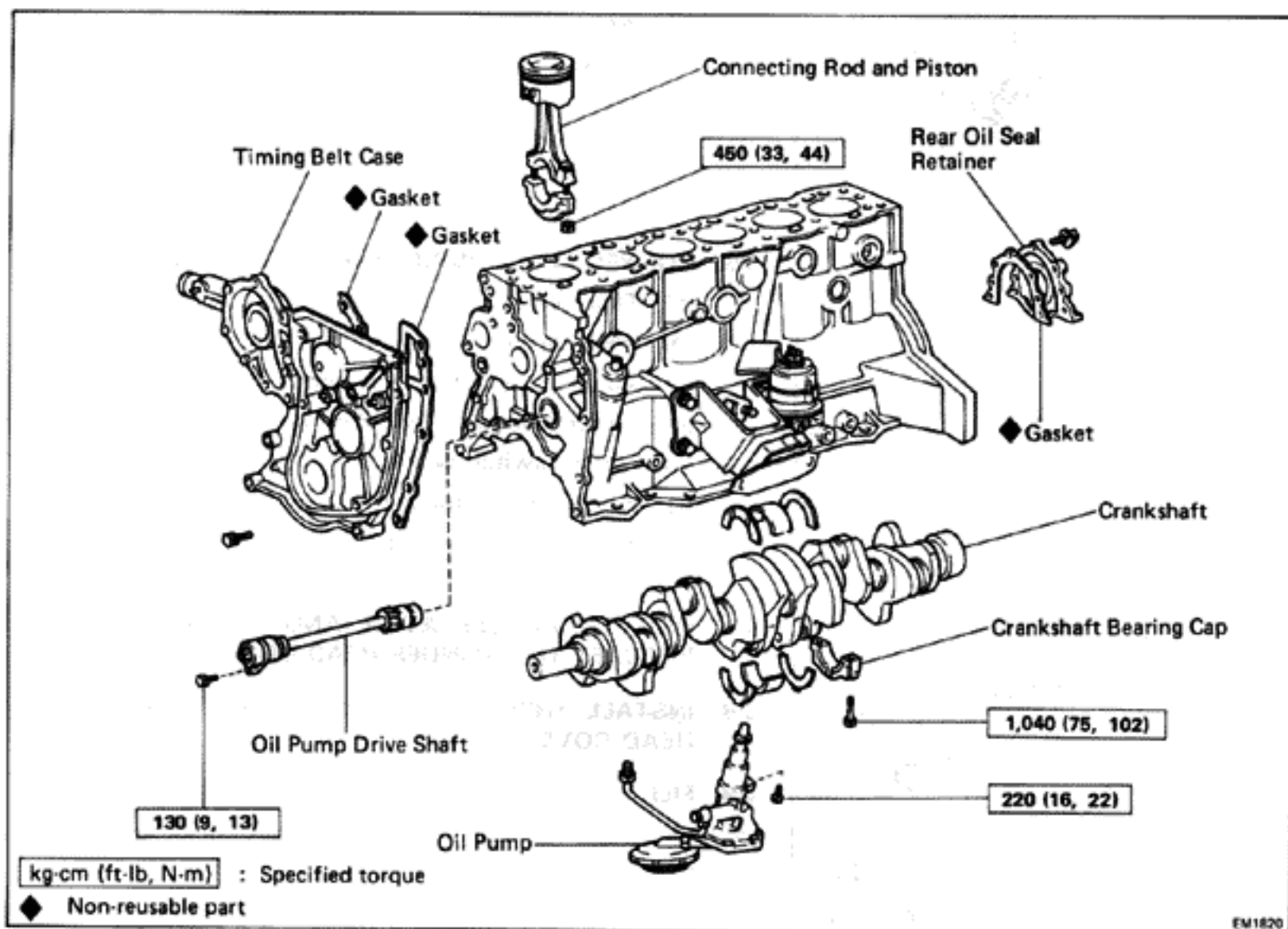
- (a) Recheck the ignition timing. (See page IG-10)
- (b) Retighten the cylinder head bolts.
(See step 3 on page EM-34)

33. ROAD TEST

Perform a road test.

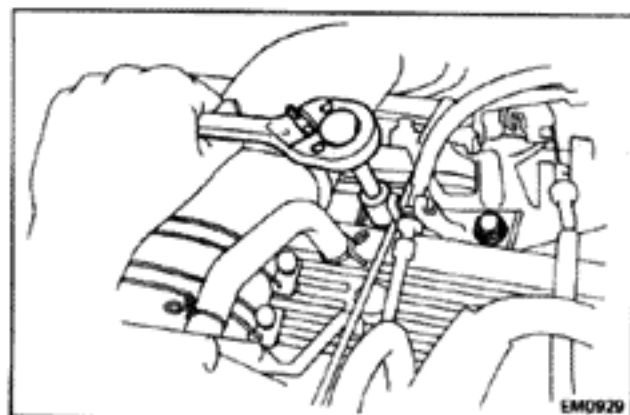
34. RECHECK COOLANT AND ENGINE OIL LEVEL

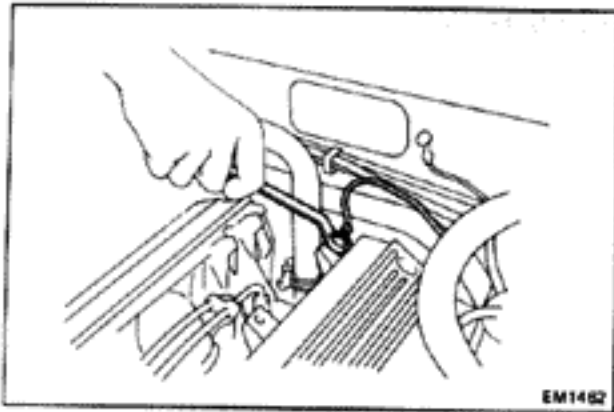
CYLINDER BLOCK COMPONENTS



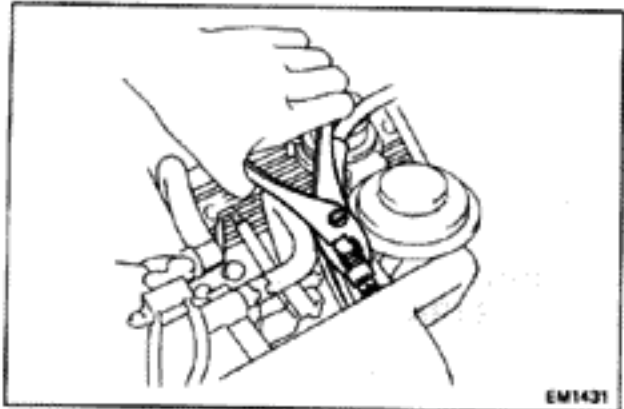
REMOVAL OF ENGINE

1. DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK
2. REMOVE HOOD
3. REMOVE BATTERY
4. REMOVE WASHER TANK
5. REMOVE AIR CLEANER CASE, AIR FLOW METER AND AIR INTAKE CONNECTOR PIPE
6. REMOVE THROTTLE CABLE BRACKET FROM CYLINDER HEAD COVER (for A/T)
7. REMOVE ACCELERATOR AND ACTUATOR CABLE BRACKET FROM CYLINDER HEAD COVER





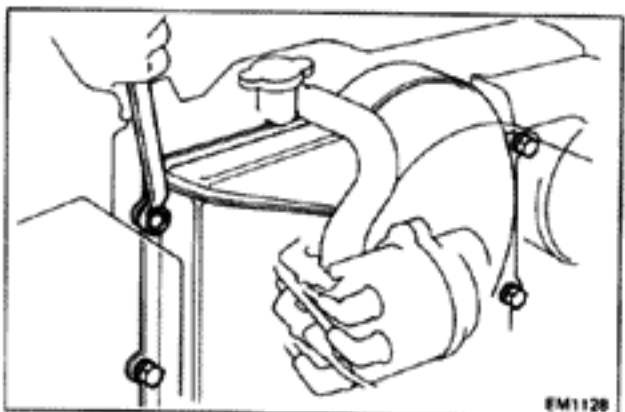
EM1432



EM1431



EM1437



EM1128

8. DISCONNECT FOLLOWING WIRES AND CABLES:

- (a) Ground strap from the cylinder head
- (b) Oxygen sensor wire
- (c) Oil pressure sending unit wire
- (d) Alternator wires
- (e) High-tension cord from the ignition coil
- (f) Distributor connector
- (g) Water temp. sending unit wire
- (h) Temp. switch wire (for A/T)
- (i) Starter wires
- (j) ECT connectors
- (k) Solenoid resistor wire connector
- (l) Knock sensor wire connector

9. DISCONNECT FOLLOWING HOSES:

- (a) Brake booster vacuum hose from the air intake chamber.
- (b) Actuator vacuum hose from the air intake chamber (with cruise control system).
- (c) EGR valve vacuum hose.

10. DISCONNECT TWO HEATER HOSES**11. DISCONNECT EFI WIRE HARNESS FROM ECU**

- (a) Remove the glove box.
- (b) Remove the computer.
- (c) Disconnect the three connectors.
- (d) Pull out the EFI wire harness from cowl panel.

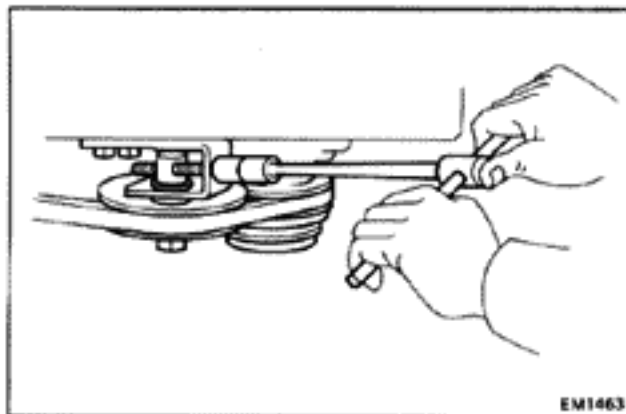
12. REMOVE FAN SHROUD AND FLUID COUPLING

- (a) Remove the radiator upper hose.
- (b) Remove the four shroud bolts and the four coupling set nuts.
- (c) Remove the shroud with the coupling.

13. REMOVE ENGINE UNDERCOVER**14. REMOVE RADIATOR**

- (a) Remove the radiator lower hose.
- (b) Disconnect the two oil cooler hoses (for A/T).
- (c) Disconnect the coolant reservoir hose.
- (d) Remove the two radiator mounting bolts and radiator.

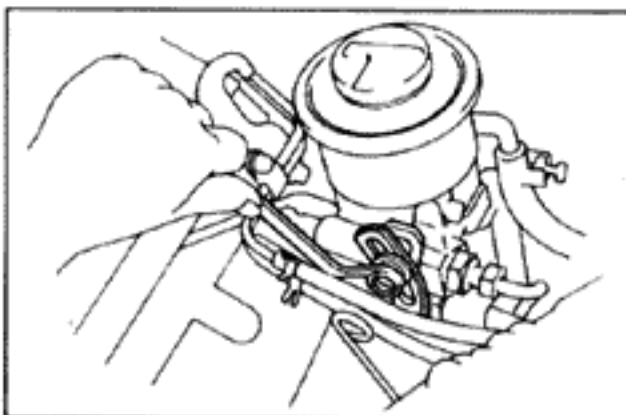
15. REMOVE COOLANT RESERVOIR TANK



EM1463

16. REMOVE COMPRESSOR WITH BRACKET FROM CYLINDER BLOCK

- (a) Remove the drive belt.
- (b) Remove the compressor mounting bolts.
- (c) Lay the compressor with bracket to one side without disconnecting the hoses.



17. REMOVE POWER STEERING PUMP FROM BRACKET

- (a) Remove the PS pump pulley with the drive belt.
- (b) Remove the three pressure and return line brackets.
- (c) Disconnect the pressure and return lines.
- (d) Remove the PS pump stay.
- (e) Remove the PS pump from bracket.

18. REMOVE ENGINE MOUNTING BOLTS ON EACH SIDE OF ENGINE AND GROUND STRAP

19. REMOVE SHIFT LEVER FROM INSIDE OF VEHICLE (M/T only)

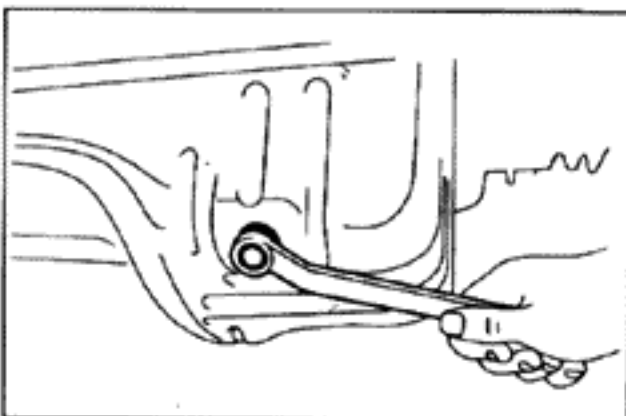
20. RAISE VEHICLE

CAUTION: Be sure the vehicle is securely supported.

21. DRAIN ENGINE OIL

22. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD

23. REMOVE EXHAUST PIPE CLAMP FROM TRANSMISSION HOUSING

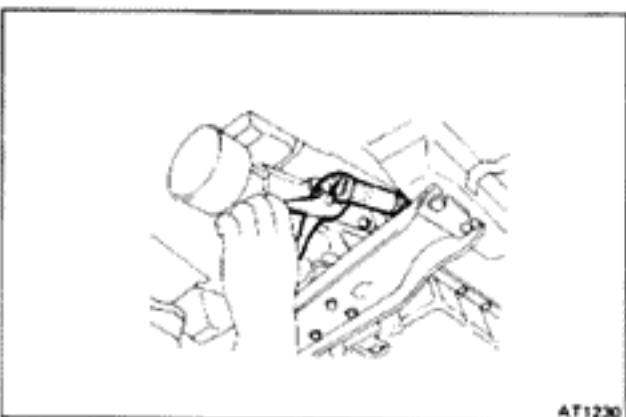


24. REMOVE CLUTCH RELEASE CYLINDER (M/T only)

25. REMOVE SPEEDOMETER CABLE

26. DISCONNECT SHIFT LINKAGE FROM SHIFT LEVER (A/T only)

27. DISCONNECT WIRE FROM BACK-UP LIGHT SWITCH (M/T only)



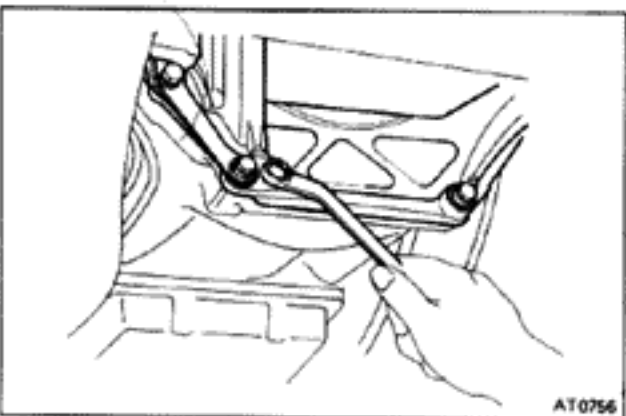
AT1230

28. REMOVE STIFFENER PLATE WITH GROUND STRAP

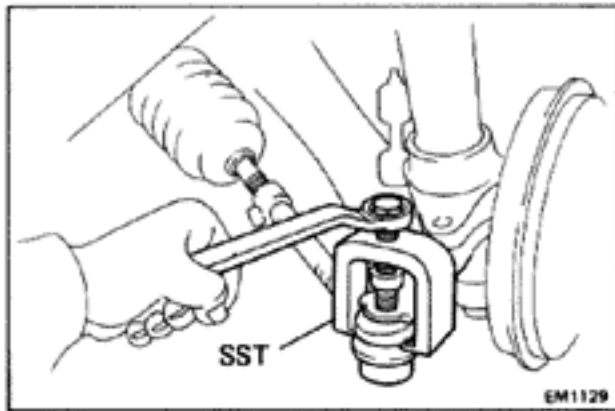
29. DISCONNECT FUEL TUBE AND HOSE

- (a) Main tube from the fuel filter.
- (b) Return hose from the fuel hose support.

CAUTION: Catch leaking fuel in a container and plug the line.

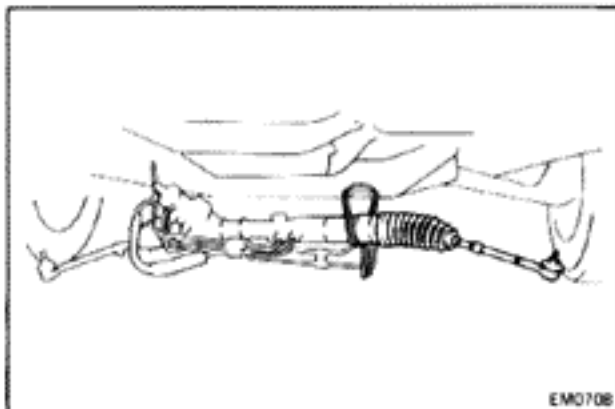


AT0756

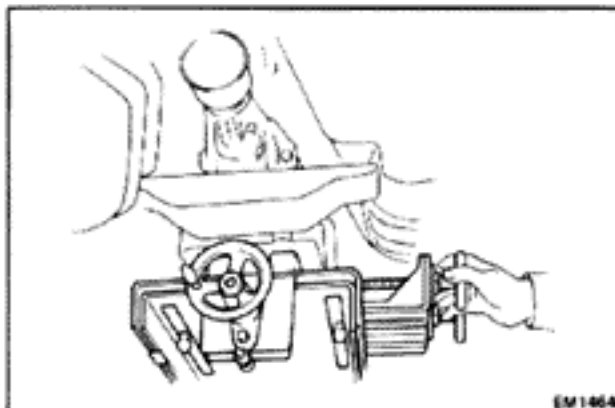
**30. REMOVE POWER STEERING GEAR HOUSING**

- (a) Remove the two lock bolts and remove the sliding yoke.
- (b) Remove the cotter pin and nut holding the knuckle arm to the tie rod.
- (c) Using SST, disconnect the tie rod end from the knuckle arm.

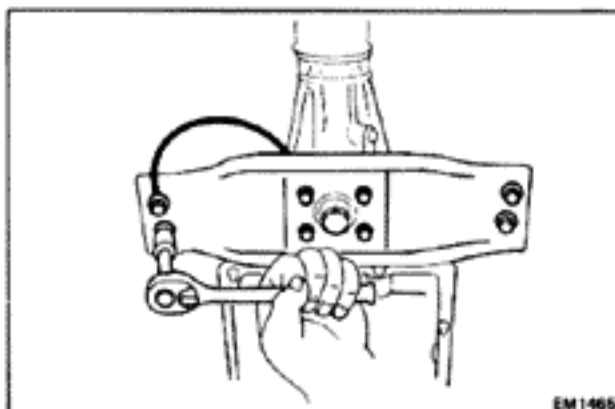
SST 09611-22012



- (d) Remove the gear housing brackets.
- (e) Remove the gear housing assembly.
- (f) Suspend the gear housing with the string or such to protect the pressure and return line.

31. REMOVE INTERMEDIATE SHAFT FROM PROPELLER SHAFT**32. PLACE JACK UNDER TRANSMISSION**

Be sure to put a wooden block between the jack and the transmission pan to prevent damage.

33. INSTALL A WOODEN BLOCK BETWEEN COWL PANEL AND CYLINDER HEAD REAR END TO PREVENT DAMAGE TO HEATER HOSE**34. REMOVE ENGINE REAR SUPPORT MEMBER WITH GROUND STRAP FROM BODY****35. REMOVE ENGINE WITH TRANSMISSION FROM VEHICLE**

- (a) Attach the engine hoist chain to the lift brackets of the engine.
 - (b) Lift the engine out of the vehicle slowly and carefully.
- NOTE: Make sure the engine is clear of all wiring and hoses.

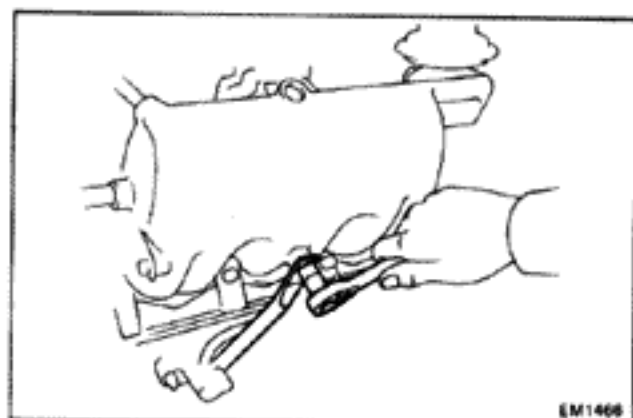
36. PLACE ENGINE ONTO ENGINE STAND**37. REMOVE TRANSMISSION FROM ENGINE**

- (a) Remove the starter.
- (b) Remove the exhaust pipe bracket from the engine.
- (c) Disconnect the transmission from the engine.

DISASSEMBLY OF CYLINDER BLOCK

(See page EM-38)

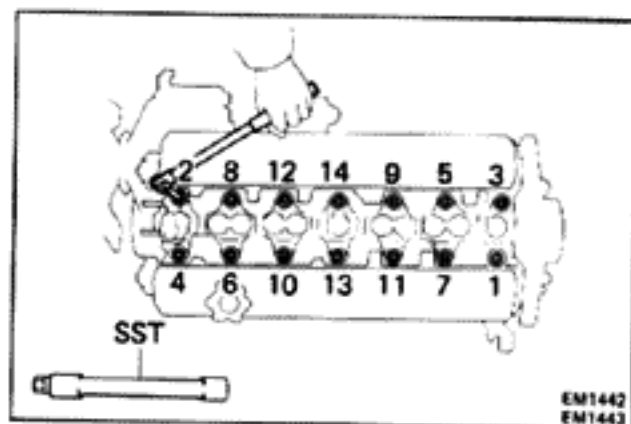
1. REMOVE CLUTCH COVER AND DISC
2. REMOVE FLYWHEEL OR DRIVE PLATE AND REAR END PLATE
3. INSTALL ENGINE STAND FOR DISASSEMBLY



EM1408

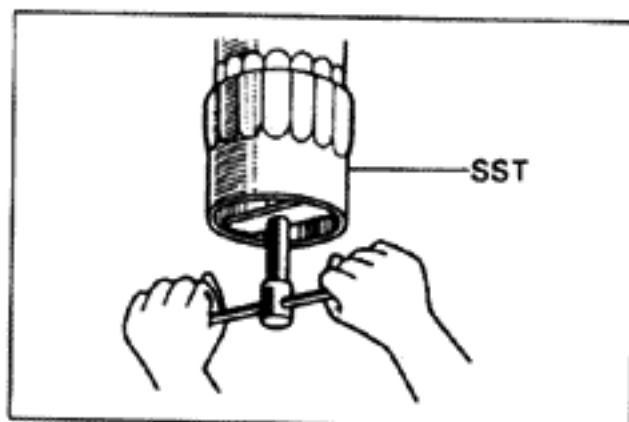
4. REMOVE CYLINDER HEAD ASSEMBLY

- (a) Disconnect the No. 1 water by-pass hose from the water by-pass pipe.
- (b) Disconnect the PCV hose from the cylinder block.
- (c) Remove the timing belt. (See pages EM-11 to 13)
- (d) Remove the No. 2 timing belt cover.
- (e) Remove the air intake chamber stay.

EM1442
EM1443

- (f) Using SST, remove the cylinder head bolts.
SST 09043-38100

- (g) Remove the cylinder head assembly.



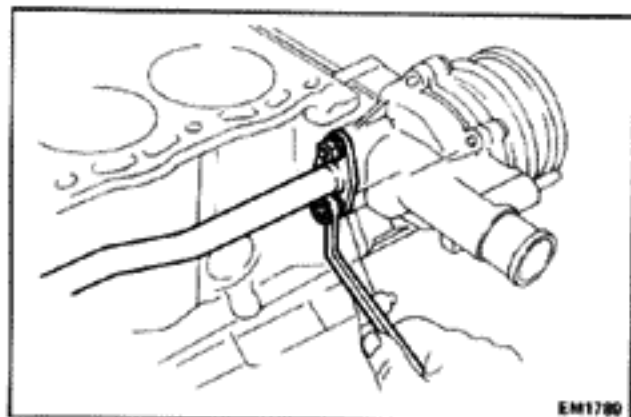
SST

5. REMOVE OIL FILTER

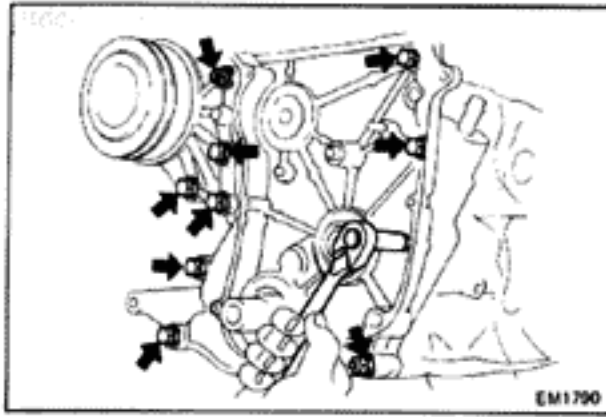
Using SST, remove the oil filter.
SST 09228-44010

6. REMOVE OIL LEVEL GAUGE**7. REMOVE ALTERNATOR****8. REMOVE FUEL FILTER****9. REMOVE FUEL HOSE SUPPORT****10. REMOVE WATER BY-PASS PIPE**

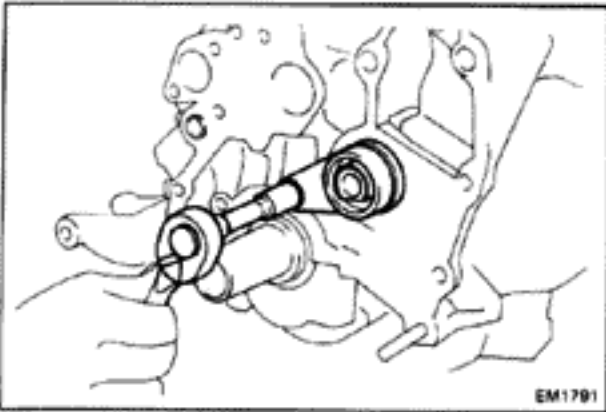
- (a) Remove the two nuts from the timing belt case.
- (b) Remove the three bolts from the cylinder block and remove the water by-pass pipe with gasket.

11. REMOVE OIL PAN
(See page LU-5)

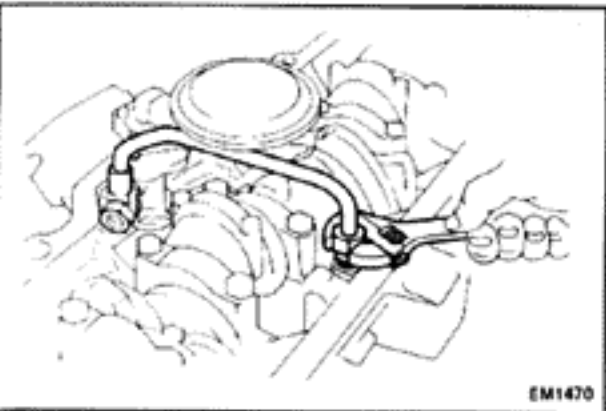
EM1780

**12. REMOVE TIMING BELT CASE WITH WATER PUMP**

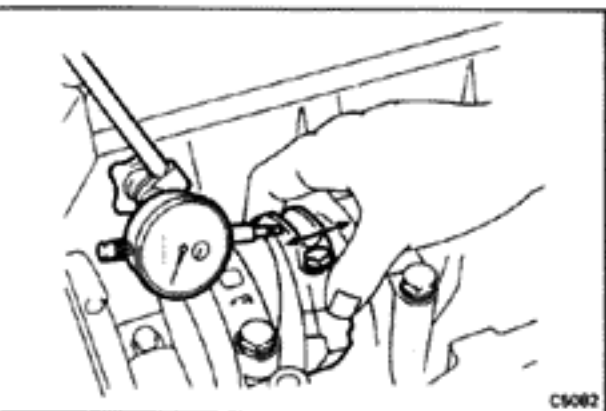
Remove the eight bolts and two nuts and remove the timing belt case and gaskets.

13. REMOVE REAR OIL SEAL RETAINER**14. REMOVE OIL PUMP DRIVE SHAFT**

- Remove the bolt holding the oil pump drive shaft.
- While turning the oil pump drive shaft, slowly pull it out so as not to damage the bearing.

**15. REMOVE OIL PUMP ASSEMBLY**

- Remove the union bolt and nut and remove the oil pump outlet pipe.
- Remove bolt holding the oil pump, and remove the oil pump assembly.

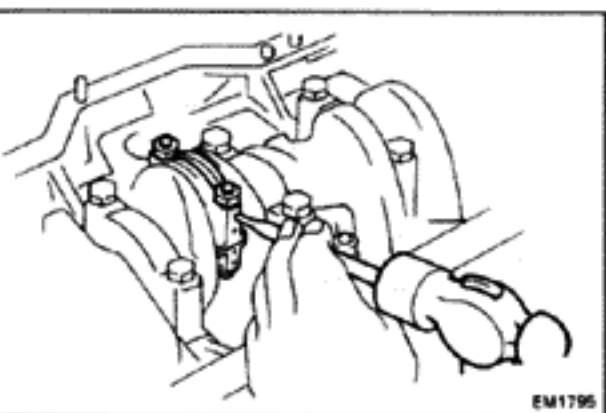
**16. MEASURE CONNECTING ROD THRUST CLEARANCE**

Using a dial gauge, measure the thrust clearance.

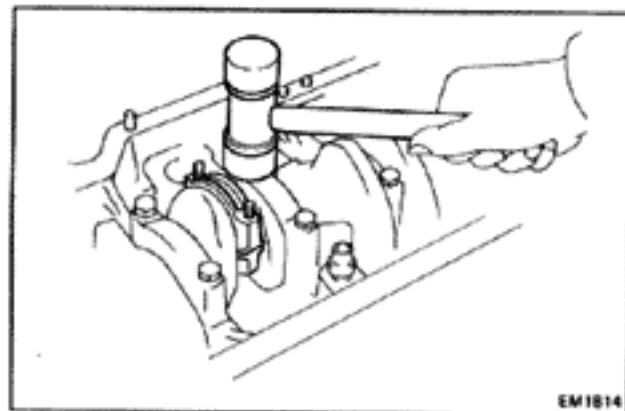
Standard clearance: 0.160 — 0.296 mm
(0.0063 — 0.0117 in.)

Maximum clearance: 0.3 mm (0.012 in.)

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

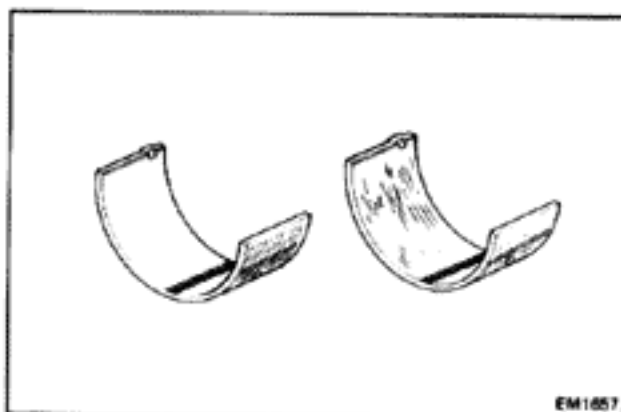
**17. REMOVE CONNECTING ROD CAPS AND MEASURE OIL CLEARANCE**

- Using a punch or numbering stamp, mark the connecting rods and caps to ensure correct reassembly.
- Remove the rod caps.

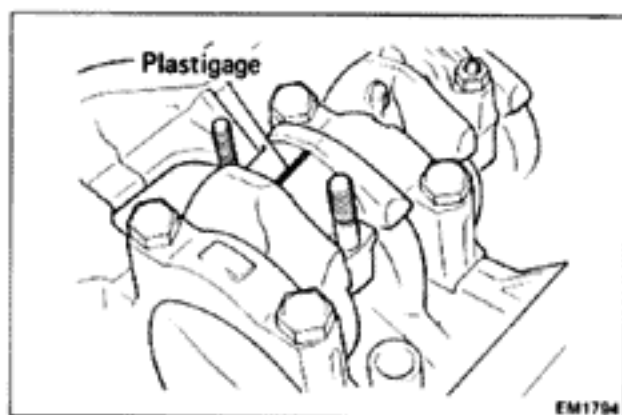


- (c) Using a plastic-faced hammer, tap the rod bolts lightly and lift off the rod cap.

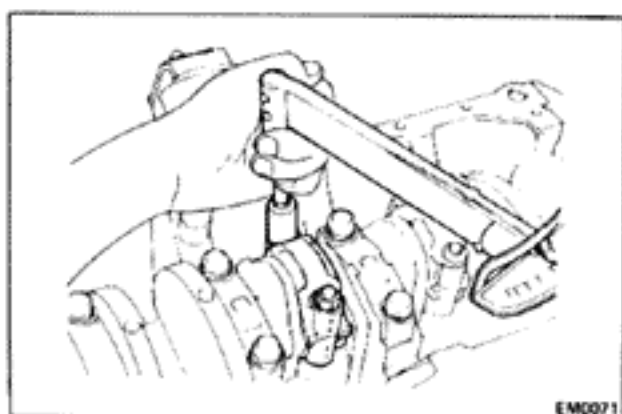
NOTE: Keep the bearing inserted with the cap.



- (d) Clean the bearings and crankshaft pins.
 (e) Inspect each bearing for pitting and radial scratches. If bearings are damaged, replace the bearings.



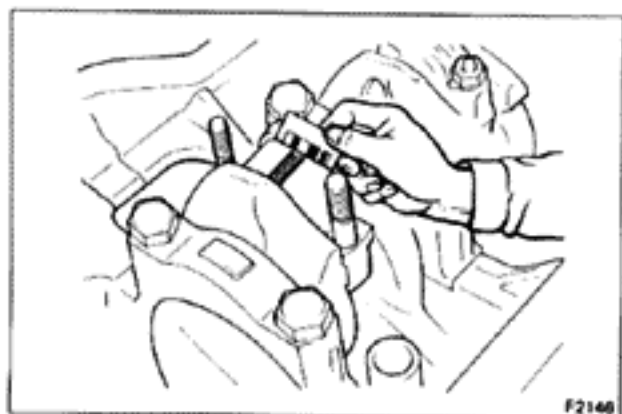
- (f) Lay a strip of plastigage across the crankshaft pin.



- (g) Align the rod and cap marks and fit on the cap. Torque the rod cap nuts.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)

NOTE: Do not turn the crankshaft.



- (h) Remove the rod cap.
 (i) Measure the plastigage at its widest point.

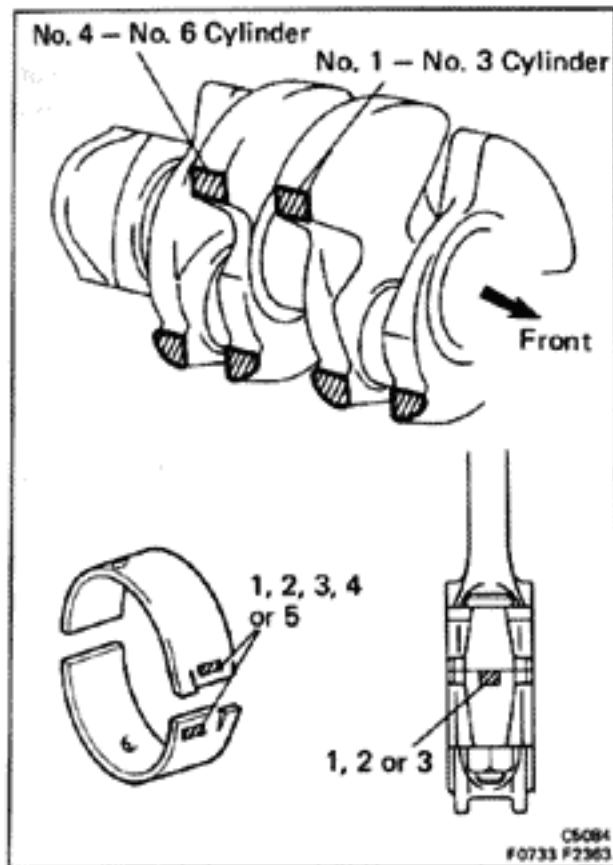
Standard clearance: 0.021 – 0.053 mm
 (0.0008 – 0.0021 in.)

Maximum clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than maximum, replace the bearings and/or grind the crank pins.

Under size bearing: U/S 0.25, 0.50

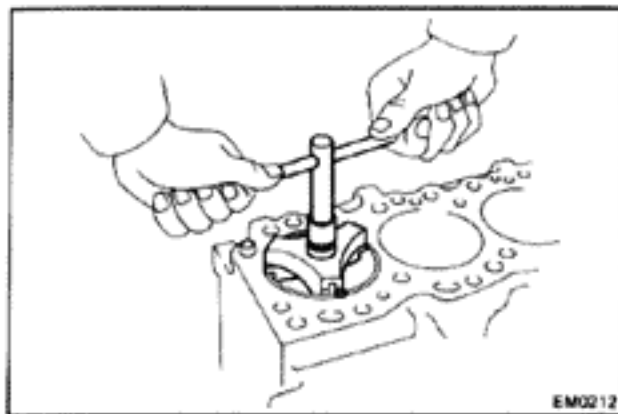
- (j) Clean out any plastigage scraps from the bearing and crankshaft pin.



NOTE: If replacing a standard size bearing with a standard oil clearance, replace with one having the same number. If the number of the bearing cannot be determined, select a bearing from the table below according to the numbers imprinted on the connecting rod cap and crankshaft.

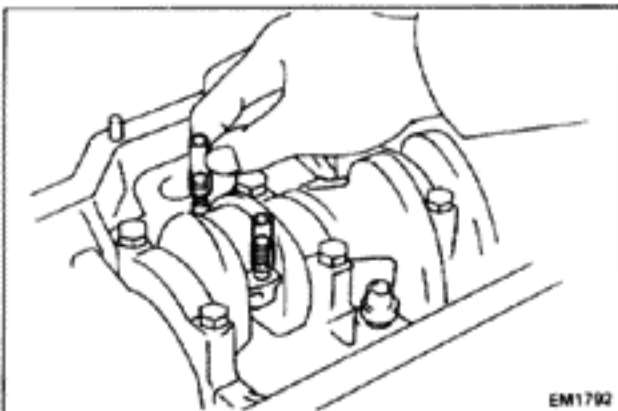
Rod cap No.	1	1	2	1	2	3	2	3	3
Crankshaft No.	0	1	0	2	1	0	2	1	2
Bearing No.	1	2	2	3	3	3	4	4	5

Example: Rod cap No. 2, Crankshaft No. 1 = Bearing No. 3

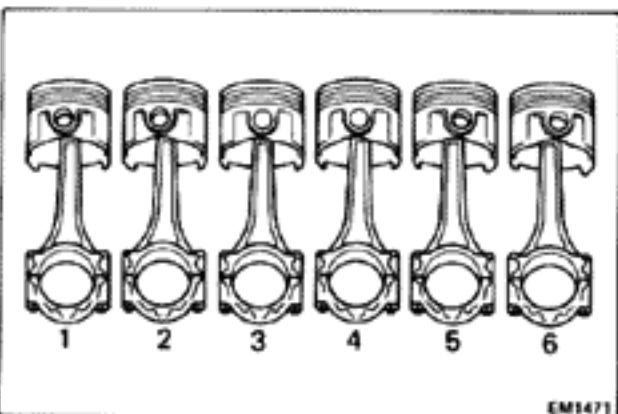


18. PUSH OUT PISTON AND CONNECTING ROD ASSEMBLY

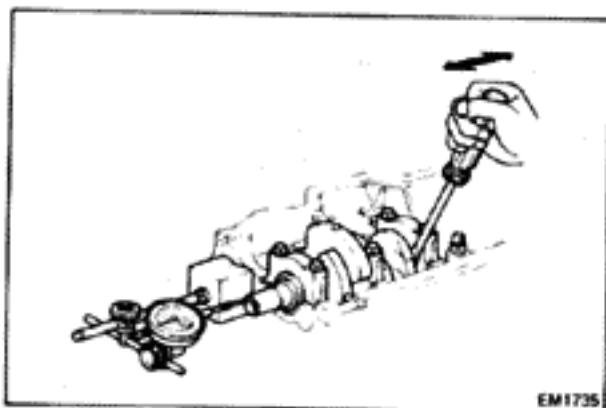
- Remove all the carbon from top of the bore to the top of the cylinder.



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



- Arrange the pistons and connecting rod caps in order.



19. MEASURE CRANKSHAFT THRUST CLEARANCE

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

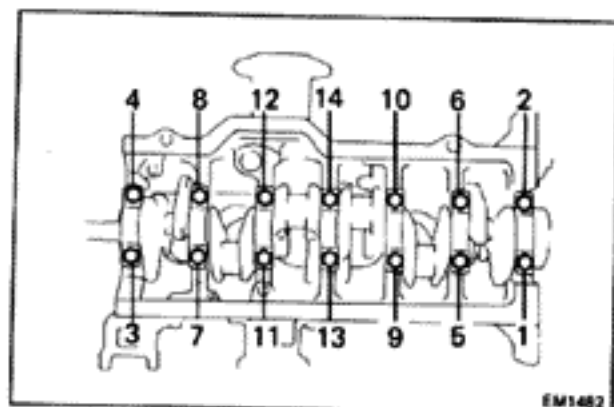
Standard clearance: 0.05 — 0.25 mm
(0.0020 — 0.0098 in.)

Maximum clearance: 0.3 mm (0.012 in.)

Oversized thrust washer: O/S 0.125, 0.25

20. REMOVE MAIN BEARING CAPS AND MEASURE OIL CLEARANCE

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



- (b) Using the removed bearing cap bolts, pry the bearing cap fore and aft, and remove it with the lower bearing and thrust washers (No. 4 journal only).

NOTE:

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

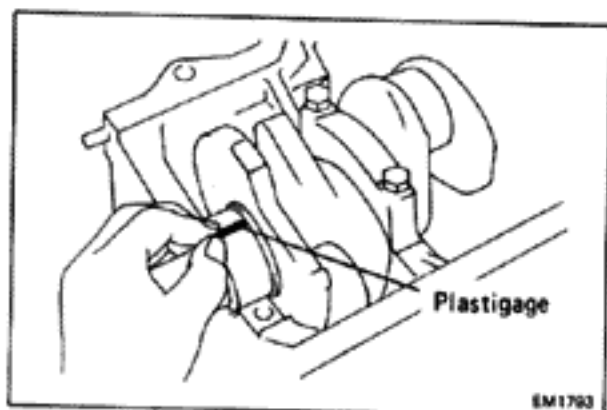
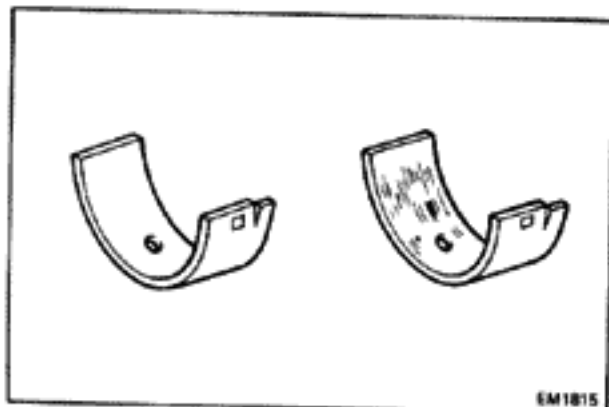
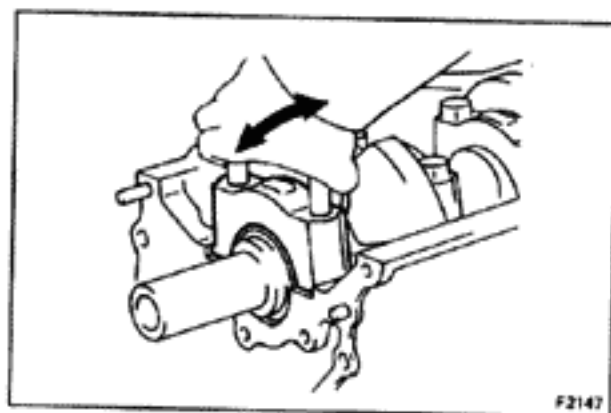
- (c) Lift off the crankshaft.

NOTE: Keep the upper bearings and upper thrust washers (for the No. 4 journal only) inserted in the cylinder block.

- (d) Clean the journals and bearings.

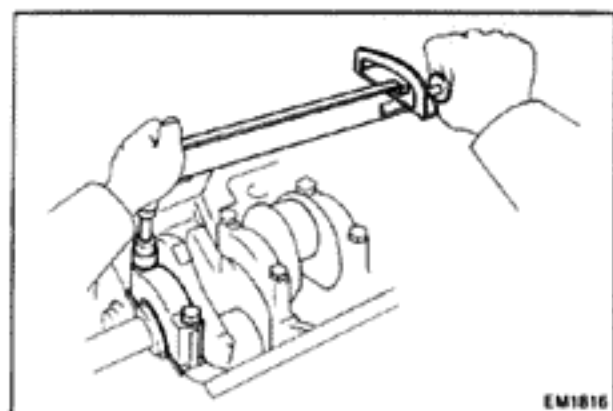
- (e) Check the journals and bearings for pitting and scratches.

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



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

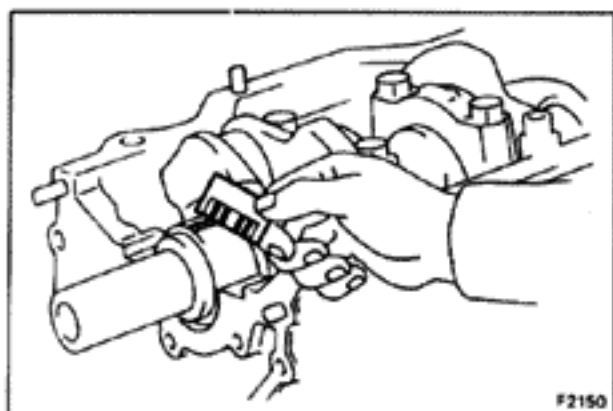
- (g) Lay a strip of plastigage across the main journals.



(h) Install the main bearing caps. Torque the cap bolts.

Torque: 1,040 kg-cm (75 ft-lb, 102 N·m)

NOTE: Do not turn crankshaft.



(i) Remove the main bearing caps.

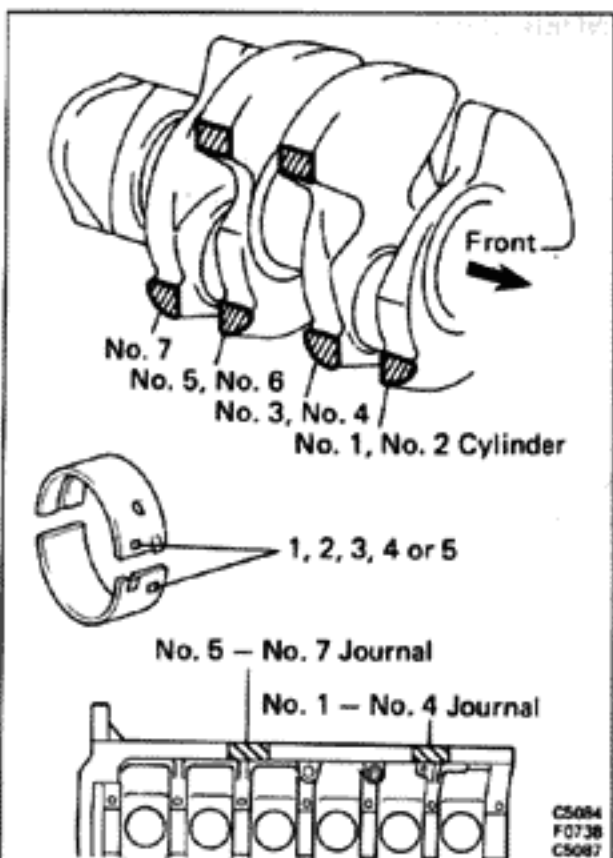
(j) Measure the plastigauge at its widest point.

Standard clearance: 0.034 – 0.058 mm
(0.0013 – 0.0023 in.)

Maximum clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than maximum, replace the bearings and/or grind the main journals.

Undersized bearing: U/S 0.25, 0.50



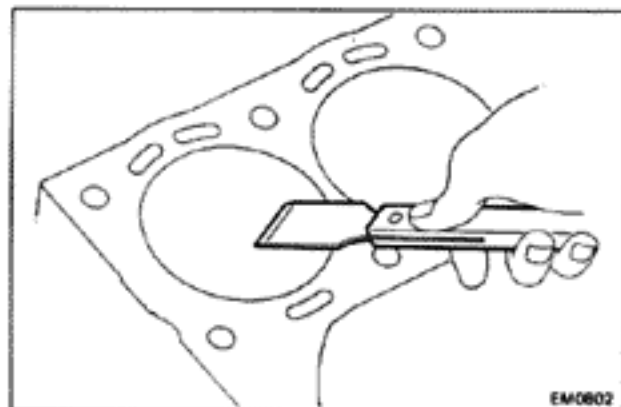
NOTE: If replacing a standard size bearing with a standard oil clearance, replace with one having the same number. If the number of the bearing cannot be determined, select a bearing from the table below according to the numbers imprinted on the cylinder block and crankshaft.

Cylinder Block No.	1	2	1	3	2	1	3	2	3
Crankshaft No.	0	0	1	0	1	2	1	2	2
Bearing No.	1	2	2	3	3	3	4	4	5

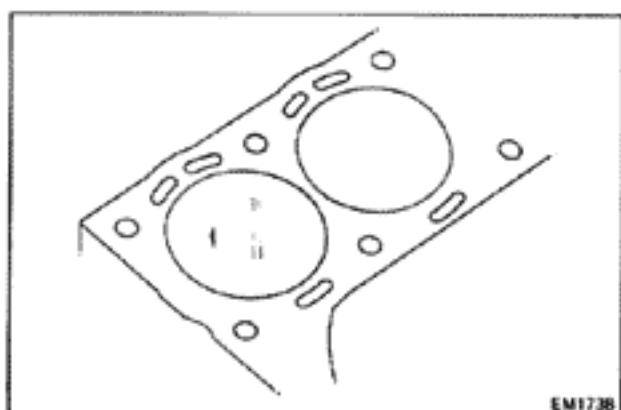
Example: Cylinder Block No. 2, Crankshaft No. 1 = Bearing No. 3

21. REMOVE CRANKSHAFT

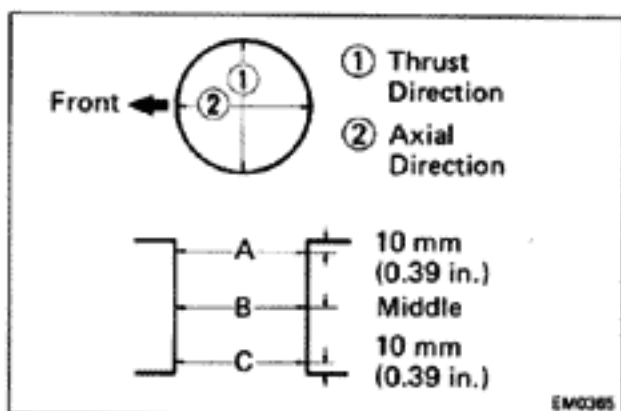
- Lift out the crankshaft.
- Remove the upper main bearings from the cylinder block.
- Clean out any plastigage scraps from the bearing and journals.



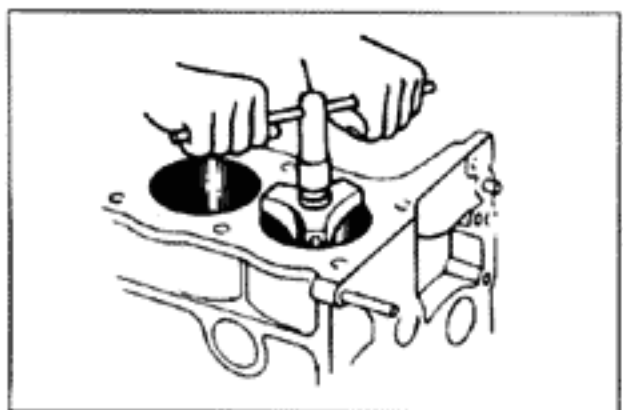
EM0802



EM1738



EM0385



INSPECTION OF CYLINDER BLOCK

1. REMOVE GASKET MATERIAL

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

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the block.

3. INSPECT CYLINDERS

Visually inspect cylinders for vertical scratches. If deep scratches are present, rebore all six cylinders. (See page EM-50)

4. INSPECT CYLINDER BLOCK WARPAGE

Warpage: Limit 0.05 mm (0.0020 in.)

If warpage is greater than the specified value, replace the cylinder block.

5. MEASURE CYLINDER BORE

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

If any of the following measurements are not within the specification, rebore the cylinder. (See page EM-50)

- (a) Cylinder diameter is greater than the maximum permissible limit.

On standard sized piston

Maximum diameter: 83.25 mm (3.2776 in.)

On oversized piston (O/S 0.50)

Maximum diameter: 83.75 mm (3.2972 in.)

On oversized piston (O/S 0.75)

Maximum diameter: 84.00 mm (3.3071 in.)

On oversized piston (O/S 1.00)

Maximum diameter: 84.25 mm (3.3169 in.)

- (b) If the difference between measurements A, B and C is greater than the taper limit, rebore the cylinder. (See page EM-50)

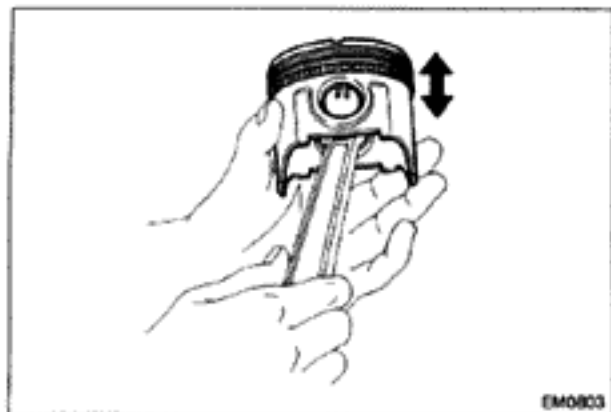
Taper limit: 0.02 mm (0.0008 in.)

- (c) If the difference between thrust and axial measurements is greater than the out-of-round limit, rebore the cylinder. (See page EM-50)

Out-of-round limit: 0.02 mm (0.0008 in.)

6. REMOVE CYLINDER RIDGE

If 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.

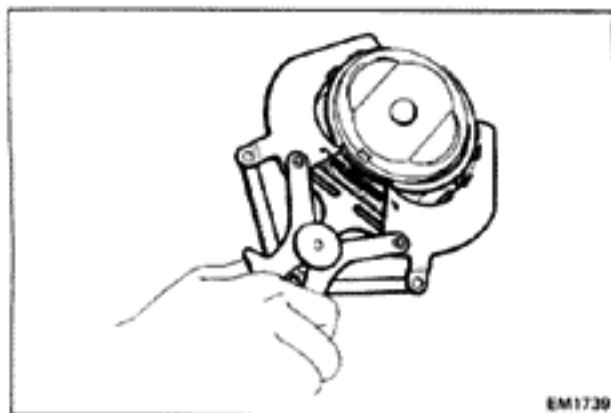


EM0803

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

1. CHECK FIT BETWEEN PISTON AND PIN

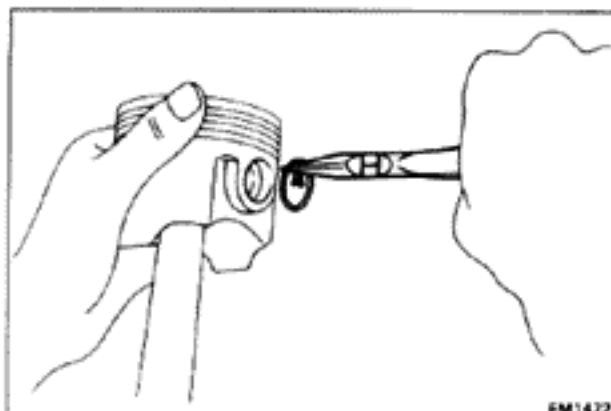
Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin.



EM1739

2. REMOVE PISTON RINGS

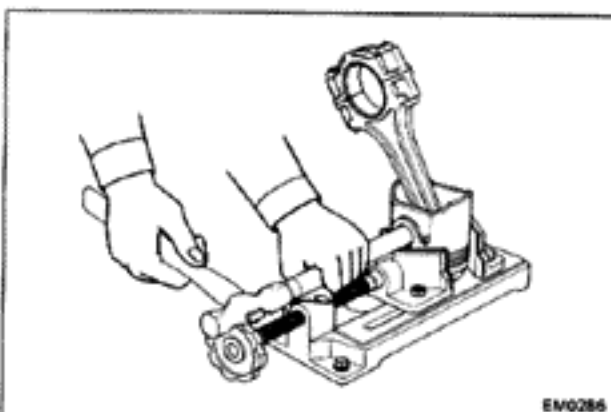
Using a piston ring expander, remove the piston rings. Keep the rings for each cylinder separated.



EM1472

3. DISCONNECT CONNECTING ROD FROM PISTON

- (a) Using needle-nose pliers, remove the snap rings from the piston.
- (b) Heat the piston in hot water to approx. 60°C (140°F).

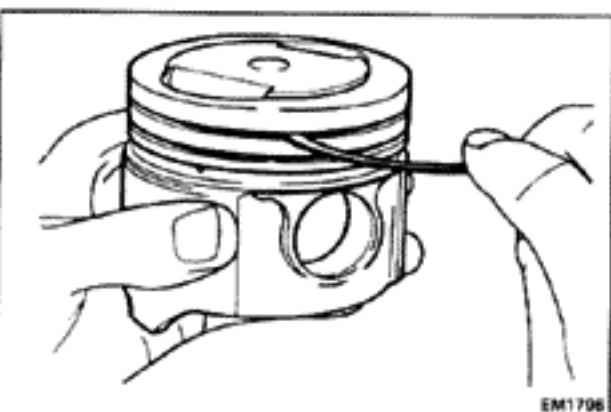


EM0286

- (c) Using a plastic-faced hammer and driver, tap the pin lightly to remove the pin from the piston.

NOTE:

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



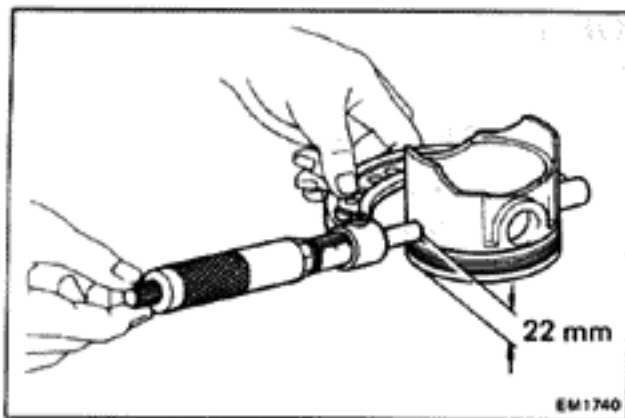
EM1708

INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLY

1. CLEAN PISTON

- (a) Scrape any carbon from the piston top.
- (b) Using a grooved cleaning tool or broken ring, clean the ring grooves.
- (c) Using a brush and solvent, clean the piston thoroughly.

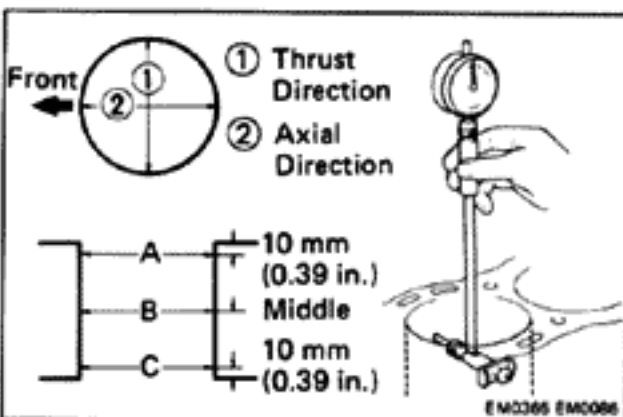
CAUTION: Do not use a wire brush.



2. MEASURE PISTON DIAMETER

- (a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 22 mm (0.87 in.) from the piston head.

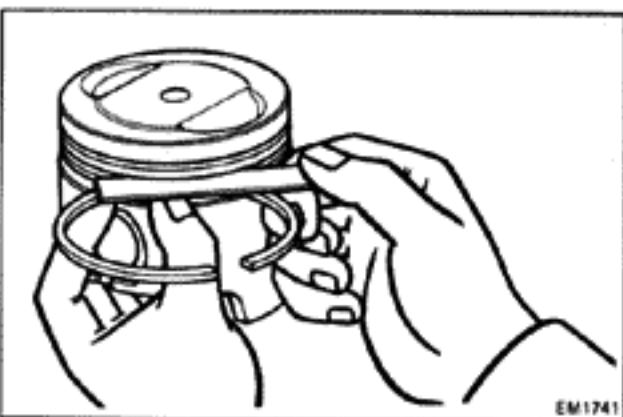
Standard diameter: 82.93 — 82.98 mm
(3.2650 — 3.2669 in.)



- (b) Check that the difference between the cylinder diameter and the piston diameter is within specification. (See step 5 on page EM-48)

Piston clearance: 0.06 — 0.08 mm
(0.0024 — 0.0031 in.)

If not within specification, replace the piston and/or re-bore all six cylinders. (See page EM-52)



3. MEASURE CLEARANCE BETWEEN PISTON RING GROOVE AND PISTON RING

Using a feeler gauge, measure the clearance between the piston ring and the ring land.

Ring groove clearance: No. 1 0.03 — 0.07 mm
(0.0012 — 0.0028 in.)
No. 2 0.02 — 0.06 mm
(0.0008 — 0.0024 in.)

If the clearance is greater than maximum, replace the piston ring and if necessary, the piston

4. MEASURE 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.
[100 mm (3.94 in.) from top surface of cylinder block]
(c) Using a feeler gauge, measure the end gap.

Ring end gap:

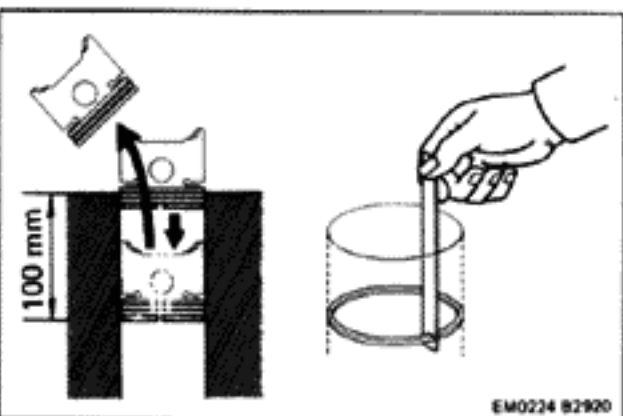
No. 1 STD 0.29—0.47 mm (0.0114—0.0185 in.)
Limit 0.71mm (0.0280 in.)
No. 2 STD 0.25—0.55 mm (0.0098—0.0217 in.)
Limit 1.15 mm (0.0453 in.)
Oil STD 0.17—0.85 mm (0.0067—0.0335 in.)
Limit 1.45 mm (0.0571 in.)

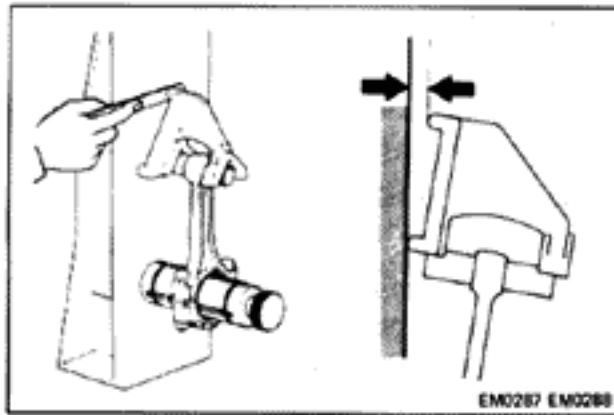
If not within specification, replace the ring.
Do not file the ring end.

5. CHECK PISTON PIN FIT

At 60°C (140°F), the pin should be able to be pushed into the piston with your thumb.

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





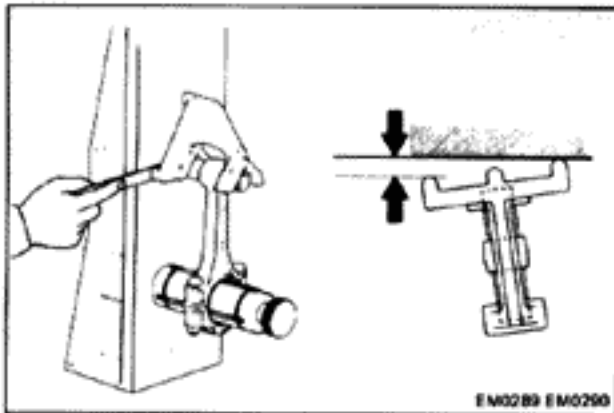
6. INSPECT CONNECTING RODS

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

- Check that the rod is not bent.

Bend limit:

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

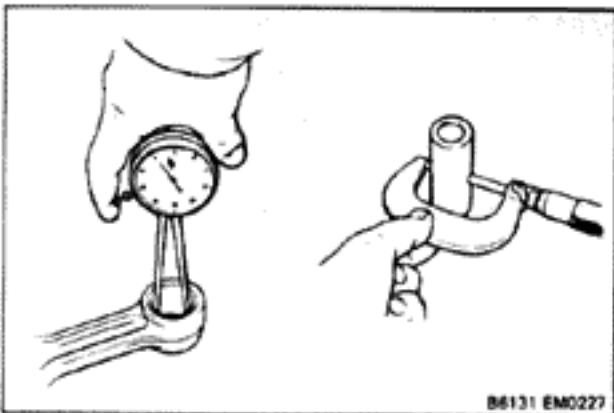


- Check that the rod is not twisted.

Twist limit:

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

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



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

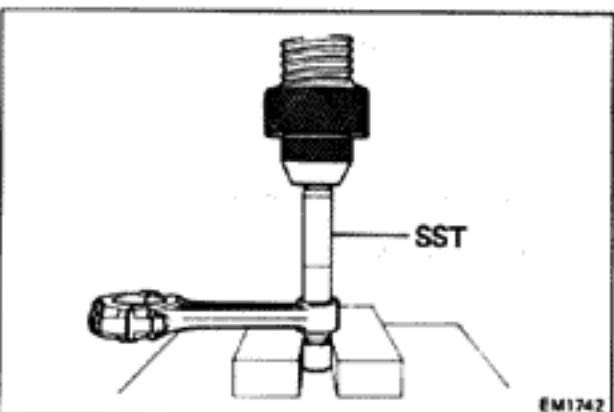
- Using an inside dial indicator, measure the inside diameter of the rod bushing.
- Using a micrometer, measure the diameter of the piston pin.
- Check that the difference between the measurements is less than the oil clearance limit.

Standard oil clearance: 0.005 — 0.011 mm

(0.0002 — 0.0004 in.)

Maximum oil clearance: 0.015 mm (0.0006 in.)

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



REPLACEMENT OF ROD BUSHING

1. REMOVE ROD BUSHING

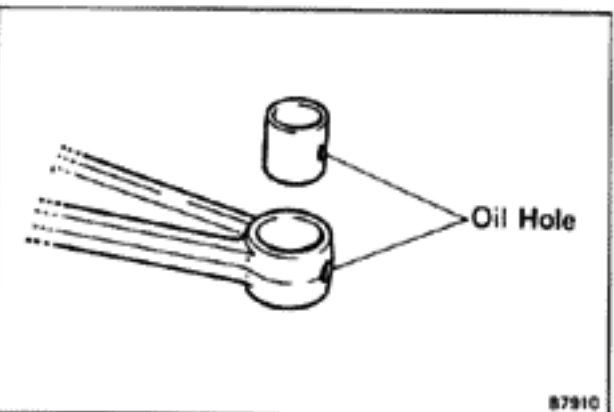
Using SST, remove the rod bushing from the connecting rod.

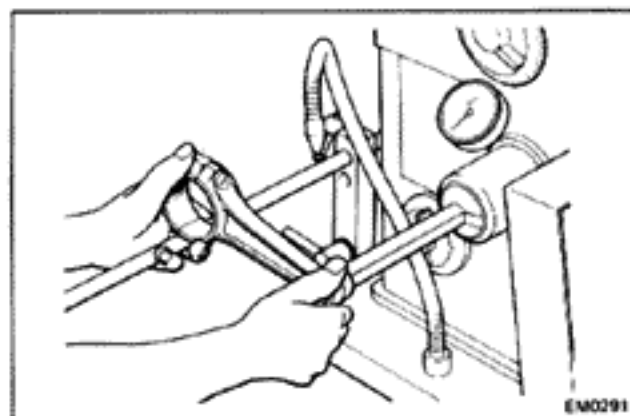
SST 09222-30010

2. INSTALL NEW ROD BUSHING

Using SST, install the rod bushing to the connecting rod.
SST 09222-30010

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





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

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

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

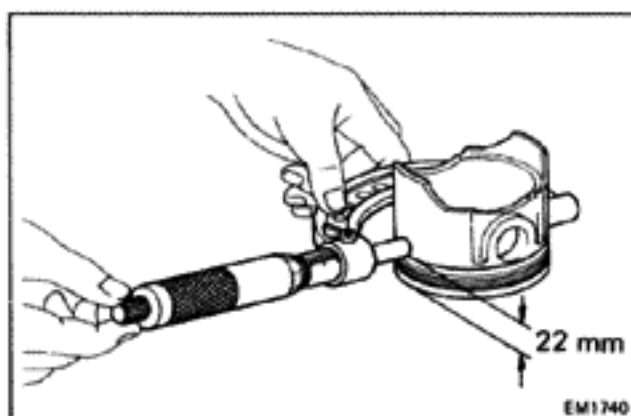
- (b) Check the pin fit at normal room temperature. Coat the pin with engine oil and push the pin into the rod with thumb pressure.

Size	Outside diameter mm (in.)
O/S 0.50	83.43 — 83.48 (3.2846 — 3.2866)
O/S 0.75	83.68 — 83.73 (3.2945 — 3.2965)
O/S 1.00	83.93 — 83.98 (3.3043 — 3.3063)

BORING OF CYLINDERS

1. SELECT OVERSIZED PISTON

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



2. CALCULATE DIMENSION TO BORE CYLINDERS

- (a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 22 mm (0.87 in.) from the piston head.
- (b) Calculate the size each cylinder is to be rebored as follows:

$$\text{Size to be rebored} = P + C - H$$

P = piston diameter

C = piston clearance

0.06 — 0.08 mm (0.0024 — 0.0031 in.)

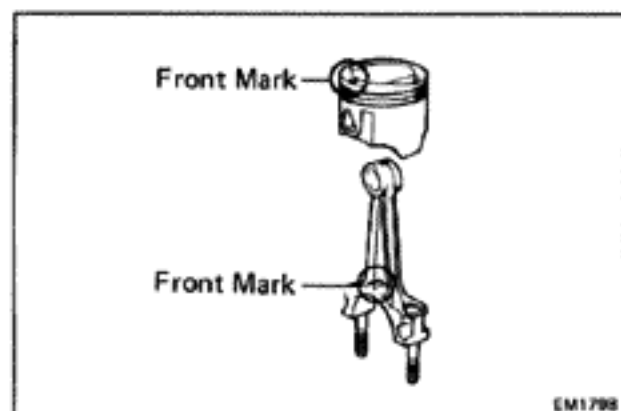
H = allowance for honing

Less than 0.02 mm (0.0008 in.)

3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Honing amount: 0.02 mm (0.0008 in.) maximum

CAUTION: Excess honing will destroy the finished roundness.



ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

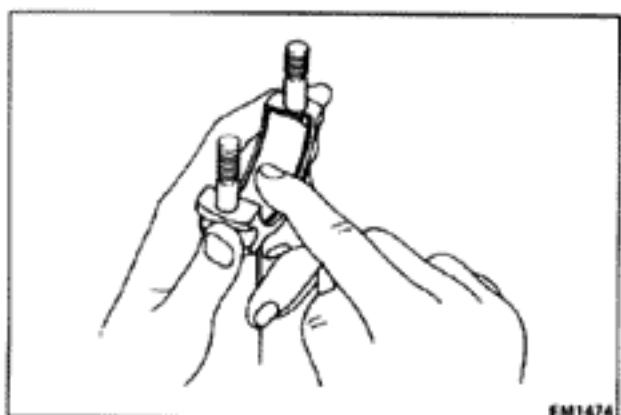
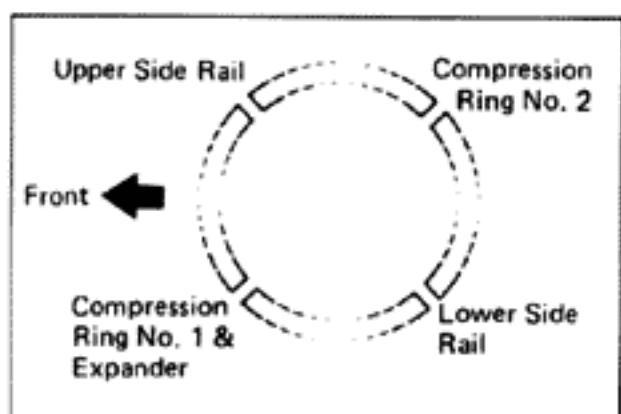
1. ASSEMBLE PISTON AND CONNECTING ROD

- Install a new snap ring on one side of the piston pin hole.
- Heat the piston in hot water to approx. 60°C (140°F).
- Align the notch on the piston with the mark on the rod and push the piston pin in with your thumb.
- Install a new snap ring on the other side of the pin.

2. PLACE RINGS ON PISTON

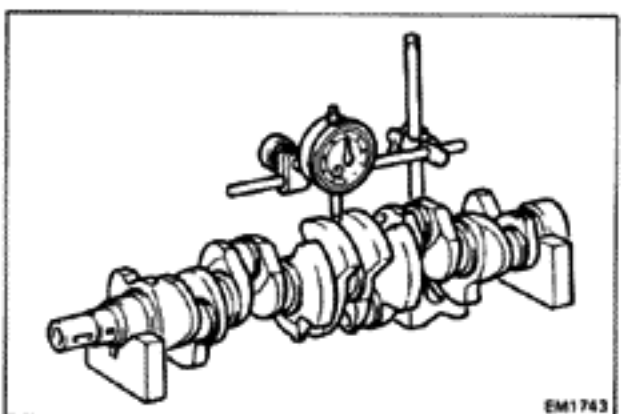
- Using a ring expander, install the top two compression rings with the code marks facing up.
- Position the piston rings so that the ring end gaps are in the shaded area as shown.

CAUTION: Do not align the end gaps.



3. INSTALL BEARINGS

- Install the bearings in the connecting rods and rod caps.
- Lubricate the face of the bearings with engine oil.



INSPECTION AND REPAIR OF CRANKSHAFT

1. MEASURE CRANKSHAFT

- Place the crankshaft on V-blocks.
- Using a runout gauge, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

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

- Using a micrometer, check the diameter of the main and crank pin journal.

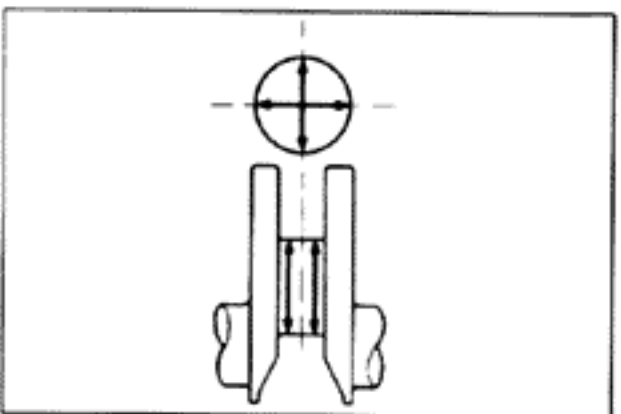
Measure the journals for out-of-round and taper as shown.

Main journal diameter: 59.988 — 60.012 mm
(2.3617 — 2.3627 in.)

Crank pin diameter: 51.976 — 52.000 mm
(2.0463 — 2.0472 in.)

Taper and out-of-round limit: 0.02 mm (0.0008 in.)

If journals are worn, regrind or replace the crankshaft.



2. GRIND CRANK PIN AND/OR MAIN JOURNAL IF NECESSARY

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

Install a new pin and/or main undersize bearings.

Bearing size (U/S 0.25, 0.50)

Main journal finished diameter:

U/S 0.25 59.730 — 59.740 mm (2.3516 — 2.3520 in.)

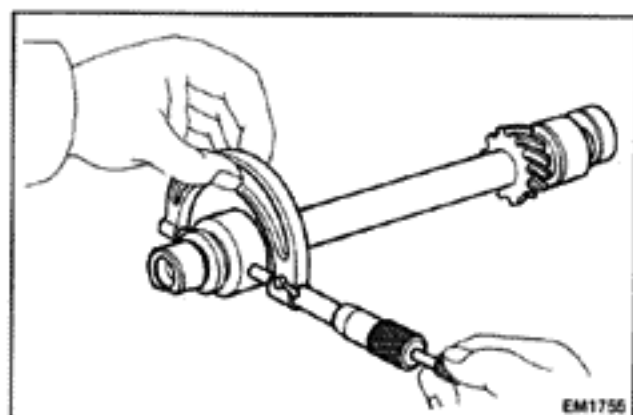
U/S 0.50 59.480 — 59.490 mm (2.3417 — 2.3421 in.)

Crank pin finished diameter:

U/S 0.25 51.725 — 51.735 mm (2.0364 — 2.0368 in.)

U/S 0.50 51.475 — 51.485 mm (2.0266 — 2.0270 in.)

Taper and out-of-round limit: 0.02 mm (0.0008 in.)



INSPECTION AND REPAIR OF OIL PUMP DRIVE SHAFT COMPONENTS

1. INSPECT OIL PUMP DRIVE SHAFT

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

Standard journal diameter:

Front 40.959 — 40.975 mm

(1.6126 — 1.6132 in.)

Rear 32.959 — 32.975 mm

(1.2976 — 1.2982 in.)

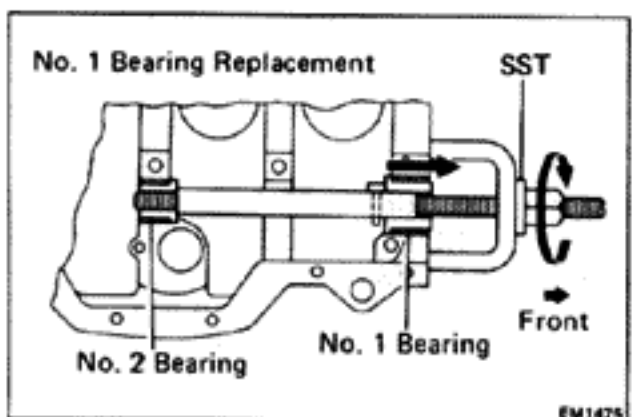
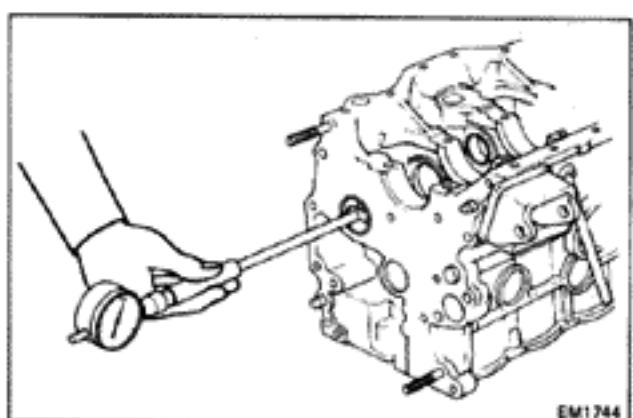
(b) Using a cylinder micrometer, measure the bearing bore.

(c) Subtract the journal diameter measurement from the bearing bore measurement.

Standard oil clearance: 0.025 — 0.066 mm
(0.0010 — 0.0026 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than maximum, replace the bearing and/or drive shaft.

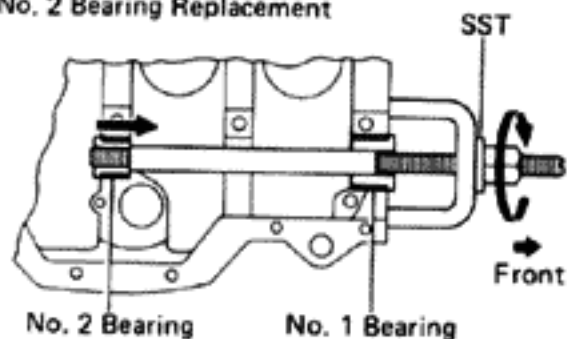


2. IF NECESSARY, REPLACE DRIVE SHAFT BEARING

(a) Using SST, replace the No. 1 bearing, using the No. 2 bearing as a guide.

SST 09215-00100 (09215-00120, 09215-00150,
09215-00160, 09215-00210, 09215-00220)

No. 2 Bearing Replacement



EM1476

- (b) Using SST, replace the No. 2 bearing, using the No. 1 bearing as a guide.

SST 09215-00100 (09215-00120, 09215-00150,
09215-00160, 09215-00210, 09215-00220)

CAUTION: When inserting the bearings, align each oil hole.

3. INSPECT OIL PUMP DRIVE SHAFT THRUST CLEARANCE

Using a feeler gauge, measure the drive shaft thrust clearance between the thrust plate and collar.

Standard thrust clearance: 0.06 – 0.13 mm
(0.0024 – 0.0051 in.)

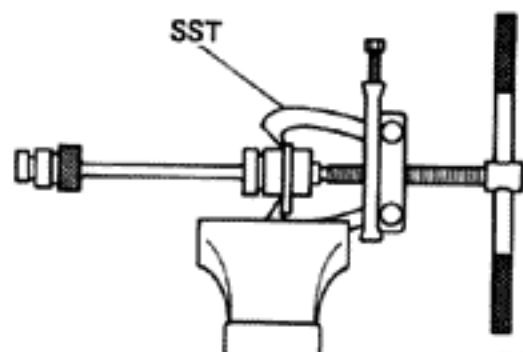
Maximum thrust clearance: 0.3 mm (0.012 in.)

If clearance is greater than maximum, replace the thrust plate and/or collar.

4. IF NECESSARY, REPLACE THRUST PLATE AND COLLAR

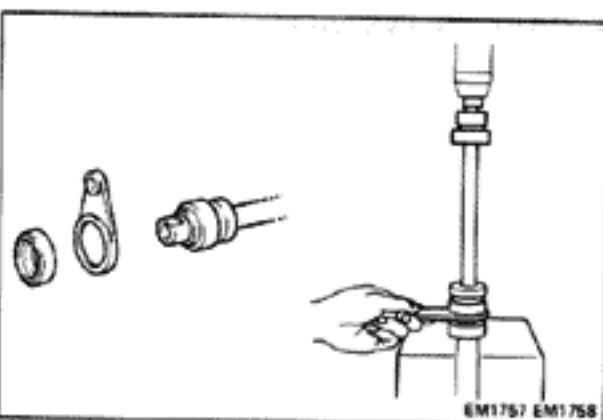
- (a) Using SST, remove the thrust plate and collar.

SST 09950-20016



EM1756

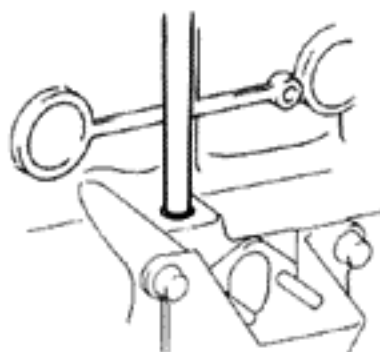
- (b) Install the thrust plate and collar in the order as shown.
(c) Using a press, install the thrust plate and collar.



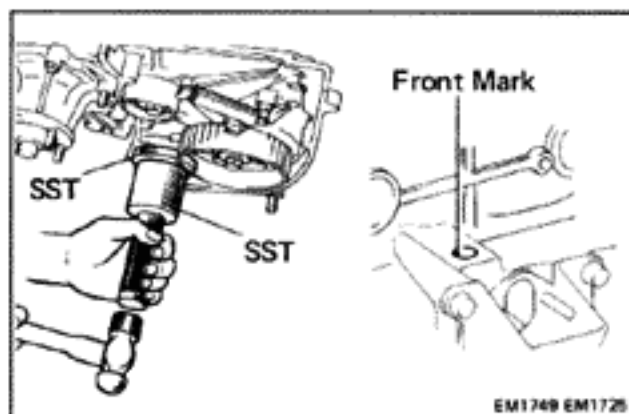
EM1757 EM1758

5. IF NECESSARY, REPLACE OIL PUMP GUIDE BUSHING

- (a) Drive out the bushing from the outer side of the block.



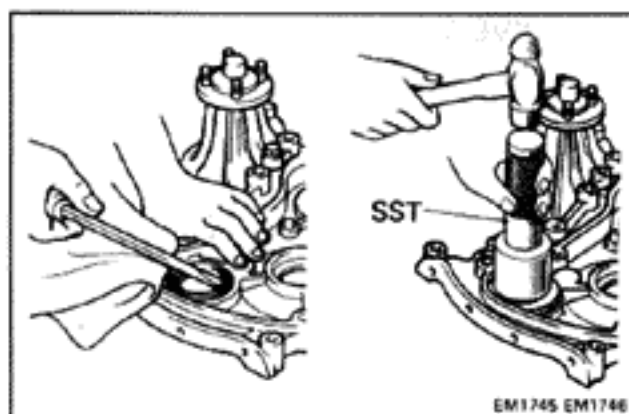
EM1821



- (b) Drive in the bushing from the inside of the block with a suitable tool.

NOTE: The oil hole should be positioned toward the crankshaft side.

- (c) Make sure the front mark of the bushing is positioned toward the front of block.



REPLACEMENT OF OIL SEALS

NOTE: There are two ways of oil seal replacement.

1. **IF TIMING BELT CASE IS REMOVED FROM CYLINDER BLOCK (Replacement of front oil seal and pump drive oil seal)**

(a) Using a screwdriver, remove the oil seal.

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

(c) Using SST, install the new oil seal.

SST 09214-41010 and 09506-35010

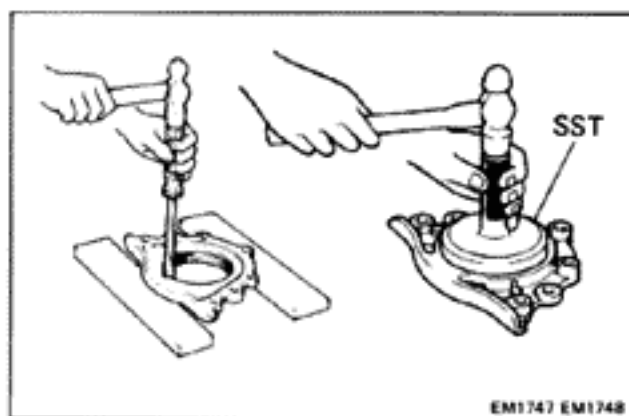
2. **IF REAR OIL SEAL RETAINER IS REMOVED FROM CYLINDER BLOCK (Replacement of rear oil seal)**

(a) Using a screwdriver, remove the oil seal.

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

(c) Using SST, install the new oil seal.

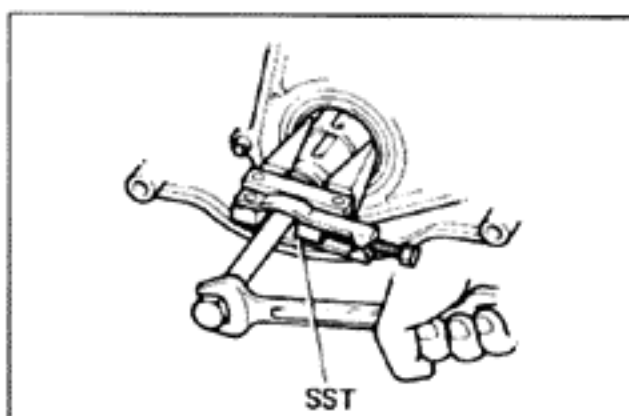
SST 09223-41020



3. **IF TIMING BELT CASE IS INSTALLED ON CYLINDER BLOCK (Replacement of front oil seal)**

(a) Using SST, remove the front oil seal.

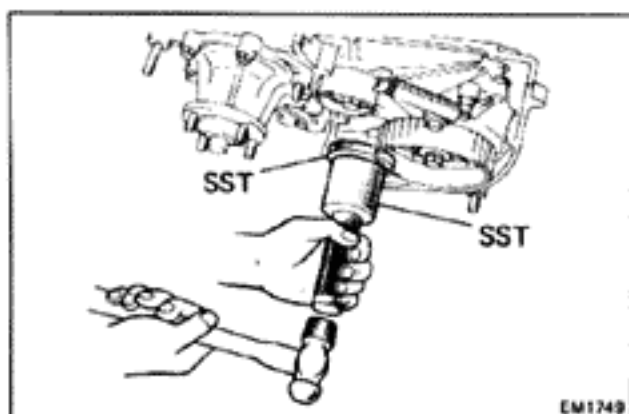
SST 09308-10010

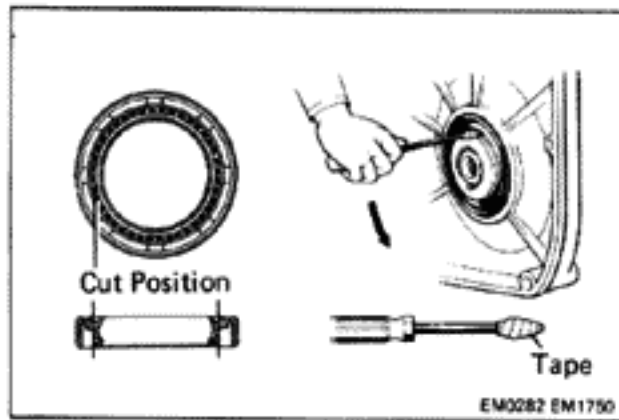


(b) Apply MP grease to the oil seal lip.

(c) Using SST, install the new oil seal.

SST 09214-41010 and 09506-35010

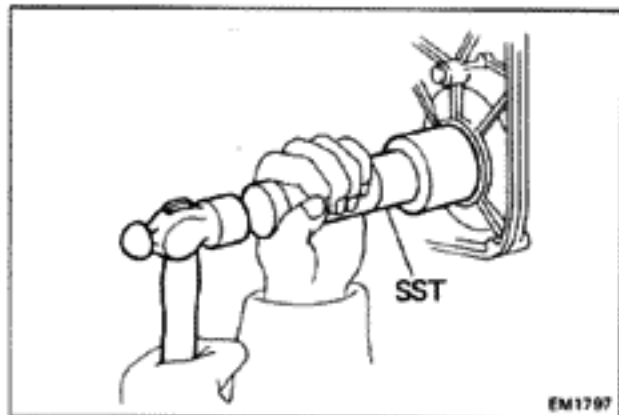




4. IF TIMING BELT CASE IS INSTALLED ON CYLINDER BLOCK (Replacement of pump drive oil seal)

- (a) As shown in the figure, use a knife to cut off the oil seal lip.
- (b) Using a screwdriver, pry out the oil seal.

NOTE: Be careful not to damage drive shaft. Tape the screwdriver tip.

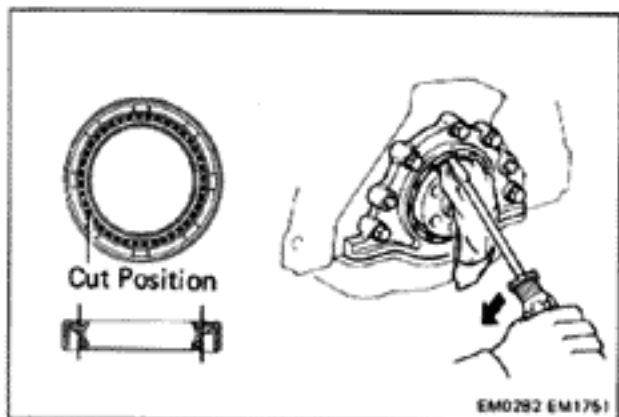


- (c) Check the drive pump shaft where it contacts the oil lip surface for cracks or damage.

- (d) Apply MP grease to the oil seal.

- (e) Using SST, install the new oil seal.

SST 09214-41010

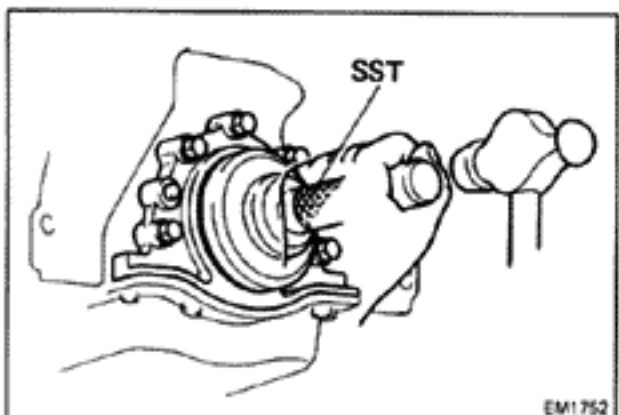


5. IF REAR OIL SEAL RETAINER IS INSTALLED ON CYLINDER BLOCK (Replacement of rear oil seal)

- (a) As shown in the figure, use a knife to cut off the oil seal lip.

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

NOTE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



- (c) Check the crankshaft where it contacts the oil lip surface for cracks or damage.

- (d) Apply MP grease to the oil seal.

- (e) Using SST, install the new oil seal.

SST 09223-41020

ASSEMBLY OF CYLINDER BLOCK

(See page EM-38)

1. INSTALL UPPER MAIN BEARING IN CYLINDER BLOCK

- Place the upper main bearing in the block.
- Install the upper thrust washers on the center main bearing with the oil grooves facing out.
- Lubricate the faces of the bearings with engine oil.

2. PLACE CRANKSHAFT IN CYLINDER BLOCK**3. INSTALL MAIN BEARING CAPS****NOTE:** Each bearing cap is numbered.

- Install thrust washers on No. 4 bearing cap with the oil grooves facing out.

- Install the bearing caps in numbered order with arrows facing forward. Tighten the bolts to the specified torque in the sequence shown and in two or three passes.

Torque: 1,040 kg-cm (75 ft-lb, 102 N·m)

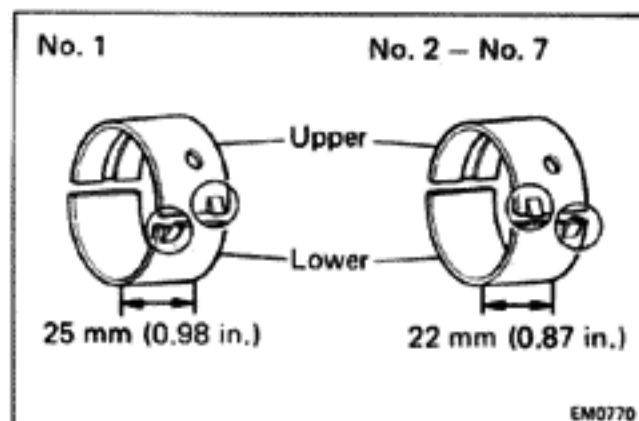
- Install the dial gauge and measure the crankshaft thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard clearance: 0.05 — 0.25 mm
(0.0020 — 0.0098 in.)

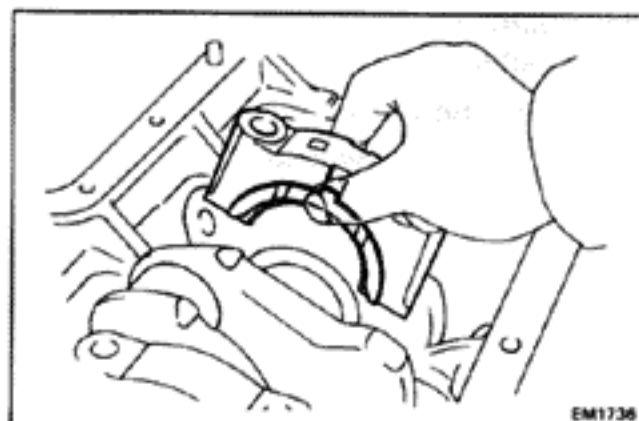
- Check that the crankshaft turns.

4. INSTALL PISTON AND CONNECTING ROD ASSEMBLY

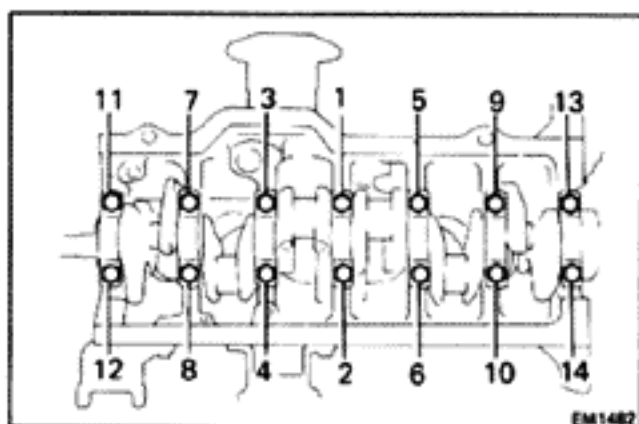
- Lubricate the cylinder bore and the crankshaft pin with clean engine oil.
- Using a ring compressor, push the correctly numbered piston and rod assembly into each cylinder. Make sure the notch and mark are facing forward.



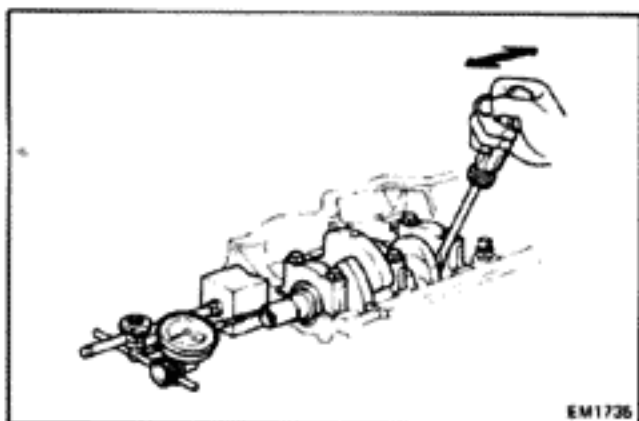
EM0770



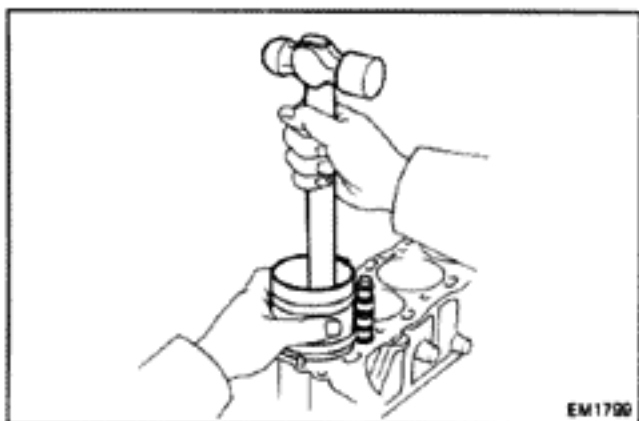
EM1736



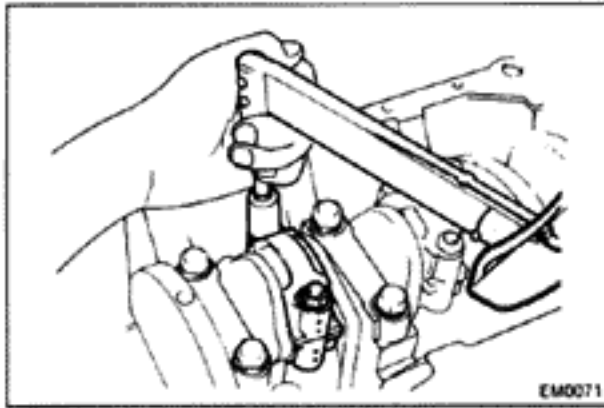
EM1482



EM1736



EM1790

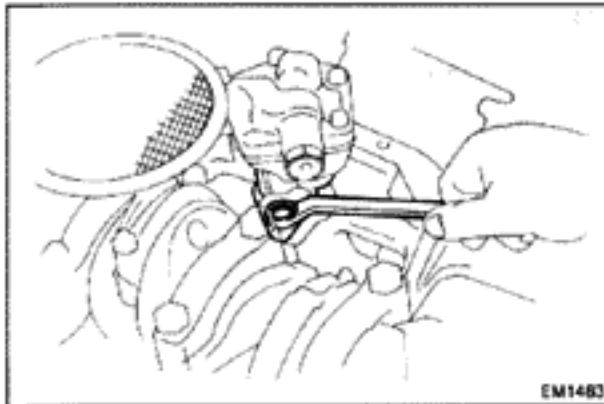


5. INSTALL ROD BEARING CAPS

- Match the numbered cap with the numbered rod.
- Align the marks punched on the rod and cap and tighten the cap nuts to specified torque alternately in two or three passes.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)

- After tightening the caps, check that the crankshaft rotates smoothly.



6. MEASURE ROD THRUST CLEARANCE (See step 16 on page EM-43)

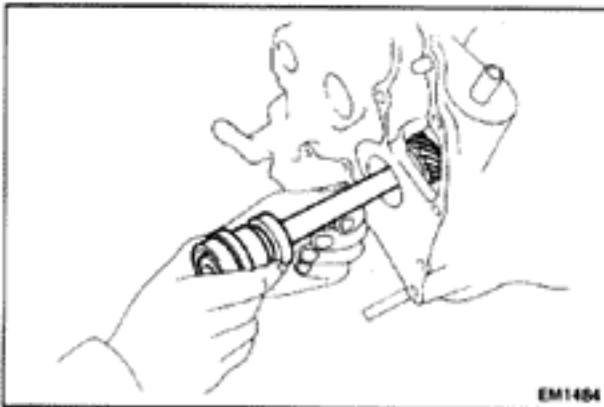
7. INSTALL OIL PUMP ASSEMBLY

- Clean the oil pump.
- Install the oil pump and holding bolt.
Torque the bolt.

Torque: 220 kg-cm (16 ft-lb, 22 N·m)

- Install the oil pipe with gasket, lock washer and union bolt. Tighten the oil pipe nut and bolt.

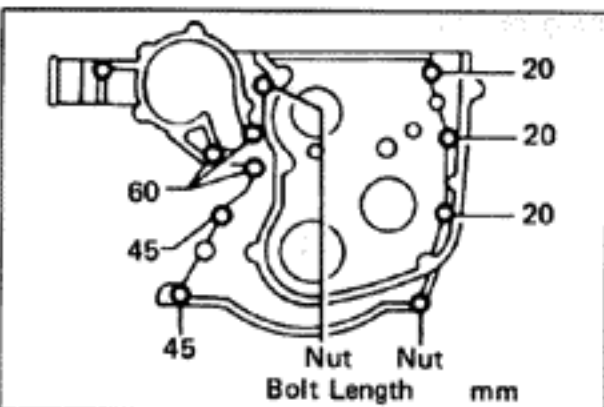
Torque: 350 kg-cm (25 ft-lb, 34 N·m)



8. INSTALL OIL PUMP DRIVE SHAFT

While turning the drive shaft, slowly insert so as not to damage the drive shaft bearing.
Torque the bolt.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)



9. INSTALL REAR OIL SEAL RETAINER

10. INSTALL TIMING BELT CASE WITH WATER PUMP

- Position a new gasket on the cylinder block.
- Install the timing belt case with eight bolts and two nuts.

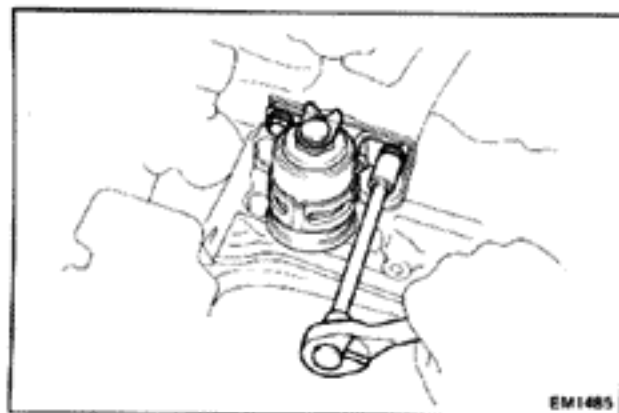
Torque:

8 mm bolt and nut	185 kg-cm (13 ft-lb, 18 N·m)
10 mm bolt	375 kg-cm (27 ft-lb, 37 N·m)

11. INSTALL OIL PAN (See page LU-7)

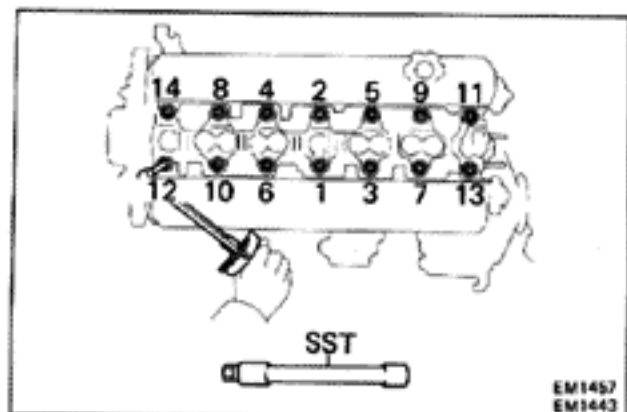
12. INSTALL WATER BY-PASS PIPE

13. INSTALL FUEL HOSE SUPPORT



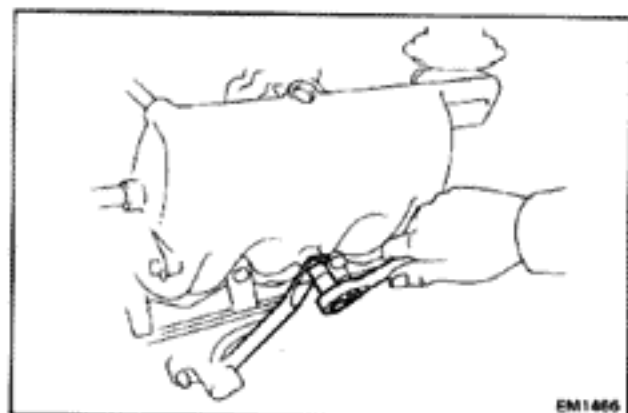
EM1485

14. INSTALL FUEL FILTER
15. INSTALL ALTERNATOR
16. INSTALL OIL LEVEL GAUGE
17. INSTALL NEW OIL FILTER

EM1457
EM1443

18. INSTALL CYLINDER HEAD ASSEMBLY

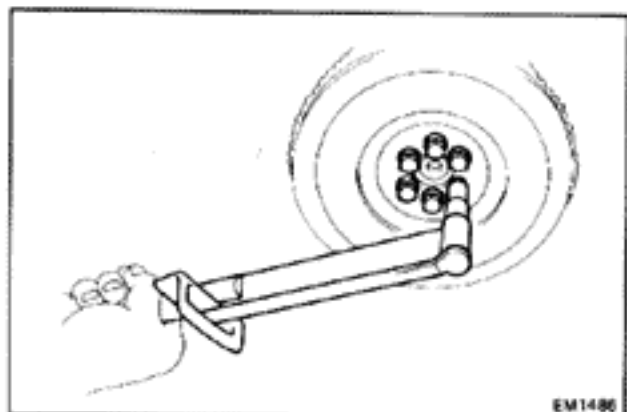
- (a) Install the cylinder head assembly.
- (b) Using SST, install and tighten the cylinder head bolts.
SST 09043-38100
Torque: 800 kg-cm (58 ft-lb, 78 N·m)



EM1486

- (c) Install the air intake chamber stay.
- (d) Install the No.2 timing belt cover.
- (e) Install the timing belt. (See page EM-14 to 17)
- (f) Connect the PCV hose to the cylinder block.
- (g) Connect the No.1 water by-pass hose to the water by-pass pipe.

19. REMOVE ENGINE STAND



EM1486

20. INSTALL REAR END PLATE

21. INSTALL FLYWHEEL OR DRIVE PLATE ON CRANKSHAFT

Install the flywheel or drive plate on crankshaft with six bolts. Torque the bolts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)

22. INSTALL CLUTCH DISC AND COVER TO FLYWHEEL (for M/T)

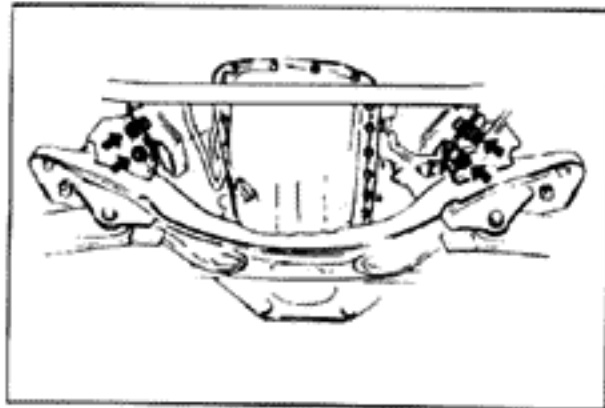
INSTALLATION OF ENGINE

1. INSTALL TRANSMISSION TO ENGINE

- (a) Install the transmission housing mount bolts and exhaust pipe bracket.
- (b) Install the starter with the mount nuts.

2. INSTALL ENGINE WITH TRANSMISSION IN VEHICLE

- (a) Attach the engine hoist chain to the lifting brackets on the engine.
- (b) Lower the engine into the engine compartment.
- (c) Align the engine with the transmission and engine mounting supports.
- (d) Install the engine mounting bolts on each side of the engine.
- (e) Remove the hoist chain.



3. RAISE VEHICLE

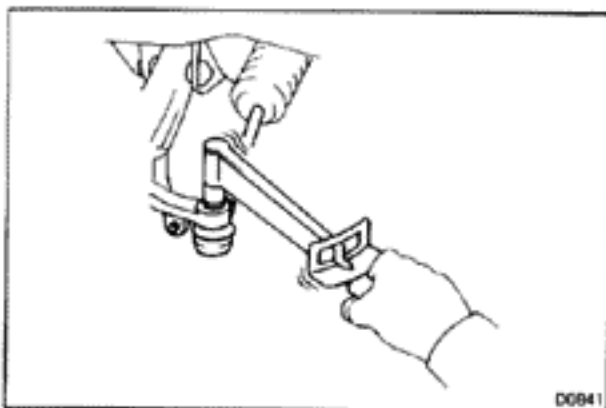
CAUTION: Be sure the vehicle is securely supported.

4. INSTALL ENGINE REAR SUPPORT MEMBER WITH GROUND STRAP TO BODY

5. INSTALL INTERMEDIATE SHAFT TO PROPELLER SHAFT

6. INSTALL POWER STEERING GEAR HOUSING

- (a) Install the gear housing with two brackets.
Torque: 770 kg-cm (56 ft-lb, 76 N·m)
- (b) Connect the tie rod ends and install a new cotter pin.
Torque: 600 kg-cm (43 ft-lb, 59 N·m)
- (c) Install the sliding yoke and two lock bolts.



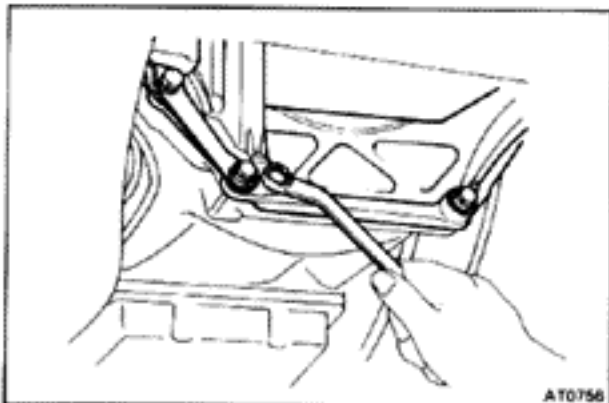
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7. CONNECT BATTERY GROUND STRAP TO ENGINE MOUNTING BRACKET

8. INSTALL STIFFENER PLATE WITH GROUND STRAP

9. CONNECT FUEL HOSE AND TUBE

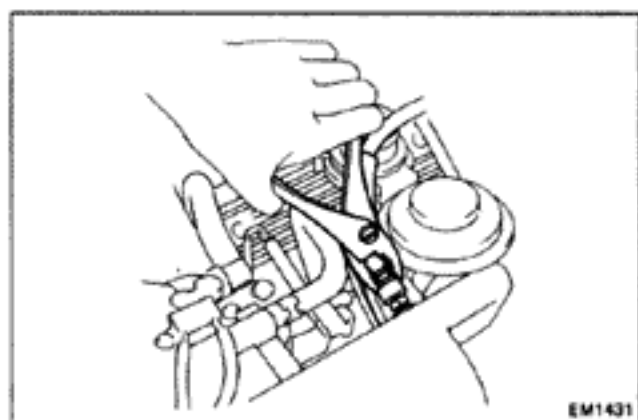
- (a) Main tube to fuel filter.
- (b) Return hose to fuel hose support.



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10. INSTALL COOLANT RESERVOIR TANK**11. INSTALL RADIATOR**

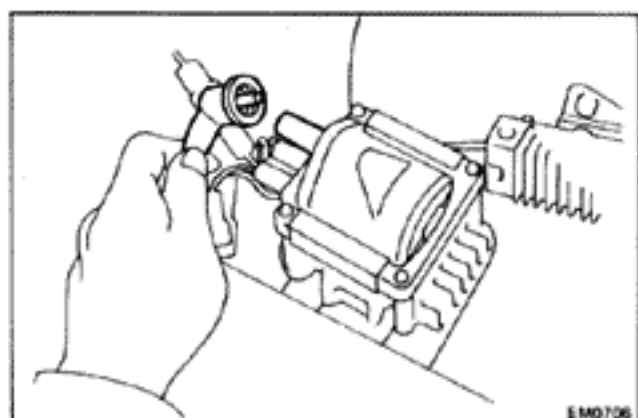
- (a) Install the radiator and the two mounting bolts.
- (b) Connect the coolant receiver tube.
- (c) Connect the two oil cooler hose. (for A/T)
- (d) Install the radiator lower hose.

12. INSTALL FAN SHROUD AND FLUID COUPLING**13. INSTALL AIR CLEANER CASE, AIR FLOW METER AND AIR INTAKE CONNECTOR PIPE****14. CONNECT EFI WIRE HARNESS TO ECU****15. CONNECT TWO HEATER HOSES TO BLOCK AND CYLINDER HEAD****16. CONNECT FOLLOWING HOSES:**

- (a) Brake booster vacuum hose to the intake manifold
- (b) Actuator vacuum hose to the intake manifold (with cruise control system)
- (c) EGR valve vacuum hose

17. CONNECT FOLLOWING WIRES AND CABLES:

- (a) Ground to the cylinder head
- (b) Oxygen sensor wire
- (c) Oil pressure sending unit wire
- (d) ECT connectors
- (e) High-tension cord from the ignition coil
- (f) Distributor connector
- (g) Water temp. sending unit wire
- (h) Temp. switch wire (for A/T)
- (i) Solenoid resistor wire connector
- (j) Knock sensor wire connector

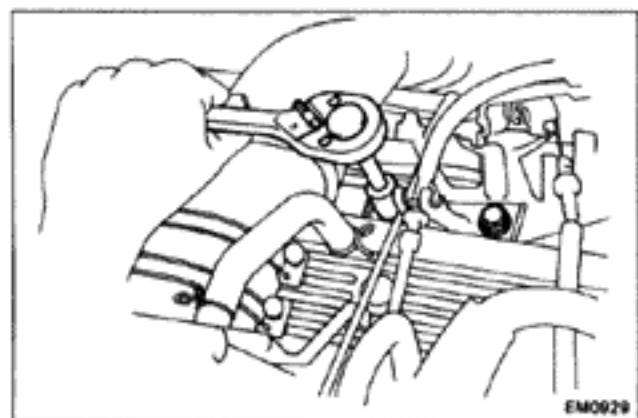
**18. INSTALL ACCELERATOR AND ACTUATOR CABLE BRACKET****19. INSTALL THROTTLE CABLE BRACKET (for A/T)****20. FILL WITH COOLANT**

Close the radiator and engine drain cocks and fill with coolant.

Total capacity: w/Heater

M/T 8.0 liters (8.5 US qts, 7.0 Imp. qts)

A/T 7.9 liters (8.3 US qts, 7.0 Imp. qts)



21. FILL WITH ENGINE OIL

Close the engine drain plug and fill with engine oil of API grade SF, fuel-efficient, multi-grade oil.

Capacity:**Dry fill**

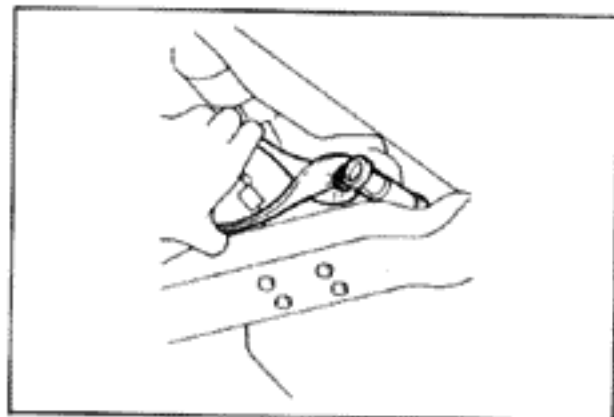
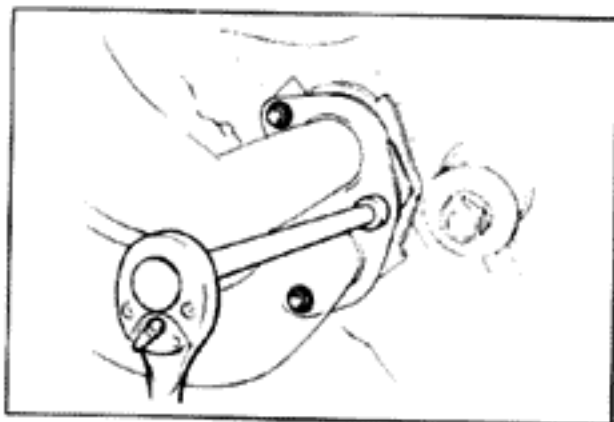
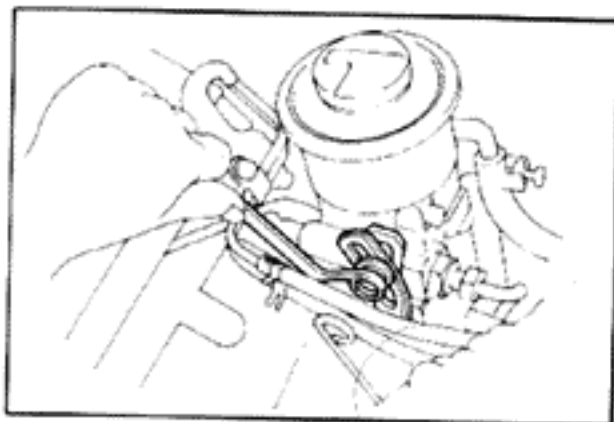
5.7 liters (6.0 US qts, 5.0 Imp. qts)

Drain and refill (w/ Oil filter change)

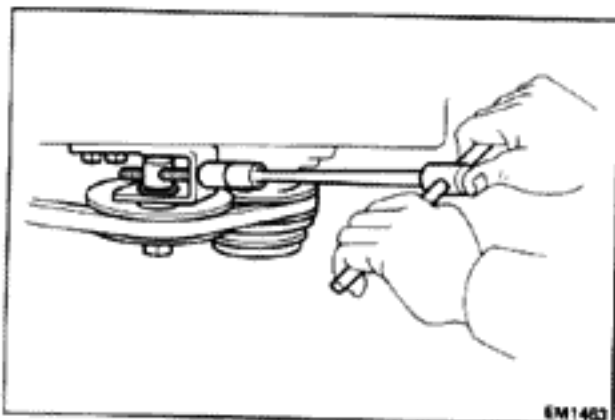
5.1 liters (5.4 US qts, 4.5 Imp. qts)

Drain and refill (w/o Oil filter change)

4.6 liters (4.9 US qts, 4.0 Imp. qts)

**22. CONNECT WIRE TO BACK-UP LIGHT SWITCH (M/T only)****23. CONNECT SPEEDOMETER CABLE****24. INSTALL CLUTCH RELEASE CYLINDER (M/T only)****25. CONNECT SHIFT LINKAGE TO SHIFT LEVER (A/T only)****26. CONNECT EXHAUST PIPE TO EXHAUST MANIFOLD****27. INSTALL EXHAUST PIPE CLAMP TO TRANSMISSION HOUSING****28. LOWER VEHICLE****29. INSTALL POWER STEERING PUMP ONTO BRACKET**

- (a) Install the PS pump and stay.
- (b) Install the PS pump pulley with the drive belt.
- (c) Pry on the alternator to obtain the specified belt tension. (See page MA-4)

**30. INSTALL COMPRESSOR WITH BRACKET ONTO BLOCK**

- (a) Install the compressor with the bracket onto the block.
- (b) Turn the adjusting belt on the idler pulley until the specified belt tension is obtained. (See page MA-4)

31. INSTALL ENGINE UNDERCOVER

32. INSTALL WASHER TANK**33. INSTALL BATTERY****34. INSTALL HOOD****35. START ENGINE**

Warm up the engine and inspect for leaks.

36. PERFORM ENGINE ADJUSTMENT

- (a) Recheck the ignition timing.
(See page IG-10)
- (b) Retighten the cylinder head bolts.
(See step 18 on page EM-60)

37. ROAD TEST

Perform a road test.

38. RECHECK COOLANT AND ENGINE OIL LEVEL