# ENGINE MECHANICAL

# TROUBLESHOOTING

| Problem | Possible cause | Remedy | Page |
|---|---|---|---|
| Engine overheats | Cooling system faulty | Troubleshoot cooling system | CO-2 |
| | Incorrect ignition timing | Reset timing | IG-10 |
| Engine will not crank or cranks slowly | Starting system faulty | Troubleshoot starting system | ST-2 |
| Engine will not start/ Hard to start (cranks OK) | Vacuum leaks<br>• PCV hoses<br>• EGR valve<br>• Intake manifold<br>• Air intake chamber<br>• Throttle body<br>• ISC valve | Repair as necessary | |
| | Pulling in air between air flow meter and throttle body | Repair as necessary | FI-58, 63 |
| | Ignition problems<br>• Ignition coil<br>• Igniter<br>• Distributor | Perform spark test | IG-4 |
| | Ignition wiring disconnected or broken | Inspect wiring | |
| | No fuel supply to injector<br>• No fuel in tank<br>• Fuel pump not working<br>• Fuel filter clogged<br>• Fuel line clogged or leaking | Troubleshoot EFI system | FI-8 |
| | EFI system problems | Repair as necessary | |
| | ISC system problem | Check ISC system | FI-60 |
| | Spark plugs faulty | Inspect plugs | IG-5 |
| | Low compression | Check compression | EM-6 |
| Rough idle, stalls or misses | Vacuum leaks<br>• PCV hoses<br>• EGR valve<br>• Intake manifold<br>• Air intake chamber<br>• Throttle body<br>• ISC valve | Repair as necessary | |
| | Pulling in air between air flow meter and throttle body | | FI-58, 63 |
| | Incorrect idle speed | Check ISC system | FI-60 |
| | Incorrect ignition timing | Reset timing | IG-10 |
| | Ignition problems<br>• Ignition coil<br>• Igniter<br>• Distributor | Perform spark test<br>Inspect coil<br><br>Inspect distributor | IG-4 |
| | Ignition wiring faulty | Inspect wiring | |
| | EFI system problems | Repair as necessary | |
| | Spark plugs faulty | Inspect plugs | |

# TROUBLESHOOTING (Cont'd)

| Problem | Possible cause | Remedy | Page |
|---|---|---|---|
| Engine hesitates/ Poor acceleration | Vacuum leaks<br>• PCV hoses<br>• EGR valve<br>• Intake manifold<br>• Air intake chamber<br>• Throttle body<br>• 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)<br>• 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<br>• PCV hoses<br>• EGR valve<br>• Intake manifold<br>• Air intake chamber<br>• Throttle body<br>• 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 |

# TROUBLESHOOTING (Cont'd)

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

# 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 MINUTES**

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

3. **MEASURE HC/CO CONCENTRATION AT IDL**

   Wait at least one minute before measuring t allow the concentration to stabilize.

   Complete the measuring within three minute

   If the HC/CO concentration does not confor to your regulations, see the table below fo possible causes.

## TROUBLESHOOTING

| HC | CO | Symptoms | Causes |
|---|---|---|---|
| High | Normal | Rough idle | 1. Faulty ignition:<br>• Incorrect timing<br>• Fouled, shorted or improperly gapped plugs<br>• Open or crossed ignition wires<br>• Cracked distributor cap<br>2. Faulty EGR system<br>• EGR valve<br>3. Leaky exhaust valves<br>4. Leaky cylinder |
| High | Low | Rough idle<br>Fluctuating HC reading | 1. Vacuum leak:<br>• Vacuum hose<br>• Intake manifold<br>2. Lean mixture causing misfire |
| High | High | Rough idle<br>Black smoke from exhaust | 1. Restricted air filter<br>2. Faulty EFI system:<br>• Faulty pressure regulator<br>• Clogged fuel return line<br>• Faulty air flow meter<br>• Defective water temp. sensor<br>• Defective air temp. sensor<br>• Faulty ECU |

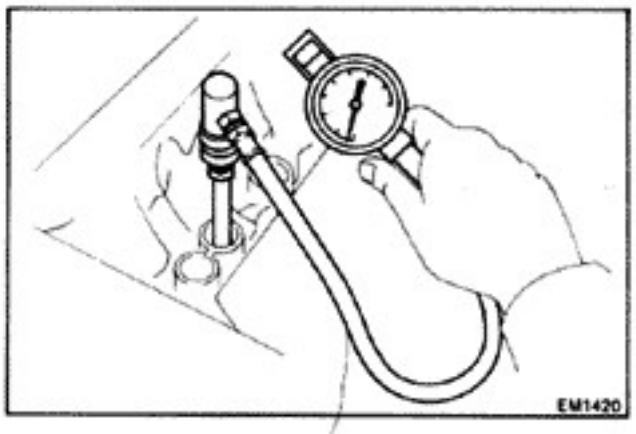
# COMPRESSION CHECK

NOTE: If there is lack of power, excessive oil consum
tion or poor fuel mileage, measure the cylinder compre
sion pressure.

1. **WARM UP ENGINE**

2. **REMOVE SPARK PLUGS**

3. **DISCONNECT HIGH-TENSION CORD FROM DISTRIBUT**




4. **MEASURE CYLINDER COMPRESSION PRESSURE**

   (a) Insert a compression gauge into the spark plug ho

   (b) Fully open the throttle valve.

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

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

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

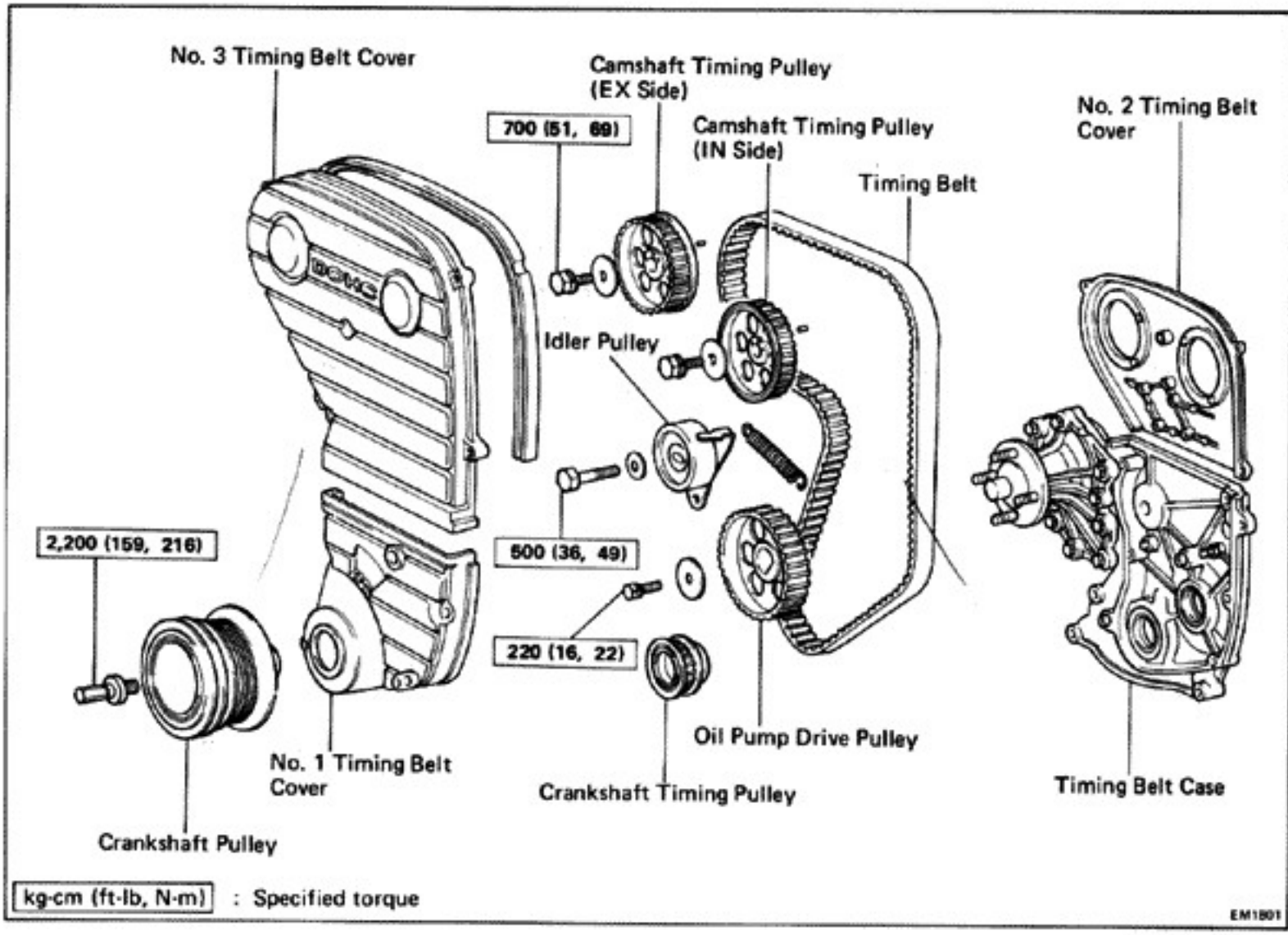
   **Compression pressure:**
   **11.5 kg/cm² (164 psi, 1,128 kPa)**
   **Minimum pressure:**
   **9.0 kg/cm² (128 psi, 883 kPa)**
   **Difference between each cylinder:**
   **Less than 1.0 kg/cm² (14 psi, 98 k**

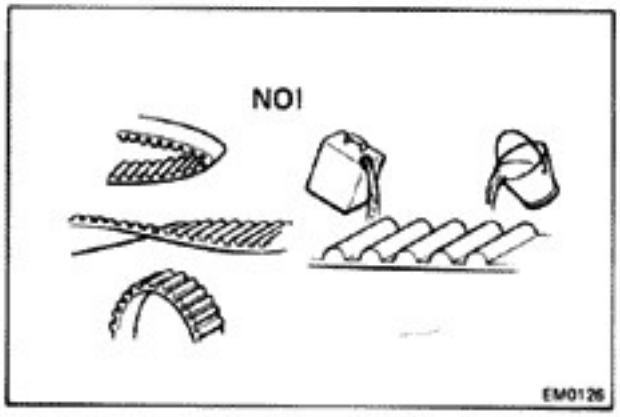
   (e) If cylinder compression in one or more cylinders is lo
   pour a small amount of engine oil into the cylinc
   through the spark plug hole and repeat steps
   through (c) for the cylinder with low compressio

   - If adding oil helps the compression, changes a
   that the piston rings and/or cylinder bore are wo
   or damaged.
   - If pressure stays low, a valve may be sticking
   seatied improperly, or there may be leakage pa
   the gasket.

# TIMING BELT

## COMPONENTS




## CAUTIONS

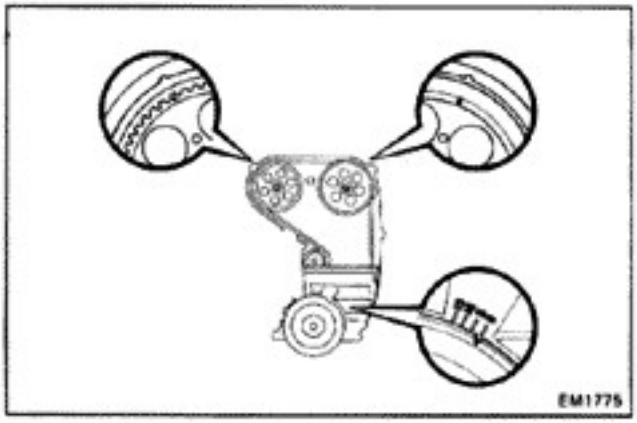
1. Do not bend, twist or turn the belt inside out.
2. Do not allow the belt to come into contact with oil, water or steam.

## INSPECTION AND ADJUSTMENT OF VALVE TIMING

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE NO.2 FAN SHROUD

4. **REMOVE NO. 3 TIMING BELT COVER**

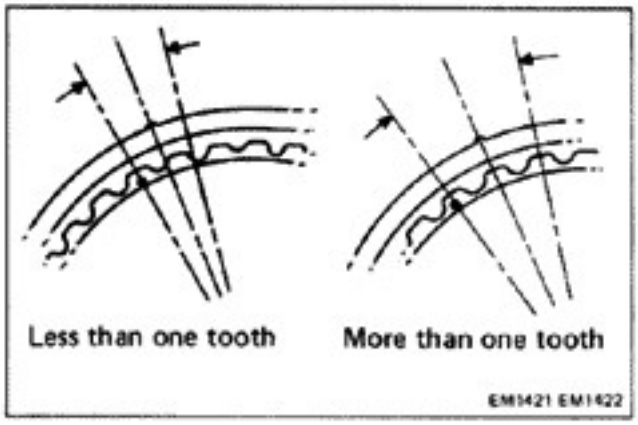
5. **REMOVE OIL FILLER CAP AND CYLINDER HEAD COVE OF EXHAUST SIDE**



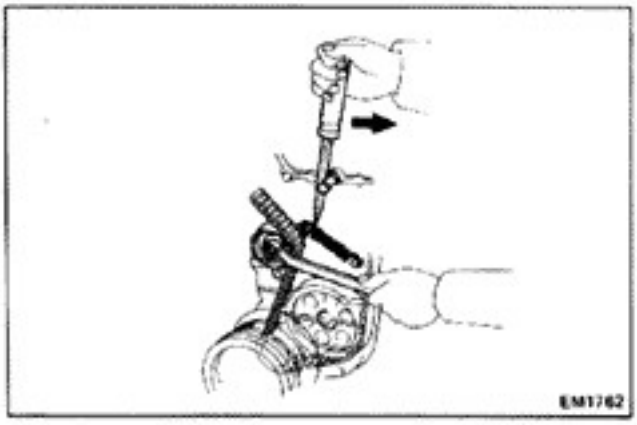

6. **CHECK CAMSHAFT TIMING PULLEY MARKS**

(a) Turn the crankshaft clockwise and set the No. cylinder to TDC/compression.

(b) Check that the matchmarks of the camshaft timi pulleys are aligned with those of the No. 2 timing be cover.




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




7. **ADJUSTMENT OF CAMSHAFT TIMING PULLEY MARK**

(a) Loosen the idler pulley set bolt a little and shift t idler pulley to the alternator side with a screwdriv and wrench.

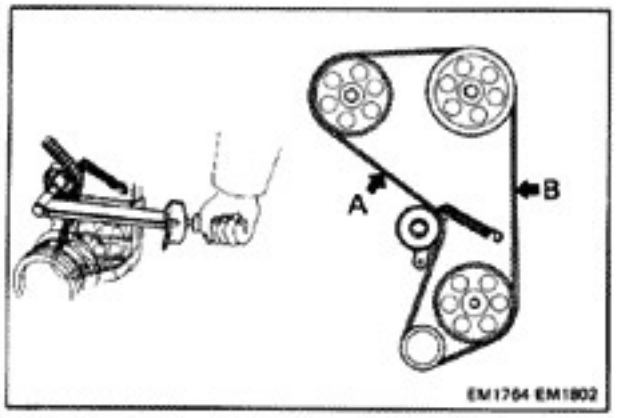
(b) Finger tighten the idler pulley set bolt.

(c) Remove the timing belt from the camshaft timi pulleys.

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

SST 09278-54012

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

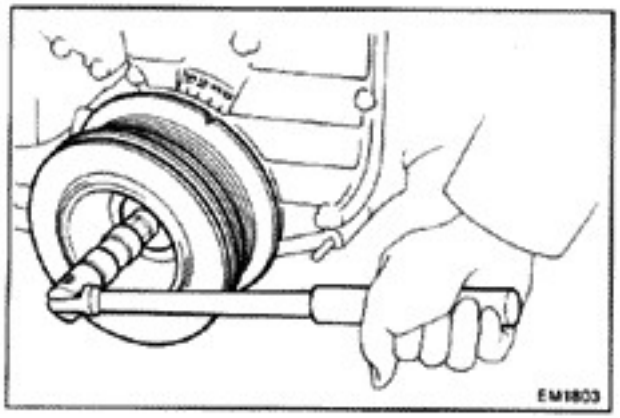



(f) Loosen the idler pulley set bolt stretch the timing belt

(g) Tighten the idler pulley set bolt.

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

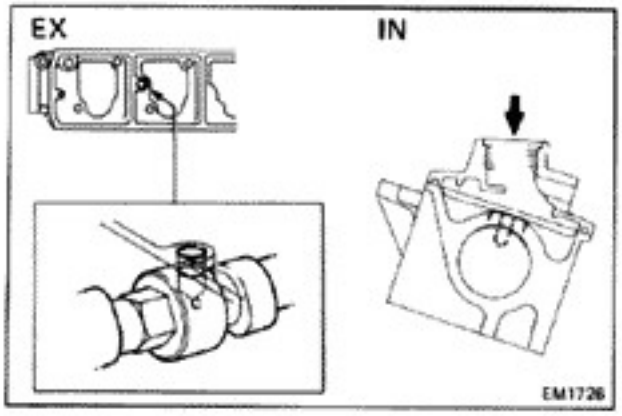
NOTE: Make sure that the timing belt tension at A is equa to that at B. If not, retighten the idler pulley set bolt.




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

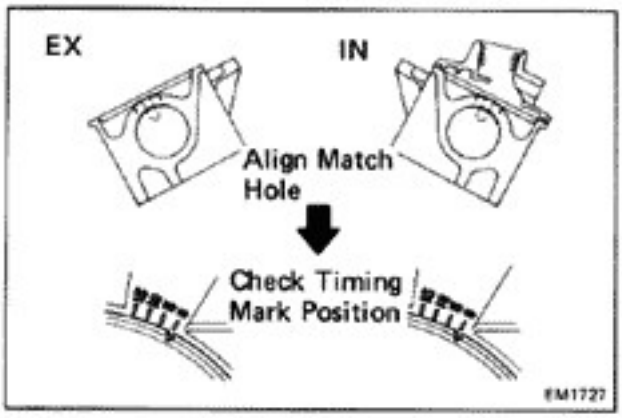
NOTE: Recheck the timing belt tension.

(i) Recheck the camshaft timing pulley marks.




## 8. CHECK MATCH HOLE OF CAMSHAFT

(a) Clean the camshaft match holes with compressed air



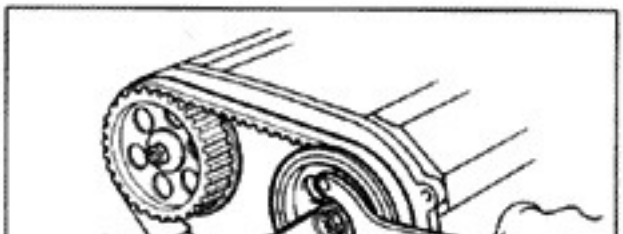

(b) Align the match hole of the camshaft with that of the camshaft housing by turning the crankshaft pulley

(c) After alignment, make a note of the crankshaft pul ley 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 ± 5°, it is correct.

If it exceeds TDC ± 5°, proceed to step 9.

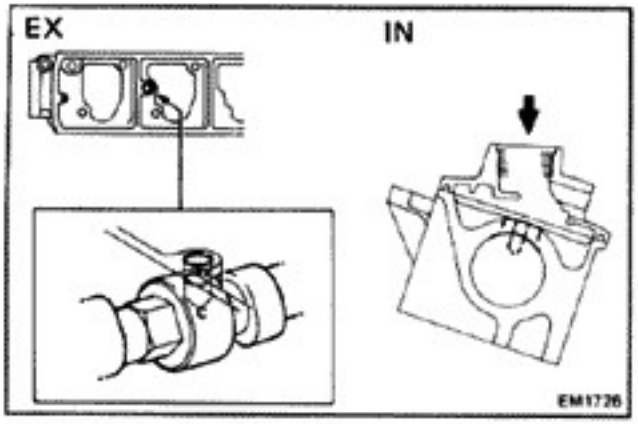


## 9. ADJUSTMENT OF CAMSHAFT MATCH HOLES

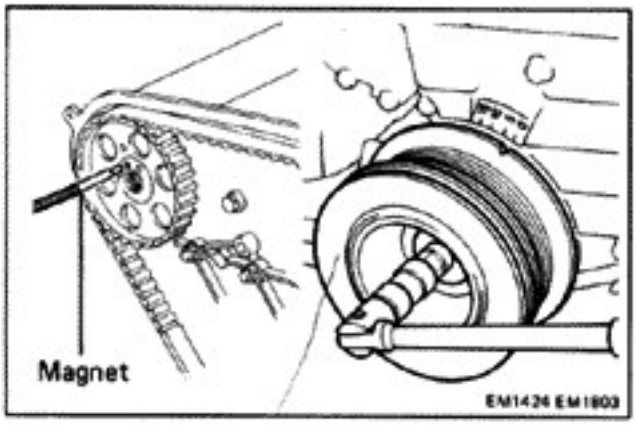
(a) Using SST to hold the camshaft timing pulley, remove the pulley set bolt.

SST 09278-54012

**CAUTION: Do not make use of the timing belt tension**

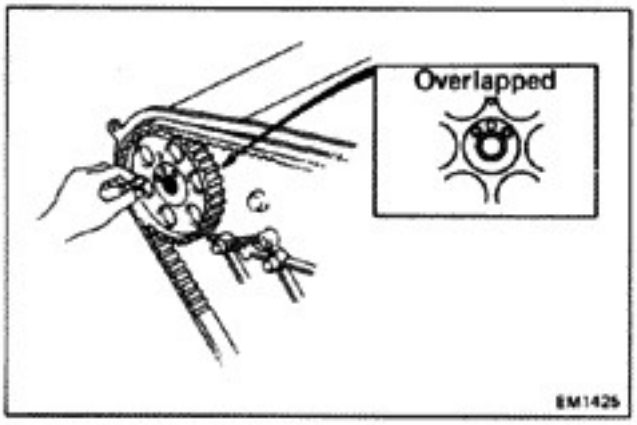



(b) Make sure that the match hole of camshaft hous
is aligned with that of the camshaft.




(c) Using a magnet, remove the match pin from the
hole of the camshaft timing pulley.

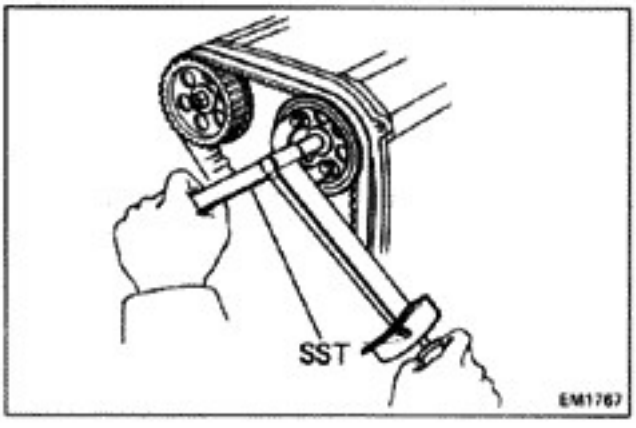
(d) Set the No. 1 cylinder to TDC/compression.




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

NOTE:

- If there is no overlapping hole, find one that is nea
overlapped and rotate the crankshaft slightly to ov
lap it, and then insert the pin.
- The crankshaft pulley angle can be adjust appro
mately 3° by changing the pin hole to the next o




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

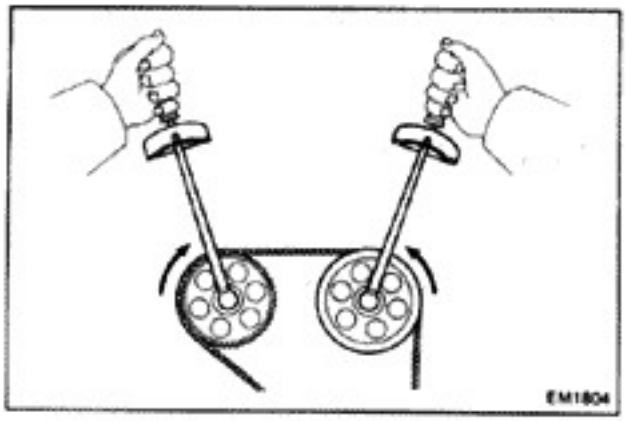
SST 09278-54012

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

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

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

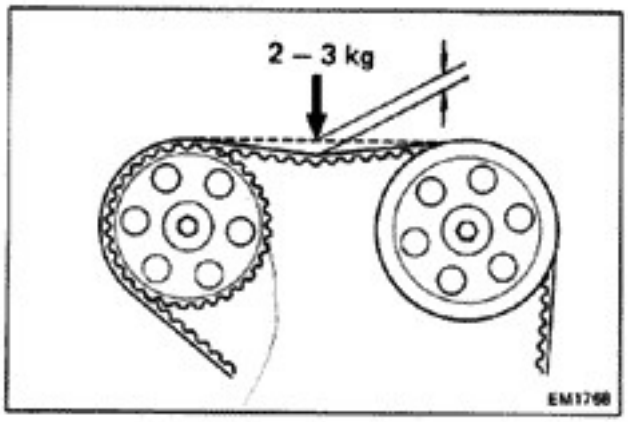
(h) Recheck the crankshaft pulley angle on the No. 1 t
ing belt cover after alignment of the camshaft ma




10. CHECK TIMING BELT TENSION

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

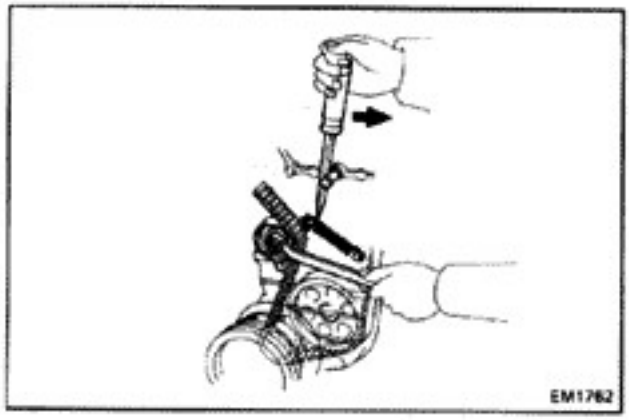
**Turning torque: 200 kg-cm (14 ft-lb, 20 N·m)**




(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, adjus with the idler pulley.

11. INSTALL NO. 3 TIMING BELT COVER

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

13. INSTALL AIR INTAKE CONNECTOR

14. INSTALL NO.2 FAN SHROUD

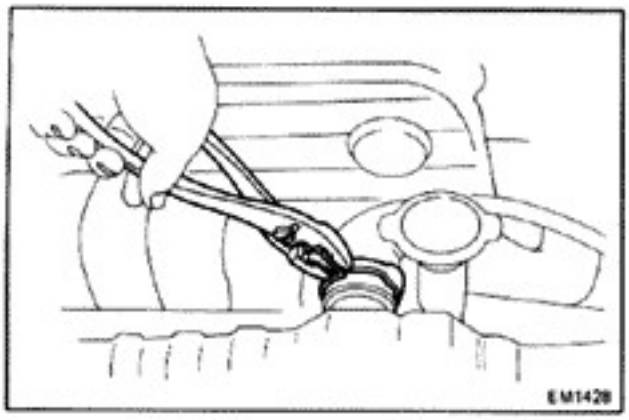
15. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTER

## REMOVAL OF TIMING BELT

**(See page EM-7)**

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL O BATTERY

2. DRAIN COOLANT



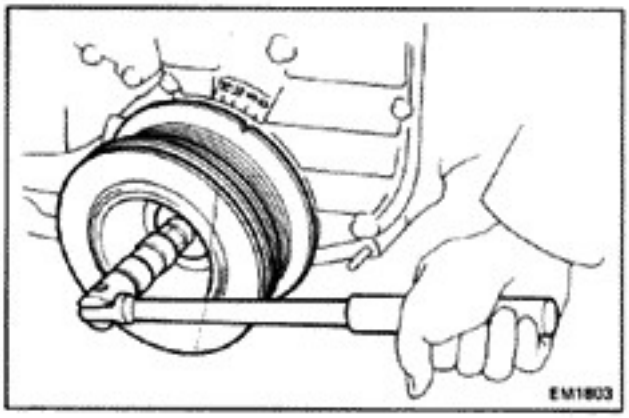

4. **REMOVE RADIATOR UPPER HOSE**

5. **LOOSEN DRIVE BELTS**

6. **REMOVE FLUID COUPLING WITH FAN SHROUD**

7. **REMOVE DRIVE BELTS**

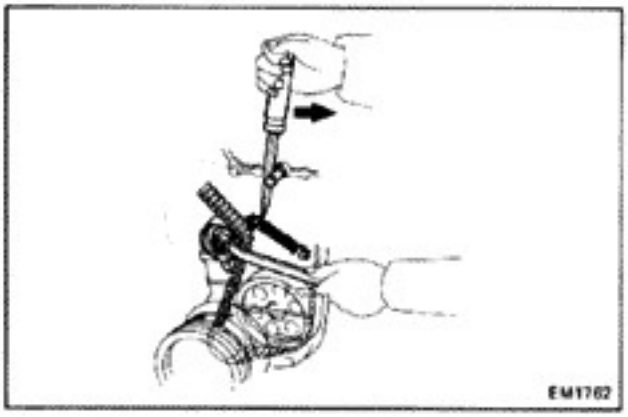
8. **REMOVE AIR INTAKE CONNECTOR**




9. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**

10. **REMOVE NO. 3 TIMING BELT COVER**

Remove the five bolts and remove the cover and gas

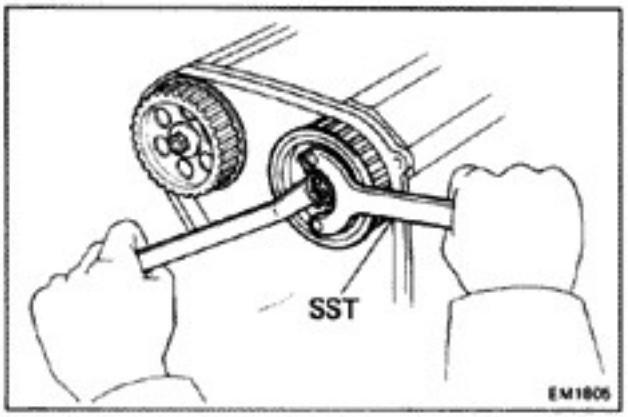



11. **RELIEVE TIMING BELT TENSION**

(a) Loosen the idler pulley set bolt a little and shift idler pulley to the alternator side with a screwdr and wrench.

(b) Finger tighten the set bolt and then relieve the tim 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 b timing pulley, and match pin.

SST 09278-54012

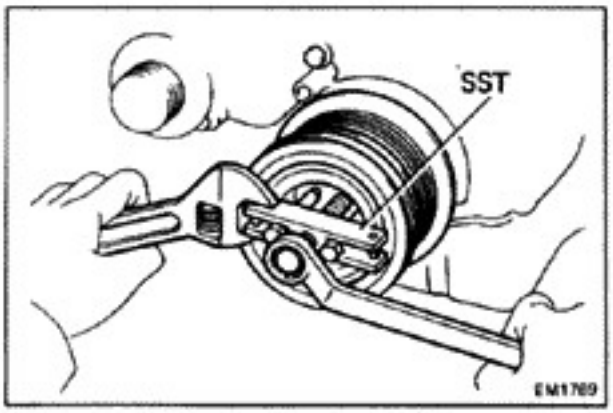
**CAUTION: Do not make use of the timing belt tens when removing and installing the pulley set bolts.**

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


14. **REMOVE CRANKSHAFT PULLEY**

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

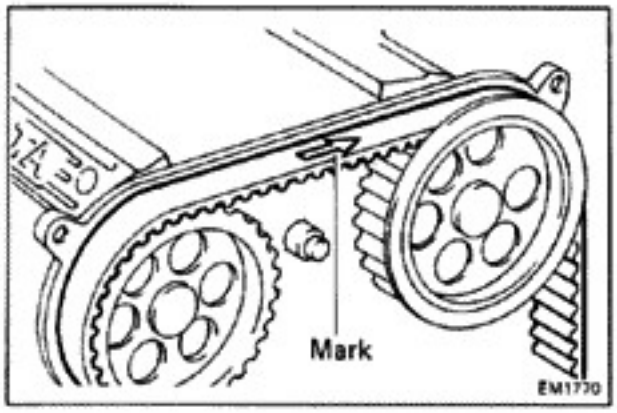
SST 09213-70010 and 09330-00021




(c) Using SST, remove the pulley.

SST 09213-31021

**15. REMOVE BRACKET OF COOLER COMPRESSOR**



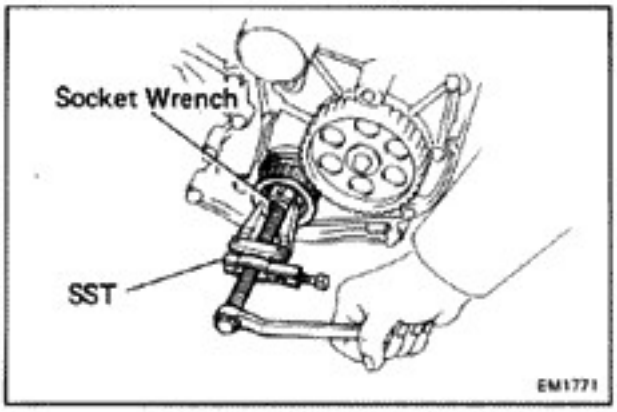

**16. REMOVE NO. 1 TIMING BELT COVER AND TIMING BEL**

(a) Using chalk, place a rotation direction mark on the tim ing belt.

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

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

(c) Remove the timing belt.

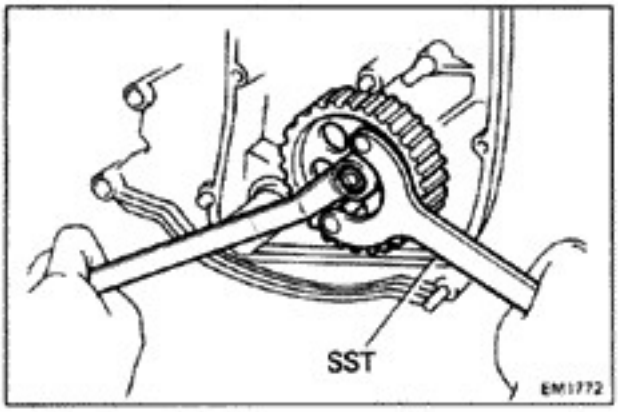



**17. REMOVE IDLER PULLEY AND TENSION SPRING**

**18. REMOVE CRANKSHAFT TIMING PULLEY**

Using SST and socket wrench, remove the crankshaft tim ing pulley.

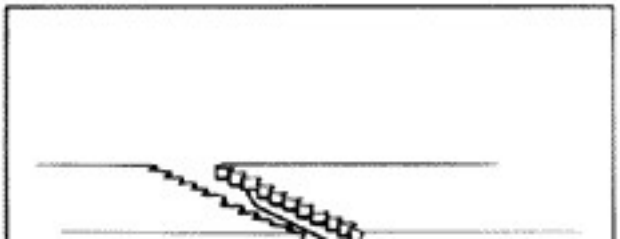
SST 09308-10010




**19. REMOVE OIL PUMP DRIVE SHAFT PULLEY**

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

SST 09278-54012

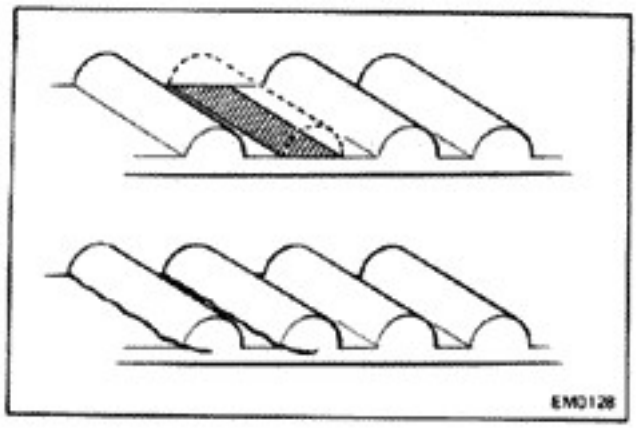


## INSPECTION OF COMPONENTS

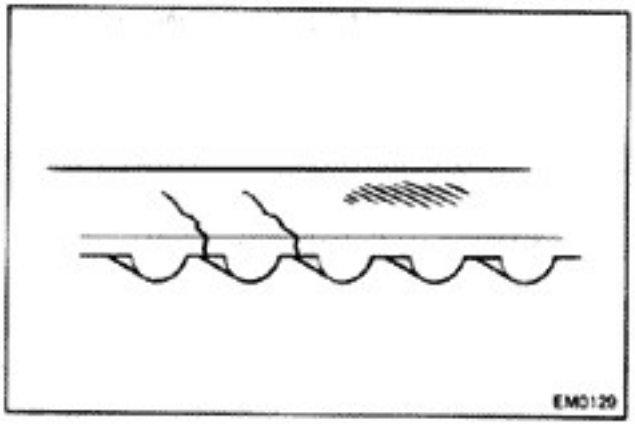
**1. INSPECT TIMING BELT**

(a) Premature parting

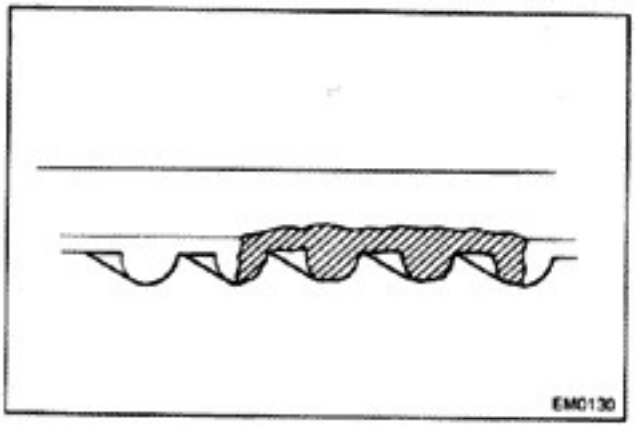
- Check for proper installation.
- Check the timing belt cover gasket for damage, an



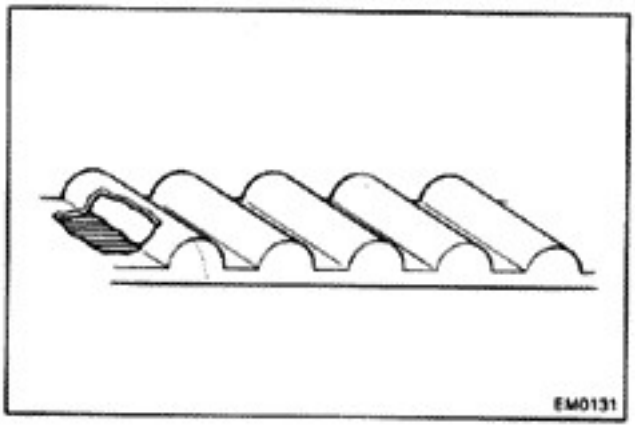

(b) If the belt teeth are cracked or damaged, check to
if the camshaft is locked.




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




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

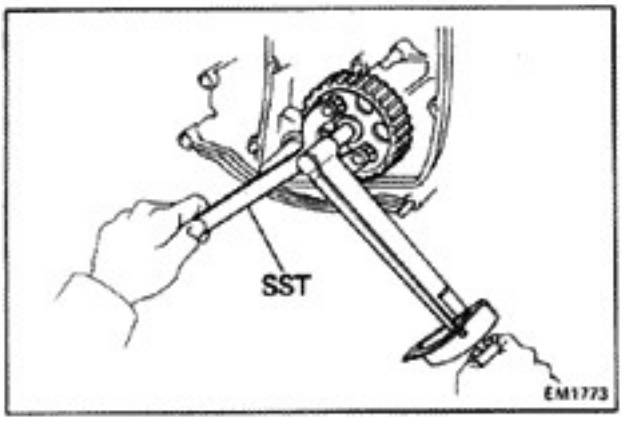



(e) If there is noticeable wear on the belt teeth, che
the timing belt cover gasket for damage and che
for correct gasket installation. Check for forei
material on the pulley teeth.

2. **INSPECT IDLER PULLEY AND TENSION SPRING**

(a) Check the turning smoothness of the timing belt id
pulley.

(b) Check the free length of the tension spring.




## INSTALLATION OF TIMING BELT

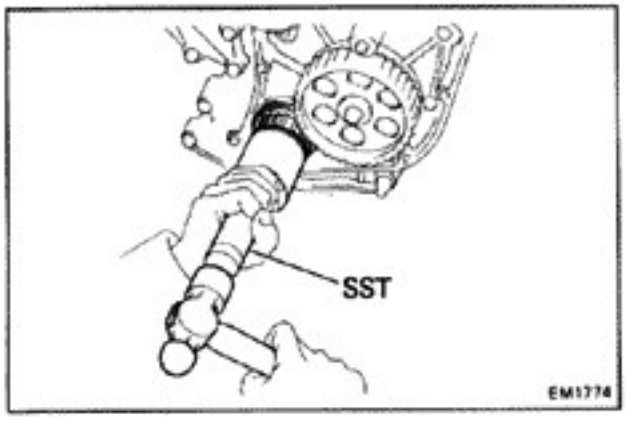
(See page EM-7)

1. **INSTALL OIL PUMP DRIVE PULLEY**

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

   SST 09278-54012

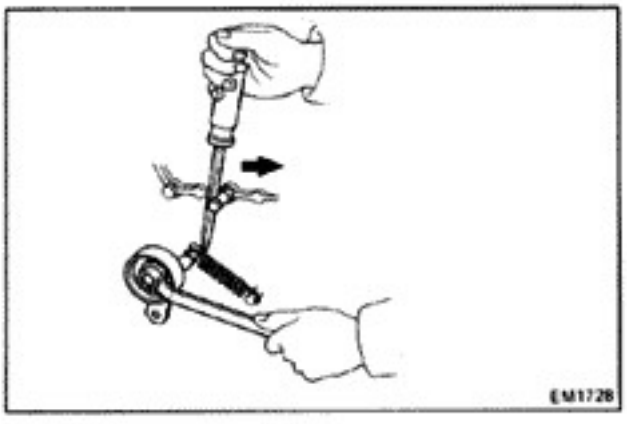
   **Torque: 220 kg-cm (16 ft-lb, 22 N·m)**




2. **INSTALL CRANKSHAFT TIMING PULLEY**

   Using SST and hammer, drive in the pulley.

   SST 09214-60010



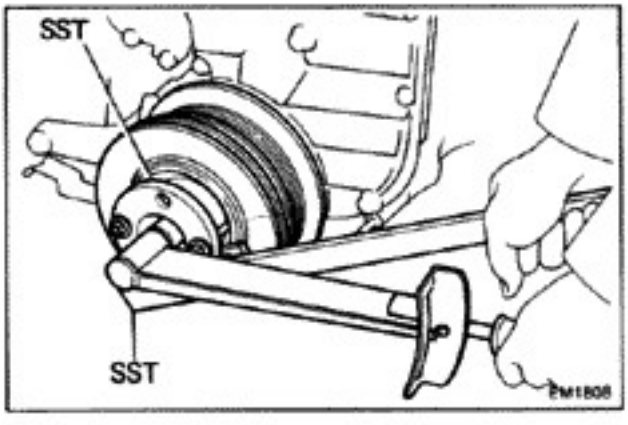

3. **TEMPORARILY INSTALL IDLER PULLEY AND TENSIO SPRING**

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

4. **TEMPORARILY INSTALL TIMING BELT ON CRANKSHAF TIMING PULLEY**

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

   (b) Install the timing belt on the crankshaft timing pulle




5. **INSTALL NO. 1 TIMING BELT COVER**

6. **INSTALL BRACKET OF COOLER COMPRESSOR**

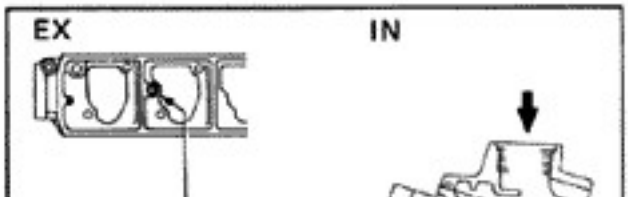
7. **INSTALL CRANKSHAFT PULLEY**

   (a) Install the crankshaft pulley and pulley bolt.

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

   SST 09213-70010 and 09330-00021

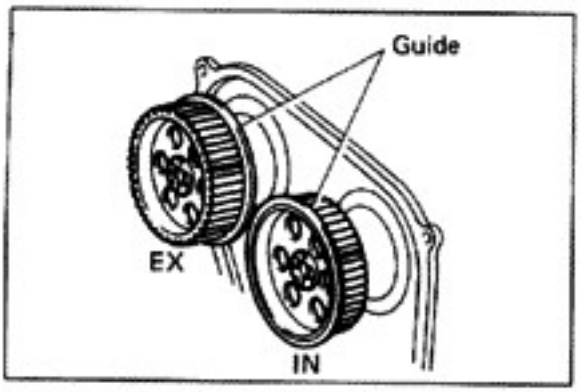
   **Torque: 2,200 kg-cm (159 ft-lb, 216 N ·m)**




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

9. **INSTALL CAMSHAFT TIMING PULLEY AND TIMING BEL**

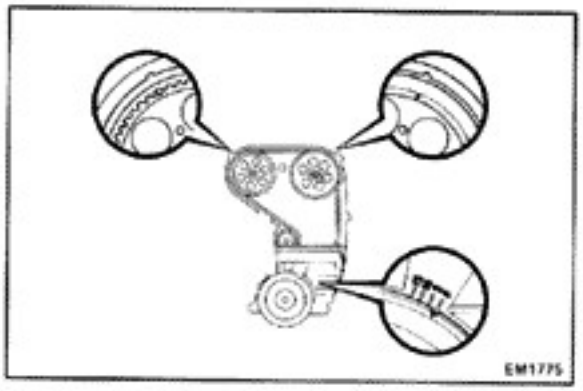
   (a) Make sure that the match hole on the No. 2 journ of the camshaft housing is aligned with that of th




(b) Install the camshaft timing pulleys with the guides fa
ing the directions indicated below.

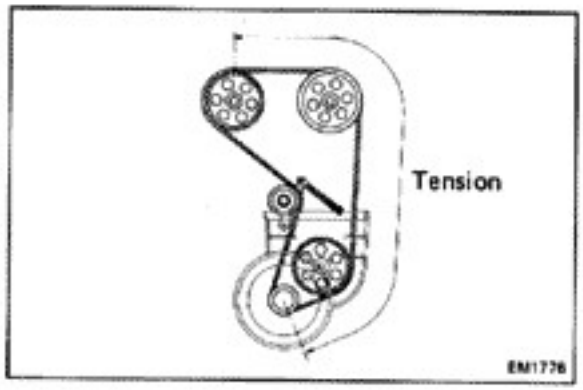
EX side ..... With the pulley guide facing the No.
timing belt cover side

IN side ..... With the pulley guide facing the fro
side



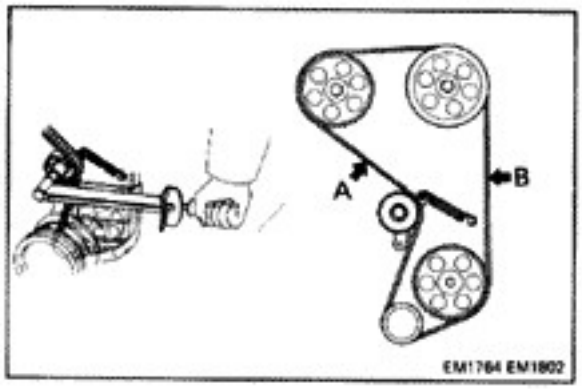

(c) Align the matchmarks of the No. 2 timing belt cov
with those of the camshaft timing pulleys and of th
crankshaft pulley.

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




(d) Install the timing belt with the belt having proper te
sion between the crankshaft timing pulley and th
camshaft timing pulley on the exhaust side.

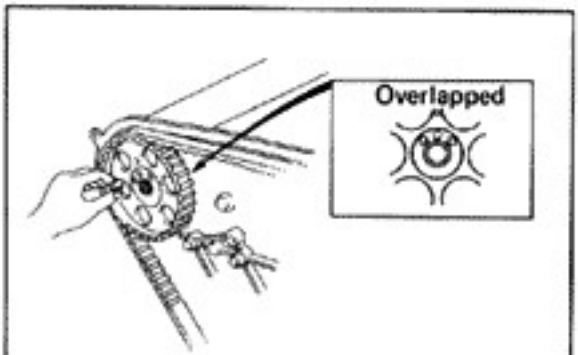
NOTE: Install the timing belt while the engine is cold




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

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

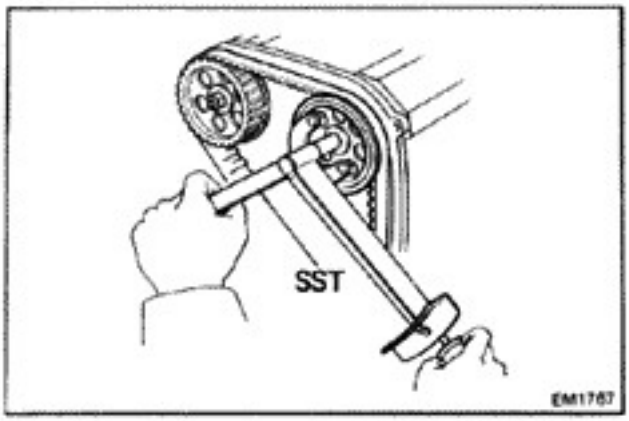
NOTE: Make sure that the timing belt tension at A is equa
to that at B.




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

NOTE:

- If there is no overlapping hole, find one that is nearl
overlapped and rotate the crankshaft slightly to over
lap it and insert the pin.
- The crankshaft pulley angle can be adjusted approxi
mately 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 tensi 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 I SPECTION AND ADJUSTMENT OF VALVE TIMIN —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)**

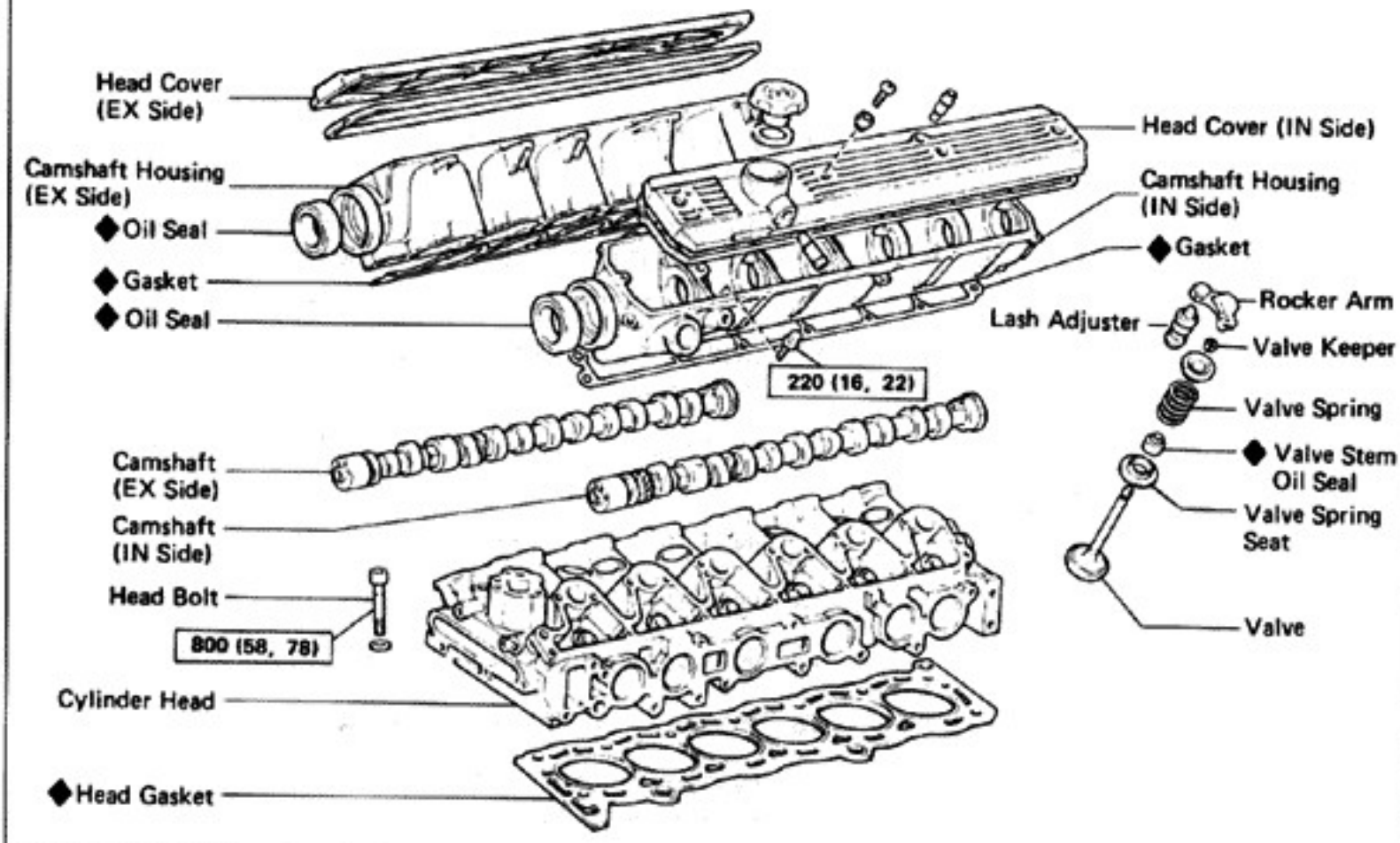
**18. INSTALL AIR CLEANER CASE WITH AIR INTAKE CONNECTOR**

**19. FILL WITH COOLANT**

**20. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTER**

# CYLINDER HEAD

## COMPONENTS

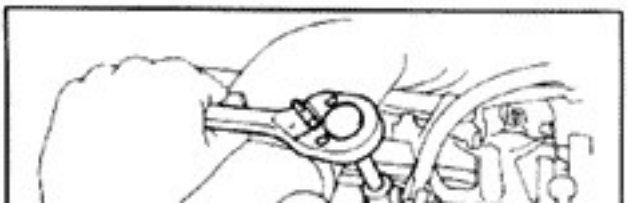



kg-cm (ft-lb, N·m) : Specified torque

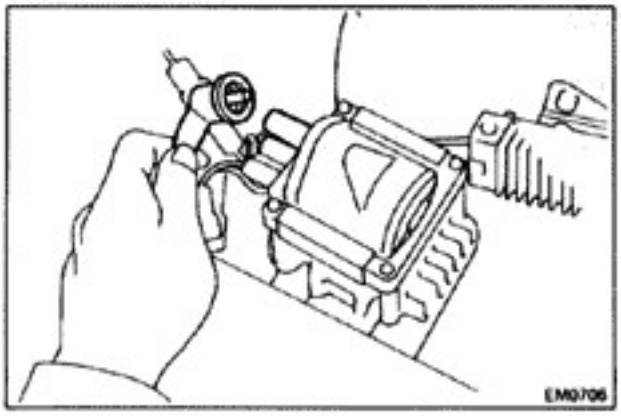
◆ Non-reusable part

## PREPARATION FOR REMOVAL

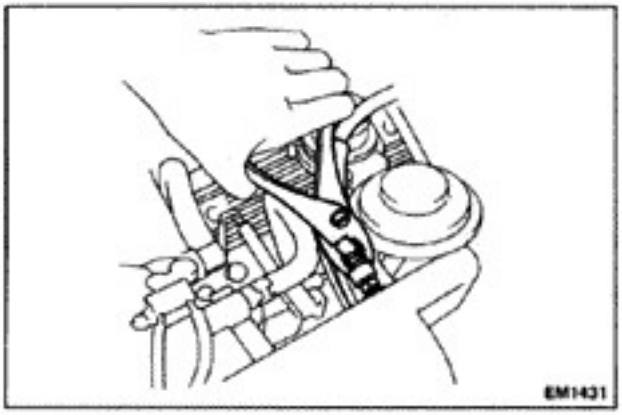
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN COOLANT
3. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD



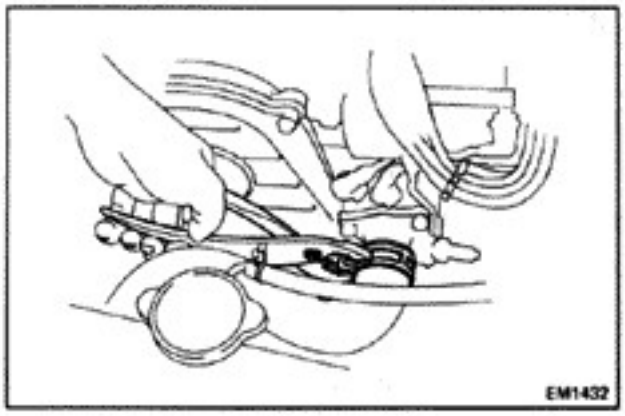
4. REMOVE THROTTLE CABLE BRACKET FROM CYLINDER HEAD COVER (for A/T)
5. REMOVE ACCELERATOR AND ACTUATOR CABLE BRACKET FROM CYLINDER HEAD COVER




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

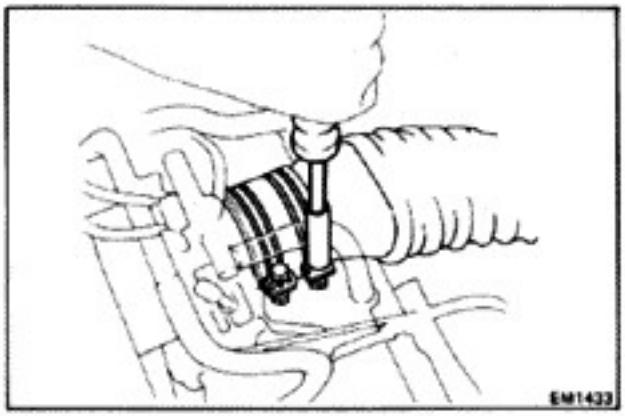



7. **DISCONNECT FOLLOWING HOSES:**
   (a) Brake booster vacuum hose
   (b) Actuator vacuum hose (with cruise control system)
   (c) Fuel hose from the intake manifold
   (d) EGR valve vacuum hose




8. **DISCONNECT RADIATOR UPPER HOSE FROM THER MOSTAT HOUSING**

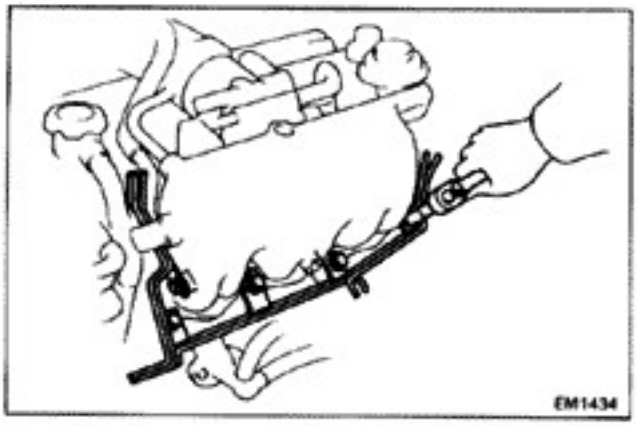
9. **DISCONNECT TWO HEATER HOSES**




## REMOVAL OF CYLINDER HEAD

1. **REMOVE AIR INTAKE CONNECTOR**
   (a) Disconnect the No. 1 air hose from the air intake con nector.
   (b) Remove the two clamp bolts.
   (c) Loosen the throttle body hose clamp and remove th air intake connector and the connector pipe.

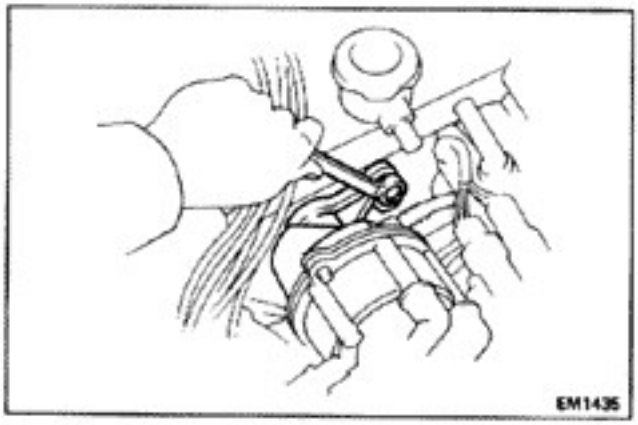
2. **DISCONNECT FOLLOWING HOSES:**
   (a) No. 1 water by-pass hose from ISC valve.
   (b) No. 2 water by-pass hose from throttle body.
   (c) Two PCV hoses from the cylinder head cover.




3. **REMOVE AIR INTAKE CHAMBER STAY**

4. **REMOVE VACUUM PIPE SUBASSEMBLY**

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




5. **REMOVE DISTRIBUTOR FROM CYLINDER HEAD**

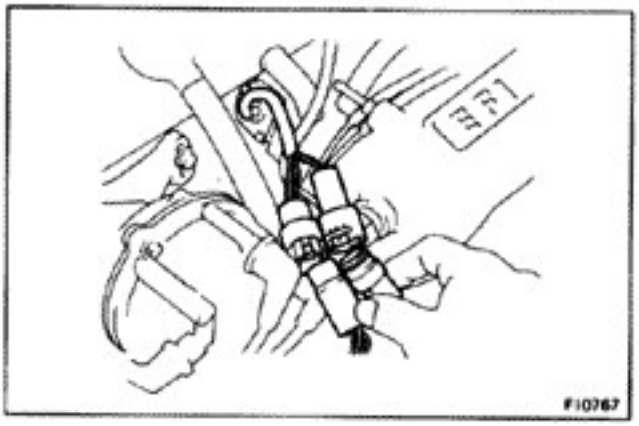
(a) Remove the high-tension cord clip bolt, leaving t
wires attached to the clips.

(b) Disconnect the high tension cord by pulling on the pl
boot.

(c) Remove the distributor holding bolt.

(d) Remove the distributor from the cylinder head w
the cap and wires.

6. **REMOVE SPARK PLUGS**




7. **DISCONNECT FOLLOWING WIRES:**

(a) Cold start injector wire

(b) Water temp. sensor wire

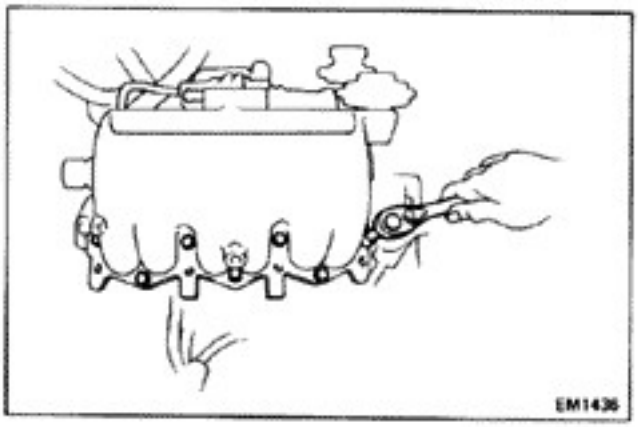
(c) Start injection time switch wire

(d) Water temp. sending unit wire

(e) Throttle position sensor wire connector

(f) ISC valve wire connectors

8. **DISCONNECT COLD START INJECTOR FUEL HOSE FRO
DELIVERY PIPE**




9. **REMOVE AIR INTAKE CHAMBER**

(a) Remove the five bolts and two nuts.

(b) Loosen the nut of the EGR pipe.

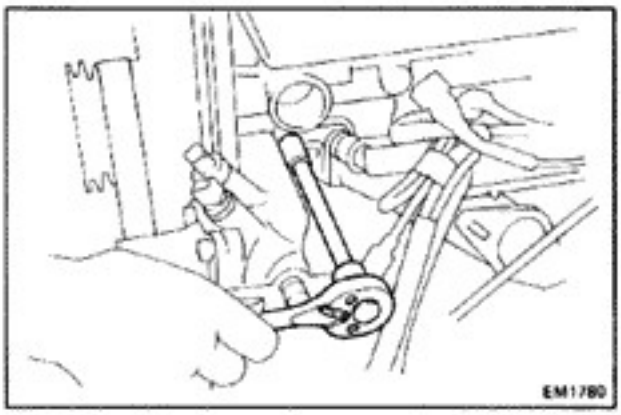
(c) Remove the air intake chamber and gasket.


10. **DISCONNECT EFI WIRE HARNESS FROM ECU**

(a) Remove the glove box.

(b) Remove the ECU.

(c) Disconnect the three connectors.

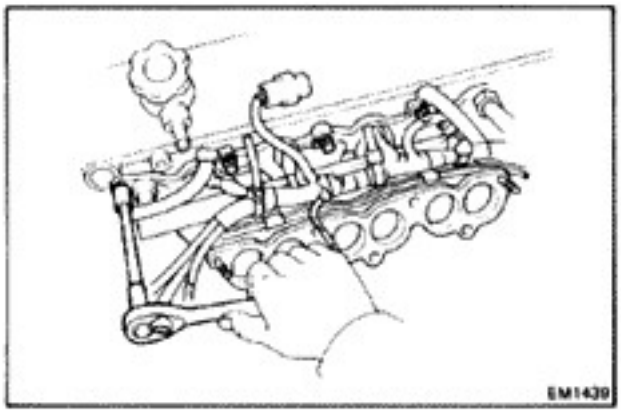



**11. REMOVE PULSATION DAMPER AND NO. 1 FUEL PIPE**

**12. REMOVE WATER OUTLET HOUSING**

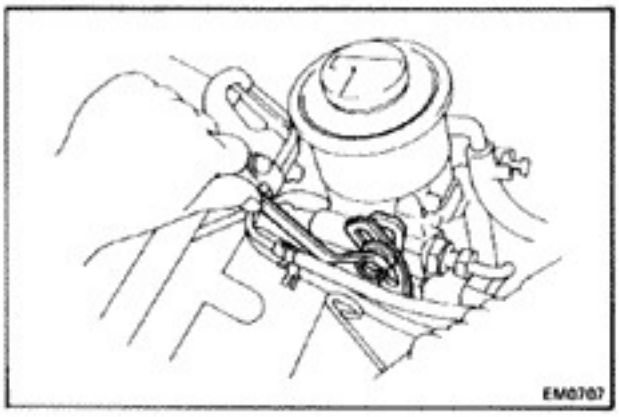
(a) Loosen the clamp and disconnect the water by-pass hose.

(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.



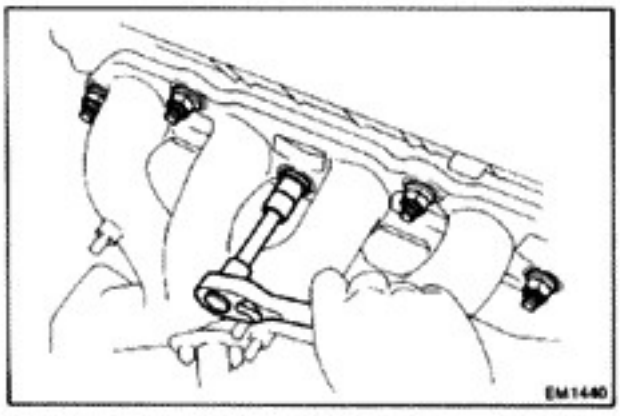

**14. REMOVE POWER STEERING PUMP FROM BRACKET**

(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.

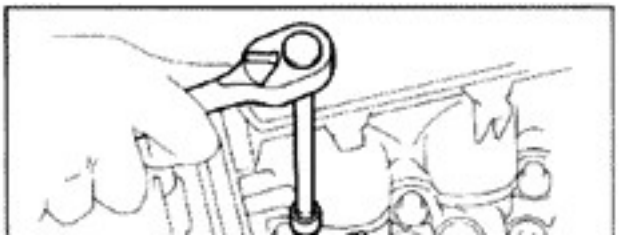



**15. REMOVE EXHAUST MANIFOLD**

(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)**

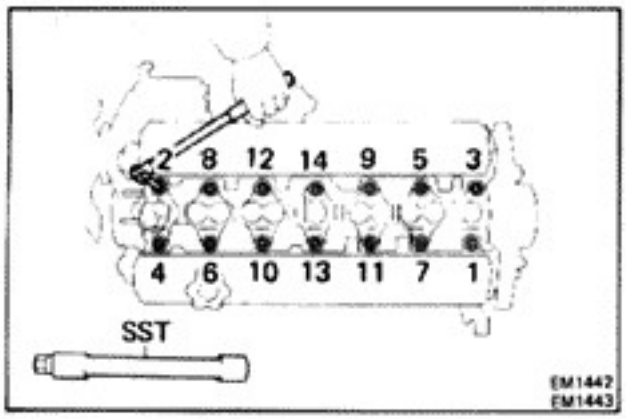


**17. REMOVE OIL PRESSURE REGULATOR**

(a) Remove the two bolts and the timing belt cover stay

(b) Remove the three bolts and the oil pressure regulato and gasket.

**18. REMOVE NO. 2 TIMING BELT COVER**

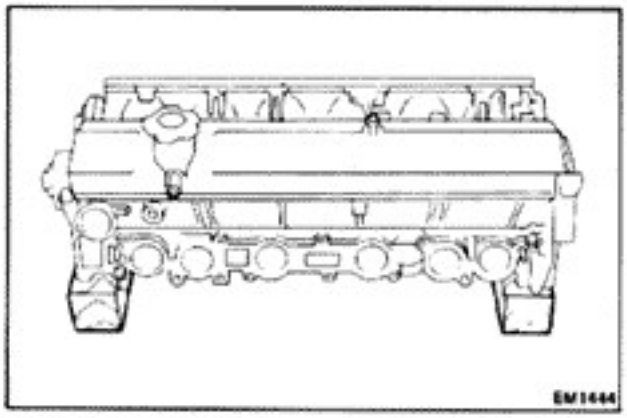



**19. REMOVE CYLINDER HEAD BOLTS**

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

SST 09043-38100

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



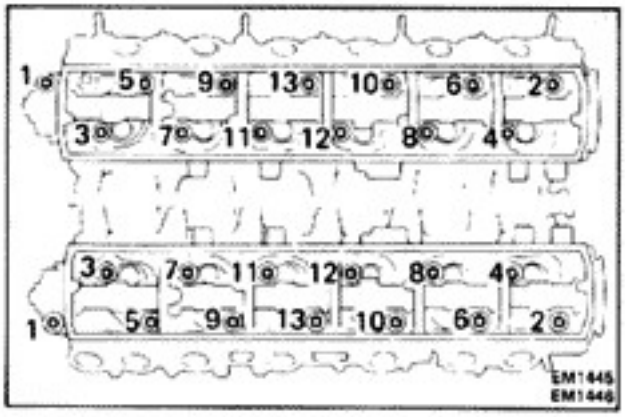

**20. REMOVE CYLINDER HEAD**

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

If the cylinder head is difficult to lift off, pry with a screw driver between the head and block saliences.

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

**21. REMOVE EGR COOLER**




## DISASSEMBLY OF CYLINDER HEAD

(See page EM-18)

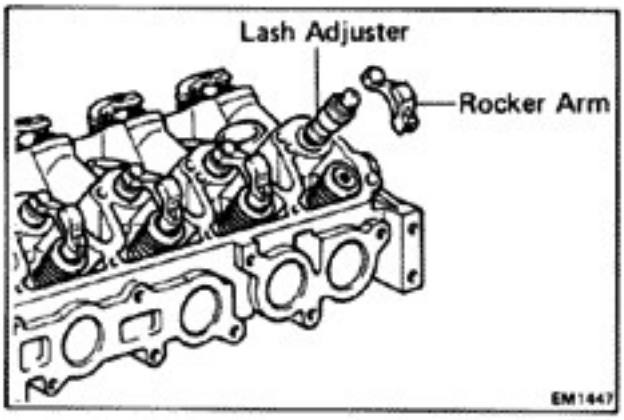
**1. REMOVE CYLINDER HEAD COVERS**

Remove the two cylinder head covers by loosening th screws.

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

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

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




**3. REMOVE ROCKER ARMS AND LASH ADJUSTERS**

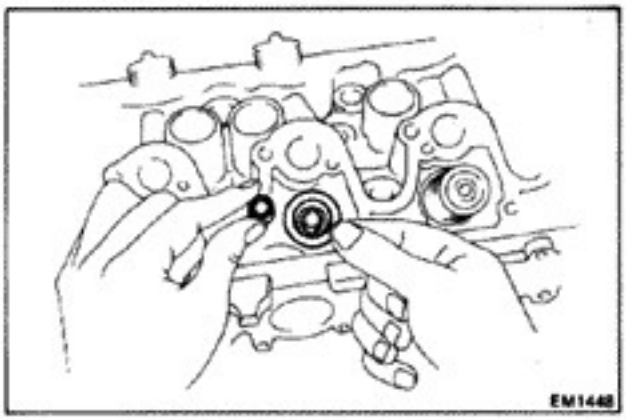
Remove the rocker arms and lash adjusters from th cylinder head.

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


**4. REMOVE VALVES**

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

SST 09202-43013

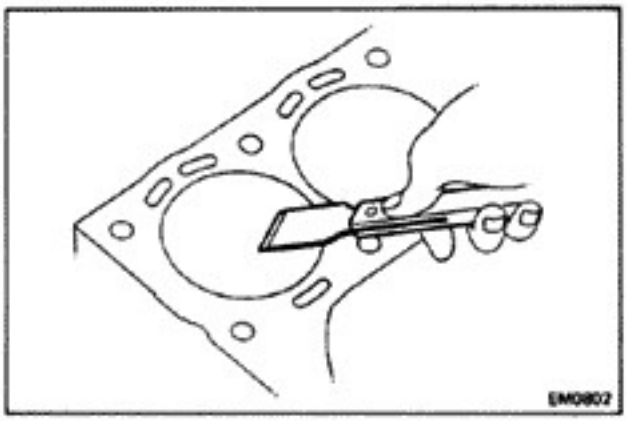



(b) Remove the valve keepers, retainers, springs ar valves.

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

(c) Remove the valve stem oil seals.

(d) Using a small screwdriver or magnet, remove the valv spring seats.

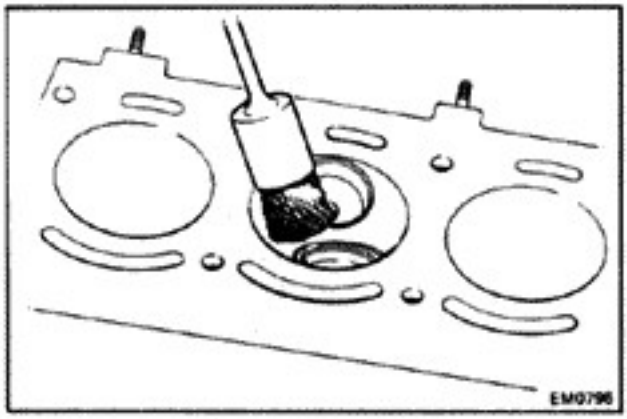



## INSPECTION AND CLEANING OF COMPONENT

### 1. CLEAN TOP OF PISTONS AND TOP OF BLOCK

(a) Turn the crankshaft and bring each piston to top dea center. Scrape the carbon from the piston top.

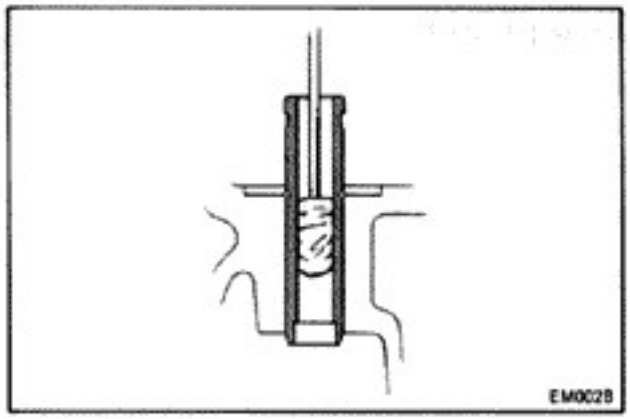
(b) Remove all gasket material from the top of the bloc Blow carbon and oil from the bolt holes.




### 2. CLEAN COMBUSTION CHAMBERS

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

**CAUTION: Be careful not to scratch the head gasket co tact surface.**



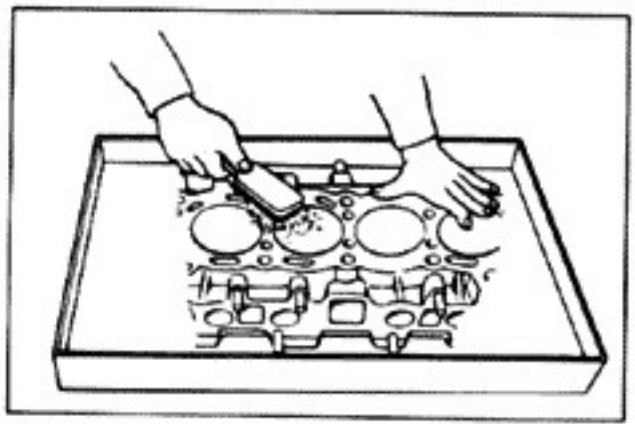

### 3. CLEAN VALVE GUIDES

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

### 4. REMOVE GASKET MATERIAL

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

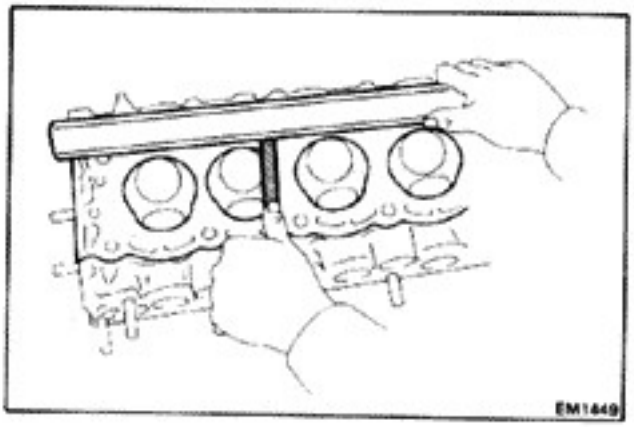
**CAUTION: Do not scratch the surface.**



**5. CLEAN CYLINDER HEAD**

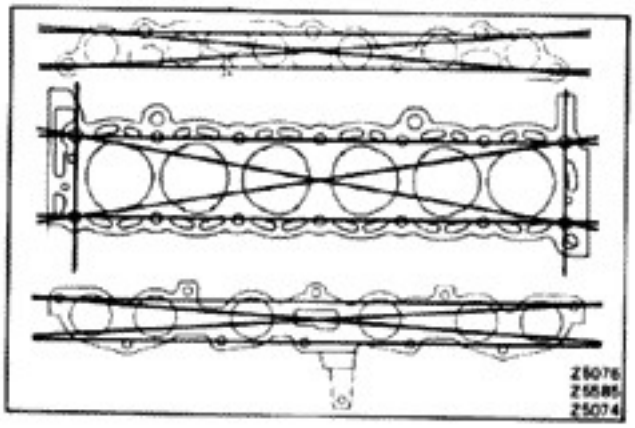
Using a soft brush and solvent, clean the head.

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




**6. CHECK HEAD FOR FLATNESS**

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




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

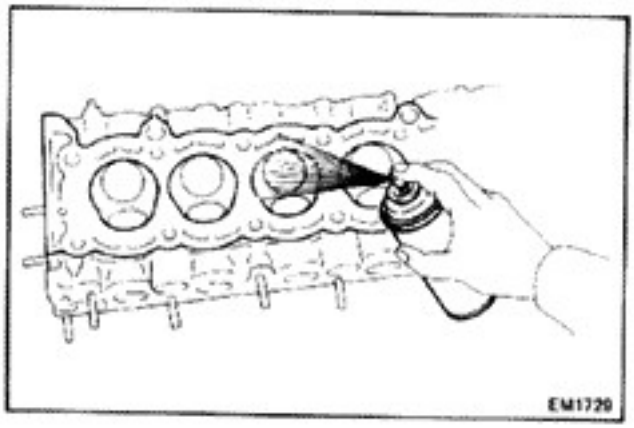
**Maximum head surface warpage:**
**0.10 mm (0.0039 i**

**Maximum intake manifold surface warpage:**
**0.10 mm (0.0039 i**

**Maximum exhaust manifold surface warpage:**
**0.10 mm (0.0039 i**

**Maximum camshaft housing surface warpage:**
**0.10 mm (0.0039 i**

If warpage is greater than specified value, replace the hea



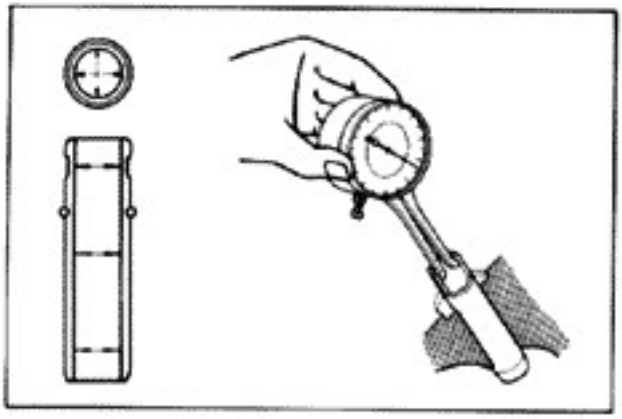

**7. INSPECT CYLINDER HEAD FOR CRACKS**

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

If a crack is found, replace the head.

**8. CLEAN VALVES**

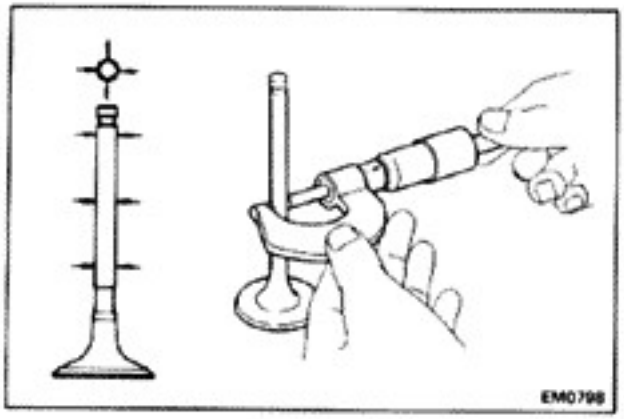
Use a gasket scraper to chip any carbon from the valv head.
Using a wire brush, clean the valve thoroughly.



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.

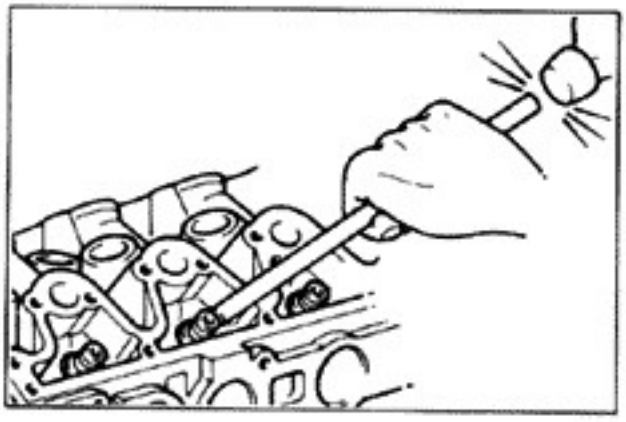
**Standard oil clearance:**

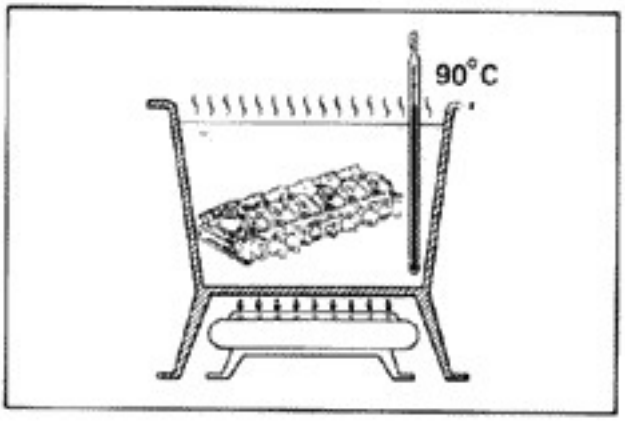
| | |
|---|---|
| **Intake** | **0.025 — 0.060 mm (0.0010 — 0.0024 in.)** |
| **Exhaust** | **0.030 — 0.065 mm (0.0012 — 0.0026 in.)** |

**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:





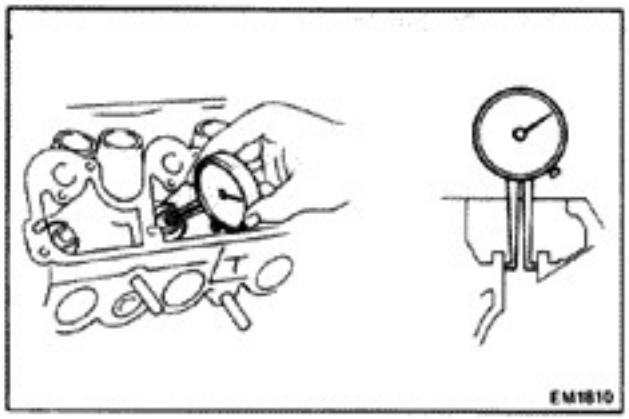

10. **IF NECESSARY, REPLACE VALVE GUIDE**

(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 gauae, measure the valve guide b
of the cylinder head.

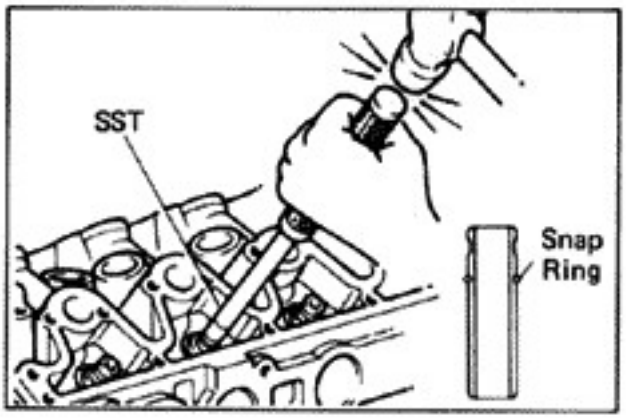
(e) Select a new valve guide.

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

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

Both intake and exhaust

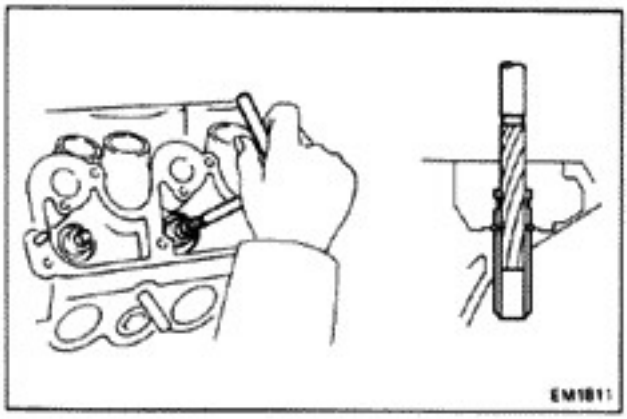
| Guide bore mm (in.) | Guide size |
|---|---|
| 13.000-13.027 (0.5118-0.5129) | Use STD |
| Over 13.027 (0.5129) | Use O/S 0.05 |




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

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

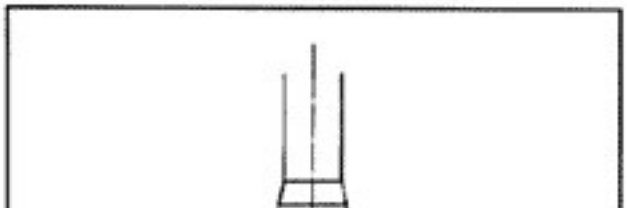
SST 09201-60011




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

**Standard oil clearance:**

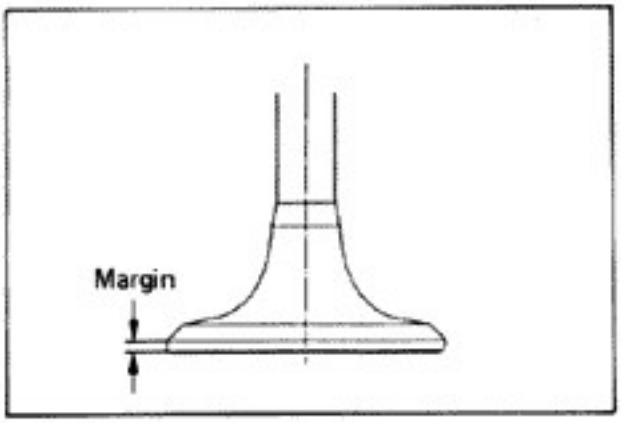
| | |
|---|---|
| **Intake:** | **0.025 — 0.060 mm (0.0010 — 0.0024 in.)** |
| **Exhaust:** | **0.030 — 0.065 mm (0.0012 — 0.0026 in.)** |



## 11. INSPECT AND GRIND VALVES

(a) Grind valves only enough to remove pits and carb

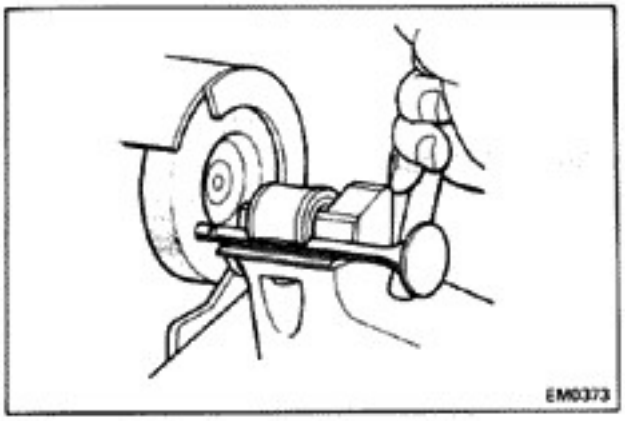
Make sure the valves are ground at the correct va
face angle.




(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 th valve.

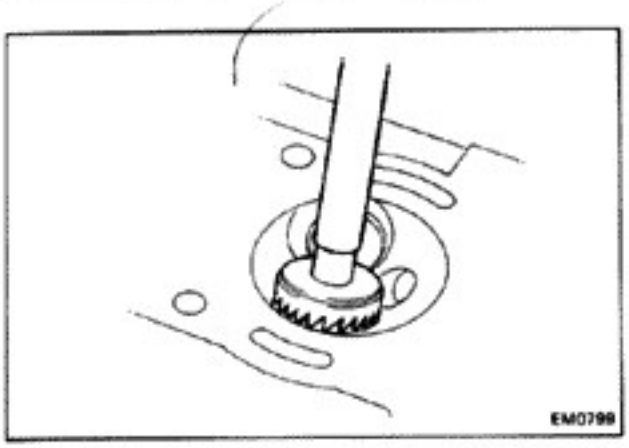



(c) Check the surface of the valve stem tip for wear.

**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 grind or replace the valve.

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

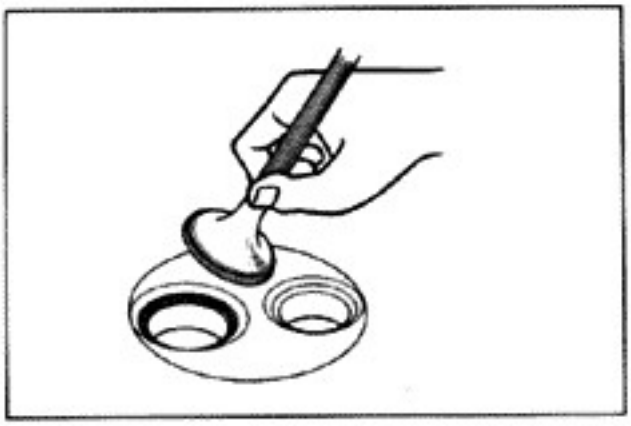



## 12. INSPECT AND CLEAN VALVE SEATS

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

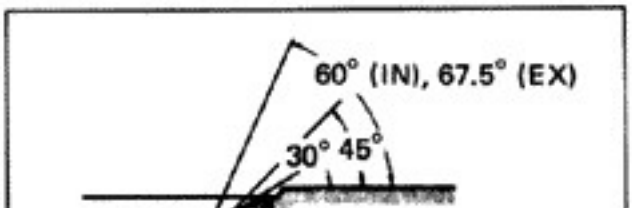
(b) Check the valve seating position.

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



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

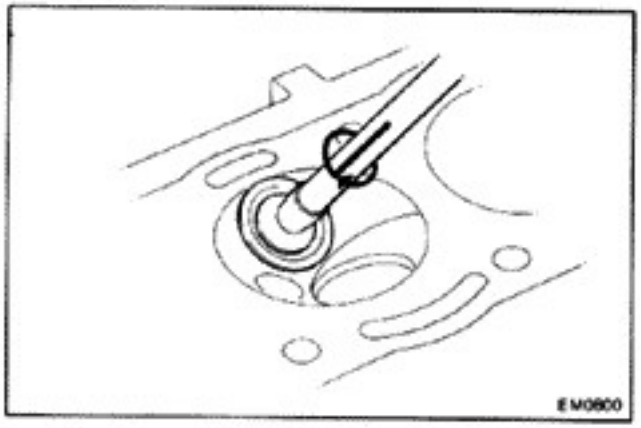
- If blue appears 360° around the face, the valve concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, th guide and seat are concentric. If not, resurface th seat.




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

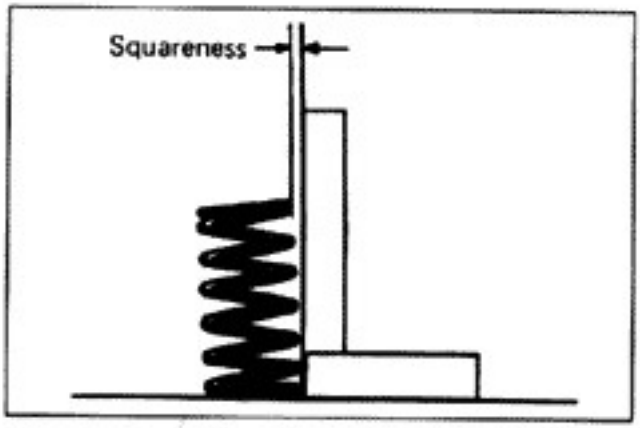
**1.2 – 1.6 mm (0.047 – 0.063 in.)**

If not correct the valve seat as follows:




(d) Hand-lap the valve and valve seat together with a
sive compound.

(e) Clean the valve and valve seat after hand-lappi

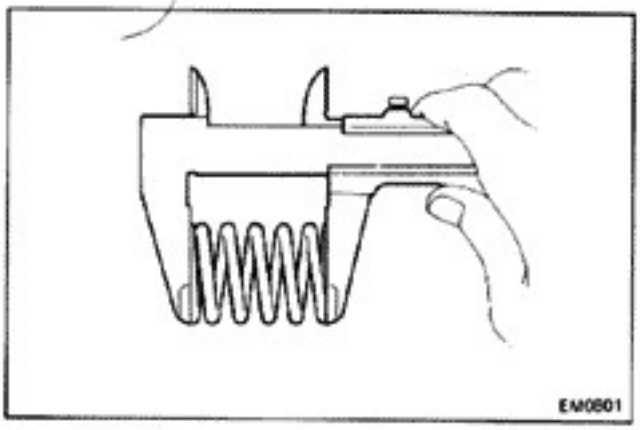



**13. INSPECT VALVE SPRINGS**

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

**Maximum allowable: 2.0 mm (0.079 in.)**

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

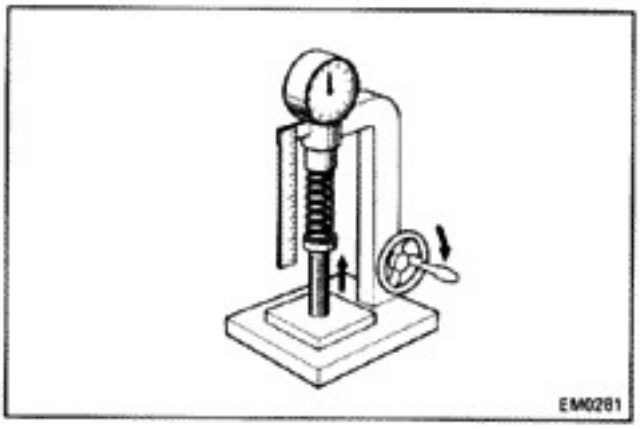



(b) Measure the free height of all springs.

**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 spr
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 t
spring.

**14. INSPECT INTAKE, EXHAUST MANIFOLDS AND AIR I
TAKE CHAMBER**

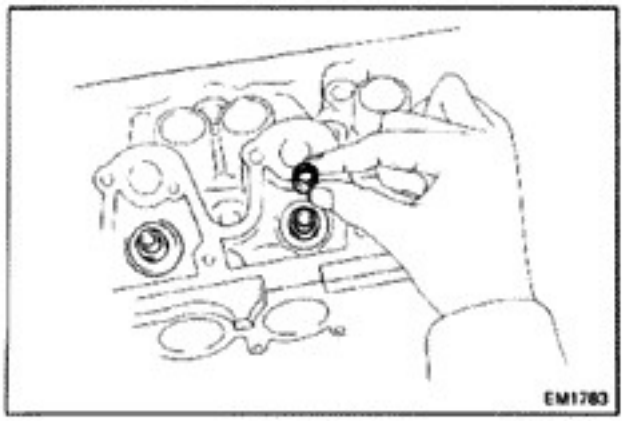
Using a precision straight edge and feeler gauge, check t

## ASSEMBLY OF CYLINDER HEAD

(See page EM-18)

NOTE:

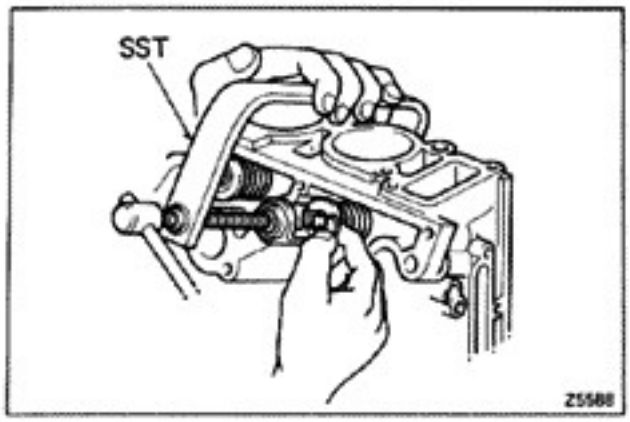
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to al sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.




### INSTALL VALVES

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

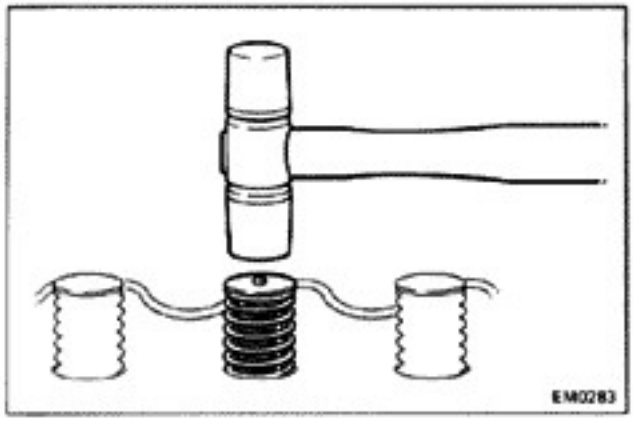
(b) Install the valve spring seats and new seals.




(c) Install springs and spring retainers on the valves.

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

SST 09202-43013



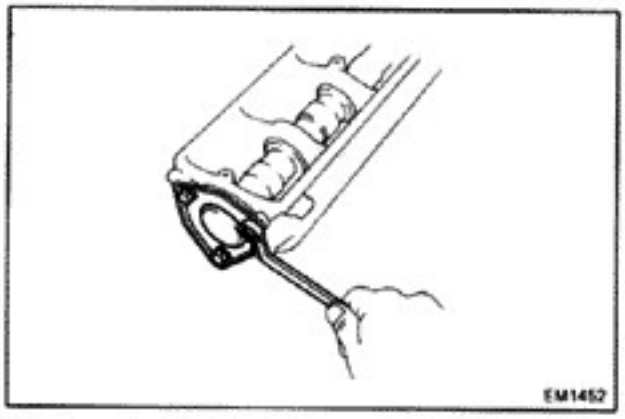

(e) Tap the stem lightly to assure proper fit.

## INSPECTION OF CAMSHAFT

### 1. MEASURE CAMSHAFT THRUST CLEARANCE

Using a dial gauge, measure the camshaft thrust clearance

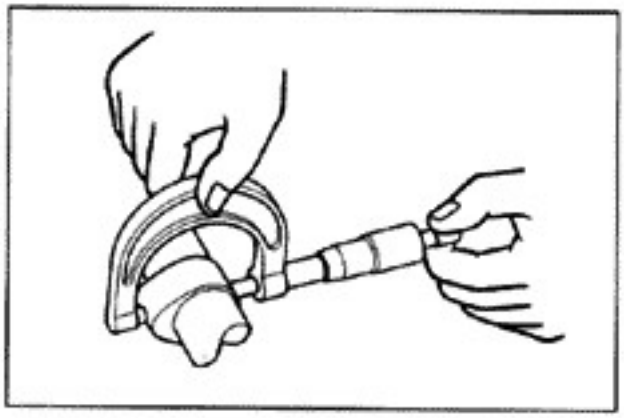
Standard clearance: 0.05 — 0.25 mm




**2. REMOVE CAMSHAFTS FROM CAMSHAFT HOUSINGS**

(a) Remove camshaft housing rear covers by loosenin the bolts.

(b) While turning the camshaft, slowly pull it out so a not to damage the camshaft housing.



**3. INSPECT CAMSHAFTS AND CAMSHAFT HOUSINGS**

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

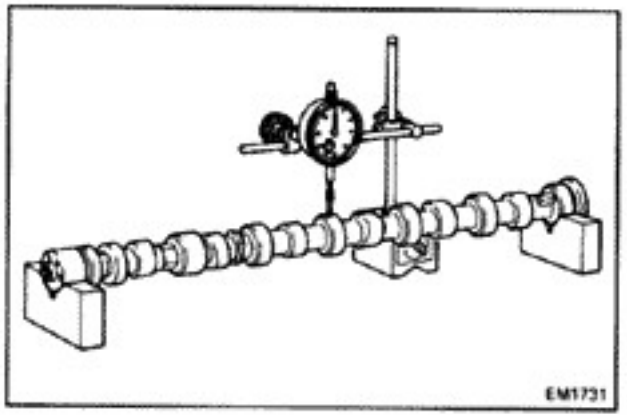
**Standard lobe height**

| | |
|---|---|
| **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.)** |

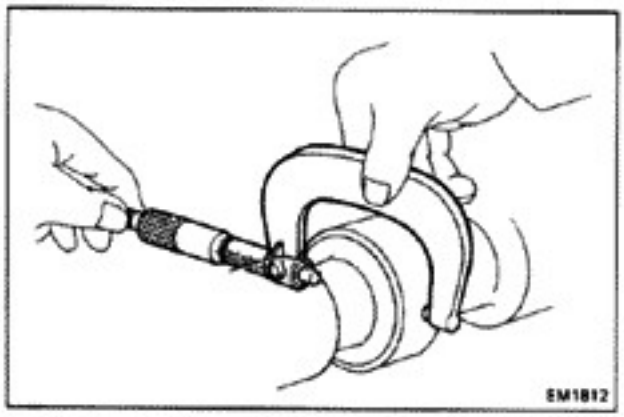
If the lobe height is less than the minimum allowable, th camshaft is worn and must be replaced.




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

**Maximum circle runout: 0.04 mm (0.0016 in.)**

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




(c) Using a micrometer, measure the journal diameter

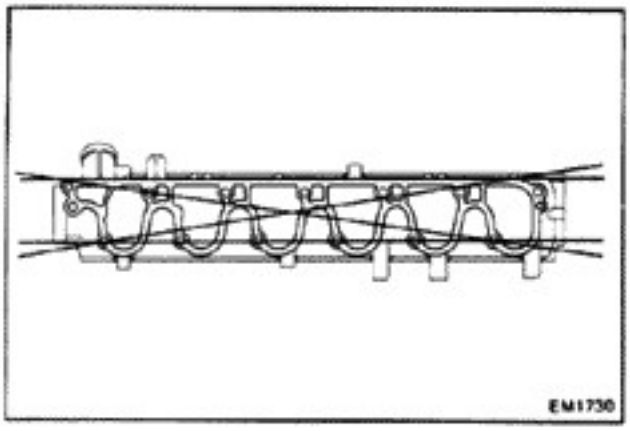
**Standard journal diameter:**

| | |
|---|---|
| **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 housin bore.

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

**Standard clearance: 0.025 — 0.066 mm**

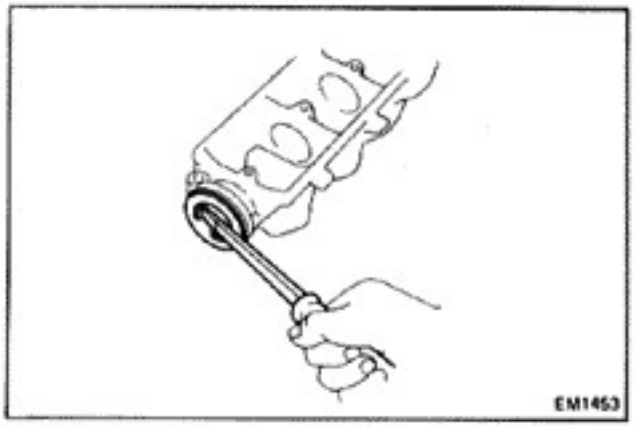



**4. INSPECT CAMSHAFT HOUSINGS FOR FLATNESS**

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

**Maximum cylinder head surface warpage:**
**0.10 mm (0.0039 i**

If warpage is greater than maximum, replace the housin

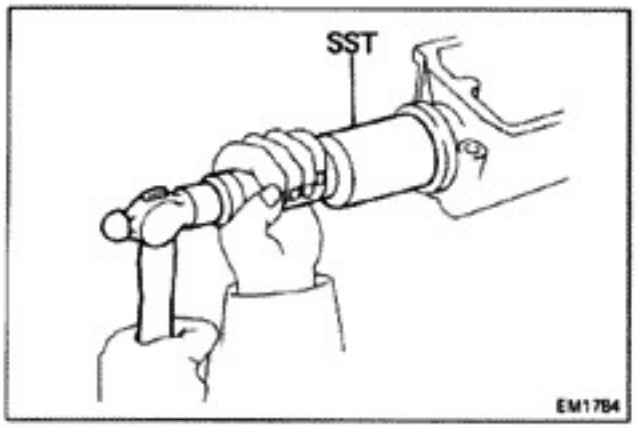



## REPLACEMENT OF CAMSHAFT HOUSING OIL SEAL

NOTE: There are two ways of oil seal replacement.

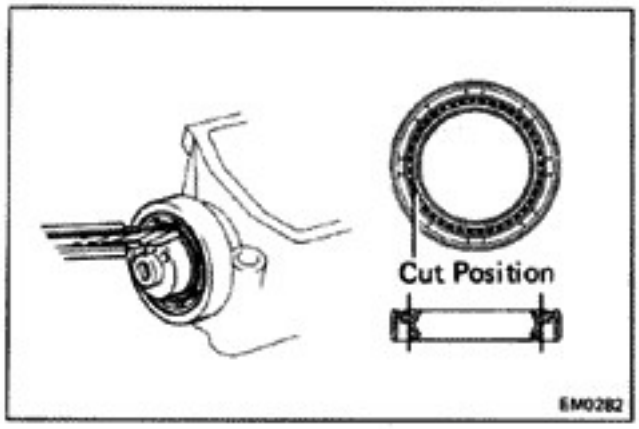
**1. IF CAMSHAFT IS REMOVED FROM CAMSHAFT HOUSING:**

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



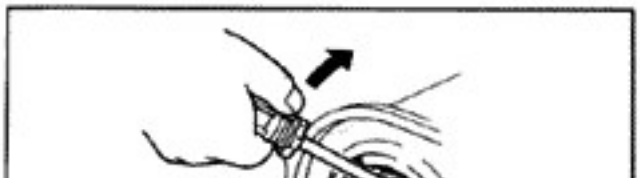

(b) Install the new oil seal on the camshaft housing.
- Apply MP grease to the oil seal.
- Using SST, install the new oil seal.

SST 09214-60010



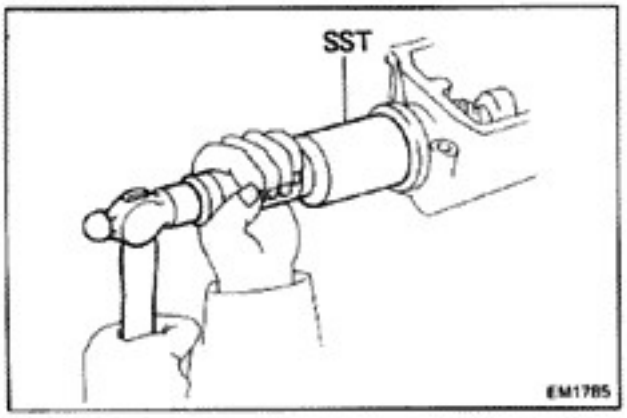

**2. IF CAMSHAFT HOUSING IS INSTALLED ON CYLINDE HEAD:**

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



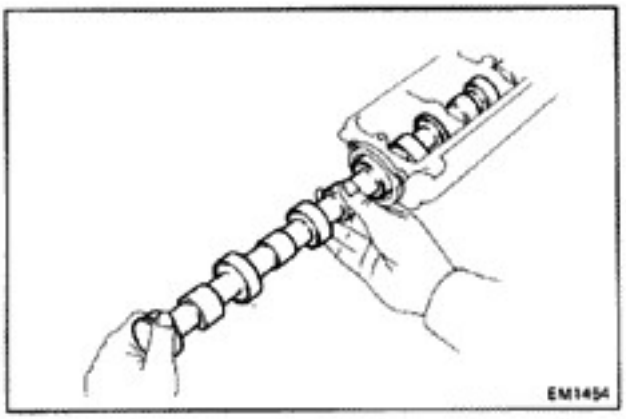
(b) Remove the oil seals.
- Using a screwdriver, pry out the oil seal.

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




(d) Install the oil seal in the camshaft housings.
- Apply MP grease to the oil seal.
- Using SST, install the new oil seal.

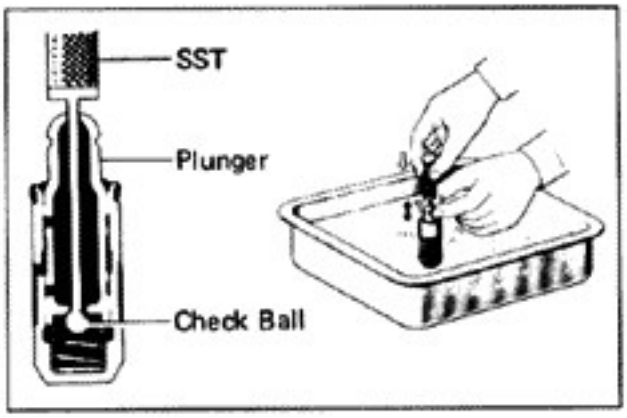
SST 09214-60010




### 3. INSTALL CAMSHAFTS IN CAMSHAFT HOUSINGS

(a) Insert the camshafts into each camshaft housing.

(b) Install the O-rings and rear end covers.




### 4. BLEED LASH ADJUSTER

(a) Immerse the lash adjuster into light oil.

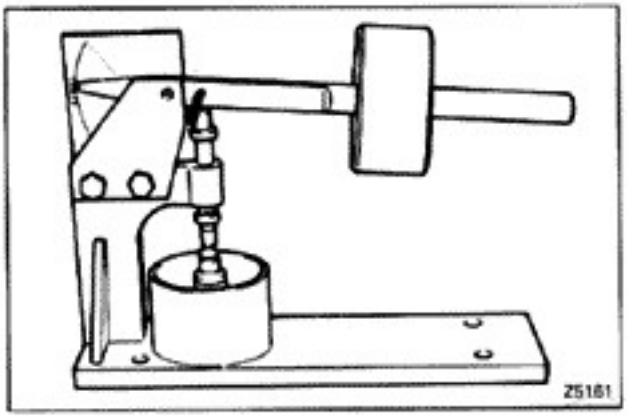
(b) Insert SST into the plunger hole and slide the plung up and down several times while pushing down light on the check ball.

SST 09276-70010

(c) Repeat steps (a) and (b) when the plunger stroke beyond about 0.5 mm (0.020 in.).

(d) Replace the lash adjuster with a new one if the plu ger stroke exceeds 0.5 mm (0.020 in.) even aft repeating steps (a) and (b) several times.

NOTE: Do not disassemble the lash adjuster.

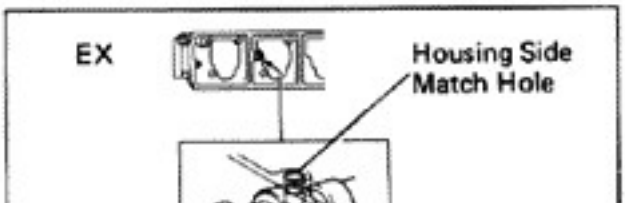



### 5. LASH ADJUSTER LEAK DOWN TEST

(a) Bleed the lash adjuster.

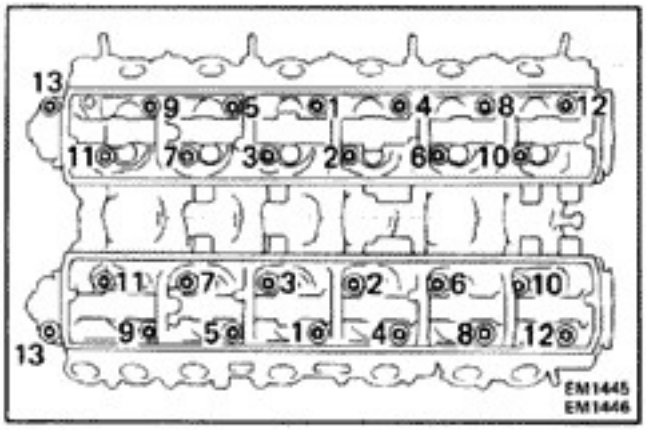
(b) Using a leak down tester, apply 20 kg (44.1 lb, 19 N) of pressure to the plunger and measure its sli down speed after it has slid down about 2 mm (0.0 in.).

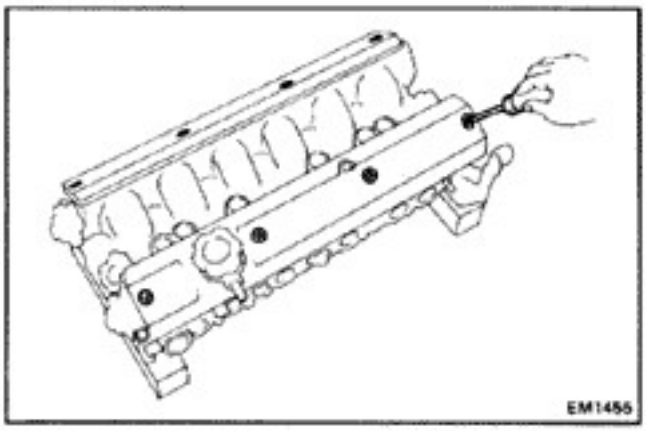
**Leak down time: 2 – 7 seconds per 1 mm (0.04 in.**




(c) Make sure that the match hole on the No. 2 journ of the camshaft housing is aligned with that of t 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**

(a) Place new gaskets over dowels on the cylinder hea

(b) Position the camshaft housing over dowels on t cylinder head.

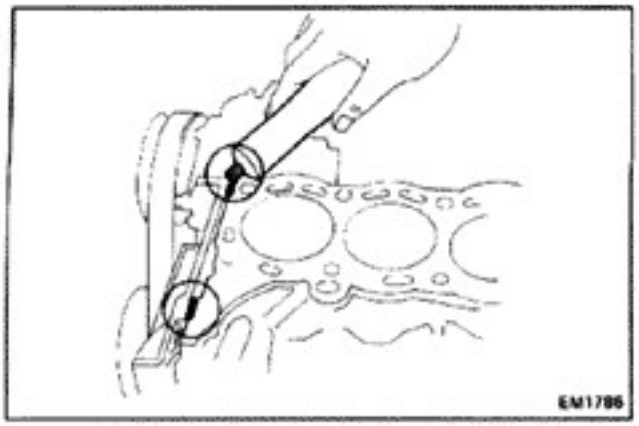
(c) Install and tighten the housing nuts and bolts grad ally in three passes in the sequence shown. Torq the nuts and bolts on the final pass.

**Torque: 220 kg-cm (16 ft-lb, 22 N·m)**

**9. INSTALL CYLINDER HEAD COVERS**

(a) Install the gaskets to the cylinder heads.

(b) Place head covers on the camshaft housing and stall the seals and screws.




## INSTALLATION OF CYLINDER HEAD

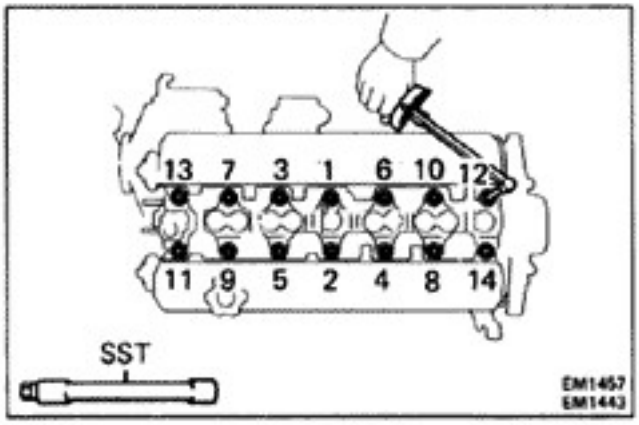
### 1. INSTALL EGR COOLER

### 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 t cylinder block.



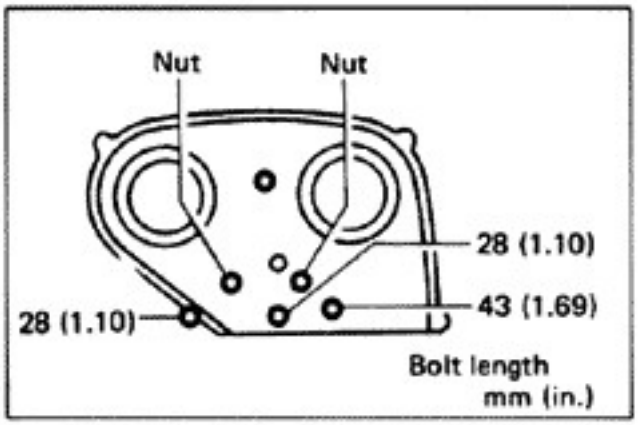

### 3. INSTALL CYLINDER HEAD

(a) Position the cylinder head over dowels on the bloc

(b) Using SST, install and tighten the head bolts grad ally in three passes and in the sequence shown. T que the bolts on the final pass.

SST 09043-38100

**Torque: 800 kg-cm (58 ft-lb, 78 N·m)**

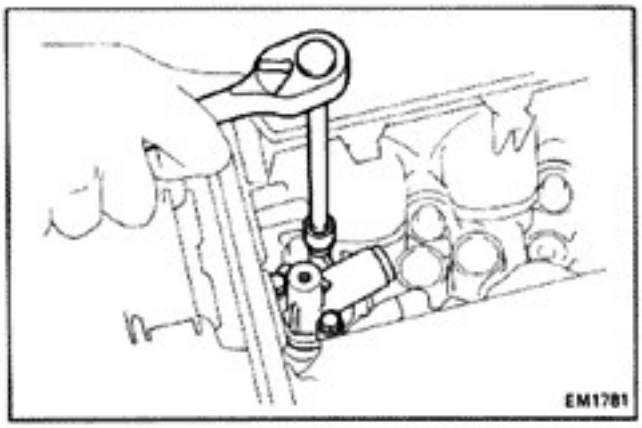



### 4. INSTALL NO. 2 TIMING BELT COVER

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

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

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




### 5. INSTALL OIL PRESSURE REGULATOR

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

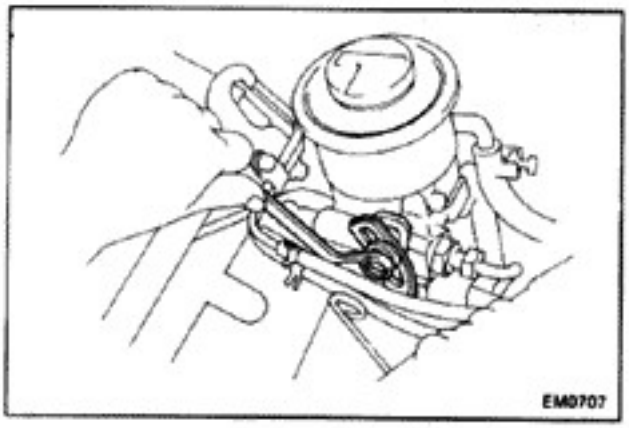
(b) Install the oil pressure regulator with three bolts

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

### 6. INSTALL CAMSHAFT TIMING PULLEYS AND TIMING BE

**(See steps 9 to 14 on pages EM-15 to 17)**

### 7. INSTALL EXHAUST MANIFOLD



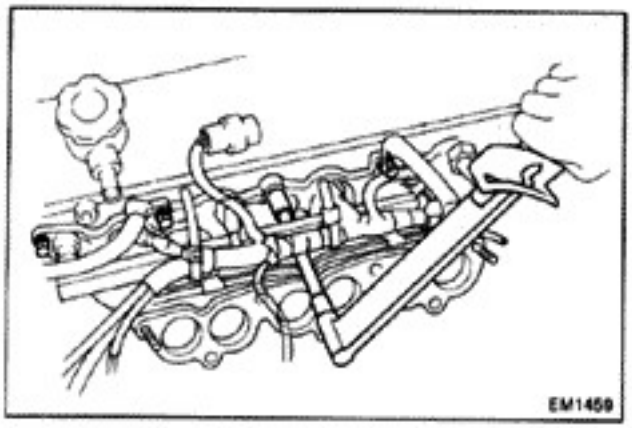

**9. INSTALL POWER STEERING PUMP ONTO BRACKET**

(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 specifie belt tension is obtained. (See page MA-4)

(e) Tighten the idler pulley nut and adjusting bolt.



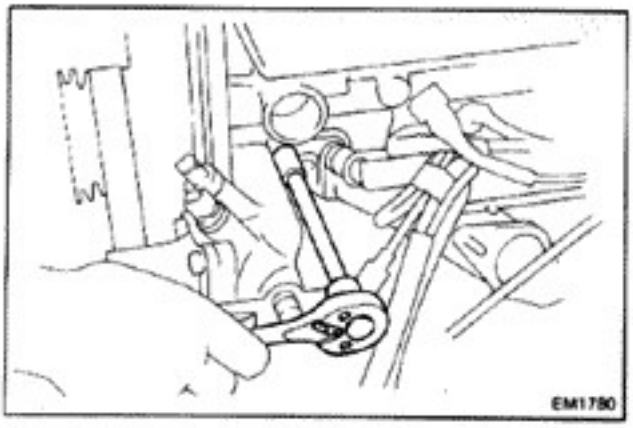

**10. INSTALL INTAKE MANIFOLD**

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

(b) Install the intake manifold with eight bolts and tw 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**

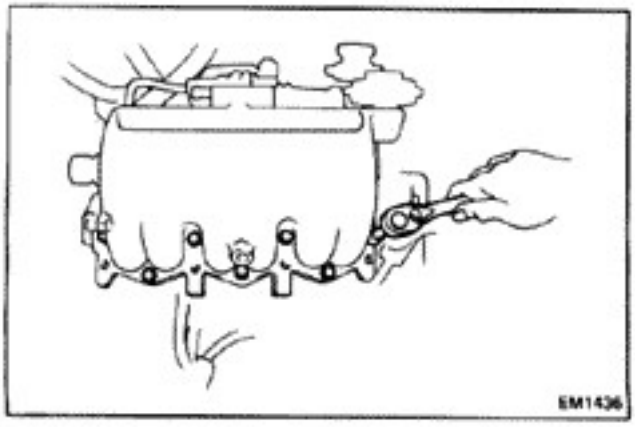
(a) Install the water outlet housing with two bolts.

(b) Connect the water by-pass hose and tighten th clamp.

**13. INSTALL NO. 1 FUEL PIPE AND PULSATION DAMPER**

(a) Finger tighten the pulsation damper and union bo with new gaskets on the fuel pipe.

(b) Tighten the fuel pipe, being careful not to bend it




**14. INSTALL AIR INTAKE CHAMBER**

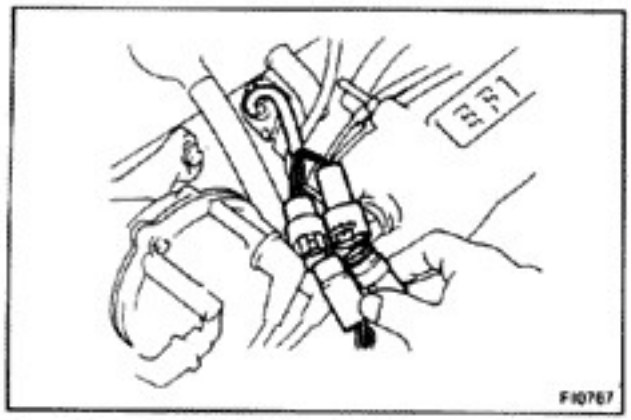
(a) Position a new gasket on the intake manifold.

(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

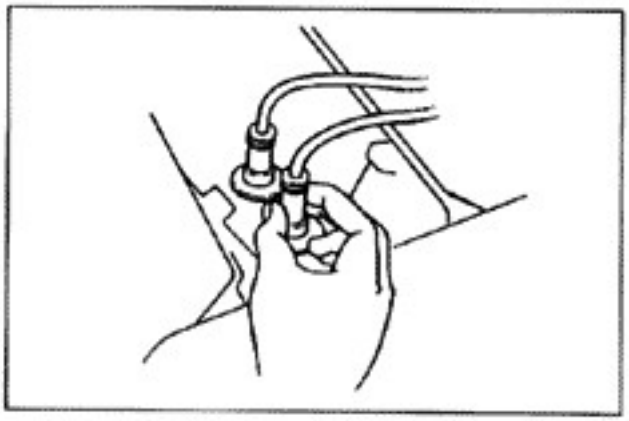
**15. CONNECT COLD START INJECTOR FUEL HOSE TO DELIV ERY PIPE**

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




**16. CONNECT FOLLOWING WIRES:**

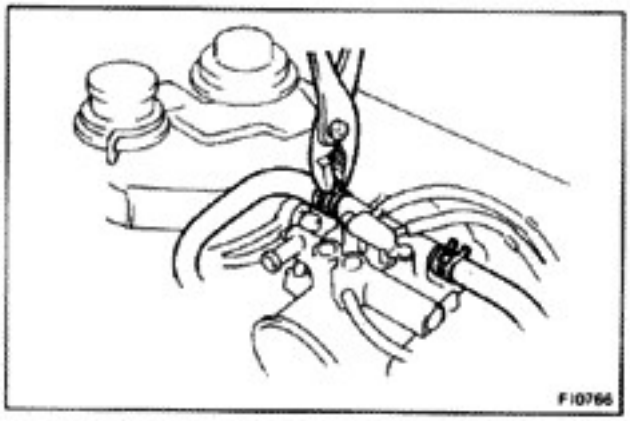
(a) Cold start injector wire
(b) Water temp. sensor wire
(c) Start injection time switch wire
(d) Water temp. sending unit wire
(e) Throttle position sensor wire connector
(f) ISC valve wire connectors



**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.

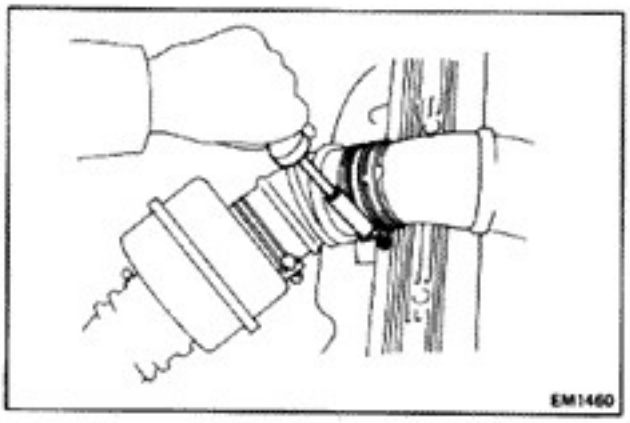



**19. INSTALL VACUUM PIPE SUBASSEMBLY**

Install the vacuum pipe with bond cable and three bol

**20. CONNECT FOLLOWING HOSES:**

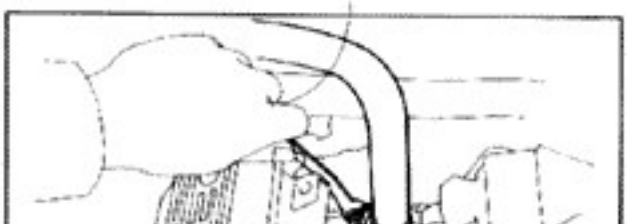
(a) Emission control hoses to the throttle body and air take chamber
(b) Fuel hoses to the fuel hose support
(c) Two PCV hoses to the cylinder head cover
(d) No. 2 water by-pass hose to throttle body
(e) No. 1 water by-pass hose to ISC valve




**21. INSTALL AIR INTAKE CONNECTOR PIPE**

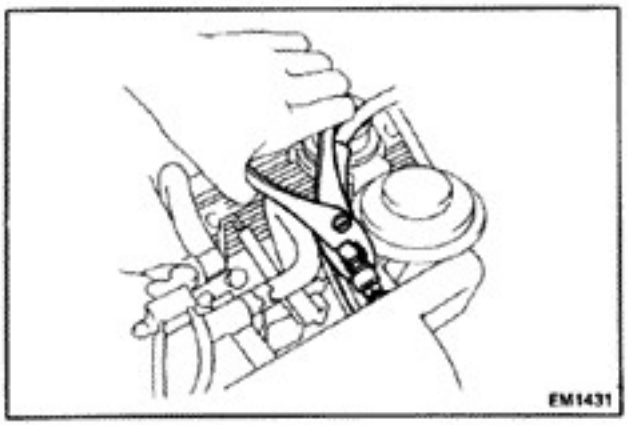
**22. INSTALL AIR INTAKE CONNECTOR**

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



**23. INSTALL TWO HEATER HOSES**

**24. INSTALL RADIATOR UPPER HOSE**



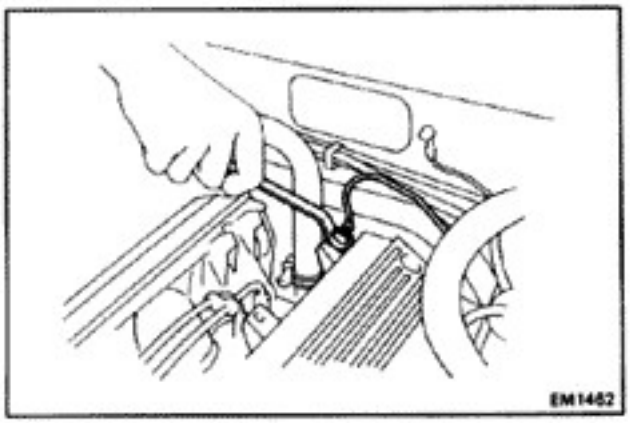

**25. CONNECT FOLLOWING HOSES:**

(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

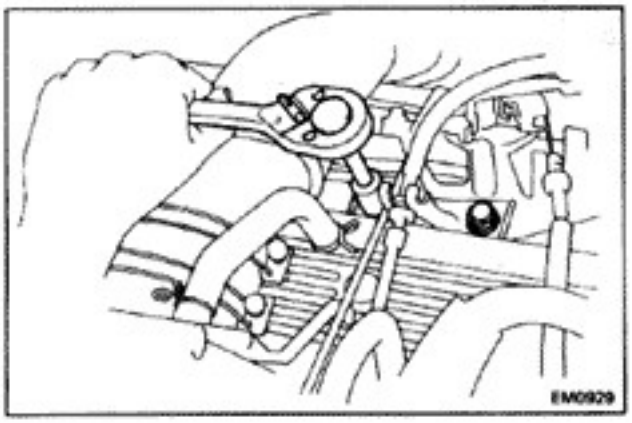
(c) Oxygen sensor wire connector

(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 CABL BRACKET TO CYLINDER HEAD COVER**

**28. INSTALL THROTTLE CABLE BRACKET TO CYLINDE HEAD COVER (for A/T)**

**29. FILL WITH COOLANT**

Close the radiator and engine drain cocks and fill wi 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 BATTER**

**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)

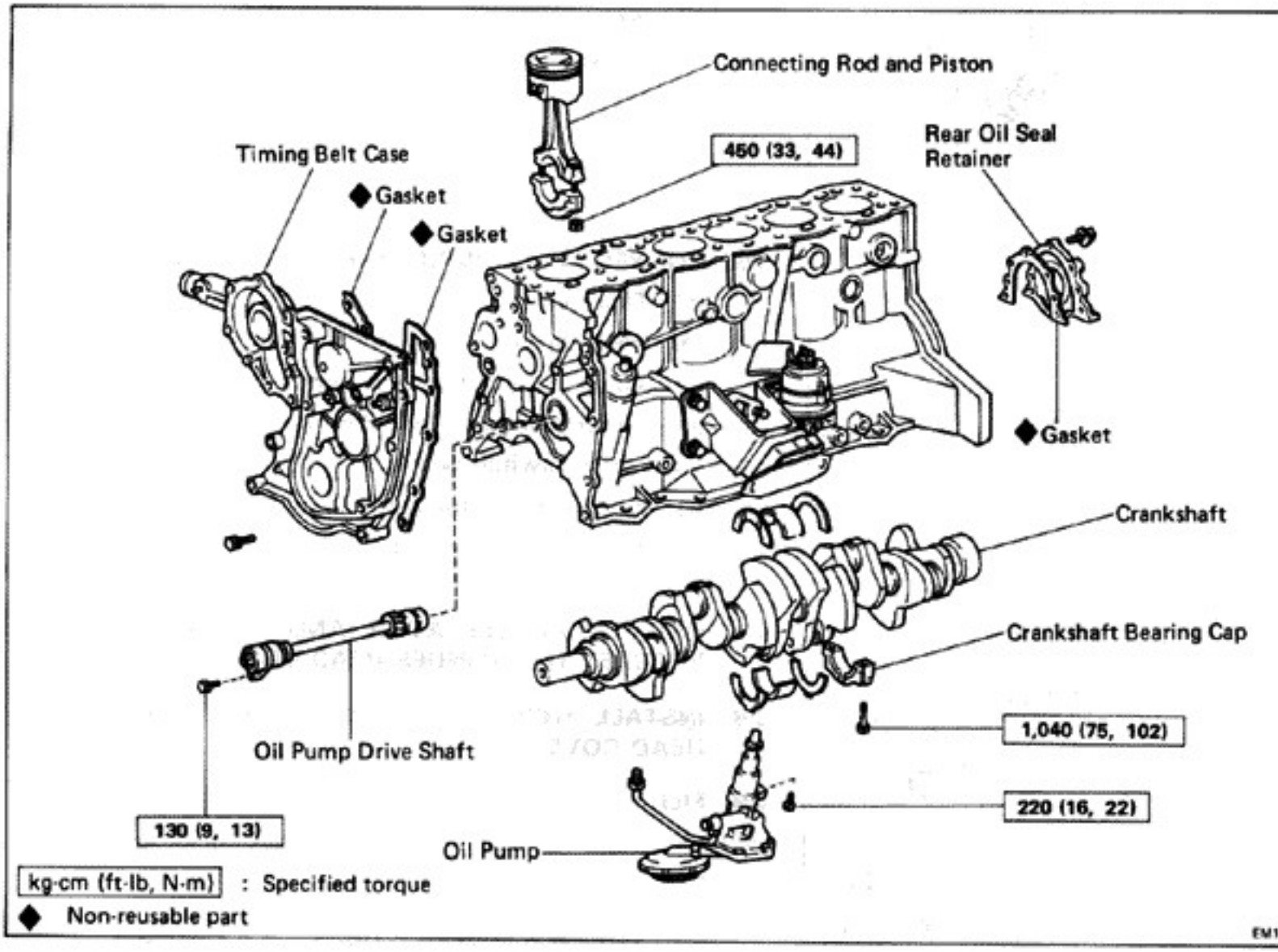
**33. ROAD TEST**

Perform a road test.

**34. RECHECK COOLANT AND ENGINE OIL LEVEL**

# CYLINDER BLOCK

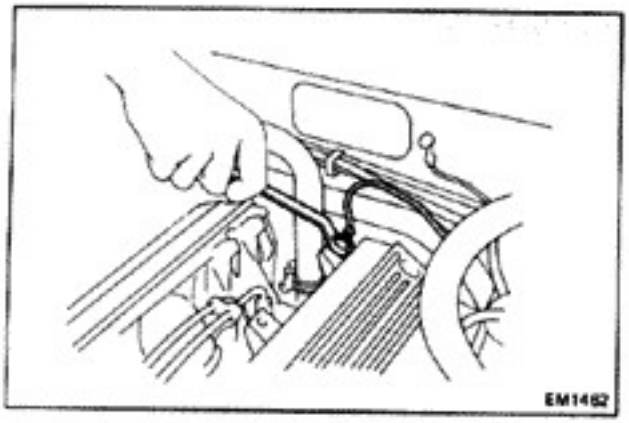
## COMPONENTS

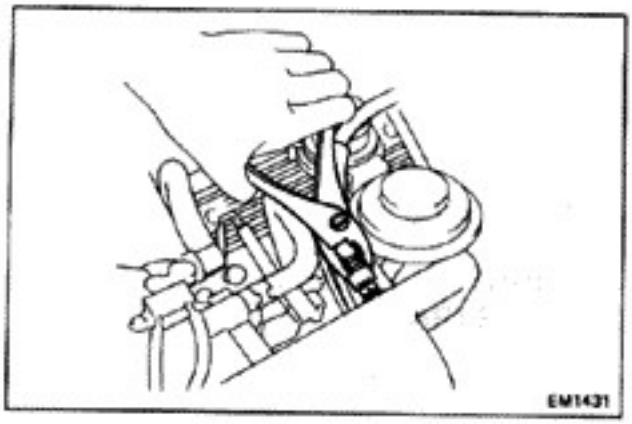



## REMOVAL OF ENGINE

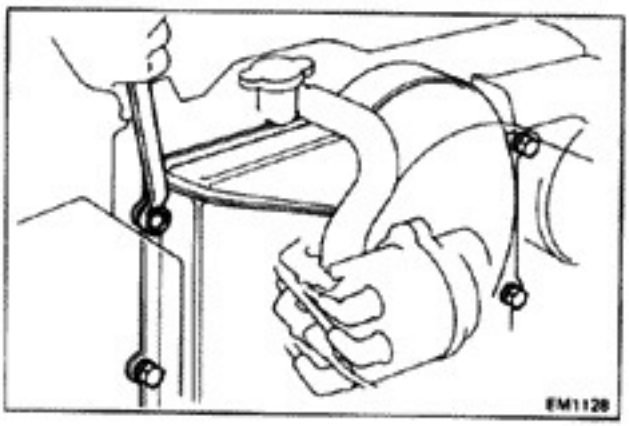
1. DRAIN COOLANT FROM RADIATOR AND CYLIND BLOCK
2. REMOVE HOOD
3. REMOVE BATTERY
4. REMOVE WASHER TANK

5. REMOVE AIR CLEANER CASE, AIR FLOW METER AND A INTAKE CONNECTOR PIPE
6. REMOVE THROTTLE CABLE BRACKET FROM CYLIND HEAD COVER (for A/T)








**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 intak chamber.
(b) Actuator vacuum hose from the air intake chambe (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.

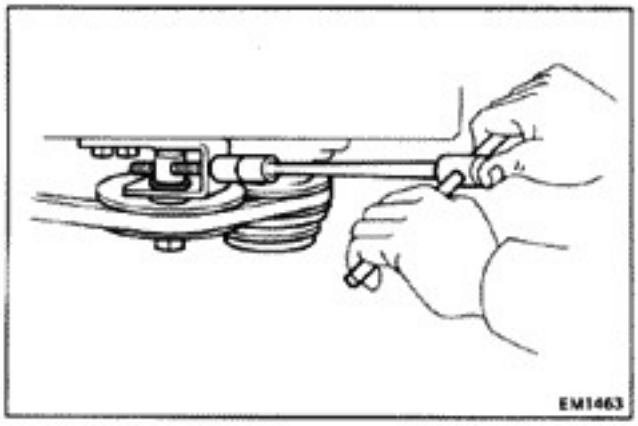
**12. REMOVE FAN SHROUD AND FLUID COUPLING**

(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.

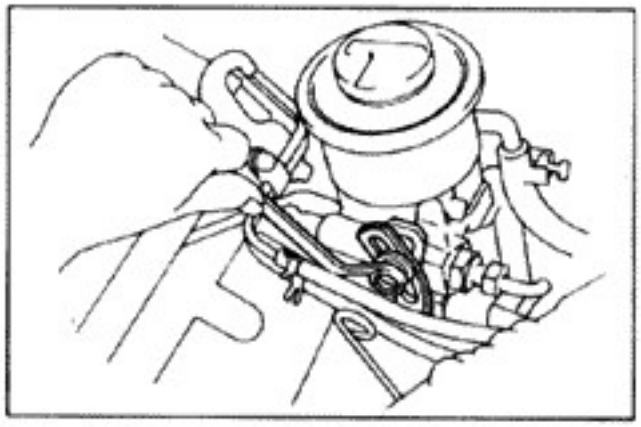
**13. REMOVE ENGINE UNDERCOVER**

**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.

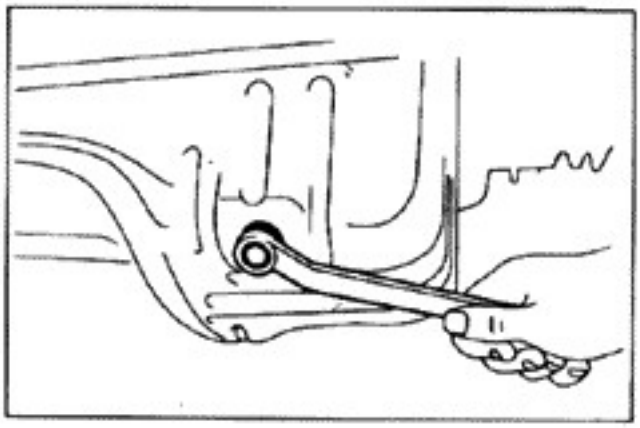



16. **REMOVE COMPRESSOR WITH BRACKET FROM CYLINDER BLOCK**
    (a) Remove the drive belt.
    (b) Remove the compressor mounting bolts.
    (c) Lay the compressor with bracket to one side with disconnecting the hoses.



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 bracke
    (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 ENGINE AND GROUND STRAP**



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

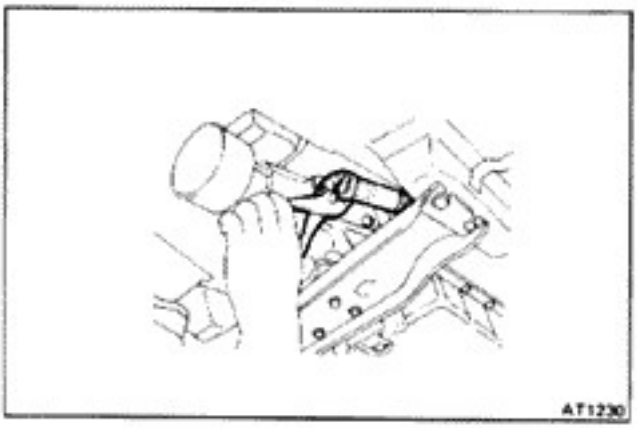
20. **RAISE VEHICLE**

    **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 TRANSMISSI HOUSING**




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

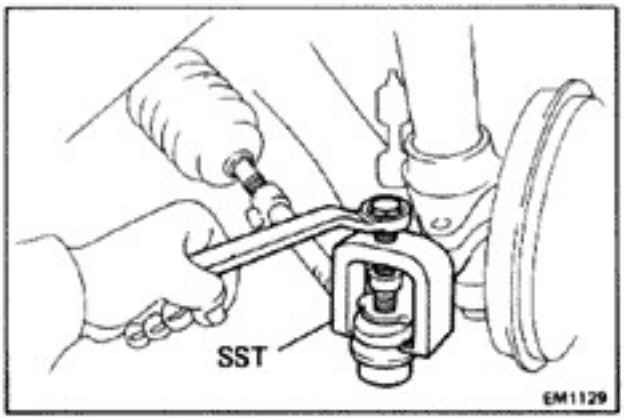
25. **REMOVE SPEEDOMETER CABLE**

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

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

28. **REMOVE STIFFENER PLATE WITH GROUND STRAP**

29. **DISCONNECT FUEL TUBE AND HOSE**
    (a) Main tube from the fuel filter.



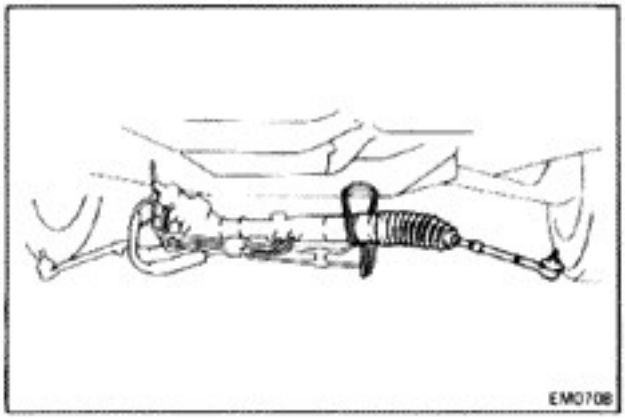

**30. REMOVE POWER STEERING GEAR HOUSING**

(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

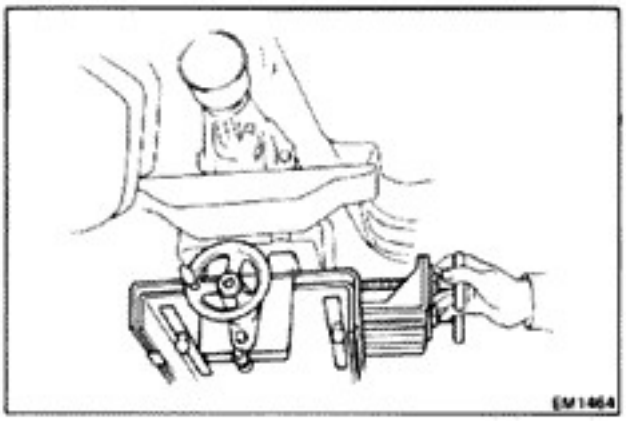



(d) Remove the gear housing brackets.

(e) Remove the gear housing assembly.

(f) Suspend the gear housing with the string or such to protect the pressure and return line.

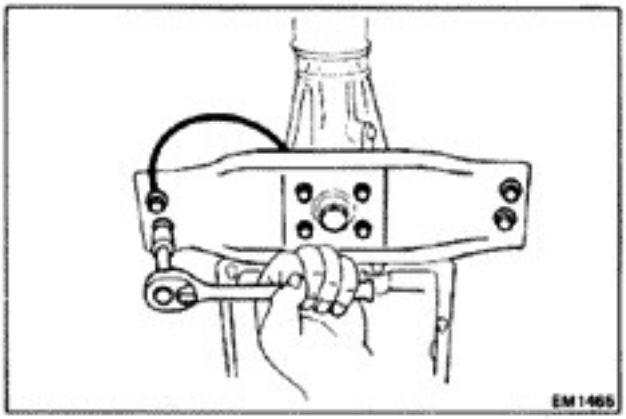
**31. REMOVE INTERMEDIATE SHAFT FROM PROPELLER SHAFT**




**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.

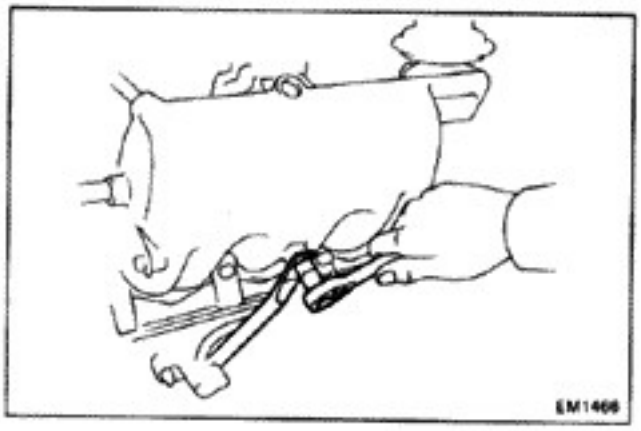
(b) Remove the exhaust pipe bracket from the engine.

(c) Disconnect the transmission from the engine.

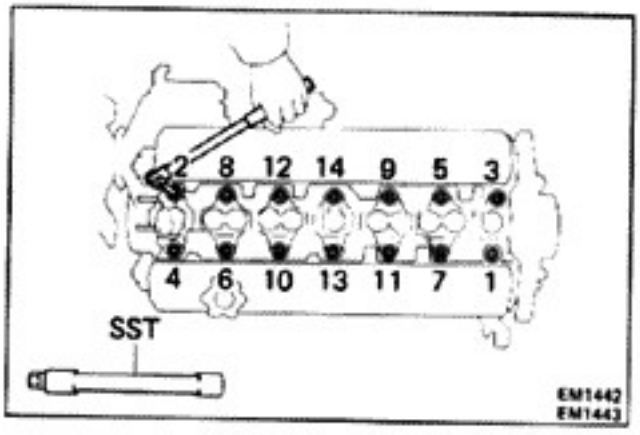
## DISASSEMBLY OF CYLINDER BLOCK

(See page EM-38)

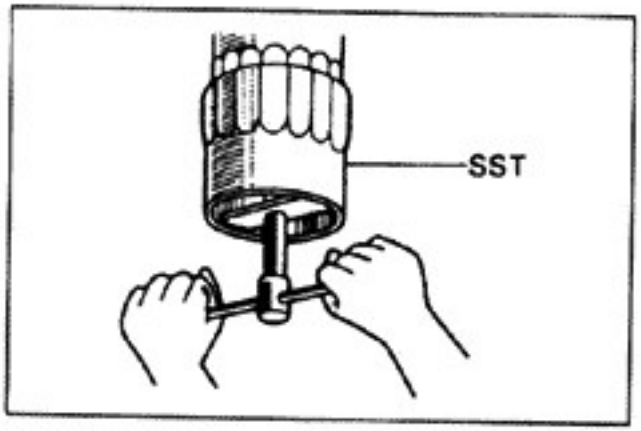
1. REMOVE CLUTCH COVER AND DISC
2. REMOVE FLYWHEEL OR DRIVE PLATE AND REAR E PLATE
3. INSTALL ENGINE STAND FOR DISASSEMBLY




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

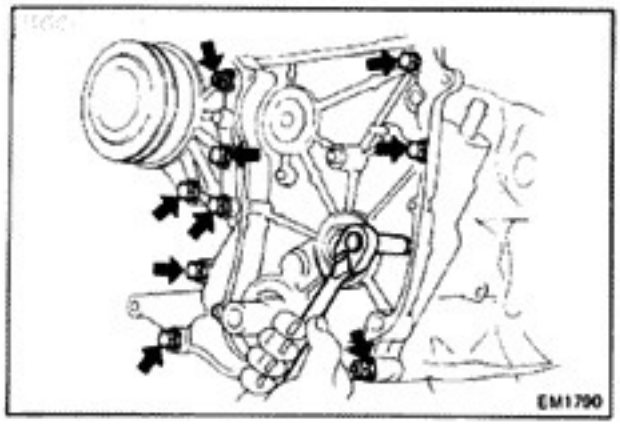



   (f) Using SST, remove the cylinder head bolts.
   SST 09043-38100
   (g) Remove the cylinder head assembly.




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

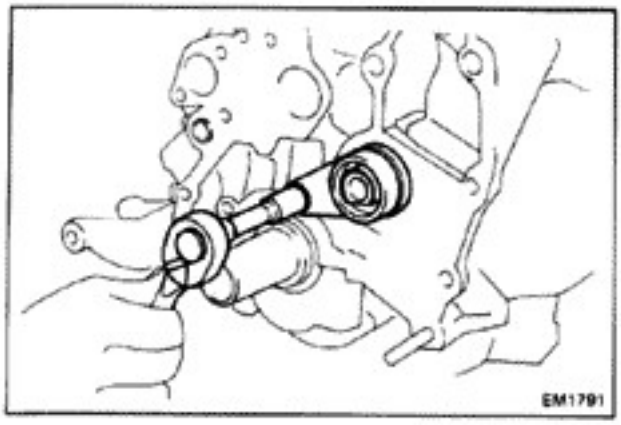
10. REMOVE WATER BY-PASS PIPE
    (a) Remove the two nuts from the timing belt case.
    (b) Remove the three bolts from the cylinder block a remove the water by-pass pipe with gasket.




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

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

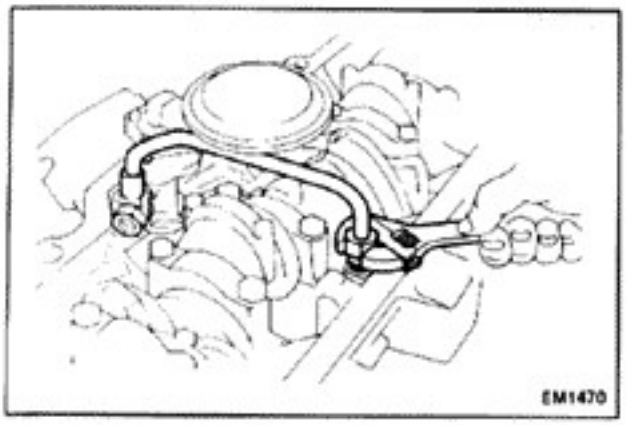
**13. REMOVE REAR OIL SEAL RETAINER**




**14. REMOVE OIL PUMP DRIVE SHAFT**

(a) Remove the bolt holding the oil pump drive shaft.

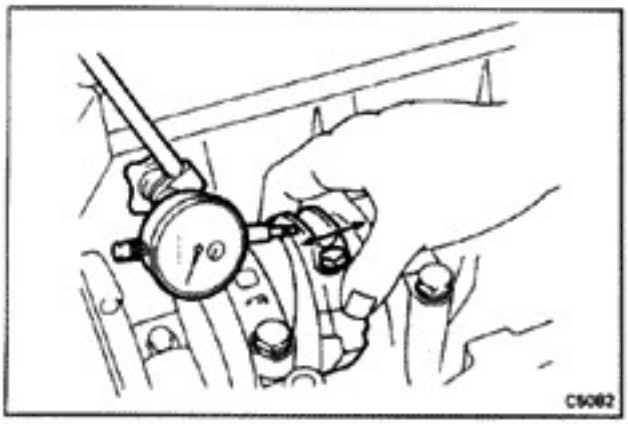
(b) While turning the oil pump drive shaft, slowly pull it out so as not to damage the bearing.




**15. REMOVE OIL PUMP ASSEMBLY**

(a) Remove the union bolt and nut and remove the oil pump outlet pipe.

(b) 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.)**

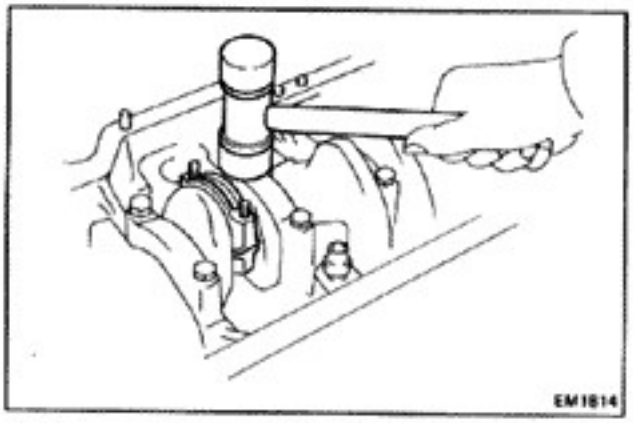
**Maximum clearance: 0.3 mm (0.012 in.)**

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

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

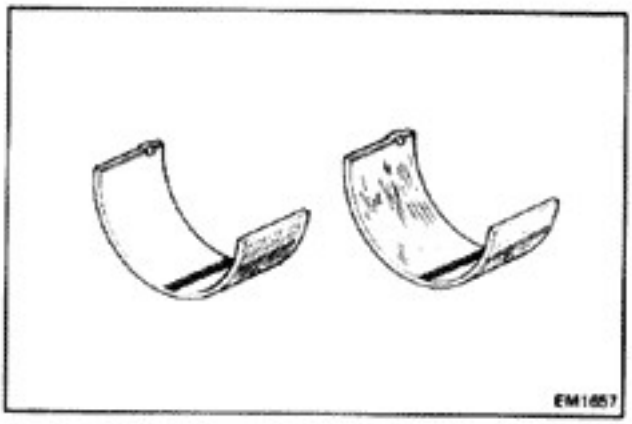
(a) Using a punch or numbering stamp, mark the connecting rods and caps to ensure correct reassembly.

(b) Remove the rod caps.




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

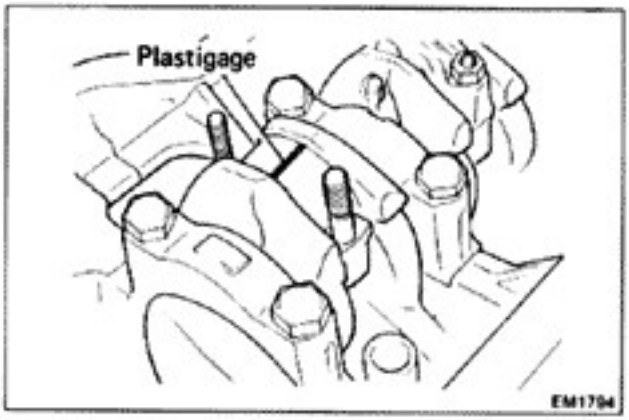
NOTE: Keep the bearing inserted with the cap.



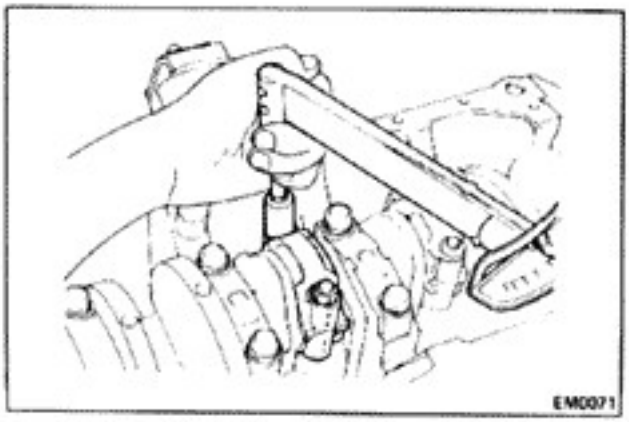

(d) Clean the bearings and crankshaft pins.

(e) Inspect each bearing for pitting and radial scratche

If bearings are damaged, replace the bearings.




(f) Lay a strip of plastigage across the crankshaft pi




(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.

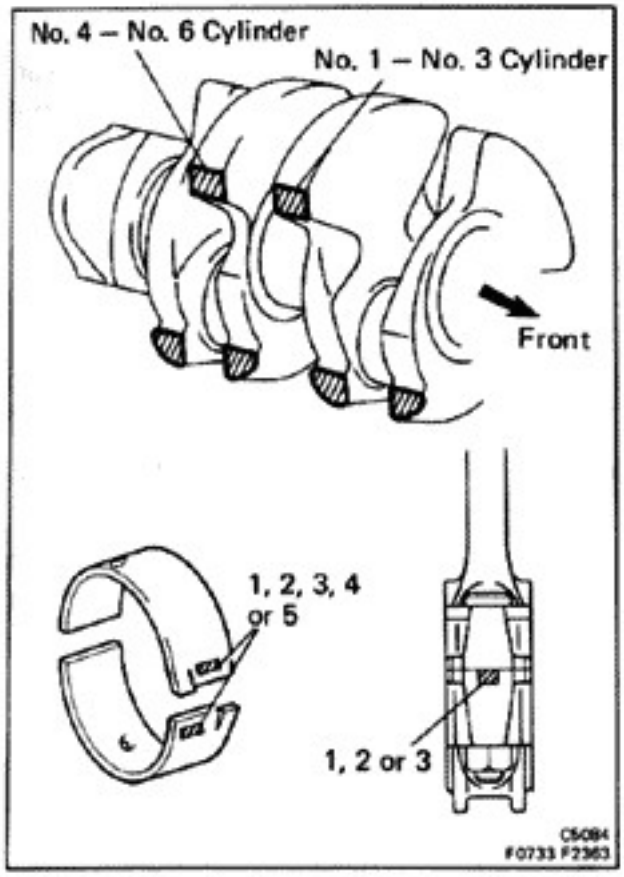
(h) Remove the rod cap.

(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.)**

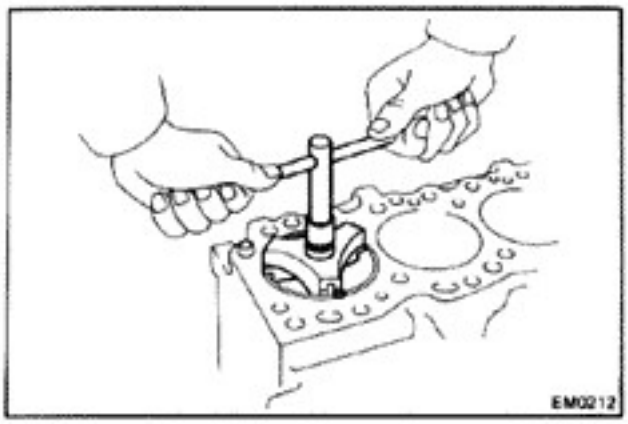
If the clearance is greater than maximum, replace the bea




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

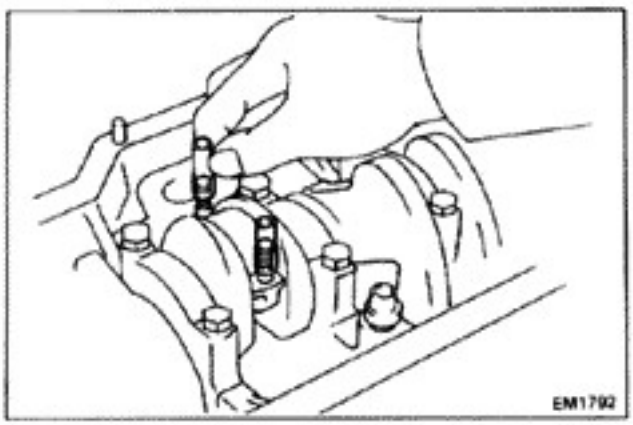
| Rod cap No. | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|
| Crankshaft No. | 0 | 1 | 0 | 2 | 1 | 0 | 2 | 1 | 2 |
| Bearing No. | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 5 |

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



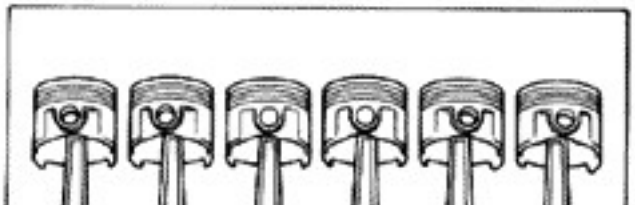

**18. PUSH OUT PISTON AND CONNECTING ROD ASSEMBL**

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

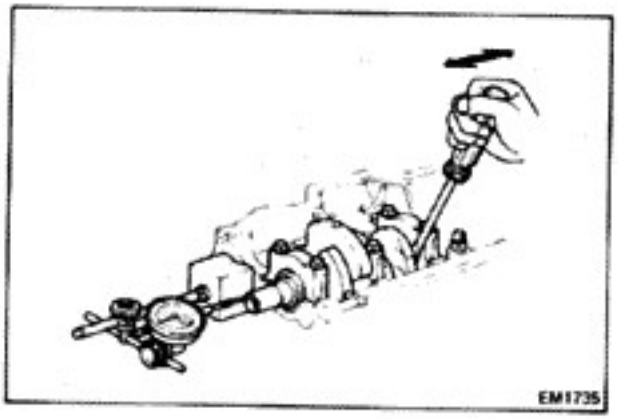



(b) Cover the rod bolts with a short piece of hose to pr tect the crank pin from damage.

(c) Push the piston and connecting rod assembly ou through the top of the cylinder block.



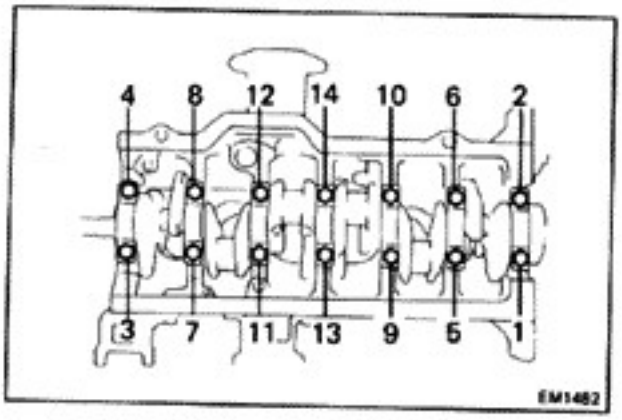
(d) Arrange the pistons and connecting rod caps in orde




**19. MEASURE CRANKSHAFT THRUST CLEARANCE**

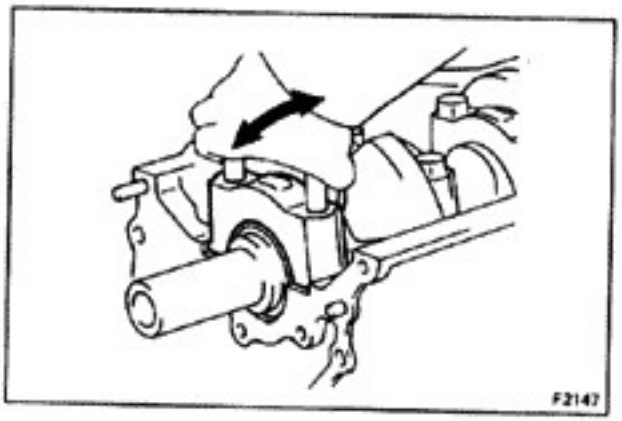
Install a dial gauge and measure the crankshaft thrust clea ance while prying the crankshaft back and forth with screwdriver.

| | |
|---|---|
| **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 O CLEARANCE**

(a) Gradually loosen and remove the bearing cap bolts i 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 bear ing and thrust washers (No. 4 journal only).

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

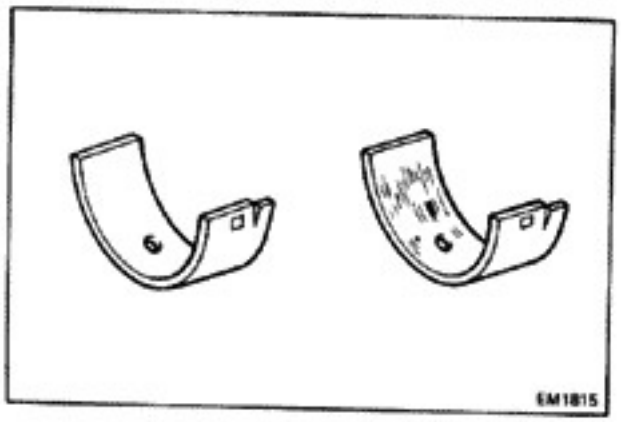
(c) Lift off the crankshaft.

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

(d) Clean the journals and bearings.

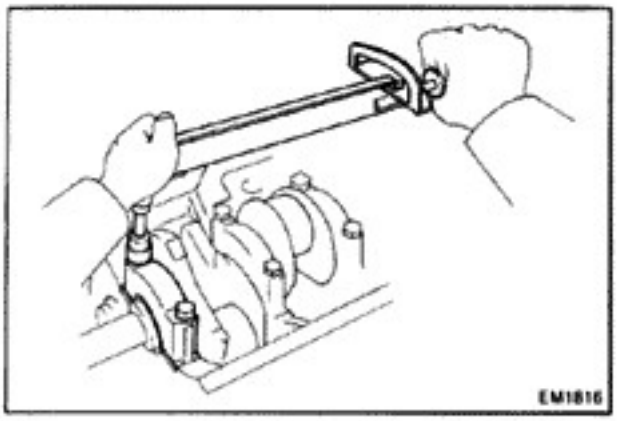
(e) Check the journals and bearings for pitting and scratches.

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.

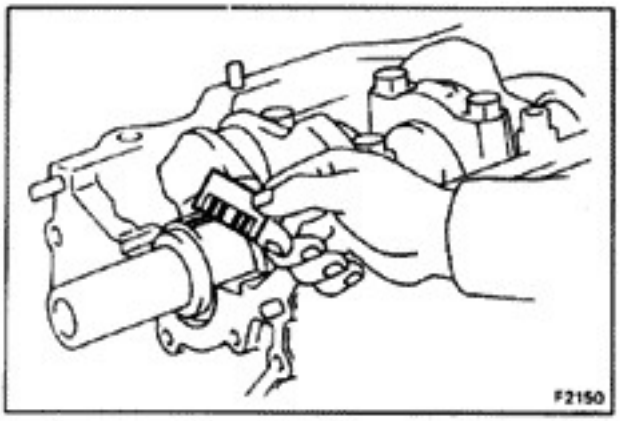
(g) Lay a strip of plastigage across the main journals.




(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.

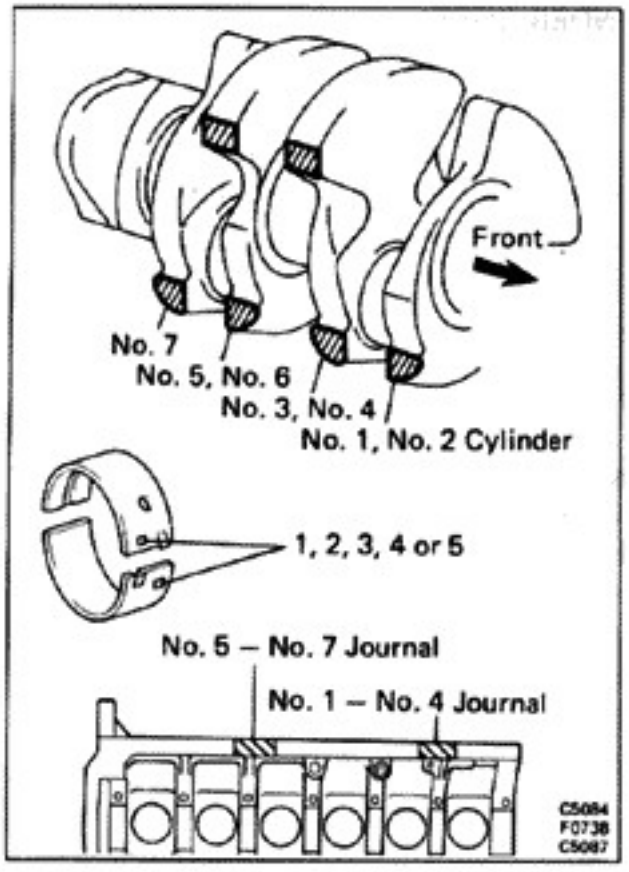
(j) Measure the plastigauge at its widest point.

**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 |

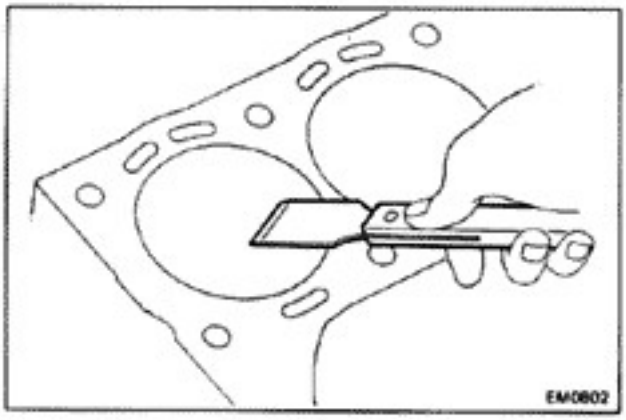
Example: Cylinder Block No. 2, Crankshaft No. 1 = Bearing No. 3

## 21. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper main bearings from the cylinder block.

(c) Clean out any plastigage scraps from the bearing and



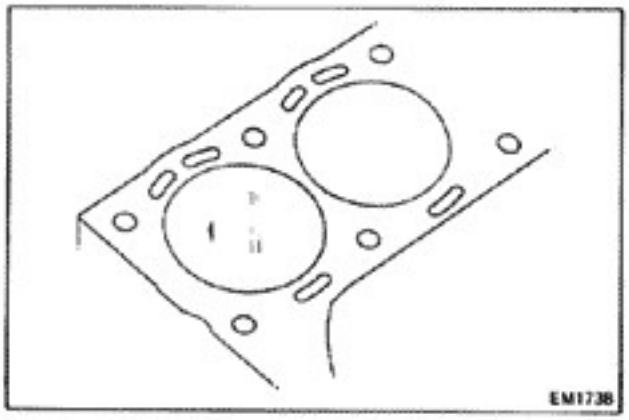

## INSPECTION OF CYLINDER BLOCK

### 1. REMOVE GASKET MATERIAL

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

### 2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the block.



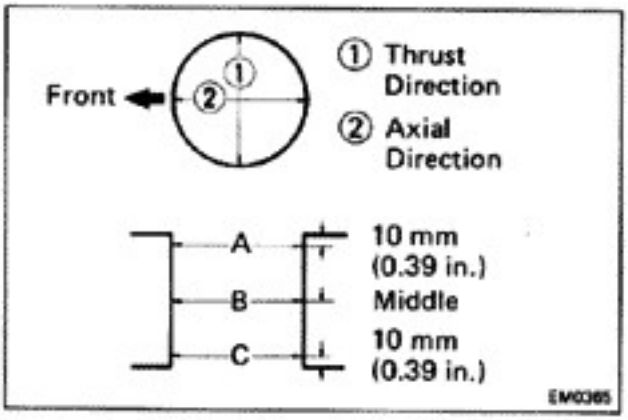

### 3. INSPECT CYLINDERS

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

### 4. INSPECT CYLINDER BLOCK WARPAGE

**Warpage: Limit 0.05 mm (0.0020 in.)**

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




### 5. MEASURE CYLINDER BORE

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

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

(a) Cylinder diameter is greater than the maximum per missible 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)

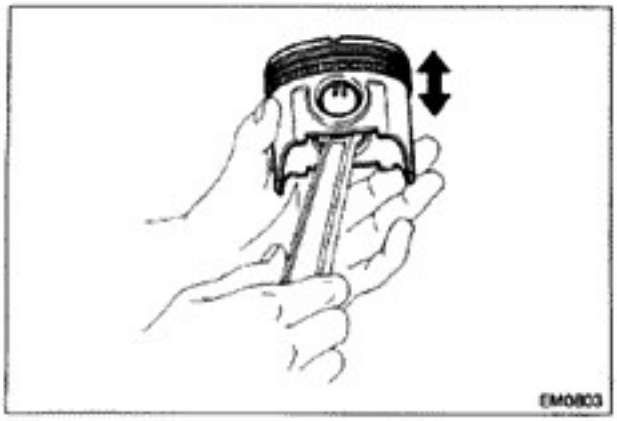
**Taper limit: 0.02 mm (0.0008 in.)**

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

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

### 6. REMOVE CYLINDER RIDGE

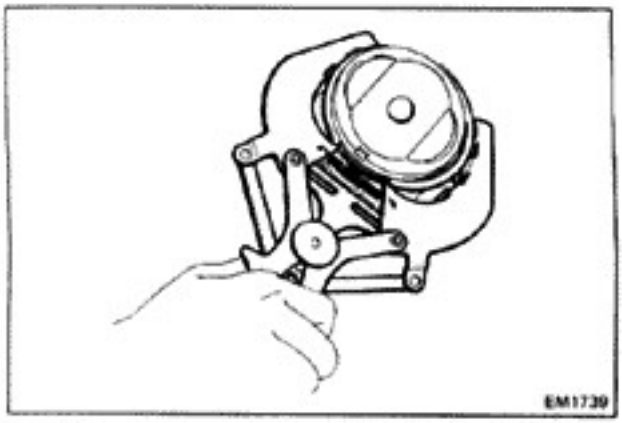
If wear is less than 0.2 mm (0.008 in.), use a ridge reame to machine the piston ring ridge at the top of the cylinder




## DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

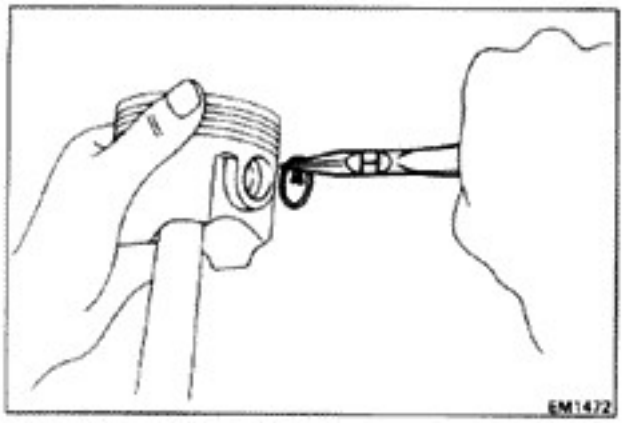
### 1. CHECK FIT BETWEEN PISTON AND PIN

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




### 2. REMOVE PISTON RINGS

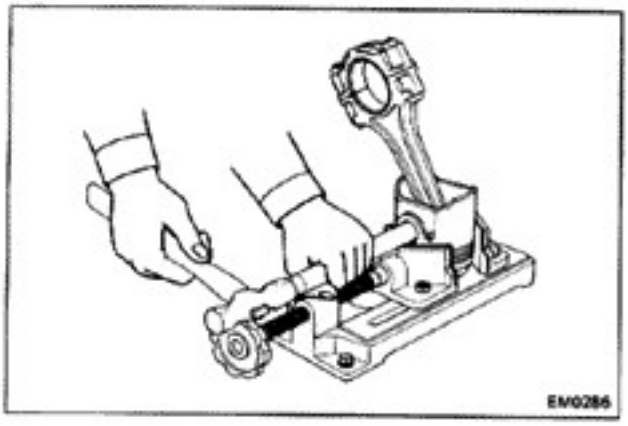
Using a piston ring expander, remove the piston rings.
Keep the rings for each cylinder separated.




### 3. DISCONNECT CONNECTING ROD FROM PISTON

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

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



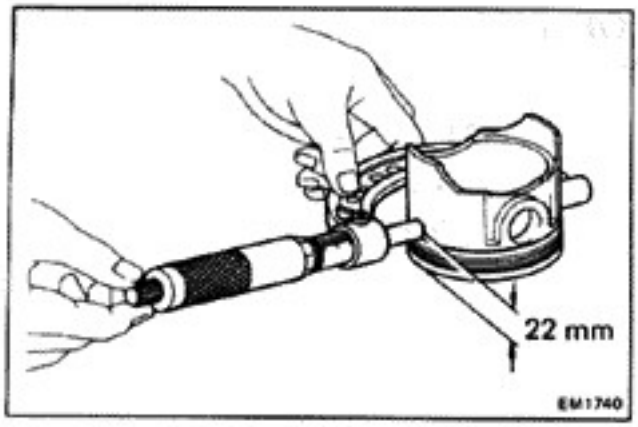

(c) Using a plastic-faced hammer and driver, tap the pin lightly to remove the pin from the piston.

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

## INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLY

### 1. CLEAN PISTON

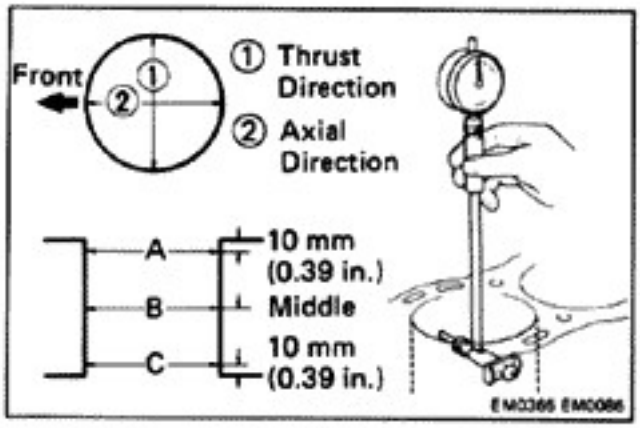
(a) Scrape any carbon from the piston top.




## 2. MEASURE PISTON DIAMETER

(a) Using a micrometer, measure the piston diameter
right angles to the piston pin center line, 22 mm (0.
in.) from the piston head.

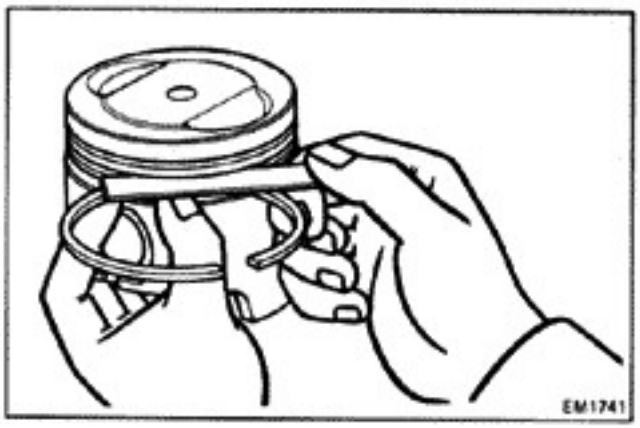
**Standard diameter:** 82.93 — 82.98 mm
(3.2650 — 3.2669 in.)




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

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

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

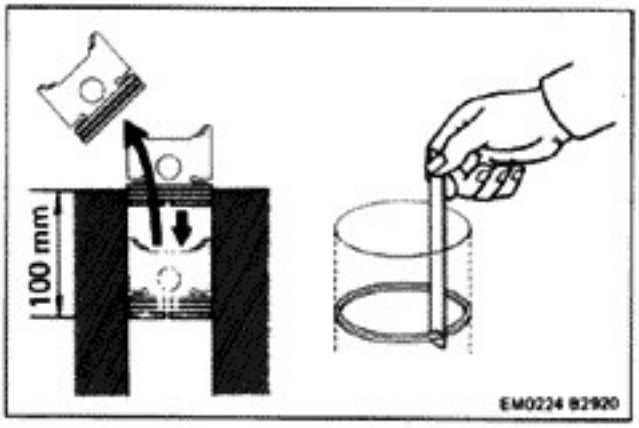



## 3. MEASURE CLEARANCE BETWEEN PISTON RING GROO AND PISTON RING

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

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

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




## 4. MEASURE RING END GAP

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

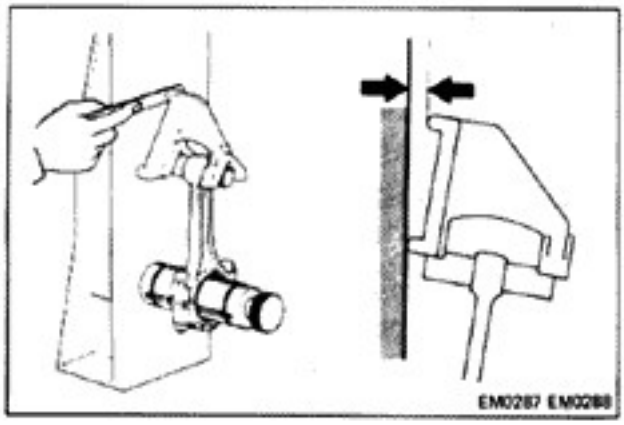
(b) Using a piston, push the piston ring a little beyond
bottom of the ring travel.
[100 mm (3.94 in.) from top surfage of cylinder blo

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

**Ring end gap:**

| | | |
|---|---|---|
| No. 1 | STD | 0.29—0.47 mm (0.0114—0.0185 i |
| | Limit | 0.71mm (0.00280 in.) |
| No. 2 | STD | 0.25—0.55 mm (0.0098—0.0217 i |
| | Limit | 1.15 mm (0.0453 in.) |
| Oil | STD | 0.17—0.85 mm (0.0067—0.0335 i |
| | Limit | 1.45 mm (0.0571 in.) |

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

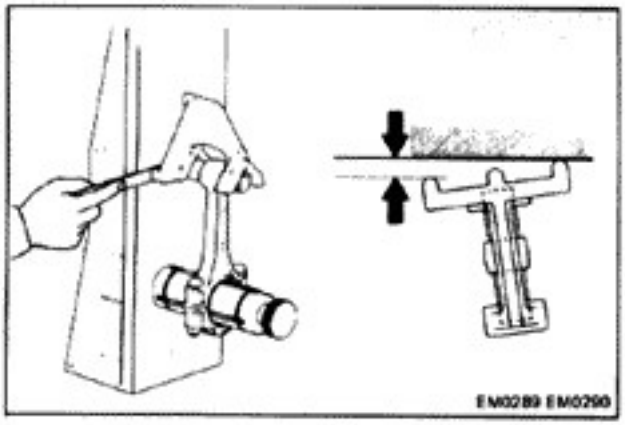



### 6. INSPECT CONNECTING RODS

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

- Check that the rod is not bent.

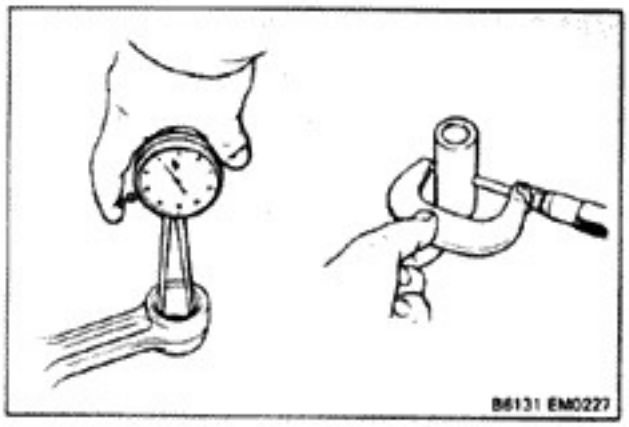
**Bend limit:**
**0.05 mm (0.0020 in.) per 100 mm (3.94 in.)**




- 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

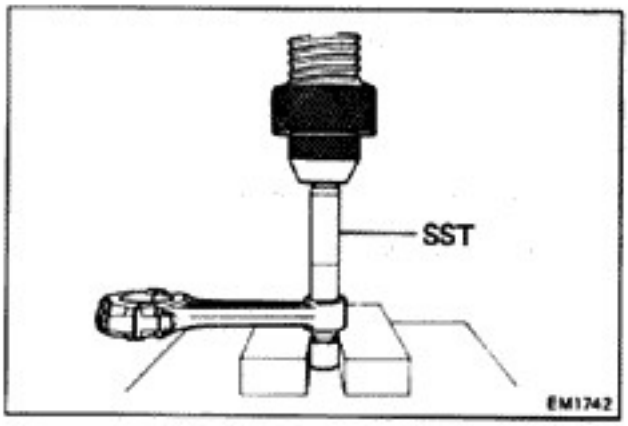



(b) Measure the oil clearance between the rod bushin and piston pin.

- Using an inside dial indicator, measure the insid diameter of the rod bushing.
- Using a micrometer, measure the diameter of th piston pin.
- Check that the difference between the measure ments 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 ro busing.

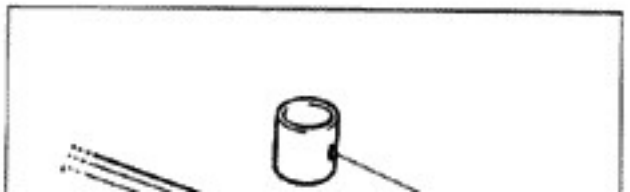



## REPLACEMENT OF ROD BUSHING

### 1. REMOVE ROD BUSHING

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

SST 09222-30010

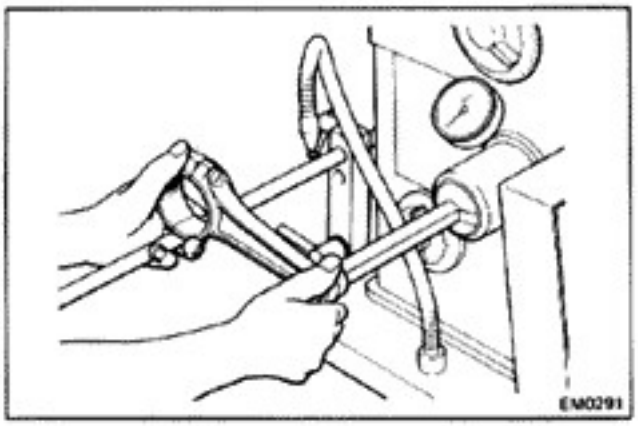


### 2. INSTALL NEW ROD BUSHING

Using SST, install the rod bushing to the connecting rod

SST 09222-30010

NOTE: Align the bushing oil hole with the connecting ro




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

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

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

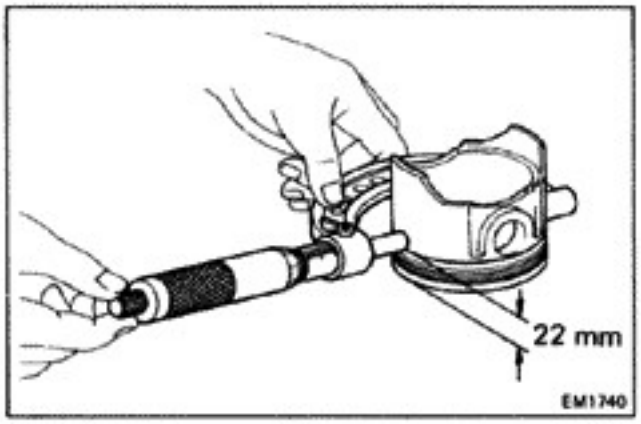
(b) Check the pin fit at normal room temperature. Coat the pin with engine oil and push the pin into t rod with thumb pressure.

## 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 b measured and select the oversized piston for that bo Bore all cylinders for the oversized piston selected.

| 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) |




### 2. CALCULATE DIMENSION TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter right angles to the piston pin center line, 22 mm (0. in.) from the piston head.

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

Size to be rebored = P + C — H

P = piston diameter

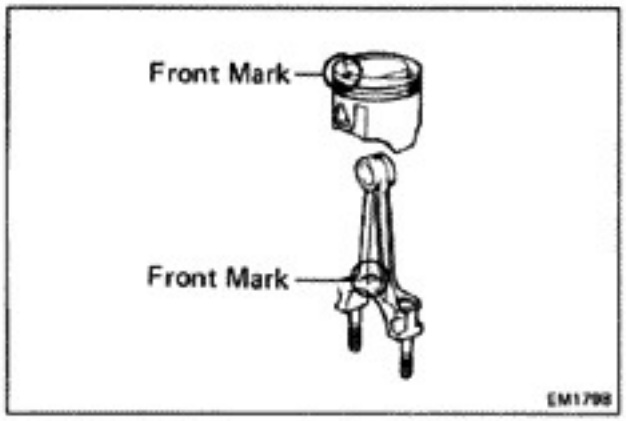
C = piston clearance
**0.06 — 0.08 mm (0.0024 — 0.0031 i**

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 finish roundness.**




## ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

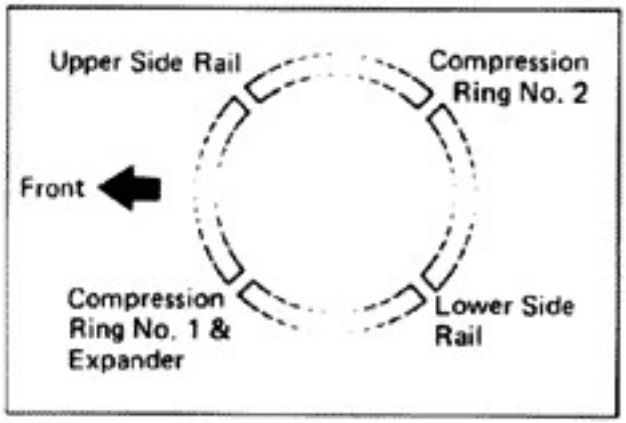
### 1. ASSEMBLE PISTON AND CONNECTING ROD

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

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

(c) Align the notch on the piston with the mark on th rod and push the piston pin in with your thumb.

(d) Install a new snap ring on the other side of the pin

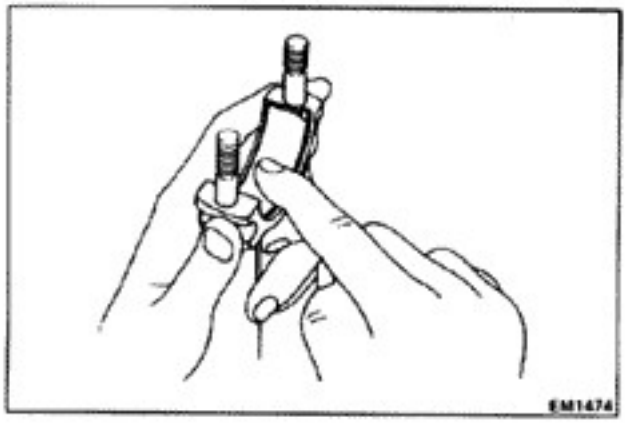



### 2. PLACE RINGS ON PISTON

(a) Using a ring expander, install the top two compres sion rings with the code marks facing up.

(b) Position the piston rings so that the ring end gaps ar in the shaded area as shown.

**CAUTION: Do not align the end gaps.**




### 3. INSTALL BEARINGS

(a) Install the bearings in the connecting rods and ro caps.

(b) Lubricate the face of the bearings with engine oil.

## INSPECTION AND REPAIR OF CRANKSHAFT

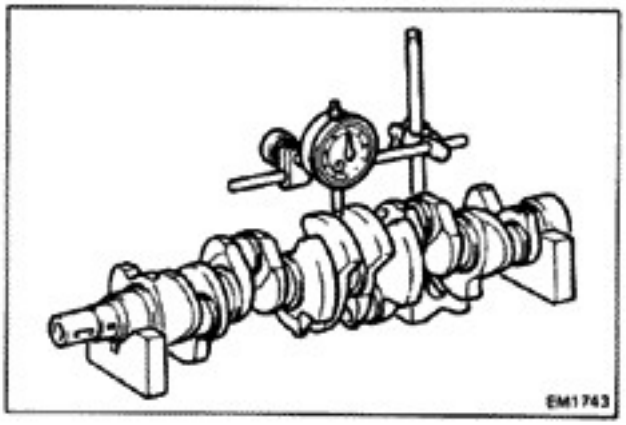
### 1. MEASURE CRANKSHAFT

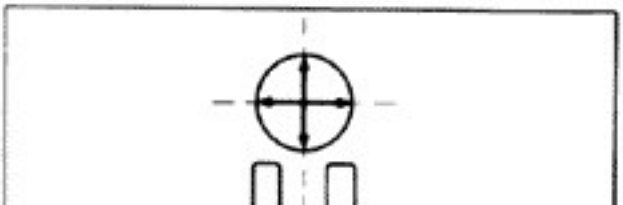
(a) Place the crankshaft on V-blocks.

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

**Maximum circle runout: 0.06 mm (0.0024 in.)**

If the runout is grerater than maximum, replace th crankshaft.



(c) Using a micrometer, check the diameter of the mai and crank pin journal.

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

**Main journal diameter: 59.988 — 60.012 mm**

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

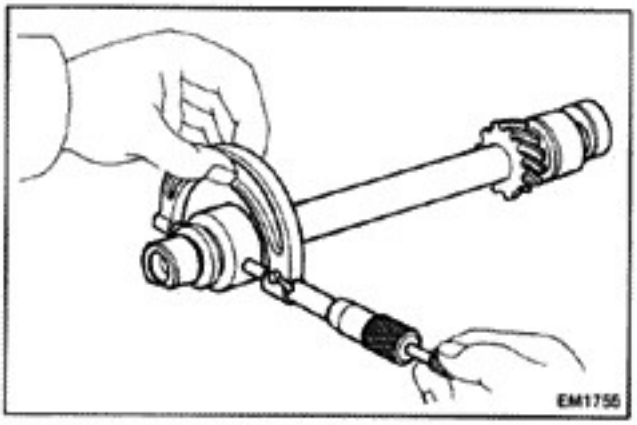
Grind the crank pins and/or main journals to the undersiz finished diameter.
Install a new pin and/or main undersize bearings.

**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 i**
**U/S 0.50 59.480 — 59.490 mm (2.3417 — 2.3421 i**

**Crank pin finished diameter:**
**U/S 0.25 51.725 — 51.735 mm (2.0364 — 2.0368 i**
**U/S 0.50 51.475 — 51.485 mm (2.0266 — 2.0270 i**

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

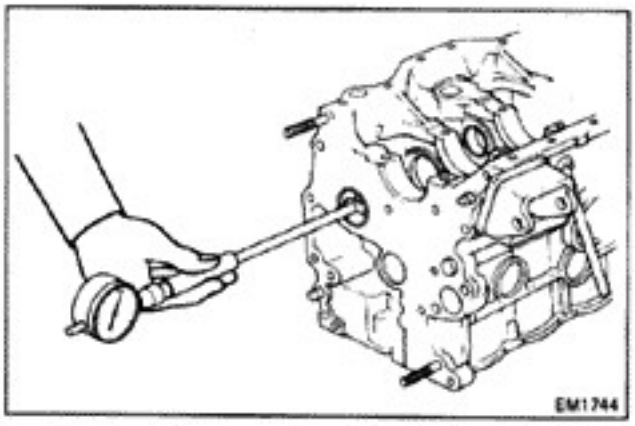

EM1755

## INSPECTION AND REPAIR OF OIL PUMP DRIV SHAFT COMPONENTS

**1. INSPECT OIL PUMP DRIVE SHAFT**

(a) Using a micrometer, measure the journal diamete

**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.)**

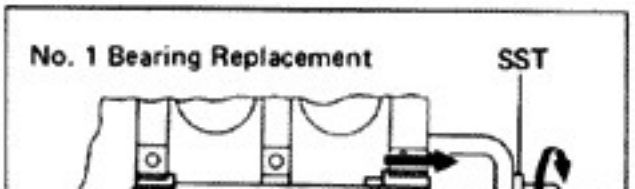

EM1744

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

(c) Subtract the journal diameter measurement from th 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.)**

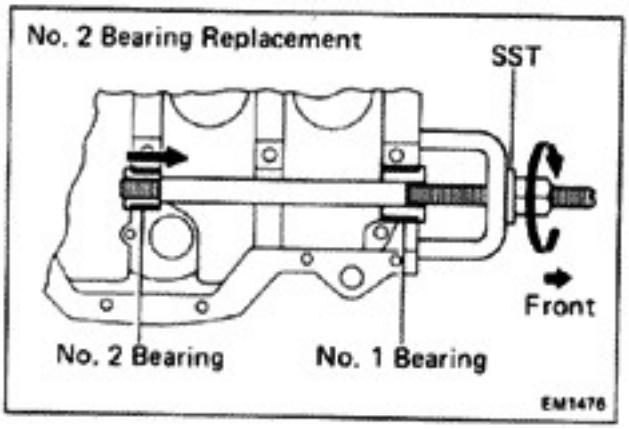
If the clearance is greater than maximum, replace the bea ing and/or drive shaft.




**2. IF NECESSARY, REPLACE DRIVE SHAFT BEARING**

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

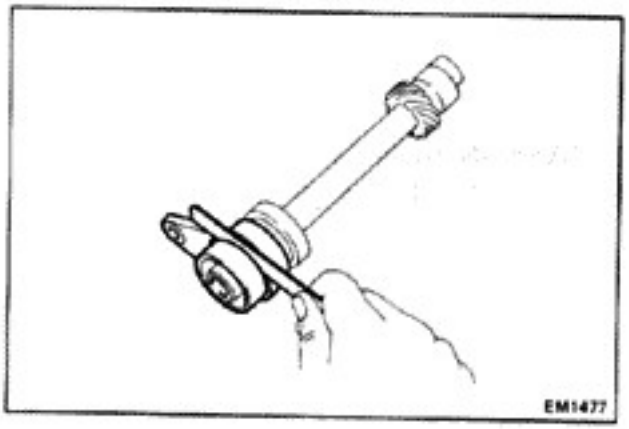
SST 09215-00100 (09215-00120, 09215-00150,




(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 oi hole.**



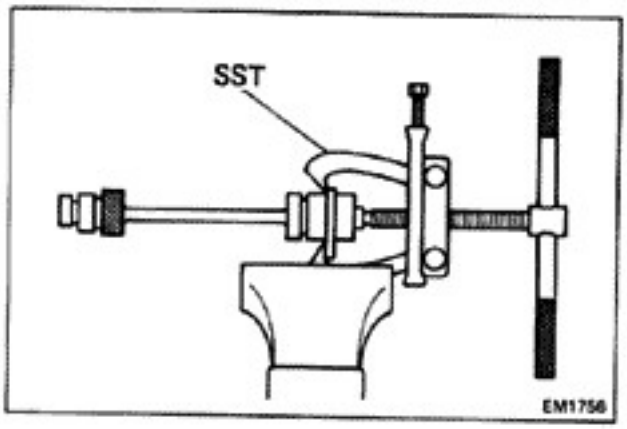

### 3. INSPECT OIL PUMP DRIVE SHAFT THRUST CLEARANCE

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.)**

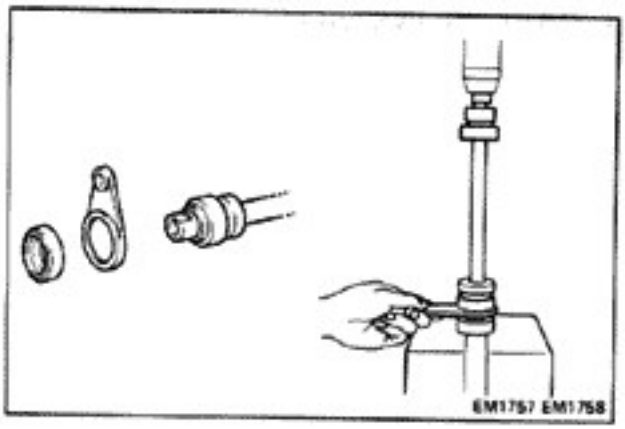
If clearance is greater than maximum, replace the thrust plate and/or collar.




### 4. IF NECESSARY, REPLACE THRUST PLATE AND COLLAR

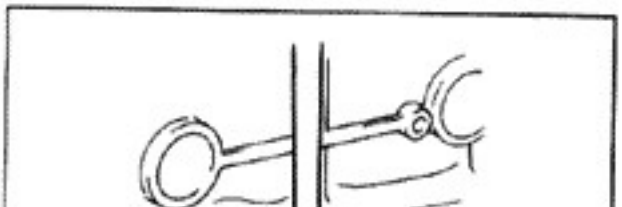
(a) Using SST, remove the thrust plate and collar.

SST 09950-20016



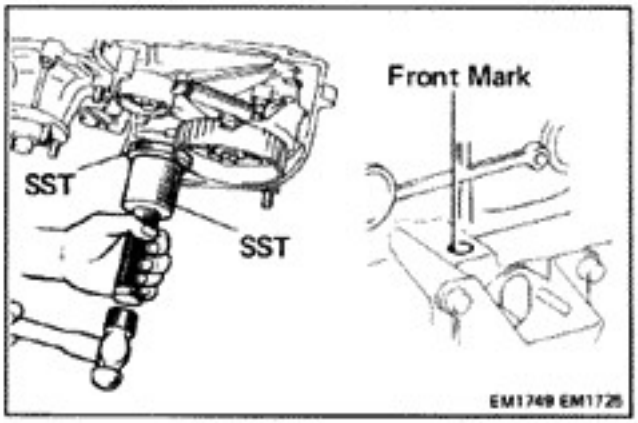

(b) Install the thrust plate and collar in the order as shown.

(c) Using a press, install the thrust plate and collar.



### 5. IF NECESSARY, REPLACE OIL PUMP GUIDE BUSHING

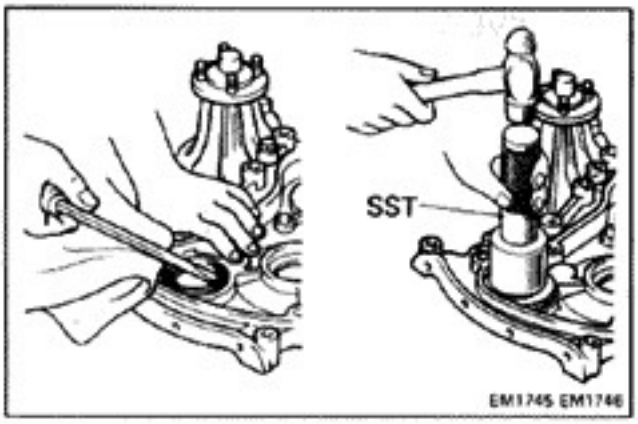
(a) Drive out the bushing from the outer side of the block.




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

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

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




## REPLACEMENT OF OIL SEALS

NOTE: There are two ways of oil seal replacement.

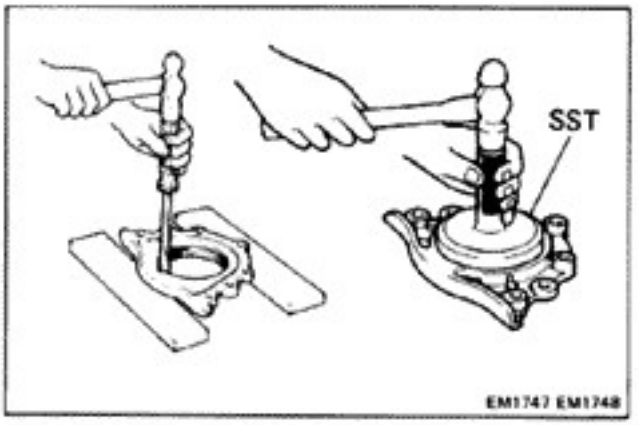
1. **IF TIMING BELT CASE IS REMOVED FROM CYLIND BLOCK (Replacement of front oil seal and pump drive seal)**

(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



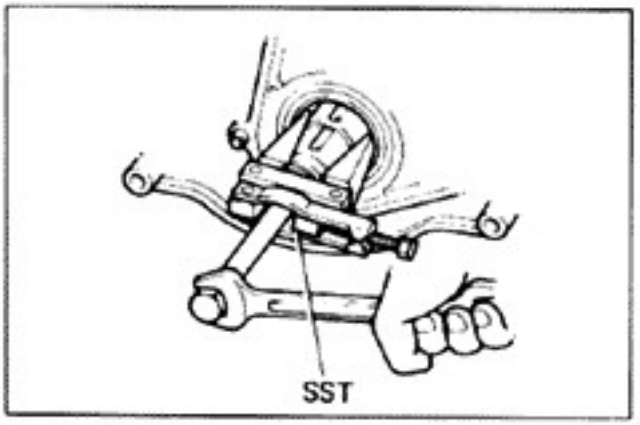

2. **IF REAR OIL SEAL RETAINER IS REMOVED FR CYLINDER BLOCK (Replacement of rear oil seal)**

(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 CYLIND BLOCK (Replacement of front oil seal)**

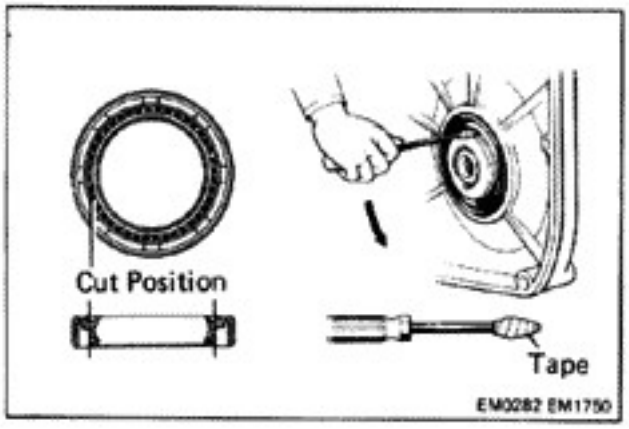
(a) Using SST, remove the front oil seal.

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

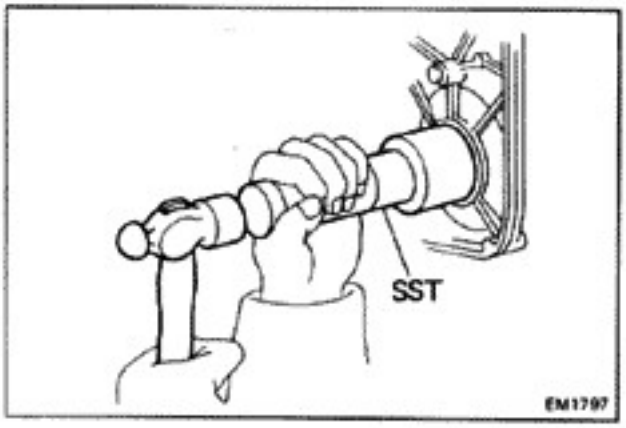



4. **IF TIMING BELT CASE IS INSTALLED ON CYLINDE BLOCK (Replacement of pump drive oil seal)**

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

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

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

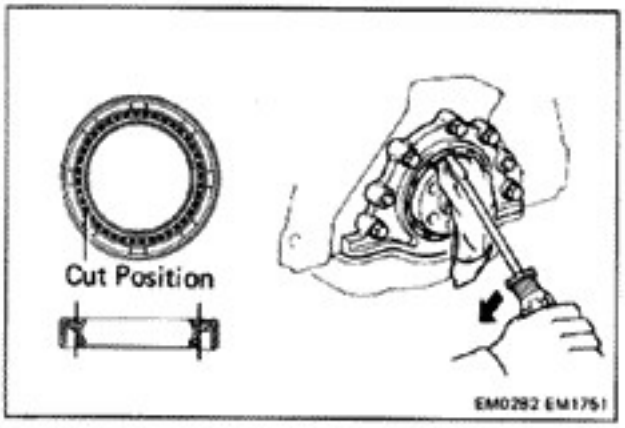



(c) Check the drive pump shaft where it contacts the o lip surface for cracks or damage.

(d) Apply MP grease to the oil seal.

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

SST 09214-41010

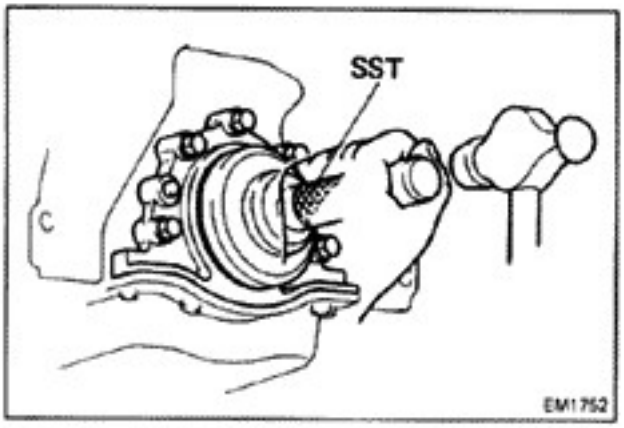



5. **IF REAR OIL SEAL RETAINER IS INSTALLED ON CYLINDE BLOCK (Replacement of rear oil seal)**

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

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

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

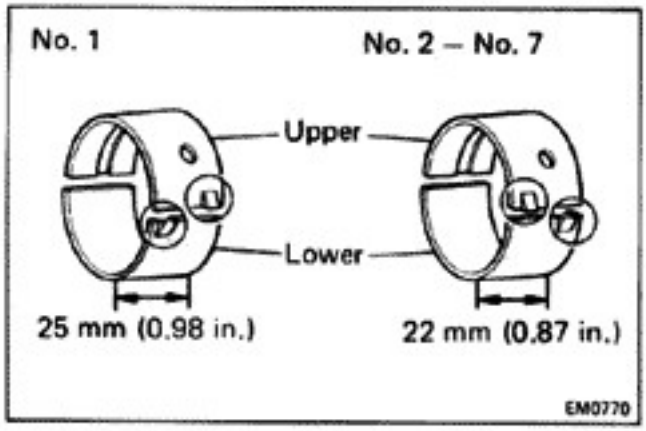



(c) Check the crankshaft where it contacts the oil lip su face for cracks or damage.

(d) Apply MP grease to the oil seal.

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

SST 09223-41020




## ASSEMBLY OF CYLINDER BLOCK

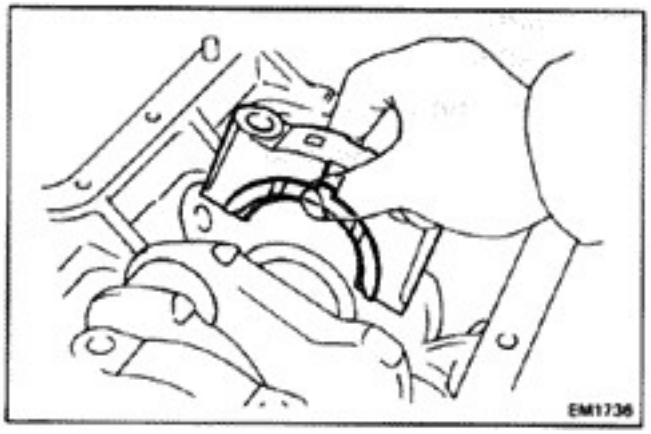
(See page EM-38)

### 1. INSTALL UPPER MAIN BEARING IN CYLINDER BLO

(a) Place the upper main bearing in the block.

(b) Install the upper thrust washers on the center bearing with the oil grooves facing out.

(c) Lubricate the faces of the bearings with engine

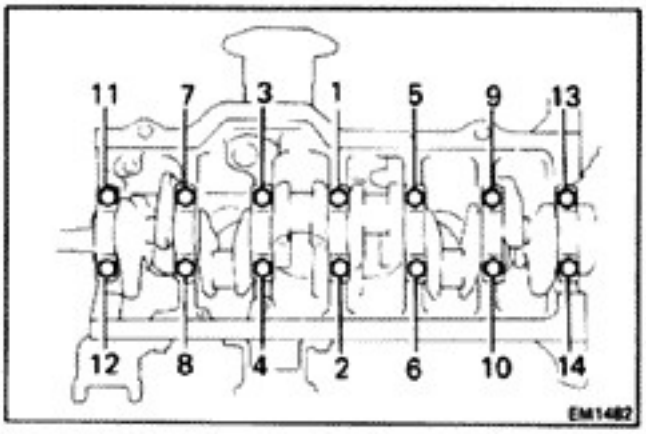



### 2. PLACE CRANKSHAFT IN CYLINDER BLOCK

### 3. INSTALL MAIN BEARING CAPS

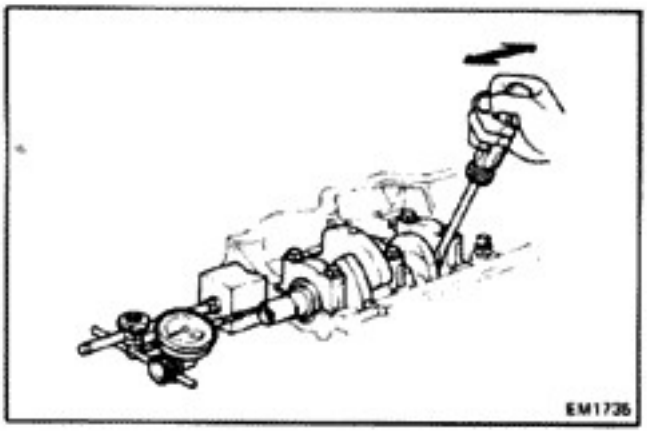
NOTE: Each bearing cap is numbered.

(a) Install thrust washers on No. 4 bearing cap with oil grooves facing out.




(b) Install the bearing caps in numbered order with arr facing forward. Tighten the bolts to the specified que in the sequence shown and in two or three pas

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



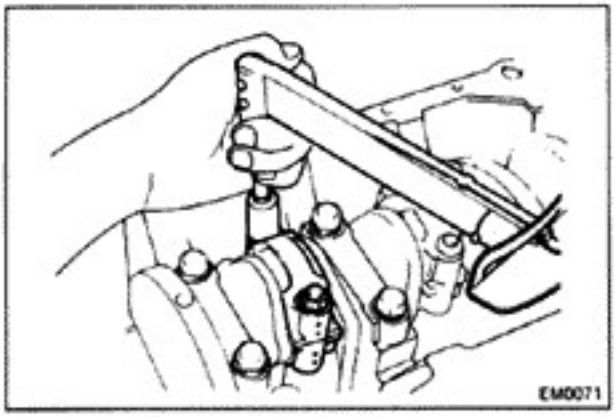

(c) Install the dial gauge and measure the cranks thrust clearance while prying the crankshaft back forth with a screwdriver.

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

(d) Check that the crankshaft turns.

### 4. INSTALL PISTON AND CONNECTING ROD ASSEMB

(a) Lubricate the cylinder bore and the crankshaft pin v clean engine oil.




**5. INSTALL ROD BEARING CAPS**

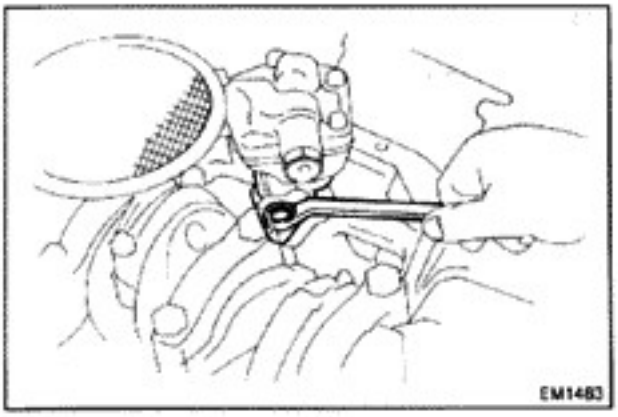
(a) Match the numbered cap with the numbered rod.

(b) 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)**

(c) 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**

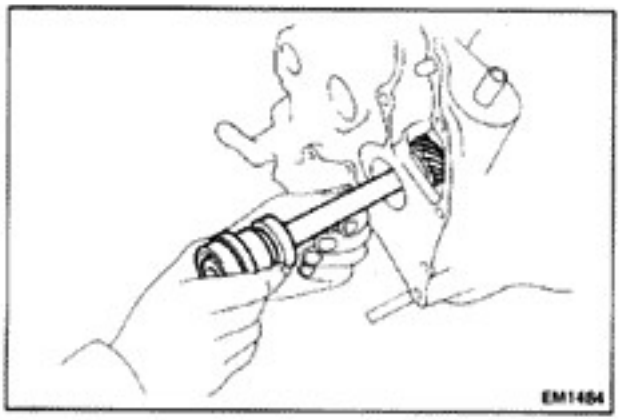
(a) Clean the oil pump.

(b) Install the oil pump and holding bolt.
Torque the bolt.

**Torque: 220 kg-cm (16 ft-lb, 22 N·m)**

(c) Install the oil pipe with gasket, lock washer and union bolt. Tighten the oil pipe nut and bolt.

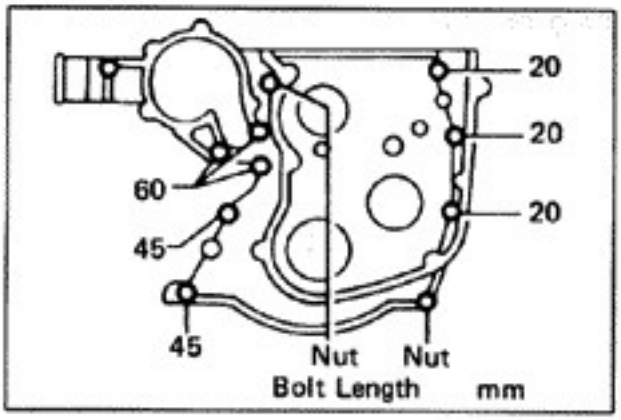
**Torque: 350 kg-cm (25 ft-lb, 34 N·m)**




**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**

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

(b) Install the timing belt case with eight bolts and two nuts.

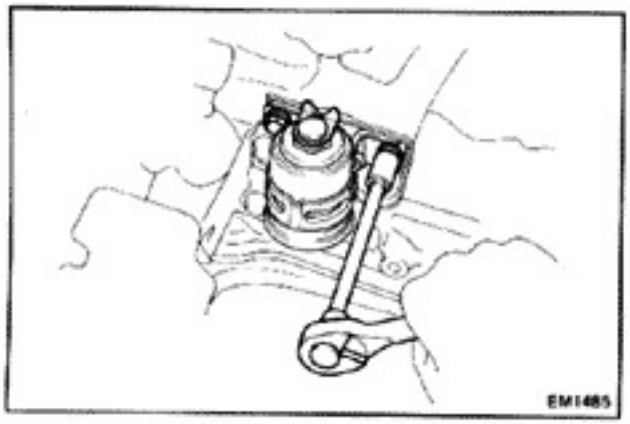
**Torque:**

| | |
|---|---|
| **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**

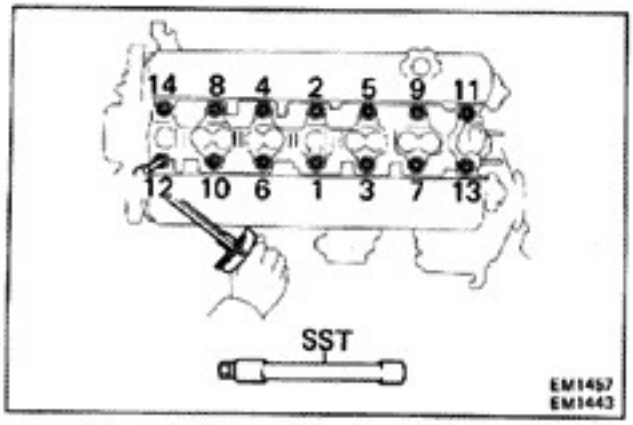



**14. INSTALL FUEL FILTER**

**15. INSTALL ALTERNATOR**

**16. INSTALL OIL LEVEL GAUGE**

**17. INSTALL NEW OIL FILTER**



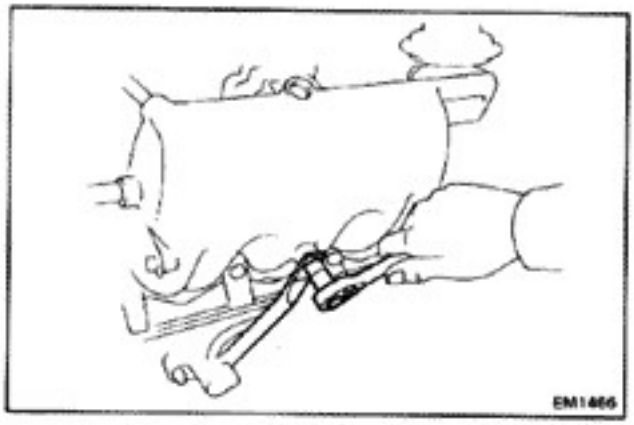

**18. INSTALL CYLINDER HEAD ASSEMBLY**

(a) Install the cylinder head assembly.

(b) Using SST, install and tighten the cylinder head bolt

SST 09043-38100

**Torque: 800 kg-cm (58 ft-lb, 78 N·m)**




(c) Install the air intake chamber stay.

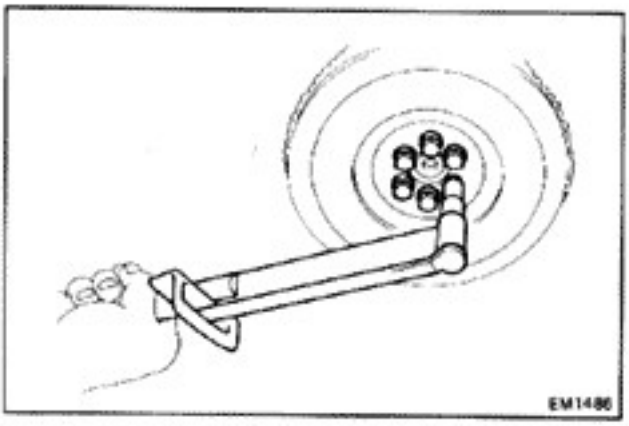
(d) Install the No.2 timing belt cover.

(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 wate by-pass pipe.

**19. REMOVE ENGINE STAND**




**20. INSTALL REAR END PLATE**

**21. INSTALL FLYWHEEL OR DRIVE PLATE ON CRANKSHAF**

Install the flywheel or drive plate on crankshaft with si 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**

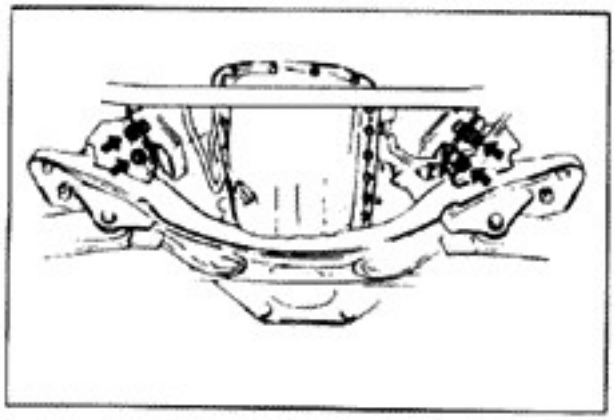
(a) Attach the engine hoist chain to the lifting brackets on the engine.

(b) Lower the engine into the engine compartment.

(c) Align the engine with the transmission and engine mounting supports.

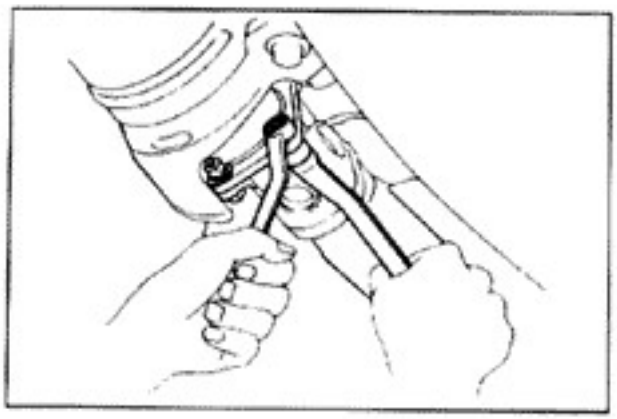
(d) Install the engine mounting bolts on each side of the engine.

(e) Remove the hoist chain.



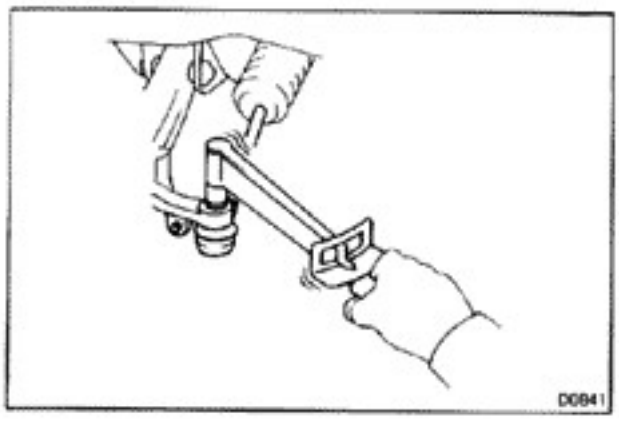
**3. RAISE VEHICLE**

**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.

**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

**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)

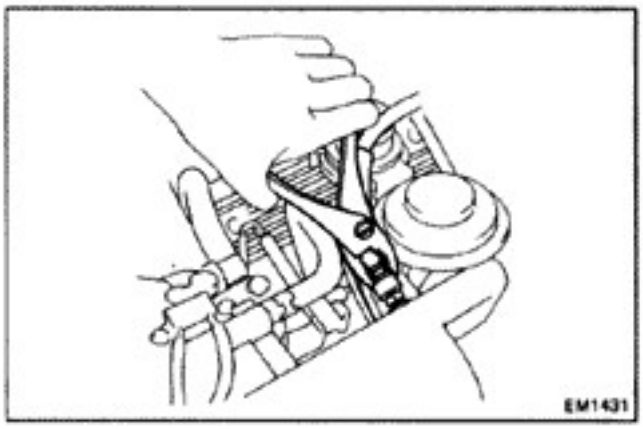
(d) Install the radiator lower hose.

**12. INSTALL FAN SHROUD AND FLUID COUPLING**

**13. INSTALL AIR CLEANER CASE, AIR FLOW METER AND A INTAKE CONNECTOR PIPE**

**14. CONNECT EFI WIRE HARNESS TO ECU**

**15. CONNECT TWO HEATER HOSES TO BLOCK AND CYLINDER HEAD**

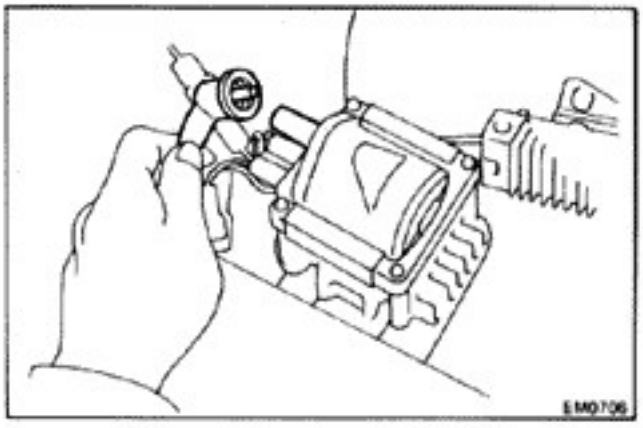



**16. CONNECT FOLLOWING HOSES:**

(a) Brake booster vacuum hose to the intake manifo

(b) Actuator vacuum hose to the intake manifold (w 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 CAB BRACKET**

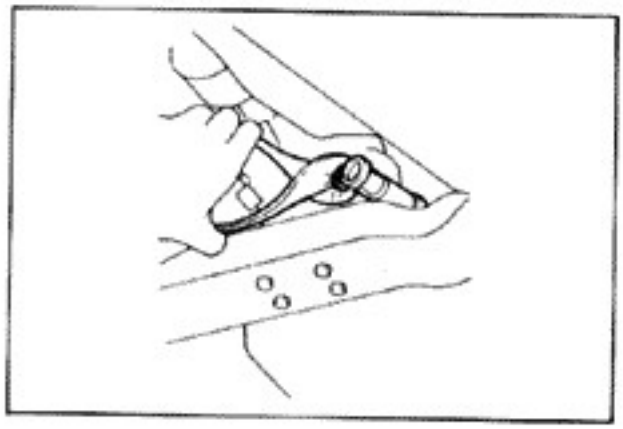
**19. INSTALL THROTTLE CABLE BRACKET (for A/T)**

**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)**

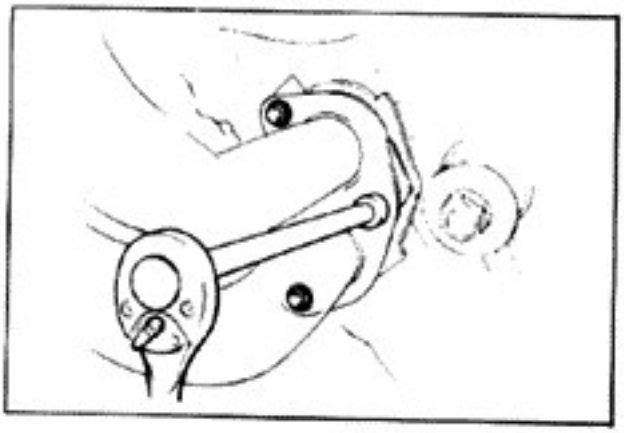


**22. CONNECT WIRE TO BACK-UP LIGHT SWITCH (M/T only)**

**23. CONNECT SPEEDOMETER CABLE**

**24. INSTALL CLUTCH RELEASE CYLINDER (M/T only)**

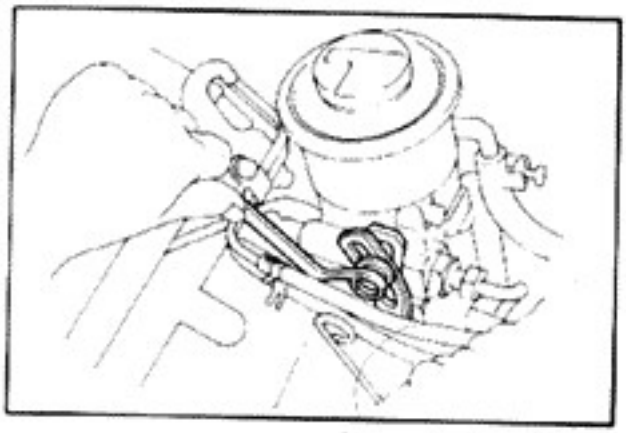
**25. CONNECT SHIFT LINKAGE TO SHIFT LEVER (A/T only)**



**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)

**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**