SECTION 6A

ENGINE MECHANICAL (G10, 1-CAM 6-VALVES ENGINE)

WARNING:
For vehicles equipped with Supplemental Restraint (Air Bag) System:

- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components and Wiring Location View" under "General Description" in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Service Precautions" under "On-Vehicle Service" in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

NOTE:
For the descriptions (items) not found in this section, refer to the same section of Service Manual mentioned in FOREWORD of this manual.

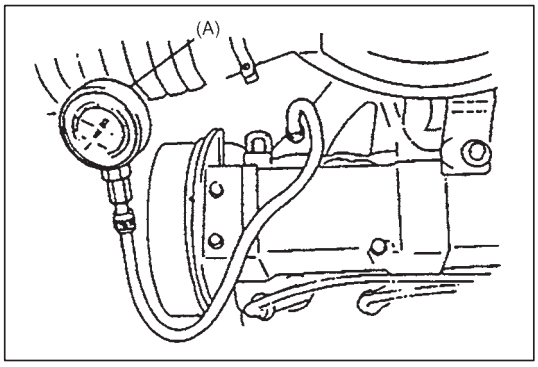
CONTENTS

ON-VEHICLE SERVICE

ENGINE VACUUM CHECK

The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

1) Warm up engine to normal operating temperature.



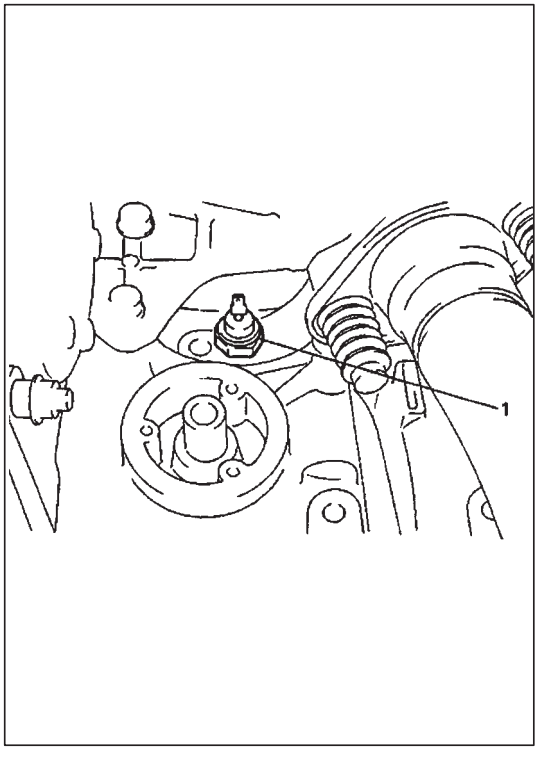
2) With engine stopped, remove blind plug hose from intake manifold and connect special tool (vacuum gauge and joint) to vacated threaded hole.

   Special Tool
   (A): 09915-67311

3) Run engine at specified idle speed (see Section 6E), and read vacuum gauge. Vacuum should be within the following specification.

   Vacuum specification: 52.6 – 65.8 kPa (40 – 50 cm·Hg, 15.7 – 19.7 in·Hg) at specified idling speed

4) After checking, apply sealant to thread of blind plug and install it to intake manifold.

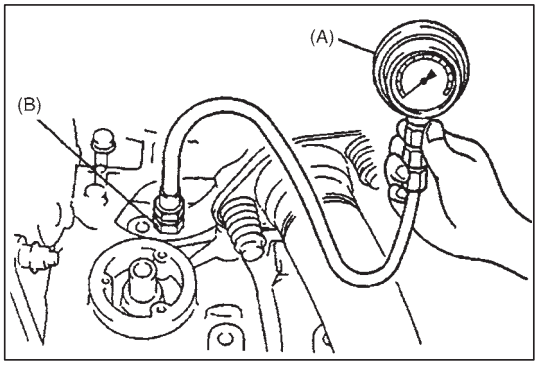


OIL PRESSURE CHECK

NOTE:
Prior to checking oil pressure, check the followings.

- **Oil level in oil pan.**
  If oil level is low, add oil up to Full level hole on oil level gauge.
- **Oil quality.**
  If oil is discolored, or deteriorated, change it.
  For particular oil to be used, refer to the table in Section 0B.
- **Oil leaks.**
  If leak is found, repair it.

1) Using special tool (Oil filter wrench), remove oil filter.
2) After removing oil filter, remove oil pressure switch (1) from cylinder block.



3) Install special tool (Oil pressure gauge) to vacated threaded hole.

Special Tool
(A): 09915-77311
(B): 09915-78211

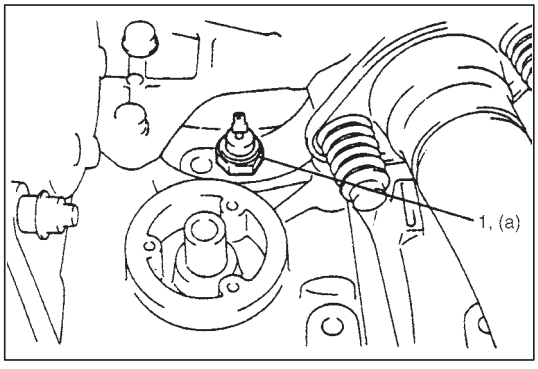
NOTE:
At this time, be very careful not to exert force to where heated oxygen sensor and its lead wire are connected.

4) Reinstall oil filter.

5) Start engine and warm it up to normal operating temperature.
6) After warming up, raise engine speed to 4,000 r/min and measure oil pressure.

Oil pressure specifications: 270 – 370 kPa (2.7 – 3.7 kg/cm^2, 38.4 – 52.6 psi) at 4,000 r/min (rpm)

7) After checking oil pressure, stop engine and remove oil filter and oil pressure gauge.



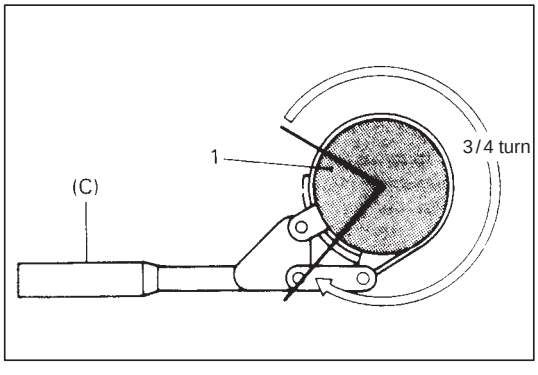
8) Before reinstalling oil pressure switch (1), be sure to wrap its screw threads with a sealing tape and tighten switch to specified torque.

NOTE:
If sealing tape edge is bulged out from screw threads of switch, cut it off.

Tightening Torque
(a): 14 N·m (1.4 kg-m, 10.5 lb-ft)

9) After oiling oil filter "O" ring (rubber gasket), screw oil filter on oil filter stand by hand until filter "O" ring contacts mounting surface.

CAUTION:
To tighten oil filter properly, it is important to accurately identify the position where filter "O" ring first contacts mounting surface.

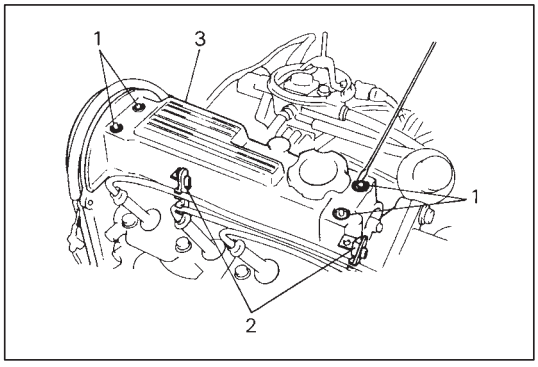


10) Tighten filter (1) 3/4 (270°) turn from the point of contact with mounting surface using an oil filter wrench.

Special Tool
(C): 09915-47310

CAUTION:
To prevent oil leakage, make sure that oil filter is tight, but do not overtighten it.

11) After installing oil filter, start engine and check oil filter for oil leakage.



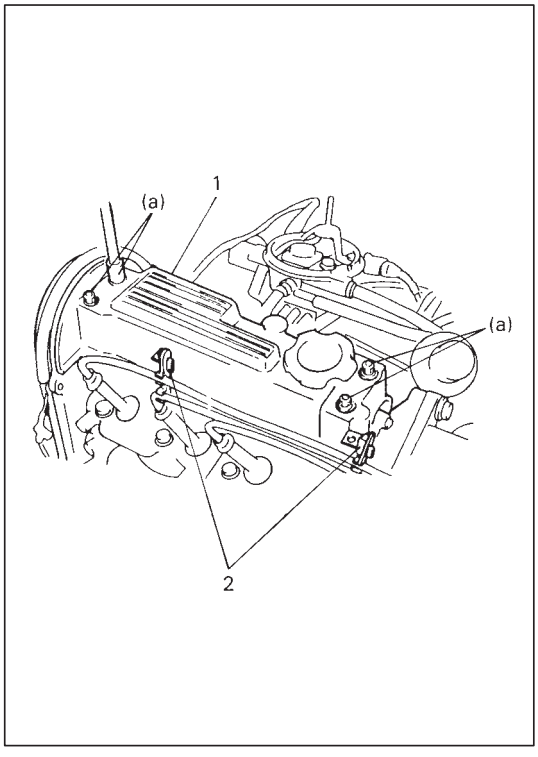
CYLINDER HEAD COVER

REMOVAL

1) Disconnect negative cable at battery.
2) Remove air cleaner assembly.
3) Remove high-tension cord clamps (2) from cylinder head cover.
4) Disconnect breather hose from cylinder head cover.
5) Remove cylinder head cover nuts and then seal washers (1).
6) Remove cylinder head cover (3) from cylinder head.

INSTALLATION

1) Install cylinder head cover gasket to head cover.
   Before installing gasket, check it for deterioration or damage, and replace as necessary.

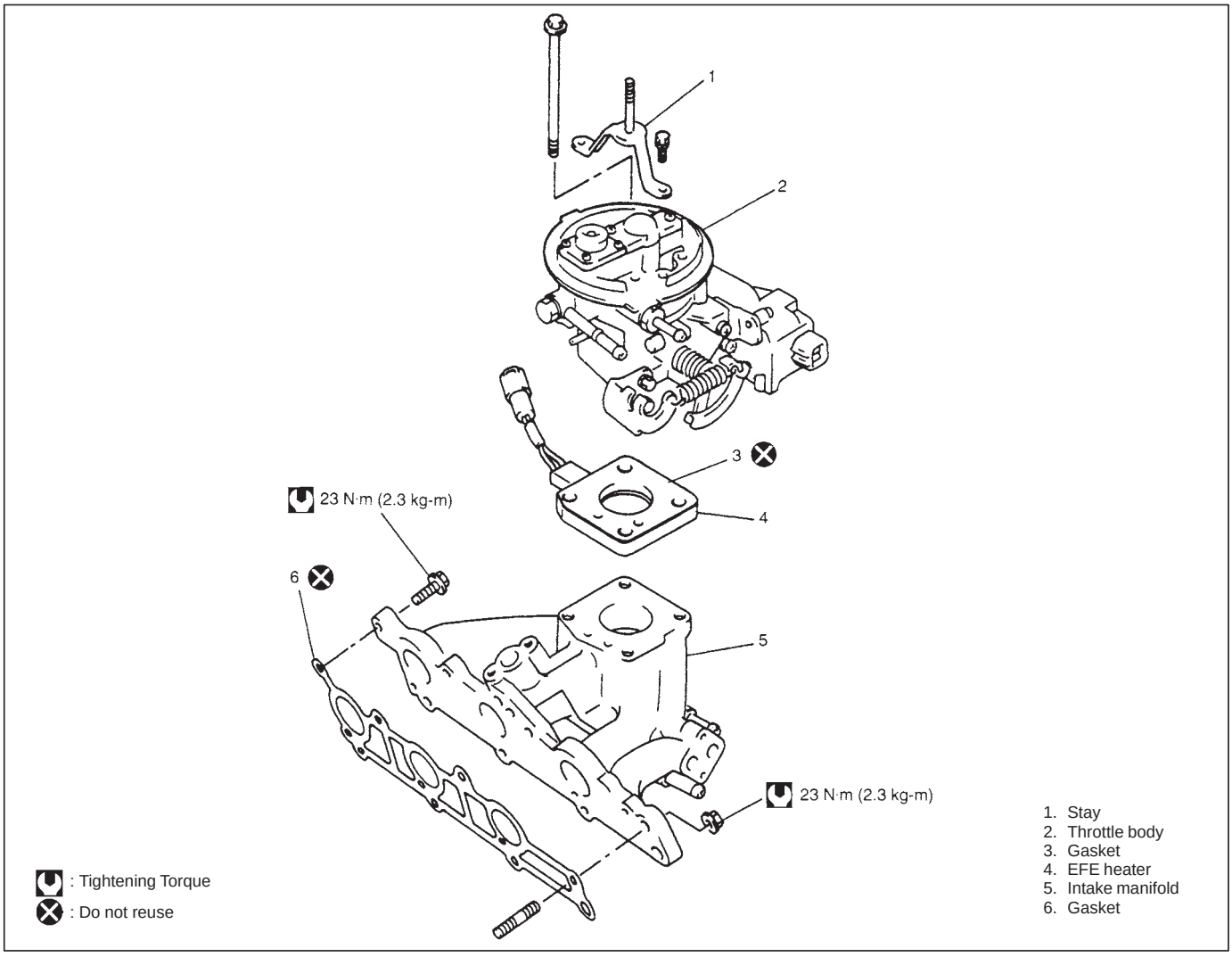


2) Install cylinder head cover (1).
   Before installing seal washers, check each one for deterioration or damage, and replace as necessary.
   Tighten cover nuts to specified torque.

   Tightening Torque
   (a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

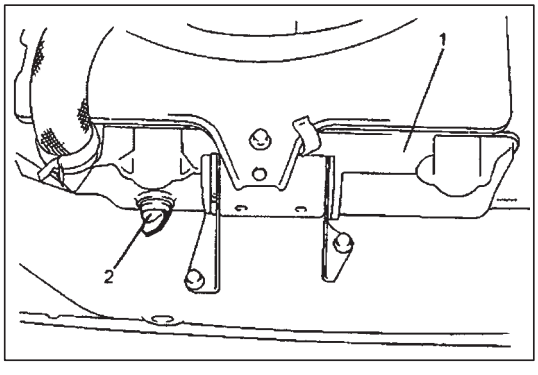
3) Install high-tension cord clamps (2) to cylinder head cover.
4) Connect breather hose to cylinder head cover.
5) Install air cleaner assembly.
6) Connect negative cable at battery.

THROTTLE BODY AND INTAKE MANIFOLD



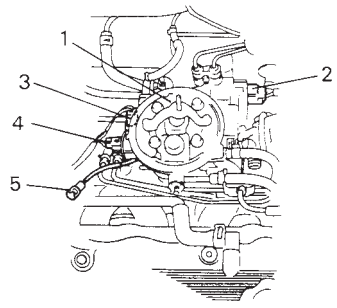
REMOVAL

1) Relieve fuel pressure according to procedure described in "FUEL PRESSURE RELIEF PROCEDURE" of Section 6.
2) Disconnect negative cable at battery.



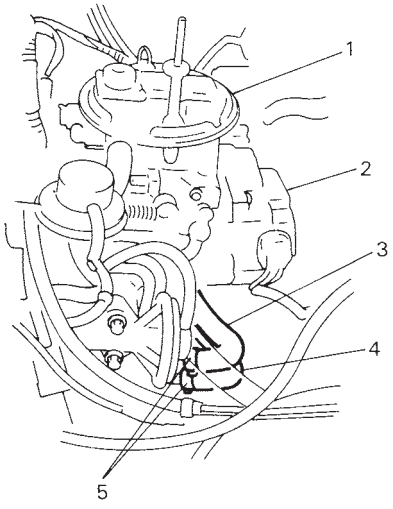
3) Drain cooling system.

WARNING:
To help avoid danger of being burned, do not remove drain plug (2) and radiator cap while engine and radiator (1) are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.



1. Throttle body

4) Remove air cleaner assembly.
5) Disconnect the following electric lead wires:
   - EGR valve
   - ISC actuator (2)
   - Ground wires from intake manifold
   - Fuel injector (4)
   - TP sensor (3)
   - EFE heater (5)
   - Engine coolant temp. gauge



1. Throttle body
2. ISC actuator
5. Clamp

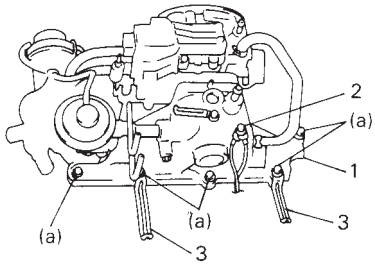
6) Disconnect fuel return (4) and feed hoses (3) from fuel pipes.
7) Disconnect coolant hoses from intake manifold.

8) Disconnect the following vacuum hoses.
   - Canister purge hose from intake manifold.
   - EGR pressure transducer hoses from EGR valve.
   - EGR valve hose from EGR valve.
   - Pressure sensor hose from intake manifold.
   - Brake booster hose from intake manifold.

9) Disconnect breather hose from PCV valve.
10) Disconnect accelerator cable from throttle body.
11) Disconnect other connected to throttle body and intake manifold, if any.
12) Remove intake manifold with throttle body from cylinder head.
13) Remove throttle body from intake manifold.

INSTALLATION

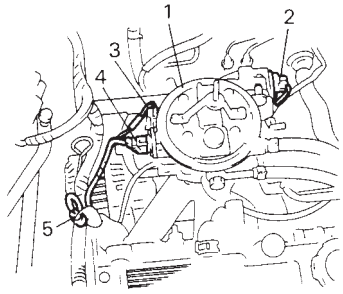
1) Install throttle body to intake manifold. (Refer to Section 6E.)
2) Install intake manifold gasket to cylinder head. Use a new gasket.



2. Ground

3) Install intake manifold (1) with throttle body to cylinder head.
   - Install clamps (3) as shown in figure, and tighten bolts and nuts to specification.

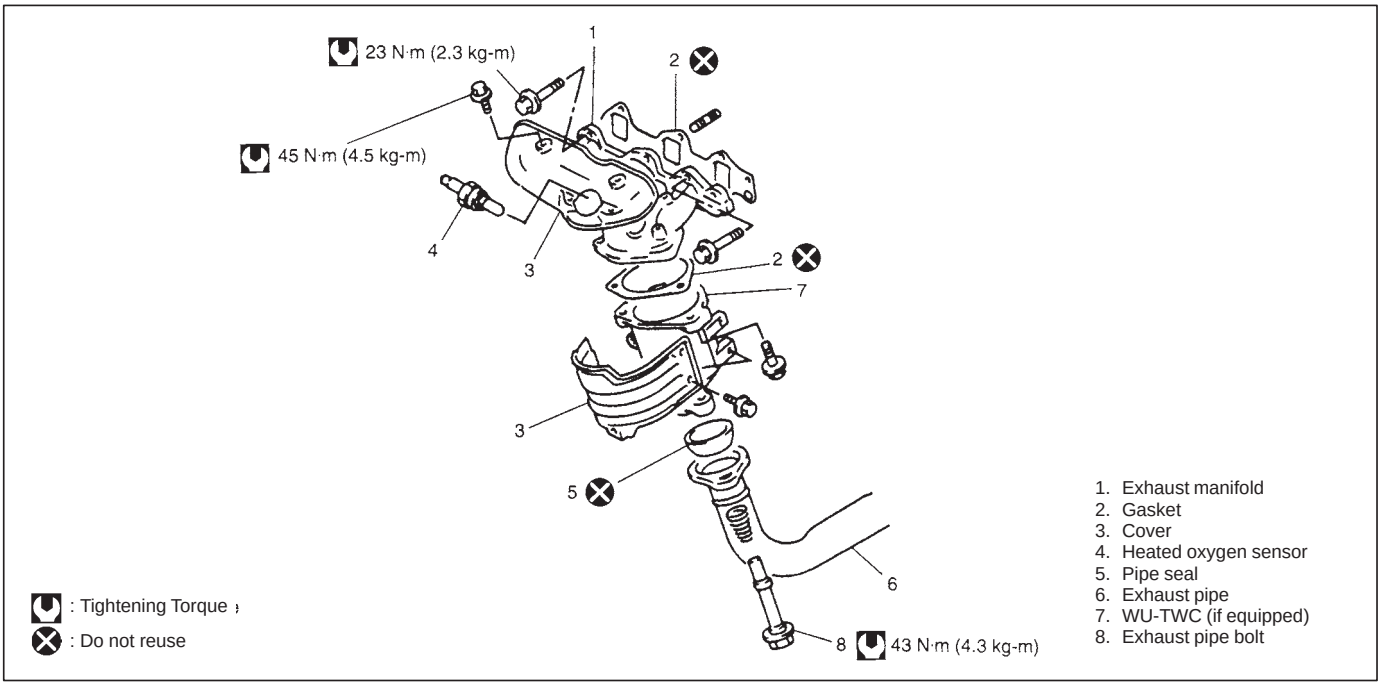
   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



1. Throttle body
2. ISC actuator coupler
3. TP sensor coupler
4. Fuel injector coupler
5. EFE heater coupler

4) Connect breather hose to PCV valve.
5) Connect vacuum hoses.
6) Connect coolant hoses.
7) Connect fuel return and feed hoses to throttle body.
8) Connect electric lead wire.
9) Connect accelerator cable to throttle body.
10) Install air cleaner assembly to throttle body.
11) Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
12) Refill cooling system.
13) Connect negative cable at battery.
14) Upon completion of installation, start engine and check for fuel leaks and engine coolant leaks.
    After warming up engine, adjust accelerator cable play to specification according to description in Section 6E.

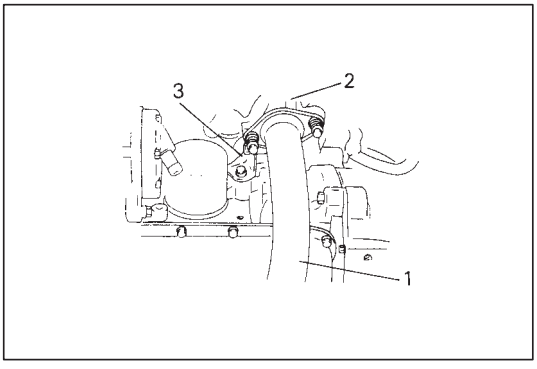
EXHAUST MANIFOLD



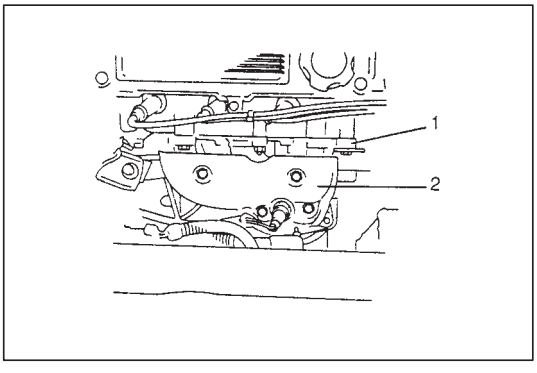
WARNING:
To avoid danger of being burned, do not service exhaust system while it is still hot.
Service should be performed after system cools down.

REMOVAL

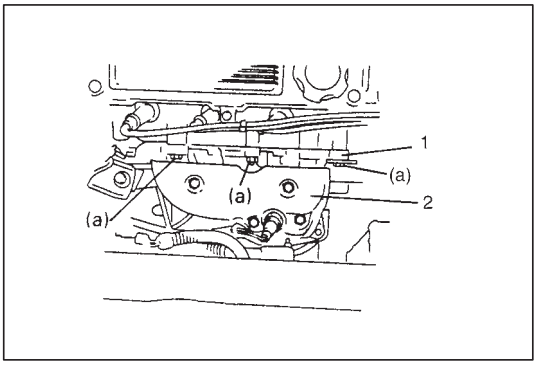
1) Disconnect negative cable at battery.
2) Disconnect heated oxygen sensor coupler.
   Release its wire from clamps.

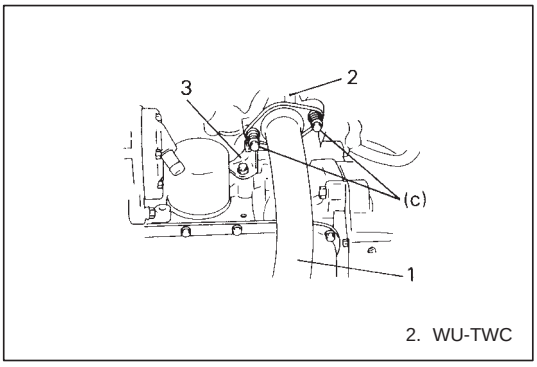


3) Disconnect exhaust pipe (1) from exhaust manifold (or WU-TWC (2)).
4) Remove WU-TWC stiffener (3). (if equipped)



5) Remove exhaust manifold cover (2). (for vehicle with WU-TWC)
6) Remove exhaust manifold (1) with WU-TWC (if equipped) and its gasket from cylinder head.





2. WU-TWC

INSTALLATION

1) Install manifold gasket to cylinder head.
   Before installing gasket, check it for deterioration or damage, and replace as necessary.
2) Install exhaust manifold (1).
   Tighten manifold bolts and nuts to specified torque.

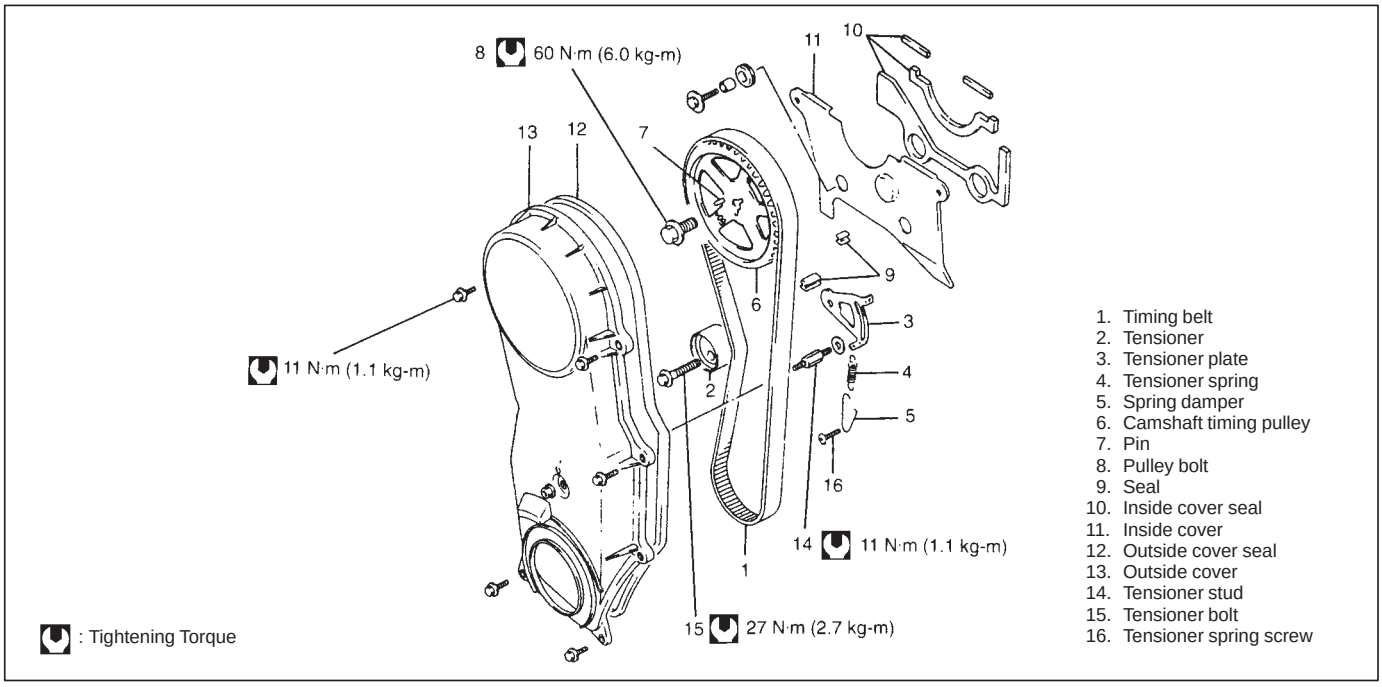
   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Install exhaust manifold cover (2).
4) Install pipe seal, and then connect exhaust pipe (1).
   Before installing pipe seal, check it for deterioration or damage, and replace as necessary.
   Tighten pipe bolts to specified torque.

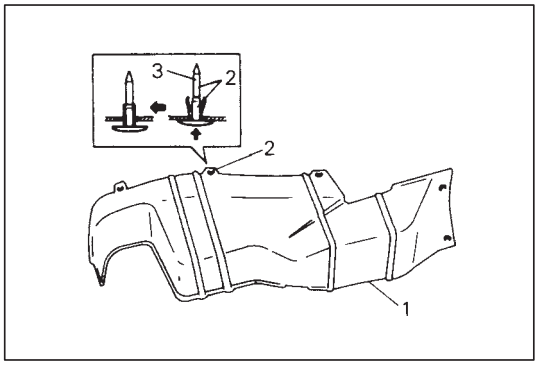
   Tightening Torque
   (c): 43 N·m (4.3 kg-m, 31.5 lb-ft)

5) Install WU-TWC stiffener (3). (if equipped)
6) Connect heated oxygen sensor coupler.
7) Clamp its wire securely.
8) Connect negative cable at battery.
9) Check exhaust system for exhaust gas leakage.

TIMING BELT AND BELT TENSIONER



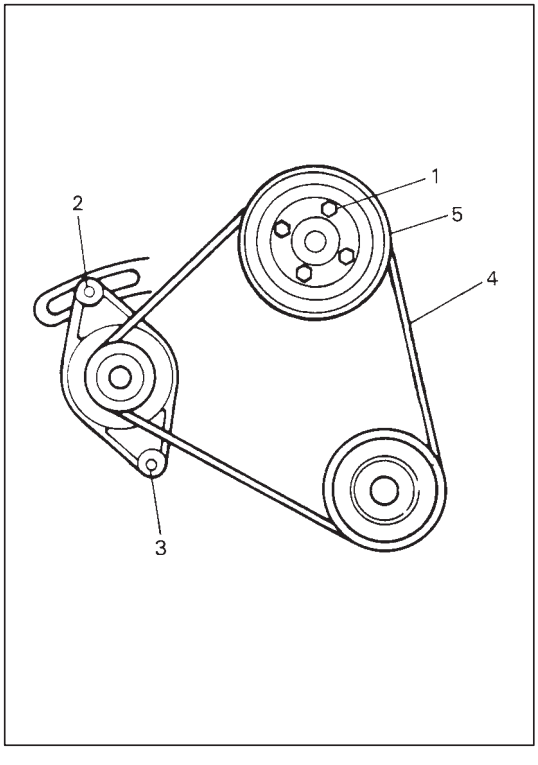
1. Timing belt
2. Tensioner
3. Tensioner plate
4. Tensioner spring
5. Spring damper
6. Camshaft timing pulley
7. Pin
8. Pulley bolt
9. Seal
10. Inside cover seal
11. Inside cover
12. Outside cover seal
13. Outside cover
14. Tensioner stud
15. Tensioner bolt
16. Tensioner spring screw



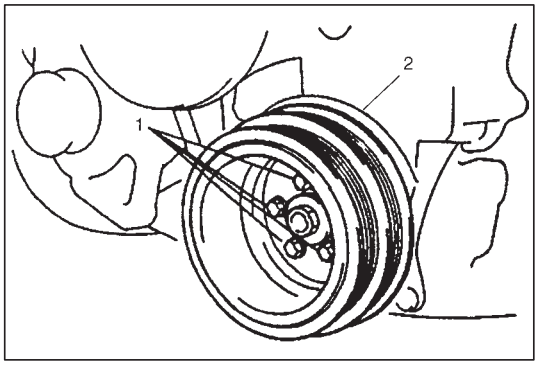
REMOVAL

1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Remove clip (2) after pushing center pin, and then remove fender apron extension (1) on right side.

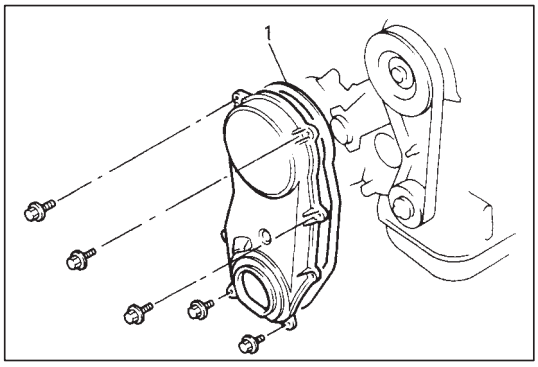
NOTE:
Do not push center pin (3) too far in, or it will fall off into fender.



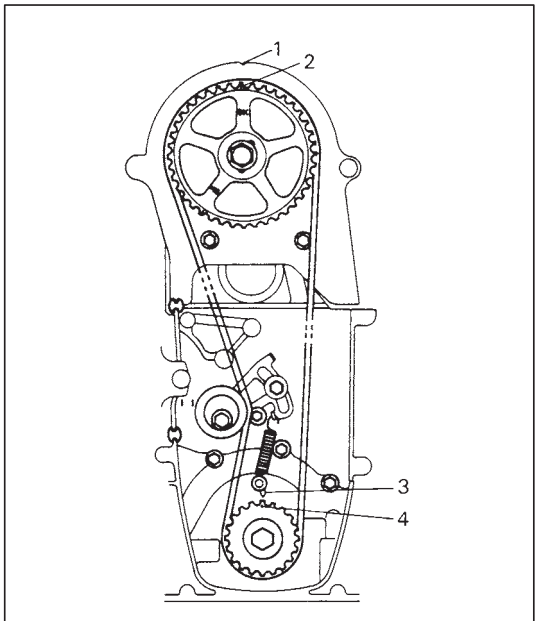
4) Remove air cleaner assembly as previously outlined.
5) Remove A/C compressor drive belt, if equipped.
6) Loosen water pump pulley bolts (1).
7) Loosen generator pivot bolts (3) and its adjusting bolt (2) and remove water pump belt (4) and its pulley (5).



8) Loosen crankshaft pulley bolts (1) and remove crankshaft pulley (2).

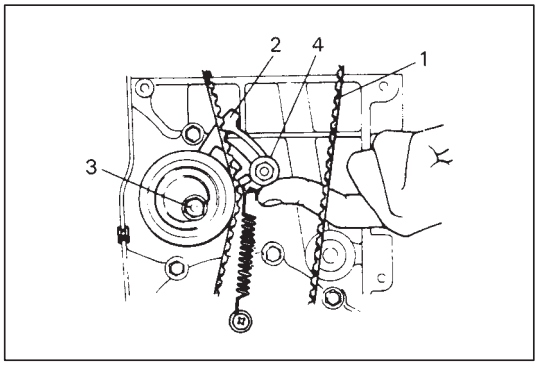


9) Remove timing belt outside cover (1).



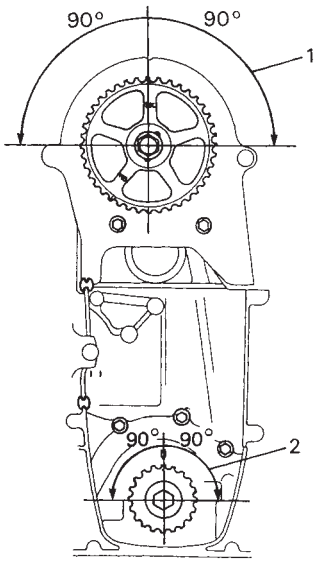
1. "V" mark on cylinder head cover
2. Timing mark on camshaft timing belt pulley
3. Arrow mark on oil pump case
4. Punch mark on crankshaft timing belt pulley

10) Align 4 timing marks as shown in figure to facilitate its installation.



11) Loosen tensioner bolt (3) and stud (4), and remove belt (1) from crankshaft timing belt pulley and camshaft timing belt pulley after pushing up the tensioner plate (2) fully by finger as shown figure.

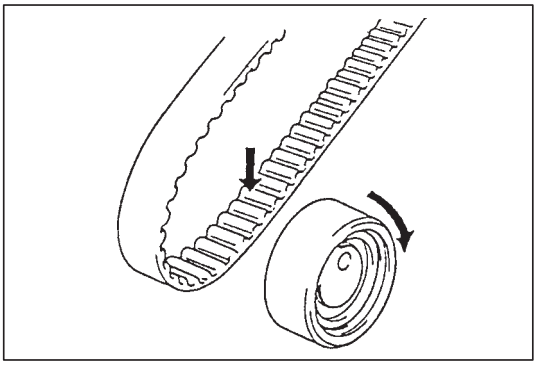
CAUTION:
Never bend timing belt.



1. Camshaft allowable turning range – – – By timing mark, within 90° from "V" mark on head cover on both right and left.
2. Crankshaft allowable turning range – – – by punch mark, within 90° from arrow mark on oil pump case on both right and left.

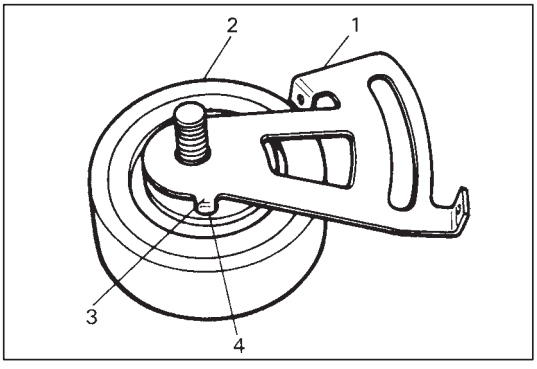
CAUTION:
After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown below. If turned, interference may occur among piston and valves, and parts related to piston and valves may be damaged.

12) Remove tensioner, tensioner plate, tensioner spring and spring damper.



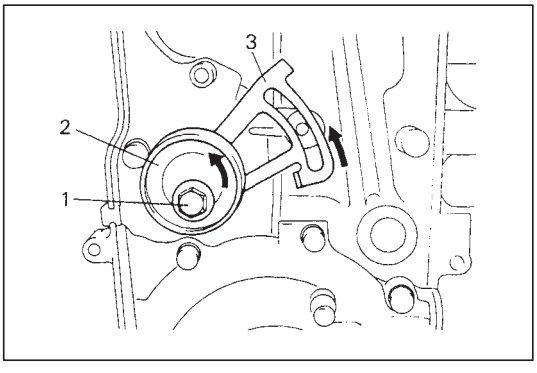
INSPECTION

- Check timing belt for wear or crack. Replace it as necessary.
- Check tensioner for smooth rotation and rattle.

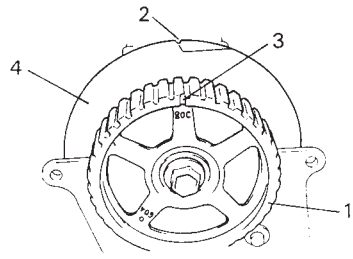


INSTALLATION

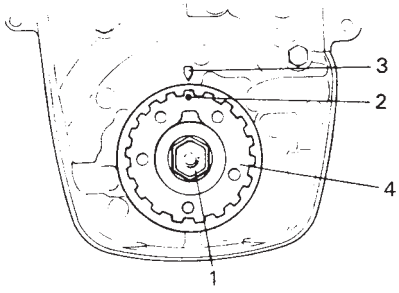
1) Install tensioner plate (1) to tensioner (2).
   Insert lug (3) of tensioner plate into hole (4) of tensioner.



2) Install tensioner (2) and tensioner plate (3).
   Do not tighten the tensioner bolt (1) and stud by wrench yet. Hand tighten only at this time.
   Check to ensure that plate movement in arrow direction as shown in figure causes tensioner to move in the same direction. If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert the plate lug into tensioner hole.

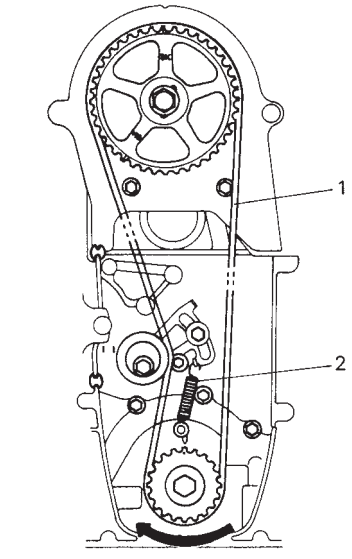


3) Check that timing mark (3) on camshaft timing belt pulley (1) is aligned with “V” mark (2) on cylinder head cover (4). If not, align two marks by turning camshaft but be careful not to turn it more than its allowable turning range which is described on previous page.



1. Crank timing belt pulley bolt

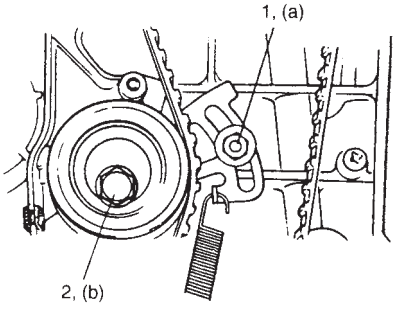
4) Check that punch mark (2) on crank timing belt pulley (4) is aligned with arrow mark (3) on oil pump case. If not, align two marks by turning crankshaft but be careful not to turn it more than its allowable turning range which is described on previous page.



Direction of crankshaft

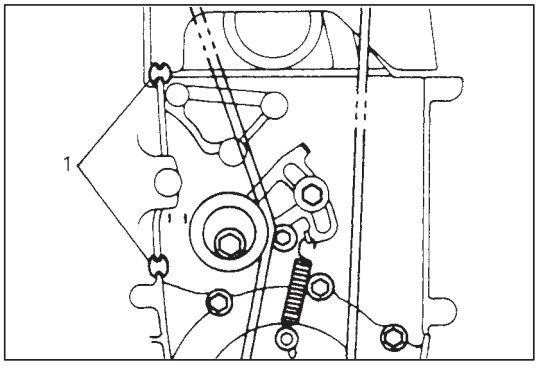
5) With two sets of marks aligned, install timing belt (1) on two pulleys in such a way that the drive side of belt is free of any slack, and with tensioner plate pushed up by finger.
And then install tensioner spring and spring damper (2) as shown in figure, and handtighten tensioner stud.

NOTE:
- **When installing timing belt, match arrow mark (➡) on timing belt with rotating direction of crankshaft.**
- **In this state, No.1 piston is at top dead center of compression stroke.**

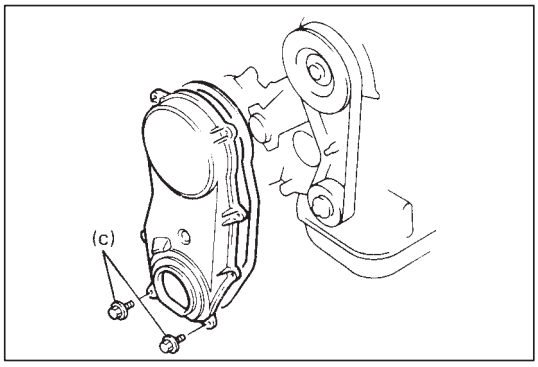


6) To take up slack of timing belt, turn crankshaft two rotations clockwise after installing it. After making sure that belt is free from slack, tighten tensioner stud (1) first and then tensioner bolt (2) to each specified torque.
Then confirm again that two sets of marks are aligned respectively.

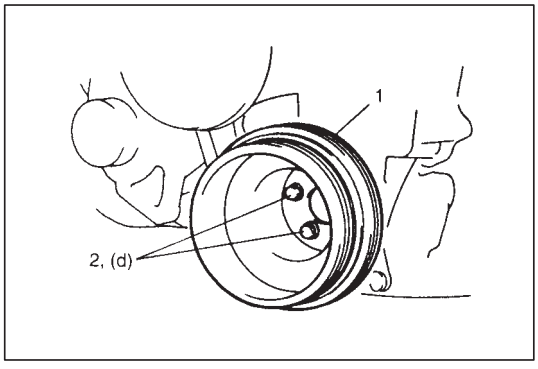
Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)
(b): 27 N·m (2.7 kg-m, 19.5 lb-ft)



7) Install timing belt outside cover.
   Before installing, make sure that rubber seal (1) is between water pump and oil pump case and another between water pump and cylinder head.



Tightening Torque
(c): 11 N·m (1.1 kg-m, 8.0 lb-ft)



8) Install crankshaft pulley (2).
   Tighten crankshaft pulley bolts (1).

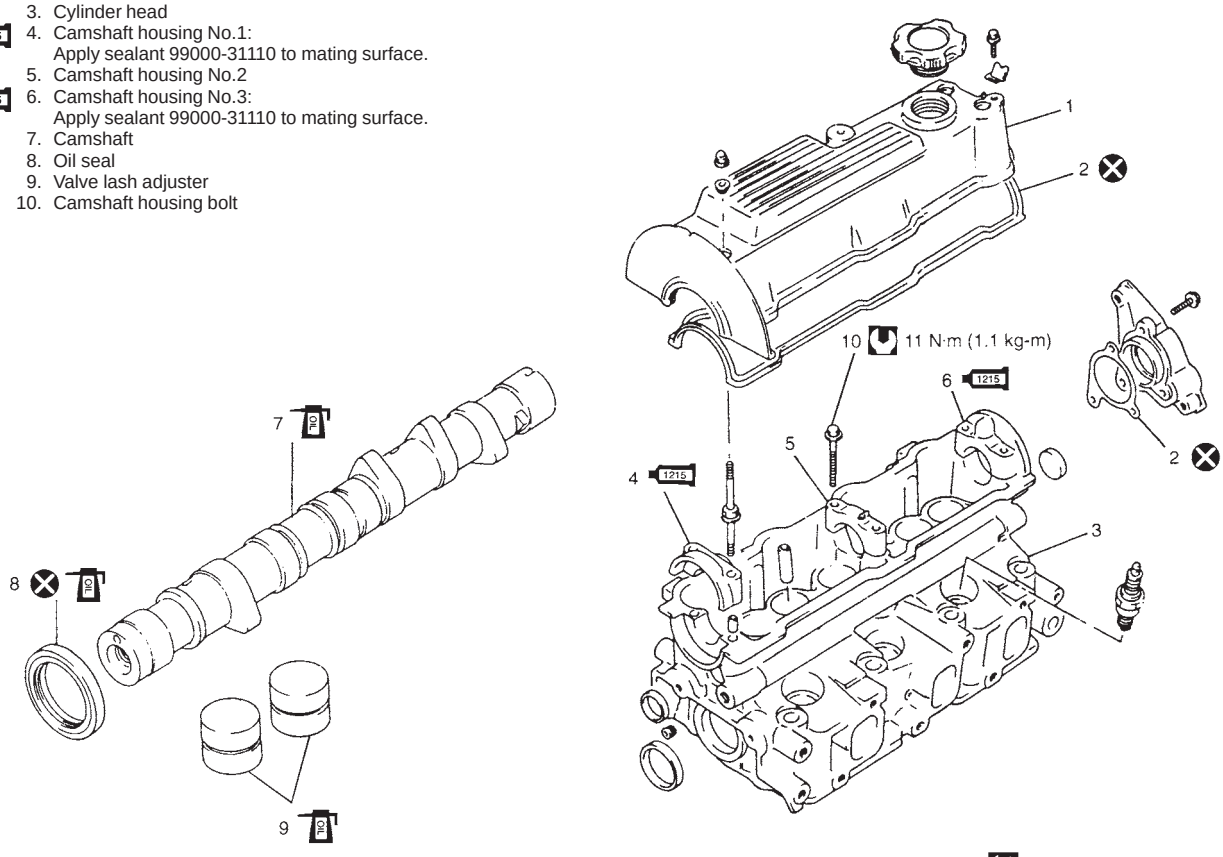
Tightening Torque
(d): 16 N·m (1.6 kg-m, 11.5 lb-ft)

9) Install water pump pulley and water pump belt.
   Adjust the belt tension to the specification.
   Refer to Section 6B for procedure to adjust the belt tension.
10) Install air cleaner assembly.

11) Install fender apron extension of right side.
12) Connect negative cable at battery.

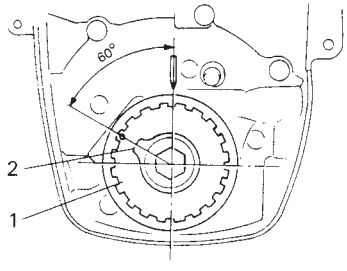
CAMSHAFT AND HYDRAULIC VALVE LASH ADJUSTER

1. Cylinder head cover
2. Gasket
3. Cylinder head
4. (1215) Camshaft housing No.1: Apply sealant 99000-31110 to mating surface.
5. Camshaft housing No.2
6. (1215) Camshaft housing No.3: Apply sealant 99000-31110 to mating surface.
7. Camshaft
8. Oil seal
9. Valve lash adjuster
10. Camshaft housing bolt



: Tightening Torque

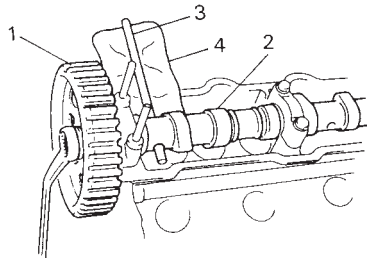
: Apply engine oil to sliding surfaces of each part.



1. Crankshaft timing belt pulley

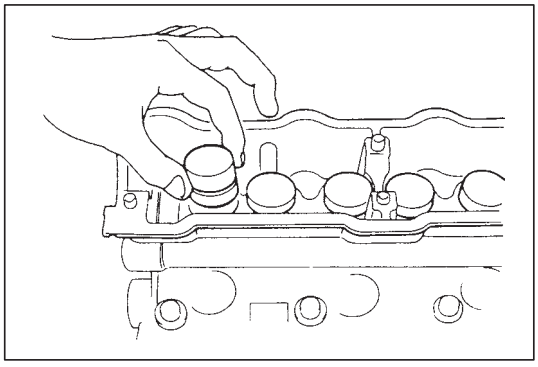
REMOVAL

1) Disconnect negative cable at battery.
2) Remove cylinder head cover as previously outlined.
3) Remove distributor and then its case from cylinder head.
4) Remove crankshaft pulley, timing belt outside cover and timing belt as previously outlined.
   After removing timing belt, set key (2) on crankshaft in position as shown in figure by turning crankshaft. This is to prevent interference between valves and piston when reinstalling camshaft.

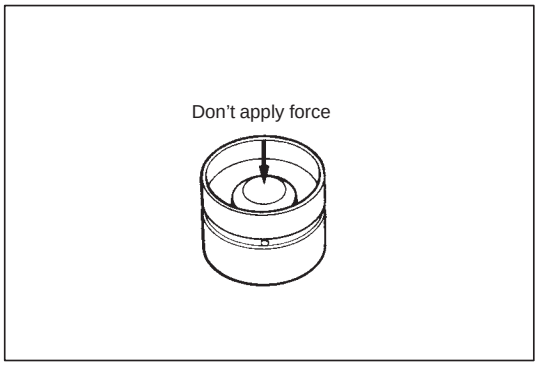


5) Remove camshaft timing belt pulley (1).
   Lock camshaft (2) with a proper size rod (3) inserted into hole (10 mm, 0.39 in.) in it as shown and then loosen camshaft timing belt pulley bolt.

NOTE:
Mating surfaces of cylinder head and cover must not be damaged in this work. So, put clean shop cloth (4) between rod and mating surfaces, and use care not to bump rod against mating surfaces hard when loosening bolt.

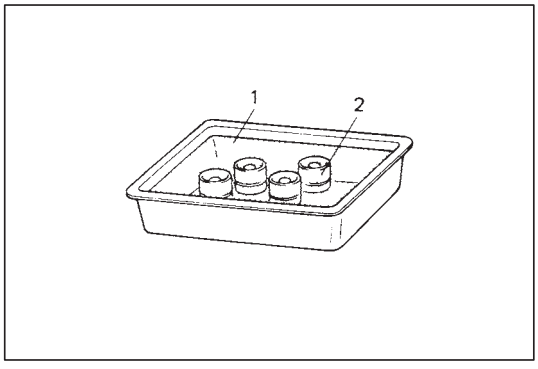


6) Remove camshaft housings from cylinder head.
7) Remove camshaft from cylinder head.
8) Remove valve lash adjuster from cylinder head.

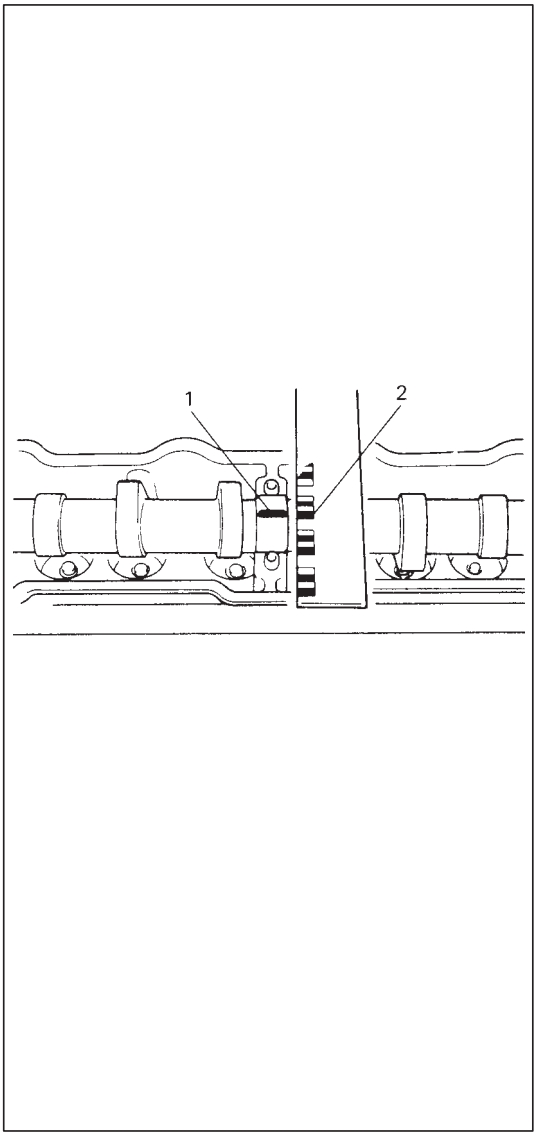


NOTE:

- **Never disassemble hydraulic valve lash adjuster.**
- **Don't apply force to body of adjuster, for oil in high pressure chamber in adjuster will leak.**



- **Immerse removed adjuster (2) in clean engine oil (1) and keep it there till reinstalling it so as to prevent oil leakage. If it is left in air, place it with its bucket body facing down. Don't place on its side or with bucket body facing up.**



INSPECTION

Camshaft journal wear:

- Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.

  If any malcondition is found, replace camshaft or cylinder head with housing. Never replace cylinder head without replacing housings.

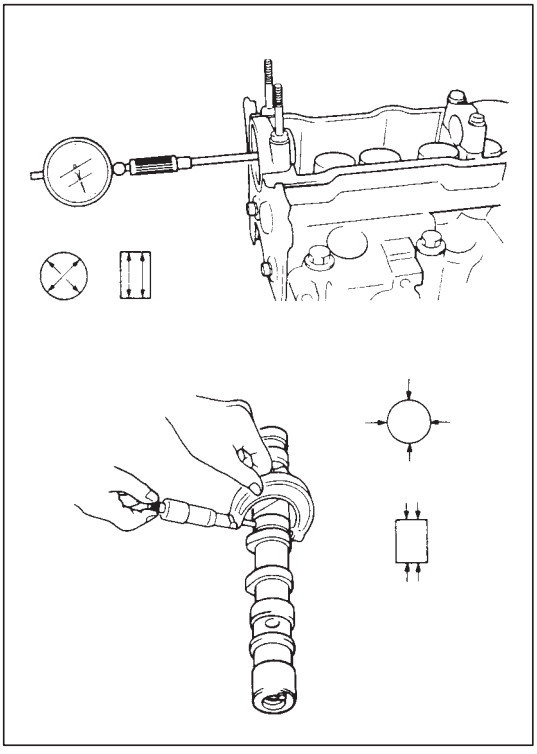
  Check clearance by using gaging plastic (1). The procedure is as follows.

  1) Clean housings and camshaft journals.
  2) Make sure that all valve lash adjusters are removed and install camshaft to cylinder head.
  3) Place a piece of gaging plastic the full width of journal of camshaft (parallel to camshaft).
  4) Install housings as outlined on the following page and evenly torque housing bolts to specified torque. Housings MUST be torqued to specification in order to assure proper reading of camshaft journal clearance.

     NOTE:
     Do not rotate camshaft while gaging plastic is installed.

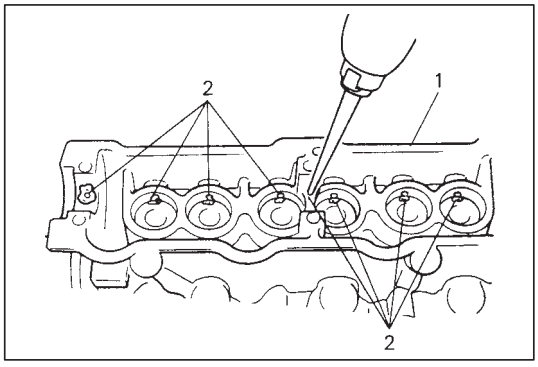
  5) Remove housing, and using scale (2) on gaging plastic envelop, measure gaging plastic width at its widest point.

	Standard	Limit
Journal clearance	0.040 – 0.082 mm (0.0016 – 0.0032 in.)	0.12 mm (0.0047 in.)



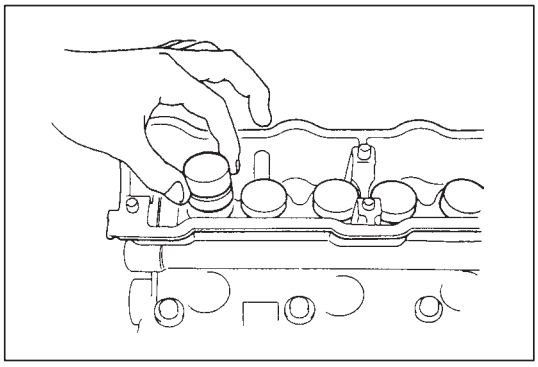
If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

Item		Standard
Camshaft journal bore dia.	No.1	26.000 – 26.021 mm (1.0236 – 1.0244 in.)
	No.2 & No.3	30.000 – 30.021 mm (1.1811 – 1.1819 in.)
Camshaft journal O.D.	No.1	25.939 – 25.960 mm (1.0212 – 1.0220 in.)
	No.2 & No.3	29.939 – 29.960 mm (1.1787 – 1.1795 in.)

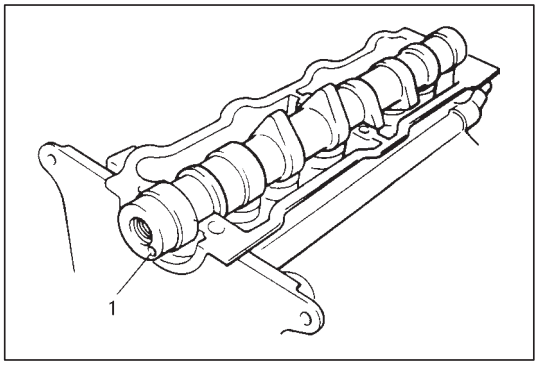


INSTALLATION

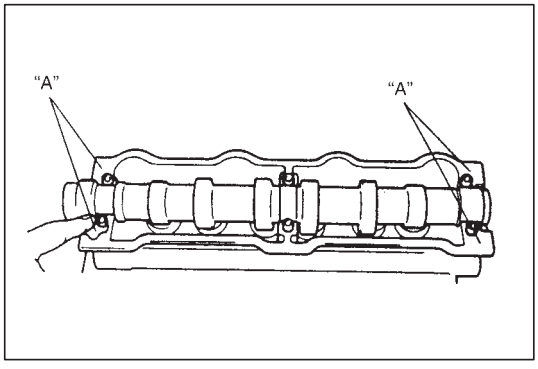
1) Before installing valve lash adjuster to cylinder head, fill oil passage of cylinder head (1) with engine oil according to the following procedure.
   Pour engine oil through camshaft journal oil holes (2) and check that oil comes out from oil holes in sliding part of valve lash adjuster.



2) Install lash adjuster to cylinder head.
   Apply engine oil around valve lash adjuster and then install it to cylinder head.

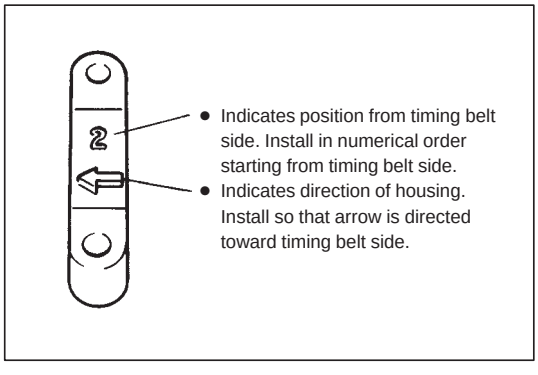


3) Install camshaft to cylinder head.
   After applying engine oil to camshaft journal and all around cam, set camshaft to cylinder head so that camshaft timing belt pulley pin hole (1) in camshaft is at lower position.

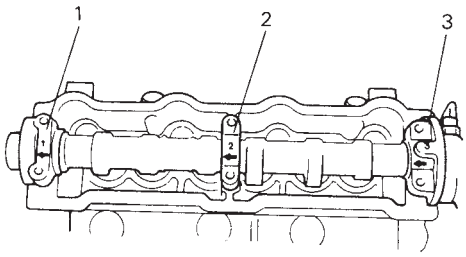


4) Install camshaft housing to camshaft and cylinder head.
   - Apply engine oil to sliding surface of each housing against camshaft journal.
   - Apply sealant to mating surface of No.1 and No.3 housings which will mate with cylinder head.

   "A": Sealant 99000-31110

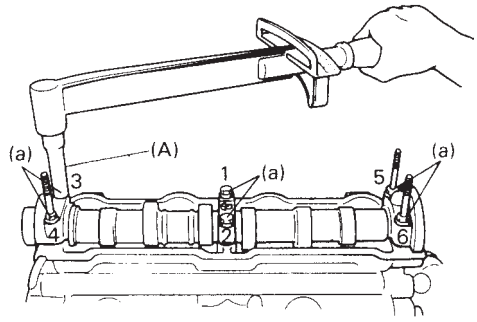


- Embossed marks are provided on each camshaft housing, indicating position and direction for installation.
  Install housing as indicated by these marks.



2. No.2 housing
3. No.3 housing

- As camshaft housing No.1 (1) retains camshaft in proper position as to thrust direction, make sure to first fit No.1 housing to No.1 journal of camshaft securely.



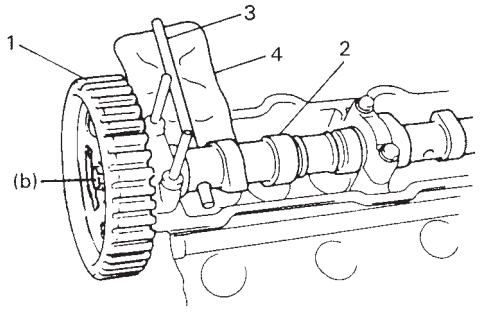
- After applying engine oil to housing bolts, tighten them temporarily first. Then tighten them by following sequence as shown in figure.
  Tighten a little at a time and evenly among bolts and repeat tightening sequence three to four times before they are tightened to specified torque.

  Special Tool
  (A): 09919-16010

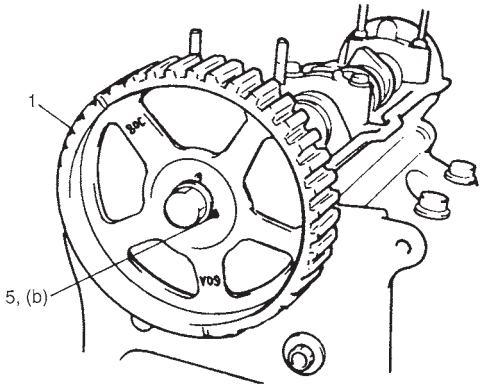
  Tightening Torque
  (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

5) Install camshaft oil seal.
   After applying engine oil to oil seal lip, press-fit camshaft oil seal till oil seal surface becomes flush with housing surface.
6) Install camshaft timing belt pulley (1) to camshaft (2) after installing dwell pin to camshaft.
   With locking camshaft as shown in figure, tighten pulley bolt to specified torque.

   Tightening Torque
   (b): 60 N·m (6.0 kg-m, 43.5 lb-ft)



3. Rod
4. Shop cloth



7) Install cylinder head cover to cylinder head as previously outlined.
8) Install timing belt, timing belt outside cover, crankshaft pulley, water pump pulley and water pump belt as previously outlined.
9) Install distributor case and distributor.
   Refer to Section 6F for installation.
10) Install air cleaner assembly as previously outlined.
11) Connect negative cable at battery.
12) Adjust ignition timing.
    Refer to Section 6F for adjustment.

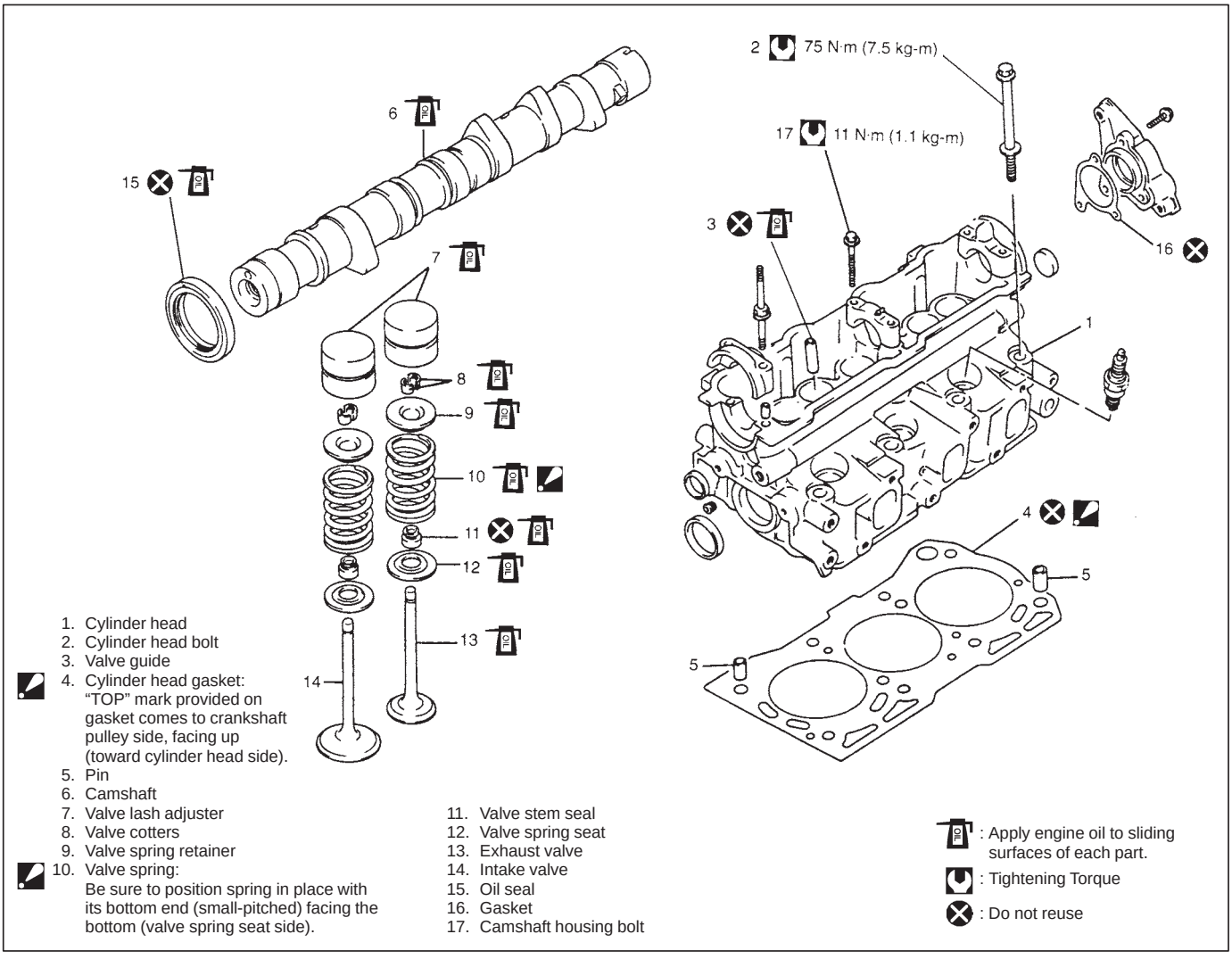
CAUTION:
- **Don't turn camshaft or start engine (i.e., valves should not be operated) for about half an hour after reinstalling hydraulic valve lash adjusters and camshaft. As it takes time for valves to settle in place, operating engine within half an hour after their installation may cause interference to occur between valves and piston.**
- **If air is trapped in valve lash adjuster, valve may make tapping sound when engine is operated after valve lash adjuster is installed. In such a case, run engine for about half an hour at about 2,000 – 3,000 r/min., and then air will be purged and tapping sound will cease. Should tapping should not cease, it is possible that valve lash adjuster is defective. Replace it if defective.**
  If defective adjuster can't be located by hearing among 6 of them, check as follows.
  1) Stop engine and remove cylinder head cover.
  2) Push adjuster downward by hand (with less than 15 kg or 33 lbs force) when cam crest is not on adjuster to be checked and check if clearance exists between cam and adjuster. If it does, adjuster is defective and needs replacement.

VALVE LASH ADJUSTER NOISE DIAGNOSIS

In case of the followings, valve lash adjuster noise may be caused by air trapped into valve lash adjusters.
- Vehicle is left for 24 hours or more.
- Engine oil is changed.
- Hydraulic lash adjuster is replaced or reinstalled.
- Engine is overhauled.

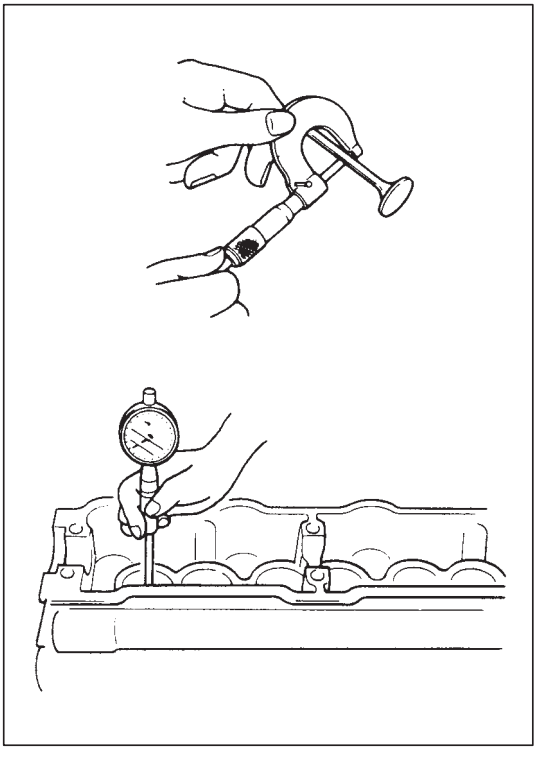
If noise from valve lash adjusters is suspected, perform the following checks.
1) Check engine oil for the followings.
   - Oil level in oil pan
     If oil level is low, add oil up to Full level hole on oil level gauge.
   - Oil quality
     If oil is discolored, or deteriorated, change it.
     For particular oil to be used, refer to Section 0B.
   - Oil leaks
     If leak is found, repair it.
   - Oil pressure (refer to Oil Pressure Check in this section)
     If defective pressure is found, repair it.
2) Run engine for about half an hour at about 2,000 to 3,000 r/min., and then air will be purge and tapping sound will cease.
3) Should tapping sound not cease, it is possible that hydraulic valve lash adjuster is defective.
   Replace it if defective.
   If defective adjuster can't be located by hearing among 16 of them, check as follows.
   a) Stop engine and remove cylinder head cover.
   b) Push adjuster downward by hand (with less than 20 kg or 44 lbs. Force) when cam crest is not on adjuster to be check if clearance exists between cam and adjuster.
      If it does, adjuster is defective and needs replacement.

VALVES AND CYLINDER HEAD



1. Cylinder head
2. Cylinder head bolt
3. Valve guide
4. Cylinder head gasket: "TOP" mark provided on gasket comes to crankshaft pulley side, facing up (toward cylinder head side).
5. Pin
6. Camshaft
7. Valve lash adjuster
8. Valve cotters
9. Valve spring retainer
10. Valve spring: Be sure to position spring in place with its bottom end (small-pitched) facing the bottom (valve spring seat side).
11. Valve stem seal
12. Valve spring seat
13. Exhaust valve
14. Intake valve
15. Oil seal
16. Gasket
17. Camshaft housing bolt

: Apply engine oil to sliding surfaces of each part.
: Tightening Torque
: Do not reuse



INSPECTION

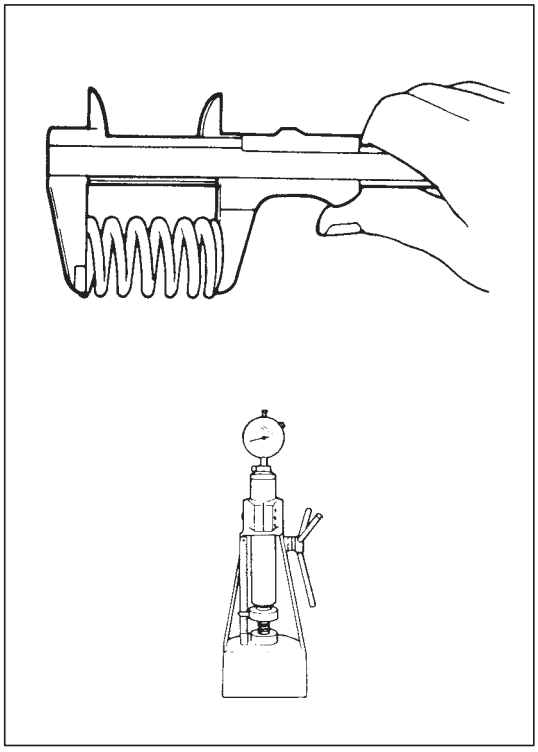
Valve Guides

Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance.

Be sure to take reading at more than one place along the length of each stem and guide.

If clearance exceeds limit, replace valve and valve guide.

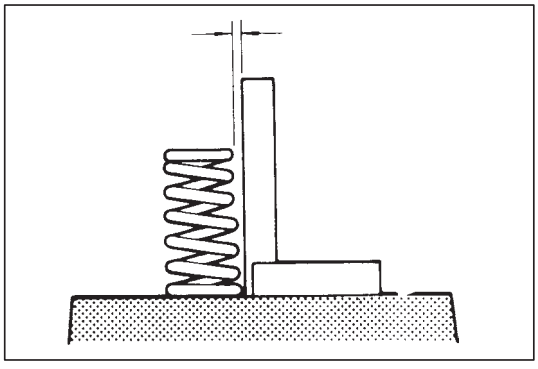
Item		Standard	Limit
Valve stem diameter	In	5.457 – 5.480 mm (0.2148 – 0.2157 in.)	———
	Ex	5.440 – 5.455 mm (0.2142 – 0.2148 in.)	———
Valve guide I.D.	In & Ex	5.500 – 5.512 mm (0.2165 – 0.2170 in.)	———
Stem-to-guide clearance	In	0.020 – 0.055 mm (0.0008 – 0.0021 in.)	0.07 mm (0.0027 in.)
	Ex	0.045 – 0.072 mm (0.0018 – 0.0028 in.)	0.09 mm (0.0035 in.)



Valve Springs

- Referring to data given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

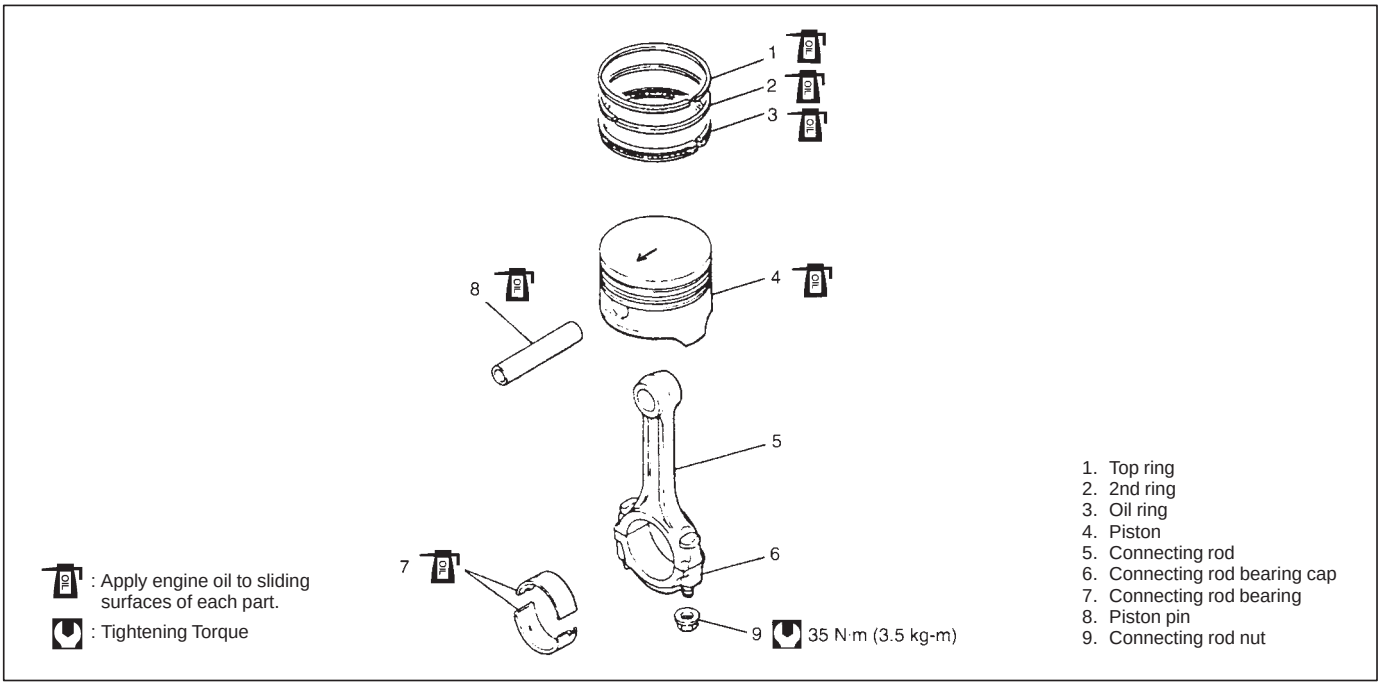
Item	Standard	Limit
Valve spring free length	42.29 mm (1.6649 in.)	41.0 mm 1.6142 in.)
Valve spring preload	209 – 235 N (20.9 – 23.5 kg) at 32.6 mm (46.1 – 51.8 lb at 1.28 in.)	187 N (18.7 kg) at 32.6 mm (41.2 lb at 1.28 in.)

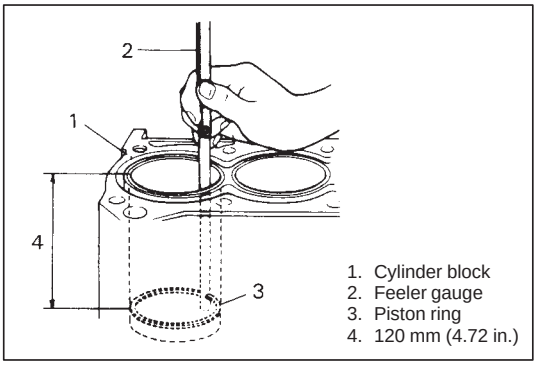


- Spring squareness:
  Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve spring found to exhibit a larger clearance than limit must be replaced.

Valve spring squareness limit.	2.0 mm (0.079 in.)

PISTONS, PISTON RINGS, CONNECTING RODS AND CYLINDERS





INSPECTION

Piston Rings

To measure end gap, insert piston ring into cylinder bore as shown in figure and then measure gap by using thickness gauge.
If measured gap is out of specification, replace ring.

NOTE:
Decarbon and clean the top of cylinder bore before inserting piston ring.

Item		Standard	Limit
Piston ring end gap	Top ring	0.15 – 0.30 mm (0.0059 – 0.0118 in.)	0.7 mm (0.0275 in.)
	2nd ring	0.20 – 0.35 mm (0.0079 – 0.0138 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.20 – 0.60 mm (0.0079 – 0.0236 in.)	1.8 mm (0.0708 in.)

UNIT REPAIR OVERHAUL

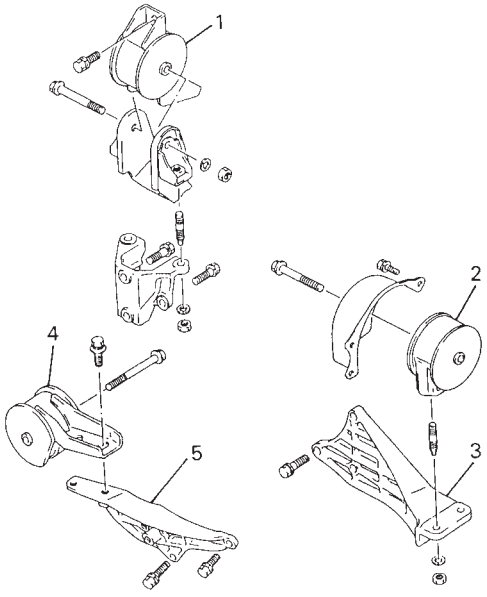
ENGINE ASSEMBLY

REMOVAL

1) Relieve fuel pressure according to procedure described in "FUEL PRESSURE RELIEF PROCEDURE" of Section 6.
2) Remove engine hood after disconnecting front window washer hose.
3) Disconnect battery cables at battery and remove battery and its tray.
4) Drain cooling system.
5) Remove air cleaner assembly.
6) Remove radiator with cooling fan. Refer to Section 6B for removal.
7) Disconnect the following electric wire harness.
   - High-tension cord from ignition coil
   - Distributor
   - EGR valve
   - ECT sensor
   - ISC actuator
   - Ground wire harness from intake manifold
   - TP sensor
   - Fuel injector
   - Oil pressure gauge
   - A/C compressor pressure switch (if equipped)
   - Heated oxygen sensor
   - Generator
   - Starter
   - Back-up light switch (For M/T model)
   - Battery negative cable from transmission
   - Shift switch of A/T (For A/T model)
   - Direct clutch and 2nd brake solenoids of A/T (For A/T model)
   - Vehicle speed sensor on A/T (For A/T model)

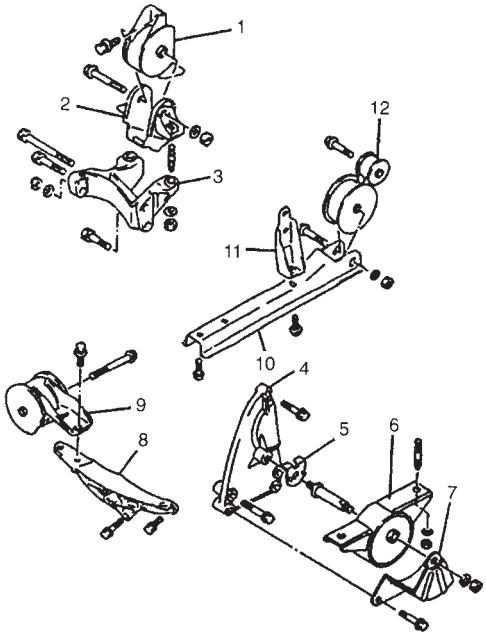
   And release above wire harness from clamps.
8) Disconnect the following vacuum hose.
   - Brake booster hose from intake manifold.
   - Canister purge hose from EVAP canister purge valve.
   - Pressure sensor hose from intake manifold.
9) Disconnect fuel return hose and fuel feed hose from fuel feed and return pipes.
10) Disconnect heater inlet and outlet hoses.

For M/T model



1. Rear mounting
2. Left mounting
3. Left mounting bracket
4. Right mounting
5. Right mounting bracket

For A/T model



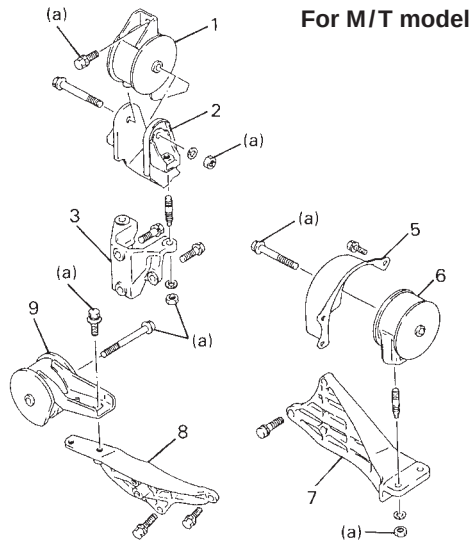
1. Rear mounting
2. Rear mounting No.2 bracket
3. Rear mounting No.1 bracket
4. Left mounting No.1 bracket
5. Stopper
6. Left mounting
7. Left mounting No.2 bracket
8. Right mounting bracket
9. Right mounting
10. Torque rod bracket
11. Stiffener
12. Torque rod

11) Disconnect the following cables.
- Accelerator cable from throttle body.
- Clutch cable from transmission. (For M/T model)
- Gear select cable and oil pressure control cable from transmission. (For A/T model)
- Speedometer cable from transmission.

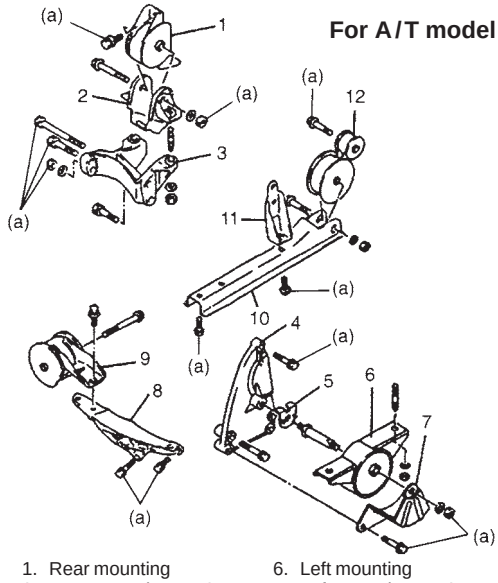
12) Hoist vehicle.
13) Remove fender apron extensions.
14) Remove exhaust pipe from exhaust manifold (or WU-TWC).
15) Remove gear shift control shaft from transmission and remove extension rod. (For M/T model)
16) Drain engine oil and transmission oil.
17) Remove drive shaft joints from differential gears of transmission.
    Refer to Section 4 (DRIVE SHAFT) for procedure to disconnect drive shaft joints.
    For engine and transmission removal, it is not necessary to remove drive shafts from steering knuckle.
18) Remove A/C compressor (if equipped) from compressor bracket with hose still attached.

    NOTE:
    Suspend removed A/C compressor at a place where no damage will be caused during removal/installation of engine with transmission.

19) Remove engine rear torque rod bracket from transmission. (For A/T model)
20) Lower vehicle.
21) Install lifting device.
22) Remove rear mounting from body.
23) Remove left side engine mounting and bracket. (For M/T model)
    Remove left mounting from body. (For A/T model)
24) Remove right side engine mounting from its bracket.
25) Before removing engine with transmission, recheck to make sure all hoses, electric wires and cables are disconnected from engine and transmission.
26) Remove engine with transmission from body.



1. Rear mounting
2. Rear mounting No.2 bracket
3. Rear mounting No.1 bracket
4. Rear mounting bracket
5. Left mounting body bracket
6. Left mounting
7. Left mounting bracket
8. Right mounting bracket
9. Right mounting



1. Rear mounting
2. Rear mounting No.2 bracket
3. Rear mounting No.1 bracket
4. Left mounting No.1 bracket
5. Stopper
6. Left mounting
7. Left mounting No.2 bracket
8. Right mounting bracket
9. Right mounting
10. Torque rod bracket
11. Stiffener
12. Torque rod

INSTALLATION

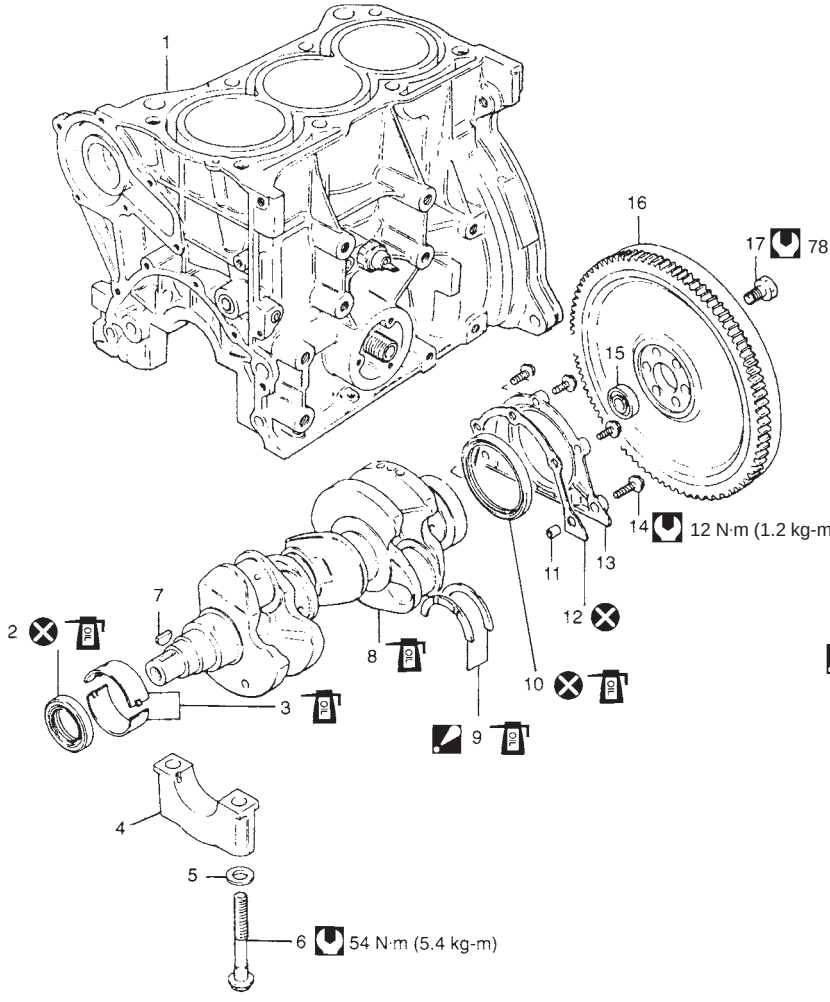
1) Lift engine with transmission into engine compartment, but do not remove lifting device.
2) Install right side engine mounting to its bracket.
3) Install left side engine mounting and its bracket.
4) Install rear mounting to body.
5) Tighten bolts and nuts of all parts installed in above steps 2), 3) and 4) to specified torque.

Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)

Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)

6) Remove lifting device.
7) Reverse removal procedures for installation of remainder.
   - Push in each drive shaft joint fully so that snap ring engages with differential gear or center bearing support.
     Use care not to damage oil seal lip when inserting.
   - Clamp electric wires securely.
8) Adjust clutch pedal free travel referring to Section 7C. (For M/T model)
   Adjust gear select cable and oil pressure control cable referring to Section 7B. (For A/T model)
9) Adjust gear shift control lever referring to Section 7A. (For M/T model)
10) Refill transmission with gear oil. (A/T fluid for A/T model) referring to Section 0B.
11) Refill engine with engine oil referring to Section 0B.
12) Refill cooling system referring to Section 6B.
13) Adjust A/C compressor drive belt referring to Section 0B. (if equipped)
14) Upon completion of installation, verify that there is no fuel leakage, coolant leakage, transmission oil leakage or exhaust gas leakage at each connection.
15) Adjust accelerator cable play referring to Section 6E.

MAIN BEARINGS, CRANKSHAFT AND CYLINDER BLOCK

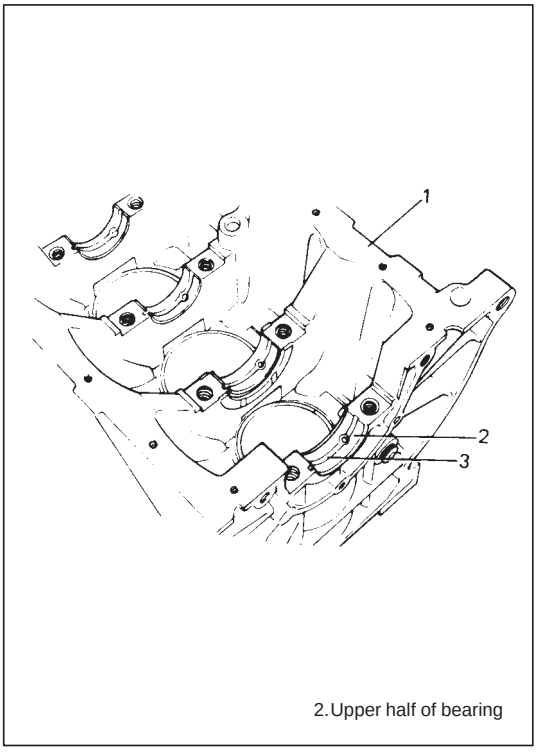


1. Cylinder block
2. Front oil seal
3. Main bearing
4. Bearing cap
5. Cap washer
6. Cap bolt
7. Timing pulley key
8. Crankshaft
9. Thrust bearing: Set oil grooves of bearing to weds.
10. Rear oil seal
11. Pin
12. Oil seal housing gasket
13. Oil seal housing
14. Housing bolt
15. Input shaft bearing
16. Flywheel
17. Flywheel bolt

: Apply engine oil to sliding surfaces of each part.
: Tightening Torque
: Do not reuse

REMOVAL

1) Remove engine with transmission from body as previously outlined.
2) Remove transmission from engine, and then remove clutch and flywheel (drive plate for A/T).
3) Remove water pump belt, generator bracket, crankshaft pulley, timing belt, and crankshaft timing belt pulley etc.
4) Remove cylinder head assembly.
5) Remove oil pan and oil pump strainer.
6) Remove pistons and connecting rods.
7) Remove oil pump and oil seal housing.
8) Remove main bearing caps and crankshaft.



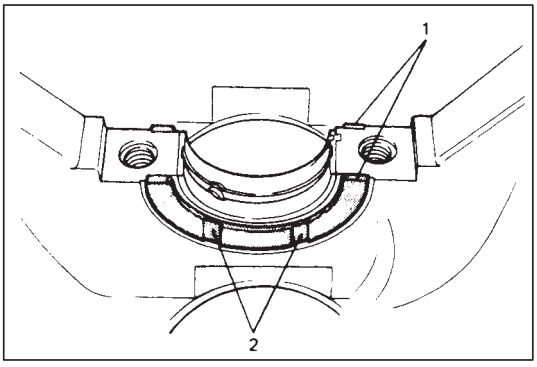
2. Upper half of bearing

INSTALLATION

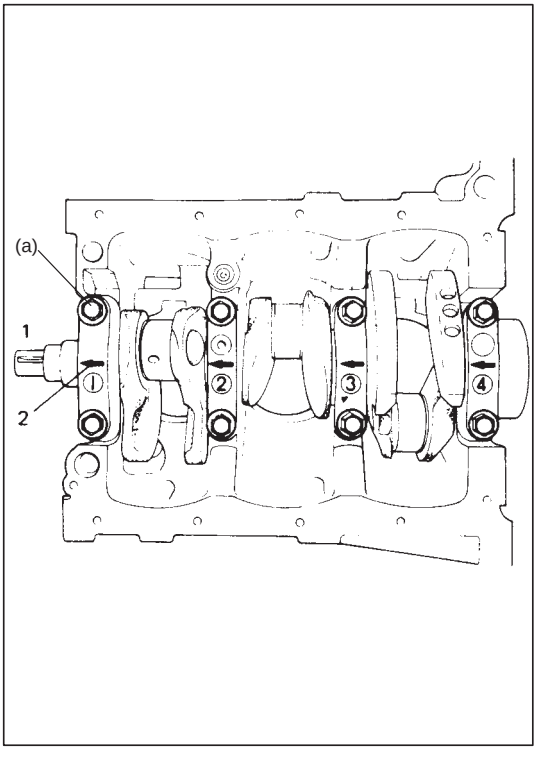
NOTE:

- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb combination and try to see that each part goes back to where it came from, when installing.**

1) Fit main bearings to cylinder block (1).
   Among two halves of main bearing, one halt has oil groove (3). Install this half with oil groove to cylinder block, and another half without oil groove to bearing cap.
   Make sure that two halves are painted in the same color.



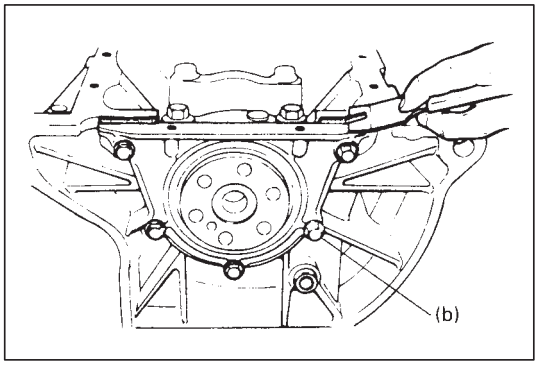
2) Fit thrust bearings (1) to cylinder block between No.2 and No.3 cylinders. Face oil groove (2) sides to crank webs.



3) Put crankshaft on cylinder block.
4) Fit bearing caps sequentially in ascending order, 1, 2, 3 and 4, starting from pulley side. Be sure to point arrow mark (2) (on each cap) to crankshaft pulley side (1).
   Gradual and uniform tightening is important for bearing cap bolts. Make sure that four caps become tight equally and progressively till specified torque is attained.

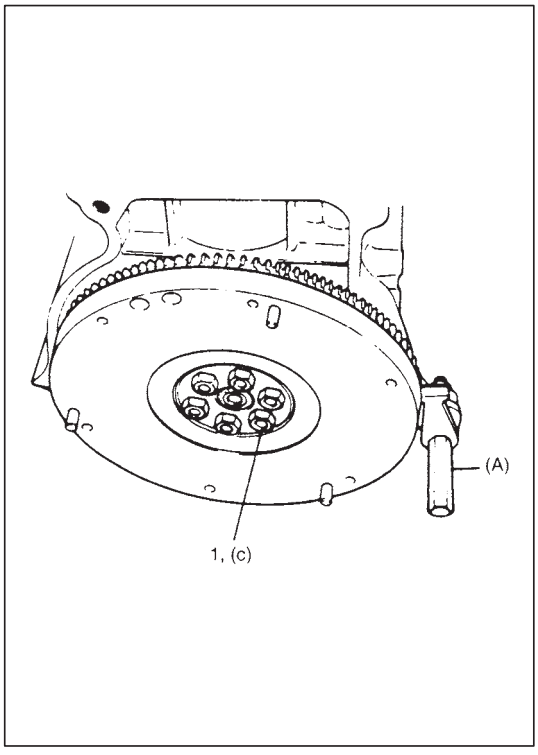
Tightening Torque
(a): 53 N·m (5.3 kg-m, 38.5 lb-ft)

NOTE:
After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turned by hand.



5) Install oil seal housing and its gasket.
Install new gasket. Do not reuse gasket removed in disassembly. Oil lip portion of oil seal before installing. Tighten housing bolts to specification.
After installing oil seal housing, gasket edges might bulge out; if so, cut them off to make them flush with cylinder block and oil seal housing.

Tightening Torque
(b): 12 N·m (1.2 kg-m, 9.0 lb-ft)

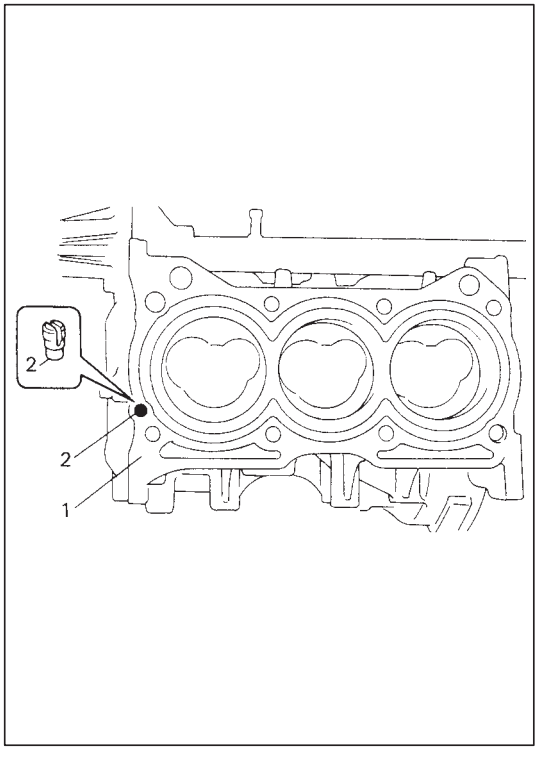


6) Install oil pump.
Refer to item “Oil pump” for installation of oil pump.
7) Install flywheel (M/T model) or drive plate (A/T model).
Using special tool, lock flywheel and torque its bolts (1) to specification.

Special Tool
(A): 09924-17810

Tightening Torque
(c): 78 N·m (7.8 kg-m, 56.5 lb-ft)

8) Install pistons and connecting rods as previously outlined.
9) Install oil pump strainer and oil pan.

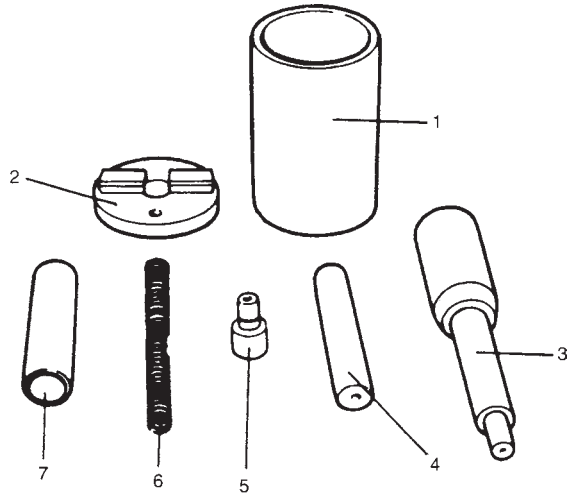


10) Install cylinder head assembly to cylinder block (1).
Before installing cylinder head assembly to cylinder block, install check valve (2) into oil gallery in cylinder block, directing slit of valve toward top of cylinder block.

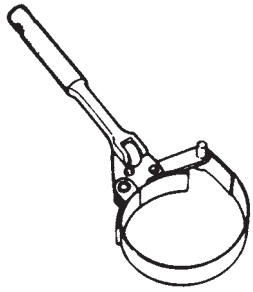
NOTE:
Tighten cylinder head bolts to specified torque as previously outlined.
Whenever installing cylinder head to new cylinder block, use following procedure to tighten cylinder head bolts.
- **Tighten cylinder head bolts to specified torque as previously outlined and loosen them once till tightening torque becomes “zero”. And then torque them to specification again.**

11) Install crankshaft timing belt pulley, timing belt, crankshaft pulley, water pump pulley, etc., as previously outlined.
12) Install clutch to flywheel (M/T model).
For clutch installation, refer to Section 7C.
13) Install engine with transmission to body as previously outlined.

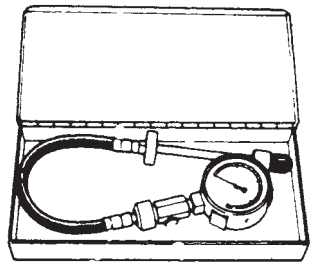
SPECIAL TOOLS



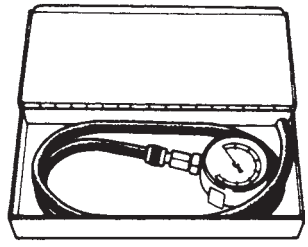
09910-38211
Piston pin remover and installer
1. Base
2. Base cap
3. Driver handle
4. Piston pin guide for installation
5. Piston pin guide for removal
6. Spring
7. Spring guide



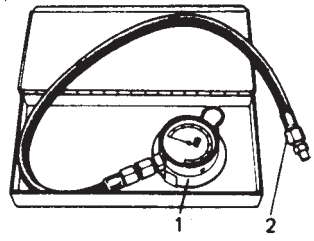
09915-47310
Oil filter wrench



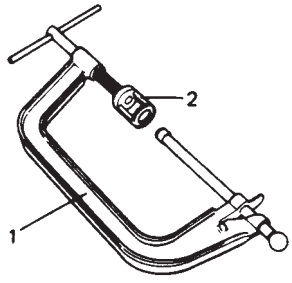
09915-64512
Compression gauge



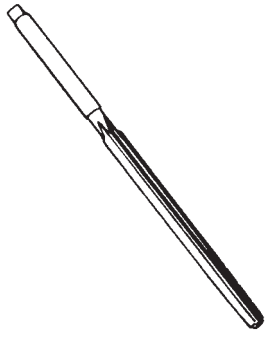
09915-67311
Vacuum gauge



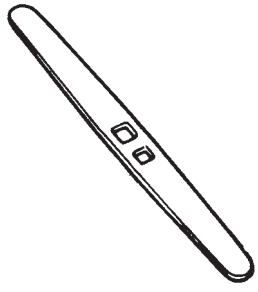
1. 09915-77311
   Oil pressure gauge
2. 09915-78211
   Oil pressure gauge attachment



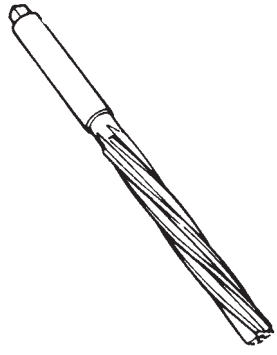
1. 09916-14510
   Valve lifter
2. 09916-14910
   Valve lifter attachment



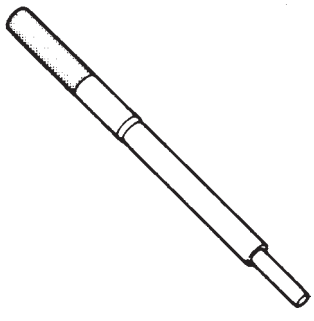
09916-34550
Reamer (5.5 mm)



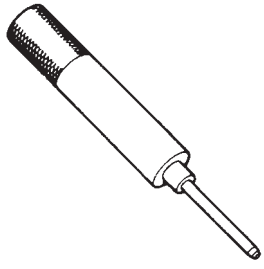
09916-34542
Reamer handle



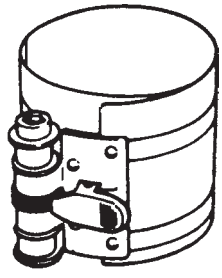
09916-38210
Reamer (11 mm)



09916-44910
Valve guide remover

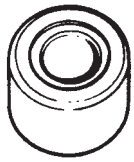
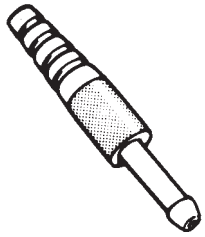
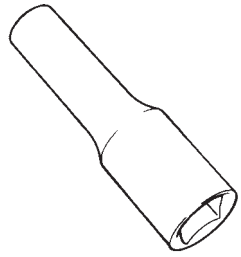
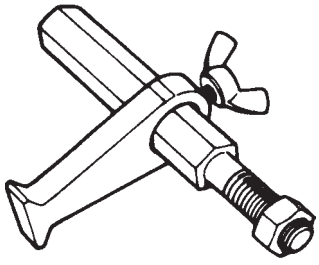
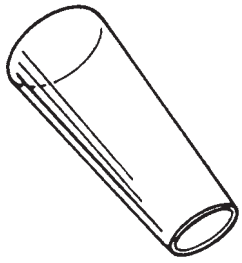


09916-58210
Valve guide installer handle



09916-77310
Piston ring compressor

09916-84511
Forceps

 09916-56011 Valve guide installer	 09917-98221 Valve stem seal installer	 09918-08210 Vacuum gauge hose joint	 09919-16010 Deep socket
 09924-17810 Flywheel holder	 09926-18210 Oil seal guide (Vinyl resin)		

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO. 1207C (99000-31150)	● Mating surfaces of cylinder block and oil pan.
	SUZUKI BOND NO. 1215 (99000-31110)	● Mating surfaces of camshaft housings (No.1 & No.3) and cylinder head.