
ENGINE MECHANICAL

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CO/HC CHECK

E3007-01

HINT: This check is used only to determine whether or not the idle CO/HC complies with specifications.

1. INITIAL CONDITIONS

- (a) Engine at reach normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All accessories switched OFF
- (e) All vacuum lines properly connected
- (f) SFI system wiring connectors fully plugged
- (g) Ignition timing set correctly
- (h) Transmission in neutral range
- (i) Tachometer and CO/HC meter calibrated by hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS

4. INSERT CO/HC METER TESTING PROBE INTO TAILPIPE AT LEAST 40 cm (1.3 ft) DURING IDLING
5. CHECK CO/HC CONCENTRATION AT IDLE

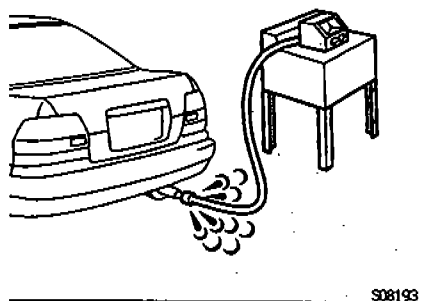
Idle CO concentration:

0 - 1.0 %

Idle HC concentration:

Applicable local regulation

CO/HC Meter



S08193

Troubleshooting

If the CO/HC concentration does not conform to specifications, perform troubleshooting in the order given below.

- (a) Check oxygen sensor operation.
(See Oxygen Sensor Inspection under EFI)
- (b) See the table next page for possible causes, and then inspect and correct the applicable causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	<ol style="list-style-type: none"> 1. Faulty ignitions: <ul style="list-style-type: none"> ● Incorrect timing ● Fouled, shorted or improperly gapped plugs ● Open or crossed high-tension cords ● Cracked distributor cap 2. Incorrect valve clearance 3. Leaky intake and exhaust valves. 4. Leaky cylinder
Low	High	Rough idle (Fluctuating HC reading)	<ol style="list-style-type: none"> 1. Vacuum leaks: <ul style="list-style-type: none"> ● PCV hoses ● Intake manifold ● Throttle body ● ISC valve ● Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	<ol style="list-style-type: none"> 1. Restricted air filter 2. Faulty EFI systems: <ul style="list-style-type: none"> ● Faulty pressure regulator ● Clogged fuel return line ● Defective water temp. sensor ● Defective air temp. sensor ● Faulty engine ECU ● Faulty injectors ● Faulty throttle position sensor ● Defective vacuum sensor

COMPRESSION CHECK

E0030-05

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

1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. DISCONNECT DISTRIBUTOR CONNECTORS

3. REMOVE OIL FILLER CAP AND NO.2 CYLINDER HEAD COVER

4. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

Disconnect the high-tension cords at the rubber boot. **DO NOT** pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

5. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the 4 spark plugs.

6. CHECK CYLINDER COMPRESSION PRESSURE

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

(b) Fully open the throttle.

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

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

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

NOTICE: This measurement must be done in as short a time as possible.

Compression pressure:

1,330 kPa (13.6 kgf/cm², 193 psi) or more

Minimum pressure:

1,080 kPa (11.0 kgf/cm², 156 psi)

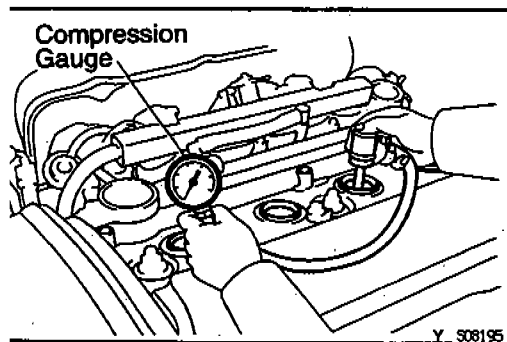
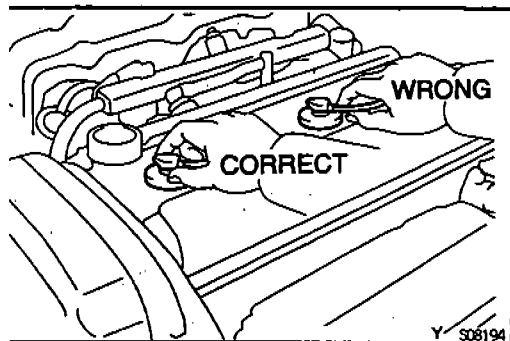
Difference between each cylinder:

98 kPa (1.0 kgf/cm², 14 psi) or less

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

- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.

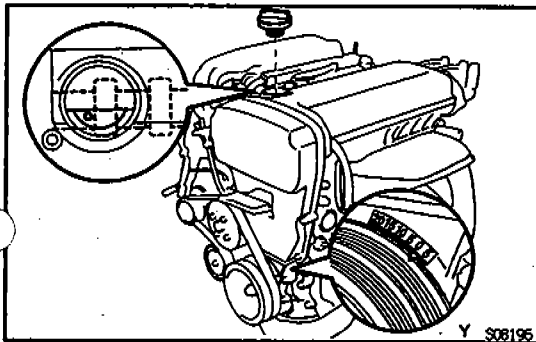
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.



VALVE CLEARANCE INSPECTION

EM02-01

HINT: Inspect and adjust the valve clearance when the engine is cold.



1. **SET NO.1 CYLINDER TO TDC/COMPRESSION**
 - (a) Remove the oil filler cap.
 - (b) Turn the crankshaft pulley and when the concave mark of the camshaft appears, make the notch of the crankshaft pulley meet the timing mark "0°" of the No.1 timing belt cover.

If not, turn the crankshaft 1 revolution (360°).

2. **DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**

3. **REMOVE CYLINDER HEAD COVER**
(See timing belt)

4. **INSPECT VALVE CLEARANCE**

- (a) Check only the valves indicated.
 - Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
 - Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

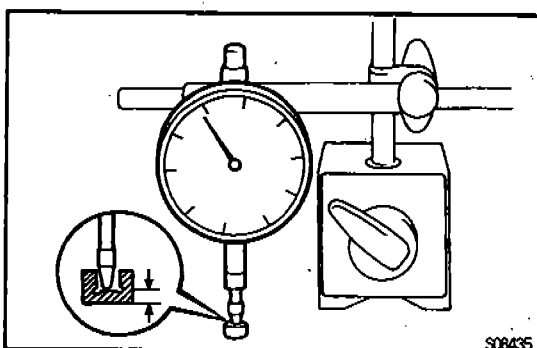
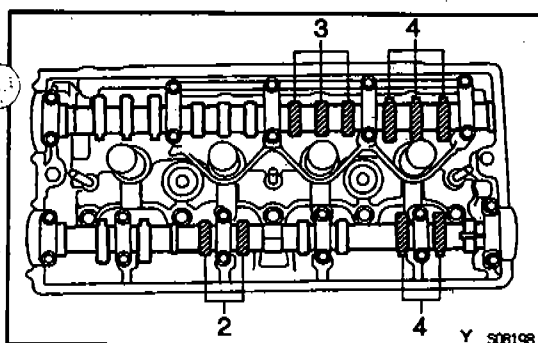
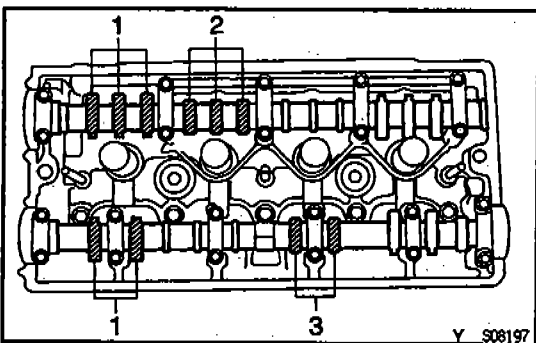
Intake	0.19 - 0.29 mm (0.007 - 0.011 in.)
Exhaust	0.39 - 0.49 mm (0.015 - 0.020 in.)

- (b) Turn the crankshaft pulley 1 revolution (360°) and align its groove with timing mark "0°" of the No.1 timing belt cover.
- (c) Check only the valves indicated shown. Measure the valve clearance. (See procedure in step (a))

5. **ADJUST VALVE CLEARANCE**

- (a) Remove the timing belt.
(See timing belt)
- (b) Remove the camshafts.
(See cylinder head)
- (c) Remove the valve lifter and adjusting shim.
- (d) Determine the replacement adjusting shim size by these Formula below:

- Using a dial indicator, measure the thickness of the removed shim.



- Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

T Thickness of removed shim

A Measured valve clearance

N Thickness of new shim

Intake	$N = T + (A - 0.24 \text{ mm (0.009 in.)})$
Exhaust	$N = T + (A - 0.44 \text{ mm (0.017 in.)})$

- Select a new shim with a thickness as close as possible to the calculated value.

HINT: For adjusting shim, 10 sizes of supplies are available for every 0.02 mm (0.0008 in.) between 1.70 mm (0.0669 in.) and 1.98 mm (0.0740 in.), 21 sizes for every 0.01 mm (0.0004 in.) between 1.90 mm (0.0748 in.) and 2.10 mm (0.0827 in.) and 10 sizes for every 0.02 mm (0.0008 in.) between 2.12 mm (0.0835 in.) and 2.30 mm (0.0906 in.).

New shim thickness

Shim No.	Thickness	mm (in.)	Shim No.	Thickness	mm (in.)
78	1.700	(0.0669)	10	2.010	(0.0791)
79	1.720	(0.0677)	11	2.020	(0.0795)
80	1.740	(0.0685)	12	2.030	(0.0799)
81	1.760	(0.0693)	13	2.040	(0.0803)
82	1.780	(0.0701)	14	2.050	(0.0807)
83	1.800	(0.0709)	15	2.060	(0.0811)
84	1.820	(0.0717)	16	2.070	(0.0815)
85	1.840	(0.0728)	17	2.080	(0.0819)
86	1.860	(0.0732)	18	2.090	(0.0823)
87	1.880	(0.0740)	19	2.100	(0.0827)
88	1.900	(0.0748)	20	2.120	(0.0835)
89	1.910	(0.0752)	21	2.140	(0.0843)
01	1.920	(0.0756)	22	2.160	(0.0850)
02	1.930	(0.0760)	23	2.180	(0.0858)
03	1.940	(0.0764)	24	2.200	(0.0866)
04	1.950	(0.0768)	25	2.220	(0.0874)
05	1.960	(0.0772)	26	2.240	(0.0882)
06	1.970	(0.0776)	27	2.260	(0.0890)
07	1.980	(0.0780)	28	2.280	(0.0898)
08	1.990	(0.0783)	29	2.300	(0.0906)
09	2.000	(0.0787)			

- Place a new adjusting shim on the valve.
- Place the valve lifter.
- Install the camshafts (See cylinder head).
- Install the timing belt (See timing belt).

6. INSTALL CYLINDER HEAD COVER (See timing belt)

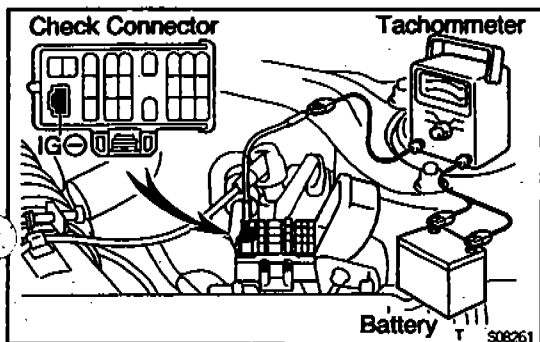
7. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

IGNITION TIMING INSPECTION

EM601-01

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the test probe of a tachometer to terminal IG of the check connector.

NOTICE:

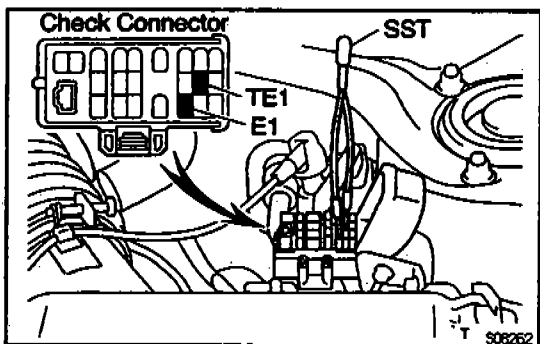
- Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.

3. INSPECT AND ADJUST IGNITION TIMING

- (a) Using SST, connect terminals TE1 and E1 of the check connector:

SST 09843-18020

HINT: After engine rpm is kept at 1,000 - 1,500 rpm for 5 seconds, check that it returns to idle speed.

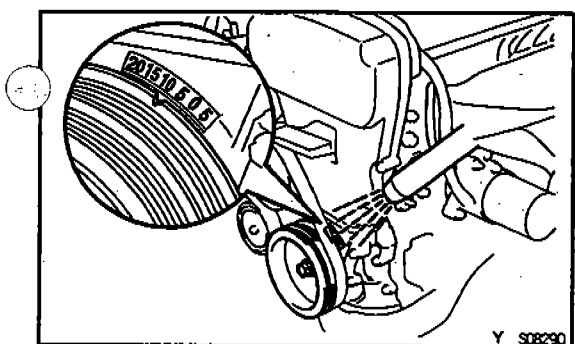


- (b) Using a timing light, check the ignition timing.

Ignition timing:

8 - 12° BTDC @ idle

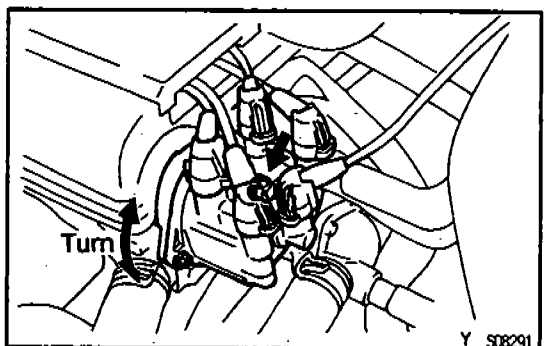
(Transmission in neutral position)

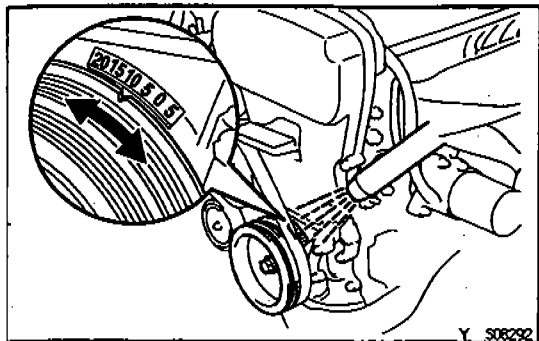


- (c) Loosen the hold-down bolt, and adjust by turning the distributor.
- (d) Tighten the hold-down bolt, and recheck the ignition timing.

Torque: 23 N·m (230 kgf·cm, 17 ft·lbf)

- (e) Remove the SST from the check connector.
- SST 09843-18020



**4. FURTHER CHECK IGNITION TIMING**

Ignition timing:

10° or more BTDC @ idle

(Transmission in neutral position)

HINT: When engine speeding up to the engine rotation, confirm that the ignition timing degree increases promptly.

5. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

IDLE SPEED INSPECTION

E627X-02

1. INITIAL CONDITIONS

- (a) Engine at normal operating temperature
- (b) Air cleaner installed
- (c) All pipes and hoses of air induction system connected
- (d) All vacuum lines properly connected
- (e) EFI system wiring connectors fully plugged
- (f) All operating accessories switched OFF
- (g) Ignition timing set correctly
- (h) Transmission in neutral position

2. CONNECT TACHOMETER

(See ignition timing)

3. INSPECT IDLE SPEED

- (a) Race the engine at 2,500 rpm for approx. 90 seconds.
- (b) Check the idle speed.

Idle speed (w/ Cooling fan OFF):

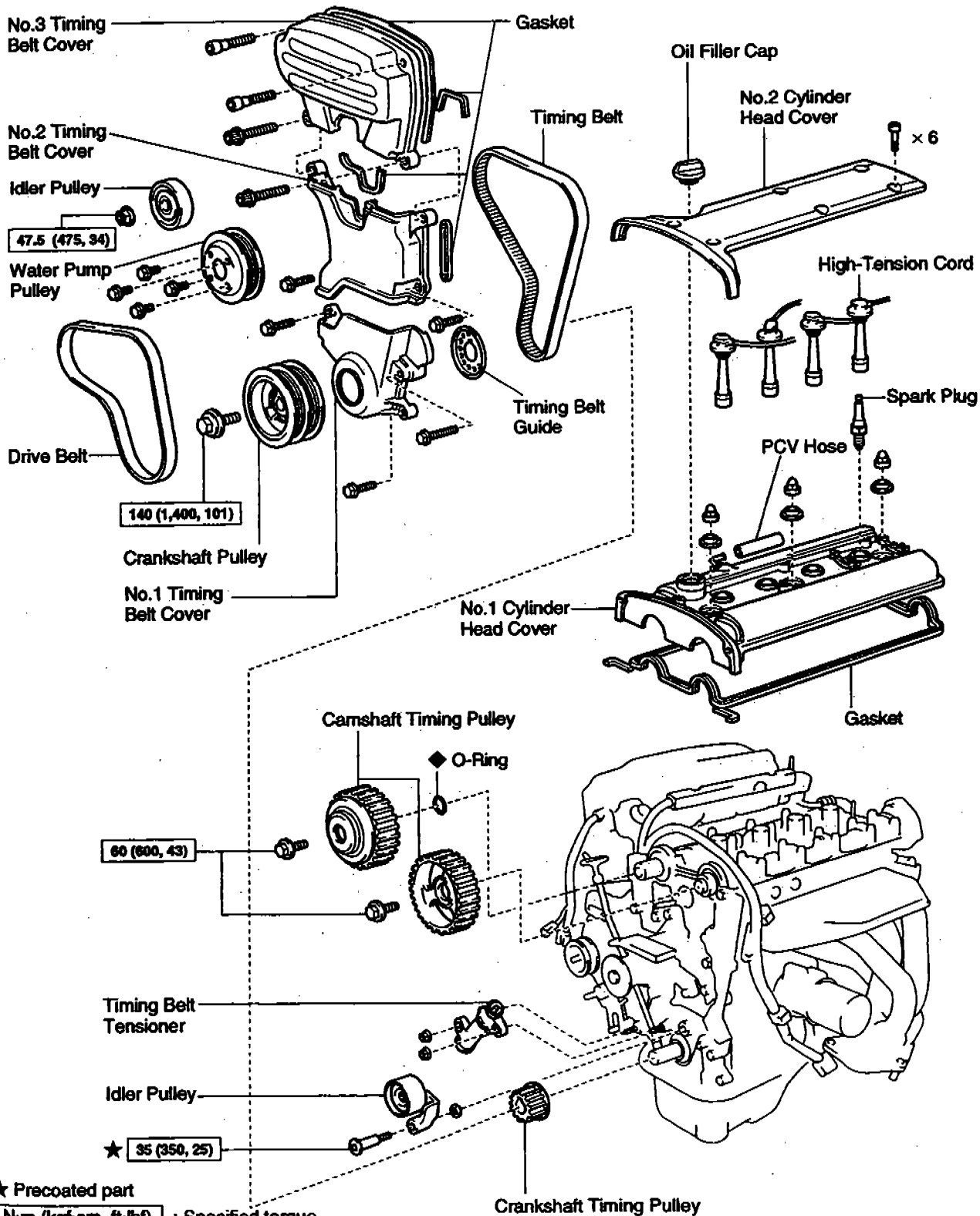
880 ± 50 rpm

If the idle speed is not as specified, check the ISC system.

4. DISCONNECT TACHOMETER

TIMING BELT COMPONENTS

EG177-01



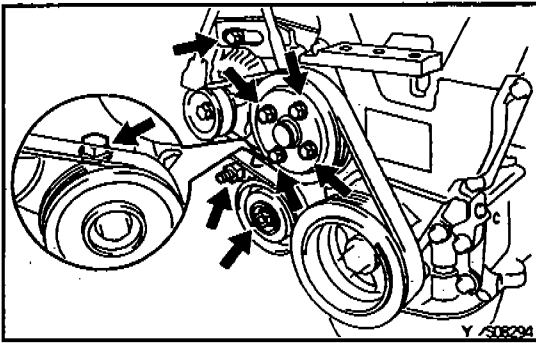
★ Precoated part

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

◆ Non-reusable part

Y

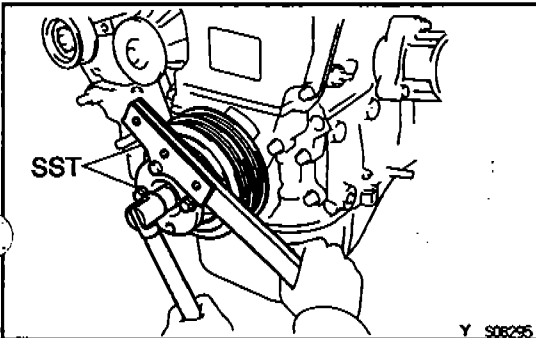
S06293



REMOVAL

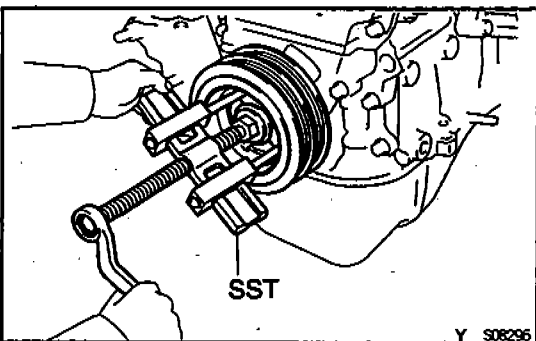
1. REMOVE ALTERNATOR DRIVE BELT AND WATER PUMP PULLEY

- (a) Loosen the 4 water pump pulley bolts.
- (b) Loosen the idler pulley adjusting lock nut and adjusting bolt.
- (c) Loosen the pivot bolt and adjusting bolt, and remove the drive belt.
- (d) Remove the 4 bolts and water pump pulley.
- (e) Remove the adjusting lock nut and idler pulley.

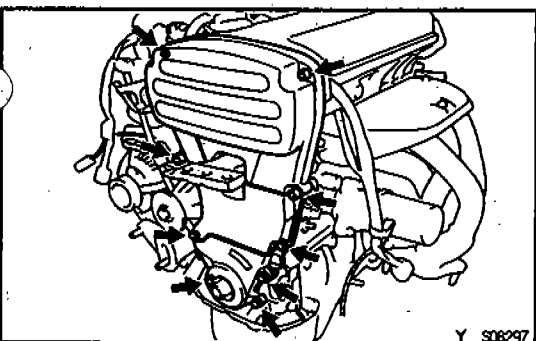


2. REMOVE CRANKSHAFT PULLEY

- (a) Using SST, remove the pulley bolt.
SST 09213-54015, 09330-00021



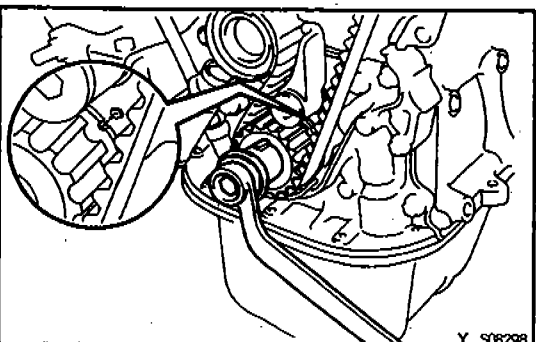
- (b) Using SST and the pulley bolt, remove the pulley.
SST 09950-50010 (09951-05010, 09952-05010, 09953-05020, 09554-05030)



3. REMOVE TIMING BELT COVERS

Remove the 9 bolts and timing belt covers.

4. REMOVE TIMING BELT GUIDE



5. SET NO.1 CYLINDER TO TDC/COMPRESSION

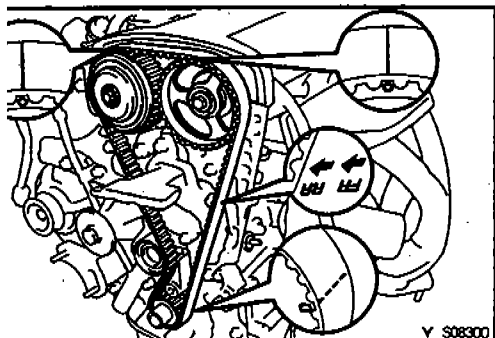
- (a) Temporarily install the crankshaft pulley bolt to the crankshaft.
- (b) Turn the crankshaft, and align the timing marks of the crankshaft timing pulley and oil pump body.

NOTICE: Always turn the crankshaft clockwise.

ENGINE MECHANICAL - TIMING BELT



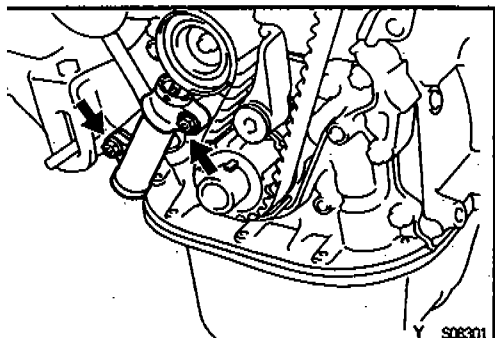
- (c) Check that timing marks of the camshaft timing pulleys and No.1 cylinder head cover are aligned.
If not, turn the crankshaft 1 revolution (360°).
- (d) Remove the crankshaft pulley bolt.



6. IF REUSING TIMING BELT, CHECK INSTALLATION MARKS ON TIMING BELT

Check that there are 3 installation marks and front mark on the timing belt.

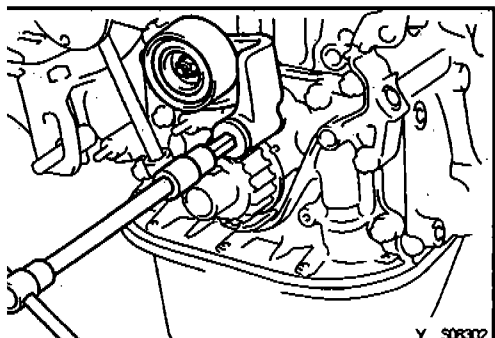
If the installation and front marks have disappeared, before removing the timing belt, place 3 new installation marks on the timing belt to match the timing marks of the timing pulleys, and place a new front mark on the timing belt.



7. REMOVE TIMING BELT TENSIONER

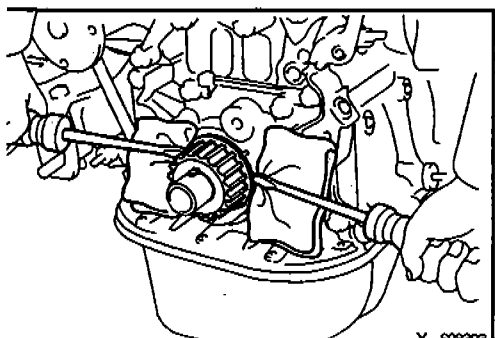
Alternately loosen the 2 nuts, and remove the tensioner.

8. REMOVE TIMING BELT



9. REMOVE IDLER PULLEY

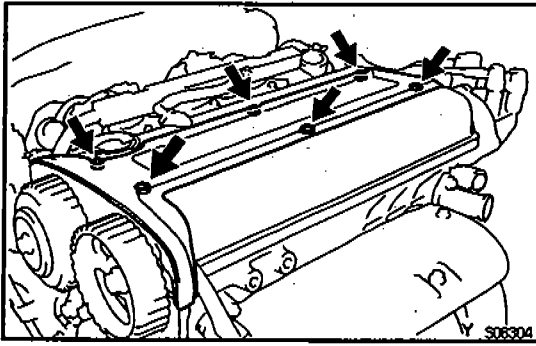
Using a 8 mm hexagon wrench, remove the bolt, pulley and washer.



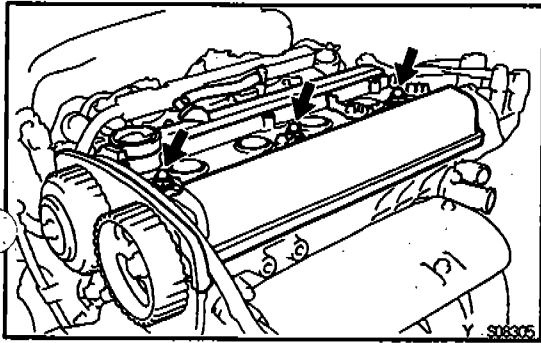
10. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use 2 screwdrivers.

NOTICE: Position shop rags as shown to prevent damage.

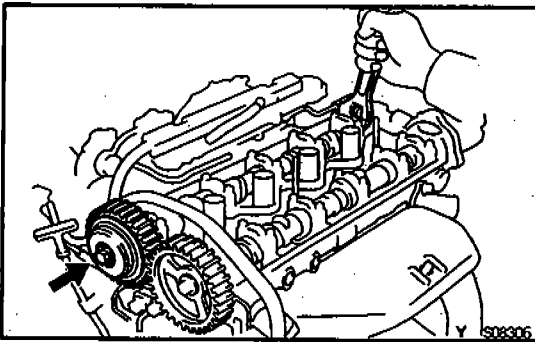
**11. REMOVE NO.2 CYLINDER HEAD COVER**

Remove the 6 bolts and No.2 cylinder head cover.

12. DISCONNECT HIGH-TENSION CORDS**13. REMOVE SPARK PLUG****14. REMOVE CYLINDER HEAD COVER**

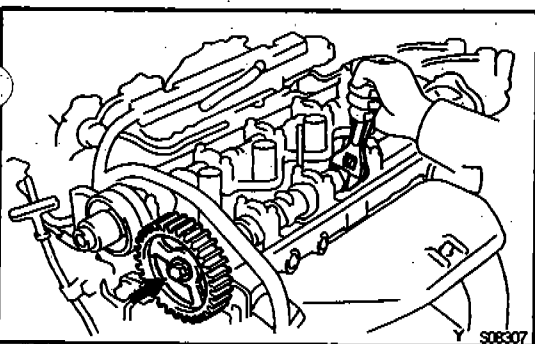
(a) Disconnect the PCV hose.

(b) Remove the 3 cap nuts, seal washers and cylinder head cover.

**15. REMOVE RH CAMSHAFT TIMING PULLEY**

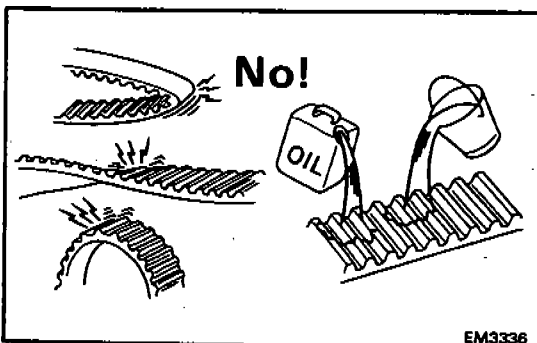
Hold the hexagonal head wrench portion of the camshaft with a wrench, and remove the bolt and timing pulley.

NOTICE: Be careful not to damage the cylinder head with the wrench.

**16. REMOVE LH CAMSHAFT TIMING PULLEY**

Hold the hexagonal head wrench portion of the camshaft with a wrench, and remove the bolt and timing pulley.

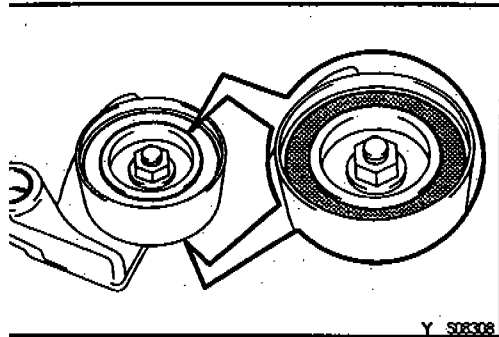
NOTICE: Be careful not to damage the cylinder head with the wrench.

**INSPECTION****1. INSPECT TIMING BELT****NOTICE:**

- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water or steam.
- Do not utilize timing belt tension when installing or removing the mount bolt of the camshaft timing pulley.

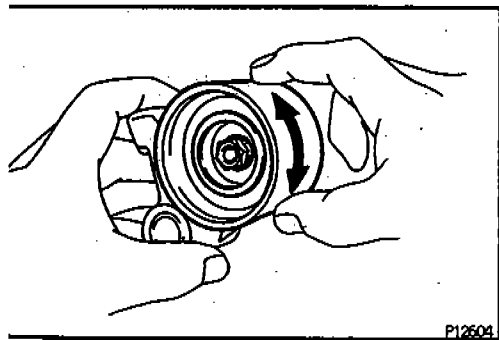
If there are any defects, as shown in the illustrations, check these points:

- (a) Premature parting
 - Check for proper installation.
 - Check the timing cover gasket for damage and proper installation.
- (b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.
- (c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.
- (d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.
- (e) If there is noticeable wear on the belt teeth, check timing cover for damage and check gasket has been installed correctly and for foreign material on the pulley teeth.
If necessary, replace the timing belt.

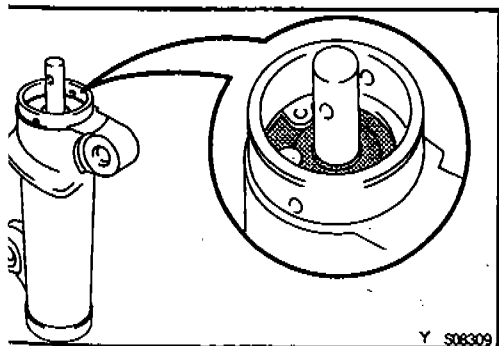


2. INSPECT IDLER PULLEY

- (a) Visually check the seal portion of the idler pulley for oil leakage.
If leakage is found, replace the idler pulley.

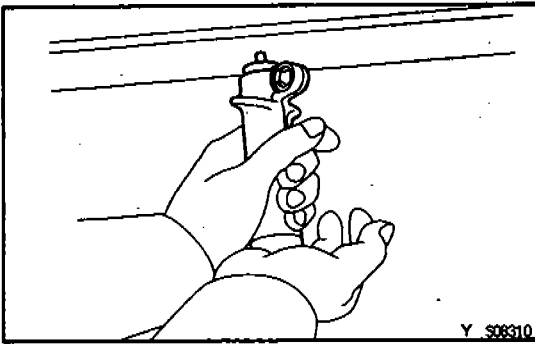


- (b) Check that the idler pulley turns smoothly.
If necessary, replace the idler pulley.

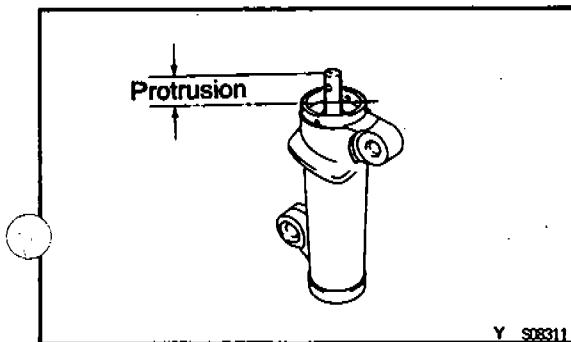


3. INSPECT TIMING BELT TENSIONER

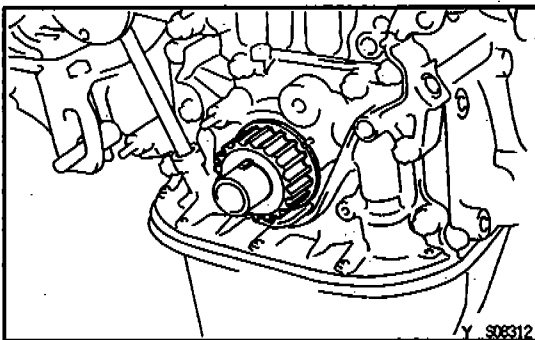
- (a) Visually check the seal portion of the tensioner for oil leakage.
HINT: If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right.
If leakage is found, replace the tensioner.



- (b) Hold the tensioner with both hands and push the push rod strongly as shown to check that it doesn't move. If the push rod moves, replace the tensioner.
NOTICE: Never hold the tensioner push rod facing downward.



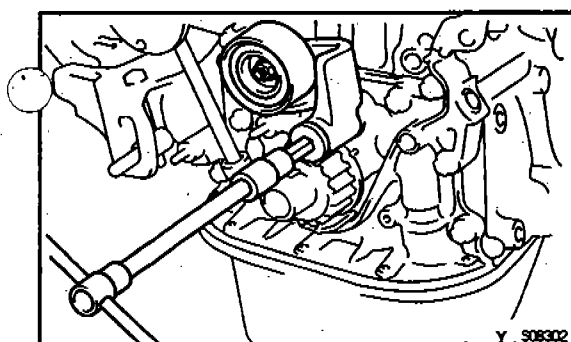
- (c) Measure the protrusion of the push rod from the housing end.
Protrusion:
 11.9 – 12.8 mm (0.469 – 0.504 in.)
 If the protrusion is not as specified, replace the tensioner.



INSTALLATION

1. INSTALL CRANKSHAFT TIMING PULLEY

- (a) Align the pulley set key with the key groove of the timing pulley, and slide on the timing pulley.
 (b) Install the timing pulley, facing the sensor side inward.
NOTICE: Do not scratch the sensor part of the crankshaft timing pulley.

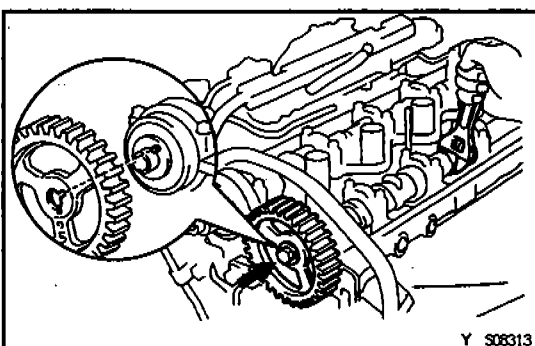


2. INSTALL IDLER PULLEY

Adhesive:

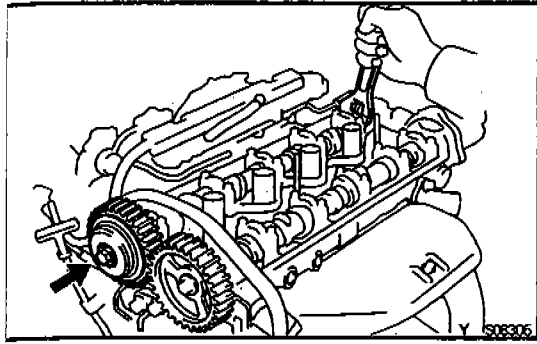
Part No. 08833-00080, THREE BOND 1344,
 LOCTITE 242 or equivalent

- (a) Using a 8 mm hexagon wrench, install the plate washer and idler pulley with the pivot bolt.
Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)
 (b) Check that the pulley bracket moves smoothly.

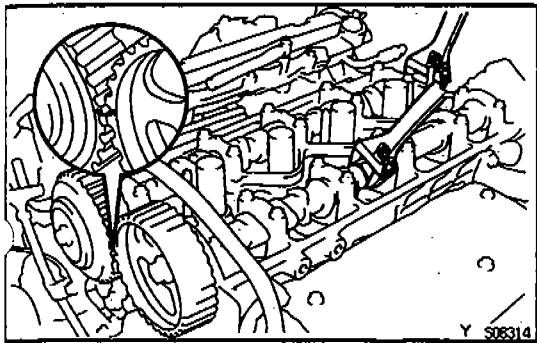


3. INSTALL LH CAMSHAFT TIMING PULLEY

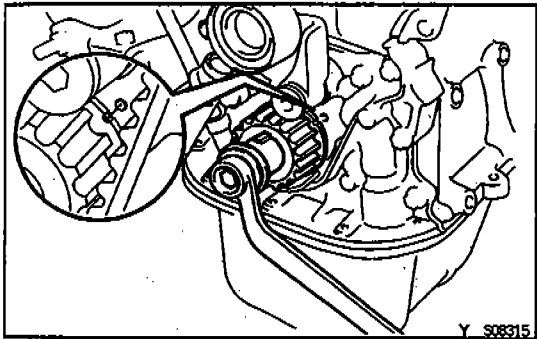
- (a) Align the camshaft knock pin with the knock pin groove on the pulley side without "5" mark and slide on the timing pulley.
 (b) Temporarily install the timing pulley bolt.
 (c) Hold the hexagonal wrench head portion of the camshaft with a wrench, and tighten the timing pulley bolt.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

**4. INSTALL RH CAMSHAFT TIMING PULLEY**

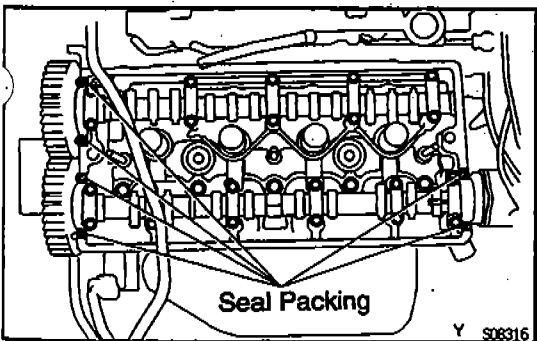
- (a) Install a new O-ring to the camshaft.
- (b) Apply light coat the engine oil to a new O-ring.
- (c) Align the knock pin on the camshaft with the knock pin groove of the timing pulley, and slide on the timing pulley.
- (d) Temporarily install the timing pulley bolt.
- (e) Hold the hexagonal wrench head portion of the camshaft with a wrench, and tighten the timing pulley bolt.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

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

- (a) Turn the hexagonal wrench head portion of the camshaft, and align the timing mark of the camshaft timing pulleys.
- (b) Temporarily install No.1 cylinder head cover.
- (c) Check align the timing marks of the pulleys and cylinder head cover.
- (d) Remove cylinder head cover.



- (e) Using the crankshaft pulley bolt, turn the crankshaft and align the timing marks of the crankshaft timing pulley and oil pump body.

**6. INSTALL CYLINDER HEAD COVER**

- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head as shown in the illustration.

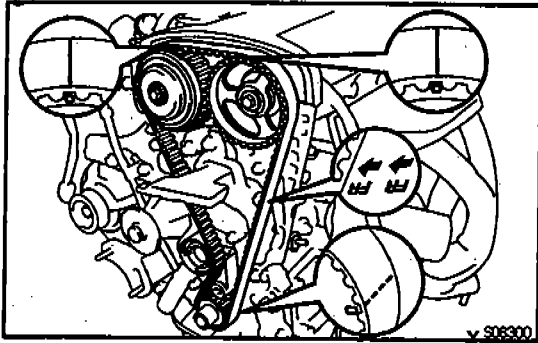
Seal packing:

Part No. 08826-00080 or equivalent

- (c) Install the gasket to the cylinder head cover.
- (d) Install the cylinder head cover with the 3 seal washers and cap nuts.

Torque: 8 N·m (80 kgf·cm, 69 in·lbf)

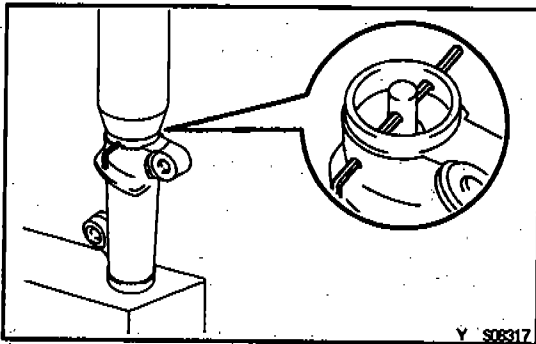
- (e) Connect the PCV hose to the cylinder head cover.

**7. INSTALL TIMING BELT**

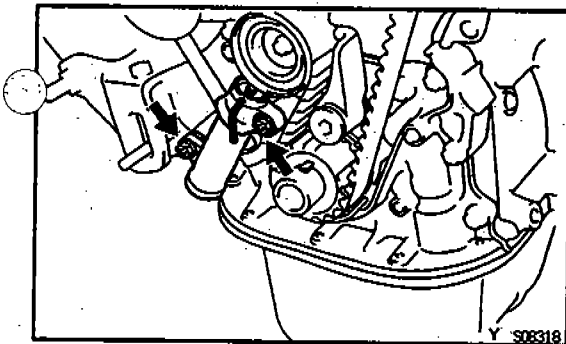
NOTICE: The engine should be cold.

- (a) Remove any oil or water on the pulleys, and keep them clean.

NOTICE: Only wipe the pulleys; do not use any cleansing agent.
- (b) Face the front mark on the timing belt forward.
- (c) Align the installation mark on the timing belt with the timing mark of the crankshaft timing pulley.
- (d) Align the installation marks on the timing belt with the timing marks of the camshaft timing pulleys.
- (e) Install the timing belt in this order:
 - (1) Crankshaft timing pulley
 - (2) LH camshaft timing pulley
 - (3) RH camshaft timing pulley
 - (4) Idler pulley

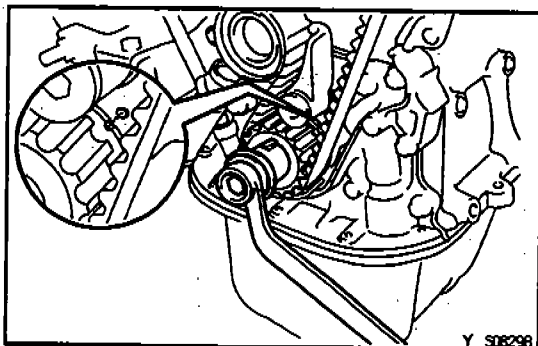
**8. SET TIMING BELT TENSIONER**

- (a) Using a press, slowly press in the push rod using 981 9,807 N (100 - 1,000 kgf, 200 - 2,205 lbf) of pressure.
- (b) Align the holes of the push rod and housing, pass a 1.27 mm hexagon wrench through the holes to keep the setting position of the push rod.
- (c) Release the press.

**9. INSTALL TIMING BELT TENSIONER**

- (a) Temporarily install the tensioner with the 2 bolts.
- (b) Alternately tighten the 2 bolts.

Torque: 9.5 N-m (95 kgf-cm, 82 in.-lbf)
- (c) Remove the 1.27 mm hexagon wrench from the tensioner.

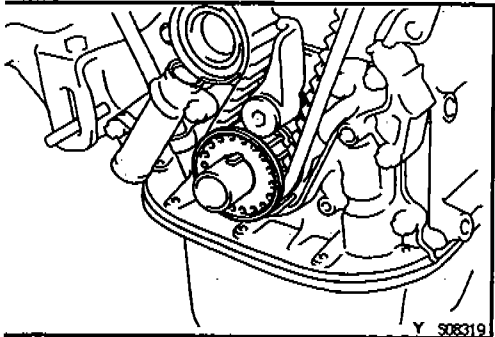
**10. CHECK VALVE TIMING**

- (a) Turn the crankshaft, and align the timing marks of the crankshaft timing pulley and oil pump body.

NOTICE: Always turn the crankshaft clockwise.



- (b) Check that the timing marks of the RH and LH timing pulleys with the timing marks of the No.1 cylinder head cover as shown in the illustration. If the marks do not align, remove the timing belt and reinstall it.
- (c) Remove the crankshaft pulley bolt.

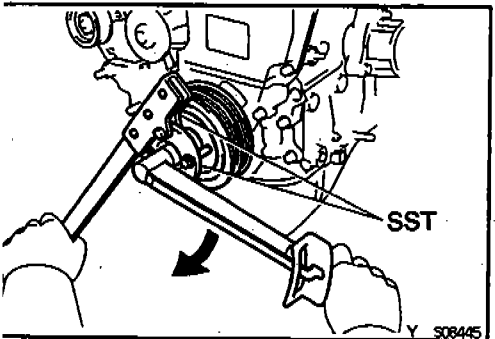


11. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.

10. INSTALL TIMING BELT COVERS

- (a) Install the No.1 timing belt cover with the 3 bolts.
Torque: 9.5 N·m (95 kgf·cm, 82 in.-lbf)
- (b) Install the No.2, No.3 timing belt covers with the 6 bolts.
Torque: 9.5 N·m (95 kgf·cm, 82 in.-lbf)



13. INSTALL CRANKSHAFT PULLEY

- (a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.
- (b) Using SST, install the pulley bolt.
SST 09213-54015, 09330-00021
Torque: 140 N·m (1,400 kgf·cm, 101 ft.-lbf)

14. INSTALL SPARK PLUGS

15. CONNECT HIGH-TENSION CORDS

16. INSTALL NO.2 CYLINDER HEAD COVER

Torque: 9.5 N·m (95 kgf·cm, 82 in.-lbf)

17. INSTALL OIL FILLER CAP

18. INSTALL WATER PUMP PULLEY AND ALTERNATOR DRIVE BELT

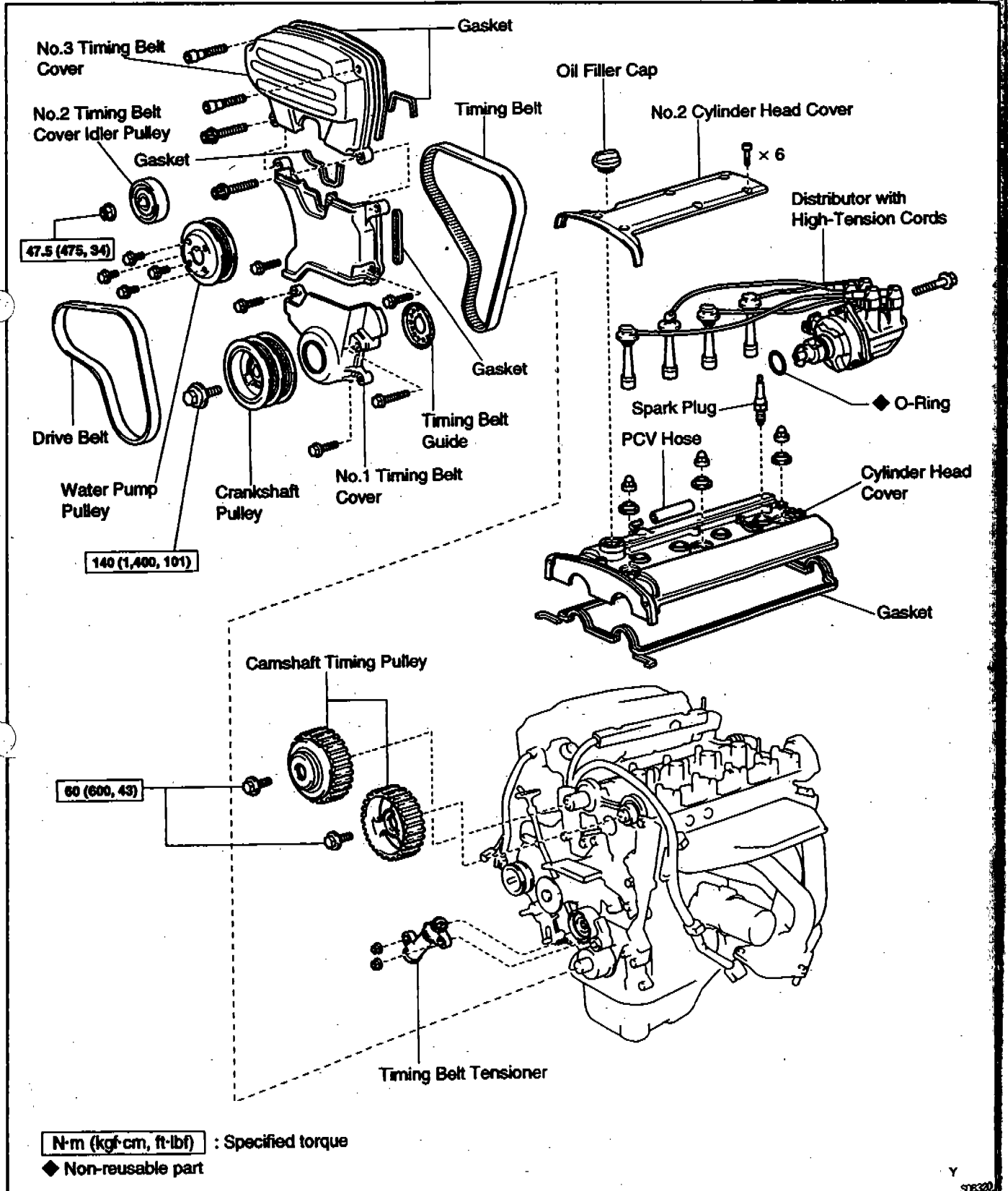
- (a) Temporarily install water pump pulley with the 4 bolts.
- (b) Temporarily install the idler pulley with the nut.
- (b) Install the drive belt with the adjusting bolt and pivot bolt.
- (c) Tighten the nut.
- (d) Tighten the 4 water pump pulley bolts.

19. ADJUST DRIVE BELT

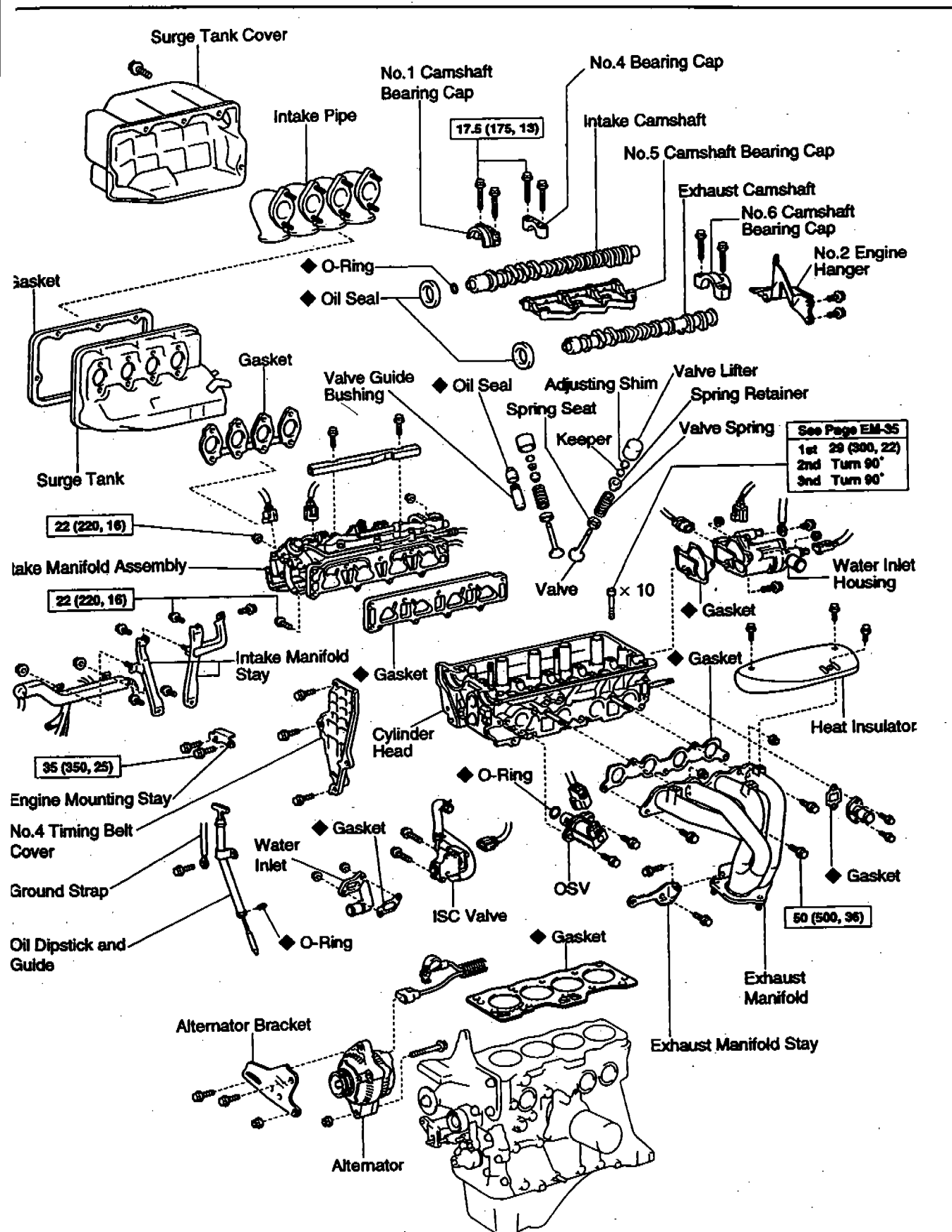
(See CH section)

CYLINDER HEAD COMPONENTS

EG181-08



ENGINE MECHANICAL - CYLINDER HEAD



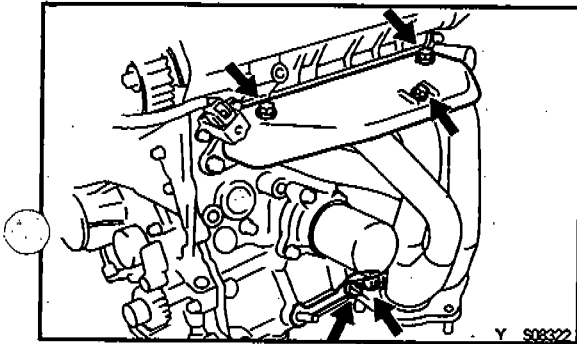
See Page EM-35
 1st Turn 90°
 2nd Turn 90°
 3rd Turn 90°

N·m (kgf·cm, ft·lbf) : Specified torque
 ◆ Non-reusable part

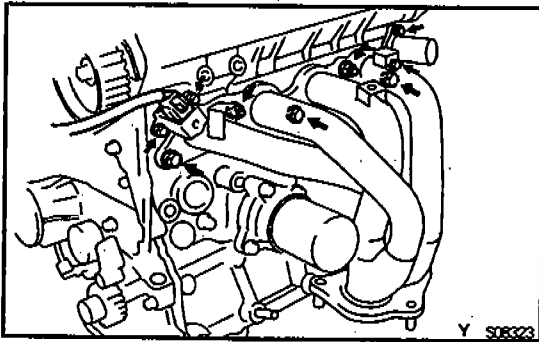
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REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE TIMING BELT
(See timing belt)
3. REMOVE DISTRIBUTOR



4. REMOVE EXHAUST MANIFOLD
 - (a) Remove the 3 bolts and upper heat insulator.
 - (b) Remove the 2 bolts and manifold stay.



- (c) Remove the 2 bolts, 3 nuts, exhaust manifold and gasket.

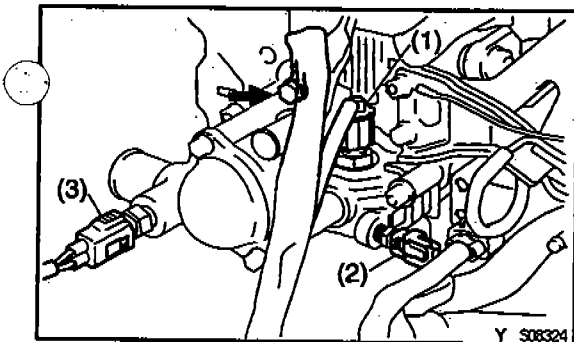
5. REMOVE WATER OUTLET

Remove the 2 bolts, water outlet and gasket.

6. REMOVE OIL SWITCHING VALVE (OSV)

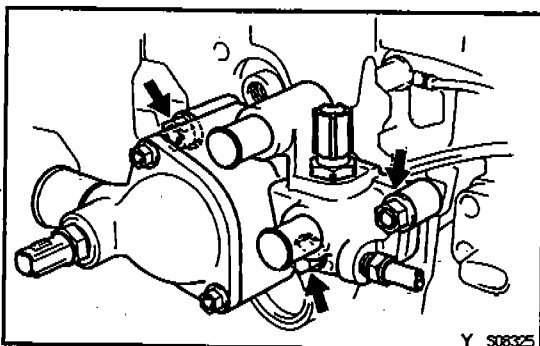
- (a) Remove the 2 bolts, OSV and O-ring.
- (b) Remove the O-ring from the OSV.

7. DISCONNECT OIL PRESSURE SWITCH CONNECTOR

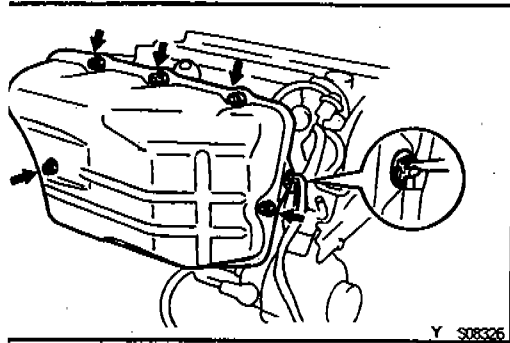


8. REMOVE WATER INLET AND INLET HOUSING

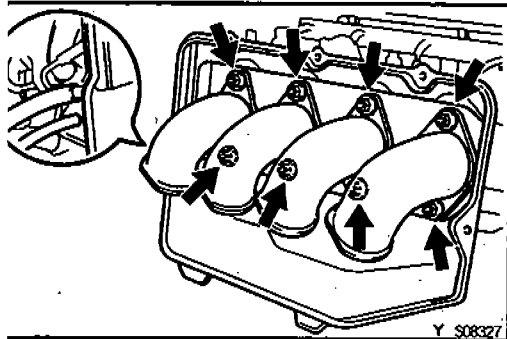
- (a) Disconnect these connectors:
 - (1) Water temperature sensor connector
 - (2) Water temperature switch connector
 - (3) Water temperature sender gauge connector
- (b) Remove the bolt holding the ground wire to the water inlet and inlet housing assembly.
- (c) Disconnect the 2 water bypass hoses.



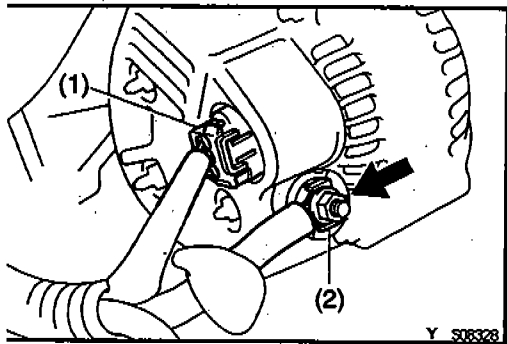
- (d) Remove the bolt, 2 nuts, the water inlet and inlet housing assembly and gasket.

**9. REMOVE SURGE TANK**

- (a) Disconnect the cord clip from the surge tank cover.
- (b) Remove the 5 bolts, surge tank cover and gasket.

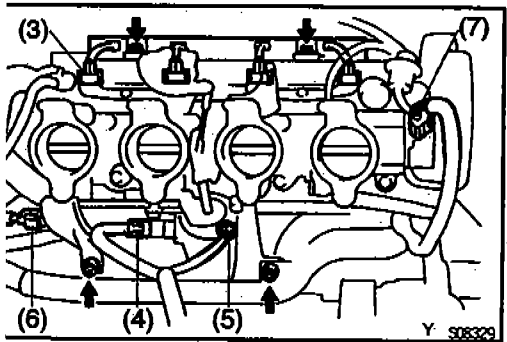


- (c) Remove the 8 bolts and 4 intake pipes.
- (d) Disconnect the vacuum hose and ISC hose from the surge tank.
- (e) Remove the surge tank and gasket.

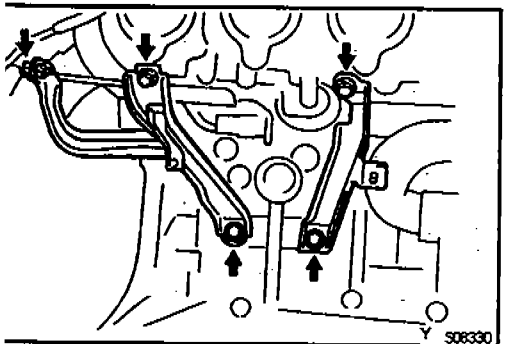
**10. REMOVE ENGINE WIRE PROTECTOR**

- (a) Disconnect these connectors and wire:

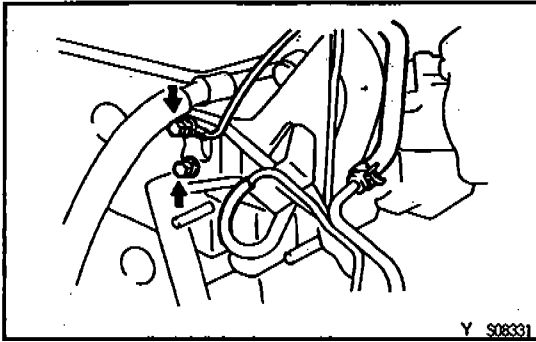
- (1) Alternator wire connector
- (2) Alternator wire



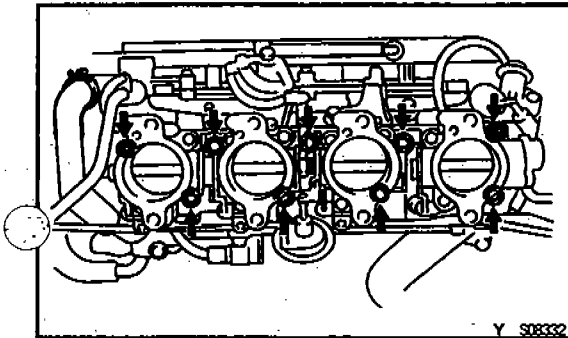
- (3) Injector connectors
- (4) VSV for EVAP connector
- (5) Knock sensor connector
- (6) ISC connector
- (7) Throttle position sensor connector
- (b) Remove the 2 bolts, 2 nuts and engine wire protectors.

**11. REMOVE INTAKE MANIFOLD STAYS**

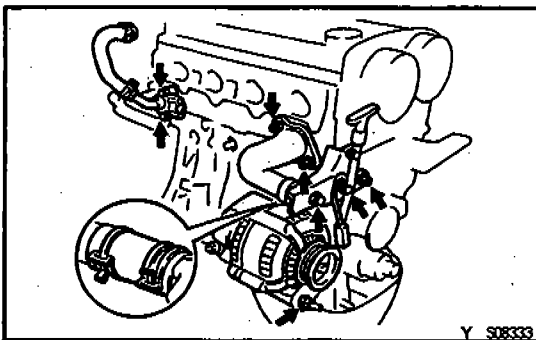
Remove the 5 bolts and intake manifold stays.

**12. REMOVE NO.2 ENGINE HANGER**

- (a) Disconnect the fuel return hose and vacuum hose from the No.2 engine hanger.
- (b) Remove the 2 bolts, ground strap and No.2 engine hanger.

**13. REMOVE INTAKE MANIFOLD**

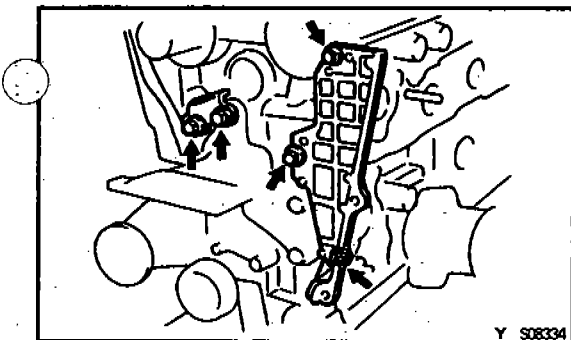
- (a) Disconnect the ISC hose and PCV hose.
- (b) Remove the 7 bolts, 2 nuts, intake manifold and gasket.

**14. REMOVE OIL DIPSTICK AND GUIDE**

- (a) Remove the mounting bolt and ground strap.
- (b) Pull out the dipstick guide together with the dipstick.
- (c) Remove the O-ring from the dipstick guide.

15. REMOVE ALTERNATOR AND ADJUSTING BAR**16. REMOVE NO.2 WATER INLET**

- (a) Remove the 2 nuts holding the water inlet to the cylinder head.
- (b) Disconnect the inlet hose from the water pump, and remove the No.2 water inlet and gasket.

**17. REMOVE ISC VALVE****18. REMOVE CYLINDER HEAD COVER**

Remove the 3 cap nuts, seal washers, cylinder head cover and gasket.

19. REMOVE CAMSHAFT TIMING PULLEYS

(See timing belt)

20. REMOVE ENGINE MOUNTING STAY

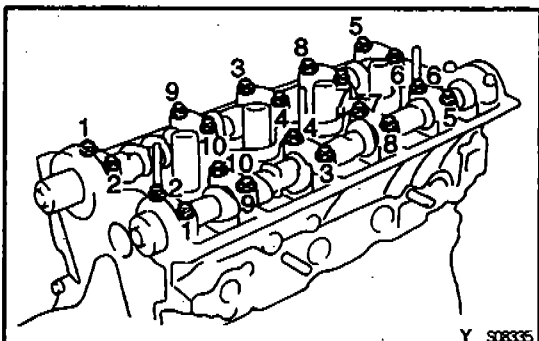
Remove the 2 bolts and engine mounting stay.

21. REMOVE NO.4 TIMING BELT COVER

Remove the 3 bolts and No.4 timing belt cover.

22. REMOVE CAMSHAFTS

- (a) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown, and remove the 5 bearing caps, oil seal and camshaft. Remove the intake and exhaust camshafts.
- (b) Remove the No.5 bearing cap from the cylinder head.

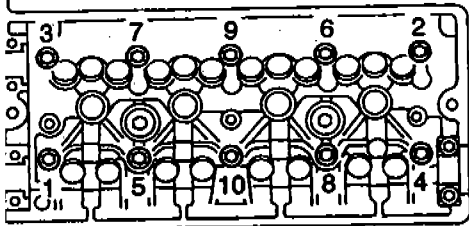
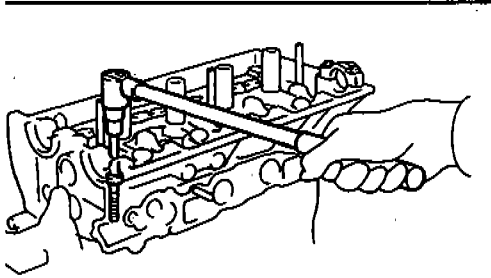


23. REMOVE CYLINDER HEAD

- (a) Uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown.

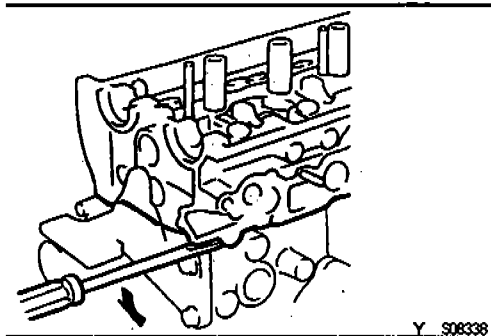
NOTICE: Cylinder head warpage or cracking could result from removing bolts in incorrect order.

- (b) Remove the 10 plate washers.

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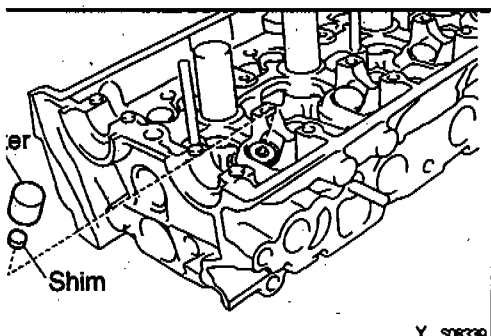
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- (c) Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.
HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block surfaces.

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



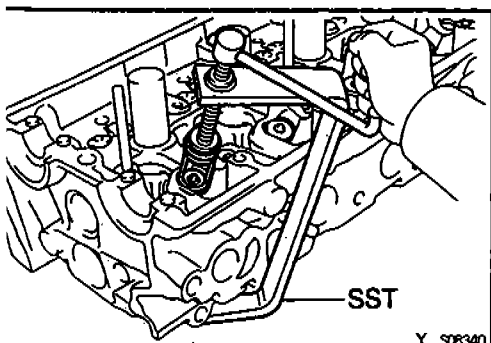
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DISASSEMBLY

E204-01

1. REMOVE VALVE LIFTERS AND SHIMS

HINT: Arrange the valve lifters and shims in correct order.



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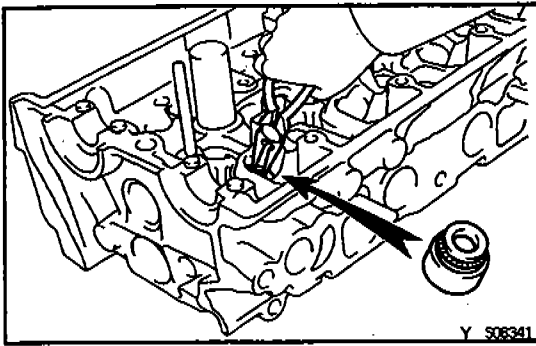
2. REMOVE VALVES

- (a) Using SST, compress the valve spring and remove the 2 keepers.

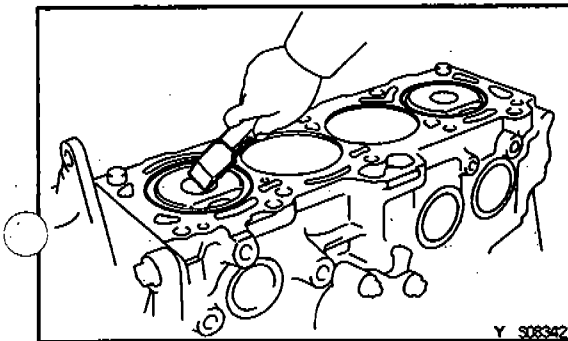
SST 09202-70020, 09202-00020

- (b) Remove these parts:

- (1) Spring retainer
- (2) Valve spring
- (3) Valve
- (4) Spring seat



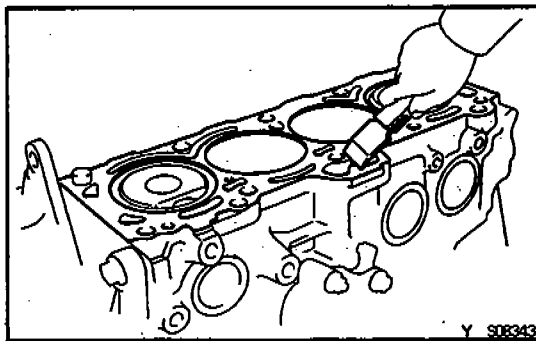
- HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.
- (c) Using needle-nose pliers, remove the oil seal.



INSPECTION

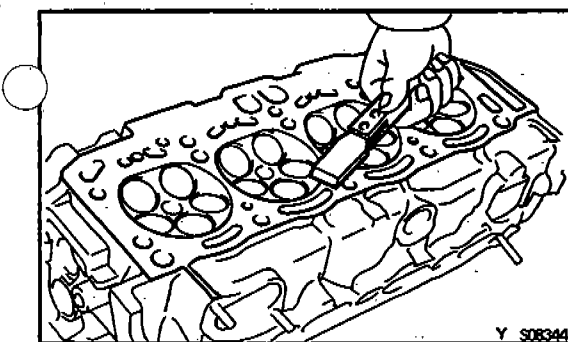
1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

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



- (b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.
- (c) Using compressed air, blow carbon and oil from the bolt holes.

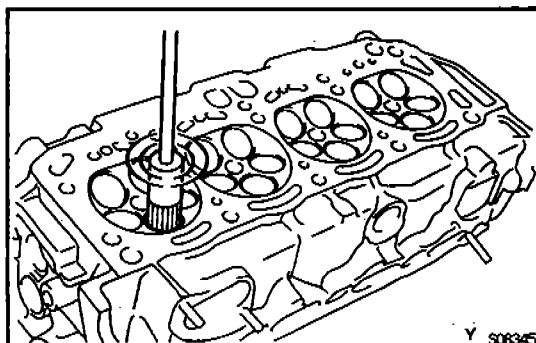
CAUTION: Protect your eyes when using high-compressed air.



2. REMOVE GASKET MATERIAL FROM CYLINDER HEAD

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

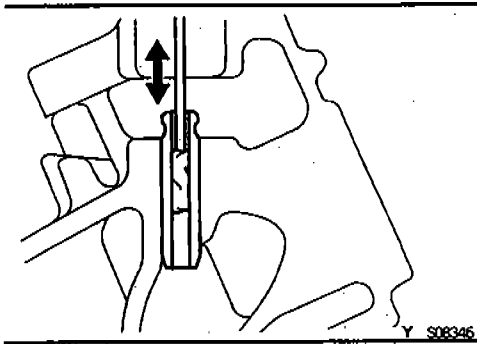
NOTICE: Be careful not to scratch the cylinder block contact surface.



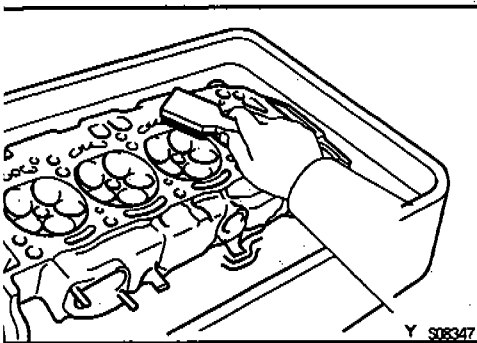
3. CLEAN COMBUSTION CHAMBERS

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

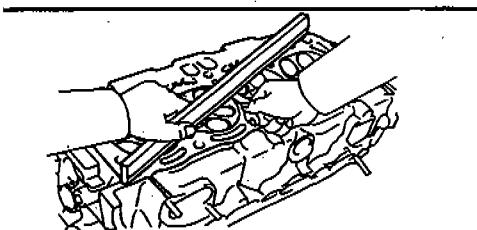
NOTICE: Be careful not to scratch the cylinder block contact surface.

**4. CLEAN VALVE GUIDE BUSHINGS**

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

**5. CLEAN CYLINDER HEAD**

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

**6. INSPECT FOR FLATNESS OF CYLINDER HEAD**

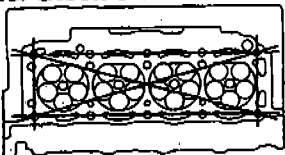
Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

Maximum warpage:

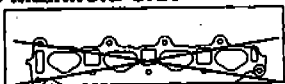
Cylinder block side	0.10 mm (0.0039 in.)
Manifold side	0.10 mm (0.0039 in.)

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

Cylinder Block Side



Intake Manifold Side

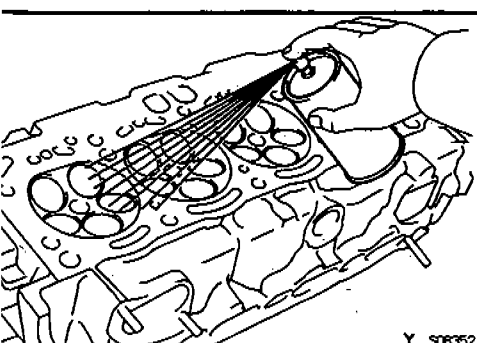


Exhaust Manifold Side



18
19
20
21

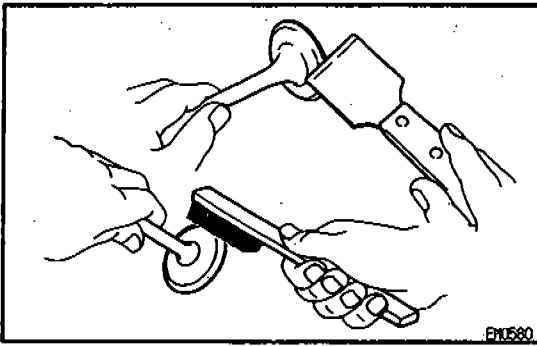
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**7. INSPECT FOR CRACKS OF CYLINDER HEAD**

Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks.

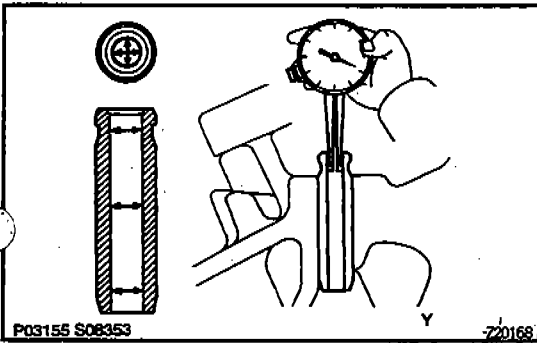
If cracked, replace the cylinder head.

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8. CLEAN VALVES

- Using a gasket scraper, chip off any carbon from the valve head.
- Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

- Using a caliper gauge, measure the inside diameter of the guide bushing.

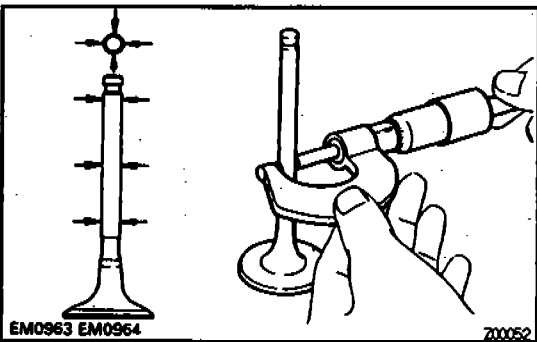
Bushing inside diameter:

5.010 – 5.030 mm (0.1972 – 0.1980 in.)

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

Valve stem diameter:

Intake	4.970 – 4.985 mm (0.1957 – 0.1963 in.)
Exhaust	4.965 – 4.980 mm (0.1955 – 0.1961 in.)



- Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

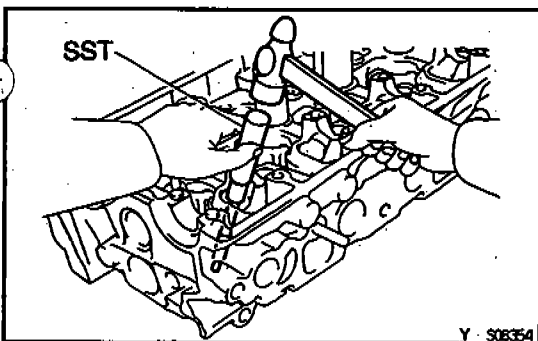
Oil clearance:

Item	Intake	Exhaust
Standard	0.025 – 0.060 mm (0.0010 – 0.0024 in.)	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
Maximum	0.08 mm (0.0031 in.)	0.10 mm (0.0039 in.)

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

10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

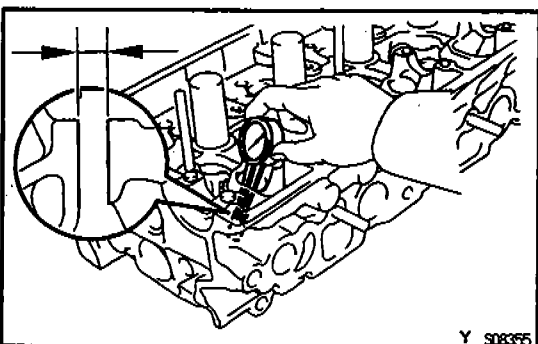
- Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).
- Using SST and a hammer, tap out the guide bushing.
SST 09201-10000 (09201-01050),
09950-70010 (09951-07150)



- Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Standard valve guide bore (Cold):

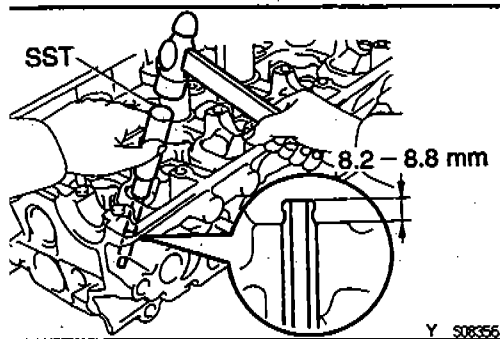
9.679 – 9.701 mm (0.3811 – 0.3819 in.)



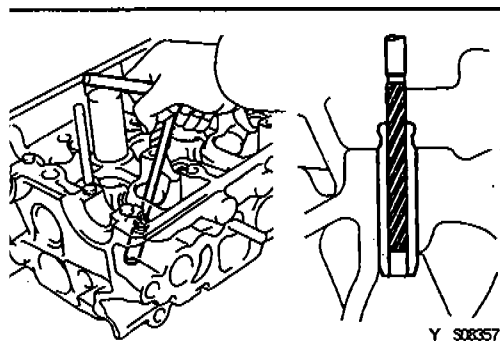
Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
9.679 - 9.701 (0.3811 - 0.3819)	Use STD
9.738 - 9.777 (0.3834 - 0.3849)	Use O/S 0.05

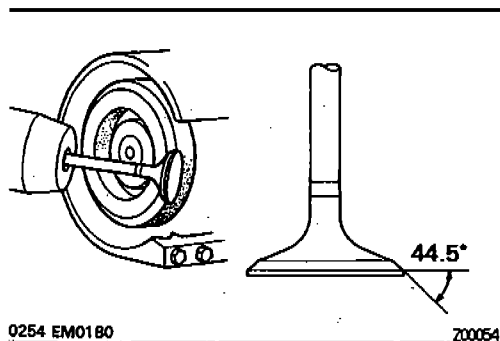
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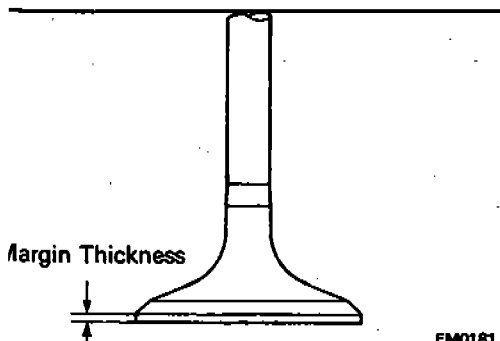


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- (d) Select a new guide bushing (STD or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 9.701 mm (0.3819 in.), machine the bushing bore to these dimension:
9.738 - 9.777 mm (0.3834 - 0.3849 in.)
If the bushing bore diameter of the cylinder head is greater than 9.777 mm (0.3849 in.), replace the cylinder head.
- (e) Gradually heat the cylinder head to 80 - 100°C (176 - 212°F).
- (f) Using SST and a hammer, tap in a new guide bushing until there is 8.2 - 8.8 mm (0.323 - 0.346 in.) protruding from the cylinder head.
SST 09201-10000 (09201-01050),
09950-70010 (09951-07150)
- (g) Using a sharp 5 mm reamer, ream the guide bushing to obtain the standard specified clearance (See step 9 above) between the guide bushing and valve stem.

11. INSPECT AND GRIND VALVES

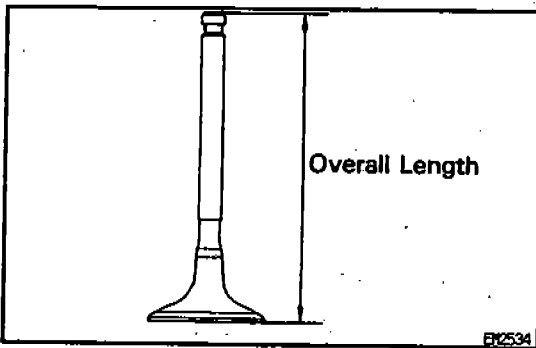
- (a) Grind the valve enough to remove pits and carbon.
(b) Check that the valve is ground to the correct valve face angle.

Valve face angle:**45°**

- (c) Check the valve head margin thickness.
Margin thickness:

Standard	0.8 - 1.2 mm (0.031 - 0.047 in.)
Minimum	0.5 mm (0.020 in.)

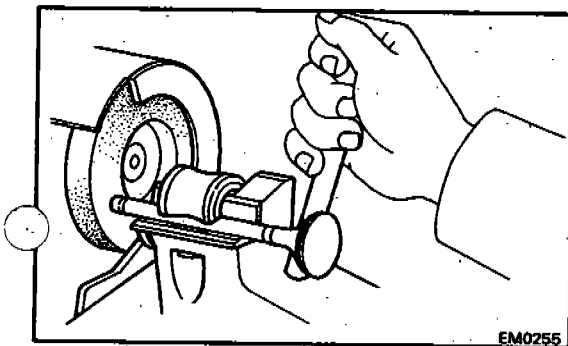
If the margin thickness is less than minimum, replace the valve.



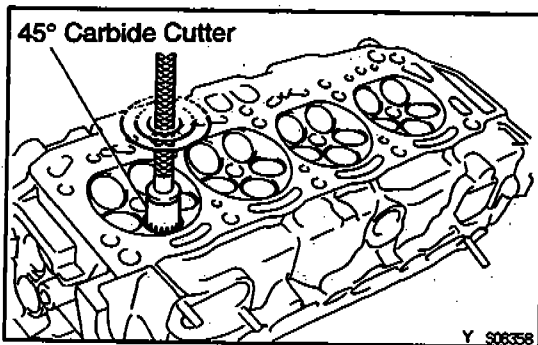
- (d) Check the valve overall length.
Overall length:

Item	Intake	Exhaust
Standard	98.51 mm (3.8783 in.)	108.45 mm (4.2697 in.)
Minimum	97.81 mm (3.8508 in.)	107.75 mm (4.2421 in.)

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

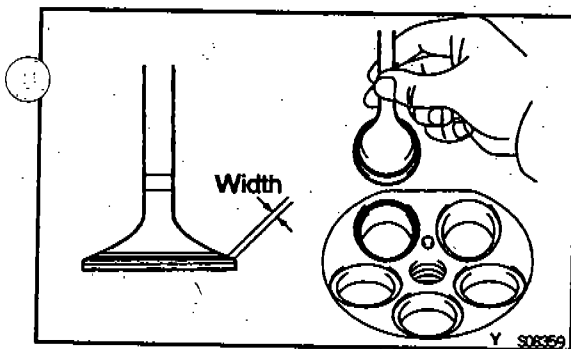


- (e) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.
NOTICE: Do not grind off more than minimum.



12. INSPECT AND CLEAN VALVE SEATS

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

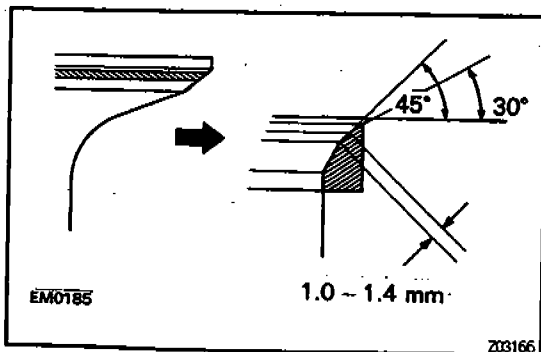


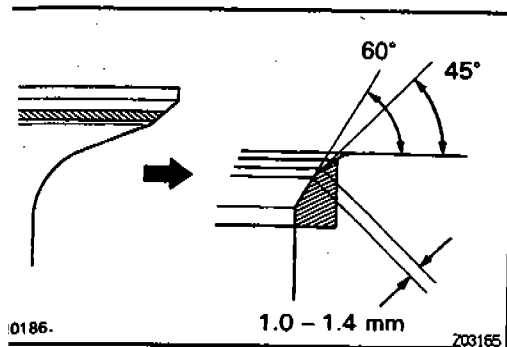
- (b) Check the valve seating position.
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.

- (c) Check the valve face and seat for the following:
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
 - If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
 - Check that the seat contact is in the middle of the valve face with the following width:
1.0 - 1.4 mm (0.039 - 0.055 in.)

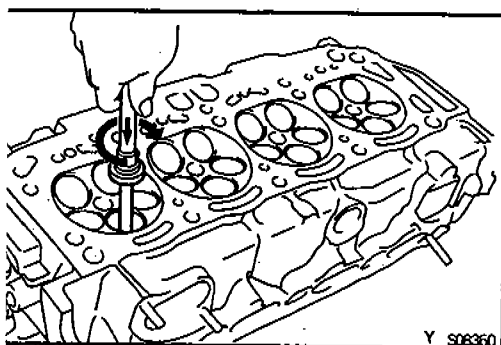
If not, correct the valve seats as follows:

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

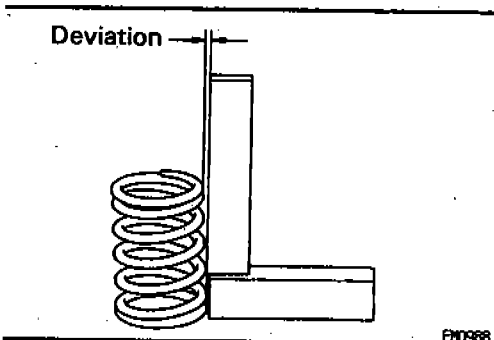




- (2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



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



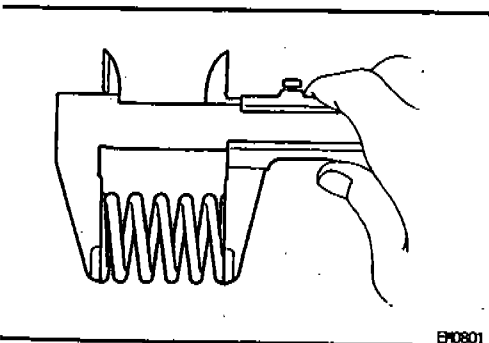
13. INSPECT VALVE SPRINGS

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

Maximum squareness:

2.0 mm (0.079 in.)

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

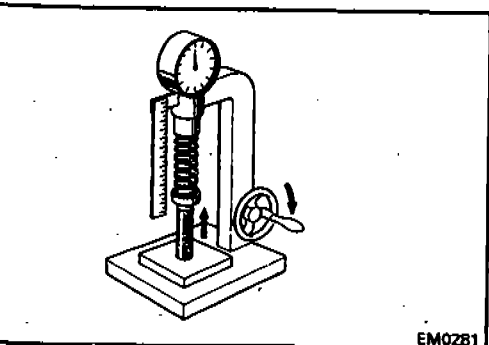


- (b) Using a vernier caliper, measure the free length of the valve spring.

Free length:

48.97 mm (1.9279 in.)

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

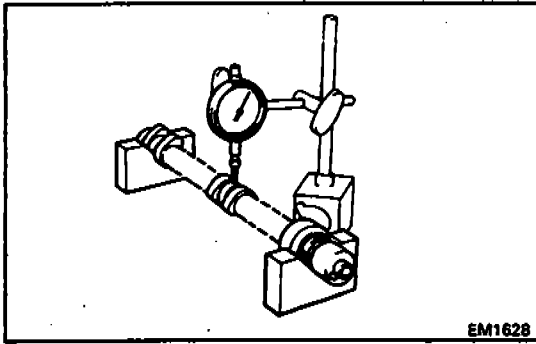


- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension (at 37.7 mm (1.4842 in.)):

149 - 165N (15.2 - 16.8 kgf, 33.5 - 37.0 lbf)

If the installed tension is not as specified, replace the valve spring.

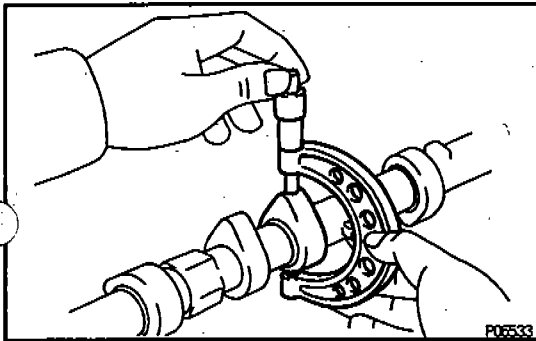
**14. INSPECT CAMSHAFT FOR RUNOUT**

- (a) Place the camshaft on V-blocks.
- (b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.04 mm (0.0016 in.)

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

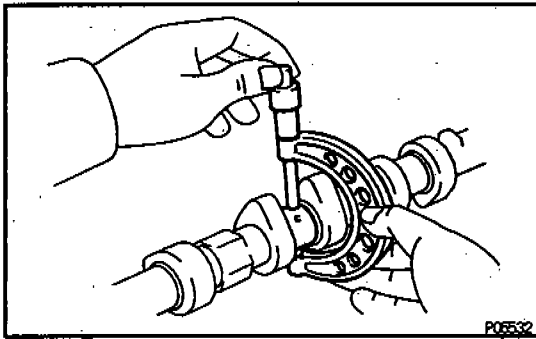
**15. INSPECT CAM LOBES**

Using a micrometer, measure the cam lobe height.

Cam lobe height

Standard	40.28 – 40.38 mm (1.5858 – 1.5898 in.)	40.09 – 40.19 mm (1.5783 – 1.5823 in.)
Minimum	40.13 mm (1.5799 in.)	39.94 mm (1.5724 in.)

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

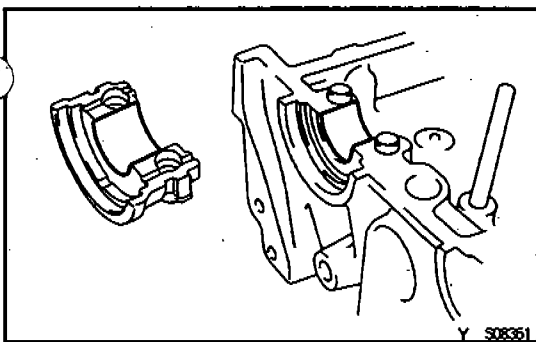
**16. INSPECT CAMSHAFT JOURNALS**

Using a micrometer, measure the journal diameter.

Journal diameter:

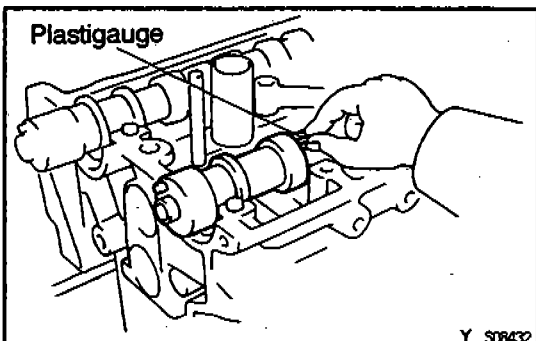
26.949 – 26.965 mm (1.0610 – 1.0616 in.)

If the journal diameter is not as specified, check the clearance.

**17. INSPECT CAMSHAFT BEARINGS**

Check that bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

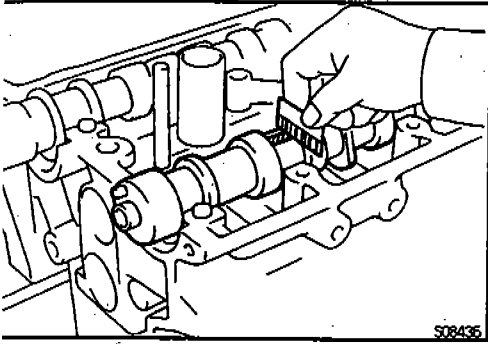
**18. INSPECT CAMSHAFT JOURNAL OIL CLEARANCE**

- (a) Clean the bearing caps and camshaft journals.
- (b) Place the camshaft on the cylinder head.
- (c) Lay a strip of Plastigauge across each of the camshaft journals.
- (d) Install the bearing caps.

(See step 3 in installation)

Torque: 17 N·m (175 kgf·cm, 13 ft·lbf)

NOTICE: Do not turn the camshaft.



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- (e) Remove the bearing caps.
 (f) Measure the Plastigage at its widest point.

Oil clearance:

Standard	0.035–0.072 mm (0.0014–0.0028 in.)
Maximum	0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

- (g) Completely remove the Plastigage.

19. INSPECT CAMSHAFT THRUST CLEARANCE

- (a) Install the camshaft.
 (See step 3 in installation)
 (b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Thrust clearance:

Standard	0.080–0.190 mm (0.0031–0.0075 in.)
Maximum	0.25 mm (0.0098 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

20. INSPECT VALVE LIFTERS AND LIFTER BORES

- (a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter:

23.500 – 23.521 mm (0.9252 – 0.9260 in.)

- (b) Using a micrometer, measure the lifter diameter.

Lifter diameter:

23.475 – 23.485 mm (0.9242 – 0.9246 in.)

- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Oil clearance:

Standard	0.015–0.046 mm (0.0006–0.0018 in.)
Maximum	0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.

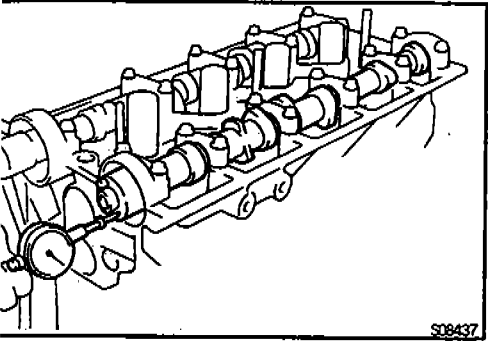
21. INSPECT INTAKE AND EXHAUST MANIFOLDS

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

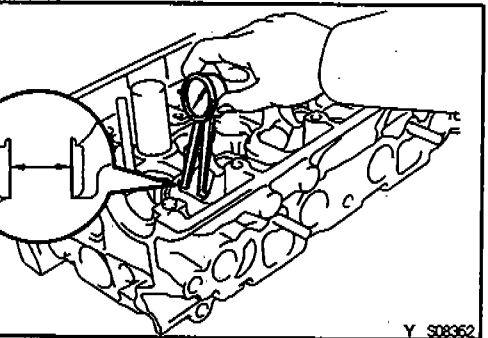
Maximum warpage:

Intake	0.10 mm (0.0039 in.)
Exhaust	0.30 mm (0.0118 in.)

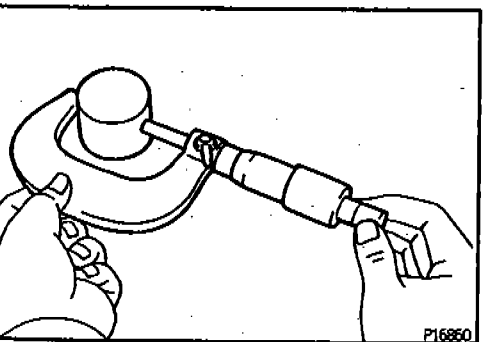
If warpage is greater than maximum, replace the manifold.



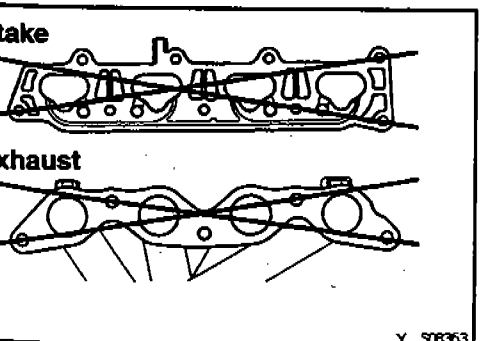
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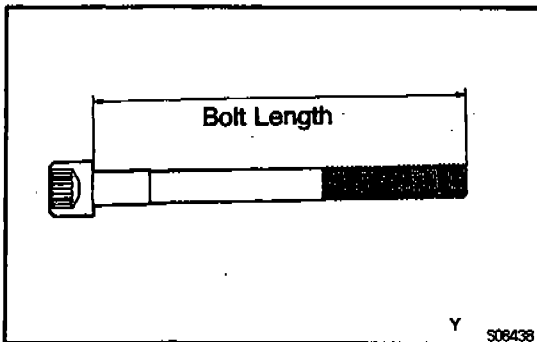
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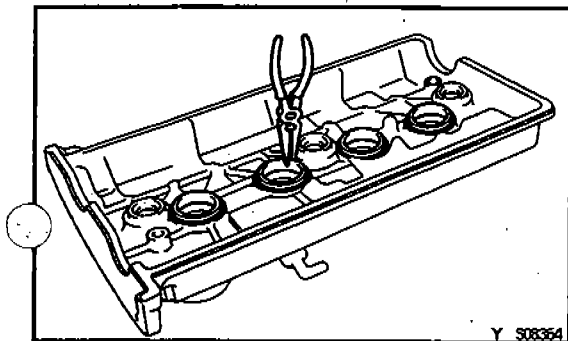
**22. INSPECT CYLINDER HEAD BOLT**

Check the head bolt length.

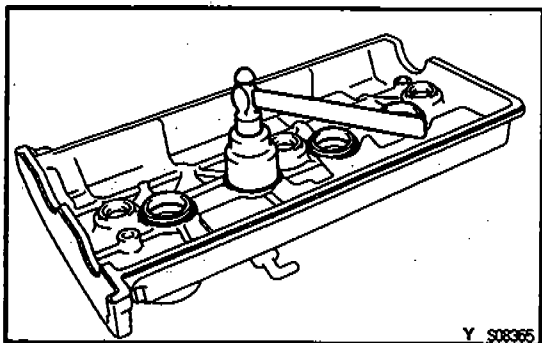
Bolt length:

Standard	114.0 – 115.0 mm (4.4882 – 4.5276 in.)
Maximum	116.5 mm (4.5866 in.)

If length greater than maximum, replace the head bolt.

**23. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKETS**

(a) Using a needle-nose pliers, pry out the tube gasket.

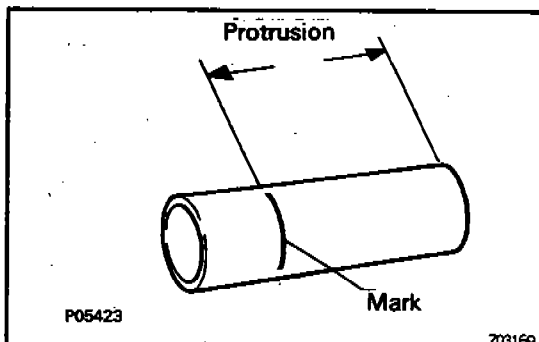


(b) Using a 32 mm socket wrench and a hammer, tap in a new tube gasket as shown in the illustration.

(c) Apply a light coat of MP grease to the gasket lip.

REASSEMBLY**HINT:**

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

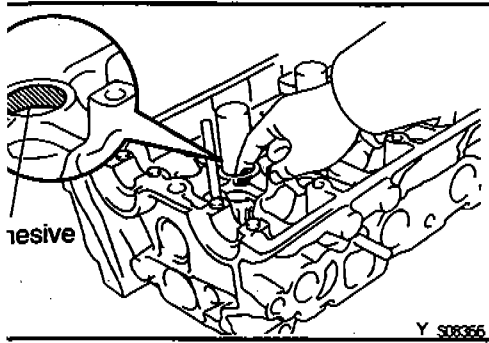
**1. INSTALL SPARK PLUG TUBES**

HINT: When using a new cylinder head, spark plug tubes must be installed.

(a) Mark the standard position away from the edge, onto the spark plug tube.

Standard protrusion:

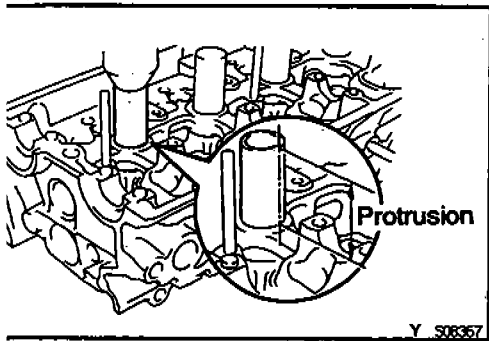
33.1 – 33.9 mm (1.303 – 1.335 in.)



- (b) Apply adhesive to the spark plug tube hole of the cylinder head.

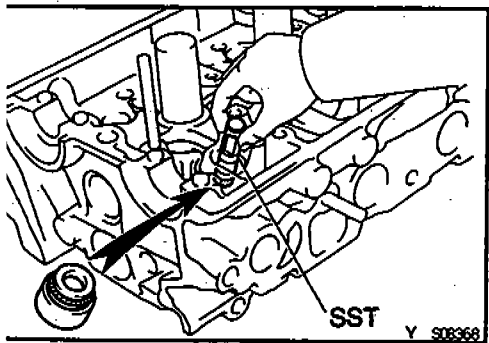
Sealant:

Part No.08833-00070, Adhesive 1324, THREE BOND 1324 or equivalent



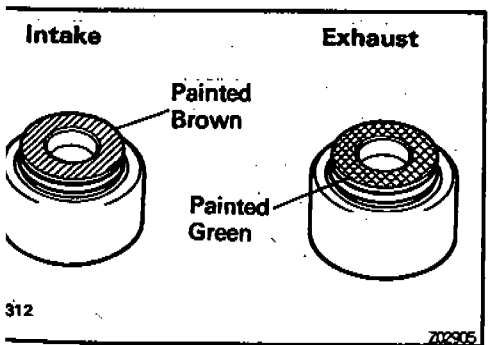
- (c) Using a press, press in a new spark plug tube until there is 33.1 – 33.9 mm (1.303 – 1.335 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.

NOTICE: Avoid pressing a new spark plug tube in too far by measuring the amount of protrusion while pressing.

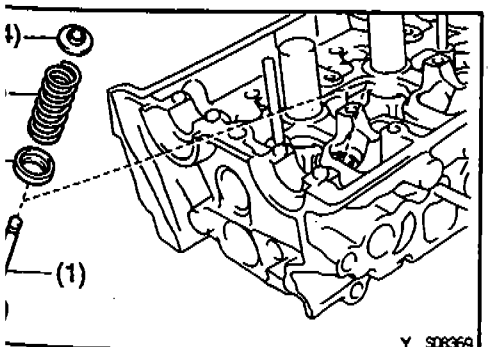


2. INSTALL VALVES

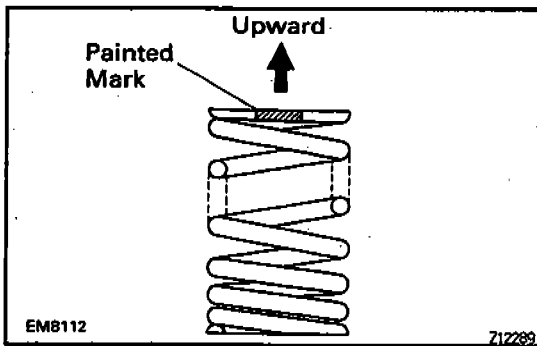
- (a) Using SST, push in a new oil seal.
SST 09201-41020



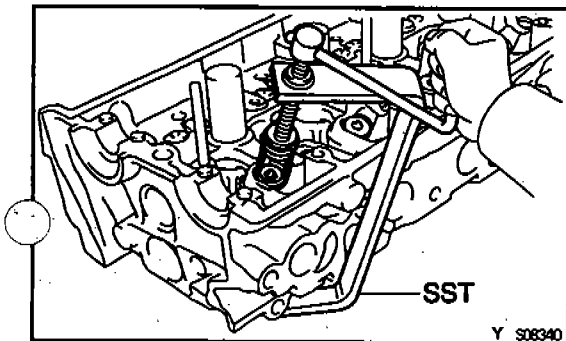
HINT: The intake valve oil seal is gray and the exhaust valve oil seal is green.



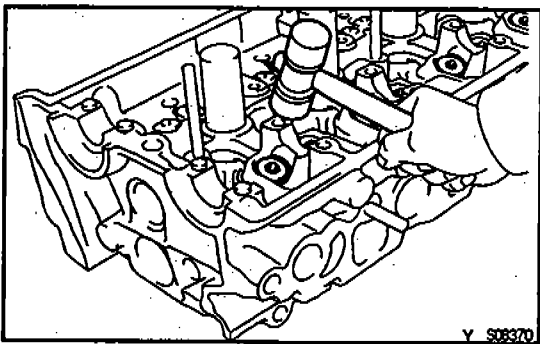
- (b) Install these parts:
- (1) Valve
 - (2) Spring seat
 - (3) Valve spring
 - (4) Spring retainer



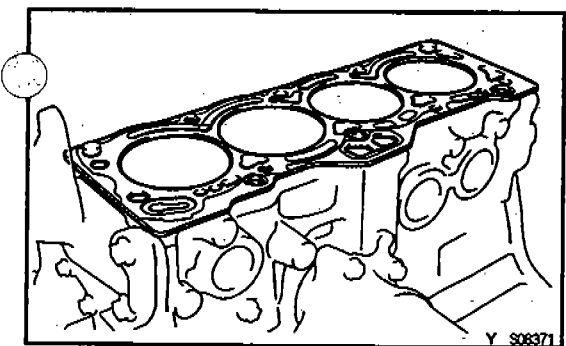
HINT: Install the valve spring, facing the printed mark upward.



- (c) Using SST, compress the valve spring and place the keepers around the valve stem.
SST 09202-70020, 09202-00020

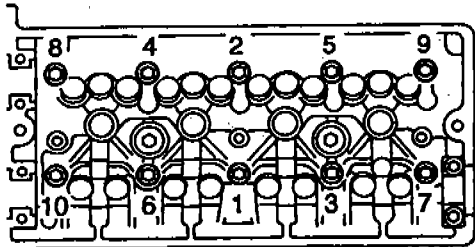
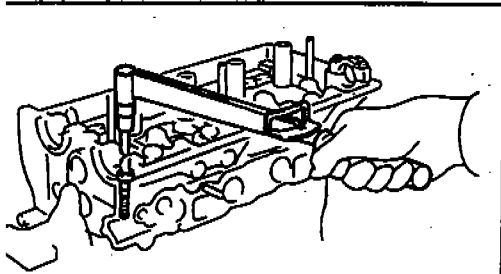


- (d) Using a plastic-faced hammer, lightly tap the valve stem tip to assure proper fit.
- 3. INSTALL VALVE LIFTERS AND SHIMS**
- (a) Install the adjusting shim and valve lifter.
(b) Check that the valve lifter rotates smoothly by hand.



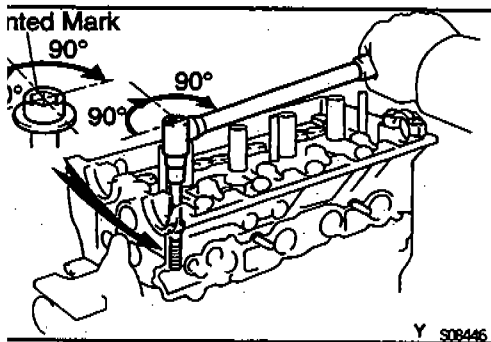
INSTALLATION

- 1. INSTALL CYLINDER HEAD GASKET**
Place a new cylinder head gasket in position on the cylinder block.
- NOTICE:** Be careful of the installation direction.

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2. INSTALL CYLINDER HEAD

HINT:

- The cylinder head bolts are tightened in 3 progressive steps (steps (c), (e) and (f)).
 - If any bolts is broken or deformed, replace it.
- (a) Place the cylinder head in position on the cylinder head gasket.
 - (b) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
 - (c) Install and uniformly tighten the 10 cylinder head bolts, in several passes, in the sequence shown.

Torque: 30 N·m (300 kgf·cm, 22 ft·lbf)

If any one of the bolts does not meet the torque specification, replace the bolt.

- (d) Mark the front of the cylinder head bolt head with paint.
- (e) Retighten the cylinder head bolts 90° in the numerical order shown.
- (f) Retighten cylinder head bolts by an additional 90°.
- (g) Check that the painted mark is now facing rearward.

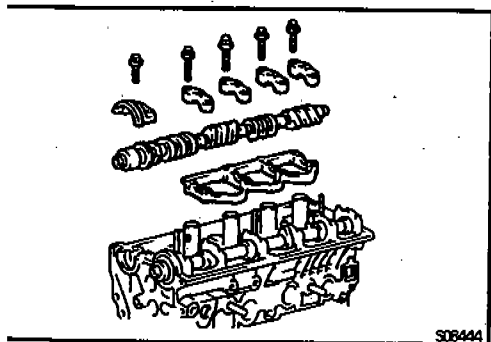
3. INSTALL CAMSHAFTS

- (a) Intake side:
Install the No.5 bearing cap to the cylinder head.
- (b) Place the 2 camshaft on the cylinder head.
HINT: Exhaust camshaft has slit and intake camshaft does not.

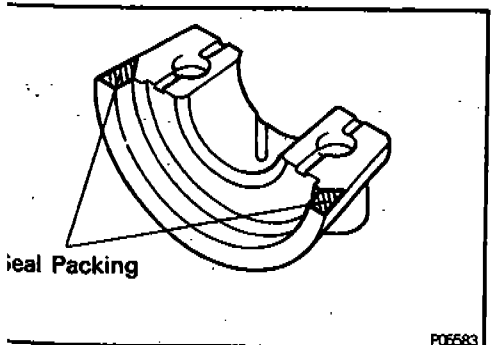
- (c) Remove any old packing (FIPG) material.
- (d) Apply seal packing to the No.1 and No.6 bearing caps as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent

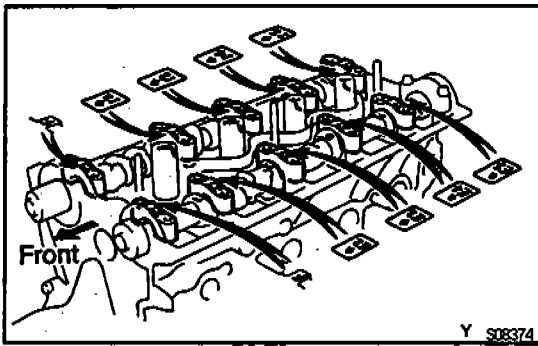


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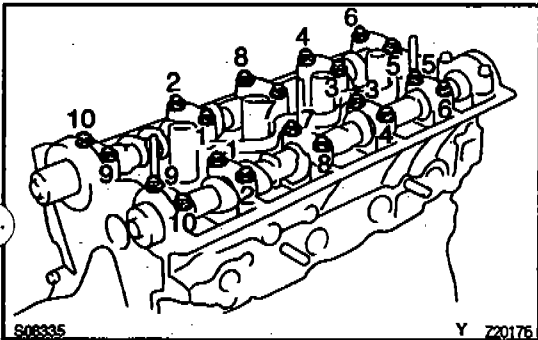


Seal Packing

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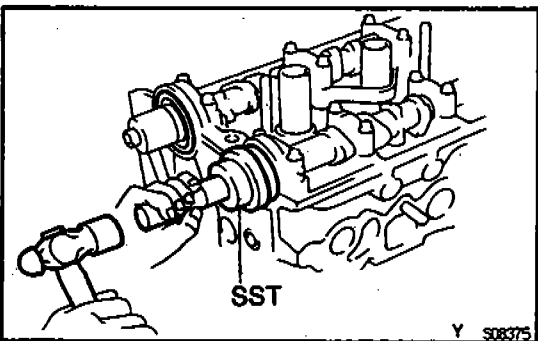
- (e) Install the bearing caps in their proper locations.
HINT: Each bearing cap has a number and front mark.



- (f) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(g) Install and uniformly tighten the 10 bearing cap bolts, several passes, in the sequence shown.

Torque: 17 N·m (175 kgf·cm, 13 ft·lbf)

4. CHECK AND ADJUST VALVE CLEARANCE
(See valve clearance)



5. INSTALL OIL SEAL

- (a) Apply MP grease to a new oil seal lip.
(b) Using SST, tap in the oil seal.

SST 09223-4601 1

NOTICE:

- Do not install the oil seal with the lip facing the wrong direction.
- Insert the oil seal into the deepest part of the cylinder head.

6. INSTALL NO.4 TIMING BELT COVER

Install the No.4 timing belt cover with 3 bolts.

Torque: 9.5 N·m (95 kgf·cm, 82 in.-lbf)

7. INSTALL ENGINE MOUNTING STAY

Torque: 35 N·m (350 kgf·cm, 25 ft·lbf)

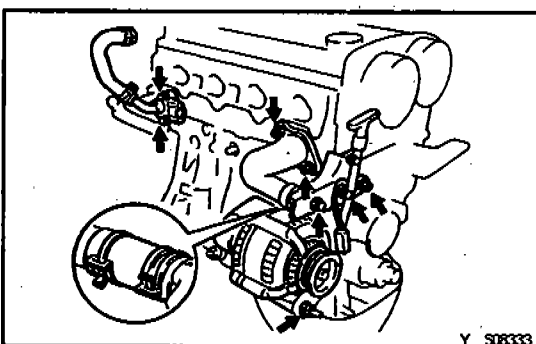
8. INSTALL CAMSHAFT TIMING PULLEYS

(See timing belt)

9. INSTALL CYLINDER HEAD COVER

(See timing belt)

Torque: 8 N·m (80 kgf·cm, 69 in.-lbf)



10. INSTALL ISC VALVE

11. INSTALL NO.2 WATER INLET

- (a) Place a new gasket to the cylinder head, facing the protrusion upward.

- (b) Connect the inlet hose to the water pump.

- (c) Install the No.2 water outlet with the 2 nuts.

Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

12. INSTALL ALTERNATOR ADJUSTING BAR

13. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK

- (a) Install a new O-ring to the dipstick guide.
- (b) Apply soapy water to the O-ring.
- (c) Push in the dipstick guide together with the dipstick, and install them with the bolt and ground strap.

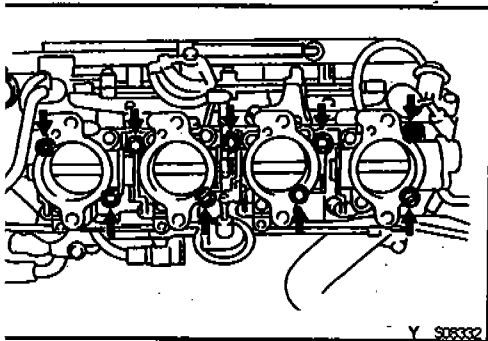
Torque: 9.5 N·m (95 kgf·cm, 82 in.-lbf)

14. INSTALL INTAKE MANIFOLD

- (a) Install a new gasket, the intake manifold with the 7 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 22 N·m (220 kgf·cm, 16 ft-lbf)

- (b) Connect the ISC hose and PCV hose.

**15. INSTALL NO.2 ENGINE HANGER**

- (a) Install the No.2 engine hanger and ground strap with the 2 bolts.

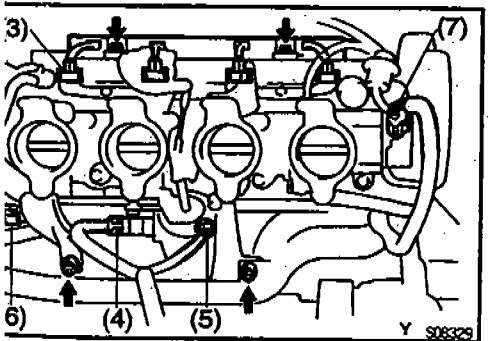
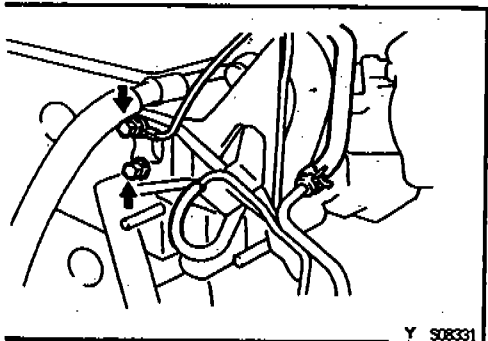
Torque: 22 N·m (220 kgf·cm, 16 ft-lbf)

- (b) Connect the fuel return hose and vacuum hose to the No.2 engine hanger.

16. INSTALL INTAKE MANIFOLD STAYS

Install the manifold stays with the 5 bolts.

Torque: 22 N·m (220 kgf·cm, 16 ft-lbf)

**17. INSTALL ENGINE WIRE PROTECTOR**

- (a) Install the engine wire protectors with the 2 bolts and 2 nuts.

- (b) Connect these connectors and wire:

- Throttle position sensor connector
- Knock sensor connectors
- VSV for EVAP connector
- Injector connectors
- Alternator wire
- Alternator wire connector

18. INSTALL SURGE TANK

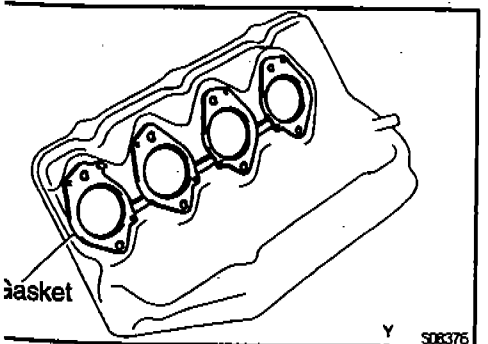
- (a) Install the gasket to the surge tank.
- (b) Install the surge tank to the throttle body.
- (c) Connect the vacuum hose and ISC hose to the surge tank.

- (d) Install the 4 intake pipes with the 8 bolts.

- (e) Install the gasket to the surge tank.

- (f) Install the surge tank cover with the 5 bolts.

- (g) Connect the cord clip to the surge tank cover.



19. INSTALL WATER INLET AND INLET HOUSING

- (a) Install a new gasket, the water inlet and inlet housing assembly with the bolt and 2 nuts.

Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

- (b) Connect the 2 water bypass hoses.
- (c) Install the ground wire with the bolt.
- (d) Connect these connectors:
- Water temperature sender gauge connector
 - Water temperature switch connector
 - Water temperature sensor connector

20. INSTALL OIL SWITCHING VALVE (OSV)

- (a) Install a new O-ring to the OSV.

- (b) Install the OSV with the 2 bolt.

Torque: 9.5 N·m (95 kgf·cm, 82 in·lbf)

21. INSTALL WATER OUTLET

Install a new gasket and the water outlet with the 2 bolts

Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

22. INSTALL EXHAUST MANIFOLD

- (a) Install a new gasket, the exhaust manifold with the 2 bolts and 3 nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 50 N·m (500 kgf·cm, 36 ft·lbf)

- (c) Install the manifold stay with the 2 bolts. Alternately tighten the bolts.

Torque: 45 N·m (450 kgf·cm, 33 ft·lbf)

- (d) Install the upper heat insulator with the 3 bolts.

Torque: 9.5 N·m (95 kgf·cm, 82 in·lbf)

23. INSTALL DISTRIBUTOR**24. INSTALL TIMING BELT**

(See timing belt)

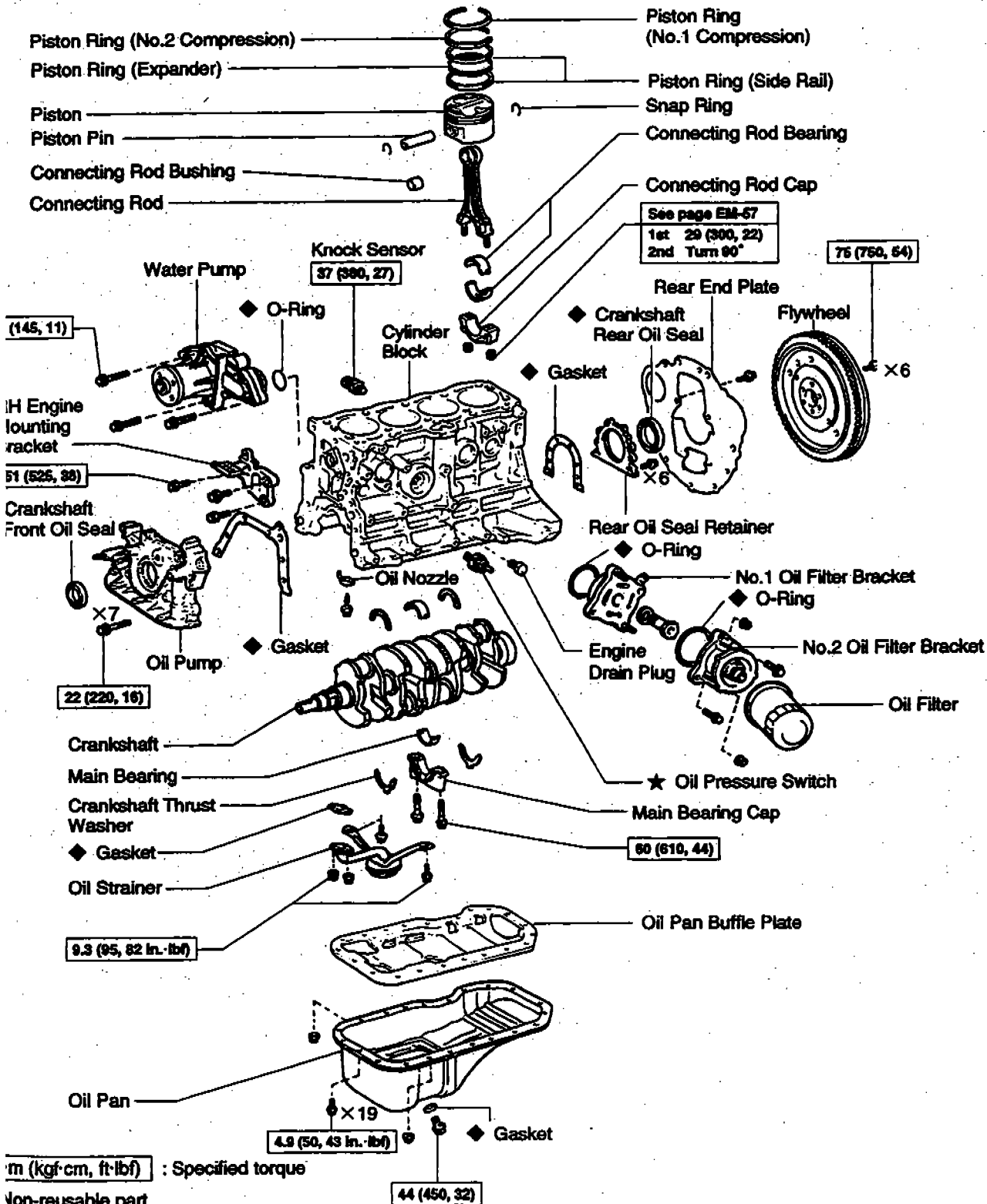
25. ADJUST DRIVE BELT

(See CH section)

26. FILL WITH ENGINE COOLANT

CYLINDER BLOCK COMPONENTS

EX-285-27



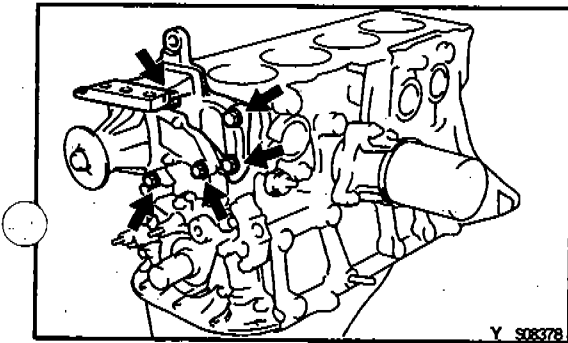
m (kgf-cm, ft-lbf) : Specified torque

Non-reusable part

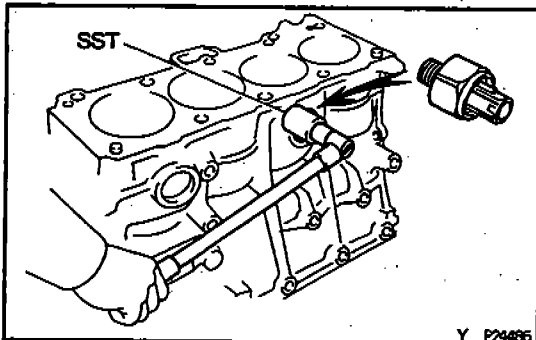
Precoated part

DISASSEMBLY

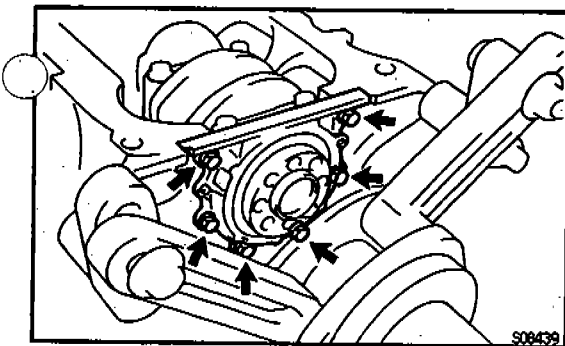
1. **REMOVE FLYWHEEL**
Remove the 6 bolts and flywheel.
2. **REMOVE REAR END PLATE**
Remove the bolt and end plate.
3. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
4. **REMOVE TIMING BELT AND PULLEYS**
(See timing belt)
5. **REMOVE CYLINDER HEAD**
(See cylinder head)
6. **REMOVE ALTERNATOR BRACKET**
Remove the 2 bolts, nut and alternator bracket.
7. **REMOVE RH ENGINE MOUNTING BRACKET**
Remove the 3 bolts and mounting bracket.
8. **REMOVE WATER PUMP**
 - (a) Remove the 2 bolts and water pump.
 - (b) Remove the O-ring.
9. **REMOVE OIL FILTER**
(See LU section)
10. **REMOVE OIL PRESSURE SWITCH**
(See LU section)
11. **REMOVE OIL FILTER BRACKET**
12. **REMOVE KNOCK SENSOR**
Using SST, remove the knock sensor.
SST 09816-30010
13. **REMOVE OIL PAN AND OIL PUMP**
(See LU section)



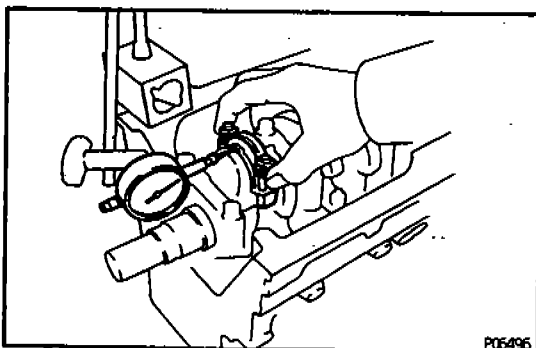
Y 508378



Y P24695



508439

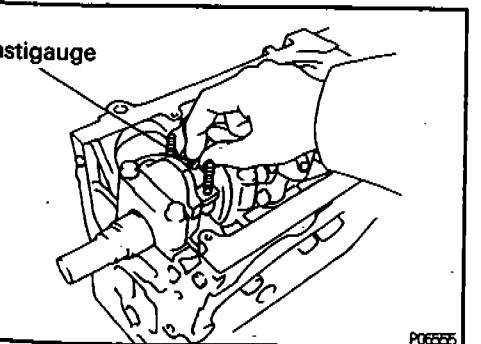
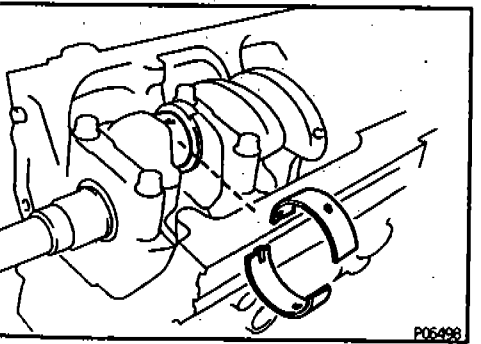
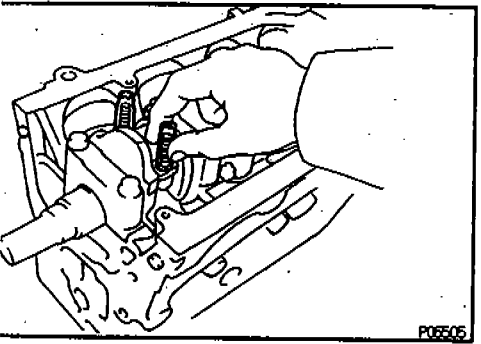
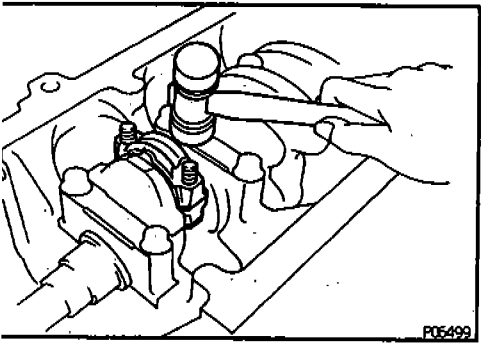
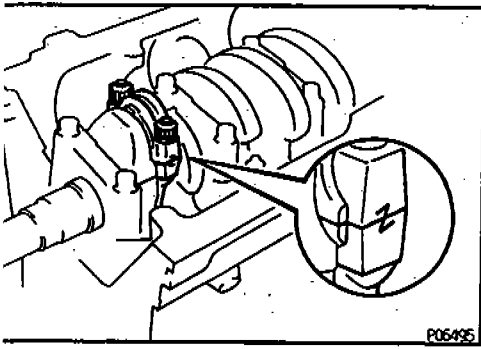


P06495

14. **REMOVE REAR OIL SEAL RETAINER**
Remove the 6 bolts, retainer and gasket.

15. **CHECK CONNECTING ROD THRUST CLEARANCE**
Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.
Thrust clearance:

Standard	0.15-0.25 mm (0.0059 - 0.0098 in.)
Maximum	0.30 mm (0.0118 in.)



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

16. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

- (a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.
- (b) Remove the connecting rod cap nuts.

- (c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.
HINT: Keep the lower bearing inserted with the connecting rod cap.

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

- (e) Clean the crank pin and bearing.
- (f) Check the crank pin and bearing for pitting and scratches. If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.

- (g) Lay a strip of Plastigage across the crank pin.
- (h) Install the connecting rod cap.
(See step 10 and 11 in reassembly)

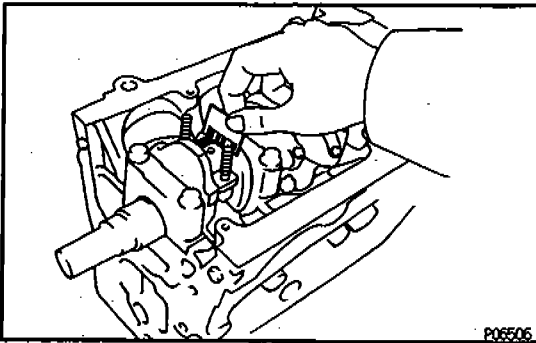
Torque:

1st: 29 N·m (300 kgf·cm, 22 ft·lbf)

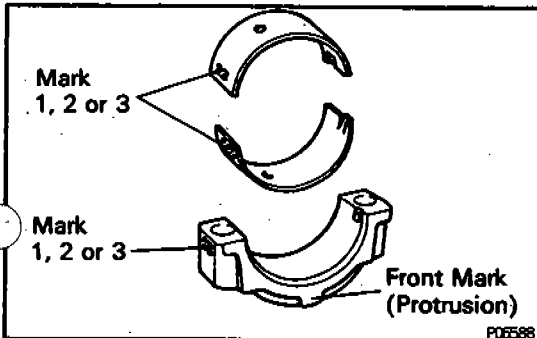
2nd: Turn extra 90°

NOTICE: Do not turn the crankshaft.

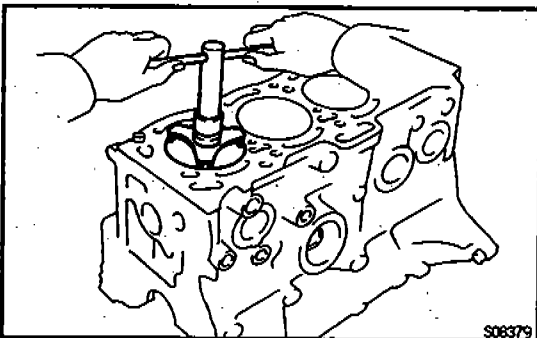
- (i) Remove the connecting rod cap.
(See procedure (b) and (c) previous page)



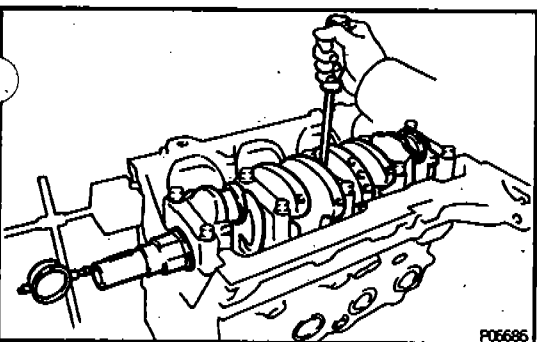
P06506



P06588



S08379



P06696

- (j) Measure the Plastigage at its widest point.
Standard oil clearance:

Item	STD	U/S 0.25
Standard	0.030–0.061 mm (0.0012–0.0024 in.)	0.019–0.073 mm (0.0007–0.0029 in.)
Maximum	0.08 mm (0.0031 in.)	0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.
HINT: If using a standard bearing, replace it with one having the same number marked on the connecting rod cap. There are 3 sizes of standard bearings, marked "1", "2" and "3" accordingly.

Standard sized bearing center wall thickness:

Mark "1"	1.486–1.490 mm (0.0585–0.0587 in.)
Mark "2"	1.490–1.494 mm (0.0587–0.0588 in.)
Mark "3"	1.494–1.498 mm (0.0588–0.0590 in.)

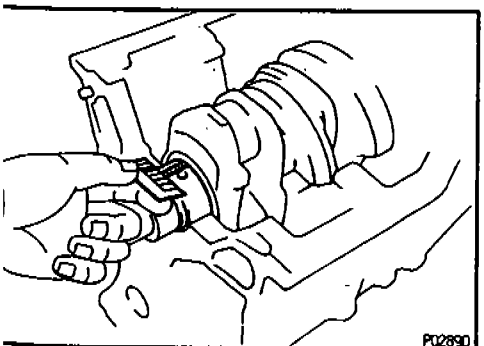
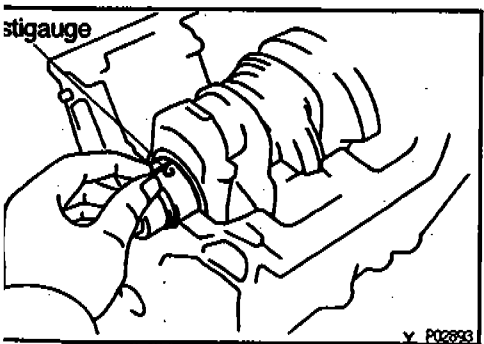
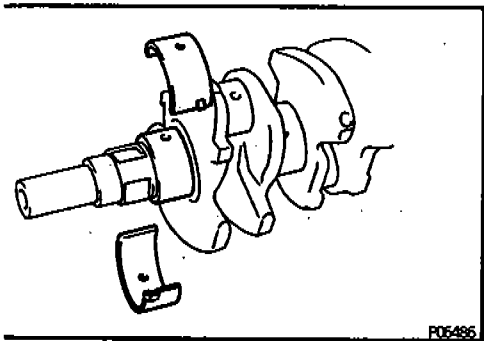
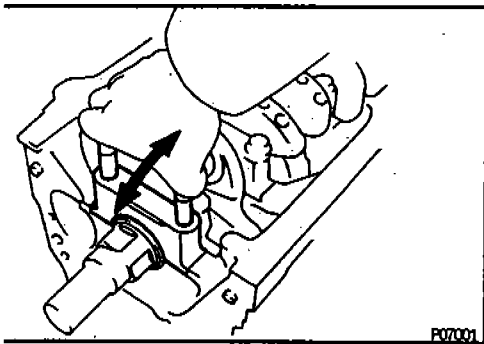
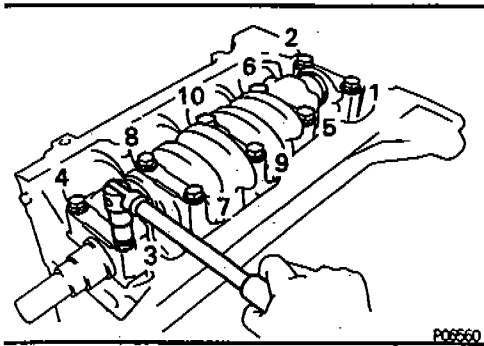
- (k) Completely remove the Plastigage.
- 17. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES**
- Using a ridge reamer, remove all the carbon from the top of the cylinder.
 - Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.
 - Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.
- HINT:
- Keep the bearings, connecting rod and cap together.
 - Arrange the piston and connecting rod assemblies in correct order.
- 18. CHECK CRANKSHAFT THRUST CLEARANCE**
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.
- Thrust clearance:

Standard	0.020–0.220 mm (0.0008–0.0087 in.)
Maximum	0.30 mm (0.0118 in.)

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

Thrust washer thickness:

2.440–2.490 mm (0.0961–0.0980 in.)



19. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

- (a) Uniformly loosen and remove the main bearing cap bolts, in several passes, in the sequence shown.

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

HINT:

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

- (c) Lift out the crankshaft.

HINT: Keep the upper bearings and upper thrust washers together with the cylinder block.

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

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

- (f) Place the crankshaft on the cylinder block.

- (g) Lay a strip of Plastigage across each journal.

- (h) Install the main bearing caps.

(See step 7 in reassembly)

Torque: 60 N-m (610 kgf-cm, 44 ft-lbf)

NOTICE: Do not turn the crankshaft.

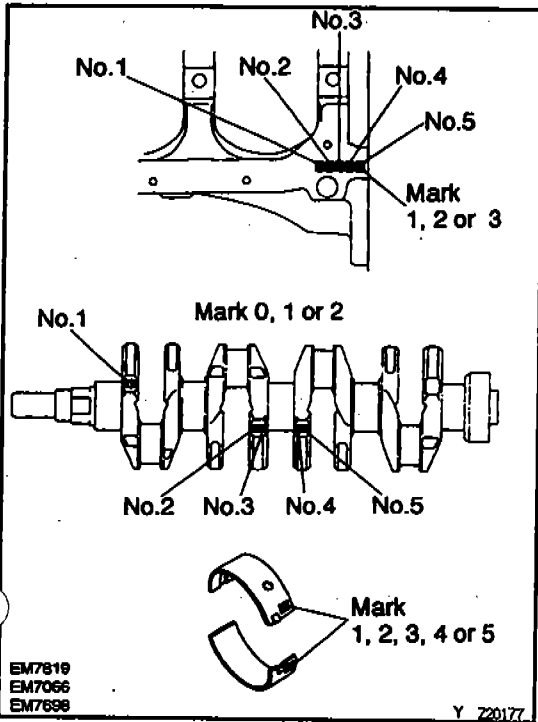
- (i) Remove the main bearing caps.

(See procedure (a) and (b) on the previous page)

- (j) Measure the Plastigage at its widest point.

Clearance:

Item	STD	U/S 0.25
Standard	0.015–0.045 mm (0.0006–0.0018 in.)	0.015–0.053 mm (0.0006–0.0021 in.)
Maximum	0.08 mm (0.0031 in.)	0.08 mm (0.0031 in.)



HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be: 0.015 – 0.045 mm (0.0006 – 0.0018 in.)

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

HINT: If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

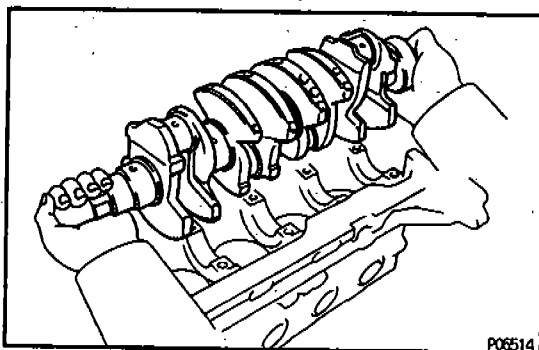
	Number marked								
	1			2			3		
Cylinder block									
Crankshaft	0	1	2	0	1	2	0	1	2
Use bearing	1	2	3	2	3	4	3	4	5

EXAMPLE: Cylinder block "2" + Crankshaft "1"
= Total number 3 (Use bearing "3")

- Reference -

	Mark	mm (in.)
Cylinder block main journal bore diameter	"1"	52.025 – 52.031 (2.0482 – 2.0485)
	"2"	52.031 – 52.037 (2.0485 – 2.0487)
	"3"	52.037 – 52.043 (2.0487 – 2.0489)
Crankshaft journal diameter	"0"	47.994 – 48.000 (1.8895 – 1.8898)
	"1"	47.988 – 47.994 (1.8893 – 1.8895)
	"2"	47.982 – 47.988 (1.8891 – 1.8893)
Standard sized bearing center wall thickness	"1"	2.002 – 2.005 (0.0788 – 0.0789)
	"2"	2.005 – 2.008 (0.0789 – 0.0791)
	"3"	2.008 – 2.011 (0.0791 – 0.0792)
	"4"	2.011 – 2.014 (0.0792 – 0.0793)
	"5"	2.014 – 2.017 (0.0793 – 0.0794)

(k) Completely remove the Plastigage.



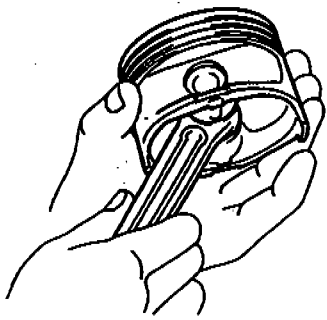
20. REMOVE CRANKSHAFT

- (a) Lift out the crankshaft.
- (b) Remove the upper bearings and upper thrust washers from the cylinder block.

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

21. CHECK FIT BETWEEN PISTON AND PISTON PIN

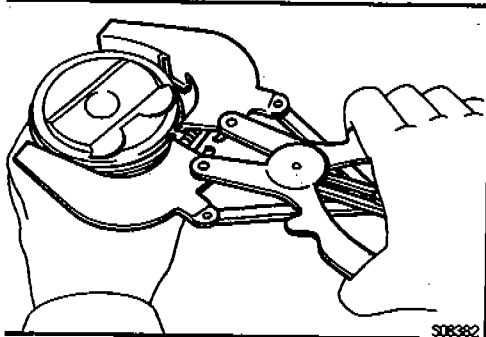
Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as a set.



P24290

22. REMOVE PISTON RINGS

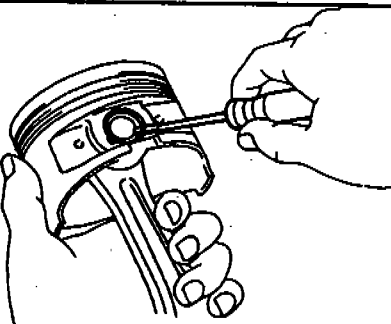
- (a) Using a piston ring expander, remove the 2 compression rings.
 - (b) Remove the 2 side rails and oil ring by hand.
- HINT: Arrange the piston rings in correct order only.



S08382

23. DISCONNECT CONNECTING ROD FROM PISTON

- (a) Using a small screwdriver, pry out the 2 snap rings.
- (b) Gradually heat the piston to approx. 60°C (140°F).

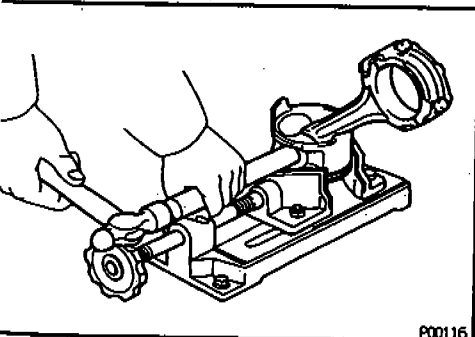


EM7360

- (c) Using a plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

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



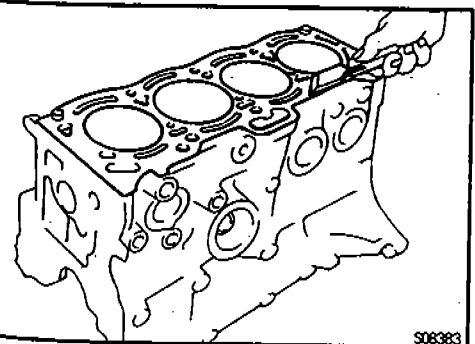
P00116

INSPECTION

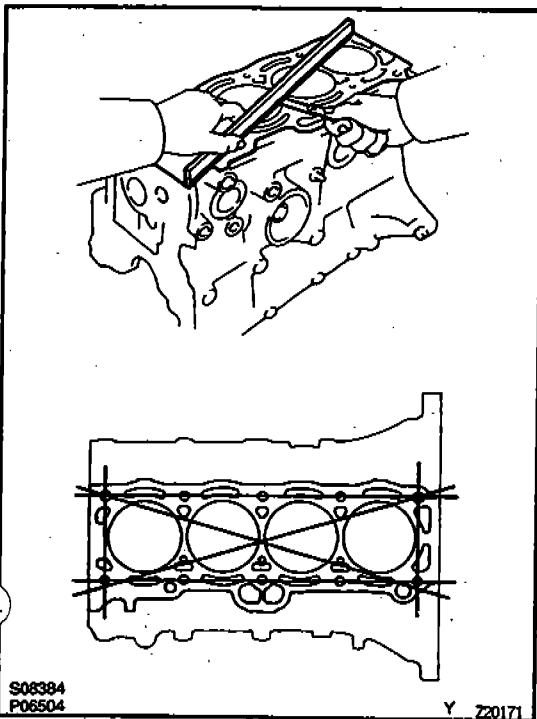
EM008-01

1. CLEAN CYLINDER BLOCK

- (a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
- (b) Using a soft brush and solvent, thoroughly clean the cylinder block.



S08383



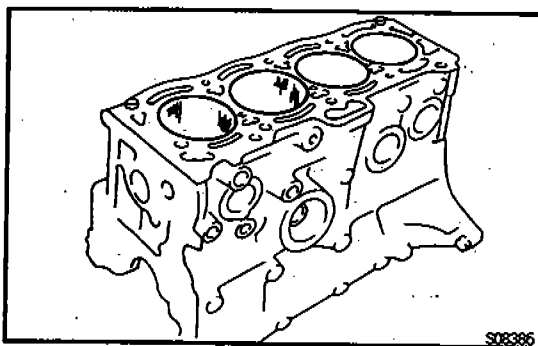
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

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

Maximum warpage:

0.05 mm (0.0020 in.)

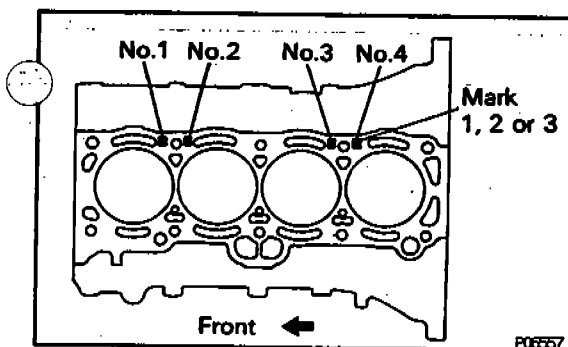
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

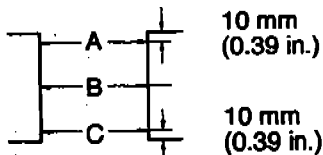
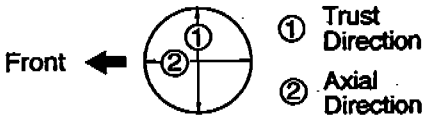
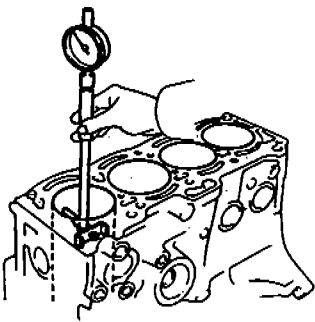
Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the 4 cylinders. If necessary, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

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



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

Standard diameter:

STD Mark "1"	81.000 – 81.010 mm (3.1890 – 3.1894 in.)
STD Mark "2"	81.010 – 81.020 mm (3.1894 – 3.1898 in.)
STD Mark "3"	81.020 – 81.030 mm (3.1898 – 3.1902 in.)

Maximum diameter:

STD	81.23 mm (3.1980 in.)
O/S 0.50	81.73 mm (3.2177 in.)

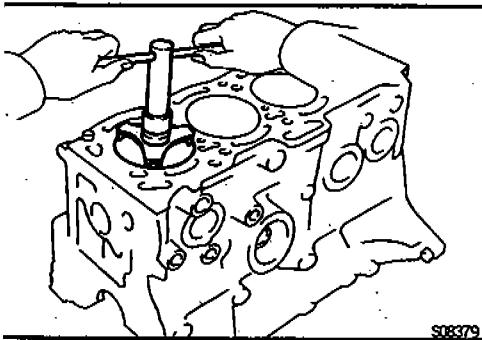
If the diameter is greater than maximum, rebore all the 4 cylinders. If necessary, replace the cylinder block.

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5. REMOVE CYLINDER RIDGE

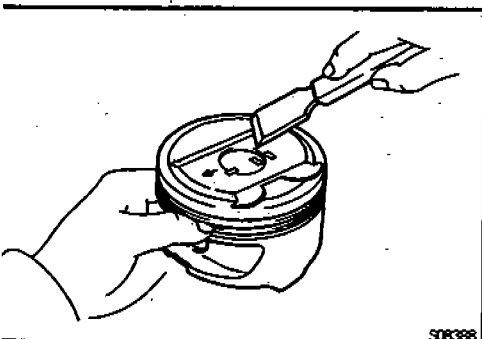
If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



S08379

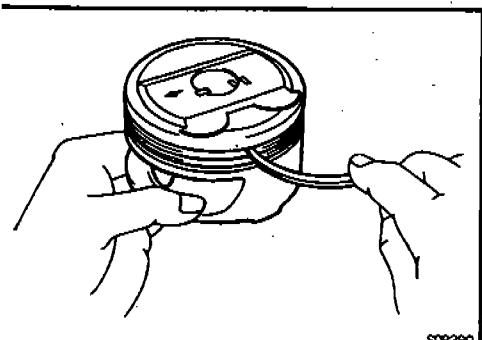
6. CLEAN PISTON

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

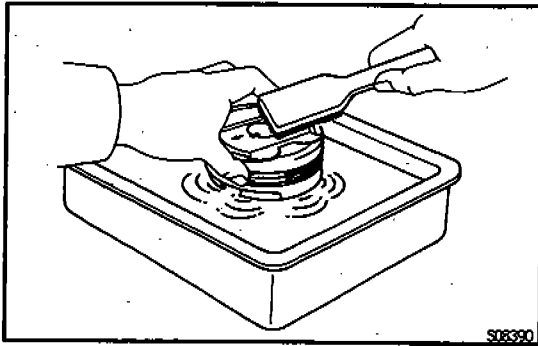


S08388

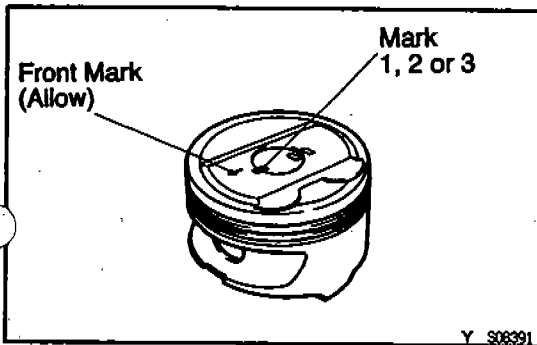
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



S08389

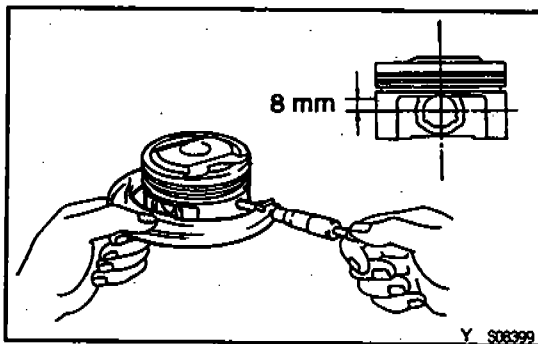


- (c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



7. INSPECT PISTON OIL CLEARANCE

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



- (a) Using a micrometer, measure the piston diameter at right angles to the piston head, 8.0 mm (0.315 in.) from the piston pin center line.

Piston diameter:

STD Mark "1"	80.895 - 80.905 mm (3.1849 - 3.1852 in.)
STD Mark "2"	80.905 - 80.915 mm (3.1852 - 3.1856 in.)
STD Mark "3"	80.915 - 80.925 mm (3.1856 - 3.1860 in.)
O/S 0.50	81.500 - 81.530 mm (3.2087 - 3.2098 in.)

- (b) Measure the cylinder bore diameter in the thrust directions. (See step 4)

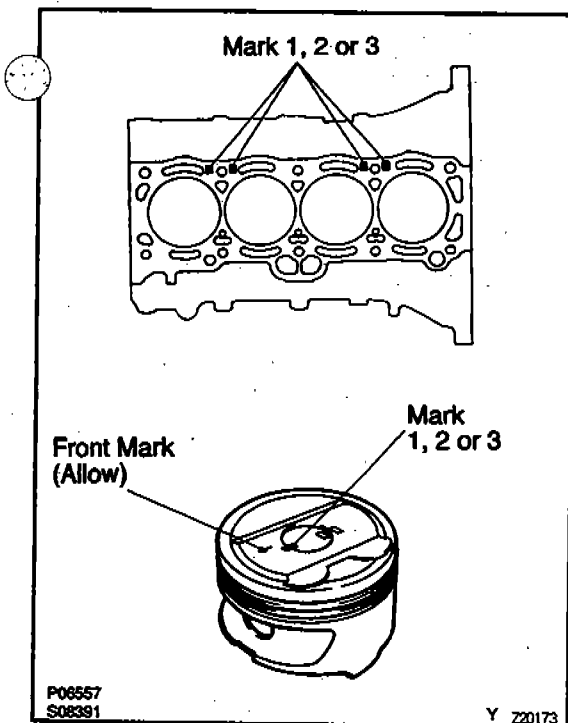
- (c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

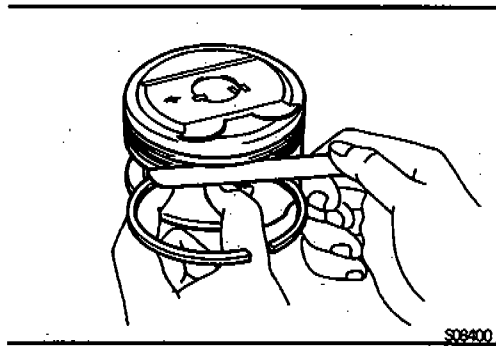
Oil clearance:

Standard	0.095 - 0.115 mm (0.0037 - 0.0045 in.)
Maximum	0.13 mm (0.0051 in.)

If the oil clearance is greater than maximum, replace the 4 pistons and rebores all the 4 cylinders. If necessary, replace the cylinder block.

HINT (Use new cylinder block): Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.





S09400

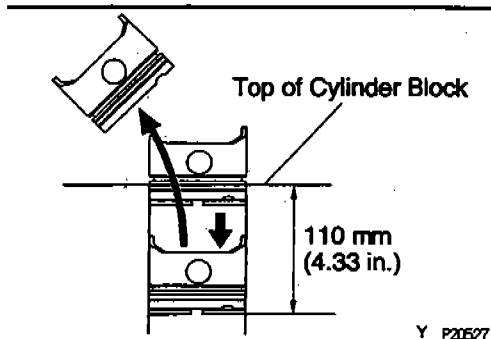
8. INSPECT PISTON RING GROOVE CLEARANCE

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

Ring groove clearance:

No.1	0.040-0.080 mm (0.0016-0.0031 in.)
No.2	0.030-0.070 mm (0.0012-0.0028 in.)
OIL	
Teikoku made	0.020-0.160 mm (0.0008-0.0063 in.)
Riken made	0.030-0.110 mm (0.0012-0.0043 in.)

If the clearance is greater than maximum, replace the piston.



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9. INSPECT PISTON RING END GAP

- Insert the piston ring into the cylinder bore.
- Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.
- Using a thickness gauge, measure the end gap.

Standard end gap:

	Riken made mm (in.)	Teikoku made mm (in.)
No.1	0.250-0.350 (0.0098-0.0138)	0.280-0.350 (0.0110-0.0138)
No.2	0.350-0.500 (0.0138-0.0197)	0.350-0.450 (0.0138-0.0177)
Oil (Side rail)	0.100-0.350 (0.0039-0.0138)	0.150-0.400 (0.0059-0.0157)

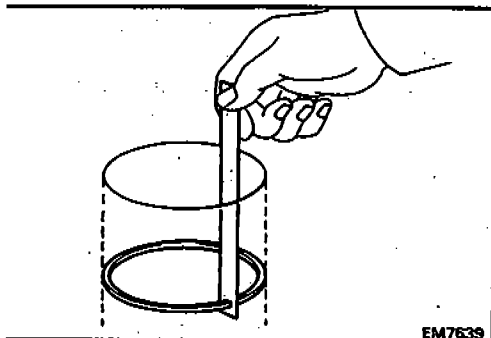
Maximum end gap:

No.1	0.95 mm (0.0374 in.)
No.2	1.05 mm (0.0413 in.)
Oil (Side rail)	1.00 mm (0.0394 in.)

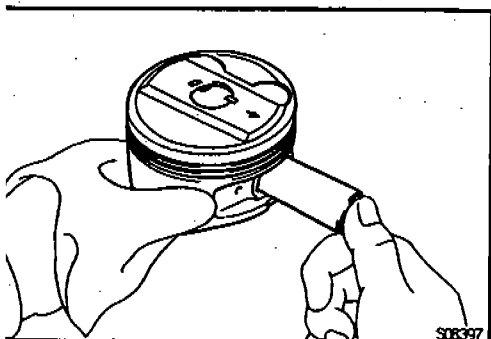
If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the 4 cylinders or replace the cylinder block.

10. INSPECT PISTON PIN FIT

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



EM7639



S08397

11. INSPECT CONNECTING ROD ALIGNMENT

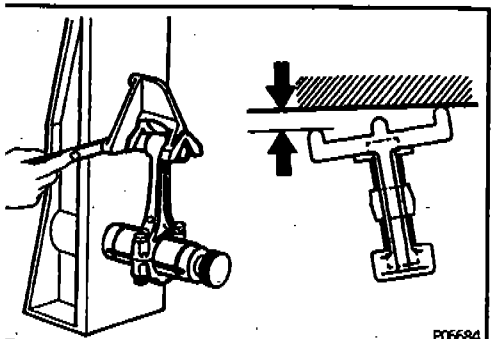
Using a rod aligner and thickness gauge, check the connecting rod alignment.

- Check for out-of-alignment.

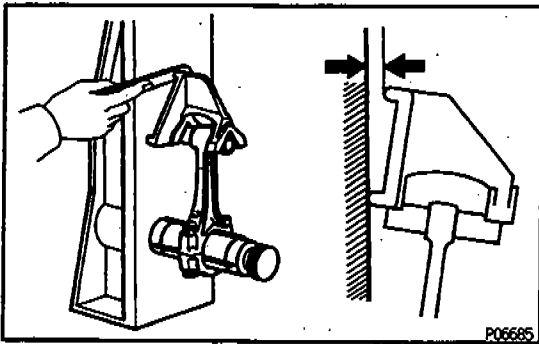
Maximum out-of-alignment:

0.03 mm (0.0012 in.) per 100 mm (3.94 in.)

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



P06694

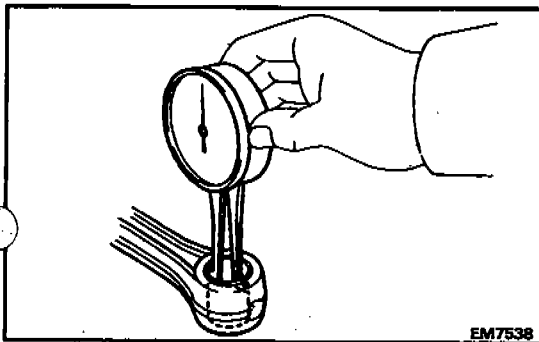


- Check for twist

Maximum twist:

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

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

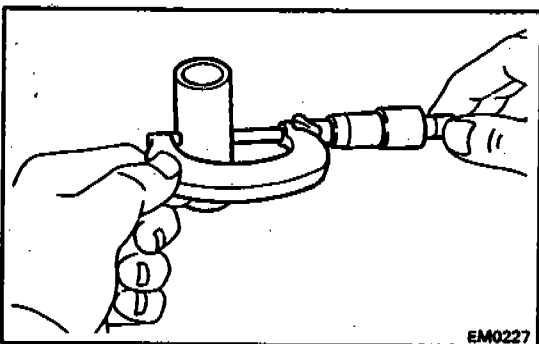


12. INSPECT PISTON PIN OIL CLEARANCE

- (a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

20.010 - 20.022 mm (0.7878 - 0.7883 in.)



- (b) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:

20.004 - 20.016 mm (0.7876 - 0.7880 in.)

- (c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Oil clearance:

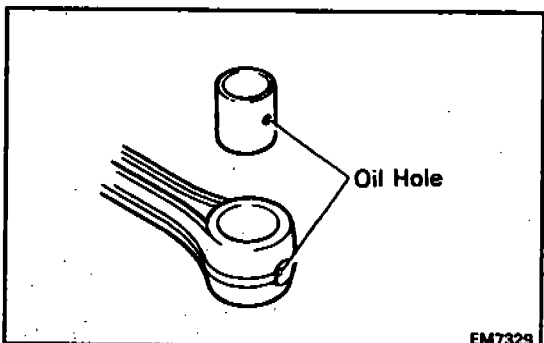
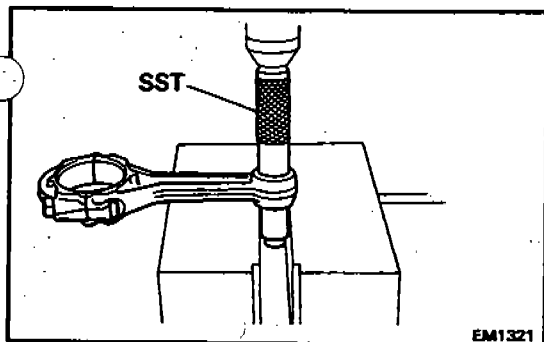
Standard	0.004 - 0.008 mm (0.0002 - 0.0003 in.)
Maximum	0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.

13. IF NECESSARY, REPLACE CONNECTING ROD BUSHING

- (a) Using SST and a press, press out the bushing.

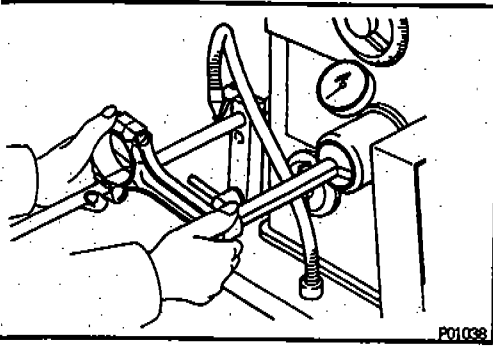
SST 09222-30010



- (b) Align the oil holes of a new bushing and the connecting rod.

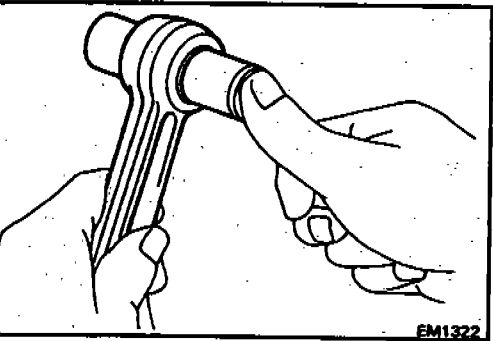
- (c) Using SST and a press, press in the bushing.

SST 09222-30010



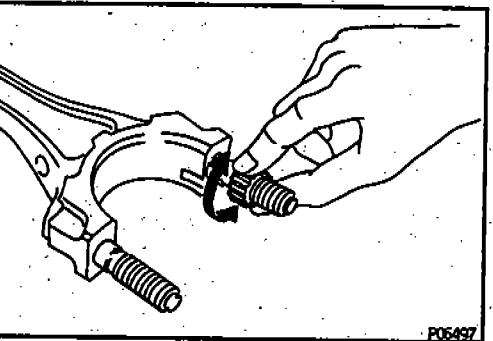
P01038

- (d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step 12 above) between the bushing and piston pin.



EM1322

- (e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



P06497

14. INSPECT CONNECTING ROD BOLTS

- (a) Install the cap nut to the connecting rod bolt. Check that the cap nut can be turned easily by hand to the end of the thread.
- (b) If the cap nut cannot be turned easily, measure the outside diameter of the connecting rod bolt with a vernier caliper.

Outside diameter:

Standard	7.900 - 8.000 mm (0.3110 - 0.3150 in.)
Minimum	7.85 mm (0.3091 in.)

HINT: If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration:

If the outside diameter is less than minimum, replace the connecting rod bolt and nut as a set.

15. CYLINDER BORING

HINT:

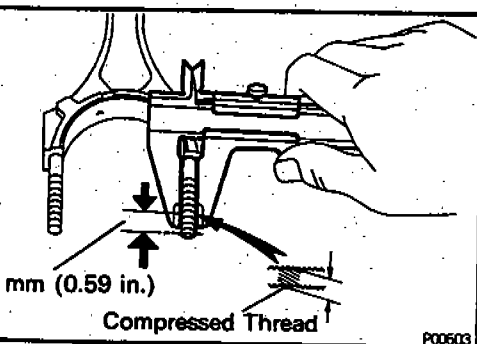
- Bore all the four cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

A. Keep oversized pistons

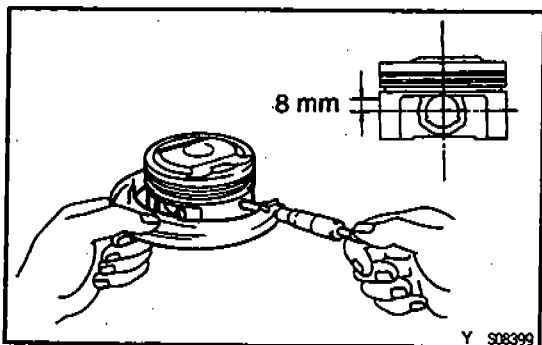
Oversized piston diameter:

O/S 0.50

81.405 - 81.435 mm (3.2049 - 3.2061 in.)



P00503



- B. Calculate amount to bore cylinders**
 (a) Using a micrometer, measure the piston diameter at right angles to the piston head, 8.0 mm (0.315 in.) from the piston pin center line.

- (b) Calculate the amount of each cylinder is to be rebored as follows:

Size to be rebored = P + C - H

P = Piston diameter

C = Piston oil clearance

0.095 - 0.115 mm (0.0037 - 0.0045 in.)

H = Allowance for honing

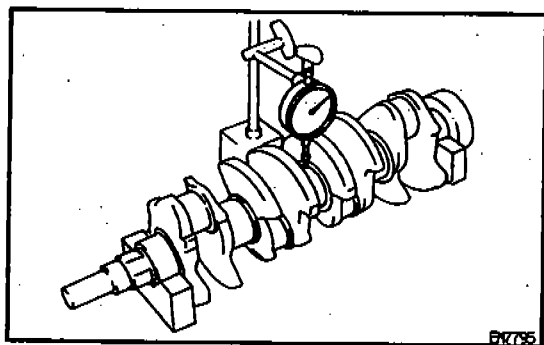
0.02 mm (0.0008 in.) or less

- C. Bore and hone cylinder to calculated dimensions**

Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.



16. INSPECT CRANKSHAFT FOR RUNOUT

- (a) Place the crankshaft on V-blocks.
 (b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.03 mm (0.0012 in.)

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

17. INSPECT MAIN JOURNALS AND CRANK PINS

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

Main journal diameter:

STD size	47.982 - 48.010 mm (1.8891 - 1.8898 in.)
US 0.25	47.745 - 47.755 mm (1.8797 - 1.8801 in.)

Crank pin diameter:

STD size	41.985 - 42.000 mm (1.6530 - 1.6535 in.)
US 0.25	41.735 - 41.750 mm (1.6431 - 1.6437 in.)

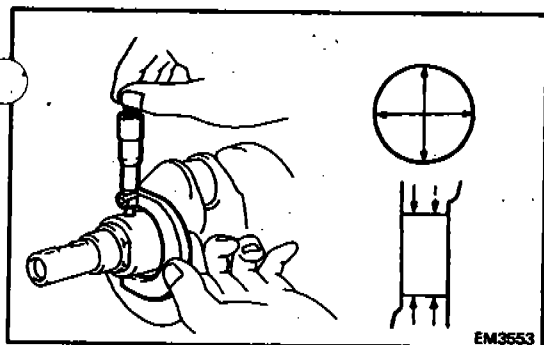
If the diameter is not as specified, check the oil clearance (See step 16 and 19 in disassembly). If necessary, grind or replace the crankshaft.

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

Maximum taper and out-of-round:

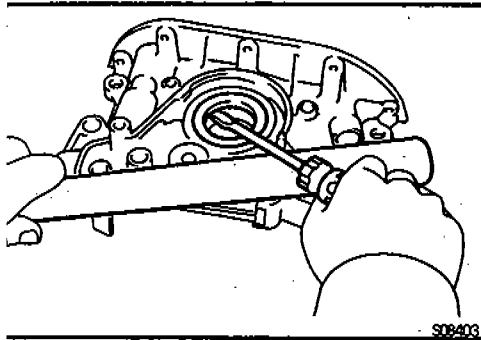
0.005 mm (0.0002 in.)

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



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

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure in step 17). Install new main journal and/or crankshaft pin undersized bearings.



19. REPLACE CRANKSHAFT FRONT OIL SEAL

HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:

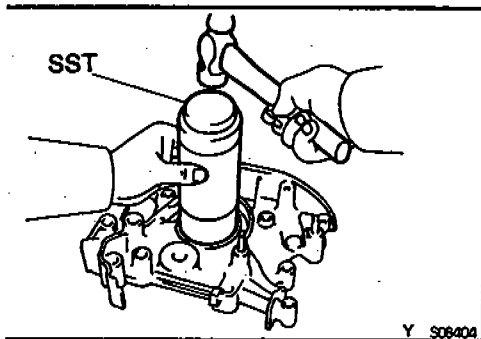
A. If oil pump is removed from cylinder block:

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

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

SST 09636-20010

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

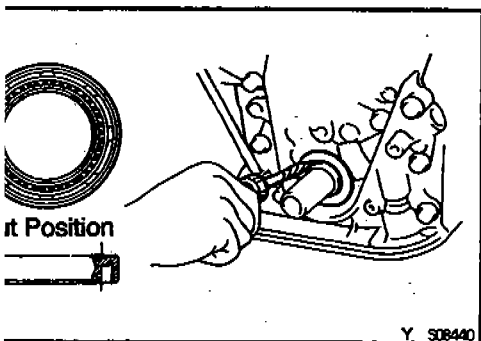


B. If oil pump is installed to the cylinder block:

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

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

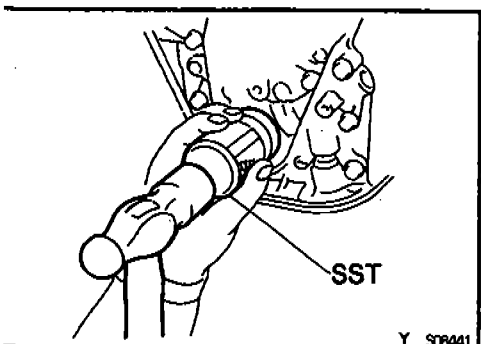
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.

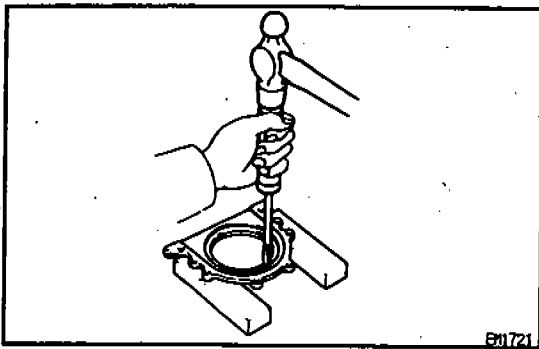


- (c) Apply MP grease to a new oil seal lip.

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

SST 09636-20010





P11721

20. REPLACE CRANKSHAFT REAR OIL SEAL

HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:

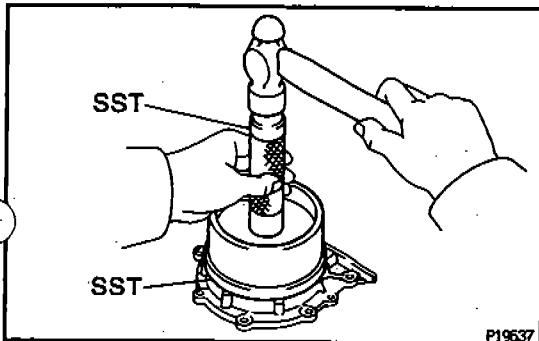
A. If rear oil seal retainer is removed from cylinder block:

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

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

SST 09223-15030, 09950-70010 (09951-07150)

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



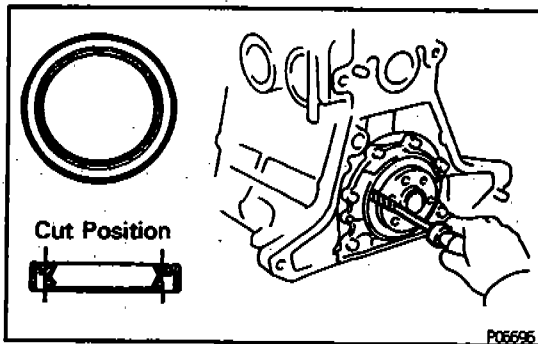
P19637

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

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

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

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

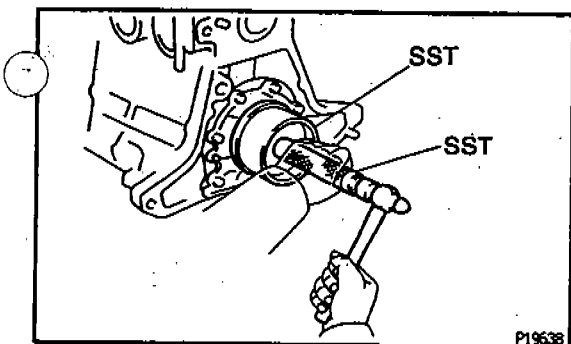


P06696

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

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

SST 09223-15030, 09950-70010 (09951-07150)

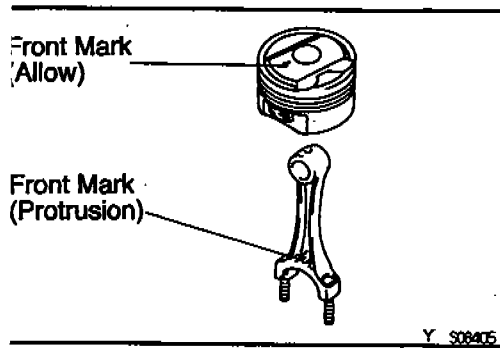


P19638

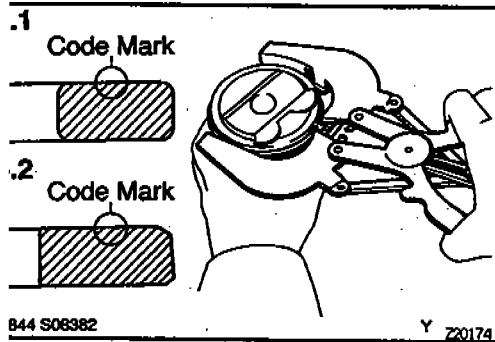
REASSEMBLY

HINT:

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



1. **ASSEMBLE PISTON AND CONNECTING ROD**
 - (a) Install a new snap ring on one side of the piston pin hole.
 - (b) Gradually heat the piston to 80–90°C (176–194°F).
 - (c) Coat the piston pin with engine oil.
 - (d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.
 - (e) Install a new snap ring on the other side of the piston pin hole.

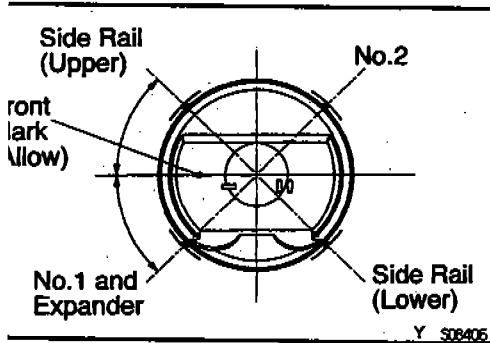


2. **INSTALL PISTON RINGS**
 - (a) Install the oil ring expander and 2 side rails by hand.
 - (b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

Code mark:

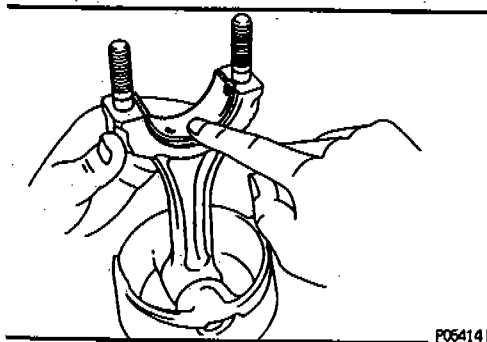
No.1: T or 1R

No.2: 2T or 2R

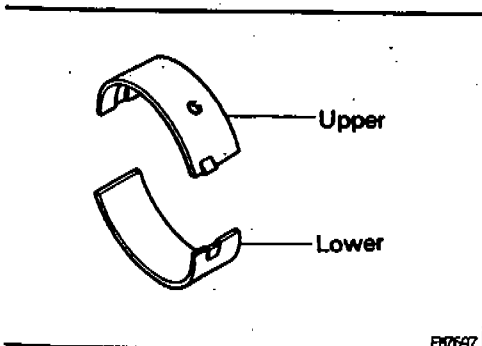


- (c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.

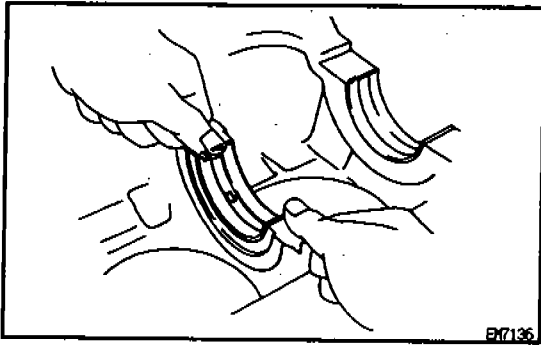


3. **INSTALL BEARINGS**
 - (a) Align the bearing claw with the groove of the connecting rod or connecting rod cap.
 - (b) Install the bearings in the connecting rod and connecting rod cap.

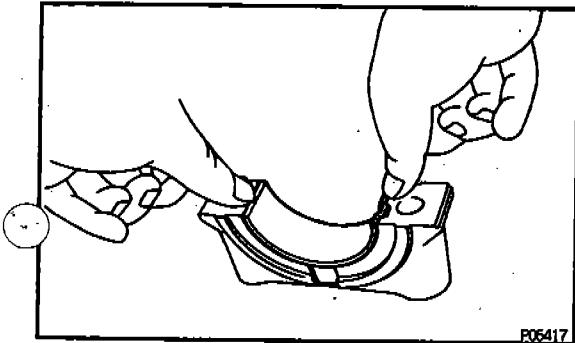


4. **INSTALL MAIN BEARINGS**

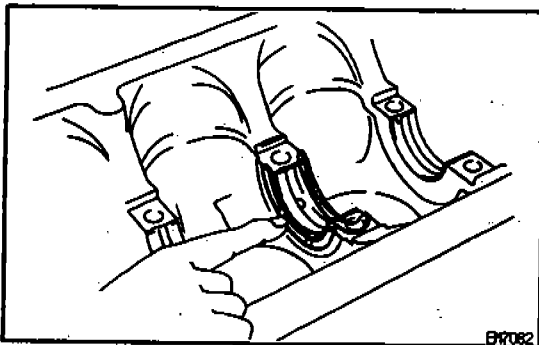
HINT: Upper bearings have an oil groove and oil holes; lower bearings do not.



- (a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.



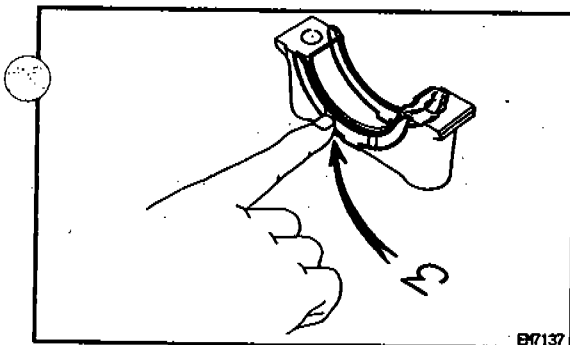
- (b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.



5. INSTALL UPPER THRUST WASHERS

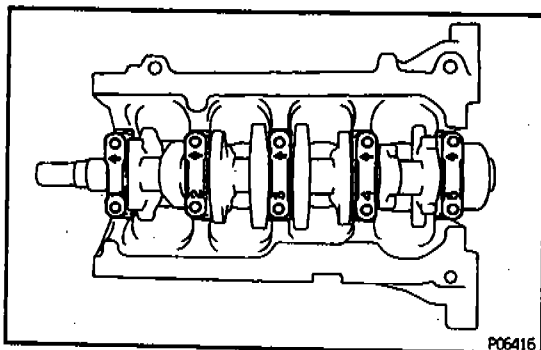
Install the 2 thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.

6. PLACE CRANKSHAFT ON CYLINDER BLOCK

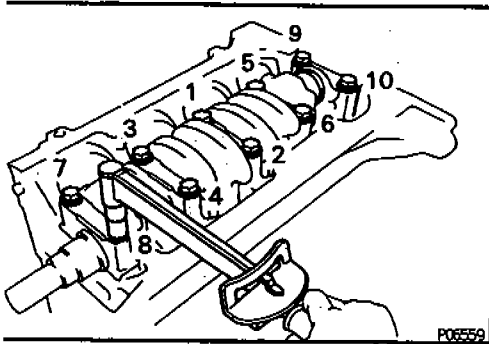


7. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

- (a) Install the 2 thrust washers on the No.3 bearing cap with the grooves facing outward.

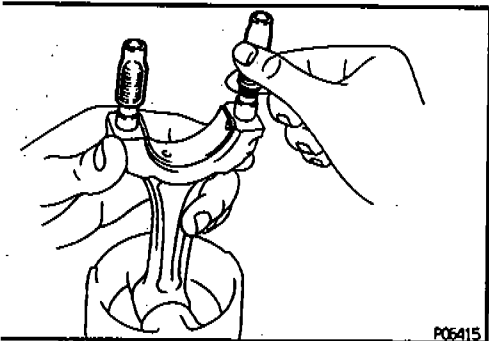


- (b) Install the 5 main bearing caps in their proper locations. HINT: Each bearing cap has a number and front mark.



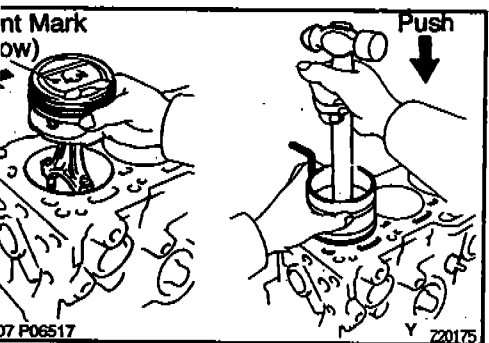
- (c) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.
- (d) Install and uniformly tighten the 10 bolts of the main bearing caps, in several passes, in the sequence shown.
Torque: 60 N-m (610 kgf-cm, 44 ft-lbf)
- (e) Check that the crankshaft turns smoothly.

8. CHECK CRANKSHAFT THRUST CLEARANCE (See step 18 in disassembly)

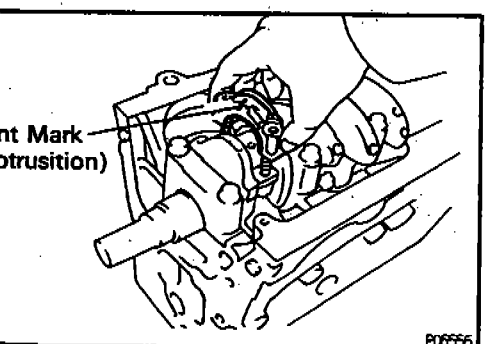


9. INSTALL PISTON AND CONNECTING ROD ASSEMBLES

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



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



10. PLACE CONNECTING ROD CAP ON CONNECTING ROD

- (a) Match the numbered connecting rod cap with the connecting rod.
- (b) Install the connecting rod cap with the front mark facing forward.

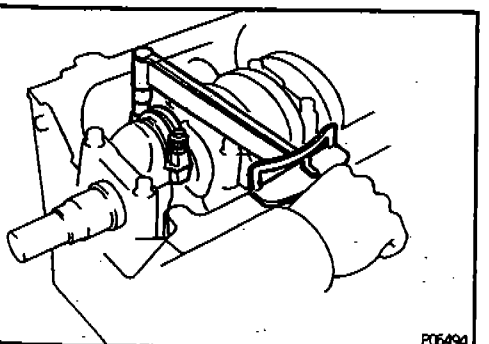
11. INSTALL CONNECTING ROD CAP NUTS

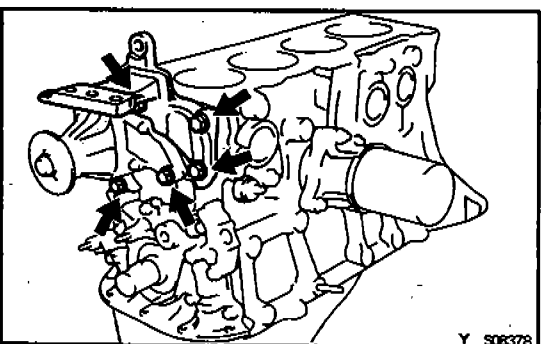
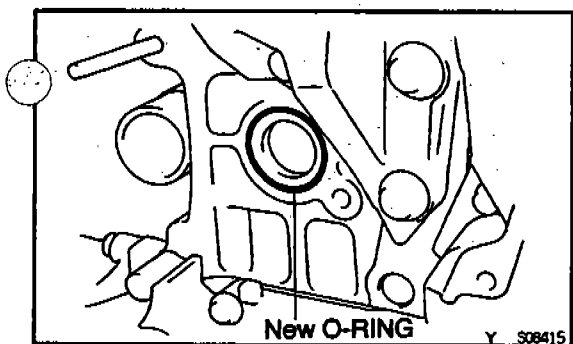
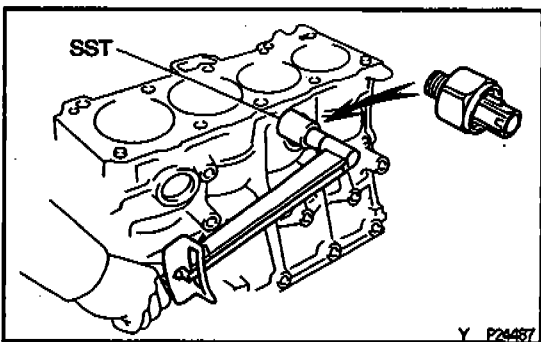
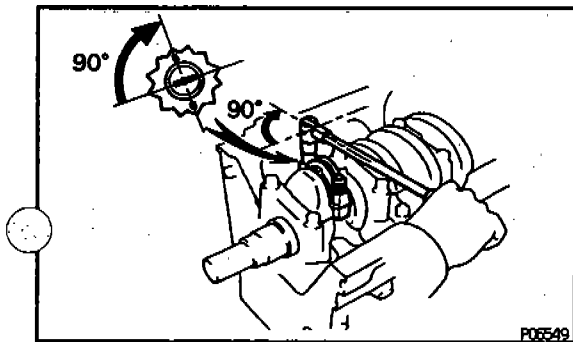
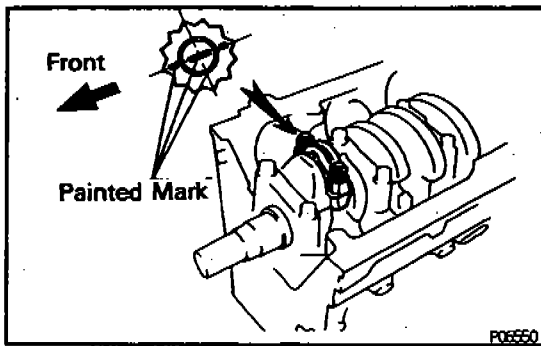
HINT:

- The cap nuts are tightened in 2 progressive steps (steps (b) and (d)).
- If any one of the connecting rod bolts is broken or deformed, replace it.

- (a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.
- (b) Install and alternately tighten the cap nuts in several passes.

Torque: 29 N-m (300 kgf-cm, 22 ft-lbf)





If any one of the cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set.

- (c) Mark the cap nut and connecting rod bolt with the paint.

- (d) Retighten the cap nuts 90° as shown.

- (e) Check that the painted mark is now at a 90° angle to the mark on the connecting rod bolt.

- (f) Check that the crankshaft turns smoothly.

12. CHECK CONNECTING ROD THRUST CLEARANCE
(See step 15 in disassembly)

13. INSTALL REAR OIL SEAL RETAINER

Install a new gasket and the retainer with the 6 bolts.
Torque: 9.5 N·m (95 kgf·cm, 82 in.-lbf)

14. INSTALL OIL PUMP AND OIL PAN
(See LU section)

15. INSTALL KNOCK SENSOR

Using SST, install the knock sensor.
SST 09816-30010

Torque: 45 N·m (450 kgf·cm, 33 ft-lbf)

16. INSTALL OIL FILTER BRACKET

17. INSTALL OIL PRESSURE SWITCH
(See LU section)

18. INSTALL OIL FILTER

(See LU section)

19. INSTALL WATER PUMP

- (a) Place a new O-ring in position on the cylinder block.

- (b) Install the water pump with the 2 bolts.
Torque: 14 N·m (145 kgf·cm, 11 ft-lbf)

20. INSTALL RH ENGINE MOUNTING BRACKET

Install the mounting bracket with the 3 bolts.

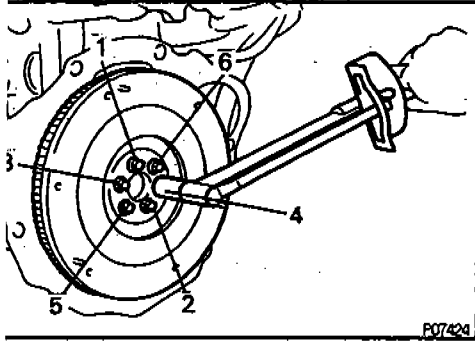
Torque: 51 N·m (525 kgf·cm, 38 ft-lbf)

21. INSTALL ALTERNATOR BRACKET

Install the alternator bracket with the 2 bolts and nut.

Torque: 39 N·m (400 kgf·cm, 39 ft-lbf)

22. **INSTALL CYLINDER HEAD**
(See timing belt)
23. **INSTALL TIMING BELT AND PULLEYS**
(See timing belt)
24. **DISCONNECT ENGINE FROM ENGINE STAND**
25. **INSTALL REAR END PLATE**
Torque: 9.5 N·m (95 kgf·cm, 82 in·lbf)



12. **INSTALL FLYWHEEL**
 - (a) Install the flywheel on the crankshaft.
 - (b) Install and uniformly tighten the mounting bolts, in several passes, in the sequence shown.Torque: 75 N·m (750 kgf·cm, 54 ft·lbf)