

ENGINE (B6 DOHC)

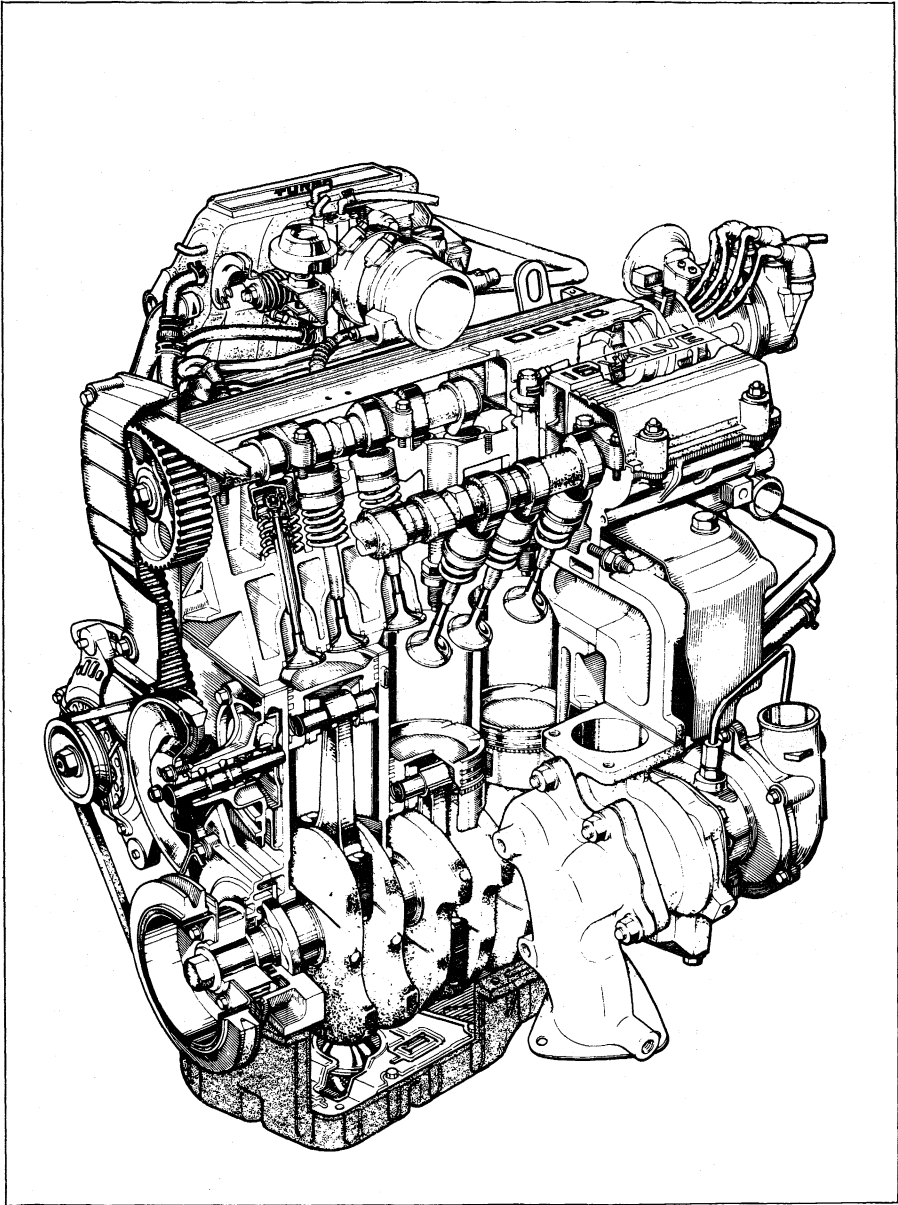
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83U01B-001

1B OUTLINE

OUTLINE

STRUCTURAL VIEW



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63U01X-002

TROUBLESHOOTING GUIDE 1B

SPECIFICATIONS

Item		Engine model	B6 DOHC
Type			Gasoline, 4-cycle
Cylinder arrangement and number			In-line 4-cylinders
Combustion chamber			Pent-roof
Valve system			OHC, belt-driven
Displacement		cc (cu in)	1,597 (97.4)
Bore and stroke		mm (in)	78 x 83.6 (3.07 x 3.29)
Compression ratio			7.9
Compression		kPa (kg/cm ² , psi)—rpm	1,079 (11.0, 156) — 300
Valve timing	IN	Open BTDC	5°
		Close ABDC	51°
	EX	Open BBDC	69°
		Close BTDC	1°
Valve clearance	mm (in)	IN	0. maintenance-free
		EX	0. maintenance-free
Idle speed (MTX in neutral)		rpm	850 ± 50
Ignition timing		BTDC	12° ± 1°
Firing order			1—3—4—2

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TRUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Difficult starting	Malfunction of engine-related components Burned valve Worn piston, piston ring, or cylinder Failed cylinder head gasket	Replace Replace or repair Replace	1B—37 1B—45 1B—15
	Malfunction of fuel system	Refer to Section 4B	
	Malfunction of electrical system	Refer to Section 5	
Poor idling	Malfunction of engine-related components Malfunction of HLA Poor valve to valve seat contact Failed cylinder head gasket	Replace Repair or replace Replace	1B—60 1B—39
	Malfunction of fuel system	Refer to Section 4B	
Excessive oil consumption	Oil working up Worn piston ring groove or sticking piston ring Worn piston or cylinder	Replace Replace or repair	1B—45 1B—45
	Oil working down Worn valve seal Worn valve stem or guide	Replace Replace	1B—59 1B—37
	Oil leakage	Refer to Section 2B	

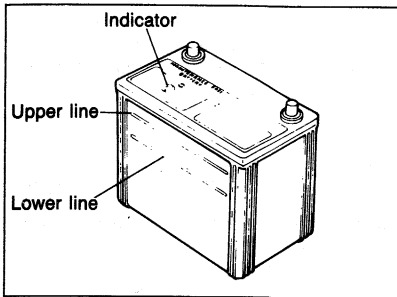
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1B TROUBLESHOOTING GUIDE

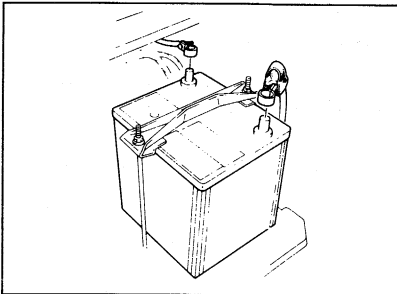
Problem	Possible Cause	Remedy	Page
Insufficient power	Insufficient compression		
	Malfunction of HLA	Replace	1B—60
	Compression leakage from valve seat	Repair	1B—39
	Seized valve stem	Replace	1B—37
	Weak or broken valve spring	Replace	1B—40
	Failed cylinder head gasket	Replace	1B—15
	Cracked or distorted cylinder head	Replace	1B—36
	Sticking, damaged, or worn piston ring	Replace	1B—46
	Cracked or worn piston	Replace	1B—46
	Malfunction of fuel system	Refer to Section 4B	
	Others		
	Slipping clutch	Refer to Section 6	
Dragging brakes	Refer to Section 11		
Wrong size tires	Refer to Section 12		
Abnormal combustion	Malfunction of engine-related components		
	Malfunction of HLA	Replace	1B—60
	Sticking or burned valve	Replace	1B—37
	Weak or broken valve spring	Replace	1B—40
	Carbon accumulation in combustion chamber	Eliminate carbon	—
	Malfunction of fuel system	Refer to Section 4B	
Engine noise	Crankshaft or bearing related parts		
	Excessive main bearing oil clearance	Replace or repair	1B—54
	Main bearing seized or heat-damaged	Replace	1B—53
	Excessive crankshaft end play	Replace or repair	1B—54
	Excessive connecting rod bearing oil clearance	Replace or repair	1B—55
	Connecting rod bearing seized or heat-damaged	Replace	1B—55
	Piston related parts		
	Worn cylinder	Replace or repair	1B—44
	Worn piston or piston pin	Replace	1B—45, 46
	Seized piston	Replace	1B—45
	Damaged piston ring	Replace	1B—46
	Bent connecting rod	Replace	1B—47
	Valves or timing related parts		
	Malfunction of HLA *	Replace	1B—60
	Broken valve spring	Replace	1B—40
	Excessive valve guide clearance	Replace	1B—37
	Malfunction of timing belt tensioner	Replace	1B—49
	Malfunction of cooling system	Refer to Section 3B	
	Malfunction of fuel system	Refer to Section 4B	
	Others		
Malfunction of water pump bearing	Replace	—	
Improper drive-belt tension	Adjust	1B—6	
Malfunction of alternator bearing	Replace	—	
Exhaust gas leakage	Repair	1B—36	

* Tappet noise may occur if the engine is not operated for an extended period of time. The noise should disappear after the engine has reached normal operating temperature.

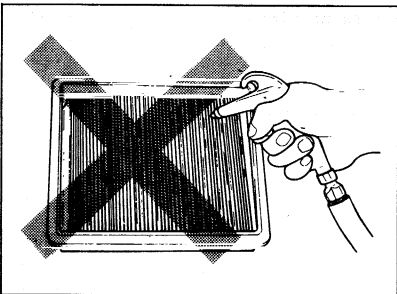
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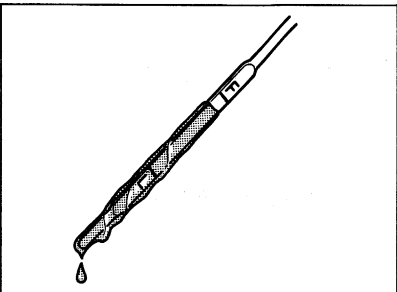
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5BU01X-008



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TUNE-UP PROCEDURE

Tune the engine according to the procedures described below.

5BU01X-006

Battery

1. Check the indicator sign on the top of the battery. If the indicator sign is blue, the battery is normal.
2. If the blue indicator sign is not visible, then the electrolyte level of the battery is low and/or the capacity is insufficient.
3. Add distilled water and/or recharge according to the procedures described in Section 5.
4. Check the tightness of the terminals to ensure good electrical connections. Clean the terminals and coat the terminals with grease.
5. Inspect for corroded or frayed battery cables.
6. Check the rubber protector on the positive terminal for proper coverage.

Air Cleaner Element

Visually check that the air cleaner element for excessive dirt, damage or oil. Replace if necessary

Caution

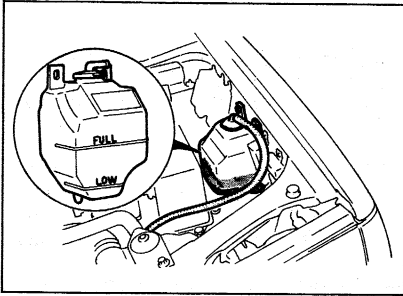
Do not clean the air cleaner element with compressed air.

Engine Oil

Check the engine oil level and condition with the dipstick.

Add oil, or change it, if necessary.

1B TUNE-UP PROCEDURE



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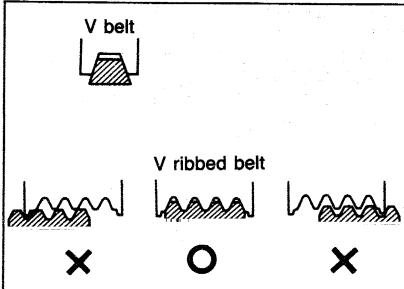
Coolant Level

Check that the coolant level is near the radiator inlet port, and that the level in the reserve tank is between the FULL and LOW marks. Add coolant if the level is low.

Warning

Never remove the radiator cap while the engine is hot.

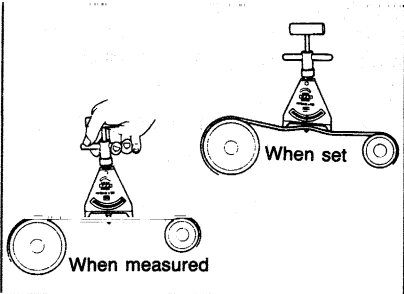
Wrap a thick cloth around the cap and carefully remove the cap.



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Drive Belt

1. Check that the drive belt is positioned in the pulley groove.
2. Check the drive belt for wear, cracks, or fraying.
3. Check the pulley for damage.



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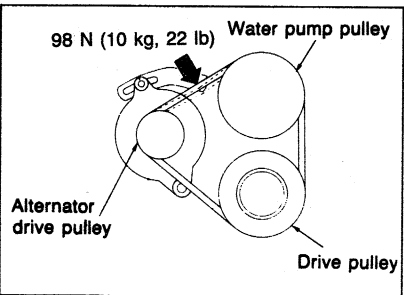
Inspection of belt tension

Check the drive belt tension by using the tension gauge.

Standard tension

N (kg, lb)

Belt	New	Used
Alternator	491—589 (50—60, 110—132)	422—491 (43—50, 95—110)
A/C	491—589 (50—60, 110—132)	422—491 (43—50, 95—110)
P/S	491—589 (50—60, 110—132)	422—491 (43—50, 95—110)
A/C and P/S	491—589 (50—60, 110—132)	422—491 (43—50, 95—110)



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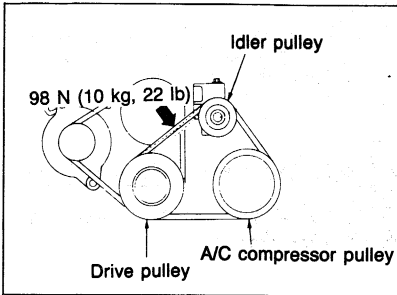
Inspection of belt deflection

Check the drive belt deflection by applying moderate pressure (98 N, 10 kg, 22 lb) midway between the pulleys.

Alternator drive belt

New: 8—9 mm (0.31—0.35 in)

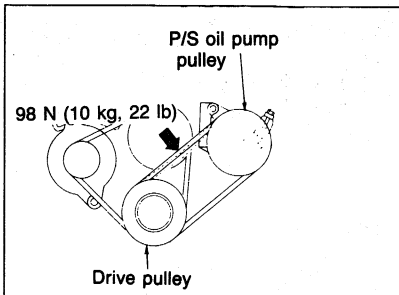
Used: 9—10 mm (0.35—0.39 in)



83U01A-008

A/C drive belt

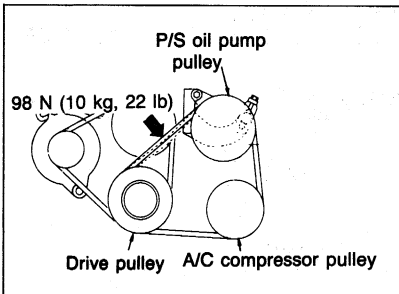
New: 8—9 mm (0.31—0.35 in)
Used: 9—10 mm (0.35—0.39 in)



83U01A-009

P/S oil pump drive belt

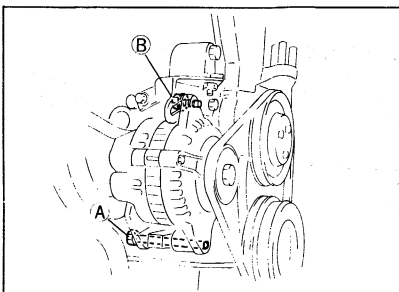
New: 8—9 mm (0.31—0.35 in)
Used: 9—10 mm (0.35—0.39 in)



83U01A-010

A/C and P/S oil pump drive belt

New: 8—9 mm (0.31—0.35 in)
Used: 9—10 mm (0.35—0.39 in)



83U01A-011

Adjustment of belt deflection

Alternator drive belt

1. Loosen the alternator mounting bolt A and adjusting bolt B.
2. Lever the alternator outward and apply tension to the belt.
3. Tighten the adjusting bolt B.

Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

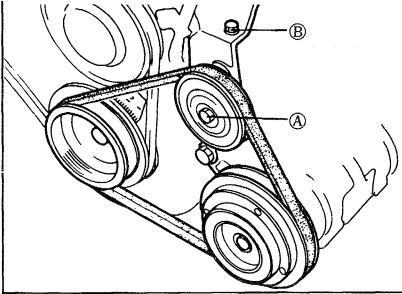
4. Tighten the mounting bolt A.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)

5. Recheck the belt tension or deflection.

1B TUNE-UP PROCEDURE



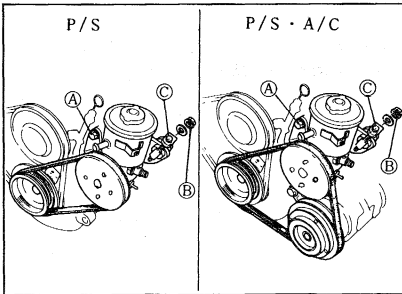
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A/C drive belt

1. Loosen the idler pulley lock bolt A.
2. Adjust the belt tension and deflection by turning the adjusting bolt B.
3. Tighten the idler pulley lock bolt A.

Tightening torque:

31—46 N·m (3.2—4.7 m·kg, 24—34 ft·lb)



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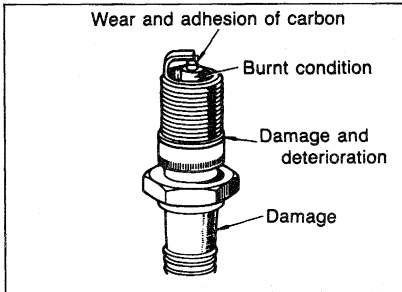
P/S oil pump drive belt, A/C and P/S oil pump drive belt

1. Loosen the mounting bolt A and adjusting bolt lock nut B.
2. Adjust the belt tension and deflection by turning the adjusting bolt C.
3. Tighten the adjusting bolt lock nut B and mounting bolt A.

Tightening torque:

**Bolt A: 31—46 N·m
(3.2—4.7 m·kg, 24—34 ft·lb)**

**Nut B: 36—54 N·m
(3.7—5.5 m·kg, 27—40 ft·lb)**



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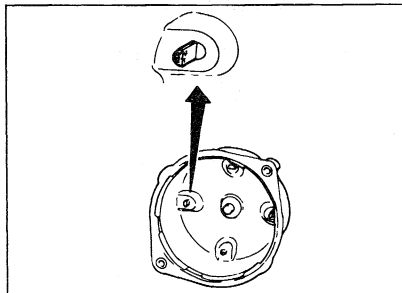
Spark Plug

Check the following points, clean or replace if necessary.

1. Damaged insulation
2. Worn electrodes
3. Carbon deposits
4. Damaged gasket
5. Burnt spark insulator
6. Plug gap

Standard plug gap:

1.00—1.10 mm (0.039—0.043 in)



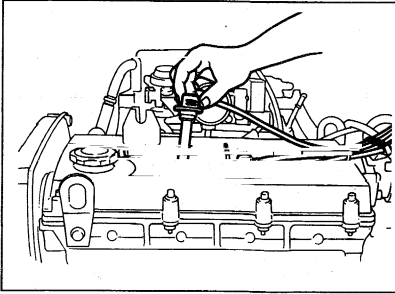
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Distributor Cap

Check the following points. If necessary, replace the distributor cap.

1. Cracks, carbon deposits
2. Burnt or corroded terminals
3. Worn distributor center contact

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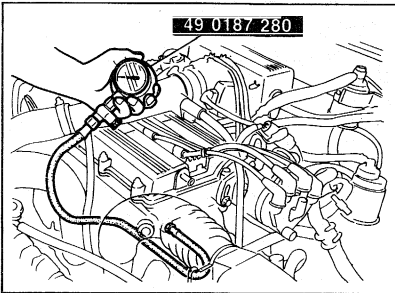


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High-tension Lead

Check the following points, if necessary clean or replace.

1. Damaged lead
2. Carbon deposits



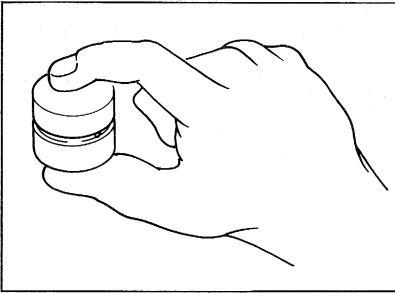
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Hydraulic Lash Adjuster

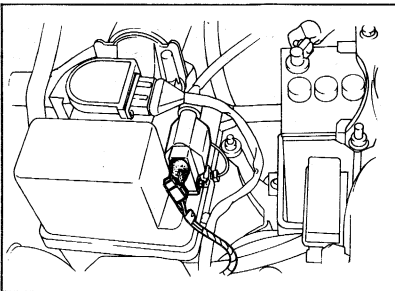
Note

Tappet noise may occur if the engine is not operated for an extended period of time. The noise should disappear after the engine has reached normal operating temperature.

1. Check for tappet noise, if noise exists, check the followings:
 - (1) Engine oil condition and level
 - (2) Cylinder head oil pressure (Refer to section 2B)
2. If the noise does not disappear, check for movement of the HLA by pushing it during disassembly.
3. If the HLA moves, replace the HLA.



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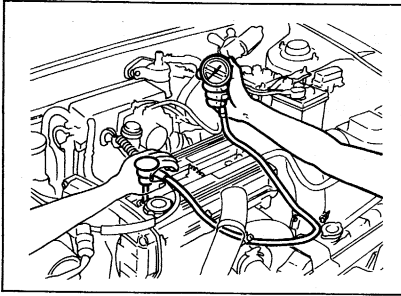
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Compression

1. Warm up the engine to operating temperature.
2. Turn it off for about 10 minutes to reduce the exhaust pipe temperature.
3. Remove all spark plugs.
4. Disconnect the primary wire connector from the ignition coil.

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1B TUNE-UP PROCEDURE



83U01B-007

5. Connect a compression gauge to the No. 1 spark plug hole.
6. Fully depress the accelerator pedal and crank the engine.
7. Check whether the gauge reads within the limits.

Standard compression:

1,079 kPa (11.0 kg/cm², 156 psi)

Compression limit:

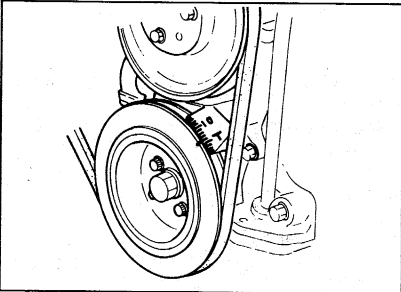
755 kPa (7.7 kg/cm², 109 psi)

8. Check each cylinder.
9. Refit the primary wire connector securely to the ignition coil.
10. Install the spark plugs and high-tension leads.

Ignition Timing

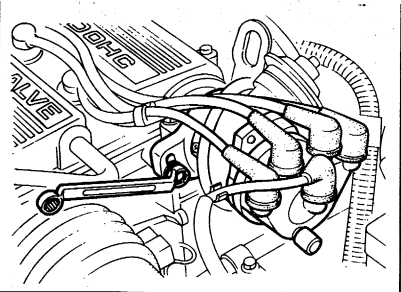
1. Warm up the engine and run it at idle.
2. Turn all electric loads OFF.
3. Connect a timing light tester.
4. Disconnect the vacuum hose from the vacuum control, and plug the hose.
5. Disconnect the black connector at distributor.
6. Check that the ignition timing mark (yellow) on the crankshaft pulley and the timing mark on the timing belt cover are aligned.

Ignition timing: 12° ± 1° BTDC



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7. If necessary, adjust the ignition timing by turning the distributor.
8. Reconnect the vacuum hose and the black connector at distributor.

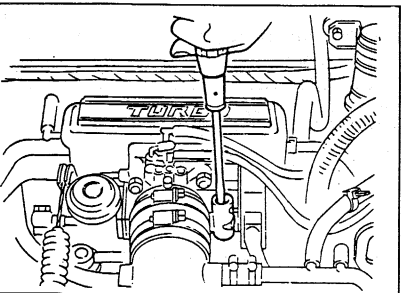


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Idle Speed

1. Connect a tachometer to the engine.
2. Turn off all lights and other unnecessary electrical loads.
3. Check the idle speed. If necessary, turn the air adjust screw and adjust to specifications.

Idle speed: 850 ± 50 rpm



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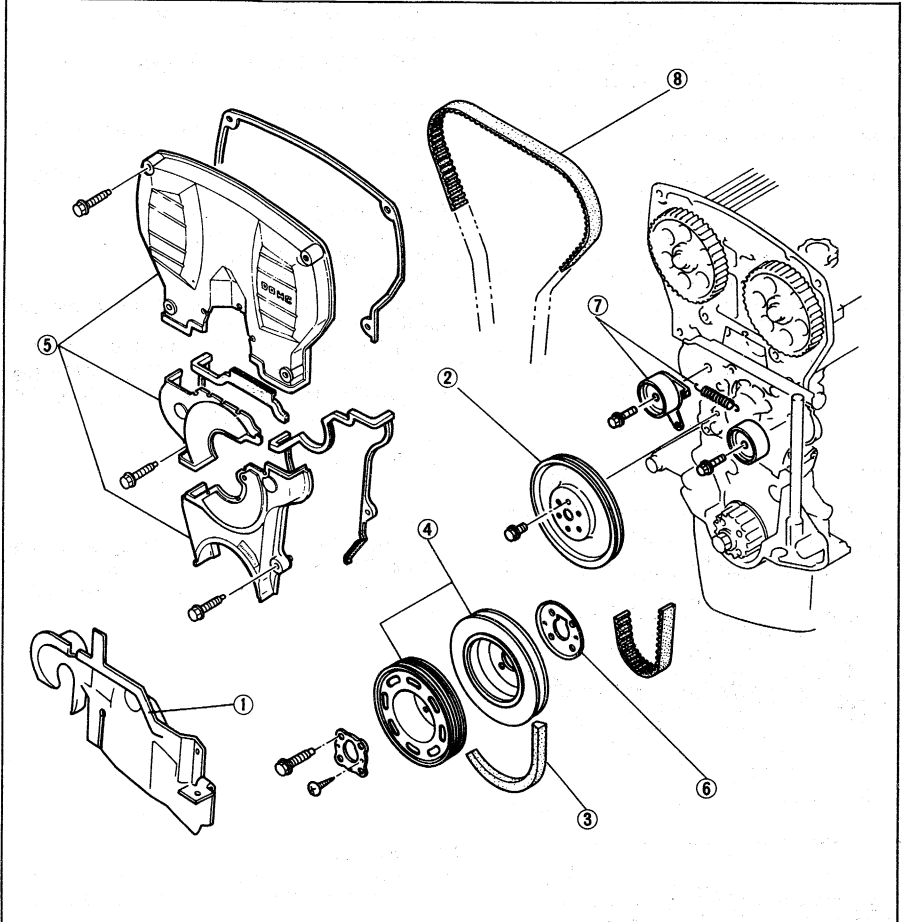
ON-VEHICLE MAINTENANCE

TIMING BELT

Removal

1. Disconnect the battery negative cable.
2. Remove the parts in the numbered sequence shown in the figure.

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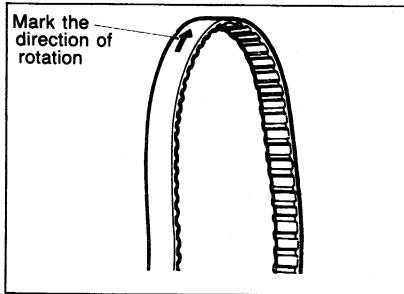
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- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Side cover 2. Water pump pulley 3. Drive belt 4. Crankshaft pulley | <ol style="list-style-type: none"> 5. Timing belt cover (upper, middle, lower) 6. Baffle plate 7. Timing belt tensioner and spring 8. Timing belt |
|--|---|

Note

Remove the No. 3 engine mount installation nuts and lower the engine to remove the A/C and P/S pulley and the crankshaft pulley.

1B ON-VEHICLE MAINTENANCE (TIMING BELT)



1. Mark the direction of rotation on the timing belt.

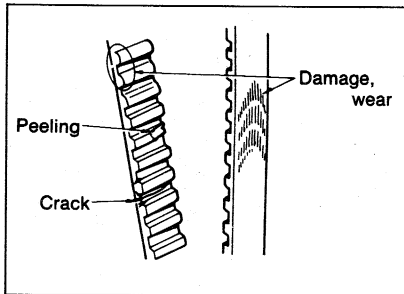
Note

The direction arrow is so the belt can be reinstalled in the same direction.

2. Remove the timing belt.

Caution

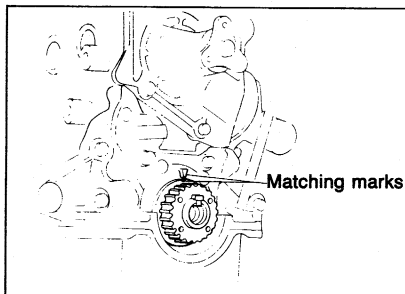
Do not allow any oil or grease on the timing belt.



Inspection

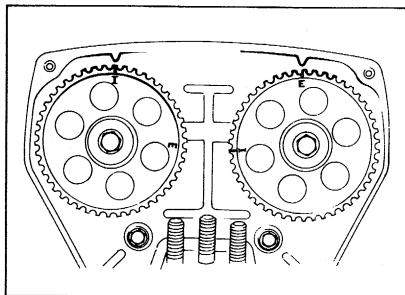
Referring to page 1B—49, inspect the following parts:

1. Timing belt
2. Timing belt tensioner and spring
3. Timing belt pulley
4. Camshaft pulley



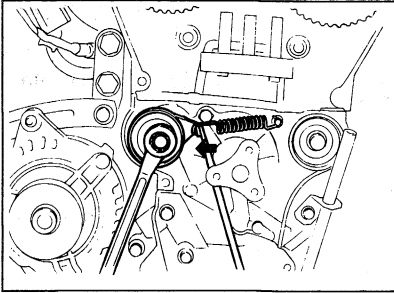
Installation

1. Be sure that the timing mark on the timing belt pulley is aligned with the matching mark.



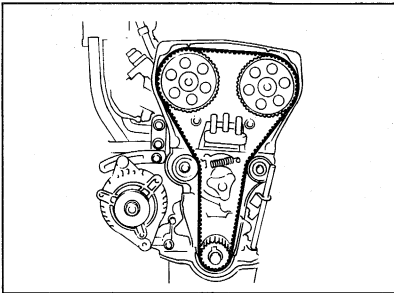
2. Be sure that the matching mark on the camshaft pulley is aligned with seal plate matching mark. If it is not aligned, turn the camshaft to align.

ON-VEHICLE MAINTENANCE (TIMING BELT) 1B



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3. Install the timing belt tensioner and spring. Temporarily secure it so the spring is fully extended.

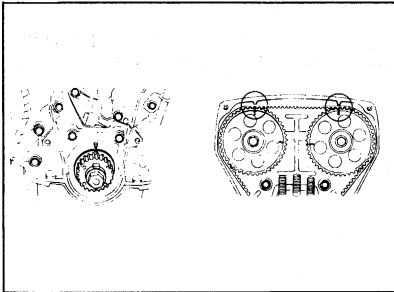


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4. Install the timing belt. (keep the right side of belt as tight as possible)

Caution

- a) The timing belt must be reinstalled in the same direction of previous rotation if it is reused.
- b) Be sure that there is no oil, grease, or dirt on the timing belt.

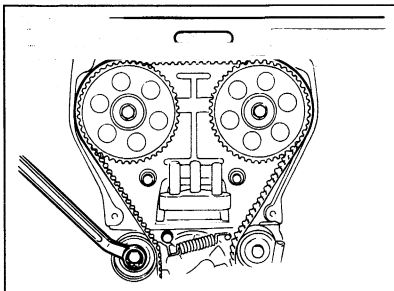


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Note

Remove all spark plugs for easier rotation.

5. Turn the crankshaft twice in the direction of rotation. (Clockwise)
6. Check that the timing marks are correctly aligned. If not repeat steps 1—5.
7. Loosen the tensioner lock bolt and apply tension to the belt.



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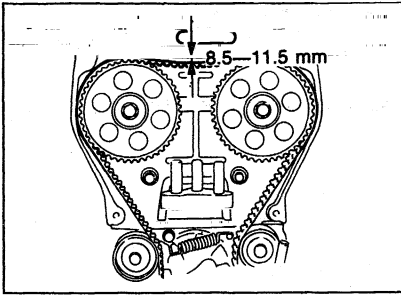
8. Tighten the timing belt tensioner lock bolt.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)

9. Turn the crankshaft twice in the direction of rotation and check the matching marks for alignment.

1B ON-VEHICLE MAINTENANCE (TIMING BELT)



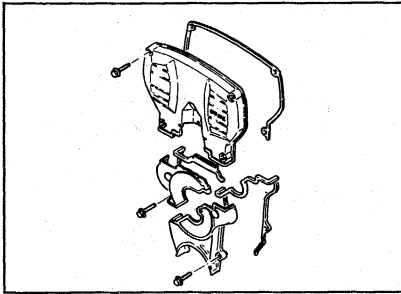
10. Measure the tension between the intake side camshaft pulley and the exhaust side camshaft pulley. If the timing belt tension is not correct, loosen the tensioner lock bolt and repeat steps 3—9 above or replace the tensioner spring.

Timing belt deflection:

8.5—11.5 mm (0.33—0.45 in)
/ 98 N (10 kg, 22 lb)

Caution

Be sure not to apply tension other than that of the tensioner spring.



11. Install the lower and upper timing belt cover.

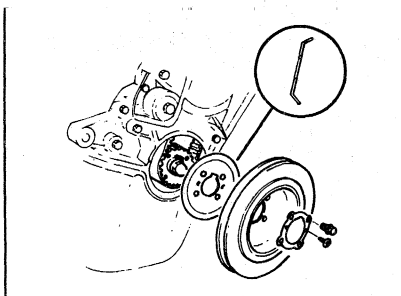
Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)

12. Install the spark plugs.

Tightening torque:

15—23 N·m (1.5—2.3 m·kg, 11—17 ft·lb)



13. Install the baffle plate and the crankshaft pulley.

Tightening torque: 12—17 N·m

(1.25—1.75 m·kg, 109—152 in·lb)

14. Install the No.3 engine mount bracket.

Tightening torque:

60—85 N·m (6.1—8.7 m·kg, 44—63 ft·lb)

15. Install the drive belt and adjust the belt tension (refer to page 1B—6).
16. Install the engine side cover.
17. Connect the battery negative cable.

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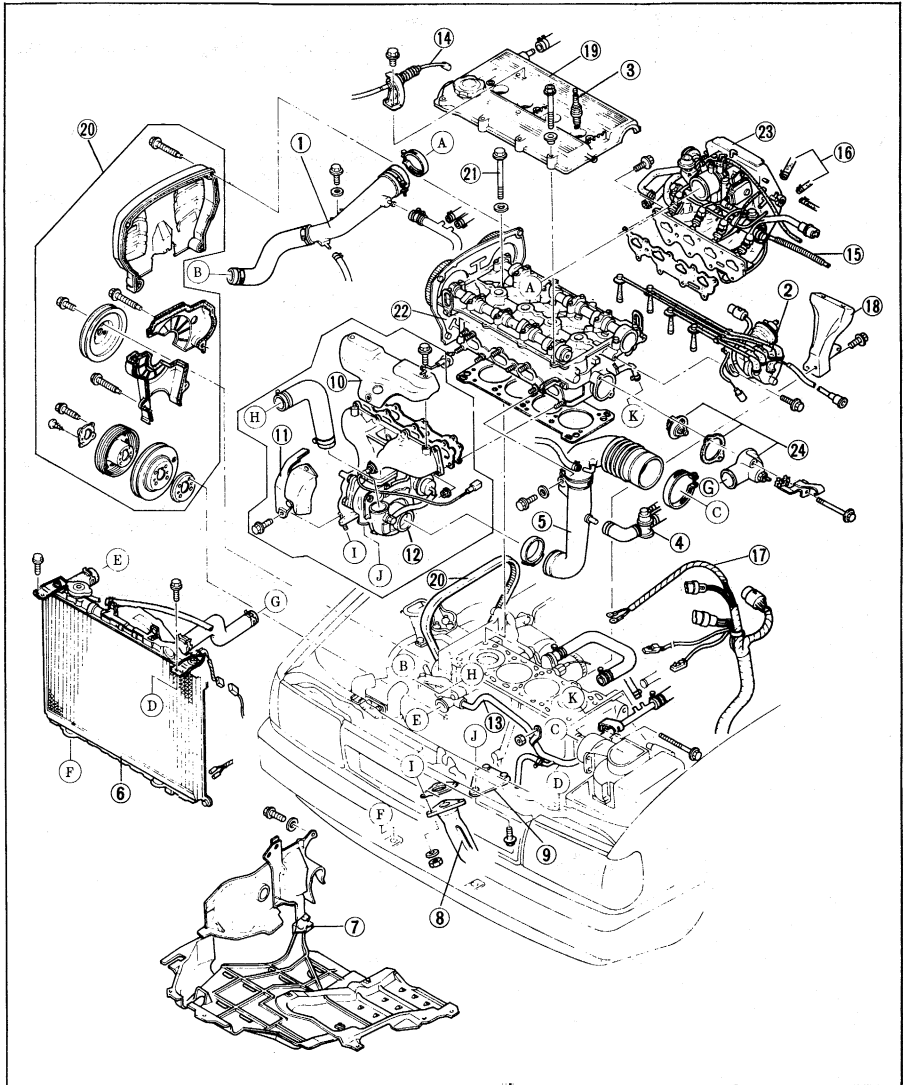
ON-VEHICLE MAINTENANCE (CYLINDER HEAD) 1B

CYLINDER HEAD Removal

Warning

Release the fuel pressure (Refer to FUEL PRESSURE RELEASE of FUEL SYSTEM section).

1. Disconnect the battery negative cable.
2. Drain the coolant.
3. Remove the parts in the numbered sequence shown in the figure.

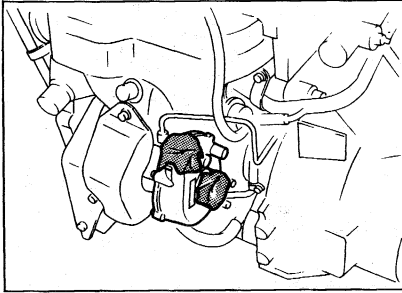


1B ON-VEHICLE MAINTENANCE (CYLINDER HEAD)

1. Air intake pipe
2. Distributor and high-tension leads
3. Spark plugs
4. Air bypass valve and hose assembly
5. Air pipe
6. Radiator (Refer to 3B—10)
7. Engine side cover and under cover
8. Exhaust pipe
9. Turbocharger bracket
10. Exhaust manifold insulator
11. Turbocharger insulator
12. Exhaust manifold and turbocharger assembly

13. Coolant bypass pipe
14. Accelerator cable
15. Fuel hoses
16. Vacuum hoses
17. Engine harness connectors
18. Surge tank bracket
19. Cylinder head cover
20. Timing belt (Refer to 1B—11)
21. Cylinder head bolts
22. Cylinder head and intake manifold assembly
23. Intake manifold assembly
24. Thermostat and thermostat cover

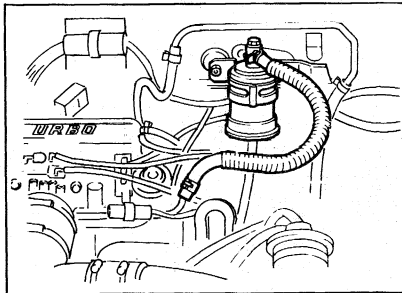
83U01B-014



77U01X-017

Turbocharger

Cover the intake and exhaust ports and oil passage to prevent dirt or other contaminants from entering.



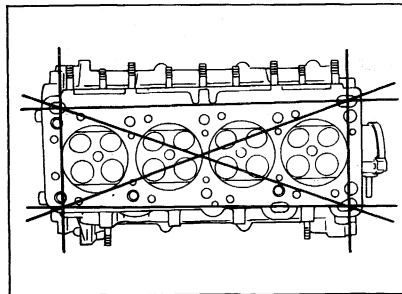
63G01C-104

Fuel hose

After disconnecting the inlet and return fuel hoses, plug them.

Warning

Cover the hose with a rag because fuel will be splashed out when disconnecting the hose.



83U01B-015

Disassembly of Cylinder Head

Refer to page 1B—30

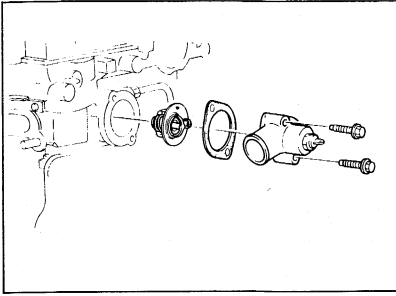
Inspection

Refer to page 1B—36

Assembly

Refer to page 1B—59

ON-VEHICLE MAINTENANCE (CYLINDER HEAD) 1B



83U01B-016

Installation

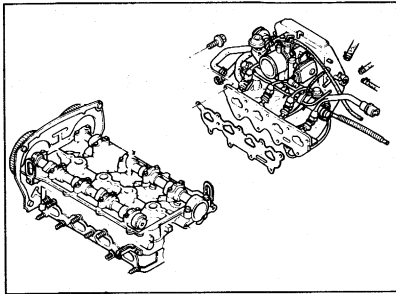
1. Install the thermostat with the jiggle pin facing upward.
2. Install the thermostat cover and gasket.

Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

Caution

The printed side of the gasket must face the thermostat.

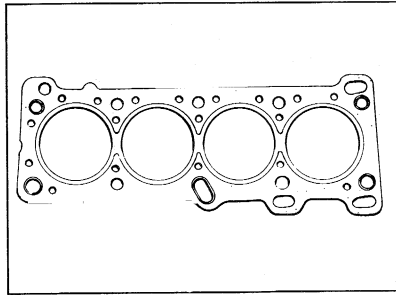


83U01B-017

3. Install the intake manifold assembly and new gasket.

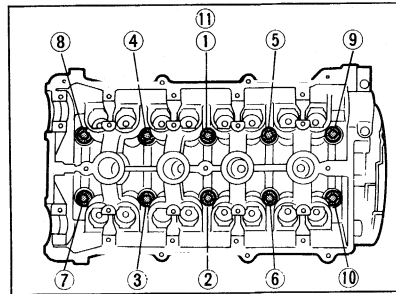
Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



83U01B-018

4. Thoroughly remove all dirt and grease from the top of the cylinder block with a rag.
5. Place the new cylinder head gasket in position.



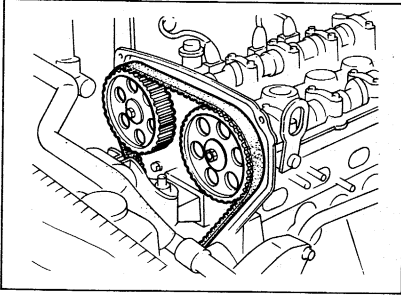
83U01B-019

6. Install the cylinder head, and tighten the cylinder head bolts gradually in the order shown in the figure.

Tightening torque:

76—81 N·m (7.7—8.3 m·kg, 56—60 ft·lb)

1B ON-VEHICLE MAINTENANCE (CYLINDER HEAD)



83U01B-020

7. Referring to the TIMING BELT section pages 1B—11 to 1B—14, install the timing belt.
8. Install the timing belt covers.

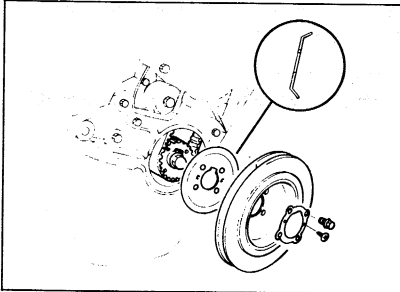
Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)

9. Install the water pump pulley.

Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)

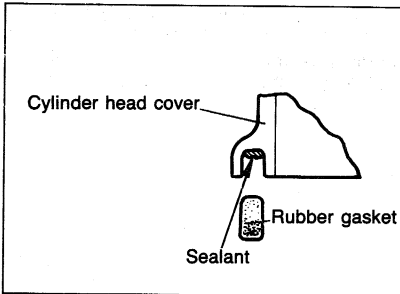


83U01B-021

10. Install the crankshaft pulley and baffle plate.

Tightening torque:

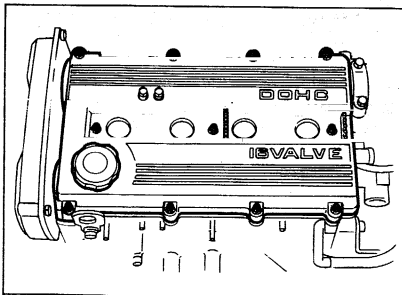
12—17 N·m (1.25—1.75 m·kg, 109—152 in·lb)



83U01B-022

11. Install the cylinder head cover.

(1) Apply a coat of sealant to the cylinder head cover as shown in the figure.



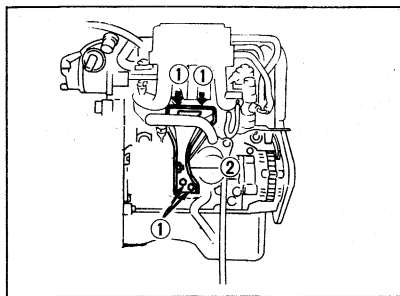
83U01B-023

- (2) Install the cylinder head cover.

Tightening torque:

3—4 N·m (0.3—0.4 m·kg, 26—35 in·lb)

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83U01B-024

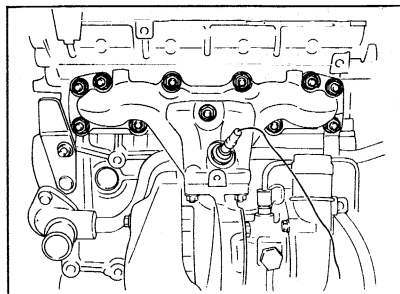
12. Install the surge tank bracket.

Tightening torque:

**Bolt ①: 31—46 N·m
(3.2—4.7 m·kg, 23—34 ft·lb)**

**Bolt ②: 19—26 N·m
(1.9—2.6 m·kg, 14—19 ft·lb)**

13. Connect the engine harness connectors.
14. Connect the vacuum hoses.
15. Connect the fuel hoses.
16. Install the accelerator cable.

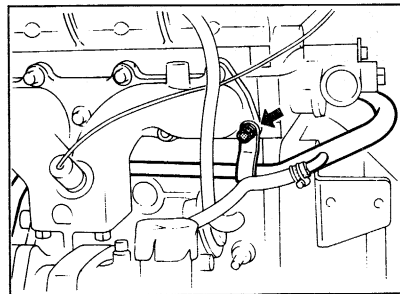


83U01B-025

17. Install the exhaust manifold and turbocharger assembly along with new gasket.

Tightening torque:

39—57 N·m (4.0—5.8 m·kg, 29—42 ft·lb)

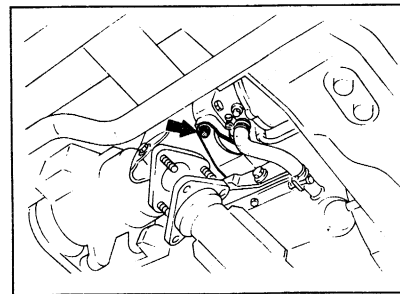


83U01B-026

18. Install the coolant bypass pipe bracket.

Tightening torque:

39—57 N·m (4.0—5.8 m·kg, 29—42 ft·lb)



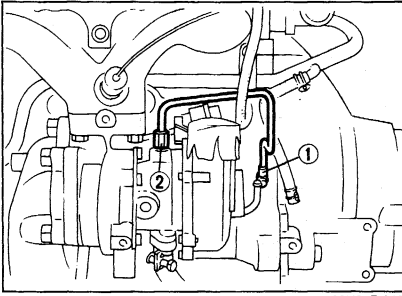
83U01B-027

19. Connect the turbocharger and turbocharger bracket.

Tightening torque:

22—30 N·m (2.2—3.1 m·kg, 16—22 ft·lb)

1B ON-VEHICLE MAINTENANCE (CYLINDER HEAD)



83U01B-028

20. Connect the oil pipe to the turbocharger and cylinder block.

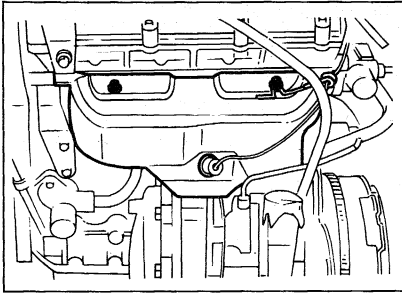
Tightening torque:

Bolt ①: 12–18 N·m

(1.2–1.8 m·kg, 104–156 in·lb)

Nut ②: 16–24 N·m

(1.6–2.4 m·kg, 12–17 ft·lb)

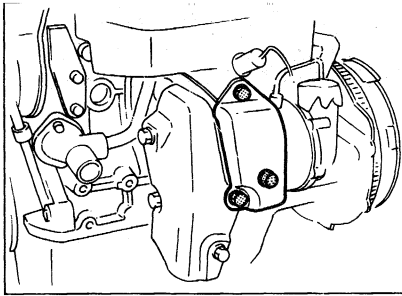


83U01B-029

21. Install the exhaust manifold insulator.

Tightening torque:

19–26 N·m (1.9–2.6 m·kg, 14–19 ft·lb)

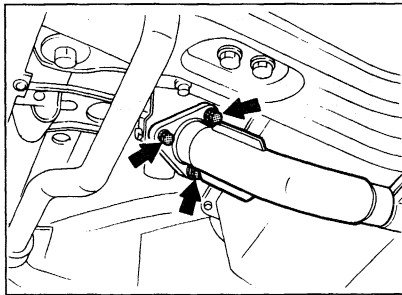


83U01B-030

22. Install the turbocharger insulator.

Tightening torque:

19–26 N·m (1.9–2.6 m·kg, 14–19 ft·lb)



83U01B-031

23. Connect the exhaust pipe to the turbocharger

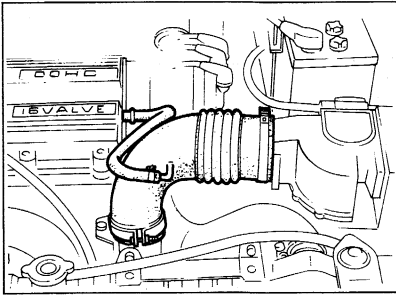
Tightening torque:

31–46 N·m (3.2–4.7 m·kg, 23–34 ft·lb)

24. Install the engine side cover and under cover.

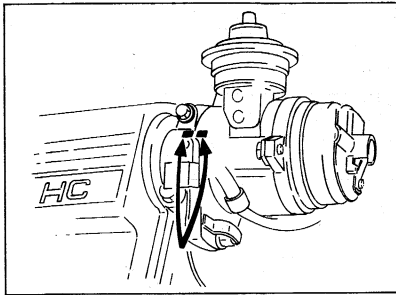
25. Install the radiator. (Refer to 3B–10)

ON-VEHICLE MAINTENANCE (CYLINDER HEAD) 1B



83U01B-032

26. Install the air pipe.
27. Install the air bypass valve and hose assembly.

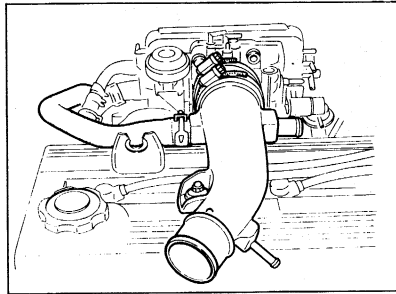


83U01B-033

28. Align the distributor blade with the grooved matching mark on the body, then install the distributor by referring to Section 5.
29. Install the spark plugs.

Tightening torque:
15—23 N·m (1.5—2.3 m·kg, 11—17 ft·lb)

30. Install the high-tension leads.



83U01B-034

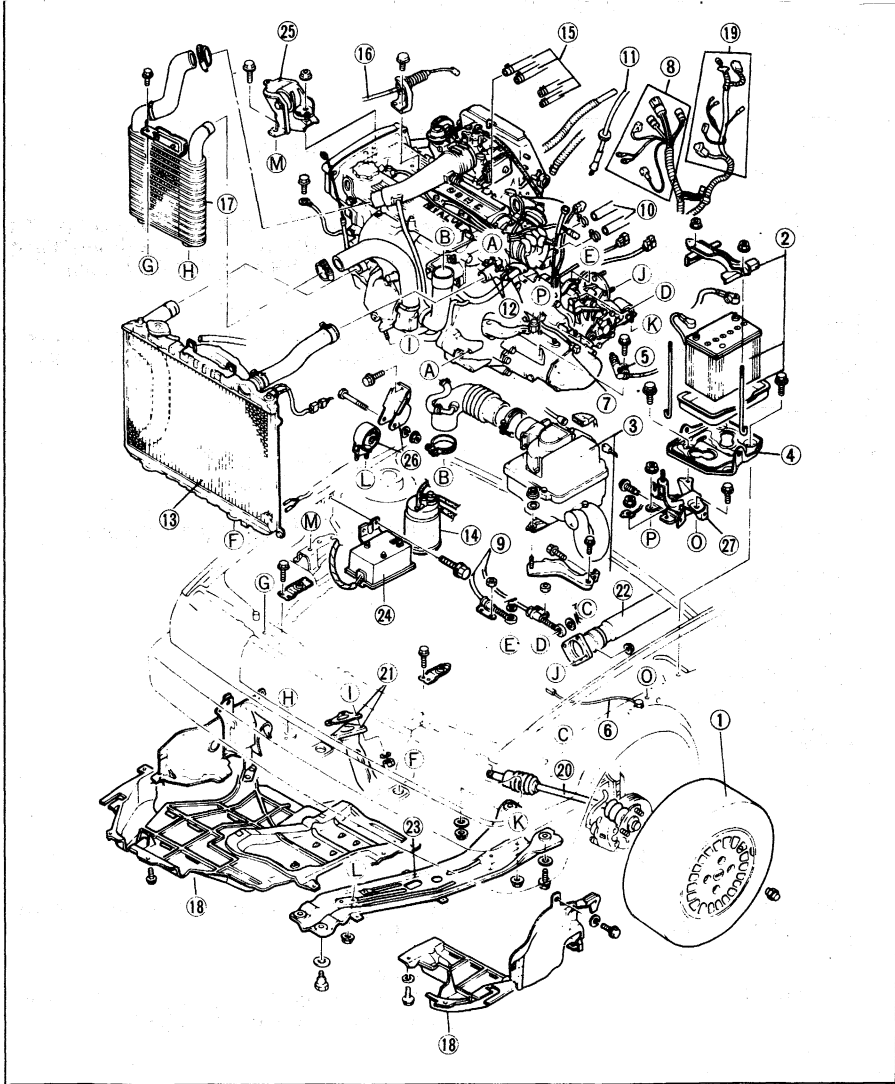
31. Install the air intake pipe.
32. Fill the radiator with coolant.
33. Perform the necessary engine adjustments, refer to TUNE-UP PROCEDURE section.

1B REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

Warning: Release the fuel pressure (Refer to FUEL PRESSURE RELEASE of FUEL SYSTEM section).

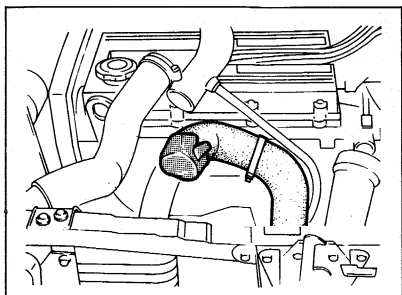
1. Disconnect the battery negative cable.
2. Drain the engine oil, transaxle oil and coolant.
3. Remove the parts in the numbered sequence shown below.
4. Install in the reverse order of removal.



83U01A-043

- | | | |
|-------------------------------|---|----------------------------------|
| 1. Front wheels | 12. Connectors (thermometer, electric fan switch) | 20. Driveshafts |
| 2. Battery | 13. Radiator | 21. Exhaust pipe |
| 3. Air cleaner | 14. Canister hoses | 22. Propeller shaft (for 4WD) |
| 4. Battery carrier | 15. Vacuum hoses | 23. Engine mount member |
| 5. Clutch release cylinder | 16. Accelerator cable | 24. Control unit |
| 6. Ground (body-transmission) | 17. Intercooler | 25. No. 3 engine mount |
| 7. Back up lamp connector | 18. Under cover and side cover | 26. No. 2 engine mount |
| 8. Engine harness connectors | 19. Connectors (starter motor, oil pressure switch, alternator) | 27. No. 4 engine mount (for 4WD) |
| 9. Shift control cables | | |
| 10. Heater hoses | | |
| 11. Speedometer cable | | |

83U01B-035



83U01B-036

Intercooler

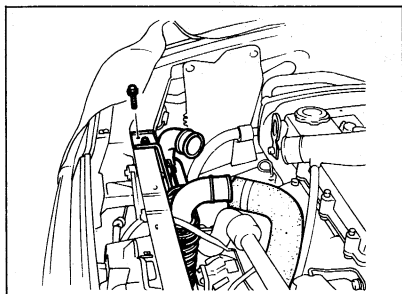
1. Disconnect the air hose from intercooler.

Caution

Cover the end of air pipes and hoses with rag to prevent any foreign material from falling into the turbocharger or intake system.

Note

Do not insert screw driver or other between air hose and intercooler pipe, when disconnecting

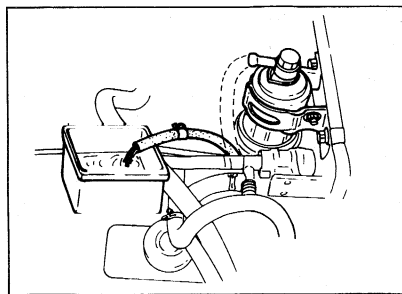


83U01B-037

2. Remove the intercooler

Note

Be careful not to damage to the fins.



63G01C-108

Fuel Hose

After disconnecting the fuel hoses (inlet and return), plug them to avoid fuel leakage.

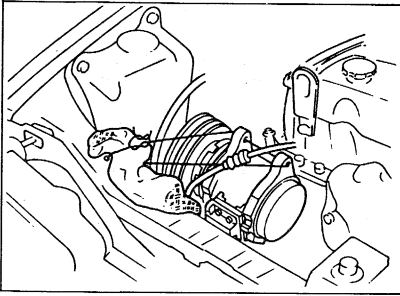
Warning

Keep sparks and open flame away from the fuel area.

Caution

When disconnect the hoses, cover the hoses with a rag since fuel will splash out.

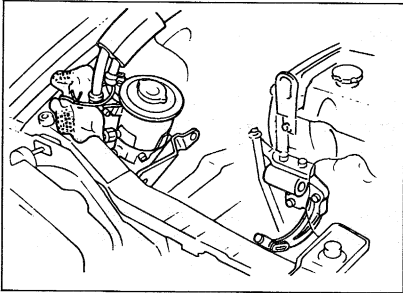
1B REMOVAL AND INSTALLATION



4BG01A-081

A/C Compressor

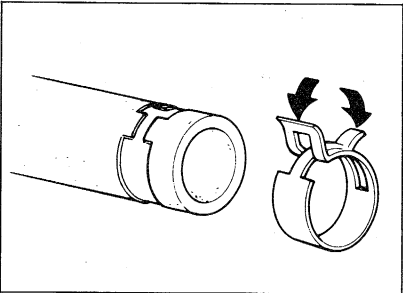
Remove the compressor, and then, with the high-pressure and low-pressure hoses still connected to it, secure the compressor as shown in the figure.



83U01A-045

P/S Pump

Secure the P/S pump as shown in the figure. Be careful not to damage the pipe when the engine is removed and installed.



83U01A-046

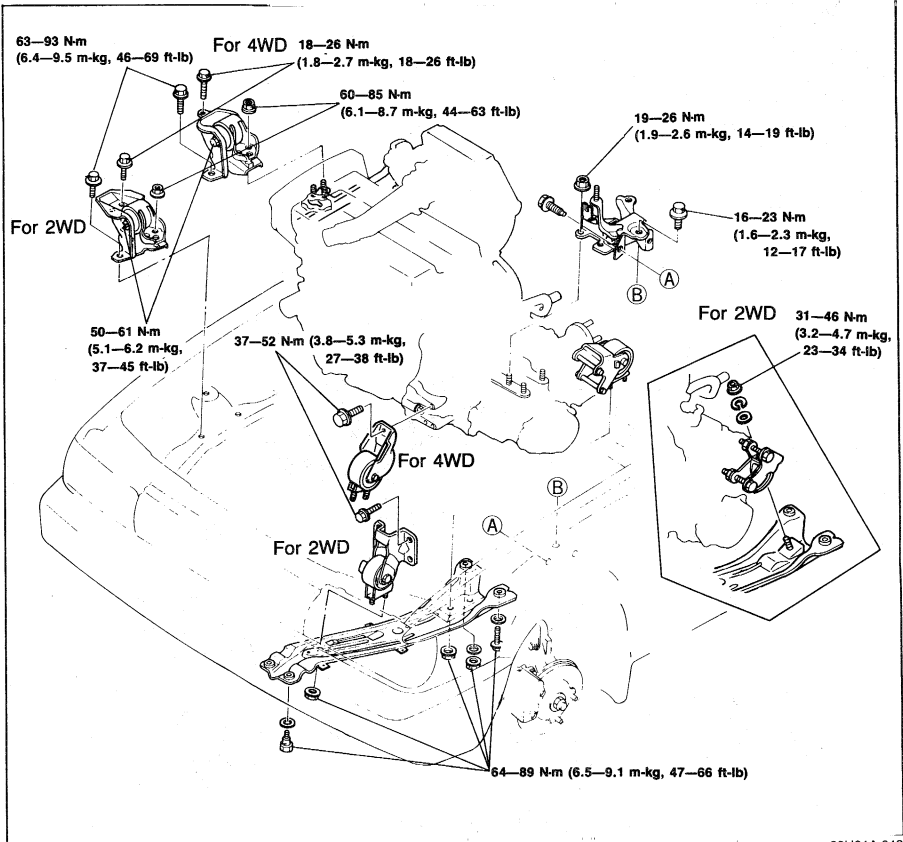
Hose Clamp

1. Position the hose clamp in the original location on the hose.
2. Squeeze the clamp lightly with large pliers to ensure a good fit.

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Engine Mount Torque Specification

After installing the engine into the engine room, tighten the engine mount bolts to the specified torque.



83U01A-046

Steps After Installation

1. Adjust the drive belt tension. (Refer to 1B–6)
2. Fill the radiator and sub tank with coolant.
3. Fill the engine with engine oil.
4. Fill the transaxle with transaxle oil.

Check Engine Condition

1. Check for leaks.
2. Perform engine adjustments as necessary.
3. Perform a road test.
4. Recheck the oil and coolant levels.

83U01B-038

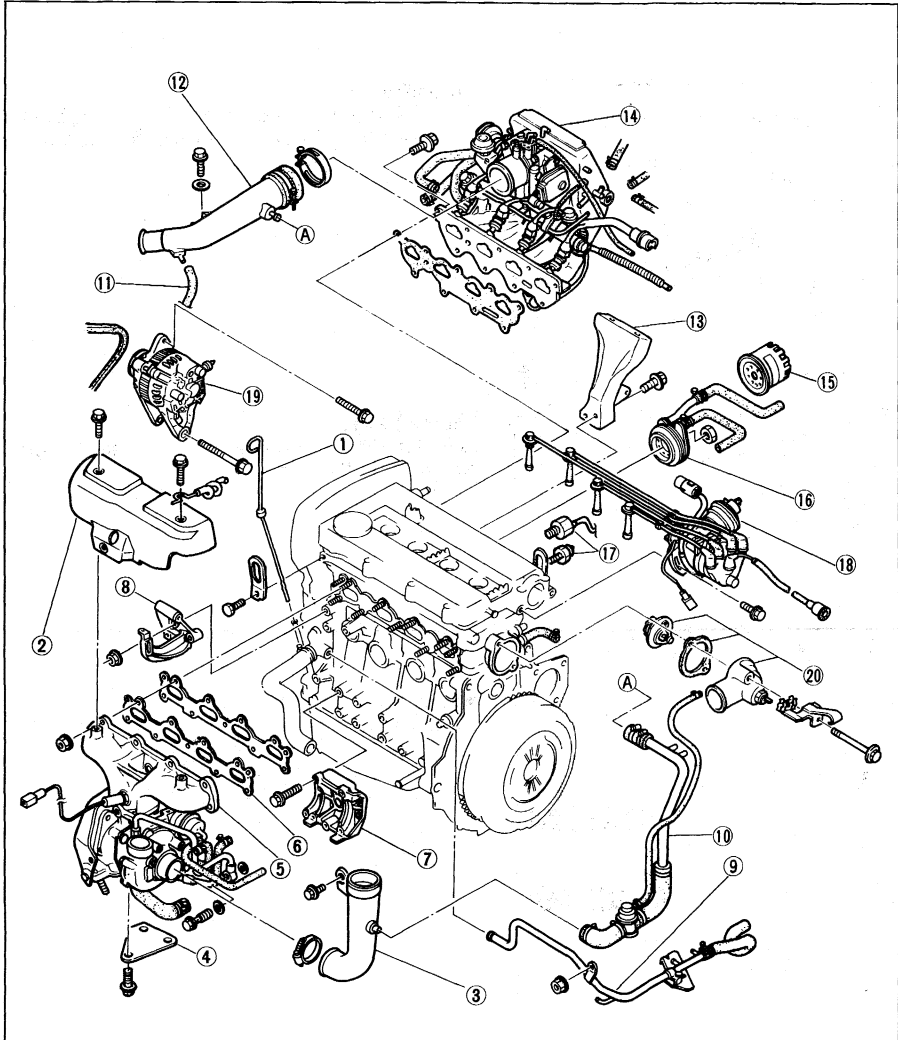
1B DISASSEMBLY

DISASSEMBLY

Disassembly Note

1. Care should be taken during the disassembly of any part or system to study its order of assembly. Any deformation, wear, or damage also should be noted.
2. Code all identical parts (such as pistons, piston rings, connecting rods, and valve springs) so that they can be reinstalled in the position from which they were removed.
3. After steam cleaning the parts, use compressed air to blow off any remaining water.
4. Remove the parts in the order shown in the figure.

Disassembly of Engine Auxiliary Parts

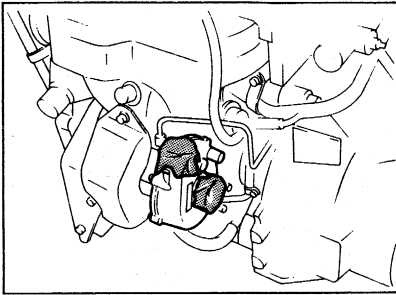


63U01X-056

DISASSEMBLY 1B

1. Dipstick
2. Exhaust manifold insulator
3. Air hose
4. Turbocharger bracket
5. Exhaust manifold and turbocharger
6. Exhaust manifold gasket
7. A/C compressor bracket
8. P/S pump bracket
9. Coolant bypass pipe and hose
10. Air bypass valve and hoses
11. Hose
12. Air intake pipe
13. Surge tank bracket
14. Intake manifold assembly
15. Oil filter
16. Oil cooler
17. Oil pressure switch and knock sensor
18. Distributor and high-tension leads
19. Alternator and drive belt
20. Thermostat cover and thermostat

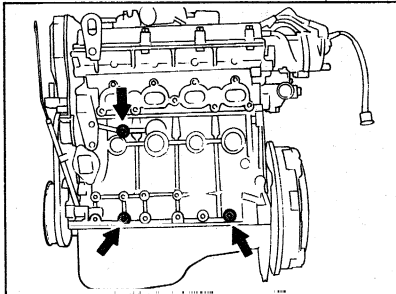
83U01B-039



77U01X-017

Turbocharger

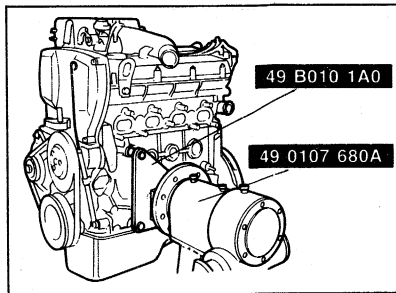
Cover the intake and exhaust ports and oil passage to prevent dirt or other contaminants from entering.



83U01X-123

Engine hanger

After removing the exhaust manifold, install the engine on the **SST**.

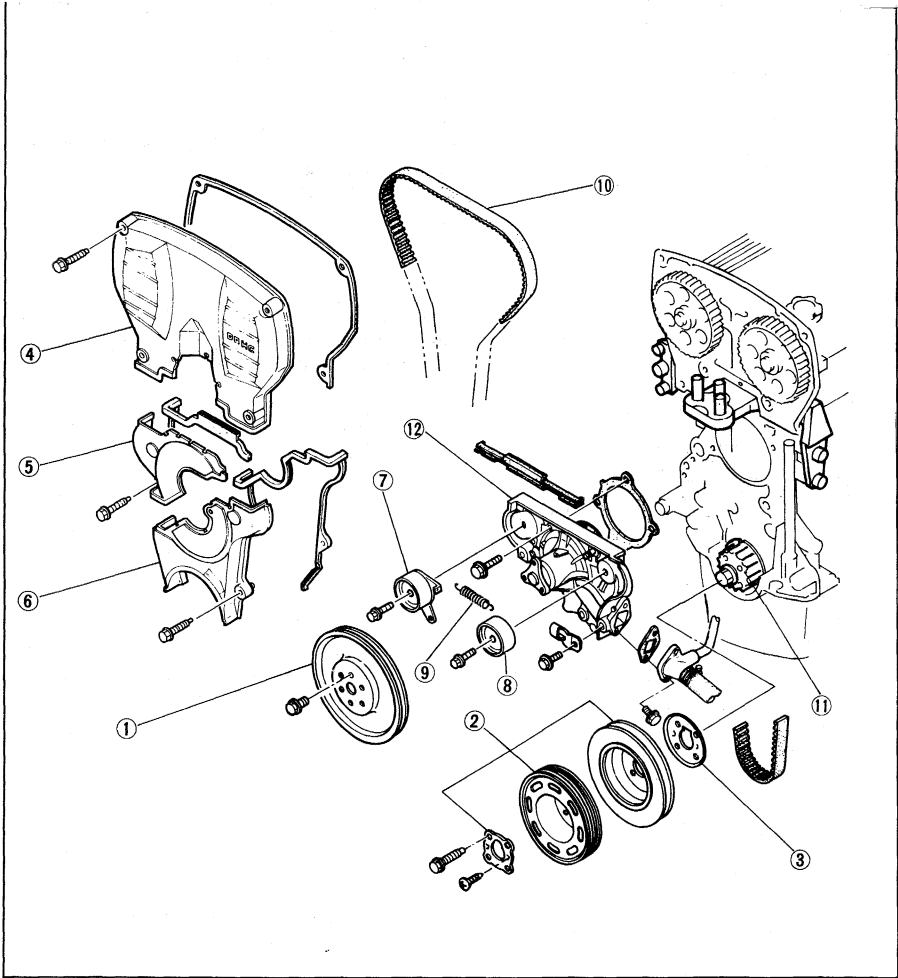


83U01A-049

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1B DISASSEMBLY

Disassembly of Front of Engine



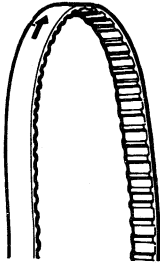
83U01B-040

1. Water pump pulley
2. Drive pulley
3. Baffle plate
4. Upper timing belt cover
5. Middle timing belt cover
6. Lower timing belt cover

7. Timing belt tensioner
8. Idler pulley
9. Tensioner spring
10. Timing belt
11. Timing belt drive pulley
12. Water pump

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Mark the direction of rotation



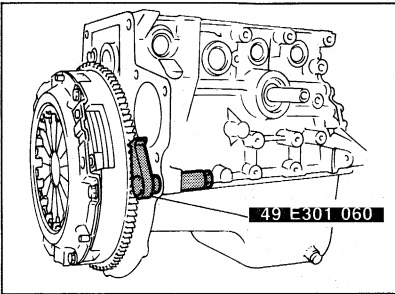
83U01A-112

Timing belt

1. Remove the tensioner spring after loosening the tensioner lock bolt.
2. Mark the direction of rotation on the timing belt.
3. Remove the timing belt.

Caution

Do not allow any oil or grease on the timing belt.



83U01X-124

Crankshaft pulley and timing belt pulley

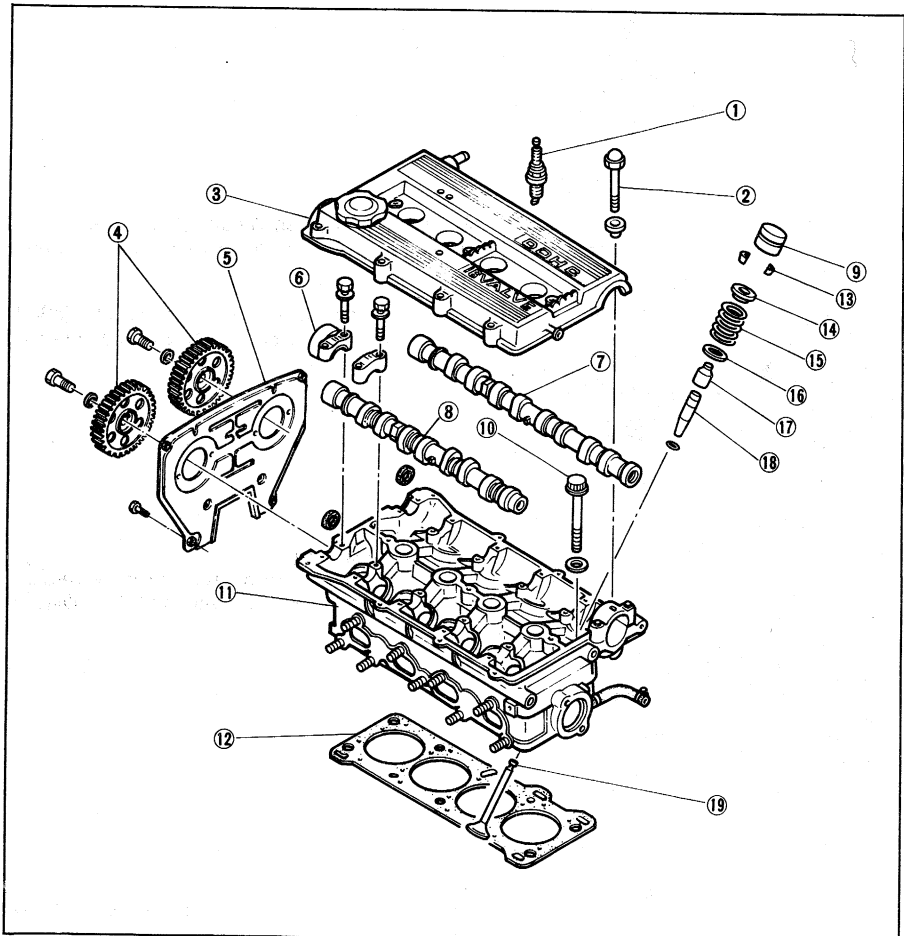
Set the **SST** to the flywheel. Remove the crankshaft pulley and the timing belt pulley.

1B DISASSEMBLY

Disassembly Related to Cylinder Head

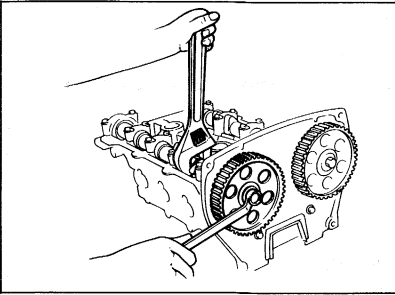
Note

During disassembly, inspect the camshaft end play, camshaft bearing oil clearance referring to **INSPECTION AND REPAIR** section.



83U01B-041

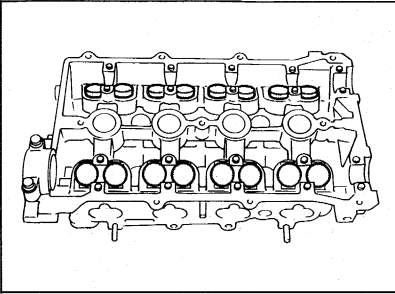
- | | |
|-----------------------------|-------------------------------|
| 1. Spark plug | 11. Cylinder head |
| 2. Cylinder head cover bolt | 12. Cylinder head gasket |
| 3. Cylinder head cover | 13. Spring retainers |
| 4. Camshaft pulley | 14. Valve spring seat (upper) |
| 5. Seal plate | 15. Valve spring |
| 6. Camshaft cap | 16. Valve spring seat (lower) |
| 7. Camshaft (IN) | 17. Valve seal |
| 8. Camshaft (EX) | 18. Valve guide |
| 9. Hydraulic lash adjuster | 19. Valve |
| 10. Cylinder head bolts | |



63G01C-039

Camshaft pulley

Remove the pulley using a wrench to prevent it from turning.



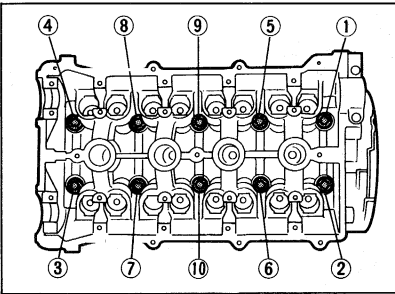
63G01C-041

HLA (Hydraulic Lash Adjuster)

Remove the HLA from the cylinder head.

Note

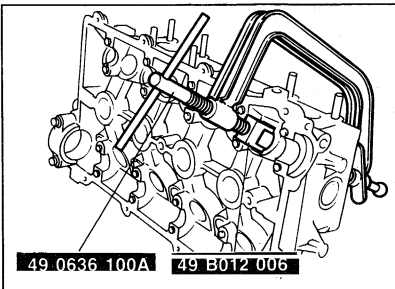
Mark all HLA so that they can be reinstalled in the position from which they were removed.



4BG01A-096

Cylinder head bolt

Remove the cylinder head bolts in the numbered order shown in the figure. Loosen them gradually, in order.



83U01B-042

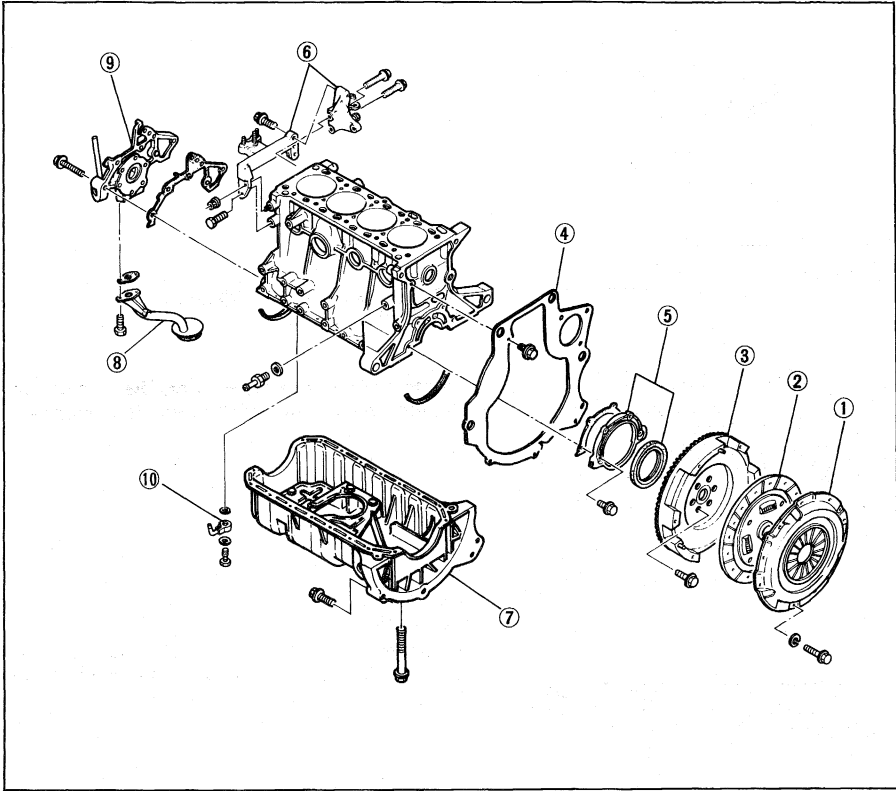
Valve

Remove the valves from the cylinder head with the SST.

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1B DISASSEMBLY

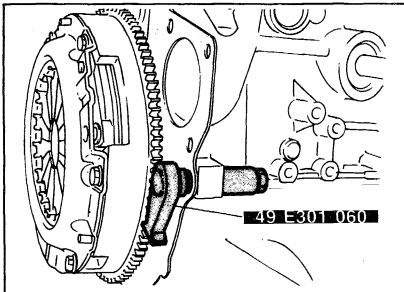
Disassembly Related to Lubrication System and Flywheel



83U01B-043

1. Clutch cover
2. Clutch disc
3. Flywheel
4. End plate
5. Rear cover

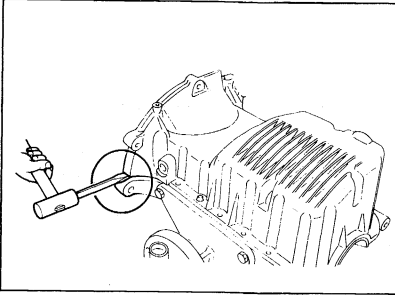
6. Engine bracket and mount arm
7. Oil pan
8. Oil strainer
9. Oil pump
10. Oil jet



83U01X-125

Clutch cover and flywheel

Remove the clutch cover and flywheel with the SST as shown in the figure.



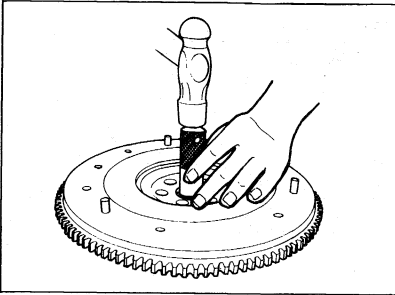
83U01B-044

Oil pan

Remove the oil pan by prying only at the points shown in the figure.

Caution

- a) Do not force a pry tool between the block and pan to prevent damaging the contact surfaces.
- b) Do not damage or scratch the contact surface when removing the oil sealant.



63U01X-065

Flywheel pilot bearing

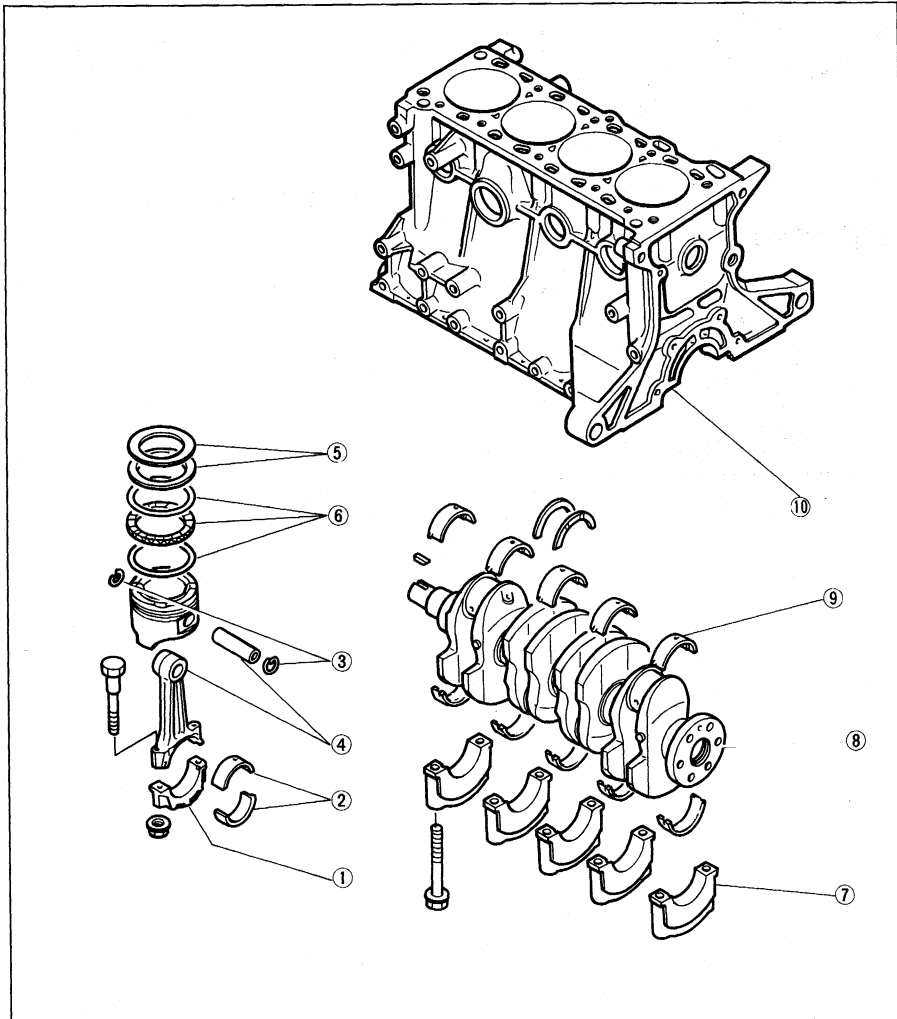
Use suitable pipe and punch out to the crankshaft side of the flywheel, as shown in the figure.

1B DISASSEMBLY

Disassembly Related to Crankshaft and Piston

Note

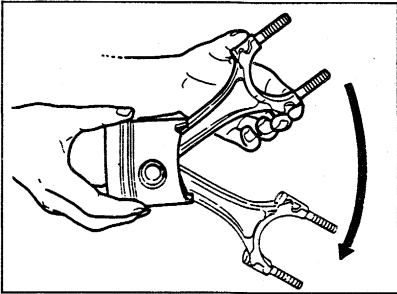
During disassembly, inspect the crankshaft end play, main journal bearing oil clearance, connecting rod bearing oil clearance, connecting rod side clearance referring to ASSEMBLY section.



1. Connecting rod caps
2. Connecting rod bearings
3. Clips
4. Connecting rod and piston pin
5. Piston rings

6. Oil rings
7. Main bearing caps
8. Crankshaft
9. Main bearings
10. Cylinder block

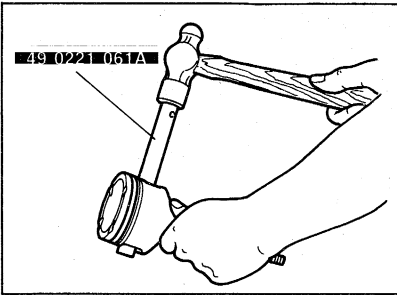
83U01B-045



83U01B-046

Piston and connecting rod

1. Check the oscillation torque of the connecting rod as shown in the figure. If the large end does not drop by its own weight, replace the piston and/or piston pin.



83U01A-054

2. Use the **SST** to remove the piston pin.

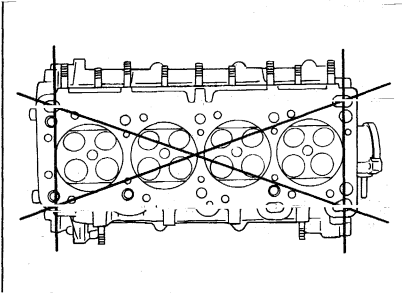
INSPECTION AND REPAIR

1. Clean all parts, taking care to remove any gasket fragments, dirt, oil or grease, carbon, moisture residue, or other foreign material.
2. Inspect and repair in the order specified.

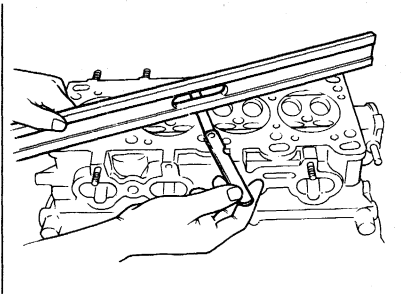
Caution

Be careful not to damage the joints or friction surfaces of aluminum alloy components such as the cylinder head or pistons.

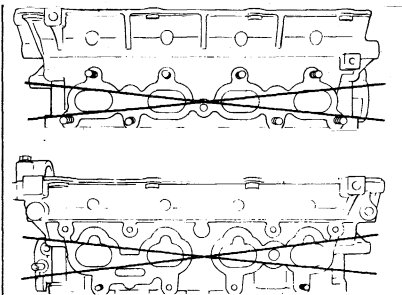
83U01A-058



83U01A-059



83U01B-047



83U01A-061

Cylinder Head

1. Inspect the cylinder head for damage, cracks, and leakage of water or oil, replace if necessary.
2. Measure the cylinder head distortion in the six directions shown in the figure.

Distortion: 0.15 mm (0.006 in) max.

3. If the cylinder head distortion exceeds specification, grind the cylinder head surface. If the cylinder head height is not within specification, replace it.

Height:

133.8—134.0 mm (5.268—5.276 in)

Grinding: 0.20 mm (0.008 in) max.

Note

Before grinding the cylinder head, first check the following and replace the head if necessary.

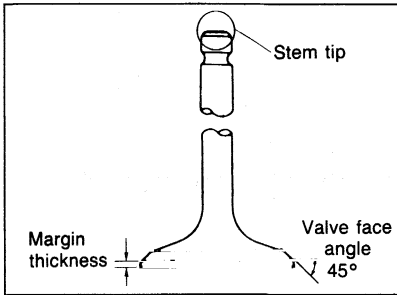
- Sinking of valve seat
- Distortion of manifold contact surface
- Camshaft oil clearance and end play

4. Measure the manifold contact surface distortion in the six directions shown in the figure.

Distortion: 0.15 mm (0.006 in) max.

5. If distortion exceeds specification, grind the surface or replace the cylinder head.

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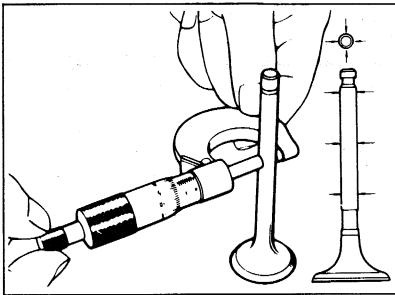
Valve and Valve Guide

1. Inspect each valve for the following, replace or resurface as necessary.
 - (1) Damaged or bent stem
 - (2) Roughness or damage to the face
 - (3) Damage or uneven wear of the stem tip
2. Check the valve head margin thickness, replace if necessary

Margin thickness

IN : 0.5 mm (0.020 in) min.

EX : 0.5 mm (0.020 in) min.



83U01B-049

3. Measure the valve length.

Length

IN : 105.29 mm (4.1452 in)

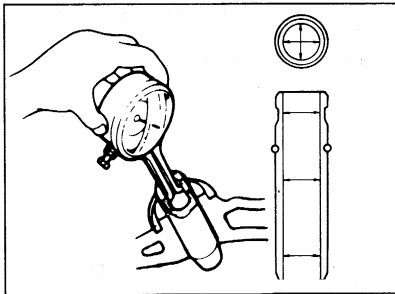
EX : 105.39 mm (4.1492 in)

4. Measure the valve stem diameter.

Diameter

IN : 5.970—5.985 mm (0.2350—0.2356 in)

EX : 5.965—5.980 mm (0.2348—0.2354 in)



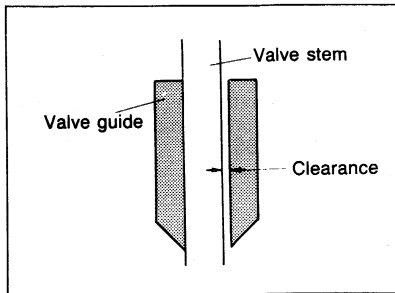
83U01B-050

5. Measure the valve guide inner diameter.

Inner diameter

IN : 6.01—6.03 mm (0.2366—0.2374 in)

EX : 6.01—6.03 mm (0.2366—0.2374 in)



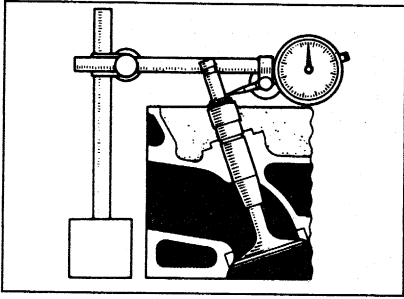
83U01A-064

6. Measure the valve stem to guide clearance.

(1) Method No. 1

Subtract the valve stem measurement from the corresponding valve guide inner diameter measurement.

1B INSPECTION AND REPAIR



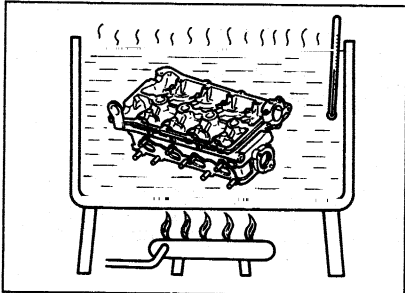
83U01B-051

- (2) Method No. 2
Measure the valve stem play at a point close to the valve guide with the valve lifted off the valve seat.

Clearance

IN : 0.025—0.060 mm (0.0010—0.0024 in)
EX: 0.030—0.065 mm (0.0012—0.0026 in)
Maximum: 0.20 mm (0.0079 in)

7. If the clearance exceeds the maximum, replace the valve and/or valve guide.

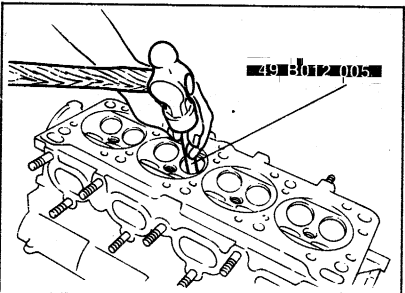


69G01B-093

Replacement of valve guide

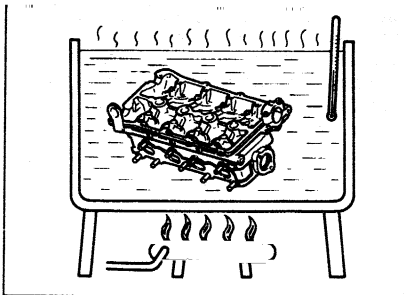
Removal

1. Gradually heat the cylinder head in water to approx. **90°C (190°F)**.



83U01B-052

2. Remove the valve guide from the side opposite the combustion chamber with the **SST**.
3. Remove the valve guide clip.

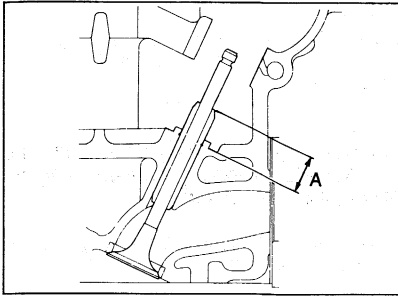


83U01A-113

Installation

1. Fit the clip onto the valve guide.
2. Gradually heat the cylinder head in water to approx. **90°C (190°F)**.
3. Tap the valve guide in from the side opposite the combustion chamber until the clip contacts the cylinder head with the **SST**.

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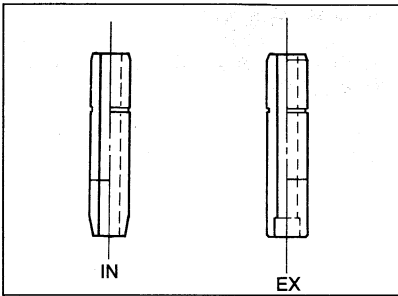


83U01B-053

4. Check that the protrusion height (dimension A in the figure) is within specification.

Height:

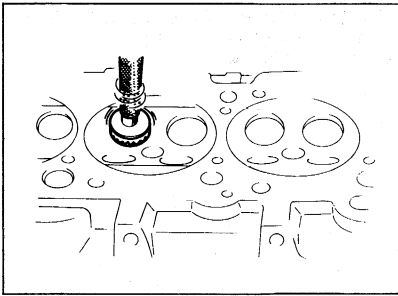
16.8—17.4 mm (0.661—0.685 in)



69G01B-098

Note

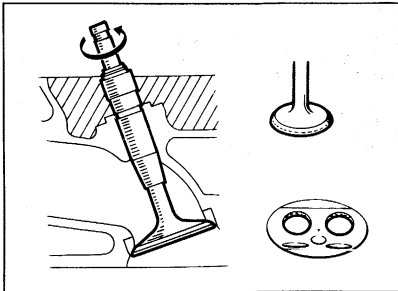
Although the shapes of the intake and exhaust valve guides are different, use the exhaust valve guide on both sides as a replacement.



83U01B-066

Valve Seat

1. Inspect the contact surface of the valve seat and valve face.
 - (1) Roughness
 - (2) Damage
2. If necessary, resurface the valve seat using a **45°** valve seat cutter and/or resurface the valve face.

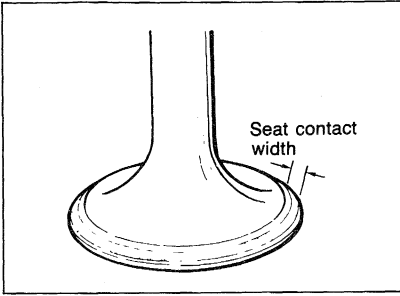


83U01B-114

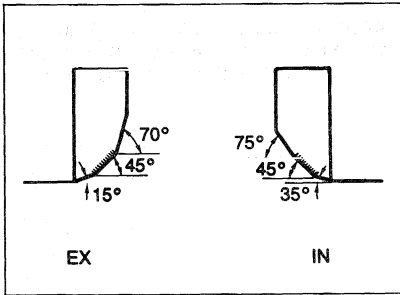
3. Apply a thin coat of prussian blue to the valve face.
4. Check the valve seating by pressing the valve against the seat.
 - (1) If blue does not appear 360° around the valve face, replace the valve.
 - (2) If blue does not appear 360° around the valve seat, resurface the seat.

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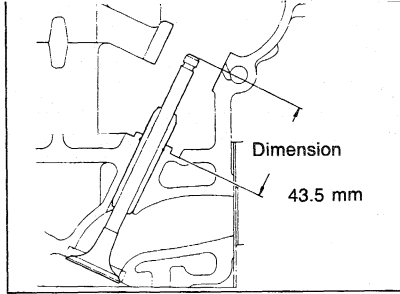
1B INSPECTION AND REPAIR



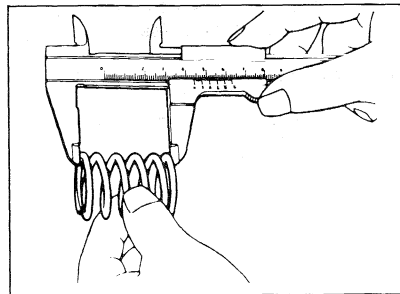
83U01B-054



83U01A-068



83U01B-055



83U01B-056

5. Check the seat contact width and valve seating position on the valve face.

Width:

0.8—1.4 mm (0.031—0.055 in)

6. Check that the valve seating position is at the center of the valve face.

- (1) If the seating position is too high, correct the valve seat using a **75°** cutter, and a **45°** cutter.
- (2) If the seating position is too low, correct the valve seat using a **35° (IN)** or **15° (EX)**, and a **45°** cutter.

7. Seat the valve to the valve seat using a lapping compound.

8. Check the sinking of the valve seat. Measure protruding length (dimension "L") of the valve stem.

Dimension "L": 43.5 mm (1.713 in)

- (1) If "L" is as below, it can be used as it is.

43.5—44.0 mm (1.713—1.732 in)

- (2) If "L" is as below, insert a spacer between the spring seat and cylinder head so that "L" will be as specified.

44.0—45.0 mm (1.732—1.772 in)

- (3) If "L" is more than as below, replace the cylinder head.

45.0 mm (1.772 in) or more

Valve Spring

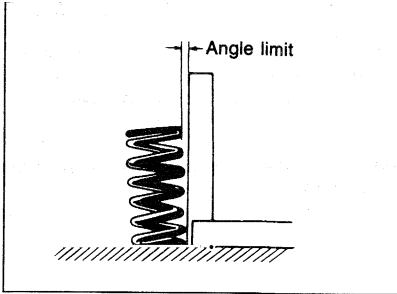
1. Inspect each valve spring for cracks or damage.
2. Check the free length and angle, replace if necessary.

Free length

Standard: 47.2 mm (1.858 in)

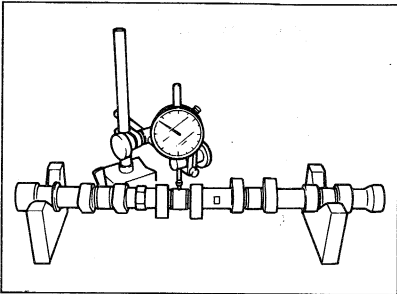
Minimum: 45.8 mm (1.803 in)

INSPECTION AND REPAIR 1B



83U01B-057

Angle: 1.6 mm (0.063 in) max.

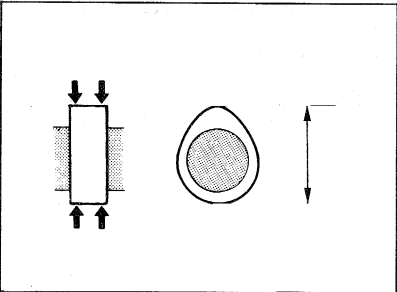


83U01A-074

Camshaft

1. Set the front and rear journals on V-blocks.
Check the camshaft runout, replace if necessary.

Runout: 0.03 mm (0.0012 in) max.



83U01B-058

2. Check the cam for wear or damage, replace if necessary.
3. Check the cam lobe height at the two places as shown.

Height

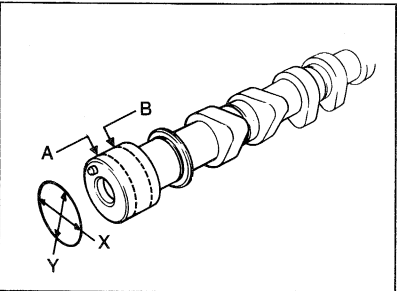
IN : 40.888 mm (1.6098 in)

EX : 40.688 mm (1.6019 in)

Minimum

IN : 40.889 mm (1.6098 in)

EX : 40.689 mm (1.6019 in)



83U01B-059

4. Measure wear of the journals in X and Y directions at the two places shown.

Diameter

No.1—No.5:

25.940—25.965 mm (1.0213—1.0222 in)

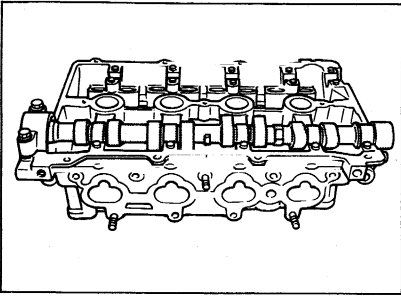
No.6:

33.961—34.000 mm (1.3370—1.3386 in)

Out-of-round: 0.05 mm (0.002 in) max.

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1B INSPECTION AND REPAIR



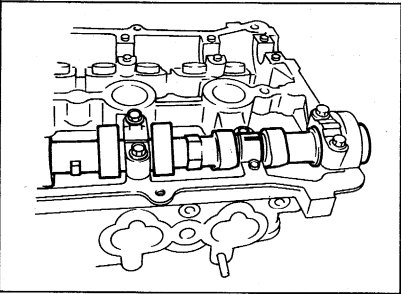
83U01B-060

5. Measure the oil clearances of the camshaft and cylinder head.

- (1) Remove any oil, or dirt from the journals and bearing surface.
- (2) Set the camshaft on the cylinder head.

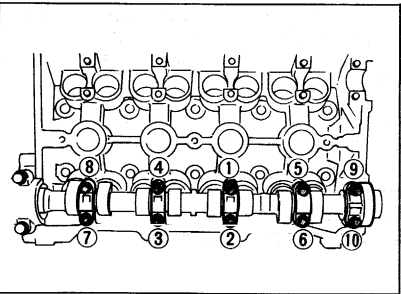
Note

Do not install the HLA, when measuring the oil clearance.



83U01B-061

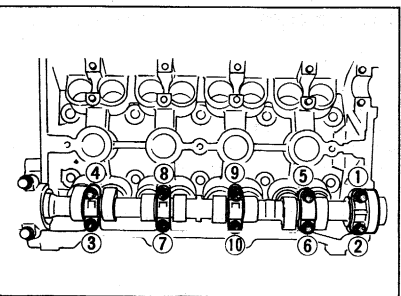
- (3) Position the plastic-gauge on top of the journal in the journal axial direction.



83U01B-062

- (4) Install the camshaft caps according to the cap number and arrow, tighten them in the order shown in the figure.

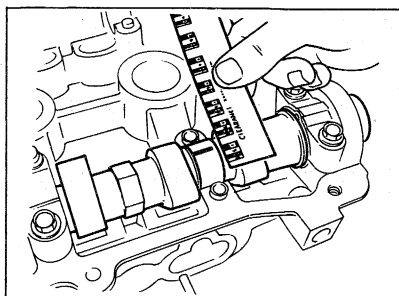
**Tightening torque: 11—14 Nm
(1.15—1.45 m·kg, 100—126 in·lb)**



83U01B-063

- (5) Loosen the camshaft cap bolts in the order shown in the figure.

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- (6) Measure the oil clearance.

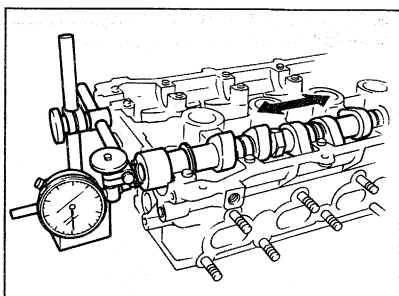
Oil clearance

No. 1—No. 5:

0.035—0.081 mm (0.0014—0.0032 in)

Maximum: 0.15 mm (0.0059 in)

- (7) If the oil clearance exceeds the maximum, replace the camshaft or the cylinder head.



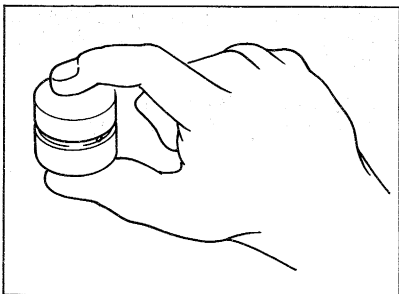
83U01B-065

6. Measure the camshaft end play. If it exceeds the maximum, replace the camshaft or the cylinder head.

End play:

0.07—0.19 mm (0.0028—0.0075 in)

Maximum: 0.20 mm (0.008 in)



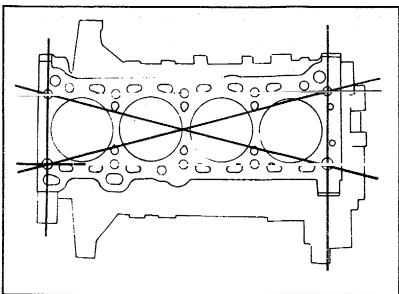
63G01C-061

HLA

1. Check the HLA for wear or damage.
2. Hold the HLA between your fingers and press it. If the HLA moves, replace it.

Note

Do not disassemble the HLA



69G01A-117

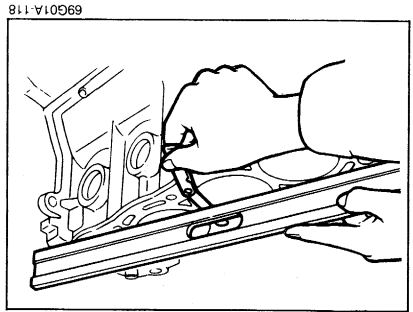
Cylinder Block

1. Check the cylinder block, repair or replace if necessary.
 - (1) Leakage damage
 - (2) Cracks
 - (3) Scoring of wall
2. Measure the distortion of the top surface of the cylinder block in the six directions shown in figure.

Distortion: 0.15 mm (0.006 in) max.

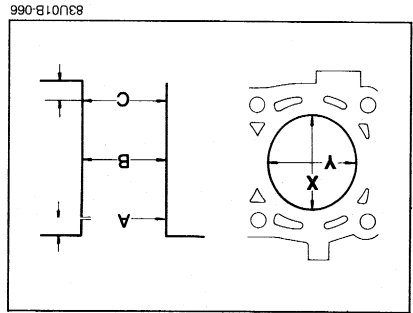
3. If the distortion exceeds the maximum, repair by grinding, or replace the cylinder block.

Grinding: 0.20 mm (0.008 in) max.



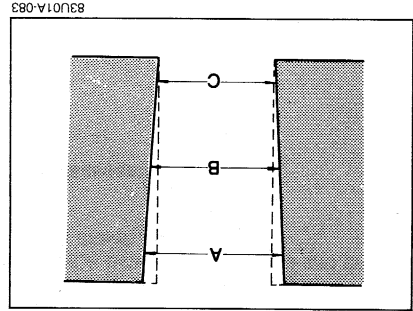
4. Measure the cylinder bore in directions X and Y at three levels in each cylinder as shown.

Cylinder bore	
Size	Bore
Standard	78.000–78.019
0.25 (0.010) oversize	78.250–78.269
0.50 (0.020) oversize	78.500–78.519
0.75 (0.030) oversize	78.750–78.769
1.00 (0.040) oversize	79.000–79.019



(1) If the difference between the measurement A and C exceeds the maximum taper, rebore the cylinder to oversize.

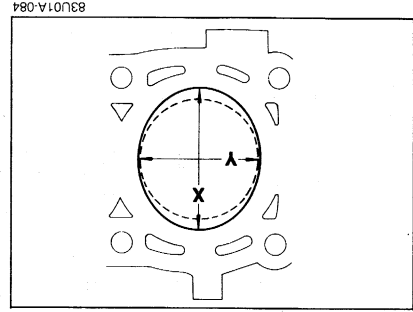
Taper: 0.019 mm (0.0007 in) max.



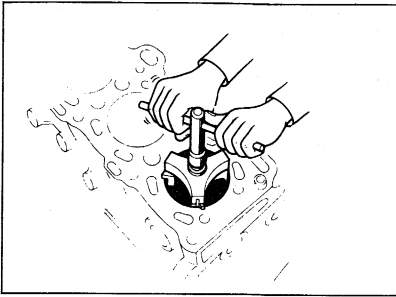
(2) If the difference between the measurement X and Y exceeds the maximum out-of-round, rebore the cylinder to oversize.

Out-of-round: 0.019 mm (0.0007 in) max.

Caution
The boring size should be the same for all cylinders.

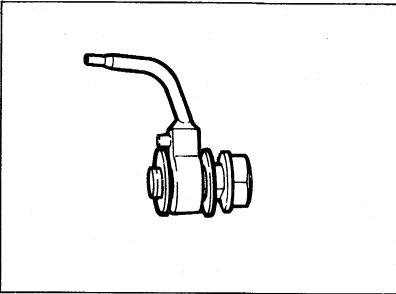


INSPECTION AND REPAIR 1B



69G01A-122

- If the upper part of the cylinder wall shows uneven wear, remove the ridge using a ridge reamer.



63G01C-063

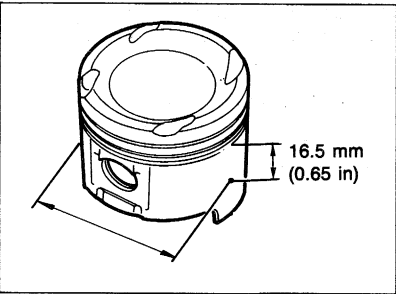
Oil Jet

- Check the oil jet for clogging.

Note

Make sure that the oil passages are not clogged.

- Check the check ball move smoothly.



83U01A-085

Piston

- Inspect the outer circumferences of all pistons for seizure or scoring, replace if necessary.
- Measure the outer diameter of each piston at a right angle (90°) to the piston pin, **16.5 mm (0.650 in) below** the oil ring land lower edge.

Piston diameter

mm (in)

Size	Diameter
Standard	77.954—77.974 (3.0690—3.0698)
0.25 (0.010) oversize	78.204—78.224 (3.0789—3.0797)
0.50 (0.020) oversize	78.454—78.474 (3.0887—3.0895)

- Check the piston to cylinder clearance.

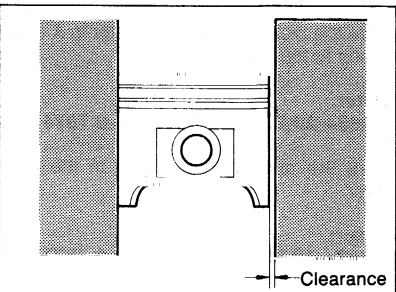
Clearance:

0.026—0.065 mm (0.0010—0.0026 in)
Maximum: 0.15 mm (0.0059 in)

- If the clearance exceeds the maximum, replace the piston or rebores the cylinder to oversize.

Note

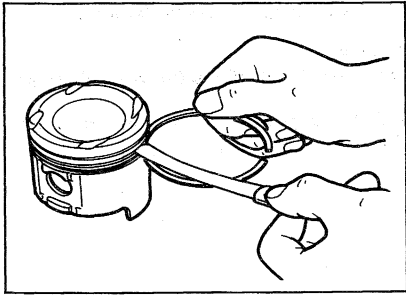
If the piston is replaced, replace the piston rings also.



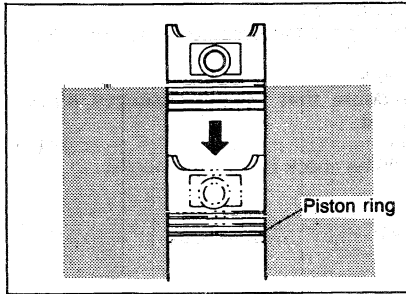
83U01A-086

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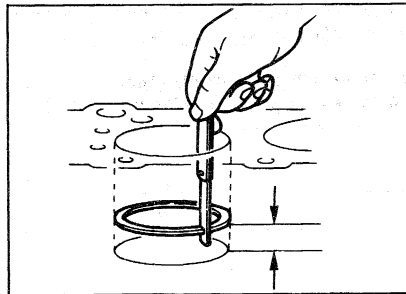
1B INSPECTION AND REPAIR



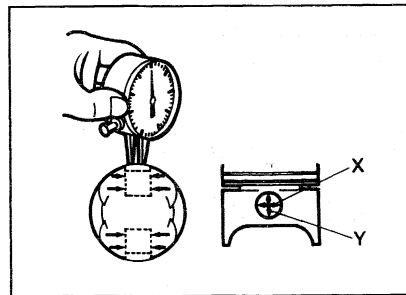
83U01A-087



83U01A-088



83U01A-089



83U01A-090

Piston and Piston Ring

1. Measure the piston ring to ring land clearance around the entire circumference using a new piston ring.

Clearance (Top and Second):

0.030—0.065 mm (0.0012—0.0026 in)

Maximum: 0.15 mm (0.006 in)

2. If the clearance exceeds the maximum, replace the piston.

3. Inspect the piston rings for damage, abnormal wear, or breakage, replace if necessary.

4. Insert the piston ring into the cylinder by hand and push it to the bottom of the ring travel in using the piston.

5. Measure each piston ring end gap using a feeler gauge, replace if necessary.

End gap

Top : 0.20—0.40 mm (0.008—0.016 in)

Second: 0.15—0.30 mm (0.006—0.012 in)

Oil rail : 0.20—0.70 mm (0.008—0.028 in)

Maximum: 1.0 mm (0.039 in)

Piston and Piston Pin

1. Measure the piston pin hole diameter in X and Y directions at four places.

Diameter:

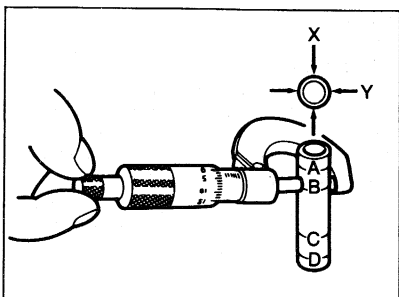
19.988—20.000 mm (0.7869—0.7874 in)

2. Measure the piston pin diameter in the same manner.

Diameter:

19.987—19.993 mm (0.7869—0.7871 in)

INSPECTION AND REPAIR 1B



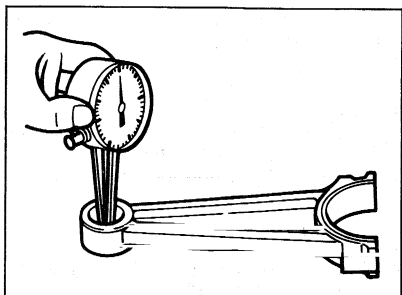
83U01B-068

3. Check the piston pin to piston clearance.

Clearance:

-0.005—0.013 mm (-0.0002—0.0005 in)

4. If the clearance exceeds the maximum, replace the piston and/or piston pin.



83U01B-069

Connecting Rod

1. Measure the connecting rod small end bore.

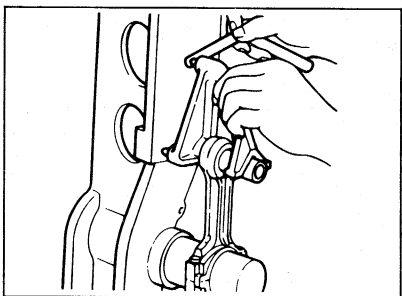
Diameter:

20.003—20.014 mm (0.7875—0.7880 in)

2. Check the clearance between the small end bore and piston pin.

Clearance:

0.010—0.027 mm (0.0004—0.0012 in)

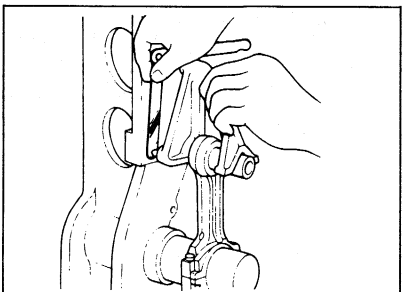


69G01B-115

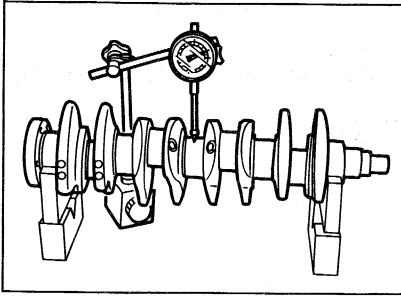
3. Check each connecting rod for bending or twisting, if necessary replace or repair.

Bend: 0.04 mm (0.0016 in) max.

Twist: 0.04 mm (0.0016 in) max.



69G01B-116

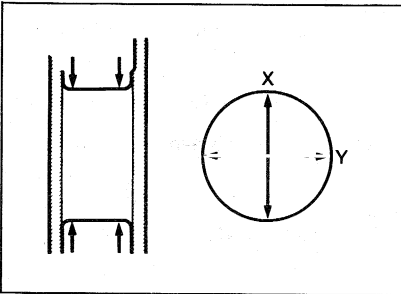


83U01A-093

Crankshaft

1. Check the journals and pins for damage, scoring, or oil hole clogging.
2. Set the crankshaft on V-blocks.
3. Check the crankshaft runout at the center journal, replace if necessary.

Runout: 0.04 mm (0.0016 in) max.



83U01A-094

4. Measure each journal diameter in X and Y directions at two places.

Main journal

Diameter:

49.938—49.956 mm (1.9661—1.9668 in)

Minimum: 49.89 mm (1.964 in)

Out-of-round: 0.05 mm (0.0020 in) max.

Crankpin journal

Diameter:

44.940—44.956 mm (1.7693—1.7699 in)

Minimum: 44.89 mm (1.7673 in)

Out-of-round: 0.05 mm (0.0020 in) max.

5. If the diameter is below the minimum, grind the journals to match undersized bearings.

Undersized bearing:

0.25 mm (0.010 in), 0.50 mm (0.020 in)

Main journal diameter undersize mm (in)

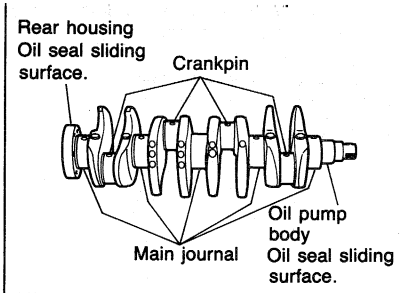
Bearing size	Journal diameter
0.25 undersize	49.688—49.706 (1.9562—1.9569)
0.50 undersize	49.438—49.456 (1.9464—1.9471)

Crankpin journal diameter undersize mm (in)

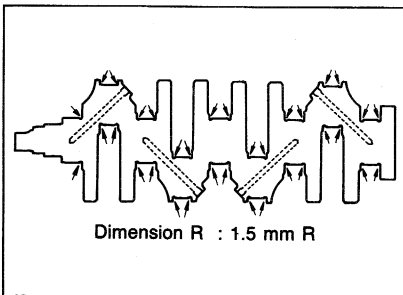
Bearing size	Journal diameter
0.25 undersize	44.690—44.706 (1.7594—1.7601)
0.50 undersize	44.440—44.456 (1.7496—1.7502)

Caution

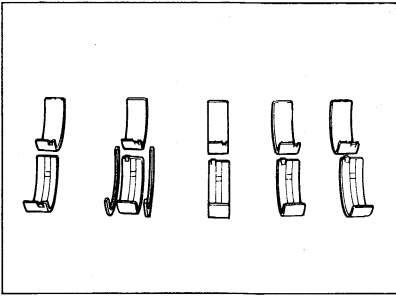
Do not grind the fillet roll.



83U01A-095



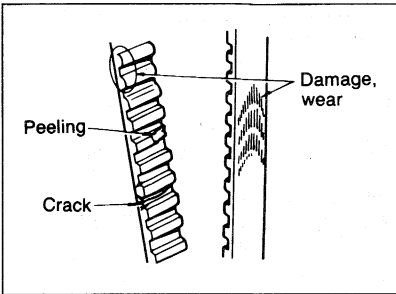
83U01A-096



83U01A-097

Main Bearing and Connecting Rod Bearing

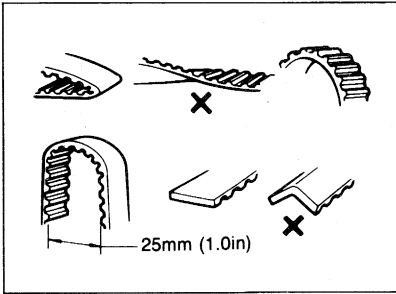
Check the main bearings and the connecting rod bearings for peeling, scoring, or other damage.



69G01B-121

Timing Belt

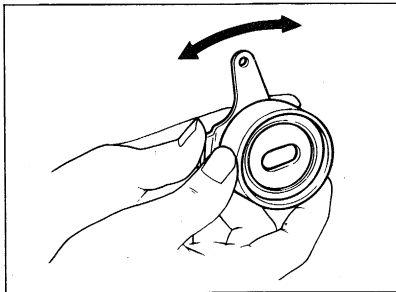
1. Replace the timing belt if there is any oil or grease on it.
2. Check the timing belt for damage, wear, peeling, cracks, or hardening, replace if necessary.



69G01B-122

Caution

- a) Never forcefully twist the timing belt. Do not turn it inside out or bend it.
- b) Be careful not to allow oil or grease on the belt.



83U01A-098

Timing Belt Tensioner and Idler Pulley

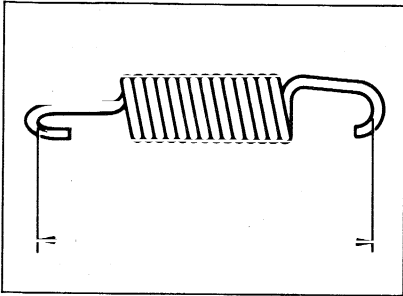
Check the timing belt tensioner and idler pulley for smooth rotation or abnormal noise, replace if necessary.

Caution

Do not clean the tensioner with cleaning fluids. If necessary, use a soft rag to wipe it clean, and avoid scratching it.

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1B INSPECTION AND REPAIR

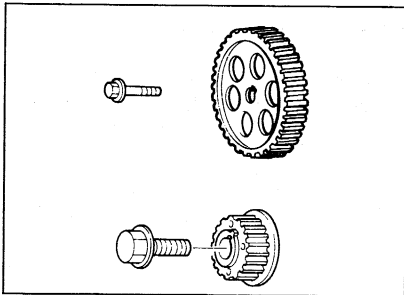


83U01B-070

Timing Belt Tensioner Spring

Check the free length of the tensioner spring, replace if necessary.

Free length:
58.8 mm (2.315 in)



83U01B-071

Timing Belt Pulley and Camshaft Pulley

Inspect the pulley teeth for wear, deformation, or other damage, replace the pulley if necessary.

Caution

**Do not clean the pulley with cleaning fluids.
If necessary, use a rag to wipe it clean.**

Timing Belt Cover (lower, middle and upper)

Inspect the timing belt covers for deformation of cracks, replace if necessary.

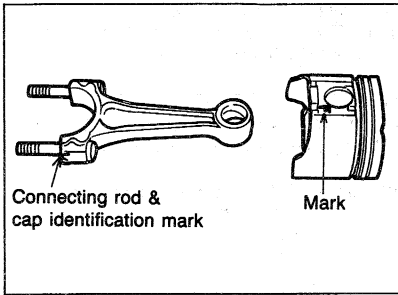
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ASSEMBLY

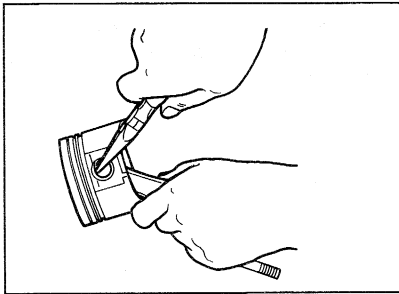
Assembly Note

1. Be sure all parts are clean before reinstallation.
2. Apply new engine oil to all sliding and rotating parts.
3. Do not reuse gaskets or oil seals.
4. During assembly, inspect all critical clearances, end plays and oil clearances.
5. Tighten bolts to the specified torques.
6. Replace bearings if they are peeling, burned, or otherwise damaged.

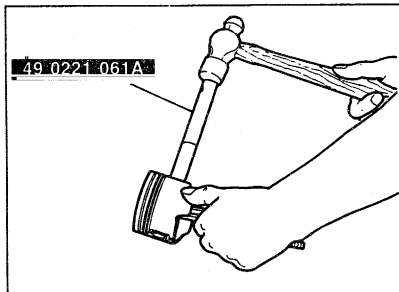
4BG01A-136



63G01C-112



63G01C-073



83U01X-126

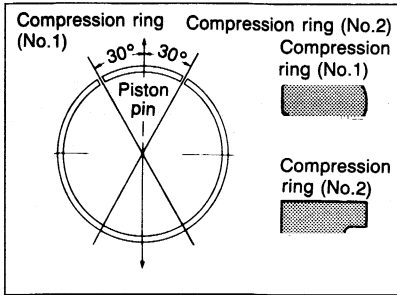
Connecting Rod

1. Align the identification mark to the cap of large end of connecting rod and "F" mark on the piston as shown in the figure.
2. Apply a coat of engine oil to the circumference of each piston pin and to the small end of each connecting rod.

3. Set a clip into the clip groove in one side of the piston.
4. Assemble the piston and connecting rod.

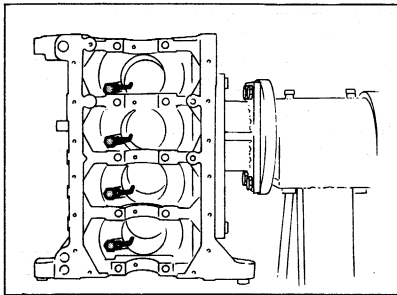
5. Using the **SST**, insert the piston pin from the opposite side of the piston.
6. Tap the piston pin into touch the clip. Install the other clip into the groove in the piston.

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5BU01X-208

- Position the opening of each ring as shown in the figure.



63G01C-076

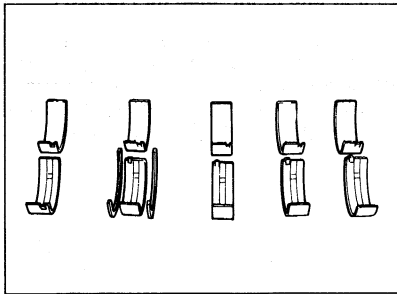
Oil Jet

Install the oil jet as shown in the figure.

**Tightening torque: 12—18 N·m
(1.2—1.8 m·kg, 104—156 in·lb)**

Note

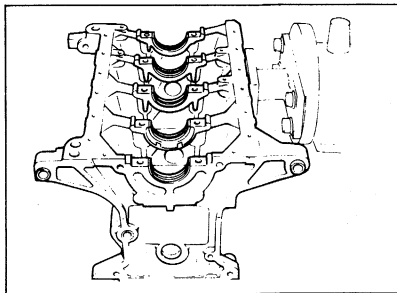
Before installation make sure that the oil passage is not clogged.



63U01X-095

Crankshaft

- Inspect the oil clearances of the crankshaft and main bearings.



4BG01A-147

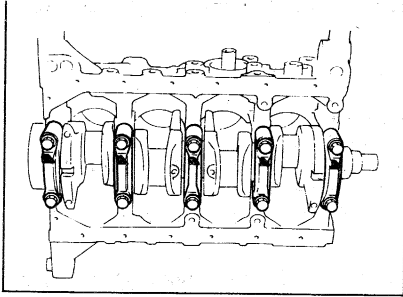
- Remove any foreign material and oil from the journal and bearing.
- Install the main bearings and the crankshaft.

Caution


The main bearing with the oil grooves must be installed in the cylinder block.

- Position the plasti-gauge on top of each journal (in the journal axial direction), away from the oil hole.

1B ASSEMBLY



63U01X-096

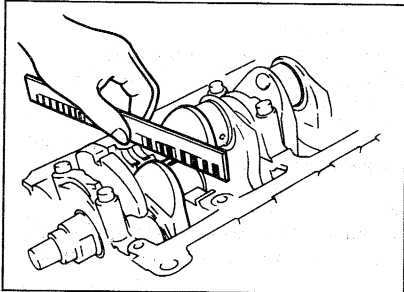
- (4) Set the main bearing caps according to the cap number and  mark, and tighten them.

Note

Do not rotate the crankshaft when measuring the oil clearances.

Tightening torque:

54—59 Nm (5.5—6.0 m·kg, 40—43 ft·lb)



83U01B-072

- (5) Remove the main bearing cap, and measure the plasti-gauge at each journal at the widest point for the smallest clearance, and at the narrowest point for the largest clearance.

Oil clearance:

0.024—0.042 mm (0.0010—0.0017 in)

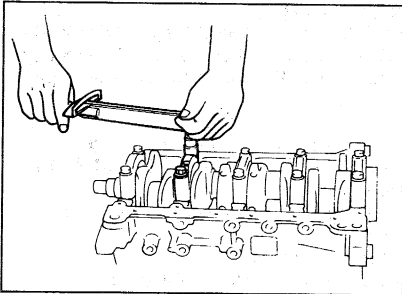
Maximum:

0.08 mm (0.0031 in)


- (6) If the oil clearance exceeds the limit, grind the crankshaft and use undersized main bearings.

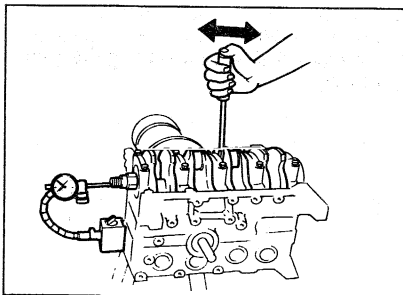
Undersized main bearings:

0.25 mm (0.010 in), 0.50 mm (0.020 in)



63G01C-078

2. Apply engine oil to the main bearings and main journals.
3. Install the thrust bearings to the cylinder block side.
4. Install the crankshaft, and install the main bearing caps according to the cap number and  mark.



83U01B-073

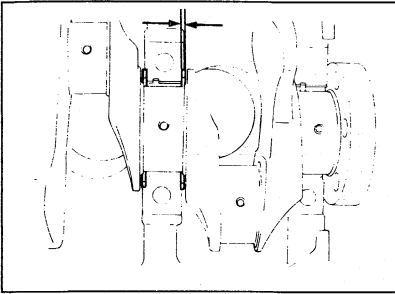
5. inspect crankshaft end play.

End play:

0.08—0.242 mm (0.0031—0.0111 in)

Maximum:

0.30 mm (0.012 in)



83U01B-074

If end play exceeds the limit, adjust the end play with thrust bearings.

Standard thickness:

2.50—2.55 mm (0.0984—0.1004 in)

Undersize width:

0.25 mm (0.010 in):

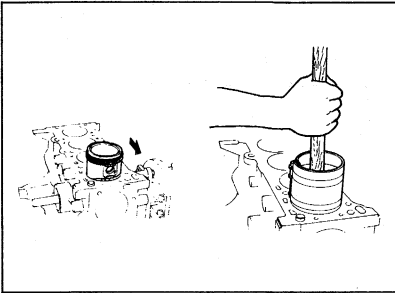
2.625—2.675 mm (0.1033—0.1053 in)

0.50 mm (0.020 in):

2.750—2.800 mm (0.1083—0.1102 in)

Note

Oil groove of the thrust bearing must face the crankshaft.



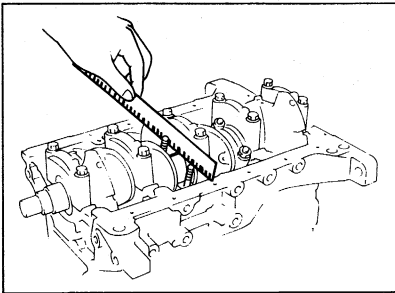
4BG01A-154

Piston and Connecting Rod Assembly

1. Apply engine oil to the cylinder walls, piston circumference, and rings.
2. Insert each piston and connecting rod into the cylinder block by using a piston insertion tool, (commercially available).

Caution

The pistons must be inserted so that the "F" marks face the front of the cylinder block.



83U01B-075

Connecting Rod Cap

1. Inspect and adjust the connecting rod bearing and crankshaft pin journal oil clearance by the same procedure used for the crankshaft and main bearing oil clearance.

Connecting rod cap tightening torque:

65—69 N·m (6.6—7.0 m·kg, 48—51 ft·lb)

Oil clearance:

0.028—0.068 mm (0.0011—0.0027 in)

Maximum:

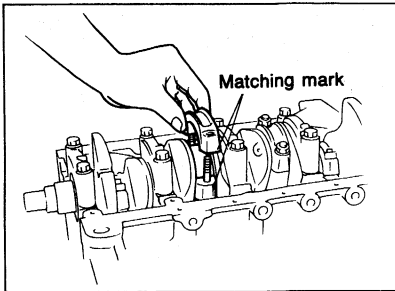
0.10 mm (0.0039 in)

Undersized connecting rod bearing:

0.25 mm (0.010 in), 0.50 mm (0.020 in)

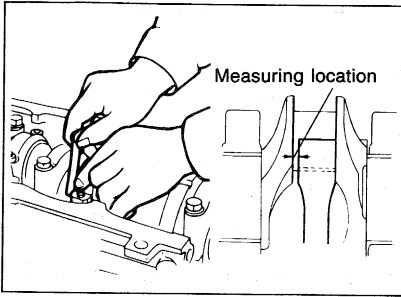
Caution

Be sure to align the connecting rod caps and on the connecting rod when installing the connecting rod cap.



63G01C-081

1B ASSEMBLY



83U01B-115

2. Check the side clearance of the connecting rods.

Clearance: 0.30 mm (0.0118 in) max.

Caution

The connecting rod side clearance must be measured before installation.

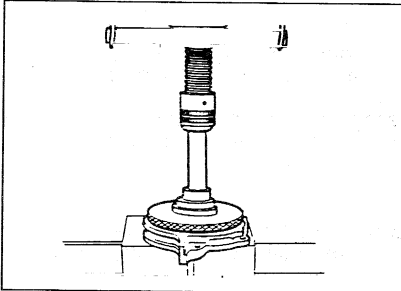
3. Apply engine oil to the crankpin journal and connecting rod bearing.
4. Install the connecting rod cap to align the matching mark and tighten it.

Tightening torque:

65—69 N·m (6.6—7.0 m·kg, 48—51 ft·lb)

Rear Cover

1. Apply engine oil to the rear cover, oil seal and oil seal lip.
2. Press the oil seal into the rear cover.

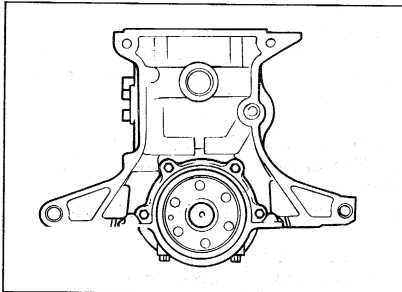


63U01X-102

3. Install the rear cover along with a new gasket.

Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)

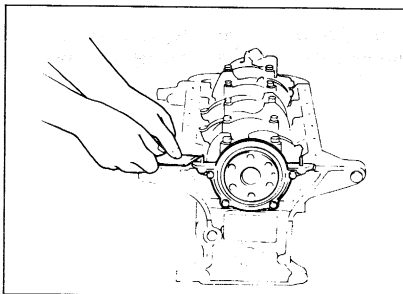


63U01X-103

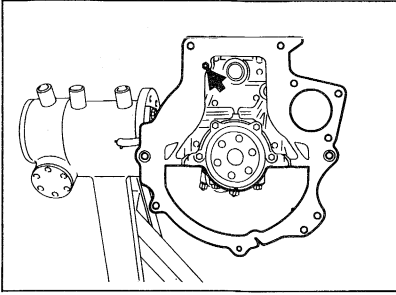
4. Cut away the exposed part of the gasket that projects out from the rear cover assembly.

Caution

Do not scratch the rear cover assembly.



63G01C-083



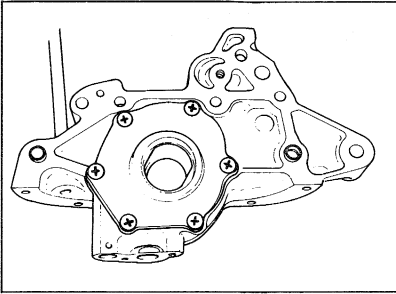
63U01X-104

End Plate

Install the end plate.

Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)



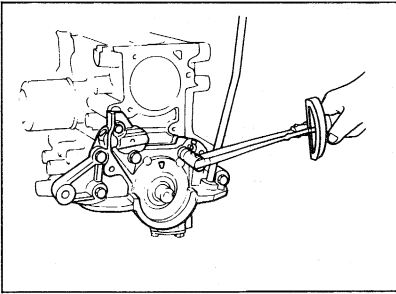
63U01X-105

Oil Pump

1. Remove any dirt or grease from the contact surfaces of the cylinder block and oil pump with a rag.
2. Apply engine oil to the oil seal lip.
3. Install new gasket.

Caution

Do not allow any sealant in the oil hole.



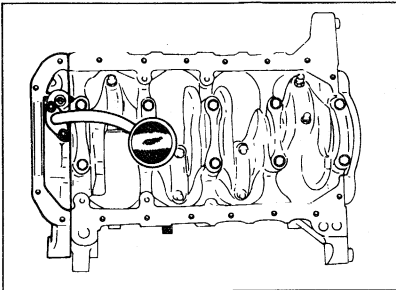
63U01X-106p

4. Install the oil pump.

Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

5. Remove any sealant which is squeezed out.



63U01X-107

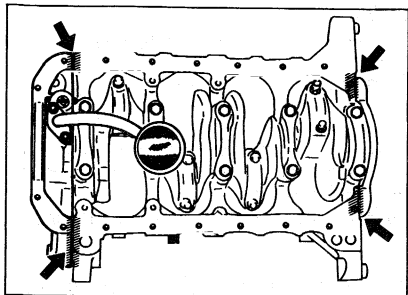
Oil Strainer

Install the oil strainer along with a new gasket.

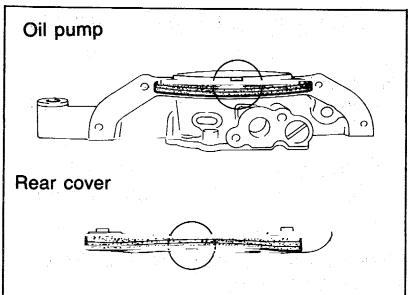
Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)

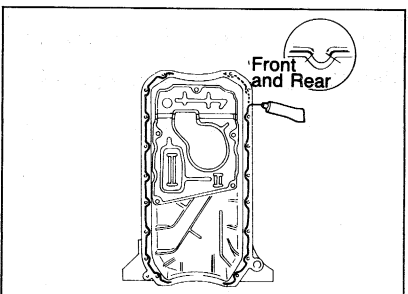
1B ASSEMBLY



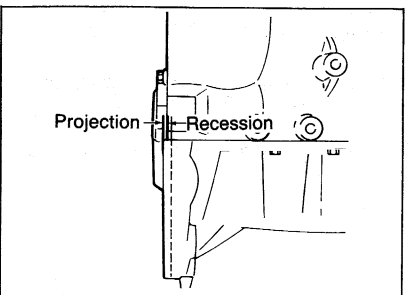
83U01B-076



83U01B-077



83U01B-078



83U01B-079

Oil Pan

1. Apply sealant to the places indicated by the arrows in the figure after cleaning the cylinder block surface.

2. Install the gaskets onto the oil pump body and rear cover with the projections in the notches as shown.

3. Clean the oil pan contact surface.

Caution
Remove all dirt and oil.

4. Apply silicone sealant to the oil pan continuously with the bead of **2.5—3.5 mm (0.0984—0.1378 in)**, rimming the surface inside the bolt holes as shown.

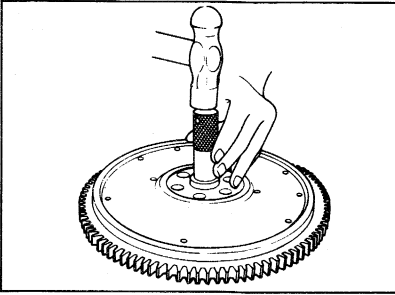
Caution
After the sealant is applied, the pan must be secured within 30 minutes.

5. Install the oil pan.

Caution
Oil pan projection and recession from the end of the cylinder block must not be more than **1.5 mm (0.06 in)**

6. Tighten the bolts gradually in three steps.

Tightening torque:
8—11 Nm (0.8—1.1 m-kp, 69—95 in-lb)



83U01A-107

Flywheel (MTX)

1. Tap the pilot bearing in with a suitable pipe and hammer.
2. Apply sealant to the flywheel bolts.

Caution

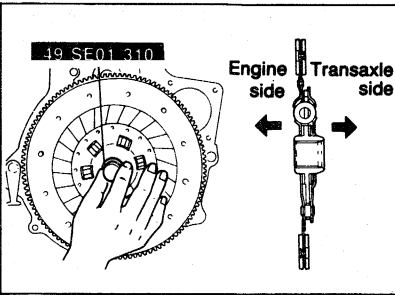
If reinstalling flywheel bolts, clean threads to remove old sealant, apply new sealant and tighten to specification.

If old sealant can not be removed, replace bolts.

3. Install the flywheel, with the SST while tightening.

Tightening torque:

96—103 N·m (9.8—10.5 m·kg, 71—76 ft·lb)



83U01B-109

Clutch Disc and Clutch Cover

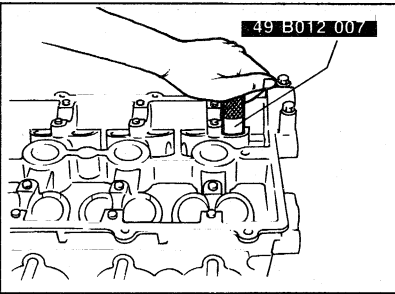
Install the clutch disc and clutch cover with the SST, and tighten the clutch cover.

Tightening torque:

18—26 N·m (1.8—2.7 m·kg, 13—20 ft·lb)

Note

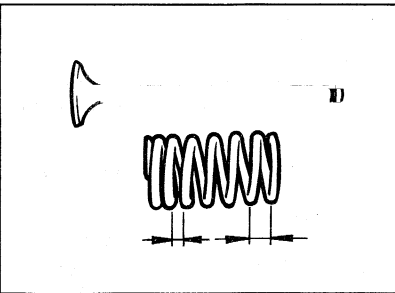
Follow the clutch disc installation directions exactly (See Section 6).



83U01X-127

Valve Seal

1. Apply engine oil to the inner surface of the new valve seal.
2. Install the valve seal onto the valve guide with the SST.



63U01X-091

Valve and Valve Spring

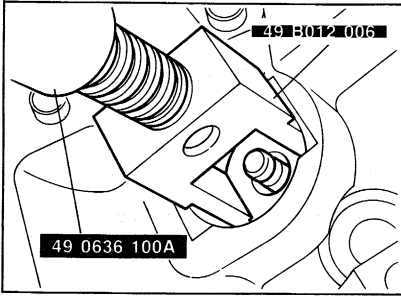
1. Install the lower spring seat.
2. Install the valve.
3. Install the valve spring and the upper spring seat.

Note

Install the spring with its narrow pitch end toward the cylinder head.

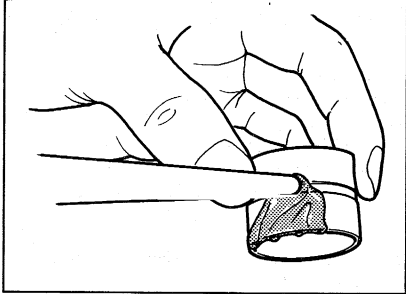
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1B ASSEMBLY



83U01X-12B

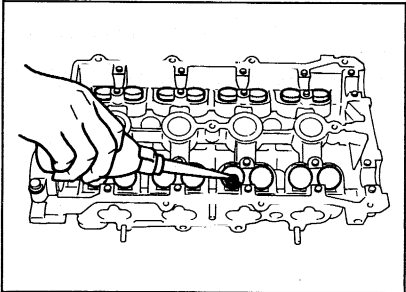
4. Install the spring retainer after compressing the valve spring with the **SST**.



83U01B-080

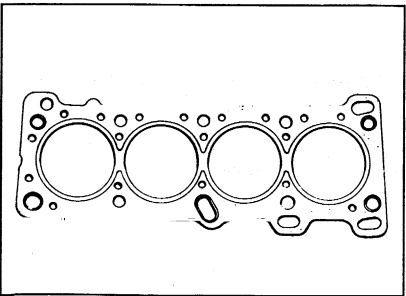
HLA

1. Apply engine oil to the sliding surface.



83U01B-081

2. Install the HLA in the position from which they were removed.
3. Check for free movement.



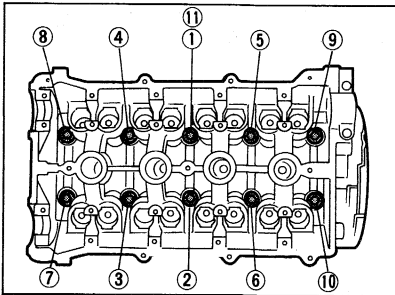
63G01C-085

Cylinder Head

1. Thoroughly remove all dirt and grease from the top of the cylinder block with a rag.
2. Use a new cylinder head gasket in position.

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ASSEMBLY 1B



63U01X-112p

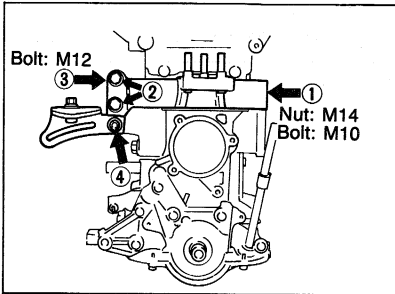
3. Install the cylinder head.

Tightening torque:

76—81 N·m (7.7—8.3 m·kg, 56—60 ft·lb)

Caution

Tightening the bolts must be done gradually and in the order shown in the figure.



83U01B-082

Engine Bracket and Mount Arm

Install the engine bracket and mount arm.

Tightening torque:

Bolt ①: 47—66 N·m

(4.8—6.7 m·kg, 35—48 ft·lb)

Bolt ②: 60—85 N·m

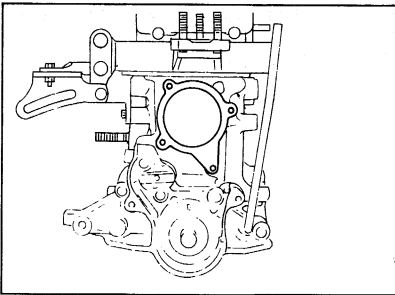
(6.1—8.7 m·kg, 44—63 ft·lb)

Bolt ③: 93—117 N·m

(9.5—11.9 m·kg, 69—86 ft·lb)

Bolt ④: 37—52 N·m

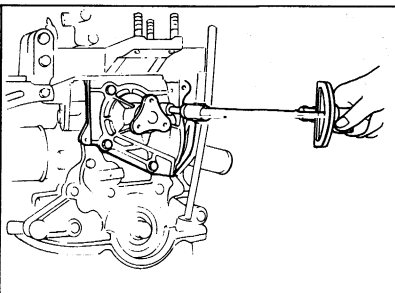
(3.8—5.3 m·kg, 27—38 ft·lb)



63G01C-084

Water Pump

1. Remove any dirt or old gasket from the water pump mounting surface.
2. Use a new water pump gasket in position.



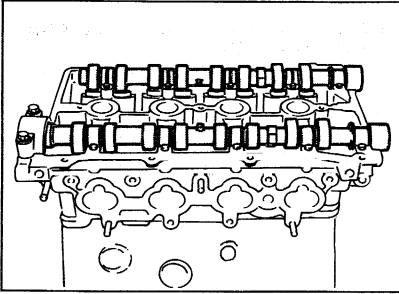
48G01A-169p

3. Install the water pump.

Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

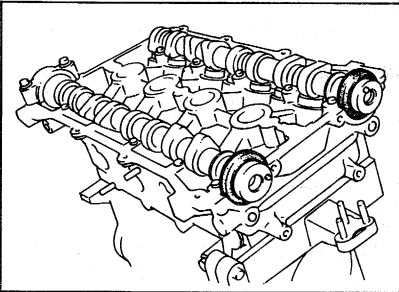
1B ASSEMBLY



63G01C-087

Camshaft

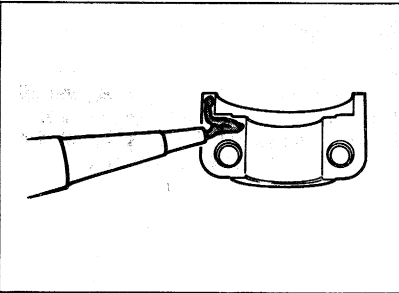
Apply engine oil to the journals, set the camshaft in position.



63G01C-088

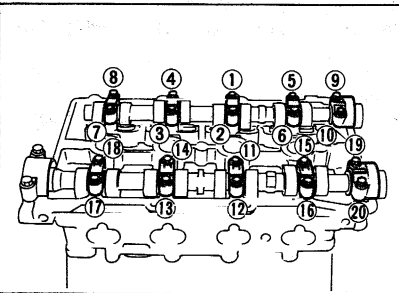
Camshaft Oil Seal

1. Apply a thin coat of engine oil to the camshaft oil seal and cylinder head.
2. Install the camshaft oil seal.



83U01B-083

3. Apply a thin coat of sealant to the front camshaft cap surface.

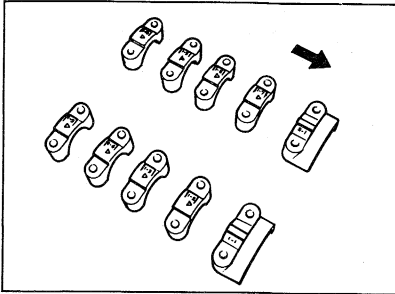


63G01C-090

4. Install the camshaft caps, tighten the camshaft cap bolts gradually in the order shown in the figure.

**Tightening torque: 11—14 N·m
(1.15—1.45 m·kg, 100—126 in·lb)**

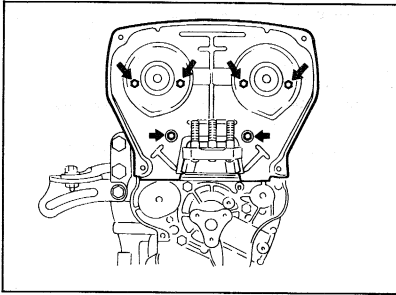
ASSEMBLY 1B



63G01C-091

Note

Install the camshaft cap according to the cap number and arrow mark.



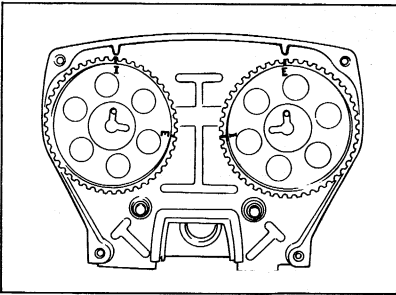
83U01B-084

Seal Plate

Install the seal plate.

Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)



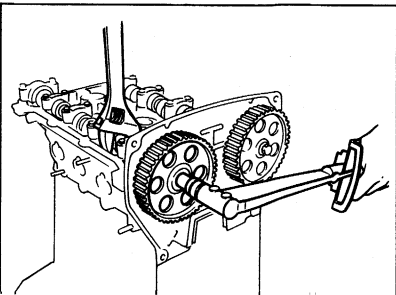
83U01B-085

Camshaft Pulley

1. Install the camshaft pulley.

Caution

For the exhaust side camshaft pulley, install the pulley with the "E" mark straight up.
For the intake side camshaft pulley, install the pulley with the "I" mark straight up.



83U01B-086

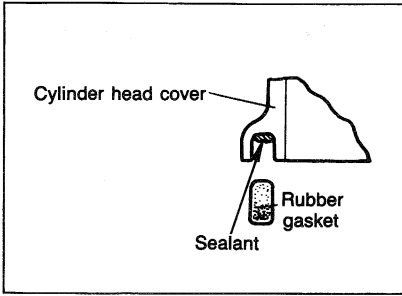
2. Tighten the camshaft pulley bolt.

Hold the camshaft using a suitable wrench on the journal, as shown.

Tightening torque:

49—61 N·m (5.0—6.2 m·kg, 36—45 ft·lb)

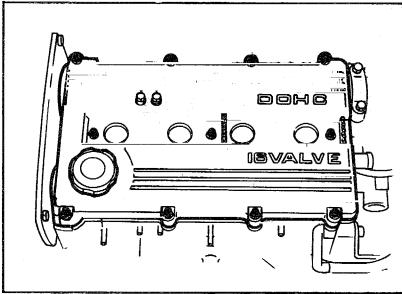
1B ASSEMBLY



63U01X-131

Cylinder Head Cover

1. Apply a coat of sealant in the groove as shown.
2. Place the gasket in position.



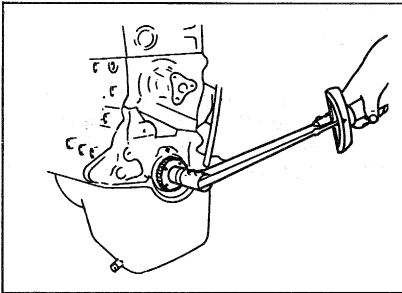
83U01B-087

3. Install the cylinder head cover with new seal washers.

Tightening torque:

3—4 Nm (0.3—0.4 m·kg, 26—35 in·lb)

4. Install the filler cap and the ventilation hose.

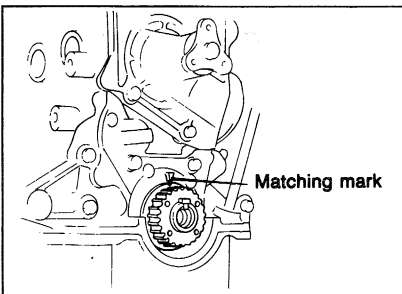


83U01A-113

Timing Belt Pulley

1. Reverse the direction of the **SST** (49 E301 060).
2. Install the timing belt pulley and key.
3. Apply sealant to the timing belt pulley bolt then tighten it.

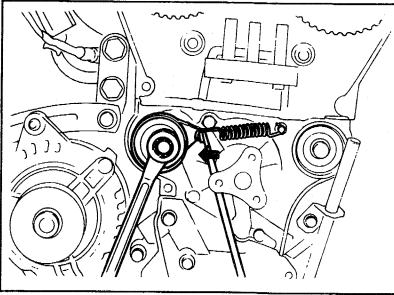
**Tightening torque: 108—128 N·m
(11.0—13.0 m·kg, 80—94 ft·lb)**



83U01X-129

4. Release the **SST** (49 E301 060).
5. Turn the crankshaft so that the timing mark on the oil pump body is aligned with the groove.

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83U01B-088

Idler Puller

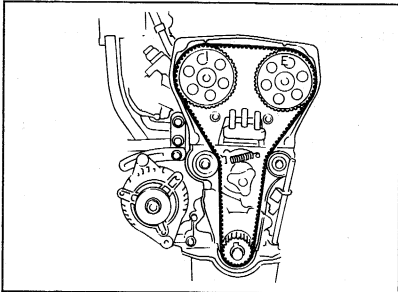
Install the idler puller.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)

Timing Belt Tensioner

1. Install the timing belt tensioner.
2. Install the tensioner spring.
3. Temporarily secure the tensioner so the spring is fully extended.



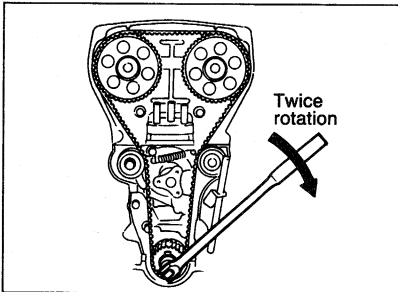
63U01X-124

Timing Belt

1. Align crankshaft and camshaft timing marks. (inlet "I" marks, exhaust "E" mark)
2. Install the timing belt. (Keep the right side of belt as tight as possible)

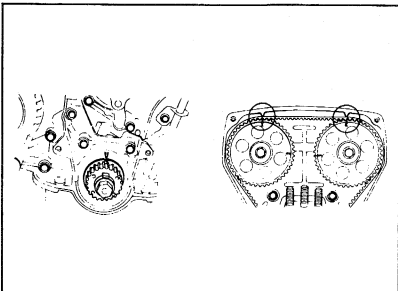
Caution

- a) The timing belt must be reinstalled in the direction of previous rotation if it is reused.
- b) Be sure that there is no oil, grease, or dirt on the timing belt.



83U01B-089

3. Turn the crankshaft twice in the direction of rotation. (Clockwise)
4. Check that the timing marks are correctly aligned. If not, repeat steps 1—3.
5. Loosen the tensioner lock bolt and apply tension to the belt.



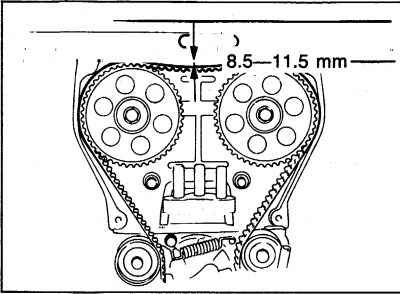
63U01X-126p

6. Tighten the timing belt tensioner to specification.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)

7. Turn the crankshaft twice in the direction of rotation and check the matching marks for alignment.

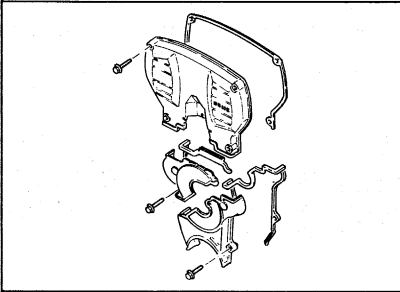


83U01B-090

8. Measure the tension between the intake side camshaft pulley and the exhaust side camshaft pulley. If the timing belt tension is not correct, temporarily secure the tensioner lock bolt so the spring is fully extended and repeat steps 1—7 above or replace the tensioner spring.

Deflection:

**8.5—11.5 mm (0.33—0.45 in)
/ 95 N (10 kg, 22 lb)**



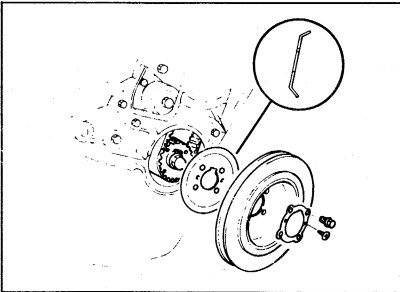
63G01C-095

Timing Belt Cover

Install the lower, middle and upper timing belt cover and a new gasket.

Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)



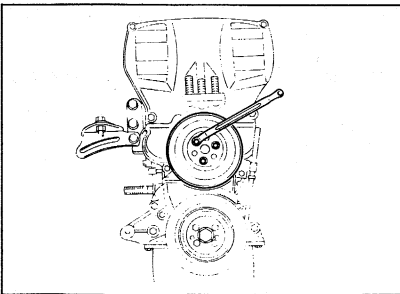
83U01B-091

Crankshaft Pulley

Install the crankshaft pulley and baffle plate.

Tightening torque: 12—17 N·m

(1.25—1.75 m·kg, 109—152 in·lb)



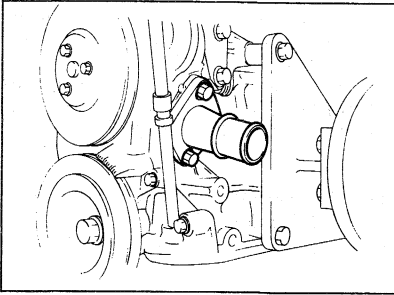
83U01B-092

Water Pump Pulley

Install the water pump pulley.

Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)



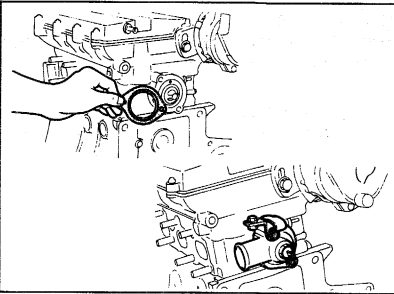
4BG01A-203

Coolant Inlet Pipe

Install the coolant inlet pipe and a new gasket.

Tightening torques:

19–26 N·m (1.9–2.6 m·kg, 14–19 ft·lb)



4BG01A-198p

Thermostat and Thermostat Cover

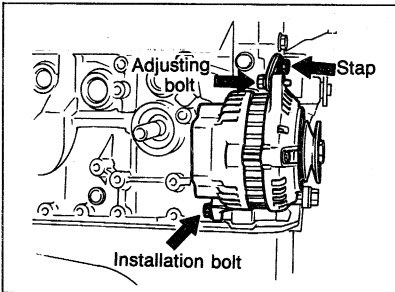
1. Install the thermostat with the jiggle pin facing upward.
2. Install the thermostat cover and gasket.

Tightening torque:

19–26 N·m (1.9–2.6 m·kg, 14–19 ft·lb)

Caution

The printed side of the gasket must face the thermostat.



83U01B-108

Alternator

1. Install the alternator strap.

Tightening torque:

37–52 N·m (3.8–5.3 m·kg, 27–38 ft·lb)

2. Install the alternator and alternator drive belt. Loosely tighten the alternator installation bolt.
3. Adjust the drive belt deflection by referring to page 1B–6.

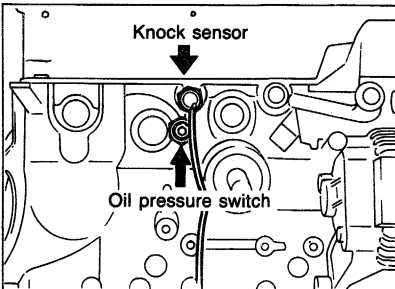
Tightening torque:

Alternator installation bolt:

37–52 N·m (3.8–5.3 m·kg, 27–38 ft·lb)

Belt adjusting bolt:

19–26 N·m (1.9–2.6 m·kg, 14–19 ft·lb)



83U01B-093

Oil Pressure Switch

Install the oil pressure switch.

Tightening torque: 12–18 N·m

(1.2–1.8 m·kg, 104–156 in·lb)

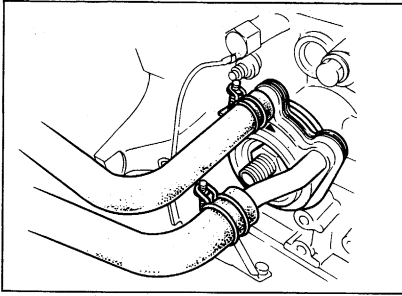
Knock Sensor

Install the knock sensor.

Tightening torque:

20–34 N·m (2.0–3.5 m·kg, 14–25 ft·lb)

1B ASSEMBLY



83U01B-094

Oil Cooler

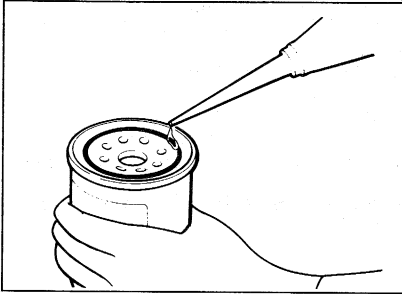
Apply engine oil to the oil cooler "O" ring and install the oil cooler to cylinder block.

Tightening torque:

29—39 N·m (3.0—4.0 m·kg, 22—29 ft·lb)

Note

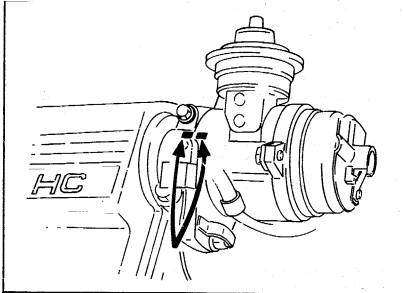
The oil cooler must be installed so the ▲ mark faces upward.



63G01C-099

Oil Filter

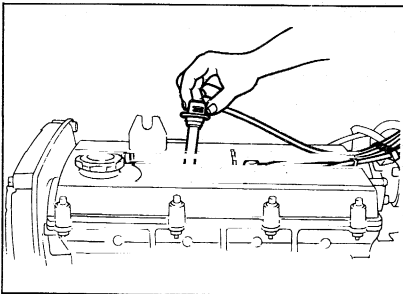
Apply engine oil to the oil filter "O" ring and install the filter, tighten thoroughly by hand.



83U01A-119

Distributor

1. Apply engine oil to the "O" ring, and position it on the distributor.
2. Apply engine oil to the drive gear.
3. Install the distributor with the blade into the camshaft groove.
4. Temporarily, loosely tighten the distributor installing bolt.



4BG01A-200

Spark Plug and High Tension Lead

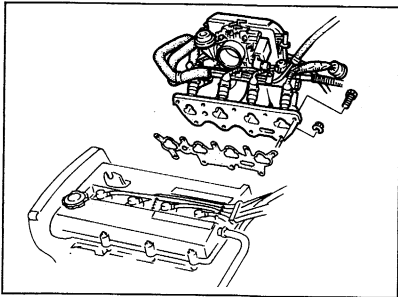
1. Install the spark plugs.

Tightening torque:

15—23 N·m (1.5—2.3 m·kg, 11—17 ft·lb)

2. Connect the high tension leads.

ASSEMBLY 1B



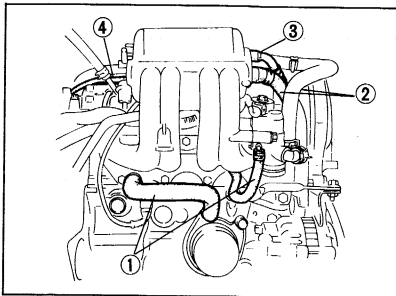
63U01X-136

Intake Manifold Assembly

1. Install the intake manifold assembly and new gasket.

Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



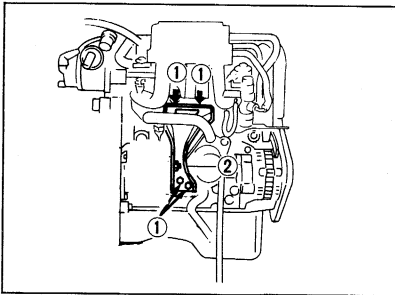
83U01B-095

2. Connect the following hoses.

- (1) Water hoses
- (2) Air hose
- (3) Ventilation hose
- (4) Vacuum hose

Caution

Hose clamp must be reinstalled in the original position on the hose.



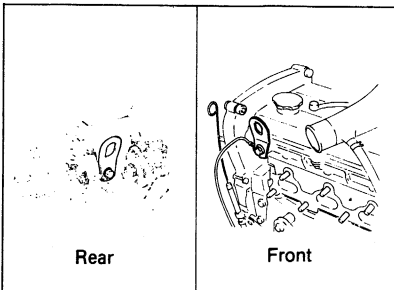
83U01B-096

Surge Tank Bracket

Install the surge tank bracket.

Tightening torque:

31—46 N·m (3.2—4.7 m·kg, 22—34 ft·lb)



63U01X-134

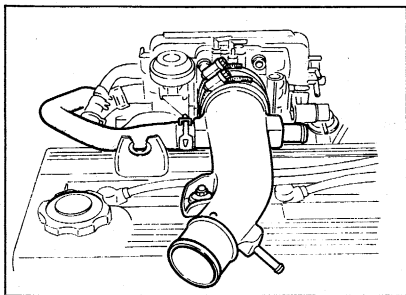
Engine Hanger

Install the front and rear engine hangers.

Tightening torque:

Front: 37—52 N·m
(3.8—5.3 m·kg, 27—38 ft·lb)

Rear: 37—52 N·m
(3.8—5.3 m·kg, 27—38 ft·lb)



83U01B-097

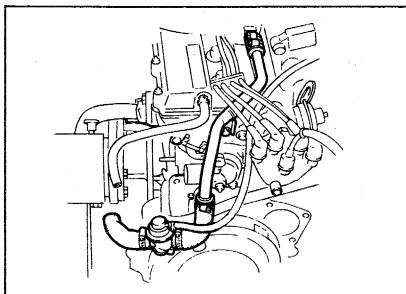
Air Intake Pipe

1. Install the air intake pipe.

Tightening torque:

8—11 N·m (0.8—1.1 m·kg, 69—95 in·lb)

2. Connect the air hose.



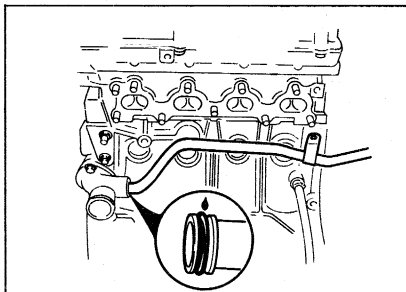
83U01B-098

Air Bypass Valve and Hoses

Install the air bypass valve and hoses.

Tightening torque:

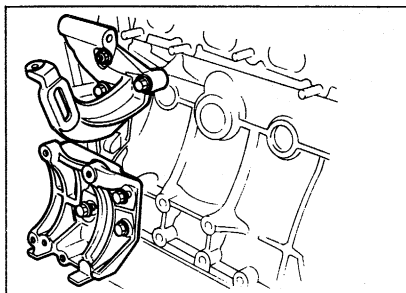
19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



83U01B-099

Coolant Bypass Hose

1. Apply a coat of long life coolant to the "O" ring.
2. Install the coolant bypass hose.



83U01A-127

Power Steering Pump Bracket

Install the power steering pump bracket.

Tightening torque:

47—66 N·m (4.8—6.7 m·kg, 35—48 ft·lb)

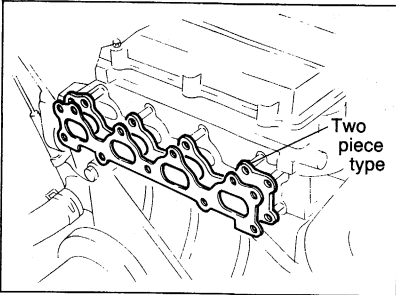
Air Conditioner Compressor Bracket

Install the air conditioner compressor bracket.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)

ASSEMBLY 1B



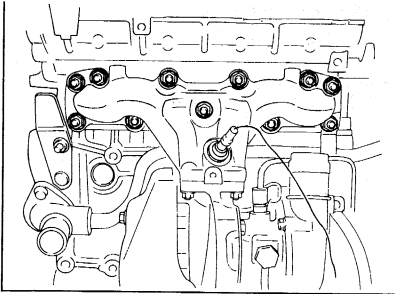
83U01B-100

Exhaust Manifold and Turbocharger Assembly

1. Remove the engine from the engine hanger and engine stand.
2. Install the exhaust manifold gasket.

Note

Two piece type gasket must be installed onto cylinder head side.

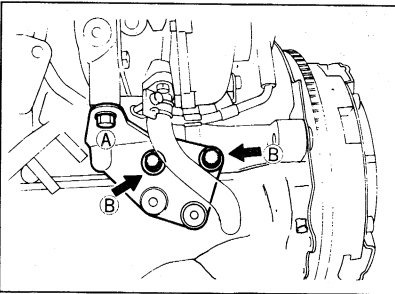


83U01B-101

3. Install the exhaust manifold and turbo charger assembly.

Tightening torque:

39—57 N·m (4.0—5.8 m·kg, 29—42 ft·lb)



83U01B-102

4. Install the turbocharger bracket.

Tightening torque:

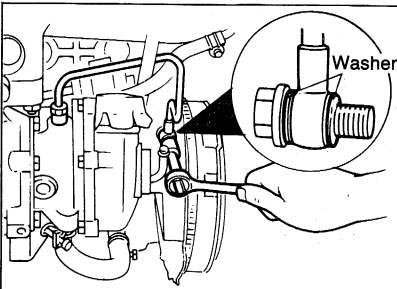
Bolt A: 25—32 N·m

(2.5—3.3 m·kg, 18—24 ft·lb)

Bolt B: 43—61 N·m

(4.4—6.2 m·kg, 32—45 ft·lb)

5. Connect the oil return hose.



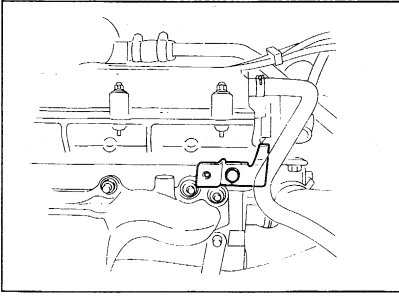
83U01B-103

6. Connect the oil pipe.

Tightening torque: 12—18 N·m

(1.2—1.8 m·kg, 104—156 in·lb)

7. Connect the water hose.



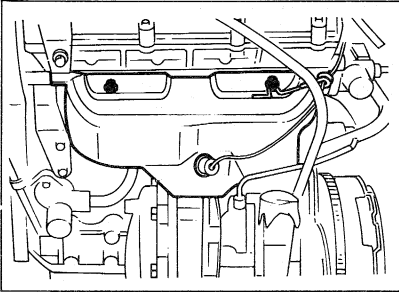
83U01B-104

Intake Air Hose Bracket

Install the intake air hose bracket.

Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



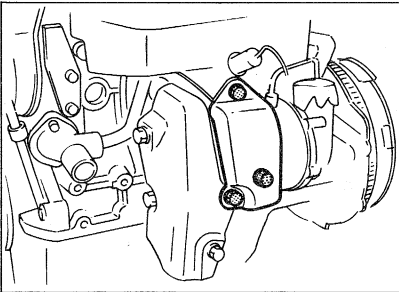
83U01B-105

Exhaust Manifold Insulator

Install the exhaust manifold insulator and wire clip.

Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



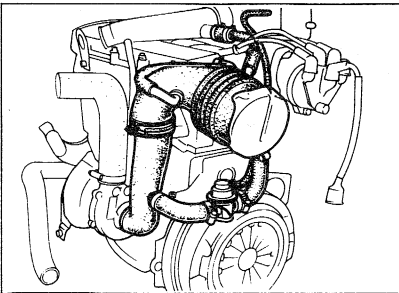
83U01B-106

Turbocharger Insulator

Install the turbocharger insulator.

Tightening torque:

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



83U01B-107

Air Hose

Install the air hose.

Oil Level Gauge

Install the dipstick.