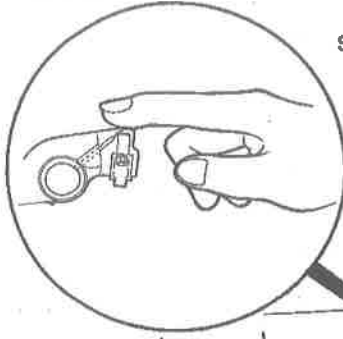
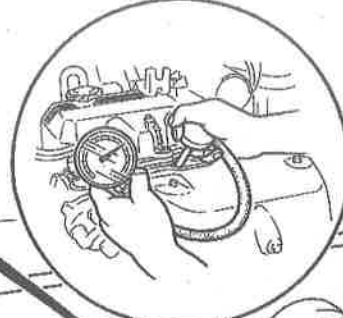


INDEX

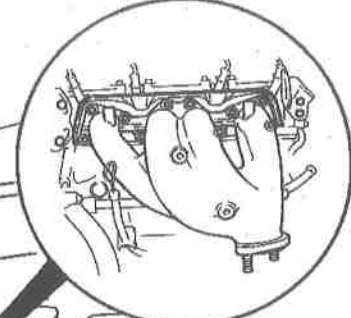
HYDRAULIC LASH ADJUSTER (HLA)
INSPECTION, PAGE B2-6



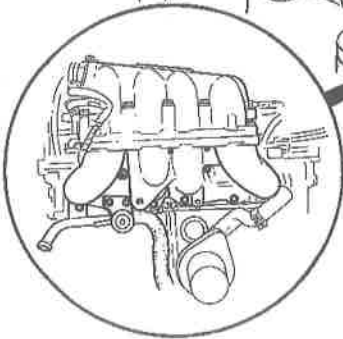
COMPRESSION
INSPECTION, PAGE B2-6
STANDARD: 1,255 kPa (12.8 kg/cm², 182 psi)-270 rpm
MINIMUM: 981 kPa (10.0 kg/cm², 142 psi)-280 rpm



EXHAUST MANIFOLD
TIGHTENING TORQUE
22-28 (2.2-2.9, 16-21)

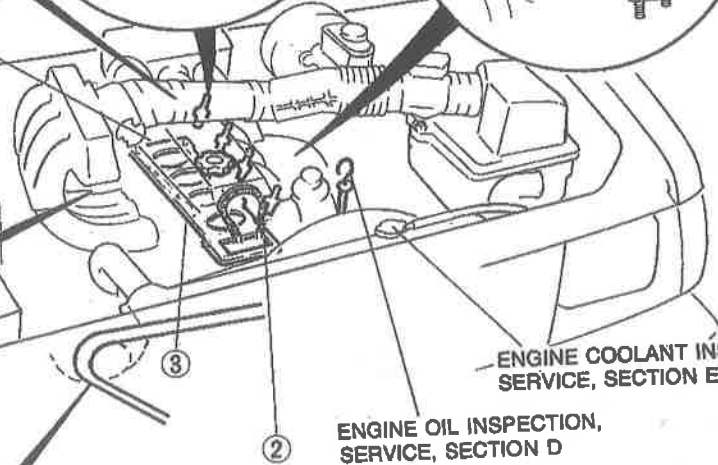


INTAKE MANIFOLD
TIGHTENING TORQUE
19-25 (1.9-2.6, 14-19)

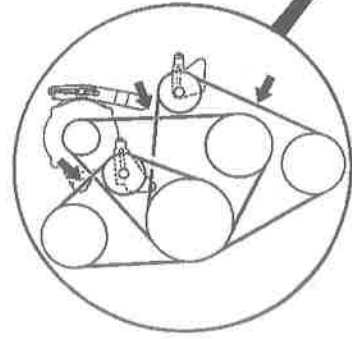


ENGINE COOLANT INSPECTION,
SERVICE, SECTION E

ENGINE OIL INSPECTION,
SERVICE, SECTION D



DRIVE BELT ADJUSTING, PAGE B2-5



DRIVE BELT	DEFLECTION		
	NEW	USED	LIMIT
ALTERNATOR	10.0-12.0 (0.39-0.47)	11.0-13.0 (0.43-0.51)	16 (0.63)
P/S OIL PUMP	6.8-7.2 (0.26-0.28)	7.2-8.0 (0.28-0.31)	10 (0.39)
A/C compressor	8.5-10.0 (0.33-0.39)	10.0-11.5 (0.39-0.45)	15 (0.59)

mm (in)/98 N (10 kg, 22 lb)

0BU0B2-015

1. Engine	
Removal	page B2-24
Disassembly	page B2-29
Inspection and Repair	page B2-39
Assembly	page B2-52
Installation	page B2-79

2. Timing chain	
Removal	page B2- 9
Installation	page B2-10
Inspection	page B2-51
3. Cylinder head gasket	
Removal	page B2-14
Installation	page B2-17

OUTLINE

SPECIFICATIONS

Item		Engine	G6
Type			Gasoline, 4-cycle
Cylinder arrangement and number			In-line, 4 cylinders
Combustion chamber			Pentroof
Valve system			OHC, chain-driven
Displacement		cc (cu in)	2,606 (158.97)
Bore and stroke		mm (in)	92.0 × 98.0 (3.62 × 3.86)
Compression ratio			8.4
Compression pressure		kPa (kg/cm ² , psi)-rpm	1,255 (12.8, 182)-270
Valve timing	IN	Open	BTDC
		Close	ABDC
	EX	Open	BBDC
		Close	ATDC
Valve clearance		IN mm (in)	0; Maintenance free
		EX mm (in)	0; Maintenance free
Idle speed (Test connector grounded)	rpm	M/T	750 ± 20 (Neutral)
		A/T	770 ± 20 (P range)
Ignition timing (TEN terminal grounded)		BTDC	5° ± 1° at idle
Firing order			1-3-4-2

2BU0B2-002

B2

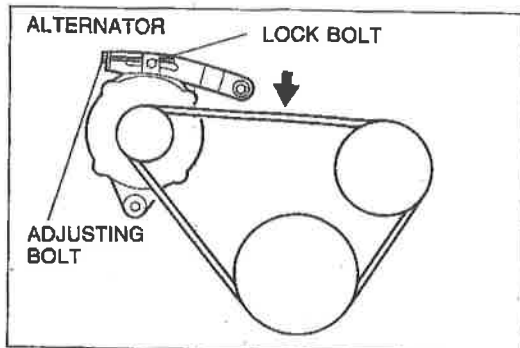
TROUBLESHOOTING GUIDE

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	B2-40 B2-45, 47 B2-14
	Malfunction of fuel system	Refer to Section F2	
	Malfunction of electrical system	Refer to Section G	
	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
Malfunction of fuel system		Refer to Section F2	
Excessive oil consumption		Oil working up Worn piston ring groove or sticking piston ring Worn piston or cylinder	Replace Replace or repair
	Oil working down Worn valve seal Worn valve stem or guide	Replace Replace	B2-67 B2-40
	Oil leakage	Refer to Section D	

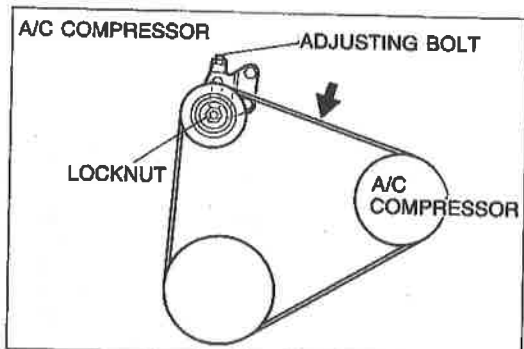
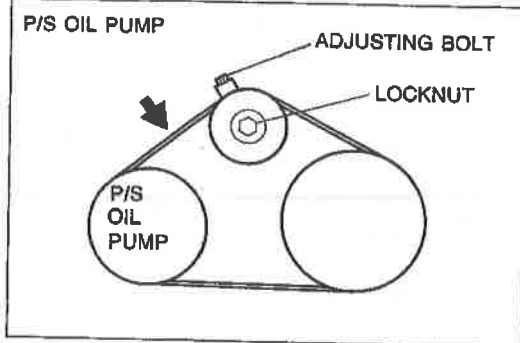
Problem	Possible Cause	Remedy	Page
Insufficient power	Insufficient compression Malfunction of HLA Compression leakage from valve seat Seized valve stem Weak or broken valve spring Failed cylinder head gasket Cracked or distorted cylinder head Sticking, damaged, or worn piston ring Cracked or worn piston	Replace Repair Replace Replace Replace Replace Replace Replace	B2-45 B2-42 B2-40 B2-43 B2-14 B2-39 B2-47 B2-47
	Malfunction of fuel system	Refer to Section F2	
	Others Slipping clutch Dragging brakes Wrong size tires	Refer to Section H Refer to Section P Refer to Section Q	
Abnormal combustion	Malfunction of engine-related components Malfunction of HLA Sticking or burned valve Weak or broken valve spring Carbon accumulation in combustion chamber	Replace Replace Replace Eliminate carbon	B2-45 B2-40 B2-43 —
	Malfunction of fuel system	Refer to Section F2	
Engine noise	Crankshaft or bearing related parts Excessive main bearing oil clearance Main bearing seized or heat-damaged Excessive crankshaft end play Excessive connecting rod bearing oil clearance Connecting rod bearing seized or heat-damaged	Replace or repair Replace Replace or repair Replace or repair Replace	B2-56 B2-49 B2-56 B2-57 B2-48
	Balance shaft related parts Improper balancer chain tension Excessive balance shaft bushing oil clearance Balance shaft bushing seized or heat-damaged	Adjust Replace Replace	B2-63 B2-50 B2-50
	Piston-related parts Worn cylinder Worn piston or piston pin Seized piston Damaged piston ring Bent connecting rod	Replace or repair Replace Replace Replace Replace	B2-45 B2-48 B2-47 B2-47 B2-48
	Valves or timing-related parts Malfunction of HLA* Broken valve spring Excessive valve guide clearance Malfunction of chain adjuster	Replace Replace Replace Replace	B2-45 B2-43 B2-41 B2- 8
	Malfunction of cooling system	Refer to Section E	
	Malfunction of fuel system	Refer to Section F2	
	Others Malfunction of water pump bearing Improper drive-belt tension Malfunction of alternator bearing Exhaust gas leakage	Refer to Section E Adjust Refer to Section G Refer to Section F2	B2- 5

0BU0B2-016

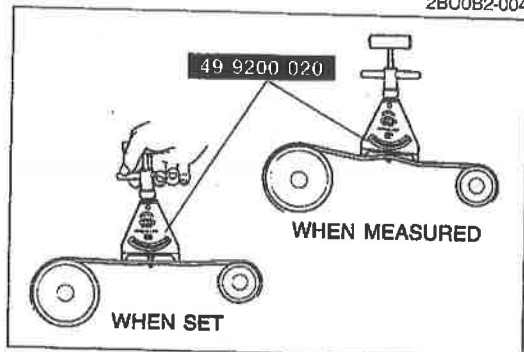
* Tappet noise may occur if the engine is not operated for an extended period. The noise should disappear after the engine has reached normal operating temperature.



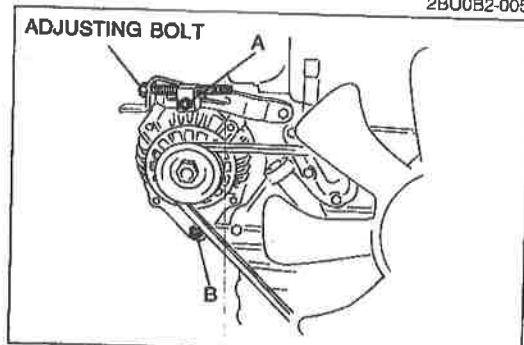
2BU0B2-003



2BU0B2-004



2BU0B2-005



2BU0B2-006

ENGINE TUNE-UP PROCEDURE

DRIVE BELT

1. Check the drive belts for wear, cracks, or fraying; replace if necessary.
2. Check the drive belt deflection by applying moderate pressure (**98 N, 10 kg, 22 lb**) midway between the pulleys.

Note

- a) Measure the belt deflection between the specified pulleys.
- b) A belt is considered "New" if it has been used on a running engine for less than five minutes. Set the deflection specified below accordingly.
- c) Check the belt deflection when the engine is cold, or at least 30 minutes after the engine has stopped.

3. If the deflection is not within specification, adjust it.

Deflection

Drive belt	mm (in)		
	New	Used	Limit
Alternator	10.0—12.0 (0.39—0.47)	11.0—13.0 (0.43—0.51)	16 (0.63)
P/S oil pump	6.6—7.2 (0.26—0.28)	7.2—8.0 (0.28—0.31)	10 (0.39)
A/C compressor	8.5—10.0 (0.33—0.39)	10.0—11.5 (0.39—0.45)	15 (0.59)

Drive belt tension check

Note

- a) Belt tension can be checked in place of belt deflection.
- b) Belt tension can be measured between any two pulleys.

4. Check the drive belt tension with the tension gauge.

Tension

Drive belt	N (kg, lb)		
	New	Used	Limit
Alternator	549—638 (56—65, 123.4—143.0)	461—549 (47—56, 103.6—123.4)	275 (28, 61.6)
P/S oil pump	412—471 (42—48, 92.4—105.6)	353—402 (36—41, 79.2—90.2)	196 (20, 44.0)
A/C compressor	559—638 (57—65, 125.7—143.0)	471—549 (48—56, 105.8—123.4)	284 (29, 63.8)

Adjustment

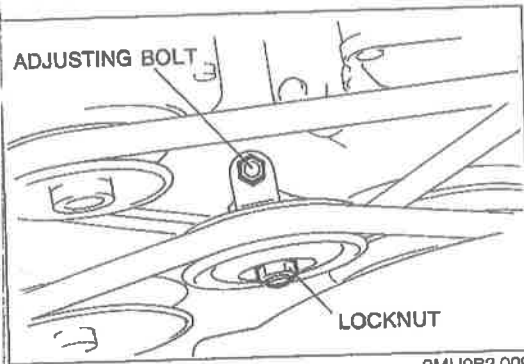
Caution

If a new belt is used, adjust belt deflection at the mid-point of "New" belt specification. A belt is considered "New" if it has been used on a running engine for less than five minutes.

- (1) Alternator belt
If necessary, loosen the alternator bolts and adjust the belt deflection by turning the adjusting bolt.

Tightening torque

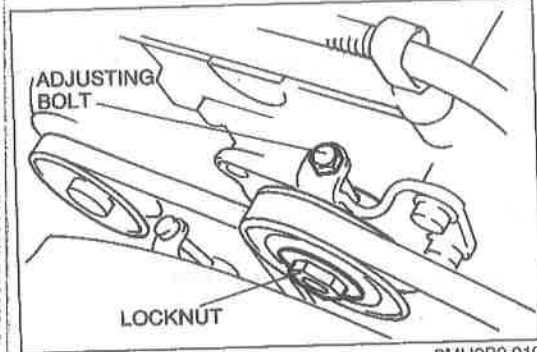
- Bolt A:** 19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)
Bolt B: 37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)



9MU0B2-009

- (2) P/S oil pump belt
If necessary, loosen the locknut and adjust the belt deflection by turning the adjusting bolt.

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



9MU0B2-010

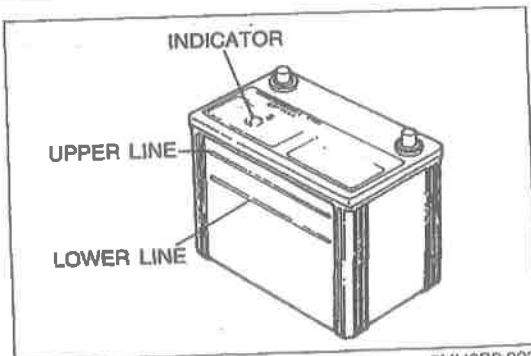
- (3) A/C Compressor belt
If necessary, loosen the locknut and adjust the belt deflection by turning the adjusting bolt.

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

HLA TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action
1. Noise when engine is started immediately after oil is changed.	Oil leakage in oil passage	Run engine at 2000—3000 rpm. If noise stops after 2 second—10 minutes*, HLA is normal. If not, replace HLA. * Time required for engine oil to circulate within engine, includes tolerance for engine oil condition and ambient temperature.
2. Noise when engine is started after setting approx. one day.		
3. Noise when engine is started after cranking for 3 seconds or more.	Oil leakage in HLA	
4. Noise when engine is started after new HLA is installed		
5. Noise continues more than 10 minutes.	Insufficient oil pressure	Check oil pressure. (Refer to Section D.) If lower than specification, check for cause. Oil pressure; 304—402 kPa (3.1—4.1 kg/cm², 44—58 psi)-3000 rpm
	Faulty HLA	(Refer to page B2—69) Press down rocker arm by hand. If it moves, replace HLA. If it does not move, HLA is normal. Measure valve clearance. If more than 0mm (0 in), replace HLA.
6. Noise occurs during idle after high-speed running	Incorrect oil amount	Check oil level. Drain or add oil as necessary.
	Deteriorated oil	Check oil quality. If deteriorated, replace with specified type and amount of oil.

2BU0B2-007



0MU0B2-003

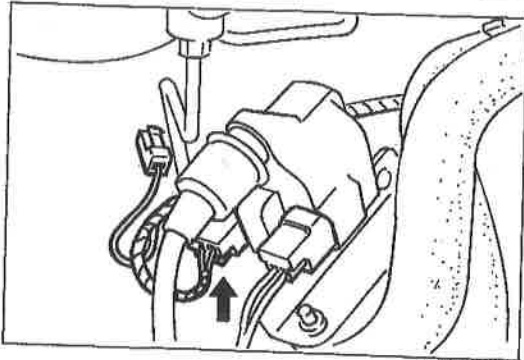
COMPRESSION

If the engine exhibits low power, poor fuel economy, or poor idle, check the following:

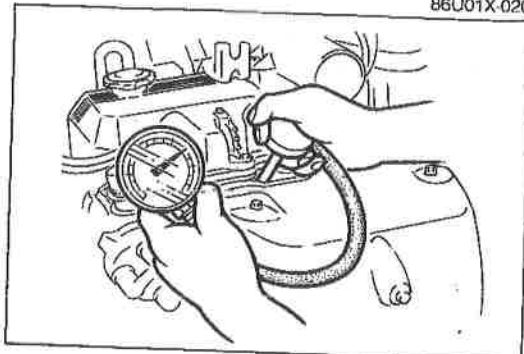
1. Ignition system (Refer to Section G.)
2. Compression
3. Fuel system (Refer to Section F2.)

INSPECTION

1. Check that the battery is fully charged. Recharge it if necessary.



B6U01X-020



1BU0B2-018

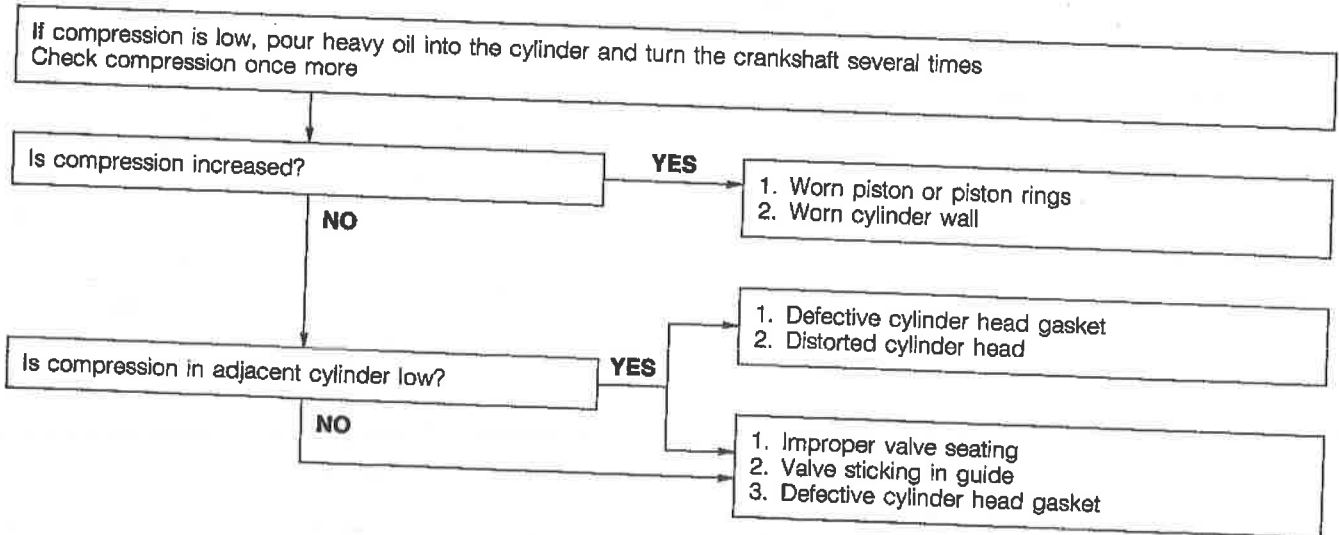
2. Warm up the engine to the normal operating temperature.
3. Turn it off for about 10 minutes to allow the exhaust manifold to cool.
4. Remove all spark plugs.
5. Disconnect the primary wire connector from the ignition coil.

B2

6. Connect a compression gauge to the No. 1 spark plug hole.
7. Fully depress the accelerator pedal and crank the engine.
8. Note the maximum gauge reading.
9. Check each cylinder.

Compression:
 1,255 kPa (12.8 kg/cm², 182 psi)-270 rpm
Minimum:
 981 kPa (10.0 kg/cm², 142 psi)-280 rpm

Possible Cause



B6U01X-022

ON-VEHICLE MAINTENANCE

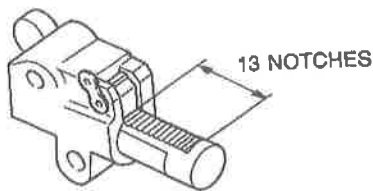
TIMING CHAIN Preparation SST

49 S120 710

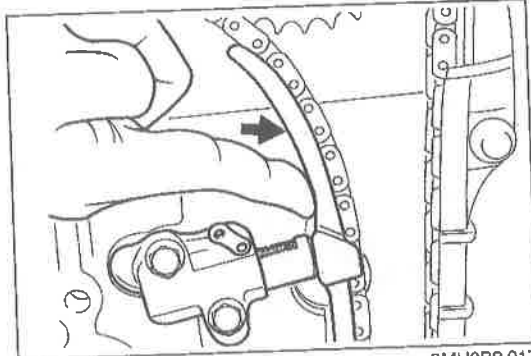
Holder, coupling
flange



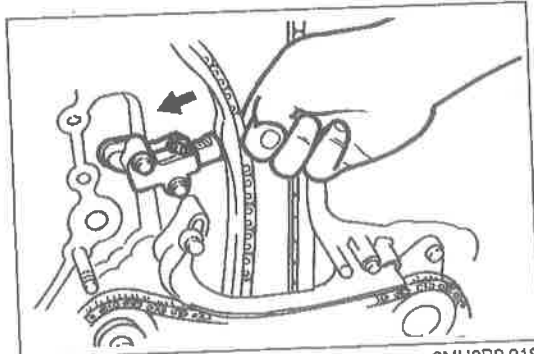
9MU0B2-015



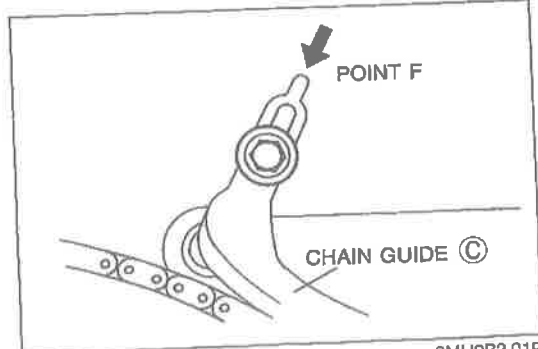
9MU0B2-016



9MU0B2-017



9MU0B2-018



9MU0B2-019

Pre-inspection Timing chain

1. Check the chain tension; if the sleeve protrudes 13 notches or more, replace the timing chain.

2. Push the chain lever in the direction of the arrow. If the excessive movement exists, there will be a chain adjuster malfunction or worn chain lever, chain guide, camshaft pulley and timing gear. Inspect and replace if necessary.

3. Push the chain adjuster sleeve in the direction of the arrow. If it moves back, the ratchet will be faulty. Replace the chain adjuster.

Balancer chain

Note

Balancer chain must be replaced if chain guide ③ bottoms at point F when adjusting.

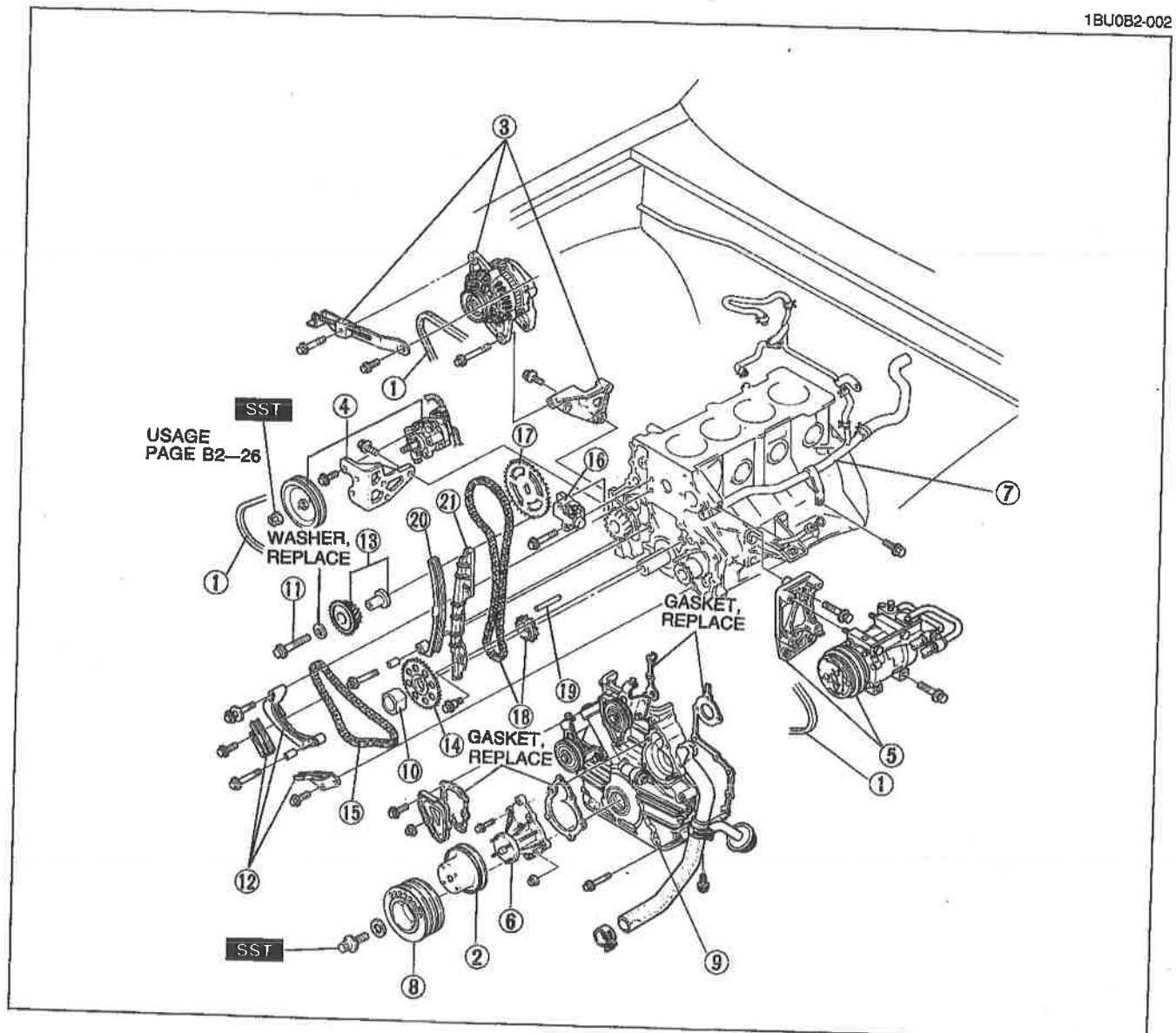
Removal

Warning: Release the fuel pressure. (Refer to Section F2.)

1. Disconnect the negative battery cable.
2. Drain the engine oil and coolant.
3. Remove the radiator cowl and cooling fan. (Refer to Section E.)
4. Remove the cylinder head. (Refer to page B2-14.)
5. Remove the oil pan. (Refer to Section D.)
6. Remove in the order shown in the figure referring to the **Removal note**.

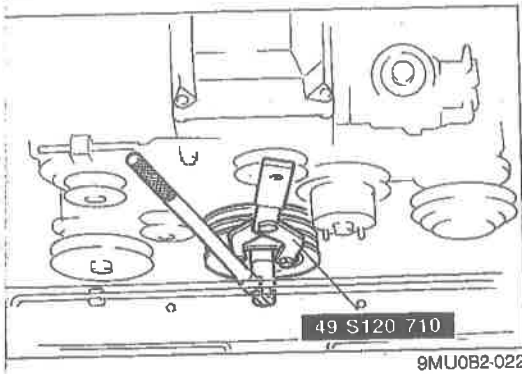
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B2



9MU0B2-021

- | | |
|---------------------------------------|----------------------------------|
| 1. Drive belts | 12. Chain guides |
| 2. Water pump pulley | 13. Idler sprocket assembly |
| 3. Alternator and bracket | 14. Crankshaft sprocket |
| 4. P/S oil pump and bracket | 15. Balancer chain |
| 5. A/C compressor and bracket | 16. Chain adjuster |
| 6. Water pump | 17. Camshaft pulley |
| 7. Coolant bypass pipe | 18. Timing chain and timing gear |
| 8. Crankshaft pulley | 19. Key |
| 9. Chain cover | 20. Chain lever |
| 10. Spacer | 21. Chain guide |
| 11. Idler sprocket assembly lock bolt | |



Removal note
Crankshaft pulley

Remove the crankshaft pulley with the **SST**.

Inspection

Inspection of timing chain related parts. (Refer to page B2-51.)
 Inspection of balancer chain related parts. (Refer to page B2-51.)

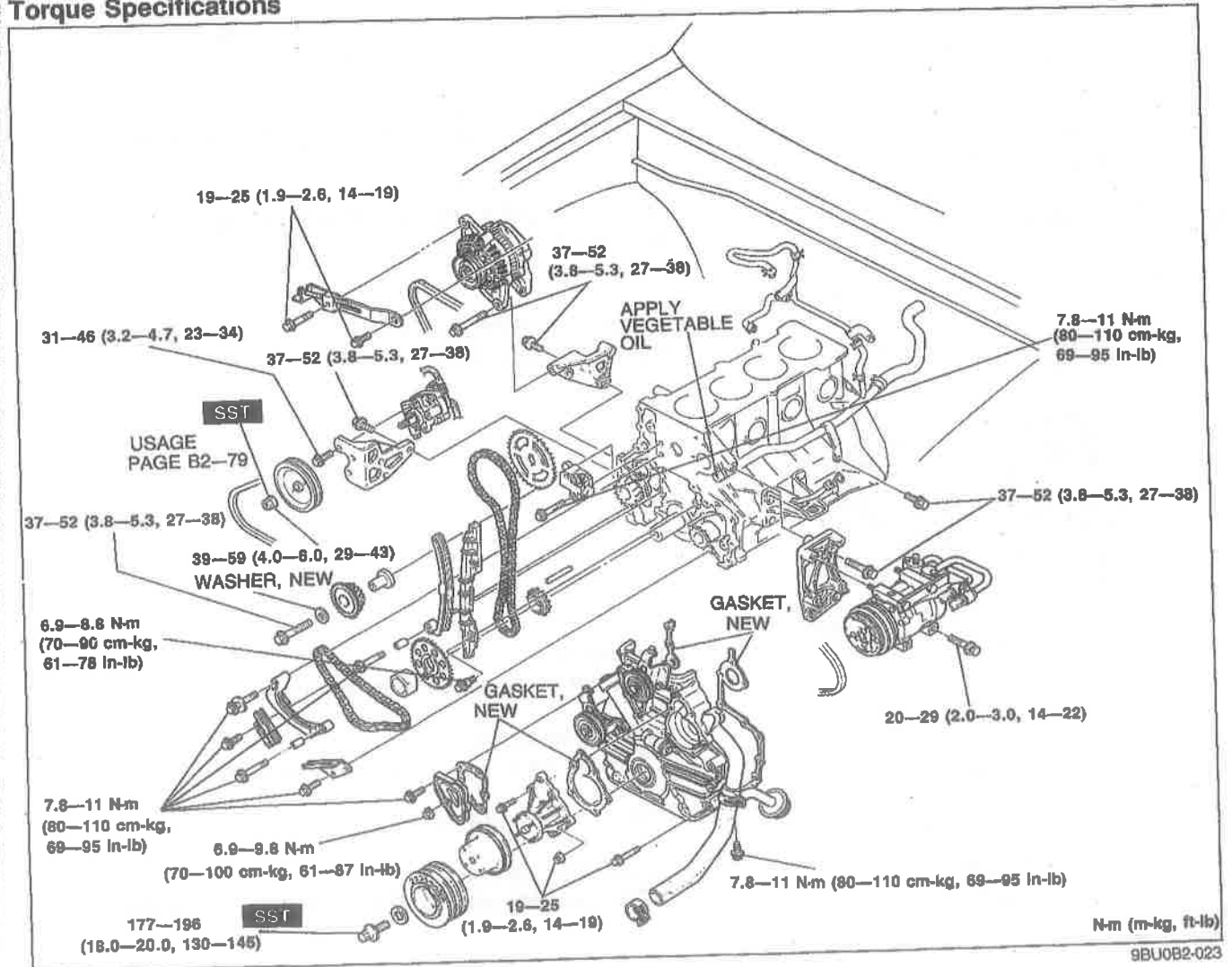
Installation

Install in the reverse order of removal referring to the **Installation note**.

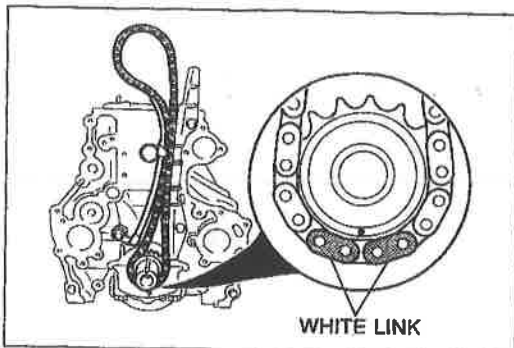
Note

- a) Position the hose clamp in the original location on the hose.
- b) Squeeze the clamp lightly with large pliers to ensure a good fit.

Torque Specifications



9BU0B2-023

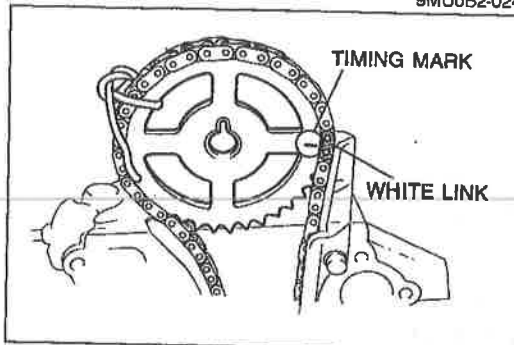


9MU0B2-024

Installation note

Timing chain

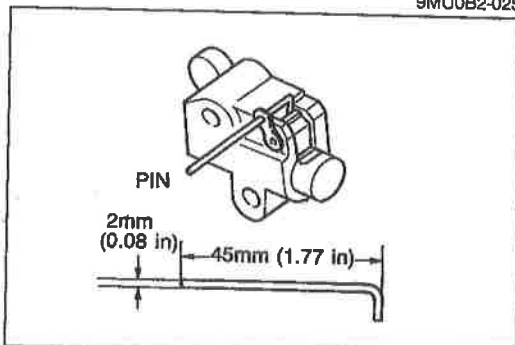
1. Install the key onto the crankshaft.
2. Install the timing chain and the timing gear as shown.



9MU0B2-025

Camshaft pulley

1. Assemble the camshaft pulley to the timing chain so that the mark on the pulley aligns with the white link on the chain.
2. Secure the pulley and the chain with a wire to prevent disengagement.



9MU0B2-026

Chain adjuster

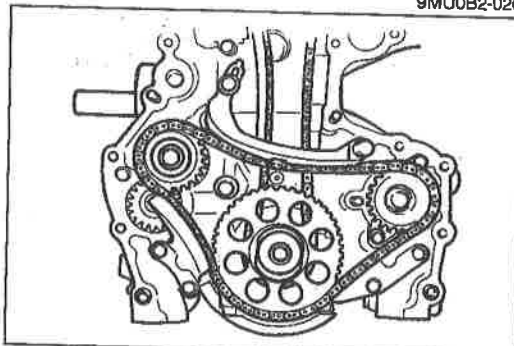
1. Insert the pin into the lever hole to hold the sleeve.
2. Install it onto the cylinder block.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

Note

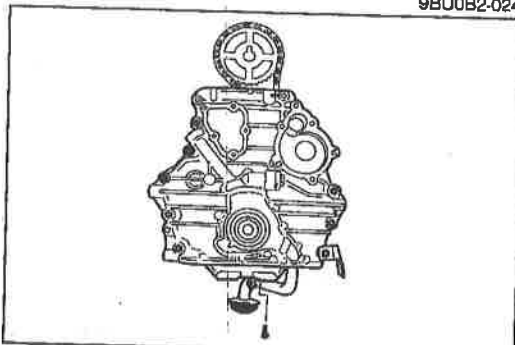
Do not forget to remove the retaining pin before installing the service cover.



9BU0B2-024

Balancer chain related parts

(Refer to page B2-60.)



9MU0B2-028

Chain cover

1. Install the chain cover with new gaskets.

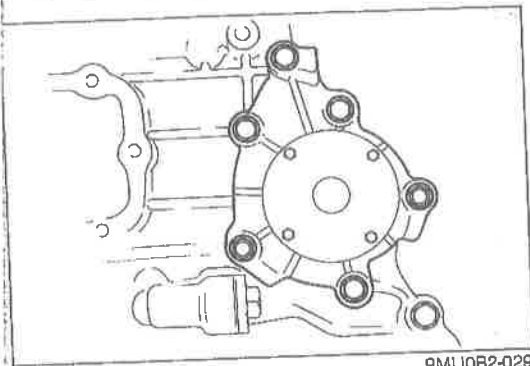
Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

2. Tighten the oil strainer stay bolt.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)



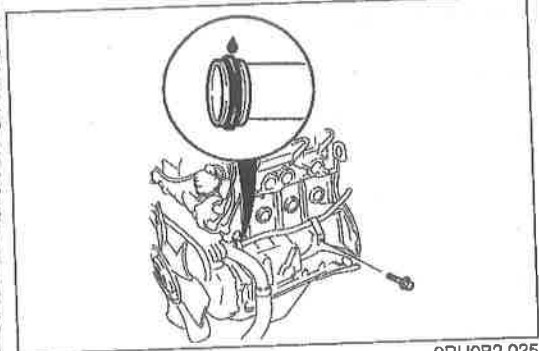
9MU0B2-029

Water pump

Install the water pump with a new gasket.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



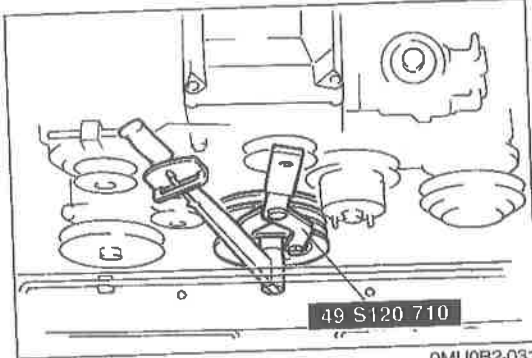
9BU0B2-025

Coolant bypass pipe

Apply vegetable oil to the new O-ring and install the coolant bypass pipe.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)



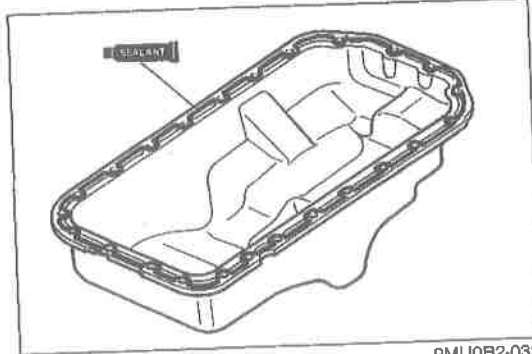
9MU0B2-031

Crankshaft pulley

Install the crankshaft pulley with the SST.

Tightening torque:

177—196 N·m (18.0—20.0 m·kg, 130—145 ft·lb)



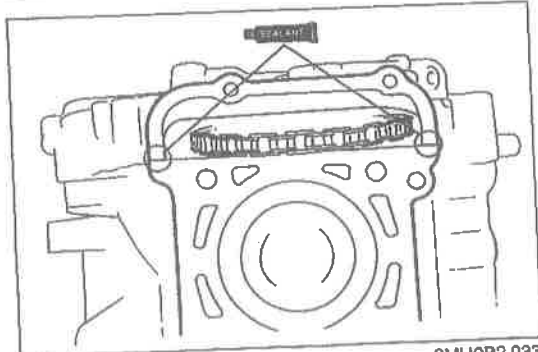
9MU0B2-032

Oil pan

1. Apply a continuous bead of silicone sealant to the oil pan along the inside of the bolt holes, and overlap the ends.
2. Install the oil pan.

Tightening torque:

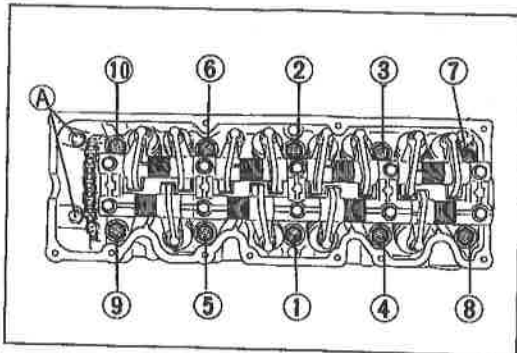
7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)



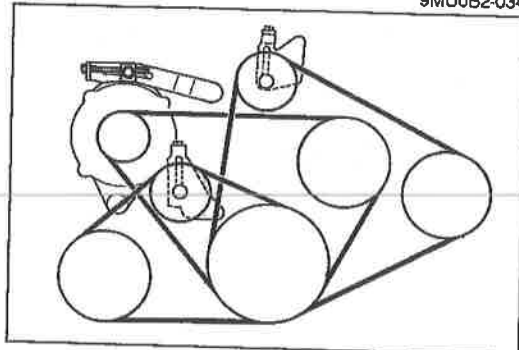
9MU0B2-033

Cylinder head gasket

1. Thoroughly remove all dirt and oil from the top of the cylinder block with a rag.
2. Apply silicone sealant to the shaded area.
3. Place a new cylinder head gasket in position.



9MU0B2-034



9BU0B2-026

Cylinder head

1. Set the cylinder head in place.
2. Apply engine oil to the bolt threads and seat faces.
3. Tighten the cylinder head bolts in two or three steps in the order shown.

Tightening torque:

80—86 N·m (8.2—8.8 m·kg, 59—64 ft·lb)

4. Tighten the remaining small cylinder head bolts (A).

Tightening torque:

16—23 N·m (1.6—2.3 m·kg, 12—17 ft·lb)

Steps After Installation

1. Install the radiator cowling and cooling fan.
(Refer to Section E.)
2. Adjust the drive belt tension. (Refer to page B2-5.)
3. Add engine oil and coolant to the specified levels.
4. Connect the negative battery cable.
5. Start the engine and do the following:
 - (1) Check for leakage of engine oil and coolant.
 - (2) Perform engine adjustments if necessary.
 - (3) Recheck the oil and coolant levels.

CYLINDER HEAD GASKET

Preparation
SST

49 S120 710

Holder, coupling
flange

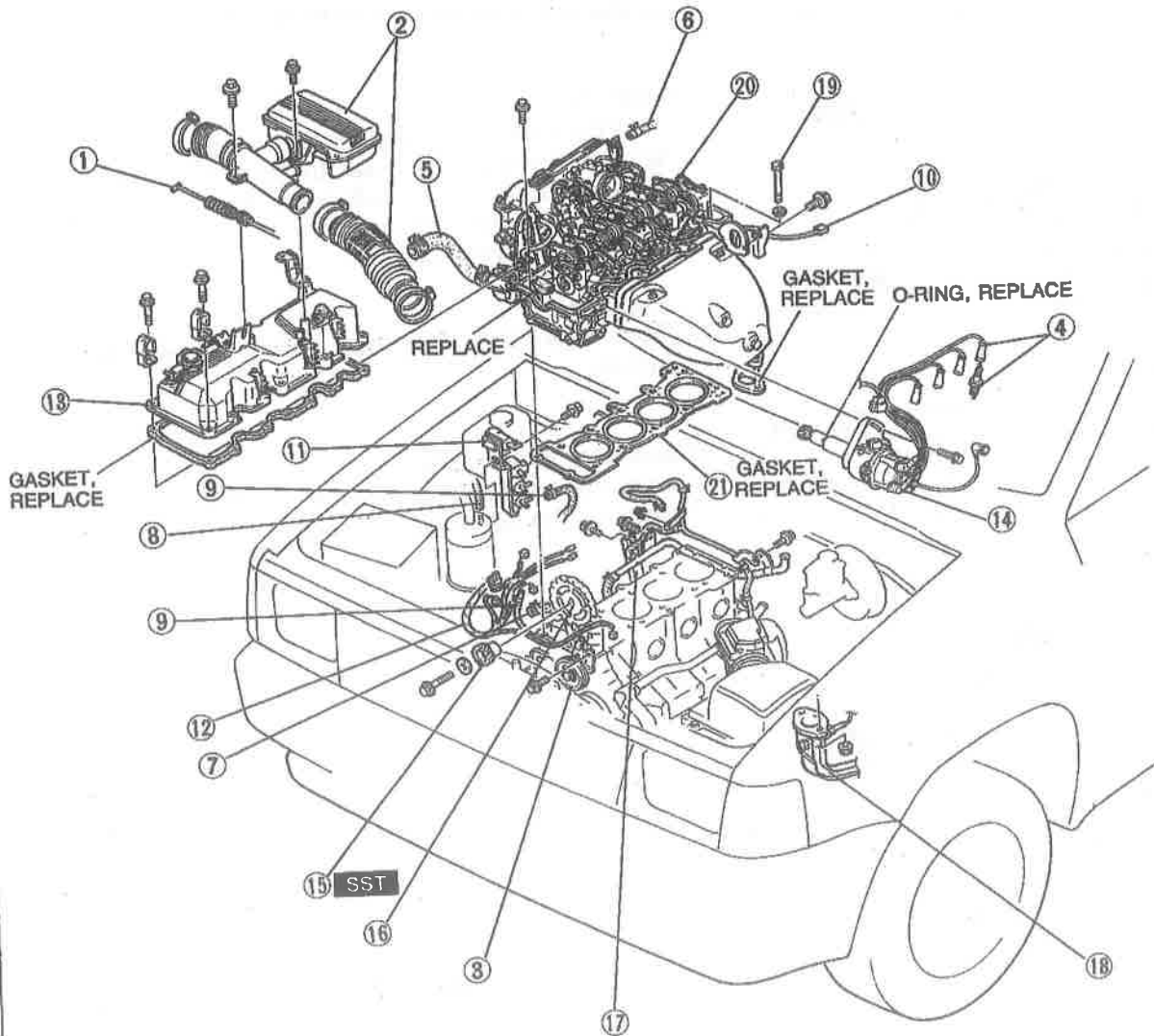


9BU0B2-048

Removal

Warning: Release the fuel pressure. (Refer to Section F2.)

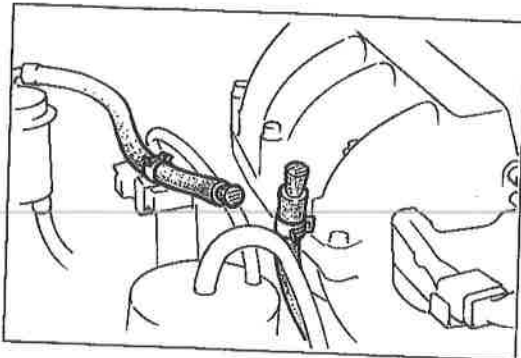
1. Disconnect the negative battery cable.
2. Drain the engine coolant.
3. Remove in the order shown in the figure referring to the **Removal note**.



18U0B2-003

1. Accelerator cable
2. Air intake pipe and resonance chamber
3. A/C drive belt and idler
4. High-tension lead and spark plug
5. Radiator upper hose
6. Brake vacuum hose
7. Oil cooler water hose
8. Canister hose
9. Fuel hose
10. Oxygen sensor connector
11. Solenoid valves
12. Emission harness connectors
13. Cylinder head cover
14. Distributor
15. Distributor drive gear
16. Camshaft pulley
17. Intake manifold bracket
18. Exhaust pipe and bracket
19. Cylinder head bolt
20. Cylinder head
21. Cylinder head gasket

9MU0B2-038



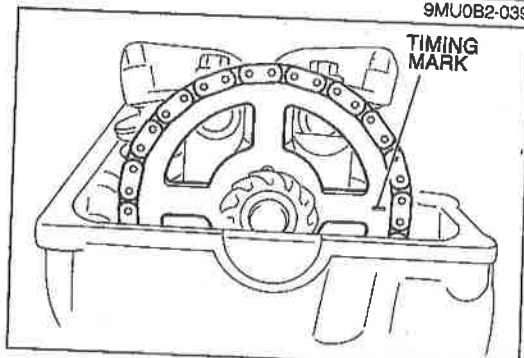
9MU0B2-039

Removal note Fuel hose

Note

- a) Cover the hose with a rag because fuel will spray out when disconnecting.
- b) Keep sparks and open flame away from the fuel area.

Plug the disconnected hoses to avoid fuel leakage.



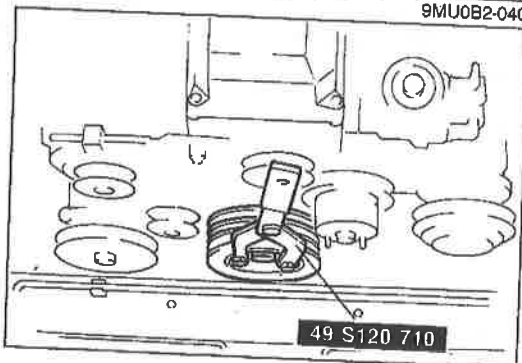
9MU0B2-040

Distributor

1. Turn the crankshaft pulley until the timing mark of the camshaft pulley is 90° degrees to the right as shown.
2. Check that the crankshaft pulley timing mark (yellow) is aligned with the indicator pin.
3. Remove the distributor.

Caution

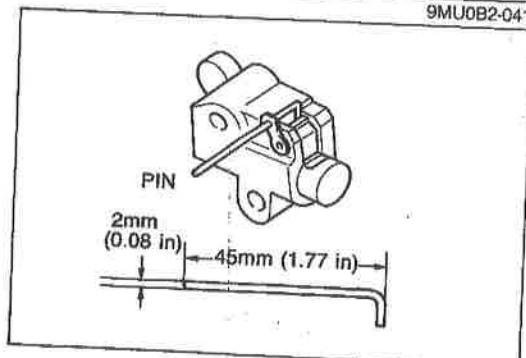
Do not turn the crankshaft during removal and installation.



9MU0B2-041

Distributor drive gear

1. Lock the crankshaft pulley with the **SST**.
2. Remove the distributor drive gear.



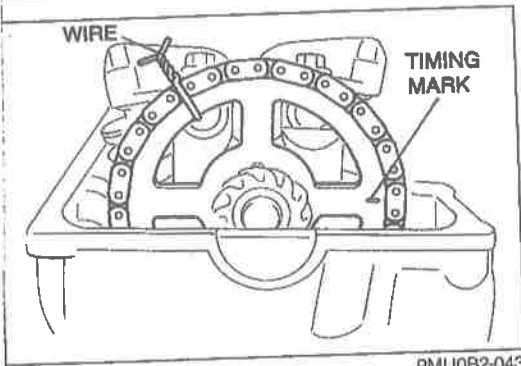
9MU0B2-042

Camshaft pulley

1. Remove the service cover on the chain cover.
2. Push the chain adjuster sleeve in toward the left and insert the pin as shown into the lever hole to hold it.

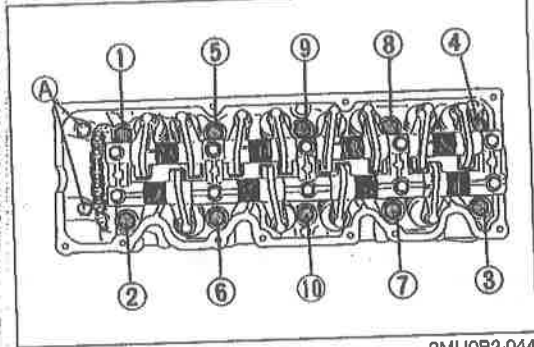
Caution

Be especially careful that the pin does not fall.



9MU0B2-043

3. Secure the camshaft pulley and the chain with a wire as shown.
4. Remove the camshaft pulley off the camshaft dowel pin.



9MU0B2-044

Cylinder head bolt

1. Remove the bolts (A).
2. Loosen the remaining cylinder head bolts in two or three steps in the order shown in the figure.

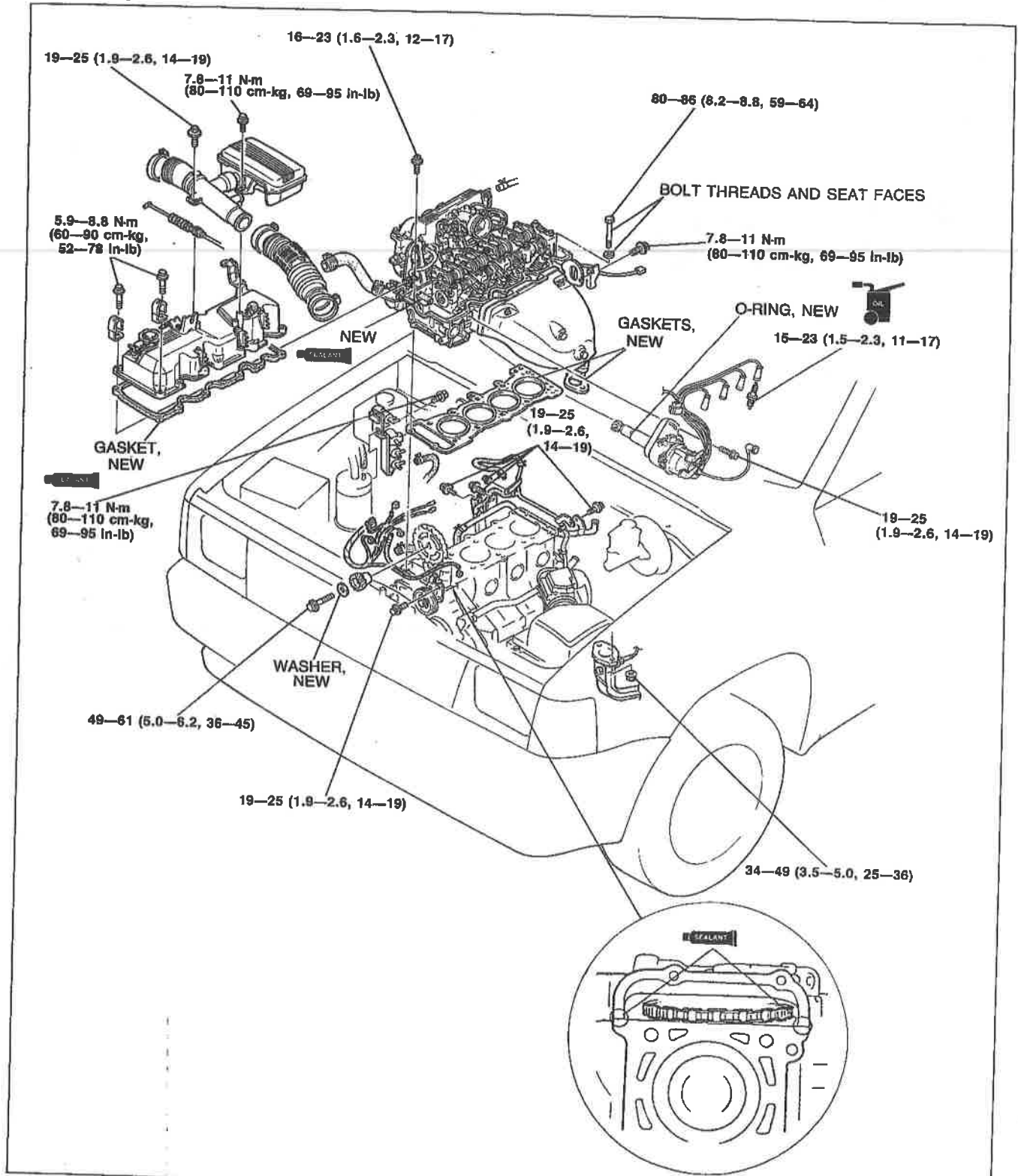
Installation

Install in the reverse order of removal referring to the **Installation note**.

Note

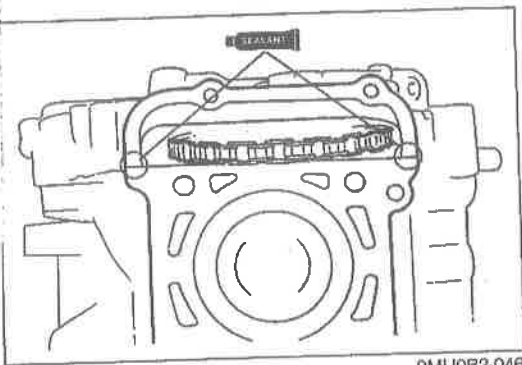
Position the hose clamp in the original location on the hose, and squeeze the clamp lightly with large pliers to ensure a good fit.

Torque Specifications

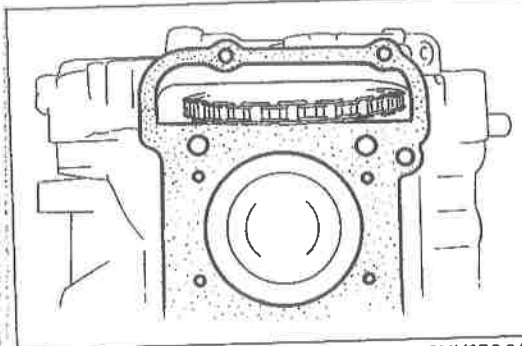


N-m (m-kg, ft-lb)

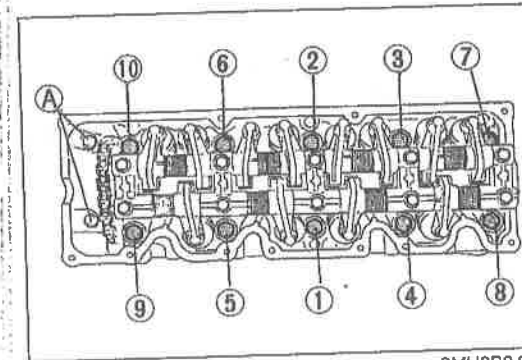
9MU0B2-045



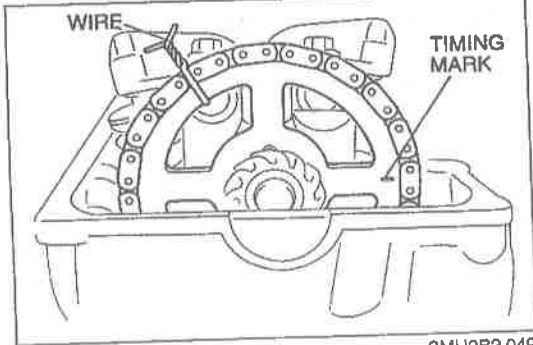
9MU0B2-046



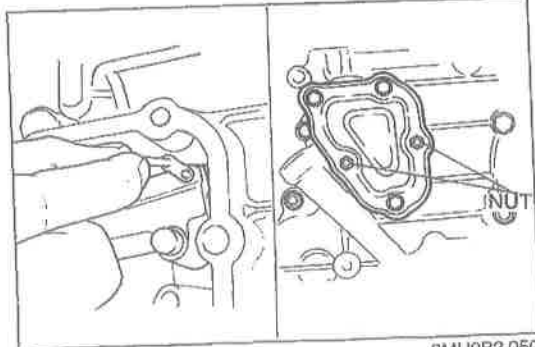
9MU0B2-047



9MU0B2-048



9MU0B2-049



9MU0B2-050

Installation note
Cylinder head gasket

1. Thoroughly remove all dirt and oil from the top of the cylinder block with a rag.
2. Apply silicone sealant to the shaded area.

3. Place a new cylinder head gasket in position.

Cylinder head

1. Set the cylinder head in place.
2. Apply engine oil to the bolt threads and seat faces.
3. Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

Tightening torque:
80—86 N-m (8.2—8.8 m-kg, 59—64 ft-lb)

4. Tighten the remaining small cylinder head bolts (A).

Tightening torque:
16—23 N-m (1.6—2.3 m-kg, 12—17 ft-lb)

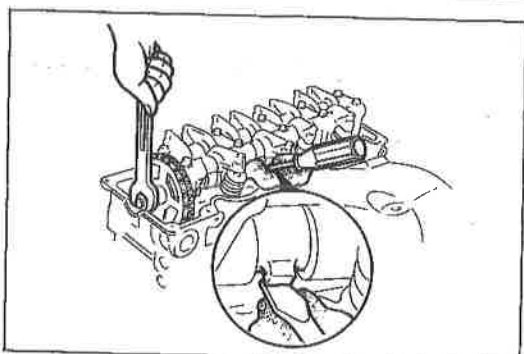
Camshaft pulley

1. Install the camshaft pulley onto the camshaft dowel pin.
2. Remove the wire securing the camshaft pulley and the chain.

3. Remove the retaining pin from the chain adjuster.
4. Install the service cover with a new gasket.

Tightening torque

Bolt: 7.8—11 N-m (80—110 cm-kg, 69—95 in-lb)
Nut: 6.9—9.8 N-m (70—100 cm-kg, 61—87 in-lb)



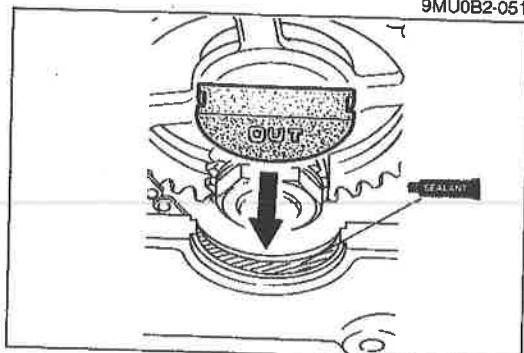
9MU0B2-051

Distributor drive gear

1. Install the distributor drive gear with a new washer and lock bolt.
2. Hold the camshaft with a screwdriver as shown in the figure.
3. Tighten the lock bolt.

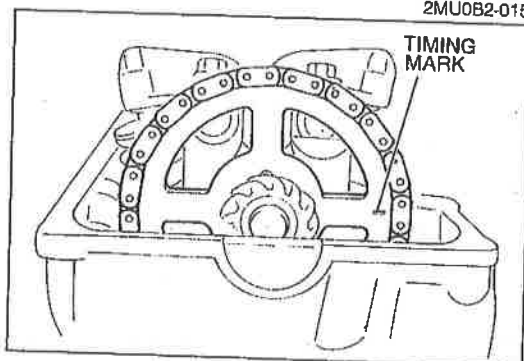
Tightening torque:

49—61 N·m (5.0—6.2 m·kg, 36—45 ft·lb)



2MU0B2-015

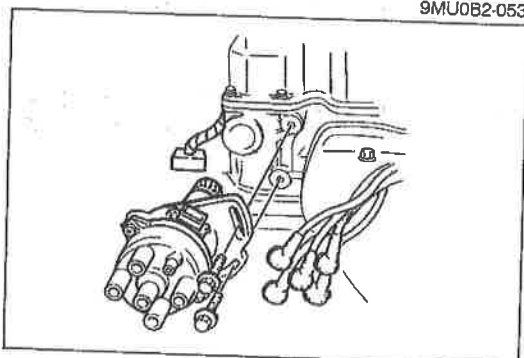
4. Apply sealant to the shaded area as shown, and install the new seal cover.



9MU0B2-053

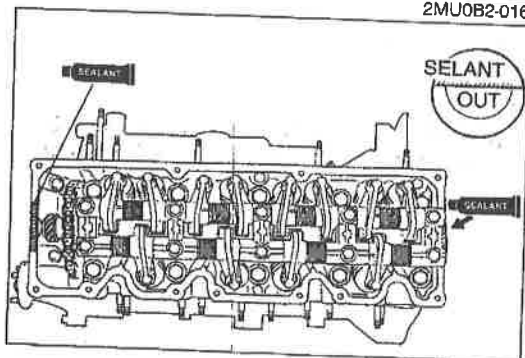
Distributor

1. Verify that the timing mark on the camshaft pulley is 90 degrees to the right, as shown.
2. Verify that the crankshaft pulley timing mark (yellow) is aligned with the indicator pin.



2MU0B2-016

3. Apply engine oil to the new O-ring and install it onto the distributor.
4. Apply engine oil to the distributor driven gear.
5. Align the marks and install the distributor.
6. Loosely tighten the distributor mounting bolt.



2MU0B2-017

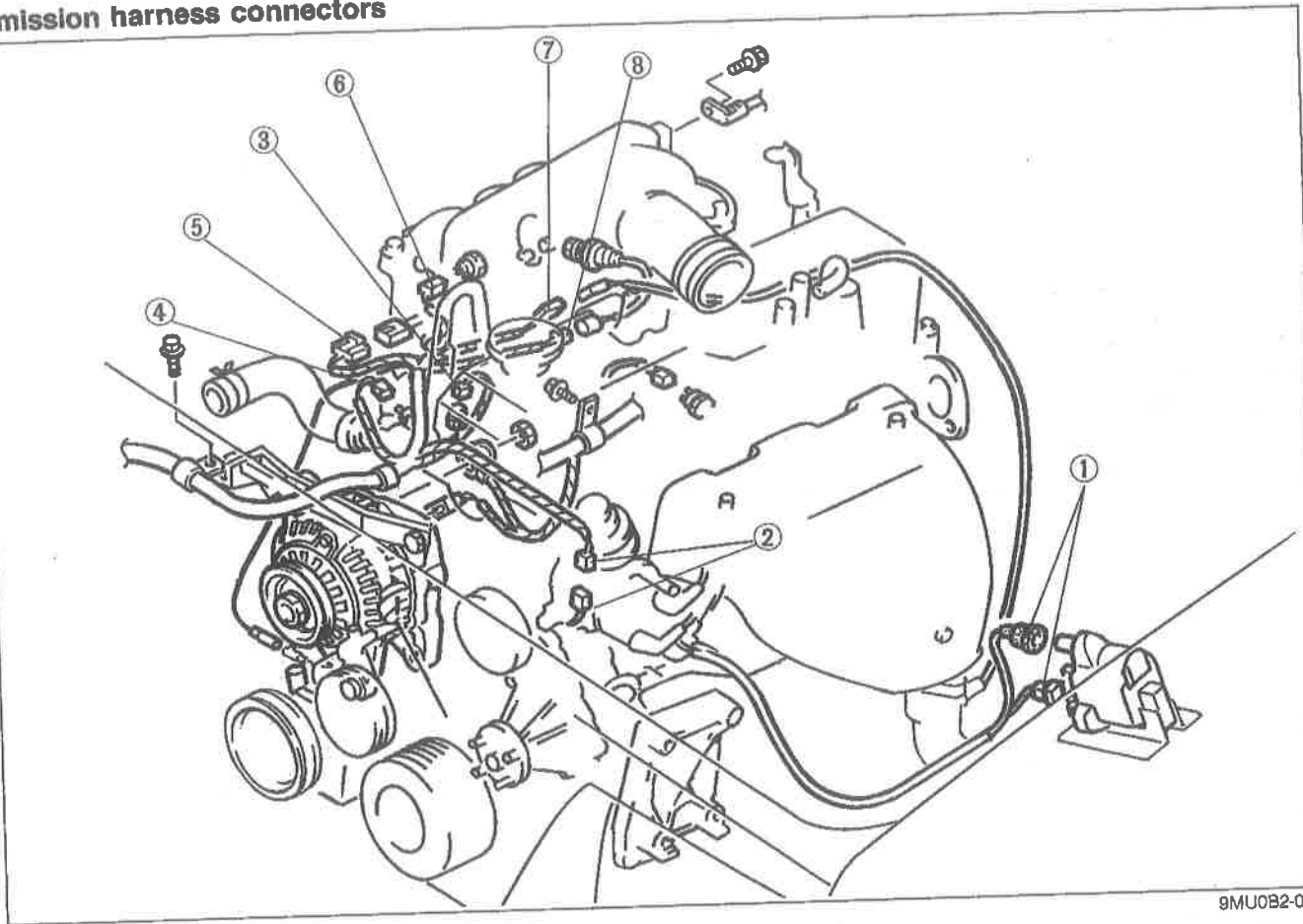
Cylinder head cover

1. Apply engine oil to the valves, rocker arms and timing chain.
2. Remove all old silicone sealant from the cylinder head and cover.
3. Coat a new gasket with silicone sealant, and install onto the cylinder head cover.
4. Apply silicone sealant to the shaded areas shown in the figure.
5. Install the cylinder head cover.

Tightening torque:

5.9—8.8 N·m (60—90 cm·kg, 52—78 in·lb)

Emission harness connectors



9MU0B2-056

- 1. IG coil
- 2. Distributor
- 3. Water thermosensor
- 4. Heat gauge unit

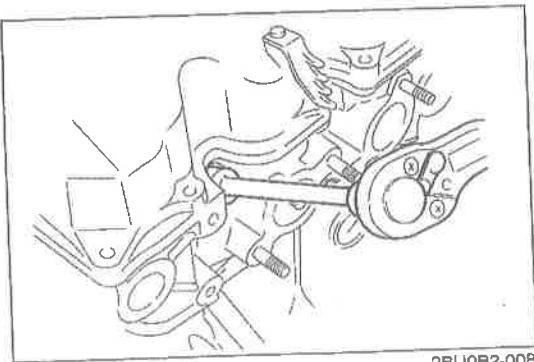
- 5. Injector harness
- 6. Intake air thermosensor
- 7. Oxygen sensor
- 8. Idle switch

Spark plug

Install the spark plugs.

Tightening torque:

15—23 N·m (1.5—2.3 m·kg, 11—17 ft·lb)



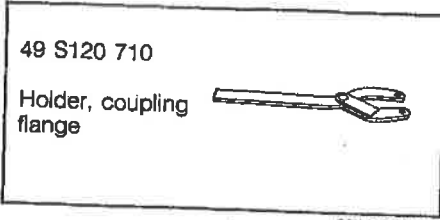
2BU0B2-008

Steps After Installation

1. Add engine coolant to the specified levels.
2. Connect the negative battery cable.
3. Start the engine and do the following:
 - (1) Check for leakage of engine coolant.
 - (2) Perform engine adjustments if necessary.
 - (3) Recheck the oil and coolant levels.

2BU0B2-008

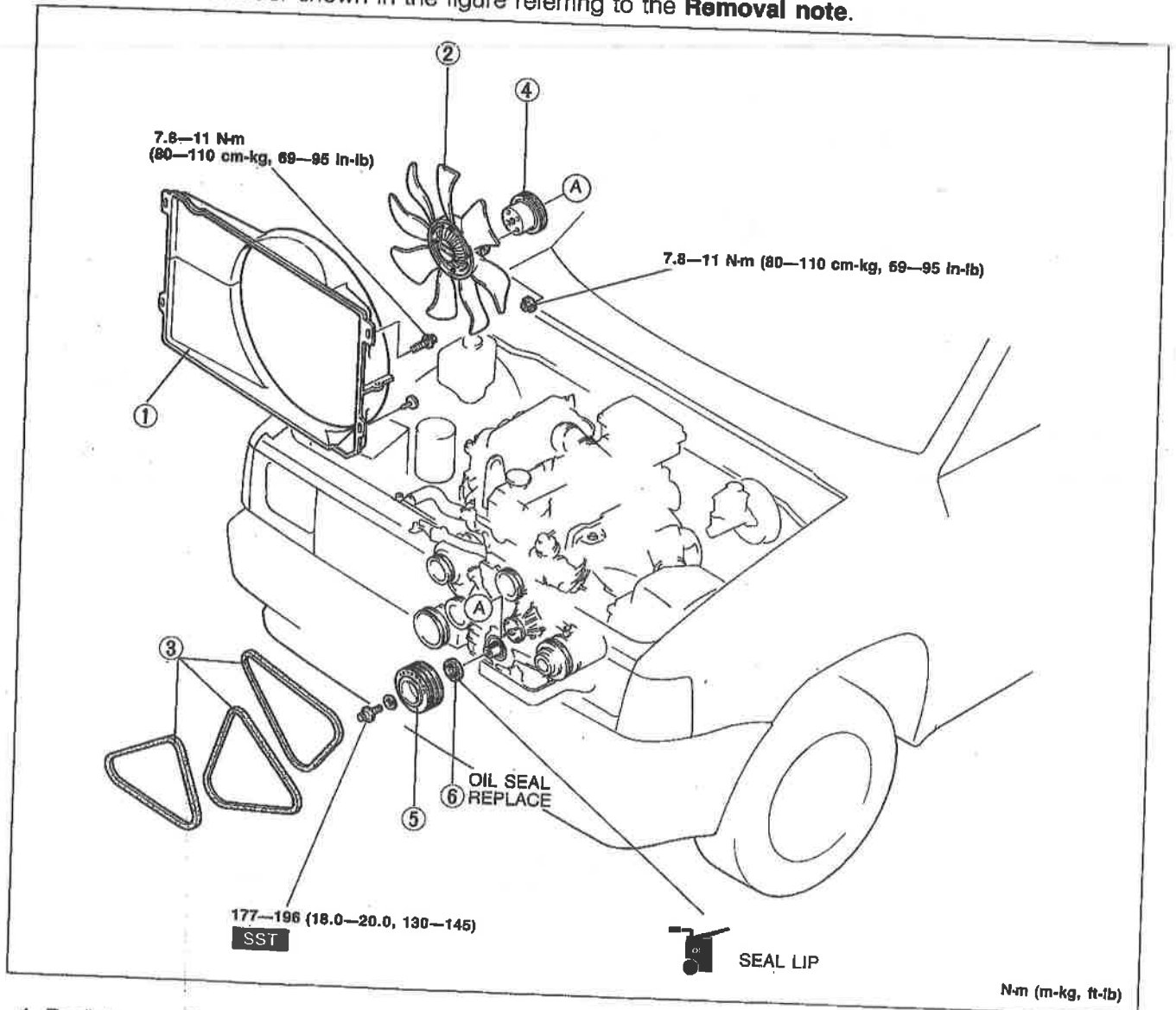
FRONT OIL SEAL
Preparation
SST



9BU0B2-049

Removal

1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Remove in the order shown in the figure referring to the **Removal note**.



N-m (m-kg, ft-lb)

1BU0B2-004

1. Radiator cowl
2. Cooling fan
3. Drive belts Adjustment.....

4. Water pump pulley
5. Crankshaft pulley
6. Front oil seal

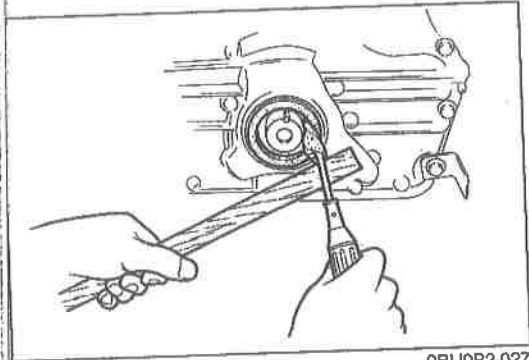
page B2-5



9MU0B2-061

Removal note**Crankshaft pulley**

Remove the crankshaft pulley with the SST.



9BU0B2-027

Front oil seal

Remove the front oil seal with a screwdriver as shown.

Installation

Install in the reverse order of removal referring to the **Installation note**.

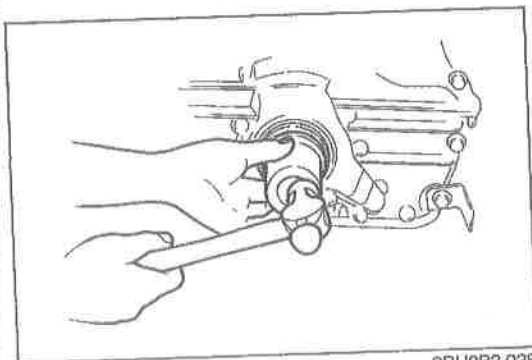
Caution

After radiator cowl installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowl.

If the fan touches the cowl, adjust the radiator cowl mounting position.

Note

Position the hose clamp in the original location on the hose, and squeeze the clamp lightly with large pliers to ensure a good fit.



9BU0B2-028

Installation note**Front oil seal**

1. Apply engine oil to the new oil seal lip.
2. Fit the oil seal onto the chain cover.
3. Tap the oil seal in evenly using a suitable pipe.

Oil seal outer diameter: 60mm (2.36 in)

Caution

The oil seal must be tapped in until it is flush with the edge of the chain cover.

Crankshaft pulley

Install the crankshaft pulley with the SST.

Tightening torque:

177—196 N·m (18.0—20.0 m·kg, 130—145 ft·lb)






Steps After Installation

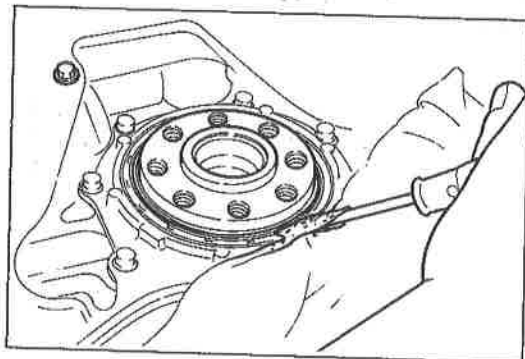
1. Add engine oil to the specified levels.
2. Connect the negative battery cable.
3. Start the engine and do the following:
 - (1) Check for leakage of engine oil.
 - (2) Perform engine adjustments if necessary.
 - (3) Recheck the oil levels.



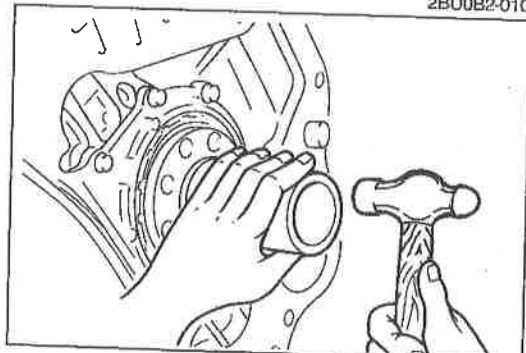
9MU0B2-064

REAR OIL SEAL Preparation SST

49 E011 1A0 Ring gear brake set 	49 E011 105 Stopper (Part of 49 E011 1A0) 	49 E011 103 Shaft (Part of 49 E011 1A0) 
49 E011 104 Collar (Part of 49 E011 1A0) 	49 SE01 310A Clutch disc centering tool 	2BU0B2-009



2BU0B2-010



9BU0B2-030

Removal

1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Remove the transmission. (Refer to Section J2.)
4. Remove the clutch cover, clutch disc, and flywheel with the **SST (49 E011 1A0)** or equivalent and **(49 SE01 310A)**. (Refer to Section H.)
5. Remove the oil seal with a screw driver and a rag.

Installation

Install in the reverse order of removal referring to the **Installation note**.

Installation note

Rear oil seal

1. Apply engine oil to the new oil seal lip.
2. Fit the oil seal onto the rear cover.
3. Tap the oil seal in evenly using a suitable pipe.

Oil seal outer diameter: 110mm (4.33 in)

Caution

The oil seal must be tapped in until it is flush with the edge of the rear cover.

Steps After Installation

1. Add engine oil to the specified levels.
2. Connect the negative battery cable.
3. Start the engine and do the following:
 - (1) Check for leakage of engine oil.
 - (2) Perform engine adjustments if necessary.
 - (3) Recheck the oil levels.

REMOVAL

PREPARATION

SST

49 W023 585A

Adjust wrench

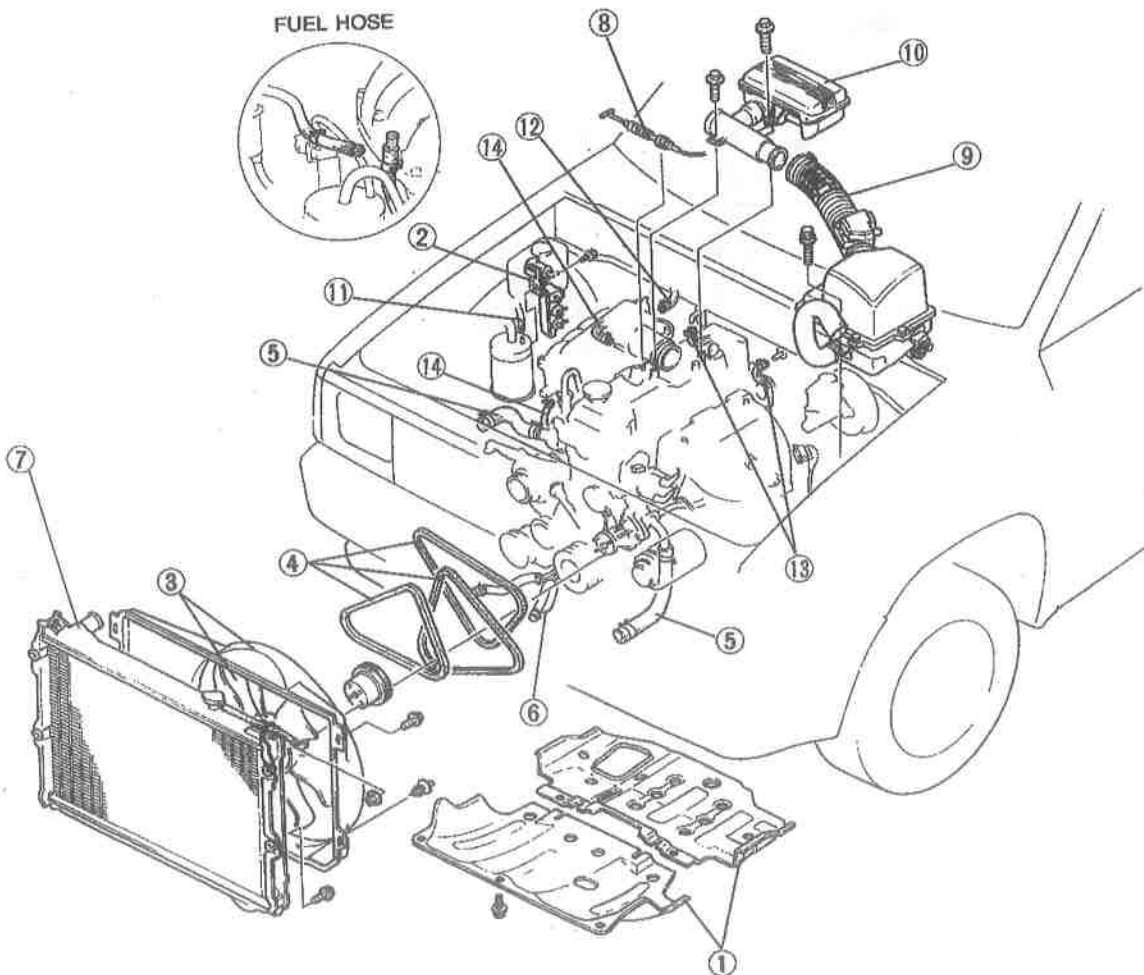


9MU0B2-069

Warning: Release the fuel pressure. (Refer to Section F2.)

1. Disconnect the negative battery cable and remove the battery.
2. Remove the starter (Refer to Section G) and transmission. (Refer to Section J2.)
3. Drain the engine oil and coolant.
4. Remove in the order shown in the figure referring to the **Removal note**.

STEP 1

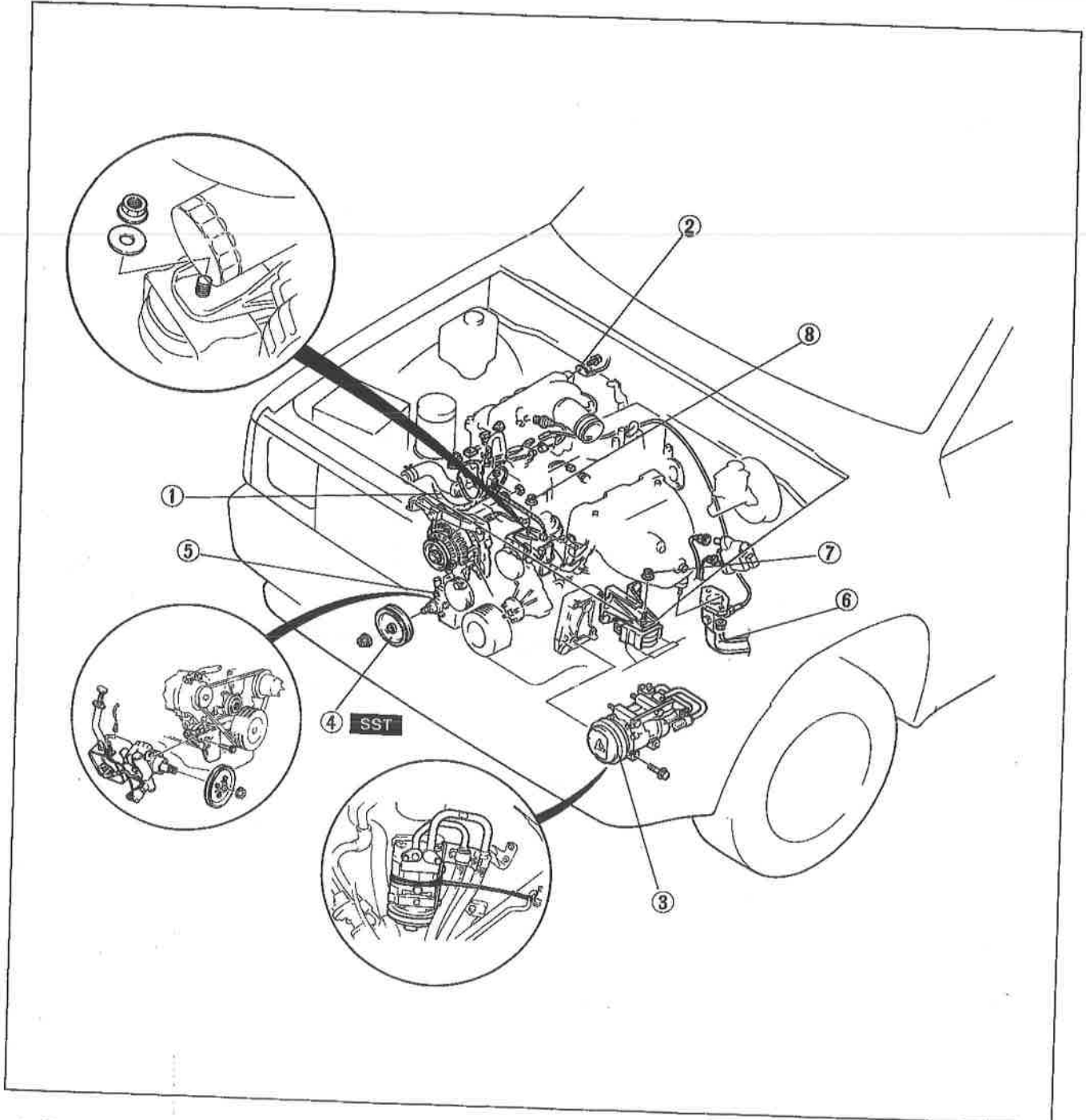


1BU0B2-005

- | | |
|-------------------------------------|--------------------------------|
| 1. Undercover | 8. Accelerator cable |
| 2. Solenoid valve | 9. Air cleaner |
| 3. Cooling fan and radiator cowling | 10. Resonance chamber assembly |
| 4. Drive belts | 11. Canister hose |
| 5. Upper and lower radiator hoses | 12. Brake vacuum hose |
| 6. Oil cooler hose (A/T) | 13. Heater hoses |
| 7. Radiator | 14. Fuel hoses |

STEP 2

0BU0B2-003



1. Emission harness connectors
2. Ground wire
3. A/C compressor
4. P/S oil pump pulley

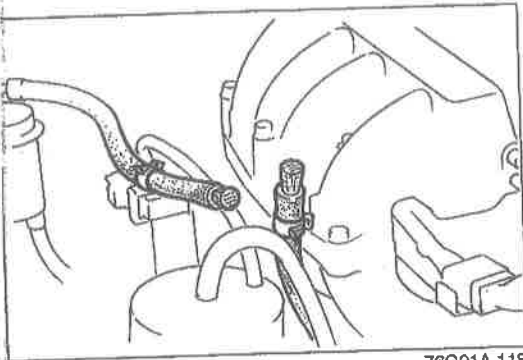
5. P/S oil pump
6. Exhaust pipe and bracket
7. Left engine mount nut
8. Right engine mount nut

9BU0B2-002

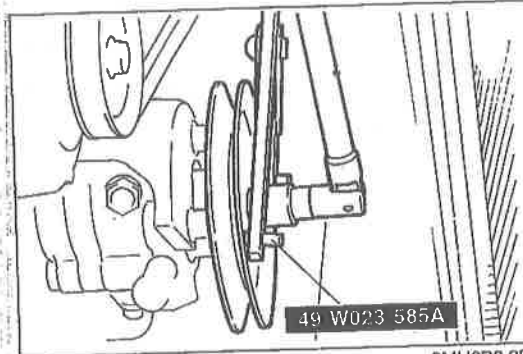
REMOVAL**Removal note**
Fuel hose**Warning**

- a) Cover the hose with a rag because fuel will spray out when disconnecting.
- b) Keep sparks and open flame away from the fuel area.

Plug the disconnected hoses to avoid fuel leakage.



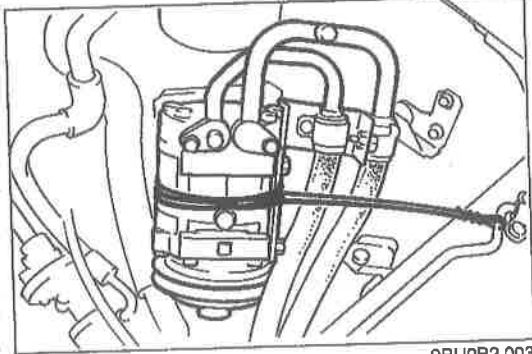
76G01A-118



9MU0B2-250

P/S oil pump pulley

Remove the P/S oil pump pulley with the **SST**.



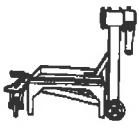
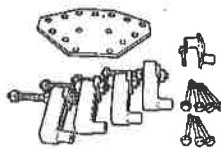
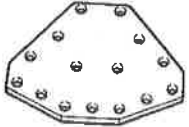



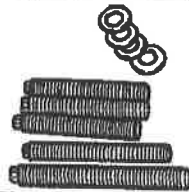

9BU0B2-003

P/S oil pump, A/C compressor

Remove the P/S oil pump and A/C compressor with the hoses still connected to them; secure the pump and compressor as shown in the figure.

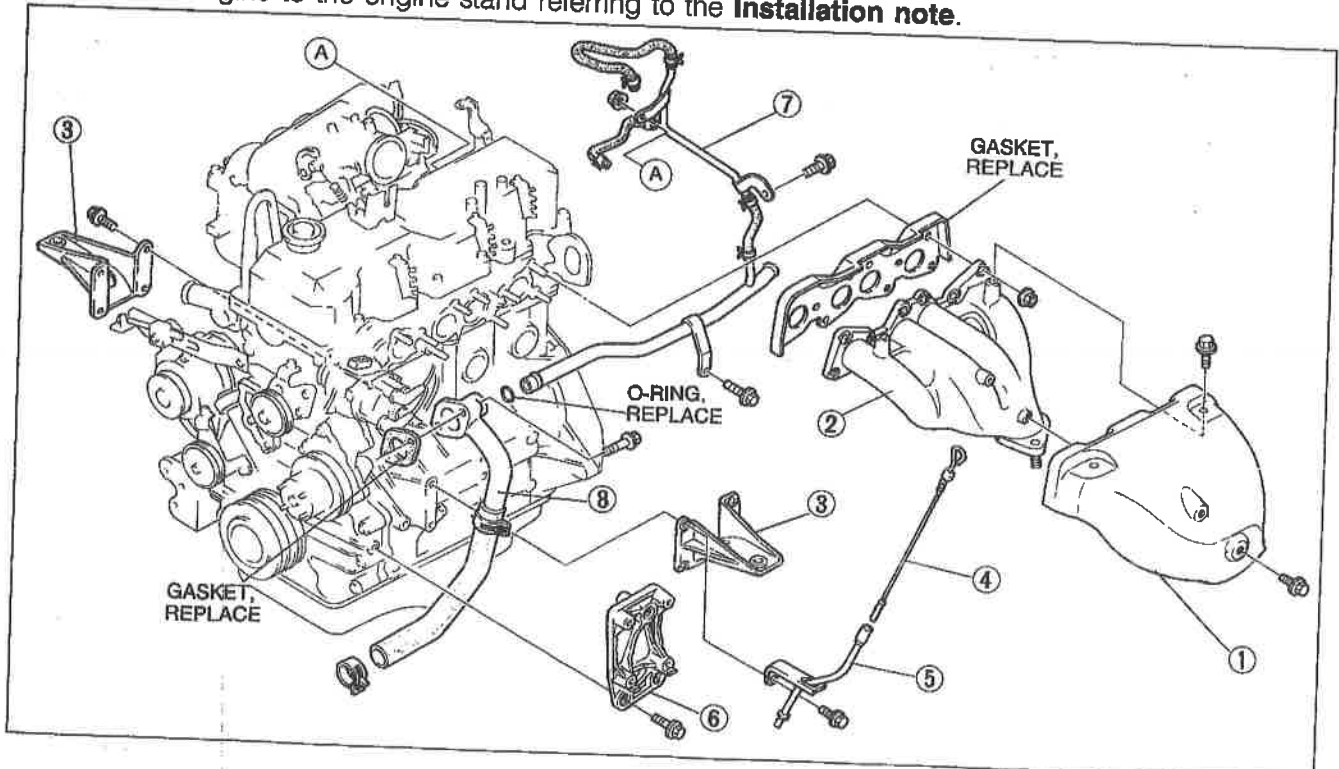
ENGINE STAND INSTALLATION

PREPARATION SST

<p>49 0107 680A Engine stand</p> 	<p>49 L010 1A0 Hanger, engine stand</p> 	<p>49 L010 101 Plate (Part of 49 L010 1A0)</p> 
<p>49 L010 102 Arms (Part of 49 L010 1A0)</p> 	<p>49 L010 103 Hooks (Part of 49 L010 1A0)</p> 	<p>49 L010 104 Nuts (Part of 49 L010 1A0)</p> 
<p>49 L010 105 Bolts (Part of 49 L010 1A0)</p> 	<p>49 L010 106 Bolts (Part of 49 L010 1A0)</p> 	<p style="text-align: right;">9MU0B2-073</p>

INSTALLATION

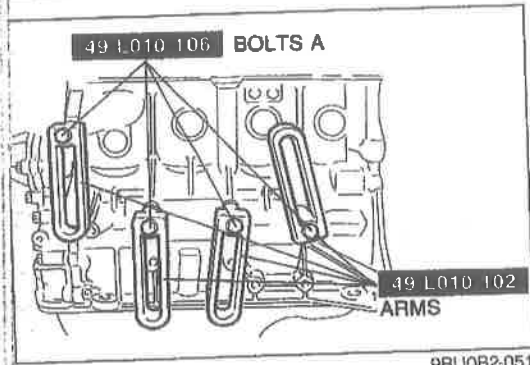
1. Remove the parts in the order shown in the figure.
2. Install the engine to the engine stand referring to the **Installation note**.



1. Exhaust manifold insulator
2. Exhaust manifold
3. Engine mount
4. Oil level gauge

5. Oil level gauge pipe and stay
6. A/C compressor bracket
7. Coolant bypass pipe
8. Coolant inlet pipe

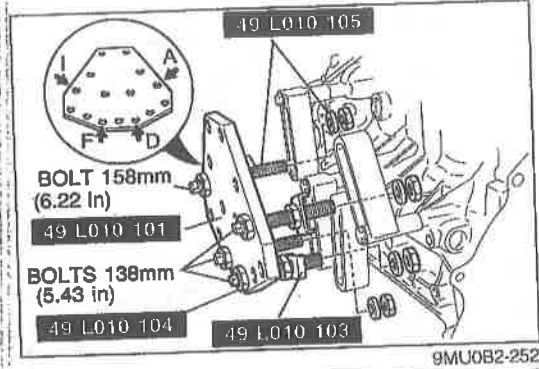
1BU0B2-006



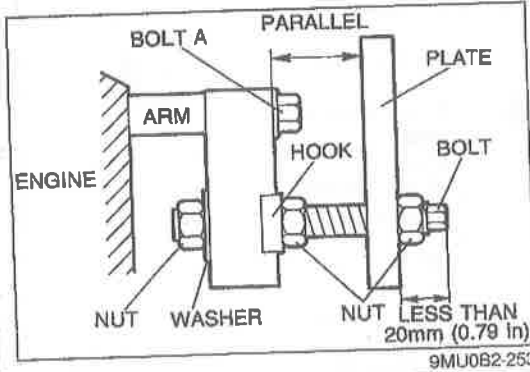
Installation note

Engine hanger

1. Install the **SST (arms)** to the block holes as shown in the figure and loosely tighten the **SST (bolts A)**.



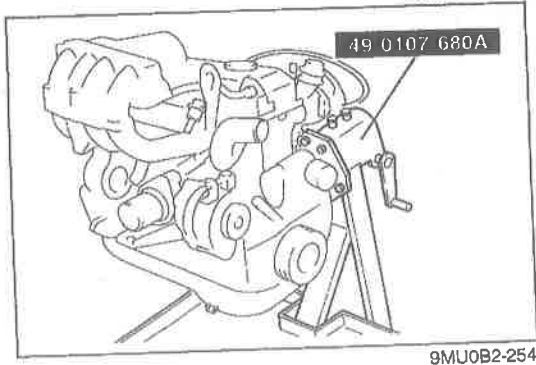
2. Assemble the **SST (bolts, nuts, hooks and plate)**.
3. Install the **SST** assembly to the respective arms while adjusting parallelism between the arms and plate by turning the bolts and nuts.



Warning

Use special caution while turning the engine stand handle to prevent hand injury.

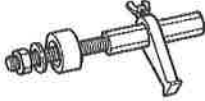




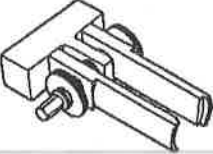
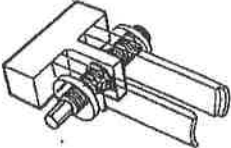
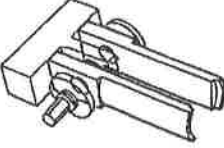
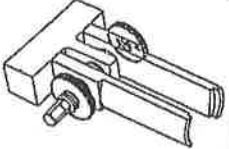

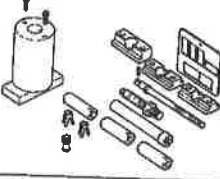

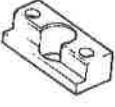

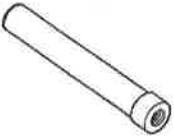



4. Tighten the bolts and nuts to fix the **SST**.



5. Install the engine on the **SST**.

DISASSEMBLY

PREPARATION
SST

49 E011 1A0 Ring gear brake set 	49 E011 105 Stopper (Part of 49 E011 1A0) 	49 E011 103 Shaft (Part of 49 E011 1A0) 
49 E011 104 Collar (Part of 49 E011 1A0) 	49 0636 100A Arm, valve spring lifter 	49 B012 0A2 Pivot, valve spring lifter 
49 B012 012 Body (Part of 49 B012 0A2) 	49 B012 013 Foot (Part of 49 B012 0A2) 	49 B012 014 Lock nut (Part of 49 B012 0A2) 
49 1285 071 Puller, bearing 	49 L011 0A0 Piston pin setting tool set 	49 L011 001 Support block body (Part of 49 L011 0A0) 
49 L011 002 Support block head (Part of 49 L011 0A0) 	49 L011 004 Screw (Part of 49 L011 0A0) 	49 L011 006 Puller & installer (Part of 49 L011 0A0) 
49 L011 009 Guide (Part of 49 L011 0A0) 	49 L011 010 Centering tool (Part of 49 L011 0A0) 	49 L011 011 Holder (Part of 49 L011 0A0) 

2BU0B2-011

1. Code all identical parts (such as pistons, piston rings, connecting rods, and valve springs) so that they can be reinstalled in the cylinder from which they were removed.
2. Clean the parts with steam; blow off any remaining water with compressed air.

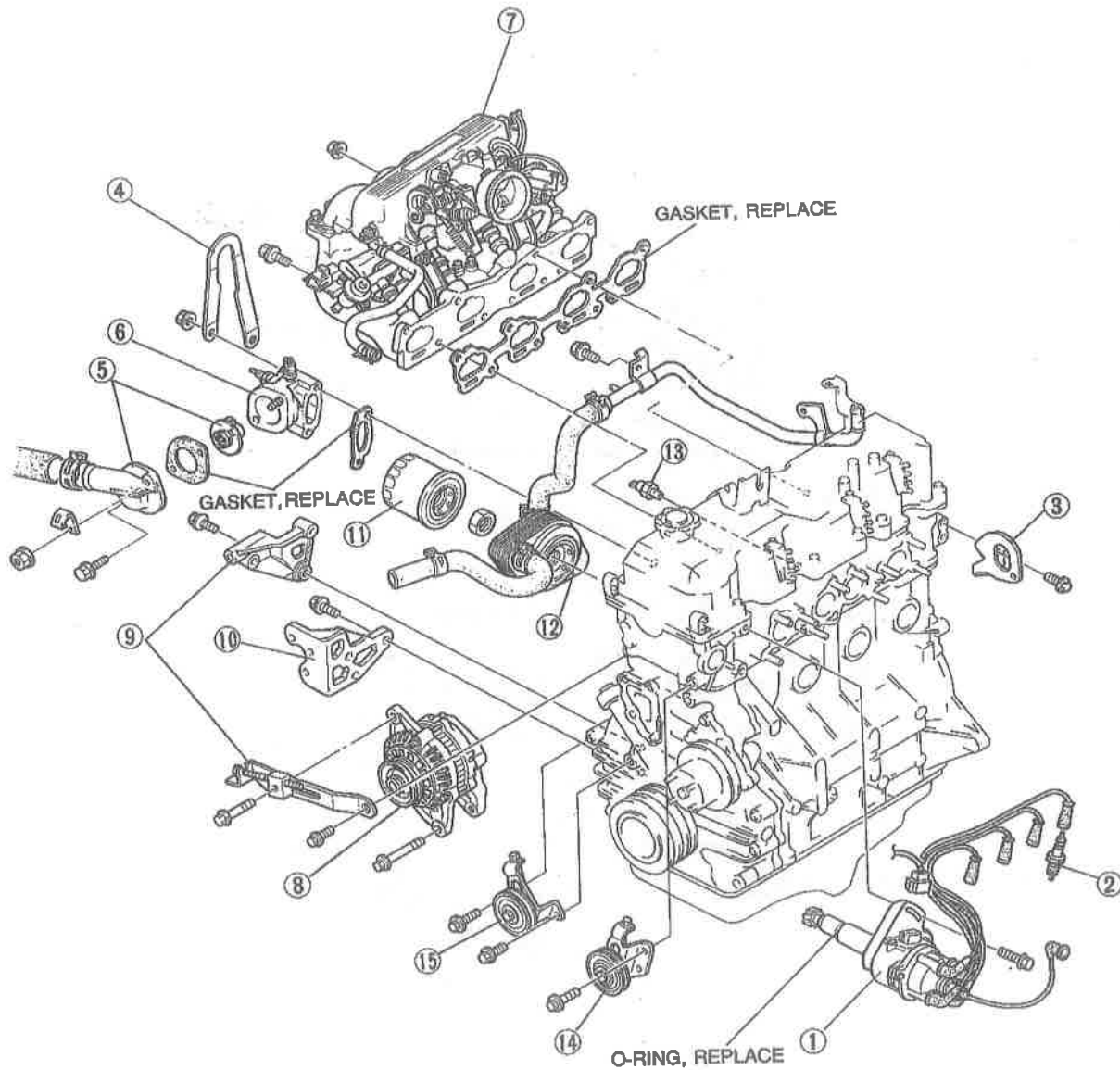
Note

During the disassembly of any part or system, be sure to study its order of assembly. Also, note any deformation, wear, or damage.

0BU0B2-019

AUXILIARY PARTS

Remove in the order shown in the figure.

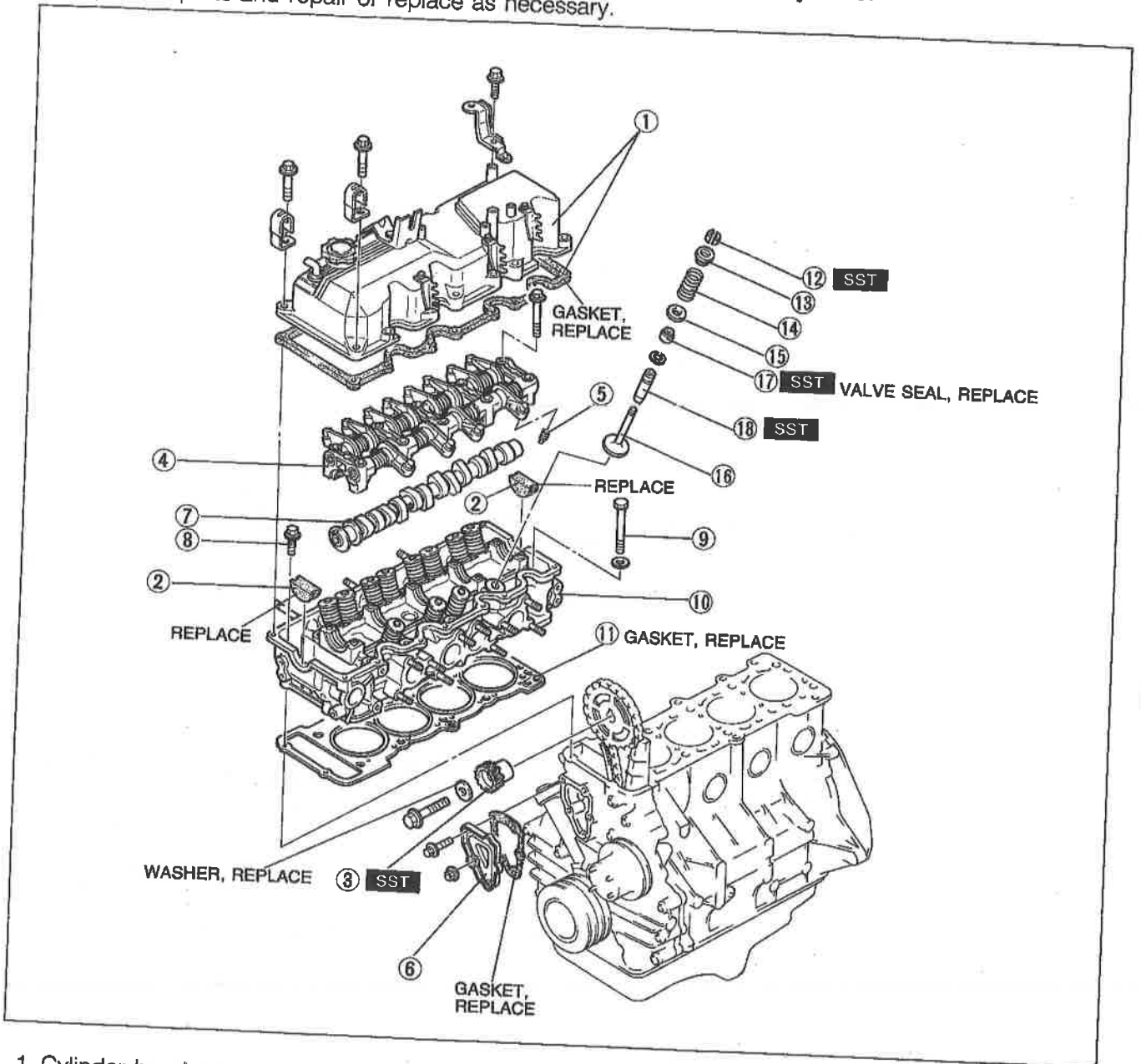


1BU0B2-007

- | | |
|--------------------------------------|---------------------------------|
| 1. Distributor and high-tension lead | 8. Alternator |
| 2. Spark plug | 9. Alternator bracket and strap |
| 3. Rear engine hanger | 10. P/S oil pump bracket |
| 4. Front engine hanger | 11. Oil filter |
| 5. Thermostat and thermostat cover | 12. Oil cooler |
| Service..... Section E | 13. Oil pressure switch |
| 6. Water outlet | 14. A/C idler bracket |
| 7. Intake manifold assembly | 15. P/S idler bracket |

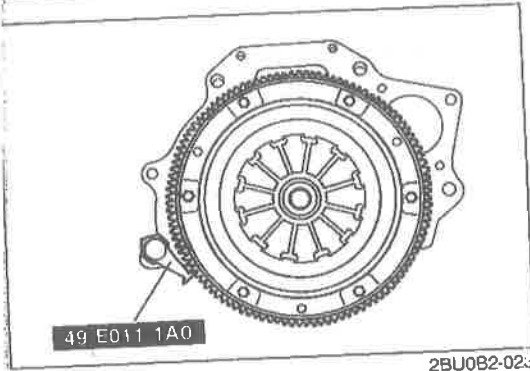
CYLINDER HEAD

1. Remove in the order shown in the figure referring to the **Disassembly note**.
2. Inspect all parts and repair or replace as necessary.



18U0B2-008

- | | |
|---|--------------------------------------|
| 1. Cylinder head cover and gasket | 11. Cylinder head gasket |
| 2. Seal cover | 12. Valve keepers |
| 3. Distributor drive gear
Inspect for wear or damage | 13. Upper spring seat |
| 4. Rocker arm and shaft assembly
Inspection | 14. Valve spring
Inspection |
| page B2-45 | 15. Lower spring seat |
| 5. Hydraulic lash adjuster (HLA)
Inspection | 16. Valve
Inspection |
| page B2-45 | 17. Valve seal
Inspection |
| 6. Service cover | page B2-40 |
| 7. Camshaft
Inspection | 18. Valve guide
Inspection |
| page B2-44 | Replacement |
| 8. Timing chain cover attaching bolt | page B2-40 |
| 9. Cylinder head bolt | page B2-41 |
| 10. Cylinder head
Inspection | |
| page B2-39 | |



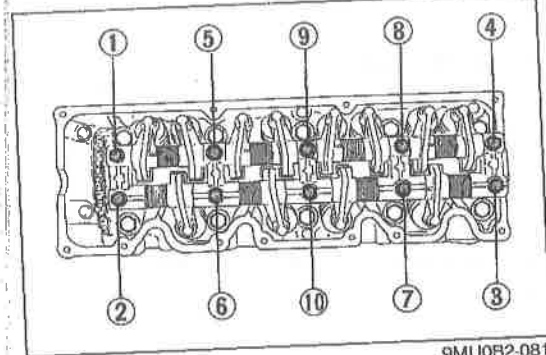
Disassembly note

During disassembly, inspect the following.

1. Camshaft end play (Refer to page B2-45.)
2. Camshaft journal oil clearance (Refer to page B2-44.)

Distributor drive gear

1. Set the **SST** or equivalent against the flywheel (M/T) or drive plate (A/T).
2. Remove the distributor drive gear.

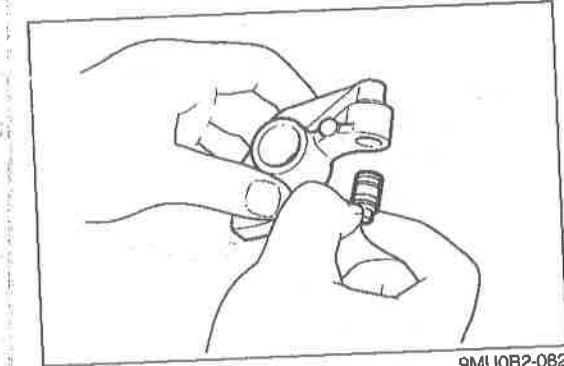


Rocker arm and shaft assembly

1. Loosen the bolts in two or three steps in the order shown in the figure.
2. Remove the rocker arm and shaft assembly together with the bolts.

Caution

Do not mix up the parts of the rocker arm and shaft assembly.

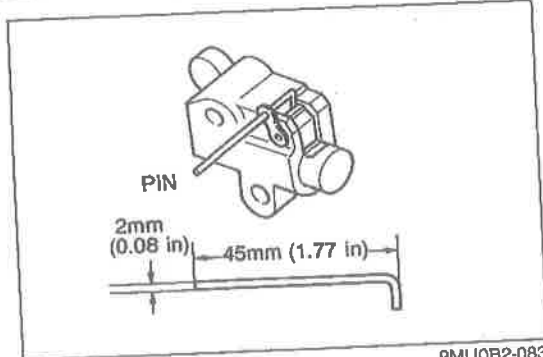


Hydraulic lash adjuster (HLA)

Remove the HLA by hand. If this is difficult, remove it with pliers.

Caution

Do not remove the HLA unless necessary because oil leakage will occur if the O-ring is damaged.



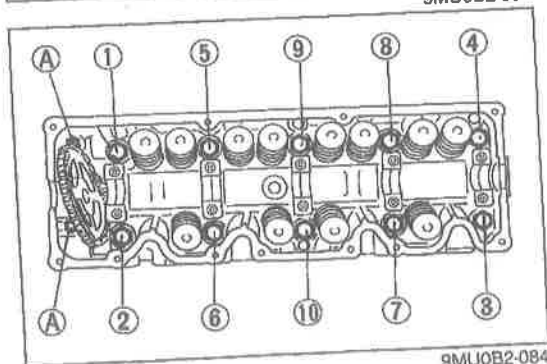
Camshaft

1. Remove the service cover on the chain cover.
2. Push the chain adjuster sleeve in toward the left and insert the pin as shown into the lever hole to hold it.

Caution

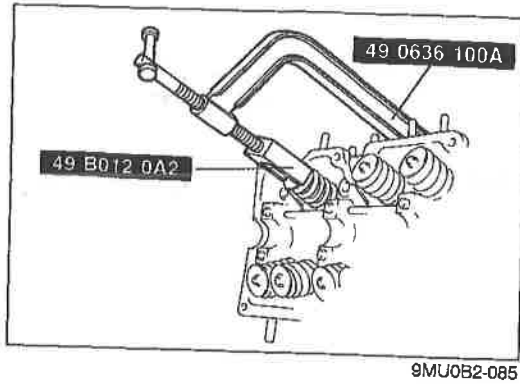
Be especially careful that the pin does not fall.

3. Remove the camshaft.



Cylinder head bolt

1. Remove the bolt (A).
2. Loosen the remaining cylinder head bolts in two or three steps in the order shown in the figure.



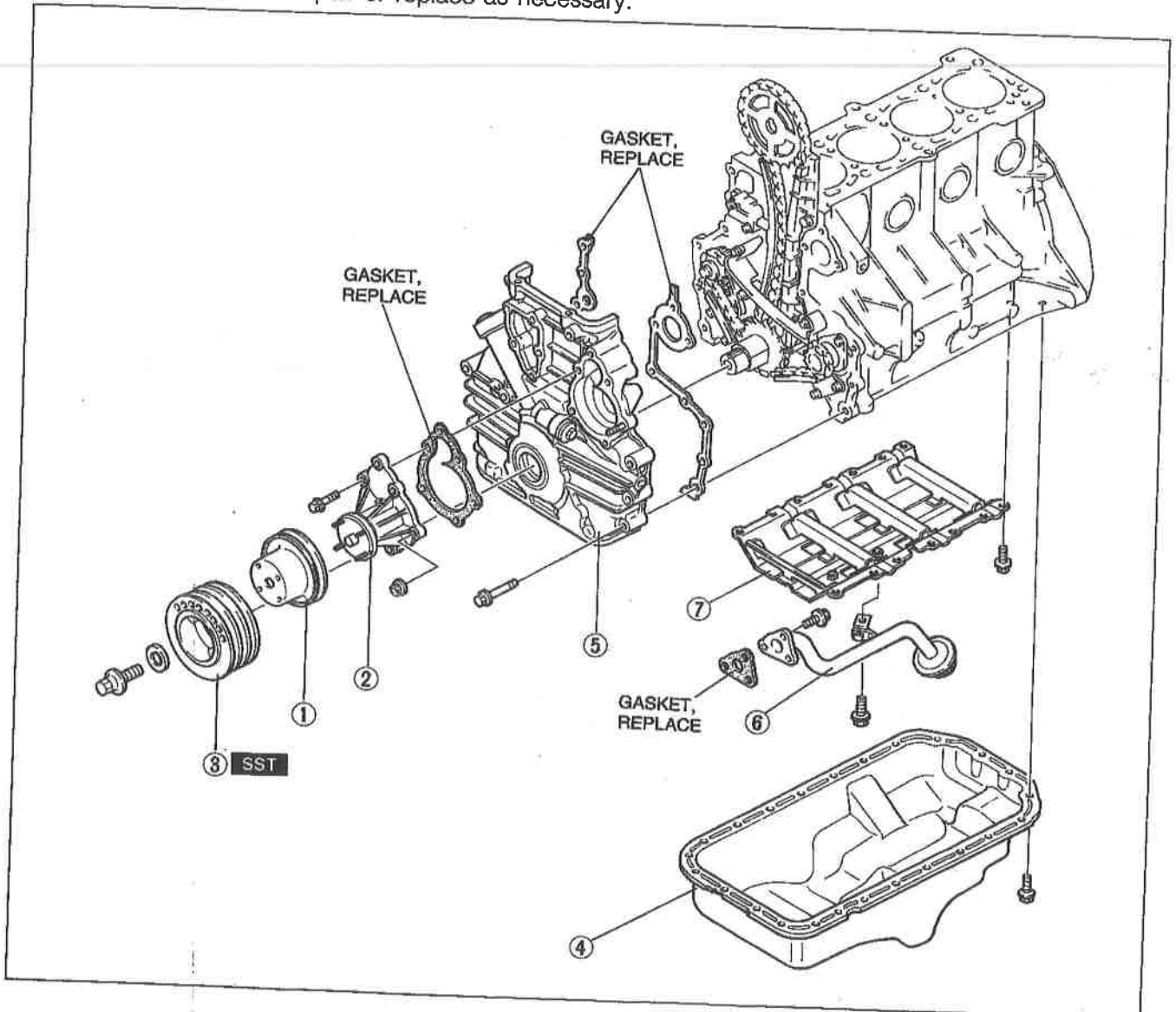
Valve

Remove the valves from the cylinder head with the **SST**.

9MU0B2-085

CHAIN CASE AND OIL PAN

1. Remove in the order shown in the figure referring to the **Disassembly note**.
2. Inspect all parts and repair or replace as necessary.



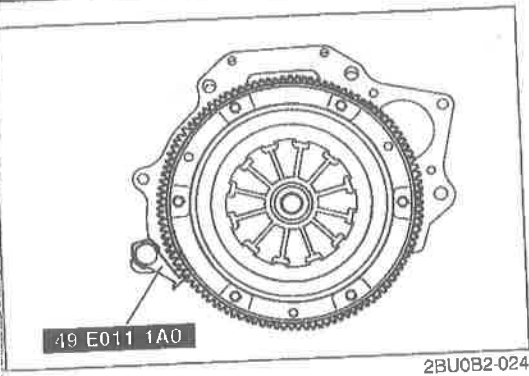
1BU0B2-009

1. Water pump pulley
2. Water pump
3. Crankshaft pulley

Section E

4. Oil pan
Inspect for damage
5. Chain cover
6. Oil strainer
7. Vibration reducing stiffener (VRS)

DISASSEMBLY (BALANCER CHAIN AND TIMING CHAIN)



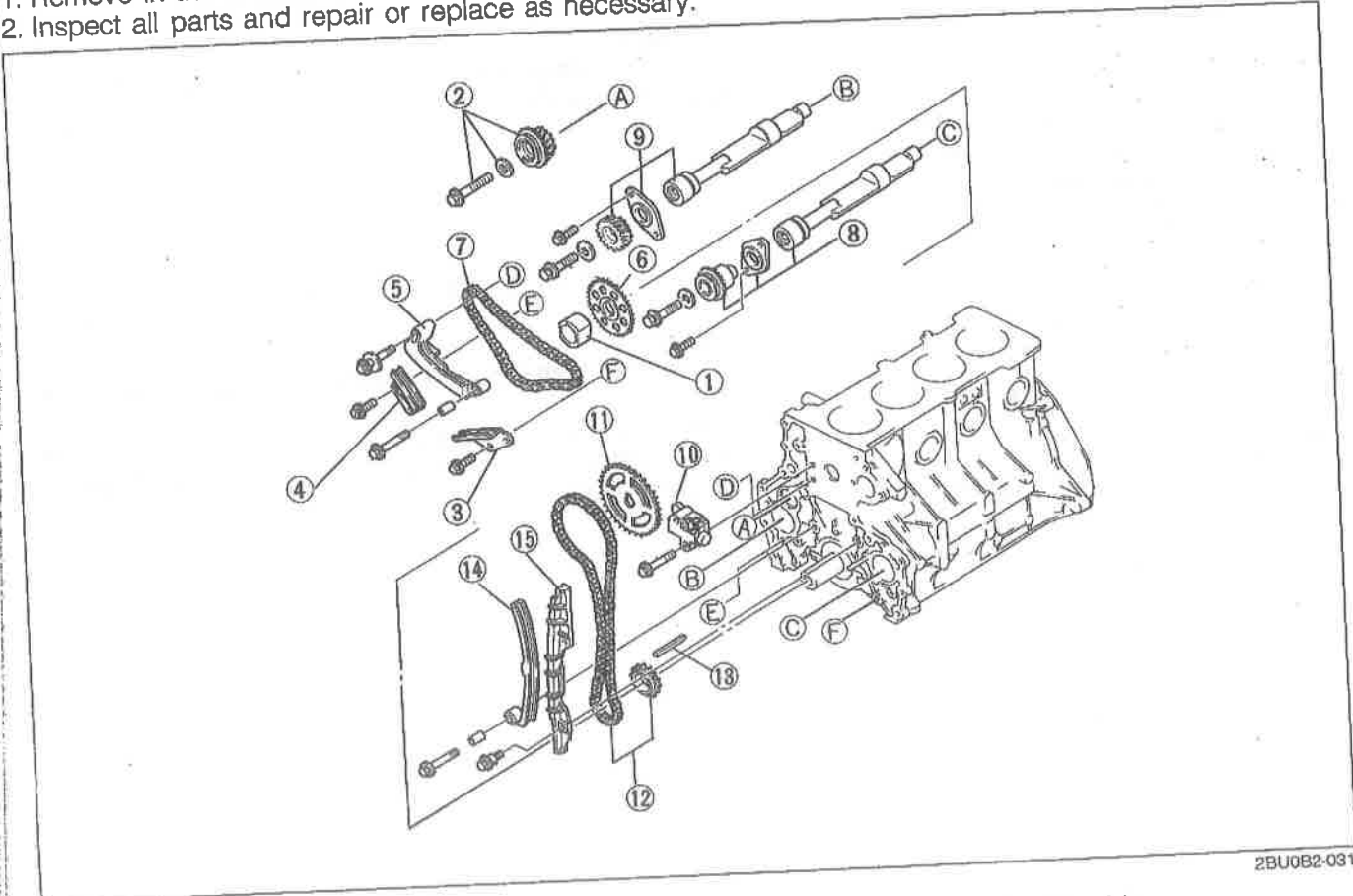
2BU0B2-024

Disassembly note
Crankshaft pulley

1. Set the **SST** or equivalent against the flywheel (M/T) or drive plate (A/T).
2. Remove the crankshaft pulley.

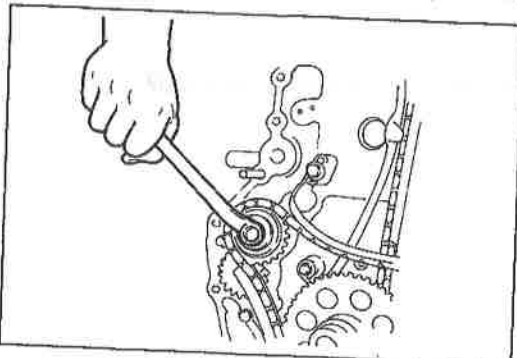
BALANCER CHAIN AND TIMING CHAIN

1. Remove in the order shown in the figure referring to the **Disassembly note**.
2. Inspect all parts and repair or replace as necessary.



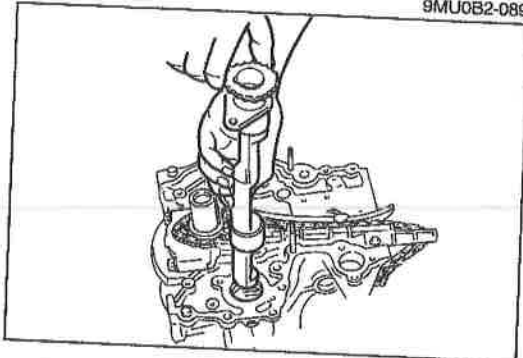
2BU0B2-031

- | | |
|---|---|
| 1. Spacer | 9. Right balance shaft assembly
Inspection page B2-50 |
| 2. Idler sprocket assembly lock bolt | 10. Chain adjuster
Inspection page B2- 8 |
| 3. Chain guide A
Inspect for wear or damage | 11. Camshaft pulley
Inspect for wear or damage |
| 4. Chain guide B
Inspect for wear or damage | 12. Timing chain and timing gear
Inspection page B2-51 |
| 5. Chain guide C
Inspect for wear or damage | 13. Key |
| 6. Crankshaft sprocket
Inspect for wear or damage | 14. Chain lever
Inspect for wear or damage |
| 7. Balancer chain
Inspect for wear or damage | 15. Chain guide
Inspect for wear or damage |
| 8. Left balance shaft assembly
Inspection page B2-50 | |



9MU0B2-089

Disassembly note
Idler sprocket assembly lock bolt
Loosen the idler sprocket assembly lock bolt, before removing the chain guides.

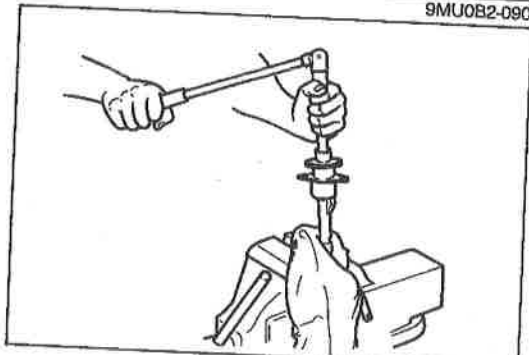


9MU0B2-090

Left and right balance shaft assembly

1. Remove the thrust plate lock bolts.
2. Pull out the balance shaft assembly.

Caution
Do not damage the balance shaft journal and bushing when pulling out the assembly.



9MU0B2-091

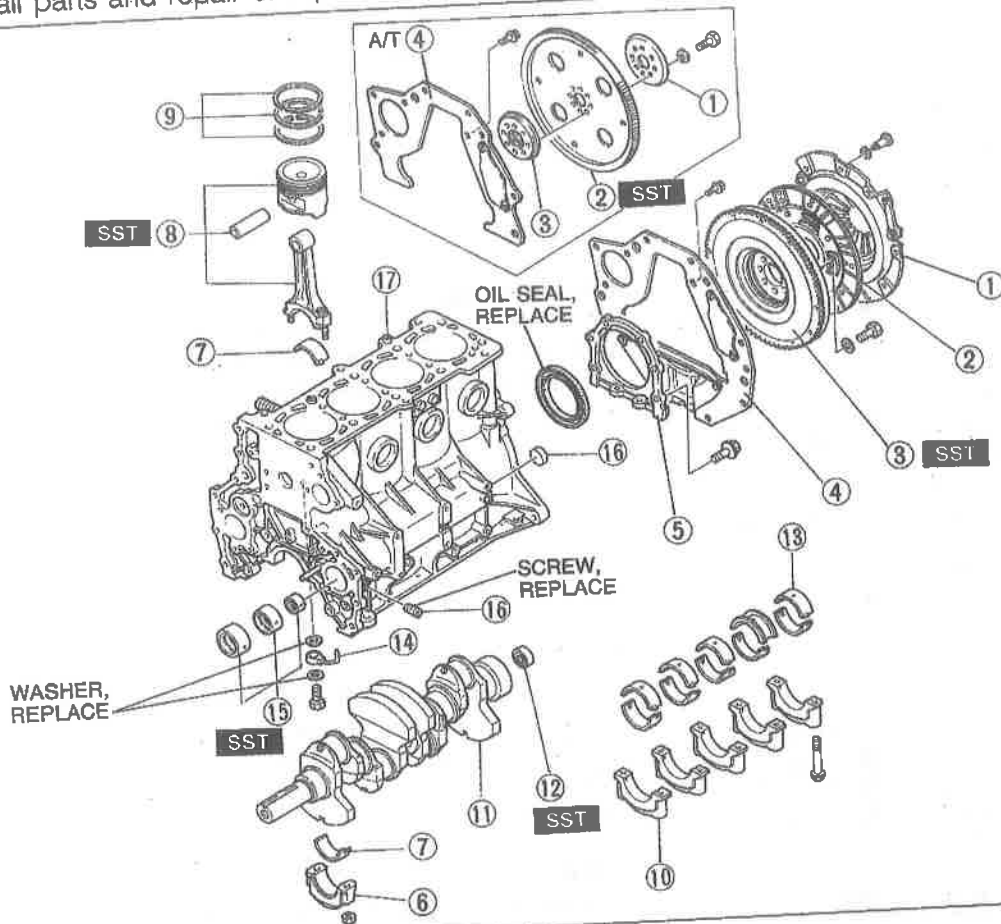
3. Disassemble the balance shaft assembly.

Caution
Do not use a vise on the journals during disassembly.

4. Distinguish the left and right balance shaft for correct assembly because the both shafts and the thrust plates are shaped the same.

CYLINDER BLOCK

1. Remove in the order shown in the figure referring to the **Disassembly note**.
2. Inspect all parts and repair or replace as necessary.

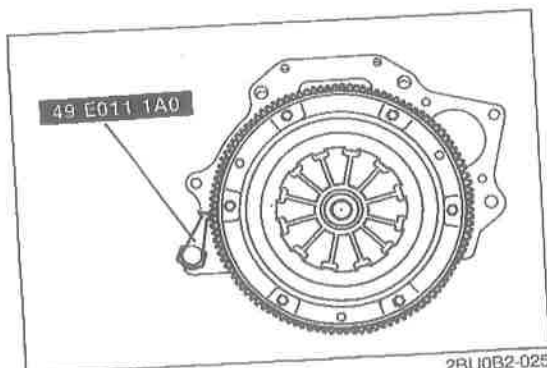


2BU0B2-018

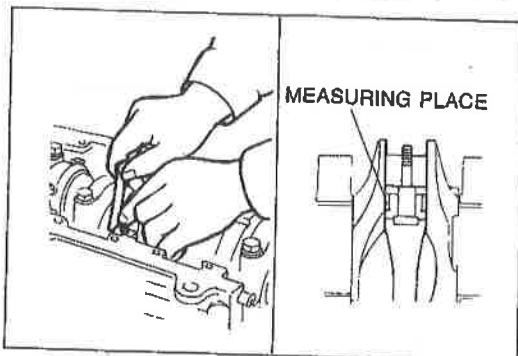
- | | |
|--|---|
| 1. Clutch cover (M/T), Plate (A/T) | 10. Main bearing cap |
| 2. Clutch disc (M/T), Drive plate (A/T) | 11. Crankshaft |
| 3. Flywheel (M/T), Adapter (A/T) | Inspection page B2-49 |
| 4. End plate | 12. Pilot bearing (M/T) |
| 5. Rear cover | 13. Main bearing |
| 6. Connecting rod cap | Inspect for peeling, scoring, or damage |
| 7. Connecting rod bearing | 14. Oil jet |
| Inspect for peeling, scoring, or damage | 15. Balance shaft bushing |
| 8. Connecting rod, piston and piston pin | Replacement page B2-50 |
| Inspection pages B2-47, 48 | 16. Blind plug and screw |
| 9. Piston ring | Replacement page B2-51 |
| Inspection page B2-47 | 17. Cylinder block |
| | Inspection page B2-45 |

Disassembly note

Clutch cover and flywheel (M/T) or drive plate
 Remove the clutch cover and flywheel (M/T), or drive plate (A/T) with the **SST** or equivalent.



2BU0B2-025

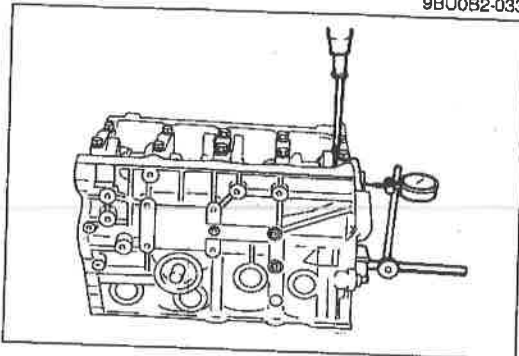


9BU0B2-033

Connecting rod and cap

Before removing the connecting rod, clean the bearing, connecting rod, and crankpin, and measure the following:

1. Connecting rod side clearance (Refer to page B2-58.)
2. Crankpin oil clearance (Refer to page B2-57.)

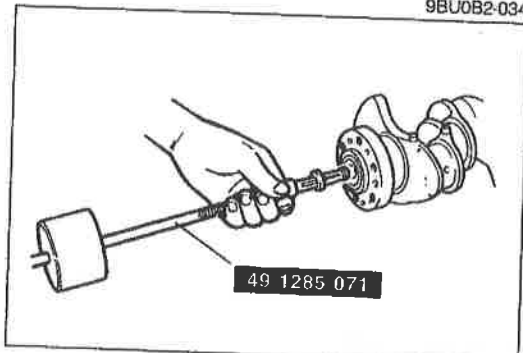


9BU0B2-034

Main bearing cap

Before removing the main bearing caps, clean the bearings, main journals, and caps, and measure the following points.

1. Crankshaft end play (Refer to page B2-56.)
2. Main journal oil clearance (Refer to page B2-56.)



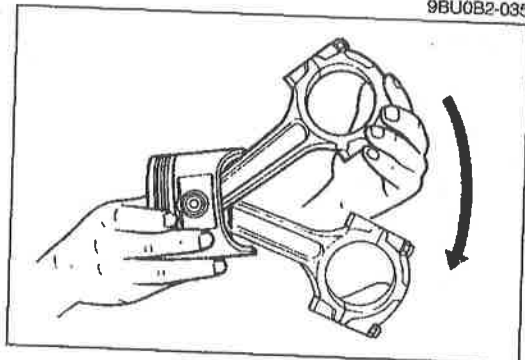
9BU0B2-035

Pilot bearing

1. Before removing the pilot bearing, inspect for sticks or excessive resistance by turning the bearing while applying force in the axial direction.
2. Remove the pilot bearing from the crankshaft with the **SST** if necessary.

Note

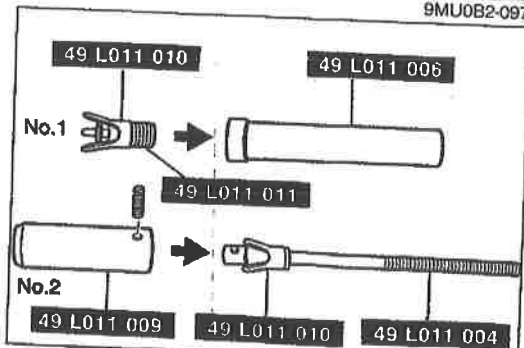
When replacing and/or cleaning the crankshaft, remove the pilot bearing.



9MU0B2-097

Piston and connecting rod

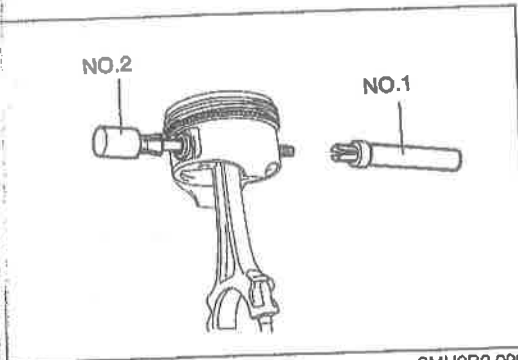
1. Before disassembling the piston and connecting rod, check the oscillation torque as shown. If the large end does not drop by its own weight, replace the piston or the piston pin.



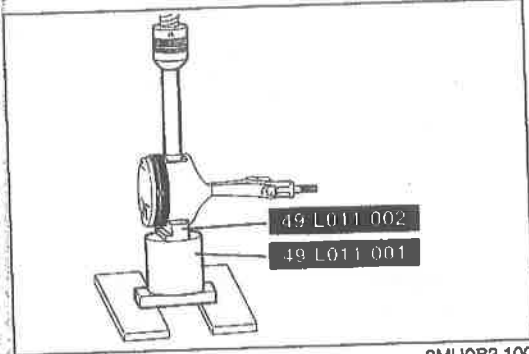
9MU0B2-098

2. Assemble the **SST** as shown.

DISASSEMBLY (CYLINDER BLOCK)



9MU0B2-099




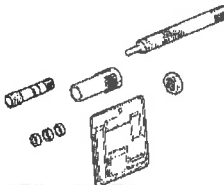
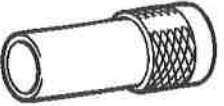


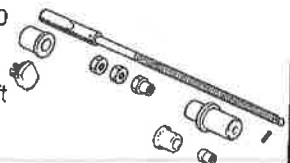

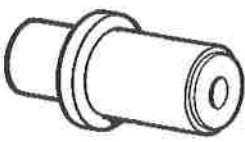
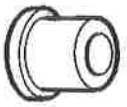

9MU0B2-100

3. Insert the **SST No.2** into the piston pin as shown and fully screw in the **SST No.1**.

4. Mount the piston and connecting rod in the **SST** as shown.
5. Press out the piston pin.
While removing the piston pin, check the pressure. If it is lower than **4,905 N (500 kg, 1,100 lb)**, replace the piston pin or connecting rod.

INSPECTION AND REPAIR

PREPARATION
SST

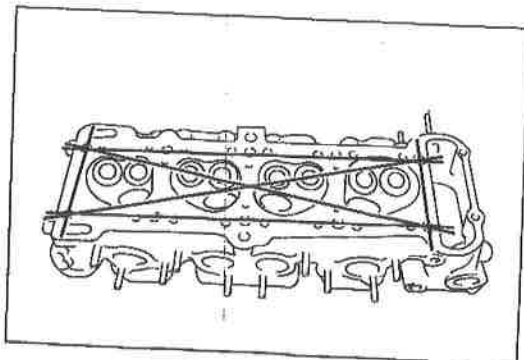
<p>49 0249 010A</p> <p>Remover & installer, valve guide</p> 	<p>49 L012 0A0</p> <p>Installer set, valve seal & valve guide</p> 	<p>49 L012 002</p> <p>Body (Part of 49 L012 0A0)</p> 
<p>49 L012 003</p> <p>Installer (Part of 49 L012 0A0)</p> 	<p>49 L012 004</p> <p>Nut (Part of 49 L012 0A0)</p> 	<p>49 L011 2A0</p> <p>Replacer, balance shaft bushing</p> 
<p>49 L011 201</p> <p>Shaft (Part of 49 L011 2A0)</p> 	<p>49 L011 202</p> <p>Attachment (Part of 49 L011 2A0)</p> 	<p>49 L011 203</p> <p>Attachment (Part of 49 L011 2A0)</p> 
<p>49 L011 204</p> <p>Attachment (Part of 49 L011 2A0)</p> 	<p>9MU0B2-101</p>	

1. Clean all parts, being sure to remove any gasket fragments, dirt, oil or grease, carbon, moisture residue, or other foreign materials.
2. Inspection and repairs must be performed in the order specified.

Caution

Do not damage the joints or friction surfaces of aluminum alloy components (such as the cylinder head or pistons).

9MU0B2-102

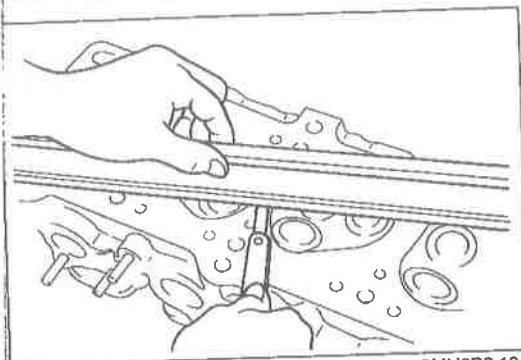


9MU0B2-103

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: 0.15mm (0.006 in) max.



9MU0B2-104

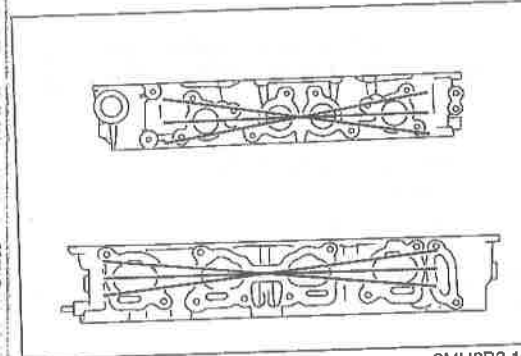
- If the cylinder head distortion exceeds specification, grind the cylinder head surface.
If the cylinder head height is not within specification, replace it.

Height: 89.95—90.05mm (3.541—3.545 in)
Grinding: 0.20mm (0.008 in) max.

Note

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

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

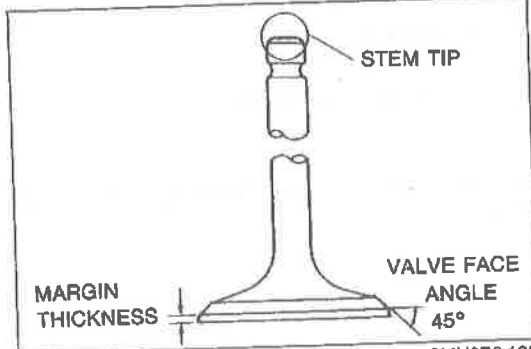


9MU0B2-105

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

Distortion: 0.15mm (0.006 in) max.

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



9MU0B2-106

Valve and Valve Guide

- Inspect each valve for the following. Replace or resurface if necessary.
 - Damaged or bent stem
 - Roughness or damage to face
 - Damage or uneven wear of stem tip
- Check the valve head margin thickness. Replace if necessary.

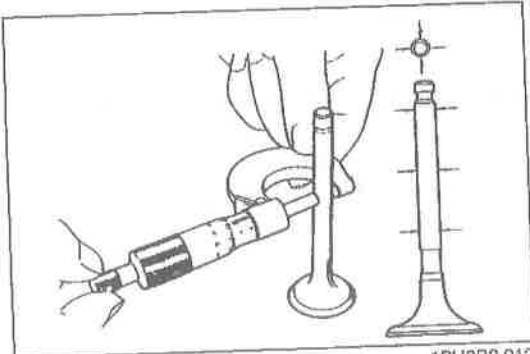
Margin thickness

IN : 1.0mm (0.039 in)
EX : 1.5mm (0.059 in)

- Measure the valve length.

Length

Standard IN : 112.69mm (4.4367 in)
EX: 113.82mm (4.4812 in)
Minimum IN : 112.29mm (4.4209 in)
EX: 113.42mm (4.4654 in)



1BU0B2-012

- Measure the valve stem diameter.

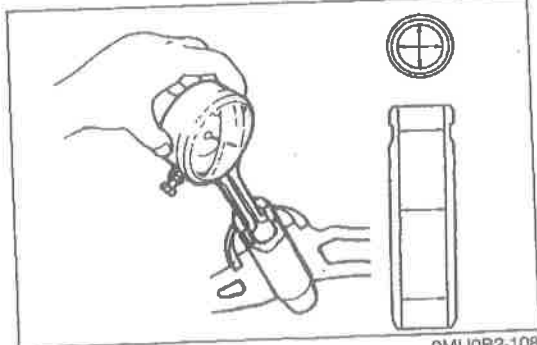
Diameter

IN : 6.970—6.985mm (0.2744—0.2750 in)
EX: 6.965—6.980mm (0.2742—0.2748 in)

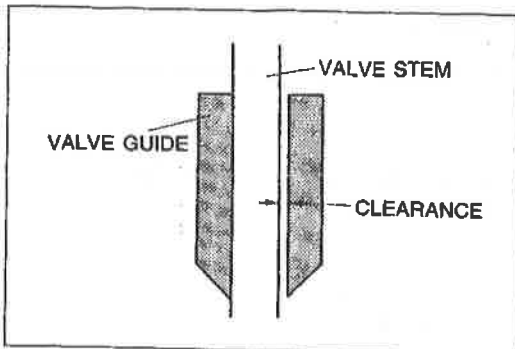
- Measure the valve guide inner diameter.

Inner diameter

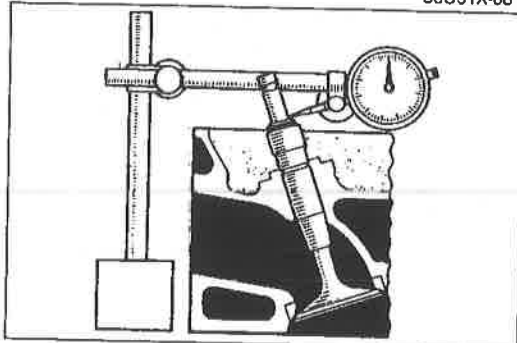
IN : 7.01—7.03mm (0.2760—0.2768 in)
EX: 7.01—7.03mm (0.2760—0.2768 in)



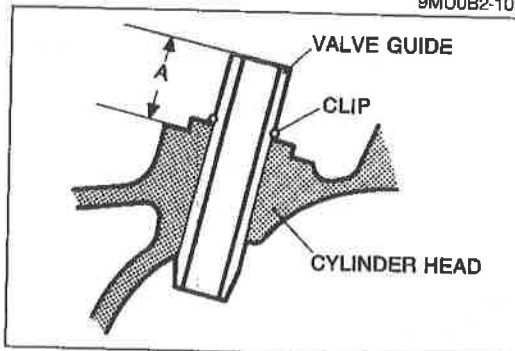
9MU0B2-108



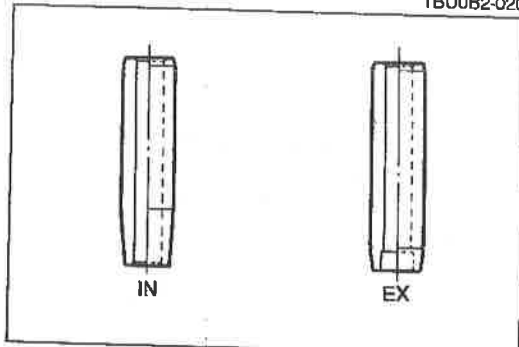
86U01X-081



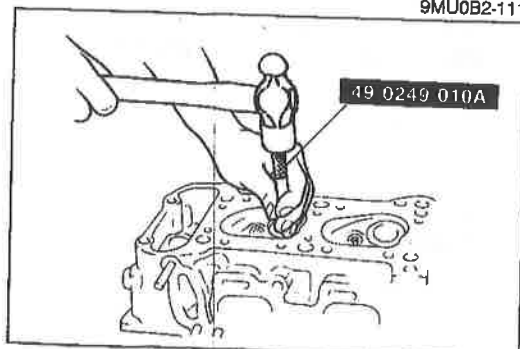
9MU0B2-109



1BU0B2-020



9MU0B2-111



9MU0B2-112

6. Measure the valve stem-to-guide clearance.

(1) Method No.1

Subtract the outer diameter of the valve stem from the inner diameter of the corresponding valve guide.

(2) Method No.2

Measure the valve stem play at a point close to the valve guide with the valve lifted slightly off the valve seat.

Clearance

IN : 0.025—0.060mm (0.0010—0.0024 in)

EX : 0.030—0.065mm (0.0012—0.0026 in)

Maximum: 0.20mm (0.008 in)

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

8. Check the valve guide projection height (dimension A in the figure). Replace if necessary.

Height: 23.5—24.2mm (0.925—0.953 in)

Note

The retainer clip is used on only the original equipment valve guide.

Replacement of valve guide

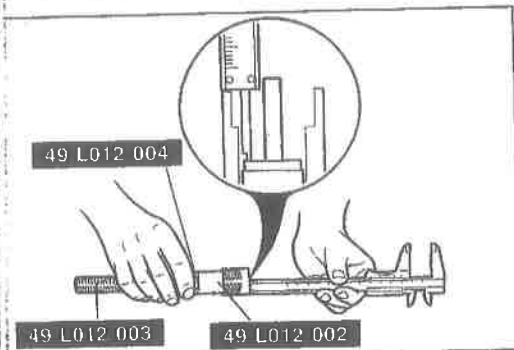
Note

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

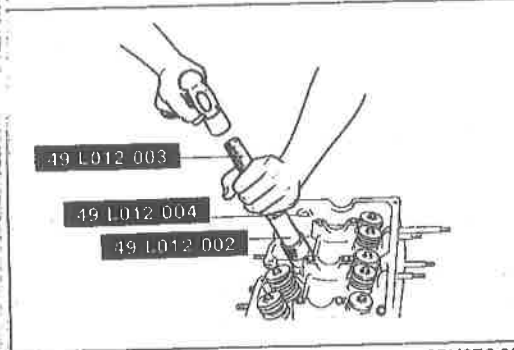
b) There is no retainer groove in the replacement valve guide.

Removal

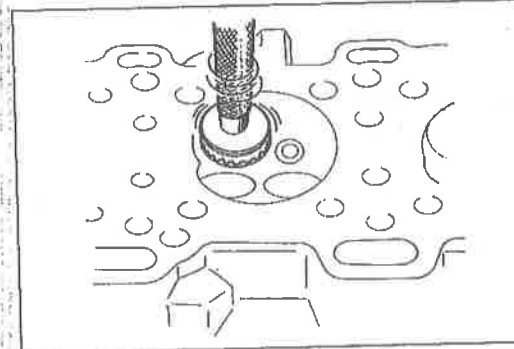
Remove the valve guide from the side opposite the combustion chamber with the SST.



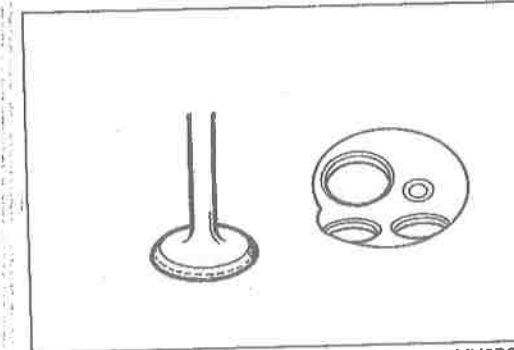
18U0B2-019



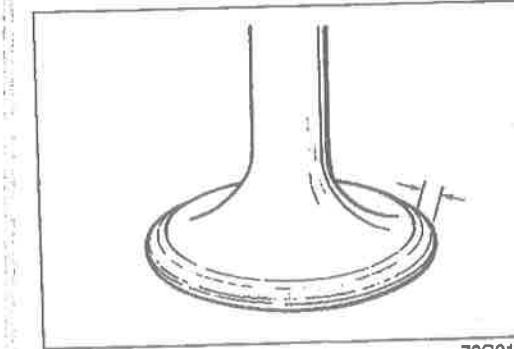
0BU0B2-021



86U01X-087



9MU0B2-255



79G01C-062

Installation

1. Assemble the **SST** so that the depth **L** is as specified.

Depth L: 23.5—24.2mm (0.925—0.953 in)

2. Tighten the locknut.

3. Tap the new valve guide in from the side opposite the combustion chamber until the **SST** contacts the cylinder head.
4. Check that the valve guide projection height is within specification.
5. If not within specification, repeat steps 1—4.

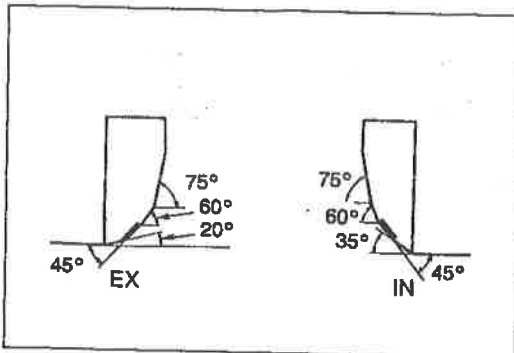
Valve Seat

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

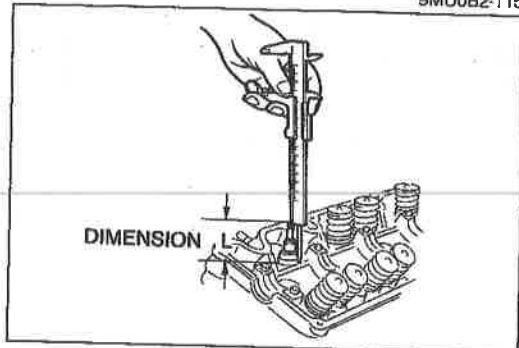
3. Apply a thin coat of Prussian blue to the valve face.
4. Check the valve seating by pressing the valve against the seat.
 - (1) If blue does not appear 360° around the valve face, replace the valve.
 - (2) If blue does not appear 360° around the valve seat, resurface the seat.

5. Check the seat contact width.

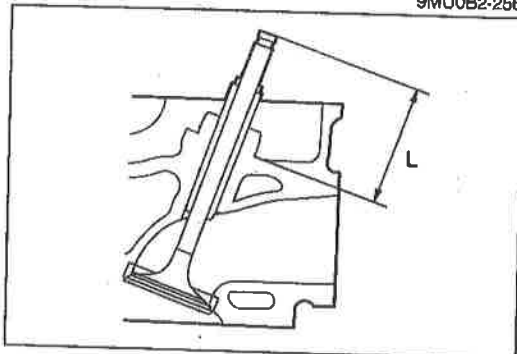
Width: 1.2—1.6mm (0.047—0.063 in)



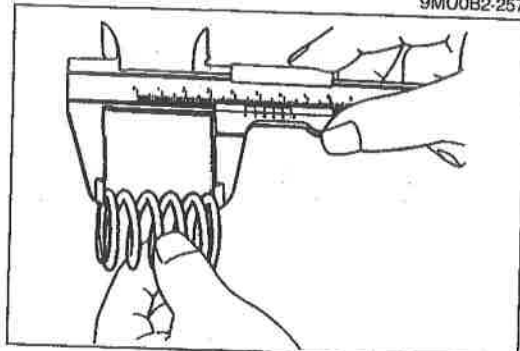
9MU0B2-115



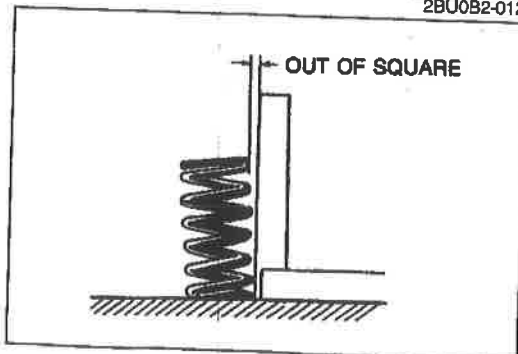
9MU0B2-256



9MU0B2-257



2BU0B2-012



9MU0B2-117

6. Check that the valve seating position is at the center of the valve face.
 - (1) If the valve seating position is too high, correct the valve seat with a **60°** cutter.
 - (2) If the valve seating position is too low, correct the valve seat with a **35° (IN)** or **20° (EX)** cutter.
7. Seat the valve to the valve seat with a lapping compound.

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

Dimension L

IN : 49.0mm (1.929 in)

EX: 49.0mm (1.929 in)

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

IN : 49.0—49.5mm (1.929—1.949 in)

EX: 49.0—49.5mm (1.929—1.949 in)

- (2) If L is as below, insert a spacer between the spring seat and cylinder head to adjust.

IN : 49.5—50.5mm (1.949—1.988 in)

EX: 49.5—50.5mm (1.949—1.988 in)

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

IN : 50.5mm (1.988 in)

EX: 50.5mm (1.988 in)

Valve Spring

1. Inspect each valve spring for cracks or damage.
2. Check the free length and out of square. Replace if necessary.

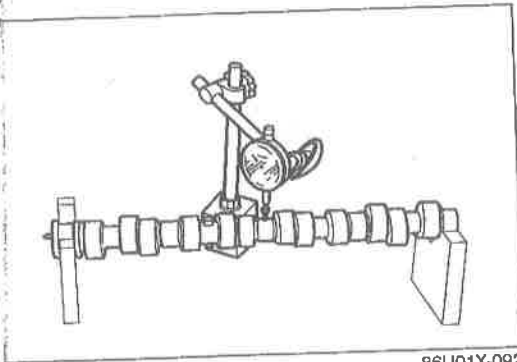
Free length

Standard: 50.05mm (1.970 in)

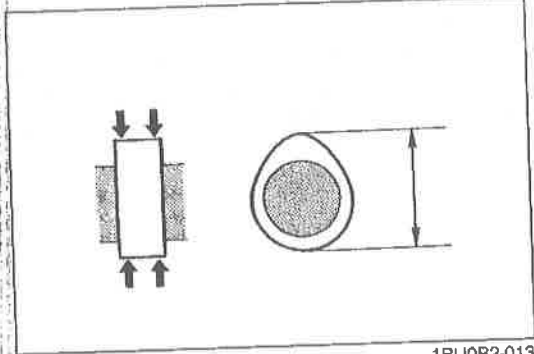
Minimum length:

43.0mm (1.693 in) with a set load of 195—221 N-m (19.9—22.6 m-kg, 144—163 ft-lb)

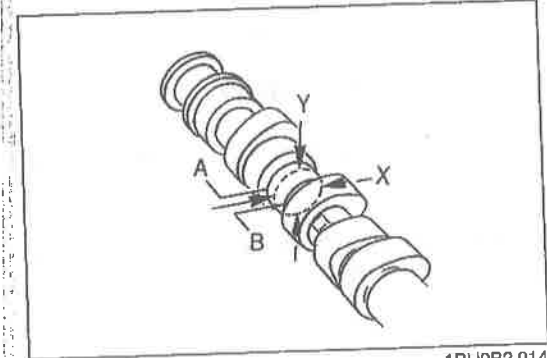
Out of square: 1.75mm (0.069 in) max.



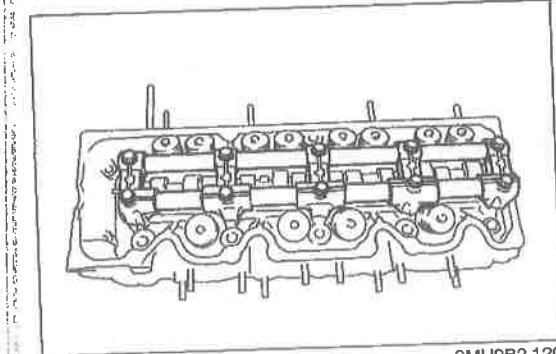
86U01X-092



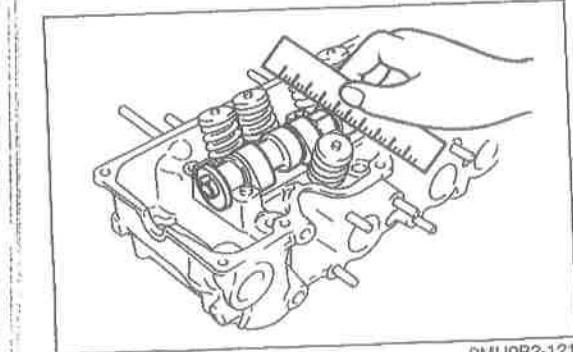
1BU0B2-013



1BU0B2-014



9MU0B2-120



9MU0B2-121

Camshaft

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

Runout: 0.03mm (0.0012 in) max.

2. Check the cam for wear or damage. Replace if necessary.
3. Check the cam lobe height at the two points as shown.

Height

IN : 41.714mm (1.6423 in)

EX: 41.988mm (1.6531 in)

Minimum

IN : 41.514mm (1.6344 in)

EX: 41.788mm (1.6452 in)

4. Measure the journal diameters in X and Y directions at the two points (A and B) as shown.

Diameter

No.1 and No.5:

29.940—29.965mm (1.1788—1.1797 in)

No.2, No.3 and No.4:

29.910—29.935mm (1.1776—1.1786 in)

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

5. Measure the oil clearance of the camshaft and camshaft caps.

- (1) Remove any oil, or dirt from the journals and bearing surface.
- (2) Set the camshaft on the cylinder head.
- (3) Position the Plastigauge on top of the journals in the axial direction.
- (4) Place the camshaft caps and rocker arm shafts in position; then tighten them to the specified torque.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

- (5) Remove the camshaft caps and measure the oil clearance at each cap.

Oil clearance

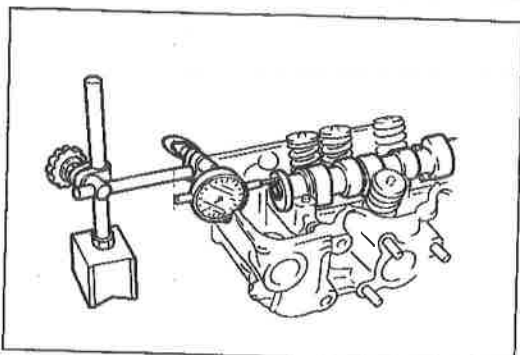
No.1 and 5: 0.035—0.085mm (0.0014—0.0033 in)

No.2, No.3 and No.4:

0.065—0.115mm (0.0026—0.0045 in)

Maximum: 0.15mm (0.006 in)

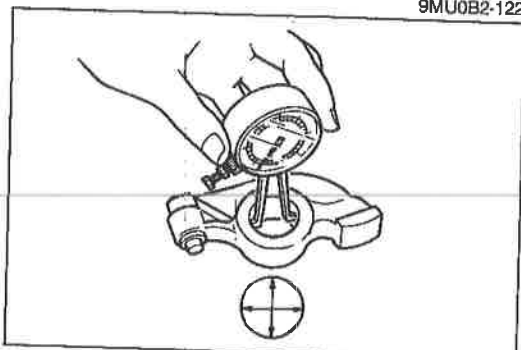
- (6) If the oil clearance exceeds the maximum, replace the cylinder head.



9MU0B2-122

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

End play: 0.02—0.15mm (0.0008—0.0059 in)
Maximum: 0.20mm (0.008 in)



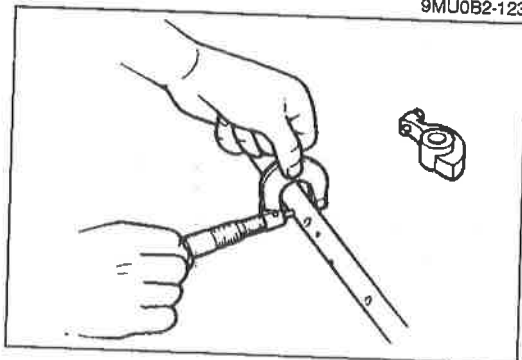
9MU0B2-123

Rocker Arm and Rocker Arm Shaft

1. Check for wear or damage to the contact surfaces of the rocker arm shaft and the rocker arm. Replace if necessary.
2. Check the oil clearance between the rocker arm and shaft. Replace if necessary.

- (1) Measure the rocker arm inner diameter.

Diameter: 21.000—21.033mm (0.8268—0.8281 in)



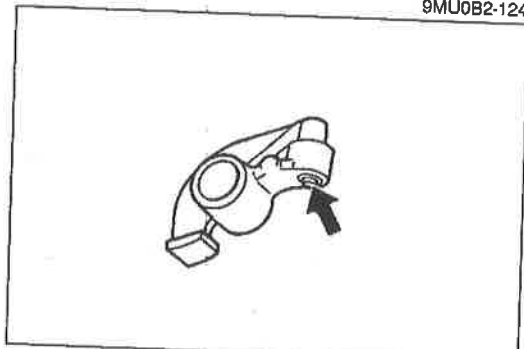
9MU0B2-124

- (2) Measure the rocker arm shaft diameter.

Diameter: 20.959—20.980mm (0.8252—0.8260 in)

- (3) Subtract the shaft diameter from the rocker arm diameter.

Oil clearance: 0.020—0.074mm (0.0008—0.0029 in)
Maximum: 0.10mm (0.004 in)



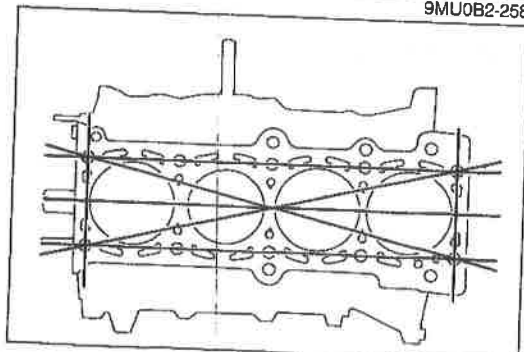
9MU0B2-258

Hydraulic Lash Adjuster (HLA)

Check the HLA face for wear or damage. Replace if necessary.

Caution

Do not remove the HLA unless necessary because oil leakage will occur if the O-ring is damaged.

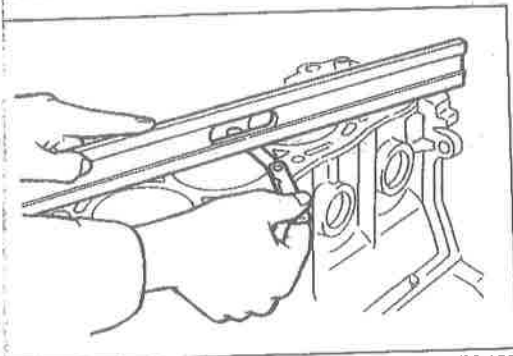


86U01X-100

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 as shown in the figure.

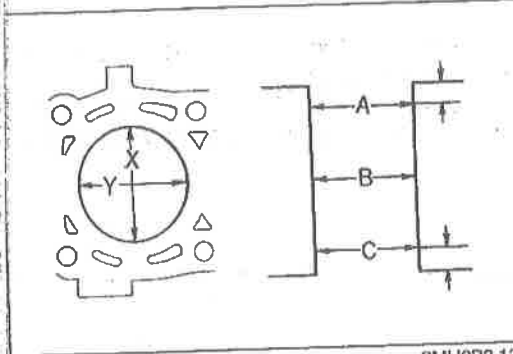
Distortion: 0.15mm (0.006 in) max.



9MU0B2-125

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

Height: 316.5mm (12.46 in)
Grinding: 0.20mm (0.008 in) max.

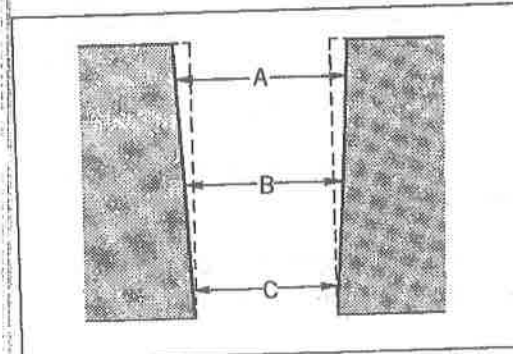


9MU0B2-126

4. Measure the cylinder bore in X and Y directions at three levels (A, B, and C) in each cylinder as shown.

Cylinder bore mm (in)

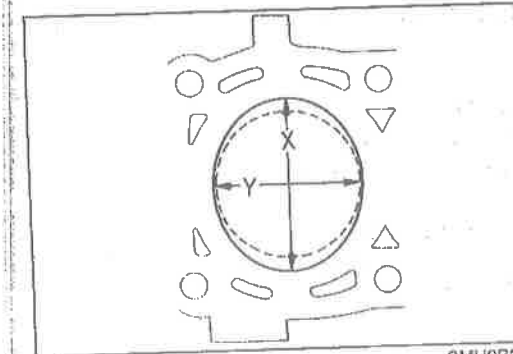
Size	Bore	Diameter
Standard		92.000—92.022 (3.6220—3.6230)
0.25 (0.010) oversize		92.250—92.272 (3.6320—3.6330)
0.50 (0.020) oversize		92.500—92.522 (3.6420—3.6430)



9MU0B2-259

- (1) If the cylinder bore exceeds the maximum, rebore the cylinder to oversize.
- (2) If the difference between the measurements A and C exceeds the maximum taper, rebore the cylinder to oversize.

Taper: 0.019mm (0.0007 in) max.



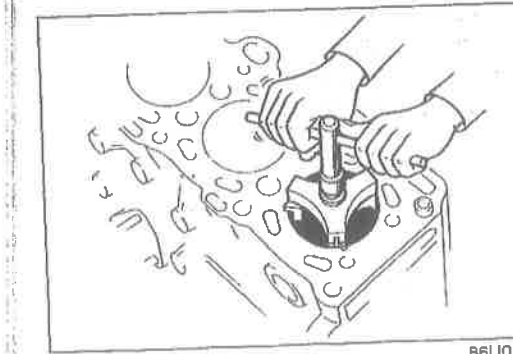
9MU0B2-260

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

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

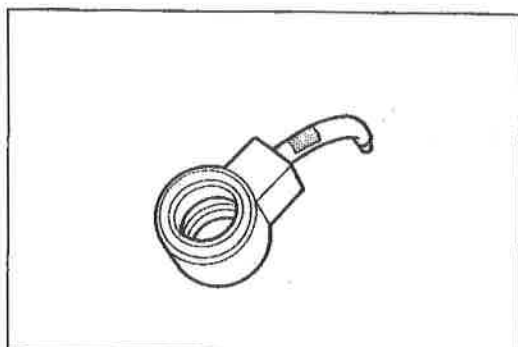
Caution

The boring size should be based on the size of an oversize piston and be the same for all cylinders.

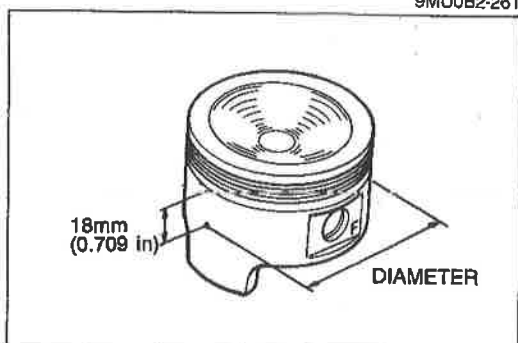


86U01X-102

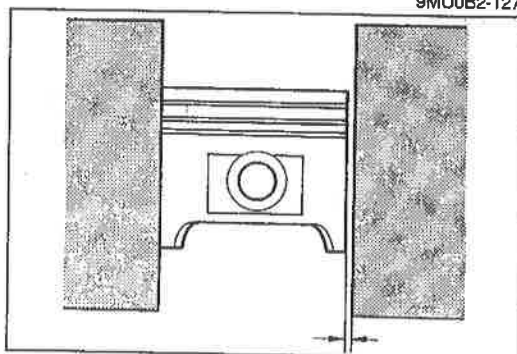
5. If the upper part of the cylinder wall shows uneven wear, remove the ridge with a ridge reamer.



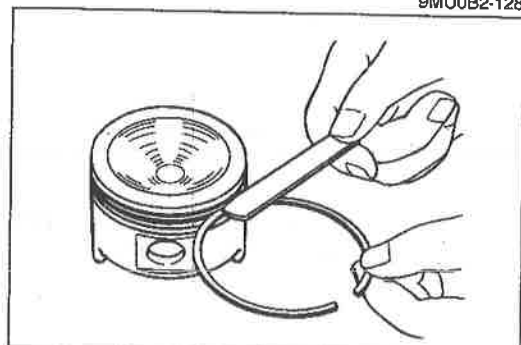
9MU0B2-261



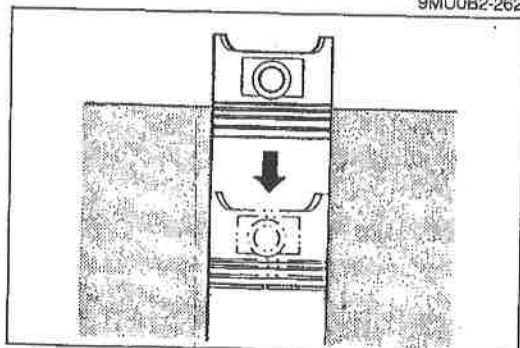
9MU0B2-127



9MU0B2-128



9MU0B2-262



9MU0B2-263

Oil Jet

1. Check the oil jet for clogging.

Note

Make sure the oil passages are not clogged.

2. Make sure the ball moves smoothly.

Piston

1. Inspect the outer circumferences of all pistons for seizure or scoring. Replace if necessary.
2. Measure the outer diameter of each piston at a right angle (90°) to the piston pin, **18mm (0.709 in)** below the oil ring land lower edge.

Piston diameter

mm (in)

Size	Piston	Diameter
Standard		91.935—91.955 (3.6194—3.6202)
0.25 (0.010) oversize		92.185—92.205 (3.6293—3.6301)
0.50 (0.020) oversize		92.435—92.455 (3.6391—3.6400)

3. Check the piston-to-cylinder clearance.

Clearance: 0.058—0.074mm (0.0023—0.0029 in)
Maximum: 0.15mm (0.006 in)

4. If the clearance exceeds the maximum, replace the piston or rebore the cylinders to fit oversize pistons.

Note

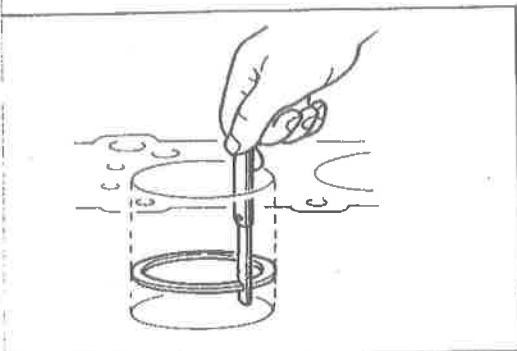
If the piston is replaced, the piston rings must also be replaced.

Piston and Piston Rings

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

Clearance (Top and Second):
0.03—0.07mm (0.0012—0.0028 in)
Maximum: 0.15mm (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 use the piston to push it to the bottom of the ring travel.



9MU0B2-129

5. Measure each piston ring end gap with a feeler gauge. Replace if necessary.

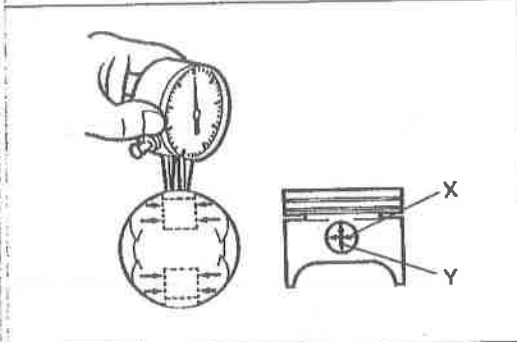
End gap

Top : 0.20—0.35mm (0.008—0.014 in)

Second: 0.25—0.40mm (0.010—0.016 in)

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

Maximum: 1.0mm (0.039 in)

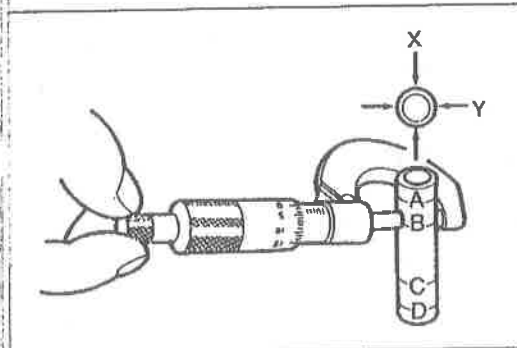


89U01X-085

Piston and Piston Pin

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

Diameter: 22.988—23.000mm (0.9050—0.9055 in)



9MU0B2-264

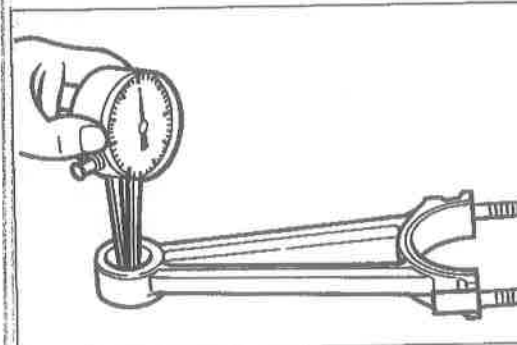
2. Measure the piston pin diameter in X and Y directions at four points.

Diameter: 22.974—22.980mm (0.9045—0.9047 in)

3. Check the piston pin-to-piston clearance.

Clearance: 0.008—0.026mm (0.0003—0.0010 in)

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



89U01X-087

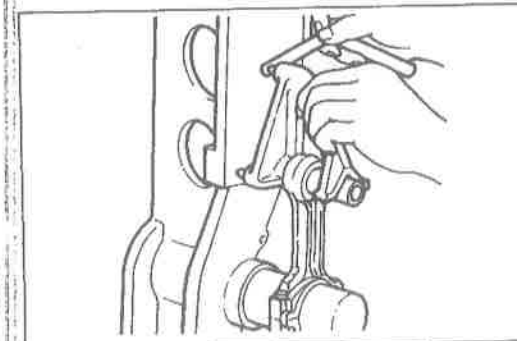
Connecting Rod

1. Measure the connecting rod small end bore.

Diameter: 22.943—22.961mm (0.9033—0.9040 in)

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

Interference: 0.013—0.037mm (0.0005—0.0015 in)



2BU0B2-019

3. Check each connecting rod for bend. Repair or replace if necessary.

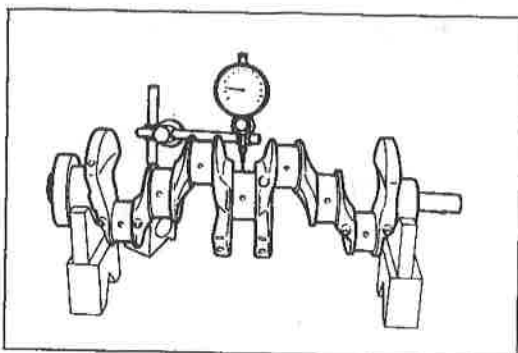
Bend: 0.249mm (0.0098 in) max.

Length (Center to Center):

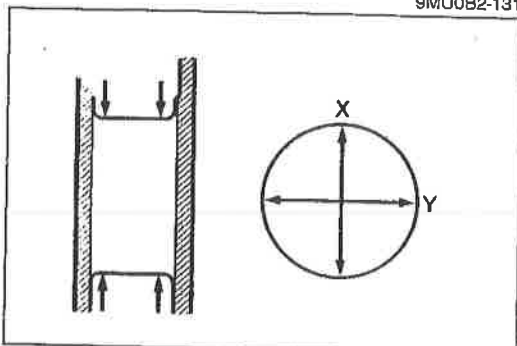
166.45—166.55mm (6.553—6.557 in)

Caution

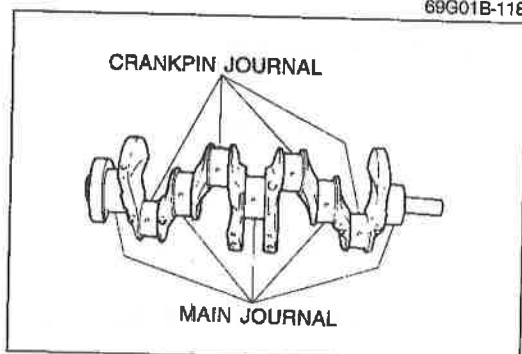
If the connecting rod is replaced, the connecting rod cap and bolts must also be replaced because they are a matched set.



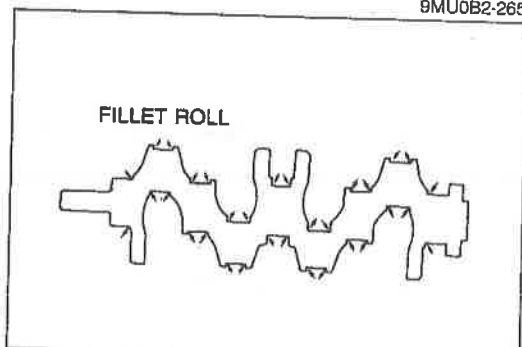
9MU0B2-131



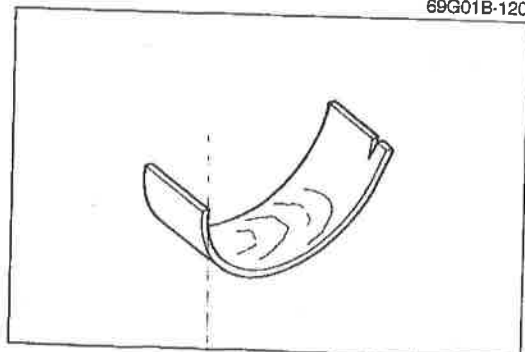
69G01B-118



9MU0B2-265



69G01B-120



79G01C-077

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: 0.03mm (0.0012 in) max.

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

Main journal

Diameter: 59.937—59.955mm (2.3597—2.3604 in)

Minimum: 59.89mm (2.358 in)

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

Crankpin journal

Diameter: 50.940—50.955mm (2.0055—2.0061 in)

Minimum: 50.89mm (2.004 in)

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

5. If the diameter is below the minimum, grind the journals to match an undersize bearing.

Undersize bearing: 0.25mm (0.010 in), 0.50mm (0.020 in), 0.75mm (0.030 in)

Main journal diameter undersize

Bearing size	Journal diameter	mm (in)
0.25 undersize	59.687—59.705 (2.3499—2.3506)	
0.50 undersize	59.437—59.455 (2.3400—2.3407)	
0.75 undersize	59.187—59.205 (2.3302—2.3309)	

Crankpin journal diameter undersize

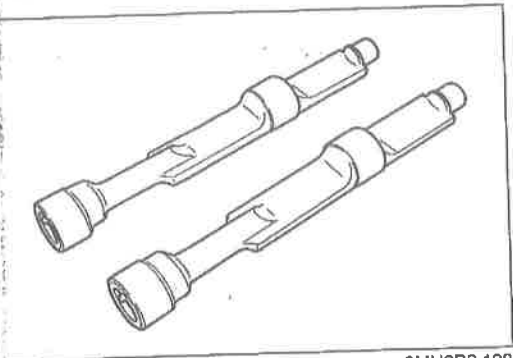
Bearing size	Journal diameter	mm (in)
0.25 undersize	50.690—50.705 (1.9957—1.9963)	
0.50 undersize	50.440—50.455 (1.9858—1.9864)	
0.75 undersize	50.190—50.205 (1.9760—1.9766)	

Caution

Do not grind the fillet roll.

Main Bearing and Connecting Rod Bearing

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



9MU0B2-132

Balance Shaft

Check the journals for wear, damage or seizure. If excessive damage or seizure is evident, check the bushings and oil clearance. If necessary, replace the balance shaft, bushings, or both.

Oil clearance

- Front : 0.050—0.115mm (0.0020—0.0045)
- Center : 0.080—0.145mm (0.0031—0.0057)
- Rear : 0.080—0.145mm (0.0031—0.0057)

Balance Shaft Bushing Replacement Removal

Note

Bushing removal must be in the order of front, center and finally rear.

1. Assemble the **SST** for each bushing so that length "L" of the **SST** is longer than specified.
2. Turn the cylinder block vertically so that the bushings can be removed straight downward.
3. Set the assembled **SST** against the respective bushing and tap it out with a hammer.

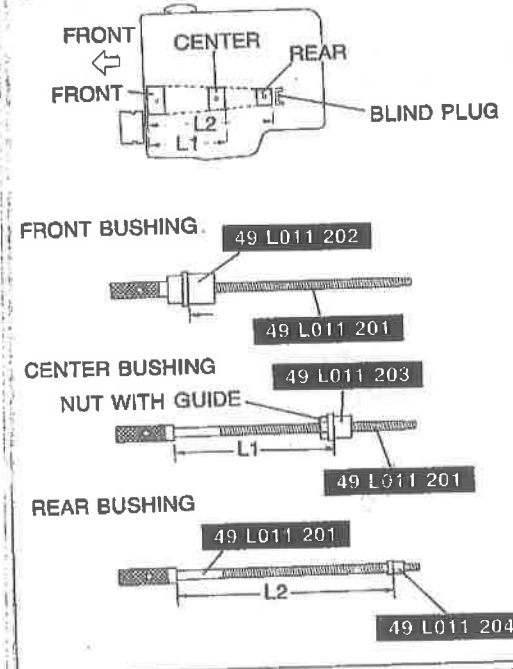
Note

The blind plug must be removed when servicing. It can be reused.

4. Remove the blind screw of the removed bushing.

- L1: 229mm (9.0 in)
- L2: 326mm (12.8 in)

REMOVAL



9MU0B2-133

Installation

Note

Bushing installation must be in the order of rear, center, and finally front.

1. Assemble the **SST** for each bushing as shown so that length "L" of the **SST** is as specified.

- L1: 309—310mm (12.17—12.20 in)
- L2: 202—203mm (7.95—7.99 in)

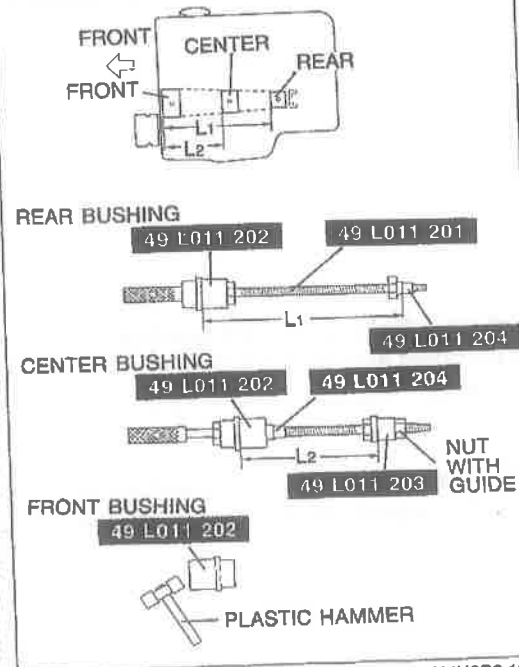
2. Turn the cylinder block vertically so that the bushings can be installed straight downward.
3. Install the bushing with the **SST** so that the bushing guide hole is aligned with the block guide hole.

Caution

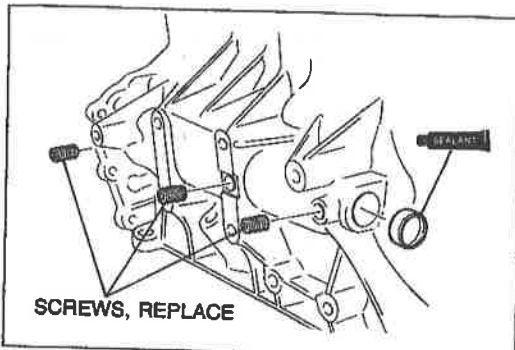
Do not use a iron hammer, use a plastic hammer on the **SST** when installing the front bushing.

4. Confirm the guide hole alignment by looking through the blind screw hole. If they are not aligned, remove the bushing and reinstall it.

INSTALLATION



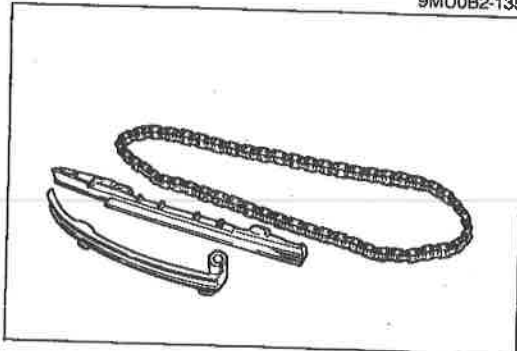
9MU0B2-134



SCREWS, REPLACE

9MU0B2-135

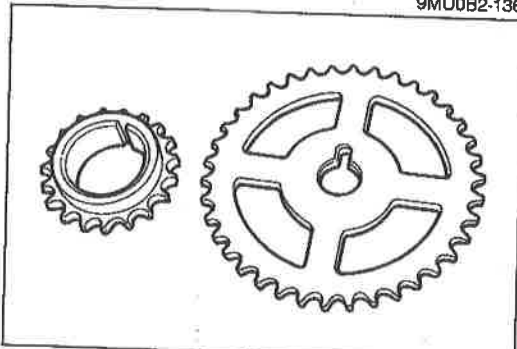
5. Install new blind screws.
6. Apply sealant to the blind plug and install it in the cylinder block.



9MU0B2-136

Timing Chain, Chain Lever, and Chain Guide

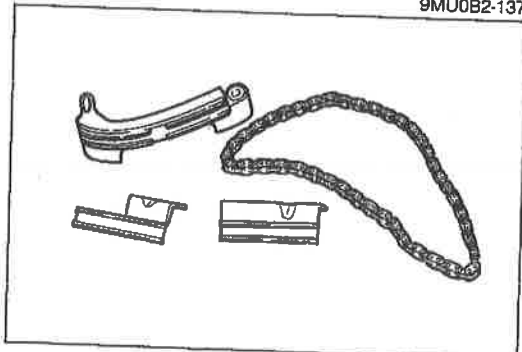
1. Check the timing chain for wear, damage, and cracks. Replace if necessary.
2. Check the rubber of the chain lever for wear, damage, peeling, and cracks. Replace if necessary.



9MU0B2-137

Timing Gear and Camshaft Pulley

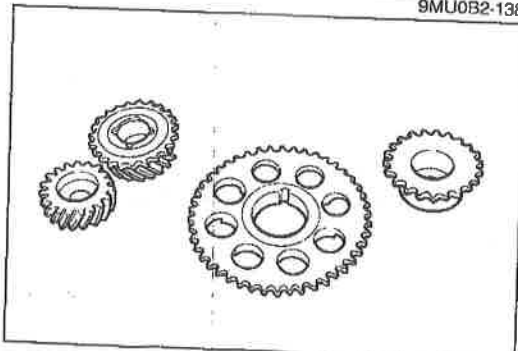
Check the timing gear and camshaft pulley for wear, damage, and cracks. Replace if necessary.



9MU0B2-138

Balancer Chain and Chain Guide

1. Check the balancer chain for wear, damage, and cracks. Replace if necessary.
2. Check the rubber of the chain lever for wear, damage, peeling, and cracks. Replace if necessary.



9BU0B2-036

Crankshaft Sprocket and Balance Shaft Sprocket

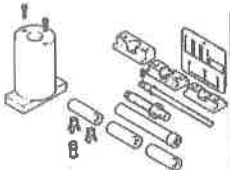

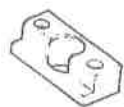






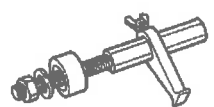



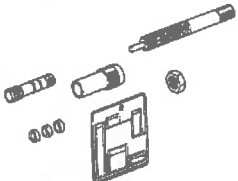
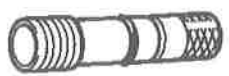
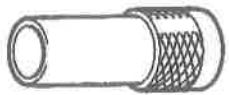

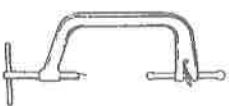
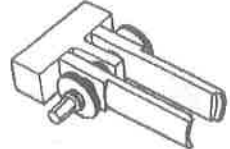
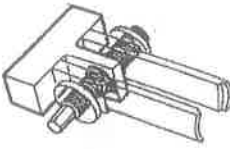
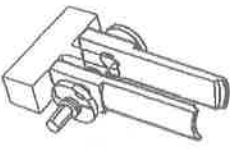
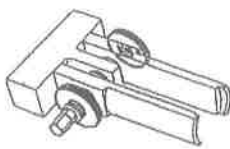

Check the crankshaft sprocket and balance shaft sprocket for wear, damage, and cracks. Replace if necessary.

Caution

If the right balance shaft gear or the idler sprocket assembly is worn or damaged, replace both as an assembly.

ASSEMBLY

PREPARATION SST

<p>49 L011 0A0</p> <p>Piston pin setting tool set</p> 	<p>49 L011 001</p> <p>Support block body (Part of 49 L011 0A0)</p> 	<p>49 L011 002</p> <p>Support block head (Part of 49 L011 0A0)</p> 
<p>49 L011 004</p> <p>Screw (Part of 49 L011 0A0)</p> 	<p>49 L011 005</p> <p>Stopper bolt (Part of 49 L011 0A0)</p> 	<p>49 L011 006</p> <p>Puller & installer (Part of 49 L011 0A0)</p> 
<p>49 L011 009</p> <p>Guide (Part of 49 L011 0A0)</p> 	<p>49 L011 010</p> <p>Centering tool (Part of 49 L011 0A0)</p> 	<p>49 L011 011</p> <p>Holder (Part of 49 L011 0A0)</p> 
<p>49 E011 1A0</p> <p>Ring gear brake set</p> 	<p>49 E011 105</p> <p>Stopper (Part of 49 E011 1A0)</p> 	<p>49 E011 103</p> <p>Shaft (Part of 49 E011 1A0)</p> 
<p>49 E011 104</p> <p>Collar (Part of 49 E011 1A0)</p> 	<p>49 L012 0A0</p> <p>Installer set, valve seal & valve guide</p> 	<p>49 L012 001</p> <p>Installer (Part of 49 L012 0A0)</p> 
<p>49 L012 002</p> <p>Body (Part of 49 L012 0A0)</p> 	<p>49 L012 005</p> <p>Spacer (Part of 49 L012 0A0)</p> 	<p>49 0636 100A</p> <p>Arm, valve spring lifter</p> 
<p>49 B012 0A2</p> <p>Pivot, valve spring lifter</p> 	<p>49 B012 012</p> <p>Body (Part of 49 B012 0A2)</p> 	<p>49 B012 013</p> <p>Foot (Part of 49 B012 0A2)</p> 
<p>49 B012 014</p> <p>Lock nut (Part of 49 B012 0A2)</p> 	<p>49 SE01 310A</p> <p>Centering tool, clutch disc</p> 	<p>2BU0B2-013</p>

ASSEMBLY (CYLINDER BLOCK)

B2

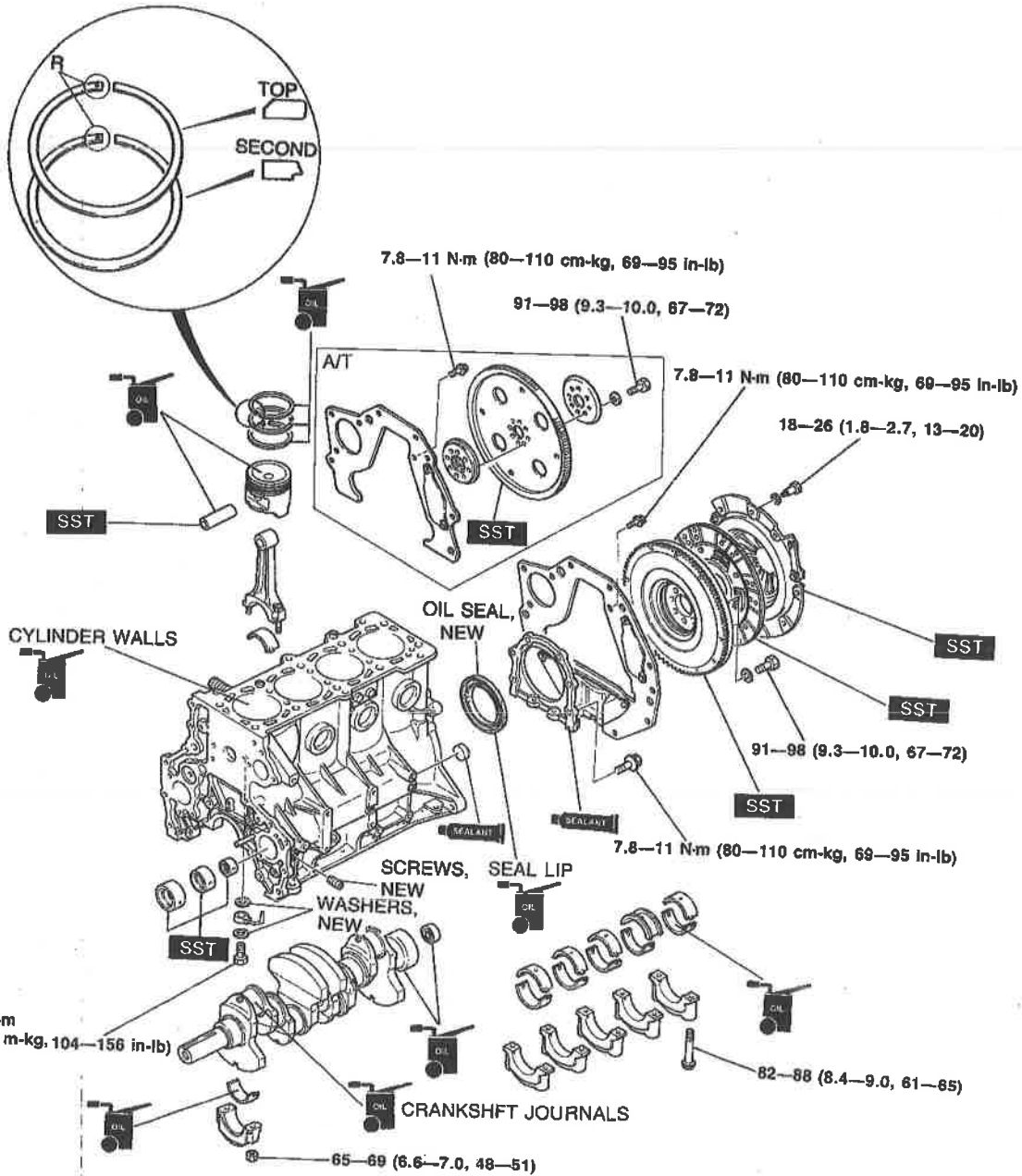
1. Clean all parts before reinstallation.
2. Apply new engine oil to all sliding and rotating parts.
3. Replace plain bearings if they are peeling, burned, or otherwise damaged.
4. Tighten all bolts and nuts to the specified torques.

Caution

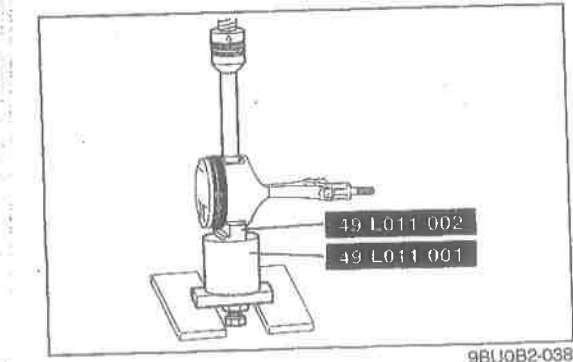
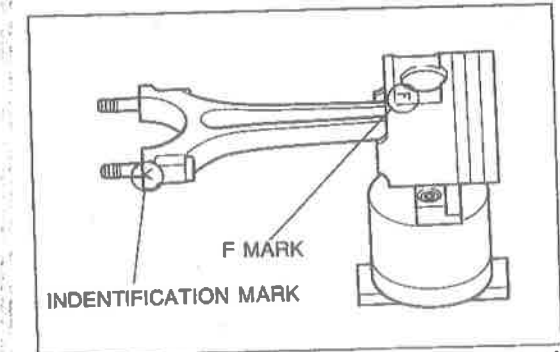
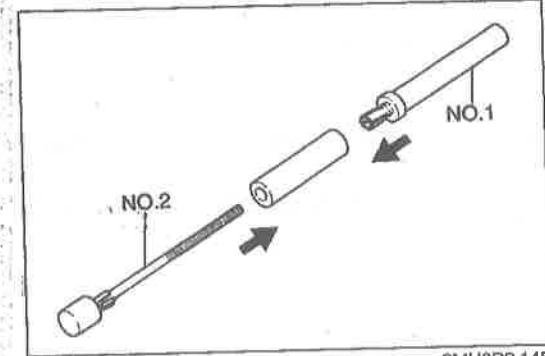
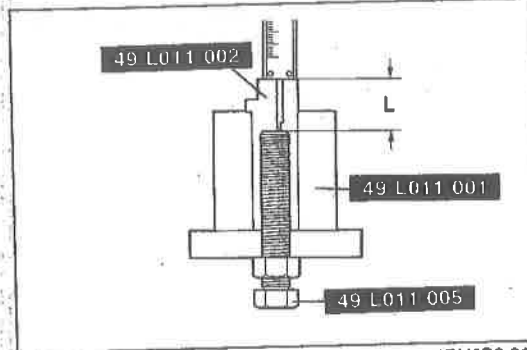
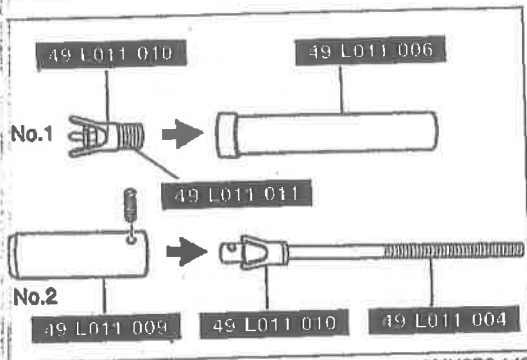
Do not reuse gaskets or oil seals.

CYLINDER BLOCK Torque Specifications

9MU062-141



N-m (m-kg, ft-lb)



Connecting Rod

1. Assemble the **SST** as shown.

2. Set the **stopper bolt** (49 L011 005) so that the depth **L** is as specified.

Depth L: 59.5—59.7mm (2.343—2.350 in)

3. Tighten the locknut.

4. Insert the **SST** No.2 into the piston pin as shown and fully screw in the **SST** No.1.

5. Apply engine oil to the piston pin.

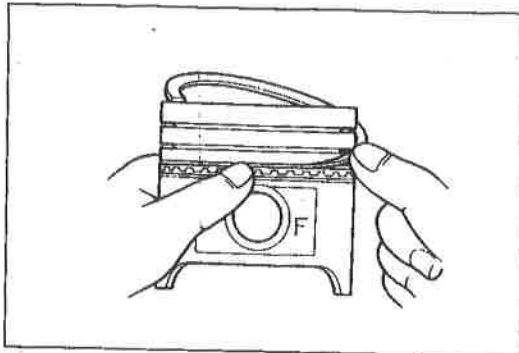
6. Set the piston on the **SST** with the **F** mark facing upward.
7. Align the identification mark to the cap of the large end of connecting rod and **F** mark on the piston as shown in the figure.

8. Press the piston pin into the piston and connecting rod until the **SST** contacts the stopper bolt.

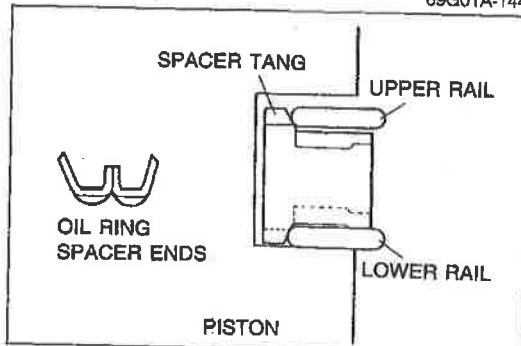
9. While inserting the piston pin, check the pressure force. If it is less than specified, replace the piston pin or the connecting rod.

Pressure force:
4,905—14,715 kN (500—1,500 kg, 1,100—3,300 lb)

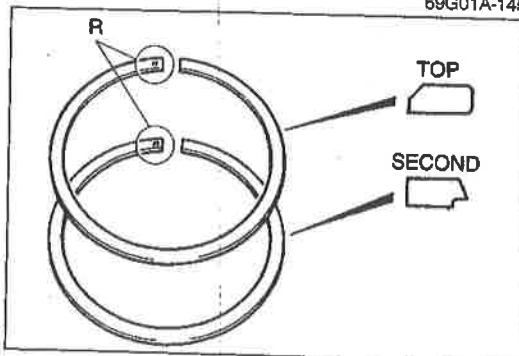
10. Check the oscillation torque of the connecting rod.
(Refer to page B2-37.)



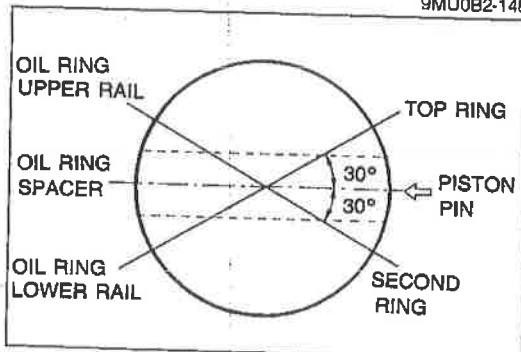
69G01A-144



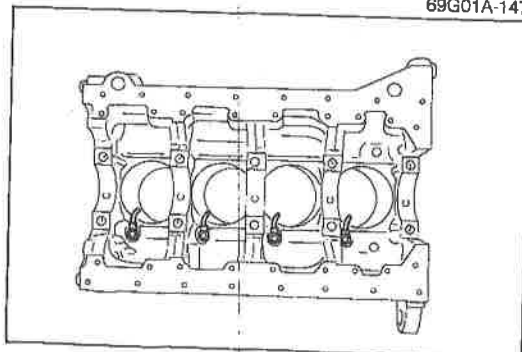
69G01A-145



9MU0B2-148



69G01A-147



0BU0B2-022

Piston Ring

1. Install the three-piece oil rings on the pistons.
 - (1) Apply engine oil to the oil ring spacer and rails.
 - (2) Install the oil ring spacer so that the opening faces upward.
 - (3) Install the upper rail and lower rail.

Note

- a) The upper rail and lower rail are the same.
- b) Each rail can be installed with either face upward.

2. Check that both rails are expanded by the spacer tangs as shown in the figure by checking that both rails turn smoothly in both directions.

3. Install the second ring to the piston first; then install the top ring. Use a piston ring expander.

Caution

- a) The ring must be installed so that the "R" marks face upward.
- b) The second ring must be installed with the scraper face downward.

4. Apply a liberal amount of clean engine oil to the second and top piston rings.

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

Oil Jet

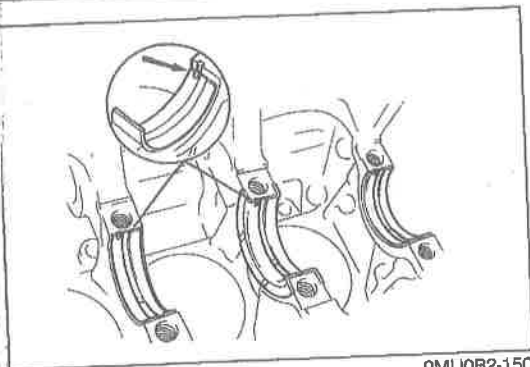
1. Install the new gaskets of the oil jet.
2. Install the oil jet as shown in the figure.

Tightening torque:

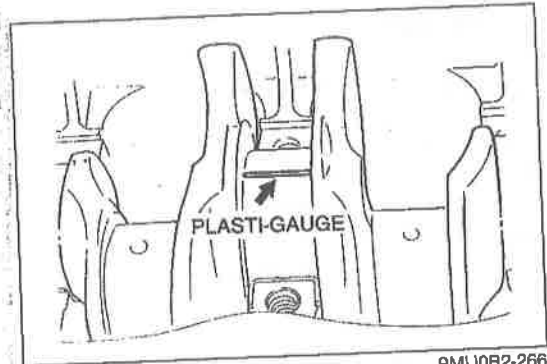
12—18 N·m (1.2—1.8 m·kg, 8.7—13 ft·lb)

Note

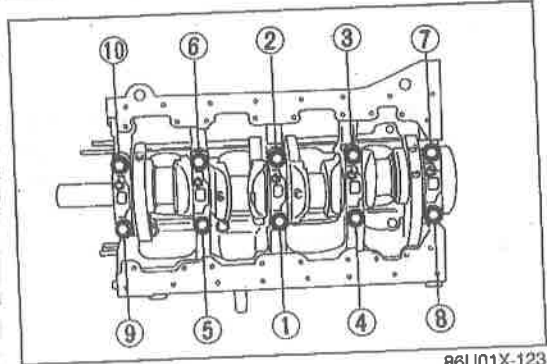
The shapes of the cylinder jet valves are the same for all cylinders.



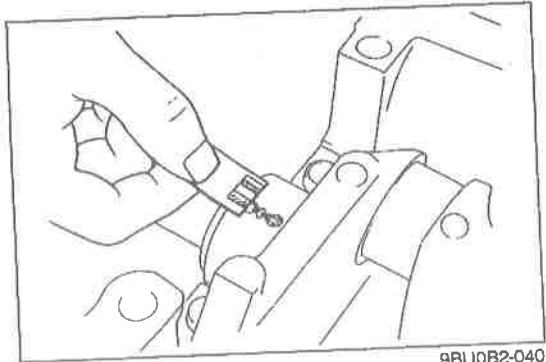
9MU0B2-150



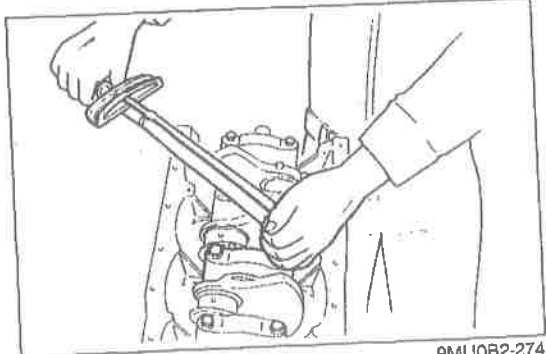
9MU0B2-266



86U01X-123



9BU0B2-040



9MU0B2-274

Crankshaft

1. Before installing the crankshaft, inspect the main bearing oil clearances as described.

Note

The No.4 bearing has thrust shoulders in the cylinder block.

Oil clearance inspection

- (1) Remove any foreign material and oil from the journals and bearings.
- (2) Install the upper main bearings in the cylinder block.
- (3) Set the crankshaft in the cylinder block.
- (4) Position the Plastigauge on top of the journals in the axial direction.
- (5) Install the main bearing caps along with the lower main bearings according to the cap number and ← mark.
- (6) Tighten the caps in two or three steps in the order in the figure.

Tightening torque:

82—88 N·m (8.4—9.0 m·kg, 61—65 ft·lb)

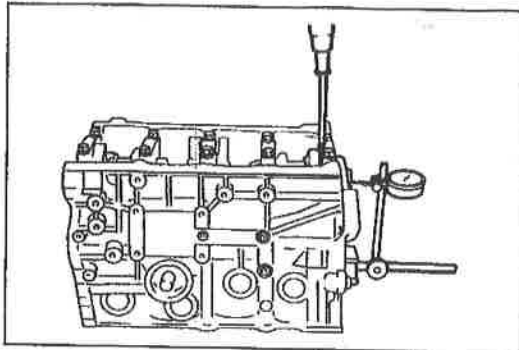
Caution

Do not rotate the crankshaft when measuring the oil clearances.

- (7) Remove the main bearing caps, and measure the Plastigauge at each journal at the widest point for the smallest clearance, and at the narrowest point for the largest clearance.
If the oil clearance exceeds specification, grind the crankshaft and use undersize main bearings.
(Refer to page B2-49.)

Oil clearance: 0.025—0.044mm (0.0010—0.0017 in)
Maximum: 0.08mm (0.0031 in)

2. Apply a liberal amount of engine oil to the main bearings and main journals.
3. Install the crankshaft and the main bearing caps according to the cap number and ← mark.
4. Verify that the crankshaft rotates smoothly by hand.

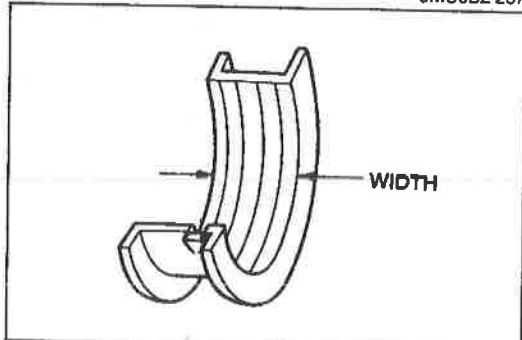


9MU0B2-267

5. Inspect the crankshaft end play.

End play: 0.08—0.18mm (0.0031—0.0071 in)
Maximum: 0.30mm (0.0118 in)

6. If the end play exceeds specification, grind the crankshaft and use an undersize center main bearing.



9MU0B2-268

Center main bearing width

Standard:

25.94—25.99mm (1.021—1.023 in)

0.25mm (0.010 in) **oversize:**

26.04—26.09mm (1.025—1.027 in)

0.50mm (0.020 in) **oversize:**

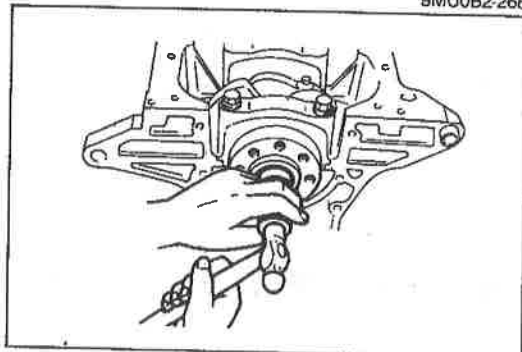
26.12—26.17mm (1.028—1.030 in)

0.75mm (0.030 in) **oversize:**

26.20—26.25mm (1.031—1.033 in)

Note

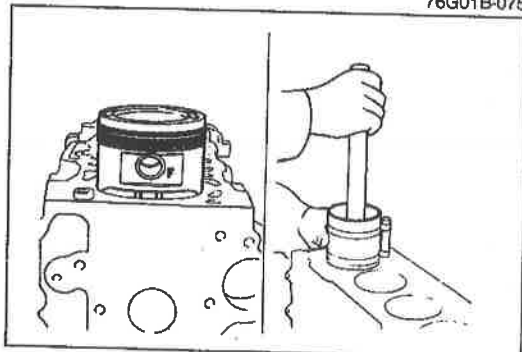
Wider thrust width is available only in an undersize No.4 main bearing



76G01B-075

Pilot Bearing

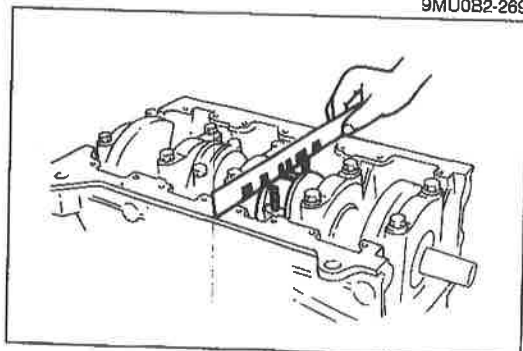
1. Apply engine oil to the outer circumference of the bearing.
2. Set a piece of pipe (outer diameter 30—34mm, 1.18—1.34 in) against the outer race of the bearing; then tap it evenly into the crankshaft.
3. Lubricate the bearing with grease.



9MU0B2-269

Piston and Connecting Rod Assembly

1. Apply a liberal amount of clean engine oil to the cylinder walls, pistons, and rings.
2. Check the piston rings for the end gap alignment.
3. Insert each piston assembly into the cylinder block with the **F** mark facing the front of the engine. Use a piston installer tool (commercially available).



9MU0B2-152

Connecting Rod Cap

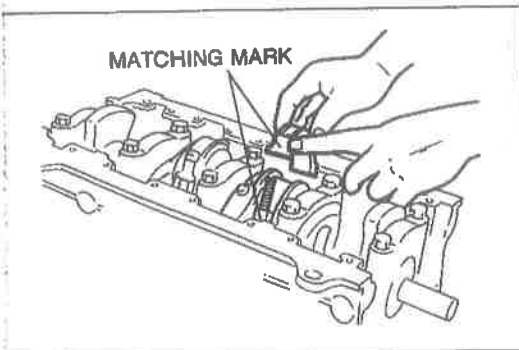
1. Check the connecting rod bearing clearances using the same procedure as used for the main bearing oil clearance.

Connecting rod cap tightening torque:

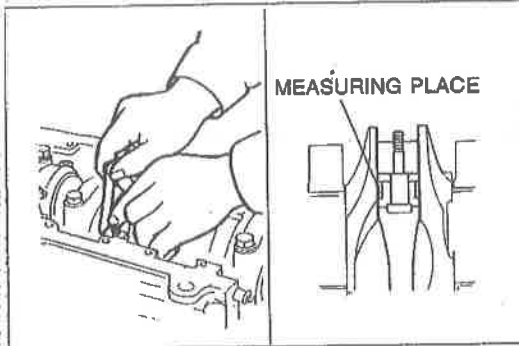
65—69 N·m (6.6—7.0 m·kg, 48—51 ft·lb)

Oil clearance: 0.027—0.067mm (0.0011—0.0026 in)

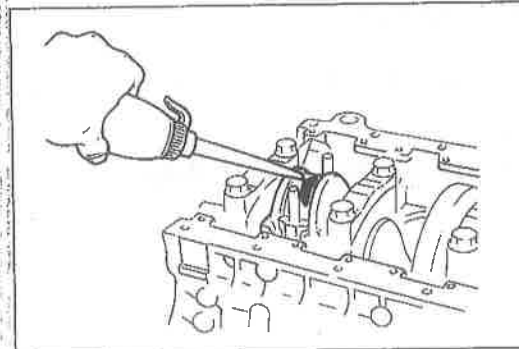
Maximum: 0.10mm (0.0039 in)



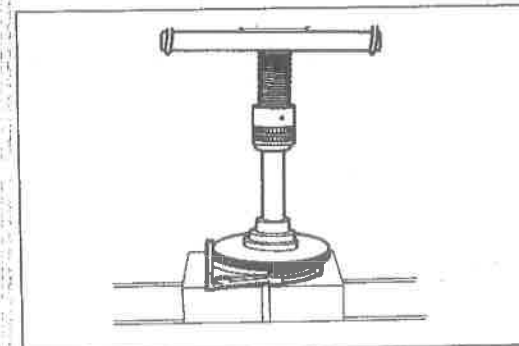
9BU0B2-041



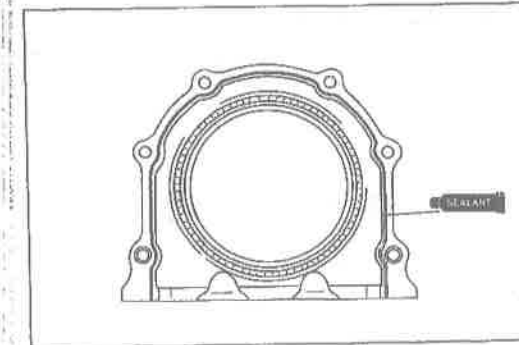
9MU0B2-270



9MU0B2-154



9BU0B2-042



9MU0B2-155

Caution

Align the matching marks on the cap and on the connecting rod when installing the connecting rod cap.

- If the oil clearance exceeds specification, grind the crankshaft and use undersize bearings. (Refer to page B2-49.)

- Check the side clearance of each connecting rod without the cap installed.

Side clearance: 0.110—0.262mm (0.0043—0.0103 in)
Maximum: 0.30mm (0.012 in)

If the clearance exceeds the maximum, replace the connecting rod.

- Apply a liberal amount of engine oil to the crankpin journal and connecting rod bearing.
- Install the connecting rod cap with the alignment marks aligned.

Tightening torque:

65—69 N·m (6.6—7.0 m·kg, 48—51 ft·lb)

- Verify that the crankshaft rotates smoothly by hand.

Rear Cover

- Apply engine oil to the rear cover and new oil seal lip.
- Press the oil seal into the rear cover.

Oil seal outer diameter: 110mm (4.33 in)

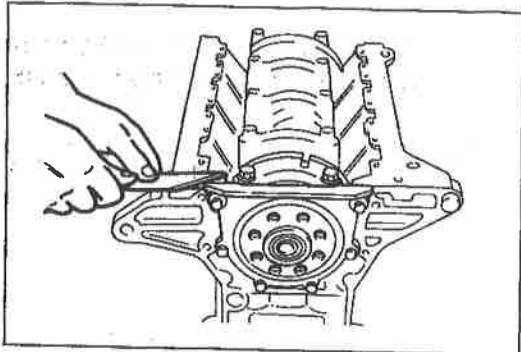
Caution

The oil seal must be pressed in until it is flush with the edge of the rear cover.

- Remove any dirt or other material from the contact surface.
- Apply a continuous bead of silicon sealant to the rear cover groove.
- Install the rear cover.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

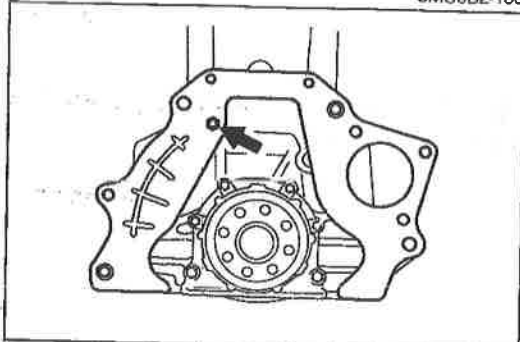


9MU0B2-156

- Cut away the portion of the sealant that projects from the rear cover assembly toward the oil pan side.

Caution

Do not scratch the rear cover assembly.



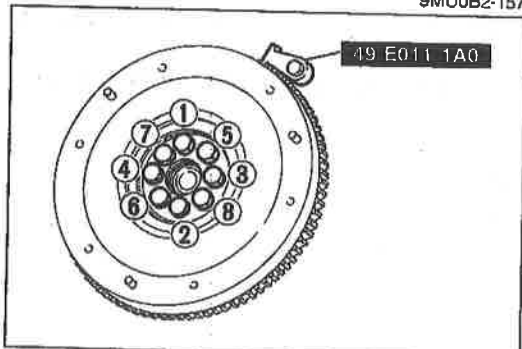
9MU0B2-157

End Plate

Install the end plate.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)



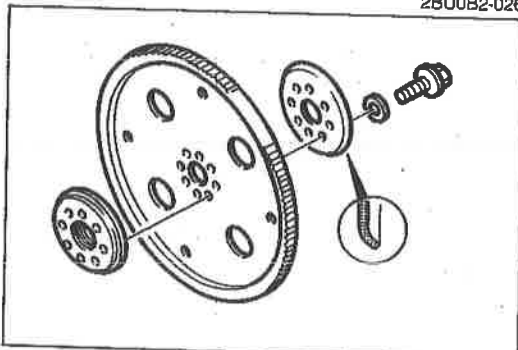
2BU0B2-026

Flywheel (M/T), Drive Plate (A/T)

1. Install, and tighten the flywheel with the **SST** or equivalent.

Tightening torque:

91—98 N·m (9.3—10.0 m·kg, 67—72 ft·lb)



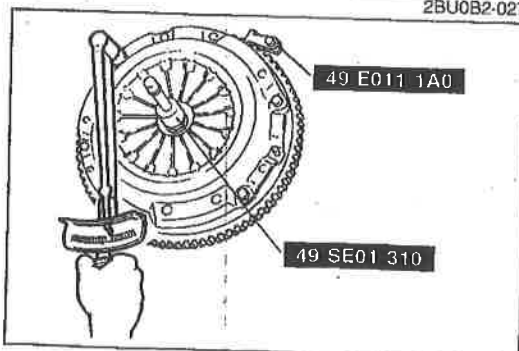
2BU0B2-027

(A/T)

2. Install, and tighten the drive plate adapter, drive plate, and plate with the **SST (49 E011 1A0)** or equivalent.

Tightening torque:

91—98 N·m (9.3—10.0 m·kg, 67—72 ft·lb)



2BU0B2-028

Clutch Disc and Clutch Cover (M/T)

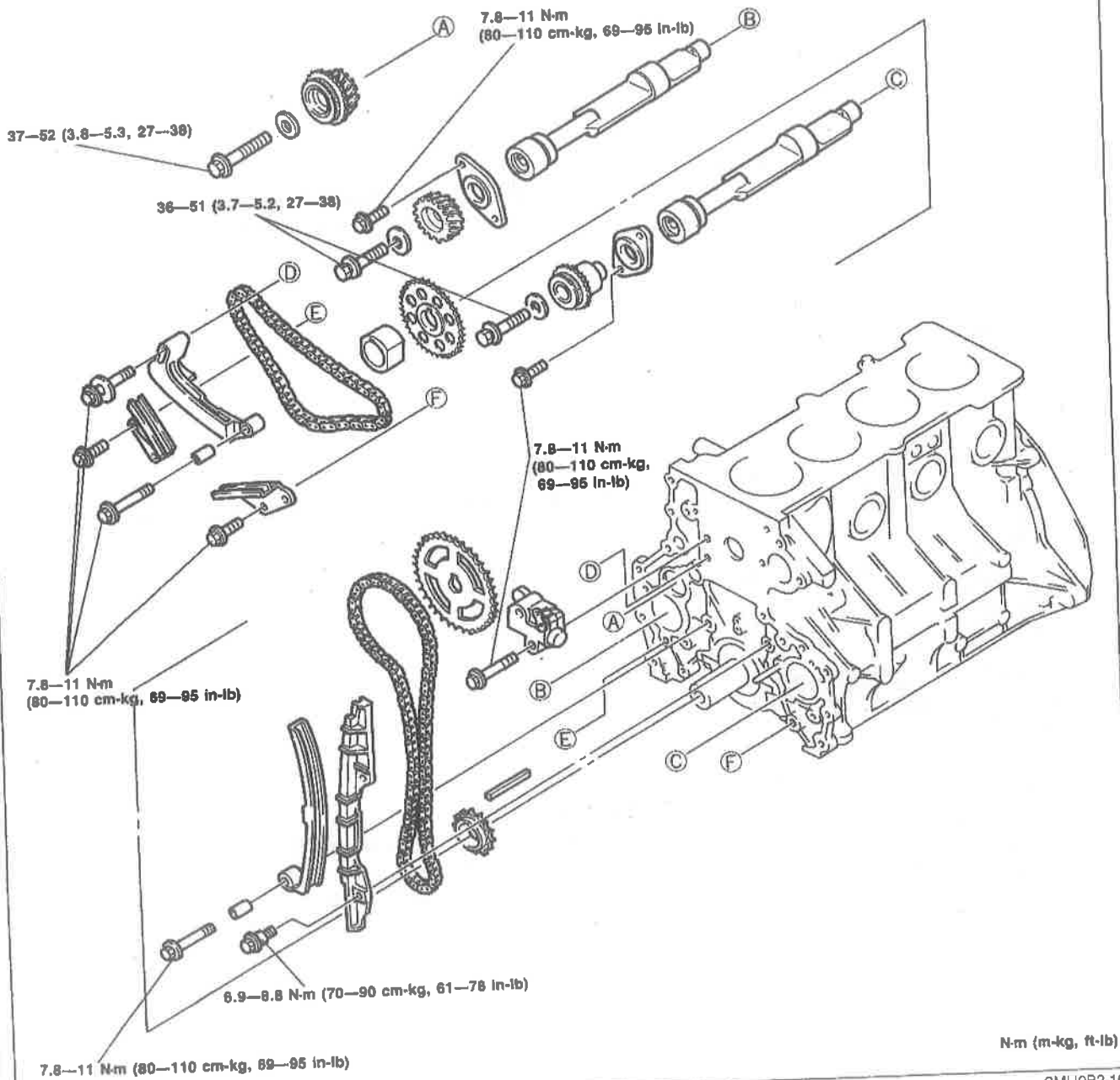
Install the clutch disc and clutch cover using the **SST** or equivalent.

(Refer to Section H.)

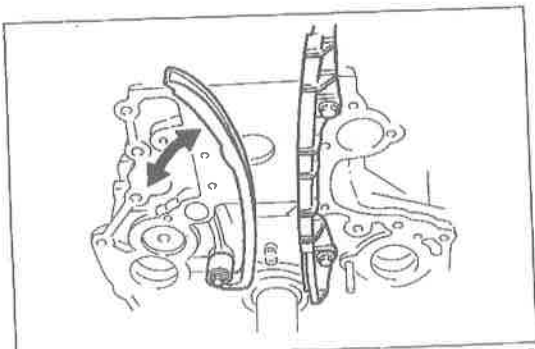
Tightening torque:

18—26 N·m (1.8—2.7 m·kg, 13—20 ft·lb)

BALANCER CHAIN AND TIMING CHAIN Torque Specification



9MU0B2-162



9MU0B2-163

Chain Guide and Chain Lever

1. Install the chain guide.

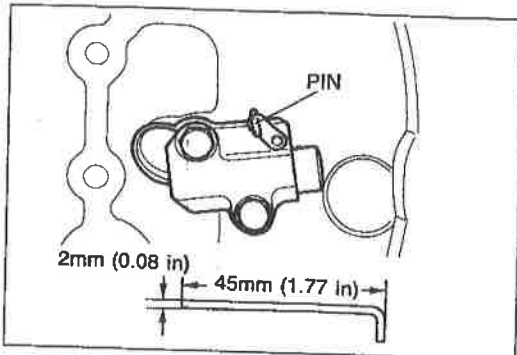
Tightening torque:

6.9—8.8 N-m (70—90 cm-kg, 61—78 in-lb)

2. Install the chain lever and check that it moves smoothly in the directions indicated.

Tightening torque:

7.8—11 N-m (80—110 cm-kg, 69—95 in-lb)



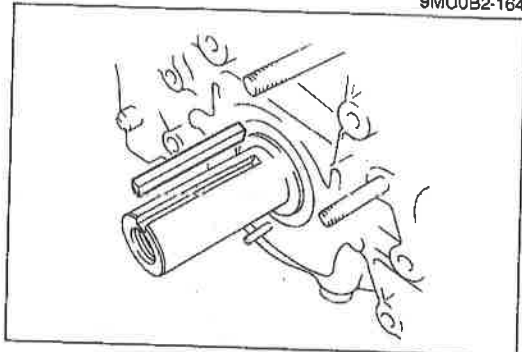
9MU0B2-164

Chain Adjuster

1. Push the chain adjuster sleeve in toward the left and insert the pin into the lever hole, as shown to hold it.
2. Install the chain adjuster.

Tightening torque:

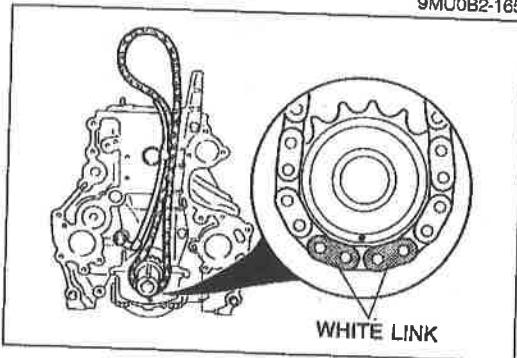
7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)



9MU0B2-165

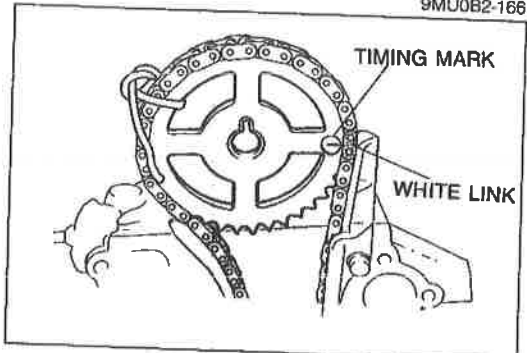
Timing Chain and Timing Gear

1. Install the key onto the crankshaft.



9MU0B2-166

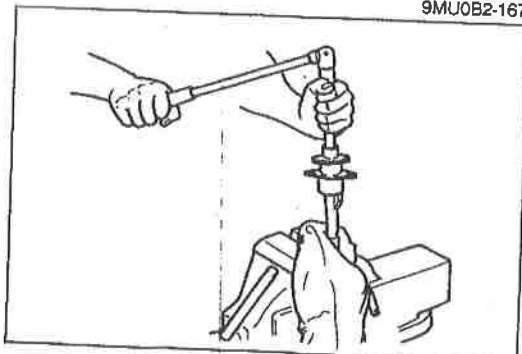
2. Install the timing chain and timing gear as shown.



9MU0B2-167

Camshaft Pulley

1. Install the camshaft pulley so that the timing mark on the pulley aligns with the white link of the timing chain.
2. Secure the camshaft pulley and the timing chain with a wire, and temporarily rest it on between the chain lever and guide.



9MU0B2-168

Left and Right Balance Shaft

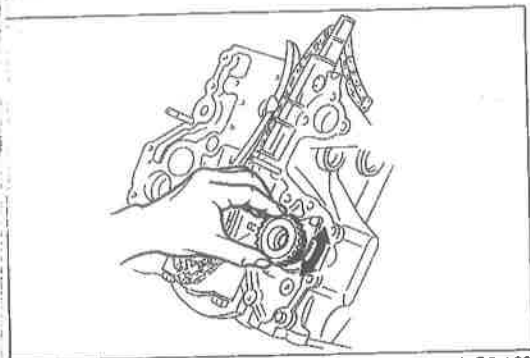
1. Assemble the left and right balance shaft.

Caution

Do not use a vise on the journals during assembly.

Tightening torque:

36—54 N·m (3.7—5.5 m·kg, 27—40 ft·lb)



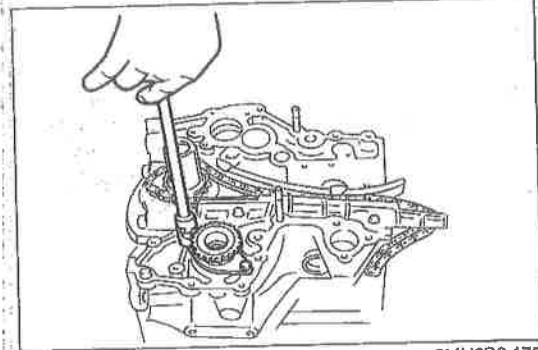
9MU0B2-169

2. Insert the left and right balance shaft assembly into the cylinder block.

Caution

Do not damage the balance shaft bushings and journals during installation.

3. Loosely tighten the thrust plate lock bolts.
4. Confirm the smooth rotation of the balance shafts.

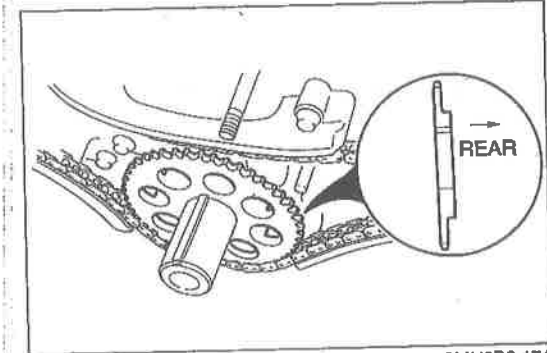


9MU0B2-170

5. Tighten the thrust plate lock bolts.

Tightening torque:

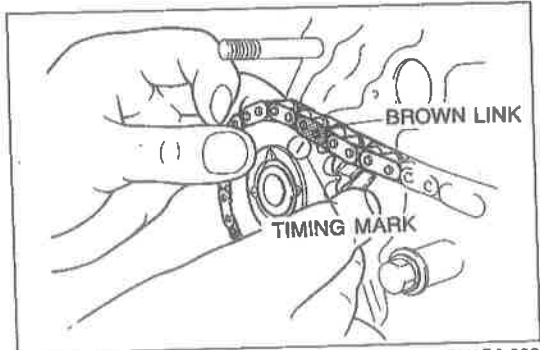
7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)



9MU0B2-171

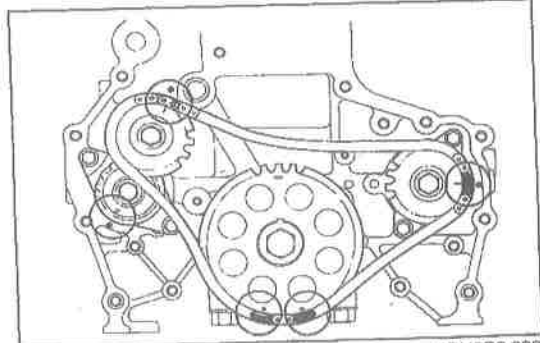
Balancer Chain

1. Install the crankshaft sprocket.



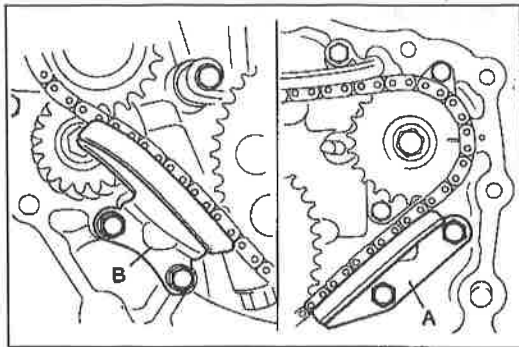
2BU0B2-032

2. Set the balancer chain on the idler sprocket assembly so that the timing mark on the idler sprocket assembly and the brown link of the balancer chain align.



2BU0B2-033

3. Install the balancer chain so that the five (5) alignment marks on the chain, sprocket, and block align, and attach the idler sprocket assembly to the cylinder block.
4. Loosely tighten the idler sprocket assembly lock bolt.

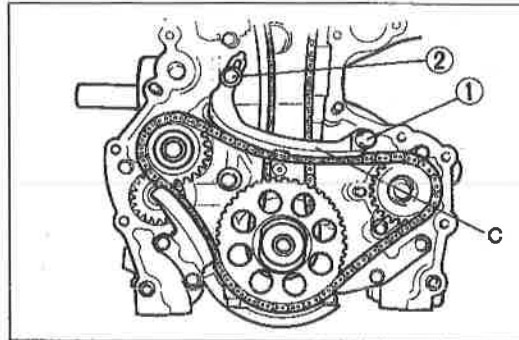


2BU0B2-034

5. Install the chain guide A and B.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)



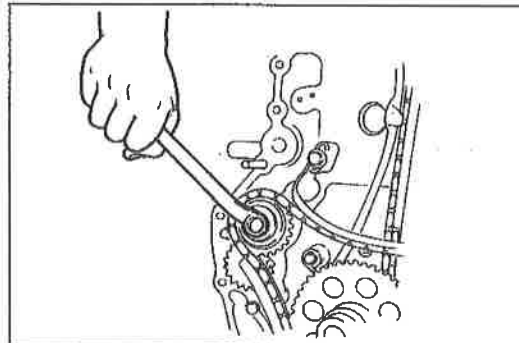
2BU0B2-036

6. Install the chain guide C, and tighten the bolt ① and loosely tighten the adjusting bolt ② (M/T).

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

Install the chain guide C, and loosely tighten the bolt ① and adjusting bolt ② (A/T).



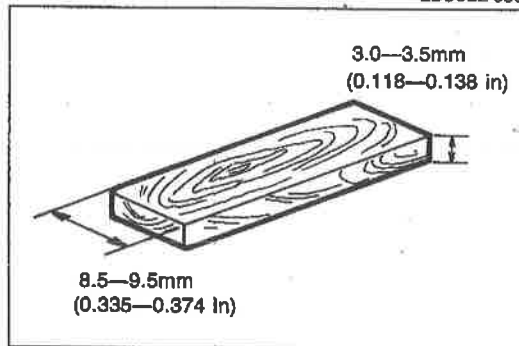
2BU0B2-036

7. Tighten the idler sprocket assembly lock bolt.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)

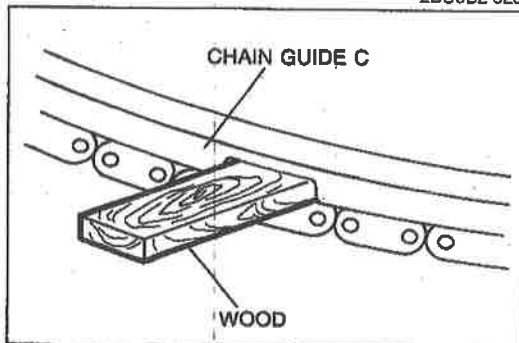
8. Install the spacer.



2BU0B2-029

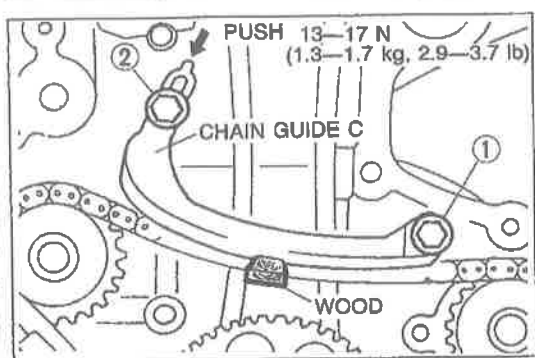
Adjustment of balancer chain tension

1. Fabricate a piece of hard wood as shown.



0BU0B2-011

2. Insert the piece of hardwood in the notch in chain guide C.



0BU0B2-012

3. Push chain guide C with a force of 13—17 N (1.3—1.7 kg, 2.9—3.7 lb) and tighten adjusting bolt ② and bolt ①.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

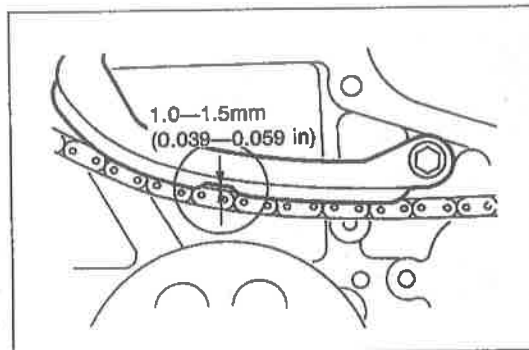
4. Remove the wood from between the chain and chain guide C.

Caution

Do not leave any wood shavings around the chain and chain guide.

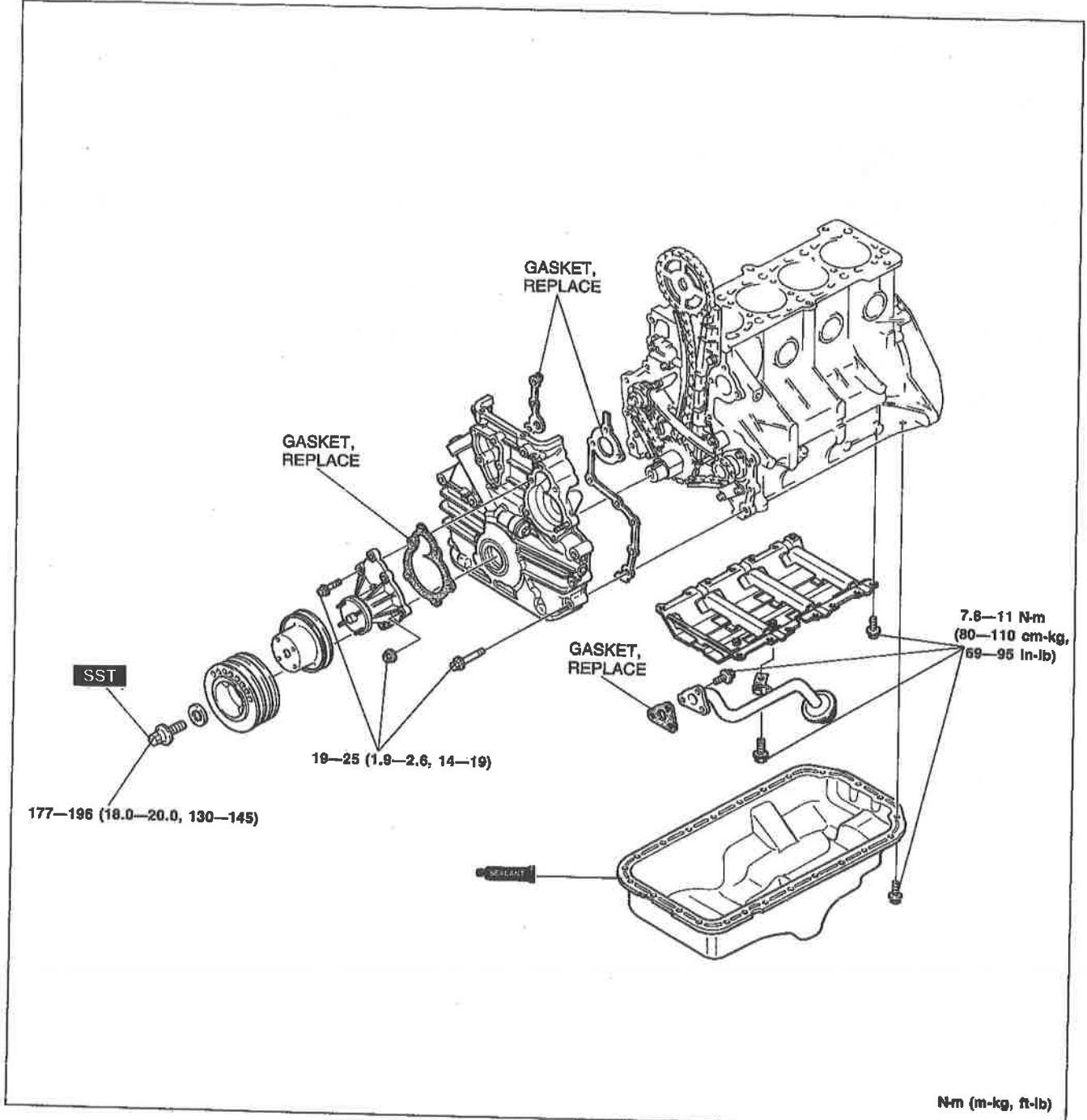
5. Measure the chain slack.

Specification: 1.0—1.5mm (0.039—0.059 in)

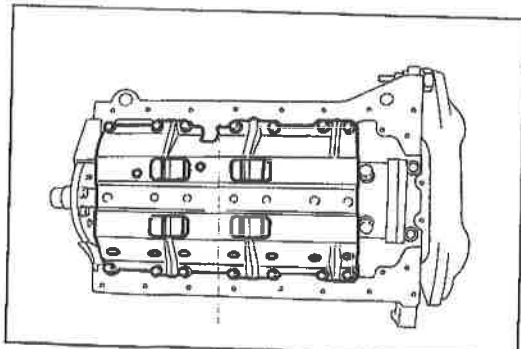


0BU0B2-023

CHAIN CASE AND OIL PAN Torque Specifications



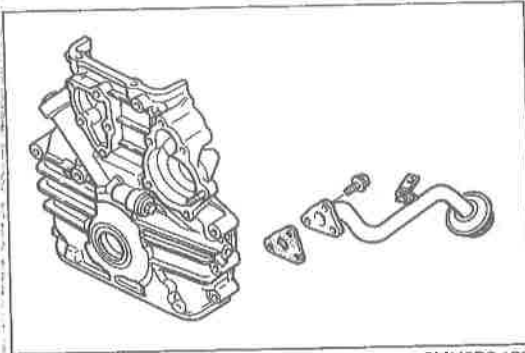
9MU0B2-180



9MU0B2-181

Vibration Reducing Stiffener (VRS)
Install the vibration reducing stiffener.

Tightening torque:
7.8-11 N-m (80-110 cm-kg, 69-95 in-lb)



9MU0B2-182

Oil Strainer

Install the oil strainer with a new gasket onto the chain cover.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

Chain Cover

1. Install the chain cover onto the cylinder block with new gaskets.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

2. Tighten the oil strainer stay bolt.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

Oil Pan

1. Remove any old sealant from the bolts and bolt holes. If the old sealant cannot be removed, replace the bolt as necessary.
2. Apply a continuous bead of silicon sealant to the oil pan along the inside of the bolt holes, and overlap the ends.
3. Apply locking agent to the bolt threads.

Caution

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

Note

New bolts of the G6 engine do not need extra locking agent because they come with it already applied.

4. Install the oil pan.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

Crankshaft Pulley

1. Reverse the direction of the SST (49 E301 060).
2. Install the crankshaft pulley, washer and bolt.
3. Tighten the lock bolt.

Tightening torque:

177—196 N·m (18.0—20.0 m·kg 130—145 ft·lb)

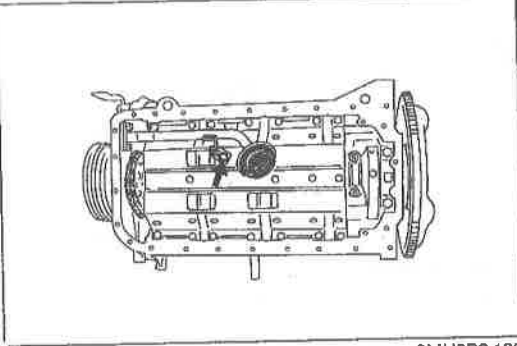
Water Pump

1. Remove any dirt or old gasket fragments from the water pump mounting surface.
2. Install the water pump along with a new gasket.

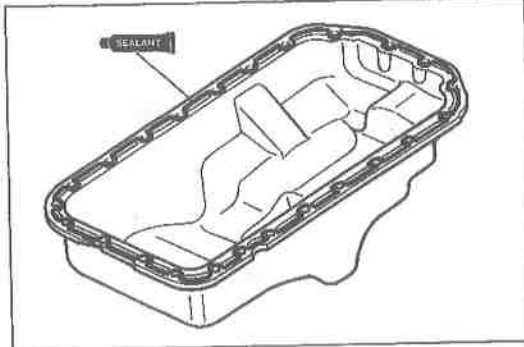
Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

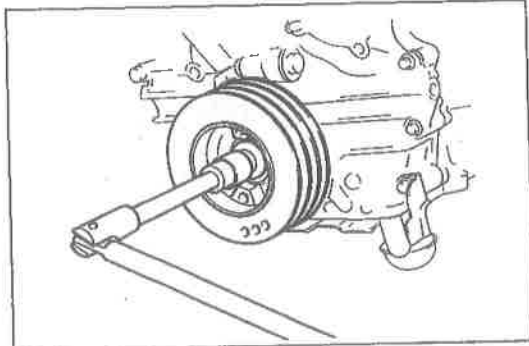
3. Temporarily install the water pump pulley.



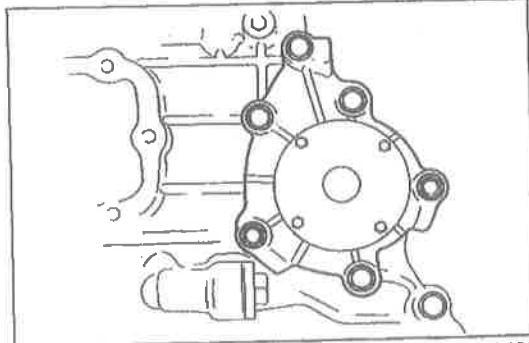
9MU0B2-183



9BU0B2-043

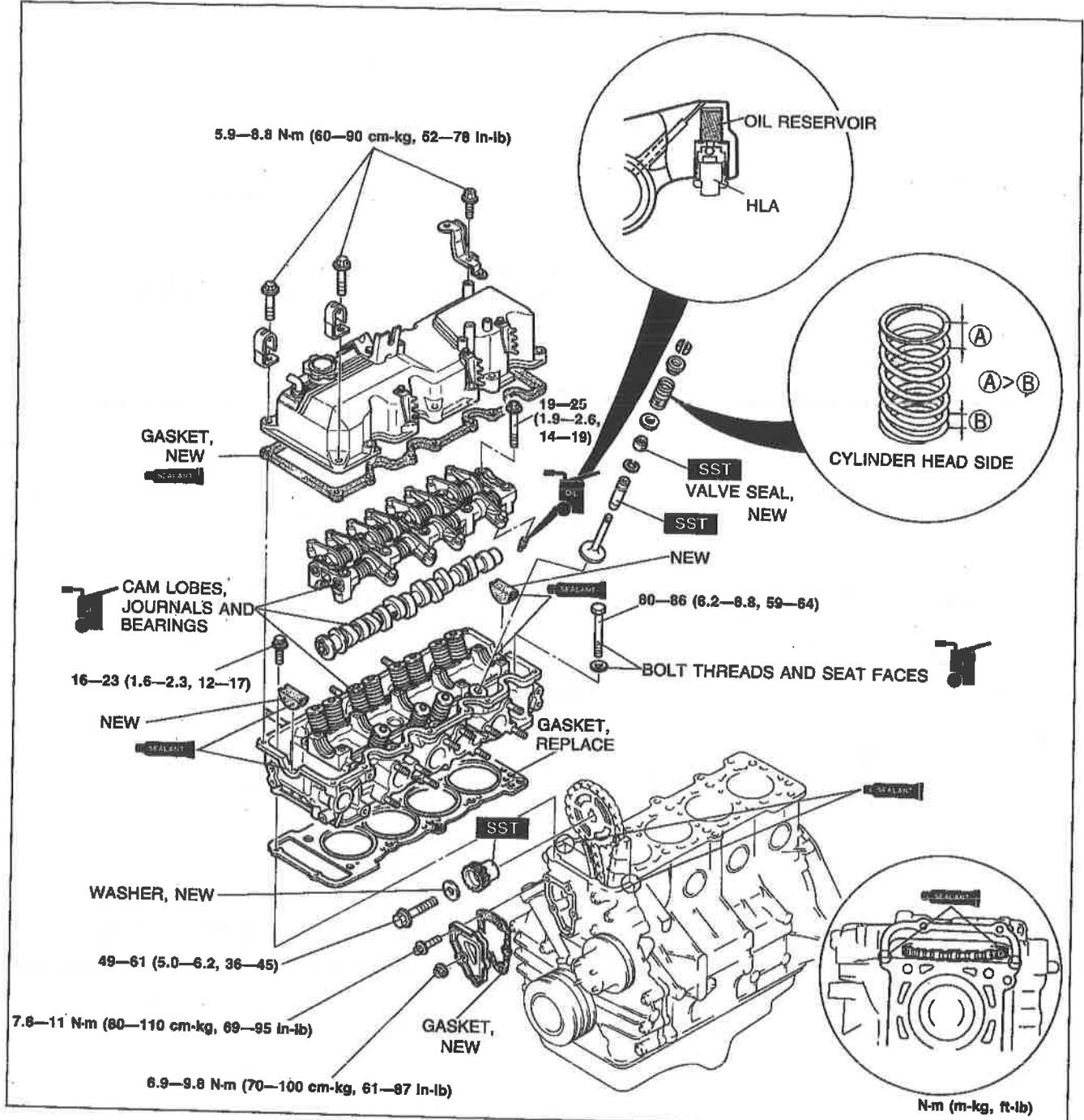


9MU9B2-185

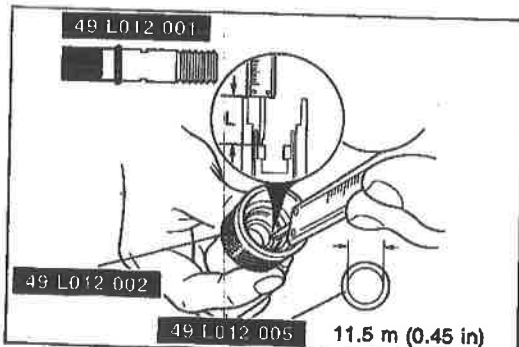


9MU0B2-186

CYLINDER HEAD Torque Specifications



9MU0B2-187

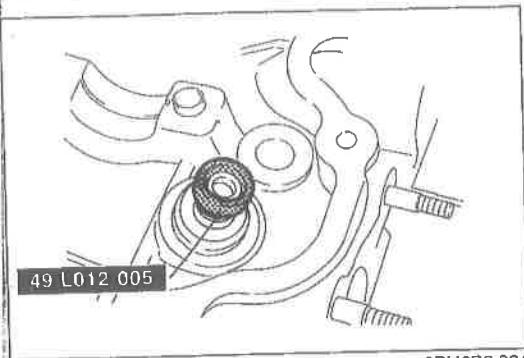


9MU0B2-188

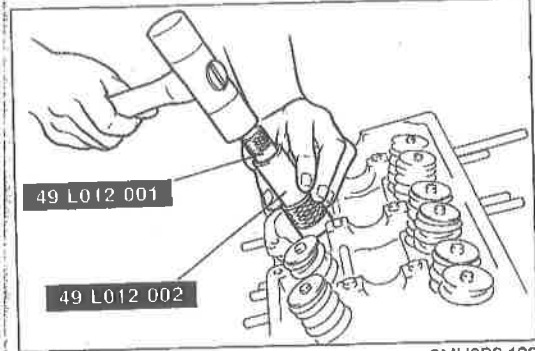
Valve Seal

1. Assemble the **SST** as shown so that the depth **L** is as specified.

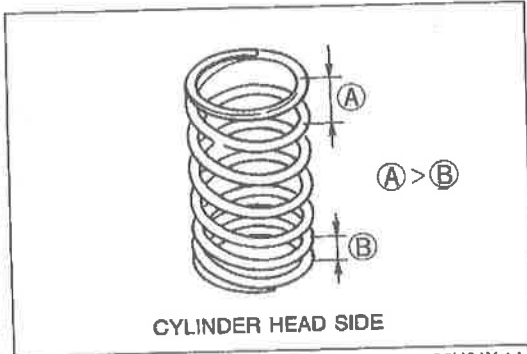
Depth L: 23.5—24.1mm (0.925—0.949 In)



2. Install the new valve seal onto the valve guide.
3. Install the **SST** onto the valve seal.



4. Tap the valve seal in until the **SST** contacts the cylinder head.

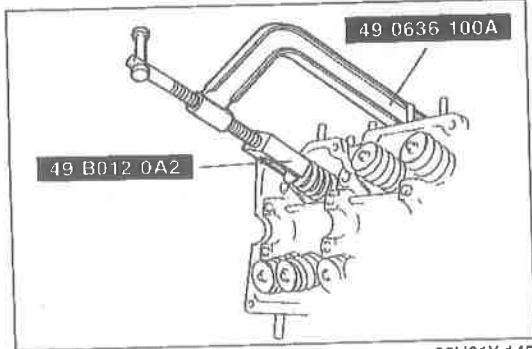


Valve and Valve Spring

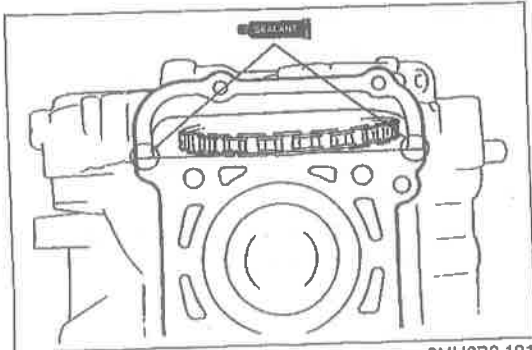
1. Install the lower spring seat.
2. Install the valve.
3. Install the valve springs and the upper spring seat.

Note

Install the valve spring with the closer pitch toward the cylinder head.

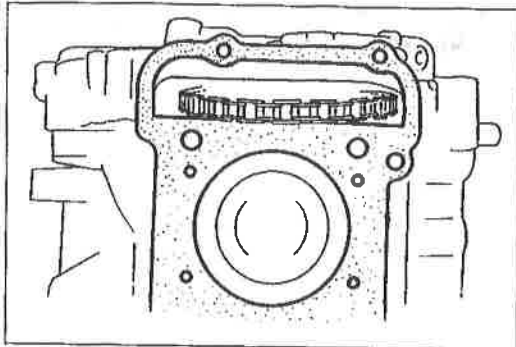


4. Compress the valve spring with the **SST**; then install the valve keepers.
5. Tap the end of the valve stem lightly two or three times with a plastic hammer to confirm that the keepers are all fully seated.

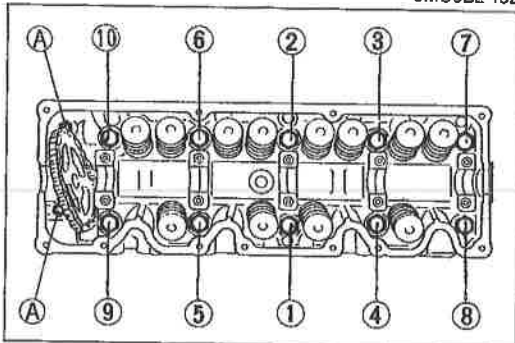


Cylinder Head Gasket

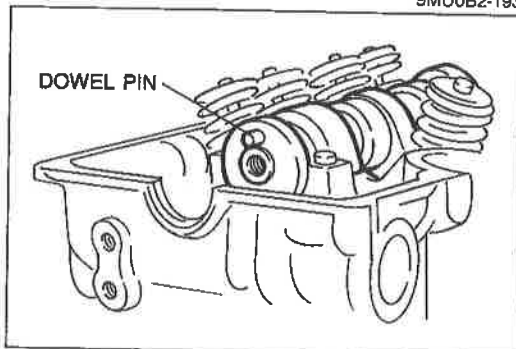
1. Thoroughly remove all dirt and oil with a rag from the top of the cylinder block.
2. Apply silicone sealant to the shaded area.



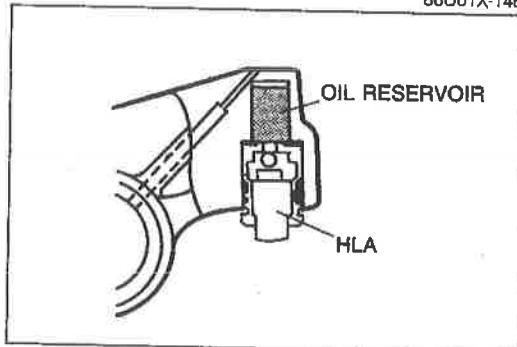
9MU0B2-192



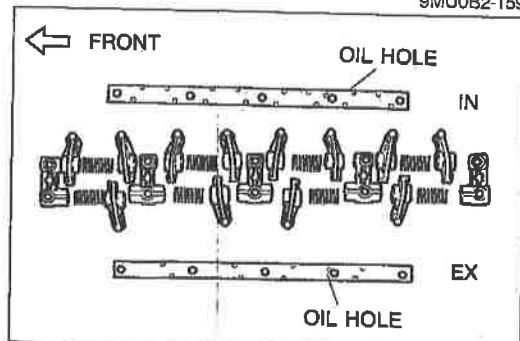
9MU0B2-193



86U01X-148



9MU0B2-159



9MU0B2-194

- Place a new cylinder head gasket in position.

Cylinder Head

- Set the cylinder head in place.
- Apply engine oil to the bolt threads and seat faces.
- Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

Tightening torque:

80—86 N·m (8.2—8.8 m·kg, 59—64 ft·lb)

- Tighten the remaining small cylinder head bolts (A).

Tightening torque:

16—23 N·m (1.6—2.3 m·kg, 12—17 ft·lb)

Camshaft

- Apply a liberal amount of engine oil to the journals and bearings.
- Place the camshaft in position with the dowel pin facing straight up.

Hydraulic Lash Adjuster (HLA)

- Pour engine oil into the oil reservoir in the rocker arm.
- Apply engine oil to the HLA.
- Carefully install the HLA into the rocker arm.

Caution

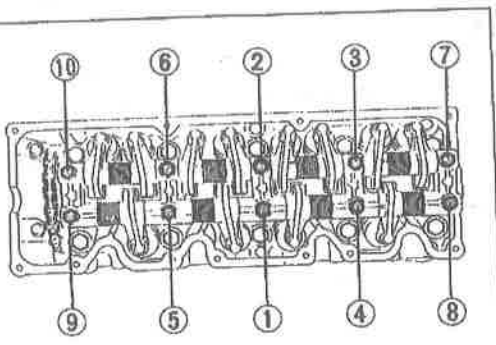
Do not damage the O-ring when installing the HLA.

Camshaft Cap, Rocker Arm and Shaft Assembly

- Assemble the rocker arm and shaft assembly as shown in the figure according to the cap number and ← mark.

Note

- The intake side shaft has twice as many oil holes as the exhaust side shaft.
- The No.4 camshaft cap has an oil hole from the cylinder head; be certain it is installed correctly.

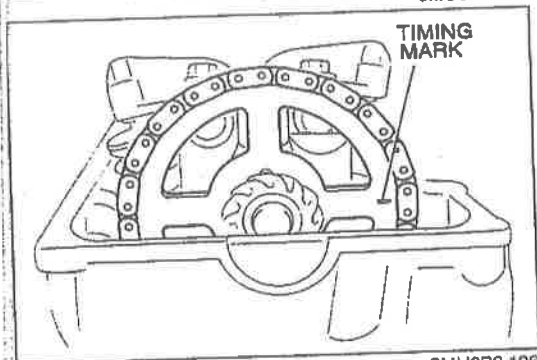


9MU0B2-195

2. Apply a liberal amount of clean engine oil to the cam lobes and journals.
3. Install the rocker arm and shaft assemblies. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque:

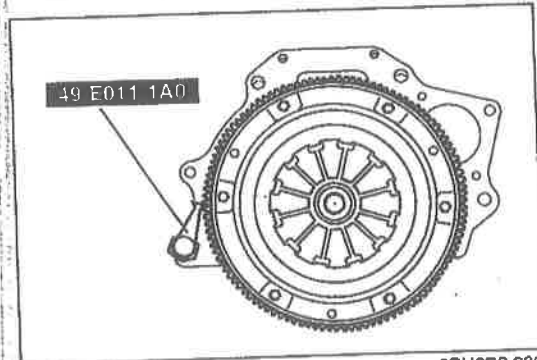
19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



9MU0B2-196

Distributor Drive Gear

1. Verify that the timing mark of the camshaft pulley and the white link of the timing chain align.
2. Install the camshaft pulley onto the camshaft dowel pin.
3. Remove the securing wire.

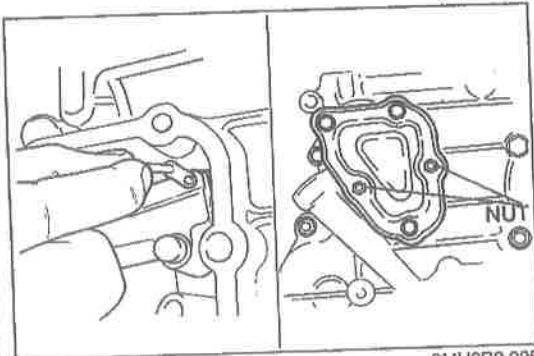


2BU0B2-030

4. Install the distributor drive gear, new washer, and lock bolt.
5. Install the **SST** or equivalent against the flywheel.
6. Tighten the lock bolt.

Tightening torque:

49—61 N·m (5.0—6.2 m·kg, 36—45 ft·lb)



0MU0B2-025

7. Remove the chain adjuster sleeve retaining pin.

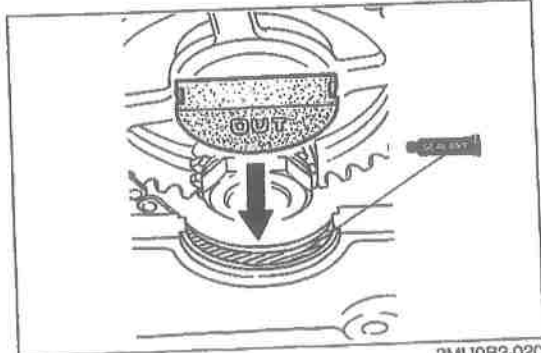
Caution

Be especially careful that the pin does not fall.

8. Install the service cover with a new gasket.

Tightening torque

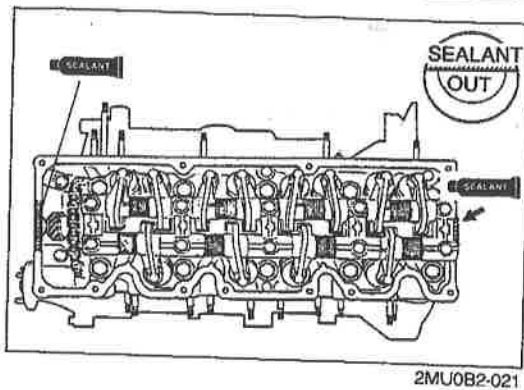
Bolt: 7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)
Nut: 6.9—9.8 N·m (70—100 cm·kg, 61—87 in·lb)



2MU0B2-020

Seal Cover

Apply sealant to the shaded area as shown, and install the new seal cover.



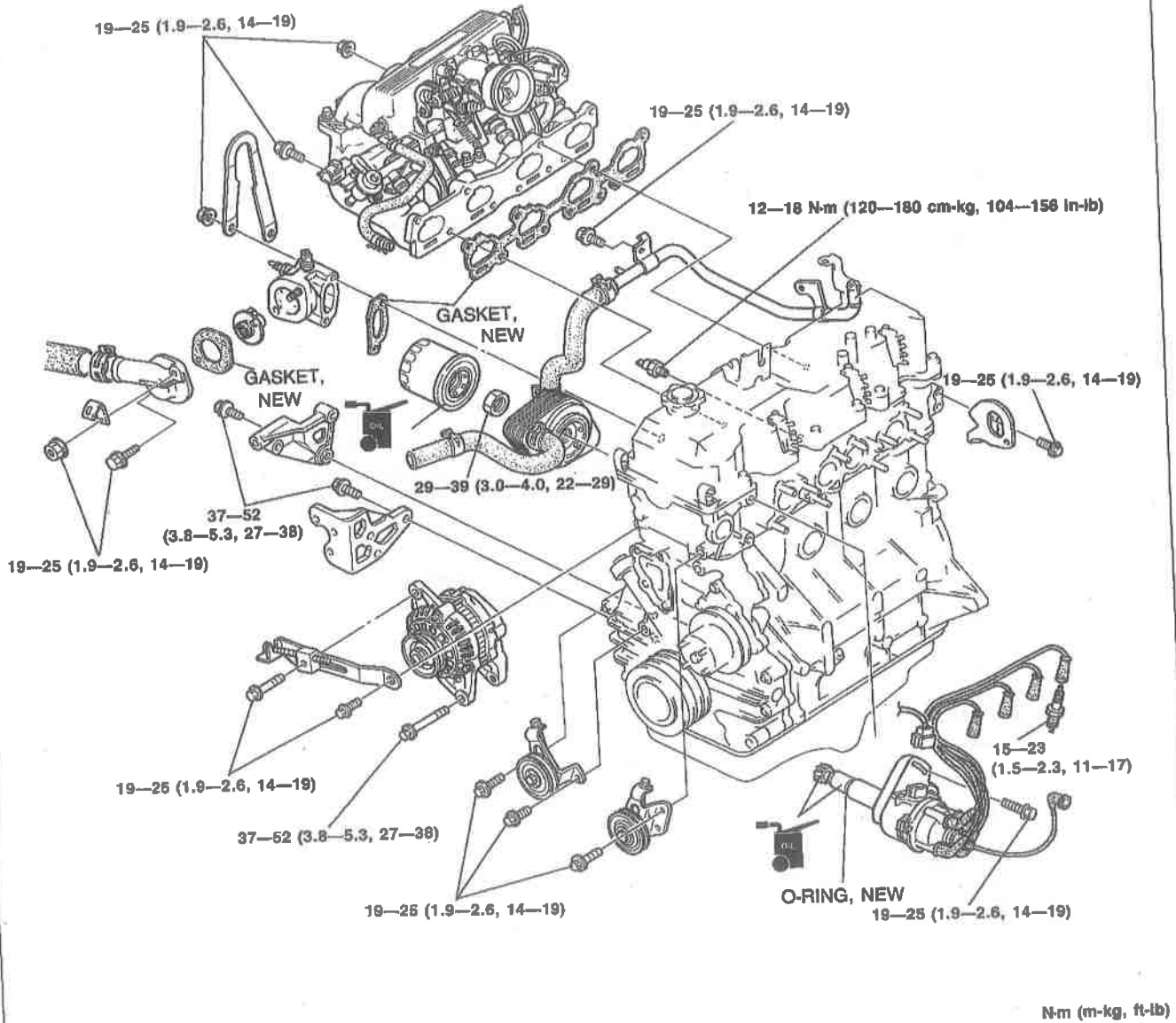
Cylinder Head Cover

1. Apply engine oil to the valves, rocker arms and timing chain.
2. Remove all old silicone sealant from the cylinder head and cover.
3. Coat a new gasket with silicone sealant, and install onto the cylinder head cover.
4. Apply silicone sealant to the shaded areas shown in the figure.
5. Install the cylinder head cover.

Tightening torque:

5.9—8.8 N·m (60—90 cm·kg, 52—78 in·lb)

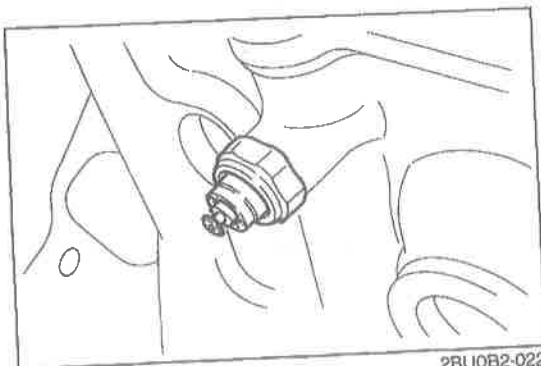
AUXILIARY PARTS
Torque Specification



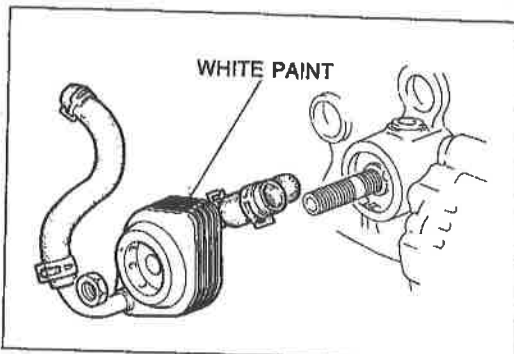
9MU0B2-201

Oil Pressure Switch
Install the oil pressure switch.

Tightening torque:
12-18 N-m (120-180 cm-kg, 104-156 in-lb)



2BU0B2-022



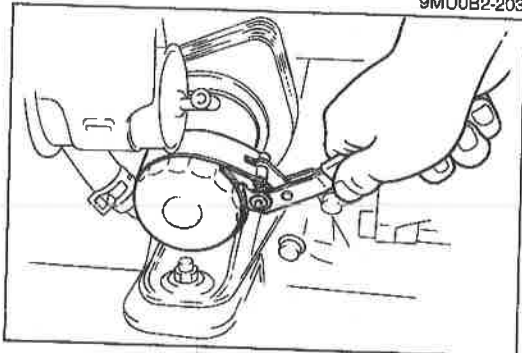
9MU0B2-203

Oil Cooler

Install the oil cooler so that the white paint is at the top.

Tightening torque:

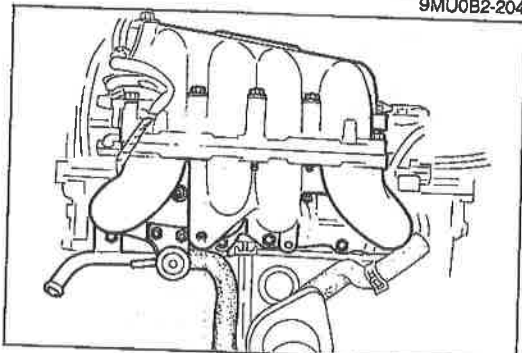
29—39 N·m (3.0—4.0 m·kg, 22—29 ft·lb)



9MU0B2-204

Oil Filter

1. Apply a small amount of engine oil to the rubber seal of the new filter.
2. Install the oil filter and tighten it by hand until the rubber seal contacts the base.
3. Then tighten the filter 1-1/6 turn with a wrench.



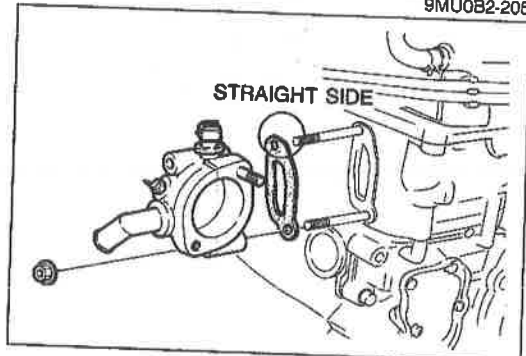
9MU0B2-205

Intake Manifold Assembly

1. Place the new gasket in position.
2. Install the intake manifold assembly.
3. Tighten the bolts and nuts in two or three steps.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



0BU0B2-026

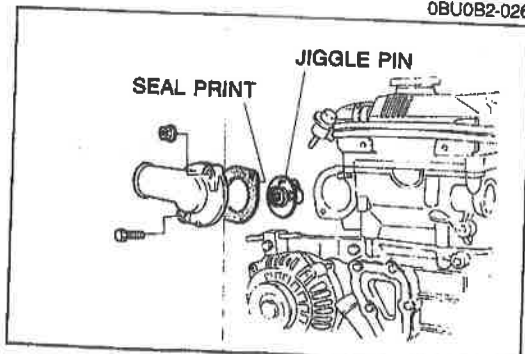
Water Outlet

1. Install the new water outlet gasket with the straight side upward.
2. Install the water outlet.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

3. Connect the oil cooler hose.



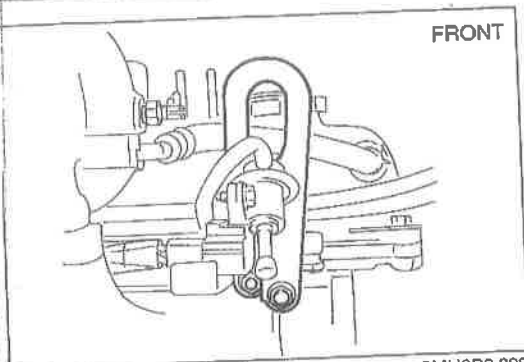
9MU0B2-207

Thermostat and Thermostat Cover

1. Install the thermostat into the water outlet with the jiggle pin at the top.
2. Position a new gasket with the printed side facing the water outlet.
3. Install the thermostat cover.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



FRONT

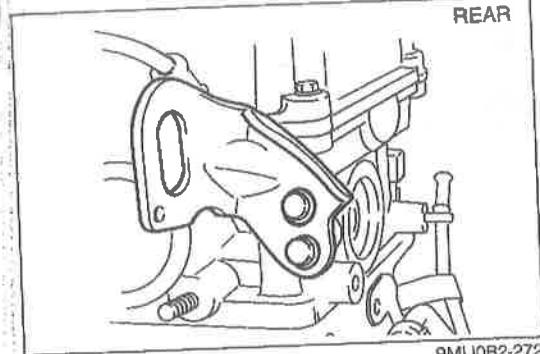
9MU0B2-208

Engine Hanger

Install the front and rear engine hangers.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



REAR

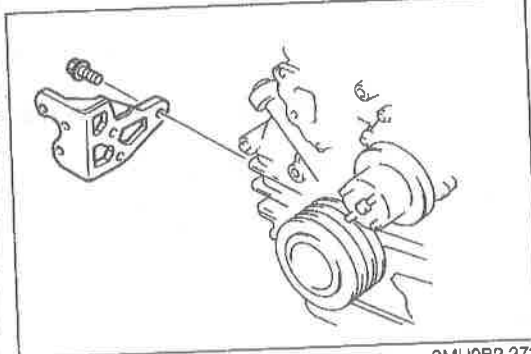
9MU0B2-272

P/S Oil Pump Bracket

Install the P/S oil pump bracket.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)



9MU0B2-273

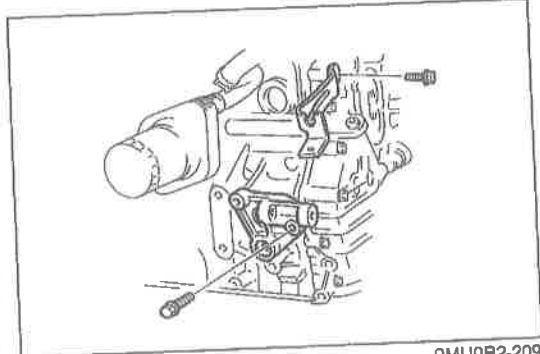
Alternator

1. Install the alternator strap and bracket.

Tightening torque

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

Strap : 19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



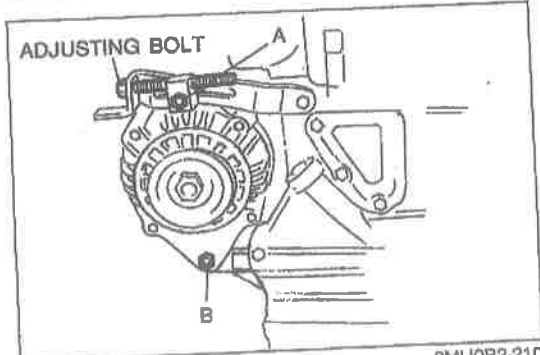
9MU0B2-209

2. Install the alternator.

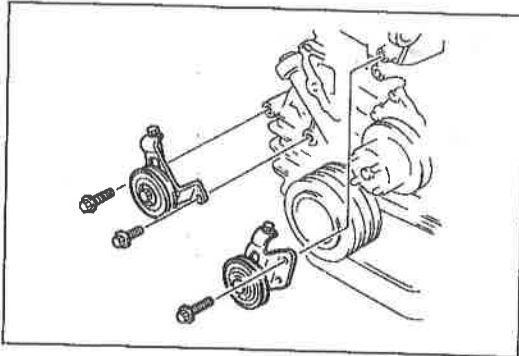
Tightening torque

Bolt A: 19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

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



9MU0B2-210



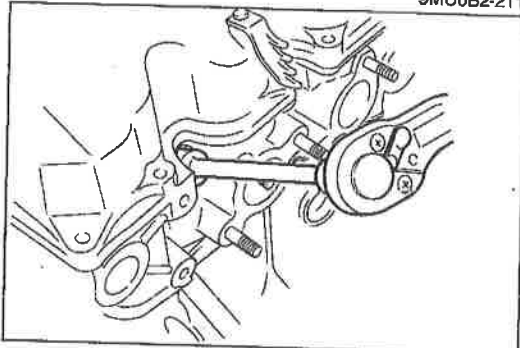
9MU0B2-211

A/C Idler Bracket and P/S Idler Bracket

Install the A/C idler bracket and P/S idler bracket.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



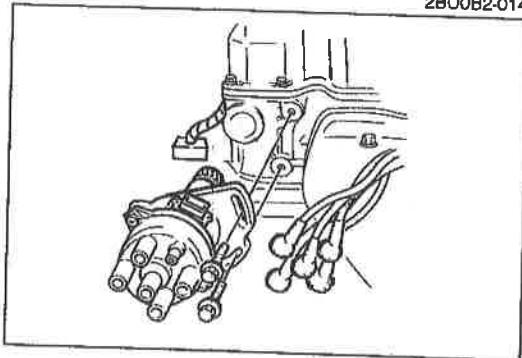
2BU0B2-014

Spark Plug

Install the spark plugs.

Tightening torque:

15—23 N·m (1.5—2.3 m·kg, 11—17 ft·lb)



9MU0B2-212

Distributor

1. Verify that the crankshaft pulley timing mark (yellow) is aligned with the indicator pin.
2. Apply engine oil to the O-ring and install it onto the distributor.
3. Apply engine oil to the distributor driven gear.
4. Align the marks and install the distributor.
5. Loosely tighten the distributor mounting bolt.

High-tension Lead

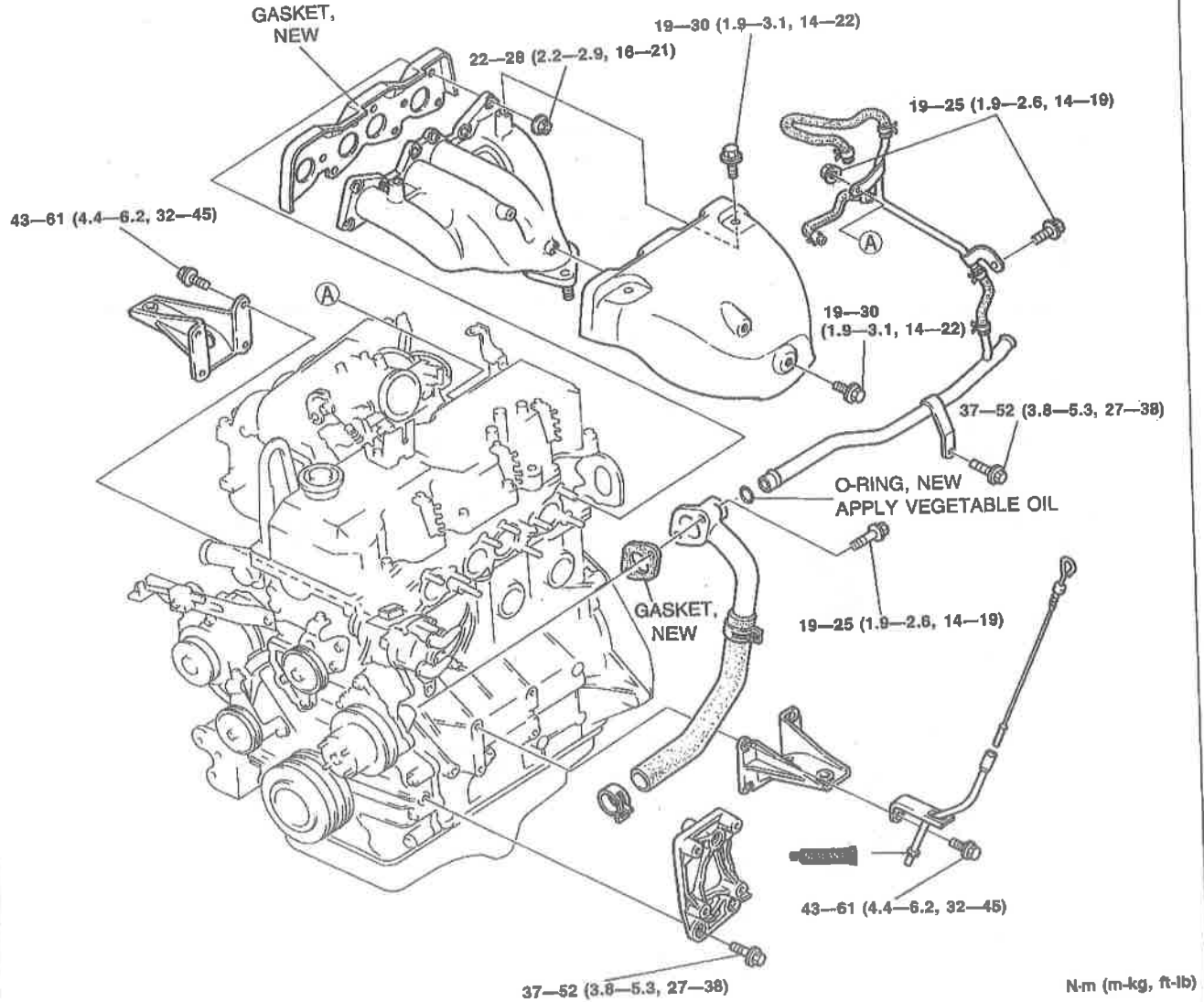
Install the high-tension leads.

ENGINE STAND REMOVAL

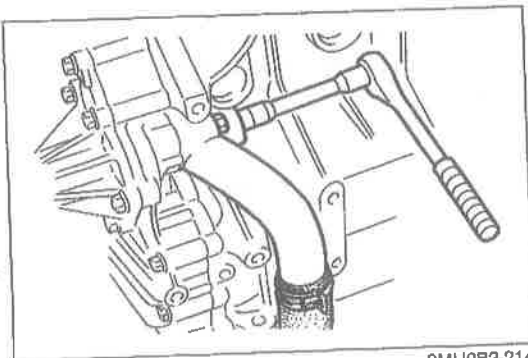
REMOVAL

1. Remove the engine from the engine stand.
2. Remove the **SST** from the engine.
3. Install in the following sequence.

Torque Specifications



9MU082-213



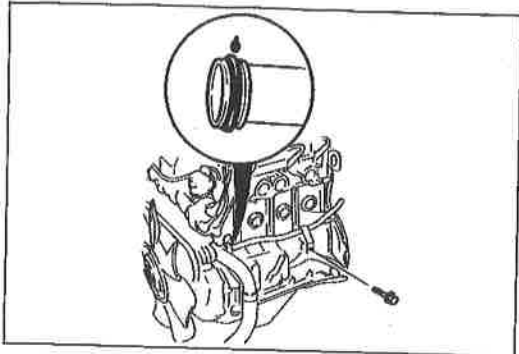
9MU082-214

Coolant Inlet Pipe and Bypass Pipe

1. Install the coolant inlet pipe with a new gasket.

Tightening torque:

19-25 Nm (1.9-2.6 m-k, 14-19 ft-lb)

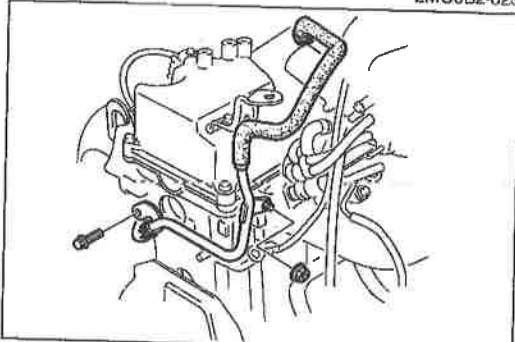


2MU0B2-023

2. Apply vegetable oil to the new O-ring.
3. Install the coolant bypass pipe.

Tightening torque:

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)



9MU0B2-216

4. Tighten the intake manifold nut.

Tightening torque:

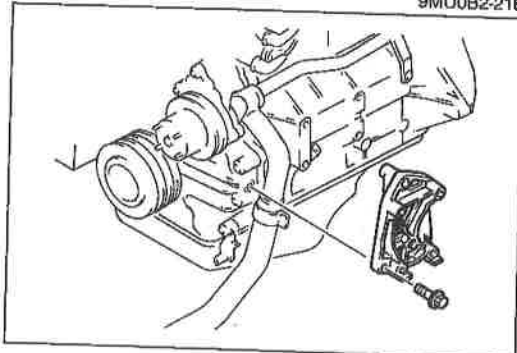
19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

5. Tighten the bolt.

Tightening torque:

19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

6. Connect the water hose to the BAC valve.



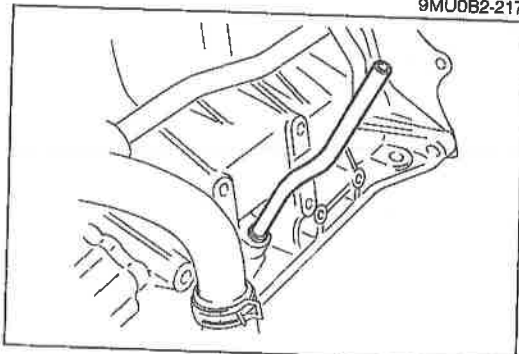
9MU0B2-217

A/C Compressor Bracket

Install the A/C compressor bracket.

Tightening torque:

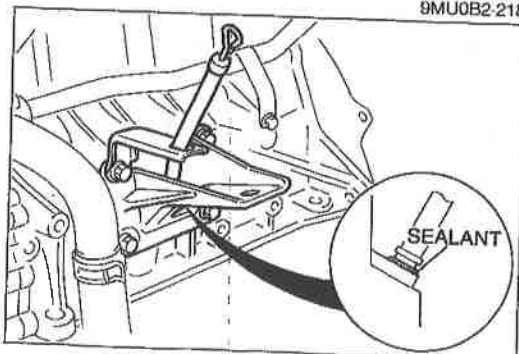
37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)



9MU0B2-218

Oil Level Gauge Pipe and Left Engine Mount

1. Tap in the oil level gauge pipe.



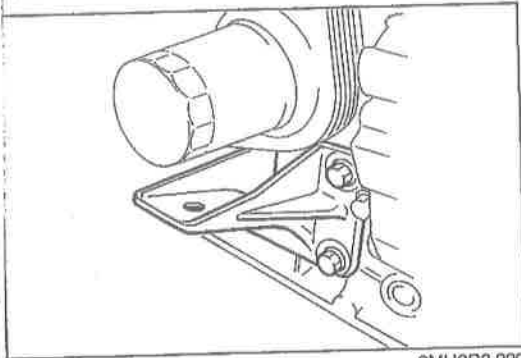
9MU0B2-219

2. Slide the oil level gauge stay over the gauge pipe.
3. Apply sealant to the shaded area in the figure.
4. Install the left engine mount and gauge stay.

Tightening torque:

43—61 N·m (4.4—6.2 m·kg, 32—45 ft·lb)

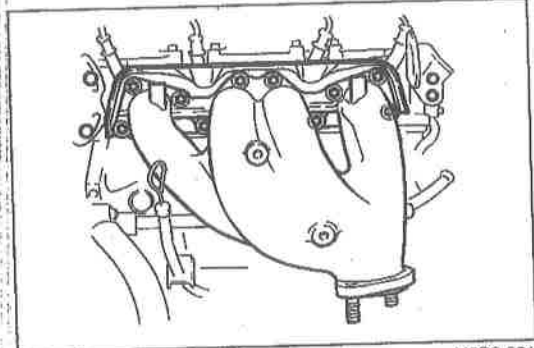
5. Install the oil level gauge.



9MU0B2-220

Right Engine Mount
Install the right engine mount.

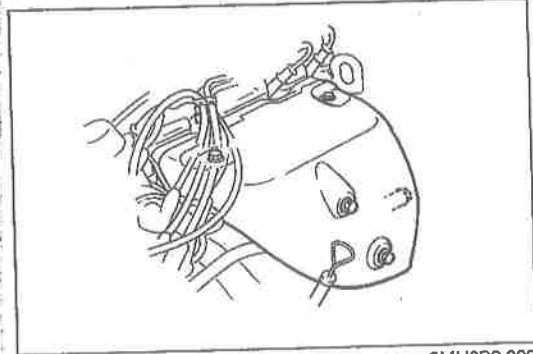
Tightening torque:
43—61 N·m (4.4—6.2 m·kg, 32—45 ft·lb)



9MU0B2-221

Exhaust Manifold
1. Install the exhaust manifold with a new gasket.
2. Tighten the nuts in two or three steps.

Tightening torque:
22—28 N·m (2.2—2.9 m·kg, 16—21 ft·lb)



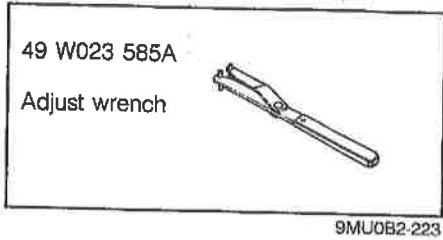
9MU0B2-222

Exhaust Manifold Insulator
Install the exhaust manifold insulator.

Tightening torque:
19—30 N·m (1.9—3.1 m·kg, 14—22 ft·lb)

INSTALLATION

PREPARATION
SST

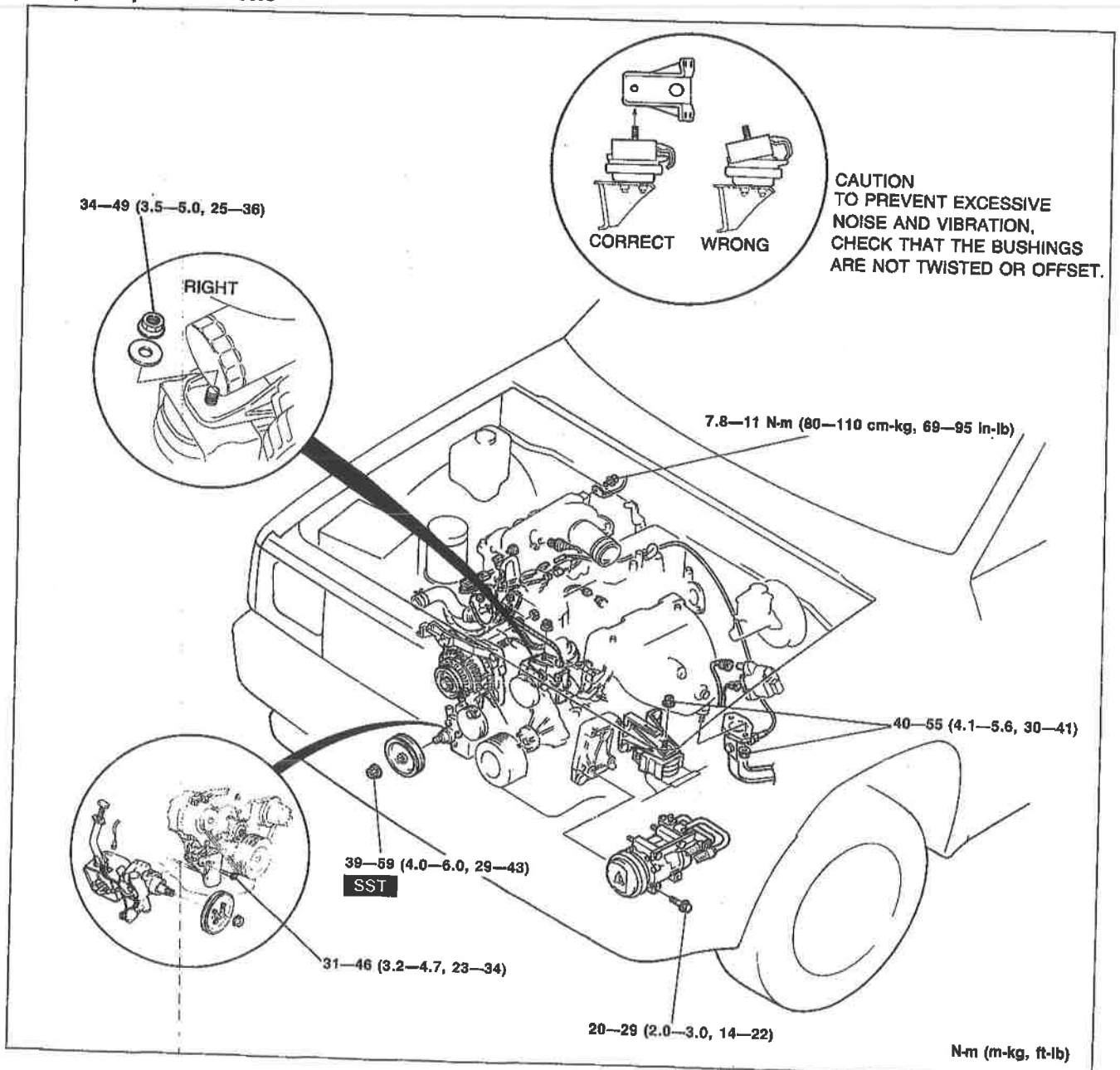


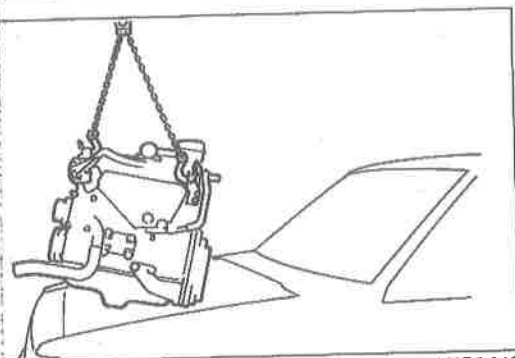
Tighten all bolts and nuts to the specified torques.

Warning: Be sure the vehicle is securely supported.

STEP 1

Torque Specifications

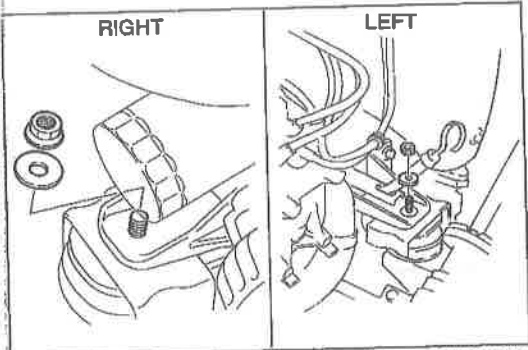




9BU0B2-046

Engine

1. Suspend the engine horizontally.
2. Install the engine in the engine compartment being careful not to damage the piping.

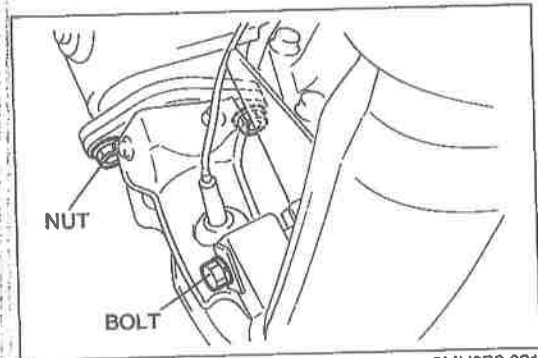


9BU0B2-011

3. Tighten the engine mount nuts.

Tightening torque:

34—49 N·m (3.5—5.0 m·kg, 25—36 ft·lb)



9MU0B2-231

Exhaust Pipe and Bracket

1. Install the exhaust pipe.

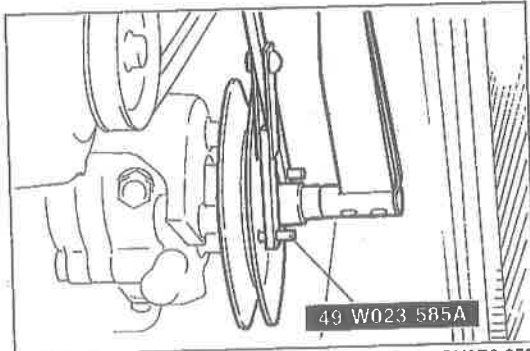
Tightening torque

Nut: 34—49 N·m (3.5—5.0 m·kg, 25—36 ft·lb)

2. Tighten the bracket bolt.

Tightening torque

Bolt: 21—27 N·m (2.1—2.8 m·kg, 15—20 ft·lb)



9BU0B2-053

P/S Oil Pump

1. Install the P/S oil pump.

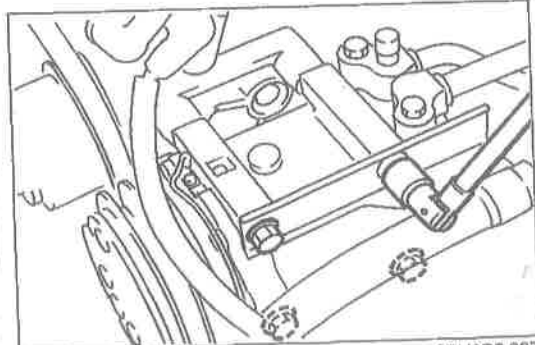
Tightening torque:

31—46 N·m (3.2—4.7 m·kg, 23—34 ft·lb)

2. Install the P/S oil pump pulley with the SST.

Tightening torque:

39—59 N·m (4.0—6.0 m·kg, 29—43 ft·lb)



0BU0B2-027

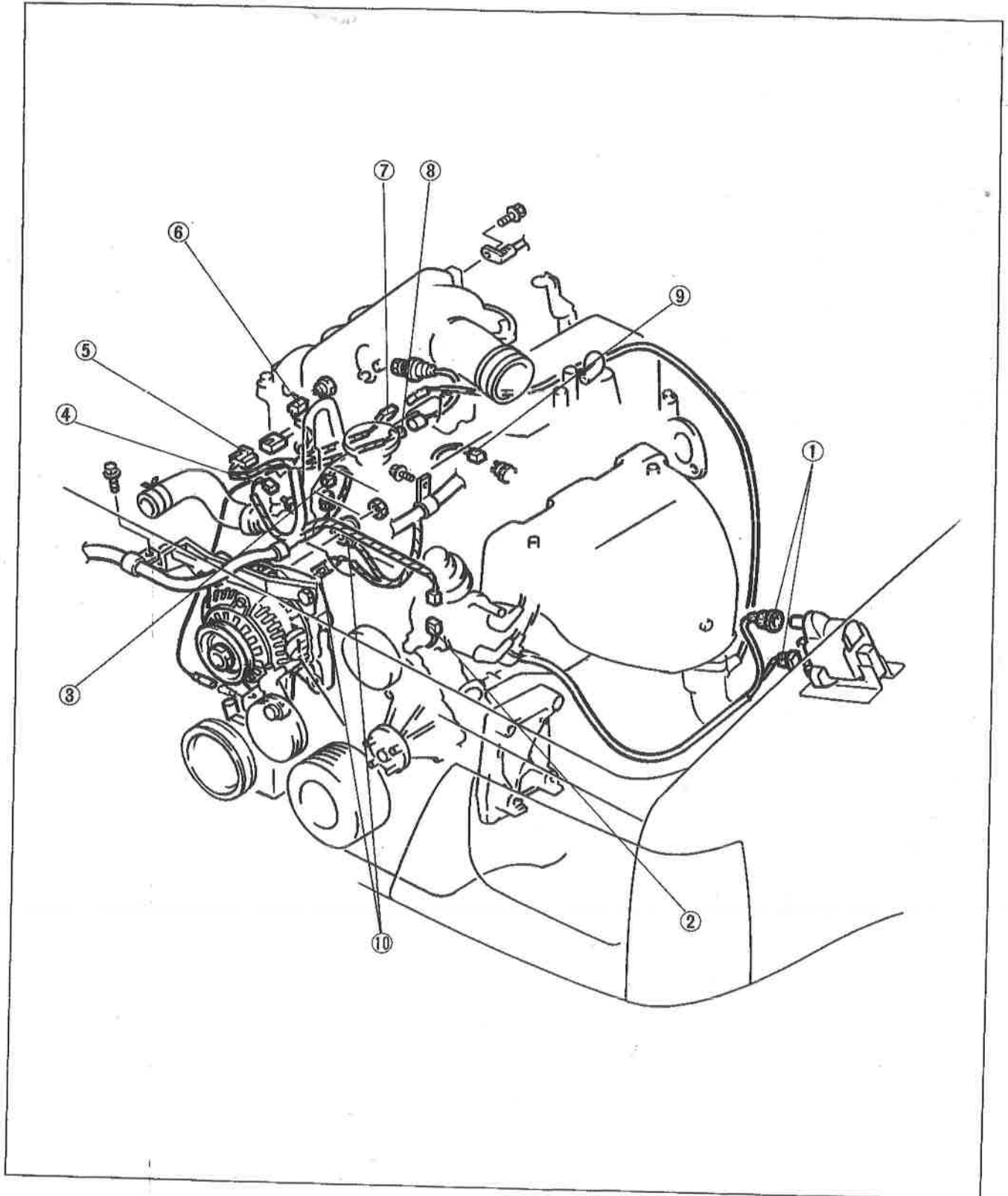
A/C Compressor

Install the A/C compressor.

Tightening torque:

39—54 N·m (4.0—5.5 m·kg, 29—40 ft·lb)

Emission Harness Connectors

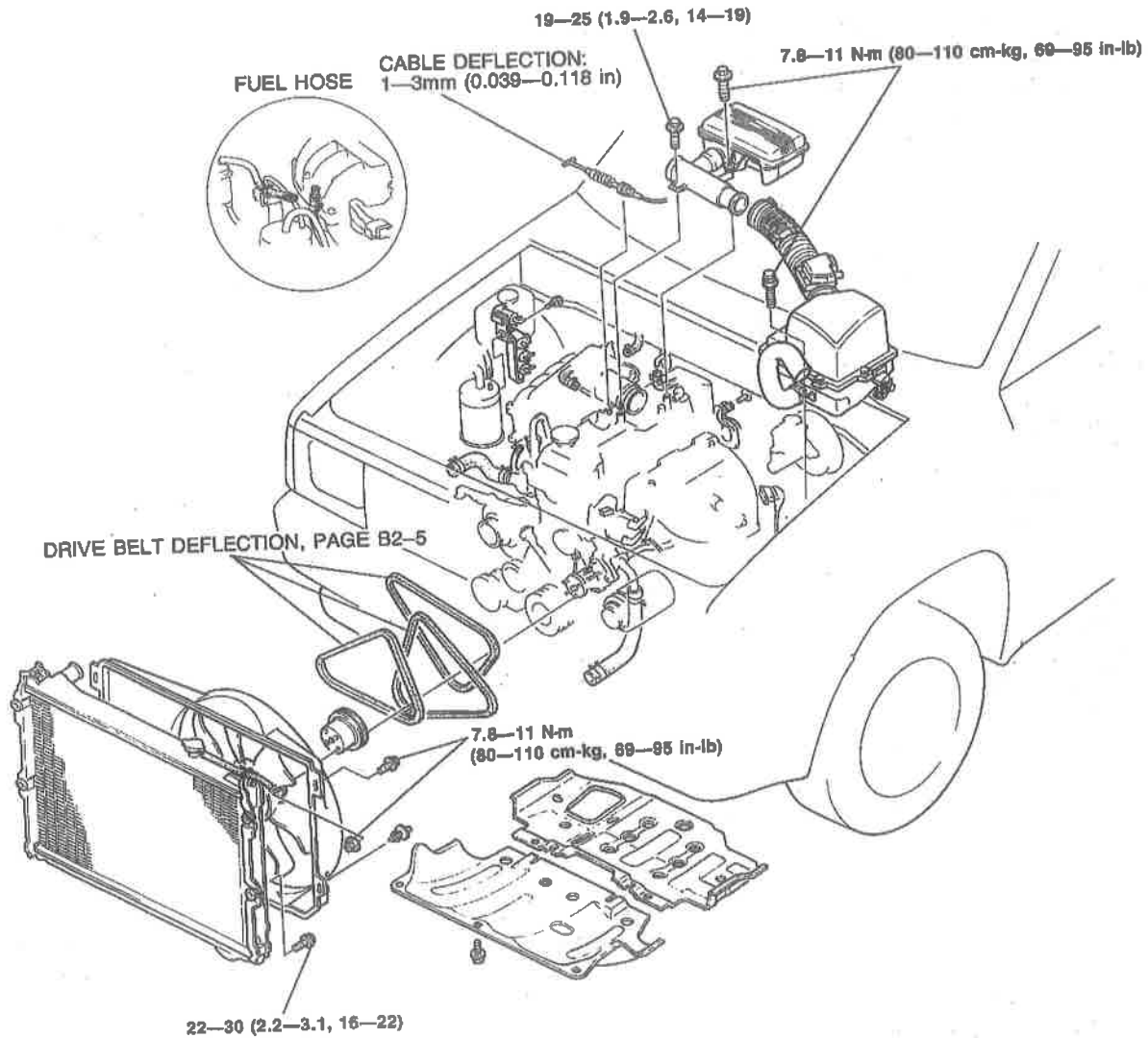


- 1. IG coil
- 2. Distributor
- 3. Water thermosensor
- 4. Heat gauge unit
- 5. Injector harness

- 6. Intake air thermosensor
- 7. Oxygen sensor
- 8. Idle switch
- 9. Oil pressure switch
- 10. Alternator

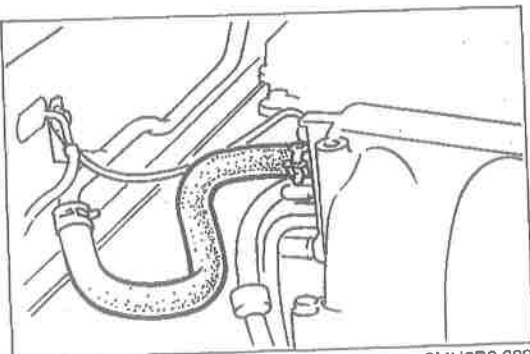
9MU0B2-237

STEP 3
Torque Specifications



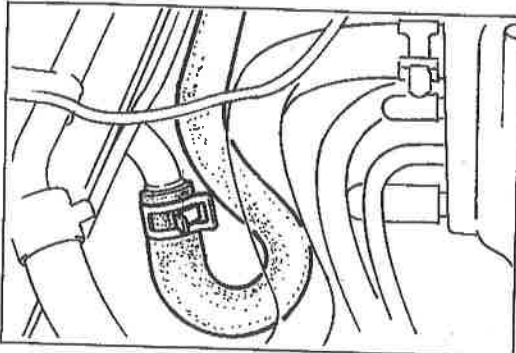
N-m (m-kg, ft-lb)

9MU0B2-238



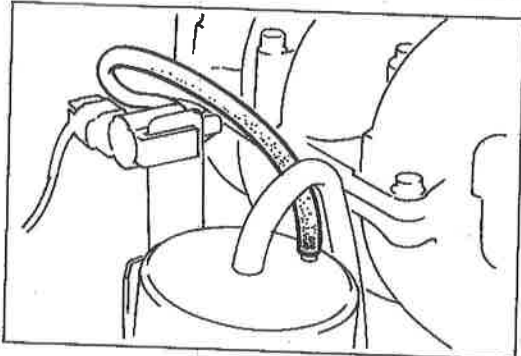
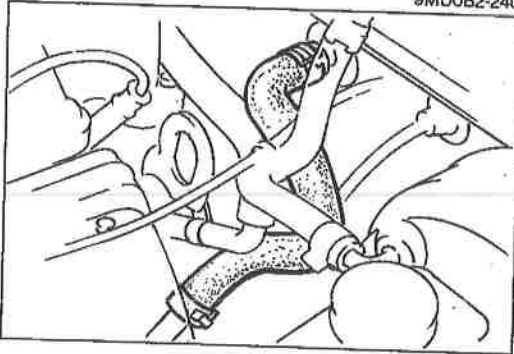
9MU0B2-239

Brake Vacuum Hose
Connect the brake vacuum hose.



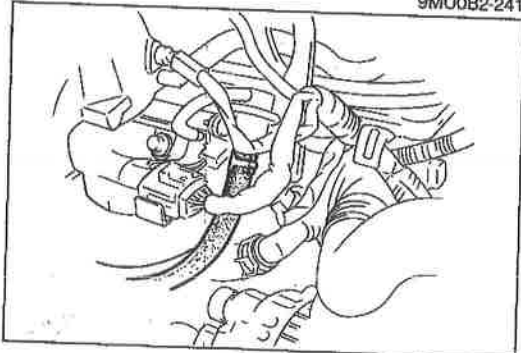
9MU0B2-240

Heater Hose
Connect the heater hoses.



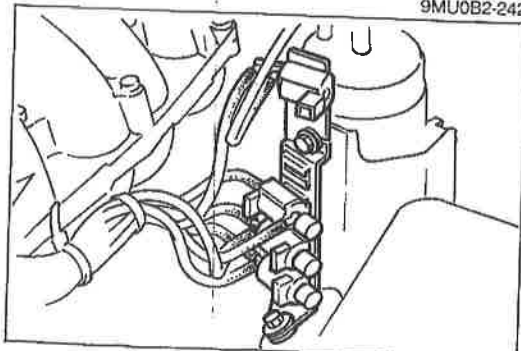
9MU0B2-241

Canister Hose
Connect the canister hose.



9MU0B2-242

Fuel Hoses
Connect the fuel hoses.

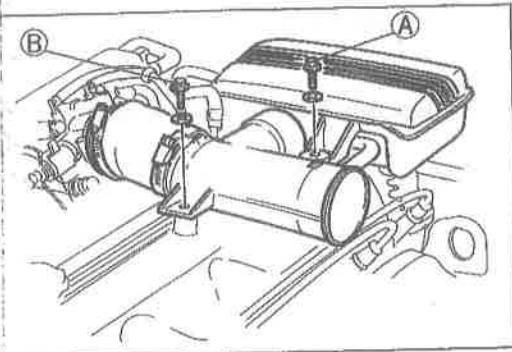


9BU0B2-012

Solenoid Valve
1. Install the solenoid valve.

Tightening torque:
7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

2. Connect the emission harness connector.



9MU0B2-244

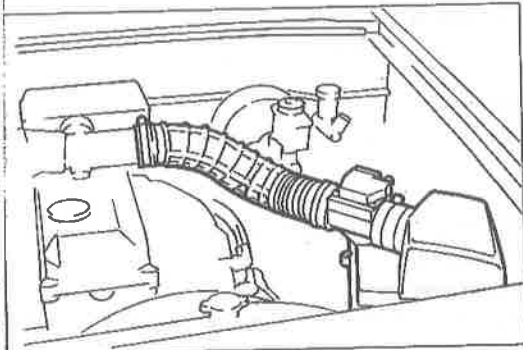
Resonance Chamber Assembly

Install the resonance chamber assembly.

Tightening torque

Bolt A: 7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

Bolt B: 19—25 N·m (1.9—2.6 m·kg, 14—19 ft·lb)



9MU0B2-245

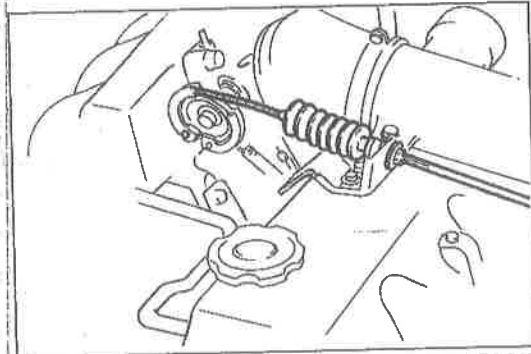
Air Cleaner

1. Install the air cleaner.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

2. Connect the airflow meter connector.

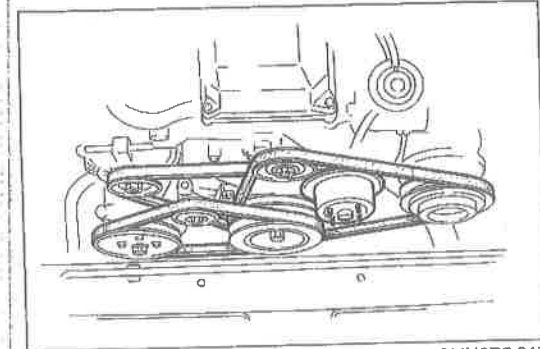


9MU0B2-246

Accelerator Cable

Install the accelerator cable.

Cable deflection: 1—3mm (0.039—0.118 in)



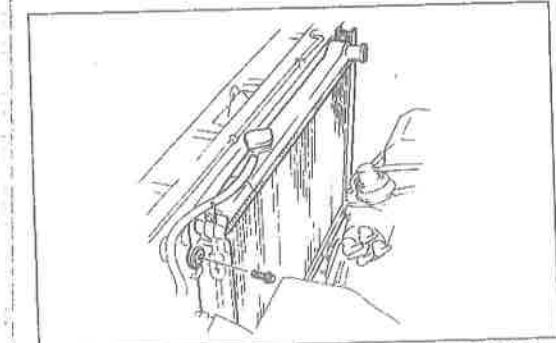
9MU0B2-247

Drive Belt

Install and adjust the drive belt deflection.
(Refer to page B2-5.)

Note

Alternator drive belt can be adjusted after cooling fan installation.



08U0B2-013

Radiator

1. Install the radiator.

Tightening torque:

22—30 N·m (2.2—3.1 m·kg, 16—22 ft·lb)

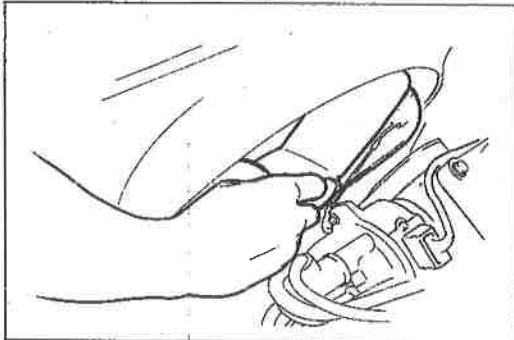
2. Connect the radiator harness, and coolant reservoir hose.
3. Connect the oil cooler hoses. (A/T)

4. Connect the upper and lower radiator hoses.

Note

- a) Position the hose clamp in the original location on the hose.
- b) Squeeze the clamp lightly with large pliers to ensure a good fit.

9MU0B2-249



9BU0B2-047

Cooling Fan and Radiator Cowling

Install the cooling fan and radiator cowling.

Tightening torque:

7.8—11 N·m (80—110 cm·kg, 69—95 in·lb)

Caution

After radiator cowling installation, rotate the cooling fan by hand and verify that the fan blade does not touch the radiator cowling. If the fan touches the cowling, adjust the radiator cowling mounting position.

Engine Oil

Add the specified amount and type of engine oil. (Refer to Section D.)

Coolant

Close the drain plug; then fill the radiator and reservoir tank with the specified amount and type of coolant. (Refer to Section E.)

Transmission

Install the manual transmission. (Refer to Section J2.)

Install the automatic transmission. (Refer to Section K2.)

Starter

Install the starter. (Refer to Section G.)

Check Engine Condition

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

0BU0B2-014