

ENGINE

(WL, WL Turbo, WL-3, WLT-3)

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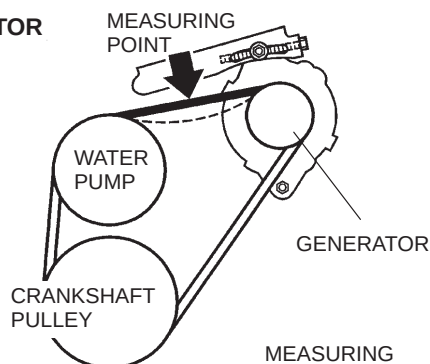
DRIVE BELT

DRIVE BELT INSPECTION

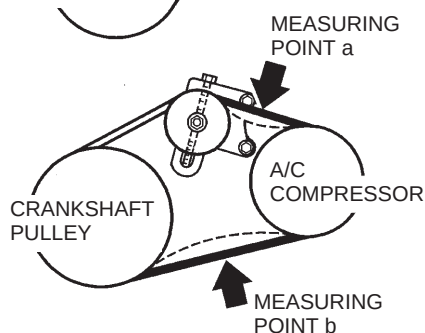
Drive Belt Deflection Check

1. Check the drive belt deflection when the engine is cold, or at least 30 minutes after the engine has stopped. Apply pressure **98 N {10 kgf, 22 lbf}** midway between the specified pulleys.

GENERATOR



A/C



Deflection

(mm {in})

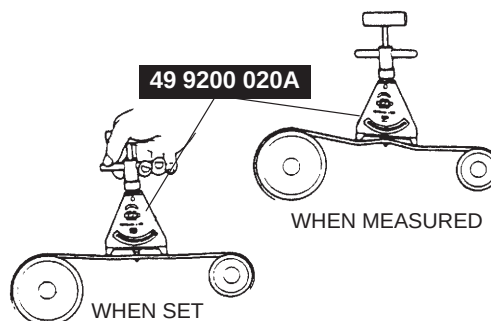
Drive belt		*New	Used	Limit
Generator		7.0—9.0 {0.28—0.35}	8.0—10.0 {0.32—0.39}	16.0 {0.63}
A/C	a	5.0—6.2 {0.20—0.24}	6.0—6.5 {0.24—0.25}	11.3 {0.44}
	b	9.5—11.8 {0.38—0.46}	11.0—12.5 {0.44—0.49}	18.0 {0.71}

* A belt that has been on a running engine for less than five minutes.

2. If the deflection is not within the specification, adjust it. (Refer to DRIVE BELT, DRIVE BELT ADJUSTMENT.)

Drive Belt Tension Check

1. Belt tension can be checked in place of belt deflection. Check the drive belt tension when the engine is cold, or at least 30 minutes after the engine has stopped. Using the **SST**, check the belt tension between any two pulleys.



DRIVE BELT, VALVE CLEARANCE

Tension

(N {kgf, lbf})

Drive belt	*New	Used	Limit
Generator	442—637 {45—65, 99—143}	383—539 {39—55, 86—121}	177 {18, 40}
A/C	403—519 {41—53, 91—116}	354—431 {36—44, 80—96}	181 {18.5, 41}

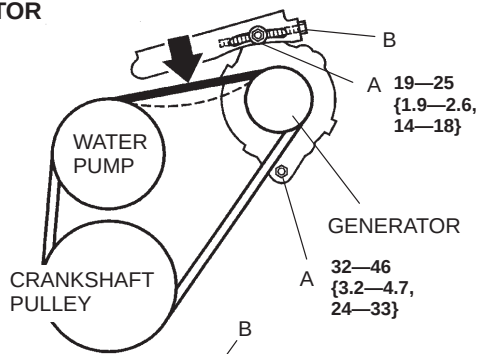
* A belt that has been on a running engine for less than five minutes.

1. If the tension is not within the specification, adjust it. (Refer to DRIVE BELT, DRIVE BELT ADJUSTMENT.)

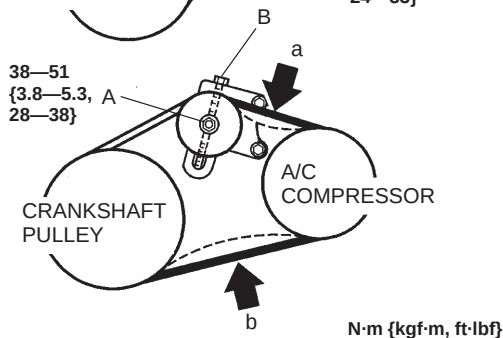
DRIVE BELT ADJUSTMENT

1. Loosen the mounting bolt and locknut A.
2. Adjust the belt deflection or tension by turning adjusting bolt B. (Refer to DRIVE BELT, DRIVE BELT INSPECTION.)
3. Tighten the mounting bolt and locknut A.

GENERATOR



A/C



4. Inspect the belt deflection or tension. (Refer to DRIVE BELT, DRIVE BELT INSPECTION.)

VALVE CLEARANCE

VALVE CLEARANCE INSPECTION/ADJUSTMENT

1. Remove the EGR pipe (WL-3, WLT-3). (See EGR SYSTEM REMOVAL/INSTALLATION.)
2. Remove the cylinder head cover.
3. Turn the crankshaft and align the timing mark with the indicator pin so that the piston of the No. 1 or No. 4 cylinders is at TDC of the compression.
4. Measure the valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.

Valve clearance

IN: 0.05—0.15 mm {0.0020—0.0059 in}

[Engine cold]

0.15 mm {0.0059 in}

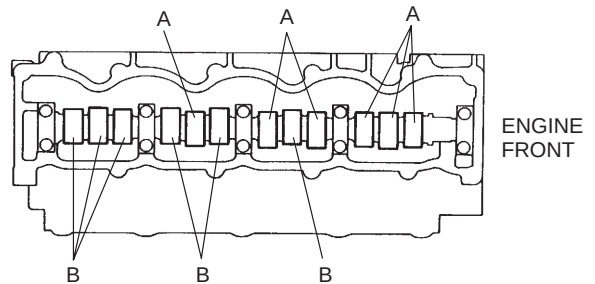
[Engine hot (Reference)]

EX: 0.15—0.25 mm {0.0060—0.0098 in}

[Engine cold]

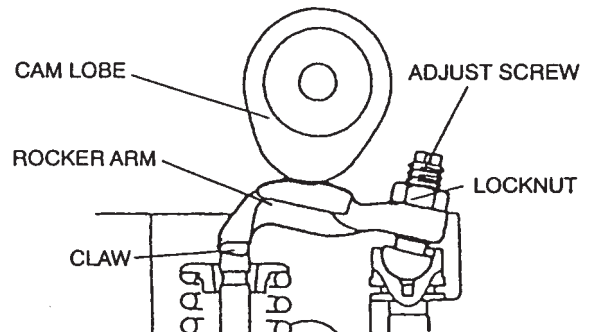
0.25 mm {0.0098 in}

[Engine hot (Reference)]



Caution

- Loosening the locknut and the adjust screw while the cam lobe is not pressing down the rocker arm will damage the claw of the rocker arm. When loosening the locknut and the adjust screw, rotate the crankshaft clockwise and be sure that the cam lobe presses down the rocker arm firmly as shown in the figure.



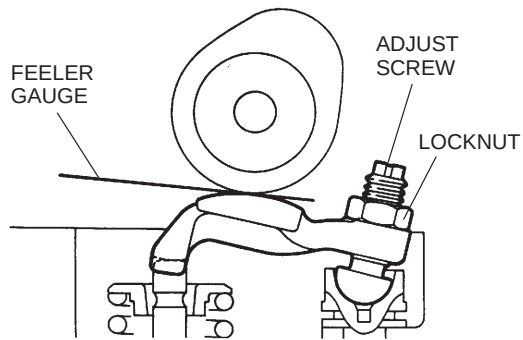
ZCF2212W002

5. If not within the specification, adjust and recheck the valve clearance.
6. Turn the crankshaft one full turn and measure the remaining valve clearances. Adjust if necessary.

Tightening torque (locknut)

16—20 N·m {1.6—2.1 kgf·m, 12—15 ft·lbf}

VALVE CLEARANCE



7. Install the cylinder head cover. (Refer to CYLINDER HEAD GASKET, CYLINDER HEAD GASKET REPLACEMENT, Cylinder Head Cover Installation Note.)
8. Install the EGR pipe (WL-3,WLT-3). (See EGR SYSTEM REMOVAL/INSTALLATION.)

COMPRESSION INSPECTION

COMPRESSION INSPECTION

Warning

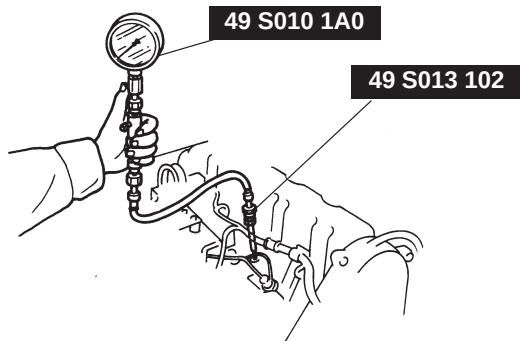
- When the engine and the oil are hot, they can badly burn. Turn off the engine and wait until they are cool.

1. Verify that the battery is fully charged. Recharge it if necessary. (Refer to Section G, CHARGING SYSTEM, BATTERY INSPECTION, Battery.)
2. Warm up the engine to the normal operating temperature.
3. Stop the engine and allow it to cool off for about 10 minutes.

Warning

- Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent fuel from spurting out of the injection nozzle hole, do not ground the FCV (fuel cut valve) terminal.

4. Disconnect the FCV (fuel cut valve) connector.
5. Remove all the glow plugs. (Refer to Section F2, INTAKE AIR SYSTEM, GLOW PLUG REMOVAL/INSTALLATION.)
6. Install the **SSTs** into the glow plug hole.



7. Crank the engine and note the maximum gauge reading.
8. Check each cylinder as above.

Compression

(kPa {kgf/cm², psi} [rpm])

Item	Engine
	WL, WL Turbo
Standard	2942 {30, 427} [200]
Minimum	2648 {27, 384} [200]

9. If the compression in one or more cylinders is low, pour a small amount of clean engine oil into the cylinder and recheck the compression.
 - (1) If the compression increases, the piston, the piston rings, or cylinder wall may be worn and overhaul is required.
 - (2) If the compression stays low, a valve may be stuck or improperly seated and overhaul is required.

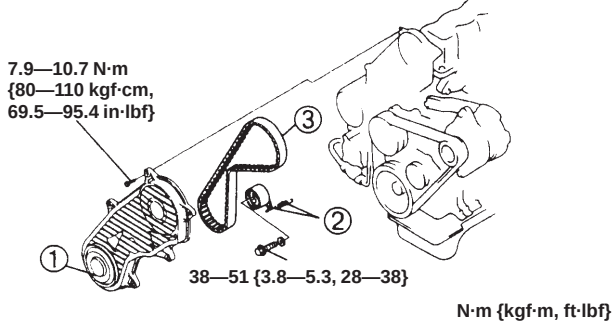
- (3) If the compression in adjacent cylinders stays low, the cylinder head gasket may be damaged or the cylinder head distorted and overhaul is required.
10. Remove the **SST**.
11. Install the glow plug. (Refer to Section F2, INTAKE AIR SYSTEM, GLOW PLUG REMOVAL/INSTALLATION.)
12. Connect the FCV (fuel cut valve) connector.

TIMING BELT

TIMING BELT

TIMING BELT REMOVAL/INSTALLATION

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

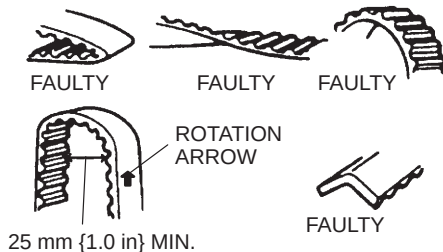


1	Timing belt cover + Installation Note
2	Tensioner, tensioner spring
3	Timing belt + Removal Note + Installation Note

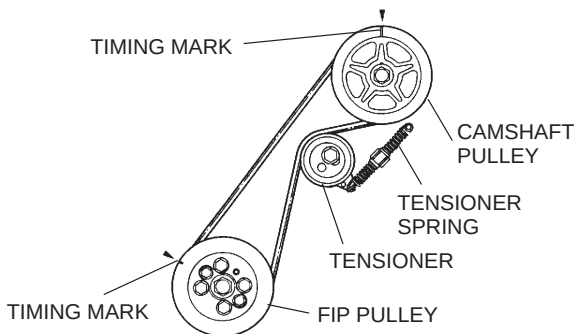
Timing Belt Removal Note

Caution

- Forcefully twisting the belt, turning it inside out, or allowing oil or grease on it will damage the belt and shorten its life.



1. Mark the timing belt rotation on the belt for proper reinstallation.
2. Turn the crankshaft clockwise and align the timing marks as shown.



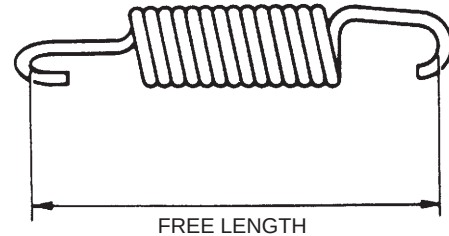
3. Remove the tensioner and tensioner spring.

Timing Belt Installation Note

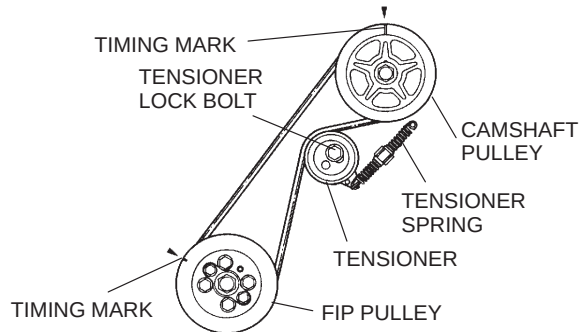
1. Measure the tensioner spring free length. Replace the tensioner spring if necessary.

Free length

63.0 mm {2.48 in}



2. Turn the crankshaft clockwise and align the timing marks as shown.



Caution

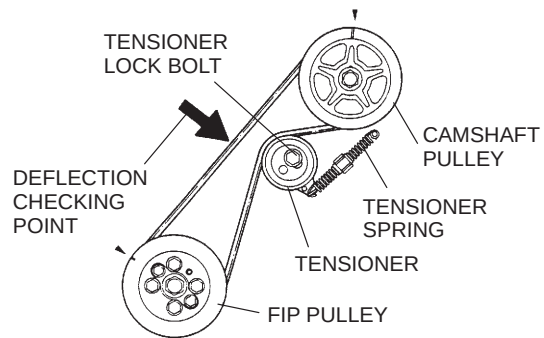
- Overtensioning of the timing belt can cause breakage of the belt and the camshaft.

3. Verify that the FIP attaching bolts and nuts are tightened to the specified torque. This must be done to prevent overtensioning of the timing belt after it has been installed.
4. Install the timing belt.
5. Install the tensioner, tensioner spring, and hand-tighten the lock bolt.
6. Turn the crankshaft clockwise twice, and align the timing marks. If they are not aligned, remove the timing belt and repeat from **Timing Belt Installation Note** Step 2.
7. Loosen the tensioner lock bolt to apply tension to the belt. Do not apply tension other than that of the tensioner spring.
8. Tighten the tensioner lock bolt. Be sure the tensioner does not move together with the bolt rotation.
9. Turn the crankshaft clockwise twice, and check the timing belt deflection as shown. If it is incorrect, repeat from **Timing Belt Removal Note**.

TIMING BELT

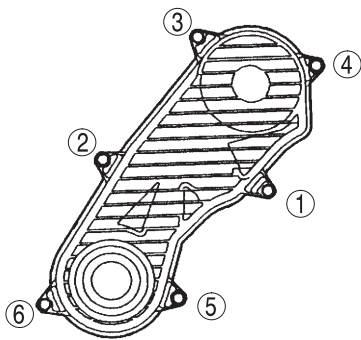
Timing belt deflection

9.0—10.0 mm {0.36—0.39 in} at
98 N {10 kgf, 22 lbf}



Timing Belt Cover Installation Note

- Tighten the timing belt cover bolts in the order shown.



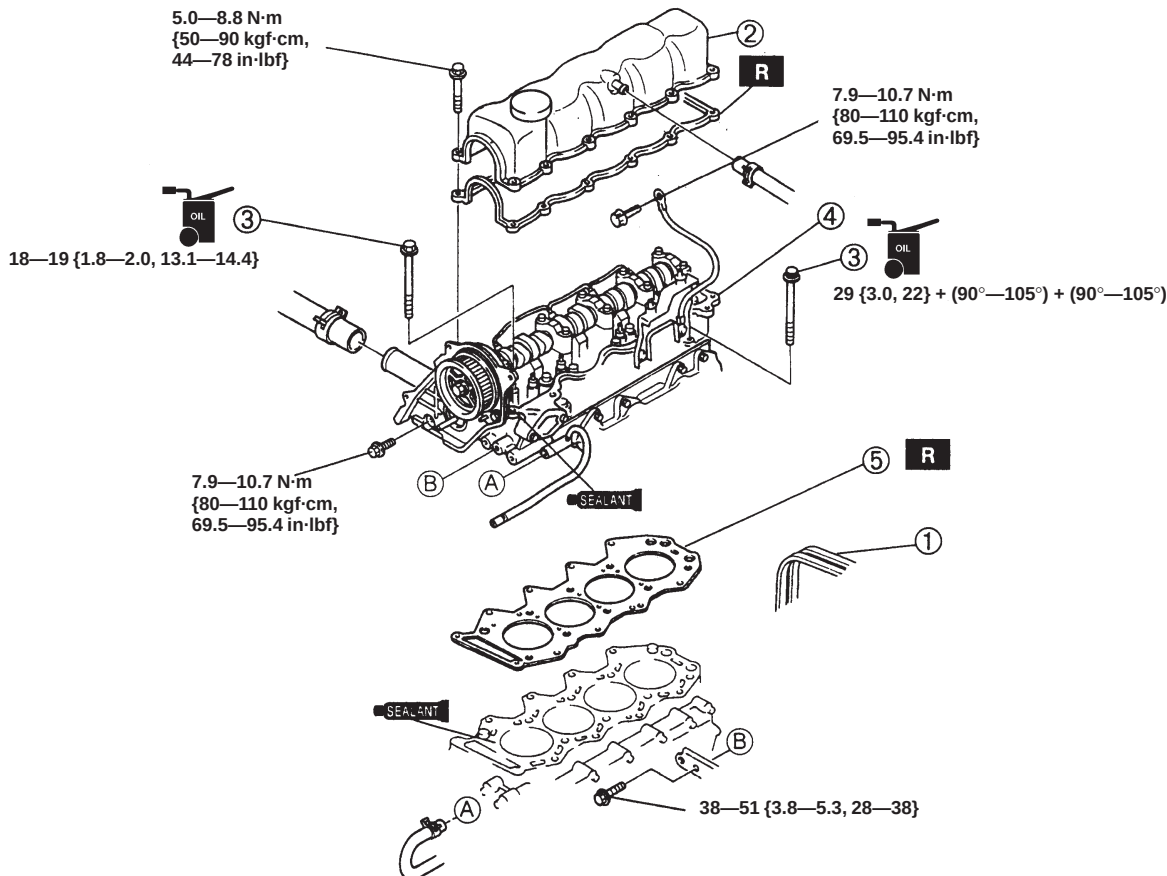
CYLINDER HEAD GASKET

CYLINDER HEAD GASKET REPLACEMENT

Warning

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures". (Refer to Section F2, FUEL SYSTEM, FUEL PRESSURE AND SERVICING FUEL SYSTEM.)

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to Section E, COOLING SYSTEM SERVICE WARNINGS.) (Refer to Section E, ENGINE COOLANT, ENGINE COOLANT REPLACEMENT.)
3. Remove the intake manifold, air intake pipe and breather chamber. (Refer to Section F2, INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
4. Remove the injection nozzle. (Refer to Section F2, FUEL SYSTEM, INJECTION NOZZLE REMOVAL/INSTALLATION.)
5. Remove the turbocharger. (WL Turbo) (Refer to Section F2, EXHAUST SYSTEM, EXHAUST SYSTEM REMOVAL/INSTALLATION.)
6. Remove the timing belt. (Refer to TIMING BELT, TIMING BELT REMOVAL/INSTALLATION.)
7. Remove in the order indicated in the table.
8. Install in the reverse order of removal.
9. Adjust the drive belt deflection. (Refer to DRIVE BELT, DRIVE BELT ADJUSTMENT.)
10. Check the engine oil level. (Refer to Section D, ENGINE OIL, ENGINE OIL INSPECTION.)
11. Bleed air in the fuel line. (Refer to Section F2, FUEL SYSTEM, FUEL FILTER AIR BLEEDING.)
12. Start the engine and
 - (1) Inspect for engine oil, engine coolant, and fuel leakage.
 - (2) Inspect the idle speed. (Refer to Section F2, ENGINE TUNE-UP, PREPARATION, Idle Speed Adjustment.)
13. Inspect the compression. (Refer to COMPRESSION INSPECTION.)



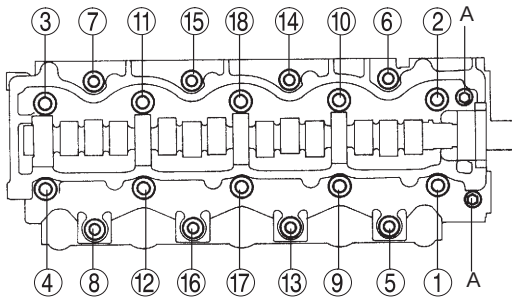
N·m {kgf·m, ft·lbf}

CYLINDER HEAD GASKET

1	Drive belt
2	Cylinder head cover + Installation Note
3	Cylinder head bolt + Removal Note + Installation Note
4	Cylinder head
5	Cylinder head gasket + Installation Note

Cylinder Head Bolt Removal Note

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

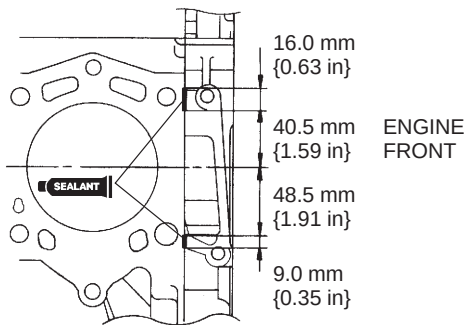


Cylinder Head Gasket Installation Note

- Apply silicone sealant to the cylinder head as shown.

Thickness

ø2.0—3.0 mm {0.08—0.11 in}



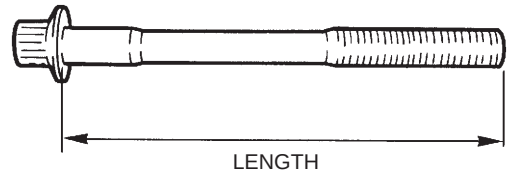
Cylinder Head Bolt Installation Note

1. Measure the length of each bolt. Replace the bolt if necessary.

Cylinder head bolt

(mm {in})

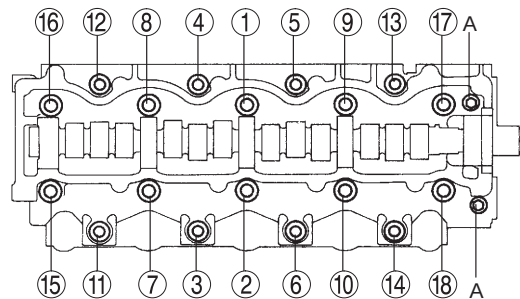
Bolt head mark	Standard length	Maximum length
W	101.2—101.8 {3.985—4.007}	102.5 {4.035}
N	113.2—113.8 {4.457—4.480}	114.5 {4.508}



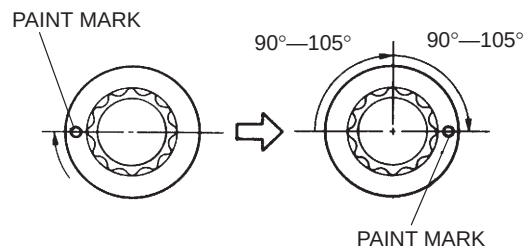
2. Apply clean engine oil to the threads and the seat face of each bolt and install them.
3. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque

29 N·m {3.0 kgf·m, 22 ft·lbf}



4. Put a paint mark on each bolt head.
5. Using the marks as a reference, tighten the bolts by turning each 90°—105° in the sequence shown.
6. Further tighten each bolt by turning another 90°—105°.



7. Tighten bolts A.

Tightening torque

18—19 N·m {1.8—2.0 kgf·m, 13.1—14.4 ft·lbf}

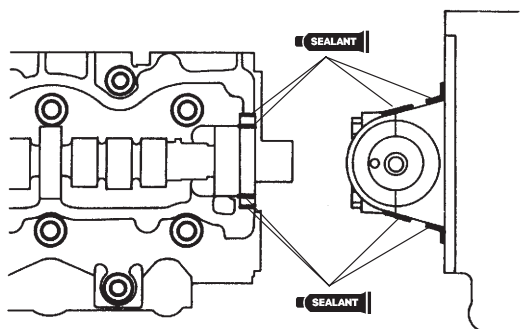
CYLINDER HEAD GASKET

Cylinder Head Cover Installation Note

1. Apply silicone sealant to the cylinder head as shown.

Thickness

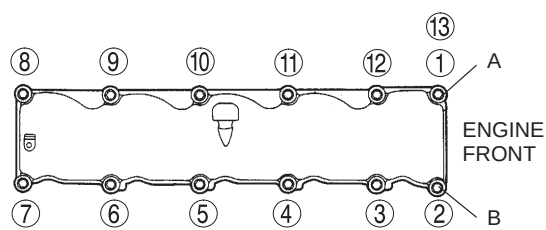
ø1.5—2.5 mm {0.060—0.098 in}



2. Tighten cylinder head cover bolts A and B.

Tightening torque

1.5—2.9 N·m {15—30 kgf·cm, 14—26 in·lbf}



3. Tighten the cylinder head cover bolts in the order shown.

Tightening torque

5.0—8.8 N·m {50—90 kgf·cm, 44—78 in·lbf}

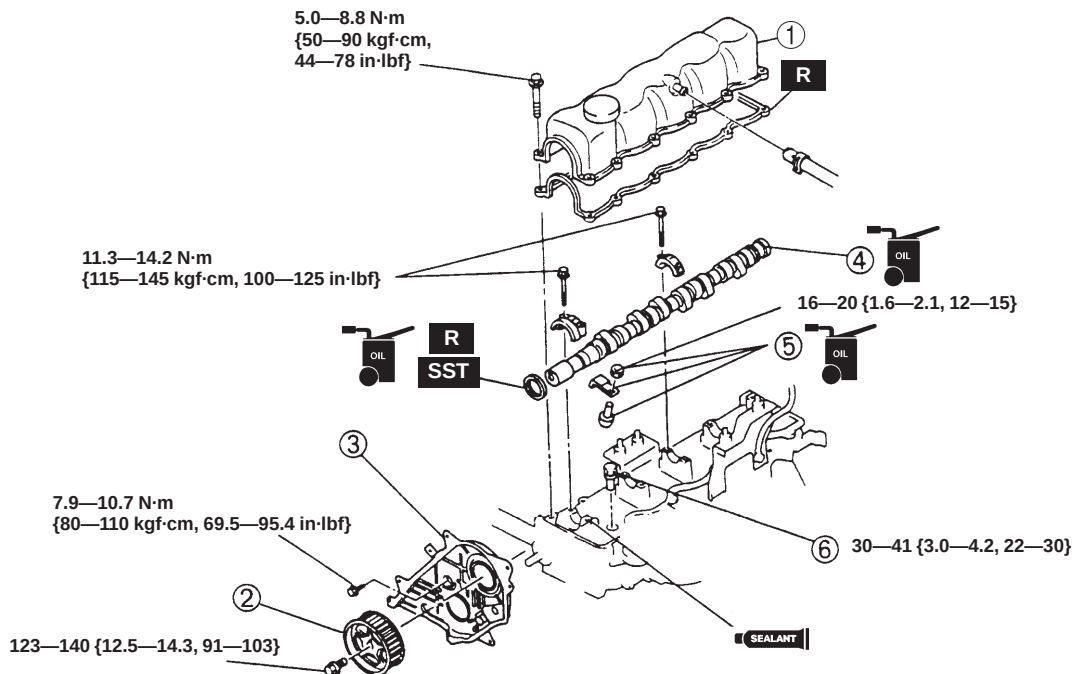
ROCKER ARM

ROCKER ARM REMOVAL/INSTALLATION

Caution

- Removing the camshaft under load can break the camshaft. When removing the camshaft, be sure to prevent the camshaft from pressing down the rocker arm. (See VALVE CLEARANCE INSPECTION/ADJUSTMENT.)

- Disconnect the negative battery cable.
- Remove the EGR pipe (WL-3,WLT-3). (See EGR SYSTEM REMOVAL/INSTALLATION.)
- Remove the air intake pipe and breather chamber. (Refer to Section F2, INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
- Remove the timing belt. (Refer to TIMING BELT, TIMING BELT REMOVAL/INSTALLATION.)
- Remove in the order indicated in the table.
- Install in the reverse order of removal.



N·m {kgf·m, ft·lbf}

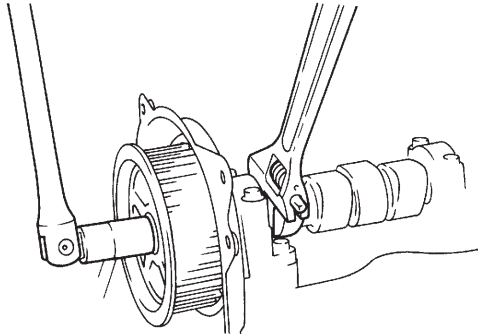
1	Cylinder head cover + VALVE CLEARANCE, VALVE CLEARANCE INSPECTION/ADJUSTMENT + CYLINDER HEAD GASKET, CYLINDER HEAD GASKET REPLACEMENT, Cylinder Head Cover Installation Note
2	Camshaft pulley + Removal Note + Installation Note

3	Seal plate + Installation Note
4	Camshaft + Removal Note + Installation Note
5	Rocker arm + Installation Note
6	Pivot

ROCKER ARM

Camshaft Pulley Removal Note

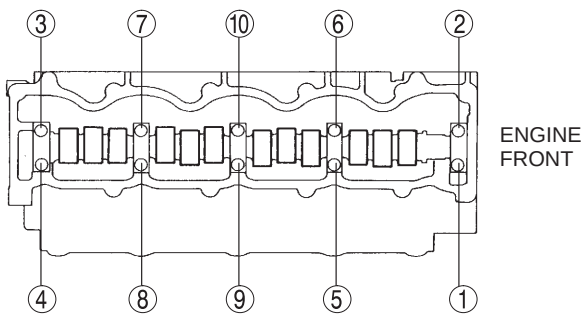
- Hold the camshaft by using a wrench on the cast hexagon.



Camshaft Removal Note

Note

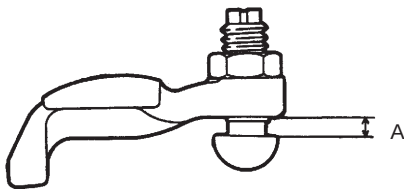
- Mark the camshaft caps so that they can be reinstalled in the position from which they were removed.
- Loosen the camshaft cap bolts in three or four steps in the order shown.



Rocker Arm Installation Note

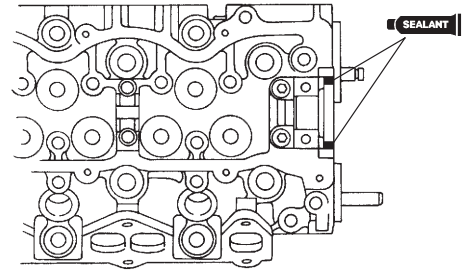
- If a new rocker arm is used, set dimension A as follows.

Dimension A
0—4 mm {0—0.1 in}

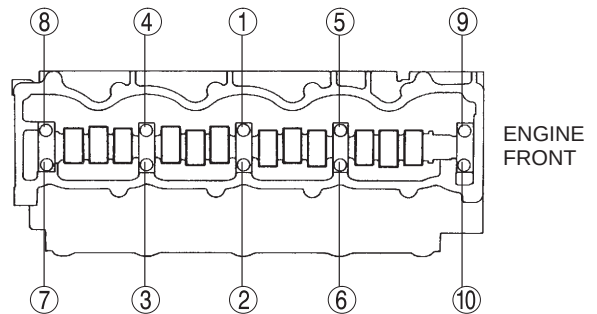


Camshaft Installation Note

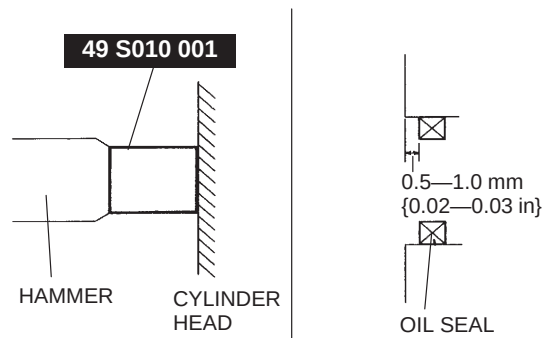
- Apply silicone sealant to the front camshaft cap mounting surfaces as shown. Prevent sealant from getting onto the camshaft journal, oil seal surface, and camshaft thrust surface.



- Tighten the camshaft cap bolts gradually in three or four steps in the order shown.

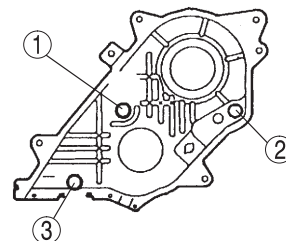


- Apply clean engine oil to the new oil seal.
- Push the oil seal slightly in by hand.
- Tap the oil seal into the cylinder head by using the SST and a hammer.
- To ensure that the oil seal is installed accurately, measure distance between the end of the cylinder head and the face of the oil seal.



Seal Plate Installation Note

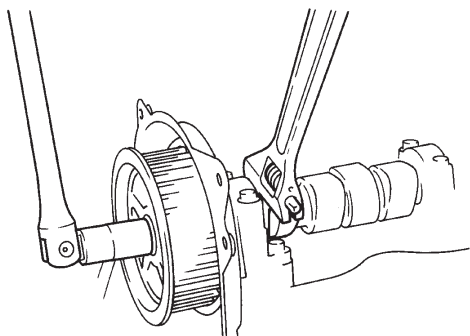
- Tighten the seal plate bolts in the order shown.



ROCKER ARM, FRONT OIL SEAL

Camshaft Pulley Installation Note

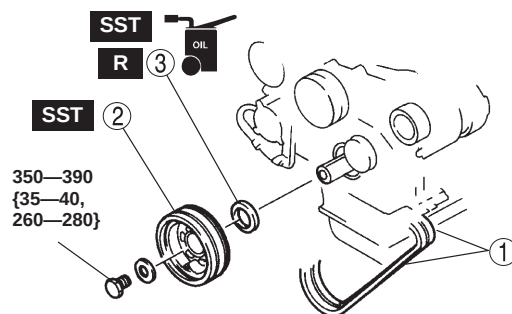
- Hold the camshaft by using a wrench on the cast hexagon and tighten the pulley lock bolt.



FRONT OIL SEAL

FRONT OIL SEAL REPLACEMENT

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to Section E, COOLING SYSTEM SERVICE WARNINGS.) (Refer to Section E, ENGINE COOLANT, ENGINE COOLANT REPLACEMENT.)
3. Remove the upper radiator hose.
4. Remove the radiator cowl and cooling fan. (Refer to Section E, WATER PUMP, WATER PUMP REMOVAL/INSTALLATION.)
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Inspect the engine oil level.
8. Adjust the drive belt deflection. (Refer to DRIVE BELT, DRIVE BELT ADJUSTMENT.)



N·m {kgf·m, ft·lbf}

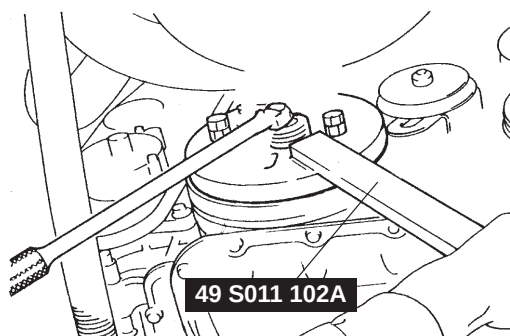
1	Drive belt
2	Crankshaft pulley + Removal Note + Installation Note
3	Front oil seal + Removal Note + Installation Note

Crankshaft Pulley Removal Note

- Hold the crankshaft by using the SST.

Caution

- Turning the crankshaft after the crankshaft pulley is removed can cause the timing gear to become dislocated.
- Removing the key can cause the key groove to become misaligned.



REAR OIL SEAL

Caution

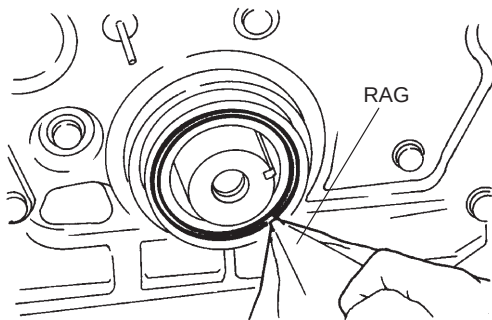
(WL-3, WLT-3)

- The TDC sensor plate is a very important part for engine operation control; any deformation of the plate may disable the operation control.
When disassembling/assembling the crankshaft pulley, be very careful not to deform the plate by interference with other parts or improper handling.

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When disassembling/assembling the crankshaft pulley, be very careful not to deform the plate by interference with other parts or improper handling.

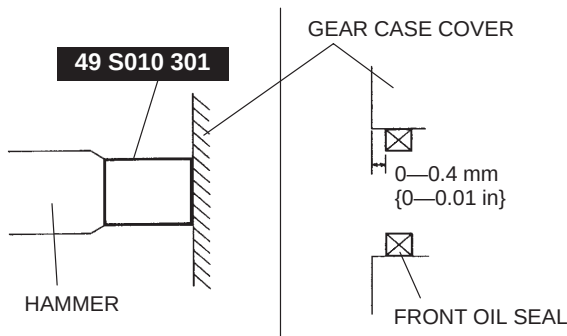
Front Oil Seal Removal Note

1. Cut the oil seal lip by using a razor knife.
2. Remove the oil seal by using a screwdriver protected with a rag.



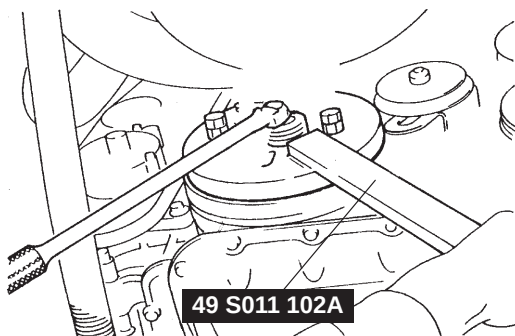
Front Oil Seal Installation Note

1. Apply clean engine oil to the new oil seal lip.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly by using the **SST** and a hammer.
4. To ensure that the oil seal is installed accurately, measure the distance between the end of the gear case cover and the face of the front oil seal.

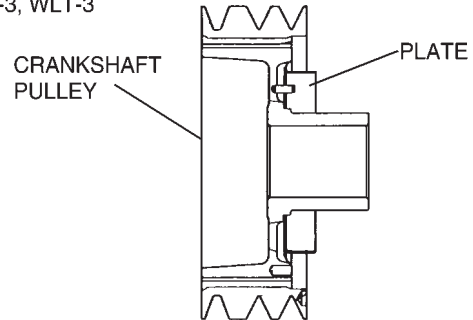


Crankshaft Pulley Installation Note

- Hold the crankshaft by using the **SST**.



WL-3, WLT-3



CE2220W003

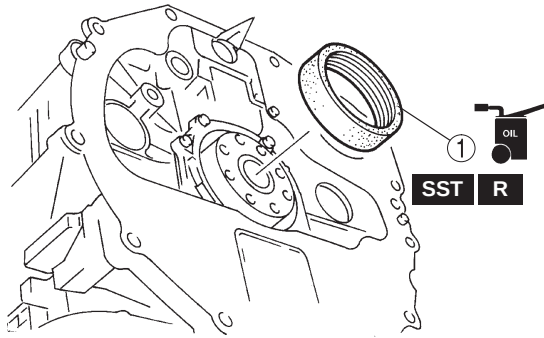
Caution

(WL-3, WLT-3)

REAR OIL SEAL

REAR OIL SEAL REPLACEMENT

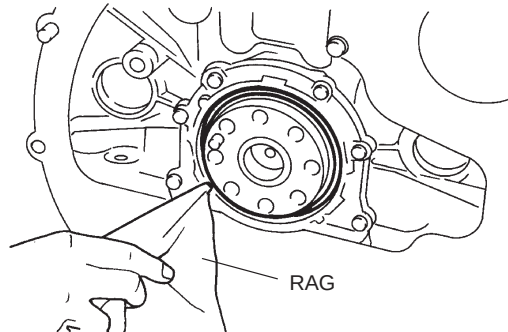
1. Disconnect the negative battery cable.
2. Remove the flywheel. (Refer to Section H, CLUTCH UNIT, CLUTCH UNIT REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Inspect the engine oil level. (Refer to Section D, ENGINE OIL, ENGINE OIL INSPECTION.)



1	Rear oil seal + Removal Note + Installation Note
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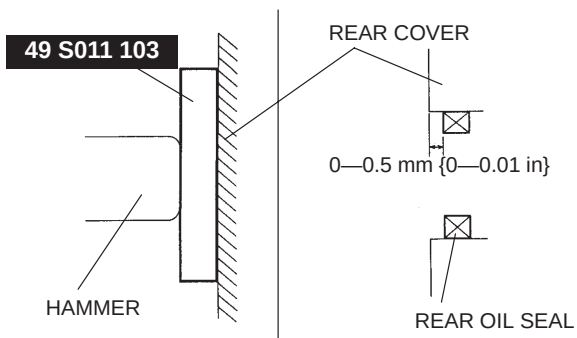
Rear Oil Seal Removal Note

1. Cut the oil seal lip by using a razor knife.
2. Remove the oil seal by using a screwdriver protected with a rag.



Rear Oil Seal Installation Note

1. Apply clean engine oil to the new oil seal lip.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly by using the **SST** and a hammer.
4. To ensure that the oil seal is installed accurately, measure the distance between the end of the rear cover and the face of the rear oil seal.



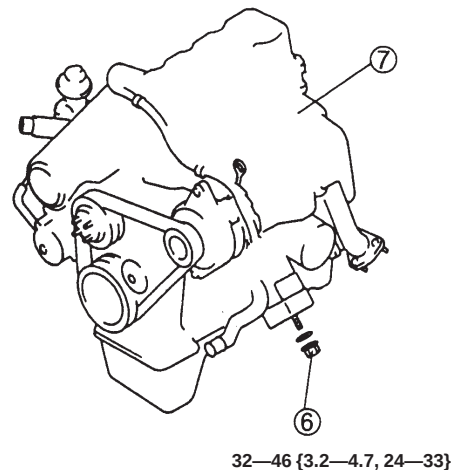
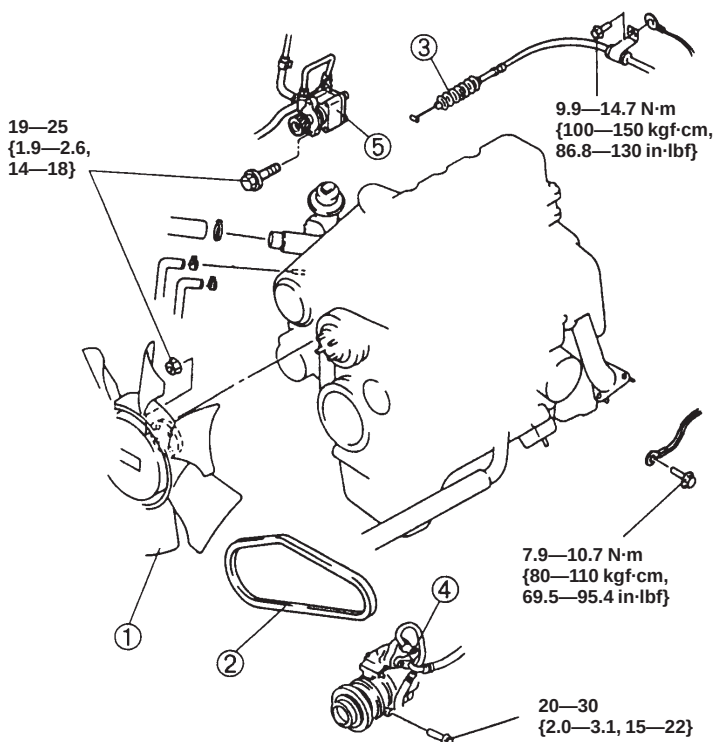
ENGINE

ENGINE REMOVAL/INSTALLATION

Warning

- Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.
- Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedures". (Refer to Section F2, FUEL SYSTEM, FUEL PRESSURE AND SERVICING FUEL SYSTEM.)

1. Remove the air intake pipe. (Refer to Section F2, INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
2. Remove the battery. (Refer to Section G, CHARGING SYSTEM, BATTERY REMOVAL/INSTALLATION.)
3. Remove the radiator. (Refer to Section E, RADIATOR, RADIATOR REMOVAL/INSTALLATION.)
4. Remove the front pipe. (Refer to Section F2, EXHAUST SYSTEM, EXHAUST SYSTEM REMOVAL/INSTALLATION.)
5. Remove the transmission. (Refer to section J1–J2, TRANSMISSION, TRANSMISSION REMOVAL/INSTALLATION.)
6. Remove in the order indicated in the table.
7. Install in the reverse order of removal.
8. Adjust the drive belt deflection. (Refer to DRIVE BELT, DRIVE BELT ADJUSTMENT.)
9. Bleed air in the fuel line. (Refer to Section F2, FUEL SYSTEM, FUEL FILTER AIR BLEEDING.)
10. Start the engine and
 - (1) Inspect the engine oil, engine coolant, and fuel leakage.
 - (2) Inspect the idle speed. (Refer to Section F2, ENGINE TUNE-UP, IDLE SPEED PREPARATION, Idle Speed Adjustment.)
11. Perform a road test.



N·m {kgf·m, ft·lbf}

1	Cooling fan
2	Drive belt
3	Accelerator cable
4	A/C compressor + Removal Note

5	P/S oil pump + Removal Note
6	Engine mount nut
7	Engine + Removal/Installation Note

ENGINE

A/C Compressor Removal Note

- Remove the A/C compressor with the pipe still connected. Position the A/C compressor so that it is out of the way.

P/S Oil Pump Removal Note

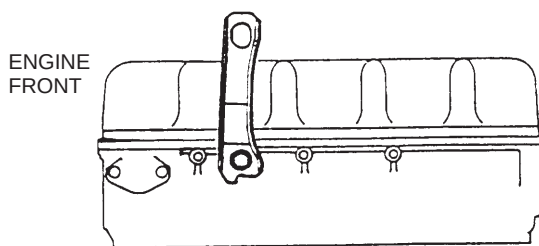
- Remove the P/S oil pump with the oil hose still connected. Position the P/S oil pump so that it is out of the way.

Engine Removal/Installation Note

- Install the engine hanger (JE48 10 561C) to the cylinder head by using bolt (99794 0820) or (M8 × 1.25, 6T, length 20 mm {0.79 in}) as shown.

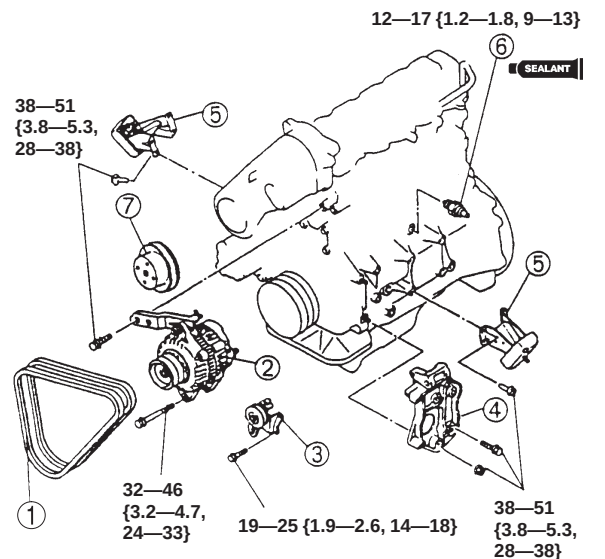
Tightening torque

19—25 N·m {1.9—2.6 kgf·m, 14—18 ft·lbf}



ENGINE DISASSEMBLY/ASSEMBLY

- Remove the intake-air system. (Refer to Section F2, INTAKE-AIR SYSTEM, INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
- Remove the exhaust system. (Refer to Section F2, EXHAUST SYSTEM, EXHAUST SYSTEM REMOVAL/INSTALLATION.)
- Remove the oil cooler. (Refer to Section D, OIL COOLER, OIL COOLER REMOVAL/INSTALLATION.)
- Disassemble in the order indicated in the table.
- Assemble in the reverse order of disassembly.



N·m {kgf·m, ft·lbf}

1	Drive belt
2	Generator
3	Idler
4	A/C compressor bracket
5	Engine mount bracket
6	Oil pressure switch + Section D, OIL PRESSURE INSPECTION
7	Water pump pulley