ENGINE

CONTENTS

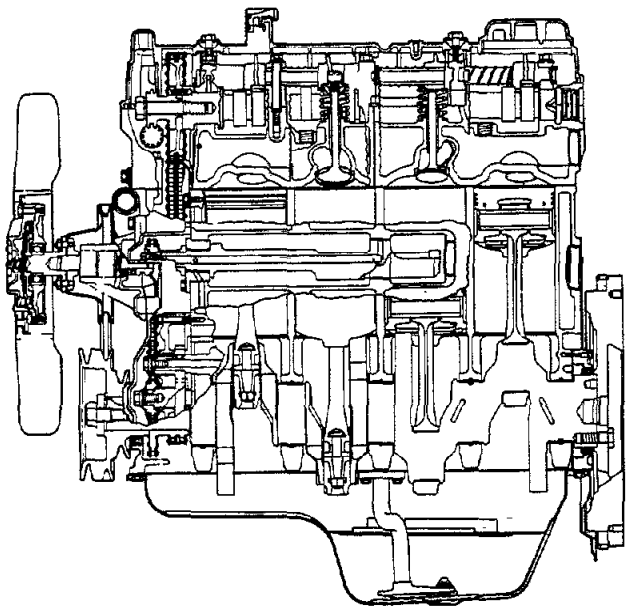
N09AA-

ENGINE <2.6L>

N09BA-A

GENERAL INFORMATION

SECTIONAL VIEW



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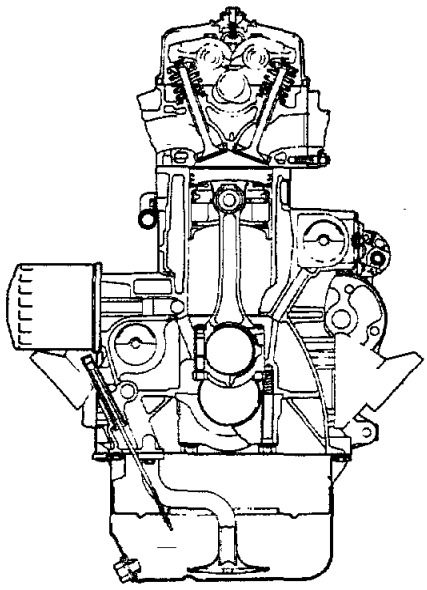

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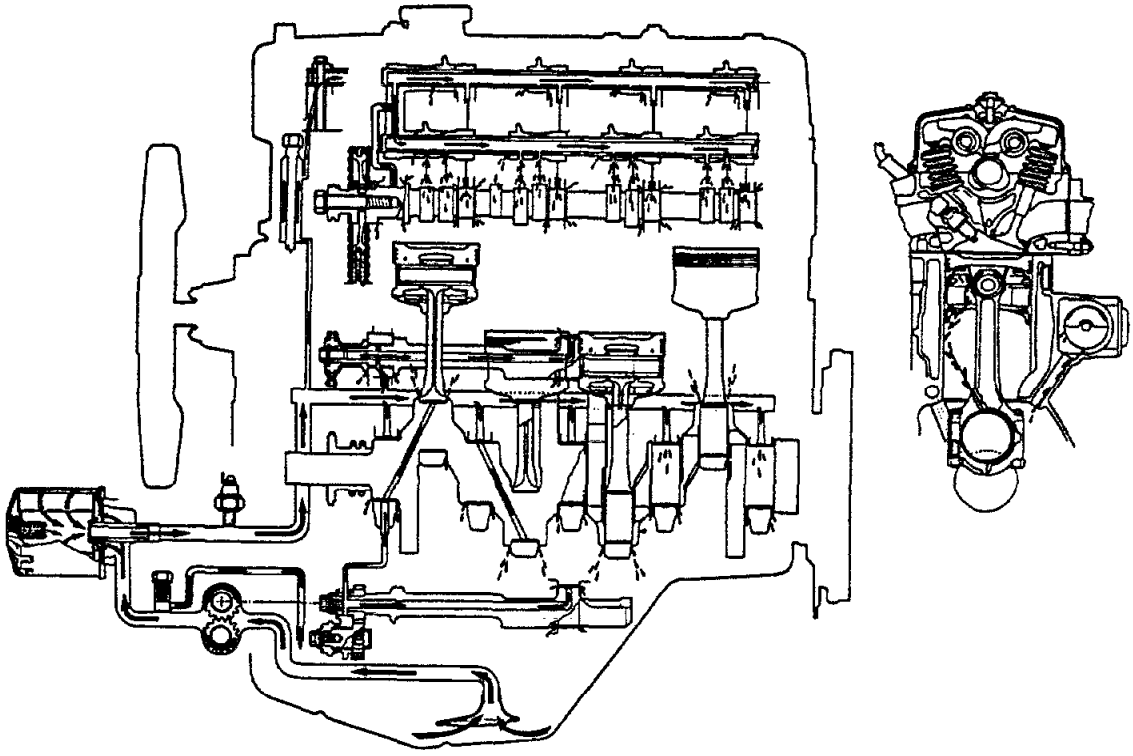
LUBRICATION DIAGRAM



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SPECIFICATIONS

GENERAL SPECIFICATIONS

N09CA-A

Items	Specifications
Type	In-line OHC
Number of cylinders	4
Bore mm (in.)	91.1 (3.587)
Stroke mm (in.)	98.0 (3.858)
Piston displacement cc (cu.in.)	2,555 (155.9)
Compression ratio	8.7
Firing order	1–3–4–2
Valve timing	
Intake valve	
Opens (BTDC)	25°
Closes (ABDC)	59°
Exhaust valve	
Opens (BBDC)	64°
Closes (ATDC)	20°
Jet valve	
Opens (BTDC)	25°
Closes (ABDC)	59°

SERVICE SPECIFICATIONS

N09CB-A

Items	Standard value	Limit
General		
Compression pressure kPa (psi)/rpm		840 (119)/250–400
Pressure difference of all cylinder kPa (psi)		Less than 100 (14)
Manifold vacuum kPa (in.Hg)	67 (20)	
Cylinder head		
Overall height mm (in.)	90.0 (3.543)	*–0.2 (–.008)
Flatness of gasket surface mm (in.)	Less than 0.05 (.0020)	0.2 (.008)
Flatness of manifold mounting surface mm (in.)	Less than 0.15 (.0059)	0.3 (.012)
Over size rework dimension of valve seat hole mm (in.)		
Intake 0.3 (.012) O.S.	47.300–47.325 (1.8622–1.8632)	
0.6 (.024) O.S.	47.600–47.625 (1.8740–1.8750)	
Exhaust 0.3 (.012) O.S.	40.300–40.325 (1.5866–1.5876)	
0.6 (.024) O.S.	40.600–40.625 (1.5984–1.5994)	

*Limit must be –0.2 (–.008) combined with amount of grinding of cylinder block gasket surface.

Items	Standard value	Limit
Oversize rework of valve guide hole (both inlet and exhaust) mm (in.)		
0.05 (.002) O.S.	13.050–13.068 (.5138–.5145)	
0.25 (.010) O.S.	13.250–13.268 (.5217–.5224)	
0.50 (.020) O.S.	13.500–13.518 (.5315–.5422)	
Oversize rework of valve seat height mm (in.)		
Intake 0.3 (.012)	7.9–8.1 (.311–.319)	
0.6 (.024)	8.2–8.4 (.323–.331)	
Exhaust 0.3 (.012)	7.9–8.1 (.311–.319)	
0.6 (.024)	8.2–8.4 (.323–.331)	
Oversize rework of valve guide hole (both intake and exhaust) mm (in.)		
0.05 (.002) O.S.	13.050–13.068 (.5138–.5145)	
0.25 (.010) O.S.	13.250–13.268 (.5217–.5224)	
0.50 (.020) O.S.	13.500–13.518 (.5315–.5322)	
Timing chain		
No. of links	102	
Pitch mm (in.)	9.5 (.374)	
Timing chain "B" for silent shaft drive		
No. of links	90	
Pitch mm (in.)	8.0 (.315)	
Clearance between chain and chain guide mm (in.)	0.2–0.8 (.008–.031)	
Camshaft		
Cam height mm (in.)		
Intake	42.43 (1.6705)	41.93 (1.6508)
Exhaust	42.43 (1.6705)	41.93 (1.6508)
Height of fuel pump drive cam mm (in.)	37 (1.46)	
Journal diameter mm (in.)	34 (1.34)	
Oil clearance mm (in.)	0.05–0.09 (.0020–.0035)	
End play mm (in.)	0.1–0.2 (.004–.008)	0.4 (.016)
Rocker arm		
I.D. mm (in.)	19 (.75)	
Clearance (Rocker arm-to-shaft) mm (in.)	0.01–0.04 (.0004–.0016)	0.10 (.0039)
Rocker arm shaft		
O.D. mm (in.)	18.9 (.744)	
Rocker arm shaft spring		
Free length mm (in.)		
Intake	64.5 (2.539)	
Exhaust	64.5 (2.539)	

Items	Standard value	Limit
Valve		
Valve length mm (in.)		
Intake	107.96 (4.2504)	
Exhaust	105.86 (4.1677)	
Stem O.D. mm (in.)		
Intake	7.960–7.975 (.3134–.3140)	
Exhaust	7.930–7.950 (.3122–.3130)	
Face angle	45°–45°30′	
Thickness of valve head mm (in.) (Margin)		
Intake	1.2 (.047)	0.7 (.028)
Exhaust	2.0 (.079)	1.5 (.059)
Valve stem to valve guide clearance mm (in.)		
Intake	0.03–0.06 (.0012–.0024)	0.10 (.0039)
Exhaust	0.05–0.09 (.0020–.0035)	0.15 (.0059)
Valve guide		
Length mm (in.)		
Intake	47 (1.85)	
Exhaust	52 (2.05)	
Service size mm (in.)	0.05 (.002), 0.25 (.010), 0.50 (.020) Oversize	
Valve seat		
Width of seat contact mm (in.)	0.7–1.2 (.028–.047)	
Seat angle	45°	
Valve spring		
Free length mm (in.)	49.8 (1.961)	48.8 (1.921)
Load N (lbs.)	329 (73) at installed height	
Installed height mm (in.)	40.4 (1.591)	41.4 (1.630)
Out of squareness	Less than 2°	4°
Jet valve		
Length mm (in.)	92.53 (3.6429)	
Stem O.D. mm (in.)	4.3 (.169)	
Seat angle	45°	
Valve clearance-Hot engine mm (in.)	0.25 (.0098)	
Valve clearance-Cold engine (Reference) mm (in.)	0.17 (.0067)	
Jet valve spring		
Free length mm (in.)	29.60 (1.1654)	
Load N (lbs.)	35 (7.7) at installed height	
Installed height mm (in.)	21.50 (.8465)	
Out of squareness	Less than 1.5°	
Cylinder block		
Cylinder bore mm (in.)	91.1 (3.587)	
Out-of-roundness and taper of cylinder bore mm (in.)	Less than 0.02 (.0008)	
Overall height mm (in.)	316 (12.44)	*–0.2 (–.008)
Flatness of gasket surface mm (in.)	Less than 0.05 (.0020)	0.1 (.004)

NOTE
*Limit must be –0.2 (–.008) combined with amount of grinding of cylinder head gasket surface.

TSB Revision

Items	Standard value	Limit
Right silent shaft		
Front journal diameter mm (in.)	21 (.83)	
Rear journal diameter mm (in.)	43 (1.69)	
Oil clearance mm (in.)		
Rear	0.094–0.135 (.0037–.0053)	
Left silent shaft		
Front journal diameter mm (in.)	23 (.91)	
Rear journal diameter mm (in.)	43 (1.69)	
Oil clearance mm (in.)		
Front	0.020–0.062 (.0008–.0024)	
Rear	0.094–0.135 (.0037–.0053)	
Piston		
O.D. mm (in.)	91.1 (3.587)	
Clearance (piston-to-cylinder) mm (in.)	0.02–0.04 (.0008–.0016)	
Ring groove width mm (in.)		
No. 1 and No. 2	1.5 (.059)	
Oil	4.0 (.157)	
Service size mm (in.)	0.25 (.010), 0.50 (.020), 0.75 (.030), 1.00 (.039) Oversize	
Piston ring		
Side clearance mm (in.)		
No. 1	0.05–0.09 (.0020–.0035)	0.12 (.0047)
No. 2	0.02–0.06 (.0008–.0024)	0.10 (.0039)
End gap mm (in.)		
No. 1	0.30–0.45 (.0118–.0177)	0.8 (.031)
No. 2	0.25–0.40 (.0098–.0157)	0.8 (.031)
Oil ring side rail	0.30–0.80 (.0118–.0315)	1.0 (.039)
Service size mm (in.)	0.25 (.010), 0.50 (.020), 0.75 (.030), 1.00 (.039) Oversize	
Connecting rod		
Bend mm (in.)	0.05(.0020) or less	
Twist mm (in.)	0.10 (.0039) or less	
Connecting rod big end to crankshaft side clearance mm (in.)	0.10–0.25 (.0039–.0098)	0.4 (.016)
Piston pin press-in load N (lbs.)	7,500–17,500 (1,653–3,858)	
Connecting rod bearing		
Oil clearance mm (in.)	0.019–0.056 (.0007–.0022)	0.1 (.004)
Service size mm (in.)	0.25 (.010), 0.50 (.020), 0.75 (.030) Undersize	
Crankshaft main bearing		
Oil clearance mm (in.)	0.021–0.046 (.0008–.0018)	0.1 (.004)
Service size mm (in.)	0.25 (.010), 0.50 (.020), 0.75 (.030) Undersize	

Items	Standard value	Limit
Crankshaft		
Pin O.D. mm (in.)	53 (2.09)	
Journal O.D. mm (in.)	60 (2.36)	
Out-of-roundness of journal and pin mm (in.)	0.015 (.0006) or less	
Taper of journal and pin mm (in.)	0.005 (.0002) or less	
End play mm (in.)	0.05–0.18 (.0020–.0071)	0.4 (.016)
Undersize rework dimension of pin mm (in.)		
0.25 (.010) U.S.	52.735–52.750 (2.0762–2.0768)	
0.50 (.020) U.S.	52.485–52.500 (2.0663–2.0669)	
0.75 (.030) U.S.	52.235–52.250 (2.0565–2.0571)	
Undersize rework dimension of journal mm (in.)		
0.25 (.010) U.S.	59.735–59.750 (2.3518–2.3524)	
0.50 (.020) U.S.	59.485–59.500 (2.3419–2.3425)	
0.75 (.030) U.S.	59.235–59.250 (2.3321–2.3327)	
Flywheel		
Runout mm (in.)		0.13 (.0051) or less
Oil pressure at curb idle speed [conditions: oil temperature is 75–90°C (167–194°F)] kPa (psi)	80 (11.4) or more	
Oil pump		
Driven gear		
Tip clearance mm (in.)	0.11–0.15 (.0043–.0059)	0.20 (.0079)
Side clearance mm (in.)	0.04–0.10 (.0016–.0039)	0.15 (.0059)
Drive gear		
Tip clearance mm (in.)	0.11–0.15 (.0043–.0059)	0.20 (.0079)
Side clearance mm (in.)	0.05–0.11 (.0020–.0043)	0.15 (.0059)
Relief spring		
Free height mm (in.)	46.6 (1.835)	
Load N (lbs.) [at 40.1 mm (1.579 in.)]	61 (13)	

NOTE
O.D. = Outer Diameter
I.D. = Inner Diameter
O.S. = Oversize Diameter
U.S. = Undersize Diameter

TORQUE SPECIFICATIONS

N09CC-A

Items	Nm	ft.lbs.
Cylinder head bolts–Cold engine	90–100	65–72
Cylinder head bolts–Hot engine	100–110	73–79
Cylinder head bolts (M8 bolt)	15–22	11–15
Camshaft bearing cap bolts (M8X70 bolt)	19–21	14–15
(M8X25 bolt)	20–27	15–19
Camshaft sprocket bolts	50–60	37–43
Rocker cover bolts	5–7	4–5
Jet valve assembly	18–22	13–15
Rocker arm adjusting nuts for jet valve	8–10	6–7
Main bearing cap bolts	75–85	55–61
Connecting rod cap nuts	45–48	33–34

TSB Revision

Items	Nm	ft.lbs.
Crankshaft pulley bolts	110–130	80–94
Oil pump driven gear bolt	60–70	44–50
Silent shaft sprocket bolt	60–70	44–50
Silent shaft chamber cover bolts	5–7	4–5
Flywheel bolts	130–140	94–101
Engine support brackets bolts	50–60	37–43
Chain guide "B" bolt (Upper)	8–10	6–7
Chain guide "B" bolt (Lower)	15–22	11–15
Oil pump cover bolt	10–12	7–9
Oil pump body screw	8–10	6–7
Oil pump assembly mounting bolt	10–12	7–9
Thrust plate bolt	10–12	7–9
Oil pan bolt	6–8	4–6
Oil pan drain plug	35–45	26–32
Oil screen bolt	15–22	11–15
Oil relief valve plug	30–45	22–32
Oil pressure switch	15–22	11–15
Exhaust manifold to front exhaust pipe	20–30	14–22
Engine mounting front insulator to frame	30–40	22–29
Engine to engine mounting front insulator	13–20	9–15
No. 2 crossmember to frame	55–75	40–54
Plate to body	18–25	13–18
Plate to transfer mounting insulator	18–25	13–18
Transfer mounting insulator to transfer mounting bracket	18–25	13–18
Transfer mounting bracket to transfer	18–25	13–18
No. 2 crossmember to engine mounting rear insulator	18–25	13–18
Engine mounting rear insulator to engine	18–25	13–18
Rear engine support member to No. 2 crossmember	18–25	13–18
Power steering oil pump to pump bracket	25–33	18–24
Power steering breather pipe	8–12	6–9
Front insulator stopper to heat protector	6–10	4–7
Chain guide access hole cover bolt	10–12	7–9
Timing chain case bolt	12–15	9–11
Chain guide "A" bolt	10–12	7–9
Chain guide "C" bolt	10–12	7–9
Oil filter	11–12	8–9

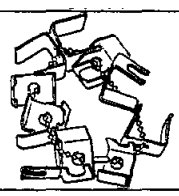
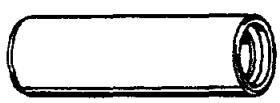
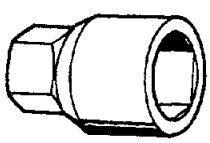
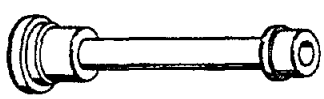
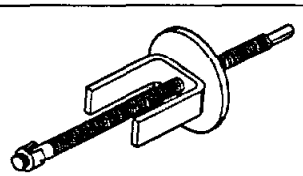
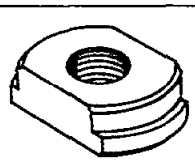
SEALANTS AND ADHESIVES

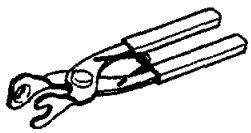
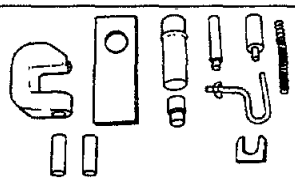
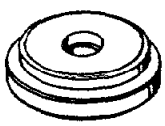
N09CE-A

Items	Specified sealants and adhesives	Quantity
Semi-circular packing	3M ART Part No. 8660 or equivalent	As required
Oil pressure switch	3M ART Part No. 8660 or equivalent	As required
Contact surface between cylinder block and chain case	3M ART Part No. 8660 or equivalent	As required
Oil pan gasket	MITSUBISHI GENUINE Part No. MZ100168 or equivalent	As required

SPECIAL TOOLS

N09DA-A

Tool	Number	Name	Use
	MD998443-01	HOLDER, auto-lash adjuster	Supporting of the auto-lash adjuster to prevent it from falting when rocker shaft assembly is removed or installed
	MD998729-01	INSTALLER, valve stem seal	Installation of valve stem seal
	MD998054-01	WRENCH, Oil pressure switch	Removal and installation of oil pressure switch
	MD998250-01	INSTALLER, front and rear silent shaft bearings	Installation of silent shaft bearing Use with MB990938-01
	MB990938-01	INSTALLER, right silent shaft front bearing	Installation of silent shaft bearing Use with MD998373-01
	MIT304204	REMOVER, silent shaft front bearing	Removal of silent shaft bearing
	MD998251-01	PULLER, silent shaft bearing	Removal of silent shaft bearing Use with MIT304204

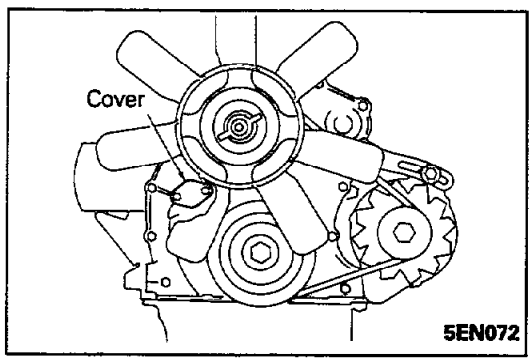
Tool	Number	Name	Use
	MD998308-01	INSTALLER, jet valve stem seal	Installation of jet valve stem seal
	MD998309	PLIER, jet valve spring	Disassembling and reassembling of jet valve assembly
	MD998310	WRENCH, jet valve	Removal and installation of jet valve
	MD998184-01	SETTING TOOL, piston pin	Removal and Installation of piston pin
	MD998376-01	INSTALL, crankshaft rear oil seal	Installation of crankshaft rear oil seal

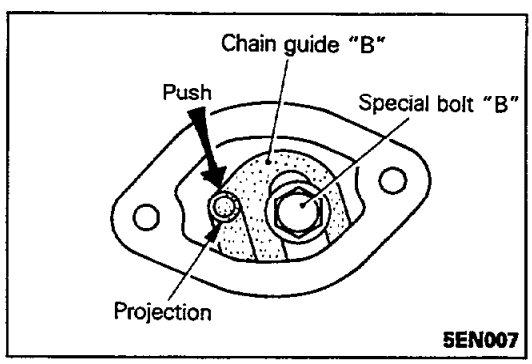
TROUBLESHOOTING

N09EAAEa

Symptom	Probable cause	Remedy
Compression too low	Cylinder head gasket blown	Replace gasket
	Piston ring worn or damage	Replace rings
	Piston or cylinder worn	Repair or replace piston and/or cylinder block
	Valve seat worn or damage	Repair or replace valve and/or seat ring
Oil pressure drop	Engine oil level too low	Check engine oil level
	Oil pressure switch faulty	Replace oil pressure switch
	Oil filter clogged	Install new filter
	Oil pump gears or body worn	Replace gears and/or body
	Thin or diluted engine oil	Change engine oil correct viscosity
	Oil relief valve stuck (opened)	Repair relief valve
	Excessive bearing clearance	Replace bearings

Symptom	Probable cause	Remedy
Oil pressure too high	Oil relief valve stuck (closed)	Repair relief valve
Noisy valves	Incorrect auto-lash adjuster	Replace auto-lash adjuster
	Thin or diluted engine oil (low oil pressure)	Change engine oil
	Valve stem or valve guide worn or damage	Replace valve and/or guide
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check engine oil level
	Low oil pressure	Refer to "Oil pressure drop"
	Thin or diluted engine oil	Change engine oil
	Excessive bearing clearance	Replace bearings
Timing chain noise	Loose timing chain	Replace timing chain and/or sprockets
Excessive engine rolling and vibration	Loose No. 2 member	Retighten
	Broken mount insulator	Replace





ENGINE ADJUSTMENT

SILENT SHAFT DRIVE CHAIN TENSION ADJUSTMENT N09FIAA

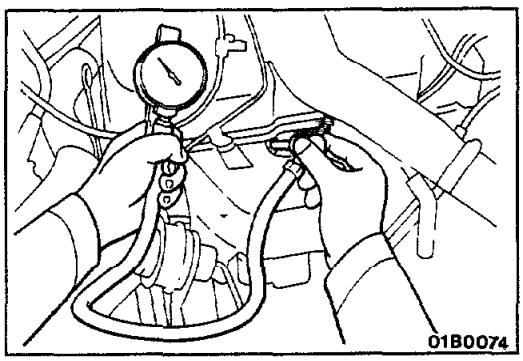
When a loose silent shaft drive chain is suspected as the probable cause of abnormal noise, the tension must be readjusted. Tension of silent shaft drive chain can be adjusted without removing timing chain cover as follows:

(1) Remove cover from access hole provided at center of chain case (under water pump).
(2) Loosen special bolt "B".
(3) Using your finger push projection on chain guide "OB" in direction of arrow. Do not push projection with a screwdriver or other tool. Improperly chain tension will cause abnormal noise.
(4) Tighten special bolt "B".
(5) Install cover. Do not reuse damaged gasket.

Cover bolt tightening torque: 10–12 Nm (7–9 ft.lbs.)

COMPRESSION PRESSURE CHECK N09FFAE

(1) Before checking compression, ensure that engine oil, the starter motor, and battery are all in normal operating condition.
(2) Start the engine and wait until engine coolant temperature has risen to 85°–95°C (185–205°F).
(3) Stop the engine and pull the spark plug cables.
(4) Remove the spark plugs.
(5) Crank the enigne to remove any foreign objects in the cylinders.



Caution
Cover the spark plug holes with shop towel, etc., in order to keep expelled foreign objects from flying out, and keep away from the holes. When measuring compression with water, oil, or fuel having entered the cylinder through a crack, etc., these will come flying out of the spark plug hole hot and fast, so to sure to take the proper precautions.

(6) Set the compression gauge to the spark plug hole.
(7) Holding the throttle valve full open, crank the engine and measure compression.

Limit : 840 kPa (119 psi) [250–400 rpm]

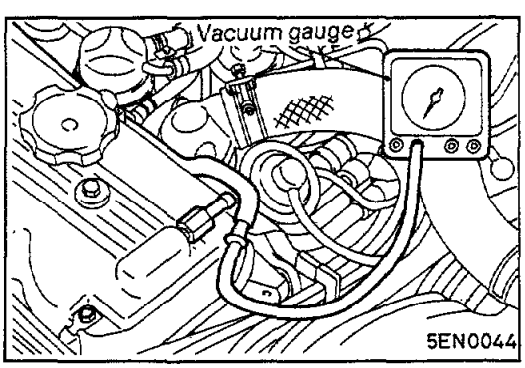
(8) Perform (6) and (7) above for all the cylinders, ensuring that compression pressure differential for each of the cylinders is within the specified limit.

Limit : Less than 100 kPa (14 psi)

(9) If a cylinder's compression or pressure differential exceeds the limit, add a small amount of oil through the spark plug hole and repeat steps (6) to (8).
   ① If the addition of oil brings compression up, it is possible that there is harmful friction between the piston ring and cylinder wall.
   ② If not compression up, valve seizure, poor valve seating, or a compression leak from the gasket are all possible.

MANIFOLD VACUUM INSPECTION N09FNAK

(1) Before inspection, put the vehicle into the following condition.
   - Engine coolant temperature : 85–95°C (185–205°F)
   - Lights, motor cooling fan, and accessories : OFF
   - Transmission : Neutral
   - Steering wheel : Straight forward position
(2) Connect a tachometer.
(3) Disconnect the ventilation hose from the positive crankcase ventilation valve, and then connect the hose to a vacuum gauge.



(4) Start the engine and check that idle speed is within the standard value range. Read off the vacuum gauge.

Standard value : 67 kPa (20 in.Hg)

(5) If not at standard value, refer to following chart for cause and repair.

Symptom	Cause	Remedy
• The vacuum gauge reading is less than standard value, but the needle is stable.	• Ignition timing is retarded.	• Adjust the ignition timing.
• The vacuum gauge needle swings slowly.	• The gas mixture is excessively rich.	• Check carburetor.
• The vacuum gauge needle drops irregularly.	• The gas mixture is excessively lean.	• Check carburetor.
• The vacuum gauge needle drops intermittently to 4.0 to 21.3 kPa (1.2 to 6.3 in. Hg).	• Incomplete close contact of intake and exhaust valve seats.	• Check and repair the valve.
• The vacuum gauge needle drops suddenly from the normal reading to 33.3 kPa (9.8 in.Hg), then returns to normal.	• Malfunction of cylinder head gasket	• Replace cylinder head gasket.

DRIVE BELTS TENSION ADJUSTMENT N09FMBD0

TENSION ADJUSTMENT OF THE ALTERNATOR DRIVE BELT

Refer to GROUP 0 – Maintenance Service.

DEFLECTION ADJUSTMENT OF POWER STEERING OIL PUMP DRIVE BELT

Refer to GROUP 19 – Service Adjustment Procedures.

TENSION ADJUSTMENT OF THE AIR CONDITIONER COMPRESSOR DRIVE BELT

Refer to GROUP 24 – Service Adjustment Procedures.

IGNITION TIMING INSPECTION AND ADJUSTMENT N09FLAB0

Refer to GROUP 8 – Ignition system.

LASH ADJUSTER CHECK N09FEABa

If an abnormal noise is heard from the lash adjusters (tappets), check as follows.

(1) While installed to the cylinder head, press the part where the rocker arm contacts the lash adjuster at the very top. If the adjuster is normal, the part pressed will feel very hard.
(2) If it easily moves all the way downward when pressed, there is a malfunction of the lash adjuster and it should be replaced with a new one.
(3) If it feels spongy or elastic, probably oil with air mixed in it has entered the lash adjuster, so follow the steps below:

- Check whether the amount of oil is too much or is not enough.
- Check whether the cause of air becoming mixed into the oil is a damaged oil screen or oil screen gasket. After repairing the cause of the air leak, warm up the engine and then drive the vehicle at low speed for a while.
  Stop the engine and leave it off for a few minutes; then restart the engine and drive at low speed. Repeat this procedure several times during the course of about one hour so as to remove the air from the oil.

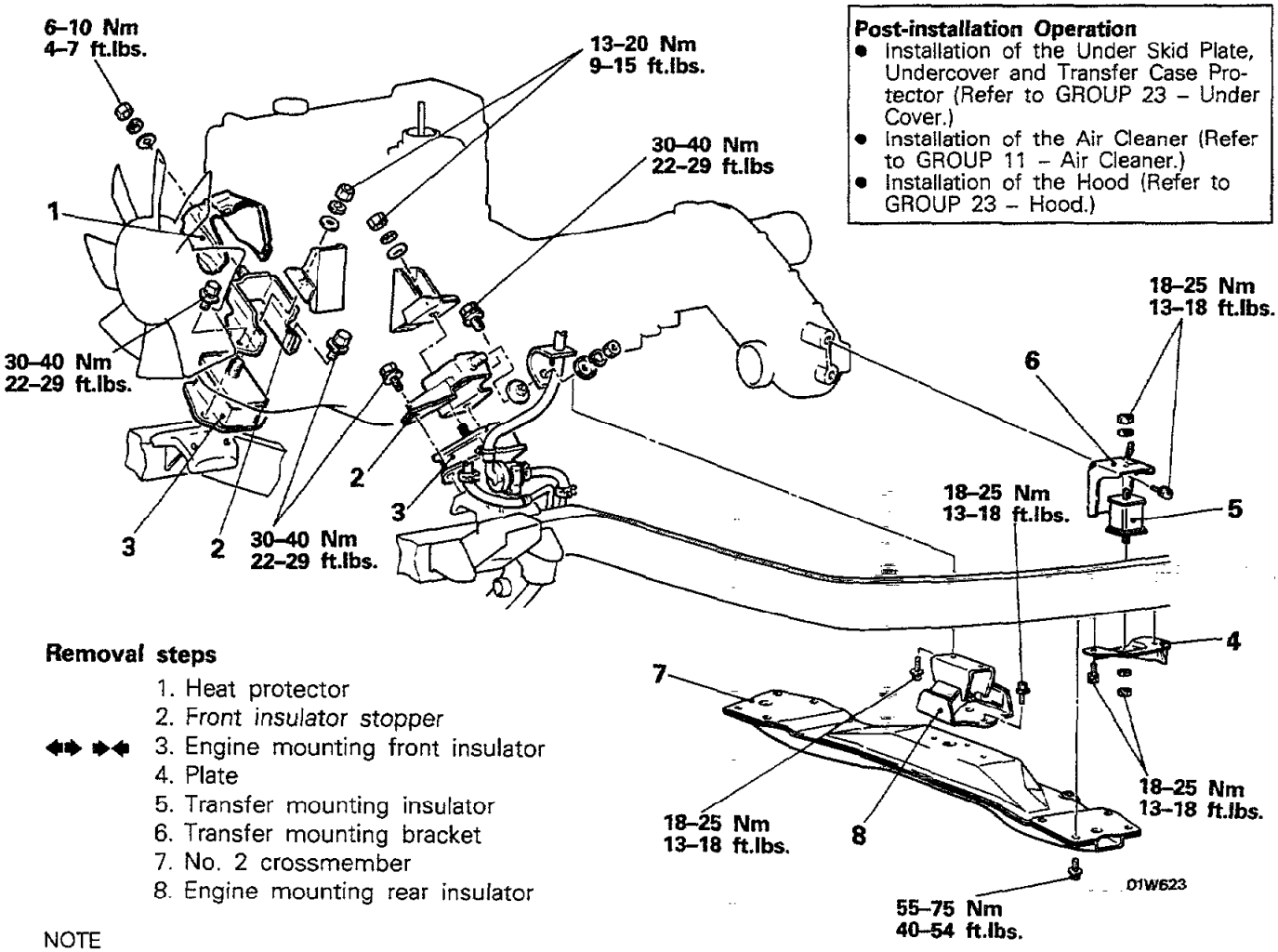
ENGINE MOUNTING

REMOVAL AND INSTALLATION

N09GA--A

Pre-removal Operation
- Removal of the Air Cleaner (Refer to GROUP 11 – Air Cleaner.)
- Removal of the Hood (Refer to GROUP 23 – Hood.)
- Removal of the Under Skid Plate, Undercover and Transfer Case Protector (Refer to GROUP 23 – Under Cover.)

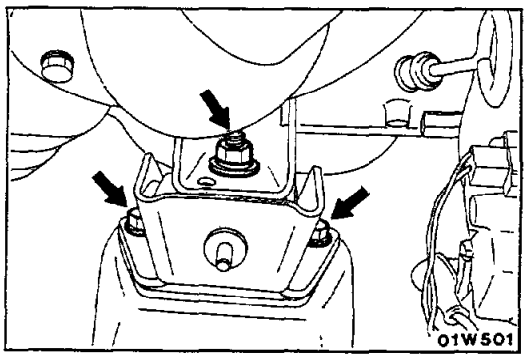
Post-installation Operation
- Installation of the Under Skid Plate, Undercover and Transfer Case Protector (Refer to GROUP 23 – Under Cover.)
- Installation of the Air Cleaner (Refer to GROUP 11 – Air Cleaner.)
- Installation of the Hood (Refer to GROUP 23 – Hood.)



Removal steps

1. Heat protector
2. *Front insulator stopper*
3. Engine mounting front insulator
4. Plate
5. Transfer mounting insulator
6. Transfer mounting bracket
7. No. 2 crossmember
8. Engine mounting rear insulator

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◀■▶ : Refer to "Service Points of Removal".
(3) ▶■◀ : Refer to "Service Points of Installation".

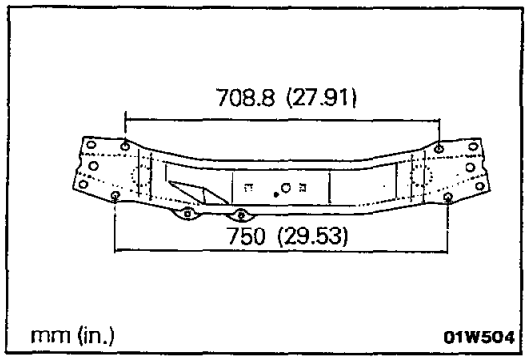


SERVICE POINTS OF REMOVAL N09GBAI0

3. REMOVAL OF ENGINE MOUNTING FRONT INSULATOR

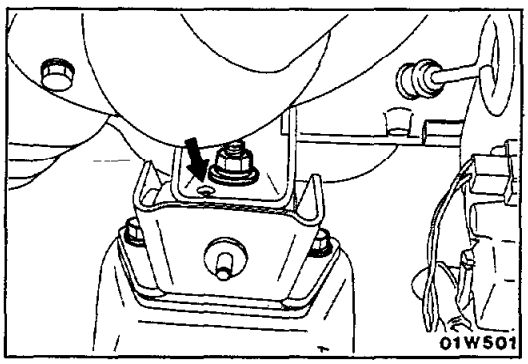
(1) Attach a chain to the engine hangers.
(2) Using a chain block-and-tackle, hang the engine slightly up so that the insulator is free of engine weight.
(3) Remove the engine mounting front insulator.

Caution
Avoid applying a strain on the radiator and fuel hoses and cables by raising the engine too high.



INSPECTION N09GCAE

- Check the insulators for cracks, separation or deformation.
- Check the front insulator stoppers for deformation.
- Check the transfer mounting bracket for deformation or corrosion.
- Check the plate for deformation or corrosion.
- Check the No. 2 crossmember for deformation or corrosion.



SERVICE POINTS OF INSTALLATION N09GDAR

3. INSTALLATION OF ENGINE MOUNTING FRONT INSULATOR

Make sure that the locating boss and hole are in alignment.

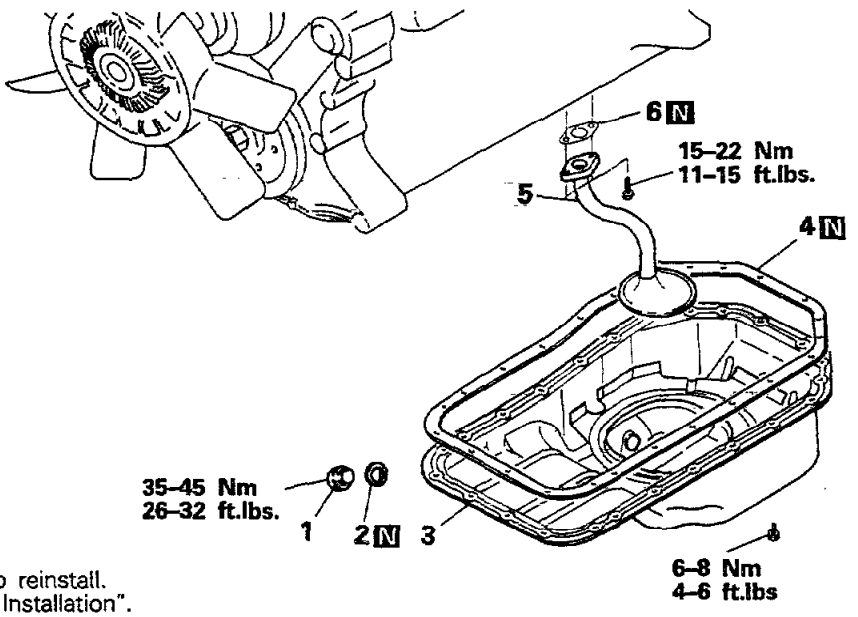
Caution
Do not distort rubber portions, and never stain rubber portions with fuel or oil.

OIL PAN AND OIL SCREEN
REMOVAL AND INSTALLATION

N09HA–A

Pre-removal Operation
- Removal of the Undercover and the Under Skid Plate (Refer to GROUP 23 – Under Cover)
- Draining of the Engine Oil (Refer to GROUP 0 – Maintenance Service.)

Post-installation Operation
- Installation of the Undercover and the Under Skid Plate (Refer to GROUP 23 – Under Cover.)
- Supplying of Engine Oil (Refer to GROUP 0 – Maintenance Service)



Removal steps

1. Drain plug
2. Drain plug gasket
3. Oil pan
- ◆◆ 4. Oil pan gasket
5. Oil screen
6. Oil screen gasket

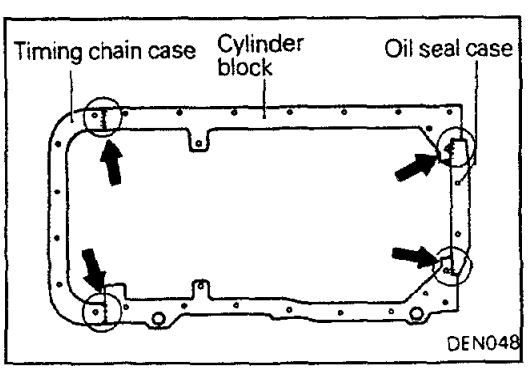
NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◆◆ : Refer to "Service Points of Installation".
(3) N : Non-reusable parts

01B0049

INSPECTION

N09HCAB

- Check the oil pan for cracks.
- Check the oil pan fitting surface for damage and deformation.
- Check the oil screen for cracked, clogged or damaged wire net and pipe.



SERVICE POINTS OF INSTALLATION

N09HDAH

4. INSTALLATION OF OIL PAN GASKET

Apply a coating of the specified sealant (where shown in the figure) to the lower surface (the surface where the oil pan is installed) of the cylinder block.

Specified sealant : MITSUBISHI GENUINE Part No. MZ100168 or equivalent

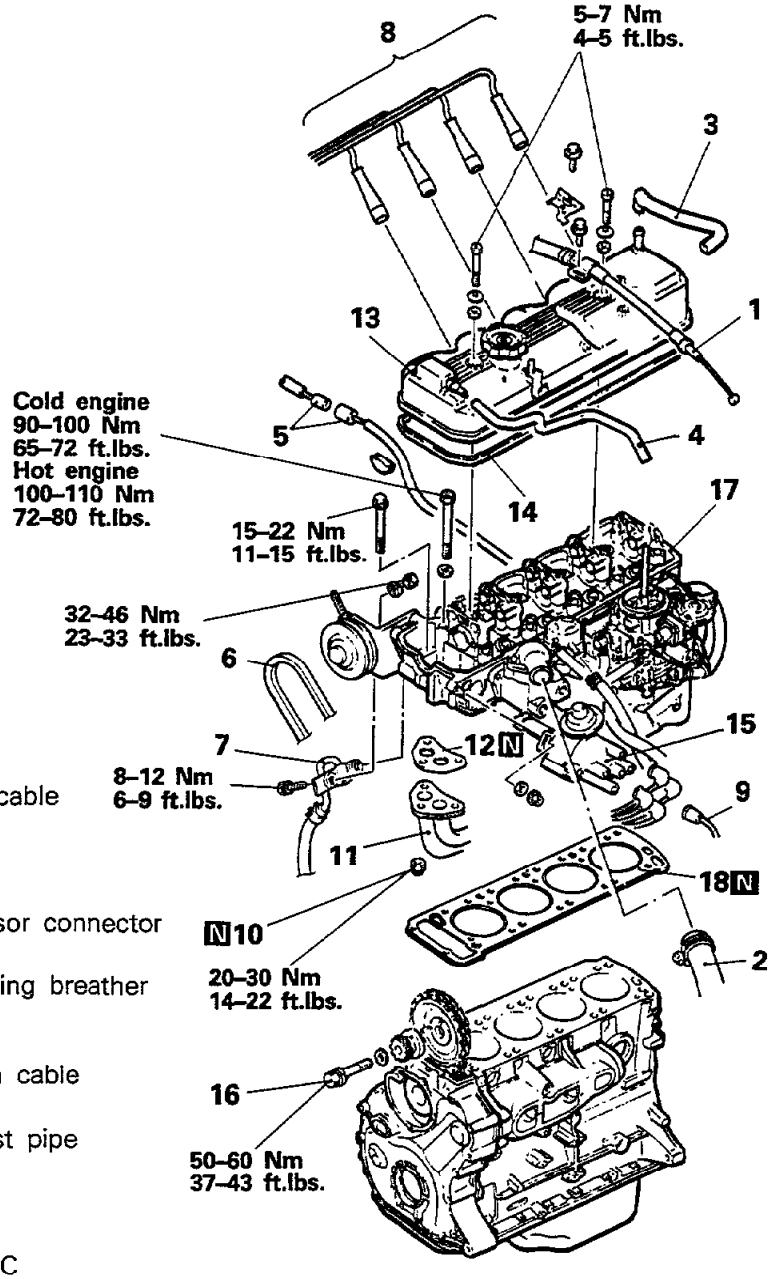
TSB Revision

CYLINDER HEAD GASKET
REMOVAL AND INSTALLATION

N09JA–A

Pre-removal Operation
- Removal of the Air Cleaner (Refer to GROUP 11 – Air Cleaner.)
- Removal of the Hood (Refer to GROUP 23 – Hood.)
- Removal of the Under Skid Plate, Undercover and Transfer Case Protector (Refer to GROUP 23 – Under Cover.)

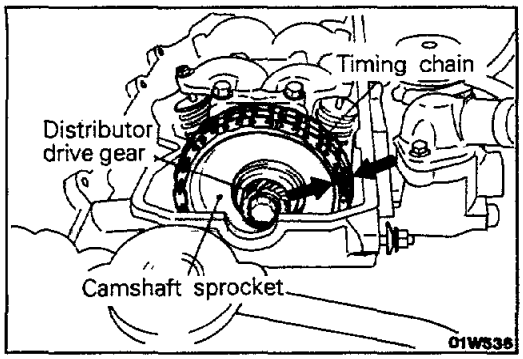
Post-installation Operation
- Installation of the Under Skid Plate, Undercover and Transfer Case Protector (Refer to GROUP 23 – Under Cover.)
- Installation of the Air Cleaner (Refer to GROUP 11 – Air Cleaner.)
- Installation of the Hood (Refer to GROUP 23 – Hood.)



Removal steps

- ◆◆ 1. Connection for accelerator cable
- 2. Radiator upper hose
- 3. Breather hose
- 4. P.C.V hose
- 5. Connection for oxygen sensor connector
- ◆◆ 6. Air-conditioner drive belt
- 7. Connection for power steering breather pipe
- 8. Spark plug cable
- 9. Connection for high tension cable
- 10. Self locking nut
- 11. Connection for front exhaust pipe
- 12. Gasket
- ◆◆ 13. Rocker cover assembly
- 14. Rocker cover gasket
- ◆◆ Fixing to No. 1 cylinder TDC
- ◆◆ 15. Distributor
- ◆◆ ◆◆ 16. Camshaft sprocket bolt
- ◆◆ ◆◆ 17. Cylinder head assembly
- ◆◆ 18. Cylinder head gasket

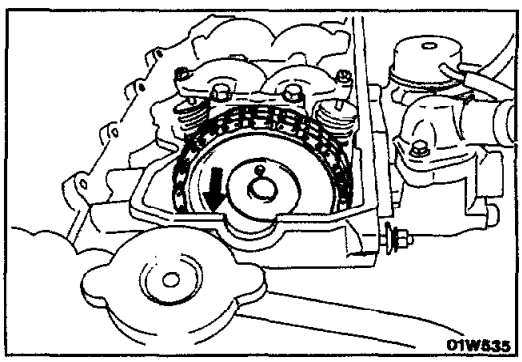
NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◆◆ : Refer to "Service Points of Removal".
(3) ◆◆ : Refer to "Service Points of Installation".
(4) N : Non-reusable parts



SERVICE POINTS OF REMOVAL N09JBAM

- **FIXING TO NO. 1 CYLINDER TDC**

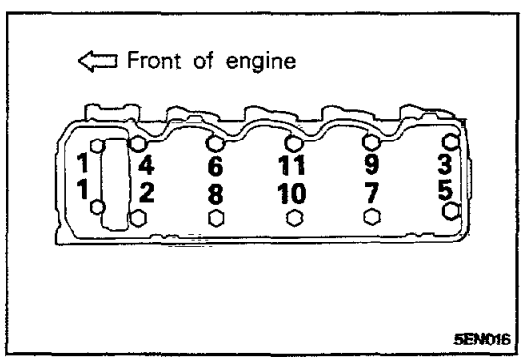
Turn the crankshaft. Check to be sure that the camshaft sprocket's timing mark and the timing chain's timing mark (shiny white leaf plate) are aligned.



16. REMOVAL OF CAMSHAFT SPROCKET BOLT

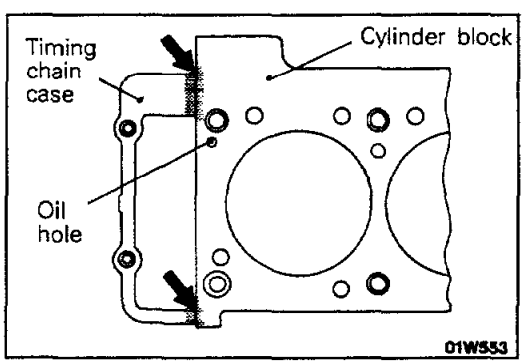
Pull the camshaft sprocket (with the timing chain attached) out from the camshaft, and place it on top of the camshaft sprocket holder.

Caution
1. **The crankshaft must not be rotated after the camshaft sprocket is pulled out from the camshaft.**
2. **Be careful not to allow the timing chain to come off from the camshaft sprocket.**



17. REMOVAL OF CYLINDER HEAD ASSEMBLY

(1) Disconnect the fuel hose, vacuum hose and wiring harness connected to the intake manifold and carburetor.
Refer to GROUP 11 – Intake Manifold and GROUP 14 – Carburetor.
(2) Loosen the bolts (in the order indicated in the figure) in 2 or 3 steps, and remove from the cylinder head.



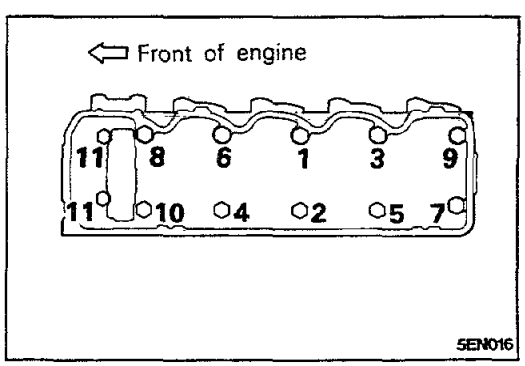
SERVICE POINTS OF INSTALLATION N09JDCI

18. INSTALLATION OF CYLINDER HEAD GASKET

Before cylinder head gasket is installed, apply specified sealant to top surface of each butt joint between cylinder block and timing chain case.

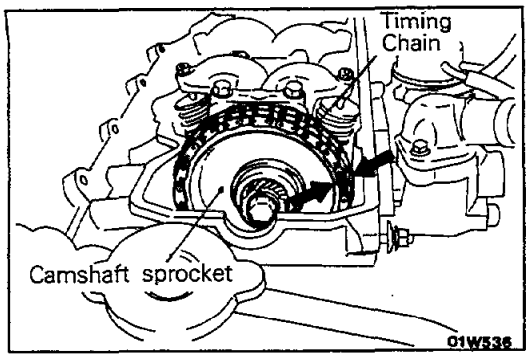
Specified sealant: 3M ART Part No. 8660 or equivalent

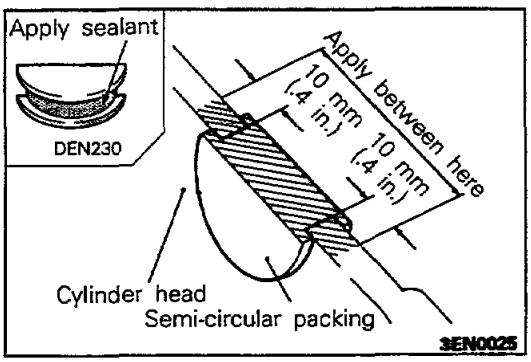
Caution
Be careful not to allow sealant to enter the oil hole in the cylinder block.



17. INSTALLATION OF CYLINDER HEAD ASSEMBLY

(1) Tighten the bolts (in the order indicated in the figure) in 2 or 3 steps, and finally tighten them at the specified torque.
(2) Connect the fuel hose, vacuum hose and wiring harness connected to the intake manifold and carburetor.
Refer to GROUP 11 – Intake Manifold and GROUP 14 – Carburetor.





16. INSTALLATION OF CAMSHAFT SPROCKET BOLT

Install the camshaft sprocket to the camshaft. Check to be sure that the timing chain's timing mark and the camshaft sprocket's timing mark are aligned.

15. INSTALLATION OF DISTRIBUTOR

Refer to GROUP 8 – Ignition System.

13. INSTALLATION OF ROCKER COVER ASSEMBLY

Apply a coating of the specified sealant to the semicircular packing and the cylinder head top surfaces, and then tighten the rocker cover assembly at the specified torque.

Specified sealant: 3M ART Part No. 8660 or equivalent

Caution
If they are overtorqued, a deformed rocker cover or oil leakage could result.

6. INSTALLATION OF AIR-CONDITIONER DRIVE BELT

Adjustment of drive belt tension for air-conditioner. (Refer to GROUP 24 – Service Adjustment Procedures.)

1. ADJUSTMENT OF ACCELERATOR CABLE

Refer to GROUP 14 – Engine Control.

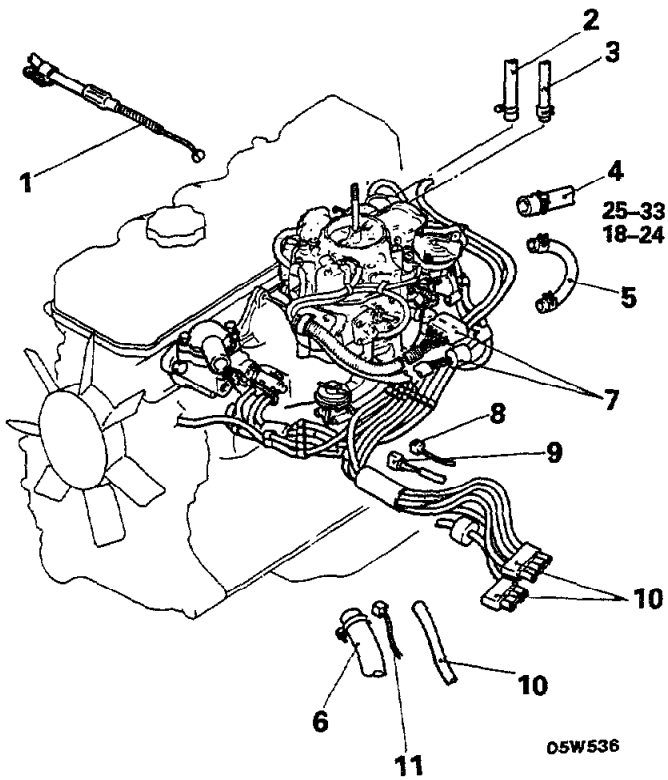
ENGINE ASSEMBLY

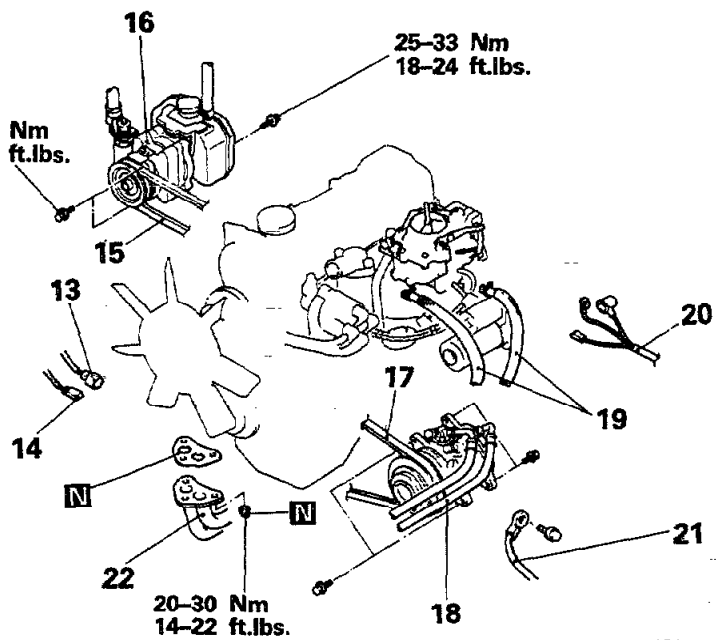
N09SA-A

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of the Hood (Refer to GROUP 23 – Hood.)
- Removal of the Air Cleaner (Refer to GROUP 11 – Air Cleaner.)
- Under Cover, Under Skid Plate, Transfer Case Protector (Refer to GROUP 23 – Under Cover.)
- Removal of the Transmission Assembly (Refer to GROUP 21 – Transmission Assembly.)
- Removal of the Radiator (Refer to GROUP 7 – Radiator.)

Post-installation Operation
- Installation of the Radiator (Refer to GROUP 7 – Radiator.)
- Installation of the Transmission Assembly (Refer to GROUP 21 – Transmission Assembly.)
- Installation of the Undercover, Under Skid Plate, Transfer Case Protector (Refer to GROUP 23 – Under Cover.)
- Installation of the Air Cleaner (Refer to GROUP 11 – Air Cleaner.)
- Installation of the Hood (Refer to GROUP 23 – Hood.)

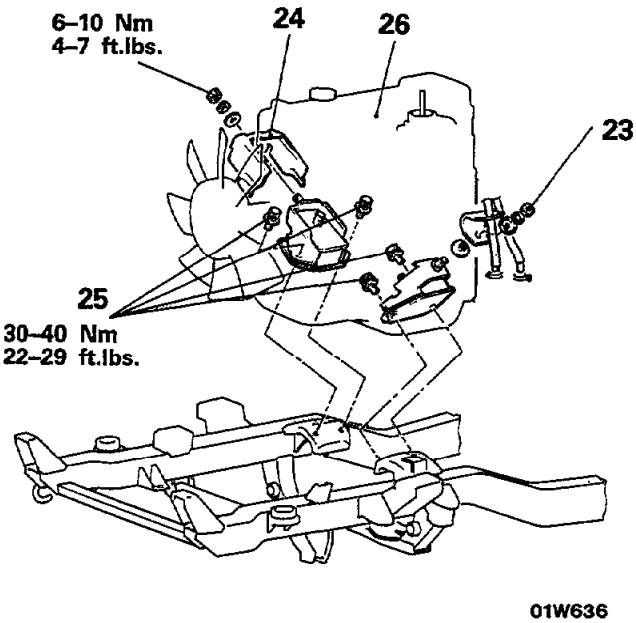




Removal steps

- ◆◆ 1. Accelerator cable
- 2. Heater hose
- 3. Brake booster vacuum hose
- 4. Water by-pass hose
- 5. Water hose
- 6. Radiator upper hose
- 7. Control harness
- 8. Engine coolant temperature switch connector (Vehicles with an air conditioner)
- 9. Engine coolant temperature sensor connector
- 10. Vacuum hose
- 11. Engine coolant temperature gauge unit connector
- 13. Oxygen sensor connector
- 14. Oil pressure gauge unit connector
- ◆◆ 15. Drive belt (power steering)
- ◆◆ 16. Power steering oil pump
- ◆◆ 17. Drive belt (air conditioner compressor)
- ◆◆ 18. Air conditioner compressor
- 19. Fuel hose
- 20. Alternator connector
- 21. Ground cable
- 22. Front exhaust pipe

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◆◆ : Refer to "Service Points of Removal".
(3) ◆◆ : Refer to "Service Points of Installation".
(4) N : Non-reusable parts.



Removal steps

23. Fuel hose clamp
24. Heat protector
25. Engine mounting front insulator attaching bolt

◆◆ ▶◆ 26. Engine assembly

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◆◆ : Refer to "Service Points of Removal".
(3) ▶◆ : Refer to "Service Points of Installation".

SERVICE POINTS OF REMOVAL N09SBDH

16. REMOVAL OF POWER STEERING OIL PUMP/18. AIR CONDITIONER COMPRESSOR

Remove the oil pump and air conditioner compressor (with the hose attached).

NOTE
Suspend the removed oil pump (by using wire or similar material) at a place where no damage will be caused during removal/installation of the engine assembly.

26. REMOVAL OF ENGINE ASSEMBLY

(1) Check to be sure that all cables, hoses, harness connectors, etc. are disconnected from the engine.
(2) Lift the chain block slowly to remove the engine assembly upward from the engine compartment.

SERVICE POINTS OF INSTALLATION N09SDAQ

26. INSTALLATION OF ENGINE ASSEMBLY

Install the engine assembly. When doing so, check carefully to be sure that all pipes and hoses are connected, and that none are twisted, damaged, etc.

17. INSTALLATION OF DRIVE BELT (AIR CONDITIONER COMPRESSOR)

Adjust belt tension. (Refer to GROUP 24 – Service Adjustment Procedures.)

15. INSTALLATION OF DRIVE BELT (POWER STEERING)

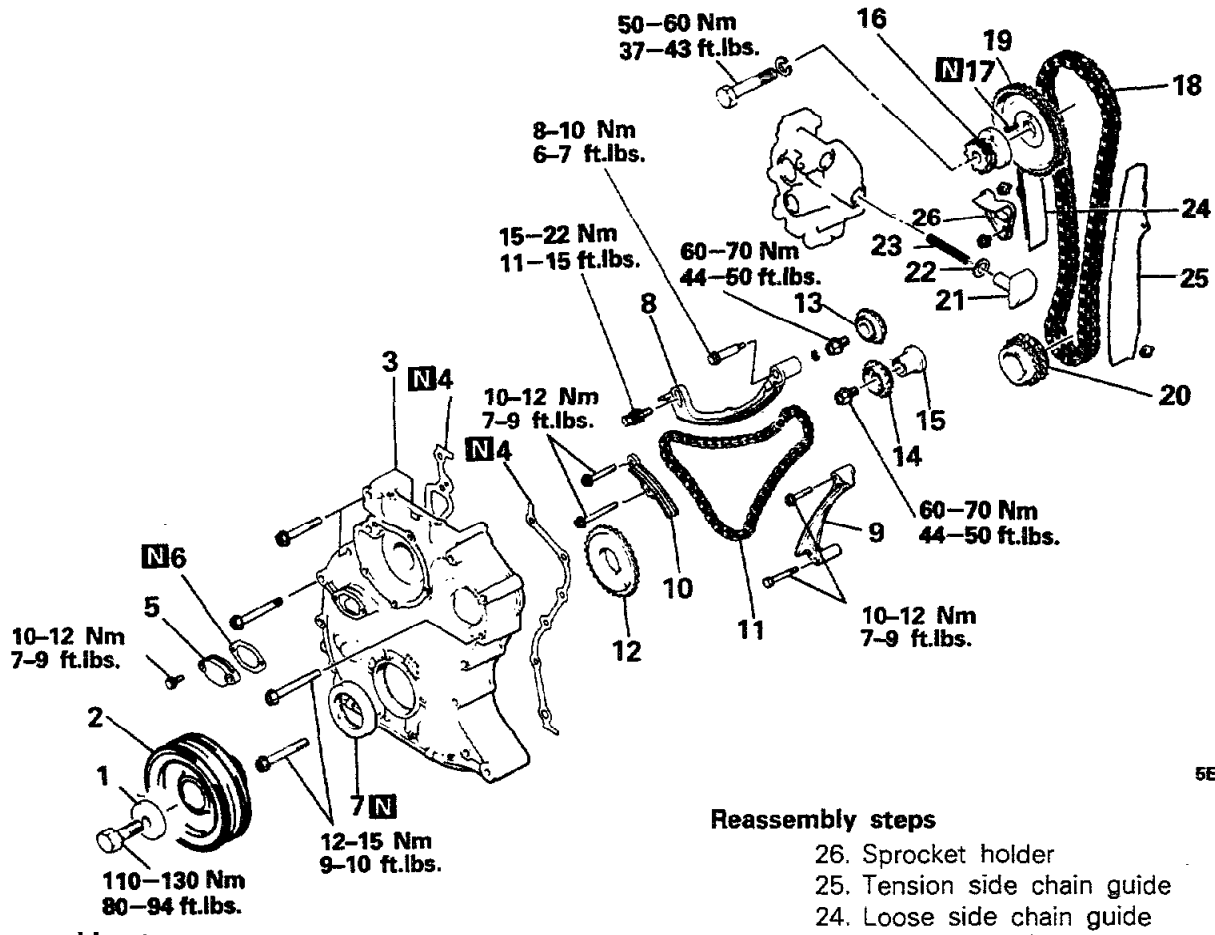
Adjust belt tension. (Refer to GROUP 19 – Service Adjustment Procedures.)

1. ADJUSTMENT OF ACCELERATOR CABLE

Refer to GROUP 14 – Engine Control.

DISASSEMBLY AND REASSEMBLY (TIMING CHAIN TRAIN)

N09WE-



Disassembly steps

1. Special washer
2. Crankshaft pulley
3. Timing chain case
4. Chain case gasket
5. Chain guide access hole cover
6. Chain guide access hole gasket
7. Oil seal
8. Chain guide "B"
9. Chain guide "A"
10. Chain guide "C"
11. Chain "B"
12. Crankshaft sprocket "B"
13. Oil pump sprocket
14. Left silent shaft sprocket
15. Spacer
16. Distributor gear
17. Spring pin
18. Timing chain ◆◆
19. Camshaft sprocket ◆◆
20. Crankshaft sprocket ◆◆
21. Tension sleeve
22. Rubber sheet
23. Tensioner spring
24. Loose side chain guide
25. Tension side chain guide
26. Sprocket holder

Reassembly steps

26. Sprocket holder
25. Tension side chain guide
24. Loose side chain guide
23. Tensioner spring ◆◆
22. Rubber sheet ◆◆
21. Tension sleeve ◆◆
20. Crankshaft sprocket
19. Camshaft sprocket
18. Timing chain ◆◆
17. Spring pin
16. Distributor gear
15. Spacer
14. Left silent shaft sprocket ◆◆
13. Oil pump sprocket
12. Crankshaft sprocket "B" ◆◆
11. Chain "B" ◆◆
10. Chain guide "C"
9. Chain guide "A"
8. Chain guide "B"
7. Oil seal ◆◆
6. Chain guide access hole gasket
5. Chain guide access hole cover
4. Chain case gasket
3. Timing chain case ◆◆
2. Crankshaft pulley
1. Special washer

NOTE
(1) ◆◆ : Refer to "Service Points of Disassembly".
(2) ◆◆ : Refer to "Service Points of Reassembly".
(3) N : Non-reusable parts

SERVICE POINTS OF DISASSEMBLY N09WFAA

18. REMOVAL OF TIMING CHAIN/19. CAMSHAFT SPROCKET/20. CRANKSHAFT SPROCKET

Remove the timing chain combined with camshaft sprocket and crankshaft sprocket.

INSPECTION N09WCAA

- Check the timing chain for roller play, wear, damage or disconnected links.
  Replace if necessary.
- Check the tensioner and chain guide rubber shoe for wear or damage.
  Replace if necessary.

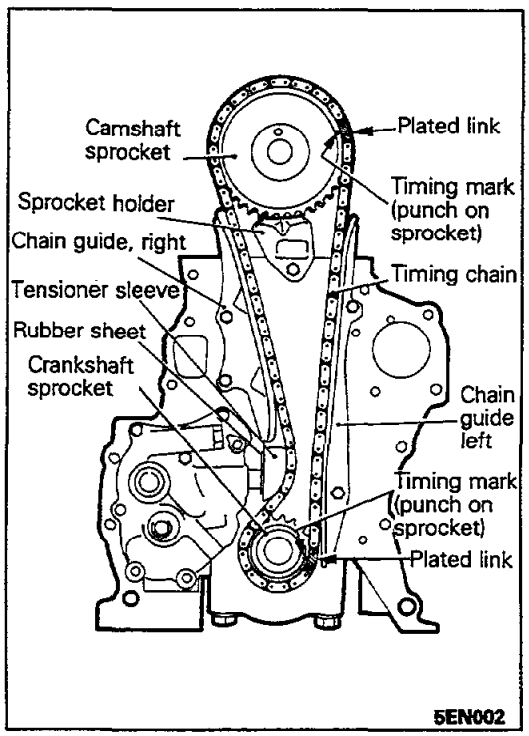
SERVICE POINTS OF REASSEMBLY N09WHAA

23. INSTALLATION OF TENSIONER SPRING/22. RUBBER SHEET/21. TENSIONER SLEEVE

Install tensioner spring, sleeve and rubber sheet to oil pump.

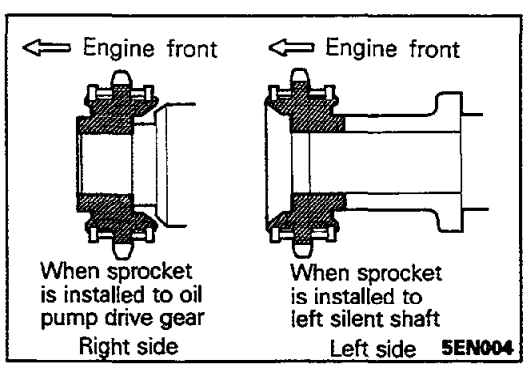
18. INSTALLATION OF TIMING CHAIN

(1) Turn crankshaft until piston of No. 1 cylinder is at top dead center.
(2) Line up plated links of timing chain and timing marks on sprockets as chain and sprockets are assembled.
(3) While sliding crankshaft sprocket onto crankshaft, install chain and sprocket. Place camshaft sprocket on sprocket holder.



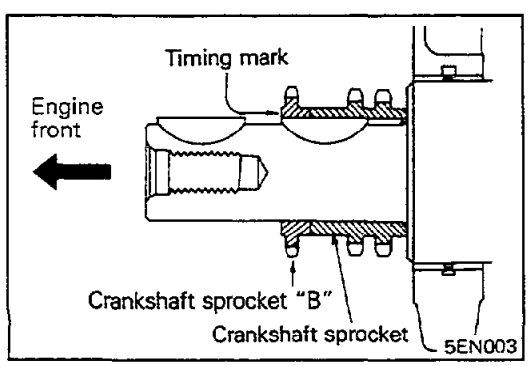
14. INSTALLATION OF LEFT SILENT SHAFT SPROCKET

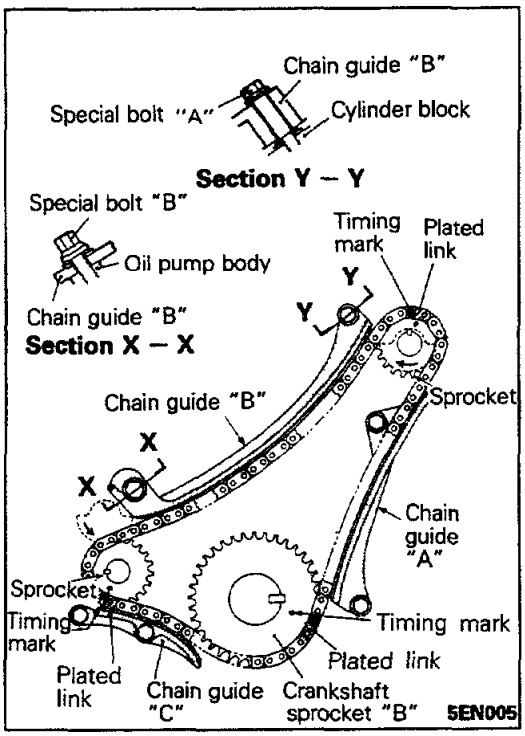
(1) Assemble silent shaft sprockets to chain "B". Make sure that timing marks are in alignment with plated links.
(2) Use care not to confuse right and left sprockets, as they are installed in opposite directions.



12. INSTALLATION OF CRANKSHAFT SPROCKET "B"

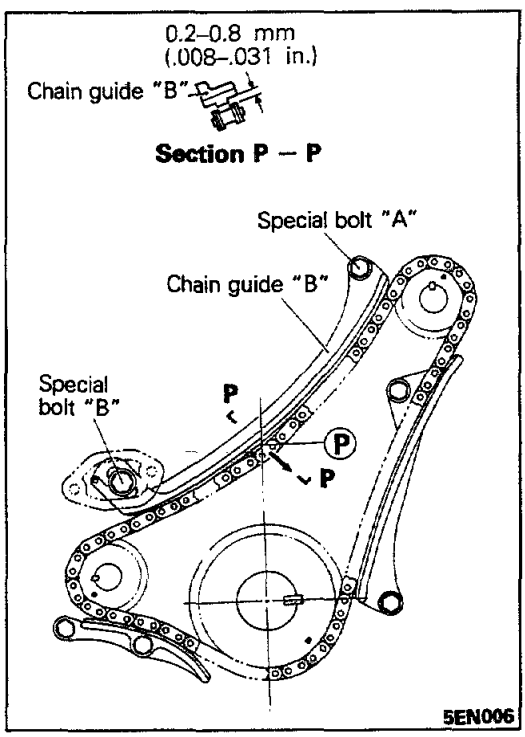
Install crankshaft sprocket "B" (for driving silent shafts) on crankshaft.





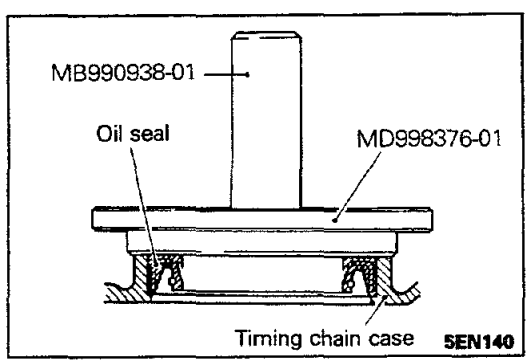
11. INSTALLATION OF CHAIN "B"

(1) Holding assembled sprockets and chain "B", align timing mark on crankshaft sprocket "B" with that on chain "B", and install sprockets to oil pump drive gear and left silent shaft. Partially tighten bolt.



(2) Rotate both silent shaft sprockets slightly to position chain slack at point P.
(3) Adjust position of chain guide "B" so that when chain is pulled in direction of arrow with finger tips, clearance between chain guide "B" and links of chain "B".

Chain and chain guide "B" gap
Standard value : 0.2–0.8 mm (.008–.031 in.)



7. INSTALLATION OF OIL SEAL

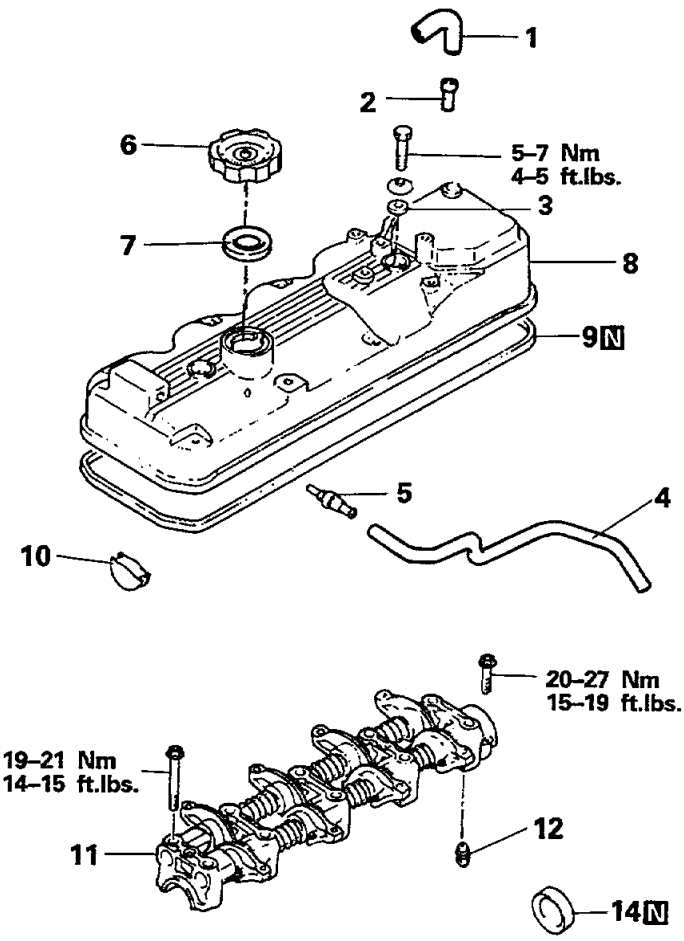
Using special tool, install the oil seal.

3. INSTALLATION OF TIMING CHAIN CASE

(1) Clean the gasket surfaces of chain case and cylinder block.
(2) Install the chain case gaskets and chain case to the cylinder block.

DISASSEMBLY AND REASSEMBLY (ROCKER ARMS, ROCKER ARM SHAFTS AND CAMSHAFT)

N09LE–A

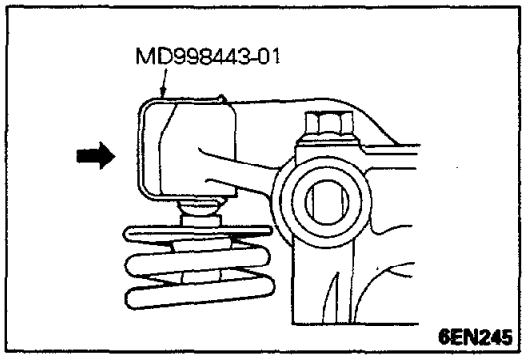


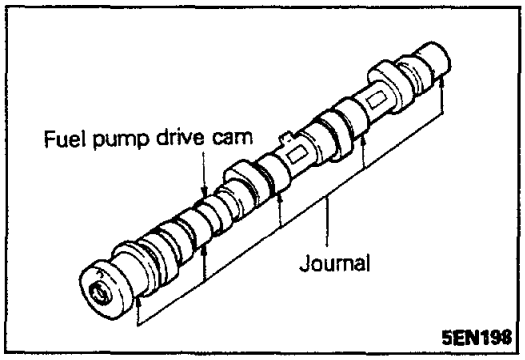
Disassembly steps

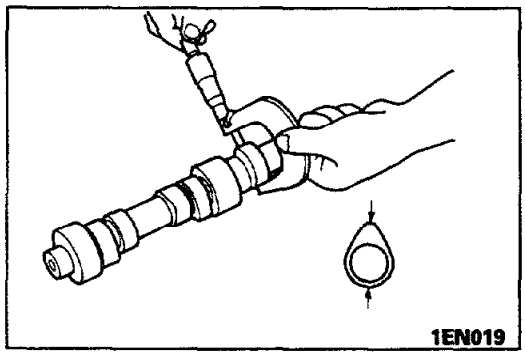
1. Breather hose
2. Pipe
3. Oil seal
4. P.C.V. hose
5. P.C.V. valve
6. Oil filler cap
7. Packing
8. Rocker cover
9. Rocker cover gasket
- ◆◆ 10. Semi-circular packing
- ◆◆ ◆◆ 11. Rocker arm and shaft assembly
12. Auto-lash adjuster
- ◆◆ 13. Camshaft
- ◆◆ 14. Circular packing

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Disassembly".
(3) ◆◆ : Refer to "Service Points of Reassembly".
(4) N : Non-reusable parts

5EN197







SERVICE POINTS OF DISASSEMBLY N09LFCA

11. REMOVAL OF ROCKER ARM AND SHAFT ASSEMBLY

Before removing the rocker arm and shaft assembly, use the special tool to ensure that the auto-lash adjuster doesn't fall out.

Caution
Put the rocker arms and auto-lash adjuster in order in cylinder No. separated places with clear distinction between the intake and exhaust ones to prevent *confusion*.

INSPECTION N09LHAA

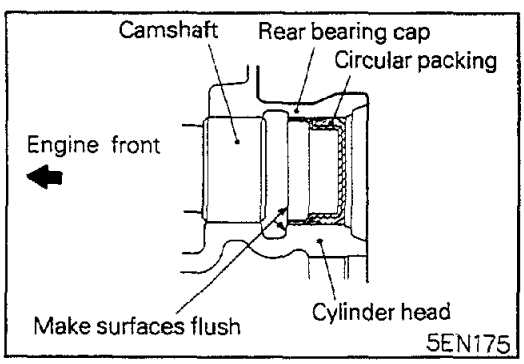
- **CAMSHAFT**

(1) Check camshaft journals for wear or damage. Replace if necessary. If journals are damaged, also inspect camshaft bearings for wear or damage. If camshaft bearing is badly worn, replace cylinder head.
(2) Check the fuel pump drive cam for wear or damage. Replace if necessary.

Camshaft
Standard value
Height of fuel pump drive cam: 37 mm (1.46 in.)
Journal diameter: 34 mm (1.34 in.)
Oil clearance: 0.05–0.09 mm (.0020–.0035 in.)

(3) Check the cam surface for abnormal wear or damage, replace the part if required. Measure cam height (i.e., its diameter), replace the cam if outside of the limit.

Cam height
Standard value
Intake: 42.43 mm (1.6705 in.)
Exhaust: 42.43 mm (1.6705 in.)
Limit
Intake: 41.93 mm (1.6508 in.)
Exhaust: 41.93 mm (1.6508 in.)
End play
Standard value: 0.1–0.2 mm (.004–.008 in.)
Limit: 0.4 mm (.016 in.)



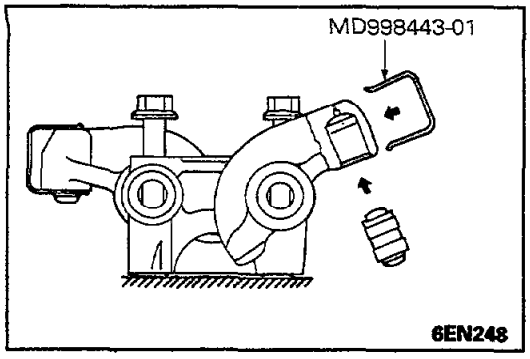
SERVICE POINTS OF REASSEMBLY N09LGCB

14. INSTALLATION OF CIRCULAR PACKING

(1) Set circular packing on cylinder head as illustrated.
(2) Install the cam cap, rocker arm and shaft assembly.

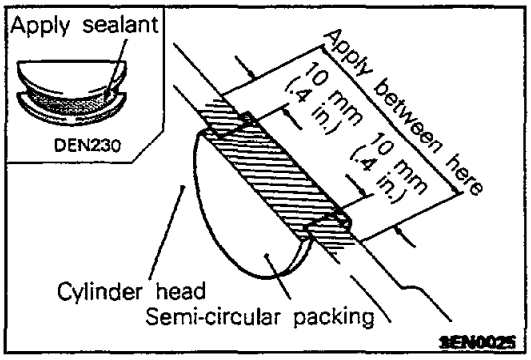
13. INSTALLATION OF CAMSHAFT

Apply engine oil to the journals of camshaft and install it to cylinder head.



11. INSTALLATION OF ROCKER ARM AND SHAFT ASSEMBLY

(1) Insert the auto-lash adjuster from below as illustrated, being careful not to spill the diesel oil inside it. Then use the special tool to prevent adjuster from falling while installing it.
(2) Place the rocker arm and shaft assembly on the cylinder head and tighten the bearing cap bolt.
(3) Remove the special tool.

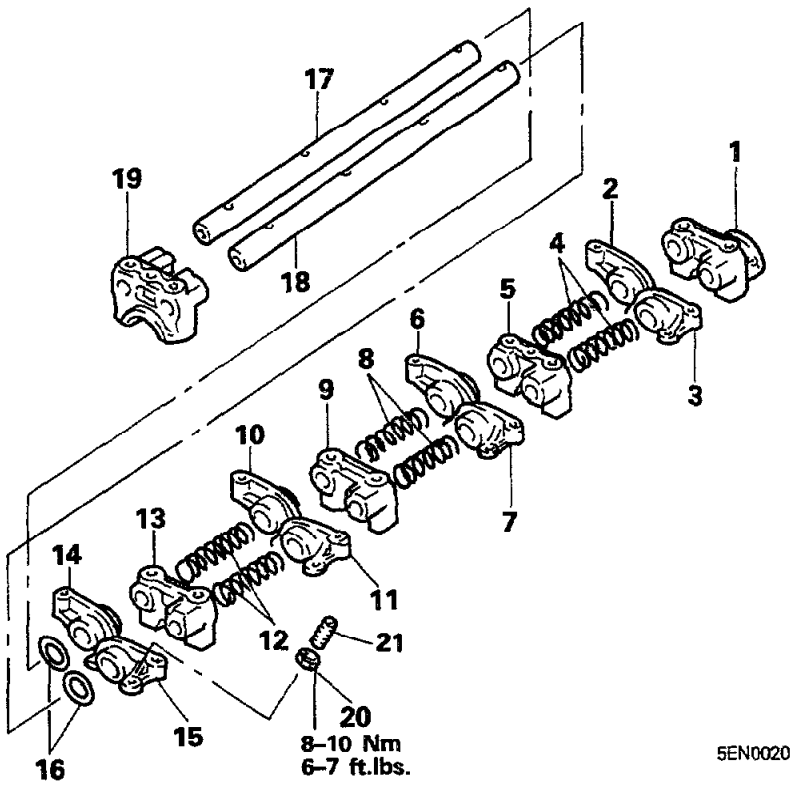


10. APPLY SEALANT TO SEMI-CIRCULAR PACKING

Apply specified sealant to portions indicated in illustration.

Specified sealant: 3M ART Part No. 8660 or equivalent

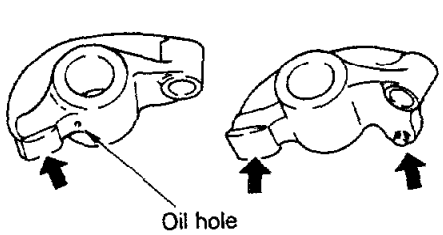
DISASSEMBLY AND REASSEMBLY (ROCKER ARM AND SHAFT ASSEMBLY) N09NE-A



Disassembly steps

1. Rear bearing cap
2. Rocker arm "C"
3. Rocker arm "A"
4. Rocker shaft spring
- ◆◆ 5. Bearing cap No.4
6. Rocker arm "C"
7. Rocker arm "A"
8. Rocker shaft spring
- ◆◆ 9. Bearing cap No.3
10. Rocker arm "C"
11. Rocker arm "A"
12. Rocker shaft spring
- ◆◆13. Bearing cap No.2
14. Rocker arm "C"
15. Rocker arm "A"
- ◆◆16. Wave washer
- ◆◆17. Right rocker arm shaft
- ◆◆18. Left rocker arm shaft
- ◆◆19. Front bearing cap
20. Nut
21. Adjusting screw

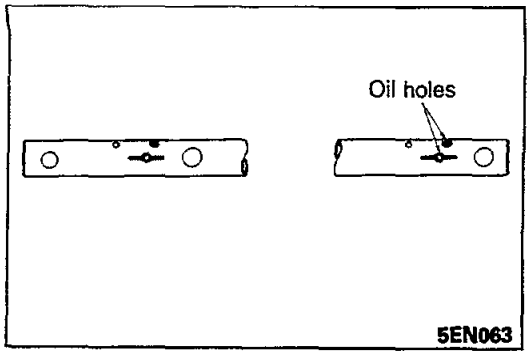
NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Reassembly".



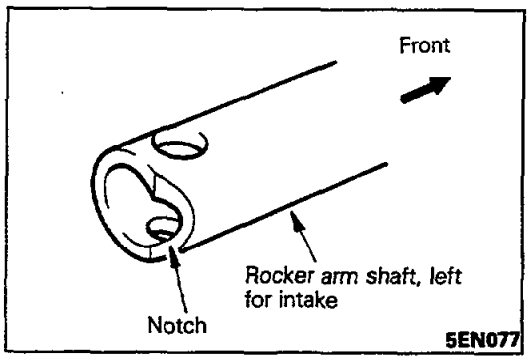
INSPECTION N09NGAD1

- **ROCKER ARM**
  (1) Check rocker arms for wear or damage. Replace if necessary.
  (2) Check to ensure that oil holes are clear.

TSB Revision



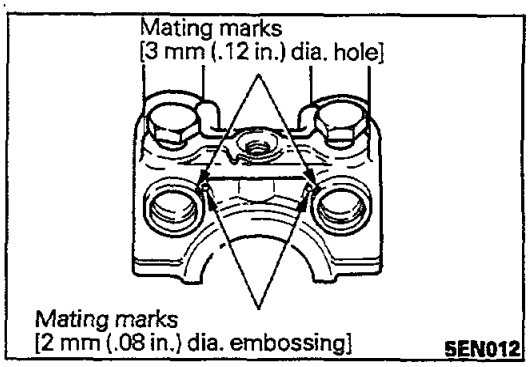
- **ROCKER ARM SHAFT**
  (1) Check rocker arm mounting portions of rocker arm shaft for wear or damage. Replace as necessary.
  (2) Check to ensure that oil holes are clear.



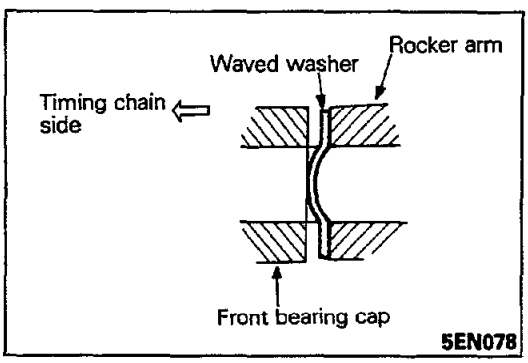
SERVICE POINTS OF REASSEMBLY N09NHCA

19. INSTALLATION OF FRONT BEARING CAP/18. LEFT ROCKER ARM SHAFT/17. RIGHT ROCKER ARM SHAFT

(1) Insert the left and right rocker shafts into the front bearing cap. The rear end of left (intake) rocker arm shaft has a notch.
(2) Align the mating mark of the rocker arm shaft front end to the mating mark of the front bearing cap. Then insert the bolts to hold shafts in bearing cap.

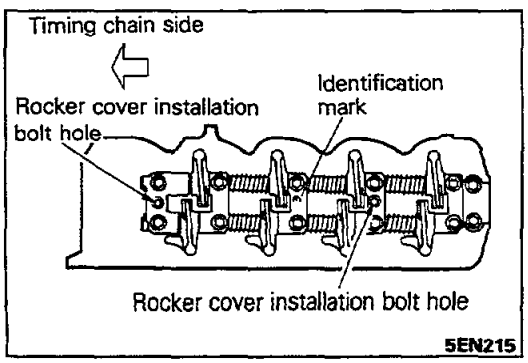


(3) Assemble the rocker arm shaft so that the alignment mark at the front end matches the alignment mark of the front bearing cap.



16. INSTALLATION OF WAVE WASHER

Install the waved washer in the direction shown in the illustration.

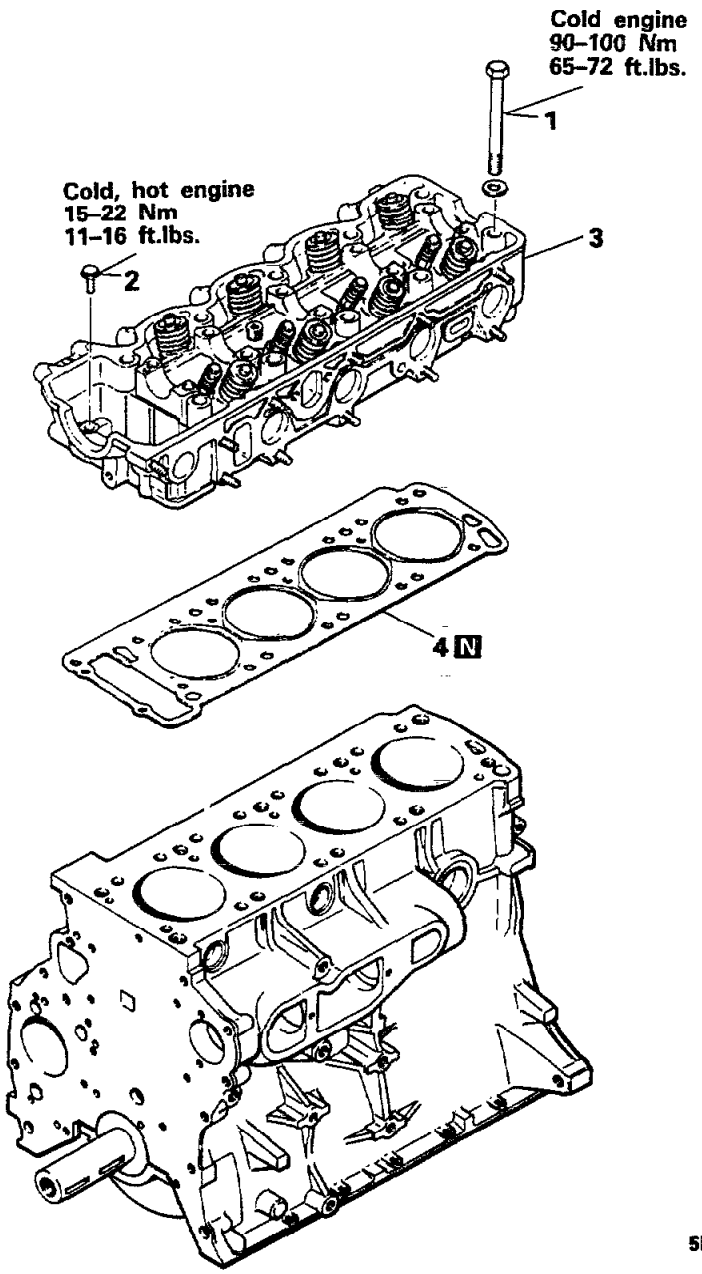


13./9./5. INSTALLATION OF BEARING CAP

Caps 2, 3 and 4 are of similar shape and require attention to the cap number during assembly.

DISASSEMBLY AND REASSEMBLY (CYLINDER HEAD)

N09OE-A

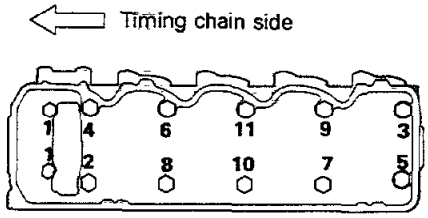


5EN200

Disassembly steps

◆◆ ▶◀ 1. Cylinder head bolt
◆◆ ▶◀ 2. Bolt
3. Cylinder head
▶◀ 4. Cylinder head gasket

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Disassembly".
(3) ▶◀ : Refer to "Service Points of Reassembly".
(4) N : Non-reusable parts



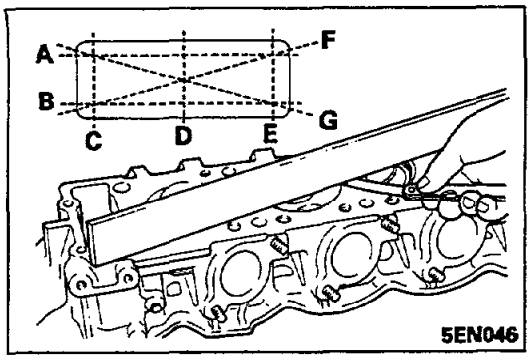
5EN015

SERVICE POINTS OF DISASSEMBLY

N09OFAC

1. REMOVAL OF CYLINDER HEAD BOLT/2. BOLT

Remove cylinder head bolts in sequence shown in illustration.



INSPECTION N090HAA

- **CYLINDER HEAD**

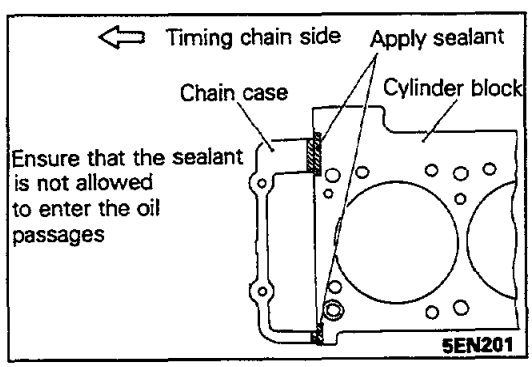
(1) Before washing, check the cylinder head for water or gas leakage, damage or cracks.
(2) Completely remove oil, deposits, sealing agent, carbon, etc. After washing the oil passages, blow air through them to check that they are not clogged.
(3) Using a straight edge and feeler gauge, measure the warpage on the A thru G areas as shown in the figure.

Standard value : Less than 0.05 mm (.0020 in.)
Limit : 0.2 mm (.008 in.)

(4) If the measured flatness exceeds the limit, grind and repair the surface to gain the flatness of standard value or less.

Grinding limit : 0.2 mm (.008 in.)
Overall height : 90 mm (3.54 in.)

Caution
The cylinder head gasket surface should be ground to within 0.2 mm (.008 in.) even with the grind of the cylinder block gasket surface.

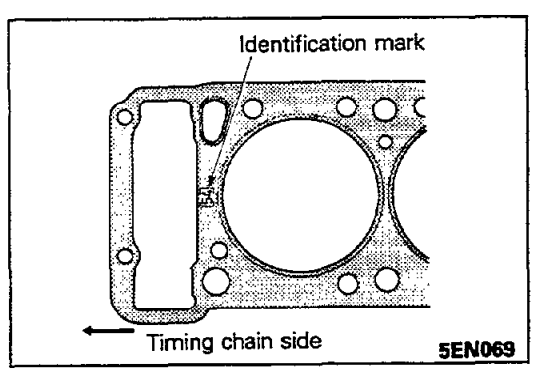


SERVICE POINTS OF REASSEMBLY N090GAC

4. INSTALLATION OF CYLINDER HEAD GASKET

(1) Clean gasket surfaces of cylinder head and cylinder block.
(2) Apply a sufficient amount of sealant or similar material to the two guides on the cylinder block and chain case as illustrated.

Specified sealant: 3M ART Part No. 8660 or equivalent

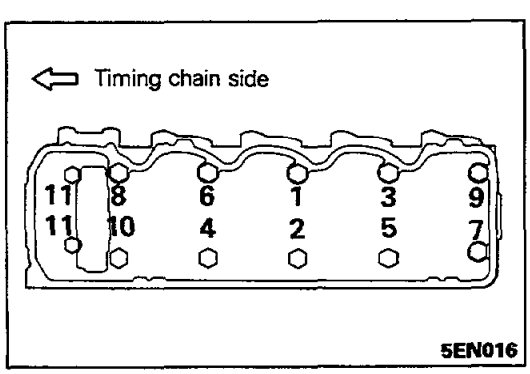


(3) Be sure to position the gasket on the cylinder block with the identification mark up.

Identification mark : "54"

(4) Align with the mark on the top of the cylinder head when installing.

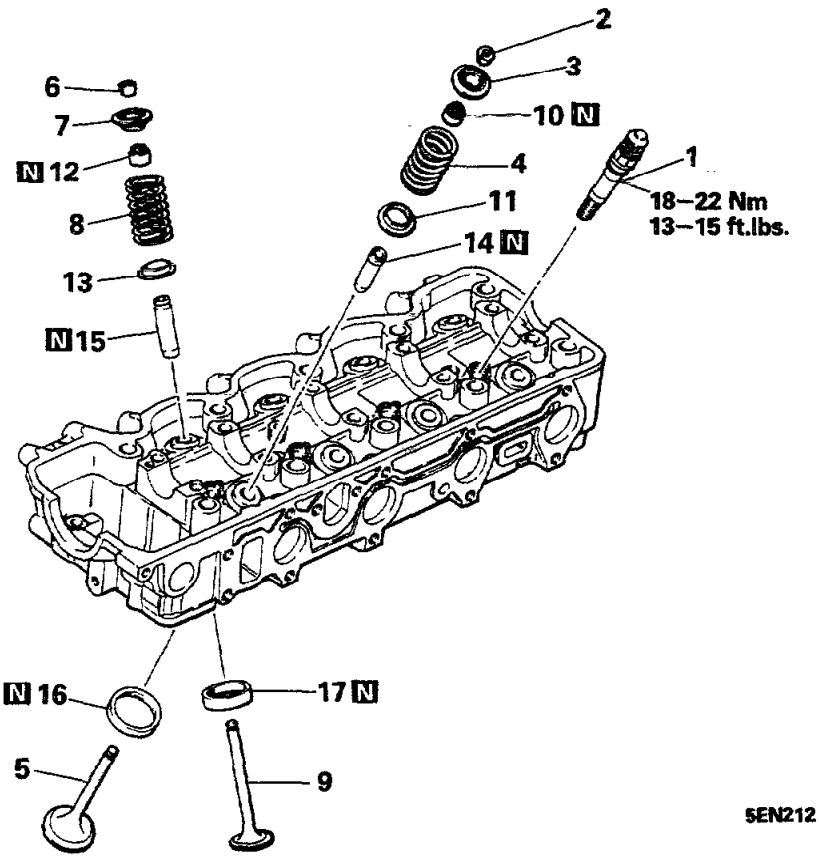
Caution
Do not apply sealant to cylinder head gasket.



2. INSTALLATION OF BOLT/1. CYLINDER HEAD BOLT

Install cylinder head bolts. Starting at top center, tighten all cylinder head bolts to 1/2 of specified torque in sequence shown in illustration.

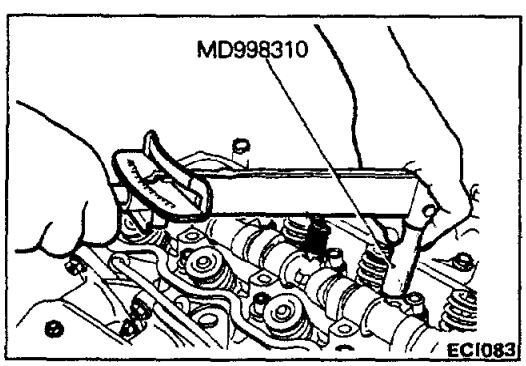
DISASSEMBLY AND REASSEMBLY (VALVES AND VALVE SPRINGS) N09PE-A

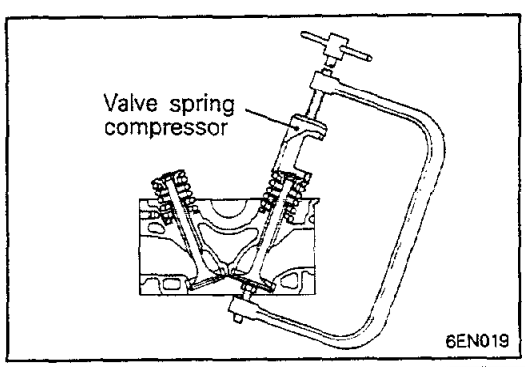


Disassembly steps

- ◆◆ ◆◆ 1. Jet valve assembly
- ◆◆ ◆◆ 2. Retainer lock
- 3. Valve spring retainer
- ◆◆ 4. Valve spring
- ◆◆ 5. Intake valve
- ◆◆ ◆◆ 6. Retainer lock
- 7. Valve spring retainer
- ◆◆ 8. Valve spring
- ◆◆ 9. Exhaust valve
- ◆◆ ◆◆ 10. Valve stem seal
- ◆◆ 11. Valve spring seat
- ◆◆ ◆◆ 12. Valve stem seal
- ◆◆ 13. Valve spring seat
- 14. Intake valve guide
- 15. Exhaust valve guide
- 16. Intake valve seat
- 17. Exhaust valve seat

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Disassembly".
(3) ◆◆ : Refer to "Service Points of Reassembly".
(4) N : Non-reusable parts





SERVICE POINTS OF DISASSEMBLY N09PFAA1

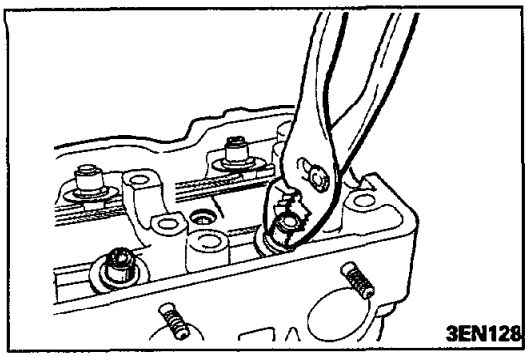
1. REMOVAL OF JET VALVE ASSEMBLY

Using special tool, remove the jet valve assembly.

Caution
When special tool is used, make certain that the wrench is not tilted with respect to the center of the jet valve. If the tool is tilted, the valve stem might be bent by the force exerted on the valve spring retainer, resulting in defective jet valve operation.

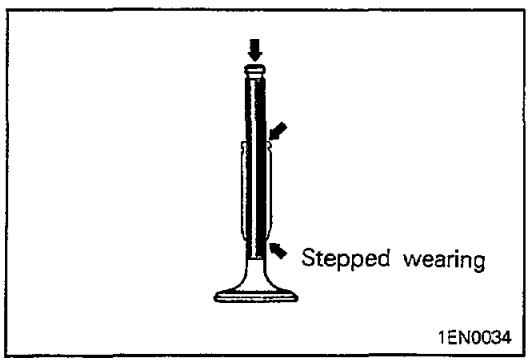
2./6. REMOVAL OF RETAINER LOCK

(1) Using valve spring compressor, compress the valve spring and remove the retainer locks.
(2) Keep these parts in order so that they can be reinstalled in their original positions.



10./12. REMOVAL OF VALVE STEM SEAL

Remove the valve stem seals with pliers and discard them.

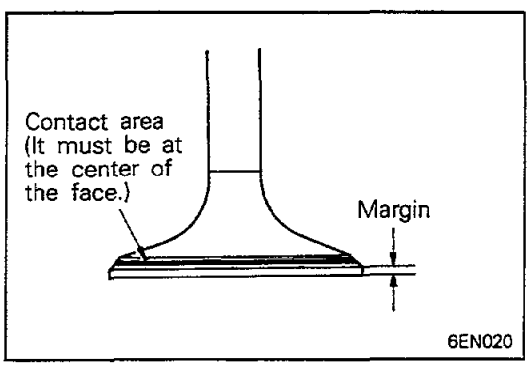


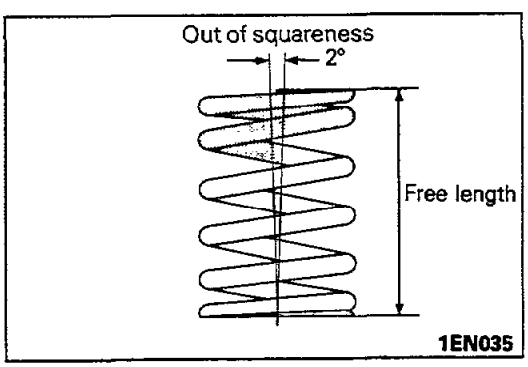
INSPECTION

- **VALVES** N09PGAF

(1) Replace the valve stem if it is worn (stepped wearing or damaged. Also replace it if the stem end (the surface contacting the auto-lash adjuster) is recessed.
(2) Check the valve face contact area, and repair the valve face by the valve refacer if it is defective. The valve seat contact area must be even at the center of the valve face.
(3) Replace the valve if the margin (thickness of the valve head) exceeds the limit.

Standard value:
Intake side: 1.2 mm (.047 in.)
Exhaust side: 2.0 mm (.079 in.)
Limit:
Intake side: 0.7 mm (.028 in.)
Exhaust side: 1.5 mm (.059 in.)

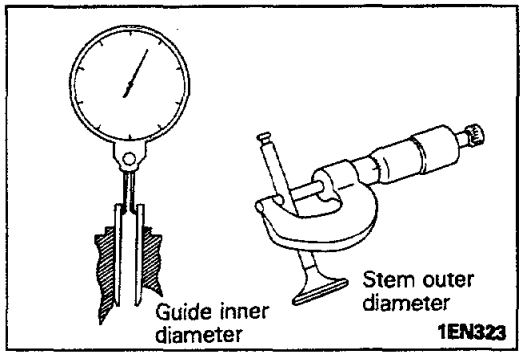


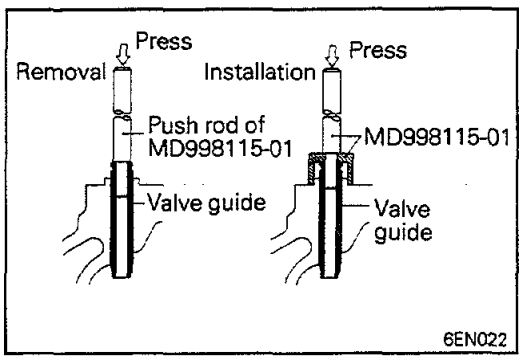


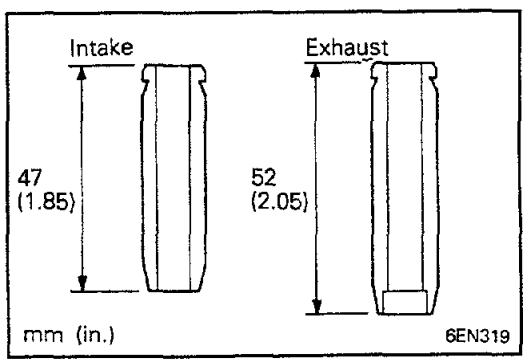
- **VALVE SPRINGS** N09PGBD

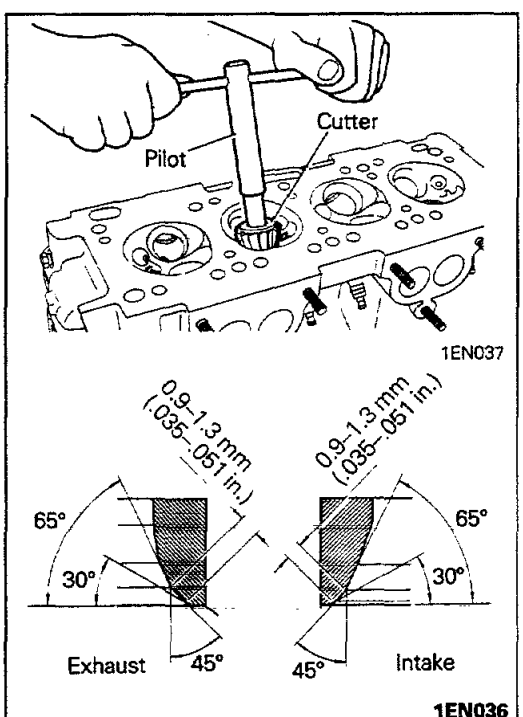
(1) Check free length of each valve spring and replace if necessary.
(2) Using a square, test squareness of each valve spring. If spring is excessively out of square, replace it.

Valve spring
Standard value
Free length: 49.8 mm (1.961 in.)
Load: 329 N (73 lbs.) at installed height
Installed height: 40.4 mm (1.591 in.)
Out of squareness: Less than 2°
Limit
Free length: 48.8 mm (1.921 in.)
Installed height: 41.4 mm (1.630 in.)
Out of squareness: 4°









- **VALVE GUIDES** N09PGCB

Check the valve stem-to-guide clearance. If the clearance exceeds the limit, replace the valve guide with new oversize part.

Valve stem-to-guide clearance
Standard value
Intake : 0.03–0.06 mm (.0012–.0024 in.)
Exhaust : 0.05–0.09 mm (.0020–.0035 in.)

Limit
Intake : 0.10 mm (.0039 in.)
Exhaust : 0.15 mm (.0059 in.)

VALVE GUIDE REPLACEMENT PROCEDURES N09PJEB

(1) Recondition the valve guide hole so that it matches the newly press-fit oversize valve guide.

Valve Guide Insert Oversizes

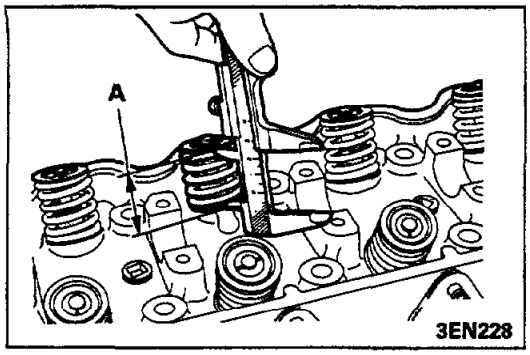
Size mm (in.)	Size mark	Cylinder head hole size mm (in.)
0.05 (.002) O.S.	5	13.050–13.068 (.5138–.5145)
0.25 (.010) O.S.	25	13.250–13.268 (.5217–.5224)
0.50 (.020) O.S.	50	13.500–13.518 (.5315–.5322)

NOTE
Do not reinsert a valve guide of the same size.

(2) Using the special tool, press-fit the valve guide. The valve guide must be press-fit from the upper side of the cylinder head. Keep in mind that the valve guides are of different length [Intake side: 47 mm (1.85 in.), Exhaust side: 52 mm (2.05 in.)].
(3) After the valve guide is press-fit, insert a new valve and check for smooth sliding.
(4) After the valve guide is replaced, check the fit between the valve and the valve seat.

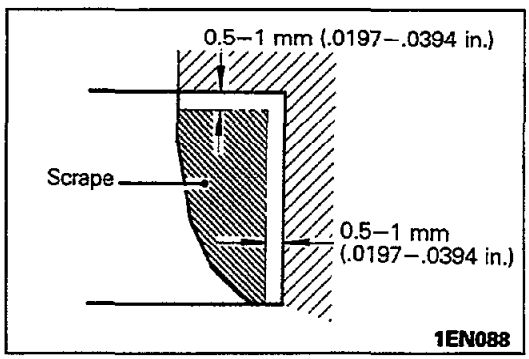
VALVE SEAT RECONDITIONING PROCEDURES N09PHAC1

(1) Check the valve guide for wear. Replace the worn guide.
(2) Recondition the valve seat with a seat grinder or cutter. The valve seat contact width should be of the specified size at the center of the valve face.
(3) The valve and valve seat should be lapped lightly with a lapping compound.



(4) Check valve seat insert sinkage. If the sinkage exceeds the service limit, replace the insert with an oversize part as described below.
(5) Measure the installed height of spring between the spring seat and the retainer with the valve spring seat, spring retainer and retainer lock installed. The amount of sinkage can be judged from the measured value.

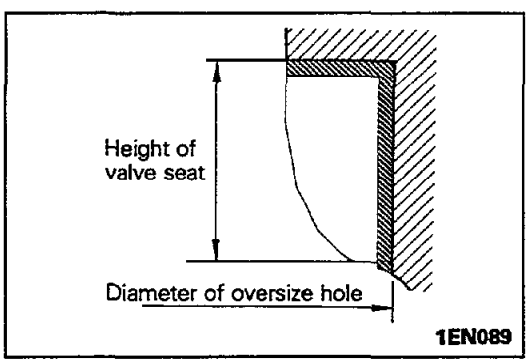
Installed height of spring A (both intake and exhaust)
Standard value : 40.4 mm (1.591 in.)
Limit : 41.4 mm (1.630 in.)



VALVE SEAT INSERT REPLACEMENT PROCEDURES

N09PIAE

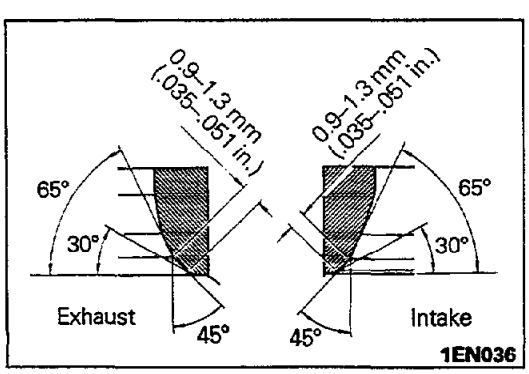
(1) To replace: scrape the inner face of the valve seat to reduce the wall thickness, and remove.



(2) Adjust the press fit diameter of the valve seat on the cylinder head side so that it matches the diameter of the oversize valve seat.

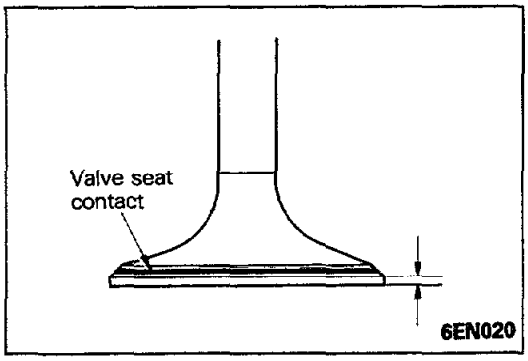
Valve Seat Insert Oversizes

Description	Size mm (in.)	Size mark	Insert height H mm (in.)	Cylinder head I.D. mm (in.)
Intake valve seat insert	0.3 (.012) O.S.	30	7.9–8.1 (.3110–.3189)	47.30–47.33 (1.8622–1.8632)
	0.6 (.024) O.S.	60	8.2–8.4 (.3228–.3307)	47.60–47.63 (1.8740–1.8750)
Exhaust valve seat insert	0.3 (.012) O.S.	30	7.9–8.1 (.3110–.3189)	40.30–40.33 (1.5866–1.5876)
	0.6 (.024) O.S.	60	8.2–8.4 (.3228–.3307)	40.60–40.63 (1.5984–1.5994)

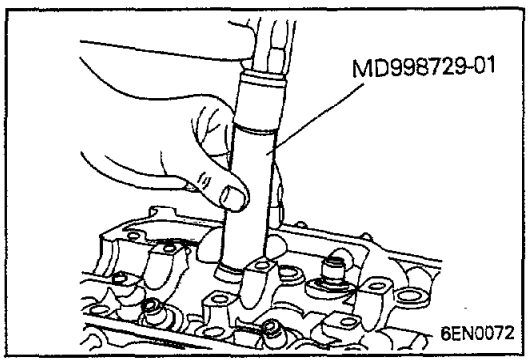


(3) Heat the cylinder head to about 250°C (480°F) and press in an oversie seat insert fit to the insert bore in the cylinder head at normal temperature.
(4) Treat the valve seat in the way shown in the diagram.
(5) Use the lapping compound, and lap the valve.

TSB Revision



(9) Ensure that the seat is properly centered on the valve face.



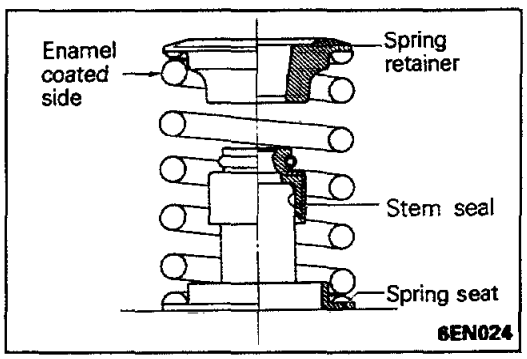
SERVICE POINTS OF REASSEMBLY N09PKDB

13. 11. INSTALLATION OF VALVE SPRING SEAT/12. 10. VALVE STEM SEAL

Install the spring seat, then using special tool, install the stem seal by lightly tapping the tool. Seal is installed in specified position, using the special tool.

Caution

1. **Incorrect installation of the seal without using special tool will result in poor sealing and cause oil leakage down valve guide.**
2. **Do not reuse stem seal.**

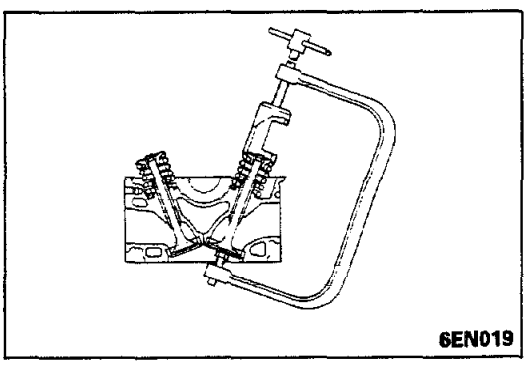


9. INSTALLATION OF EXHAUST VALVE/5. INTAKE VALVE

Apply engine oil to each valve, insert valves into the valve guides. Avoid inserting the valve into the seal with force. After insertion, check to see if the valve moves smoothly.

8./4. INSTALLATION OF VALVE SPRING

Valve springs should be installed with the enamel coated side toward the valve spring retainer.

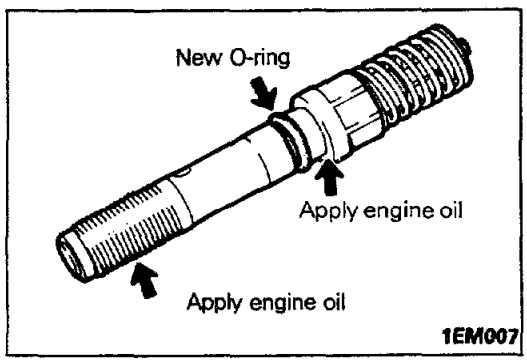


6./2. INSTALLATION OF RETAINER LOCK

(1) Using the valve spring compressor, compress the valve spring and install the retainer lock.

Caution
When compressing the spring with the Valve Spring Compressor, check to see that the valve stem seal is not pressed to the bottom of the retainer. Then start installing the retainer lock.

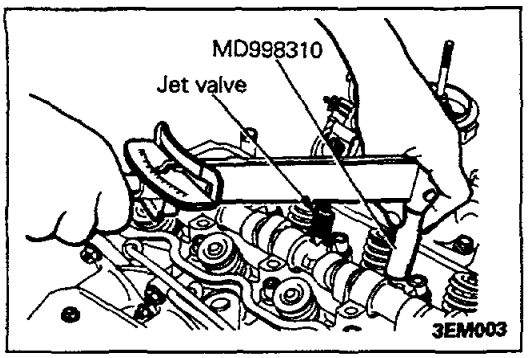
(2) Make certain that retainer locks are positively installed.



1. INSTALLATION OF JET VALVE ASSEMBLY

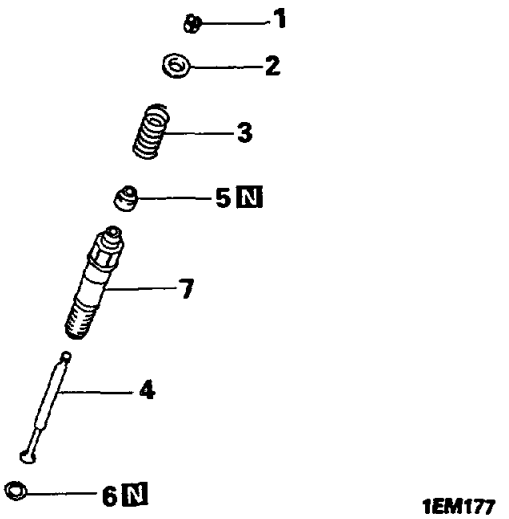
(1) Apply engine oil to the O-ring, jet body threads and seat surface.

Caution
Make sure that the O-ring is a new one.



(2) Screw the jet valve assembly into cylinder head by hand. Tighten the jet valve to the specified torque with Special Tool and a torque wrench while holding the special tool in line with the jet valve center line.

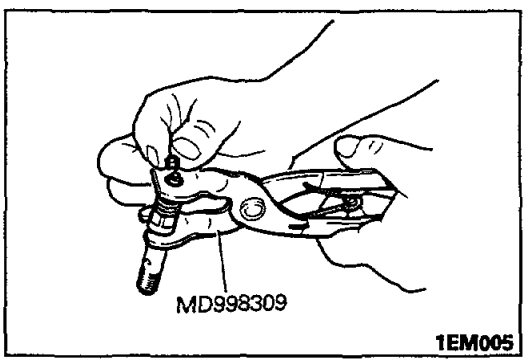
DISASSEMBLY AND REASSEMBLY (JET VALVE ASSEMBLY) N09QE-B



Disassembly steps

◆◆▶◆ 1. Retainer lock
▶◆ 2. Valve spring retainer
▶◆ 3. Valve spring
▶◆ 4. Jet valve
▶◆ 5. Stem seal
6. O-ring
7. Jet body

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆▶ : Refer to "Service Points of Disassembly".
(3) ▶◆ : Refer to "Service Points of Reassembly".
(4) N : Non-reusable parts



SERVICE POINTS OF DISASSEMBLY N09QFAA1

1. REMOVAL OF RETAINER LOCK

Using special tool, remove the retainer lock.

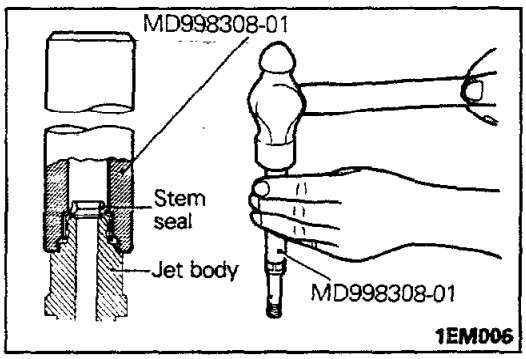
INSPECTION N09QGAA1

- Make sure that the jet valve slides smoothly in the jet body and has no play.

Caution
Combination of the jet valve and jet body should not be disturbed and the jet valve and jet body should be replaced as an assembly.

- Check the valve head and valve seat for damage or seizure.
- Check the spring for sag, cracks or breakage.

Standard value
Jet valve
Length : 92.53 mm (3.6429 in.)
Stem O.D. : 4.3 mm (.169 in.)
Seat angle : 45°
Jet valve spring
Free length : 29.60 mm (1.1654 in.)
Load : 35 N (7.7 lbs.) at installed height
Installed height : 21.50 mm (.8465 in.)
Out of squareness: Less than 1.5°



SERVICE POINTS OF REASSEMBLY

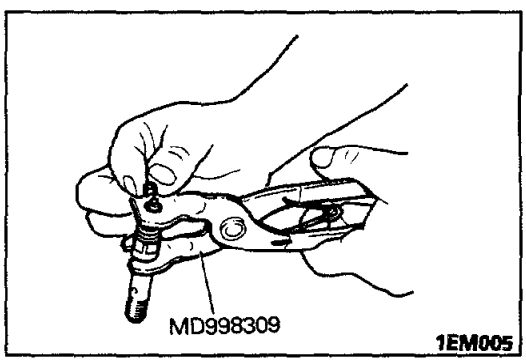
N99QHAB

5. INSTALLATION OF STEM SEAL

Using special tool, install the stem seal.

4. INSTALLATION OF JET VALVE

(1) Apply engine oil to the stem of the jet valve.
(2) Use care to prevent damage to the new seal lips.
(3) Check to ensure that the valve sliders smoothly.

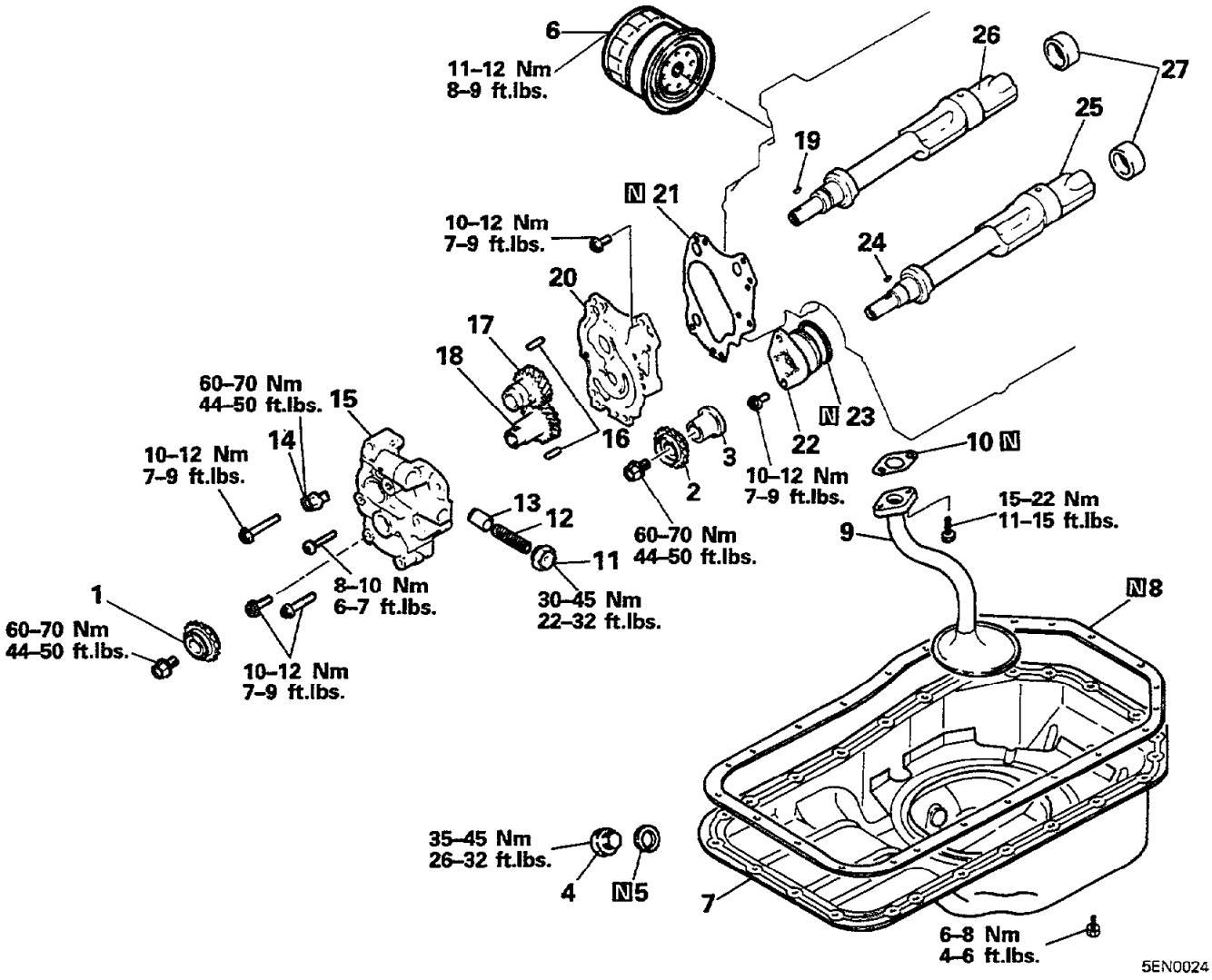


3. INSTALLATION OF VALVE SPRING/2. VALVE SPRING RETAINER/1. RETAINER LOCK

(1) Mount the valve spring and valve spring retainer on jet body.
(2) Compress the valve spring with special tool, using care not to damage the valve stem by hte bottom of valve spring retainer.
(3) While the spring being kept compressed, install the retainer lock.

DISASSEMBLY AND REASSEMBLY (FRONT CASE, OIL PUMP AND SILENT SHAFT)

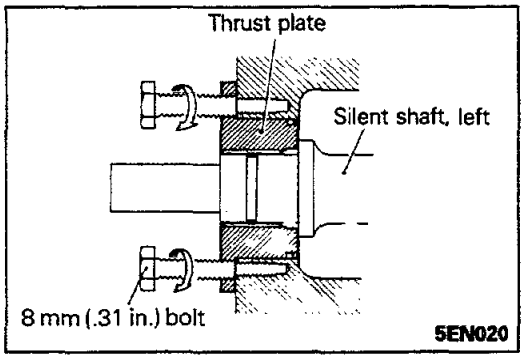
N09RF-

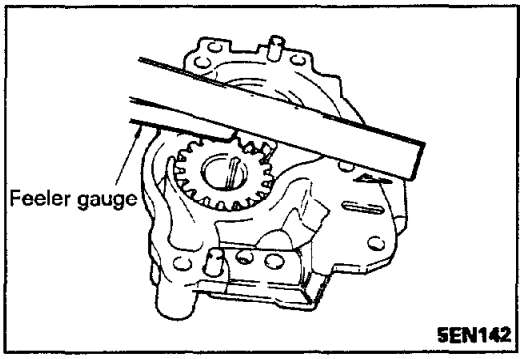


Disassembly steps

1. Oil pump sprocket
2. Left silentshaft sprocket
3. Spacer
4. Oil drain plug
5. Oil drain plug gasket
6. ◆◆ Oil filter
7. ◆◆ Oil pan
8. ◆◆ Oil pan gasket
9. Oil screen
10. Oil screen gasket
11. Plug
12. Relief spring
13. Relief plunger
14. Flange bolt
15. ◆◆ Oil pump body
16. Pin
17. ◆◆ Driven gear
18. ◆◆ Drive gear
19. Woodruff key
20. Oil pump cover
21. Oil pump gasket
22. ◆◆ ◆◆ Thrust plate (with front bearing)
23. ◆◆ O-ring
24. Woodruff key
25. ◆◆ Left silent shaft
26. Right silent shaft
27. Rear bearing

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Disassembly.".
(3) ◆◆ : Refer to "Service Points of Reassembly".
(4) N : *Non-reusable parts.*





SERVICE POINTS OF DISASSEMBLY N09RGAD

22. REMOVAL OF THRUST PLATE

Install 8mm (.31 in.) dia. bolts into threaded holes of flange and turn bolts in to remove the thrust plate.

INSPECTION N09RCGB

- **OIL PUMP**

(1) Check gear contacting surfaces of cover for step wear.
(2) Check the clearance of drive and driven gears. If clearance is excessive, replace case and cover assembly and/or gears.

Standard value
Driven gear
Tip clearance: 0.11–0.15 mm (.0043–.0059 in.)
Side clearance: 0.04–0.10 mm (.0016–.0039 in.)
Drive gear
Tip clearance: 0.11–0.15 mm (.0043–.0059 in.)
Side clearance: 0.05–0.11 mm (.0020–.0043 in.)

Limit
Driven gear
Tip clearance : 0.20 mm (.0079 in.)
Side clearance : 0.15 mm (.0059 in.)
Drive gear
Tip clearance : 0.20 mm (.0079 in.)
Side clearance : 0.15 mm (.0059 in.)

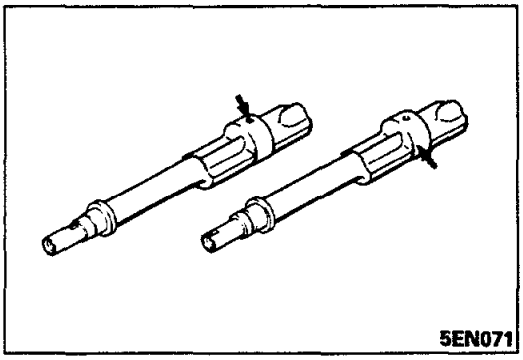
- **RELIEF PLUNGER AND SPRING** N09RCHC

(1) Insert the relief plunger in the oil pump body and check to see if it operates smoothly.
(2) Check the relief spring for breakage or sagging.

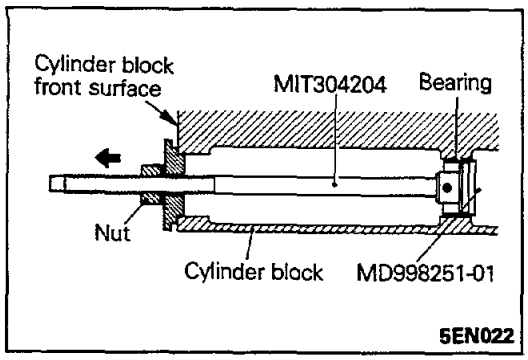
Standard value
Relief spring
Free length : 46.6 mm (1.835 in.)
Load : 61 N/40.1 mm (13 lbs./1.579 in.)

- **SILENT SHAFT** N09RCIA

(1) Check journals for wear, damage and seizure. If excessive damage or seizure is evident, check bearing as well. If necessary, replace silent shaft or bearing or both.
(2) Check oil hole (passage) for clogging. Clean or repair as necessary.



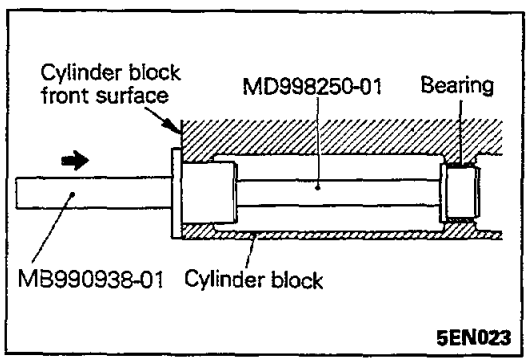
Standard value
Oil clearance
Left silent shaft
Front : 0.020–0.062 mm (.0008–.0024 in.)
Rear : 0.094–0.135 mm (.0037–.0053 in.)
Right silent shaft
Rear : 0.094–0.135 mm (.0037–.0053 in.)



SILENT SHAFT BEARING REPLACEMENT PROCEDURE

N09REAA

(1) Using special tool, remove silent shaft rear bearing.



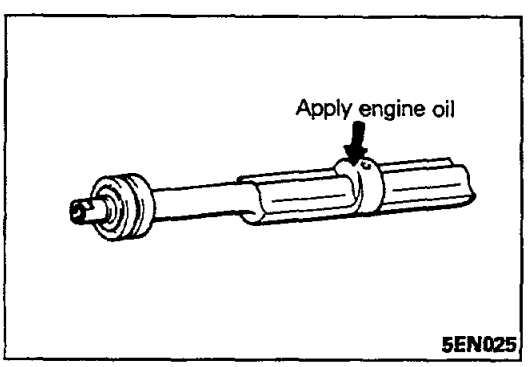
(2) Apply engine oil to O.D. of bearing, using special tool, install silent shaft bearing to cylinder block.

SERVICE POINTS OF REASSEMBLY

N09RHAE

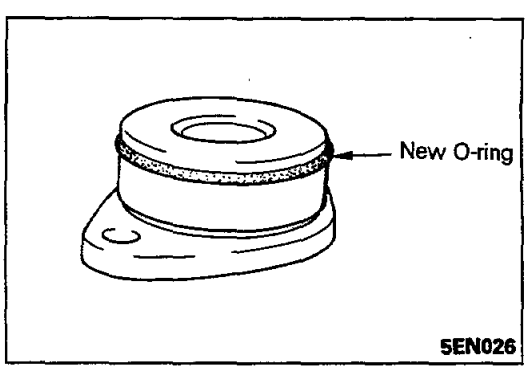
25. INSTALLATION OF LEFT SILENT SHAFT

(1) Apply engine oil to journal of left silent shaft.
(2) Insert left silent shaft into cylinder block. Insert silent shaft carefully to prevent damage to the bearing.



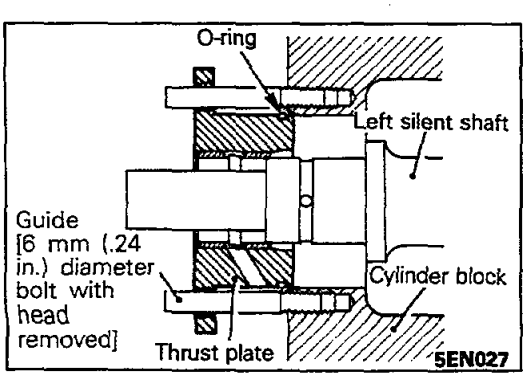
23. INSTALLATION OF O-RING

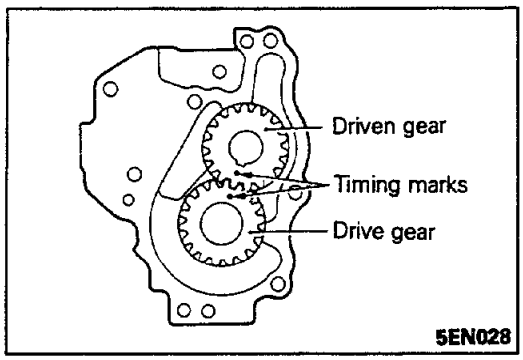
(1) Install o-ring in groove of thrust plate.
(2) Apply engine oil around O-ring.



22. INSTALLATION OF THRUST PLATE

(1) Install two guides in threaded holes for mounting thrust plate. Guides should be fabricated by cutting off hexagon heads bolts 6 mm (.24 in.) in diameter and 50 mm (1.97 in.) long.
(2) Install thrust plate into cylinder block along guides. Without use of guide, threaded holes will be hard to align.

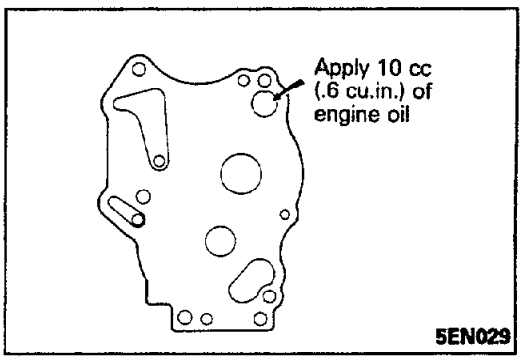




18. INSTALLATION OF DRIVE GEAR/17. DRIVEN GEAR

Install oil pump gears to oil pump body and align timing marks.

Caution
If timing marks are out of alignment, phase of silent shaft will change and vibration will result.

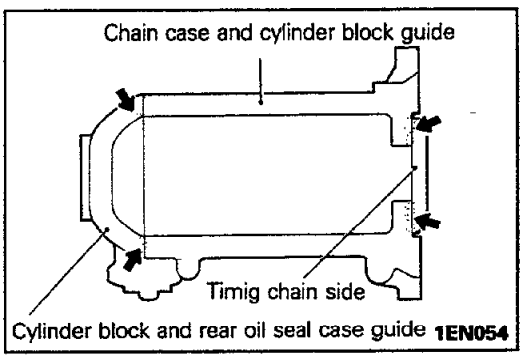


15. INSTALLATION OF OIL PUMP BODY

Place pump assembly in same position as it was installed on engine and supply approx. 10 cc (.6 cu.in.) of clean engine oil in delivery port.

8. INSTALLATION OF OIL PAN GASKET

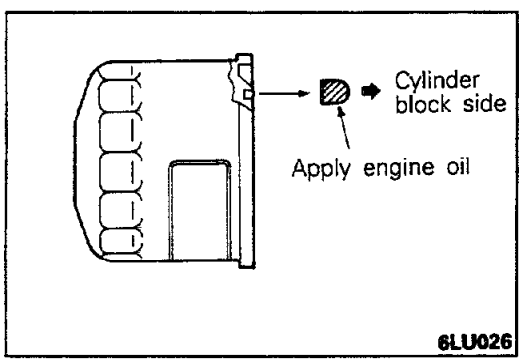
Refer to P.9-16.



7. INSTALLATION OF OIL PAN

Apply sealant to four places on the cylinder block side of the hatched area.

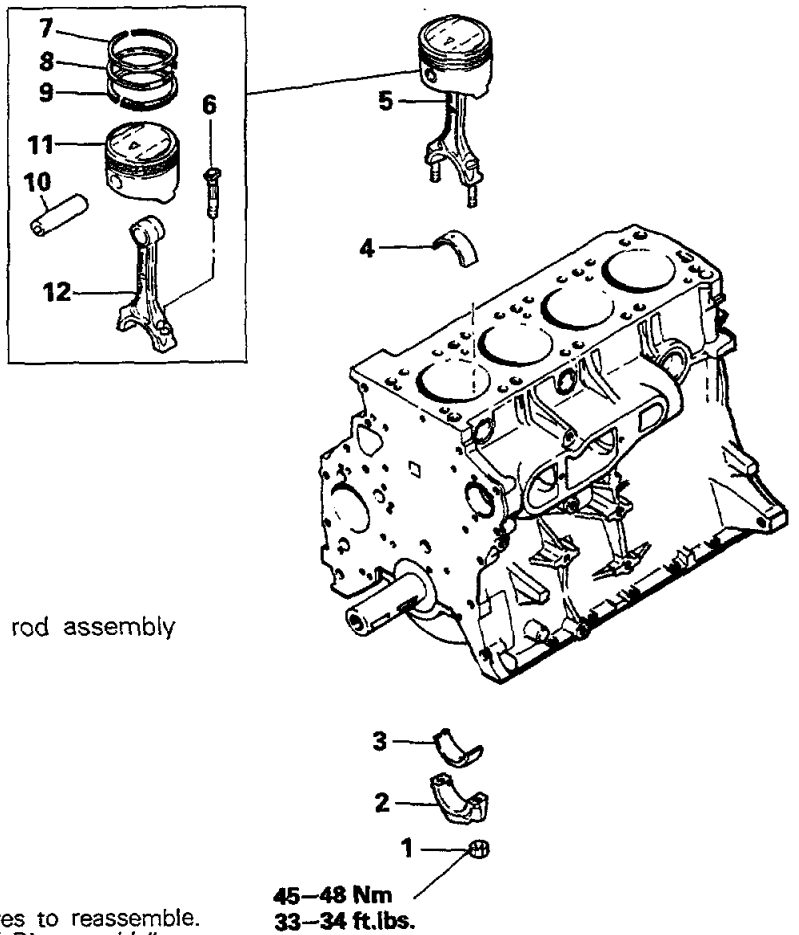
Specified sealant: MITSUBISHI GENUINE Part No. MZ100168 or equivalent



6. INSTALLATION OF OIL FILTER

Clean the mounting surface on the cylinder block side, apply a thin coat of engine oil to the oil filter O-ring and tighten the oil filter.

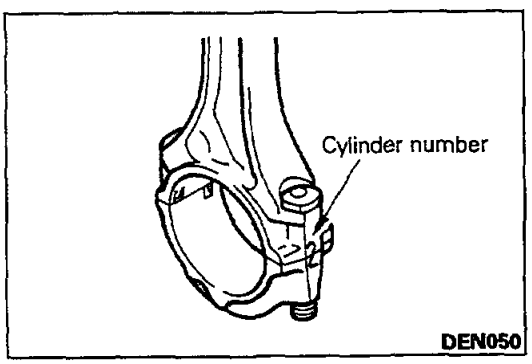
DISASSEMBLY AND REASSEMBLY (PISTON AND CONNECTING ROD) N09TE-A



Disassembly steps

1. Nut
2. ◆◆ ◆◆ Connecting rod cap
3. Bearing
4. Bearing
5. ◆◆ Piston and connecting rod assembly
6. Bolt
7. ◆◆ ◆◆ No. 1 piston ring
8. ◆◆ ◆◆ No. 2 piston ring
9. ◆◆ Oil ring
10. ◆◆ ◆◆ Piston pin
11. Piston
12. Connecting rod

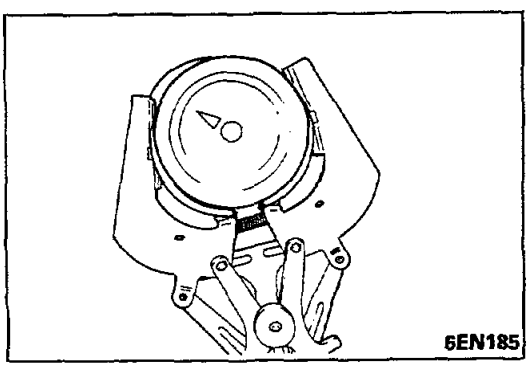
NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Disassembly".
(3) ◆◆ : Refer to "Service Points of Reassembly".



SERVICE POINTS OF DISASSEMBLY N09TFCA

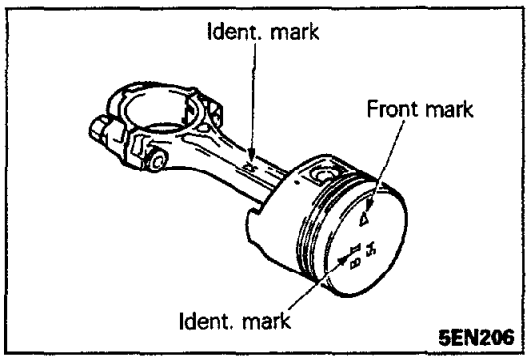
2. REMOVAL OF CONNECTING ROD CAP

Mark the large end of the connecting rod with the cylinder number for use during reassembly.



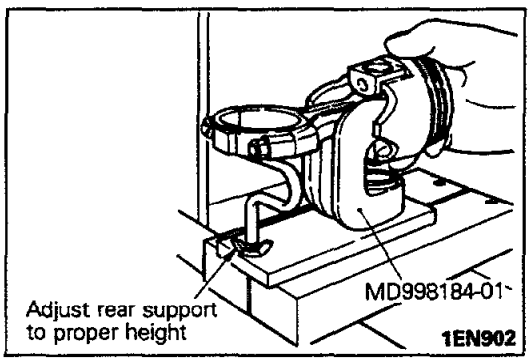
7. REMOVAL OF No. 1 PISTON RING/8. No. 2 PISTON RING

Remove the piston rings with a piston ring expander.

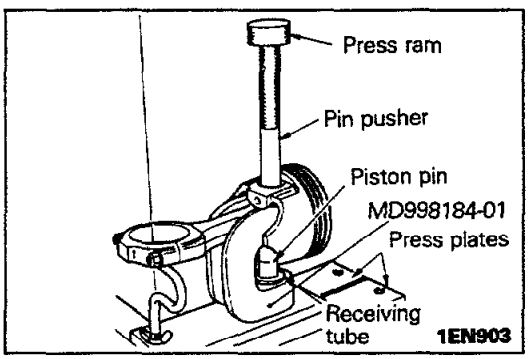


10. REMOVAL OF PISTON PIN

(1) Set piston and connecting rod assembly in tool body in such a way that front mark (arrow mark of piston or identification mark of connecting rod) will be faced upward.
(2) Press plates must be used to provide adequate support to the base during pressing operations.



(3) Place piston and connecting rod with arrow mark or identification mark upward over anvil so lip of insert in between connecting rod boss and inside surface of piston. The connecting rod boss should bear on as much of the insert surface as possible.
(4) Adjust connecting rod rear support until rod is horizontal to press bed surface. Misalignment of pin and receiving tube may result if support adjustment is not correct.



(5) Position piston pin pusher onto pin and remove pin with press ram.

Caution
As piston pin is removed, it must pass through receiving tube.
Check alignment and adjust if necessary.

INSPECTION

N09THAA

- **PISTON**

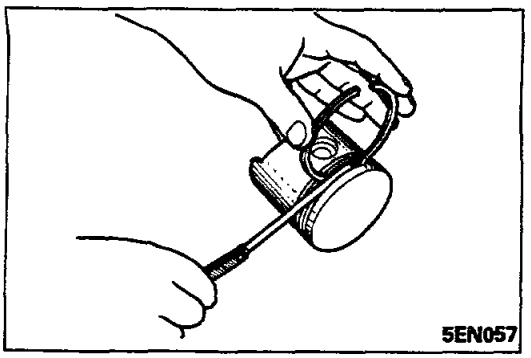
(1) When there are streaks or signs of seizure on the outer surface of the piston (especially on the thrust side), or if there are cracks in the outer surface, replace.
(2) Check the pin boss area oil port. If clogged, clean the oil port.

NOTE
Replace the piston and the piston pin as a set.

- **PISTON PIN**

The piston pin should be able to be inserted into the piston pin hole merely by pushing it in with your finger. If any resistance is noted or if the pin is loose, replace it.

NOTE
Replace the piston and the piston pin as a set.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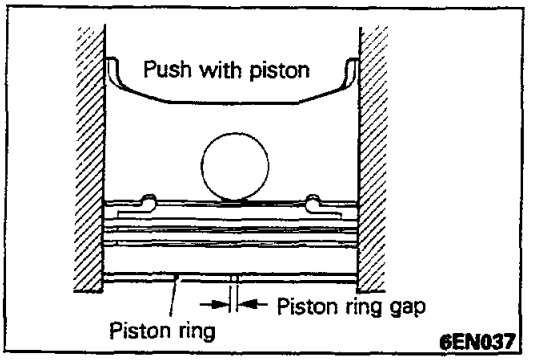


6EN037

- **PISTON RING** N09TCBE

(1) Check for piston ring damage, wear, and bends, replaceing the rings if anything unusual is noted. Also be sure to change the piston rings when a new piston is installed.

(2) Check the clearance between the piston ring and the ring groove. When it exceeds the limit, replace the rings, the piston, or both.

Piston ring side clearance
Standard value
No.1 : 0.05–0.09 mm (.0020–.0035 in.)
No.2 : 0.02–0.06 mm (.0008–.0024 in.)
Limit
No.1 : 0.12 mm (.0047 in.)
No.2 : 0.10 mm (.0039 in.)

(3) Insert the piston ring into the cylinder bore putting it against the top of the piston head and pressing it in. When it makes a right angle, measure the piston ring gap with a feeler gauge. When the gap is too large, replace the piston ring.

Piston ring end gap
Standard value
No.1 : 0.30–0.45 mm (.0118–.0177 in.)
No.2 : 0.25–0.40 mm (.0098–.0157 in.)
Oil ring side rail : 0.30–0.80 mm (.0118–.0315 in.)
Limit
No.1 : 0.8 mm (.031 in.)
No.2 : 0.8 mm (.031 in.)
Oil ring side rail : 1.0 mm (.039 in.)

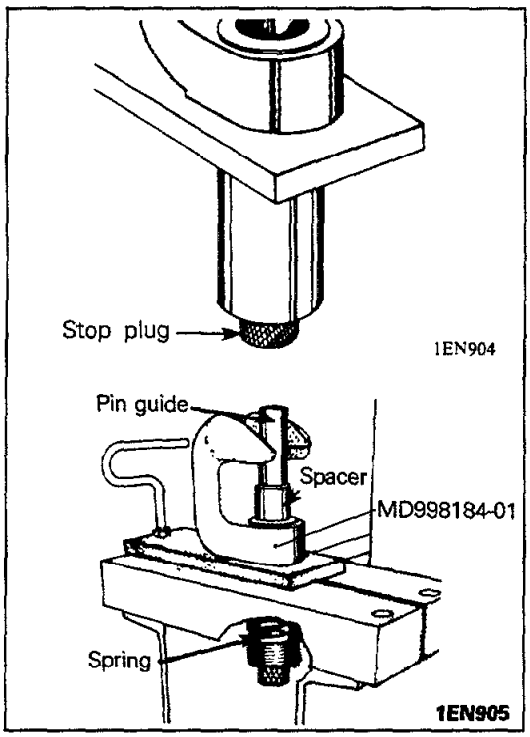
- **BEARING**

(1) Visually check the surface of the bearing, replacing those which are lopsided, streaked, damaged, or show signs of seizure. When streaks or seizure are excessive, check the crankshaft. If damage is discovered on the crankshaft, either replace it or reuse it after undersize machining.

(2) Measure the inner diameter of the connecting rod bearing and the outer diameter of the crankshaft pin. If the gap (oil clearance) exceeds limit, replace the bearing, and, if necessary, the crankshaft. Or, undersize machine the crankshaft and replace the bearings with an appropriate undersized type.

Standard value: 0.019–0.056 mm (.0007–.0022 in.)
Limit: 0.1 mm (.004 in.)

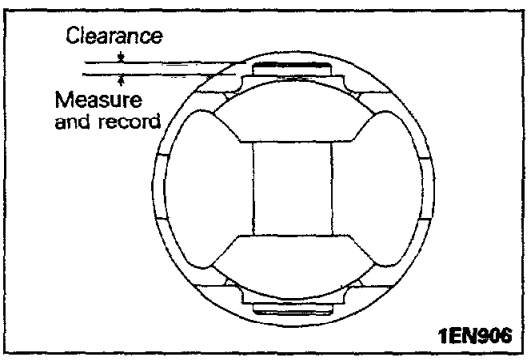
NOTE
For the method by which the oil clearance is measured using a plastigauge, refer to the item on the crankshaft.



SERVICE POINTS OF REASSEMBLY

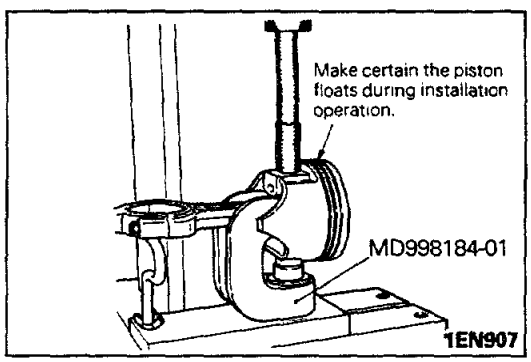
10. INSTALLATION OF PISTON PIN

(1) Thread stop plug approximately half way into the bottom of the receiving tube.
(2) Select the largest diameter piston pin guide that will pass through piston and rod. Install spring, spacer, and guide into receiving tube.



(3) With connecting rod removed from piston, insert piston pin into piston bore. Carefully measure amount of pin that protrudes equally from both sides of piston. Record this measurement for future use.
(4) Position connecting rod and piston over the anvil. The spring loaded piston guide will pass through piston and rod and align it. Lubricate pin and insert it into piston.
(5) Place piston pin pusher on piston pin and push pin through connecting rod unitl the pin protrudes some distance measured and recorded above in step 3.

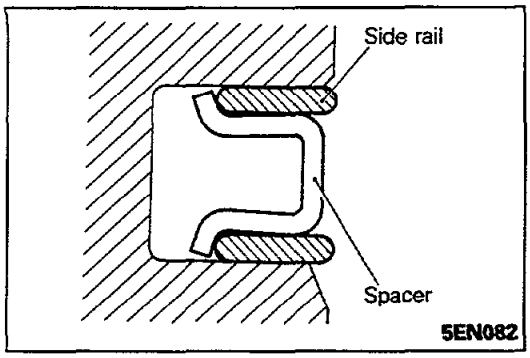
Caution
The piston must be free to float during installation; check frequently.



(6) Apply hydraulic pressure to pin and adjust stop plug until stop plug comes in contact with spacer.
(7) Remove piston and pin assembly from anvil and check piston pin to make sure it is centered. If it is not centered, adjust stop plug up or down to obtain proper centering. The pin stop is now set for any remaining pistons.

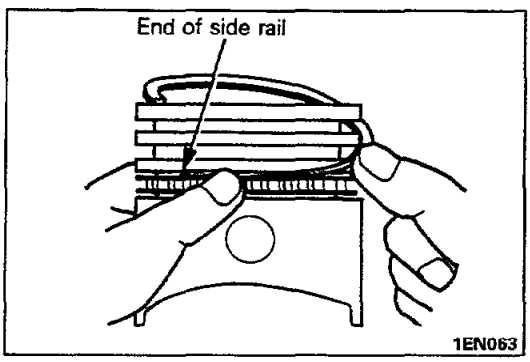
Caution
If the required installation load is out of specification, replace piston pin and/or connection rod.

Piston pin press in load: 7500–17500 N
(1653–3858 lbs.)



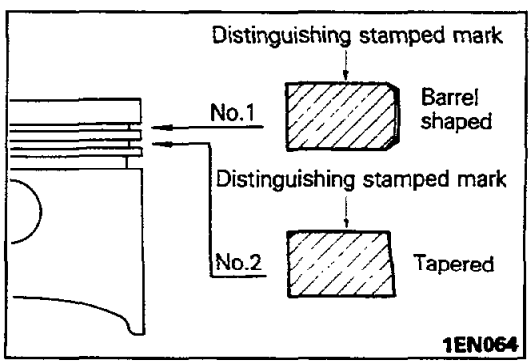
9. INSTALLATION OF OIL RING

(1) Assemble the oil ring spacer into the piston ring groove. Then, after assembling the upper side rail, assemble the lower side rail. There is no difference between the upper and lower side rails or spacers.



(2) The side rail may be easily installed by pushing it in with your finger after fitting the end over the piston groove.

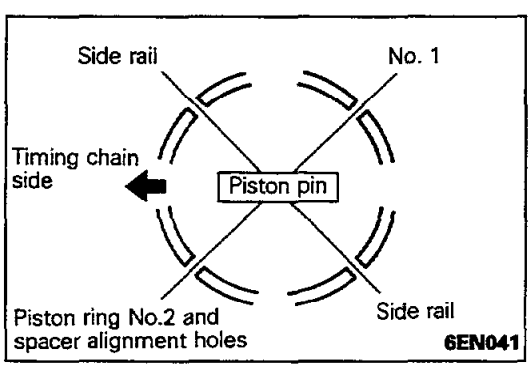
Caution
Do not use piston ring expander when installing side rail.



8/7. INSTALLATION OF NO.2 PISTON RING/NO.1 PISTON RING

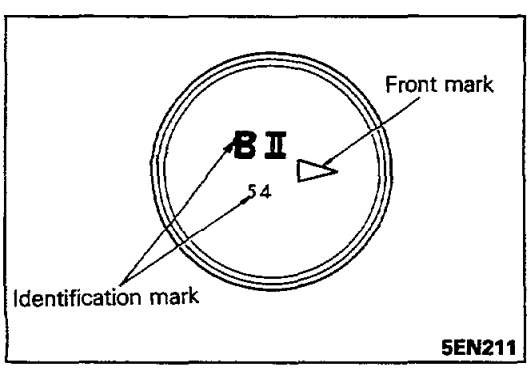
Using a piston ring expander, install No.2 and No.1 piston ring.

Caution
1. **Pay close attention to the differences in shape between Nos. 1 and 2 to avoid confusing them.**
2. **Install piston rings 1 and 2 with the maker and size marks facing up (toward the top of the piston).**

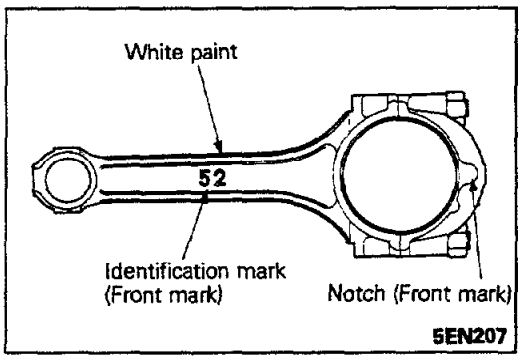


5. INSTALLATION OF PISTON AND CONNECTING ROD ASSEMBLY

(1) Apply plenty of engine oil to the outer piston surfaces, the piston ring and the oil ring.
(2) Align the mating holes in the piston and oil rings (side rail, spacer) as illustrated.

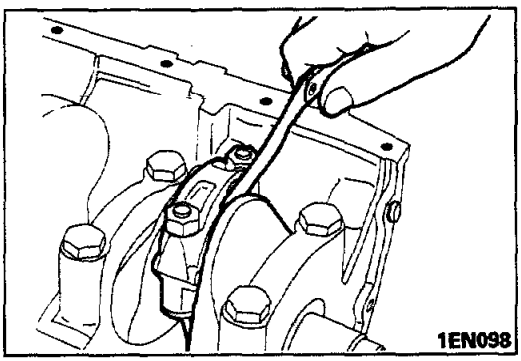


(3) Orient the piston and connecting rod assembly so that the front mark on the top of the piston and the front mark on the connecting rod (distinguishing mark) face toward the front of the engine (the timing belt side) and insert it into the cylinder.



2. INSTALLATION OF CONNECTING ROD CAP

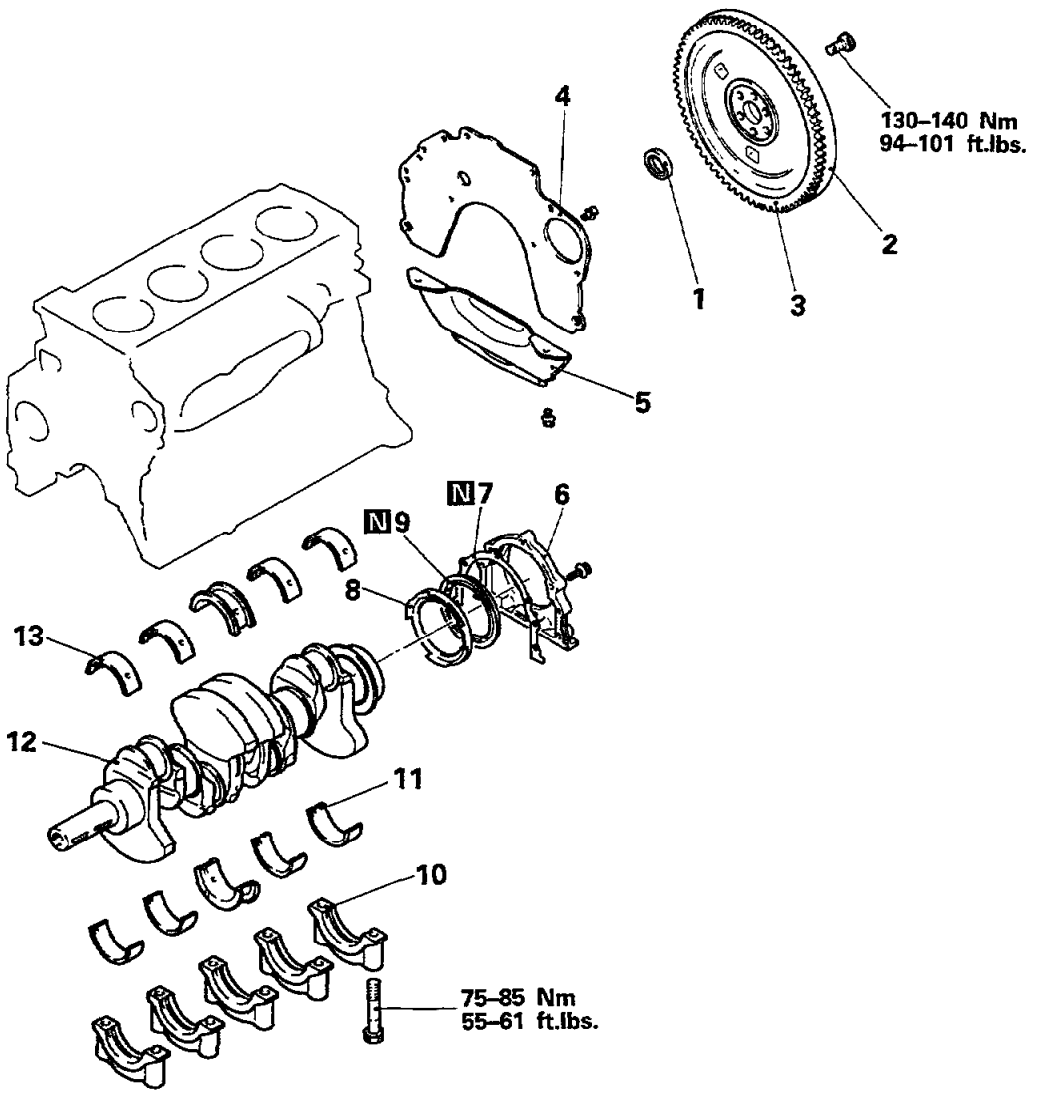
(1) When the connecting rod is installed, make sure that identification mark and notch are on same side.



(2) Check the connecting rod big end side clearance.

Connecting rod big end side clearance
Standard value : 0.10–0.25 mm (.0039–.0098 in.)
Limit : 0.4 mm (.016 in.)

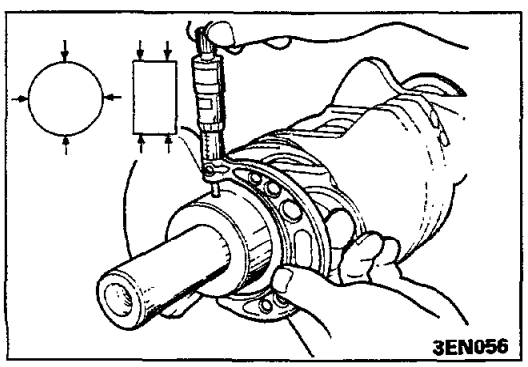
DISASSEMBLY AND REASSEMBLY (CRANKSHAFT AND FLYWHEEL) N09UE-A



Disassembly steps

1. Ball bearing
2. Flywheel
3. Ring gear
4. Rear plate
5. Bell housing cover
6. Oil seal case
7. Oil seal case gasket
- ◆◆ 8. Oil separator
- ◆◆ 9. Oil seal
- ◆◆ 10. Bearing cap
- ◆◆ 11. Lower bearing
12. Crankshaft
- ◆◆ 13. Upper bearing

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Reassembly".
(3) N : Non-reusable parts

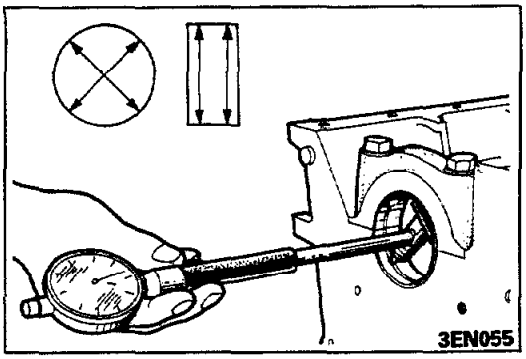


INSPECTION N09UHAA

- **CRANKSHAFT**

(1) Check the crankshaft journals and pins for damage, uneven wear and cranks. Also check oil holes for clogging. Correct or replace any defective part.
(2) Inspect out-of-roundness and taper of crankshaft journal and pin.

Standard value
Crankshaft journal O.D. : 60 mm (2.36 in.)
Crank pin O.D. : 53 mm (2.09 in.)



Limit
Out-of-roundness of journal and pin : 0.015 mm (.0006 in.)
Taper of journal and pin 0.005 mm (.0002 in.)

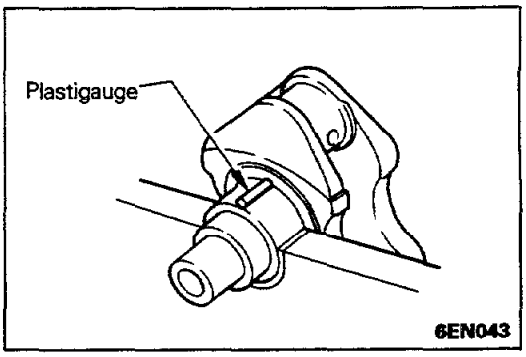
(3) To check the oil clearance, measure the outside diameter of the crankshaft journal and the crank pin and the inside diameter of the bearing. The clearance can be obtained by calculating the difference between the measured outside and inside diameters.

Standard value
Crankshaft main bearing : 0.021– 0.046 mm (.0008–.0018 in.)
Connecting rod bearing : 0.019–0.056 mm (.0007–.0022 in.)

Limit
Crankshaft main bearing : 0.1 mm (.004 in.)
Connecting rod bearing : 0.1 mm (.004 in.)

- **MAIN BEARINGS AND CONNECTING ROD BEARINGS**

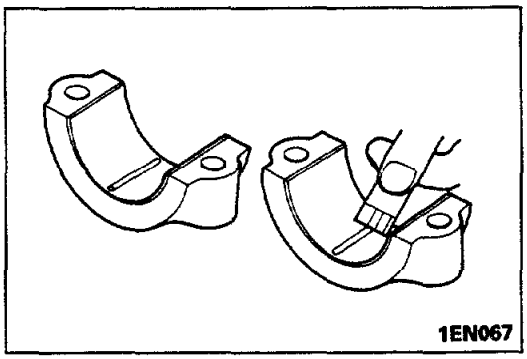
Visually inspect each bearing for peeling, melt, seizure and improper contact. Replace the defective bearings.



PLASTIGAUGE METHOD

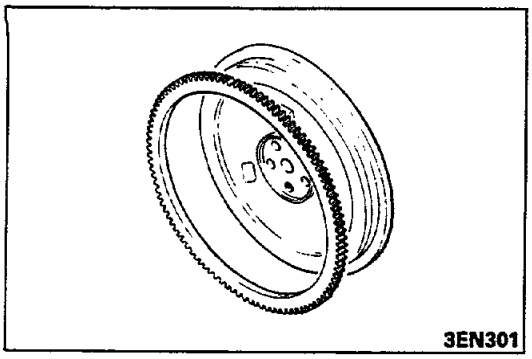
Plastigauge may be used to measure the clearance.

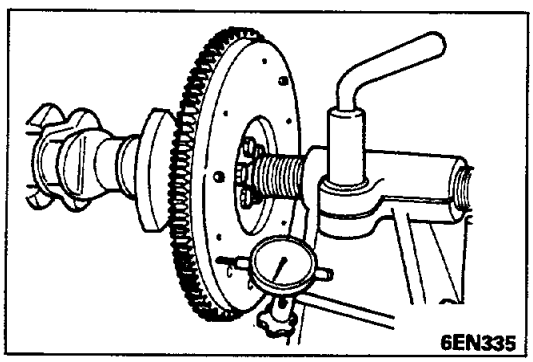
(1) Remove oil and grease and any other dirt from bearings and journals.
(2) Cut plastigauge to the same length as the width of the bearing and place it in parallel with the journal, off oil holes.
(3) Install the crankshaft, bearings and caps and tighten them to the specified torques. During this operation, do NOT turn the crankshaft.
(4) Remove the caps. Measure the width of the plastigauge at the widest part by using a scale printed on the plastigauge sleeve.
(5) If the clearance exceeds the repair limit, the bearing should be replaced or an undersize bearing used.
When installing a new crankshaft, be sure to use standard size bearings.
(6) Should the standard clearance not be obtained even after bearing replacement, the journal should be ground to undersize and a bearing of the same size should be installed.

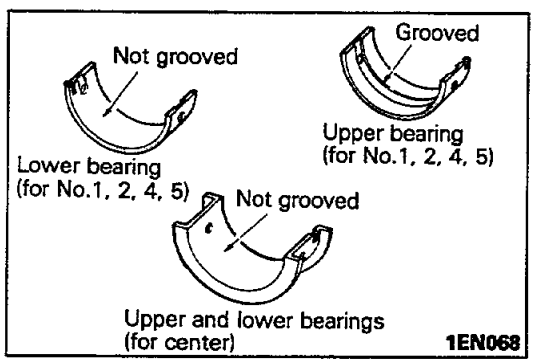


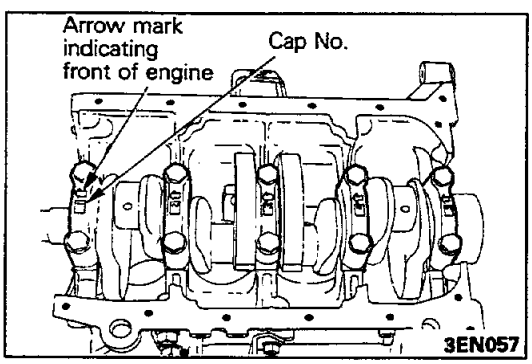
- **OIL SEAL**

Check front and rear oil seals for damage or worn lips. Replace any seat that is defective.









- **RING GEAR**

When there is wear, cracks, or other damage to the ring gear teeth, replace the ring gear by the following procedure. Check the starter motor pinion.

Ring gear replacement procedure :

(1) Tap around the ring gear to loosen and remove it from the flywheel.

Caution
The ring gear cannot be removed while it is hot.

(2) Heat the ring gear to 300°C (572°F) and put it into the flywheel.

- **FLYWHEEL**

(1) Make a visual inspection of the clutch disc. If stepped wear, streaking, or seizure are apparent, replace it.
(2) If flywheel run out exceeds the limit, replace it.

Limit : 0.13 mm (.005 in.)

SERVICE POINTS OF REASSEMBLY N09UGAD

13. INSTALLATION OF UPPER BEARING

When reusing the main bearings, remember to install them by referring to location marks made at the time of removal.
Be sure oil holes in bearings align with oil hole in block.

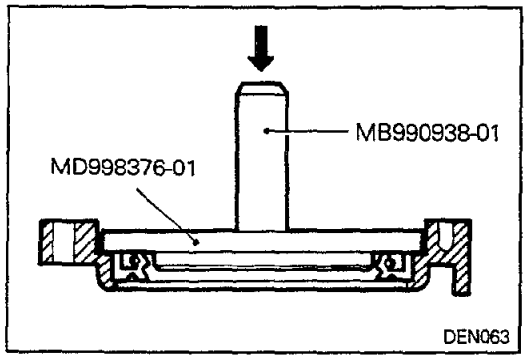
11. INSTALLATION OF LOWER BEARING

Check to ensure that the lower bearing has no oil groove.

10. INSTALLATION OF BEARING CAP

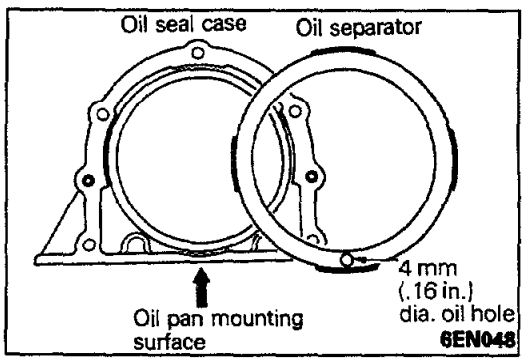
(1) The caps should be installed with the arrow mark directed toward the crank pulley side of engine. Cap numbers must be in correct order.
(2) Tighten cap bolts in sequence : Center, No. 2, No.4, front and rear cap bolts.
(3) Cap bolts should be tightened evenly in 2 to 3 stages before they are finally tightened.
(4) Make certain that crankshaft turns freely and has the proper clearance between the center main bearing thrust flange and the connecting rod big end bearing.

Standard value : 0.05–0.18 mm (.0020–.0071 in.)
Limit : 0.4 mm (.016 in.)



9. INSTALLATION OF OIL SEAL

Using special tool, press fit the oil seal all the way in without tilting it.

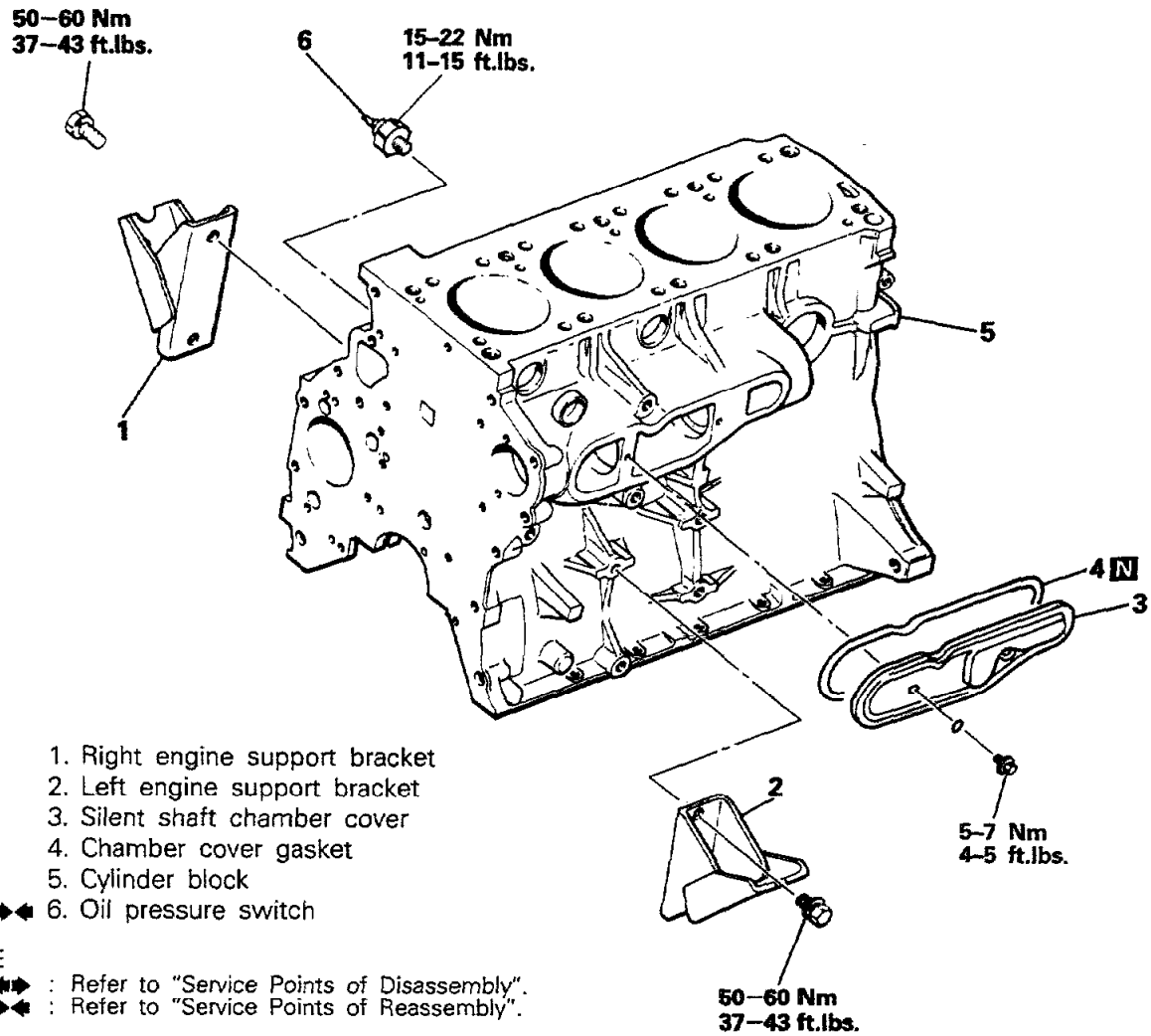


8. INSTALLATION OF OIL SEPARATOR

Press the oil separator into the oil seal case. Install it so that the separator oil hole is on the very botttom, as illustrated.

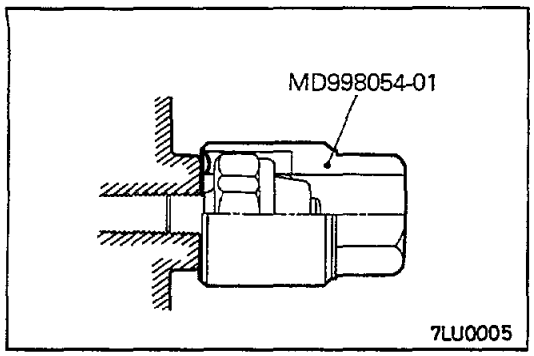
DISASSEMBLY AND REASSEMBLY (CYLINDER BLOCK)

N09VF-A



1. Right engine support bracket
2. Left engine support bracket
3. Silent shaft chamber cover
4. Chamber cover gasket
5. Cylinder block
6. Oil pressure switch

NOTE
(1) ◀■▶ : Refer to "Service Points of Disassembly".
(2) ▶■◀ : Refer to "Service Points of Reassembly".



SERVICE POINTS OF DISASSEMBLY N09VGAB

6. REMOVAL OF OIL PRESSURE SWITCH

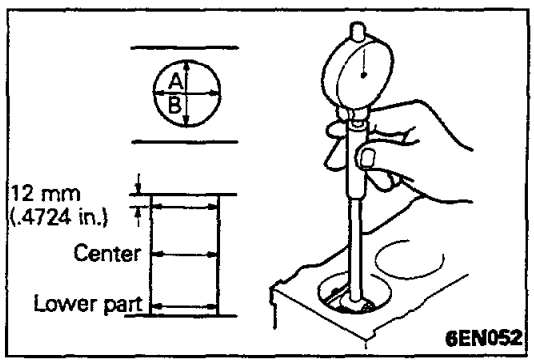
(1) Remove the terminal of oil pressure switch.
(2) Using the special tool, remove the oil pressure switch.

Caution
Sealant is coated on the threaded part, so be careful not to damage when removing.

INSPECTION N09VHAA

- **CYLINDER BLOCK**

(1) Visually check the cylinder block for scores, rust and corrosion. Also check for cracks or any other defects by using a flaw detecting agent (magnafluxing). Correct or replace the block if defective.
(2) Measure the cylinder bore with a cylinder gauge at three levels in the directions of A and B.
(3) If the cylinder bores show more than specified out-of-round or taper, or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed, and new oversize pistons and rings fitted.



Measuring points are as shown.

Standard value
Cylinder bore: 91.1 mm (3.587 in.)
Out-of-roundness and taper of cylinder bore: Less than 0.02 mm (.0008 in.)

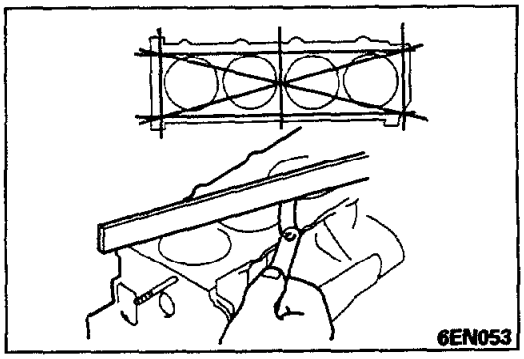
(4) If cylinder top ridge is worn in stages, cut away with ridge reamer.
(5) Oversize pistons are available in four sizes.

Piston service size and mark
0.25 mm (.010 in.) O.S.: 0.25
0.50 mm (.020 in.) O.S.: 0.50
0.75 mm (.030 in.) O.S.: 0.75
1.00 mm (.039 in.) O.S.: 1.00

(6) To rebore the cylinder bore to oversize, keep the specified clearance between the oversize piston and the bore, and make sure that all pistons used are of the same oversize. The standard measurement of the piston outside diameter is taken at a level 2 mm (.08 in.) above the bottom of the piston skirt and across the thrust faces.

Standard value
Piston-to-cylinder wall clearance: 0.02–0.04 mm (.0008–.0016 in.)

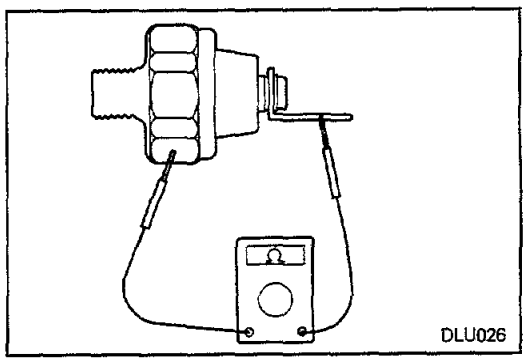
(7) Check for damage and cracks.



(8) Check top surface for flatness. If excessive flatness is evident, grind to minimum limit or replace.

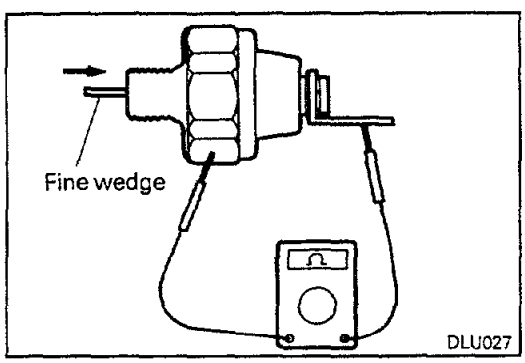
Flatness of gasket surface
Standard dimension: 0.05 mm (.0020 in.) or less
Limit: 0.1 mm (.004 in.)
Overall height
Standard value: 316 mm (12.44 in.)
Limit (amount of cylinder block gasket surface grind: −0.2 mm (−.008 in.)

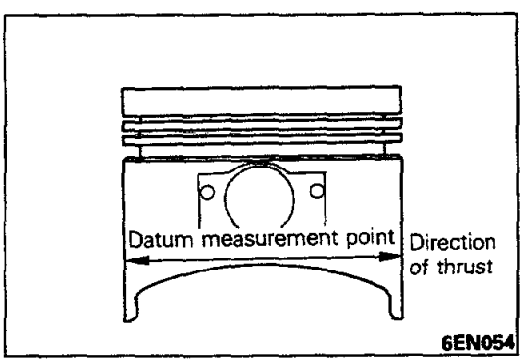
Caution
The cylinder block gasket surface should be ground to within 0.2 mm (.008 in.) even with the grind of cylinder head gasket surface.



• OIL PRESSURE SWITCH

(1) Connect a tester (ohm range) between the terminal and the body and check for conductivity. If there is no conductivity, replace the switch.
(2) Next insert a very fine wedge through the oil hole, pushing it slightly. There should be no conductivity (resistance should be infinite). If there is conductivity even when wedge is pushed, replace the switch.
(3) Or, if there is no conductivity when a 50 kPa (71 psi) pressure is placed through the oil hole, the switch is operating properly. Check at this time to see that there is no air pressure leakage. If there is air pressure leakage, the diaphragm is broken, and the switch should be replaced.





BORING THE CYLINDER

(1) Based on the largest cylinder bore, determine the over sized piston to be used.
(2) Measure with the outside diameter of the piston as the datum measurement points.

NOTE
There are four sizes of oversize piston : 0.25 mm (.010 in.), 0.50 mm (.020 in.), 0.75 mm (.030 in.), 1.00 mm (.039 in.).

(3) Calculate the reground bore size based on the measured value of the outside piston diameter.

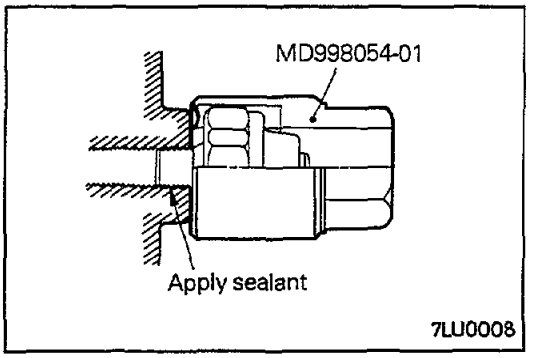
NOTE
Bore size = outside piston diameter + 0.02–0.04 mm (.0008–.0016 in.) (gap between cylinder and piston) –0.02 mm (.0008 in.) (honing)

(4) Hone each of the cylinders to the calculated measurement.

Caution
In order to avoid uneven boring due to the rise in temperature, bore the cylinders in the following sequence: #2, #4, #1, and #3.

(5) Hone the cylinders, finishing them to the proper dimension (outside piston diameter + gap with cylinder).
(6) Check the gap between the piston and cylinder.

Standard value : 0.02–0.04 mm (.0008–.0016 in.)



SERVICE POINTS OF REASSEMBLY N09VIAB

6. INSTALLATION OF OIL PRESSURE SWITCH

Coat the threads of switch with sealant and install the switch using the special tool.

Specified sealant: 3M ART Part No. 8660 or equivalent

Caution
1. Keep the end of threaded portion clear of sealant.
2. Avoid an overtightening.