
ENGINE

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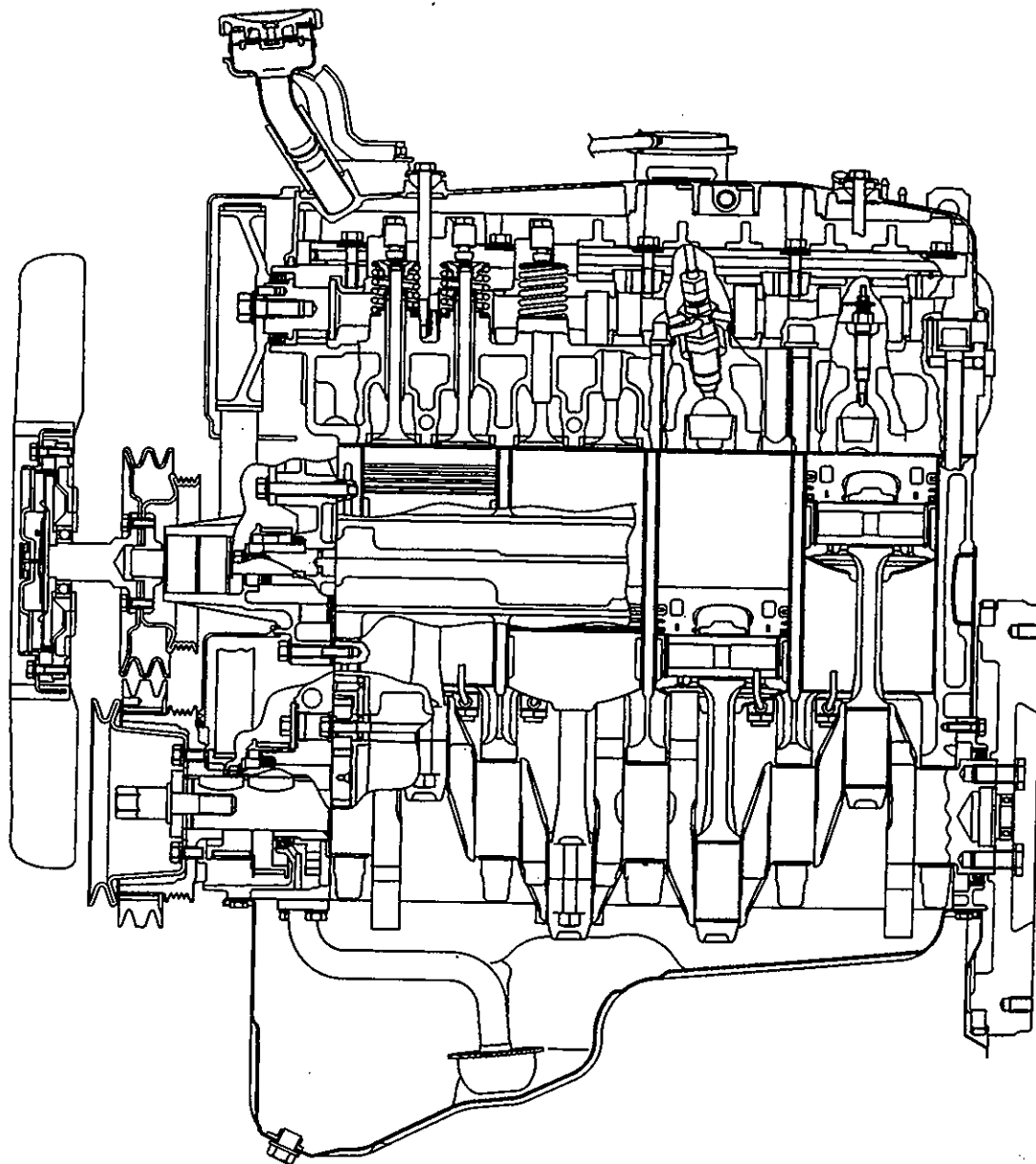
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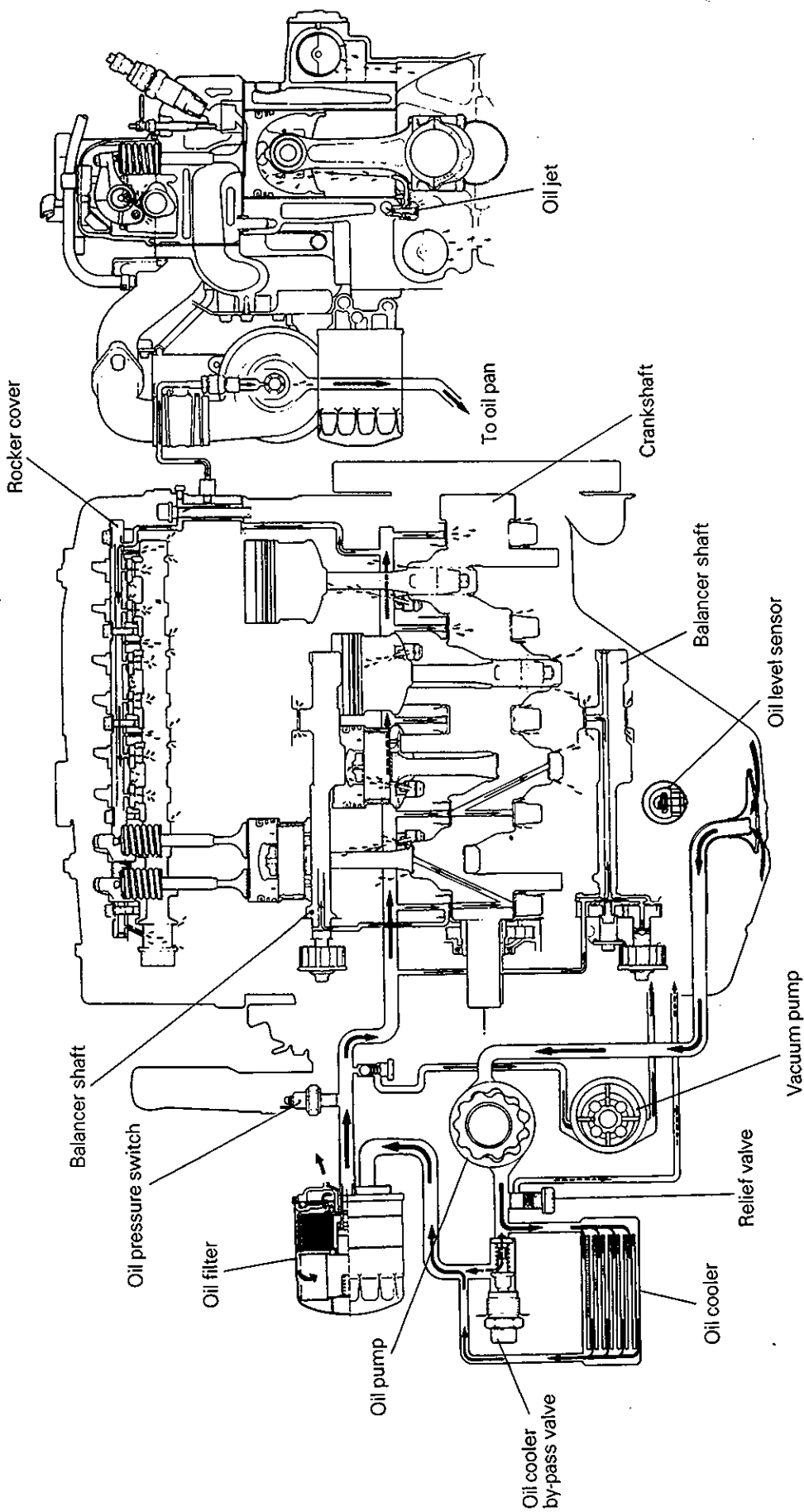
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GENERAL INFORMATION

ENGINE SECTIONAL VIEW



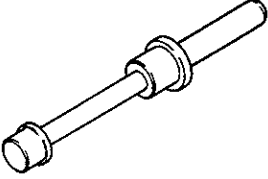
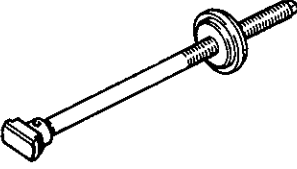
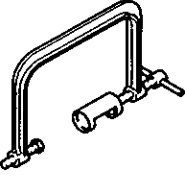
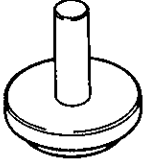


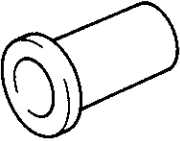
LUBRICATION SYSTEM



	Standard	Limit
Piston ring		
End gap		
No. 1 ring	0.25 - 0.40 (0.0098 - 0.0157)	0.8 (0.0315)
	T/C 0.35 - 0.50 (0.0138 - 0.020)	0.8 (0.0315)
No. 2 ring	0.25 - 0.45 (0.0098 - 0.0177)	0.8 (0.0315)
	T/C 0.25 - 0.40 (0.0098 - 0.0157)	0.8 (0.0315)
Oil ring	0.25 - 0.45 (0.0098 - 0.0177)	0.8 (0.0315)
Ring-to-ring groove clearance		
No. 1 ring	0.13 - 0.17 (0.0051 - 0.0067)	0.20 (0.0079)
	T/C 0.06 - 0.08 (0.0024 - 0.0031)	0.15 (0.0059)
No. 2 ring	0.05 - 0.09 (0.0020 - 0.0035)*	0.15 (0.0059)
	0.03 - 0.07 (0.0012 - 0.0028)	0.15 (0.0059)
	T/C 0.05 - 0.07 (0.0020 - 0.0028)	0.15 (0.0059)
Oil ring	0.02 - 0.07 (0.0008 - 0.0028)	0.10 (0.0039)
Service size	0.50 (0.020), 1.00 (0.039) oversize	
*: Pistons with ring carrier		
Piston pin		
O.D.	28.994 - 29.000 (1.1411 - 1.1417)	
Connecting rod		
Big end center-to-small end center length	157.95 - 158.05 (6.218 - 6.222)	
Bend	0.05 (0.0020)	
Twist	0.1 (0.004)	
Big end side clearance	0.10 - 0.25 (0.0039 - 0.0098)	0.40 (0.0157)
Crankshaft		
End play	0.05 - 0.18 (0.002 - 0.007)	0.25 (0.0098)
Journal O.D.	66 (2.60)	
Pin O.D.	53 (2.09)	
Out-of-roundness and taper of journal and pin	Within 0.005 (0.00020)	
Concentricity of journal	Within 0.015 (0.0006)	
Oil clearance of journal	0.02 - 0.05 (0.0008 - 0.0020)	0.10 (0.0039)
Oil clearance of pin	0.02 - 0.05 (0.0008 - 0.0020)	0.10 (0.0039)
Journal		
0.25 U.S.	65.735 - 65.750 (2.588 - 2.589)	
0.50 U.S.	65.485 - 65.500 (2.578 - 2.579)	
0.75 U.S.	65.235 - 65.250 (2.568 - 2.569)	
Pin		
0.25 U.S.	52.735 - 52.750 (2.0762 - 2.0768)	
0.50 U.S.	52.485 - 52.500 (2.0663 - 2.0670)	
0.75 U.S.	52.235 - 52.250 (2.0565 - 2.0571)	
Cylinder block		
Cylinder I.D.	91.10 - 91.13 (3.5866 - 3.5878)	
Flatness of gasket surface	0.05 (0.0020)	0.10 (0.0039)
Overall height	318.45 - 318.55 (12.5374 - 12.5413)	
Flywheel		
Runout		0.13 (0.0051)

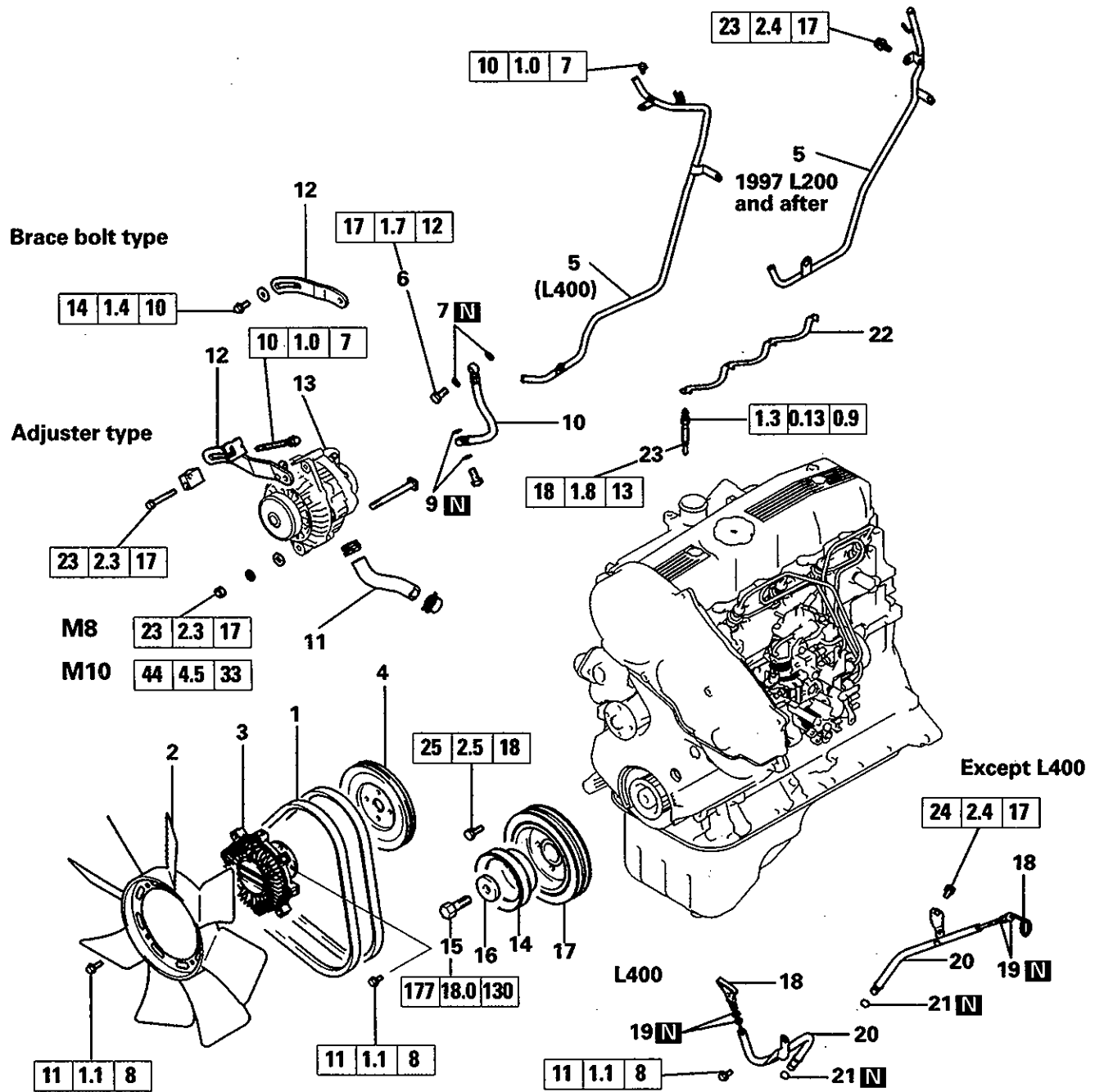
TORQUE SPECIFICATIONS

	Nm	Torque kgm	ft.lbs.
Drive belt and glow plug			
Cooling fan bolt	11	1.1	8
Fan clutch bolt	11	1.1	8
Vacuum pipe bolt (L400)	10	1.0	7
Vacuum pipe bolt (1997 L200 and after)	23	2.4	17
Vacuum pipe bolt (2001 model PAJERO)			
M8 x 16	12	1.2	9
M8 x 20	22	2.2	16
Eye bolt	17	1.7	12
Auto tensioner bolt	44	4.5	33
Power steering pump bracket bolt (Washer)	22	2.2	16
Power steering pump bracket bolt (Flange)	24	2.4	17
Alternator pivot bolt			
M8	23	2.3	17
M10	44	4.5	33
Brace bolt	14	1.4	10
Lock bolt	23	2.3	17
Adjusting bolt	10	1.0	7
Crankshaft pulley bolt	25	2.5	18
Crankshaft bolt	117	18.0	130
Oil level gauge guide bolt			
M6 (L400)	11	1.1	8
M8 (Except L400)	24	2.4	17
Glow plug plate nut (Except 2001 PAJERO)	1.3	0.13	0.9
Glow plug plate nut (2001 PAJERO)	1.8	0.18	1.3
Glow plug	18	1.8	13
Timing belt			
Timing belt cover bolt	11	1.1	8
Flange bolt	10	1.0	7
Tensioner spacer nut	25	2.6	19
Timing belt tensioner bolt	25	2.6	19
Camshaft sprocket bolt	67	7.0	51
Injection pump sprocket nut	83	8.5	61
Balancer shaft sprocket bolt and nut	36	3.7	27
Timing belt rear cover bolt	11	1.1	8
Fuel injection pump and injection nozzle			
Injection pump protector	14	1.4	10
Injection pipe clamp bolt	5	0.5	3.7
Injection pipe union nut.	29	3.0	22
Injection pump nut	19	1.9	14
Injection pump bolt	24	2.4	17
Injection pump bracket	22	2.2	16
Fuel return pipe nut	27	2.8	20
Injection nozzle	54	5.5	40
Injection nozzle holder			
Retaining nut	37	3.8	27

Tool	Number	Name	Use
	MD998250	Balancer shaft bearing installer	Installation of silent shaft rear bearing
	MD998251	Balancer shaft bearing puller	Removal of silent shaft rear bearing
	MD998303	Valve spring compressor	Compression of valve spring
	MD998376	Crankshaft rear oil seal installer	Installation of crankshaft rear oil seal
	MD998380	Bearing installer stopper	Guide for removal and installation of silent shaft right rear bearing
	MD998381	Camshaft oil seal installer	Installation of camshaft oil seal
	MD998382	Crankshaft front oil seal guide	Guide for installation of crankshaft front oil seal

3. DRIVE BELT AND GLOW PLUG

REMOVAL AND INSTALLATION <PAJERO (Up to 2000 model), L200, L300, L400>



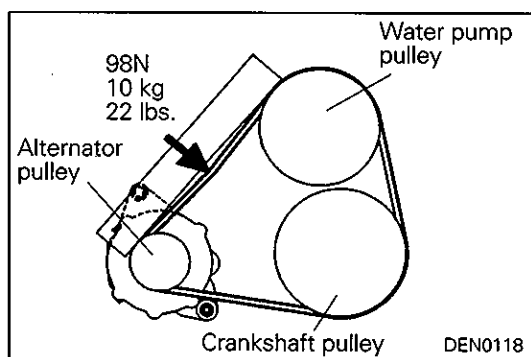
Removal steps

- ▶D◀ 1. Drive belt
- 2. Cooling fan
- 3. Fan clutch
- 4. Water pump pulley
- 5. Vacuum pipe
- 6. Eyebolt
- 7. Gasket
- 8. Eyebolt
- 9. Gasket
- 10. Oil tube
- ▶C◀ 11. Oil hose
- 12. Alternator brace

- 13. Alternator
- 14. Crankshaft pulley (for A/C)
- ◀A▶ ▶B◀ 15. Crankshaft bolt
- 16. Special washer
- 17. Crankshaft pulley
- 18. Oil level gauge
- 19. O-ring
- 20. Oil level gauge guide
- 21. O-ring
- 22. Glow plug plate
- ◀B▶ ▶A◀ 23. Glow plug

◆C◆ OIL HOSE INSTALLATION

- (1) Install the hose with its identification color painted end to the oil pan.



◆D◆ DRIVE BELT TENSION ADJUSTMENT

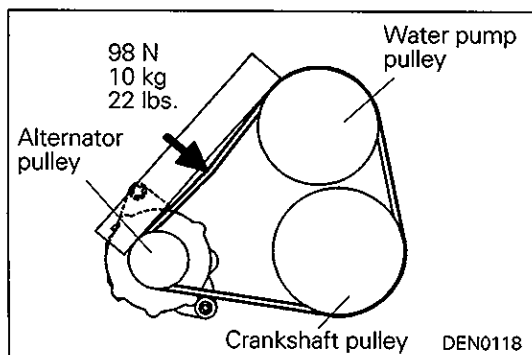
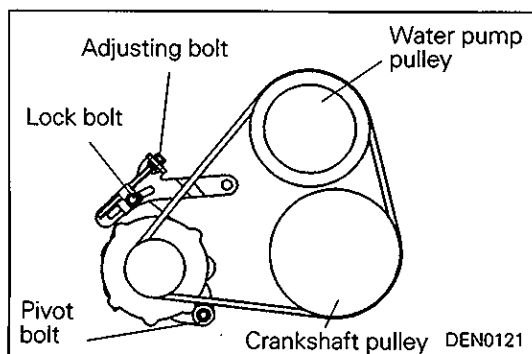
ADJUSTER TYPE

- (1) Apply a force of 98 N (10 kg, 22 lbs.) to the position shown by the arrow in the illustration and measure the belt deflection.

Adjust the belt deflection to the standard value by the adjusting bolt.

Standard value: 13 – 16 mm

- (2) Tighten nut for pivot bolt to the specified torque.
- (3) Tighten lock bolt to the specified torque.
- (4) Tighten adjusting bolt to the specified torque.



BRACE BOLT TYPE

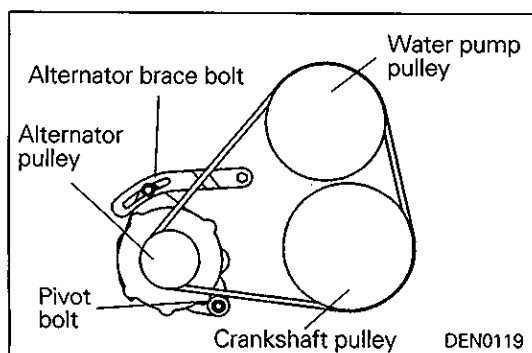
- (1) Apply a force of 98 N (10 kg, 22 lbs.) to the position shown by the arrow in the illustration and measure the belt deflection.

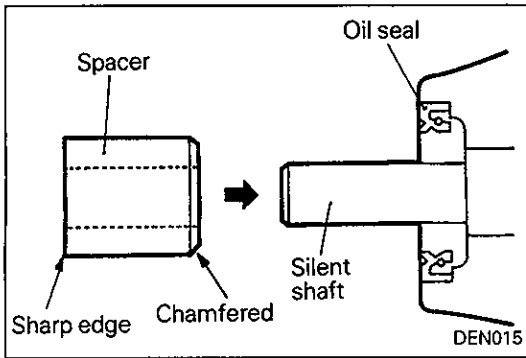
Adjust the belt deflection to the standard value by moving the alternator.

Standard value:

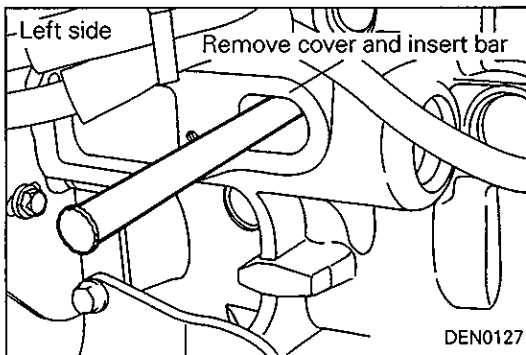
New belt	9 – 12 mm (0.35 – 0.47 in.)
Used belt	11 – 14 mm (0.43 – 0.55 in.)

- (3) Tighten brace bolt to the specified torque.
- (2) Tighten nut for pivot bolt to the specified torque.

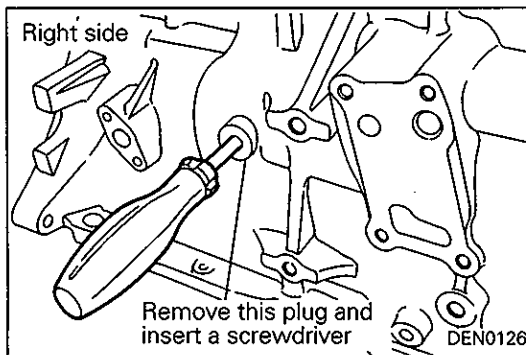


**INSTALLATION SERVICE POINTS****◆A◆ SPACER INSTALLATION**

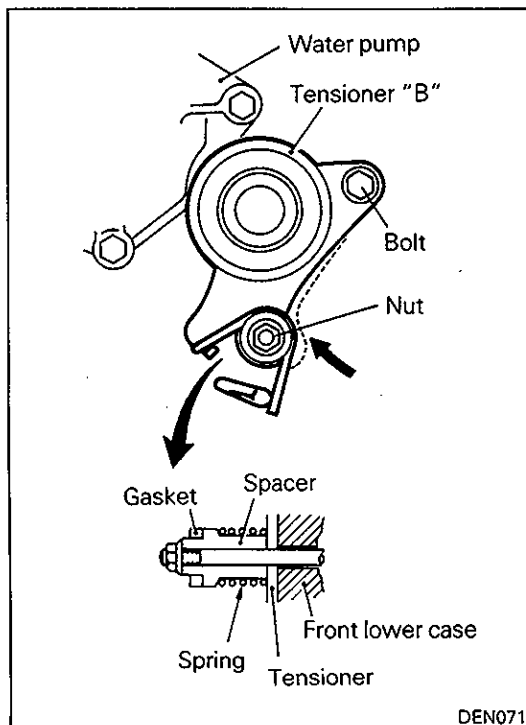
- (1) Install the spacer with its chamfered end toward the oil seal.

**◆B◆ BALANCER SHAFT SPROCKET, LEFT INSTALLATION**

- (1) Lock the balancer shaft in the same way as used in the removal procedure.
- (2) Install the balancer shaft sprocket and tighten the bolt to the specified torque.

**◆C◆ BALANCER SHAFT SPROCKET, RIGHT INSTALLATION**

- (1) Lock the balancer shaft in the same way as used in the removal procedure.
- (2) Install the balancer shaft sprocket and tighten the nut to the specified torque.

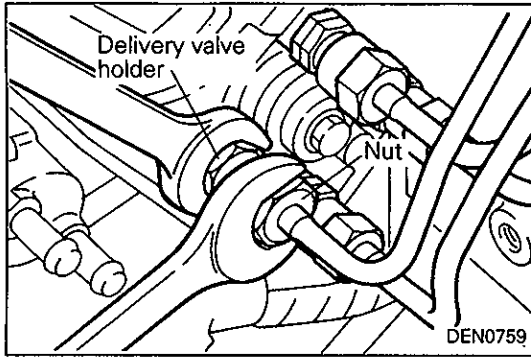
**◆D◆ TIMING BELT TENSIONER "B" INSTALLATION**

- (1) Install the tensioner, tensioner spring and spacer.

NOTE

Be sure to install the tensioner spring with its shorter end toward the water pump.

- (2) Move tensioner "B" toward water pump and tighten mounting nut and bolt.



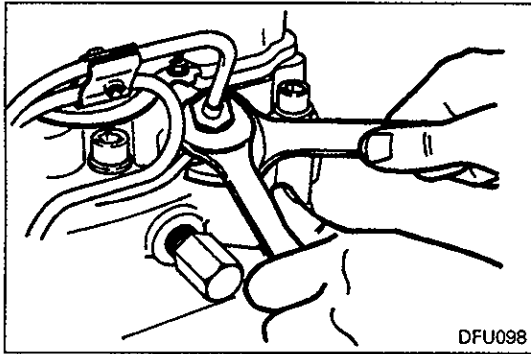
REMOVAL SERVICE POINTS

◊A◊ INJECTION PIPE REMOVAL

- (1) When loosening the union nuts on the injection pump, hold delivery valve holder on fuel injection pump head with a wrench to prevent it from rotating along with the union nut.

Caution

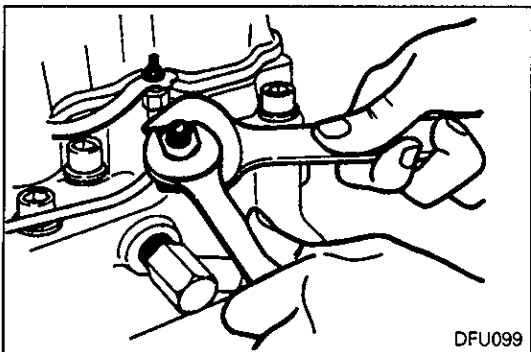
- If the injection pipe has been removed, plug the delivery valve holder to prevent foreign matter from entering the injection pump.



- (2) When loosening the union nuts on the injection nozzles, hold hexagon nut of fuel return pipe with a wrench to prevent it from rotating along with the union nut.

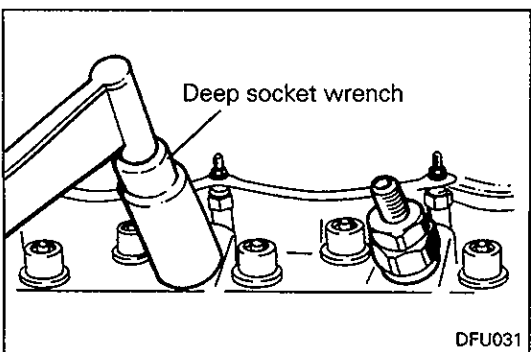
◊B◊ FUEL INJECTION PUMP REMOVAL

- (1) Do not hold the injection pump by the accelerator lever or the fast idle lever. These levers must not be removed.



◊C◊ FUEL RETURN PIPE NUT REMOVAL

- (1) When removing the fuel return pipe nut, hold the hexagon nut of fuel return pipe with a wrench.



◊D◊ INJECTION NOZZLE REMOVAL

- (1) Write the number of the cylinder on the injection nozzle that has been removed.

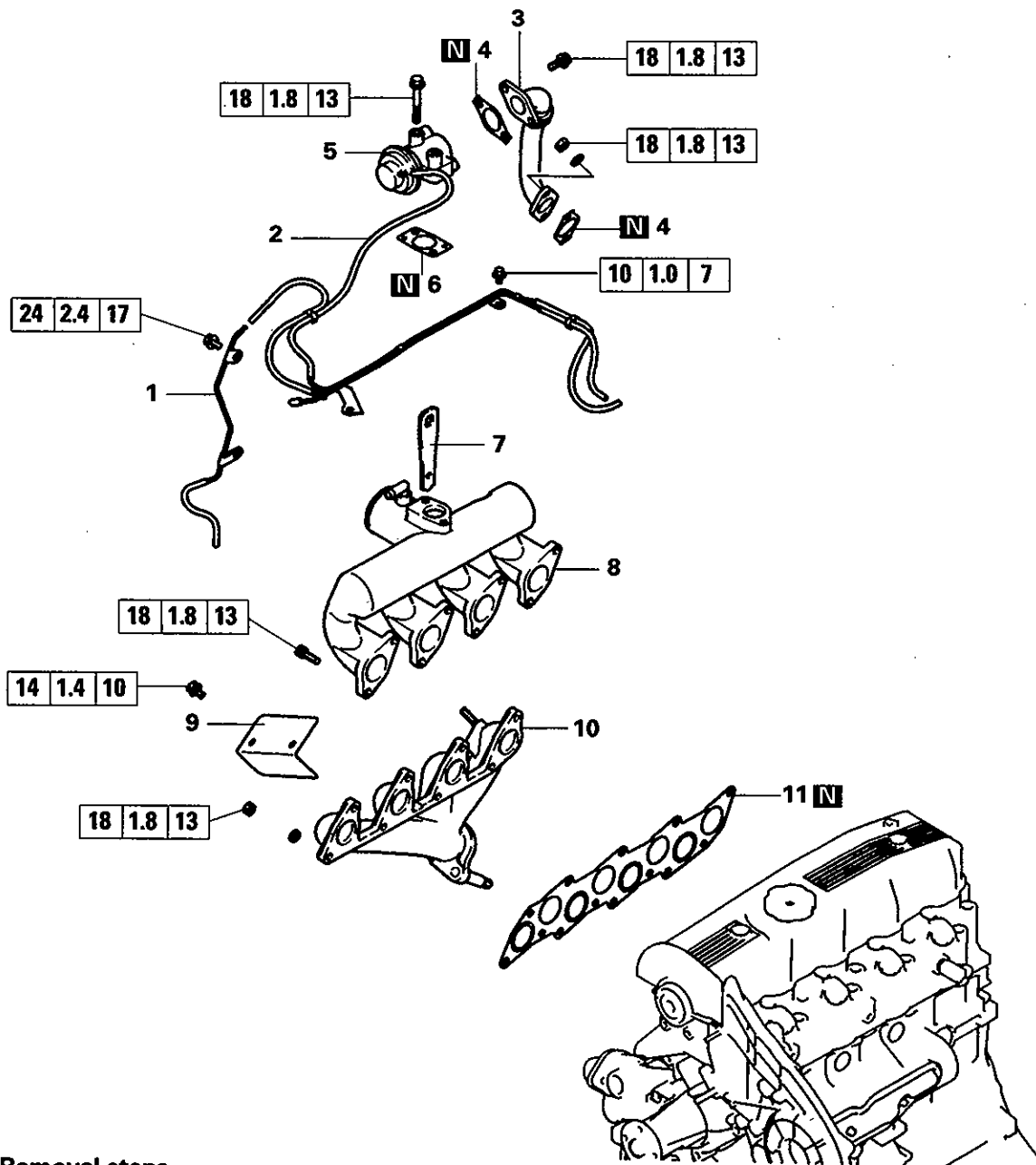
Caution

- Cover the opening with an appropriate cap to prevent entry of dust, water and foreign material into the fuel passage and combustion chamber.

7. INTAKE AND EXHAUST MANIFOLDS

REMOVAL AND INSTALLATION

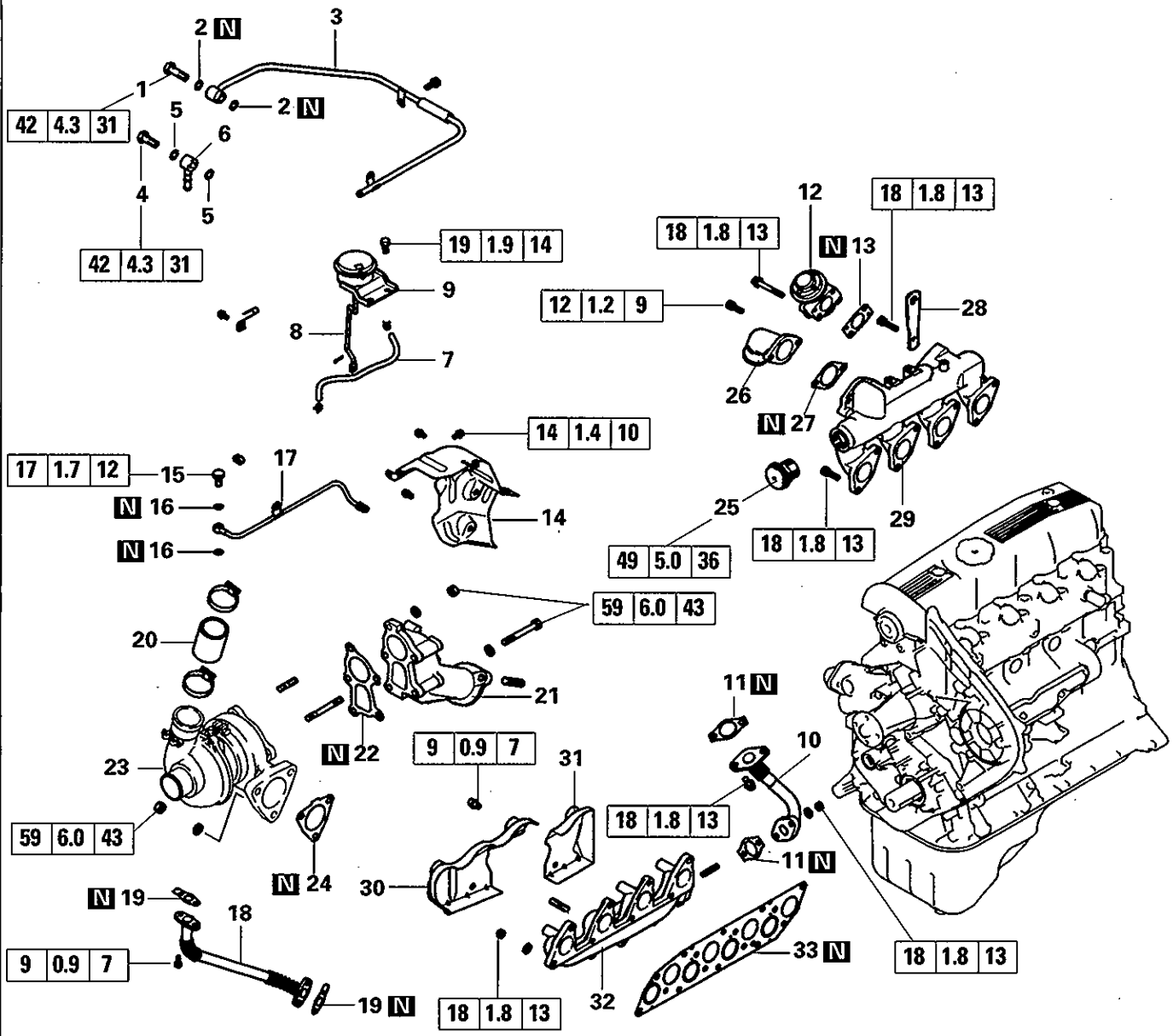
Engines without turbocharger



Removal steps

- | | | |
|----------------------------------|---|----------------------------|
| 1. Vacuum pipe and hose assembly | } | Engines with
EGR system |
| 2. Vacuum pipe and hose assembly | | |
| 3. EGR pipe | | |
| 4. Gasket | | |
| 5. EGR valve | | |
| 6. Gasket | | |
| 7. Engine hanger | | |
| 8. Intake manifold | | |
| 9. Heat protector | | |
| 10. Exhaust manifold | | |
| 11. Manifold gasket | | |

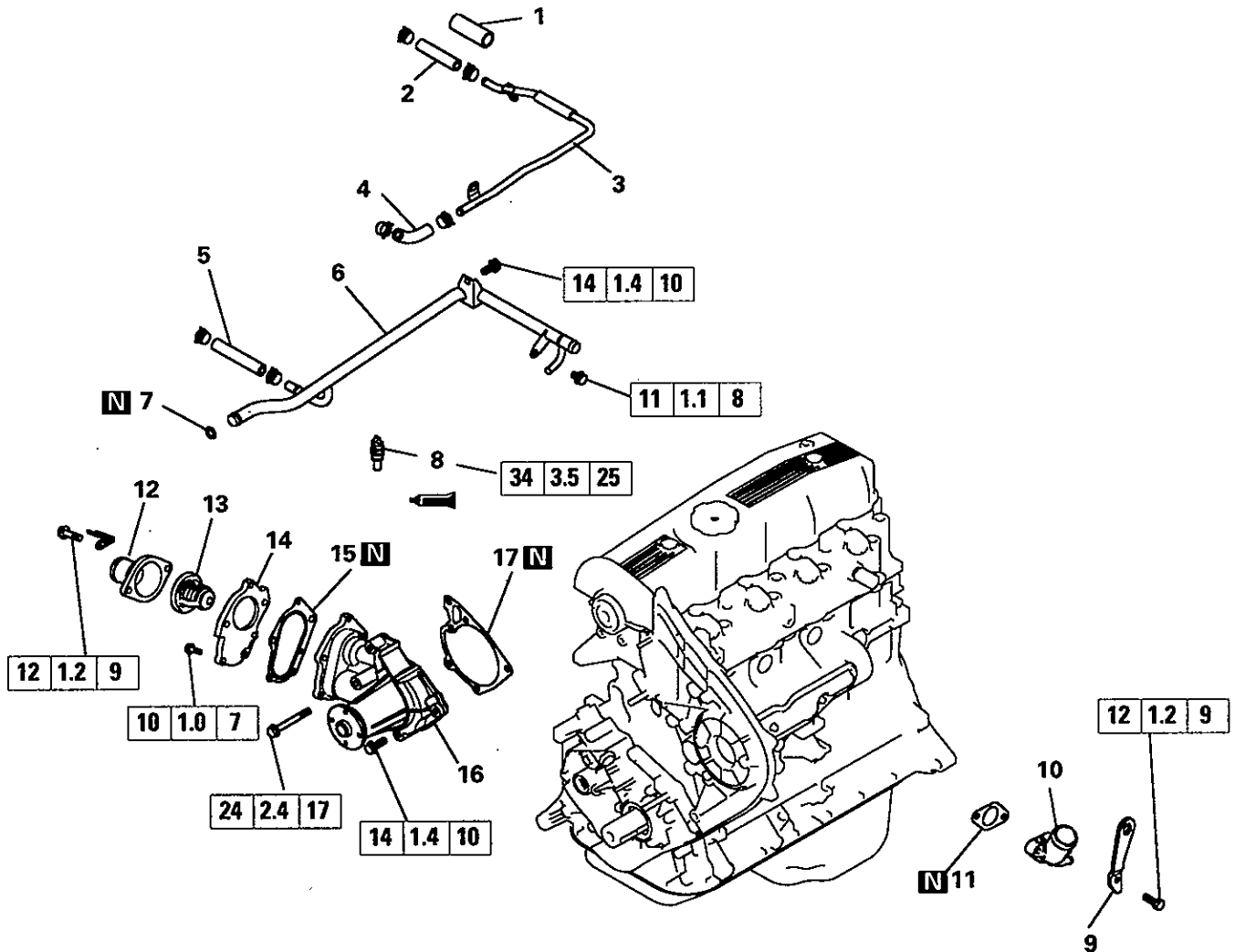
Engines with turbocharger <L400>



Disassembly steps

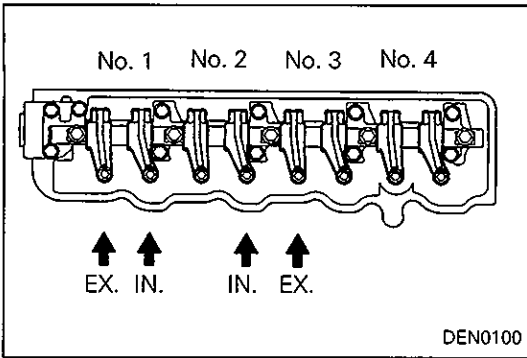
- | | |
|--|---|
| <ul style="list-style-type: none"> 1. Eyebolt 2. Gasket 3. Water pipe "B" 4. Eyebolt 5. Gasket 6. Water pipe "A" 7. Boost hose 8. Snap ring 9. Waste gate actuator 10. EGR pipe 11. Gasket 12. EGR valve 13. Gasket 14. Heat protector "B" ▶A 15. Eyebolt 16. Gasket 17. Oil pipe | <ul style="list-style-type: none"> 18. Oil return pipe 19. Gasket 20. Air hose 21. Exhaust fitting 22. Gasket 23. Turbocharger assembly 24. Gasket 25. Relief valve 26. Air inlet fitting 27. Gasket 28. Engine hanger 29. Intake manifold 30. Heat protector, front 31. Heat protector, rear 32. Exhaust manifold 33. Gasket |
|--|---|

Except engines with intercooler and turbocharger<PAJERO (From 2001 model)>

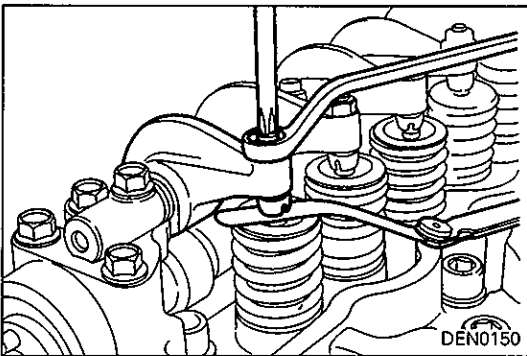


Removal steps

- | | | |
|-----|-----------------------------------|--------------------------|
| | 1. Hose protector | 10. Water outlet fitting |
| | 2. Water hose | 11. Gasket |
| | 3. Water pipe | 12. Water inlet fitting |
| | 4. Water hose | ▶B◀ 13. Thermostat |
| | 5. Water hose | 14. Plate |
| | 6. Water pipe | 15. Gasket |
| ▶D◀ | 7. O-ring | 16. Water pump |
| ▶C◀ | 8. Coolant temperature gauge unit | 17. Gasket |
| | 9. Engine hanger | |



(2) Adjust the valve clearance at points shown in the illustration.

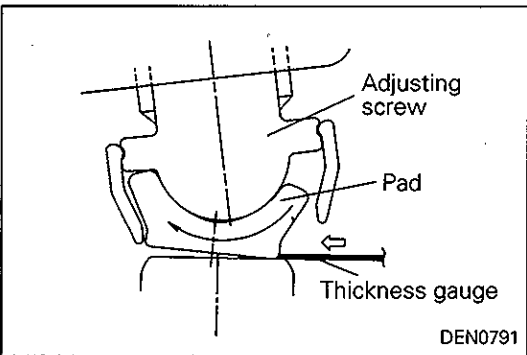


(3) Loosen the adjusting screw lock nut.

(4) Using a thickness gauge, adjust the valve clearance by turning the adjusting screw.

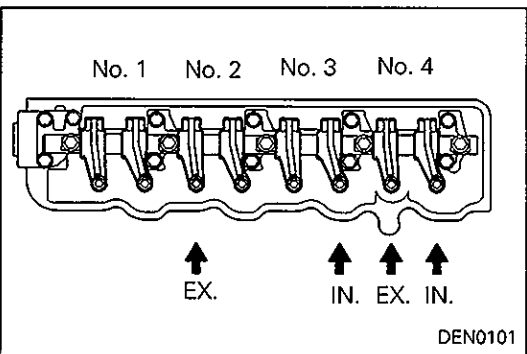
Standard value (on cold engine): 0.15 mm (0.006 in.)

(5) While holding the adjusting screw with a screwdriver, tighten the lock nut.



NOTE

If the elephant foot type adjusting screw is provided, insertion of a thickness gauge may be hindered by the slanted pad when rechecking the clearance after adjustment. To avoid this, insert a thickness gauge in the direction from the center line of the cylinder head to outside.



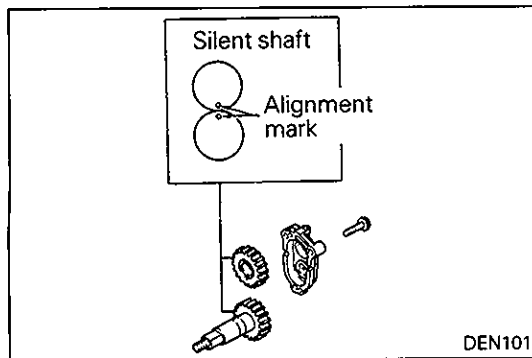
(6) Rotate clockwise the crankshaft one complete turn (360 degree).

(7) Adjust the valve clearance at points shown in the illustration.

(8) Repeat steps (3) to (5) to adjust the valve clearance of remaining valves.

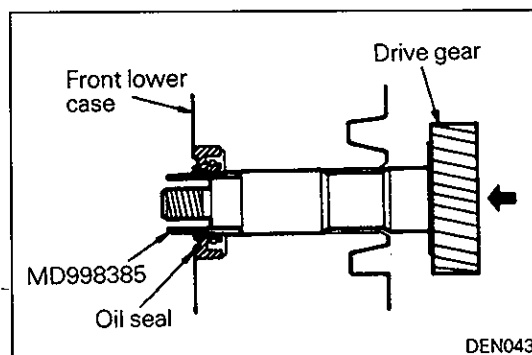
NOTE

With the engine mounted on vehicle, warm up the engine. Then, check for valve clearance at hot engine and adjust if necessary.

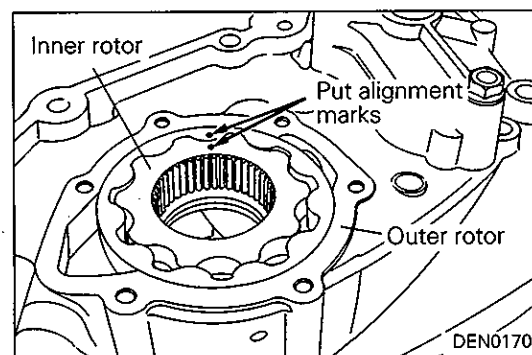


◆D◆ BALANCER SHAFT DRIVE GEAR / BALANCER SHAFT DRIVEN GEAR INSTALLATION

- (1) Install the silent shaft drive and driven gears to the front lower case. Make sure that the alignment marks are in line.

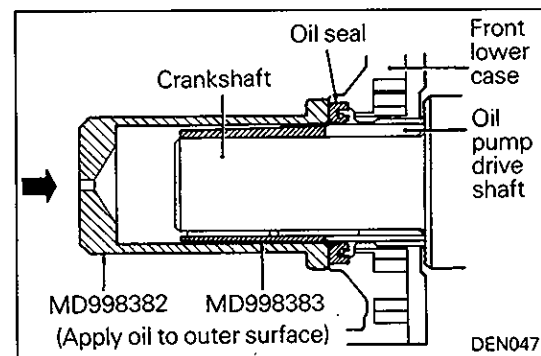


- (2) Install the special tool to the drive gear. Apply engine oil to the outer surface of the special tool and the drive gear shaft and install the drive gear as shown.



◆E◆ INNER ROTOR / OUTER ROTOR INSTALLATION

- (1) Install the outer rotor in the same direction as before noting the mark put at the time of removal. Apply engine oil to the entire rotor surface.



◆F◆ CRANKSHAFT FRONT OIL SEAL INSTALLATION

- (1) Attach the special tool to the crankshaft and apply engine oil to the outer surface of the tool.
- (2) Using the special tool, install the front oil seal into the front lower case.