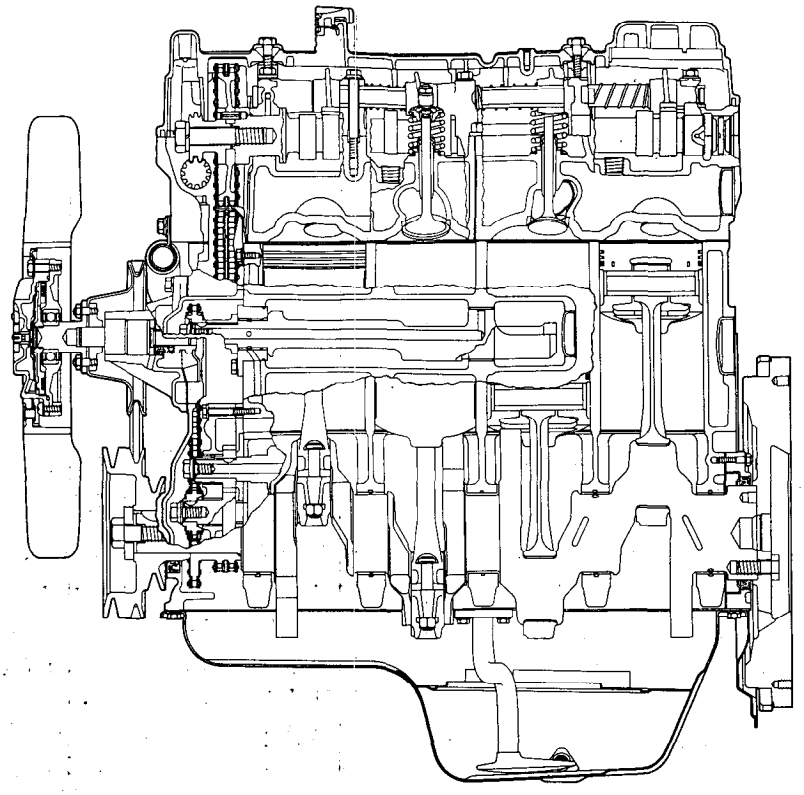
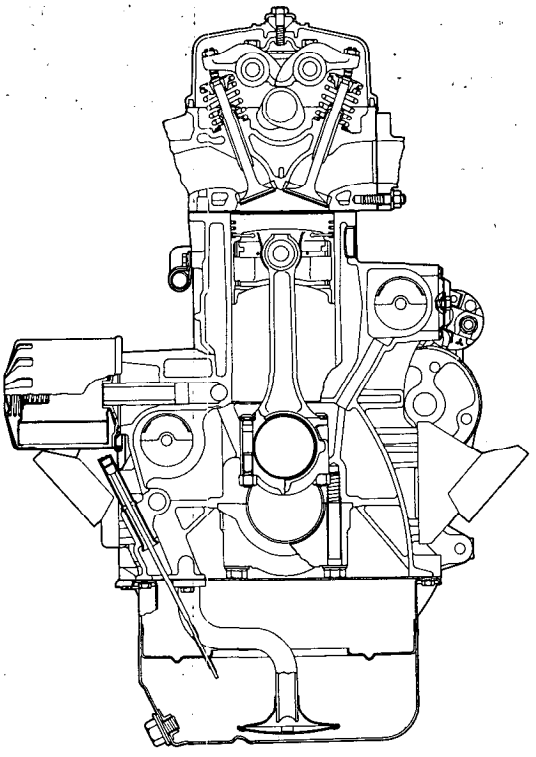
ENGINE

CONTENTS

G54B ENGINE



5EN116



5EN117

GENERAL SPECIFICATIONS

Description	Specifications
General	
No. and arrangement of cylinders	4, in-line, vertical
Combustion chamber type	Hemispherical
Valve arrangement	Overhead valve type
Camshaft arrangement	Overhead camshaft type
Total displacement cc (cu.in.)	2,555 (155.9)
Bore x stroke mm (in.)	91.1 x 98 (3.59 x 3.86)
Compression ratio	8.2
Valve timing	
Intake valve and jet valve open/close	25°BTDC/59°ABDC
Exhaust valve open/close	64°BBDC/20°ATDC
Firing order	1–3–4–2
Valve clearance at hot engine mm (in.)	0.15 (.006) – intake
	0.25 (.010) – exhaust and jet
Timing chain	
Type	Double roller
No. of links	102
Pitch mm (in.)	9.5 (.375)
Timing chain "B" for silent shaft drive	
Type	Single roller
No. of links	90
Pitch mm (in.)	8.0 (.315)
Crankshaft sprocket	
Material	Ferrous sintered alloy
No. of teeth	19
Crankshaft sprocket "B"	
Material	Cast iron
No. of teeth	34
Camshaft sprocket	
Material	Cast iron
No. of teeth	38
Silent shaft and oil pump sprocket	
Material	Steel
No. of teeth	17
Rocker arm	
Material	Aluminum die casting
	Slipper made from special sintered alloy
I.D. mm (in.)	18.9 (.744)
Oil clearance mm (in.)	0.01-0.04 (.0004-.0016)

Description	Specifications
Camshaft	
Driven by	Chain
Material	Cast iron, cam surface chilled
Cam height mm (in.)	42.5 (1.673)
Valve lift mm (in.)	10.5 (.413)
Cam diameter for fuel pump drive mm (in.)	37 (1.457)
Journal diameter mm (in.)	34 (1.339)
Oil clearance mm (in.)	0.05-0.09 (.002-.004)
Identification mark	6
Cylinder head	
Material	Aluminum alloy
Deflection of gasket surface mm (in.)	Less than 0.05 (.002)
Valve guide hole diameter 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)
Intake valve seat ring hole diameter mm (in.)	
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 valve seat ring hole diameter mm (in.)	
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)
Valve guide installation height mm (in.)	14 (.551)
Intake valves	
Material	Special heat-resistant steel
Treatment	Sur-sulf
Valve diameter mm (in.)	46 (1.811)
Stem diameter mm (in.)	8.0 (.3150)
Clearance (stem-to-guide) mm (in.)	0.03-0.06 (.0012-.0024)
Margin mm (in.)	1.2 (.047)
Identification mark	N
Exhaust valves	
Material	Special heat-resistant steel Valve face padded with stellite
Treatment	Tufftriding
Valve diameter mm (in.)	38 (1.496)
Stem diameter mm (in.)	8.0 (.3150)
Clearance (Stem to guide) mm (in:)	0.05-0.09 (.0020-.0035)
Margin mm (in.)	2.0 (.079)
Identification mark	N

Description	Specifications
Valve springs	
Free height mm (in.)	47.5 (1.870)
Load N (lbs)/mm (in.)	275 (62)/40.4 (1.591)
Square	Less than 1.5°
Identification color	Blue
Right silent shaft	
Driven by	Chain
Material	Steel
Rear journal diameter mm (in.)	43 (1.693)
Oil clearance mm (in.)	0.06-0.10 (.0024-.0039)
Left silent shaft	
Driven by	Chain
Material	Steel
Front journal diameter mm (in.)	23 (.906)
Rear journal diameter mm (in.)	43 (1.693)
Oil clearance mm (in.)	
Front	0.02-0.06 (.0008-.0024)
Rear	0.06-0.10 (.0024-.0039)
Piston	
Material	Special aluminum alloy
Type	Autothermic (Steel strut used for 4G54)
Diameter (Standard) mm (in.)	91.1 (3.587)
Clearance (Piston-to-cylinder) mm (in.)	0.02-0.04 (.0008-.0016)
Pistons for service mm (in.)	0.25 (.010), 0.50 (.020), 0.75 (.030), 1.00 (.040), oversize
Piston rings	
No. of rings per piston	3
No. of compression rings	2
No. of oil rings	1
Compression ring type	
No. 1 ring	Barrel type, special cast iron, chrome face
No. 2 ring	Taper type, special cast iron, chrome face
Oil ring type	3-piece steel rail, chrome face
Ring gap mm (in.)	
No. 1 ring	0.30-0.45 (.012-.018)
No. 2 ring	0.25-0.40 (.010-.015)
Oil ring	0.3-0.6 (.012-.024)
Ring side clearance mm (in.)	
No. 1 ring	0.05-0.09 (.002-.004)
No. 2 ring	0.02-0.06 (.001-.002)
Rings for service mm (in.)	0.25 (.010), 0.50 (.020), 0.75 (.030), 1.00 (.040), oversize

Description	Specifications
Connecting rod	
Length (Center to center) mm (in.)	166 (6.535)
Piston pin bore diameter mm (in.)	21.974-21.985 (.8651-.8655)
Side clearance (Big end) mm (in.)	0.1-0.25 (.004-.010)
Crankshaft	
Material	Steel
Main bearing journal diameter mm (in.)	60 (2.362)
Connecting rod journal diameter mm (in.)	53 (2.087)
Maximum allowable out-of-round and/or taper of journal mm (in.)	0.01 (.0004)
Oil clearance mm (in.)	
Main bearing journal	0.02-0.05 (.0008-.0020)
Connecting rod journal	0.02-0.06 (.0008-.0024)
Thrust taken by	No. 3 main bearing
End play mm (in.)	0.05-0.18 (.0020-.0071)
Bearings for service available in standard size and following undersizes mm (in.)	0.25 (.010), 0.50 (.020), 0.75 (.030)
Cylinder block	
Material	Cast iron
Water jacket	Siamese type
Cylinder bore mm (in.)	91.1 (3.587)
Out-of-round and taper mm (in.)	Less than 0.02 (.0008)
Maximum allowable oversize (Cylinder bore) mm (in.)	1.00 (.039)
Oil pump	
Type	Gear
Driven by	Chain
Oil pressure at idle kPa (psi)	49 (7.1) or more
Relief valve opening pressure kPa (psi)	392 (57)
Oil filter	
Type	Cartridge, full flow
Size (Diameter x Length) mm (in.)	90 x 100 (3.54 x 3.94)
Engine oil	
Capacity including that of oil filter liters (U.S.qts., Imp.qts.)	
Rear-wheel drive models	5.0 (5.2, 4.4)
4-wheel drive models	5.8 (6.1, 5.1)
Recommended oil (API classification)	SE or SF

SERVICE SPECIFICATIONS

Standard value	
Valve clearance – Hot engine mm (in.)	
Intake valve	0.15 (.006)
Exhaust valve	0.25 (.010)
Jet valve	0.25 (.010)
Piston pin press-in load N (lbs.)	7,355-17,162 (1,653-3,858)
Flywheel runout mm (in.)	0.1 (.004) max.
Oil pressure gauge unit	
Current value mA	
at 0 kPa (0 psi)	0
at 392 kPa (57 psi)	84
at 785 kPa (114 psi)	110

TORQUE SPECIFICATIONS

	Nm (ft.lbs.)
Front engine mounting	
Engine support front insulator to engine	13-20 (9-14)
Front insulator stopper to heat protector	6-10 (4-7)
Engine support front insulator to engine mounting bracket	30-40 (22-29)
Rear engine mounting	
Vehicles with a manual transmission	
Engine support rear insulator to No. 2 crossmember	18-25 (13-18)
Engine support rear insulator to transmission	18-25 (13-18)
No. 2 crossmember to frame	55-75 (40-54)
Frame to plate	18-25 (13-18)
Transfer support insulator to transfer mounting bracket	18-25 (13-18)
Transfer support insulator to plate	18-25 (13-18)
Transfer mounting bracket to transfer	18-25 (13-18)
Vehicles with an automatic transmission	
Engine support rear insulator to No. 2 crossmember	30-42 (22-30)
Engine support rear insulator to transmission	17-23 (12-17)
No. 2 crossmember to frame	55-75 (40-54)
Frame to plate	18-25 (13-18)
Transfer support insulator to plate	18-25 (13-18)
Transfer mounting bracket to transfer	18-25 (13-18)
Transfer mounting bracket to pipe	30-42 (22-30)
Cylinder head bolts – cold engine	
Nos. 1 through 10	89-98 (65-72)
No. 11	15-21 (11-15)
Cylinder head bolts – hot engine	
Nos. 1 through 10	98-107 (73-79)
No. 11	15-21 (11-15)
Camshaft bearing cap bolts	17-20 (14-15)
Camshaft sprocket bolt	49-58 (37-43)

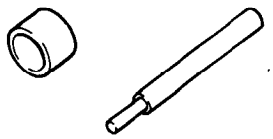
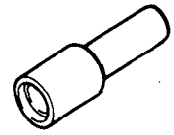
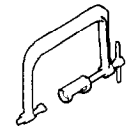
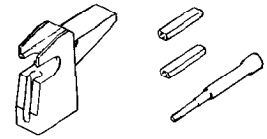
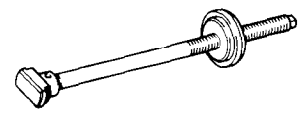
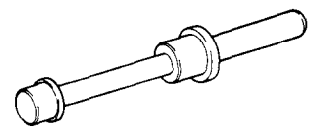
Rocker cover bolts	5-6 (4-5)
Heater joint	20-39 (15-28)
Intake and exhaust manifold nuts or bolts	15-19 (11-14)
Rocker arm adjusting nuts	12-17 (9-13)
Main bearing cap bolts	74-83 (55-61)
Connecting rod cap nuts	45-47 (33-34)
Crankshaft pulley bolts	108-127 (80-94)
Oil pump sprocket bolt	30-39 (22-28)
Silent shaft sprocket bolt	30-39 (22-28)
Silent shaft chamber cover bolts	4-5 (3-4)
Flywheel bolts	128-137 (94-101)
Drive plate bolts	128-137 (94-101)
Engine support bracket bolts	40-49 (29-36)
Chain guide "B" bolt (upper)	8-9 (6-7)
Chain guide "B" bolt (lower)	15-21 (11-15)
Chain guide access hole cover bolts	10-11.5 (7.5-8.5)
Oil pump cover bolt	10 -11 (7-8)
Oil pump assembly mounting bolt	8-9 (6-7)
Oil pressure switch and gauge unit	15-21 (11-15)
Oil pan bolt	6-7 (4.5-5.5)
Oil pan drain plug	59-78 (44-57)
Oil filter	11-12 (8-9)
Oil filter stud	50-58 (37-43)
Oil relief valve plug	40-49 (29-36)
Water temperature gauge unit	30-39 (22-28)

LUBRICANT

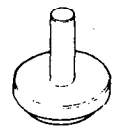
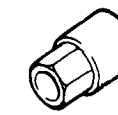
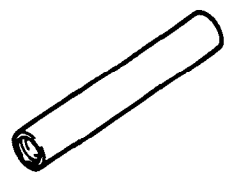
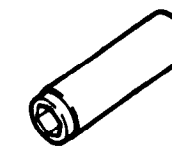
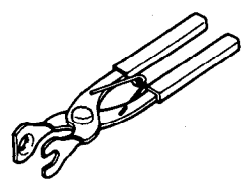
	Specified lubricant	Quantity
Engine oil (including oil filter and cooler)	API classification SE or higher	4.5 liters (4.5 U.S. qts., 3.7 Imp. qts.)

SEALANT AND ADHESIVE

	Specified sealant and adhesive	Quantity
Top of cylinder head circular packing	3M Super Weather Strip adhesive 8001 or equivalent	As required
Threaded portion of oil pressure gauge unit	3M Liquid Gasket 8959 or equivalent	As required

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998115 Valve guide installer 		MD998148 "D" Valve seat cutter pilot 	
MD998173 "D" Valve seat cutter [30° – O.D. 40 mm (1.57 in.)] 		MD998377 Valve stem seal installer 	Use with valve spring seat
MD998175 "D" Valve seat cutter [30° – O.D. 44 mm (1.73 in.)] 		MD998303 "*" Valve spring compressor 	May also be used for MA904
MD998158 "D" Valve seat cutter [45° – O.D. 40 mm (1.57 in.)] 		MD998184 "*" Piston pin setting tool 	
MD998159 "D" Valve seat cutter [45° – O.D. 44 mm (1.73 in.)] 		MD998251 "*" Silent shaft bearing puller 	For rear bearing
MD998165 "D" Valve seat cutter [65° – O.D. 44 mm (1.73 in.)] 		MD998250 "*" Silent shaft bearing installer 	For rear bearing

"*", "D" see page 2 for instructions.

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998376 "*" Crankshaft rear oil seal installer 		MD998054 Oil pressure switch wrench 	
MD998308 Jet valve stem seal installer 		MD998310 Jet valve socket wrench 	
MD998309 Jet valve spring pliers 			

"*" see page 2 for instructions.

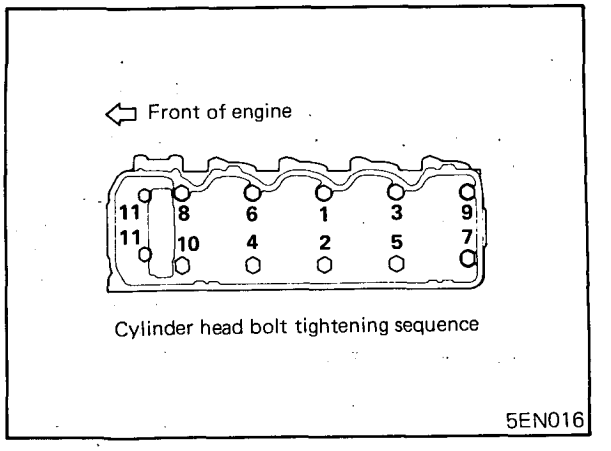
Symptom	Probable cause	Remedy
NOISY ENGINE		
Knocking of crankshaft and bearing	Loose main bearing	Replace
	Seized bearing	Replace
	Bent crankshaft	Replace
	Excessive crankshaft end play	Replace thrust bearing
Piston and connecting rod knocking	Loose bearing	Replace
	Seized bearing	Replace
	Loose piston pin	Replace piston and pin or connecting rod
	Loose piston in cylinder	Recondition cylinder
	Broken piston ring	Repair or replace
	Improper connecting rod alignment	Realign
Camshaft knocking	Loose bearing	Replace
	Excessive end play	Replace
	Broken cam gear	Replace
Timing chain noise	Improper chain tension	Adjust or replace
	Worn and/or damaged chain	Replace
	Worn sprocket	Replace
	Worn and/or broken tension adjusting mechanism	Replace
	Excessive camshaft and bearing clearance	Replace
Camshaft and valve mechanism knocking	Improper valve clearance	Adjust
	Worn adjusting screw	Replace
	Worn rocker face	Replace
	Loose valve stem in guide	Replace guide
	Weakened valve spring	Replace
	Seized valve	Repair or replace
Water pump knocking	Improper shaft end play	Replace water pump assembly
	Broken impeller	Replace water pump assembly

Symptom	Probable cause	Remedy
OTHER MECHANICAL TROUBLE		
Stuck valve in guide	Improper valve clearance	Adjust
	Insufficient clearance between valve stem and guide	Clean stem or ream guide
	Weakened or broken valve spring	Replace
	Damage to valve stem	Replace
Valve stuck on seat	Improper valve clearance	Adjust
	Weakened valve spring	Replace
	Thin valve head edge	Replace valve
	Narrow valve seat	Reface
	Overheating	Repair or replace
	Excessive engine speed	Drive at proper speed
	Stuck valve guide	Repair or replace
Excessively worn cylinder and piston	Shortage of engine oil	Add or change oil Check oil level on daily basis
	Dirty engine oil	Clean crankcase, change oil and replace oil filter element
	Poor oil quality	Use proper oil
	Overheating	Repair or replace
	Wrong assembly of piston with connecting rod	Repair or replace
	Improper piston ring clearance	Replace
	Dirty air cleaner	Clean air cleaner and replace filter
	Too rich mixture	Adjust or replace carburetor
	Stuck choke valve	Clean or replace carburetor choke chamber
	Over choking	Repair or replace choke assembly
Damaged connecting rod	Shortage of engine oil	Add or change oil Check oil level on daily basis
	Low oil pressure	Correct
	Poor engine oil quality	Use proper oil
	Rough crankshaft surface	Grind or replace
	Clogged oil passage	Clean

Symptom	Probable cause	Remedy
Damaged connecting rod (continued)	Bearing worn or eccentric	Replace
	Bearing improperly assembled	Correct or replace
	Loose bearing	Replace
	Incorrect connecting rod alignment	Repair or replace
Damaged crankshaft bearing	Shortage of engine oil	Add or change oil Check oil level on daily basis
	Low oil pressure	Adjust or repair
	Poor quality engine oil	Use proper oil
	Worn or out-of-round crankshaft journal	Repair or replace
	Clogged oil passage in crankshaft	Clean
	Bearing worn or eccentric	Replace bearings and check engine oil lubrication system
	Bearing improperly assembled	Repair or replace
	Non-concentric crankshaft or bearing	Replace
Excessive vibration	Loose engine mounts	Tighten or replace
	Silent shaft bearings damaged	Replace
	Improper phase of silent shafts	Adjust

RETORQUING OF CYLINDER HEAD BOLTS

1. When cylinder head bolts are retorqued, first slightly loosen and then tighten to specified torque.
2. Be sure to follow the specified torquing sequence. (5EN016)



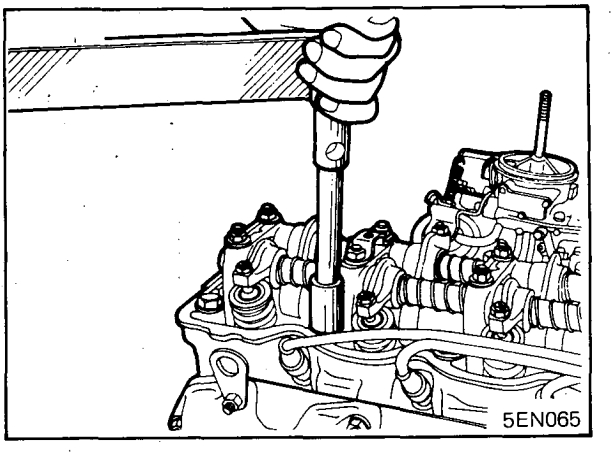
Cylinder head bolt tightening sequence

5EN016

3. After cylinder head bolts have been tightened to specified torque, run engine until normal operating temperature is reached, allow it to cool down, and then retorque bolts to specification for best results.

Tightening torque
Cylinder head bolt (No. 1 to 10)
- Cold engine ..... 89-98 Nm (65-72 ft.lbs.)
- Hot enging ..... 98-107 Nm (73-79 ft.lbs.)

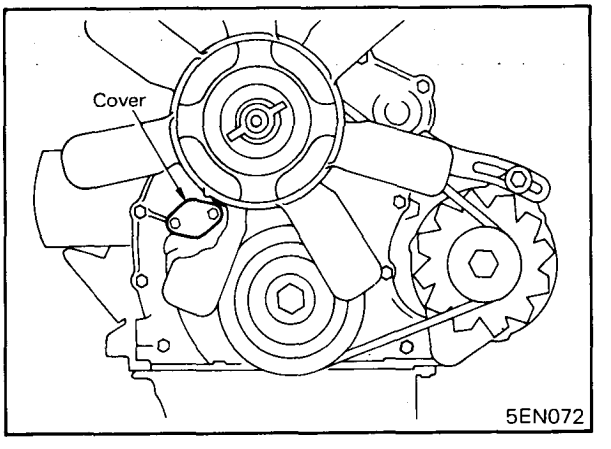
Cylinder head bolt (No. 11) ..... 15-21 Nm (11-15 ft.lbs.)


5EN065

SILENT SHAFT DRIVE CHAIN TENSION ADJUSTMENT PROCEDURE

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:

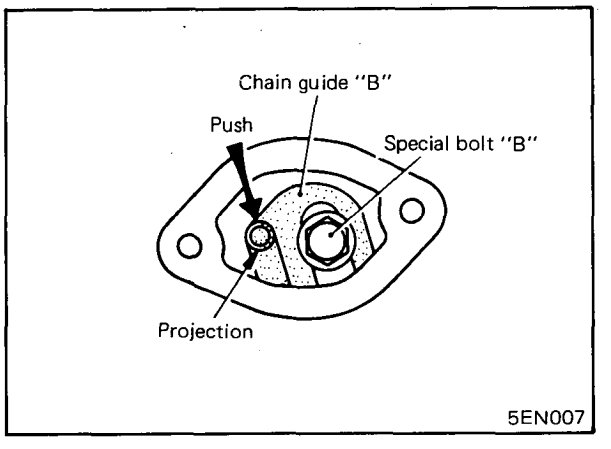
1. Remove cover from access hole provided at center of chain case (under water pump).



5EN072

2. Loosen special bolt "B".
3. Using your finger push projection on chain guide "B" in direction of arrow. Do not push projection with a screwdriver or other tool. Improperly chain tension will cause abnormal noise. (5EN007)
4. Tighten special bolt "B".
5. Install cover. Do not reuse damaged gasket.

Cover bolt tightening torque .....
10-11.5 Nm (7.5-8.5 ft. lbs.)



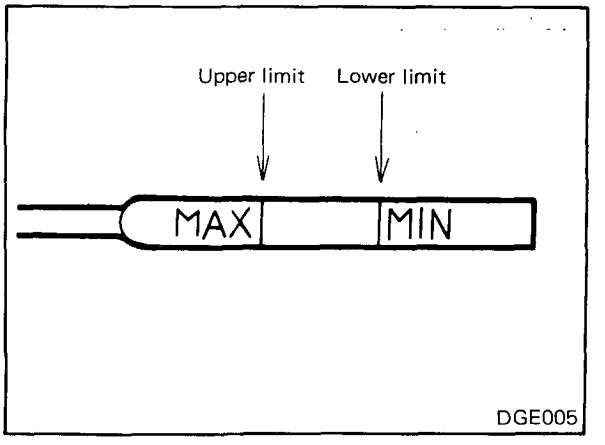
5EN007

ENGINE OIL LEVEL GAUGE

The oil level gauge is located on the right side of the engine. Maintain engine oil level within the marking lines on the oil level gauge. (DGE005)

The oil level in the oil pan may read at the "MAX" mark line (upper limit) after the engine has been standing for several hours. When the engine is started the oil level drop somewhat due to filling of oil passages, etc.

When the oil level is at or below the "MIN" mark line (lower limit) on the level gauge, add 1 liter (1 U.S. qt., 0.9 Imp. qt.). The oil should never be allowed to remain below the lower limit.

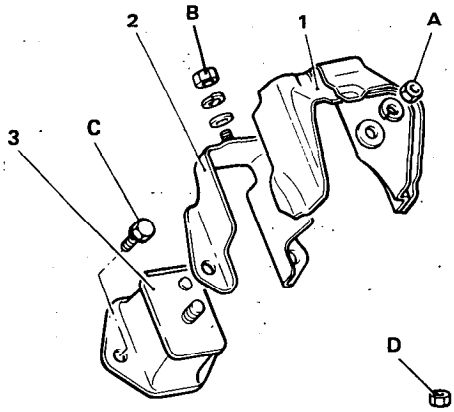


Caution

Do not overfill crankcase. This will cause oil aeration and loss of oil pressure.

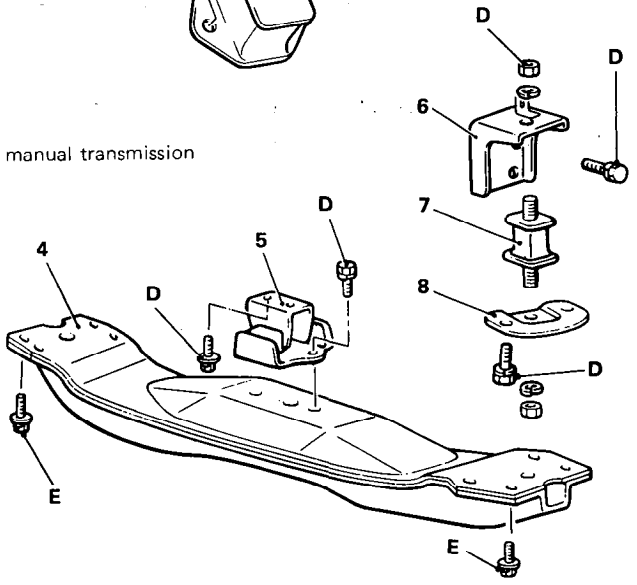
COMPONENTS

Front mounting



Rear mounting

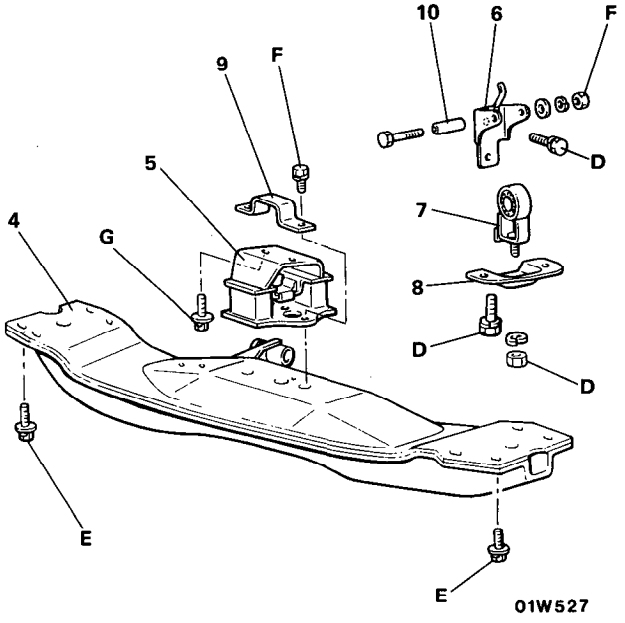
Vehicles with a manual transmission



01W502

1. Heat protector
2. Front insulator stopper
3. Engine support front insulator
4. No. 2 crossmember
5. Engine support rear insulator
6. Transfer mounting bracket
7. Transfer support insulator
8. Plate
9. Stopper
10. Pipe

Vehicles with an automatic transmission



01W527

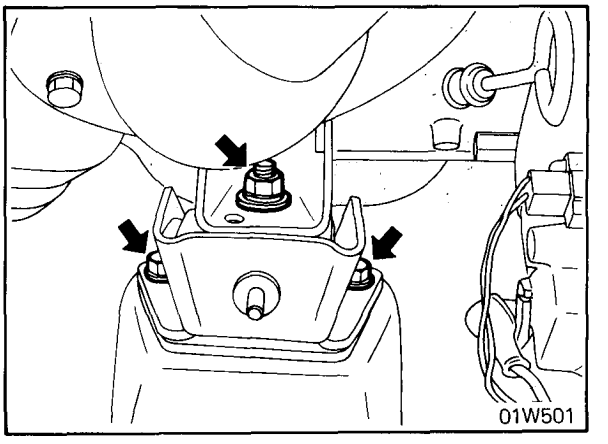
	Nm	ft.lbs.
A	13-20	9-14
B	6-10	4-7
C	30-40	22-29
D	18-25	13-18
E	55-75	40-54
F	30-42	22-30
G	17-23	12-17

REMOVAL

Front Mounting

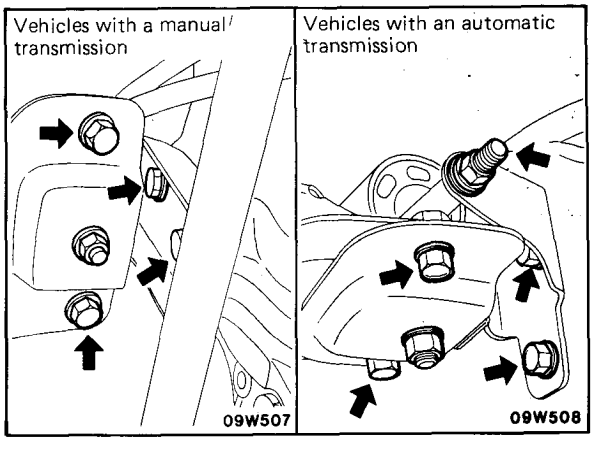
1. Remove the heat protector from the front insulator stopper.
2. Remove the engine mounting nuts and bolts from the front insulators. (01W501)
3. Attach a chain to the engine hangers.
4. Using a chain block and tackle, raise the engine and remove the insulators.

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

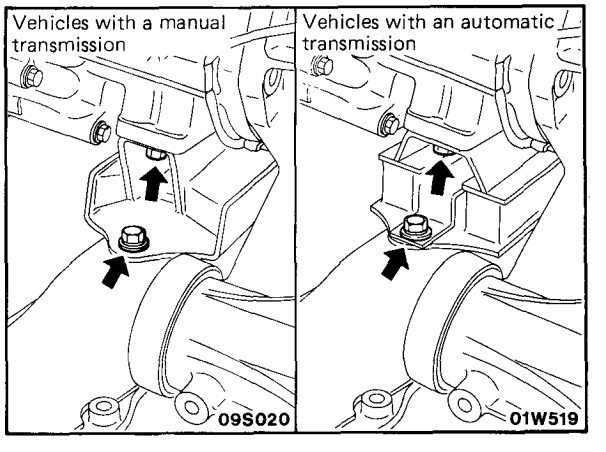


Rear Mounting

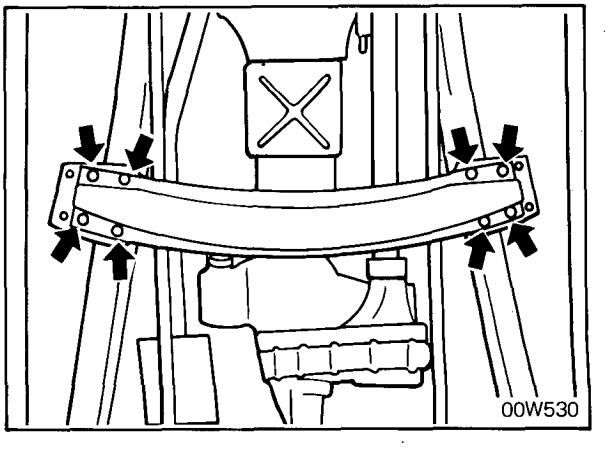
1. Support the transfer with a jack.
2. After the transfer mounting bracket and transfer support insulator have been separated, remove the plate from the side frame. (09W507, 09W508)
3. Detach the transfer mounting bracket from the transfer. (09W507, 09W508)



4. Support the transmission with a jack.
5. Detach the engine support rear insulator from the engine. (S09020, 01W519)

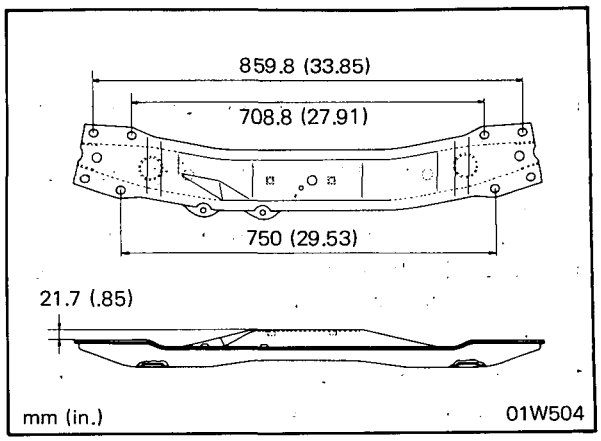


6. For vehicles with an automatic transmission, detach the cross select shaft from the No. 2 crossmember. (Refer to GROUP 21.)
7. Remove the No. 2 crossmember mounting bolts. (00W530)
8. Remove the engine support rear insulator from the No. 2 crossmember.



INSPECTION

1. Check insulators for cracks, separation or deformation.
2. Check transfer mounting bracket for deformation or corrosion.
3. Check plate for deformation or corrosion.
4. Check No. 2 crossmember for deformation or corrosion.



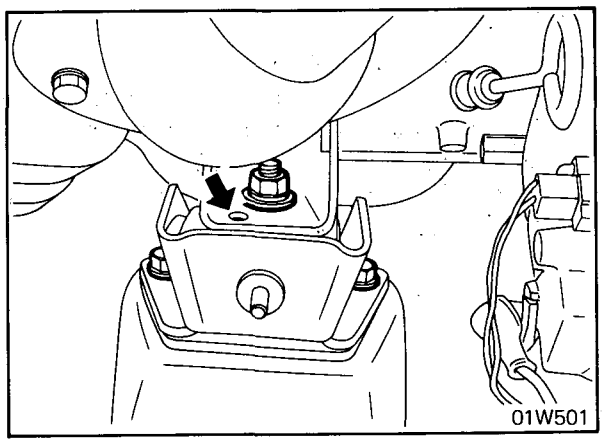
INSTALLATION

Front Insulator

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

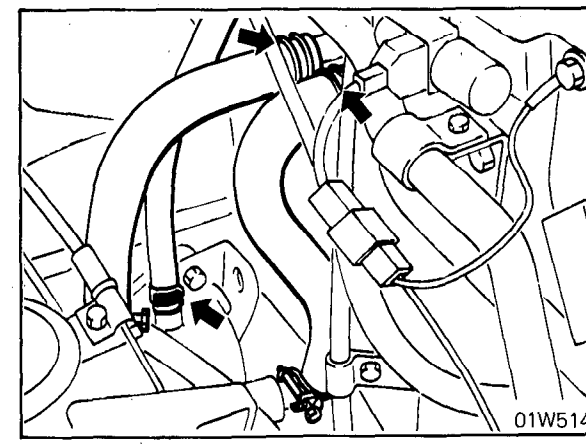
Caution

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

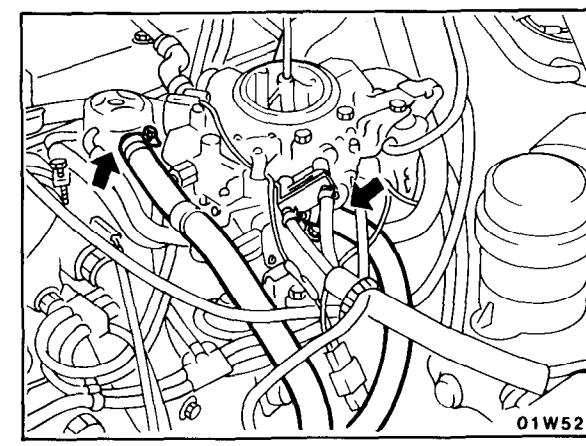


REMOVAL

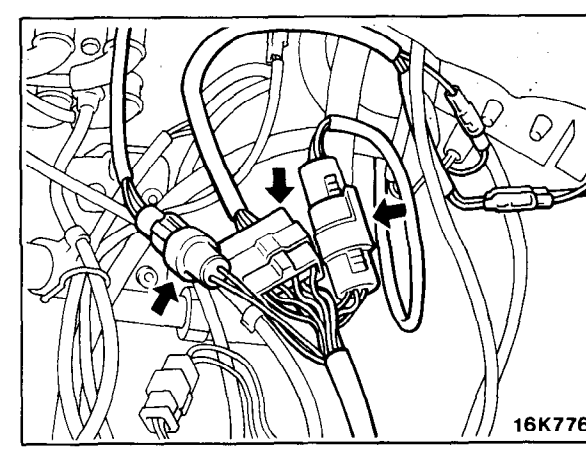
1. Disconnect the ground cable from the battery terminal.
2. Remove the hood. (Refer to GROUP 23.)
3. Remove the air cleaner.
4. Disconnect the heater hoses. (01W514)
5. Disconnect the brake booster vacuum hose. (01W514)



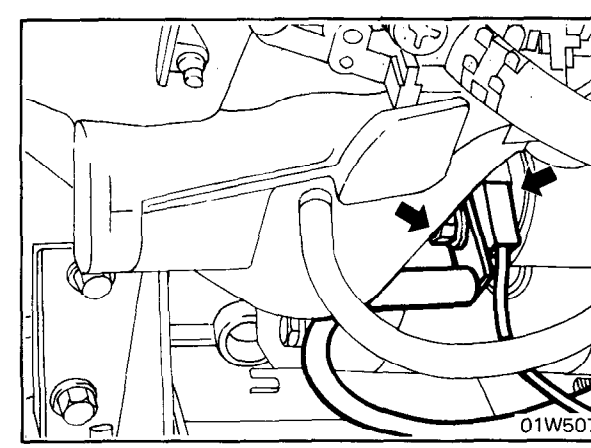
6. Disconnect the fuel hoses. (01W526)
7. Disconnect the accelerator cable. (Refer to GROUP 14.)



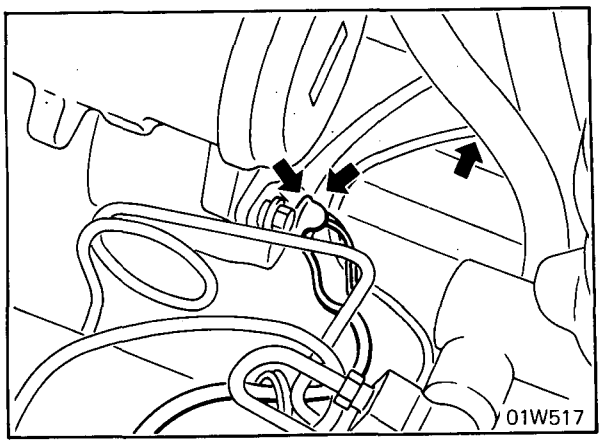
8. For vehicles equipped to meet California regulations (can also be sold in Federal States), disconnect the air temperature sensor connector, throttle position sensor connector and the carburetor control wiring harness connector.



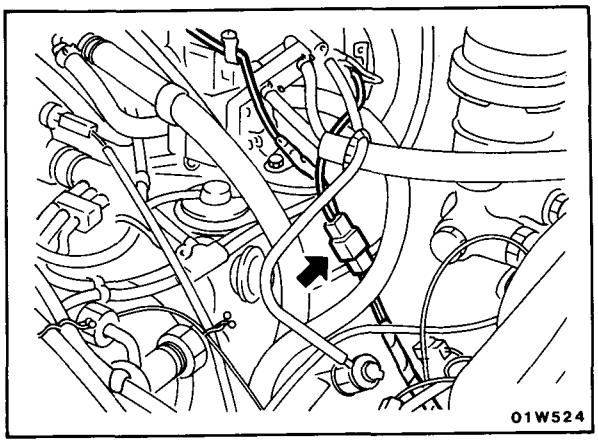
9. Disconnect the starter motor wiring harness. (01W507)
10. Remove the clutch release cylinder from the transmission. (Refer to GROUP 21.)



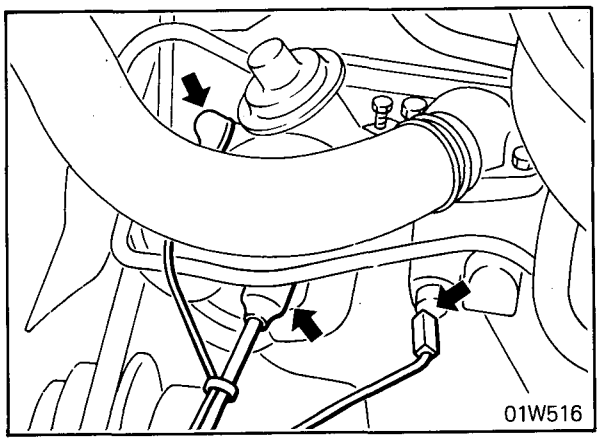
11. Disconnect the alternator wiring harness.
12. Disconnect the engine ground cable.



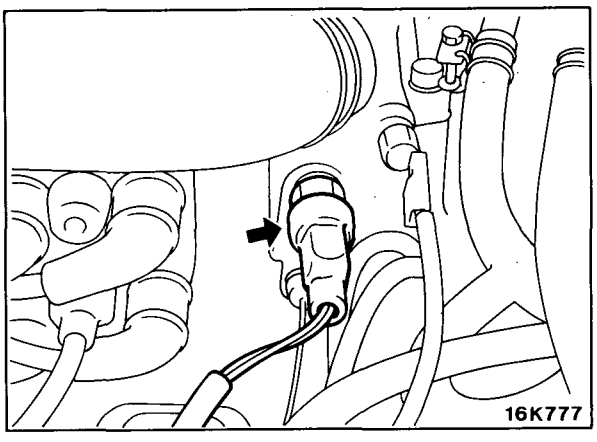
13. Disconnect the fuel cut solenoid valve and bowl vent valve connector.



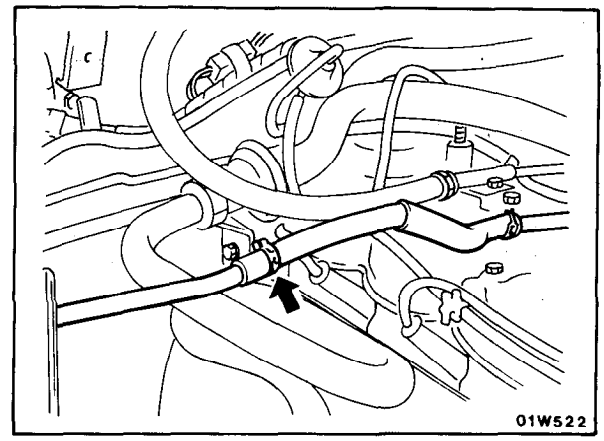
14. Disconnect the high-tension cable. (01W516)
15. Disconnect the water temperature gauge connector. (01W516)
16. Remove the power steering pump. (Refer to GROUP 19.)



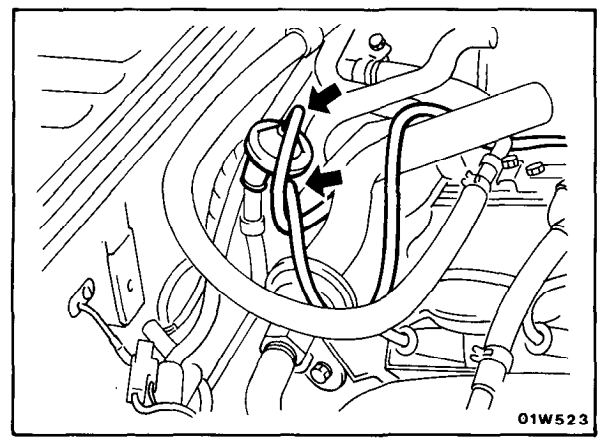
17. For vehicles equipped to meet California regulations (can also be sold in Federal States), disconnect the water temperature sensor.



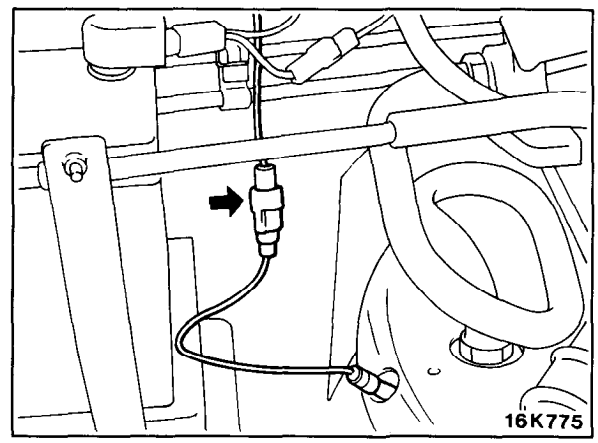
18. Disconnect the vapor hose.



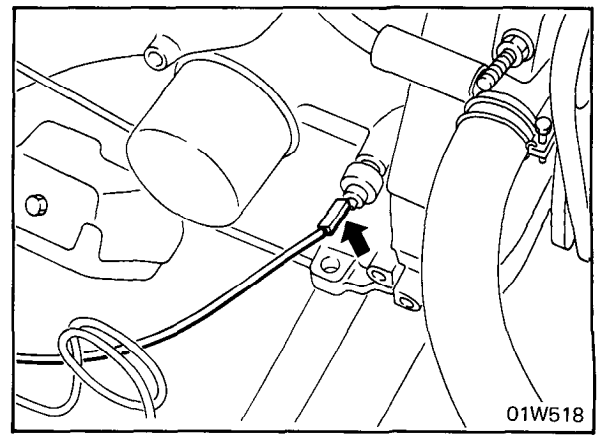
19. Disconnect the purge hoses from the purge control valve.



20. For vehicles equipped to meet California regulations (can also be sold in Federal States), disconnect the Oxygen sensor connector.



21. Disconnect the oil pressure switch harness. (01W518)
22. Remove the radiator assembly. (Refer to GROUP 7.)
23. Remove the front exhaust pipe. (Refer to GROUP 11.)
24. Remove the transfer case protector. (Refer to GROUP 21.)
25. Disconnect the speedometer cable. (Refer to GROUP 21.)
26. Disconnect the back-up light switch harness and 4-wheel drive indicator light switch harness. (Refer to GROUP 21.)
27. Remove the front and rear propeller shafts. (Refer to GROUP 16.)
28. Remove the transmission gearshift lever (vehicles with a manual transmission) or transmission selector lever (vehicles with an automatic transmission) and transfer shift lever.
29. For vehicles with an automatic transmission, remove the oil cooler hoses and tubes. (Refer to GROUP 7.)
30. Remove the engine mounting. (Refer to p. 9-17.)
31. Using a chain block and tackle, raise and remove the engine and transmission assembly diagonally out of the engine compartment.

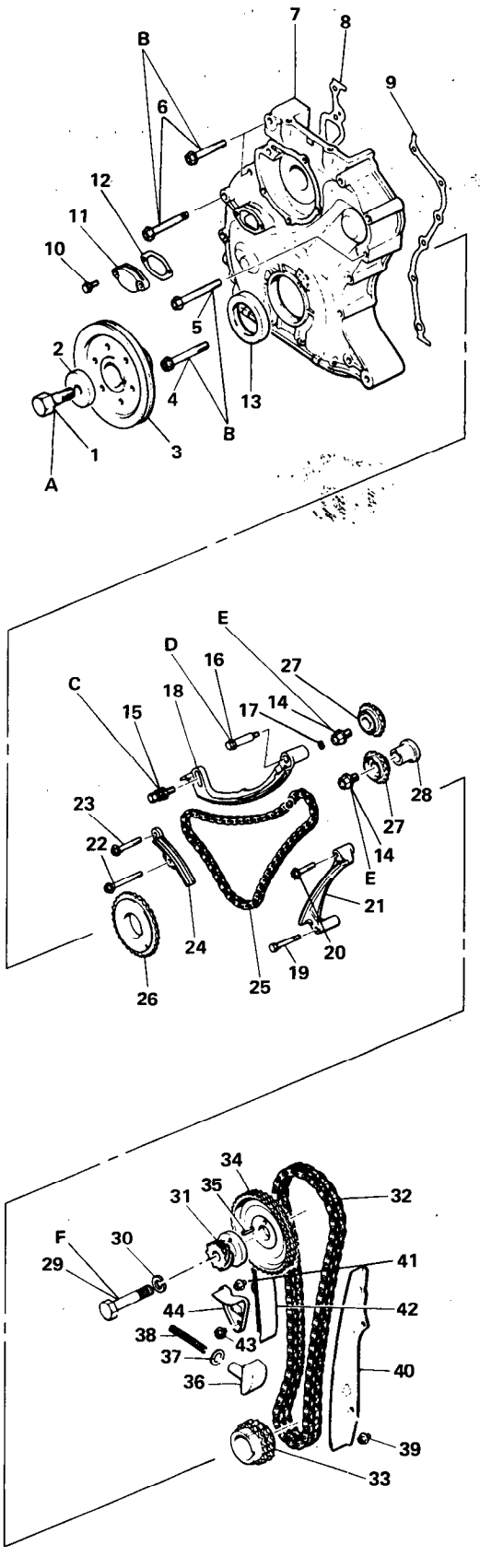


INSTALLATION

1. Supply coolant to the cooling system. (Refer to GROUP 7.)
2. Supply transmission and transfer case fluid. (Refer to GROUP 21.)
3. Supply engine oil. (Refer to p. 9-8.)
4. Adjust the clutch control system. (Refer to GROUP 6.)
   Adjust the accelerator cable. (Refer to GROUP 14.)
   Adjust the hood alignment. (Refer to GROUP 23.)
5. Torque all parts to specifications during assembly.

COMPONENTS

1. Crankshaft pulley bolt
2. Special washer
3. Pulley
4. Flange bolt – 8x68 (8)
5. Flange bolt – 8x73
6. Flange bolt – 8x58 (2)
7. Timing chain case
8. Chain case gasket (R)
9. Chain case gasket (L)
10. Flange bolt – 6x18 (2)
11. Cover
12. Gasket
13. Oil seal
14. Flange bolt – 10x15 (2)
15. Special bolt "B"
16. Special bolt "A"
17. Spring washer
18. Chain guide "B"
19. Flange bolt – 6x60
20. Flange bolt – 6x45
21. Chain guide "A"
22. Flange bolt – 6x45
23. Flange bolt – 6x32
24. Chain guide "C"
25. Chain "B"
26. Crankshaft sprocket "B"
27. Sprocket "B" (2)
28. Spacer
29. Bolt w/washer – 14x70
30. Plain washer
31. Distributor gear
32. Timing chain
33. Crankshaft sprocket
34. Camshaft sprocket
35. Spring pin
36. Tensioner
37. Rubber sheet
38. Spring
39. Flange bolt – 6x10
40. Tension side chain guide
41. Flange bolt – 6 x 10 (2)
42. Loose side chain guide
43. Flange bolt (2)
44. Sprocket holder



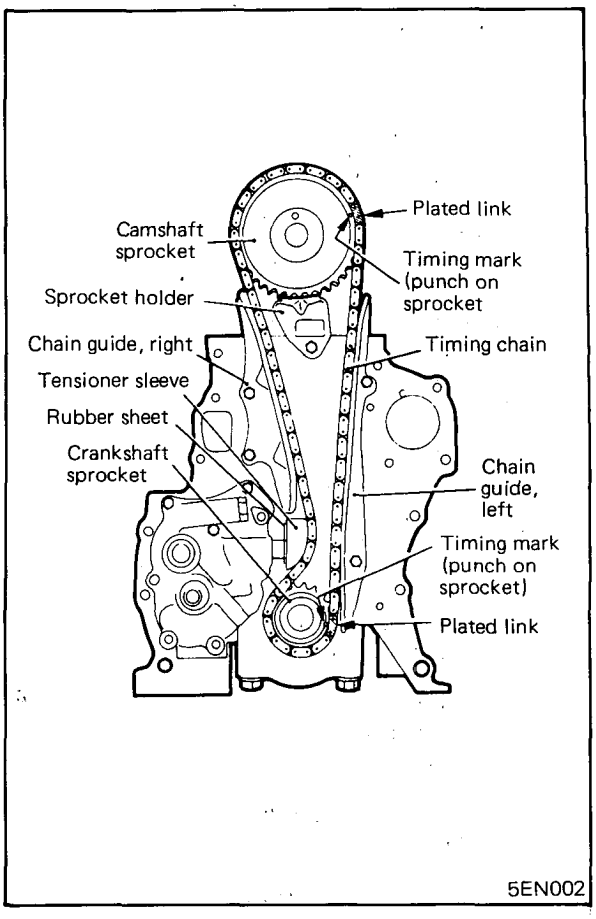
NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

	Nm	ft.lbs.
A	108-127	80-94
B	12-14	9-10.5
C	15-21	11-15
D	8-9	6-7
E	59-68	44-50
F	49-58	37-43

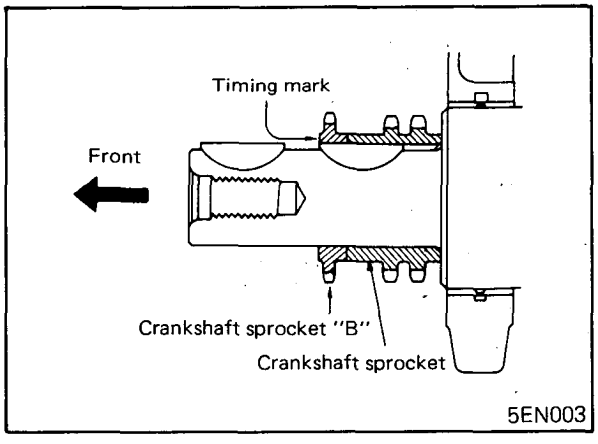
5EN119

TIMING CHAIN INSTALLATION PROCEDURE

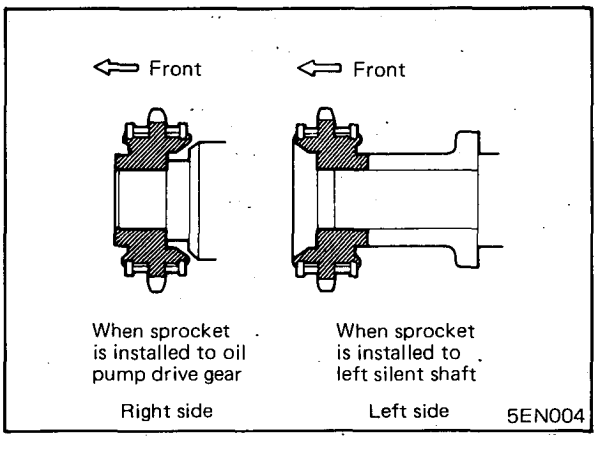
1. Install sprocket holder and chain guides.
2. Turn crankshaft until piston of No.1 cylinder is at top dead center.
3. Install tensioner spring, sleeve and rubber sheet to oil pump.
4. Line up plated links of timing chain and timing marks on sprockets as chain and sprockets are assembled.
5. While sliding crankshaft sprocket onto crankshaft, install chain and sprocket. Place camshaft sprocket on sprocket holder.



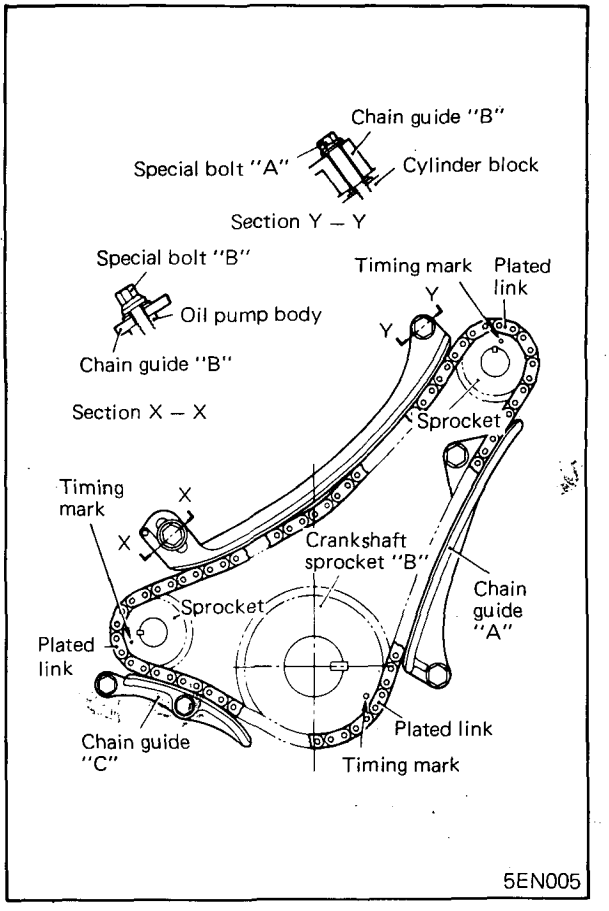
6. Install crankshaft sprocket "B" (for driving silent shafts) on crankshaft.



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

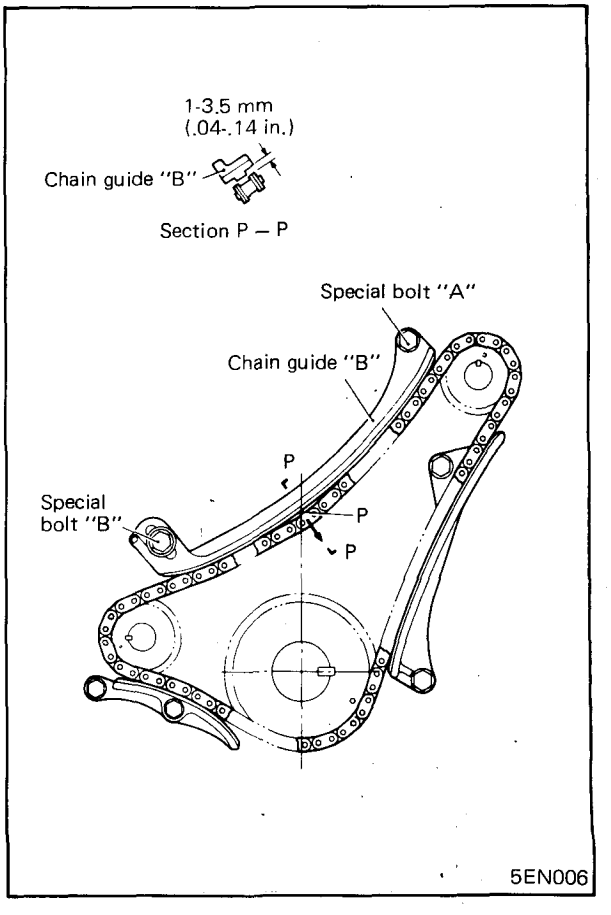


8. Holding assembled sprockets and chain "B", align timing mark on crankshaft sprocket "B" with that on chain "B", and install sprockets to oil pump drive gear and left silent shaft. Partially tighten bolt.
9. Temporarily install chain guides "A", "B" and "C".
10. Tighten silent shaft sprocket bolts to specified torque.
11. Tighten chain guide "A" mounting bolts firmly.
12. Tighten chain guide "C" mounting bolts firmly.



13. Rotate both silent shaft sprockets slightly to position chain slack at point P.
14. 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" will be 1 to 3.5 mm (.04 to .14 in.) and tighten special bolts "A" and "B".

Tightening torque
- Special bolt "A" . . . . . 8-9 Nm (6-7 ft.lbs.)
- Special bolt "B" . . . . 15-21 Nm (11-15 ft.lbs.)

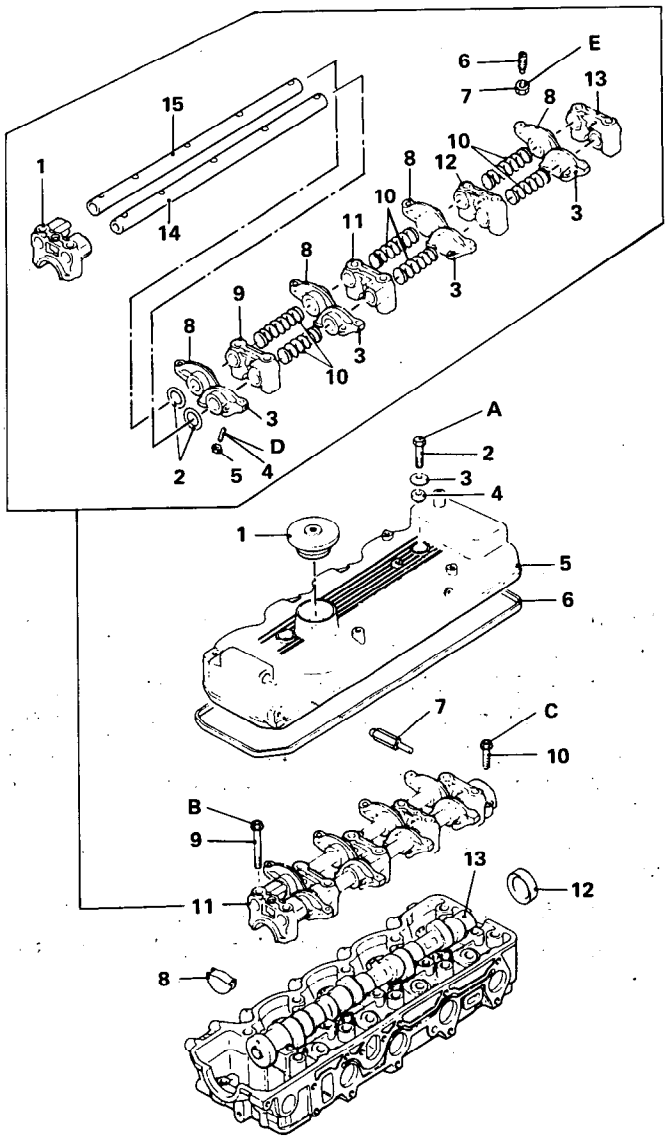


COMPONENTS

1. Oil filler cap
2. Bolt – 8x40 (2)
3. Washer (2)
4. Oil seal (2)
5. Rocker cover
6. Rocker cover gasket
7. PCV valve
8. Semi-circular packing
9. Flange bolt (10)
10. Flange bolt – 8x25 (2)
11. Rocker arm and shaft assembly
    - -1 Bearing cap, front
    - -2 Wave washer (2)
    - -3 Rocker arm "A" (4)
    - -4 Adjusting screw (4)
    - -5 Nut (4)
    - -6 Adjusting screw (8)
    - -7 Nut (8)
    - -8 Rocker arm "C" (4)
    - -9 Bearing cap No. 2
    - -10 Rocker arm spring (6)
    - -11 Bearing cap No. 3
    - -12 Bearing cap No. 4
    - -13 Bearing cap, rear
    - -14 Rocker arm shaft left
    - -15 Rocker arm shaft right
12. Circular packing
13. Camshaft

NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

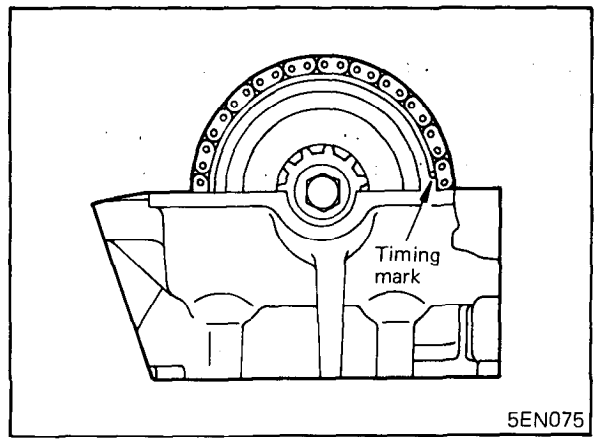
	Nm	ft.lbs.
A	5-6.8	3.7-5.0
B	19-20	14-15
C	20-26	15-19
D	8-9.5	6-7
E	12-17	9-13



5EN074

REMOVAL

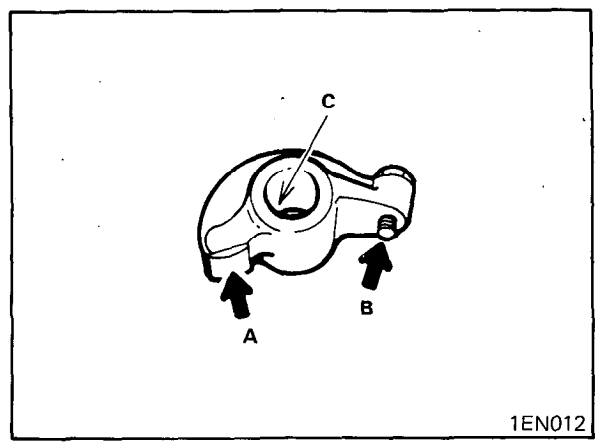
1. Before rocker arm and rocker shaft are removed, make sure that piston in No. 1 cylinder is at top dead center on compression stroke.
2. Illustration shows position of camshaft sprocket timing mark when piston in No. 1 cylinder is placed at top dead center on compression stroke. (5EN075)



INSPECTION

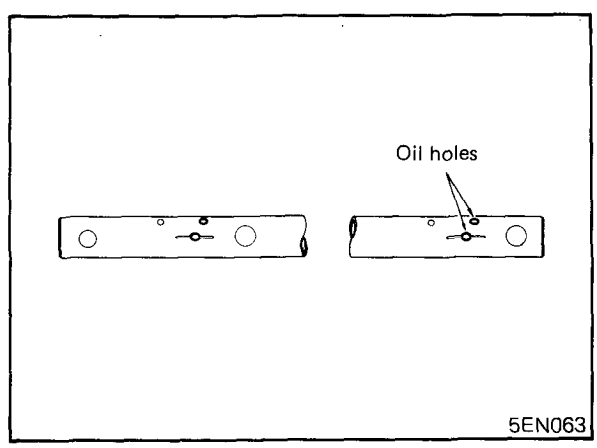
Rocker Arm

1. Check for wear of portions A, B and C, and replace if following conditions are evident. (1EN012)
   (1) Portion A dented or worn
   (2) Portion B eccentric
   (3) Portion C (inside diameter) excessively loose on shaft
2. Check to ensure that oil holes are clear. (rocker arm with oil holes only)



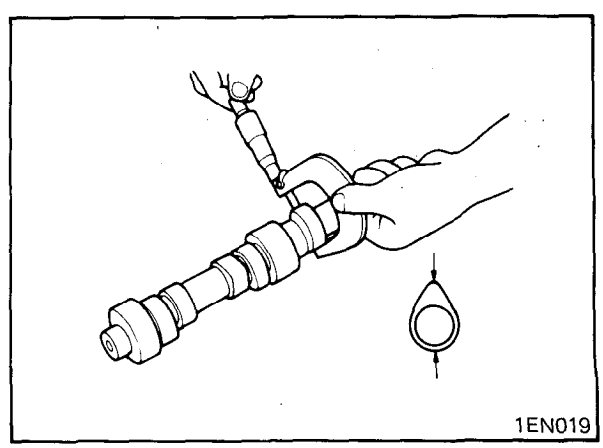
Rocker Arm Shaft

1. Check to ensure that rocker arm mounting portion is not worn.
2. Check to ensure that oil holes are clear. (5EN063)



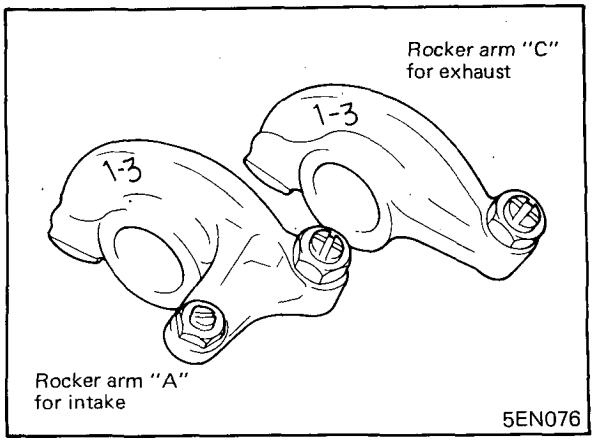
Camshaft

1. If the following areas of the camshaft are badly worn or damaged, replace. (1EN019)
   (1) Journals
   (2) Cam lobes
   (3) Fuel pump drive cam
   (4) Distributor drive gear teeth
   (5) Oil seal contacting surface
2. If camshaft bearing is badly worn, replace cylinder head.
3. If oil seal lip is worn, replace.

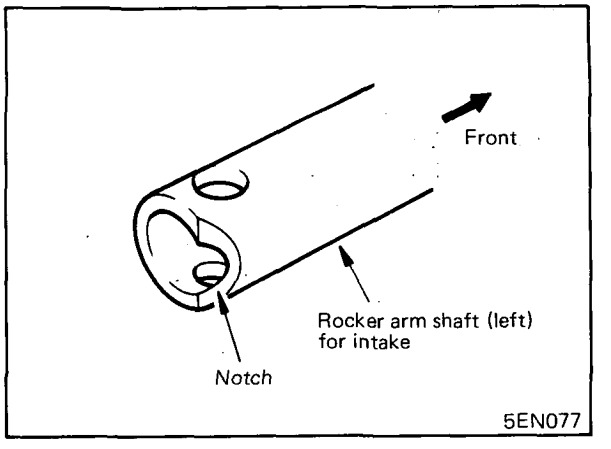


INSTALLATION

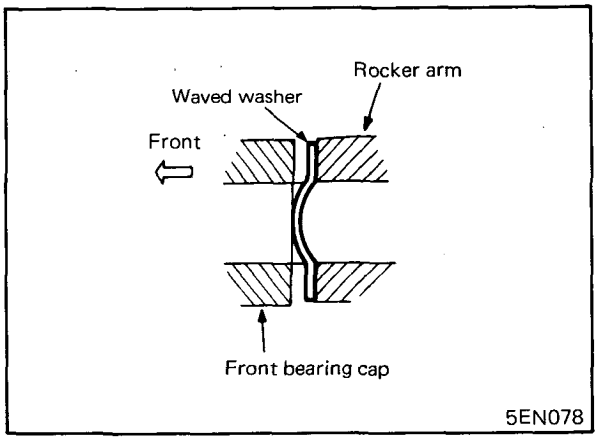
There are two kinds of rocker arms: rocker arm "A" and rocker arm "C".
Rocker arm "A" drives intake valves and jet valves.
Rocker arm "C" drives exhaust valves.



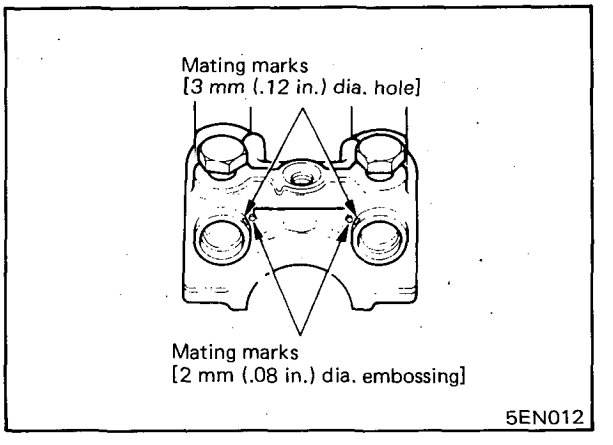
1. Insert the left and right rocker shafts into the front bearing cap. The rear end of left (intake) rocker arm shaft has a notch as shown in 5EN077.
2. Align the mating mark of the rocker arm shaft front end to the mating mark of the front bearing cap. Then insert the bolts to hold shafts in bearing cap.



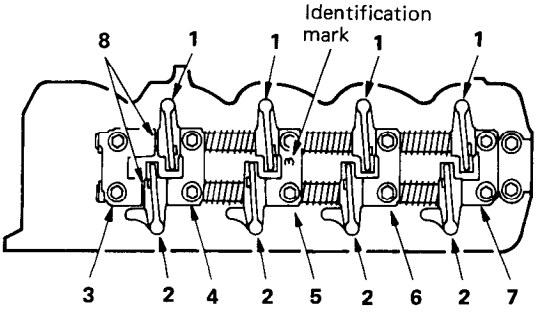
3. Install the waved washer in the direction shown in the illustration.



4. Assemble the rocker arm shaft so that the alignment mark at the front end matches the alignment mark of the front bearing cap. (5EN012)
5. Install the rocker arms, shafts, caps, etc., as shown in illustration before installation to the cylinder head. Insert the bolts to hold parts in position. (5EN079)

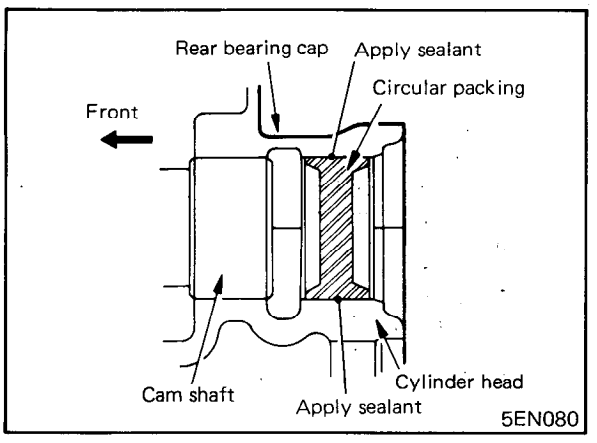


1. Rocker arm "C"
2. Rocker arm "A"
3. Front bearing cap
4. No. 2 bearing cap
5. No. 3 bearing cap
   (Inscribed mark 3 on top surface)
6. No. 4 bearing cap
   (Rocker screw hole on top surface)
7. Rear bearing cap
8. Waved washer



5EN079

6. Apply engine oil to the journals of camshaft and install it to cylinder head.
7. Coat the sealant to the O.D. of circular packing and install the circular packing to cylinder head as shown in 5EN080.
8. Install the rocker arms, shafts and bearing caps assembly to the cylinder head, and tighten the bearing cap bolts to specified torque.
9. Adjust the valve clearance. See "Lubrication and Maintenance", Group 0, for detailed procedure.



5EN080

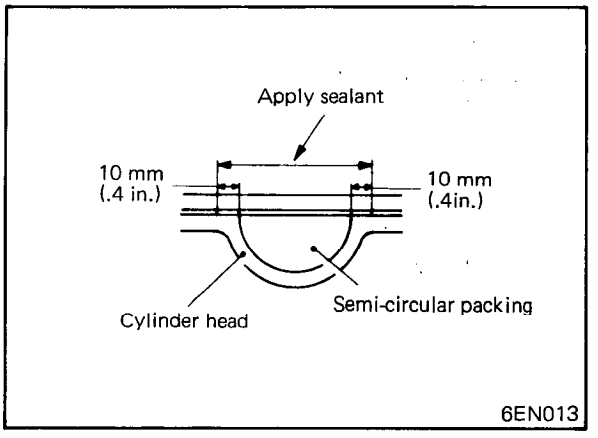
10. Install the semi-circular packing to the front of cylinder head and apply sealant to top of semi-circular packing.

Recommended adhesive .....
3M Super Weather Strip Adhesive 8001 or equivalent

11. Install the rocker cover gasket and rocker cover.

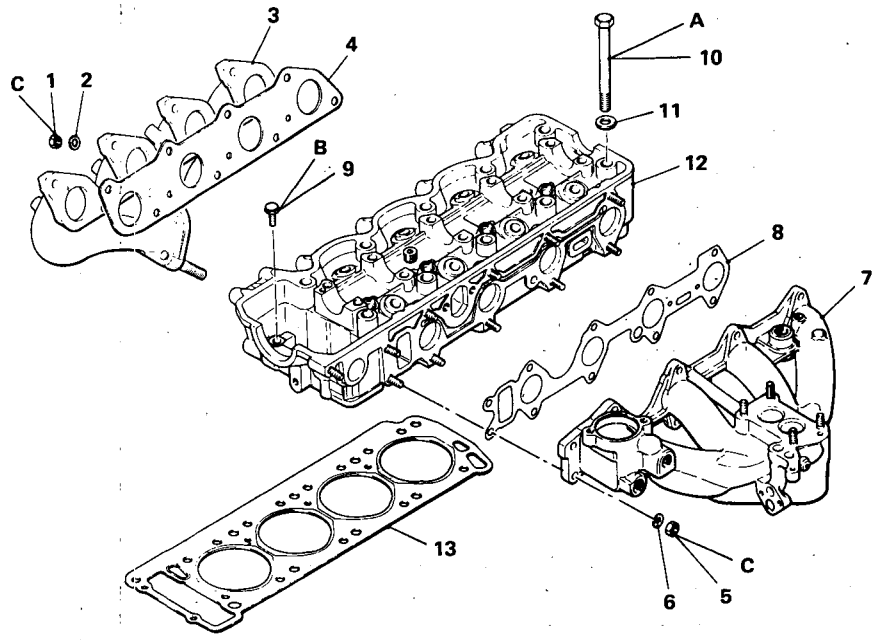
Caution
Make sure that rocker cover bolts are tightened to specified torque.
If they are overtorqued, a deformed rocker cover or oil leakage could result.

Tightening torque
Rocker cover bolts ..... 5-6 Nm (3.7-5.0 ft.lbs.)



6EN013

COMPONENTS



1. Nut (8)
2. Plain washer (7)
3. Exhaust manifold
4. Exhaust manifold gasket
5. Nut (9)
6. Spring washer (9)
7. Intake manifold
8. Intake manifold gasket
9. Flange bolt (2)
10. Cylinder head bolt (10)
11. Washer (10)
12. Cylinder head
13. Cylinder head gasket

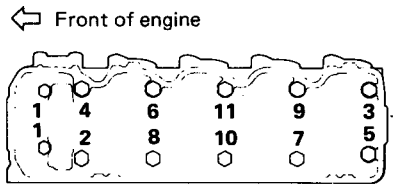
NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

		Nm	ft.lbs.
A	Cold engine	89-98	65-72
	Hot engine	98-107	73-79
B		15-21	11-15
C		15-19	11-14

5EN086

REMOVAL

1. Remove cylinder head bolts in sequence shown in illustration. (5EN015)
2. Cylinder head bolts can be loosened with ordinary socket wrench or special tool MD998051.

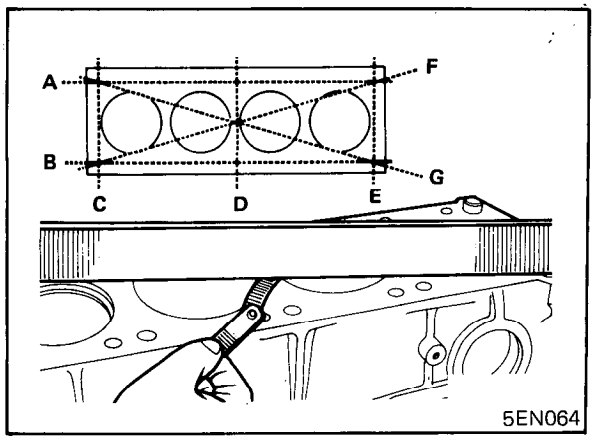


5EN015

INSPECTION

Cylinder Head

1. Check cylinder head gasket surface for warping by using a straight edge in directions of A, B, ... as shown in illustration. (5EN064)
2. If warping exceeds 0.1 mm (.004 in.) in any direction, either replace cylinder head or lightly machine cylinder head gasket surface.

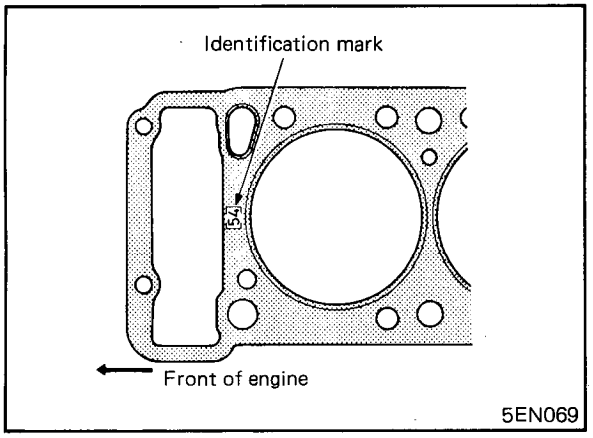


INSTALLATION

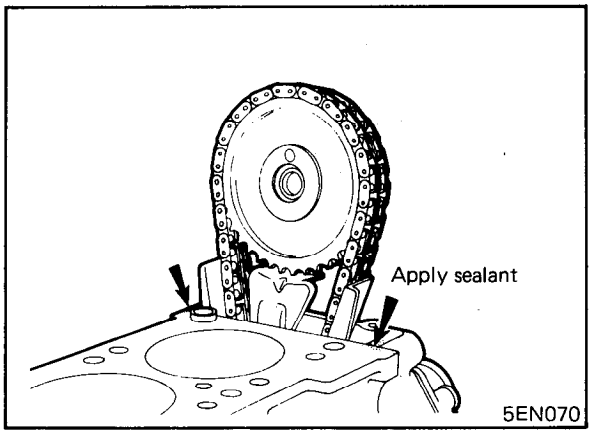
Cylinder Head Gasket

1. Clean gasket surfaces of cylinder head and cylinder block.
2. Install gasket surface with identification mark toward cylinder head. (5EN069)

Caution
Do not apply sealant to cylinder head gasket.



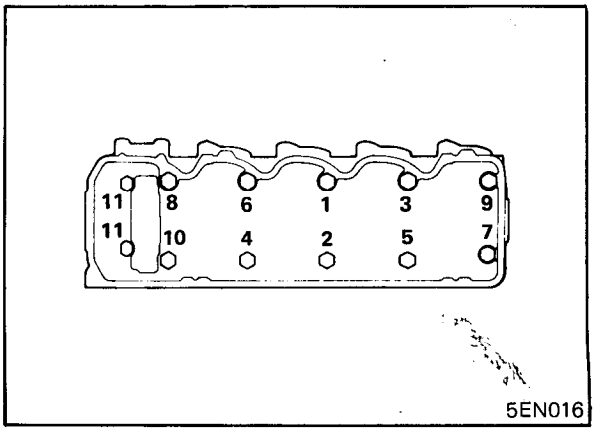
3. Before cylinder head gasket is installed, apply sealant to top surface (indicated by arrows in illustration) of each butt joint between cylinder block and chain case.



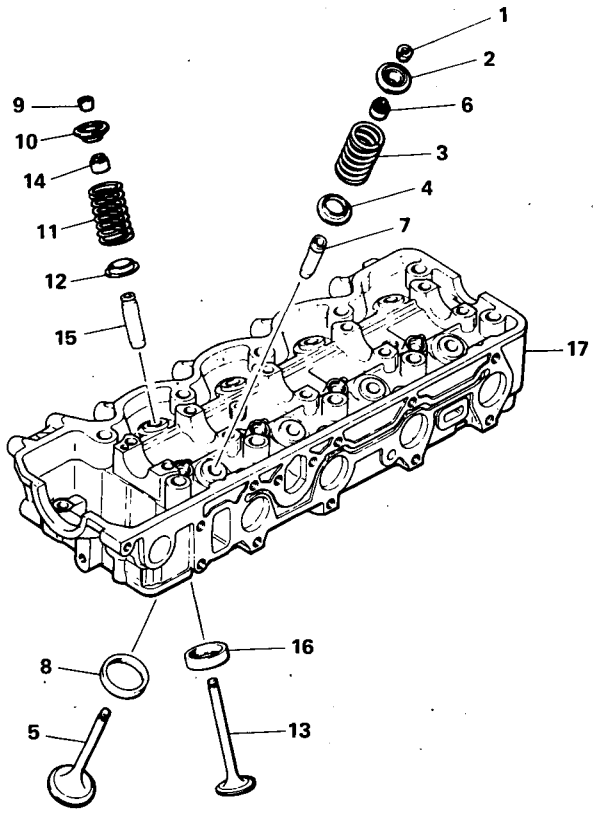
Cylinder Head

1. Install cylinder head assembly.
2. Install cylinder head bolts.
3. Starting at top center, tighten all cylinder head bolts to 1/2 of specified torque in the sequence shown in illustration. (5EN016)
4. Torque all cylinder head bolts to the specifications in the same sequence.

Cylinder head bolt (Nos.1 through 10) tightening torque
Cold engine ..... 89-98 Nm (65-72 ft.lbs.)
Hot engine ..... 98-107 Nm (73-79 ft.lbs.)
Cylinder head bolt (No.11) tightening torque
15-21 Nm (11-15 ft.lbs.)



COMPONENTS



1. Lock (8)
2. Retainer (4)
3. Spring (4)
4. Seat (4)
5. Intake valve (4)
6. Valve stem seal (4)
7. Intake valve guide (4)
8. Intake valve seat (4)
9. Lock (8)
10. Retainer (4)
11. Spring (4)
12. Seat (4)
13. Exhaust valve (4)
14. Valve stem seal (4)
15. Exhaust valve guide (4)
16. Exhaust valve seat (4)
17. Cylinder head

NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

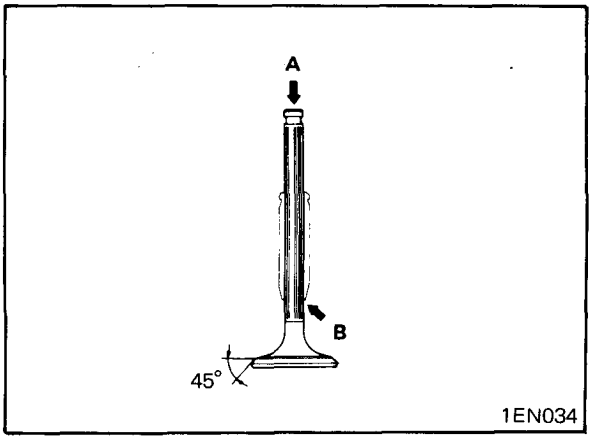
5EN017

Disassembled parts, such as valves, valve springs, should be grouped in accordance with their cylinder numbers.

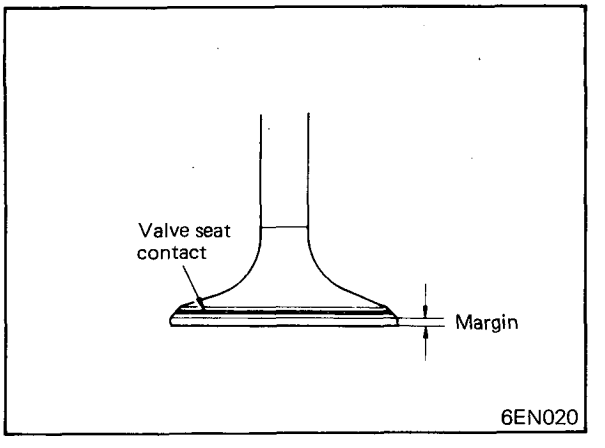
INSPECTION

Valves

1. Check each valve for wear, damage or deformation of head and stem at "B". Repair or replace excessively worn, damaged or deformed valves.
2. If stem tip "A" is pitted, correct by grinding. This correction must be limited to a minimum. Also reface valves with a valve grinder.
3. Check valve stem-to-guide clearance. Replace valve and/or valve guide if necessary.

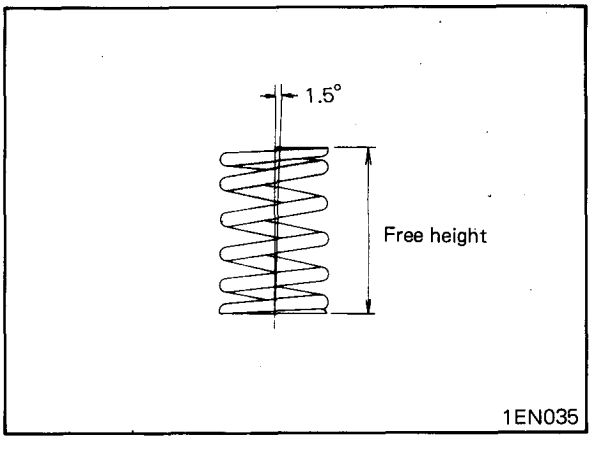


4. Replace valve if the margin of the face has decreased to less than 0.5 mm (.02 in.). (6EN020)
5. Valve seat contact should be made at center of valve face.
6. Using marking compound, check for even contact with valve seat.
7. If inadequate contact with valve seat is evident, correct valve seat and/or reface valve.



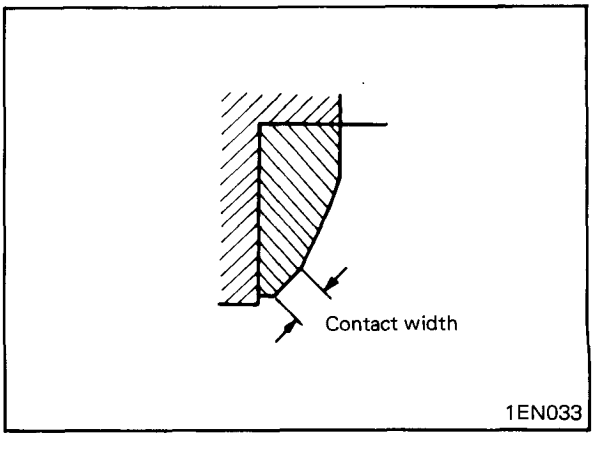
Valve Springs

1. Check free height of each valve spring and replace if necessary. (1EN035)
2. Using a square, test squareness of each valve spring. If spring is excessively deformed, replace it.



Valve Seats

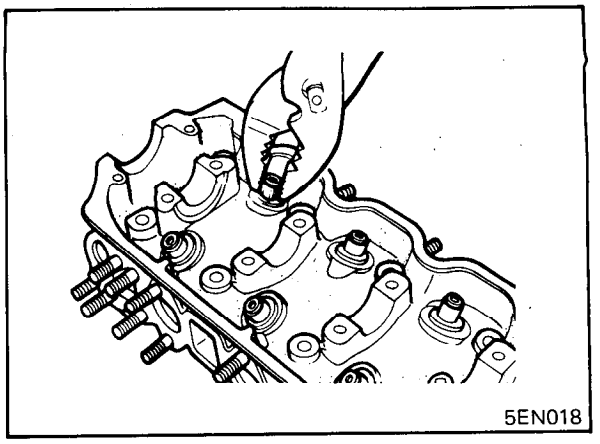
1. Check valve seats for evidence of overheating or improper contact with valve face. Correct or replace seat if necessary.
2. Valve seat contact width should be as specified. (Refer to p. 9-32.) (1EN033)



VALVE STEM SEAL REPLACEMENT

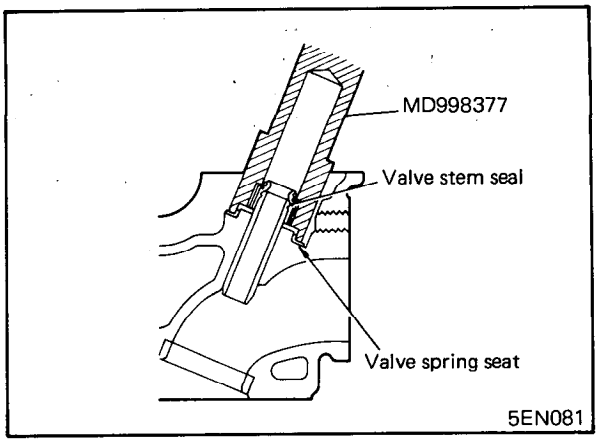
1. Remove valve stem seal with pliers and discard it.

Caution
Do not reuse valve stem seal.


5EN018

2. Install spring seats.
3. Lightly tap seal into place with special tool. (5EN081)

NOTE
Incorrect installation of seal will adversely affect lip and eccentricity, resulting in oil leakage past valve guides.



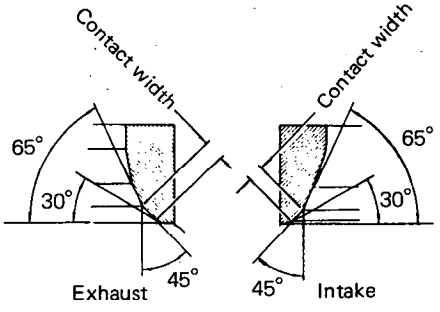
5EN081

VALVE SEAT RECONDITIONING

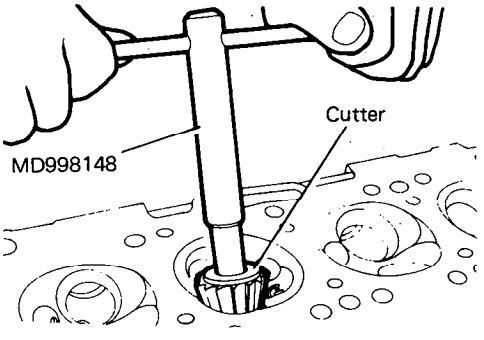
1. When correcting, check valve guide for wear. Replace guide if worn, and then correct seat.
2. To correct valve seat, use special tools. (1EN036, 1EN037)

Contact width	
Exhaust	1.2-1.6 mm (.047-.063 in.)
Intake	0.9-1.3 mm (.035-.051 in.)

3. After correction, valve and valve seat should be lapped with a lapping compound.



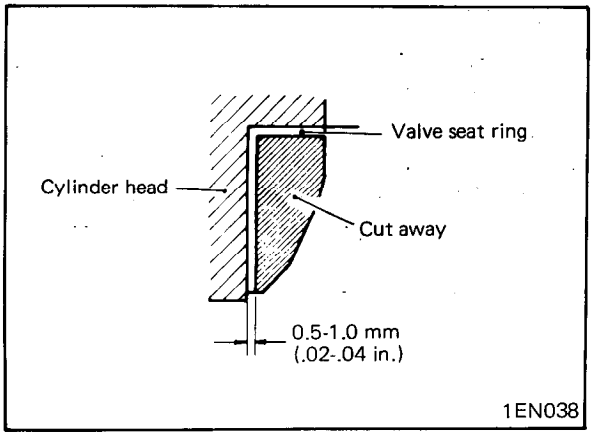
1EN036



1EN037

VALVE SEAT INSERT REPLACEMENT PROCEDURE

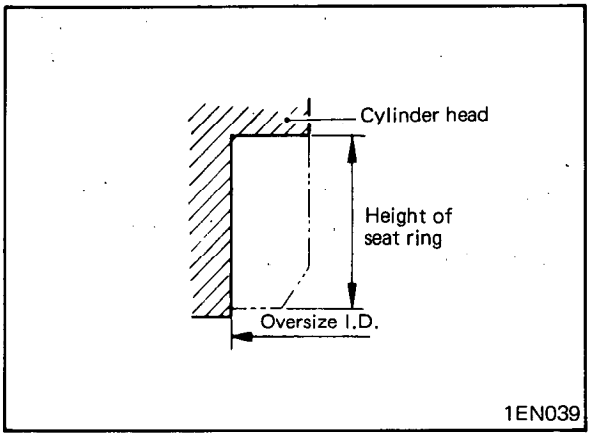
1. When seat insert is to be removed, cut away excess metal from inside of insert with cutter before removal.



2. Grind valve insert bore in cylinder head to match the outside diameter and height of oversize seat insert. (1EN039)
3. Before insert is installed, heat cylinder head proper to approx. 250°C (480°F).

Caution
If seat insert is installed at room temperature, cylinder head will be ground and seat ring will not tightly fit.

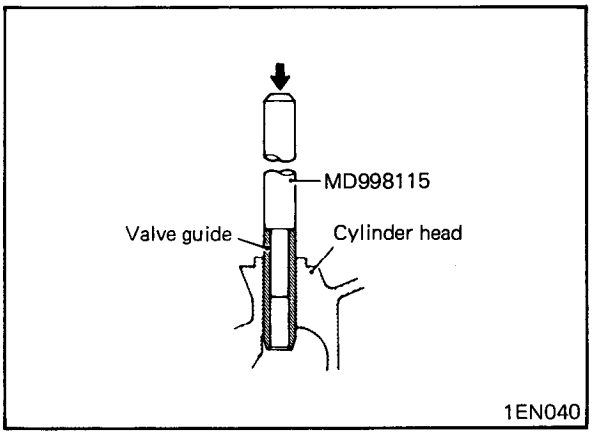
4. Press-fit insert quickly in hole provided in cylinder head.
5. After installation, recondition valve seat with seat cutter. See "Valve Seat Reconditioning".



VALVE GUIDE REPLACEMENT PROCEDURE

Replace the valve guide as follows.

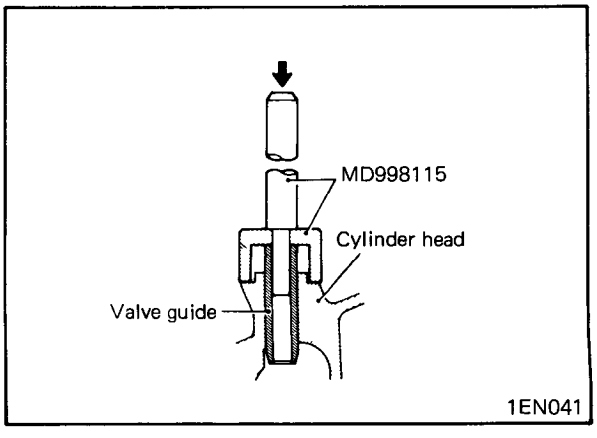
1. Using special tool, press valve guide out toward cylinder head lower surface. (1EN040)
2. Machine valve guide hole in cylinder head to outer diameter of oversize valve guide.



3. Using special tool install the valve guide. Use of valve guide installer makes it possible to press the valve guide to a predetermined height. Valve guide should be installed from top of cylinder head. (1EN041)

Caution
If valve guide of standard size has been removed, do not reinstall a standard size valve guide. Be sure to install valve guide at room temperature.

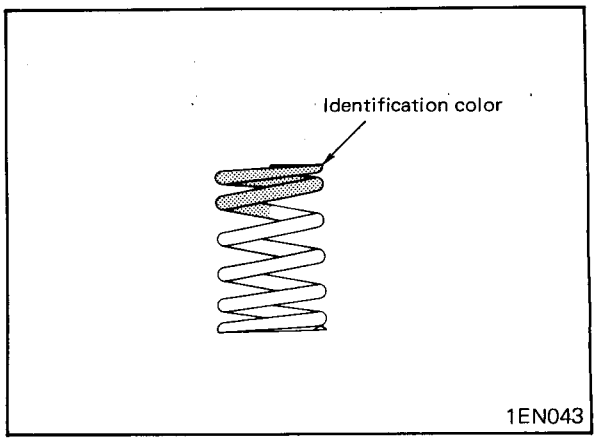
4. After valve guides have been installed, insert new valves and check for free movement.
5. When valve guides have been replaced, check for valve face-to-seat contact and correct valve seats as necessary.



REASSEMBLY

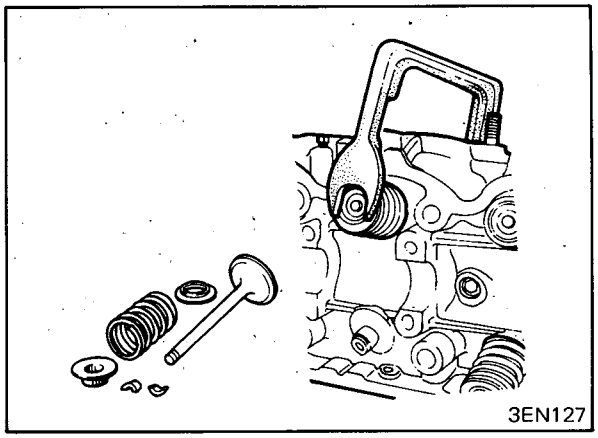
1. Apply engine oil to each valve. Insert valves into guides. Avoid inserting valve into seal with force. After insertion, check to see if valve moves smoothly.
2. Valve springs should be installed with identification color side toward valve spring retainer. (1EN043)

Identification color	Blue

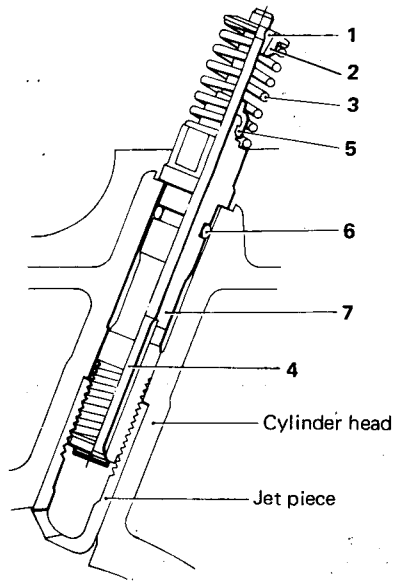


3. Use valve spring compressor or suitable tool to compress spring and install retainer lock. (3EN127)
4. After installation of valves, make certain that retainer locks are positively installed.

Caution
When spring is compressed with Valve Spring Compressor or suitable tool, check to see that the bottom of retainer does not contact the valve stem seals.



COMPONENTS



1. Retainer lock
2. Spring retainer
3. Spring
4. Jet valve
5. Valve stem seal
6. O-ring
7. Jet body

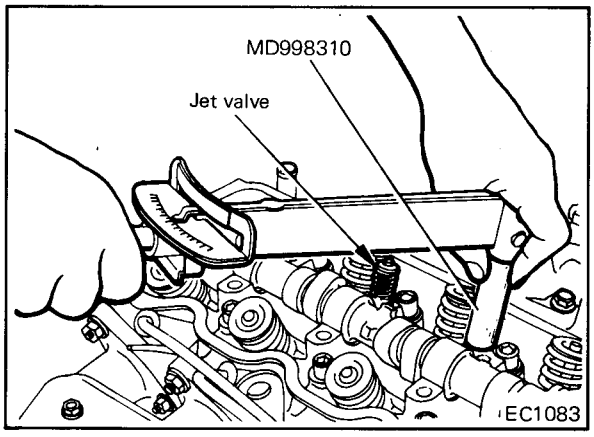
NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

EC1084

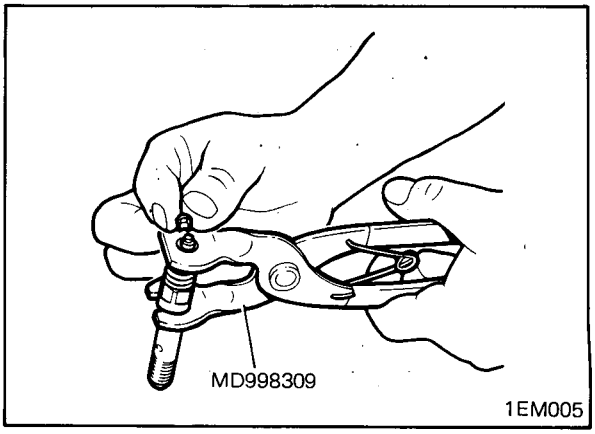
REMOVAL

1. Remove the jet valve assembly with special tool.

Caution
When using the jet valve socket wrench, 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. Remove the jet valve spring retainer lock with special tool and remove the valve spring retainer and valve spring.



INSPECTION

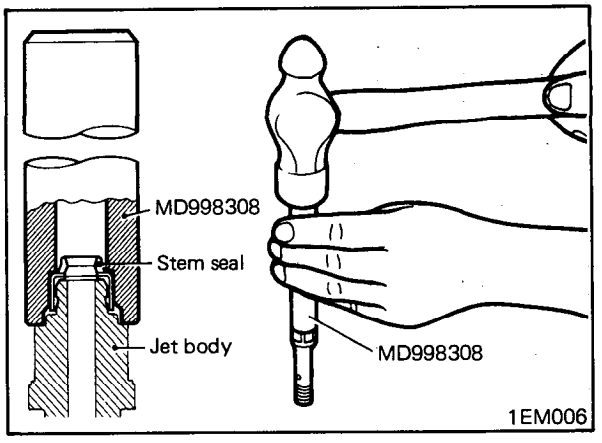
1. Check to ensure that the jet valve slides smoothly with no play in the jet body. Do not attempt to adjust the fit of the jet valve in the jet body. Replace the jet valve and jet body as an assembly.
2. Check the face of the jet valve and the jet body seat for seizure or damage. If defective, replace the jet valve and jet body as an assembly.
3. Check the jet valve spring for deterioration, cracks or damage, and replace if defective.

INSTALLATION

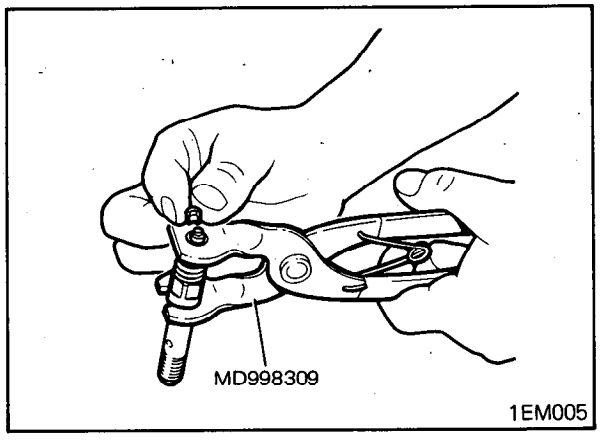
1. Install the jet valve stem seal with the special tool. (1EM006)

Caution
Do not reuse old valve stem seal.

2. Apply engine oil to the stem of the jet valve before inserting the jet valve into the jet body. When inserting the valve, use care to prevent damage to the new valve stem seal lips. After installation, check to ensure that the valve slides smoothly.

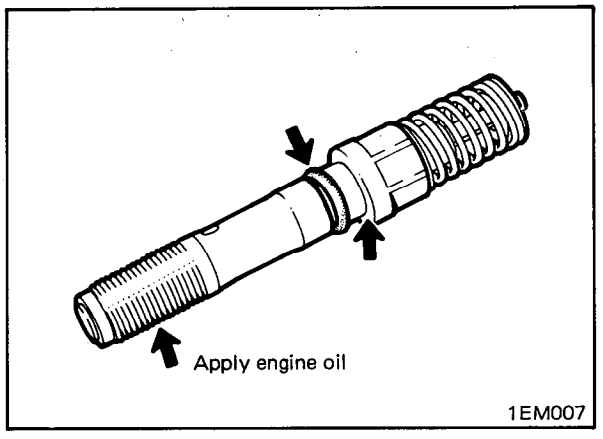


3. Mount the jet valve spring and jet valve spring retainer. Then compress the spring with the special tool, and install the retainer lock. When compressing the spring with pliers, use care not to avoid damaging the valve stem with the bottom of the spring retainer.



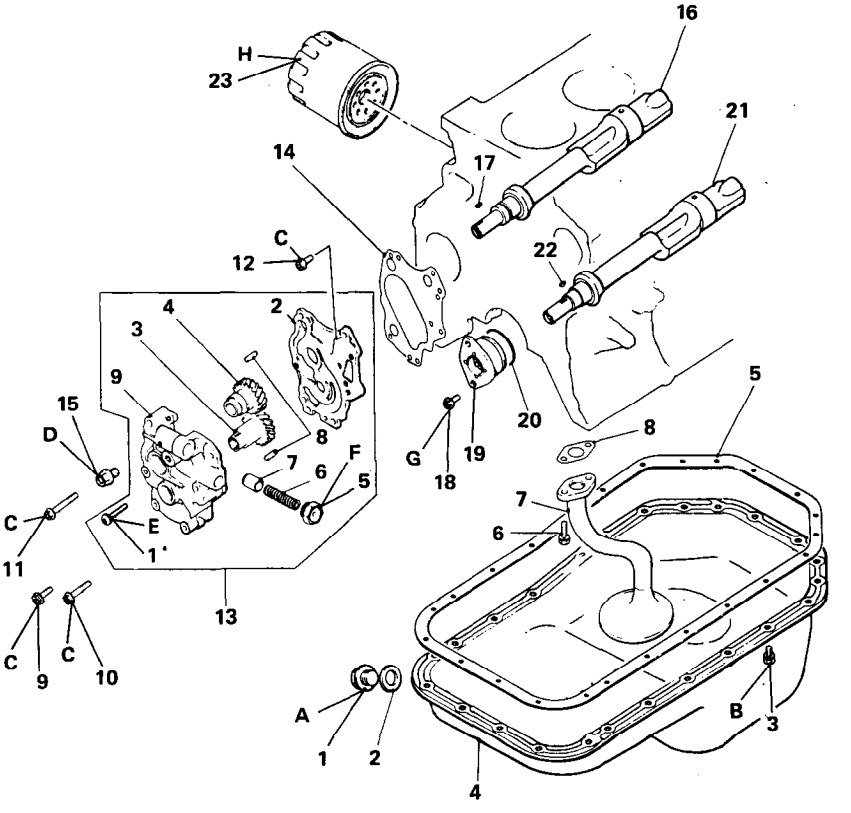
4. Install a new O-ring into the groove around the jet body and apply engine oil to the O-ring. Apply engine oil to the jet body threaded area and seat surface. (1EM007)
5. Screw the jet valve assembly into the cylinder head by hand, and tighten to the specified torque with special tool. Hold the jet valve socket wrench firmly to make sure that it is not tilted with respect to the center of the jet valve.

Tightening torque
Jet valve assembly ..... 18-21 Nm (13-15 ft.lbs.)



COMPONENTS

1. Oil drain plug
2. Oil drain plug gasket
3. Bolt (24)
4. Oil pan
5. Gasket
6. Bolt (2)
7. Oil screen
8. Oil screen gasket
9. Flange bolt – 6x22
10. Flange bolt – 6x38
11. Flange bolt – 6x45
12. Flange bolt – 6x16
13. Oil pump assembly
    - -1 Screw
    - -2 Oil pump cover
    - -3 Oil pump drive gear
    - -4 Oil pump driven gear
    - -5 Plug
    - -6 Relief spring
    - -7 Relief valve
    - -8 Pin (2)
    - -9 Oil pump body
14. Oil pump gasket
15. Flange bolt
16. Silent shaft, right
17. Woodruff key
18. Flange bolt (2)
19. Thrust plate
20. O-ring
21. Silent shaft, left
22. Woodruff key
23. Oil filter

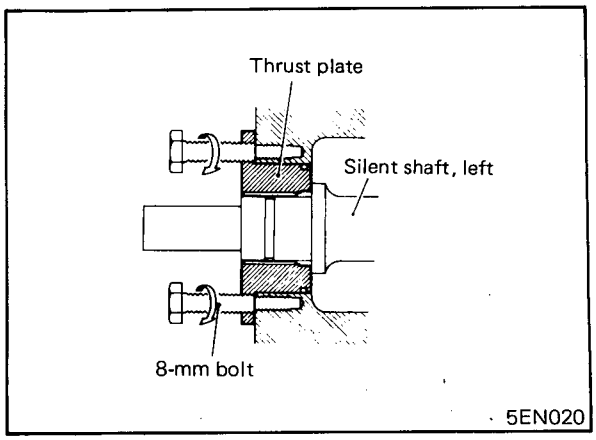


NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

	Nm	ft.lbs.
A	59-78	44-57
B	6-7	4.5-5.5
C	10-11.5	7.5-8.5
D	59-68	44-50
E	8-9	6-7
F	30-44	22-32
G	10-11.5	7.5-8.5
H	11-12	8-9

REMOVAL

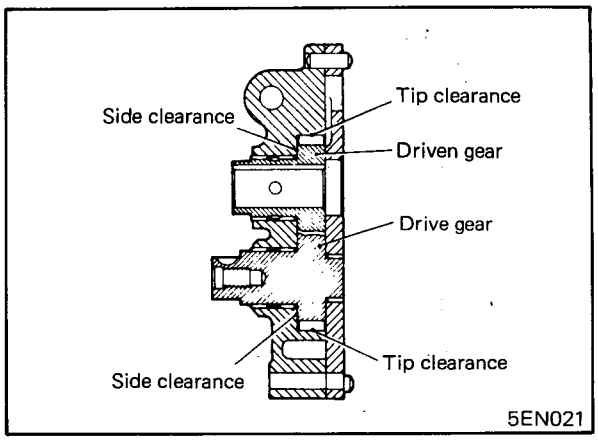
When the thrust plate is to be removed, install 8 mm dia. bolts into threaded holes of flange and turn bolts equally to remove the thrust plate.



INSPECTION

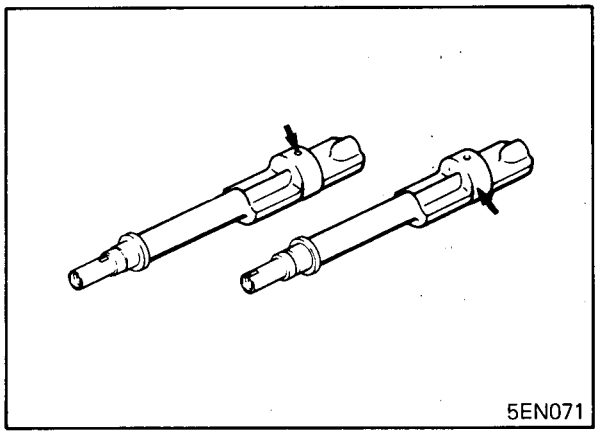
Oil Pump

1. Install drive gear and driven gear to oil pump body and measure clearance.
2. Check for stepped wear of gear contacting surfaces of body and cover.
3. If clearance is excessive, or if case or cover has stepped wear, replace case and cover assembly, replace gears, or both.



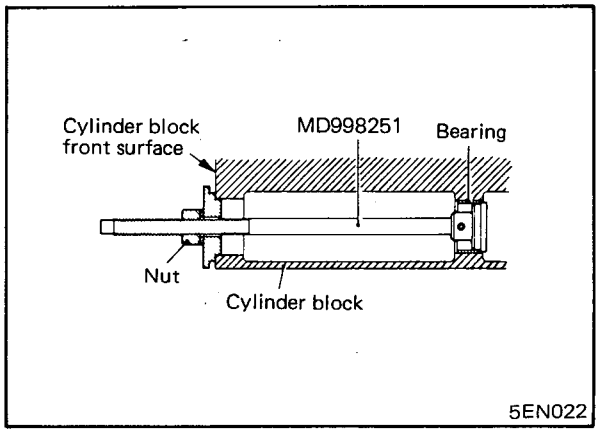
Silent Shafts

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



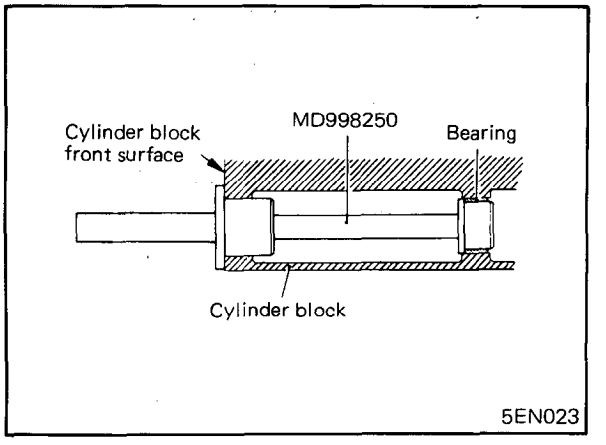
SILENT SHAFT BEARING REPLACEMENT PROCEDURE

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



2. Using special tool, install silent shaft bearing to cylinder block.

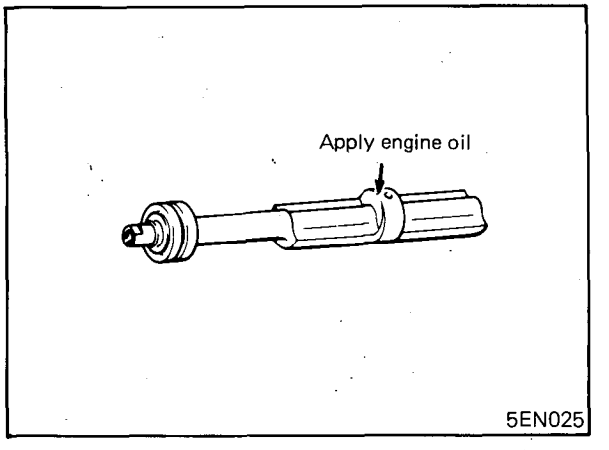
Caution
Before installing bearing, apply engine oil to outer surface of bearing.



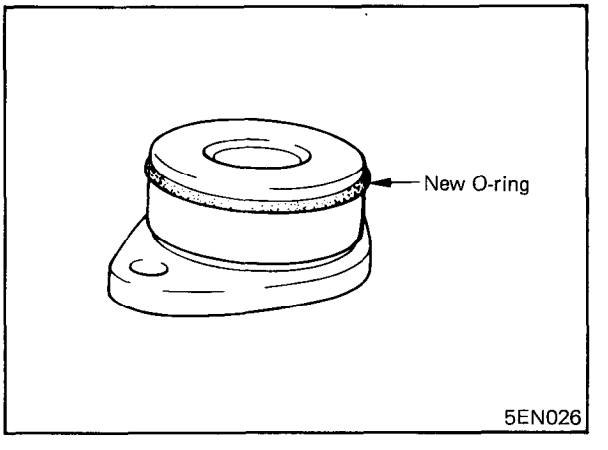
INSTALLATION

Left Silent Shaft

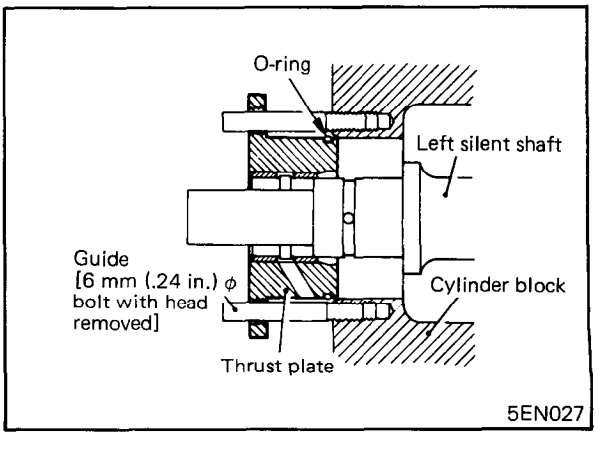
1. Apply engine oil to journal of left silent shaft. (5EN025)
2. Install left silent shaft into cylinder block carefully, to prevent damage to the bearing.



3. Install new O-ring into groove of thrust plate. (5EN026)
4. Apply engine oil around O-ring.



5. Install two guides into threaded holes for mounting thrust plate. Guides should be fabricated by cutting off hexagonal heads of bolts 6 mm (.24 in.) in diameter and 50 mm (2 in.) long. (5EN027)
6. Install since thrust plate into cylinder block along guides. Without use of guides, threaded holes will be hard to align, turning to align holes might twist or damage the O-ring, so make sure that thrust plate is correctly installed by use of the guides.

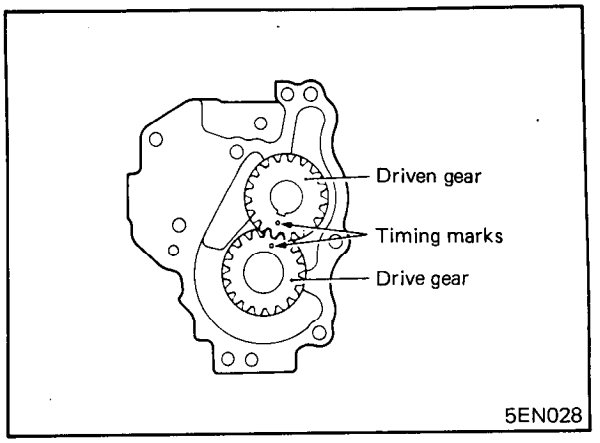


Right Silent Shaft and Oil Pump

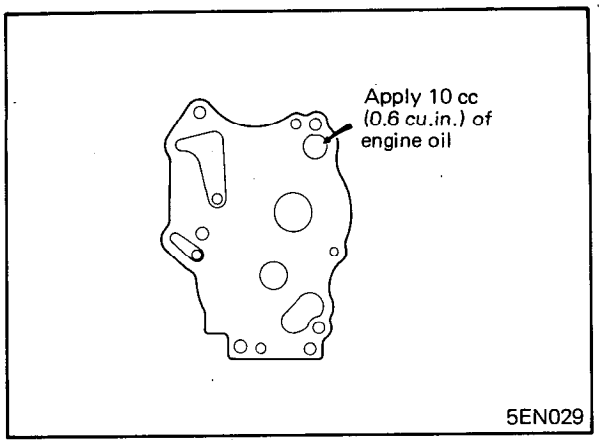
1. Install oil pump gears to oil pump body and align timing marks. (5EN028)

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

2. Install oil pump cover to body and tighten screws.

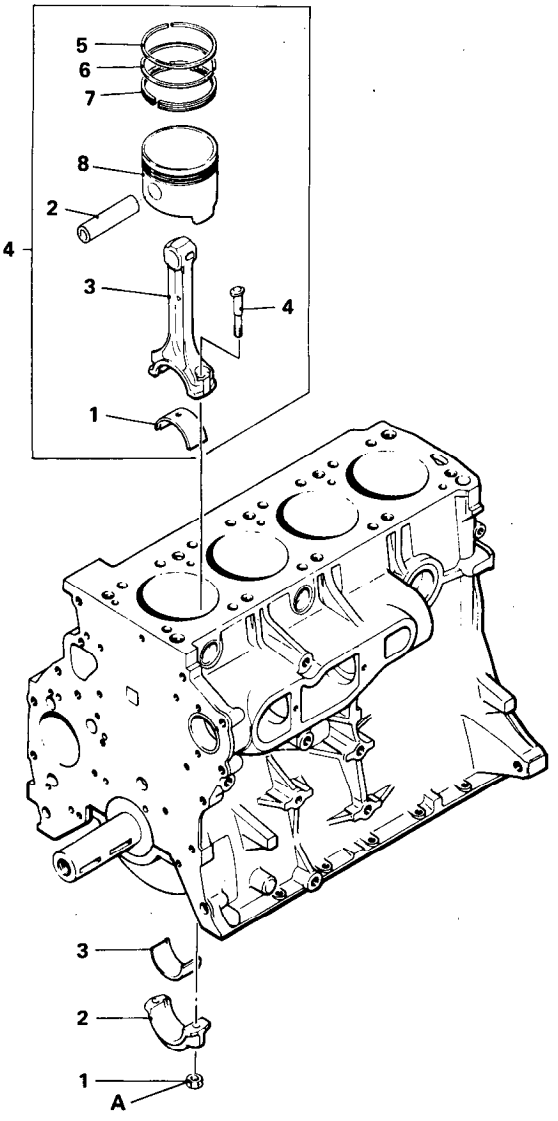


3. After installing pump cover, position pump assembly in same position as it was originally installed on engine and put approx. 10 cc (0.6 cu.in.) of clean engine oil in delivery port. (5EN029)
4. Install right silent shaft into oil pump driven gear.
5. Install driven gear and silent shaft tightening bolt and tighten to specified torque.
6. Apply engine oil to journal of right silent shaft.
7. Install silent shaft and oil pump as an assembly to cylinder block. Use care to avoid damaging rear bearing as the shaft is installed.
8. Tighten oil pump mounting bolts to specified torque.



Torque specification
Oil pump mounting bolts . . . . . 10-10.5 Nm (7.5-8.5 ft.lbs.)

COMPONENTS



1. Nut (8)
2. Bearing cap (4)
3. Bearing (4)
4. Piston and connecting rod assembly (4)
   - -1 Bearing (4)
   - -2 Piston pin (4)
   - -3 Connecting rod (4)
   - -4 Bolt (8)
   - -5 No. 1 piston ring (4)
   - -6 No. 2 piston ring (4)
   - -7 Oil ring (4)
   - -8 Piston (4)

NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

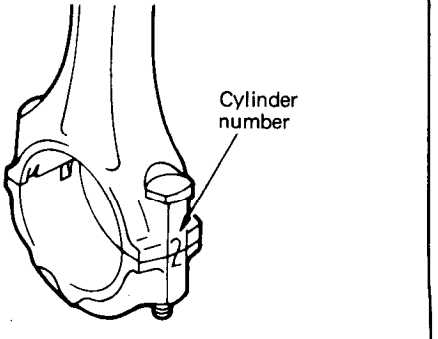
	Nm	ft.lbs.
A	45-47	33-34

5EN120

REMOVAL

Connecting Rod Cap

1. Before connecting rod cap is removed, make the cylinder number on the connecting rod and on the cap and big end side surfaces. (DEN050)
2. Keep bearings in order of corresponding connecting rods (according to cylinder numbers) for proper reassembly.

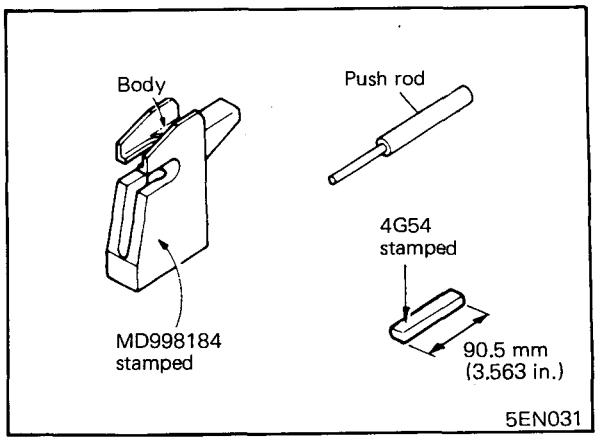


DEN050

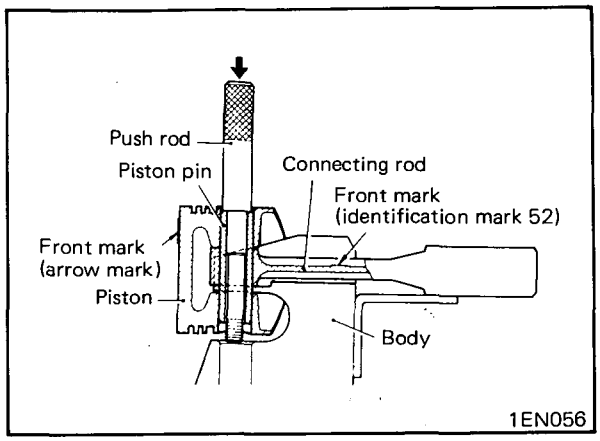
PISTON PIN REMOVAL AND INSTALLATION PROCEDURES

Caution
Tools vary on different engine models.

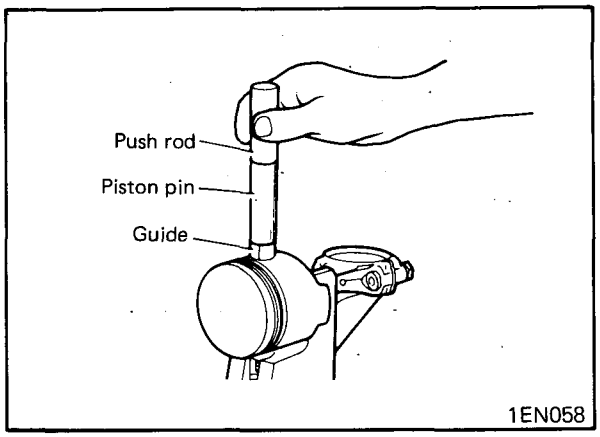
1. Use the special tools illustrated to remove and install piston and connecting rod.



2. Set piston and connecting rod assembly in tool body so that the front mark (arrow mark of piston or identification mark of connecting rod) is positioned upward.
3. Place connecting rod securely on tool body.
4. Insert push rod into piston pin and remove piston pin with press. (1EN056)

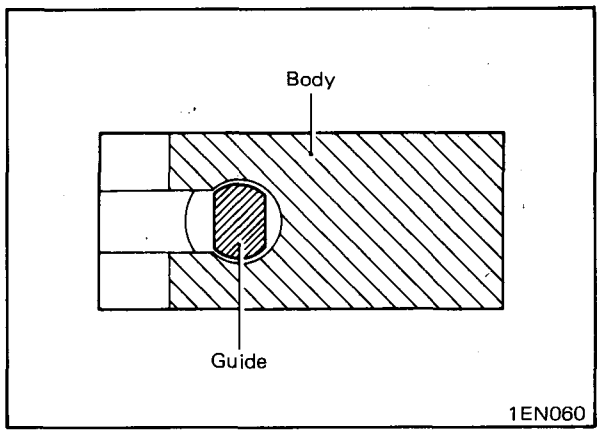


5. Assemble piston pin, push rod and guide. (1EN058)
6. Apply engine oil to outer surface of piston pin and small end bore of connecting rod.
7. Set connecting rod and piston with front mark facing up.

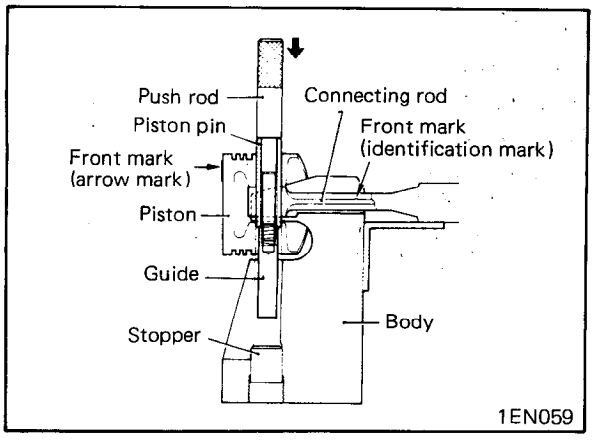


8. Insert push rod, piston pin and guide as a unit into piston pin hole and connecting rod small end hole.
9. Align the guide so that the two parallel surfaces are positioned as shown in illustration. (1EN060)
10. Press piston pin into piston pin hole applying the specified load with a press. If required installation load is not within specifications, replace piston pin and/or connecting rod.

Piston pin press-in load . . . . . .
7,355-17,162 N (1,653-3,858 lbs.)

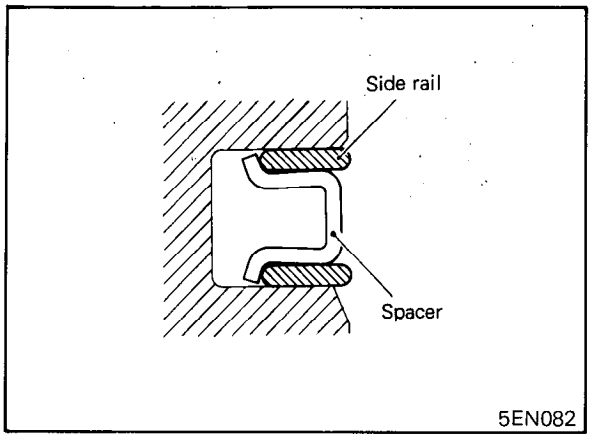


11. Turn the push rod 1/4 turn and separate the piston and connecting rod assembly from the special tool.
12. After pressing in piston pin, make sure that connecting rod turns and slides easily.



PISTON RING INSTALLATION PROCEDURE

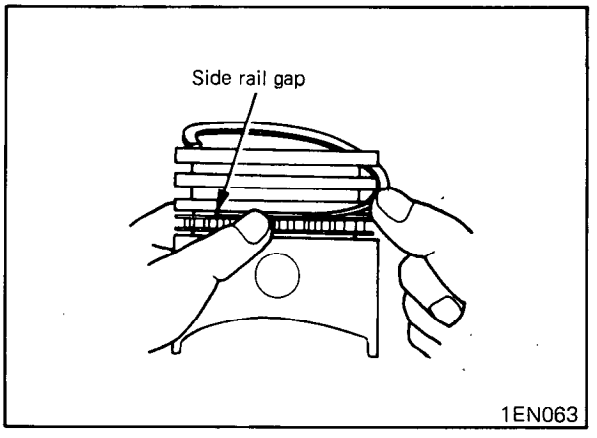
1. Install spacer.



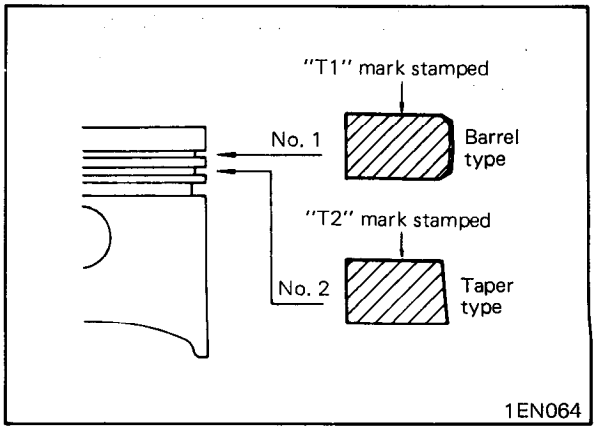
2. Install upper side rail. To install side rail, first put one end of side rail between piston ring groove and spacer, hold it down firmly, and then press down the portion which is to be inserted into groove with a finger as illustrated. (1EN063)

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

3. Install lower side rail by same procedure as Step 2.



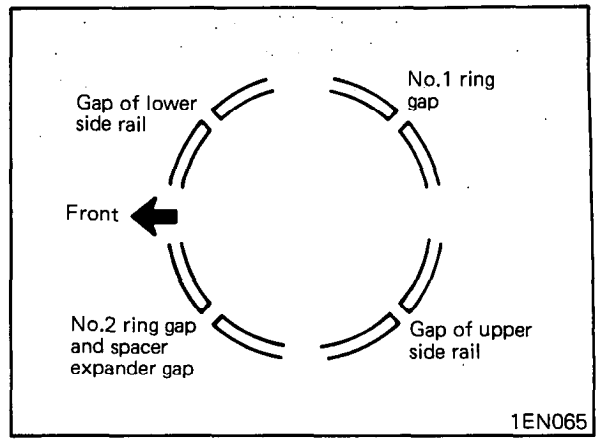
4. Using piston ring expander, install No. 2 piston ring.
5. Install No.1 piston ring.
6. Apply engine oil around piston and piston rings.



INSTALLATION

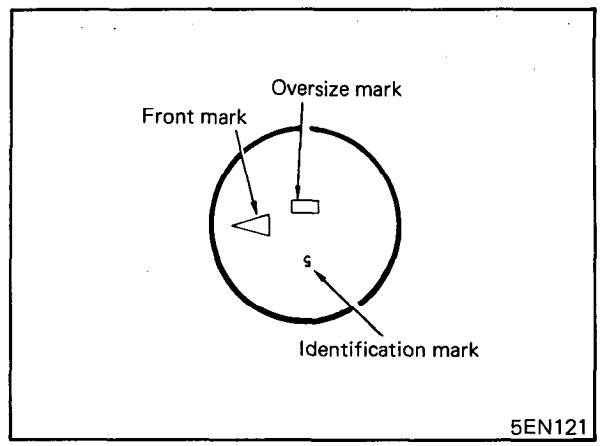
When installing the piston and connecting rod assembly into cylinder, be sure to check the following:

1. Position the ring gaps as far as possible from adjacent gaps. Make sure that gaps are not positioned in thrust or pin directions. (1EN065)
2. Use a piston ring compressor to hold the rings as they are installed into the cylinder.

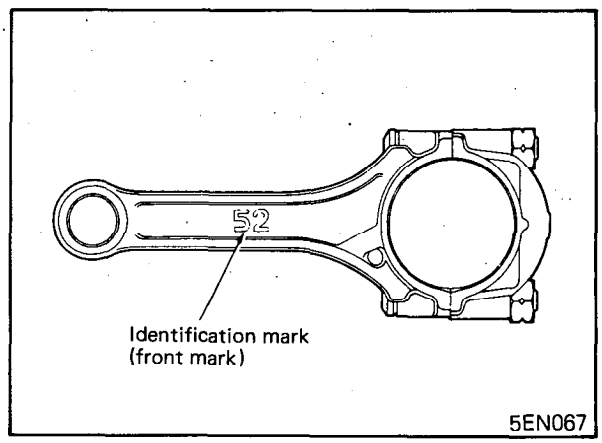


1EN065

3. Make sure that front mark of piston and front mark (identification mark) of connecting rod are directed toward front of engine. (5EN121, 5EN067)
4. When connecting rod cap is installed, make sure that cylinder numbers which were put on rod and cap at disassembly match.

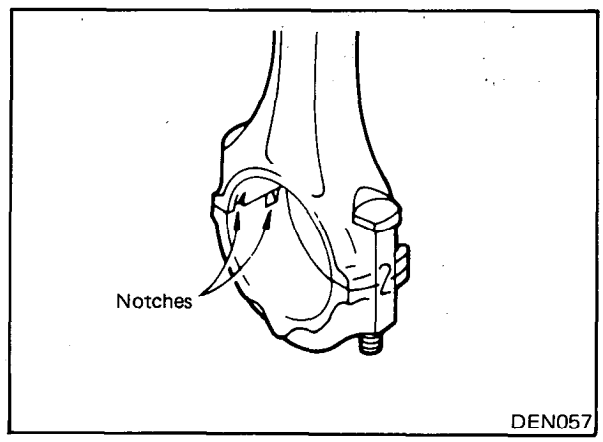


5EN121



5EN067

5. When installing a new connecting rod, make sure that the notches for holding the bearing in place are on the same side.



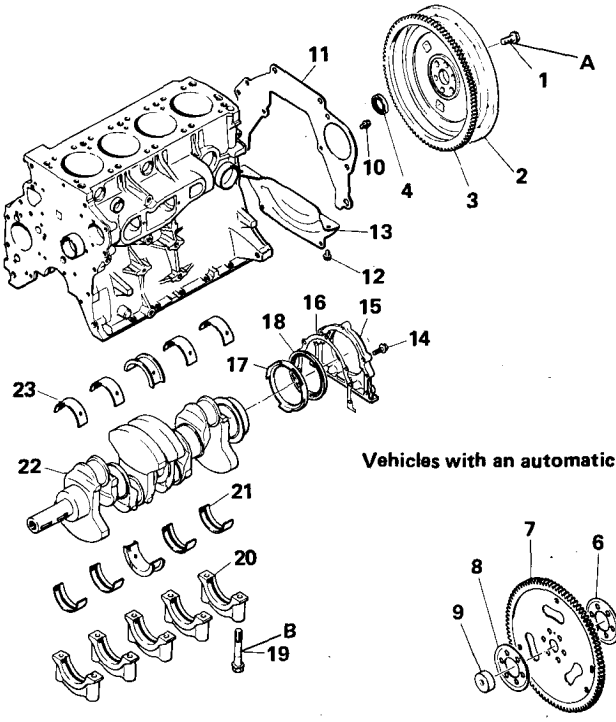
DEN057

COMPONENTS

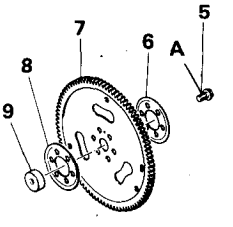
1. Flywheel bolt (6)
2. Flywheel
3. Ring gear
4. Ball bearing
5. Drive plate bolt (6)
6. Adapter plate
7. Drive plate assembly
8. Adapter plate
9. Crankshaft bushing
10. Flange bolt (2)
11. Rear plate
12. Flange bolt (2)
13. Bell housing cover
14. Flange bolt (5)
15. Oil seal case
16. Gasket
17. Separator
18. Rear oil seal
19. Bolt (10)
20. Bearing cap (5)
21. Crankshaft bearing (5)
22. Crankshaft
23. Crankshaft bearing (5)

NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

Vehicles with a manual transmission



Vehicles with an automatic transmission



	Nm	ft.lbs.
A	128-137	94-101
B	74-83	55-61

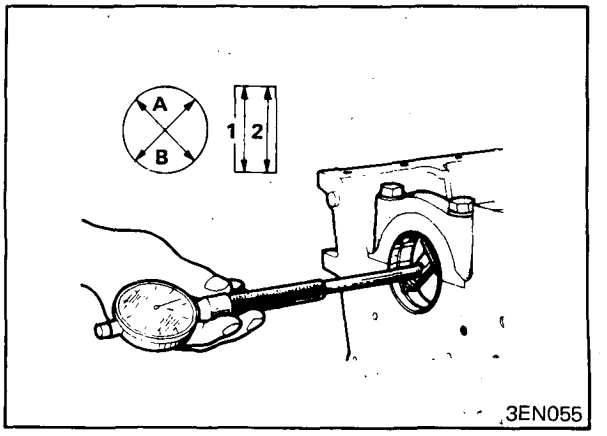
5EN033

INSPECTION

Oil Clearance Measurement

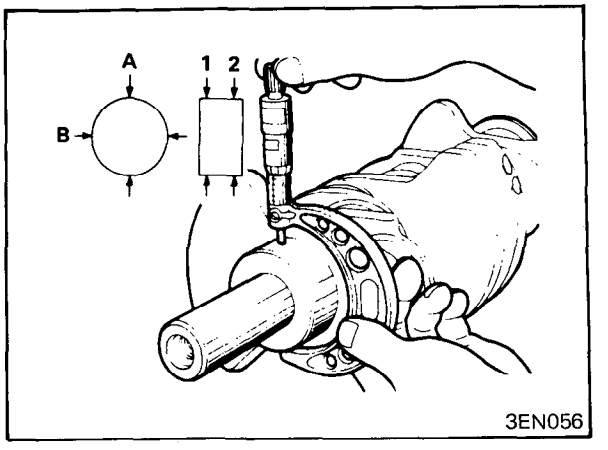
1. After main bearing cap has been tightened to specified torque, measure inside diameter of main bearing with a cylinder gauge.

Tightening torque
Main bearing cap belt ..... 74-83 Nm (55-61 ft.lbs.)



3EN055

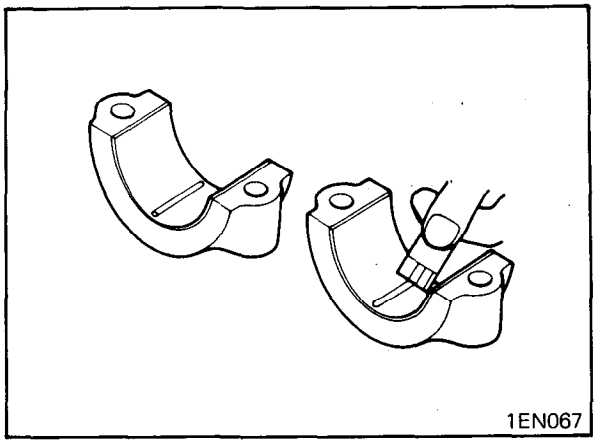
2. Measure outside diameter of crankshaft journal with a micrometer. (3EN056)
3. If oil clearance is excessive, replace main bearing.
4. Check bearing and journal for seizure or damage. If necessary, replace bearing or crankshaft or machine journal to undersize.



3EN056

Oil Clearance Measurement (Plastigage Method)

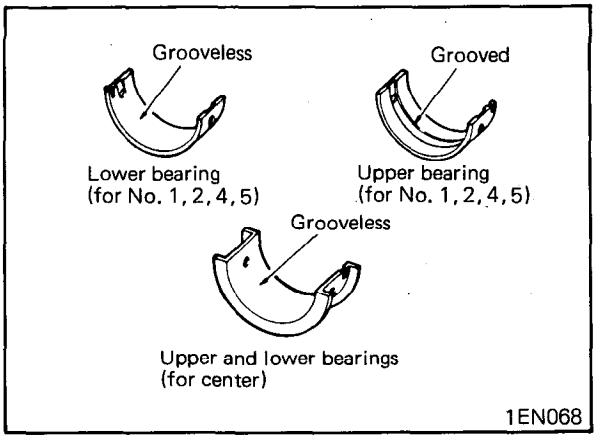
1. Remove oil and dirt from bearings and journals.
2. Cut plastigage to same length as width of bearing and install it parallel with journal, away from oil holes.
3. Install crankshaft, bearings and caps and tighten them to specified torque. During this operation, do NOT turn crankshaft.
4. Remove caps. Measure width of plastigage at the widest part with the scale printed on gauge envelope. (1EN067)


1EN067

INSTALLATION

Main Bearing

1. Install grooved main bearing (upper bearing) on cylinder block side.
2. Install grooveless main bearing (lower bearing) on main bearing cap side.
3. Both upper and lower bearings for center (thrust bearing) are grooveless.



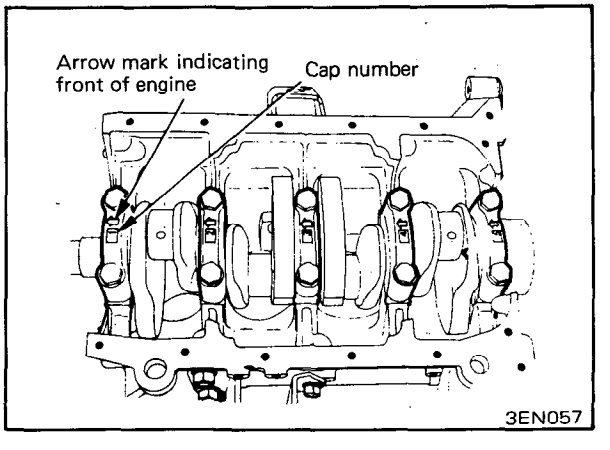
1EN068

Crankshaft

1. Install crankshaft. Apply engine oil to journals and pins.
2. Caps should be installed with arrow mark directed toward front of engine. Cap number must be correct.
3. Tighten cap bolts to specified torque in sequence of center, No. 2, No. 4, front and rear caps.

Cap bolt tightening torque ..... 74-84 Nm (55-61 ft.lbs.)

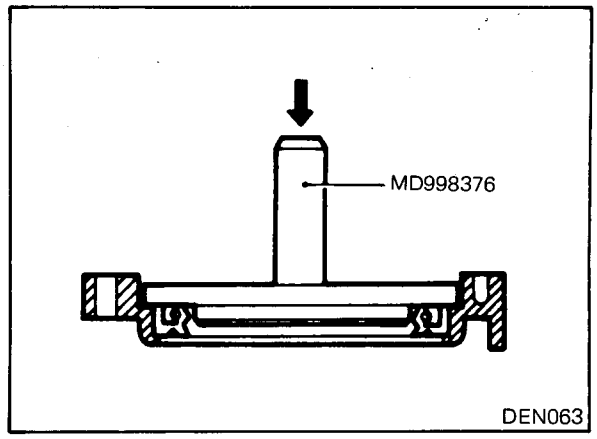
4. Cap bolts should be tightened evenly in 2 to 3 stages before they are tightened to specified torque.
5. Make certain that crankshaft turns freely and has proper end play.



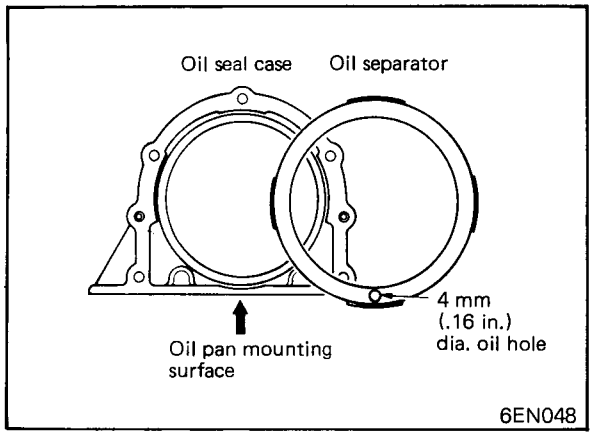
3EN057

Crankshaft Rear Oil Seal

1. Using special tool, install oil seal into oil seal case.



2. Push the oil separator into case, being sure that the 4 mm (.16 in.) diameter oil hole positioned at the bottom of the case (oil pan mounting surface side).
3. Install the oil seal case to the engine block, install 7 bolt and torque to specifications.

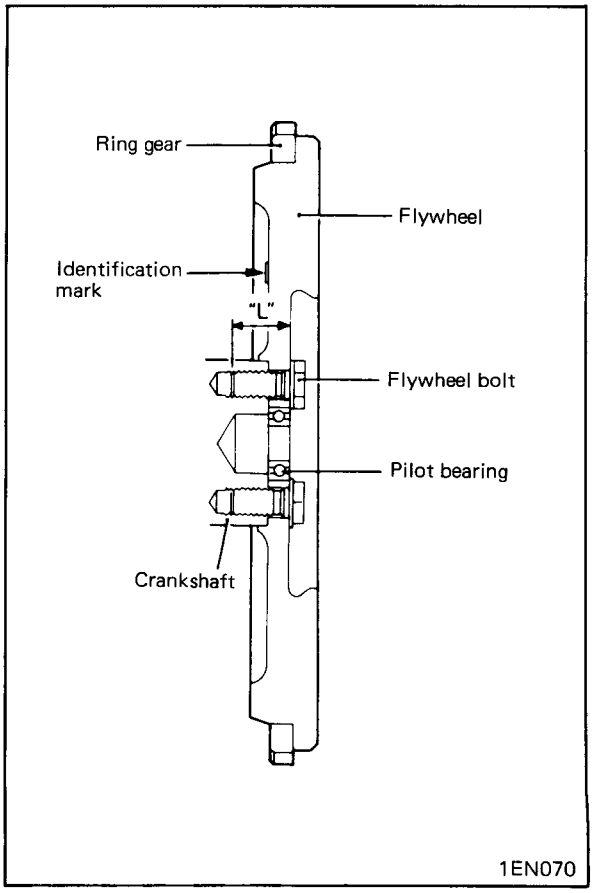


Flywheel

1. Install flywheel and tighten bolts to specified torque. Check clutch mounting surface for runout.

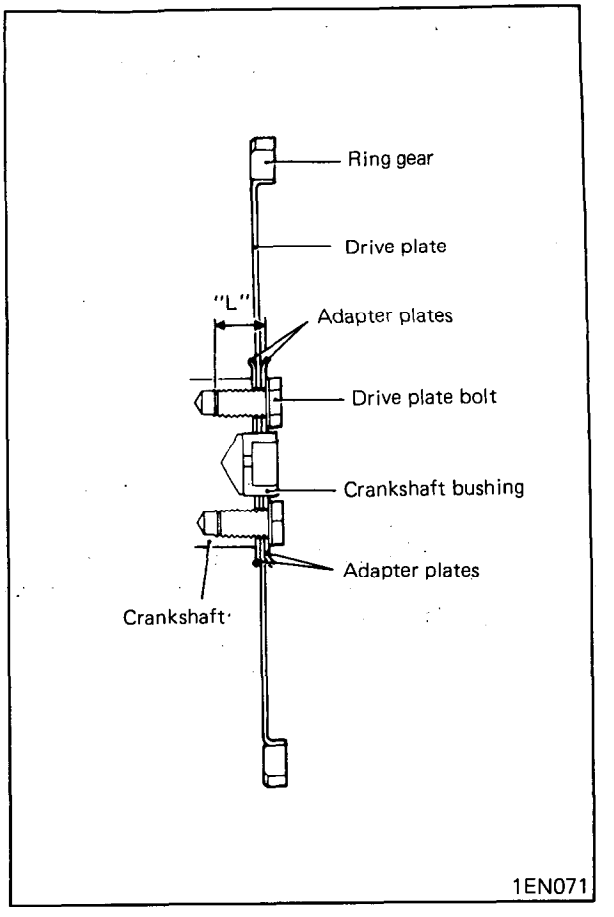
Tightening torque	128-137 Nm (94-101 ft.lbs.)
Flywheel runout	0.1 mm (.004 in.) max.

2. To install flywheel, use 26 mm (1.024 in.) bolts with "11" marked on the heads. Do not use shorter bolts for installing drive plate.

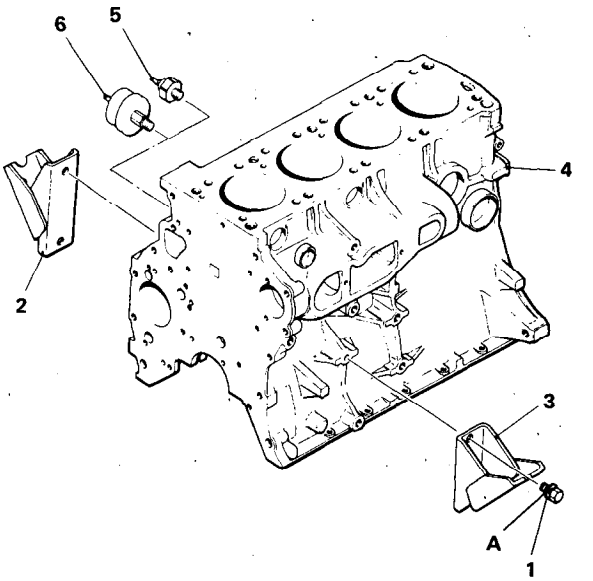


Drive Plate

1. Install adapter plates and drive plate and tighten bolts to specified torque.
2. Use bolts 21.5 mm (.846 in.) in length ("L") to install drive plate.



COMPONENTS



1. Bolt (4)
2. Engine support bracket
3. Engine support bracket
4. Cylinder block
5. Oil pressure switch
6. Oil pressure gauge unit (if so equipped)

NOTE
Numbers show order of disassembly.
For reassembly, reverse order of disassembly.

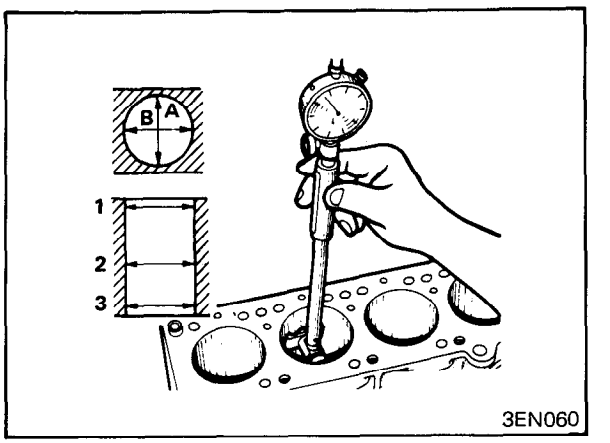
	Nm	ft.lbs.
A	40-49	29-36

5EN034

INSPECTION

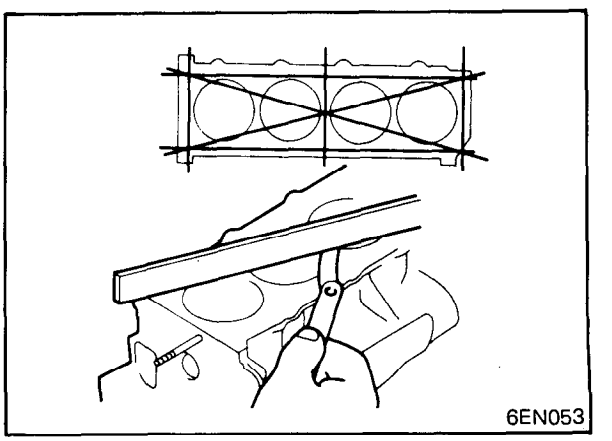
Cylinder Block

1. Measure cylinder bore with a cylinder gauge at three levels in directions of A and B. (3EN060)
   Level 1: No. 1 piston ring position with piston at TDC
   Level 2: Center of cylinder
   Level 3: Bottom of cylinder
2. If cylinder bores show more than specified out-of-round or taper, or if cylinder walls are badly scuffed or scored, cylinder block should be rebored and honed, and new oversize piston and rings fitted.



3EN060

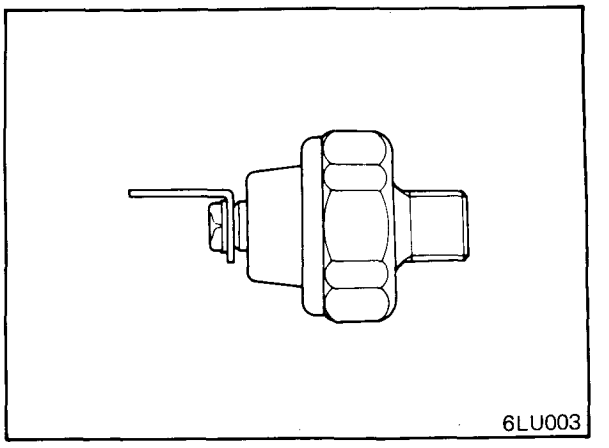
3. Check for damage and cracks.
4. Check top surface for distortion. If excessive distortion is evident, grind to minimum limit or replace. (6EN053)



6EN053

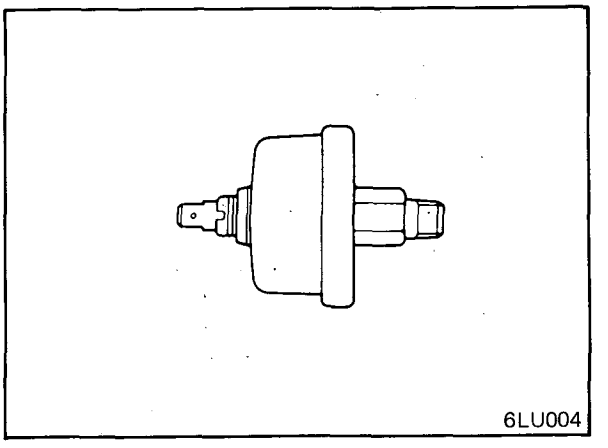
Oil Pressure Switch

1. If "OIL PRESSURE" indicating lamp lights when ignition switch is set to "ON" and goes out when engine is started and running at idle, then everything is in order. If "OIL PRESSURE" lamp does not light when ignition switch is set to "ON", check switch, lamp and wiring.
2. If there is current flow when ignition switch is set to "ON" and if there is no current flow when engine is running at idle, switch is good.
   If switch is good, check lamp and wiring.



Oil Pressure Gauge Unit

1. Since bimetal type has constructional characteristics which vary its resistance as it repeats ON-OFF states, it cannot be checked by measuring its resistance.
2. It can be checked by use of an AC type ammeter measuring changes in current.



CYLINDER BORING

1. Oversize of pistons to be used should be determined on the basis of the largest cylinder bore.

Size mark	
0.25 mm (.01 in.) O.S.	0.25
0.50 mm (.02 in.) O.S.	0.50
0.75 mm (.03 in.) O.S.	0.75
1.00 mm (.04 in.) O.S.	1.00

NOTE
Size mark is stamped on top of piston.

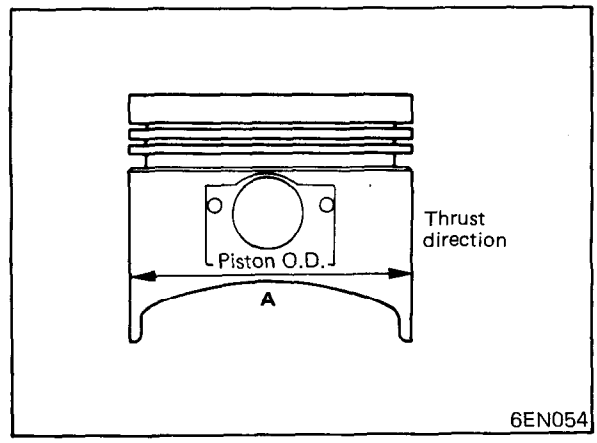
2. Measure outside diameter of piston to be used at position "A", in thrust direction, as shown. (6EN054)
3. Based on measured piston O.D., calculate the boring finish dimension.
   Boring finish dimension = Piston O.D. + 0.01 to 0.03 mm (.0004 to .0012 in.) (clearance between piston O.D. and cylinder) – 0.02 mm (.0008 in.) (honing margin)
4. Bore all cylinders to calculated bore finish dimension.

Caution
To prevent distortion that may result from temperature rise during honing, bore cylinders in the following order: No. 2, No. 4, No. 1, No. 3.

5. Hone to final finish dimension [piston O.D. + 0.01 to 0.03 mm (.0004 to .0012 in.)].
6. Check clearance between piston and cylinder.

Clearance between piston and cylinder	0.01-0.03 mm (.0004-.0012 in.)

NOTE
When boring cylinders, finish all four cylinders to same oversize. Do not bore only one cylinder to an oversize.



INSTALLATION

1. Apply recommended sealant to threaded portion.

Recommended sealant	3M Liquid Gasket 8959 or equivalent

2. Using special tool (MD998054), tighten switch to specified toruqe.

Tightening torque	
Oil pressure gauge unit	15-21 Nm (11-15 ft.lbs.)