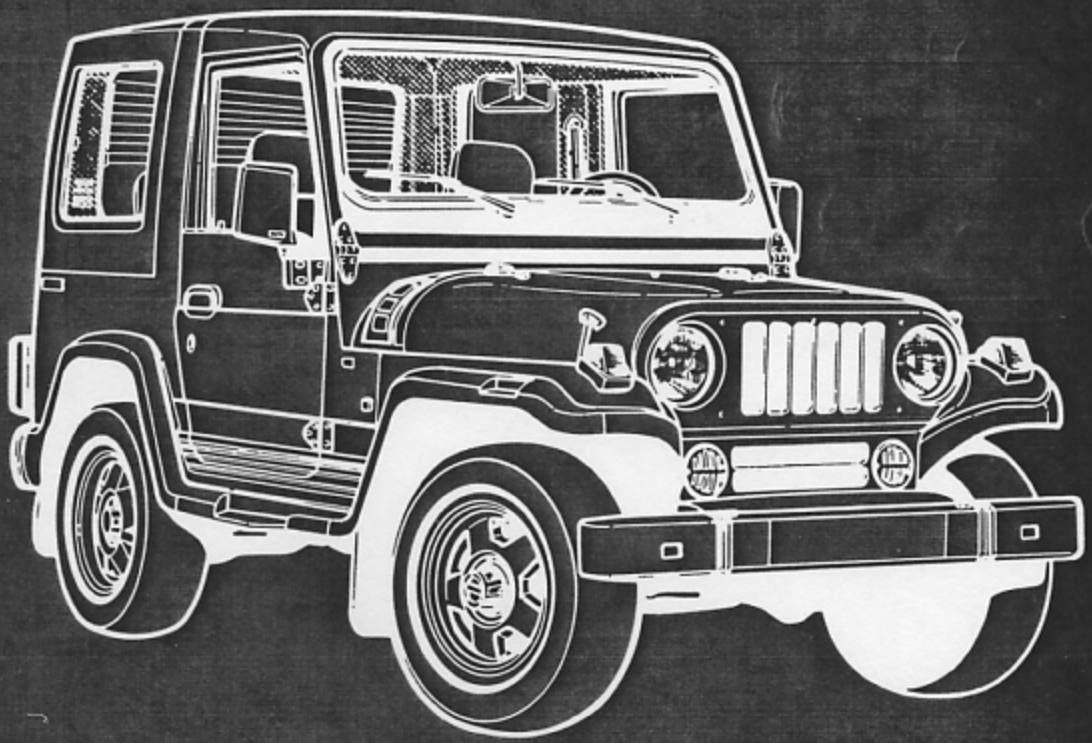
ROCSTA
WORKSHOP MANUAL

• AM102



ASIA MOTORS

ROCSTA WORKSHOP MANUAL

FOREWORD

This workshop manual has been prepared to provide information covering normal service, repair and maintenance for ASIA ROCSTA.

Information in this manual is divided into Groups, each Group covers a general vehicle system like transmission, steering, etc.

Each Group also contains Summary, Specification, Troubleshooting, Removal and Installation, Adjustment, Diagnosis and Testing.

For satisfaction of Asia customer, proper service and maintenance by technician is essential.
So it is important that service personnel fully understand the contents of this manual and should keep in a handy place for quick and easy reference.

The information, photographs, drawings and specifications contained in this manual are best available at the time of printing. So, it is recommended that this manual should be kept up-to-date by receiving of new information.

Asia Motors reserves the right to change the specifications and contents of this manual without obligation and advance notice.
We sure this workshop manual will help you with maintaining and keeping the best condition of this vehicle.

December, 1994
ASIA MOTORS Co., Inc.

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GENERAL INFORMATION 0

⊠ FUNDAMENTAL PROCEDURES

NOTES, CAUTIONS, AND WARNINGS

As you read through the procedures, you will come across **NOTES, CAUTIONS,** and **WARNINGS.** Each one is therefore a specific purpose. **NOTES** give you **added information** that will help you to complete a particular procedure. **CAUTIONS** are given to prevent you from making an error that could **damage the vehicle. WARNINGS** remind you to be especially careful in those areas where carelessness can cause **personal injury.** The following list contains some general **WARNINGS** you should follow when you work on a vehicle.

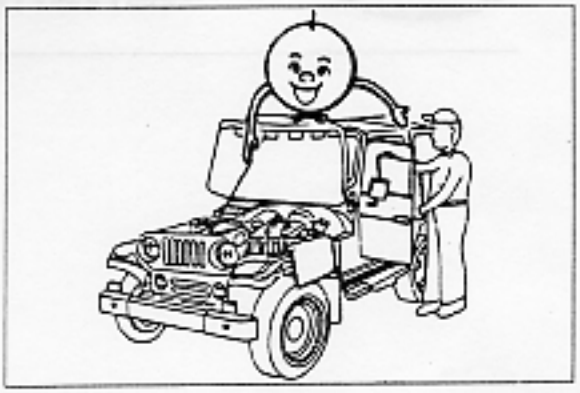

Fig. 0-1

◈ PROTECTION OF THE VEHICLE

Always be sure to cover fenders, seats, and floor areas before starting work.

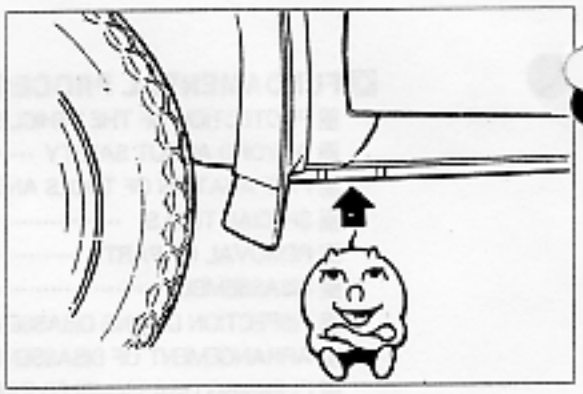

Fig. 0-2

◈ A WORD ABOUT SAFETY

It is imperative that the following precautions be followed when jacking up the vehicle.

1. Wheels must be blocked.
2. Take care to use only specified jacking positions.
3. Support the vehicle with safety stands(rigid racks).

The engine should be started only after first checking to be sure it is clear of tools, people, etc.

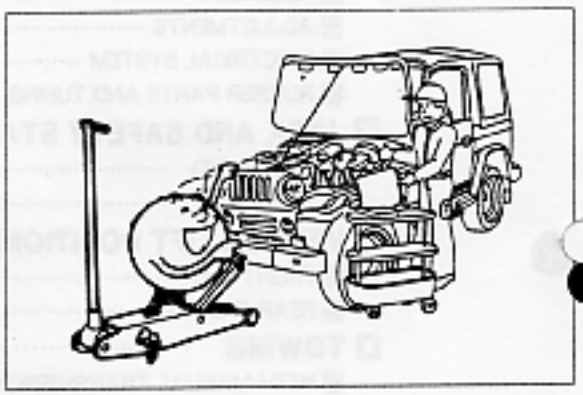

Fig. 0-3

◈ PREPARATION OF TOOLS AND MEASURING EQUIPMENT

Be sure all needed tools and measuring equipment are available and ready for use.

◈ SPECIAL TOOLS

Be sure to use the specified special tools when they are required. Do not attempt to use substitutes.

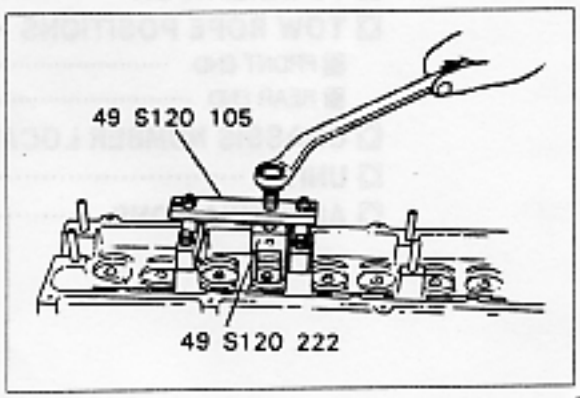

Fig. 0-4

◆ REMOVAL OF PARTS

When checking a problem, try at the same time to determine the cause, and begin work after first determining which parts must be removed and/or disassembled.

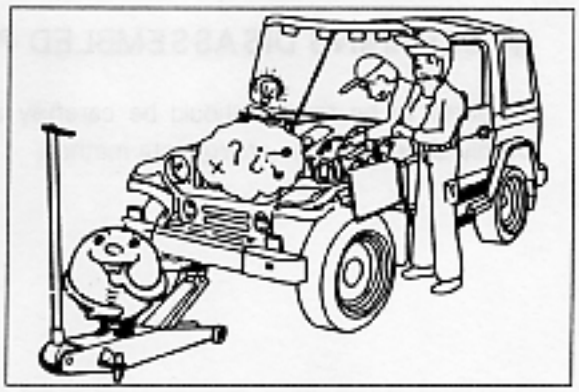

Fig. 0-5

◆ DISASSEMBLY

If the disassembly procedure is complex and/or many parts are to be disassembled, the various parts should be identified(in a way which will not affect their performance of external appearance) so that correct assembly will be easier and faster.

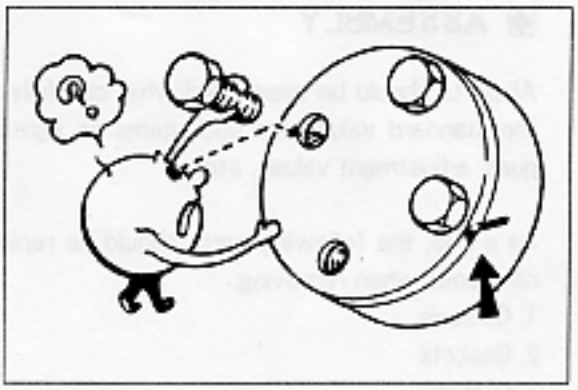

Fig. 0-6

◆ INSPECTION DURING DISASSEMBLY

Each part should be carefully inspected, as it is disassembled, for malfunctioning operation, deformation, damage, etc.

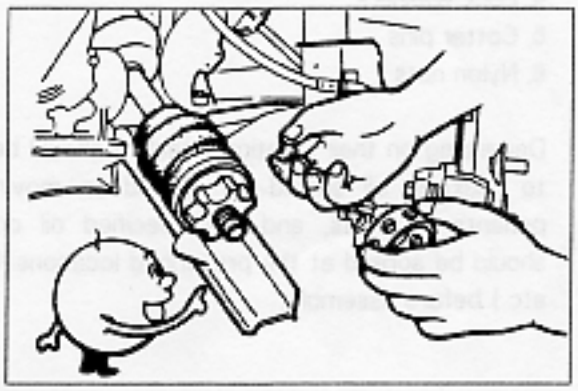

Fig. 0-7

◆ ARRANGEMENT OF DISASSEMBLED PARTS

All disassembled parts should be carefully arranged for later assembly. Be sure to separate parts which are to be replaced from those to be reused.

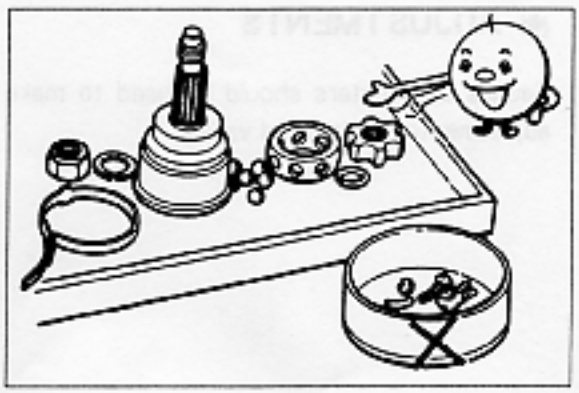

Fig. 0-8

◆ CLEANING DISASSEMBLED PARTS

All parts to be reused should be carefully and thoroughly cleaned by the appropriate method.

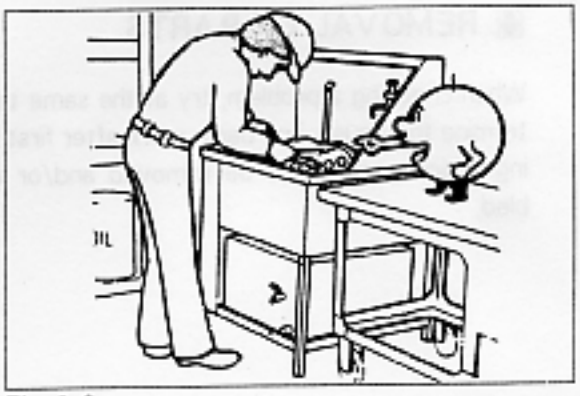

Fig. 0-9

◆ ASSEMBLY

All parts should be assembled while carefully following the standard values for such items as tightening torques, adjustment values, etc.

As a rule, the following parts should be replaced with new ones when removing.

1. Oil seals
2. Gaskets
3. O-rings
4. Lock washers
5. Cotter pins
6. Nylon nuts

Depending on their locations, sealant should be applied to gaskets, oil should be applied to moving components of parts, and the specified oil or grease should be applied at the prescribed locations(Oil seals, etc.) before assembly.

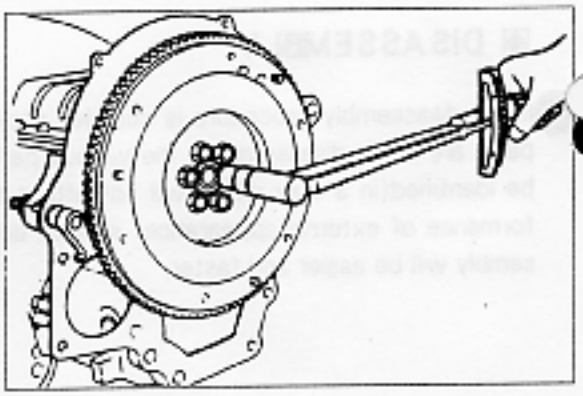

Fig. 0-10

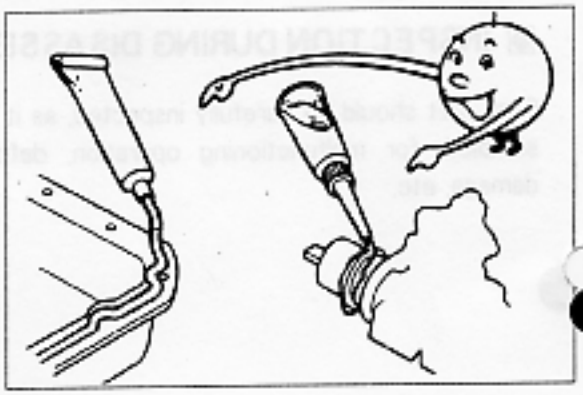

Fig. 0-11

◆ ADJUSTMENTS

Gauges and testers should be used to make correct adjustments to standard values.

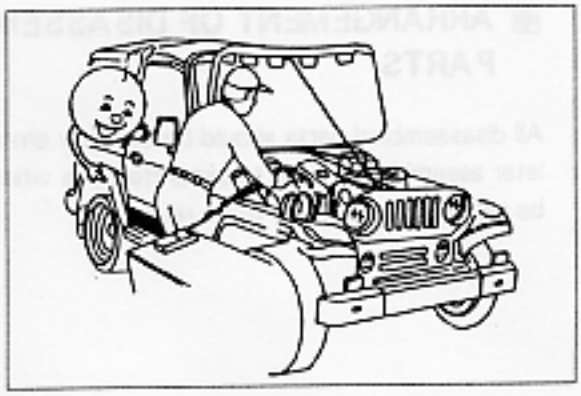

Fig. 0-12

◆ ELECTRICAL SYSTEM

Be sure to disconnect the battery cable from the negative(−) terminal of the battery.
When connectors are to be disconnected, never pull on the wiring itself.
When locking connectors are to be connected, insert them all the way in until a "click" is heard.
Handle sensors and relays carefuly take care not to drop or knock them against other parts.

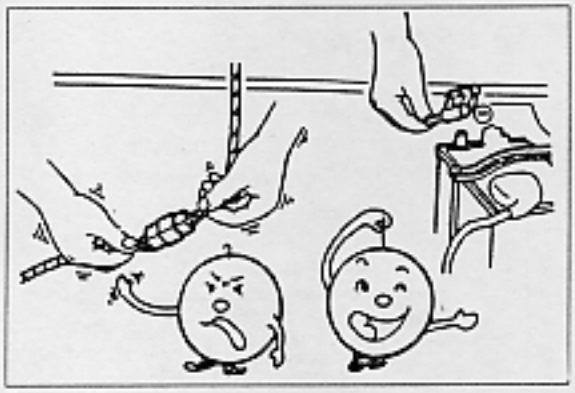

Fig. 0-13

◆ RUBBER PARTS AND TUBING

Be careful that rubber parts and tubing do not come in contact with gasoline or oil.

Fig. 0-14

◇ JACK AND SAFETY STAND(RIGID RACK) POSITIONS

◆ FRONT END

JACK POSITION
Differential part of the axle housing

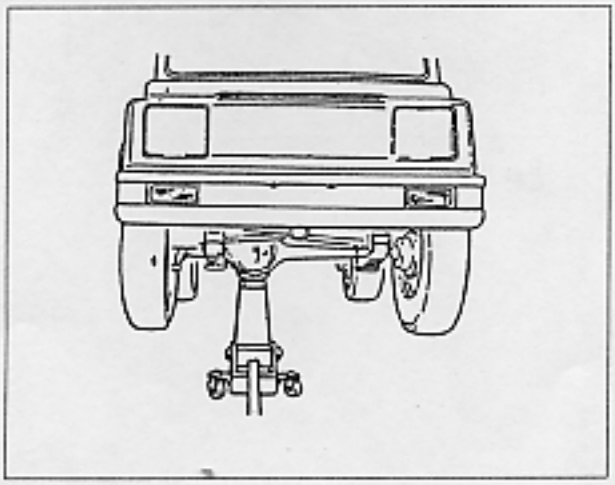

Fig. 0-15

SAFETY STAND POSITIONS
Chassis frame part

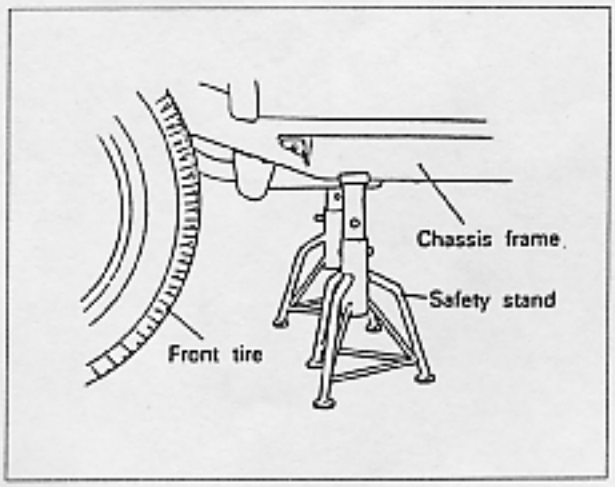

Fig. 0-16

◆ REAR END

JACK POSITION

Differential part of the axle housing

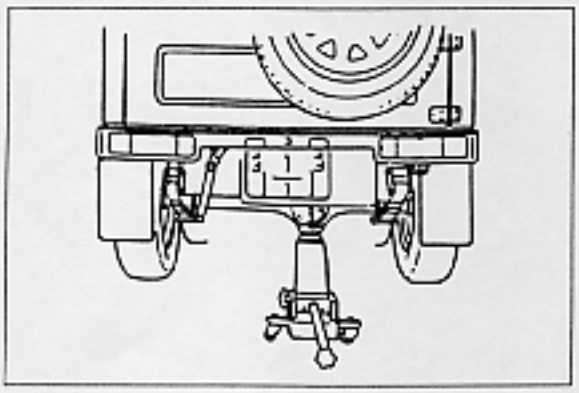

Fig. 0-17

SAFETY STAND

Chassis frame part

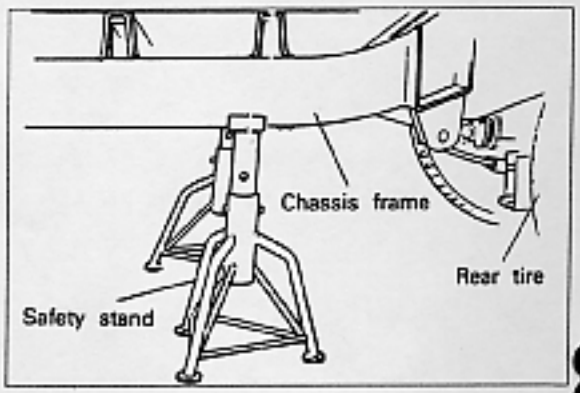

Fig. 0-18

☒ VEHICLE LIFT POSITIONS

◆ FRONT END

Chassis frame part

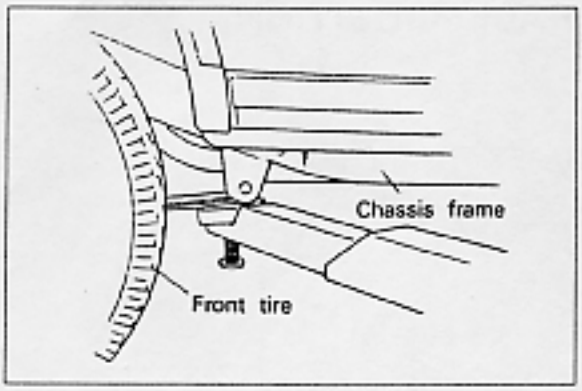

Fig. 0-19

◆ REAR END

Chassis frame part

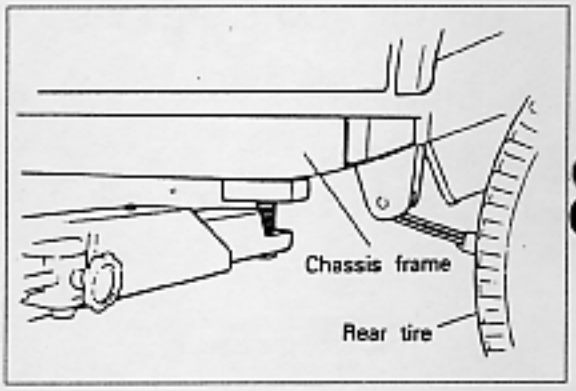

Fig. 0-20

⊠ TOWING

Proper towing equipment is necessary to prevent damage to the vehicle during any towing operation. Laws and regulations applicable to vehicles in tow must always be observed.
Release the parking brake, place the transmission shift lever in neutral, set the ignition switch in the ACC position, and the driving mode to the 2WD. As a rule, towed vehicles should be pulled with the driving wheels off the ground.

◆ WITH MANUAL TRANSMISSION

If the transmission, rear axle, and steering system are not damaged, the vehicle may be towed on all four wheels. If any of these components are damaged, use a towing dolly.

⊠ TOWING HOOK

After attaching a rope to the towing hook, tow the vehicle.

Caution

Do not attempt to tow with other parts of the vehicle, this could result in serious damage to the vehicle, so only the towing hook can be used in towing.

⊠ CHASSIS NUMBER LOCATION

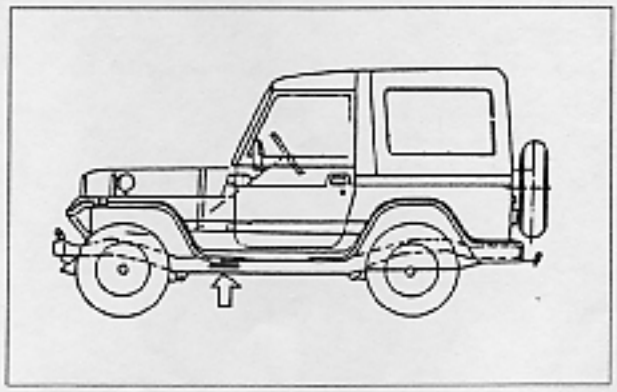

Fig. 0-23

⊠ TOW ROPE POSITIONS

◆ FRONT END

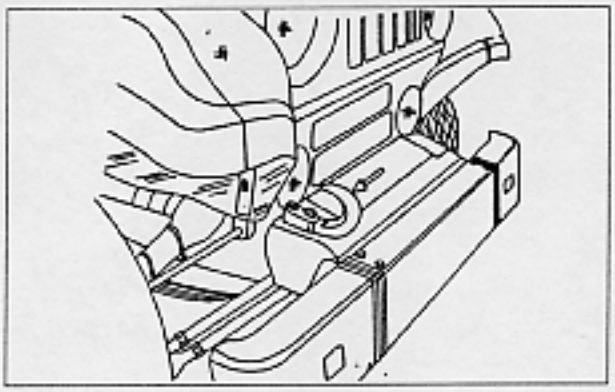

Fig. 0-21

◆ REAR END

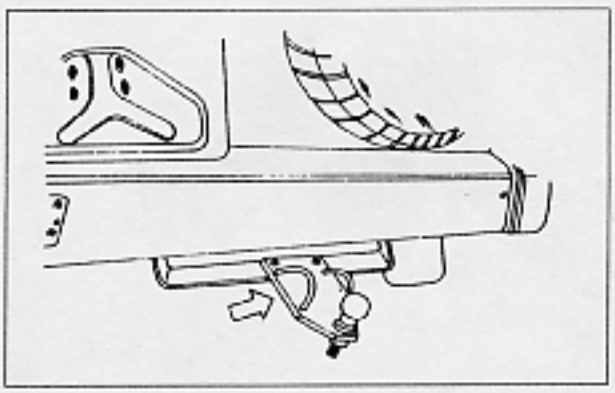

Fig. 0-22

UNITS

m·kg(ft·lb or in·lb)	Torque
rpm	Revolutions per minute
A	Ampere(s) (current)
V	Volts(S) (Voltage)
Ω	Ohm(s) (resistance)
kg/cm²(lb/in²)	Pressure (Usually positive)
mmHg(inHg)	Pressure (Usually positive)
W	Watt
liters(US qt, Imp qt)	Volume
mm(in)	Length

ABBREVIATIONS

ABDC	After bottom dead center
A/C	Air conditioner
ACC	Accessories
ATDC	After top dead center
BBDC	Before bottom dead center
BTDC	Before top dead center
E/L	Electrical load
ELR	Emergency locking retractor
EX	Exhaust
GND	Ground
IC	Electric Integrated circuit
IG	Ignition
IN	Intake
INT	Intermittent
LH	Left hand
M	Motor
M/S	Manual steering
MTX	Manual transaxle
OFF	Switch off
ON	Switch on
PCV	Positive crankcase ventilation
P/S	Power steering
PRC	Pressure regulator control
P/W	Power window
RH	Right hand
SOHC	Single overhead camshaft
SST	Special service tool
ST	Start
SW	Switch
TDC	Top dead center

ASIA

ENGINE 1A

⊠ OUTLINE

◈ OUTLINE OF CONSTRUCTION

The new MAGMA diesel engine, by using the latest technological advances, is an excellent balance of output, fuel consumption, durability and quiet operation.
Its main features are

1. Aluminum alloy cylinder head
2. Direct-drive OHC(overhead camshaft)
3. Timing belt
4. New tightening method for cylinder head bolts
5. Oil baffle plate for vibration reduction

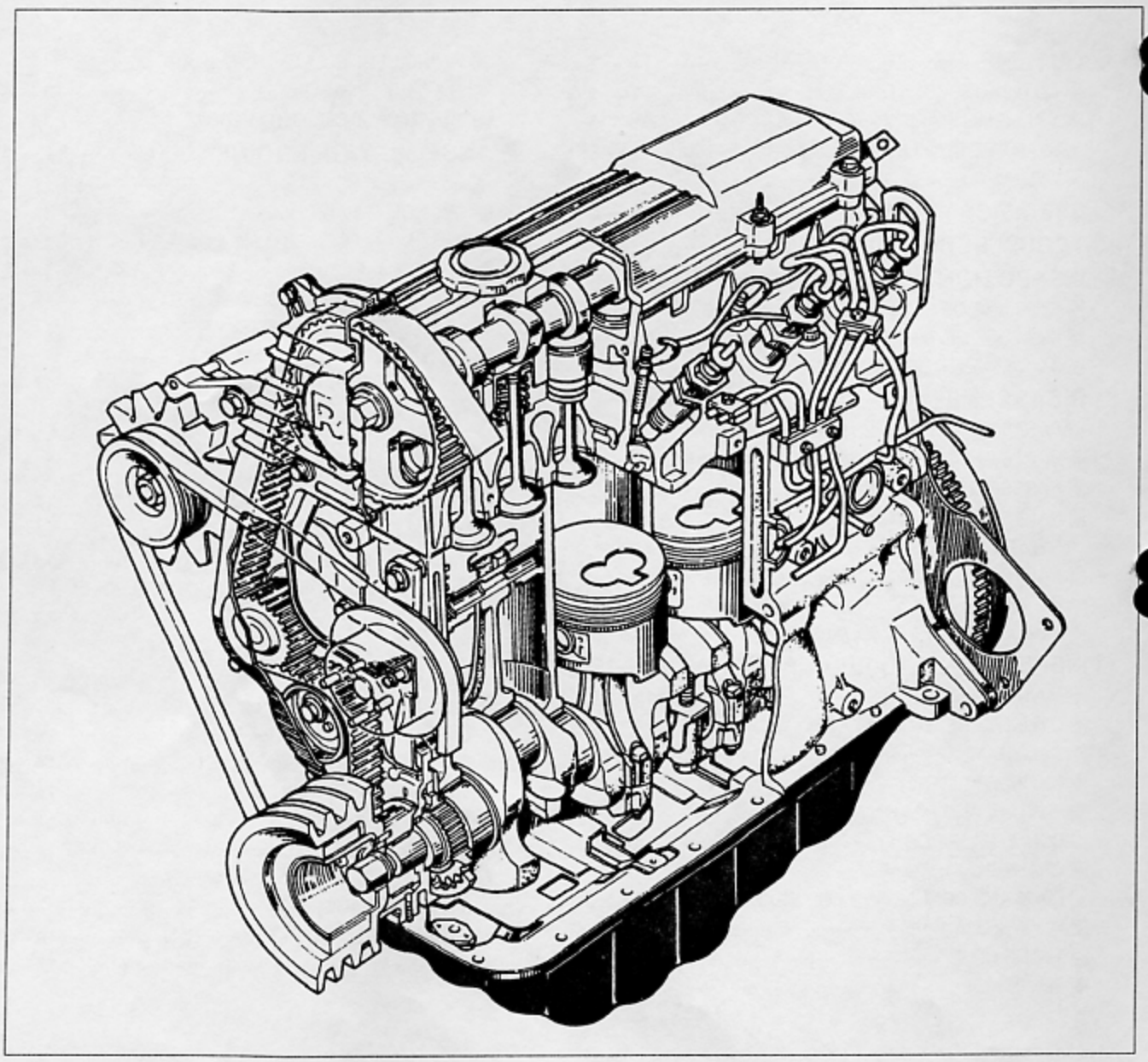

Fig. 1A-1

◆ VALVE MECHANISM

By employing a direct-drive OHC(overhead camshaft), the parts, such as the push rods, rocker arms, rocker arm shafts, etc., used in the OHV(overhead valve) engine are not necessary. This has resulted in reduced size and weight, decreased mechanical loss, and a great improvement of high rotation efficiency.

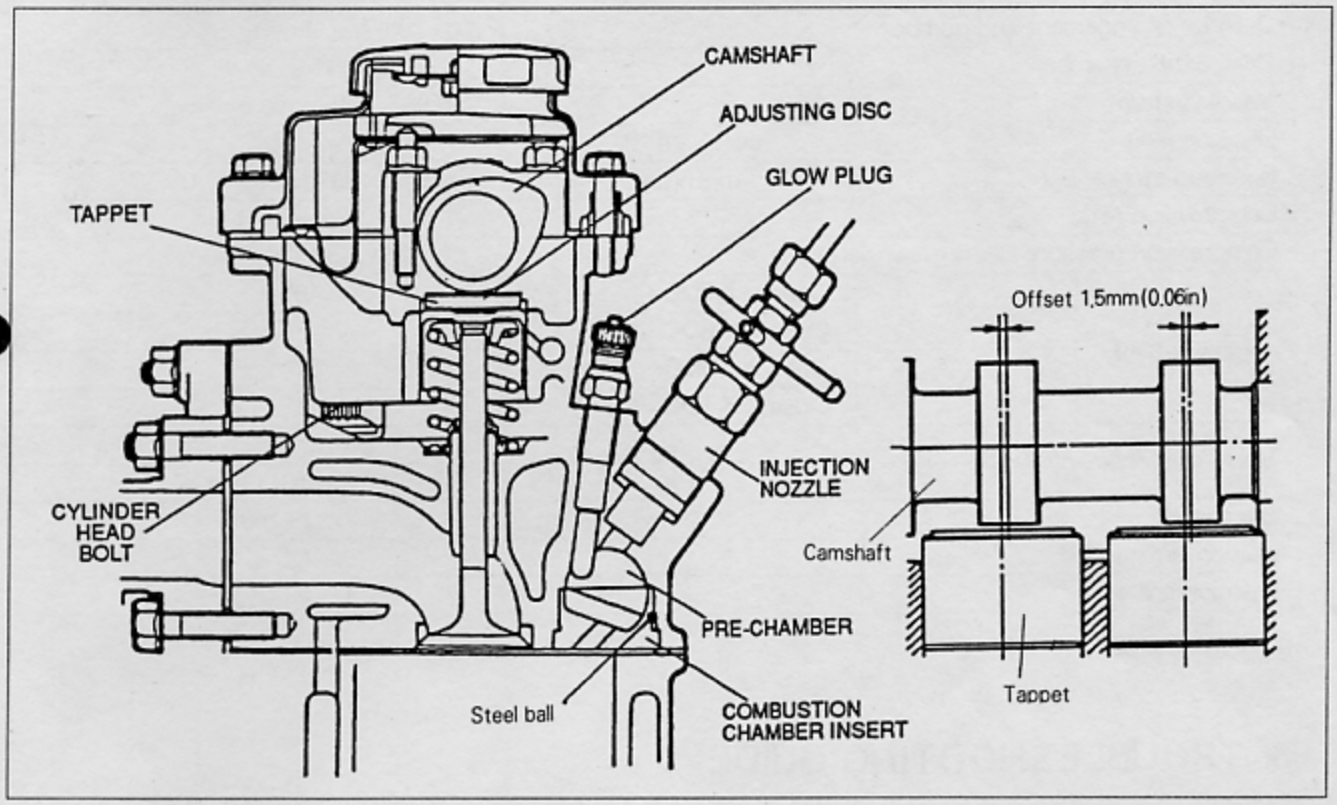

Fig. 1A-2

◆ SLANT BOTTOM SWIRL CHAMBER

By employing the slant bottom swirl chamber having good combustion efficiency, the combustion chamber can maintain high power and low fuel consumption.

◆ CYLINDER HEAD BOLT

The cylinder head bolts are tightened by means of the bolt torque-angle method.
When performing any service procedures related to the cylinder head, special care should be taken. Refer to the main text for detailed information regarding the tightening method.

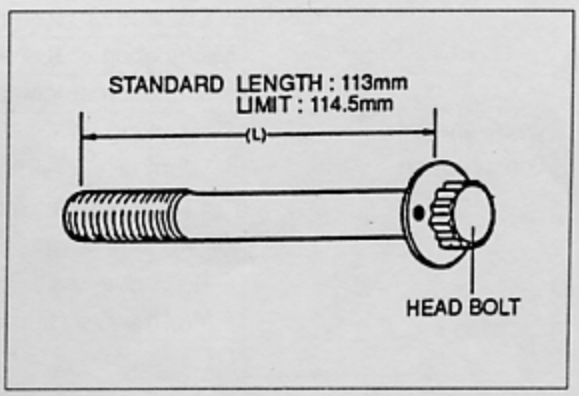

Fig. 1A-3

SPECIFICATIONS

Items \ Engine			MAGMA
Type			Diesel, 4-cycle
Cylinder arrangement and number			In-line, 4 cylinders
Combustion chamber			Swirling flow
Valve system			OHC, belt-drive 8 valves
Displacement cc(cu in)			2,184
Bore and stroke mm(in)			86.0×94.0(3.39×3.70)
Compression ratio			22.9±0.4:1
Compression pressure kPa(kg/cm²,psi)-rpm			2,942(30,426)−200
Valve timing	IN	Open BTDC	10°
		Close ABDC	42°
	EX	Open BBDC	57°
		Close ATDC	11°
Valve clearance mm(in)		IN	0.25(0.0098)
		EX	0.35(0.0138)
Idle speed rpm			700~750
Ignition timing			ATDC 4°
Injection order			1−3−4−2

TROUBLESHOOTING GUIDE

Problem	Possible cause	Correction
Insufficient power	**Insufficient compression**	
	Improper valve clearance	Adjust
	Compression leakage from valve seat	Repair(grind the valve seat)
	Seized valve stem	Replace
	Weak or broken valve spring	Replace
	Failed cylinder head gasket	Replace
	Cracked or distorted cylinder head	Replace or repair
	Sticking, damaged, or worn piston ring	Replace
	Cracked or worn piston	Replace
	Malfunction of fuel system	Refer to section 4A
	Malfunction of ignition system	Refer to section 5
Excessive oil consumption	**Oil working up**	
	Worn or sticking piston ring or piston ring groove	Replace
	Worn piston or cylinder	Replace
	Oil working down	
	Bad valve seal	Replace
	Worn valve stem and guide	Replace
	Oil leakage	Refer to section 2A

Problem	Possible cause	Correction
Difficult starting	**Malfunction of engine-related components**	
	Burned valve	Replace
	Worn piston, piston ring, or cylinder	Replace
	Burned cylinder head gasket	Replace
	Malfunction of fuel system	Refer to section 4A
	Malfunction of electrical system	Refer to section 5
Abnormal combustion	**Malfunction of components related to engine**	
	Improper valve clearance	Adjust
	Sticking or burned valve	Replace
	Weak or broken valve spring	Replace
	Carbon accumulation in combustion chamber	Eliminate the carbon
	Malfunction of fuel system	Refer to section 4A
	Malfunction of electrical system	Refer to section 5
Poor idling	**Malfunction of components related to engine**	
	Improper valve clearance	Adjust
	Poor valve to valve seat contact	Repair or replace
	Failure of cylinder head gasket	Replace
	Malfunction of fuel system	Refer to section 4A
	Malfunction of electrical system	Refer to section 5
Engine noise	**Crankshaft or bearing related parts**	
	Excessive main bearing oil clearance	Replace or repair
	Main bearing seized or heat-damaged	Replace
	Excessive crankshaft end play	Replace or repair
	Excessive connecting rod bearing oil clearance	Replace or repair
	Connecting rod bearing seized or heat-damaged	Replace
	Piston related parts	
	Worn cylinder	Replace
	Worn piston or piston pin	Replace
	Seized piston	Replace
	Damaged piston	Replace
	Bent connecting rod	Replace
	Valves related parts	
	Excessive valve clearance	Adjust
	Broken valve spring	Replace
	Excessive clearance between valve stem and guide	Replace
	Insufficient lubrication of rocker arm	Replace
	Others	
	Improper drive-belt tension	Adjust
	Malfunction of water pump bearing	Refer to Section 3A
	Malfunction of alternator bearing	Refer to Section 5
	Exhaust gas leakage	Repair
	Malfunction of timing belt tensioner	Replace

⊠ INSPECTION AND ADJUSTMENT

◈ CHECKING OF COMPRESSION PRESSURE

1. Make sure the battery is fully charged.
2. Warm up the engine thoroughly.
3. Remove all the fuel injection pipes, nozzles and washers.
4. Install the compression gauge adapter(49 1456 010) to the injection nozzle hole.
5. Connect a compression gauge to the compression gauge adapter.

Compression pressure:kg/cm²(lb/in²)-rpm
Standard:30(426)—200
Limit:27(384)—200

Caution
While cranking, disconnect the fuel cut solenoid valve connector.

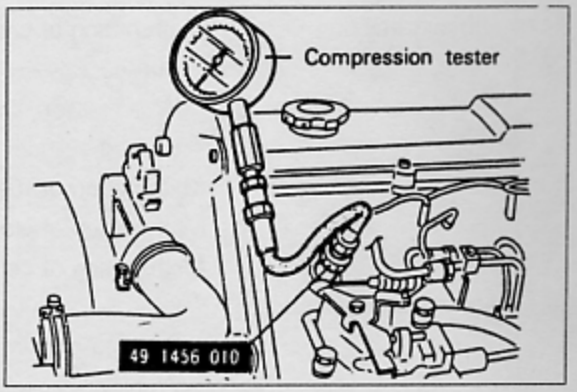

Fig. 1A-4

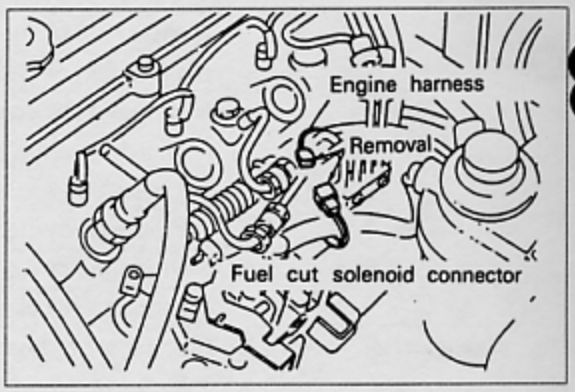

Fig. 1A-5

◈ MEASURE OF THE VALVE CLEARANCE

1. Position No.1 cylinder to the compression top dead center.
2. Measure the valve clearance of No.1 and No.2 of the intake side and No.1 and No.3 of the exhaust side.
3. Turn the crankshaft one turn(forward direction), and then measure the rest of the valve clearance.

Valve clearance;
Engine warm condition
intake:0.30mm(0.012in)
Exhaust:0.40mm(0.016in)
Engine cold condition
Intake:0.20~0.30mm(0.008~0.012in)
Exhaust:0.30~0.40mm(0.012~0.016in)

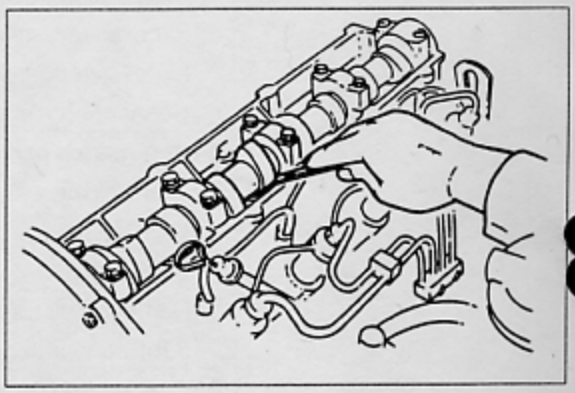
Fig. 1A-6

◈ ADJUSTMENT OF THE VALVE CLEARANCE

Adjust the valve clearances by following the procedures below if they are not within the standard.

1. Face the intake cam straight upward.
2. Move the tappet so that its notch is at the manifold side, so that access to the adjusting disc is easy.
3. Using the tappet holder(49 S120 220), press the tappet down to the position where the adjusting disc becomes accessible.
4. Using a small screw driver or similar tool, take out the adjusting disc.
5. Select an appropriate disc depending on the valve clearance measured. Install it and check the clearance again.

Example(Intake valve):
Thickness of original adjusting disc+(measured clearance−standard clearance)=thickness of new adjusting disc.
4.00+(0.30−0.25)=4.05mm
0.157+(0.012−0.010)=0.159in

Note

The number marked on the disc indicates its thickness.
Example:3825 means 3.825mm(0.1506in).
Adjusting discs are available in 37 different thickness within the 3.400~3.650mm(0.134~0.144in), 4.350~4.600mm(0.171~0.181in) range, at intervals of 0.050mm(0.002in) and 3.700~4.275mm (0.146~0.169in) range, at intervals of 0.25mm(0.00984in).

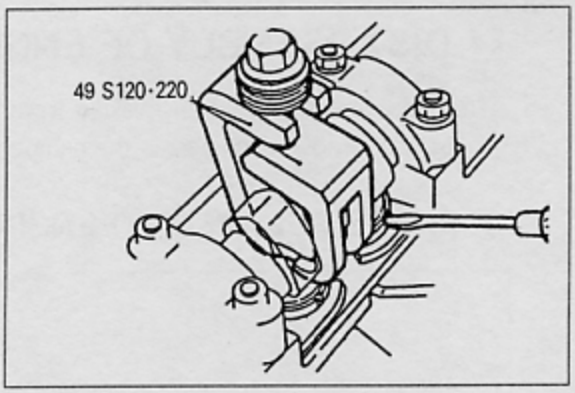

Fig. 1A-7

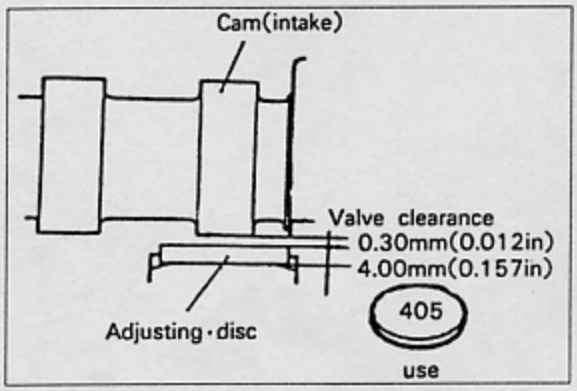

Fig. 1A-8

⊠ DISASSEMBLY OF ENGINE

After disassembling the transmission from the engine and transmission complete, put the engine on the engine hanger and remove each part in the numbered order shown in the figure.

◆ PARTS RELATED TO ENGINE AUXILIARY

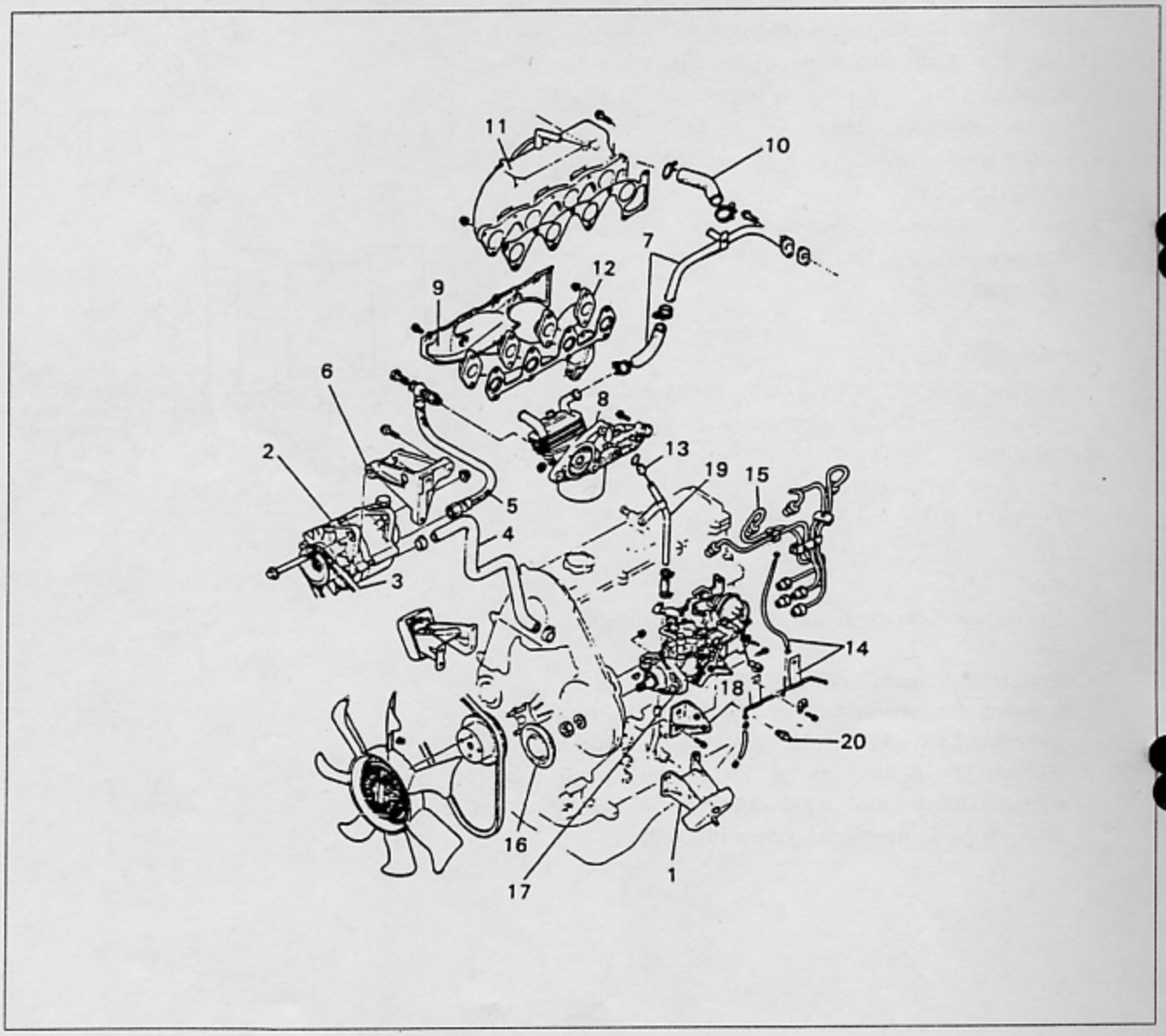

Fig. 1A-9

1. Engine mounting bracket
2. Alternator and vacuum pump Ass'y
3. Fan belt
4. Oil hose(Vacuum pump~oil pan)
5. Oil hose(Vacuum pump~oil filter)
6. Alternator bracket
7. Water by-pass pipe(for oil cooler)
8. Oil filter, oil cooler and bracket
9. Heat insulator
10. Blow-by hose
11. Intake manifold
12. Exhaust manifold
13. Oil level gauge
14. Fuel leak pipe and hose Ass'y
15. Injection pipe Ass'y
16. Injection pump pulley cover
17. Injection pump complete
18. Injection pump stay
19. Oil level gauge guide pipe
20. Oil pressure switch

◆ PARTS RELATED TO TIMING MECHANISM

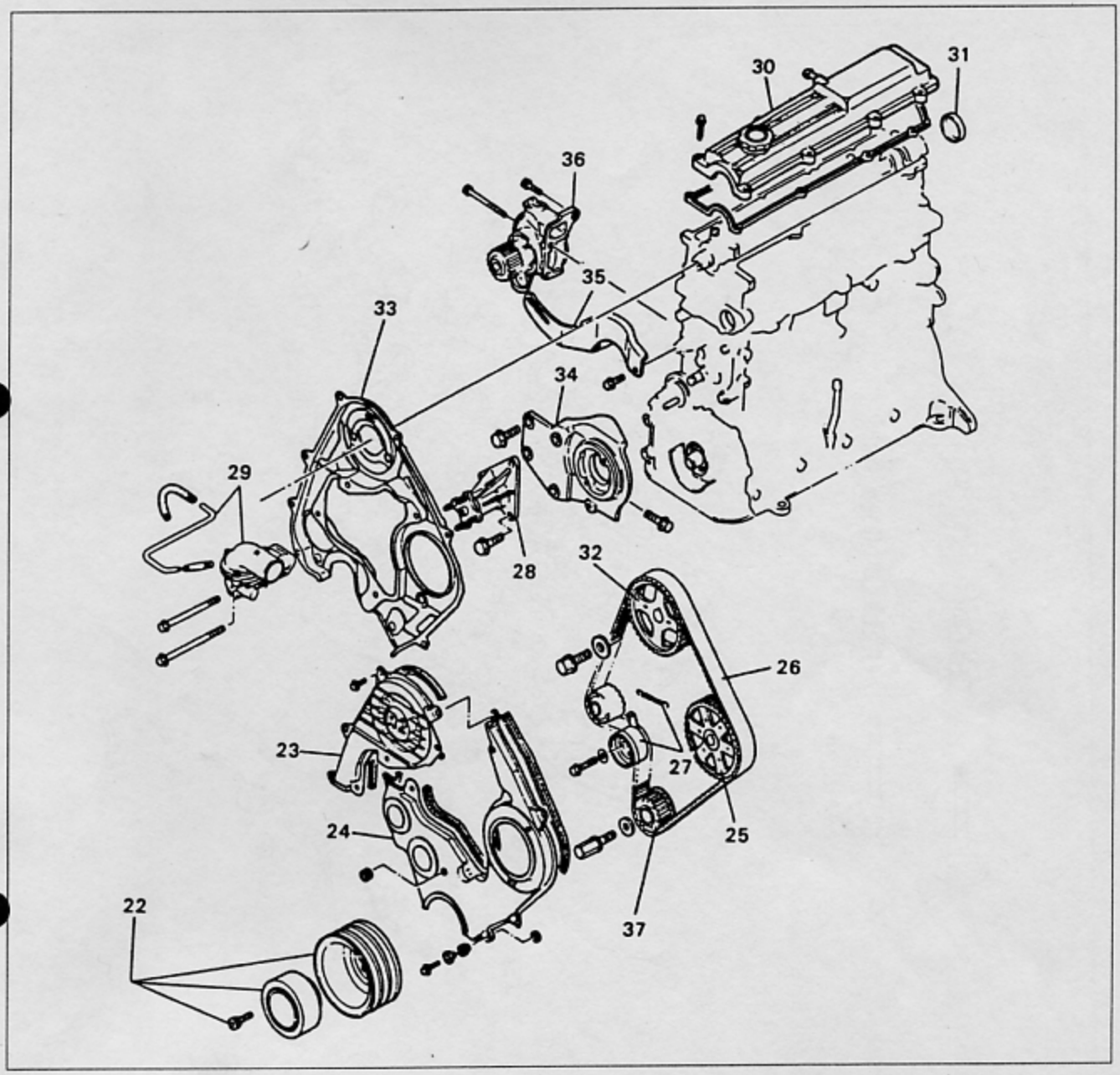

Fig. 1A-10

22. Crankshaft pulley and damper
23. Timing belt cover, right and seal rubber
24. Timing belt cover, left and seal rubber
25. Injection pump pulley and key
26. Timing belt
27. Tensioner spring and tensioner
28. Cooling fan pulley bearing complete
29. Thermostat and casing Ass'y and by-pass hose
30. Cylinder head cover
31. Seal cap
32. Camshaft pulley and key
33. Seal plate
34. Injection pump bracket
35. Alternator strap
36. Water pump complete
37. Timing belt crank pulley and woodruff key

◆ PARTS RELATED TO CYLINDER HEAD

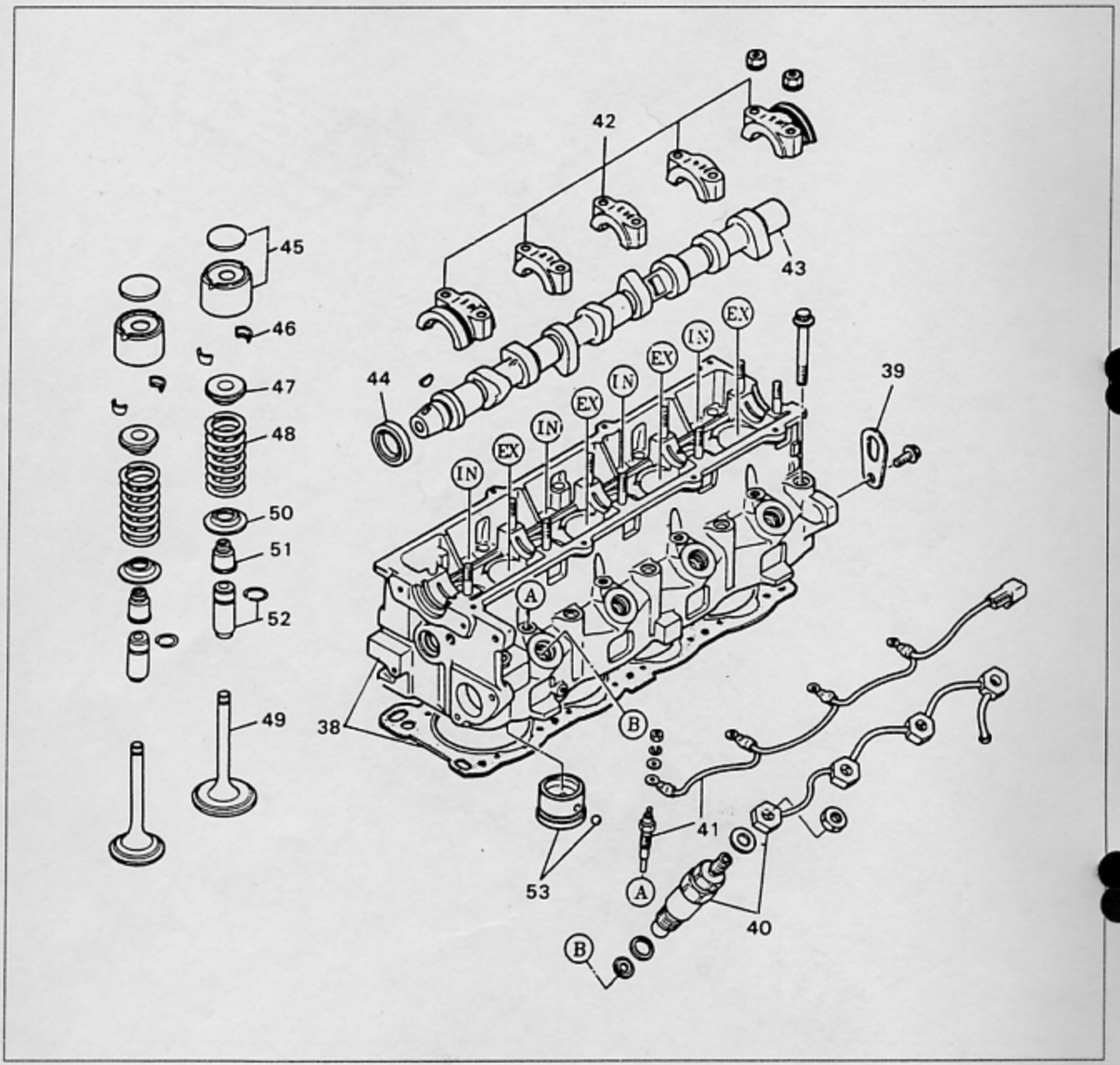

Fig. 1A-11

38. Cylinder head complete and gasket
39. Engine hanger
40. Injection pipe and nozzle
41. Glow-plug and cable
42. Camshaft cap
43. Camshaft
44. Oil seal
45. Tappet and adjusting disc
46. Valve cotter
47. Valve spring seat, upper
48. Valve spring
49. Valve
50. Valve spring seat, lower
51. Valve seal
52. Valve guide and clip
53. Combustion chamber, inside

◈ PARTS RELATED TO LUBRICATION SYSTEM AND FLYWHEEL

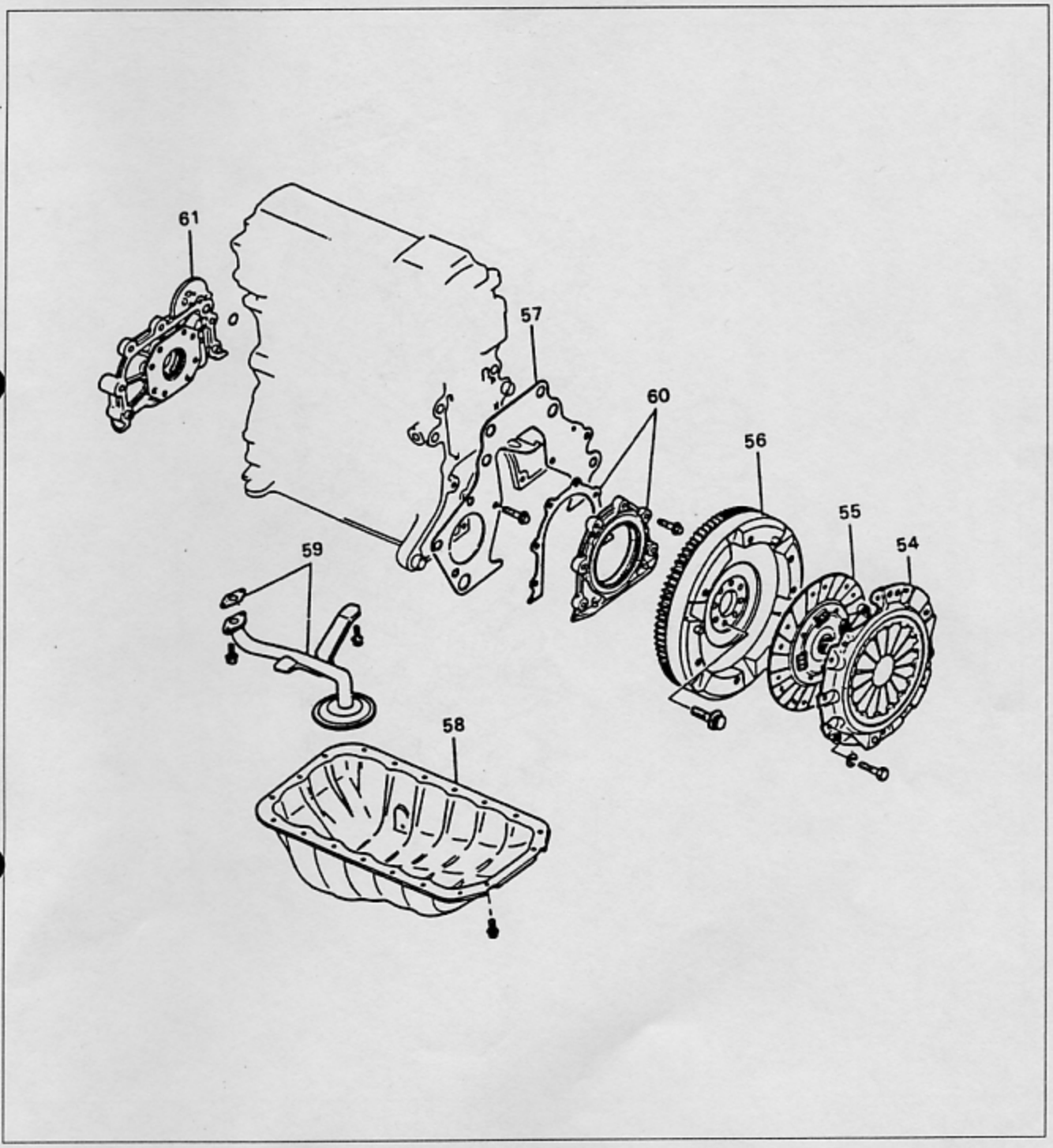

Fig. 1A-12

54. Clutch cover Ass'y
55. Clutch disc
56. Flywheel Ass'y
57. End plate
58. Oil Pan
59. Oil strainer and gasket
60. Rear cover Ass'y and gasket
61. Oil pump body Ass'y

◈ PARTS RELATED TO CRANKSHAFT AND PISTON ASSEMBLY

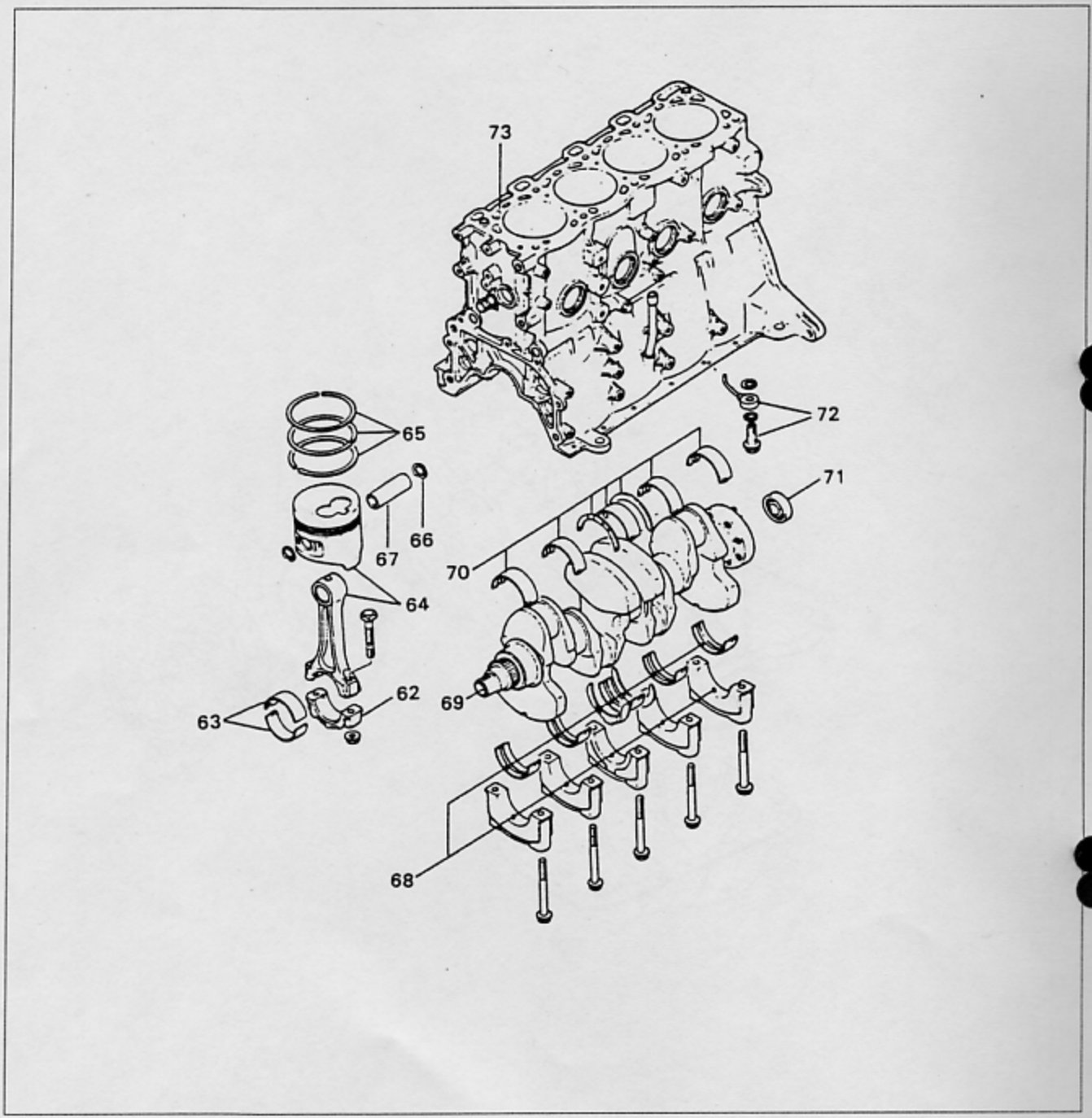

Fig. 1A-13

62. Connecting rod bearing cap
63. Connecting rod bearing
64. Connecting rod and piston
65. Piston ring
66. Snap ring
67. Piston pin
68. Main bearing cap, main bearing and thrust bearing
69. Crankshaft
70. Main bearing and thrust bearing(cylinder block side)
71. Pilot bearing
72. Oil jet and oil jet valve
73. Cylinder block Ass'y

NOTES ABOUT DISASSEMBLY

(1) Inspect each part individually during disassembly for the way it was assembled, and for deformation, wear, and damage.
(2) Mark or otherwise indicate parts which are similar(pistons, piston rings, connecting rods, valve springs, etc.) so that they can be reinstalled in the cylinder they were removed from.
(3) Be sure all disassembled parts are placed so that they are in order and for the correct cylinder.
(4) After steam cleaning the parts, use compressed air to blow off any remaining water(especially from pilot bearing).

◈ DISASSEMBLY PROCEDURES

ENGINE HANGER

1. After separating all connections, install the engine onto the engine hanger(49 G030 005) attached to the engine stand(49 0107 680A).
2. Drain the engine oil.

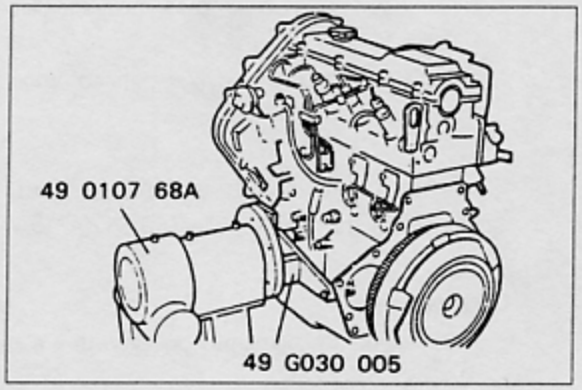

Fig. 1A-14

INJECTION PUMP PULLEY

1. Make a matching mark on the injection pump body and pump bracket.
2. After tentatively tightening the pulley and the pump bracket not to rotate by using suitable bolt as shown in the figure, loosen the lock nut.
3. After loosening the pump body tightening nut, and then disassemble the pulley by using pulley puller(49 S120 215)
4. Make a matching mark on the pump and bracket.

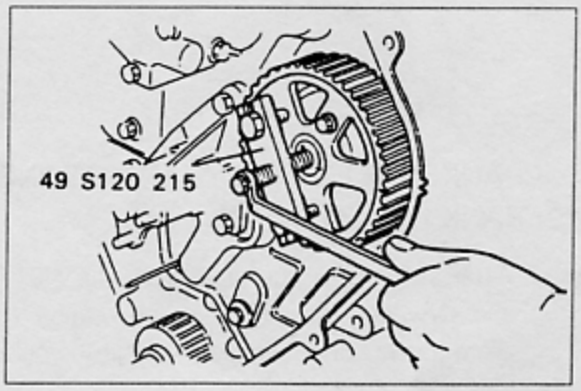

Fig. 1A-15

TIMING BELT

1. Disassemble the timing belt as shown in the figure 1A－10.

Cautions:

Inspect the timing belt as shown in the figure 1A－63. In case of no problem, express the recognizing mark of the direction of correct rotation on the belt by chalk. That is in order to prevent from wrongly assembling in case of reusing it.

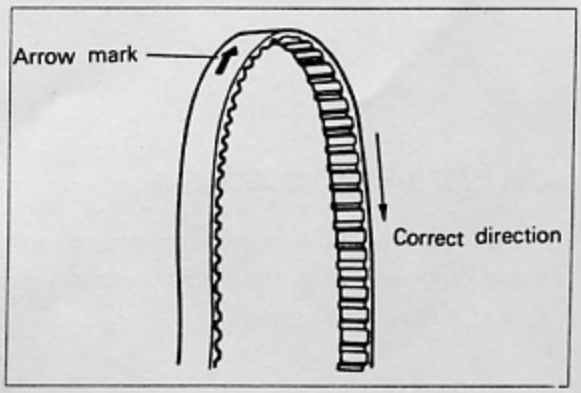

Fig. 1A-16

CAMSHAFT PULLEY

1. As shown in the figure, hold the camshaft with the wrench(29mm, 1.14 in) to prevent camshaft from turning and loosen the camshaft pulley lock bolt.

Cautions:

- **Before removing the camshaft pulley, turn the crankshaft 45° clockwise, to prevent damage to the valve.**
- **Don't damage the cylinder head edge with the wrench.**

2. Separate the camshaft and pulley from the camshaft, using the pulley puller(49 S120 215A).

Caution:

- **Do not hit the camshaft pulley with a hammer.**

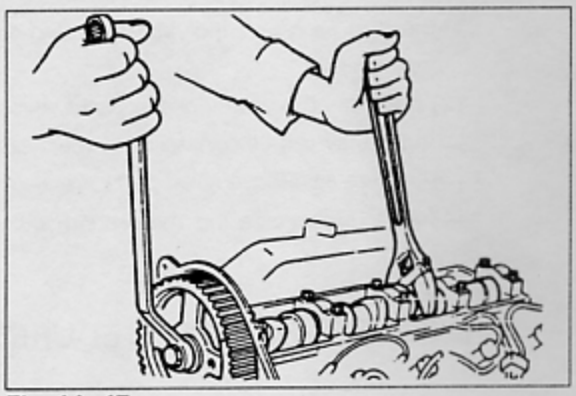

Fig. 1A-17

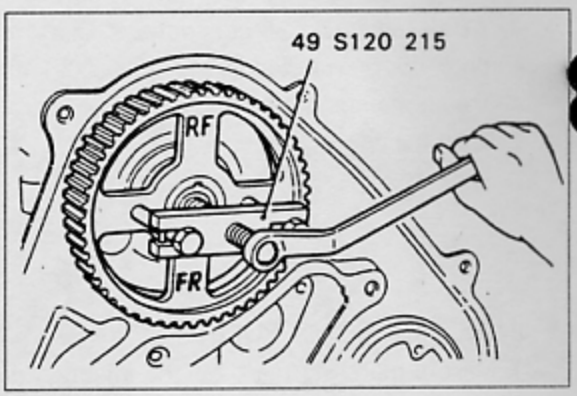

Fig. 1A-18

CRANKSHAFT PULLEY AND TIMING BELT CRANK PULLEY

1. After setting the ring gear brake(49 V101 060) into the flywheel assembly and preventing the pulley from turning, and then disassemble the pulley.

Cautions:

- **Using the pulley puller(49 S120 215A), remove the timing belt crank pulley.**
- **Don't hit and twist.**

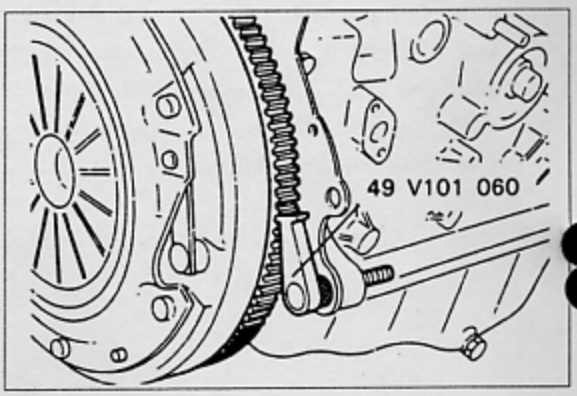

Fig. 1A-19

CYLINDER HEAD COMPLETE

Loosen the cylinder head (retaining) bolts in the numbered order shown in the figure. Loosen them each a little at a time, in the order.

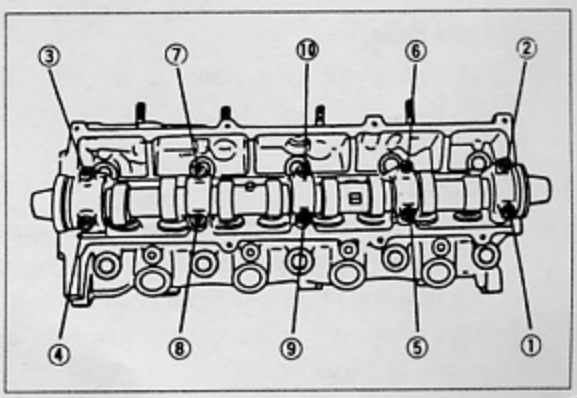

Fig. 1A-20

CAMSHAFT CAP

Loosen the camshaft cap nut in the numbered order shown in the figure.
Loosen them each a little at a time, in the order.

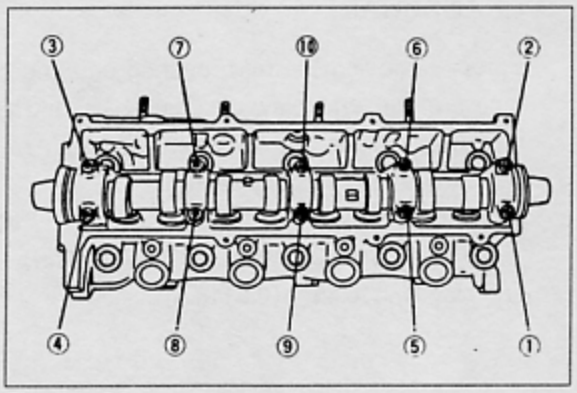

Fig. 1A-21

VALVE

Remove the valve cotter, valve seat (upper & lower), valve spring and valve from the cylinder head by using the valve spring lifter and pivot(49 0336 100A & 40 S120 222)

Caution:
When disassembling the valve sets, set the tappet and adjusting disc and then arrange according to the order of being assembled.

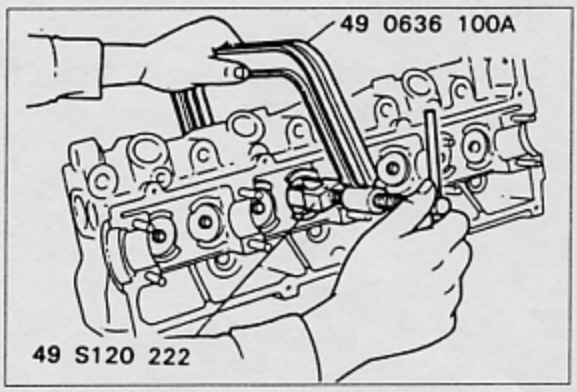

Fig. 1A-22

VALVE SEAL

After removing the lower valve seat, remove the valve seal by using the valve seal remover(49 S120 170).

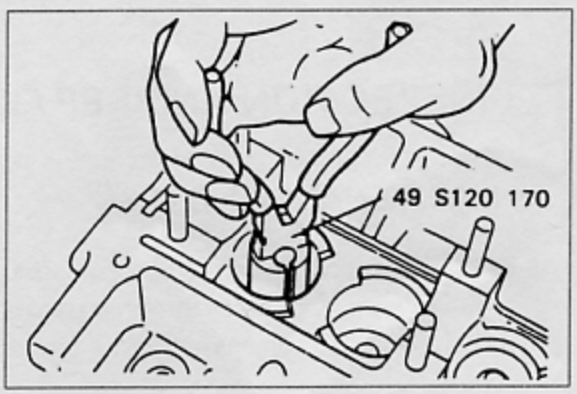

Fig. 1A-23

COMBUSTION CHAMBER INSERT

Bring the suitable round pole into contact with glow plug hole and remove by striking as shown in the figure.

Caution:
When removing the combustion chamber insert, pay attention not to lose the steel ball.

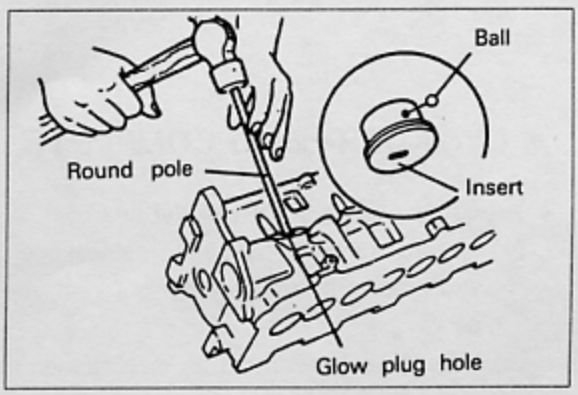

Fig. 1A-24

CRANKSHAFT

Before removing the main bearing cap and crankshaft, measure the end play of crankshaft and record the measured values. Later, when installing, refer to the selection of the thrust bearing.

Standard end play:

0.04~0.282mm(0.0016~0.0111in)

End play limit:0.3mm(0.0118in)

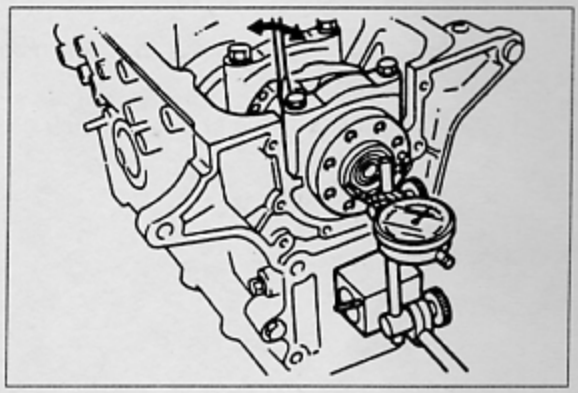

Fig. 1A-25

PILOT BEARING

Using the needle bearing puller(49 1285 071), remove the pilot bearing from the crankshaft end.

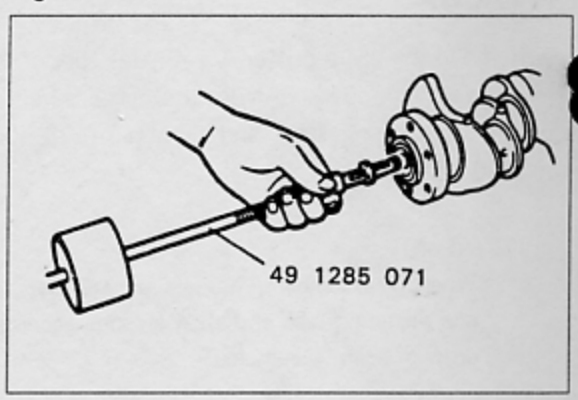

Fig. 1A-26

⊠ INSPECTION AND REPAIR

◈ MAINTENANCE NOTES

1. Before inspection, clean each part, and take care to remove any gasket fragment, dirt, oil or grease, carbon, moisture residue, or other foreign materials.
2. Be careful not to damage the joints or sliding parts of aluminum alloy components such as cylinder head, pistons.
3. Inspection and repair must be done in the order specified.

◈ CYLINDER HEAD COMPLETE

1. Inspection and repair of cylinder head
   (1) Inspect for water leakage, fuel leakage, damage, and cracks. If any problem is found, replace the part.
   (2) Measure cylinder head for distortion in the six directions shown in the figure.
   Distortion limit:0.15mm(0.006in)

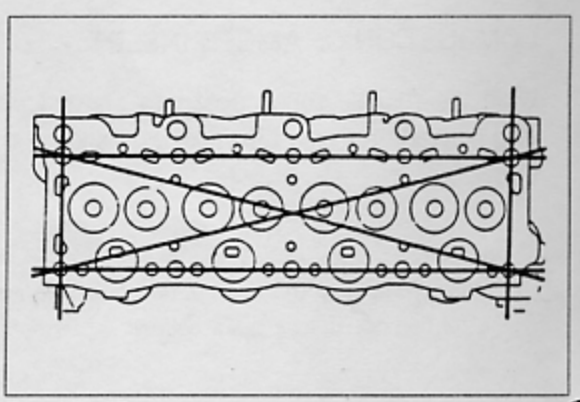

Fig. 1A-27

(3) If cylinder head distortion exceeds the limit, replace the cylinder head.

Cautions:

Do not attempt to repair a cylinder head by milling or grinding.
Handle the cylinder head carefully, taking special care not to damage its lower surface.

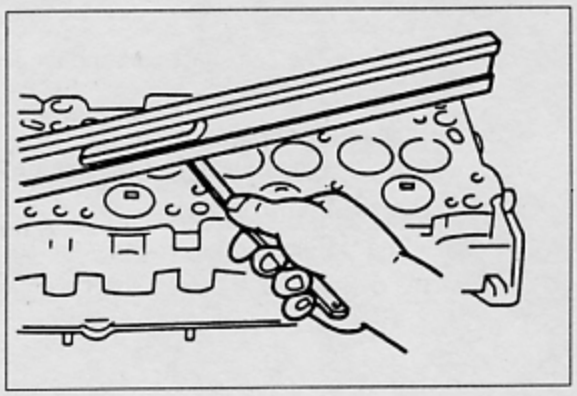

Fig. 1A-28

(4) Measure the distortion of manifold contacting surface.
If the distortion exceeds the limit, grind the surface, or replace the cylinder head.

Distortion limit: 0.20mm (0.008in)

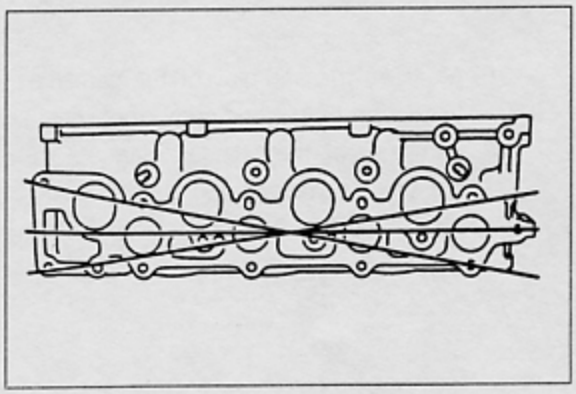

Fig. 1A-29

(5) Measure the oil clearance of camshaft.
(a) Remove the tappet and adjusting disc from the cylinder head, and separate them by cylinder.
(b) Clean away oil or dirt from the camshaft or cylinder head journal.
(c) Set a plastigauge on the camshaft journal (in the axial direction of the journal.)
(d) Set the camshaft cap, and tighten to the specified torque.

Camshaft cap tightening torque: 2.0~2.7m·kg (15~20 ft·lb)

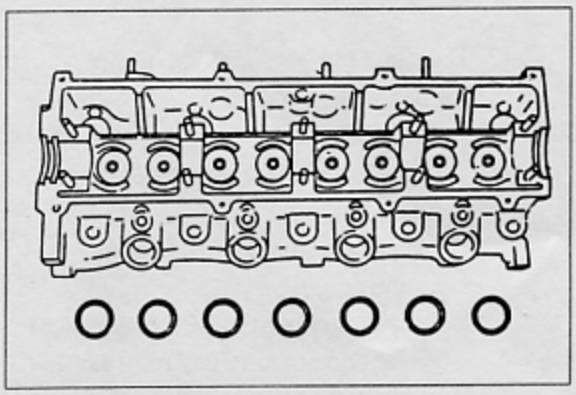

Fig. 1A-30

Cautions:

When installing the camshaft cap, note the correct order and arrow marks.
When tightening the camshaft cap nut, do so evenly and in the order shown in the engine assembly section.

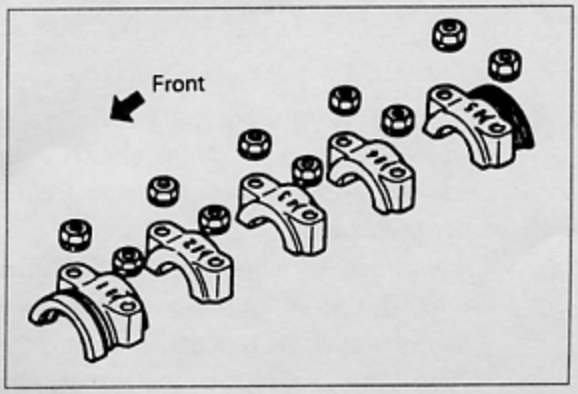

Fig. 1A-31