

- iii. Calculate for each follower the shim thickness required, in the following manner:

$A + B - C = \text{shim thickness.}$

Example:

Measured clearance $A = 0,24 \text{ mm}$

Shim thickness $B = 2,72 \text{ mm}$

Inlet valve clearance $C = 0,40 \text{ to } 0,46 \text{ mm}$

Shim thickness required: $A + B - C$

$= 0,24 + 2,72 - 0,40 \text{ to } 0,46 \text{ mm}$

$= 2,50 \text{ to } 2,56 \text{ mm}$

- (4) Shims available are shown in the table below:

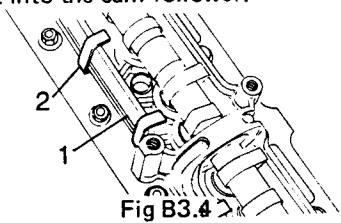
TABLE B3.1 - SHIMS AVAILABLE

REF	THICKNESS	REF	THICKNESS
97	2,47 mm	13	2,87 mm
99	2,52 mm	15	2,93 mm
01	2,56 mm	17	2,98 mm
03	2,62 mm	19	3,03 mm
05	2,67 mm	21	3,08 mm
07	2,72 mm	23	3,13 mm
09	2,77 mm	25	3,18 mm
11	2,83 mm	27	3,23 mm

- (5) In the example above it can be calculated that using a shim of 2,52 mm will give a thickness which is between the required limits.

- (6) The old shim may be discarded.

- (7) Smear the new shim with petroleum jelly and fit it into the cam follower.



- (8) Refer to Fig B3.4. Fit the followers (1) into their respective guides and hold them in place with the retaining clips (2) (special tool 18G 1218).

- (9) Refit the camshaft carrier (see Sub-section B4, Chapter 4, Para 2, steps (4) to (15)) and re-check valve clearances.

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SUB-SECTION B4

REMOVAL AND REPLACEMENT PROCEDURES

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SUB-SECTION B4

CHAPTER 1

ENGINE - REMOVAL AND REPLACEMENT

REMOVAL

1. Remove the engine as detailed below:

- (1) Drain the engine oil.
- (2) Remove the bonnet (see Sub-section M3, Chapter 1).
- (3) Disconnect the battery earth lead (see Sub-section O5, Chapter 3).
- (4) Remove the radiator (see Sub-section E4, Chapter 1) and grille panel (see Sub-section M3, Chapter 6).
- (5) Remove the gearbox tunnel cover (see Sub-section M3, Chapter 5).
- (6) Disconnect the two exhaust pipes from the manifold (see Sub-section F3, Chapter 2).
- (7) Disconnect the oil cooler pipes from the filter (see Sub-section B4, Chapter 22).

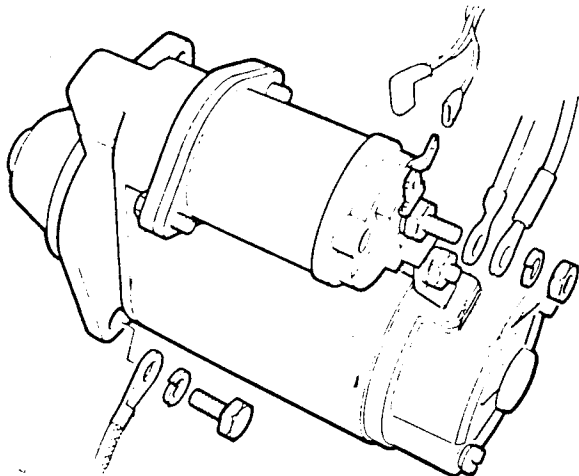


Fig B4.1

- (8) Refer to Fig B4.1. Disconnect five electrical leads from the starter motor.

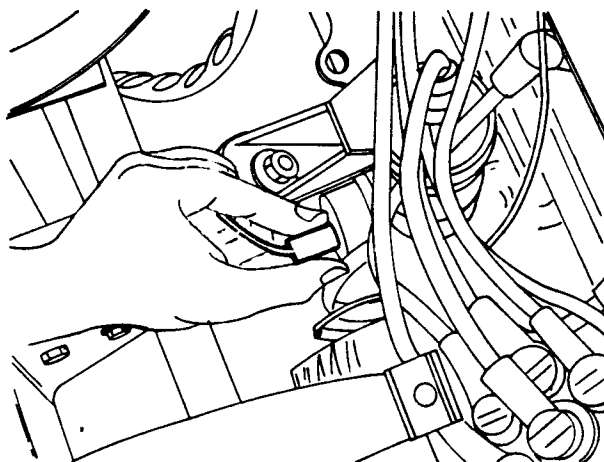


Fig B4.2

- (9) Refer to Fig B4.2. Disconnect the oil pressure switch lead.

- (10) Disconnect the engine earth cable at the chassis.

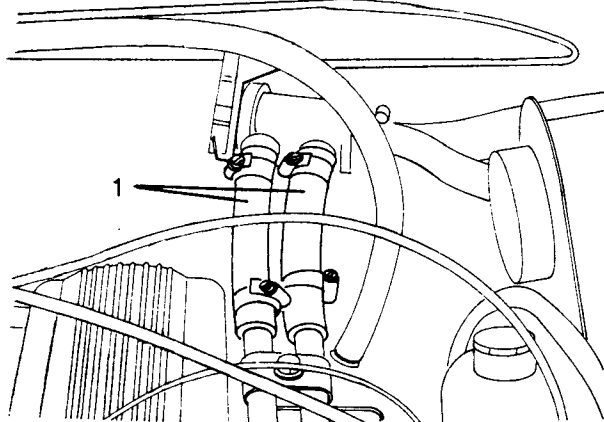


Fig B4.3

- (11) Refer to Fig B4.3. Disconnect the heater hoses (1) from the heater water valve.

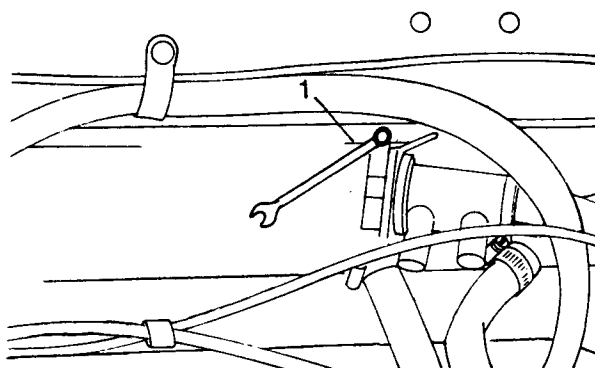


Fig B4.4

- (12) Refer to Fig B4.4. Disconnect the control cable (1) at the heater water valve.

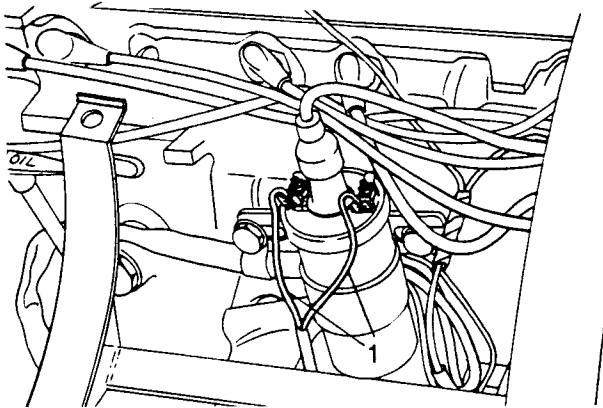


Fig B4.5

- (13) Refer to Fig B4.5. Disconnect the switch leads (1) at the ignition coil.

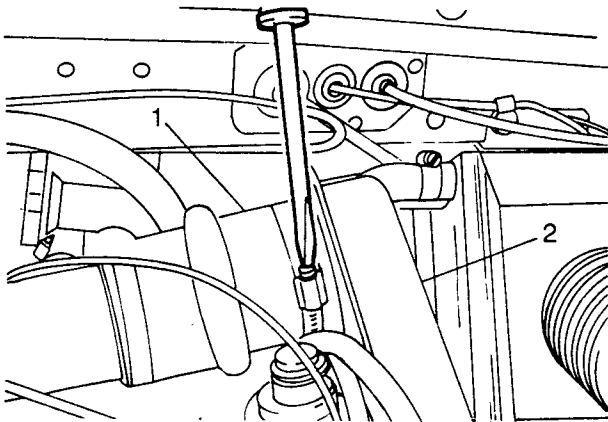


Fig B4.6

- (14) Refer to Fig B4.6. Remove the hose (1) between the air cleaner and the air intake box (2) over the carburetors.

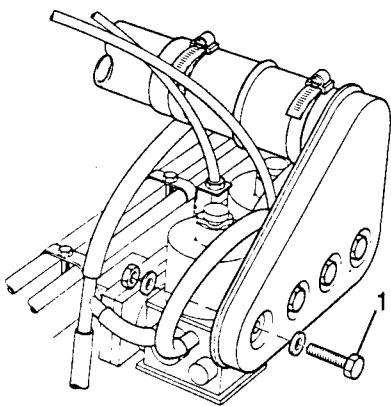


Fig B4.7

- (15) Refer to Fig B4.7. Remove the air intake box by removing the four bolts (1) holding the box to the carburettor. Note that the bolts have loose nuts and washers behind the box.

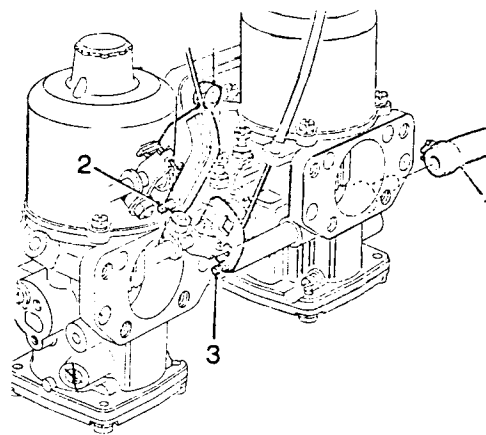


Fig B4.8

- (16) Refer to Fig B4.8. Disconnect the fuel feed (1) at the carburettor.

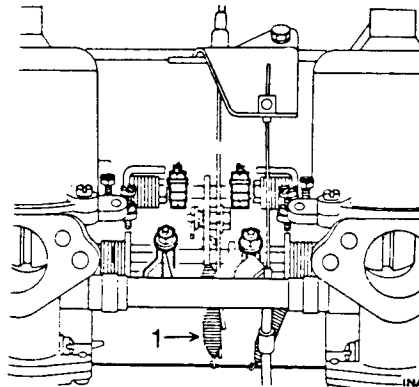


Fig B4.9

- (17) Refer to Fig B4.9. Release the accelerator return spring (1).

- (18) Disconnect the accelerator cable at the carburettor. (The fixing is (2) on Fig B4.8).

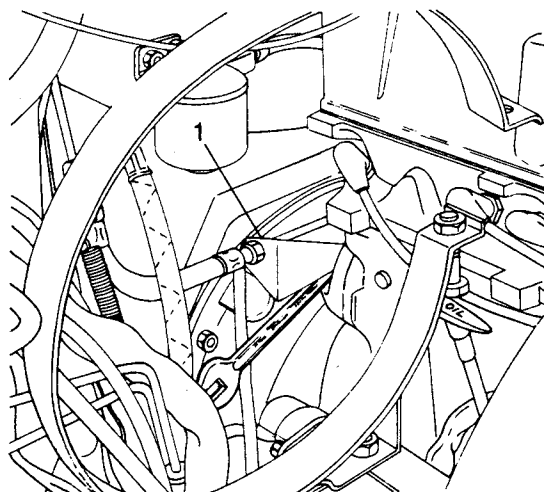


Fig B4.10

- (19) Refer to Fig B4.10. Remove the fixings securing the clutch hose and speedometer cable bracket (1) at the flywheel housing.

- (20) Disconnect the cold start control cable at the carburettor. (The fixing is (3) on Fig B4.8).

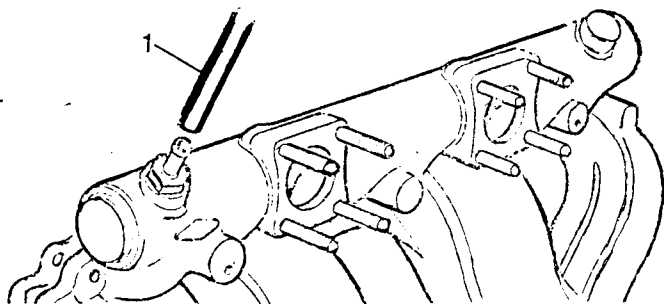


Fig B4.11

- (21) Refer to Fig B4.11. Detach the servo hose (1) at the manifold pipe.

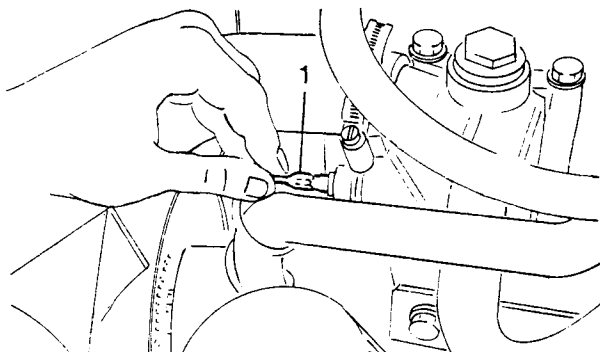


Fig B4.12

- (22) Refer to Fig B4.12. Disconnect the electrical lead (1) at the coolant temperature transmitter.

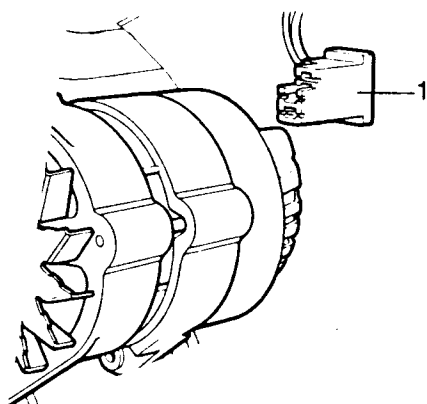


Fig B4.13

- (23) Refer to Fig B4.13. Disconnect the electrical leads (1) at the alternator.

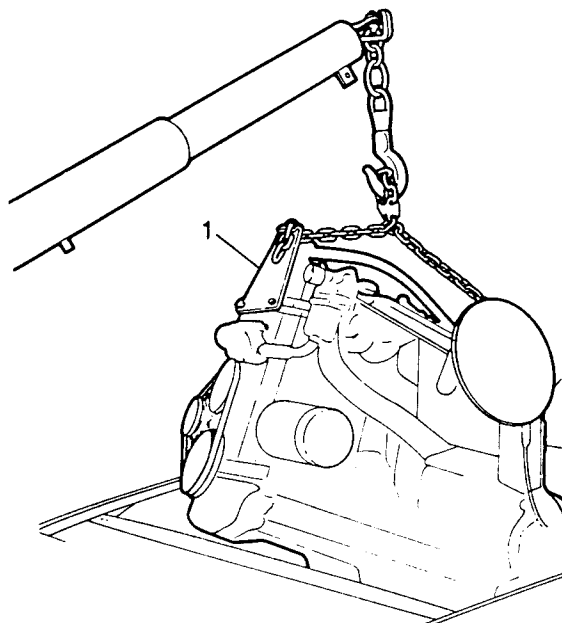


Fig B4.14

- (24) Refer to Fig B4.14. Support the engine weight using suitable lifting tackle with engine lifting brackets 18GA041 (1). Note that the figure is only to illustrate the fixings for the lifting brackets. The engine is not lifted clear of the vehicle at this stage.

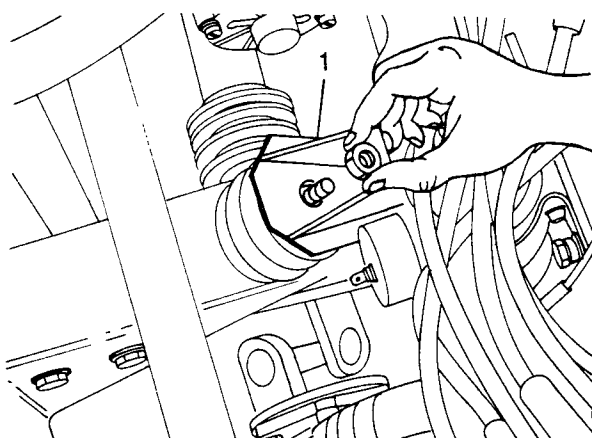


Fig B4.15

- (25) Refer to Fig B4.15. Remove the engine front mountings upper (1) and lower fixings.

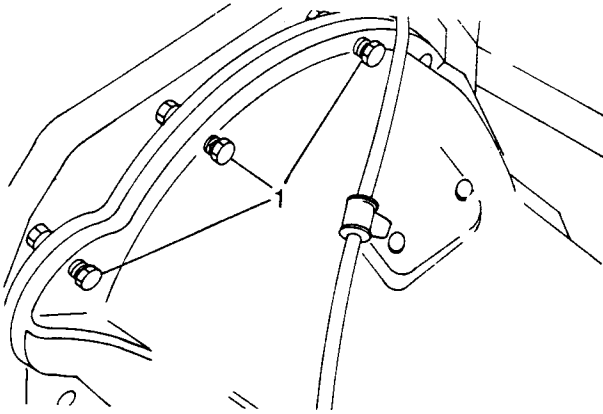


Fig B4.16

(26) Refer to Fig B4.16. Support the gearbox, using suitable packing blocks or a jack, and remove the bell housing to flywheel housing fixings (1).

(27) Pull the engine forward sufficiently to disengage the drive from the gearbox.

(28) Ensure that all cables, pipes etc. are clear then hoist the engine from the vehicle.

REPLACEMENT

2. To replace the engine:

(1) Engage a gear to prevent gearshaft rotation and offer up the engine to the gearbox. If necessary, rotate the engine sufficient to align the gearbox primary pinion with the clutch plate splines.

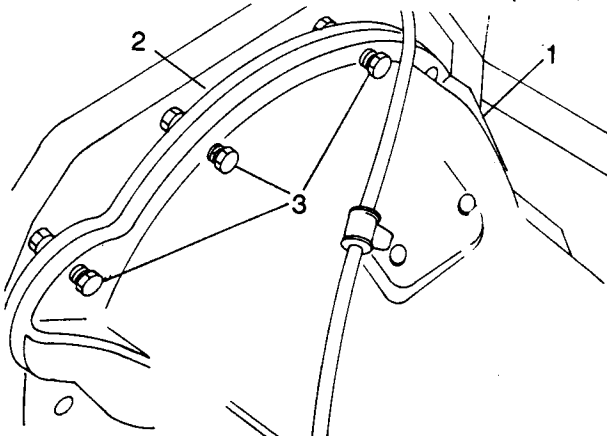


Fig B4.17

(2) Refer to Fig B4.17. When aligned, push the engine fully to the rear and secure the bell housing (1) to the flywheel housing (2), tightening the fixings (3) evenly.

(3) Lift the engine sufficiently to remove the packing or jack from beneath the gearbox.

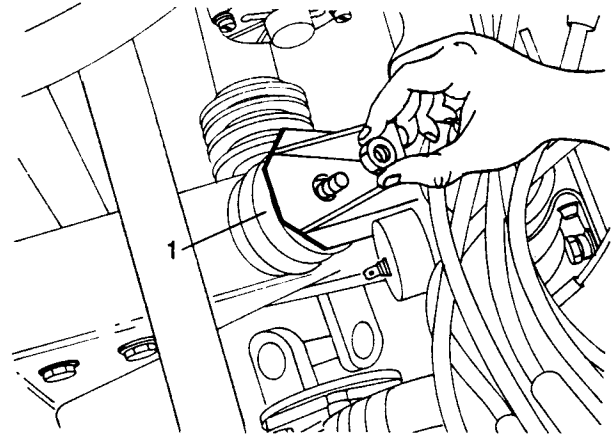


Fig B4.18

(4) Refer to Fig B4.18. Insert and secure the engine front mounting rubbers (1).

(5) Remove the sling and engine lifting brackets.

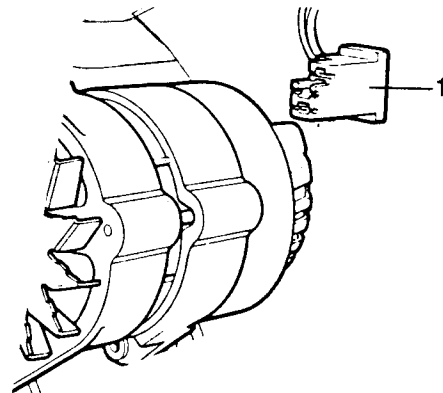
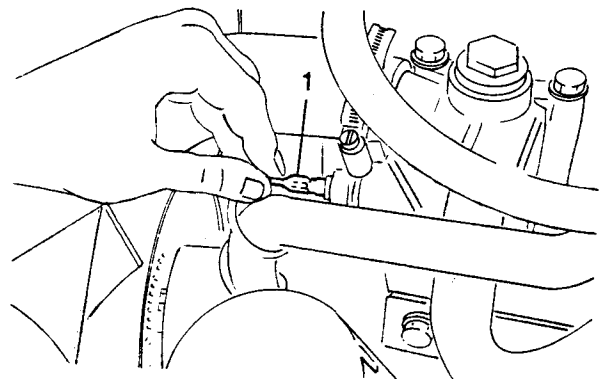


Fig B4.19

(6) Refer to Fig B4.19. Reconnect the electrical plug (1) to the alternator.



(7) Refer to Fig B4.20. Connect the leads (1) to the coolant temperature indicator.

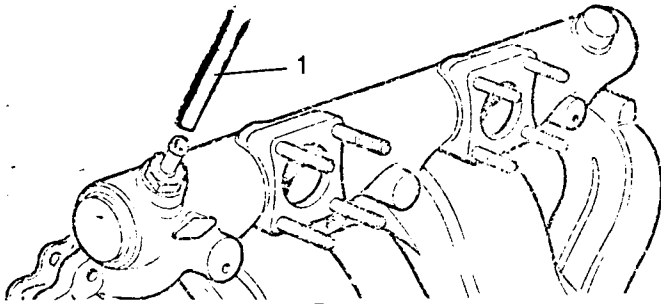


Fig B4.21

- (8) Refer to Fig B4.21. Fit the servo hose (1) to the manifold pipe.

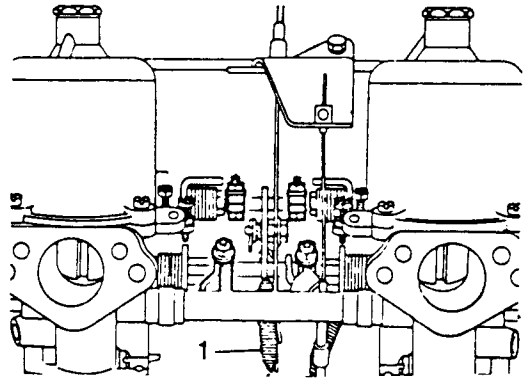


Fig B4.24

- (13) Refer to Fig B4.24. Replace the accelerator return spring (1).

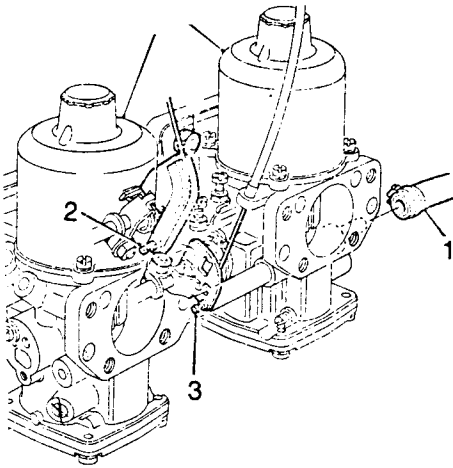


Fig B4.22

- (9) Refer to Fig B4.22. Connect the cold start control cable at the carburettor fixing (3).
- (10) Refit the accelerator cable to the carburettor fixing (2).
- (11) Reconnect the fuel feed pipe (1) to the carburettor.

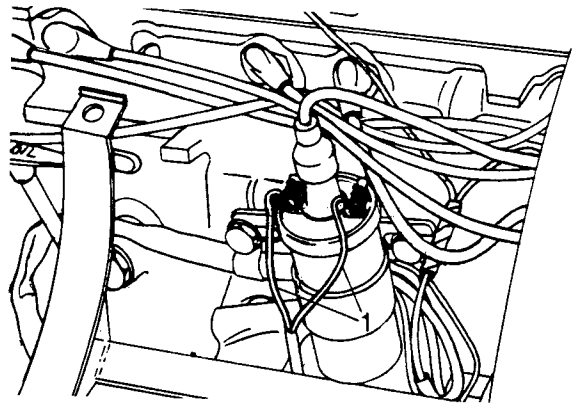


Fig B4.25

- (14) Refer to Fig B4.25. Connect the switch lead (1) at the ignition coil.

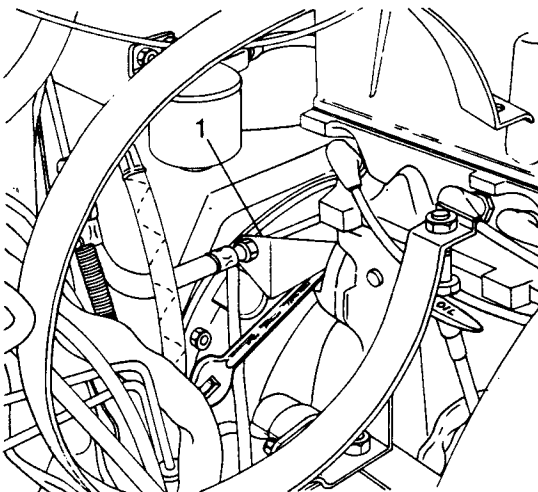


Fig B4.23

- (12) Refer to Fig B4.23. Refit the clutch hose and speedometer cable bracket (1) at the flywheel housing.

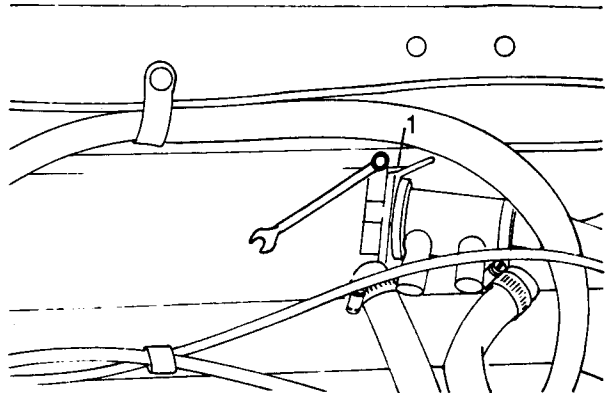


Fig B4.26

- (15) Refer to Fig B4.26. Connect the control cable (1) at the heater water valve.

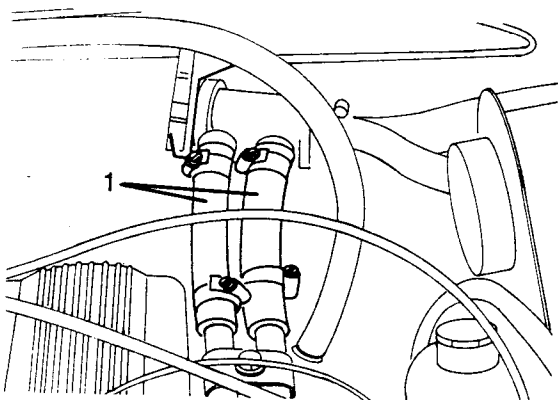


Fig B4.27

(16) Refer to Fig B4.27. Connect the heater hoses (1).

(17) Reconnect the engine earth cable to the chassis side member.

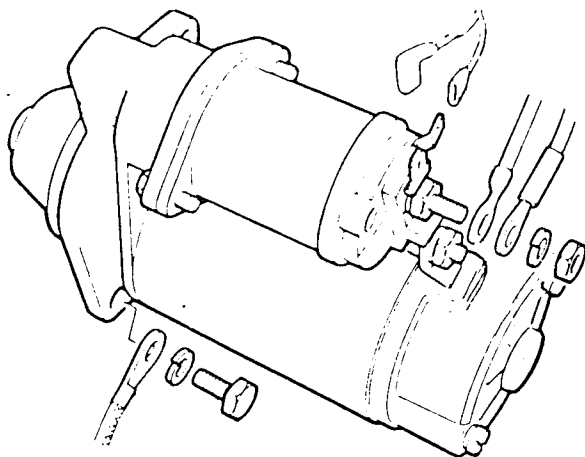


Fig B4.28

(18) Refer to Fig B4.28. Reconnect the five electrical leads to the starter motor and where applicable secure with nuts or bolt and lock washers.

(19) Reconnect the oil cooler pipes to the filter (see Sub-section B4, Chapter 22).

(20) Refit and secure the two exhaust pipes (see Sub-section F3, Chapter 2).

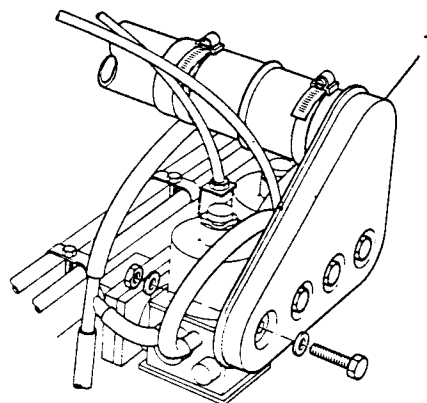


Fig B4.29

(21) Refer to Fig B4.29. Fit the air intake box (1) over the carburetors.

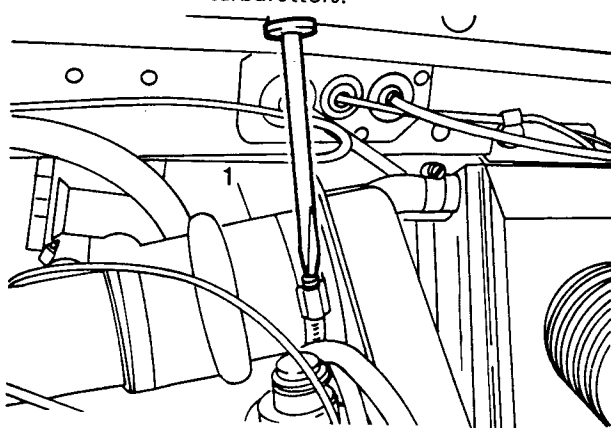


Fig B4.30

(22) Refer to Fig B4.30. Reconnect the hose (1) between the air cleaner and the air intake box.

(23) Refit the gearbox tunnel cover (see Sub-section M3, Chapter 5).

(24) Replace the grille panel (see Sub-section M3, Chapter 6) and radiator (see Sub-section E4, Chapter 1).

(25) Reconnect the battery earth lead (see Sub-section O5, Chapter 3).

(26) Refill the engine with the correct grade of oil.

(27) Replace the bonnet (see Sub-section M3, Chapter 1).

SUB-SECTION B4

CHAPTER 2

OIL PUMP DRIVE SHAFT - REMOVAL AND REPLACEMENT

REMOVAL

1. The drive shaft is in the tube forming the distributor drive shaft. To remove:
 - (1) Remove the distributor (see Sub-section D4, Chapter 2).

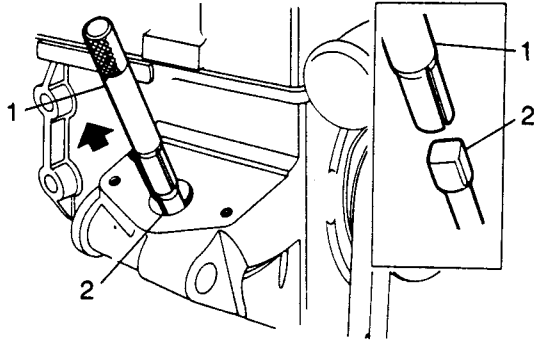


Fig B4.31

- (2) Refer to Fig B4.31. Position tool 18G1147 (1) with the slots diagonally across the square end of the oil pump drive shaft (2).
 - (3) Press down on the tool and then withdraw the drive shaft upwards.

REPLACEMENT

2. To replace the oil pump drive shaft:
 - (1) Fit the shaft into the distributor drive shaft tube.
 - (2) Ensure full engagement. If necessary use the special tool to turn the shaft until it fits into the square hole in the distributor shaft.
 - (3) Replace the distributor (see Sub-section D4, Chapter 2).

SUB-SECTION B4

CHAPTER 3

DISTRIBUTOR DRIVE SHAFT - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the drive shaft:

- (1) Raise the vehicle on a hoist or stands.

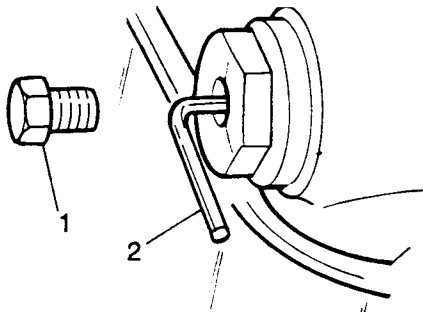


Fig B4.32

- (2) Refer to Fig B4.32. Retract the timing chain tensioner by removing the chain tensioner adaptor screw (1), fitting a 3,17 mm allen key (2) and turning the key 90° clockwise.

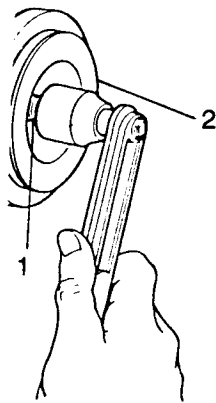


Fig B4.33

- (3) Refer to Fig B4.33. Loosen the harmonic balancer bolt (1) using special tool 18G98A (2).

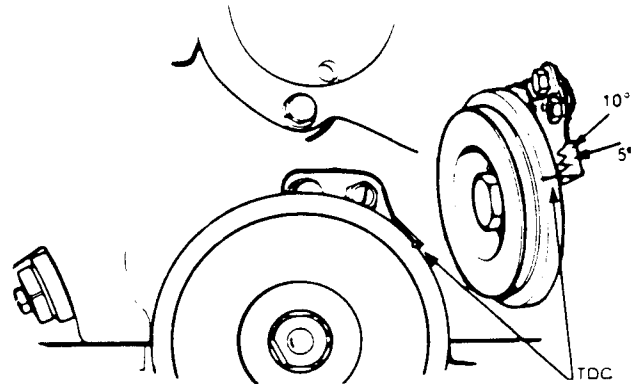


Fig B4.34

- (4) Refer to Fig B4.34. Set the timing marks to TDC with No 1 cylinder firing. See Fig B4.35.

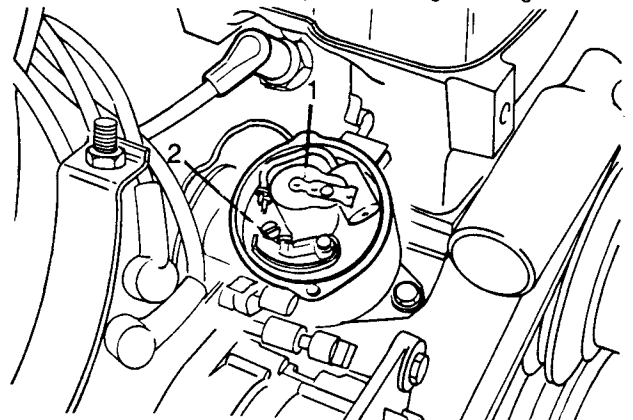


Fig B4.35

- (5) Refer to Fig B4.35. The No 1 cylinder firing position is with the distributor rotor (1) pointing to No 1 cylinder take-off (as shown) and the points (2) opening.
- (6) Remove the distributor (see Sub-section D4, Chapter 2).
- (7) Remove the harmonic balancer ((2) on Fig B4.14).
- (8) Remove the crankshaft oil seal (see Sub-section B4, Chapter 7).
- (9) Remove the oil pump (see Sub-section B4, Chapter 16) and oil pump drive shaft. Note that this shaft will come out from the bottom of the engine block once the pump is removed.

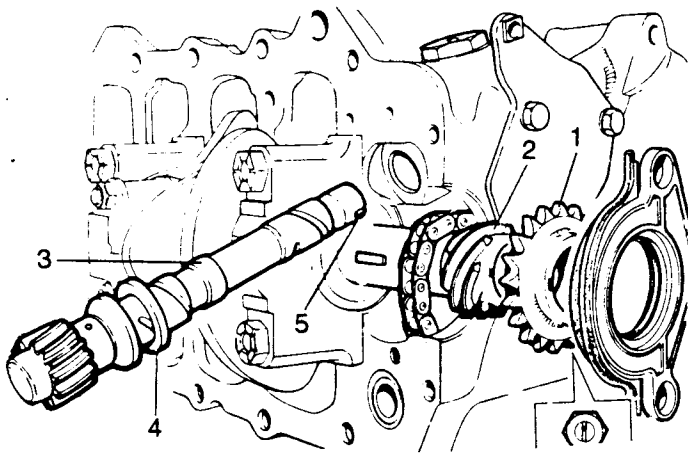


Fig B4.36

(10) Refer to Fig B4.36. Move the sprocket (1) and drive gear (2) forwards.

(11) Pull out the distributor drive shaft (3).

REPLACEMENT

2. Fig B4.36 still refers. Replace the distributor drive shaft as follows:

(1) Fit the thrust washer (4) to the drive shaft.

(2) Check that No 1 piston is at TDC.

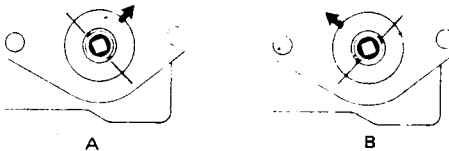


Fig B4.37

(3) Refer to Fig B4.37. Fit the drive shaft into the housing with the large slot ((5) on Fig B4.36) running in the 10 o'clock/4 o'clock position (Fig B4.37A, shown looking from the top).

(4) Push the driver gear into position. As the teeth mesh the drive shaft will turn through 90° bring the slot into the 2 o'clock/8 o'clock position (Fig B4.37B). This is the correct position for No 1 cylinder firing.

(5) Refit the distributor (see Sub-section D4, Chapter 2) and check that the rotor arm is set for No 1 cylinder firing with the contact breaker points just opening.

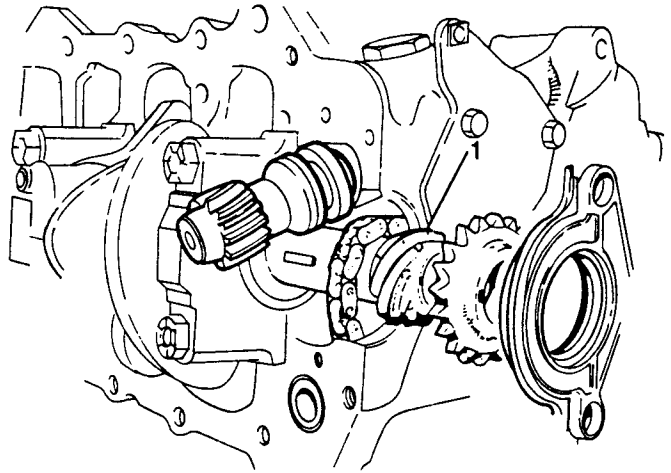


Fig B4.38

(6) Refer to Fig B4.38. Position the sprocket (1) over its woodruff key and replace the chain.

(7) Refit the oil pump drive shaft ensuring that it fits into the square hole at the top of the distributor drive shaft.

(8) Replace the oil pump (see Sub-section B4, Chapter 16).

(9) Replace the crankshaft oil seal (see Sub-section B4, Chapter 7).

(10) Replace the sump (see Sub-section B4, Chapter 17).

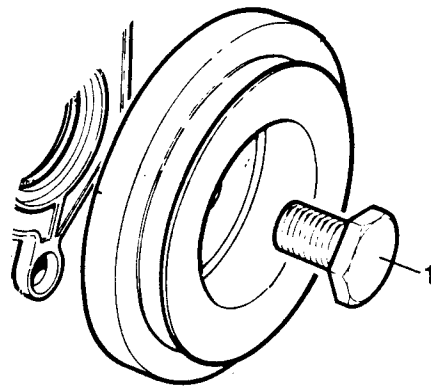


Fig B4.39

(11) Refer to Fig B4.39. Fit the harmonic balancer and pulley and secure with the harmonic balancer bolt (1). Torque the bolt 81 to 92 N.m.

(12) Release the chain tensioner by turning the allen key ((2) on Fig B4.32) 90° counterclockwise.

(13) Remove the allen key and replace the screw ((1) on Fig B4.32).

SUB-SECTION B4

CHAPTER 4

CAMSHAFT AND FOLLOWERS - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the camshaft and followers:

- (1) Remove the camshaft cover and gasket (see Sub-section B4, Chapter 11).

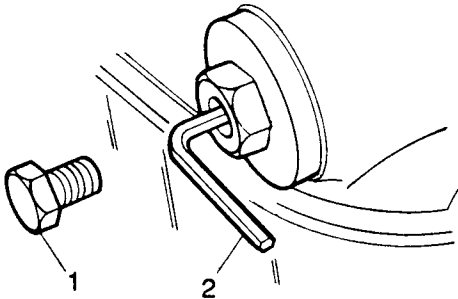


Fig B4.40

- (2) Refer to Fig B4.40. Retract the timing chain tensioner by removing the chain tensioner adaptor screw (1), fitting a 3,17 mm allen key (2) and turning the key 90° clockwise.

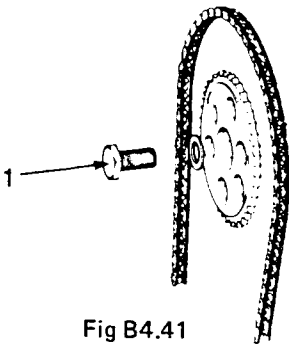


Fig B4.41

- (3) Refer to Fig B4.41. Remove the fixing (1) for the camshaft sprocket and remove the sprocket.

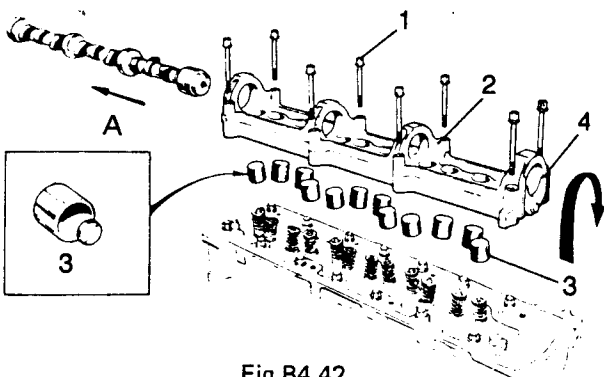


Fig B4.42

- (4) Refer to Fig B4.42. Evenly slacken the camshaft carrier bolts (1) in a diagonal sequence until the valve spring pressure is released.

- (5) Remove the camshaft carrier bolts.

- (6) Raise the camshaft carrier (2) sufficiently to allow the followers (3) to clear the engine valves.

- (7) Push the followers into the camshaft carrier until they contact the camshaft.

- (8) Continue to remove the carrier assembly by easing it away from the cylinder head and quickly revolve it to prevent the followers from falling out.

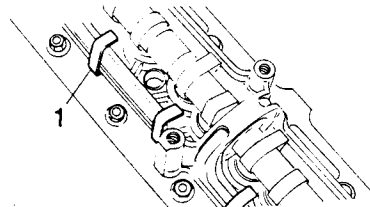


Fig B4.43

NOTE

Refer to Fig B4.43. Special tool 18G1218 (tappet retaining clips) (1) may be used to prevent the followers falling out during this operation.

- (9) On the bench remove the cam followers with their adjusting shims, maintaining them in the order in which they were removed.

- (10) Remove the camshaft locating plate (4).

- (11) Remove the camshaft in the direction of arrow A.

REPLACEMENT

2. Replace the camshaft as detailed below:

- (1) Lubricate the cam bearings and fit the camshaft in the opposite direction to arrow A.

- (2) Fit and secure the camshaft locating plate.

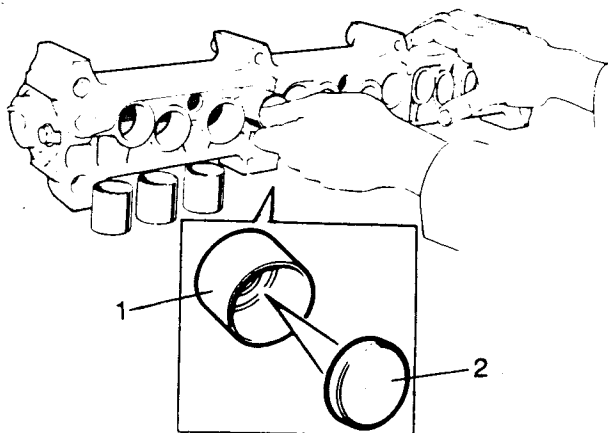


Fig B4.44

- (3) Refer to Fig B4.44. Lay the carrier on its side, lubricate the followers (1) and fit them into their respective housings. Smear the shims (2) with grease and replace them.
- (4) Check the bottom face of carrier for burrs or damage, as any protrusions will affect valve clearance. Also check that the carrier bolt thread and the respective threads in the cylinder head are free of foreign material.
- (5) Position the carrier over the two locating dowels in the cylinder head, taking care not to dislodge the adjusting shims.

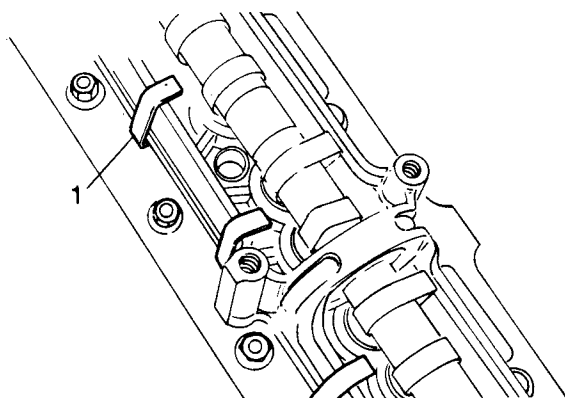


Fig B4.45

- (6) Refer to Fig B4.45. If the tappet retaining clips (1) are fitted, remove them at this stage.

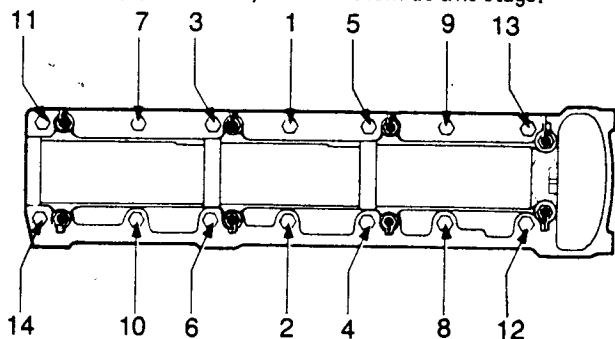


Fig B4.46

- (7) Refer to Fig B4.46. Fit the carrier bolts (1 to 14) and gradually tighten them in a diagonal sequence to 27 Nm.
- (8) Revolve the camshaft several times.

- (9) Check valve clearances and reset if required (see Sub-section B3).

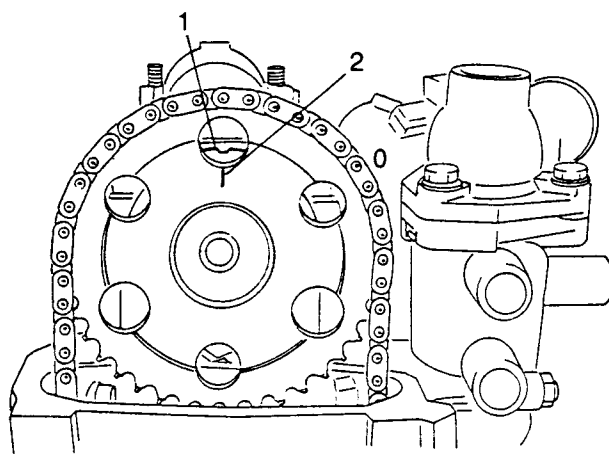


Fig B4.47

- (10) Refer to Fig B4.47. Temporarily fit the sprocket to the camshaft and turn the sprocket until the timing mark (1) on the sprocket aligns with the mark (2) on the carrier. Remove the sprocket.

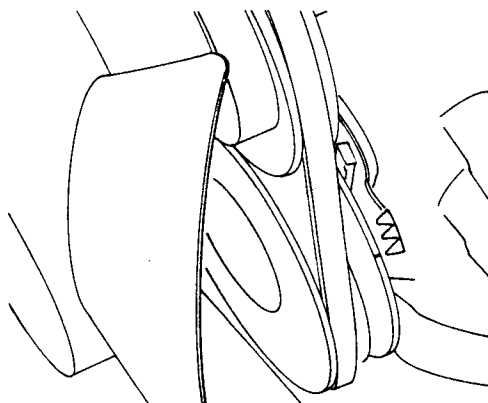


Fig B4.48

- (11) Refer to Fig B4.48. Set the crankshaft pulley timing mark to the TDC position with No 1 cylinder firing (rotor pointing to No 1 cylinder take-off and points opening).
- (12) Fit the timing chain over the (loose) camshaft sprocket, maintaining the aligning marks.
- (13) Fit the camshaft sprocket with the chain, onto the camshaft.
- (14) Fit and tighten the securing bolt to 37 N.m.
- (15) Release the chain tensioner by turning the Allen key (Fig B4.40) 90° counterclockwise.
- (16) Replace the camshaft cover and gasket (see Sub-section B4, Chapter 11).

SUB-SECTION B4

CHAPTER 5

CONNECTING RODS AND PISTONS - REMOVAL AND REPLACEMENT

REMOVAL

1. First remove the engine from the vehicle (see Sub-section B4, Chapter 1).
2. Remove the connecting rods and pistons as follows:
 - (1) Remove the cylinder head (see Sub-section B4, Chapter 10).
 - (2) Remove the oil pump (see Sub-section B4, Chapter 16).
 - (3) Remove any traces of carbon from around the top of the cylinder bores.
 - (4) Check the top of the bores for wear. If a ridge is present it should be removed prior to withdrawing the piston assemblies or damage to the piston could result.
 - (5) Carefully remove carbon from the top of the piston.

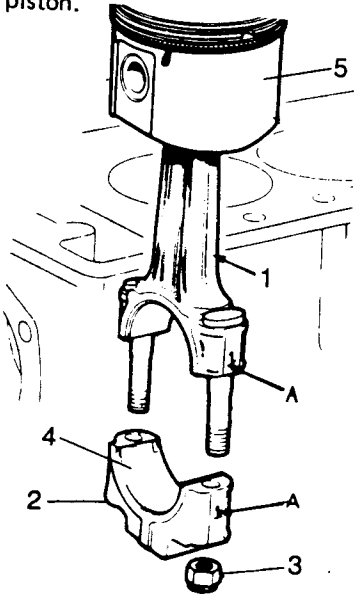


Fig B4.49

- (6) Refer to Fig B4.49. Mark each piston by number in its forward position.

NOTE

The pistons have offset gudgeon pin bosses and can only be fitted one way: The mark "FRONT" or Δ faces the front of the engine.

- (7) Mark the connecting rods (1) and caps (2) so that they may be assembled in their correct order ('A' in Fig B4.49).
- (8) Remove nuts (3).
- (9) Remove the connecting rod caps (2) and bearings (4).

- (10) Remove the pistons (5) and connecting rods (1) out through top.

- (11) Temporarily refit the connecting rod caps and bearing shells to their respective rods.

REPLACEMENT

CAUTION

It is essential that the piston is fitted the correct way round on the connecting rod. The mark "FRONT" or Δ on the piston crown faces the front of the engine and the cylinder number stamped on the connecting rod and cap faces the distributor side of the engine.

2. To replace the connecting rods and pistons:
 - (1) Ensure that the connecting rod big end bores are clean and free from burrs or marks.
 - (2) Clean the bearing shells and fit them to the connecting rods and caps. The shells are notched to fit the recesses machined in the rods and caps.

NOTE

Any foreign material between the bearing shells and connecting rod or cap will affect clearance and result in bearing failure.

- (3) Liberally lubricate the cylinder bores, pistons and connecting rod bearings with engine oil.

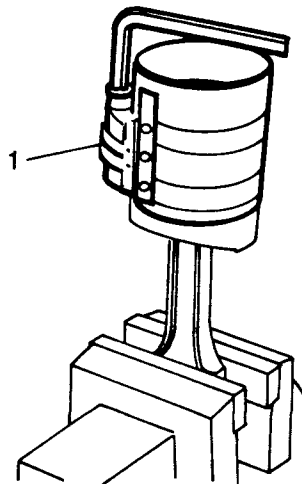


Fig B4.50

- (4) Refer to Fig B4.50. Compress the piston rings using a suitable ring compressor (1).

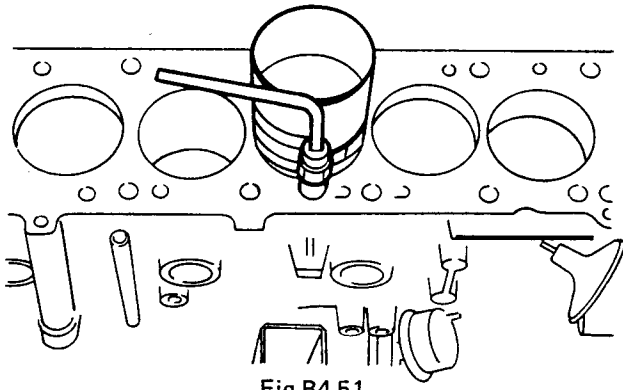


Fig B4.51

- (5) Refer to Fig B4.51. Enter the piston and connecting rod assembly to the cylinder bores from the top, ensuring that the oil jet holes in the connecting rods are facing the distributor side of the engine.
- (6) Gently tap the piston into the cylinder, at the same time checking that the connecting rods are facing the distributor side of the engine.

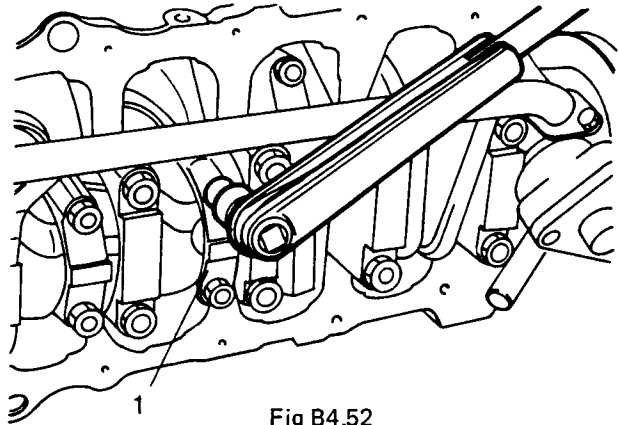


Fig B4.52

- (7) Refer to Fig B4.52. With the connecting rod positioned on the crankshaft, fit the connecting rod cap (1) and lower half bearing.
 - (8) Fit the connecting rod bolts and tighten the nuts to 42 to 47 N.m.
3. Replace the oil pump (see Sub-section B4, Chapter 16), the sump (see Sub-section B4, Chapter 17), the cylinder head (see Sub-section B4, Chapter 10).

SUB-SECTION B4

CHAPTER 6

CRANKSHAFT PULLEY AND VIBRATION DAMPER ASSEMBLY - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the crankshaft pulley and vibration damper assembly:
 - (1) Remove fan cowling assembly.
 - (2) Slacken alternator drive belt and remove (see Sub-section O5, Chapter 1).

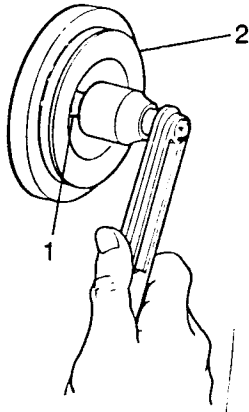


Fig B4.53

- (3) Refer to Fig B4.53. Loosen the retaining bolt (1) with special tool 18G98A and remove bolt.
- (4) Remove the assembly (2) from the shaft using suitable levers.

REPLACEMENT

2. Replace the crankshaft pulley and vibration damper as follows: (Fig B4.53 still applies).
 - (1) Lubricate the seal surface with engine oil.
 - (2) Replace crankshaft pulley and vibration damper assembly (2).
 - (3) Refit retaining bolt (1) and torque to 81 to 95 N.m.
 - (4) Replace the alternator drive belt (see Sub-section O5, Chapter 1).
 - (5) Replace fan cowl assembly.

SUB-SECTION B4

CHAPTER 7

SUMP FRONT SEAL, SEAL HOUSING AND CRANKSHAFT OIL SEAL - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the components:

- (1) Remove the sump and gaskets (see Sub-section B4, Chapter 17).
- (2) Remove the crankshaft pulley and vibration damper assembly (see Sub-section B4, Chapter 6).

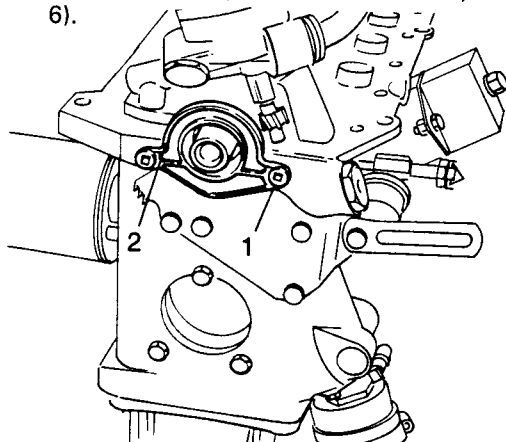


Fig B4.54

- (3) Refer to Fig B4.54. Remove the two counter sunk head screws (1) and washers securing the seal housing (2) to the crankcase and detach the housing.
- (4) Detach the reservoir seal from its groove in the housing.



Fig B4.55

- (5) Refer to Fig B4.55. Carefully drift out the crankshaft oil seal (1) as necessary or alternatively replace the seal and housing as a unit.

REPLACEMENT

2. Refit the seals and housings as detailed below:

- (1) Carefully press a new crankshaft oil seal into the housing as necessary.
- (2) Install the seals and housing assembly over the crankshaft, maintaining fitted horizontal alignment of the countersunk holes and the threaded holes in the crankcase.

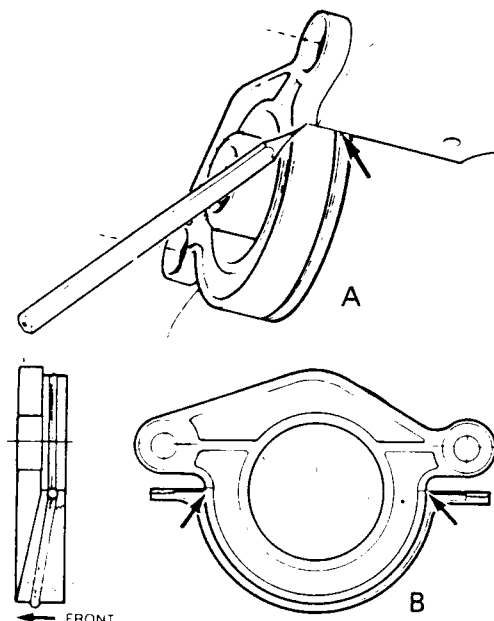


Fig B4.56

- (3) Refer to Fig B4.56. Using a lead pencil mark the position of the crankcase rails on the housing. (Fig B4.56A).
- (4) Remove the housing.
- (5) Fit the seal in the groove in the housing, so that the under side of the lugs align with the pencil lines on the housing, and the hooded part of the seal faces to the front and away from the engine. (Fig B4.56B).

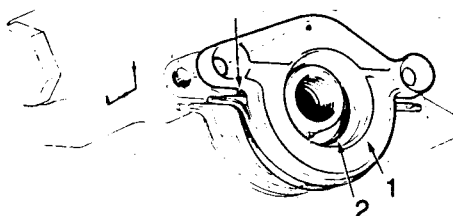


Fig B4.57

- (6) Refer to Fig B4.57. Locate the housing (1) in position on the crankcase and align the attaching screw holes.
- (7) Keeping the housing assembly in the same horizontal alignment, position the whole assembly vertically away from the engine so that the crankshaft oil seal (2) lips are resting on the crankshaft.

CRANKSHAFT REAR OIL SEAL - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the rear oil seal:

- (1) Remove the flywheel (see Sub-section B4, Chapter 13).

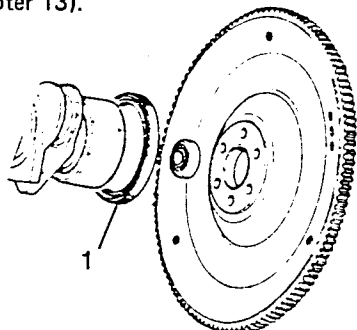


Fig B4.59

- (2) Refer to Fig B4.59. Extract the seal (1) from the cylinder block.

- (4) Lubricate the inside of the seal replacer sleeve (3) 18GA044 and fit it over the crankshaft against the seal (4).

- (5) Fit the nut to the adaptor and wind up till the seal enters its housing. Continue to wind in until the seal is flush or just clear of the crankcase face.

NOTE

Clearance must exist between the seal and the flywheel mounting face on the crankshaft.

- (6) Refit the flywheel (see Sub-section B4, Chapter 13).

REPLACEMENT

2. Replace the seal as follows:

- (1) Liberally lubricate the seal lip and the surface of the crankshaft with engine oil.

NOTE

The direction of crankshaft rotation is indicated on the seal by an arrow.

- (2) Carefully fit the seal to the crankshaft journal, turning it in the opposite direction to the arrow (clockwise).

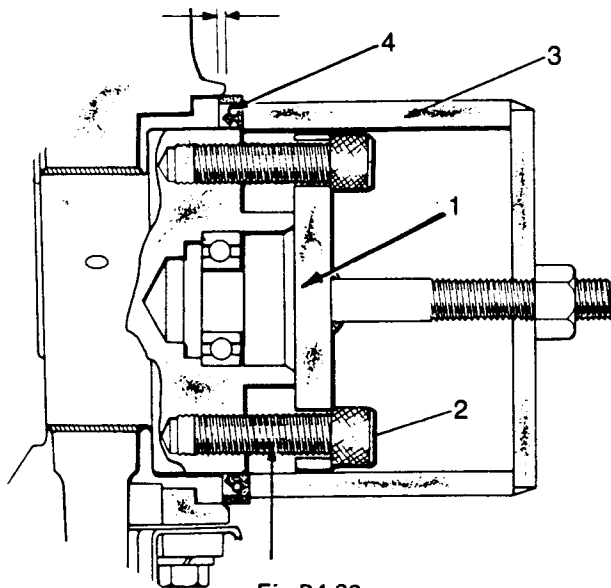


Fig B4.60

- (3) Refer to Fig B4.60. Secure the seal replacer adaptor 18GA044 (1) to the end of the crankshaft with the screws (2) as shown.

SUB-SECTION B4

CHAPTER 9

CRANKSHAFT - REMOVAL AND REPLACEMENT

REMOVAL

1. For this operation, first carry out the following procedure:
 - (1) Remove the engine (see Sub-section B4, Chapter 1).
 - (2) Remove the clutch (see Sub-section H3.4, Chapter 1).
 - (3) Remove the flywheel (see Sub-section B4, Chapter 13).
 - (4) Turn the engine over and remove the sump (see Sub-section B4, Chapter 17).
 - (5) Remove the engine back plate and adaptor plate.
 - (6) Remove the oil pump (see Sub-section B4, Chapter 16).
 - (7) Remove the oil pump drive shaft (see Sub-section B4, Chapter 2).
 - (8) Remove the crankshaft pulley and vibration damper assembly (see Sub-section B4, Chapter 6).
 - (9) Remove the oil reservoir front seal, seal housing and crankshaft oil seal (see Sub-section B4, Chapter 7).
 - (10) Remove the crankshaft rear oil seal (see Sub-section B4, Chapter 8).
 - (11) Remove the distributor drive shaft assembly (see Sub-section B4, Chapter 3).

2. To remove the crankshaft:

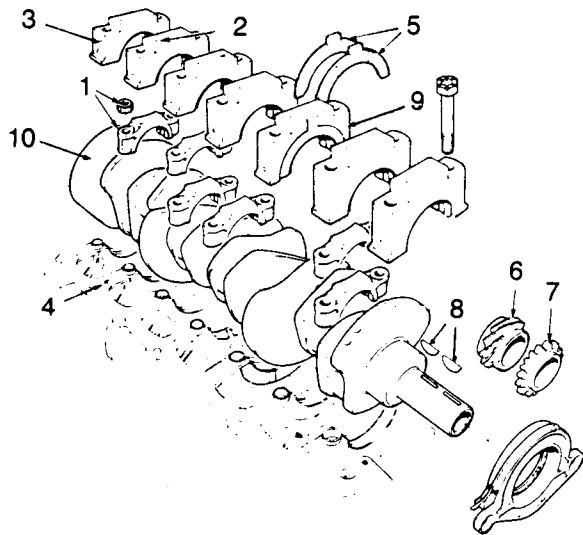


Fig B4.61

- (1) Refer to Fig B4.61. Remove the connecting rod caps (1) maintaining them in their correct order for replacement.
- (2) Remove the main bearing caps (2) noting the location stamping. The caps are number stamped on the LH side (3) and corresponding numbers are stamped on the LH side main bearing webs adjacent to the cap joint (4) to ensure correct replacement.
- (3) Lift the crankshaft from the engine and recover the thrust washers (5) from both sides of No 3 main bearing housing (9).
- (4) Remove the gear (6), sprocket (7) and keys (8) as necessary.

INSPECTING

3. Inspect the crankshaft as follows:
 - (1) Thoroughly clean the crankshaft ensuring that there is no foreign material remaining in the oilway.
 - (2) Check the main and connecting rod journals for size and wear.
 - (3) Check the condition of the thrust faces at No. 3 main journal.
 - (4) Check the condition of the spigot bearing (10).

REPLACEMENT

4. Note that Fig B4.61 still applies. To replace the crankshaft:

- (1) Replace the keys (8), gear (6) and sprocket (7) if these have been removed.
- (2) Fit bearing shells to their respective housings.
- (3) Lubricate the crank shaft journals and install shaft in the crankcase.
- (4) Fit the upper half thrust washers in position in the crankcase at No 3 main bearing.
- (5) Install No 3 main bearing cap (9) with its thrust washers (5).

NOTE

The oil grooves in the thrust washers face the crankshaft.

- (6) Install the remainder of the main bearing caps (2) and check the bearing clearances.
- (7) Torque the main bearing bolts to 95 N.m.
- (8) Ensure that the crankshaft turns freely.
- (9) Check and adjust as necessary the crankshaft end float.
- (10) Fit the connecting rod bearing shells and assemble the connecting rods to their shaft journals using new self-locking nuts on the bolts. Tighten the nuts to 42 to 47 N.m.
- (11) Ensure that the crankshaft turns freely.

5. Having now replaced the crankshaft, continue:

- (1) Replace the distributor drive shaft assembly (see Sub-section B4, Chapter 3).
- (2) Fit the crankshaft rear oil seal (see Sub-section B4, Chapter 8).
- (3) Replace the oil reservoir front seal, seal housing and crankshaft oil seal (see Sub-section B4, Chapter 7).

- (4) Refit the crankshaft pulley and vibration damper assembly (see Sub-section B4, Chapter 6).

- (5) Replace the oil pump drive shaft (see Sub-section B4, Chapter 2).

- (6) Refit the oil pump, cleaning the oil pump pick-up strainer first (see Sub-section B4, Chapter 16).

- (7) Fit a new oil filter.

- (8) Replace the engine back plate and adaptor to plate.

- (9) Clean and replace the sump (see Sub-section B4, Chapter 17).

- (10) Replace the flywheel (see Sub-section B4, Chapter 13).

- (11) Refit the clutch (see Sub-section H3.4, Chapter 1).

- (12) Replace the engine (see Sub-section B4, Chapter 1).

- (13) Prime the lubrication system prior to starting the engine:

- a. Fill the engine with oil to the level indicated on the dipstick.
- b. Disconnect the main coil lead.
- c. Remove the spark plug.
- d. Crank the engine on the starter until the oil pressure warning light is extinguished.
- e. Replace the plugs and reconnect the main coil lead.

- (14) Start the engine and check for oil leaks.

- (15) Stop the engine and top up the engine oil as necessary.

- (16) Check engine tune.

SUB-SECTION B4

CHAPTER 10

CYLINDER HEAD AND GASKET - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the cylinder head:

- (1) Disconnect the battery.
- (2) Drain the cooling system (see Sub-section E6).
- (3) Remove the air intake box on the carburettors (see Sub-section C4, Chapter 1).

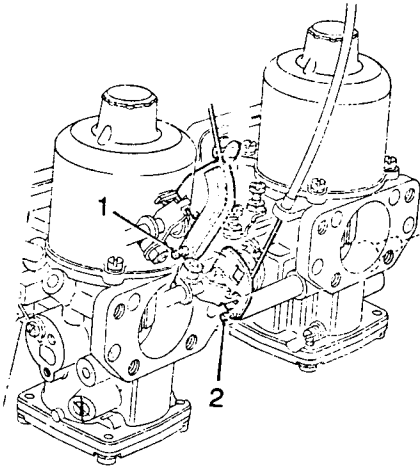


Fig B4.62

- (4) Refer to Fig B4.62. Loosen the fixing (1) and withdraw the accelerator control cable.
- (5) Loosen the fixing (2) and withdraw the mixture (choke) control cable.

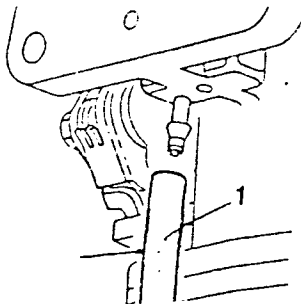


Fig B4.63

- (6) Refer to Fig B4.63. Disconnect the ignition vacuum pipe (1) from the manifold.

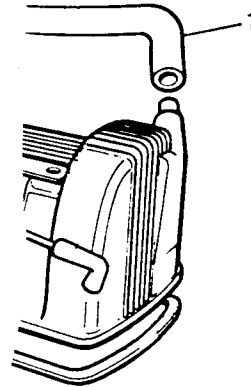


Fig B4.64

- (7) Refer to Fig B4.64. Disconnect the engine breather hose (1) from the cam cover.

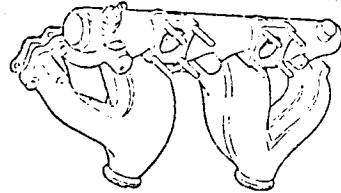


Fig B4.65

- (8) Refer to Fig B4.65. Disconnect the exhaust down pipes (1) from the manifold.
- (9) Disconnect the top radiator hose, the heater hoses and the bypass hose.
- (10) Undo the bolt holding the clamp for the heater hoses on the inlet manifold and lay the hoses to one side.

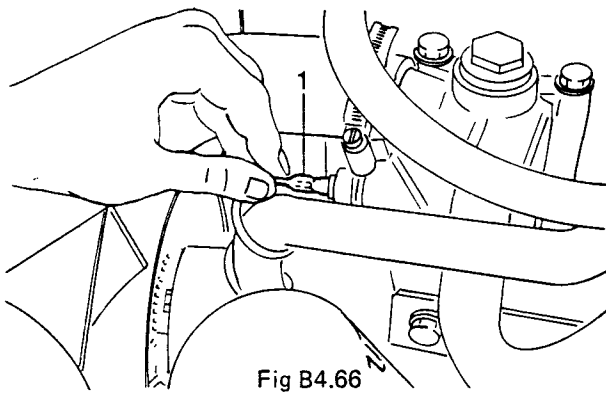


Fig B4.66

- (11) Refer to Fig B4.66. Disconnect the wire (1) from the coolant temperature transmitter. The transmitter is located in the thermostat housing on the left hand upper side of the engine just above the water pump and oil filter.

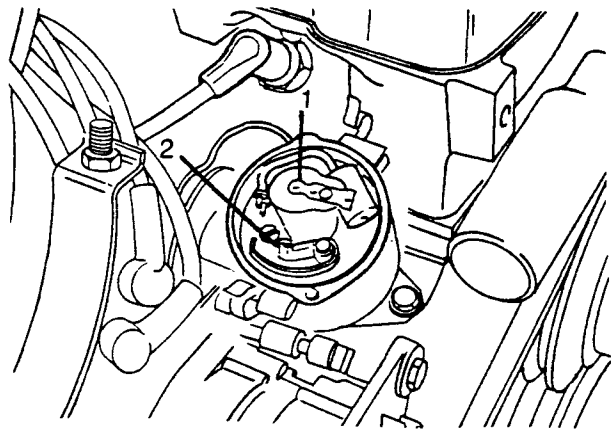


Fig B4.69

- (15) Refer to Fig B4.69. Check that No 1 cylinder is in the firing position (rotor (1) pointing to No 1 cylinder take-off and points (2) opening).

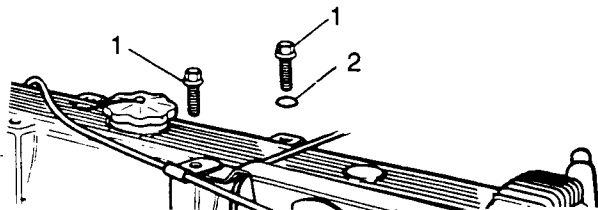


Fig B4.67

- (12) Refer to Fig B4.67. Remove the eight flanged bolts (1) and O-rings (2) securing the cam cover and remove the cover and gasket.
- (13) Remove the distributor cap and the leads from the spark plugs. It may be necessary to rotate the distributor slightly so that the cap does not foul the head when being removed.

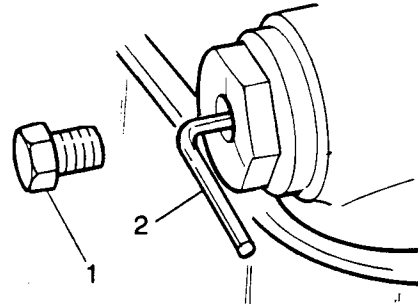


Fig B4.70

- (15) Refer to Fig B4.70. Remove the chain tensioner adaptor screw (1).
- (16) Insert a 3,17 mm allen key (2) and turn it 90° clockwise to retract the chain tensioner.

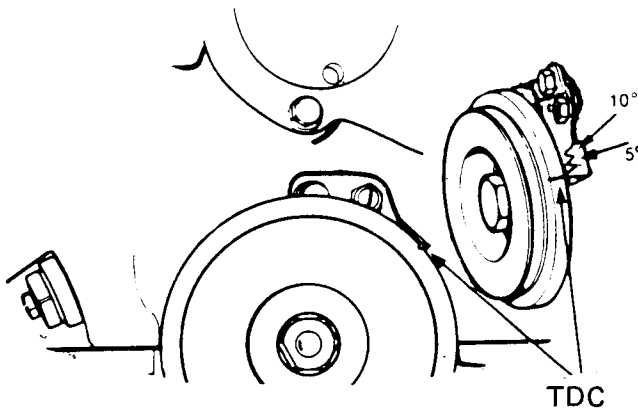


Fig B4.68

- (14) Refer to Fig B4.68. Turn the engine until the mark on crankshaft pulley lines up with the TDC mark on the engine block.

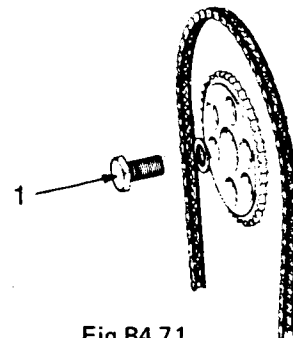


Fig B4.71

- (17) Refer to Fig B4.71. Unscrew the camshaft sprocket retaining screw (1), remove the sprocket and allow the chain to hang over the guides.

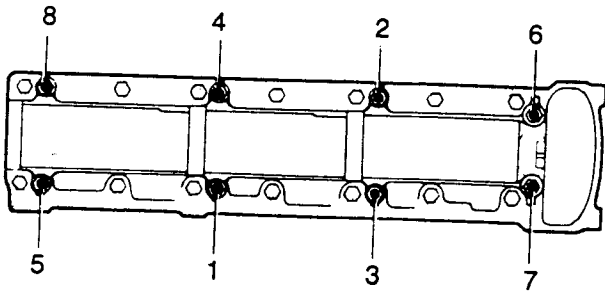


Fig B4.72

- (18) Refer to Fig B4.72. Slacken the cylinder head bolts (1 to 8) gradually in a diagonal sequence starting with bolt (8) and ending with bolt (1) and remove the bolts.

- (19) Lift off the cylinder head and remove the gasket.

REPLACEMENT

2. Replace the cylinder head as detailed below:

- (1) Fit a new cylinder head gasket.
- (2) Replace the cylinder head and bolts. Tighten the bolts gradually in the sequence bolt (1) to bolt (8) (Fig B4.72). Final torque figure for the bolts is 90 N.m.

- (3) Check that the crankshaft pulley mark is still at TDC.

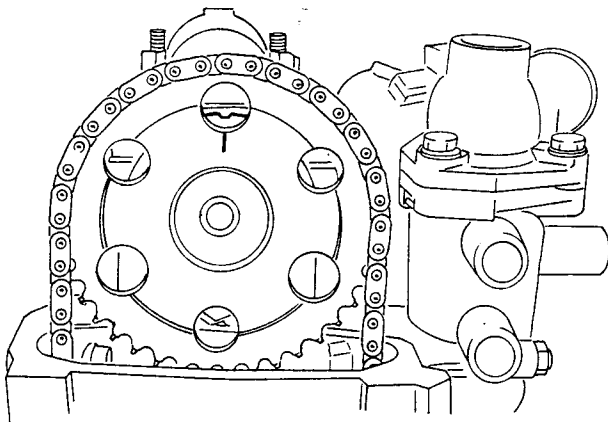


Fig B4.73

- (4) Refer to Fig B4.73. Fit the camshaft sprocket and locating pin. Check that the timing marks on the sprocket and cam cover align, then replace the bolt and tighten to 47 N.m.

- (5) Replace the chain over the sprocket.

- (6) Release the chain tensioner by turning the allen key (Fig B4.70) 90° counterclockwise.

- (7) Remove the allen key and replace the adaptor screw.

- (8) Refit the distributor cap and the spark plug leads.

- (9) Replace the cam cover, using a new gasket and secure with the eight flanged bolts and O-rings. Tighten the bolts to 8 N.m.

NOTE

Do not overtighten the bolts. A bolt flange which touches the alloy cover will promote noise from the valve mechanism.

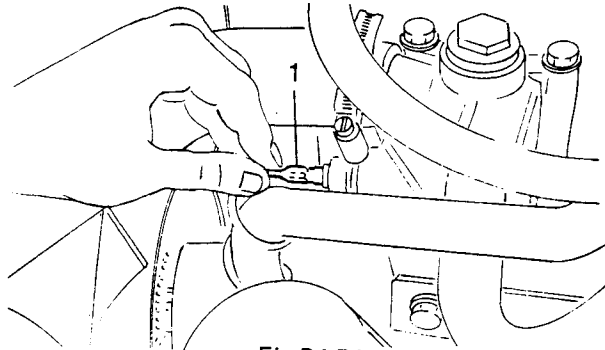


Fig B4.74

- (10) Refer to Fig B4.74. Reconnect the wire to the coolant temperature transmitter (1).

- (11) Position the heater hoses and secure with the clamp on the inlet manifold.

- (12) Reconnect the bypass hose, the heater hoses and the top radiator hose.

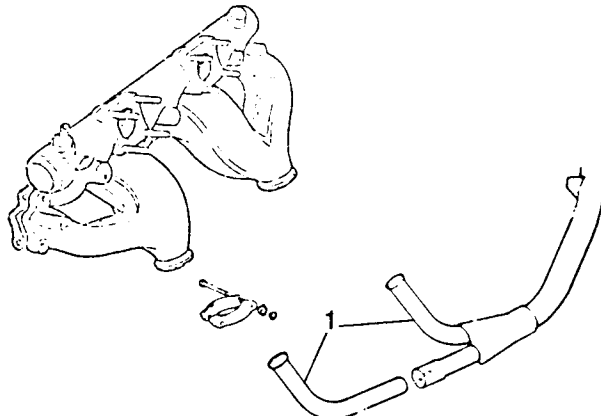


Fig B4.75

- (13) Refer to Fig B4.75. Position and connect the exhaust downpipes (1) to the manifold.

- (14) Connect the engine breather hose to the cam cover (Fig B4.64).

- (15) Connect the ignition vacuum pipe to the manifold (Fig B4.63).

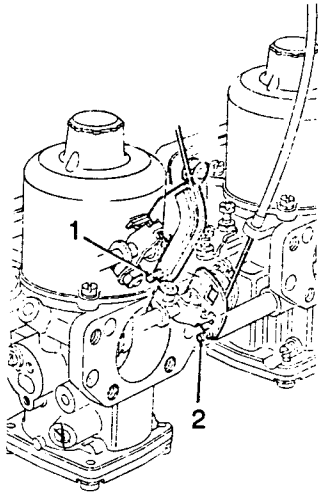


Fig B4.76

- (16) Refer to Fig B4.76. Refit the mixture cable and secure with the fixing (2).

- (17) Replace the accelerator cable and secure with the fixing (1).
- (18) Refit the air intake box over the carburetors (see Sub-section C4, Chapter 1).
- (19) Fill the cooling system (see Sub-section E6).
- (20) Reconnect the battery.
- (21) If the position of the distributor has been disturbed, reset the ignition timing (see Sub-section D3, Chapter 2).

SUB-SECTION B4

CHAPTER 11

CAMSHAFT COVER - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the camshaft cover:

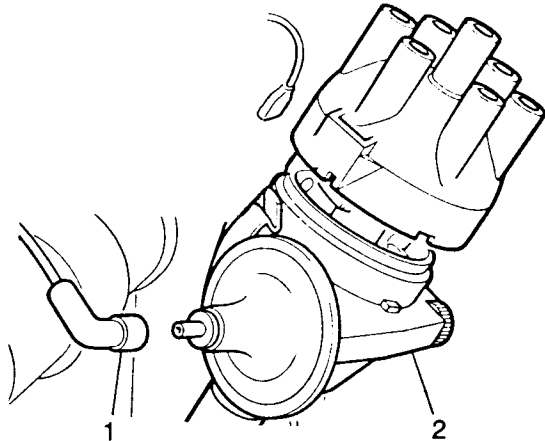


Fig B4.77

- (1) Refer to Fig B4.77. Disconnect the vacuum advance pipe (1) at the distributor (2).

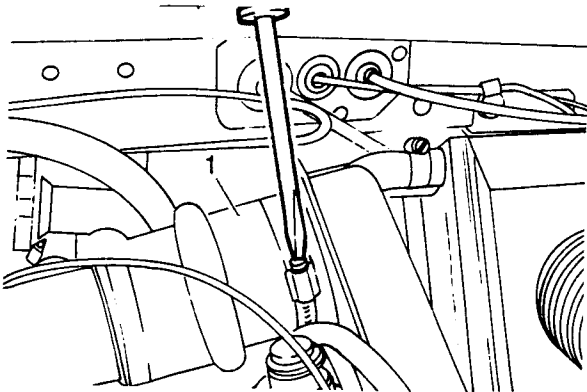


Fig B4.78

- (2) Refer to Fig B4.78. Remove the air intake hose (1) between the air cleaner and the air intake box.

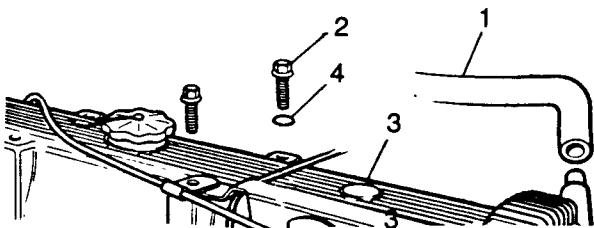


Fig B4.79

- (3) Refer to Fig B4.79. Disconnect the breather pipe (1) from the front of the cam cover (3).
- (4) Starting from the centre of the cover slacken the eight flanged bolts (2).

- (5) Remove the bolts and O-rings (4).
- (6) Move the choke and accelerator cables to one side and lift off the cover over the camshaft carrier.
- (7) Remove the gasket.

REPLACEMENT

2. Replace the cam cover as follows:

- (1) Fit a new cover gasket.
- (2) Replace the cam cover, fitting it under the choke and accelerator cables.
- (3) Fig B4.79 still applies. Examine the O-ring seals (4) for damage or wear. Replace if necessary.
- (4) Fit the flanged bolts (1) and O-rings (2). Tighten the bolts evenly to 8 N.m., working diagonally from the centre. Check that the O-rings (4) stand proud of the bolt flange when the bolts are tightened.

NOTE

Do not overtighten. A bolt flange which touches the alloy cover will promote noise from the valve mechanism.

- (5) Refit the air intake hose and tighten the hose clamps.
- (6) Reconnect the breather pipe to the front of the cam cover (Fig B4.79,(1)).
- (7) Reconnect the vacuum advance pipe to the distributor (Fig B4.77,(1)).

SUB-SECTION B4

CHAPTER 12

FRONT ENGINE MOUNTINGS - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the front mountings:
 - (1) Support the engine with an engine sling.

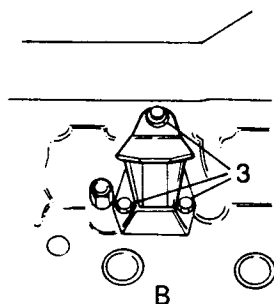
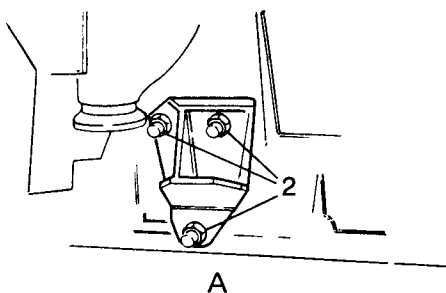
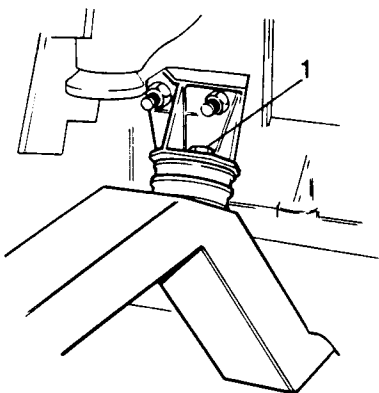


Fig B4.80

- (2) Refer to Fig B4.80. Remove the nuts (1) and spring washers securing the engine mountings to the rubber mountings.
- (3) Remove the nuts (2) and spring washers securing the mountings to the engine brackets (Fig B4.80A - left hand mounting, B4.80B - right hand mounting).
- (4) Remove the mountings.

REPLACEMENT

2. Replace the engine mountings as follows:
 - (1) Fit the mounting into position.
 - (2) Refit the nuts and spring washer securing the mountings of the engine brackets.
 - (3) Replace the spring washers and nuts securing the engine mountings to the rubber mountings.
 - (4) Remove the engine sling.

SUB-SECTION B4

CHAPTER 13

FLYWHEEL - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the flywheel:

- (1) Remove the clutch assembly (see Sub-section H3.4, Chapter 1).

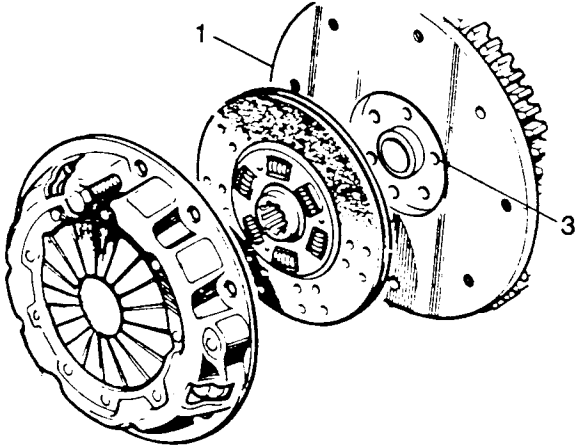


Fig B4.81

- (2) Refer to Fig B4.81. Mark the position of the flywheel (1) in relation of the crankshaft.
- (3) Remove the six bolts (3) and withdraw the flywheel.

REPLACEMENT

2. Replace the flywheel as follows:

- (1) Fit the flywheel to the crankshaft with the six securing bolts, ensuring the positioning marks are aligned.
- (2) Torque the securing bolts to 81 to 88 N.m.
- (3) Replace the clutch assembly (see Sub-section H3.4, Chapter 1).
- (4) Replace the gearbox (see Sub-section H1.3, Chapter 1).

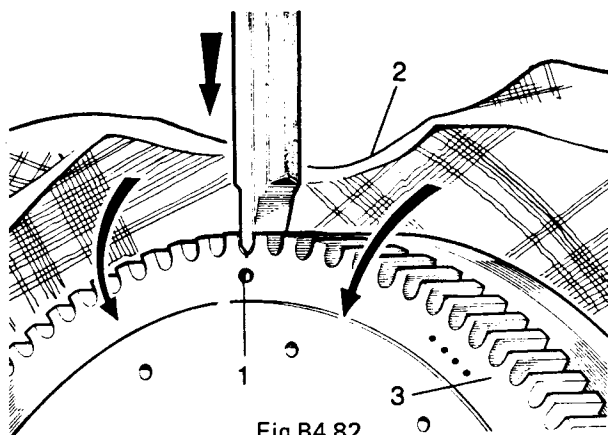
SUB-SECTION B4

CHAPTER 14

STARTER RING GEAR - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the starter ring gear:
 - (1) Remove the flywheel (see Sub-section B4, Chapter 13).



- (2) Refer to Fig B4.82. Drill a 10 mm diameter hole (1) axially between the root of any tooth and the inner diameter of the starter ring sufficiently deep to weaken the ring. DO NOT allow the drill to enter the flywheel.
- (3) Secure the flywheel in a vice fitted with soft jaws and place a cloth (2) over the flywheel as protection from flying fragments.

WARNING

Take adequate precautions against flying fragments as the starter ring gear may fly to pieces when being split.

- (4) Place a chisel immediately above the drilled hole and strike it sharply to split the starter ring gear (3).

REPLACEMENT

2. Replace the starter ring gear as detailed below:
 - (1) Place the flywheel, flanged side down, on a flat surface.
 - (2) Heat the starter ring gear uniformly to between 170 and 175 degrees centigrade but do not exceed the higher temperature.
 - (3) Locate the heated ring gear in position on the flywheel with the chamfered inner diameter towards the flywheel flange.
 - (4) Press the starter ring gear firmly against the flange until the ring contracts sufficiently to grip the flywheel.
 - (5) Allow the flywheel to cool gradually. DO NOT hasten the cooling in any way and thereby avoid the setting up of internal stresses in the ring gear which could lead to subsequent fracture or failure.
 - (6) Replace the flywheel (see Sub-section B4, Chapter 13).

SUB-SECTION B4

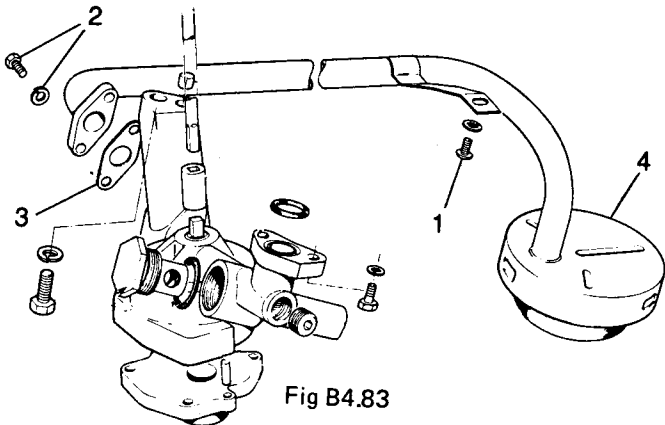
CHAPTER 15

OIL PICK-UP PIPE AND STRAINER ASSEMBLY - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove this assembly:

- (1) Remove the sump (see Sub-section B4, Chapter 17).



- (2) Refer to Fig B4.83. Remove the screw (1) spring, and flat washer securing the support bracket to the main bearing cap. Remove the two screws (2) and spring washers securing the pipe flange to the oil pump. Remove the assembly, detach and discard the flange gasket (3).

REPLACEMENT

2. Replace the assembly as follows:

- (1) Wash the oil strainer (4) in petrol.
- (2) Using a new flange gasket (3), fit the assembly to the oil pump. DO NOT tighten the screws at this stage.
- (3) Check for clearance between the support bracket and the mounting face on the main bearing cap and alignment of the holes. Should clearance or misalignment be present remove the assembly and adjust the bracket.
- (4) Tighten the flange screws and the bracket screw. Ensure that there is no strain on the flange when the three screws are tightened.
- (5) Replace the sump (see Sub-section B4, Chapter 17).

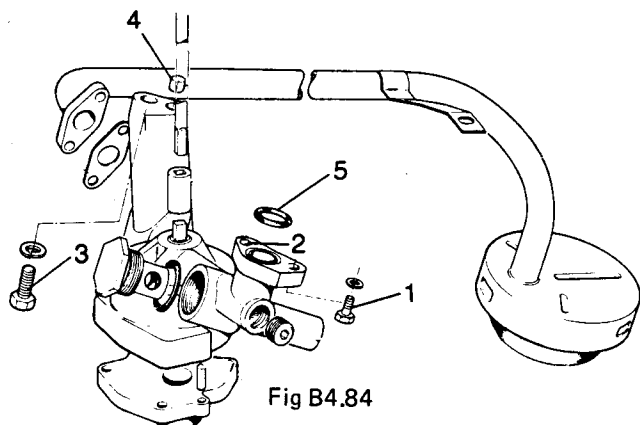
SUB-SECTION B4

CHAPTER 16

OIL PUMP - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the oil pump:
 - (1) Remove the oil pipe pick-up and strainer assembly (see Sub-section B4, Chapter 15).



- (2) Refer to Fig B4.84. Remove the bolt (1) clamping the oil pump outlet sealing ring flange to the crankcase. Left-hand side of the engine. Note that hole (2) is an alternative mounting used in early models. It is not used on this model.
 - (3) Remove the bolt (3) securing the oil pump to the crankcase. Right-hand side of the engine.
 - (4) Lift the oil pump assembly off the locating dowels (4) and recover the outlet sealing ring (5).

NOTE

If the pump is removed with the engine in situ, the square ended oil pump drive shaft disengages from its driving square and drops out.

REPLACEMENT

2. To replace the oil pump: (Fig B4.84 still applies).
 - (1) Fit a new sealing ring (5) to the outlet flange.
 - (2) Ensure that the pump drive shaft is fitted.
 - (3) Fit the pump over the locating dowels (4). Should the pump assembly not sit evenly on both mounting faces due to zero end float between the drive square and the distributor drive shaft, check that the shaft has not disengaged from the distributor at the drive tang. Normal shaft end float should be approximately 2,54 mm.
 - (4) Secure the pump to the crankcase with the bolt (3) and lockwasher. Tighten to 27 to 33 N.m.
 - (5) Replace the bolt (1) and lockwasher holding the pump to the crankcase. Tighten to 8 to 10 N.m.
 - (6) Refit the oil pick-up pipe and strainer (see Sub-section B4, Chapter 15).
 - (7) Prime the engine before starting by cranking with the starter motor having first removed the coil lead and the spark plugs.