

## SUB-SECTION B4

### CHAPTER 17

#### SUMP - REMOVAL AND REPLACEMENT

##### REMOVAL

1. To remove the sump:
  - (1) Remove the engine oil dipstick.
  - (2) Raise the vehicle to a suitable working height and support it with stands.

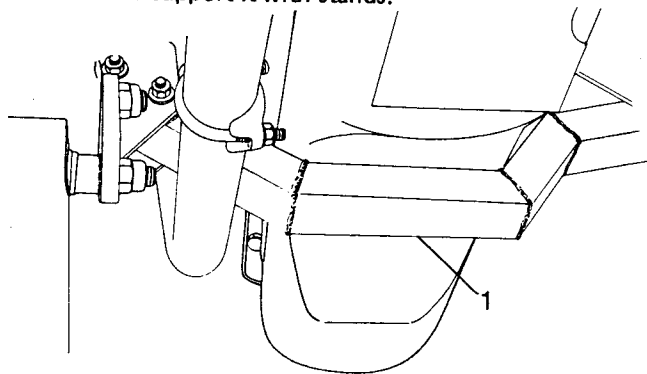


Fig B4.85

- (3) Refer to Fig B4.85. Remove the engine mounting member (1) across the sump (four bolts, washers and locknuts).
- (4) Drain the engine oil (see Sub-section B6).

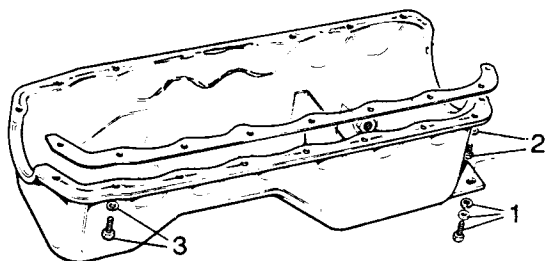


Fig B4.86

- (5) Refer to Fig B4.86. Remove the two bolts, plain and spring washers (1) securing the support plate to the adaptor plate.
- (6) Remove the two 4,76 mm UNC screws (2) and flat washers securing the sump, rear seal and gasket to the adaptor plate.
- (7) Remove the remaining 16 screws and spring washers (3) securing the sump to the cylinder block.
- (8) Lower and remove the sump.

##### REPLACEMENT

2. Replace the sump as detailed below:
  - (1) Check the front and rear sump seals for damage or wear and replace if necessary.
  - (2) Fit a new sump gasket as follows:
    - i. Apply a thin coat of Permatex No 3 jointing compound to the side rails of the crankcase and allow it to become tacky.
    - ii. Apply a thin coat of jointing compound to the underside of each gasket and allow it to become tacky.
    - iii. Position the gasket on the side rails so that all holes line up, and the end of the gasket at the front abuts with the lug on the front seal, while at the same time it is positioned on top of the sealing rib.

##### NOTE

It is not necessary to use jointing compound on the rubber seals.

- (3) Offer up the sump to the crankcase.
- (4) Fig B4.86 still applies. Fit the 16 screws and spring washers (3) and torque to 10 to 13 N.m.
- (5) Replace the two bolts, plain and spring washers (1) securing the support plate to the adaptor plate.
- (6) Refit the two 4,76 mm UNC screws and flat washers (2) securing the sump, rear seal and gasket to the adaptor plate.
- (7) Replace the engine cross mounting member.
- (8) Lower the vehicle to the ground.
- (9) Replace the dipstick and fill with the correct grade of oil.

## SUB-SECTION B4

### CHAPTER 21

#### TIMING CHAIN GUIDES - REMOVAL AND REPLACEMENT

##### REMOVAL

1. To remove the timing chain guides:

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

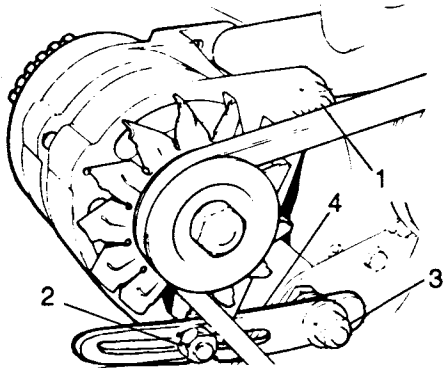


Fig B4.104

(2) Refer to Fig B4.104. Slacken the nuts (1) and (2) and remove the alternator belt.

(3) Remove the nut (3) and take off the alternator adjusting bracket (4).

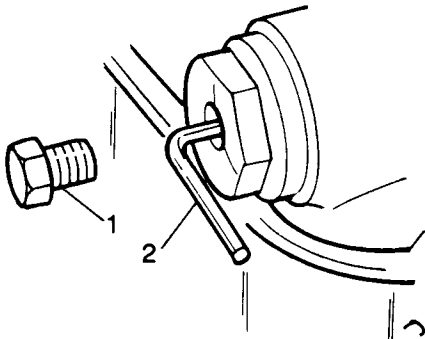


Fig B4.105

(4) Refer to Fig B4.105. 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.

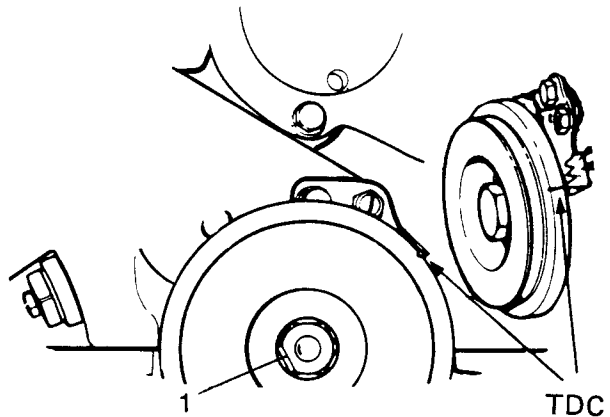


Fig B4.106

(5) Refer to Fig B4.106. Loosen the harmonic balancer bolt (1) using special tool 18G98A.

(6) Set the crankshaft pulley timing mark to the TDC position with No 1 cylinder firing.

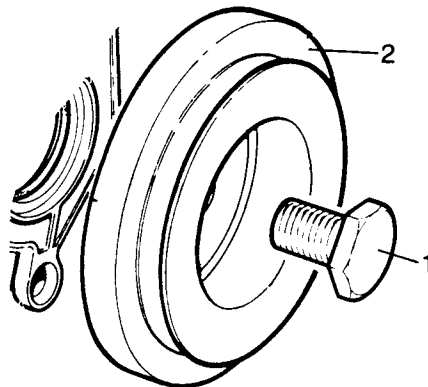


Fig B4.107

(7) Refer to Fig B4.107. Remove the harmonic balancer bolt (1) and pull the crankshaft pulley (2) away.

(8) Remove the camshaft cover (see Sub-section B4, Chapter 11).

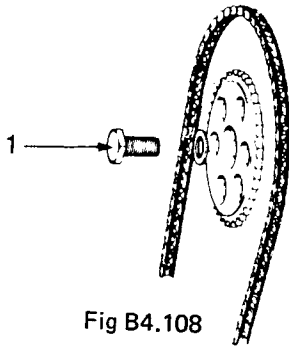


Fig B4.108

- (9) Refer to Fig B4.108. Remove the fixing (1) for the camshaft sprocket and remove the sprocket.

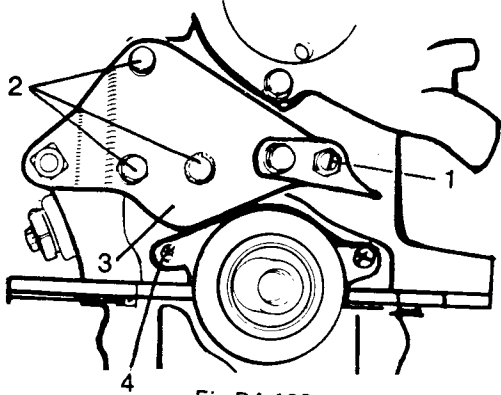


Fig B4.109

- (10) Refer to Fig B4.109. Remove the locknut (1) and three bolts (2) and lift away the timing cover (3).
- (11) Slacken the sump screws sufficiently to lower the sump by approximately 5 mm.
- (12) Remove the two seal housing screws (4). Carefully separate the housing gasket from the sump gasket with a suitable blade or knife and remove the housing.

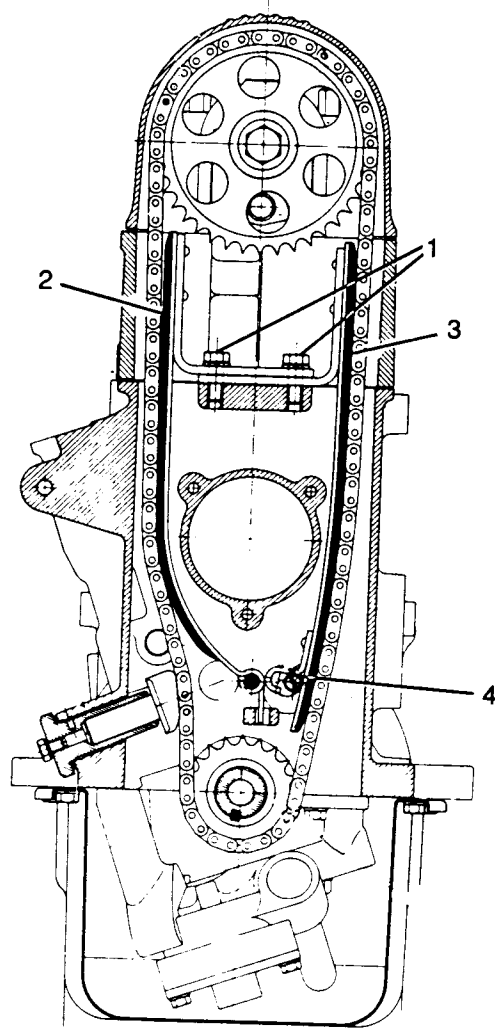


Fig B4.110

- (13) Refer to Fig B4.110. Remove the guide retaining bolts (1).
- (14) Release the RH guide (2) from the engine.
- (15) Release the LH guide (3) from the adjuster (4) at the bottom and remove the guide by lifting and turning through 90° anti-clockwise.

#### REPLACEMENT

2. Replace the chain guides as follows:
  - (1) Replace the LH guide first, turning the cam adjuster to ensure that the guide is vertical.
  - (2) Fit the RH guide.
  - (3) Replace the guide retaining bolts and tighten to 24 to 27 N.m.

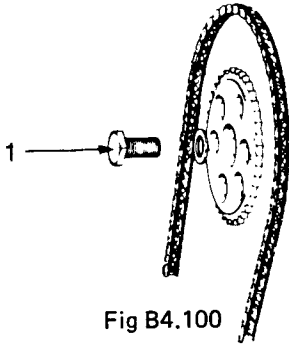


Fig B4.100

- (9) Refer to Fig B4.100. Remove the fixing (1) for the camshaft sprocket and remove the sprocket.

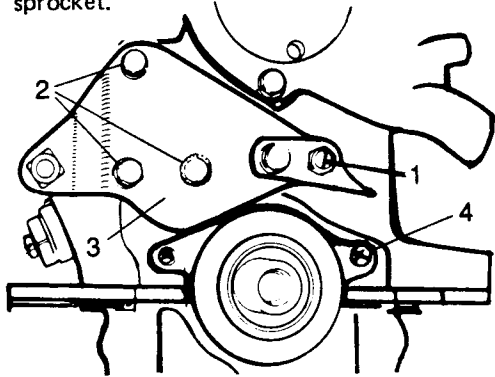


Fig B4.101

- (10) Refer to Fig B4.101. Remove the locknut (1) and three bolts (2) and lift away the timing cover (3).

- (11) Slacken the sump screws sufficiently to lower the sump by approximately 5 mm.

- (12) Remove the two seal housing screws (4). Carefully separate the housing gasket from the sump gasket with suitable blade or knife and remove the housing.

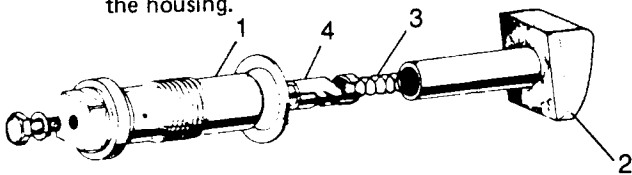


Fig B4.102

- (13) Refer to Fig B4.102. Unscrew the tensioner body (1) from the engine block.

- (14) Turn the cam adjuster stud ((1) on Fig B4.101) to obtain maximum slack in the chain.

- (15) Lever the chain away from the tensioner (2) and turn the tensioner through 180°. Finally push the chain inwards and remove the tensioner through the timing cover aperture.

**NOTE**

In some cases it may be necessary to remove the camshaft sprocket to obtain sufficient chain movement.

**REPLACEMENT**

2. To replace the chain tensioner: (Fig B4.102 still applies).

- (1) Fit the spring (3) and plunger (4) into the tensioner and lock them in place by fitting the Allen key and turning it 90° clockwise. Remove the Allen key.

- (2) Fit the tensioner through the timing hole cover. Push the chain inwards and place the tensioner in position.

- (3) Screw in the tensioner body (1) while holding the tensioner against the chain.

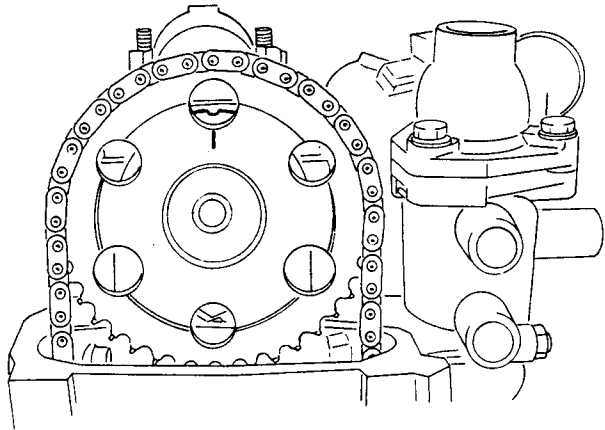


Fig B4.103

- (4) Refer to Fig B4.103. Replace the camshaft sprocket. Check that the timing marks on the sprocket and carrier are aligned.

- (5) Refit the chain over the sprocket.

- (6) Replace the camshaft cover (see Sub-section B4, Chapter 11).

- (7) If the crankshaft sprocket has been removed, replace it and refit the chain.

- (8) Turn the cam adjuster stud ((1) on Fig B4.101) to the point where the slack in the chain is just taken up. Do not overtighten the chain.

- (9) Fit the allen key into the chain tensioner and turn 90° counterclockwise to release the tensioner.

- (10) Replace the seal housing, securing it with the two screws.

- (11) Retighten the sump screws to 10 to 13 N.m.

- (12) Replace the timing cover noting that the dowel bolt goes through the eye at the bottom of the fixed (RH) chain guide. Tighten the other three bolts to 24 to 27 N.m.
- (13) Replace and tighten the locknut on the cam adjuster stud. Do not move the stud while tightening the nut.
- (14) Refit the crankshaft pulley and tighten the harmonic balancer bolt to 81 to 95 N.m. Check that the timing mark is still at TDC.
- (15) Replace the alternator adjusting bracket.
- (16) Replace and tension the alternator bolt. Tighten the three nuts (1), (2) and (3) on Fig B4.96.
- (17) Lower the vehicle to the ground.

## SUB-SECTION B4

### CHAPTER 18

#### OIL PRESSURE RELIEF VALVE - REMOVAL AND REPLACEMENT

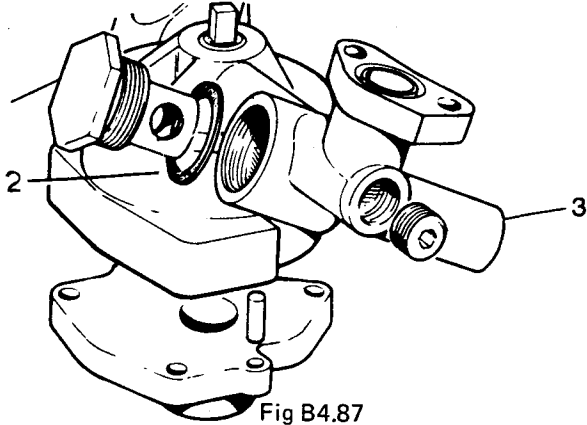
##### INTRODUCTION

1. The oil pressure relief valve is a sealed non-adjustable assembly pressed into the oil pump body. Should a valve be suspect it must be replaced.

##### REMOVAL

2. To remove the relief valve:

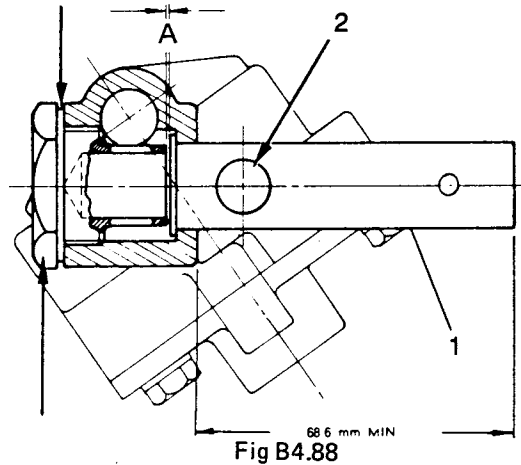
- (1) Remove the oil pump assembly (see Sub-section B4, Chapter 16).



- (2) Refer to Fig B4.87. Remove the relief valve screw plug (1) and copper washer (2).
- (3) Press the valve assembly (3) from the pump body.

##### REPLACEMENT

3. Replace the valve as follows:



- (1) Refer to Fig B4.88. Enter the valve (1) into its housing on the oil pump. This press fit valve must be positioned so that the discharge hole (2) is parallel to the pump mounting face.
- (2) Ensure the valve is square in the housing and press in until the locating flange bottoms in the housing.
- (3) Fit the copper washer and plug assembly and tighten the plug.
- (4) Check that a clearance of 0,05 to 0,5 mm exists at dimension A after the plug is tightened.
- (5) Replace the oil pump assembly (see Sub-section B4, Chapter 16).

**TIMING CHAIN - REMOVAL, FITTING NEW CHAIN AND REPLACEMENT**

**REMOVAL**

1. To remove the timing chain:

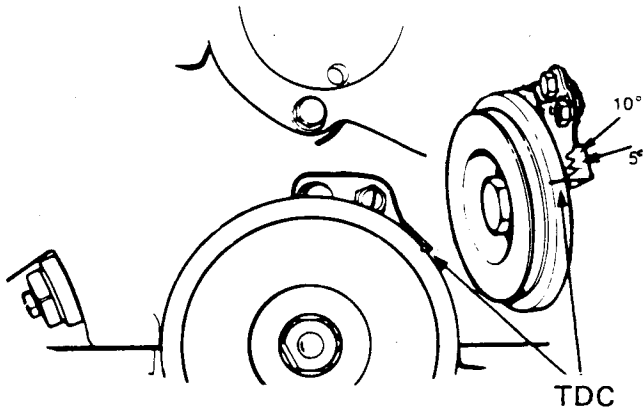


Fig B4.89

- (1) Refer to Fig B4.89. Set the timing marks to TDC. With No 1 cylinder firing (distributor rotor pointing to No 1 cylinder take-off and the points opening).
- (2) Remove the camshaft cover and gasket (see Sub-section B4, Chapter 11).

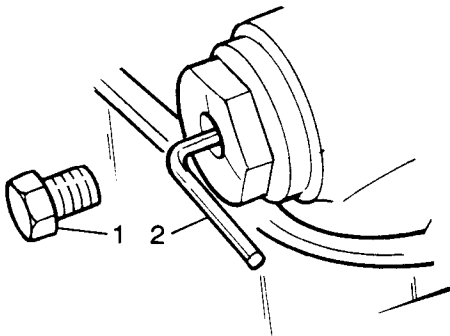


Fig B4.90

- (3) Refer to Fig B4.90. 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.

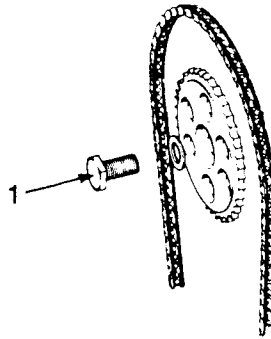


Fig B4.91

- (4) Refer to Fig B4.91. Remove the fixing (1) for the camshaft sprocket and remove the sprocket.

**FITTING NEW CHAIN**

2. The following procedure continues from the removal procedure. To fit a new chain:

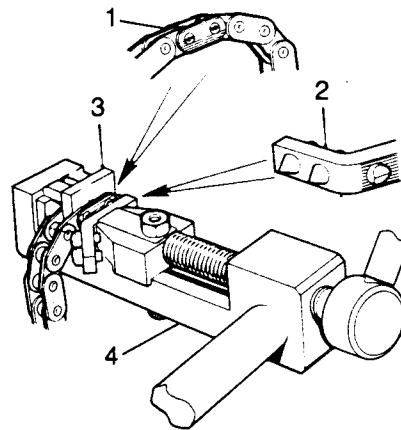


Fig B4.92

- (1) Refer to Fig B4.92. Locate the bright link of the chain (1) in special tool 18G1151 (4).
- (2) Fit the pointed extractor adaptor (2) into the head of the tool sliding press. Fit the bridge-piece of the tool (3) into the bright link.
- (3) Position the link in the front of the tool anvil with the rivet side of the link (link pin heads with horizontal depressions) towards the sliding press of the tool.
- (4) Tighten the press until the link pins shear through the link plate.
- (5) Retract the press and remove the chain.
- (6) Remove the extractor from the press.

- (7) Attach the replacement chain to the old chain with a piece of wire so the old chain will act as 'pull through' to locate the new chain around the guides, tensioner and crankshaft sprocket.

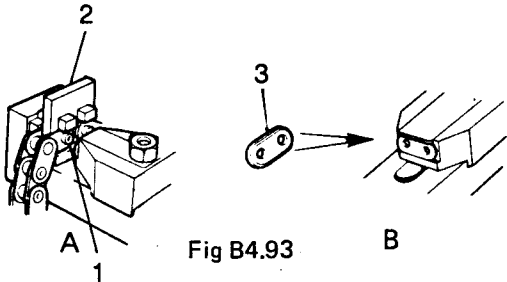


Fig B4.93

- (8) Refer to Fig B4.93. Join the ends of the chain with a new link and position the link in the anvil with the head of the pins towards the press.
- (9) Fit the locating bridge (2) with its legs centralising the link in the anvil.
- (10) Locate the plate of the link (3), chamfered side away from the chain, on the bed of the press.
- (11) Press the plate fully onto the link pins, ensuring that the holes and pins are aligned.
- (12) Retract the press.

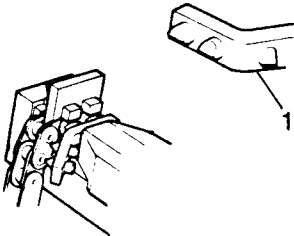


Fig B4.94

- (13) Refer to Fig B4.94. Fit the rivet adaptor (1) into the head of the press and tighten the press fully down onto the pins using hand pressure only on the press tommy-bar.
- (14) Check that a slight side-play exists on the link with no tight spots.

## REPLACEMENT

3. To replace the chain:

- (1) Fit the camshaft sprocket. Tighten the bolt to 47 N.m.

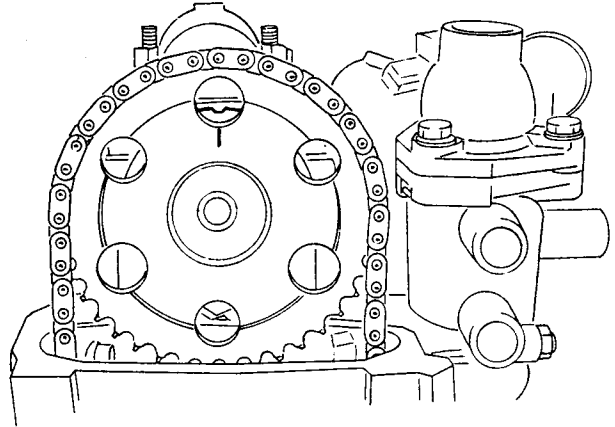


Fig B4.95

- (2) Refer to Fig B4.95. Align the timing marks on the camshaft sprocket and carrier.
- (3) Check that the crankshaft pulley mark is at the TDC position with No 1 cylinder firing.
- (4) Fit the chain over the sprocket, making sure that it is also over the bottom sprocket.
- (5) Release the timing chain tension by turning the allen key 90° counterclockwise. Remove the allen key and replace the adaptor screw (Fig B4.90).
- (6) Replace the camshaft cover (see Sub-section B4, Chapter 11).



## SUB-SECTION B4

### CHAPTER 20

#### TIMING CHAIN TENSIONER - REMOVAL AND REPLACEMENT

##### REMOVAL

1. To remove the timing chain tensioner:

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

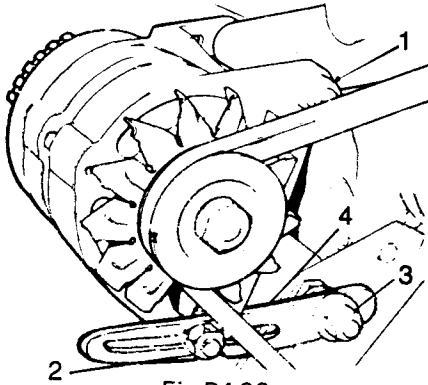


Fig B4.96

(2) Refer to Fig B4.96. Slacken the nuts (1) and (2) and remove the alternator belt.

(3) Remove the nut (3) and take off the alternator adjusting bracket (4).

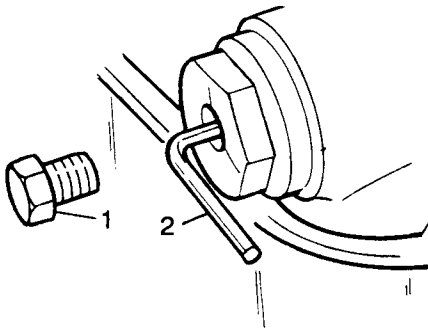


Fig B4.97

(4) Refer to Fig B4.97. Retract the timing chain tensioner by removing the chain tensioner adaptor screw (1), fitting a 3,17 mm allen key (2) and turning key 90° clockwise. Remove the Allen key.

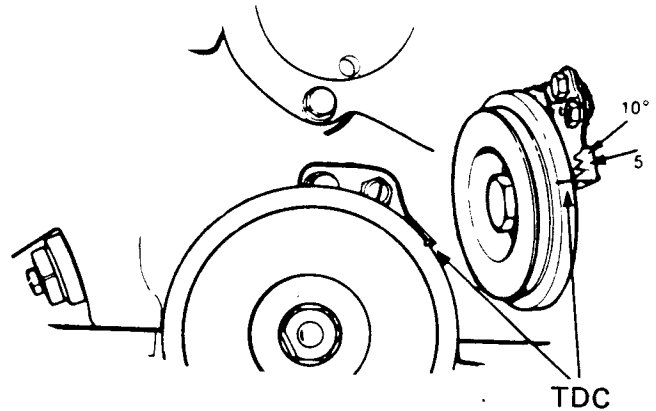


Fig B4.98

(5) Refer to Fig B4.98. Loosen the harmonic balancer bolt (1) using special tool 18G98A.

(6) Set the crankshaft pulley timing mark to the TDC position with No 1 cylinder firing.

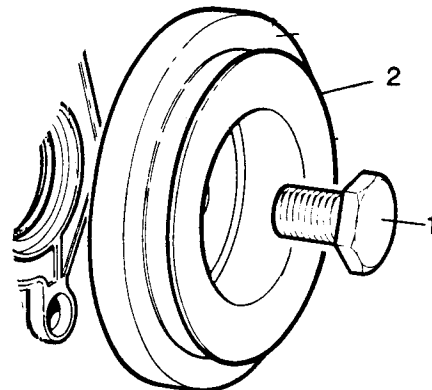


Fig B4.99

(7) Refer to Fig B4.99. Remove the harmonic balancer bolt (1) and pull the crankshaft pulley (2) away.

(8) Remove the camshaft cover (see Sub-section B4, Chapter 11).

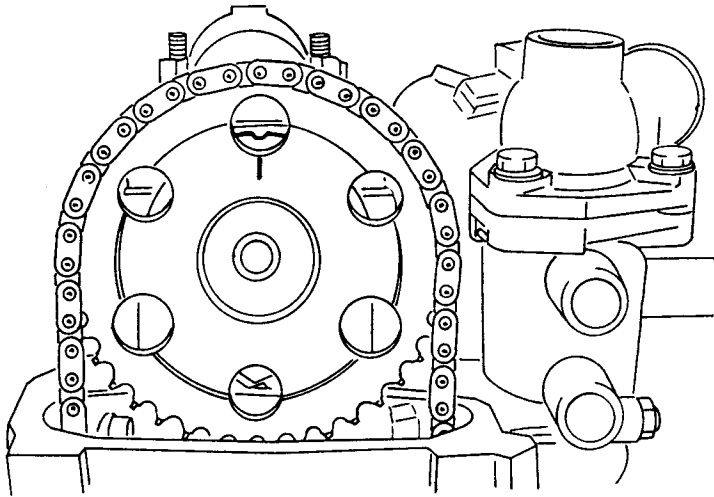


Fig B4.111

- (4) Refer to Fig B4.111. Replace the camshaft sprocket. Check that the timing marks on the sprocket and carrier are aligned.
- (5) Refit the chain over the sprocket.
- (6) Replace the camshaft cover (see Sub-section B4, Chapter 11).

- (7) Turn the cam adjuster stud ((4) on Fig B4.110) to the point where the slack in the chain is just taken up. Do not overtighten the chain.
- (8) Fit the allen key into the chain tensioner and turn 90° counterclockwise to release the tensioner.
- (9) Replace the seal housing, securing it with the two screws.
- (10) Retighten the sump screws to 10 to 13 N.m.
- (11) Refit the crankshaft pulley and tighten the harmonic balancer bolt to 81 to 95 N.m. Check that the timing mark is still at TDC.
- (12) Replace the timing cover noting that the dowel bolt goes through the eye at the bottom of the fixed (RH) chain guide. Tighten the other three bolts to 24 to 27 N.m.
- (13) Replace and tighten the locknut on the cam adjuster stud. Do not move the stud while tightening the nut.
- (14) Replace the alternator adjusting bracket.
- (15) Replace and tension the alternator. Tighten the three nuts (1), (2) and (3) on Fig B4.104.
- (16) Lower the vehicle to the ground.

## SUB-SECTION B4

### CHAPTER 22

#### OIL COOLER AND PIPES - REMOVAL AND REPLACEMENT

##### REMOVAL

1. The oil cooler is located under the radiator. To remove:

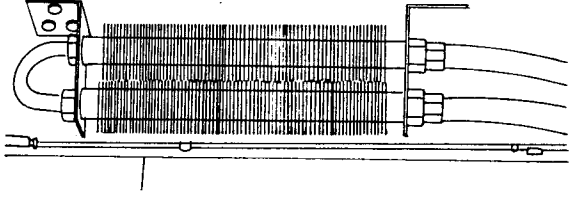


Fig B4.112

- (1) Refer to Fig B4.112. Remove the six nuts and bolts securing the oil cooler to the chassis.
- (2) Lower the oil cooler from the chassis.

- (3) Refer to Fig B4.113. Using a suitable container to catch the oil, disconnect the oil cooler pipes from the oil filter adaptor housing and remove the pipes.

##### REPLACEMENT

2. To replace the oil cooler:
  - (1) Fig B4.113 still applies. Reconnect the pipes to the oil filter adaptor housing.
  - (2) Fig B4.112 still applies. Position the oil cooler on the chassis and secure with the six nuts and bolts.

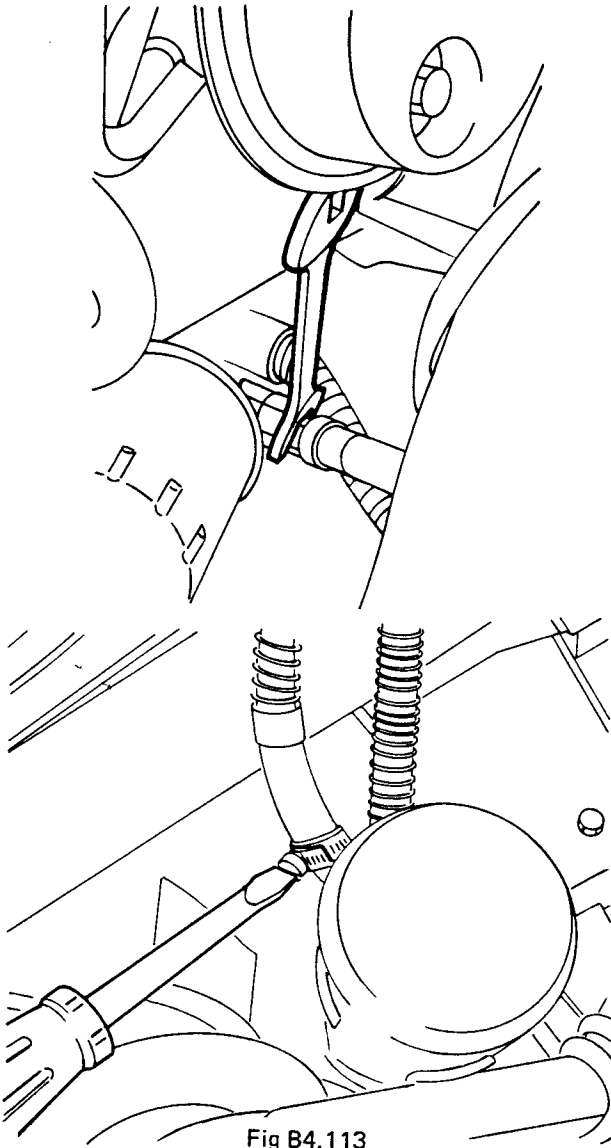


Fig B4.113

**SUB-SECTION CONTENTS LIST**

**SUB-SECTION B5**

**ENGINE OVERHAUL PROCEDURES**

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2	FLYWHEEL - OVERHAUL	B5.5
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## SUB-SECTION B5

### CHAPTER 1

#### CONNECTING RODS AND PISTONS - DISMANTLING AND REASSEMBLY

##### DISMANTLING

1. Remove the connecting rod and piston (see Sub-section B4, Chapter 5) then proceed as follows:

- (1) Remove the piston rings over the crown of the piston.

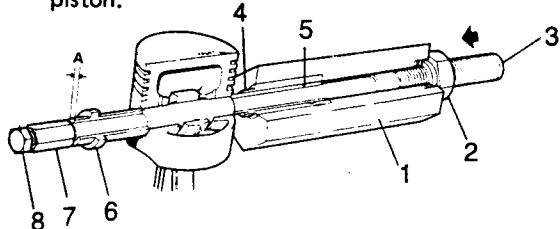


Fig B5.1

- (2) Refer to Fig B5.1. Retain the hexagon body (1) of special tool 18G1150 in a vice.
- (3) Screw the large nut (2) forward until the nut contacts the thrust race.
- (4) Push the screw (3) forward until the nut contacts the thrust race.
- (5) Locate the piston adaptor (4) of 18G1150D in the bore of the body with its spigot facing outwards.
- (6) Smear the outside diameter of the parallel sleeve (5) with oil and fit the sleeve onto the centre screw, groove end first.
- (7) Fit the piston, with the mark "FRONT" or  $\Delta$  etched on the piston crown towards the adaptor, and onto the centre screw of 18G1150.

##### CAUTION

The gudgeon pin bore is offset towards the distributor side of the engine. A gudgeon pin counter bore is on the forward side of the piston only (marked "FRONT" or  $\Delta$  on the piston crown).

- (8) Fit the remover/replacer bush (6) on the centre screw with the flanged end away from the gudgeon pin.
- (9) Screw the stop-nut (7) onto the centre screw and adjust it until approximately 1,0 mm end-play (dimension A) exists on the assembly.
- (10) Lock the stop-nut securely with the lock screw (8).
- (11) Check that the remover/replacer bush and parallel sleeve are correctly positioned in the bore on both sides of the piston.
- (12) Screw the large nut (2) up to the thrust race.

- (13) Hold the lock screw (8) and turn the large nut until the gudgeon pin is withdrawn from the piston.

##### REASSEMBLY

2. To reassemble the connecting rods and pistons:

- (1) Check the connecting rod alignment.
- (2) Remove the large nut of 18G1150 and pull the centre screw out of the body approximately 50 mm.

##### CAUTION

Ensure that the threads of the large nut and screw are lubricated.

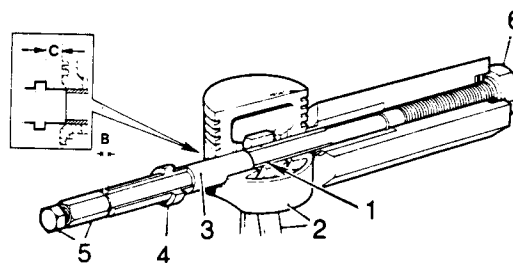


Fig B5.2

- (3) Refer to Fig B5.2. Slide the parallel sleeve (1), groove end last onto the centre screw, and up to the shoulder.
- (4) Lubricate the gudgeon pin and bores of the connecting rod and piston with graphited oil (Acheson's Colloids 'Oildag').
- (5) Fit the connecting rod and piston to the tool (2) with the connecting rod entered on the sleeve up to the groove.
- (6) Fit the gudgeon pin (3) into the piston bore up to the connecting rod.
- (7) Fit the remover/replacer bush (4) with the flanged end towards the gudgeon pin.
- (8) Screw the stop-nut onto the centre screw; adjust the nut to give a 1,0 mm end-play (dimension B) and lock the nut securely with the lock screw (5).
- (9) Screw the large nut up to the thrust race (6).
- (10) Set the torque wrench to 16 N.m (this represents the minimum load for an acceptable fit).
- (11) Using a torque wrench on the large nut, and holding the lock screw, pull the gudgeon pin in until assembly dimension (dimension C) is 8,5

mm. Under no circumstances must the flange of the remover/replacer bush be allowed to contact the piston.

**CAUTION**

*If the torque wrench has not broken through-out the pull, the fit of the gudgeon pin to the connecting rod is not acceptable and necessitates the renewal of components. The large nut and centre screw of the tool must be kept well oiled.*

(12) Remove the tool.

(13) Check that the piston pivots freely on the pin, also with sideways movement, and that the gudgeon pin will not foul the bore. If stiffness exists, wash the assembly in fuel or paraffin (kerosene), lubricate the gudgeon pin with Acheson's Colloids 'Oildag' and re-check for ingrained dirt or damage.

(14) Check the piston and connecting rod for alignment.

3. Refit the piston rings:

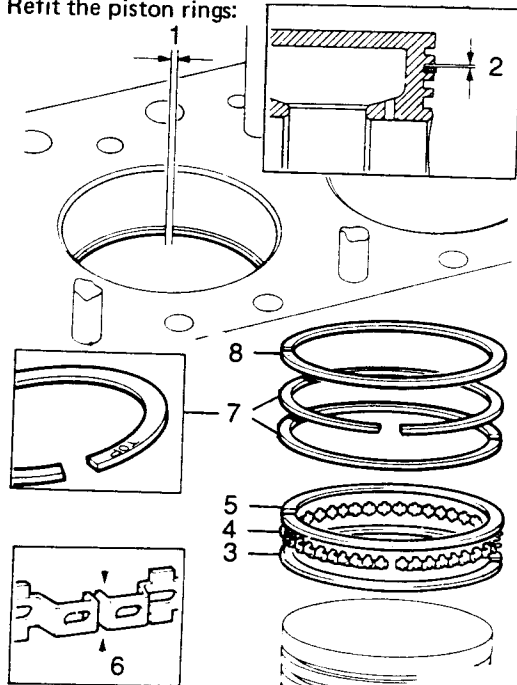


Fig B5.3

(1) Refer to Fig B5.3. Check the piston ring gap in the cylinder bore (1). To be 0,203 to 0,43 mm.

(2) Check the ring to groove clearance (2). To be 0,038 mm.

(3) Fit the bottom rail (3) to the oil control ring to the piston, and position it below the bottom groove.

(4) Fit the oil control expander (4) into the bottom groove.

(5) Move the bottom oil control ring into the bottom groove.

(6) Fit the top control ring rail (5) into the bottom groove.

(7) Check that the ends of the expanders are butting (6) but not overlapping and set the gaps of the rails and expander at 90 degrees to each other.

(8) Fit the tapered compression ring (7) with the face marked 'Top' towards the top of the piston; these rings are thinner than the top compression ring.

(9) Fit the plain compression ring (8) to the top groove.

(10) Position the ring gaps at 90 degrees to each other and away from the thrust side of the piston.

4. Replace the connecting rod and piston assembly (see Sub-section B4, Chapter 5).

mm. Under no circumstances must the flange of the remover/replacer bush be allowed to contact the piston.

**CAUTION**

*If the torque wrench has not broken through-out the pull, the fit of the gudgeon pin to the connecting rod is not acceptable and necessitates the renewal of components. The large nut and centre screw of the tool must be kept well oiled.*

(12) Remove the tool.

(13) Check that the piston pivots freely on the pin, also with sideways movement, and that the gudgeon pin will not foul the bore. If stiffness exists, wash the assembly in fuel or paraffin (kerosene), lubricate the gudgeon pin with Acheson's Colloids 'Oildag' and re-check for ingrained dirt or damage.

(14) Check the piston and connecting rod for alignment.

3. Refit the piston rings:

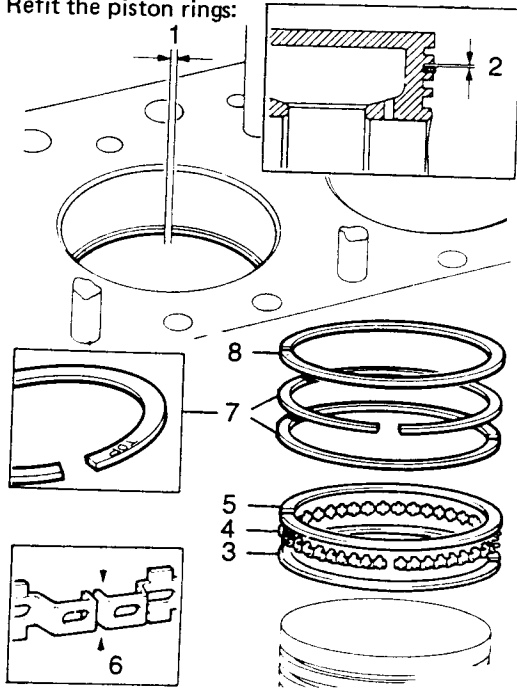


Fig B5.3

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(10) Position the ring gaps at 90 degrees to each other and away from the thrust side of the piston.

4. Replace the connecting rod and piston assembly (see Sub-section B4, Chapter 5).

## SUB-SECTION B5

### CHAPTER 2

#### FLYWHEEL - OVERHAUL

##### PROCEDURE

1. Overhaul the flywheel as follows:

- (1) Remove the flywheel (see Sub-section B4, Chapter 13).
- (2) Measure the overall thickness of the flywheel. Fit a new flywheel if it is more than 2 mm below the specified thickness of 50 mm.
- (3) If the flywheel is above the minimum thickness, the clutch face may be refaced as follows:

- (4) Remove the dowels.
- (5) Reface the flywheel over the complete surface.
- (6) Check the overall thickness of the flywheel to ensure that it is still above the minimum thickness.
- (7) Refit the dowels.
- (8) Replace the flywheel (see Sub-section B4, Chapter 13).



## SUB-SECTION B5

### CHAPTER 3

#### OIL PUMP - OVERHAUL

##### DISMANTLING

1. First dismantle the pump as follows:

- (1) Remove the pump (see Sub-section B4, Chapter 16).

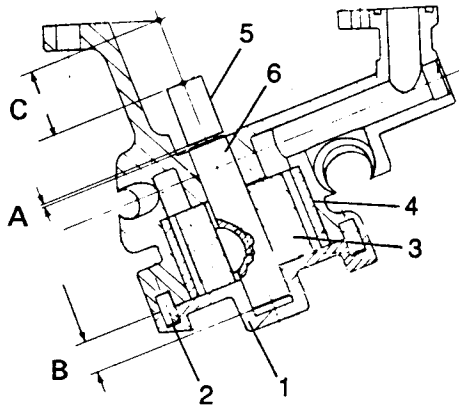


Fig B5.4

- (2) Refer to Fig B5.4. Remove the two screws, spring washers and Allen screw securing the pump cover (1) to the body.
- (3) Remove the cover with O-ring by tapping with a suitable drift on the area adjacent to the dowel bosses (2).
- (4) Identify the rotor lobe (3) with its mating cavity in the outer ring (4) to facilitate correct assembly.
- (5) Remove the outer ring, clean and dry all components.
- (6) Only remove the drive square (5) if it is to be replaced. Grip the square at the driving end and drift out the rotor shaft (6).

##### INSPECTING

2. Inspect the components as follows:

##### NOTE

The only serviceable components of the oil pump are the drive square and relief valve assembly. The oil pump must be renewed as an assembly if the rotor lobe clearance is in excess of 0,14 mm.

- (1) Check the drive square for looseness and position on the shaft. A clearance of 0,76 mm must exist between the bottom of the square and the shoulder of the shaft (dimension A).
- (2) Check for indication of flaring or splitting of the square at the drive end.

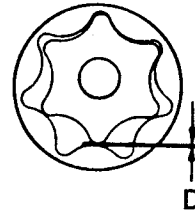


Fig B5.5

- (3) Refer to Fig B5.5. Fit the outer ring in its original running position and check rotor lobe clearance using feeler gauges (dimension D). Clearance to be 0,089 to 0,127 mm.

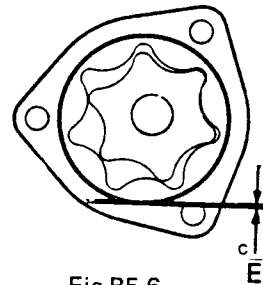


Fig B5.6

- (4) Refer to Fig B5.6. Check outer ring to body clearance (dimension E). Clearance to be 0,28 mm maximum.

##### NOTE

The outer ring to body clearance (dimension E) will be nil when checking rotor lobe clearance.

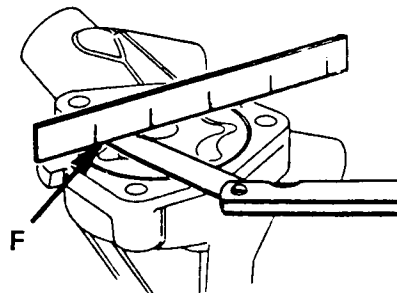


Fig B5.7

- (5) Refer to Fig B5.7. Check the outer ring end float (dimension F). Float to be 0,11 to 0,12 mm.
- (6) Check rotor end float. To be 0,11 to 0,14 mm.

##### REASSEMBLY

3. To reassemble the pump:

- (1) Lubricate the rotor and shaft assembly if removed.

- (2) Mount the pump vertically under a press ram with the rotor shaft end on the press bed.
- (3) Locate the square drive and press on until it is 0,6 mm from the shoulder.

**NOTE**

The chamfer on the shaft at the shoulder should be visible when the rotor assembly is seated in the body. If the chamfer is not visible check the fitted dimensions of the rotor and shaft as shown in Fig B5.4.

These dimensions are:

Dimension A : 0,76 mm

Dimension B : 12,32 to 12,57 mm

Dimension C : 25,65 to 25,90 mm

- (4) Refit the outer ring with the chamfer toward the pump body and the correct cavity with its mating rotor lobe.
- (5) Fit the bottom cover with O-ring, spring washers, screws and Allen screw.
- (6) Tighten the screws and check that the pump shaft turns freely.

## SUB-SECTION B6

### MAINTENANCE

#### INTRODUCTION

1. General maintenance on the engine requires a regular inspection for obvious defects including oil and coolant leaks from pipes, hoses and connections.
2. At the intervals specified the sump should be drained and replenished with fresh clean oil of the correct grade. Under severe conditions of mud or dust, the first and subsequent oil changes must be more frequent, even to the extent of a daily change. Under deep wading conditions through water carrying mud and grit, a daily oil change is essential.

#### ACCELERATOR CABLE

3. At first service (1 500 km) and thereafter every 10 000 km or 6 months:
  - (1) Lubricate the accelerator cable using clean engine oil paying particular attention to accelerator cross shaft bearings.
  - (2) Check the cable for correct operation and ensure that there is no tendency to stick.

#### CHECKING ENGINE OIL LEVEL

##### NOTE

Whenever the oil level is checked, whether the engine is hot or cold, the vehicle must be parked on a level surface.

4. Check engine oil level daily or weekly depending on operating conditions.

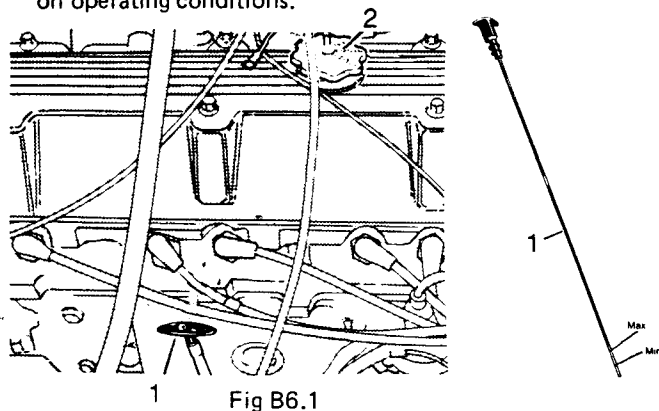


Fig B6.1

- (1) Refer to Fig B6.1. Withdraw the dipstick (1), wipe it with a lint free cloth and reinsert it to its full depth.
- (2) Withdraw the dipstick again and check that the oil level is between the maximum and minimum marks on the dipstick. Reinsert the dipstick.
- (3) If necessary, remove the filler cap (2) and add sufficient oil to take the level close to but not above the maximum mark on the dipstick. Replace the filler cap.

- (4) Under normal circumstances the oil level must never be allowed to fall below the minimum mark on the dipstick.

#### CHANGING ENGINE OIL

##### NOTE

Adhere strictly to the oil qualities and grades specified in the service schedule and Technical Specifications.

##### CAUTION

*The engine must be at operating temperature before the oil is drained. Draining must be carried out soon after the engine has stopped so that suspended pollutants do not settle out.*

5. Drain and refill the sump at first service (1 500 km) and thereafter every 10 000 km or 6 months.

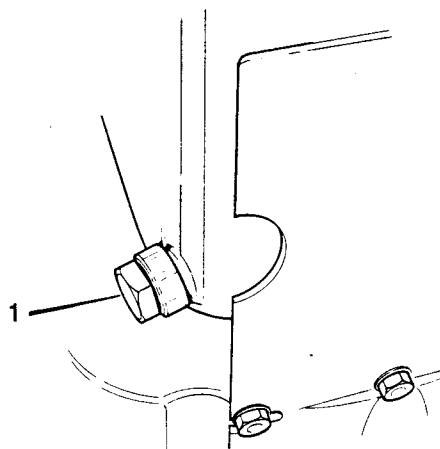


Fig B6.2

- (1) Refer to Fig B6.2. Place a container under the sump drain plug (1). The container must be capable of holding five litres of old oil.
- (2) Remove the oil filter cap ((2) on Fig B6.1).
- (3) Remove the drain plug (1) and allow all oil to drain from the engine.
- (4) Replace the drain plug, using a new copper gasket.
- (5) Change the oil filter (see paragraph below).
- (6) Refill with fresh oil and check the level as described in paragraph 4.
- (7) Run the engine and check for oil leaks at the filter and drain plug.

## CHANGING THE FILTER

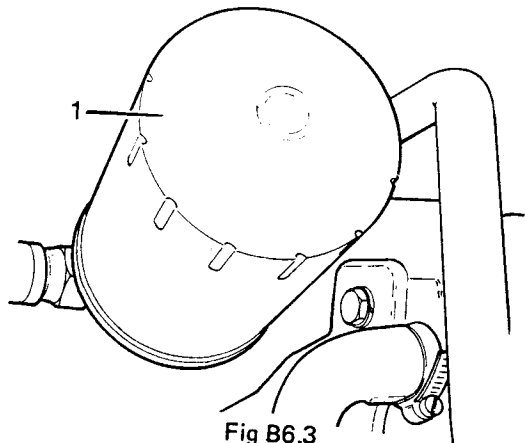


Fig B6.3

6. Refer to Fig B6.3. The filter (1) is located on the left hand side of the engine. Change the filter every 10 000 km or 6 months.

- (1) With the sump drained, unscrew the filter canister.
- (2) Remove and discard the used filter.
- (3) Thoroughly clean the canister.
- (4) Lubricate the sealing washer of the new filter with engine oil.
- (5) Fit the new filter into the canister and screw the canister onto the engine.

## CARBURETTOR HYDRAULIC DAMPERS

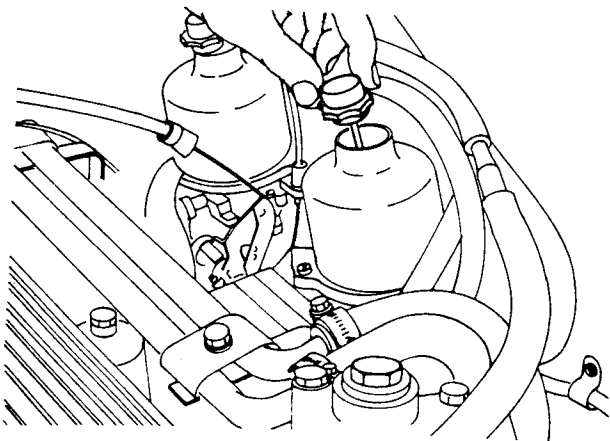


Fig B6.4

7. Refer to Fig B6.4. At first service (1 500 km) and every 10 000 km or 6 months thereafter unscrew the cap on top of the suction chamber and withdraw the hydraulic damper. Replenish the damper reservoir as necessary with SAE 20 oil to within about 12 mm from the top of the tube. Replace the cap and damper.

## CLEANING THE ENGINE

8. It is essential that the external parts of the engine are kept clean. Several methods of cleaning can be used and the choice of method depends on the facilities available and the condition of the engine. Dust can be removed with compressed air. The best method of cleaning, especially if oil or grease are present is using a steam jet.

9. Oil and grease can also be removed using a commercial detergent. Allow time for the detergent to loosen the oil and grease and then wash off with water.

### NOTE

When washing the engine with water take care to protect the starter motor, alternator and all other electrical devices from water splash.

## FLYWHEEL HOUSING DRAIN PLUG

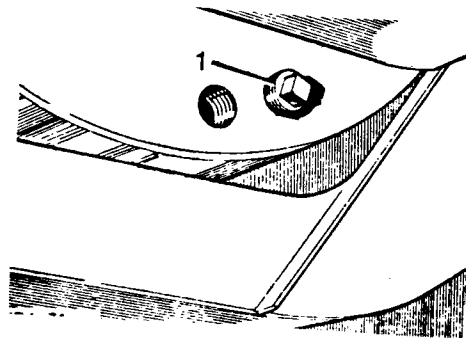


Fig B6.5

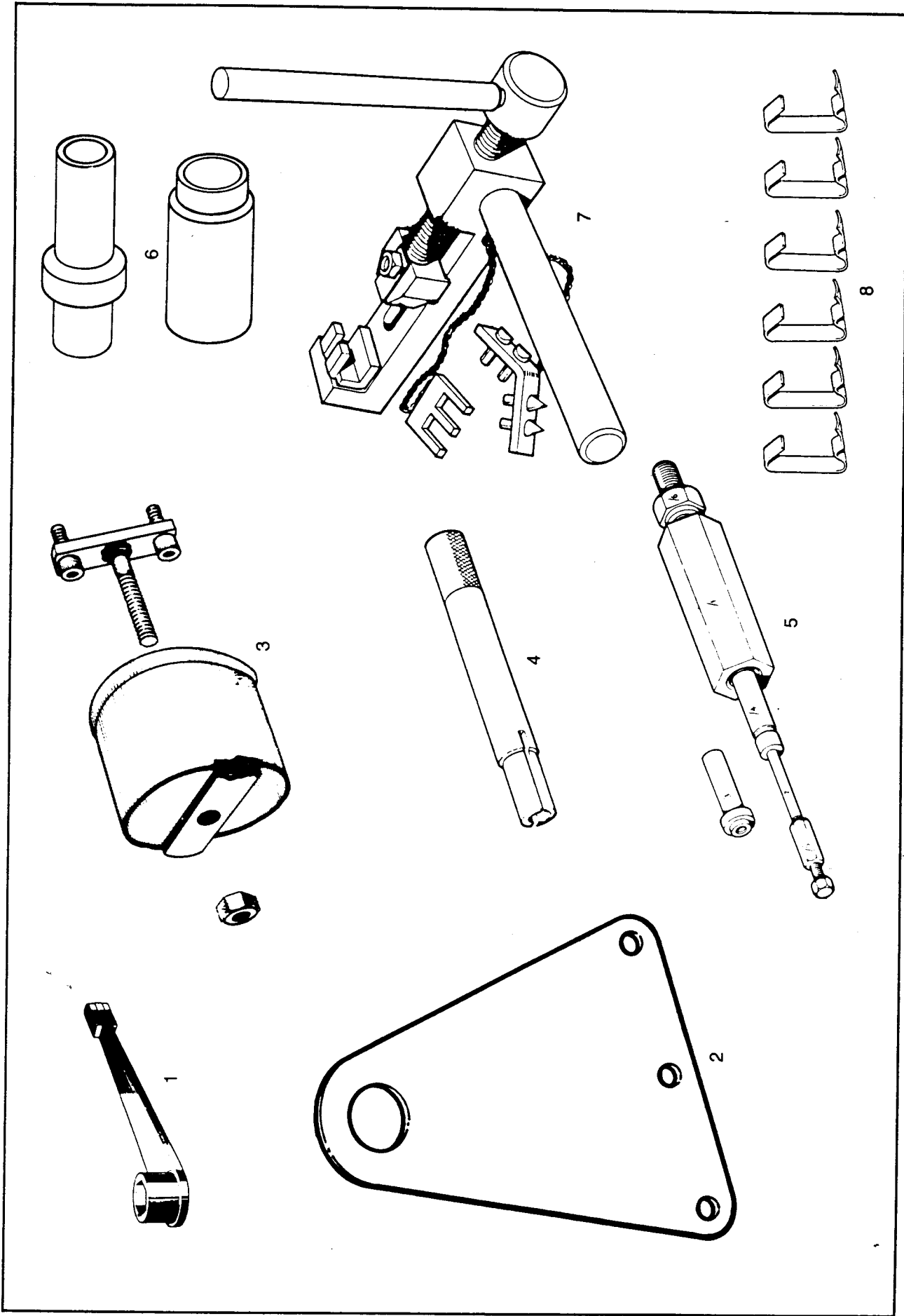
10. Refer to Fig B6.5. The flywheel housing can be completely sealed to exclude mud and water under severe wading conditions, by means of a plug (1) fitted in the bottom of the housing. The plug (1) is screwed into a hole adjacent to the drain hole and should only be fitted when the vehicle is expected to do wading or very muddy work.

11. When the plug is in use it must be removed every 5 000 km or 3 months and all oil allowed to drain off before the plug is replaced.

**SUB - SECTION B7**  
**SPECIAL WORKSHOP TOOLS**

**B7.1**

SPECIAL WORKSHOP TOOLS FOR SECTION B - POWER UNIT



**SPECIAL WORKSHOP TOOLS FOR SECTION B - POWER UNIT**

Item Ref	Mfr. Part No. & / or Drg.No. &/or Spec. No.	I. C. N.	Item Name and Description	Items/ Unit	Repair Lines
Item Verw.	Verv. Ond. Nr. & / of Tek.Nr. &/of Spes.Nr.	I. B. N.	Itemnaam en Beskrywing	Items/ Eenhd.	Herstel Lyne 1 2 4
1	18G98A				
2	18GA041		CRANKSHAFT NUT SPANNER for removing cranskschaft nut		
3	18GA044		ENGINE LIFTING BRACKETS for use with double ended chain		
4	18G1147		REAR CRANKSHAFT OIL SEAL REPLACER for fitting oil seal		
5	18G1150		OIL PUMP DRIVE SHAFT remover and replacer		
6	18G1150D		GUDGEON PIN remover and replacer		
7	18G1151		ADAPTOR for use with 18G1150		
8	18G1218		TIMING CHAIN LINK remover and replacer TAPPET RETAINING CLIPS for use when removing camshaft carrier		

# SECTION CONTENTS LIST

## SECTION C

### FUEL SYSTEM

SUB-SECTION	DESCRIPTION	PAGE
C1	DESCRIPTION AND SPECIFICATIONS	C1.1
C2	FAULT DIAGNOSIS AND CORRECTIVE ACTION	C2.1
C3	CARBURETTORS - TUNE AND ADJUST	C3.1
C4	REMOVAL AND REPLACEMENT PROCEDURES	C4.1
C5	OVERHAUL PROCEDURES	C5.1
C6	MAINTENANCE	C6.1



**SUB-SECTION CONTENTS LIST**

**SUB-SECTION C1**

**DESCRIPTION AND SPECIFICATIONS**

<b>CHAPTER</b>	<b>DESCRIPTION</b>	<b>PAGE</b>
1	DESCRIPTION OF THE FUEL SYSTEM	C1.3
2	SPECIFICATIONS	C1.4

## SUB-SECTION C1

### CHAPTER 1

#### DESCRIPTION OF THE FUEL SYSTEM

##### INTRODUCTION

1. The fuel system consists of a fuel tank, an electric fuel pump, a separate filter and the carburetters. The recommended fuel for the system is Premium grade (coast 93 octane, high altitude 98 octane).

##### TANK

2. The 90 litre fuel tank is mounted at the rear of the vehicle underneath the load area. It incorporates an electrically operated gauge unit connected to an instrument panel meter. The meter gives a constant indication of the amount of fuel in the tank.
3. The filler tube has an anti theft device which prevents removal of fuel by syphoning.

##### PUMP AND FILTER

4. The tank feeds fuel to a vertically mounted Facit fuel pump. This is an electrically operated type which runs immediately the ignition is switched on.

5. The outlet pipe feeds fuel to a separate filter mounted on the rear wall of the engine compartment. The filter has a reusable element which is accessible when the filter body is removed.

##### CARBURETTERS

6. Twin SU HIF6 carburetters are fitted to the inlet manifold, each carburetter feeding three cylinders. The carburetters are of the semi downdraught type. They receive fuel from the filter and air from the air cleaner via an intake box.
7. As the throttle is opened, progressively greater amounts of fuel and air are metered into the engine, thereby increasing engine speed. A manually operated choke is fitted which greatly increases the fuel supply to provide a richer mixture for cold starting.
8. The two carburetters must be balanced to ensure an even metering of fuel to all cylinders and optimum performance of the engine.

## SUB-SECTION C1

### CHAPTER 2

#### SPECIFICATIONS

##### INTRODUCTION

1. General data for the fuel system is given in Table C1.1. These are no torque specifications for the fuel system other than for the carburetter fixings to the inlet manifold studs. This specification is given in Table B1.2.

TABLE C1.1 - GENERAL DATA

ITEM	DESCRIPTION
Carburetter— make	S.U. Twin HIF 6
— type	10 <sup>0</sup> semi-downdraught
— choke size	44,45 mm
— needle	BCP
— spring colour	Red
— jet size	2,54 mm
— damper oil	SAE 20 or 20/30 Multigrade
Carburetter— float level	0,5–1,5 mm
Air cleaner-type	Donaldson Cyclopac
Fuel pump-type	Electric-Facit
Recommended octane rating	93 (coast), 98 (highveld)
Maximum C.O. at idle	3-4%

## SUB-SECTION C2

### FAULT DIAGNOSIS AND CORRECTIVE ACTION

#### INTRODUCTION

1. This Sub-section deals with fault diagnosis and corrective action for the fuel system. In Table C2.1, a list of symptoms, the probable cause and the necessary action is given. It should be noted that the Table is not exhaustive and faults may occur which are not listed. Should the Table fail to give an indication of a fault, the suspected components should be removed for closer inspection and/or overhaul.

TABLE C2.1 - FUEL SYSTEM FAULT DIAGNOSIS CHART

SYMPTOM	POSSIBLE CAUSE	REMEDY
Difficult starting when cold	Insufficient choke action.  Fast idle adjustment incorrect.  Float chamber level too low.  Carburetter flooding.  No fuel supply to carburetter.	Check action of cold start unit to ensure that the choke is being applied fully - adjust choke cable. Check and adjust fast idle setting. Check linkage between choke and throttle for distortion. Check needle valve for sticking (closed). Check float level setting. Check inlet connection filter for blockage. Check external fuel system in accordance with fuel system fault diagnosis. Check needle valve for sticking - (open). Float punctured. Fuel pump pressure too high. Float level too high. Check filters and pump for blockage. Check fuel tank breather and fuel lines for blockage. Remove fuel pump and check operation. Overhaul or fit new pump.
Difficult starting when hot	Choke sticking 'on'.  Blocked air cleaner.  Float chamber level too high.	Check to ensure choke is returning to fully 'off' position, reset as necessary. Fit new air cleaner elements, (check indicator). Check float level setting. Check float arms for distortion. Check needle valve for sticking. Punctured float, fuel pump pressure too high.
Lack of engine power	Piston sticking.  Water in fuel.	Check piston assembly moves freely and returns under spring load - centre jet assembly. Check diaphragm for cracks or porosity. If water is present in float chamber, the complete fuel system should be drained, fuel components should be

		dismantled, inspected for contamination, paying particular attention to filters.
Erractic slow-running or stalling	<p>Float level too low.</p> <p>Incorrect jet setting.</p> <p>Carburettor air leaks.</p> <p>Manifold air leaks.</p>	<p>Check float chamber level. Check for needle valve sticking.</p> <p>Check and reset jet settings in accordance with carburettor overhaul instructions.</p> <p>Check throttle spindle and bearings for wear.</p> <p>Check inlet manifold gasket for leakage. Check inlet manifold for cracks and distortion of mating faces. Check gasket between carburettor and manifold. Check condition of vacuum servo pipes and connections.</p>
Excessive fuel consumption	<p>Blocked air cleaner.</p> <p>Damper oil too thick. Incorrectly adjusted carburettor.</p> <p>Float level too high. Worn jets and needle.</p> <p>Incorrect needle. Choke sticking 'on'.</p> <p>Engine fault.</p>	<p>Fit new air cleaner elements.</p> <p>Replace with correct grade. Check and reset slow running in accordance with carburettor tune and adjust instructions. Check and reset float level. Check and replace as necessary.</p> <p>Check needle type. Check to ensure choke is returning to fully 'off' position, reset as necessary. See engine fault diagnosis.</p>

## SUB-SECTION C3

### CARBURETTERS - TUNE AND ADJUST

#### NOTE

Before servicing or tuning a carburetter in an endeavour to rectify poor engine performance, make sure that the maladjustment or fault is not from another source by first checking:

Valve clearance  
 Spark plug condition  
 Contact breaker (dwell angle)  
 Ignition timing and advance  
 Presence of air leaks into the induction system

#### 1. To tune the carburetters:

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

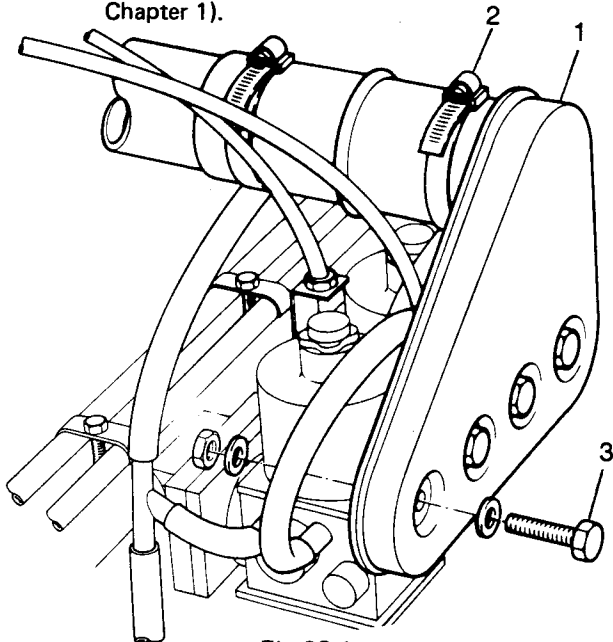


Fig C3.1

(2) Refer to Fig C3.1. Remove the air intake box (1) by disconnecting the air inlet hose (2) and removing the four bolts (3) holding the box to the carburetters. (The bolts have loose nuts and washers behind the box).

(3) Check the throttle for correct operation and free movement with no signs of sticking.

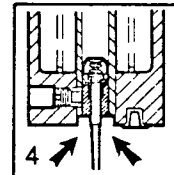
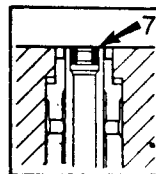
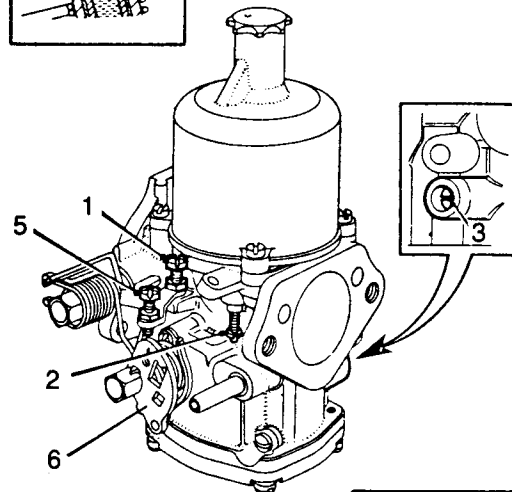
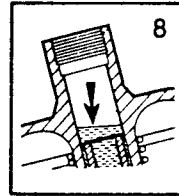


Fig C3.2

(4) Refer to Fig C3.2. Unscrew the throttle adjusting screws (1) until they are just clear of the throttle lever with the throttle closed, then turn the screws (1) clockwise one turn on each.

(5) Raise the piston of each carburetter with the lifting pin (2) and check that it falls freely onto the bridge when the pin is released. If the piston shows any tendency to stick, the carburetter must be serviced.

(6) Lift and support the piston clear of the bridge so that the jet is visible; if this is not possible due to the installed position of the carburetter, remove the suction chamber assembly.

(7) Turn the jet adjusting screw (3) anti-clockwise until the jet (7) is flush with the bridge without exceeding the bridge height. Ensure that the jets on multi-carburetters are in the same relative position to the bridge of their respective carburetters.

(8) Check that the needle shank is flush with the underside of the piston (4).

(9) Turn the jet adjusting screws (3) clockwise until jet is 2,5 mm below bridge (2 1/4 to 2 1/2 turns).

(10) Turn the fast idle adjusting screws (5) anti-clockwise until they are well clear of the cam.