

GROUP 01

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(*) SEE WORKSHOP MANUAL - PETROL ENGINES — GR. 01 -



REMOVAL AND REFITTING OF ENGINE



FOREWORD

This section contains all the data and procedures concerning the operations necessary for the removal and the refitting of the engine fitted in the Alfa Romeo vehicle:

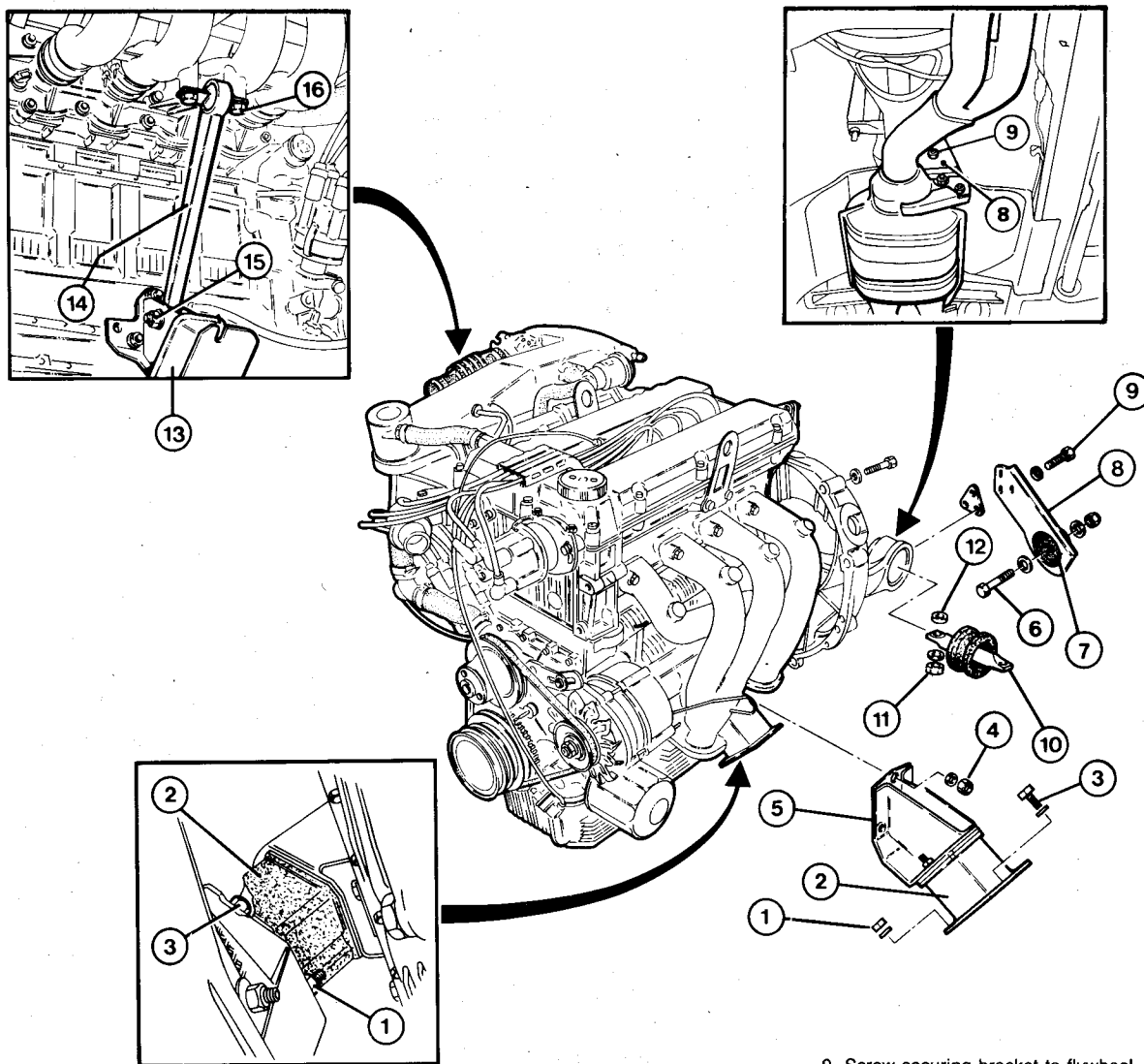


version with catalytic convertor

Given the large number and variety of the operations involved in the removal and refitting of the engine, it is recommended that the operator read the procedures carefully and examine the accompanying illustrations thoroughly in order to obtain a general overall understanding of the engine in question.

The knowledge thus obtained will enable the operator to acquire the correct operational techniques and prevent the oversight of technical data, cautions and warnings.

LOCATION OF ENGINE MOUNTINGS



- 1. Nut securing side mounting to the body
- 2. Elastic component of side mounting
- 3. Screw securing side mounting to the body
- 4. Nut securing mounting to engine block
- 5. Engine mounting - left side

- 6. Bolt securing exhaust tube bracket to rubber-type bushing
- 7. Rubber-type bushing for exhaust tube bracket
- 8. Exhaust tube support bracket

- 9. Screw securing bracket to flywheel housing cover
- 10. Rear engine mounting
- 11. Nut securing rear mounting to body
- 12. Spacer
- 13. Engine mounting - right side
- 14. Air intake support strut
- 15. Bolt securing strut to air intake
- 16. Screw securing strut to air intake

REMOVAL

1. Preliminary operations

a. Place the vehicle on a hydraulic lift and stop the front wheels with appropriate wheel chocks.

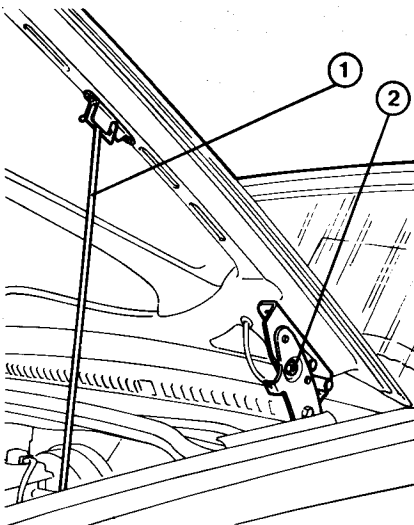
CAUTION:

If the engine is hot will be necessary to operate with care to avoid burns.

b. Open the engine hood and support it with the rod (1). Remove the bolts (2) that limit the movement of each hinge and open the hood as far as it will go.

WARNING:

Protect the resting surfaces of the hood with soft material.



1. Rod
2. Bolts

CAUTION:

For maximum safety, the operator is advised to secure the hood in the manner he feels best. The non observance of this precaution may result in the sudden lowering of the hood.

For the following operations, refer to the figure «View of engine compartment» of the vehicle in question.

- c. Disconnect the positive terminal «+» and the negative terminal «-» of the battery (1).
- d. Unscrew the screw that secures the battery mounting bracket and if necessary remove the battery.
- e. Disconnect the servo-brake vacuum tube from the union on the servo-brake (2) by loosening the relative pipe clip (see detail A).

2. Removal of the air intake system

- a. Disconnect the connector (3) from the air flow gauge.
- b. Disconnect the following tubing from the air intake duct:
 - Peak r.p.m. oil vapour recycling tube (4).
 - By-pass tube for idle r.p.m. regulation (5).
- c. Loosen the clip (6) and disconnect the intake duct (7) from the accelerator housing.
- d. Loosen the clip (8) and remove the air intake duct (7) from the air flow gauge.
- e. Unhook the four spring clips securing the air filter cover (9) and remove it together with the air flow gauge. Also remove the filter element.
- f. If it is felt to be necessary unscrew the three nuts (10) that secure the air filter container (11) to the body and remove it (see detail B).
- g. If it is felt to be necessary loosen the nut of the clip (62) and remove the air duct (63) of the air filter (see detail C).

CAUTION:

Suitably block the inlets of the air intake manifold so as to prevent the introduction of foreign matter.

3. Removal of radiator and tubing of cooling system

- a. Disconnect the following tubes and hoses, preferably removing them from the part indicated:
 - loosen the clip (12) and disconnect the coolant return hose (13) from the thermostat (see detail D);

- loosen the clip and disconnect the coolant delivery hose (14) from the water pump (see detail D);

NOTE:

Place a suitable container under the vehicle to collect the coolant liquid.

- loosen the clip and disconnect the coolant return tube (15) from the water pump (see detail D);
- loosen the clip and disconnect the radiator filler tube (16) from the three way joint (see detail D);
- loosen the clip and disconnect the breather tube (17) from the radiator;
- loosen the clip and disconnect the cooling system breather tube (18) from the single butterfly valve housing joint (see detail E).
- b. Disconnect the electric fan activating lead (20) from the thermostich fitted on the lower right part of the radiator (see detail F).
- c. Disconnect the electric fan power feed lead (21) from the flying connection (see detail F).
- d. Unscrew the securing screw (22) of the radiator (23) to the metal sheet of the body and remove the radiator together with the electric fan.

4. Removal of the fuel system

CAUTION:

- Operate with caution: the fuel supply system may be under pressure.
- Keep the tubing turned upwards in order to avoid spilling of fuel. Also make sure that the workshop is adequately equipped, in order to be able to operate in safety.

- a. Disconnect the fuel return tube (24) from the pressure regulator (25) (see detail G).
- b. Disconnect the fuel delivery tube (26) from the hammering damper (27) (see detail H).

WARNING:

There may be residual pressure between the fuel pump and the hammering damper, which may give rise to a spray of petrol; suitably plug the disconnected tubing (26).

c. Disconnect the fuel vapour recycling tube (64), coming from the solenoid valve from the air intake manifold.

5. Disconnect the accelerator control cable

- a. Turn (forwards) the accelerator control cam right round and slide out the pawl of the accelerator cable (28) inserted in the end of the cam (see detail I).
- b. Remove the accelerator cable (28) from the support bracket (29) extracting it from below (see detail I).

6. Disconnection of electric leads

- a. Disconnect the following electric leads, removing them from the part indicated:
 - high tension lead (30) from the front spark plugs ignition coil;
 - high tension lead (31) from the rear spark plugs ignition coil;
 - minimum and maximum accelerator butterfly switch lead (33) from the respective switch (see detail E);
 - power supply lead (34) from the constant idle regulator actuator;
 - ground leads (35) of the injection system from the right side of the cylinder head cover;
 - engine oil pressure indicator lead (36) from the sensor fitted on the right side of the engine block (see detail M);
 - coolant temperature sensor lead (37) from the sensor fitted on the right part of the intake manifold (see detail M);
 - coolant temperature indicator lead (38) from sensor on rear part of cylinder (see detail M);
 - maximum coolant temperature warning lamp lead (39) from thermocontact on rear part of cylinder head (see detail M);

- r.p.m. and timing sensor lead (40) from connection fitted on right side of engine compartment (see detail N);
- engine ground lead (41), loosen screw on front right side of engine block near hydraulic steering pump (see detail O);
- minimum engine oil pressure warning lamp lead from the flying connection (42) near the alternator (see detail O);
- minimum engine oil level warning lamp lead (43), from the sensor contact fitted on the right side of engine block under the ignition distributor (see detail P);
- timing variator leads (44) from the respective connector on front right side of cylinder head;
- electric fuel injectors power supply leads (45) from the respective connectors;
- alternator power supply lead (46) and warning light lead (47) from the terminal board (48) fitted on the left side of the engine compartment (see detail Q);
- power supply leads (49) and exciting lead (50) from the starter motor (51) fitted on the right side of the rear cover (see detail R);
- lambda sensor connectors (65) and (66) situated on the rear part of the air intake manifold, remove the engine compartment protection (see detail T).

WARNING:

Detach the electric leads from any wire clips and separate them from the engine so as not to obstruct its removal.

7. Removal of compressor and air-conditioner

- a. Working from beneath the vehicle, remove the two bolts that secure the air conditioner compressor support bracket (52) to the engine block.
- b. Remove the compressor drive belt (53).
- c. Move the compressor (52) to the right side of the vehicle and secure it suitably.

d. If it is felt necessary, drain off the Freon and disconnect the compressor from the tube joints.

8. Removal of servo steering pump

- a. Loosen the securing screws of the belt tensioning pulley (54) and remove the servo steering pump drive belt (55).
- b. Loosen the three screws (56) securing the servo steering pump to the support.
- c. Move the servo steering pump (57) to the left side of the vehicle and secure it suitably.
- d. If it is felt necessary drain off or suck out using a syringe, the fluid from the tank (58) and disconnect the tubes from the servo steering pump.

9. Final operations

- a. Loosen, on both sides, but do not remove, the screws (59) that secure the upper part of the engine mountings to the metal sheet of the body (see detail S).
- b. Unscrew the two screws (60) that secure the upper part of the heat shield (61) from left engine mounting (see detail S).

For the following steps of the procedure, refer to the figure «View of the under part» of the vehicle in question.

10. Draining off oil

(if required, according to the operations to be carried out)

- a. Raise vehicle on hydraulic lift.
- b. Unscrew the plug (1) and drain off the engine oil. Screw plug back on when the operation is finished.

11. Removal of exhaust tube

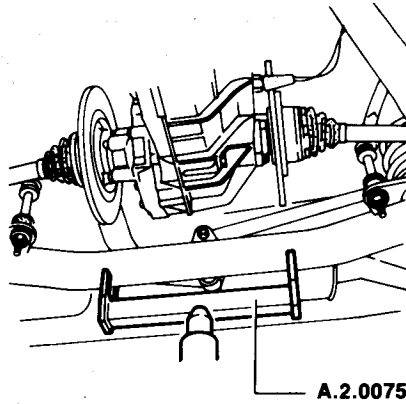
- a. Unscrew the screws and remove the heat shield from the catalytic silencer box (33).
- b. Remove the four nuts which washers (2) connecting the catalytic silencer box (3) of the exhaust tube to the exhaust manifold of the engine.
- c. Loosen the nut (4) that locks the pipe clip (5) connecting the central length of the exhaust tubing to the rear length (6) (see detail A).
- d. Remove the bolts (7) securing the catalytic silencer box to the bracket (8) at the end of the flywheel housing bell.

- e. Unhook the catalytic silencer box (3) from the elastic support rings (9) (see detail B).
- f. Unhook the central length from the elastic support rings and remove the complete exhaust tube from the rear length.
- g. Remove the two screws (10) that secure the lower part of the heat shield, fitted on the left engine mounting, and remove the shield (11).

12. Removal of the propeller shaft

- a. Remove the four screws and remove the upper heat shield (34) of the silencer box.
- b. Remove the central cross piece (13) unscrewing the screws (12) securing it to the body.
- c. Slip off the protective boot (14) and unscrew and remove the bolt (15) connecting the gear selector rod (16) (see detail C). If it is felt to be necessary, unscrew the screws (17) securing the gear lever support (18) and move it so as to facilitate the removal of the propeller shaft (see detail C).
- d. Unscrew the bolts (19) and remove the panel (20) protecting the flywheel (see detail E).
- e. With the gear lever in neutral and turning the propeller shaft (21) appropriately, unscrew alternately the nuts (22) and the bolts (23) that connect the shaft to the flywheel and the clutch fork respectively (see details D and F).
- f. Unscrew the two screws (24) and disconnect the stud (25) of the rear engine mounting from the body (see detail G).
- g. Unscrew the two nuts (26) and disconnect the central support (27) of the propeller shaft from the body (see detail C).
- h. Unscrew the six screws (28) securing the rear cross piece (29) to the body and remove it (see detail B).
- i. Raise the rear axle with a column-type jack equipped with cradle A.2.0075 and slip the propeller shaft off from the clutch fork.

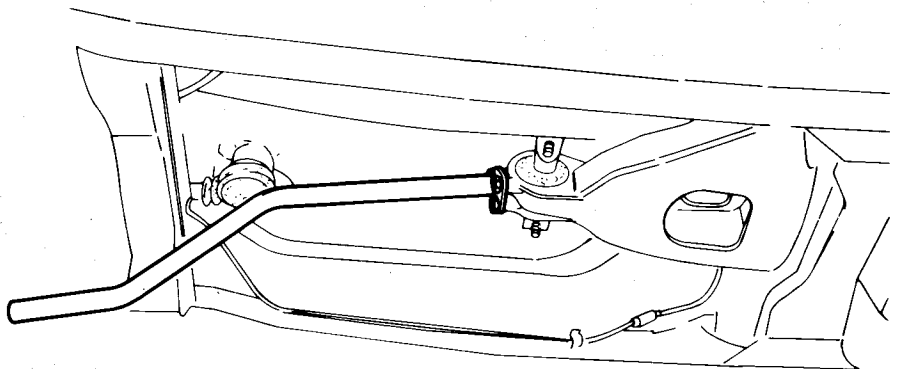
- j. Lower the jack and remove the propeller shaft.



13. Final operations

- a. Fit a suitable lever on the rear engine mounting so as to facilitate the operation of the removal of the engine.
- b. Unscrew and remove the lower securing nuts (30) of the side engine mountings (31) (see detail H).
- c. Lower the hydraulic lift and unscrew and remove the upper securing screws (32) of the side engine mountings (31) (see detail H).
Raise the hydraulic lift again.
- d. Attach the engine to the lifting gear, raise it with an adequate hoist and remove it from the engine compartment manoeuvring it with the lever attached to the rear engine mounting.

CAUTION:
If necessary disconnect the central spark plug leads and remove the spark plugs themselves.



REFITTING

For the following steps of the procedure refer to the figure «View of the under part» of the vehicle in question.

1. Preliminary operations

- a. Fit the manoeuvring lever on the rear engine mounting.
- b. Attach the engine to suitable lifting gear and using a hoist, let it fall gently into the engine compartment, manoeuvring it by the manoeuvring lever.
- c. Centre the engine in the engine compartment resting it on the two side mountings and making sure that the holes for screws and bolts are aligned for both the mountings.
- d. Insert and fully tighten the screws (32) securing the elastic mountings (31) to the body (see detail H) on both sides.
- e. Raise the vehicle and screw and fully tighten the nuts (30) securing the lower part of the elastic mountings to the body (see detail H) on both sides.
- f. Remove the manoeuvring lever from the rear engine mounting.

2. Refitting of the propeller shaft

- a. Carry out the refitting of the complete propeller shaft by reversing the procedure described at step 12. «Removal» taking into account the following:
 - Lubricate the front bushing of the propeller shaft and the spherical seating of the rear joint with 5 cm³ of ISECO MOLYKOTE BR2 grease.
 - If necessary use the same grease to grease the flywheel of the engine.
 - From time to time lock the propeller shaft, preventing it from rotating using the method which is felt to be most suitable and then fully tighten the nuts (22) and the bolts (23) of the elastic joints to the specified tightening torque:

T : Tightening torque
 Nuts and bolts securing the propeller shaft elastic joints to the flywheel and the clutch fork
 55 ÷ 57 N·m
 (5.6 ÷ 5.8 kg·m)

WARNING:
 When refitting use new self-locking nuts.

- Tighten the nuts (26) securing the central support (27) of the propeller shaft

to the floor of the vehicle to the specified torque.

T : Tightening torque
 Nuts securing the central support of the propeller shaft
 93 ÷ 103 N·m
 (9.5 ÷ 10.5 kg·m)

- b. Fix the stud (25) of the rear engine mounting to the body by means of the two screws (24).
- c. Refit the flywheel protection panel (20) tightening the bolts (19).
- d. Refit the gear selector rod (16) by means of the bolt (15) tightening it to the specified torque and then fit on the protective boot (14).

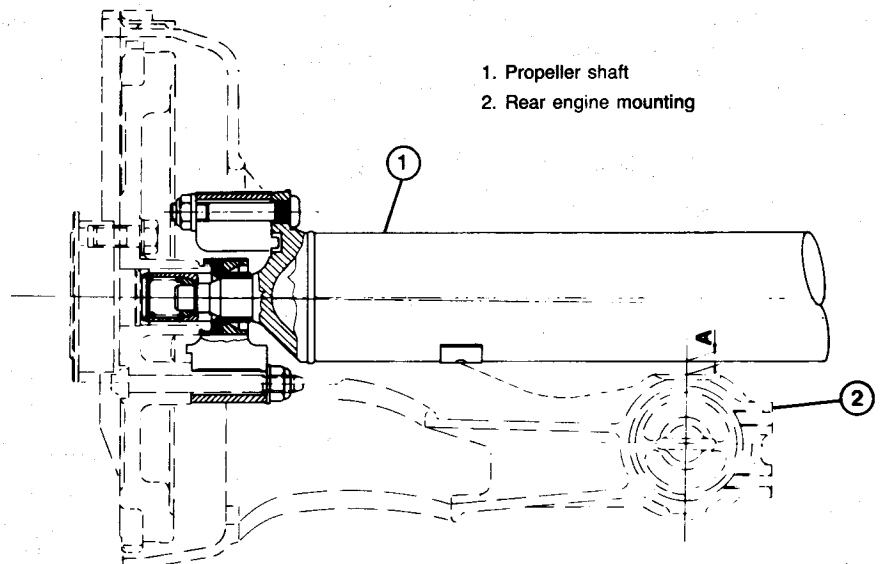
T : Tightening torque
 Nut securing the gear selector rod to the rear lever
 13 ÷ 16 N·m
 (1.3 ÷ 1.6 kg·m)

- e. Fit the central cross piece (13) to the body, tightening the screws (12).
- f. Tighten, to the specified torque, the screws (28) securing the gear box assembly support cross piece (29) to the body.

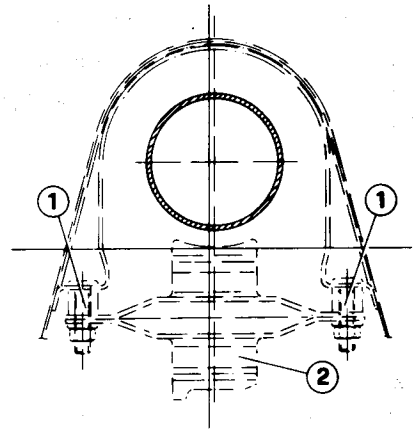
T : Tightening torque
 Screw securing the gear box assembly support cross piece to the body
 39 ÷ 44 N·m
 (4.0 ÷ 4.5 kg·m)

- g. Check that the distance «A» between

Distance «A» between the propeller shaft and the rear engine mounting
 A = 7 mm



the propeller shaft and the rear engine mounting is equal to the specified distance.
 h. If the distance is not equal to that specified, vary accordingly the length of the spacers (1) between the engine mounting (2) and the body.



3. Refitting of the exhaust tube

- a. Position the catalytic silencer (3) on the elastic support rings (9).
- b. Position the central length of the exhaust tube on the elastic support rings and connect it to the rear length (6) without tightening the nut (4) of the pipe clip (5).
- c. Tighten the bolt (7) that secures the catalytic silencer box (3) to the bracket (8) at the end of the flywheel housing bell.

- d. Shake the exhaust tube a little so as to seat it properly.
- e. Fully tighten the nuts with washers (2) that secure the catalytic silencer box to the exhaust manifold of the engine and lock the pipe clip (5) tightening the nut (4).
- f. Fit the catalytic silencer heat shield (33) tightening the respective screws.

For the following steps in the procedure refer to the figure «View of the engine compartment» of the vehicle in question.

4. Refitting of servo steering pump

- a. Position the servo steering pump (57), fix it to the support and tighten the screws (56).
- b. Fit the drive belt (55) on the pulley, move the belt tensioner pulley (54) upwards until the specified tension is reached and then tighten the screws securing the belt tensioner pulley.

Load to be applied to the middle part of the belt:
 $P = 147 \div 294 \text{ N (15} \div 30 \text{ kg)}$

Camber:
 $F = 13 \text{ mm}$

- c. If operations have been carried out on the servo steering system restore the system to proper working order operating as follows:

- Reconnect the tubes to the servo steering pump observing the following tightening torques:

T : Tightening torques
Oil return tube fitting on servo steering pump fitting
 $45 \div 50 \text{ N}\cdot\text{m}$
 $(4.3 \div 5.1 \text{ kg}\cdot\text{m})$

Oil delivery tube fitting on servo steering pump fitting
 $28 \div 31 \text{ N}\cdot\text{m}$
 $(2.9 \div 3.2 \text{ kg}\cdot\text{m})$

- Refill the reservoir (58) with the specified fluid (AGIP ATF DEXRON B 11297; IP DEXRON FLUID B 11297) filling it completely full.
- On the pump fitting, loosen the fitting securing the oil return tube from the pump reservoir until the fluid comes out and until all the air is expelled.

- Tighten the fitting to the specified torque.
- With the engine refitting completed, start the engine and top up the reservoir until the level is stabilised.
- With the engine running turn the steering wheel putting on a few full locks, both left and right, and then top up the reservoir to the «MAX» reference mark.
- Refit the reservoir filler cap.

5. Refitting of the air-conditioner compressor

- a. Refit the lower bracket of the air-conditioner compressor (52) to the engine block securing it to the vehicle with the relative bolts.
- b. Refit the compressor drive belt (53).
- c. Restore the correct tension to the compressor drive belt and tighten the nut.

Load to be applied to the middle part of the belt:
 $P = 78 \text{ N (8 kg)}$

Camber:
 $F = 10 \div 15 \text{ mm}$

- d. If disconnected fit the tube fittings to the compressor (52) and refill with Freon.

6. Refitting of radiator

Refit the radiator together with the electric fan and then reconnect the tubes of the cooling system, proceeding in the reverse order to that described in «Removal» at step 3.

7. Refitting of the air filter

Refit the air filter and then reconnect the air feed tubes, proceeding in the reverse order to that described in «Removal» at step 2.

8. Fuel supply system

Restore the fuel supply system proceeding in the reverse order to that described in «Removal» at step 4.

9. Refitting of the accelerator control cable

Reconnect the accelerator cable proceeding in the reverse order to that described in «Removal» step 5.

10. Electrical connections

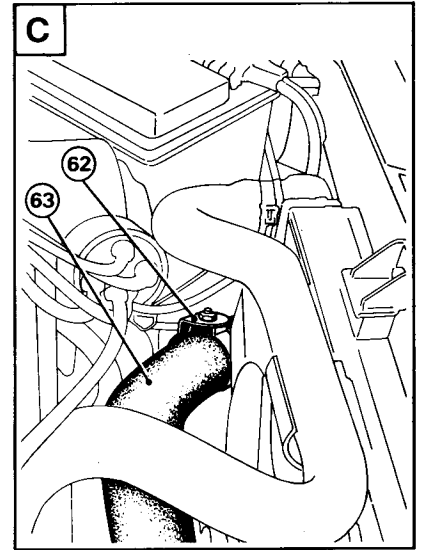
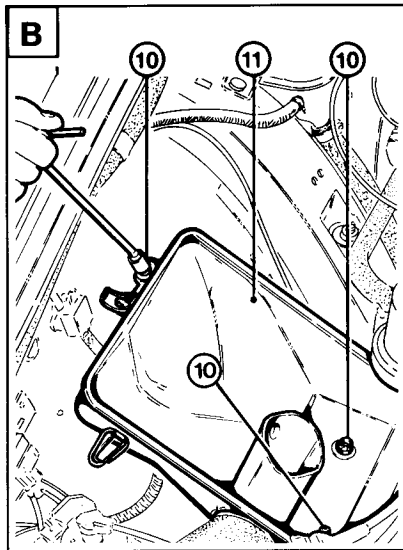
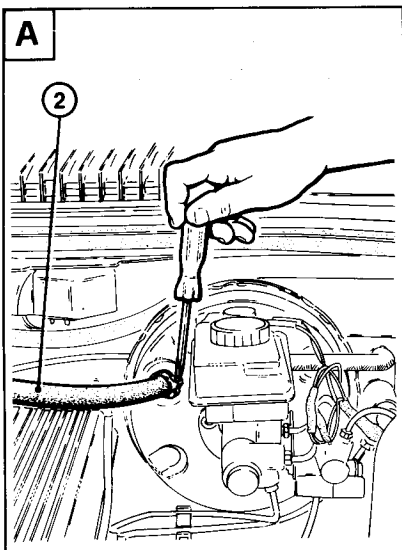
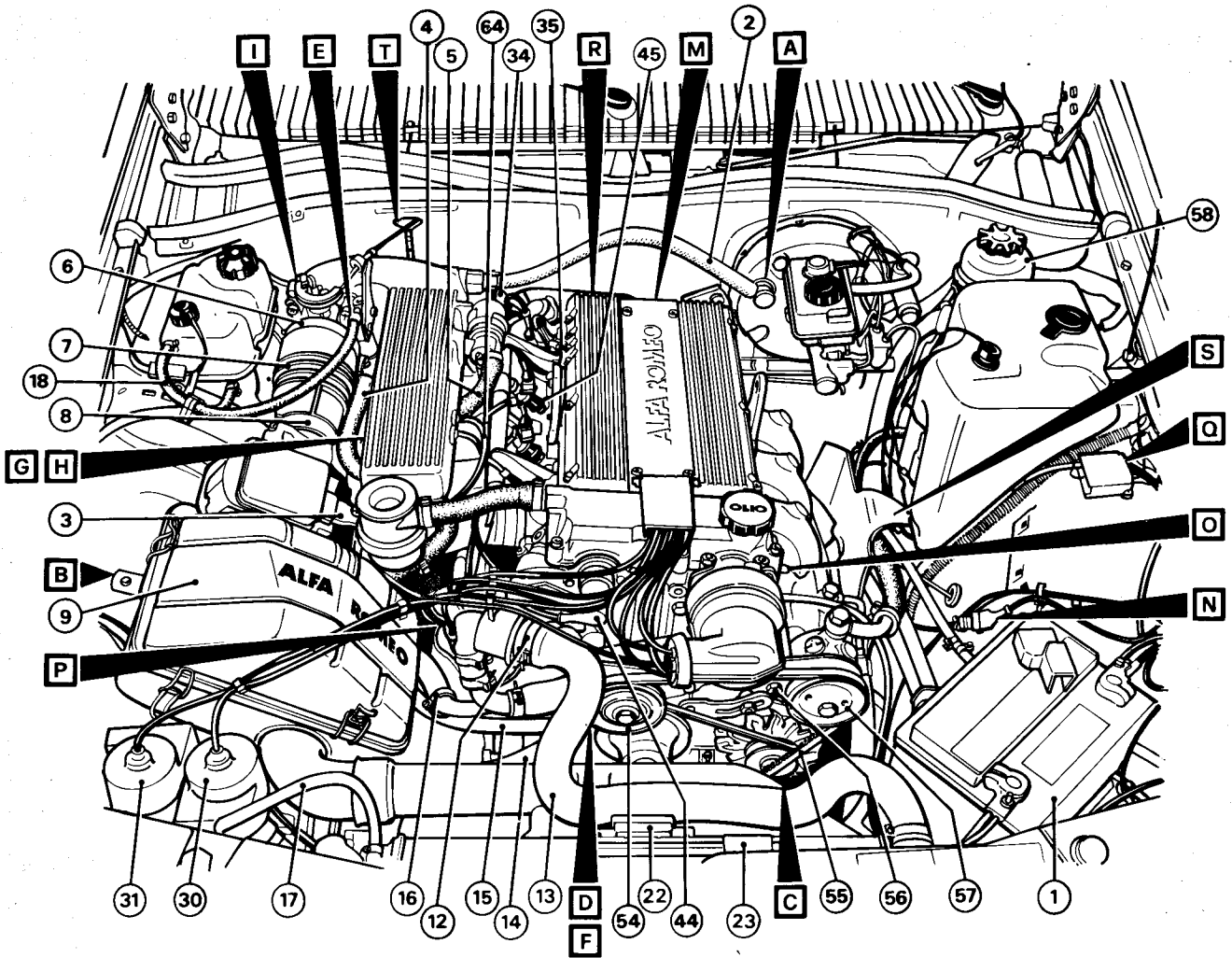
Restore the electrical connections proceeding in the reverse order to that described in «Removal» at step 6.

11. Final operations

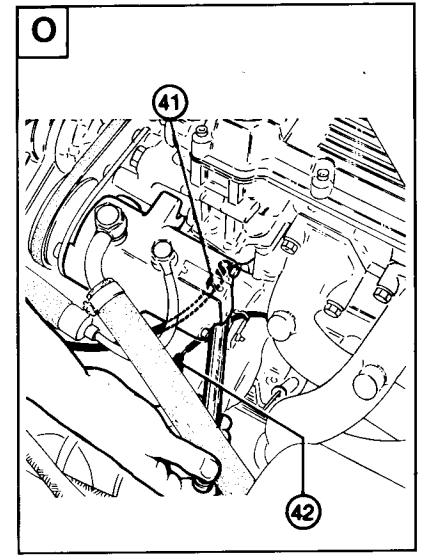
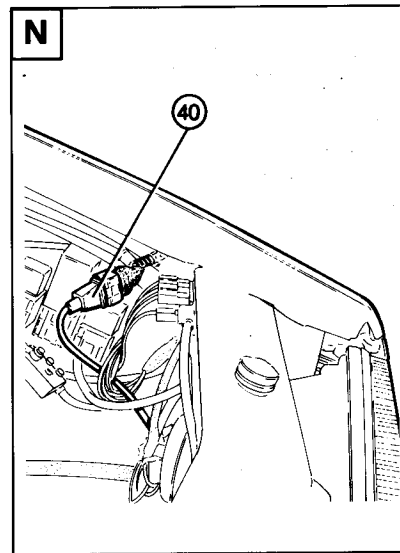
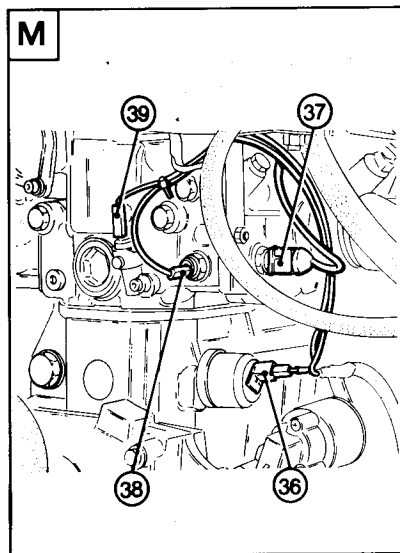
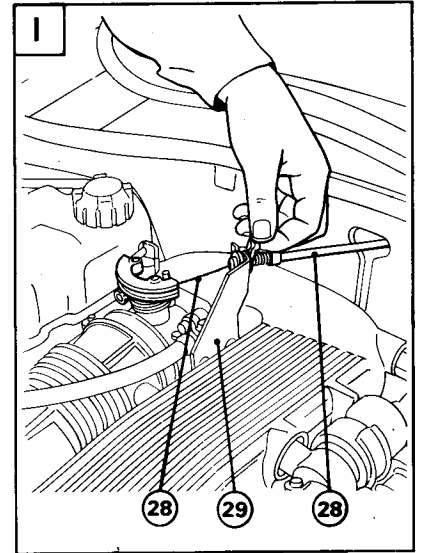
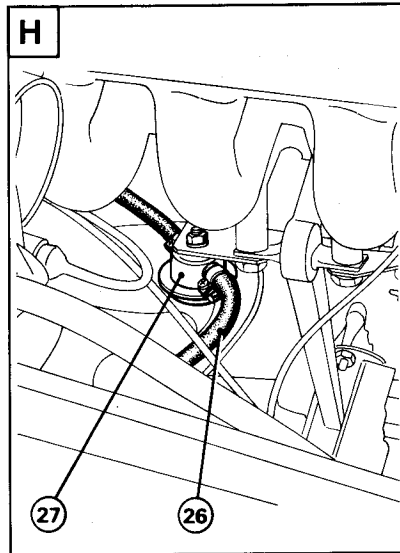
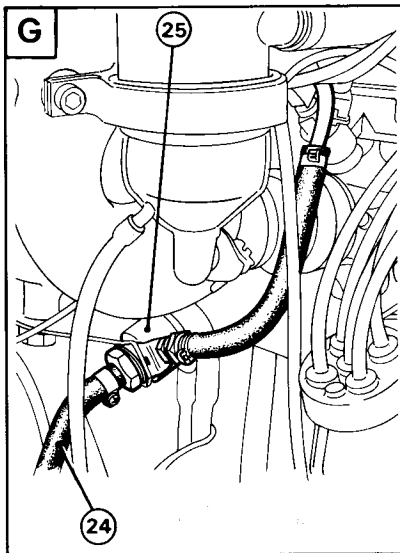
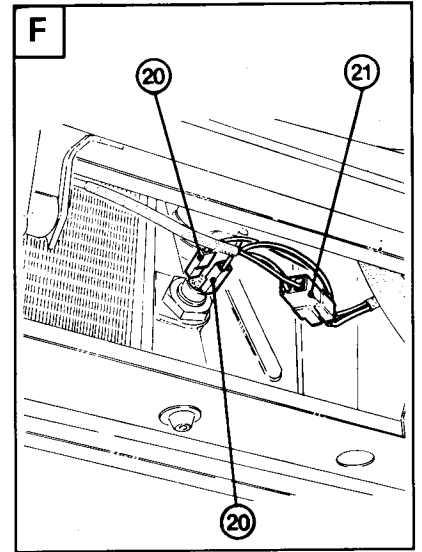
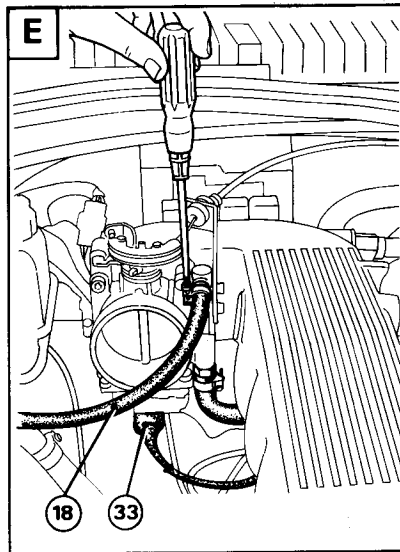
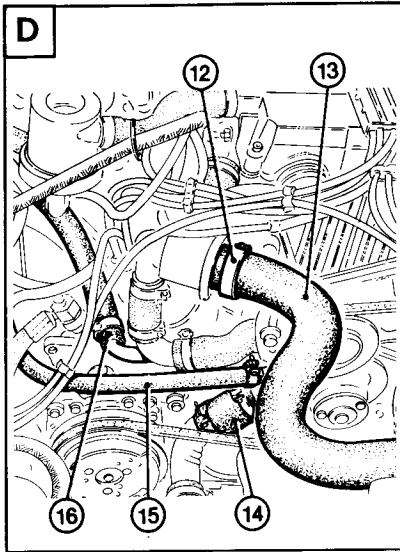
- a. Reconnect the servo brake vacuum tube (2) to the fitting on the servo brake.
- b. Position the battery (1) in its compartment and secure it with the relative mounting bracket. Reconnect the battery terminals.
- c. For filling and checks refer to the paragraph «Engine maintenance» — Group 00.
- d. Release the engine hood, support it and re-attach the hinge securing bolts on both sides of the vehicle.

ENGINE MAIN MECHANICAL UNIT

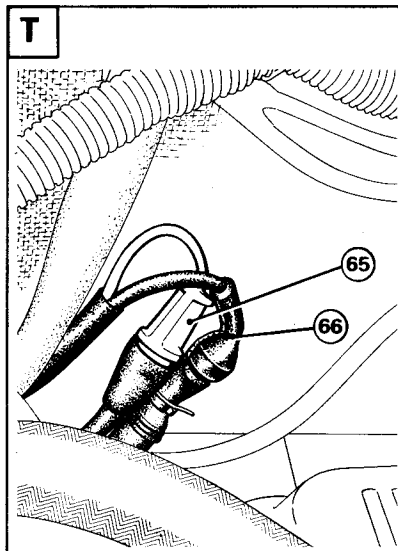
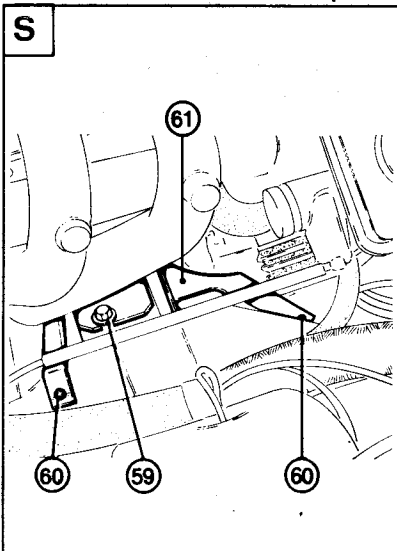
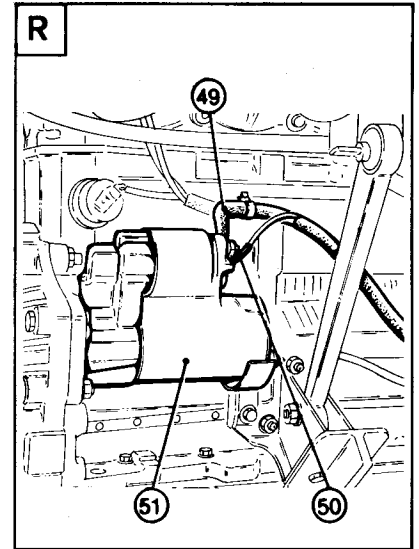
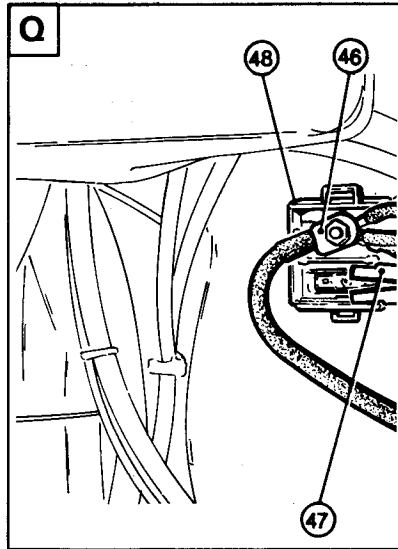
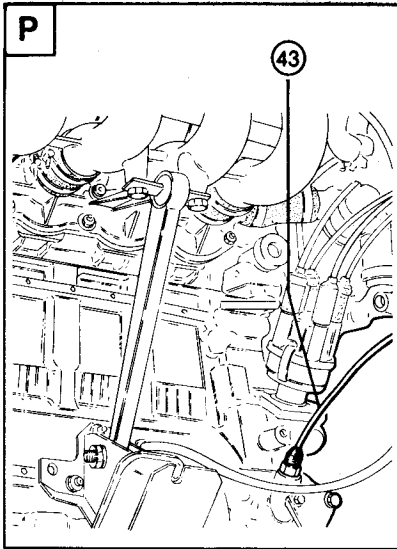
VIEW OF ENGINE COMPARTMENT



ENGINE MAIN MECHANICAL UNIT



ENGINE MAIN MECHANICAL UNIT



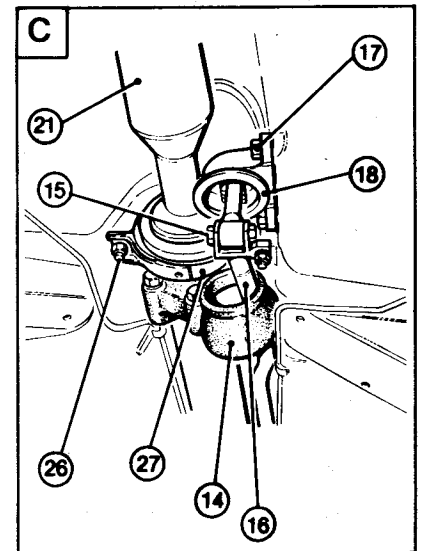
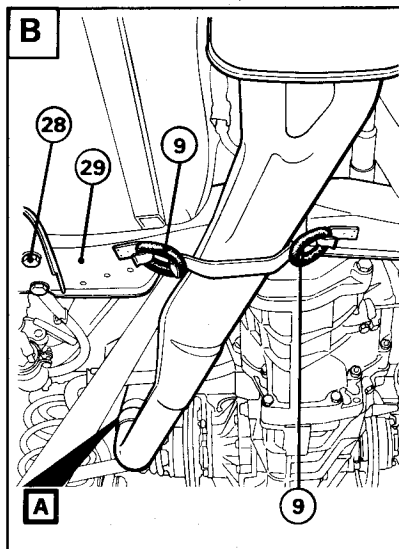
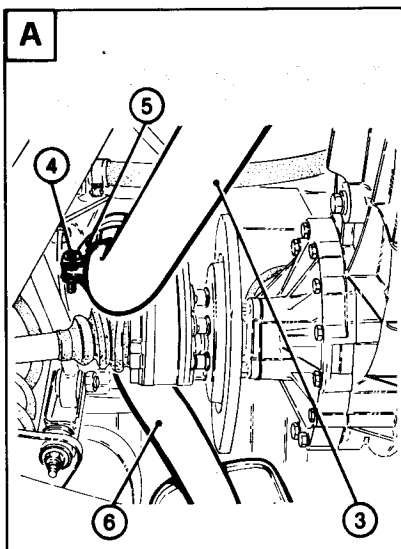
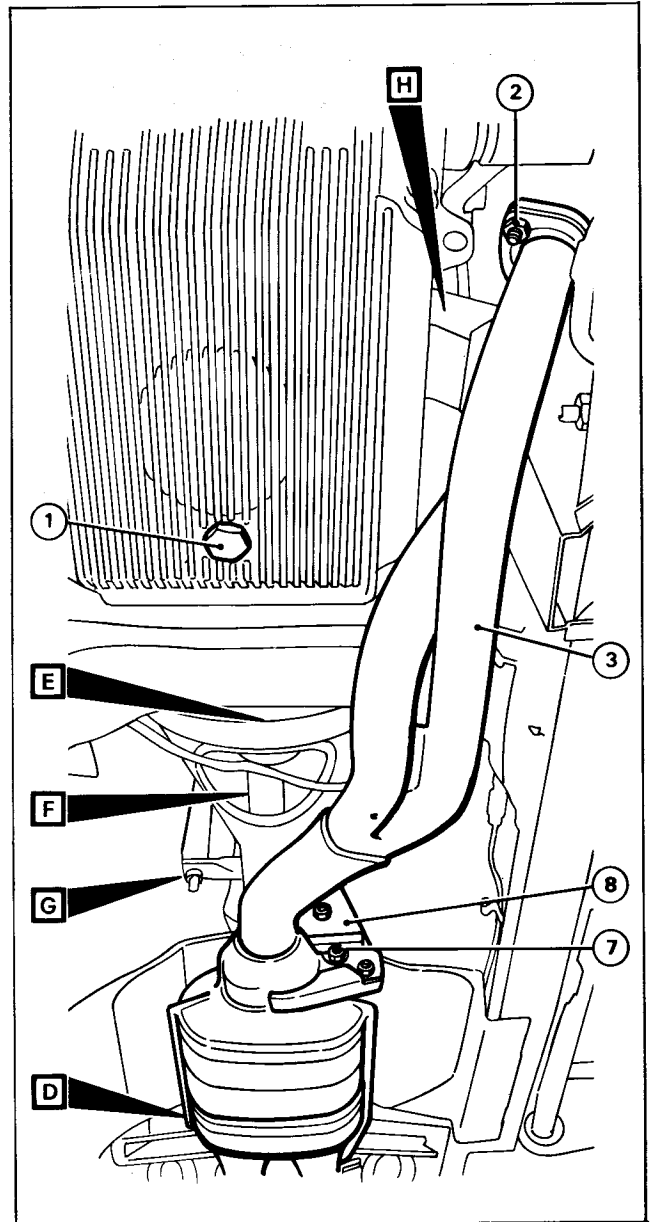
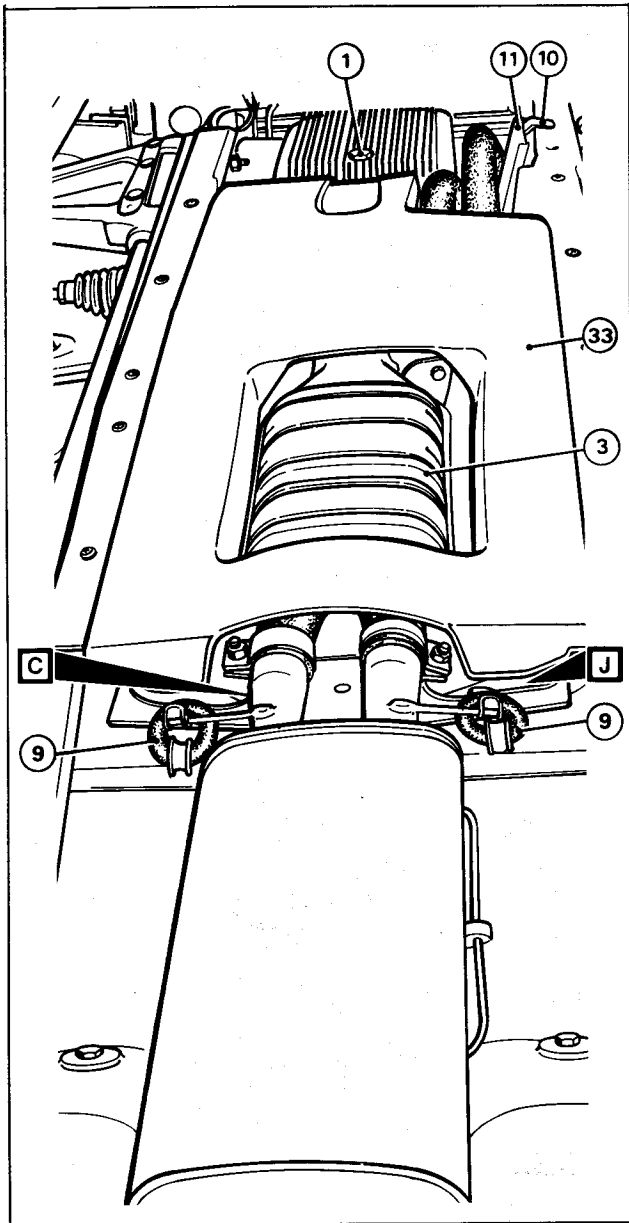
1. Battery
2. Servo brake vacuum tube
3. Air flow gauge lead
4. Maximum r.p.m. oil vapour tube
5. Idle r.p.m. by-pass tube
6. Air intake duct securing clip
7. Air intake duct
8. Air intake duct securing clip
9. Air filter cover
10. Air filter container securing nuts
11. Air filter container
12. Hose securing clip
13. Coolant return hose
14. Coolant delivery hose
15. Coolant return tube
16. Radiator filler tube
17. Radiator breather tube

18. Cooling system breather tube
19. Deleted
20. Electric fan activating lead
21. Electric fan power supply lead
22. Radiator securing screw
23. Radiator
24. Fuel return tube
25. Fuel pressure regulator
26. Fuel delivery tube
27. Pulse damper
28. Accelerator control cable
29. Support bracket
30. Front spark plug ignition coil lead
31. Rear spark plug ignition coil lead
32. Deleted
33. Accelerator butterfly switch
34. Idle regulation actuator lead

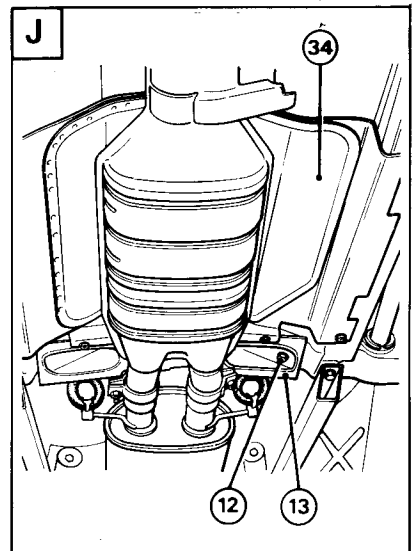
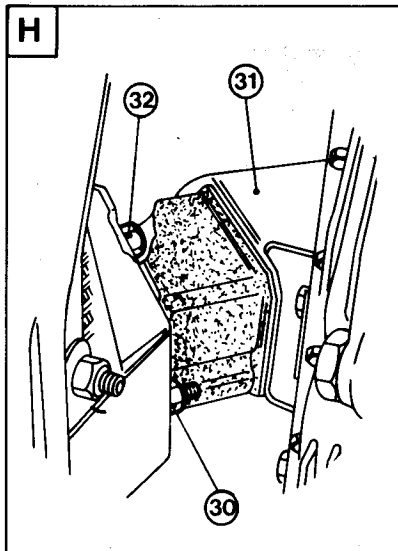
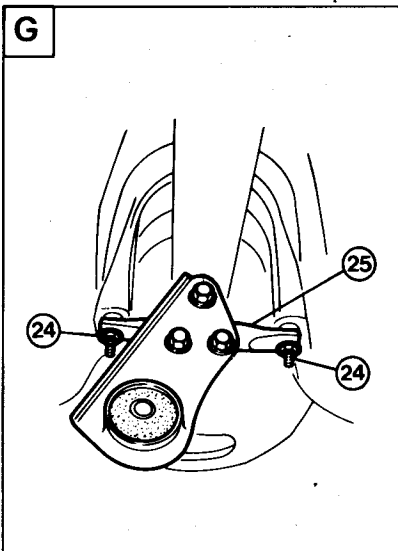
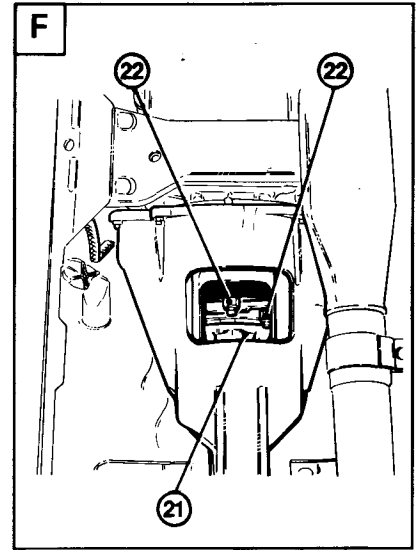
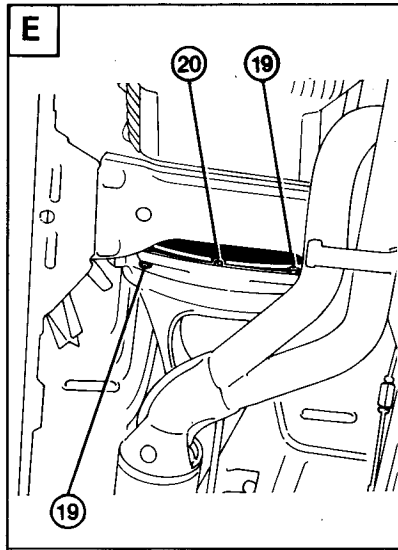
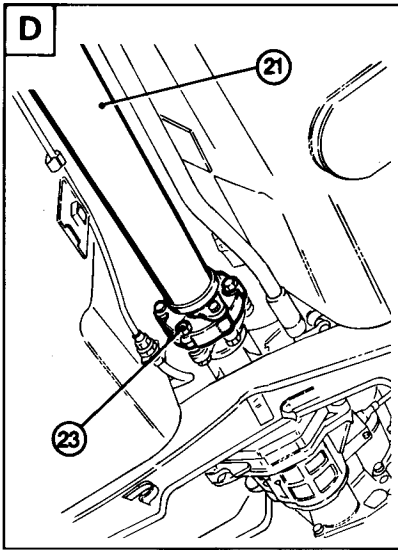
35. Fuel delivery system, ground leads
36. Engine oil pressure indicator lead
37. Coolant temperature sensor lead
38. Coolant temperature indicator lead
39. Maximum coolant temperature warning lamp lead
40. Timing and r.p.m. sensor lead
41. Engine ground lead
42. Connection for minimum oil pressure warning lamp lead
43. Minimum oil level warning lamp lead
44. Timing variator leads
45. Electric fuel injector power supply leads
46. Alternator power supply leads
47. Alternator warning lamp lead
48. Terminal board
49. Starter motor power supply leads
50. Starter motor electromagnet excitation lead
51. Starter motor
52. Air-conditioner compressor
53. Compressor drive belt
54. Belt tensioner pulley
55. Servo steering pump drive belt
56. Servo steering pump securing screws
57. Servo steering pump
58. Servo steering system fluid reservoir
59. Side engine mounting upper securing screws
60. Heat shield securing screws
61. Heat shield (left mounting)
62. Pipe clip
63. Air duct
64. Fuel vapour recycling tube
65. Lambda sensor resistance connector
66. Lambda sensor connector

ENGINE MAIN MECHANICAL UNIT

VIEW OF THE UNDER PART



ENGINE MAIN MECHANICAL UNIT



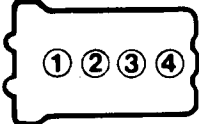
1. Oil drainage plug
2. Nuts with washers for securing of the catalytic silencer box to the exhaust manifold
3. Catalytic silencer box exhaust tube
4. Pipe clip nut
5. Pipe clip
6. Rear length of exhaust tube
7. Bolt for securing catalytic silencer box to the bracket
8. Support bracket for catalytic box exhaust tube
9. Elastic rings
10. Heat shield securing screws
11. Heat shield on left mounting
12. Central cross-piece securing screws
13. Central cross-piece
14. Protective boot
15. Securing bolt

16. Gear selector rod
17. Support securing screws
18. Gear lever support
19. Flywheel protective panel securing bolts
20. Flywheel protective panel
21. Propeller shaft
22. Nuts securing front elastic joint
23. Bolts securing rear elastic joint
24. Screws securing stud
25. Rear engine mounting stud
26. Nuts securing propeller shaft central support
27. Propeller shaft central support
28. Screws securing rear cross-piece
29. Rear cross piece
30. Side engine mounting lower securing screws
31. Side engine mountings

32. Side engine mounting upper securing screws
33. Catalytic silencer box heat shield (lower)
34. Catalytic silencer box heat shield (upper)

TECHNICAL DATA

TECHNICAL FEATURES OF ENGINE

		Engine
		2000
		(062.24)
Cycle		Otto 4 stroke cycles
Number of cylinders		4 in line
Numbering of cylinders		
Bore — Stroke	mm	84 x 88,5
Cylinder capacity	cm ³	1962
Combustion chamber	cm ³	54,5
Compression ratio		10
Power DIN		
Maximum	kW (CV)	107 (148) at 5700 ÷ 5900 r.p.m.
Torque DIN	Nm (kgm)	156,9 (16) at 2000 r.p.m.
		176,5 (18) at 3000 r.p.m.
		186,3 (19) at 4000 r.p.m.
Effective average piston velocity (1)	m/1''	17,7
Octane requirement	R.O.N.	95
	Sensitivity (2)	10
Engine oil pressure (3)		
Minimum at idle r.p.m.		49,03 (0,49; 0,5)
Minimum at maximum r.p.m.	kPa (bar; kg/cm ²)	343,19 (3,43; 3,5)
Maximum at minimum r.p.m.		441,24 ÷ 490,27 (4,41 ÷ 4,90; 4,5 ÷ 5,0)

(1) At minimum r.p.m.

(2) Difference between the Octane Research Method Number and the Octane Method Number

(3) Values to be measured with engine at normal running temperature (oil at 90°C)