NOVEMBER 1997

SUBSCRIPTION

RPO No: 7511

REF. 1 No XM 100-00/13

PETROL ENGINE

ES9J4 (2946 cm³. V6)

- **POWER UNIT**

MAN 108931

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POWER UNIT

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4 – TIGHTENING THE CYLINDER HEADS

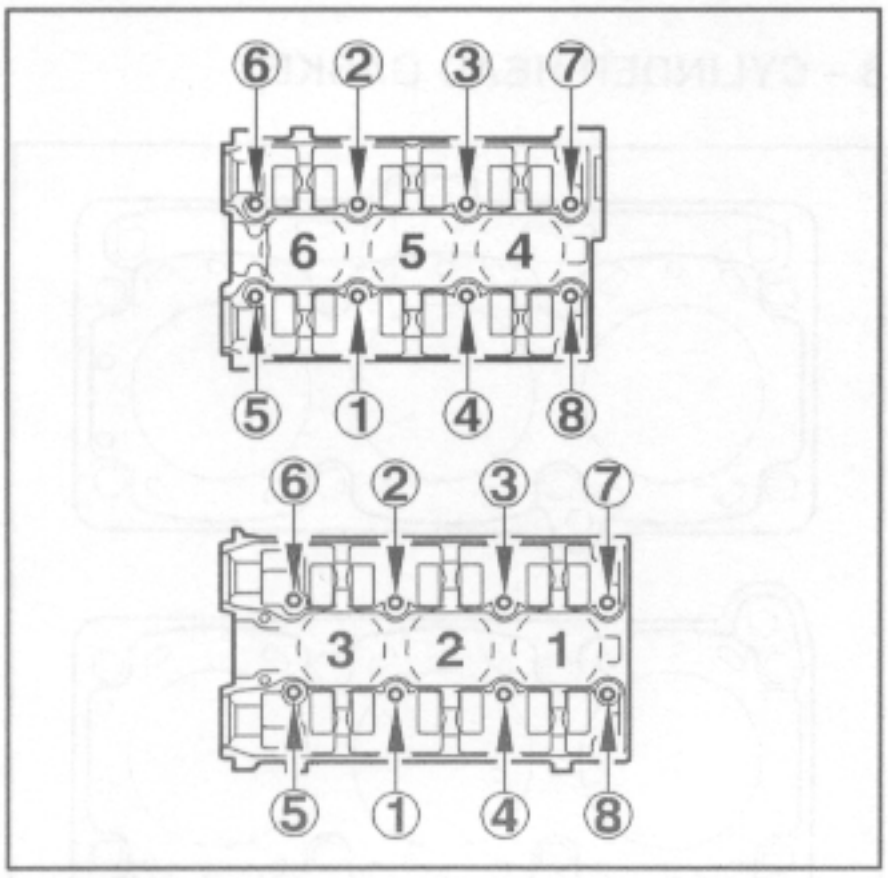


Fig : B1BP1ECC

Tightening method :

- pre–tighten the bolts to 2 m.daN
- slacken
- pre–tighten the bolts to 1,5 m.daN
- finish with an angular tightening of 225 °

5 – TIMING GEAR

5.1 – The camshafts

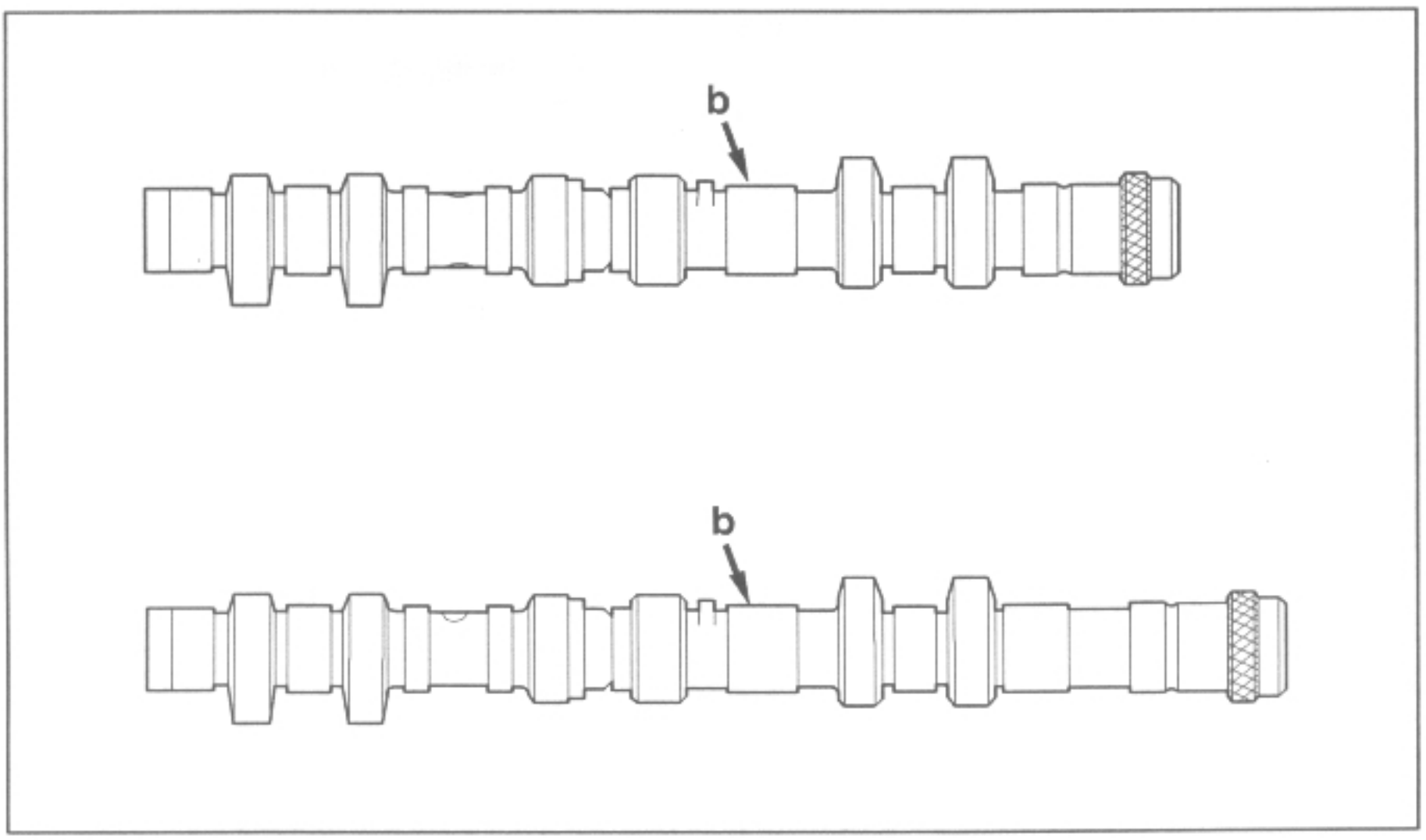


Fig : B1BP1EDD

NOTE : The marking is opposite the flywheel.

Marking of the camshafts (at "b") :

- inlet camshaft (L.H.) : A 718
- inlet camshaft (R.H.) : A 717
- exhaust camshaft (L.H.) : E 720
- exhaust camshaft (R.H.) : E 719

5.2 – Valve timing table

Theoretical valve timing with a 1 mm valve clearance :

Inlet	B.T.D.C.	–8°
	A.B.D.C.	38°
Exhaust	B.B.D.C.	38°
	A.T.D.C.	–8°

5.3 – Valve clearances when cold

Hydraulic tappets with automatic adjustment.

DATA : ENGINE MOUNTING ASSEMBLY

1 – DESCRIPTION

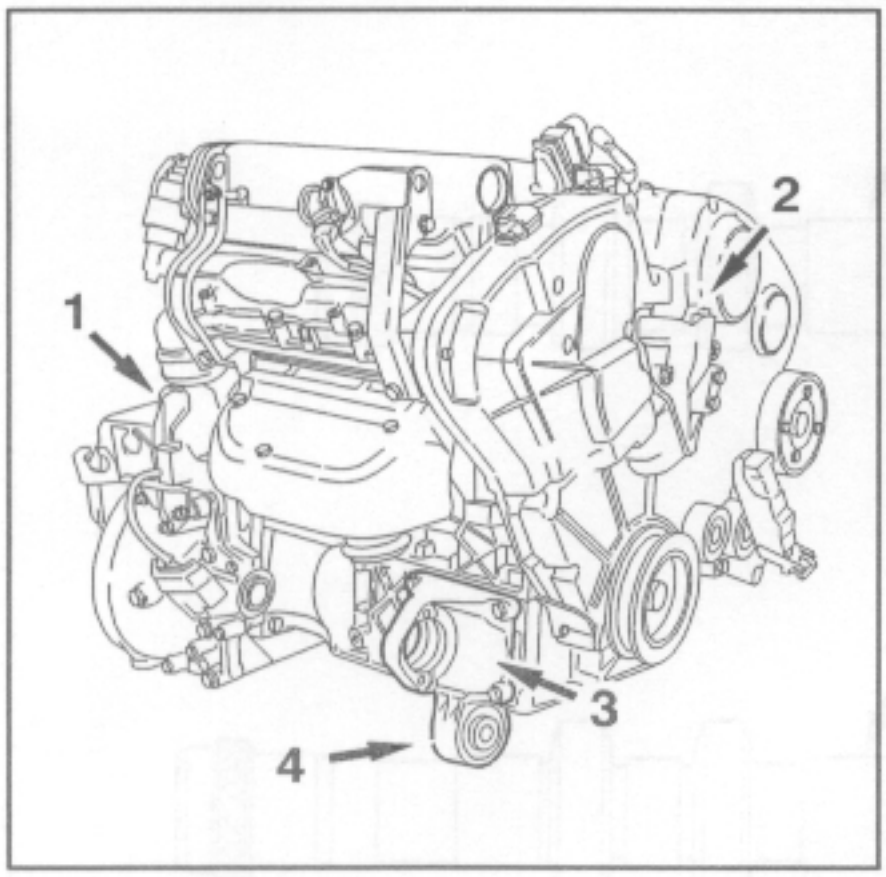


Fig : B1BP1ESC

(1) left hand upper engine mounting.
(2) right hand upper engine mounting.
(3) right hand lower engine mounting.
(4) torque rod.

2 – TIGHTENING TORQUES

2.1 – Left hand upper engine mounting (manual gearbox)

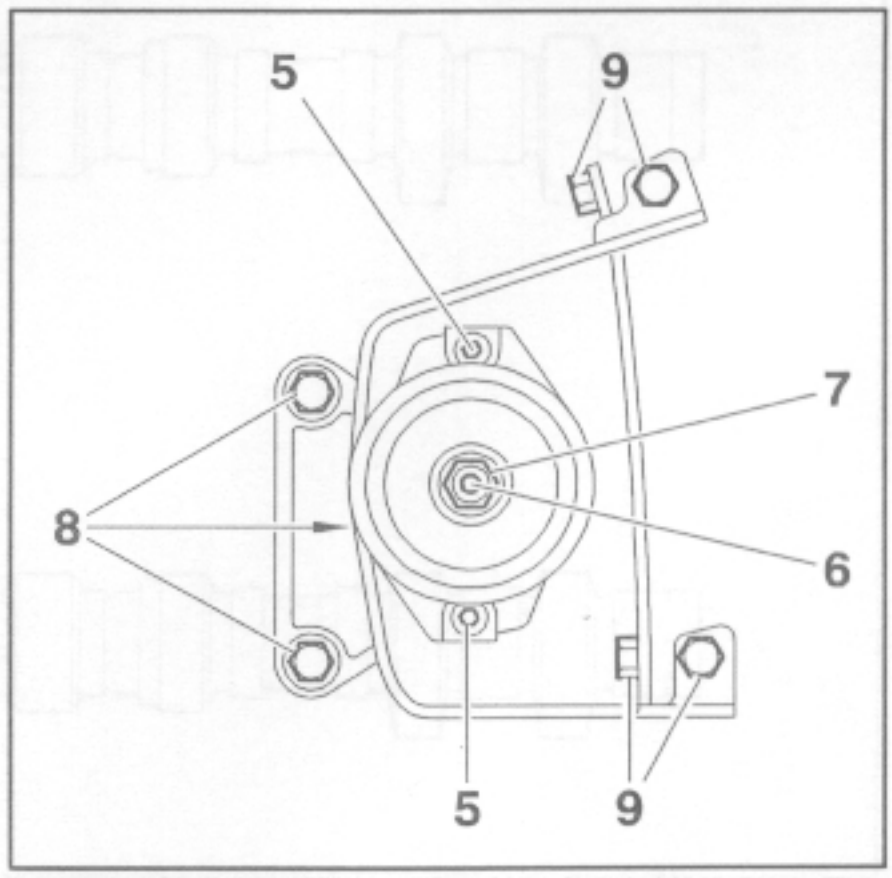


Fig : B1BP1M3C

Tighten :
- nut (7) to 6.5 m.daN
- bolts (5) to 3 m.daN
- bolts (8) to 4.5 m.daN
- the engine support shaft (6) to 5 m.daN
- bolts (9) to 2.7 m.daN

2.2 – Left hand upper engine mounting (automatic gearbox)

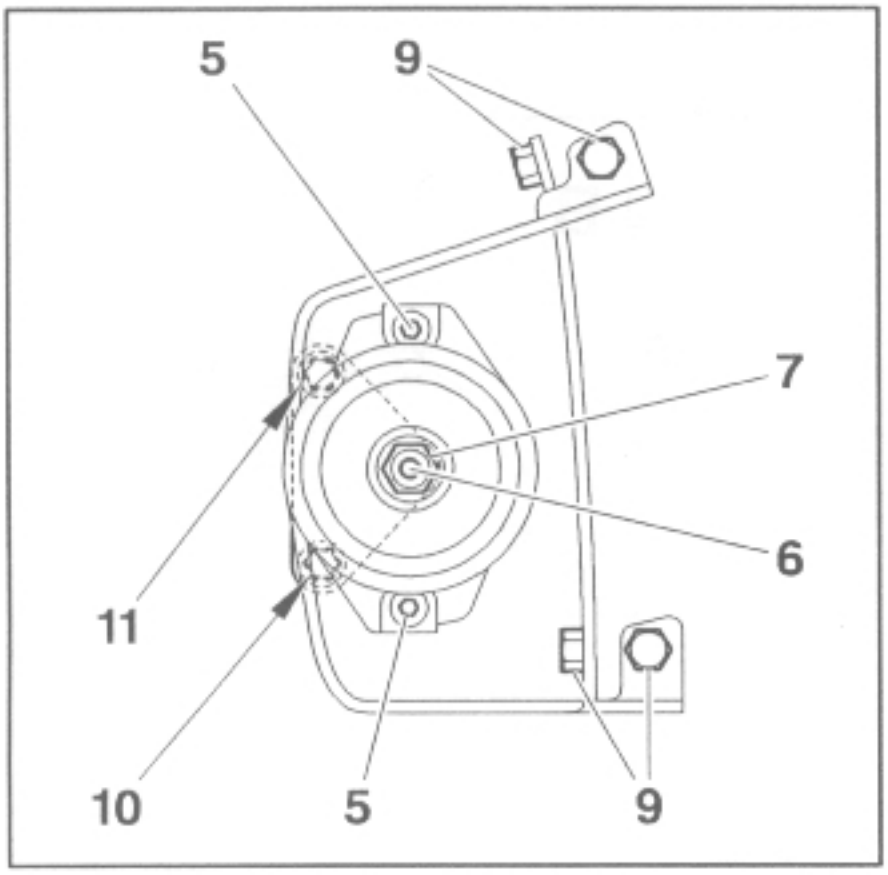


Fig : B1BP1NNC

Tighten :
- nut (7) to 6,5 m.daN
- bolts (5) to 3 m.daN
- bolt (10) to 7,5 m.daN
- bolt (11) to 6 m.daN
- engine support shaft (6) to 5 m.daN
- bolts (9) to 2,7 m.daN

2.3 – Right hand upper engine mounting

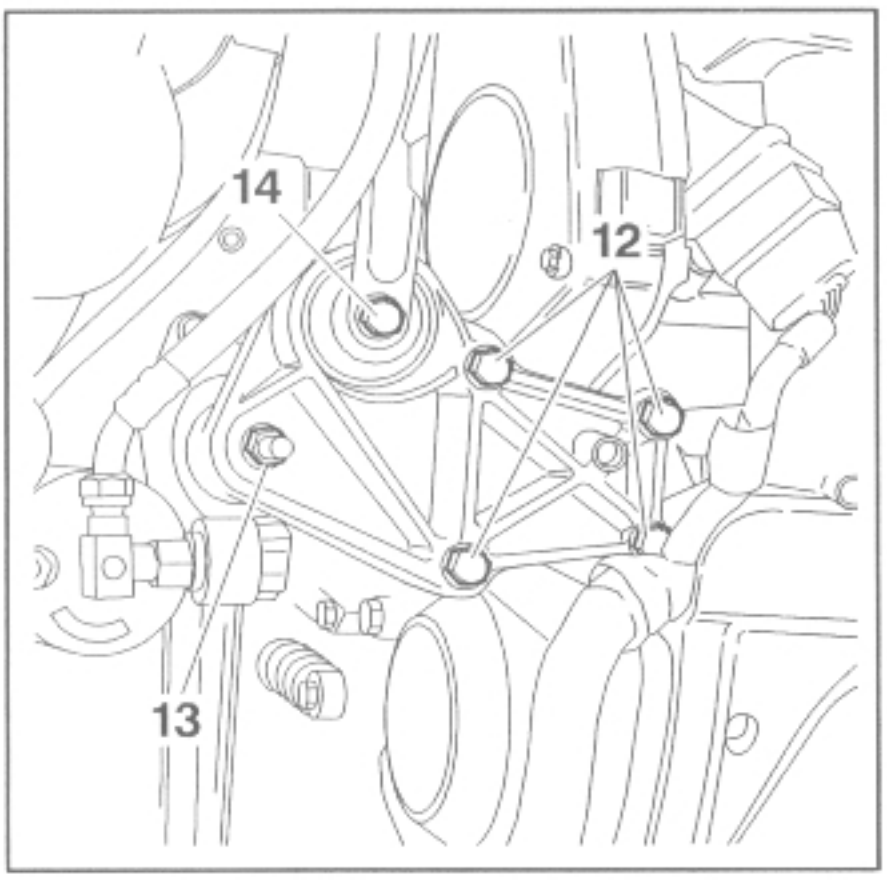


Fig : B1BP1M4C

Tighten :
- bolts (12) to 4,5 m.daN
- nut (13) to 4,5 m.daN
- bolt (14) to 5 m.daN

2.4 – Right hand lower engine mounting

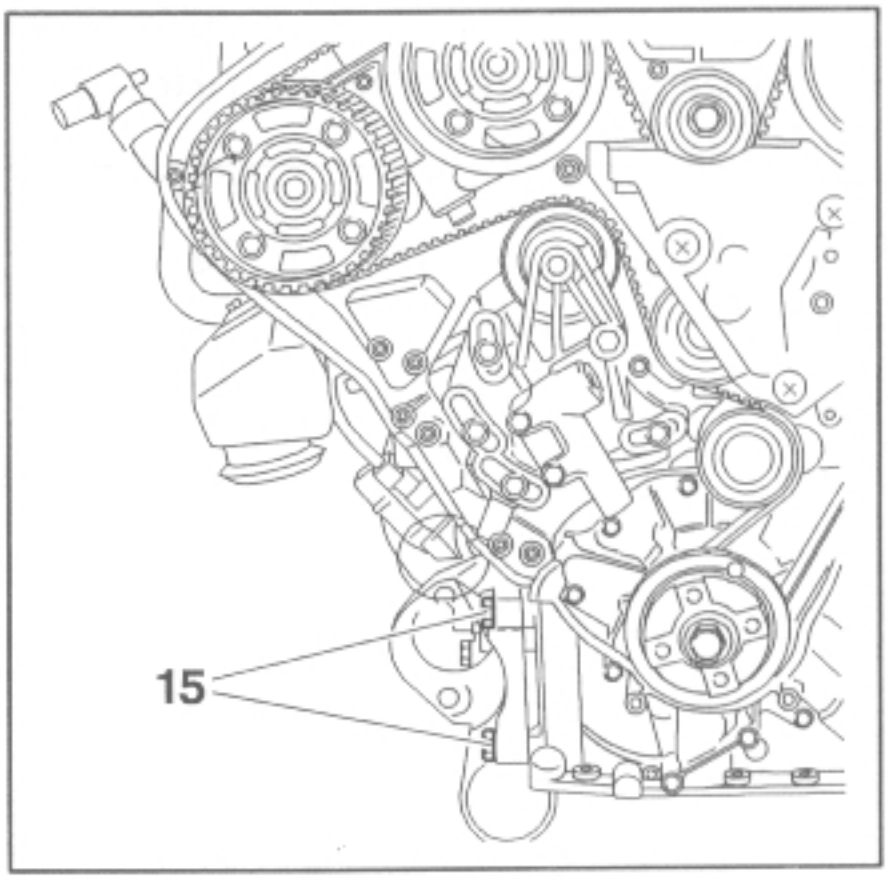


Fig : B1BP1M5C

Tighten the bolts (15) to 4,5 m.daN.

2.5 – Torque rod

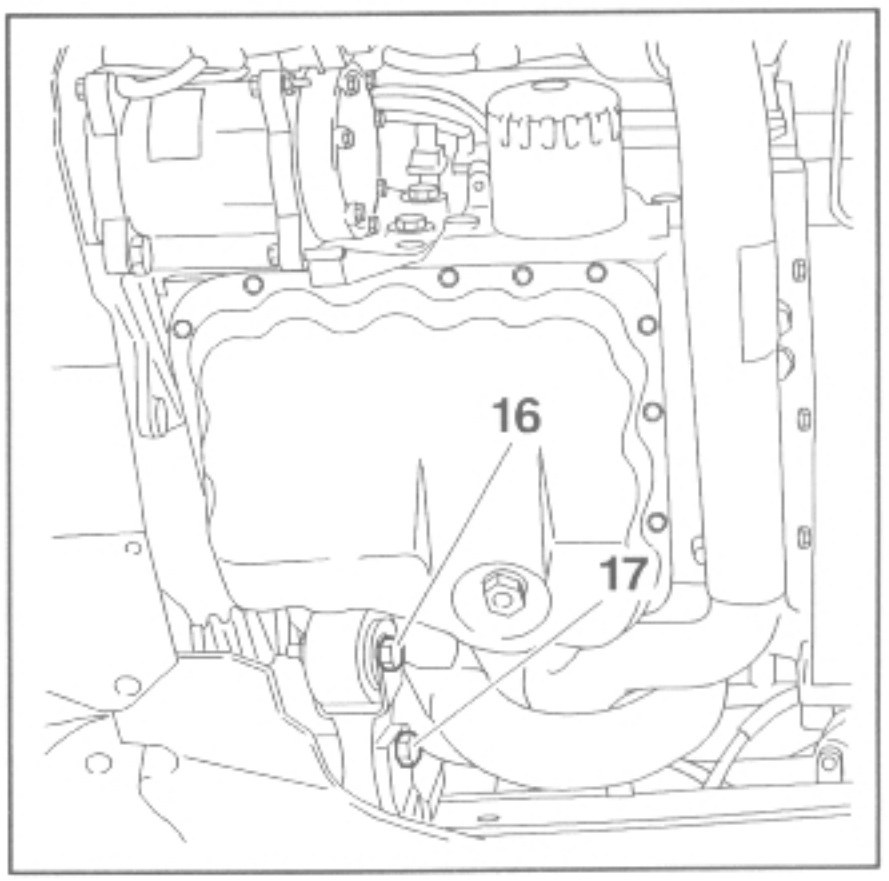


Fig : B1BP1M6C

Tighten :
- bolt (16) to 5 m.daN
- bolt (17) to 5 m.daN

DATA : TIGHTENING TORQUES

1 – ENGINE/GEARBOX MOUNTINGS

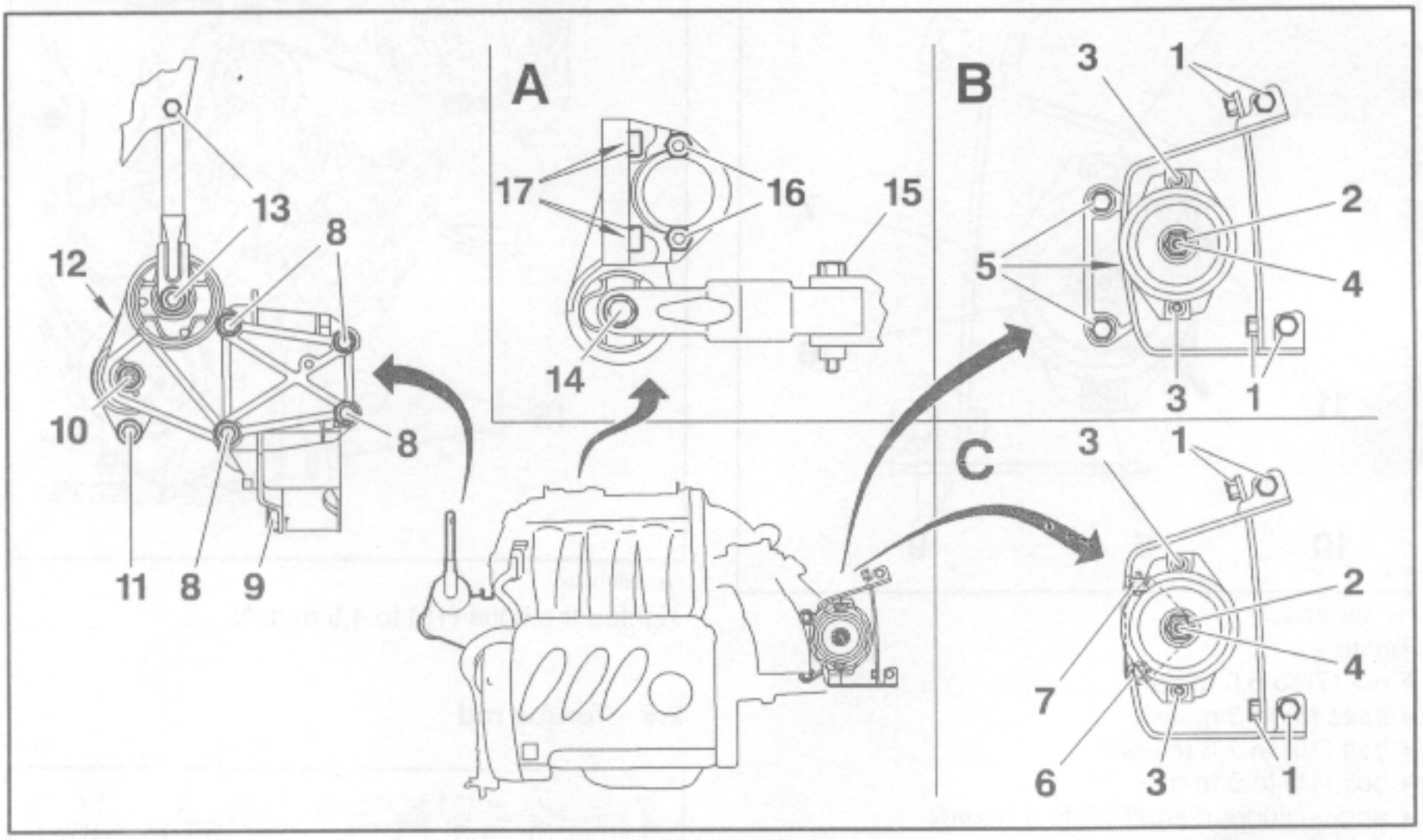


Fig : B1BP1M7D

A : right hand lower engine mounting.

B : manual gearbox.

C : automatic gearbox.

Left hand engine mounting :

Item	Component	Tightening torque (m.daN)
(1)	Bolt	2.7
(2)	Nut	6.5
(3)	Bolt	3
(4)	Support shaft	5
(5)	Bolt	4.5
(6)	Bolt	7.5
(7)	Bolt	6

Right hand upper engine mounting :

Item	Component	Tightening torque (m.daN)
(8)	Bolt	4,5
(9)	Bolt	6
(10)	Nut and stud	4,5
(11)	Bolt	3
(12)	Bolt	3
(13)	Bolt	5

Right hand lower engine mounting :

Item	Component	Tightening torque (m.daN)
(14)	Bolt	5
(15)	Bolt	5
(16)	Nut	1
(17)	Bolt	4,5

2 – ENGINE

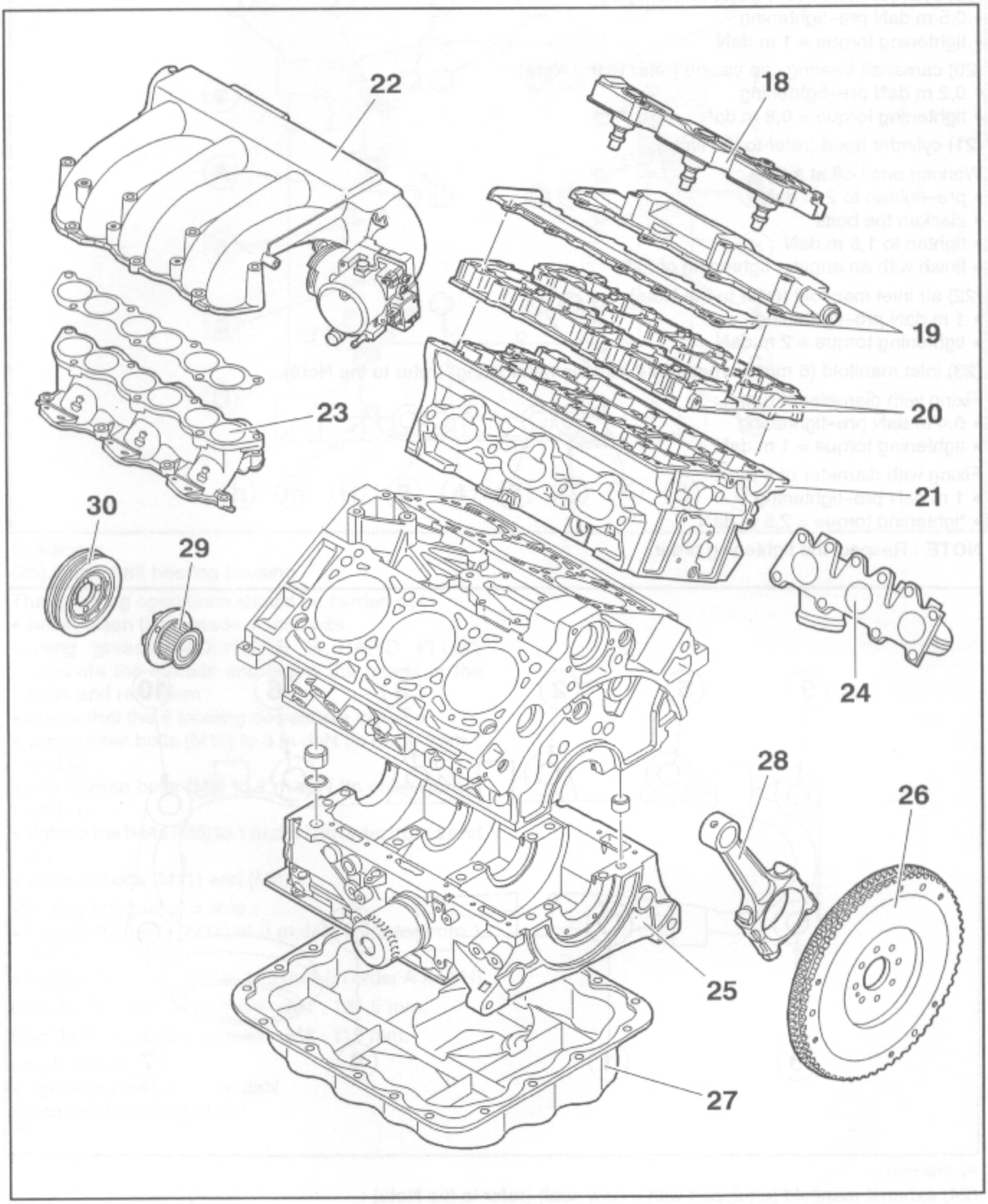


Fig : B1BP1GWP

(18) compact coil unit : tighten to 1 m.daN.

(19) cylinder head cover (refer to the Note) :
- 0,5 m.daN pre–tightening
- tightening torque = 1 m.daN

(20) camshaft bearing cap casing (refer to the Note) :
- 0,2 m.daN pre–tightening
- tightening torque = 0,8 m.daN

(21) cylinder head (refer to the Note).

Working one bolt at a time :
- pre–tighten to 2 m.daN
- slacken the bolts
- tighten to 1,5 m.daN
- finish with an angular tightening of 225 °

(22) air inlet manifold (refer to the Note) :
- 1 m.daN pre–tightening
- tightening torque = 2 m.daN

(23) inlet manifold (6 mm diameter or 8 mm diameter fixing) (refer to the Note).

Fixing with diameter of 6 mm :
- 0,4 m.daN pre–tightening
- tightening torque = 1 m.daN

Fixing with diameter of 8 mm :
- 1 m.daN pre–tightening
- tightening torque = 2,5 m.daN

NOTE : Respect the tightening order.

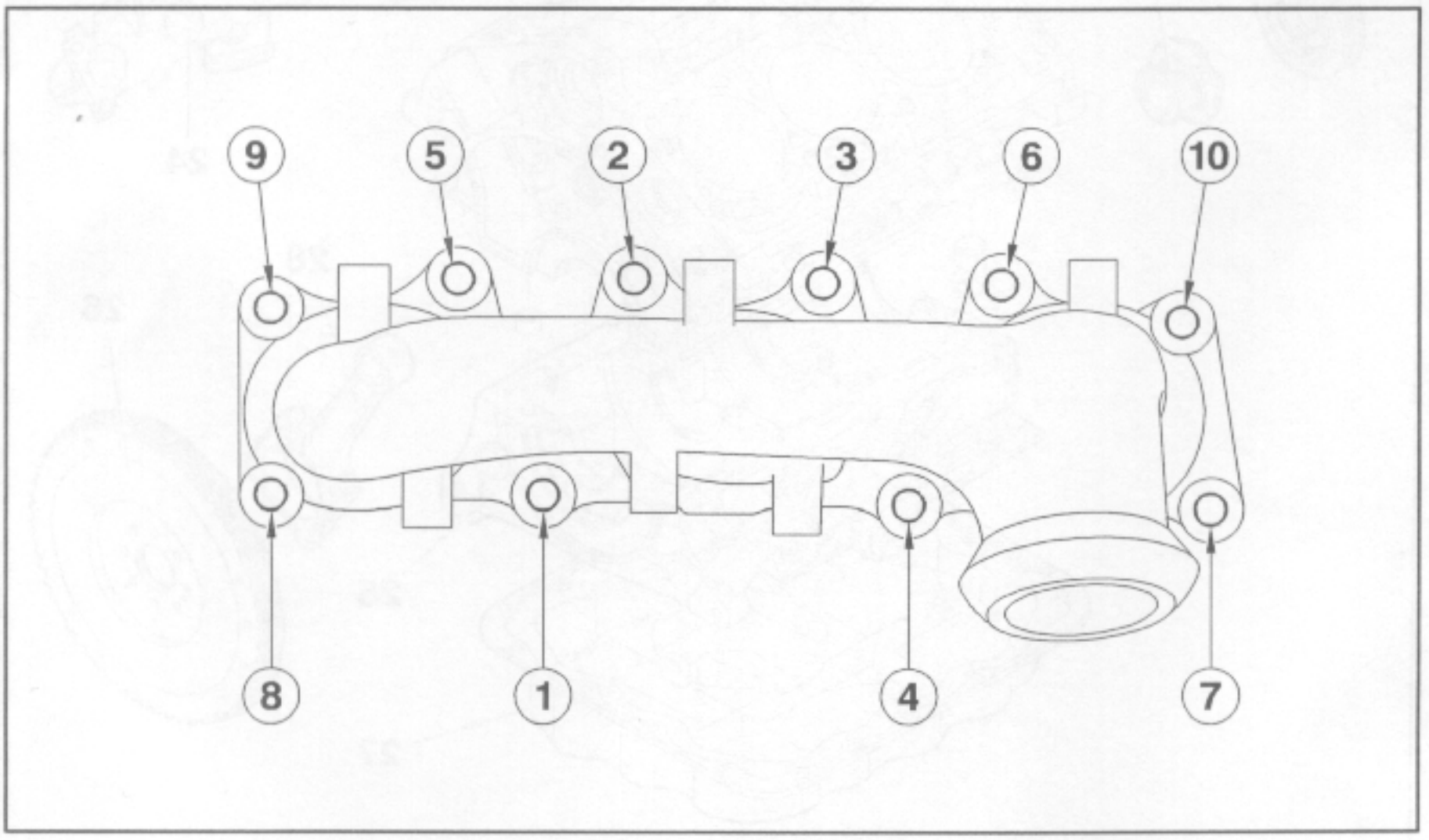


Fig : B1BP1GXD

(24) exhaust manifold (equipped with a new seal) (refer to the Note) :
- 1 m.daN pre–tightening
- tightening torque = 3 m.daN

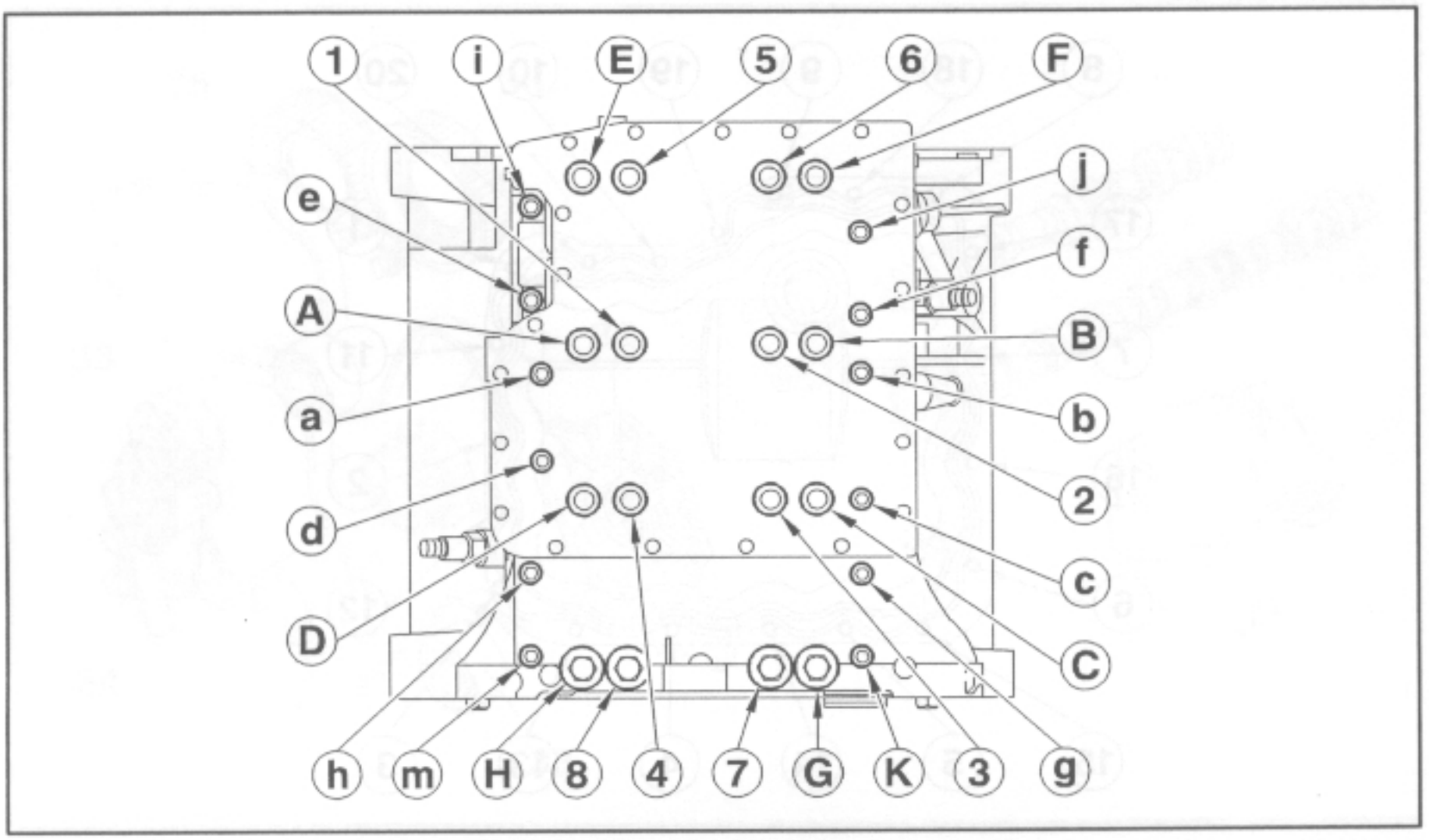


Fig : B1BP1GYD

(25) crankshaft bearing housing.

The following operations should be carried out :

- brush clean the threads of the bolts
- using grease "MOLYKOTE G RAPID PLUS", lubricate the threads and below the heads of the bolts and refit them
- check that the 8 locating dowels are in place
- pre–tighten bolts (M11) to 3 m.daN (in order from 1 and 8)
- pre–tighten bolts (M8) to 1 m.daN (in order from A and H)
- tighten the bolts (M6) to 1 m.daN (in order from a and m)
- slacken bolts (M11) and (M8)

Working one bolt at a time :

- tighten the bolts (M11) to 3 m.daN (in order from 1 and 8)
- tighten the bolts (M8) to 1 m.daN (in order A and H)

Max. bolt length below head = M1 : 131,5 mm.

Max. bolt length below head = M8 : 119 mm.

(26) flywheel :

- tightening torque = 1 m.daN
- angular tightening of 60°

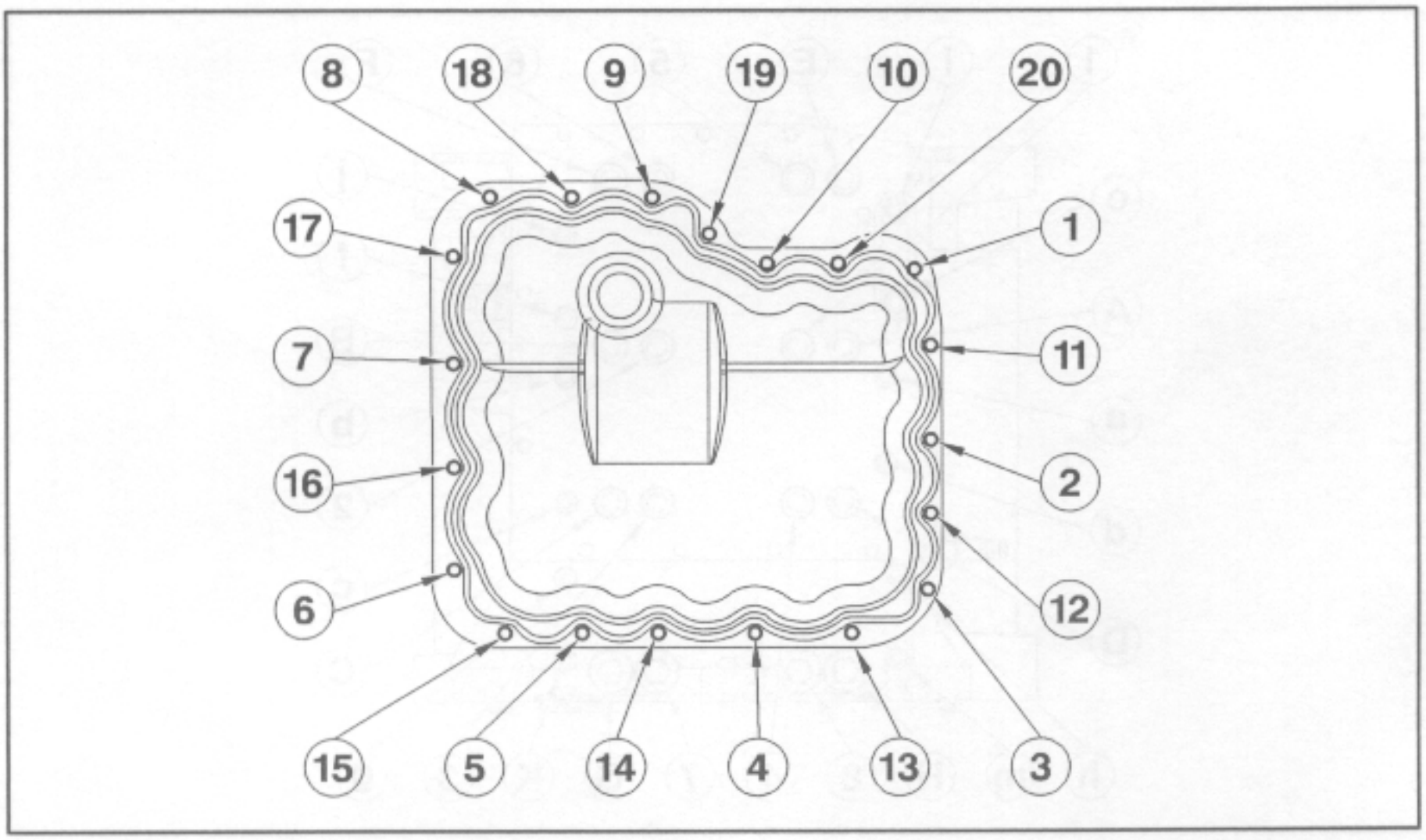


Fig : B1BP1GZD

(27) sump :
- 0,5 m.daN pre–tightening
- tightening torque = 0,8 m.daN

(28) connecting rod caps :
- tightening torque = 2 m.daN
- angular tightening of 74°

(29) crankshaft pulley hub :
- tightening torque = 4 m.daN
- angular tightening of 80°

(30) crankshaft pulley : tighten to 2,5 m.daN.

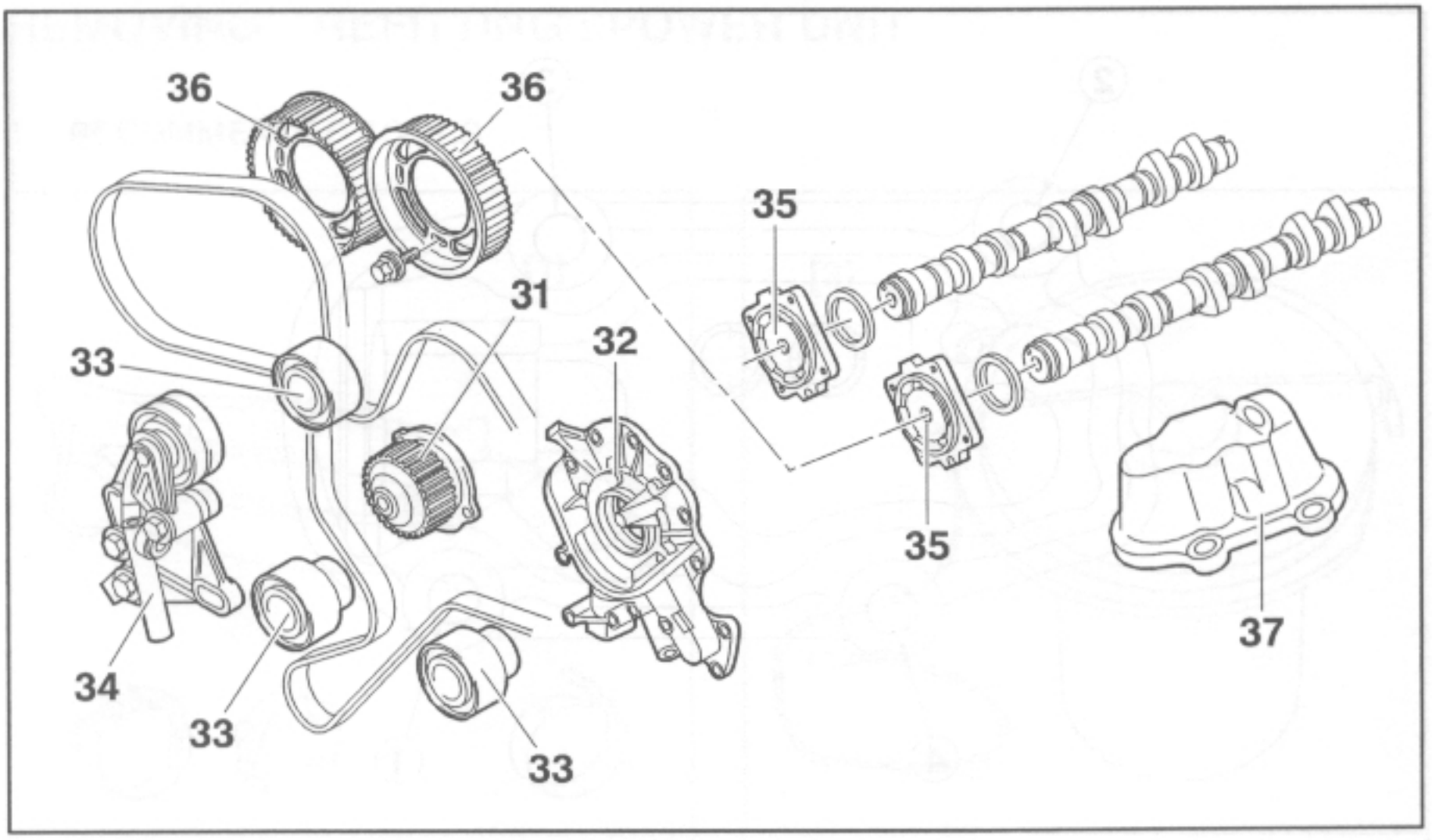


Fig : B1BP1H0D

(31) coolant pump (refer to the Note) :
- 0,5 m.daN pre–tightening
- tightening torque = 0,8 m.daN

(32) oil pump coolant pump (refer to the Note) :
- 0,5 m.daN pre–tightening
- tightening torque = 0,8 m.daN

NOTE : Respect the tightening order.

(33) guide roller : tighten to 8 m.daN.

(34) timing belt tensioner roller : tighten to 8 m.daN.

(35) camshaft hubs.

1st method (recommended method) :
- tightening torque = 2 m.daN
- angular tightening of 57°

2nd method : tightening torque = 8 m.daN.

(36) camshaft pulleys : tighten to 1 m.daN.

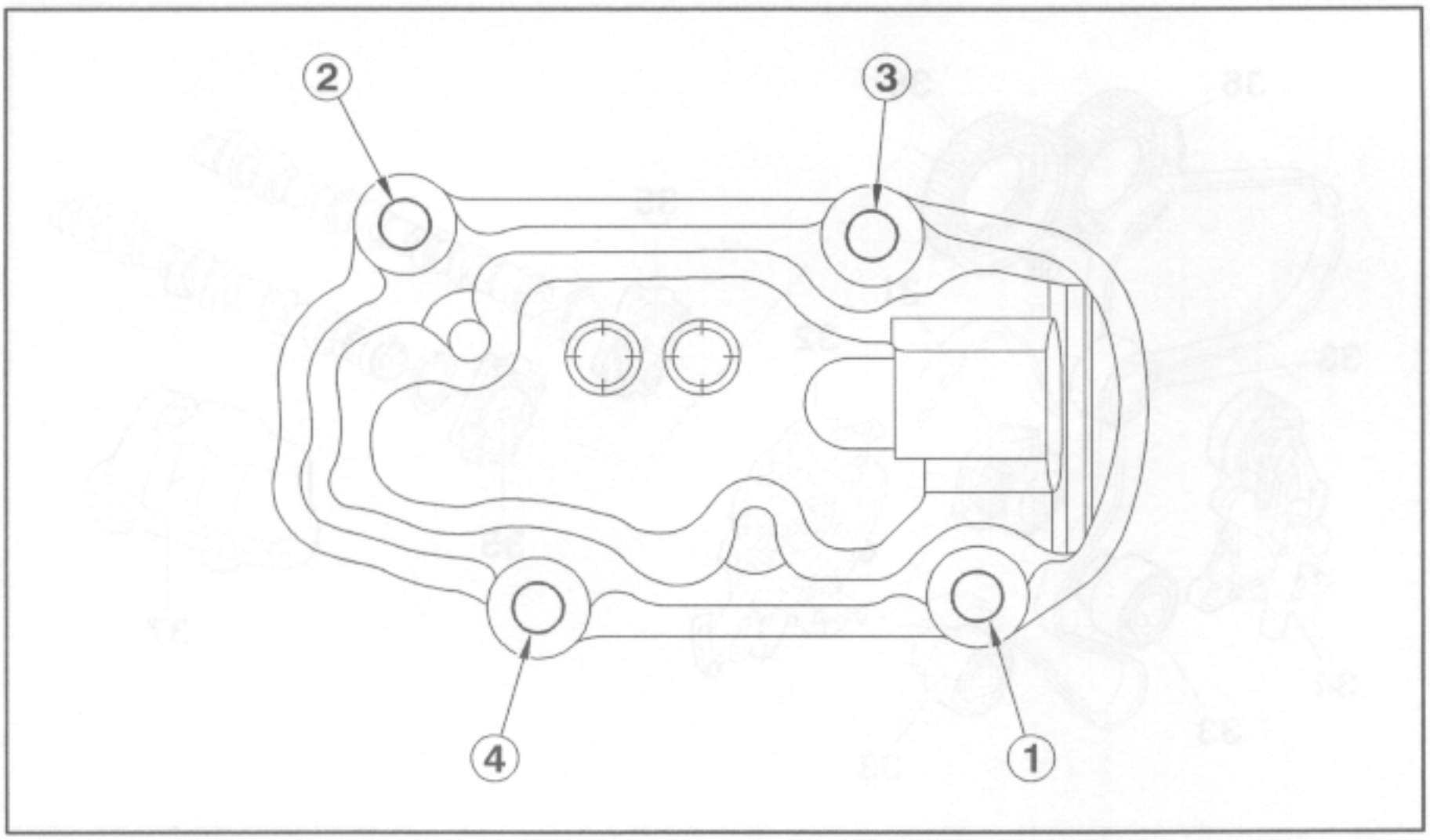


Fig : B1BP1H1D

(37) oil fumes recovery housing (in order from 1 to 4) :

- 0,5 m.daN pre–tightening
- tightening torque = 1 m.daN

REMOVING – REFITTING : POWER UNIT

1 – RECOMMENDED TOOLS

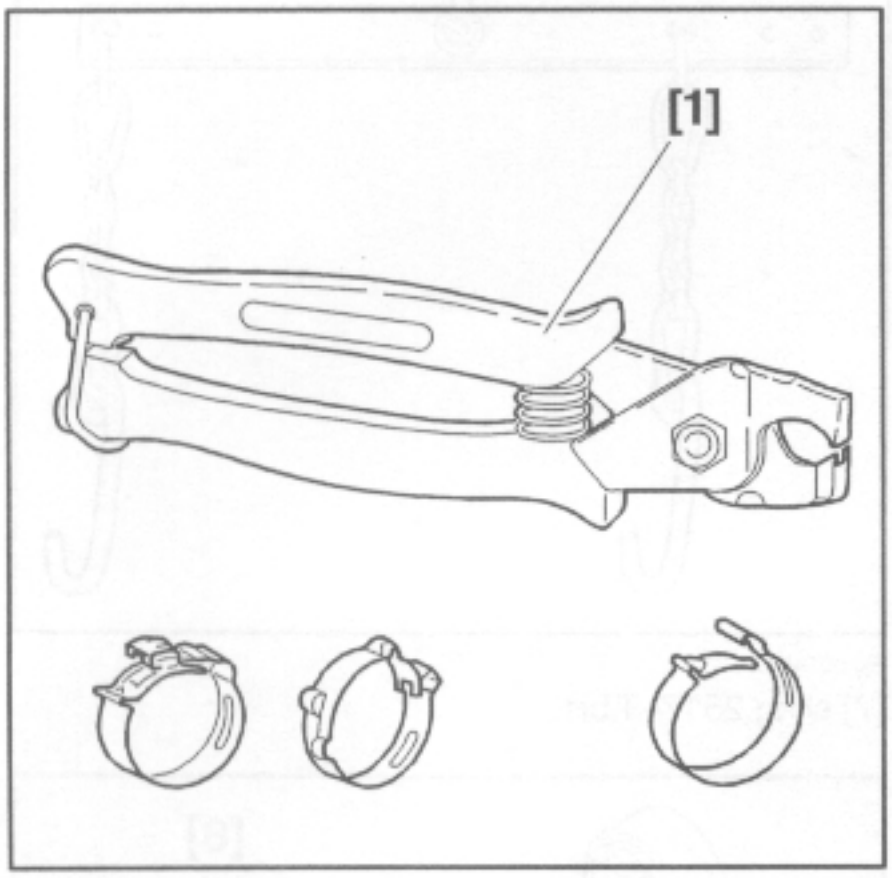


Fig : E5–P088C

[1] pliers to remove "clic" clips 4145–T.

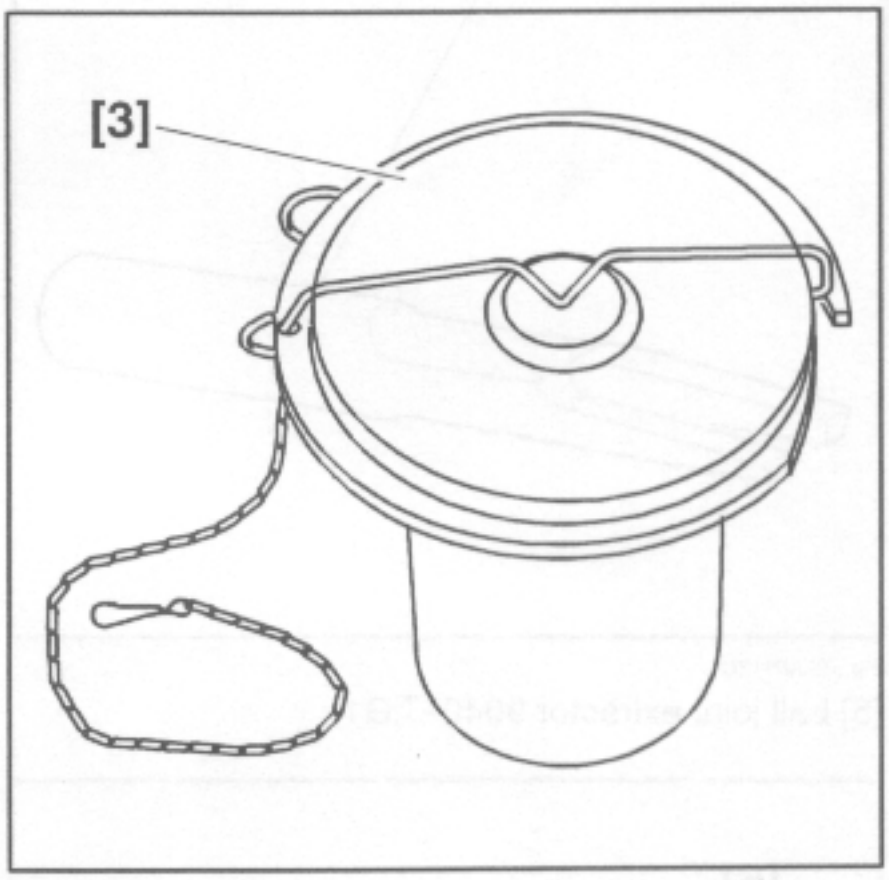


Fig : E5–P073C

[3] LHM reservoir/filter assembly cover 9004–T.

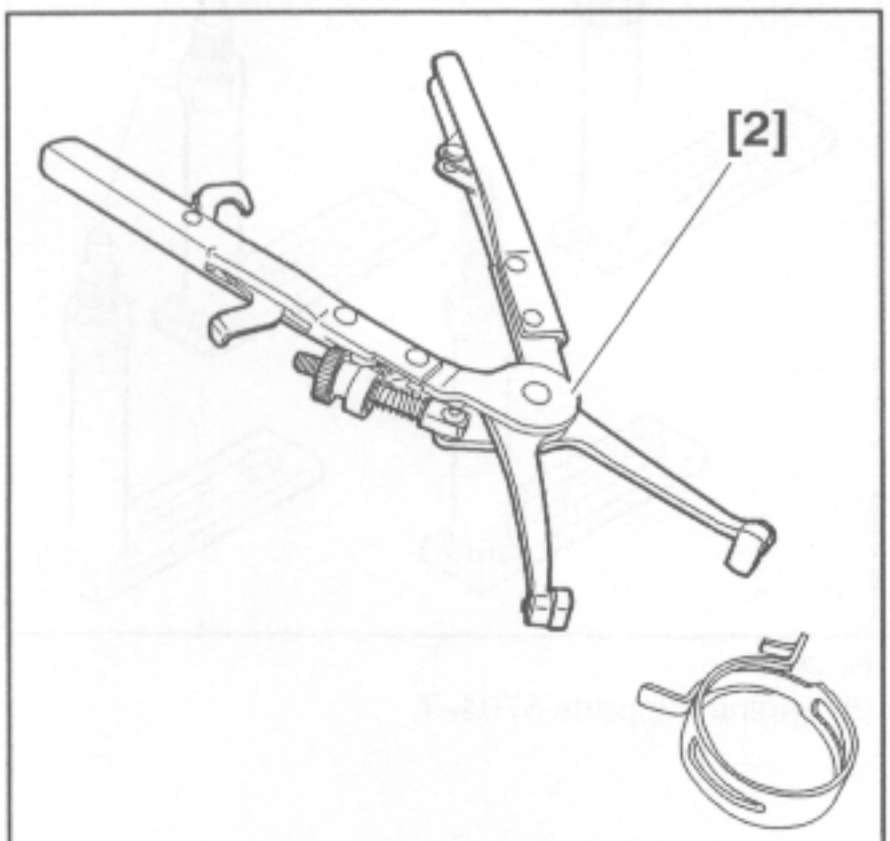


Fig : E5AP02WC

[2] pliers for removing and refitting hose clips 9029–T.

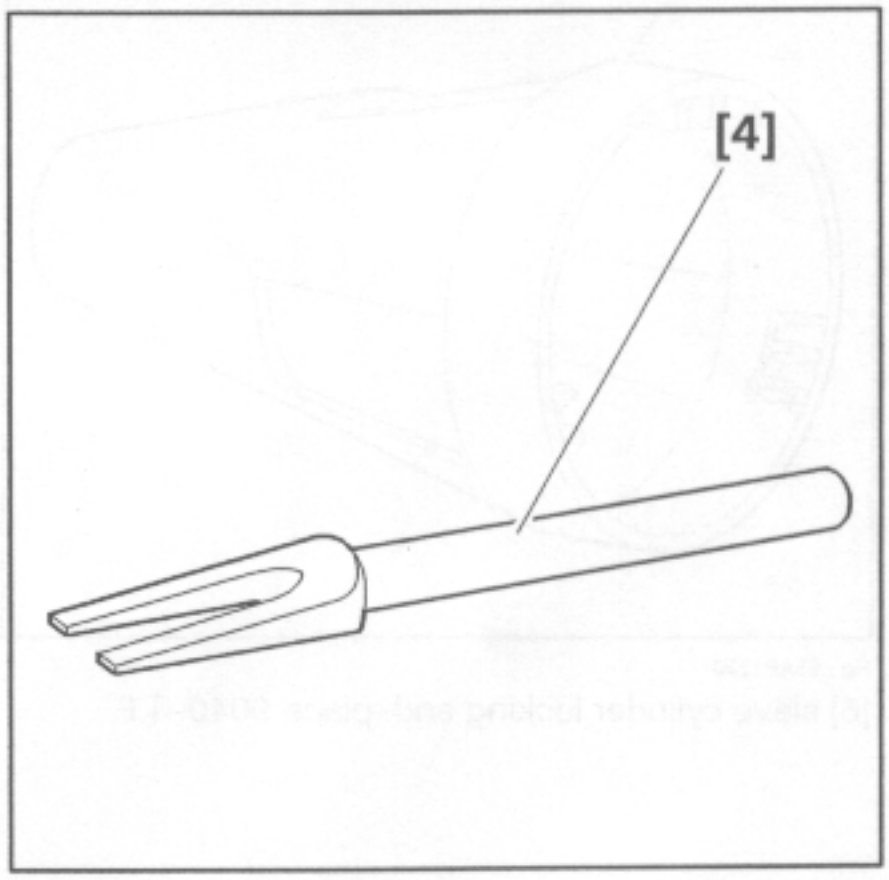


Fig : E5–P060C

[4] ball joint extractor 9040–T.G2.

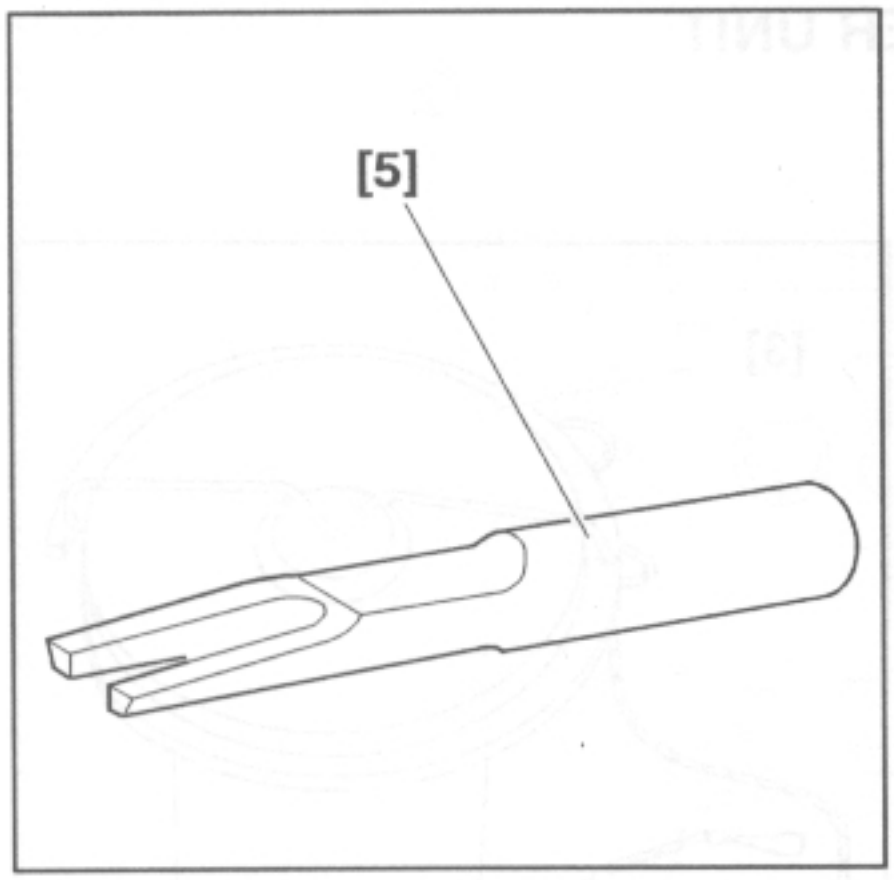


Fig : E5AP11ZC
[5] ball joint extractor 9040–T.G1.

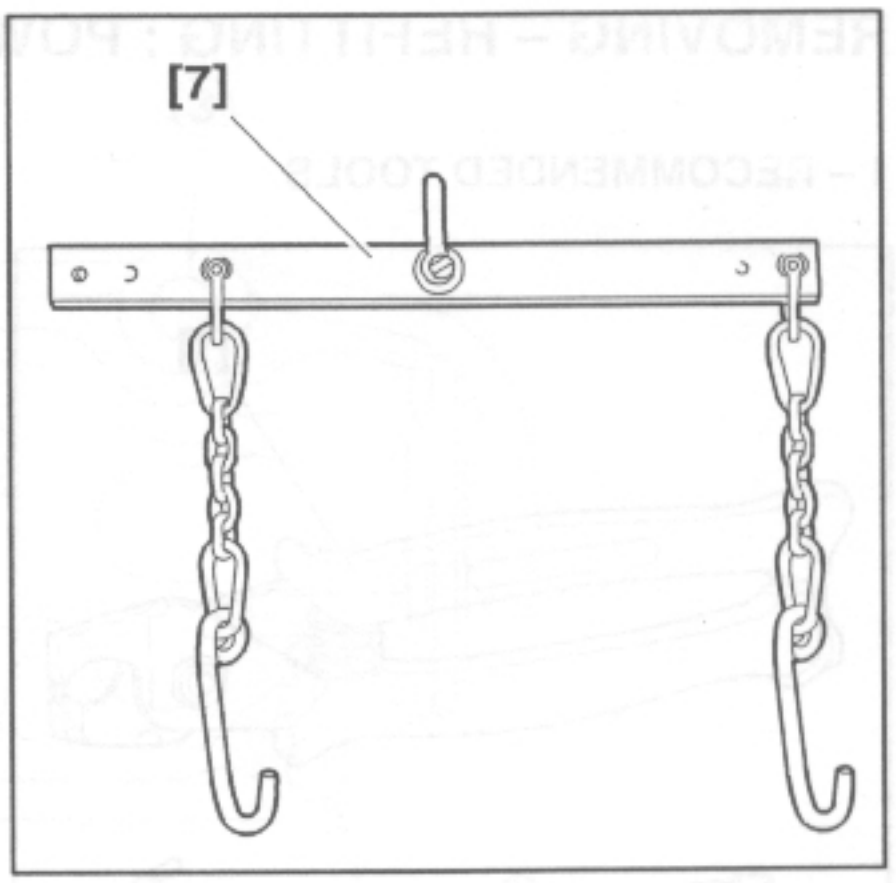


Fig : E5AP121C
[7] sling 2517–T.bis.

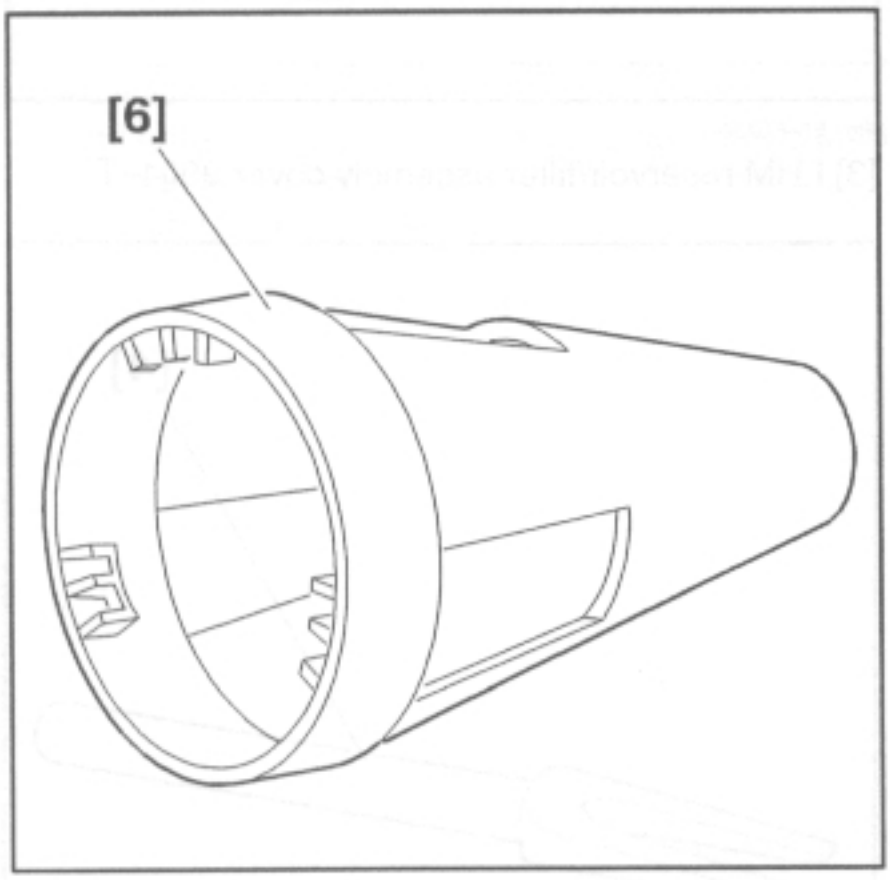


Fig : E5AP120C
[6] slave cylinder locking end–piece 9040–T.F.

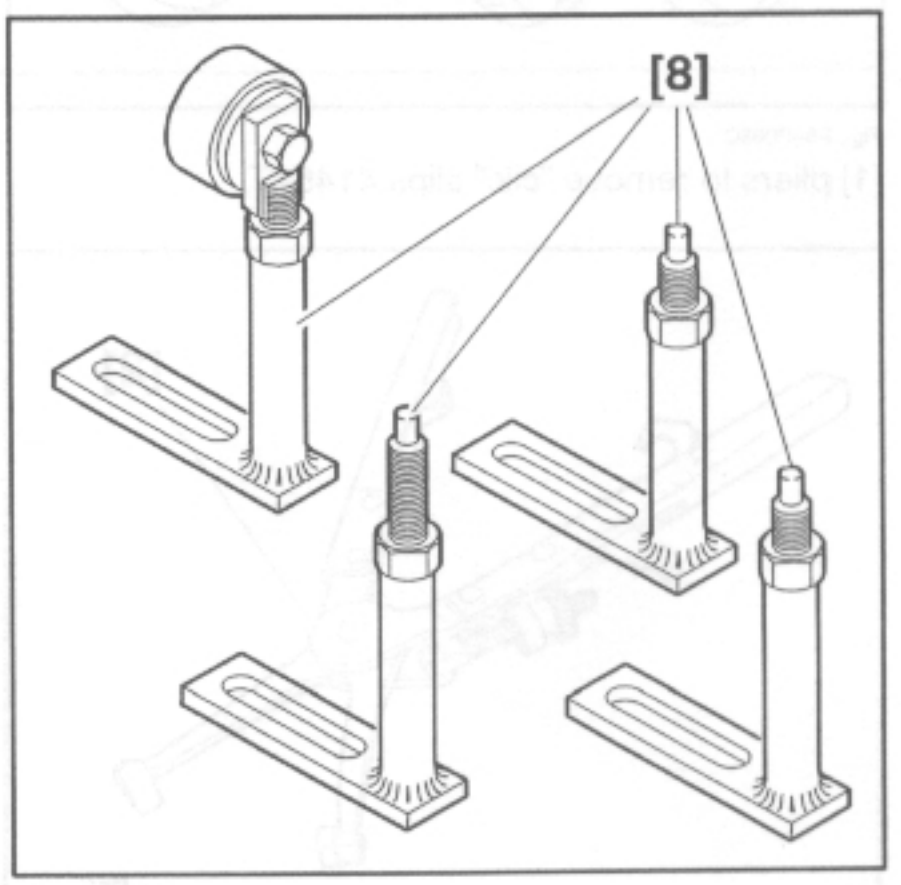


Fig : E5–P14ZC
[8] engine supports 5704–T.

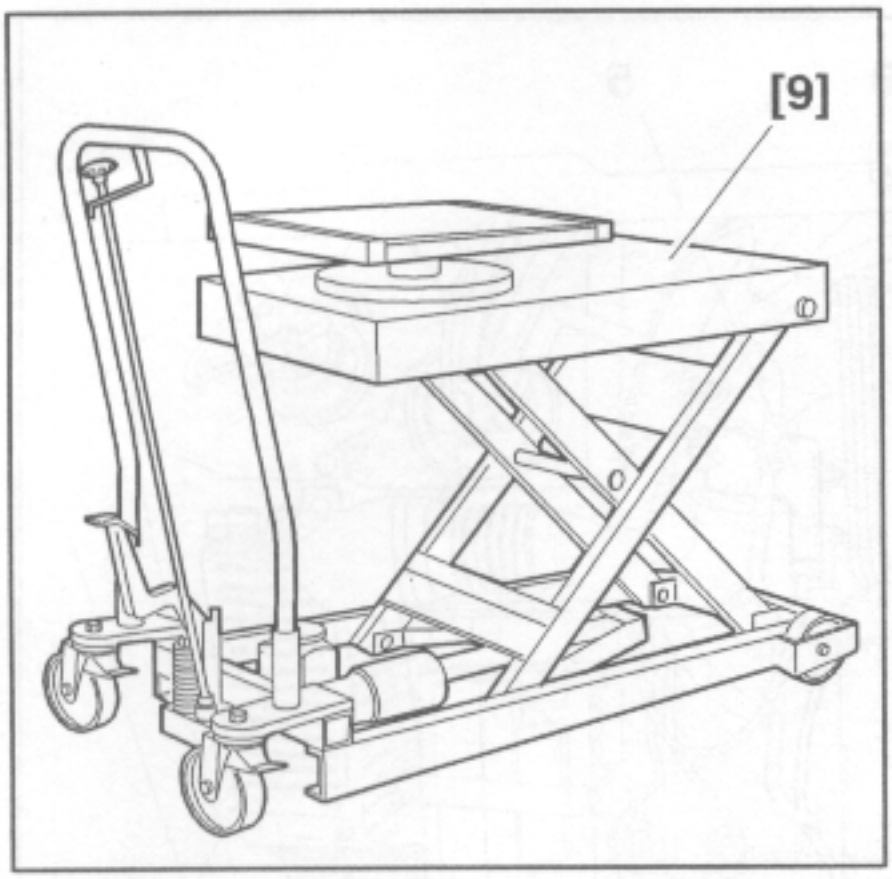


Fig : E5–P150C
[9] lifting table 5702–T.A.

2 – PRELIMINARY OPERATIONS

Disconnect the battery negative terminal.

Depressurize the hydraulic circuit
(see the relevant operation).

Drain :
- the cooling system (see the relevant operation)
- the gearbox (manual gearbox)

Remove :
- the driveshafts (see the relevant operation)
- the auxiliary equipment drive belt (see the relevant operation)
- front splash shields

3 – REMOVING

NOTE : Plug the orifices when uncoupling a pipe.

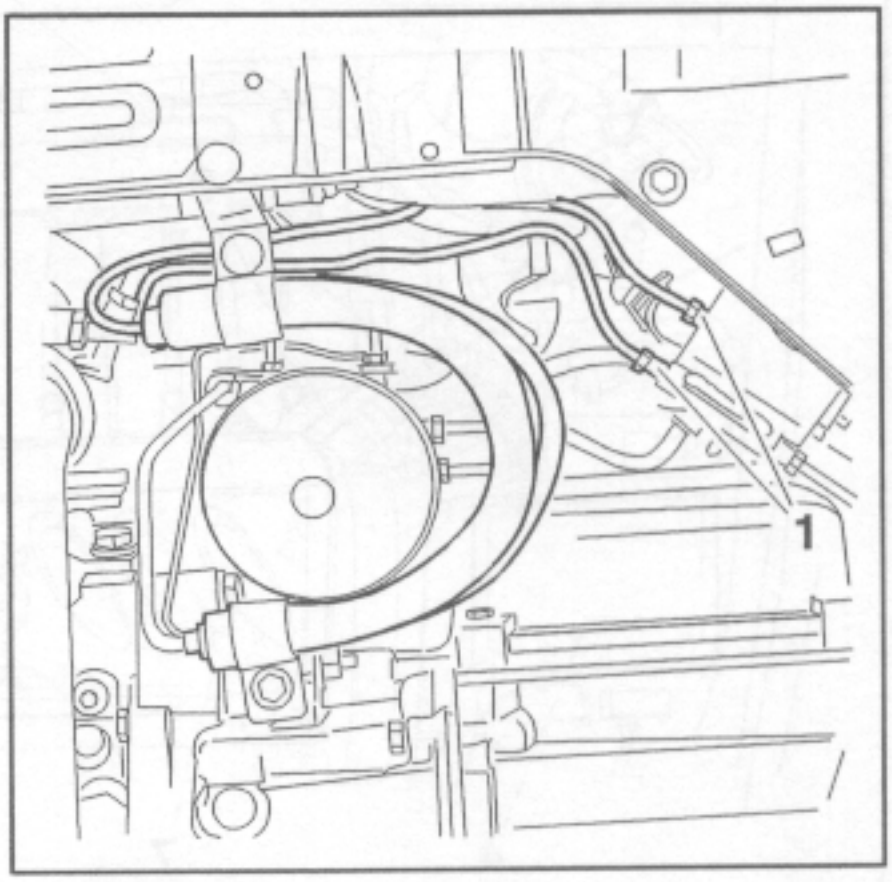


Fig : B3BP121C
Uncouple the pipes (1).

Remove the pipes fixing (1) on the cradle.

WARNING : Do not open the cooling system.

Remove the fixings of the air conditioning compressor (suspend the air conditioner compressor from the bodyshell of the vehicle).

Uncouple :
- the exhaust ball–joint
- the lower torque reaction rod

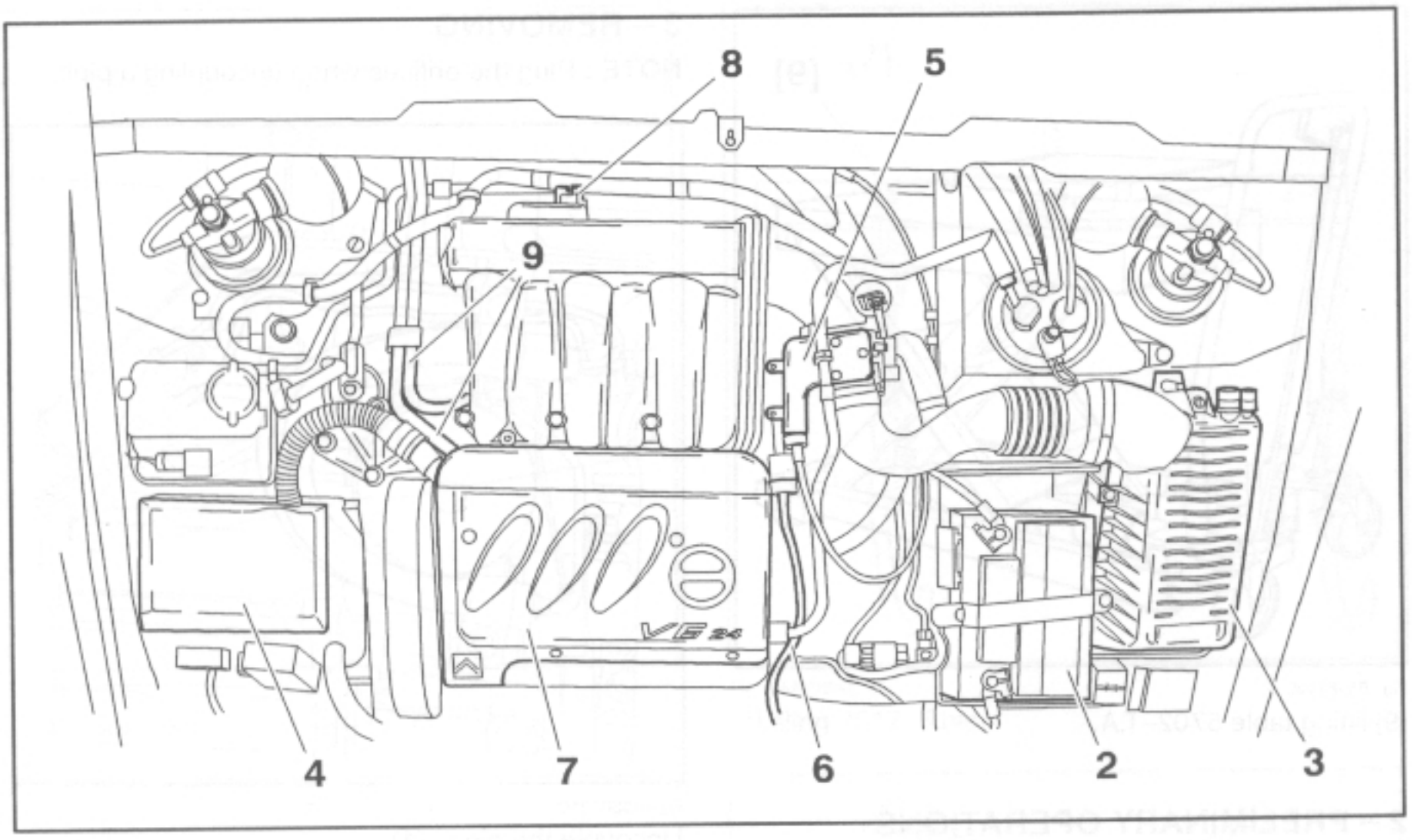


Fig : B1BP1M8D

Remove :
- the battery (2)
- the air filter housing (3)
- the ECU housing cover (4)
- the throttle butterfly housing (5)

Uncouple :
- the accelerator cable
- the flexible hose (6)

Remove :
- the engine cover (7)
- the sensor (8) (integrated pressure sensor)

Release the pressure in the injector fuel rail (see the relevant operation).

Uncouple the click–fit unions of the fuel supply and return pipes (9).

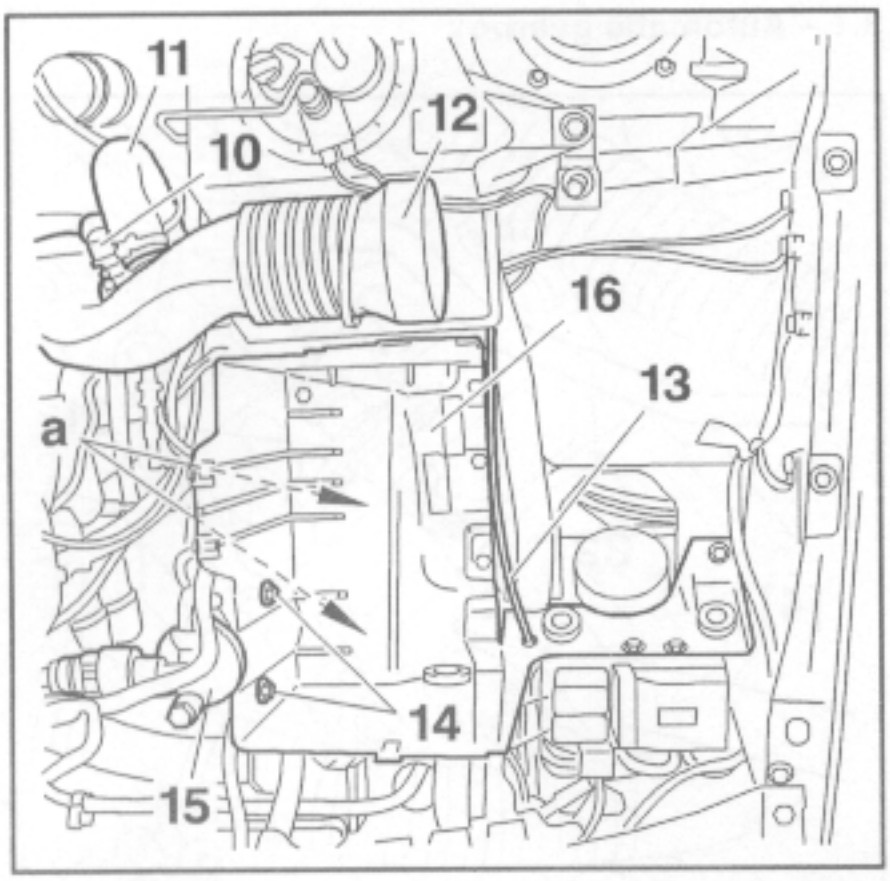


Fig : B1BP1M9C

Disconnect the inlet air temperature sensor (10).

Disconnect the pipe (11) ; by means of tool [1].

Remove the air inlet duct (12).

Uncouple the bonnet opening cable (from the upper front crossmember).

Release the bonnet opening cable (13) from the battery tray.

Remove the 2 screws (14).

Release the drier (15).

Remove :
- the screws at "a"
- the battery tray (16)

NOTE : Mark the routing and fixing points of the harnesses fixed to the battery tray (16).

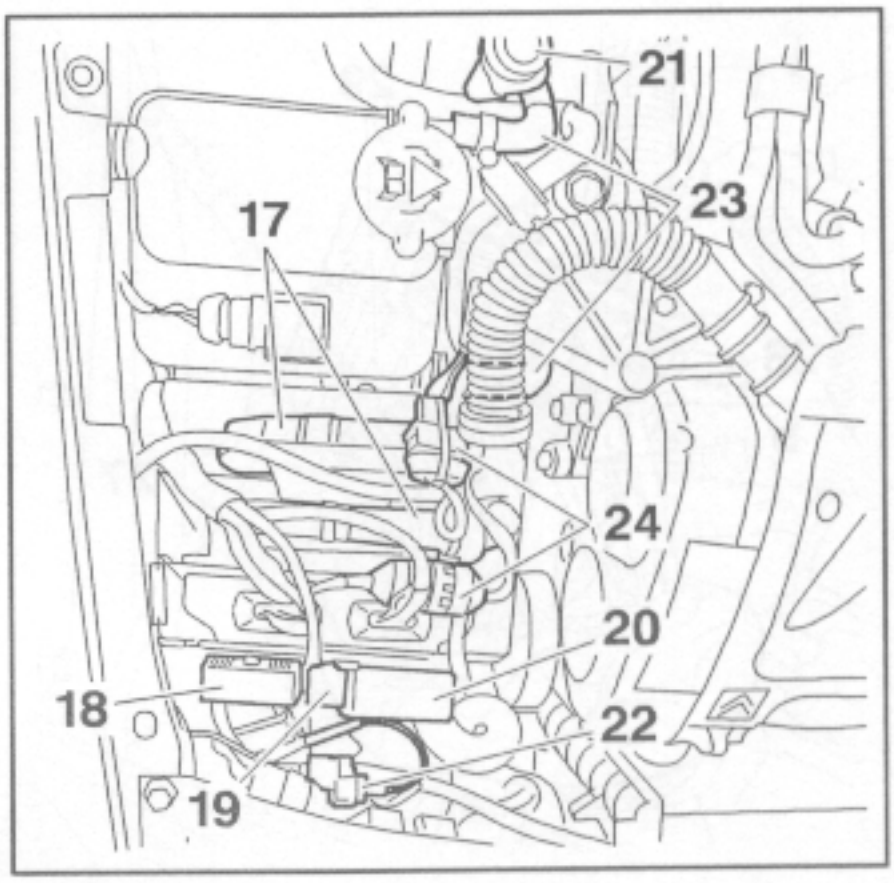


Fig : B1BP1MAC

Disconnect :
- the ECUs (17)
- the housing (18)
- the relay (19)
- the cruise control electronic control unit (20)
- the inertia switch (21)
- the canister bleed electrovalve (22)

Disconnect the hoses (23) ; by means of tool [2].

Disconnect the connectors (24).

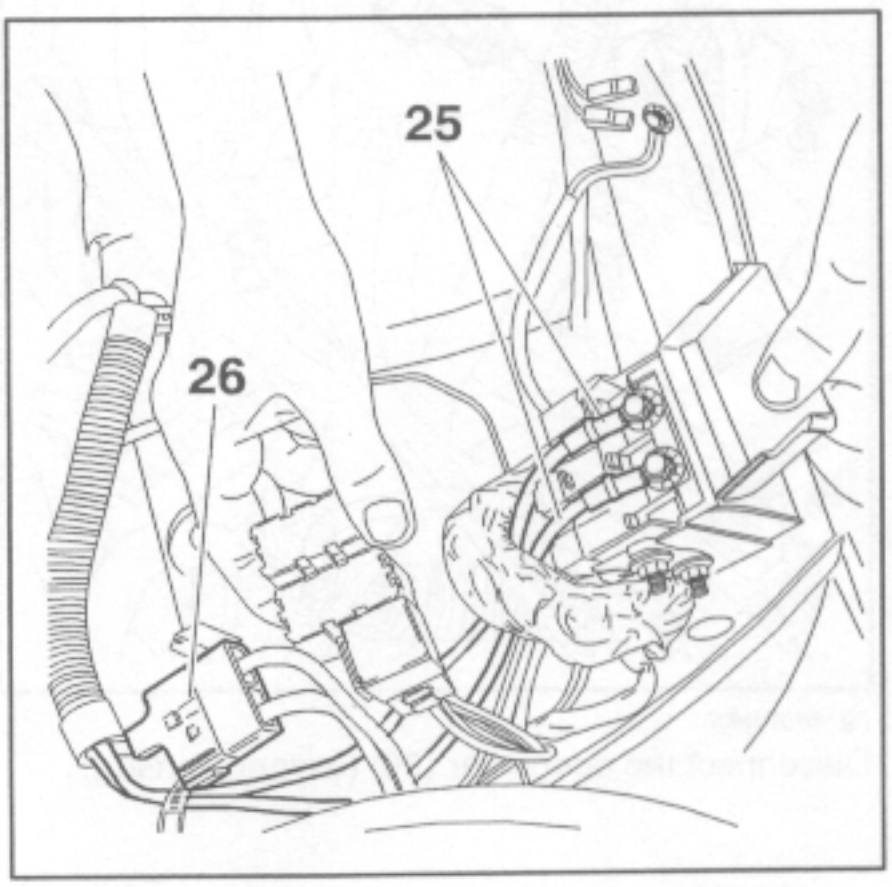


Fig : B1BP1MBC

Disconnect :
- the wires (25)
- the connector (26)

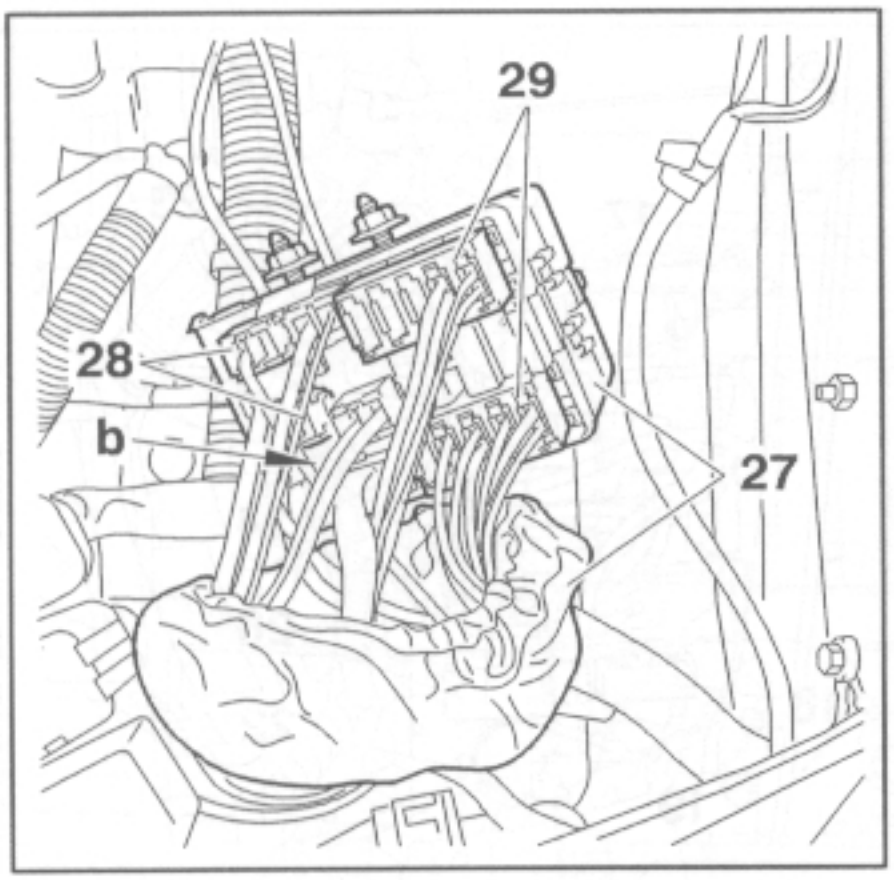


Fig : B1BP1MCC

Release the junction box from its protective cover (27).

Disconnect :

- the connectors (28) and (29)
- the connector at "b"

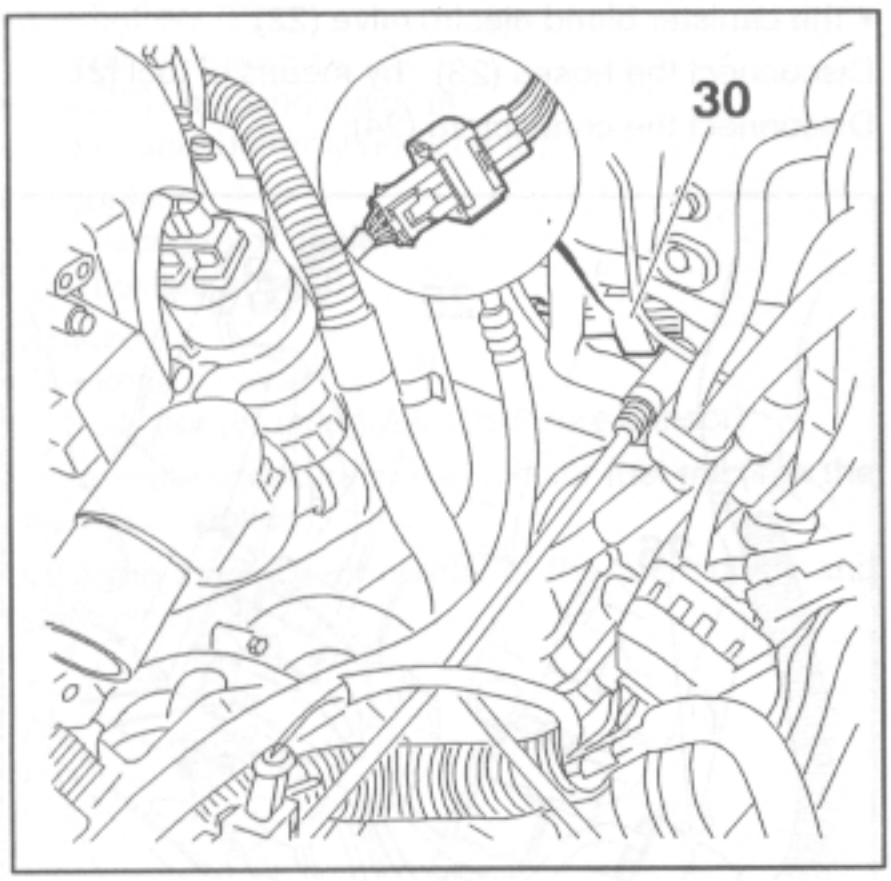


Fig : B1BP1MDC

Disconnect the connector (30) (oxygen sensor).

3.1 – Automatic gearbox

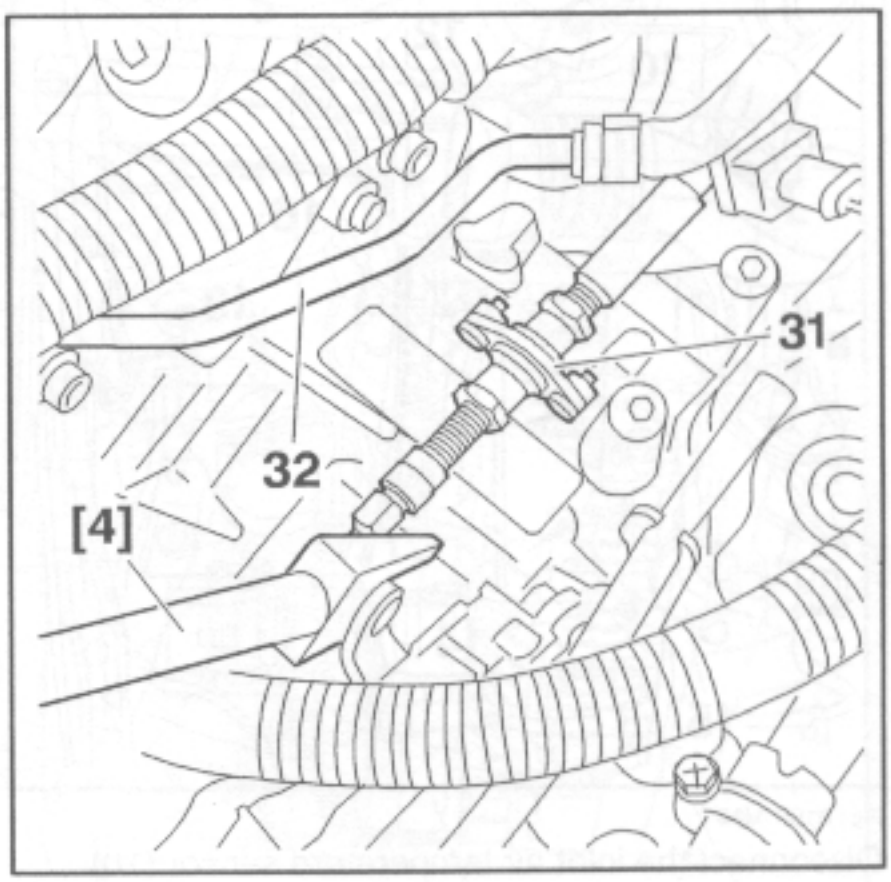


Fig : B2CP30HC

Uncouple the selector cable (31) ; by means of tool [4].

Unclip the gear selection sheath from its mounting.

WARNING : Do not twist the rod of the gear selection cable when uncoupling.

3.2 – Manual gearbox

Uncouple the control rods for gear selection ; by means of tool [5].

Remove the retaining clips of the gear selector cables.

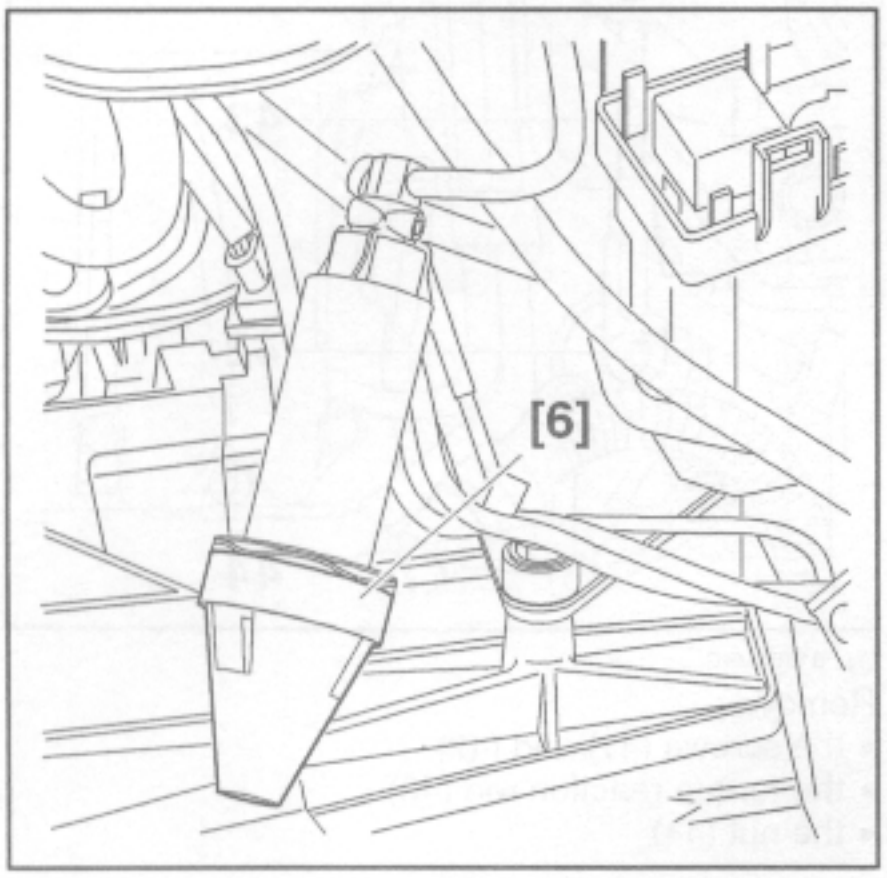


Fig : B1BP1MEC

Disconnect the clutch slave cylinder from the gearbox (by rotation).

Fit the tool [6] to the clutch slave cylinder.

WARNING : Do not drop the clutch push rod into the bell housing.

3.3 – Removing : (continued)

Uncouple the return pipe (32).

Remove :

- the LHM tank fluid pick–up unit
- the LHM tank

Put tool [3] into place.

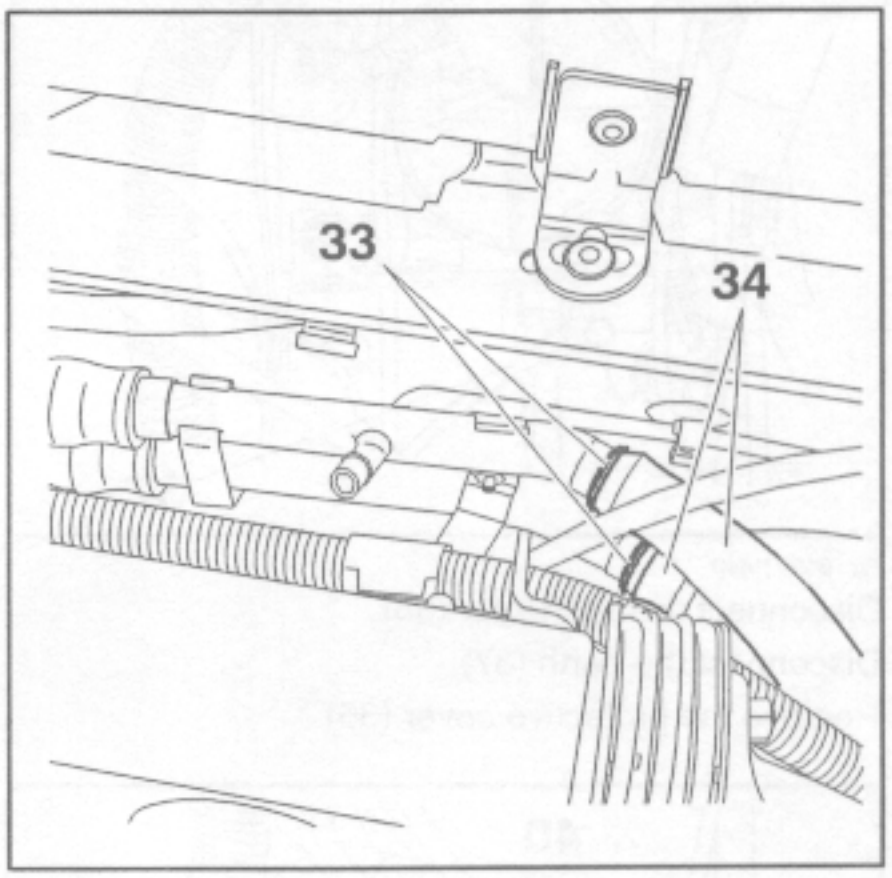


Fig : B1BP1MFC

Remove the clips (33).

Disconnect the hoses (34).

Remove the front panel (see the relevant operation).

Uncouple the 2 hoses from the radiator.

Remove the radiator.

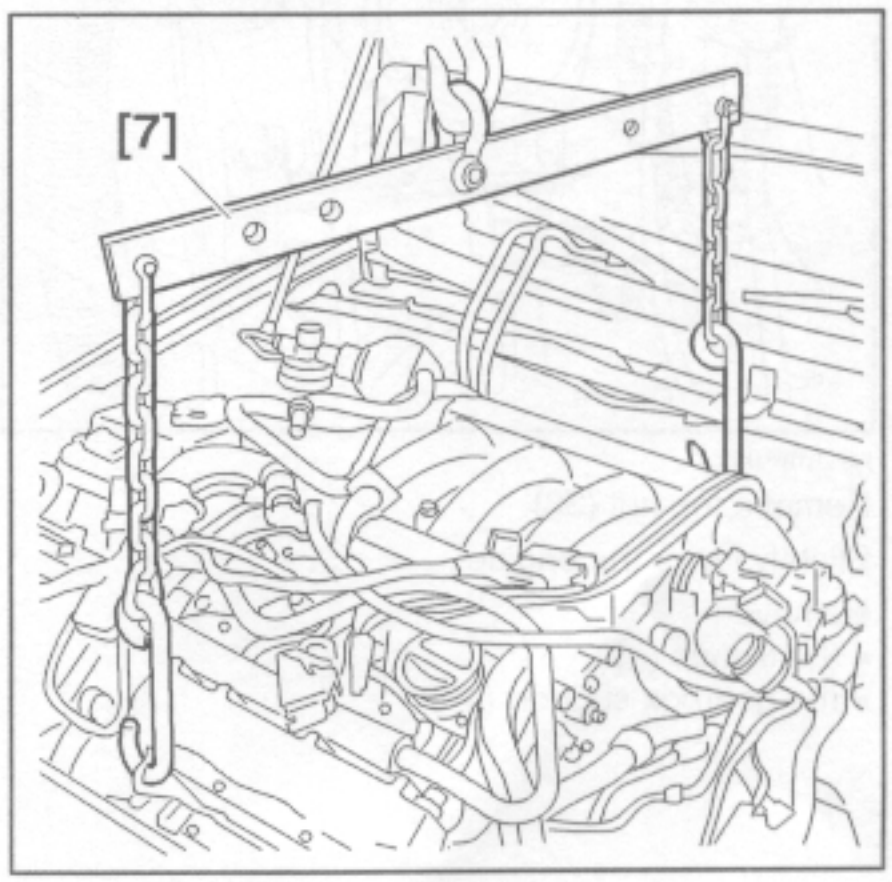


Fig : B1BP1MGC

Support the power unit ; by means of tool [7].

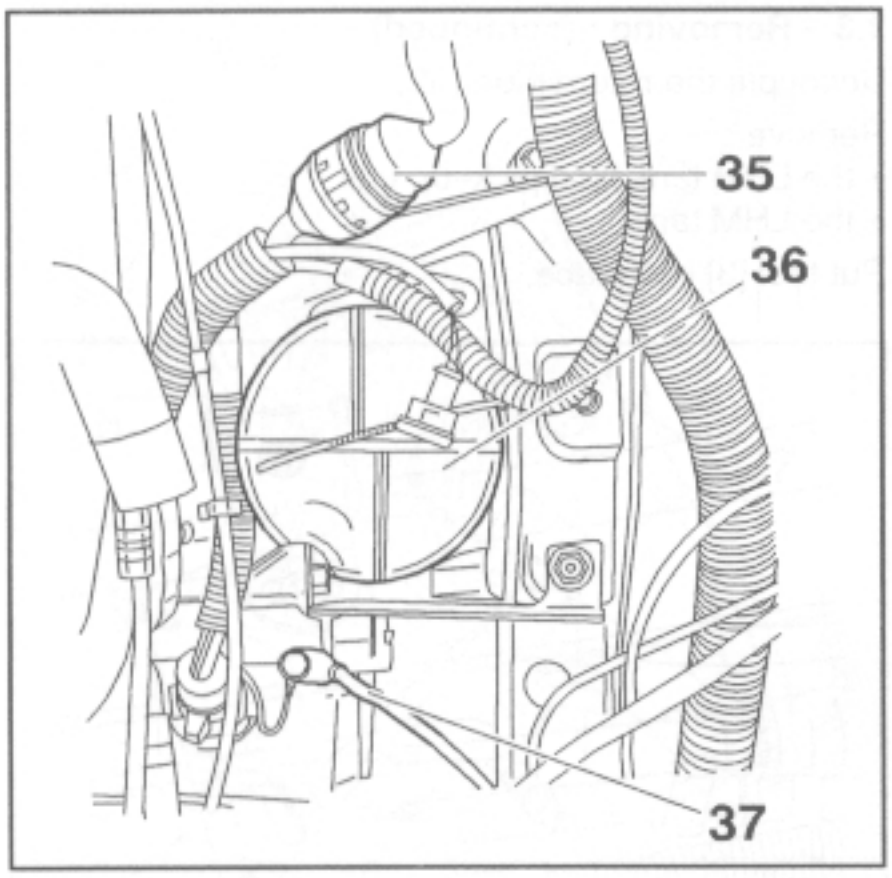


Fig : B1BP1MHC

Disconnect the connector (35).

Disconnect the earth (37).

Remove the protective cover (36).

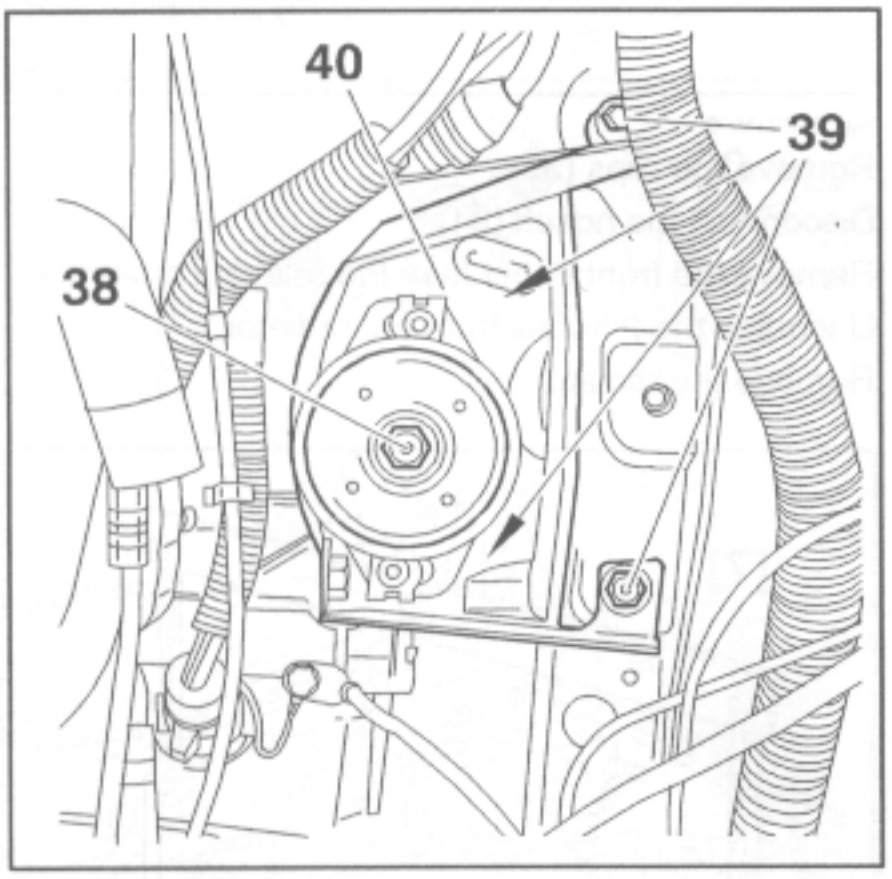


Fig : B1BP1MJC

Remove the nut (38).

Slightly lower the engine.

Remove :

- the fixings (39)
- the gearbox support (40)

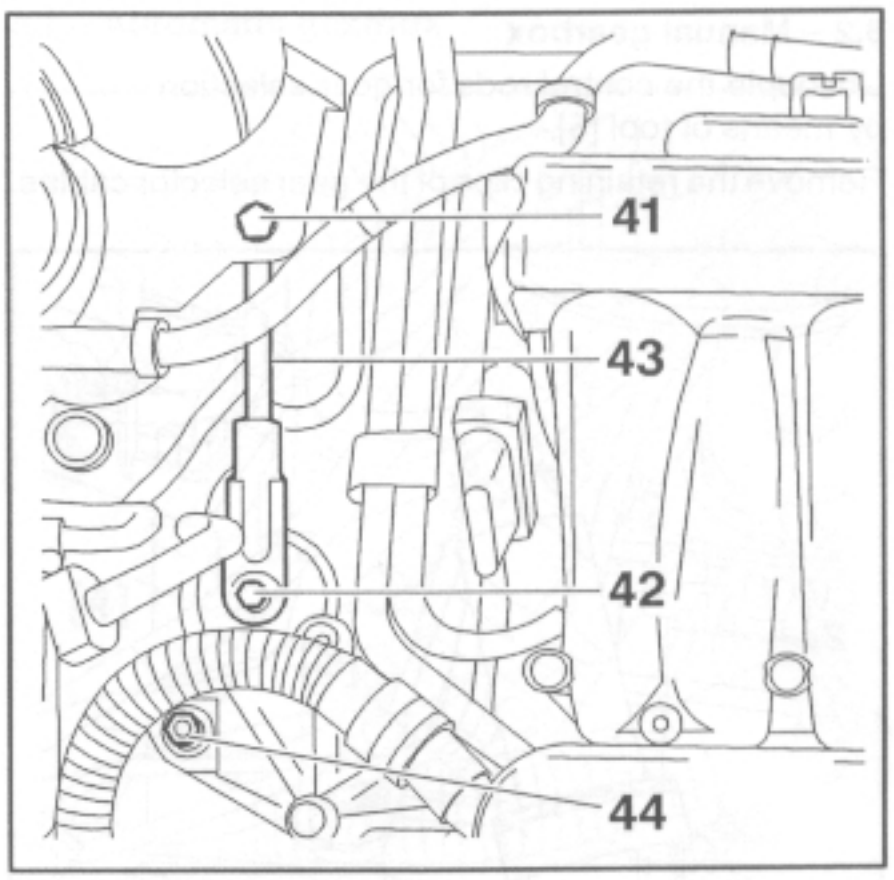


Fig : B1BP1MKC

Remove :

- the screws (41) and (42)
- the torque reaction rod (43)
- the nut (44)

WARNING : Take care not to damage the bulkhead.

NOTE : Carefully release the air conditioning condenser from the body.

Remove the power unit.

NOTE : This operation is carried out from above.

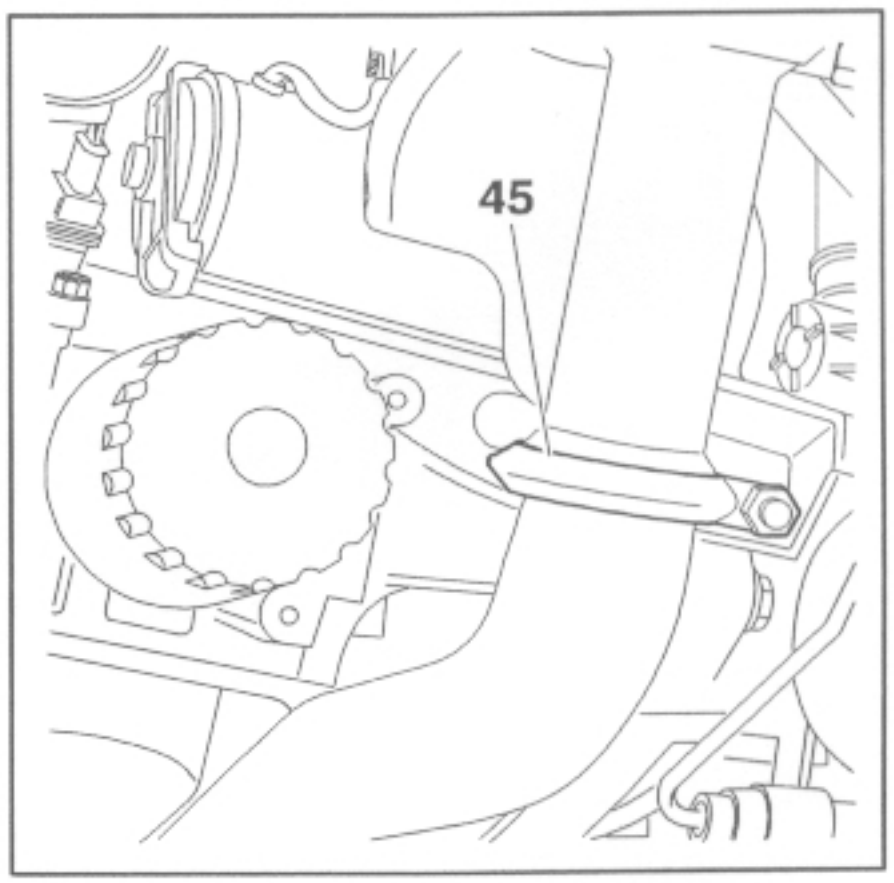


Fig : B1BP1MLC

Remove the exhaust clamp (45).

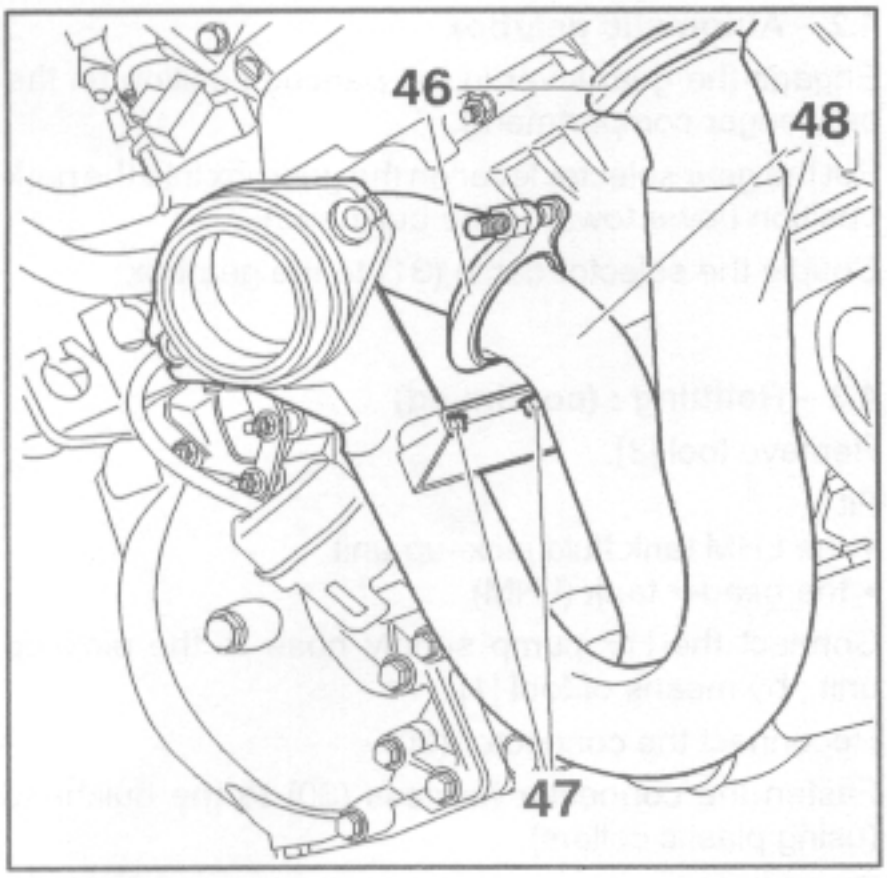


Fig : B1BP1MMC

Slacken the clamps (46).

Remove :
- the nuts (47)
- the exhaust pipes (48)

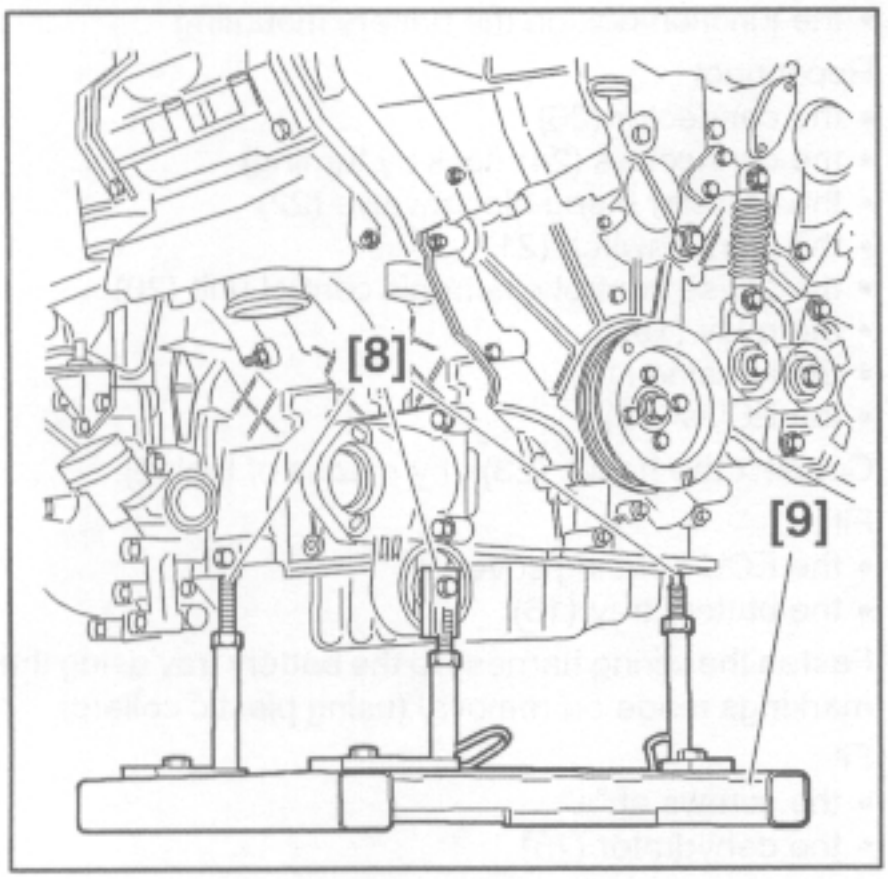


Fig : B1BP1MNC

Position the support shafts (8).

Place the engine/gearbox assembly on the lifting table [9].

4 – REFITTING

IMPERATIVE : Always fit new Nylstop nuts.

Fit (on the workshop crane) :
- the exhaust pipes (48)
- the nuts (47)
- the clamping collars (45), (46) ; tighten to 2,5 m.daN
- the gearbox mounting spacer ; coat with G7 grease : 3 grammes

Position the power unit near its fixing points by fitting the lower torque reaction rod.

Place a jack below the gearbox (insert a block of wood).

Using the jack, locate the stud of the gearbox in its support.

Fit :
- gearbox support (40)
- screws (39) ; tighten to 2,7 m.daN
- nut (38) ; tighten to 6,5 m.daN

Lower the power unit to the right level and refit the right engine support.

Fit :
- the nut (44) ; tighten to 4,5 m.daN
- the torque reaction rod (43)
- the screw (41) ; tighten to 5 m.daN
- the screw (42) ; tighten to 5 m.daN

Connect the return pipe (32).

Fit the air conditioning condenser.

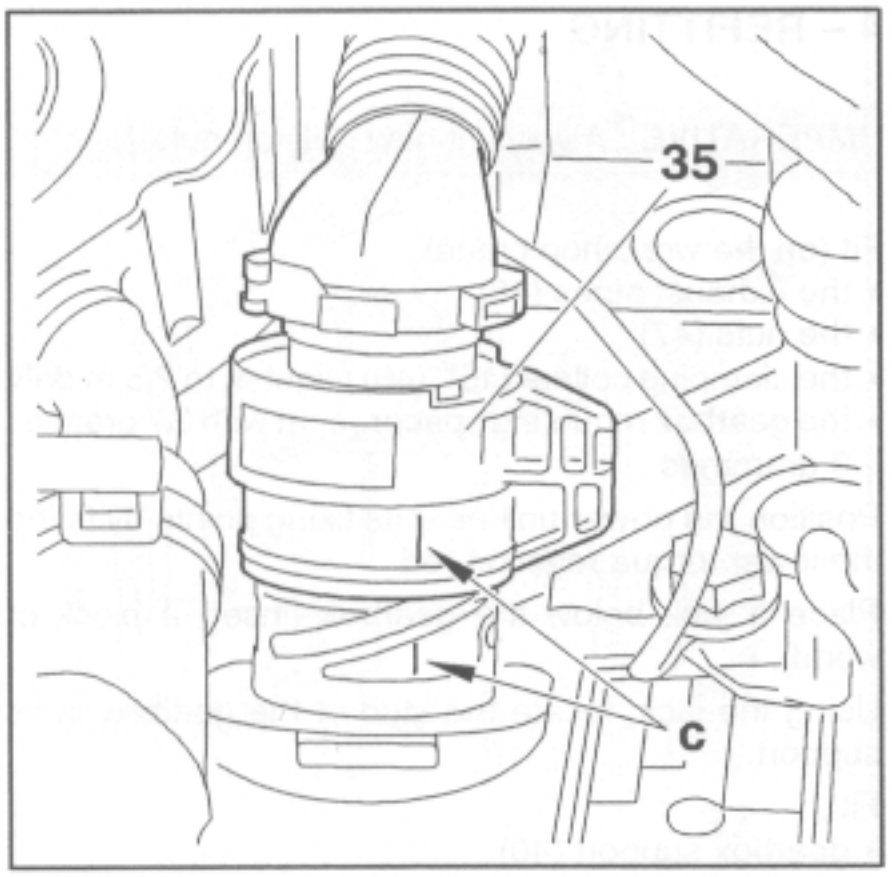


Fig : B1BP1MPC

NOTE : To facilitate locking the connector (35), align the two markings "c".

Reconnect the connector (35) (lock by turning).

Fit :
- the protector (36)
- the earth (37)

Couple the heater matrix hoses (34) (O ring seal).

Fit :
- the clips (33)
- the gear selector sheath retaining clip

4.1 – Manual gearbox

Remove tool [6].

Refit the clutch slave cylinder.

Couple up the control rods for gear selection.

Refit the gear selector cable retaining clips.

4.2 – Automatic gearbox

Engage the gear lever in the parking position (in the passenger compartment).

Put the gear selector lever on the gearbox into the park position (lever towards the bulkhead).

Couple the selector cable (31) to the gearbox.

4.3 – Refitting : (continued)

Remove tool [3].

Fit :
- the LHM tank fluid pick–up unit
- the header tank (LHM)

Connect the HP pump supply hose to the pick–up unit ; by means of tool [1].

Reconnect the connector (30).

Fasten the connector harness (30) to the bulkhead (using plastic collars).

Reconnect :
- connectors (28) and (29)
- the connector at "b"

Fit :
- the wires (25)
- the protective cover (27)
- the junction box on the battery mounting

Reconnect :
- the connector (26)
- the connectors (24) (lock by turning)
- the canister bleed electrovalve (22)
- the inertia switch (21)
- the cruise control electronic control unit (20)
- the relay (19)
- the housing (18)
- the ECUs (17)

Connect the hoses (23) ; by means of tool [2].

Fit :
- the ECU housing cover (4)
- the battery tray (16)

Fasten the wiring harness to the battery tray using the markings made on removal (using plastic collars).

Fit :
- the screws at "a"
- the dehydrator (15)

Refit the pipes fixing (1) on the cradle.

Couple the tubes (1).

Refit the front panel (see the relevant operation).

Recouple :
- the bonnet release cable (13)
- the pipe (11) ; by means of tool [1]
- the air sleeve (12)
- the fuel supply and return piping (9)
- flexible hose (6)
- the accelerator cable
- the housing (5)

Fit the cover (7).

Reconnect :
- the sensor (8) (pressure sensor integrated)
- inlet air temperature sensor (10)

Check that the cooling system is not leaking.

Fit :
- the air filter housing (3)
- the air conditioning compressor

Refit the exhaust ball joint ; tighten to 1 m.daN.

Fit :
- the auxiliary equipment drive belt (see the relevant operation)
- the driveshafts (see the relevant operation)
- the front splash shields

Reconnect the battery negative terminal.

Fill the cooling system (see the relevant operation).

Checking the levels.

IMPERATIVE : Start the engine, with the pressure regulator release screw loosened.

Bleed the cooling system (see the relevant operation).

REMOVING – REFITTING : AUXILIARY EQUIPMENT DRIVE BELT

NOTE : The auxiliary equipment drive belt is tensioned automatically by the dynamic tensioner.

1 – REMOVING

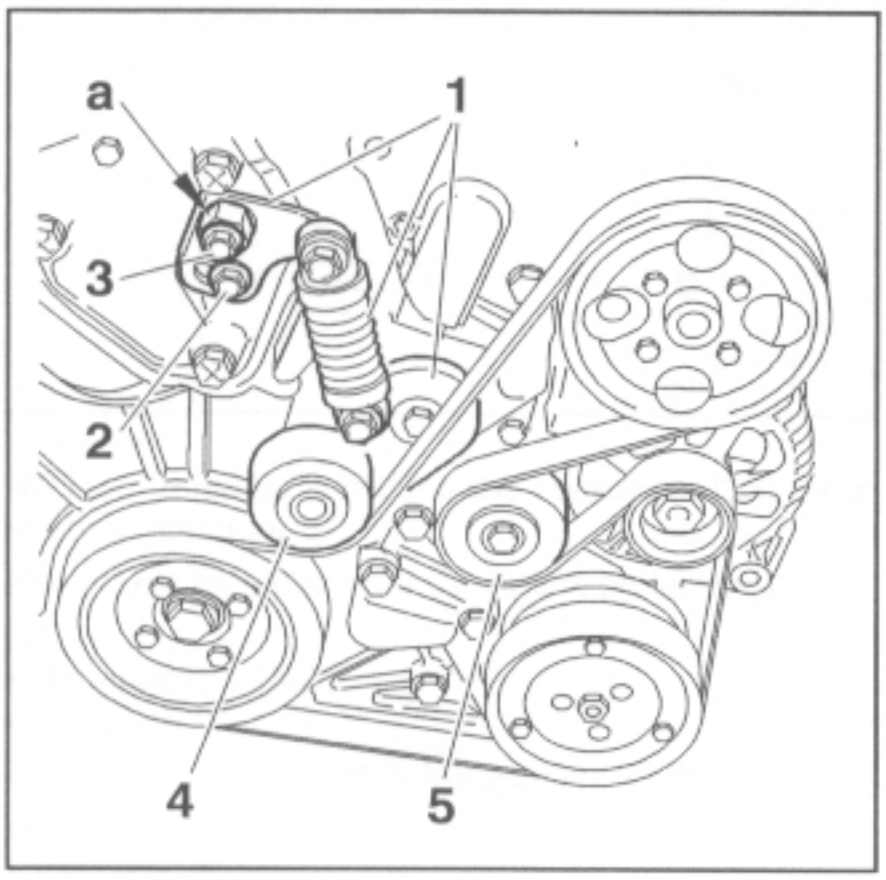


Fig : B1BP1EXC

Slacken bolt (3).

Keep the dynamic tensioner (1) under tension using the hexagon "a".

Disengage the shoulder of the bolt (2) from the oblong hole in the dynamic tensioner.

Release the dynamic tensioner (1) using the hexagon "a".

Remove the auxiliary equipment drive belt.

NOTE : Check that rollers (4) and (5) rotate freely (no tight spot).

2 – REFITTING

Reinstall the auxiliary equipment drive belt.

NOTE : Check that the belt is correctly located in the grooves of the various pulleys.

Bring the dynamic tensioner (1) into its operating position using the hexagon "a".

Tighten the bolt (2) to 2,5 m.daN.

Tighten the bolt (3) to 2,5 m.daN.