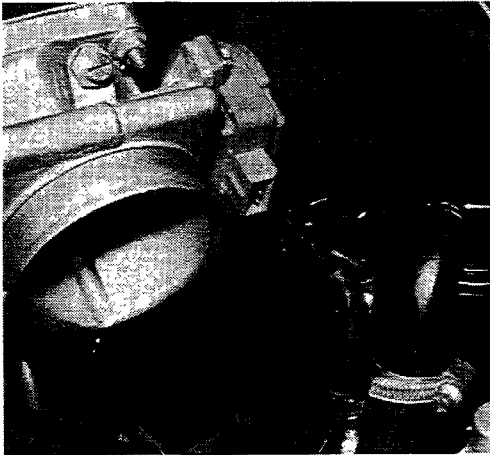


REMOVING-REFITTING POWER UNIT	1
FUEL SYSTEM	
- Diagram showing operation of fuel system	19
LUBRICATION	
- Diagram showing lubrication system	21
COOLING SYSTEM	
- Diagram showing operation of cooling system	23
FUEL SYSTEM	
- Diagram showing IAW (MPI) injection/ignition system	25
- Injection/ignition system (IAW) wiring diagram	26
- Absolute pressure sensors - Over-boost device solenoid valve	27
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- Detonation sensor - Butterfly casing	29

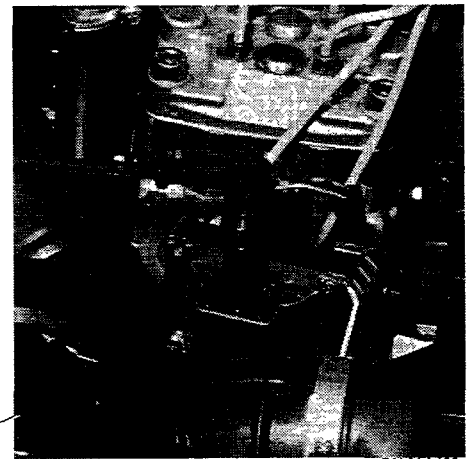
Position the vehicle on a lift.

Then, proceed as follows;

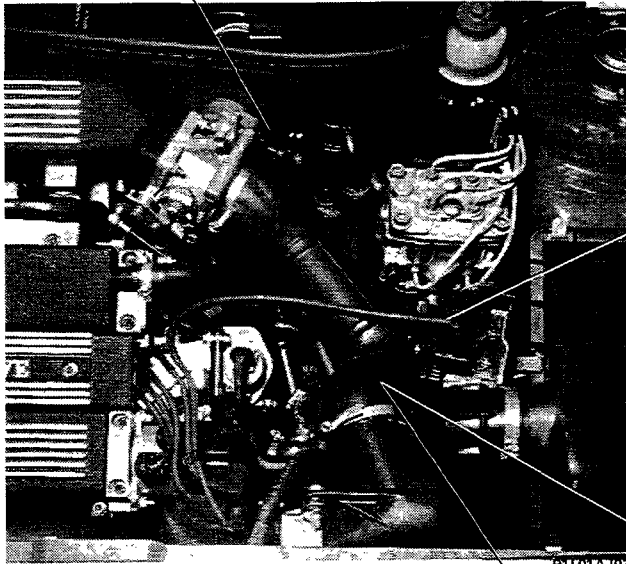
- drain the coolant;
- remove the bonnet lid;
- disconnect the negative lead from the battery;
- remove the items illustrated below:



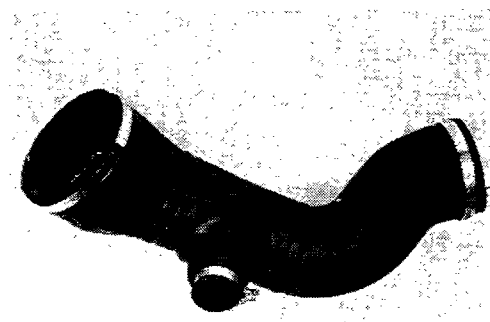
P1L01AJ01



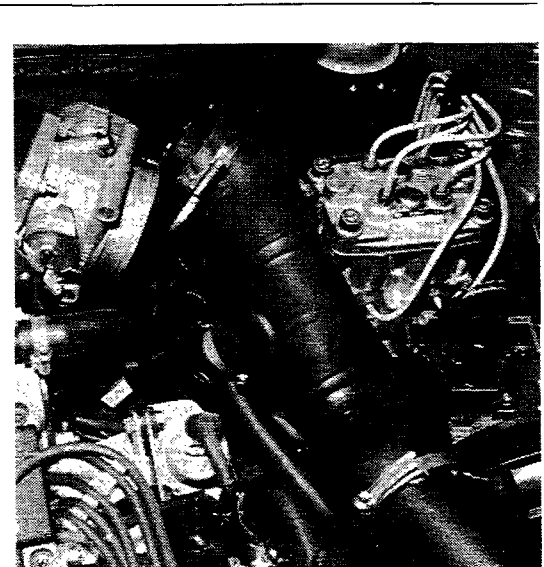
P1L01AJ02



P1L01AJ03

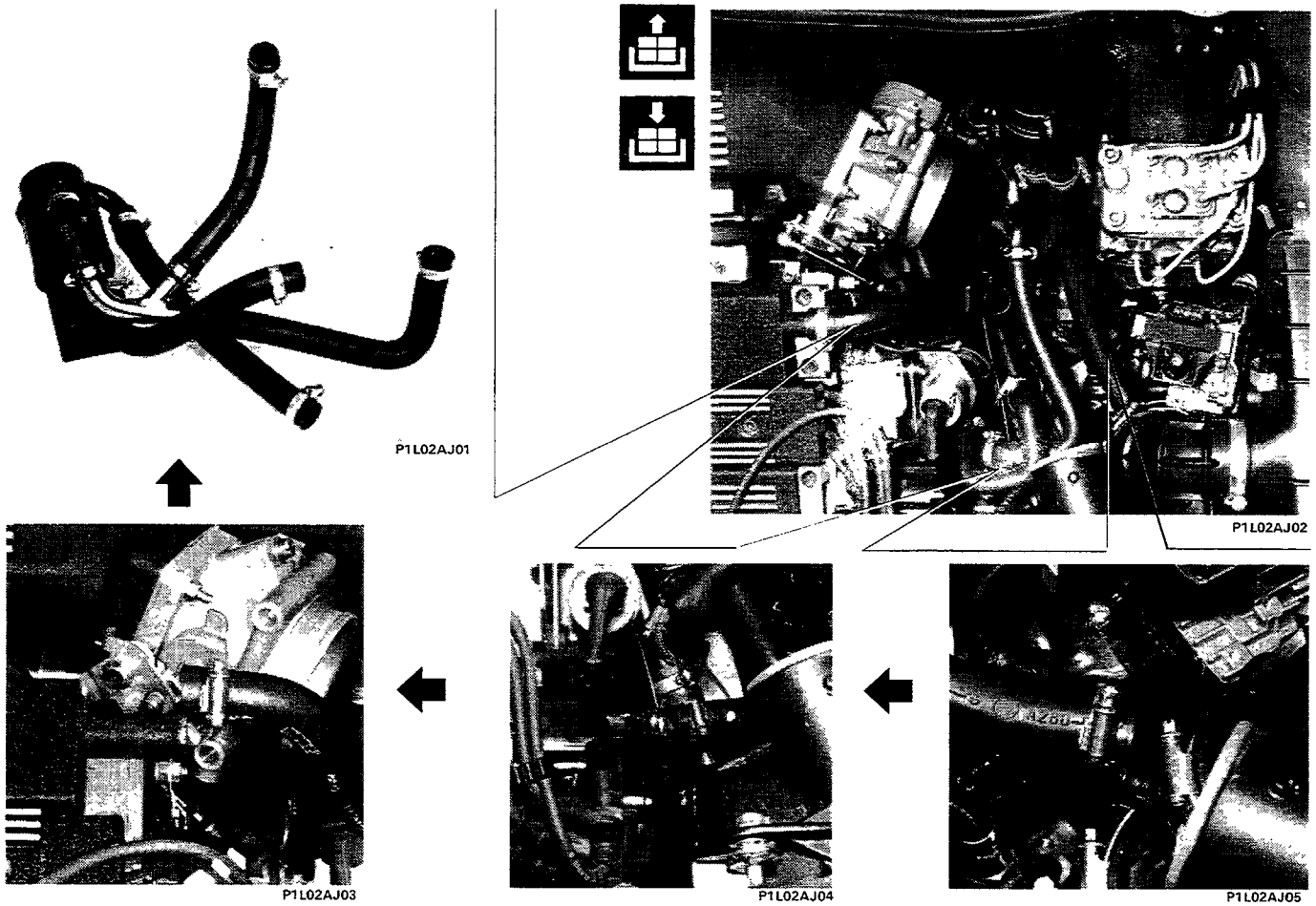


P1L01AJ05

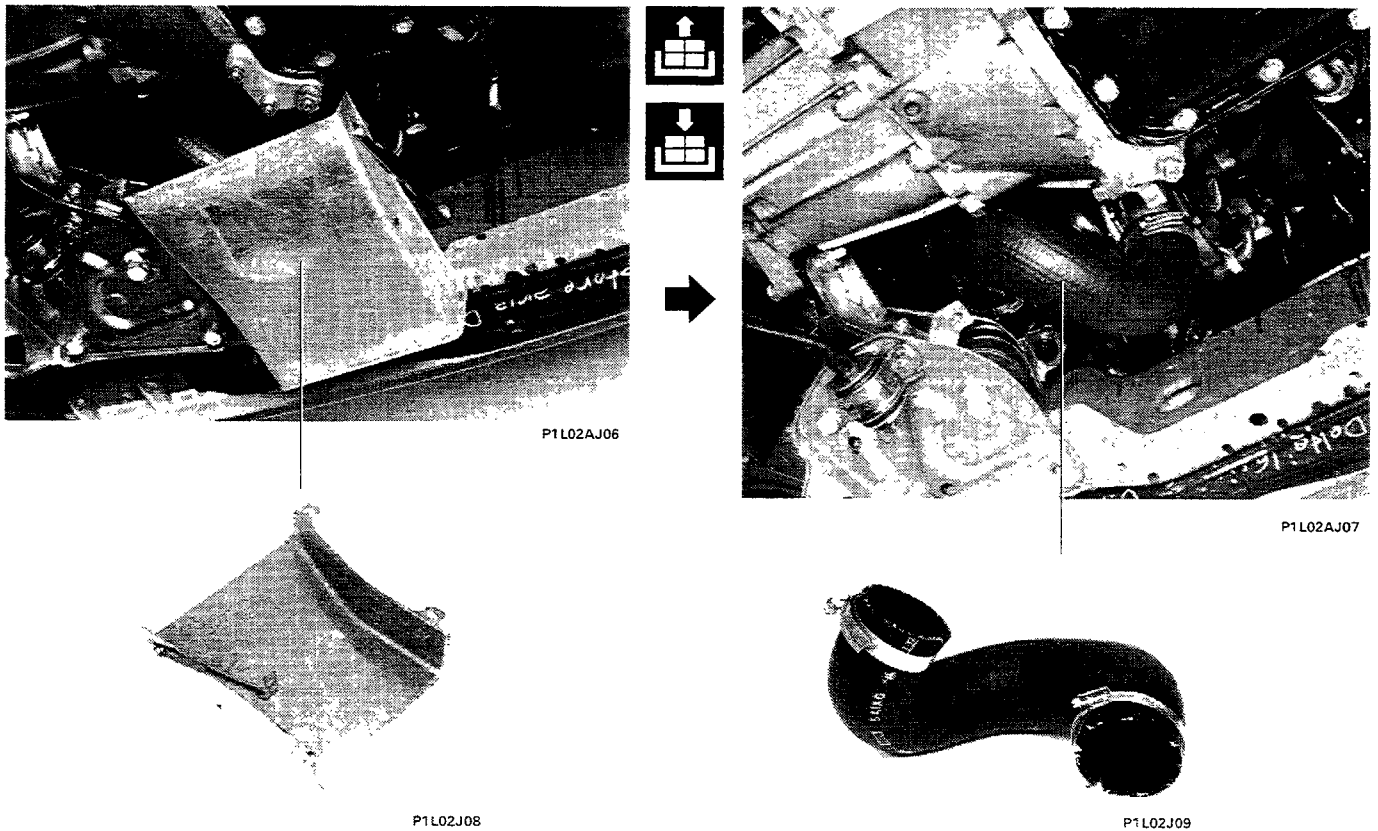


P1L01AJ04

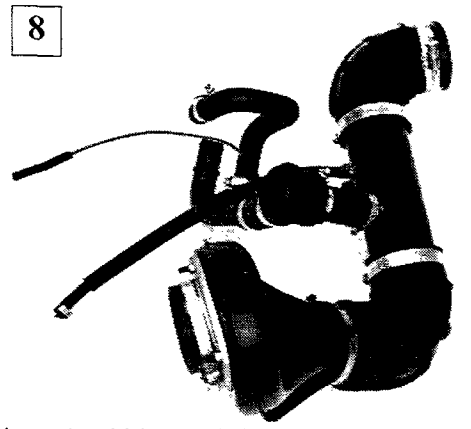
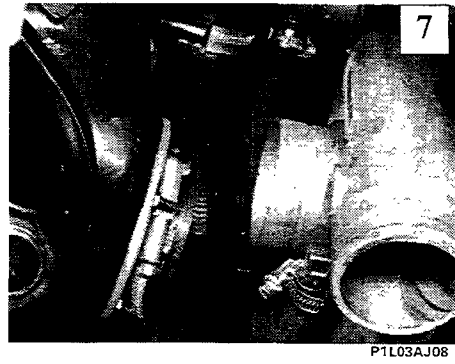
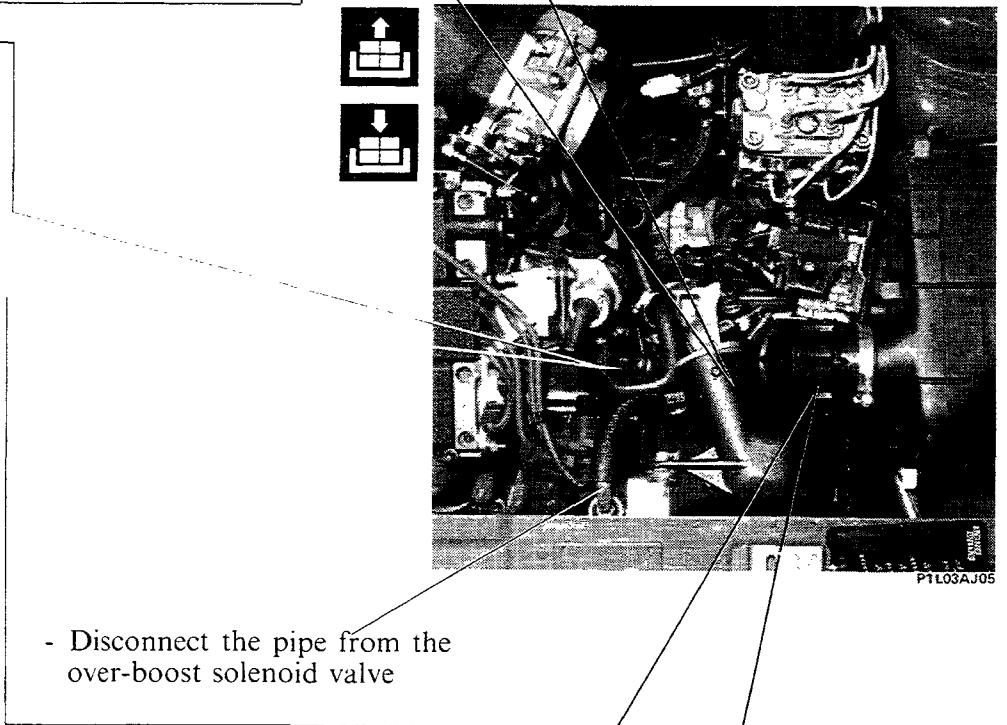
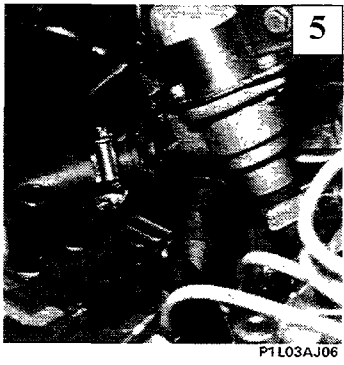
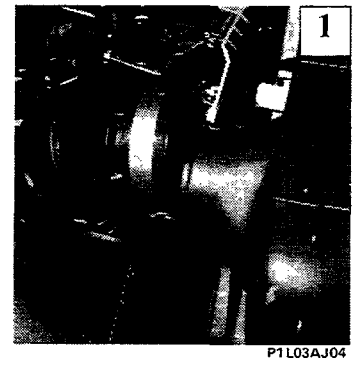
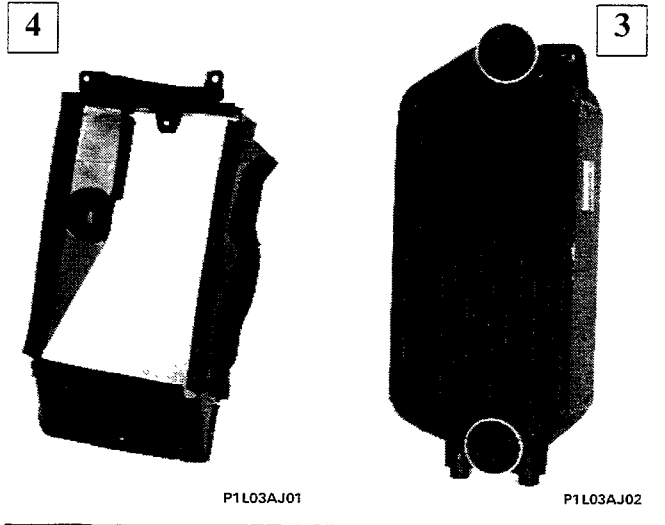
18.



Raise the vehicle and carry out the following operations, from underneath:

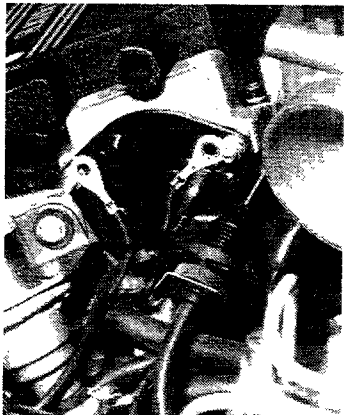
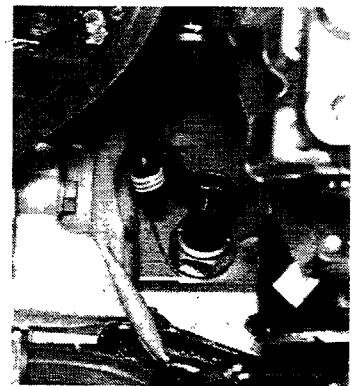
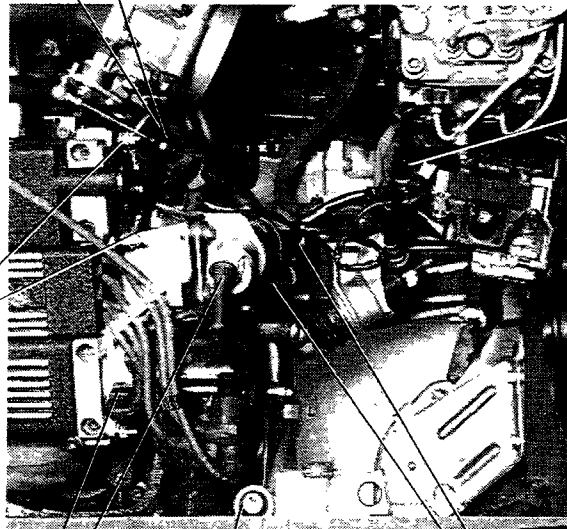
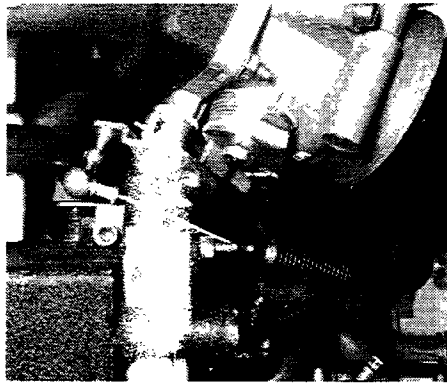
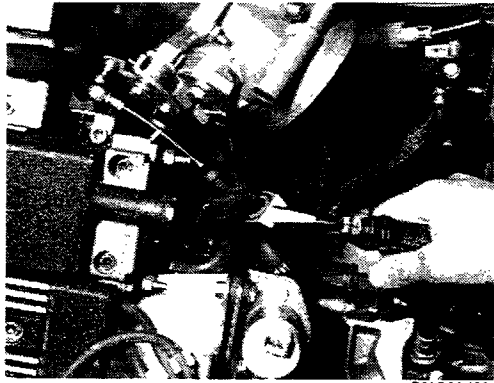


In order to extract the cooling radiator it must be disconnected from the duct

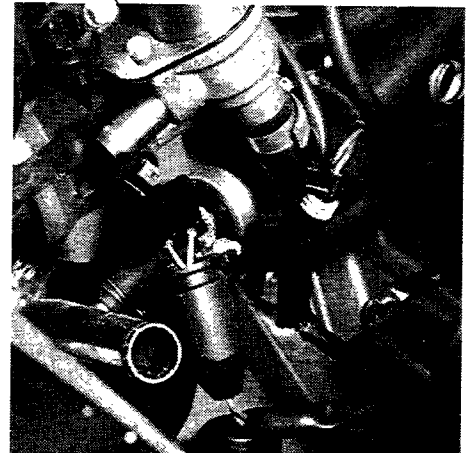
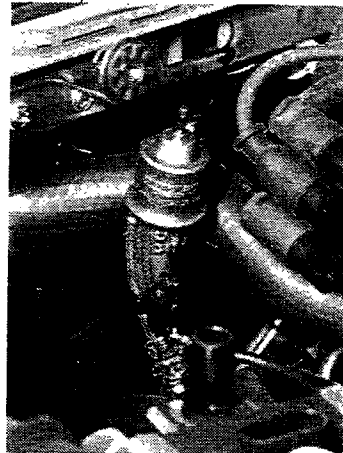
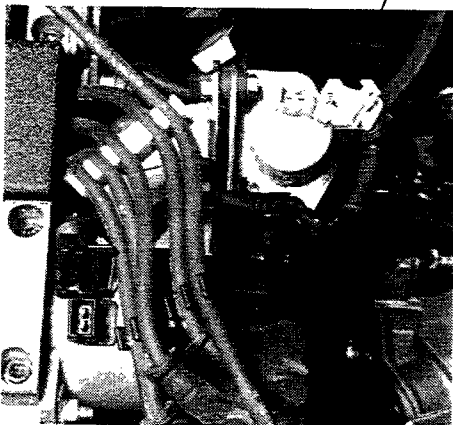


The numbers at the side of the illustrations indicate the order in which the operations should be carried out

10.



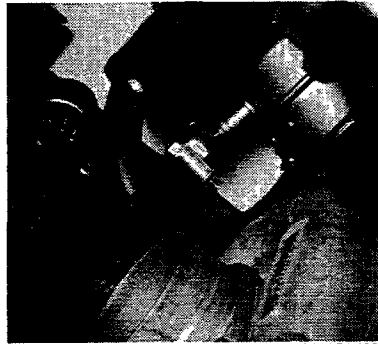
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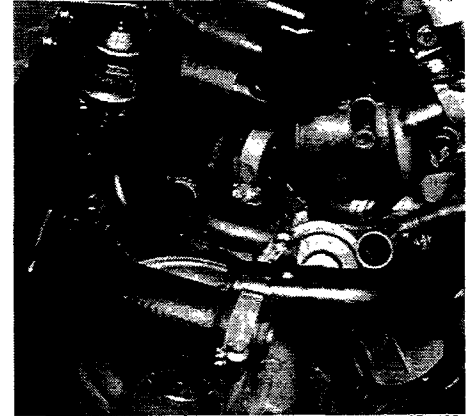
Pipes connecting over-boost solenoid valve to wastegate valve and turbocharger



P1L05AJ01

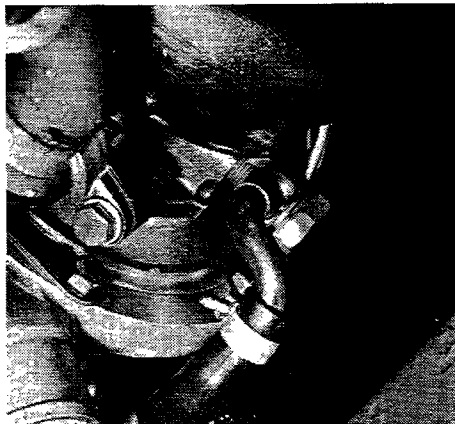


P1L05AJ02

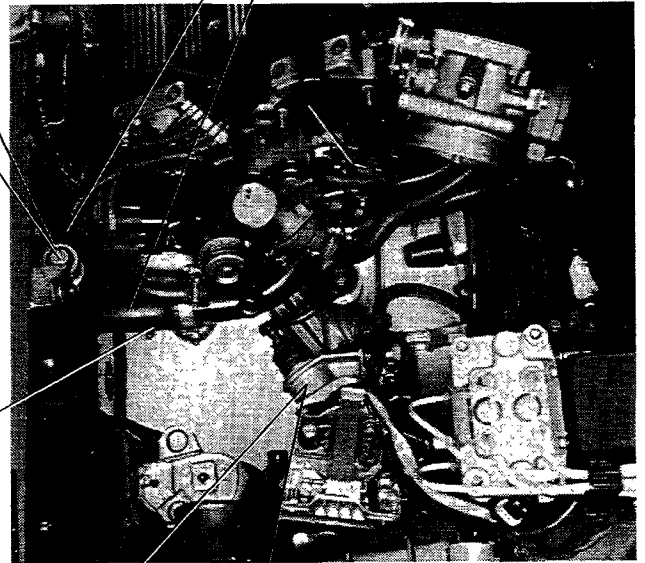


P1L05AJ03

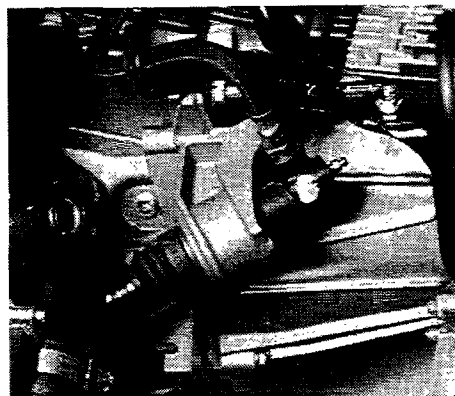
Coolant hose between turbocharger and radiator



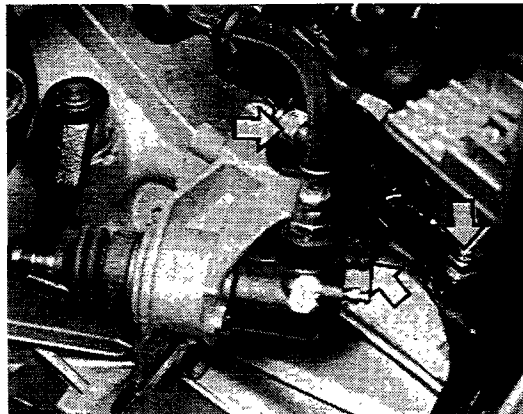
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P1L05AJ04



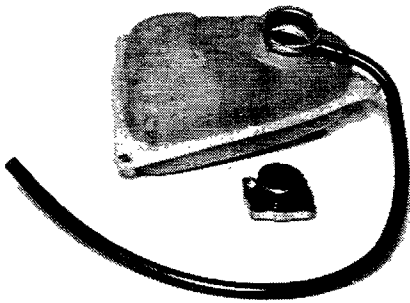
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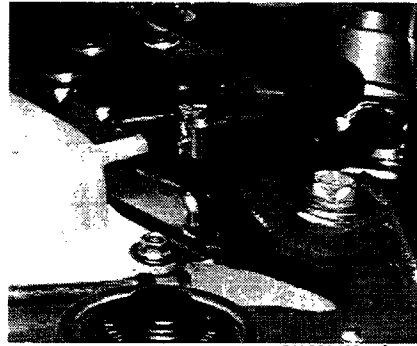
P1L05AJ07

Remove the clutch release operating cylinder and bracket and place it in the engine compartment without removing the oil pipe

10.



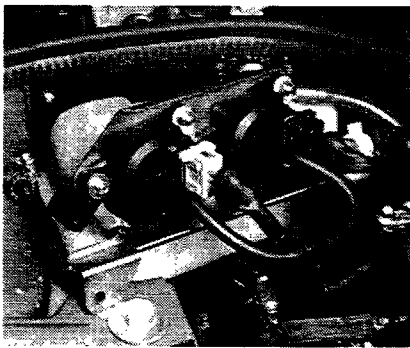
P1L06AJ01



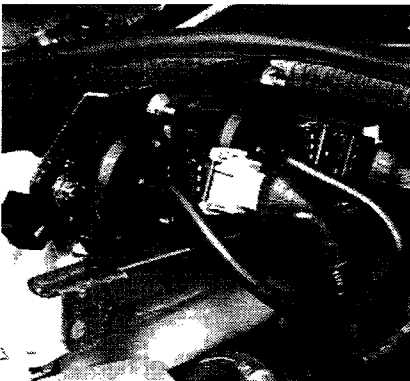
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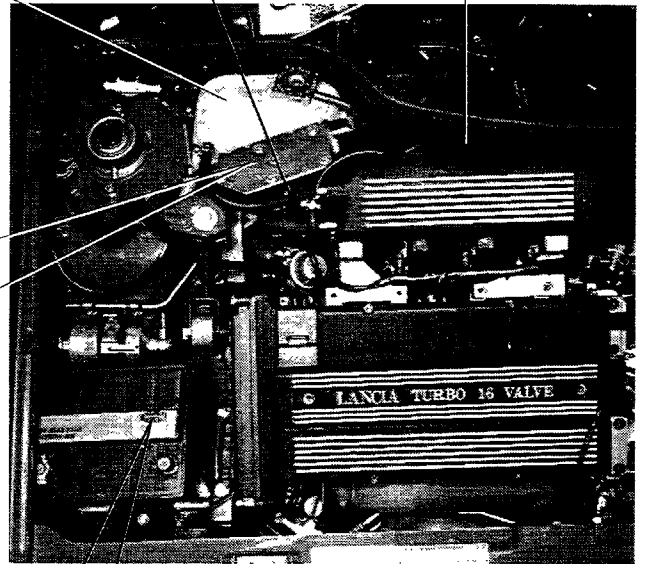
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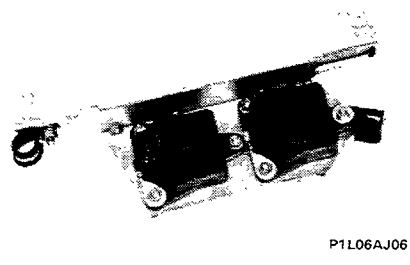
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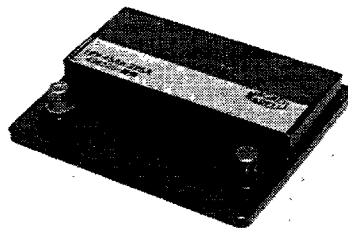
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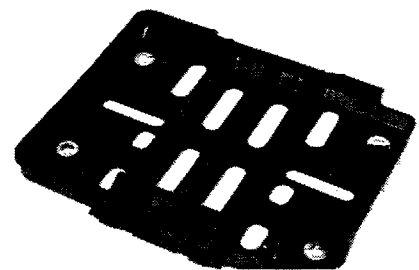
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P1L06AJ06

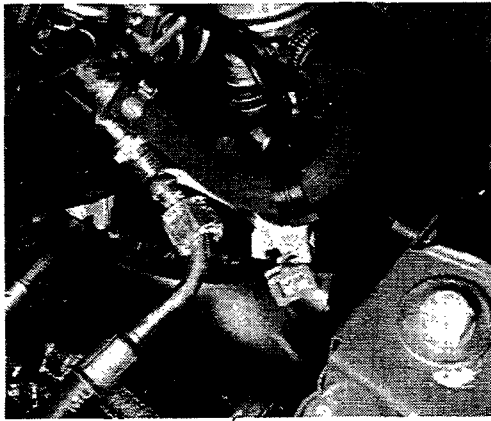


P1L06AJ08

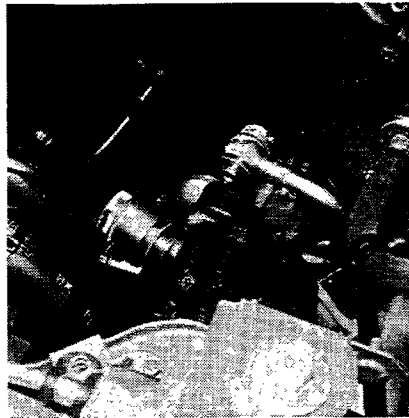


P1L06AJ09

Fuel supply pipe and electrical connection for engine rpm and TDC sensor



P1L07AJ02



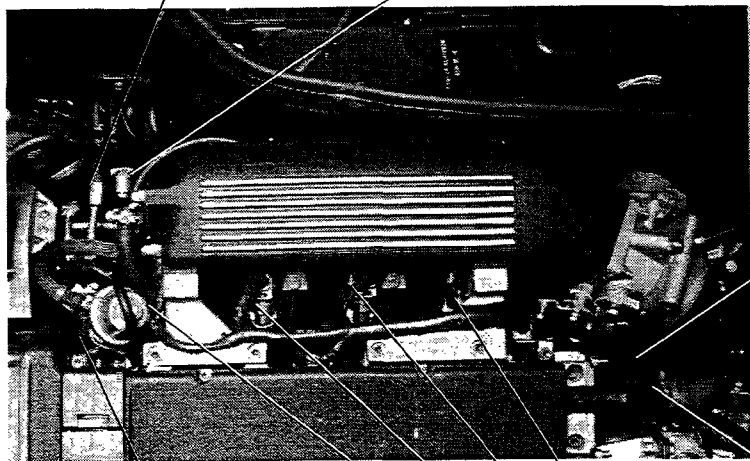
P1L07AJ01

Oil pipes from power assisted steering pump

Electrical connection for detonation sensor



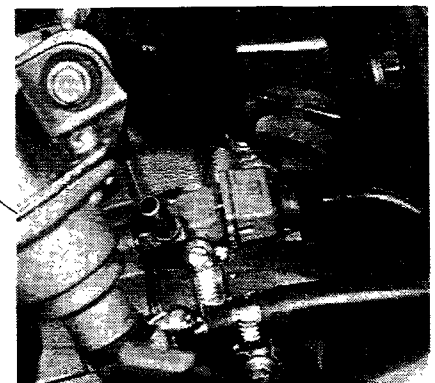
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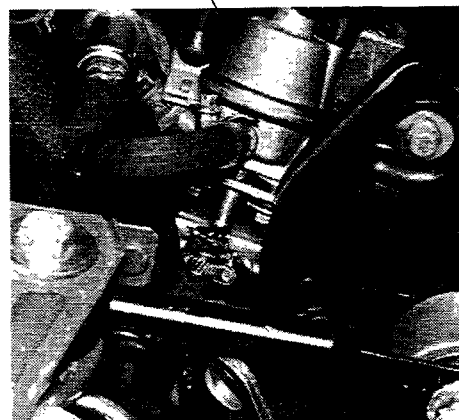
P1L07AJ04



Electrical connection for coolant temperature sensor (for I.A.W. ignition/injection)

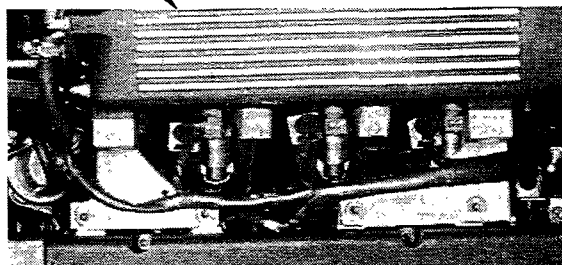


P1L07AJ05



P1L07AJ06

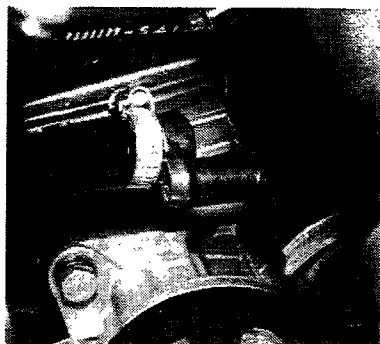
Fuel return pipe from pressure regulator



P1L07AJ07

Electrical connections for injectors

10.



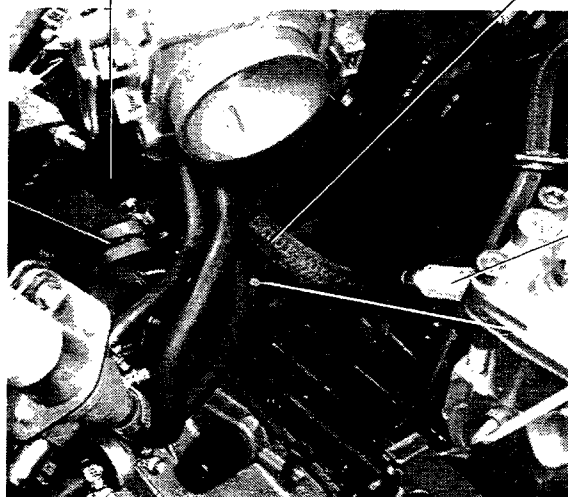
P1L08AJ01



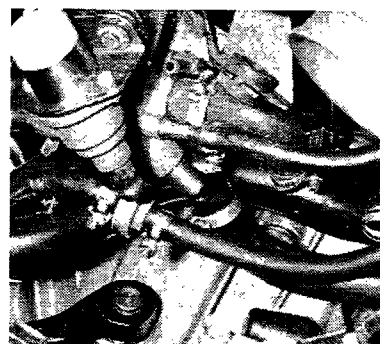
P1L08AJ02



P1L08AJ03

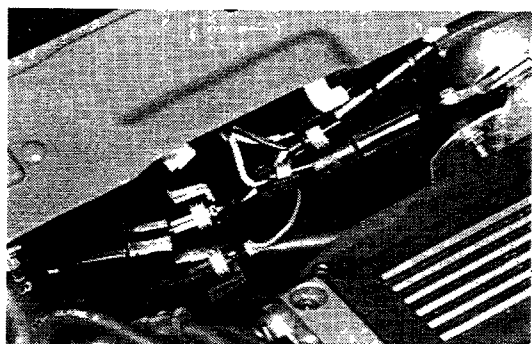


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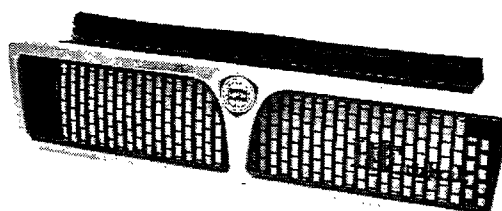


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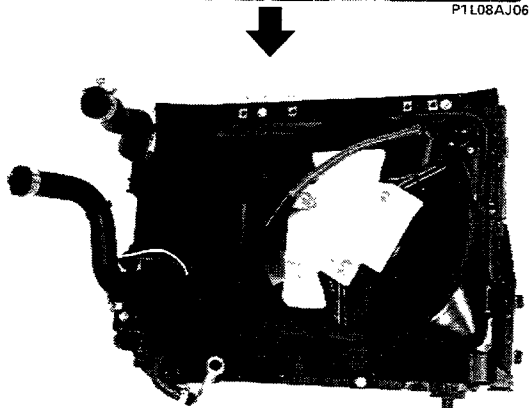
In order to facilitate the removal of the radiator, the front bumper must be moved forwards; in addition, the radiator must be disconnected from the engine oil cooling radiator as well as from the cross member



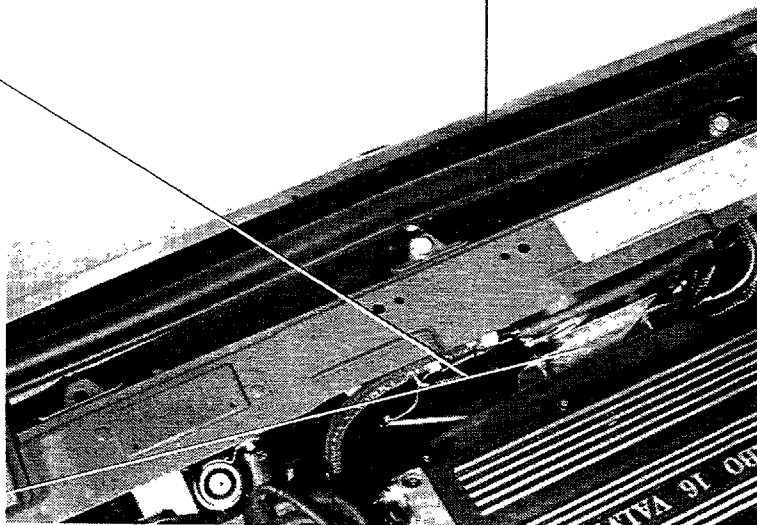
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P1L08AJ07

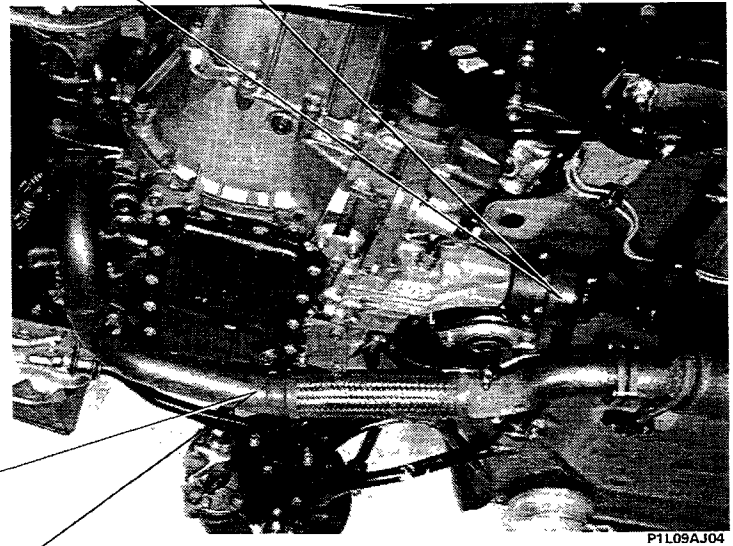
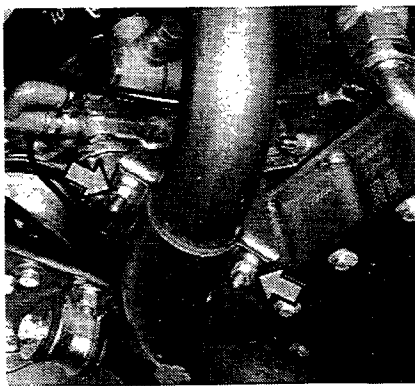
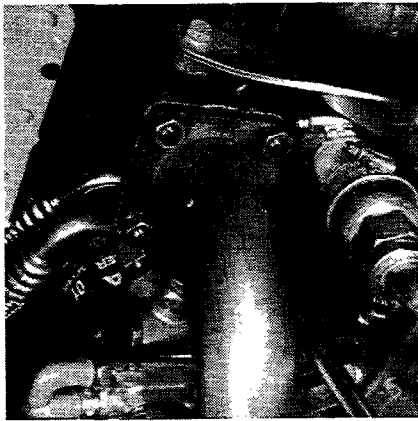
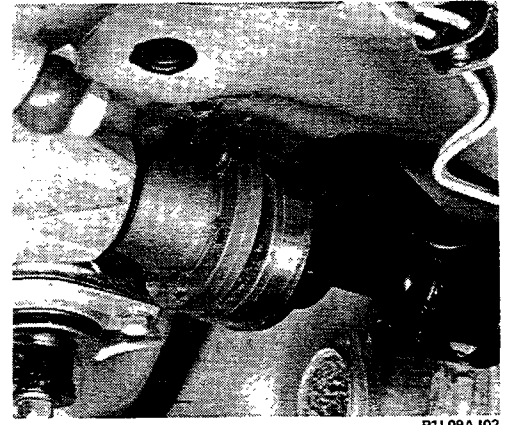
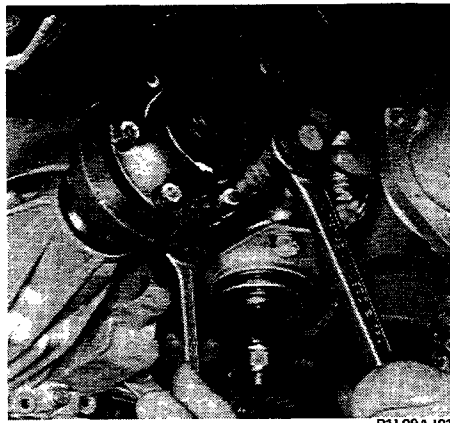


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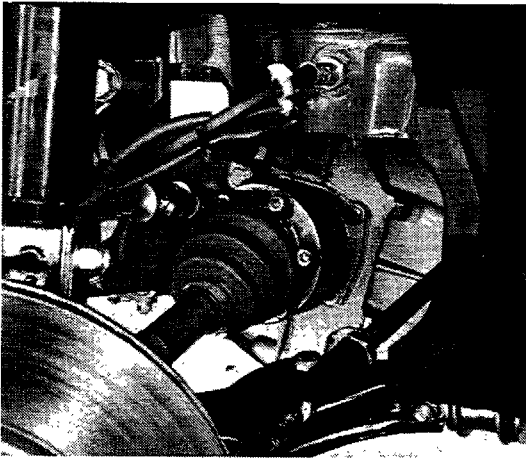


P1L08AJ09

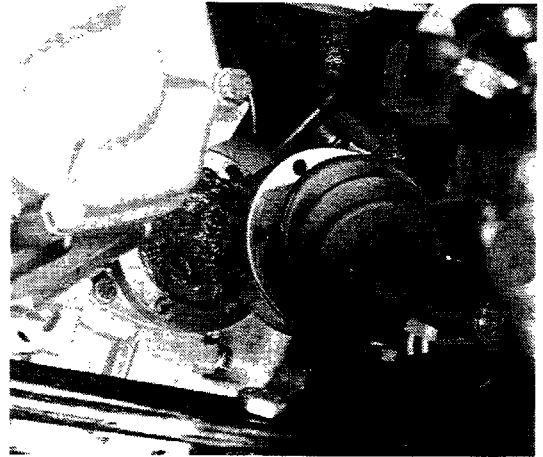
- remove the front wheels and remove the right side wheel arch liner;
- raise the lift and, from underneath the vehicle, drain the gearbox oil; then carry out the following operations:



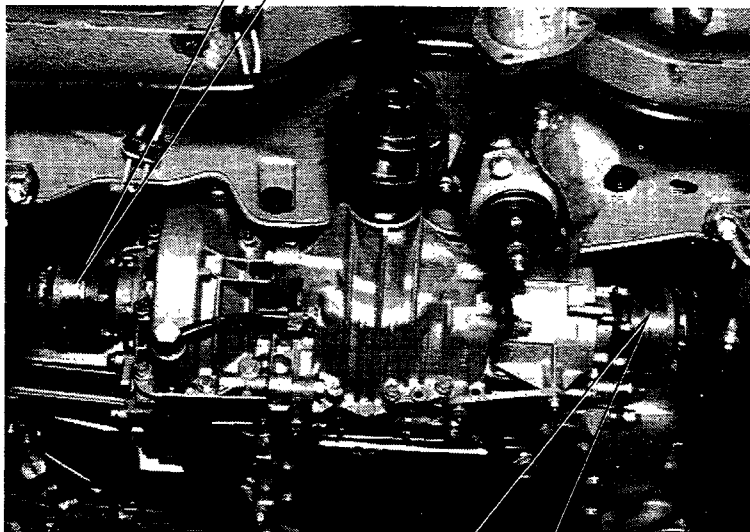
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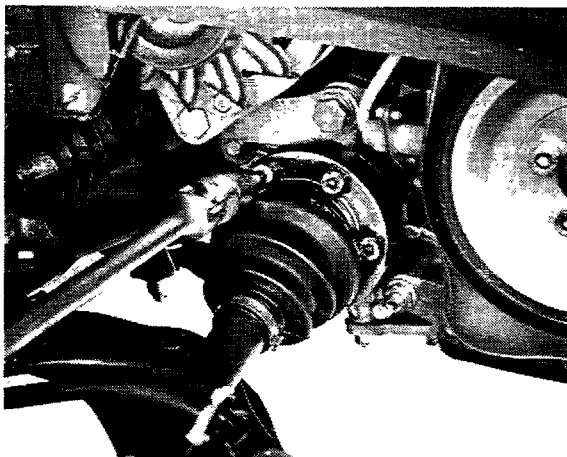
P1L10AJ01



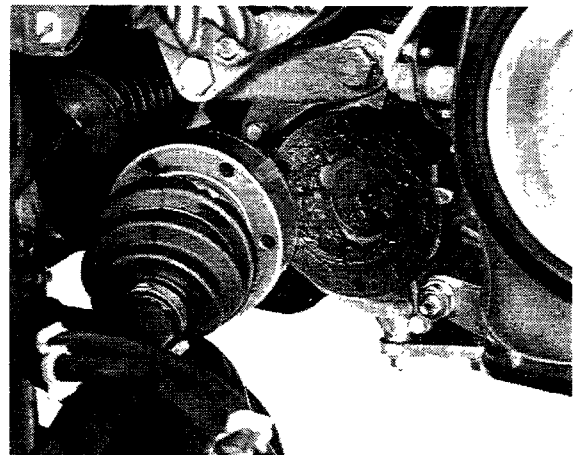
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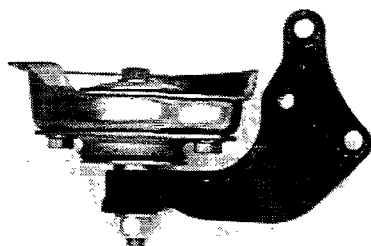
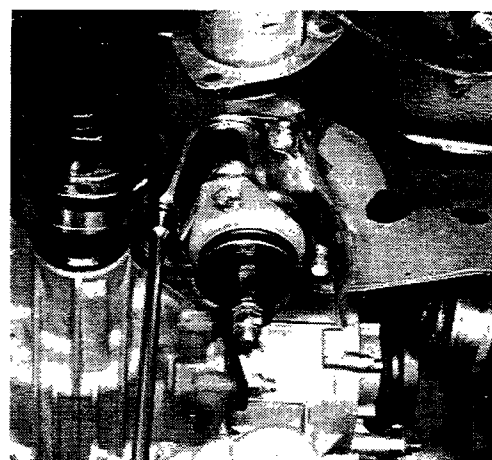
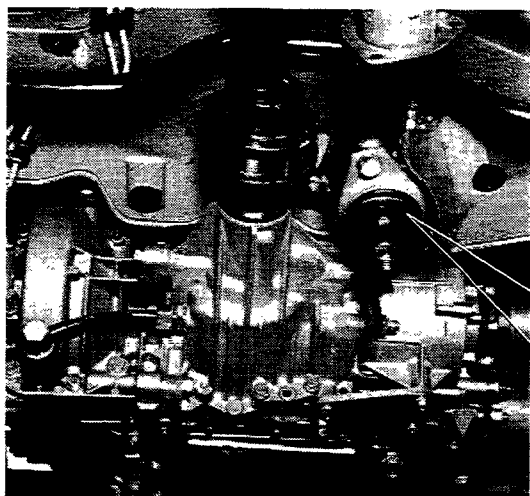
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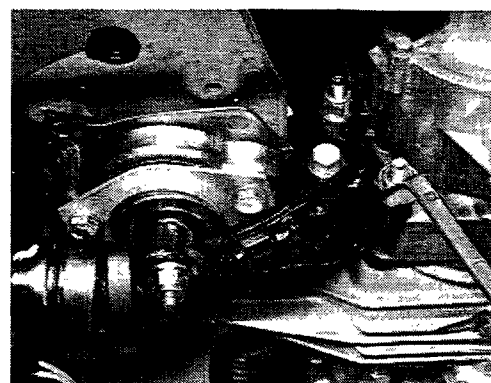
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P1L10AJ05

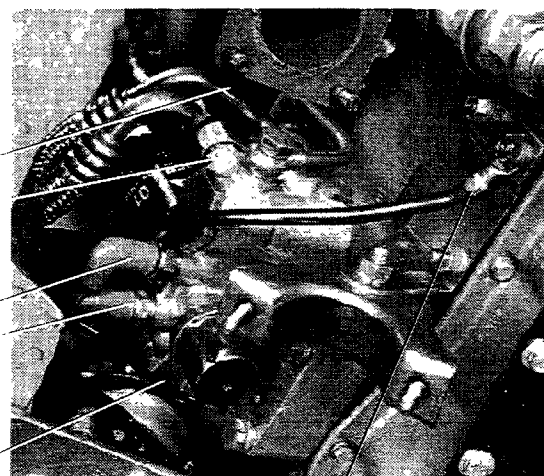
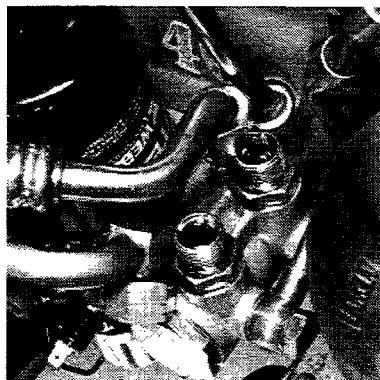


P1L11AJ04

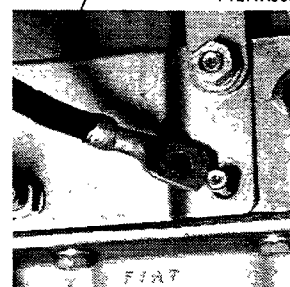
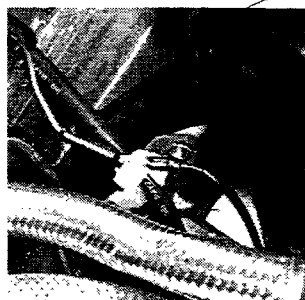
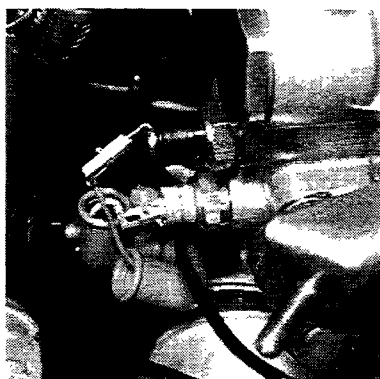


P1L11AJ03

- disconnect the electrical connections from the alternator and from the starter motor

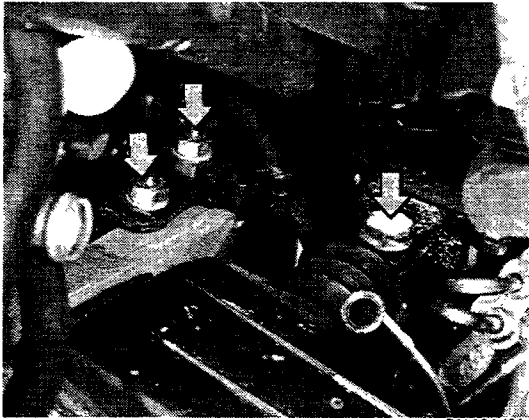


P1L11AJ06

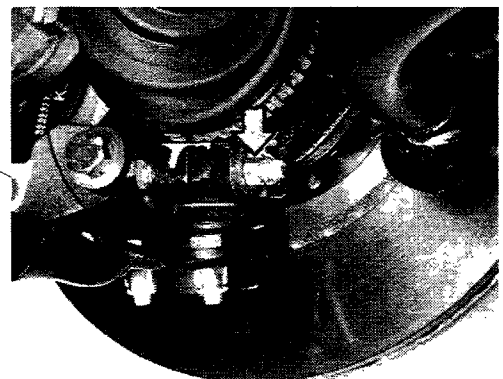
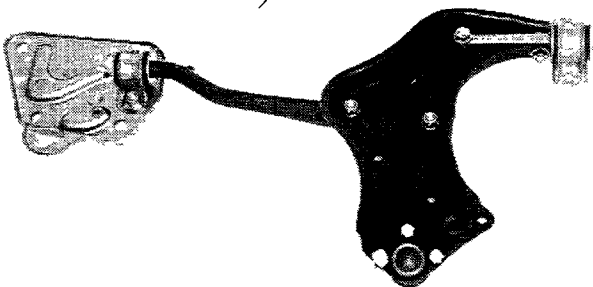
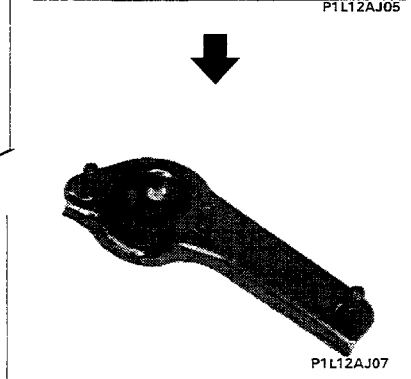
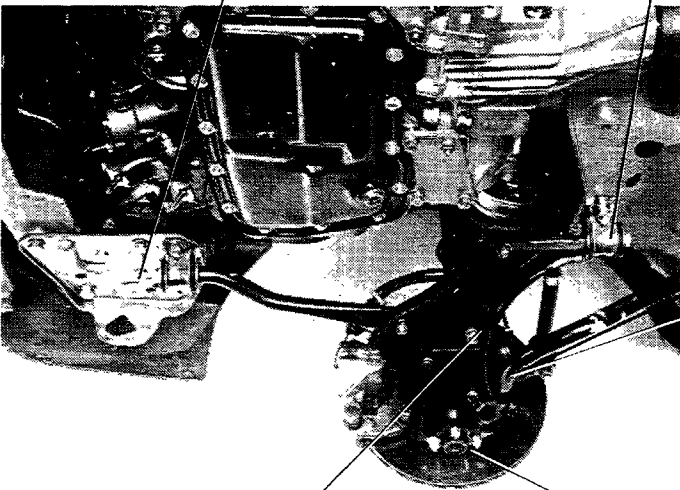
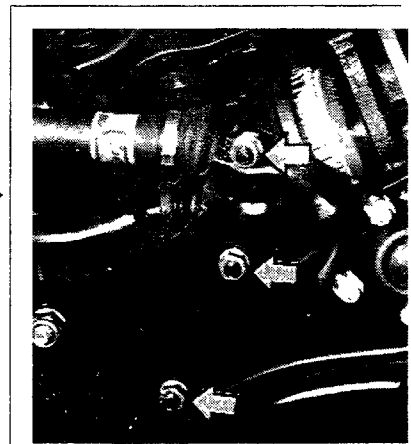
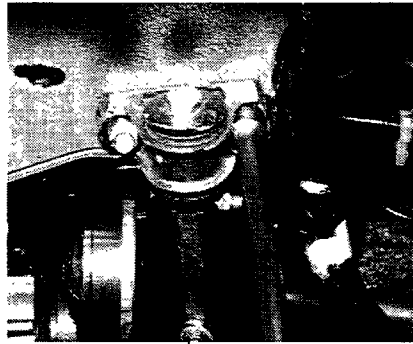
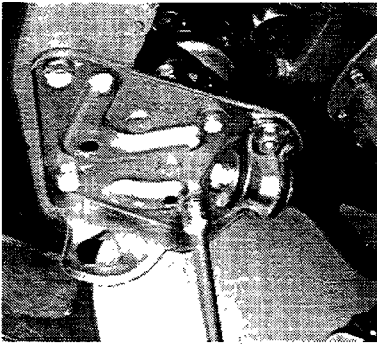


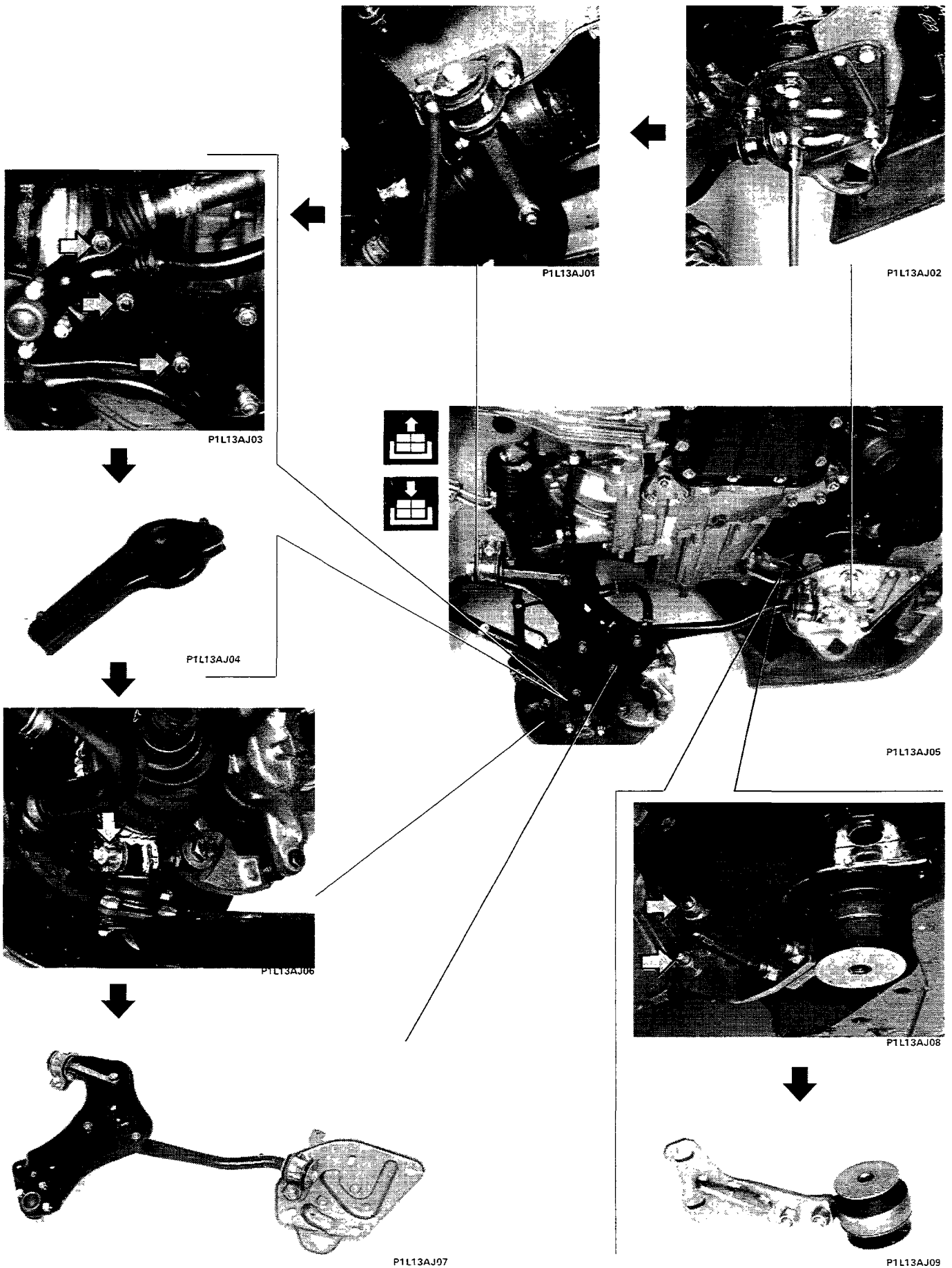
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10.

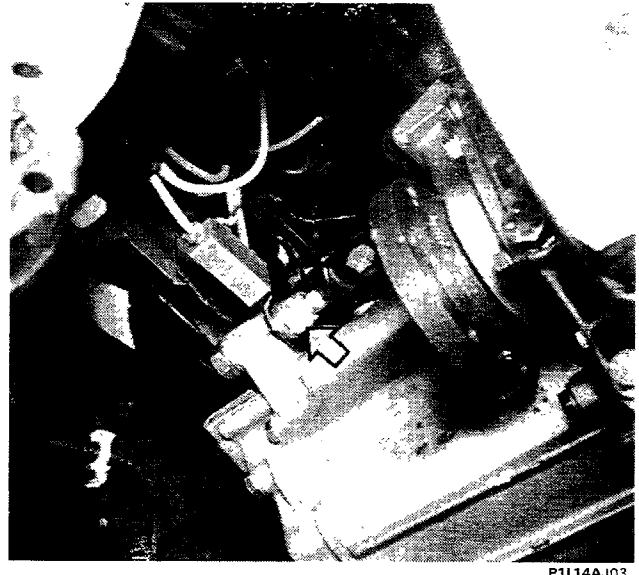
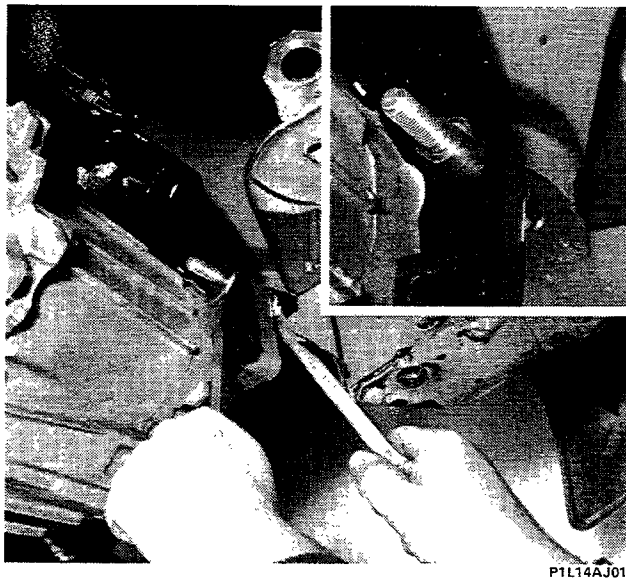


- disconnect the gear engagement and selector rods adjusting the nuts and bolt shown by the arrows

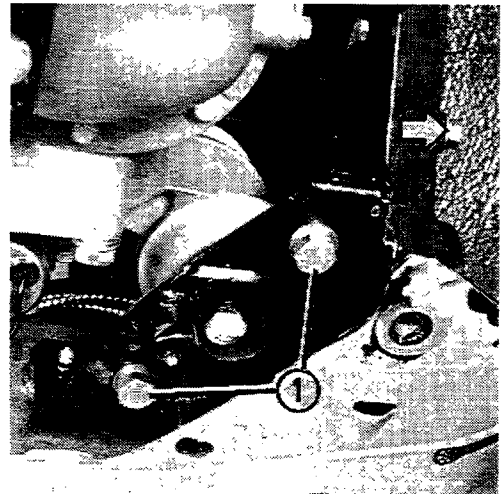
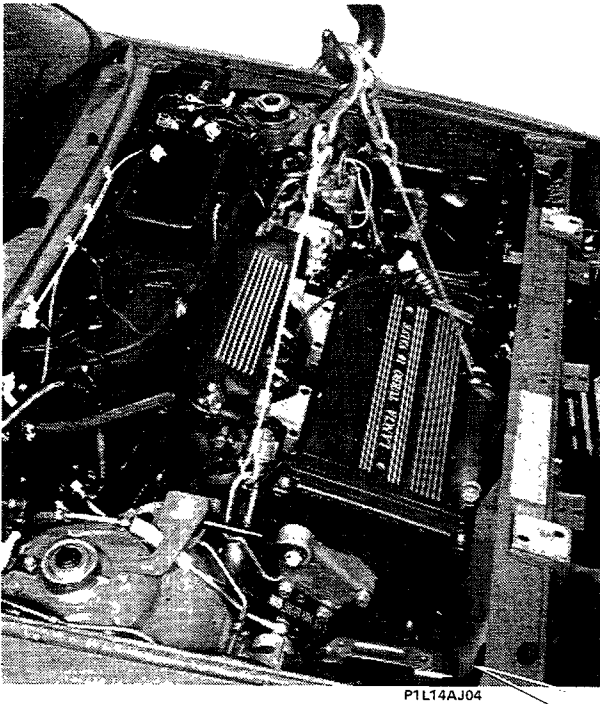




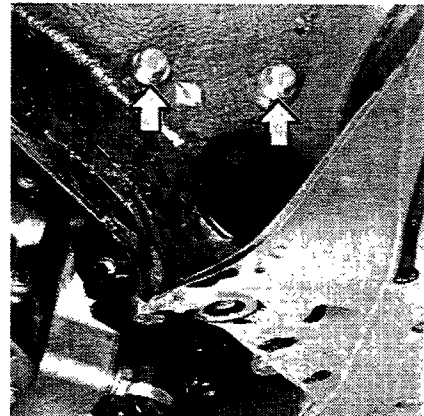
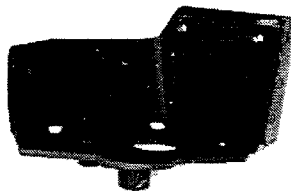
10.



- loosen the bolts fixing the support brackets to the gearbox;
- lower the lift, position the universal hook 186059200 in the special brackets on the power unit : then, using the hoist, place the engine under slight pressure;

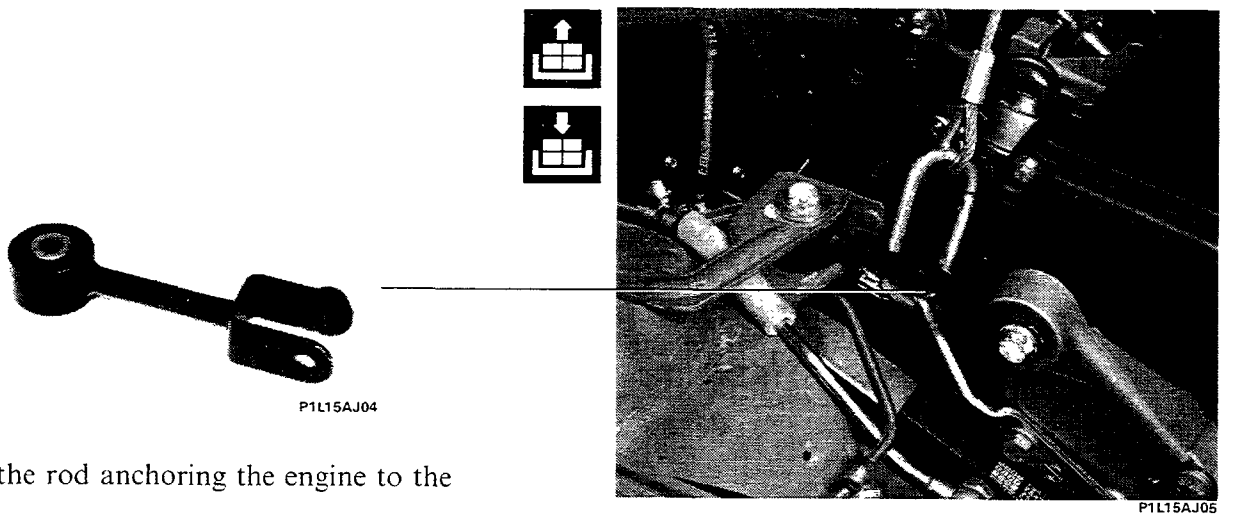


- remove the engine side flexible mounting from the support bracket, acting on the bolts (1); then, remove the bolts shown by the arrows, which fix the support bracket to the bodyshell;

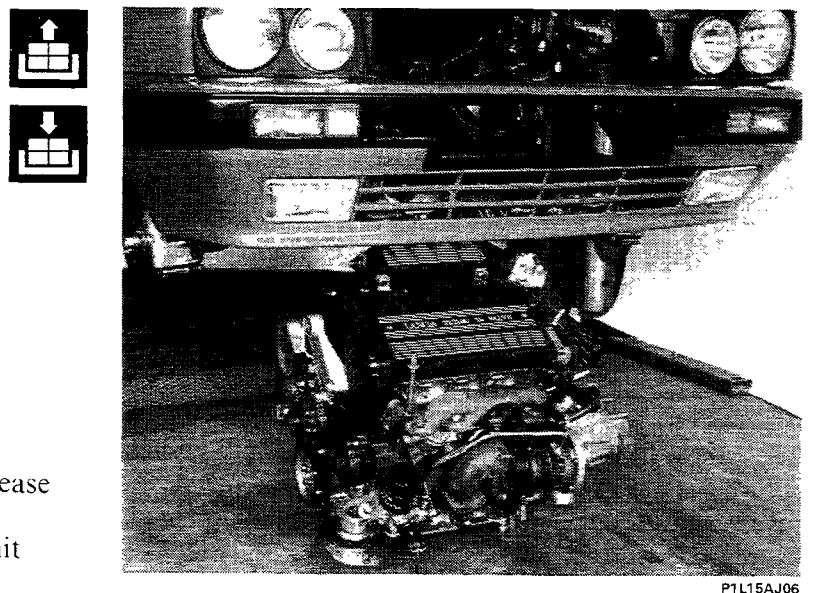




- remove the support brackets from the gearbox and from the flexible joint;



- Remove the rod anchoring the engine to the bodyshell



- lower the power unit to the ground and release the hoist
- raise the vehicle and extract the power unit

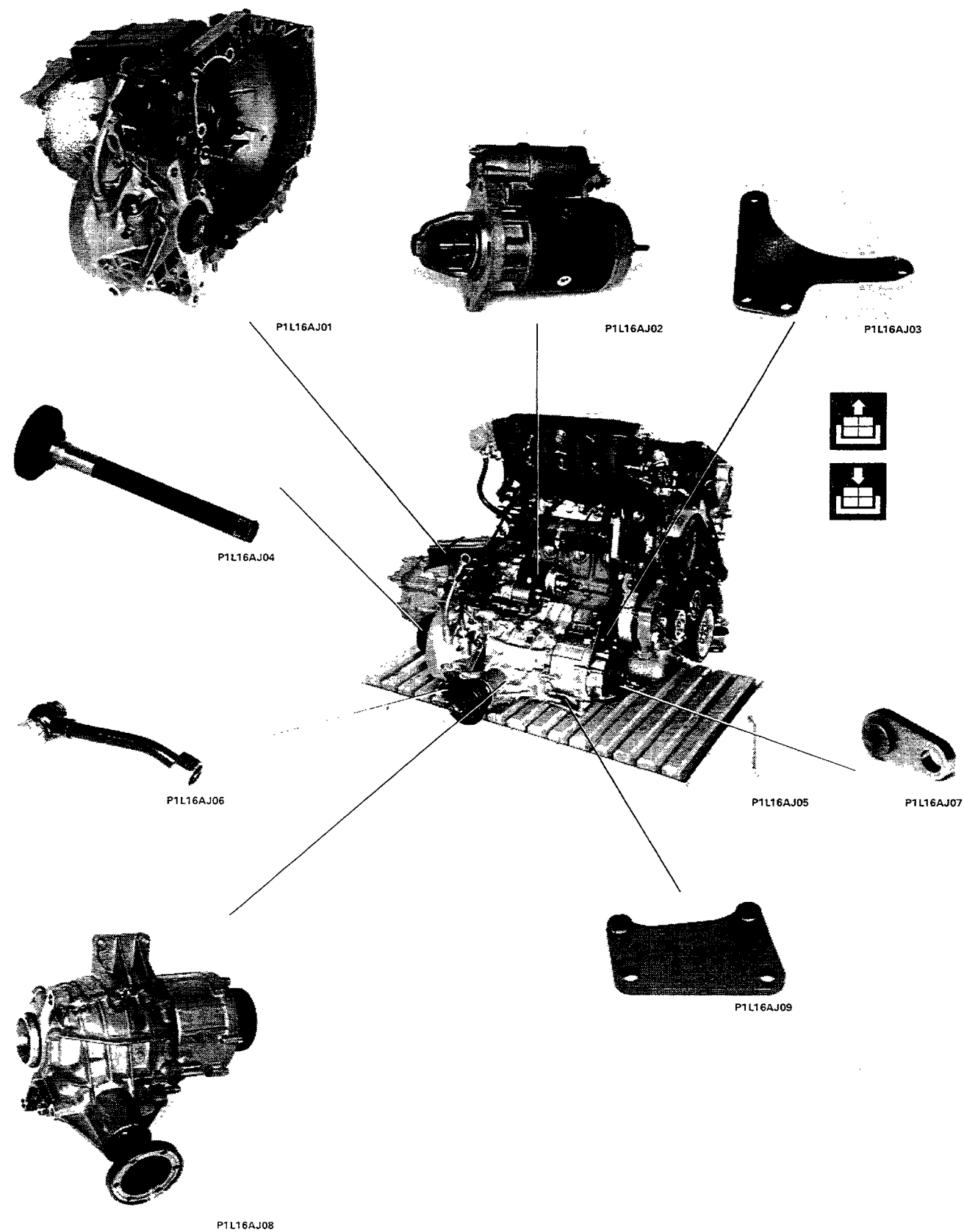
Engine

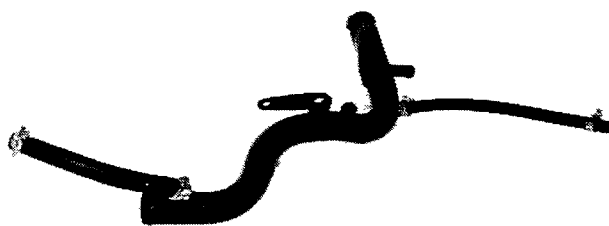
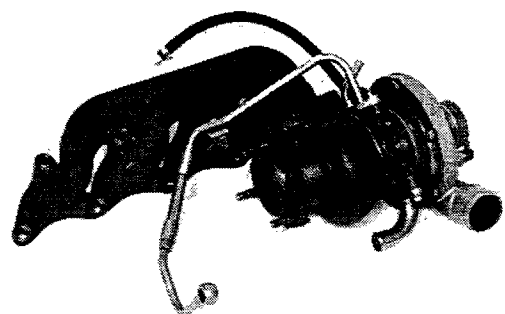
Removing-refitting power unit

DELTA HF integrale 16v

10.

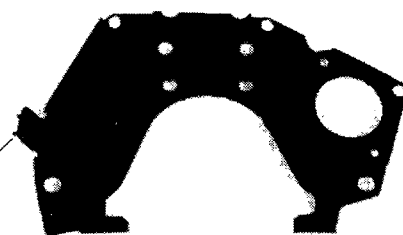
- rest the engine on a support and then remove the items illustrated below:





P1L17AJ02

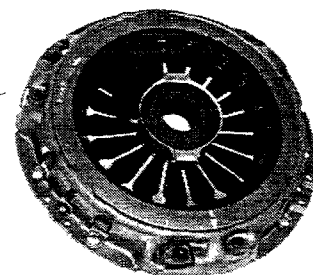
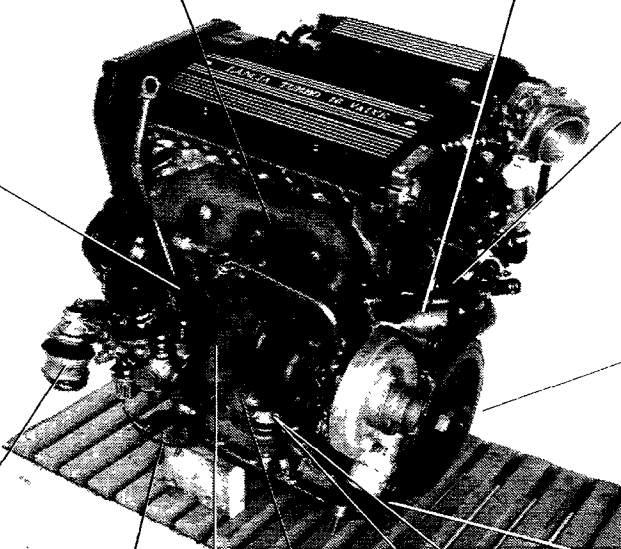
P1L17AJ01



P1L17AJ03



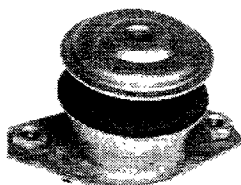
P1L17AJ04



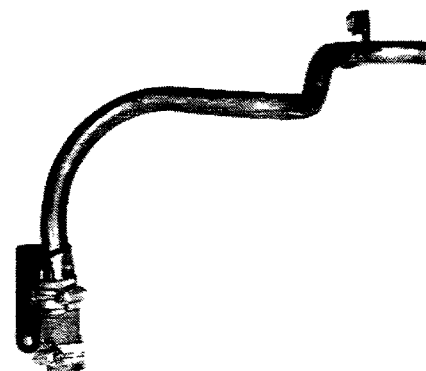
P1L17AJ06



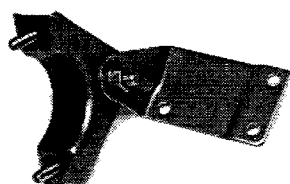
P1L17AJ07



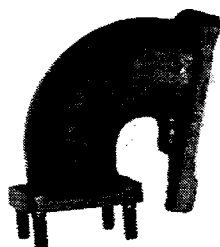
P1L17AJ08



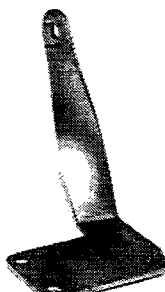
P1L17AJ12



P1L17AJ19



P1L17AJ10



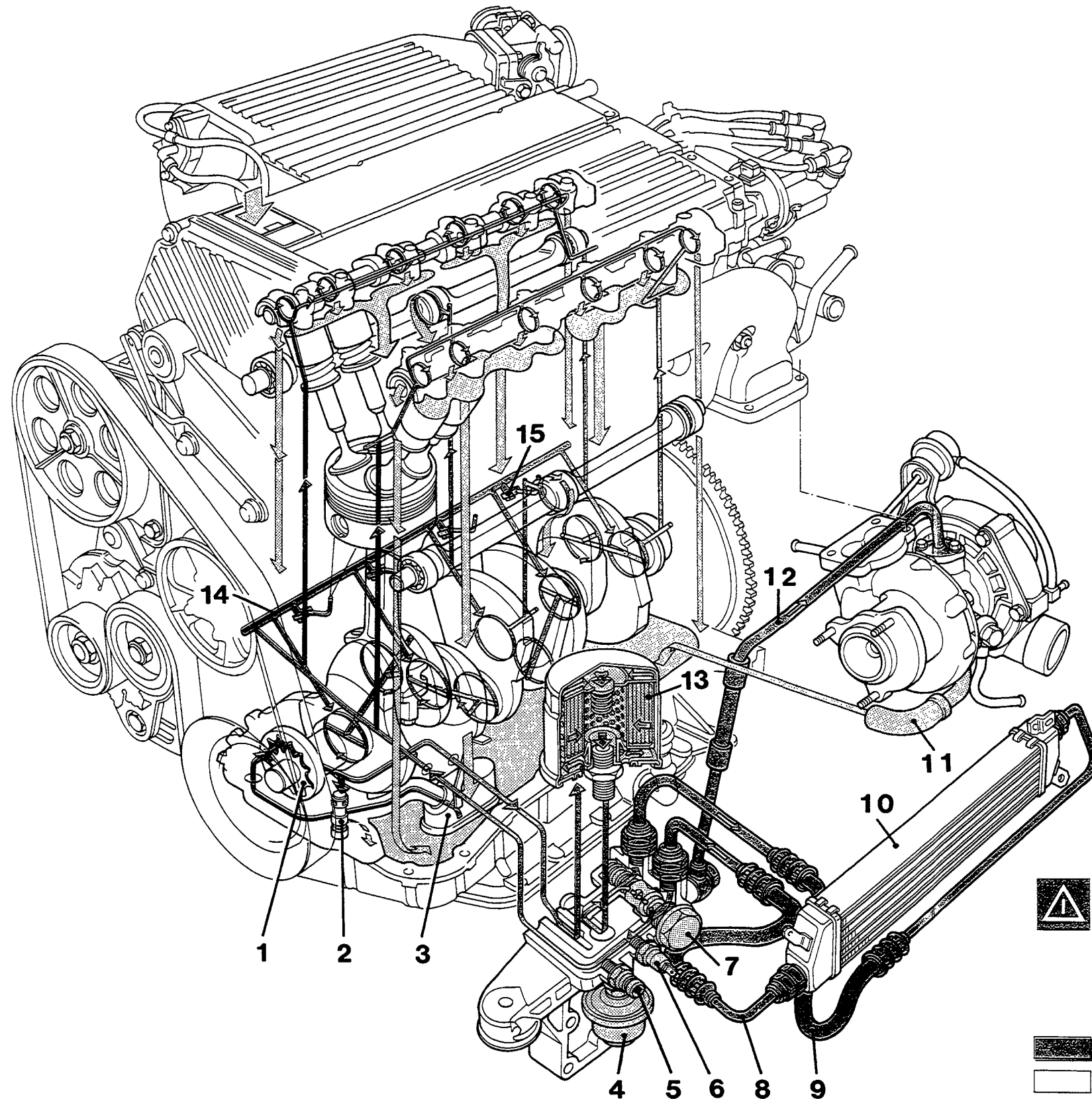
P1L17AJ11



P1L17AJ13

NOTE To refit the power unit simply reverse the order of the operations carried out for its removal

DIAGRAM SHOWING LUBRICATION SYSTEM



1. Lobe gear oil pump
2. Oil pressure relief valve
3. Strainer with gauze filter
4. Oil pressure sender unit
5. Oil temperature sender unit
6. Switch signalling insufficient oil pressure
7. Plug for oil radiator thermostatic by-pass valve
8. Oil return pipe from cooling radiator to thermostatic valve
9. Oil supply pipe from thermostatic valve to cooling radiator
10. Engine oil cooling radiator
11. Oil return duct from turbocharger to sump
12. Main duct supplying oil under pressure to turbocharger
13. Full flow cartridge oil filter with safety valve for cutting out filter if filter element is blocked
14. Main duct supplying oil under pressure to various components
15. Piston cooling oil jets

The piston cooling jets (15) have a built in ball valve which opens at a pressure of 1.25 - 1.75 bar.

If it is not working properly, replace the jet

The thermostatic valve, located in the oil filter mounting, has the following function:

a) when the temperature is below $78 \pm 2^\circ\text{C}$, the oil passes directly into the cartridge filter and returns to the engine.

b) when the temperature is above $83,5^\circ$ the thermostatic valve is open and allows the oil to pass into the cooling radiator and lower the temperature thus guaranteeing improved lubrication.



The thermostatic valve is not available as spares; if it is not working properly, replace the complete oil filter mounting.



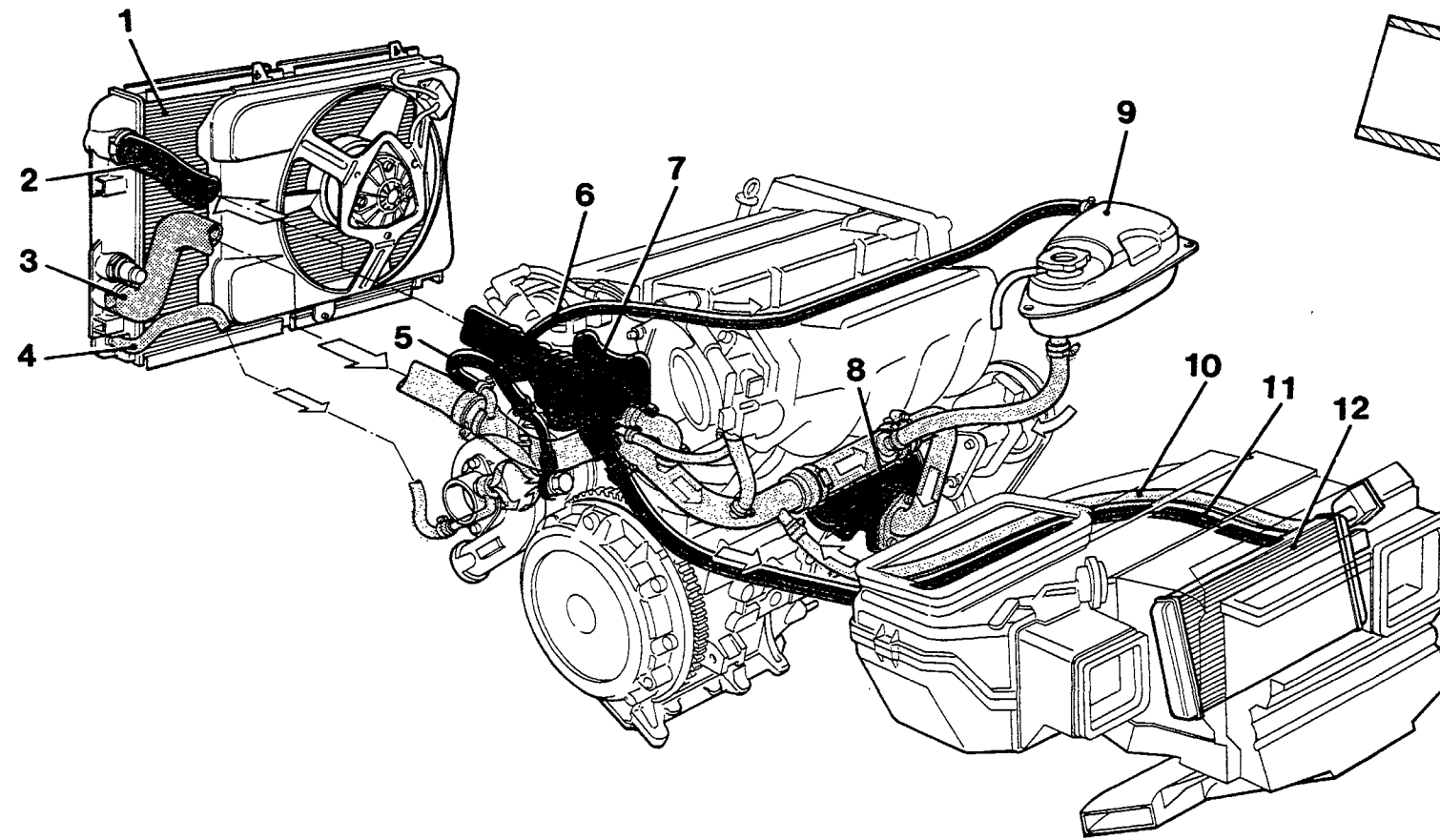
Supply circuit



Return circuit

P121AJ01 P121AJ02

DIAGRAM SHOWING OPERATION OF COOLING SYSTEM



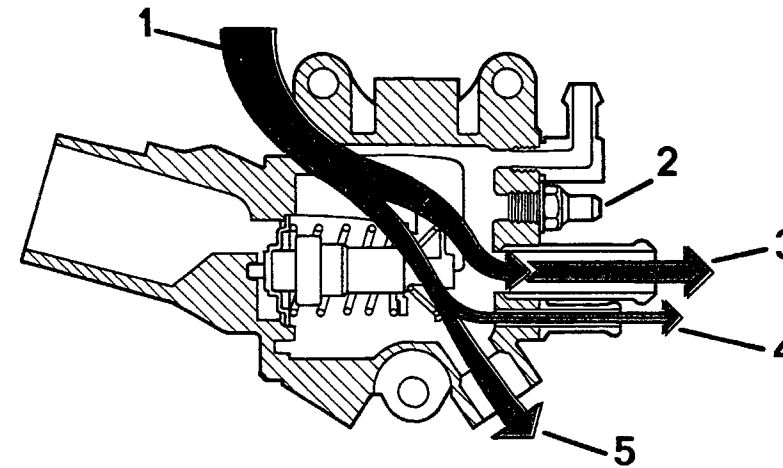
P1L23AJ01 P1L23AJ02

- 1. Engine coolant radiator
- 2. Coolant hose between thermostat and radiator
- 3. Coolant hose between radiator and pump
- 4. Coolant hose between the radiator and the turbocharger
- 5. Coolant hose between turbocharger and pump
- 6. Coolant return hose to expansion tank
- 7. Controlled by-pass thermostat for coolant mixture

- 8. Water pump
- 9. Expansion tank
- 10. Coolant hose between the car interior heater-radiator and the pump
- 11. Coolant hose between thermostat and car interior heater-radiator
- 12. Car interior heater-radiator

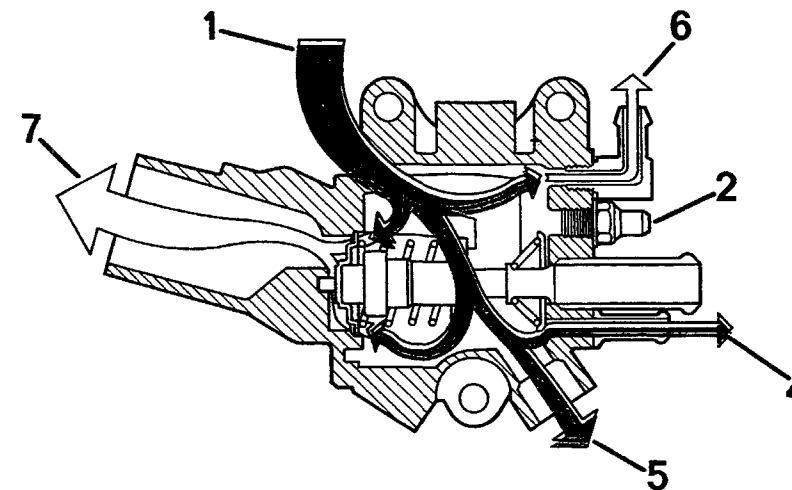
Supply circuit
 Return circuit

BY-PASS THERMOSTAT CLOSED



P1L23AJ03 P1L23AJ04

BY-PASS THERMOSTAT OPEN



P1L23AJ05 P1L23AJ06

- 1. From the engine
- 2. Coolant temperature sender unit
- 3. To the by-pass
- 4. To the butterfly casing
- 5. To the car interior heater
- 6. To the expansion tank
- 7. To the coolant radiator

DIAGRAM SHOWING OPERATION OF FUEL SYSTEM

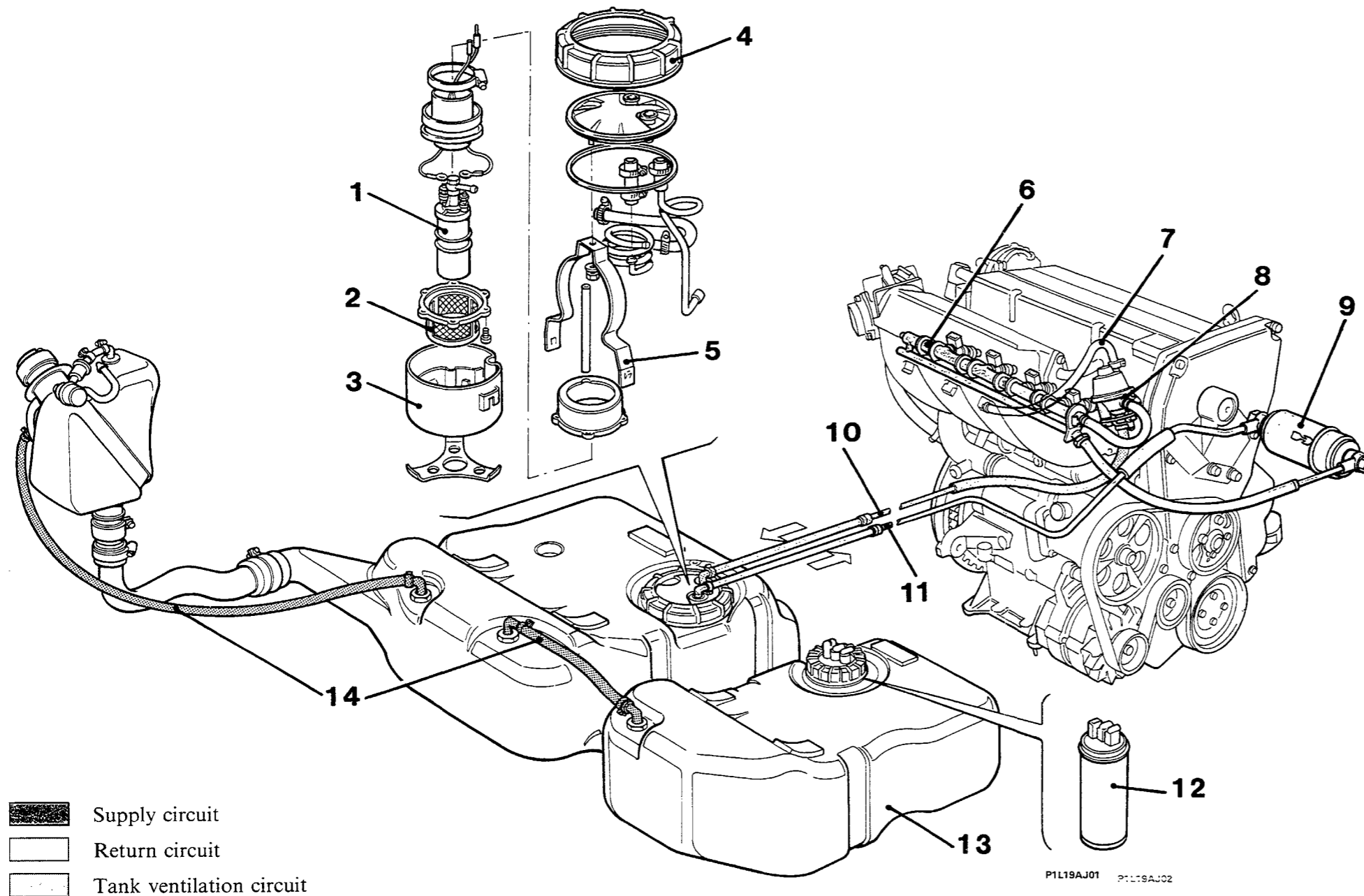
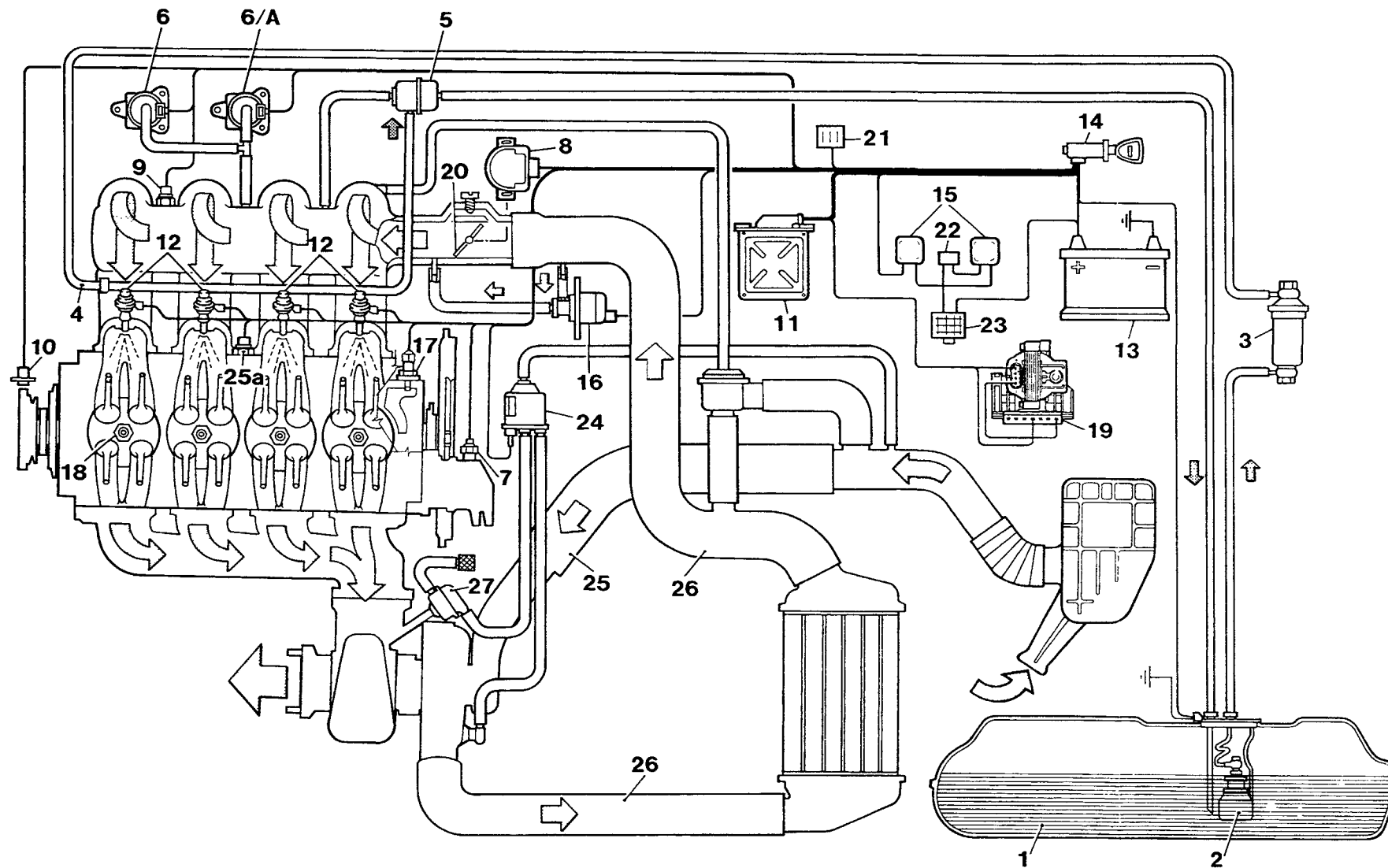


DIAGRAM SHOWING I.A.W. (M.P.I.) INJECTION/IGNITION SYSTEM



1. Fuel tank
2. Electric fuel pump
3. Fuel filter
4. Fuel manifold
5. Fuel pressure regulator
6. Intake air absolute pressure sensor
- 6A. Intake air absolute pressure sensor
7. HT distributor with injection timing sensor
8. Butterfly valve position sensor
9. Intake air temperature sensor
10. Rpm and TDC sensor
11. Electronic control unit
12. Injectors
13. Battery
14. Ignition switch
15. Injection ignition relay feeds
16. Supplementary air solenoid valve for automatic engine idle adjustment
17. Coolant temperature sensor
18. Spark plugs
19. Ignition coil with power module
20. Butterfly valve
21. Diagnostic socket
22. Fuse
23. Connector block
24. Over-boost solenoid valve
25. Intake air duct from the filter
- 25A. Detonation sensor
26. Compressed air ducts from turbocharger
27. Supercharging adjustment actuator (waste-gate valve)

Foreword

The I.A.W. injection/ignition system fitted on the Delta HF integrale 16 V is similar to the one fitted on the Delta Hf integrale.

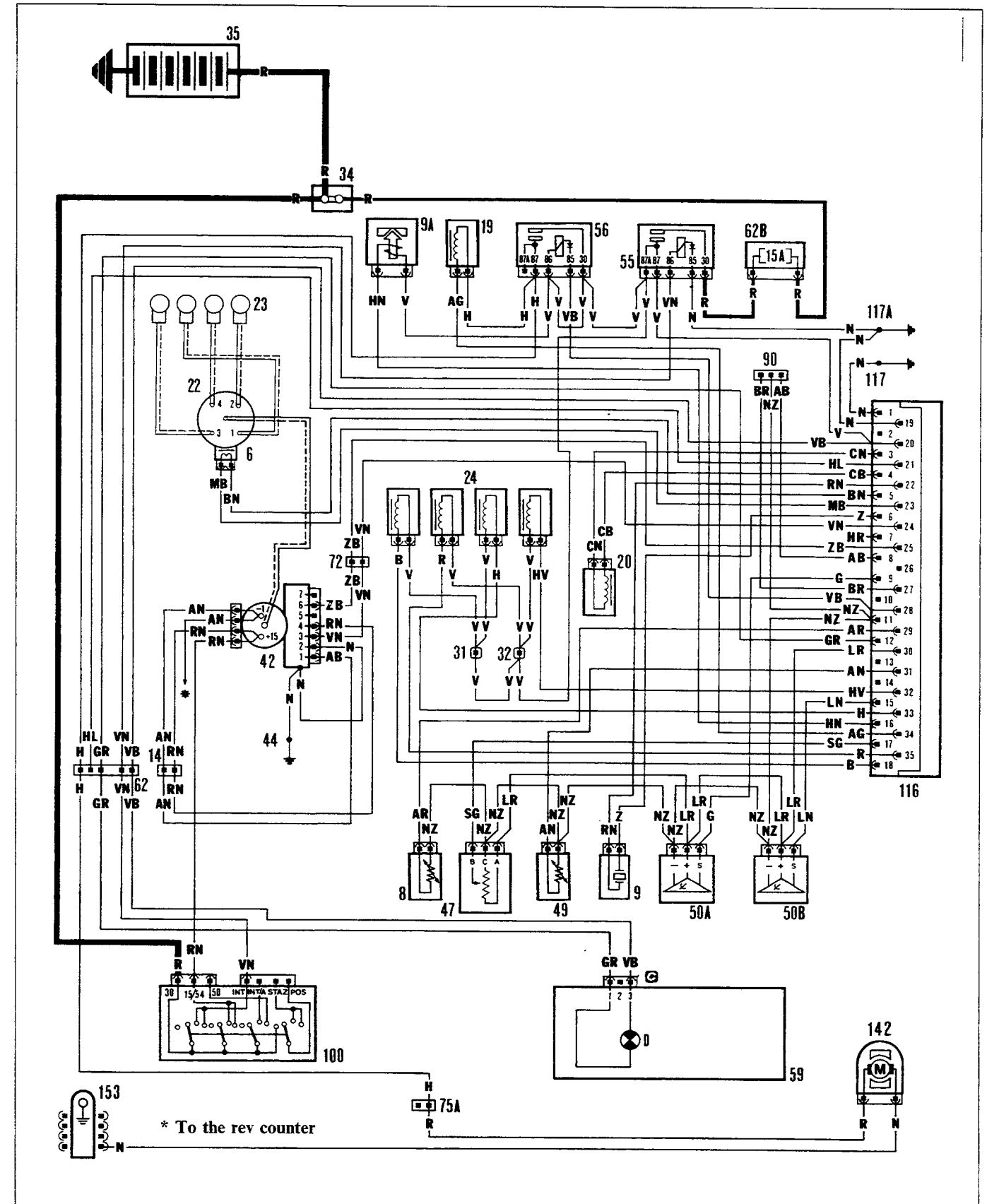
However, certain small modifications have been made to further improve the reliability of the system with the resulting differences: 1 - The use of two absolute pressure sensors rather than one. 2 - A different over-boost solenoid valve with a consequently different intervention strategy. 3 - A different location for the detonation sensor on the cylinder head. 4 - A different butterfly valve control mechanism on the butterfly casing.

NOTE *This section only deals with the variants compared with the I.A.W. system fitted on the Delta HF Integrale which has been extensively covered in section 10 of this binder*

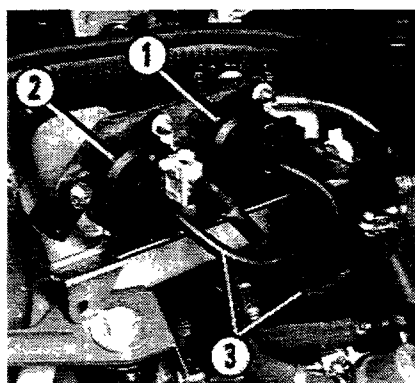
10.

Injection/ignition system (I.A.W) wiring diagram

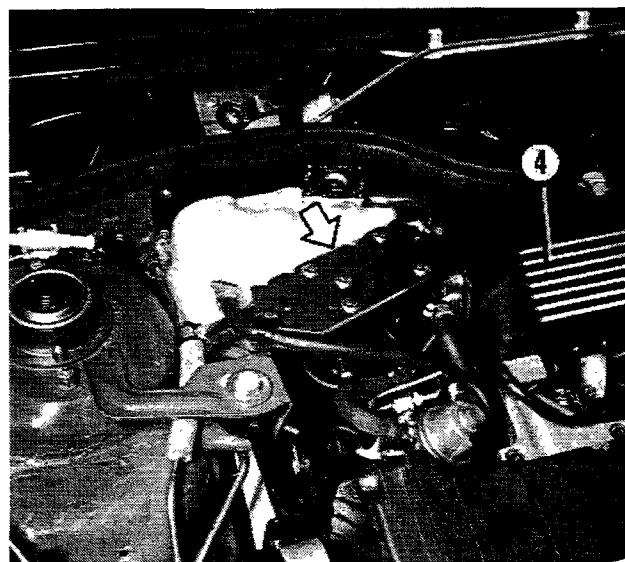
- 6. Timing sensor
- 8. Coolant temperature sensor (I.A.W.)
- 9. Detonation sensor
- 9/A Over-boost solenoid valve
- 14. Connector block
- 19. Solenoid air valve (V.A.E.)
- 20. Rpm and TDC sensor
- 22. Ignition distributor
- 23. Spark plugs
- 24. Fuel injectors
- 31. Connector block
- 32. Connector block
- 34. Connector block
- 35. Battery
- 42. Ignition coil with power module
- 44. Earth on engine
- 47. Butterfly valve position sensor
- 49. Air temperature sensor
- 50/A. Absolute pressure sensor
- 50/B. Absolute pressure sensor
- 55. Injector relay feed
- 56. Electric fuel pump relay feed
- 59. Instrument panel
 - D. System failure warning light (I.A.W.)
- 62. Connector block
- 62/B. System protective fuse (I.A.W.)
- 72. Connector block
- 75/A. Connector block
- 90. Diagnostic socket
- 100. Ignition switch
- 116. Injection/ignition electronic control unit - (I.A.W.)
- 117. Connector
- 117/A. Connector
- 142. Electric fuel pump
- 153. Rear earth cable loom



Location of absolute pressure sensors in engine compartment



P1L27AJ02



P1L27AJ01

1°) ABSOLUTE PRESSURE SENSORS

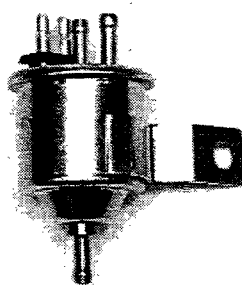
Two absolute pressure sensors are fitted on the Delta HF integrale 16 V version. They are connected by a rubber pipe (3) to the inlet manifold (4).

The pressure sensor (1) supplies a voltage signal proportional to the absolute pressure in the inlet manifold for pressure values up to 1600mmHg, whilst the other absolute pressure sensor (2) provides the signal for pressure values up to 2280mmHg. With the use of two absolute pressure sensors the signal is clearer since for pressures greater than 0.7 bar the sensor (1) is no longer sufficient to guarantee a clear signal reading. Therefore when the pressure in the inlet manifold exceeds 0.7 bar, the electronic control unit changes the signal reading to sensor (2).

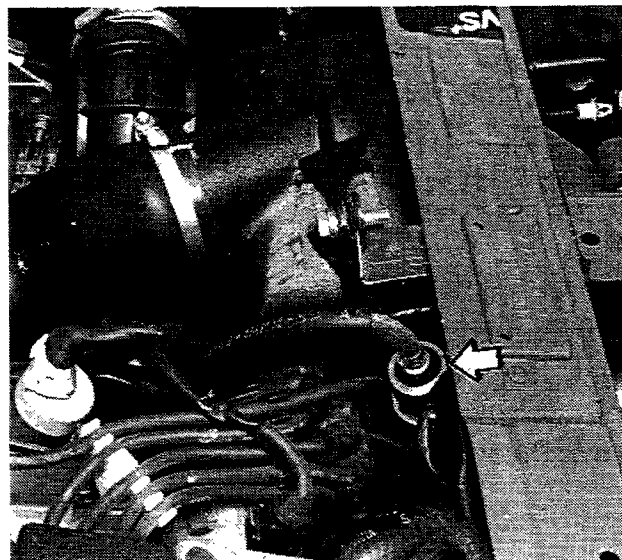


The base and cover of the sensor are different colours, one is black and the other is grey. If the sensors are removed-refitted, the same colour sensor and electrical connector must always be matched together.

2°) OVER-BOOST DEVICE SOLENOID VALVE



P1L27AJ04

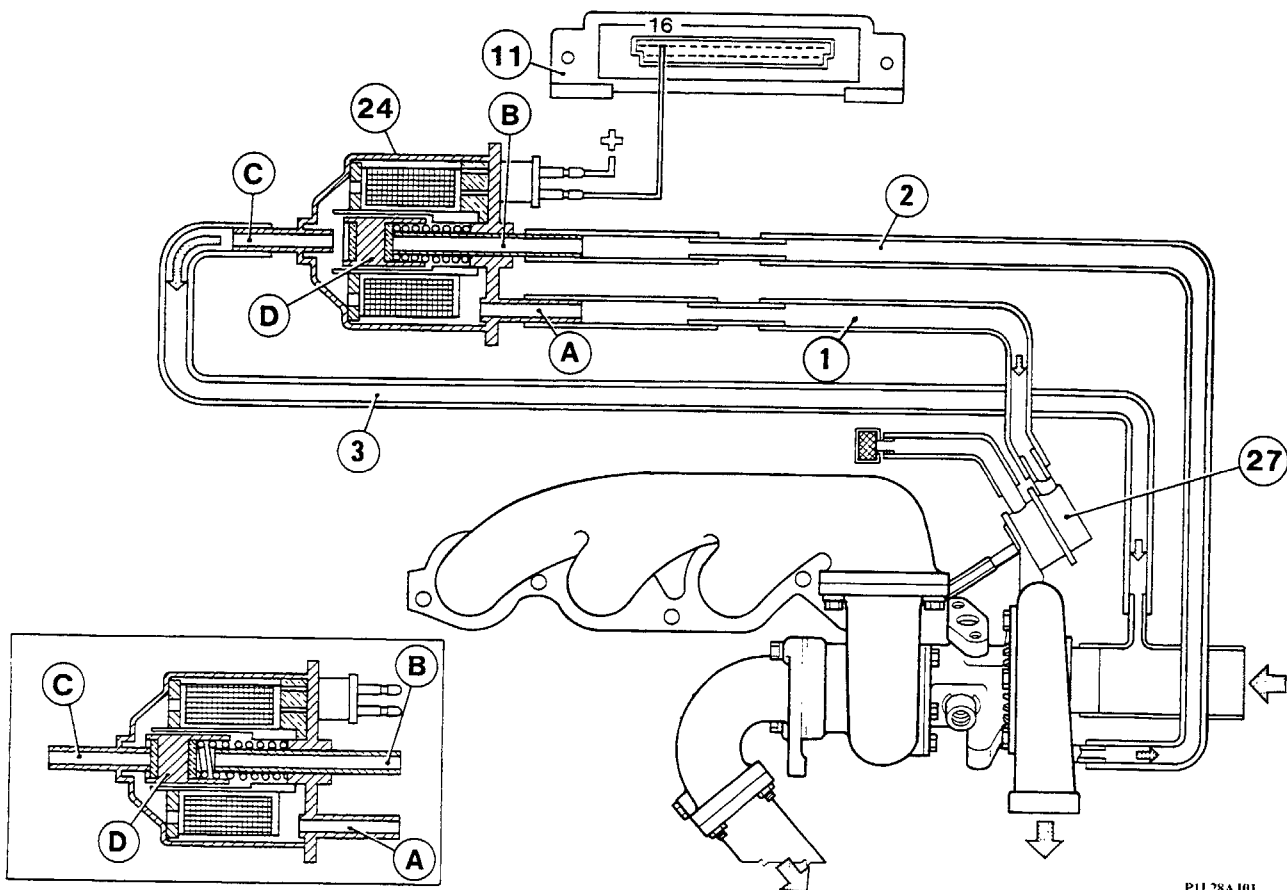


P1L27AJ03

Location on vehicle of over-boost solenoid valve

10.

DIAGRAM SHOWING OVER-BOOST SOLENOID VALVE CONNECTION



P1L28AJ01

Operation of over-boost device

The over-boost device solenoid valve (24) is permanently controlled by the injection/ignition electronic control unit via terminal (16). The description of the operation of the over-boost device is similar to that previously described in chapter 10 - fuel system - in this binder therefore a description of the operation of the over-boost solenoid valve (24) only follows.

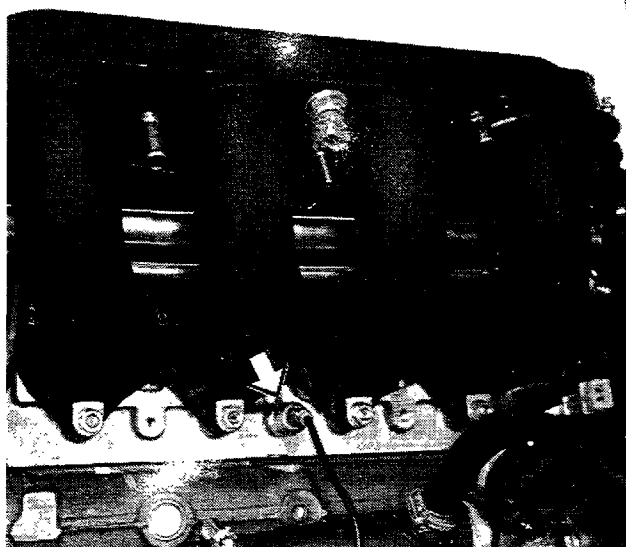
The over-boost device solenoid valve (24) is a three-way A-B-C solenoid valve. Duct A is connected via sleeve (1) to the waste-gate valve actuator (27). Duct B via sleeve (2) is connected to the turbocharger excess pressure duct. Duct C is connected via sleeve (3) to the turbocharger intake duct. When the solenoid valve is not activated by the control unit, cylinder D closes duct C, leaving channels A and B in contact with one another, and the excess pressure arriving in duct B acts on the waste-gate actuator (27), thereby adjusting the excess supply pressure. When the solenoid valve is activated by the electronic control unit, cylinder D, magnetized by the coil winding, starts to pulse, controlled by a Duty-cycle signal, opening duct C for variable lengths of time; these opening frequencies vary according to sample curves memorized in the control unit and the pressure in the inlet manifold plus the engine load conditions.

The opening of duct C allows, via sleeve (3), part of the pressure to be discharged which was formerly acting on the waste-gate valve actuator (27) in the inlet manifold and the turbocharger thus creating the over-boost function.

NOTE *The Delta HF integrale 16 V version no longer has an over-boost warning light and instead there is an I.A.W. injection/ignition system failure warning light.*

3°) DETONATION SENSOR

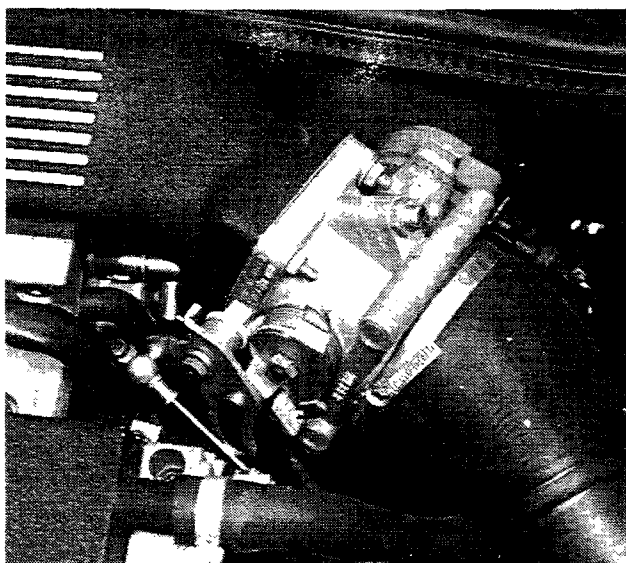
Location of detonation sensor on cylinder head



P1L29AJ01

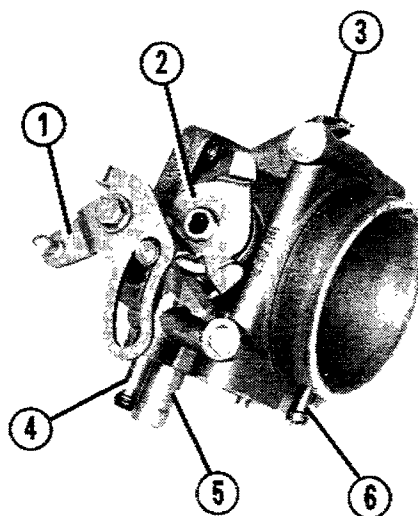
4°) BUTTERFLY CASING

View of butterfly casing on vehicle



P1L29AJ02

- 1) Lever for butterfly valve control cable attachment
- 2) Butterfly valve control lever
- 3) Engine idle speed adjustment screw
- 4) Attachment for coolant supply hose from butterfly casing heating motor.
- 5) Attachment for supplementary air supply hose from idle speed adjustment solenoid valve (V.A.E)
- 6) Attachment for coolant return hose from butterfly casing to engine.



P1L29AJ03