LANCIA

LANCIA k

Volume 5

Workshop
Manual

The information contained in this publication is purely indicative and could be out of date following modifications made by the Manufacturer, at any time, for technical or commercial reasons or in order to conform to legal requirements in the various countries.

Fiat Auto S.p.A.
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TECHNICAL SERVICE MANUAL COMPOSITION

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Print N°	Sections	Page Nos.	Versions	Notes
506.475/26 (I/99)	**10**	1-46	1998 20V 2446 20V 98 Update	Engine: Fuel system
		1-52	2959 V6 24V 98 Update	Engine: Fuel system
		1-24	2387 JTD 98 Range	Engine: Operations on vehicle
506.475/25 (III/99)	**55**	1-45	1998 20V 2446 20V 2959 V6 20V 98 Update	Electrical equipment: Wiring diagrams
506.475/27 (IV/99)	**10**	17-18	1998 20V 2446 20V 98 Update	Update: Fuel system
	00	1-7	2446 20V 99 Update	Technical Data
506.475/29 (IX/99)	**55**	44/1-44/4	1998 20V automatic transmission 2446 20V automatic transmission 99 Update	Wiring diagrams update Electrical equipment
506.475/30 (V/2000)	**55**	1-4	2959 V6 24v 99 Update	Electrical equipment: Removing-refitting alternator
		44/4-44/10	2387 JTD 99 Update	Wiring diagrams update

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GENERALITES CARACTERISTIQUES TECHNIQUES	INTRODUCTION TECHNICAL DATA	ALLGEMEINES TECHNISCHE DATEN	GENERALITÀ DATI TECNICI
MOTEUR	ENGINE	MOTOR	MOTORE
EMBRAYAGE	CLUTCH	KUPPLUNG	FRIZIONE
BOITE DE VITESSES DIFFERENTIEL	GEARBOX DIFFERENTIAL	SCHALTGETRIEBE AUS-GLEICHGETRIEBE	CAMBIO DI VELOCITÀ DIFFERENZIALE
ARBRE DE TRANSMISSION	PROPELLER SHAFT	GELENKWELLE	ALBERO DI TRASMISSIONE
DIFFERENTIEL ARRIERE	REAR DIFFERENTIAL	HINTERES AUS-GLEICHGETRIEBE	DIFFERENZIALE POSTERIORE
FREINS	BRAKING SYSTEM	BREMSEN	FRENI
DIRECTION	STEERING	LENKUNG	STERZO
SUSPENSIONS ET ROUES	SUSPENSION AND WHEELS	AUFHÄNGUNGEN UND RÄDER	SOSPENSIONI E RUOTE
ORGANES SUBSIDIAIRES	AUXILIARY UNITS	ZUSATZ-EINRICHTUNGEN	ORGANI SUSSIDIARI
EQUIPEMENT ELECTRIQUE	ELECTRICAL EQUIPMENT	ELEKTRISCHE ANLAGE	IMPIANTO ELETTRICO
CARROSSERIE	BODYWORK	CAROSSERIE	CARROZZERIA

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NOTE *This section shows 2446 20v engine variants with Bosch Motronic ME 3.1 returnless fuel system. Consult the LANCIA k 1998 range manual, publication no. 506.475/25 for further information.*

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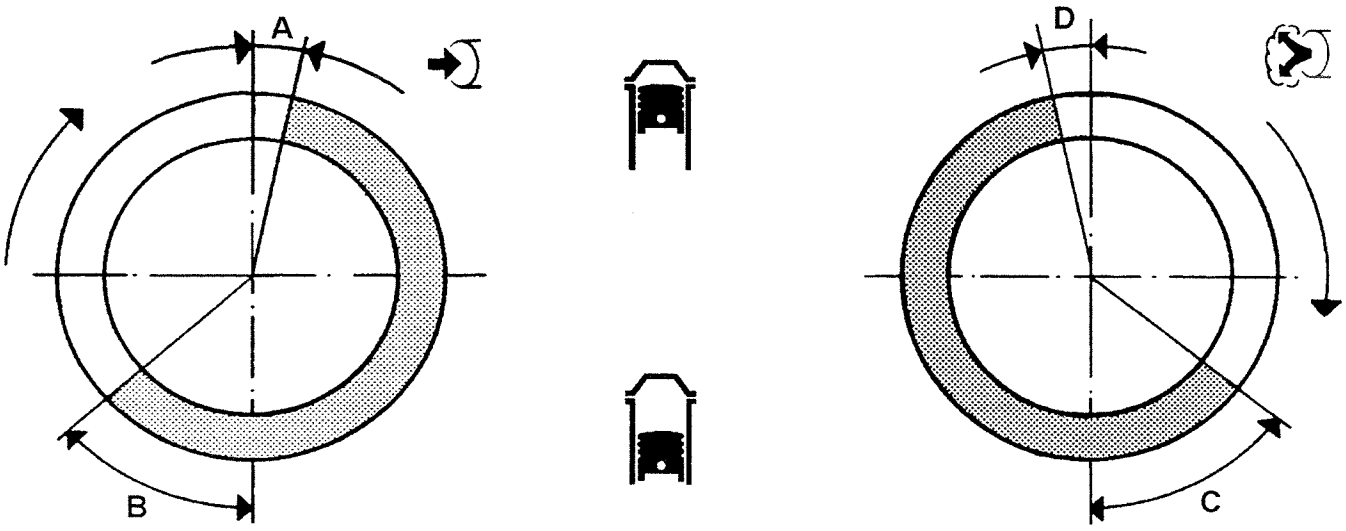
	CHASSIS	ENGINE	VERSION	GEARBOX	
			SALOON	1 3 5 / 2 4 R	
2446 20V	ZLA 838.000	838 A2.000	838 AC 1AA 03	●	
			838 AC 11A 15		●

	CHASSIS	ENGINE	VERSION			GEARBOX	
			SW	COUPÉ	CODE	1 3 5 / 2 4 R	
2446 20V	ZLA 838.000	838 A2.000	●		838 BC 1AA09	●	
				●	838 CC 1AA 13	●	
			●		838 BC 11A 16		●

TIMING DIAGRAMS



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TIMING ANGLES			2446 20V
A — Inlet		starts before TDC	12° after TDC (*) 6° (**)
B		ends after BDC	52° (*) 34° (**)
C — Exhaust		begins before BDC	40°
D		ends after TDC	0°

(*) With low engine load
(**) With high engine load and consequent variable valve timing cut-in

2446 20V

COOLING SYSTEM

Cooling circuit		Coolant circulationvia centrifugal pump, radiator and fan controlled by electronic control unit
Coolant pump drive		by belt
Fan activation-deactivation controlled by control unit	⇄ 1st speed	96.4
	⇄ 2nd speed	101.9
	stop 1st speed	93.6
	stop 2nd speed	98.7
Engine coolant thermostat	opening begins	81° - 85°C
	max opening	99° - 103°C
	valve travel	9.5 mm
Fitting clearance betwen impeller vanes and pump casing		-
Pressure for checking system water tightness		0.98 bar
Checking exhaust valve on supplementary expansion tank plug		0.98 bar

CONTROL

Make	Bosch Motronic ME 3.1 Electronic integrated injection-ignition
Electric	pump
Flow rate	⩾ 120 l/h
Fuel pressure regulator setting	3.5 bar

Checking idle concentration of pollutant emissions	CO (%)	HC (p.p.m.)	CO_2 (%)
Upstream of the catalytic converter	04 - 1	⩽ 600	⩾12
Downstream of the catalytic converter	⩽ 0.35	⩽ 90	⩾ 13

00.10

COMPONENTS OF BOSCH MOTRONIC ME 3.1 INTEGRATED INJECTION - IGNITION SYSTEM

	2446 20V
Injection/ignition system electronic control unit	0.261.206.069
Throttle body	0.205.003.052
Injector	0.280.155.770
Electric fuel pump	0.580.313.020
Air flow meter	0.280.217.108
Engine coolant temperature sensor	269 0350 402 183.01
Lambda sensor	0.258.006.072 0.258.006.193
Fuel vapour solenoid valve	0.280.142.340
Knock sensor	0.261.231.131
Injection timing sensor	0.232.101.036
Top Dead Centre and rpm sensor	0.260.210.160
Potentiometer on accelerator pedal	0.281.002.202

GEARBOX AUTOMATIC AISIN	ENGINE VERSION	2446 20V
Speeds		❶ ❷ ❸ ❹ Ⓡ
Gear ratios	❶ ○ ○ ○ ○	3.606:1
	○ ❷ ○ ○ ○	2.060:1
	○ ○ ❸ ○ ○	1.366:1
	○ ○ ○ ❹ ○	0.982:1
	○ ○ ○ ○ Ⓡ	3.949:1
Idler ratio		56/57 (0.982)
Torque converter	Ø mm	241
X Drive torque ratio (splitter)		1.99
Quantity of fluid	for initial filling	7.5 l (6.8 kg)
	periodic change	3 l (2.7 kg)

GI/2 ●

(●) DEXTRON II automatic transmission fluid

DIFFERENTIAL

Spur gear and pinion set ratio		2.864 (63/22)
Ratio at the wheels	❶ ○ ○ ○ ○	10.328
	○ ❷ ○ ○ ○	5.899
	○ ○ ❸ ○ ○	3.912
	○ ○ ○ ❹ ○	2.813
	○ ○ ○ ○ Ⓡ	11.309

	2446 20V
STARTER MOTOR	Magneti Marelli E 70R-12V 1.4 kW (with reduction gear)
ALTERNATOR	Magneti Marelli A 127I-14V – 55/100A Bosch NC-14V-60/120A (*)
VOLTAGE REGULATOR	BUILT IN ELECTRONIC
BATTERY	12V – 60Ah
IGNITION COIL	Integrated electronic injection-ignition Bosch Motronic ME 3.1
IGNITION COIL	0.221.504.014 (1 per spark plug)
POWER MODULE	-
SPARK PLUGS	LANCIA 7G BMSR Champion RC8 BYC

(*) For vehicles with air conditioning

CONTROL MODULE BOSCH MOTRONIC INTEGRATED ELECTRONIC INJECTION-IGNITION	2446 20V
Make	0.261.206.069
Firing order	1 – 2 – 4 – 5 – 3

IGNITION COIL (1 PER SPARK PLUG)

Make		Bosch
Type		0.221.504.014
Ohmic resistance of primary winding at 20°C	Ω	0.73
Ohmic resistance of secondary winding at 20°C	Ω	9600

TOP DEAD CENTRE AND RPM SENSOR

Make and type		Bosch 0.261.210.119
Sensor winding resistance at 20°C	Ω	774 ÷ 946
Distance (gap) between sensor and crankshaft pulley tooth	mm	0.8 ÷ 1.5

KNOCK SENSOR

Make	Bosch
Type	0.261.231.007

SPARK PLUGS

Make and type	Champion RC8BYC
Thread	M 14 x 1.25
Electrode gap	0.8 ÷ 1

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BOSCH MOTRONIC ME 3.1 M.P.I. INTEGRATED INJECTION/IGNITION SYSTEM

Introduction

Starting from November 1998 the 1998 20V version will be equipped with a new Bosch Motronic ME 3.1 type injection/ignition system.

This system belongs to the category of static advance, inductive discharge digital electronic ignition systems integrated with sequentil, phased electronic injection systems. The system has only one electronic control unit, a single set of wiring and one joint set of sensors.

Its function is to inject the exact quantity of petrol, into the engine inlet manifold, upstream of the inlet valves, designed to mix with the air introduced in the cylinder to obtain the correct mixture strength.

The Motronic ME 3.1 system gurantees efficient operation providing optimum performance and fuel economy and allowing a reduction in harmful emissions by means of a prompt response to the different engine operating conditions.

General description of the injection system

There are essentially two conditions which must always be satisfied in the preparation of the air/fuel mixture for the smooth running of the engine:

1. the metering (air/fuel ratio) should be kept as steady as possible and close to the stoichiometric value, to ensure rapid combustion avoiding unnecessary fuel consumption;
2. the mixture should be composed of petrol vapours diffused as finely and evenly as possible in the air.

As far as the optimum metering, on the other hand, is concerned, it is calculated by the control unit after the following measurements:

- exact quantity of intake air via the flow meter (air flow meter);
- engine rotation speed via the rpm sensor;
- power requested via the accelerator pedal potentiometer;
- Engine coolant temperature via the sensor on the thermostat mounting;
- measurement of the exhaust gas oxygen content via the Lambda sensor.nda lambda.

This information is processed by a micro-calculator contained in the injection/ignition electronic control unit which determines the basic injection time by means of experimentally obtained values which are stored in a special memory in the above mentioned control unit.

General description of the ignition system

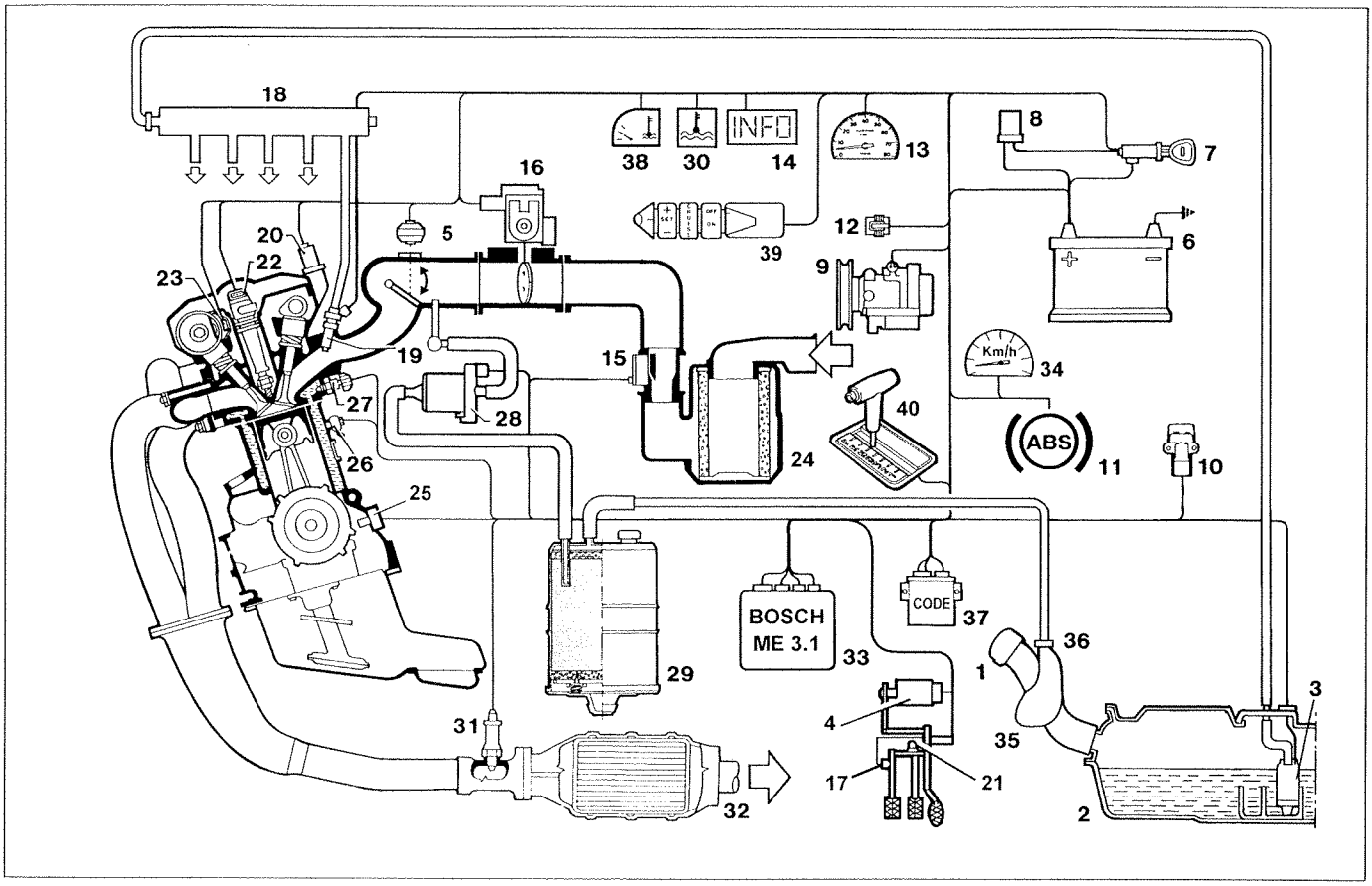
The ignition system is the static advance inductive discharge type (i.e. there is no high tension distributor) with power modules located inside the electronic control unit.

The system has a single coil for each spark plug: the advantages of this solution are:
- less electrical overloading
- gurantee of constant discharge at each spark plug

The electronic control unit contains a map where the entire series of optimum advance values which the engine can use in its operating range on the basis of the engine speed and load conditions are memorized.

In the case of detonation it is possible to selectively delay the ignition in the individual cylinder, recognized by the combination of values transmitted by the detonation sensors and the timing sensor.

INJECTION/IGNITION SYSTEM FUNCTIONAL DIAGRAM



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1. Fuel tank filler cap
2. Fuel tank
3. Electric fuel pump with filter and pressure regulator
4. Accelerator pedal potentiometer
5. Variable geometry manifold solenoid valve
6. Battery
7. Ignition switch
8. System relay feed
9. Climate control compressor
10. Inertia switch
11. ABS control unit (vehicle speed signal)
12. Diagnostic socket
13. Rev counter
14. Injection system failure Infocenter
15. Air flow meter
16. Butterfly casing actuator
17. Clutch pedal switch
18. Fuel manifold
19. Injectors
20. Phase transformer solenoid valve
21. Brake pedal switch
22. Ignition coils
23. Engine timing sensor
24. Air filter
25. Engine rpm sensor
26. Detonation sensors
27. Coolant temperature sensor
28. Fuel vapour solenoid valve
29. Charcoal filter
30. Engine coolant overheating warning light
31. Lambda sensor
32. Catalytic silencer
33. Injection/ignition control unit
34. Speedometer
35. Fuel vapour separator
36. Multi-purpose valve
37. Lancia CODE control unit
38. Engine coolant temperature gauge
39. Cruise control system
40. Automatic transmission

These values have been obtained experimentally, by means of a long series of practical tests carried out on prototypes at the engine test bench, to identify the advances where it is possible to achieve the best compromise between the conflicting demans of maximum power and a reduction in consumption and harmful exhaust emissions.
The optimum advances have then been stored in the system control unit memory. During the operation of the engine, the control unit is constantly informed of the (engine) speed and load conditions and on this basis it "selects" the necessary advance value from its memory for the spark to strike at the spark plug in the cylinder during the explosion stroke with the optimum advance.

In addition the control unit corrects this value on the basis of further factors such as the engine coolant temperature, intake air temperature, detonation and butterfly valve position, so that the ignition point is always optimum.

The information required by the control unit to operate the single coils is transmitted by means of electrical signals from the following sensors:

a. **An rpm sensor** which produces an alternating single phase signal whose frequency indicates the engine rpm.

b. **An air flow meter** with a temperature sensor which, on the basis of the quantity/temperature of the air drawn in by the engine transforms these values into electrical signals, sending them to the electronic control unit.

c. **Two detonation sensors** which, located in the upper part of the cylinder block/crankcase one between cylinders 1 and 2 and the other between cylinders 4 and 5, allow the control unit to recognize the cylinder where detonation (or the onset of detonation) is taking place and correct the ignition advance at the spark plug for the cylinder concerned only.

d. **An accelerator pedal potentiometer** which transforms the angular value assumed by the actual pedal into an electrical signal allowing the control unit to recognize the minimum, partial and full load conditions.

Injection/ignition system functions

In addition to electronically controlling the moment of ignition and the air flow rate at the idle rotation speed, in order to allow the smooth operation of the engineas the environmental parameters and loads applied vary, the control unit must also control and manage the injection so that the stoichiometric (air/-fuel) ratio is always within the optimum value.

The electronic control unit establishes the «time» for operating the injectors using a relatively simply rule which can be summarized as follows.

Taking the physical properties of the fuel (viscosity and density) and the difference in pressure between the fuel pressure and the pressure in the inlet manifolds as constant, the quantity of fuel injected only depends on the «opening time» of the injector.

The injection/ignition system basically carries out the following functions:

- injection timing adjustment;
- ignition advance adjustment;
- check on cold starting;
- check on the enrichment during acceleration;
- fuel cut-off during overrun;
- check on engine idle speed;
- restriction of the maximum engine speed;
- check on combustion via the Lambda sensor;
- fuel vapour recovery;
- check on detonation;
- check on the phase transformer;
- check on the inlet manifold
- self-adjustment of the system;
- autodiagnosis;
- connection with engine immobilizer device (Lancia CODE);
- management of the climate control system;
- management of the radiator fans.
- check on the cruise control system (where fitted)
- connection with the automatic transmission (where fitted)

SYSTEM MANAGEMENT STRATEGIES

Adjustment of the injection times

Digital technology has made it possible to guarantee optimum consumption and performance by means of maps, stored in the electronic control unit memory, according to the engine speed and load conditions.
The control unit oprates the injectors with great speed and precision, calculating the opening time on the basis of the engine load (rpm and air flow rate), also taking into account the battery voltage and the temperature of the engine coolant.

The injection is sequential and phased for each cylinder (the moment of injection is not simultaneous for all cylinders) and takes place at the optimum injection point.

Adjustment of the ignition advance

Thanks to a map stored in its memory, the control unit is capable of calculating the advance in accordance with the engine load (minimum, partial, full load, on the basis of the rpm and air flow rate), the intake air temperature and the engine coolant temperature.
It is possible to selectively delay the ignition at the cylinder required, recognized from the combination of values recorded by the detonation and cam angle sensors.

Check on cold starting

Under these circumstances there is a natural weakening of the mixture as a result of the poor turbulence of the particles of fuel at low temperatures and reduced evaporation and condensation on the internal walls of the inlet manifold, all of which is exacerbated by the increased viscosity of the lubricant oil.

The electronic control unit recognizes this condition and corrects the injection time according to the signal for the coolant temperature, the intake air temperature, the battery voltage and the engine speed.

The ignition advance is only subject to the engine speed and the temperature of the engine coolant.

During starting the control unit implements an initial simultaneous injection for all the injectors (full-group injection) and after the recognition of the reference on the flywheel, it switches to normal sequential phased operation.

Check on the enrichment of the mixture during acceleration

The control unit detects the acceleration request from the signal supplied by the accelerator pedal potentiometer and, as a result, increases the injection times and alters the opening of the butterfly valve in order to reach the required number of revs rapidly.
If, following an acceleration request, the variation in the signal supplied by the air flow meter exceeds a pre-set increase, the control unit not only adjusts the injection to meet the new requirements it also increases it further for several seconds to improve the responsiveness.

Fuel cut-off

When the accelerator pedal is released and beyond a certain pre-set engine speed threshold, the injection control unit cuts off the supply to the injectors.

With no supply, the number of revs starts to decrease at a speed which depends on the vehicle driving conditions.

Before the idle speed is reached, the dynamics of the engine speed decrease are verified.

If they exceed a certain value, the fuel supply is partly reactivated on the basis of a logic which involves "the soft accompaniment of the engine idle speed".

Having reached this condition the normal idle functions are reactivated and the cut-off is only reactivated when the fuel cut-off threshold is exceeded to ensure that the engine runs smoothly. The levels for restoring the fuel supply and cut-off vary according to the engine temperature.

There is another fuel cut-off logic in the control unit which intervenes during partial deceleration, i.e. when the engine load conditions are lower.

The function is only activated if the new condition persists for a pre-set time and after having adapted the ignition advance angle to the new situation.

Check on engine idle speed

The control unit recognizes the "idle" condition (accelerator pedal released) from the signal supplied by the accelerator pedal potentiometer and according to the signals of the brake and clutch pedal switches and the electrical consumers being switched on (climate control and radiator fan) and operates the butterfly valve motor so that the idle speed is 700±50 rpm.

The correction of the idle also takes place through the variation of the ignition angle which has a more immediate effect.

The correct self-learning of the butterfly minimum and maximum opening positions is therefore vital for the effective control of the idle speed; it should be carried out at least once in production and each time the engine control unit or the motorized butterfly casing is replaced.

A self-adjustment function allows the adjustment of the idle to possible variations, over a period of time, in the condition of the idle management components.

Restriction of the maximum engine speed (protection outside of revs)

When the engine speed exceeds 6,800 rpm, the electronic control unit reduces the injector operating time to prevent the engine from being overloaded also protecting it outside of the revs.

If the engine speed exceeds 7,000 rpm, then the control unit activates the fuel cut-off strategy operating the injectors when the speed goes below a certain level.

Check on combustion using Lambda sensor

The Lambda sensor informs the control unit of the quantity of oxygen present in the exhaust and therefore the correct air/fuel metering by means of a two-level voltage signal corresponding to a lean mixture and a rich mixture, respectively

To obtain the ideal mixture for the operation of the three-way catalytic converter and minimize emissions, the petrol must be injected according to a pre-set (stoichiometric) ratio with the intake air, measured from the unitary value of the Lambda parameter (=1); in the case of a lean mixture it is >1, in the case of a rich mixture, on the other hand, it is <1.

The Lambda sensor, in contact with the exhaust gases, produces an electrical signal whose voltage value depends on the concentration of oxygen in the actual gases:

if the mixture is lean (>1), the sensor provides a low voltage level (<200 mV) and the control unit slightly increases the quantity of petrol injected;

if the mixture is rich (<1), the sensor provides a high voltage level (>800 mV) and the control unit reduces the quantity of petrol injected.

The closed-loop management of the Lambda sensor allows the control unit to keep the Lambda value very close to the theoretical unitary value, also assisted by appropriate self-adjustment functions.
The control unit also manages the supply of the Lambda sensor heater. In effect, on the basis of the engine load and speed, the control unit processes a forecast for the temperature of the exhaust gases and consequently controls the heater current supply, limiting it to the actual needs which depend on the engine conditions.

Fuel vapour recovery

The (pollutant) fuel vapours are sent to an active charcoal filter and from there to the engine where they are burnt; this takes place by means of a solenoid valve which is only operated by the control unit when the engine is in a certain load condition to allow the correct combustion without the operation of the engine being "disturbed": in effect, the control unit compensates for this quantity of petrol entering with a reduction in the supply to the injectors.

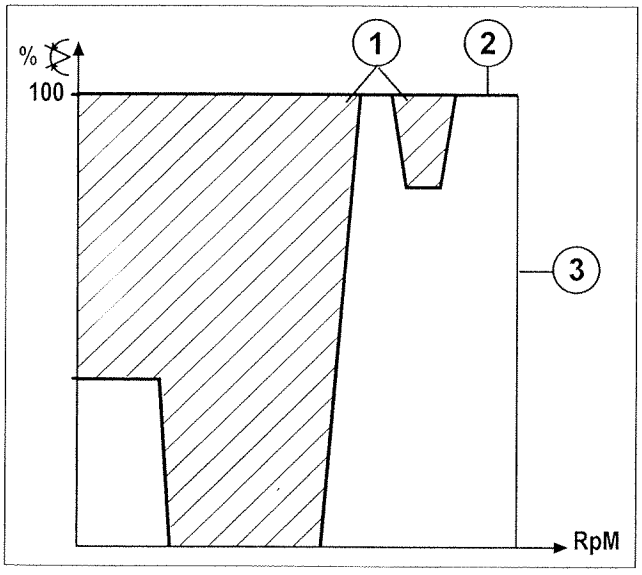
Check on detonation

This function is designed to detect the presence of detonation (engine knock) by processing the signal coming from the appropriate sensors. The control unit continuously compares the signals coming from the sensors with a set value which, in turn, is constantly updated to take into account background noise and the ageing of the engine.

The control unit is thereby capable of detecting the presence of detonation, (or the onset of detonation) and reduces the ignition advance (from 3° up to a maximum of about 9°), until the phenomenon disappears. Later, the advance is gradually restored to the basic value.

In acceleration conditions, a higher level is used to take into account the increased engine noise under these circumstances. The detonation control strategy is also equipped with a self-adjustment function which memorizes the reductions in the advance which are continuously repeated in order to adjust the map to the different conditions the engine finds itself in.

Check on phase transformer



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The control unit controls the phase transformer hydraulic actuator solenoid valve (fitted on the inlet side camshaft) by means of a relay.

There are two operating positions for the transformer:

A. OFF position (power, reduced engine load and idle), corresponding to the normal camshaft fitting value;

B. ON position (torque), corresponding to an 18° crankshaft advance of the camshaft.

The transformer, normally in the OFF position, is switched to the ON position according to the engine load and speed conditions, as illustrated in the diagram.

In any case, the ON position is only enabled if the coolant temperature is above 40°C.

1. Transformer in ON position
2. Accelerator pedal fully depressed
3. Maximum speed restriction

Obviously the control of the phase transformer operates with a hysteresis field, i.e. the solenoid valve activation level is always higher than the deactivation level; this is in order to avoid balance conditions and too rapid a succession of movements from one timing diagram to another with obvious operational irregularities.

Check on inlet manifold

The control unit controls the geometry of the inlet ducts to improve the quantity of air drawn in by the engine.

The control unit selects the short ducts for speeds above 4500 rpm and high loads

In other engine operating conditions, the control unit selects the long duct configuration.

Self-adjustment of the system

The control unit is equipped with a self-adjustment function which has the task of recognizing the changes which take place in the engine due to the process of bedding in and the ageing of both the components and the actual engine.

These changes are memorized in the form of modifications to the basic map and are designed to adapt the operation of the system to the gradual alterations in the engine and the components compared with when they are new.

This adjustment function also makes it possible to compensate for the inevitable differences (due to production tolerances) in components which may be replaced. This makes it possible to gain maximum results from all vehicles without special adjustment and checking operations.

Autodiagnosis

The ME 3.1 injection/ignition system is also equipped with an "**autodiagnostic**" function which memorizes any faults in the sensors and actuators making their identification and correction easier. Any faults are signalled at the Infocenter.

Check on cruise control (where fitted)

According to the cruise control lever setting, the injection/ignition control unit directly operates the butterfly casing actuator to control and maintain the memorized vehicle speed.
A warning light activated by the control unit indicates whether or not the system is operating.
The injection control unit momentarily deactivates the cruise control system when the brake pedal or the clutch pedal is operated; by pressing the recall button the operation of the cruise control system at the last speed memorized is restored.

Connection with automatic transmission

The control unit adjusts the engine speed according to the load when the selector lever is moved to change gear.

Connection with engine immobilizer device (Lancia CODE)

To improve protection against theft attempts, the vehicle is equipped with an immobilizer system (Lancia CODE) which only allows the activation of the injection/ignition control unit through an electronic code.

Each time the key is turned to the OFF position, the Lancia CODE system completely deactivates the injection/ignition control unit.

If the ignition key is turned from OFF to ON, the following operations take place, in order:

1. The injection/ignition control unit sends the Lancia CODE control unit a request for the secret code in order to deactivate the immobilizer function.
2. The Lancia CODE control unit responds by only sending the secret code after having, in turn, received the recognition code transmitted by the ignition key which contains a special transponder.
3. The recognition of the secret code allows the de-activation of the immobilizer function and the injection/ignition control unit can activate the normal system management programme.

A special two-way serial line allows the exchange of data between the injection/ignition control unit and the Lancia CODE control unit.

If the Lancia CODE system is faulty the engine can still be started up via the emergency procedure.

Given the presence of the Lancia CODE system **DO NOT**, *during the fault diagnosis and/or functional checks, carry out tests using another injection/ignition control unit. In such a case the Lancia CODE control unit would transfer the (unrecognized) recognition code to the test control unit which could then no longer be used on other vehicles.*

Management of the climate control system

The injection/ignition control unit is functionally connected to the climate control system, in that:

1. it receives the request to switch on the compressor from the climate control unit via pin F6 and carries out the appropriate interventions (additional air);
2. it gives the go ahead to switch on the compressor via pin F13, when the strategy conditions are verified;
3. it receives information concerning the state of the four stage pressure switch from pins F9 and F41 and carries out the appropriate interventions (operation of the radiator fan).

As far as point 1 is concerned,, if the engine is idling, the control unit increases the air flow rate passing through the motorized butterfly casing in advance of the compressor being switched on and viceversa returns the actuator to the normal delay position after the compressor is switched off.

On the other hand, as far as point 2 is concerned, the control unit automatically controls the disengagement of the compressor:

- for several seconds (timed disengagement):
  - in high engine power request conditions (strong acceleration);
  - during engine take-off;
- as long as the following critical conditions persist:
  - for engine coolant temperatures above a certain value;
  - for engine speeds above or below a certain level.

Management of the radiator fans

The control unit directly controls the operation of the radiator fans according to the temperature of the engine coolant and the engagement of the climate control system.
The fans are engaged when the temperature exceeds 98°C (1st speed) and 101°C (2nd speed). They are switched off with a hysteresis of 2°C below the temperature threshold.

AIR INTAKE CIRCUIT

The 1998 5 cylinder 20 valve version is equipped with a special system of air intake ducts. The manifold is composed of two half shells and an internal rocker element (module) which, operated by a special pneumatic actuator, can assume two positions and alter the length of the inlet ducts (variable geometry).

In this way there are five possible long (torque) ducts or five short (power) ducts.

The two different length ducts operate alternately allowing maximum volumetric efficiency at different speeds.

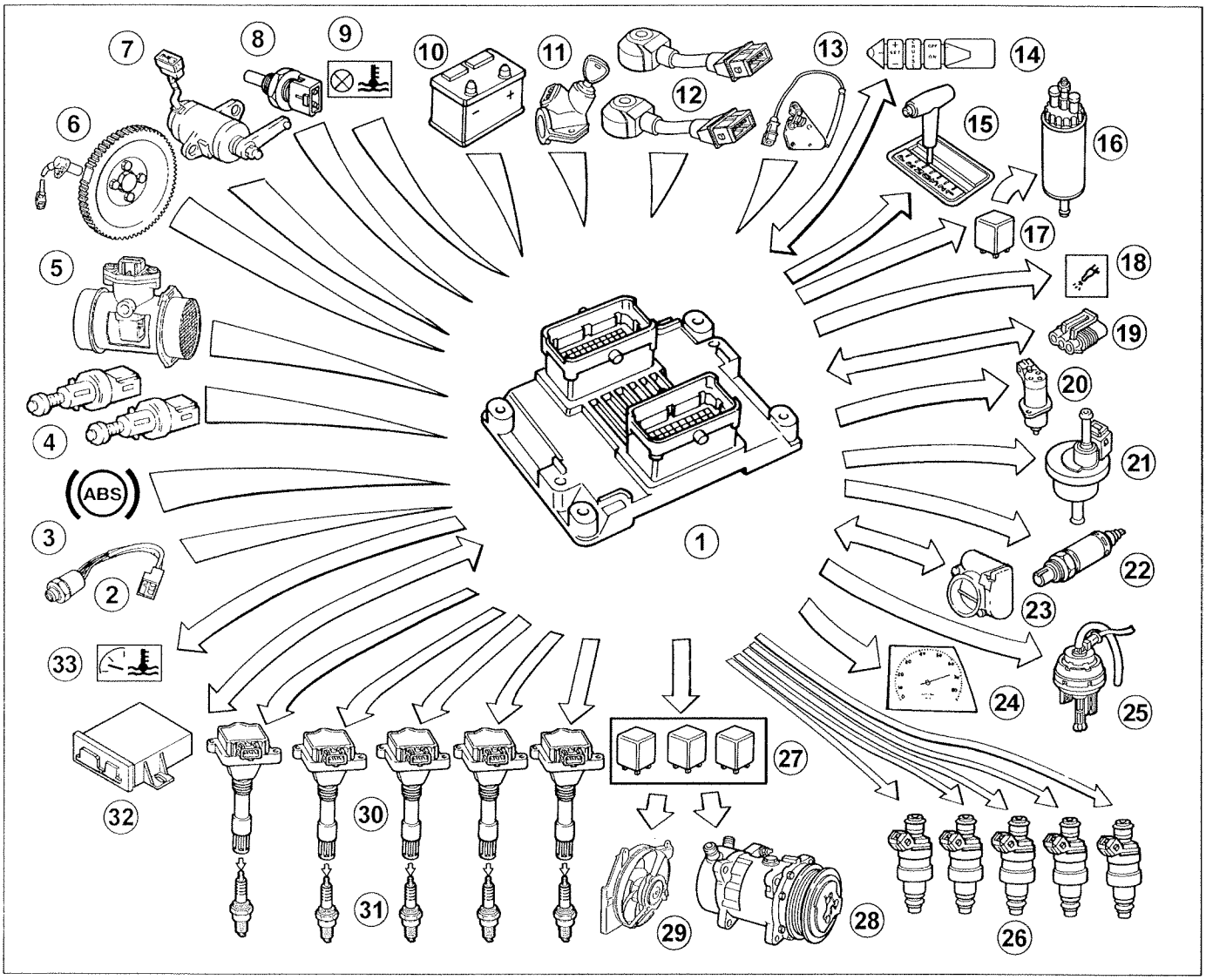
By selecting the length of the inlet duct appropriately the oscillations of the column of gas entering can be timed with the movement of the valve to increase the inertia effect of the gaseous mass in the cylinder.

This means that the degree of filling can be increased.

Obviously the device operates with a hystersis field, i.e. the changes from "power" duct and viceversa do not always take place at the same engine speed.

This is to avoid the possible creation of balance conditions and too rapid shifts from one length to another with obvious operational irregularities.

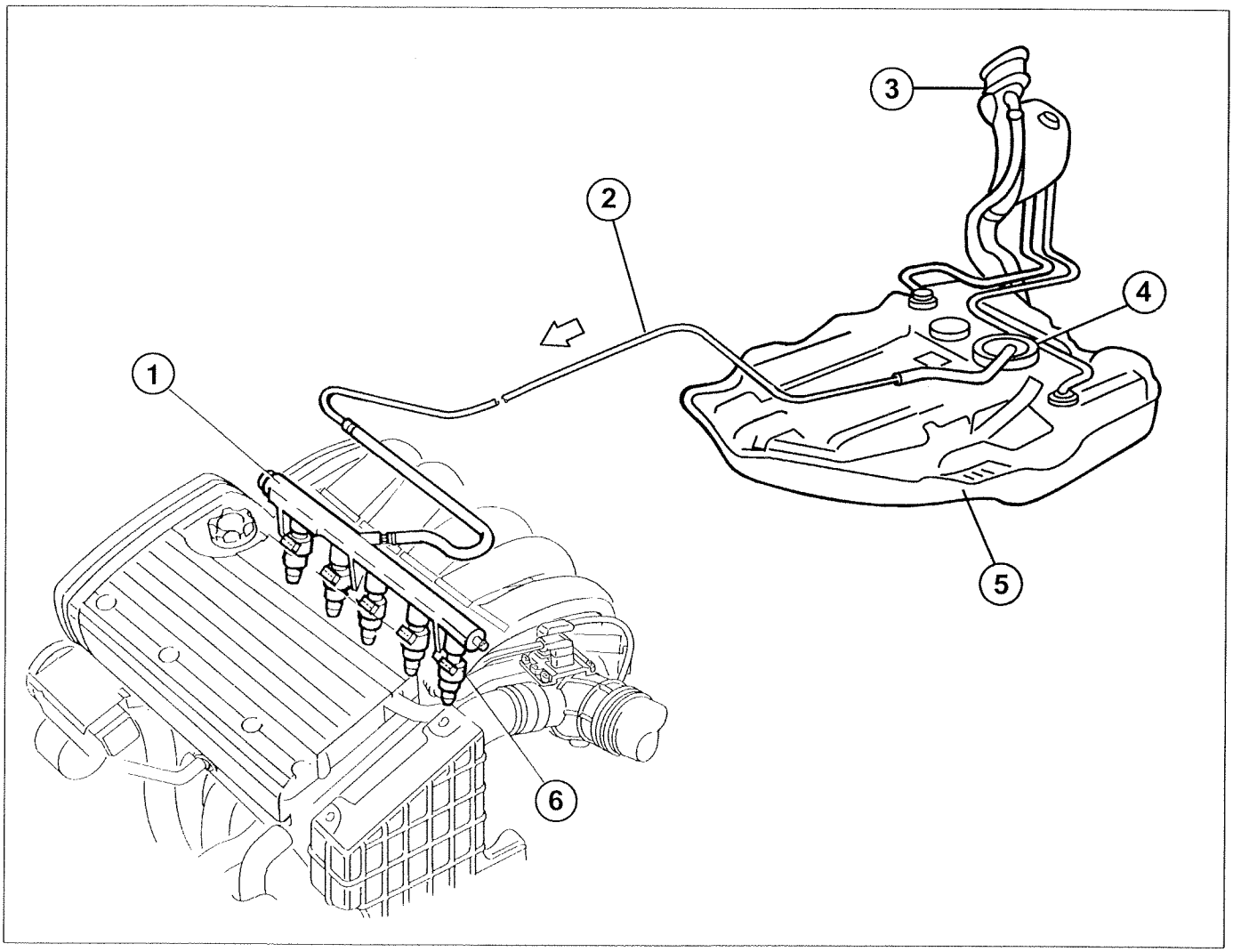
DIAGRMA SHOWING INFORMATION ENTERING/LEAVING THE INJECTION/IGNITIN SYSTEM CONTROL UNIT AND SENSORS/ACTUATORS



P3U09GX01

1. Electronic control unit
2. Four stage pressure switch
3. Vehicle speed signal (from ABS)
4. Brake and clutch pedal switches
5. Flow meter
6. Rpm sensor
7. Accelerator pedal potentiometer
8. Coolant temperature sensor
9. Coolant overheating warning light
10. Battery
11. Ignition switch
12. Detonation sensors
13. Timing sensor
14. Cruise control system
15. Automatic transmission
16. Electric fuel pump
17. Electric fuel pump relay
18. System failure signal at Infocenter
19. Diagnostic socket
20. Phase transformer solenoid valve
21. Fuel vapour solenoid valve
22. Lambda sensor
23. Butterfly casing actuator
24. Rev counter signal
25. Variable geometry inlet manifold solenoid valve
26. Injectors
27. Climate control compressor and radiator fan high/low speed relays control unit
28. Climate control system
29. Radiator fan
30. Coils
31. Spark plugs
32. Lancia CODE control unit
33. Water temperature gauge

DIAGRAM SHOWING FUEL SUPPLY CIRCUIT



P3U10GX01

1. Fuel supply manifold
2. Fuel supply pipe to the injectors
3. Fuel filler
4. Electric fuel pump with filter and pressure regulator
5. Tank
6. Injectors

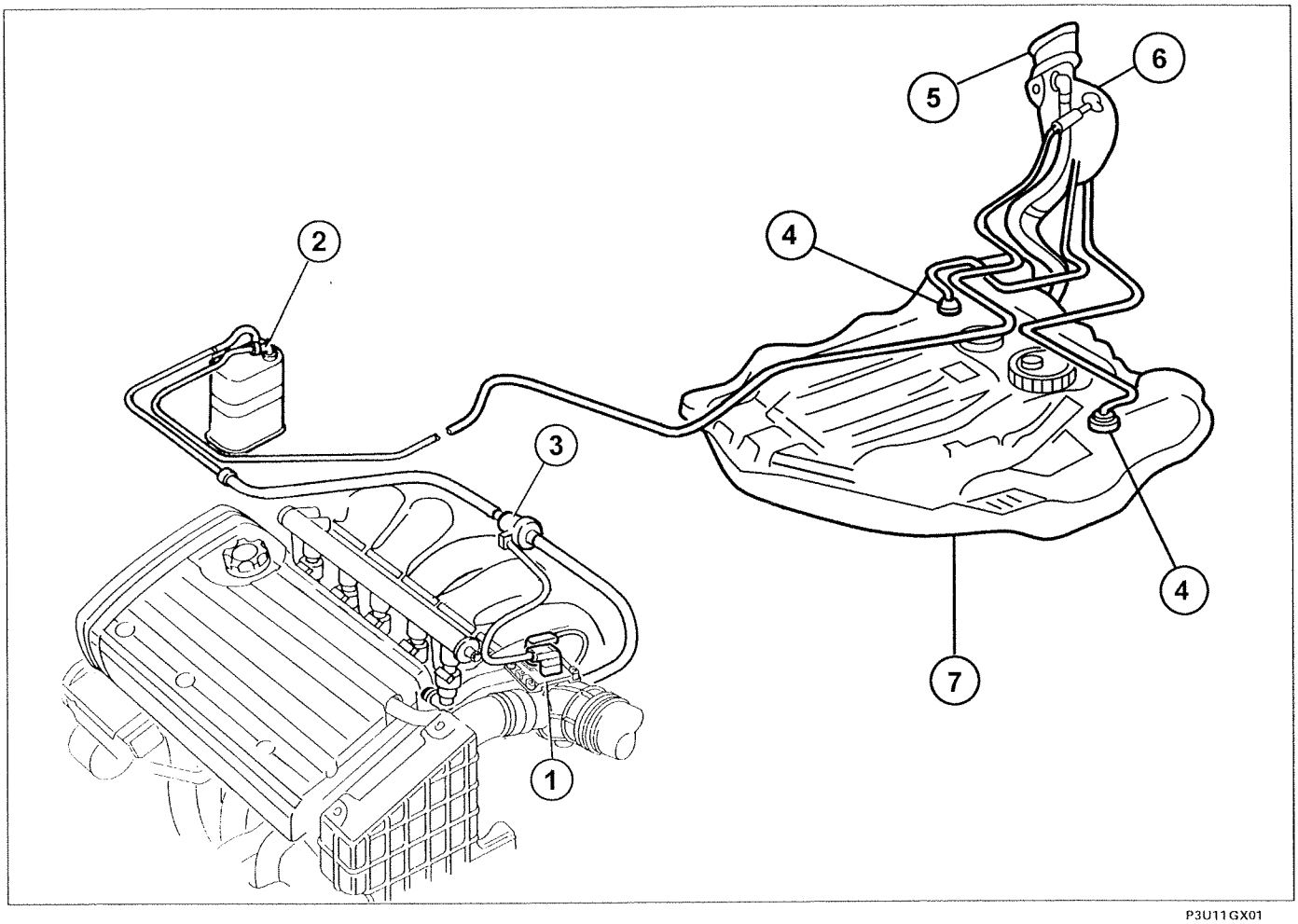
The fuel supply system takes place by means of an electric pump immersed in the tank which draws in the fuel and sends it to the filter and then to the injectors.

The fuel system is the returnless type, i.e. there is only one pipe between the fuel tank and the engine.

This system makes it possible to:
- keep the risk of fire, in the case of an accident, to a mimimum;
- reduce fuel vapour emissions into the atmosphere.

The electric fuel pump is enclosed in a casing which also incorporates the fuel pressure regulator, the fuel gauge and the fuel filter.
The system is also fitted with an inertia switch which, if the vehicle is involved in an impact, cuts off the electric fuel pump supply.

DIAGRAM SHOWING FUEL ANTI-EVAPORATION CIRCUIT



P3U11GX01

1. Injection/ignition control unit
2. Charcoal filter
3. Fuel vapour cut out solenoid valve
4. Multi-purpose valve
5. Filler cap with safety and ventilation valve
6. Fuel vapour separator
7. Tank

The anti-evaporation system is designed to prevent the fuel vapours, consistingof the lightest fractions of hydrocarbons which basically form in the tank, from being discharged into the atmosphere.
The system works, above all, when the outside temperature is high, when the temperature of the fuel increases and consequently the tendency for evaporation is higher; under these circumstances there is an increase in the pressure inside the tank (7).
In particular, even when the tank (7) is full and the vehicle is stationary, the multi-purpose valves (4) remain open as they are located in a higher position than the breather pipe and therefore they allow the vapours to reach the separator (6), from where they condense and mainly return to the tank (7).
If, on the other hand, the fuel is splashing around during driving or the vehicle overturns, the valves (4) close preventing the fuel from escaping.
Then the pressure inside the tank reaches about 30-40 mbar, the multi-purpose valves (4) open and the fuel vapours reach the charcoal filter (2). The valves (4) also allow an intake of air into the tank through the charcoal filter, for example, after the level of the fuel has decreased with the consequent vacuum created inside the tank.
With the engine running, the control unit (1) operates the fuel vapour cut out solenoid valve (3), which allows the intake of vapours by the engine and the consequent washing of the charcoal filter (2).
If, as a result of the malfunction of one of the components, the pressure inside the tank increases to dangerous levels, the safety valve (5), located near the cap, allows the pressure to be discharged outwards.
If necessary, this valve can open in the opposite direction to ventilate the tankand prevent the vacuum reaching excessive levels.

SYSTEM FOR RECIRCULATING GASES COMING FROM THE ENGINE CRANKCASE (BLOW-BY)

The system controls the emission, from the cylinder block/crankcase, of the exhaust gases composed of air/petrol mixtures and the burnt gases which escape through the piston seals, in addition to the lubricant oil vapours and recirculates them to the inlet.

The breather gases, directed by special partitions, rise by the engine oil filler and then pass through the coils (7), under the tappet cover, where they lose part of the oil which they contain which returns to the camshafts, via the pipe (6) in the form of droplets.

The pipe (6) is an appropriate siphon shape to prevent the breather gases from escaping and only allows the recirculation of the drops of oil.

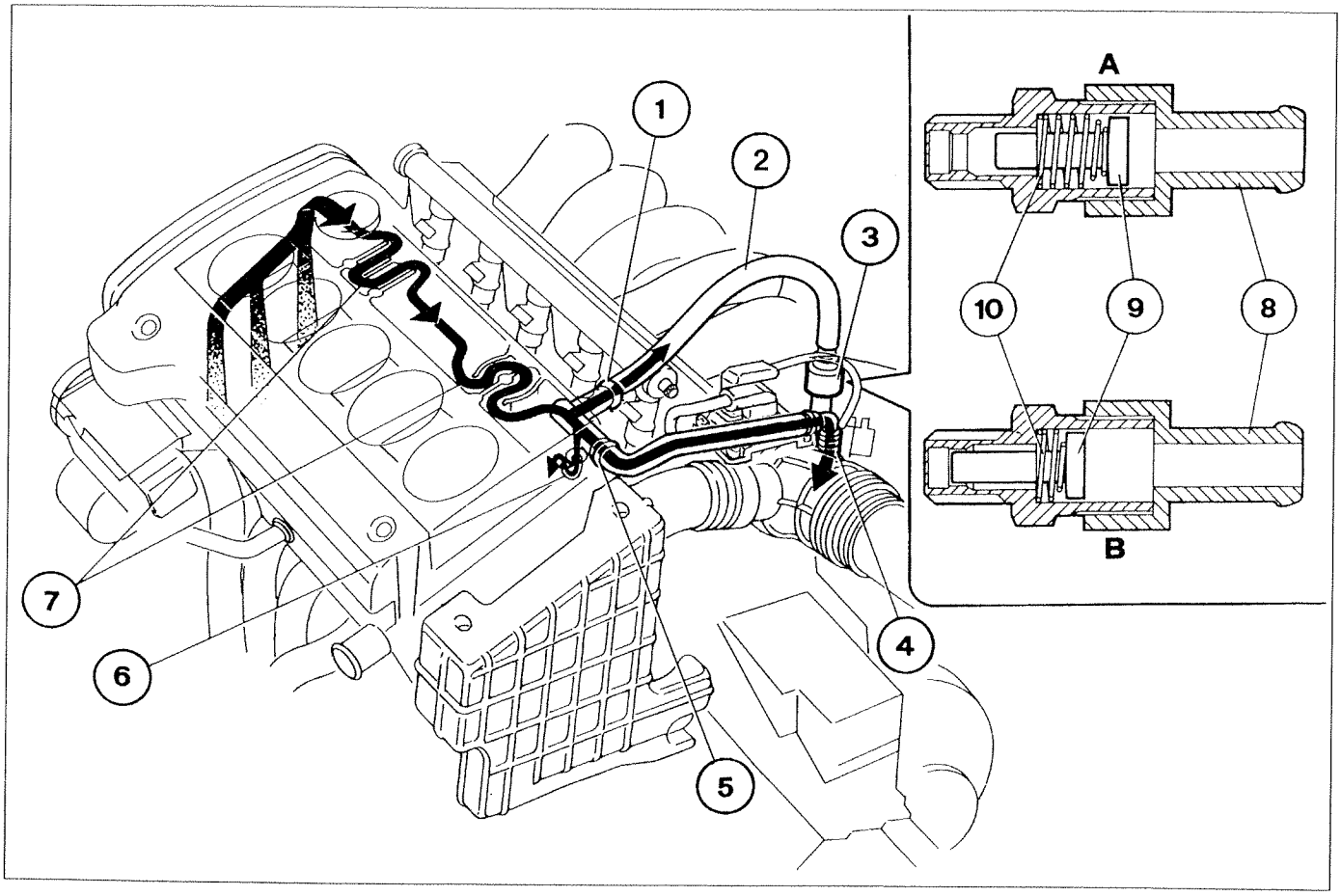
With the butterfly open, the gases comes out of the intake (5) and are sent, via the connector (4) on the air hose, upstream of the butterfly valve, to be drawn into the manifold.

With the butterfly closed, the vacuum in the inlet manifold draws in the gases through the intake (1) and, through the pipe (2) they reach the connector (3) on the inlet manifold where a PCV valve (8) (Positive Crank Ventilation) which shutters the inlet is fitted.

The PCV valve can be modulated and the quantity of gas which passes through is proportional to the vacuum in the inlet manifold.

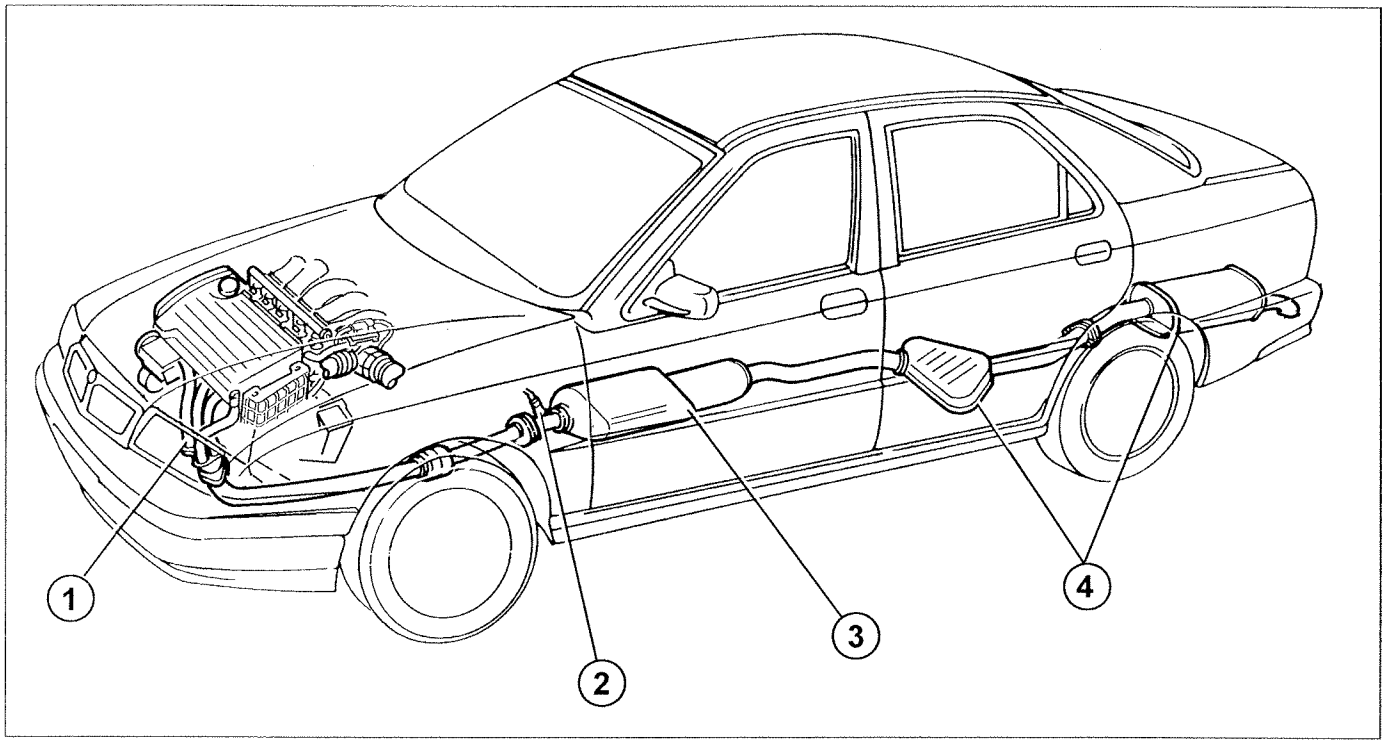
When the butterfly valve is completely open (condition A), the vacuum inside the inlet manifold is minimal, the spring (10) is completely extended and the PCV valve allows the maximum flow of breather gases.

Conversely, with the butterfly completely closed (condition B), the vacuum inside the manifold is maximum which causes the movement of the piston (9) which shutters the section through which the breather gases flow inside the PCV valve thereby restricting the intake of actual gases into the manifold.



P3U12GX01

ENGINE EXHAUST ASSEMBLY DIAGRAM



P3U13GX01

1. Exhaust manifold
2. Lambda sensor
3. Catalytic silencer
4. Silencers

The closed-loop type control of the mixture strength is activated by the Lambda sensor which measures the oxygen content of the exhaust gases upstream of the catalytic silencer.

The Lambda sensor measurements allow the electronic control unit to continuously correct the quantity of petrol injected, thereby keeping the air/fuel ratio constant.

This means that the harmful exhaust emissions are kept in check, a function completed by the three way catalytic converter (catalytic silencer).

The efficient operation of the catalytic silencer and consequently containing the toxicity of the exhaust gases, depends on the air/fuel ratio which the engine receives.

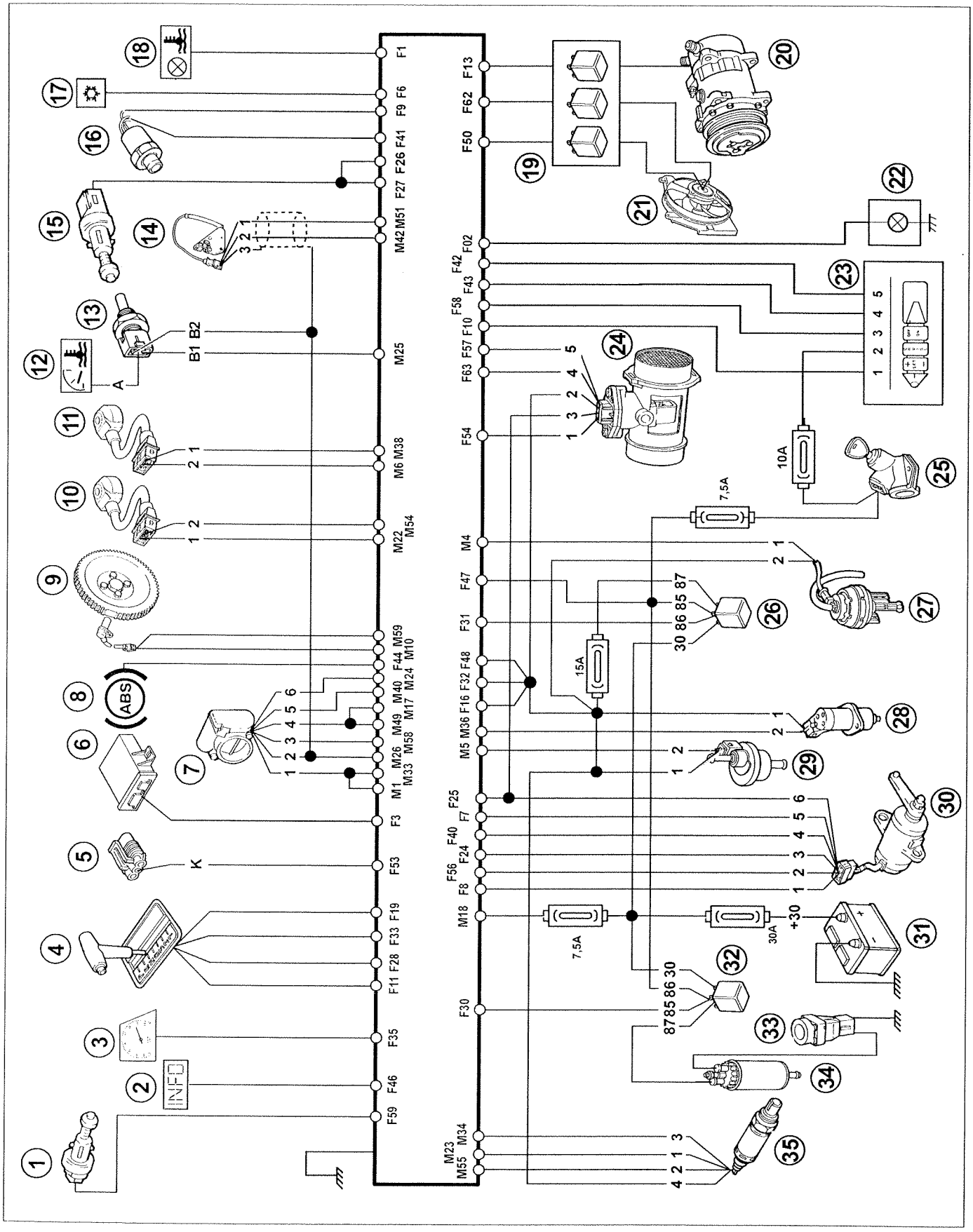
The three-way type catalytic converter makes it possible to simultaneously keep down the levels of the three pollutant gases present in the exhaust: unburnt hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NOx).

Two types of chemical reaction take place inside the converter:
- oxidation of the CO and the HC, converted into carbon dioxide (CO2) and water (H2O);
- reduction of the NOx, converted into Nitrogen (N2).

The following would rapidly put the catalytic converter out of action and make it irreparable:
- the presence of lead in the petrol which lowers the degree of conversion to such levels that it makes the presence of the catalytic converter in the system useless;
- the presence of unburnt petol in the converter: in effect, a flow of petrol for 30s in an ambient of 800 °C (temperature inside the silencer) is sufficient to cause the catalyzer to melt and break.

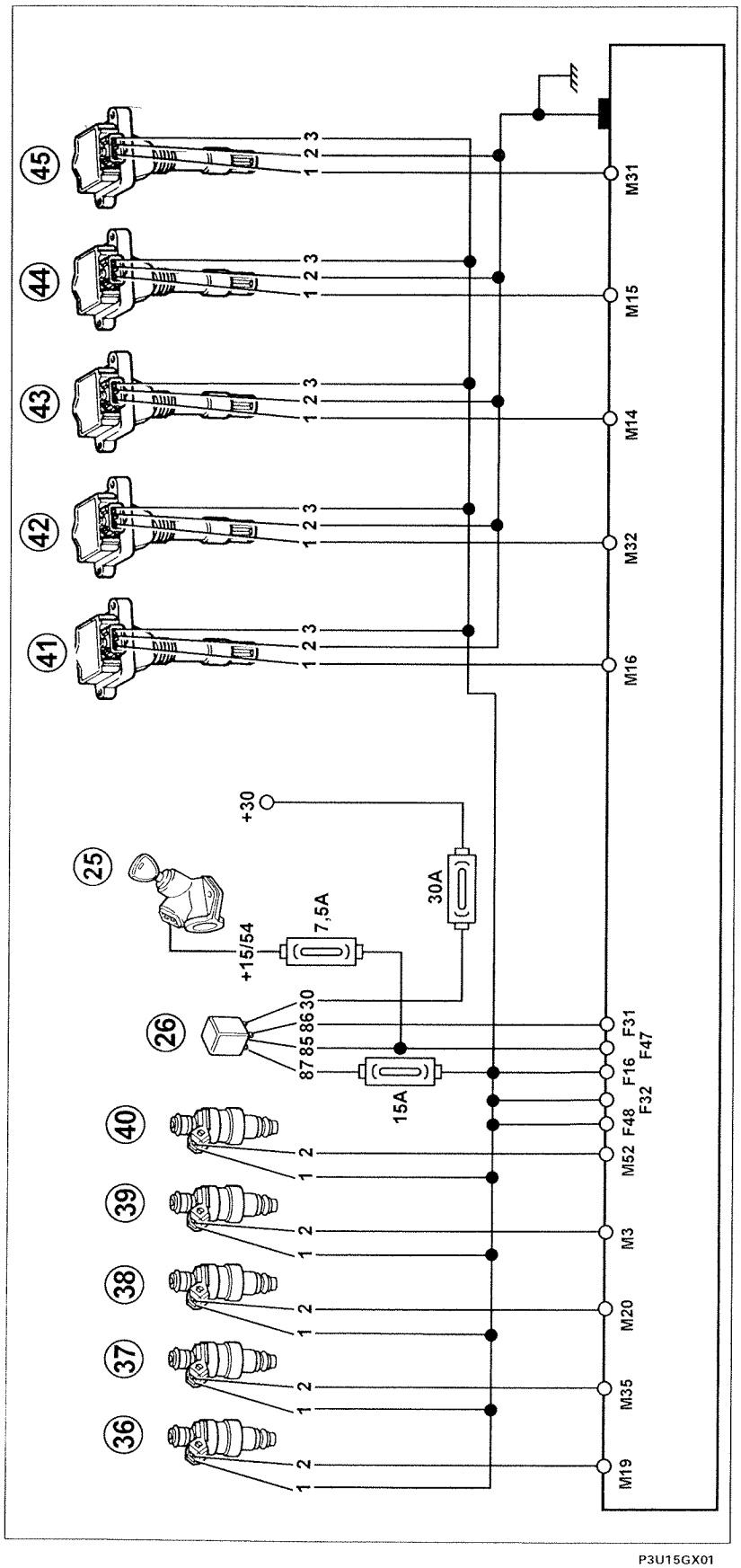
It is vital for the injection/ignition system to be in perfect working order, therefore **the spark plug leads should not, under any circumstances, be disconnected with the engine running and, if tests are carried out, the catalytic converter should be replaced with a suitable length of pipe.**

INJECTION/IGNITION SYSTEM WIRING DIAGRAM



P3U14GX01

Connection between control unit/ignition coils and injectors



P3U15GX01

Key:

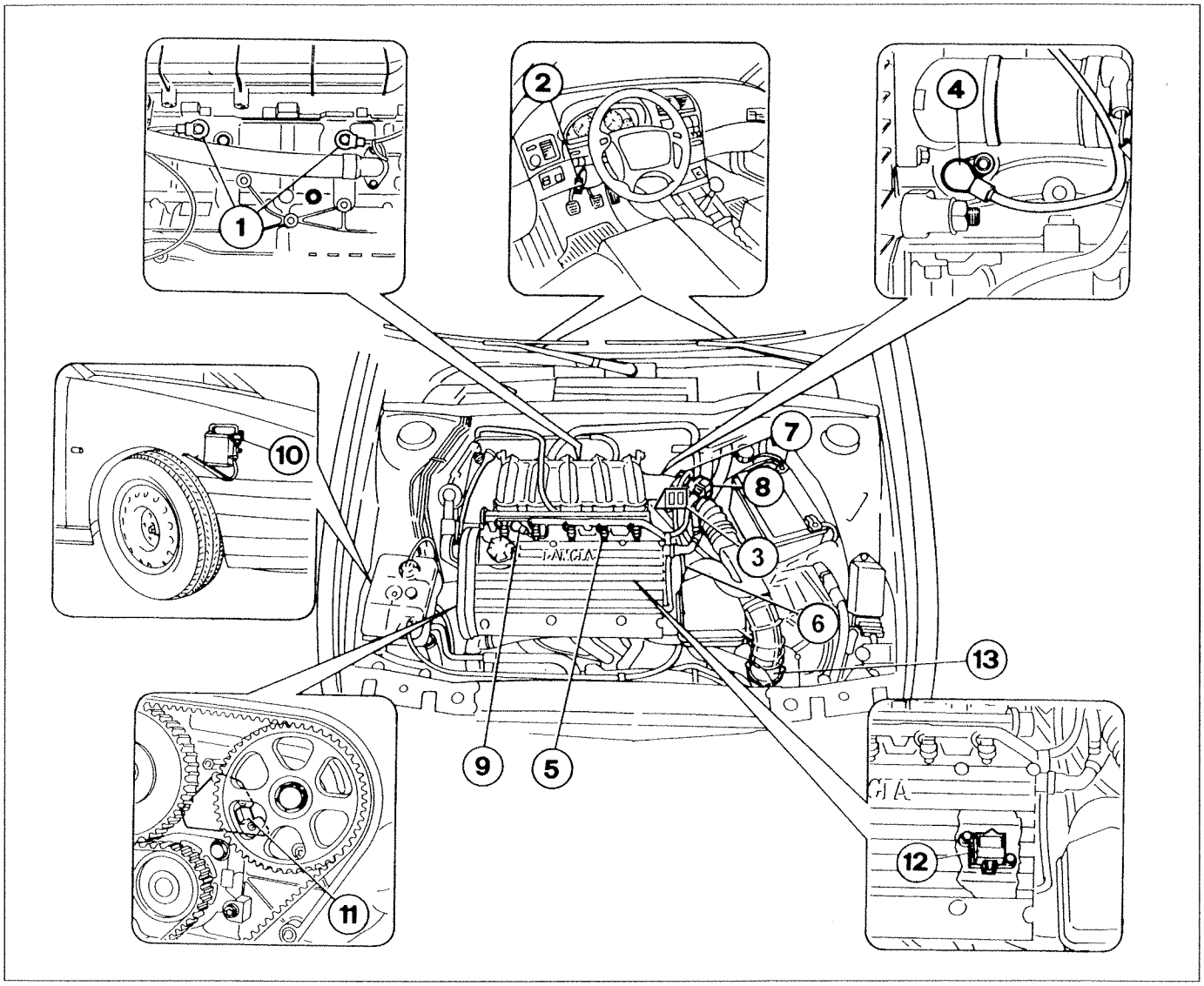
1. Clutch pedal switch
2. Infocenter
3. Rev counter signal
4. Automatic transmission
5. Diagnostic socket
6. Lancia CODE control unit
7. Butterfly casing actuator
8. Vehicle speed signal (from ABS system)
9. Rpm and TDC sensor
10. Detonation sensor 1
11. Detonation sensor 2
12. Engine coolant temperature gauge
13. Coolant temperature sensor
14. Timing sensor
15. Brake pedal switch
16. Four stage pressure switch
17. Climate control engagement
18. Coolant overheating warning light
19. Air conditioning compressor and radiator high/low speed fans relay control unit
20. Air conditioning compressor
21. Radiator fans
22. Cruise control warning light
23. Cruise control system
24. Flow meter
25. Ignition switch
26. Injection/ignition system relay feed
27. Variable geometry manifold solenoid valve
28. Timing variator solenoid valve
29. Fuel vapour solenoid valve
30. Accelerator pedal potentiometer
31. Battery
32. Electric fuel pump relay
33. Inertia switch
34. Electric fuel pump
35. Lambda sensor

36-40. Injectors N° 1 to 5

41-45. Ignition coils for cylinders N° 1 to 5

10.

LOCATION OF INJECTION/IGNITION SYSTEM COMPONENTS



Key

1. Detonation sensors
2. Diagnostic socket
3. Injection/ignition control unit
4. Rpm and TDC sensor
5. Injectors
6. Coolant temperature sensor
7. Fuel vapour solenoid valve
8. Butterfly casing actuator
9. Phase transformer solenoid valve
10. Charcoal filter
11. Timing sensor
12. Single coils
13. Air flow meter

INJECTION - IGNITION SYSTEM COMPONENTS

The injection-ignition system consists mainly of a wiring system, an electronic control unit (I.E. control unit) and the following sensors and actuators:

Sensors

- RPM and TDC sensor
- Knock sensors
- Engine coolant temperature sensor
- Timing sensor
- Throttle position sensor (built into the throttle body acuator)
- Intake air temperature sensor
- Intake air flow and temperature sensor (debimeter)
- Lambda probe
- Potentiometer on accelerator pedal
- Brake pedal switch
- Clutch pedal switch

Actuators

- Throttle body actuator
- Variable valve timing control solenoid
- Fuel vapour cut-off solenoid
- Variable geometry manifold control solenoid
- Fuel pump (including filter and pressure regulator)
- Injectors
- Ignition coils
- Spark plugs

INJECTION - IGNITION SYSTEM WIRING

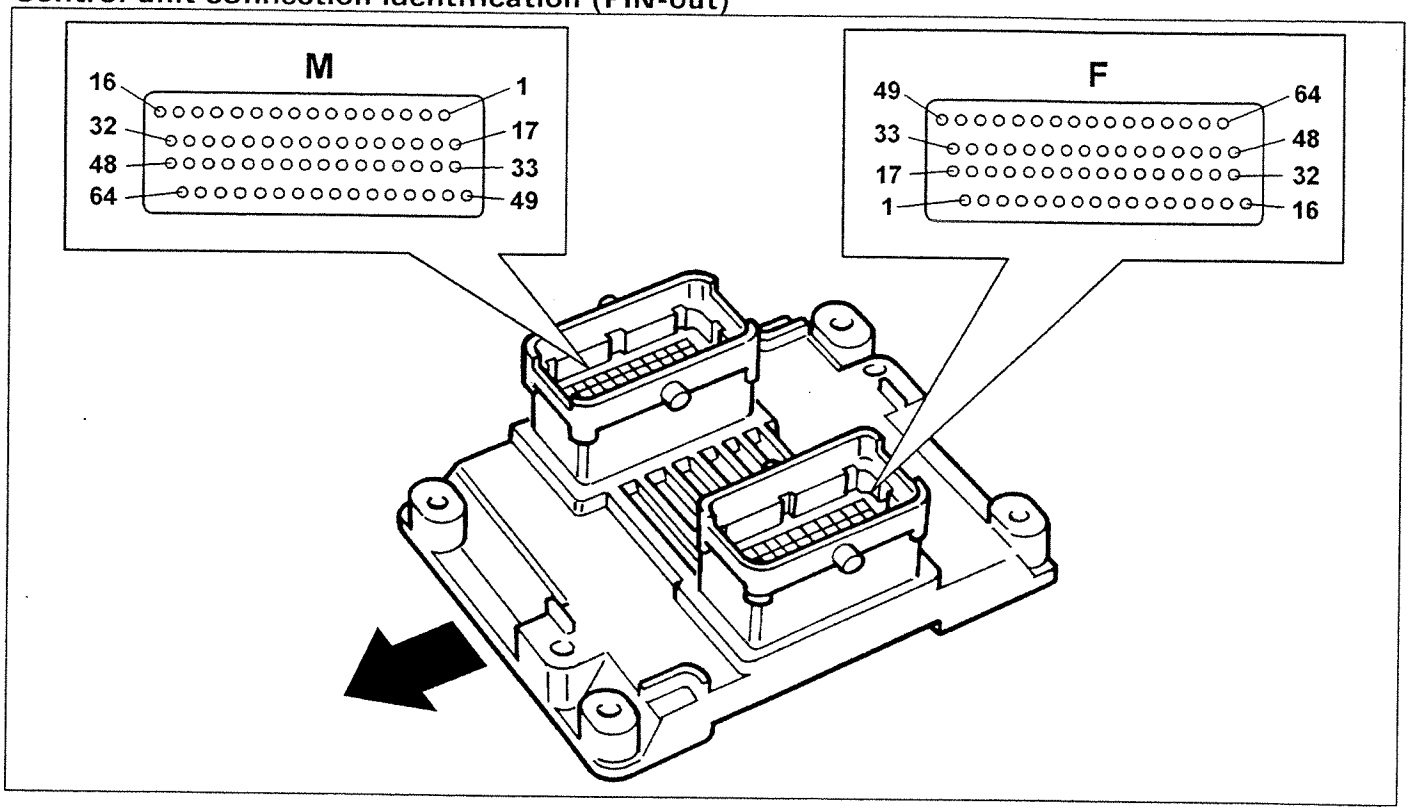
The various system components are connected by two different wiring systems.
Engine side wiring (connector M) connects components fitted to the engine to the injection control unit.
The vehicle side wiring (connector F) connects the other components to the control unit and acts as an interface with other vehicle wiring systems.
The two connectors (M and F) are the same and both are 64-pin. Special insertion keys prevent wires being misconnected to the wrong control unit connectors.

ELECTRONIC INJECTION-IGNITION CONTROL UNIT

The injection-ignition electronic control unit is located in the engine bay, secured to a braket beside the intake manifold.
The control unit processes signals from the various sensors by applying software algorithms and controls the actuators accordingly (particularly the injectors and pressure regulator) to achieve the best possible engine service conditions.
The control unit is "flash E.P.R.O.M." type, i.e. it can be reprogrammed from outside without andy need to adjust the hardware.

10.

Control unit connection identification (PIN-out)



3N19HJ01

CONNECTOR F

1 Excessive engine coolant temperature warning light
2. Cruise control light
3. Lancia CODE control unit
4. Not connected
5. Not connected
6. Climate control system compressor activation request
7. Accelerator pedal potentiometer 1 activation
8. Accelerator pedal 1 potentiometer signal
9. Low radiator fan speed activation request
10. Cruise control
11. Drive selection (automatic transmission)
12. Not connected
13. Climate control system compressor activation control
14. Not connected
15. Power supply from battery
16. Power supply from relay
17. Not connected
18. Not connected
19. Accelerator position (automatic transmission)
20. Not connected
21. Not connected
22. Not connected
23. Not connected

CONNECTOR M

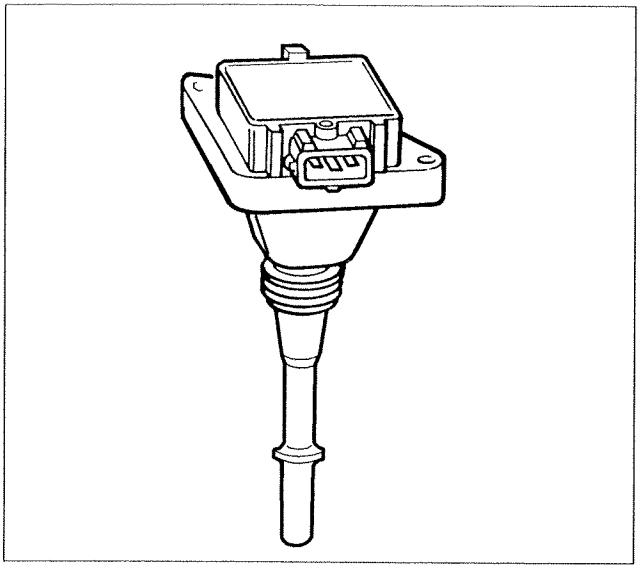
1 Throttle body motor (-)
2. Not connected
3. Cylinder 4 injector
4. Variable geometry manifold actuator
5. Fuel vapour cut-off solenoid
6. Knock sensor 2 reference earth
7. Not connected
8. Not connected
9. Not connected
10. Engine rpm sensor
11. Not connected
12. Not connected
13. Not connected
14. Cylinder 3 ignition coil
15. Cylinder 4 ignition coil
16. Cylinder 1 ignition coil
17. Throttle body motor (+)
18. Not connected
19. Cylinder 1 injector
20. Cylinder 3 injector
21. Not connected
22. Knock sensor 1 signal
23. Lambda probe signal

CONNECTOR F

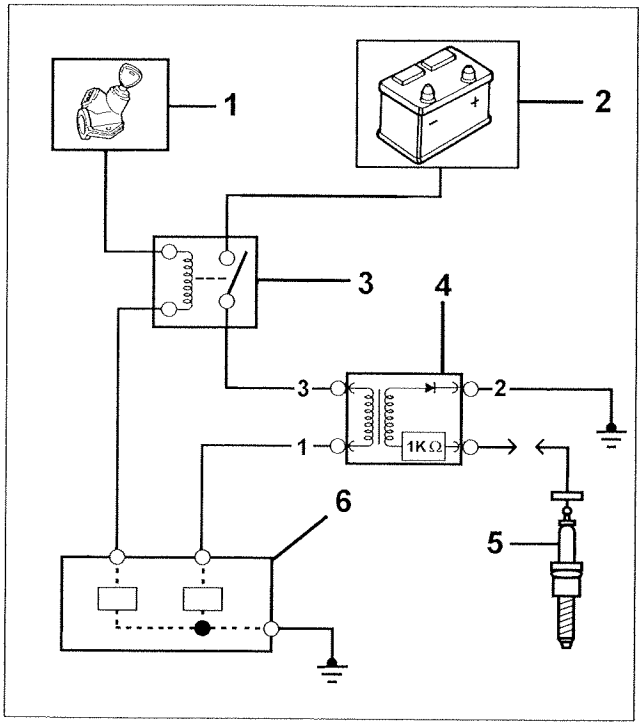
24. Accelerator pedal potentiometer 1 earth
25. Accelerator pedal potentiometer 2 earth and air flow meter
26. Brake pedal switch for cruise control
27. Brake pedal switch
28. Gear change signal (automatic transmission)
29. Not connected
30. Electric fuel pump relay
31. Fuel system relay go ahead
32. Supply from relay
33. Coolant temperature (automatic transmission)
34. Not connected
35. Rev counter signal
36. Not connected
37. Not connected
38. Not connected
39. Not connected
40. Accelerator pedal potentiometer 2 signal
41. Request to engage radiator fan high speed
42. Cruise control
43. Cruise control
44. Vehicle speed signal (from ABS)
45. Not connected
46. Injection system failure
47. Supply from ignition switch
48. Supply from relay
49. Not connected
50. Go ahead to engage radiator fan low speed
51. Not connected
52. Not connected
53. Diagnostic socket, line K
54. Intake air temperature signal
55. Not connected
56. Accelerator pedal potentiometer 1 supply
57. Intake air quantity signal
58. Cruise control
59. Clutch pedal switch
60. Not connected
61. Not connected
62. Go ahead to engage radiator fan high speed
63. Reference voltage for flow meter
64. Not connected

CONNECTOR M

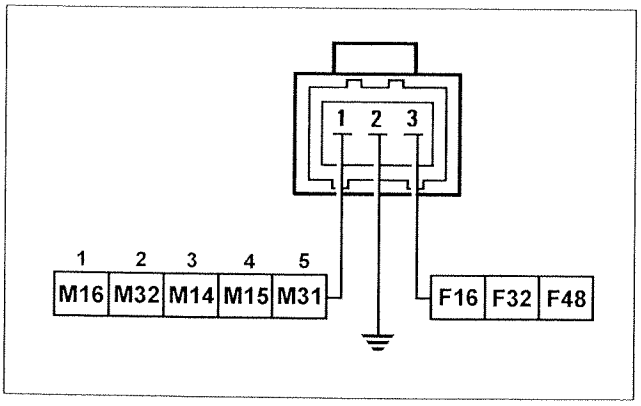
24. Butterfly casing potentiometer 1 signal
25. Coolant temperature
26. Reference earth for butterfly casing potentiometers 1 and 2, coolant temperature sensor and timing sensor
27. Not connected
28. Not connected
29. Not connected
30. Not connected
31. Ignition coil for cylinder 5
32. Ignition coil for cylinder 2
33. Butterfly casing motor (-)
34. Earth for Lambda sensor
35. Injector for cylinder 2
36. Timing variator solenoid valve
37. Not connected
38. Detonation sensor 2 signal
39. Not connected
40. Buttefly casing potentiometer 2 signal
41. Not connected
42. Timing sensor signal
43. Not connected
44. Not connected
45. Not connected
46. Not connected
47. Not connected
48. Not connected
49. Butterfly casing motor (+)
50. Not connected
51. Reference voltage for timing sensor
52. Injector for cylinder 5
53. Not connected
54. Reference earth for detonation sensor 1
55. Reference earth for Lambda sensor
56. Not connected
57. Not connected
58. Supply for butterfly casing potentiometers 1 and 2
59. Engine rpm sensor
60. Not connected
61. Not connected
62. Not connected
63. Not connected
64. Not connected



P3U20GX01



P3U20GX02



P3U20GX03

IGNITION COILS (0.221.504.014)

The ignition is the static advance electronic type with one coil for each spark plug (SINGLE COIL); this solution eliminates the high tension circuit, improving reliability and safety and reducing the risk of interference due to high tension leads and connections.

It involves a normal coil which increases the tension of the impulse sent to the spark plugs: each individual coil, located on the cylinder head, supplies a spark plug directly without intermediary cables.

Checking coil primary winding circuit resistance

The resistance is checked by connecting an ohmmeter to the outside pins (1 and 3) of the connector:

Primary resistance: 0.73 ohm

Electrical specifications

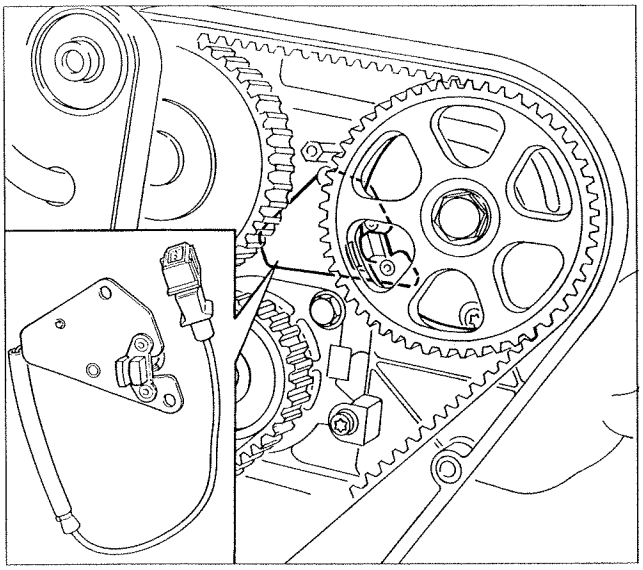
Primary winding inductance..... 2,5 mH
Primary winding resistance..... 0,73 Ω
Anti-interference resistance ..... 1 KΩ

Electrical connections wiring diagram

1. Supply through ignition switch
2. Supply through battery
3. Relay
4. Single coil
5. Spark plug
6. Electronic control unit

Wiring connector

The numbers in the boxes, connected to pin 1, indicate the corresponding control unit pins arranged in the order of the cylinder numbers.

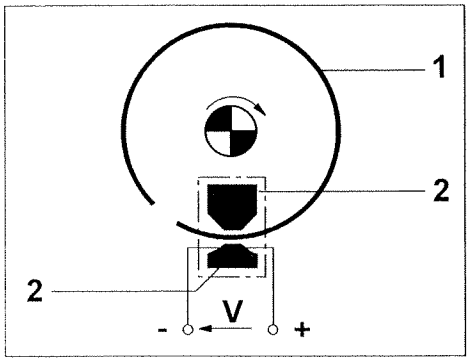


P3U21GX01

TIMING SENSOR (0.232.101.026)

The Bosch Motronic ME 3.1 system is a sequential, phased type, i.e. the injection of the fuel takes place in sequence for each cylinder during the inlet stroke.
To achieve this, in addition to the rpm and TDC signal, the electronic control unit also uses a timing signal to determine the point of injection.
The signal sent to the control unit is produced by a Hall effect sensor fitted by the exhaust side camshaft drive pulley.

Operating principle



P3U21GX02

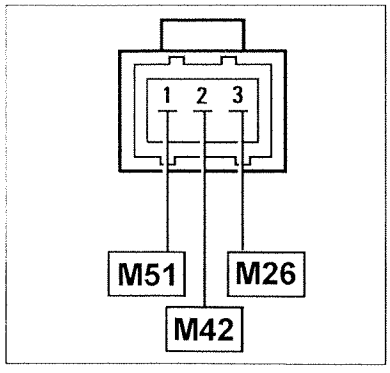
1. Deflector (pulley seal)
2. Magnetic material

A semi-conductor layer, through which the current passes, immersed in a normal magnetic field (lines of force perpendicular to the direction of the current) produces a difference in power, known as "HALL" voltage.
If the intensity of the current remains constant, the voltage produced only depends on the intensity of the magnetic field; it is sufficient therefore to simply alter the intensity of the magnetic field periodically to produce a modulated electrical signal whose frequency is proportional to the speed at which the magnetic field changes.
To achieve this change a metal ring (internal part of the pulley) with an opening is made to pass through the sensor. As it moves the metal part of the ring covers the sensor blocking the magnetic field with a resulting low output signal; conversely, corresponding to the opening and the magnetic field, the sensor produces a high signal.

As a result the high signal alternates with the low signal once every two engine revolutions, namely when cylinder N°1 is 78° before TDC.
This signal, together with the rpm and TDC signal, allows the control unit to recognize the cylinders and determine the point of injection. For each engine revolution the control unit checks that there is a timing signal; if this signal is missing for two consecutive revolutions, the control unit signals the failure (warning light in the instrument panel comes on) and does not allow the engine to be started up.

Wiring connector

The numbers indicate the corresponding control unit pins



P3U21GX03

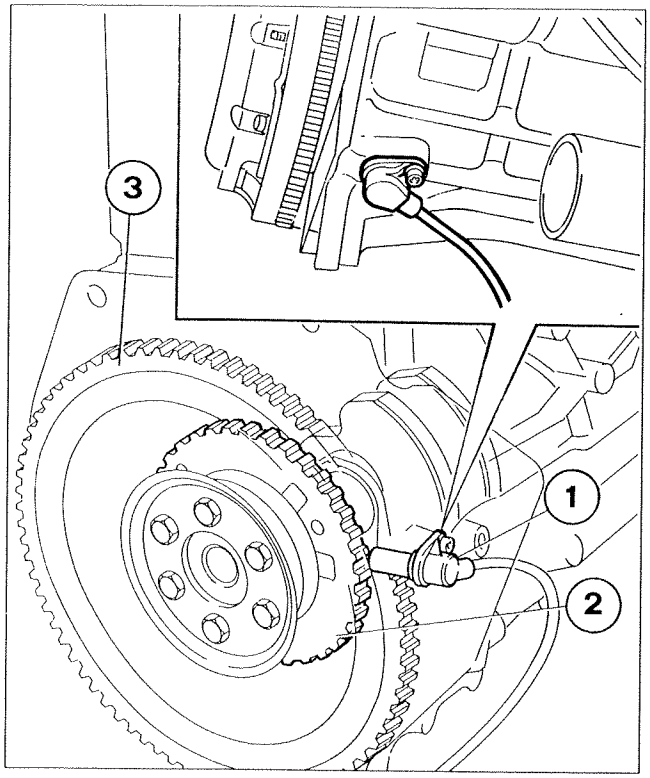
Removing-refitting

This operation involves the removal of the toothed belt from the camshaft and the exhaust side camshaft toothed pulley.

Once these operations have been carried out, it is necessary to:
- disconnect the electrical connector;
- undo the fixing bolts and remove the sensor.

When refitting, carry out the procedure in the reverse order, following the instructions for refitting and tensioning the toothed belt.

NOTE *The sensor does not require any sort of adjustment.*



P3U22GX01

1. Rpm sensor
2. Toothed pulley
3. Engine flywheel

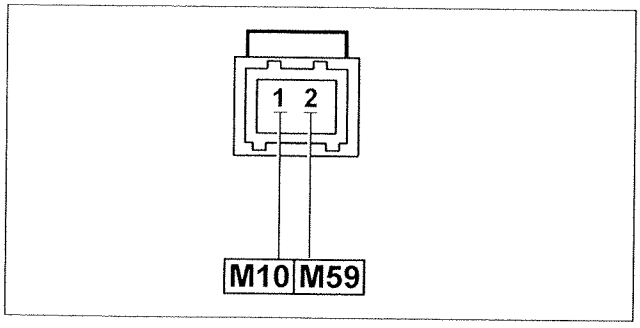
RPM AND TDC SENSOR (0.261.210.160)

This sensor which measures the rpm and TDC is the inductive type, in other words it operates by varying the magnetic field produced when the teeth on a toothed pulley (flywheel) located inside the cylinder block-/crankcase and fixed to the crankshaft rear counter-weight pass by. In this way the sensor is fixed to the cylinder block/crankcase and the gap and the angular position no longer need to be checked and adjusted.

The teeth which pass in front of the sensor alter the gap between the pulley and the sensor; the flow, which varies as a result, produces an alternating voltage whose frequency depends on the number of revs.

The flywheel consists of 58 teeth plus a space equivalent to the two missing teeth.

The reference defined by the space of the two missing teeth constitutes the basis for measuring the point of synchronism (TDC).



P3U22GX02

Removing-refitting

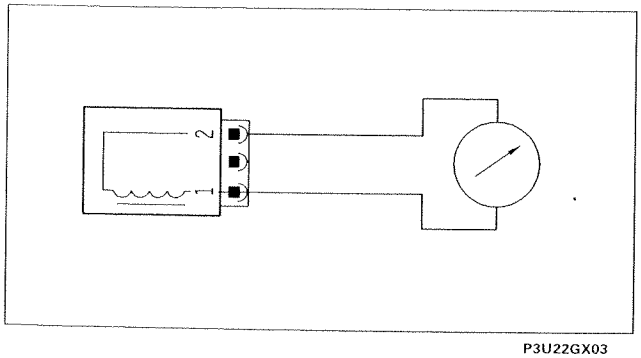
Position the vehicle on a lift then, working from the lower part of the vehicle.

- Disconnect the electrical connector;
- undo the bolt fixing the sensor and remove it from its housing.

Wiring connector

The sensor is connected to the electronic control unit (pins M10 and M59) by means of twisted cables covered by an anti-interference outer casing.

NOTE *The numbers indicate the corresponding control unit pins*

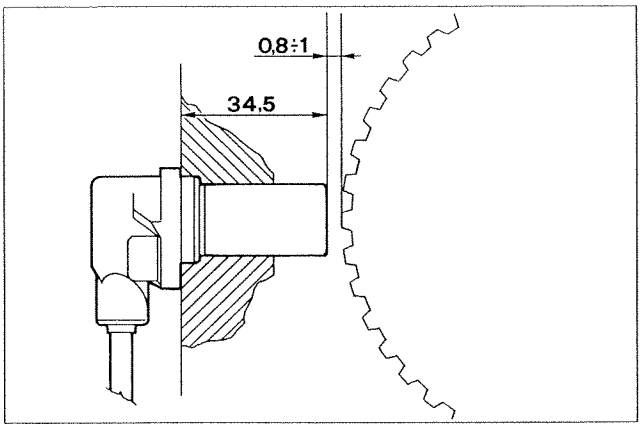


P3U22GX03

Checking the resistance

The sensor resistance can be measured by disconnecting the connector and connecting an ohmmeter to the sensor.

Resistance: 774-946 ohm at 20°C



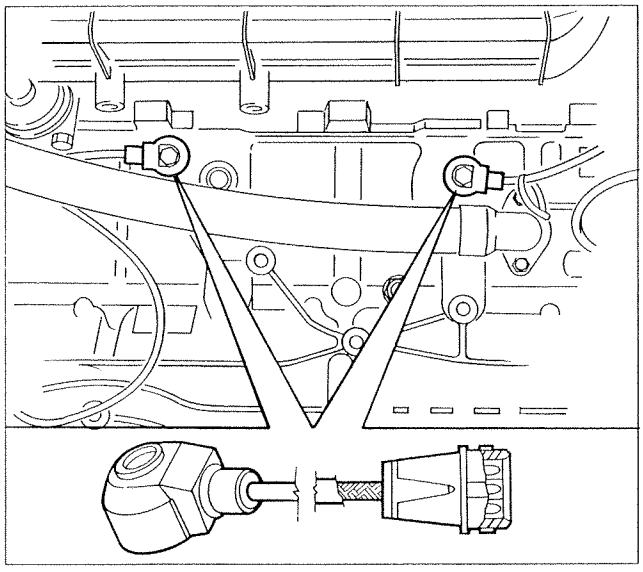
P3U23GX01

When measuring the distance, it is necessary to be at right angles with the flywheel and by a tooth and not a gap.

Checking the gap

The rpm and TDC sensor is fixed directly to the cylinder block/crankcase and therefore the gap and the angular position no longer need to be adjusted. If a fault is suspected, the gap can be checked, proceeding as follows:

- remove the rpm and TDC sensor;
- check that the distance between the surface of the sensor and the flywheel tooth corresponds to the sum of the length of the sensor (34.5 mm) and the gap (0.8 - 1.5 mm).



P3U23GX02

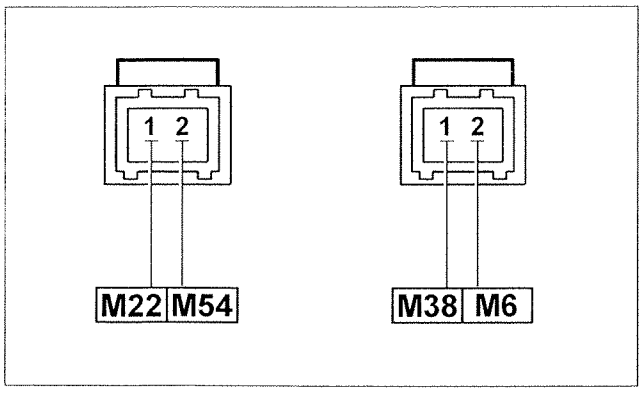
DETONATION SENSORS (0.261.231.095)

The detonation sensors are located in the monoblock under the inlet manifolds between cylinders 1-2 and 4-5, respectively.

These sensors have a bush to prevent inappropriate torque tightening. **If they are replaced, do not place shims or washers between the cylinder block/crankcase and sensor contact surfaces.**

When the engine is knocking (detonation), vibrations of a certain frequency are produced in the cylinder block/crankcase.

This phenomenon creates mechanical repercussions on a piezoelectric crystal which sends a signal to the control which, on the strength of this signal, reduces the ignition advance (from 3° up to a maximum of 9.7°) until the phenomenon disappears. Later, the advance is gradually restored to the basic value.

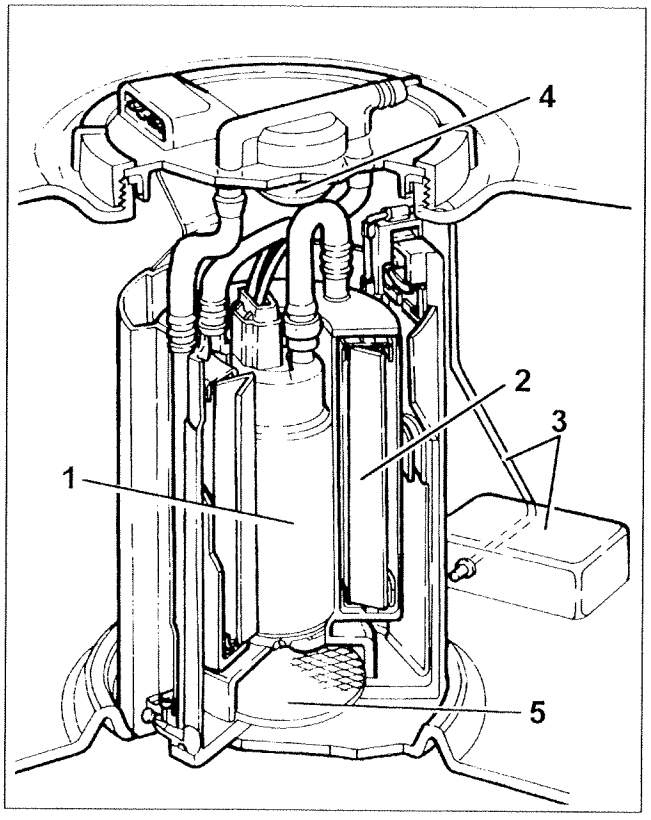


P3U23GX03

Wiring connector

The sensors are connected to the electronic control unit (Pins M22/M54 and M38/M6) by means of twisted cables covered by an anti-interference outer casing.

NOTE *the numbers in the boxes indicate the corresponding control unit pins.*



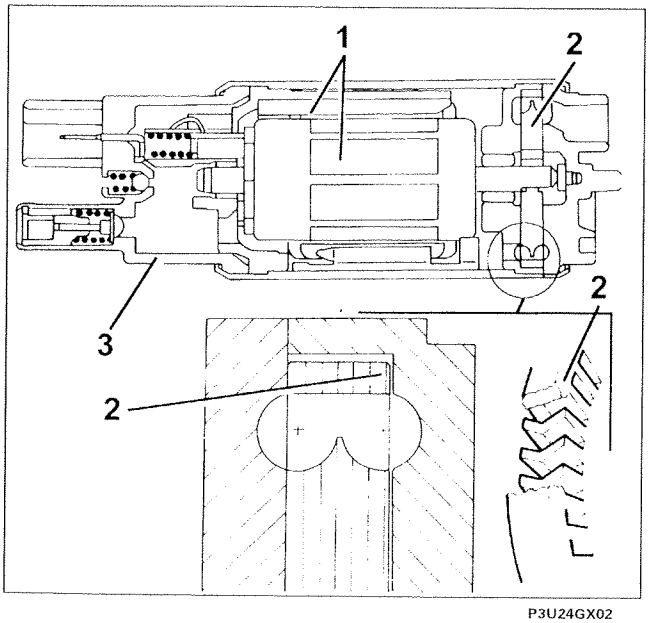
P3U24GX01

ELECTRIC FUEL PUMP (0.580.313.011)

The electric fuel pump is located inside the fuel tank housed in a casing which also incorporates:

- the fuel pressure regulator;
- the fuel gauge;
- the fuel filter.

1. electric fuel pump;
2. fuel filter;
3. level gauge with float;
4. diaphragm pressure regulator;
5. gauze pre-filter;



P3U24GX02

The electric fuel pump has a permanent magnet electric motor (1) which drives the pump (2) impeller and a support cover (3) which contains the electrical and hydraulic connections.
The electric pump is the single stage peripheral flow type giving high performance in low voltage and temperature conditions.
The advantages compared with electric pumps which operate on the volumetric principle are as follows:
- lighter;
- smaller

FUEL SUPPLY MANIFOLD

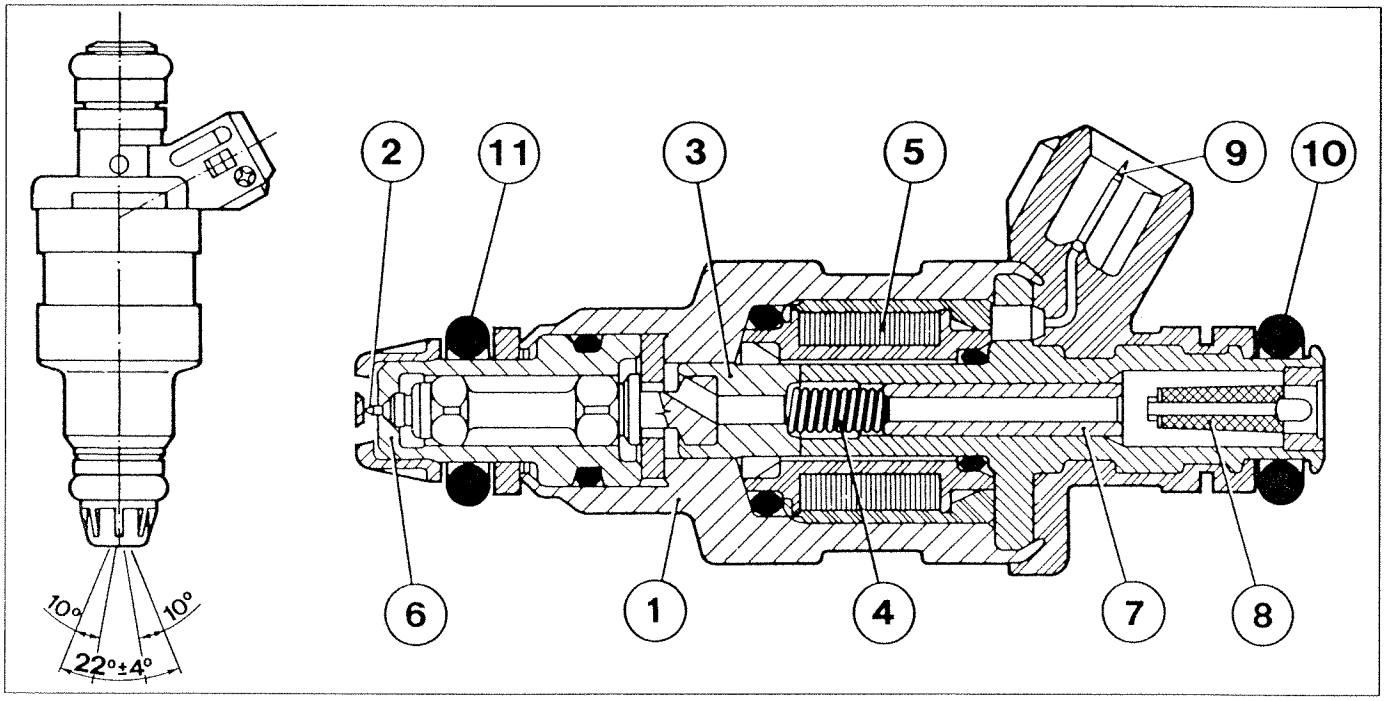
The fuel manifold is fixed to the inside of the inlet manifold and its task is to send the fuel to the injectors.
The fuel manifold is produced by aluminium die-casting and incorporates the seats for the injectors.
The fuel intake takes place through the fixing of a conical seal bolt.

INJECTORS (0.280.155.770)

The twin jet type injectors are fitted on the inlet manifolds, immediately before the inlet valves.
These injectors are specific for engines with 4 valves per cylinder, making it possible to direct the jets towards the two inlet valves.

The jets of fuel which come out of the injectors at a pressure of 3 bar are instantly atomized forming two cones of about 10° each.

The operation of the injectors is the «sequential phased» type, i.e. the five injectors are operated in accordance with the engine cylinder intake sequence, whilst the supply can already start for each cylinder during the expansion stroke up to when the inlet stroke has already begun.
The injectors are fixed by the fuel manifold which presses them into their housings in the inlet manifolds. In addition, they are secured to the fuel manifold by means of «safety clips». Two rubber seals (10) and (11) ensure the seal on the inlet manifold and the fuel manifold.

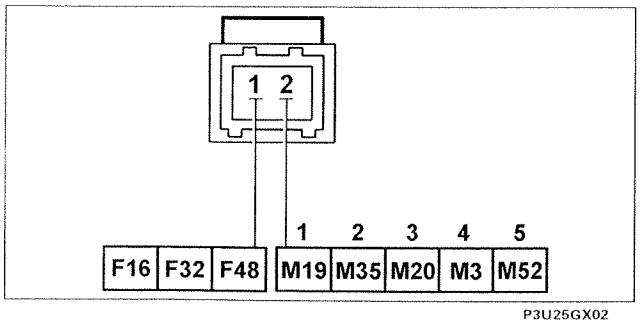


P3U25GX01

1. Injector body
2. Needle
3. Magnetic core
4. Coil spring
5. Winding
6. Injector nose
7. Adjustable spring
8. Fuel filter
9. Electrical connection socket
10. Fuel seal
11. Vacuum seal

Wiring connector

NOTE *The numbers indicate the corresponding control unit pins arranged in the order of the cylinder numbers.*

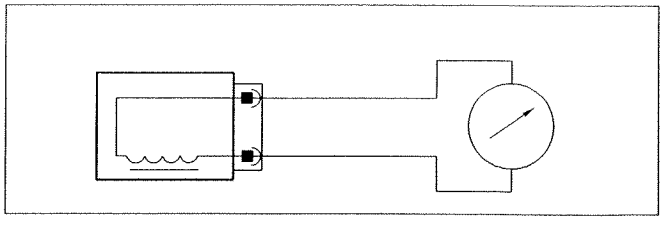


P3U25GX02

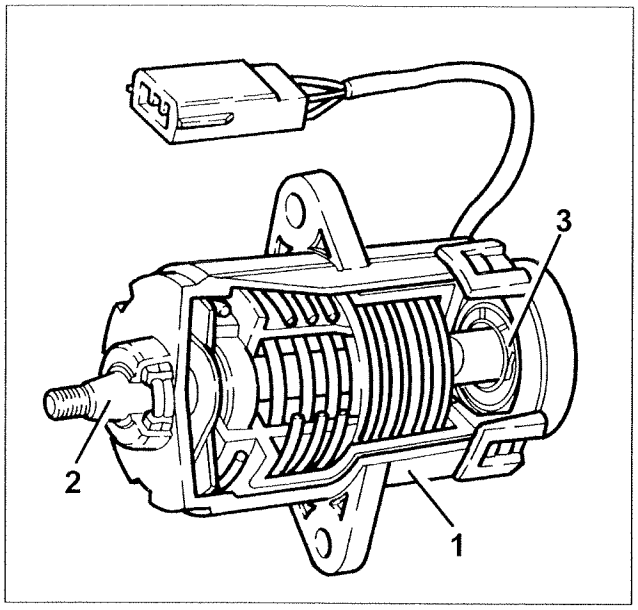
Checking the resistance

The injector resistance can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

Resistance value 16.2 ohm



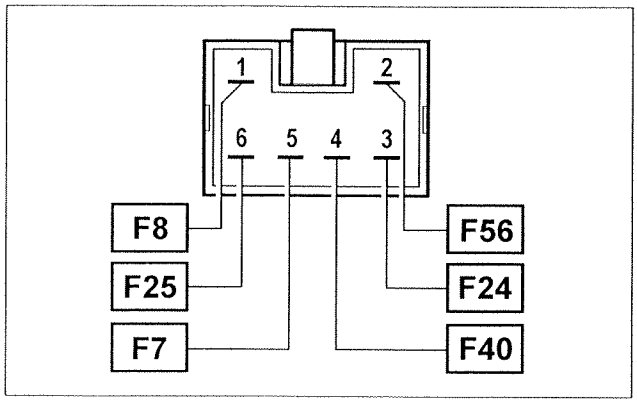
P3U25GX03



P3U26GX01

ACCELERATOR PEDAL POTENTIOMETER

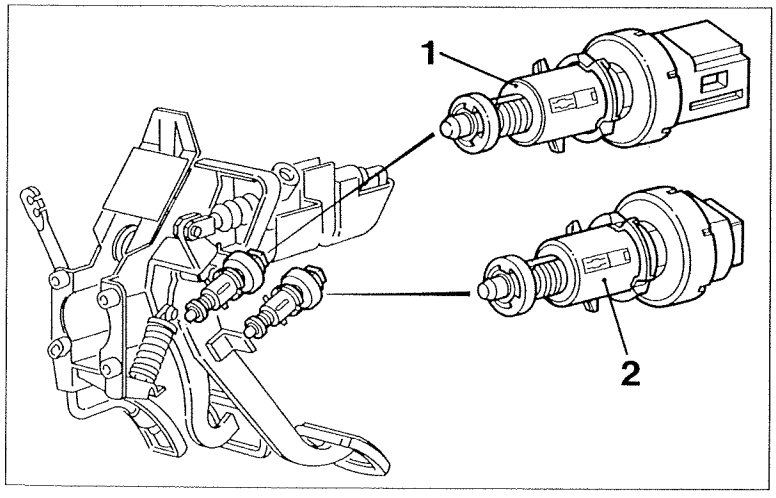
The position of the accelerator pedal is transformed into an electrical voltage signal and is sent to the injection control unit from the potentiometer connected to the pedal.
The accelerator pedal position signal is then processed, together with the information relating to the number of revs, in order to determine the injection timing and pressure.
The sensor consists of a casing (1) fixed to the pedals assembly by means of a flange, which contains a shaft (2), in an axial position, connected to the two potentiometers (3): one main one and one safety one.
There is one coil spring on the shaft which guarantees the correct resistance to pressure, whilst a second spring ensures the return.



P3U26GX02

WIRING CONNECTOR

The numbers indicate the corresponding control unit pins



P3U26GX03

BRAKE PEDAL SWITCH

There is a switch (1) on brake pedal which operates the brake lights; this switch also sends a signal to pin F27 of the injection control unit.

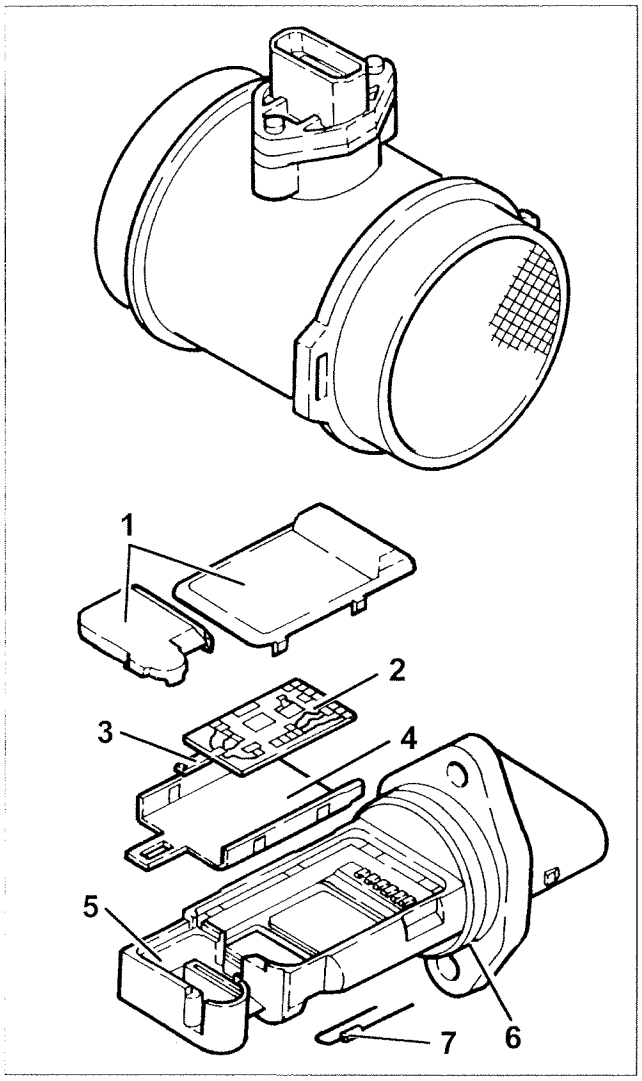
The "brake pedal pressed" signal is used by the control unit to:

- understand that there is a deceleration situation;
- check the plausibility of the signal coming from the accelerator potentiometer.

CLUTCH PEDAL SWITCH

There is a switch (2) on the clutch pedal connected to pin F59 of the injection control unit.

The "clutch pedal operated" signal is used by the injection control unit to distinguish between gear engaged and gear change conditions.



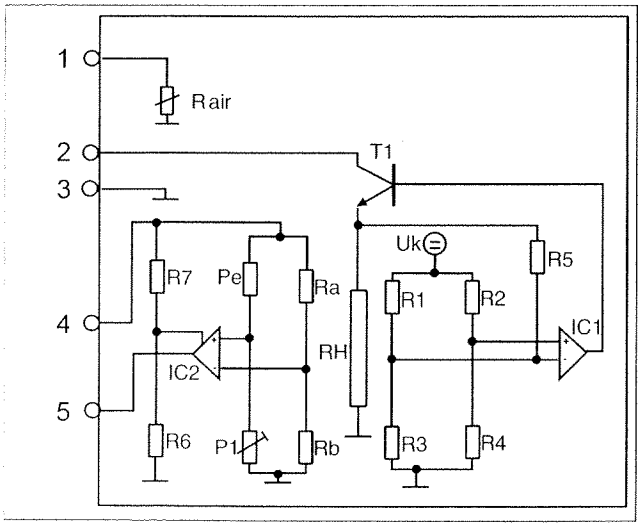
P3U27GX01

AIR FLOW METER (0.281.002.199)

The flow meter is on the air inlet hose and is the hot film type.
The flow meter contains the intake air temperature sensor.
The operation is based on a heated diaphragm located in a measuring duct through which the intake air entering the engine flows.
The hot film diaphragm is kept at a constant temperature (about 120 °C above the temperature of the intake air) by the heating resistance.
The mass of air passing through the measuring duct tends to remove heat from the diaphragm therefore, in order to keep the latter at a constant temperature, a certain current must pass through the resistance.
This current, being proportional to the mass of air flowing to the engine, is measured by a suitable Wheatstone bridge and the signal obtained is sent to the injection control unit.

1. Covers
2. Electronic card
3. Sensor
4. Support plate
5. Support
6. Seal (O-Ring)
7. Temperature sensor

NOTA *Questo debimetro misura direttamente la massa d'aria (e non il volume) eliminando così i problemi di temperatura, altitudine, pressione ecc.*

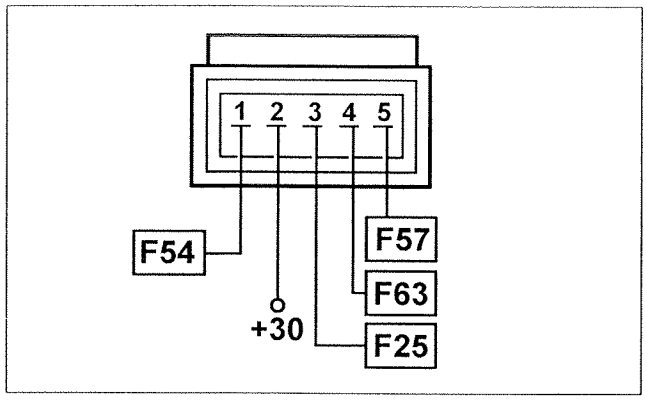


P3U27GX02

1. Air temperature signal
2. Battery voltage
3. Earth
4. Reference voltage (5V)
5. Air flow rate signal

Descrizione del funzionamento

The Wheatstone bridge (made of resistors R1,R2,R3,R4) is balanced when R3 is about 120 °C higher than the temperature of the air.
The air that passes through the diaphragm removes heat from R3, therefore the bridge is unbalanced.
This situation is detected by the circuit at IC1 which operates the transistor T1, in a manner proportional to the bridge imbalance and the transistor causes more current to pass through Rh to heat R3 and restore the equilibrium of the bridge.
Circuit IC2 measures the current passing through Rh.
This current makes it possible to maintain the equilibrium of the bridge and is therefore proportional to the mass of air passing through the air flow meter.

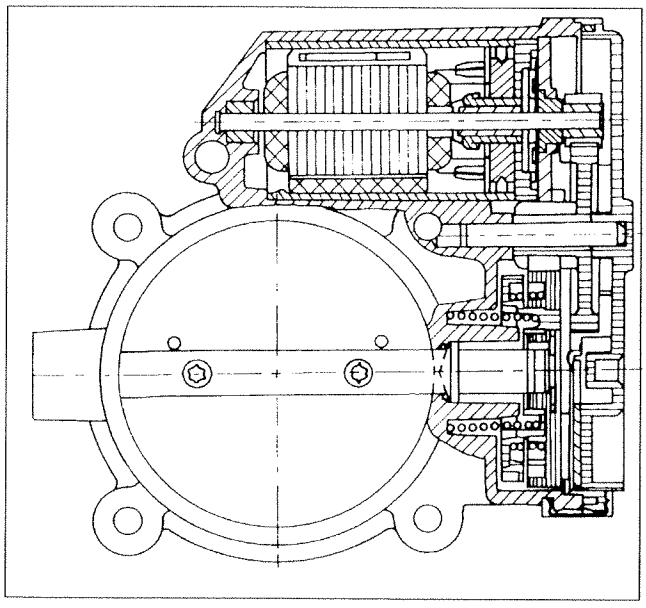


P3U28GX01

Wiring connector

The numbers indicate the corresponding control unit pins.

BUTTERFLY CASING ACTUATOR



P3U28GX02

The actuator is fixed to the inlet chamber and regulates the quantity of air drawn in by the engine.

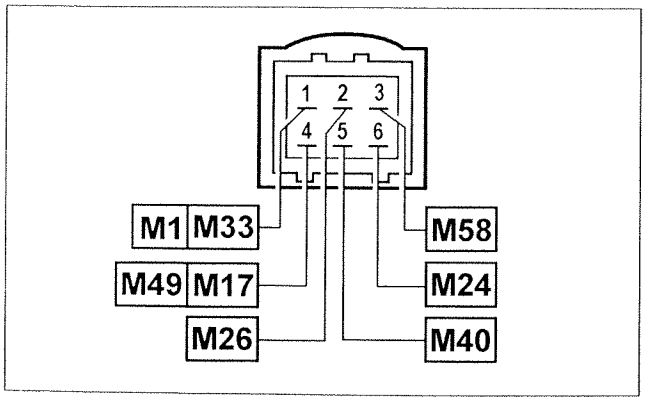
Depending on the signal coming from the accelerator pedal potentiometer, the injection control unit controls the opening of the butterfly through a direct current motor integrated in the butterfly casing actuator.

The butterfly casing actuator is equipped with two integrated potentiometers connected in parallel so that one controls the other and viceversa.

If there is a fault with the two potentiometers or there is no supply, the control unit reduces the engine torque, according to the position of the accelerator pedal.

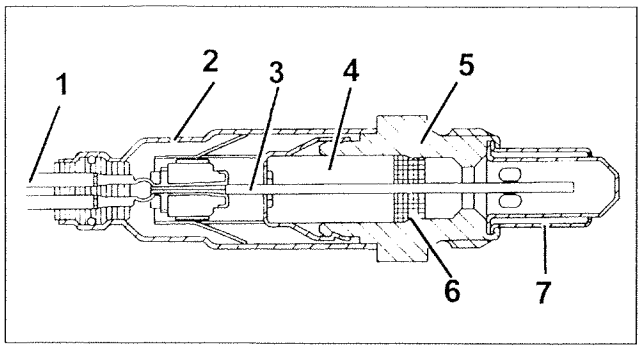
If the butterfly casing actuator or the injection control unit is replaced, the following "self-learning" procedure must be carried out:

- Place the ignition key in the ON position and keep it in this position for 30 secs.
- Turn the ignition key to the OFF position for 5 secs.
- Return the key to the ON position and start up the engine.



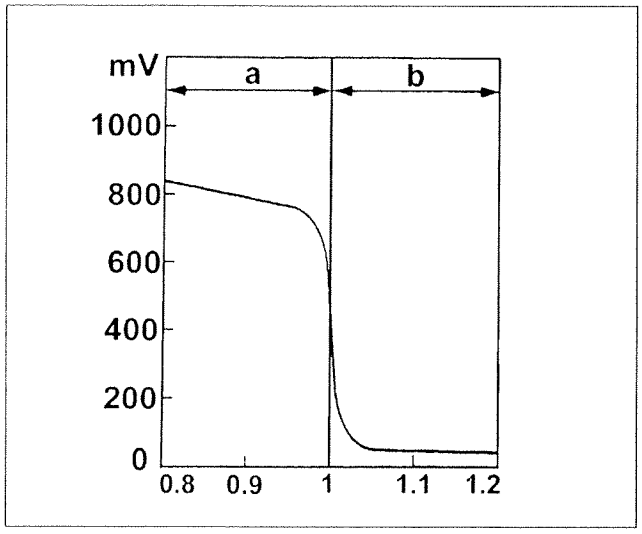
Wiring connector

The numbers indicate the corresponding control unit pins.



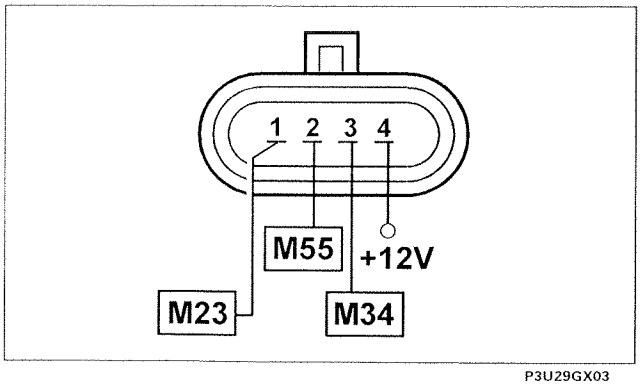
P3U29GX01

1. Connecting cable
2. Protective sleeve
3. Sensor element
4. Ceramic support pipe
5. Sensor housing
6. Ceramic seal
7. Protective pipe



P3U29GX02

a. Rich mixture (shortage of air)
b. Lean mixture (excess air)



P3U29GX03

LAMBDA SENSOR

The Lambda sensor is the "planar" type, fitted on the front section of exhaust pipe and informs the injection control unit of the progress of the combustion (stoichiometric ratio).
To obtain an optimum mixture the quantity of air drawn in by the engine must be equal to the theoretical amount required to burn the entire amount of fuel injected.
In this case the Lambda factor (l) ratio between the quantity of intake air and the quantity of theoretical air (required to burn all the fuel injected) is equal to 1.

Therefore:
$\lambda=1$ ideal mixture
$\lambda>1$ lean mixture
$\lambda<1$ rich mixture

The Lambda sensor, in contact with the exhaust gases, produces an electrical signal, whose voltage value depends on the concentration of oxygen present in the actual gases.

This voltage varies sharply when the composition of the mixture shifts away from the value $\xi\gamma\alpha$

The heating of the Lambda sensor is managed by the injection control unit in a manner proportional to the temperature of the exhaust gases.

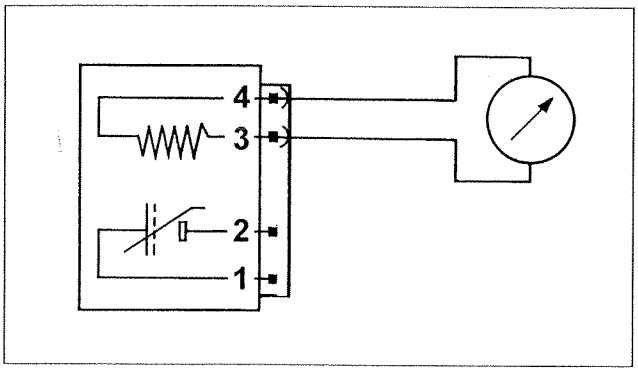
This avoids thermal shocks to the ceramic casing due to the contact of the condensation water present in the exhaust gases when the engine is cold.

The measuring cell and the heater are integrated in the "planar" (stratified) ceramic element with the advantage that the cell heats up rapidly allowing a closed-loop check within a few seconds of the engine being started up.

Wiring connector

The numbers indicate the corresponding control unit pins.

The Lambda sensor can be rapidly put out of action by the presence of even slight amounts of lead in the fuel.



P3U30GX01

Check on resistance

The resistance of the heater and the sensor can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

Resistance = 500-1000 ohm at 20°C

PHASE TRANSFORMER

In order to achieve a good compromise between high performance in terms of power at high speeds and good torque at low speeds, a phase transformer (electronically controlled and hydraulically operated) has been adopted for the inlet camshaft.

This device makes it possible to vary the timing diagram (inlet stroke) according to the engine load conditions; this parameter is processed by the MOTRONIC control unit on the basis of the electrical signals received by the air flow meter and the rpm sensor and is sent as a command to the phase transformer solenoid.

The construction of the device involves a main assembly on the inlet camshaft which is designed to alter the angular position of the shaft in relation to the drive pulley.

There is also a valve, operated by a solenoid, both of which are found on the inlet manifold and are hydraulically connected to the main assembly by means of suitable ducts.

The operating principle is as follows:

- with the temperature of the coolant below 40 °C and when the engine is idling or the speed exceeds 4800 rpm, the solenoid (1) is de-energized, therefore the valve body (2), thrust by the opposing spring (3), remains raised not allowing the oil, arriving from the duct (A), to reach the transformer. In this case, the inlet valve timing remains unaltered.
  With the coolant temperature above 40 °C and the engine speed above idling and below 4800 rpm with the butterfly angle greater than about 8°, the solenoid (1) is energized, thereby pushing the valve body (2) downwards. In this position the oil, coming from the duct (A), enters the piston chamber (B) and from there, via a special port, reaches duct (C) inside the latter.

The oil can only flow out of the above mentioned duct through the upper port (in contact with duct (D) supplying oil to the transformer because, as the valve body (2) is lowered, the lower port is not in contact with the drainage duct (E).

The oil reaches chamber (G), through ducts (D) and (F), moving the piston (4) axially towards the engine; as this piston has helical teeth on the outside, as a result of this axial movement, it is forced to rotate in a clockwise direction (as seen from the timing side).

Its rotation is transmitted, by means of a straight toothed splined profile, to the pinion (5) which, bolted onto the threaded end of the camshaft (6), transmits the rotation to the shaft, thereby altering the inlet valve timing by an advance of 9°.

When the solenoid is de-energized, the valve body (2) returns to the original position, interrupting the flow of oil under pressure to the chamber (G), but allowing the return of the oil to the drainage, thanks to the thrust of the opposing spring (7).

An additional duct guarantees the lubrication of the camshaft bearing even when the device is not activated.

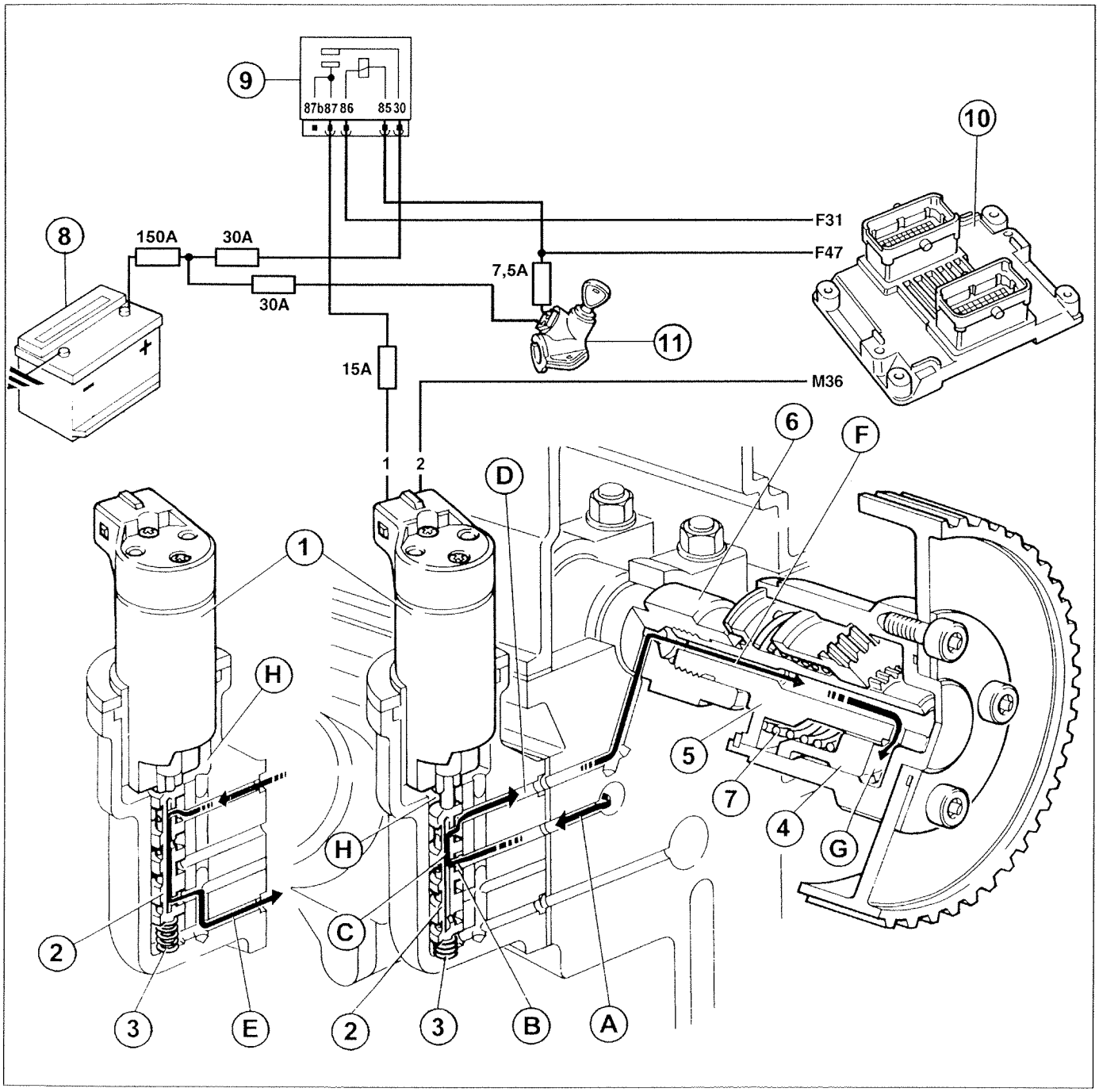
The oil which reaches chamber (H) of the solenoid as a result of seepage, is discharged via the drainage duct (E).

Recovery

If the solenoid valve is faulty, the control unit final stage (driver) is deactivated.

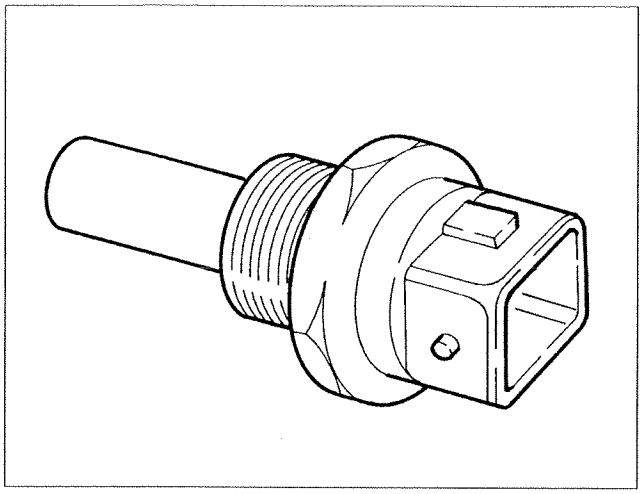
10.

Phase transformer operating diagram

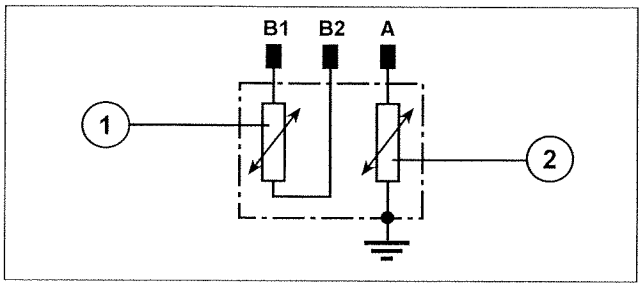


P3U32GX01

1. Solenoid valve
2. Valve body
3. Valve body spring
4. Piston
5. Pinion
6. Camshaft element
7. Piston spring
8. Battery
9. Injection/ignition system relay
10. Injection/ignition control unit
11. Ignition switch



P3U33GX01



P3U33GX02

COOLANT TEMPERATURE SENSOR

This sensor is fitted on the themostat casing; it consists of a brass casing which affords protection for the actual resistive elements comprising two NTC (Negative Temperature Coefficient) thermistors, whose electrical resistance decreases as the temperature increases.

The two NTC sensors are distinct and provide information concerning the temperature for the special indicator in the instrument panel and for the injection/ignition control unit.
The reference voltage for the NTC element for the injection system is 5 Volt; since the control unit inlet circuit is designed as a voltage divider, this voltage is shared between a resistance in the control unit and NTC resistance for the sensor. As a result, the control unit is capable of making evaluations through the changes in voltage and thereby gaining information concerning the temperature.

1. NTC for injection system
2. NTC for indicator in the instrument panel

Recovery

The last value measured is used or, if the temperature of the intake air is above a certain value, then the fixed value of 80 °C is used.
The self-adjustment of the mixture strength is inhibited.
The radiator fan is activated.
The self-adjustment of the idle is inhibited.

INJECTION NTC

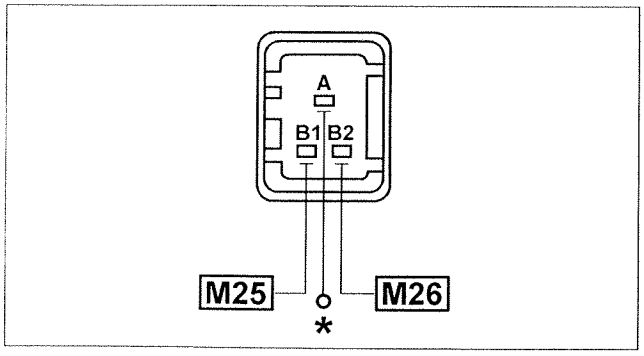
°C	Ω	°C	Ω
-20	15970	40	1150
-10	9620	50	807
0	5975	60	576
10	3816	70	418
20	2500	80	309
25	2044	90	231
30	1679	100	176

NTC STRUMENTO

°C	Ω
60	512÷602
90	184÷208
120	76÷88

Wiring connector

The numbers indicate the respective control unit pins.



P3U33GX03

* Connection to the coolant temperature gauge in the instrument panel.

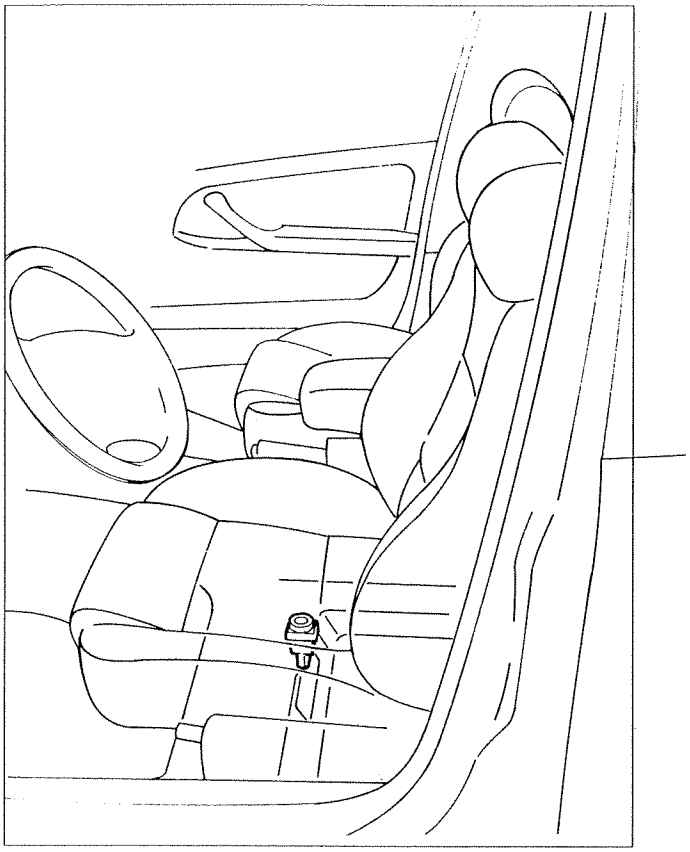
Checking the resistance

The table at the side contains the resistance values which the NTC elements can assume according to the temperature. These figures can be measured by disconnecting the connector and connecting an ohmmeter to the sensor pins.

Removing-refitting

Disconnect the electrical connection and remove the sensor.

Tightening torque 2.2 da Nm.

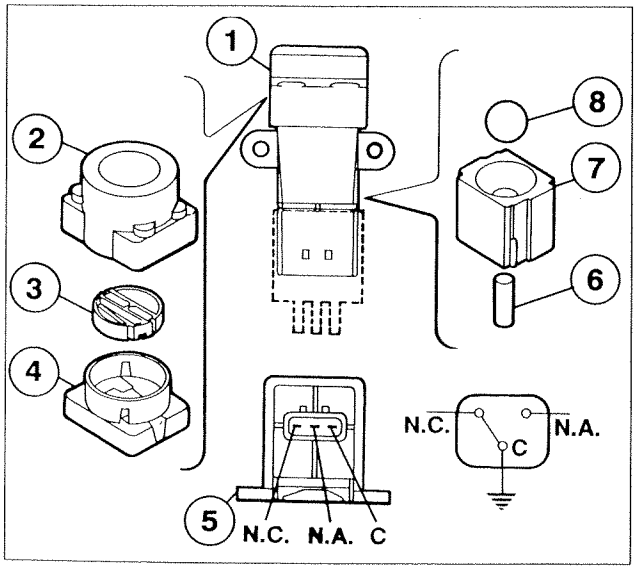


P3U34FX02

INERTIA SAFETY SWITCH

In order to improve the safety of the occupants of the vehicle in the case of impacts the vehicle is equipped with an inertia switch located inside the passenger compartment, under the driver's seat on the right hand side.
This sensor reduces the risk of fire (as a result of fuel escaping) by de-activating the electric pump supplying the injection circuit.
The inertia switch consists of a steel ball in a (conical shaped) housing which is kept in place by the attraction force of a permanent magnet.
If the vehicle is invovled in a violent crash, the ball is released from the magnetic clip and opens the normally closed (NC) electrical circuit, interrupting the connection to earth of the electric pump and consequently the supply to the injection system.
To restore the connection to earth for the electric pump, the seat has to be moved backwards and the switch pressed until a click is heard.

Even after an apparently slight impact, if there is a smell of fuel or leaks are noticed from the fuel system, do not turn the inertia switch back on, but first search for the cause of the problem and correct it to prevent the risk of fire.



P3U34GX01

Inertia switch components

1. Complete inertia sensor
2. Outer casing
3. Button
4. Upper side
5. Engagement side
6. Permanent magnet
7. Permanent magnet housing
8. Steel ball

C. Common terminal
N.C. Normally closed contact
N.A. Normally open contact

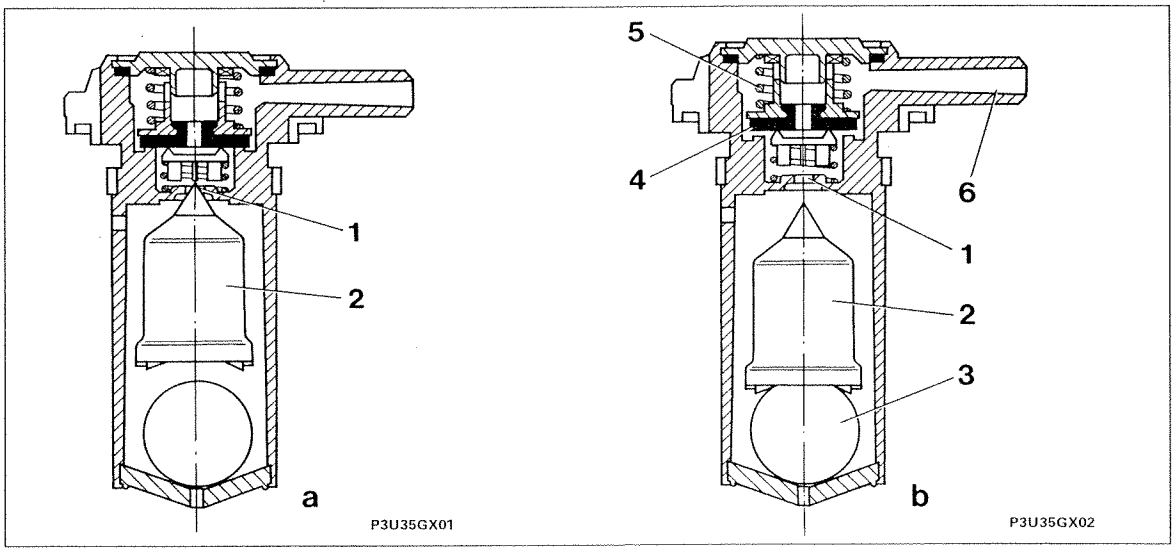
Multi-purpose valve

This valve is used to carry out different functions, namely:

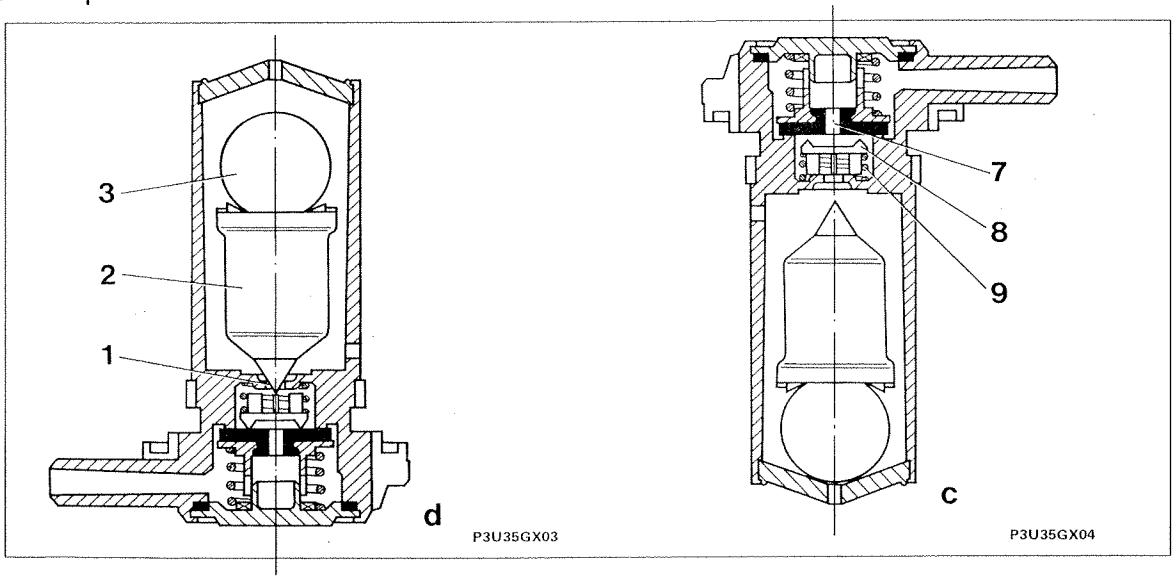
- to prevent the flow of liquid fuel if the tank is too full or in the case of an accident where the vehicle has overturned;
- to allow the breathing of petrol vapours to the active charcoal filter;
- to allow the ventilation of the tank if there is a vacuum inside it.

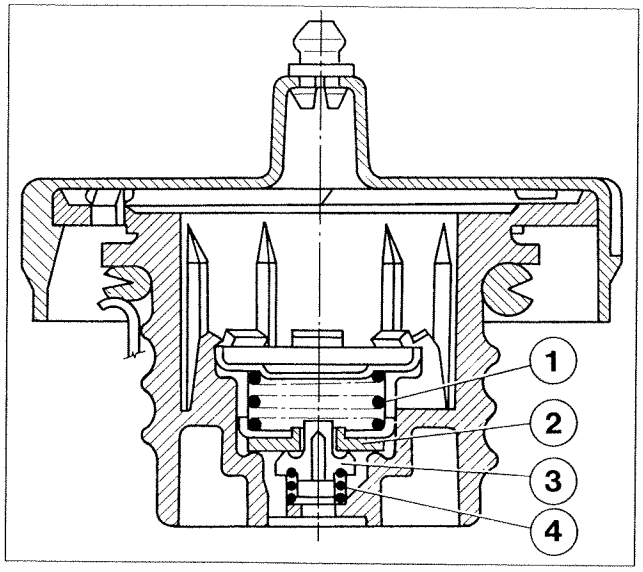
The valve consists of a float casing (2), a heavy ball (3), a plate (4) thrust against the valve body (5) and a shim (8) thrust against the plate (4) by a spring (9). The operation of the multi-purpose valve can be summarized in the following cases, depending on how full the fuel tank is:

a. if the tank is full, the float (2) shutters the port (1) preventing the liquid fuel from reaching the active charcoal filter preventing it from being damaged;
b. if the level of the fuel in the tank decreases, the float (2) moves down and rests on the ball (3) opening the port (1); when the pressure exerted by the petrol vapours on the plate (4) exceeds the spring (5) loading, a ring section opens between the actual plate and the valve body, which allows the petrol vapours to come out of the duct (6) and reach the active charcoal filter.

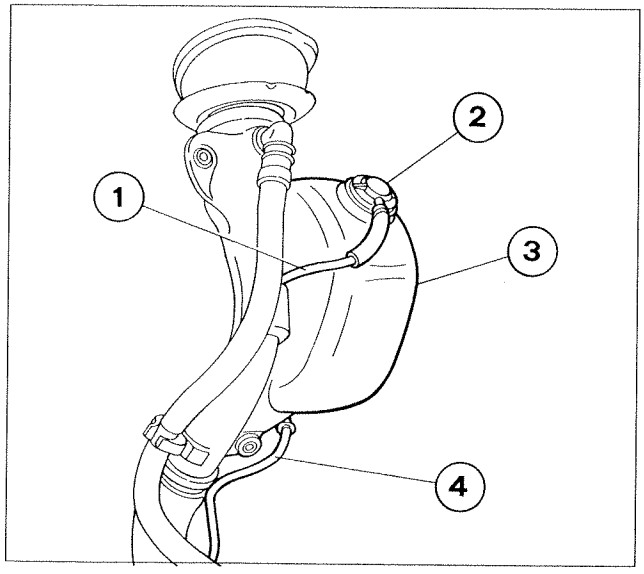


c. if the level of the fuel in the tank decreases to such an extent that a vacuum is created inside the tank, this acts on the shim (8) and, overcoming the spring (9) loading, recalls it downwards allowing the ventilation of the tank through the port (7);
d. if the vehicle overturns, irrespective of how full the tank is, the ball (3), weighing down on the float (2), pushes it against the port (1) preventing the dangerous flow of petrol to the inlet manifold and the consequent risk of fire.





P3U36GX01



P3U36GX02

1. Pipe connecting the fuel vapour separator to the active charcoal filter
2. Multi-purpose valve
3. Fuel vapour separator
4. Pipe connecting the vapour separator to the fuel tank

Safety and ventilation valve

This valve is located in the fuel filler cap and, depending on the pressure in tank, performs the following functions:

- discharging the excess pressure which forms inside the tank outwards (safety function); the pressure acts on the plate (2) and, overcoming the spring (1) loading, allows the excess vapours to be discharged outwards.
- allowing the flow of outside air into the tank when, as a result of fuel consumption, the vacuum which forms inside the tank is excessive (ventilation function). In this case, when the vacuum exceeds the spring (4) loading, it moves the valve (3) allowing the intake of air.

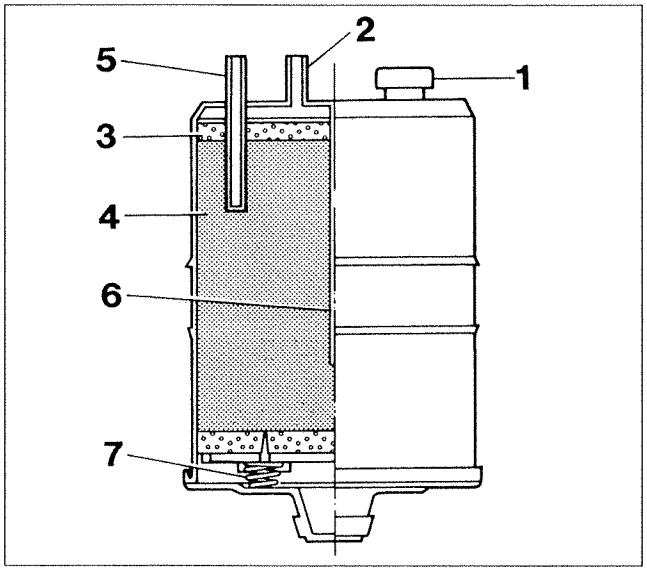
Fuel vapour separator (expansion tank)

The fuel vapours coming from the tank reach the vapour separator (3), located to the side of the fuel filler, through the pipe (4).

Some of the vapours condense and return to the tank via the same pipe (4), whilst the remaining vapours leave the separator through the multi-purpose valve (2) and are directed to the active charcoal filter via the pipe (1).

CHARCOAL FILTER AND FUEL VAPOUR CUT OUT SOLENOID VALVE

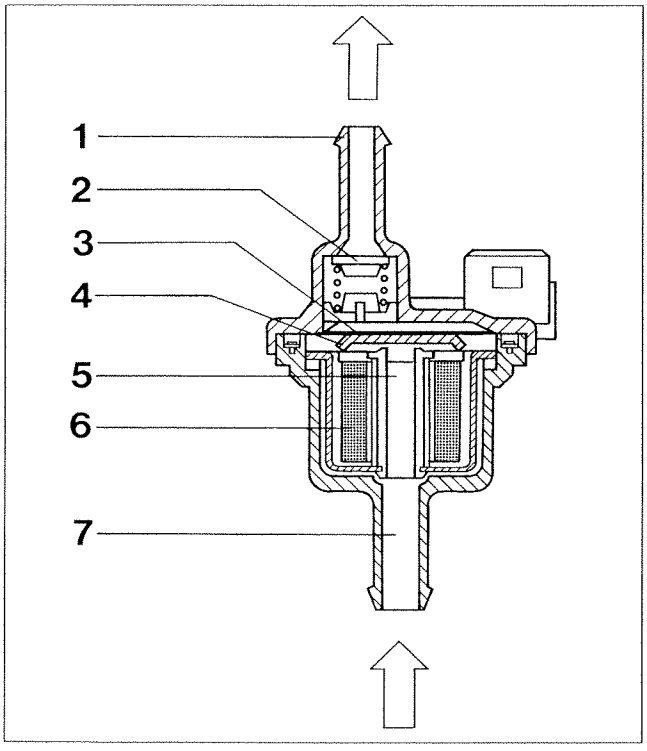
Questi componenti fanno parte del sistema antievaporazione e recupero vapori carburante. Il filtro a carboni è ubicato nel vano passaruota destro e per accedervi è necessario rimuovere la parte anteriore del rivestimento del vano passaruota anteriore destro.
L'elettrovalvola inetrcettatrice è posta nel vano motore sotto il collettore di aspirazione.



P3U37GX01

Filtro a carboni

È costituito da granuli di carbone (4) che trattengono i vapori di benzina che entrano dalla presa (5).
L'aria di lavaggio che entra dalla presa (1), attraverso il filtro di carta (3), lambisce i granuli di carbone asportando i vapori di benzina per convogliarli verso l'uscita (2) e da questa verso la valvola intercettatrice.
L'aria, entrata dalla presa (5), può anche essere richiamata dalla depressione nel serbatoio provvedendo alla ventilazione dello stesso. La divisione (6) assicura che l'aria di lavaggio aspirata lambisca tutti i granuli di carbone favorendo il rilascio dei vapori di benzina verso il collettore di aspirazione.
Sono inoltre presenti due molle (7) che consentono una dilatazione della massa dei granuli quando la pressione aumenta.



P3U37GX02

1. Inlet connector
2. One-way valve
3. Spring
4. Shutter
5. Outlet port
6. Solenoid valve
7. Outlet connector

Vapour cut out solenoid valve (0.280.142.340)

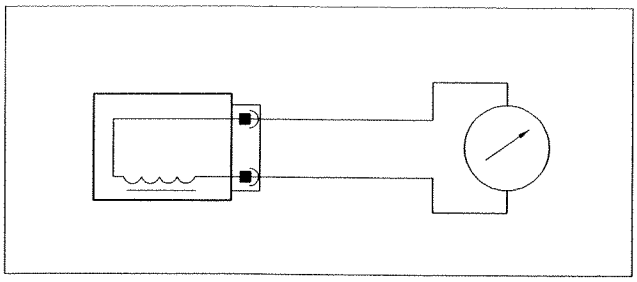
The function of this valve is to control the quantity of petrol vapours drawn in by the active charcoal filter and directed to the inlet manifold which is done by the electronic control unit.
If this valve is not supplied, it is in the open position; when the ignition is switched ON, it closes preparing for operation. In effect, if energized, the solenoid valve (6) attracts the shutter (4) which, overcoming the spring (3) loading, closes the port (5) preventing the flow of petrol vapours.

The operation is controlled from the electronic control unit in the following way:

- during starting the solenoid valve remains closed, preventing the petrol vapours from excessively enriching the mixture;
- with the engine started up, the electronic control unit sends the solenoid valve a signal which modulates the opening.

In this way the control unit controls the quantity of petrol vapours sent to the inlet, preventing considerable variations in the mixture strength (especially during idling).

NOTE *The solenoid valve must be fitted in the corrct position: the arrow on the casing should be pointing towards the vacuum intake on the inlet manifold.*

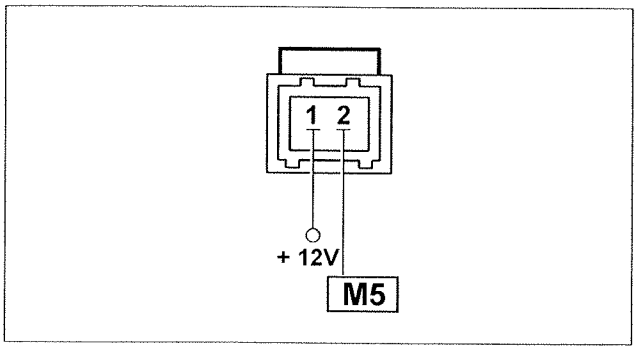


P3U25GX03

Checking the resistance

The resistance of the solenoid valve can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

Resistance: 17.5-23.5 ohm at 20 °C



P3U38GX01

Wiring connector

NOTE *The numbers indicate the corresponding control unit pins*

CHECKS - ADJUSTMENTS AND REPAIR OPERATIONS ON THE BOSCH MOTRONIC ME 3.1 INJECTION/IGNITION SYSTEM IN ADDITION TO THE FAULT DIAGNOSIS

WHEN WORKING ON A VEHICLE EQUIPPED WITH A MOTRONIC INJECTION/IGNITION SYSTEM THE FOLLOWING PRECAUTIONS MUST BE OBSERVED:

- *do not start up the engine when the electrical connections are not properly connected or slack at the battery terminals;*
- *do not use a rapid battery charger to start up the engine;*
- *never disconnect the battery with the engine running;*
- *when recharging the battery, disconnect it first from the network;*
- *if the vehicle is going in a drying oven after painting, at temperatures in excess of 80 °C, the injection/ignition electronic control unit must be removed;*
- *do not connect or disconnect the electronic control unit multiple connector with the ignition switch in the ON position;*
- *always disconnect the negative battery lead before carrying out electrical welding on the vehicle.*

It should be remembered that this system has a memory which is permanently supplied (stand-by memory) where the self-adjustment values are stored. If the battery is disconnected then this information is lost and can only be acquired again after a certain length of time so this operation should be carried out as infrequently as possible.

CHECKING ENGINE IDLE SPEED

If the engine idle speed is not 750 ± 50 rpm and the injection-ignition control unit is the self-adjusting type then it is not possible to carry out an adjustment, therefore it is necessary to check that the accelerator linkage is correctly adjusted and the fault should be looked by carrying out a complete fault diagnosis using the Examiner/SDC

CHECKING CONCENTRATION OF POLLUTANT EMISSIONS

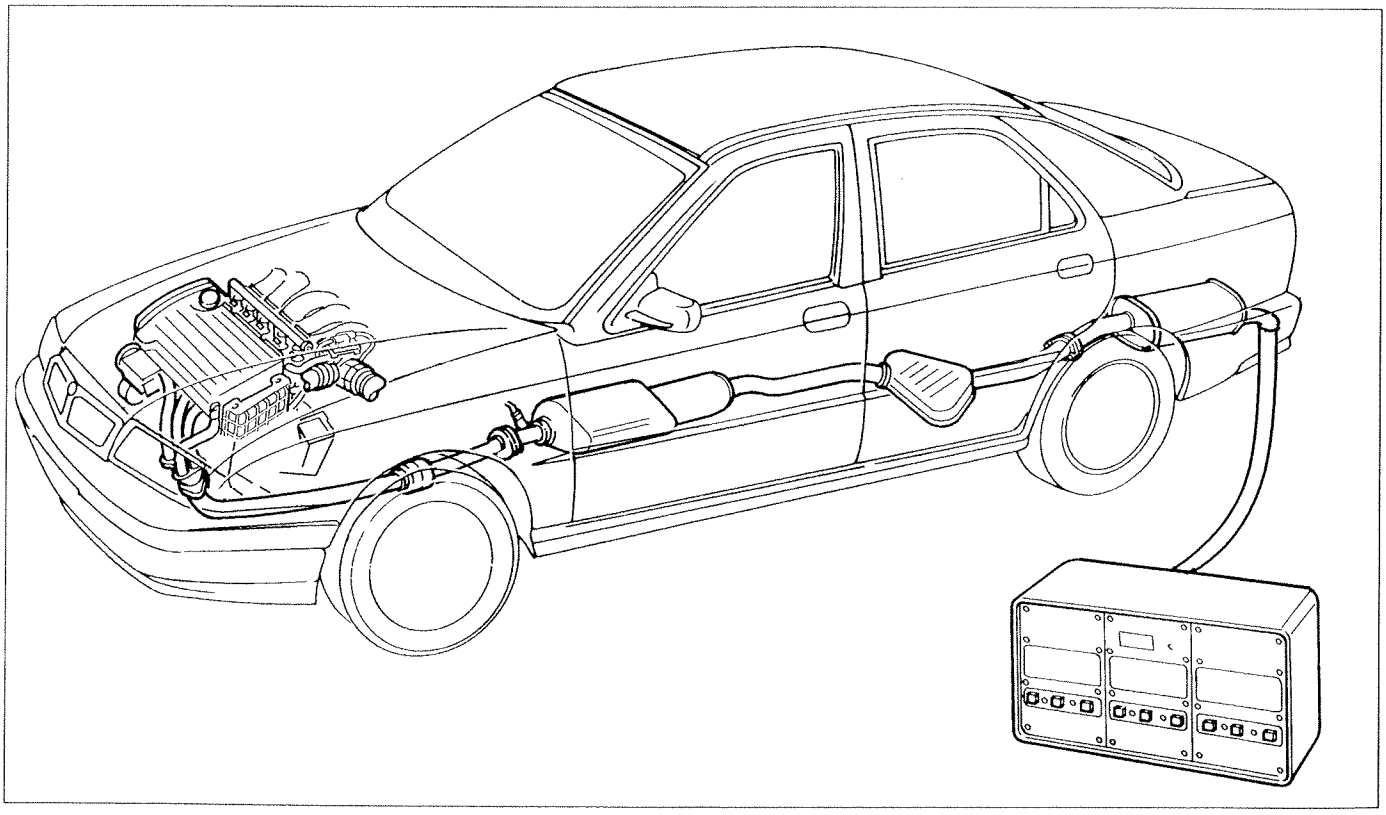
Through the self-adjustment of the system, the Motronic ME 3.1 system ensures a continuous check on the idle speed and the CO percentage thereby making any other external adjustment operation superfluous (there are no longer any adjustment screws). However, a check on the contents of the exhaust gases downstream of the catalyzer can provide precious information concerning the injection/ignition system operating conditions, the engine parameters or the catalyzer.

Checking the exhaust concentration of CO and HC

The exhaust concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) is measured by inserting a suitably calibrated CO tester probe at least 30 cm into the end of the exhaust pipe as shown in the diagram.

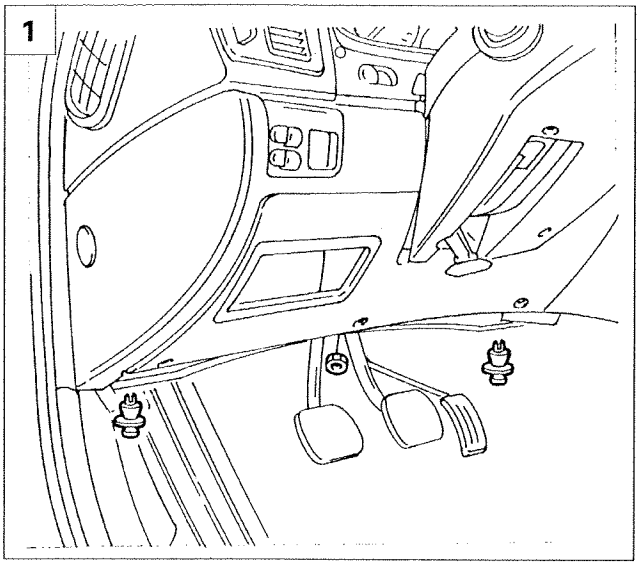
If the shape of the end section of the exhaust pipe does not allow the sensor to be fully introduced then a special extension pipe must be added which guarantees the seal in the join area.

1. Check that the idle CO and HC concentrations are correct.
2. If the value of the HCs differs from the recommended limit, proceed with tuning the engine checking the following in particular: the ignition advance angle - the valve clearances - the valve gear timing - the engine compression. If the engine parameters are correct then the cause of the problem should be sought in the decreased efficiency of the catalyzer.



P3U40GX01

1



P3U21GJ01

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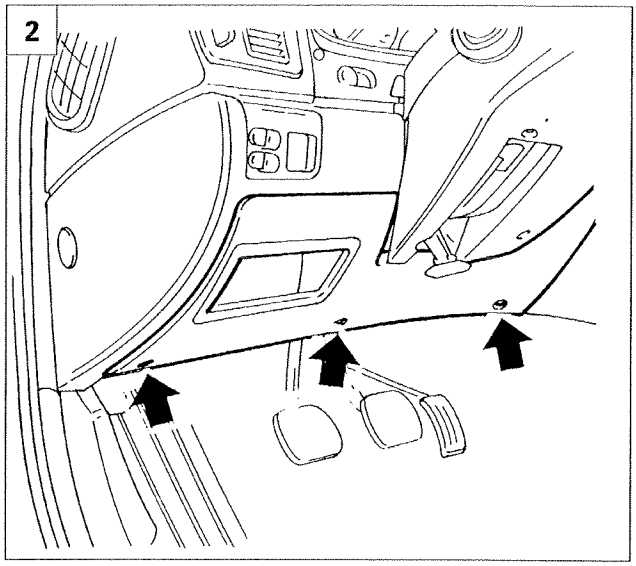

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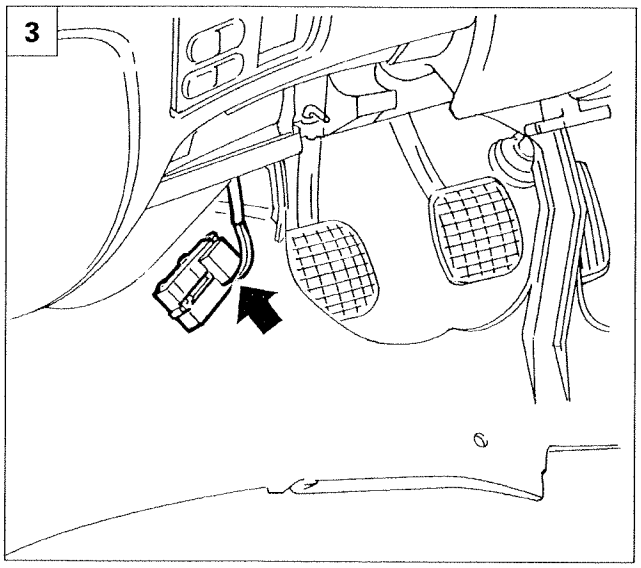

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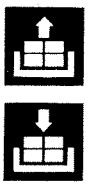
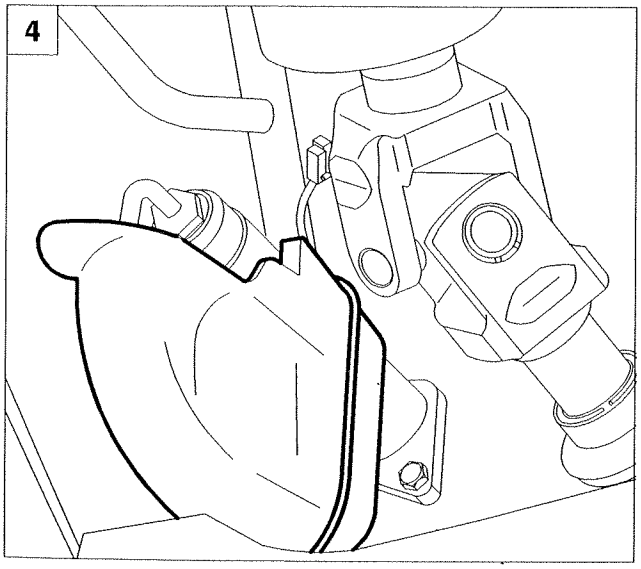


REMOVING - REFITTING ACCELERATOR PEDAL POTENTIOMETER

- Disable the alarm (if fitted) housed in the luggage compartment, right side and disconnect the negative battery lead.

1. Undo the two buttons and the fixing nut and remove the floor carpet on the driver's side.
2. Undo the fixing bolts and remove the protection for the fuse box.
3. Disconnect the electrical connection for the pedals courtesy light.
4. Cut the band and remove the plastic shield for the clutch pump.
5. Undo the outlet connector for the clutch pump taking care to ensure that no fluid escapes.

4



P3U21GJ04

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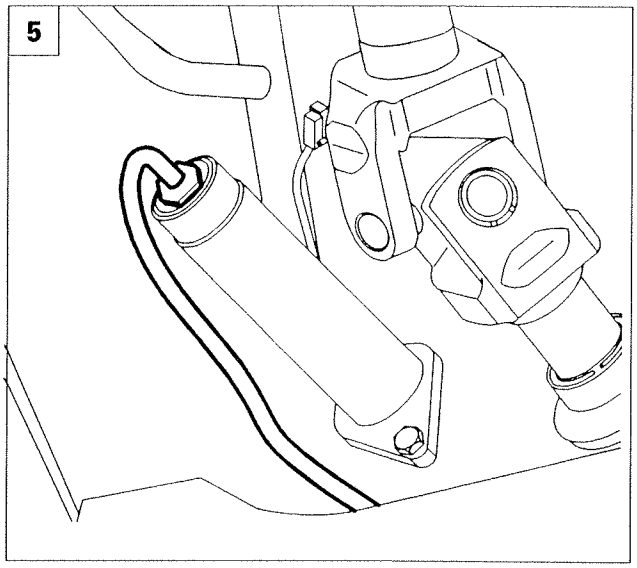

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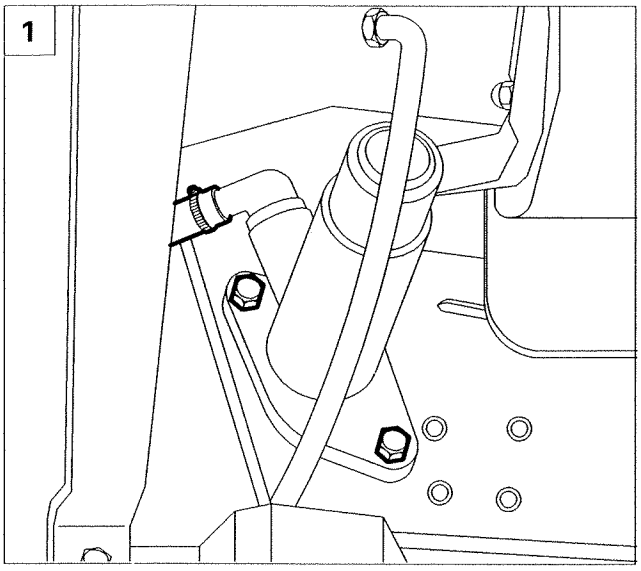

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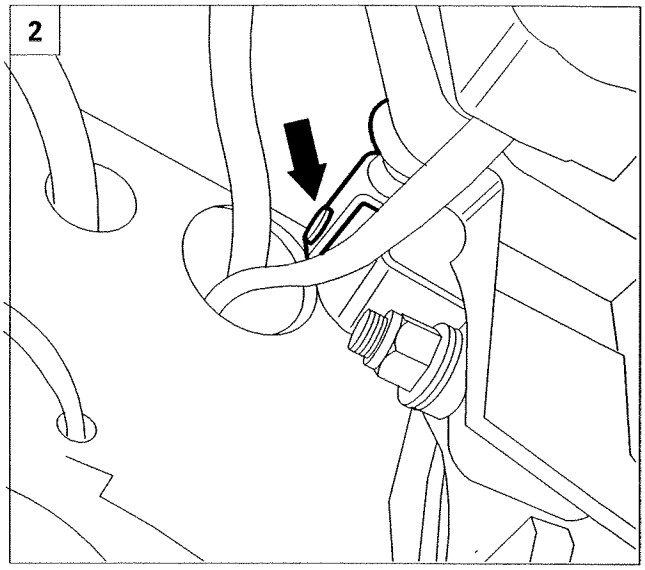

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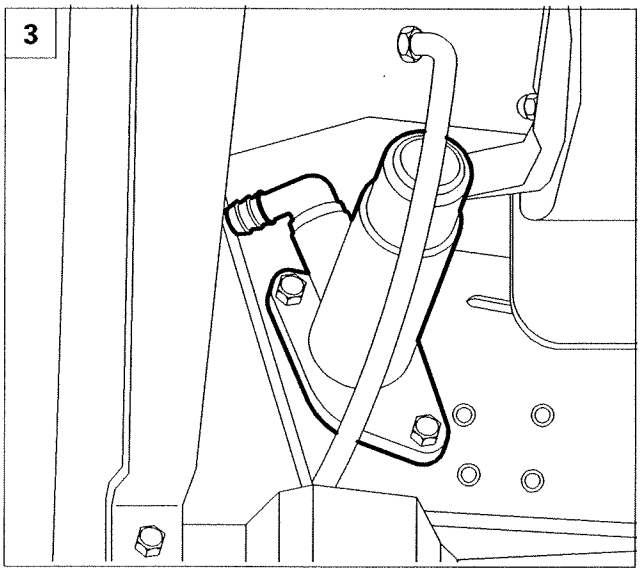

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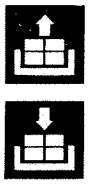


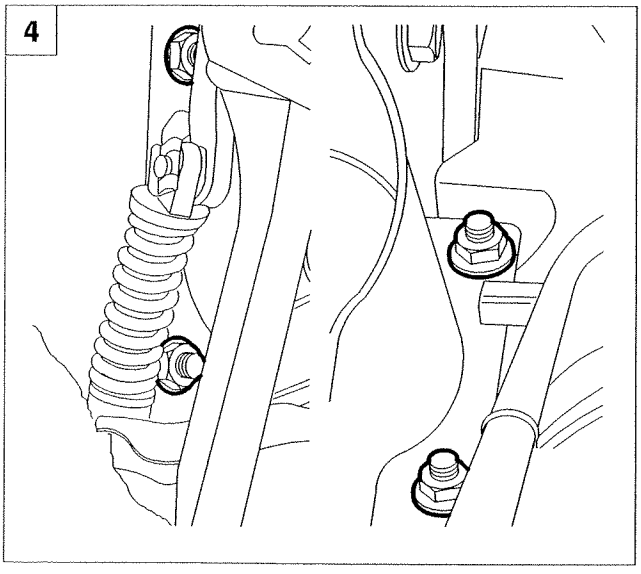
1. Remove the band and remove the clutch pump fluid inlet pipe.

2. Remove the seal and remove the pin which connects the clutch pump to the pedal.

3. Undo the fixing nuts and remove the clutch pump.

4. Undo the bolts fixing the pedals assembly to the brake servo.

5. Disconnect the electrical connector for the accelerator potentiometer.



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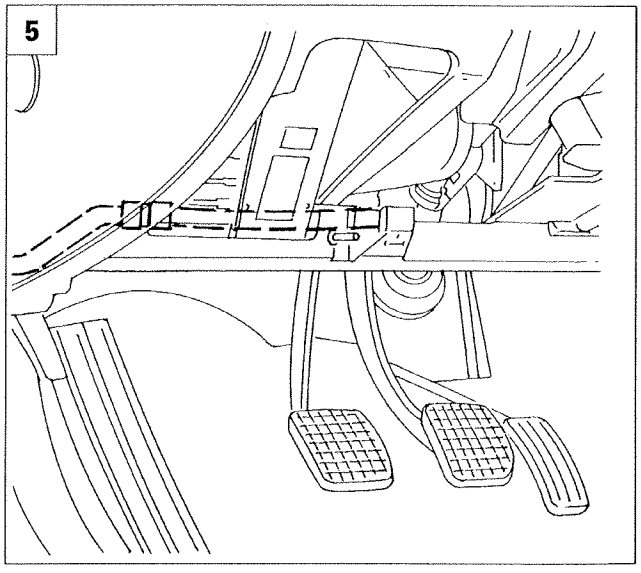
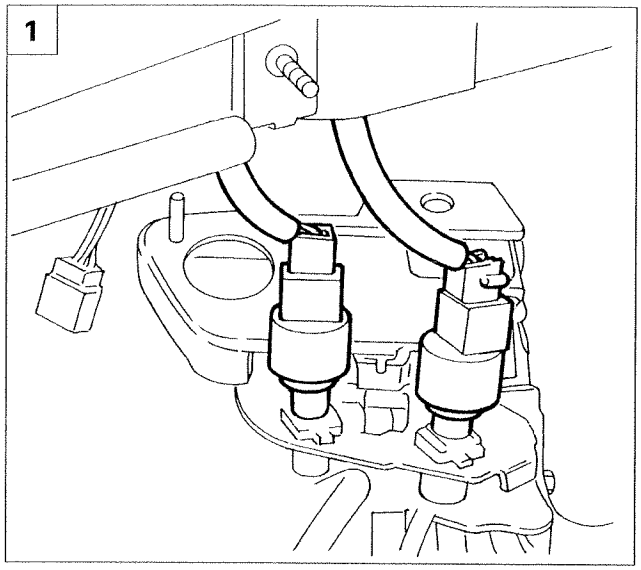


P3U22GJ05

1



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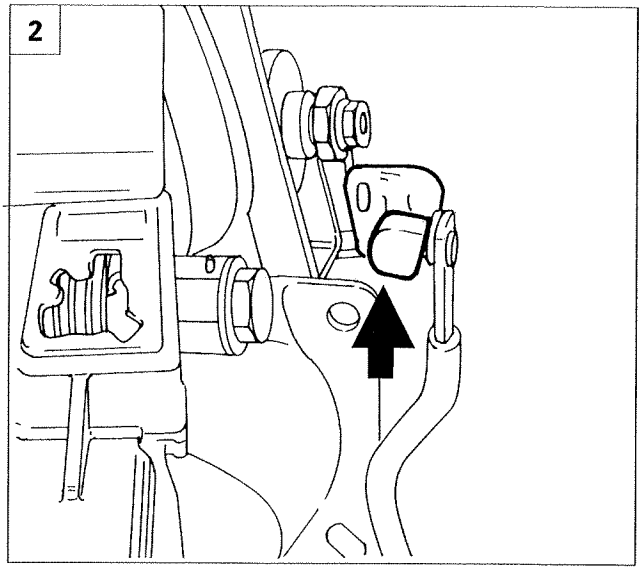

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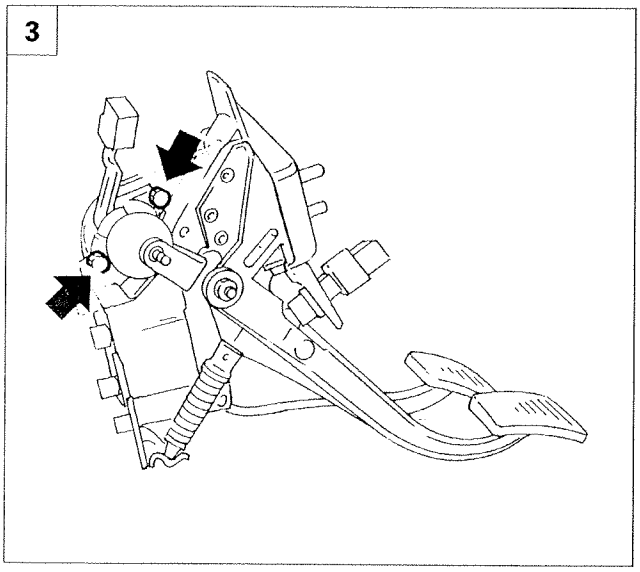
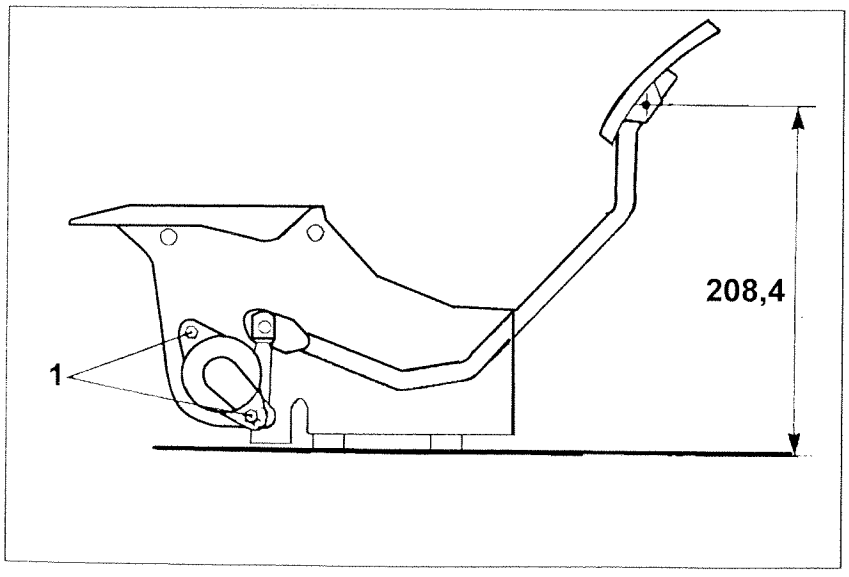


P3U23GJ03

1. Remove the pedals assembly from the mounting bracket and disconnect the electrical connector for the brake pedal switch and the clutch pedal switch.

2. At the bench, remove the potentiometer idler rod.

3. Undo the fixing bolts and remove the accelerator potentiometer.



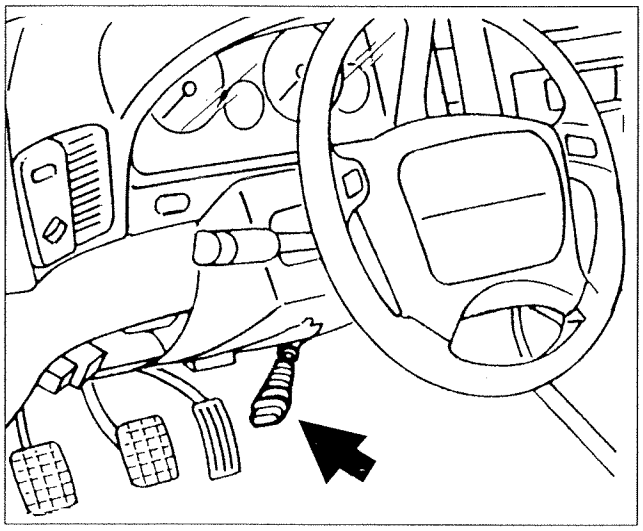
P3U23GJ04

Refitting

Fit the potentiometer in its housing, tighten the fixing bolts (1) and connect the linkage.
Rest the assembly on a reference plane as illustrated in the diagram and measure 208.4 millimetres from the plane to the rivet connecting the pedal to the lever.
With the pedal in this position, tighten the fixing bolts (1) for the accelerator potentiometer.
Refit the pedals assembly reversing the order of the operations carried out for the removal.

Bleed the system

ADJUSTING ACCELERATOR PEDAL END OF TRAVEL



P3U24GJ02

Connect the diagnostic equipment to the socket inside the vehicle.

With the pedal in the end of travel position, check that the voltage readings on the instrument correspond to the figures in the table.

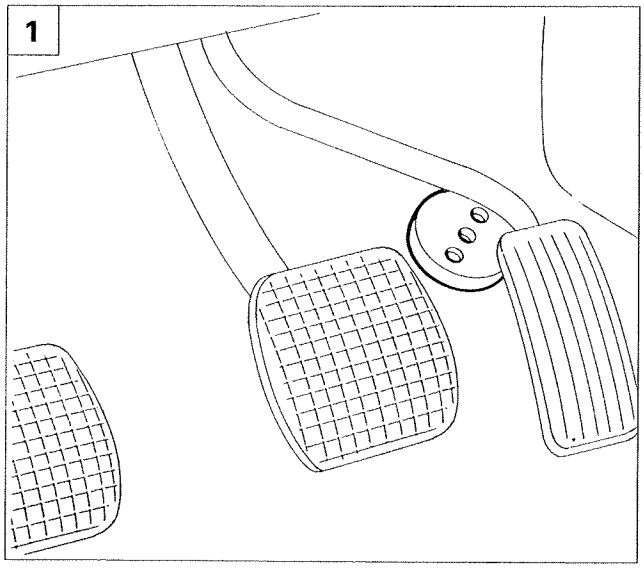
Accelerator position in minimum position

V	V%
0,5 ± 0,1	10 ± 2

Accelerator position in maximum position

V	V%
$4{,}4\ ^{+\ 0{,}2}_{-\ 0{,}1}$	$88\ ^{+\ 4}_{-\ 2}$

The voltage figures are only valid with a supply voltage of 5V; as this voltage varies, the percentage readings on the diagnostic equipment must be considered.



P3U24GJ01

1. To correct the voltage values with the accelerator in the maximum position, regulate the adjustment device and repeat the procedure using the diagnostic equipment.

DIAGNOSTICS

The complete fault diagnosis of the system can be carried out by means of an active dialogue with the diagnostic equipment (Examiner SDC).
If a fault is detected with the sensors, the electronic control unit replaces the information coming from the faulty sensor with pre-memorized (recovery) information to allow the engine to run. The detection of a fault involves it being permanently memorized and the sensor excluded from the system until the signal is once again compatible.
The same procedure is applied if the fault invovles an actuator or control flap. The detection of a fault and the replacement with recovery data means that the fault is signalled by the special warning light in the instrument panel coming on.
The following parameters can, in the case of a fault, be managed by the control unit: flow meter, idle adjustment actuator, coolant temperature sensor, butterfly valve position sensor, Lambda sensor, air temperature sensor, battery voltage and detonation sensors. In the case of faults with the control unit, the timing sensor or the injectors, the system does not identify the fault and the vehicle breaks down. Irregularities can be read, by an operator, on the control unit using the Fiat/Lancia Tester.

Detecting faults

This is carried out during the basic function which manages the sensor/actuator.

Memorizing the error and the structure of the errors memory

The errors are memorized in the control unit in the order in which they arrive in the RAMs. The location and the type of error is recorded for each of them and 2 environmental conditions (specific for each type of fault) measured the moment the fault is detected plus a frequency counter.

Classification of the defect

If a defect is recognized for the first time and the error state persists for a time $t > 0.5s$, then the defect is memorized as "permanent". If this defect later disappears, it is memorized as "intermittent" and "not present". If it then reappears, it remains memorized as "intermittent", but becomes "present".
The classification of a fault as "permanent" activates the recovery function; when the fault disappears the normal reading or implementation function is restored.
Several types of fault are classified as "important", i.e. significant in terms of pollution control regulations. The presence of these faults is signalled by the warning light in the instrument panel coming on.

Frequency counter

Each error is allocated a frequency counter, which is used to determine the moment a fault which is no longer present was recorded. The first time a fault is detected the counter is set at 10. If the fault disappears then the counter remains at the current value. If it reappears then it is increased by 1 (with a maximum upper limit of 50).
The counter is decreased is time the vehicle is started up and the fault has not reappeared. If the counter reaches zero, then the fault is automatically cancelled from the memory.
If after the counter has decreased the fault should reappear the counter is returned to a value of 10 (if it is at a figure of more than 10 then it is not altered).

Signalling a fault

The failure warning light comes on when there is a defect memorized as "present" and "important".
The delay time between the detection of the fault and the warning light coming on is 0.1 seconds; the delay time between the disappearance of the fault from the memory and the warning light going out is 4 seconds.
The warning light comes on each time the ignition key is turned to the ON position. If there are "important" faults already present, then the warning light goes out after 4 seconds.

Cancelling the error

When the frequency counter reaches 0, the fault is and the associated parameters are cancelled.

The immediate cancellation of the entire errors memory occurs in the following cases:
- by means of the "cancel errors memory" command sent by the tester;
- by interrupting the electronic control unit supply (disconnecting the battery or the control unit connector).

Fault diagnosis with Examiner/SDC

The exchange of data between the injection/ignition control unit and the diagnostic equipment (Examiner/SDC) takes place by means of a two-way serial line (line K) using the standard Bosch communication protocol.

The diagnostic equipment can provide the following information:
- display of the errors;
- display of the engine parameters;
- active diagnosis

List of errors

Description	Nature of the errors
Rpm sensor	Loss of signals
Butterfly potentiometer	C.C.
Air temperature sensor	C.C.
Coolant temperature sensor	C.A-C.C.
Battery	Supply > 16.01V. Supply < 10V.
Lambda sensor	C.A-C.C.- Incorrect CO value
Injector	C.C
Idle speed actuator	C.C.
Petrol vapour solenoid valve	C.C.
Relays actuators	C.C.
Control unit	Faults in the operation of the microprocessor or the control unit memories are signalled.
Flow meter	C.C.
Timing sensor	Signal absent or not plausible
Detonation sensor	Signal absent or not plausible
Vehicle speed signal	Signal absent or not plausible
Phase transformer	C.C.
Electric fuel pump	C.C.
Lancia CODE	Code not recognized or not received

Parameters displayed

Engine rpm
Injection time
Advance
Intake air temperature
Coolant temperature
Butterfly valve opening angle
Battery voltage
Lambda sensor
Self-adjustment
Flow meter
Engine knock (detonation)
Vehicle speed
Petrol vapour cut out solenoid valve
Lancia CODE
Mileage covered

Active diagnosis

The following active tests can be carried out using the diagnostic equipment:
- Phase transformer
- Injector
- Failure warning light
- Petrol vapour solenoid valve
- Air conditioning
- Idle speed actuator
- Cancelling errors.

Recovery

If the sensors are faulty, the control unit replaces the value sent by the sensor with a Recovery value which, according to the different faults is either stored in the control unit memory or specially constructed using other available information in order to allow the vehicle to reach a service centre.
This value is also transmitted to the diagnostic equipment, therefore, during the fault diagnosis it is worth bearing in mind that if there are problems the error for the sensor concerned will be signalled and the Recovery value will appear on the display.

Permanent memory

The control unit has a «permanent» type memory (EEPROM), in other words it keeps a record of the error even in the cause of the problem has disppeared and the ignition has been switched OFF; it also has a «volatile» type memory (RAM) which, on the other hand, loses the information concerning the error as soon as the cause disppears.
This also makes it possible to identify errors of an occasional nature more efficiently.
Before ending the fault diagnosis, the contents of the «permanent» memory must be cancelled using the Examiner/SDC in Active diagnosis.
If this is not the case, when the diagnostic equipment is reconnected the errors already examined will be signalled.
The contents of the «permanent" errors memory can be cancelled in the following ways:

1 - Using the Examiner/SDC in active diagnosis.
2 - If the cause of the error is no longer present and the engine has been started up 5 times (running for at least 20 minutes) with an interval of at least 2 minutes between each time the engine is started up.

Disconnecting the control unit from the system, even for very long periods, does not cancel the contents of the «permanent» memory.

10.

page

The information contained in this publication is purely indicative and could be out of date following modifications made by the Manufacturer, at any time, for technical or commercial reasons or in order to conform to legal requirements in the various countries.

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BOSCH ME 2.1 INTEGRATED INJECTION/IGNITION SYSTEM

Introduction

The BOSCH ME 2.1 system fitted on the 3000 V6 - 24v engine belongs to the category of systems which integrate a static advance, digital, electronic ignition system with a phased, multiple, intermittent type indirect electronic fuel injection system.
The system can be divided into the following sub-systems;

ELECTRICAL/ELECTRONIC CIRCUIT
INLET CIRCUIT
FUEL SUPPLY CIRCUIT
EMISSION CONTROL DEVICES

The system is capable of acquiring the following parameters:
- the engine rotation speed;
- the correct sequence for TDC in the cylinder explosion stroke (injection timing);
- the intake air flow rate and temperature;
- the accelerator pedal position;
- the temperature of the engine coolant;
- the effective mixture strength;
- the presence of any detonation;
- the speed of the vehicle;
- the possible operation of the brake or clutch pedals;
- the battery voltage;
- the possible switching on of the air conditioning;
- the signals coming from the other control systems connected (via the CAN line).

This information, if it is in analogue form, is converted into digital signals by the analogue/digital converters (A/D) to allow it them to be used by the control unit.
The management programme (software) inside the control unit memory consists of a series of strategies, each of which manages a precise system control function.

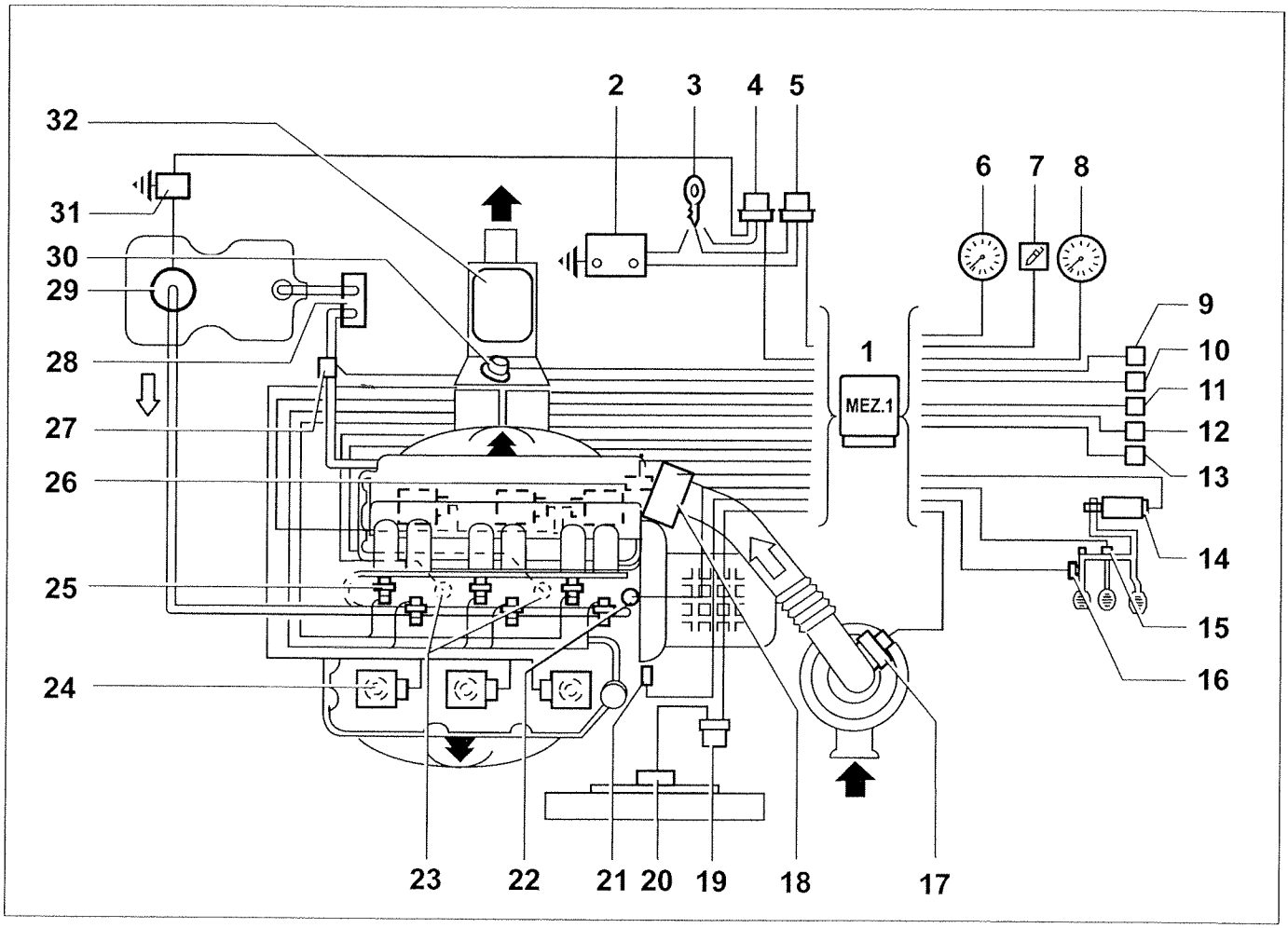
By using the information (input) listed previously, each strategy processes a series of parameters based on maps of data stored in special areas of the control unit memory and then controls the system actuators (output) which consist of devices which allow the operation of the engine, namely:

- injectors;
- ignition coils;
- relays;
- implementation actuators and solenoid valves;
- interface with the vehicle;
- interface with other control systems connected.

NOTE *The BOSCH ME 2.1 engine control system does not require any adjustments as it is the self-adjusting type.*

NOTE *The connectors described in the text are seen from the side opposite the cable inlet. The numbers indicate the corresponding engine control unit pins.*

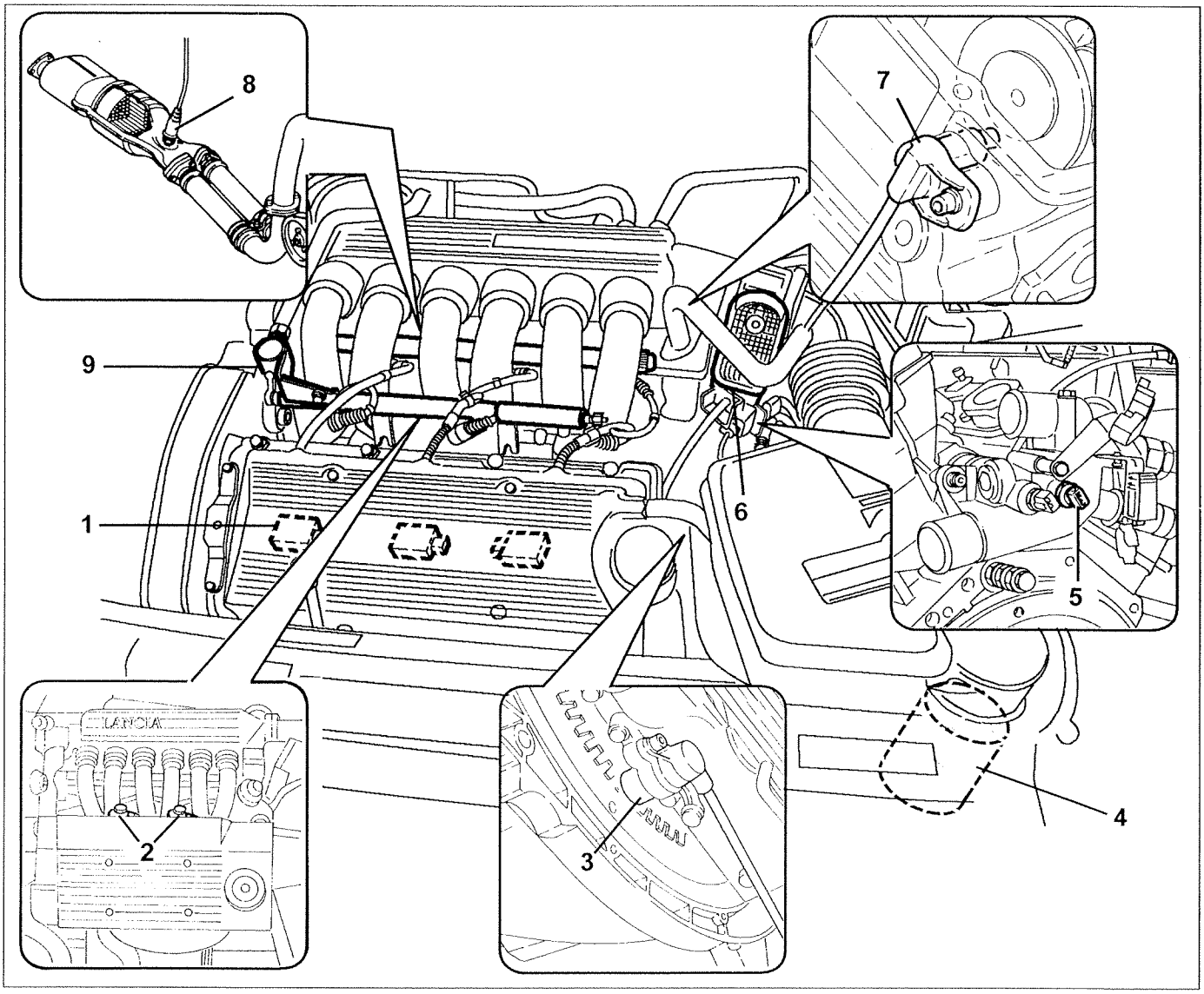
BOSCH ME 2.1 INJECTION/IGNITION SYSTEM FUNCTIONAL DIAGRAM



P3U02FX01

1. Engine control unit
2. Battery
3. Ignition switch
4. Electric fuel pump relay
5. Engine control system relay
6. Rev counter
7. System failure light
8. Speedometer
9. CAN connection line (communication with ABS / ASR / automatic transmission control units)
10. Climate control connection
11. LANCIA CODE connection
12. Diagnostic equipment connection
13. Cruise control connection
14. Accelerator pedal position sensor
15. Brake pedal switch
16. Clutch pedal switch
17. Air flow meter with air temperature sensor
18. Butterfly casing integrated with D.V.L.
19. Radiator fan relays/fuses
20. Radiator fan
21. Engine rpm and TDC sensor
22. Coolant temperature sensor
23. Detonation sensor
24. Ignition coil (one per cylinder)
25. Injector (one per cylinder)
26. Engine timing sensor
27. Charcoal filter solenoid valve
28. Charcoal filter
29. Electric fuel pump
30. Lambda sensor
31. Inertia switch
32. Catalizer

LOCATION OF BOSCH ME 2.1 INJECTION/IGNITION SYSTEM COMPONENTS IN THE ENGINE COMPARTMENT



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1. Ignition coils (left cylinder head)
2. Detonation sensors
3. Engine rpm and TDC sensor
4. Air flow meter
5. Coolant temperature sensor
6. Butterfly casing integrated with D.V.L.
7. Engine timing sensor
8. Lambda sensor
9. Fuel manifold complete with injectors

SYSTEM MANAGEMENT STRATEGIES

Operating principle
Any engine operating point is identified by two parameters:
- rotation speed;
- engine load.

If these parameters are known by processing, it is possible to calculate and then implement the injection (quantity of fuel supplied and timing with TDC in explosion stroke), the ignition (correct ignition advance) and other possible functions for each engine operating point.

In the BOSCH ME 2.1 system, the rotation speed is measured directly by means of the sensor, whilst the engine load is determined indirectly, on the basis of the air flow rate and the temperature (both measured via the flow meter).
Special maps are produced, during experiments on the engine and the vehicle, for the injection and the ignition, where the injection time/phase and ignition advance (for a certain number of pairs of speed/load parameters, required for the correct operation of the engine are stored.
For any engine operating point not exactly between those values stored in the memory the values are determined by mathematical interpolation.

The injection time values calculated are also correctly according to the signal coming from the Lambda sensor which, on the basis of suitable operating strategies, ensures that the mixture strength constantly fluctuates around the stoichiometric value.

All special operating situations which require special adjustments of the basic injection time/phase and ignition advance values are managed by the engine control unit by means of suitable strategies on the basis of the signals coming from the various system sensors.

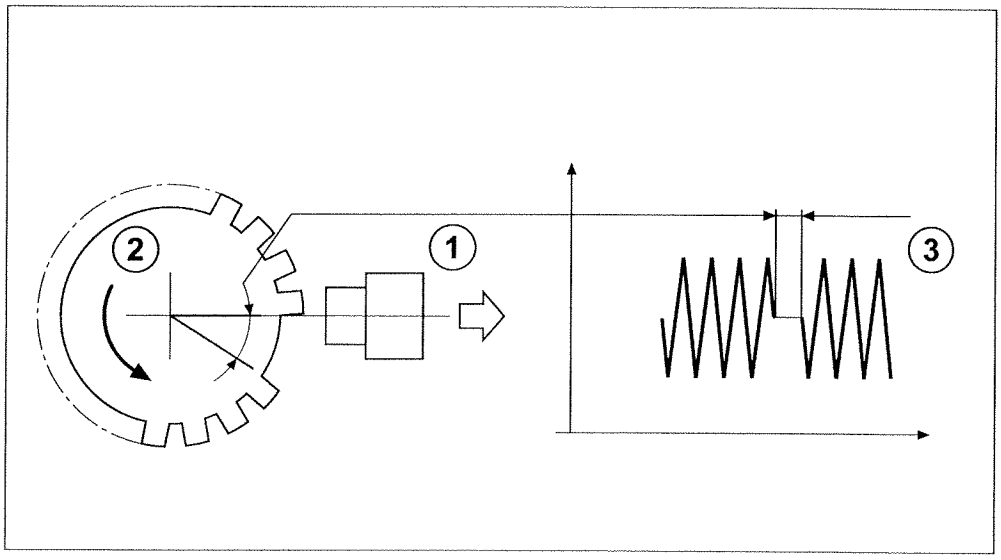
The injection/ignition system basically carries out the following functions:

- management of the signals
- management of the injection
- management of the ignition
- motorized butterfly casing operation
- check on the engine idle speed
- check on the charcoal filter solenoid valve
- self-adjustment
- immobilizer connection (Lancia CODE)
- auxiliary functions (radiator fans, climate control, cruise control, antispin, automatic transmission).

MANAGEMENT OF THE SIGNALS

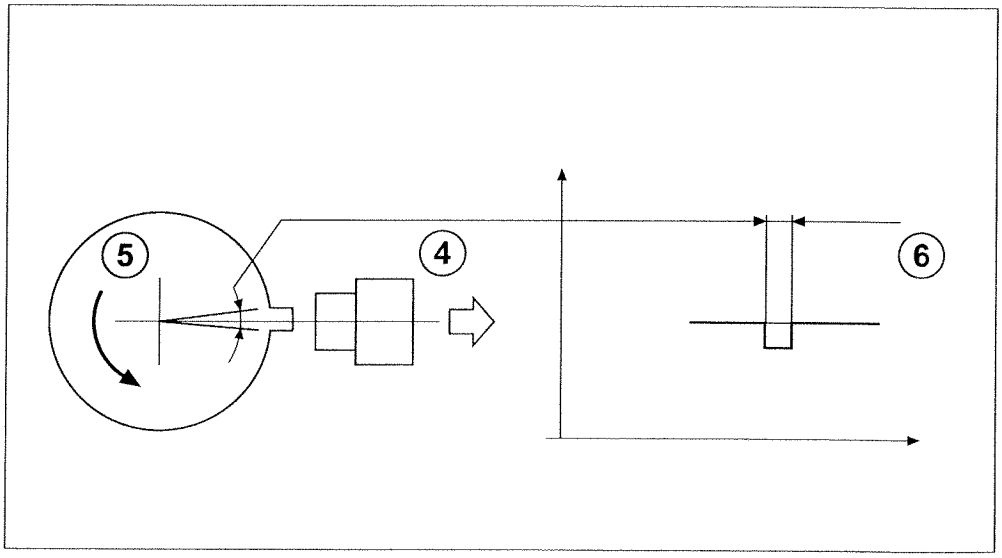
NOTE *The "signals" refer to the collection of signals coming from the sensor on the crankshaft and the one on the camshaft which, having a precise reciprocal position, provide the control unit with a synchronized sequence of signals which the control unit is capable of recognizing.*

During starting, the control unit recognizes the timing of the injection and the ignition, which are fundamental for the subsequent operation of all the strategies.
This recognition is implemented on the basis of the interpretation of the future signal coming from the flywheel sensor on the crankshaft and the engine timing sensor on the camshaft.
There are sixty teeth on the flywheel, two of which have been removed to create a discontinuity: the angle between the two consecutive teeth is therefore 6°: The signal is the sinusoid type.



1. Engine rpm and TDC sensor (solenoid)
2. Flywheel 60-2 teeth (crankshaft)
3. Flywheel signal (engine speed sensor)

The signal coming from the timing sensor consists of a square wave corresponding to the passing of the single tooth on the wheel in front of the sensor.



4. Engine timing sensor (Hall effect)
5. Flywheel 1 tooth (camshaft)
6. Flywheel signal (engine timing sensor)

INJECTION MANAGEMENT

Calculation of injection time/phase and operation of injectors
The "basic" injection time is calculated by a mathematical interpolation of the speed/load map: the values contained in the map, obtained experimentally, also depend on the characteristics of the injector.
The "final" injection time is determined by means of a calculation algorhythm in which the "basic" injection time is corrected by a series of coefficients which take into account the different engine operating conditions which are hightlighted by the various sensors present in the system.
The operation of the injectors is the phased sequential type. The timing of the injectors can vary according to the engine speed.

Checking the mixture strength
The injection time is continuously corrected according to the signal coming from the Lambda sensor so that the mixture strength constantly fluctuates around the stoichiometric value at a frequency which is not noticeable whilst driving.

The control unit also manages the supply of the Lambda sensor heater. In effect, according to the engine load and speed conditions, it processes a forecast of the exhaust gas temperature and controls the heater supply current, limiting it to actual heating requirements.

Starting and operation when cold

During cold starting the injection is managed simultaneously (full group, i.e. not phased until the recognition of the injection phase, after which the management becomes phased.
The injection time whilst the starter motor is turning the engine is determined by a special map depending on the temperature of the coolant: after starting the normal map is then used for the calculation.

During operation when cold, since there is a natural weakening of the mixture as a result of the reduced evaporation and the strong condensation on the internal walls of the fuel inlet manifold, the "basic" injection time is increased by a multiplication coefficient which depends on the temperature and speed of the engine.

Operation during acceleration and deceleration
Acceleration and deceleration are interpreted by the system as transition stages between two conditions, starting and arriving: this transition can be positive (acceleration) or negative (deceleration).
The transition management strategy is very complex as it has to take a large number of factors into account.
The extent of the correction basically depends on the variation in the engine load, measured by the flow meter and indirectly determined by the position of the accelerator pedal: however, other factors such as the speed of movement of the accelerator pedal, the engine speed and the temperature of the engine coolant also play a part.
In general, the "basic" injection time is increased for positive transitions and decreased for negative transitions.
In particular, if the increase in the injection time is noticeable at an injector which has just closed, the control unit reopens the injector (extra pulse), to compensate the mixture strength extremely quickly: the subsequent injections are already increased on the basis of the coefficients mentioned previously.

Operation in full load conditions
This strategy is enabled when the butterfly exceeds a certain level which, in turn, depends on the engine speed.
The injection time in this situation is determined by a special map according to the engine load and speed conditions.

Rotation speed restriction
This strategy limits the maximum speed which can be reached by the engine enabling the cut-off when 6800 rpm is reached (7000 rpm can be reached) for a maximum period of 5 seconds.
The operation of the injectors is restored at 6600 rpm.

Operation in cut off conditions
The control unit enables the cut-off strategies when the temperature of the engine exceeds a certain level.
The cut-off strategy is enabled when:
- the idle condition is recognized;
- the number of revs is beyond a certain level, which varies inversely to the ratio of the gear engaged (the cut-off operation speed is high in short gears and gradually lower in long gears).

Before the idle condition is reached the dynamics of the number of revs decrease is checked: if it is higher than a given value, the fuel injection is partly activated on the basis of a logic which involves the "soft accompaniment" of the engine at idle speed.
When the idle speed condition is reached, normaly functions are resumed.
The fuel cut off is also enabled in the case of partial deceleration, identified by particular engine speed or load conditions, on condition that this situation exists for a pre-set time.

Operation of electric fuel pump
The electric fuel pump is operated by the engine control unit via a relay.
The pump cuts out:
- if the engine speed goes below 50 rpm
- after a certain period (about 5 seconds) with the ignition key in the MAR position without the engine being started up (timed go ahead);
- if the inertia switch has intervened.

IGNITION MANAGEMENT

The management of the ignition basically consists of determining the desired ignition advance according to the engine operating conditions and its implementation through the operation of the power transistors, located inside the control unit.
The "basic" advance value, calculated on the basis of the engine load and speed, is then corrected according to the different engine operating conditions.
The primary winding of each coil is supplied by the battery voltage via the relayand is connected to the power transistors incorporated in the engine control unit, whose transmitter is earthed, whilst the base receives the operating voltage from the control unit.

According to the engine rotation speed and the ignition advance to be implemented, the engine control unit establishes the moment for the start of conduction in the primary winding so that the desired current intensity (saturation) is reached in the primary winding just before the current is interrupted.

Thei angle of this moment obviously varies in relation to TDC for the explosion stroke of each cylinder and the greater the engine rotation speed, the greater the advance since the time required to saturate the current in the coil primary winding is virtually constant: it is determined using suitable coefficients stored in the memory (dwell management).

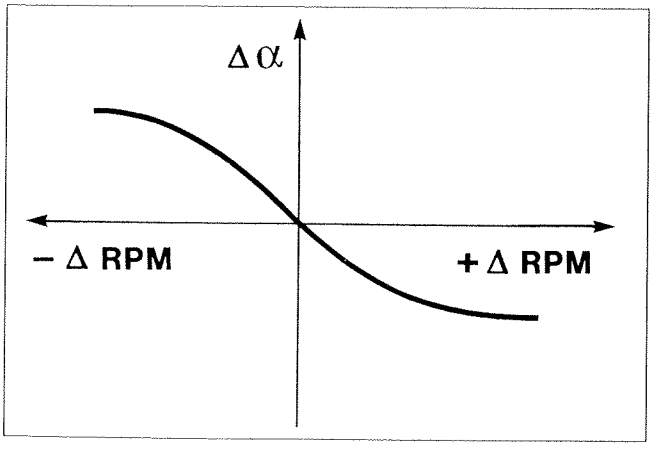
The moment of the start of conduction is also corrected on the basis of the battery voltage.
The engine control unit determines the moment the current in the primary winding is interrupted, transforming the advance degrees into the time required by the engine to pass through this angle: this time constitutes the advance in relation to TDC for the explosion stroke with which the current at the base of the transistor is interrupted.
The moment the current is interrupted at the base of the power transistors, the connection to earth for the primary winding is interrupted and, consequently, the high tension discharge takes place in the secondary winding.

Starting

During starting it is not possible to implement the normal management of the advance because considerable fluctuations in the rotation speed do not allow the correct calculation of the dwell and the advance.
The control unit implements a fixed advance for the entire time the engine is driven by the starter motor.

Operation in cut-off conditions

The injection advance is reduced on entry into cut-off: from the moment the supply of fuel is restored, the advance gradually returns to the "basic" vaue.



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△α correction of ignition advance when idling
+△ RPM: the speed during idling exceeds the nominal one
-△ RPM: the speed during idling is lower than the nonimal one

Operation with engine idling

When the engine is idling, the management of the advance is implemented independenly of the "basic" advance.
The advance value during whilst idling is correctly in a manner which is inversely proportional to the variation of the speed in relation to the pre-set speed which, in turn, depends on the temperature of the coolant.
In particular, the advance is increased if the speed decreases and is decreased if the speed increases to guarantee the stability of the actual speed.

Control of the detonation

This strategy has the task of detecting the presence of detonation, by processing the signal coming from the appropriate sensor. The strategy constantly compares the signal coming from the sensor with a level which is, in turn, constantly updated to take into account background noise and the ageing of the engine.
If the system recognizes the presence of detonation, the strategy reduces the ignition advance, in steps of 3° up to a maximum of 9° until the phenomenon disappears. Latern on, the advance is gradually restored to the basic value or until the onset on the phenomenon.
The strategy is also equipped with a self-adjustment function which memorizes the reductions in the advance which are continuously repeated to adjust the advance to the different conditions the engine finds itself in (for example the use of a low octane rating fuel). The strategy is capable of restoring the advance to the map value if the conditions which have caused the reduction disappear.

OPERATION OF MOTORIZED BUTTERFLY CASING

The engine control unit controls the position of the butterfly through the operation of a direct current motor integrated in the butterfly casing.
The operating strategy determines the position of the butterfly mainly on the basis of the position of the accelerator pedal and the engine speed.
The transition stages are managed to improve the response of the engine according to the operation of the pedal by the driver and the engine operating conditions.
The control unit also sets the position of the butterfly according to the specific requirements connected to the different vehicle systems (antispin, cruise control, automatic transmission, etc.).

ENGINE IDLE SPEED MANAGEMENT

The general purpose of this strategy is to keep the engine speed around the value memorized (engine warm: 700 rpm), the position of the actuator depending on the engine speed and load conditions and the vehicle speed.
- Starting.

When the key is inserted, the position assumed by the actuator depends on the engine temperature (open-loop position).
- Engine idle speed.

The engine speed varies according to the temperature of the engine is constantly kept close to this value by modifying the position of the butterfly to compensate for any fluctuations in the speed: this particularly takes place when external loads are switched on (power assisted steering, heated rear windscreen, etc.).
If the fans and the air conditioning is switched on, both managed by the control unit, the strategy manages the actuator in advance of the engagement of the load; the same takes place on automatic versions with the vehicle stationary and the gearbox in drive.
- Deceleration.

In deceleration conditions outside of idling, the control unit controls the position of the actuator through a special flow rate curve (dash-pot curve), in other words slowing down the return of the butterfly to the closed position thereby achieving a reduction in the engine braking effect.

In addition, if the vehicle is decelerating, the information concerning its speed correlated to the engine speed, allows the optimum management of the dash-pot effect, adjusting it to the gear engaged.

CONTROL OF CHARCOAL FILTER SOLENOID VALVE

This strategy controls the position of the charcoal filter solenoid valve as follows:
- with the engine warm, the control unit operates the solenoid valve in duty-cycle to control the quantity of fuel vapours sent to the inlet (scavenging of the charcoal filter) according to the engine speed and load conditions. In particular, the system alternates periods of scavenging with periods free from scavenging: during the latter, the self-adjustment strategy is enabled; it is disabled during scavenging;
- in cut-off conditions the solenoid valve remains closed.
- after warm starting the solenoid valve remains closed for several moments, then it starts to be controlled in conjunction with the activation of the control of the mixture strength via the Lambda sensor;
- after cold starting, the solenoid valve remains closed for the entire time that the engine is warming up.

SELF-ADJUSTMENT

Self-adjustment of the system

The control unit is equipped with a self-adjustment function which has the task of recognizing the changes which take place in the engine due to the processes of bedding in over a period of time and the ageing of both the components and the engine itself.

These changes are memorized in the form of modifications to the basic map and are designed to adapt the operation of the system to the gradual alterations in the engine and the components in relation to the specifications when new.

This adjustment function also makes it possible to compensate for any inevitable differences (due to production tolerances) with components which may be replaced. This means that all vehicles can give maximum results without special adjustment and control operations.

Self-learning:
In the following conditions:
- removing, refitting or replacing the injection control unit
- removing, refitting or replacing the butterfly casing integrated with D.V.L.

the control unit, if commanded by the diagnostic equipment, implements the self-learning logic.
The values stored in the control unit memory are not cancelled even if the battery is disconnected.

MANAGEMENT OF THE ANTI-THEFT FUNCTION (LANCIA CODE)

To improve protection against theft attempts, the vehicle is equipped with an engine immobilizer system (Lancia CODE) which only allows the activation of the injection/ignition control unit by means of an electronic code.

Each time the key is turned to the OFF position, the Lancia CODE system completely deactivates the injection/ignition control unit.

If the key is turned from OFF to ON, the following operations take place, in order:

1. The injection/ignition control unit sends the Lancia CODE control unit a request for the secret code in order to deactivate the immobilization of the functions.
2. The Lancia CODE control unit responds by only sending the secret code after having, in turn, received the recognition code transmitted by the ignition key, which contains a special transponder.
3. The recognition of the secret code allows the de-activation of the immobilization of the functions and the injection/ignition control unit can activate the normal system management programme.

A special two-way serial line allows the exchange of data between the injection/ignition control unit and the Lancia CODE control unit.

If there is a failure with the Lancia CODE system, the vehicle can be started up using special emergency procedures.

Given the presence of the Lancia CODE system DO NOT, during the diagnostic stage and/or operational checks, carry out tests using another injection/ignition control unit. In such a case the Lancia CODE control unit would transfer the (unrecognized) code to the test control unit which could then no longer be used on any other vehicles.

COMPLEMENTARY FUNCTIONS
Management of radiator fans

NOTE *Since the coolant temperature is measured by the sensor there is no longer a thermal contact on the radiator.*

The engine control unit controls the engagement of the radiator fans according to the coolant temperature and activation of the climate control.

There are two operating speeds for the fans, managed according to two different logics, completely independent of one another.

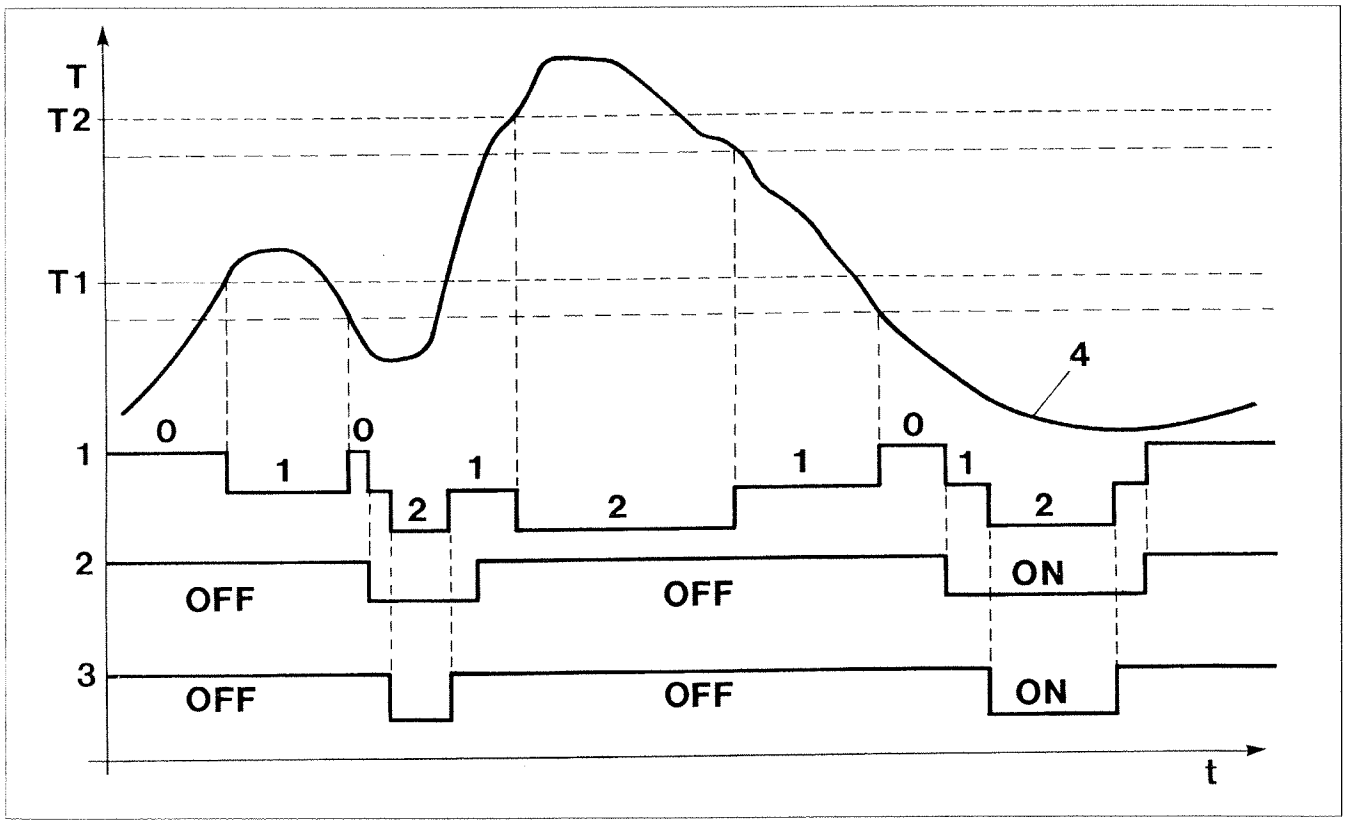
a) According to the temperature of the coolant:

- low speed: the fan is switched on when the temperature of the coolant reaches the lower level (T1);
- high speed: the fan is switched on when the temperature of the coolant reaches the upper level (T2).

The fan is switched off with a hysteresis of around 3 °C.

b) According to the condition of the four stage pressure switch:

- low speed: the fan is switched on when the pressure switch 2nd stage is reached;
- high speed: the fan is switched on when the pressure switch 3rd stage is reached.



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T1 = lower level
T2 = upper level
ON: level activated
OFF: level de-activated

1. Fan state: 0 = off
   1 = low speed
   2 = high speed
2. The level of the four stage pressure switch
3. The level of the four stage pressure switch
4. Coolant temperature progress

Climate control system connection

The injection/ignition control unit is functionally connected to the climate control system as follows:

1. it receives the request to switch on the compressor and operate the various interventions (additional air);
2. it gives the go ahead to switch on the compressor, then the strategy conditions are verified;
3. it receives information on the stage of the four stage pressure switch and operates the various interventions (operation of the radiator fan).

As far as point 1 is concerned, if the engine is idling, the control unit increases the air flow rate, modifying the position of the butterfly in advance of the compressor being switched on and conversely it returns the butterfly to the normal position after the compressor is switched off.
As far as point 2 is concerned, the control unit automatically operates the switching off of the compressor;

- for several seconds after starting;
- when the temperature of the engine coolant exceeds a certain level (engine overheated).

Control of cruise control system (where fitted)

According to the position of the cruise control lever the control unit directly operates the motorized butterfly to control and maintain the motorized speed.
The cruise control is temporarily disabled:

- by operating the brake
- by operating the clutch

the "recall" button is used to return to the speed memorized. The cruise control is not disabled if there is a request for acceleration (e.g. overtaking) and the vehicle returns automatically to speed set as soon as the accelerator is released.
The ASR function (antispin) has priority over the cruise control for safety reasons.

Connection with the ABS/ASR control unit (where fitted)

The dialogue between the engine control unit and the ABS/ASR control unit takes place via the CAN line available at the two control units.
If the wheels are slipping (signalled by the ABS/ASR control unit), the injection control unit reduces the engine torque by:

- reducing the ignition advances
- reducing the butterfly opening angle.

Connection with the automatic transmission control unit (where fitted)

The dialogue between the engine control unit and CAE automatic transmission control unit takes place via the CAN line available at the two control units.
If the wheels are slipping (signalled by the CAE control unit) the injection control unit reduces the engine torque by:

- reducing the ignition advances
- reducing the butterfly opening angle.

DIAGNOSTICS

The system is equipped with an autodiagnostic function designed to check for any irregularities in the following components:

Actuators
injectors
coils
charcoal filter solenoid valve
motorized butterfly casing
electric fuel pump relay
climate control relay
fan relays

Sensors
engine speed sensor
engine timing sensor
Lambda sensor
accelerator pedal position sensor
coolant temperature sensor
detonation sensor
brake-clutch pedal switches
air flow meter

The control unit autodiagnostic system checks the signals coming from the sensors and compares them with the permissible limit figures:

signalling of faults during starting

- warning light on for 4 seconds indicates test stage
- warning light off after 4 seconds indicates no failure in components which can alter the pollution control figures
- warning light on after 4 seconds indicates failure

signalling of faults during operation

- warning light on indicates failure
- warning light off indicates no failure in components which can alter the pollution control values

Recovery strategy

If a fault is detected with the sensors/actuators, the control unit, where possible, replaces the missing data, reconstrucing it using the software (recovery) to allow the operation of the engine.

Using the diagnostic equipment it is possible to carry out a complete fault diagnosis of the system which, in three stages, allows the:
- display of a series of functional parameters (with the engine switched off orrunning);
- display of the errors and their cancellation;
- activation of certain actuators (active diagnosis).

ELECTRICAL/ELECTRONIC CIRCUIT

ENGINE CONTROL UNIT

The control unit uses a "FLASH EPROM".
This new technology allows a development of the calibrations (for example, to improve driving comfort) without having to remove the control unit or replace the EPROM.
The operation consists of loading the new programme in the control unit memory, via the diagnostic connector, using the diagnostic equipment, afterhaving checked the normal operation of the system elements (no defects).

Operation

The engine control unit M10 controls and regulates the entire ignition system and electronic injection. The direct supply of the control unit reaches the battery, from the maxifuse line of CENTR B5, at pin 4 of connector B of M10 via the line protected by fuse F20 of the junction unit B1.

The main injection relay J10 controls the entire system: it is supplied directly by the battery via the maxi-fuse line B80; it is energized by a signal controlled by the ignition (INT/A) from the line protected by fuse F16 of the junction unit B1; as a result, the main relay J10 sends the supply:
- to pin 2 of connector A of the actual control unit M10;
- to the injectors N70;
- to the coils A30;
- to the timing sensor K47, via the line protected by fuse B40;
- to the air flow meter K41, via the line protected by fuse B40;
- to the vapour recovery solenoid valve L10, via the line protected by fuse B40;
- to the Lambda sensor heater K40, via the line protected by fuse B40;

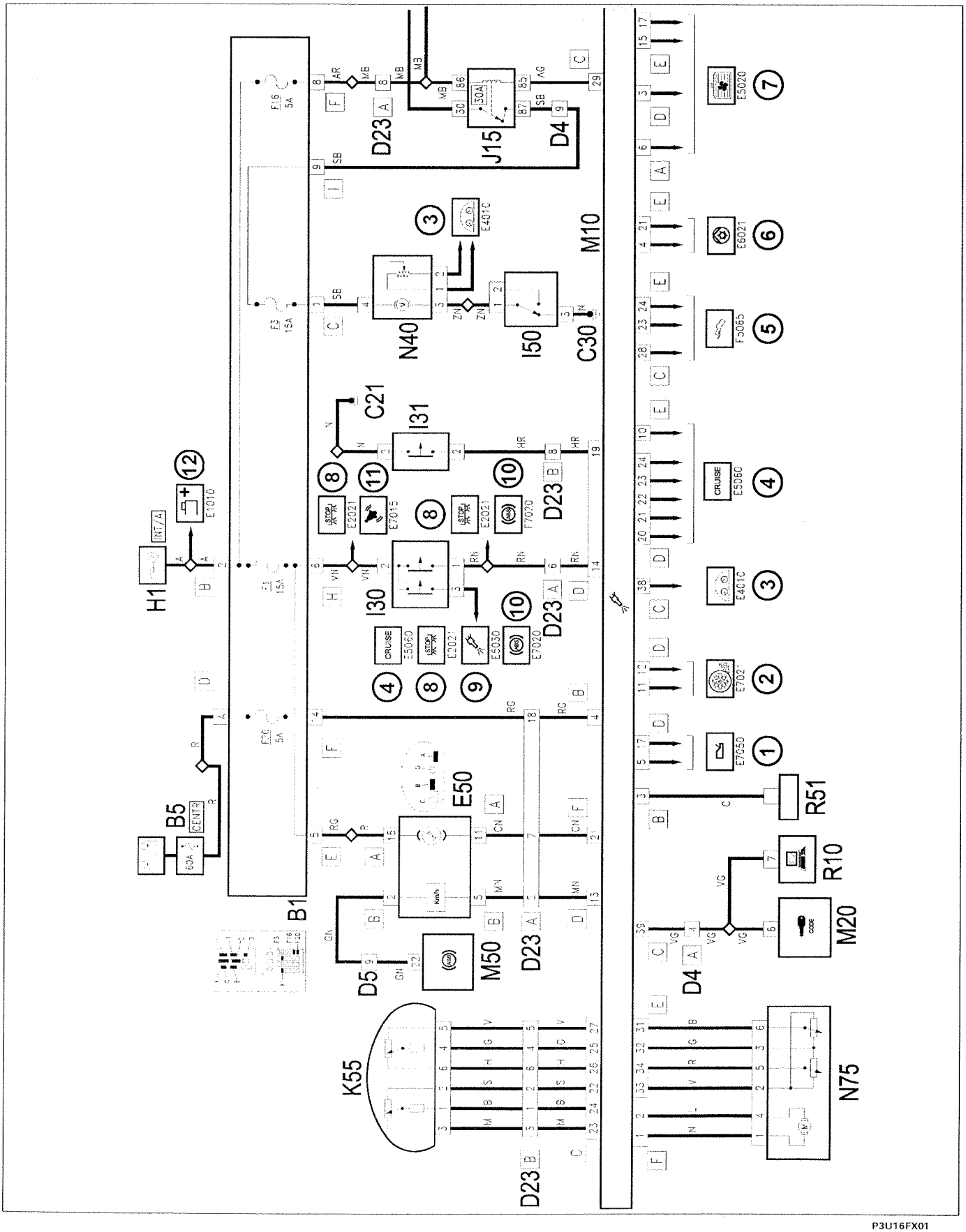
the supply controlled by ignition (INT/A) also supplies the petrol pump relay J15 which is enrgized by an (earth) signal coming from pin 29 of connector C of the control unit M10.
It provides the supply - via fuse F3 of the junction unit B1 - for the electric fuel pump N40, which is connected to earth through the inertia switch I50, which, in the case of an impact, interrupts the circuit and prevents dangerous supplies of fuel.
Pins 3, 7, 8 of connector A of the control unit M10 are earthed and act as a reference, the first two for the ignition and the third for the injectors.
Pin 8 of connector F is also earthed.

The engine control unit M10 receives signals from the different sensors, thereby keeping all the engine operating parameters under control.
The timing sensor K47 receives a reference earth from pin 39 of connector E of the control unit M10 and sends a signal whose frequency corresponds to the timing at pin 40 of the same connector.
The engine temperature sender unit K36 receives a reference earth from pin 28 of connector E of the control unit M10 and supplies a signal proportional to the temperature of the engine coolant to pin 29 of connector E of the same control unit. The same sender unit provides information for theengine temperature gauge and overheating warning light.
The heated Lambda sensor K40 provides the control unit M10 with information surrouding the correct composition of the air/fuel mixture: the signal is sent to pin 32 of connector C of the control unit, whilst pin 31 provides the reference earth. The sensor K40 is heated by a resisatnce to ensure correct operation, even when cold; the resistance is supplied by relay J10 and receives the heating signal from pin 5 of connector A of M10.
The detonation sensors K50 and K51 allow, via the unaltered frequency signals from pins 42 and 44 of connector E of the control unit, respectively, information to be received concerning detonation conditions. The earth is sent by pins 41 and 43, respectively, of connector E of the control unit M10.
The air flow meter K41 (supplied by the relay J10) receives the reference voltage from pin 46 of connector E for the control unit and sends pin 47 of the same connector a signal proportional to the air flow rate. There is an air temperature sensor inside K41: the reference earth for the sensor is supplied from pin 48 of connector E of M10, whilst pin 45 of connector E receives the air temperature signal.

The accelerator pedal K55 is fitted with two integrated potentiometers (one main one and one safety one). The first receives a supply and earth from pins 22 and 23 of connector C of M10, respectively and sends the signal to pin 25.

Pin 14 for connector C of M10 receives the signal coming from the brake lights switch I30, with the supply "controlled by the ignition" (INT/A) with the line protected by fuse F1 of the junction unit B1.
Pin 19 for connector D of control unit M10 receives an earth signal coming from the clutch pedal switch I31.
Injectors N70 receive a go ahead supply for the opening from the main relay J10.
The engine control unit sends the commands to the injectors from pins 25, 13, 1, 26, 14 and 2 of the connector for cylinders 1, 2, 3, 4, 5 and 6, respectively.
Control unit M10 also controls the coils A30 via the signals for the primary coil windings, whilst the secondary winding sends the impulse to the spark plugs: pins 20, 6, 17, 13, 19 and 5 for connector F operate ignition coils 1, 2, 3, 4, 5 and 6, respectively. The primary coils A30 receive the go ahead supply for opening from the main relay J10.
The butterfly casing actuator N75 is fitted with two integrated potentiometers connected in parallel: it controls the opening of the butterfly by means of a stepping motor.
The motor receives a supply from pins 1 and 2 of connector F of M10. Pin 33 of connector E sends a supply to the two potentiometers, pin 32 of connector E provides the earth signal for them, whilst pins 31 and 34 of the same connector receive signals which arrive from the butterfly casing actuator N75.
The fuel vapour recovery solenoid valve L10 allows the flow of fuel vapours to the engine inlet where they are added to the mixture which enters the combustion chamber. Valve L10, supplied by the main relay J10 (through fuse B40), is opened by the control unit when the engine is operated by a duty cycle type signal from pin 21 of connector C for the control unit M10.
Control unit M10 is connected with the Lancia CODE control unit M20 through the special serial line from pin 39 of connector C; in this way, if the LANCIA CODE does not detect a correct code it does not give the go ahead and the engine is not started up.
The control unit is equipped with an autodiagnostic system, which can be used by connecting it to connector R10: it receives all the signals indirectly from the control unit M10 through the M20 CODE control unit serial line (pin 39 of connector C).
The autodiagnostic system also produces a signal - from pin 21 of connector F - for the "injection failure" warning light, in the instrument panel E50, which comes out of the control unit M10, whilst pin 15 of connector A for E50 provides a suppply controlled by the ignition (INT/A) from the line protected by fuse F1 of the junction unit B1. The speedometer signal (vehicle speed) reaches pin 13 of connector D for the control unit M10; the signal is produced by the ABS control unit M50.
The control unit M10 sends - pin 38 of connettore C - the instrument a signal proportional to the engine speed.
The control unit M10 is connected to the air conditioning system via pins 4 and 21 of connector E. This makes it possible to adjust the engine idle speed to the increase in the load each time the compressor is switched on or to switch it off in the case of high engine speed or load conditions.
The control unit also controls the engine cooling system: pin 6 of connector A, pin 3 of connector D and pins 15, 17 of connector E control the engagement of the relevant fan. The control unit M10 is connected to the electronic automatic transmission (CAE) via pins 5, 17 of connector D.
Pins 11 and 12 of connector D for the control unit M10 involve the connection with the ABS/ASR control unit, a connection made through the CAN line.
Pins 20, 21, 22, 23, 24 of connector D and pin 10 of connector E of control unit M10 are connected with the Cruise Control.
On some versions there is an additional connector R51 for connection with the control unit, located in the engine compartment; this connection is only used by the production plant and should not, under any circumstances, be used in a service situation.

BOSCH ME 2.1 SYSTEM WIRING DIAGRAM



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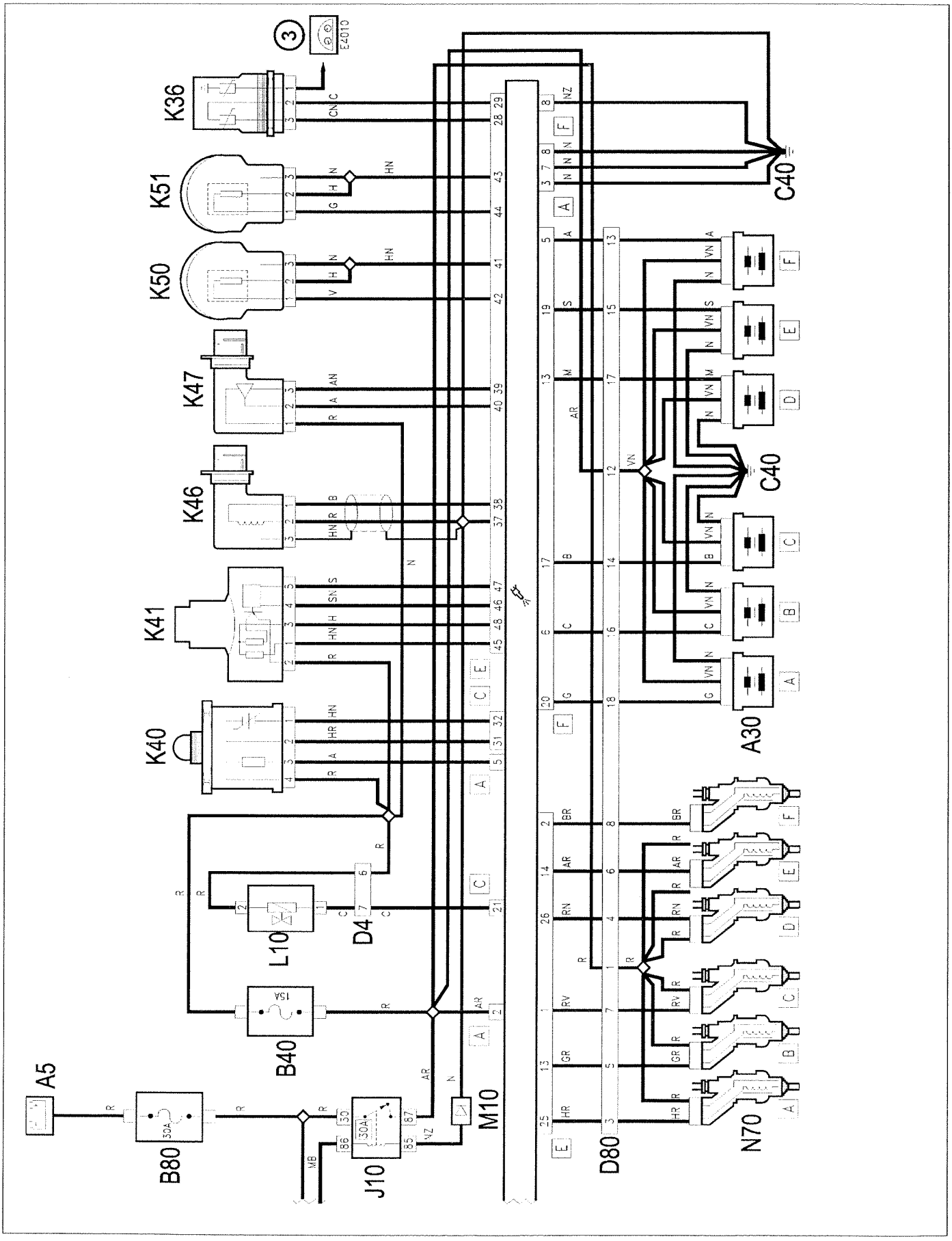
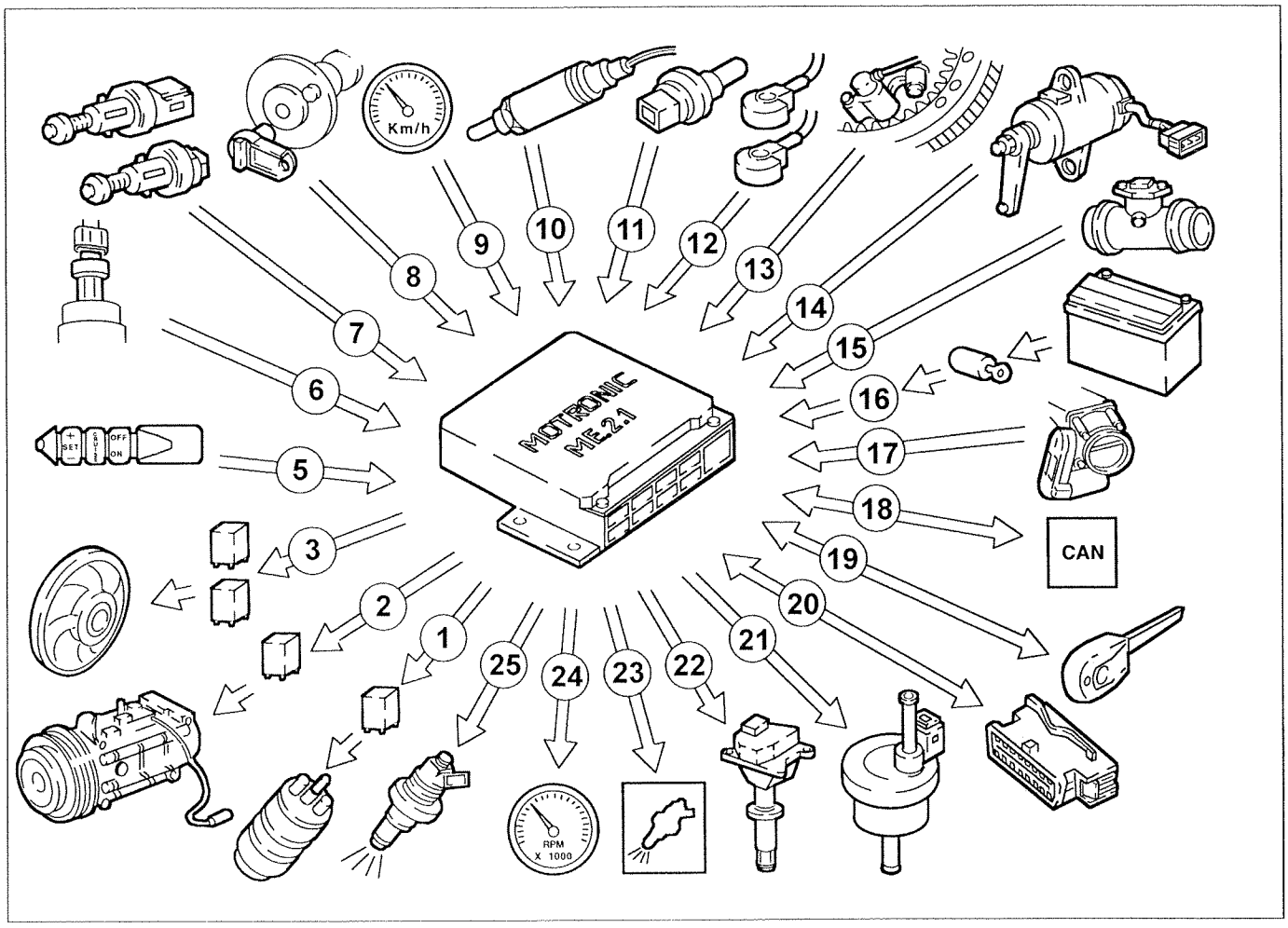


BOSCH ME 2.1 wiring diagram key

A30	Ignition coil
A5	Junction board
B1	Junction unit
B40	Injection services fuse
B5	MAXI FUSE box
B80	I.E. fuse (MAXI FUSE)
C21	Dashboard earth on Air Bag bracket
C30	Left rear earth
C40	Earth on engine
D23	Dashboard/i.e. coupling
D4	Engine front coupling
D5	ABS coupling plus antispin
D80	Injector coil coupling
E50	Instrument panel
I30	Switch on brake pedal
I31	Switch on clutch pedal
I50	Inertia switch
J10	Main injection relay
J15	Fuel pump relay
K36	Coolant temperature sensor/sender unit
K40	Lambda sensor
K41	Air flow meter
K46	Rpm sensor
K47	Cam angle sensor
K50	Detonation sensor
K51	Detonation sensor 2
K55	Accelerator pedal potentiometer
L10	Fuel vapour recovery solenoid valve
L15	Variable geometry solenoid valve
M10	Engine control unit
M11	Main injection relay diode
M20	CODE control unit
M50	ABS control unit
N40	Electric fuel pump and gauge
N70	Injector
N75	Integrated butterfly casing actuator
R10	Multiple diagnostic coupling
R51	I.E. control unit addtitional socket

1	Automatic transmission
2	CAN line
3	On board instruments
4	Cruise Control
5	Accelerator pedal
6	Air conditioning switch
7	Engine cooling fan
8	Brake lights
9	Engine control unit
10	ABS control unit
11	Horn
12	Supply from battery

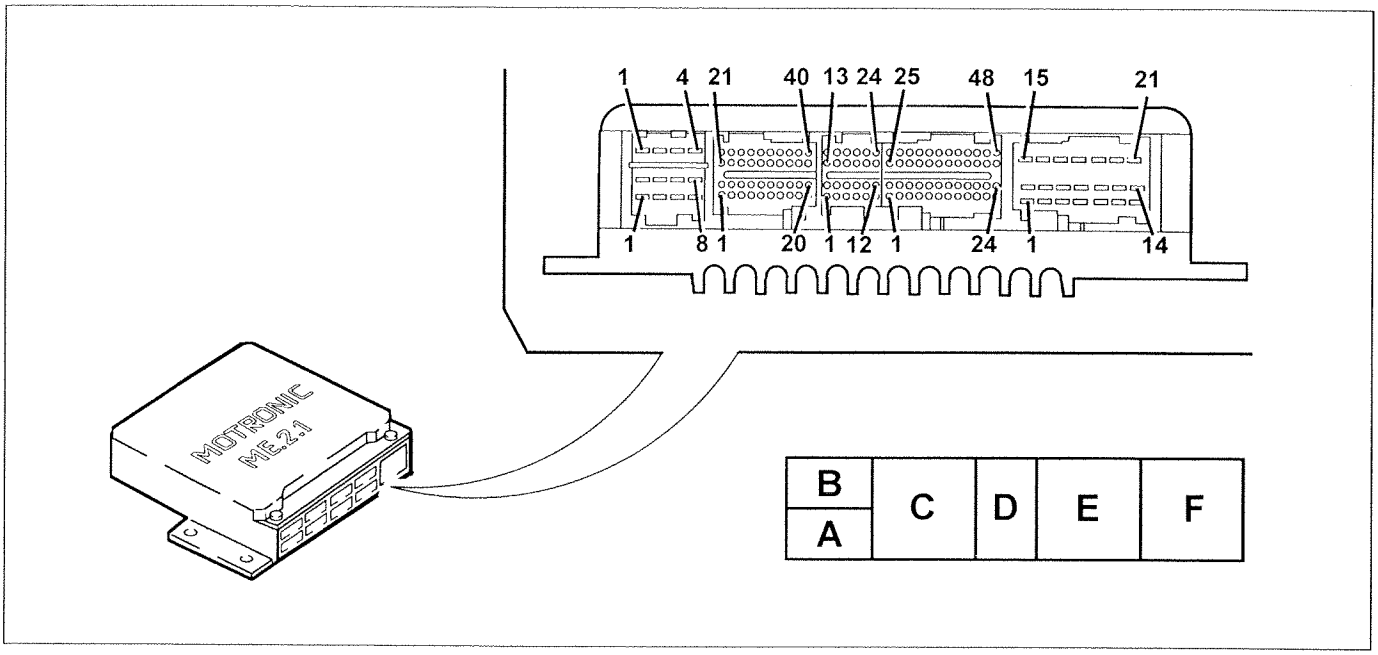
DIAGRAM SHOWING INFORMATION ARRIVING AT/LEAVING THE CONTROL UNIT AND SENSORS/ACTUATORS



P3U19FX01

1. Electric fuel pump
2. Air conditioning compressor
3. Radiator fan
4. N.c.
5. Cruise control
6. Four stage pressure switch
7. Brake-clutch pedal switches
8. Timing sensor
9. Speedometer
10. Lambda sensor
11. Coolant temperature sensor
12. Detonation sensors
13. Engine speed sensor
14. Accelerator pedal position sensor
15. Air flow meter with air temperature sensor
16. Battery
17. Butterfly casing integrated with D.V.L.
18. CAN line (communication with ABS / ASR / automatic transmission control units)
19. LANCIA CODE
20. Diagnostic equipment socket
21. Charcoal filter solenoid valve
22. Ignition coil (one per cylinder)
23. System failure light
24. Rev counter
25. Injector (one per cylinder)

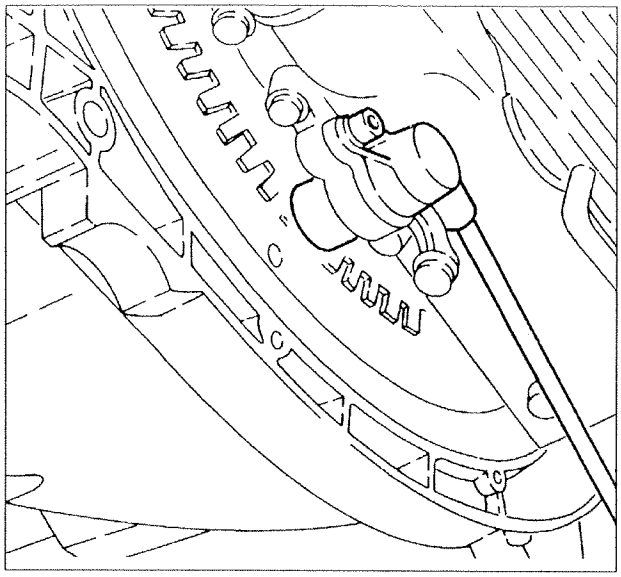
BOSCH ME 2.1 SYSTEM CONTROL UNIT PIN OUT

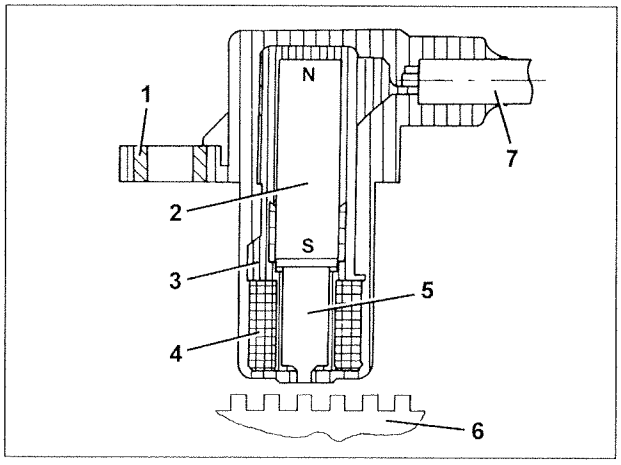


P3U20FX01

A-1 N.c.
A-2 Supply
A-3 Earth for ignition
A-4 N.c.
A-5 Lambda sensor heater
A-6 Fan 1st speed relay
A-7 Earth for ignition
A-8 Sensor earth
B-1 N.c.
B-2 N.c.
B-3 Programming
B-4 Battery
C-1 N.c.
C-2 N.c.
C-3 N.c.
C-4 N.c.
C-5 N.c.
C-6 N.c.
C-7 N.c.
C-8 N.c.
C-9 N.c.
C-10 N.c.
C-11 N.c.
C-12 N.c.
C-13 N.c.
C-14 N.c.
C-15 N.c.
C-16 N.c.
C-17 N.c.
C-18 N.c.
C-19 N.c.
C-20 N.c.
C-21 Charcoal filter solenoid valve
C-22 Accelerator pedal potentiometer 1 supply
C-23 ccelerator pedal potentiometer 1 earth
C-24 Accelerator pedal potentiometer 1 signal
C-25 Accelerator pedal potentiometer 2 signal
C-26 Accelerator pedal potentiometer 2 earth
C-27 Accelerator pedal potentiometer 2 supply
C-28 N.c.
C-29 Fuel pump relay
C-30 N.c.
C-31 Lambda sensor earth
C-32 Lambda sensor signal
C-33 N.c.
C-34 N.c.
C-35 N.c.
C-36 N.c.
C-37 N.c.
C-38 Rpm signal
C-39 Diagnostic connection (line K)
C-40 N.c.
D-1 N.c.
D-2 N.c.
D-3 Cooling fan 2nd speed relay
D-4 N.c.
D-5 CAE gear selector switch
D-6 N.c.
D-7 N.c.
D-8 N.c.

D-9 N.c.
D-10 N.c.
D-11 "High" CAN line
D-12 "Low" CAN line
D-13 Speedometer signal
D-14 Brake lights switch
D-15 N.c.
D-16 N-c-
D-17 CAE recognition
D-18 N.c.
D-19 Clutch pedal switch
D-20 Cruise control set +
D-21 Cruise control set -
D-22 Cruise control recall
D-23 Brake switch
D-24 Deactivation of cruise control
E-1 Operation of injector for cylinder n° 3
E-2 Operation of injector for cylinder n° 6
E-3 N.c.
E-4 Operation of air conditioning compressor relay
E-5 N.c.
E-6 N.c.
E-7 N.c.
E-8 N.c.
E-9 N.c.
E-10 Cruise control on warning light
E-11 N.c.
E-12 N.c.
E-13 Operation of injector for cylinder n° 2
E-14 Operation of injector for cylinder n° 5
E-15 Air conditioning pressure switch 1st stage
E-16 N.c.
E-17 Air conditioning pressure switch 2nd stage
E-18 N.c.
E-19 N.c.
E-20 N.c.
E-21 Air conditioning switch
E-22 N.c.
E-23 N.c.
E-24 N.c.
E-25 Operation of injector for cylinder n° 1
E-26 Operation of injector for cylinder n° 4
E-27 N.c.
E-28 Engine coolant temperature sensor earth
E-29 Coolant temperature sensor signal
E-30 N.c.
E-31 Butterfly casing potentiometer 1
E-32 Butterfly casing potentiometer earth
E-33 Butterfly casing potentiometer supply
E-34 Butterfly casing potentiometer 2
E.35 N.c.
E-36 N.c.
E-37 Engine rpm sensor (-)
E-38 Engine rpm sensor (+)
E-39 Timing sensor earth
E-40 Timing sensor signal
E-41 Earth for detonation sensor 1 (cylinders 1-4-5)
E-42 Detonation sensor 1 signal
E-43 Earth for detonation sensor 2 (cylinders 2-3-6)
E-44 Detonation sensor 1 signal
E-45 Air temperature sensor
E-46 Flow meter - reference voltage 5V
E-47 Flow meter signal
E-48 Flow meter earth
F-1 Butterfly casing motor integrated with D.V.L. (-)
F-2 Butterfly casing motor integrated with D.V.L. (+)
F-3 N.c.
F-4 N.c.
F-5 Operation of ignition coil for cylinder n° 6
F-6 Operation of ignition coil for cylinder n° 2
F-7 N.c.
F-8 Earth
F-9 N.c.
F-10 N.c.
F-11 N.c.
F-12 N.c.
F-13 Operation of ignition coil for cylinder n° 4
F-14 N.c.
F-15 N.c.
F-16 N.c.
F-17 Operation of ignition coil for cylinder n° 3
F-18 N.c.
F-19 Operation of ignition coil for cylinder n° 5
F-20 Operation of ignition coil for cylinder n° 1
F-21 Operation of injection warning light





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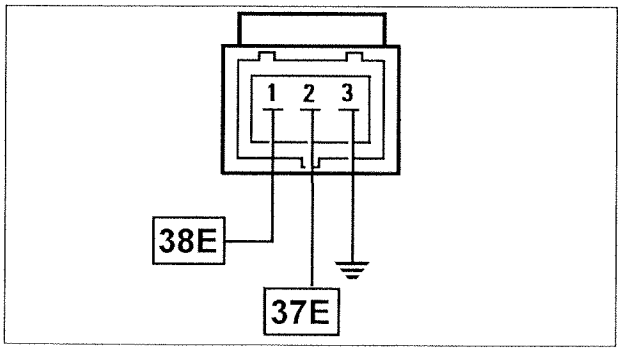

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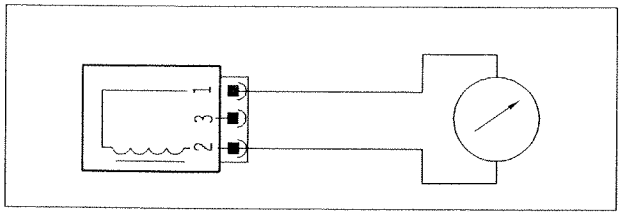


ENGINE RPM AND TDC SENSOR

The engine rpm and TDC sensos is fixed to the cylinder block/crankcase facing the flywheel on the crankshaft pulley.

Operating principle

The sensor consists of a tubular casing which houses a permanent magnet (2) and an electrical winding (4). The magnetic flow created as a result of the flywheel teeth pasing is subject to fluctuations resulting from the variation in the gap.

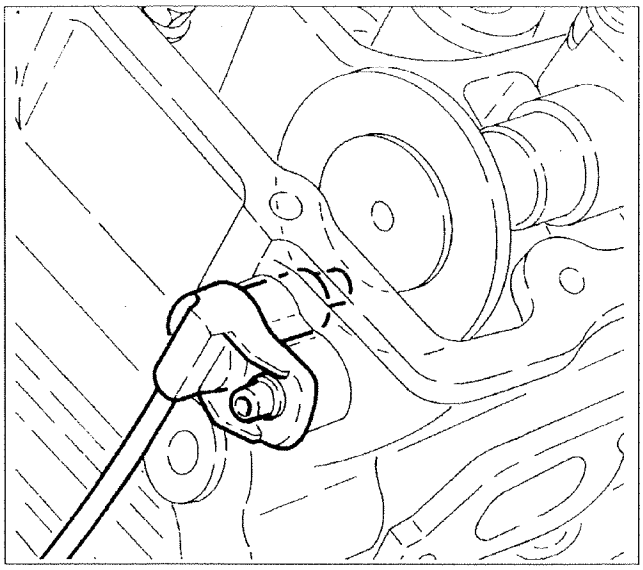
These fluctuations produce an electro-motive force in the winding where there is an alternately positive and negative voltage. The peak sensor output voltage depends, all things being equal, on the distance between the sensor and the tooth (gap).

1, Brass metal bushing
2, Permanent magnet
3, Plastic sensor casing
4, Coil winding
5, Polar core
6, Ring gear or flywheel
7, Electrical cable

Wiring connector

The sensor resistance can be measured by disconnecting the connector and connecting an ohmmeter to the sensor.

Resistance: 860+10% ohm at 20 °C



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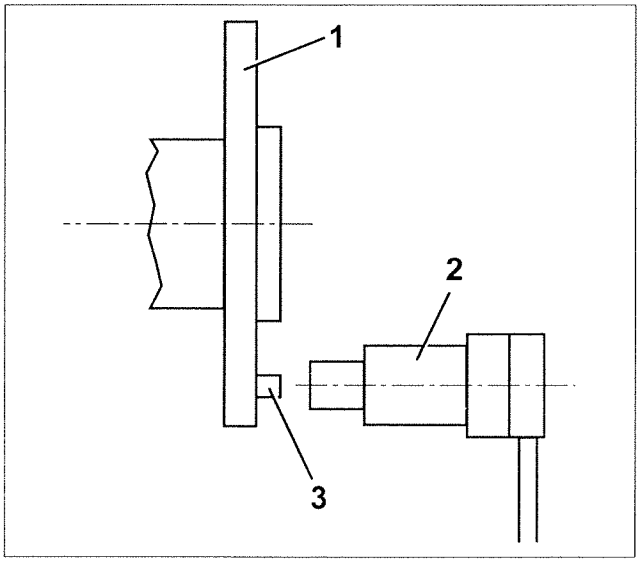
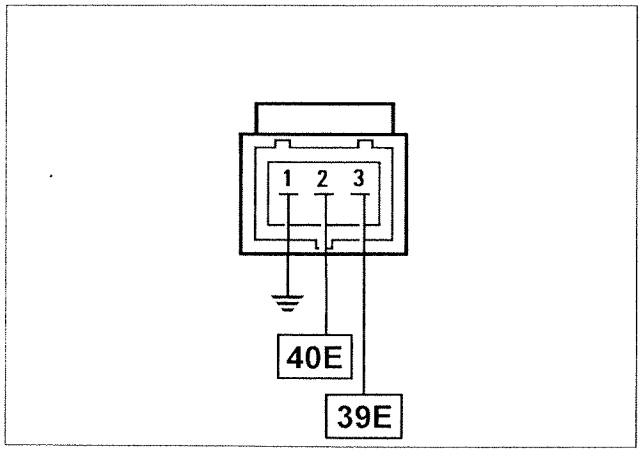


P3U23FX02

Wiring connector



P3U23FX03

ENGINE TIMING SENSOR

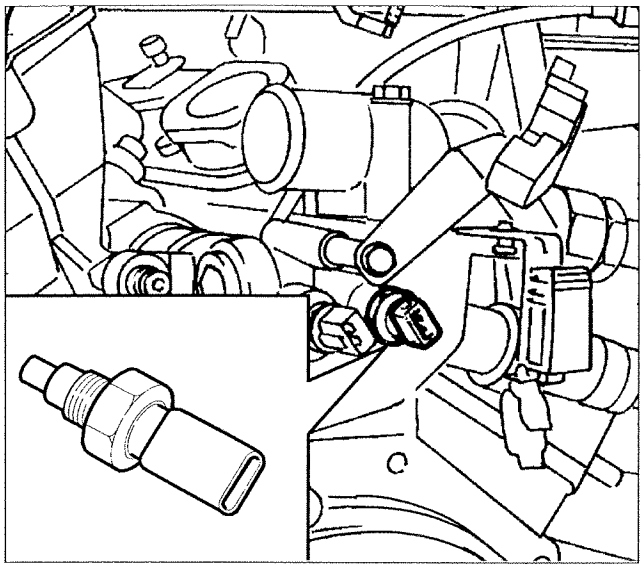
The engine timing signal, together with the engine rpm and TDC signal, allows the control unit to recognize the order of the cylinders to implement the phased injection.
This signal is produced by a Hall effect sensor, fitted by the exhaust camshaft drive pulley.

NOTE *The sensor angular position cannot be adjusted in any way.*

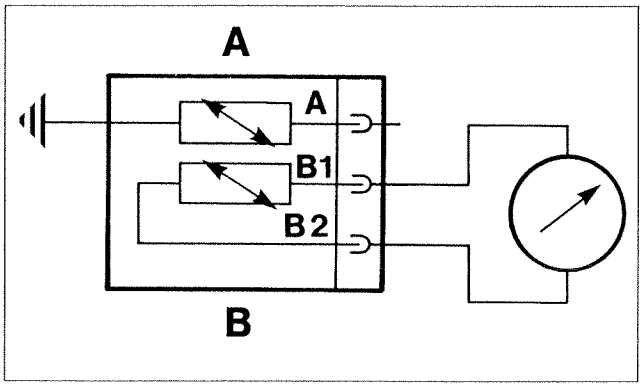
Operating principle

1, Camshaft disc
2, Timing sensor
3, Dowel

A semi-conductor layer through which the current passes, immersed in a normal magnetic field (lines of force perpendicular to the direction of the current) produces a difference in power, known as Hall voltage.
If the intensity of the current remains constant, the voltage created only depends on the intensity of the magnetic field. Simply varying the intensity of the field periodically therefore produces a modulated electrical signal.
The rotation of the disc (1) when the dowel (3) passes the sensor (2) locks the magnetic field with a consequent "low" output signal. Conversely, when after the dowel (3) the sensor (2) reading produces a "high" signal. As a result the high signal alternates with the low signal once every two revolutions of the engine (see paragraph on "signal management").



P3U24FX01



P3U24FX02

COOLANT TEMPERATURE SENSOR

This sensor is fitted on the themostat casing; it is made up of a brass casing which affords protection to the actual resistive elements consisting of two NTC thermistors (Negative Temperature Coefficient, the electrical resistance of the sensor decreases as the temperature increases).
The two NTC elements are distinctive and provide information on the temperature for the specific gauge in the instrument and for the injection/ignition control unit.
The reference voltage for the NTC element for the injection system is 5 Volt; since the control unit intake circuit is designed as a voltage divider, this voltage is shared between a resistance in the control unit and the sensor NTC resistance. As a result the control unit is capable of carrying out evaluations through the changes in voltage and thereby obtain information on the temperature.

A. NTC for instrument panel
B. NTC for injection system

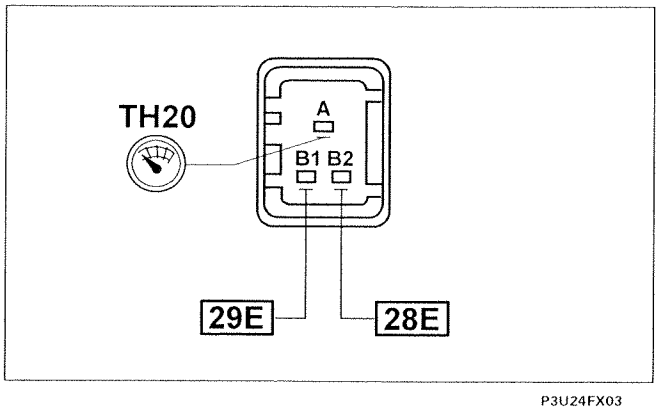
INJECTION NTC

°C	Ω
-20	15970
-10	9620
0	5975
10	3816
20	2500
25	2044
30	1679
40	1150
50	807
60	576
70	418
80	309
90	231
100	176

INSTRUMENT NTC

°C	Ω
	76/88
60	512/602
90	
120	

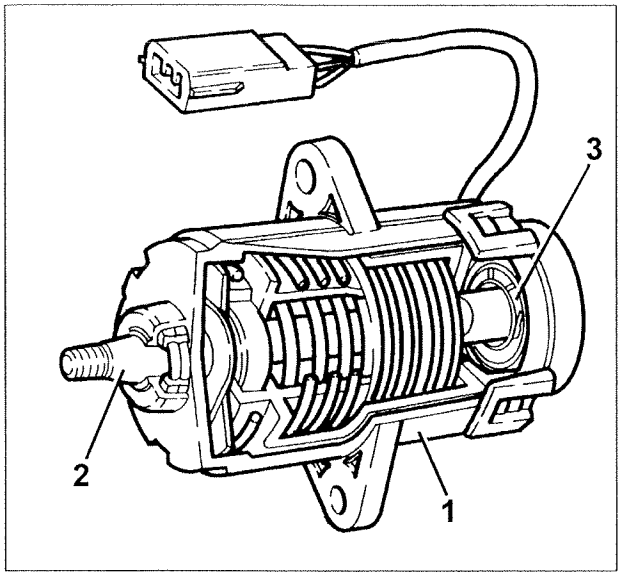
Wiring connector



P3U24FX03

Checking the resistance

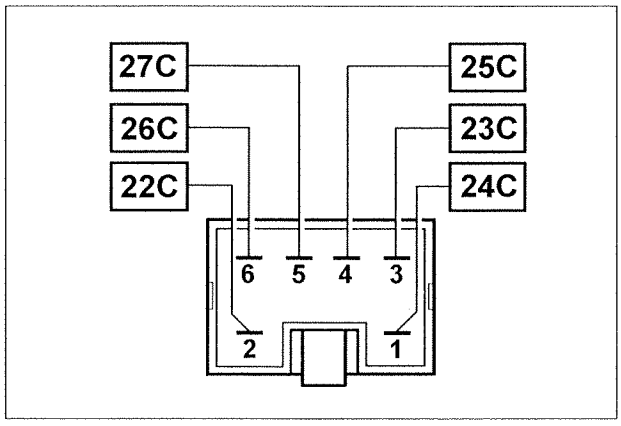
The table at the side contains the resistance values which the NTC elements can assume according to the temperature. These figures can be measured by disconnecting the connector and connecting an ohmmeter to the sensor pins.



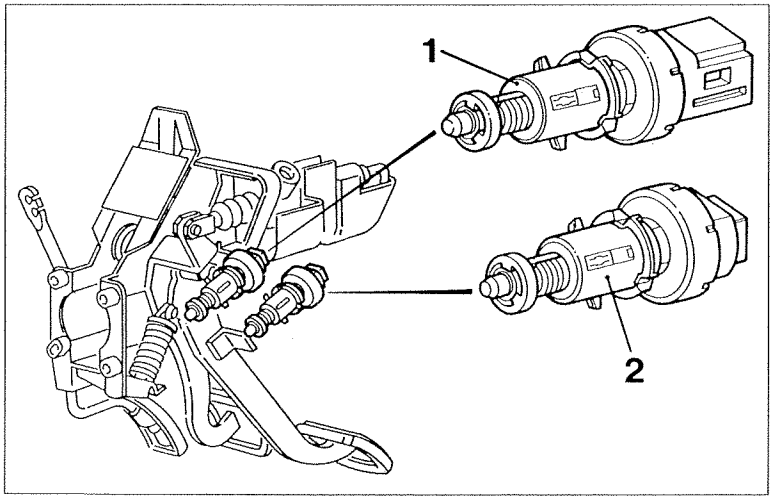
ACCELERATOR PEDAL POTENTIOMETER

The position of the accelerator pedal is tranformed into an electrical voltage signal and is sent to the injection control unit by the potentiometer connected to the pedal.
The accelerator pedal position signal is processed together with the information relating to the engine speed to obtain the injection times and pressures.
The sensor consists of a casing (1) fixed to the pedals by means of a flange, which contains a shaft (2), in an axial position, connected to the two potentiometers (3): one main one and one safety one.
A coil spring on the shaft guarantees the correct resistance to pressure, whilst a second spring ensures the return on release.

Wiring connector



P3U25FX02



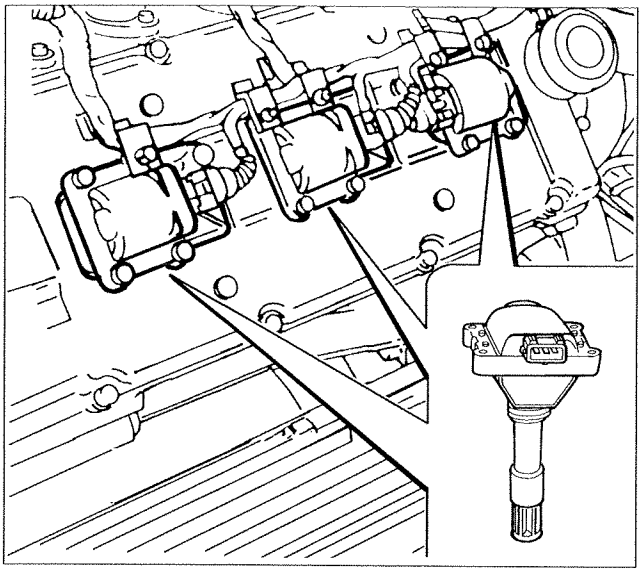
P3U25FX03

BRAKE PEDAL SWITCH

There is a switch (1) on the brake pedal which operates the brake lights; the same switch sends a signal for the injection control unit.
The "brake pedal pressed" signal is used by the control units for:
- understanding a deceleration situation;
- checking the plausibility of the signal coming from the accelerator potentiometer.

CLUTCH PEDAL SWITCH

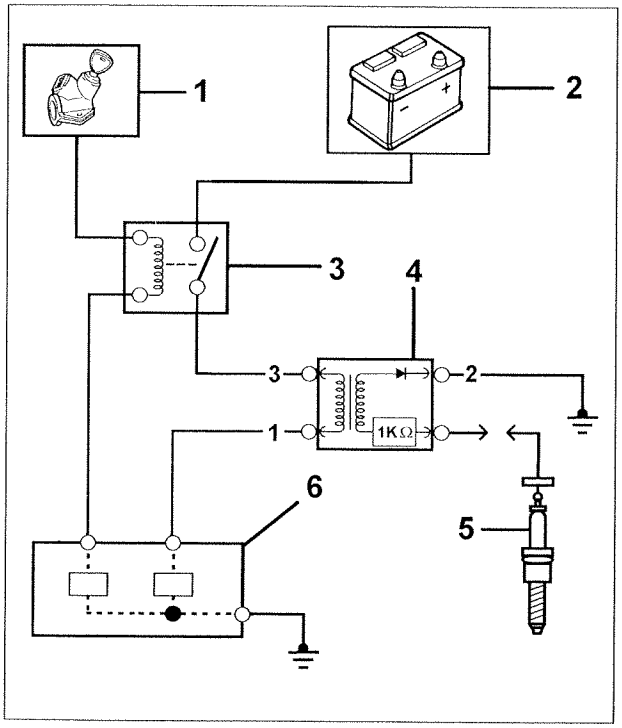
There is a switch (2) on the clutch pedal connected to the injection control unit.
The "clutch pedal operated" signal is used by the injection control unit for distinguishing gear engaged and gear change conditions.



P3U26FX01

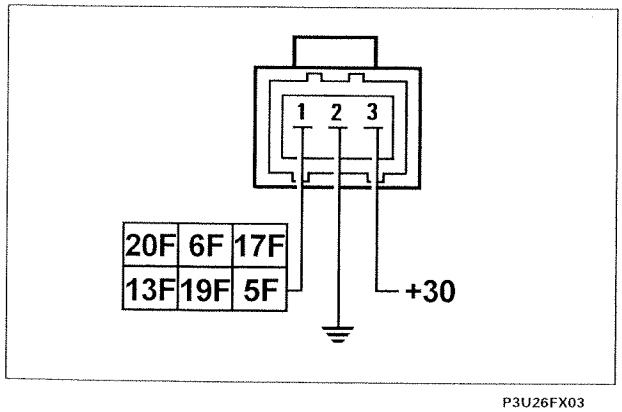
IGNITION COILS

The ignition is the static advance type, with a single coil for each spark plug (SINGLE COIL); this solution dispenses with the high tension circuit, improving reliability and safety and decreasing the risk of interference due to high tension connections and leads.
It involves a normal coil which increases the tension of the impulse sent to the spark plugs: each single coil, located in the cylinder head, directly supplies a spark plug without intermediary cables.



P3U26FX02

Diagram showing electrical connections
1. Supply through ignition switch
2. Battery
3. Relay
4. Coil
5. Spark plug
6. Electronic control unit



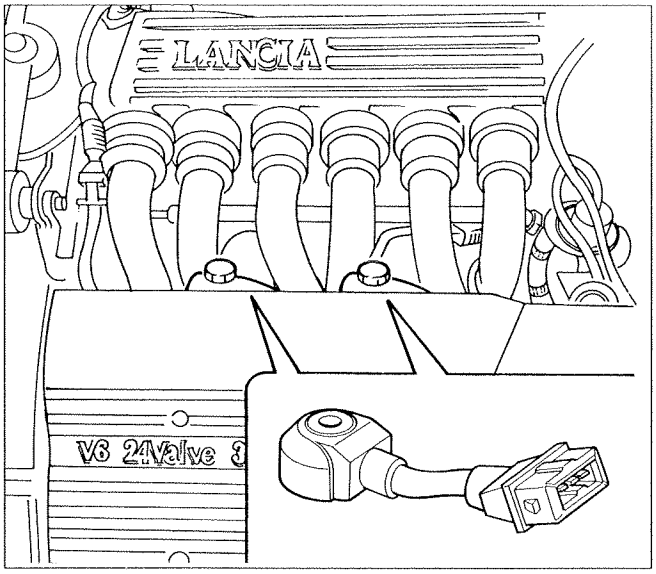
P3U26FX03

Checking coil primary winding resistance

The resistance is checked by connecting an ohmmeter to the outer pins (pins 1 and 3) of the connector:

Primary resistance: 0,48 ohm

Wiring connector

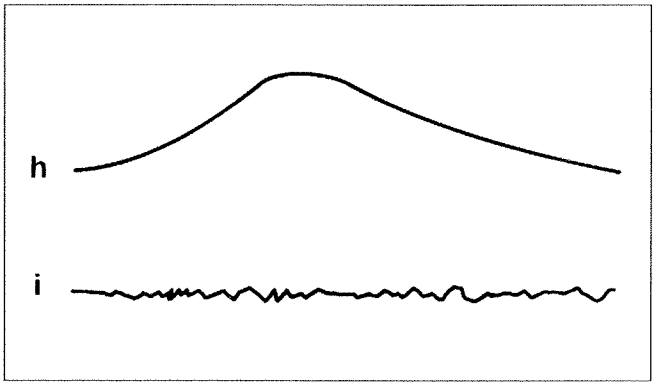


P3U27FX01

DETONATION SENSOR

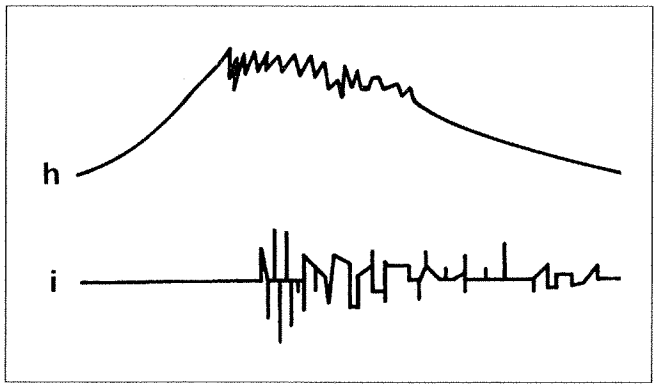
The detonation sensors are located in the monobloc under the inlet manifolds.
These sensors have a bush to prevent incorrect torque tightening. If they are replaced, do not place washers or shims between the crankcase and sensor contact surfaces.
This sensor makes it possible to detect detonation, vibrations due to the irregular combustion of the mixture in the combustion chamber.
If this phenomenon is repeated it can destroy the mechanical parts as a result of the irregular increase in the temperature of the walls.

When the engine is detonating, vibrations of a particular frequency are produced in the cylinder block which are transformed by the sensor into a voltage signal proportional to their intensity.



P3U27FX02

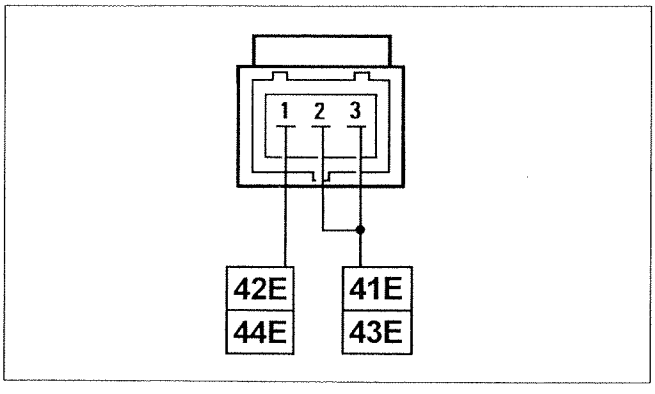
A: combustion without detonation
The curve (h) shows the pressure in the cylinder without detonation.
The sensor produces a signal (i) corresponding to the curve (h).



P3U27FX03

B: combustion with detonation
The curve (h) shows the pressure in the cylinder with detonation: it can be seen that the pressure is more irregular. The sensor signal (i) detects the onset of particularly intense vibrations.

Wiring connector

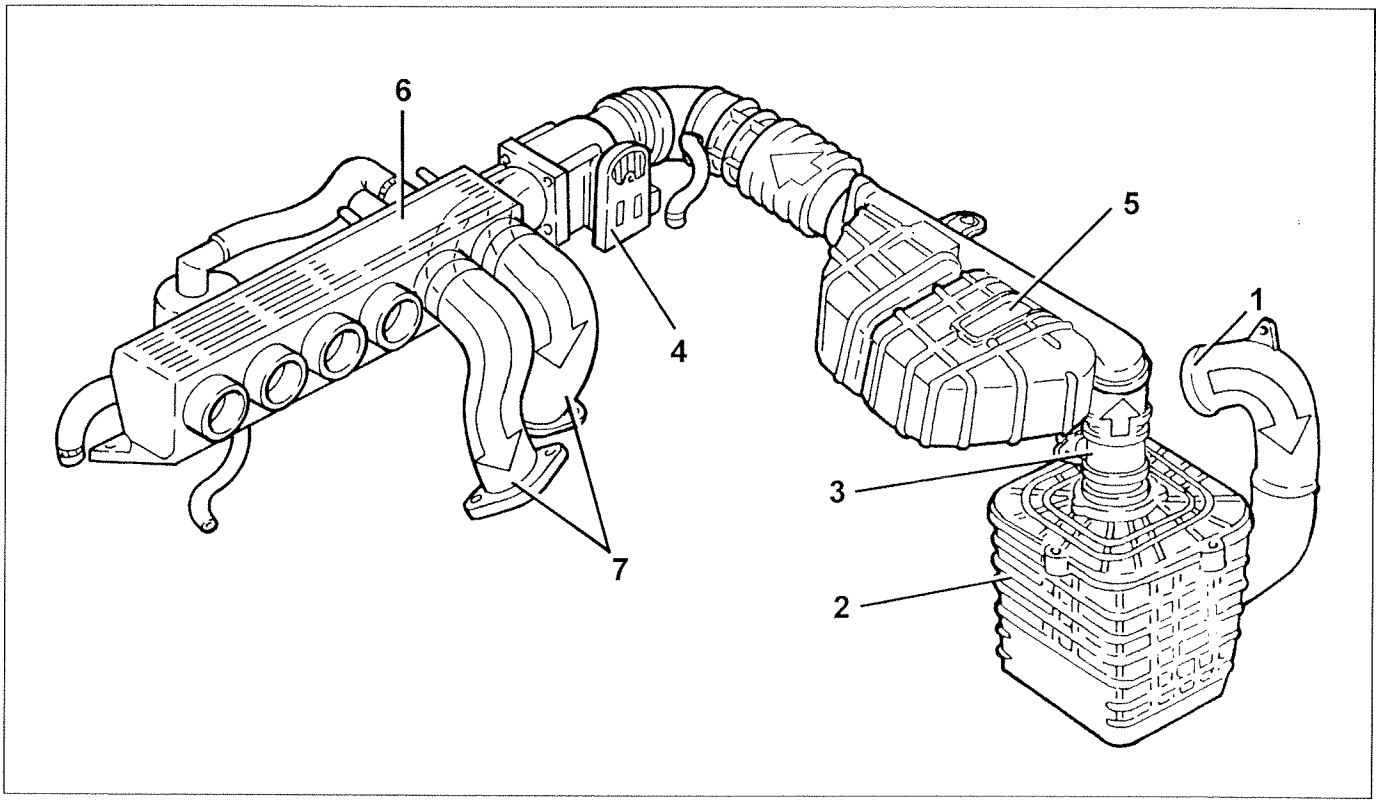


P3U27FX04

INLET CIRCUIT

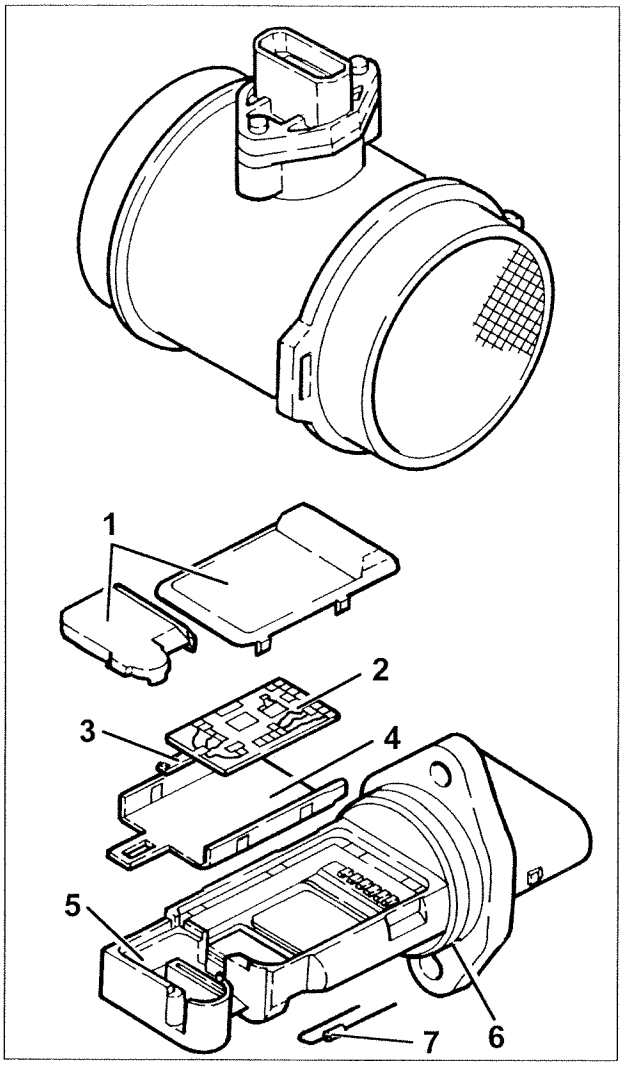
The inlet circuit consists of the following components;
- air filter with hoses;
- air flow meter;
- acoustic resonator fitted in parallel to the inlet hose;
- motorized butterfly casing;
- inlet chamber on which the inlet manifolds and the motorized butterfly casing are fitted.

DIAGRAM SHOWING INLET CIRCUIT

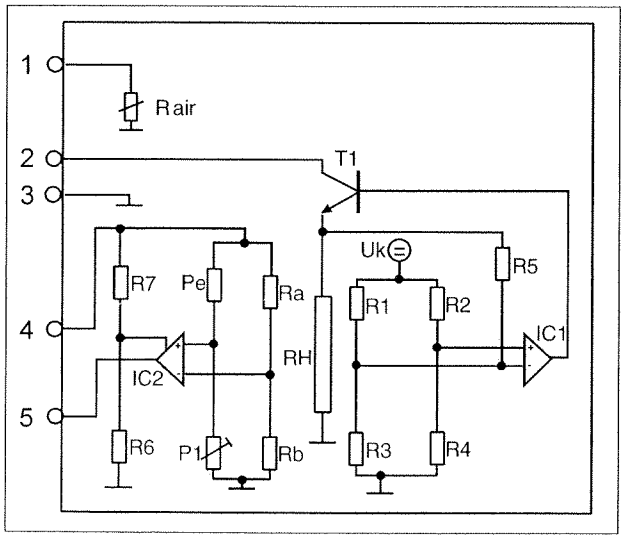


P3U28FX01

1. Inlet vent
2. Air filter
3. Air flow meter
4. Motorized butterfly casing
5. Resonator
6. Inlet chamber
7. Inlet manifolds



P3U29FX01



P3U29FX02

1. Air temperature signal
2. Battery voltage
3. Earth
4. Reference voltage (5V)
5. Air flow rate signal

AIR FLOW METER

The flow meter is located on the air inlet hose and is the hot film type.
The intake air temperature sensor is integrated inside the flow meter.
The operation is based on a heated diaphragm in a measuring duct through which the air entering the engine flows.
The hot film diaphragm is kept at a constant temperature (about 120 °C higher than the temperature of the entering air) by the heating resistance.

The mass of air passing through the measuring duct tends to remove heat from the diaphragm therefore, in order to keep the latter at a constant temperature, a certain current must flow through the resistance.

This current, being proportional to the mass of air flowing through the engine, is measured by a Wheatstone bridge and the signal obtained is sent to the injection control unit.

1. Covers
2. Electronic card
3. Sensor
4. Support plate
5. Support
6. O-Ring
7. Temperature sensor

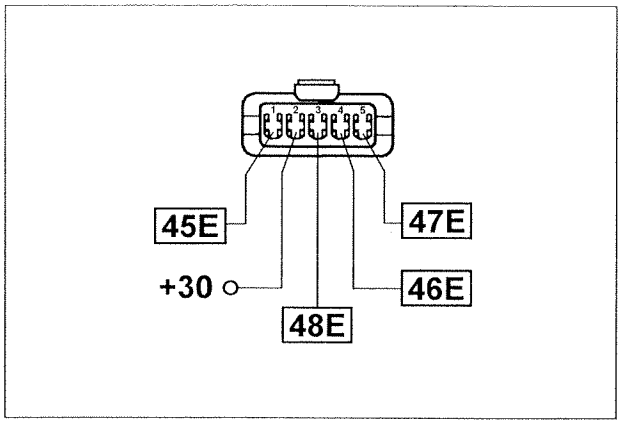
NOTE *This flow meter measures the mass of air (and not the volume) directly, thereby eliminating problems of temperature, altitude, pressure, etc.*

Description of the operation

The Wheatstone bridge (made up of resistances R1, R2, R3, R4) is balanced when R3 is about 120 °C higher than the temperature of the air.

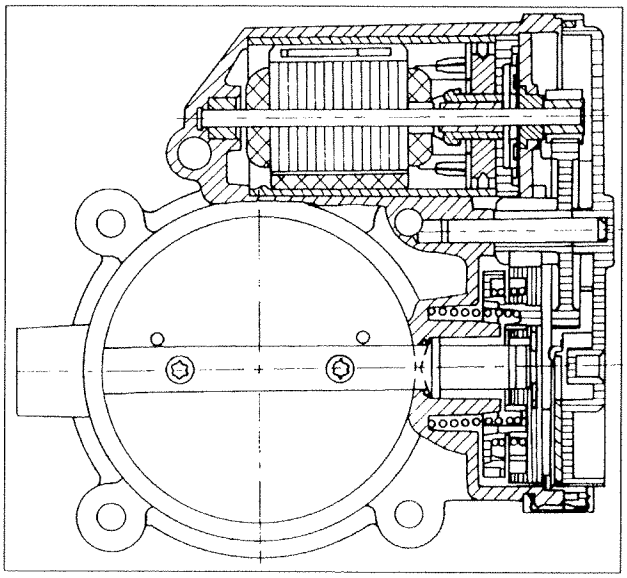
The air that passes through the diaphragm removes heat from R3, consequently the bridge is not balanced.

This situation is detected by the circuit at IC1, which controls transistor T1, in a manner proportional to the imbalance of the bridge, as a result of which more current passes through Rh to heat R3 and therefore restore the balance of the bridge.
The circuit IC2 measures the current passing through Rh.
This current allows the bridge to be kept balanced and is therefore proportional to the mass of air passing through the air flow meter.



P3U30FX01

Wiring connector



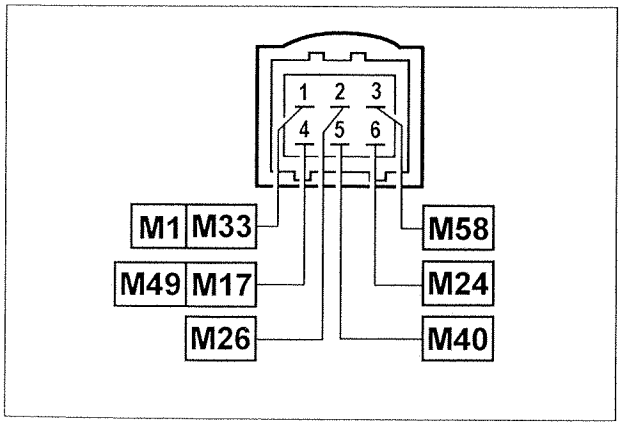
P3U30FX02

BUTTERFLY CASING ACTUATOR

The actuator is fixed to the inlet chamber and regulates the quantity of air drawn in by the engine.

Depending on the signal coming from the accelerator pedal potentiometer, the injection control unit opens the butterfly by means of a direct current motor integrated in the butterfly casing actuator.

The butterfly casing actuator is equipped with two integrated potentiometers connected in parallel so that they control each other. In the case of a fault with the two potentiometers or if there is no supply, the control unit reduces the engine torque, according to the position of the accelerator pedal. The replacement of the butterfly casing actuator or the injection control unit means that the "self-learning" procedure has to be carried out (see chapter on CHECKS, ADJUSTMENTS AND REPAIR OPERATIONS).



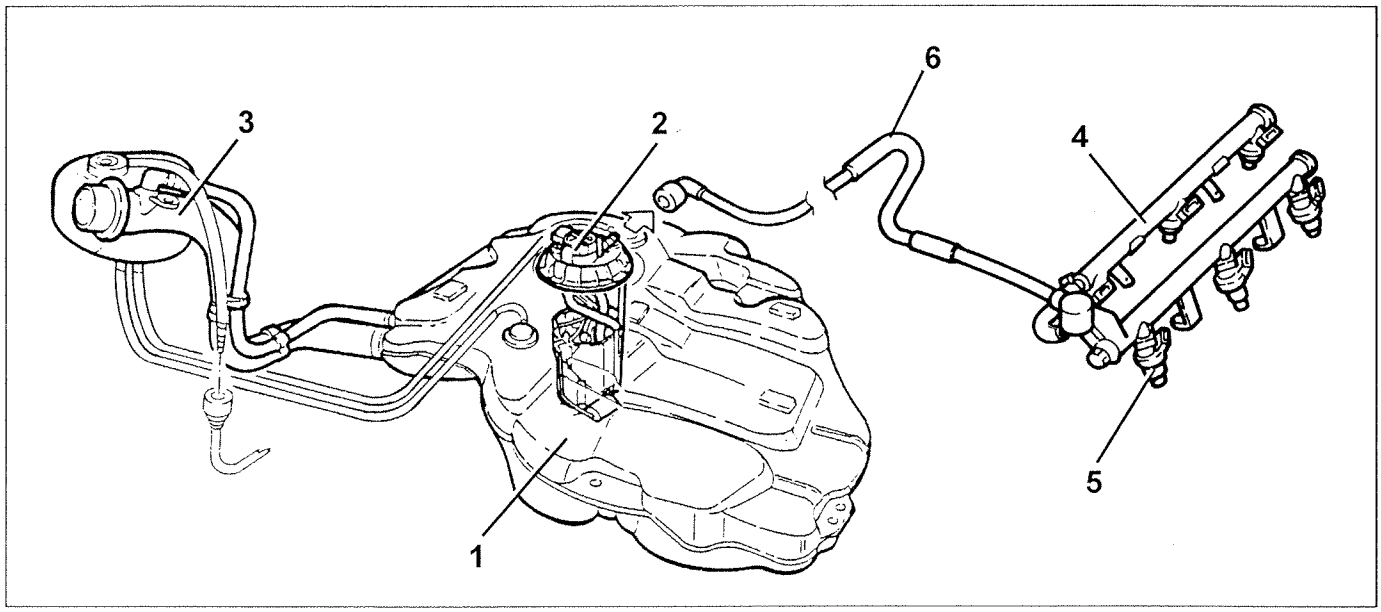
P3U30FX03

Wiring connector

FUEL SUPPLY CIRCUIT

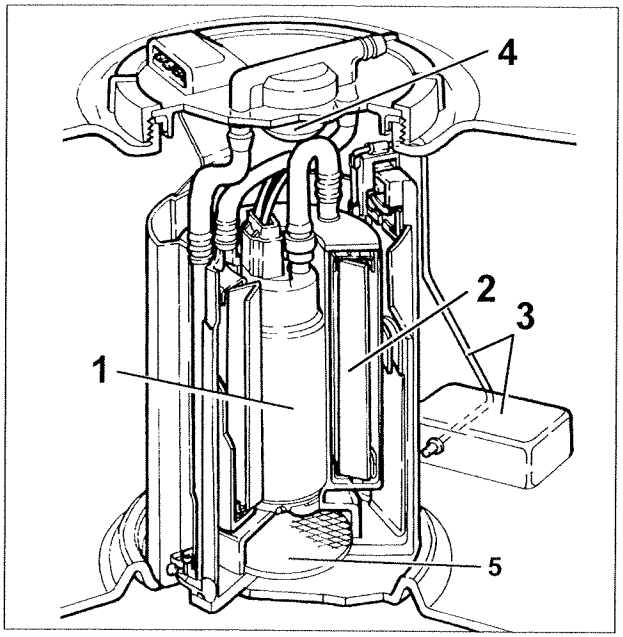
This circuit consists of the following components:
- Fuel tank
- Drip tray complete with pump, filter, pressure regulator and gauge
- Supply pipe
- Returnless type fuel manifold complete with injectors

DIAGRAM SHOWING FUEL CIRCUIT



P3U31FX01

1 Fuel tank
2 Drip tray complete with pump, filter, pressure regulator and gauge
3 Fuel filler
4 Returnless type fuel manifold
5 Injector
6 Supply pipe



P3U32FX01

1. Electric fuel pump
2. Fuel filter
3. Gauge with float
4. Pressure regulator
5. Gauze pre-filter

FUEL DRIP TRAY ASSEMBLY

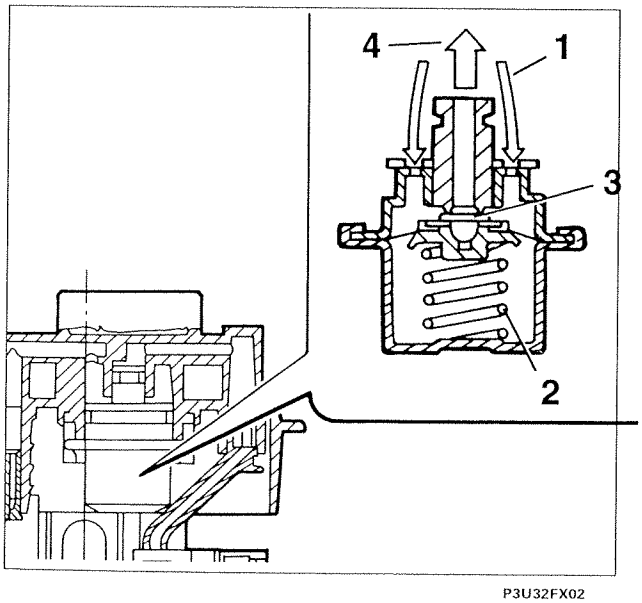
Electric fuel pump

The pump is housed inside the fuel tank in a special tray which also supports the gauge and is equipped with a filter on the pump inlet.
The pressure regulator is fitted on the pump supply.
The pump is the single stage peripheral flow type and is adapted to run on unleaded fuel.
The rotor is driven by a c.c. electrical motor supplied by a relay, operated by the control unit to ensure:

- that the pump cuts out if the speed goes below a minimum level
- the timed operation (about 5 seconds) each time the ignition switch is turned to the ON position without the engine being started up;
- the operation with the engine started up.

The pump is equipped with an excess pressure valve which short circuit the supply with the inlet if the pressure in the supply circuit exceeds about 5 bar to prevent the electric motor from overheating.

In addition, a one-way valve in the supply, prevents the entire fuel circuit from being drained when the pump is not working.



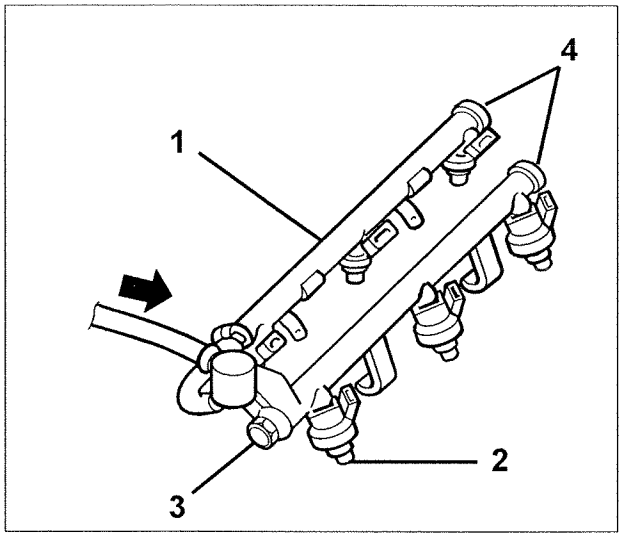
P3U32FX02

Fuel filter

The fuel filter is housed in the casing surrounding the pump and does not require periodic replacement.

Fuel pressure regulator

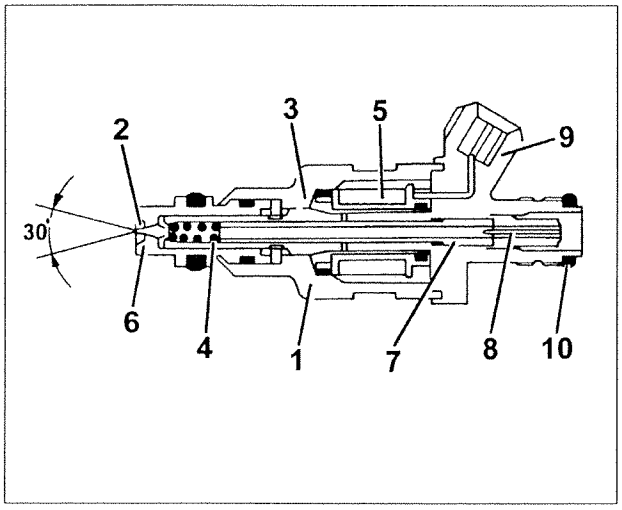
This is a differential diaphgragm type device, regulated during manufcature to a pressure of 3.50±0,05 bar and located in the top part of the drip tray assembly.
The fuel under pressure (1), coming from the pump, exerts a force on the flow valve (3) opposed by the calibrated spring (2). As the calibration pressure is exceeded, the flow valve opens and the excess fuel (4) returns to the tank, thereby stabilizing the pressure in the circuit.



FUEL MANIFOLD

The fuel manifold, which has the task of distributing the fuel to the injectors, is produced by aluminium die-casting and incorporates the seats for the injectors and the air bleed valve.
The fuel intake is achieved by means of a rapid attachment. Since the system is the returnless type, there is no recirculation pipe.

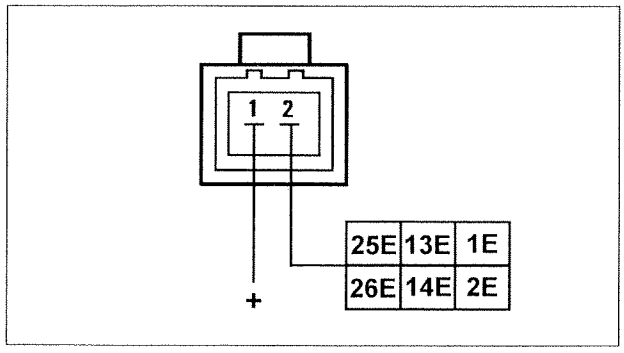
1. Fuel manifold
2. Injectors
3. Fuel supply connector
4. Bleed valve



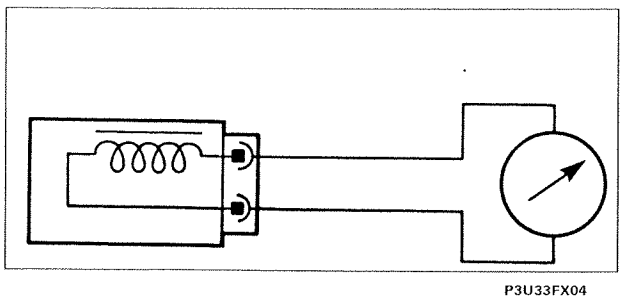
INJECTORS

The injector has the task of supplying the amount of fuel required for the operation of the engine: the fuel is injected into the inlet manifold, immediately upstream of the inlet valves.
A single jet, top-feed type of injector basically consists of a nozzle operated by a solenoid valve and a return spring.
In the rest position, the needle (2), which is in one piece with the core (3), is thrust by the spring onto the nose of the injector (6), closing the opening and guaranteeing the seal to prevent the unwanted escape of fuel.
As soon as the winding (5) is energized, the core is attracted, it compresses the spring opening the nozzle port and allowing the fuel to come out.

1. Injector body
2. Needle
3. Magnetic core
4. Coil spring
5. Winding
6. Injector nose
7. Adjustable spring
8. Filter
9. Electrical connection
10. Seal



P3U33FX03

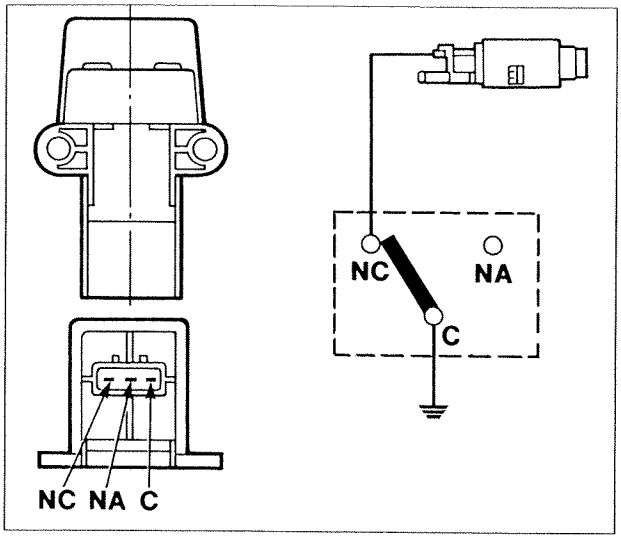


P3U33FX04

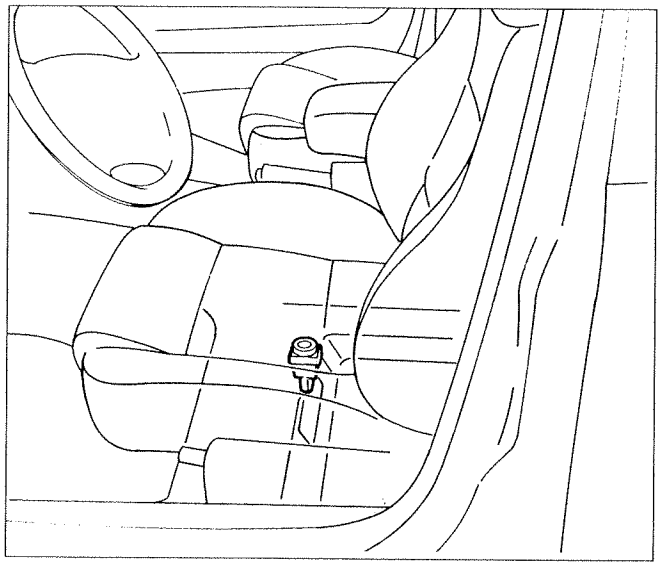
Wiring connector

The injector resistance can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

Resistance value: 14.5±5% ohm at 20 °C



P3U34FX01



P3U34FX02

INERTIA SAFETY SWITCH

The inertia switch has the task of interrupting the electrical supply of the electric fuel pump if the vehicle is subject to violent deceleration (impact) to prevent fuel from escaping and creating a fire risk if the fuel manifold or the supply pipe are damaged.

The switch consists of a steel ball fitted in a conical shaped housing and kept in position by the attraction force of a permanent magnet.

Below the action of acceleration due to inertia forces, the ball can be released from the magnetic clip and gradually come out of the tapered housing in an upwards movement which depends on the angle of the cone.

There is a rapid mechanism above the ball which forms a normally closed (NC) circuit. When the ball is struck, the mechanism changes position into a normally open (NA) circuit thereby interrupting the electrical supply to the electric pump and causing it to cut out.

The calibration of the switch causes intervention at acceleration above 1.2 g (about 11.7 m/s^2, corresponding to an impact at a speed of around 25 kph).

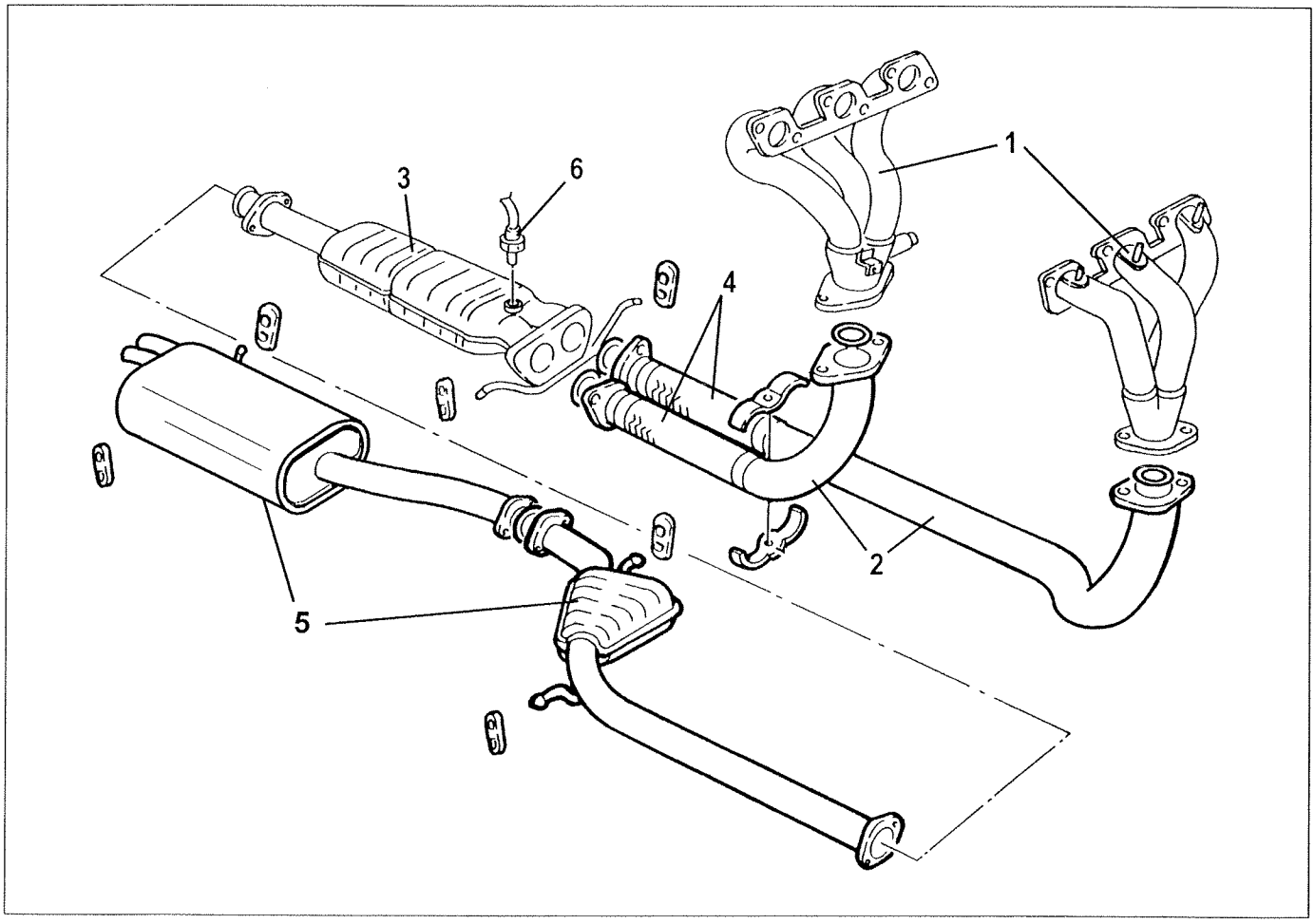
To restore the connection to earth for the auxiliary electric pump, the seat must be moved backwards and the switch pressed until it can be heard to click.

After an apparently slight impact, if there is a smell of fuel or there are leaks from the fuel system, do not turn the switch back on, but search for the cause of the problem and remedy it to prevent the risk of fire.
If this is not the case and there are no leaks, the vehicle can be restrated by pressing the button to reactivate the electric pump.

EMISSION CONTROL DEVICES

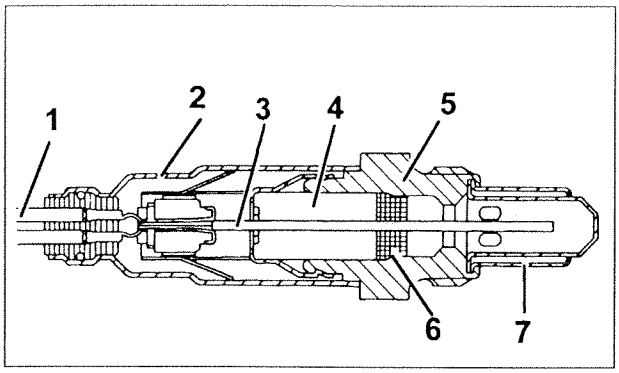
The devices adopted for this purpose have two objectives:
- to keep down the levels of pollutant substances present at the exhaust, by means of the Lambda sensor and the catalytic silencer;
- to eliminate the outwards dispersion of unburnt hydrocarbons, by means of the (fuel) anti-evaporation system and the (lubricant) oil vapour recirculation system.

DIAGRAM SHOWING EXHAUST SYSTEM

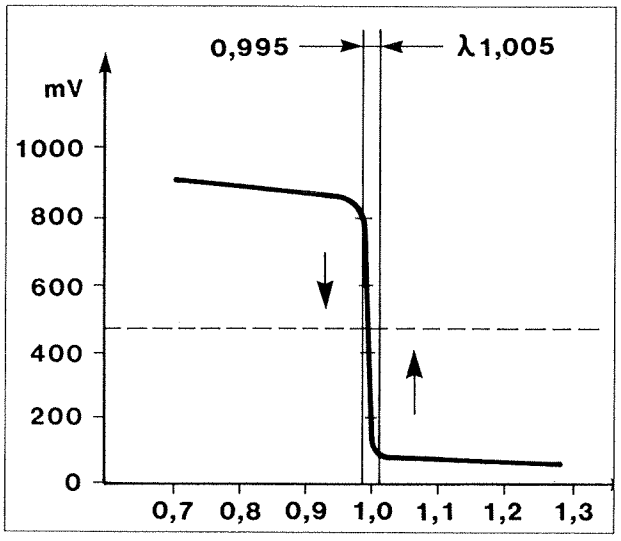


P3U35FX01

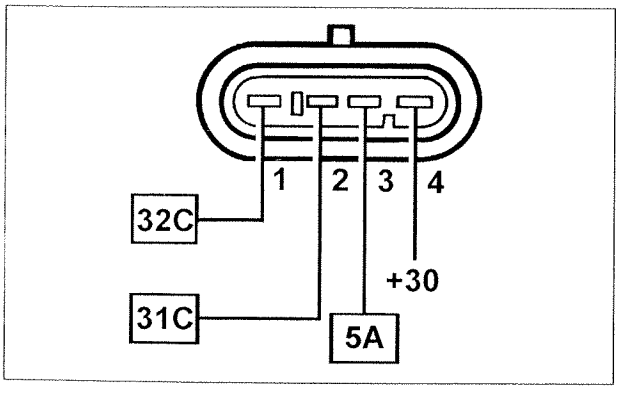
1. Exhaust manifold
2. First section of exhaust
3. Catalytic silencer
4. Flexible element
5. Silencers
6. Lambda sensor



1. Connecting cable
2. Protective sleeve
3. Planar sensor element
4. Ceramic support pipe
5. Sensor housing
6. Ceramic seal
7. Protective tube



Wiring connector



P3U36FX03

LAMBDA SENSOR

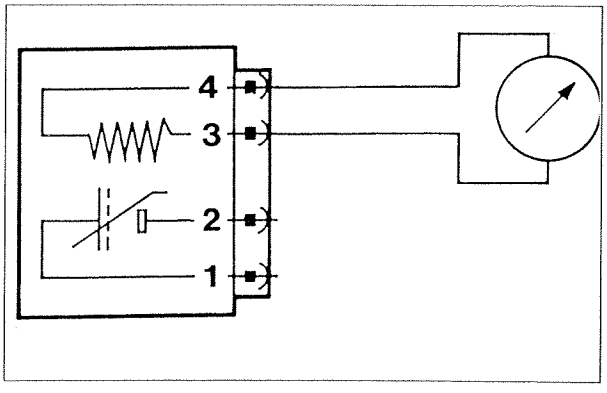
The Lambda sensor measures the oxygen content of the exhaust gases: it is fitted on the exhaust pipe, upstream of the catalytic silencer.
The sensor output signal is sent to the control unit for the correction (feed-back) of the mixture strength.
When the sensor provides a low signal (voltage below 200 mV), the control unit recognizes a weak mixture and increases the injection time; later on, when the sensor signal is high (voltage above 800 mV), the control unit recognizes a rich mixture and decreases the injection time. This sequence is repeated with a frequency in the order of tens of Hertz, so that the engine is constanly operating at a mixture strength fluctuating around the stoichiometric value. The measuring cell and the heater are integrated in the "planar" (stratified) ceramic element with the advantage of the cell heating up rapidly to allow the closed loop control within 10 seconds of the engine being started up.

At temperatures below 300°C, the ceramic material is not activated, therefore the sensor does not send signals which can be understood: to ensure that it heats up rapidly during starting and the temperature is maintained during idling, the sensor is equipped with a heater with an electrical resistance controlled by the control unit.

The sensor can be rapidly put out of action by the presence of even slight amounts of lead in the fuel

The sensor heater resistance can be measured by disconnecting the connector and connecting an ohmmeter as shown in the diagram.

Resistance: 0.5/1 KΩ at 20°C

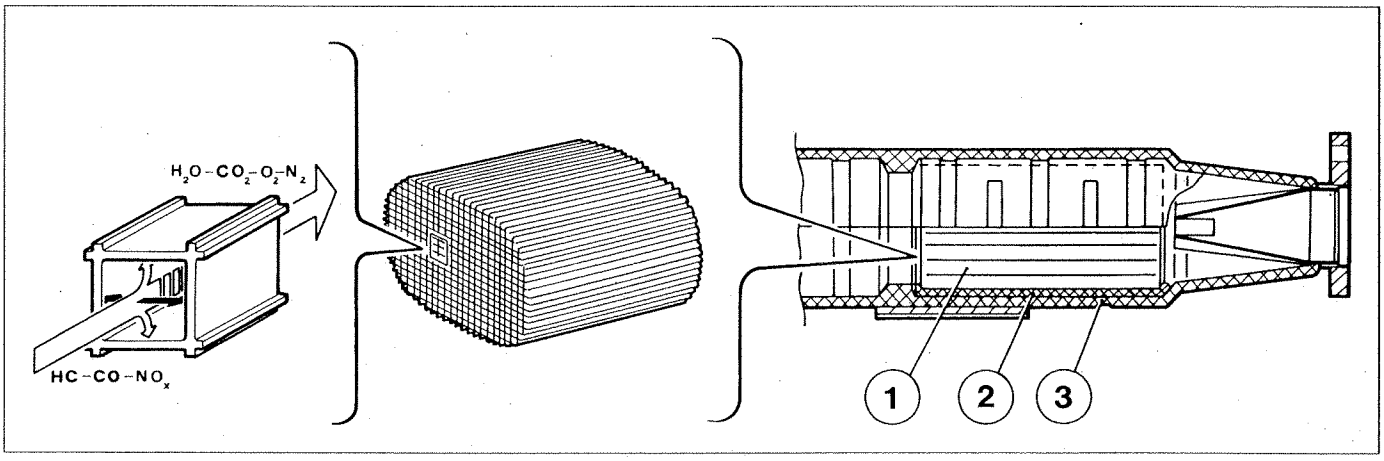


P3U36FX04

CATALYTIC SILENCER

The catalytic silencer is a device which makes it possible to simultaneously keep down the levels of the three main pollutants present in the exhaust: unburnt hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx).
Two types of chemical reaction take place inside the catalyzer:
- oxidation of the CO and the HC, converted into carbon dioxide (CO_2) and water (H_2O);
- dissolving of the NOx, converted into nitrogen (N_2).

These reactions can take place in an extremely short space of time thanks to the presence, inside the structure (cermamic support) of the catalyzer, of a layer of active substances (platinum and rhodium) which greatly accelerate the conversion speed of the harmful substances.
The efficiency of this conversion process is therefore conditioned by the fact that the mixture strength on which the engine is running is constantly fluctuating around the stoichiometric value, which is achieved thanks to the feed-back control carried out by the control unit on the basis of the Lambda sensor signals.
Lastly, the conversion processes are activated at temperatures above 300° - 350°C; it is therefore essential that the catalyzer reaches this temperature as quickly as possible in order to work properly.



P3U37FX01

1. Ceramic monolith
2. Metal support
3. Steel outer casing

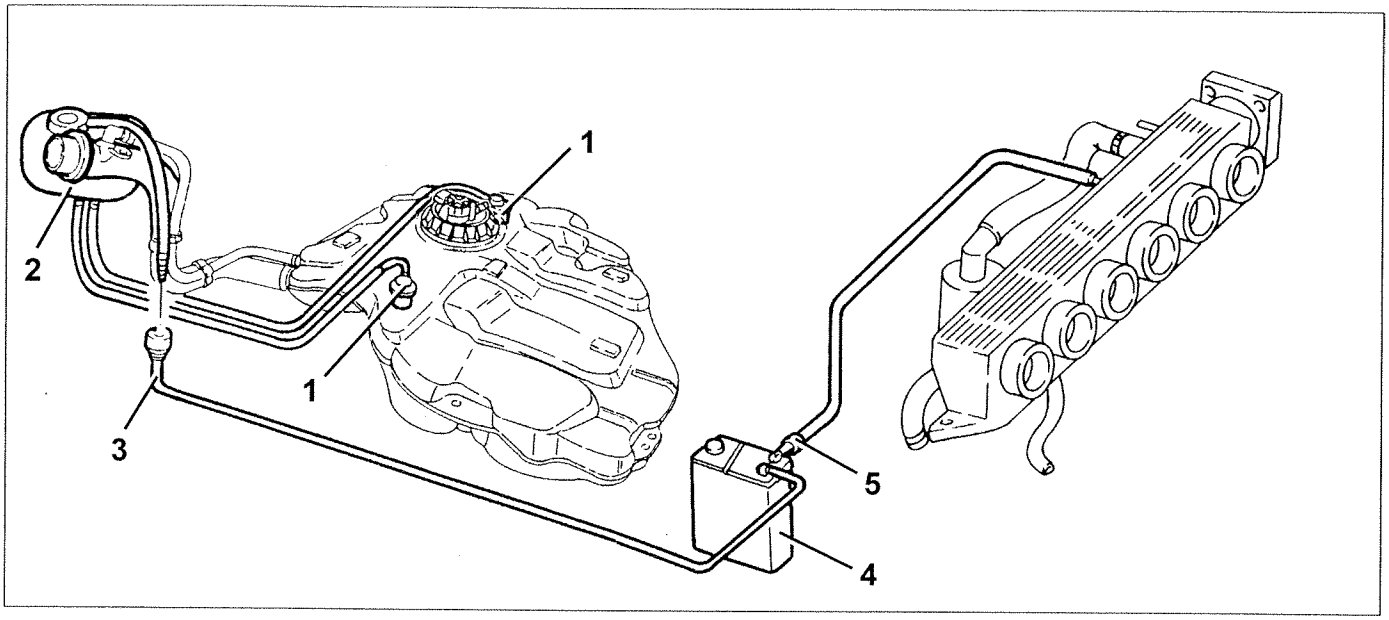
When operations have to be carried out near the catalytic silencer, the vehicle should be left for a while because the (internal) operating temperature of the catalyzer is between 500 and 850 °C.

There are basically two things which can ruin the inside of the catalyzer, namely:

- *the presence of lead in the fuel which lowers the degree of conversion to practially nil ("lead poisoning") and irreparably damages the Lambda sensor as well;*
- *the presence of totally unburnt fuel in the exhaust gases, due to failed ignition, which causes an increase in temperature which leads to the melting of the ceramic support. As a result, the coil connectors should not be disconnected with the engine running for any reason whatsoever: in the case of tests, the silencer should be replaced with an equivalent length of pipe.*

10.

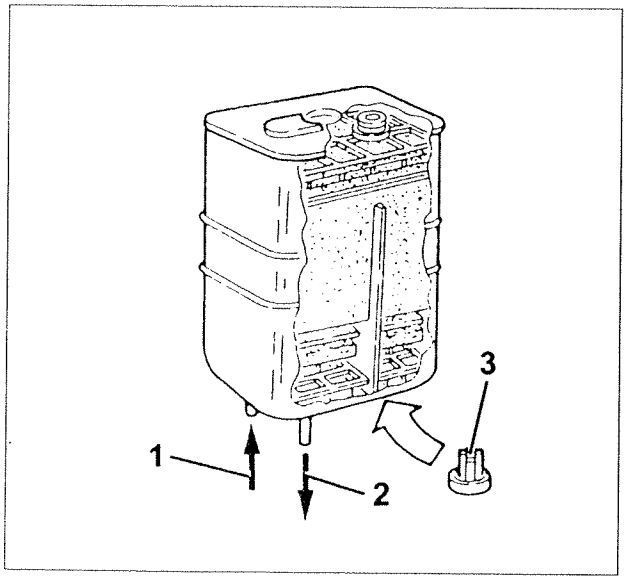
DIAGRAM SHOWING ANTI-EVAPORATION CIRCUIT



P3U38FX01

1. Multi-purpose valve
2. Separator
3. Vapour supply to the charcoal filter
4. Charcoal filter
5. Charcoal filter solenoid valve

ANTI-EVAPORATION SYSTEM COMPONENTS



P3U38FX02

Active charcoal filter

The vapours coming from the tank are sent to the separator (2) through the two multi-purpose valves (1).
The vapours which condense in the separator return to the tank.
The vapours which do not condense are sent, via the pipe (3), to the canister (4) where they are absorbed and stored by the activated charcoal.
The vapours are directed to the inlet manifold by means of the solenoid valve (5) operated by the injection control unit.

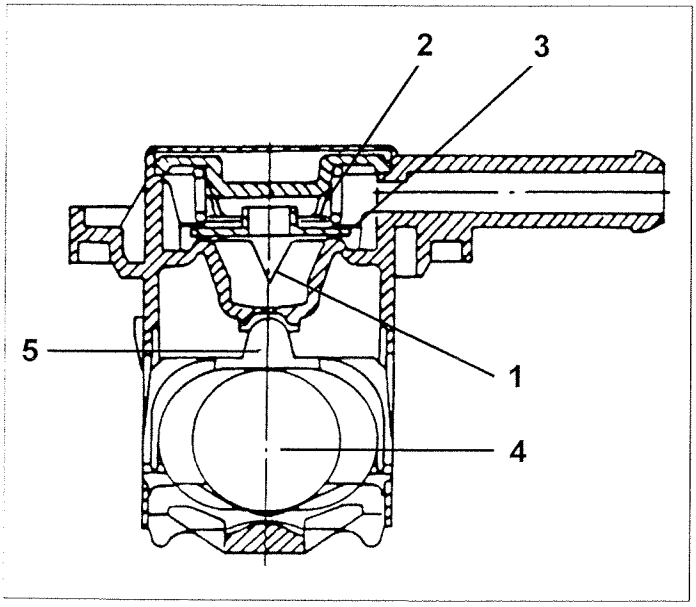
1. From the multi-purpose valve
2. To the solenoid valve
3. Single-acting valve

Multi-purpose valve

The functions of the two multi-purpose valves are:
- pressurizing the tank
- retaining
- sealing in case of overturning.

Pressurizing the tank

The tank pressure is maintained between 30 and 45 mbar using a fluro-silicon rubber valve resting on a seal.
The valvel is supported by a stainless steel plate and opposed by a spring.
When the pressure in the tank exceeds the recommended value, it overcomes the resistance of the spring and allows the valve to raise, thereby allowing the flow of vapours towards the canister.
When the pressure returns to within the recommended limits, the valve closes.



P3U39FX01

Retaining

In certain operating conditions a vacuum can form in the tank as a result of:

- thermal variations
- fuel consumption.

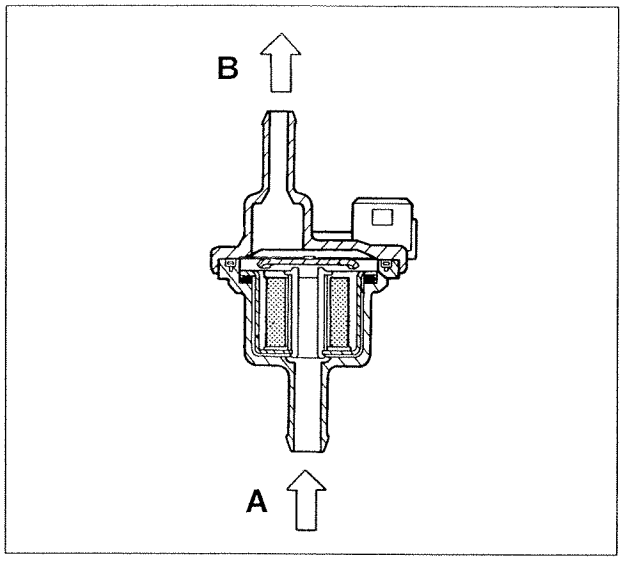
The function of the valve, in this case, is to restore the pressure in the tank through the intake of air.
Any faults with this function can cause irregular operation or the breakdown of the vehicle through problems with the electric pump supply.
This function is carried out by the valve fitted directly on the fluoro-silicon rubber mounting.

Sealing in the case of overturning (rollover)

The rollover function is to prevent the escape of fuel from the tank if the vehicle overturns or if it is on a steep incline.
During normal operation of the vehicle (bends, acceleration, braking, etc.) the fuel may spill over into the canister.

The high rollover sensitivity prevents this.
The rolling closing angle is less than 33°.

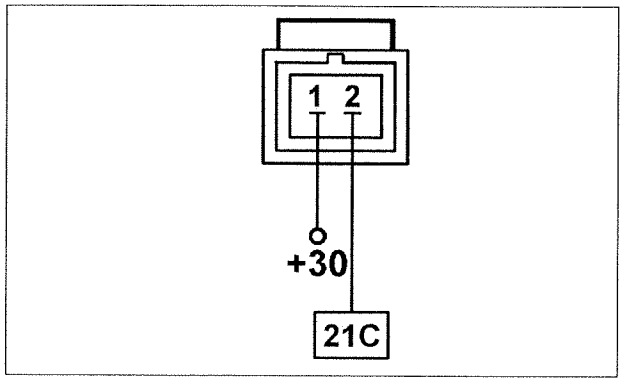
1. Pressurizing valve
2. Shim
3. Spring
4. Ball
5. Float



Charcoal filter solenoid valve

The function of this valve is to control the quantity of vapours drawn in by the active charcoal filter and directed to the inlet manifold by means of the injection/ignition electronic control unit.
If the valve is not supplied it is closed to prevent the fuel vapours from escaping.

A from the charcoal filter
B to the inlet manifol



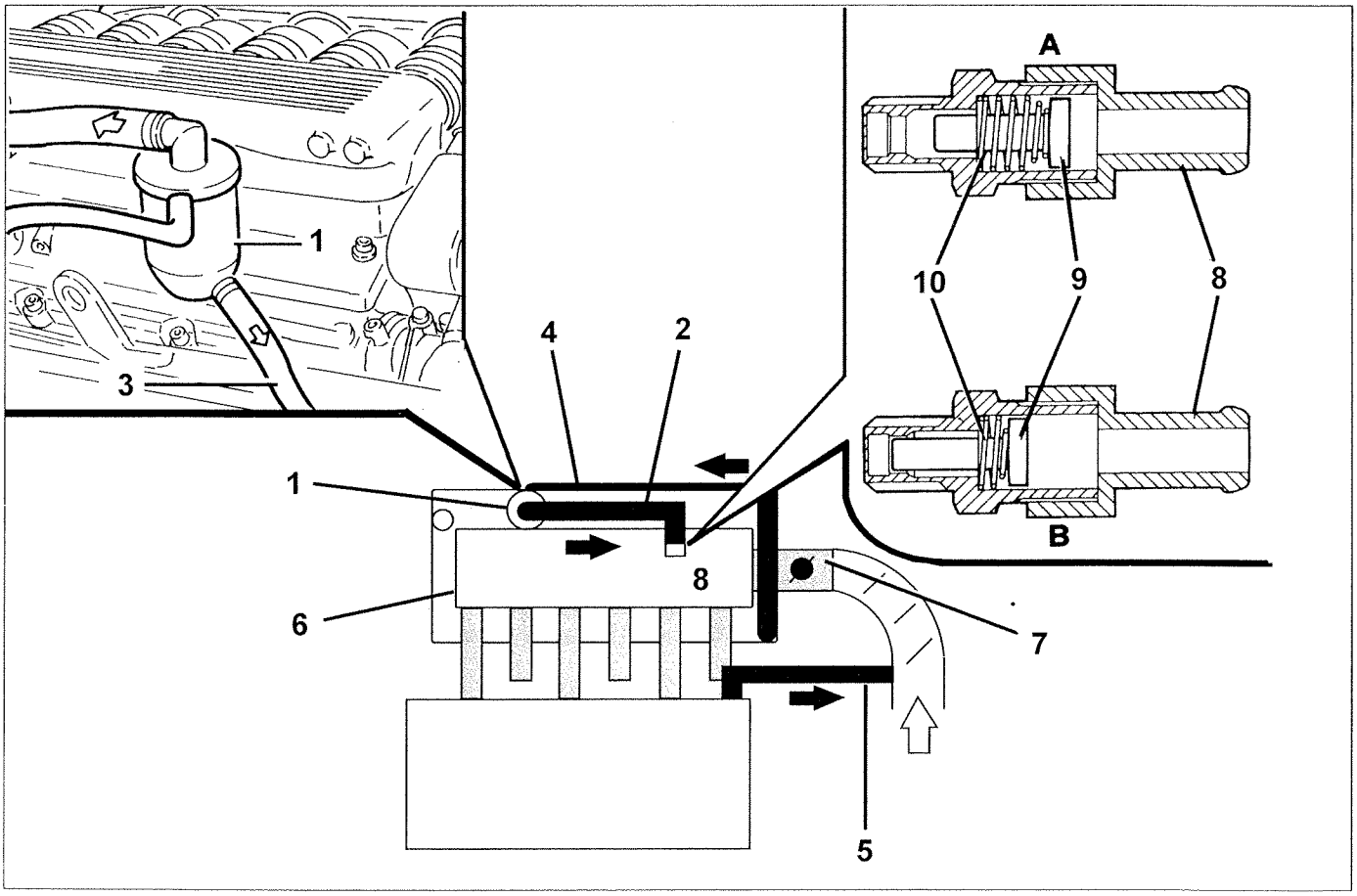
P3U40FX02

Wiring connector

SYSTEM FOR RECIRCULATING GASES COMING FROM THE ENGINE CRANKCASE (BLOW-BY)

This system controls the emission, from the crankcase, of the breather gases consisting of air/petrol mixtures and burnt gases which escape from the piston seals, in addition to the lubricant oil vapours, recirculating them to the inlet.
The emission of oil vapours is controlled by means of a separator (1) which directs the vapours released from the cylinder heads to the pipe (2).
The difference in temperature between the separator and the oil vapours causes partial condensation. The condensed vapours are sent to the cylinder head via the pipe (3).
With the butterfly open, the gases are sent, via the hose (5), upstream of the butterfly valve (7) to be drawn into the manifold.
With the butterfly closed the vacuum in the inlet manifold (6) draws in the gases through the pipe (4) via a PCV valve (8) (Positive Crank Ventilation) which shutters the inlet.
The PCV valve, in effect, is modulated and the quantity of gases passing through is proportional to the vacuum in the inlet manifold.

When the butterfly valve is completely open (condition A), the vacuum inside the inlet manifold is minimal, the spring (10) is completely extended and the PCV valve allows the maximum flow of breather gases.
Conversely, with the butterfly completely closed (condition B), the vacuum inside the manifold is maximum which causes the movement of the piston (9) which shutters the section through which the breather gases flow inside the PCV valve thereby liminting the intake of the actual gases.



P3U41FX01

CHECKS, ADJUSTMENT AND REPAIR OPERATIONS ON THE BOSCH ME 2.1 SYSTEM

When working on a vehicle fitted with the Bosch ME2.1 system, observe the following precautions:
- *do not start up the engine when the terminals for the electrical connections are not properly connected or slack at the battery poles;*
- *do not use a rapid battery charger for starting the engine;*
- *never disconnect the battery from the electrical equipment with the engine running;*
- *in order to charge the battery, disconnect it first from the electrica system;*
- *if the vehicle goes in a drying oven after painting at temperatures in excess of 80 °C, the engine control unit must be removed from the vehicle first;*
- *do not connect/disconnect the control unit multiple connectors with the ignition switch in the ON position;*
- *always disconnect the negative battery lead before carrying out electrical welding on the vehicle.*

The system has a memory which is directly supplied by the battery, even with the ignition switched off, where the self-adjustment values are stored. Disconnecting the battery will result in this information being lost and it can only be acquired again after a certain amount of time: this operation should therefore be limited as far as possible.

CHECKING THE CONCENTRATION OF THE EMISSIONS

The system manages the advance, the carbon monoxide (CO) content and the idle air flow rate, without the possibility of any manual adjustments. However, a check on the content of the exhaust gases, upstream and downstream of the catalyzer can provide precious indications on the operating conditions of the injection/ignition system, the engine parameters and the catalyzer.

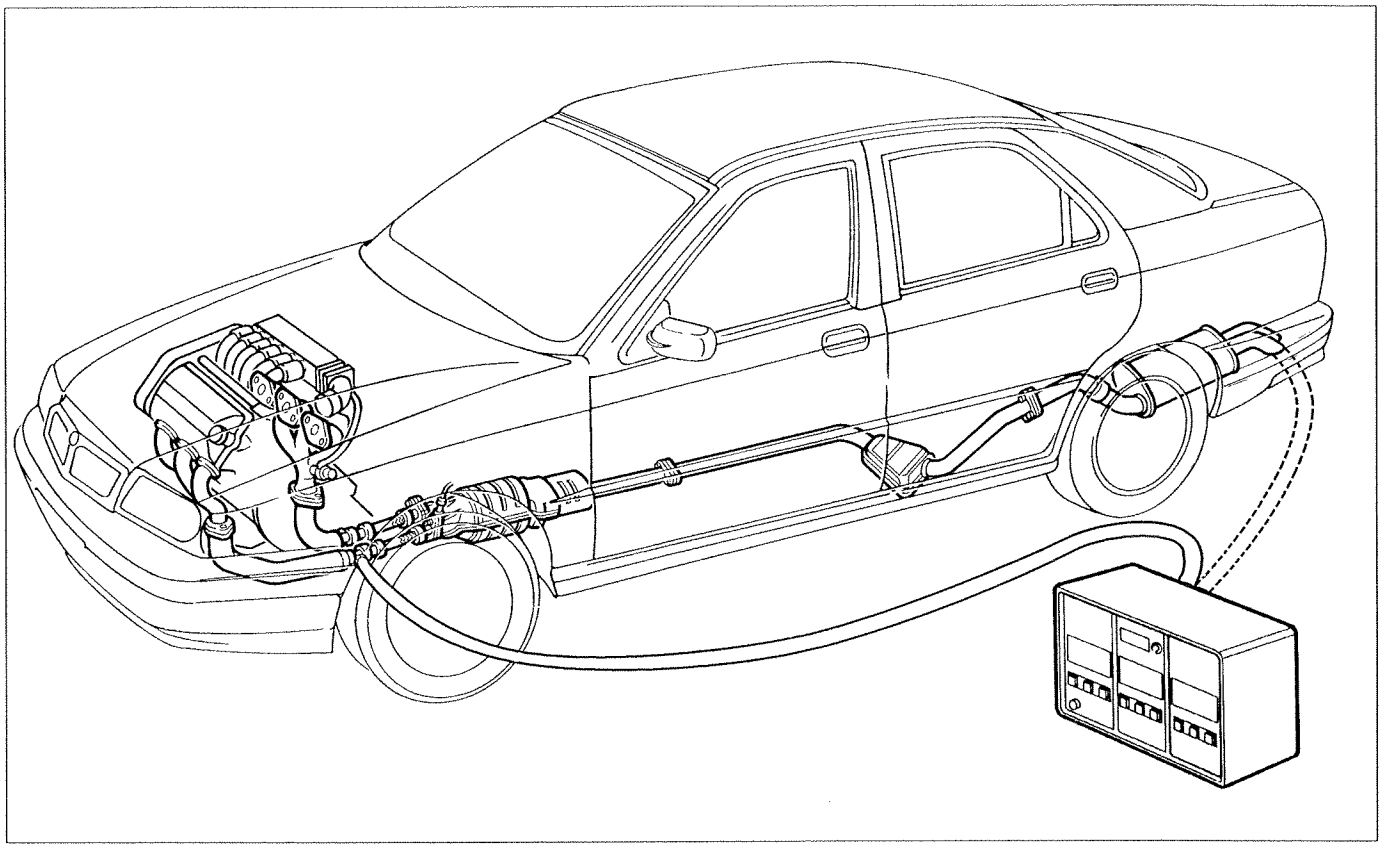
Checking idle concentration of CO and HC upstream of the catalytic silencer

To check the concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) upstream of the catalyzer, proceed as follows:
1. Undo the cap located on the exhaust pipe, upstream of the catalyzer, and tighten the tool in its place.
2. Connect a suitably calibrated CO-tester probe to the tool.
3. Start up the engine and let it reach operating temperature.
4. Check that the engine speed corresponds to the recommended figure.
5. Check that the idle concentration of CO is within the recommended values (see table); if this is not the case, itis necessary to check:

- that the Lambda sensor is working properly, using the diagnostic equipment;
- for the presence of air penetration in the area surrounding the Lambda sensor housing;
- the injection and ignition system (in particular, the wear of the spark plugs).

6. In the same conditions, check that the concentration of HC is below 500 p.p.m.
7. If these figures are not found, proceed with tuning the engine, checking in particular:

- the valve gear timing;
- the engine compression.



P3U43FX01

Table summarizing the pollutant emission tolerance figures

	CO (%)	HC (p.p.m.)	CO2 (%)
Upstream of the catalyzer	0,4 ÷ 1	–500	–12
Downstream of the catalyzer	–0,35	–90	–13

Checking concentration of CO and HC at the exhaust

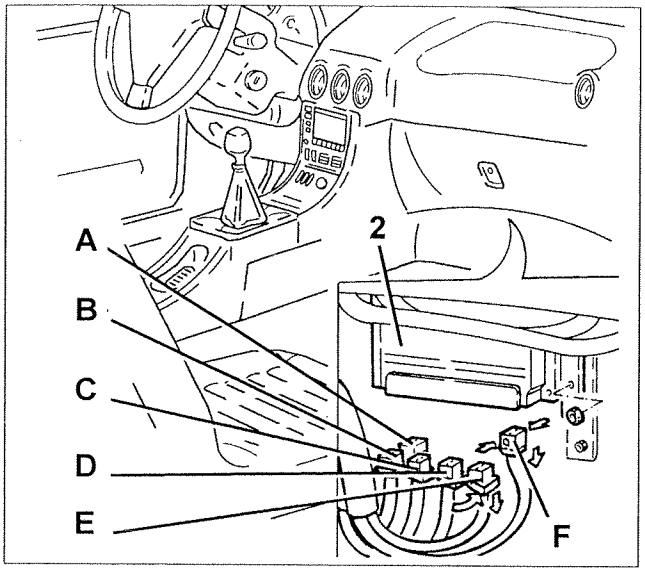
The exhaust concentration of carbon monoxide (CO) and unburnt hydrocarbons (HC) is measured by inserting a suitably calibrated tester probe at least 30 cm into the end of the exhaust pipe.

1. Check that the idle CO and HC concentrations correspond to the recommended figures (see table).

2. If the value of the HC is outside of the recommended limit, whilst that measured previously upstream of the catalyzer was correct, the engine parameters are correct and therefore the cause of the problem should be sought in the decreased efficiency of the catalyzer.

CHECKING THE ENGINE IDLE SPEED

If the engine idle speed does not correspond to the recommended figure and the system is the self-adjusting type, then it is not possible to carry out any adjustments. Therefore it is necessary to check that the accelerator linkage is correctly adjusted and the cause of the problem should be sought by carrying out a complete fault diagnosis using the diagnostic equipment.



P3U44FX01

ENGINE CONTROL UNIT

Removing

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- disconnect the battery terminal (-);
- remove the control unit shield;
- disconnect the electrical connections D, E, F, C, B, A from the control unit following the order given above;
- undo the nuts and remove the control unit (2).

Refitting

Proceed as follows:
- fit the control unit and fix it using the nuts;
- connect and attach the electrical connection to the control unit following the order A, B, C, D, E, F;
- fit the shield and connect the battery terminal (-);
- carry out the control unit self-learning procedure.

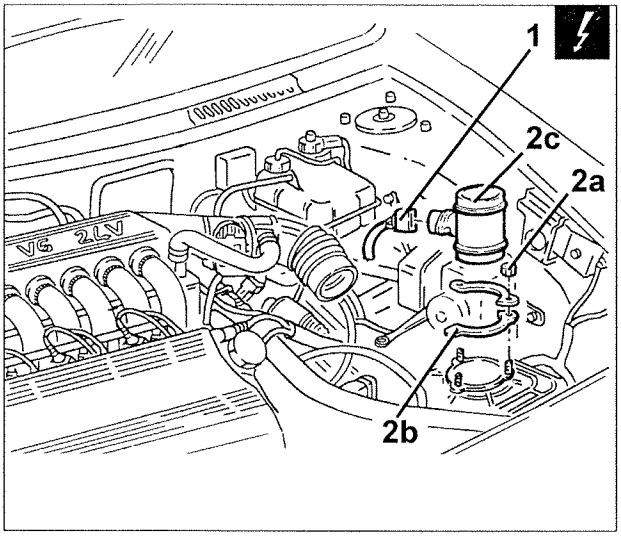
CARRYING OUT THE SELF-LEARNING PROCEDURE FOR THE ENGINE CONTROL UNIT

NOTE *During this procedure, from the moment the control panel is supplied to the end of the procedure, never press the accelerator pedal, the brake pedal or the clutch pedal.*

Make sure that the ignition switch is in the OFF position;

Proceed as follows:
- connect the switch MPX 97 (1806365000) to the diagnostic socket;
- place the knob in position 3;
- connect the Examiner diagnostic equipment;
- turn the ignition switch to the ON position;
- wait for 60 seconds, the time required for the control unit to check the spring inside the butterfly casing and the butterfly minimum/maximum angular positions;
- place the ignition switch in the OFF position;
- wait for 15 seconds, the time required for the control unit to record the values learnt in the Eprom;
- using the Examiner, check that the idle self-learning procedure has been successfully completed.

NOTE *If the self-learning procedure is not correct, turn the ignition switch to the OFF position and repeat the procedure described above.*
If the problem persists, check that the diagnostic cable is correctly connected and check the operation of the instrument.



P3U45FX01

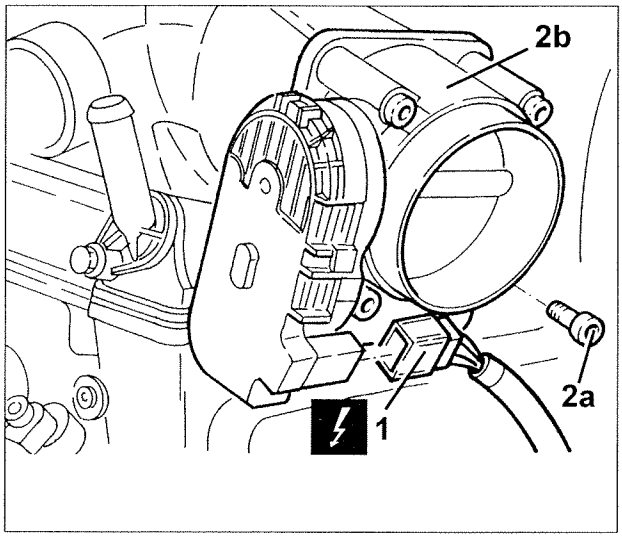
AIR FLOW METER

Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- disconnect the battery terminal (-);
- proceed with removing the left front and left rear engine compartment side covers and the resonator;
- disconnect the electrical connection (1) from the butterfly casing;
- undo the nuts (2a);
- remove the brackets (2b) and the air flow meter (2c).

Proceed with the refitting, reversing the order of the operations carried out for the removal.



P3U45FX02

BUTTERFLY CASING INTEGRATED WITH D.V.L.

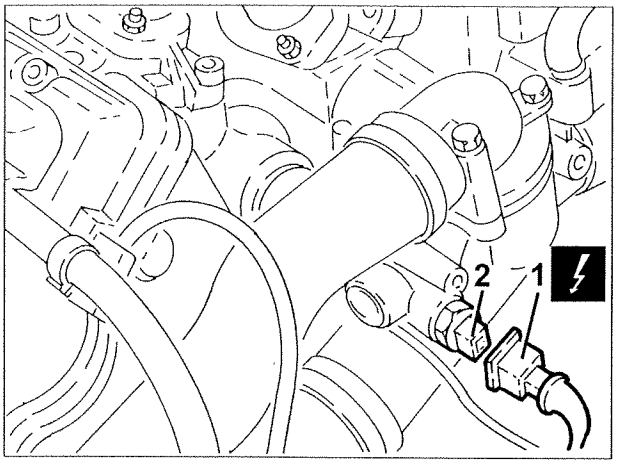
Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- disconnect the battery terminal (-);
- proceed with removing the left front and left rear engine compartment side covers and the hose between the resonator and the butterfly casing;
- disconnect the electrical connection (1) from the butterfly casing;
- undo the bolts (2a);
- remove the butterfly casing (2b) complete with seal.

Proceed with the refitting, reversing the order of the operations carried out for the removal.

NOTE *When refitting, the butterfly casing learning procedure must be repeated.*



P3U46FX01

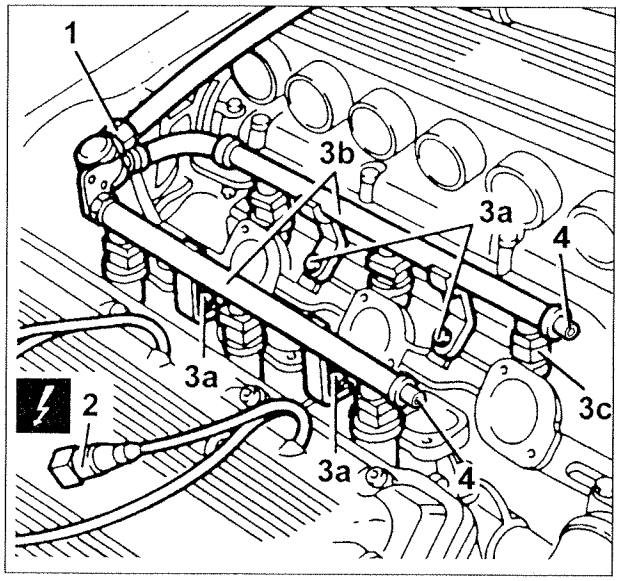
COOLANT TEMPERATURE SENSOR

Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF positino.*

Proceed as follows:
- disconnect the battery terminal (-);
- proceed with removing the left front and left rear engine compartment side covers and the resonator;
- disconnect the electrical connection (1) from the coolant temperature sensor (2);
- undo and remove the sensor.

Proceed with the refitting, reversing the order of the operations carried out for the removal.



P3U46FX02

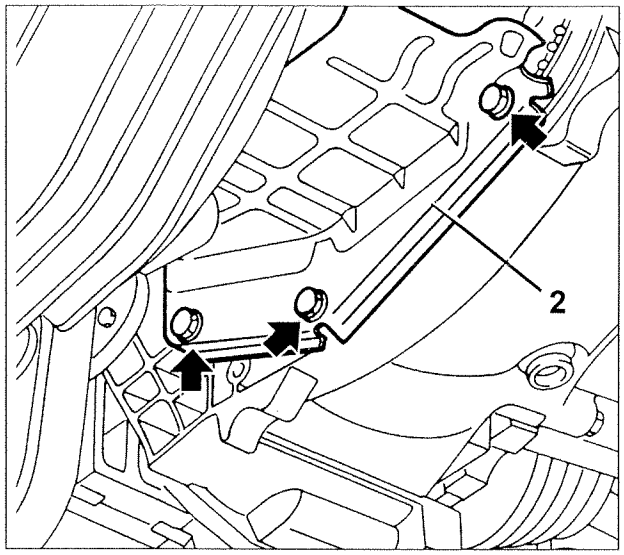
FUEL MANIFOLD COMPLETE WITH INJECTORS

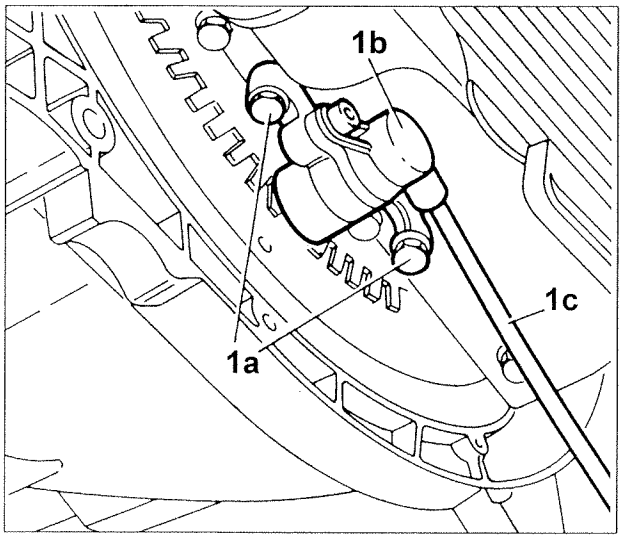
Removing-refitting

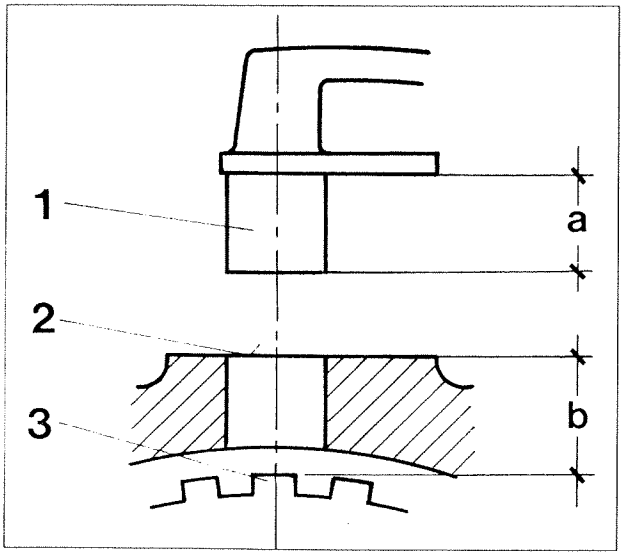
NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- disconnect the battery terminal (-);
- proceed with the removal of the inlet ducts;
- discharge the fuel pressure, acting on the breather valve (4);
- disconnect the fuel supply pipe (1) from the fuel manifold (3b);
- disconnect the electrical connections (2) from the injectors;
- undo the bolts (3a) and remove the fuel manifold complete with injectors (3c).

Proceed with the refitting, reversing the order of the operations carried out for the removal.







ENGINE SPEED SENSOR

Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- position the vehicle on a lift;
- disconnect the battery terminal (-);
- raise the lift, then remove the protection/shield under the engine and the left exhaust pipe from the exhaust manifold;
- undo the bolts (arrow) and remove the lower engine flywheel protection (2);
- undo the bolts (1a) and remove the sensor (1b) from its housing;
- release the electrical wiring for the sensor from the fixings;
- disconnect the electrical connection (3) for the sensor, then remove it.

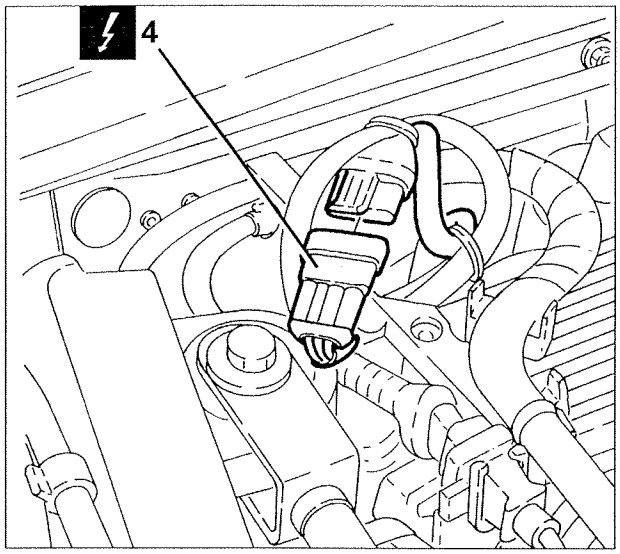
Proceed with the refitting, reversing the order of the operations carried out for the removal.

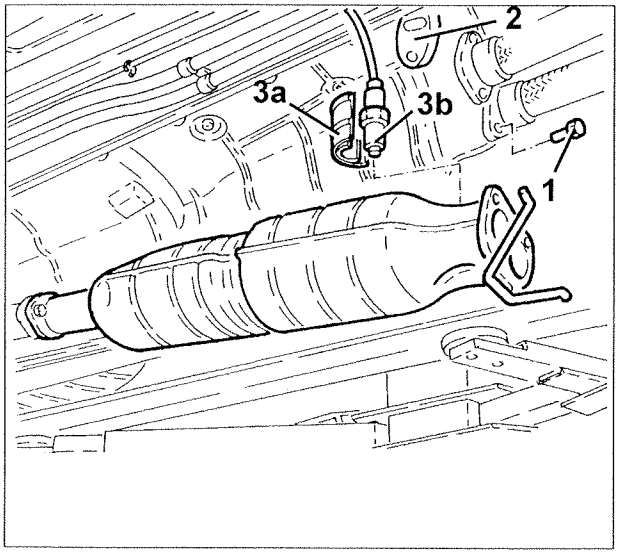
Checking the gap

If you wish to check the gap between the sensor and the flywheel, follow the instructions given below:
- measure the distance between the end of the sensor and the lower part of the sensor bracket (distance "a");
- measure the distance between the fitting dowel on the cylinder block/crankcase and the upper part of the tooth (distance "b"), repeating the measurement for at least two opposite teeth;
- The gap (t = b-a) should be between 0.8 and 1.5 mm.

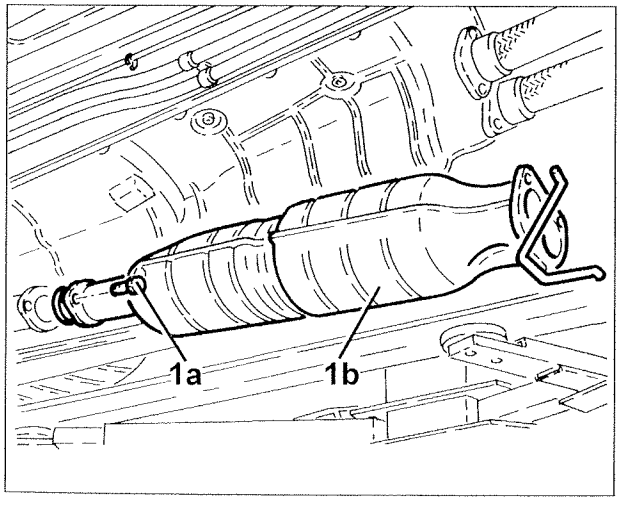
The gap cannot be adjusted, therefore if the value measured is outside of the tolerance, check the condition of the sensor and the flywheel.

1. Sensor
2. Fitting dowel
3. Flywheel tooth





P3U48FX02



P3U48FX03

LAMBDA SENSOR

Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- position the vehicle on a lift;
- disconnect the battery terminal (-);
- raise the lift, then disconnect the electrical connection (4) for the Lambda sensor and release the electrical wiring from the fixings;
- remove the protection under the engine;
- undo the bolts (1) fixing the catalytic converter to the exhaust pipes;
- release the catalytic converter (2) from the support seals;
- remove the protection (3a);
- undo the Lambda sensor (3b) and remove it.

Proceed with the refitting, reversing the order of the operations carried out for the removal.

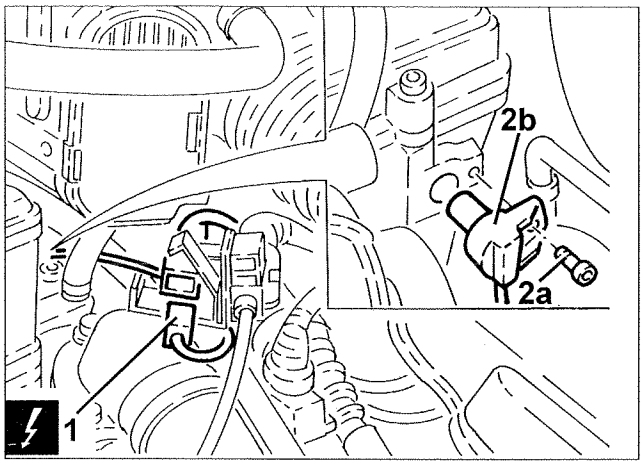
CATALYTIC SILENCER

Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- position the vehicle on a lift;
- disconnect the battery terminal (-);
- raise the lift, then remove the Lambda sensor following the instructions given above;
- undo the bolts (1a) fixing the catalytic converter (1b) to the intermediate exhaust silencer and remove it;
- then remove the gaskets.

Proceed with the refitting, reversing the order of the operations carried out for the removal.



P3U49FX01

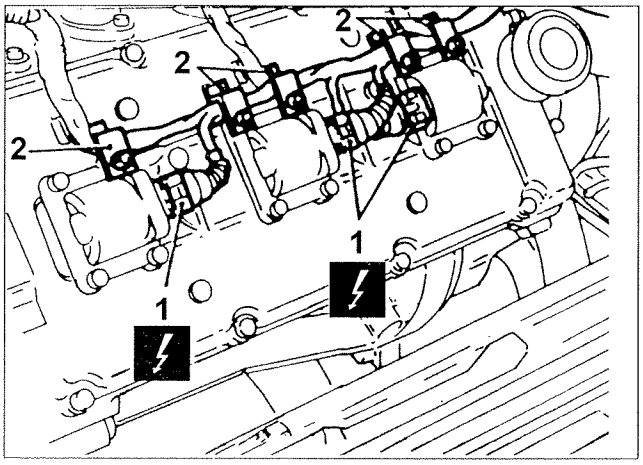
ENGINE TIMING SENSOR

Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- disconnect the battery terminal (-);
- proceed with removing the left front and left rear engien compartment side covers and the hose between the resonator and the butterfly casing;
- disconnect the electrical connection (1) from the engine timing sensor and release the wiring from the fixing bands;
- undo the bolt (2a) and remove the sensor (2b).

Proceed with the refitting, reversing the order of the operations carried out for the removal.



P3U49FX02

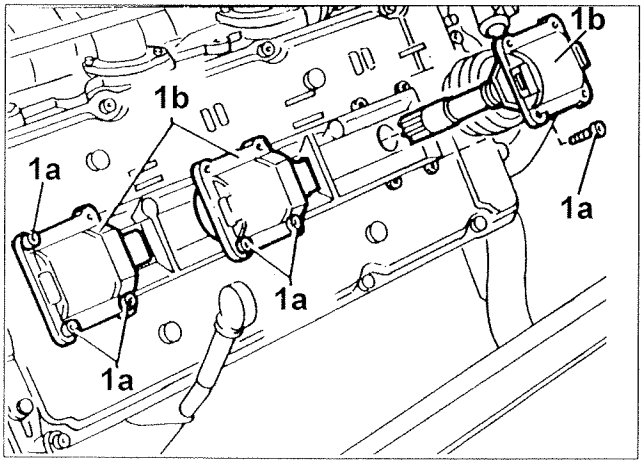
LEFT CYLINDER HEAD IGNITION COILS

Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- disconnect the battery terminal (-);
- remove the left cylinder head ignition coil cover;
- disconnect the electrical connections (1) from the ignition coils;
- undo the bolts and remove the brackets (2) fixing the electrical wiring;
- undo the remaining fixing bolts (1a) and remove the ignition coils (1b).

Proceed with the refitting, reversing the order of the operations carried out for the removal.



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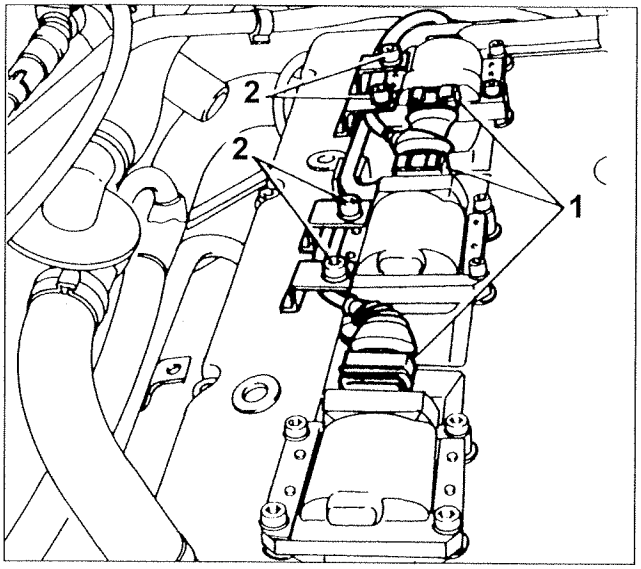

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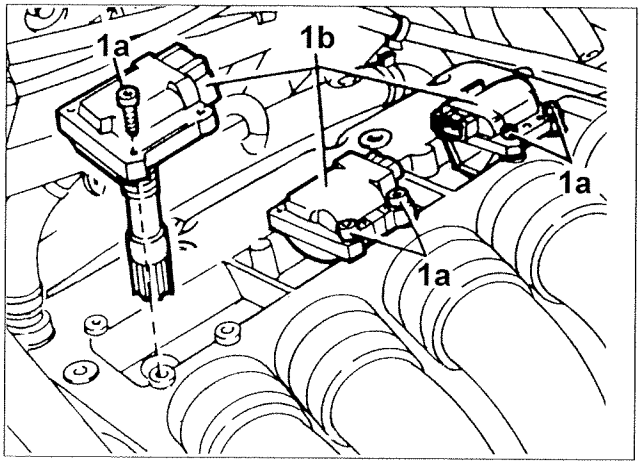


P3U50FX02

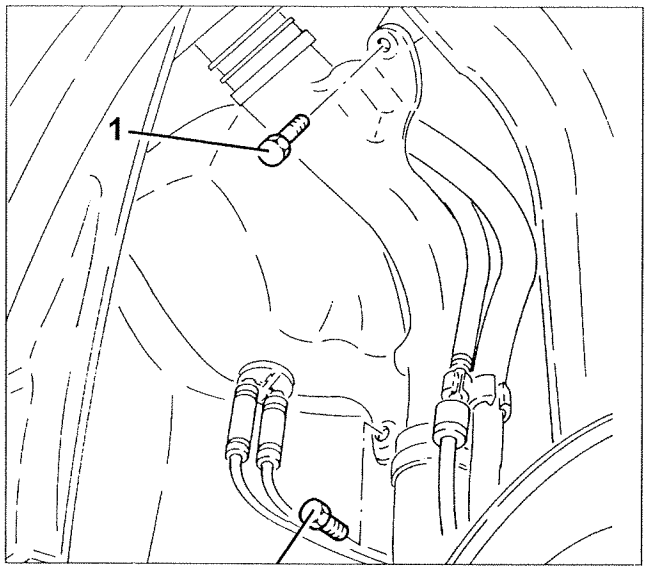
RIGHT CYLINDER HEAD IGNITION COILS

Removing-refitting

NOTE *Make sure that the ignition switch is in the OFF position.*

Proceed as follows:
- disconnect the battery terminal (-);
- remove the sleeve between the resonator and the butterfly casing;
- remove the air chamber;
- disconnect the electrical connections (1) from the ignition coils;
- undo the bolts (2a) and remove the brackets (2b) fixing the electrical wiring;
- undo the remaining fixing bolts (1a) and remove the ignition coils (1b).

Proceed with the refitting, reversing the order of the operations carried out for the removal.

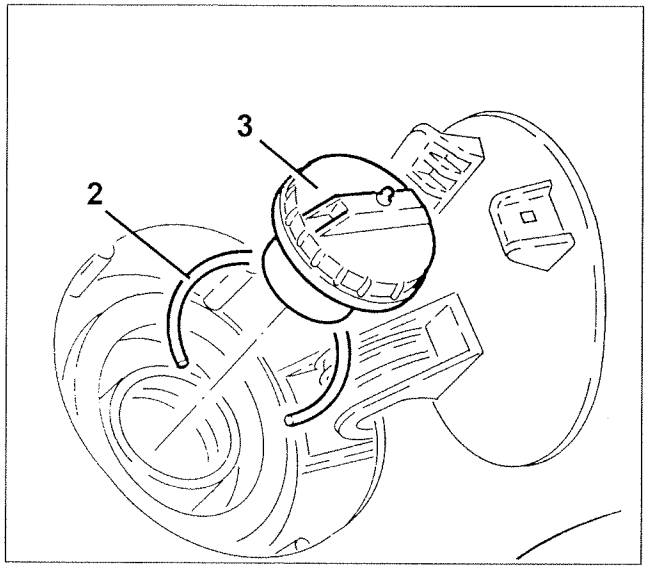


P3U51FX01

MULTI-PURPOSE VALVE

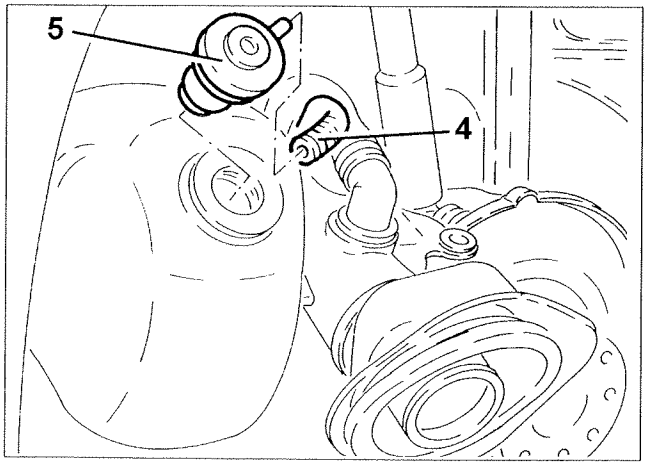
Removing-refitting

Proceed as follows:
- position the vehicle on a lift;
- remove the right rear wheel;
- raise the lift, then undo the bolts and remove the rear section of the right rear wheel arch liner;
- undo the bolts (1) fixing the fuel filler pipe to the bodyshell;



P3U51FX02

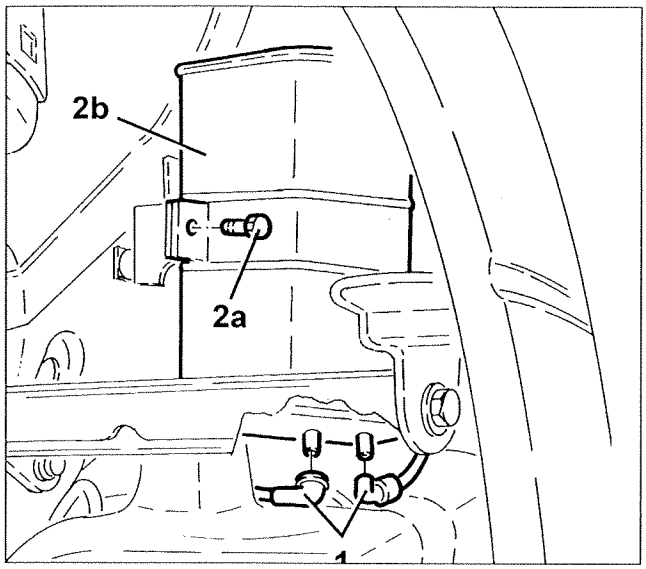
- remove the fuel filler cap (3);
- remove the spring (2) fixing the fuel filler pipe;
- release the latter from the housing, pressing inwards;



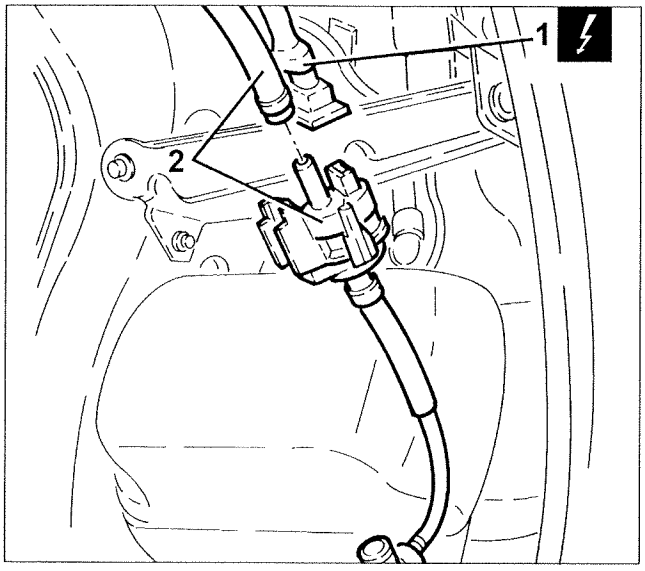
P3U51FX03

- disconnect the fuel vapour recirculation pipe (4) from the multi-purpose valve (5);
- remove the multi-purpose valve from the fuel vapour separator.

Proceed with the refitting, reversing the order of the operations carried out for the removal.



P3U52FX01



P3U52FX02

ACTIVE CHARCOAL FILTER

Removing

Proceed as follows:
- position the vehicle on a lift;
- remove the right front wheel;
- raise the lift, then remove the right front additional wheel arch liner;
- disconnect the fuel vapour inlet and outlet pipes (1) for the active charcoal filter (2b);
- undo the bolt (2a) and remove the active charcoal filter after having released it from the solenoid valve.

Proceed with the refitting, reversing the order of the operations carried out for the removal.

CHARCOAL FILTER VALVE

Removing-refitting

Proceed as follows:
- position the vehicle on a lift;
- raise the lift, then proceed with removing the active charcoal filter as described previously;
- disconnect the electrical connection (1) from the solenoid valve;
- disconnect the pipes (2) and remove the solenoid valve.

Proceed with the refitting, reversing the order of the operations carried out for the removal.

page

OPERATIONS ON VEHICLE

The information contained in this publication is purely indicative and could be out of date following modifications made by the Manufacturer, at any time, for technical or commercial reasons or in order to conform to legal requirements in the various countries.

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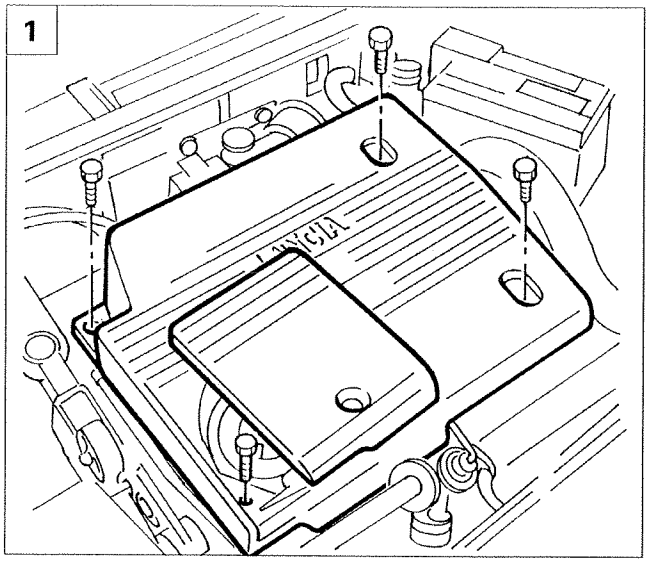
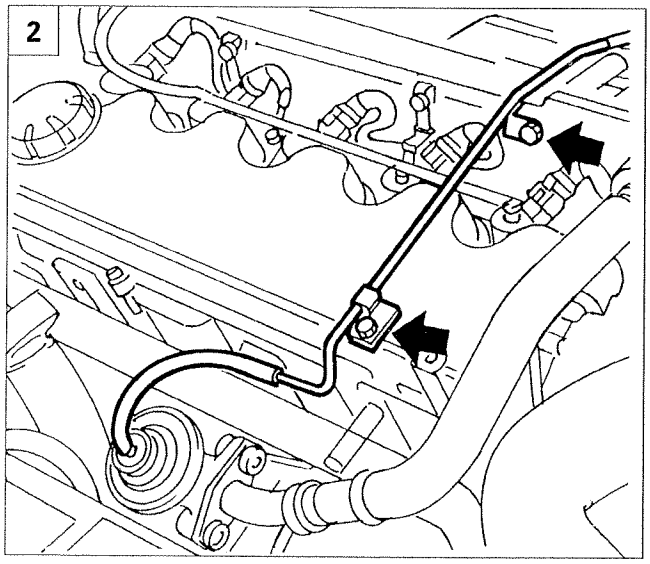
REMOVING-REFITTING INJECTORS



P3U01GJ02

- Disable the alarm (if fitted), in the luggage compartment on the right side, and disconnect the negative battery lead.

1. Remove the upper engine protective cover.



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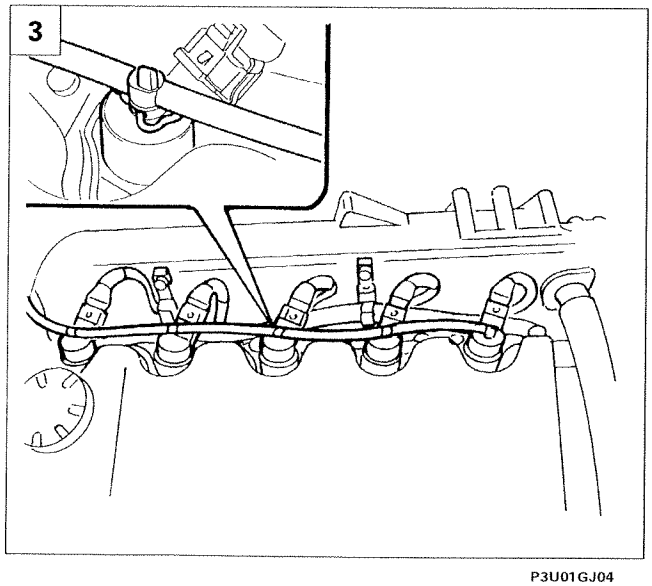
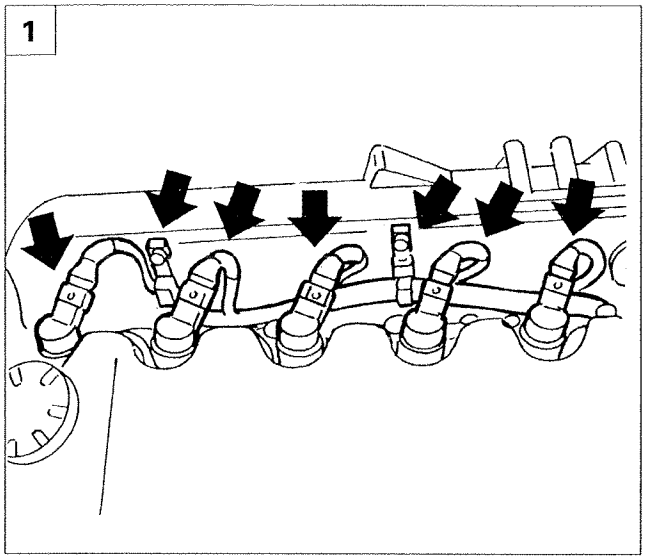
2. Undo the two bolts shown in the diagram and move the rigid pipe between the E.G.R. valve and the solenoid valve aside.



P3U01GJ04

3. Disconnect the fuel return pipe from the injectors working on the spring.

10.



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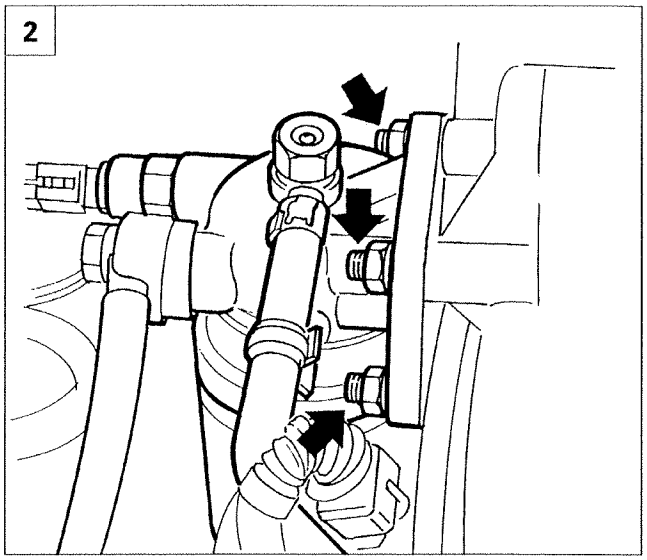

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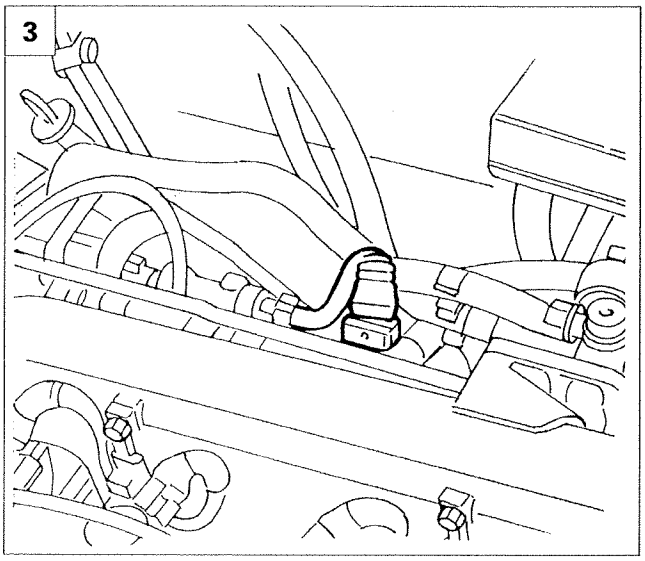

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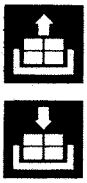
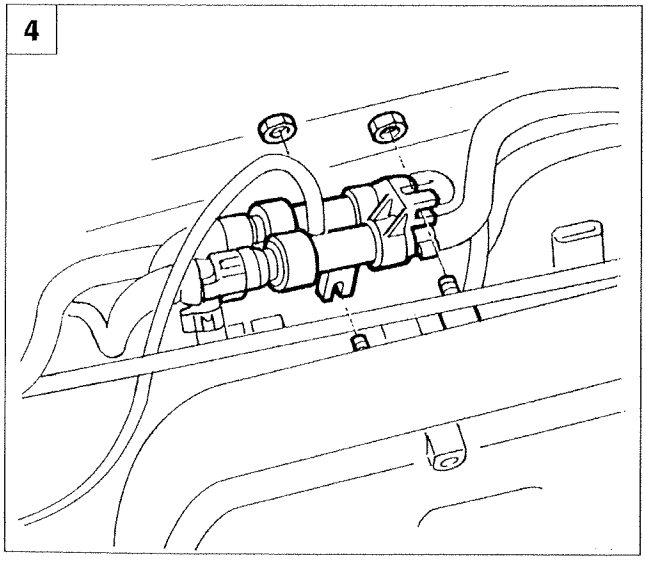


1. Disconnect the electrical connections from the injectors and move the wiring aside undoing the two bolts as illustrated.
2. Undo the fixing nuts and position the oil filter at theside.
3. Disconnect the electrical connector from the excess pressure sensor.
4. Move the fuel return manifold aside.
5. Undo the injector side connectors for the pipes between the distribution manifold and the injectors.



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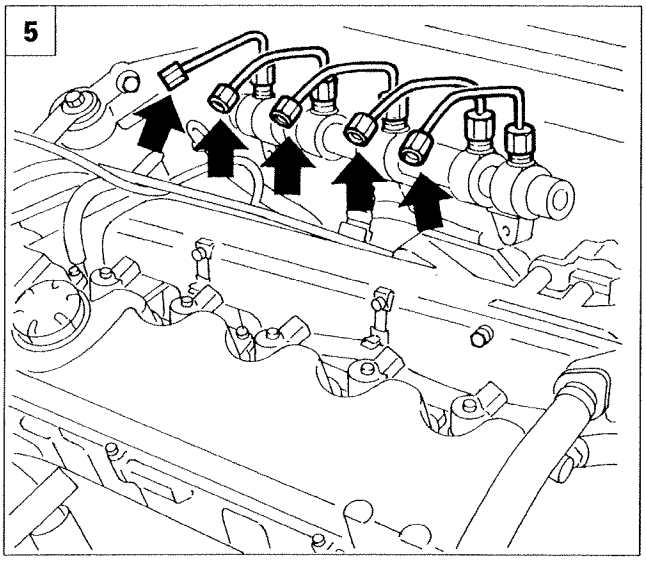

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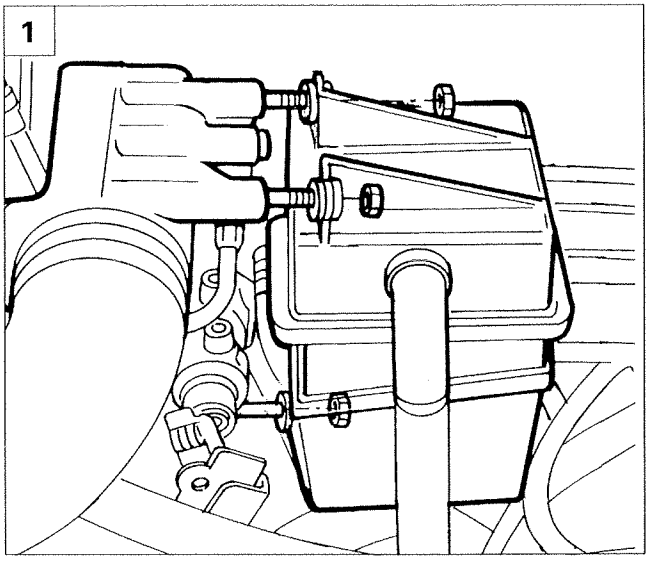
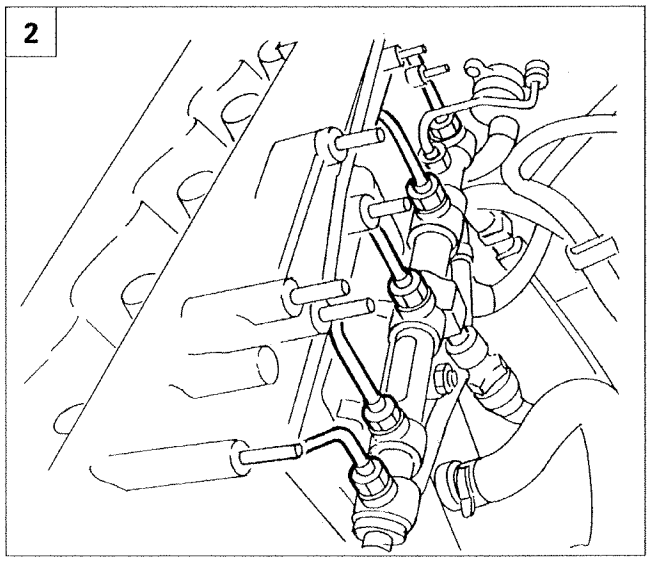


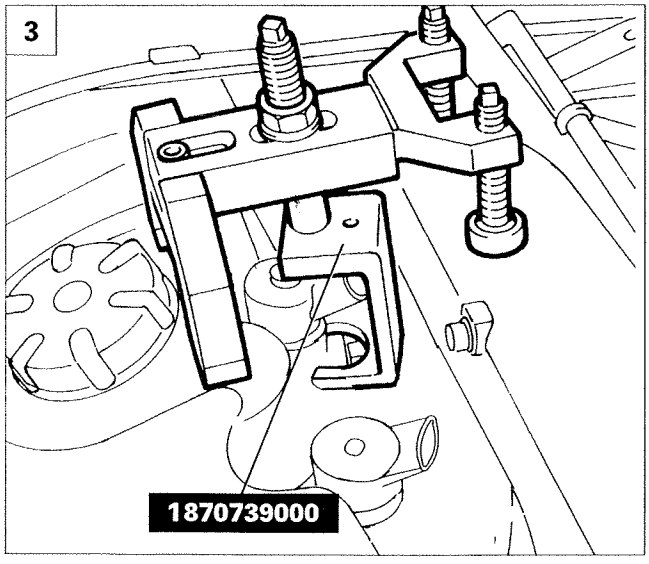
P3U03GJ01

1. Move the oil vapour separator aside undoing the three fixing nuts.



P3U03GJ02

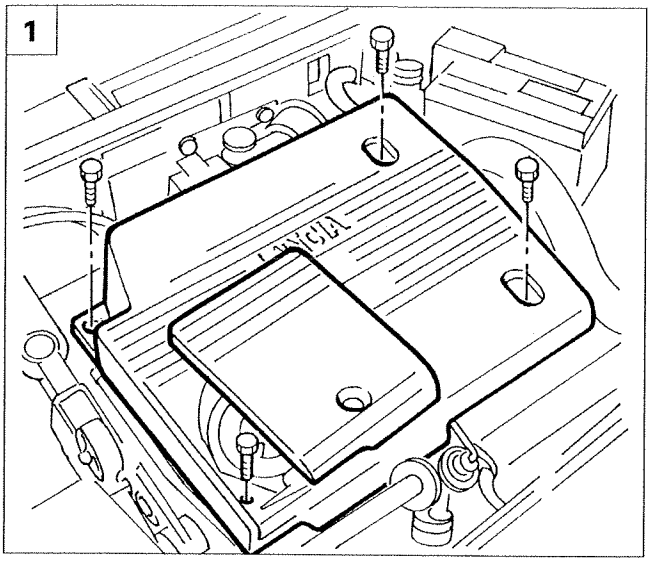
2. Undo the manifold side connectors for the pipes between the distribution manifold and the injectors and remove them.



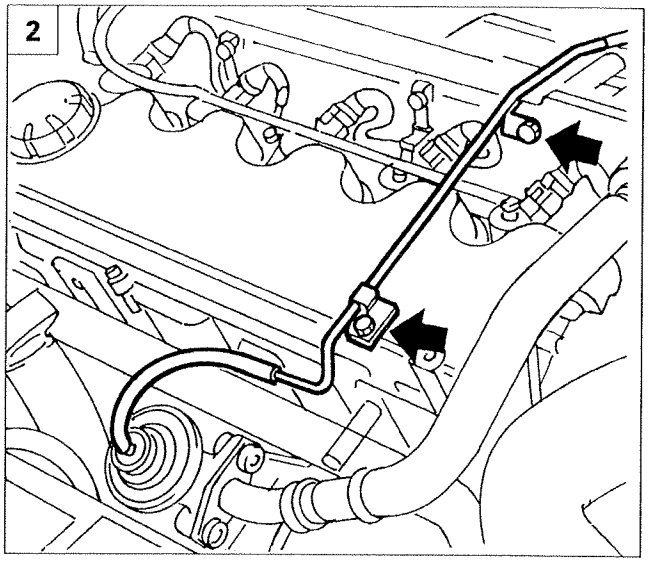
P3U03GJ03

3. Undo the fixing nuts and carefully remove the injector bracket.
Use 1870739000 to remove the injectors.

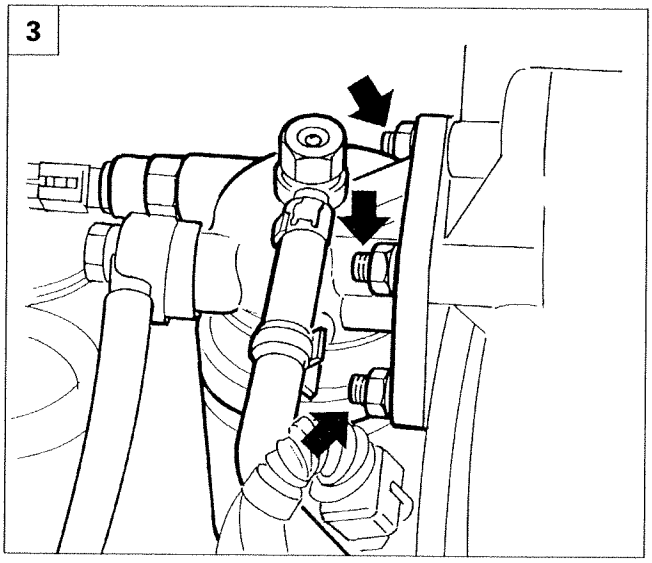
NOTE *When refitting carry out the operations described above in the reverse order, replacing the washers under the injectors and tighten the connectors for the pipes between the distribution manifold and the injectors to the recommended torque of 2 daNm.*



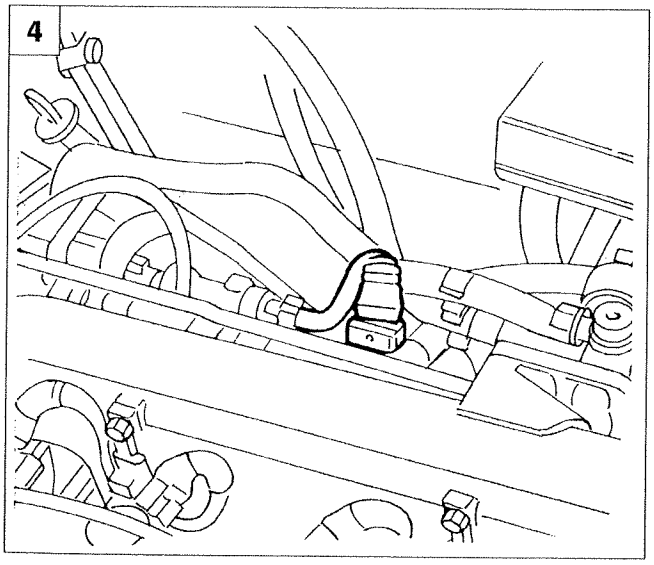
P3U01GJ02



P3U01GJ03



P3U02GJ02



P3U02GJ03

REMOVING - REFITTING DISTRIBUTION MANIFOLD

- Disable the alarm (if fitted), in the luggage compartment, right side, and disconnect the negative battery lead.

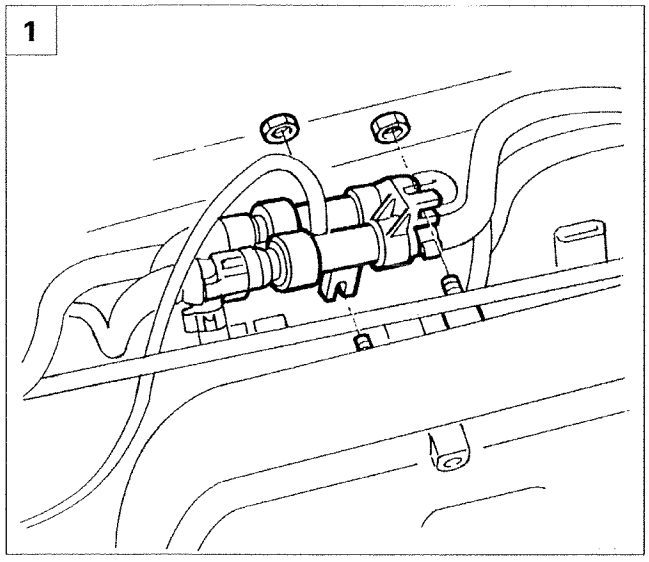
1. Remove the upper engine protective cover.

2. Undo the two bolts shown in the diagram and move the rigid pipe between the E.G.R. valve and the solenoid valve aside.

3. Undo the fixing nuts and position the diesel filter at the side.

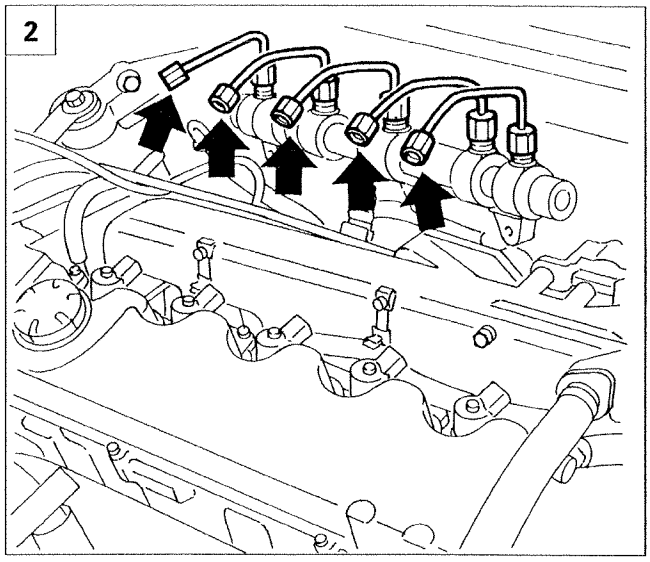
4. Disconnect the electrical connector from the excess pressure sensor.

1



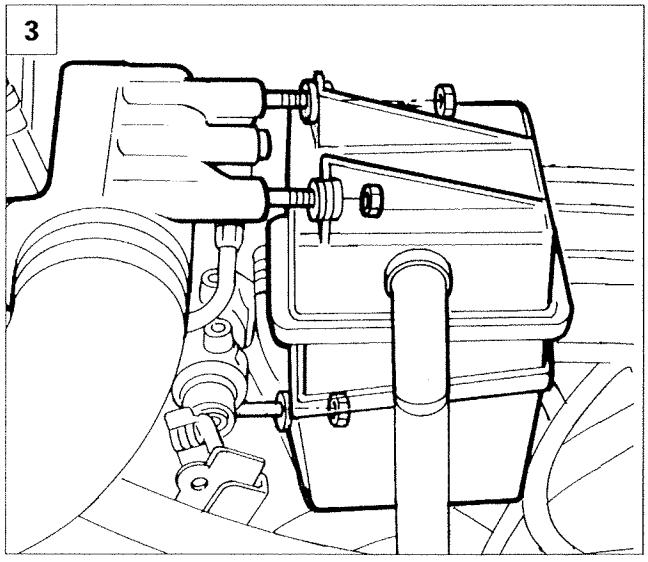
P3U02GJ04

2



P3U02GJ05

3



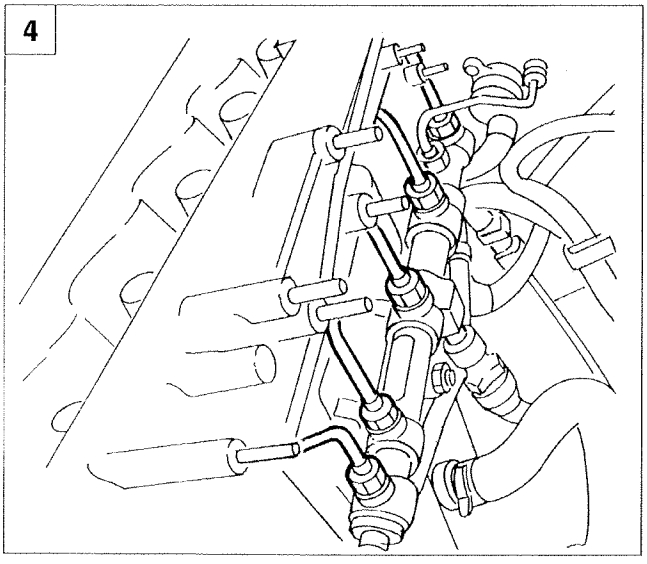
P3U03GJ01

1. Move the return manifold aside.

2. Undo the injector side connectors for the pipes between the distribution manifold and the injectors.

3. Move the oil vapour separator aside undoing the three fixing nuts.

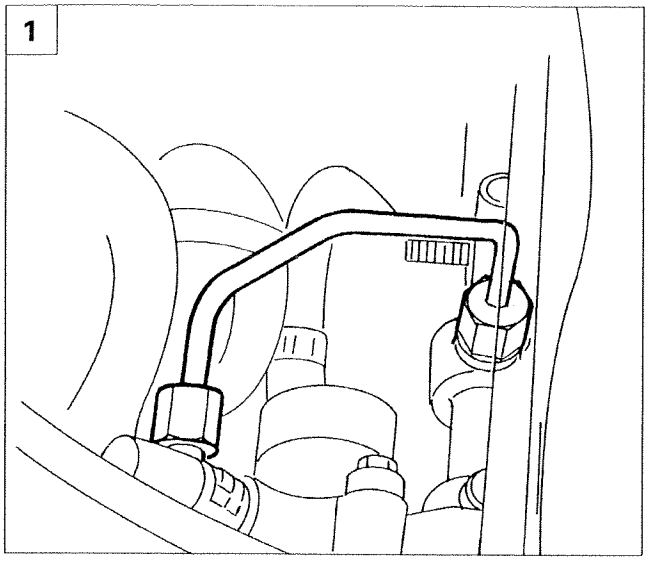
4



P3U03GJ02

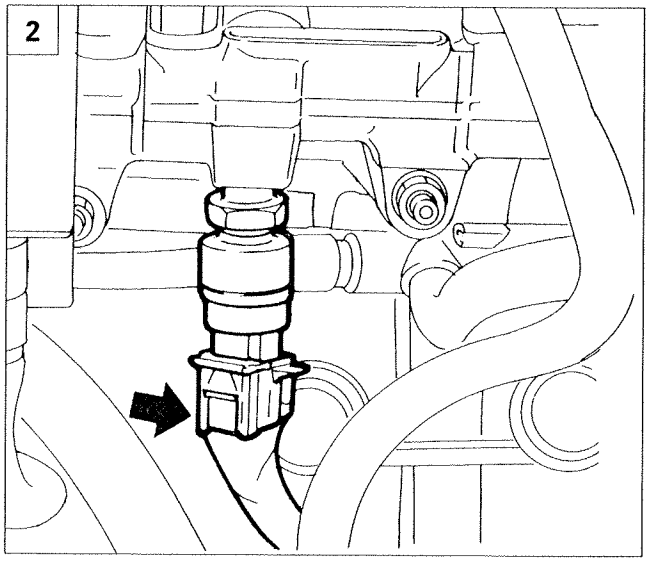
4. Undo the manifold side connectors for the pipes between the distribution manifold and the injectors and remove them.

10.



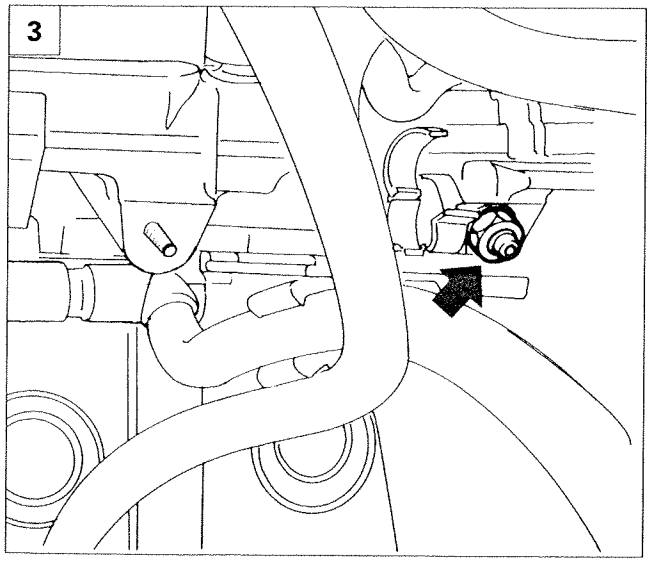
P3U06GJ01

1. Remove the fuel supply pipe between the pressure pump and the distribution manifold.



P3U06GJ02

2. Disconnect the electrical connection from the fuel pressure sensor.

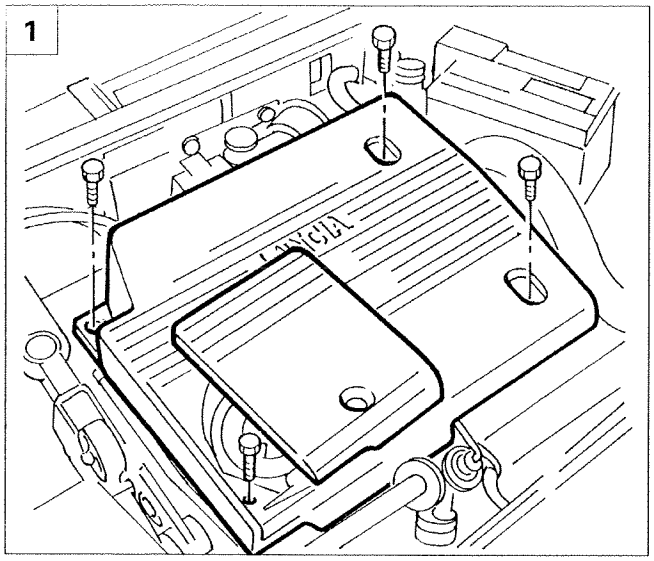


P3U06GJ03

3. Undo the remaining fixing nut illustrated in the diagram and carefully remove the distribution manifold.

NOTE *To refit, reverse the order of the operations described above, tightening the connectors for the pipes between the distribution manifold and the injectors and the fuel supply pipe from the pressure pump to the recommended torque of 2 daNm.*

1



P3U01GJ02

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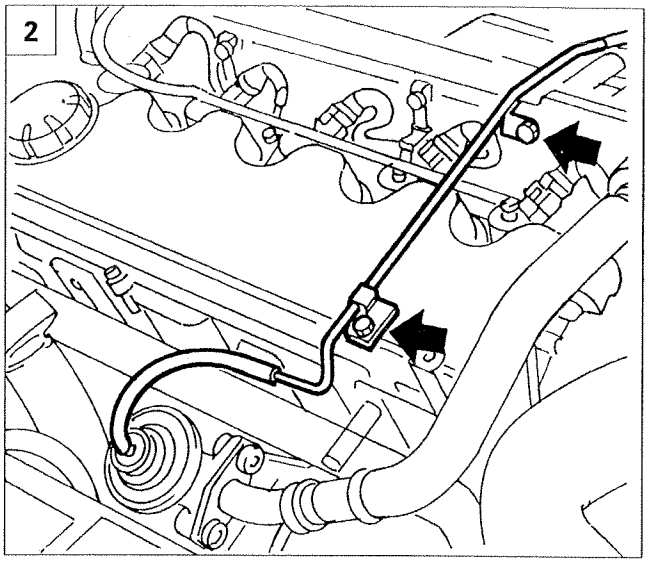

P3U01GJ03

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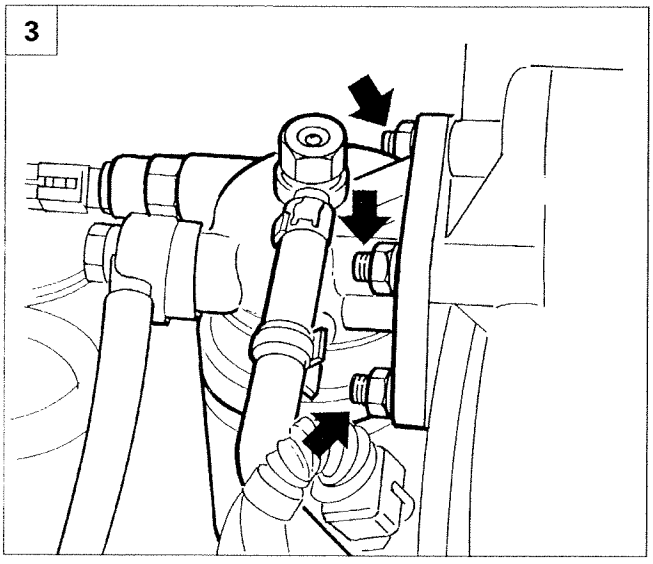


P3U02GJ02

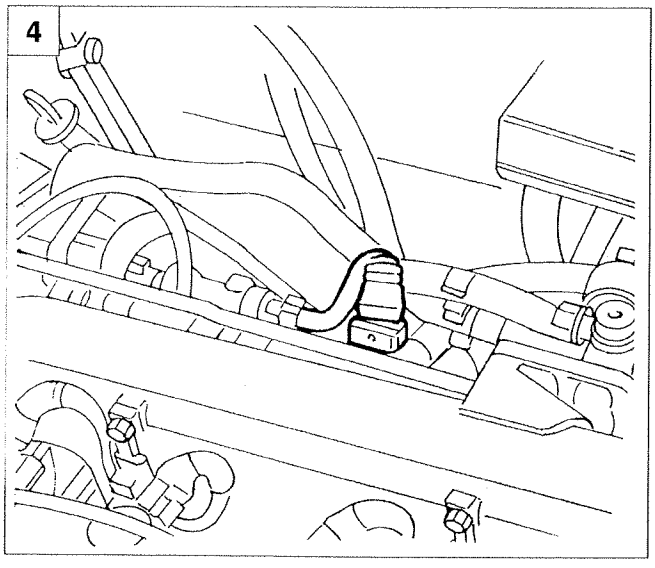
REMOVING-REFITTING HEATER PLUGS

- Disable the alarm (if fitted), in the luggage compartment, right side, and disconnect the negative battery lead.

1. Remove the upper engine protective cover.

2. Undo the two bolts shown in the diagram and move the rigid pipe between the E.G.R. valve and the solenoid valve aside.

4

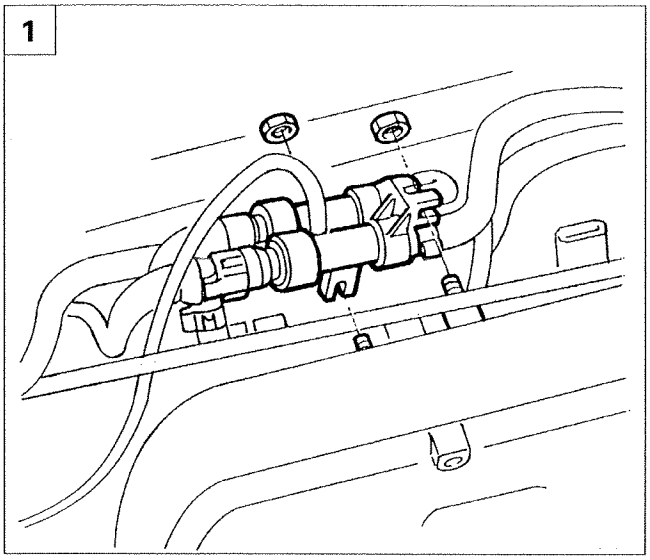


P3U02GJ03

3. Undo the fixing nuts and position the diesel filter to the side.

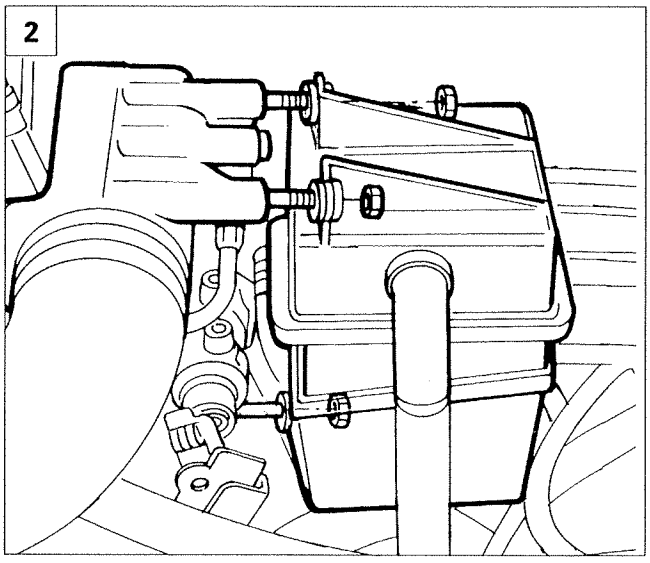
4. Disconnect the electrical connector from the excess pressure sensor.

10.



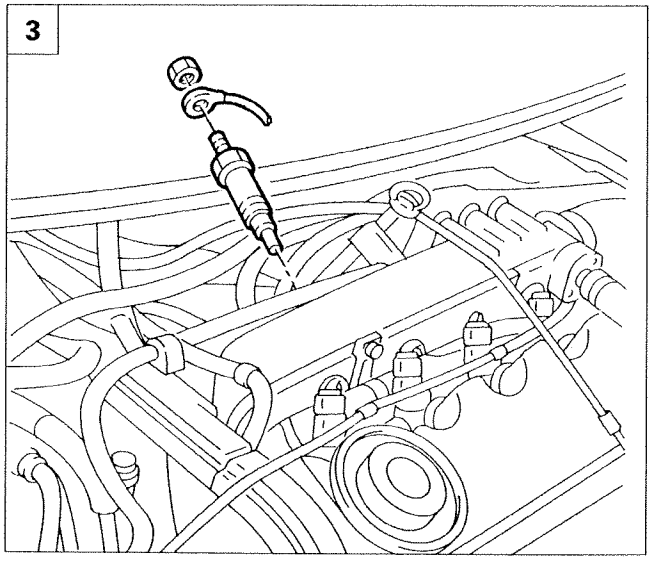
P3U02GJ04

1. Move the return manifold aside.



P3U03GJ01

2. Undo the fixing nuts and position the oil vapour separator to the side.

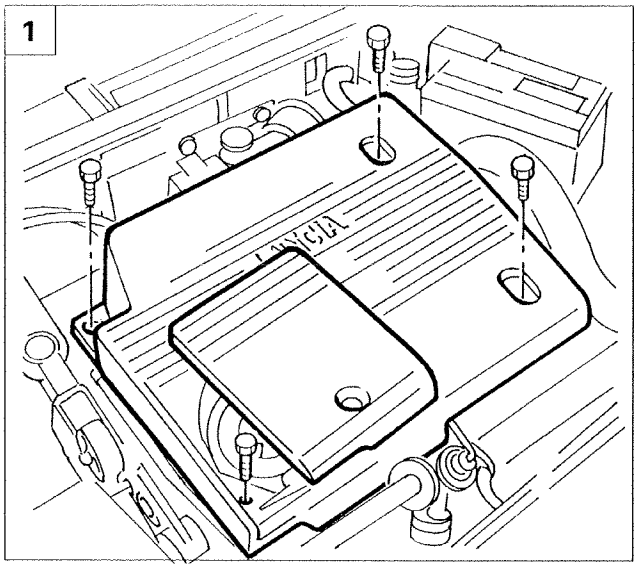


P3U08GJ03

3. Disconnect the electrical connection, undo the fixing nut and remove the heater plugs using a suitable spanner.

NOTE *To refit, carry out the operations described above in the reverse order.*

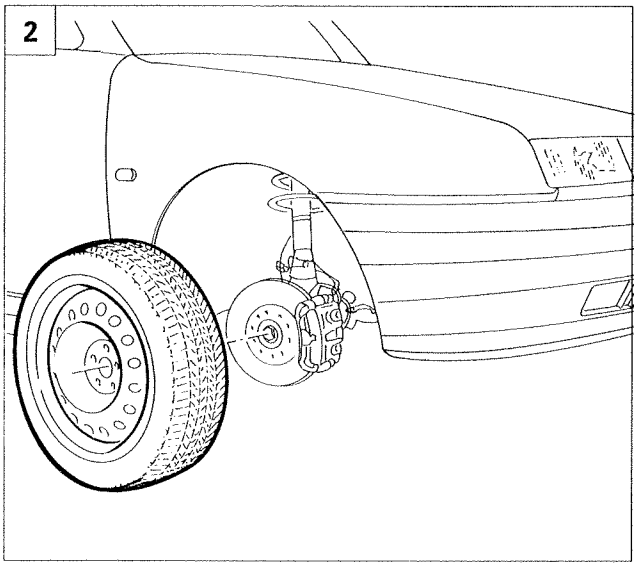
REMOVING-REFITTING PRESSURE PUMP



P3U01GJ02

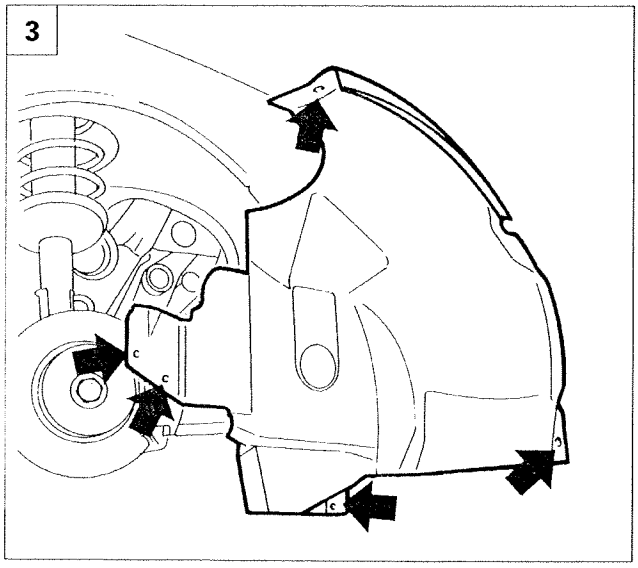
- Disable the alarm (if fitted), in the luggage compartment, right side, and disconnect the negative battery lead.

1. Remove the upper engine protective cover.



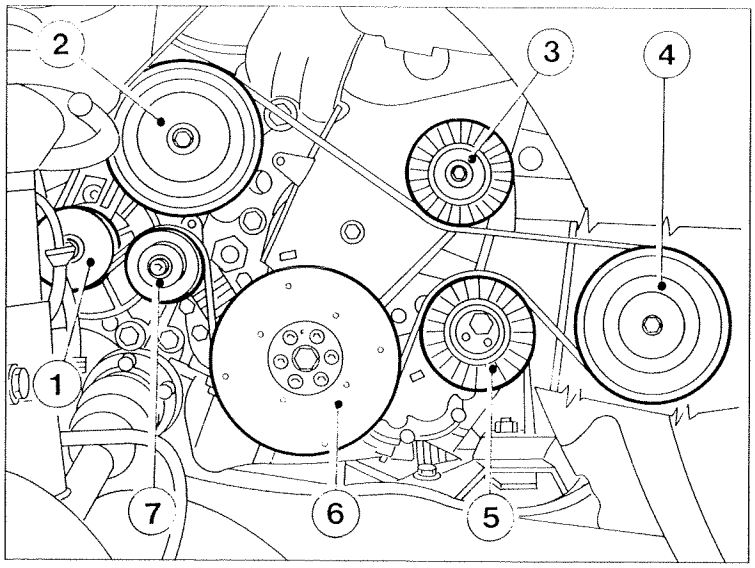
P3U09CJ01

2. Position the vehicle on a lift and remove the right front wheel.



P3U09GJ01

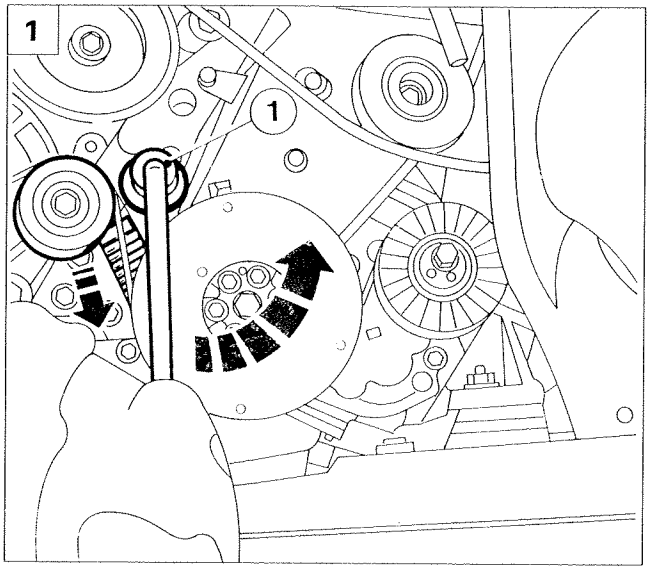
3. Remove the right side wheel arch liner.



P3U10GJ04

iew of auxiliary shaft belt itted on vehicle:

1. Alternator
2. Power assisted steering pump
3. Fixed pulley
4. Air conditioning compressor pulley
5. Moving pulley
6. Crankshaft pulley
7. Automatic tensioning device

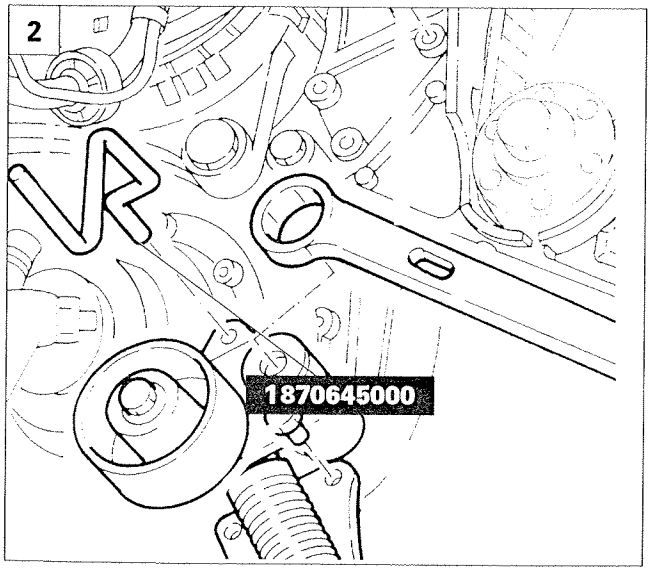


P3U10GJ01

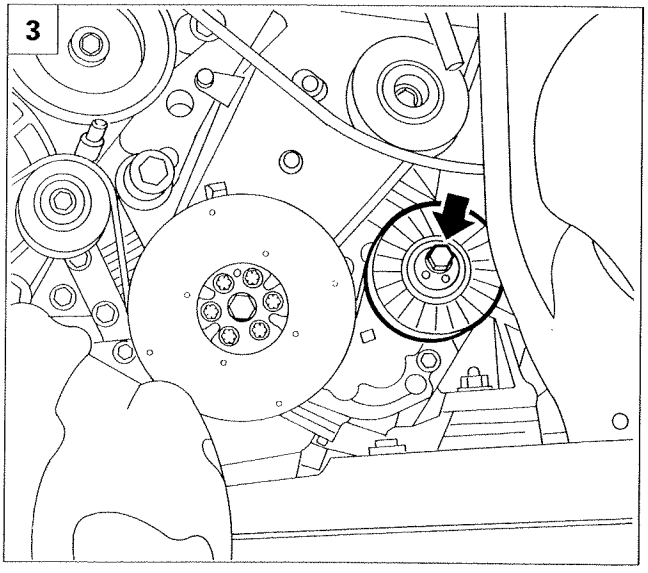
1. Loosen the belt tensioner rotating the automatic tensioner nut (1) in an anti-clockwise direction.

2. Rotate the tensioner until the reference opning (3) in the actual tensioner corresponds with the opening (2) in the bracket; then insert tool 1870645000 to lock the tensioner in this position.

3. Loosen the tension of the moving pulley acting on the fixing bolt; then remove the auxiliary shaft drive belt.

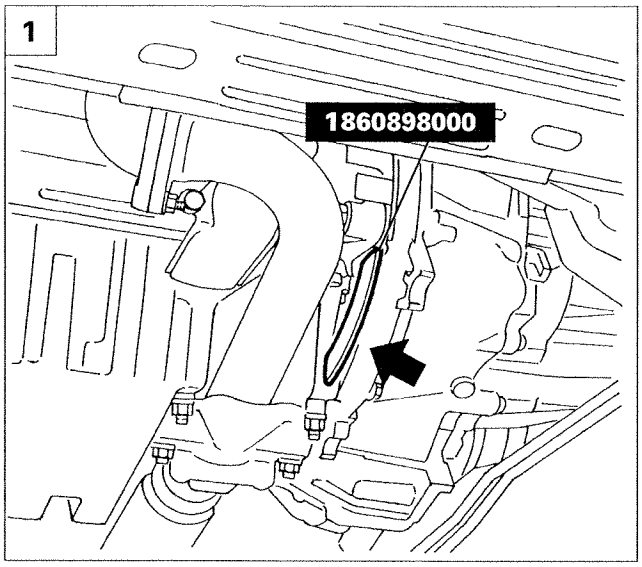


P3U10GJ02



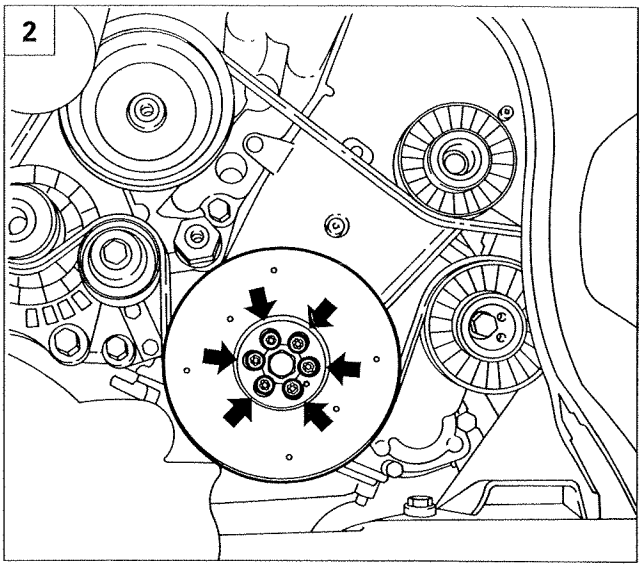
P3U10GJ03

1



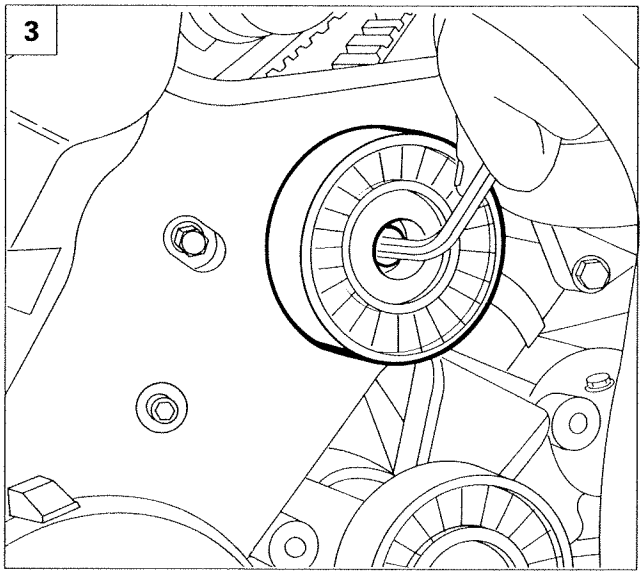
P3U11GJ01

2



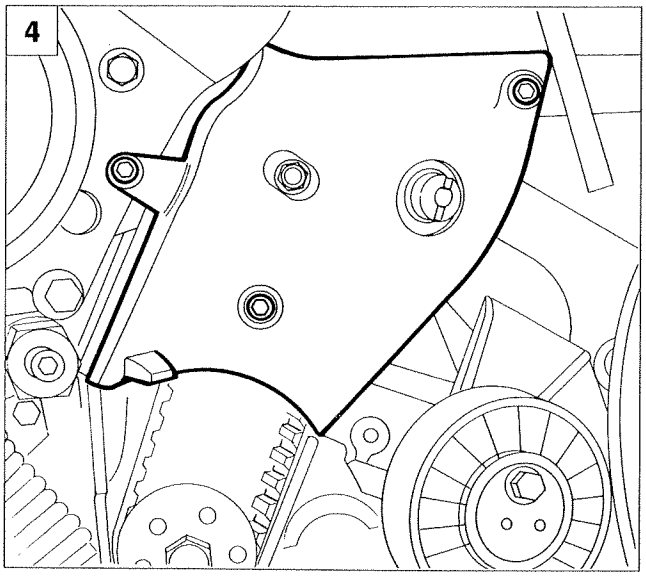
P3U11GJ02

3



P3U11GJ03

4



P3U11GJ04

After having removed the auxiliary shaft drive belt, proceed as follows:

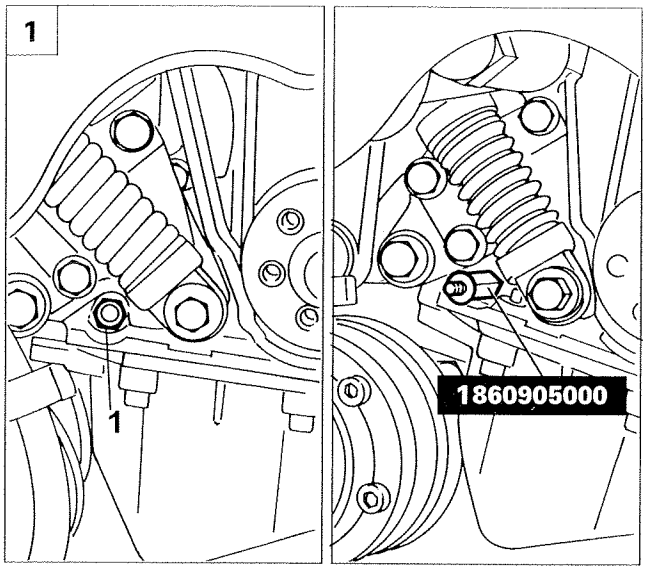
1. Remove the lower engine shield and lock the flywheel using tool 1860898000.

2. Remove the auxiliary shaft drive pulley on the crankshaft (damper flywheel).

3. Remove the fixed idler pulley for the auxiliary shaft belt, to allow the subsequent removal of the timing belt lower shield.

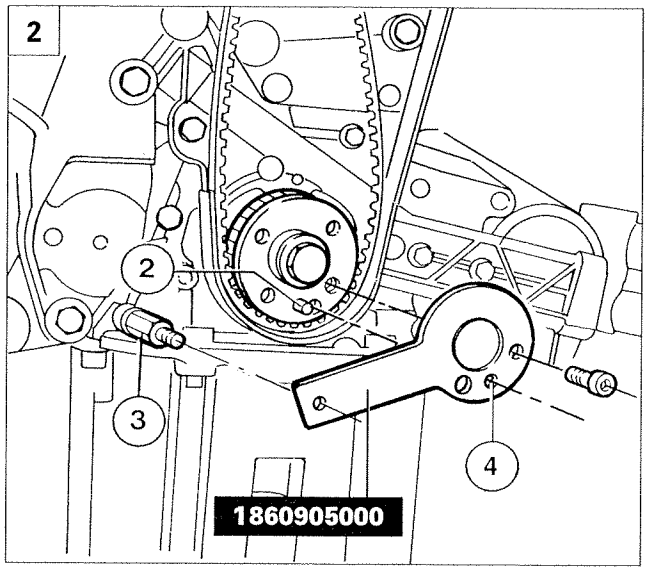
4. Remove the lower shield for the timing drive belt and remove the flywheel lock.

10.



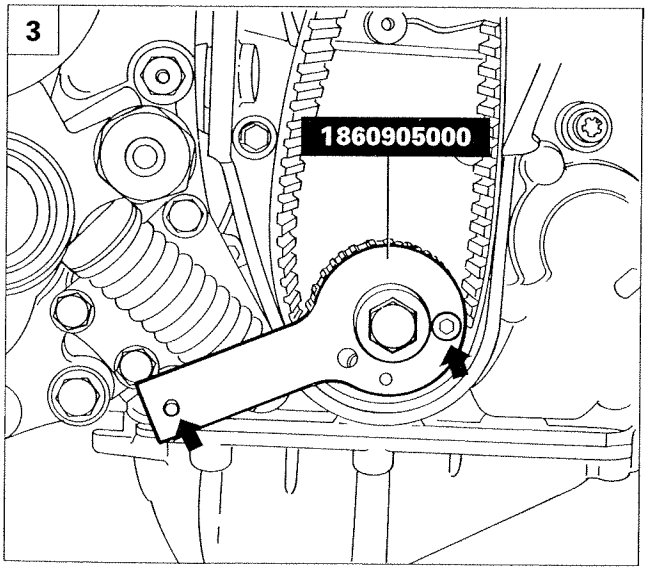
P3U12GJ01 P3U12GJ02

1. Remove the oil pump fixing bolt; position the the pin for tool 1860905000 for determining T.D.C. in place of the bolt.



P3U12GJ03

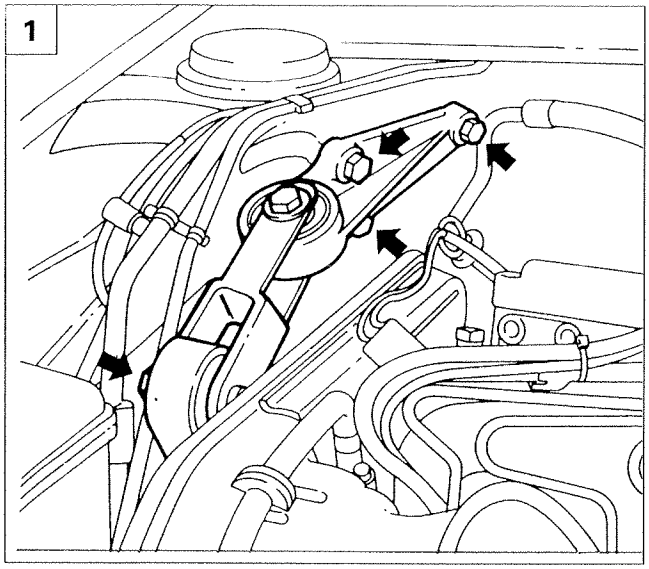
2. Position tool 1860905000 on the crankshaft drive gear and on the pin (3) fitted previously; rotate the crankshaft using small movements until the centering dowel (2) is aligned with the opening (4) in the tool. In this position cylinder n° 1 is correctly aligned at T.D.C.



P3U12GJ04

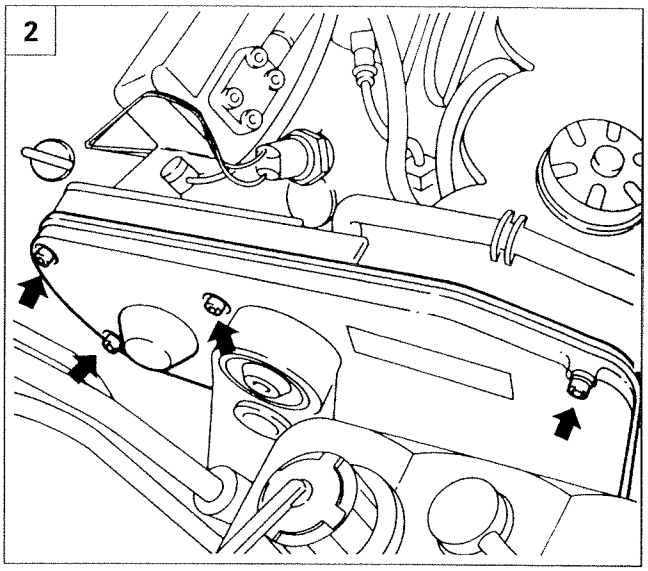
3. Fix the tool 1860905000 to the crankshaft drive gear using the bolt shown.

1



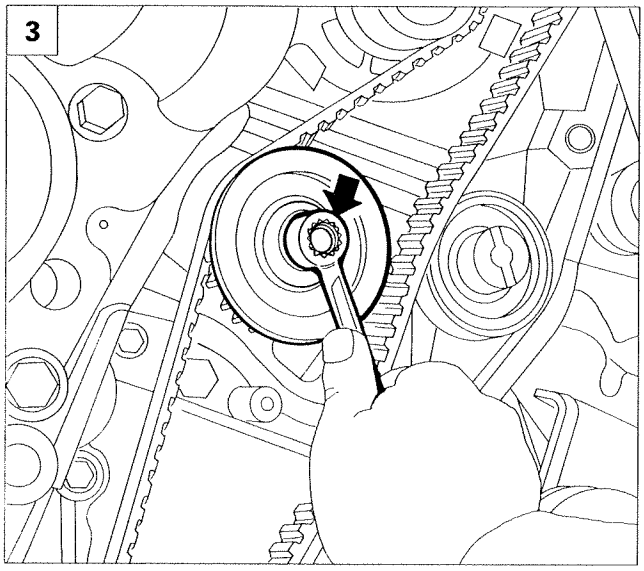
P3U13GJ01

2



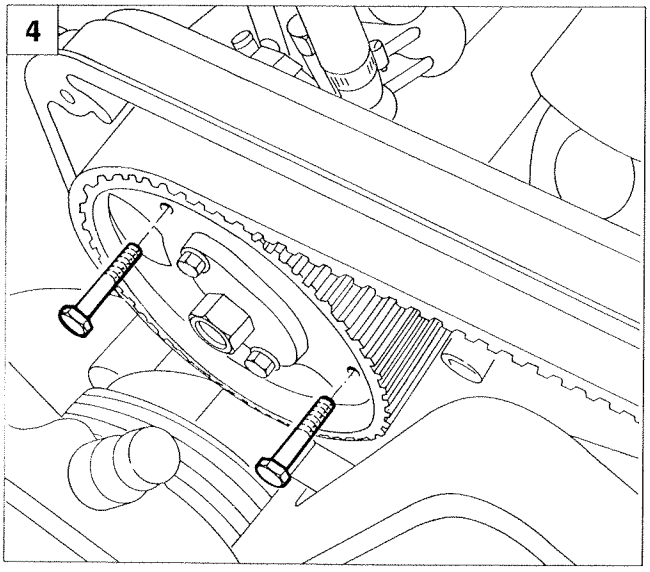
P3U13GJ02

3



P3U13GJ03

4



P3U13GJ04

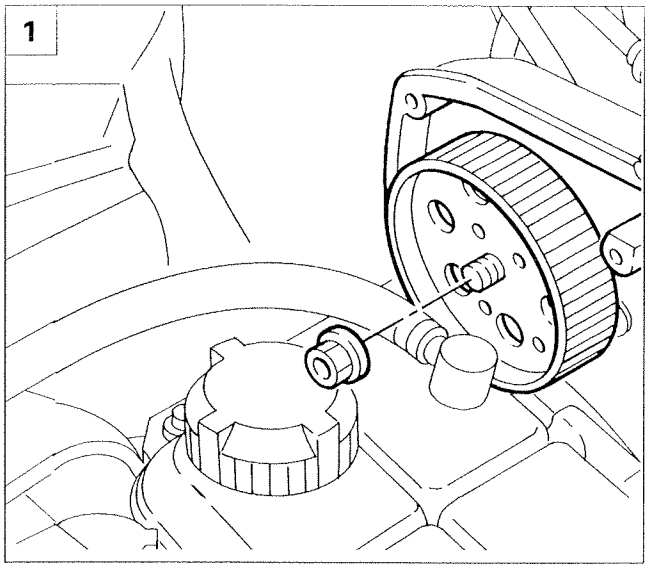
1. Remove the reaction rod and the support, acting on the fixings shown in the diagram, to allow the subsequent removal of the timing belt upper shield.

2. Remove the upper timing belt shield.

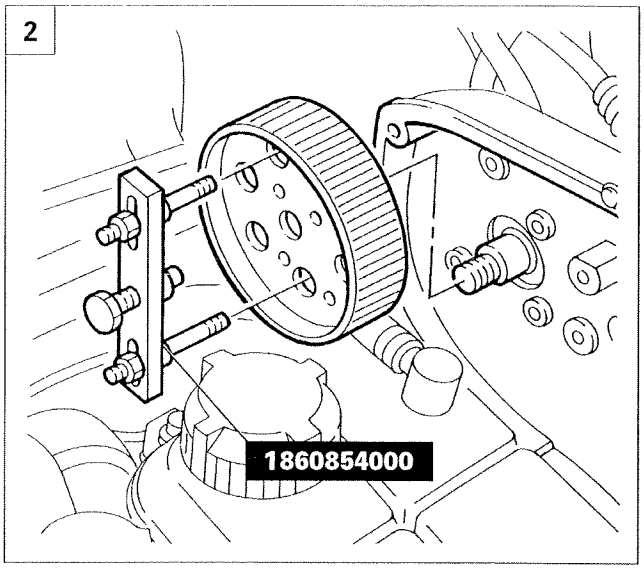
3. Remove tool 1860905000 then loosen the timing belt tension acting on the nut shown in the diagram and remove the actual belt.

4. Lock the pressure pump pulley inserting two service bolts with an M6 thread in the openings and tightening the bolts on the pump mounting.

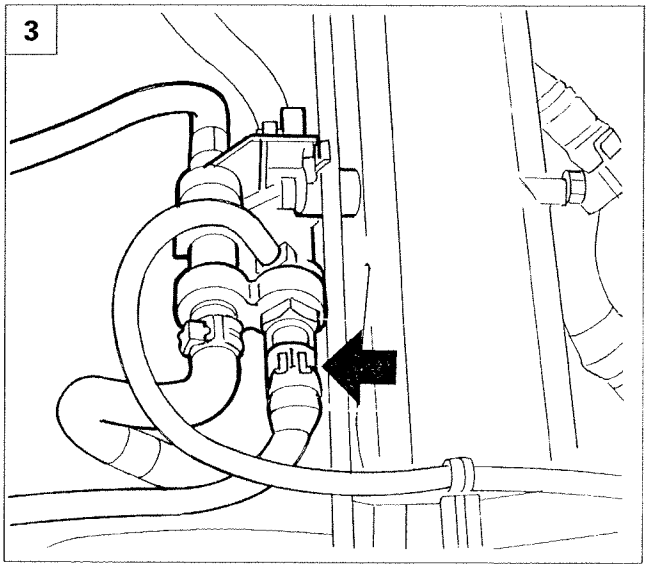
10.



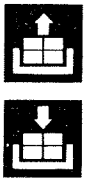
P3U14GJ01



P3U14GJ02



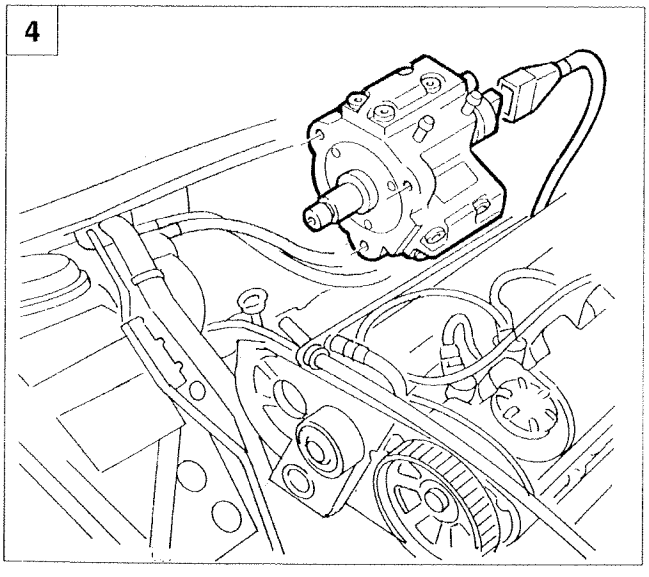
P3U14GJ03



1. Undo the nut fixing the pressure pump pulley.

Remove the two bolts used for locking the pressure pump pulley.

2. Remove the pulley using tool 1860854000.

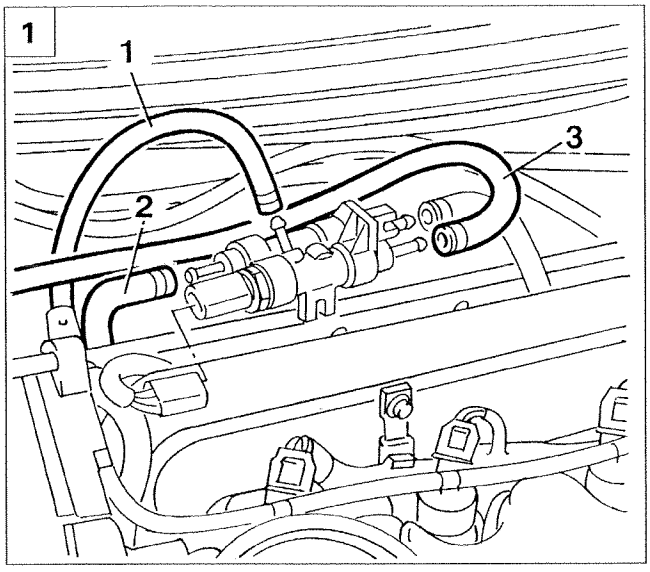


P3U14GJ04

3. Disconnect the electrical connection from the fuel temperature sensor.

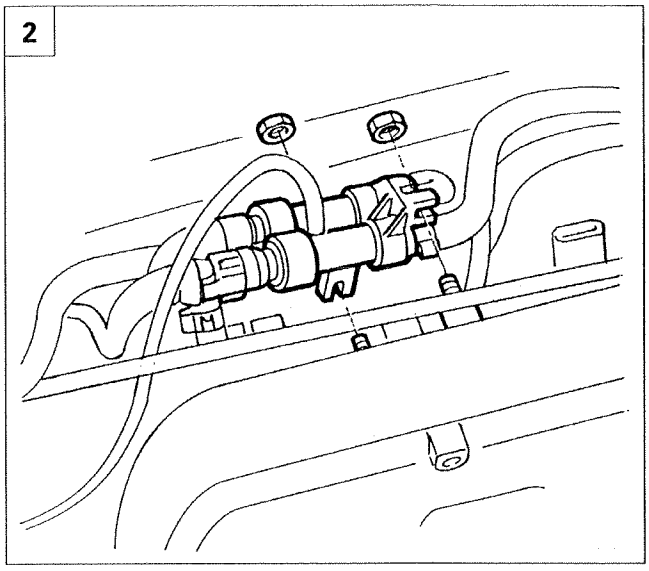
4. Disconnect the electrical connection from the fuel pressure regulator on the pressure pump.

1



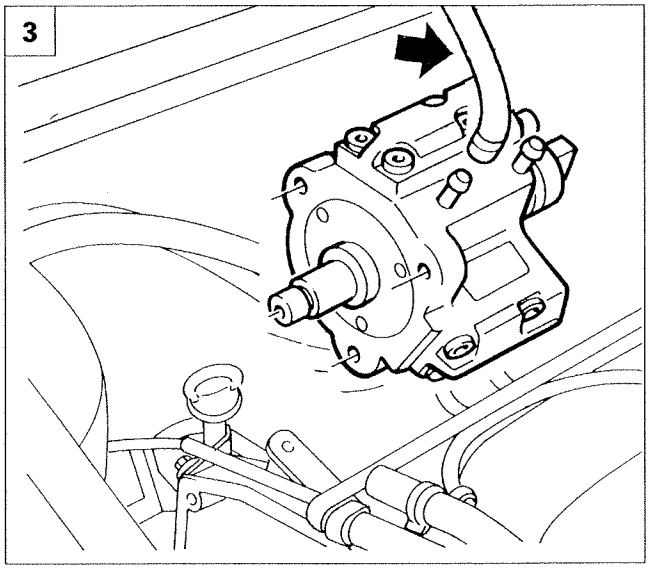
P3U15GJ01

2



P3U02GJ04

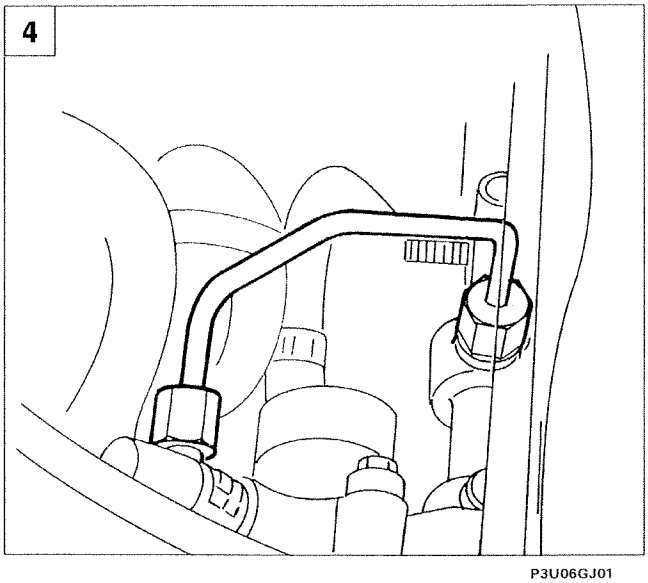
3



P3U15GJ03

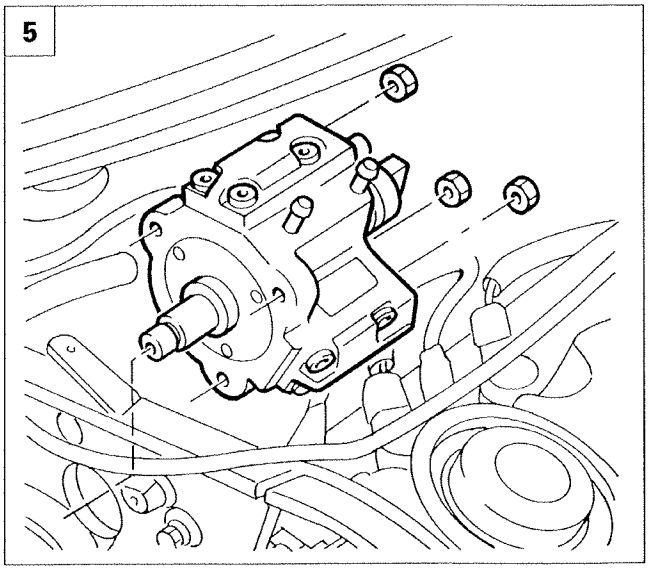
1. Disconnect the following items from the fuel return manifold:
   1. the fuel return pipe from the injectors
   2. the return pipe from the pressure pump
   3. the fuel return pipe from the filter
2. Undo the nuts and remove the fuel return manifold.
3. Disconnect the fuel inlet pipe from the pressure pump.
4. Remove the fuel supply pipe from the pressure pump to the distribution manifold.
5. Remove the pressure pump.

4



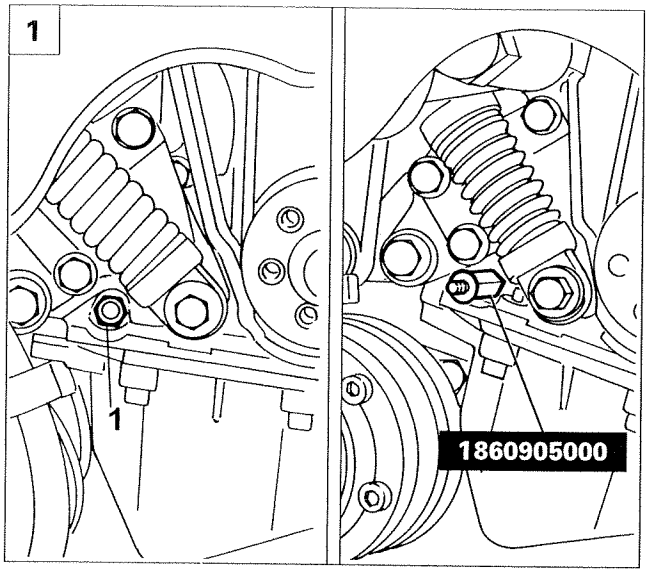
P3U06GJ01

5



P3U15GJ02

1



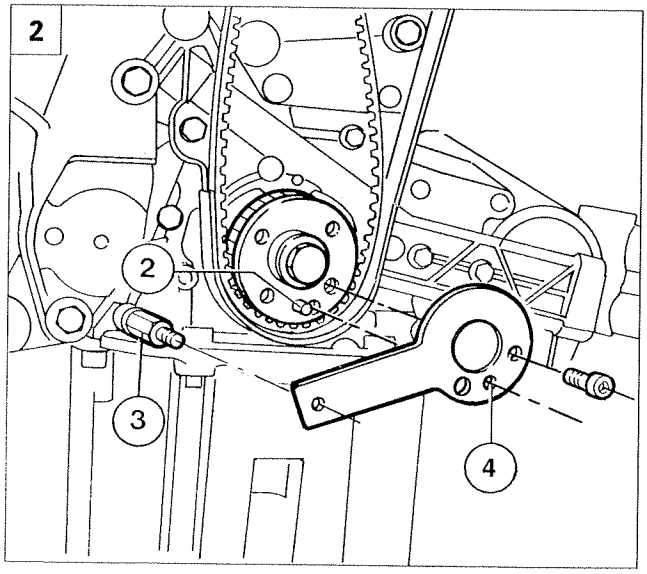
P3U12GJ01 P3U12GJ02

Refitting

Reverse the order of the operations described above until the refitting of the pressure pump pulley. Then proceed with the refitting and tensioning of the timing belt and the auxiliary shaft drive belt.

The timing belt should always be replaced each time it is removed. Tighten the nut securing the pressure pump to a torque of 2.5 daNm and the connectors securing the fuel supply pipe between the pressure pumpand the distribution manifold to a torque of 2 daNm.

2



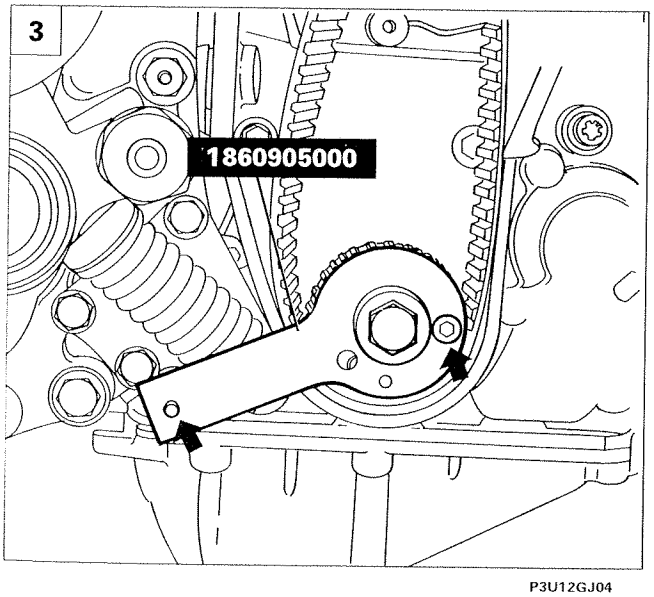
P3U12GJ03

Fitting and tensioning timing drive belt

1. Remove the bolt (1) fixing the oil pump; position the pin for tool 1860905000 for deteriming T.D.C. in place of the bolt.

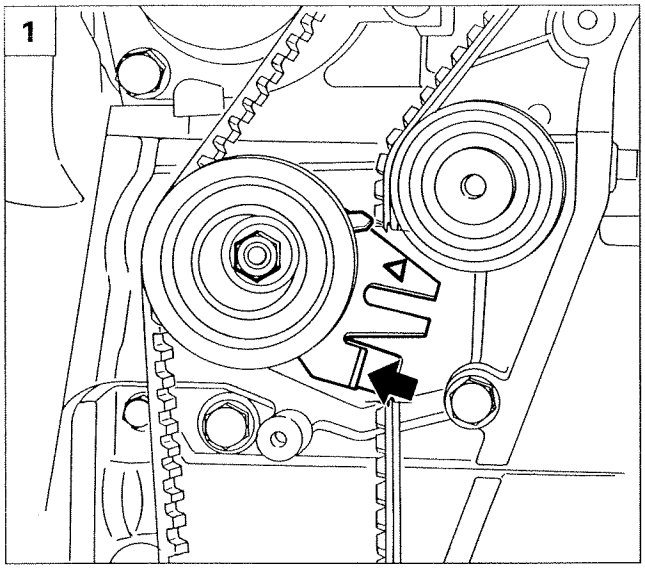
2. Fit the timing drive belt on the crankshaft drive gear only. Position tool 1860905000 on the crankshaft drive gear and on the pin (3) fitted previously; rotate the crankshaft, using small movements, until the centering dowel (2) is aligned with the opening (4) in the tool. In this position cylinder n° 1 is exactly at T.D.C.

3



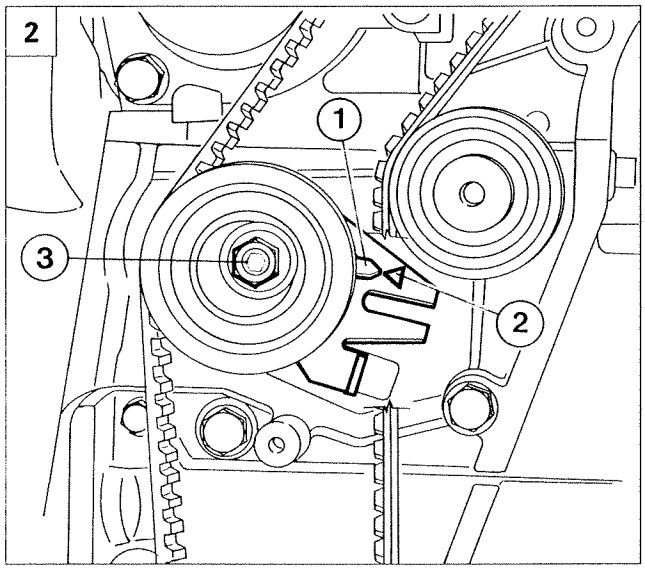
P3U12GJ04

3. Fix the tool 1860905000 to the crankshaft drive gear using the bolt shown and complete the refitting of the upper section of the belt.



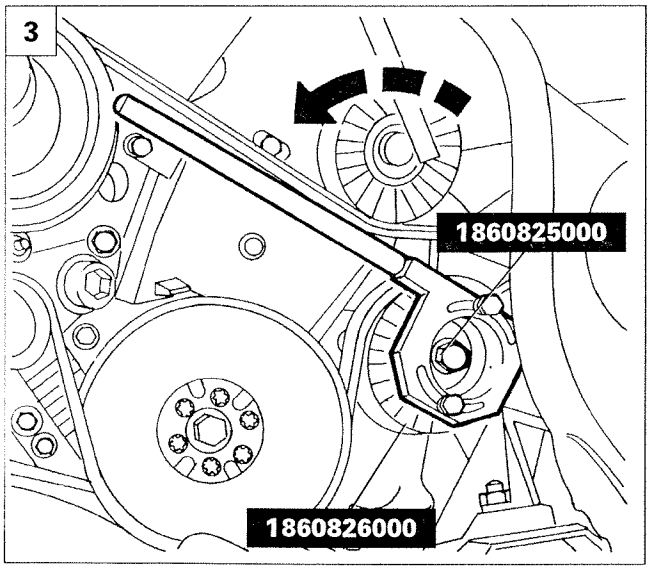
P3U17GJ01

1. Using a screwdriver, apply force to the automatic tensioner so that the tensioner is in the maximum tension position, then tighten the nut fixing the tensioner to the mounting. Release the crankshaft from tool 1860905000 and rotate it through two revolutions in its normal direction of rotation.



P3U17GJ02

2 Loosen the nut fixing the tensioner (3) and, using a screwdriver for leverage in order not to completely discharge the tensioner, ensure that the moving reference (1) on the tensioner coincides with the fixed reference (2), then tighten the tensioner (3) fixing nut to a torque of 2.5 daNm.

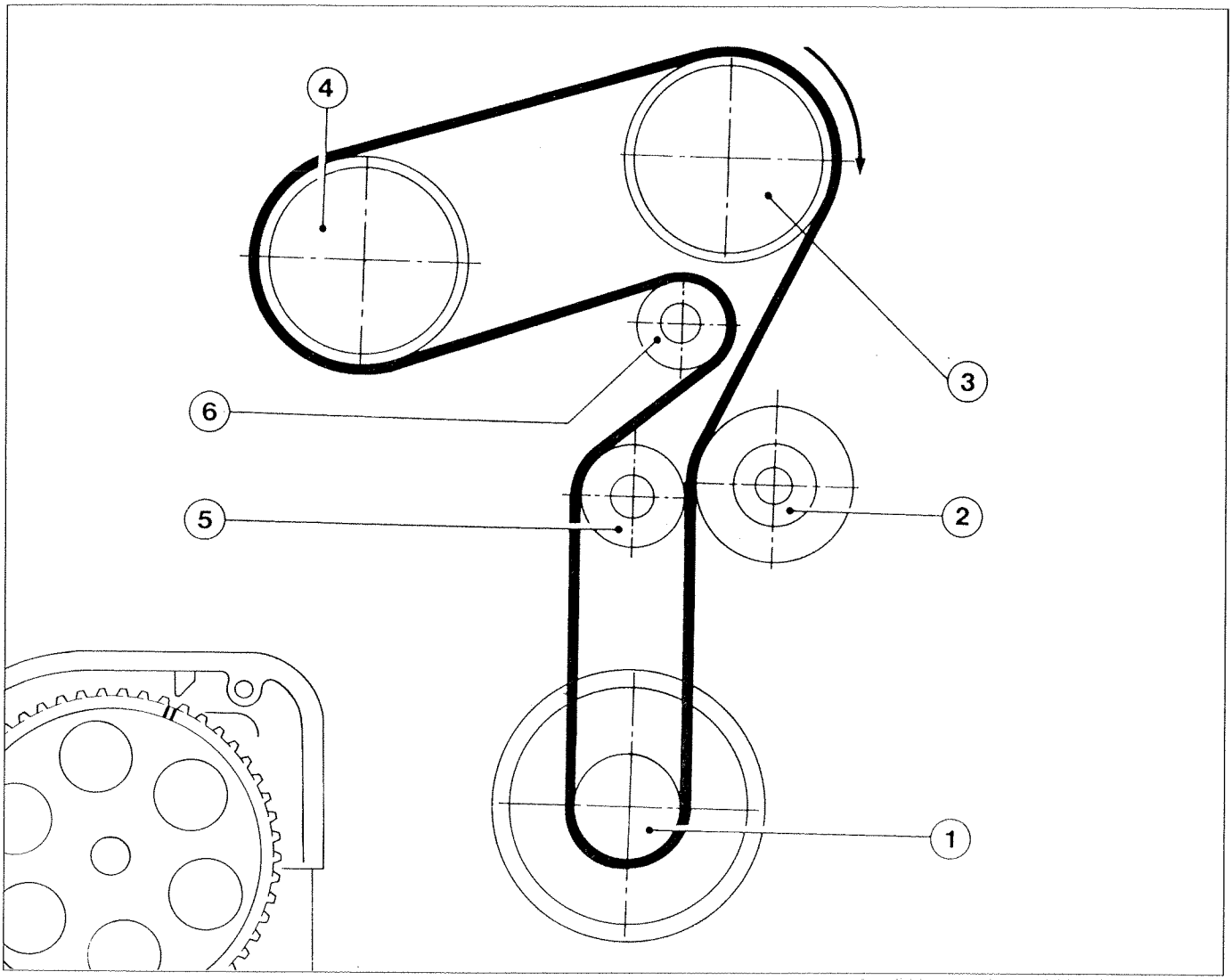


P3U17GJ03

Refitting and tensioning the auxiliary shaft belt

2. Fit the belt suitably reversing the order of the operations described for the removal. The tensioning is carried out by positioning tools 1860826000 and 1860825000 on the (not locked) moving pulley by the special openings; rotate the lever obtained in this way in an anti-clockwise direction until it is possible to easily remove pin 1860830000. Lock the bolt (3) fixing the moving tensioner in this position. The automatic tensioner pre-loaded spring will ensure that the belt is correctly tensioned.

Timing belt fitting order



P3U18GJ01

P3U18GJ02

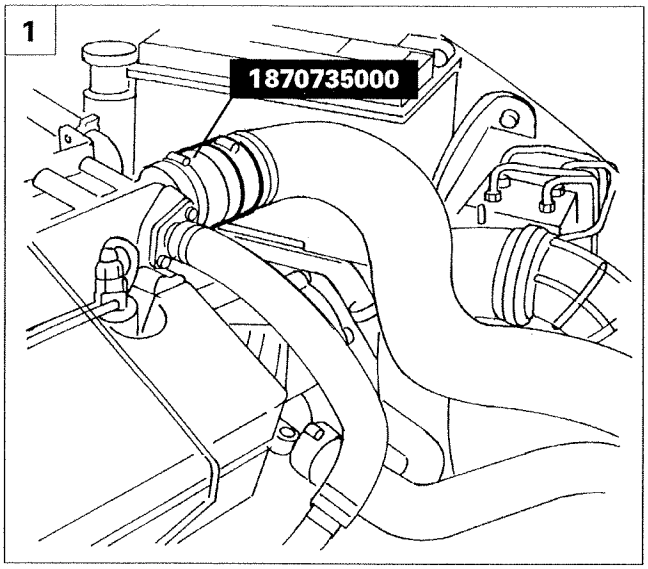
The position for the two timing references on the crankshaft pulley and the tappet cover is illustrated.

The belt should be fitted observing the following order:

- crankshaft drive gear (1);
- fixed pulley (2);
- camshaft pulley (3);
- injection pump pulley (4);
- automatic tensioner pulley (5);
- water pump pulley (6).

NOTE *The belt should be fitted taking care to ensure there is no bending or sharp angles which would adversely affect the structure of the actual belt.*

1

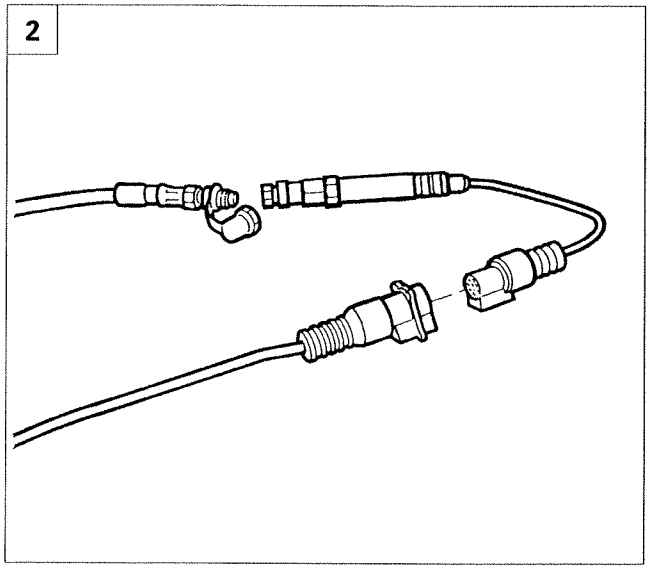


P3U19GJ01

CHECKING SUPERCHARGING PRESSURE

1. Fit tool 1870737000 between the air hose and the inlet manifold.

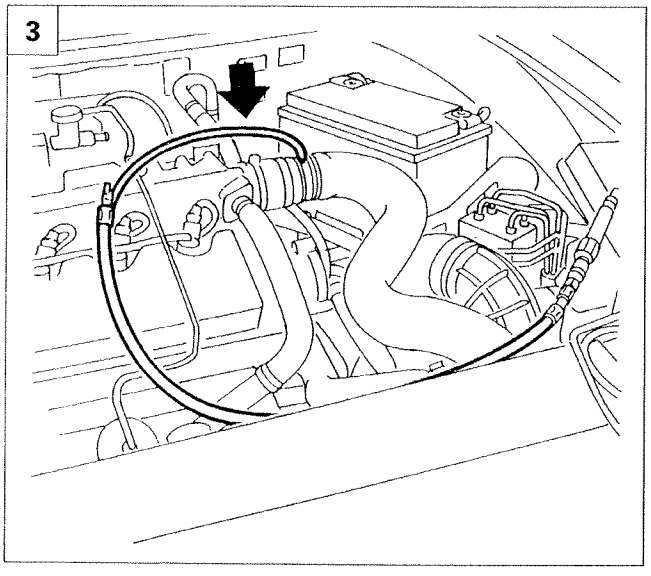
2



P3U19GJ02

2. Wire the pressure transducer as illustrated in the diagram.

3



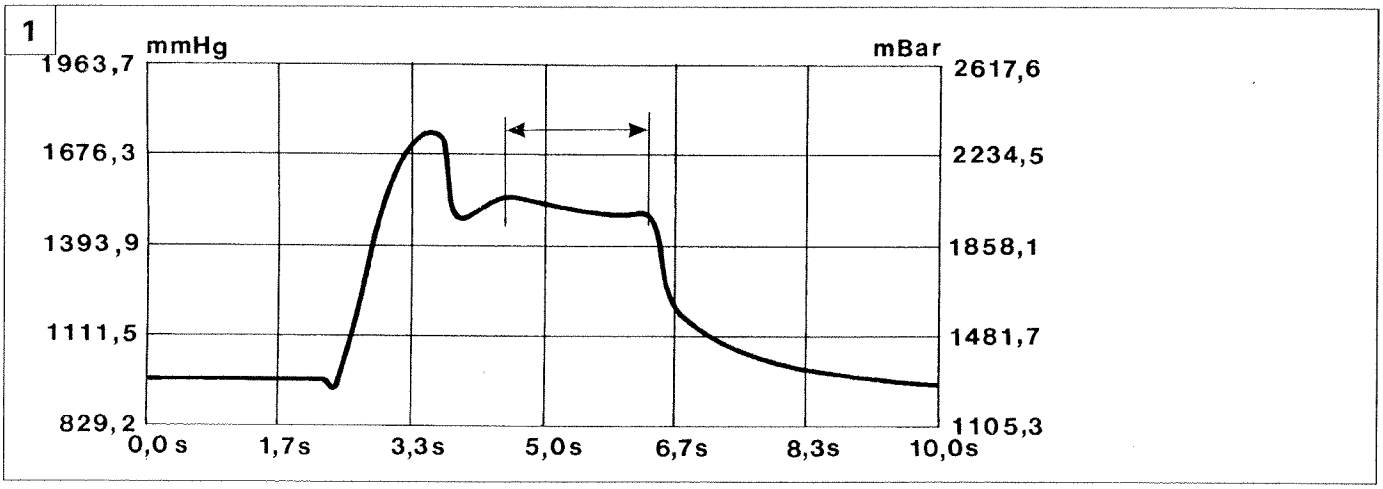
P3U19GJ03

3. Connect the pressure transducer to tool 1870737000

Place the Examiner diagnostic equipment in the passenger compartment and connect it to the pressure transducer.

- Select "pressure gauge" on the Examiner/SDC and prepare it for the acquisition of data in the "intake pressure" mode with an end of scale of 2000 mmHg and time setting of 10 seconds
- Road test the vehicle (adhering to the speed limits in force) as folows:
- With motorway conditions available, let the vehicle reach 2500 rpm in 4th gear.
- Start the graphic acquisition by pressing "start" on the diagnostic equipment and after about 2 seconds fully depress the accelerator pedal until 3500 rpm is reached.
- Having reached this speed, completely release the accelerator pedal.

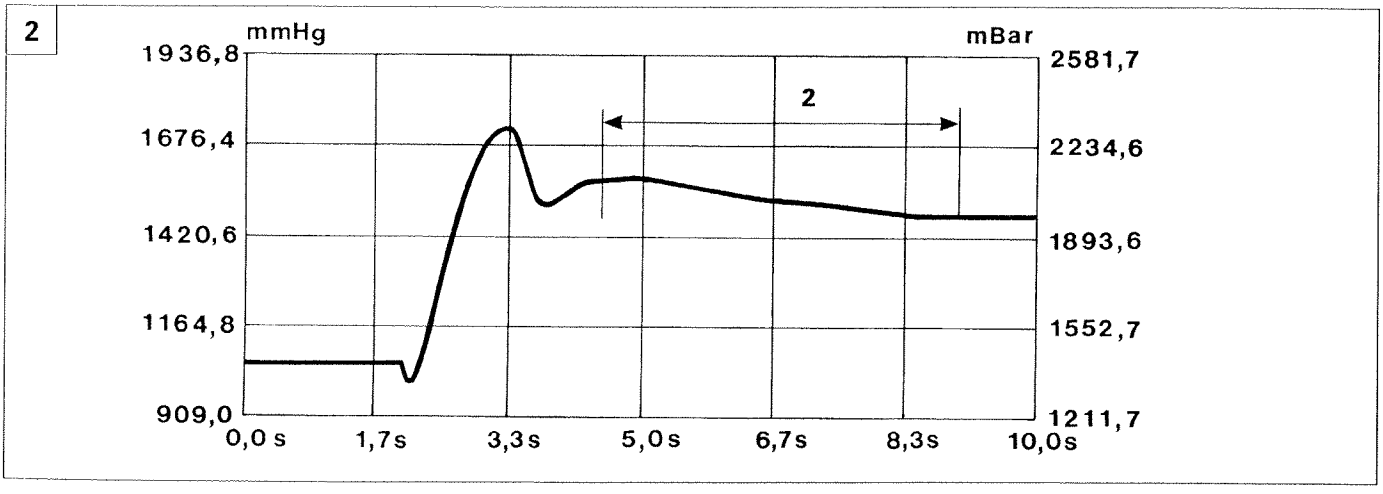
1. Display the resulting graph and in the pressure section (1), excluding the initial peak, the reading should be 1900 - 2800 mbar (1444 - 1581 mmHg) corresponding to a supercharging pressure of 900 - 1080 mbar.



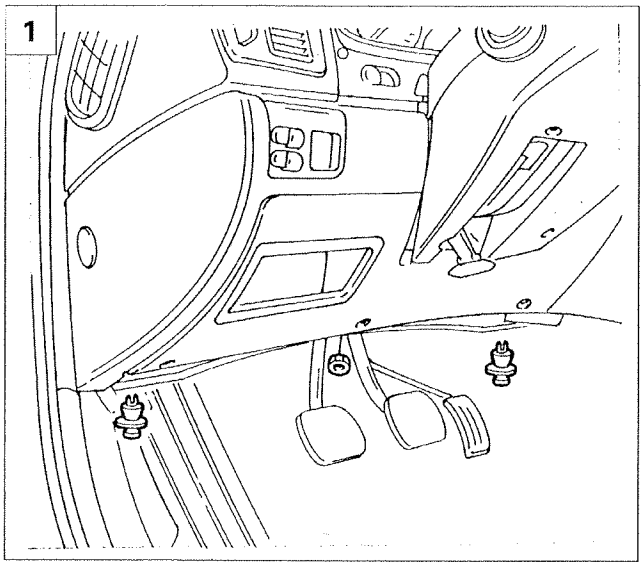
P3U20GJ01

- During an extra-urban journey at various speeds, let the vehicle reach 2500 rpm in 3rd gear.
- Start the graphic acquisition by pressing "start" on the diagnostic equipment and after about 2 seconds fully depress the accelerator pedal until 3500 rpm is reached.
- Having reached this speed, completely release the accelerator pedal.

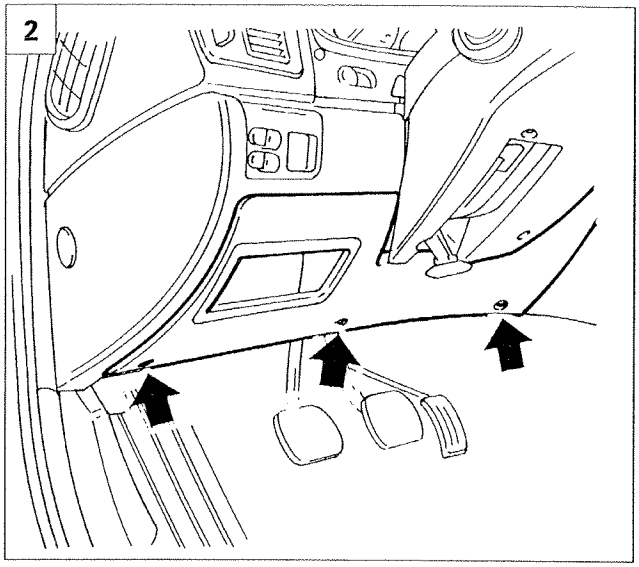
2. Display the resulting graph and, in the pressure section (2), excluding the initial peak, the reading should be 1900 - 2080 mbar (1444 - 1581 mmHg) corresponding to a supercharging pressure of 900 - 1080 mbar.



P3U20GJ02



P3U21GJ01

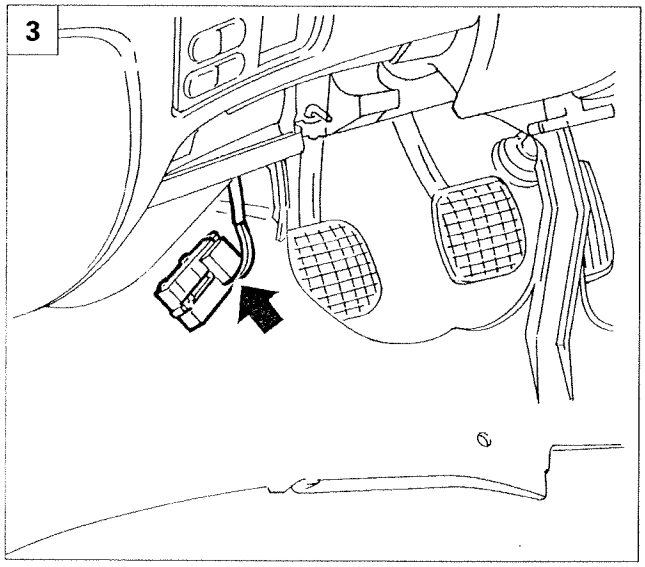


P3U21GJ02

REMOVING - REFITTING ACCELERATOR PEDAL POTENTIOMETER

- Disable the alarm (if fitted) housed in the luggage compartment, right side and disconnect the negative battery lead.

1. Undo the two buttons and the fixing nut and remove the driver's side floor mat.
2. Undo the fixing bolts and remove the protection for the fuse box.
3. Disconnect the electrical connection for the pedals courtesy light.
4. Cut the band and remove the plastic shield for the clutch pump.
5. Undo the clutch pump outlet connector taking care to prevent any fluid from escaping.



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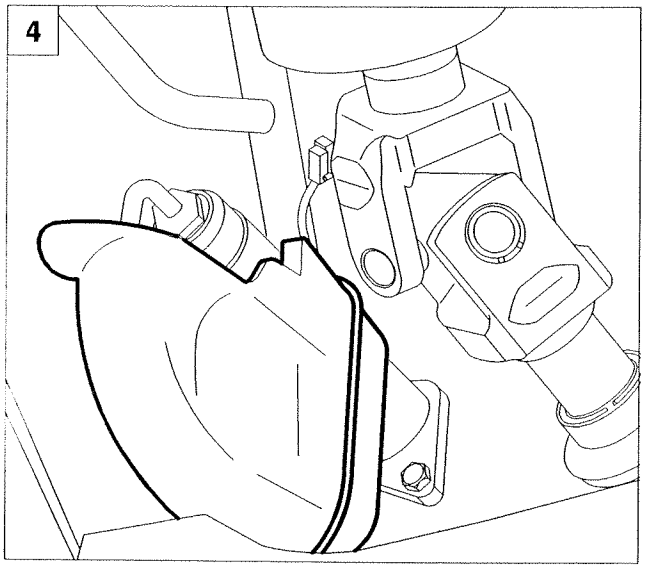
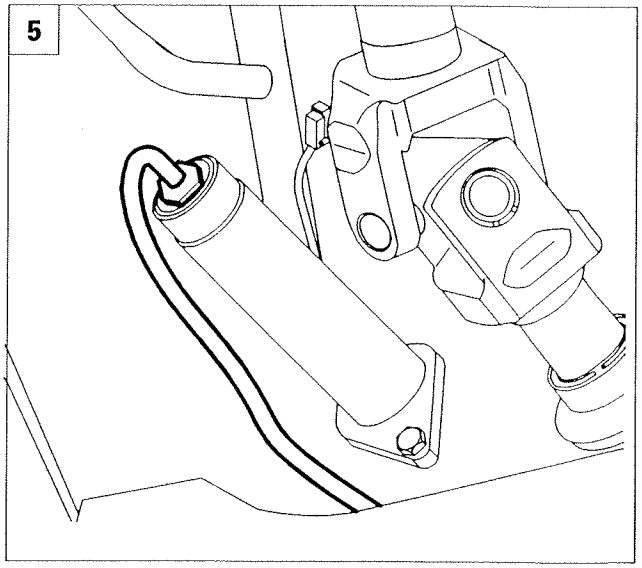


P3U21GJ04



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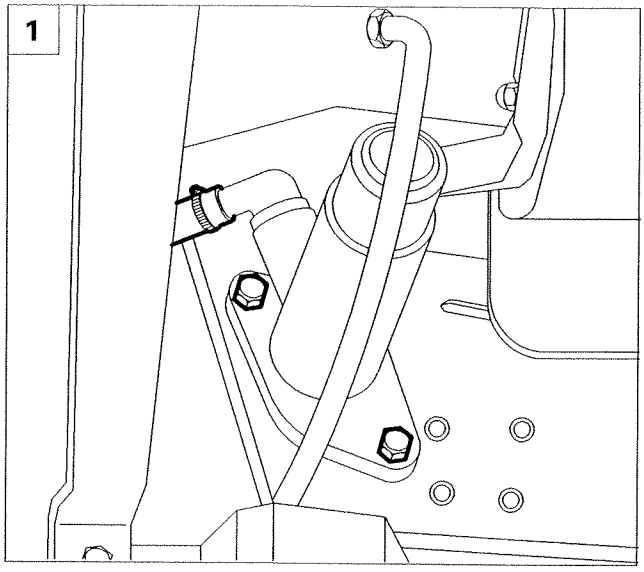

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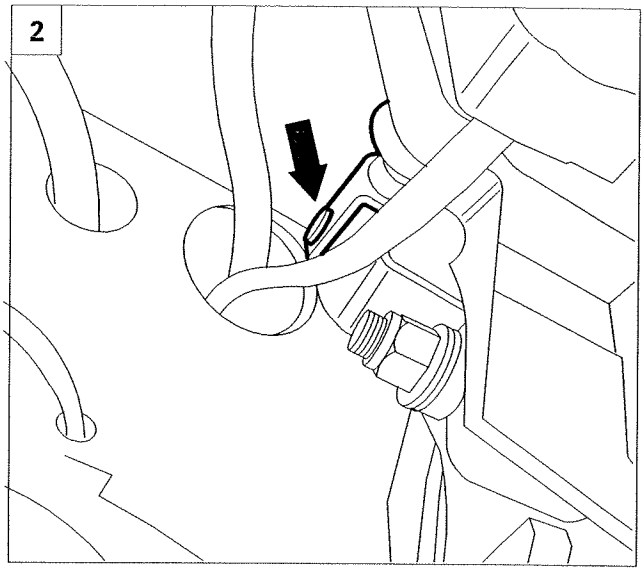

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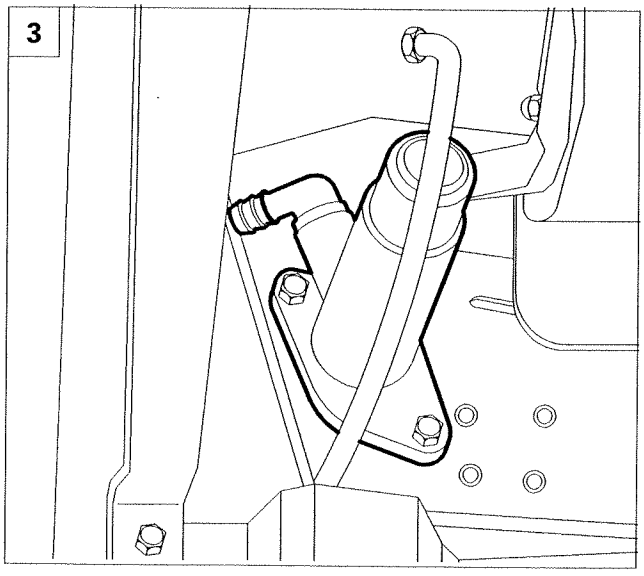

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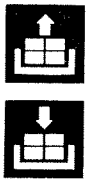


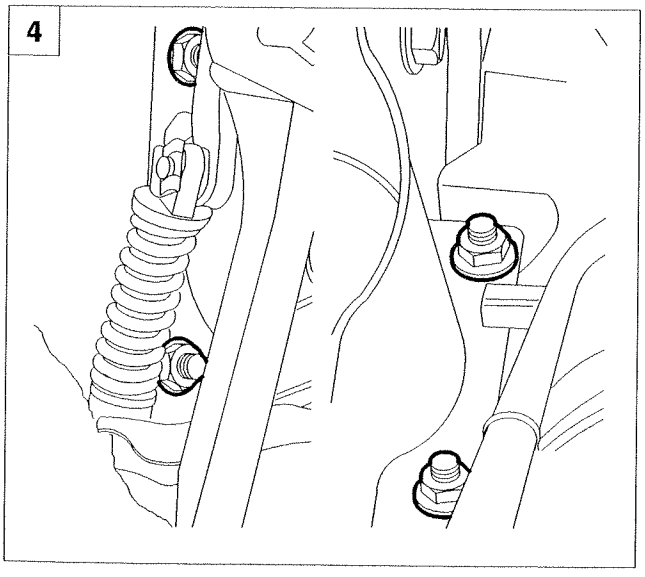
1. Remove the band and remove the clutch pump fluid inlet pipe.

2. Remove the circlip and remove the pin connecting the clutch pump to the pedal.

3. Undo the fixing nuts and remove the clutch pump.

4. Undo the bolts fixing the pedals assembly to the brake servo.

5. Disconnect the electrical connector for the accelerator potentiometer.



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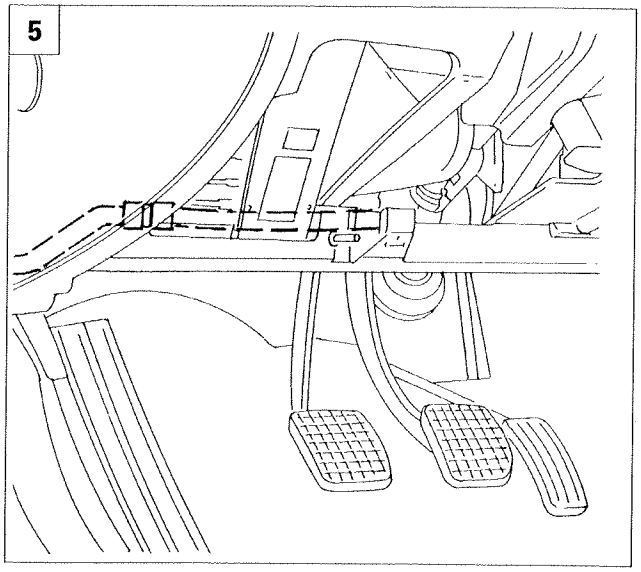

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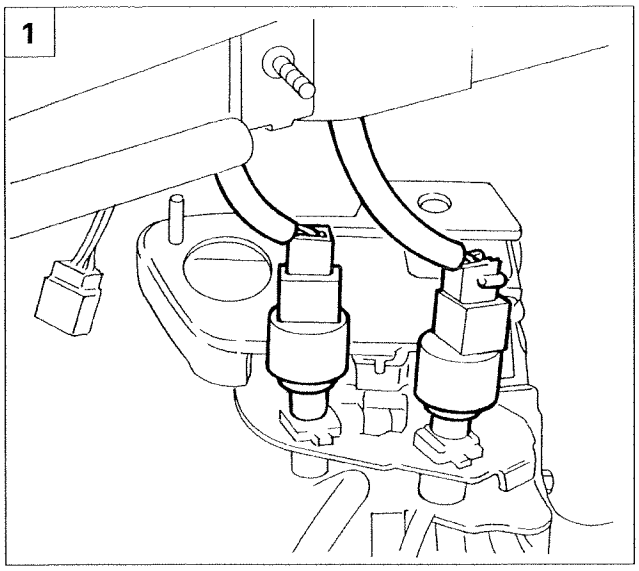

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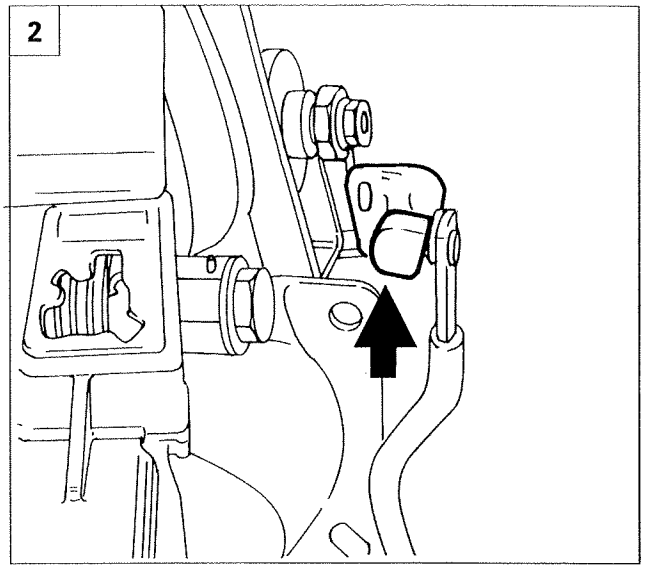

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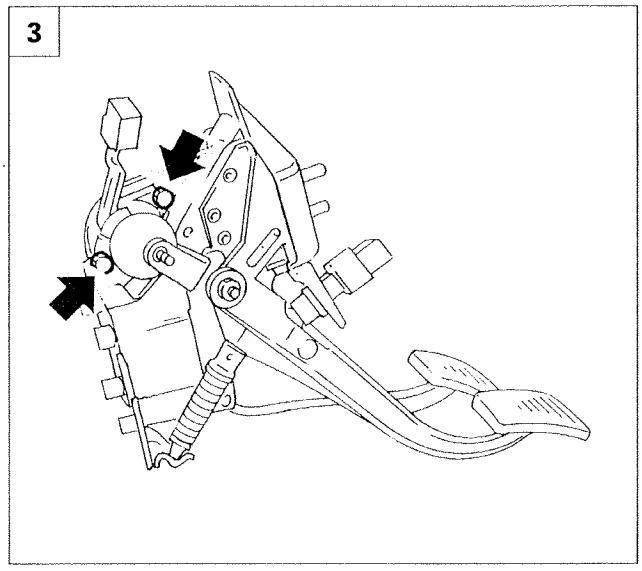

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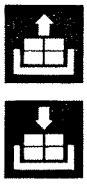
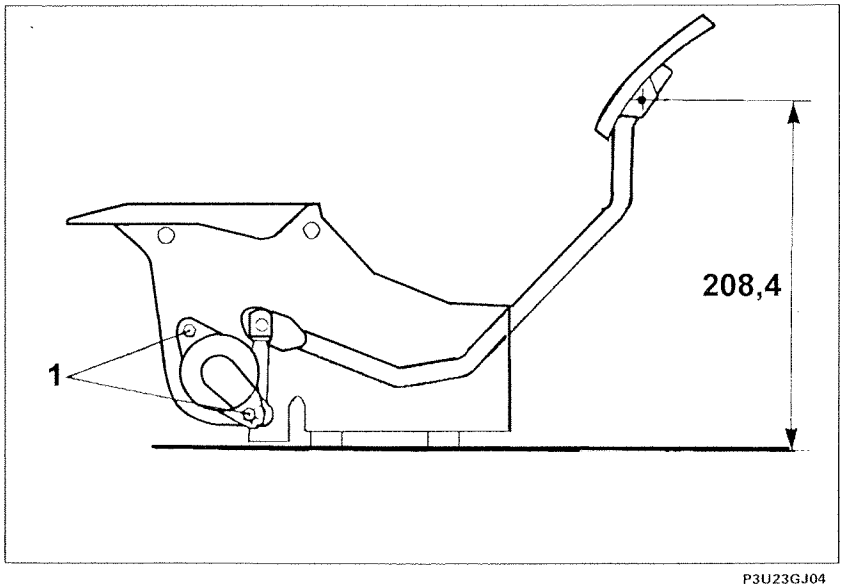


1. Remove the pedals assembly from the mounting bracket and disconnect the electrical connector for the brake pedal switch and for the clutch pedal switch.

2. At the bench, remove the potentiometer idler rod.

3. Undo the fixing bolts and remove the accelerator potentiometer.



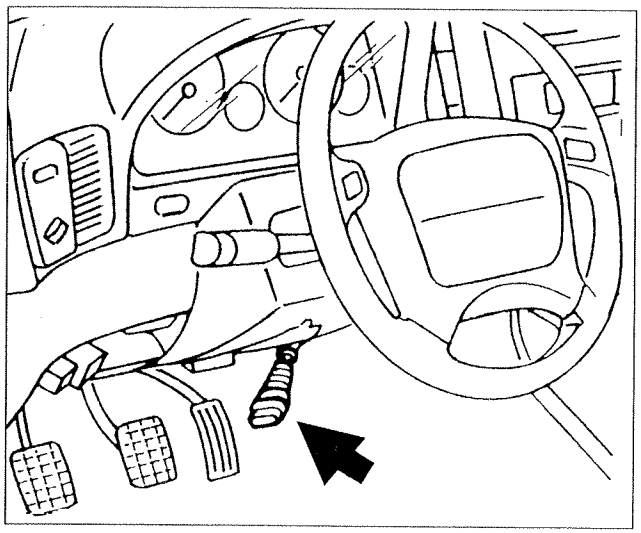
P3U23GJ04

Refitting

Fit the potentiometer in its housing, tighten the fixing bolts (1) and connect the linkage.
Rest the assembly on a reference plane as illustrated in the diagram and measure 208.4 millimetres from the plane to the rivet connecting the pedal to the lever.
With the pedal in this position, tighten the bolt (1) fixing the accelerator potentiometer.
Reattach the pedals assembly, reversing the order of the operations described for the removal.


Bleed the system

ADJUSTING ACCELERATOR PEDAL END OF TRAVEL



P3U24GJ02

Connect the diagnostic equipment to the socket inside the vehicle.

With the pedal in the end of travel position, check that the voltage readings on the instrument correspond to the figures in the table.

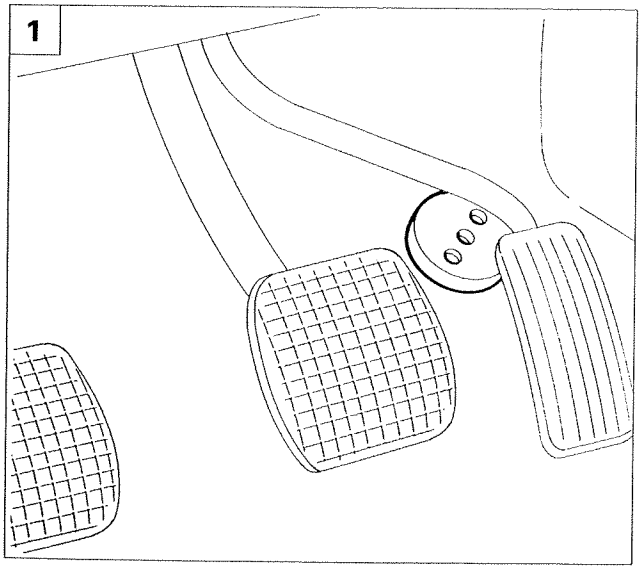
Accelerator position in minimum position

V	V%
0,4 ± 0,05	8 ± 1 %

Accelerator position in maximum position

V	V%
3,9 +0/-0,2	78 + 0%/-4%

The voltage readings are only valid with a supply voltage of 5V, as this voltage varies the percentage readings on the diagnostic equipment should be considered.



P3U24GJ01

1. To correct the voltage values with the accelerator in the maximum position, regulate the adjustment device and repeat the procedure using the diagnostic equipment.

GENERALITES CARACTERISTIQUES TECHNIQUES	INTRODUCTION TECHNICAL DATA	ALLGEMEINES TECHNISCHE DATEN	GENERALITÀ DATI TECNICI
MOTEUR	ENGINE	MOTOR	MOTORE
EMBRAYAGE	CLUTCH	KUPPLUNG	FRIZIONE
BOITE DE VITESSES DIFFERENTIEL	GEARBOX DIFFERENTIAL	SCHALTGETRIEBE AUS-GLEICHGETRIEBE	CAMBIO DI VELOCITÀ DIFFERENZIALE
ARBRE DE TRANSMISSION	PROPELLER SHAFT	GELENKWELLE	ALBERO DI TRASMISSIONE
DIFFERENTIEL ARRIERE	REAR DIFFERENTIAL	HINTERES AUS-GLEICHGETRIEBE	DIFFERENZIALE POSTERIORE
FREINS	BRAKING SYSTEM	BREMSEN	FRENI
DIRECTION	STEERING	LENKUNG	STERZO
SUSPENSIONS ET ROUES	SUSPENSION AND WHEELS	AUFHÄNGUNGEN UND RÄDER	SOSPENSIONI E RUOTE
ORGANES SUBSIDIAIRES	AUXILIARY UNITS	ZUSATZ-EINRICHTUNGEN	ORGANI SUSSIDIARI
EQUIPEMENT ELECTRIQUE	ELECTRICAL EQUIPMENT	ELEKTRISCHE ANLAGE	IMPIANTO ELETTRICO
CARROSSERIE	BODYWORK	CAROSSERIE	CARROZZERIA

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DIFFERENTIEL ARRIERE	REAR DIFFERENTIAL	HINTERES AUS-GLEICHGETRIEBE	DIFFERENZIALE POSTERIORE
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EQUIPEMENT ELECTRIQUE	ELECTRICAL EQUIPMENT	ELEKTRISCHE ANLAGE	IMPIANTO ELETTRICO
CARROSSERIE	BODYWORK	CAROSSERIE	CARROZZERIA

GENERALITES CARACTERISTIQUES TECHNIQUES	INTRODUCTION TECHNICAL DATA	ALLGEMEINES TECHNISCHE DATEN	GENERALITÀ DATI TECNICI
MOTEUR	ENGINE	MOTOR	MOTORE
EMBRAYAGE	CLUTCH	KUPPLUNG	FRIZIONE
BOITE DE VITESSES DIFFERENTIEL	GEARBOX DIFFERENTIAL	SCHALTGETRIEBE AUS-GLEICHGETRIEBE	CAMBIO DI VELOCITÀ DIFFERENZIALE
ARBRE DE TRANSMISSION	PROPELLER SHAFT	GELENKWELLE	ALBERO DI TRASMISSIONE
DIFFERENTIEL ARRIERE	REAR DIFFERENTIAL	HINTERES AUS-GLEICHGETRIEBE	DIFFERENZIALE POSTERIORE
FREINS	BRAKING SYSTEM	BREMSEN	FRENI
DIRECTION	STEERING	LENKUNG	STERZO
SUSPENSIONS ET ROUES	SUSPENSION AND WHEELS	AUFHÄNGUNGEN UND RÄDER	SOSPENSIONI E RUOTE
ORGANES SUBSIDIAIRES	AUXILIARY UNITS	ZUSATZ-EINRICHTUNGEN	ORGANI SUSSIDIARI
EQUIPEMENT ELECTRIQUE	ELECTRICAL EQUIPMENT	ELEKTRISCHE ANLAGE	IMPIANTO ELETTRICO
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CARROSSERIE	BODYWORK	CAROSSERIE	CARROZZERIA

page

For anything not dealt with, refer to section 50 Auxiliary Units in the previous edition (Print no. 506.475/01).

The information in this publication is intended as a guide and could be superseded as a result of modifications adopted by the Manufacturer at any time due to technical and commercial reasons and in accordance with local regulations.

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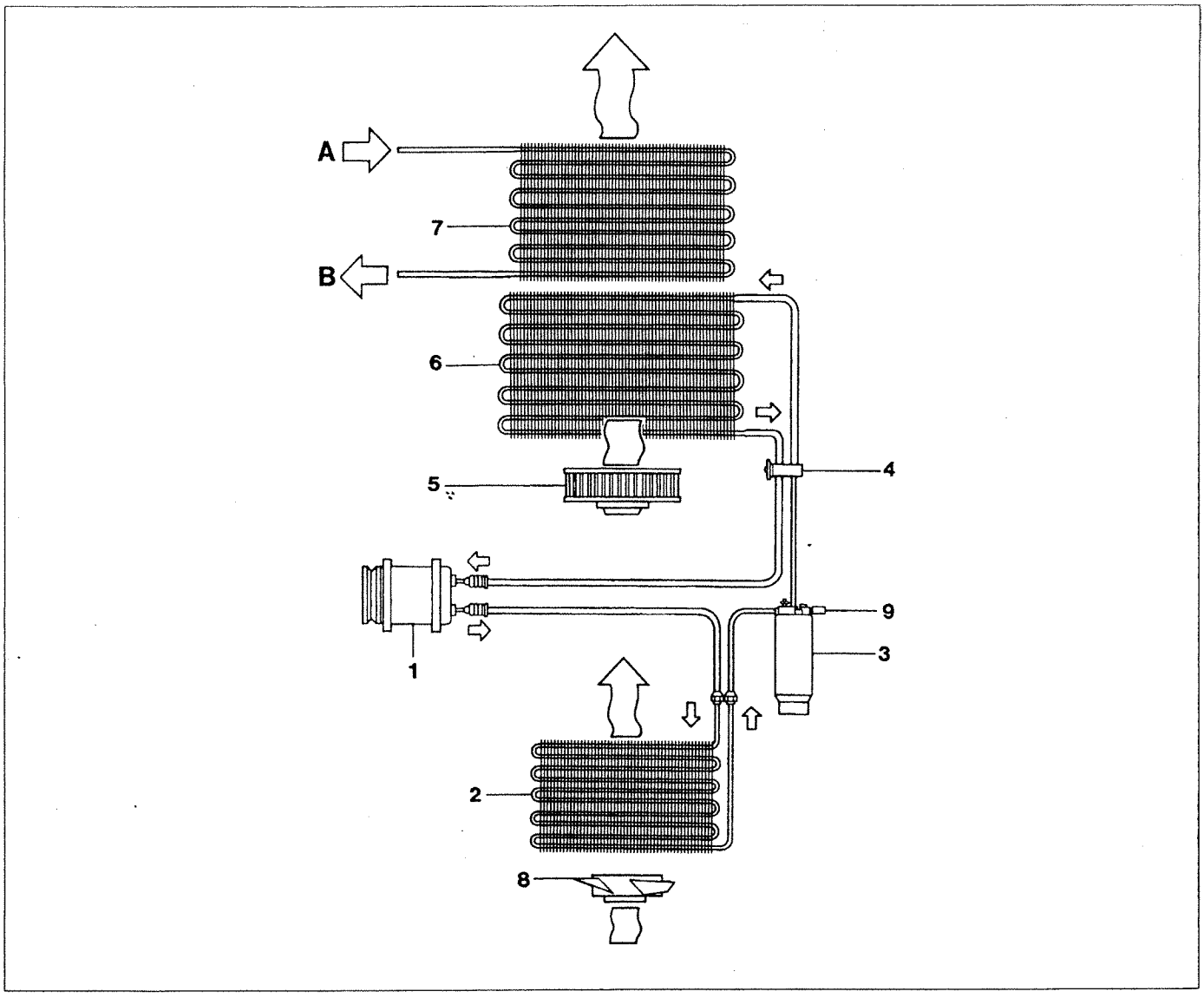
INTRODUCTION

The automatic climate control system can, ideally, be divided into two parts.
The first part consists of a closed circuit system (shown in the diagram below) which produces cold air and mainly uses the following components:
- a compressor;
- a condenser, which is fitted in front of the engine coolant radiator;
- an evaporator, which is located in the evaporator/heater unit;
- a drier filter.

The second part of the system consists of a closed circuit, which uses the engine coolant to produce hot air.



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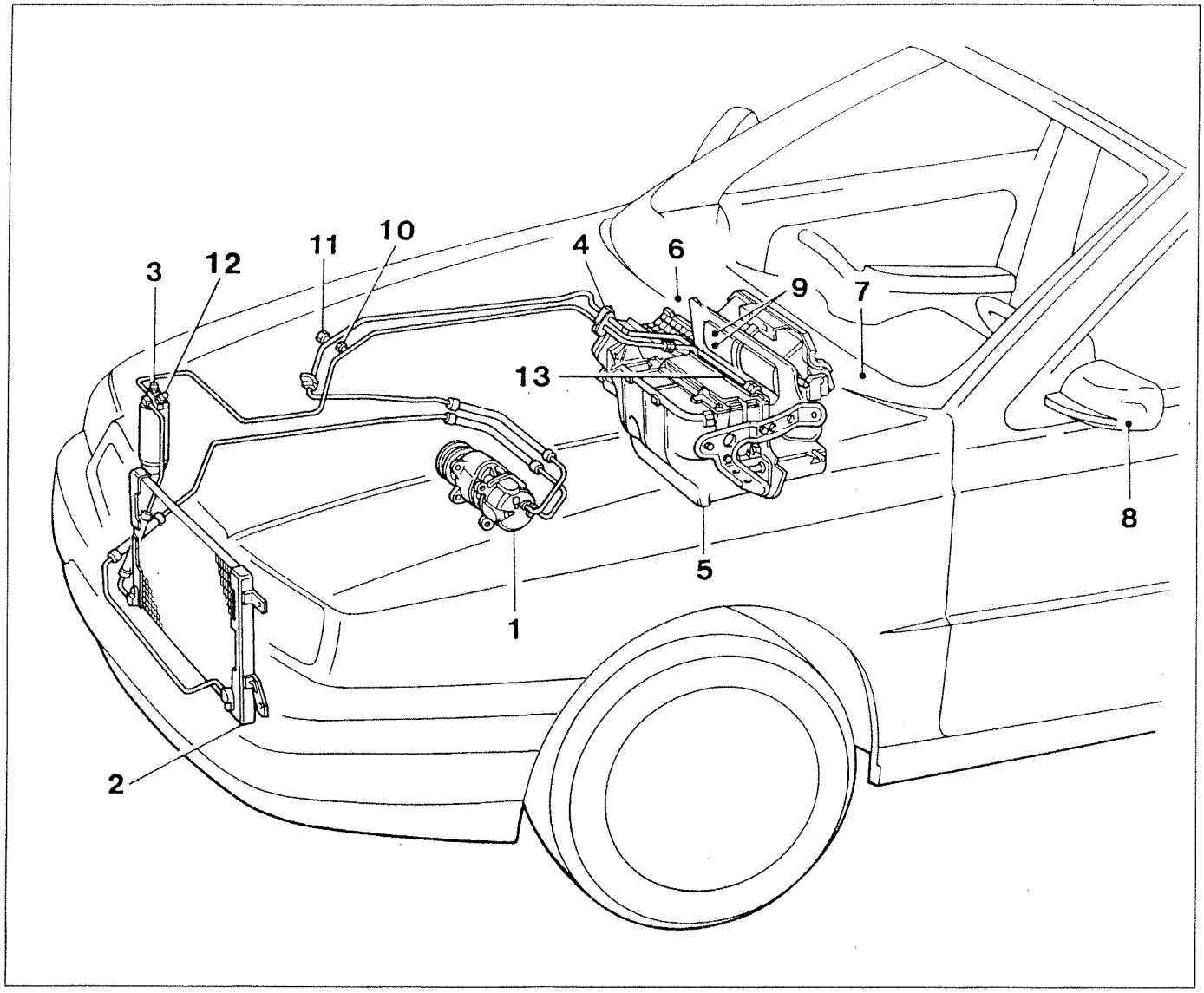
Climate control system diagram

1. Compressor
2. Condenser
3. Drier filter
4. Expansion valve
5. Evaporator fan
6. Evaporator
7. Evaporator heater
8. Condenser fan
9. 4 stage pressure switch

A. Water inlet
B. Water outlet

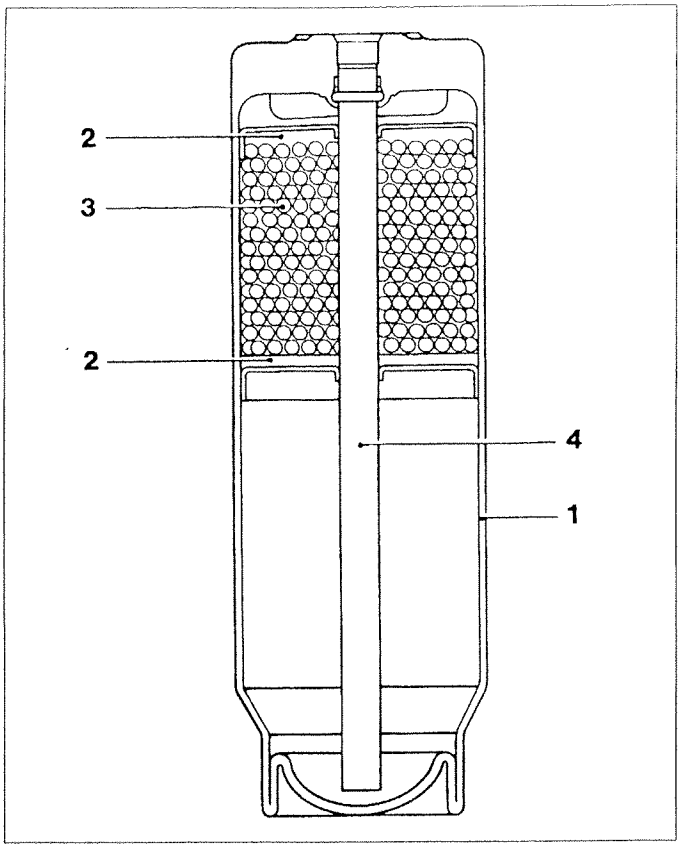


P3U02BH01

Diagram showing climate control system in the vehicle

1. Compressor
2. Condenser
3. Drier filter
4. Expansion valve
5. Evaporator
6. Solar ray sensor
7. Passenger comp. interior air temp. sensor
8. Passenger comp. exterior air temp. sensor
9. Mixed air temperature sensor
10. Pressurizing valve
11. Exhaust valve
12. 4 stage pressure switch
13. Combination filter element

GENERAL DESCRIPTION OF THE CLIMATE CONTROL SYSTEM COMPONENTS



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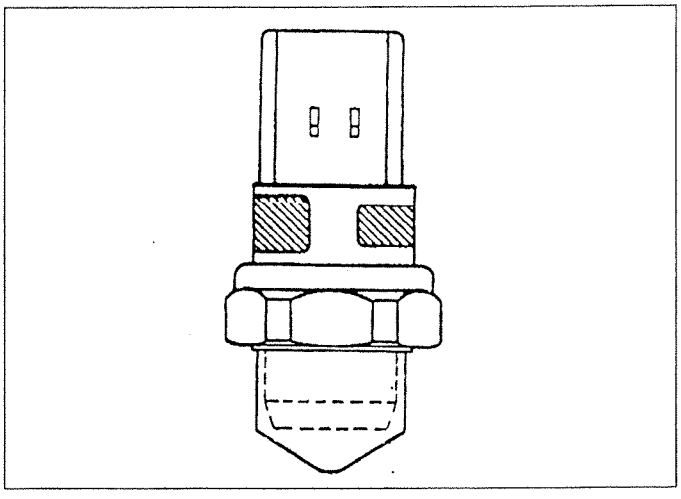
1. Filter body
2. Filter
3. Drier pack
4. Outlet union



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DRIER FILTER

The drier filter, fitted between the condenser and the expansion valve, performs three basic functions:

- it acts as an accumulator for the coolant fluid
- it acts as a filter element
- it acts as a drier element.

The filter accumulates a large part of the coolant (in a liquid state) and acts as a separator between the coolant in a liquid state and a gaseous state.

Humidity in the system can be extremely damaging because, if it comes into contact with the coolant fluid, it produces hydrochloric and fluorochloric acid which corrodes the components which then deteriorate.

Humidity can also result in the formation of ice in the system expansion valve.

There are special substances (SILICAGEL and activated aluminium) inside the drier filter which retain the humidity present in the coolant fluid.

For this reason the drier filters must be kept in a dry environment and sealed until the moment of fitting.

4 STAGE PRESSURE SWITCH

The four stage pressure switch has the task of separately operating the two speed levels of the radiator and condenser cooling fans when the vehicle is stationary or travelling at low speeds and the flow of air produced by the movement of the vehicle starts to fail.

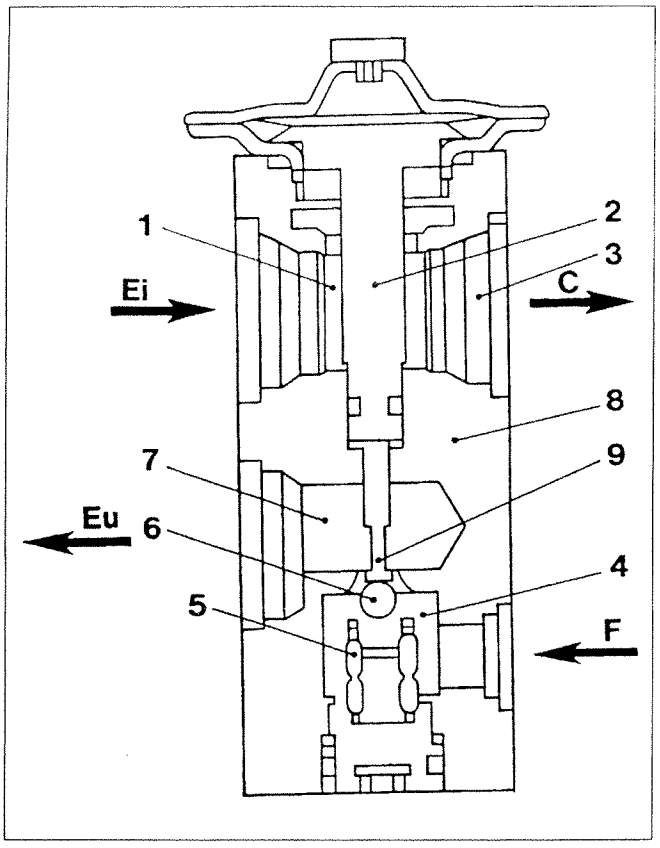
The condensation of the coolant must be activated through forced ventilation.

In addition, it has the task of disconnecting the compressor pulley electro-magnet coupling, when the pressure of the fluid (high pressure side) reaches dangerous limits (28 ± 2 bar), in spite of the action of the radiator and condenser cooling fan.

When the pressure is below 2.45 bar and the outside temperature is below 5°C, the thermal pressurizing conditions are insufficient to cause the evaporation of the coolant.

Calibration values (bar)

Level	Opens	Closes	Differential
1°	2,45 ± 0,35	3,5 max	
2°		15 ± 1	4 ± 1
3°		20 ± 1,2	4 ± 1
4°	28 ± 2		6 ± 2



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1. Evaporator outlet fluid duct
2. Thermo-sensitive element
3. To the compressor inlet connector
4. Fluid under pressure
5. Opposing spring
6. Ball and calibrated port
7. Expanded fluid (to the evaporator inlet connector)
8. Expansion valve body
9. Rod

C. To the compressor
F. To the drier filter
Ei. Evaporator inlet
Eu. Evaporator outlet

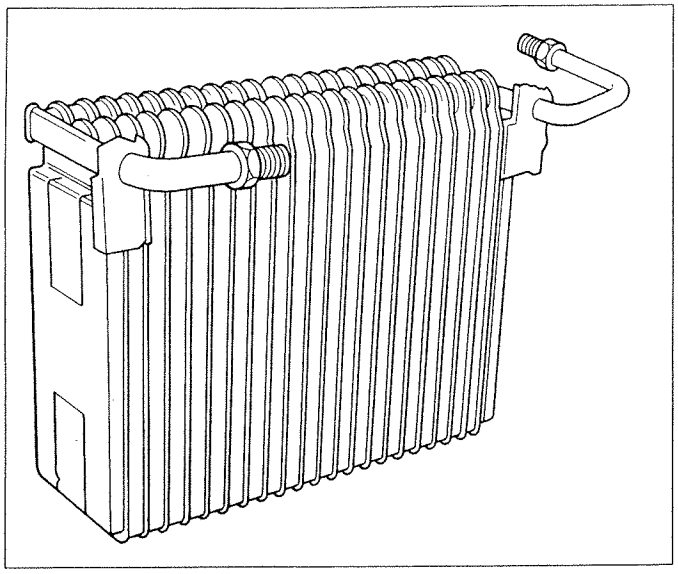
EXPANSION VALVE

The expansion valve controls the flow of fluid to the evaporator so that the power of the coolant in the system is maximum, adjusting the flow rate and the pressure of the coolant according to the different compressor rotation speeds.
This type of valve has two different areas through which the coolant flows:
- one lower one, from the drier filter 4 to the evaporator 7, contains the overheating spring 5 and the modulating element which, in this case, is the ball 6 housed in the calibrated duct.
- one upper one, from the evaporator 1 to the compressor 3, containing the thermostatic sensor 2 which is connected to the upper part of the diaphragm and the ball 6.

This valve carries out three different functions in the system:
- controlling the coolant flow rate
- stabilizing the evaporation temperature;
- controlling overheating.

The flow rate control function is carried out through the movement of the ball 6, connected via the rod 9 to the thermostatic sensor 2.
The action of the ball is opposed by the spring 5.
The position of the ball 6 depends on the difference in pressure acting the diaphragm inside the sensor 2; this, in turn, depends on the temperature of the coolant coming out of the evaporator.
High evaporator 1 outlet temperatures (corresponding to conditions where large quantities of heat are dissipated) cause an increase in the pressure inside the thermostatic sensor 2; this leads to the movement of the rod 9 and the ball 6 connected to it, which increases the size of the area through which it flows and consequently the system flow rate.

A low evaporator 1 outlet temperature (corresponding to conditions where the heat dissipitation is low) create a restricted area for the calibrated port 6 reducing the system flow rate.
The calibrated port also "atomizes" the fluid in a liquid state, to facilitate subsequent evaporation. The function of stabilizing the evaporation pressure, according to the difference in temperature, between the evaporator inlet and outlet, is carried out as follows: the lower part of the diaphgram is sensitive to the temperature of the coolant at the evporator inlet, thanks to a duct which joins it to the valve outlet, Downstream of the calibrated port whilst the upper part is sensitive to the temperature at the evaporator outlet. The variations in pressure between the evaporator inlet and outlet, lead to variations in temperature which act in the opposite direction to the rod 9 and the ball 6 connected to it (contributing to damping the oscillations) .
The control of the overheating is ensured by the spring 5, which is suitably calibrated to allow smooth operation when there is a rise in the pre-set temperature. This rise in temperature (overheating) ensures that the fluid at the evaporator is in a vapour state, without the presence of any fluid which, if drawn in by the compressor, could damage the valves.



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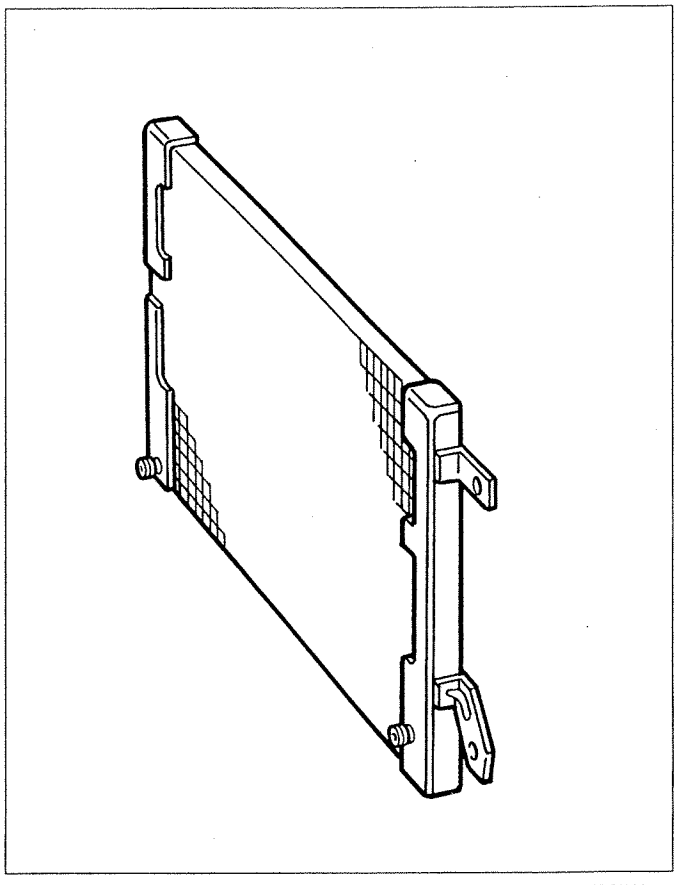
EVAPORATOR

The evaporator is fitted inside the passenger compartment in the evaporator/heater assembly.
The expansion stage takes place inside the evaporator with the consequent evaporation of the fluid, which causes a rapid decrease in temperature.
The evaporator is therefore a heat exchanger with the function of cooling the air which comes into contact with it.

The ambient air to be conditioned for the passenger compartment is forced to pass through the heat pack by means of an electric fan; it is therefore cooled and dehumidified because the vapour condenses on the surface of the coils and is then discharged outwards through a pipe.
The system is designed to run with the windows of the vehicle closed.



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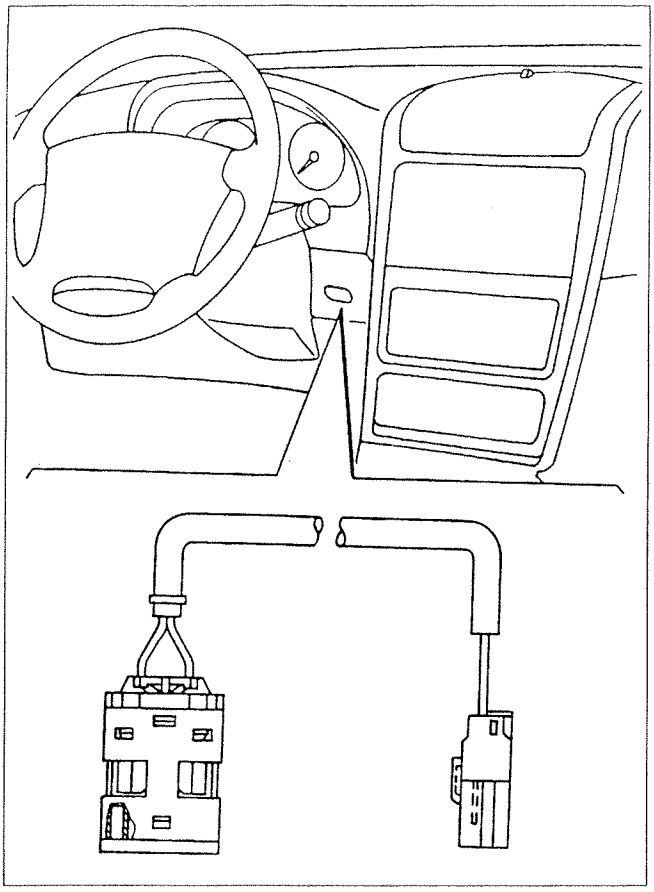
CONDENSER

The condenser, fitted in front of the engine radiator, is designed to give off a certain amount of heat with the consequent change of the R134A coolant from a gaseous state to a liquid state (temperature of 60 °C).
It consists of an aluminium radiator with a high thermal efficiency level, cooled by the air from the dynamic ventilation produced through the electric fan and the movement of the vehicle.
An insufficient heat exchange in the condenser, in addition to producing an increase in the pressure in the system, results in the incomplete condensation of the R134A, therefore fluid still in a gaseous state will reach the expansion valve, considerably reducing the cooling capacity of the system.

In certain driving conditions (traffic jams or uphill) and at high outside temperatures, the coolant fluid may not manage to liquefy completely; therefore, in addition to the existing engine cooling radiator switch, there is a pressure switch designed to engage the electric fan, independently of the engine coolant temperature command.



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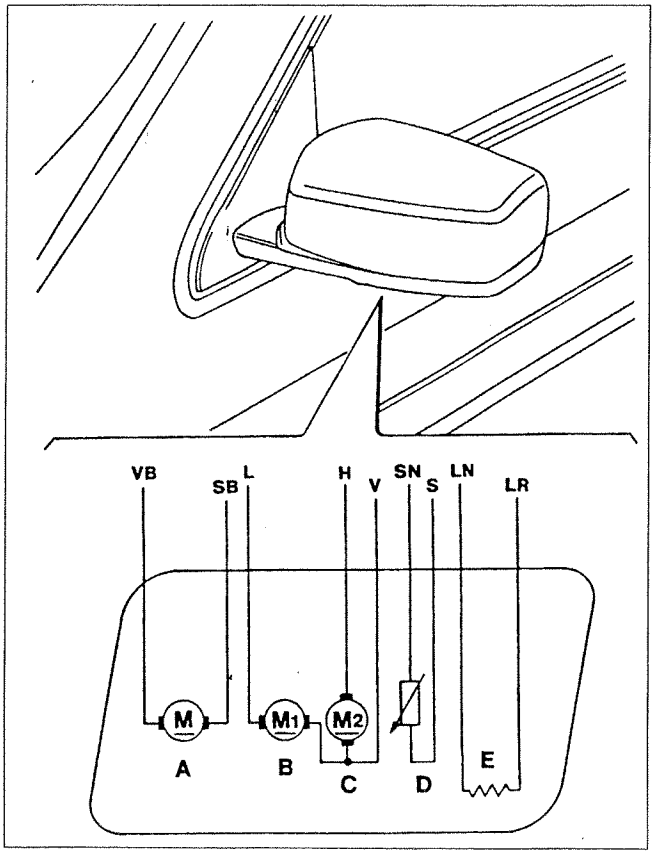

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INSIDE AIR TEMPERATURE SENSOR

This sensor is located between the steering column and the INFOCENTER control unit. It is fitted on an inlet so that the temperature reading for the air inside the passenger compartment is as reliable as possible.
It is an "NTC" type sensor with a resistance of 2.2 kOhm at 25°C; its operating temperarture ranges from a minimum of -30°C to a maximum of +85°C.

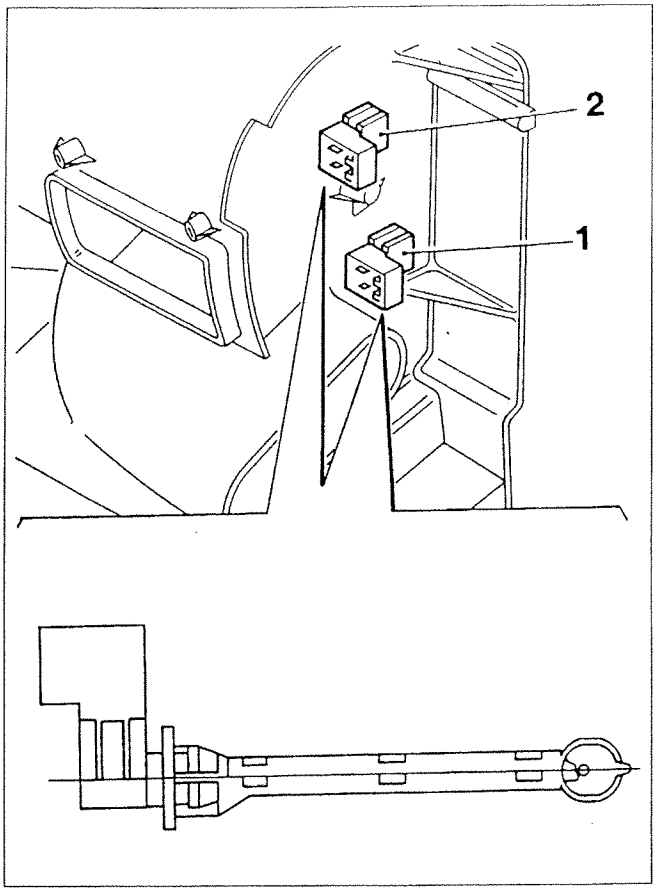
Temperature (C°)	Resistance (Ohm)
-15	15982
-10	12154
0	7200
+10	4393
+20	2753
+30	1768
+40	1161

OUTSIDE AIR TEMPERATURE SENSOR (D)

This sensor is fitted below the left external rear view mirror, as shown in the diagram.
It is an "NTC" type sensor with a nominal value of 10 kOhm at 25°C.

Temperature (C°)	Resistance (Ohm)
-20	100000
-10	55000
0	32650
+10	20000
+20	12500
+30	8000
+40	5000

A. Overturned
B. Vertical
C. Horizontal
D. Outside temperature sensor
E. Defrosting



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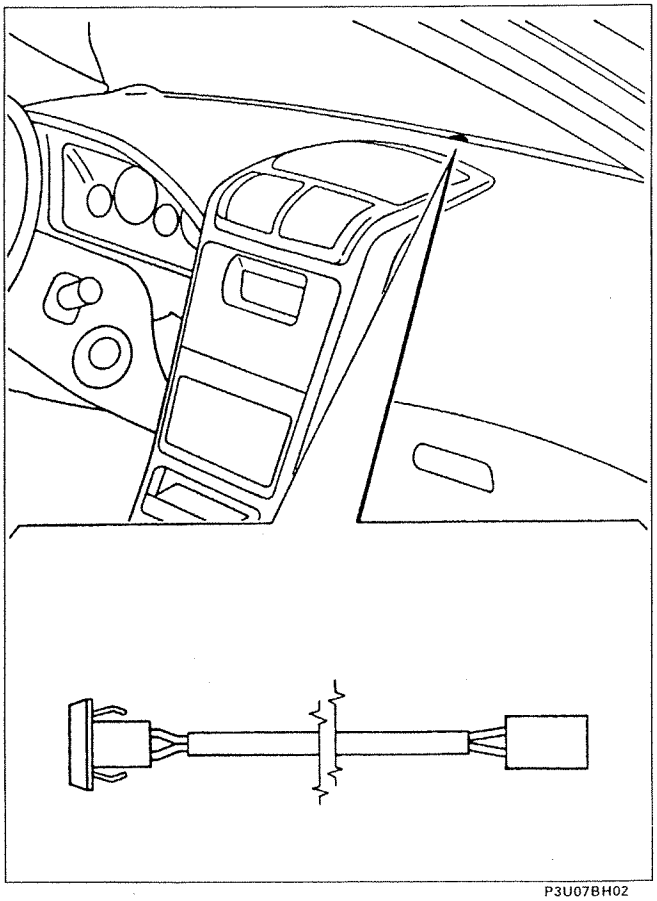
MIXED AIR TEMPERATURE SENSORS

In order to ensure an optimum temperature reading, two sensors have been used whose only difference is their colour.
Sensor (1) gives a reading for the air directed to the lower vents, whilst sensor (2) gives a reading for the air directed to the upper vents.
If an air distribution is selected which includes both solutions, the INFOCENTER takes an average of the temperature readings for the two sensors.
The sensors in question are the "NTC" type with a resistance of 10 KOhm at 25°C; their operating temperatures range from a minimum of -20°C to a maximum of +90°C.

Temperature (C°)	Resistance (Ohm)
-5	42326
0	32650
+10	19899
+20	12492
+30	8057



P3U07BH02

SOLAR RAY SENSOR

The solar ray sensor is located in the dashboard, near the windscreen. It is the photodiode type.

COMPRESSOR

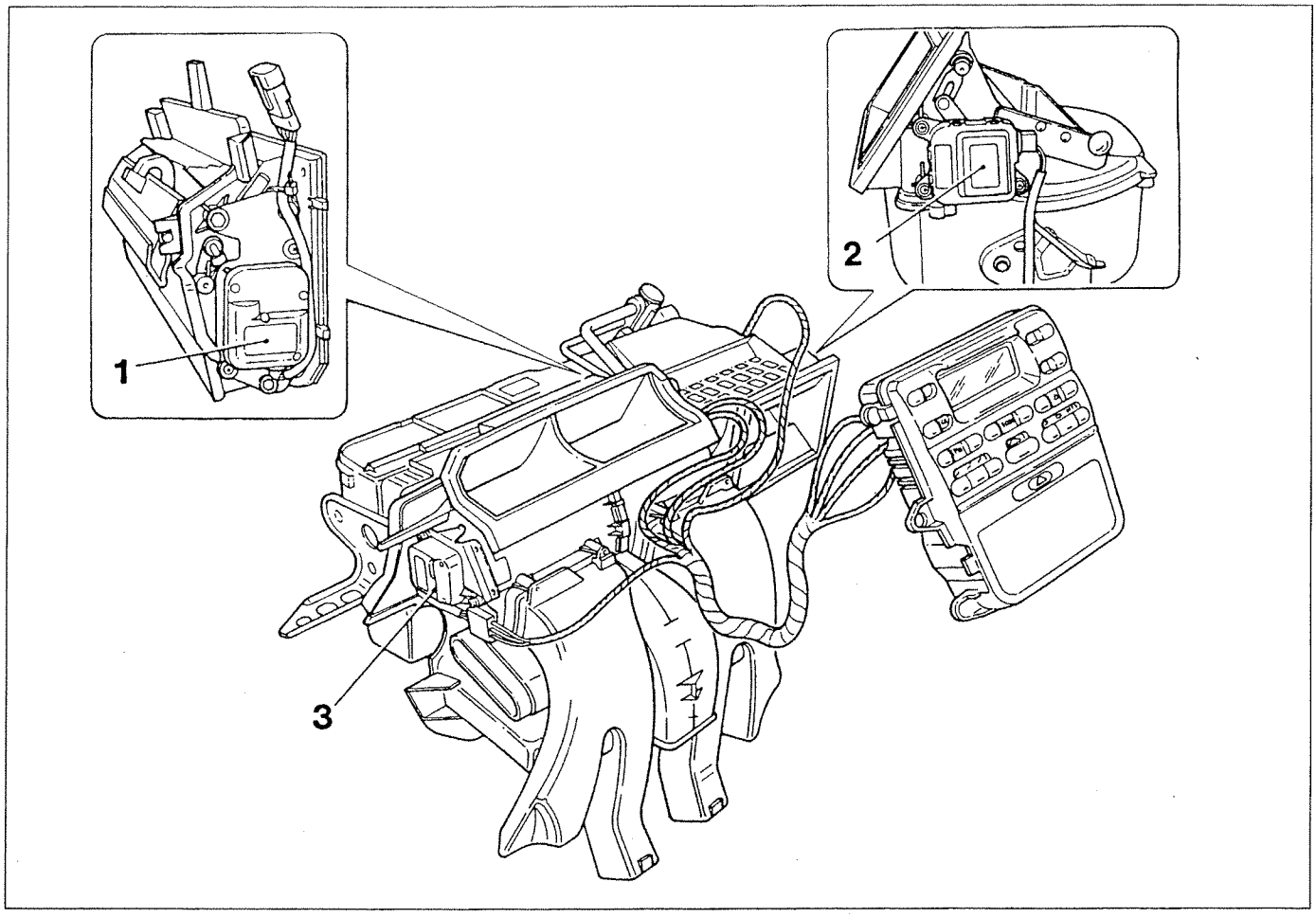
There are two types of compressor used in this climate control system, namely:

- NIPPONDENSO 7SB
- SANDEN SD 7 V 16.

50.

EVAPORATOR/HEATER UNIT

The system should automatically regulate the following parameters and functions: air temperature at the vents, fan speed, air distribution, recirculation, engagement of the compressor.
There is provision in the system for the manual adjustment of the following parameters and functions: fan speed in 5 positions, air distribution in 4 positions (5 in automatic), recirculation, engagement of the compressor.
The manual manoeuvres take priority over the automatic operation and are memorized until the user cancels the command and restores the automatic operation of the function.
By manually varying one of the parameters, the other remain controlled automatically. The temperature of the air at the vents is always controlled automatically to ensure that the temp. inside the passenger compartment corresponds to the one indicated on the display (except if the system is switched off).
As described previously, the climate control system is integrated with the **INFOCENTER system which is analyzed, in detail, in Section 55 - Electrical equipment.**



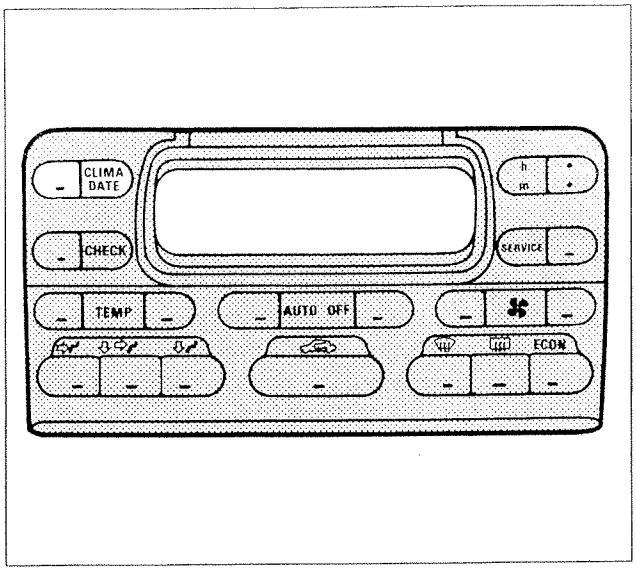
P3U08BH01

1. Mixture actuator
2. Recirculation actuator
3. Distribution actuator

COMBINATION FILTER ELEMENT

The air introduced in the passenger compartment from the outside passes through a combination filter, composed of two layers:
- the first "particle" layer is designed to trap the small particles of fine dust and pollen.
- the second "activated charcoal" layer retains several pollutant agents (odours) present in the atmosphere.

CLIMATE CONTROL SYSTEM CONTROLS



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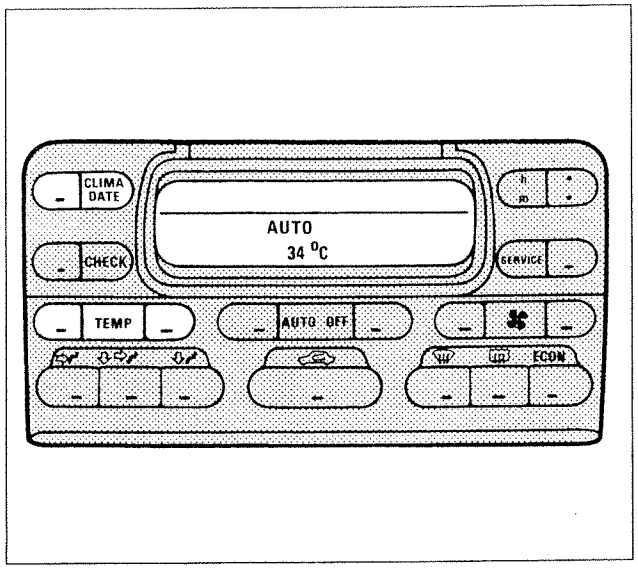

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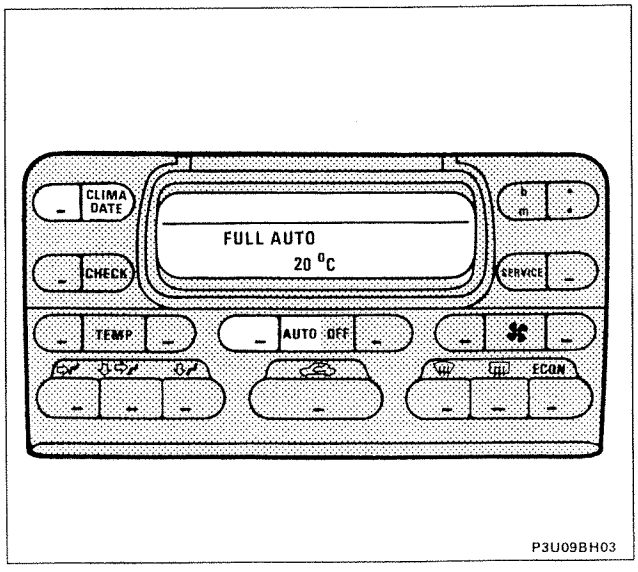


P3U09BH03

The controls which allow the use of the automatic climate control system are located in the INFOCENTER system which is in the centre of the dashboard.

CLIMA DATE button

This is for gaining access in the INFOCENTER system to the climate control function.

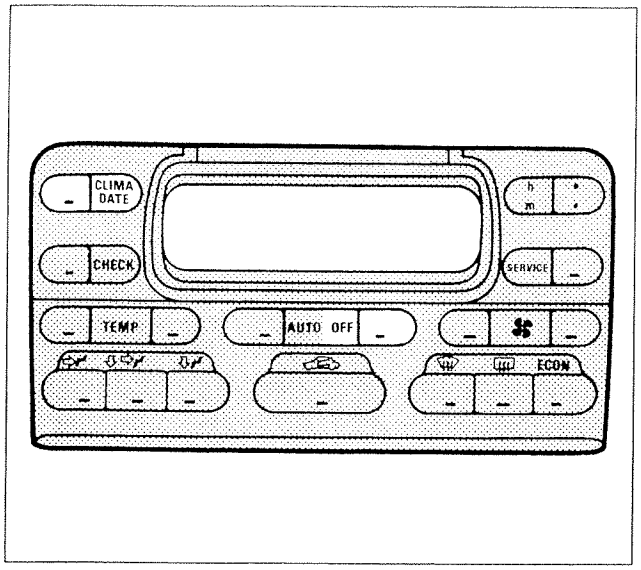
TEMP buttons

By using the TEMP buttons the user can select the temperature for the passenger compartment in a 15 °C range (from 18 °C to 32 °C). The temperature reading appears on the display, however long the buttons are pressed for.
If the user sets a temperature above 32 °C (90 °F), the HI condition occurs (see HI button), accompanied by the disappearance of the words FULL AUTO and the appearance of the word AUTO. This condition involves the following situations:
- mixture flap stuck in maximum hot position;
- FLOOR distribution (unless the user makes a different selection or there is a different period of time between starting up the engine and the optimum temperature being reached, also known as starting transition)
- compressor managed by the system logic, unless the user makes a different selection;
- air flow rate equal to 300 m/h, unless the user makes a different selection, or a setting of 80 m/h for the starting transition;
- recirculation switched off.

The exit from this situation only takes place **by altering the requested temperature.**

AUTO button

By pressing the AUTO button the system automatically checks the temperature, the distribution, the fan speed and the engagement of the recirculation.
When the system is in this situation the words FULL AUTO appear on the display.



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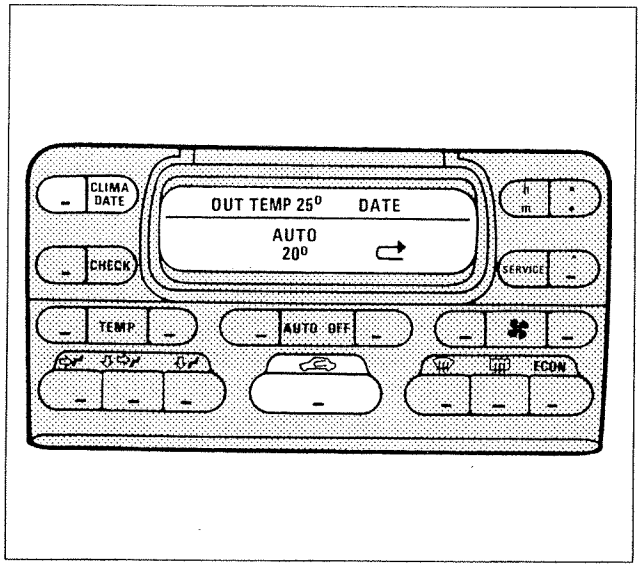

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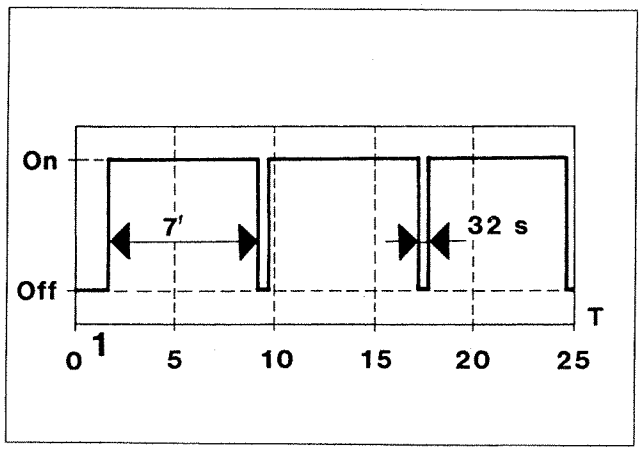


P3U10BH03

Passenger compartment air exchange logic (only with treated temperature above 3°C)

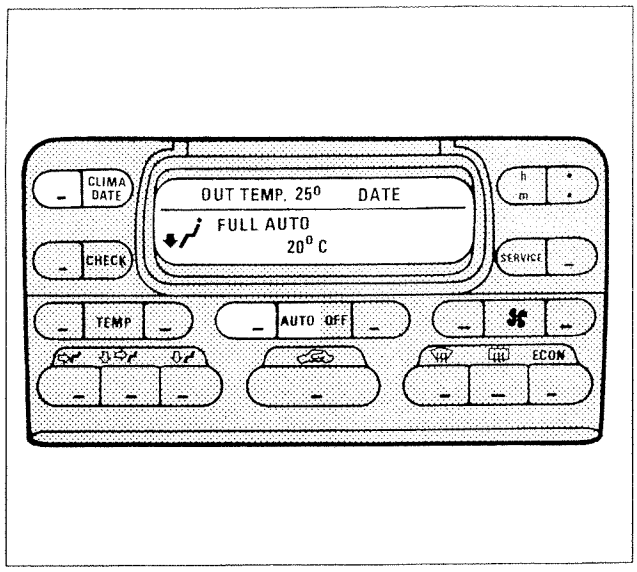
OFF button

When the OFF button is pressed the system switches off (if it is on) or switches on (if it is off). When this button is operated the messages on the display relating to the operation of the climate control should go out, with only the recirculation remaining on.

RECIRCULATION button (⇦)

Pressing the recirculation button switches on that function and the appropriate symbol appears on the display. If there are no manual operations, the recirculation is controlled automatically (through a special actuator). This takes place according to the outside temperature when it is above 26 °C and also the treated (or mixed) temperature.
Under these circumstances, a special automatic cycle is activated for the management of the recirculation. It consists of switching on the recirculation function for 7 minutes (complete exclusion of flow of air from the outside) during which the recirculation symbol appears on the display. When the above mentioned period has elapsed, the system opens the recirculation flap for 32 seconds to allow the exchange of air inside the vehicle. During this operation the symbol disappears from the display. When the 32 seconds have elapsed, the recirculation flap closes for another 7 minutes and the symbol reappears on the display and the cycle is repeated below 26 °C or the recirculation button is pressed manually.

NOTE *With the engine running (immediately after starting), if the outside temperature conditions are equal to or above 26 °C (condition for the recirculation to be automatically switched on), this function is not enabled until the inside temperature value set by the user stabilizes.*



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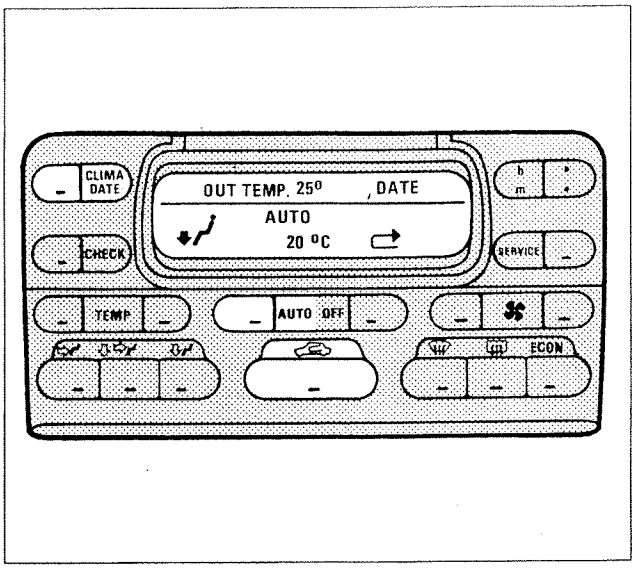
If the system is working automatically, the words FULL AUTO appear on the display. The INFOCENTER system logic carries out the timed opening of the recirculation flap (the recirculation system disappears from the display).



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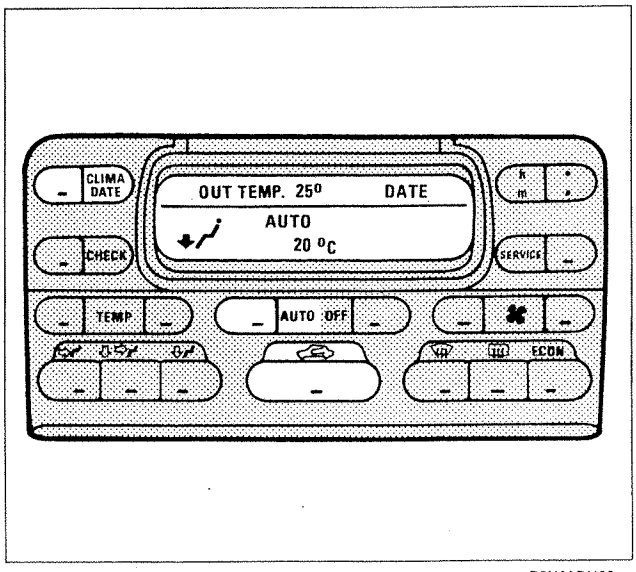
If the recirculation button is pressed when the recirculation is switched on, the words FULL AUTO disappear from the display and the recirculation symbol appears. The recirculation function remains on permanently.



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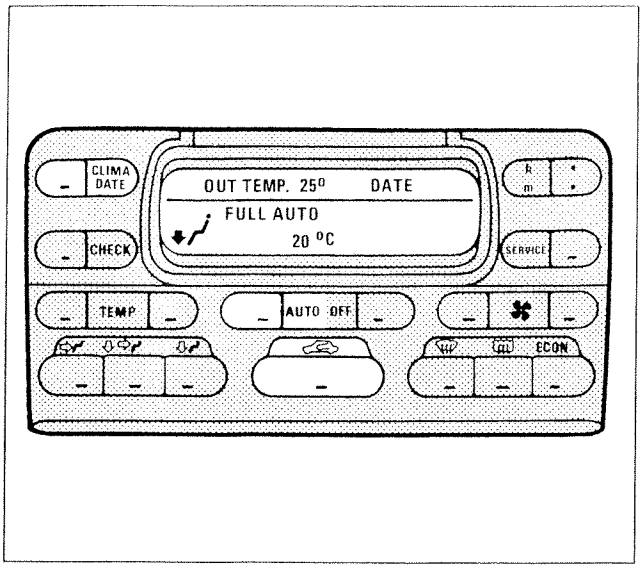
If the recirculation button is pressed again the symbol disappears from the display and the recirculation function remains off permanently.



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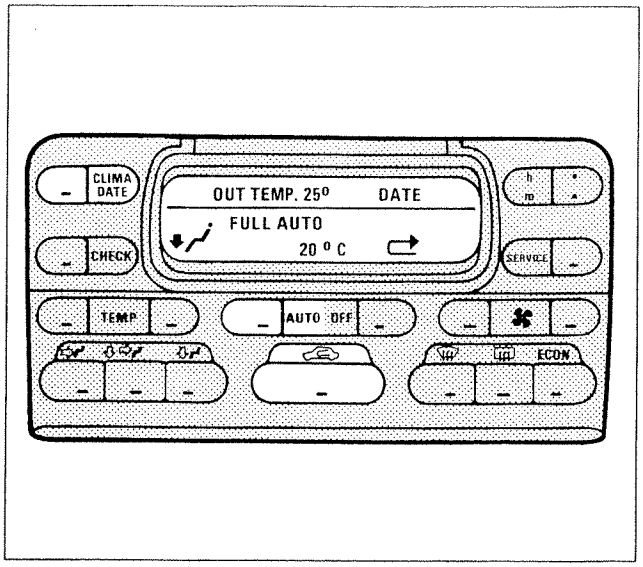
If the recirculation button is pressed for a third time, the initial automatic recirculation control function is returned to. The words FULL AUTO reappear on the display and the cyclical operation of 7 mins and 32 secs is restored.



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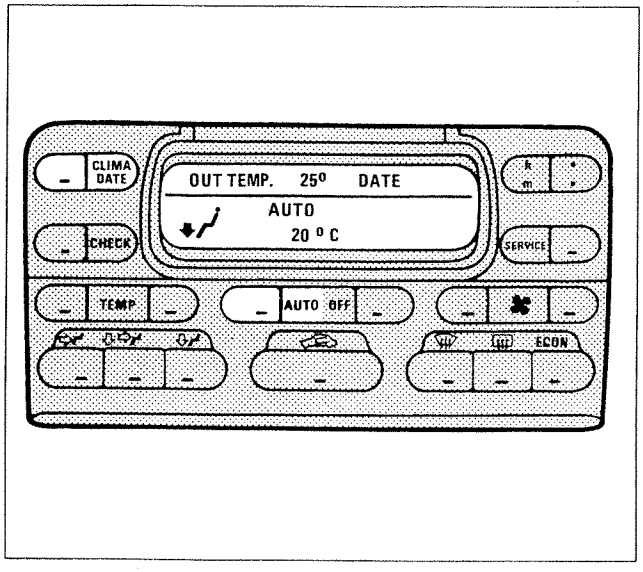
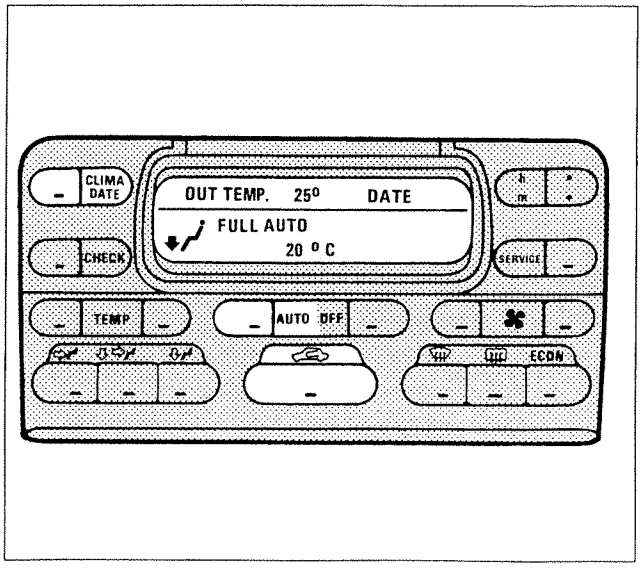
There are other possible situations with the temperature below 26 °C:

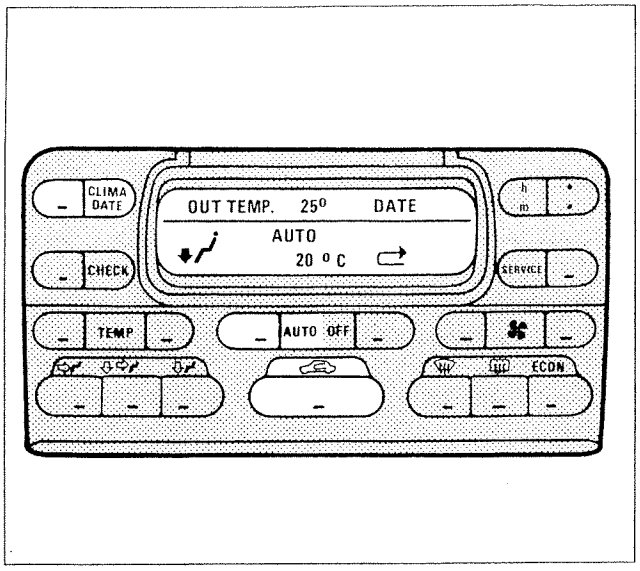
1. During the phase when the INFOCENTER control unit is working in FULL AUTO conditions and the RECIRCULATION function is engaged, if the button () is pressed, the air vents open and will no longer be controlled by the control unit. The word AUTO will appear on the display and the recirculation symbol will disappear.
2. In the the phase in which the control unit is working in FULL AUTO conditions, but not in the RECIRCULATION stage (i.e. with the outside air vents open), if the button () is pressed, the words FULL AUTO will disappear and the word AUTO will appear together with the recirculation symbol.



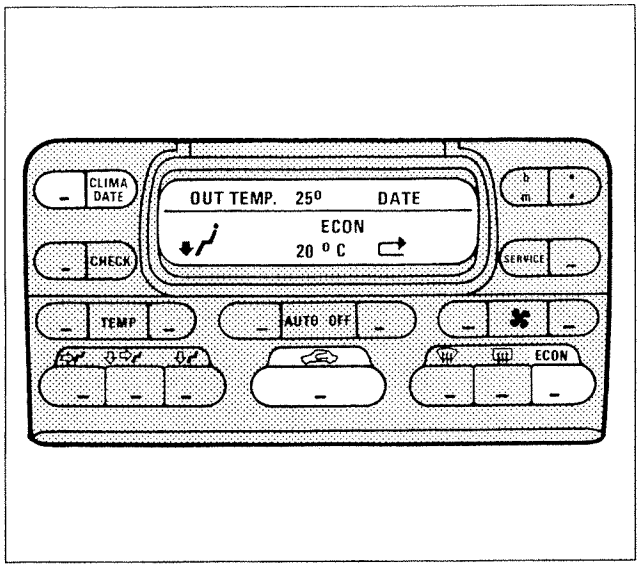
P3U12BH03



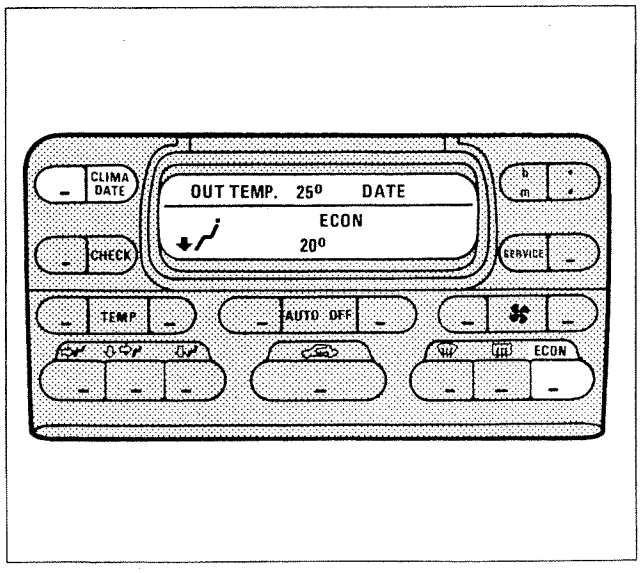
P3U12BH04



P3U13BH01



P3U13BH02



P3U13BH03

Behaviour of the recirculation with the ECON button switched on

When the system is working in ECON conditions, the RECIRCULATION function can only be switched on manually.
When the ECON button is pressed, the climate control is in the position with the timed opening of the outside air intake vents and hte moment they are opened, the symbol disappears from the display.
If the button is pressed for a second time, this function is eliminated and the control unit takes control of the climate control system.

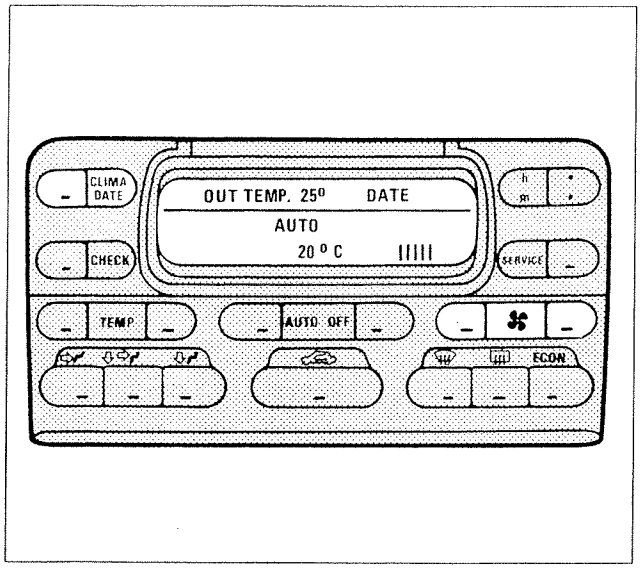
ECON button

When the ECON button is pressed the compressor is excluded and the words AUTO ECON appear on the display.
Once the button is pressed, the function is memorized for an indefinite period, even after the vehicle stops, like other manual commands.
If the button is pressed again, it cancels the function and the control of both the compressor and the other parameters linked to the ECON returns to automatic.
The movement the ECON button is pressed, the system checks whether the outside temperature is higher than or lower than the requested temperature.
There are two possible situations:

A. If the outside temperature is below the requested temperature, then the system works normally and is capable of meeting the requirements without switching on the compressor.

B. If the outside temperature is higher than the inside temperature, then the system is not capable of decreasing the temperature in the passenger compartment.

This situation is shown on the INFOCENTER display by the flashing of the word ECON, for about 10 seconds.
This flashing situation is memorized and each time the car is started up or the inside temperature is altered to be lower than or equal to the outside temperature or the AUTO condition is reached it will appear on the display.
If the TEMP button is pressed, the user can increase or decrease the temperature by 1 °C.
Taking the outside temperature as greater than that requested, the word ECON will appear on the display, flashing and later constantly.



P3U14BH01

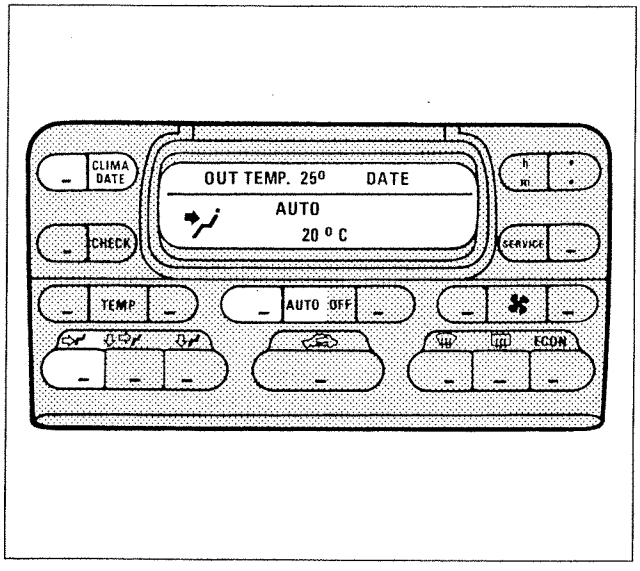
FAN speed buttons

Pressing the AIR buttons changes the air flow rate which is shown by a bar-graph (consisting of 5 bars) and the word AUTO will appear on the display. If there is no manual intervention, the speed is controlled by the logic and the words FULL AUTO appear on the display.
It is possible to operate the AIR button manually to increase (right button) or decrease (left button) the flow rate; in the latter case, with the compressor switched on, the fan is always activated (minimum one bar), whilst the ECON button remains off.

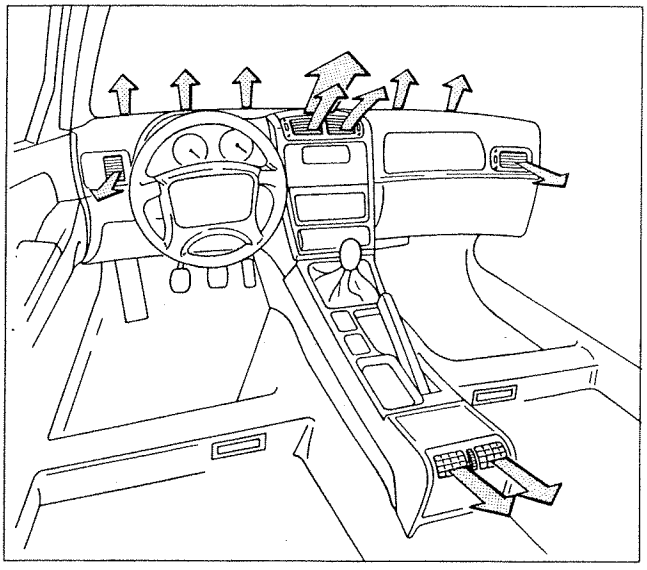
VENT (⇧), BILEV (⇳), FLOOR (⇩) air distribution buttons

Pressing the VENT, BILEV, FLOOR buttons alters the distribution of the air and the symbols plus the word AUTO will appear on the display

A. If the VENT button is pressed, the symbol will appear on the display and the air will be directed to the centre of the dashboard.

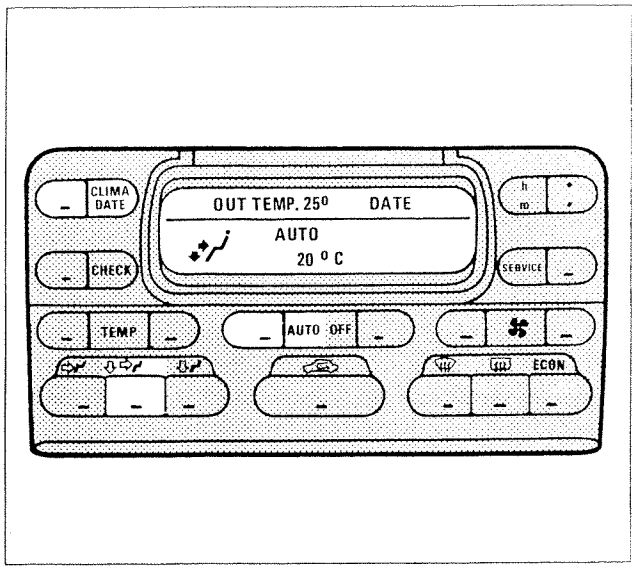


P3U14BH02

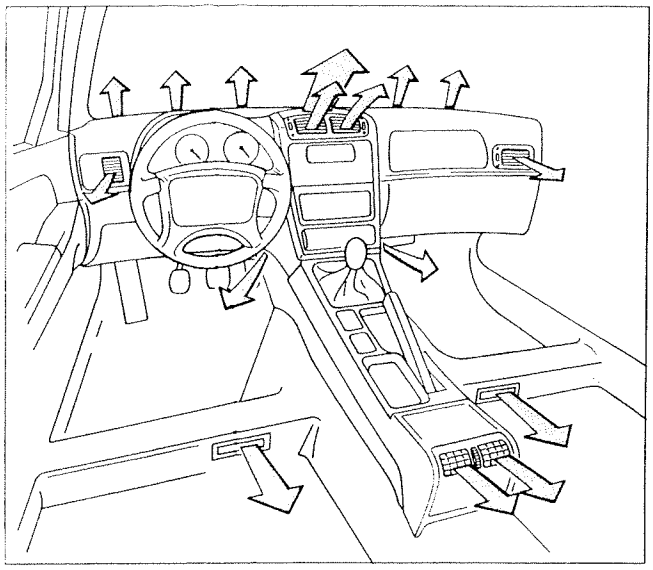


P3U14BH03

B. If the BILEV button is pressed, the symbol ( ) comes on in the display and the air is directed to the lower-central part of the dashboard.

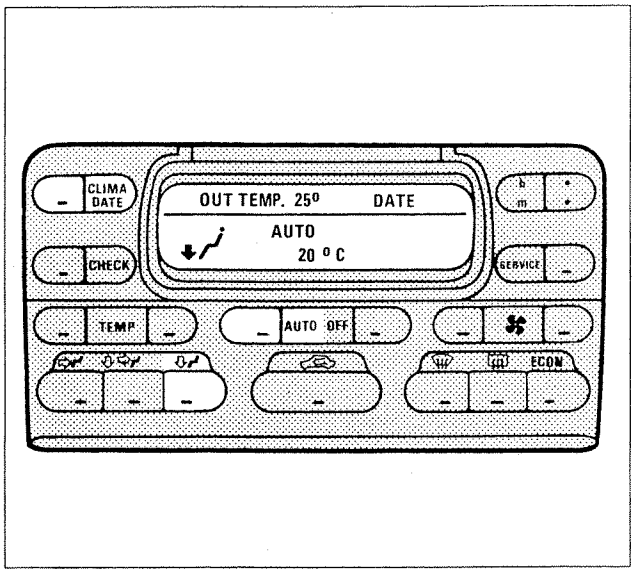


P3U15BH01

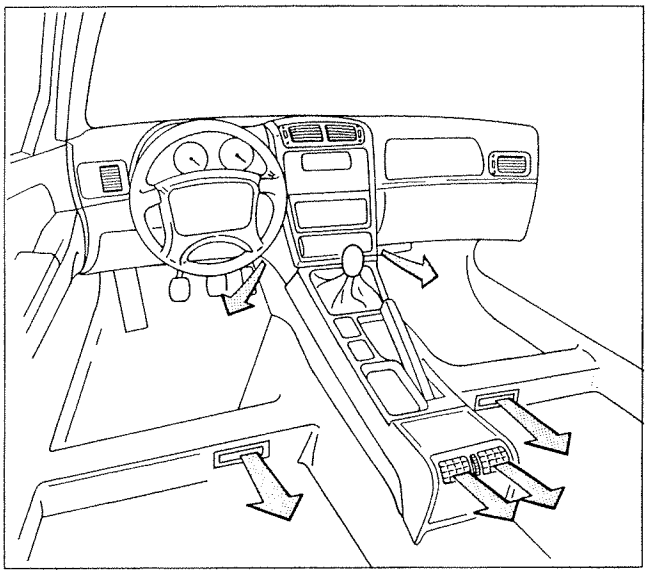


P3U15BH02

C. If the FLOOR button is pressed, the symbol ( ) comes on in the display and the air is directed to the lower part of the dashboard.

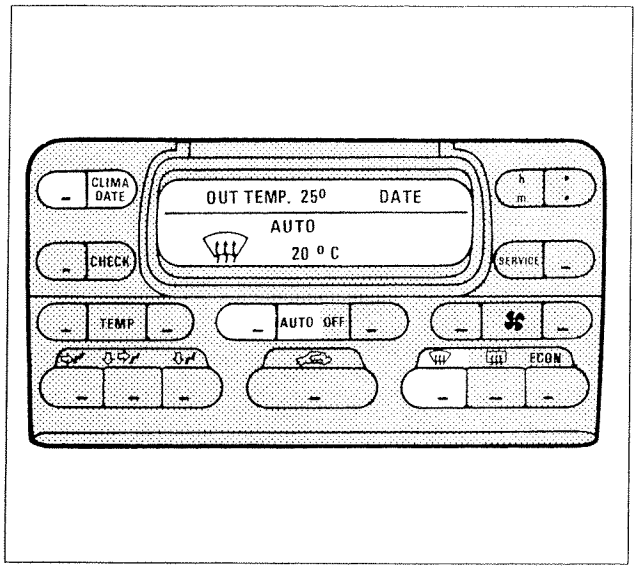


P3U15BH03



P3U15BH04

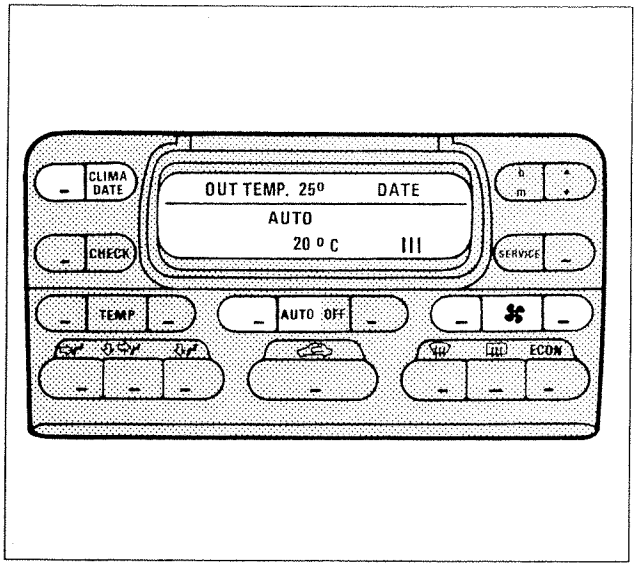
During the winter temperature increase stage, until the treated air at the vents reaches a temperature above 21 °C, the system operates with the fan at the first speed.



P3U16BH01

Button for demisting the windscreen ( )

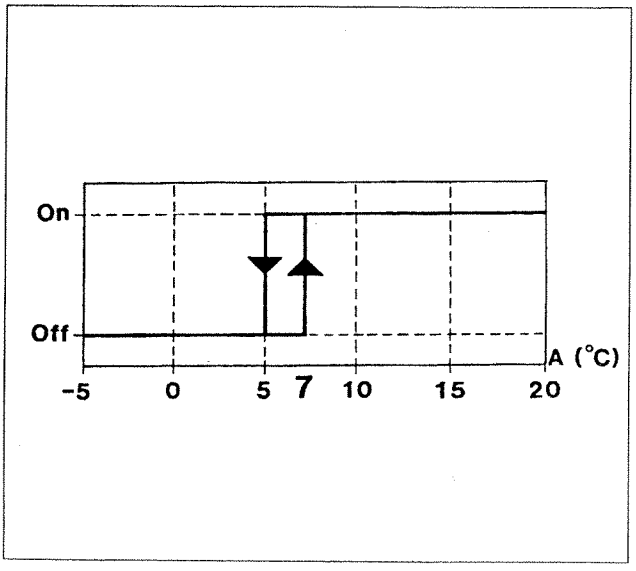
This function is only switched on automatically during the temperarture increase stage until the temperature of the air at the vents is above 21 °C.
In all other cases the function can only be switched on manually and is accompanied by the appearance of the symbol and the word AUTO.



P3U16BH02

Air flow rate

If the AIR buttons are operated the change in the air flow rate should be displayed through the bar-graph and the appearance of the word AUTO.
If there is no manual intevention, the speed will be controlled continuously by the INFO-CENTER logic and the words FULL AUTO will appear on the display.
With the compressor switched on, the minimum speed which can be set manually will correspond to one bar lit up in order to prevent the compressor from freezing.



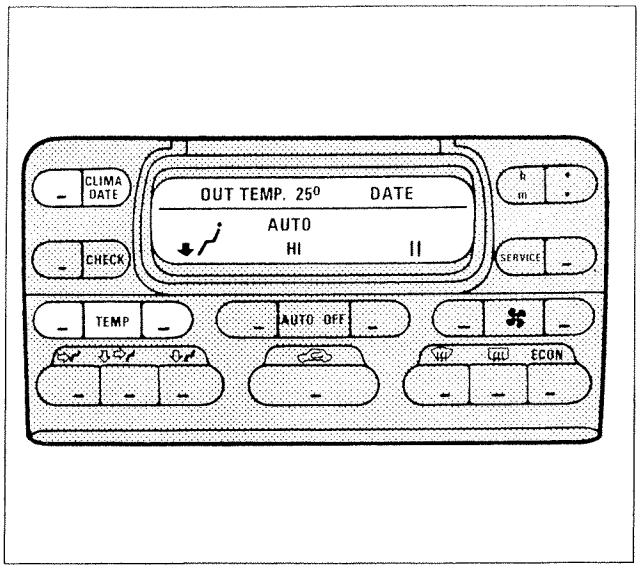
P3U16BH03

Switching on the compressor

The INFOCENTER sends a signal to the Bosch MOTRONIC electronic control unit to activate the compressor. The engagement of the compressor, apart from the 4 stage pressure switch, depends on the outside temperature (A) in accordance with the law illustrated.

With outside temperatures between 5 and 7 °C, the logic should switch on the compressor, on condition that the OFF and ECON buttons are not switched on.

If the recirculation has been switched on manually, the compressor will remain switched on until the outside temperature reaches -5 °C.



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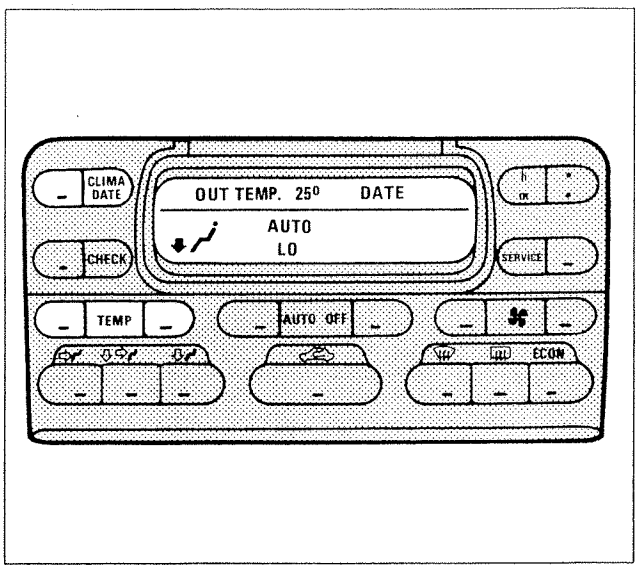

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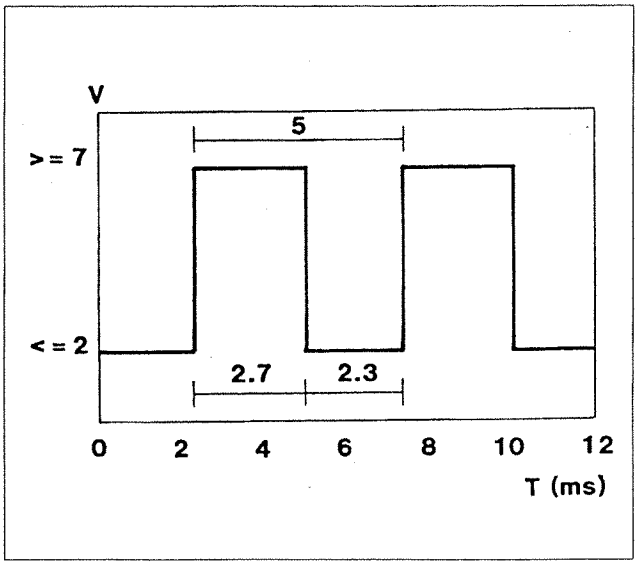


P3U17BH03

HI condition

If the user sets a temperature above 32 °C (90 °F), the HI condition ensues, i.e. maximum heating. This will appear on the display accompanied by the word AUTO.
This situation leads to the following consequences:
- mixture flap stuck in "completely hot" position;
- distribution flap in FLOOR position, unless the user makes a different selection or the distribution setting is at DEF;
- compressor managed by the logic, unless the user has made a different selection;
- air flow rate equal to 300 m^3/h, unless there is a different selection or a setting of 80 m^3/h;
- recirculation switched off.

The exit from this state only takes place by decreasing the temperature.

LO condition

If the user sets a temperature below 18 °C (64 °F) then the LO condition ensues, i.e. maximum cooling. This word appears on the display accompanied by AUTO. This situation leads to the following consequences:
- mixture flap stuck in the maximum cold position;
- distribution positioned at VENT, unless the user has made a different selection;
- air flow rate equal to 400 m^3/h, unless the user has made a different selection;
- compressor managed by the logic, unless the user has made a different selection;
- recirculation on without reopening.

The exit from this state can only take place by increasing the requested temperature.

CALCULATION OF THE OUTSIDE TEMPERATURE

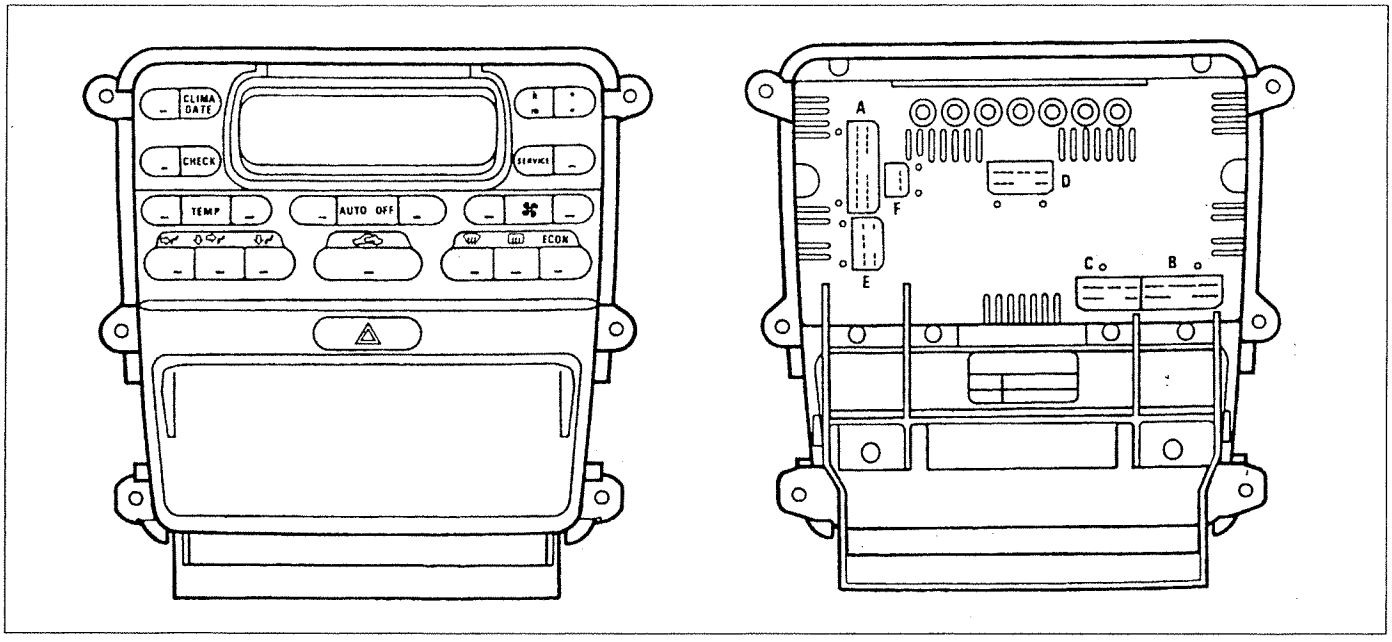
Speedometer signal

This signal arrives from the multiple instrument and is a signal processed by the INFO-CENTER for calculating the temperature according to the speed of the vehicle.

50.

The impulse generator is based on a HALL effect sensor, with 4 impulses/ revolution (equal to 4 impulses/metre) operating at ambient temperature, 14V and 3000 rpm.

The value of the outside temperature at which the system operates is selected each second from the value memorized and the value detected, according to the forward speed and the time, in accordance with a logic in the control unit.
In other words, with the ignition switched on, the control unit takes into account the outside temperature value which the sensor measures and compares it with the last temperature memorized before the ignition was switched OFF.
If the outside temperature is below the figure memorized previously, the control unit replaces the latter value with the one in its memory; if it is higher, it is not updated.
With the vehicle moving, the outside temperature value is updated also using the signal from the instrument panel speedometer; this signal is considered according to a threshold figure of 30 km/h.
If the vehicle speed does not exceed 30 km/h, the value of the outside air temperature is only updated if it decreases in relation to the value memorized previously the moment the ignition was switched ON.
If the vehicle exceeds 30 km/h for at least one minute, then the value of the outside air temperature is replaced by the one memorized previously, both if it has increased or decreased.

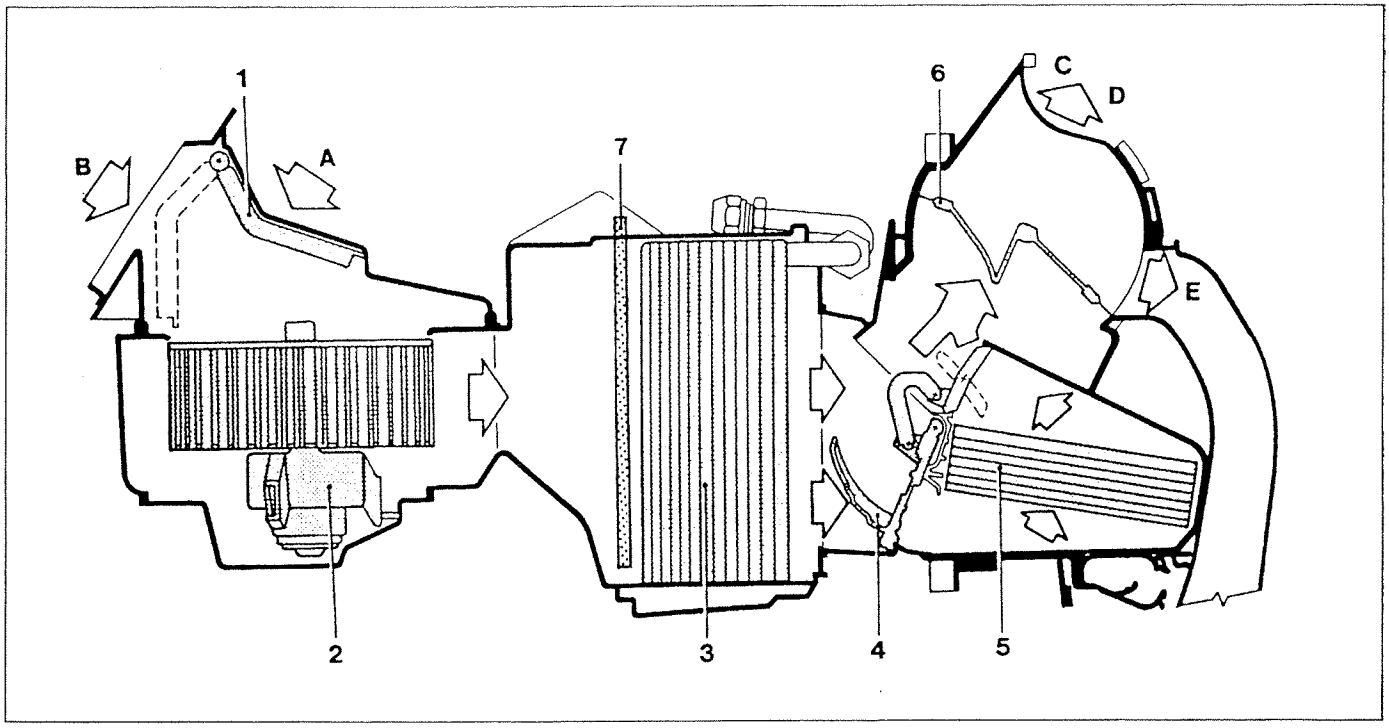


P3U18BH01

CONNECTOR	SIGNAL ARRIVING
A	Earths and supplies
B	Faules and wear
C	Faults
D	Climate control
E	Various signals
F	Fault diagnosis

AIR DISTRIBUTION DIAGRAM

The air is drawn in by the electric fan (2) through the air intakes according to the position of the recirculation flap (1); (B) indicates an air flow from the outside and (A) an air flow from the interior of the vehicle.
The air passes through the evaporator (3) and reaches the mixing area where the mixture flap (4), depending on the position it is in, directs the air directly to either the distribution or the heater radiator (5). Lastly, the mixed air is directed, according to the position of the distribution flatp (6), either to the demisting (C) or the ventilation (D) or the floor (E).



P3U19BH01

1. Recirculation flap
2. Electric fan
3. Evaporator
4. Mixture flap
5. Heater radiator
6. Distribution flap
7. Combination filter
   (not prevent on versions with heaters)

A. Passenger compartment interior air flow (recirculation
B. Outside air flow
C. Windscreen air flow
D. Centre, front, side vents air flow
E. Lower and rear vents air flow

GENERALITES CARACTERISTIQUES TECHNIQUES	INTRODUCTION TECHNICAL DATA	ALLGEMEINES TECHNISCHE DATEN	GENERALITÀ DATI TECNICI
MOTEUR	ENGINE	MOTOR	MOTORE
EMBRAYAGE	CLUTCH	KUPPLUNG	FRIZIONE
BOITE DE VITESSES DIFFERENTIEL	GEARBOX DIFFERENTIAL	SCHALTGETRIEBE AUS-GLEICHGETRIEBE	CAMBIO DI VELOCITÀ DIFFERENZIALE
ARBRE DE TRANSMISSION	PROPELLER SHAFT	GELENKWELLE	ALBERO DI TRASMISSIONE
DIFFERENTIEL ARRIERE	REAR DIFFERENTIAL	HINTERES AUS-GLEICHGETRIEBE	DIFFERENZIALE POSTERIORE
FREINS	BRAKING SYSTEM	BREMSEN	FRENI
DIRECTION	STEERING	LENKUNG	STERZO
SUSPENSIONS ET ROUES	SUSPENSION AND WHEELS	AUFHÄNGUNGEN UND RÄDER	SOSPENSIONI E RUOTE
ORGANES SUBSIDIAIRES	AUXILIARY UNITS	ZUSATZ-EINRICHTUNGEN	ORGANI SUSSIDIARI
EQUIPEMENT ELECTRIQUE	**ELECTRICAL EQUIPMENT**	**ELEKTRISCHE ANLAGE**	**IMPIANTO ELETTRICO**
CARROSSERIE	BODYWORK	CAROSSERIE	CARROZZERIA

Electrical equipment

Index

55.

page

The information contained in this publication is supplied as a guide and may no longer be up to date as a result of modifications made by the Manufacturer, at any time, for reasons of a technical or commercial nature in addition to meet legal requirements in different countries.

Fiat Auto S.p.A.
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Assistenza Tecnica
Largo Senatore G. Agnelli, 5 – 10040 Volvera – To – (Italia)
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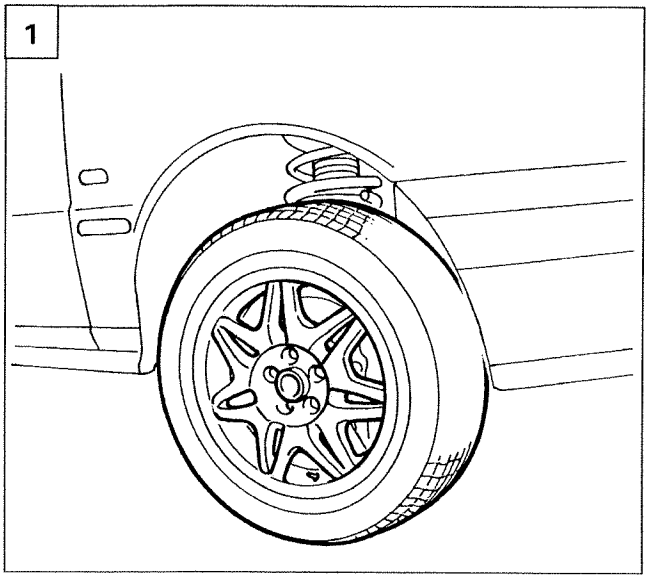
Printed by Satiz S.p.A. – Turin (Italy)
order n° *604.47.413*

REMOVING - REFITTING ALTERNATOR

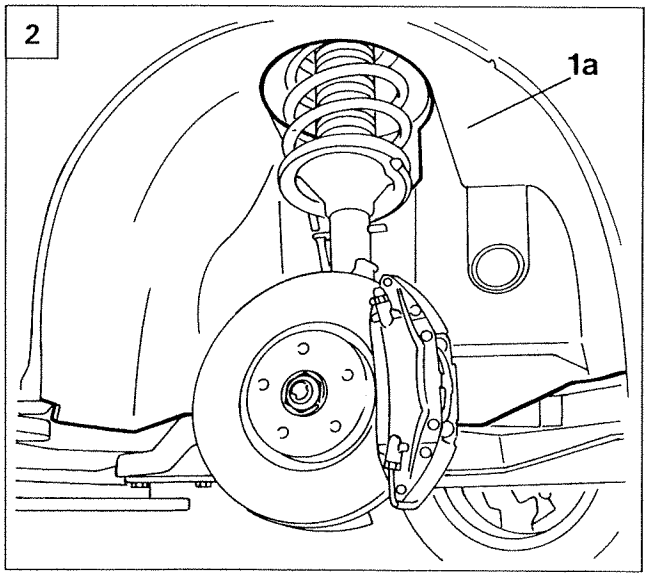


3U001QL01

Removing

- Disable the alarm (if fitted) and disconnect the negative battery lead.

1. Position the vehicle on a lift and remove the right front wheel.

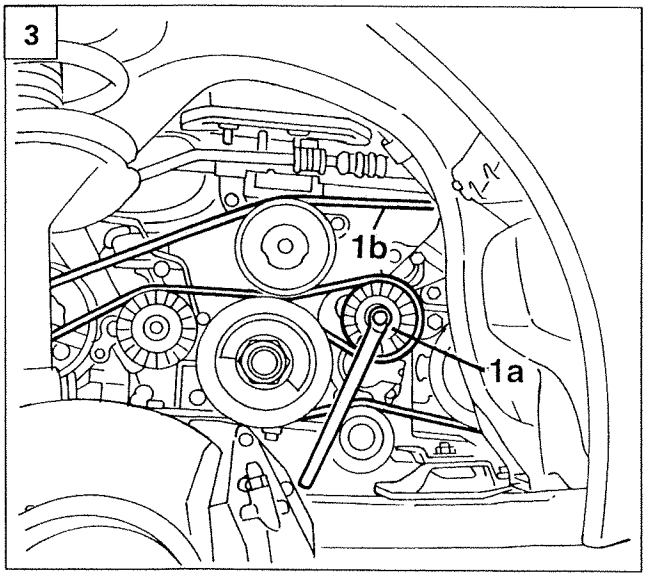


3U001QL02

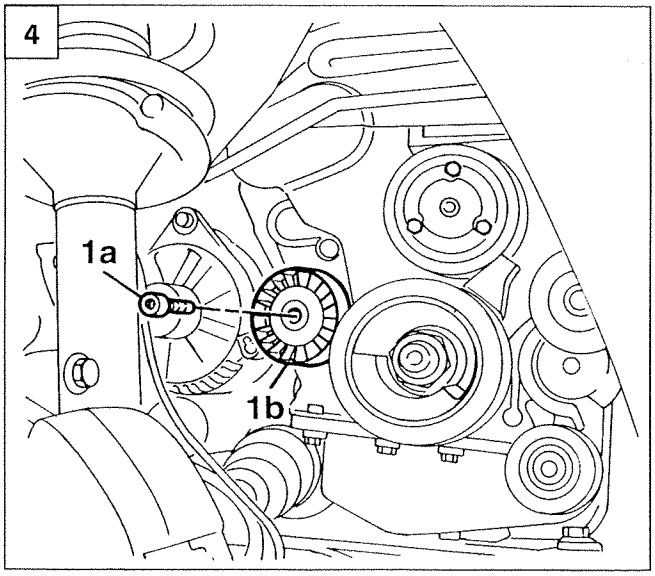
2. Undo the bolts and remove the complete right wheel arch liner (1a).

3. Working on the automatic tensioner (1a), remove the auxiliary shaft drive belt (1b) from the alternator pulley.

4. Undo the fixing bolt (1a) and remove the fixed tensioner (1b).

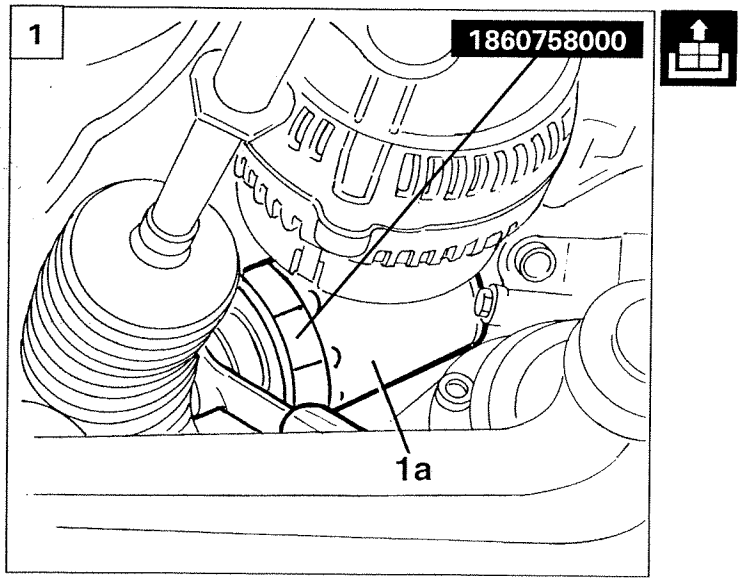


3U001QL03



3U001QL04

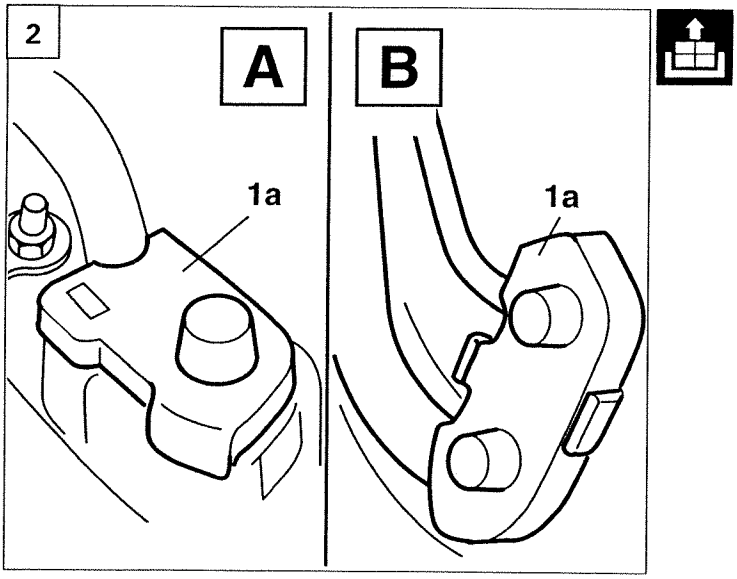
55.



3U002QL01

- Remove the shield under the engine.
- Position a suitable container for collecting the oil.

1. Use tool 1860758000 to remove the oil filter (1a).



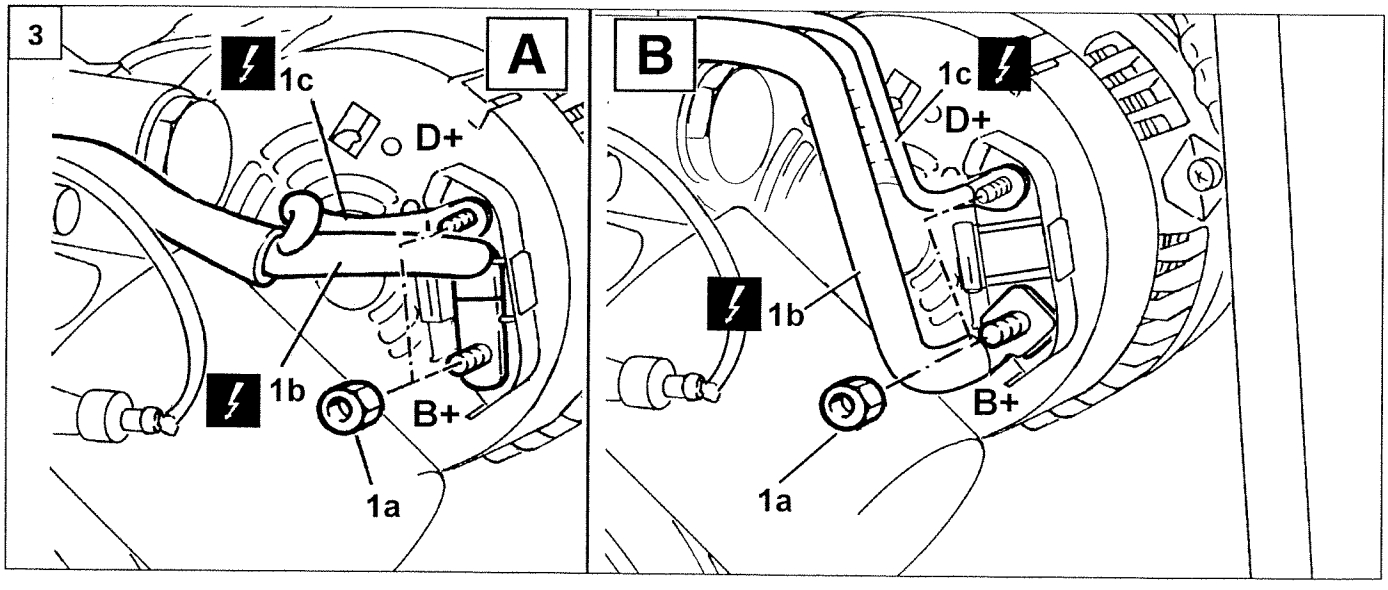
3U002QL02

2. Open the plastic protection (1a) for the alternator electrical connections.

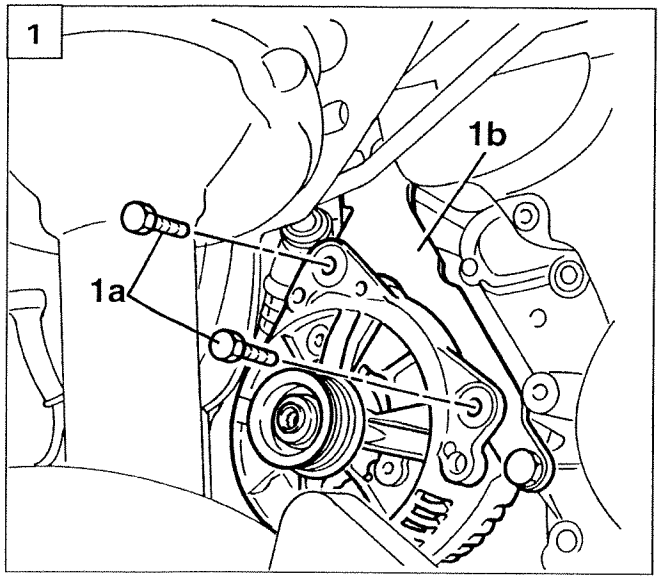
Configuration A: vehicles up to chassis n° 2108250

Configuration B: vehicles up to chassis n* 2108251

3. Undo the fixing nuts (1a) and disconnect the cables (1b) and (1c), for alternator terminals B+ and D+, respectively.



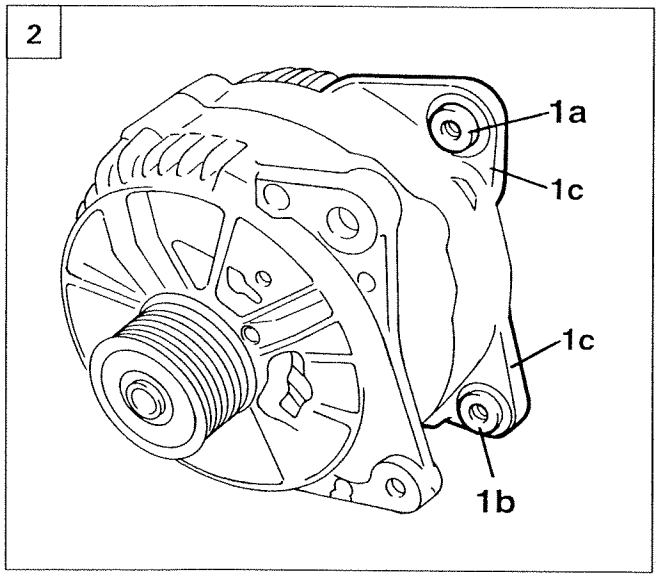
3U002QL03



3U003QL01

1. Undo the bolts (1a) fixing the alternator to the mounting brakcet (1b).

- Release the alternator from its housing and remove it.



3U003QL02

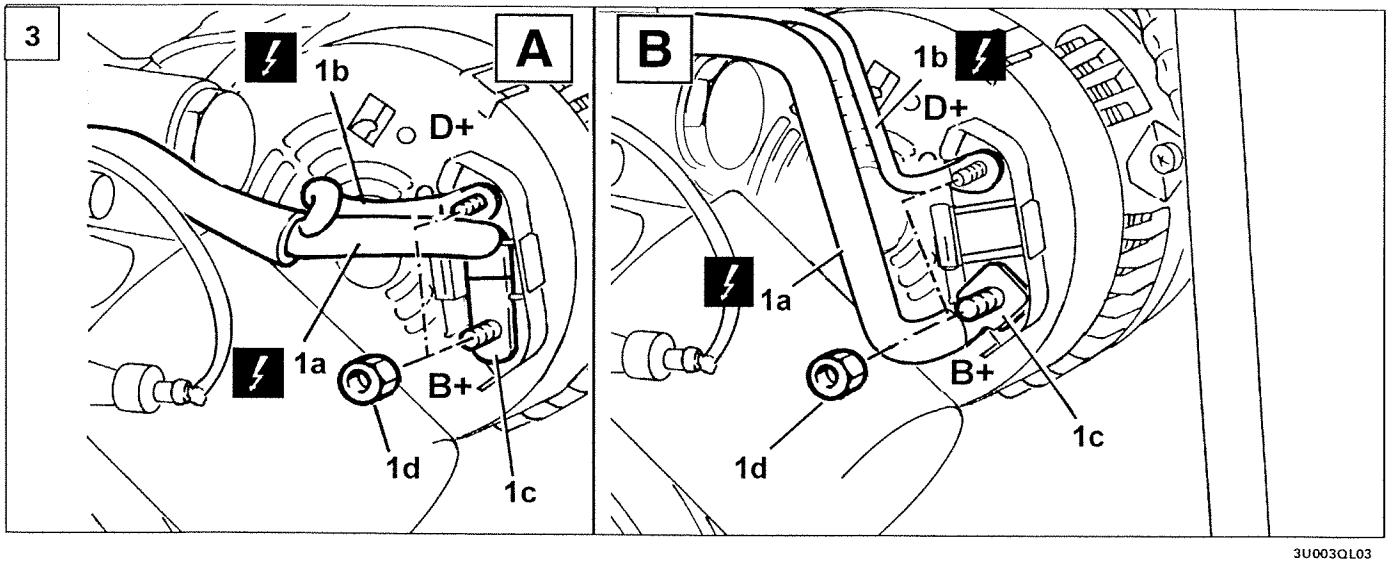
Refitting

2. Position the bushes (1a) and (1b) in line with the alternator fixing tabs (1c).

- Fit the alternator and tighten the fixing bolts to the mounting bracket.

Alternator fixing bolts: 2.5 daNm

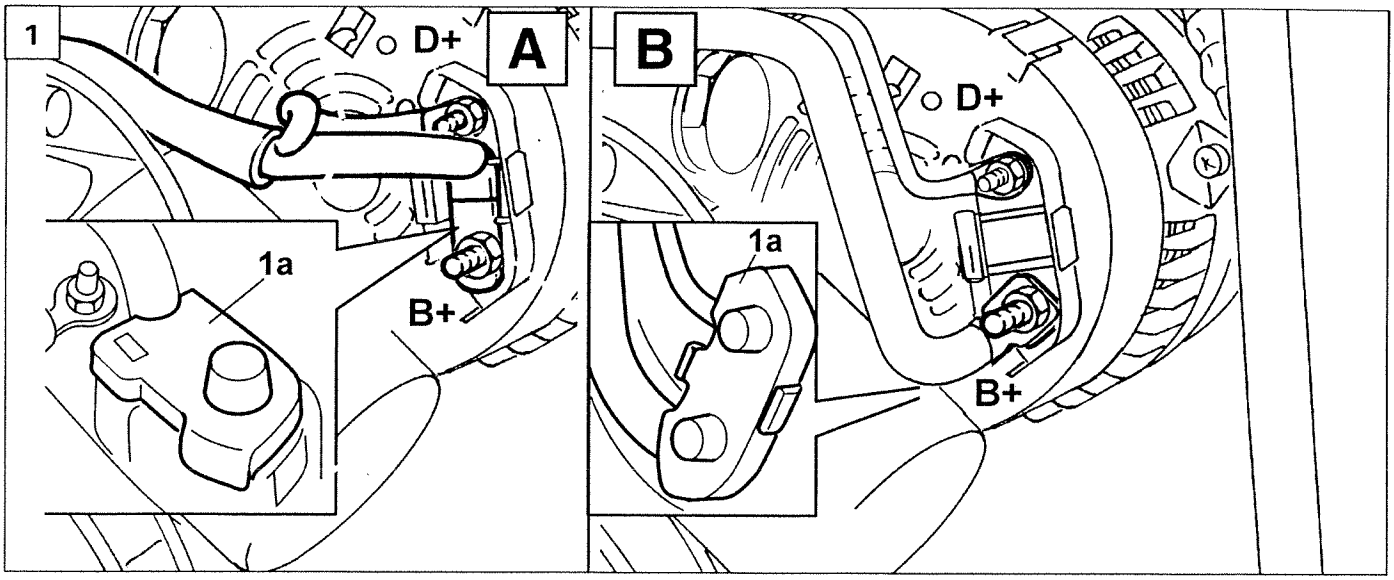
3. Connect the cables (1a) and (1b) to the alternator terminals B+ and D+, respectively so that the terminal (1c) for cable (1a), connected to terminal B+, is positioned vertically on the alternator cover, towards terminal D+ for configuration A; and is facing downwards for configuration B, as illustrated in the diagram. Then secure the cable terminals using the nuts (1d).



3U003QL03

55.

1. Fit the protective cover (1a) for terminal B+, for configuration A, and he cover for both terminals B+ and D+, for configuration B. Make sure that the protection is correctly closed and that the alternator cables are in the correct position, shown in the diagram.



3U004QL01

- Fit a new oil filter; lubricate the gasket, tighten by hand to a torque of 1.5 daNm (i.e. tighten by a further ¾ of a turn).
- Fit the shield under the engine.
- Fit the fixed tensioner and tighten the fixing bolt
- Fit the engine components drive belt (services belt).
- Fit the complete wheel arch and secure it using the bolts.

- Fit the right front wheel and tighten the bolts to a torque of 9.8 daNm.
- Remove the vehicle from the lift and check/top up the engine oil level.
- Reset the alarm (if fitted).
- Connect the negative battery lead.

page

For anything not deal with, see the 98 range wiring diagrams in the 4th volume manual

The information in this publication is intended as a guide and could be superseded as a result of modifications adopted by the Manufacturer at any time due to technical and commercial reasons and in accordance with local regulations.

Fiat Auto S.p.A.

D.M.C. – M.D.S.
Servizi la Cliente – Post vendita
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Print no. 506.475/25 – Marzo 1999 – 400
Printed by Satiz S.p.A. – Turin (Italy)
order n° *604.46.450*

DESCRIPTION	SALOON/SW COUPÉ			
	1998	2446	2959	2387
Version with air conditioning Engine cooling – Engine coolant temperature gauge and overheating warning light	5	5	27	
Version without air conditioner Engine cooling – Engine coolant temperature gauge and overheating warning light	7	7		
LANCIA-CODE	9	9	29	
Automatic heating	11	11		
Side lights and warning light – Dipped headlamps – Main beam headlamps and warning light – Parking lights – Number plate lights	13	13		
Fuel gauge and reserve warning light – Handbrake warning light – Insufficient brake fluid warning light – Seat belts not fastened warning light – Speedometer – Milometer/trip meter and zeroing button – Rev counter – Current socket – Voltmeter	15	15		
Starting – Electronic injection and ignition – Recharging and warning light – Insufficient engine oil pressure warning light – Injection system failure warning light – Rev counter – Speedometer	17S	17	37	
Automatic climate control system	19	19	39	
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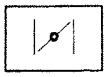
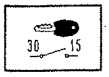
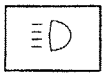
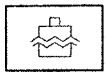
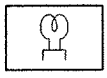
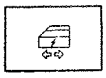
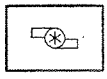
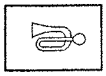
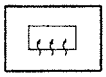
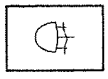
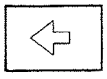
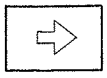
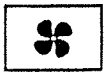
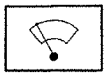
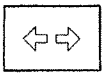
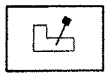
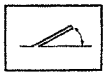
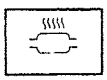
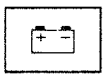
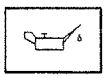
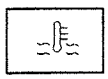
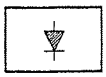
Anti-lock brakes (A.B.S.) and failure warning light			35	
Cruise Control	31	31	33	
Automatic transmission (ZF)			43	
Version with automatic transmission Starting – Electronic injection and ignition – Recharging and warning light – Insufficient engine oil pressure warning light – Injection system failure warning light – Rev counter – Speedometer	44/1	44/1		
Automatic transmission (AISIN)	44/2	44/2		
Version with automatic transmission Direction indicators and warning light – Hazard warning lights and warning light – Brake lights – Reversing lights	44/3	44/3		
Version with air conditioning Engine cooling – Engine coolant temperature gauge and overheating warning light				44/4
Starting – Diesel injection pressure pump electronic control unit – Recharging and warning light – Insufficient engine oil pressure warning light – Injection system failure warning light – Heater plugs control unit and warning light				44/6
Instrument panel connections				44/8

Electrical symbols

 Positions	 Choke	 Switch discharge
 Main beam headlamps	 Water in fuel filter	 Dipped headlamps
 Heated seat	 Heater plugs	 Direction indicators signalling for central locking
 Seat belts	 Turbocharging pressure	 Electric horns
 Heated rear windscreen	 Rear fog lamp	 Left direction indicator
 Handbrake applied and insufficient brake fluid level	 Fog light	 Right direction indicator
 A.B.S.	 Brake pad wear	 Engine cooling
 Hazard warning lights	 Turbocharging pressure	 Windscreen wiper
 Direction indicators	 Automatic gearbox oil temperature	 Electrically operated sun roof
 Handbrake and insufficient brake fluid level	 Speed limiter	 Catalytic silencer temperature
 Recharging	 Fuel level	 Resistance
 Engine oil pressure	 Engine coolant temperature	 Diode

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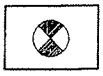
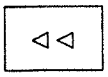
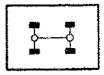
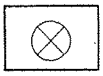
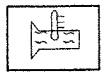
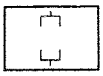
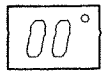
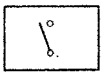
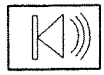
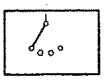
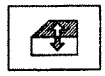
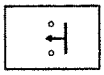
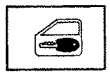
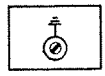
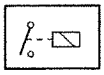
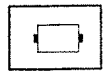
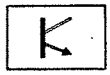
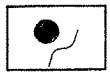
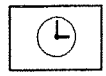
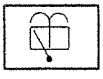
55.

Electrical symbols

 Warning light	 Trip computer	 Differential lock
 Bulb	 Electronic injection	 Automatic gearbox oil temperature
 Fuse	 Engine oil level	 Temperature
 Switch open	 Brake fluid level (Japanese version)	 Anti-theft device
 Selector switch	 Doors open	 Electric windows
 Button open	 Central locking	 Earth
 Switch controlled by coil (Relay)	 Sport Function controlled damping suspension	 Number plate lights
 Motor	 Transistor	 Impulse generator (Timer)
 Rearscreen wiper	 Air-Bag	 Analogue clock
 Headlamp washer	 A.B.S. (Japanese Version)	 Digital clock
 Windscreen wash/wipe	 Brake lights failure	 Speedometer
 Rearscreen wash/wipe	 Windscreen wiper	 Rev counter

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Electrical symbols

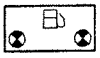

Digital speedometer


Digital rev counter


Digital fuel gauge


Analogue fuel gauge


Analogue engine temperature gauge


Econometer


Digital engine temperature gauge


Engine oil temperature

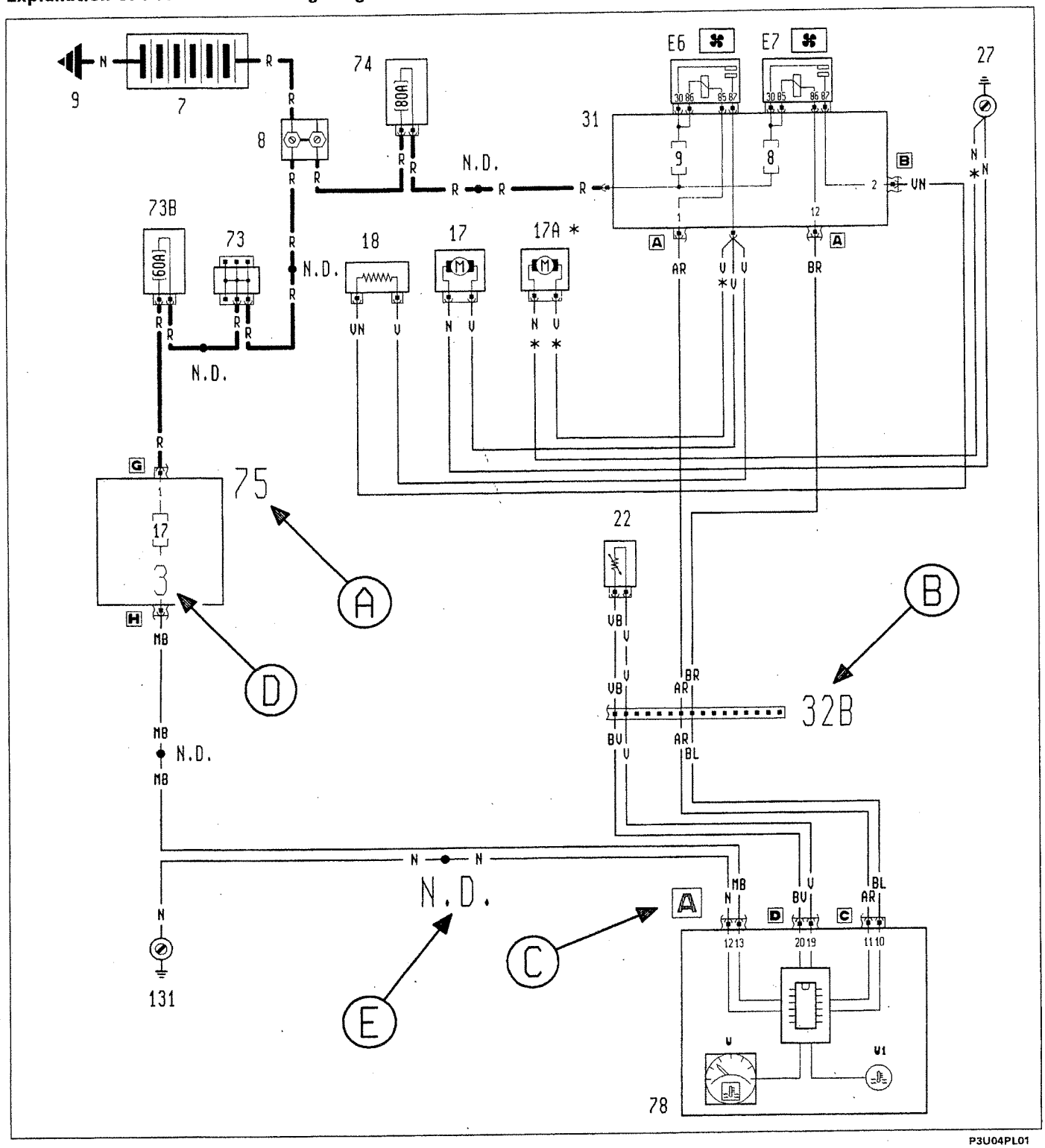

Engine oil pressure gauge


Voltmeter

P3U03PL01

55.

Explanation of how to read wiring diagrams



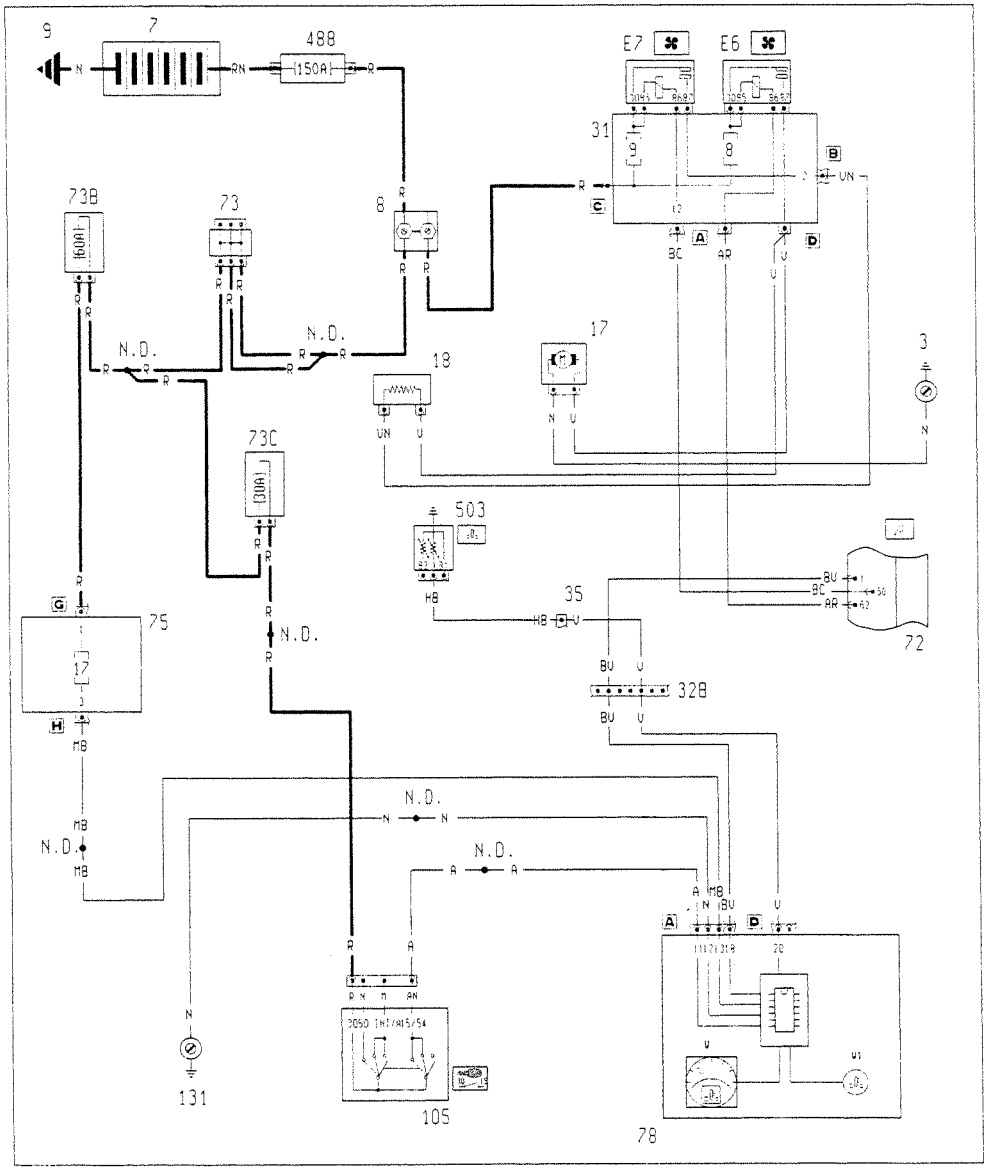
Reference key

A Component number
B Connection number
C Identification of connector at component
D Connecting pin number
E Ultrasound welding taped in cable loom

3U04PL

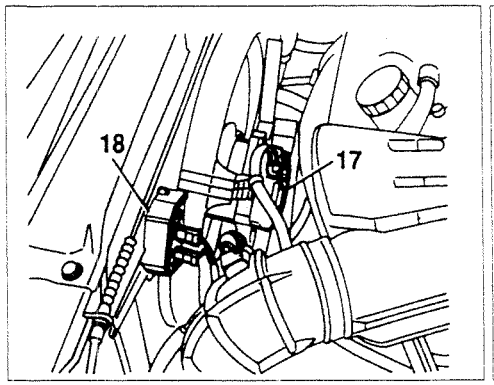
Versions with air conditioning

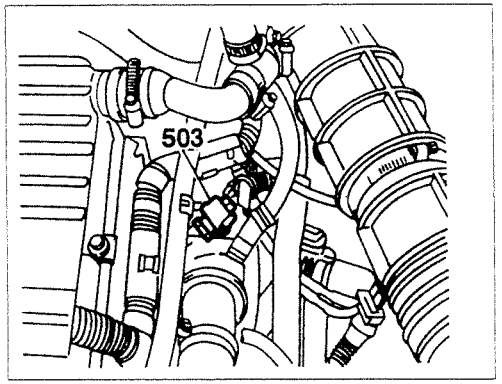
Engine cooling - Water temperature gauge and overheating warning light - (See key at end of wiring diagrams)

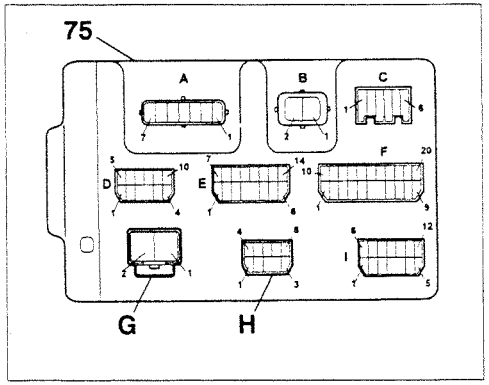


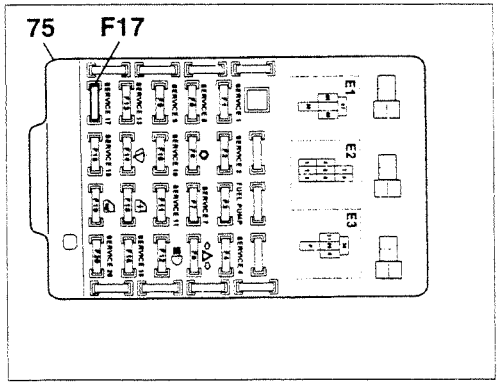
3U05PL

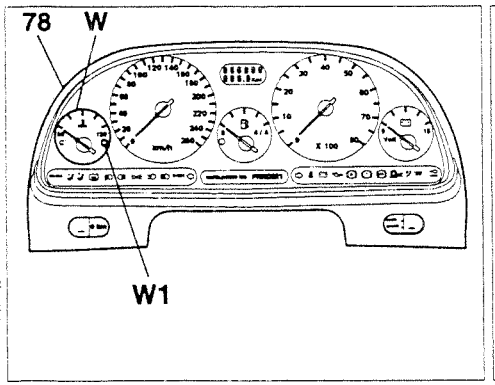
Location of components

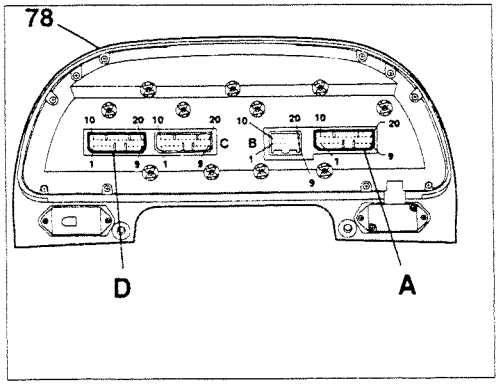












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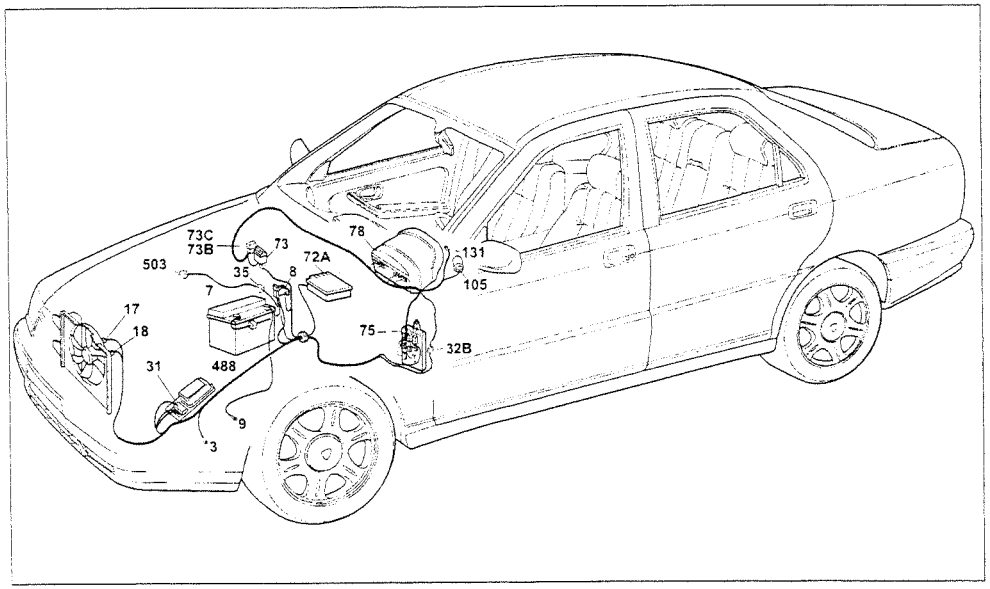


P3U07PL01

Versions with climate control

Engine cooling - Water temperature gauge and overheating warning light

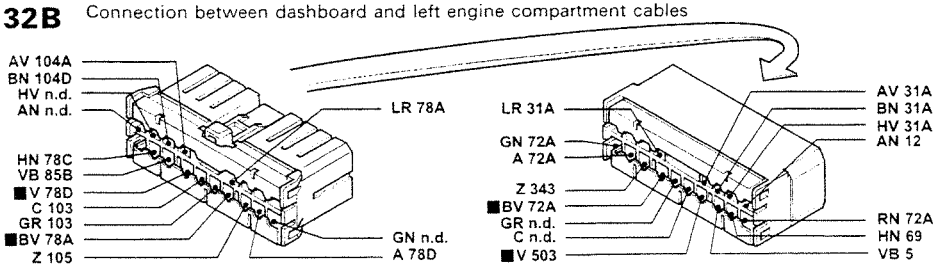
Components key

3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
17 1st Engine cooling fan
18 Fan speed resistance
31 Peripheral control unit (engine compartment)
E6 Engine cooling fan high speed relay feed
E7 Engine cooling fan low speed relay feed
32B Connection between dashboard and left engine compartment cables
35 Front/electronic injection cable coupling
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / alarm device
75 Junction unit (dashboard)
78 Instrument panel
W Water temperature gauge
W1 Engine coolant overheating warning light
105 Ignition switch
131 Earth on steering column support
503 Water temperature sensor

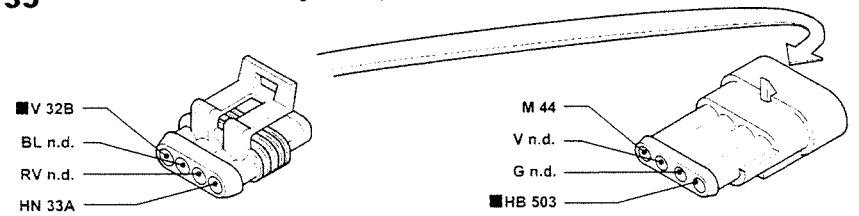
N.D. Ultrasound welding taped in cable loom

3U07PL

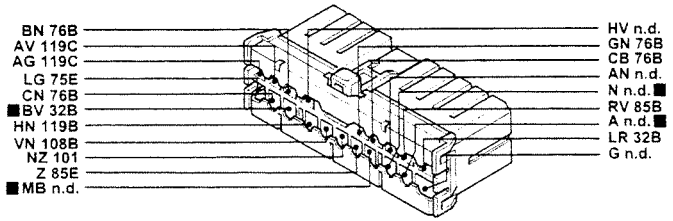
32B Connection between dashboard and left engine compartment cables



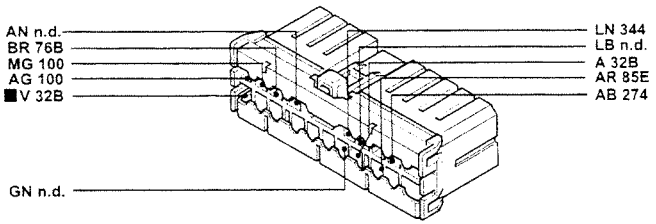
35 Connection between engine compartment and electronic injection cables



78A Instrument panel



78D Instrument panel



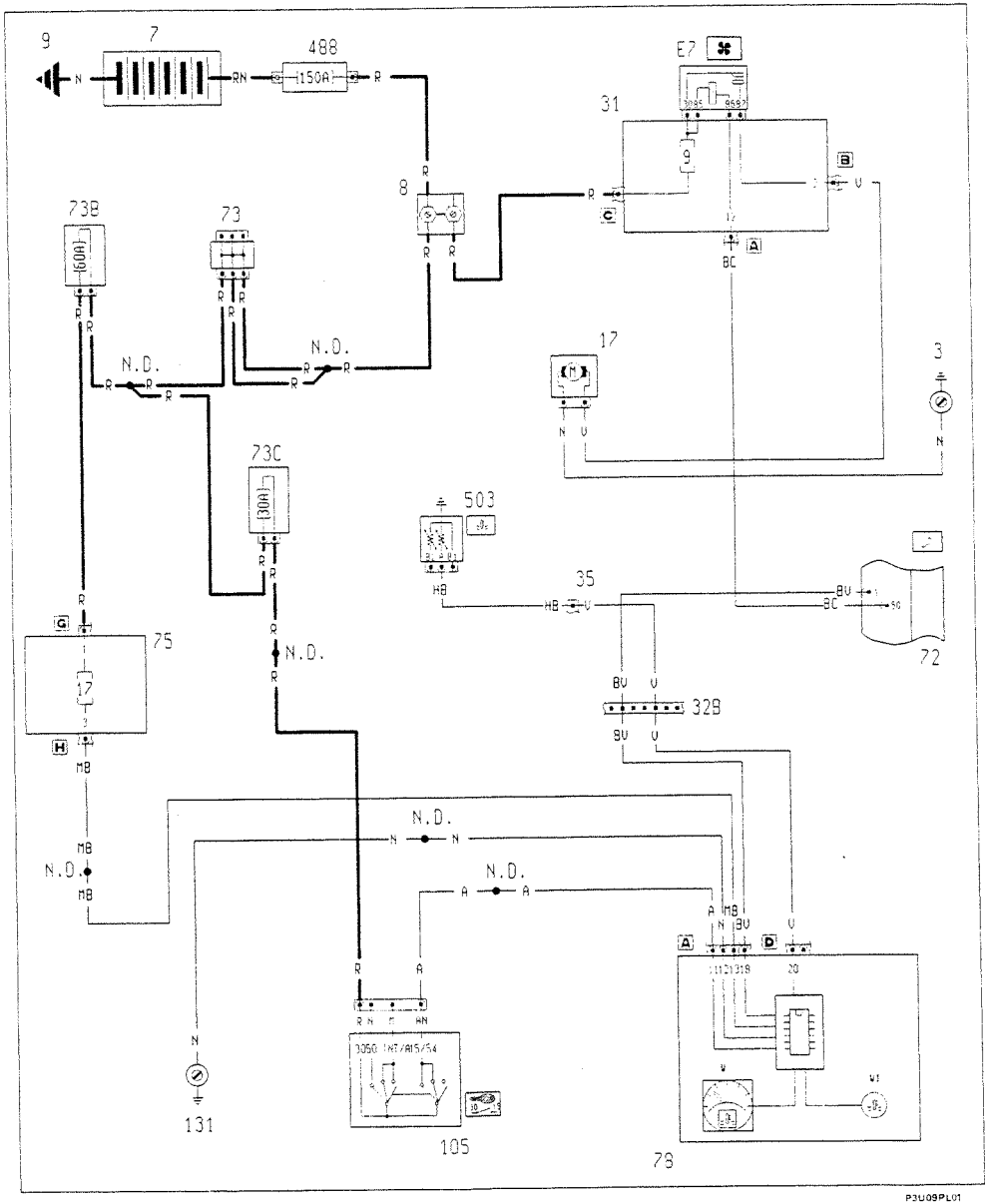
P3U08PL01

The cables in the wiring diagram are marked

3U08PL

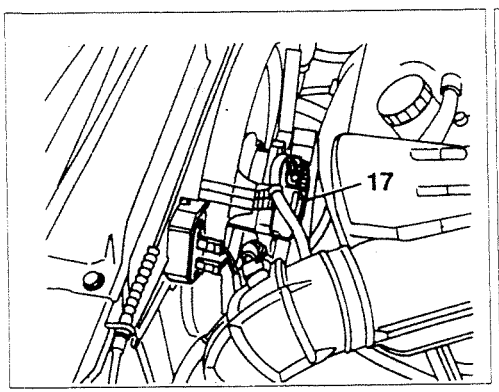
Versions without air conditioning

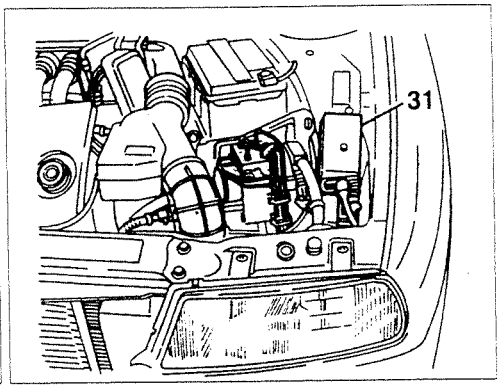
Engine cooling - Water temperature gauge and overheating warning light - (See key at end of wiring diagrams)

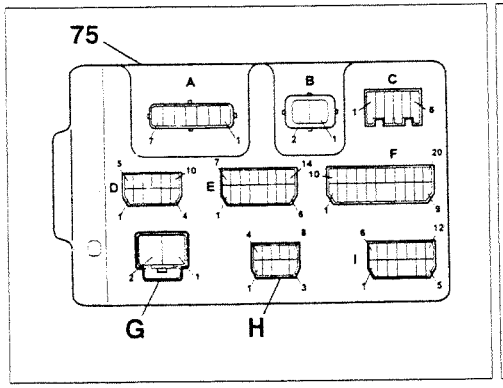


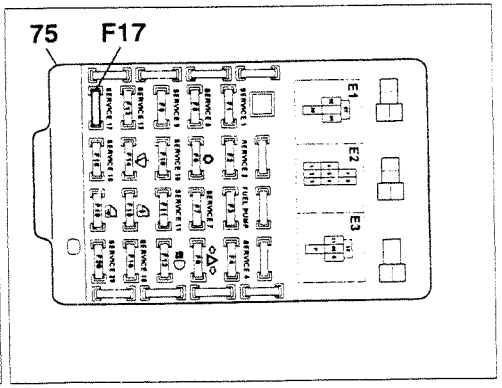
3U09PL

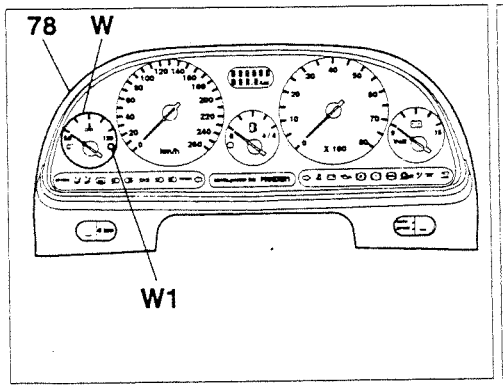
Location of components

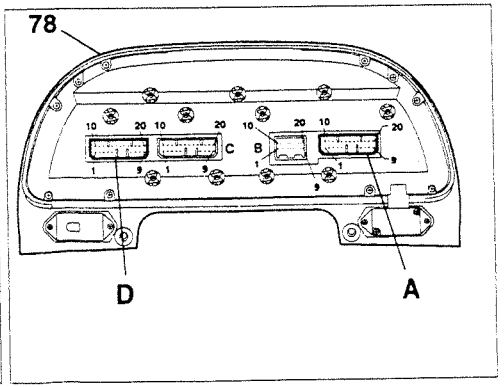






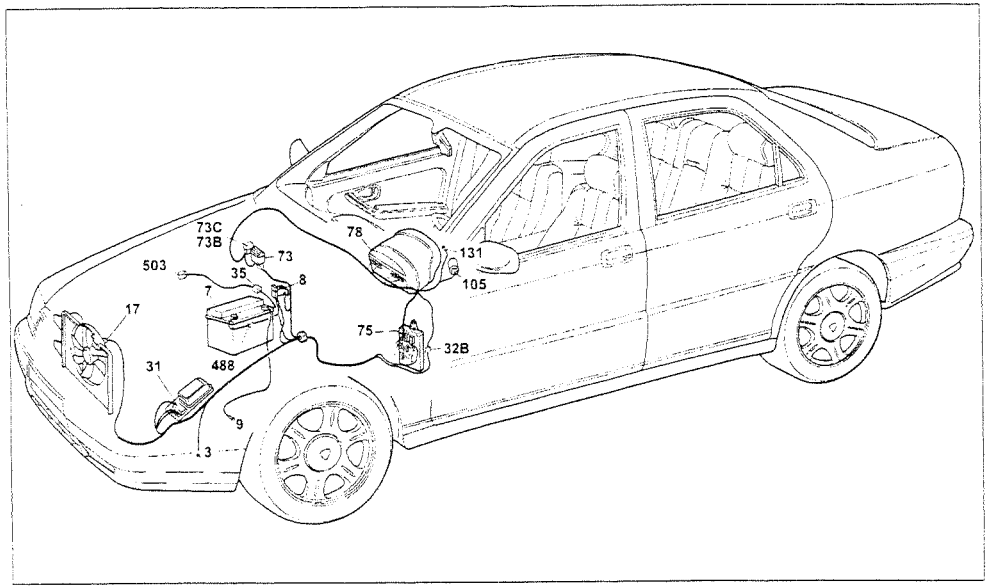






P3U10PL01

3U10PL



P3U11PL01

Versions without climate control

Engine cooling - Water temperature gauge and overheating warning light

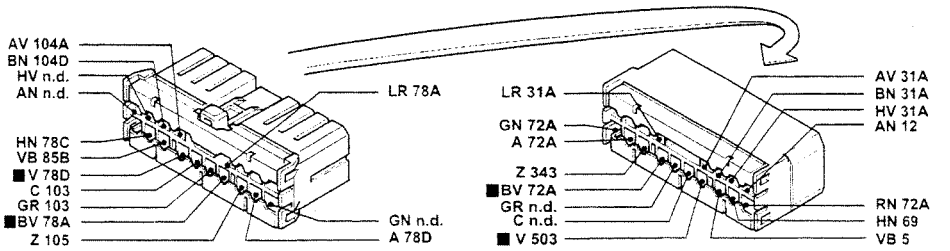
Components key

3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
17 1st Engine cooling fan
31 Peripheral control unit (engine compartment)
32B Connection between dashboard and left engine compartment cables
35 Connection between engine compartment / electronic injection cables
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / alarm device
75 Junction unit (dashboard)
78 Instrument panel
W Water temperature gauge
W1 Engine coolant overheating warning light
105 Ignition switch
131 Earth on steering column support
503 Water temperature sensor

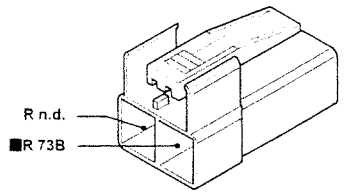
N.D. Ultrasound welding taped in cable loom

3U11PL

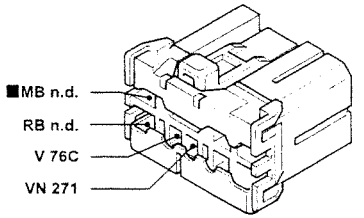
32B Connection between dashboard and left engine compartment cables



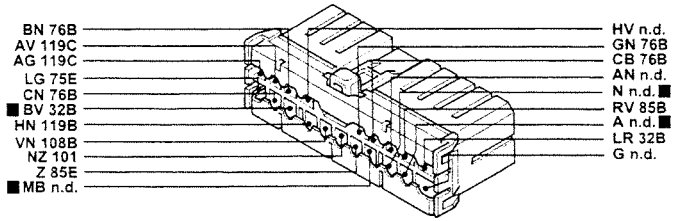
75H Junction unit (dashboard)



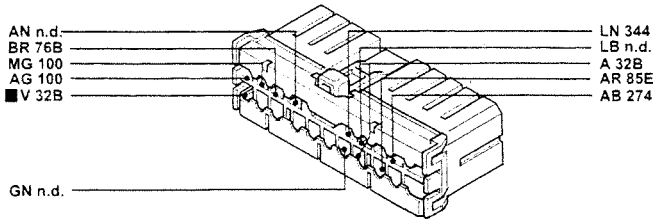
75G Junction unit (dashboard)



78A Instrument panel



78D Instrument panel

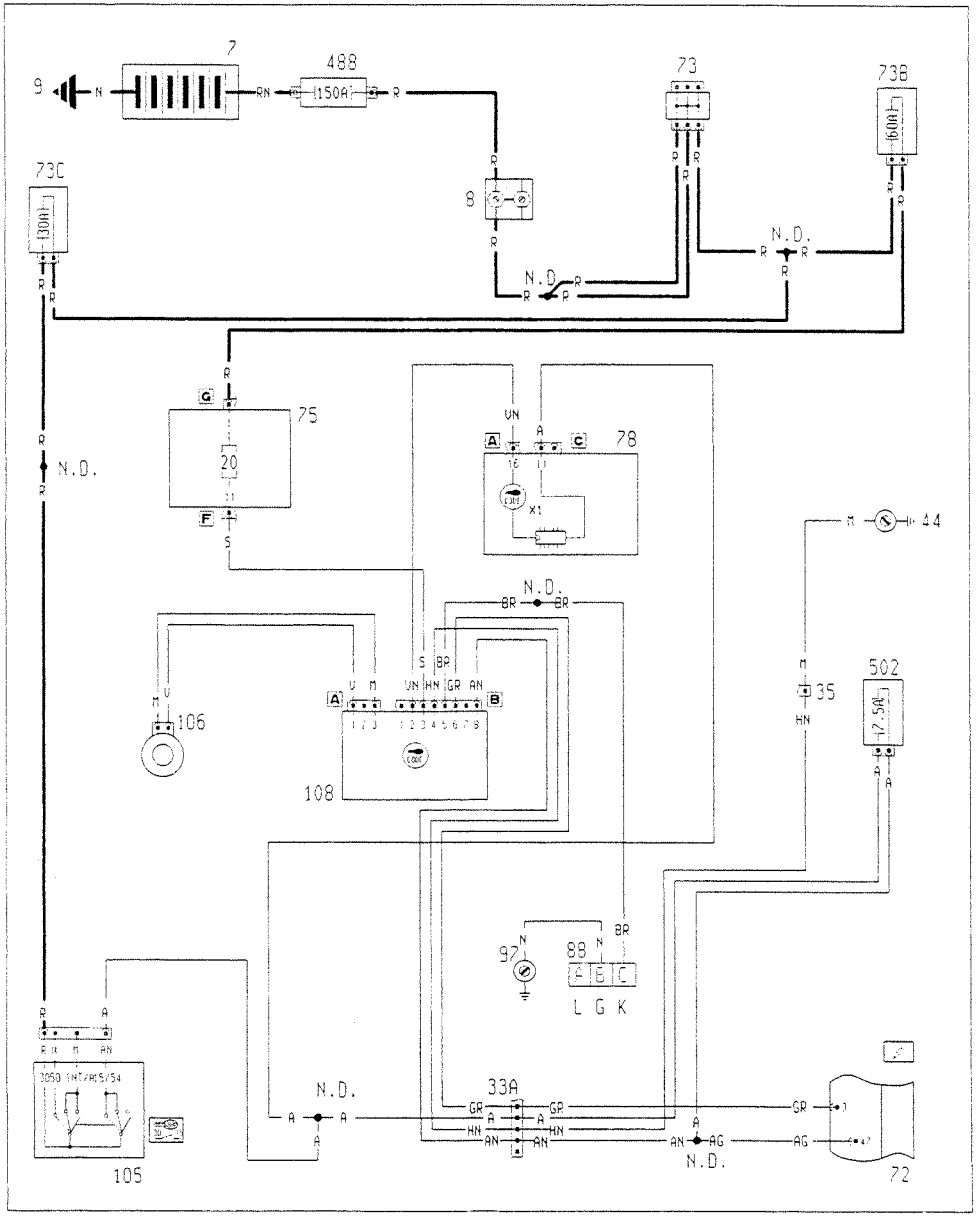


P3U12PL01

The cables in the wiring diagram are marked

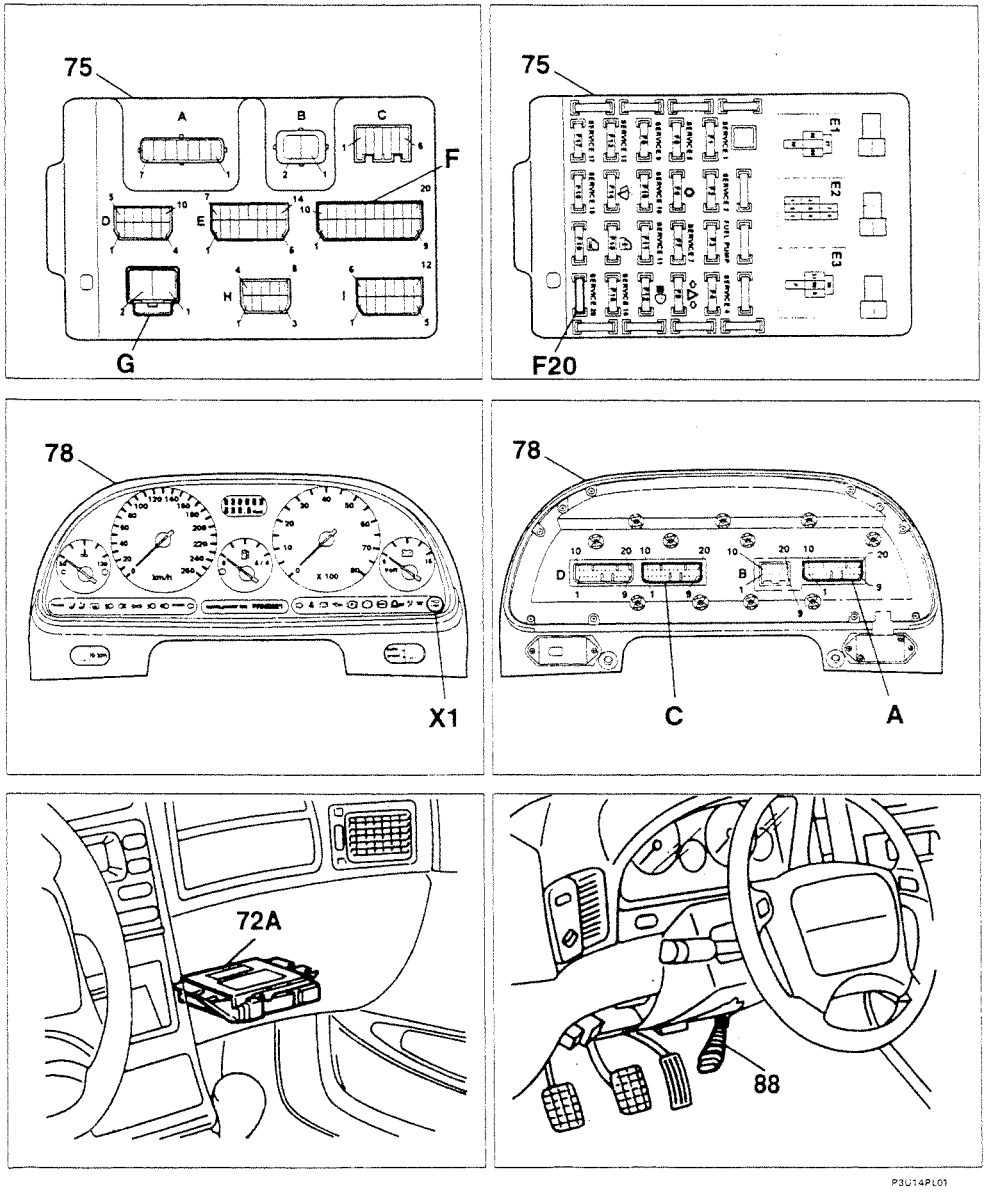
3U12PL

Lancia CODE - (See key at end of wiring diagrams)

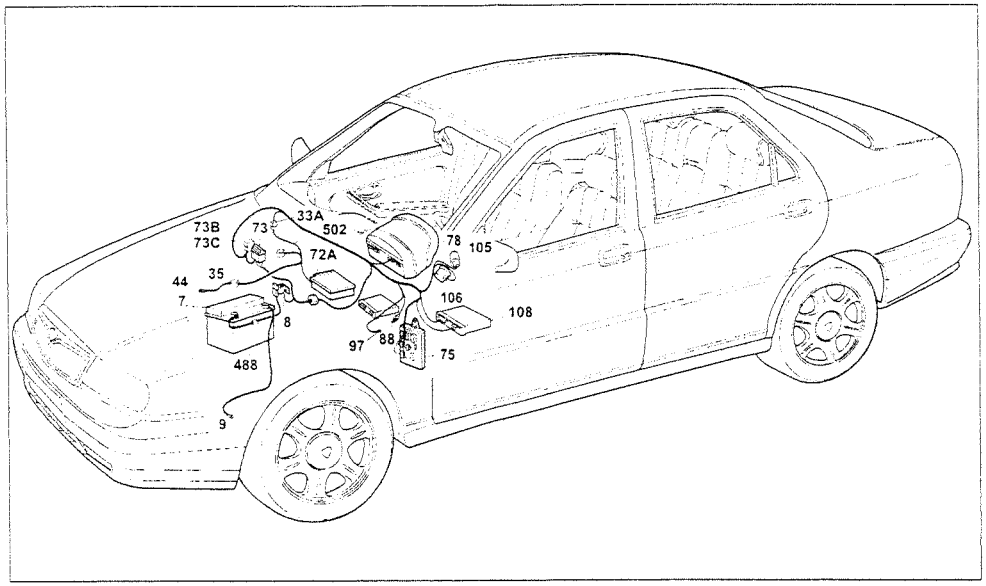


3U13PL

Location of components



3U14PL



P3U15PL01

Engine cooling - Water temperature gauge and overheating warning light

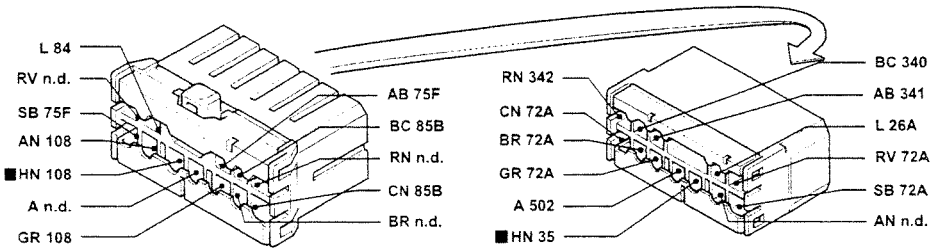
Components key

7 Battery
8 Main connector block
9 Earth on bodysheli
33A Dashboard cable / right engine compartment cable
35 Connection between engine compartment / electronic injection cables
44 Power earth
72A Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / alarm device
75 Junction unit (dashboard)
78 Instrument panel
X1 Lancia CODE failure warning light
105 Ignition switch
106 Lancia CODE aerial
108 Lancia CODE control unit
488 150 A maxifuse
502 7.5 A fuse for immobilizer

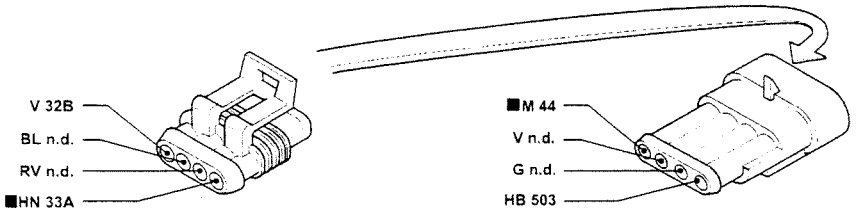
N.D. Ultrasound welding taped in cable loom

3U15PL

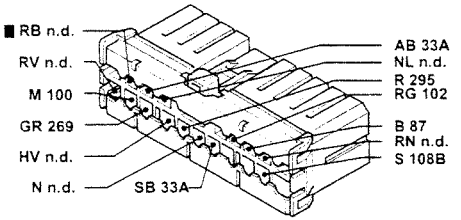
33A Connection between dashboard and right engine compartment cables



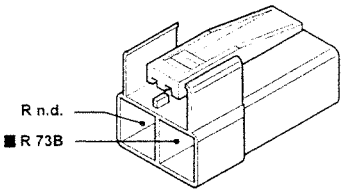
35 Connection between engine compartment and electronic injection cables



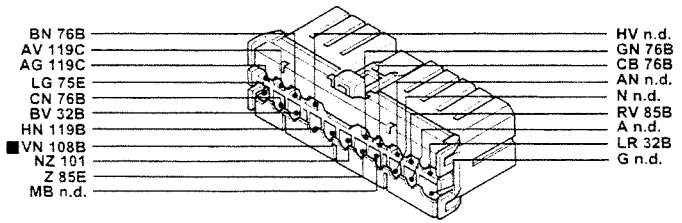
75F Junction unit (dashboard)



75G Junction unit (dashboard)



78A Instrument panel

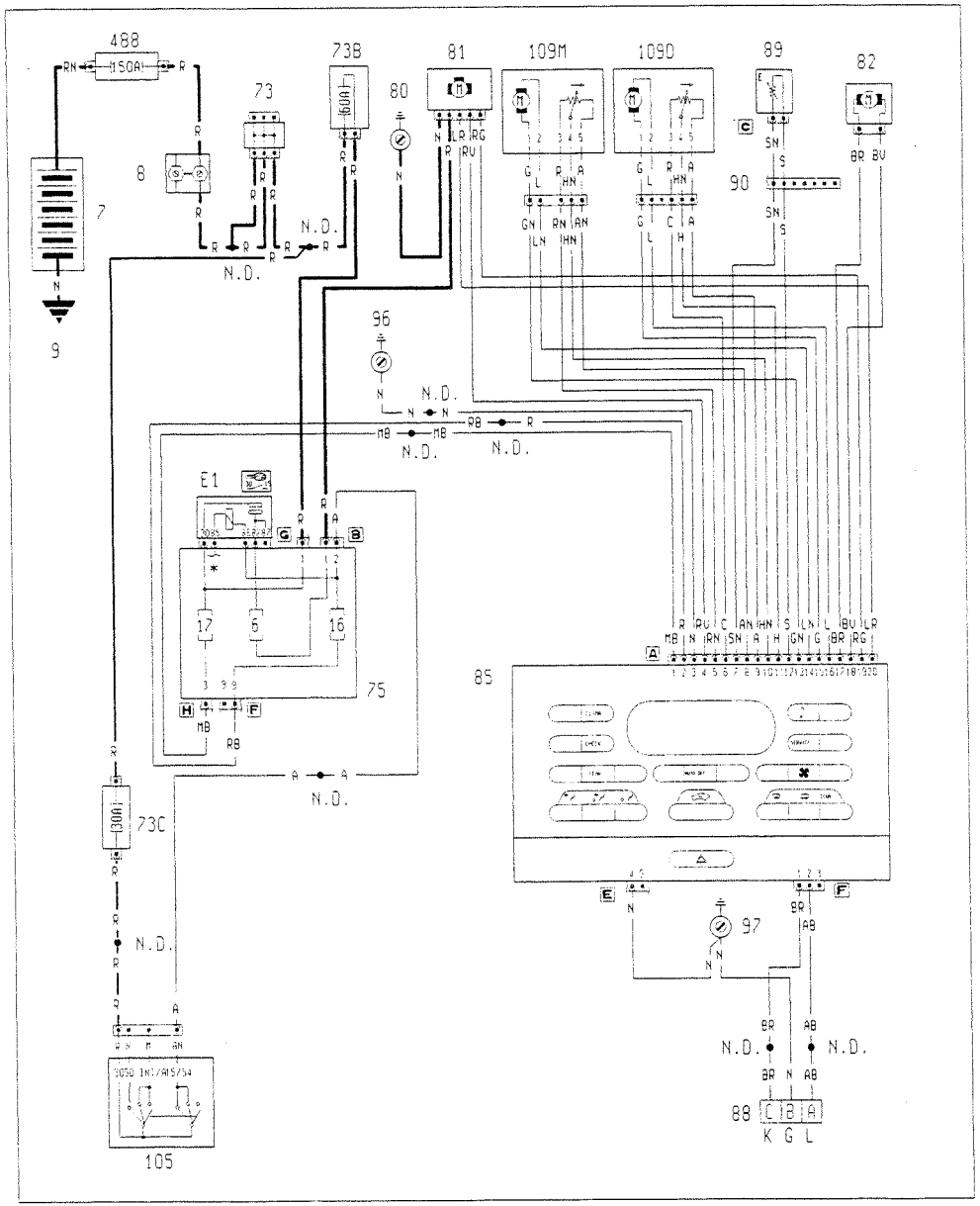


P3U16PL01

The cables in the wiring diagram are marked

3U16PL

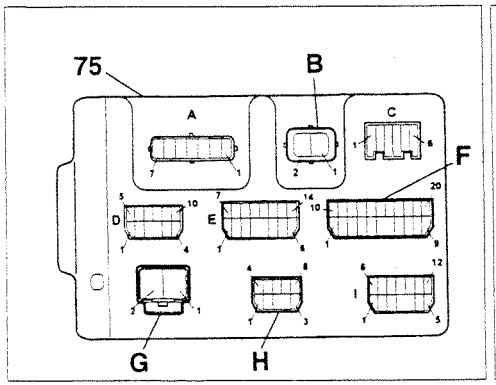
Automatic heater - (See key at end of wiring diagrams)

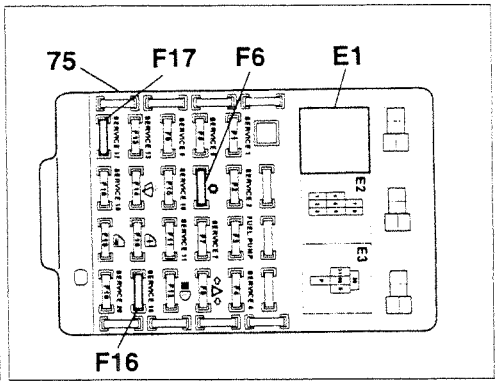


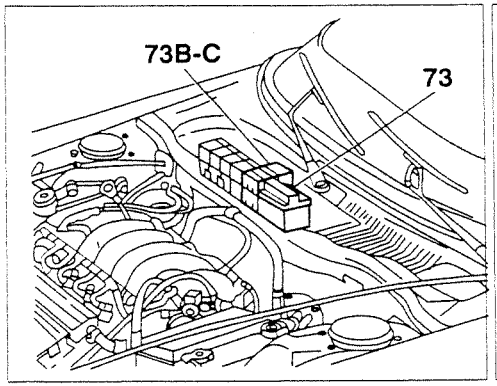
P3U17PL01

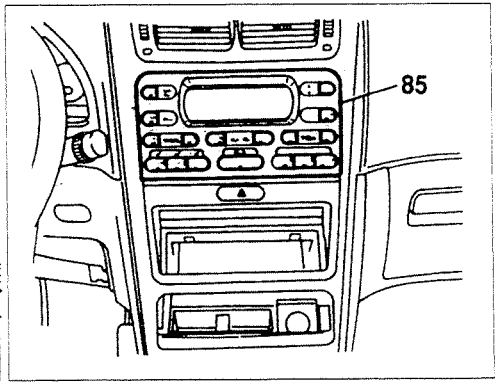
3U17PL

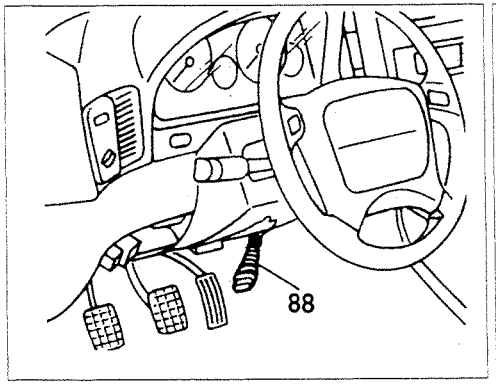
Location of components

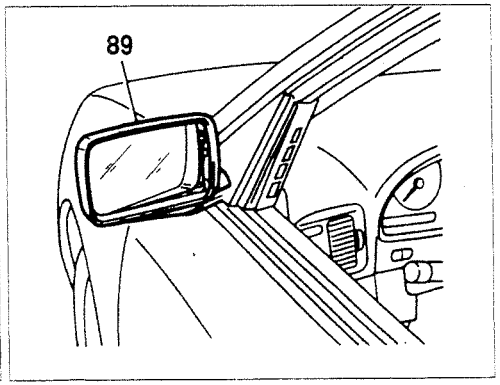






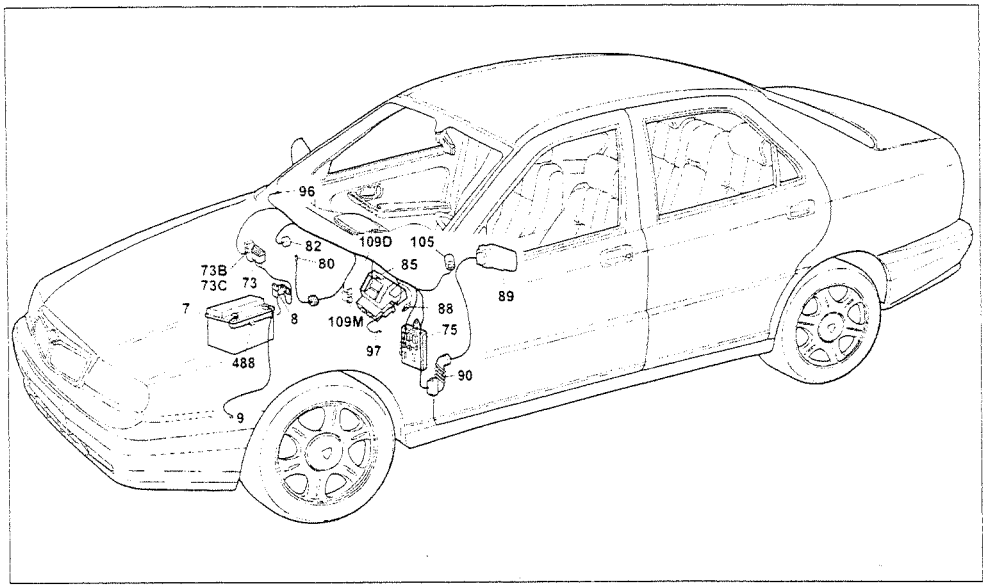






P3U18PL01

3U18PL



P3U19PL01

Automatic heater

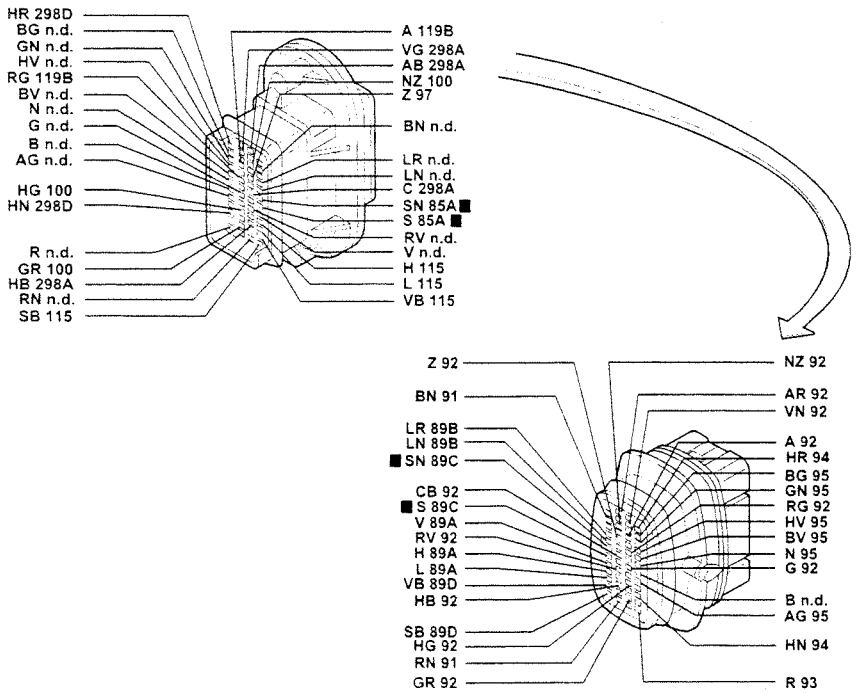
Components key

7 Battery
8 Main connector block
9 Earth on bodyshell
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / anti-theft device
75 Junction unit (dashboard)
E1 Ignition discharge relay
80 Power earth on dashboard
81 Climate control fan (Brushless)
82 Air recirculation motor
85 Infocenter control unit
88 Diagnostic socket
89 Left rear view mirror
90 Connection between dashboard / left front door cables
96 Earth on carrier
97 Earth on floor
105 Ignition switch
109D Distribution / mixture motor
109M Distribution / mixture motor
488 150 A maxifuse

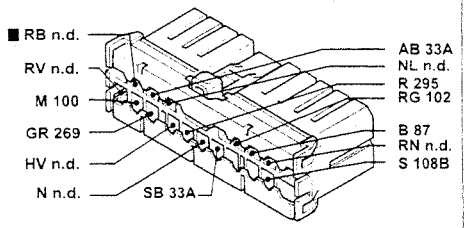
N.D. Ultrasound welding taped in cable loom

3U19PL

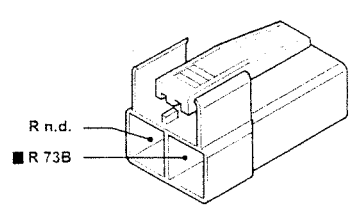
90 Connection between dashboard and left front door cables



75F Junction unit (dashboard)



75G Junction unit (dashboard)

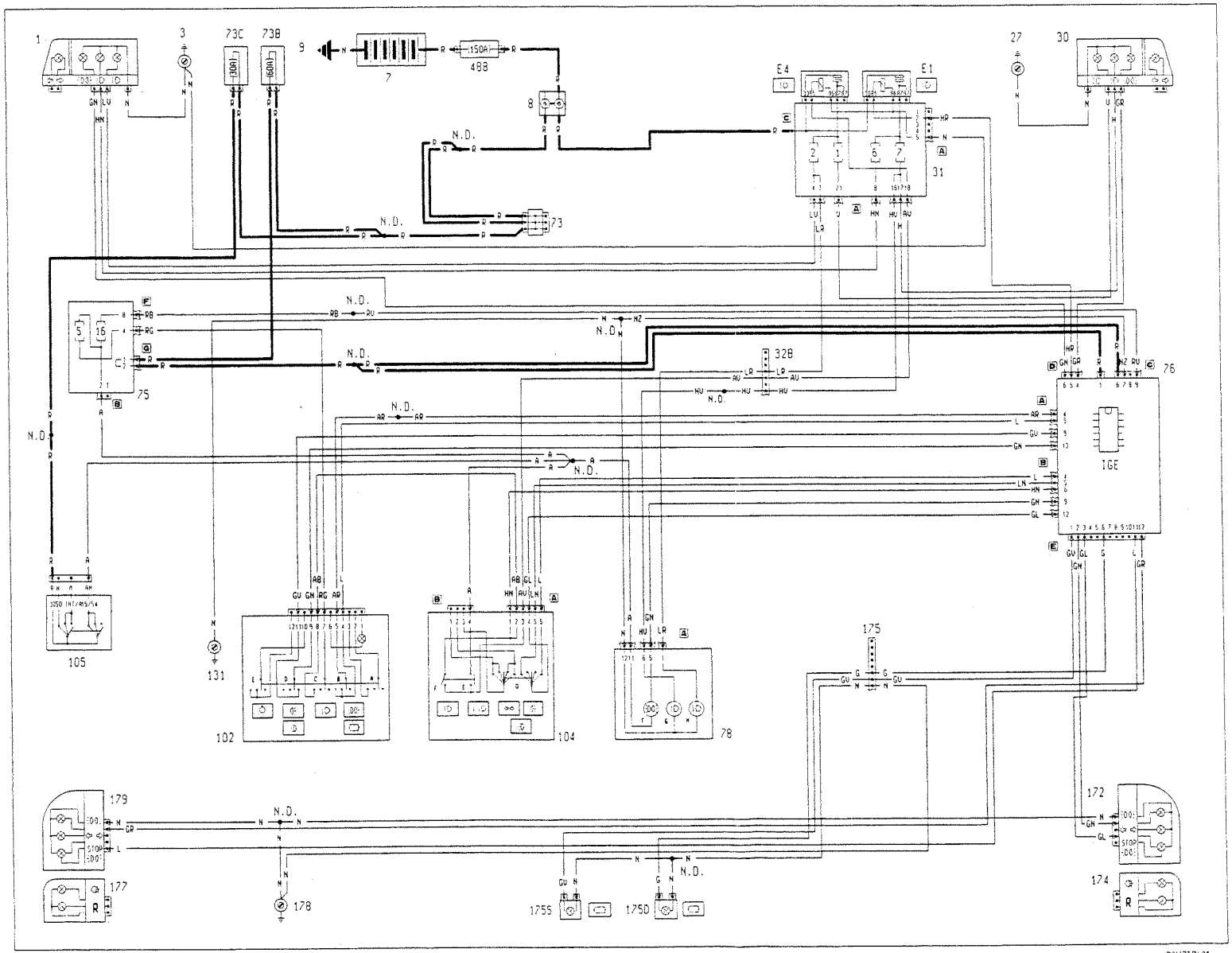


P3U20PL01

The cables in the wiring diagram are marked

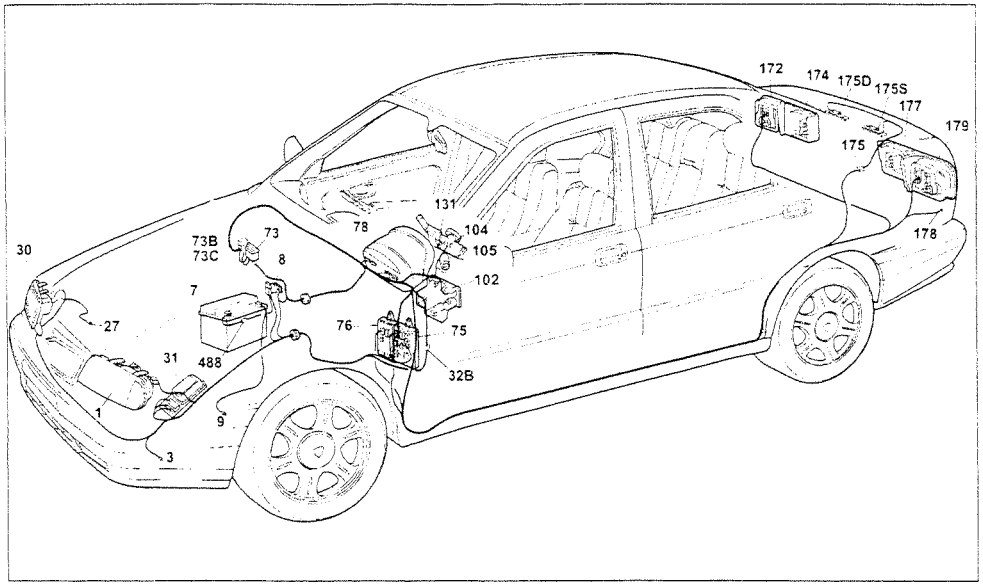
3U20PL

Side lights and warning light - Dipped headlamps and warning light - Main beam headlamps and warning light - Parking lights - Headlamp flasher - Number plate lights - (See key at end of wiring diagrams)



P3U21PL01

3U21PL



P3U23PL01

Side lights and warning light - Dipped headlamps and warning light - Main beam headlamps and warning light - Parking lights - Headlamp flasher - Number plate lights

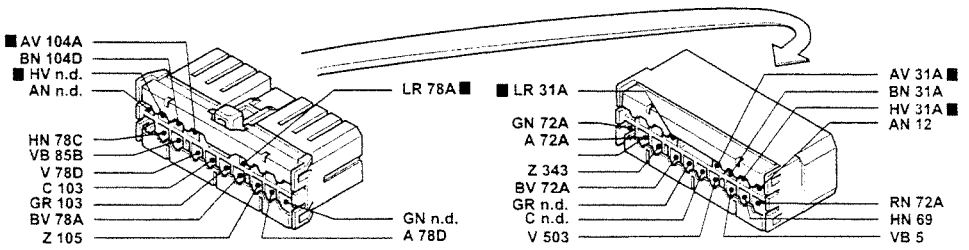
Components key

1 Left front light cluster
3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
27 Right front earth
30 Right front light cluster
31 Peripheral control unit (engine compartment)
E1 Dipped headlamps relay feed
E4 Main beam headlamps relay feed
32B Connection between dashboard / left engine compartment cables
73 Secondary connector block
73B 60 A fuse protecting I.G.E. control unit / junction unit
73C 30 A fuse protecting ignition switch / anti-theft device
75 Junction unit (dashboard)
76 I.G.E. control unit
78 Instrument panel
F Side lights warning light
G Dipped headlamps warning light
H Main beam headlamps warning light
102 Exterior lights control unit
B Side lights / number plate lights control switch
C Dipped headlamps / main beam headlamps control switch
D Parking lights control switch
E Ideogram lights control switch
104 Steering column switch unit
D Direction indicators / parking lights control switch
E Main beam headlamps flasher button
F Main beam headlamps control switch
105 Ignition switch
131 Earth on steering column support
172 Right rear light cluster on fixed section
174 Right rear light cluster on movable section
175 Connection between left longitudinal / tailgate cables
175S Left no. plate light
175D Right no. plate light
177 Left rear light cluster on movable section
178 Left rear earth
179 Left rear light cluster on fixed section
488 150 A maxifuse

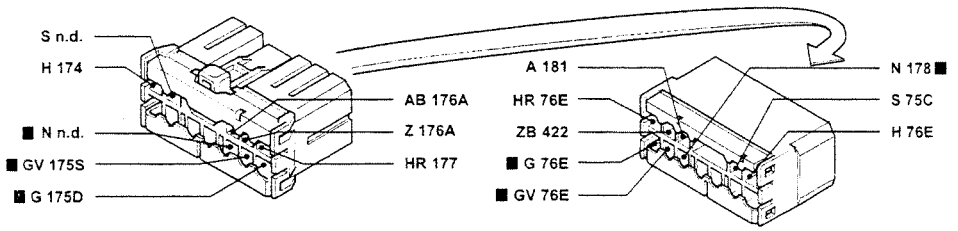
N.D. Ultrasound welding taped in cable loom

3U23PL

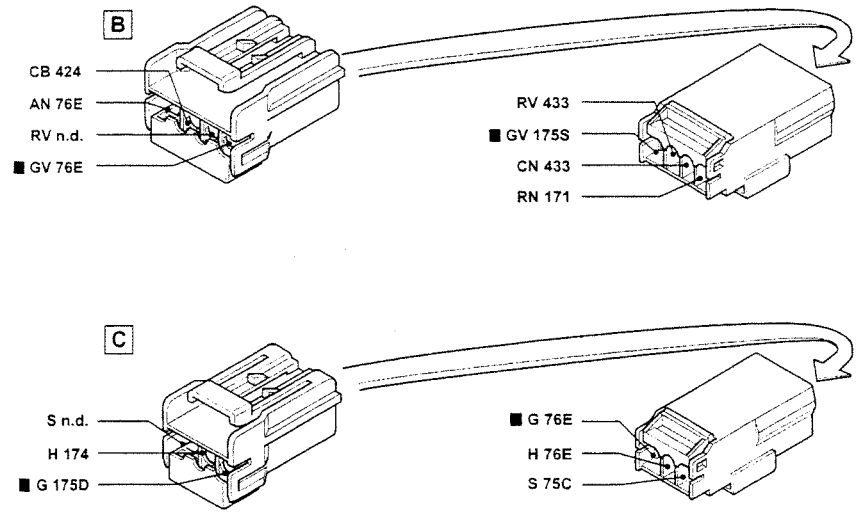
32B Connection between dashboard and left engine compartment cables



175 Connection between left longitudinal and tailgate cables



175 Connection between left longitudinal and tailgate cables (Only for Station Wagon versions)

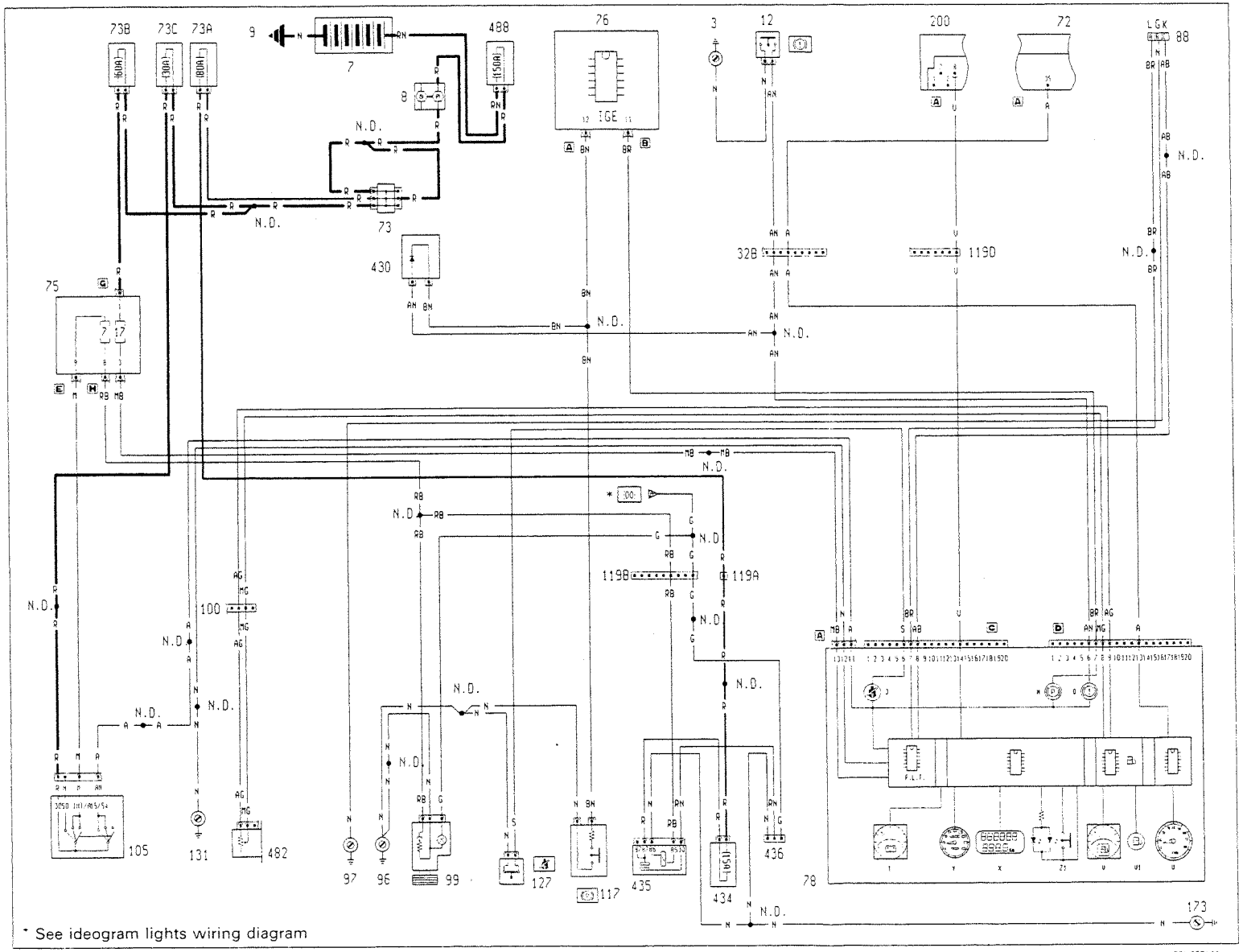


The cables in the wiring diagram are marked

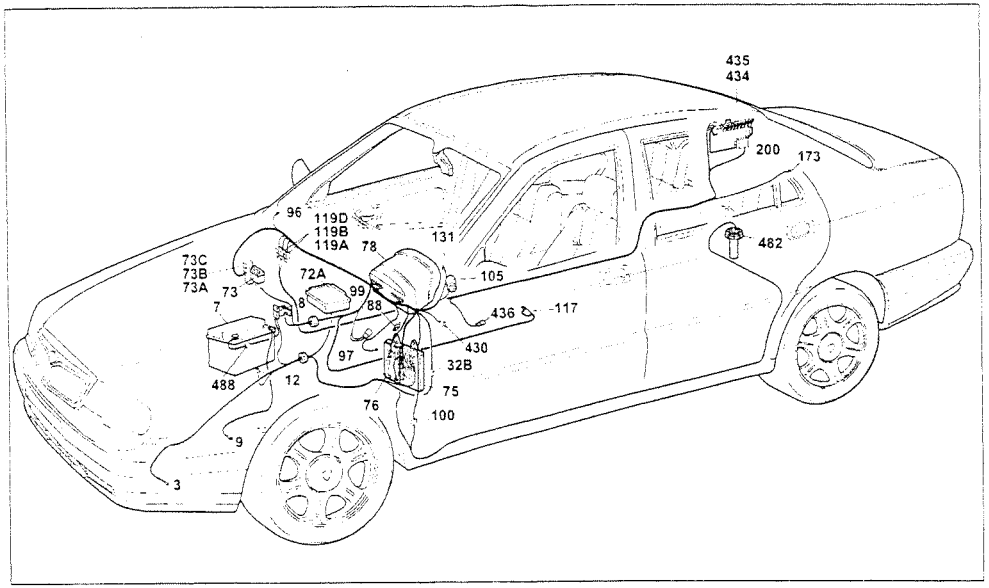
P3U24PL01

3U24PL

Fuel gauge and reserve warning light - Handbrake warning light - Insufficient brake fluid level warning light - Seat belt unfastened warning light - Speedometer - Milometer/trip meter and zeroing button - Rev counter -Current socket- Voltmeter- (See key at end of wiring diagrams)



3U25PL



P3U27PL01

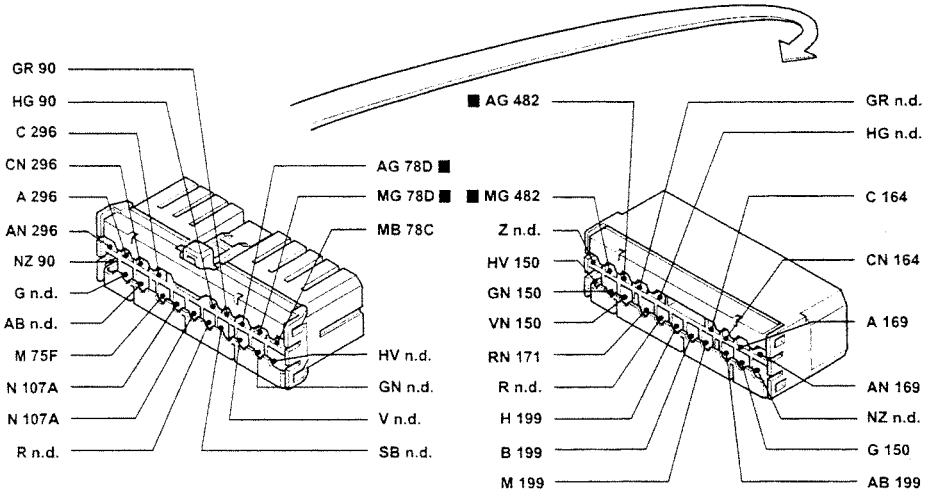
Fuel gauge and reserve warning light - Handbrake warning light - Insufficient brake fluid level warning light - Seat belt unfastened warning light - Speedometer - Milometer/trip meter display and zeroing button - Rev counter - Current socket - Voltmeter

Components key

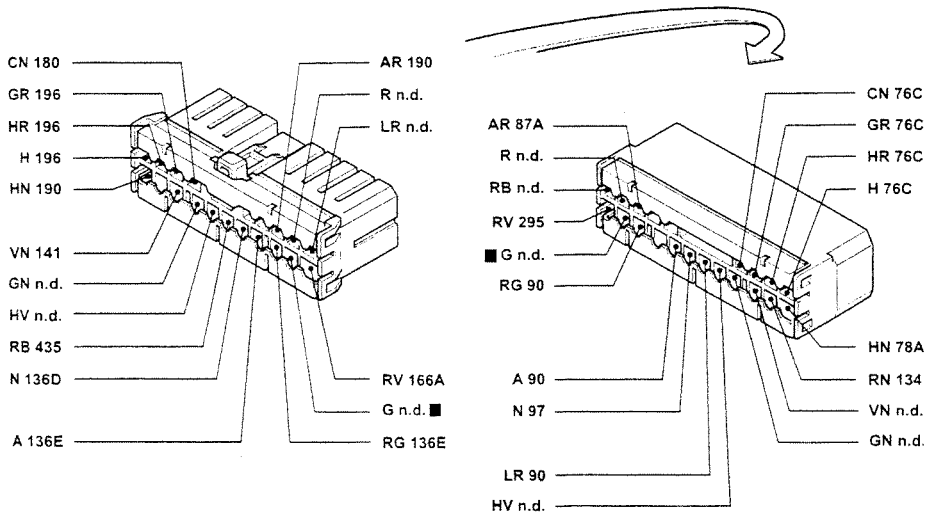
3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
12 Insufficient brake fluid level sensor
32B Connection between dash and left engine compartment cables
72A Fuel injection control unit
73 Secondary connector block
73A 80A fuse protecting services
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch/alarm device
75 Junction unit (dashboard)
76 I.G.E. control unit
78 Instrument panel
J Seat belts not fastened warning light
N Handbrake / I.G.E. control unit warning light
O Insufficient brake fluid level warning light
T Voltmeter
U Electronic rev counter
V Fuel gauge
V1 Fuel reserve warning light
X Milometer/trip meter
Y Electronic tachometer
Z1 Trip computer zeroing button
88 Diagnostic socket
96 Earth on carrier
97 Earth on floor
99 Cigar lighter
100 Connection between dashboard and left longitudinal cables
105 Ignition switch
117 Switch signalling handbrake applied
119A Connection between dashboard and right longitudinal cables
119B Connection between dashboard and right longitudinal cables
119D Connection between dashboard and right longitudinal cables
131 Earth on steering column support
173 Right rear earth
200 Controlled damping suspension electronic control unit (S C S)
430 Connecting diode for handbrake applied/insufficient brake fluid level system
434 15A fuse protecting current socket
435 Current socket relay feed
436 Current socket
482 Electric fuel pump / fuel gauge
488 150 A maxifuse
N.D Ultrasound welding taped in cable loom

3U27PL

100 Connection between dashboard and left longitudinal cables



119B Connection between dashboard and right longitudinal cables

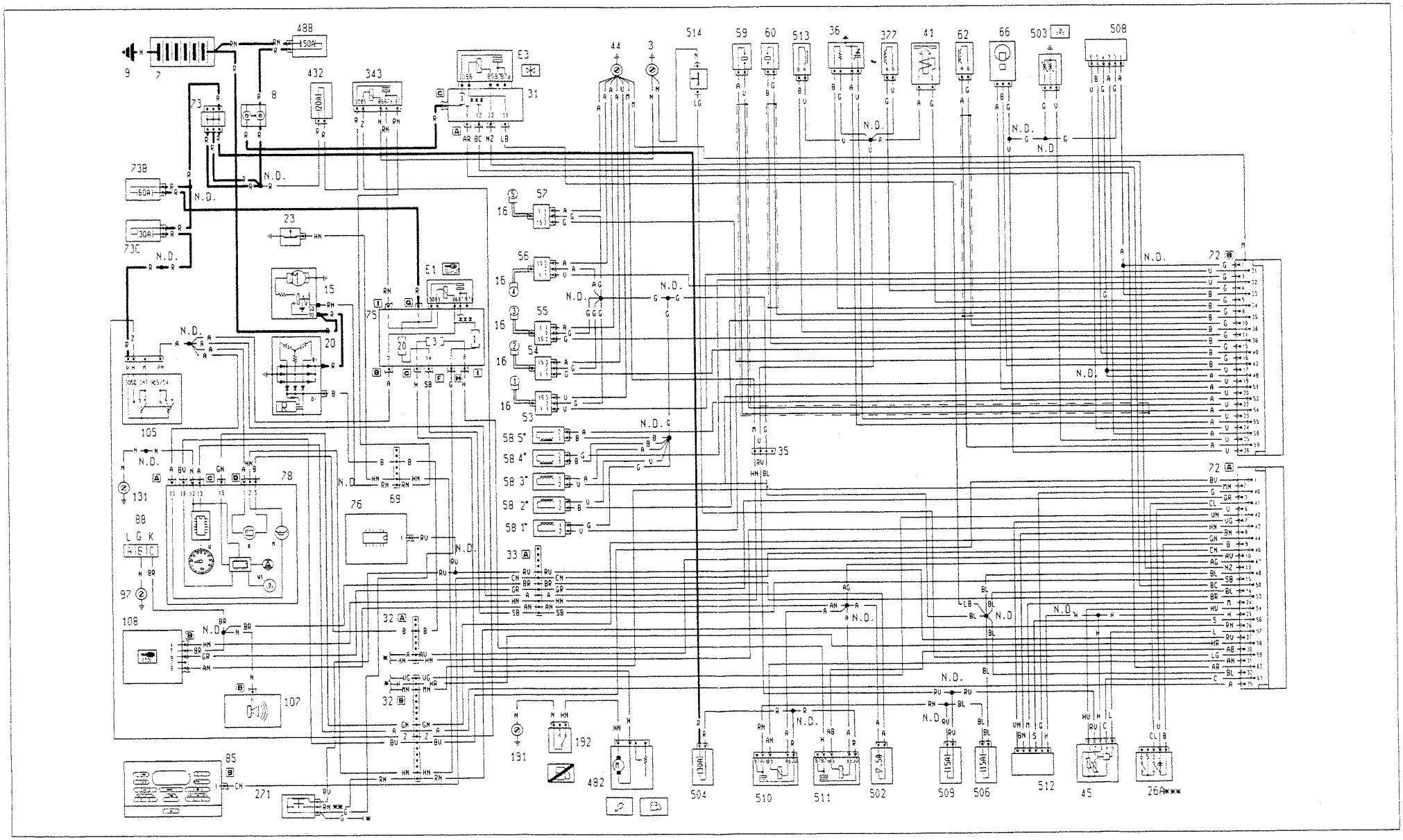


P3U28PL01

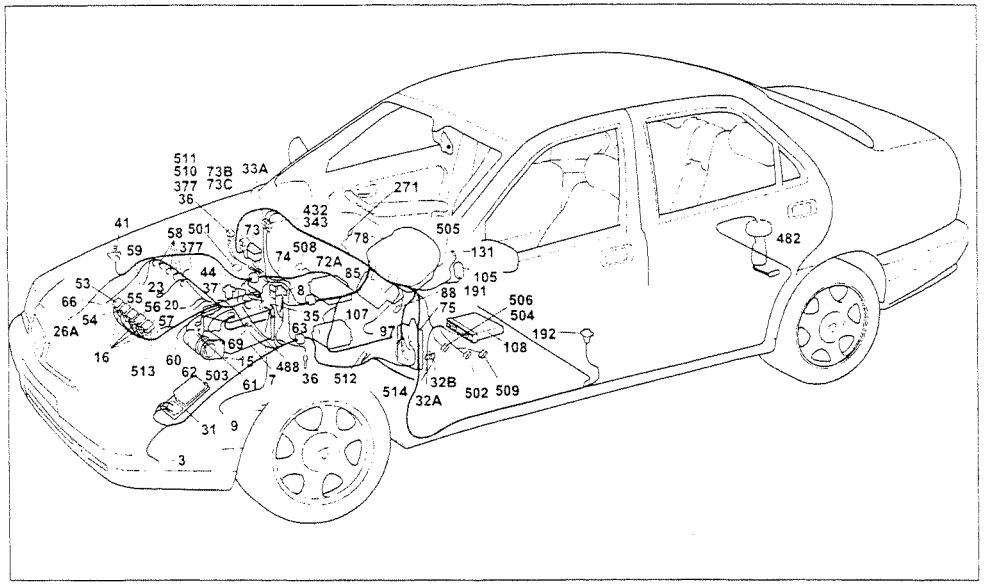
The cables in the wiring diagram are marked

3U28PL

Starting - Electronic injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Injection system failure warning light - (See key at end of wiring diagrams)



3U29PL



P3U31PL01

Starting - Electronic injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Injection system failure warning light

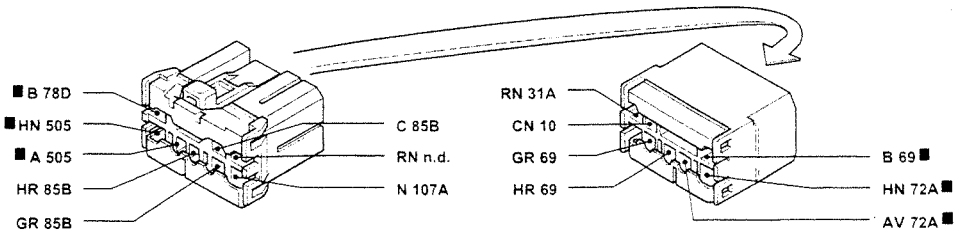
Components key

3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
15 Starter motor
16 Spark plugs
20 Alternator
23 Sensor signalling minimum engine oil pressure
25 Air temperature sensor
26A Four stage pressure switch
31 Peripheral control unit (engine compartment)
E3 Compressor coupling relay feed
32A Connection btwn dash. & left engine comp. cables
32B Connection btwn dash. & left engine comp. cables
33A Connection btwn dash. & right engine comp. cables
35 Connection between engine compartment and electronic injection cables
36 Heated Lambda sensor
37 Idle adjustment actuator
41 Petrol vapour cut out solenoid valve
44 Power earth
53 Ignition coil
54 Ignition coil
55 Ignition coil
56 Ignition coil
57 Ignition coil
58 Injectors
59 1 Detonation sensor
60 2 Detonation sensor
61 Electronic injection engine coolant temperature sensor
62 Rpm sensor
63 Potentiometer on butterfly valve
66 Timing sensor
69 Engine services cable connection
72A Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / alarm device
75 Junction unit (dashboard)
E1 Ignition discharge relay
78 Instrument panel
K Battery recharging warning light
M Insufficient engine oil pressure warning light
U Electronic rev counter
Y Electronic tachometer
85 Infocenter control unit
88 Diagnostic socket
97 Earth on floor
105 Ignition switch
107 Alarm control unit
108 Lancia CODE control unit
191 Earth for inertia switch
192 Inertia switch
343 40A starter relay
377 Phase transformer
432 20A protective fuse ignition switch relay feed
482 Electric fuel pump / fuel gauge
488 150 A maxifuse
501 Flow meter
502 7.5 A fuse protecting Lancia CODE
503 Water temperature sensor
504 30 A fuse protecting electronic injection
506 15 A fuse protecting electronic injection
508 Motorized actuator on butterfly casing
509 15 A fuse for electronic injection cable
510 Infocenter relay feed with engine control unit 30 A
511 Pump relay 20 A
512 Potentiometer on accelerator pedal
513 Phase transformer injector
514 Clutch switch

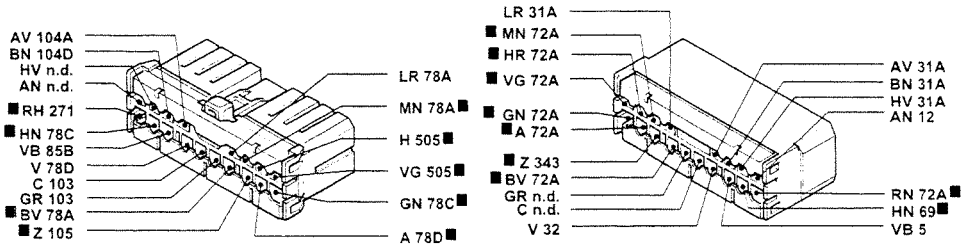
N.D. Ultrasound welding taped in cable loom

3U31PL

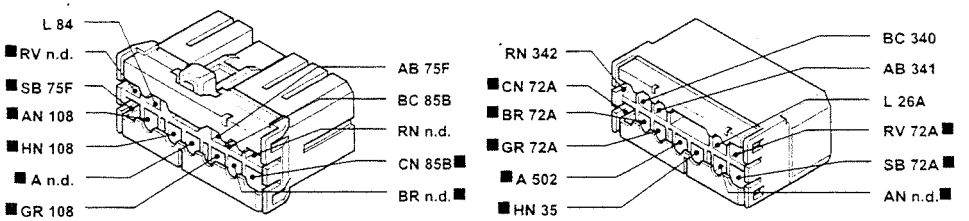
32A Connection between dashboard and left engine compartment cables



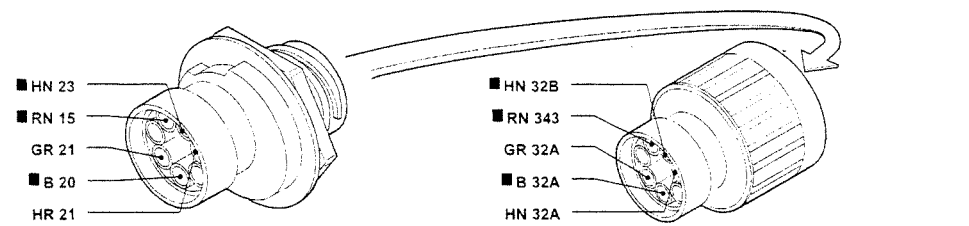
32B Connection between dashboard and left engine compartment cables



32C Connection between dashboard and left engine compartment cables



69 Engine services cable connection

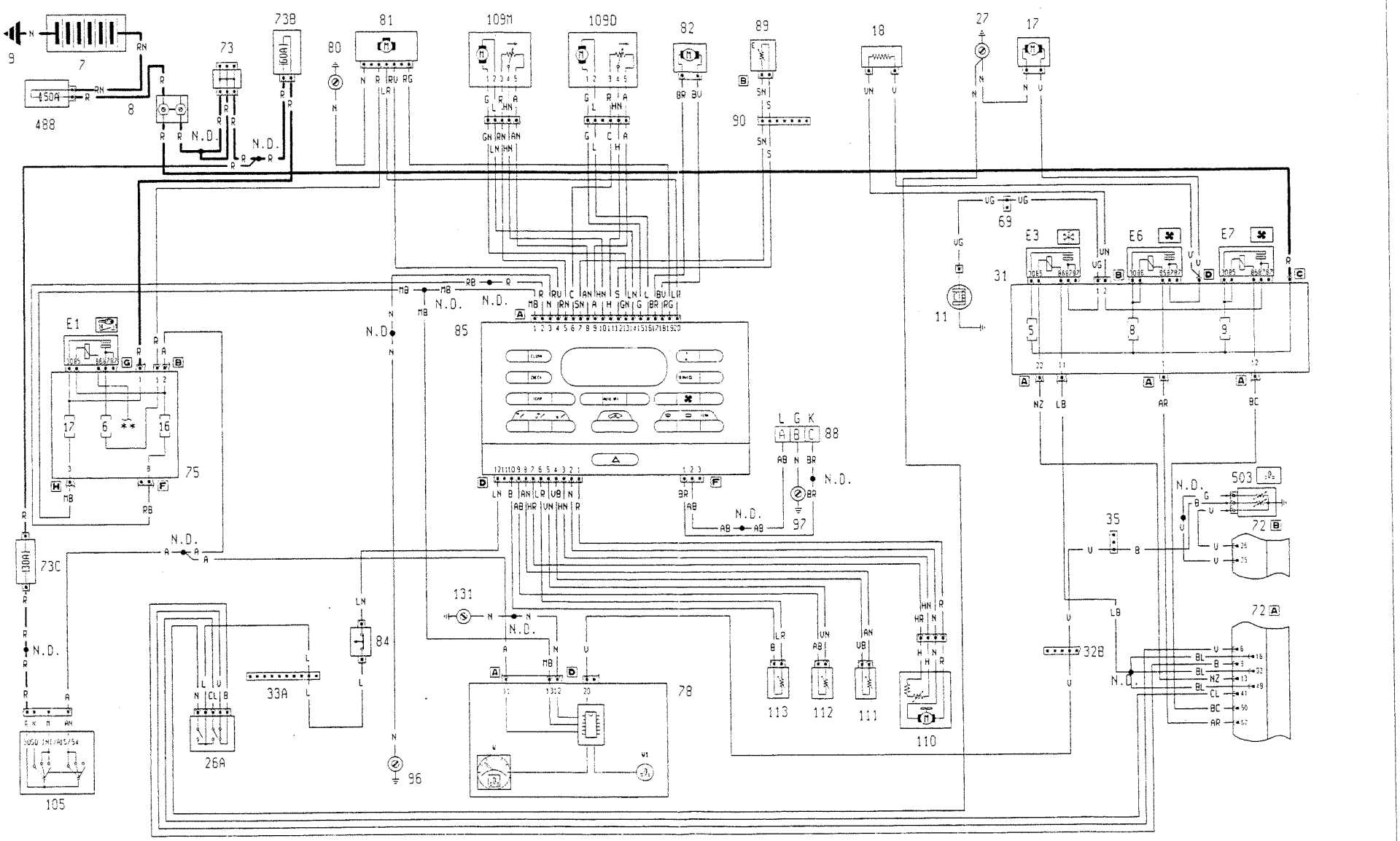


P3U32PL01

The cables in the wiring diagram are marked

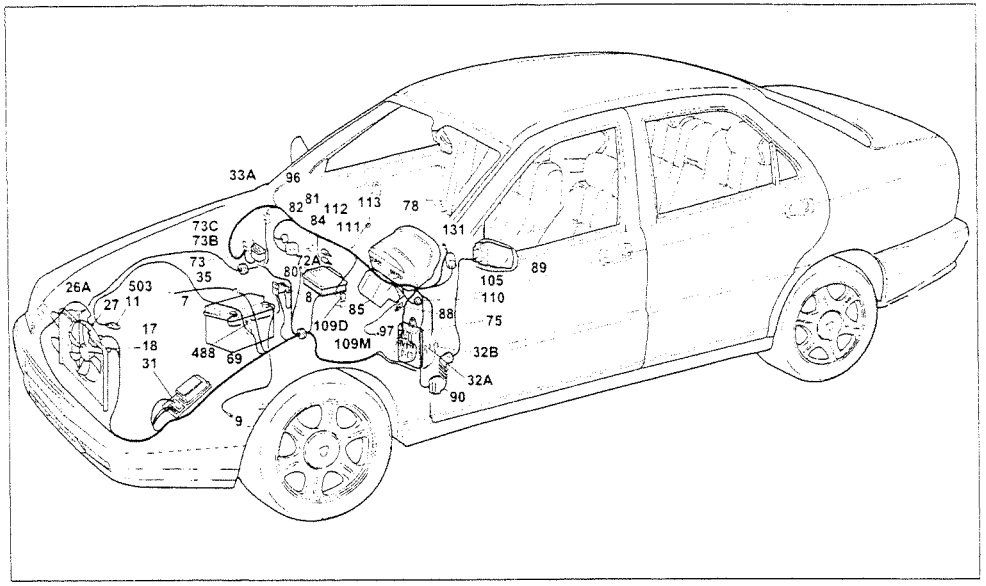
3U32PL

Automatic climate control - (See key at end of wiring diagrams)



* See starting wiring diagram

3U33PL



P3U35PL01

Automatic climate control

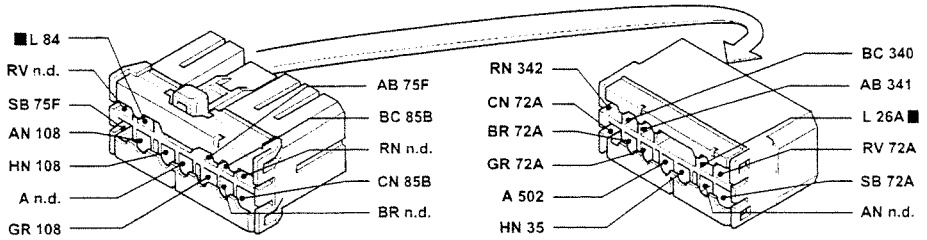
Components key

7 Battery
8 Main connector block
9 Earth on bodyshell
11 Compressor coupling for air conditioning
17 1st. Engine cooling fan
18 Engine cooling fan speed resistance
26A Four stage pressure switch
27 Right front earth
31 Peripheral control unit (engine compartment)
E3 Compressor coupling relay feed
E6 Engine cooling fan high speed relay feed
E7 Engine cooling fan low speed relay feed
32A Connection btwn dash. & left engine comp. cables
32B Connection btwn dash. & left engine comp. cables
33A Connection btwn dash. & right engine comp. cables
35 Connection between engine comp. and electronic injection cables
69 Engine services cable connection
72A Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch/anti-theft device
75 Junction unit (dashboard)
E1 Ignition discharge relay
78 Instrument panel
W Water temperature gauge
W1 Engine coolant overheating warning light
80 Power earth on dashboard
81 Climate control fan (Brushless)
82 Air recirculation motor
85 Infocenter control unit
88 Diagnostic socket
89 Left rear view mirror
A Motor for folding left rear view mirror
B Motor for vertical adjustment of left rear view mirror
C Motor for horizontal adjustment of left rear view mirror
D Left rear view mirror heating resistance
90 Connection between dashboard and left front door cables
96 Earth on carrier
97 Earth on floor
105 Ignition switch
109D Distribution / mixture motor
109M Distribution / mixture motor
110 Vehicle interior air temperature sensor
111 Mixed air sensor 1
112 Mixed air sensor 2
113 Solar temperature sensor
131 Earth on steering column support
488 150 A maxifuse
503 Water temperature sensor

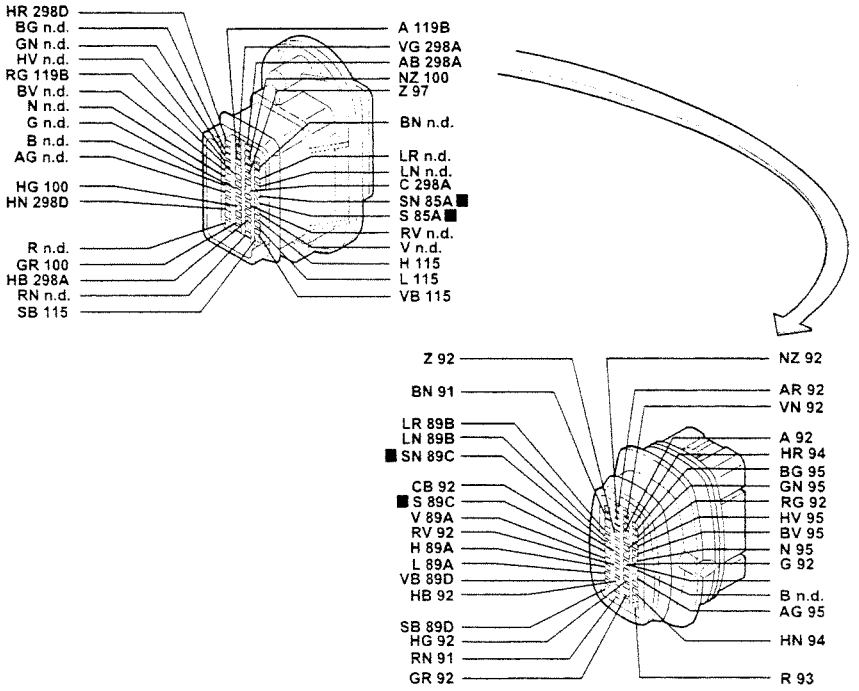
N.D. Ultrasound welding taped in cable loom

3U35PL

33A Connection between dashboard and right engine compartment cables



90 Connection between dashboard and left front door cables

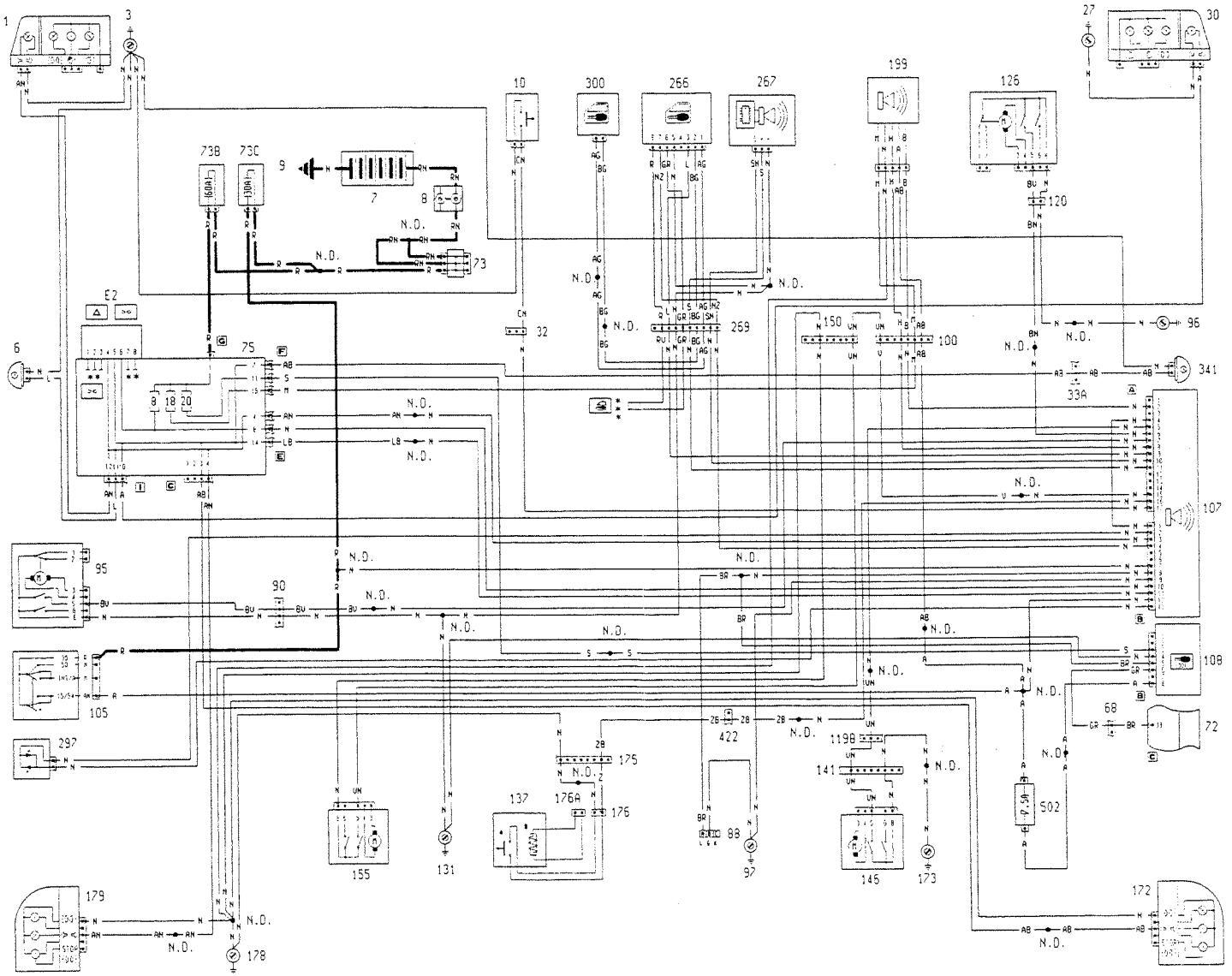


The cables in the wiring diagram are marked

P3U36PL01

3U36PL

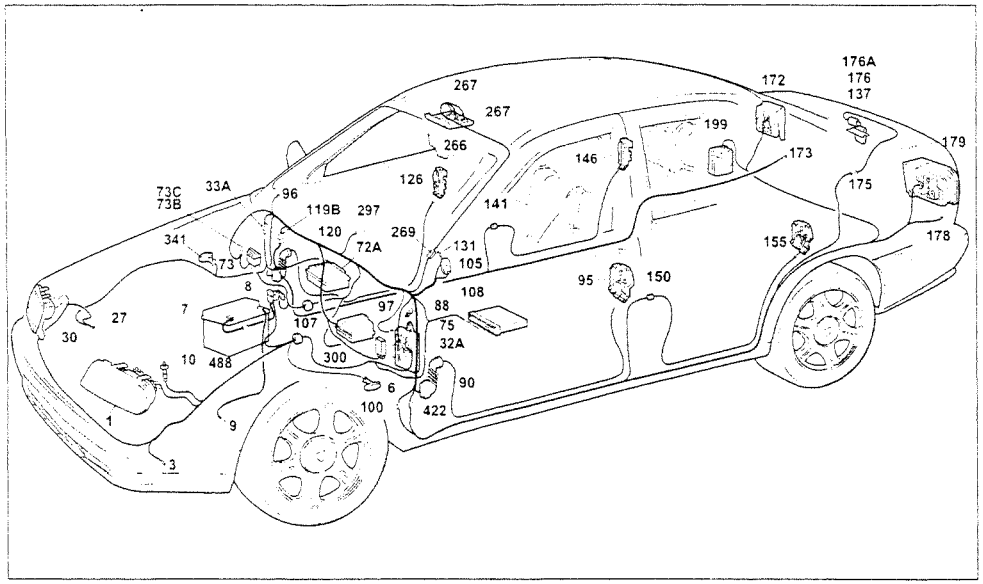
Alarm device - (See key at end of wiring diagrams)



* See direction indicators wiring diagram

** See central locking wiring diagram

3U37PL



P3U39PL01

Alarm device

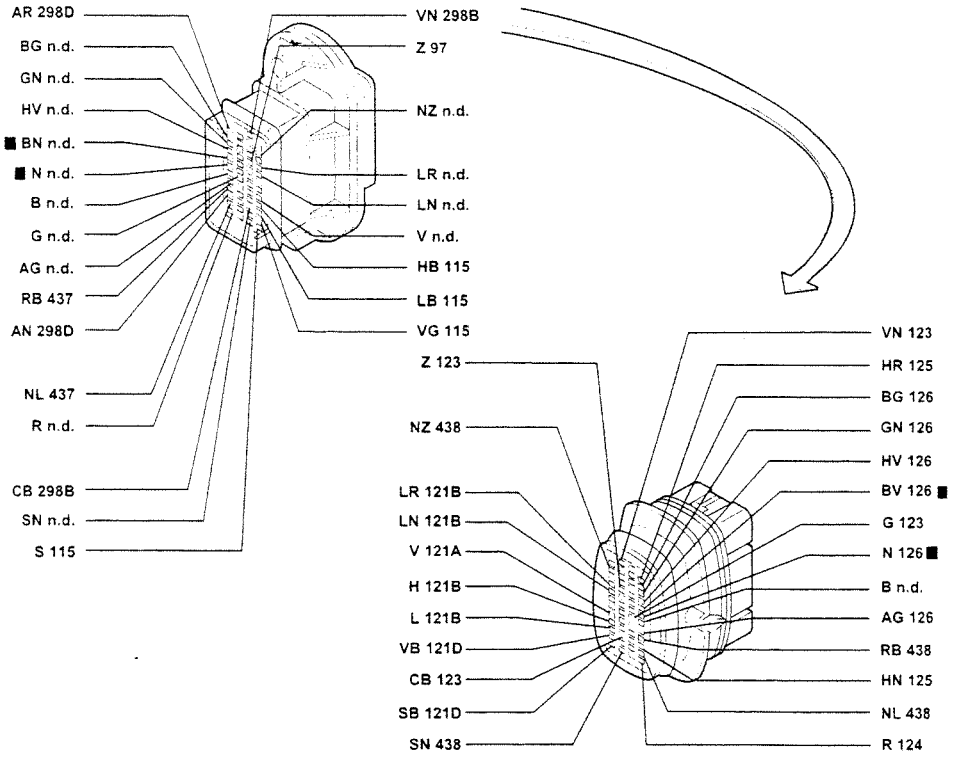
Components key

1 Left front light cluster
3 Left front earth
6 Left side direction indicator
7 Battery
8 Main connector block
9 Earth on bodyshell
10 Button on bonnet for engaging alarm
27 Right front earth
30 Right front light cluster
32A Connection between dash & left engine compartment cables
33A Connection between dash & right engine compartment cables
44 Power earth
72A Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch/alarm device
75 Junction unit (dashboard)
E2 Intermittent device for direction indicators / hazard warning lights
88 Diagnostic socket
90 Connection between dashboard and left front door cables
95 Left front central locking geared motor and signalling of left front door open and alarm on
96 Earth on carrier
97 Earth on floor
100 Connection between dashboard and left longitudinal cables
105 Ignition switch
107 Alarm control unit
108 LANCIA-CODE control unit
119B Connection between dashboard and right longitudinal cables
120 Connection between dashboard and right front door cables
126 Right front central locking geared motor and signalling of right front door open and alarm on
131 Earth on steering column support
137 Tailgate lock assembly
A Luggage compartment courtesy light and alarm on switch
141 Connection between right longitudinal and right rear door cables
146 Right rear door central locking geared motor and signalling of right rear door open and alarm on
150 Connection between left longitudinal and left rear door cables
155 Left rear door central locking geared motor and signalling of left rear door open and alarm on
172 Right rear light cluster on fixed section
173 Right rear earth
175 Connection between left longitudinal and tailgate cables
176 Tailgate cables connection
177 Left rear light cluster on movable section
178 Left rear earth
179 Left rear light cluster on fixed section
199 Alarm siren
266 Infra red receiver for alarm device
267 Volumetric sensors for alarm device
269 Connection between dashboard and receiver cables
297 Alarm device warning light
300 Central locking electronic control unit
341 Right side direction indicator
422 Connection between dashboard and left longitudinal cables
488 150 A maxifuse

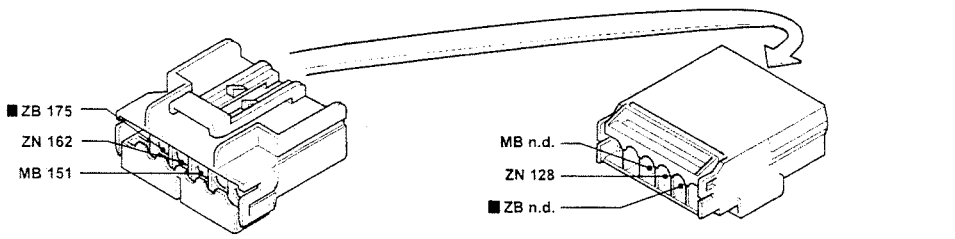
N.D. Ultrasound welding taped in cable loom

3U39PL

120 Connection between dashboard and right front door cables



422 Connection between dashboard and left longitudinal cables

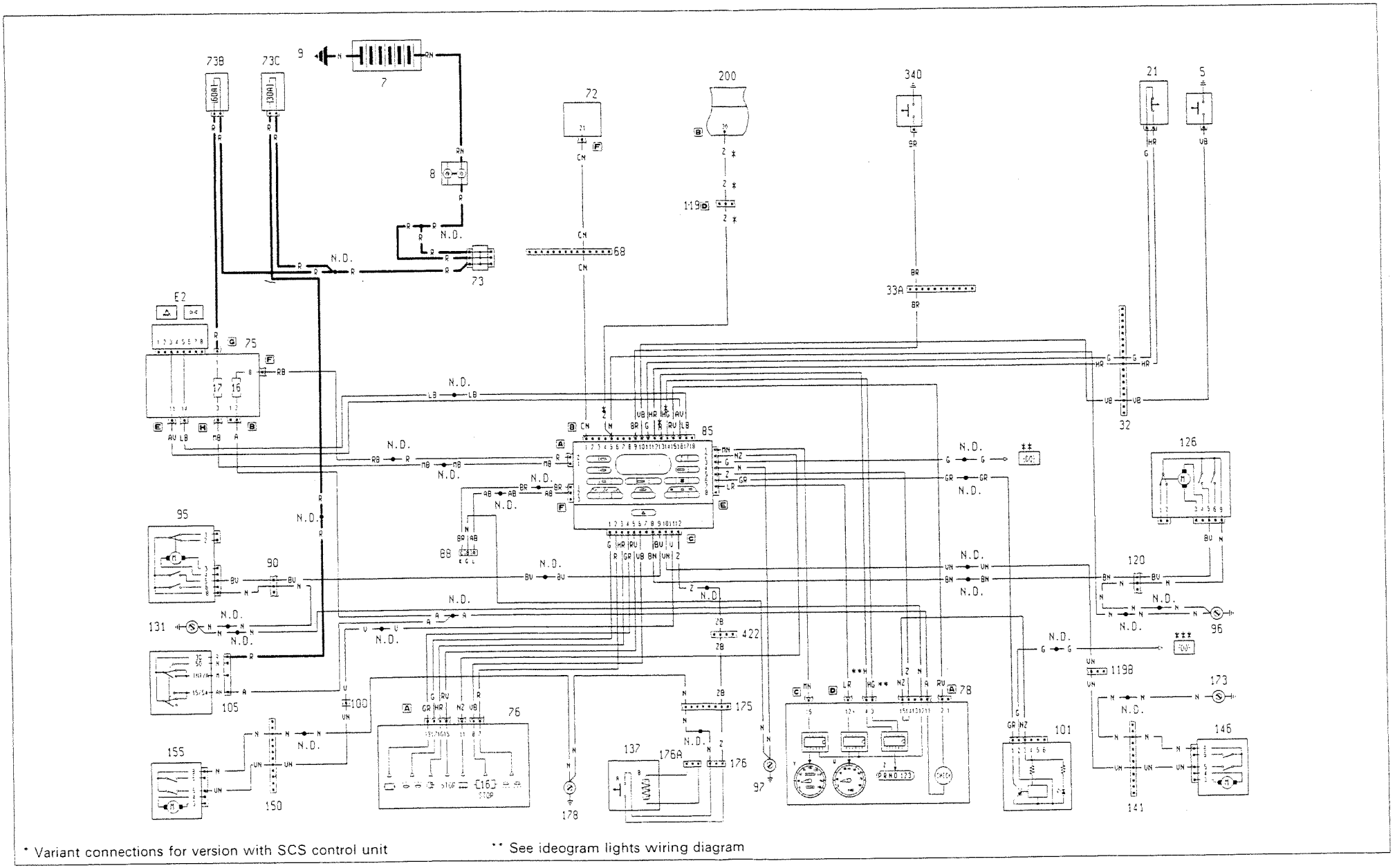


The cables in the wiring diagram are marked

P3U40PL01

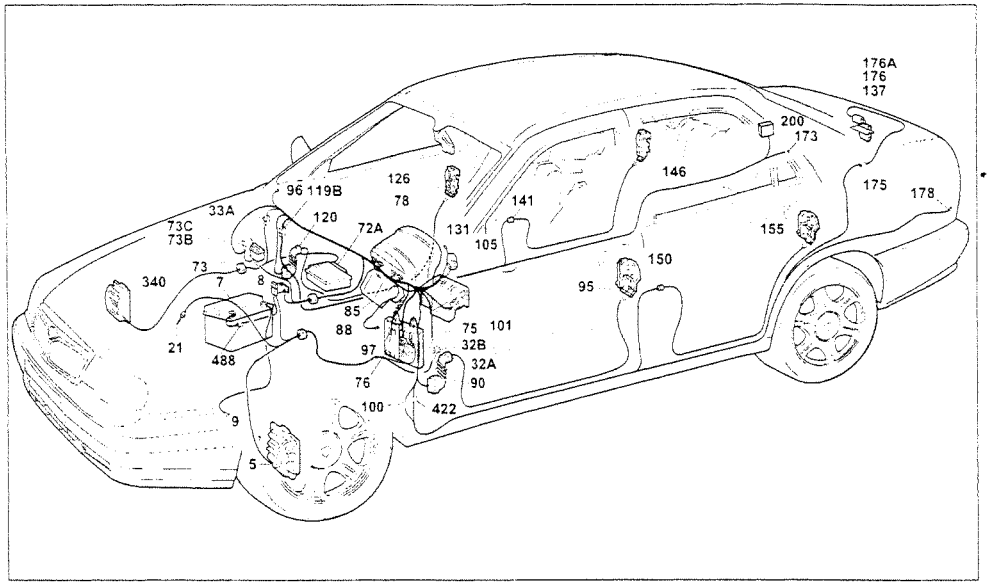
3U40PL

Complete Infocenter - (See key at end of wiring diagrams)



* Variant connections for version with SCS control unit

** See ideogram lights wiring diagram



P3U43PL01

Complete Infocenter

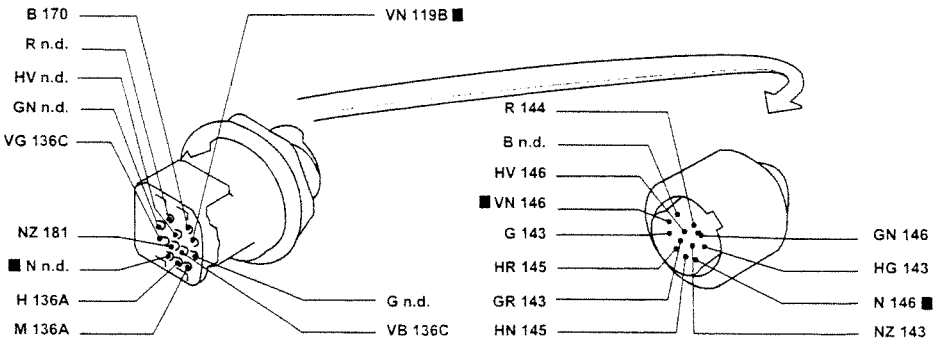
Components key

5 Left front brake pad wear sensor
7 Battery
8 Main connector block
9 Earth on bodyshell
21 Minimum engine oil level sensor
32A Connection between dash. & left engine compartment cables
32B Connection between dash. & left engine compartment cables
33A Connection between dash. & right engine compartment cables
69 Engine services cable connection
72A Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch/anti-theft device
75 Junction unit (dashboard)
E2 Intermittent device for direction indicators / hazard warning lights
76 I.G.E. control unit
78 Instrument panel
I Check summary warning light
U Electronic rev counter
Y Electronic tachometer
Z Electronic automatic transmission gear selection display
85 Infocenter control unit
88 Diagnostic socket
90 Connection between dashboard and left front door cables
95 Left front central locking geared motor and signalling of left front door open and anti-theft device on
96 Earth on carrier
97 Earth on floor
100 Connection between dashboard and left longitudinal cables
101 Light dimmer
105 Ignition switch
119B Connection between dashboard and right longitudinal cables
120 Connection between dashboard and right front door cables
126 Right front central locking geared motor and signalling of right front door open and anti-theft device on
131 Earth on steering column support
137 Tailgate lock assembly
A Luggage compartment courtesy light switch and anti-theft device on
141 Connection between right longitudinal and right rear door cables
146 Right rear door central locking geared motor and signalling of right rear door open and anti-theft device on
150 Connection between left longitudinal and left rear door cables
155 Left rear door central locking geared motor and signalling of left rear door open and anti-theft device on
173 Right rear earth
176 Connection between left longitudinal and tailgate cables
176 Tailgate cables connection
178 Left rear earth
200 Controlled damping suspension electronic control unit (S.C.S.)
340 Right front brake pad wear sensor
343 40A starter relay
422 Connection between dashboard and left longitudinal cables
488 150 A maxifuse

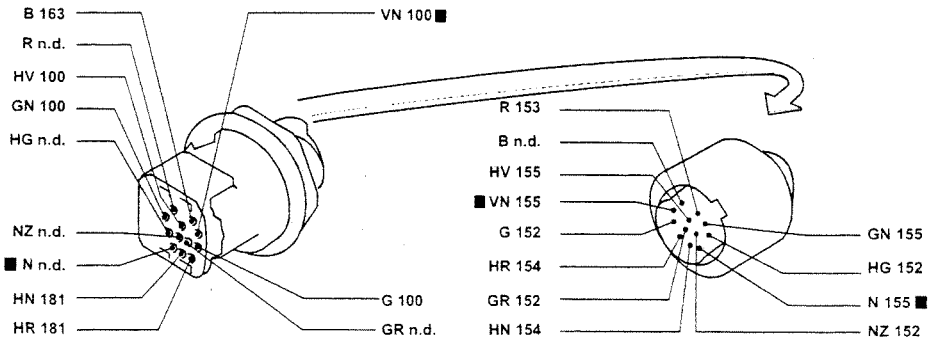
N.D. Ultrasound welding taped in cable loom

3U43PL

141 Connection between right longitudinal and right rear door cables



150 Connection between left longitudinal and left rear door cables

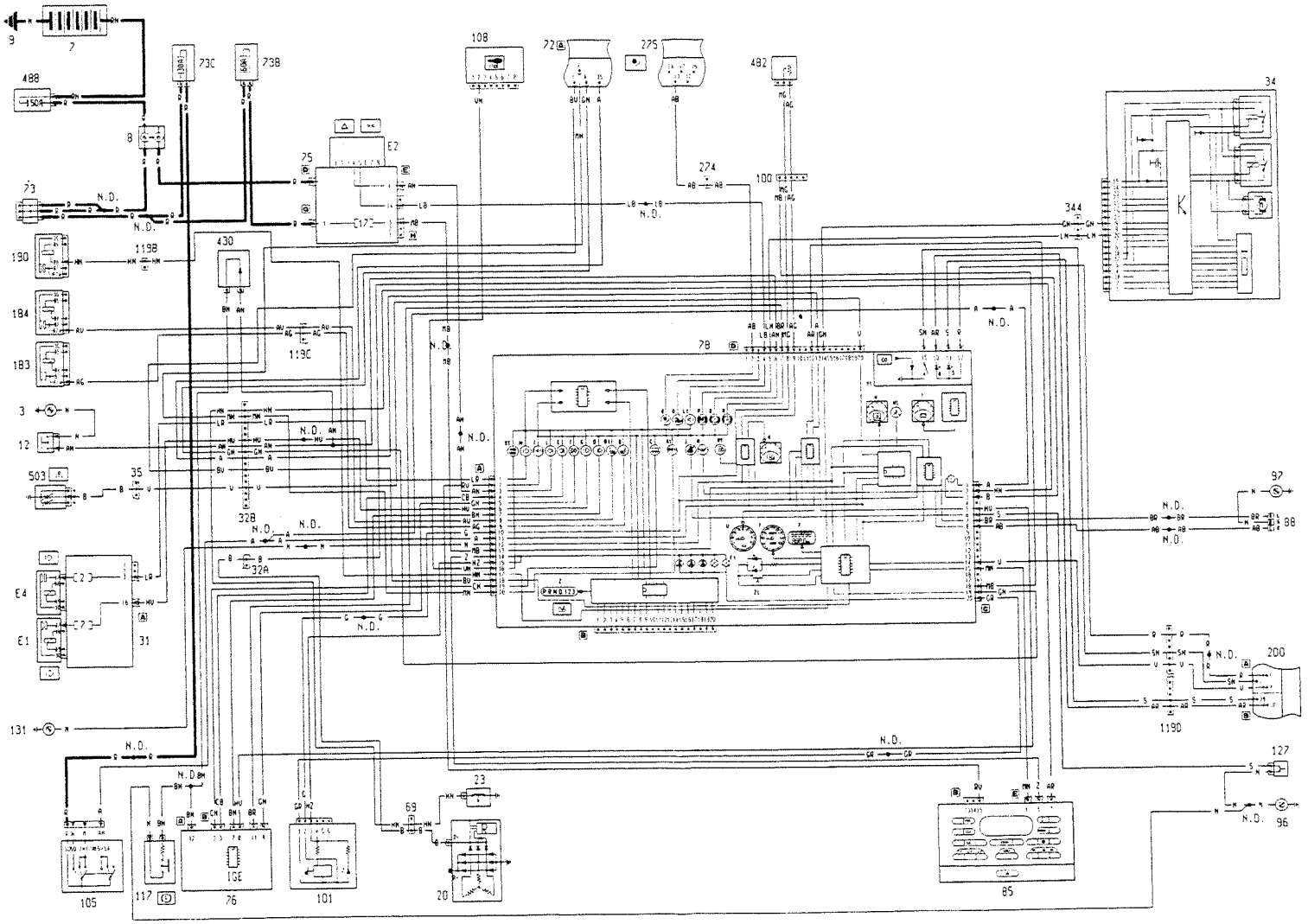


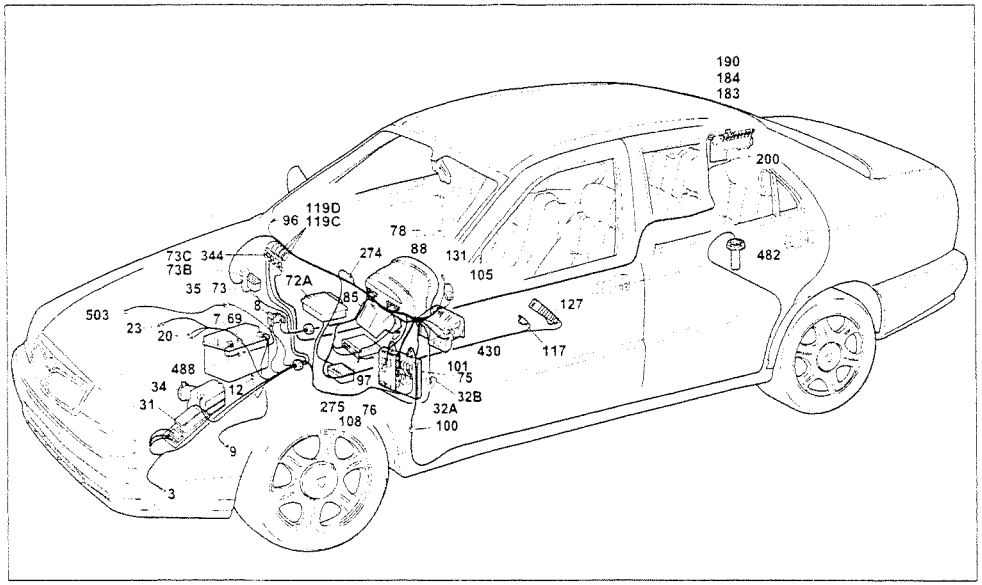
The cables in the wiring diagram are marked

P3U44PL01

3U44PL

Instrument panel connections - (See key at end of wiring diagrams)





P3U47PL01

Instrument panel connections

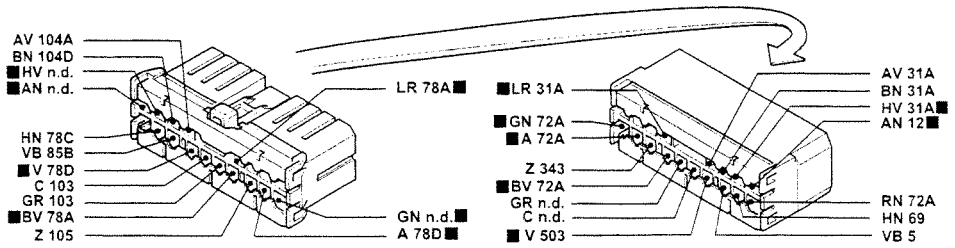
Components key

3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
12 Insufficient brake fluid level sensor
20 Alternator
22 Engine coolant temperature sender unit
23 Sensor signalling minimum engine oil pressure
26A Four stage pressure switch
31 Peripheral control unit (engine compartment)
E1 Dipped headlamps relay feed
E4 Main beam headlamps relay feed
E6 Engine cooling fan high speed relay feed
E7 Engine cooling fan low speed relay feed
32A Connection between dash and left engine compartment cables
32B Connection between dash and left engine compartment cables
33A Connection between dash and right engine compartment cables
34 Anti-lock brakes electro-hydraulic control unit (A.B.S.)
35 Connection between engine comp. / electronic injection cables
69 Connection for services cables in engine
72A Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch/anti-theft device
75 Junction unit (dashboard)
E2 Intermittent device for direction indicators / hazard warning lights
76 I.G.E. control unit
78 Instrument panel
85 Infocenter control unit
88 Diagnostic socket
96 Earth on carrier
97 Earth on floor
100 Connection between dashboard and left longitudinal cables
101 Light dimmer
105 Ignition switch
108 Lancia CODE control unit
117 Switch signalling handbrake applied
119C Connection between dashboard and right longitudinal cables
119D Connection between dashboard and right front door cables
127 Switch signalling seat belts not fastened
131 Earth on steering column support
183 Relay for driver's seat heater pad
184 Relay for passenger seat heater pad
190 Tailgate locking / unlocking relay
198 Servotronic device electronic control unit
200 Controlled damping suspension electronic control unit (S.C.S.)
274 Connection between dashboard and AIR-BAG cables
275 AIR-BAG control unit
344 Connection between dash and anti-lock brakes cables (A.B.S.)
430 Connnecting diode for handbrake applied/insufficient brake fluid level system
482 Electric fuel pump / fuel gauge
488 150 A maxifuse
503 Water temperature sensor

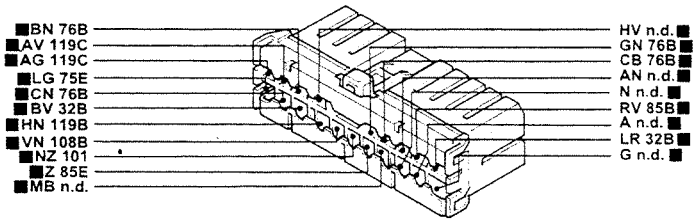
N.D. Ultrasound welding taped in cable loom

3U47PL

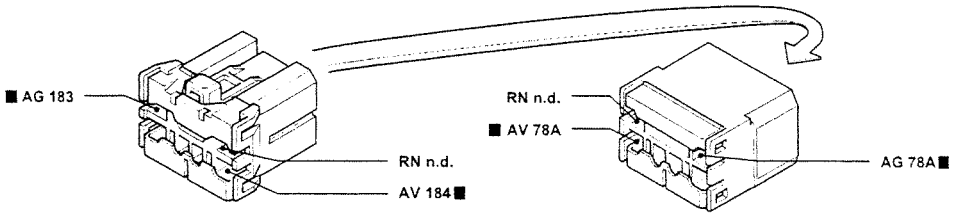
32B Connection between dashboard and left engine compartment cables



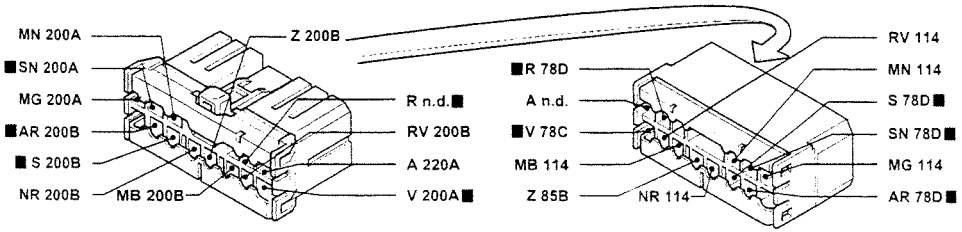
78A Trailer direction indicator warning light



119C Connection between dashboard and right longitudinal cables



119D Connection between dashboard and right longitudinal cables



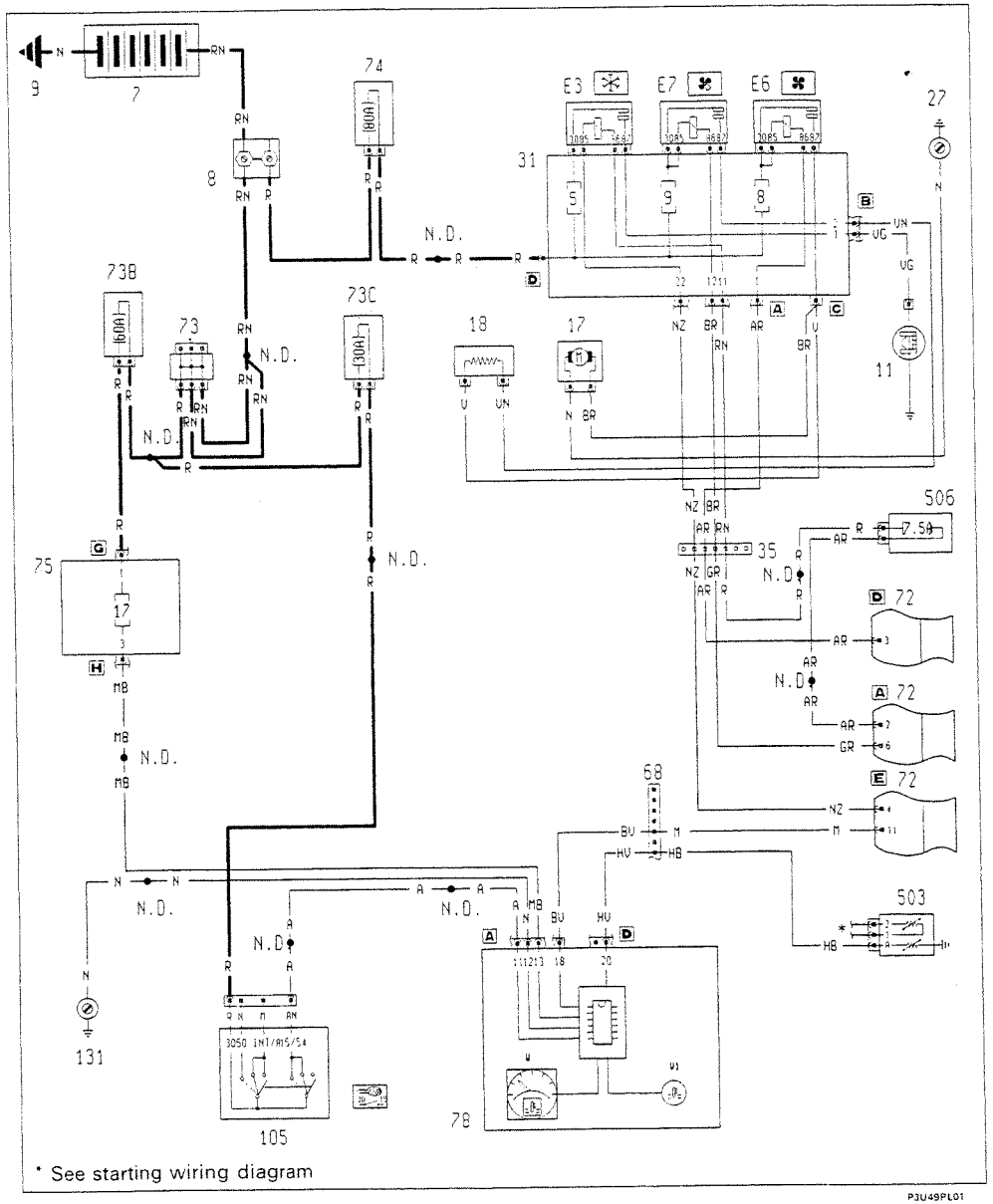
P3U48PL01

The cables in the wiring diagram are marked

3U48PL

Version with air conditioning

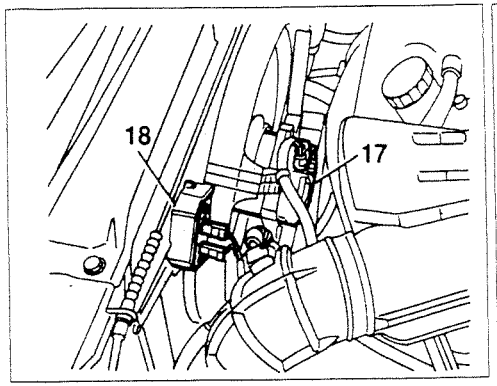
Engine cooling - Water temperature gauge and overheating warning light - (See key at end of wiring diagrams)

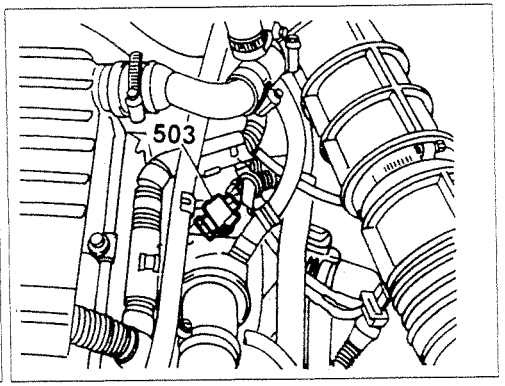


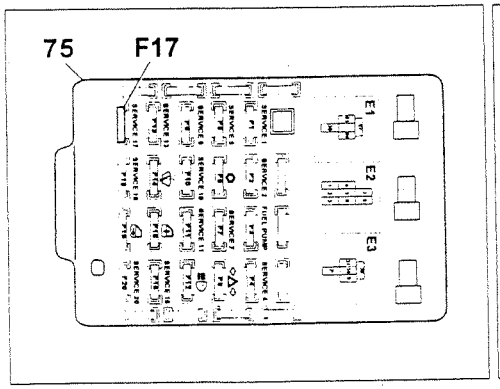
P3U49PL01

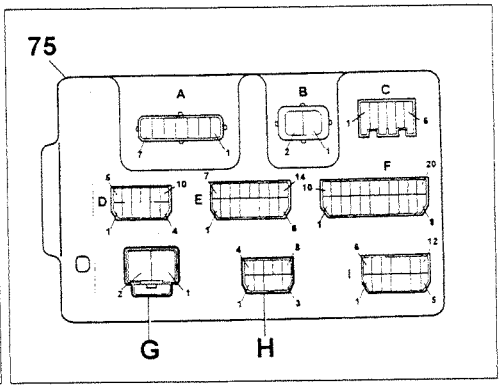
3U49PL

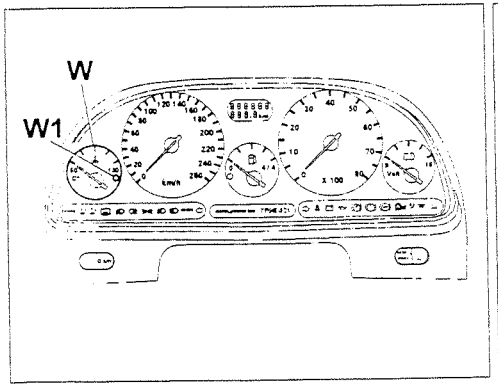
Location of components

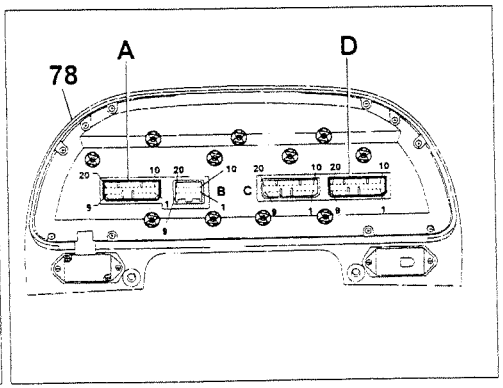






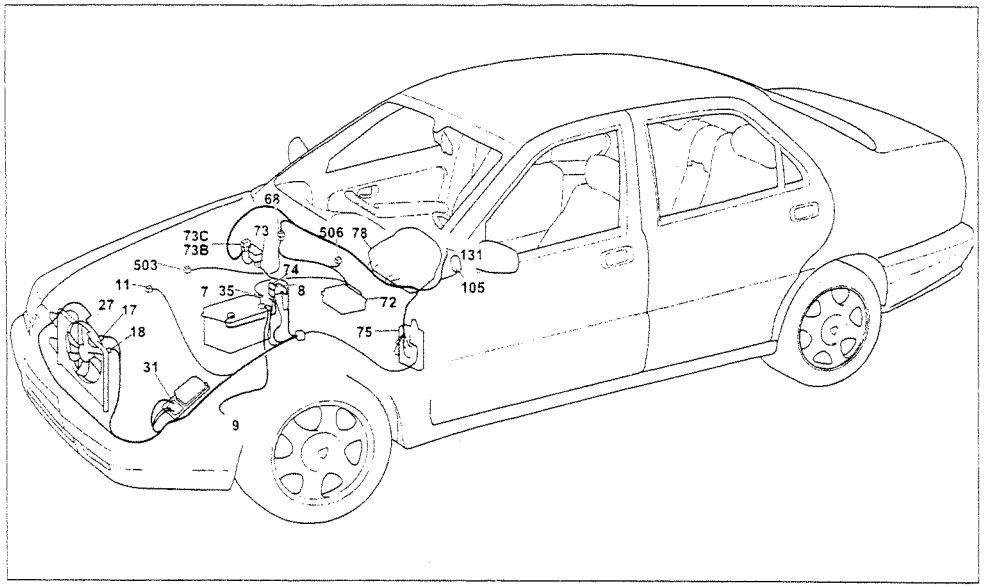






P3U50PL01

3U50PL



P3U51PL01

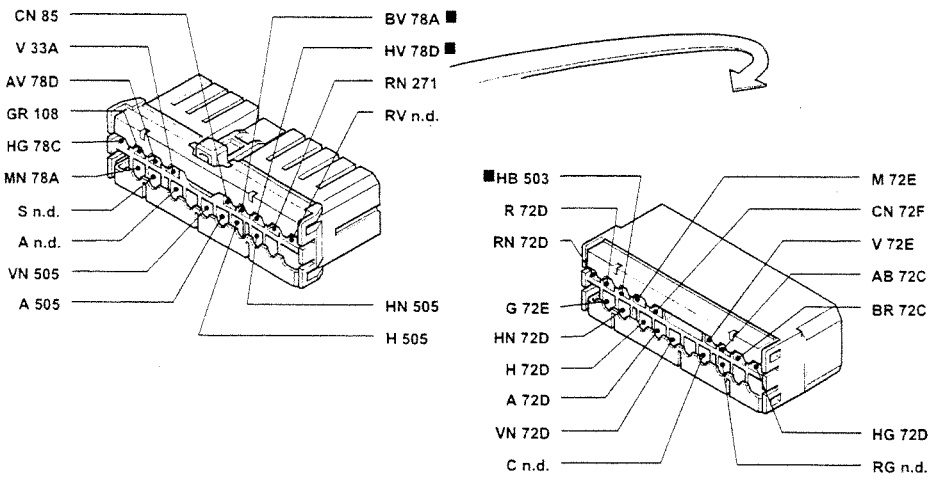
Version with air conditioning
Engine cooling - Water temperature gauge and overheating warning light

Components key

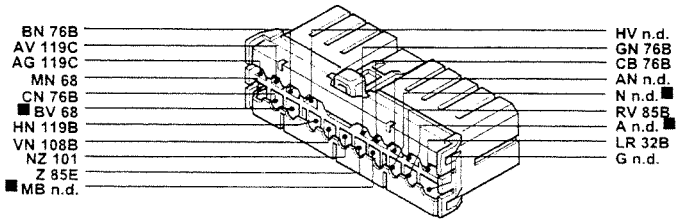
7 Battery
8 Main connector block
9 Earth on bodyshell
11 Compressor coupling for air conditioning
17 1st Engine cooling fan
18 Engine cooling fan speed resistance
27 Right front earth
31 Peripheral control unit (engine compartment)
E3 Compressor coupling relay feed
E6 Engine cooling fan high speed relay feed
E7 Engine cooling fan low speed relay feed
35 Connection between engine compartment and electronic injection cables
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / alarm device
74 80A fuse protecting peripheral control unit (engine compartment)
68 Connection between dashboard and electronic injection cables
72 Electronic injection control unit
75 Junction unit (dashboard)
78 Instrument panel
W Water temperature gauge
W1 Engine coolant overheating warning light
105 Ignition switch
131 Earth on steering column support
503 Dual engine coolant sender unit
506 15A fuse protecting electronic injection control unit
N.D. Ultrasound welding taped in cable loom

3U51PL

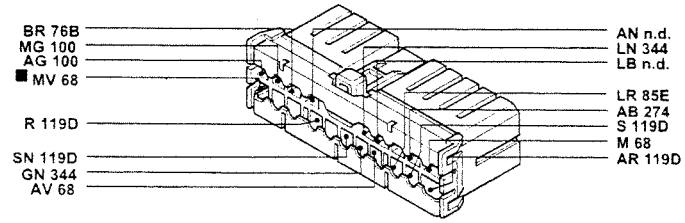
68 Connection between dashboard and injection cables



78A Instrument panel



78D Instrument panel

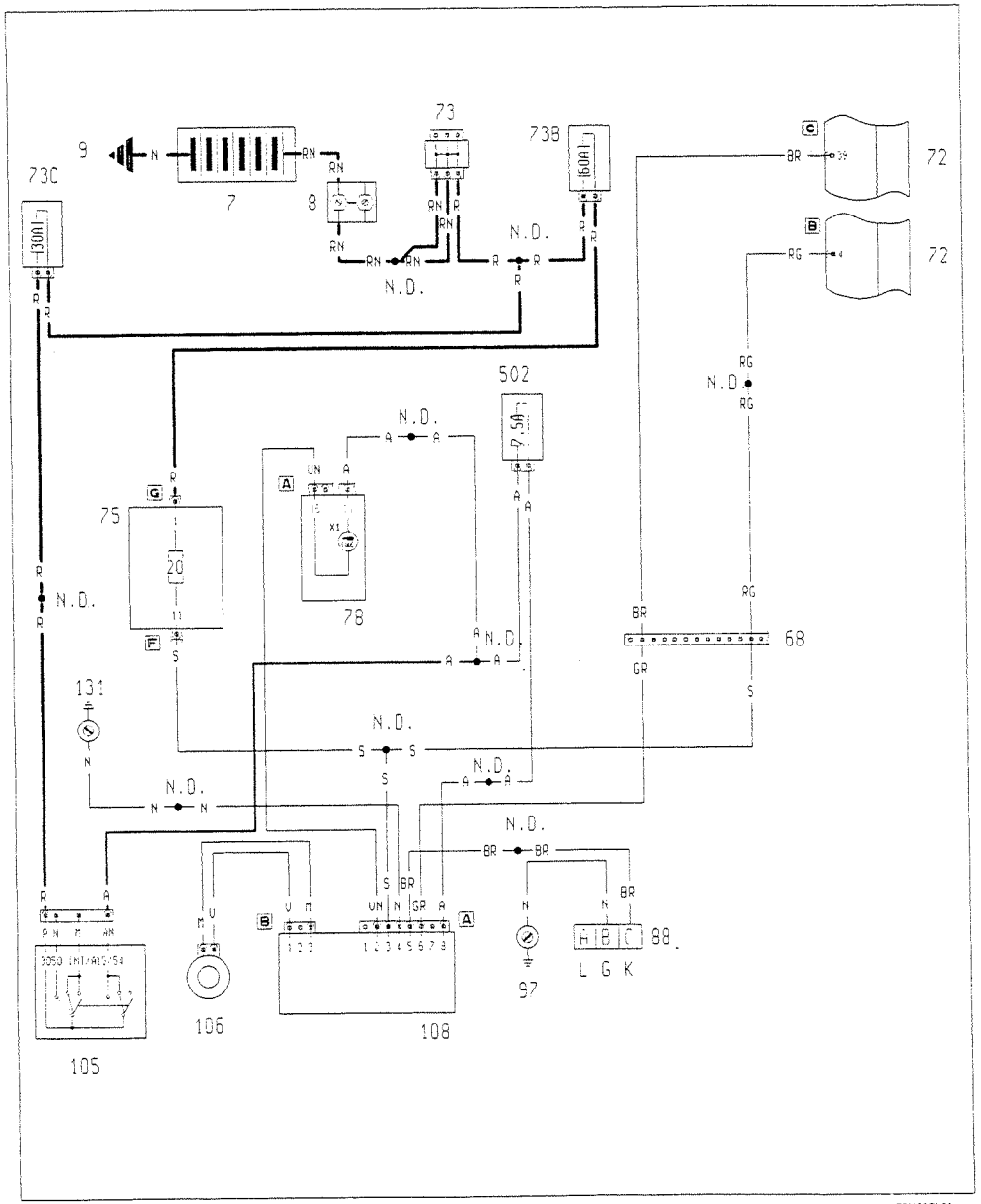


The cables in the wiring diagram are marked

P3U52PL01

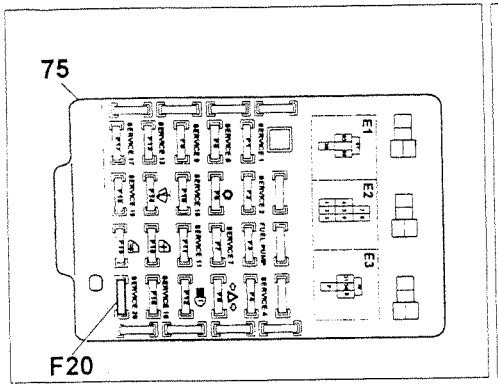
3U52PL

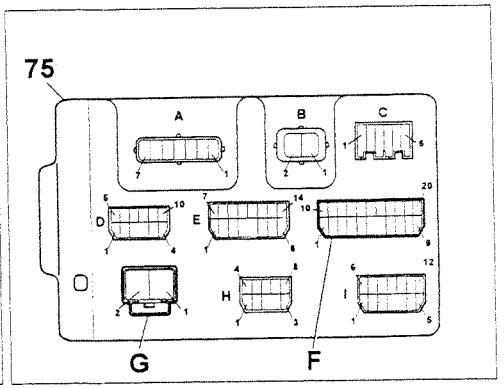
LANCIA-CODE device and failure warning light - (See key at end of wiring diagrams)

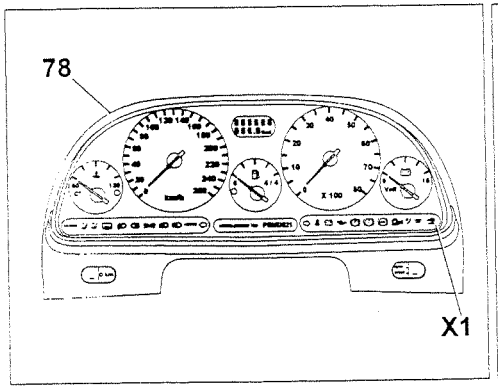


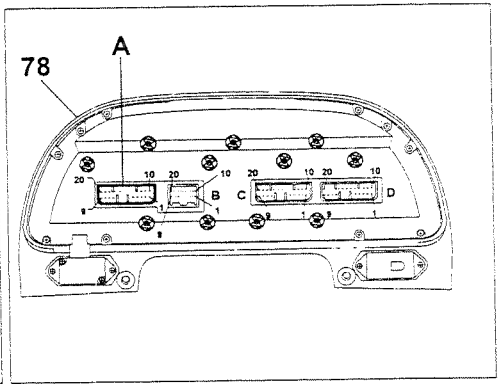
3U53PL

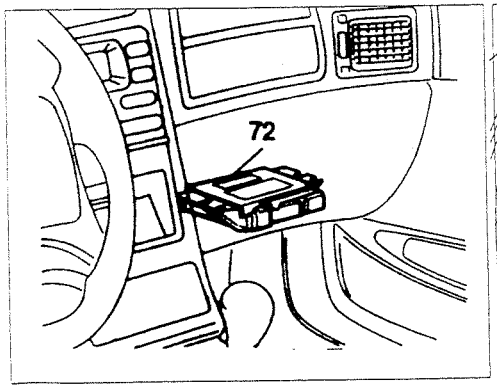
Location of components

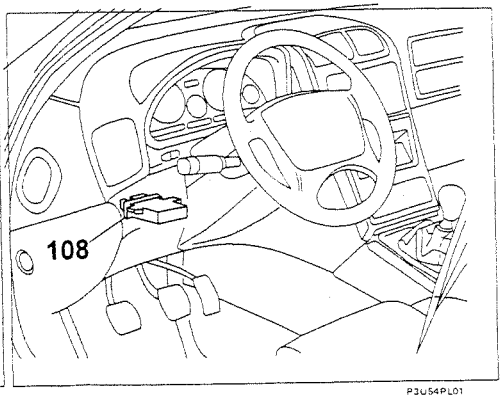






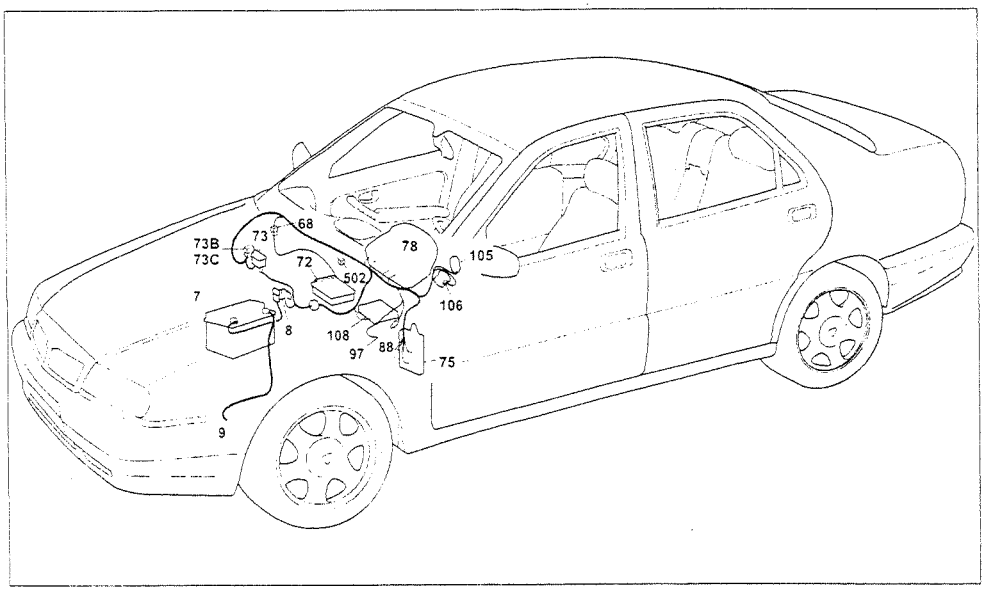






P3U54PL01

3U54PL



P3U55PL01

LANCIA-CODE device

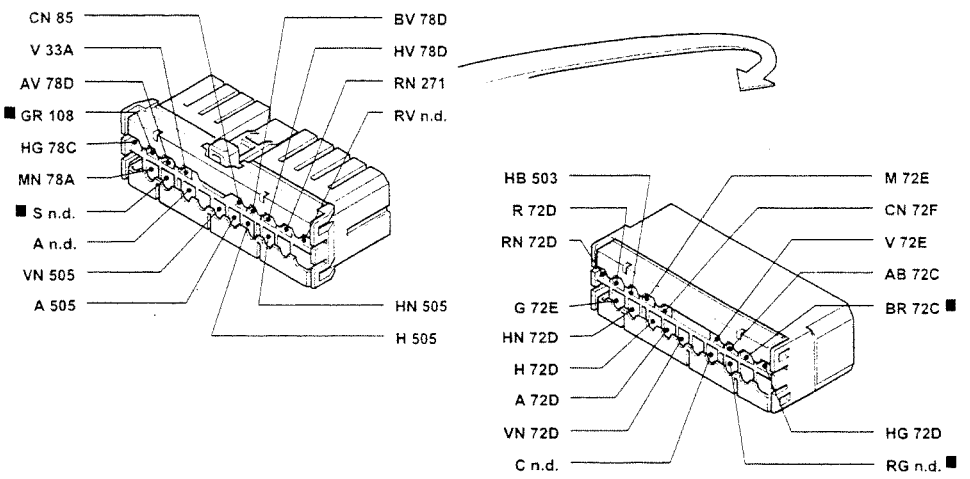
Components key

7 Battery
8 Main connector block
9 Earth on bodyshell
68 Connection between dashboard and electronic injection cables
72 Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / alarm device
75 Junction unit (dashboard)
78 Instrument panel
X1 Lancia CODE failure warning light
88 Diagnostic socket
97 Earth on floor
105 Ignition switch
106 Lancia CODE aerial
108 Lancia CODE control unit
502 7.5A fuse protecting Fiat-CODE

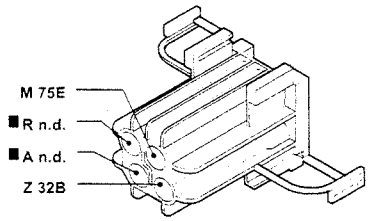
N.D. Ultrasound welding taped in cable loom

3U55PL

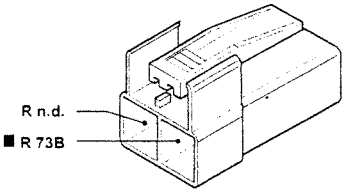
68 Connection between dashboard and injection cables



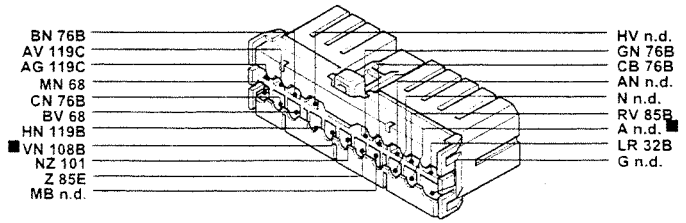
105 Ignition switch



75G Junction unit



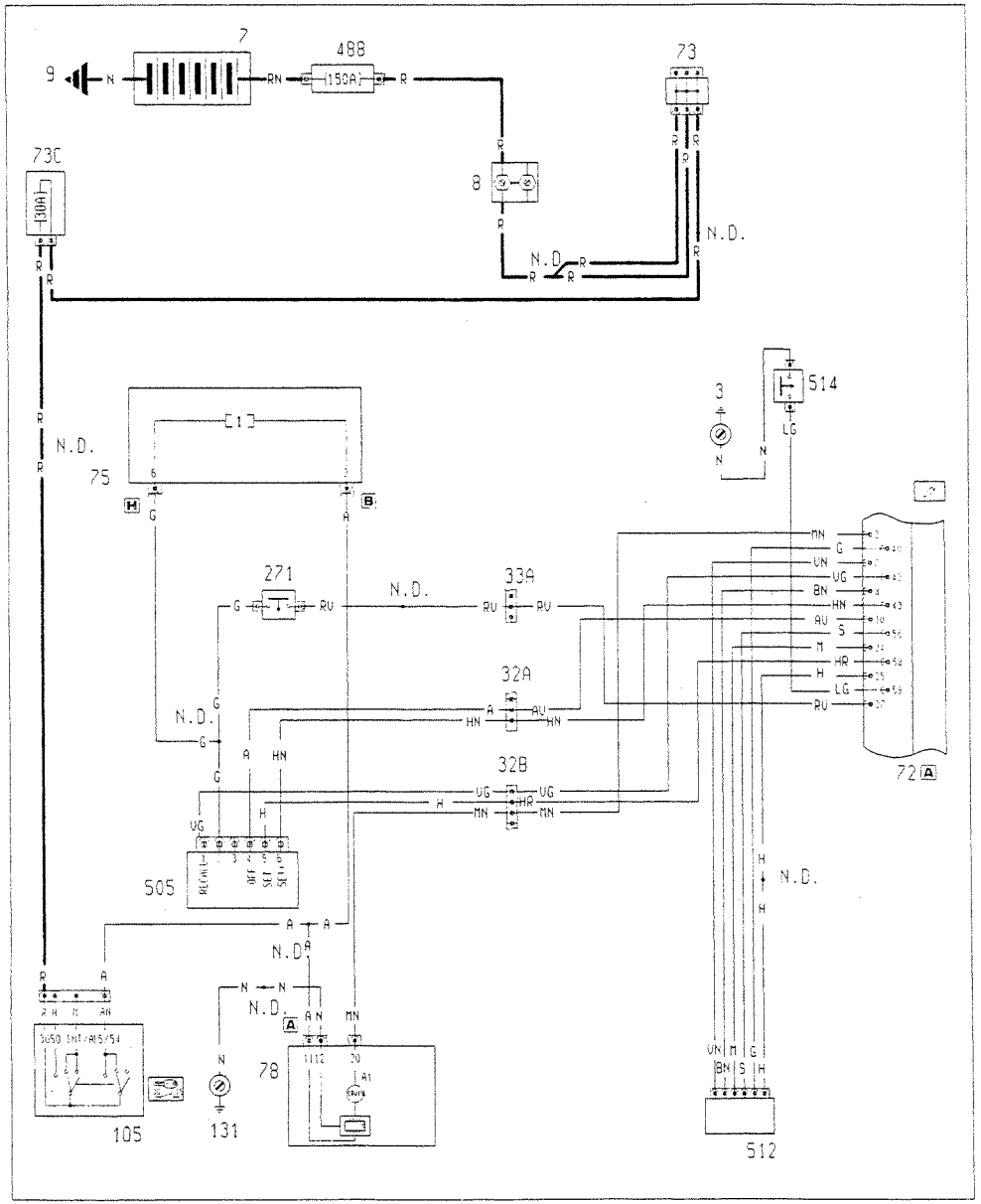
7B Junction unit



P3U56PL01

3U56PL

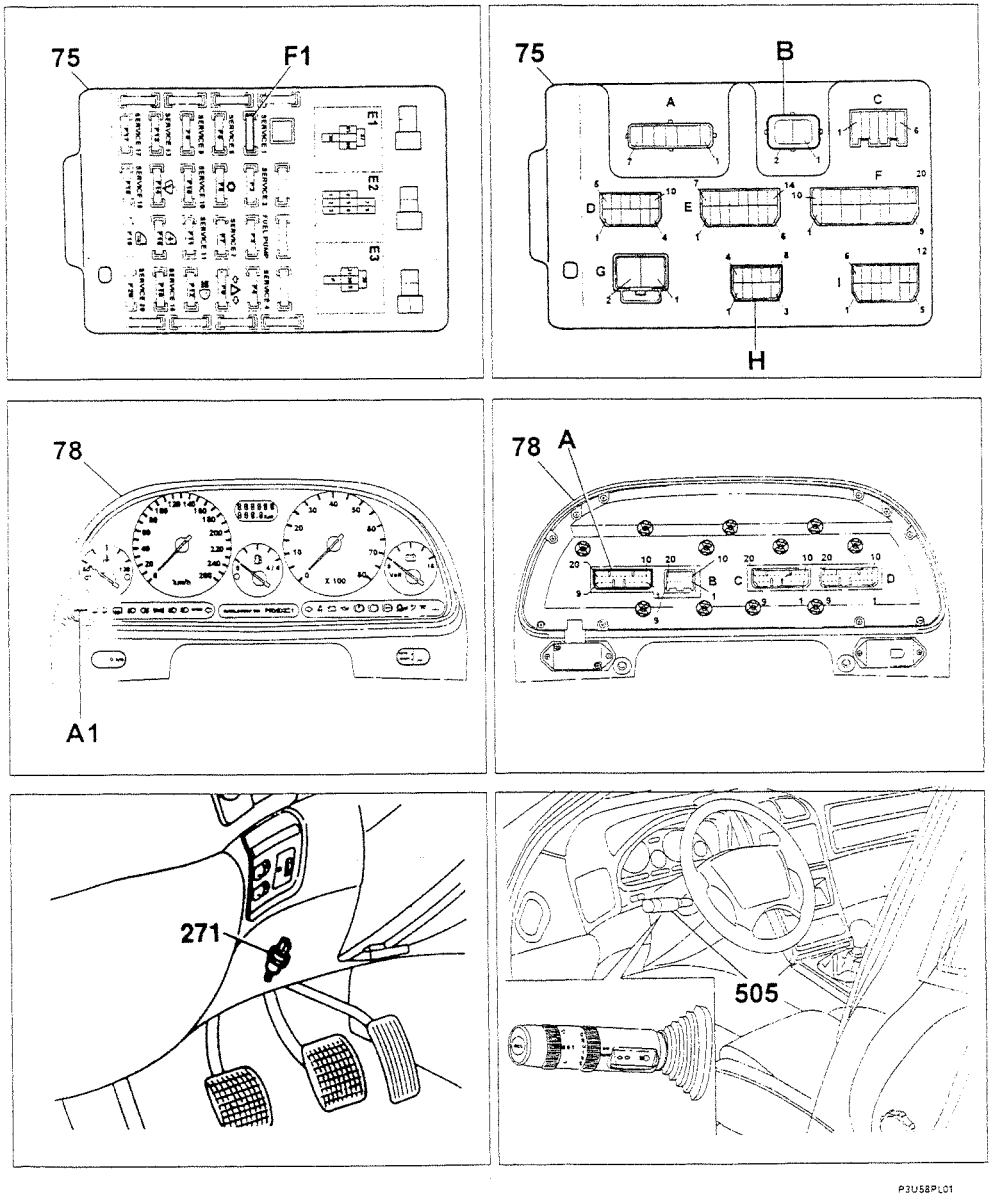
Cruise Control - (See key at end of wiring diagrams)



P3U57PL01

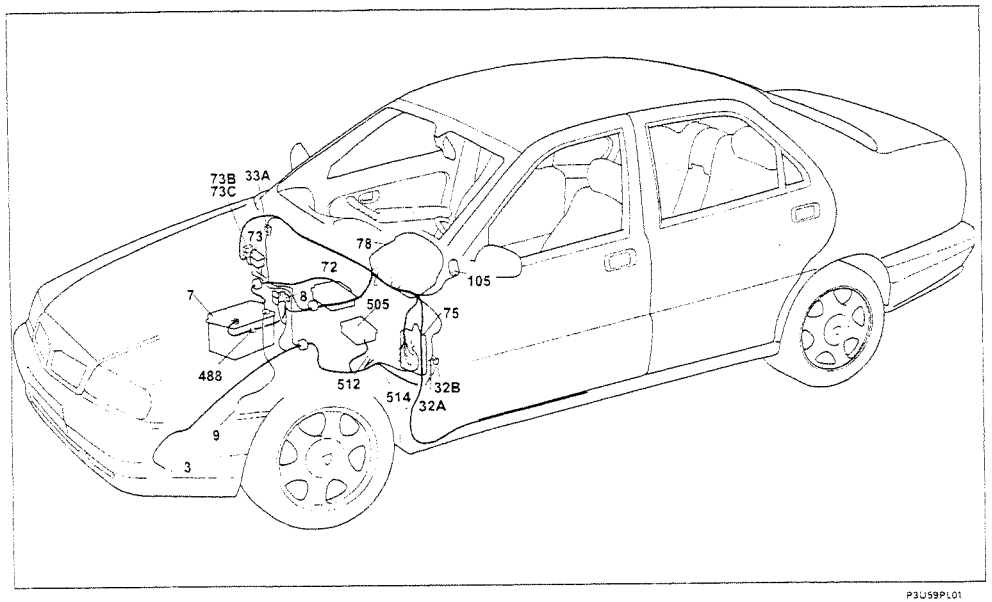
3U57PL

Location of components



P3U58PL01

3U58PL



P3U59PL01

Cruise Control

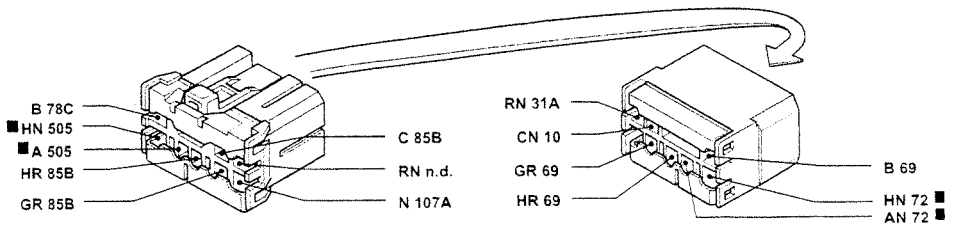
Components key

3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
32A Connection between dashboard and left engine compartment cables
32B Connection between dashboard and left engine compartment cables
33 Connection between dashboard and right engine compartment cables
72 Fuel injection control unit
73 Secondary connector block
73C 30A fuse protecting ignition switch/alarm device
75 Junction unit (dashboard)
78 Instrument panel
A1 Cruise control warning light
105 Ignition switch
131 Earth on driver's side support
271 Brake lights switch
488 150A maxi fuse
505 Cruise Control operation
512 Potentiometer on accelerator pedal
514 Switch on clutch

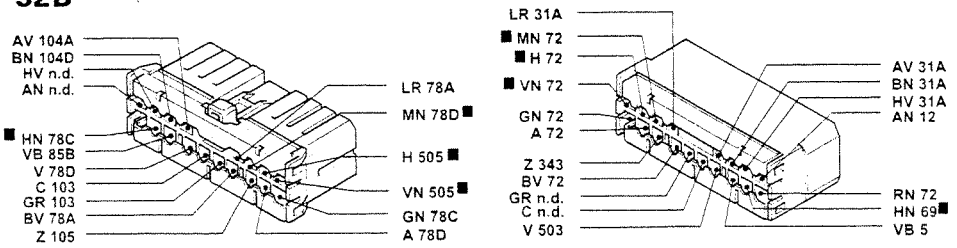
N.D. Ultrasound welding taped in cable loom

3U59PL

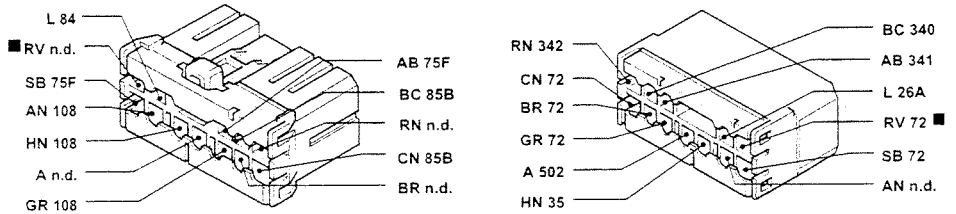
32A Connection between dashboard and left engine compartment cables



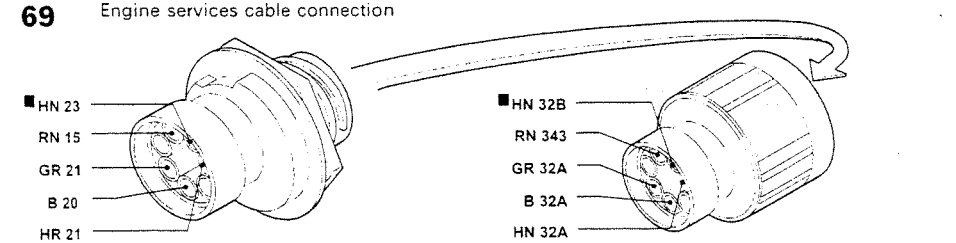
32B Connection between dashboard and left engine cables



33A Connection between dashboard and right engine cables



69 Engine services cable connection

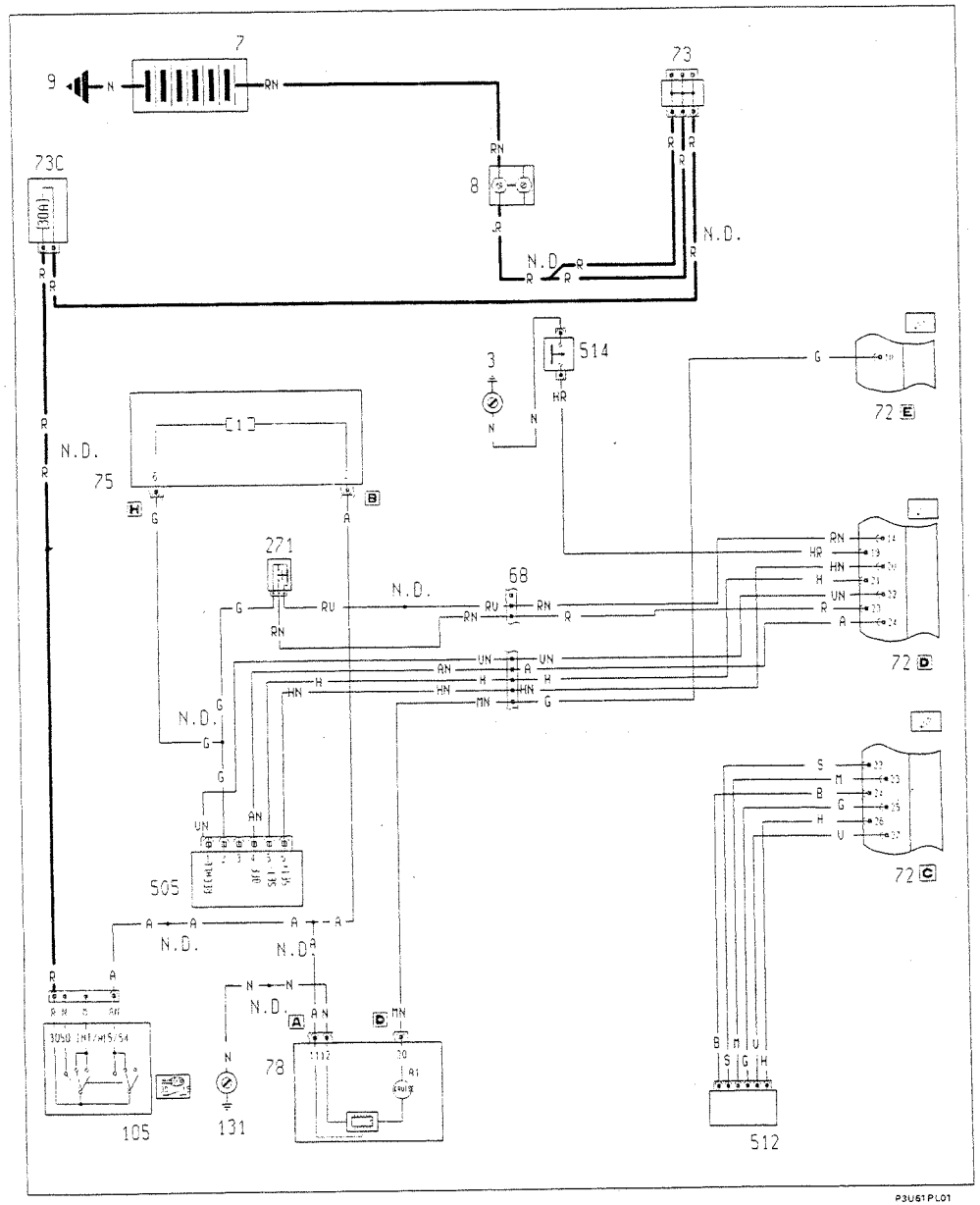


P3U60PL01

The cables in the wiring diagram are marked

3U60PL

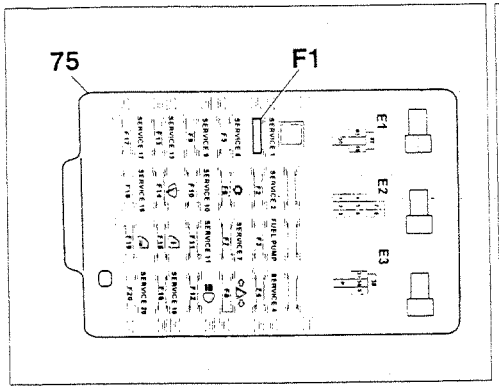
Cruise Control - (See key at end of wiring diagrams)

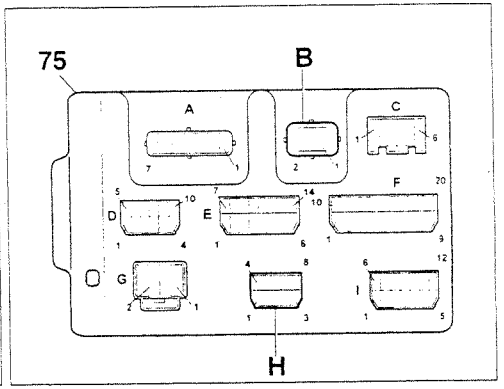


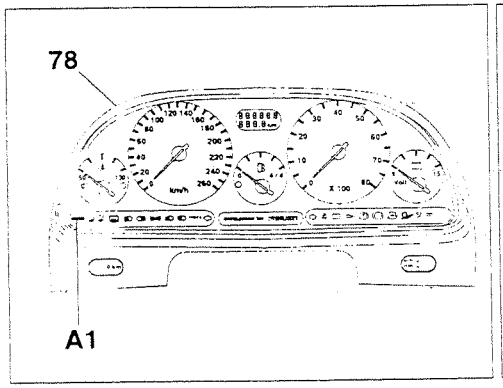
P3U61PL01

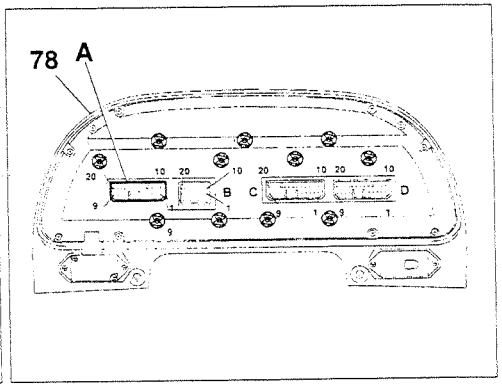
3U61PL

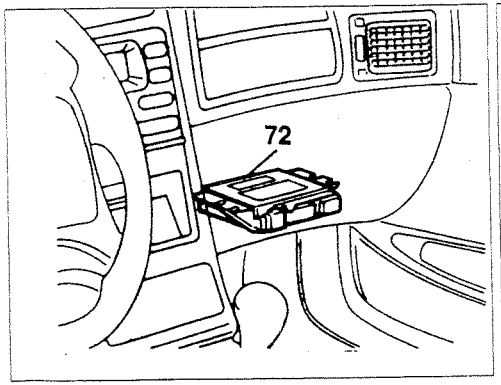
Location of components

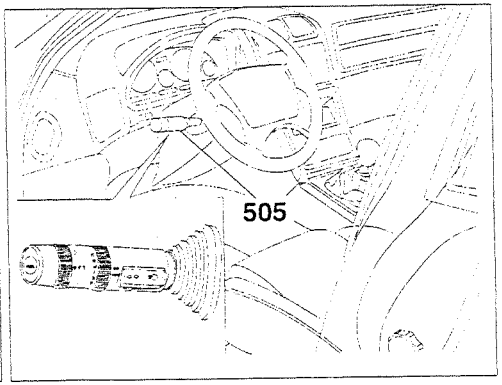






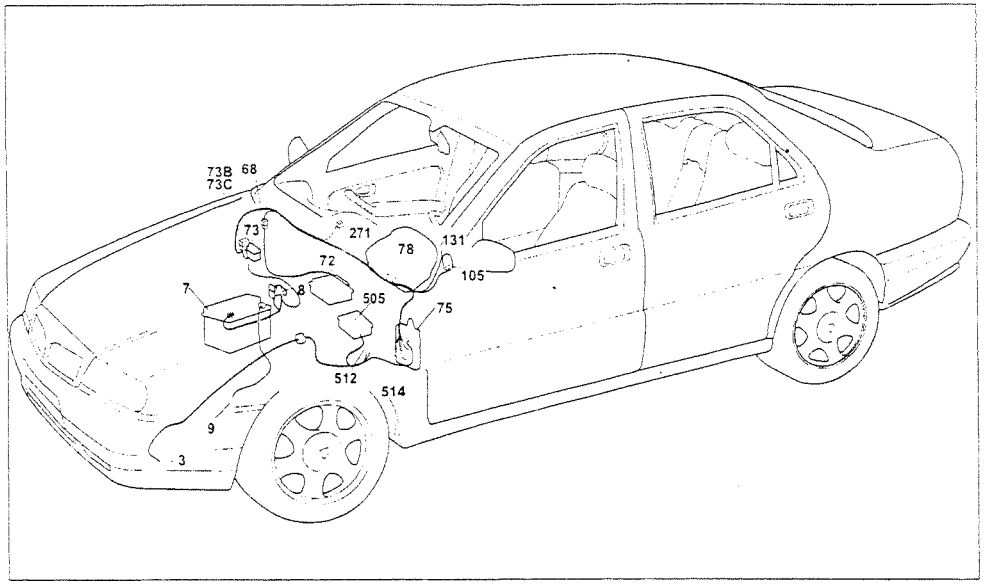






P3U62PL01

3U62PL



P3U63PL01

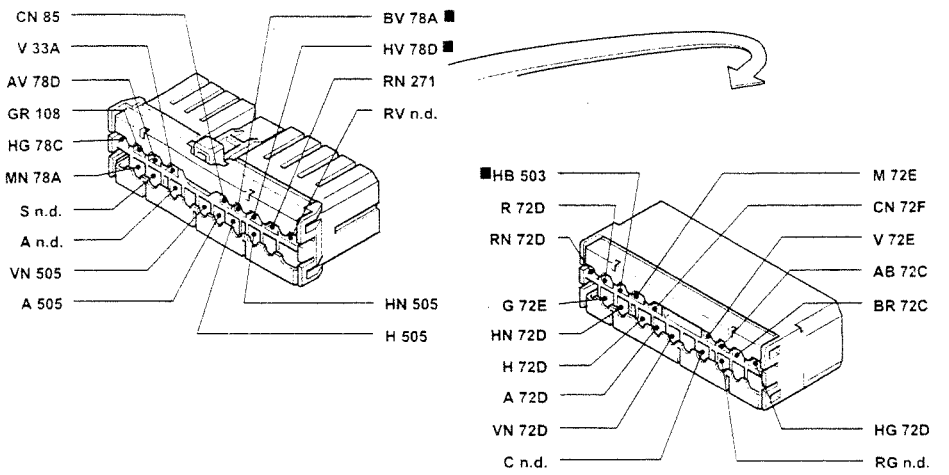
Cruise Control

Components key

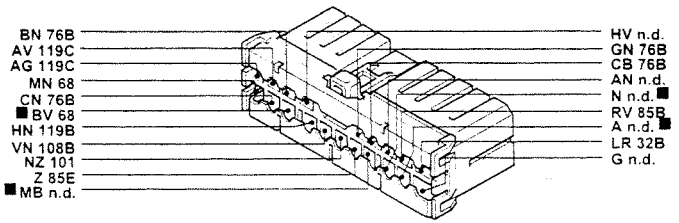
3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
68 Connection between dashboard and electronic injection cables
72 Electronic injection control unit
73 Secondary connector block
73C 30A fuse protecting ignition switch / alarm device
75 Junction unit (dashboard)
78 Instrument panel
A1 Cruise control warning light
105 Ignition switch
131 Earth on steering column support
505 Cruise Control operation
512 Potentiometer on accelerator pedal
514 Switch on clutch
N.D. Ultrasound welding taped in cable loom

3U63PL

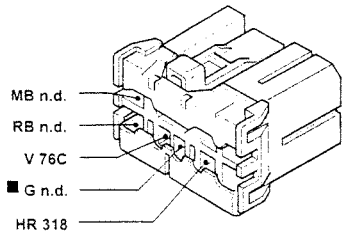
68 Connection between dashboard and electronic injection cables



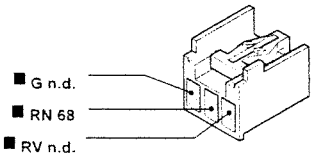
78A Instrument panel



75H Junction unit (dashboard)



271 Brake lights switch

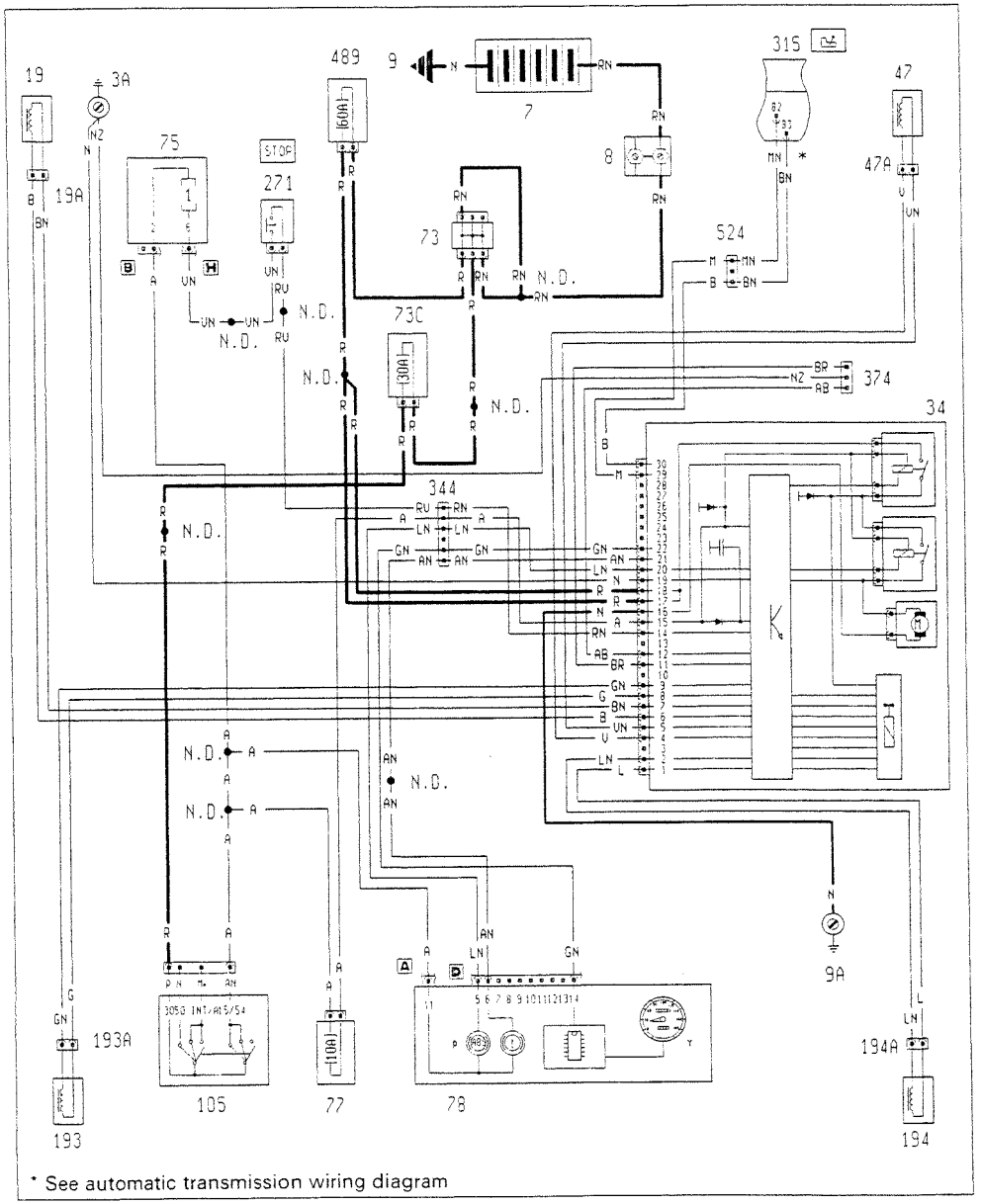


P3U64PL01

The cables in the wiring diagram are marked

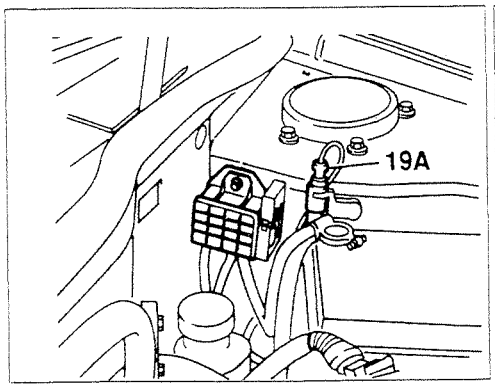
3U64PL

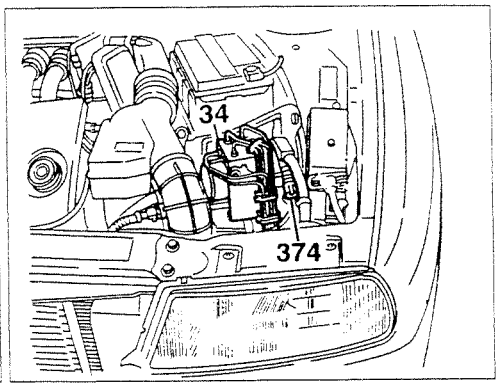
Anti-lock brakes (A.B.S.) and failure warning light - (See key at end of wiring diagrams)

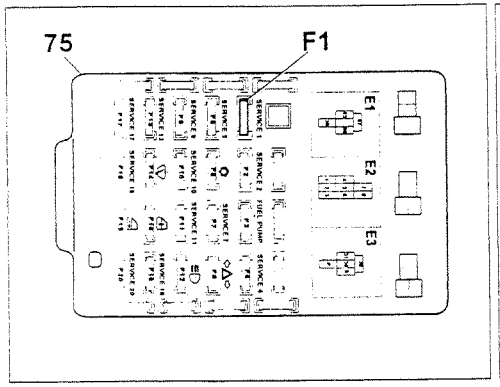


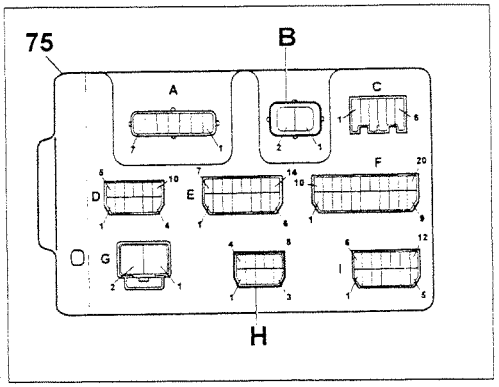
3U65PL

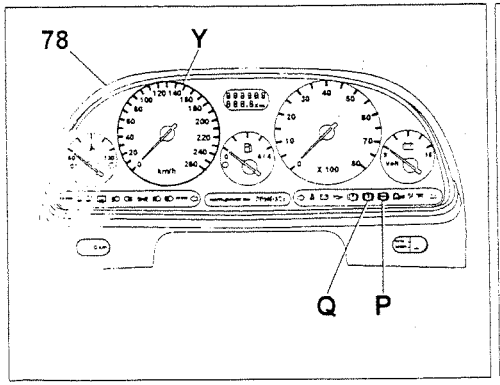
Location of components

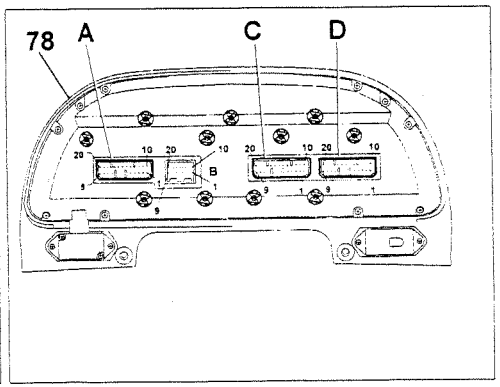






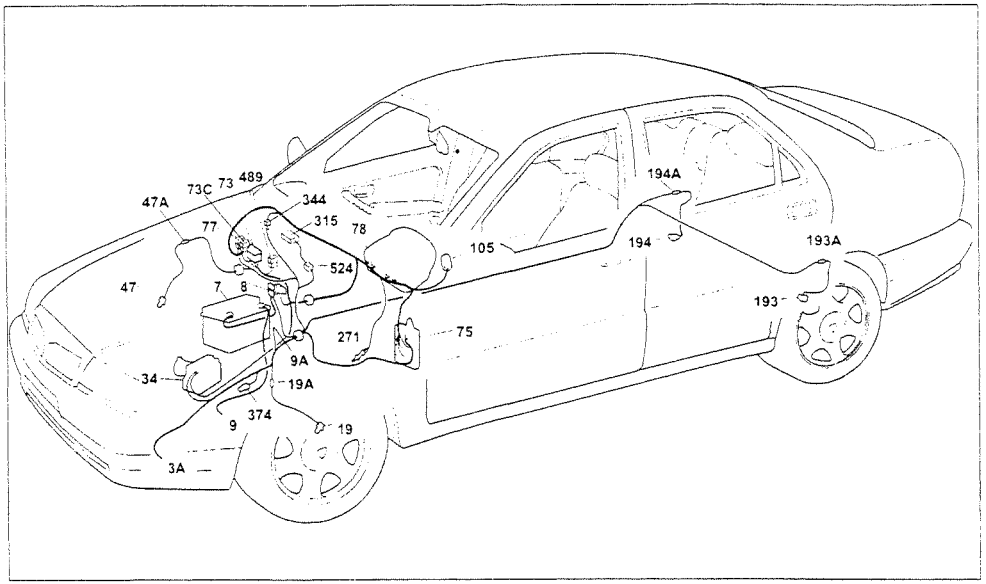






P3U66PL01

3U66PL



P3U67PL01

Anti-lock brakes (A.B.S.) and failure warning light

Components key

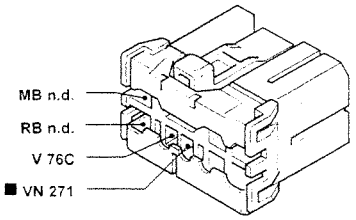
3A Left front earth for anti-lock brakes (A.B.S.)
7 Battery
8 Main connector block
9 Earth on bodyshell
9A Earth on side panel for anti-lock brakes (A.B.S.)
19 Sensor on left front wheel for anti-lock brakes (A.B.S.)
19A Connection for A.B.S. cable with sensor on left front wheel for anti-lock brakes (A.B.S.)
34 Anti-lock brakes electronic control unit (A.B.S.)
47 Sensor on right front wheel for anti-lock brakes (A.B.S.)
47A Connection for A.B.S. cable with sensor on right front wheel for anti-lock brakes (A.B.S.)
73 Secondary connector block
73C 30A fuse protecting ignition switch / anti-theft device
75 Junction unit (dashboard)
77 10A fuse protecting anti-lock brakes (A.B.S.)
78 Instrument panel
P Anti-lock braking system failure warning light (A.B.S.)
O Insufficient brake fluid level warning light
Y Electronic tachometer

105 Ignition switch
193 Sensor on left rear wheel for anti-lock brakes (A.B.S.)
193A Connection for A.B.S. cable with sensor on left rear wheel for anti-lock brakes (A.B.S.)
194 Sensor on right rear wheel for anti-lock brakes (A.B.S.)
194A Connection for A.B.S. cable with sensor on right rear wheel for anti-lock brakes (A.B.S.)
271 Brake lights switch
344 Connection between dashboard and anti-lock brakes cables (A.B.S.)
374 Diagnostic socket for anti-lock braking system (A.B.S.)
488 150A maxi fuse
315 Electronic automatic transmission gear selector control unit
503 Connection between A.B.S. and automatic transmission cables

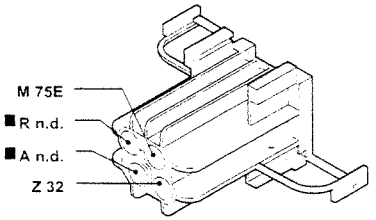
N.D. Ultrasound welding taped in cable loom

3U67PL

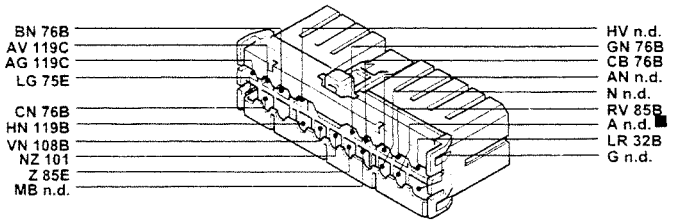
75H Junction unit (dashboard)



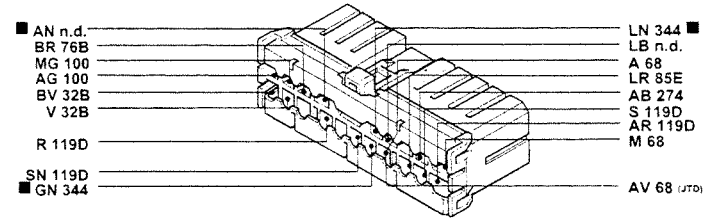
105 Ignition switch



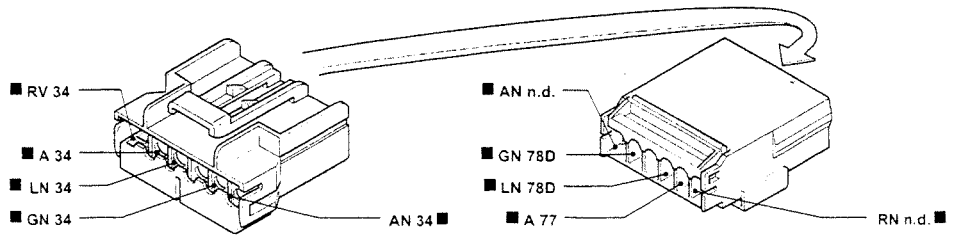
78A Instrument panel



78D Instrument panel



344 Connection between dashboard and anti-lock brakes cables (A.B.S.)

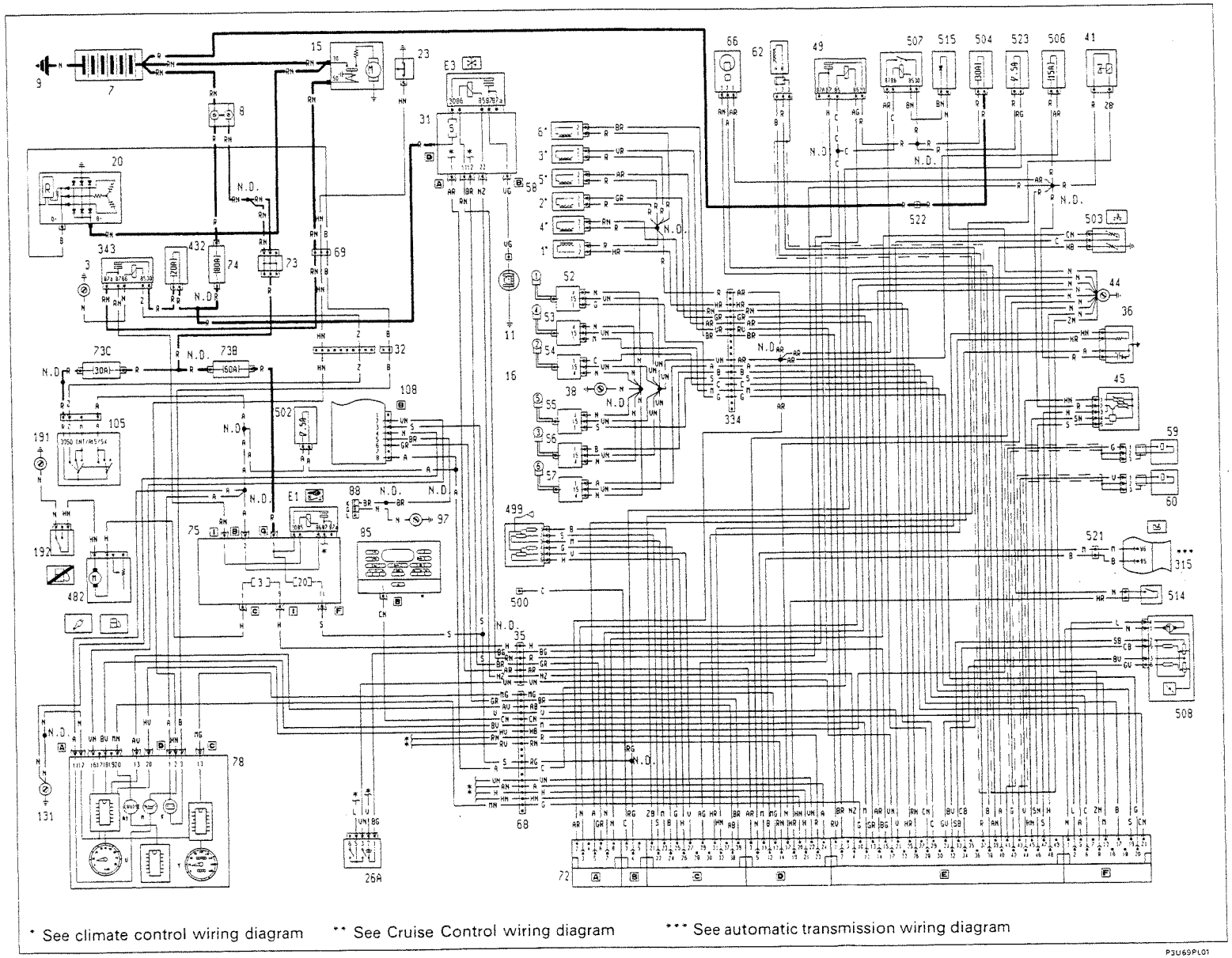


P3U08PL01

The cables in the wiring diagram are marked

3U68PL

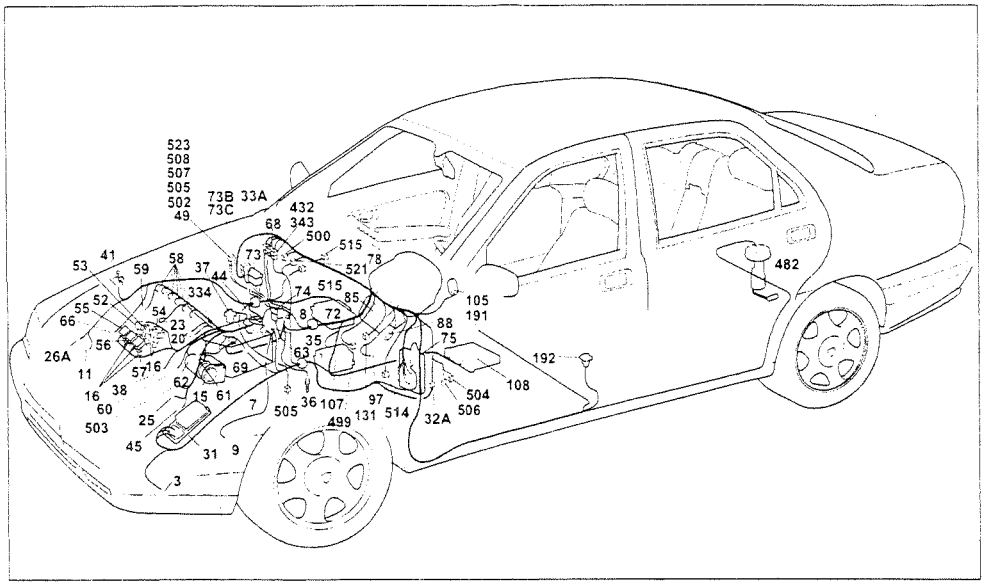
Starting - Electronic injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Warning light signalling injection system failure - Rev counter - -Speedometer - (See key at end of wiring diagrams)



* See climate control wiring diagram ** See Cruise Control wiring diagram *** See automatic transmission wiring diagram

P3U69PL01

3U69PL



P3U71PL01

Starting - Electronic injection and ignition - Recharging and warning light - Insufficient engine oil pressure warning light - Warning light signalling injection system failure - Rev counter - Speedometer

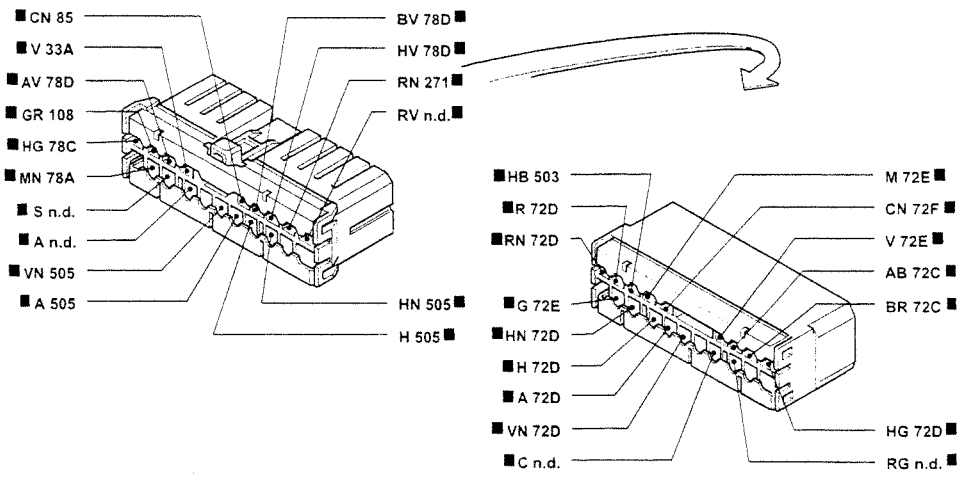
Components key

3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
11 Compressor coupling for air conditioning
15 Starter motor
16 Spark plugs
20 Alternator
23 Sensor signalling minimum engine oil pressure
25 Air temperature sensor
26A Four stage pressure switch
31 Peripheral control unit (engine compartment)
53 Compressor coupling relay feed
32 Connection between dash. and left engine compartment cables
33A Connection between dash. and right engine compartment cables
35 Con. btwn engine comp. & electron. inject. cables
36 Heated Lambda sensor
38 Earth for electronic injection
40 E.G.R. solenoid valve
41 Petrol vapour cut out solenoid valve
44 Power earth
45 Air flow meter
49 Electric fuel pump and heated Lambda sensor relay feed
51 Air flow meter relay feed
52 Ignition coil
53 Ignition coil
54 Ignition coil
55 Ignition coil
56 Ignition coil
57 Ignition coil
58 Injectors
59 1st. Detonation sensor
60 2nd. Detonation sensor
61 Electronic injection engine coolant temperature sensor
62 Rpm sensor
63 Potentiometer on butterfly valve
66 Timing sensor
68 Connection between dashboard and electronic injection cables
72 Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / alarm device
74 80A fuse protecting peripheral control unit (engine compartment)
75 Junction unit (dashboard)
E1 Ignition discharge relay
78 Instrument panel
A1 Cruise control warning light
K Battery recharging warning light
M Insufficient engine oil pressure warning light
U Electronic rev counter
Y Electronic tachometer
85 Infocenter control unit
88 Diagnostic socket
97 Earth on floor
105 Ignition switch
108 Lancia CODE control unit
131 Earth on driver's side steering column support
191 Earth for inertia switch
192 Inertia switch
271 Brake lights switch
334 Connection between electronic injection cable and injector bridge
482 Electric fuel pump / fuel gauge
499 Sensor on accelerator pedal
500 Diagnostic connector
502 7.5 A fuse protecting Lancia-CODE
504 30A fuse protecting electronic injection control unit
505 Cruise Control control unit
506 15A fuse protecting electronic injection system
507 Main relay
508 Motorized actuator on butterfly casing
514 Switch on clutch
515 Diode for signal inversion
521 Connection between rain gutter and engine compartment cable
522 Connection between battery services and electronic injection cables

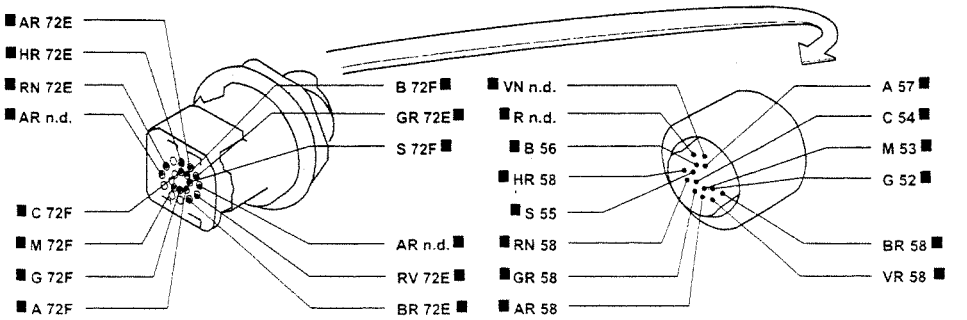
N.D. Ultrasound welding taped in cable loom

3U71PL

68 Connection between dashboard and electronic injection cables



334 Connection between electronic injection cable and injector bridge

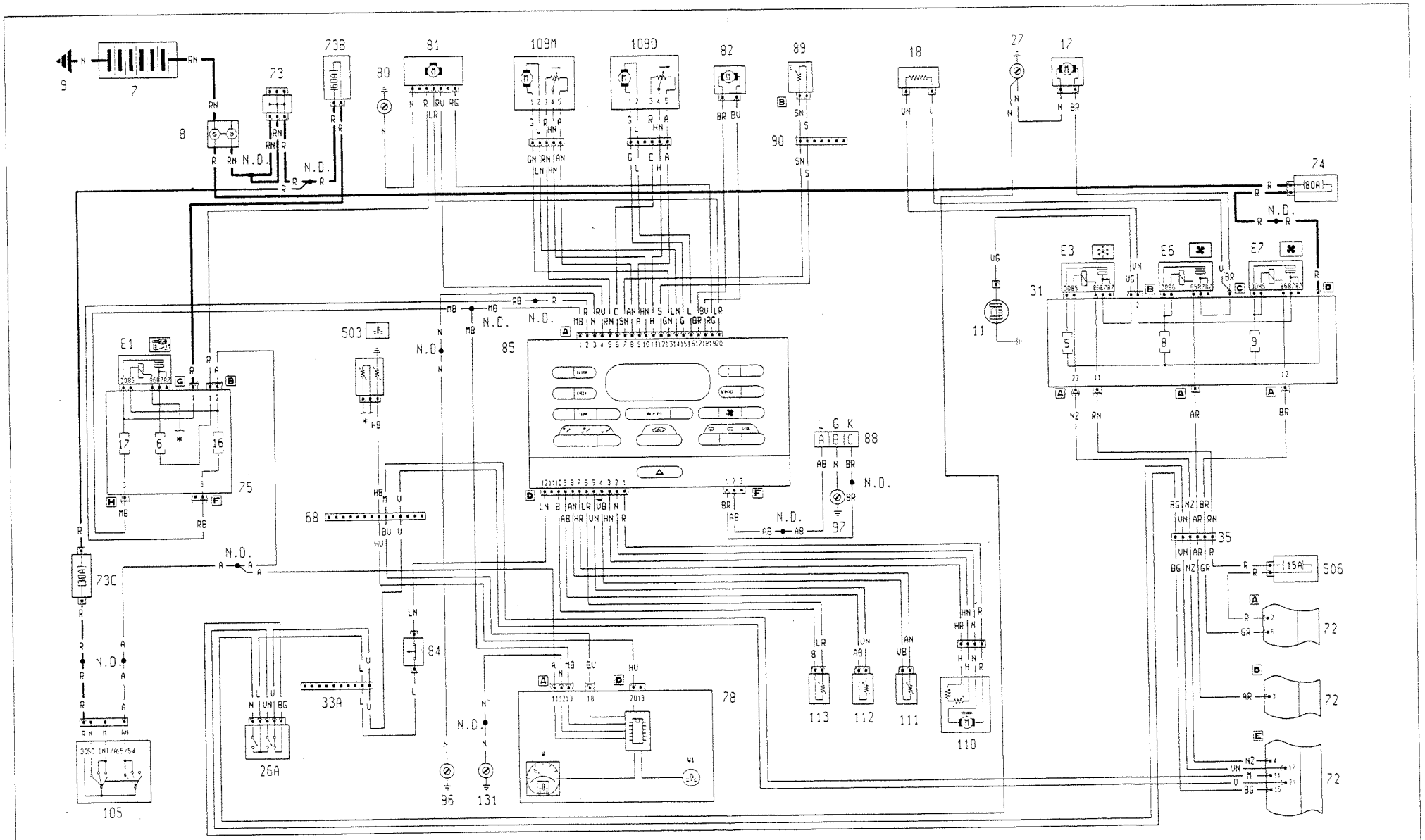


P3U72PL01

The cables in the wiring diagram are marked

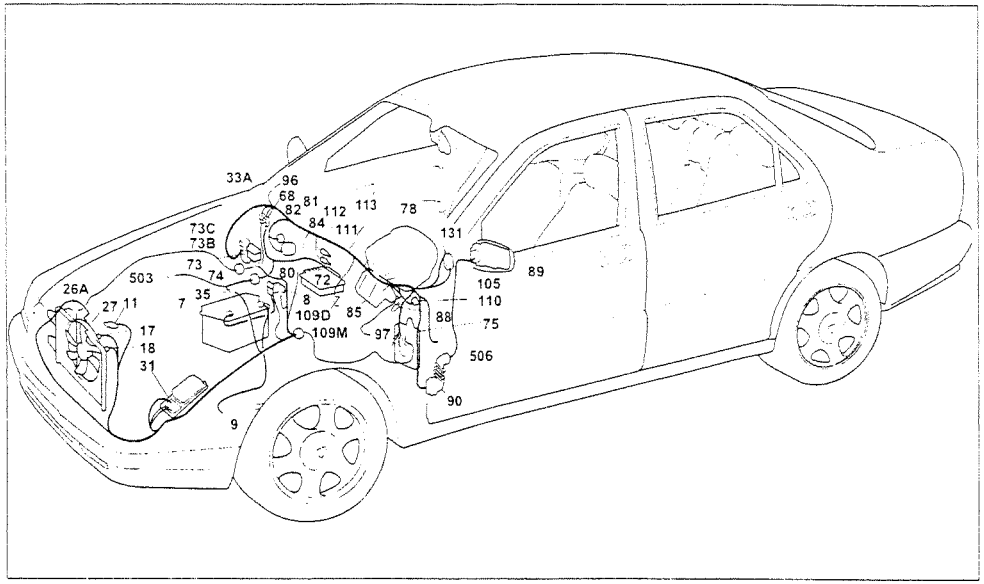
3U72PL

Automatic climate control - (See key at end of wiring diagrams)



* See starting wiring diagram

3U73PL



P3U75PL01

Automatic climate control

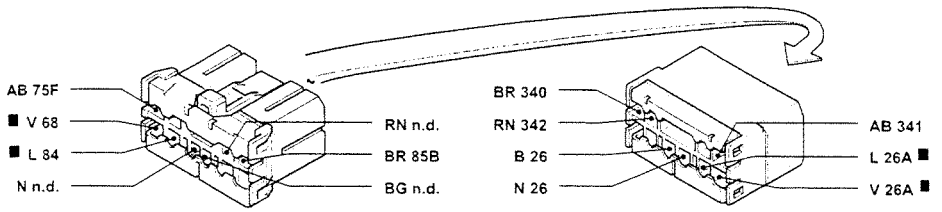
Components key

7 Battery
8 Main connector block
9 Earth on bodyshell
11 Compressor coupling for air conditioning
17 1st Engine cooling fan
18 Engine cooling fan speed resistance
26A Four stage pressure switch
27 Right front earth
31 Peripheral control unit (engine compartment)
E3 Compressor coupling relay feed
E6 Engine cooling fan high speed relay feed
E7 Engine cooling fan low speed relay feed
33A Connection between dash and right engine compartment cables
35 Connection between engine comp. & electronic injection cables
68 Connection between dashboard and electronic injection cables
81 Sensor for engine coolant temperature
72 Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch/anti-theft device
74 80A fuse protecting peripheral control unit (engine compartment)
75 Junction unit (dashboard)
E1 Ignition discharge relay
78 Instrument panel
W Water temperature gauge
W1 Engine coolant overheating warning light
80 Power earth on dashboard
81 Climate control fan (Brushless)
82 Air recirculation motor
84 Single stage pressure switch (3000 i.e.)
85 Infocenter control unit
88 Diagnostic socket
89 Left rear view mirror
A Motor for folding left rear view mirror
B Motor for vertical adjustment of left rear view mirror
C Motor for horizontal adjustment of left rear view mirror
D Left rear view mirror heating resistance
90 Connection between dashboard and left front door cables
96 Earth on carrier
97 Earth on floor
105 Ignition switch
109D Distribution / mixture motor
109M Distribution / mixture motor
110 Vehicle interior air temperature sensor
111 Mixed air sensor 1
112 Mixed air sensor 2
113 Solar temperature sensor
131 Earth on steering column support
506 15A fuse protecting electronic injection

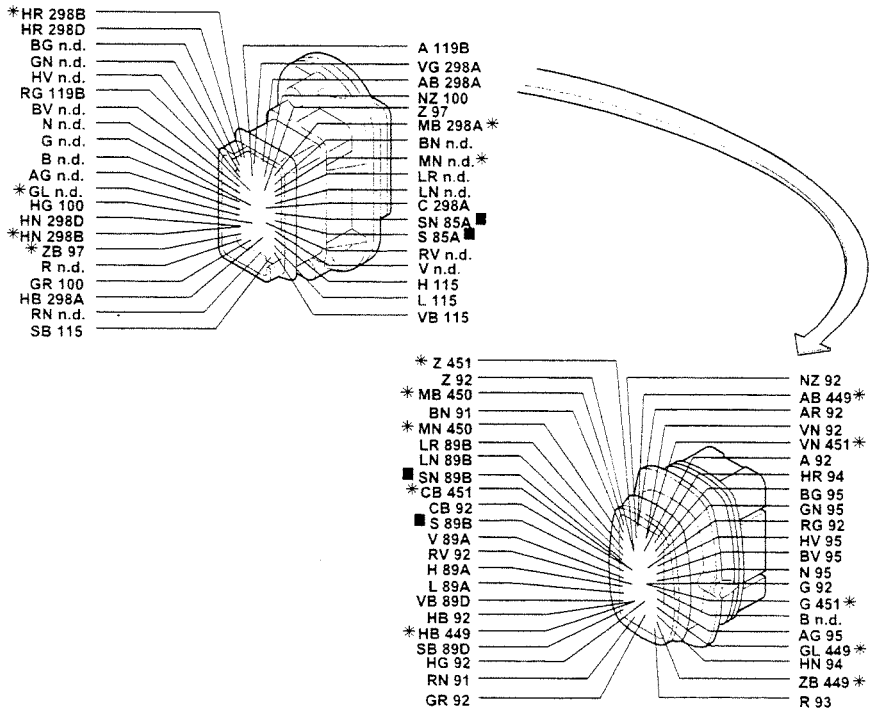
N.D. Ultrasound welding taped in cable loom

3U75PL

33A Connection between dashboard and right engine compartment cables



90 Connection between dashboard and left front door cables

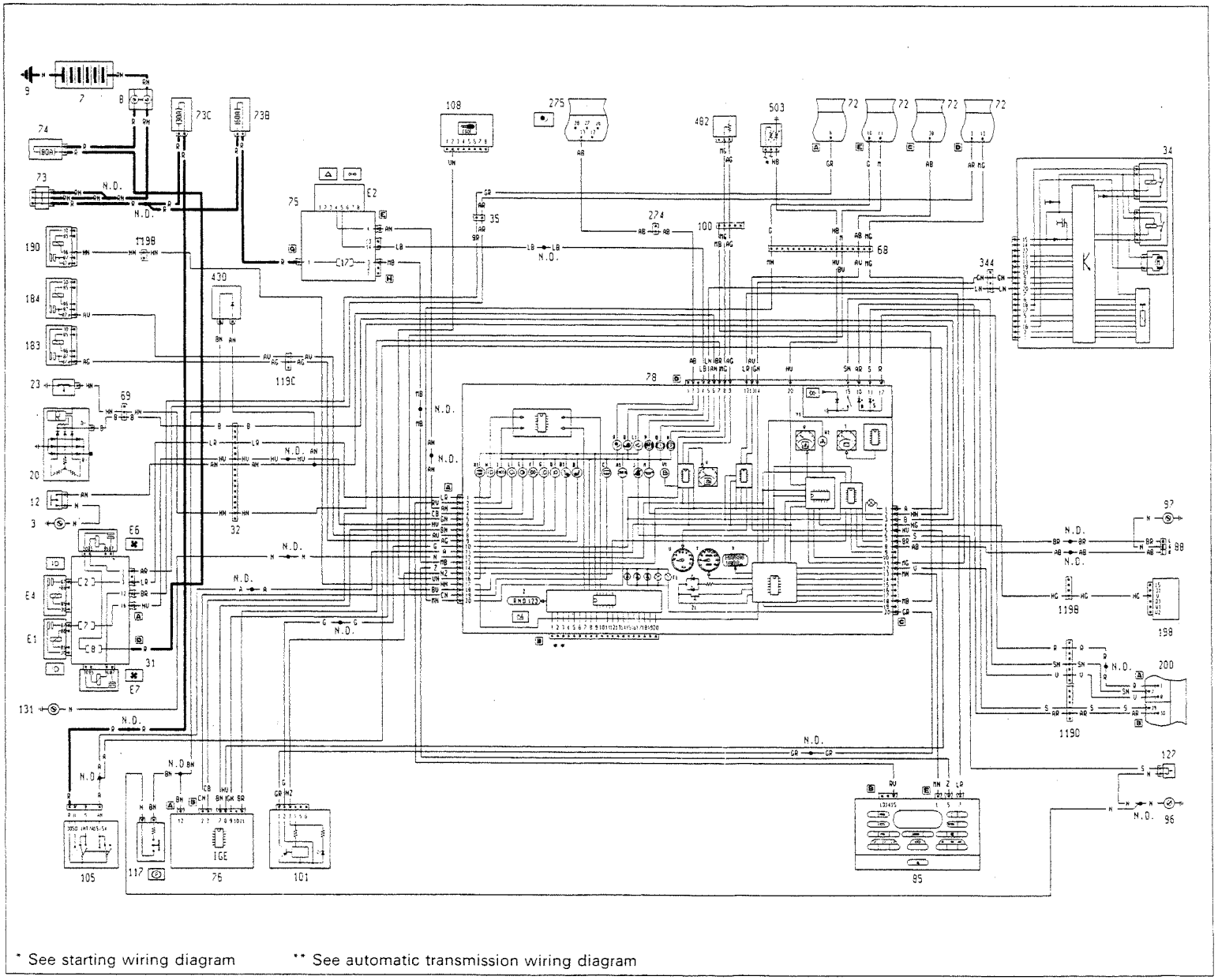


P3U76PL01

The cables in the wiring diagram are marked

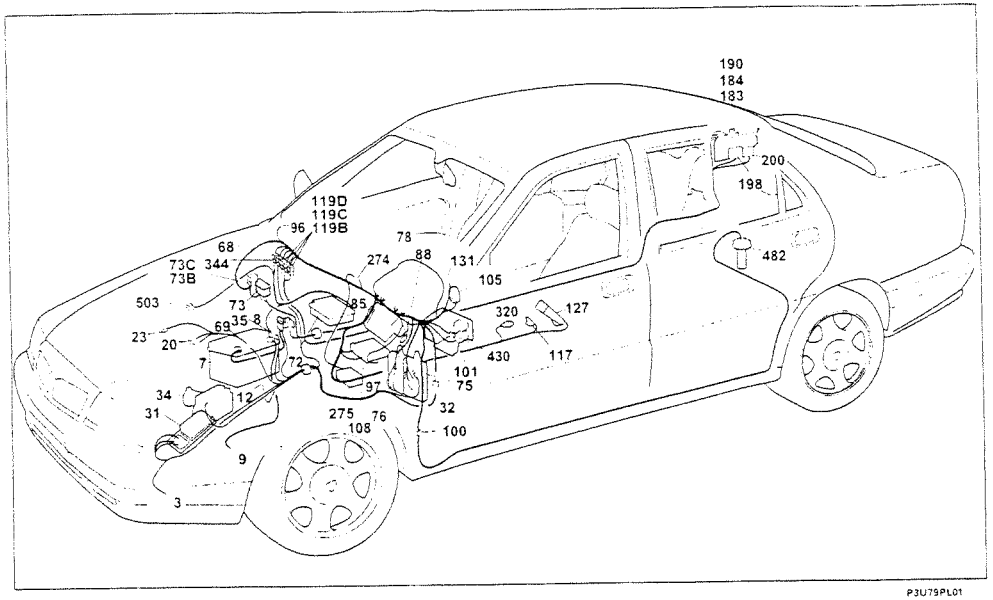
3U76PL

Instrument panel connections - (See key at end of wiring diagrams)



3U77PL

P3U77PL01



P3U79PL01

Instrument panel connections

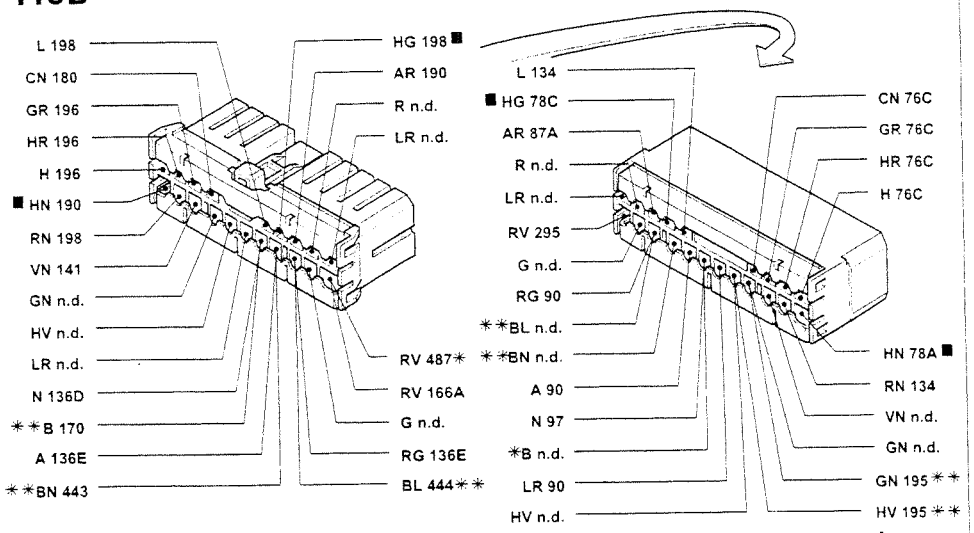
Components key

3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
12 Insufficient brake fluid level sensor
20 Alternator
23 Sensor signalling minimum engine oil pressure
31 Peripheral control unit (engine compartment)
E1 Dipped headlamps relay feed
E4 Main beam headlamps relay feed
E6 Engine cooling fan high speed relay feed
E7 Engine cooling fan low speed relay feed
32 Connection between dashboard and left engine compartment cables
34 Anti-lock brakes electro-hydraulic control unit (A B S)
35 Connection between engine compartment and injection cables
68 Connection between dashboard and electronic injection cables
69 Connection for services cables in engine
72 Fuel injection control unit
73 Secondary connector block
73B 60A protective fuse for I G E control unit / junction unit
73C 30A fuse protecting ignition switch/anti-theft device
74 80A fuse protecting peripheral control unit (engine compartment)
75 Junction unit (dashboard)
E2 Intermittent device for direction indicators / hazard warning lights
76 I G E control unit
78 Instrument panel (See key at the end of the wiring diagrams)
85 Infocenter control unit
88 Diagnostic socket
96 Earth on carrier
97 Earth on floor
100 Connection between dashboard and left longitudinal cables
101 Light dimmer
105 Ignition switch
108 Lancia CODE control unit
117 Switch signalling handbrake applied
119B Connection between dashboard and right longitudinal cables
119C Connection between dashboard and right longitudinal cables
119D Connection between dashboard and right front door cables
127 Switch signalling seat belts not fastened
131 Earth on steering column support
167 Fuel gauge
183 Relay for driver's seat heater pad
184 Relay for passenger seat heater pad
190 Tailgate locking/unlocking relay feed
198 Servotronic device electronic control unit
200 Controlled damping suspension electronic control unit (S C S)
274 Connection between dashboard and AIR-BAG cables
275 AIR-BAG control unit
320 Trim on electronic automatic transmission gear selector lever
344 Connection between dashboard and anti-lock brakes cables (A B S)
430 Connecting diode for handbrake applied/insufficient brake fluid level system
482 Electric fuel pump / fuel gauge

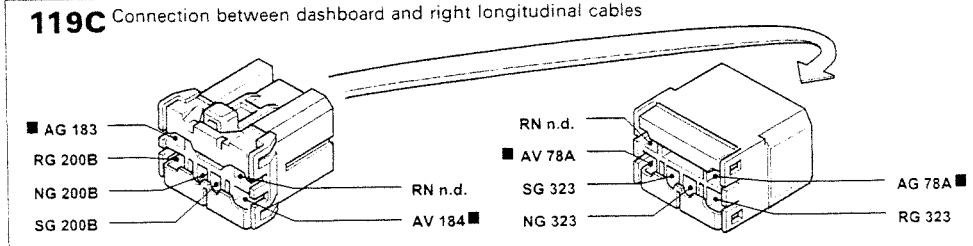
N.D. Ultrasound welding taped in cable loom

3U79PL

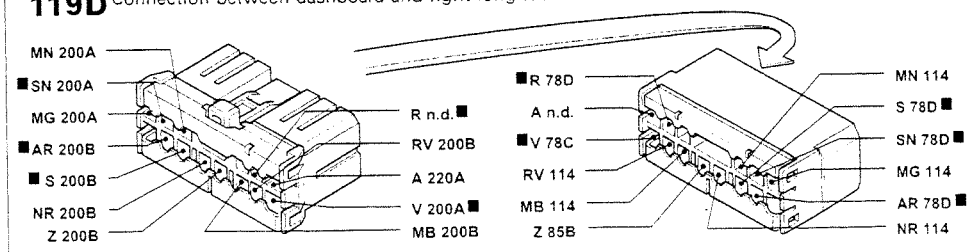
119B Connection between dashboard and right longitudinal cables



119C Connection between dashboard and right longitudinal cables



119D Connection between dashboard and right longitudinal cables

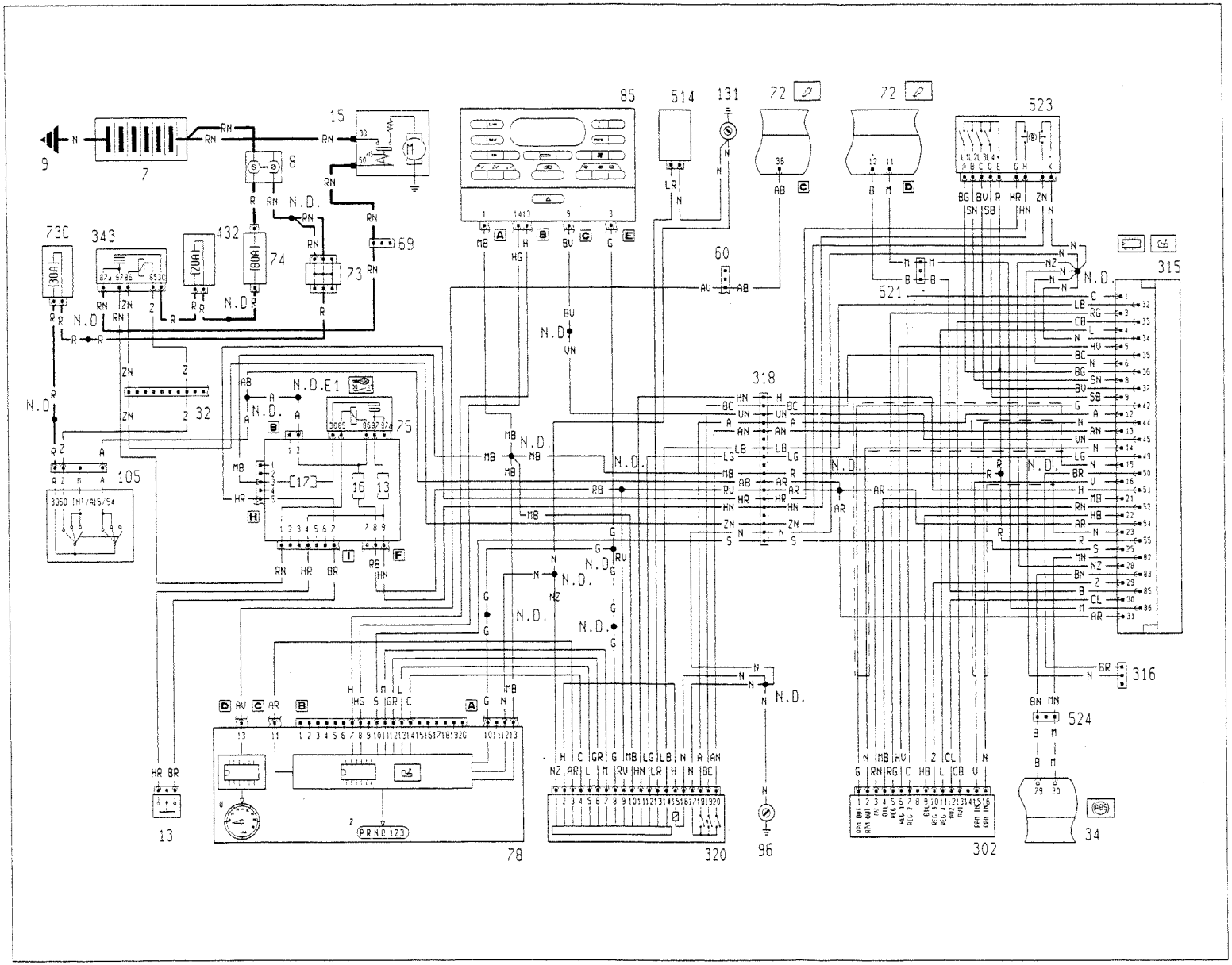


P3U80PL01

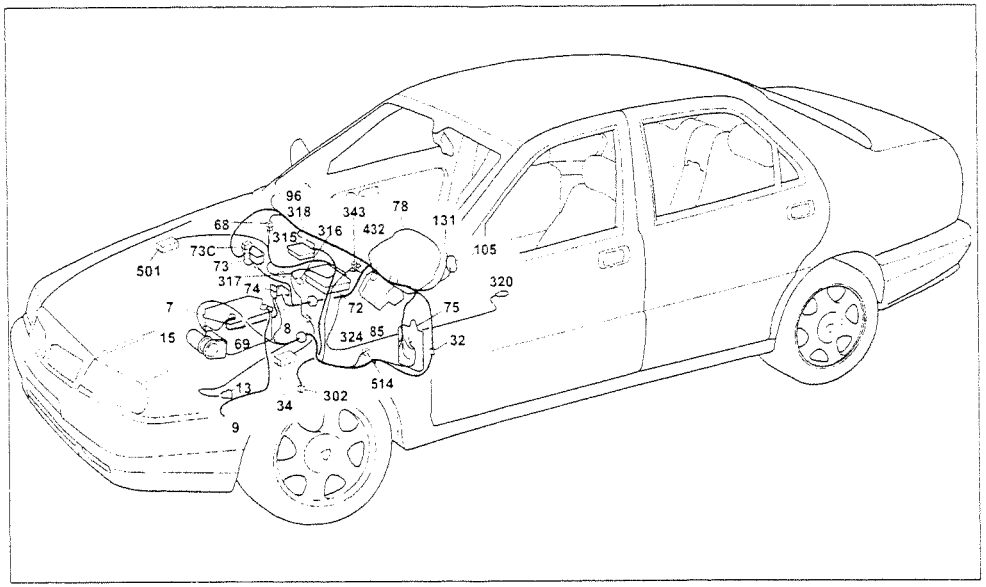
The cables in the wiring diagram are marked

3U80PL

Sportronic automatic transmission - (See key at end of wiring diagrams)



3U81PL



P3U83PL01

Automatic transmission (Sportronic)

Components key

7 Battery
8 Main connector block
9 Earth on bodyshell
13 Reversing lights switch
15 Starter motor
32 Connection between dashboard and left engine compartment cables
61 Engine coolant temperature sensor
68 Connection between dashboard and electronic injection cables
69 Engine services cable connection
72 Fuel injection control unit
73 Secondary connector block
73C 30A fuse protecting ignition switch/alarm device

74 80A fuse protecting peripheral control unit (engine compartment)
75 Junction unit (dashboard)
E1 Ignition discharge relay
78 Instrument panel
U Electronic rev counter
Y Electronic tachometer
Z Electronic automatic transmission gear selection display
85 Infocenter control unit
90 Connection between dashboard and left front door cables
95 Left front central locking geared motor and signalling of left front door open and alarm on
96 Earth on carrier

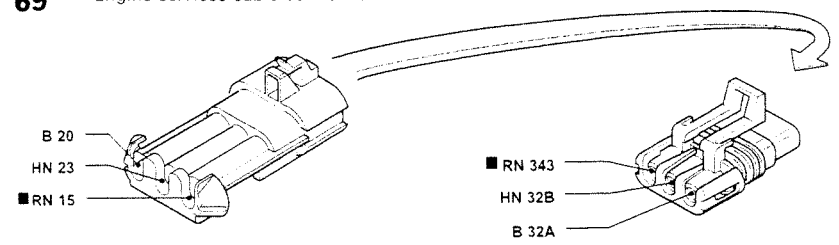
105 Ignition switch
131 Earth on steering column support
175 Connection between left longitudinal and tailgate cables
302 Switch control unit
315 Electronic automatic transmission gear selector control unit (ZF)
316 Diagnostic socket for electronic automatic transmission
317 Connection between automatic transmission and electronic injection cables
318 Connection between electronic auto. trans. and dash cables
320 Trim on electronic automatic transmission gear selector lever
343 40A starter relay
432 20A protective fuse ignition switch relay feed

501 Connection for sensor cables for automatic transmission
514 Switch on clutch

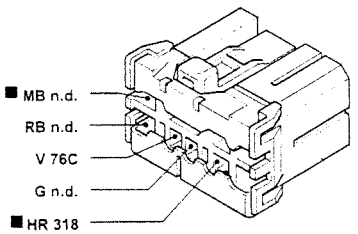
N.D. Ultrasound welding taped in cable loom

3UB3PL

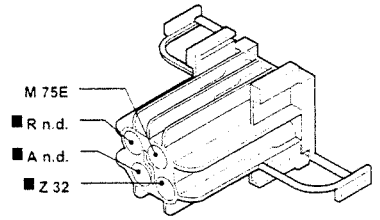
69 Engine services cable connection



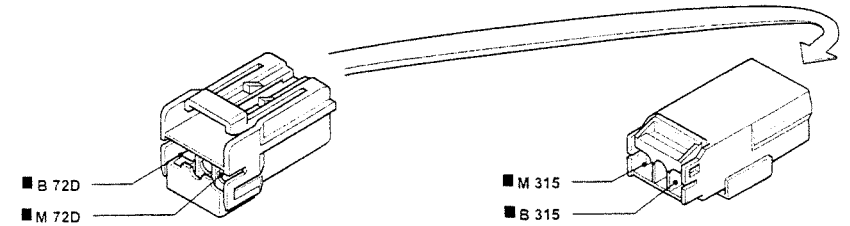
75H Instrument panel



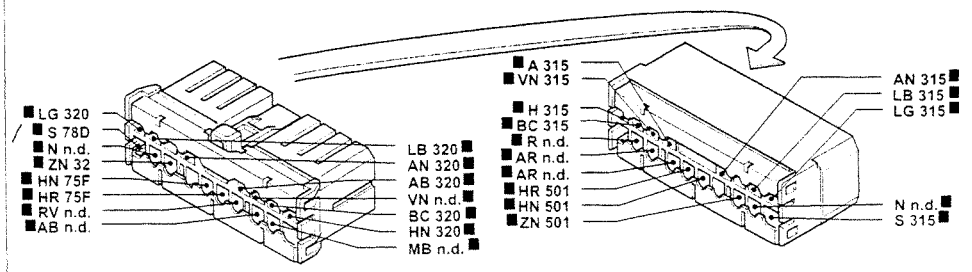
105 Ignition switch



317 Connection between electronic auto. trans. & 2959 electronic injection cables



318 Connection between electronic auto. trans. and dashboard cables



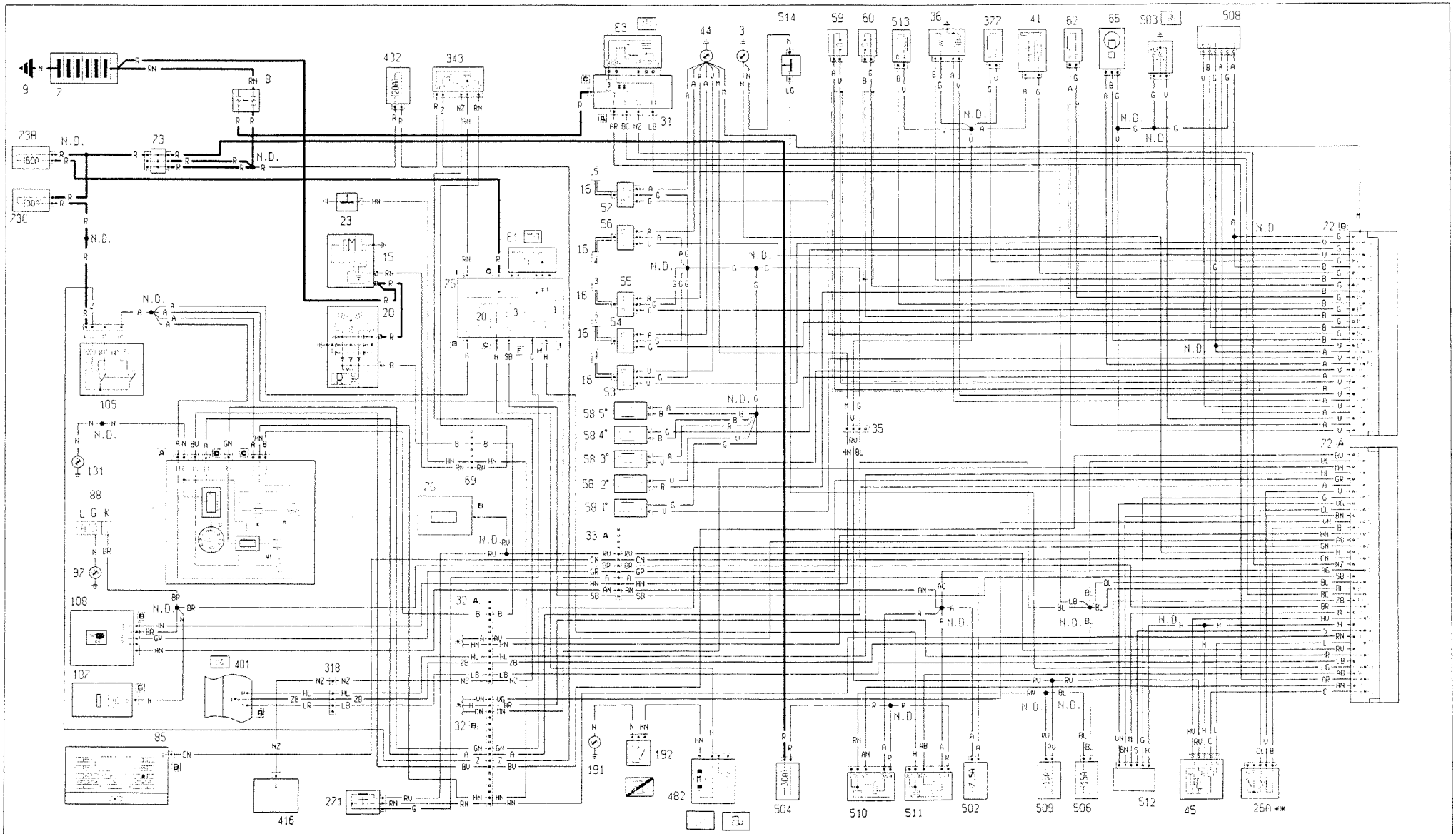
P3U84PL01

The cables in the wiring diagram are marked

3UB4PL

55.

Version with automatic transmission
Starting - Electronic ignition and fuel injection - Recharging and low engine oil warning light - Fuel injection fault warning light - Rev Counter - Speedometer - (See key at end of wiring diagrams)

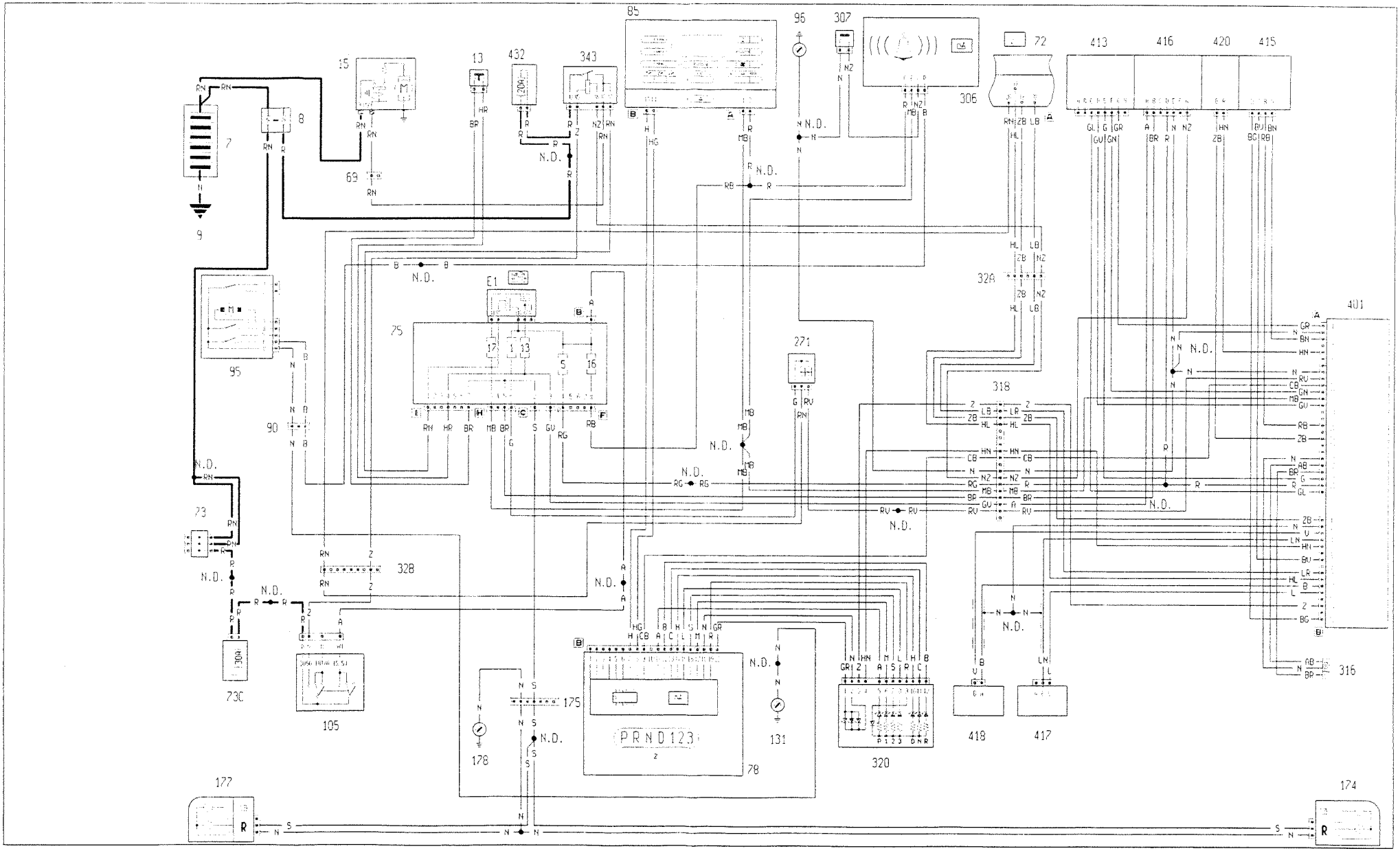


* See cruise control diagram ** See automatic air conditioning diagram

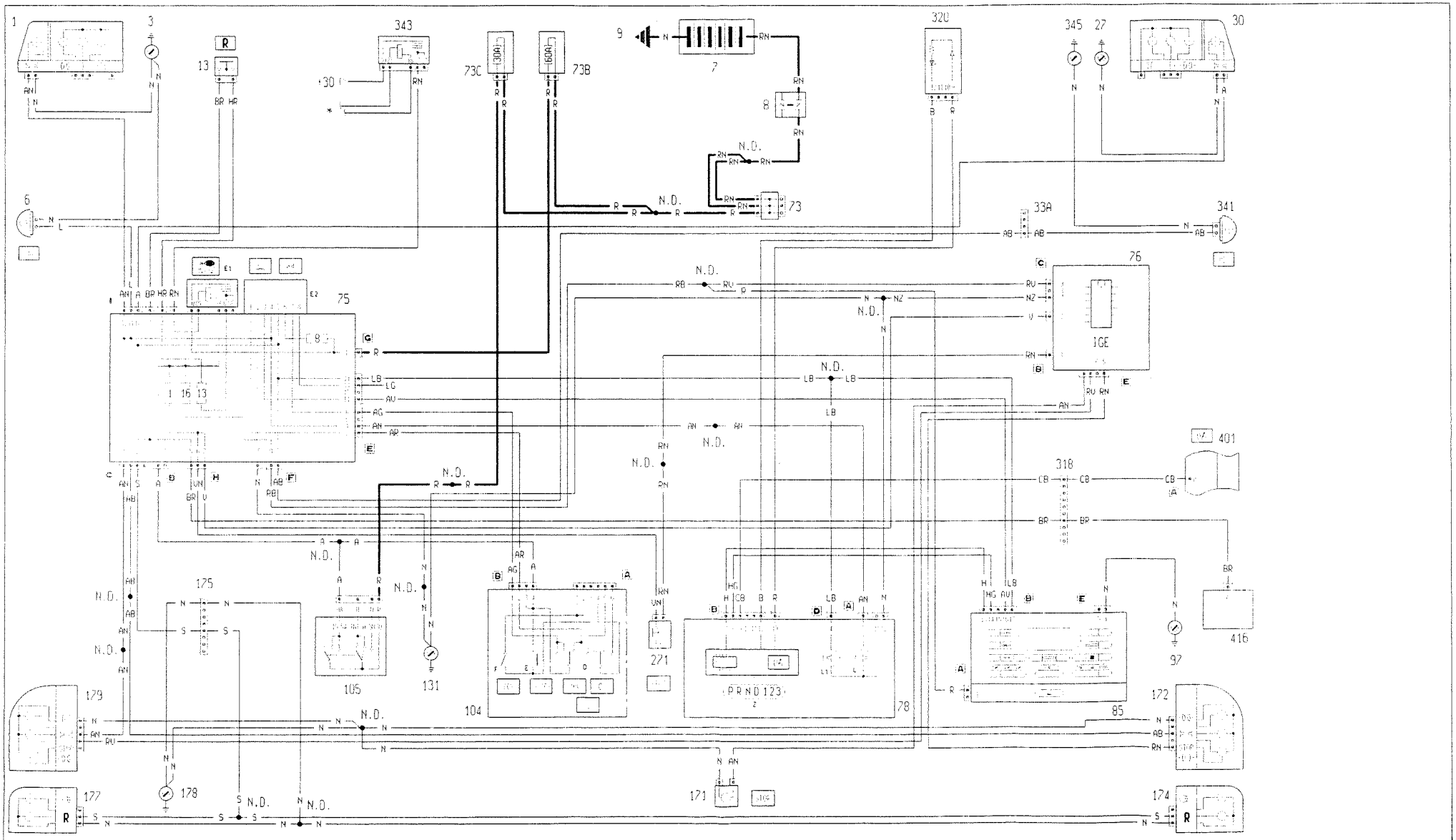
35084PL02

55.

Automatic transmission (Aisin) - (See key at end of diagrams)



Version with automatic transmission
Direction indicators and warning light - Hazard warning lights and warning light - Brake lights - Reversing lights -
(See key at end of wiring diagrams)



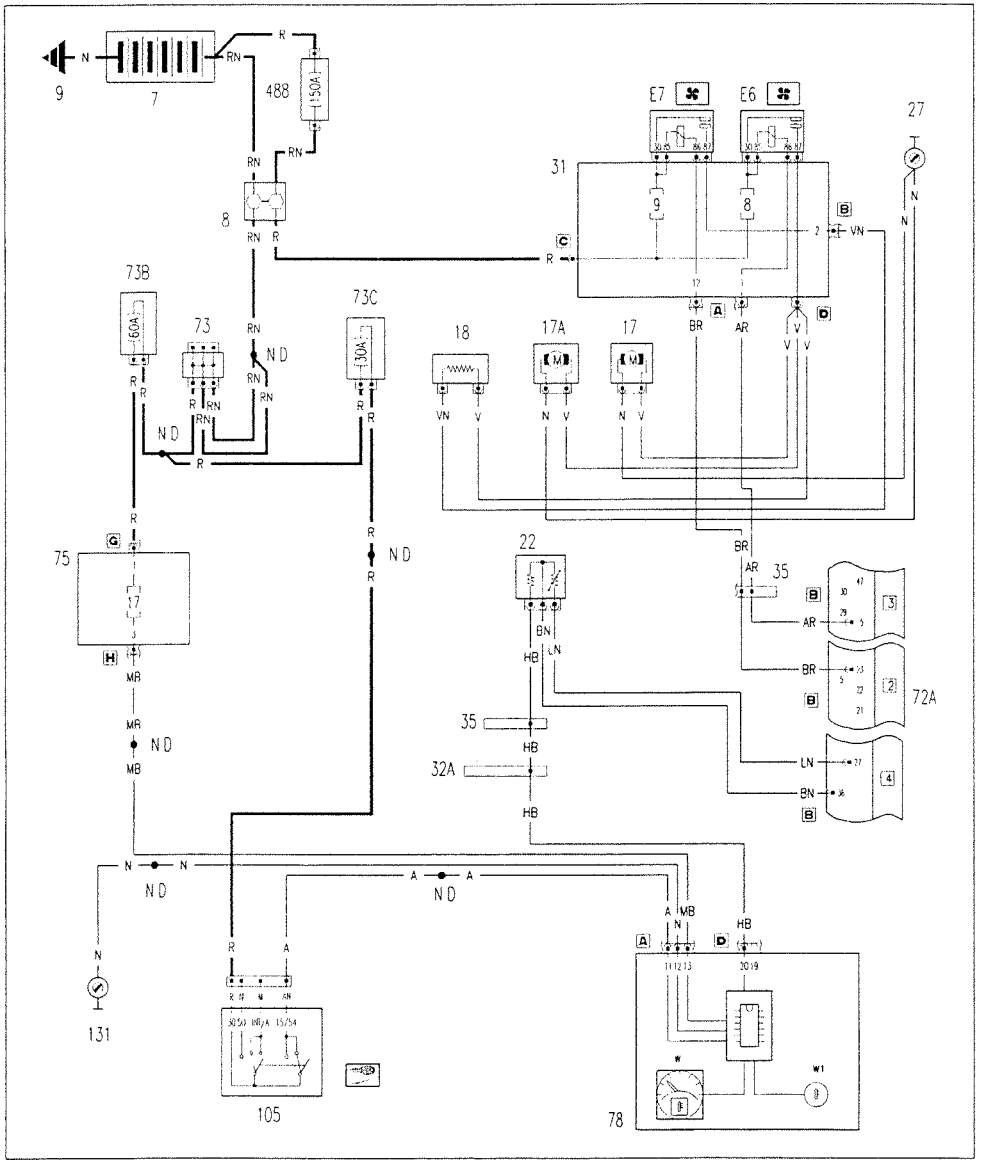
55.

Key to components

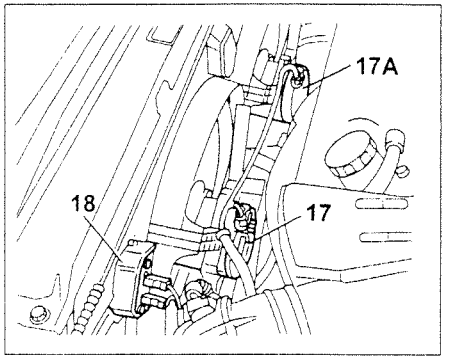
171 Additional stop lights warning light
174 Right rear light cluster on moving part
174 Connection between left longitudinal cable and tailgate cable
177 Left rear light cluster on moving part
178 Left rear earth
307 Automatic transmission horn control switch
318 Connection between electronic automatic transmission cable and dashboard cable
401 Electronic automatic transmission gear selection control unit
413 Connection to solenoids assembly
415 Gear position selector
416 Gear position selector
417 Engine rpm sensor
418 Vehicle speed sensor
420 Gearbox oil temperature sensor

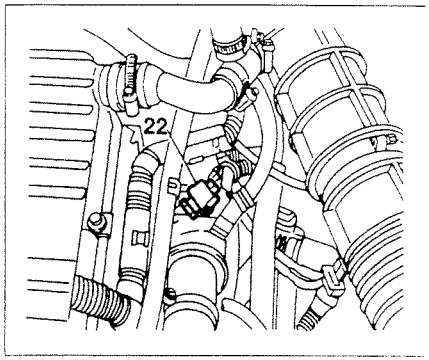
Components not present in the complete key

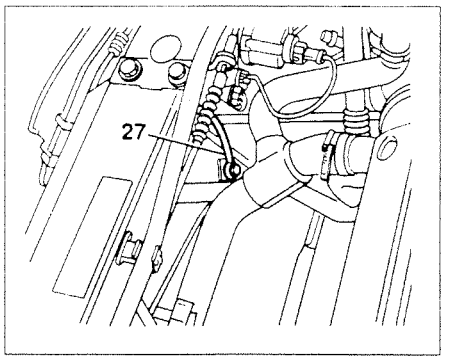
TD version with air conditioning
Engine cooling – Engine coolant temperature gauge and overheating warning light – (See key at end of wiring diagrams)

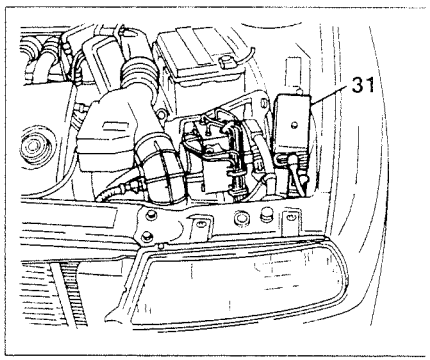


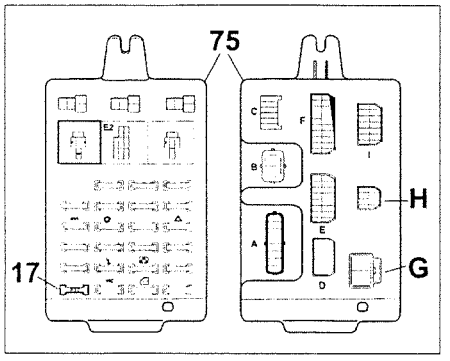
Component location

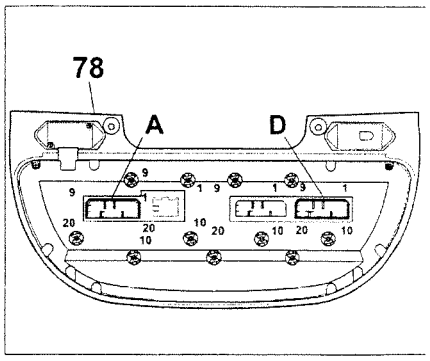


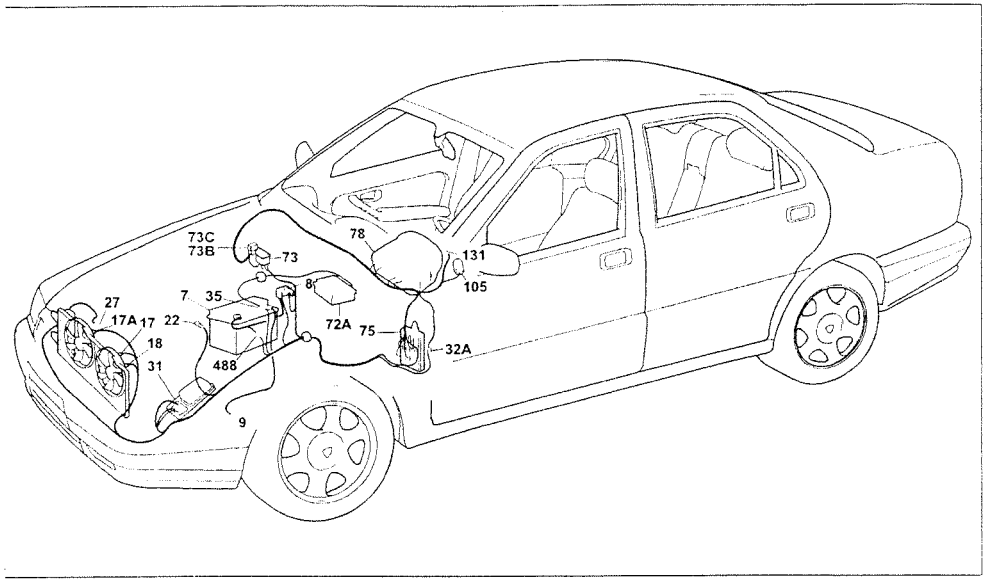










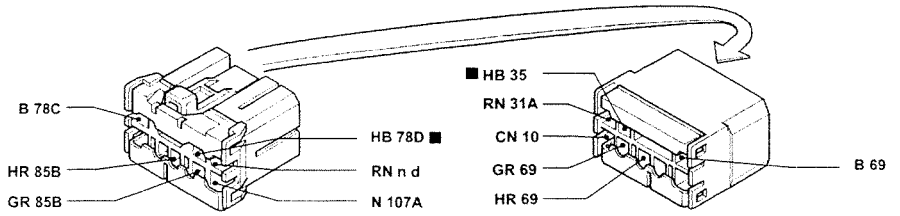


Version with air conditioning
Engine cooling – Engine coolant temperature gauge and overheating warning light

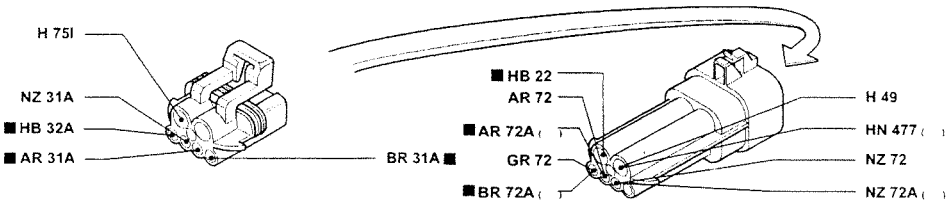
Component key

7 Battery
8 Main connector block
9 Earth on bodyshell
17 1stengine cooling fan
17A 2nd engine cooling fan
18 Engine cooling fan resistance
22 Engine coolant temperature sender unit
27 Right front earth
31 Peripheral control unit (engine compartment)
E6 Engine cooling fan high speed relay
E7 Engine cooling fan low speed relay
32A Connection between dashboard and left engine compartment cables
35 Connection between engine compartment and electronic injection cables
72A Fuel pump electronic control unit
73 Secondary connector block
73B 60A fuse protecting I G E control unit / junction unit
73C 30A fuse protecting ignition switch
74 80A fuse protecting peripheral control unit (engine compartment)
75 Junction unit (dashboard)
78 Instrument panel
W Engine coolant temperature gauge
W1 Engine coolant overheating warning light
105 Ignition switch
131 Earth on steering column support
488 150A maxifuse

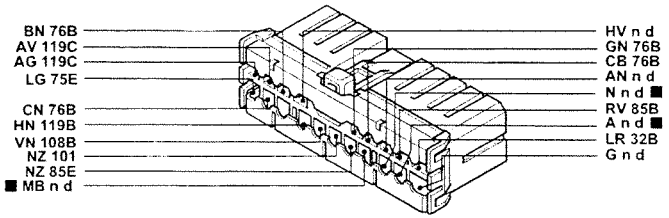
32A Connection between dashboard and left engine compartment cables



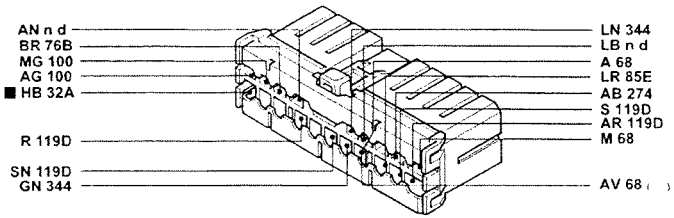
35 Connection between engine compartment and electronic injection cables



78A Instrument panel

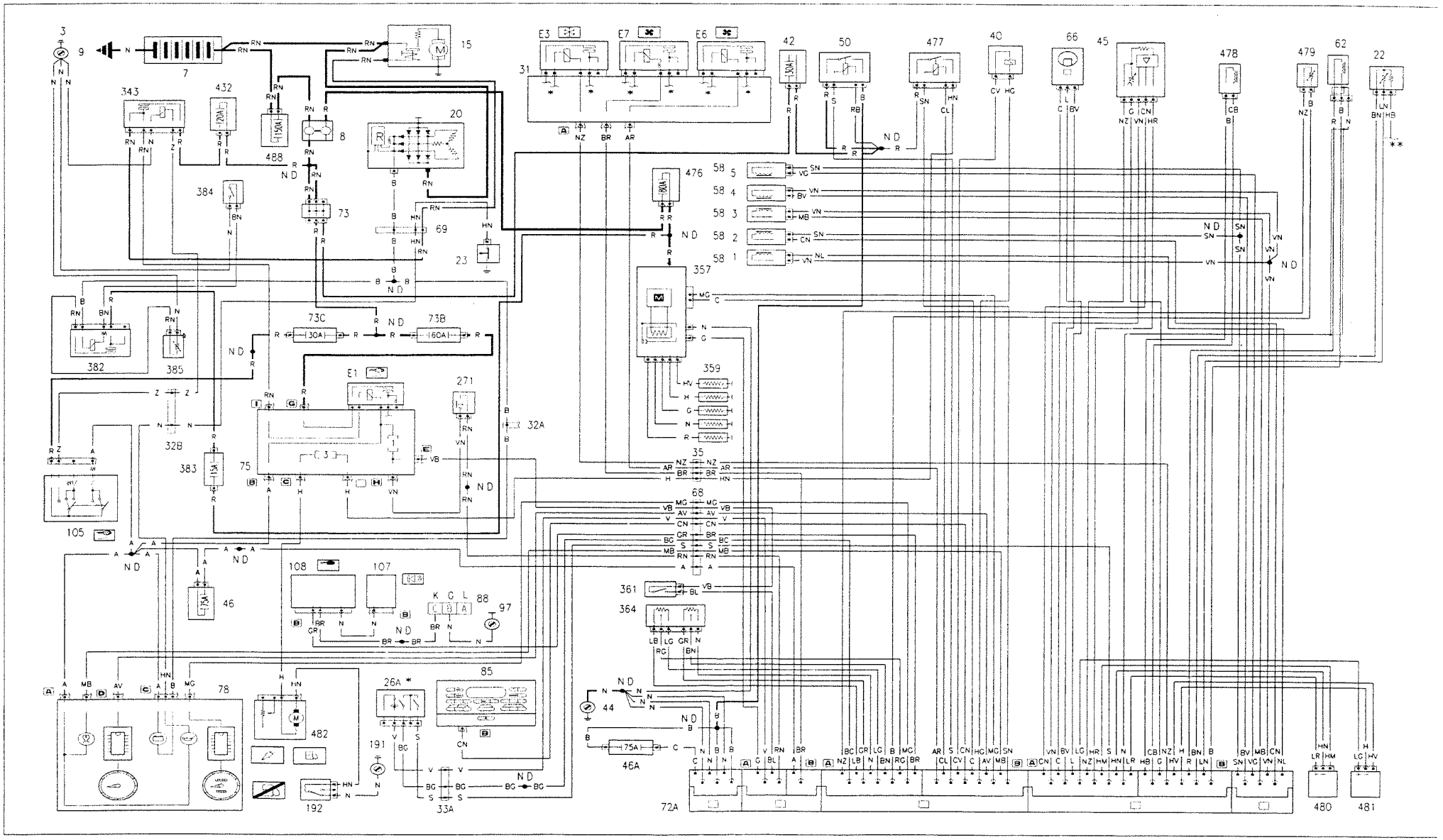


78D Instrument panel



■ The cables in the wiring diagram are marked by a square

Starting – Diesel injection pressure pump electronic control unit – Recharging and warning light – Insufficient engine oil pressure warning light – Injection system failure warning light – Heater plugs control unit and warning light



See air conditioning wiring diagram

See engine cooling wiring diagram

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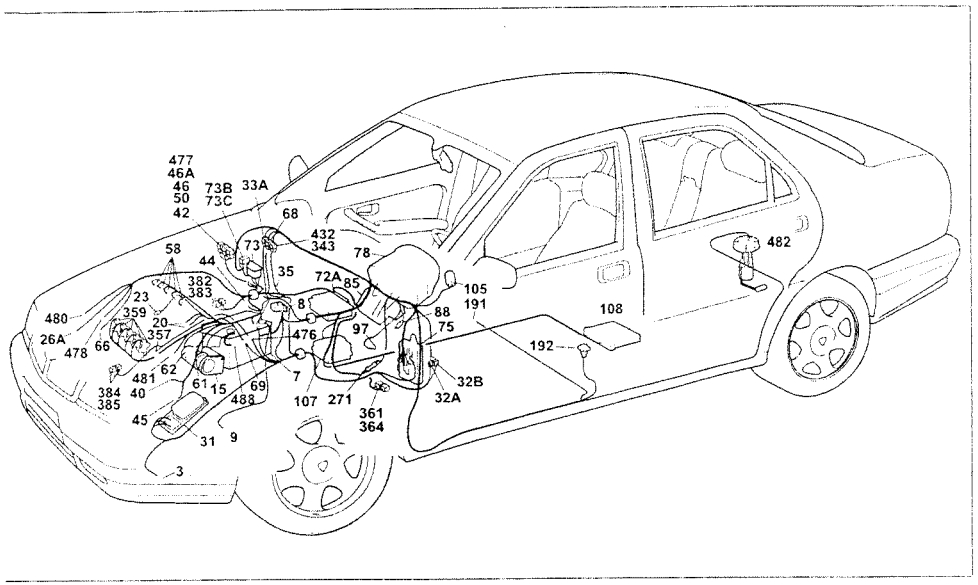


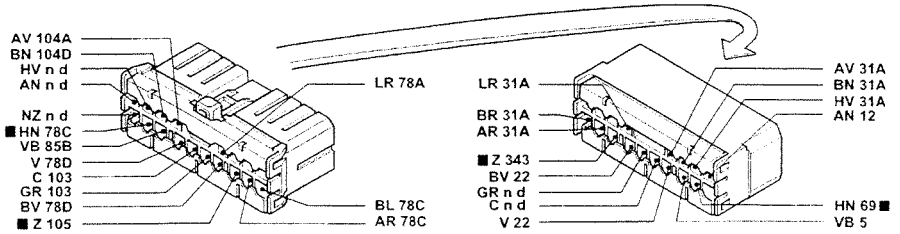
2387 JTD version

Starting – Diesel injection pressure pump electronic control unit – Recharging and warning light – Insufficient engine oil pressure warning light – Injection system failure warning light – Heater plugs control unit and warning light

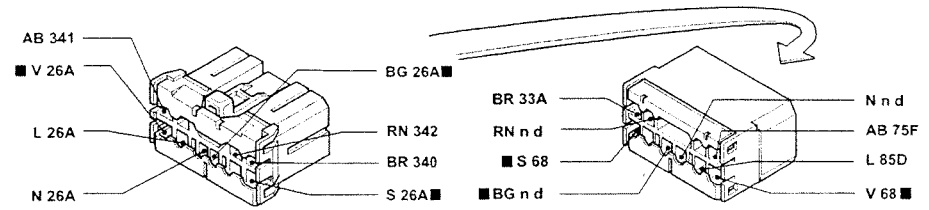
Component key

3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
12 Insufficient brake fluid level sensor
20 Alternator
22 Engine coolant temperature sender unit
23 Minimum engine oil pressure sensor
26 Three stage pressure switch
26A Four stage pressure switch
31 Peripheral control unit (engine compartment)
E1 Relay feed
E4 Main beam headlamps relay feed
E6 Engine cooling fan high speed relay feed
E7 Engine cooling fan low speed relay feed
32A Connection between dashboard and left engine compartment cables
32B Connection between dashboard and left engine compartment cables
33A Connection between dashboard and right engine compartment cables
35 Connection between engine compartment and electronic injection cables
68 Connection between dashboard housing and electronic injection cables
69 Engine services cables connection
72A Fuel pump electronic control unit
73 Secondary connector block
73B 60A fuse protecting I G E control unit/junction unit
73C 30A fuse protecting ignition switch
75 Junction unit (dashboard)
76 I G E control unit
78 Instrument panel
85 Infocenter control unit
88 Diagnostic socket
96 Earth on carrier
97 Earth on floor
100 Connection between dashboard and right longitudinal cables
101 Light dimmer
105 Ignition switch
108 LANCIA CODE control unit
117 Switch signalling handbrake applied
119C Connection between dashboard and right longitudinal cables
119D Connection between dashboard and right longitudinal cables
127 Switch signalling seat belts not fastened
131 Earth on steering column support
183 Relay for driver s side heater pad
184 Relay for driver s side heater pad
198 Servotronik electronic control unit
200 Controlled damping suspension electronic control unit
274 Connection between dashboard and air bag cables
275 Air Bag control unit
302 Switch control unit
315 Electronic automatic transmission gear selector control unit
318 Connection between electronic automatic transmission and dashboard cables
320 Trim on electronic automatic transmission gear selector lever
344 Connection between dashboard and anti lock brakes cables
401 Electronic automatic transmission gear selector control unit
430 Diode connecting handbrake system/insufficient brake fluid level
482 Fuel pump/Fuel gauge
488 150A maxifuse
N D Ultrasound welding taped in cable loom

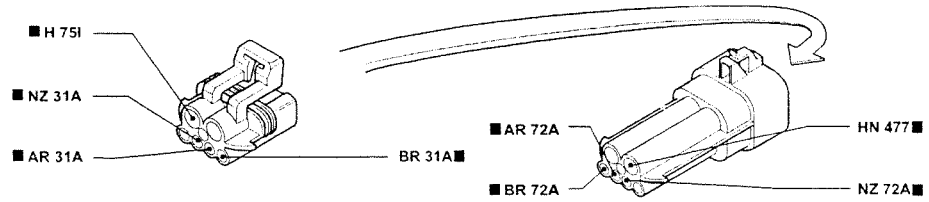
32B Connection between dashboard and left engine compartment cables



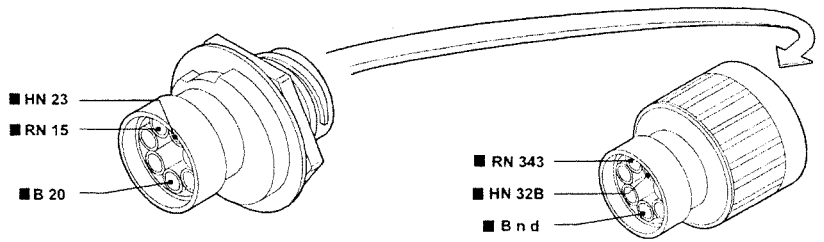
33A Connection between dashboard and right engine compartment cables



35 Connection between engine compartment and electronic injection cables

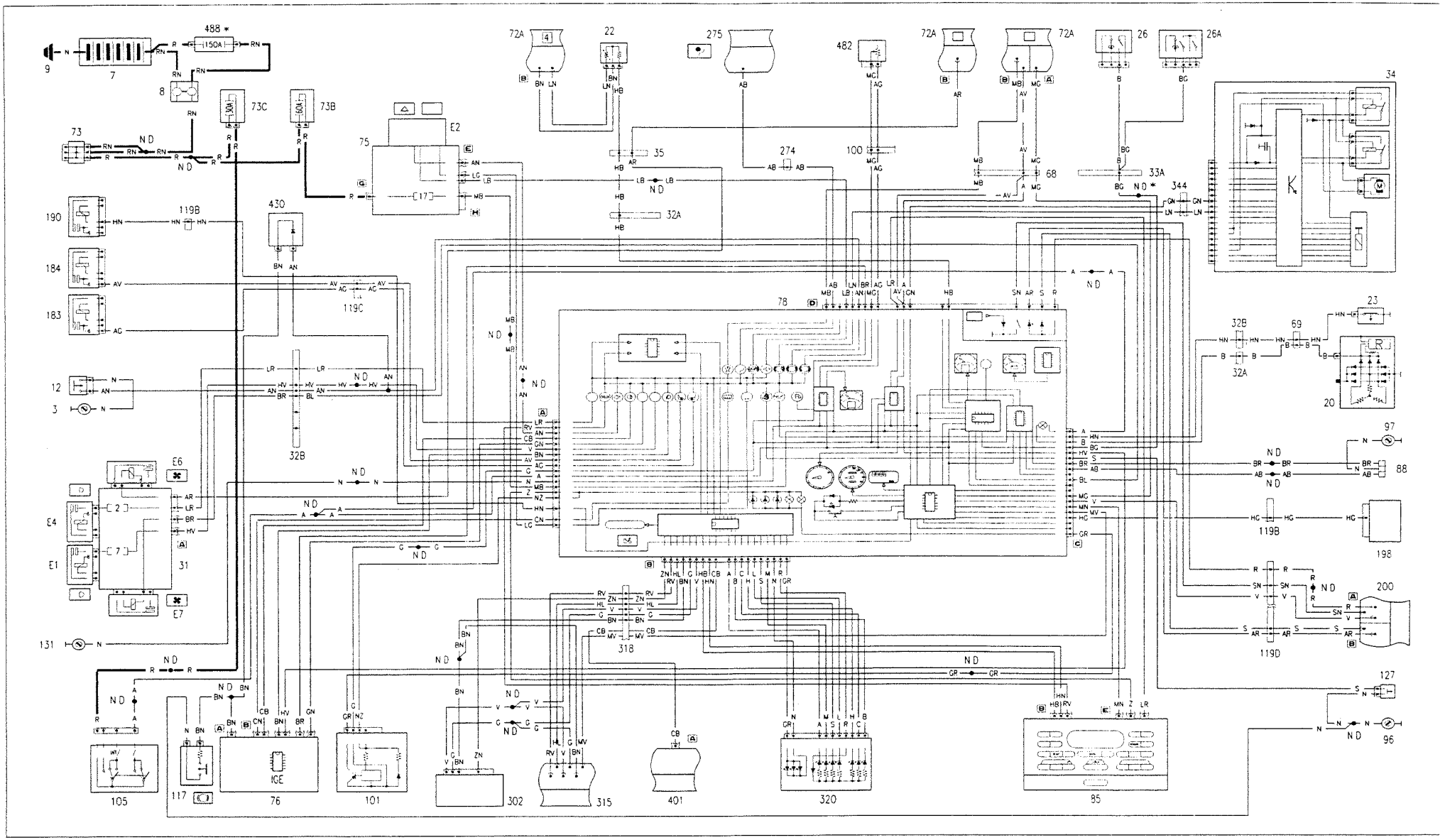


69 Engine services cable connection



■ The cables in the wiring diagram are marked by a square

Instrument panel connections



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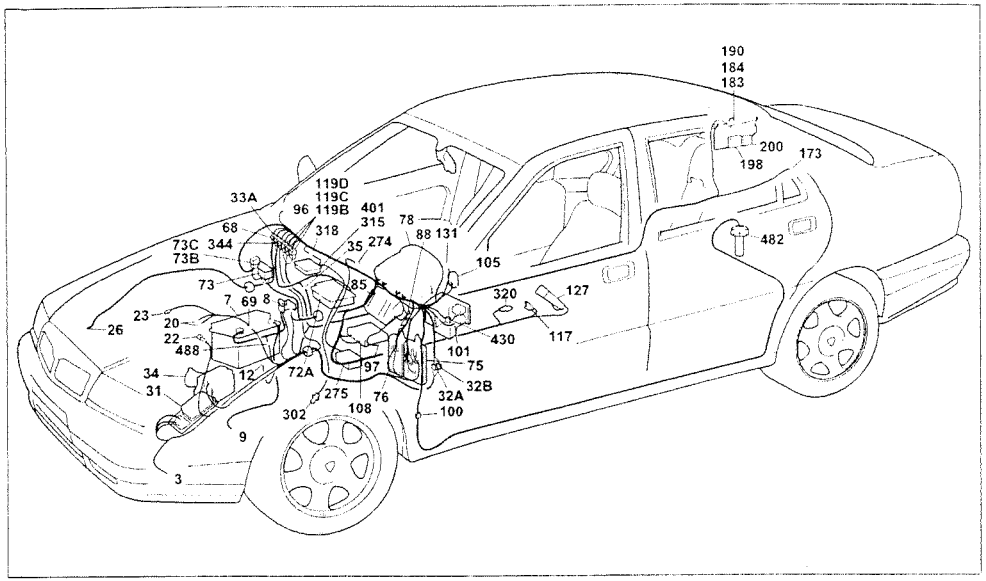


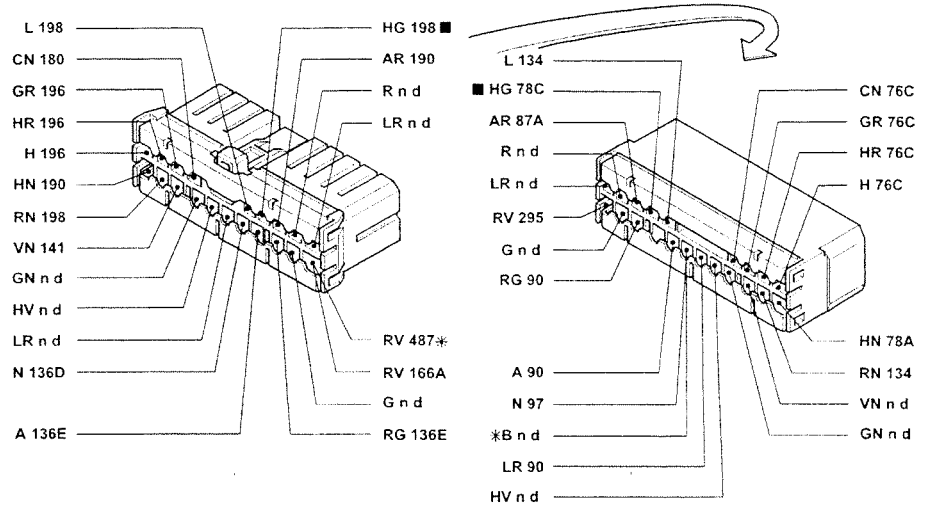
Diesel version
Instrument panel connections

Component key

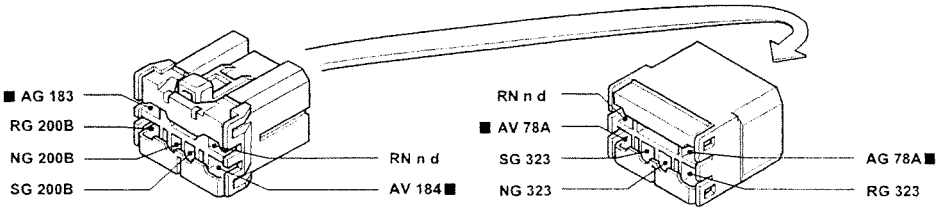
3 Left front earth
7 Battery
8 Main connector block
9 Earth on bodyshell
15 Starter motor
20 Alternator
23 Minimum engine oil pressure sensor
26A Four stage pressure switch
31 Peripheral control unit (engine compartment)
E3 Compressor coupling relay feed
E6 Engine cooling fan high speed relay feed
E7 Engine cooling fan low speed relay feed
32A Connection between dashboard and left engine compartment cables
32B Connection between dashboard and left engine compartment cables
33A Connection between dashboard and right engine compartment cables
35 Connectino between engine compartment and electronic injection cables
40 E G R solenoid valve
42 30A fuse protecting electronic injection
44 Power earth
45 Air flow meter
46A 7 5A fuse protecting electronic injection
50 Electronic injectino system relay feed
58 Injectors
61 Electronic injection engine coolant temperature sensor
62 Rpm sensor
66 Timing sensor
68 Connection between dashboard and electronic injection cables
69 Engine services cables connection
72A Fuel pump electronic control unit
73 Secondary connector block
73B 60A fuse protecting I G E control unit/junction unit
73C 30A fuse protecting ignition switch
75 Junction unit (dashboard)
E1 Switch discharge relay
78 Instrument panel
K Battery recharging warning light
M Insufficient engine oil pressure warning light
S Heater plugs warning light
U Electronic rev counter
Y Electronic speedometer
85 Infocenter control unit
88 Diagnostic socket
97 Earth on floor
105 Ignition switch
107 Alarm control unit
108 LANCIA CODE control unit
191 Inertia switch earth
271 Brake lights switch
343 40A starter relay
357 Heater plugs control unit
359 Heater plugs
361 Switch on clutch pedal
364 Potentiometer on accelerator pedal
382 Heated diesel filter relay feed (P T C)
383 15A fuse protecting heated diesel filter (P T C)
384 Heated diesel filter thermal contact (P T C)
385 Heated diesel filter resistance (P T C)
432 20A fuse protecting ignition switch relay feed
476 80A fuse protecting heater plugs control unit
477 Fuel pump relay
478 Fuel pressure regulator
479 Fuel temperature sensor
480 Fuel pressure regulator
481 Fuel pressure sensor
482 Fuel pump/fuel gauge
488 150A maxifuse

N D Ultrasound welding taped in cable loom

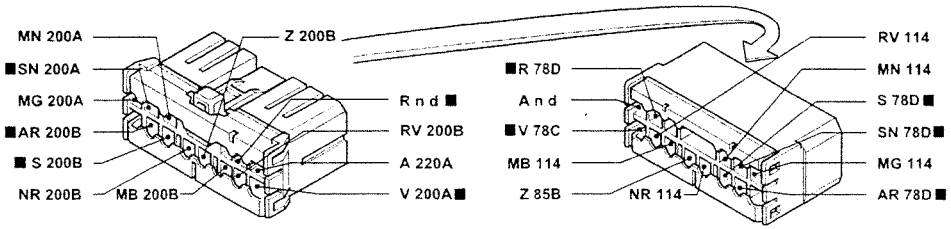
119B Connection between dashboard and right longitudinal cables



119C Connection between dashboard and right longitudinal cables



119D Connection between dashboard and right longitudinal cables



■ The cables in the wiring diagram are marked by a square

Component key

171 Additional brake lights warning light
174 Right rear light cluster on moving section
177 Left rear light cluster on moving section
178 Left rear earth
307 Automatic transmission acoustic warning cotnrol switch
318 Connection between electronc automatic transmission and dashboard cables
401 Electronic automatic transmission gear selector control unit
413 Connection to the solenoid valve unit
415 Gear selector position
416 Gear selector position
417 Engine rpm sensor
418 Vehicle speed sensor
420 Transmission fluid temperature sensor

Components not present in complete key

Components key

1 Left front light cluster
3 Left front earth
3A Left front earth for anti-lock brakes (A.B.S.)
5 Left front brake pad wear sensor

6 Left side direction indicator
7 Battery
8 Main connector block
9 Earth on bodyshell
9A Earth on side panel for anti-lock brakes (A.B.S.)
10 Button on bonnet lid for engaging anti-theft device
11 Compressor coupling for air conditioning
12 Insufficient brake fluid level sensor

13 Reversing lights switch
15 Starter motor
16 Spark plugs
17 1st Engine cooling fan
18 Engine cooling fan speed resistance

19 Sensor on left front wheel for anti-lock brakes (A.B.S.)
19A Connection between anti-lock brake (A.B.S.) cable and sensor on left wheel

20 Alternator
21 Minimum engine oil level sensor

22 Engine coolant temperature sender unit

23 Sensor signalling minimum engine oil pressure
26A Four stage pressure switch
27 Right front earth
30 Right front light cluster
31 Peripheral control unit (engine comp.)
E1 Dipped headlamps relay feed
E2 Horn relay feed

E3 Compressor coupling relay feed
4 Main beam headlamps relay feed
5 Fog lights relay
E6 Engine cooling fan high speed relay feed

E7 Engine cooling fan low speed relay feed

32A Connection between dashboard and left engine compartment cables
32B Connection between dashboard and left engine compartment cables
33A Connection between dashboard and right engine compartment cables
34 Anti-lock brakes electro-hydraulic control unit (A.B.S.)
35 Connection between engine compartment and electronic injection cables
36 Heated Lambda sensor
38 Earth for electronic injection
41 Petrol vapour cut out solenoid valve
44 Power earth
45 Air flow meter
47 Sensor on right front wheel for anti-lock brakes (A.B.S.)
47A Connection between anti-lock brakes (A.B.S.) cable and sensor on right wheel
49 Electric fuel pump and heated Lambda sensor relay feed
52 Ignition coil
53 Ignition coil
54 Ignition coil
55 Ignition coil
56 Ignition coil
57 Ignition coil
58 Injectors
59 1st Detonation sensor
60 2nd Detonation sensor
61 Engine coolant temperature sensor for electronic injection
62 Rpm sensor
66 Timing sensor
67 Electronic injection cables connection
68 Connection between dashboard and electronic injection cables
69 Engine services cable connection
72 Fuel injection control unit
73 Secondary connector block
73A 80A fuse protecting rear services
73B 60A protective fuse for I.G.E. control unit / junction unit
73C 30A fuse protecting ignition switch / anti-theft device
74 80A fuse protecting peripheral control unit (engine compartment)
75 Junction unit (dashboard)
E1 Ignition discharge relay
E2 Intermittent device for direction indicators / hazard warning lights
E3 Timer for headlamp washer
76 I.G.E. control unit
77 10A fuse protecting anti-lock brakes (A.B.S.)
78 Instrument panel
A Trailer direction indicator warning light
A1 Cruise control warning light
B Driver's side heated seat warning light
B1 Passenger's side heated seat warning light
C Heated rear windscreen warning light
D Fog lights warning light
E Rear fog lamps warning light
F Side lights warning light
F1 Instrument panel light bulbs
G Dipped headlamps warning light
H Main beam headlamps warning light
I Check summary warning light
J Seat belts not fastened warning light
K Battery recharging warning light
M Insufficient engine oil pressure warning light
N Handbrake/I.G.E. control unit warning light
O Insufficient brake fluid level warning light
P Anti-lock braking system failure warning light (A.B.S.)
T Voltmeter
U Electronic rev counter
V Fuel gauge
V1 Fuel reserve warning light
X Milometer/trip meter
X1 LANCIA-CODE failure warning light
Y Electronic tachometer
Y1 S.C.S. switch unit
W Water temperature gauge
W1 Engine coolant overheating warning light
Z Electronic automatic transmission gear selection display
Z1 Trip computer zeroing button
80 Power earth on dashboard
81 Climate control fan (Brushless)
82 Air recirculation motor
84 Single stage pressure switch (3000 i.e.)
85 Infocenter control unit
88 Diagnostic socket
89 Left rear view mirror
A Motor for folding left rear view mirror
B Motor for vertical adjustment of left rear view mirror
C Motor for horizontal adjustment of left rear view mirror
D Left rear view mirror heating resistance
90 Connection between dashboard and left front door cables
95 Left front central locking geared motor and signalling of left front door open and anti-theft device on
96 Earth on carrier
97 Earth on floor
100 Connection between dashboard and left longitudinal cables
101 Light dimmer
102 Exterior lights control unit
B Control switch for side lights / number plate lights
C Control switch for dipped beam headlamps / main beam headlamps
D Parking lights control switch
E Ideogram lights control switch
104 Steering column switch unit
D Switch for direction indicators / parking lights
E Main beam headlamps flasher button
F Main beam headlamps control switch
104G Switch for rearscreen wash/wipe
105 Ignition switch
106 Immobilizer aerial
107 Anti-theft control unit
108 Immobilizer control unit
109D Distribution / mixture motor
109M Distribution / mixture motor
110 Vehicle interior air temperature sensor
111 Mixed air sensor 1
112 Mixed air sensor 2
113 Solar temperature sensor
117 Switch signalling handbrake applied
119A Connection between dashboard and right longitudinal cables
119B Connection between dashboard and right longitudinal cables
119C Connection between dashboard and right longitudinal cables
119D Connection between dashboard and right front door cables
120 Connection between dashboard and right front door cables
126 Right front central locking geared motor and signalling of right front door open and anti-theft device on
127 Switch signalling seat belts not fastened
128 Timer for front courtesy light
129 Electrically operated sun roof end of travel switch
130 Electrically op. sun roof control button
131 Earth on steering column support
137 Tailgate lock assembly
A Luggage comp. courtesy light switch and engagement of anti-theft device
B Tailgate locking/unlocking motor

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141 Connection between right longitudinal and right rear door cables
146 Right rear door central locking geared motor and signalling of right rear door open and anti-theft device on
150 Connection between left longitudinal and left rear door cables
155 Left rear door central locking geared motor and signalling of left rear door open and anti-theft device on
170 Right rear courtesy light
172 Right rear light cluster on fixed section
173 Right rear earth
175 Connection between left longitudinal and tailgate cables
176 Geared motor for locking / unlocking luggage compartment tailgate
178 Left rear earth
179 Left rear light cluster on fixed section
182 Rear connector block
183 Relay for driver's seat heater pad
183A 7.5A fuse protecting driver's heated pad relay
184 Relay for passenger seat heater pad
190 Relay for locking / unlocking luggage compartment tailgate
191 Earth for inertia switch
192 Inertia switch
193 Sensor on left rear wheel for anti-lock brakes (A.B.S.)
193A Connection between anti-lock brakes (A.B.S) cable and sensor on left rear wheel
194 Sensor on right rear wheel for anti-lock brakes (A.B.S.)
198A Diagnostic socket
199 Anti-theft device alarm
200 Controlled damping suspension electronic control unit (S.C.S)
266 Infra red receiver for anti-theft device
267 Volumetric sensors for anti-theft device
269 Connection between dashboard and receiver cables
271 Brake lights switch
274 Connection between dashboard and AIR-BAG cables
275 AIR-BAG control unit
297 Alarm device warning light
300 Central locking electronic control unit
301 Solenoid valves
302 Switch control unit
315 Electronic automatic transmission gear selector control unit (ZF)
316 Diagnostic socket for electronic automatic transmission
317 Connection between electronic auto. trans. and electronic injection cables
318 Connection between electronic automatic transmission and dashboard cables
320 Trim on automatic transmission gear selector lever with anti-lock brakes cable (A.B.S.)
334 Connection between electronic injection cable and injector bridge
340 Right front brake pad wear sensor
341 Right side direction indicator
343 40A starter relay
344 Connection between dashboard and anti-lock brakes cables (A.B.S.)
345 Right front earth
374 Diagnostic socket for anti-lock braking system (A.B.S.)
377 Phase transformer
422 Connection between dashboard and left longitudinal cables
430 Connecting diode for handbrake applied/insufficient brake fluid level system
431 Direction indicators operation when doors are locked
432 20A protective fuse ignition switch relay feed
434 15A fuse protecting current socket
435 Current socket relay feed
436 Current socket
482 Electric pump/fuel gauge
488 150A maxi fuse
499 Sensor on accelerator pedal
500 Diagnostic connector
501 Cables connection for automatic transmission sensors
502 7.5 fuse protecting Fiat-CODE
503 Connection between A.B.S. control unit cable and automatic transmission
504 30A fuse protecting electronic injection control unit
505 Cruise Control control unit
506 15A fuse protecting electronic injection system
507 Injection system relay feed
508 Motorized actuator on butterfly casing
509 15A fuse protecting electronic injection system
510 30A relay for infocenter control unit/ electronic injection control unit
511 Relay for fuel pump
512 Potentiometer on accelerator pedal
513 Phase transformer injector
514 Switch on clutch
515 Diode for signal inversion
516 Side Bag control unit
517 Driver's Side Air Bag
518 Passenger Side Air Bag
519 Driver's satellite
520 Passenger satellite
521 Rain gutter connection with engine compartment cable

N.D. Welding taped in cable loom

Cable colour code

A	Light blue
B	White
C	Orange
G	Yellow
H	Grey
L	Blue
M	Brown
N	Black
R	Red
S	Pink
V	Green
Z	Violet
AB	Light blue-White
AG	Light blue-Yellow
AN	Light blue-Black
AR	Light blue-Red
AV	Light blue-Violet
BG	White-Yellow
BL	White-Blue
BN	White-Black
BR	White-Red
BV	White-Green
BZ	White-Violet
CA	Orange-Light blue
CB	Orange-White
CN	Orange-Black
GN	Yellow-Black
GL	Yellow-Blue
GR	Yellow-Red
GV	Yellow-Green
HG	Grey-Yellow
HN	Grey-Black
HR	Grey-Red
HV	Grey-Green
LB	Blue-White
LG	Blue-Yellow
LN	Blue-Black
LR	Blue-Red
LV	Blue-Green
MB	Brown-White
MN	Brown-Black
NZ	Black-Violet
RB	Red-White
RG	Red-Yellow
RN	Red-Black
RV	Red-Green
SN	Pink-Black
VB	Green-White
VN	Green-Black
VR	Green-Red
ZB	Violet-White