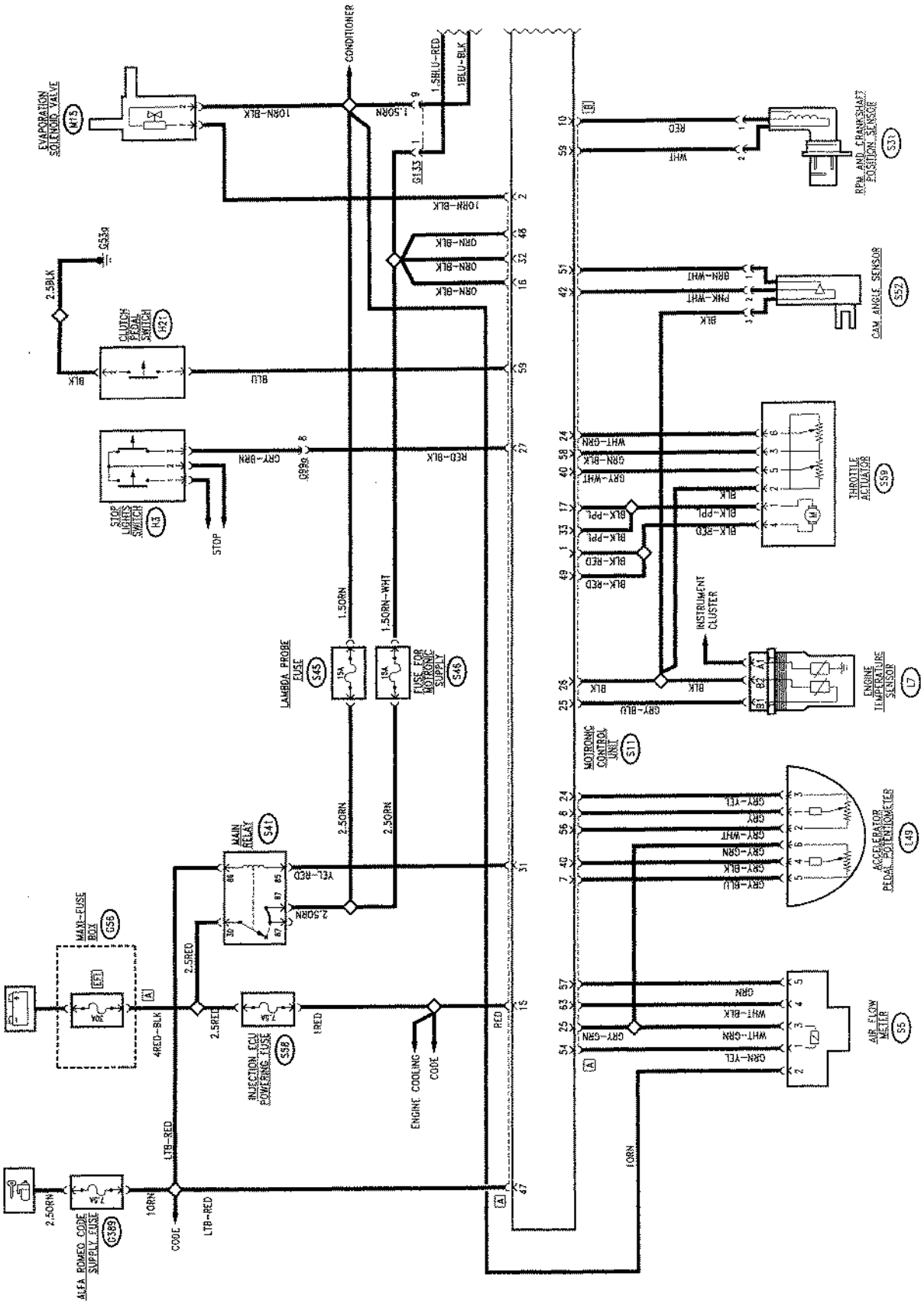
INJECTION/IGNITION SYSTEM
MOTRONIC ME3.1
3.0 V6 24 V Engine

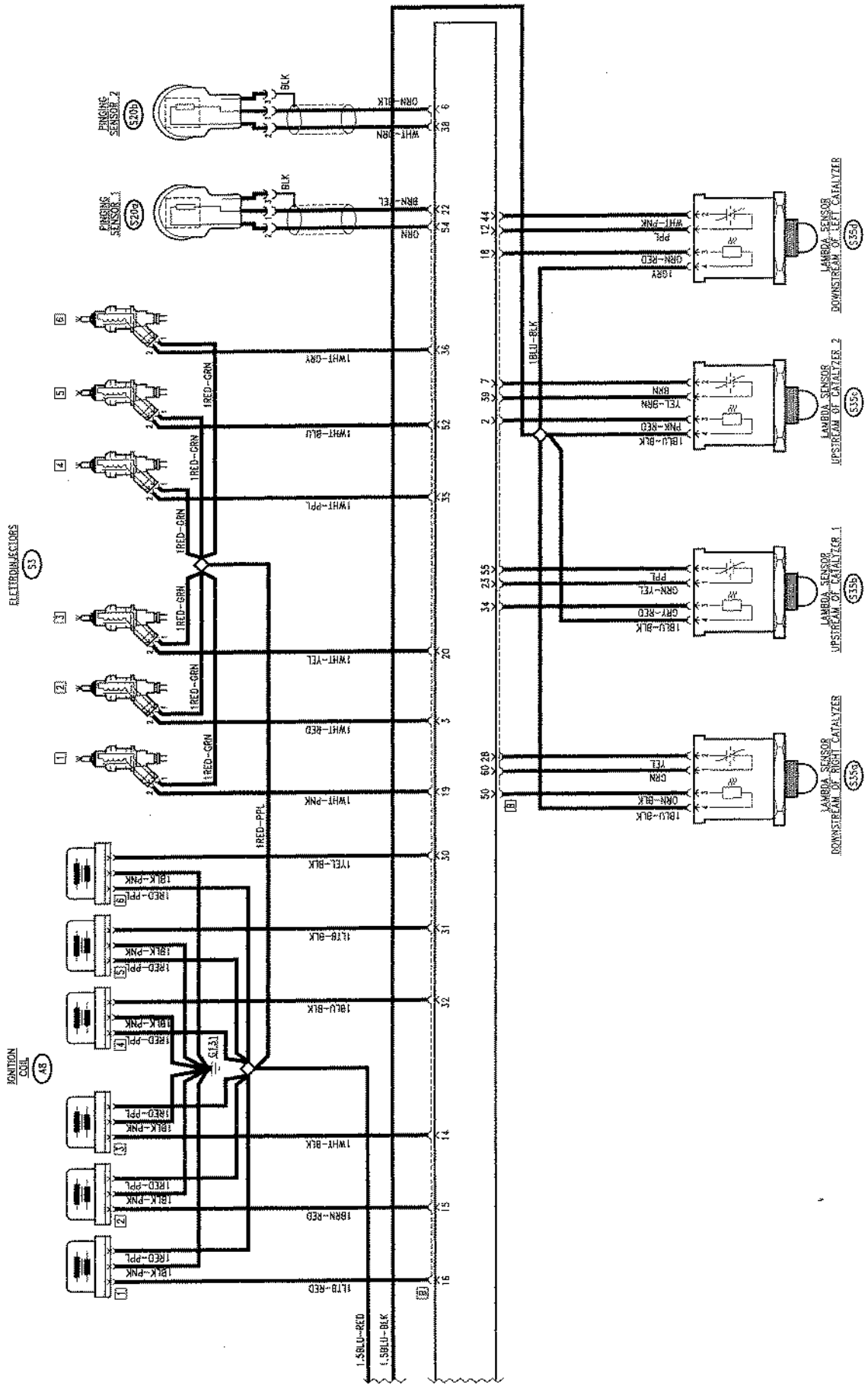
INDEX

WARNING:
the new MOTRONIC ME3.1 EURO3 version replaces the previous version (up to September 2000).

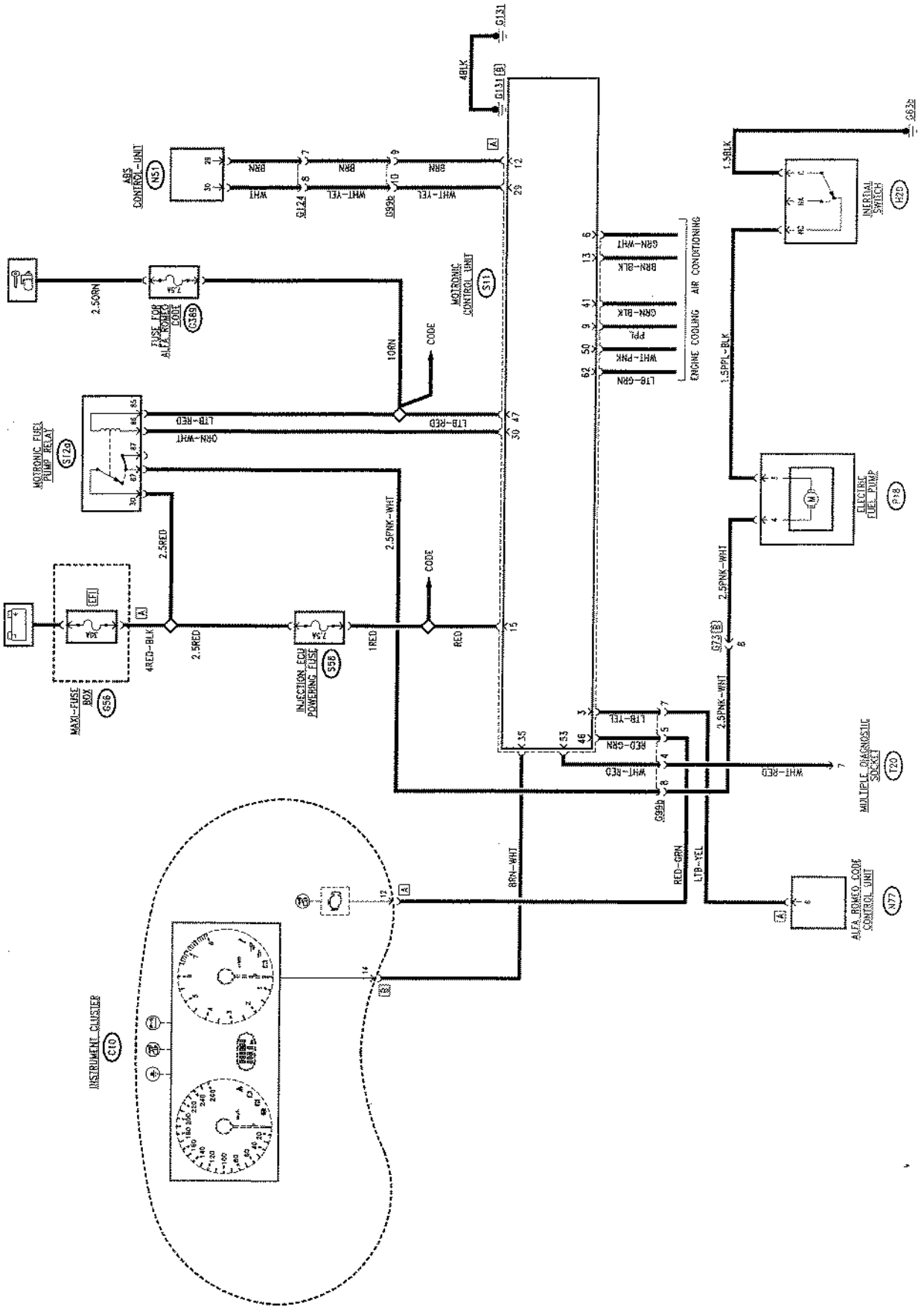
WIRING DIAGRAM A



WIRING DIAGRAM B



WIRING DIAGRAM C



GENERAL DESCRIPTION

The **3.0 V6 24V** engine is a 6 cylinder engine in a 60° V formation, with 24 valves, a twin camshaft for each head and a motorized throttle casing.

The entire system is managed by an integrated electronic injection/ignition system the **Bosch Motronic ME3.1 EOBD**.

The Bosch Motronic ME3.1 system with a motorized throttle belongs the category of integrated systems:

– ignition

– sequential and phased electronic injection.

The control unit controls the idle air flow rate set through the electronic throttle.

The control unit controls the moment of ignition with the advantage of keeping the engine running smoothly as the environmental parameters and loads applied vary.

The control unit controls and manages the injection so that the air/fuel ratio is always sufficiently close to the stoichiometric value to maximize the conversion efficiency of the catalyzers. In full power and high usage conditions, the mixture is enriched to ensure maximum performance.

The main functions of the system are, basically, as follows:

– self-learning;

– self-adjustment of the system;

– autodiagnosis;

– recognition of the Alfa Romeo CODE (immobilizer);

– control of cold starting;

– control of combustion - Lambda sensor;

– control of detonation;

– control of mixture enrichment during acceleration;

– fuel cut off with accelerator pedal released;

– fuel vapour recovery;

– control of the maximum rpm;

– control of the fuel pump;

– connection with the climate control system;

– recognition of the position of the cylinders;

– control of the optimum injection time for each cylinder;

– adjustment of the ignition advances;

– management of idle speed (also dependent on battery voltage);

– control of the fans;

– connection with the ABS control unit;

– connection with the instrument panel.

– fuel system dignosis;

– catalyzer diagnosis;

– detection of misfire;

– Lambda sensors diagnosis.

Injection system

The essential conditions that must always be satisfied in the preparation of the air/fuel mixture for the smooth running of controlled ignition engines are, in the main:

– the metering (air/fuel ratio) should be kept as close as possible to the stoichiometric value in order to ensure the maximum conversion capacity of the catalytic converter (max efficiency).

– the homogeneity of the mixture, composed of fuel dispersed in the air as finely and evenly as possible.

The information that the control unit processes for controlling the optimum metering is received through electrical signals transmitted by the:

– air flow meter and air temperature sensor, for the exact quantity of intake air

– rpm sensor, which produces an alternating, single phase signal whose frequency indicates the engine speed

– throttle potentiometer, to recognize the conditions requested by the driver.

– coolant temperature sensor on the thermostat

– Lambda sensors to determine the oxygen content of the exhaust gases.

There are two Lambda sensors in the exhaust system (one per main bearing) at the pre-catalyzer intake. There are also two other Lambda sensors, downstream of the catalyzers, for determining the efficiency of the catalyzers and for correcting the injection times for the two main bearings, over a period of time, in order to ensure the maximum conversion efficiency of the catalyzers.

Ignition system

The ignition system is the static advance, inductive discharge type (i.e. with no High Tension distributor) with the power modules inside the injection control unit.

In this system, there is a single coil for each spark plug (SINGLE COIL); The advantages of this solution are:

– less electrical overload;

– guarantee of constant discharge at each spark plug.

There is a map stored in the control unit memory containing the entire set of optimum ignition advance values (for each cylinder during the explosion stroke) that the engine can use according to the engine speed and load requirements.

The control unit corrects the advance value mainly based on the following:

– Engine coolant temperature

– intake air temperature

– detonation.

The information that the control unit processes to operate the coils is received by means of electrical signals sent by the:

– air flow meter and air temperature sensor, for the exact quantity of intake air

– rpm sensor, which produces an alternating, single phase signal whose frequency indicates the engine speed

– detonation sensors (on the top part of the cylinder block/crankcase between the two heads) for recognizing the cylinder where there is detonation and correcting the ignition advance

– throttle potentiometer, for recognizing the minimum load, partial load and full gas conditions

– timing sensor.

The control unit uses the rpm signal for recognizing any possible misfire which could damage the catalyzers.

For further details see the "EOBD VEHICLE EMISSION CONTROL SYSTEMS ON BOARD DIAGNOSIS" publication (No. 507135).

FUNCTIONAL DESCRIPTION

The engine management control unit **S11** controls and regulates the entire electronic injection and ignition system.
The direct supply for the system arrives from the battery from the line for maxifuse EFI of **G56A**.
The supply controlled by the ignition arrives from the line protected by fuse **S58**.
The control unit **S11** is supplied directly by the battery at pin 15 of connector A. The ignition-controlled supply, on the other hand, reaches pin 47 of connector A via the line protected by fuse **G389**.
The main relay **S41** controls the entire system: it is energized by a control signal (earth) coming from pin 31 of connector A of the control unit **S11** and, as a result, sends the supply:

to pins 16, 32 and 48 of connector A of the actual control unit, to the coils **A8** and to the injectors **S3** via the line protected by fuse **S46**;

to the air flow meter **S5**, to the fuel vapour recovery solenoid valve **M15**, to the variable geometry solenoid valve **S57**, to the phase transformer actuator **S15** and to the Lambda sensors **S35**; (all these lines are protected by fuse **S45**).

The fuel pump relay **S12a** is supplied by the line for MAXIFUSE EFI **G56A**. It is energized by a control signal (earth) coming from pin 30 of connector A of the control unit **S11** and provides the supply for the electric fuel pump **P18**, which is connected to earth via the inertia switch **H20** which, in the case of an impact, interrupts the circuit and prevents a supply of fuel which would be dangerous.

The earth point **G131B**, which is connected to the engine earth **G131** is located on the control unit.

The engine control unit **S11** receives the signals from the different sensors thereby keeping all the engine operating parameters under control.

The rpm sensor **S31**, via a frequency signal sent to pins 10 and 59 of connector B of the control unit **S11**, provides information concerning the engine speed: the intensity of these two signals is extremely low and they are therefore suitably screened.

The timing sensor (cam angle **S52**) is supplied from pin 51 of connector B of the control unit **S11** and sends a signal whose frequency corresponds to the timing at pin 42 of connector B of the actual control unit.

The engine temperature sender unit **L7** receives a reference earth from pin 26 of connector B of the control unit **S11** and provides a signal proportional to the temperature of the engine coolant at pin 25 of connector B of the control unit. The same sender unit also provides the signal for the instrument panel for the warning light (see "Instrument panel").

The four Lambda sensors **S35a**, **S35b**, **S35c** and **S35d** provide the control unit **S11** with information on the correct composition of the air/fuel mixture in three different exhaust positions: two upstream of the pre-catalyzers, two downstream of the main catalyzers.

The sensor **S35a** downstream of the right catalyzer sends the signal to pin 28 of connector B of **S11**, whilst pin 60 provides the reference earth. The sensor **S35a** is heated by a resistance, supplied by the main relay and receives an earth signal from pin 50 of connector B of the control unit **S11**.

The sensor **S35b**, on the right pre-catalyzer, sends the signal to pin 23 of connector B of **S11**, whilst pin 55 provides the reference earth. The sensor **S35b** is heated by a resistance in order to ensure correct operation even when cold. The resistance is supplied by the main relay and receives an earth signal from pin 34 of connector B of the contorl unit **S11**.

The sensor **S35c** on the left pre-catalyzer sends the signal to pin 39 of connector B of **S11**, whilst pin 7 provides the reference earth. The sensor S35c is heated by a resistance, supplied by the main relay and receives an earth signal from pin 2 of connector B of the control unit **S11**.

The sensor **S35d**, downstream of the left catalyzer, sends the signal to pin 44 of connector B of **S11**, whilst pin 12 provides the reference earth. The sensor **S35c** is heated by a resistance, supplied by the main relay, and receives an earth signal from pin 18 of connector B of the control unit **S11**.

The two detonation sensors **S20a** and **S20b** make it possible, via a frequency signal sent to pins 22 and 38 of connector B of the control unit **S11**, to have information on the detonation conditions: they receive a reference earth from pins 54 and 6 of connector B. The intensity of these signals is extremely low and therefore they are suitably screened.

The air flow meter **S5** (supplied by relay **S41**) receives the reference voltage from pin 63 of connector A of the control unit and sends pin 57 of connector A a signal proportional to the air flow rate. There is also an air temperature sensor located inside **S5**: the sensor reference earth is supplied by pin 25 of connector A of **S11**, whilst the air temperature sensor reaches pin 54 of connector A.

The control unit **S11** controls the opening of the individual injectors **S3** through special duty-cycle type signals sent by pins 19 (cyl. 1), 3 (cyl. 2), 20 (cyl. 3), 35 (cyl. 4), 52 (cyl. 5) and 36 (cyl. 6) of connector B of **S11**.

The injectors **S3** receive the go ahead supply for opening the main relay **S41**.

The control unit **S11** also controls the coils **A8** through the control signals (earth) for the coil primary windinngs, whilst the secondary winding sends the impulse to the spark plugs: from pin 14, 15, 16, 31, 30 and 32 of connector B of **S11** for cylinders 1, 2, 3, 4, 5 and 6.

The primary windings for the coils **A8** receive a supply from the relay **S41**.

The fuel vapour recovery solenoid valve **M15** allows the flow of fuel vapours towards the engine intake where they are added to the mixture entering the combustion chamber. The valve **M15**, supplied by the main relay **S41**, is opened by the control unit when the engine is loaded by a duty-cycle type signal from pin 2 of connector A of **S11**.

The throttle casing actuator **S59** is equipped with two integrated potentiometers connected in parallel: it controls the opening of the throttle by means of a stepping motor.

The motor receives a supply from pins 17 and 49 of connector B of **S11**. Pin 33 of connector B sends the supply to the two potentiometers, pin 26 of connector B provides the earth signal for them, whilst pins 24 and 40 of the connector receive the signals arriving from the throttle casing actuator **S59**.

Pin 27 of connector A of **S11** receives the signal coming from the brake lights switch **H3** ("pedal released" signal).

Pin 59 of connector A of **S11** receives an earth signal coming from the clutch pedal switch **H21**.

The control unit **S11** is connected to the ALFA ROMEO CODE control unit at pin 6 of **N77** via the special line for pin 3 of connector A.

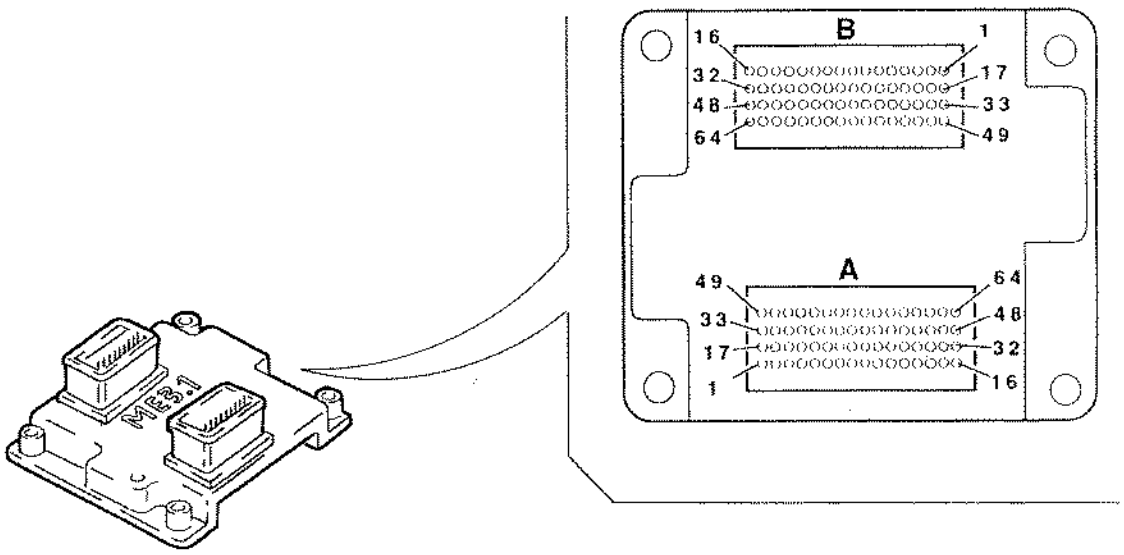
The control unit is equipped with an autodiagnostic system which can be used by connecting to the standardized diagnostic connector **T20**: signals from pin 53 of connector A from the control unit **S11** arrive via the special diagnostic line. The autodiagnostic system also produces the signal for the "injection - EOBD failure" warning light in the instrument panel **C10** which comes out of pin 46 of connector A of the control unit **S11**.

The speedometer (vehicle speed) signal reaches the control unit **S11** from the ABS control unit **N51** via the CAN line - pins 12 and 29 of connector A of **S11**: it is also used for the managment of the misfire function and the transmission of the speedometer signal).

The control unit **S11** sends a signal, from pin 35 of connector A, proportional to the engine speed, to the instrument panel **C10**.

The control unit **S11** is connected to the air conditioning system via pins 6 and 13 of connector A. This makes it possible to adjust the engine idle speed as the load increases each time the compressor is switched on or to switch it off in the case of high speeds or high engine loads (see "Automatic air conditioning").

The control unit also controls the engine cooling system: pins 9, 41, 50 and 62 of connector A control the engagement of the appropriate fan.



Control unit pin-out

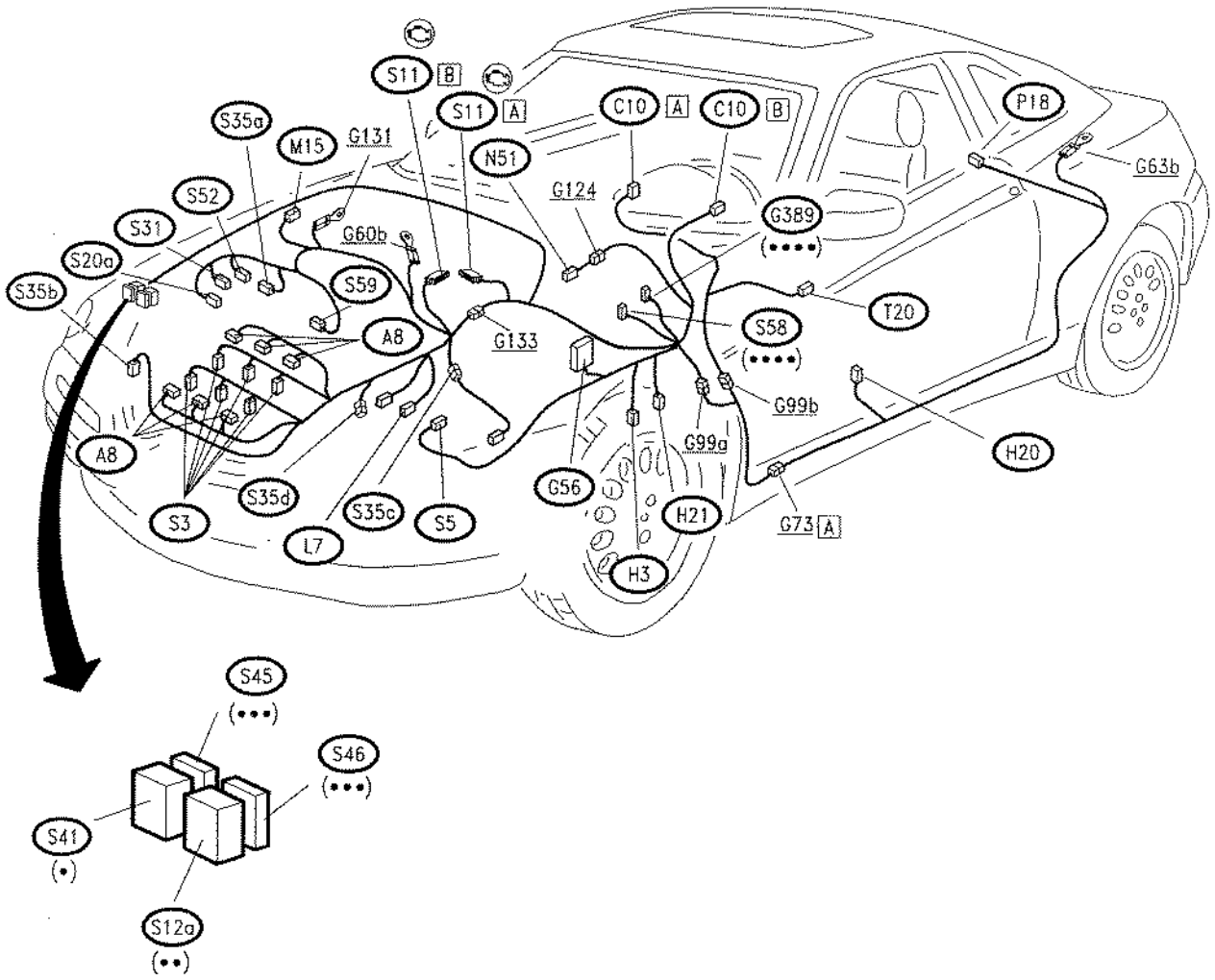
Connector A

A1 - Not connected
A2 - Fuel vapour solenoid valve operation
A3 - Alfa Romeo CODE connection
A4 - Not connected
A5 - Not connected
A6 - Compressor engagement request
A7 - Accelerator pedal potentiometer supply
A8 - Accelerator pedal 1 potentiometer signal
A9 - Quadrinary - 1st fan speed request
A10 - Not connected
A11 - Not connected
A12 - CAN-L line
A13 - Compressor relay feed
A14 - Not connected
A15 - Direct supply
A16 - Supply controlled by ignition - via main relay
A17 - Not connected
A18 - Not connected
A19 - Engine temperature warning light
A20 - Not connected
A21 - Not connected
A22 - Fuel level sensor
A23 - Not connected
A24 - Accelerator pedal 1 potentiometer earth
A 25 - Accelerator pedal 2 and earth potentiometer earth air temperature sensor
A26 - Not connected
A27 - Brake lights switch
A28 - Not connected
A29 - CAN-H line
A30 - Fuel pump relay feed
A31 - Main relay activation
A32 - Supply controlled by ignition - via main relay
A33 - Not connected
A34 - Not connected
A35 - Rev counter signal
A36 - Not connected
A37 - Not connected
A38 - Not connected
A39 - Not connected
A40 - Accelerator pedal 2 potentiometer signal
A41 - Quadrinary - fan 2nd speed request
A42 - Not connected
A43 - Not connected
A44 - Not connected
A45 - Not connected
A46 - Injection warning light (EOBD)
A47 - Supply controlled by ignition
A48 - Supply controlled by ignition - via main relay
A49 - Not connected
A50 - Operation of fan 1st speed
A51 - Not connected
A52 - Not connected
A53 - Diagnostic connection (line K)
A54 - Air temperature sensor signal
A55 - Not connected
A56 - Accelerator pedal potentiometer supply
A57 - Air flow meter signal
A58 - Not connected
A59 - Clutch pedal switch
A60 - Not connected
A61 - Not connected
A62 - Operation of fan 2nd speed
A63 - Supply for flow meter
A64 - Not connected

Connector B

B1 - Throttle casing motor earth
B2 - Lambda sensor heater (pre-cat. front)
B3 - Operation of injector for cyl. 2
B4 - Not connected
B5 - Not connected
B6 - Detonation sensor 2 reference earth
B7 - Lambda sensor earth (pre-cat. front)
B8 - Not connected
B9 - Not connected
B10 - Engine rpm sensor
B11 - Not connected
B12 - Lambda sensor earth (post-cat. left)
B13 - Not connected
B14 - Cylinder 3 coil operation
B15 - Cylinder 2 coil operation
B16 - Cylinder 1 coil operation
B17 - Throttle casing motor supply
B18 - Lambda sensor heater (post-cat. left)
B19 - Operation of injector for cyl. 1
B20 - Operation of injector for cyl. 3
B21 - Not connected
B22 - Detonation sensor 1
B23 - Lambda sensor signal (pre-cat. rear)
B24 - Throttle casing potentiometer 1
B25 - Engine coolant temperature
B26 - Sensors reference earth
B27 - Not connected
B28 - Lambda sensor signal (post-cat. right)
B29 - Not connected
B30 - Cylinder 6 coil operation
B31 - Cylinder 5 coil operation
B32 - Cylinder 4 coil operation
B33 - Throttle casing motor earth
B34 - Lambda sensor heater (pre-cat. rear)
B35 - Operation of injector for cyl. 4
B36 - Operation of injector for cyl. 6
B37 - Not connected
B38 - Detonation sensor 2
B39 - Lambda sensor signal (pre-cat. front)
B40 - Throttle casing potentiometer 2
B41 - Not connected
B42 - Timing sensor signal
B43 - Not connected
B44 - Lambda sensor signal (post-cat. left)
B45 - Not connected
B46 - Not connected
B47 - Not connected
B48 - Not connected
B49 - Throttle casing motor supply
B50 - Lambda sensor heater (post-cat. right)
B51 - Timing sensor earth
B52 - Operation of injector for cyl. 5
B53 - Not connected
B54 - Detonation sensor 1 reference earth
B55 - Lambda sensor earth (pre-cat. rear)
B56 - Not connected
B57 - Not connected
B58 - Throttle casing potentiometers supply
B59 - Engine rpm sensor
B60 - Lambda sensor earth (post-cat. right)
B61 - Not connected
B62 - Not connected
B63 - Not connected
B64 - Not connected

LOCATION OF COMPONENTS



(•) Red Socket
(••) Black Socket
(•••) Blue Fuse Carrier
(••••) Brown Fuse Carrier