



GESTIONE ELETTRONICA MOTORI BENZINA

198 - Bravo

ELECTRONIC MANAGEMENT OF PETROL ENGINES - DESCRIPTION

An electronic control system supervises and manages all engine parameters to optimize performance and fuel consumption by means of a real-time response to different operating conditions.

The system is managed by a single control unit which controls both ignition and injection.

Depending on the signals received from numerous sensors, the control unit manages the injectors connected to it, handling the following systems:

- fuel supply;
- air supply;
- accelerator pedal;
- engine cooling;
- combustion control - Lambda sensors;
- control of exhaust with catalytic converter;
- fuel vapour recirculation.

The throttle body is also controlled electronically by the control unit: the throttle opening is calculated according to a specific logic inside the engine management control unit; the mechanical connection between the accelerator pedal and the throttle body is thereby eliminated.

Thanks to the electronic management described above and the innovative PDA system, this engine conforms to the most recent emission control regulations (EURO 4).

For more details

See descriptions 1056 PETROL INJECTION SYSTEM

The system is also controlled by dedicated relays in the engine compartment junction unit. Lines supplying the control unit and various system components (sensors and actuators) are protected by dedicated fuses that are also located in the junction unit.

ELECTRONIC MANAGEMENT OF PETROL ENGINES - OPERATIONAL DESCRIPTION

The M10 engine management control unit controls and regulates the entire ignition and electronic injection system.

Control unit M10 is supplied directly from the battery at pin 18 of connector A, via a line protected by fuse F18 junction unit B1 .

The ignition-operated power supply arrives via a line protected by fuse F16 of the engine compartment junction unit B1 at pin 51 of connector A of M10 .

The main injection relay switch T9 of B1 controls the entire system: it is energised by a control signal (earth) from pin 19 of connector A of the control unit M10 and then forwards power supply:

- to pins 17, 49 and 33 of connector A of the actual control unit, via the line protected by fuse F17 of B1;
- to fuel vapour recovery solenoid L10 and to lambda sensors K15 and K17 (all these lines are protected by fuse F11 of B1);
- to coils A30 and injectors N70 via a line protected by fuse F22 of B1.

Fuel pump relay T10 of B1 is supplied by the line protected by fuse F21 of B1.

It is energized by a control signal coming from pin 62 of connector A of control unit M10 and provides the power supply for the electric fuel pump N40 which is earthed via the inertia switch I50 which interrupts the circuit in the case of an impact and stops the dangerous supply of fuel.

Engine control unit M10 receives signals from the various different sensors, in this way it keeps all the engine operating parameters under control.

The rpm sensor K46 provides information, via a frequency signal sent to pins 10 and 42 of connector B of the control unit M10, about the engine speed.

Timing sensor K47 is supplied from pin 7 of connector B of control unit M10 ; this receives a reference earth from pin 9 of connector B, and sends a signal with a frequency corresponding to the phase to pin 36 of connector B of the control unit.

Integrated air temperature sensor K43 receives a reference earth from pin 26 of connector B; it sends a signal corresponding to intake air temperature to pin 55 of the control unit. Pin 7 of connector B of M10 sends a reference power supply to sensor K43 , which returns a signal proportional to intake air pressure to pin 6.

The engine temperature sender unit K36 receives a reference earth from pin 9 of connector B of the control unit M10 and provides a signal proportional to the temperature of the engine coolant at pin 38 of connector B of the control unit.

The Lambda sensor on pre-converter K15 and the one on catalyzer K17 provide control unit M10 with information concerning the correct composition of the air-fuel mixture.

The sensor K15 sends a signal to pin 8 of connector B of the control unit, while pin 25 provides a reference earth: these two signals are very low intensity and are therefore appropriately shielded. Sensor K15 is heated by a resistance to ensure correct operation even when cold; the resistance is supplied by the main relay T9; pin 49 of connector B of M10 provides the reference earth.

The sensor K17 sends a signal to pin 57 of connector B of the control unit, while pin 41 provides a reference earth: these two signals are very low intensity and are therefore appropriately shielded. Sensor K17 is heated by a resistance to ensure correct operation even when cold; the resistance is supplied by the main relay T9; pin 17 of connector B of M10 provides the reference earth.

The knock sensor K50 provides information, by means of frequency signals, concerning the onset of knock in the combustion chamber: it sends two signals to pins 37 and 21 of connector B of M10; these signals are also appropriately shielded.

Accelerator pedal K55 has two built-in potentiometers (a main one and a safety one). The former receives power and earth signals from pins 21 and 22 respectively of connector A of M10 and sends a corresponding signal to pin 54 of the same connector. The latter receives power and earth signals from pins 4 and 5 of connector A of M10 and sends a corresponding signal to pin 37 of the same connector.

The control unit M10 receives - at pin 42 of connector A - a signal from the minimum engine oil pressure sensor K30

Pin 25 of connector A of M10 receives the signal coming from the brake lights switch I30 - N.A. contact - with an ignition-controlled supply (INT) from fuse F37 of junction unit B2; it receives the signal - N.C. contact - coming from the brake lights switch I30 at pin 57 of connector A of M10 with an ignition-controlled supply from fuse F35 of junction unit B2.

Pin 7 of connector A of M10 receives the signal coming from the clutch switch I31.

The control unit M10 controls the opening of the injectors N70 by means of special signals sent by pins 51, 18, 2 and 34 of connector B of M10. The injectors N70 receive a power supply to enable the opening of the main relay T9 of B1 .

The control unit M10 also controls the coils A30 through control signals for the primary winding of the coil, while the secondary winding sends a pulse to the spark plugs: from pins 32, 16, 31 and 15 of connector B of M10. The primary windings of coils A30 receive a power supply to enable opening of main relay T9 of B1 .

Throttle body actuator N75 has two built-in potentiometers connected in parallel: this controls the throttle opening by means of a step motor.

The motor receives a supply from pairs of pins 11-43 and 28-60 of connector B of M10 . Pin 56 of connector B sends power to both potentiometers, while pin 58 sends an earth signal to the potentiometers; pins 23 and 39 of the same connector receive signals from the throttle body actuator N75.

Fuel vapour recovery solenoid L10 allows the flow of fuel vapours to the engine intake, where they are added to the mixture entering the combustion chamber. Valve L10 is supplied from main relay T9 of B1 ; it is opened by the control unit when the engine is loaded via a signal from pin 33 of connector B of M10 .

The self-diagnosis data may be read by connecting to connector C of Body Computer M1 pin 7, which receives signals from pin 2 of connector A of the control unit M10 through the appropriate diagnosis line.

On right hand drive versions there is also diagnostic connector R10 separate from the Body Computer.

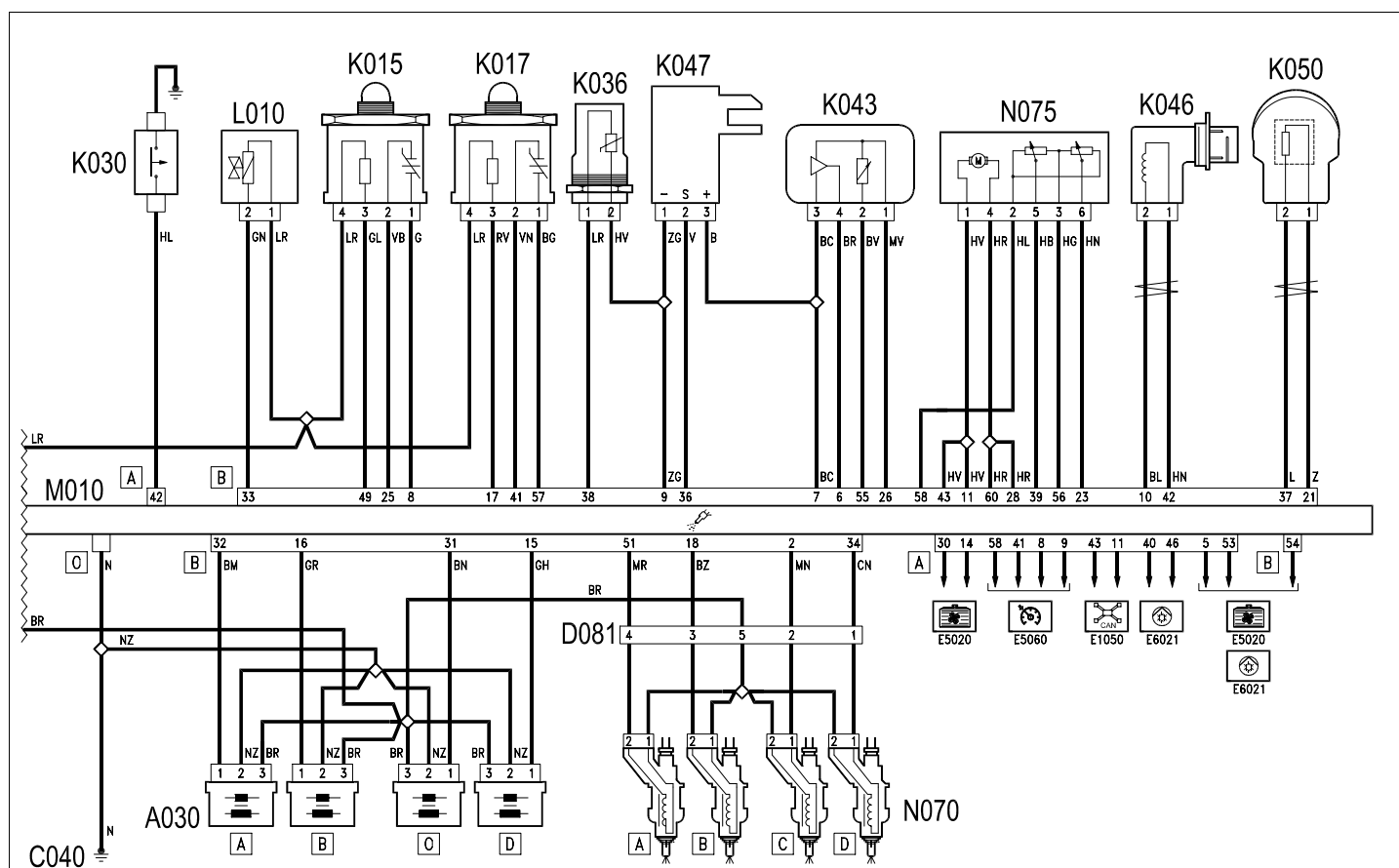
The autodiagnostic system for the control unit M10 also produces a signal - which leaves pin 31 of connector A - which is connected directly to the EOBD warning light in the instrument panel E50.

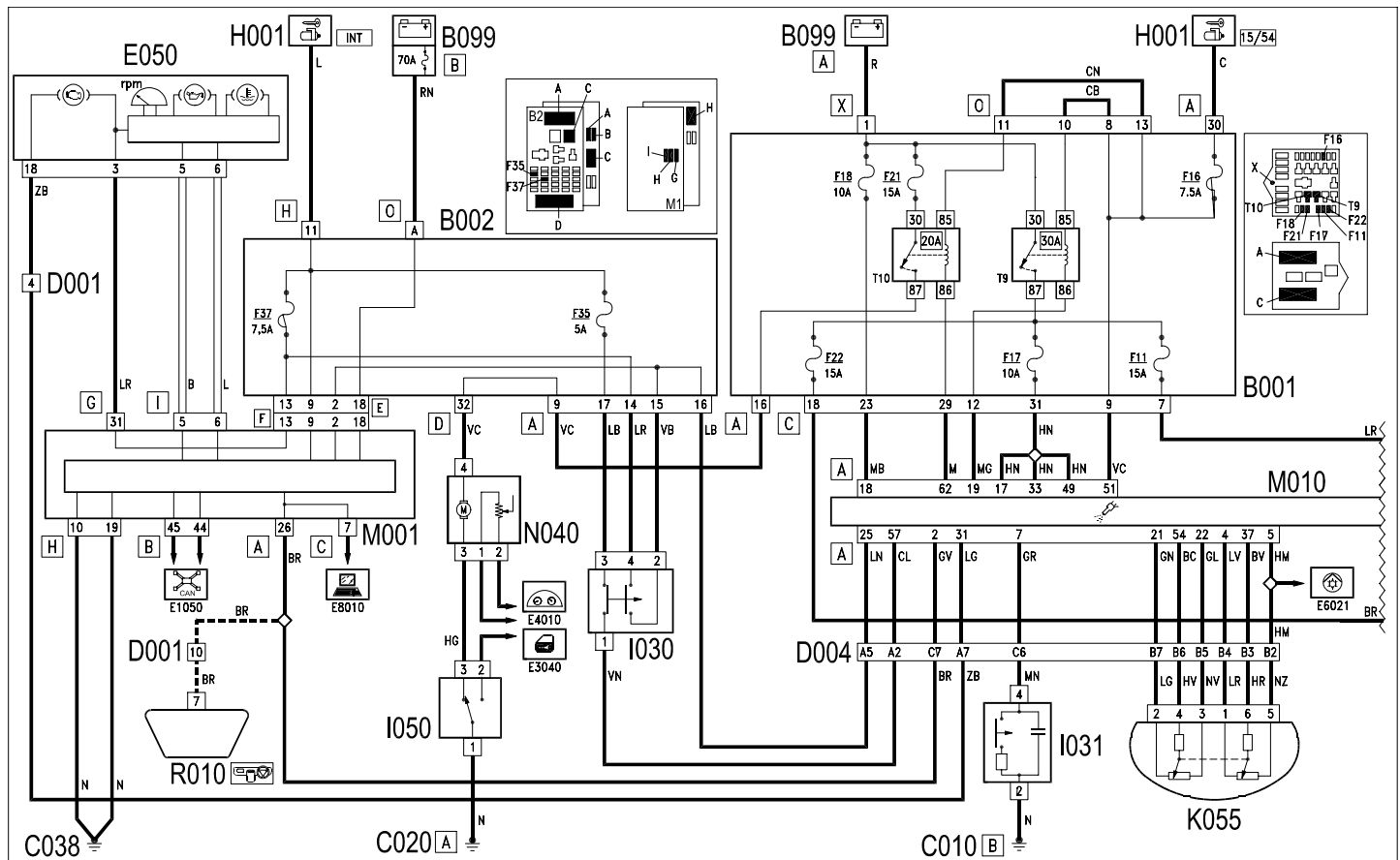
Control unit M10 is then connected via the CAN to Body Computer M1 and to the other network nodes: information on the following is sent through this connection

- engine coolant temperature, which is sent to the instrument panel E50 which manages the gauge and the warning light;
- engine rpm, which is sent to the instrument panel E50 rev counter;
- minimum engine oil pressure, which is sent to the instrument panel E50 which manages the warning light;

It receives the speedometer signal, via the CAN, produced by the ABS control unit M50.

PETROL ENGINE ELECTRONIC MANAGEMENT - WIRING DIAGRAM

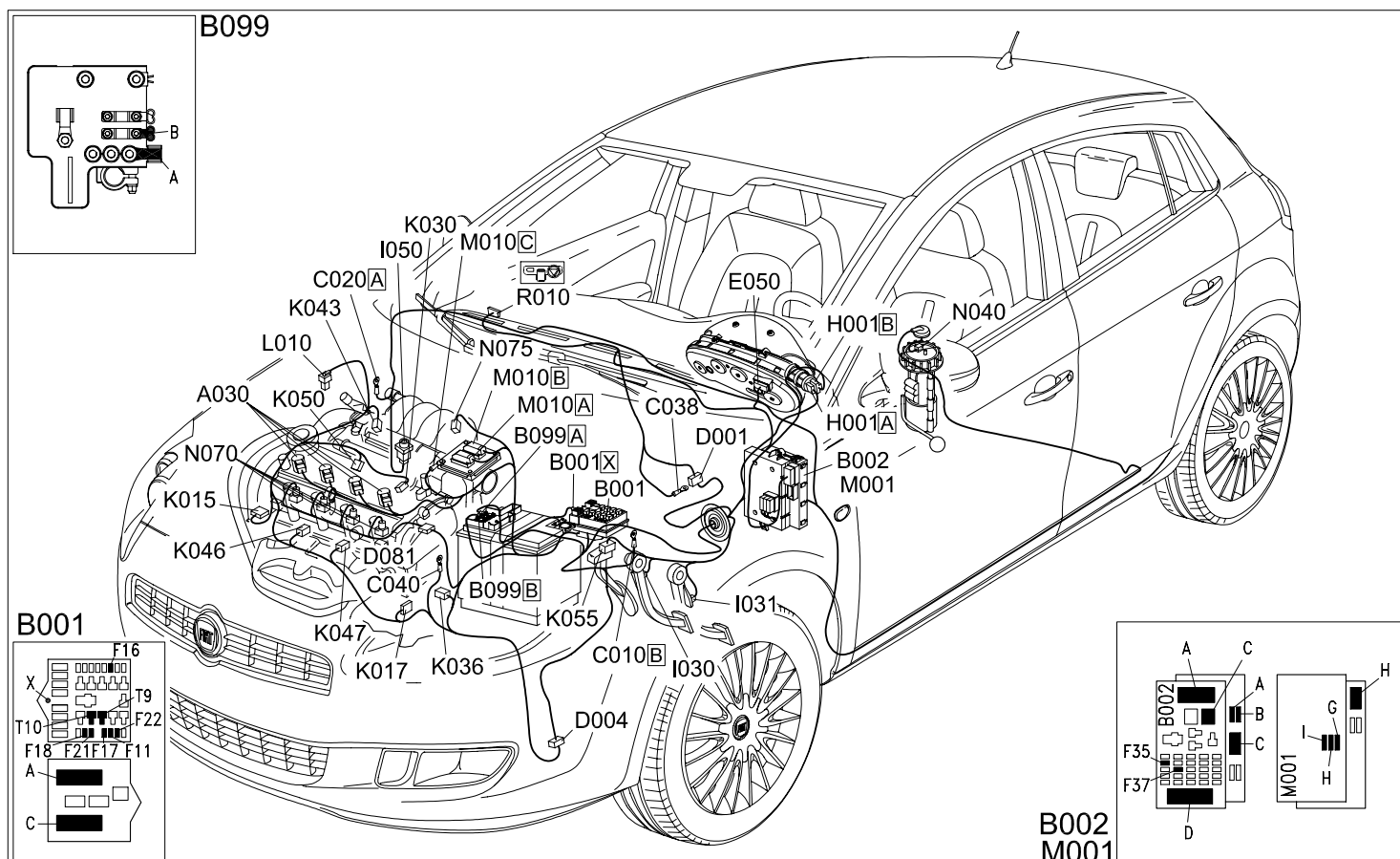




| Component Code | Description | Reference to the operation |
|----------------|---|---|
| A030 | IGNITION COIL | Op. 5510C14 IGNITION COIL/S - R.R. |
| A030 | IGNITION COIL | Op. 5590B11 IGNITION COIL CONNECTOR - R.R. |
| B001 | JUNCTION UNIT | Op. 5505A13 ADDITIONAL JUNCTION UNIT IN ENGINE COMPARTMENT - R.R. |
| B002 | JUNCTION UNIT UNDER DASHBOARD | Op. 5505A35 MAIN BODY COMPUTER/JUNCTION UNIT - R.R. |
| B099 | MAXI FUSE BOX ON BATTERY | - |
| C010 | LEFT FRONT EARTH | - |
| C020 | PASSENGER SIDE DASHBOARD EARTH | - |
| C038 | EARTH ON CENTRE TUNNEL | - |
| C040 | EARTH ON ENGINE | - |
| D001 | FRONT/DASHBOARD COUPLING | - |
| D004 | FRONT/ENGINE COUPLING | - |
| D081 | INJECTOR JUNCTION | - |
| E050 | INSTRUMENT PANEL | Op. 5560B10 CONTROL PANEL - R+R |
| H001 | IGNITION SWITCH | Op. 5520A10 IGNITION SWITCH ASSEMBLY - R+R |
| I030 | BRAKE PEDAL SWITCH | Op. 5550D10 BRAKE LIGHT SWITCH - R+R |
| I031 | CLUTCH PEDAL SWITCH | Op. 1056B78 SWITCH ON CLUTCH PEDAL - R.R (PETROL ENGINES) |
| I050 | INERTIA SWITCH | Op. 1040A74 INERTIA SWITCH FOR ELECTRIC PUMP SUPPLY CIRCUIT R + R |
| K015 | LAMBDA SENSOR ON PRE-CATALYZER | Op. 1080B94 FRONT LAMBDA SENSOR TO WITH CATALYTIC CONVERTER - R.R |
| K015 | LAMBDA SENSOR ON PRE-CATALYZER | Op. 5590B14 FRONT OXYGEN SENSOR CONNECTOR - R.R. |
| K017 | LAMBDA SENSOR ON CATALYZER | Op. 1080B95 REAR LAMBDA SENSOR TO CATALYTIC CONVERTER - R.R |
| K017 | LAMBDA SENSOR ON CATALYZER | Op. 5590B15 REAR OXYGEN SENSOR CONNECTOR - R.R. |
| K030 | ENGINE OIL PRESSURE SENSOR (SWITCH) | Op. 1084A42 ENGINE OIL PRESSURE WARNING LIGHT SWITCH - R.R. |
| K030 | ENGINE OIL PRESSURE SENSOR (SWITCH) | Op. 5590B01 OIL PRESSURE SENSOR CONNECTOR - R.R. |
| K036 | ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT | Op. 1056B50 ENGINE COOLANT TEMPERATURE SENSOR - R + R |

| | | |
|------|---|--|
| K036 | ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT | Op. 5590B02 ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT CONNECTOR - R.R. |
| K043 | INTEGRATED AIR TEMPERATURE SENSOR | Op. 1056B54 INTAKE AIR PRESSURE/TEMPERATURE SENSOR - R.R. |
| K043 | INTEGRATED AIR TEMPERATURE SENSOR | Op. 5590B03 AIR TEMPERATURE/PRESSURE SENSOR CONNECTOR - R.R. |
| K046 | RPM SENSOR | Op. 5510C26 ENGINE RPM SENSOR - R+R |
| K046 | RPM SENSOR | Op. 5590B04 RPM SENSOR CONNECTOR - R.R. |
| K047 | TIMING SENSOR | Op. 1056B51 CAM ANGLE SENSOR - R.R. |
| K047 | TIMING SENSOR | Op. 5590B05 PHASE SENSOR CONNECTOR - R.R. |
| K050 | DETONATION SENSOR | Op. 5510C42 DETONATION SENSOR (ONE) - R.R. |
| K050 | DETONATION SENSOR | Op. 5590B18 KNOCK SENSOR CONNECTOR - R.R. |
| K055 | ACCELERATOR PEDAL POTENTIOMETER | Op. 1068A20 ACCELERATOR PEDAL WITH BUILT-IN POTENTIOMETER - R.R. |
| L010 | FUEL VAPOUR RECOVERY SOLENOID VALVE | Op. 1080E20 ENABLEMENT SOLENOID FOR FLOW OF FUEL VAPOUR TO INLET - R+R |
| L010 | FUEL VAPOUR RECOVERY SOLENOID VALVE | Op. 5590B23 FUEL VAPOUR RECOVERY SOLENOID VALVE CONNECTOR - R.R. |
| M001 | BODY COMPUTER | Op. 5505A35 MAIN BODY COMPUTER/JUNCTION UNIT - R.R. |
| M010 | ENGINE MANAGEMENT CONTROL UNIT | Op. 1056B82 INJECTION/IGNITION SYSTEM E.C.U. (ONE) - R + R |
| N040 | FUEL PUMP AND LEVEL GAUGE | Op. 1040A70 SUBMERGED PUMP ASSEMBLY COMPLETE WITH LEVEL GAUGE CONTROL - R + R |
| N070 | INJECTOR | Op. 1056B70 INJECTOR (ONE) - R + R WITH FUEL MANIFOLD PIPE REMOVED - INCLUDES SEAL REPLACEMENT |
| N075 | INTEGRATED THROTTLE BODY ACTUATOR | Op. 1056B14 THROTTLE BODY - R + R |
| N075 | INTEGRATED THROTTLE BODY ACTUATOR | Op. 5590B10 INTEGRATED THROTTLE BODY ACTUATOR CONNECTOR - R.R. |
| R010 | MULTIPLE TESTER CONNECTION | - |

ELECTRONIC MANAGEMENT OF PETROL ENGINES - COMPONENT LOCATION



| Component Code | Description | Reference to the operation |
|----------------|--------------------------------|--|
| A030 | IGNITION COIL | Op. 5510C14 IGNITION COIL/S - R.R. |
| A030 | IGNITION COIL | Op. 5590B11 IGNITION COIL CONNECTOR - R.R. |
| B001 | JUNCTION UNIT | Op. 5505A13 ADDITIONAL JUNCTION UNIT IN ENGINE COMPARTMENT - R.R. |
| B002 | JUNCTION UNIT UNDER DASHBOARD | Op. 5505A35 MAIN BODY COMPUTER/JUNCTION UNIT - R.R. |
| B099 | MAXI FUSE BOX ON BATTERY | - |
| C010 | LEFT FRONT EARTH | - |
| C020 | PASSENGER SIDE DASHBOARD EARTH | - |
| C038 | EARTH ON CENTRE TUNNEL | - |
| C040 | EARTH ON ENGINE | - |
| D001 | FRONT/DASHBOARD COUPLING | - |
| D004 | FRONT/ENGINE COUPLING | - |
| D081 | INJECTOR JUNCTION | - |
| E050 | INSTRUMENT PANEL | Op. 5560B10 CONTROL PANEL - R+R |
| H001 | IGNITION SWITCH | Op. 5520A10 IGNITION SWITCH ASSEMBLY - R+R |
| I030 | BRAKE PEDAL SWITCH | Op. 5550D10 BRAKE LIGHT SWITCH - R+R |
| I031 | CLUTCH PEDAL SWITCH | Op. 1056B78 SWITCH ON CLUTCH PEDAL - R.R (PETROL ENGINES) |
| I050 | INERTIA SWITCH | Op. 1040A74 INERTIA SWITCH FOR ELECTRIC PUMP SUPPLY CIRCUIT R + R |
| K015 | LAMBDA SENSOR ON PRE-CATALYZER | Op. 1080B94 FRONT LAMBDA SENSOR TO WITH CATALYTIC CONVERTER - R.R |
| K015 | LAMBDA SENSOR ON PRE-CATALYZER | Op. 5590B14 FRONT OXYGEN SENSOR CONNECTOR - R.R. |
| K017 | LAMBDA SENSOR ON CATALYZER | Op. 1080B95 REAR LAMBDA SENSOR TO CATALYTIC CONVERTER - R.R |
| K017 | LAMBDA SENSOR ON CATALYZER | Op. 5590B15 REAR OXYGEN SENSOR CONNECTOR - R.R. |

| | | |
|------|---|--|
| K030 | ENGINE OIL PRESSURE SENSOR (SWITCH) | Op. 1084A42 ENGINE OIL PRESSURE WARNING LIGHT SWITCH - R.R. |
| K030 | ENGINE OIL PRESSURE SENSOR (SWITCH) | Op. 5590B01 OIL PRESSURE SENSOR CONNECTOR - R.R. |
| K036 | ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT | Op. 1056B50 ENGINE COOLANT TEMPERATURE SENSOR - R + R |
| K036 | ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT | Op. 5590B02 ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT CONNECTOR - R.R. |
| K043 | INTEGRATED AIR TEMPERATURE SENSOR | Op. 1056B54 INTAKE AIR PRESSURE/TEMPERATURE SENSOR - R.R. |
| K043 | INTEGRATED AIR TEMPERATURE SENSOR | Op. 5590B03 AIR TEMPERATURE/PRESSURE SENSOR CONNECTOR - R.R. |
| K046 | RPM SENSOR | Op. 5510C26 ENGINE RPM SENSOR - R+R |
| K046 | RPM SENSOR | Op. 5590B04 RPM SENSOR CONNECTOR - R.R. |
| K047 | TIMING SENSOR | Op. 1056B51 CAM ANGLE SENSOR - R.R. |
| K047 | TIMING SENSOR | Op. 5590B05 PHASE SENSOR CONNECTOR - R.R. |
| K050 | DETONATION SENSOR | Op. 5510C42 DETONATION SENSOR (ONE) - R.R. |
| K050 | DETONATION SENSOR | Op. 5590B18 KNOCK SENSOR CONNECTOR - R.R. |
| K055 | ACCELERATOR PEDAL POTENTIOMETER | Op. 1068A20 ACCELERATOR PEDAL WITH BUILT-IN POTENTIOMETER - R.R. |
| L010 | FUEL VAPOUR RECOVERY SOLENOID VALVE | Op. 1080E20 ENABLEMENT SOLENOID FOR FLOW OF FUEL VAPOUR TO INLET - R+R |
| L010 | FUEL VAPOUR RECOVERY SOLENOID VALVE | Op. 5590B23 FUEL VAPOUR RECOVERY SOLENOID VALVE CONNECTOR - R.R. |
| M001 | BODY COMPUTER | Op. 5505A35 MAIN BODY COMPUTER/JUNCTION UNIT - R.R. |
| M010 | ENGINE MANAGEMENT CONTROL UNIT | Op. 1056B82 INJECTION/IGNITION SYSTEM E.C.U. (ONE) - R + R |
| N040 | FUEL PUMP AND LEVEL GAUGE | Op. 1040A70 SUBMERGED PUMP ASSEMBLY COMPLETE WITH LEVEL GAUGE CONTROL - R + R |
| N070 | INJECTOR | Op. 1056B70 INJECTOR (ONE) - R + R WITH FUEL MANIFOLD PIPE REMOVED - INCLUDES SEAL REPLACEMENT |
| N075 | INTEGRATED THROTTLE BODY ACTUATOR | Op. 1056B14 THROTTLE BODY - R + R |
| N075 | INTEGRATED THROTTLE BODY ACTUATOR | Op. 5590B10 INTEGRATED THROTTLE BODY ACTUATOR CONNECTOR - R.R. |
| R010 | MULTIPLE TESTER CONNECTION | - |