



## GESTIONE ELETTRONICA MOTORI BENZINA

191 - Giulietta

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## 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.

This version adopts a 1.4 16V turbo engine with MultiAir technology, a new electro-hydraulic valve management system controlling air and combustion directly. This ensures considerable advantages in terms of maximum power increase, torque improvement at low speed and reduction of fuel consumption and emissions.

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

- fuel supply;
- air delivery;
- accelerator pedal;
- engine cooling;
- combustion control - Lambda sensors;
- control of exhaust with catalytic converter;
- fuel vapour recirculation;
- turbocharging pressure adjustment;
- Multiair solenoid valve management.

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.

This engine adopts the innovative Multiair system for the intake valves: a piston, operated by a mechanical cam, is connected to the intake valve through a hydraulic chamber, controlled by an ON/OFF type, normally open solenoid valve.

When the valve is closed, the oil in the hydraulic chamber acts as a solid body and sends the lifting command from the mechanical intake cam to the intake valves.

When the valve is open, the hydraulic chamber and the intake valves are disconnected, they no longer follow the intake cam, closing due to the force of the spring.

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

Engine management control unit M010 controls and governs the entire electronic ignition and injection system.

The control unit M010 receives a direct supply from the battery to pin 50 of connector A through the line protected by fuse F18 of the control unit B001.

The ignition-operated power supply (15/54) arrives through a line protected by fuse F16 of the engine compartment junction unit B001 at pin 88 of connector A of M010 .

Pins 1, 2 and 4 of connector A of M010 are earthed.

The main injection relay switch T09 of B001 controls the entire system: it is energised by a control (earth) signal from pin 52 of connector A of control unit M010 and then forwards a power supply:

- to pins 3, 5 and 6 of connector A of the control unit itself, through the line protected by fuse F22 of B001;
- to pin 54 of connector B and to the fuel vapour recovery solenoid valves L010, wastegate L037 and turbocharger by-pass L102, as well as oxygen sensors K015 and K017: all these lines are protected by fuse F11 of B001;
- to coils A030 and injectors N070 through a line protected by fuse F17 of B001.

The fuel pump relay T10 of B001 is supplied by the line for fuse F21 of B001.

It is energised by a control signal from pin 94 of connector A of the control unit M010 and supplies power to fuel pump N040.

The engine management control unit M010 receives signals from the various sensors, thereby keeping all the engine operating parameters under control.

The rpm sensor K046 is supplied and receives an earth reference from pins 7 and 14 respectively of connector B of M010 and supplies information about engine speed through a frequency signal sent to pin 29 of connector B of M010.

The timing sensor K047 is supplied by pin 7 of connector B of control unit M010; it receives a reference earth from pin 24 of connector B, and sends a frequency signal corresponding to the timing to pin 27 of connector B of the control unit.

The air pressure/temperature sensor K044 receives a reference earth from pin 24 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 M010 sends a power supply to sensor K044, which returns a signal proportional to intake air pressure to pin 57.

Turbocharging sensor K082 receives a reference earth from pin 24 of connector B and a power supply from pin 7 of connector B of M010 and returns a signal proportional to turbocharging pressure to pin 58.

The engine temperature sender unit K036 receives a reference earth from pin 24 of connector B of control unit M010 and sends a signal proportional to engine coolant temperature to pin 39 of connector B of the control unit.

The oil temperature sender unit K029 receives a reference earth from pin 24 of connector B of control unit M010 and sends a signal proportional to engine coolant temperature to pin 40 of connector B of the control unit.

The Lambda sensor on the pre-converter K015 and the one on converter K017 provide the control unit M010 with information concerning the correct composition of the air-fuel mixture

The sensor K015 sends a signal to pin 64, 86 and 87 of connector B of the control unit, while pin 65 provides the reference earth. The sensor K015 is heated by a resistance to ensure correct operation even when cold; the resistance is supplied by the main relay switch T09; pin 51 of connector B of M010 provides the reference earth.

The sensor K017 sends a signal to pin 63 of connector B of the control unit, while pin 85 provides a reference earth. The sensor K017 is heated by a resistance to ensure correct operation even when cold; the resistance is supplied by the main relay switch T09; pin 77 of connector B of M010 provides the reference earth.

The knock sensor K050 provides information, by means of frequency signals, concerning the onset of knock in the combustion chamber: it sends a signal to pin 10, while it receives the reference earth from pin 11; the two signals are appropriately shielded - pin 9 of the same connector.

Accelerator pedal K055 contains two built-in potentiometers (a main one and a safety one). The former receives power and earth signals respectively from pin 36 and 55 of connector A of M010 and sends a corresponding signal to pin 61 of the same connector. The latter receives power and earth signals respectively from pins 37 and 53 of connector A of M010 and sends a signal to pin 83 of the same connector.

The control unit M010 receives - at pin 44 of connector B - a signal from the minimum engine oil pressure sensor K030.

Pin 62 of connector A of M010 receives a signal from brake light switch I030 - NO contact - provided with an ignition-controlled power supply from fuse F37 of Body Computer M001. Through the CAN, it receives a signal - NC contact - from brake light switch I030, provided with an ignition-controlled power supply from fuse F51 of Body Computer M001

Pins 25 and 84 of connector A of M010 receive the signals coming from the clutch switch I031, "ignition-operated" by the fuse F51 of the Body Computer M001.

The pin 24 of connector A of M010 receives the signal from the reverse switch I020, with "ignition-controlled" supply from the fuse F51 of the Body Computer M001.

Control unit M010 controls the opening of injectors N070 by means of special signals sent from pins 3, 4, 19 and 18 of connector B of M010. The injectors N070 receive a power supply to enable main relay switch T09 of B001 to open.

The control unit M010 also controls the coils A030 through control signals for the coil's primary winding, while the secondary winding sends an impulse to the spark plugs: from pins 17, 16, 1 and 2 of connector B of M010. The primary windings of coils A030 receive a power supply to enable opening of main relay T09 of B001 .

Throttle body actuator N075 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 pin 45 and 60 of connector B of M010. Pin 6 of connector B supplies both potentiometers, while pin 25 sends an earth signal; pins 43 and 59 of the same connector receive signals from the throttle body actuator N075.

Fuel vapour recovery solenoid L010 allows fuel vapours to flow through toward the engine intake, where they join the mixture that is entering the combustion chamber. The valve L010 is supplied by the main relay switch T09 of B001; it is opened by the control unit when the engine is operating in load conditions by means of a signal from pin 53 of connector B of M010.

The turbocharger pressure solenoid valve regulates the turbocharger's mechanical wastegate valve; the solenoid valve L037 is supplied by the main relay switch T09 of B001 and is controlled by the control unit through a signal from pin 8 of connector A of M010.

The turbocharger by-pass solenoid L102, connected to the intake pipe near the throttle body, allows the excess pressure to be discharged during the release stage in order to prevent excessive increases in pressure which could damage the inlet pipes and upset the operation of the turbine.

It is supplied by the main relay switch T09 of B001 and is controlled by the control unit through a signal from pin 52 of connector B of M010.

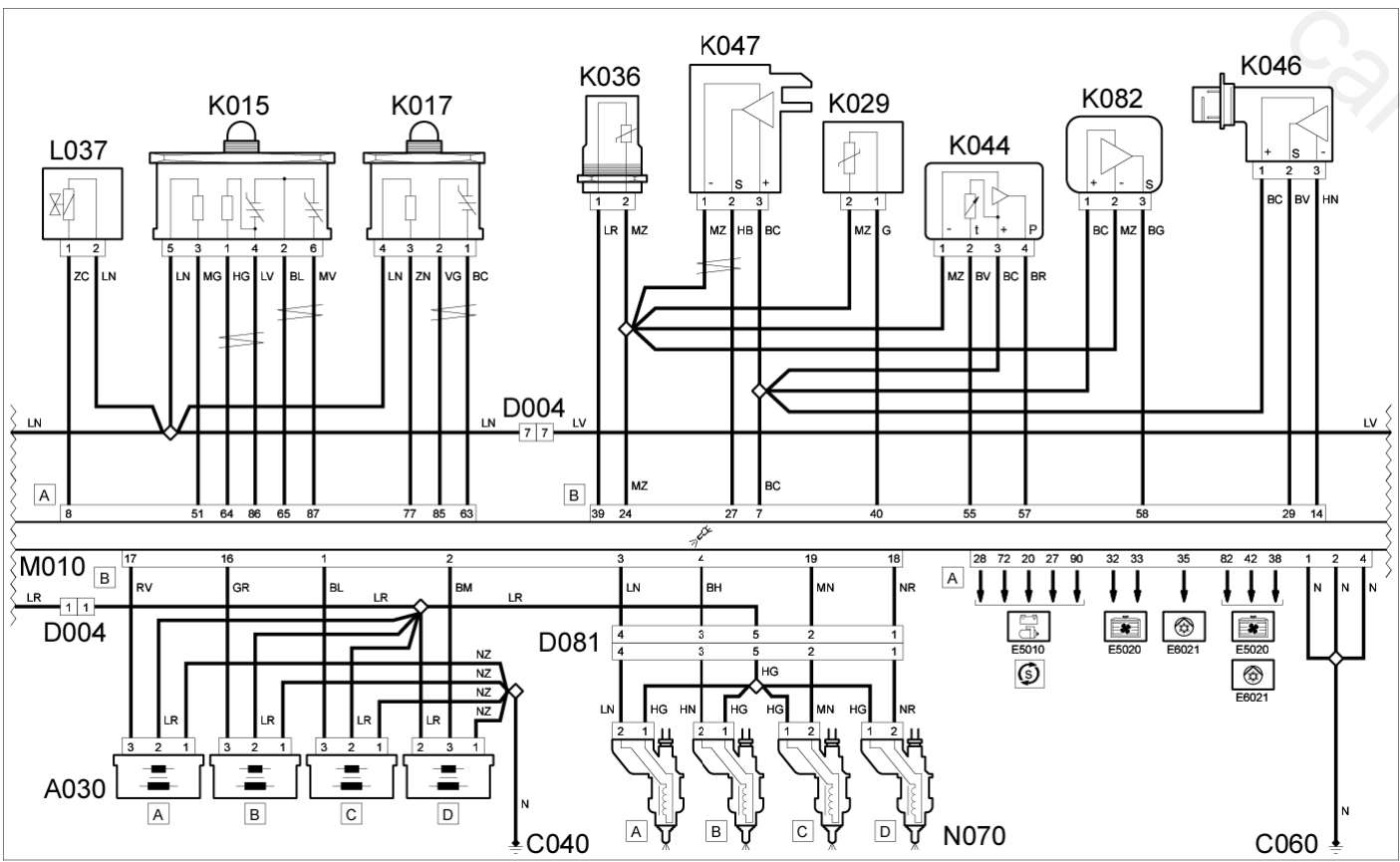
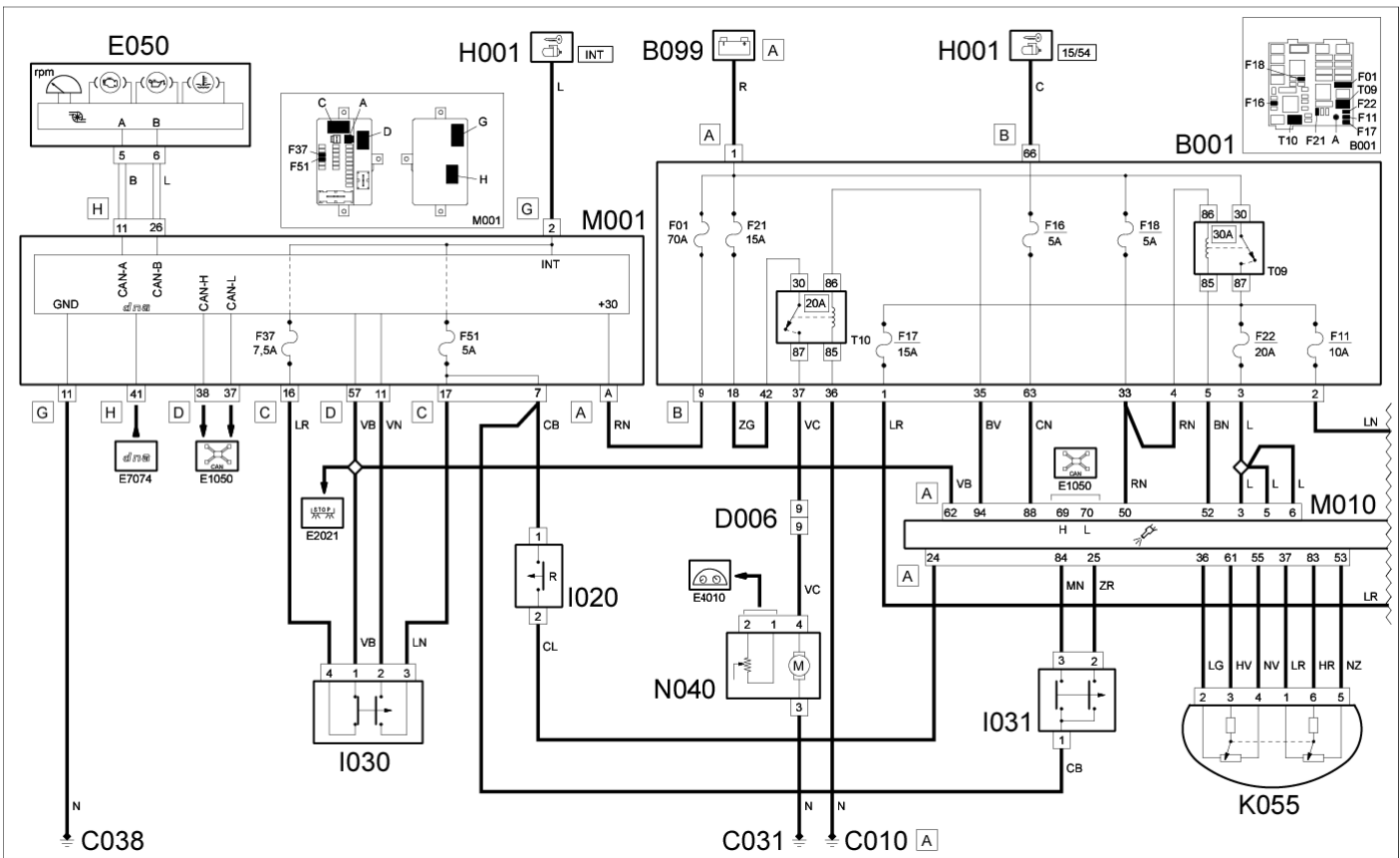
The control unit M010 controls the Multiair solenoid valves N197 fitted on the 4 cylinders by appropriate signals sent by pins 32-47, 31-46, 34-49 and 33-48 of connector B of M010.

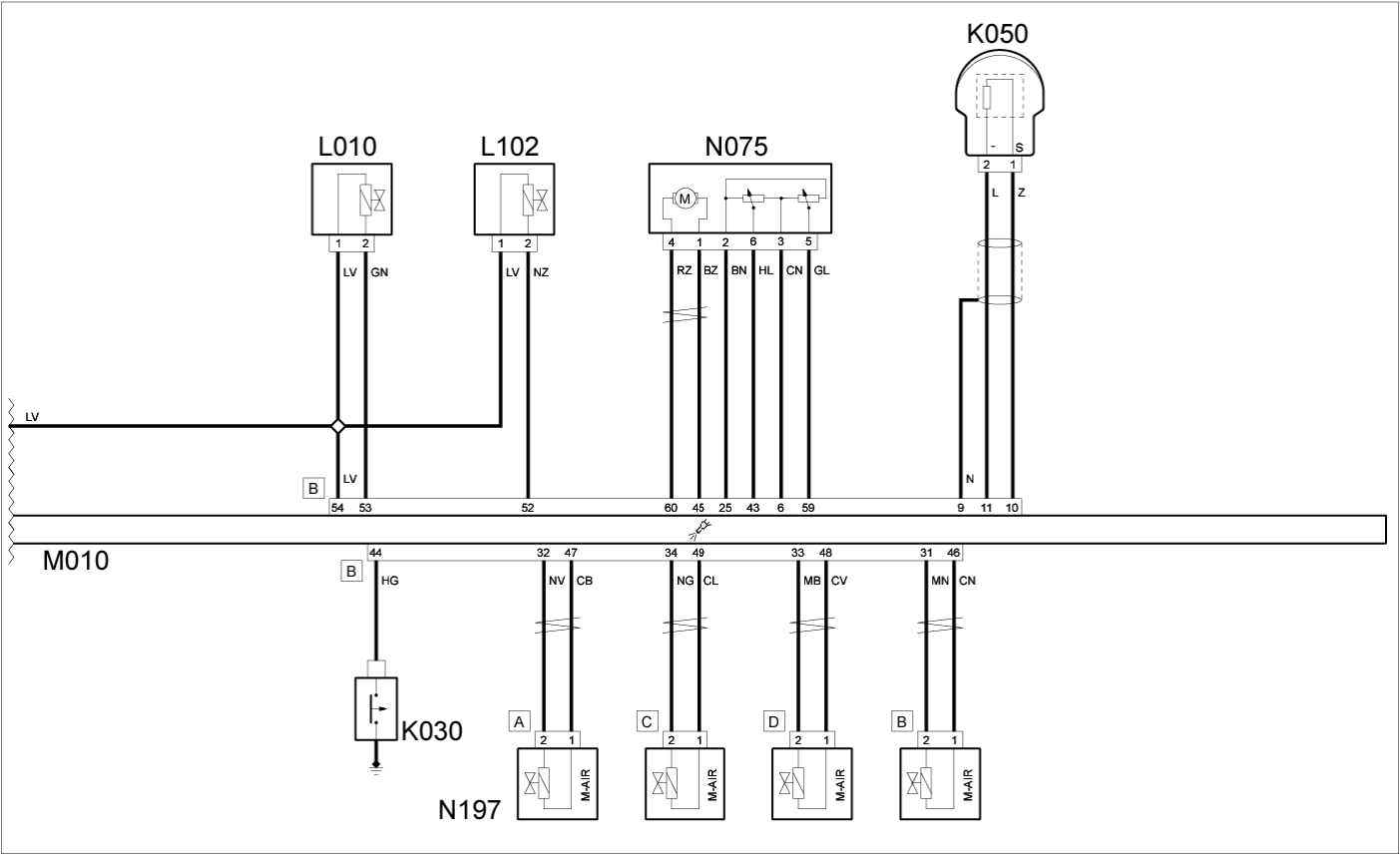
Control unit M010 is then connected via the CAN to Body Computer M1 and to the other network nodes: information on the following is sent through this connection

- self-diagnosis of the system that also produces a signal for the EOBD warning light, located on the instrument panel E050 and that is connected to the connector R010;
- engine coolant temperature, which is sent to the instrument panel E050 which manages the gauge and the warning light;
- engine rpm, which is sent to the instrument panel E050 rev counter;
- minimum engine oil pressure, which is sent to the instrument panel E050 that controls the warning light;
- too high turbocharger pressure, sent to instrument panel E050, which controls the displaying.

It receives the speedometer signal, via the CAN, produced by the ABS control unit M050.

## PETROL ENGINE ELECTRONIC MANAGEMENT - WIRING DIAGRAM

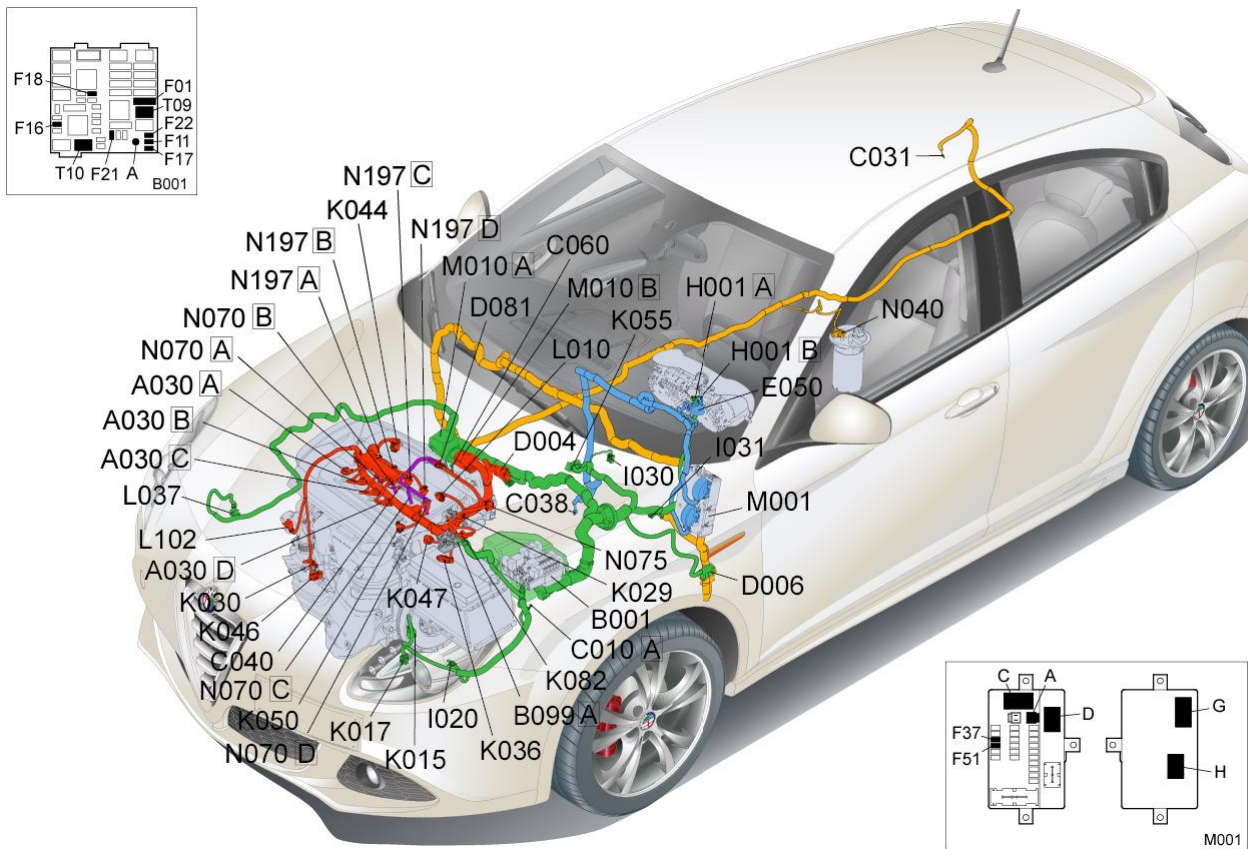




| Component Code | Description                                   | Reference to the operation                                                                    |
|----------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------|
| A030           | IGNITION COIL                                 | Op. 5510C14 IGNITION COIL/S - R.R.                                                            |
| A030           | IGNITION COIL                                 | Op. 5590B11 IGNITION COIL CONNECTOR - R.R.                                                    |
| B001           | JUNCTION UNIT                                 | Op. 5505A28 CONTAINER FOR ADDITIONAL JUNCTION UNIT IN ENGINE COMPARTMENT - R.R.               |
| B099           | MAXI FUSE BOX ON BATTERY                      | Op. 5530B40 SUPPLY BOX ON BATTERY (LINK BATTERY AND FUSE BOX) - R R                           |
| C010           | LEFT FRONT EARTH                              | -                                                                                             |
| C031           | RIGHT REAR EARTH                              | -                                                                                             |
| C038           | EARTH ON CENTRE TUNNEL                        | -                                                                                             |
| C040           | EARTH ON ENGINE                               | -                                                                                             |
| C060           | INJECTION CONTROL UNIT EARTH                  | -                                                                                             |
| D004           | FRONT/ENGINE COUPLING                         | -                                                                                             |
| D006           | FRONT/REAR COUPLING                           | -                                                                                             |
| D081           | INJECTOR JUNCTION                             | -                                                                                             |
| E050           | INSTRUMENT PANEL                              | Op. 5560B10 CONTROL PANEL - R+R                                                               |
| H001           | IGNITION SWITCH                               | Op. 5520A18 IGNITION SWITCH CONTACT CARRIER LOCK BARREL - R.R.                                |
| I020           | REVERSING LIGHTS SWITCH                       | Op. 5550D22 REVERSING LIGHT SWITCH - 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)                                     |
| K015           | LAMBDA SENSOR ON PRE-CATALYZER                | Op. 1080B94 FRONT LAMBDA SENSOR TO WITH CATALYTIC CONVERTER - R.R                             |
| K017           | LAMBDA SENSOR ON CATALYZER                    | Op. 1080B95 REAR LAMBDA SENSOR TO CATALYTIC CONVERTER - R.R                                   |
| K029           | ENGINE OIL TEMPERATURE SENSOR                 | Op. 1036F21 UNIAIR MODULE OIL TEMPERATURE SENSOR - R.R.                                       |
| K029           | ENGINE OIL TEMPERATURE SENSOR                 | Op. 5590B42 ENGINE OIL TEMPERATURE 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.                    |
| K044           | AIR TEMPERATURE/PRESSURE SENSOR               | Op. 1056B54 INTAKE AIR PRESSURE/TEMPERATURE SENSOR - R.R.                                     |
| K044           | AIR TEMPERATURE/PRESSURE 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                               |
| K082           | SUPERCHARGING SENSOR                          | Op. 1056B44 AIR PRESSURE SENSOR - R + R                                                       |
| K082           | SUPERCHARGING SENSOR                          | Op. 5590B06 SUPERCHARGING SENSOR CONNECTOR - R.R.                                             |
| L010           | FUEL VAPOUR RECOVERY SOLENOID VALVE           | Op. 1080E28 PIPE FROM ACTIVE CHARCOAL FILTER TO SOLENOID - R.R.                               |
| L010           | FUEL VAPOUR RECOVERY SOLENOID VALVE           | Op. 5590B23 FUEL VAPOUR RECOVERY SOLENOID VALVE CONNECTOR - R.R.                              |
| L037           | WASTE GATE SOLENOID VALVE                     | Op. 1064B38 WASTE GATE SUPERCHARGING PRESSURE ADJUSTMENT SOLENOID VALVE - R.R.                |
| L102           | TURBOCHARGER BY-PASS SOLENOID VALVE           | Op. 1048B58 TURBOCHARGER AIR BY-PASS VALVE - R.R.                                             |
| L102           | TURBOCHARGER BY-PASS SOLENOID VALVE           | Op. 5590B26 TURBOCHARGER BY-PASS 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 REPLACEMNT |
| N070           | INJECTOR                                      | Op. 5590B09 INJECTOR CONNECTOR - R.R.                                                         |
| 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.                                |
| N197           | MULTIAIR ACTUATOR                             | Op. 1036F20 UNIAIR MODULE - R.R.                                                              |
| N197           | MULTIAIR ACTUATOR                             | Op. 5590B40 MULTIAIR ACTUATOR CONNECTOR - R.R.                                                |



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. 5505A28 CONTAINER FOR ADDITIONAL JUNCTION UNIT IN ENGINE COMPARTMENT - R.R.               |
| B099           | MAXI FUSE BOX ON BATTERY                      | Op. 5530B40 SUPPLY BOX ON BATTERY (LINK BATTERY AND FUSE BOX) - R R                           |
| C010           | LEFT FRONT EARTH                              | -                                                                                             |
| C031           | RIGHT REAR EARTH                              | -                                                                                             |
| C038           | EARTH ON CENTRE TUNNEL                        | -                                                                                             |
| C040           | EARTH ON ENGINE                               | -                                                                                             |
| C060           | INJECTION CONTROL UNIT EARTH                  | -                                                                                             |
| D004           | FRONT/ENGINE COUPLING                         | -                                                                                             |
| D006           | FRONT/REAR COUPLING                           | -                                                                                             |
| D081           | INJECTOR JUNCTION                             | -                                                                                             |
| E050           | INSTRUMENT PANEL                              | Op. 5560B10 CONTROL PANEL - R+R                                                               |
| H001           | IGNITION SWITCH                               | Op. 5520A18 IGNITION SWITCH CONTACT CARRIER LOCK BARREL - R.R.                                |
| I020           | REVERSING LIGHTS SWITCH                       | Op. 5550D22 REVERSING LIGHT SWITCH - 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)                                     |
| K015           | LAMBDA SENSOR ON PRE-CATALYZER                | Op. 1080B94 FRONT LAMBDA SENSOR TO WITH CATALYTIC CONVERTER - R.R                             |
| K017           | LAMBDA SENSOR ON CATALYZER                    | Op. 1080B95 REAR LAMBDA SENSOR TO CATALYTIC CONVERTER - R.R                                   |
| K029           | ENGINE OIL TEMPERATURE SENSOR                 | Op. 1036F21 UNIAIR MODULE OIL TEMPERATURE SENSOR - R.R.                                       |
| K029           | ENGINE OIL TEMPERATURE SENSOR                 | Op. 5590B42 ENGINE OIL TEMPERATURE 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.                    |
| K044           | AIR TEMPERATURE/PRESSURE SENSOR               | Op. 1056B54 INTAKE AIR PRESSURE/TEMPERATURE SENSOR - R.R.                                     |
| K044           | AIR TEMPERATURE/PRESSURE 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                               |
| K082           | SUPERCHARGING SENSOR                          | Op. 1056B44 AIR PRESSURE SENSOR - R + R                                                       |
| K082           | SUPERCHARGING SENSOR                          | Op. 5590B06 SUPERCHARGING SENSOR CONNECTOR - R.R.                                             |
| L010           | FUEL VAPOUR RECOVERY SOLENOID VALVE           | Op. 1080E28 PIPE FROM ACTIVE CHARCOAL FILTER TO SOLENOID - R.R.                               |
| L010           | FUEL VAPOUR RECOVERY SOLENOID VALVE           | Op. 5590B23 FUEL VAPOUR RECOVERY SOLENOID VALVE CONNECTOR - R.R.                              |
| L037           | WASTE GATE SOLENOID VALVE                     | Op. 1064B38 WASTE GATE SUPERCHARGING PRESSURE ADJUSTMENT SOLENOID VALVE - R.R.                |
| L102           | TURBOCHARGER BY-PASS SOLENOID VALVE           | Op. 1048B58 TURBOCHARGER AIR BY-PASS VALVE - R.R.                                             |
| L102           | TURBOCHARGER BY-PASS SOLENOID VALVE           | Op. 5590B26 TURBOCHARGER BY-PASS 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 REPLACEMNT |
| N070           | INJECTOR                                      | Op. 5590B09 INJECTOR CONNECTOR - R.R.                                                         |
| N075           | INTEGRATED THROTTLE BODY ACTUATOR             | Op. 1056B14 THROTTLE BODY - R + R                                                             |

N075  
N197  
N197

INTEGRATED THROTTLE BODY ACTUATOR  
MULTIAIR ACTUATOR  
MULTIAIR ACTUATOR

Op. 5590B10 INTEGRATED THROTTLE BODY ACTUATOR CONNECTOR - R.R.  
Op. 1036F20 UNIAIR MODULE - R.R.  
Op. 5590B40 MULTIAIR ACTUATOR CONNECTOR - R.R.