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GESTIONE ELETTRONICA MOTORI DIESEL

250/251 - Ducato

DIESEL ENGINE ELECTRONIC MANAGEMENT - DESCRIPTION

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

The Diesel engine is equipped with a UNIJET COMMON RAIL injection system. In this Common Rail injection system with a CP1H Radialjet pump, the flow rate regulator located upstream of the high pressure pump modulates the fuel flow to the level required by the low pressure system.

The high pressure pump then supplies the Rail correctly.

Because this solution only pressurises the required amount of fuel, energy efficiency is improved and system fuel heating is limited.

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

- fuel supply;
- air supply;
- glow plugs;
- accelerator pedal;
- engine cooling;
- exhaust gas recirculation;
- combustion control.

This version has a linear Lambda sensor, fitted on the front section of the exhaust pipe (downstream of the turbocharger) which informs the engine management control unit of the progress of the combustion. It is used to compare the reading of the air flow meter with the one mapped in the control unit and, if necessary, correct the fuel injection to be within the emission limits.

The electronic management system described above ensures that this engine meets the very latest EOBD (European On Board Diagnosis) system emission control and monitoring requirements EURO 4. This system allows continuous diagnosis of emission-related car components and notifies the driver if any of the components should deteriorate by turning on a warning light in the instrument panel.

The aim of the system is to:

- monitor system efficiency;
- indicate an increase in emissions due to vehicle malfunction;
- indicate the need to replace damaged components.

For more details,

See descriptions 1060 DIESEL INJECTION FUEL SYSTEM

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

DIESEL ENGINE ELECTRONIC MANAGEMENT - FUNCTIONAL DESCRIPTION

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

The ignition-operated power supply (15/54) arrives via a line protected by fuse F16 of the engine compartment junction unit B001 at pin 28 of connector B.

The main injection relay T09 of junction unit B001 controls the entire system: the coil receives a direct battery power supply via the line protected by fuse F18 of the engine compartment junction unit.

This relay is energized by an (earth) control signal from pin 72 of connector B of the engine management control unit M010 and then forwards a power supply:

- to pin 1 of connector B of the control unit, via the line protected by fuse F17 of B001 ;
- to pin 5 of connector B of the control unit, via the line protected by fuse F22 of B001 ;
- to pin 6 of the heater plugs control unit M015, via the line protected by fuse F11 of B001; this power supply also reaches the EGR solenoid valve L030, the throttle casing solenoid valve L062, the oil vapour heating resistance O007 (if present) and pin 4 of the Lambda sensor K040.

The heater plugs control unit also receives a direct battery power supply, at pin 11, via the line protected by fuse F02 of the engine compartment junction unit B001.

The fuel pump relay T10 of junction unit B001 provides a direct battery power supply to the fuel pump N040 - pin 1 - along the line protected by fuse F21 of the engine compartment junction unit B001.

The coil is energized by pin 20 of connector B of the engine management junction unit M010; the coil for relay T10 receives a reference earth, via pin 11 of connector C of the engine compartment junction unit B001, coming from the NC contact for the inertia switch I050 (pin 3).

In the case of an impact the inertia switch opens, no longer supplying the reference earth to the coil for relay T10 and thereby interrupting the activation of the fuel pump N040 and the additional heating pump N044.

See E6015 ADDITIONAL HEATER

Pins 2, 4 and 6 of connector B of the engine management control unit M010 are connected to the left front earth C010; the following are connected to this earth: the heater plugs control unit M015 (pin 7), the throttle body solenoid valve L062 (pin 3), the oil vapour heating resistance O007 (pin 2) and the engine oil sensor signals control unit M186 (pin 4).

The heater plugs control unit M015 is connected, via pins 1, 2, 3 and 4 to the heater plugs A040, A, B, C and D and via pins 9 and 10 to pins 52 (preheating time/fault detection feedback) and 93 (heater plugs signal) of connector B of the engine management control unit M010.

The engine management control unit M010 receives signals from the various sensors in order to control all engine service parameters.

The engine management control unit controls an earth signal from pin 51 of connector B, the heater inside the Lambda sensor K040 (pin 3).

The control unit M010 sends a "pumping" current, from pin 65 of connector B, to the Lambda sensor K040 (pin 1), which is compared with the "setting" one received from pin 87 of connector B (at pin 5 of K040). The Lambda sensor receives a reference earth, at pin 2, from pin 86 of connector B of M010 and sends a voltage signal, from pin 6, proportional to the percentage of oxygen measured in the exhaust gases to pin 64 of connector B of control unit M010.

The engine management control unit controls the EGR solenoid valve L030 from pin 60 of connector A and the throttle body solenoid valve L062 from pin 59 of connector A.

The engine oil sensor signals control unit M186 receives an ignition-controlled power supply (INT) at pin 1, via the line protected by fuse F35 located in the junction unit under the dashboard B002; it receives the information from the engine oil level sensor K032, at pins 3 (positive) and 6 (negative) and sends these signals, from pins 2 (oil level signal) and 5 (earth signal) to the control unit M010 (pins 52 and 22 of connector A respectively).

The engine rpm sensor K046 supplies, via frequency signals exchanged with pins 12 (negative) and 27 (positive) of connector A of M010, information on engine speed.

Timing sensor K047 is supplied from pin 11 of connector A of M010 . It receives a reference earth from pin 20 of connector B of control unit M010 and sends a frequency signal corresponding to the phase at pin 50 of connector A.

The engine coolant sensor K036 receives a reference earth from pin 41 of connector A of control unit M010 and sends a signal proportional to engine coolant temperature to pin 58 of connector A of the control unit.

The control unit M10 receives - at pin 56 of connector A - a signal from the minimum engine oil pressure sensor K030.

The air flow meter K041 receives an ignition-controlled power supply (INT) via the line protected by fuse F35 of the junction unit B002; it receives a reference earth, from pin 44 of connector A of the engine management control unit M010 and sends a signal proportional to the air flow rate to pin 42 of connector A. An air temperature sensor inside K041 also sends an air temperature signal to pin 37 of connector A of the engine management control unit M010 .

The accelerator pedal K055 is equipped with two built-in potentiometers: a main one and a safety one. The former receives power and earth signals from pins 45 and 30 of connector B and sends a corresponding signal to pin 9 of the same connector of

M010. The latter receives power and earth signals from pins 46 and 8 of connector B of M010 and sends a corresponding signal to pin 31 of the same connector.

The fuel temperature sensor K081, located on the diesel filter, receives a reference earth from pin 10 of connector B of M010 and sends a signal to pin 11 of the same connector.

The fuel flow rate regulator N193 has the task of managing the fuel flow rate to the pumping pistons correctly. The two control signals come from pins 19 (power supply) and 49 (negative) of connector A of the engine management control unit M010.

The water in the diesel filter sensor K031 receives an ignition-controlled power supply (INT) via the line protected by fuse F35 of the junction unit B002; it is connected, from pin 2, to the left front earth C010 and sends, the signal for the presence of water in the diesel filter, from pin 1 to pin 74 of of connector B of the engine management control unit M010.

The fuel pressure sensor K083 is connected to pins 8 (earth), 28 (power supply) and 43 (signal) of connector A of the engine management control unit M010.

The engine management unit M010 controls the opening of individual injectors N070, via appropriate signals sent from pins 16-47 (cyl.1), 2-31 (cyl.2), 1-46 (cyl.3), 17-33 (cyl.4) of connector A.

The air pressure/temperature sensor K044, located in the intake manifold, receives a power supply and reference earth from pins 13 and 23 of connector A of the engine management control unit M010 and sends absolute pressure and temperature signals to pins 40 and 53 of connector A.

Pin 17 of connector B of control unit M010 receives an NA signal from the switch on brake pedal I030, supplied by an ignition-controlled supply (INT) via a line protected by fuse F37 of junction unit B002.

Pin 80 of connector B of control unit M010 receives an NC signal from the switch on brake pedal I030, supplied by an ignition-controlled supply (INT) via a line protected by fuse F42 of junction unit B002.

For versions available from 11/2006, this ignition-operated power supply (INT) is protected by fuse F35 of B002 (pin 17 of connector A).

Pin 79 of connector B of M010 receives an earth signal from clutch pedal switch I031.

The control unit M010 is connected via the CAN, pins 83 and 84 of connector B, to the Body Computer M001, pins 48 and 49 of connector A, and to the other network nodes; information is sent, via this connection, for the management of the indicators and warning lights in the instrument panel E050, in particular for the management of:

- engine coolant temperature gauge and warning light;
- rev counter;
- minimum engine oil pressure warning light;
- heater plugs warning light;
- water in diesel filter sensor;
- "general failure" warning light lit up for the failure of the engine oil pressure sensor or the operation of the inertia switch.

See E4010 INSTRUMENT PANEL

It also manages the "injection system/EOBD failure" warning light directly from pin 71 of connector B via the direct connection with pin 18 of the instrument panel E050.

The control unit M010 receives a speedometer signal generated by the braking system control unit M051 via the CAN.

It is also connected:

- from pin 25 of connector B to the K line for managing the self diagnostic functions;

See E8010 DIAGNOSTIC MULTIPLE CONNECTOR

- from pins 69 and 90 of connector B for managing the engine cooling fans;

See E5020 ENGINE COOLING

- from pins 12, 13, 22 and 29 of connector B for managing the compressor engagement function;

See E6021 COMPRESSOR ENGAGEMENT

- from pins 38, 56, 77 and 78 of connector B for managing the Cruise Control function;

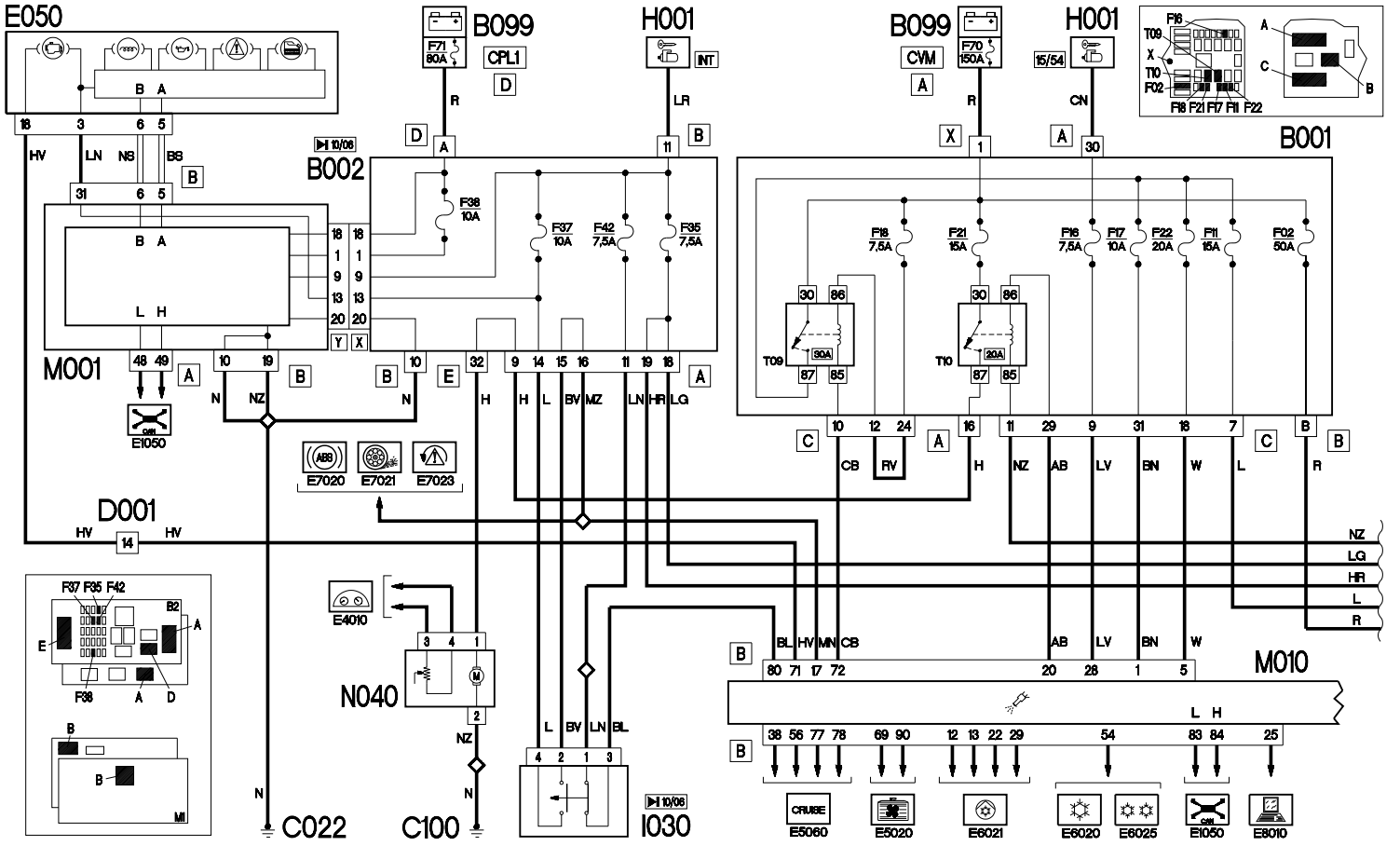
See E5060 CRUISE CONTROL

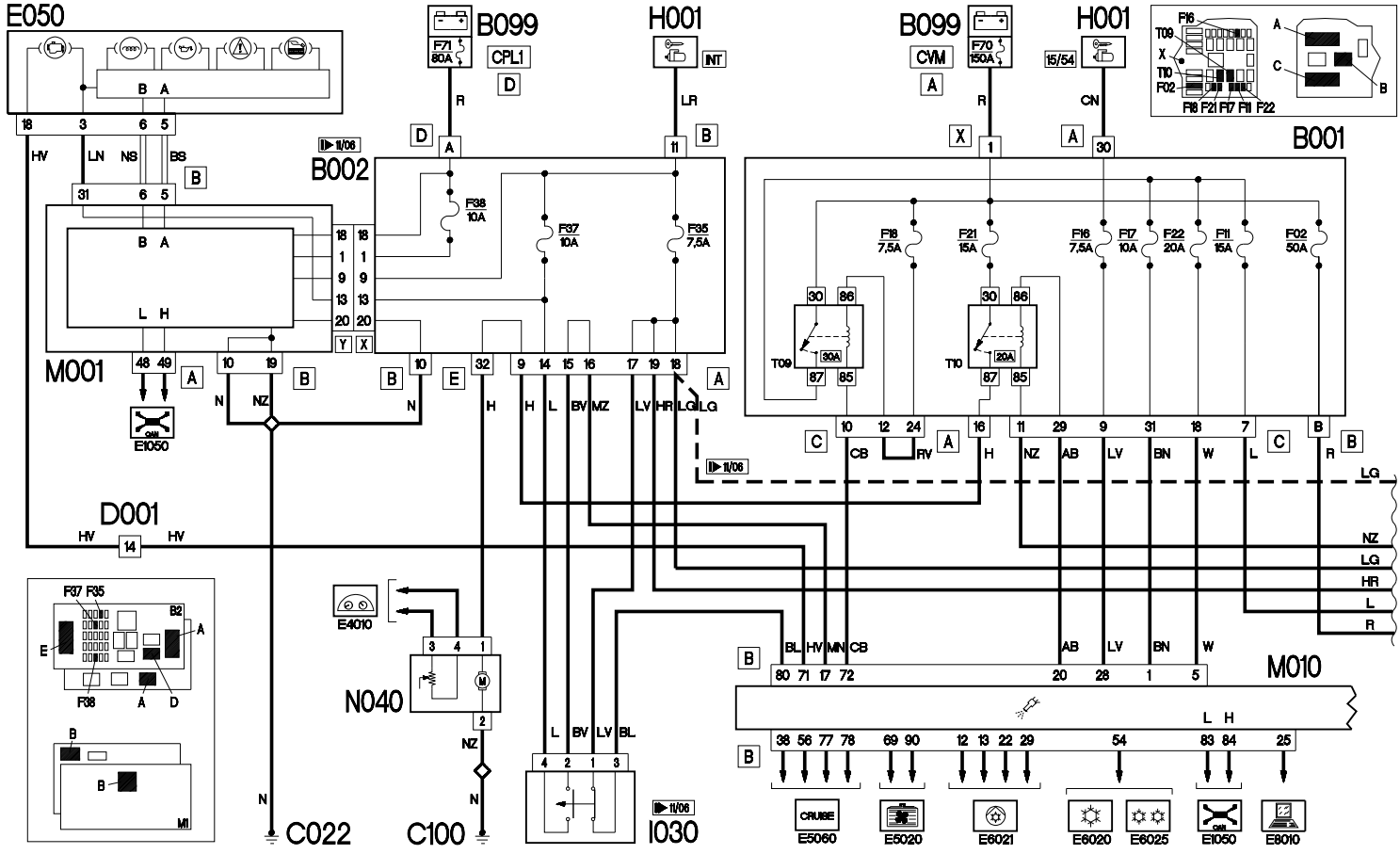
- from pin 54 of connector B to receive the compressor engagement request.

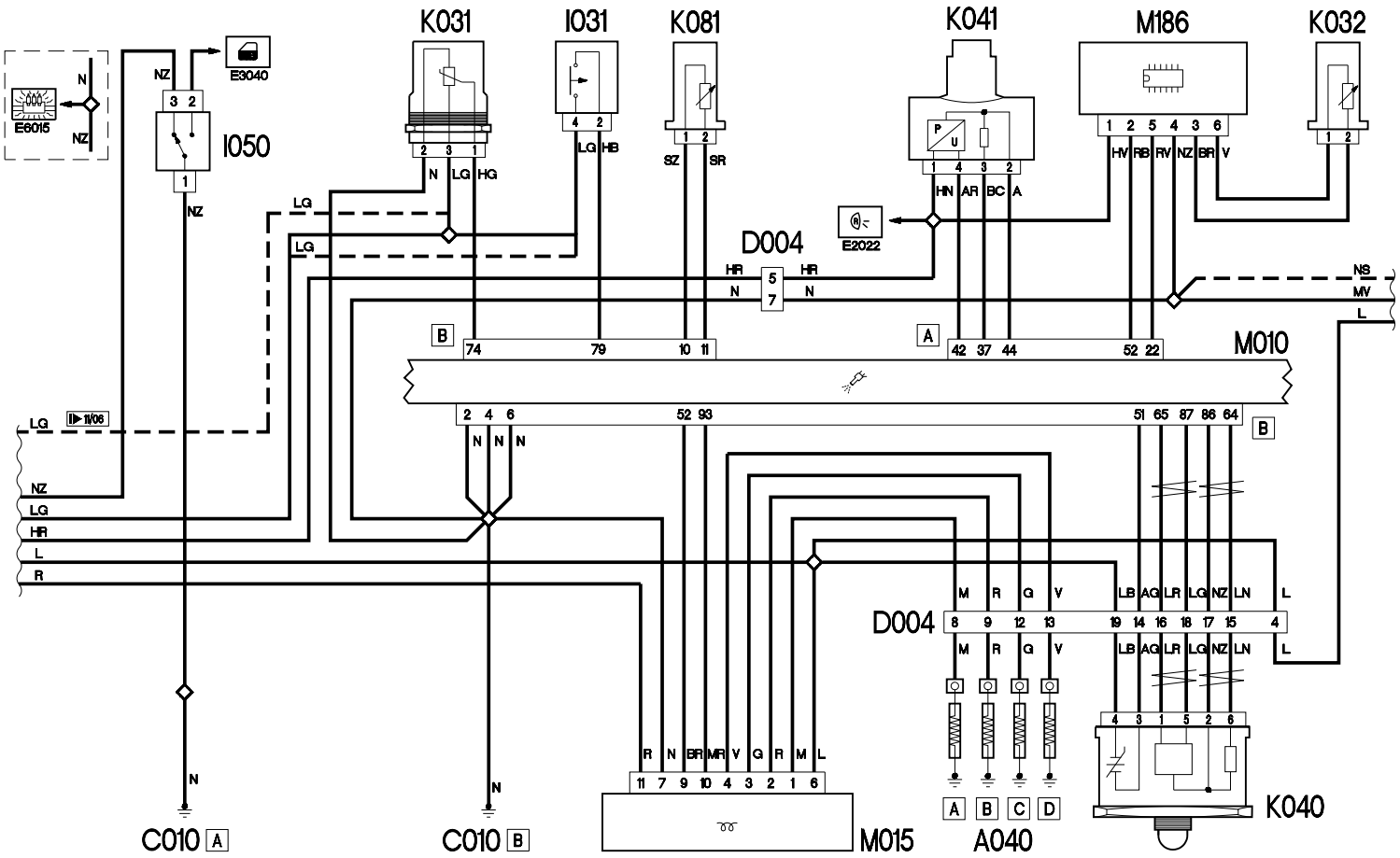
See E6020 AIR CONDITIONING

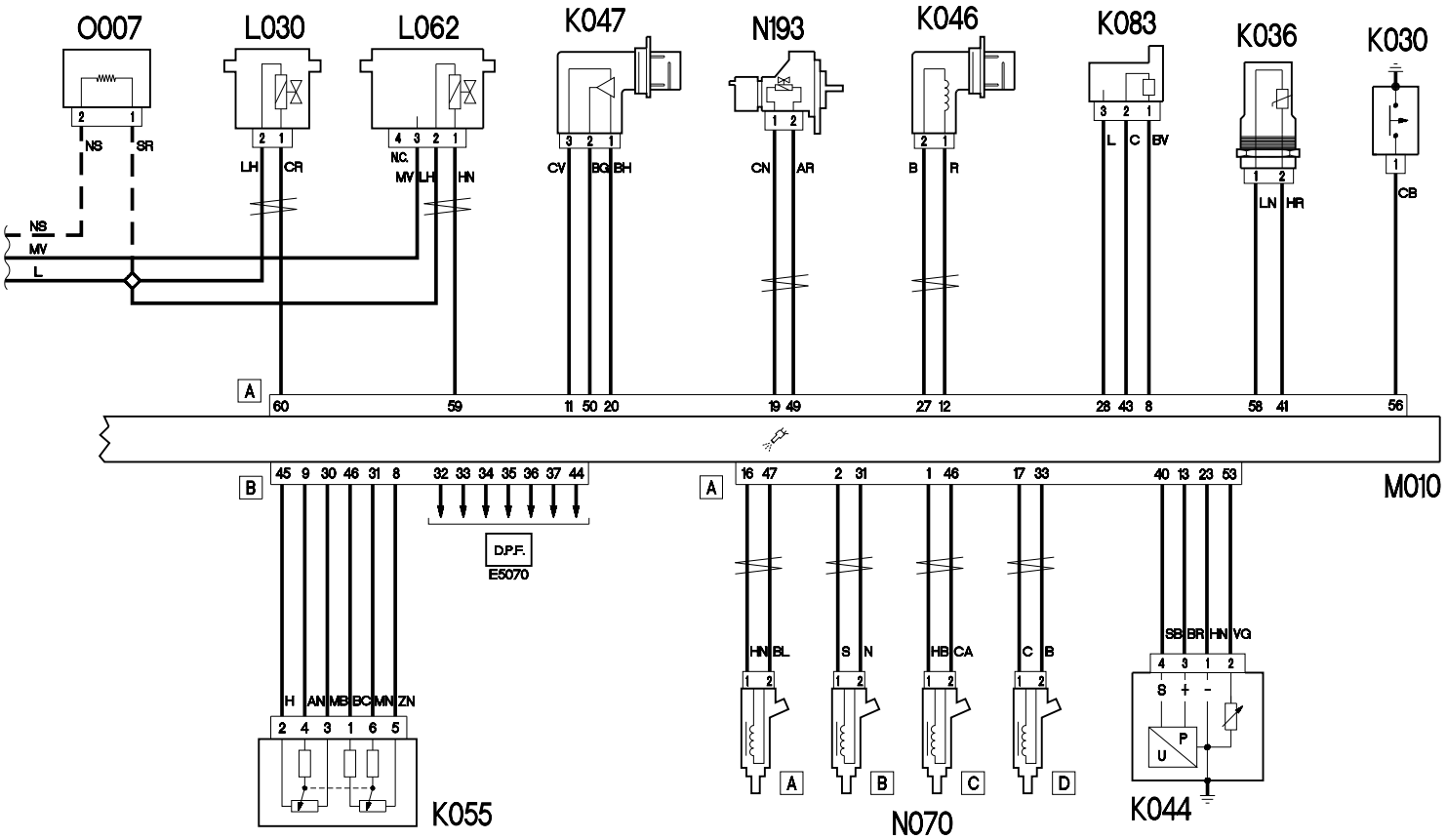
See E6025 SUPPLEMENTARY AIR CONDITIONER

DIESEL ENGINE ELECTRONIC MANAGEMENT - WIRING DIAGRAM






K031
I031
K081
K041
M186
K032
E6015
E3040
I050
D004
E2022
M010
M015
A040
K040
C010 A
C010 B


O007
L030
L062
K047
N193
K046
K083
K036
K030
M010
D.P.F.
E5070
K055
N070
K044

Component code	Description	With reference to the assembly
A040	HEATER PLUGS	Op. 5520C COLD STARTING SYSTEM (DIESEL ENGINES)
B001	JUNCTION UNIT	Op. 5505A MULTI-FUNCTION COMPONENTS
B002	JUNCTION UNIT UNDER DASHBOARD	Op. 5505A MULTI-FUNCTION COMPONENTS
B099	MAXI FUSE BOX ON BATTERY	Op. 5530B BATTERY AND LEADS
C010	LEFT FRONT EARTH	-
C022	Centre dashboard earth	-
C100	CAB EARTH	-
D001	FRONT/DASHBOARD COUPLING	-
D004	FRONT/ENGINE COUPLING	-
E050	INSTRUMENT PANEL	Op. 5560B ANALOGUE CONTROL PANEL
H001	IGNITION SWITCH	Op. 5520A IGNITION SWITCH
I030	BRAKE PEDAL SWITCH	Op. 5550D BRAKE AND REVERSING LIGHTS
I031	CLUTCH PEDAL SWITCH	Op. 5580A CRUISE CONTROL SYSTEM
I050	INERTIA SWITCH	Op. 1040A FUEL TANK AND COMPONENTS
K030	ENGINE OIL PRESSURE SENSOR (SWITCH)	Op. 1084A SIGNALLING/CONTROL DEVICES
K031	WATER IN DIESEL FILTER SENSOR	Op. 1060G DIESEL INJECTION PRESSURE PUMP ELECTRONIC CONTROL
K032	ENGINE OIL LEVEL SENSOR	Op. 1084A SIGNALLING/CONTROL DEVICES
K036	ENGINE COOLANT TEMPERATURE SENSOR/SENDER UNIT	Op. 1060G DIESEL INJECTION PRESSURE PUMP ELECTRONIC CONTROL
K040	LAMBDA SENSOR	Op. 1080B EXHAUST EMISSION CONTROL SYSTEM
K041	AIR FLOW METER	Op. 1048A VACUUM AIR CIRCUIT
K044	AIR TEMPERATURE/PRESSURE SENSOR	Op. 1072B INTAKE MANIFOLDS
K046	RPM SENSOR	Op. 1060G DIESEL INJECTION PRESSURE PUMP ELECTRONIC CONTROL
K047	TIMING SENSOR	Op. 1060G DIESEL INJECTION PRESSURE PUMP ELECTRONIC CONTROL
K055	ACCELERATOR PEDAL POTENTIOMETER	Op. 1068A ACCELERATOR PEDAL CONTROL
K081	FUEL TEMPERATURE SENSOR	Op. 1060G DIESEL INJECTION PRESSURE PUMP ELECTRONIC CONTROL

K083	FUEL PRESSURE SENSOR	Op. 1060G DIESEL INJECTION PRESSURE PUMP ELECTRONIC CONTROL
L030	EGR SOLENOID	Op. 1080C EXHAUST GAS RECIRCULATION (E.G.R.)
L062	THROTTLE BODY SOLENOID VALVE	Op. 1080C EXHAUST GAS RECIRCULATION (E.G.R.)
M001	BODY COMPUTER	Op. 5505A MULTI-FUNCTION COMPONENTS
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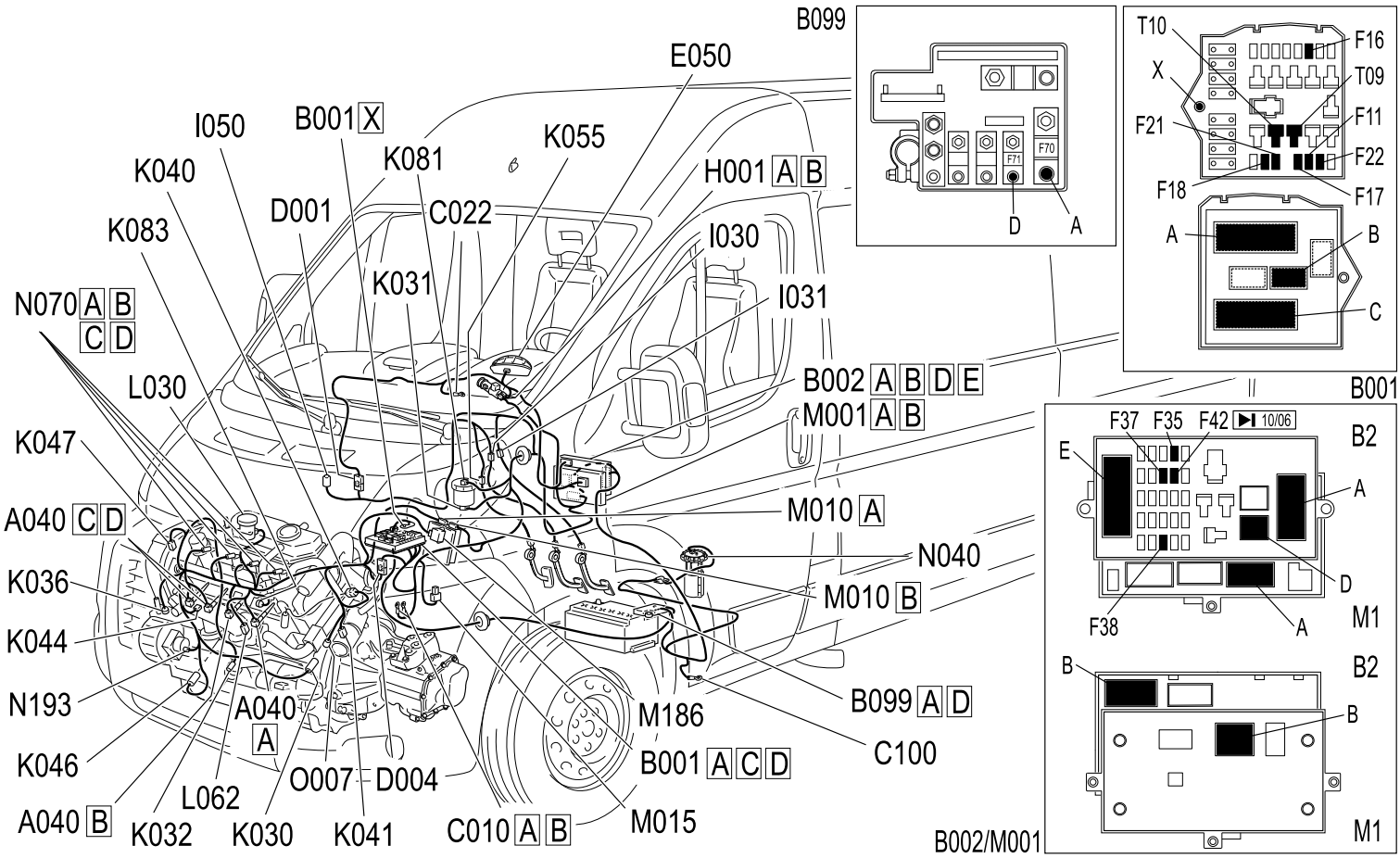
M015	HEATER PLUGS CONTROL UNIT	Op. 5520C COLD STARTING SYSTEM (DIESEL ENGINES)
M186	ENGINE OIL SENSOR SIGNAL CONTROL UNIT	Op. 1060G DIESEL INJECTION PRESSURE PUMP ELECTRONIC CONTROL
N040	FUEL PUMP AND LEVEL GAUGE	Op. 1040A FUEL TANK AND COMPONENTS
N070	INJECTOR	Op. 1060F INJECTORS AND PIPES
N193	FUEL FLOW RATE REGULATOR	Op. 1060E DIESEL PRESSURE PUMP AND CONTROL
O007	OIL VAPOUR HEATING RESISTANCE	-

DIESEL ENGINE ELECTRONIC MANAGEMENT - COMPONENT LOCATION



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