



STARTING AND RECHARING

147

STARTING AND RECHARGING - Description

The ignition and recharging circuit comprises the battery, starter motor and alternator.

The starter motor consists of a direct current motor supplied by the battery and an excitation solenoid. When the ignition key is turned to the extreme position (AVV), the starter motor windings are supplied, producing electro-magnetic forces which rotate the motor pinion. At the same time, the solenoid is energized and operates the mechanism for engaging the pinion in the flywheel ring gear, thus turning over the engine.

The alternator recharges the battery during normal engine rotation.

The alternator shaft (rotor) is turned by the crankshaft by means of a belt.

When supplied with an excitation current, the rotor sets up a magnetic field that induces an alternating current in the fixed coil (stator). A diode rectifying bridge located on the back of the alternator transforms the alternating current into a direct current, which is sent to recharge the battery.

A voltage regulator, also built into the alternator, maintains a constant voltage supply (about 14V) throughout the load and engine speed ranges.

The efficiency of the recharging system is controlled by the Body Computer, which measures the D+ signal coming from the alternator with the engine running (rpm over 700).

If a fault is detected, the relevant warning light on the instrument panel is switched on.

The Body Computer also acquires the battery voltage value in the 6-18V field.

The information is then supplied to the CAN network for the controls unit node on the door which excludes some services in the case of a voltage drop (for example E2510 COURTESY LIGHTS).

STARTING AND RECHARGING - Functional description

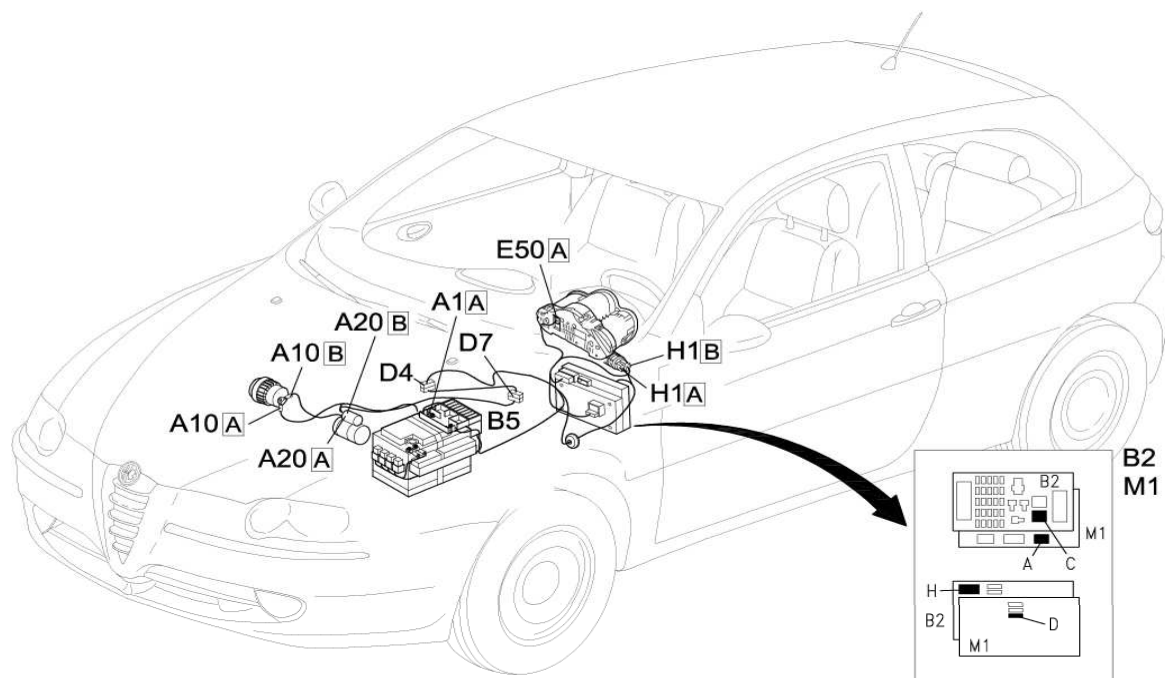
When the ignition key in the switch H1 is turned to the extreme position (START) - pin 50 - the winding of the solenoid - pin 50 - of the starter motor A20 is supplied.

This supply comes from the battery via the line of maxifuse IGN of B5 .

Pin 30 of A20 , the actual starter motor, receives the voltage coming directly from the battery A1 .

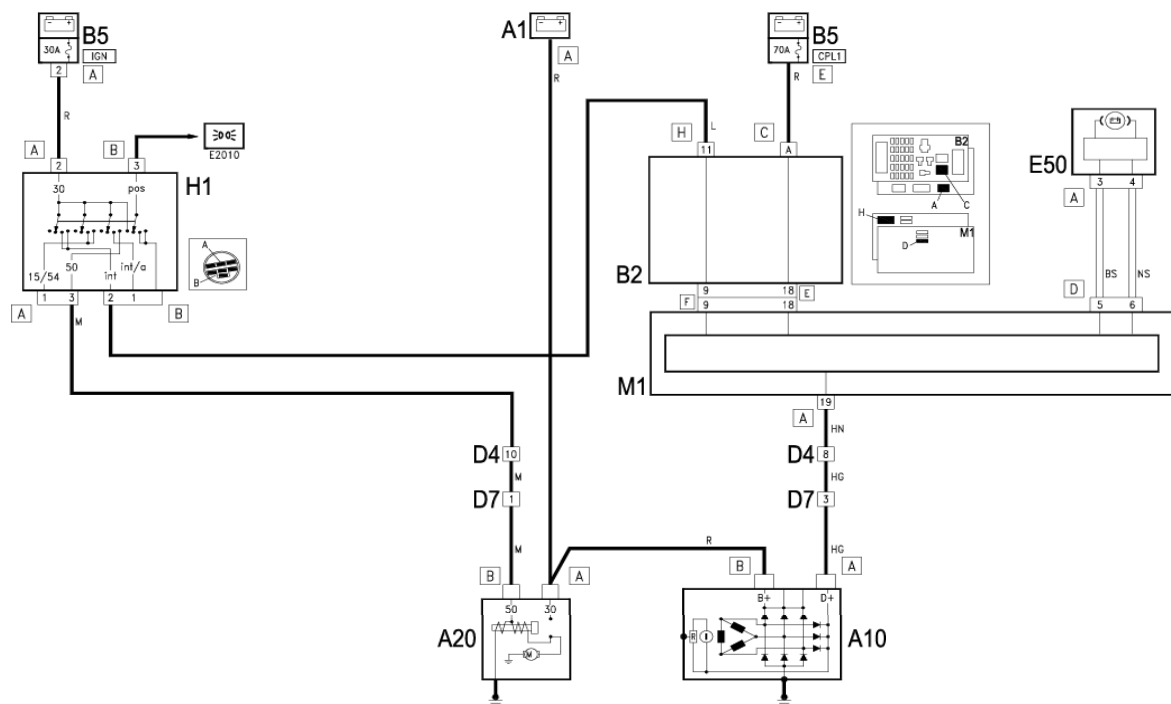
The direct current generated by the alternator A10 (pin B+) is sent to the battery A1 , passing through the motor A20 . When the alternator does not turn, and so does not recharge the battery, an earth signal is sent from pin D+ to the Body Computer - pin 19 of connector A: this is connected via the CAN line to the instrument panel E50 and manages, as described above, the switching on of the recharging warning light on the instrument panel E50 .

STARTING AND RECHARGING - Location of components



Component code	Name	Assembly reference
A1	Battery	5530B
A10	Alternator	5530A
A20	Starter' motor	5520B
B1	Engine compartment junction unit	-
B1	Engine compartment junction unit	5505A
B2	Junction unit under dashboard	5505A
B5	MAXI FUSE box	-
B99	Maxifuse box on battery	5530B
D4	Front / engine coupling	-
D7	Recharging / front connection	-
E50	Instrument panel	5560B
H1	Ignition switch	5520A
J5	Starting enablement relay	-
M1	Body computer	5505A
M54	"Selespeed transmission control unit"	2127E

STARTING AND RECHARGING - Wiring diagram



Component code	Name	Assembly reference
A1	Battery	5530B
A10	Alternator	5530A
A20	Starter' motor	5520B
B1	Engine compartment junction unit	-
B1	Engine compartment junction unit	5505A
B2	Junction unit under dashboard	5505A
B5	MAXI FUSE box	-
B99	Maxifuse box on battery	5530B
D4	Front / engine coupling	-
D7	Recharging / front connection	-
E50	Instrument panel	5560B
H1	Ignition switch	5520A
J5	Starting enablement relay	-
M1	Body computer	5505A
M54	"Selespeed transmission control unit"	2127E



ENGINE COOLING

147

ENGINE COOLING - Description

The engine radiator and air conditioner condenser cooling system consists of two fans activated in parallel at two different speeds.

- the first speed is activated at a first coolant temperature level or at a certain air conditioner coolant pressure.
- The second speed cuts in at a higher temperature or pressure threshold.

The fans are operated by means of three specific relays located in the engine compartment junction unit.

The fan power supply line is protected by two special maxifuses.

ENGINE COOLING - Functional description

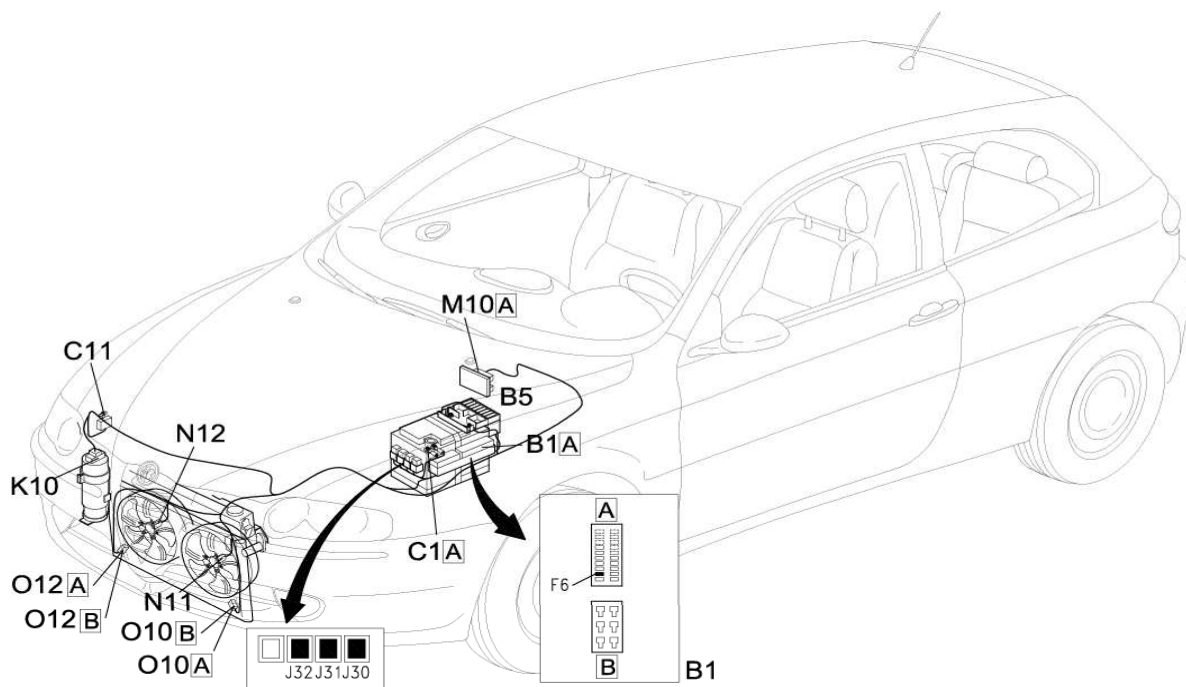
The relays J30, J31 and J32 located next to the engine compartment junction unit manage the engagement of the two fans N11 and N12 at two speeds: their coils are supplied by the line for fuse F6 of the engine compartment junction unit B1A.

The relays are energized by a control signal - earth - coming from the engine control unit M10.

If the engine coolant reaches a first temperature level, or the 4-stage pressure switch K10 indicates to the control unit M10 - pin 9 of connector A - that a first pressure level has been reached, the control unit M10 sends a signal - from pin 50 of connector A - to the fan 1st speed relay J30, which then sends the supply to the fan N11 via the additional resistor O10 and to the fan N12 via the additional resistor O12: the two fans thus turn at the first speed (slow).

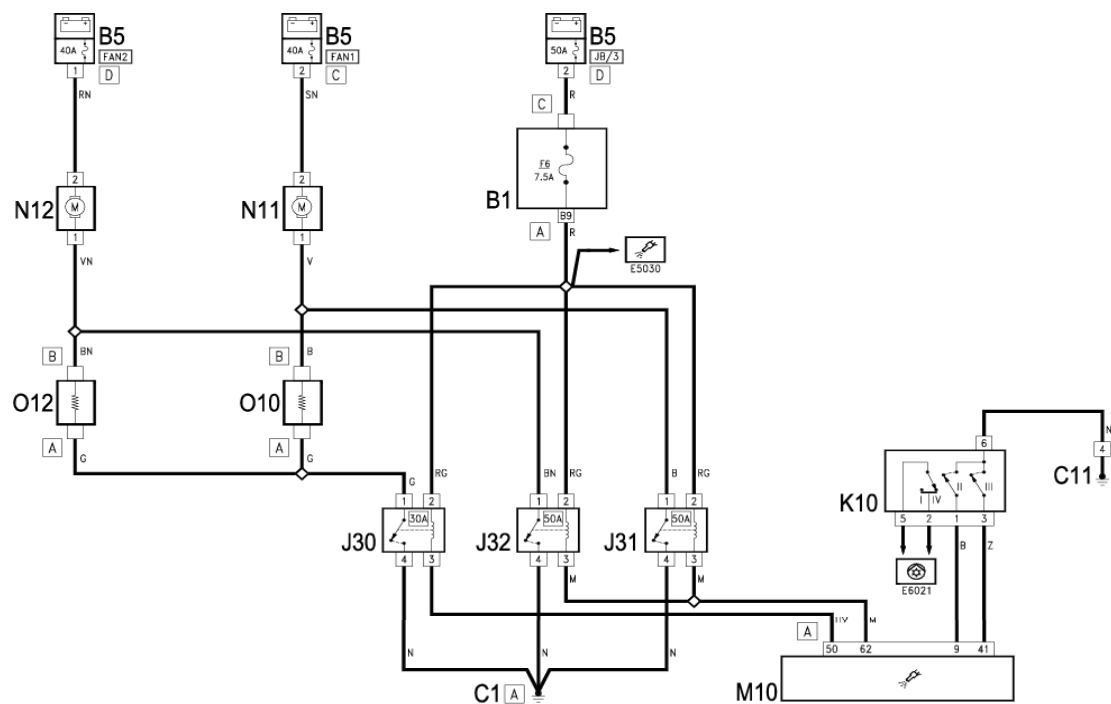
If the coolant reaches a higher temperature level, or the 4-stage pressure switch K10 indicates to the control unit M10 - pin 41 of connector A - that a higher pressure has been reached, the control unit M10 sends a signal - from pin 62 of connector A - to the two 2nd speed relays J31 and J32, which send the supply directly to the fan N11 and to the fan N12: the two fans then turn at the maximum speed.

ENGINE COOLING - Location of components



Component code	Name	Assembly reference
B1	Engine compartment junction unit	5505A
B5	MAXI FUSE box	-
B99	Maxifuse box on battery	5530B
C1	Battery earth	-
C11	Right front earth	-
H1	Ignition switch	5520A
J30	Engine fan 1st. speed relay	-
J31	Engine fan 2nd. speed relay	-
J32	Engine fan 2nd. speed relay	-
K10	4 stage pressure switch	5040B
M10	Engine management ECU	1056B
M10	Engine management ECU	1060G
N11	Engine electric fan motor	-
N11	Engine electric fan motor	1088E
N12	Engine fan motor -2	-
O10	Engine fan adjustment resistor	-
O10	Engine fan adjustment resistor	1088E
O12	Engine fan adjustment resistor -2	-

ENGINE COOLING - Wiring diagram



Component code	Name	Assembly reference
B1	Engine compartment junction unit	5505A
B5	MAXI FUSE box	-
B99	Maxifuse box on battery	5530B
C1	Battery earth	-
C11	Right front earth	-
H1	Ignition switch	5520A
J30	Engine fan 1st. speed relay	-
J31	Engine fan 2nd. speed relay	-
J32	Engine fan 2nd. speed relay	-
K10	4 stage pressure switch	5040B
M10	Engine management ECU	1056B
M10	Engine management ECU	1060G
N11	Engine electric fan motor	-
N11	Engine electric fan motor	1088E
N12	Engine fan motor -2	-
O10	Engine fan adjustment resistor	-
O10	Engine fan adjustment resistor	1088E
O12	Engine fan adjustment resistor -2	-



PETROL ENGINE ELECTRONIC MANAGEMENT

147

PETROL ENGINE ELECTRONIC MANAGEMENT - Description

An electronic management system supervises and governs all engine parameters. It optimises performance and fuel consumption by responding in real time to different service conditions.

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

The system uses signals received from numerous sensors to control actuators. It is connected to the following systems:

- fuel supply;
- air supply system;
- accelerator pedal;
- engine cooling;
- exhaust with two catalytic preconverters controlled by four lambda sensors;
- fuel vapour recirculation.

The throttle body is also controlled electronically by the control unit: specific software in the engine management control unit computes throttle opening; This dispenses with the need for a mechanical connection between the accelerator pedal and the throttle body.

Thanks to the electronic management described above, this engine conforms to the latest anti-pollution and continuous control regulations in accordance with the EOBD (European On Board Diagnosis) system.

For more details 1056 PETROL INJECTION SYSTEM

The system is also controlled by means of two relays located in the relay junction unit in the engine compartment.

The supply lines for the control unit and the various system components (sensors and actuators) are protected by a specific maxifuse and other fuses, located in the junction unit in the engine compartment.

PETROL ENGINE ELECTRONIC MANAGEMENT - Functional description

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

The direct supply for the system arrives from the battery from the line for the maxifuse IE of B5.

The supply controlled by the ignition (15/54) reaches pin 47 of connector A of M10 from the line protected by fuse F11 of the engine compartment unit B1A.

The control unit M10 is supplied directly by the battery at pin 15 of connector A, via a line protected by fuse F6 of the unit B1.

The main injection relay T9 of B1 controls the entire system: this is excited by a control signal (earth) received from pin 31 of connector A of control unit M10 and then sends power:

- to pins 16, 32 and 48 of connector A of the unit, via the line protected by fuse F8 of B1;
- to the air flow meter K41, the fuel vapour recovery solenoid L10, the variable valve timing actuator N76 and the Lambda probes K15, K16 and K17 and K18 (all of these lines are protected by fuse F9 of B1A);
- to the injectors N70 and the coils A30, via the line protected by fuse F10 of B1A.

The fuel pump relay T10 of B1B is supplied from the line of fuse F4 of B1A.

It is energized by a control signal (earth) from pin 30 of connector A of control unit M10 and supplies power to fuel pump N40, which is earthed through the inertia switch I50, which cuts off the circuit in the case of a crash and so prevents the dangerous spilling of fuel.

The engine control unit M10 receives signals from the various sensors in order to monitor all engine service conditions.

Rpm sensor K46 provides information on engine speed via a frequency signal sent to pins 10 and 59 of connector B of control unit M10. These two signals are very low intensity and are therefore shielded.

Timing sensor K47 is supplied from pin 51 of connector B of control unit M10, receives a reference earth from pin 26 of connector B and sends a signal of frequency corresponding to the timing to pin 42 of control unit connector B.

Engine temperature sender unit K36 receives a reference earth from pin 26 of connector B of control unit M10 and supplies a signal proportional to the coolant temperature to pin 25 of control unit connector B.

The three Lambda probes K15, K16, K17 and K18 provide the control unit M10 information concerning the correct composition of the air-fuel mixture in four different positions of the exhaust: two are upstream of the precatlyzers, and two are downstream of the catalyzers.

The probe K15, on the right precatlyzer, sends a signal to pin 23 of connector B of M10, while pin 55 supplies the reference earth. Probe K15 is heated by a resistor in order to ensure it works efficiently even when cold. The resistor is supplied by the main relay and receives an earth signal from pin 34 of connector B of control unit M10.

The probe K16, on the left precatlyzer, sends the signal to pin 39 of connector B of M10, while pin 7 supplies the reference earth. The probe K16 is heated with a resistor, supplied by the main relay, and receives an earth signal from pin 2 of connector B of control unit M10.

The probe K17 downstream of the right catalyzer (front) sends the signal to pin 28 of connector B of M10, while pin 60 supplies the reference earth. The probe K17 is heated with a resistor, supplied by the main relay, and receives an earth signal from pin 50 of connector B of control unit M10.

The sensor K18 downstream of the left catalyzer (rear) sends the signal to pin 44 of connector B of M10, while pin 12 supplies the reference earth. The probe K18 is heated with a resistor, supplied by the main relay, and receives an earth signal from pin 18 of connector B of control unit M10.

Knock sensor - 1 K50 provides information on knock status via a frequency signal sent to pin 22 of connector B of control unit M10. It receives a reference earth from pin 54 of connector B. The signals are very low intensity and are therefore shielded.

Knock sensor - 2 K50 provides information on knock status via a frequency signal sent to pin 6 of connector B of control unit M10. It receives a reference earth from pin 38 of connector B. The signals are very low intensity and are therefore shielded.

Air flow meter K41 (supplied by the relay J10) receives a reference voltage from pin 63 of connector A of the control unit, and sends to pin 57 of connector A a signal proportional to the air flow. K41 also contains an air temperature sensor: the sensor reference earth is supplied by pin 25 of connector A of M10, while an air temperature signal is received by pin 54 of connector A.

Accelerator pedal K55 is fitted with two built-in potentiometers (a main one and a safety back-up). The first receives power and earth from pins 56 and 24 respectively of connector A of M10 and sends a corresponding signal to pin 8 of the same connector. The second receives power and earth from pins 7 and 25 respectively of connector A of M10 and sends a corresponding signal to pin 40 of connector A.

Pin 274 of connector A of M10 receives the signal coming from the brake lights switch I30, with the supply controlled by the ignition (INT) from fuse F37 of the junction unit B2.

Pin 50 of connector A of M10 receives the signal coming from the clutch switch I31.

Control unit M10 controls the opening of individual injectors N70, via duty cycle signals produced 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 M10.

The injectors N70 receive a power supply to enable the opening from the main relay R9.

Control unit M10 also controls coils A30 via control signals (earth) for the coil primary windings, while the secondary winding sends a pulse to the spark plugs: from pins 16, 15 and 14 of connector B for cylinder pair 1-3 and from pins 30, 31 and 32 of connector B of M10 for cylinders 4-6.

The coil A30 primary windings receive a signal to enable opening from the main relay.

Throttle body actuator N75 is fitted with two built-in potentiometers connected in parallel: they control throttle opening via a stepper motor.

The motor receives information from pins 17 - 49 and 1 - 33 of connector B of M10 . Pin 58 of connector B sends a power supply to both potentiometers, pin 58 supplies an earth signal to the potentiometers, while pins 40 and 24 of the same connector receive signals from the throttle body actuator N75.

Fuel vapour recovery solenoid L10 allows fuel vapours to pass through to the engine intake where they join the mixture entering the combustion chamber. Valve L10, supplied by main relay, is opened by the control unit when the engine is under load via a duty-cycle signal from pin 2 of connector A of M10.

The control unit M10 receives the signal for the minimum engine oil pressure sensor K30 at pin 60 of connector A.

The control unit M10 is connected via the CAN network to the Body Computer M1 and the other nodes on the network: through this connection, it sends information concerning:

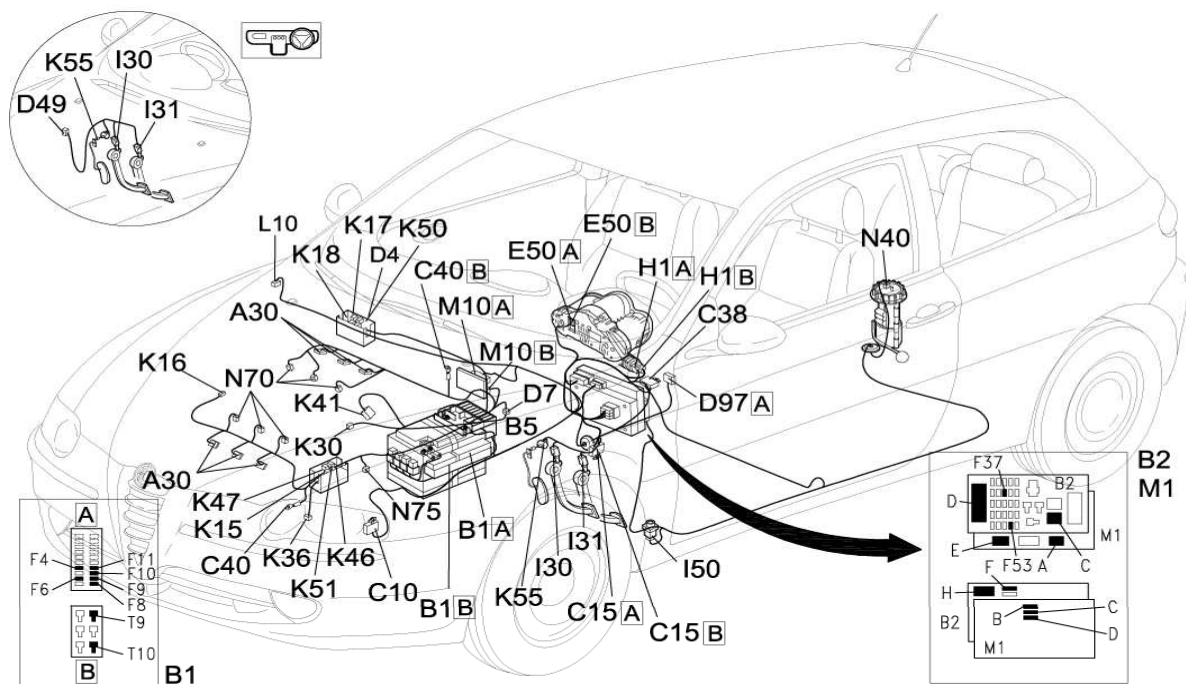
- system self-test, which can be used by connecting to connector G of M1 .
- engine water temperature, which is sent to the instrument panel E50 which manages the relevant gauge and warning light;
- rpm, which is sent to the rev counter of the instrument panel E50 ;
- engine oil minimum pressure, which is sent to instrument panel E50 which manages the relevant warning light;

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

The self-test system of the control unit M10 also generates a signal - which comes from pin 46 of connector A - which is connected directly to the 'EOBD' warning light located in the instrument panel E50 .

The self-test data can be read by connecting to connector G of the Body Computer M1 - pin 7: it receives the signals from pin 53 of connector A from the control unit M10 via the specific tester line.

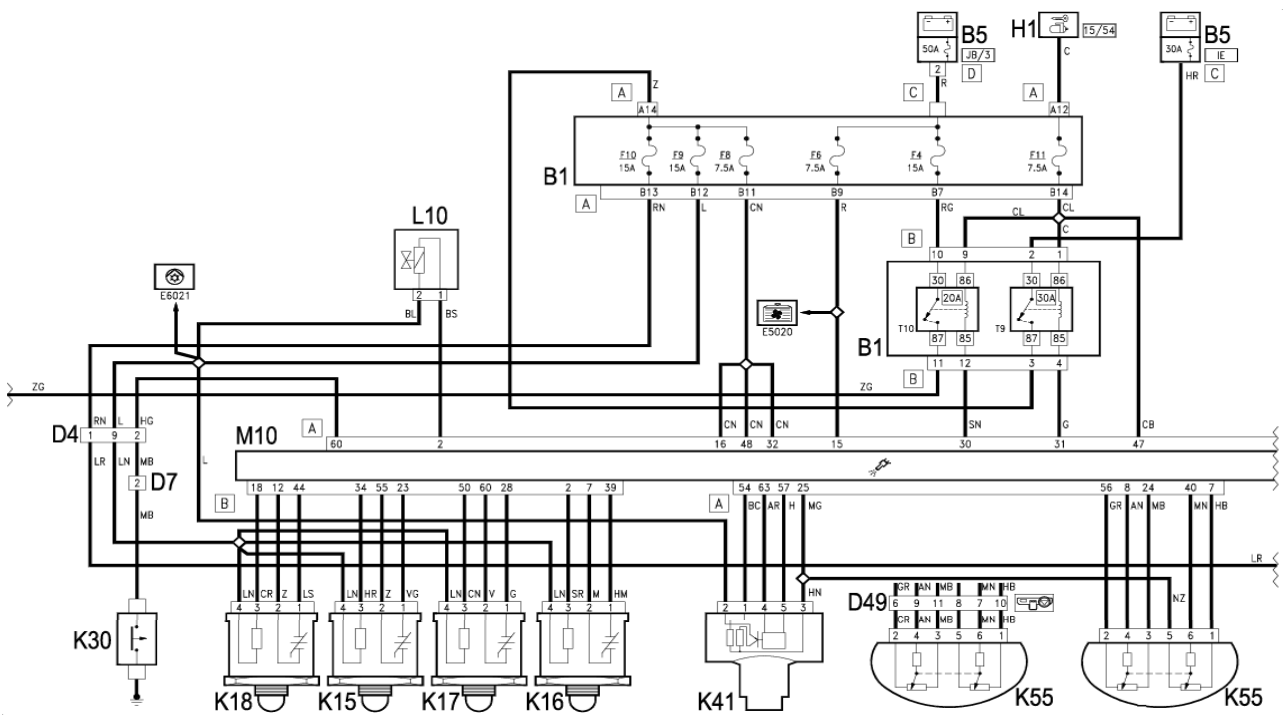
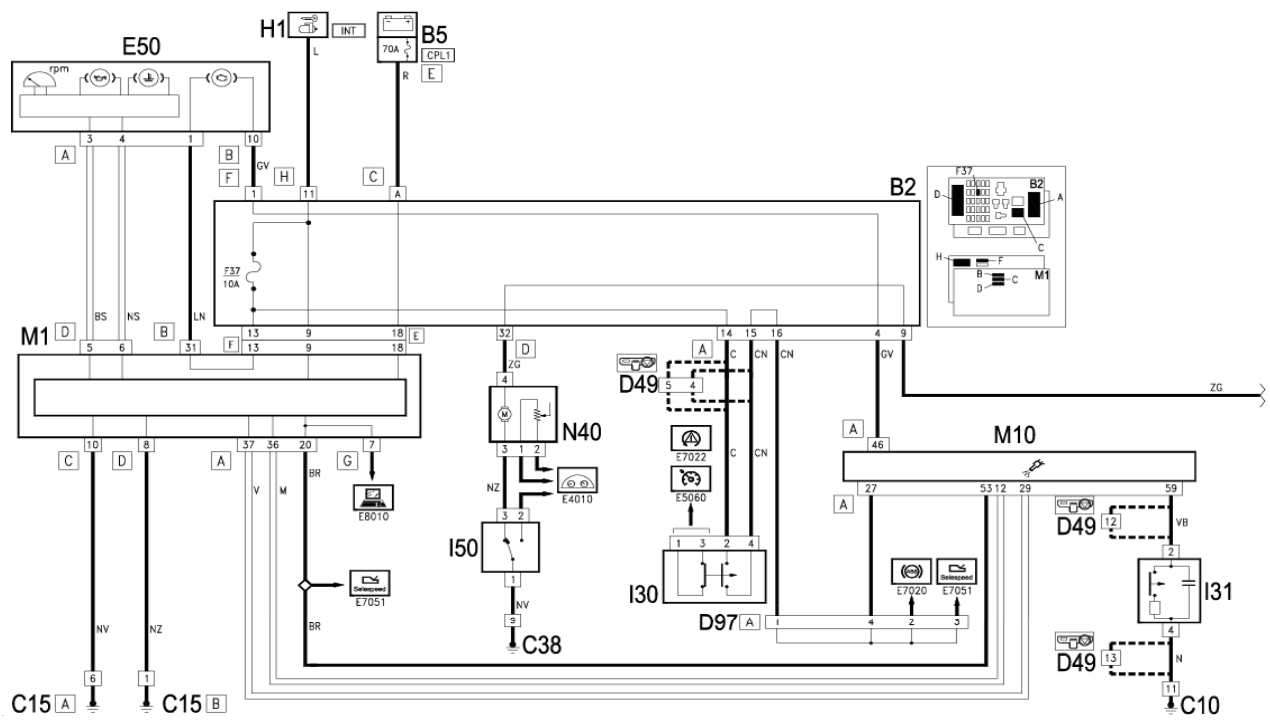
PETROL ENGINE ELECTRONIC MANAGEMENT - Location of components

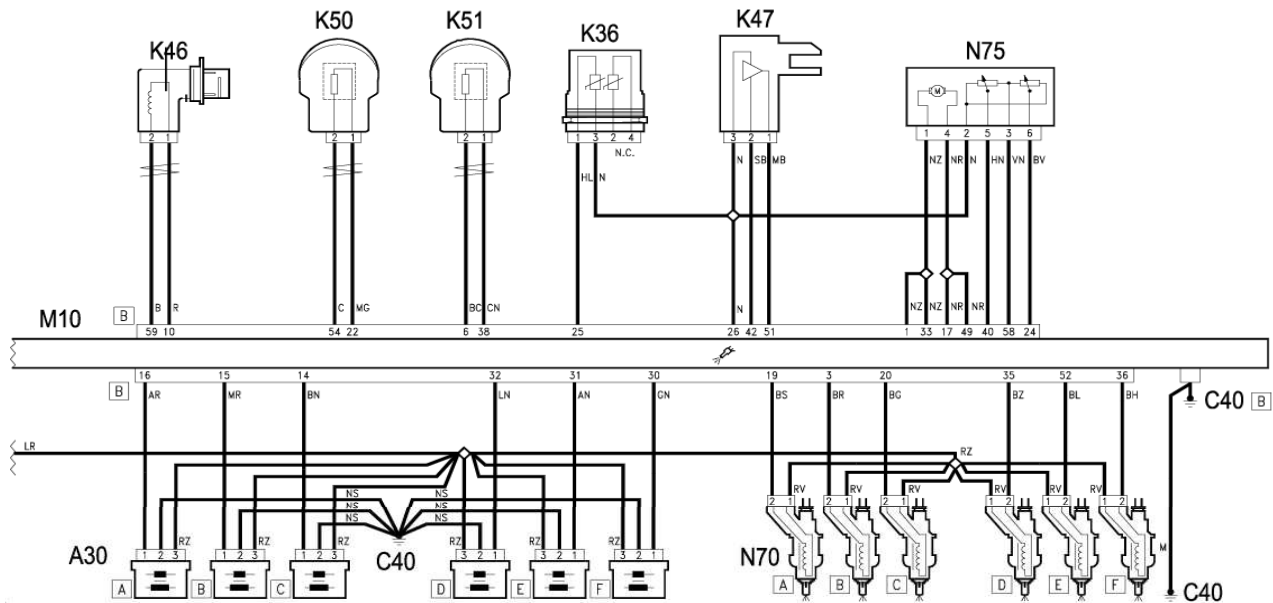


Component code	Name	Assembly reference
A30	Ignition coil (cyl. 1)	5510C
A30	Ignition coil (cyl. 2)	5510C
A30	Ignition coil (cyl. 3)	5510C
A30	Ignition coil (cyl. 4)	5510C
A30	Ignition coil	5510C
B1	Engine compartment junction unit	-
B1	Engine compartment junction unit	5505A
B2	Junction unit under dashboard	5505A
B5	MAXI FUSE box	-
B99	Maxifuse box on battery	5530B
C10	Front left earth	-
C15	Facia earth, driver's side	-
C38	Earth on centre tunnel	-
C40	Earth on engine	-
D4	Front / engine coupling	-
D7	Recharging / front connection	-
D49	Pedal assembly join	-
D97	Short circuiting coupling	-
E50	Instrument panel	5560B
H1	Ignition switch	5520A
I30	Brake pedal switch	5550D
I31	Clutch pedal switch	1056B
I50	Inertial switch	1040A
K15	Lambda sensor on pre-catalyzer	1080B
K15	Lambda sensor on right pre-catalyzer	1080B
K15	Lambda sensor on right pre-catalyzer	1080B
K16	Lambda sensor on left pre-catalyzer	1080B
K16	Lambda sensor on pre-catalyzer -2	1080B
K17	Lambda sensor downstream of post-catalyzer	1080B
K17	Lambda sensor downstream of post-catalyzer	1080B
K17	Lambda sensor on catalyzer	1080B
K18	Lambda sensor on catalyzer -2	1080B
K30	Engine oil pressure sensor (switch)	1084A
K36	Engine temperature sender unit	1056B
K41	Air flow meter	1056B
K46	RPM sensor	5510C
K46	RPM sensor	5510C

K47	Timing sensor.	1056B
K50	Detonation sensor - 1	5510C
K50	Detonation sensor - 1	5510C
K51	Knock sensor - 2	5510C
K55	Accelerator pedal potentiometer	1068A
L10	Fuel vapour recovery solenoid	1080E
L15	Variable geometry control solenoid	1072D
M1	Body computer	5505A
M10	Engine management ECU	1056B
N40	Fuel pump and sender unit	1040A
N70	Injector (cyl. 1)	1056B
N70	Injector (cyl. 2)	1056B
N70	Injector (cyl. 3)	1056B
N70	Injector (cyl. 4)	1056B
N70	Injector	1056B
N75	Throttle body actuator	1056B
N76	Timing variator actuator	1056B

PETROL ENGINE ELECTRONIC MANAGEMENT - Wiring diagram





Component code	Name	Assembly reference
A30	Ignition coil (cyl. 1)	5510C
A30	Ignition coil (cyl. 2)	5510C
A30	Ignition coil (cyl. 3)	5510C
A30	Ignition coil (cyl. 4)	5510C
A30	Ignition coil	5510C
B1	Engine compartment junction unit	-
B1	Engine compartment junction unit	5505A
B2	Junction unit under dashboard	5505A
B5	MAXI FUSE box	-
B99	Maxifuse box on battery	5530B
C10	Front left earth	-
C15	Facia earth, driver's side	-
C38	Earth on centre tunnel	-
C40	Earth on engine	-
D4	Front / engine coupling	-
D7	Recharging / front connection	-
D49	Pedal assembly join	-
D97	Short circuiting coupling	-
E50	Instrument panel	5560B
H1	Ignition switch	5520A
I30	Brake pedal switch	5550D
I31	Clutch pedal switch	1056B
I50	Inertial switch	1040A
K15	Lambda sensor on pre-catalyzer	1080B
K15	Lambda sensor on right pre-catalyzer	1080B
K15	Lambda sensor on right pre-catalyzer	1080B
K16	Lambda sensor on left pre-catalyzer	1080B
K16	Lambda sensor on pre-catalyzer -2	1080B
K17	Lambda sensor downstream of post-catalyzer	1080B
K17	Lambda sensor downstream of post-catalyzer	1080B
K17	Lambda sensor on catalyzer	1080B
K18	Lambda sensor on catalyzer -2	1080B
K30	Engine oil pressure sensor (switch)	1084A
K36	Engine temperature sender unit	1056B
K41	Air flow meter	1056B
K46	RPM sensor	5510C
K46	RPM sensor	5510C
K47	Timing sensor.	1056B
K50	Detonation sensor - 1	5510C
K50	Detonation sensor - 1	5510C

K51	Knock sensor - 2	5510C
K55	Accelerator pedal potentiometer	1068A
L10	Fuel vapour recovery solenoid	1080E
L15	Variable geometry control solenoid	1072D
M1	Body computer	5505A
M10	Engine management ECU	1056B
N40	Fuel pump and sender unit	1040A
N70	Injector (cyl. 1)	1056B
N70	Injector (cyl. 2)	1056B
N70	Injector (cyl. 3)	1056B
N70	Injector (cyl. 4)	1056B
N70	Injector	1056B
N75	Throttle body actuator	1056B
N76	Timing variator actuator	1056B



CRUISE CONTROL

147

CRUISE CONTROL - Description

The Cruise Control function allows the vehicle to always be driven at a constant speed without pressing the accelerator pedal.

The function is managed by the engine control unit which receives the commands from the special Cruise Control lever on the left of the steering wheel, under the steering column switch unit.

The function is switched on by turning the ring nut (ON).

When a speed is set (SET +, SET -) it remains memorized and can be recalled at any time (RCL).

The function is automatically switched off:

- by pressing the brake pedal;
- by pressing the clutch pedal;
- by turning the ring nut to OFF;
- by turning off the engine;

In these cases the last speed reached is memorized, and can be recalled by pressing the RCL button.

The system also switches off at vehicle speeds below the permitted minimum (about 30 km/h)

When the function is switched on, the relevant warning light on the instrument panel, connected via the CAN network to the engine management control unit, comes on.

For more details 5580A cruise control system

CRUISE CONTROL - Functional description

The Cruise Control function is controlled by engine management unit M10 upon a command from the Cruise Control switch H7 located to the left of the steering wheel.

The switch H7 is supplied when the ignition is switched on (INT) - pin 2 - from the line protected by the fuse F35 of the unit under the dashboard B2 .

Control H7 is connected to management unit M10:

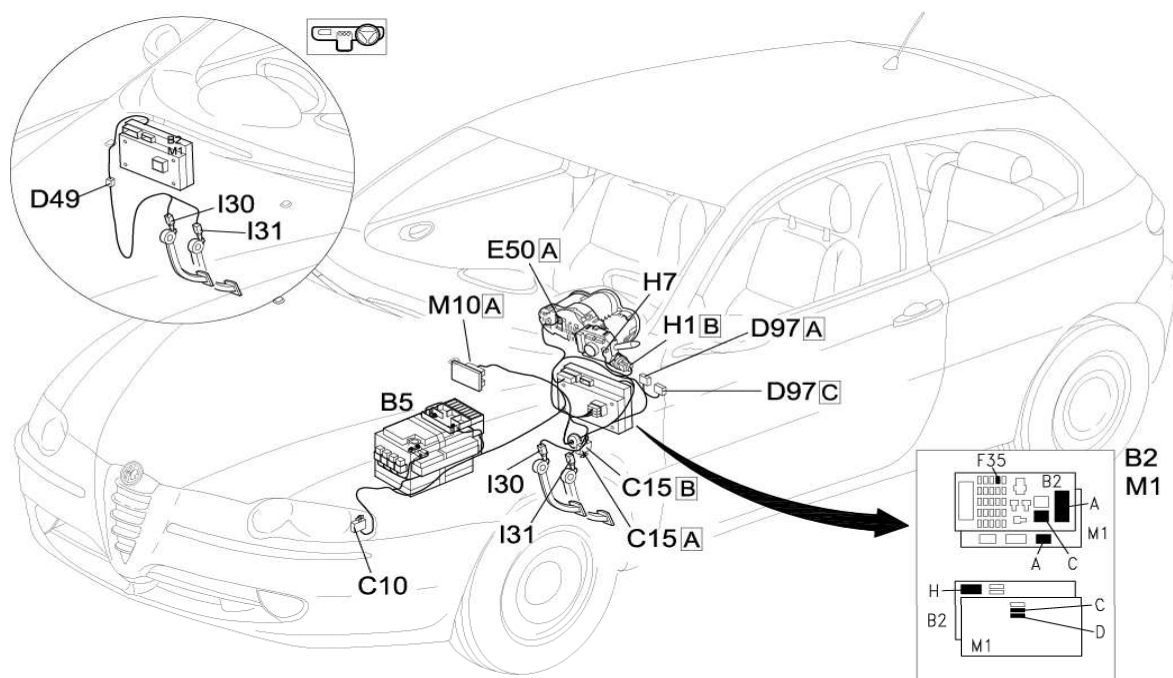
- to pin 10 of connector A, with the ON/OFF signal
- to pin 42 of connector A, with the RCL signal
- to pin 43 of connector A, with the SET + signal
- to pin 58 of connector A, with the SET - signal

Pin 26 of connector A of M10 receives the 'pedal released' signal (N.C. contact) coming from the second contact for the brake lights switch I30 with the supply controlled by the ignition (INT) from the line protected by fuse F35 of the unit under the dashboard B2.

Pin 50 of connector A of M10 receives the signal coming from the clutch switch I31 .

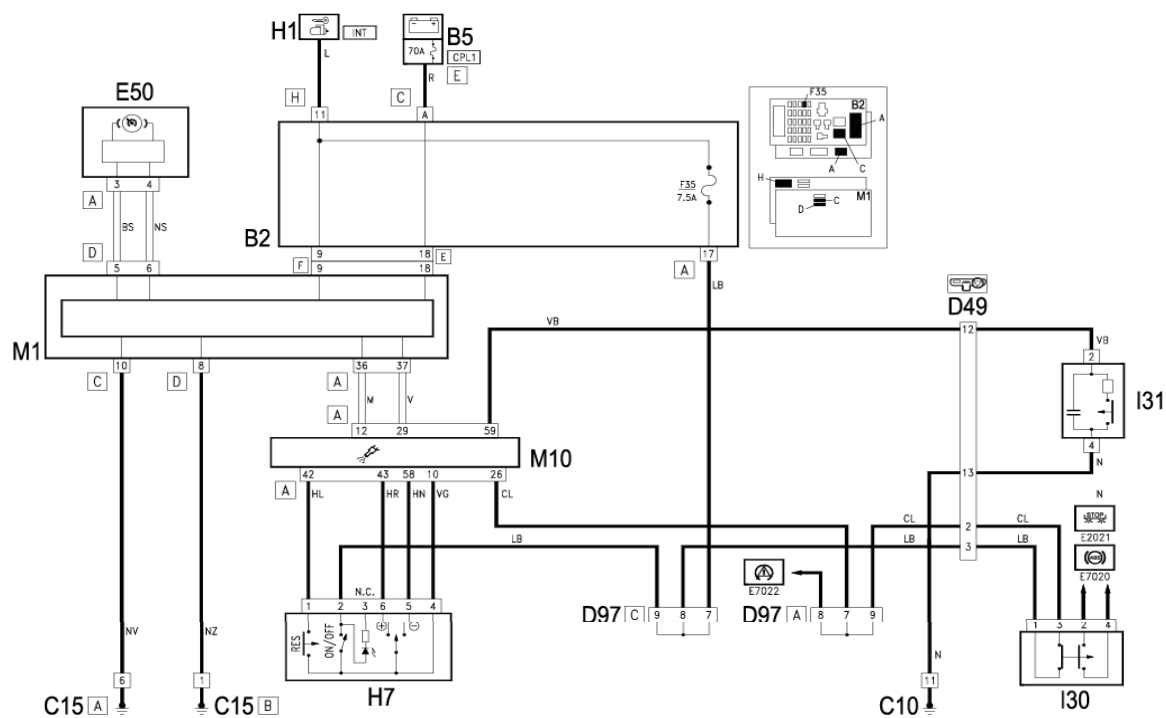
Via the CAN line, the engine control unit M10 is connected to the Body Computer M1 and the instrument panel E50 , to manage the 'Cruise Control on' warning light.

CRUISE CONTROL - Location of components



Component code	Name	Assembly reference
B1	Engine compartment junction unit	-
B2	Junction unit under dashboard	5505A
B5	MAXI FUSE box	-
B99	Maxifuse box on battery	5530B
C15	Facia earth, driver's side	-
D49	Pedal assembly join	-
D97	Short circuiting coupling	-
E50	Instrument panel	5560B
H1	Ignition switch	5520A
H7	Cruise Control	5580A
I30	Brake pedal switch	5550D
I31	Clutch pedal switch	1056B
I31	Clutch pedal switch	1060G
M1	Body computer	5505A
M10	Engine management ECU	1056B
M10	Engine management ECU	1060G

CRUISE CONTROL - Wiring diagram



Component code	Name	Assembly reference
B1	Engine compartment junction unit	-
B2	Junction unit under dashboard	5505A
B5	MAXI FUSE box	-
B99	Maxifuse box on battery	5530B
C15	Facia earth, driver's side	-
D49	Pedal assembly join	-
D97	Short circuiting coupling	-
E50	Instrument panel	5560B
H1	Ignition switch	5520A
H7	Cruise Control	5580A
I30	Brake pedal switch	5550D
I31	Clutch pedal switch	1056B
I31	Clutch pedal switch	1060G
M1	Body computer	5505A
M10	Engine management ECU	1056B
M10	Engine management ECU	1060G