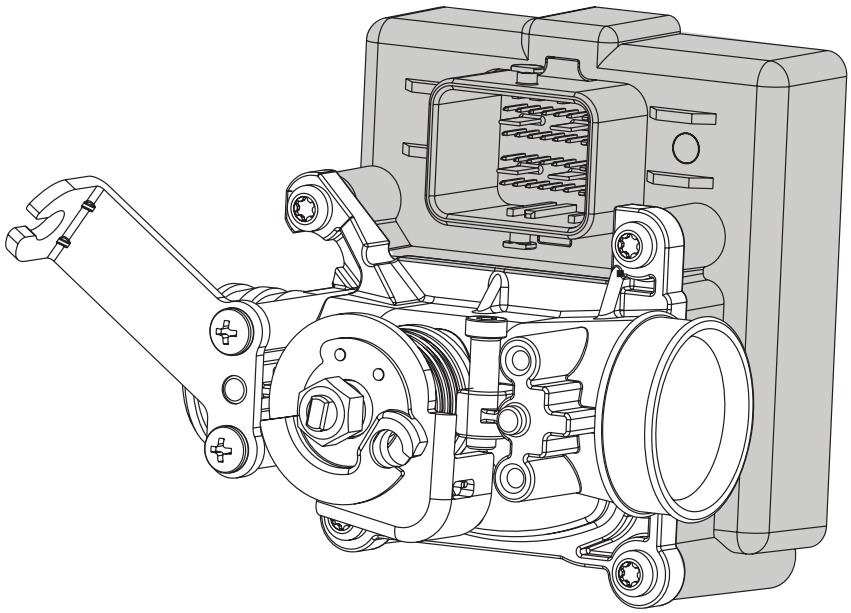
PEUGEOT
SCOOTERS

Sales division
Technical network leadership

WORKSHOP MANUAL



OPERATING PRINCIPLE FOR THE M3A2 INJECTION SYSTEM 2 STROKE ENGINE

TABLE OF CONTENTS

SYSTEM ADVANTAGES 2

SYNOPTICS 3

GENERAL VIEW 4

DETAILED DESCRIPTION OF COMPONENTS 5

Ignition and injection control unit 5

Battery 6

Current generator 6

Engine speed sensor 6

Vehicle speed information 7

Rear wheel speed signal housing 7

Instrument panel 8

Diagnostic plug OBD 8

Engine temperature sensor 8

Kickstand contact switch 9

Ignition coil 9

Fuel pump 10

Electric oil pump 10

FUNCTIONING STRATEGIES 11

DIAGNOSTIC 12

Reading fault context 12

Diagnostic tools 12

Diagnostic procedure with the diagnostic tool 12

Fault codes 13

ELECTRICAL TESTS 15

ECU pinout/Electrical tests 16

Manual procedures 19

Manual procedures 19

Fuel pump flow rate checking procedure: 19

Procedure for draining the oil pump 20

Checking fuel pressure 20

WIRING DIAGRAM 21

SYSTEM ADVANTAGES

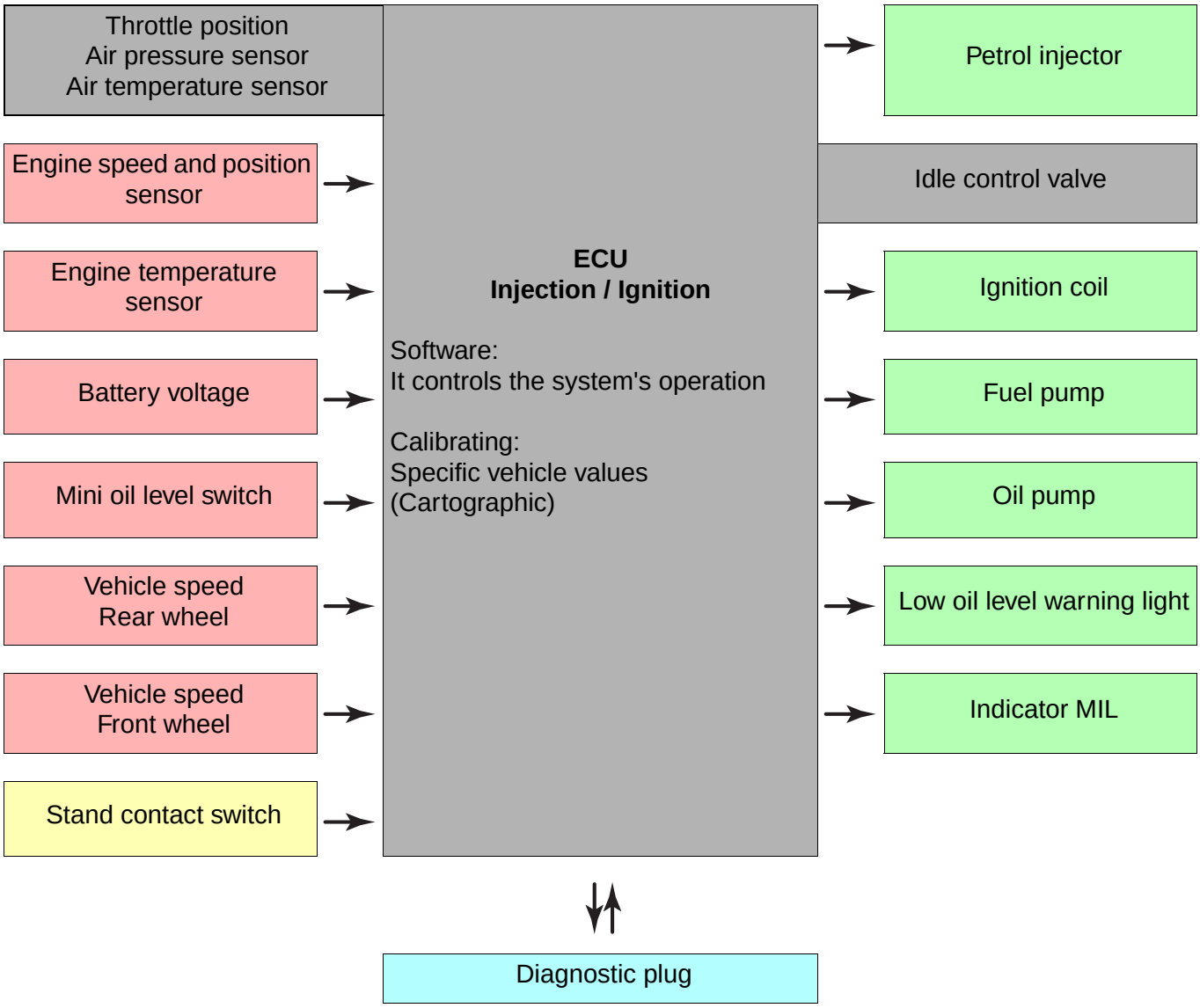
To meet the Euro 4 standard, Peugeot Motocycles has made technological choices to maintain the best performance on its engines.

For the 50cc 2 Euro 4 engine, our M3A2 injection system reinforces its performances (cold start, idling stability, engine torque, etc.) with a greater control of petrol consumption (-20%) and oil consumption (-50%).

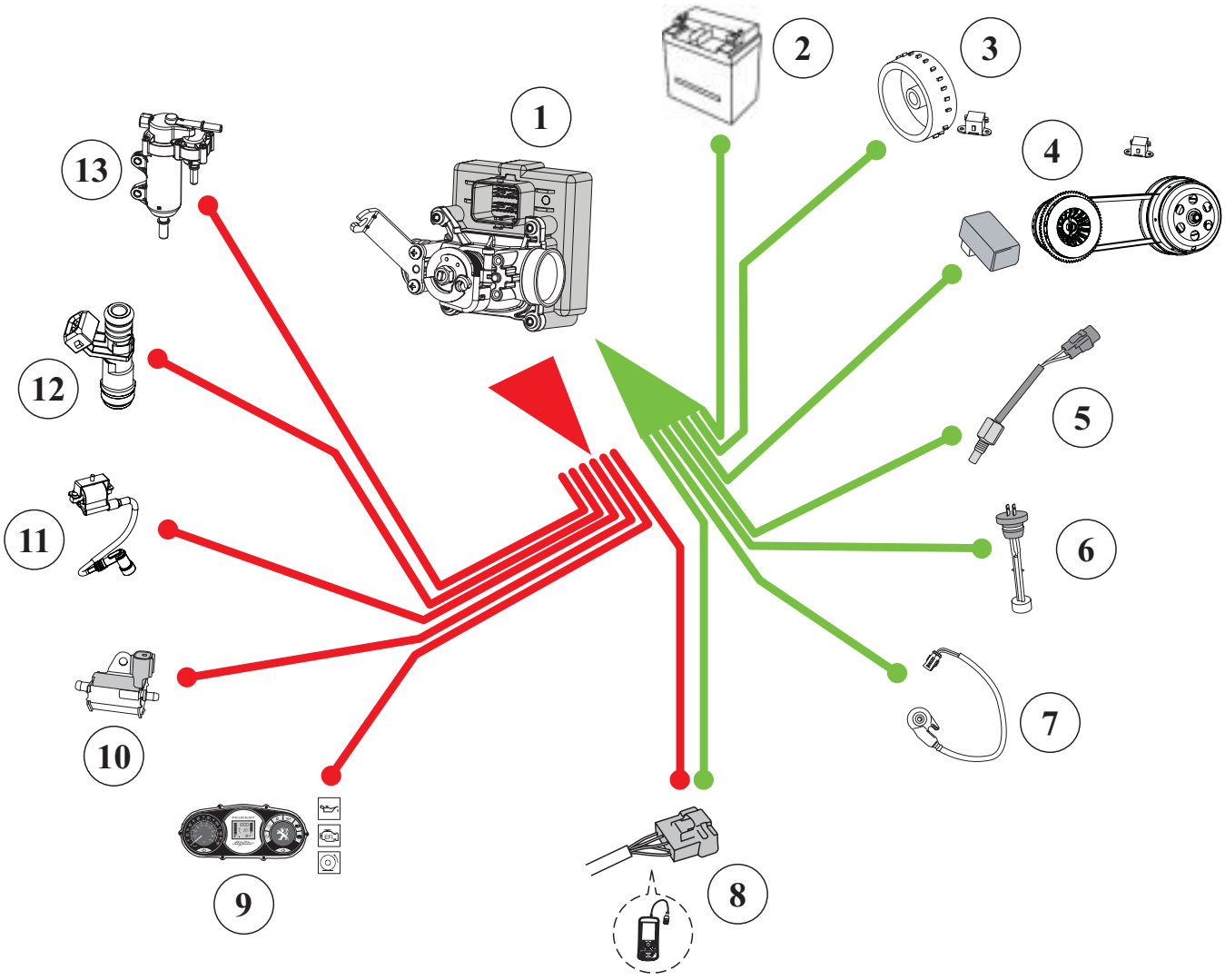
This technology also relies on tried and tested components to guarantee its reliability: UCE M3A2, DK7 injector (automobile standard), fast connectors on fuel circuit ...

The basic principle of the system consists in measuring the engine speed and the airflow or the air pressure in order to determine the optimal fuel quantity to inject, as well as the optional ignition advance to apply.

SYNOPTICS



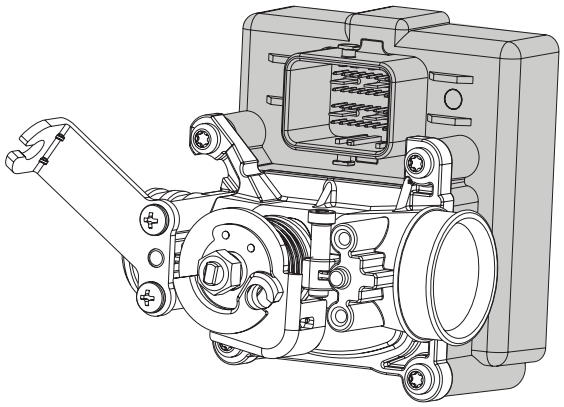
GENERAL VIEW



1. Injection ECU
2. Battery
3. Engine speed sensor
4. Speed sensor/Rear wheel speed signal housing
5. Engine temperature sensor
6. Mini oil level switch
7. Kickstand switch
8. Diagnostic plug
9. Instrument panel
   - Vehicle speed information
   - Diagnostic light (MIL)
   - Low oil level warning light
10. Oil pump
11. HT coil
12. Petrol injector
13. Fuel pump

DETAILED DESCRIPTION OF COMPONENTS

■ Ignition and injection control unit



Including:

- Throttle unit
- Air temperature sensor
- Air pressure sensor
- Idle control valve

- 32 pin connector.
- Operating voltage: Between 8.5 and 14.7 volts.
- Protection against over voltage up to 24 volts.

Fuel metering is controlled by the ECU, it determines the fuel injector opening time according to the engine air intake (measured by the throttle unit), the engine speed (measured by the speed sensor) and the necessary corrections (cold start, acceleration, idle, etc...)...

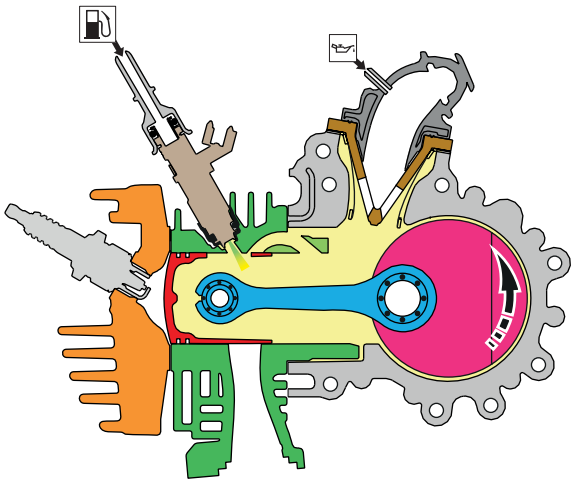
The computer controls the dosage of separated lubricants, using the information provided to determine the quantity of oil to be injected through the oil pump.

To avoid any risk of damaging the ECU, the ECU or the components of the circuit must never be disconnected when the vehicle is under power.

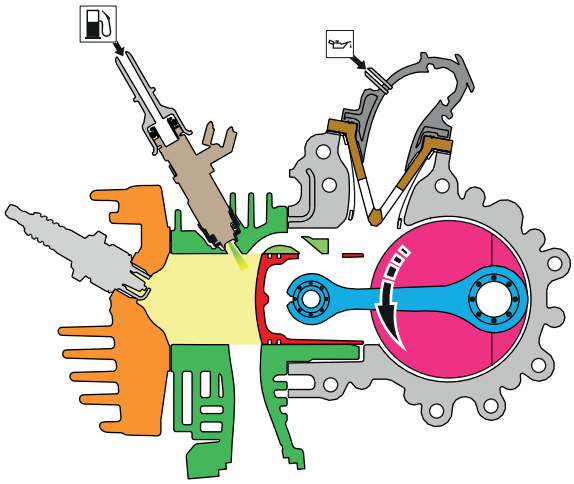
To avoid any risk of destruction of an electrical component, you are strongly advised not to use a booster charger to start the vehicle.

Never modify the throttle stop adjustment.

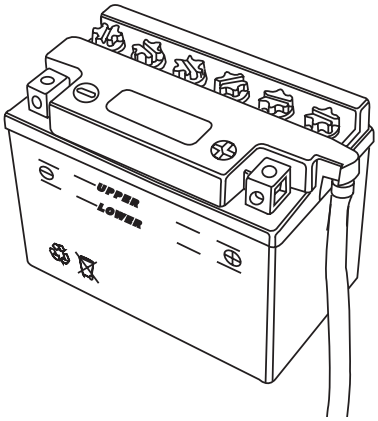
When idling, fuel is injected into the crankcase through the piston inlet port.



When the engine is running, fuel is injected directly into the combustion chamber.



■ Battery



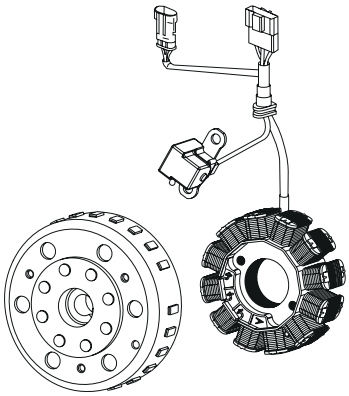
The battery is essential for the operation of the system.

The minimum battery voltage necessary for the ECU to function is 8.5 volts.

The ECU continually needs to know the battery voltage to enable it to adapt the order signal time for the different systems.

The response time of an injector, for example, is directly linked to its supply voltage. The ECU will therefore modify the injector signal time to compensate for battery voltage variations.

■ Current generator



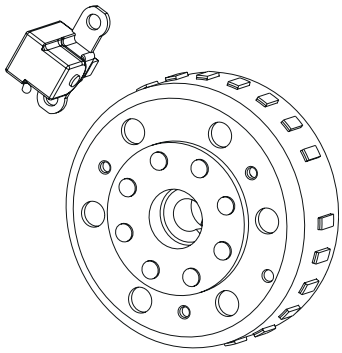
The current generator supplies electricity to the vehicle and recharges its battery. It delivers alternating current which is transformed to direct current by the voltage regulator.

When the battery is low, the engine can be started using the kick starter. The generator supplies sufficient minimum voltage for the system to operate.

Power: 170 W/5000 tr/mn.

- Check: R = 0.8 $^{\pm 10\%}$ Ω.

■ Engine speed sensor



Pulse wheel fixed to the magneto flywheel.

This toothed wheel has 24 teeth, and is removed to mark the position of the piston.

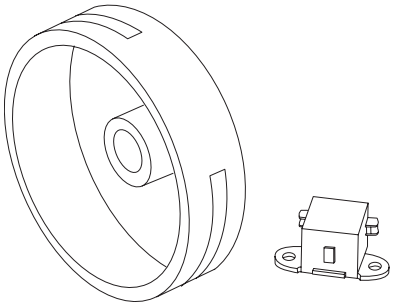
Signal voltage from 1.7 to 75 volts according to the engine speed.

Connection:

- Pin 1: To ECU pin B1.
- Pin 2: To ECU pin B2.

- Check: R = 125 $^{\pm 10\%}$ Ω.
- Air-gap: 0.5 - 0.7 mm

■ Vehicle speed information



The computer needs to know the vehicle speed to be able to adapt the injector control times.

This speed is measured by the transmission sensor and by the speed information from the instrument panel.

Drive sensor

Located on the driven pulley, this sensor reveals the vehicle's speed.

Clutch housing: 4 targets

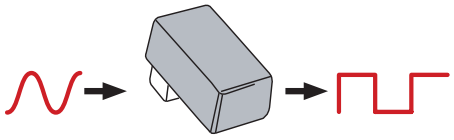
Check: R = 150 $^{\pm 10\%}$ Ω

Air-gap: 0.5 to 1.5 mm

Operation voltage: From 35 to100 V~

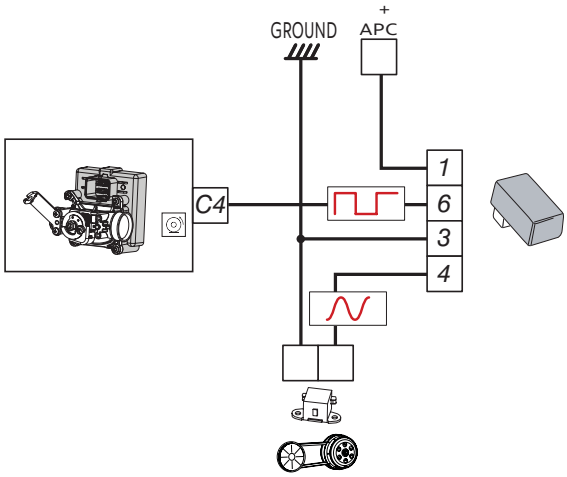
As the speed sensor is positioned in the factory, only remove it if absolutely necessary.

■ Rear wheel speed signal housing

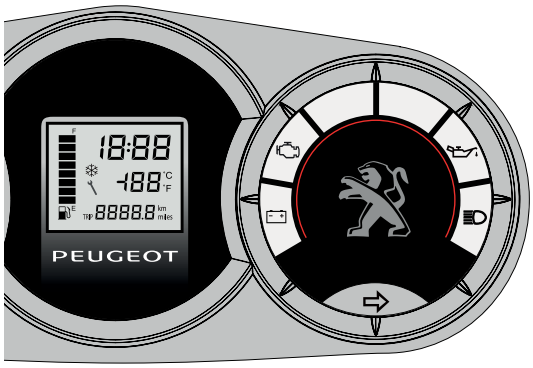


This housing converts the sinusoidal signal emitted by the transmission sensor into a square signal.

Connection: To ECU pin C4.



■ Instrument panel



Front wheel speed information

Measured by the multiplier, the speed information is sent by the instrument panel to the injection computer (except for mechanical instrument panels)

- Connection: To ECU pin E3.

Emissions control system failure warning light/Diagnostic light (MIL)

A diagnostic telltale informs the rider of the presence of a fault in the system.

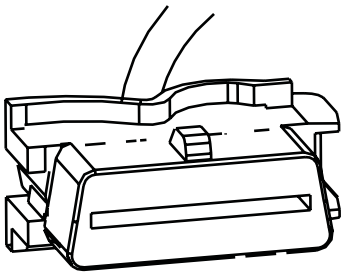
- Connection: To ECU pin F3.

Separate lubrication oil indicator light

If the separate lubrication oil level is low, the tell-tale of the instrument panel goes on.

- Connection: To ECU pin F1.

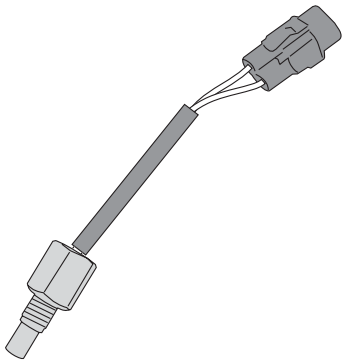
■ Diagnostic plug OBD



The OBD connector allows you to connect an approved diagnostic tool and check the injection ECU using standardized queries on the vehicle's compliance or the presence of anomalies.

- Connection: To ECU pin B4.

■ Engine temperature sensor



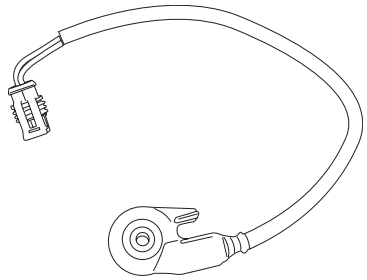
Located on the cylinder head, this sensor informs the ECU of the engine's thermal state. The ECU will modify the opening time of the injector based on the data sent by the temperature sensor.

Connection:

- Pin 1: To ECU pin C2.
- Pin 2: To ECU pin D1.

- Check: R = 10.6 $^{\pm 20\%}$ kΩ to 20°C.

■ Kickstand contact switch



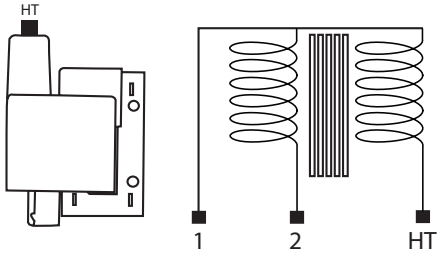
The stand is fitted with a contactor which will allow the engine to be started up if the stand is down but only with limited engine speed.

Engine speed limitation: 2500 tr/mn

Connection:

- Pin 1: To ECU pin D4.
- Pin 2: To the ground.

■ Ignition coil



Connection:

- Pin 1: To ECU pin H3.
- Pin 2: + G4.

Check:

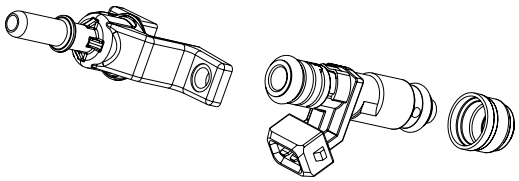
- Primary winding: 1 and 2: R = 3.3 $^{\pm 20\%}$ Ω.
- Secondary coil: R = 13 $^{\pm 20\%}$ kΩ.

The ECU controls the ignition, it uses the speed sensor to determine the ignition point (in relation to the missing tooth on the speed sensor wheel).

It calculates ignition-spark advance based on parameters such as engine load, RPM, temperature, etc

A dwell time (coil charging time) correction is applied based on the battery voltage.

Petrol injector



The fuel injector, controlled by the computer, injects the fuel required to run the engine.

Connection:

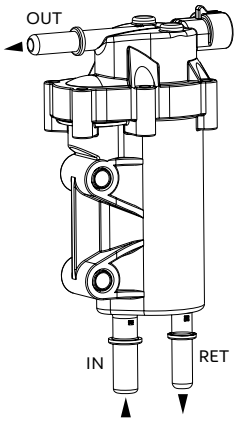
- Pin 1: + G4.
- Pin 2: To ECU pin G1.

Check: R = 13 $^{\pm 10\%}$ Ω.

The gaskets must be changed every time they are removed

■ Fuel pump

An electric pump controlled by the ECU supplies fuel to the injector via a relay. This fuel is supplied with a 5 bar pressure, the pressure is limited and regulated by a pressure regulator integrated in the pump.
The pump functions for 3 seconds when the ignition is turned on in order to pressurise the fuel system.

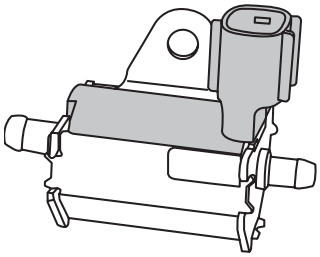


External pump
Pressure regulator: 5 bars
Connection:
- Pin 1: to fuel pump relay.
- Pin 2: To the ground.

• Check: R = 2.5 $^{\pm 10\%}$ Ω.

■ Electric oil pump

The lubricant is injected into the intake manifold by an electric pump managed by the injection computer.
The flow of oil is dosed according to the engine speed and quantity of air intake.



Connection:
- Pin 1: To ECU pin H2.
- Pin 2: To the ground.

• Check: R = 2.5 $^{\pm 10\%}$ Ω.

FUNCTIONING STRATEGIES

■ Ecu software

This is the program which manages functioning of the system using the data supplied to it.

■ ECU calibration

Adaptation of the system to the machine is by determining a certain number of machine specific values. These values are determined by bench testing, and entered into the calculation tables which the ECU uses to adapt the system to the machine.

Example: Engine temperature map. Fuel quantity map. Speed map. Throttle position map.

■ Cut-off on deceleration

Under high deceleration and to save fuel, the system cuts off the injection. When the injection is cut off while decelarating, the fuel injector is shut.

■ Idle management

The idle speed is controlled entirely by the ECU which determines the corrections to be applied and how to apply them to obtain a correct idle speed whether the engine is cold or hot. No adjustment is necessary.

In order to obtain a correct idle speed in all cases, the ECU adapts:

- The idle valve position.
- The ignition advance.

■ Diagnostic light (MIL)

The light comes on when the ignition is turned on to check it is operational and comes off as soon as the engine starts if there is no incident.

If an incident occurs, the driver is informed by the light.

DIAGNOSTIC

■ Reading fault context

This mode displays instant data for a fault. When a fault is detected, the injection ECU records the data from the sensors at the precise moment the fault appeared.

■ Diagnostic tools

A diagnostic light informs the driver of a fault. A diagnostic tool may be connected to the ECU to "read" this memory, the fault codes, vehicle operating parameters.

System diagnostic is carried out by the ECU which checks all the components connected to it.

■ Diagnostic procedure with the diagnostic tool

Refer to the workshop manual: Using the diagnostic tool TEP 2010.

■ Fault codes

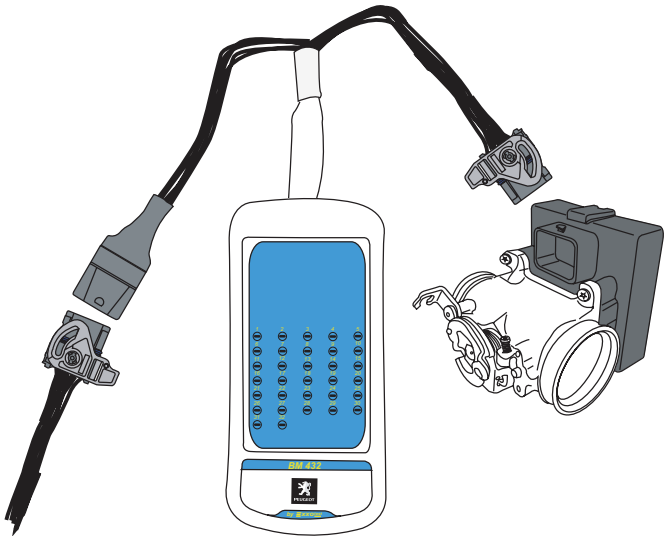
Fault codes	Designation	**Cause**
P0217	Engine overheating	Value of the engine temperature sensor outside normal range. - Check: - The sensor, - The wiring harness. - That the cooling system is in compliance.
P0335	Speed sensor circuit fault	- Check: - The engine speed sensor - The wiring harness.
P0120	Potentiometer adaptation fault	Potentiometer value outside normal range. Change the ECU.
P0124	Potentiometer variation fault	
P0122 P0123	Potentiometer fault	
P0562 P0563	Battery voltage fault	- Check: - The battery, - The regulator. - The wiring harness.
P0201 P0261 P0262	Petrol injector fault	- Check: - The injector, - The wiring harness.
P0351	Ignition fault	- Check: - The spark plug, - The coil, - The wiring harness.
P0230 P0231 P0232	Petrol pump relay fault	- Check: - The fuel pump relay, - The wiring harness.
P0219	Engine overspeed	Appears when the maximum engine speed threshold has been exceeded
P0507	Abnormal idle	Check machine conformity, no air leaks, leaks on fuel system...
P0505	Idle adaptation.	
P0508 P0509	Idle valve fault	Change the ECU.

P0117 P0118	Engine temperature sensor	Value of the engine temperature sensor outside normal range. - Check: - The sensor, - The wiring harness. - That the cooling system is in compliance.
P0119	Engine temp. variation	
P0112 P0113	Air temperature sensor	Change the ECU.
P0114	Air temp. variation	
P0650	Warning LED	- Check: - The wiring harness. - The LED
P0107 P0108 P2228 P2229	Intake pressure sensor	Change the ECU.
P0336	Engine sensor teeth	- Check: - The engine speed sensor. - The magneto. - The wiring harness.
P0500	Vehicle speed fault	- Check: - The speedo sensor. - The wiring harness.
P1687 P1688 P1689	2T oil indicator light fault	- Check: - The wiring harness. - The indicator light.
P1690 P1691	Oil pump fault 2T	- Check: - The wiring harness. - Oil pump.
P1211 P1212 P1213 P1214	Speed sensor signal fault	- Check: - The speedo sensor. - The wiring harness.

ELECTRICAL TESTS

■ Tools required

- A digital multimeter.
- The TEP 2010 with the latest update.
- 32 terminal block BM432. Reference: 759982.



The new wiring harness feature sealed connectors. These connectors no longer allow you to carry out electric checks that are necessary for diagnosing the system.

To allow you to carry out these checks without any risk for the wiring harness, we designed a specific interface which is connected between the machine's wiring harness and the ECU.

This interface features as many check points as terminals on the ECU.

Every terminal is numbered and represents the corresponding terminal of the ECU.

The interface allows you to::

- Check the resistance of the components, in this case the connector on the ECU side is not connected and the ignition is switched off.
- Check the voltage, in this case the connector on the ECU side is not connected and the ignition is switched on.
- Check the voltage when operating, in this case the two connectors are conntected and the ignition is switched on, or the engine is running.

■ ECU pinout/Electrical tests

Checking the components with an ohmmeter

Preliminary conditions:

- Ignition is cut.
- The 32 terminal shall be connected only to the wiring harness.
- Set the multimeter to ohmmeter.

Terminal	Use	Measurement (Resistance)	Value
B1/B2	Engine speed sensor	Measure the resistance between terminal B1 and B2	R = 125 $^{\pm 20\%}$ Ω
C2/D1	Engine temperature sensor	Measure the resistance between terminal C2 and D1	R = 10.6 Ω to 20°C
D3	Oil level indicator	Measure the resistance between terminal D3 and the earth	R = 0 Ω if the tank is full R = Infinite value if the tank is empty
D4	Lateral stand (option)	Measure the resistance between terminal D4 and the earth	Vehicle without stand: R = 0 Ω Stand is folded back: R = 0 Ω Stand is stretched out: R = Infinite value
G1	Petrol injector	Measure the resistance between terminal G1 and G4	R = 13 $^{\pm 10\%}$ Ω
G2	Fuel pump relay	Measure the resistance between terminal G2 and G4	R = 71.5 $^{\pm 10\%}$ Ω
H2	Electric oil pump	Measure the resistance between terminal H2 and G4	R = 27.5 $^{\pm 10\%}$ Ω
H3	HT coil	Measure the resistance between terminal H3 and G4	R = 3.3 $^{\pm 10\%}$ Ω
H4	ECU earth	Measure the resistance between terminal H4 and the earth	R = 0 Ω

Checking the components with a voltmeter

Preliminary conditions:

- The machine's battery shall be correctly charged.
- The32 way terminal block shall be connected to the wiring harness and to the ECU.
- set the multimeter to DC voltmeter.
- Turn on the ignition.

Terminal	Use	Measurement (Tension)	Value
C2	Engine temperature sensor	Between terminals C2 and H4	U = 4.2V
D3	Oil level indicator	Between terminals D3 and H4	U = 11.8V
E3	Vehicle speed information	Between terminals E3 and H4.	U = 11.8V
F1	Min. oil level indicator	Between terminals F1 and H4.	U = 11.8V
F4	Battery voltage	Between terminals F4 and H4.	U = 12V
G1	Petrol injector	Between terminals G1 and H4.	U = 12V
G2	Fuel pump relay	Between terminals G2 and H4.	U = 12V
G4	+ after the ignition.	Between terminals G4 and H4.	U = 12V
H2	Electric oil pump	Between terminals H2 and H4.	U = 12V
H3	HT coil	Between terminals H3 and H4.	U = 12V
H4	ECU earth	Between terminals H4 and F4.	U = 12V

Checking the the components when operating

Preliminary conditions:

- The machine's battery shall be correctly charged.
- The32 way terminal block shall be connected to the wiring harness and to the ECU.
- Turn on the ignition.

Terminal	Use	Measurement/Action	Value
B1/B2	Engine speed sensor	Between terminals B1 and B2. Set the multimeter to AC voltmeter. Engine idling.	From 8.5V to9V
C4	Drive sensor (Rear wheel signal)	Between terminals C4 and H4. Set the multimeter to AC voltmeter. Presence of variable voltage when the wheel is turned manually.	From 4V to6V
E3	Vehicle speed information (Front wheel signal) (Depending on model)	Bridge the terminals E3 and H4 of the inspection terminal block. Set the multimeter to AC voltmeter. Presence of variable voltage when the wheel is turned manually.	From 8V to15V

■ Manual procedures

Draining the fuel pump

The fuel pump functions as soon as the engine is running.

It also functions when the ignition is turned on for a short time (3 seconds) in order to fill and pressurise the fuel circuit.

Procedure:

- Turn on the ignition.

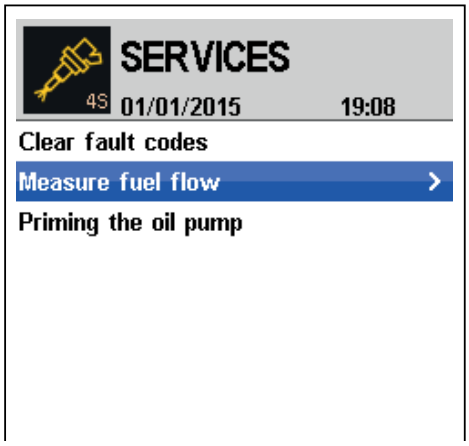
The pump functions for a short time (3 seconds).

- Repeat the operation until the circuit has been drained completely (turning the ignition on approximately 3 times).

Fuel pump flow rate checking procedure:

Petrol is highly inflammable, do not smoke in the working area and avoid proximity to flames or sparks.
Leave the engine to cool for at least 2 hours before any intervention.

It is possible to turn the motor on for a few seconds to partially lower the fuel pressure in the circuit.

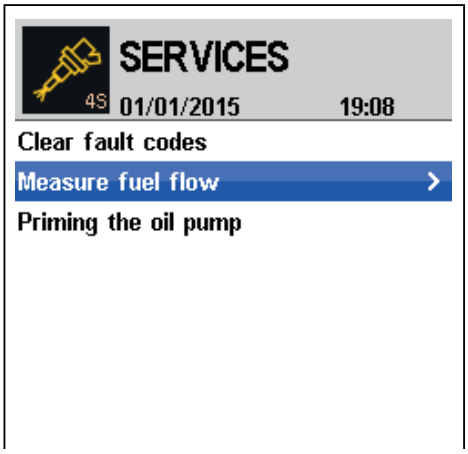


The flow measurement for the fuel pump must be carried out using the TEP2010 tool (Service functions).

1. Disconnect the fuel pump.
2. Start the engine to lower the fuel pressure in the system.
3. Disconnect the fuel injector pipe. (Put a rag around the hose to prevent fuel from splashing).
4. Connect the fuel pump.
5. Place the feed back pipe into a graduated jar, press the control button to operate the fuel pump, and measure the flow of fuel.

Volume of fuel measured: 40 ml minimum.

Procedure for draining the oil pump

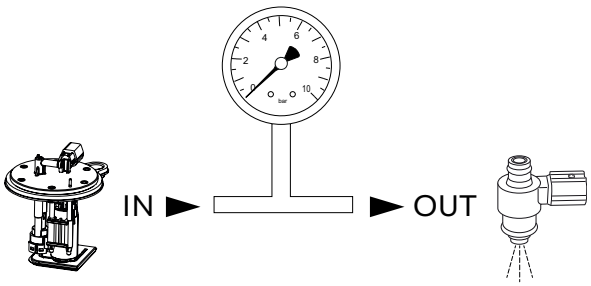


The oil pump must be drained using the TEP2010 tool (Service functions).

1. The oil hose must be disconnected from the inlet pipe.
2. Press the control button as often as necessary so that the oil drips out of the hose

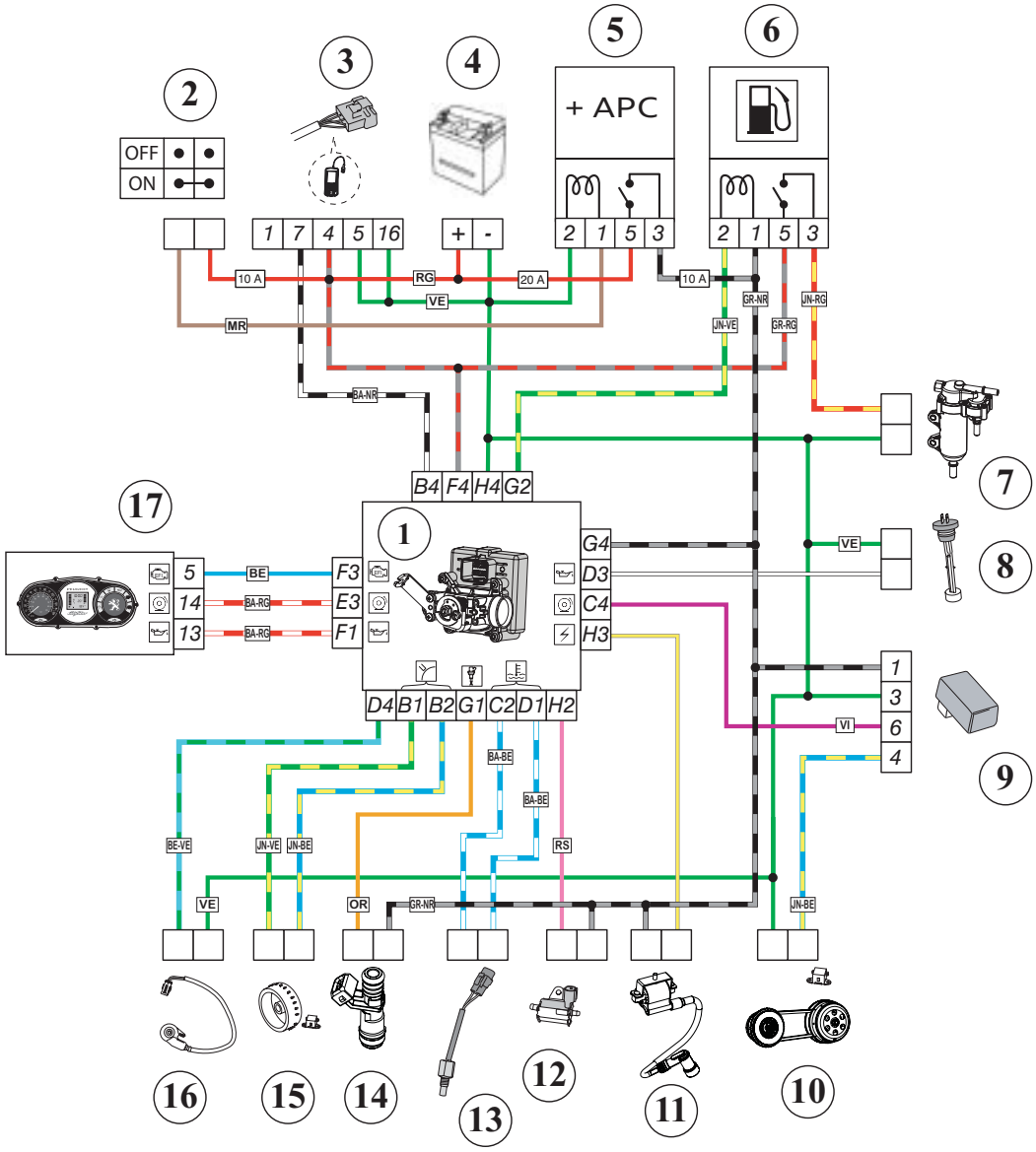
During draining, the minimum level indicator light flashes.

Checking fuel pressure



1. Disconnect the fuel pump.
2. Start the engine to lower the fuel pressure in the system.
3. Disconnect the fuel injector pipe. (Put a rag around the hose to prevent fuel from splashing).
4. Insert manometer ref. no. 757877 as a bypass between the fuel pump and injector.
5. Connect the fuel pump.
6. Turn the ignition on 3 times to bleed the fuel system.
7. With the engine stopped, check the fuel pressure which must be 5 bars when switching on the fuel pump.

WIRING DIAGRAM



1. Injection ECU
2. Ignition switch
3. OBD socket
4. Battery
5. Power supply relay
6. Fuel pump relay
7. Fuel pump
8. Mini oil level switch
9. Vehicle speed signal housing
10. Drive sensor
11. HT coil
12. Oil pump
13. Engine temperature sensor
14. Petrol injector
15. Engine speed and position sensor
16. Kickstand switch
17. Instrument panel

P/N. MA0067

In our permanent concern to make improvements PEUGEOT MOTOCYCLES reserves the right to suppress, modify, or add any reference mentioned.

DPEA/QPRC/DTEF Printed in the E.U. 27/9/18 (non contractual pictures)