OPERATING PRINCIPLE FOR THE M3A2 INJECTION SYSTEM
2 STROKE ENGINE
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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.
Throttle position
Air pressure sensor
Air temperature sensor

Engine speed and position sensor

Engine temperature sensor

Battery voltage

Mini oil level switch

Vehicle speed
Rear wheel

Vehicle speed
Front wheel

Stand contact switch

ECU
Injection / Ignition

Software:
It controls the system’s operation

Calibrating:
Specific vehicle values
(Cartographic)

Petrol injector

Idle control valve

Ignition coil

Fuel pump

Oil pump

Low oil level warning light

Indicator MIL

Diagnostic plug
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: $R = 0.8 \pm 10\% \, \Omega$.

■ 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: $R = 125 \pm 10\% \, \Omega$.
- 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: $R = 150 \pm 10\% \Omega$
  - Air-gap: 0.5 to 1.5 mm
  - Operation voltage: From 35 to 100 V~

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**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.
DETAILED DESCRIPTION OF COMPONENTS

■ 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: $R = 10.6 \pm 20\% \, \Omega$ 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/min

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 ±20% Ω.
- Secondary coil: R = 13 ±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 ±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.

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**External pump**

**Pressure regulator:** 5 bars

**Connection:**
- Pin 1: to fuel pump relay.
- Pin 2: To the ground.

• Check: $R = 2.5 \pm 10\% \, \Omega$.

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**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: $R = 2.5 \pm 10\% \, \Omega$. 
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.

■ Cut-off on deceleration
Under high deceleration and to save fuel, the system cuts off the injection. When the injection is cut off while decelerating, 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

<table>
<thead>
<tr>
<th>Fault codes</th>
<th>Designation</th>
<th>Cause</th>
</tr>
</thead>
</table>
| 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 | - Check:  
  - The sensor,  
  - The wiring harness. |
| P0124       | Potentiometer variation fault | - Check:  
  - The sensor,  
  - The wiring harness. |
| P0122       | Potentiometer fault | Potentiometer value outside normal range. Change the ECU. |
| 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. |
<p>| 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. |</p>
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Issue Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0117</td>
<td>Engine temperature sensor</td>
<td>Value of the engine temperature sensor outside normal range.</td>
</tr>
<tr>
<td>P0118</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P0119</td>
<td>Engine temp. variation</td>
<td></td>
</tr>
<tr>
<td>P0122</td>
<td>Air temperature sensor</td>
<td>Change the ECU.</td>
</tr>
<tr>
<td>P0113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P0114</td>
<td>Air temp. variation</td>
<td></td>
</tr>
<tr>
<td>P0650</td>
<td>Warning LED</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P0107</td>
<td>Intake pressure sensor</td>
<td>Change the ECU.</td>
</tr>
<tr>
<td>P0108</td>
<td></td>
<td></td>
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<tr>
<td>P2228</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2229</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P0336</td>
<td>Engine sensor teeth</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>P0500</td>
<td>Vehicle speed fault</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>P1687</td>
<td>2T oil indicator light fault</td>
<td></td>
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<tr>
<td>P1688</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1689</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1690</td>
<td>Oil pump fault 2T</td>
<td></td>
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<tr>
<td>P1691</td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>P1211</td>
<td>Speed sensor signal fault</td>
<td></td>
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<tr>
<td>P1212</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1213</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1214</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tools required

- A digital multimeter.
- The TEP 2010 with the latest update.

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 connected and the ignition is switched on, or the engine is running.
## Electrical Tests

### 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.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Use</th>
<th>Measurement (Resistance)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1/B2</td>
<td>Engine speed sensor</td>
<td>Measure the resistance between terminal B1 and B2</td>
<td>R = 125 ±20% Ω</td>
</tr>
<tr>
<td>C2/D1</td>
<td>Engine temperature sensor</td>
<td>Measure the resistance between terminal C2 and D1</td>
<td>R = 10.6 Ω to 20°C</td>
</tr>
<tr>
<td>D3</td>
<td>Oil level indicator</td>
<td>Measure the resistance between terminal D3 and the earth</td>
<td>R = 0 Ω if the tank is full</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R = Infinite value if the tank is empty</td>
</tr>
<tr>
<td>D4</td>
<td>Lateral stand (option)</td>
<td>Measure the resistance between terminal D4 and the earth</td>
<td>Vehicle without stand: R = 0 Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stand is folded back: R = 0 Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stand is stretched out: R = Infinite value</td>
</tr>
<tr>
<td>G1</td>
<td>Petrol injector</td>
<td>Measure the resistance between terminal G1 and G4</td>
<td>R = 13 ±10% Ω</td>
</tr>
<tr>
<td>G2</td>
<td>Fuel pump relay</td>
<td>Measure the resistance between terminal G2 and G4</td>
<td>R = 71.5 ±10% Ω</td>
</tr>
<tr>
<td>H2</td>
<td>Electric oil pump</td>
<td>Measure the resistance between terminal H2 and G4</td>
<td>R = 27.5 ±10% Ω</td>
</tr>
<tr>
<td>H3</td>
<td>HT coil</td>
<td>Measure the resistance between terminal H3 and G4</td>
<td>R = 3.3 ±10% Ω</td>
</tr>
<tr>
<td>H4</td>
<td>ECU earth</td>
<td>Measure the resistance between terminal H4 and the earth</td>
<td>R = 0 Ω</td>
</tr>
</tbody>
</table>
Checking the components with a voltmeter

**Preliminary conditions:**
- The machine's battery shall be correctly charged.
- The 32 way terminal block shall be connected to the wiring harness and to the ECU.
- Set the multimeter to DC voltmeter.
- Turn on the ignition.

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

**Preliminary conditions:**
- The machine's battery shall be correctly charged.
- The 32-way terminal block shall be connected to the wiring harness and to the ECU.
- Turn on the ignition.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Use</th>
<th>Measurement/Action</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1/B2</td>
<td>Engine speed sensor</td>
<td>Between terminals B1 and B2. Set the multimeter to AC voltmeter. Engine idling.</td>
<td>From 8.5V to 9V</td>
</tr>
<tr>
<td>C4</td>
<td>Drive sensor (Rear wheel signal)</td>
<td>Between terminals C4 and H4. Set the multimeter to AC voltmeter. Presence of variable voltage when the wheel is turned manually.</td>
<td>From 4V to 6V</td>
</tr>
<tr>
<td>E3</td>
<td>Vehicle speed information (Front wheel signal) (Depending on model)</td>
<td>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.</td>
<td>From 8V to 15V</td>
</tr>
</tbody>
</table>
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.
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