

# Chapter 4 Part C:

## Fuel and exhaust systems - Motronic injection

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### Degrees of difficulty

<b>Easy</b> , suitable for novice with little experience 	<b>Fairly easy</b> , suitable for beginner with some experience 	<b>Fairly difficult</b> , suitable for competent DIY mechanic 	<b>Difficult</b> , suitable for experienced DIY mechanic 	<b>Very difficult</b> , suitable for expert DIY or professional 
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### Specifications

For engine to model applications refer to Chapter 2

#### Air cleaner

Element . . . . . Champion U543

#### Fuel filter

Type . . . . . Champion L201

#### System

Model application/Type:

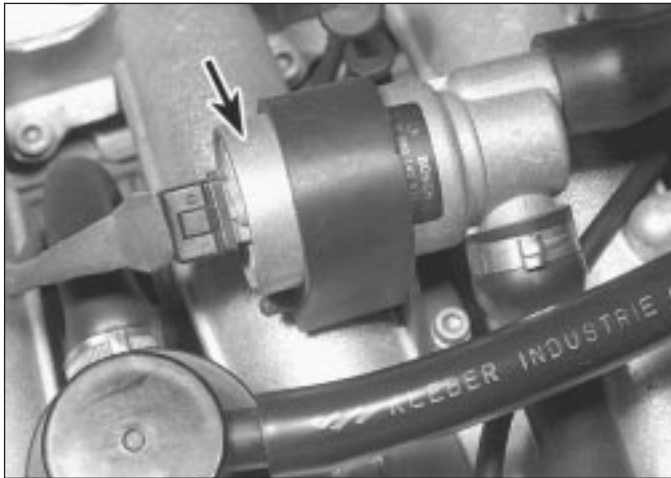
BX 19 GTi 16v (pre 1991) . . . . .	Motronic ML4.1
BX 19 GTi (from July 1990) . . . . .	Motronic MP3.1
BX 19 GTi 16v (from 1991) . . . . .	Motronic M1.3
BX 19 TZi with catalytic converter . . . . .	Motronic M1.3

Idle speed:

Motronic ML4.1 . . . . .	850 rpm (not adjustable)
Motronic MP3.1 . . . . .	850 to 900 rpm
Motronic M1.3:	
BX 19 GTi 16v . . . . .	850 rpm (not adjustable)
BX 19 TZi . . . . .	850 to 950 rpm

CO percentage in exhaust gas:

Motronic ML4.1 . . . . .	0.8 to 1.5
Motronic MP3.1 . . . . .	1.0 to 2.0
Motronic M1.3:	
BX 19 GTi 16v . . . . .	0.8 to 1.5
BX 19 TZi . . . . .	Controlled by ECU



1.6a Idle actuator (arrowed)



1.6b Injector and fuel pump relays protected by plastic cover - GTi 16v with Motronic ML4.1

## 1 General information and precautions

### General information

Three types of Motronic engine management systems have been fitted to the Citroën BX range, their model applications being listed in *Specifications*.

To provide fine control of the engine to suit prevailing operating conditions, the system controls the functions of both the fuel injection and ignition systems.

The Electronic Control Unit (ECU) receives signals from various sensors and computes the optimum volume of fuel to be injected and the optimum ignition advance setting to suit the prevailing conditions.

In the event of the failure of a system component, the ECU has the capability to permit the engine to operate, albeit at reduced power and efficiency, until the fault can be investigated by a Citroën dealer who will have access to the necessary specialist test equipment.

The following sensors supply the ECU with information:

- a) *Airflow meter* - measures the volume of air entering the engine
- b) *Air temperature sensor* - measures the temperature of the air entering the engine (integral with the airflow meter)
- c) *Throttle position switch* - senses the position of the throttle valve
- d) *Coolant temperature sensor*
- e) *TDC sensor* - measures engine speed and crankshaft position
- f) *Knock sensor* (only fitted to BX 19 GTi 16v with Motronic M1.3) - senses the engine vibrations associated with pre-ignition, which may cause engine damage unless the ignition timing is retarded as a preventative measure
- g) *Lambda (oxygen) sensor* (only fitted to

models equipped with Motronic M1.3 and catalytic converter) - measures the oxygen content of the exhaust gases  
 Additionally, the Motronic systems comprise the following components:

- a) *Air cleaner* - located on the left-hand front wing valance, the casing incorporates the airflow meter
- b) *Fuel pump and filter*
- c) *Fuel pulsation damper* - located in the fuel line close to the filter, reduces fuel pump noise
- d) *Fuel pressure regulator* - located on the end of the fuel rail within the engine compartment, maintains a constant fuel pressure
- e) *Fuel injectors*
- f) *Idle actuator* - (BX 19 GTi 16v with Motronic M1.3 or ML4.1) - controls the volume of air bypassing the throttle valve at idle, thus maintaining a suitable idle speed during warm-up and a constant speed when the engine is warm (see illustration)
- g) *Supplementary air device* (models with Motronic M1.3 and catalytic converter, and Motronic MP3.1 system) - provides supplementary air to the idling circuit as an aid to starting and warm-up
- h) *Throttle butterfly housing* - two throttle valves open simultaneously and the housing is coolant-heated to improve fuel atomization
- i) *Electronic control unit (ECU)* - located under the driver's seat, the ECU controls the system components
- j) *HT distributor* (all except Motronic MP3.1) - the distributor simply distributes HT current to the spark plugs and consists of a rotor arm on the end of the camshaft (inlet camshaft on 16v models) and a conventional distributor cap.
- k) *Ignition coil* - for the Motronic ML4.1 and M1.3 systems, a conventional ignition coil is used, being triggered by signals from

the ECU. The Motronic MP3.1 system uses a distributorless ignition system with a double coil which operates on the "wasted-spark" principle, supplying current directly to the spark plugs when triggered by signals from the ECU

- l) *Relays* - injector and fuel pump relays are fitted, both being controlled by the ECU (see illustration)
- m) *Idle mixture (CO) adjustment potentiometer* - for the Motronic ML4.1 and M1.3 (non-catalyst) systems, the idle mixture adjustment potentiometer is incorporated in the airflow meter casing. The Motronic MP3.1 system uses a remotely-mounted potentiometer located in the engine compartment on the inner right-hand wing panel. Note that on models equipped with the M1.3 system and catalytic converter, no adjustment of idle mixture is possible

All Motronic systems function in a similar manner, the differences between systems being of a minor nature, mainly associated with system sensors and the programming of the ECU.

### Precautions

#### Fuel warning

Many of the procedures in this Chapter require the removal of fuel lines and connections which may result in some fuel spillage. Before carrying out any operation on the fuel system refer to the precautions given in Safety first! at the beginning of this Manual and follow them implicitly. Petrol is a highly dangerous and volatile liquid and the precautions necessary when handling it cannot be overstressed.

#### System maintenance

Residual fuel pressure will remain in the system lines long after the vehicle is used. Before disconnecting any fuel line, depressurise the fuel system.

In order to prevent damage to the electrical components of the system, observe the following precautions:

- a) Never disconnect the battery with the engine running
- b) Never disconnect the electronic control unit with the ignition on
- c) Never use a test light for checking system circuits

### Tamperproof adjustment screws

Certain adjustment points in the fuel system are protected by "tamperproof" caps, plugs or seals. The purpose of such tamperproofing is to discourage, and to detect, adjustment by unqualified operators.

In some EEC countries (though not yet in the UK), it is an offence to drive a vehicle with missing or broken tamperproof seals. Before disturbing a seal, satisfy yourself that you will not be breaking local or national anti-pollution regulations by doing so. Fit a new seal when adjustment is complete, when this is required by law.

Do not break tamperproof seals on a vehicle which is still under warranty.

### Unleaded petrol - usage

Pre-1991 GTi 16 valve models are suitable for running on 97 RON leaded petrol only and cannot be run on unleaded petrol. All other models not equipped with a catalytic converter can be run on either 97 RON leaded fuel or 95 RON unleaded fuel without adjustment.

Models equipped with a catalytic converter must be run on 95 RON unleaded fuel only. The use of leaded fuel will seriously damage the converter.

### Catalytic converters

The catalytic converter is a reliable and simple device which needs no maintenance in itself but there are some facts of which an owner should be aware if the converter is to function properly for its full service life.

- a) DO NOT use leaded petrol in a vehicle equipped with a catalytic converter - the lead will coat the precious metals, reducing their converting efficiency, and will eventually destroy the converter.
- b) Always keep the ignition and fuel systems well-maintained, in accordance with the manufacturer's schedule. Ensure that the air cleaner element, the fuel filter (where fitted) and the spark plugs are renewed at the correct intervals. If the inlet air/fuel mixture is allowed to become too rich due to neglect, the unburned surplus will enter and burn in the catalytic converter, overheating the element and eventually destroying the converter.
- c) If the engine develops a misfire, do not drive the vehicle until the fault is cured. The misfire will allow unburned fuel to enter the converter, which will result in its overheating.
- d) DO NOT push-start the car. This will soak the catalytic converter in unburned fuel,

causing it to overheat when the engine does start.

- e) DO NOT switch off the ignition at high engine speeds or "blip" the throttle before switching off. If the ignition is switched off at anything above idle speed, unburned fuel will enter the very hot catalytic converter, with the possible risk of its igniting on the element and damaging the converter.
- f) DO NOT use fuel or engine oil additives as these may contain substances harmful to the catalytic converter.
- g) DO NOT continue to use the vehicle if the engine burns oil to the extent of leaving a visible trail of blue smoke. Unburned carbon deposits will clog the converter passages and reduce its efficiency. In severe cases, the element will overheat.
- h) The converter operates at very high temperatures, causing the heat shields on the vehicle underbody and the casing to become hot enough to ignite combustible materials which brush against it. DO NOT park the vehicle in dry undergrowth, or over long grass or piles of dead leaves.
- i) The converter is FRAGILE. Do not strike it during servicing work and take great care when working on the exhaust system. Ensure that the converter is well clear of any jacks or other lifting gear used to raise the vehicle and do not drive the vehicle over rough ground, road humps etc. in such a way as to "ground" the exhaust system.
- j) In some cases, particularly when the vehicle is new or is used for stop/start driving, a sulphurous smell may issue from the exhaust. This is common to many converter-equipped cars and seems to be due to the small amount of sulphur found in some petrols reacting with hydrogen in the exhaust to produce hydrogen sulphide (H<sub>2</sub>S) gas. Although this gas is toxic, it is not produced in sufficient amounts to be a problem. Once the vehicle has covered a few thousand miles, the problem should disappear. In the meanwhile, a change of driving style or petrol brand may effect a solution.
- k) A converter used on a well-maintained and well driven car, should last for



5.1 Fuel pump location - GTi 16v with Motronic ML4.1

between 50 000 and 100 000 miles. From this point on, careful checks should be made at all specified service intervals of the CO level, to ensure that the converter is still operating efficiently. If the converter is no longer effective, it must be renewed.

## 2 Air cleaner element - renewal



Refer to Chapter 1, Section 28.

## 3 Airflow meter - removal and refitting



- 1 The airflow meter is integral with the air cleaner casing.
- 2 To remove the assembly, disconnect the battery negative lead and the sensor wiring plug, then release the retaining clips and lift the assembly away from the air cleaner body.
- 3 Refitting is a reversal of removal.

## 4 Fuel system - depressurisation



Refer to Section 3 in Part B of this Chapter.

## 5 Fuel pump - removal and refitting



Refer to Section 4 in Part B of this Chapter (see illustration).

## 6 Fuel filter - removal and refitting



Refer to Chapter 1, Section 36.

## 7 Fuel level transmitter - removal and refitting

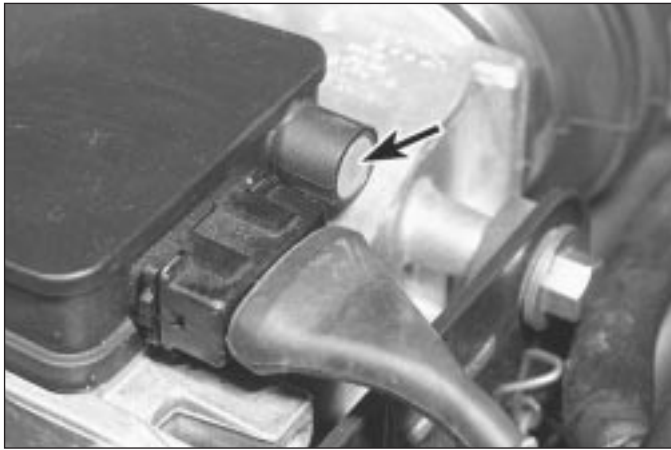


Refer to Section 9 in Part A of this Chapter.

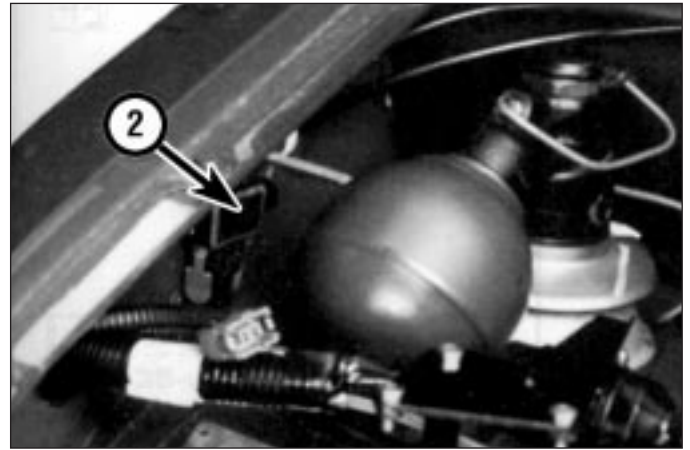
## 8 Fuel tank - removal, inspection and refitting



Refer to Section 7 in Part B of this Chapter.



10.3 Idle mixture adjustment screw tamperproof cap (arrowed)



10.13 Idle mixture adjustment potentiometer location (2)

**9 De-aeration reservoir - removal and refitting**



Refer to Section 8 in Part B of this Chapter.

**10 Idle speed and mixture - adjustment**



**Motronic ML4.1**

**Idle speed adjustment**

1 The idle speed and ignition timing are controlled by the ECU and no adjustment is possible.

**Mixture adjustment**

2 To adjust the idle mixture, run the engine until it reaches normal operating temperature (the cooling fan should have cut in and out), then stop the engine and connect an exhaust gas analyser in accordance with the manufacturer's instructions.

3 Where applicable, remove the tamperproof cap from the mixture (CO) adjustment screw on the airflow meter (see illustration).

4 With the engine idling, turn the adjustment screw as necessary to obtain the specified CO content.

5 On completion, stop the engine. Disconnect the exhaust gas analyser and where necessary, fit a new tamperproof cap to the mixture adjustment screw.

**Motronic M1.3 without catalyst**

**Idle speed adjustment**

6 On non-catalyst equipped models with Motronic M1.3, the idle speed and ignition timing are controlled by the ECU and no adjustment is possible.

**Mixture adjustment**

7 The idle mixture can be adjusted as described for the Motronic ML4.1 system.

**Motronic M1.3 with catalyst**

**Idle speed adjustment**

8 Refer to Chapter 1, Section 23.

**Mixture adjustment**

9 The idle mixture and ignition timing are controlled by the ECU and no adjustment is possible.

**Motronic MP3.1**

10 Both idle speed and mixture can be adjusted on this system but the ignition timing is controlled by the ECU.

**Idle speed adjustment**

11 Refer to Chapter 1, Section 23.

**Mixture adjustment**

12 Run the engine until it reaches normal operating temperature (the cooling fan should have cut in and out), then stop the engine and connect a tachometer and an exhaust gas analyser in accordance with the manufacturer's instructions.

13 Remove the tamperproof plug from the idle mixture adjustment potentiometer (located on the right-hand inner wing panel) (see illustration).

14 Turn the adjustment screw as necessary to obtain the specified CO reading.

15 If necessary, readjust the idle speed, then recheck the CO reading.



11.1 Removing a fuel injector from the rail

16 If necessary, repeat the procedure given in paragraph 22 until the idle speed and CO values are as specified.

17 On completion, stop the engine. Disconnect the tachometer and exhaust gas analyser and fit a new tamperproof cap to the idle mixture adjustment potentiometer.

**11 Fuel injectors - removal and refitting**



Refer to Section 12 in Part B of this Chapter (see illustration).

**12 Accelerator cable - removal and refitting**



Refer to Section 13 in Part B of this Chapter but note that there is no need to check the idle speed after refitting. Instead, check that the throttle butterfly is fully closed with the accelerator pedal in the rest position.

**13 Inlet and exhaust manifolds - removal and refitting**



Refer to Section 14 in Part B of this Chapter

**14 Exhaust system - maintenance, removal and refitting**



Refer to Section 15 in Part B of this Chapter but note that on models fitted with a catalytic converter, it will be necessary to disconnect the wiring from the lambda sensor before removing the exhaust front section. It may also be necessary to remove the heat shield from the underbody area around the catalytic converter to allow sufficient clearance to remove the exhaust system.