






Chapter 5 Part B:

Ignition system - fuel injection models

Contents

Distributor cap (Motronic system) - inspection	6	Ignition coil - maintenance, testing and renewal	5
Distributor (Motronic system) - dismantling and reassembly	7	Ignition switch and steering lock	12
Electronic Control Unit (ECU) - removal and refitting	8	Magneti Marelli system - testing	2
Engine management system relay assembly (Magneti Marelli system) - renewal	9	Sensors (Magneti Marelli system) - removal and refitting	11
General information and precautions	1	Spark plugs - removal, inspection and fitting	3
HT leads - maintenance and fitting	4	TDC sensor (Motronic system) - removal and refitting	10

Degrees of difficulty

Easy , suitable for novice with little experience 	Fairly easy , suitable for beginner with some experience 	Fairly difficult , suitable for competent DIY mechanic 	Difficult , suitable for experienced DIY mechanic 	Very difficult , suitable for expert DIY or professional 
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5B

Specifications

For engine to model applications refer to Chapter 2

System

Model application/Type:

BX 19 GTi (pre July 1990)	Bosch LE3 Jetronic
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
BX 16 fuel injection	Magneti Marelli G6.10

HT leads

Type:

BX 19 GTi	Champion LS-10
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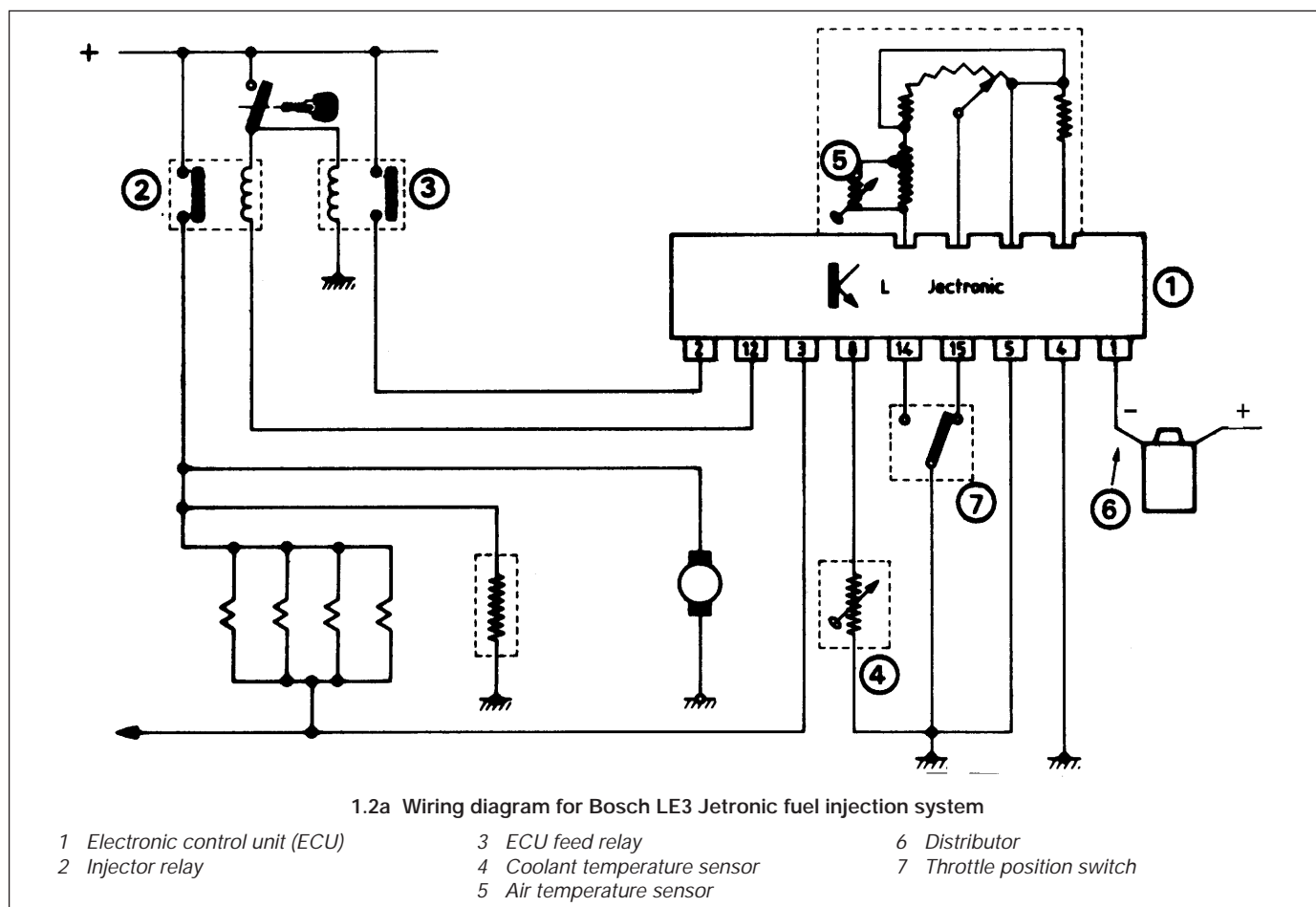
Spark plugs

	Type	Electrode gap
BX 16	Champion C9YCX	0.9 mm
BX 19 GTi	Champion RC7YCC	0.8 mm
BX 19 GTi 16v	Champion RC7YCC	1.6 mm

Torque wrench settings

Spark plugs:

	Nm	lbf ft
Taper seat type	12	9
Flat seat type (with washer)	25	18



1 General information and precautions

General information

Bosch LE3 Jetronic system

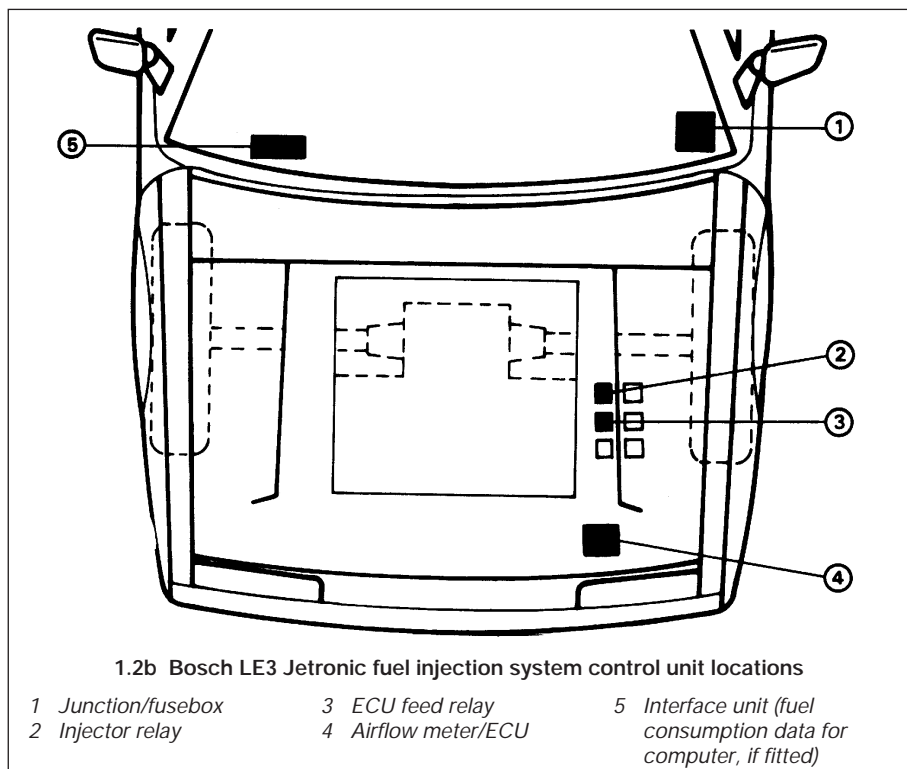
Fitted to BX 19 GTi models manufactured before July 1990, operation of this system is fully explained in Chapter 4B.

The electronic control unit (ECU) incorporated in the system is triggered by the ignition circuit and sends impulses to the injectors, which operate simultaneously and inject fuel in the vicinity of the inlet valves. The ECU is provided with sensors to determine engine temperature, speed and load, and the quantity of air entering the engine (see illustrations).

Motronic system

Three types of Motronic engine management systems have been fitted to the Citroën BX range, their model applications being as follows:

- 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



Operation of these system types is fully explained in Chapter 4C, the main components of the ignition function of each system type being as follows:

- a) *Electronic control unit (ECU) - located under the driver's seat, the ECU controls the system components and receives signals from various sensors.*
- b) *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*
- c) *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.*
- b) *Crankshaft sensor - informs the ECU of crankshaft position and engine speed*
- c) *Throttle potentiometer - informs the ECU of throttle valve position and rate of throttle opening/closing*
- d) *Coolant temperature sensor - informs the ECU of engine temperature*
- e) *Fuel/air mixture temperature sensor - informs the ECU of temperature of fuel/air mixture charge entering cylinders*
- f) *Lambda (oxygen) sensor - informs the ECU of oxygen content of exhaust gases*

Precautions

General

Refer to the precautions listed in Part A of this Chapter.

Engine management systems

Engine management modules are very sensitive components and certain precautions must be taken to avoid damaging them. These are as follows:

The following sensors supply the ECU with information:

- a) *Air temperature sensor - measures the temperature of the air entering the engine (integral with the airflow meter)*
- b) *Throttle position switch - senses the position of the throttle valve*
- c) *Coolant temperature sensor*
- d) *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*
- e) *Lambda (oxygen) sensor (only fitted to models equipped with Motronic M1.3 and catalytic converter) - measures the oxygen content of the exhaust gases*
- f) *TDC sensor - measures engine speed and crankshaft position*
- a) *Although underbonnet-mounted modules will tolerate normal underbonnet conditions, they can be adversely affected by excess heat or moisture. If using pressure washing equipment in the vicinity of the module, take care not to direct jets of water or steam at the module. If this cannot be avoided, remove the module from the vehicle and protect its wiring plug with a plastic bag.*
- b) *On models with underbonnet-mounted modules, do not run the engine with the module detached from the body panel, as the body acts as an effective heat sink and the module may be damaged due to internal overheating.*
- c) *Do not attempt to improvise fault diagnosis procedures using a test lamp or multimeter, as irreparable damage could be caused to the module.*
- d) *After working on engine management system components, ensure that all wiring is correctly reconnected before reconnecting the battery or switching on the ignition.*

Magneti Marelli system

Fitted to fuel-injected BX 16 models, operation of this system is fully explained in Chapter 4D.

On the ignition side of this system, the ECU has full control. The ignition system is of the static, distributorless type and consists solely of an ignition HT coil with four outputs. The ignition coil comprises two separate HT coils which supply two cylinders each (one coil supplies cylinders 1 and 4 - the other coil cylinders 2 and 3). Under control of the ECU, the ignition coil operates on the "wasted-spark" principle, ie. each spark plug sparks twice for every cycle of the engine, once on the compression stroke and once on the exhaust stroke.

The ECU uses its inputs from the various sensors to calculate the required ignition advance setting and coil charging time. These sensors are as follows:

- a) *Manifold absolute pressure (MAP) sensor - informs the ECU of engine load*



2.3 Magneti Marelli system diagnostic connector

2 Magneti Marelli system - testing



1 If a fault appears in the system, first ensure that all system wiring connectors are securely connected and free of corrosion.

2 Ensure that any fault is not due to poor maintenance. That is, check that the air cleaner element is clean, the spark plugs are in good condition and correctly gapped, that the valve clearances are correctly adjusted and that the engine breather hoses are clear and undamaged.

3 If these checks fail to reveal the cause of the problem, the vehicle should be taken to a Citroën dealer for testing. A wiring block connector is incorporated in the engine management circuit, into which a special electronic diagnostic tester can be plugged (**see illustration**). The tester will locate the fault quickly and simply, alleviating the need to test all the system components individually, which is a time-consuming operation that carries a high risk of damaging the ECU.

3 Spark plugs - removal, inspection and fitting



Refer to the information given in Section 2 in Part A of this Chapter, noting that the flat-seated spark plugs with washers are also fitted to BX 19 GTi and BX GTi 16 valve engines.

4 HT leads - maintenance and fitting



Where applicable, refer to Section 3 in Part A of this Chapter.

5 Ignition coil - maintenance, testing and renewal



Maintenance and testing

1 Refer to Section 4 in Part A of this Chapter.

Renewal

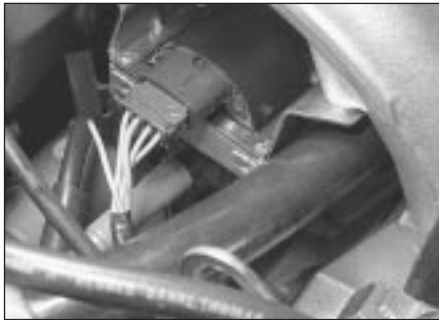
Bosch LE3 Jetronic system

2 Ignition coil type and location on the BX 19 GTi manufactured before July 1990 differs to that on other models in the range.

3 The coil is mounted on the underside of the air inlet manifold (**see illustration**).

4 To remove the coil, detach the wiring connectors and unbolt the unit, complete with its retaining bracket.

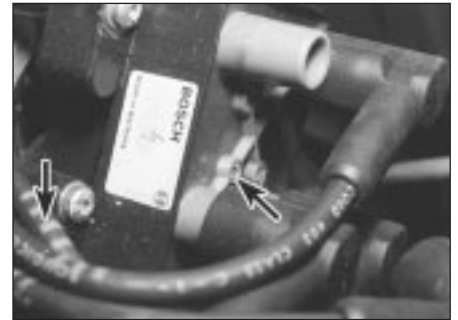
5 Refitting is a reversal of the removal procedure.



5.3 Ignition coil location - GTi with Bosch LE3 system



5.8 Disconnect ignition coil wiring connector



5.9 Disconnect HT leads, noting cylinder number markings on leads and coil (arrowed)

Magneti Marelli system

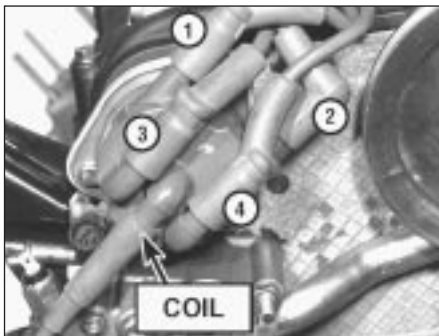
6 The ignition coil of this system is mounted on the left-hand end of the cylinder head, and can be removed as follows.

7 Disconnect the battery negative terminal.

8 Disconnect the wiring connector from the base of the coil (see illustration).

9 Make a note of the correct fitted positions of the HT leads, then disconnect them from the coil terminals. Note that on genuine Citroën leads, each lead is marked with its cylinder number, indicated by red blocks printed near the end of the lead. The coil terminals are also numbered for identification (see illustration).

10 Undo the four Torx retaining screws and remove the coil from the end of the cylinder head.



7.1 Distributor cap and HT leads - GTi 16v with Motronic ML4.1

11 Refitting is a reverse of the removal procedure, ensuring that the HT leads are correctly reconnected.

6 Distributor cap (Motronic system) - inspection



1 Check inside the HT lead end fittings of the cap for signs of corrosion, which will look like a white crusty powder. Remove any corrosion found.

2 Wipe the cap clean and carefully inspect it inside and out for signs of cracks, carbon tracks (tracking) and worn, burned or loose contacts.

3 Check that the central carbon brush is unworn, free to move against spring pressure and making good contact with the rotor arm.

4 Clean and inspect the rotor arm.

5 If defects are found, then renew the cap or arm.

7 Distributor (Motronic system) - dismantling and reassembly



1 Disconnect the battery negative lead, then disconnect the HT leads from the spark plugs (see illustration).

2 Loosen the securing screws and withdraw the distributor cap complete with HT leads.

3 Where applicable, remove the three securing screws, then pull the rotor arm from the end of the camshaft (see illustration).

4 On BX 19 GTi 16 valve models, the rotor drive flange can be removed after removing the single Torx retaining screw. The plastic baseplate can then be removed (see illustration).

5 Refitting is a reversal of removal. On BX 19 GTi 16 valve models, clean the threads of the rotor drive flange retaining screw and apply locking fluid before refitting. Note that the components will only fit in one position.

8 Electronic Control Unit (ECU) - removal and refitting



Motronic system

1 The ECU is located under the driver's seat (see illustration).

2 To remove the unit, first disconnect the battery negative lead.

3 To gain access to the unit, unclip the front seat cushion from the seat frame, then release it from the upholstery retaining hooks and remove the seat cushion.

4 Unscrew the bolt securing the unit to its mounting bracket, then disconnect the ECU wiring plug and withdraw the unit.

5 Refitting is a reversal of removal.



7.3 Removing a rotor arm securing screw - GTi 16v with Motronic ML4.1



7.4 Rotor drive flange - GTi 16v with Motronic ML4.1



8.1 ECU location - GTi 16v with Motronic ML4.1



8.6 ECU is located under the driver's seat - Magneti Marelli system

Magneti Marelli system

6 Refer to the information given for the Motronic system (see illustration).

9 Engine management system relay assembly (Magneti Marelli system) - renewal



1 The engine management relay assembly is situated in the engine compartment, mounted on the right-hand wing valance (see illustration).

2 To remove the assembly, first disconnect the battery negative terminal.

3 Disconnect the wiring connector, then undo the retaining screw and remove the relay assembly from the engine compartment.

4 Refitting is a reverse of removal.

10 TDC sensor (Motronic system) - removal and refitting



Removal

1 The TDC sensor is mounted in the gearbox bellhousing.

2 Disconnect the wiring plug, then disconnect the wiring from the sensor.

3 Remove the sensor securing screw and withdraw the sensor from the bellhousing. Where applicable, recover the shim which may be fitted between the sensor and the bellhousing.



11.3 Crankshaft sensor location (retaining screw arrowed)



9.1 Engine management relay assembly location - Magneti Marelli system

Refitting

4 Refitting is a reversal of removal. Note the following.

5 On BX 19 GTi 16 valve models, use a depth gauge to measure the distance between the sensor mounting face and the top of one of the teeth on the flywheel.

6 If the reading obtained is 25 mm, refit the sensor without a shim. If the reading is 24.1 mm, a suitable shim (available from Citroën dealers) must be fitted between the sensor and the bellhousing.

11 Sensors (Magneti Marelli system) - removal and refitting



Crankshaft sensor

1 The crankshaft sensor is fitted to the top of the transmission housing, beside the left-hand end of the cylinder block. To remove it, first disconnect the battery negative terminal.

2 Trace the wiring back from the sensor to its wiring connector, then depress the retaining tabs and disconnect it from the main wiring harness (see illustration).

3 Undo the bolt securing the sensor to the transmission housing and remove the sensor from the vehicle (see illustration).

4 Refitting is a reverse of removal.

Lambda sensor

Note: This sensor is delicate and will not work



11.5 Lambda sensor wiring connectors (arrowed) situated in right-hand corner of engine compartment



11.2 Crankshaft sensor wiring connector situated behind ignition coil

if dropped or knocked, if its power supply is disrupted, or if any cleaning materials are used on it.

5 Open the bonnet and locate the sensor wiring connectors which are clipped to the right-hand end of the engine compartment bulkhead (see illustration). Disconnect the battery negative terminal, then disconnect both the wiring connectors and free the wiring harness from any relevant retaining clips.

6 Chock the rear wheels, then jack up the front of the car and support it on axle stands (see "Jacking and vehicle support").

7 Free the lower end of the sensor wiring from any relevant retaining clips, then unscrew the sensor from the front pipe and remove it along with its sealing washer (see illustration).

8 Prior to refitting, examine the sealing washer for signs of damage and renew as necessary.

9 Ensure that the sensor and manifold threads are clean, then apply a smear of high-temperature anti-seize compound to the sensor's threads.

10 Fit the sealing washer to the sensor, then refit the sensor to the front pipe and tighten it securely.

11 Ensure that the sensor wiring is correctly routed up the bulkhead and secure the wiring in position with any relevant clips or ties.

12 Return to the engine compartment, then reconnect the sensor wiring connectors and secure the wiring to the bulkhead with any remaining clips or ties. Reconnect the battery, and lower the vehicle to the ground.



11.7 Lambda sensor location



11.13 Fuel/air mixture temperature sensor location

Fuel/air mixture temperature sensor

13 This sensor is screwed into the right-hand side of the inlet manifold and is removed as follows (see illustration).

14 Disconnect the battery negative terminal.

15 Disconnect the wiring connector, then unscrew the sensor from the inlet manifold.

16 Refitting is a reverse of the removal procedure, ensuring that the switch is securely tightened.

Manifold absolute pressure (MAP) sensor

17 This sensor is mounted onto a bracket which is situated just behind the alternator. To remove the sensor, first disconnect the battery negative terminal.



11.18a Slacken and remove the three retaining nuts and bolts . . .

18 Slacken and remove the three retaining nuts and bolts, then free the sensor from the bracket. Disconnect the wiring connector and vacuum hose and remove the sensor from the engine compartment (see illustrations).

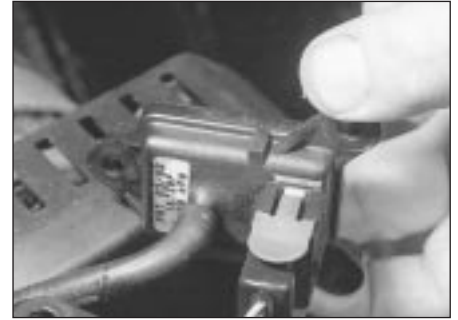
19 Refitting is a reverse of the removal procedure.

Coolant temperature sensor

20 This sensor is located on the left-hand end of the rear face of the cylinder head, access to it being strictly limited. Either drain the cooling system, or be prepared for some coolant loss as the sensor is removed.

21 To improve access to the sensor, remove the HT coil.

22 Disconnect the wiring connector from the sensor.



11.18b . . . then free MAP sensor from bracket and disconnect vacuum hose and wiring connector

23 Unscrew the sensor, then remove it from the cylinder head and plug its aperture to prevent the entry of dirt. If the cooling system has not been drained, work quickly to minimise coolant loss.

24 Refitting is a reverse of removal, noting that any sealing washer must be renewed. If no sealing washer is fitted, apply a smear of sealant to the sensor threads to prevent leakage.

12 Ignition switch and steering lock



Removal and separation of the switch and lock is described in Chapter 11.