

Chapter 5 Part C:

Starting and charging systems

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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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Specifications

For engine to model applications refer to Chapter 2

System

Type 12 volt, negative earth

Battery

Rating:

BX and BX 14	29 or 35 Ah
BX 16 and BX 19	33, 45 or 50 Ah
BX 16 and BX 19 with air conditioning	50 or 60 Ah

Alternator

Make Bosch, Ducellier, Paris-Rhone or Melco

Application:

BX and BX 14 (pre Feb 1984)	Bosch 0120 489 163 164 Ducellier 516 039 Paris-Rhone A 13 N 43
Regulator	Bosch 1 197 311 100 Ducellier 511 020 Paris-Rhone YH 1639
BX and BX 14 (from Feb 1984)	Bosch B 120 427 315 Paris-Rhone A 13 N 38
Regulator	Bosch 1 1973 11008 Paris-Rhone YH 1925
BX 16 and BX 19 (pre Feb 1984)	Melco A 002 T 26 391 Bosch A 120 427 141 Melco A 866 T 03 870
Regulator	Bosch 1 1973 311 100
BX 16 and BX 19 (from Feb 1984)	Bosch 0 120 489 258 259 Paris-Rhone A 13 N 95 Bosch 1 197 311 008 Paris-Rhone YH 1925
Regulator	Melco A 3 T 45 191 G Melco A 003 T 45 291 Melco 03870 RS 3809
BX 16 - air conditioned models (80A/1120W)	
Regulator	
Minimum output at 13.5 volts:	
BX, BX 14, BX 16 and BX 19:	
900 rpm engine speed	32 amps
1800 rpm engine speed	47 amps
BX 16 - air conditioned models:	
900 rpm engine speed	54 amps
1800 rpm engine speed	75 amps

Starter motor

Make	Ducellier, Paris-Rhone or Bosch
Type	Pre-engaged, 12 volt
Application:	
BX and BX 14	Ducellier 532 014 Paris-Rhone D 8 E 151 Bosch 9 000 1 42 002
BX 16 and BX 19	Ducellier 534 039 Paris-Rhone D 9 E 48 Bosch A 001 208 316 F Bosch 0 001 208 516 E

1 General information and precautions

General information

The system is of the 12 volt negative earth type. Major components comprise a 12 volt battery, a starter motor, and an alternator which is belt-driven from a crankshaft pulley.

The battery supplies a steady amount of current for the ignition and other electrical circuits and provides a reserve of electricity when the current consumed by the electrical equipment exceeds that being produced by the alternator.

The alternator is controlled by a regulator. This ensures a high output if the battery is in a low state of charge or the demand from the electrical equipment is high. Alternatively, it ensures a low output if the battery is fully charged and there is little demand from the electrical equipment.

The starter motor is of the pre-engaged type, its drive pinion being brought into mesh with the starter ring gear on the flywheel before the main current is applied.

When the starter switch is operated, current flows from the battery to the solenoid mounted on top of the starter motor body. The solenoid plunger moves inwards, so causing a centrally pivoted lever to push the drive pinion into mesh with the starter ring gear. When the plunger reaches the end of its travel, it closes an internal contact and full starting current flows to the starter field coils. The armature is then able to rotate the crankshaft, so starting the engine.

Precautions

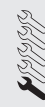
It is necessary to take extra care when working on the electrical system to avoid damage to semi-conductor devices (diodes and transistors) and to avoid the risk of personal injury. In addition to the precautions given in the "Safety first!" Section at the beginning of this manual, take note of the following points when working on the system.

- Before disconnecting any wiring or removing components, always ensure that the ignition is switched off.
- Disconnect the battery leads before using a mains charger.
- Do not reverse the battery connections. Components such as the alternator or any

other having semi-conductor circuitry could be irreparably damaged.

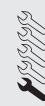
- If the engine is being started using jump leads and a slave battery, connect the batteries positive to positive and negative to negative. This also applies when connecting a battery charger.
- Never disconnect the battery terminals or alternator multi-plug connector when the engine is running.
- The battery leads and alternator multi-plug must be disconnected before carrying out any electric welding on the vehicle.
- Never use an ohmmeter of the type incorporating a hand cranked generator for circuit or continuity testing.
- When carrying out welding operations on the vehicle using electric welding equipment, disconnect the battery and alternator.

2 Battery - maintenance



Refer to "Weekly Checks".

3 Battery - charging



Warning: During battery electrolyte replenishment, never add water to sulphuric acid otherwise it will explode. Always pour the acid slowly onto the water.



Warning: The battery will be emitting significant quantities of (highly-inflammable) hydrogen gas during charging and for approximately 15 minutes afterwards. Do not allow sparks or naked flames near the battery or it may explode.

Caution: Specially rapid "boost" charges which are claimed to restore the power of a battery in 1 to 2 hours are not recommended as they can cause serious damage to the battery plates through overheating

Caution: If the battery is being charged from an external power source whilst the battery is fitted in the vehicle, both battery leads must be disconnected to prevent damage to the electrical circuits.

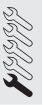
1 In winter when heavy demand is placed on the battery (starting from cold and using more electrical equipment), it is a good idea occasionally to have the battery fully charged from an external source. The charge rate will depend on battery type. For most owners however, the best method will be to use a trickle-charger overnight, charging at a rate of 1.5 amps.

2 Rapid 'boost' charges which are claimed to restore the power of the battery in 1 to 2 hours are not recommended, as they can cause serious damage to the battery plates through overheating and may cause a sealed battery to explode.

3 Ideally, the battery should be removed from the vehicle before charging and moved to a well-ventilated area.

4 Continue to charge the battery until all cells are gassing vigorously and no further rise in specific gravity or increase in no-load voltage is noted over a four-hour period. When charging is complete, turn the charger off before disconnecting its leads from the battery.

4 Battery - removal and refitting



Caution: When reconnecting the battery, always connect the positive lead first and the negative lead last.

Removal

- The battery is on a carrier fitted to the wing valance of the engine compartment.
- Disconnect the negative and then the positive leads from the battery terminals by releasing the terminal nuts and bolts.
- Release the battery clamp and carefully lift the battery from its carrier. Hold it vertically to ensure that none of the electrolyte is spilled. Note the earth strap attached to the clamp stud.

Refitting

- Refitting is a direct reversal of this procedure. Reconnect the positive lead before the negative lead and smear the terminals with petroleum jelly to prevent corrosion. Never use ordinary grease

5 Alternator drivebelt - removal, refitting and adjustment



Removal

- 1 On BX and BX 14 engines, remove the HP pump drivebelt.
- 2 Loosen the alternator adjustment and pivot bolts, swivel the alternator towards the engine and remove the drivebelt from the pulley (see illustration).

Refitting

- 3 Refitting is a reversal of removal but drivebelt adjustment must be made before fully tightening the mounting/adjustment bolts.

Adjustment

- 4 Correct tensioning of the alternator drivebelt will ensure that it has a long and useful life. If the belt is loose, alternator performance will be affected. If the belt is too tight it will cause unnecessary alternator bearing wear. In either case the belt itself will suffer and its life will be shortened.
- 5 The drivebelt is tensioned by pivoting the alternator out and securing it when the belt is correctly tensioned.
- 6 To adjust drivebelt tension, first check that it is correctly located in both pulleys then, with the mounting and adjustment strap bolts loosened, pivot the alternator outwards to tighten the drivebelt. You can use a lever to help achieve this but it must be a wooden one and it must be used only at the pulley end of the alternator. Levering on the case or at the end opposite to the drive pulley can easily cause expensive damage.
- 7 Tighten the belt as much as possible (but without over stretching it) to take up any play in the belt at its mid point on the longest run between the pulleys. Whilst a taut tension is required the belt must not be overtightened. Tighten the alternator mounting and adjuster strap bolts to set the tension.
- 8 If a new belt has been fitted, recheck its tension after a nominal mileage has been covered.



7.3 Removing the rear shield - Paris-Rhone alternator



5.2 Alternator drivebelt and adjustment strap - BX 16

6 Alternator - removal and refitting



Removal

- 1 Open the bonnet and disconnect the negative battery terminal followed by the positive battery terminal.
- 2 Note the location of the alternator supply wires, then disconnect them from the rear cover.
- 3 On BX and BX 14 engines, remove the HP pump drivebelt.
- 4 Loosen the alternator adjustment and pivot bolts, swivel the alternator towards the engine and remove the drivebelt from its pulley.
- 5 Support the alternator and unscrew and remove its adjustment and pivot bolts. The alternator can now be carefully lifted from the vehicle.

Refitting

- 6 Refitting the alternator is a reversal of the removal procedure. Reconnect the alternator wiring before the battery.
- 7 Adjust the alternator drivebelt tension and on BX and BX 14 models, refit and adjust the HP pump drivebelt.

7 Alternator - brush renewal



- 1 Because of the different types of alternator fitted, it is not practical to describe the

procedure for each one in detail. The following procedure applies to the Paris-Rhone 750W alternator. Detail differences will be found with other makes.

- 2 Remove the alternator from the vehicle.
- 3 Remove the rear shield. Some force may be needed to prise it off (see illustration).
- 4 Remove the two screws which secure the regulator/brush holder assembly. Disconnect the regulator lead from the spade terminal and slide the assembly out (see illustrations).
- 5 In most cases the brushes will have wear limit marks in the form of a groove etched along one face of each brush. When the brushes are worn down to these marks, they are worn out and must be renewed. No dimension is given by Citroen. If in doubt about the condition of the brushes, compare them with ones and if necessary, renew the brushes as a set.
- 6 The old brushes must be unsoldered and the new ones soldered in their place.

8 Starter motor - testing

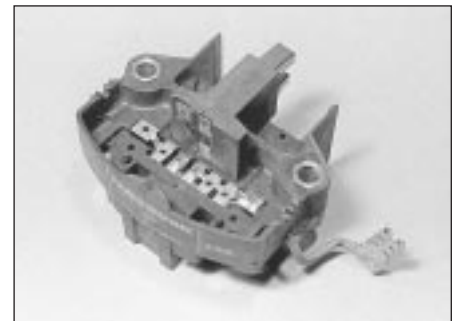


Note: This procedure was carried out with the starter motor in the vehicle

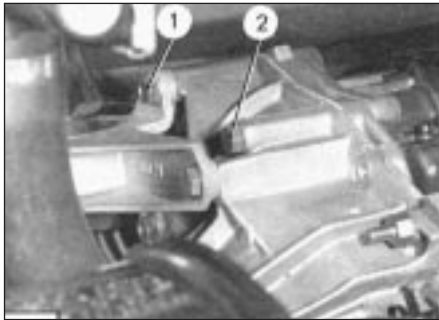
- 1 If the starter motor fails to operate, first check the condition of the battery by switching on the headlamps. If they glow brightly, then gradually dim after a few seconds, the battery is in an uncharged condition.
- 2 If the battery is in good condition, check the terminal connections for security. Also check that the earth lead is making good contact with the body frame.
- 3 Check the security of the main cable and solenoid cable connections on the starter motor.
- 4 If the starter motor still fails to turn, check that the solenoid is being energised. To do this, connect a 12 volt test lamp and leads between the large solenoid terminal and earth. When the ignition key is turned to the starting position, the lamp should glow. If not, either the supply circuit is open due to a broken wire or a faulty ignition switch, or the solenoid is defective. If the solenoid is supplying current to the starter motor, the fault must be in the starter motor.



7.4a Disconnect the regulator lead . . .



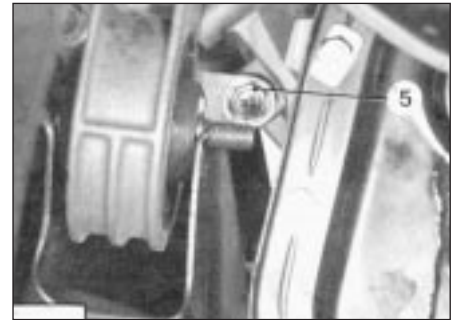
7.4b . . . and remove the regulator and brush holder unit



9.4 Remove the starter motor retaining bolts 1 and 2



9.5 Remove the engine mounting nuts 3 and 4



9.6 Starter motor retaining bolt (5) beyond the mounting

9 Starter motor - removal and refitting



BX and BX 14 models

- 1 Disconnect the earth lead from the battery terminal.
- 2 Disconnect the leads from the starter motor and the red identification plug from the solenoid unit.
- 3 Support the engine/transmission, using a jack underneath or a hoist and sling from above.
- 4 Unscrew and remove the two starter motor retaining bolts (see illustration).
- 5 Unscrew and remove the engine mounting nuts (see illustration).
- 6 Raise the engine/transmission just enough to provide access to the starter motor retaining bolt beyond the mounting (see illustration).
- 7 Unscrew and remove the two bolts securing the starter motor rear bearing then withdraw the starter motor.
- 8 Refitting is a reversal of the removal procedure.

BX 16 and BX 19 models

- 9 Disconnect the battery earth lead from the battery terminal.
- 10 To improve access to the starter motor, disconnect and remove the air filter duct.
- 11 Disconnect the wiring from the starter motor, taking note of the connecting positions.
- 12 Undo the two bolts securing the starter motor mounting bracket to the engine. Note that the lower bolt secures the hydraulic line location clip.
- 13 Unscrew and remove the three socket-head bolts on the transmission side then withdraw the starter motor, complete with its mounting bracket.
- 14 Refitting is a reversal of the removal procedure.

BX 19 GTi models

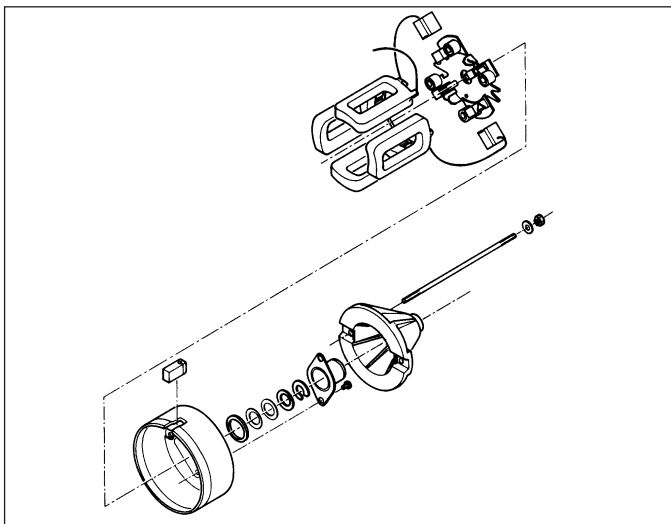
- 15 Access to the starter motor on this model is poor and the vehicle is best raised and supported at the front end to give a suitable working area underneath. On 16 valve versions, it is possible to remove the starter motor after first taking out the radiator and working through the front grille opening (cover flap removed).

- 16 Working from underneath, unclip and detach the three crankcase breather hoses from the engine (near the oil filter). Unscrew and remove the oil filter, taking care if the engine is still warm as any oil spillage will be hot.
- 17 Detach the battery earth lead.
- 18 Undo the starter motor bracket bolts at the filter end. Unscrew and remove the starter motor-to-clutch housing securing bolts, then withdraw the starter motor. Detach the wiring connections and remove the starter motor from the vehicle.
- 19 Refitting is a reversal of the removal procedure. In view of its relatively low cost, the oil filter is best renewed.

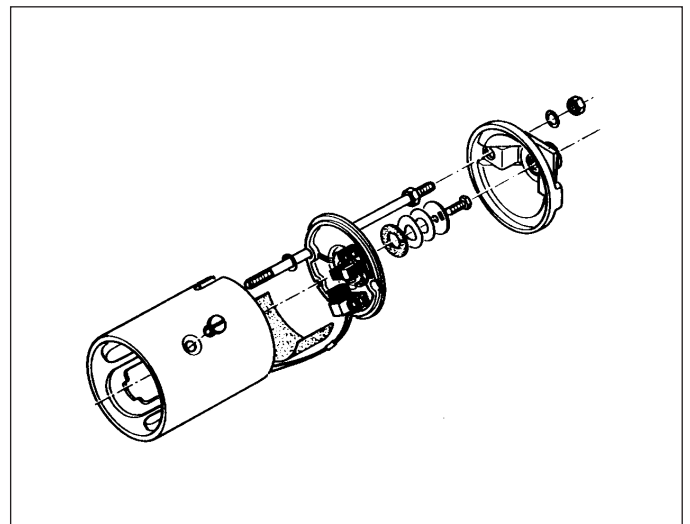
10 Starter motor - brush renewal



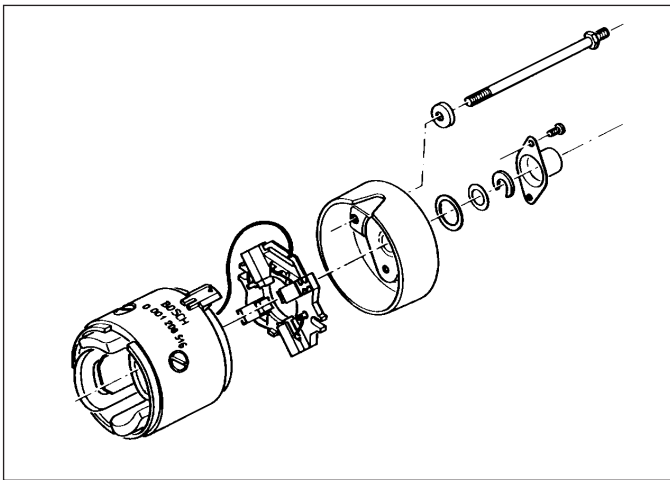
- 1 Because of the different types of starter motor fitted, it is not practical to describe the procedure for each one in detail. The following procedure applies to the Ducellier starter motor. Other makes are similar (see illustrations).



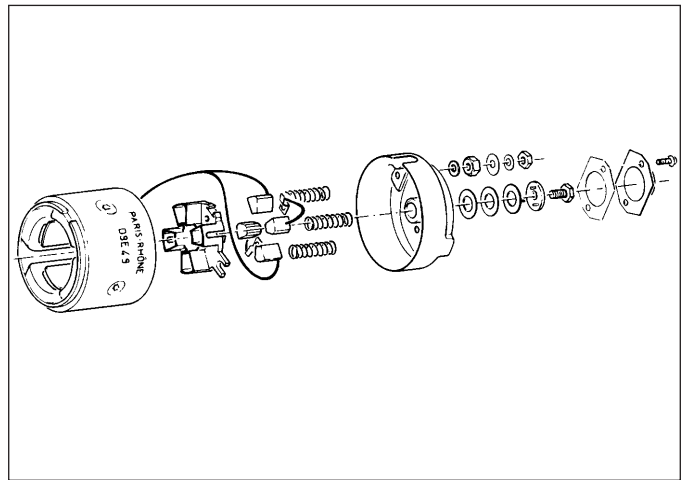
10.1a Brush and cover components - Bosch starter motor fitted to BX 14



10.1b Brush and cover components - Paris-Rhone starter motor fitted to BX 14



10.1c Brush and cover components - Bosch starter motor fitted to BX 16



10.1d Brush and cover components - Paris-Rhone starter motor fitted to BX 16

2 With the motor removed from the vehicle, unscrew the two nuts securing the engine mounting bracket to the motor and remove the bracket. Remove the locknuts and retaining nuts and take off the motor endplate.

3 Prevent the shaft from turning by jamming the drive pinion, and undo the end bearing seal retaining bolt. Remove the seal assembly with its spring (see illustration).

4 To gain access to the brushes, lever the bearing plate from the body. The brushes are mounted on the underside of the plate (see illustration).



10.3 Removing seal assembly and spring

5 In most cases the brushes will have wear limit marks in the form of a groove etched along one face of each brush. When the brushes are worn down to these marks, they are worn out and must be renewed. No dimension is given by Citroen. If in doubt about the condition of the brushes and springs, compare them with new components and if necessary, renew the brushes as a set.

6 To remove each brush, proceed as follows. Lift the positive brush spring and remove the brush from its housing to enable the bearing plate to be removed (see illustration). Note the arrangement of washers on the armature shaft.

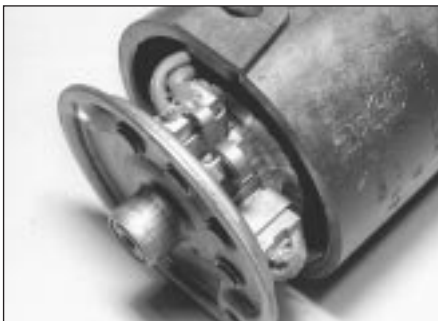
7 The brushes can be removed by unsoldering the connecting wires to the holder and to the field coil unit. Take care not to damage the latter during removal and assembly of the brushes (see illustration).

8 If the brushes are serviceable, clean them with a solvent-moistened cloth. Check that the brush spring pressure is equal for all brushes and holds each brush securely against the commutator.

9 Clean the commutator with a solvent-moistened cloth, then check for signs of scoring, burning, excessive wear or severe pitting. If damaged, the commutator should be attended to by an auto-electrician.

10 Undercut the separators of the commutator using an old hacksaw blade to a depth of about 0.5 to 0.8 mm. The commutator may be further cleaned by using a strip of very fine glass paper. Do not use emery cloth for this purpose, as the carborundum particles will become embedded in the copper surfaces.

11 Fitting of the brushes is a reversal of the removal procedure. Make sure that the brushes slide freely in their holders.



10.4 Removing bearing plate



10.6 Bearing plate and brushes



10.7 Brush connections to field coil