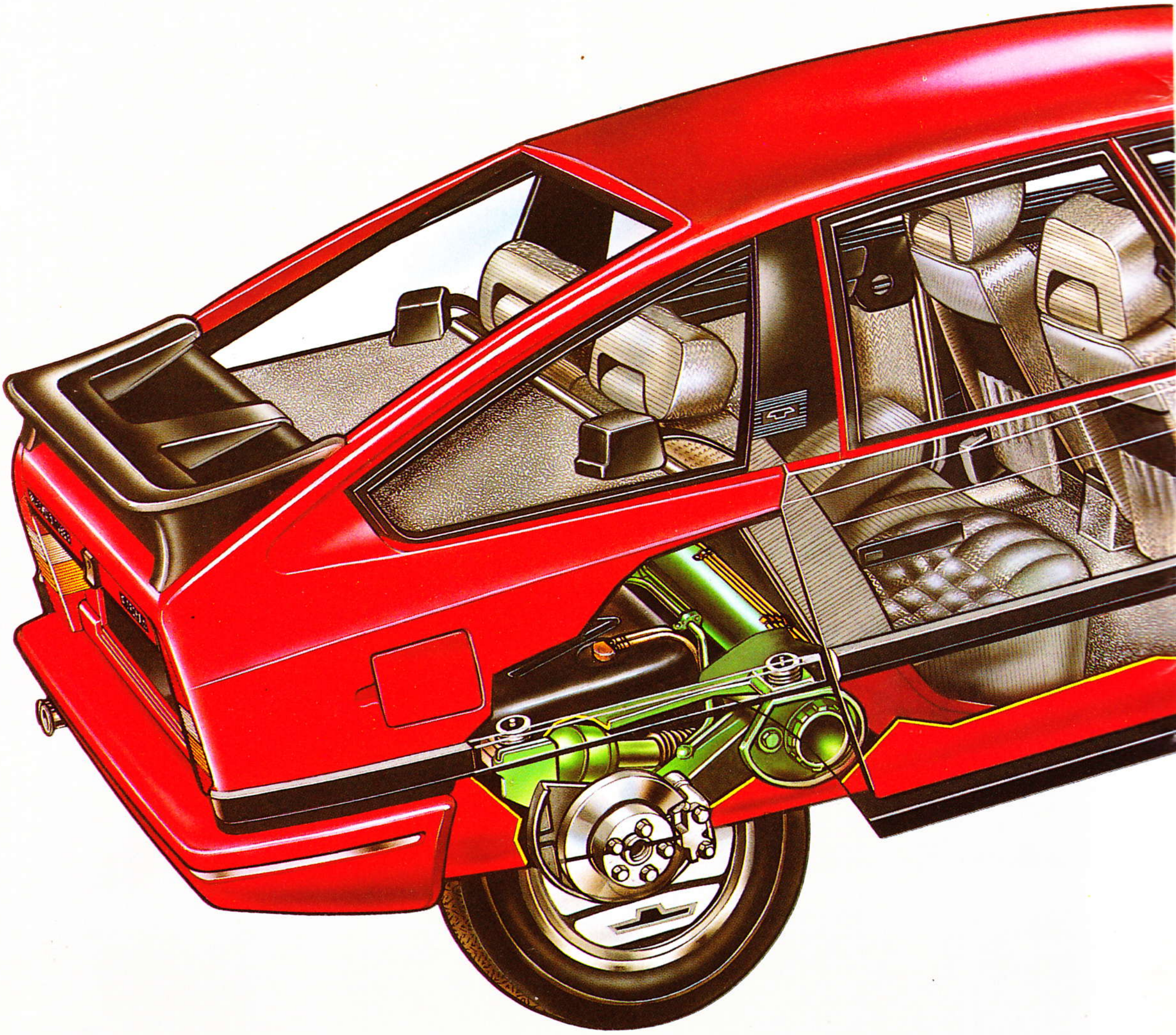
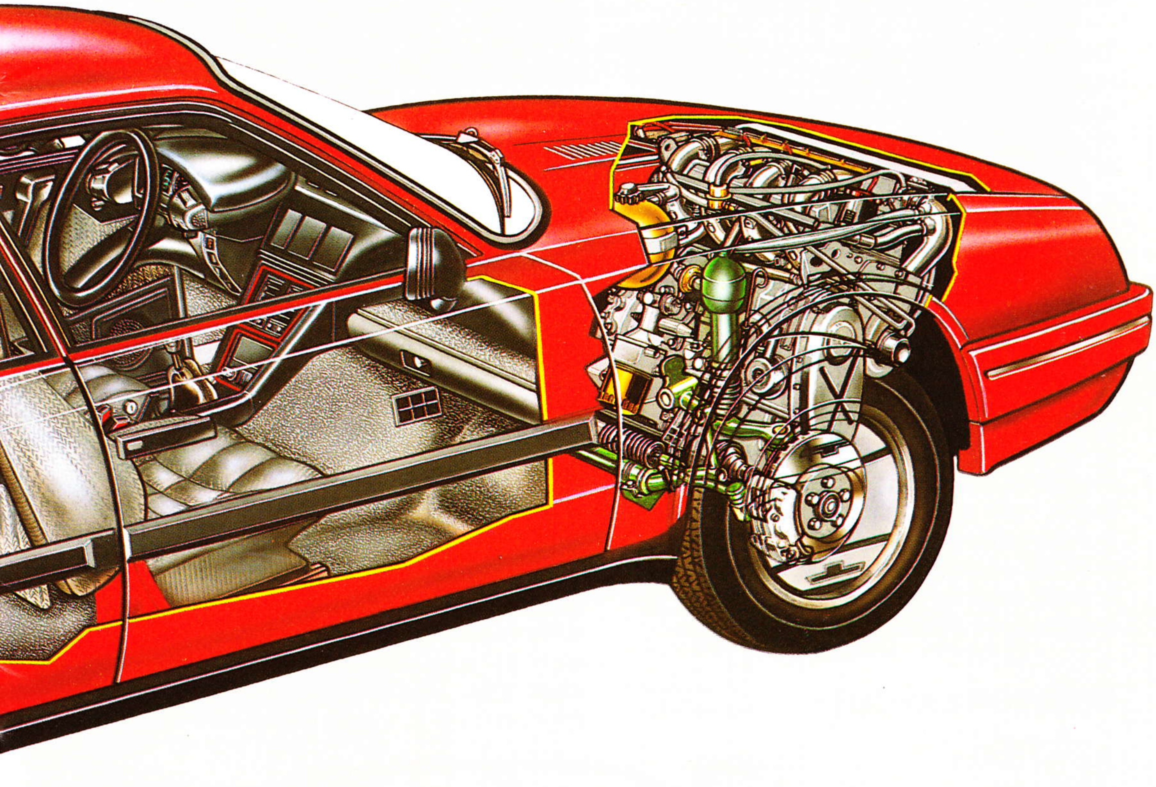
TECHNOLOGY

The CX's performance and attractiveness are based on prover technical qualities. Front wheel drive, aerodynamic styling, and isolated passenger cabin all contribute to the CX's remarkable active and passive security. Its excellent roadholding serves the powerful and flexible motorisation in petrol and diesel, carburettor, injection or turbo versions. The hydraulics systems, developed on the DS and SM, give the CX suspension, braking and steering qualities renowned the world over.



(Editechnic drawing Citroën C.86.025.13).



BODYWORK

The CX range is composed of "three-box" 4-door, 5-seat saloons and of estate cars.

AERODYNAMICS

The distinctive shape of the CX is aerodynamically efficient. Not only does this have a beneficial effect on fuel consumption, it also results in better roadholding by offering better natural stability and minimal sidewind sensitivity. Moreover, there is the great advantage that the suspension maintains a constant ride height and attitude so that the CX retains its aerodynamic qualities whatever its load.

BODY SHELL DESIGN

The steel monocoque which forms the body shell is mounted on an auxiliary frame by means of twelve flexible attachements. This auxiliary frame, which consists of front and rear sub-frames joined together by two longerons, in turn forms the mounting for the mechanical units: the engine/transmission and the suspension. This arrangement has several advantages:
1) A two-stage filtration which allows the cabin to be acoustically isolated from the engine/transmission assembly.
2) Filtration of the noise and vibration set up by the motion of the tyres.
3) Improved directional stability, since the combination of body shell and auxiliary frame creates a structure which is exceptionally stiff in torsion. This in turn ensures that the suspension members retain their correct angular position relative to the longitudinal axis of the body.

INTERIOR LAYOUT

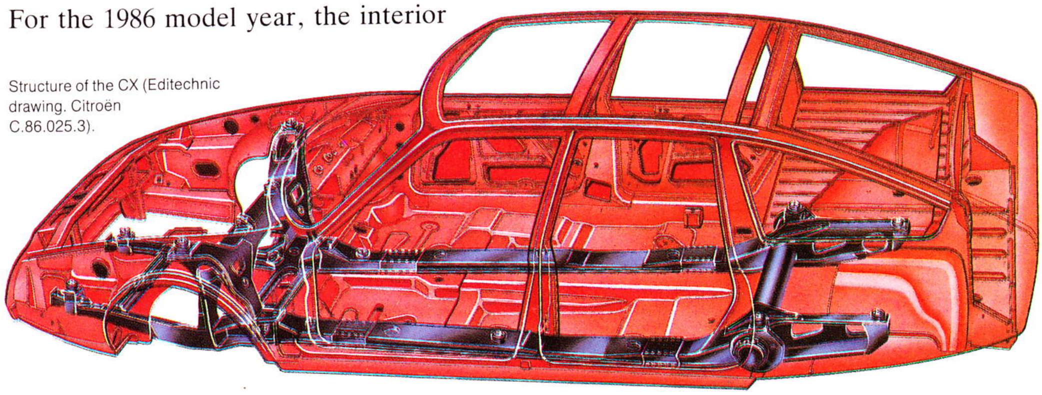
For the 1986 model year, the interior layout of the CX has been completely changed. The new layout is based on three main objectives: to offer more space within the same cabin, to introduce more warmth and impression of quality through the replacement of plastic trim with cloth, and to offer the most restful possible appearance by using shapes which are continuous and unified in style, so as to create visual harmony.

ACTIVE OR PRIMARY SAFETY

This is achieved by giving the car those qualities which allow the driver to avoid an accident. These include: the roadholding, suspension, brakes, steering, aerodynamics and ergonomics.

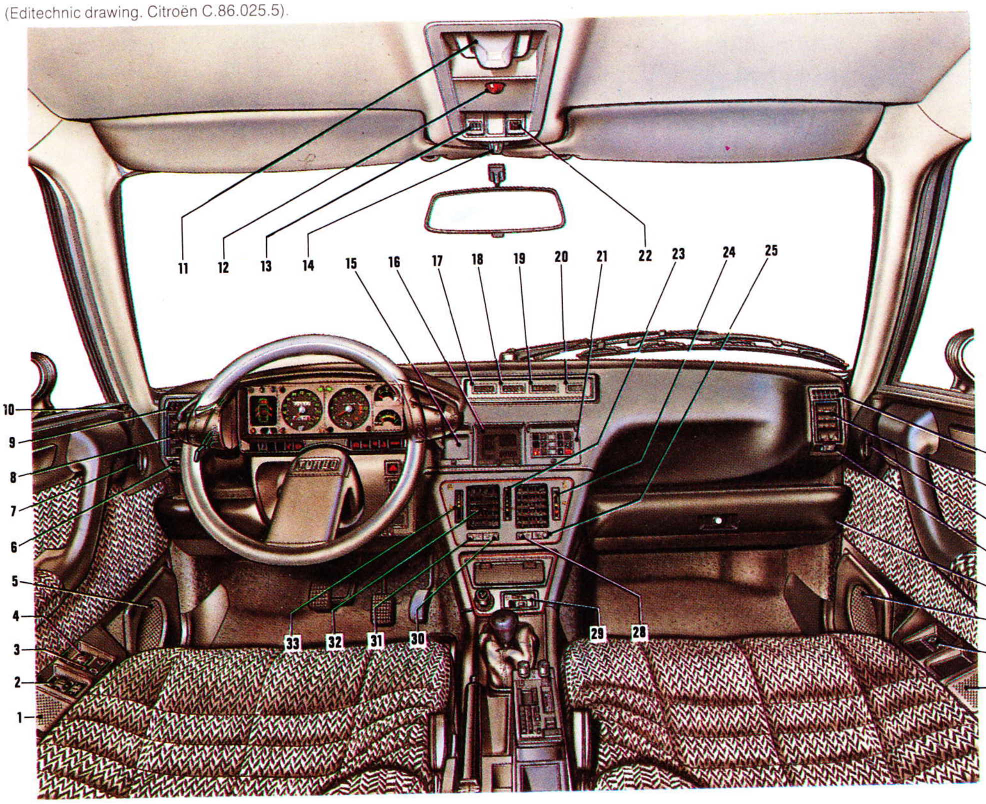
In all these areas, the CX gains points through:

- front-wheel drive and all-independent suspension,
- a very low centre of gravity,
- hydropneumatic suspension giving constant ride height and attitude no matter what load is carried,
- fully power-operated brakes with high pressure operating on four discs with separate hydraulic circuits. A compensator limits the braking effort at the rear according to the load on the back wheels,
- an extremely rapid brake system response time and constant efficiency in all circumstances,
- the option of anti-lock braking which prevents the wheels from locking so as to achieve shorter stopping distances, better stability and controllability through constant grip, whatever the road conditions (optional on 2.5 litre petrol and 2.5 litre



Structure of the CX (Editechnic drawing. Citroën C.86.025.3).

CX GTi Turbo dashboard
(Editechnic drawing. Citroën C.86.025.5).



1 - Location for loudspeaker
2 - Left and right wing mirror controls
3 - Front window control: left-right selector
4 - Front window control: up or down, normal operation or by one touch
5 - Location for loudspeaker
6 - Side vent control
7 - Interior locking system
8 - Side vent
9 - Side window de-icer and de-mister vent
10 - Electronic door locking warning light
11 - Map reader
12 - Door locking and unlocking receiver
13 - Rear window and rearview mirror de-icing switch and warning light
14 - Interior temperature sensor
15 - Storage space
16 - Storage space for coins
17 - Oil temperature display and warning
18 - Water temperature display and warning
19 - On-board computer data display
20 - Exterior temperature display and ice warning
21 - On-board computer
22 - Interior light switch
23 - Central vents control
24 - Air temperature control: 15 to 30°
25 - Air conditioning switch (intense)
- press switch to close external air inlet-air cooled and recycled

26 - Glove box
27 - Right front window control
28 - Air conditioning switch
- press switch to cool incoming air

29 - Electric height control switch
30 - Air inlet control
- switch out: admission of external air
- switch in: recyling of internal air

31 - Air distribution control
- switch out: air distributed through interior
- switch in: de-misting and de-icing of windscreen and side windows

32 - Central vents
33 - Heater fan control

turbocharged diesel saloon and estate models),

- the rapid response of the car to movements of the steering wheel,

- the absence of any feedback through the steering wheel of shocks encountered by the front wheels over bumps or potholes,

- the maintenance of good straight-line stability in all circumstances: over rough surfaces, in sidewinds, on cambered roads and at high speeds,

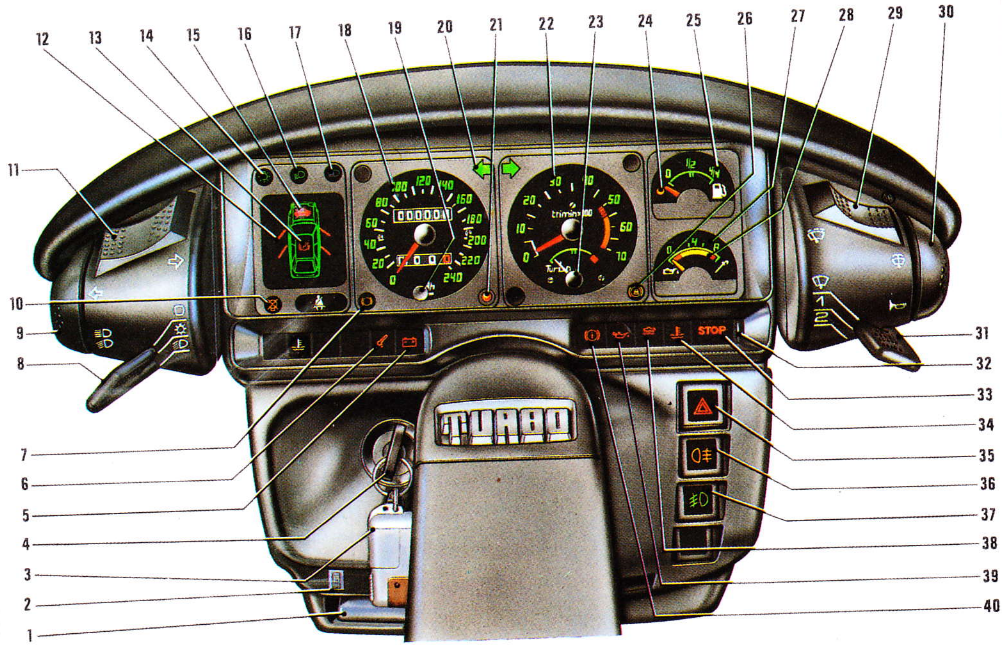
- double optic headlamps on some models,

- a comfortable seat for "minimum fatigue".

- the dashboard has been entirely redesigned and incorporates controls grouped according to function and within the driver's reach without having to leave hold of the steering wheel,

- a comprehensive system of information for the driver: clear, easy to read supplementary (warning of burnt-out lamps) and new (warning of ice) data.

Instrument panel
(Editechinc drawing. Citroën C.86.025.7).



1 - Bonnet release
2 - Rheostat for instrument lighting
3 - Remote control for locking an unlocking doors
4 - Anti-theft switch
5 - Battery charge warning light
6 - Oil temperature warning light
7 - Front brake pad wear warning light
8 - Headlamp switch: side and tail lamps/dipped beam/ main beam
9 - Flasher switch - dipped beam/main beam
10 - Warning light for non operation of rear lamps
11 - Direction indicator switch
12 - "Door open" warning light
13 - "Hand brake on" warning light
14 - Side and tail lamp indicator
15 - "Bonnet open" warning light
16 - Dipped beam indicator
17 - Main beam warning light
18 - Speedometer
19 - Trip re-set button
20 - Direction indicator warning light
21 - Knock-sensor malfunction warning light
22 - Rev-counter
23 - Turbo pressure indicator
24 - Fuel-low warning light
25 - Fuel gauge
26 - ABS system malfunction indicator
27 - Oil pressure gauge
28 - Oil level gauge
29 - Windscreen wash and wipe control: intermittent wipe, and wipe plus wash
30 - Horn
31 - Windscreen wiper controls: stop, slow, fast
32 - Warning light tester
33 - "STOP" warning light: stop at once
34 - Water over-heating warning light
35 - Hazard switch and warning light
36 - Front fog lamp switch and warning light
37 - Rear fog lamp switch and warning light
38 - Low water level warning light
39 - Oil pressure warning light
40 - LHM liquid pressure and level warning light

PASSIVE OR SECONDARY SAFETY

This is achieved by giving the car those qualities which serve to protect its occupants by minimising or preventing the effects of a collision.

In the CX, these include:

• The body design
Engine/transmission assembly installed transversely: maximum crush distance available ahead of the cabin.
Rigid cabin structure independent of the auxiliary frame.
The auxiliary frame directly resists forces imposed by the unsprung masses and thus protects the body shell.

• The structure
Deformation of the front section calculated so as not to overload the side panels, in order to avoid deforming them and so allowing the doors to be opened.
Rigidity of the lower structure achieved through the use of a one-piece floor panel with intermediate crossmembers.

• The cabin
Absence of dangerous intrusions.
Single-spoke steering wheel and safety-type steering column.

ENGINES

The CX range of engines is complete, diverse, and makes use of the latest technology: solid-state electronic ignition, electronic fuel injection, turbocharging. Altogether there are six engines of various power outputs:

- 2-litre petrol, carburettor, 106 HP,
- 2.2-litre petrol, carburettor, 115 HP,
- 2.5-litre petrol injection, 138 HP,
- 2.5-litre petrol injection, turbocharged, 168 HP,
- 2.5-litre diesel, naturally aspirated, 75 HP,
- 2.5-litre diesel, turbocharged, 95 HP.

All these engines have in common a four-cylinder in-line water-cooled layout, and are installed transversely and inclined forwards.

2-LITRE AND 2.2-LITRE PETROL ENGINES

These units, built by the Société Française de Mécanique at Douvrin, differ in capacity and output.

Layout: inclined 15° forwards, light alloy cylinder head with single toothed-belt-driven overhead camshaft and rocker-operated valves, light alloy cylinder block with removeable cast-iron "wet" cylinder liners, forged alloy steel crankshaft with five main bearings.
Fuel system: dual-choke Solex or Weber carburettor, manual choke, mechanical fuel pump, electric heater in inlet manifold (2.2-litre only).
Lubrication: gear-type oil pump;
Cooling: two-speed electric fan;
Ignition: distributor driven by camshaft.
Main dimensions: capacity: 1995 cc (2-litre); 2165 cc (2.2-litre), max power: 106 HP DIN (2-litre); 115 HP DIN (2.2-litre).

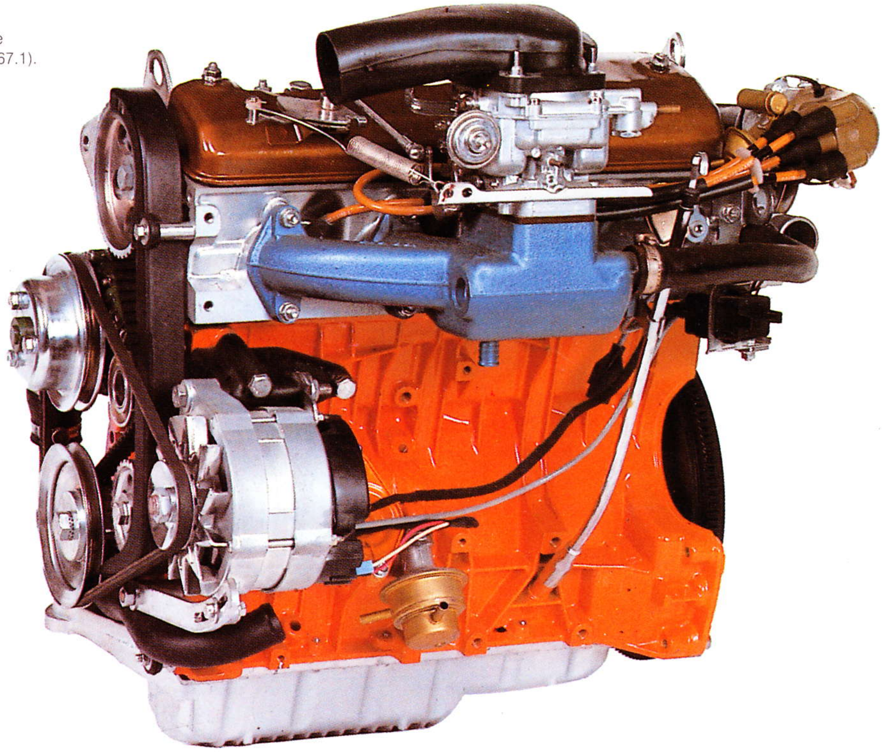
2.5-LITRE PETROL AND DIESEL ENGINES

These are made by the Société Mécanique Automobile de l'Est (SMAE) at Metz-Trémery, and have the following features in common: inclined 30° forwards, light-alloy cylinder head, cast-iron cylinder block, forged alloy steel crankshaft with five main bearings, side-mounted cast-iron camshaft housed in the cylinder block, valves operated by tappets, pushrods and rockers.

2.5-LITRE PETROL INJECTION ENGINES

These are either normally aspirated or turbocharged (both with electronic injection). Their capacity is 2500 cc. The normally aspirated version develops 138 HP, while the turbocharged version develops 168 HP.

CX 2 litre engine
(Citroën C.86.067.1).



2.5-litre petrol, naturally aspirated

Layout: light alloy cylinder head with hemispherical combustion chambers. Cast-iron cylinder block with removeable cast-iron "wet" cylinder liners.

Fuel system: Bosch type LE 2-Jetronic fuel injection with overrun cut-off. Additional fuel for cold starting is delivered by increasing the opening time of the four injectors. System description: see page 23.

Ignition: solid-state electronic ignition (AEI) Description: see page 24.

Lubrication: Gear-type oil pump.

Cooling: two-speed electric fan.

Main dimensions: capacity: 2500 cc, max power: 138 HP DIN.

2.5-litre petrol, turbocharged

Layout (compared with naturally aspirated 2.5-litre): Redesigned cylinder head with new combustion chamber shape. Valve seats in steel instead of cast-iron. Smaller-diameter inlet valves, 44 instead of 49 mm.

Triple-layer cylinder head gasket.

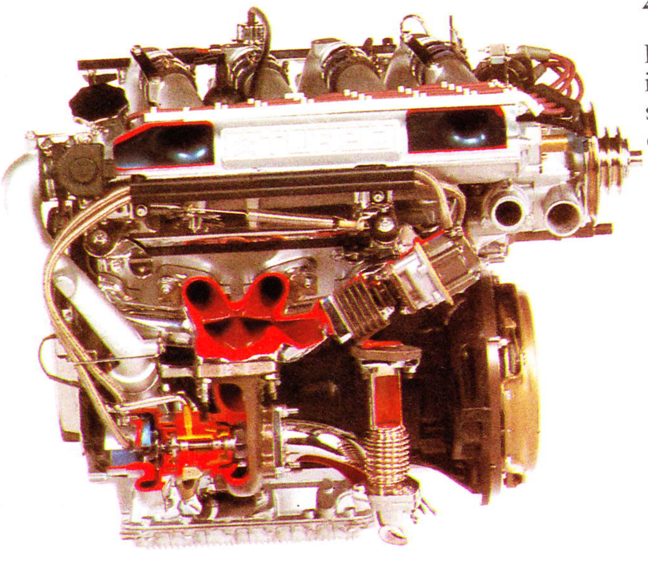
Special flat-crowned pistons.

Ignition: solid-state electronic ignition as naturally aspirated unit with addition of knock-detector circuit. See description on page 25.

Air delivery by turbocharger. See description on page 26.

Fuel delivery by Bosch L-Jetronic fuel injection with auxiliary cold-start injector. Fuel cutoff on overrun and at 6090 rpm to prevent overspeeding.

2.5 litre petrol injection turbo engine (Citroën C.85.80.1).



System description: see page 26.

Lubrication: oil pump of higher output.

Installation of oil/coolant heat exchanger.

Cooling: increased radiator surface area, 418 ins^2 instead of 372 ins^2.

Main dimensions: capacity: 2500 cc, max power: 168 HP DIN.

2.5-LITRE DIESEL ENGINES

As with the 2.5 petrol engines, there are normally aspirated and turbocharged versions.

2.5-litre diesel, naturally aspirated

Layout: cylinder head containing Ricardo Comet V turbulent combustion pre-chambers. Coolant flow galleries within the head ensure efficient and even cooling of all chambers. Overhead valves, installed vertically and parallel.

Fuel system: CAV-RotoDiesel DPA type rotary injection pump with mechanical minimum/maximum governor; characteristics modified so as to avoid jerkiness and hesitation. RotoDiesel injectors: rating 115 to 120 bars (1,750 psi).

Lubrication: by external oil pump. Piston undersides cooled by oil spray across connecting rods.

Cooling: by twin electric fans.

Main dimensions: capacity: 2500 cc, max power: 75 HP DIN. For other dimensions, see page 25.

2.5-LITRE DIESEL, TURBOCHARGED

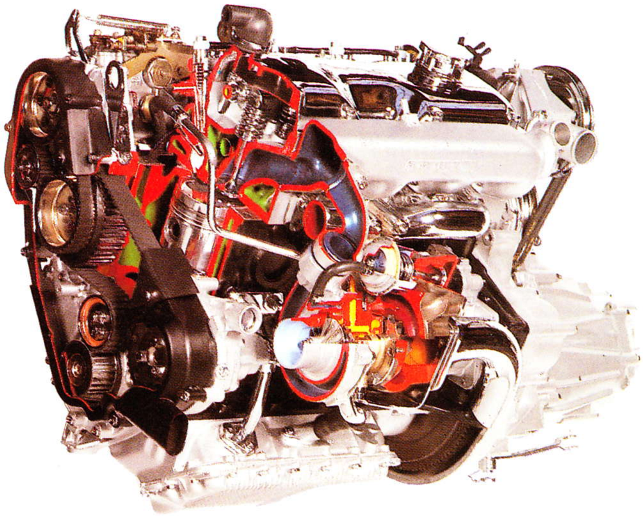
Layout: identical to that above. However, in order to accommodate the higher stresses involved, the cylinder head and block, crankshaft, connecting rods, pistons, gudgeon pins and head gasket have all been reinforced as necessary. The inlet manifold has been modified to accept the turbocharger unit and the exhaust ports have been opened up from 45 to 52 mm diameter to improve gas flow.

Fuel system: fuel delivery

The engine is equipped with a new RotoDiesel pump of higher performance, the DPC type. Among other features, it is equipped with a new hydropneumatic valve which modifies the fuel flow accord-

ing to the boost pressure. Injector rating: 135 to 140 bars (2,000 psi).
Air supply is maintained by the turbocharger.
Lubrication: the pump output is increased by 16%, and an auxiliary circuit feeds the turbocharger bearings.
The piston undersides are cooled by continuous spray from a line of fixed jets adjacent to the camshaft housing. An oil/coolant heat exchanger is installed.
Cooling: the capacity of the circuit is increased by 1 litre to 13 litres. The surface area of the radiator is increased from 356 in^2 to 418 in^2.
The diameter of the electric cooling fans in increased from 12 ins to 12.9 ins.
Main dimensions: capacity: 2500 cc, max power: 95 HP DIN.

2.5 litre turbocharged diesel engine (Citroën C.83.49.11).



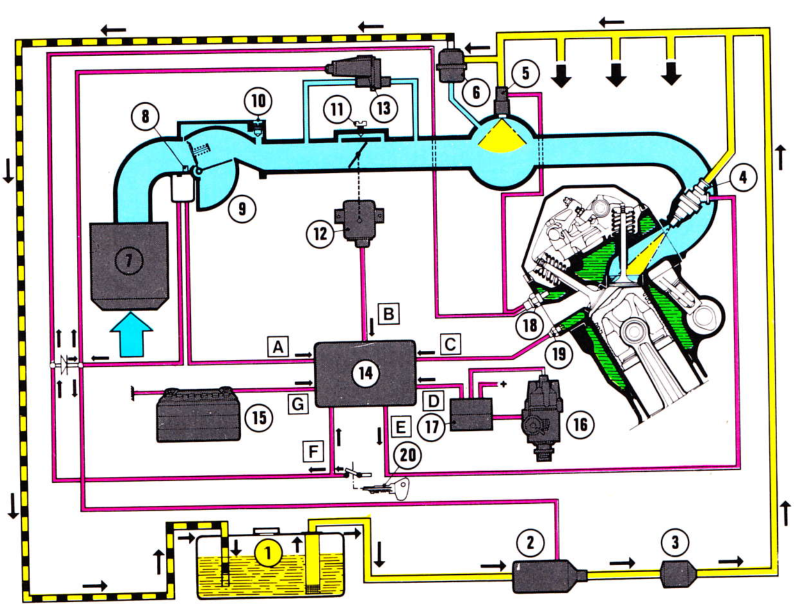
PETROL INJECTION

(2.5 litre petrol engines)

Optimum carburation can only be assured through close control of the air: fuel ratio. In order to ensure complete combustion, it is necessary to deliver 1 gramme of fuel for every 15 grammes of air: thus the theoretically perfect air: fuel ratio is 15:1.
On the other hand, a richer air: fuel ratio of about 12.5:1 is needed in order to achieve maximum power, and a leaner one of about 18:1 to achieve optimum fuel economy.
Fuel injection is a superior system when meeting the need for good fuel delivery: it offers accurate metering, homogeneous mixing and equal division between cylinders, quicker and easier starting from cold and high flow rates at maximum power.

For each cylinder of the engine, an injector atomises exactly the right quantity of fuel at exactly the right moment, in the inlet port immediately above the inlet valve. Injection allows:

- improved engine performance thanks to increased inlet airflow (no obstruction by carburettor venturi);
- reduced specific fuel consumption, and reduced levels of carbon monoxide and unburned hydrocarbon in the exhaust, thanks to more precise metering of the fuel;
- quieter and more flexible engine operation thanks to the more uniform combustion in each cylinder;
- automatic adjustment of the mixture for engine starting, whether hot or cold.



Electronic injection: diagram of the L-Jetronic system (Editechnic drawing. Citroën C.86.025.8).

1 - Petrol tank
2 - Petrol pump
3 - Petrol filter
4 - Injector
5 - Cold start injector
6 - Pressure regulator
7 - Air filter
8 - Air temperature sensor
9 - Airflow meter
10 - Airflow meter by-pass to regulate mixture
11 - Screw to regulate idle
12 - Throttle spindle switch
13 - Supplementary air control
14 - Electronic computer
15 - Battery
16 - Distributor
17 - Electronic ignition unit
18 - Thermal switch
19 - Water temperature sensor
20 - Ignition - starting switch

OPERATING PRINCIPLE

The CX 25 is equipped with an electronically-controlled fuel injection system: the Bosch L or LE 2-Jetronic. In this type of injection the metering of the fuel depends on the extremely accurate measurement of the inlet air mass flow. This determines the amount of fuel which must be delivered for optimum combustion. An electronic computer therefore receives accurate and instantaneous information about the quantity and temperature of the incoming air, the engine speed and load, the coolant temperature and the start of injection. It uses these parameters to determine the exact quantity of fuel needed by the engine at that moment and delivers it by controlling the time for which the injectors remain open.

DESCRIPTION

The electronic fuel injection system comprises three distinct circuits: fuel, air and electronic.

Fuel circuit

An electric pump feeds fuel from the tank to the injector gallery.
A pressure regulator maintains the fuel within this gallery at an effectively constant pressure.
The electronically-controlled injectors atomise the fuel directly above the inlet valves. The amount of fuel delivered depends solely on the length of time for which they remain open.
An auxiliary cold-start injector (L-Jetronic) enriches the mixture for starting from cold.

Air circuit

The air drawn in through the filter passes first through the flowmeter and then through the control butterfly valve before arriving in the inlet manifold, each of whose outlets feeds a single cylinder.
The flowmeter provides its essential signal to the system computer in the form of a voltage (which determines the duration of the injectors opening time and hence of the amount of fuel delivered) proportional to the quantity of air being drawn in by the engine. It also includes an air temperature sensor and a bypass channel to allow the adjustment mixture strength at idling speed.
Finally, it ensures that the fuel pump operates.

An additional air control, dependent on coolant temperature, provides an extra air supply to the engine during warming-up.

Electronic circuit

The system computer receives information regarding the amount of air drawn in by the engine, the coolant temperature, the position of the butterfly control valve and the operation of the starter as well as the engine speed and the beginning of injection. It performs its calculations accordingly and sends electrical signals to the injector solenoids.
Injection frequency:
The L-Jetronic system injectors work in parallel and therefore operate simultaneously, twice during each rotation of the camshaft (in other words, once for each rotation of the crankshaft). They therefore inject half the fuel quantity needed by the engine at each operation.
The timing of each injector operation is determined by the computer which takes its signal from the ignition coils.

SOLID-STATE ELECTRONIC IGNITION

(On 2.5-litre petrol engines)

The ignition system must perform three tasks: the creation, distribution and release, at the appropriate moment, of a high-tension current.
AEI (Allumage Electronique Intégral) is a system which carries out this function without the use of any moving parts subject to wear. It comprises a computer, three sensors and two coils.

OPERATION

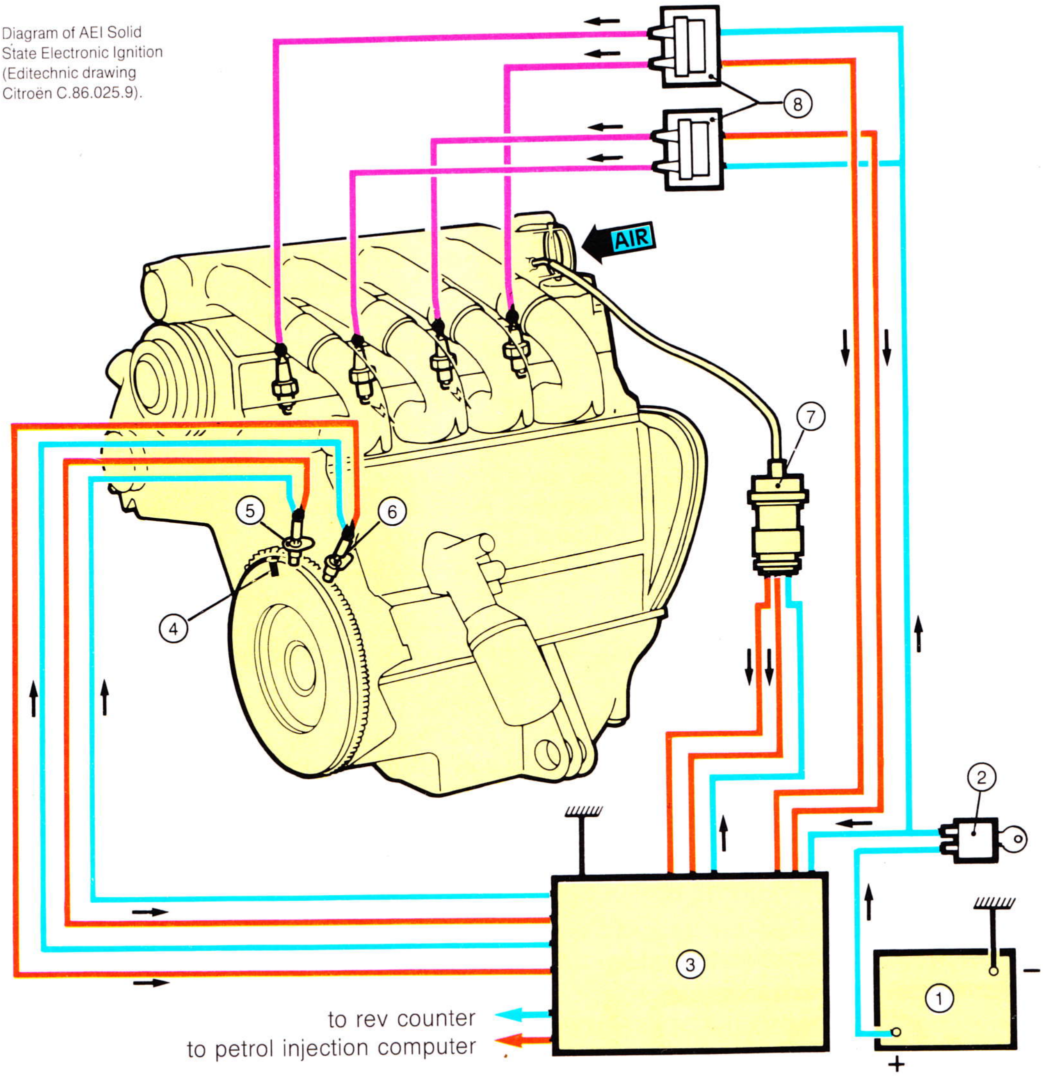
Creation of the secondary current (25,000 volts)

This is generated by interaction between the coils and the computer, the latter releasing the energy stored in the coils.

Distribution

The normal distributor is replaced by the firing of two plugs at a time: Nos 1 and 4, 2 and 3.
A metallic stud is attached to the engine flywheel, passing close to a magnetic sensor mounted on the cylinder block. The positions of stud and sensor are determined so as to trigger a signal to the computer before top dead centre in cylinders 1 and 4; the computer then causes the

Diagram of AEI Solid State Electronic Ignition (Editechnic drawing Citroën C.86.025.9).



1 - Battery
2 - Admission switch
3 - Computer
4 - Peg (on flywheel)
5 - Proximity sensor
6 - Speed sensor
7 - Vaccuum sensor
8 - Coil

plugs to fire in those two cylinders as a function of engine speed.
The plugs in cylinders 2 and 3 fire exactly half an engine revolution later.
The system computer receives information on their position, and regulates firing.

Determination of ignition advance

Dynamic advance (function of engine speed)
A second magnetic sensor attached to the cylinder block senses the passage of the teeth on the engine flywheel and informs the computer of the engine speed.
Dynamic advance (function of engine load)
A pressure sensor linked to the inlet manifold produces an electric current proportional to the pressure value. The computer accepts this signal and calculates a correction dependent on the engine load.

ADVANTAGES OF AEI

Optimum performance, elimination of setting and adjustment, easier cold starting, ability to ignite weaker mixtures.

KNOCK DETECTION

(On 2.5-litre turbocharged petrol engines)

The increased pressures within supercharged engines can cause pre-ignition of the mixture, and hence knocking. This can be prevented by retarding the ignition.
The knock detection system comprises a knock sensor and additional circuits within

the AEI computer. The sensor is attached to the engine and detects the onset of knocking. It then sends an electric signal to the computer which retards the ignition timing by an amount which depends on the severity of the knocking.
The AEI computer continues to exercise basic control of the ignition, but the amount of advance which it determines is then modified by the additional anti-knock computer circuits.

SUPERCHARGING

This is the process of forcing into an engine (petrol or diesel) a quantity of air greater than that which it would normally draw in. It results in higher power and torque output without any increase in cylinder capacity. A concomitant increase in the amount of fuel supplied is called for.

OPERATION

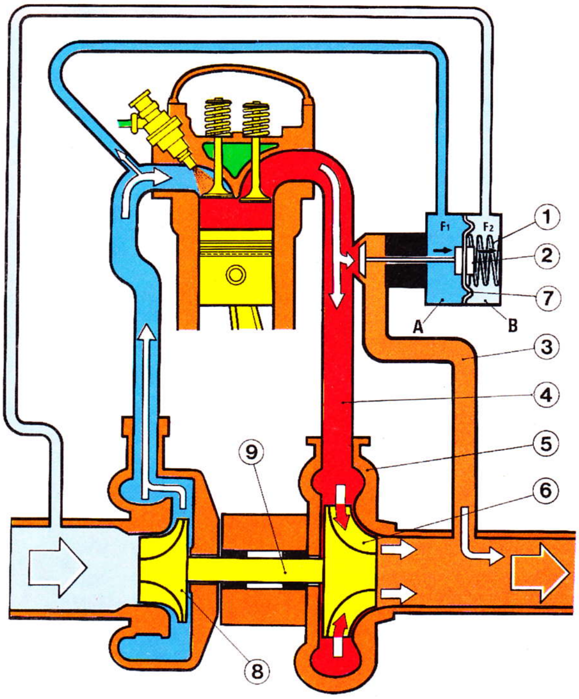
The turbocharger

This is the "lung" of the supercharging system. The turbine wheel (6) is turned by the exhaust gas as it emerges from the engine. It drives the compressor disc (8) at the same speed by means of the shaft (9). Rotating at very high speed (between 110,000 and 150,000 rpm) the compressor creates low pressure which sucks in atmospheric air. This is then compressed by the disc vanes and impelled towards the intake side of the engine. In order to deliver the correct amount of fuel, the injection computer (in the petrol engine) or the CAV-RotoDiesel DPC type pump (in the diesel engine) must take account of this additional parametre.

Pressure regulation

The boost pressure must be limited to a maximum value low enough to avoid damage to the engine.
Example of regulator operation: CX 25 GTi Turbo
The action of the spring (1) on the valve (2) shuts off the passage between channels (3) and (4), so that the entire exhaust gas stream enters the turbine casing (5).
Thus all the energy contained in the gas flow impinges on the turbine wheel (6), and results in the highest possible boost pressure in the cylinders increasing with the engine speed. The maximum boost value of 8.2 psi (560 mb) is attained at the peak torque speed of 3250 rpm.
The action of the spring (1) in keeping the valve closed is opposed by the force F1 created by the boost pressure acting in chamber A and applied through the diaphragm (7).
Chamber B is at low pressure because it is linked to the duct upstream of the compressor wheel (8). This low pressure in chamber B also acts on the membrane which is attached to the spring, applying a force F2 (which is additional to F1) that opposes the force F applied by the spring itself. It therefore increasingly reduces the effect of the latter as engine speed increases.
For F ≥ F1 + F2: the valve is closed (engine speed less than 3250 rpm at full load). Above this maximum-torque speed, the valve opens progressively and the boost pressure falls, reaching a value of 6.5 psi at 5000 rpm.

Diagram of the turbocharger on a 2.5 litre petrol engine
(Editechnic drawing. Citroën C.85.50.1).



1 - Spring
2 - Valve
3 - Pipe
4 - Exhaust manifold
5 - Turbine casing
6 - Turbine wheel
7 - Diaphragm
8 - Compressor wheel
9 - Shaft

RESULT OF TURBOCHARGING ON THE CX

In the CX 25 Diesel Turbo: maximum power is increased by 26% and maximum torque by 40%.
In the CX 25 GTi Turbo: maximum power is increased by 21% and maximum torque by 39%.

AXLES

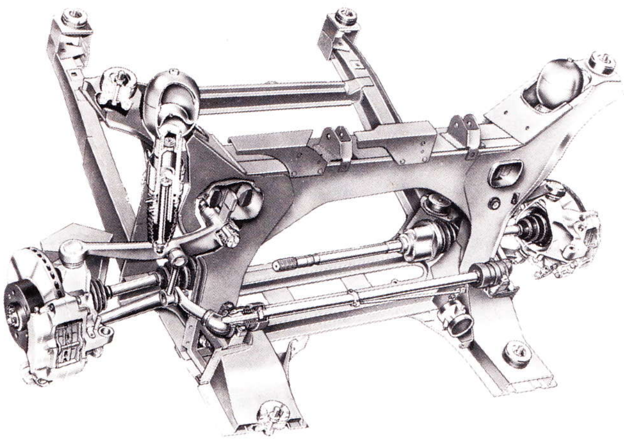
The front and rear sub-frames carry suspension arms to which are fitted the wheel hubs. They are linked to the suspension system (cylinders/spheres, anti-roll bars).

FRONT AXLE

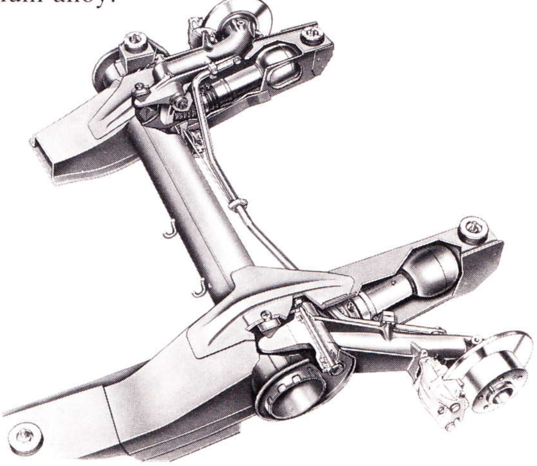
The transversal suspension arms form a parallelogram. They are made of steel. Their axes of articulation are not parallel to the ground, but dip 12° forwards in order to prevent lift or dive when accelerating or braking, maintaining the vehicle's attitude.

REAR AXLE

The trailing suspension arms are made of aluminium alloy.



CX front axle
(Editechnic drawing. Citroën N.31.801).



CX rear axle
(Editechnic drawing. Citroën N.31.802).

TRANSMISSION

Like all Citroën models since 1934, the CX is front-wheel drive, the advantages of which, in safety, roadholding and driving comfort hardly need repeating.

On the CX, the engine and transmission are transversely mounted in the front.

DRIVESHAFT

At gearbox end is a tripod joint, and Rzeppa type joints at outer end.

CLUTCH

All units have a dry single plate, mechanically operated, diaphragm clutch incorporating spring damping within the hub.

GEARBOXES

The CX range is equipped with manual gearboxes of 4 or 5 forward gears, or automatic with 3 forward gears. They are transversely mounted on the left hand side of the engine.

Gear changes are controlled by a floor-mounted lever on the centre console.

AUTOMATIC GEARBOX

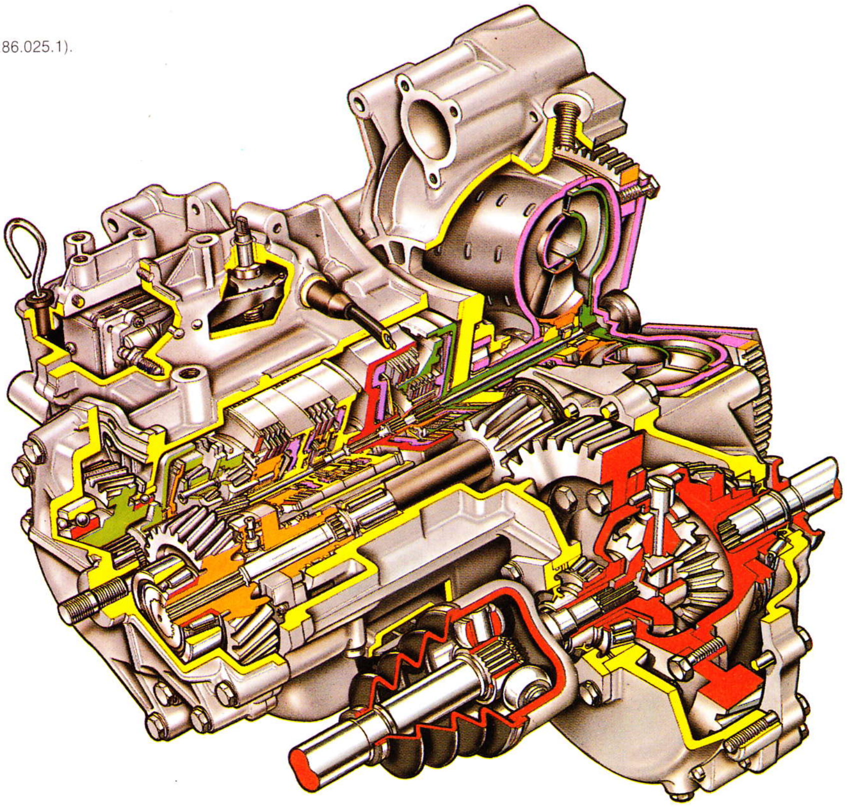
The automatic gearbox, made by ZF, has been available on CXs since July 1980.

With three forward ratios, it is of the epicyclic type.

The gearbox comprises:

- a torque-converter which hydraulically links the engine and the transmission for speeds above idling speed, and increases engine torque when starting.
- a pump which draws oil in the gearbox housing and feeds the converter, the hydraulic unit and lubricates the pinions and bearings of the gearbox.
- a hydraulic unit whose oil pressure controls the automatic gear ratio changes, depending on the position of the gear lever (controlled by the driver), the engine speed or the position of the accelerator pedal.
- a gearbox housing containing 3 brakes, 2 clutches, 2 epicyclic pinion gear trains.

Automatic gearbox
(Editechnic drawing C.86.025.1).

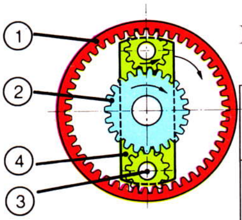


Operation of epicyclic gear train

The epicyclic train consists of annulus ①, sun wheel ②, two planet wheels ③ and planet wheel carrier ④.

Case 1 : 1st gear (fig. 1)

Brake units within the gearbox can hold stationary the following elements: annulus, sun wheel, carrier.



In this case the conditions are:

Annulus	fixed
Carrier	driven member
Sun wheel	driving member

The movement of the sun wheel causes the planet gears to climb around the inside of the fixed annulus thereby imparting movement to the carrier.

During one revolution of the carrier the planet wheels have imparted a foward movement of the sun wheel.

This movement is in relation to the number of teeth on the annulus (73 teeth) plus the equivalent of one revolution of the carrier about the sun wheel (35 teeth).

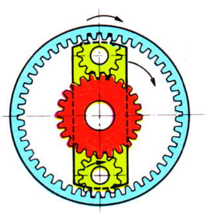
Consequently, the relationship will be :

$$\frac{73 + 35}{35} = 3.09$$

The ratio between the engine driven sun wheel and the carrier output member is therefore 3.09:1.

Case 2: 2nd gear (fig. 2)

Annulus	engine driven
Carrier	driven member
Sun wheel	fixed



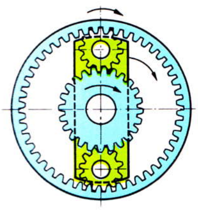
The annulus drives the planet wheels which turn about the fixed sun wheel. The carrier rotates in the same sense.

This time there is a forward movement of one revolution of the annulus (73 teeth) about the sun wheel (35 teeth).

The resulting reduction is:

$$\frac{73 + 35}{73} = 1.48:1$$

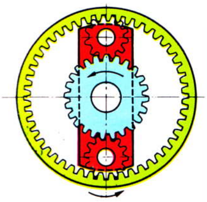
Case 3: 3rd gear (fig. 3)



Annulus	locked to sun wheel
Carrier	driven member
Sun wheel	driving member

Annulus and sun wheel are mechanically locked together and therefore turn at the same speed.
The planet wheels are unable to rotate and are therefore also locked. As a result the whole assembly rotates together resulting in a direct-drive 3rd gear.

Case 4: Reverse (fig. 4)



Annulus	driven member
Carrier	fixed
Sun wheel	driving member

As the carrier is fixed, the sun wheel drives the planet wheels which in turn impart reverse movement to the annulus.

The resulting ratio is in direct proportion to the respective numbers of teeth on the sun wheel (35) and annulus (73), i.e. 2.09:1.

The choice of ratio and sense of rotation of the output shaft depend upon the combination of clutches and brakes which are applied within the automatic transmission.

Following requirements, the brakes immobilise sun wheel, annulus, or carrier.

The clutches connect the engine driven shaft (torque convertor output member) to the sun wheel or the annulus.

HYDRAULIC SYSTEM

For more than 50 years, hydraulic principles have been applied to the brakes and transmissions of the motor car.

Application was widened in 1953 when Citroën introduced a hydraulic suspension system. This logical technical evolutionary development improved comfort, safety and performance.

The new arrangement led to greater braking efficiency. This resulted from linking braking and suspension systems to achieve automatic apportioning of front to rear braking effort in relation to weight distribution. A further natural benefit was that the two systems could be served by the same source of pressure circuit.

Shortly afterwards the steering mechanism was also to benefit. Citroën announced hydraulically assisted steering in 1955 and in 1970 launched the Varipower system which set new standards in the areas of safety, efficiency and ease of use.

RESERVE OF PRESSURE

The three systems which are hydraulically served (suspension, braking and steering) receive their energy supply from an accumulator in which the hydraulic mineral fluid, "LHM", is maintained between given values of pressure.

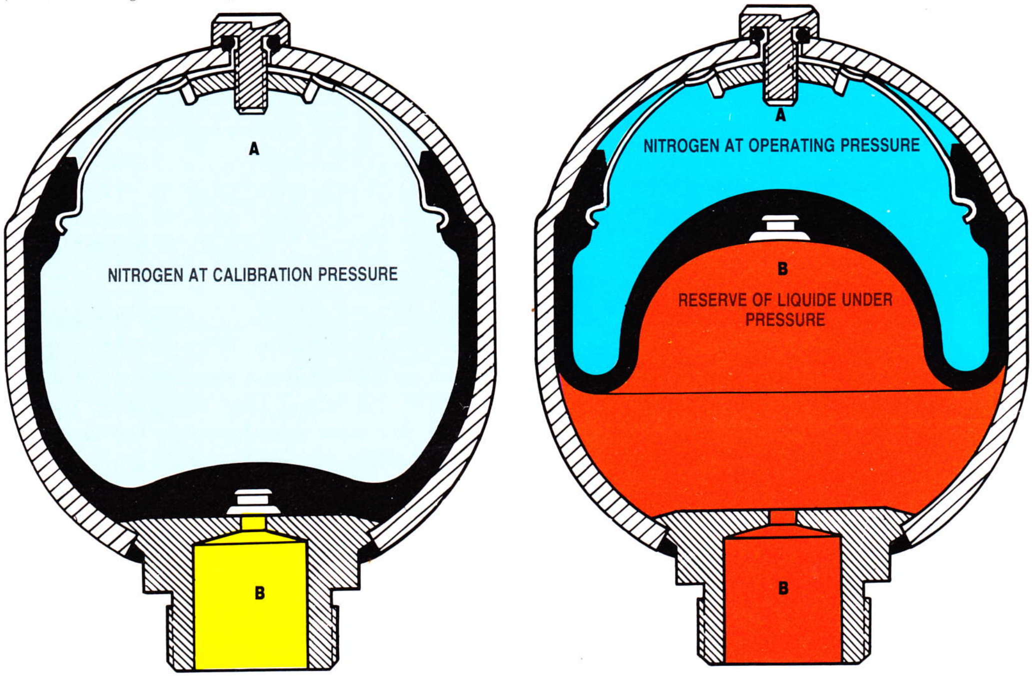
The souce of pressure system consists of a reservoir, a hydraulic pump, a main accumulator, a pressure regulator, and a priority valve.

The reservoir stores clean, filtered LHM liquid.

The pump, driven from the camshaft, is the mechanical heart of the system. It turns at half engine speed constantly pumping liquid, delivery pressure being either atmospheric or the operationnal pressure of the hydraulic system. A substantially constant pressure is maintained in the accumulator by the pressure regulator. It directs the output from the pump to the reserve of pressure circuit when the pressure falls below 14.5 bars. This is the "cut-in" point. In the same way flow is directed back to the reservoir when the pressure reaches 175 bars, the "cut-out" point.

The main accumulator can store, under pressure, a certain volume of incompressible hydraulic liquid and deliver it smoothly. Its principal role is to rapidly supply liquid under pressure to meet any major demand.
It consists of a steel sphere whose interior is divided into two chambers, A and B, by a flexible membrane.
Chamber A contains a certain volume of gas (nitrogen) at a certain pressure known as the working pressure.
During the charging phase, the LHM fluid enters chamber B and compresses the membrane until a pressure of 175 bars is reached, at which point the membrane moves no further.
Whenever required, the liquid is then supplied smoothly by the action of the membrane under the pressure of the gas.

Accumulator
(Editechnic drawing C.82.335.50).



The priority (safety) valve

Since the pressure reserve serves three distinct functions (suspension, braking, steering) a security valve is fitted, which gives priority to the safety-related functions, front brakes and steering.
The security valve isolates the front brakes and the steering from the front and rear suspension (should there be any fault in the suspension) and vice-versa (thus retaining rear-wheel braking).

SUSPENSION

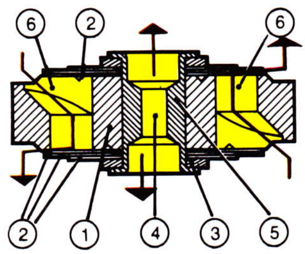
With mechanical suspension systems it is difficult to reconcile all the parameters which must be satisfied in order to achieve both good ride comfort and good roadholding. Citroën has been able to resolve these problems by adopting hydropneumatic suspension. The system is exceptionally reliable and still leads the field, confirming the world-wide reputation of Citroën cars as particularly comfortable and safe.

HYDROPNEUMATIC SUSPENSION

Hydropneumatic suspension uses an unusual medium, consisting of two fluids: a mineral oil (LHM) and a gas (nitrogen). The conventional mechanical (coil) spring is here replaced by a mass of gas enclosed within a steel sphere.
The LHM is separated from the gas by a flexible membrane and occupies the rest of the sphere. Its purpose is to transmit movement between the suspension arms and the gas.
The car body and its occupants therefore rest on four pneumatic springs acted upon

Damper
(Editechnic drawing Citroën C.82.335.52).

1 - Valve body
2 - Plate valves
3 - Distance-piece
4 - Central port
5 - Rivet
6 - Calibrated ports



by the movements of the four independently suspended wheels.
The use of the intervening liquid also allows automatic adjustment, through changes in its volume, of variations in the ride height of the car such as are caused by loading, for instance.

DESCRIPTION

Apart from the pressure reserve system which supplies it with high-pressure LHM, the actual suspension system consists of: four spheres, four dampers, four cylinders with pistons and connecting rods, and two height correctors.

The sphere

There is one sphere per wheel, and the gas which each contains forms the elastic element of the suspension.

The damper

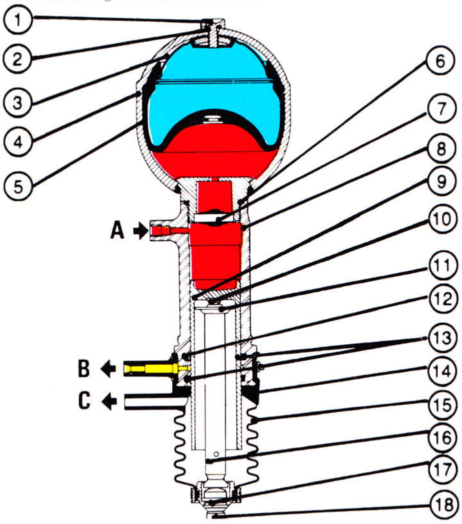
This limits the size of oscillations, the jolting of the wheels, and the rebound of the body by providing damping of small movements of the wheels.
There is one damper for each sphere, consisting of a steel disc whose periphery is pierced by calibrated holes. Its two faces are closed by carefully-calibrated valves, and it is located by a central rivet at whose axis is a further calibrated hole.
The damping effect is achieved by the throttling of the liquid as it passes through the calibrated holes partially closed by the valves.

The suspension cylinder

This is attached to the body, and forms a mounting for one suspension sphere. It is filled with LHM and contains a piston. When a bump is encountered, the piston moves the liquid in the cylinder towards the sphere. The gas then acts in the same way as a mechanical spring. When the wheel drops into a hole, the pressure of the gas forces the liquid back into the cylinder.

These movements of the LHM are slowed down by the damper. The compression

Cross-section of CX rear suspension cylinder
(Editechnic drawing Citroën C.82.335.54).



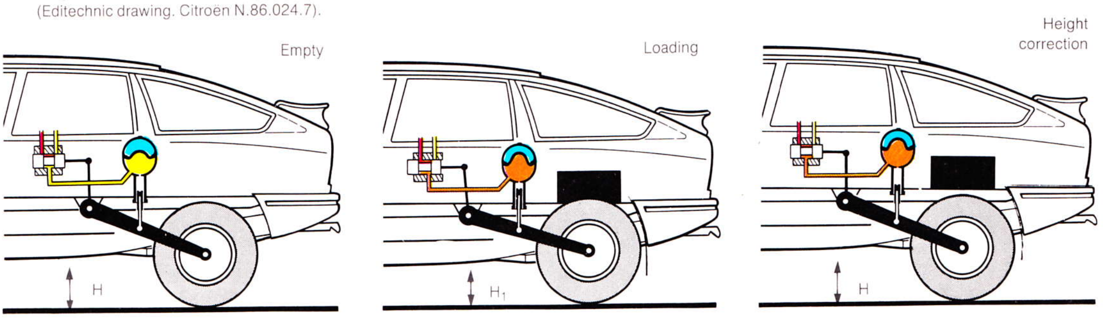
1 - Sealing plug
2 - O ring seal
3 - Cup
4 - Sphere
5 - Diaphragm
6 - O ring seal
7 - Damper
8 - Cylinder
9 - Piston
10 - Thrust-pad
11 - Centering washer
12 - Teflon seal
13 - O ring seals
14 - Felt seal
15 - Dust cap
16 - Suspension rod
17 - Ball
18 - Ball socket
A. Fluid from height corrector valve
B. Leakage return circuit
C. Breather

and expansion of the gas absorbs the energy generated by the shocks, so protecting the body and its occupants.

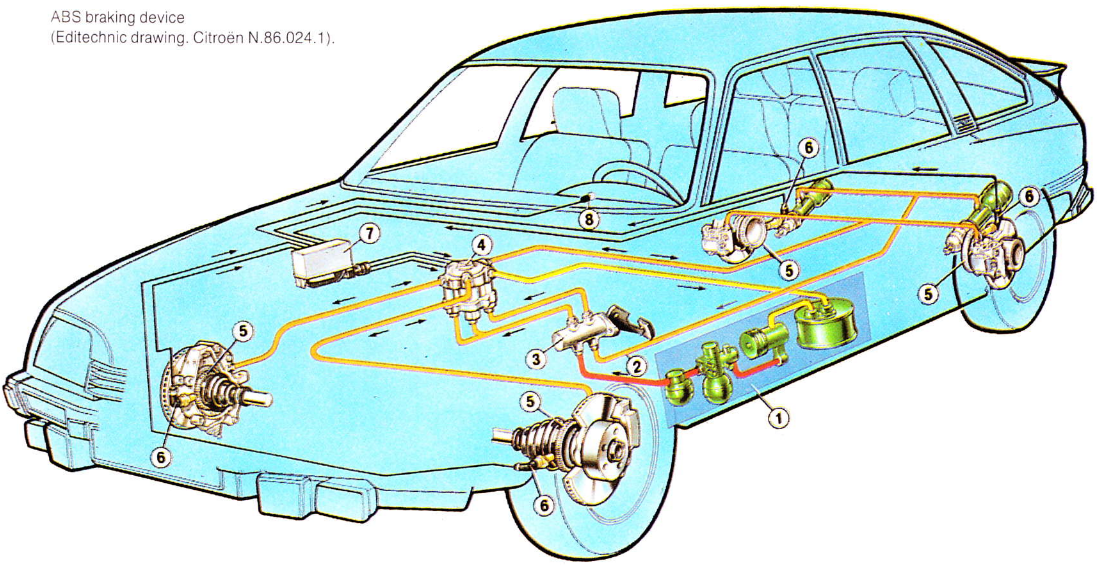
HEIGHT CORRECTION

This system allows the car's ride height to be maintained at a constant level automatically, whatever the static loading and the state of the road surface, by varying the volume of LHM between each piston and membrane.
Further, an electrical control allows the ride height of the car to be adjusted in order to clear obstacles.
These functions are carried out by two height correctors, one connected to the front suspension and the other to the rear.

Height correction
(Editechnic drawing. Citroën N.86.024.7).



ABS braking device
(Editechnic drawing. Citroën N.86.024.1).



1 - Pressure reserve: supplying front brakes, suspension, steering
2 - Rear suspension circuit : supplying rear brakes
3 - Brake control valve
4 - Three-electrovalve hydraulic unit
5 - Toothed wheels
6 - Electromagnetic sensors
7 - Electronic computer
8 - ABS malfunction warning light

The system improves safety at both high and low speeds by providing rapid response, and increases driving comfort by eliminating reactions at the steering wheel and reducing the amount of movement necessary.

THE PROBLEMS OF STEERING

The effort called for in cornering, and the size of the movement involved, is tiring for the driver.

In a conventional mechanical steering system, a reduction in the effort required can only be achieved by increasing the amount of movement, and vice versa.

With conventional power-assisted steering, the effort needed to manœuvre is reduced with the aid of an hydraulic jack. But to avoid over-rapid changes of direction at high speed because of the lightness of the steering, relatively low-geared steering must still be retained and the amount of wheel movement is still quite large.

It is therefore difficult to reconcile these three requirements: low steering effort for manœuvring, stability, and rapid response (high gearing) at high speed.

THE VARIPOWER SOLUTION

This system satisfies all three conditions, each of which is here considered separately:

Movement of the wheels

This is carried out by hydraulic pressure, the driver choosing their position by operating a servo valve. Whatever the wheel position, the jack is moved hydraulically, which is the main reason for the excellent directional stability of the CX.

From the safety point of view, the wheel position cannot be affected by forces exerted by bumps or potholes.

Steering effort

A cam and an hydraulic servo controlled by a centrifugal governor act to increase the steering effort under certain conditions of speed and cornering.

When the car is stationary or moving slowly, the steering effort remains very low even towards full lock.

As the speed increases, so does the effort. The rate of increase of effort has been calculated to ensure that the effort never becomes tiring, but is still sufficient at high speed to remind the driver that safety demands smaller wheel movements.

The system also self-centres the front wheels, even when the car is at a standstill, as soon as the steering wheel is released.

High-geared steering

The chosen gearing (2.5 turns of the wheel between locks) offers the maximum manœuvrability for the sake of safety.