PRESENTATION OF THE AL4 AUTOMATIC TRANSMISSION
DOCUMENT SUMMARY

PRESENTATION OF THE AL4 AUTOMATIC TRANSMISSION

The aim of this document is to give a brief description of the design and operation of the electronically managed AL4 automatic transmission which offers precise, adaptive control as well as excellent gear changing quality.

The following subjects are dealt with in this document:

- Presentation of the transmission and various pieces of information,
- The selector control,
- Lubrication,
- The converter,
- The mechanism,
- The ECU,
- Auto-diagnostics,
- The electrical circuit,
- Unit maintenance.
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AL4 AUTOMATIC TRANSMISSION
I - INTRODUCTION

- Electronically operated transverse automatic transmission.
- Four forward gears and one reverse gear.
- "Fuzzy logic" auto-adaptive ECU which controls the converter, gear changes and specific programs.
- The maximum torque capacity is 210 mN.
- Sealed transmission with reduced maintenance.
- Transmission oil cooled by heat exchanger.
- Current application: CITROËN XANTIA PHASE II vehicles with XU Petrol and Diesel engines.
II - PRESENTATION

Transmission layout
- Hydraulic torque converter with lock-up device.
- Primary shaft.
- Two "Simpson 2" type epicyclic gear trains.
- Multiplate clutches.
- Multidisc and band brakes.
- Step down gear in central position.
- Differential with sealed outputs.

Control
This is performed by:
- the hydraulic unit,
- the ECU,
- a cable control.

Features
- Lock-up of 2nd, 3rd and 4th gears.
- Electronic control of all regulation and gear changing functions.
- Three programs offered to driver:
  Auto adaptive - Sport - Snow
- Gears and programs displayed on dashboard.
- Cannot change up a gear in the no load position.
- User interface performed by a "stepped" selector grid with Shift-Lock safety function and program push buttons.
- "1st" imposed position selected using push button.
- Auto adaptive "Flash EEPROM" ECU.
- Downgraded operation in the event of a fault.
- Closed loop operation.
- On board diagnostics.
- Selector lever not in position P reminder buzzer.

Important: The automatic transmission ECU is linked to the engine management ECU so as to obtain:
  - good driving pleasure,
  - efficient mechanical protection for transmission and engine,
  - increased operating safety,
  - compliance with antipollution standards.
Chapter 1

III - DESCRIPTION OF THE AL4 AUTOMATIC TRANSMISSION

A - CROSS SECTION
B - PARTS LIST

1 - Converter
2 - Input shaft
3 - Fitted oil pump
4 - Secondary pinion of step down gear
5 - Park wheel
6 - Secondary shaft
7 - Drive pinion
8 - Ring
9 - Differential unit
10 - Cover
11 - Adjustable plate
12 - Hydraulic distributor (DH)
13 - Manual valve
14 - Auxiliary hydraulic distributor (DHA)
15 - Clutch E1 (Reverse and 1st)
16 - Clutch E2 (2nd, 3rd, 4th)
17 - Hub
18 - Brake F1 (4th)
19 - Brake F2 (Reverse)
20 - Brake F3 (1st and 2nd)
21 - Epicyclic gear train
22 - Primary pinion of step down gear
IV - IDENTIFYING THE COMPONENTS OF THE AUTOMATIC TRANSMISSION

A - AUTOMATIC TRANSMISSION

The automatic transmission identification is engraved on the rear housing.

A - Component reference
B - Serial number
B - ECU

C - Siemens reference
D - Siemens serial number
E - Siemens number bar code
F - Serial number
G - Software version
H - Hardware version
I - Customer number bar code

AL4 AUTOMATIC TRANSMISSION

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V - SPECIFICATIONS - SERVICING

A - FREQUENCY - CAPACITIES

<table>
<thead>
<tr>
<th>Engine</th>
<th>XUD9 BTF/XU10J4R/XU7JP4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission capacity</td>
<td>Approximately 6 litres</td>
</tr>
<tr>
<td>Draining capacity</td>
<td>Approximately 3 litres</td>
</tr>
<tr>
<td>Exclusive oil</td>
<td>CITROËN 97.36.22</td>
</tr>
<tr>
<td>Draining interval</td>
<td>Lubricated for life</td>
</tr>
<tr>
<td>Top-up interval</td>
<td>60 000 km</td>
</tr>
<tr>
<td>Transmission lubrication</td>
<td>Pressurised</td>
</tr>
<tr>
<td>Final drive lubrication</td>
<td>Pressurised</td>
</tr>
<tr>
<td>Weight</td>
<td>≈ 70 kg with oil and ECU</td>
</tr>
<tr>
<td>Torque capacity</td>
<td>210 mN from 2000 to 4500 rpm</td>
</tr>
</tbody>
</table>

B - GEARS

<table>
<thead>
<tr>
<th>Engine</th>
<th>XUD9BTF</th>
<th>XU10J4R</th>
<th>XU7JP4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission type</td>
<td>20TP04</td>
<td>20TP05</td>
<td>20TP06</td>
</tr>
<tr>
<td>Tyres - circumference</td>
<td>205/60R15 - 1.920 m</td>
<td>185/65R15-1.895m</td>
<td></td>
</tr>
<tr>
<td>Gear ratios</td>
<td>Rd</td>
<td>Rdem</td>
<td>Vveh</td>
</tr>
<tr>
<td>1st</td>
<td>0.367</td>
<td>2.72</td>
<td>11.55</td>
</tr>
<tr>
<td>2nd</td>
<td>0.667</td>
<td>1.5</td>
<td>21.00</td>
</tr>
<tr>
<td>3rd</td>
<td>1</td>
<td>1</td>
<td>31.48</td>
</tr>
<tr>
<td>4th</td>
<td>1.407</td>
<td>0.71</td>
<td>44.30</td>
</tr>
<tr>
<td>Reverse</td>
<td>-0.407</td>
<td>-2.45</td>
<td>12.81</td>
</tr>
<tr>
<td>Step down gear</td>
<td>52x67</td>
<td>52x67</td>
<td></td>
</tr>
<tr>
<td>Cylindrical torque</td>
<td>25x71</td>
<td>23x73</td>
<td></td>
</tr>
<tr>
<td>Tachometric torque</td>
<td>24x20</td>
<td>24x20</td>
<td></td>
</tr>
</tbody>
</table>

Speeds in km/h are given for 1000 rpm.
Rd = driveshaft ratio / Rdem = demultiplication ratio
Vveh = Vehicle speed.

Internal gear change safety thresholds:

<table>
<thead>
<tr>
<th>LEVER POSITION</th>
<th>SAFETY THRESHOLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>113 km/h</td>
</tr>
<tr>
<td>2</td>
<td>73 km/h</td>
</tr>
<tr>
<td>2 + press on &quot;1&quot; button of</td>
<td>35 km/h</td>
</tr>
<tr>
<td>program selector</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>15 km/h</td>
</tr>
<tr>
<td>R + foot on brake</td>
<td>25 km/h</td>
</tr>
</tbody>
</table>

AL4 AUTOMATIC TRANSMISSION
VI - LAYOUT OF THE AL4 AUTOMATIC TRANSMISSION

\[ C_m = \text{Engine torque} \]
\[ \omega_m = \text{Engine speed} \]
\[ \omega_e = \text{Gear train output speed} \]
\[ C_r = \text{Torque at road wheels} \]
\[ \omega_b = \text{Gear train input speed} \]
\[ \omega_r = \text{Road wheel speed} \]
VII - MISCELLANEOUS ADVICE

A - TOWING

The transmission is lubricated when the engine is running since this drives the transmission oil pump. Thus, when towing, the drive wheels must be raised off the ground. However, the vehicle may be towed with the drive wheels on the ground under exceptional circumstances and provided that the following conditions are complied with:

- the selector lever must be in position N,
- do not add any oil,
- do not exceed 50 km/h over a distance of 50 km.

B - DRIVING

Never drive with the ignition switched off.

Never push the vehicle to try and start it (not possible with automatic transmission).

*Note:* The automatic transmission is only lubricated when the engine is running.

C - OPERATIONS ON ELECTRICAL COMPONENTS

Never disconnect:

- the battery whilst the engine is running,
- the ECU whilst the ignition is switched on.

Before reconnecting a connector, check:

- the condition of the various contacts (bent, rusted...),
- that the mechanical locking device is present and check its condition.

During electrical inspections:

- the battery must be correctly charged,
- never use a power source greater than 16 V,
- never use a tell-tale light.
D - OPERATIONS ON MECHANICAL COMPONENTS

Never place the transmission on the ground unprotected.

The converter retaining pin must be inserted when the transmission is removed.

The centring pin must be used to couple the transmission to the engine.

Remove the centring pin just before coupling the transmission to the engine.
SELECTOR CONTROL

I - SELECTOR LEVER

The selector lever, through the selector shaft (on the transmission), operates the multifunction switch and the manual valve on the hydraulic distributor.

A - Upper part
B - Lower part
C - Sleeve stop
D - Control lever
E - Locking plunger for the Shift-Lock function
Ri - Initial setting
The selector lever, located on the central console, has six positions laid out on an offset or "stepped" grid.

The lever has a mechanical safety device which is unlocked by exerting a radial action on the lever.

**Note:** The ignition must be switched on and the brake pedal pressed to unlock the selector lever from position P. This is the Shift-Lock function.

C - Sleeve stop
Ri - Initial setting
G - Control return with ball joint
II - PROGRAM SELECTOR

This is located on the central console next to the selector lever and has 3 push buttons.

The driver can therefore inform the ECU of his selection:

- desired program,
- 1st imposed → this is obtained by pressing the "1" button of the selector with the selector lever in position 2 on the grid.

Gears change automatically depending on vehicle speed and engine load in accordance with various gear changing laws. The gear changing laws are chosen by the ECU as a function of one of the three programs available to the driver.

The driver can select a program by pressing one of the "S" or "*" program selector buttons.
The following three programs are available:

- **autoadaptive or "normal" (no buttons pressed):**
  
  this is the basic program; the ECU adjusts the operation of the automatic transmission to the style of driving, the road and engine load; it promotes fuel economy,

- **"Sport" (S button pressed):**
  
  this program promotes sporty driving to the detriment of consumption. Gears are still changed automatically,

- **"Snow" (* button pressed):**
  
  this program is suited to driving on low adherence ground. In drive, this means that either first gear or first and second gears are no longer available and gears are changed down less frequently using a specific set of changing laws.

  Furthermore, in the imposed positions 1, 2, 3, the "Snow" set of laws are used which take into account the restrictions relating to the chosen imposed position.

**Note:** Every time the ignition is switched off then on again, the ECU automatically switches to the "normal program" configuration.
CHECKING THE OIL LEVEL

Check the oil level every 60 000 kms.

Prerequisites:

- vehicle on horizontal ground,
- check that the transmission is not in downgraded mode,
- remove the filler plug 1 and systematically add 0.5 litres of oil to the transmission,
- press the brake and change through all the gears,
- selector lever in position P,
- engine running at idle speed,
- oil temperature 60 °C ± 8 °C.

1 - Filler plug
2 - Transmission housing
3 - Level plug
4 - Drain plug

AL4 AUTOMATIC TRANSMISSION

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• Remove the level plug (3).

• If oil streams out then starts to drip → close the level plug and tighten to 2.4 mdaN.

• If oil drips out or does not flow at all → close the level plug (3),
  stop the engine,
  add 0.5 litres of oil to the transmission,
  repeat the level checking procedure,
  the oil level is correct if oil streams out and then starts to drip,
  close the level plug (3) and tighten to 2.4 mdaN
  close the filler plug (1) and tighten to 2.4 mdaN

Too much oil may have the following consequences:

• abnormal heating of the oil,
• oil leaks.

Too little oil may damage the transmission.

Note: An oil check is not included in the PDI nor the first service.
THE TORQUE CONVERTER

The AL4 automatic transmission is fitted with a standard torque converter which has an added lock-up device.

I - DESCRIPTION

1 - Lock-up piston
2 - Double sided friction plate
3 - Vibration damper
4 - Impeller
5 - Turbine
6 - Stator
7 - Free wheel
8 - Oil pump drive
9 - Automatic transmission input shaft drive

AL4 AUTOMATIC TRANSMISSION
The torque converter consists of:

- an impeller (4), linked to the engine,
- a turbine (5), linked to the transmission,
- a stator (6), fitted on the free wheel (7) and located between the impeller and the turbine,
- a lock-up device operated by the ECU which consists of a piston (1), a friction plate (2) and a vibration damper (3).

The converter is secured to the engine drive plate (end plate). Its role is to provide a flexible and automatic link between the engine and the transmission.

It has two operating phases:

- the converter phase where it multiplies the engine torque by up to 2.2 times,
- the coupling phase where it transmits the engine torque with an efficiency of 0.98 (1 if it is locked up).

II - CONVERTER LOCK-UP

A - GENERAL

The clutch is hydraulically operated by an electrovalve controlled by the ECU.

The clutch can be in one of two states:

- open state → normal converter operation,
- closed state where it connects the impeller and the turbine so as to transmit all of the engine torque → engine brake available, reduction in fuel consumption, cooling of automatic transmission oil.

Lock-up is available on 2nd, 3rd and 4th gears (and 1st gear in rare cases).

The converter is locked up by inverting the direction of oil flow.

The ECU controls the two possible states of the lock-up using a set of memorised laws.
B - OPERATING PRINCIPLE OF THE LOCK-UP

The lock-up piston (1) is used to connect the impeller (4) to the turbine (5) via the vibration damper (3) and the friction plate (2).

1 - Converter not locked up

In the unlocked mode, oil pressure arrives through the lock-up circuit (a) so as to free the lock-up piston from the clutch plate. The oil then supplies the converter and the spring through the converter circuit (b).

2 - Converter locked up

In the locked mode, the lock-up circuit (a) is connected to tank. The oil therefore arrives through the converter circuit (b) into the converter causing the lock-up piston to move. This allows the turbine to connect with the impeller via the vibration damper and double sided clutch plate.

Note: The lock-up piston is joined to the rotating impeller.
THE EPICYCLIC GEAR TRAIN

I - DESCRIPTION

To provide the four forward gears and one reverse gear, the AL4 automatic transmission has a SIMPSON type epicyclic gear train.

This consists of two simple epicyclic gear trains connected together.

There are:

- two sunwheels P1 and P2,
- two sets of planet wheels S1 and S2,
- two planet wheel carriers PS1 and PS2,
- two rings C1 and C2.

The two gear trains are connected in the following manner:

- planet wheel carrier PS1 and ring C2 are connected together,
- planet wheel carrier PS2 and ring C1 are connected together.

Gear train n°1 is located on the rear housing side.

Gear train n°2 is located on the converter side; the movement systematically exits through its planet wheel carrier PS2.
**Gear train specifications**

<table>
<thead>
<tr>
<th>Component</th>
<th>Teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunwheel P1</td>
<td>33</td>
</tr>
<tr>
<td>Sunwheel P2</td>
<td>40</td>
</tr>
<tr>
<td>Planet wheel S1</td>
<td>21</td>
</tr>
<tr>
<td>Planet wheel S2</td>
<td>19</td>
</tr>
<tr>
<td>Ring C1</td>
<td>81</td>
</tr>
<tr>
<td>Ring C2</td>
<td>80</td>
</tr>
</tbody>
</table>

**AL4 Automatic Transmission**

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II - OPERATING PRINCIPLE

1st gear

2nd gear

PP<sub>des</sub> = Primary step down pinion

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3rd gear

```
PP des = Primary step down pinion
```

4th gear

```
PP des = Primary step down pinion
```
Reverse

\[ \text{PP des} = \text{Primary step down pinion} \]

Table of moving parts

<table>
<thead>
<tr>
<th>GEAR</th>
<th>DRIVING COMPONENT</th>
<th>REACTION COMPONENT</th>
<th>RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P1</td>
<td>P2</td>
<td>2.72</td>
</tr>
<tr>
<td>2</td>
<td>PS1 - C2</td>
<td>P2</td>
<td>1.5</td>
</tr>
<tr>
<td>3</td>
<td>P1 and PS1 - C2</td>
<td>none</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>PS1 - C2</td>
<td>P1</td>
<td>0.71</td>
</tr>
<tr>
<td>Reverse</td>
<td>P1</td>
<td>PS1 - C2</td>
<td>2.45</td>
</tr>
</tbody>
</table>

AL4 AUTOMATIC TRANSMISSION

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ECU

The ECU of the AL4 transmission is an autoadaptive and upgradable ECU with a 56 track Flash Eprom.

I - ECU FUNCTIONS

The ECU performs the following functions:

A - GEAR CHANGING LAWS

The ECU has 10 gear changing laws allowing the operation of the transmission to be altered to the driver's style of driving, to the chosen program and to the internal and external conditions.

The following laws are therefore obtained:

- 6 laws: for autoadaptivity,
- 1 law: for the snow program,
- 1 law: "unlocked" for low temperature operation,
- 1 law: for depollution when cold (heating),
- 1 law: for automatic transmission temperature protection.

B - PROGRAMS

The ECU manages three programs: autoadaptive, Sport and Snow (upon driver's request).

C - AUTO-ADAPTIVENESS

The ECU has an autoadaptive program which allows it to chose the law which will be the best suited to the following conditions from the ten laws listed above:

- driver's style of driving → 3 laws = "economic", Medium", "Sport ",
- road profile and vehicle load → 3 laws = "slight incline" (or "braking 1"), "sharp incline" (or "braking 2"), "decline",
- temperature,
- selected program.
D - GEAR CHANGE UP PREVENTION DUE TO SUDDEN REMOVAL OF FOOT FROM ACCELERATOR

This function prevents the transmission from changing up to a higher gear when the foot is suddenly removed from the accelerator pedal; this allows the engine brake to be maintained whilst decelerating.

E - GEAR LOCKING FOLLOWING A LAW CHANGE

For reasons of safety and comfort, the transmission is prevented from changing up or down a gear too quickly if the law has just changed.

F - CHANGE DOWN

The ECU is totally responsible for changing down the gears as a function of engine load, vehicle speed and driving conditions. The ECU authorises a double change down (from 4th to 2nd and 3rd to 1st) or forces a single change down.

Furthermore, the ECU provides a change down function in the event of sustained braking in order to anticipate downward gear changes and so as to provide the engine brake.

G - MOMENTARY SWITCH TO SPORT PROGRAM

So as to provide better power take-up in the normal program, the ECU temporarily switches to a more sporty law when the accelerator pedal is suddenly pressed down.

H - KICKDOWN

The kickdown order is given by the automatic transmission ECU after the accelerator pedal is pressed down fully and depending on vehicle speed.

I - MANAGEMENT OF IMPOSED GEARS

The ECU is totally responsible for changing to imposed gears in terms of operation and safety (changing limits).

J - CONTROLLING THE LINE PRESSURE

The ECU works out the value of line pressure with closed loop feedback. The reference value is a function of the turbine torque to overcome.
K - MANAGING GEAR CHANGES

When the ECU decides to change a gear, it must operate the various electrovalves involved in a precise order and in accordance with timers which are a function notably of the engine load and vehicle speed. This provides a good overlap between the receiver which is emptying and the one which is filling up.

L - OPERATING THE CONVERTER LOCK-UP CLUTCH

This function optimises the converter operation by locking it up to save fuel, to obtain engine braking, to encourage cooling of the transmission oil and to prevent slip. A law which depends on vehicle speed, throttle position and gear engaged is used to decide whether to lock the converter up or not.

M - TORQUE REDUCTION

This function is used to increase driving pleasure by reducing the engine torque when changing gear. This action consists of momentarily reducing the ignition advance in accordance with a pre-programmed table provided by the engine management computer.

N - IDLE SPEED COMPENSATION

This function is used to attenuate the dragging effect of the transmission when it is being driven through the engine management computer (idle reference speed).

O - AUTOMATIC TRANSMISSION PROTECTION

- Reverse gear safety: for vehicle speed > Threshold.
- Incorrect operations:
  - on the automatic transmission: change from N → D or N → R prohibited if N > threshold. The change is authorised if N < threshold or after a timer.

P - SHIFT-LOCK FUNCTION

This function locks the selector lever in position P when the ignition is switched on. The lever is unlocked by pressing the brake pedal.
Q - CONTROL PANEL DISPLAY

The ECU informs the driver of the position of the selector lever and the choice of program using the liquid crystal display on the control panel.

The ECU may also warn the driver of a transmission problem by flashing the sport and snow display.

R - "OLD OIL" FUNCTION

Using the parameters of automatic transmission oil temperature and the time for which the oil is subject to a high temperature, the ECU increments an "old oil" counter. When this reaches the calibrated maximum valve, the ECU orders the "Sport" and "Snow" warning lights to flash on the control panel to warn the driver that the automatic transmission oil needs changing.

S - SAFETY - DIAGNOSTIC

The ECU:

- permanently checks its supplies and that its sensors and actuators are operating correctly,
- validates and stores operating faults,
- talks with after-sales tools through line K,
- provides a downgraded mode,
- asks the engine management computer to illuminate the engine management light in the event of a fault leading to a deterioration in the level of vehicle pollution (only on fiscal level L4).

T - CONFIGURATION - DOWNLOADING

The ECU can be upgraded; its program can be updated by downloading.

The configuring operation is used to configure the automatic transmission ECU depending on the options which are not fitted to the vehicle.

U - OTHER FUNCTIONS

The following three functions, inherent to automatic transmission, are performed by the multifunction switch:

1 - Buzzer
   This tells the driver that he is leaving his vehicle without having put the selector lever in position P.

2 - Illumination of reversing lights in position R.

3 - Prevention from starting engine when not in positions P or N.
II - OPERATING SUMMARY

Load information
A - Petrol engine with double track potentiometer
B - Petrol engine with single track potentiometer
C - Diesel engine

AL4 AUTOMATIC TRANSMISSION
## Parts list

<table>
<thead>
<tr>
<th>REF.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Accelerator pedal</td>
</tr>
<tr>
<td>2</td>
<td>Kickdown function on accelerator cable</td>
</tr>
<tr>
<td>3</td>
<td>Double track throttle potentiometer</td>
</tr>
<tr>
<td>4</td>
<td>TDC sensor</td>
</tr>
<tr>
<td>5</td>
<td>Engine coolant temperature probe</td>
</tr>
<tr>
<td>6</td>
<td>Petrol injection ECU</td>
</tr>
<tr>
<td>7</td>
<td>Single track throttle potentiometer</td>
</tr>
<tr>
<td>8</td>
<td>Petrol injection ECU</td>
</tr>
<tr>
<td>9</td>
<td>Potentiometer on injection pump load lever</td>
</tr>
<tr>
<td>10</td>
<td>Diesel injection ECU</td>
</tr>
<tr>
<td>11</td>
<td>Torque reduction electrovalve</td>
</tr>
<tr>
<td>12</td>
<td>Kickdown information</td>
</tr>
<tr>
<td>13</td>
<td>Engine load information</td>
</tr>
<tr>
<td>14</td>
<td>Engine speed + engine coolant temperature information</td>
</tr>
<tr>
<td>15</td>
<td>Engine torque information (provided by injection ECU)</td>
</tr>
<tr>
<td>16</td>
<td>Torque reduction request information + idle speed compensation request information</td>
</tr>
<tr>
<td>17</td>
<td>Illumination of EOBD light request information (only on versions with L4 depollution)</td>
</tr>
<tr>
<td>18</td>
<td>LED display (control panel)</td>
</tr>
<tr>
<td>19</td>
<td>Diagnostic socket</td>
</tr>
<tr>
<td>20</td>
<td>Sequence electrovalve</td>
</tr>
<tr>
<td>21</td>
<td>Pressure modulating electrovalve</td>
</tr>
<tr>
<td>22</td>
<td>Oil flow modulating electrovalve</td>
</tr>
<tr>
<td>23</td>
<td>Transmission oil temperature probe</td>
</tr>
<tr>
<td>24</td>
<td>Transmission oil pressure sensor</td>
</tr>
<tr>
<td>25</td>
<td>Transmission input speed sensor</td>
</tr>
<tr>
<td>26</td>
<td>Transmission output speed sensor</td>
</tr>
<tr>
<td>27</td>
<td>Multifunction switch</td>
</tr>
<tr>
<td>28</td>
<td>Reversing lights</td>
</tr>
<tr>
<td>29</td>
<td>Starter motor prevention relay</td>
</tr>
<tr>
<td>30</td>
<td>Shift lock actuator</td>
</tr>
<tr>
<td>31</td>
<td>Gear lever</td>
</tr>
<tr>
<td>32</td>
<td>Program selector (Sport, Snow, Normal, 1st imposed)</td>
</tr>
<tr>
<td>33</td>
<td>Brake pedal (braking information)</td>
</tr>
<tr>
<td>34</td>
<td>Stop switch</td>
</tr>
<tr>
<td>35</td>
<td>Automatic transmission ECU</td>
</tr>
<tr>
<td>36</td>
<td>Not in position P reminder buzzer</td>
</tr>
<tr>
<td>37</td>
<td>Throttle position information (throttle potentiometer)</td>
</tr>
</tbody>
</table>
### III - ECU CONNECTIONS

<table>
<thead>
<tr>
<th>PIN N°</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Output: supply (+) for sequence electrovalves (EVS1 to EVS6)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Output: supply to electrovalve controlling flow in heat exchanger</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Output: air conditioning compressor cut-off command</td>
<td>not used</td>
</tr>
<tr>
<td>4</td>
<td>Output: display (on instrument panel)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Output: torque reduction request /idle speed compensation</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>/</td>
<td>depending on version</td>
</tr>
<tr>
<td>6</td>
<td>Output: illumination of EOBD light request information (*) (to engine management computer)</td>
<td>L4 version</td>
</tr>
<tr>
<td>7</td>
<td>Output: sequence electrovalve EVS3 (earth)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Output: sequence electrovalve EVS4 (earth)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Output: sequence electrovalve EVS2 (earth)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Output: sequence electrovalve EVS1 (earth)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Output: shift lock actuator control</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Output: heat exchanger oil flow electrovalve control (EPDE)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Output: sequence electrovalve EVS5 (earth)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Output: sequence electrovalve EVS6 (earth)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Input: kickdown control</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Input: brake redundant contact (brake opening contact)</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>L diagnostic line</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>K diagnostic line</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Output: lock-up electrovalve</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Output: main pressure electrovalve</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Input: engine torque information</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Throttle position information input (driver's wishes information)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Supply (+) to oil pressure sensor</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Supply (-) to oil pressure sensor</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Supply (+) to modulating electrovalves (pressure EVM, lock-up EVM)</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Supply (+) to ECU</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Supply to ECU (common earth with engine management ECU)</td>
<td></td>
</tr>
<tr>
<td>29 -</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Input: multifunction switch position S2 contact</td>
<td></td>
</tr>
</tbody>
</table>

**AL4 AUTOMATIC TRANSMISSION**

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### PIN N° | DESCRIPTION | COMMENTS
--- | --- | ---
32 | Input: multifunction switch S3 contact | 
33 | Input: multifunction switch S4 contact | 
34 | Input: multifunction switch Parking/Neutral contact | 
35 | / | 
36 | Input: program selector, "1" button | 
37 | Input: multifunction switch S1 contact | 
38-39 | / | 
40 | Input: program selector: snow button | 
41 | Input: program selector, normal/sport button | 
42 | Electronic earth for multifunction switch | 
43 | Input: stop lights contact (brake closing contact) | 
44 | / | 
45 | Input: signal (+) from turbine speed sensor | 
46 | Input: signal (-) from turbine speed sensor | 
47 | Signal (-) from automatic transmission output speed sensor | 
48 | Signal (+) from automatic transmission output speed sensor | 
49 | Input: engine speed information (TDC) | 
50 | / | 
51 | Supply (-) for throttle potentiometer | double track potentiometer 
52 | Supply (+) for throttle potentiometer | double track potentiometer 
53 | Signal (-) from oil temperature probe | 
54 | Signal (+) from oil temperature probe | 
55 | Input: signal from line pressure sensor | 
56 | Input: signal from throttle potentiometer | 
56 | / | 

EMC: engine management ECU - EOBD: European On Board Diagnosis

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AUTO-DIAGNOSTIC

I - FAULT WARNINGS

The appearance of certain faults in the system causes the SPORT and SNOW warning lights to flash.

The sport and snow warning lights flash in the following cases:

- when the transmission oil is too hot (extinguish when oil has cooled),
- when the transmission oil is old (oil counter value at calibrated maximum value),
- when there is a break in the serial link between the transmission ECU and the control panel.

The "SPORT" and "SNOW" warning lights flash if there is a fault on the following components or information:

- transmission ECU,
- ECU supply,
- oil pressure sensor,
- supply to sequence electrovalves (EVS1 to EV6),
- regulation fault in main hydraulic pressure,
- multifunction switch,
- sequence electrovalves (EVS1 to EV6),
- main pressure modulating electrovalve (pressure EVM),
- converter lock-up modulating electrovalve (lock-up EVM),
- oil flow electrovalve in heat exchanger,
- main hydraulic pressure electrovalve,
- accelerator pedal not programmed,
- input speed and output speed,
- input speed and engine speed,
- output speed and engine speed,
- engine speed information,
- pedal position,
- supply to analogue sensors.
### II - MEMORISED FAULTS / DOWNGRADED MODES

There are 6 levels of downgraded mode depending on the fault detected.

<table>
<thead>
<tr>
<th>FAULT FOUND</th>
<th>EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1</strong></td>
<td>kick down input</td>
</tr>
<tr>
<td><strong>Level 2</strong></td>
<td>transmission oil temperature, engine torque information, display control, shift lock actuator</td>
</tr>
<tr>
<td><strong>Level 3</strong></td>
<td>vehicle speed, lock-up modulating electrovalve, torque reduction output, pressure sensor, supply to sensors, brake switch input, heat exchanger flow modulating electrovalve (EPDE), throttle position information supplied by the injection ECU and torque information missing</td>
</tr>
<tr>
<td><strong>Level 4</strong></td>
<td>engine speed, transmission input speed sensor</td>
</tr>
<tr>
<td><strong>Level 5</strong></td>
<td>throttle potentiometer information, engine torque information, multifunction switch (loss of reverse gear safety when driving), supply to analogue sensors, pressure modulating electrovalve, main pressure regulation, heat exchanger oil flow modulating electrovalve control, input speed and output speed, input speed and engine speed, output speed and engine speed</td>
</tr>
<tr>
<td><strong>Level 6</strong></td>
<td>ECU not working, sequence electrovalves, supply to sequence electrovalves, accelerator pedal position not programmed</td>
</tr>
</tbody>
</table>

**Warning:** Transmission in stopping mode: a loud bang may be felt when moving the lever from P ⇒ R or N ⇒ R.

**Warning:** In hydraulic emergency mode, gear changing safety limits are no longer provided.

---

**AL4 AUTOMATIC TRANSMISSION**

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WIRING DIAGRAM - XANTIA

PETROL ENGINE/WITHOUT CRUISE CONTROL

I - LAYOUT

AL4 AUTOMATIC TRANSMISSION
Chapter 8

PETROL ENGINE/WITH CRUISE CONTROL

I - LAYOUT

AL4 AUTOMATIC TRANSMISSION
Chapter 8

DIESEL ENGINE/WITHOUT CRUISE CONTROL

I - LAYOUT

AL4 AUTOMATIC TRANSMISSION

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II - PARTS LIST

BB00 - Battery
BF00 - Passenger compartment fuse box
BMF1 - Maxi fuse box
C001 - Diagnostic socket
CA00 - Ignition switch
M000 -
MC10 -
MC16 -
MM07 -
0004 - Control panel
1005 - Starting prohibition relay
1316 - Throttle position sensor
1621 - Automatic transmission vehicle speed sensor
1630 - Automatic transmission ECU
1631 - Torque reduction electrovalve
1635 - Automatic transmission electro-hydraulic unit
1637 - Automatic transmission kickdown switch
1638 - Automatic transmission shift-lock actuator
1640 - Automatic transmission program selector
1642 - Shift lock control relay
2100 - Stop switch
7307 - Cruise control safety relay
10 - - - Starting function, current generation
12 - - - Injection supply function
21 - - - Stop lights function
22 - - - Reversing lights function
30 - - - Passenger compartment lighting function
73 - - - Cruise control function
80 - - - Air conditioning function

AL4 AUTOMATIC TRANSMISSION
AFTER-SALES OPERATIONS

I - DOWNLOADING

This operation is to be performed in the following cases:

• when the automatic transmission ECU is updated,

• to adapt the automatic transmission ECU to an upgraded engine management computer,

The downloading operation must be followed by:

• a pedal programming operation,

• configuration,

• a road test.

IMPORTANT: The engine management computer must be upgraded every time the automatic transmission ECU is upgraded.

Following the procedure on the ELIT or PROXIA/LEXIA diagnostic tool to perform a downloading operation.

II - CONFIGURATION

This operation is to be performed in the following cases:

• replacement of ECU,

• downloading to ECU.

A new or newly downloaded ECU is always configured with the following three options:

• with or without shift lock,

• with or without air conditioning,

• with or without EOBD (L4 depollution standard).

The ECU configuration operation consists of preventing the options not fitted to the vehicle from being subject to the diagnostic procedure.

Follow the procedure on the ELIT or PROXIA/LEXIA diagnostic tool to perform a configuration operation.
III - PEDAL PROGRAMMING

This operation is to be performed in the following cases:

- replacement of ECU,
- replacement of automatic transmission,
- updating by downloading,
- replacement or adjustment of accelerator cable,
- replacement of or downloading to engine management computer (XUD9BTF/XU7JP4/L4),
- replacement of throttle potentiometer,
- replacement of diesel injection pump.

Follow the procedure on the ELIT or PROXIA/LEXIA diagnostic tool to perform a pedal programming operation.

IV - INITIALISING THE "OLD OIL" COUNTER

This procedure will be active from update n°13 of the diagnostic tools. The aim of this operation is to tell the automatic transmission ECU that the transmission oil has just been changed.

V - UPDATING THE "OLD OIL" COUNTER

This procedure will be active from update n° 13 of the diagnostic tools. It consists of making the transmission ECU memorise the "old oil" counter should the ECU be replaced without changing the oil.

Note: If the oil counter cannot be read from an old ECU, change the transmission oil.

VI - TEST AFTER REPAIR WORK

The ECU permanently adapts itself to the transmission. Thus, when replacing the transmission, the ECU or another transmission component, a road test must be performed choosing a route which allows frequent gear changes and the use of all gears. All the programs should also be selected.

This test is absolutely essential so that the ECU can adapt itself to the transmission by comparing reference values with actual values. The difference recorded is then memorised to allow optimum gear changing quality.
### VII - CHANGING PARTS, OPERATIONS TO BE PERFORMED

<table>
<thead>
<tr>
<th>COMPONENT REPLACED</th>
<th>OPERATION TO BE PERFORMED</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission (1)</td>
<td>Adjust multifunction switch</td>
<td>requires diagnostic tool + multimeter</td>
</tr>
<tr>
<td></td>
<td>+ Initialise old oil counter (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ Road test</td>
<td></td>
</tr>
<tr>
<td>Transmission oil</td>
<td>Initialise old oil counter (2)</td>
<td>requires diagnostic tool</td>
</tr>
<tr>
<td>Replace hydraulic distributor components (hydraulic distributor, electrovalves)</td>
<td>Adjust control inside transmission + Road test</td>
<td>special tool</td>
</tr>
<tr>
<td>Heat exchanger oil flow modulating electrovalve</td>
<td></td>
<td>Do not drain transmission</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check oil level</td>
</tr>
<tr>
<td>Transmission input speed sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission output speed sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main pressure sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil temperature probe</td>
<td>Remove hydraulic distributor</td>
<td>Requires transmission to be drained. Requires electrical harness inside transmission to be removed. Requires control inside transmission to be adjusted. Check oil level</td>
</tr>
<tr>
<td>Replace or adjust accelerator cable</td>
<td>Program accelerator pedal</td>
<td>Check operation of kickdown switch</td>
</tr>
<tr>
<td>Replace throttle potentiometer</td>
<td>Program pedal</td>
<td>requires diagnostic tool</td>
</tr>
<tr>
<td>Replace diesel injection pump (with potentiometer on load lever)</td>
<td>Program pedal</td>
<td></td>
</tr>
<tr>
<td>Replace injection ECU</td>
<td>Program pedal</td>
<td>download automatic transmission ECU</td>
</tr>
<tr>
<td>Multifunction switch</td>
<td>Adjust switch</td>
<td>multimeter</td>
</tr>
<tr>
<td>Replace transmission ECU</td>
<td>Read old oil counter in old ECU (2), note the value + Configure new ECU + Update oil counter in new ECU from value stored in old one (2) (3) + Program accelerator pedal + Road test</td>
<td>download engine management computer</td>
</tr>
</tbody>
</table>

(1) New transmissions are supplied filled with oil  
(2) Possible from update n° 13 of diagnostic tools  
(3) If the oil counter cannot be read from an old ECU, replace the transmission oil.
VIII - AUTHORISED OPERATIONS DURING THE WARRANTY PERIOD

Transmission fitted

Authorised replacements:

- drain and fill oil,
- download/configure ECU,
- program pedal,
- initialise/update "old oil" counter,
- hydraulic distributor cover seal,
- selector shaft seal,
- driveshaft seals,
- seal between closing plate and transmission housing,
- gear selector control,
- heat exchanger and its seals,
- accessible plugs, support brackets and control pins,
- complete hydraulic distributor,
- electrovalves and pressure regulators on hydraulic distributor,
- speed sensors (turbine speed, engine speed, vehicle speed),
- transmission oil temperature probe,
- electrical harness inside transmission,
- TDC sensor,
- selector lever position switch,
- oil pressure sensor,
- relays,
- transmission ECU (*).

Note: If the oil in the transmission is burnt, always replace the heat exchanger.

(*) only after approval.

Transmission removed

Authorised replacements (depending on transmission architecture):

- torque converter,
- inter housing gasket,
- whole transmission (*).

**IMPORTANT:** When returning a transmission under warranty, return it with its heat exchanger.

(*) only after approval.

AL4 AUTOMATIC TRANSMISSION
The operating procedures for the various authorised operations are given in the corresponding after-sales document.

Replacing the whole AL4 transmission or its ECU must be subject to prior approval.

This approval is given by the Regional Headquarters for France. The point of sale fills in the "request for replacement approval" (copy enclosed) and sends this duly completed request to the Regional Headquarters. After being analysed, additional technical assistance will be proposed in order to complete the diagnostic or replacement approval will be faxed back to the point of sale on the approval request.

For UK, contact warranty department at Citroën UK or follow After Sales procedure for UK RHD vehicles.

IX - AUTOMATIC TRANSMISSION REPAIR BY THE CITROËN AUTOMATIC TRANSMISSION CENTRE, SOUTH WEST PARIS

Conditions

- The vehicle is not under contractual warranty (1 year).
- Preliminary checks (level and quality of oil, adjustments relating to transmission, etc…) and any repairs (repairs with or without removing transmission) must have been performed.

Procedure

- Send the centre the duly completed approval sheet by fax.
- Upon receiving the work request, the centre will specify its provisional repair time by telephone or fax.
- The centre will send the point of sale special packaging for transport purposes with blanks and the converter lock corresponding to the AL4 automatic transmission.
- Remove the transmission from the vehicle.
- Package the transmission (leave oil / water exchanger fitted) and attach the photocopy of the workshop customer work order, the approval request sheet and the works order.
- Send the transmission to the centre using GEFCO transport (specific procedure).
- Transmission will be returned by GEFCO after repair.
- Return empty special packaging to GEFCO with blanks and converter lock.

AL4 AUTOMATIC TRANSMISSION

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## REQUEST FOR REPLACEMENT APPROVAL OR ASSISTANCE FOR MB3/4HP20/AL4 AUTOMATIC TRANSMISSION

<table>
<thead>
<tr>
<th>Warranty start</th>
<th>Stamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle type</td>
<td></td>
</tr>
<tr>
<td>Engine type</td>
<td></td>
</tr>
<tr>
<td>Transmission type</td>
<td></td>
</tr>
<tr>
<td>ECU type</td>
<td></td>
</tr>
<tr>
<td>V.I.N or DAM N°</td>
<td></td>
</tr>
<tr>
<td>Transmission N°</td>
<td></td>
</tr>
<tr>
<td>Mileage</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>

1) **VEHICLE IMMOBILISED** [ ] YES [ ] NO Form completed by: Telephone Fax

2) **CUSTOMER complaint** .................................................................

3) **OIL**
   - appearance [ ] coloured [ ] oil burnt [ ] normal
   - Check at 80°C level [ ] level insufficient [ ] level normal [ ] too much oil
   - Check at 60°C (AL4) level [ ] level insufficient [ ] level normal too much oil
   - Leak Location ............... [ ] dripping [ ] flowing

For the next section, only complete relevant sections:

4) **OPERATING FAULT**
   - [ ] gears do not change
   - [ ] random changes
   - [ ] delay engaging N-D or N-R
   - [ ] problem in imposed gears
   - [ ] slipping
   - [ ] slipping then knocking
   - [ ] knocking
   - [ ] no drive
   - other ............................................................... [ ] when changing up
   - [ ] sudden fault
   - [ ] when changing down
   - [ ] engine cold
   - [ ] engine warm
   - [ ] progressive degradation
   - [ ] occasionally
   - [ ] when changing gears which ones ? ..........................................................
   - [ ] when changing lever position, state positions ..................................
   - coherence between lever position/control panel display of P → 1 [ ] YES [ ] NO

5) **NOISE**
   - conditions when driving [ ] when accelerating [ ] when decelerating [ ] stationary
   - type of noise [ ] metallic [ ] friction [ ] whining [ ] cyclic

6) **MEMORISED FAULTS**
   - Warning light flashing (if fitted): [ ] YES [ ] NO
   - Transmission ECU identification ............. Engine ECU identification .............

   Transmission: Engine:

7) **POINT OF SALE COMMENTS:**
   - e.g. associated variables .................................................................

8) **RESPONSE TO APPROVAL REQUEST**
   - (Approval n°) ..............................................................................

**AL4 AUTOMATIC TRANSMISSION**
Note: Above for France. For UK contact warranty department, Citroën UK Ltd.
**X - SPECIAL TOOLING**

**Box - ( ) 0338**

A - Drift
B - 2 sockets for removing-refitting converter
C - Right hand driveshaft seal extractor
D - Tool for holding converter
E - Ball joint extractor
F - Tool for fitting converter lip seal
G - Hook for removing lip seal from converter
H1 - Tool for fitting left hand driveshaft seal
H2 - Guide for fitting left hand driveshaft seal
J1 - Tool for fitting right hand differential output seal
J2 - Guide for fitting right hand differential output seal
K - Tool for fitting selector shaft seal
L - Interface harness for checking AL4 automatic transmission
M1 - Screw for setting internal selector control
M2 - Shim for adjusting internal selector control
N1 - Gear changing shaft seal extractor
N2 - Gear changing shaft seal extractor
P - Socket for removing transmission mounting

**AL4 AUTOMATIC TRANSMISSION**
XI - DIAGNOSTIC TOOLING

ELIT unit: 4125-T

This tool is used for:

- identifying ECUs,
- reading faults,
- erasing faults,
- measuring parameters,
- activating actuators,
- programming accelerator pedal,
- configuring ECUs,
- updating the ECU by downloading.

PROXIA station: 4165-T

This tool is used for:

- identifying ECUs,
- reading faults,
- erasing faults,
- measuring parameters,
- activating actuators,
- programming accelerator pedal,
- configuring ECUs,
- updating the ECU by downloading,
- consulting wiring diagrams.
LEXIA station: 4171-T

This tool is used for:

- identifying ECUs,
- reading faults,
- erasing faults,
- measuring parameters,
- activating actuators,
- programming accelerator pedal,
- configuring ECUs,
- updating the ECU by downloading,
- consulting wiring diagrams.

Terminal box and harness: 4187-T

Using a voltmeter and an ohmmeter, this tool is used to check:

- sensors and actuators,
- automatic transmission harness.