CITROËN

TECHNICAL TRAINING

FAULT FINDING GUIDE using LEXIA

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DEALER QUALITY
DEVELOPMENT DIVISION

BROCHURE SUMMARY

FAULT FINDING GUIDE USING LEXIA

The aim of this document is to present the various fault finding methods incorporated into the tool.

The various applications used by the "guided method" will be dealt with in this document:

- Case based reasoning (CBR),

- The DIAGSYS model,

- Fault charts and symptom charts.

CONTENTS

CONTENTS OF THE LEXIA TOOL

I - FUNCTIONS INCORPORATED INTO LEXIA

To make it as quick and efficient as possible to locate faults, many functions have been integrated into LEXIA. They form all of the tools required for fault finding on CITROËN vehicles. These functions are:

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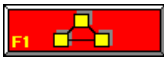
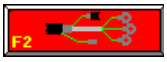
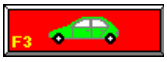
- **operating principles:** these use the CITROËN TECHNICAL DOCUMENTATION and provide a simplified functional description of all of the multiplexed systems in order to facilitate their understanding (e.g. air conditioning, BSI, etc).

1b 

1c 

1d 

- **wiring diagrams:** the user can access all the electrical layout, wiring and location diagrams relating to the vehicle on which he is working, whenever he needs. LEXIA automatically selects the correct diagrams (vehicle, RPO n°, devices, etc).

1e 

- **physical measurements:** LEXIA incorporates a multimeter function (voltmeter, ohmmeter, ammeter) and a pre-programmed oscilloscope function with automatic measurement scale adjustment. Using this pre-programmed oscilloscope function, the user can compare the shape of the signal measured with that of standard curves incorporated in LEXIA. Measurements can be taken automatically if LEXIA is fitted with an automatic harness tester.

- **remote assistance:** remote assistance allows an assistant (consultant technician or technical assistant) to control the user's diagnostic tool remotely, in order to assist him.

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- **trace:** all operations performed during a diagnostic session by the user are memorised step by step using this function. The user can, when necessary, view or print the result of the trace function.

LEXIA also provides access to all the autodiagnostic functions of the ECUs fitted on CITROËN vehicles:

- **fault reading:** this function is used to read permanent and temporary faults memorised by the ECUs as well as the contexts associated to each fault, where these are available in the ECU.

- **parameter measurements:** this function is used to view the values taken by the ECU operating parameters and to check whether the information used by the ECUs is coherent with their theoretical values which can be viewed using a help screen.

- **actuator tests:** this function is used to activate the actuators connected to the ECUs in order to check they are operating correctly (e.g. windscreen wipers, illumination of LEDs, etc).

II - LEXIA MODULES LINKED TO FAULT FINDING

- **Case Based Reasoning (C.B.R.):** this method, which searches through the cases in the fault database with solutions incorporated in LEXIA, is used for a "straight to the point" repair if an identical case to the problem found exists. It can also guide the fault finding procedure by proposing cases similar to the problem noted.

- **DIAGSYS model:** this method uses reasoning based on system models which provide an operating description of the systems fitted on multiplexed vehicles. By using these models, LEXIA guides the user step by step and allows him to single out the ECU from amongst all the multiplexed ECUs which is at the origin of the fault causing the customer complaint or the fault code dealt with.

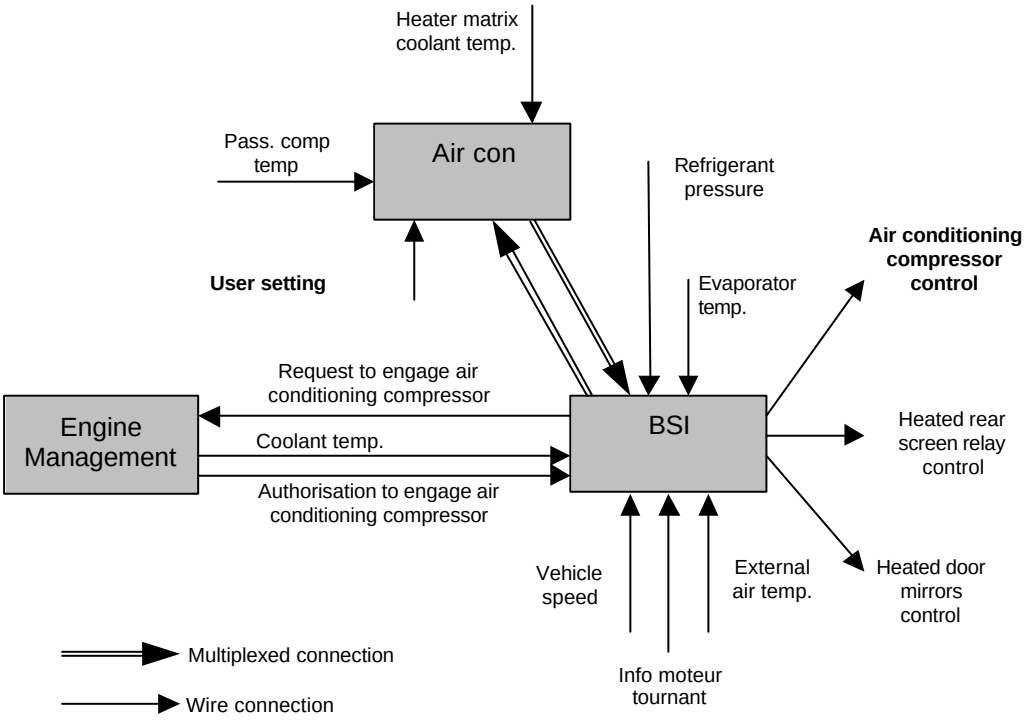
- **Fault charts and symptom charts:** these diagnostic charts are used to guide the user step by step within his search process allowing him to precisely locate the fault (faulty component, broken wire, etc) causing the customer complaint or the fault code dealt with.

THE GUIDED FAULT FINDING PROCEDURE

I - REMINDER OF THE FAULT FINDING CONTEXT LINKED TO MULTIPLEXED VEHICLES

- **Shared functions**

On a multiplexed vehicle, the functions are no longer controlled by a single ECU but instead their operation is shared between several ECUs. For example, the climate control function on the Xsara Picasso involves 3 ECUs: the climate control ECU, the engine management ECU and the BSI. They operate as follows:



It can be seen therefore that a problem on the climate control function may potentially be due to several causes which are not necessarily linked to the climate control ECU. This is why, before anything else, finding a fault on a multiplexed vehicle consists of determining the ECU to which the fault is directly attached. The guided method proposed by LEXIA, based on the customer complaint entered by the user, is used to isolate the ECU to which the fault is attached.

- **Local fault, remote fault**

A fault is said to be local if it is directly linked to the ECU being checked. If the fault was memorised due to another ECU transmitting incorrect information, this fault is then said to be remote.

For example, in the above case, incorrect information from the evaporator sensor will lead to a *local* fault code being memorised in the BSI as the sensor which supplies this information is directly connected to this ECU. The BSI cannot transmit the correct temperature value, measured by the evaporator sensor, to the climate control ECU which will also cause a fault to be memorised in this ECU (a fault which is not directly linked to the climate control ECU): this fault will therefore be called *remote.*

II - DESCRIPTION OF THE GUIDED METHOD PROCEDURE

Initially and after selecting in LEXIA the faulty function on the vehicle, the guided method is used to determine the ECU which should be checked. Secondly, it allows the faulty component to be located precisely, connected to the ECU identified during the first step of the fault finding procedure.

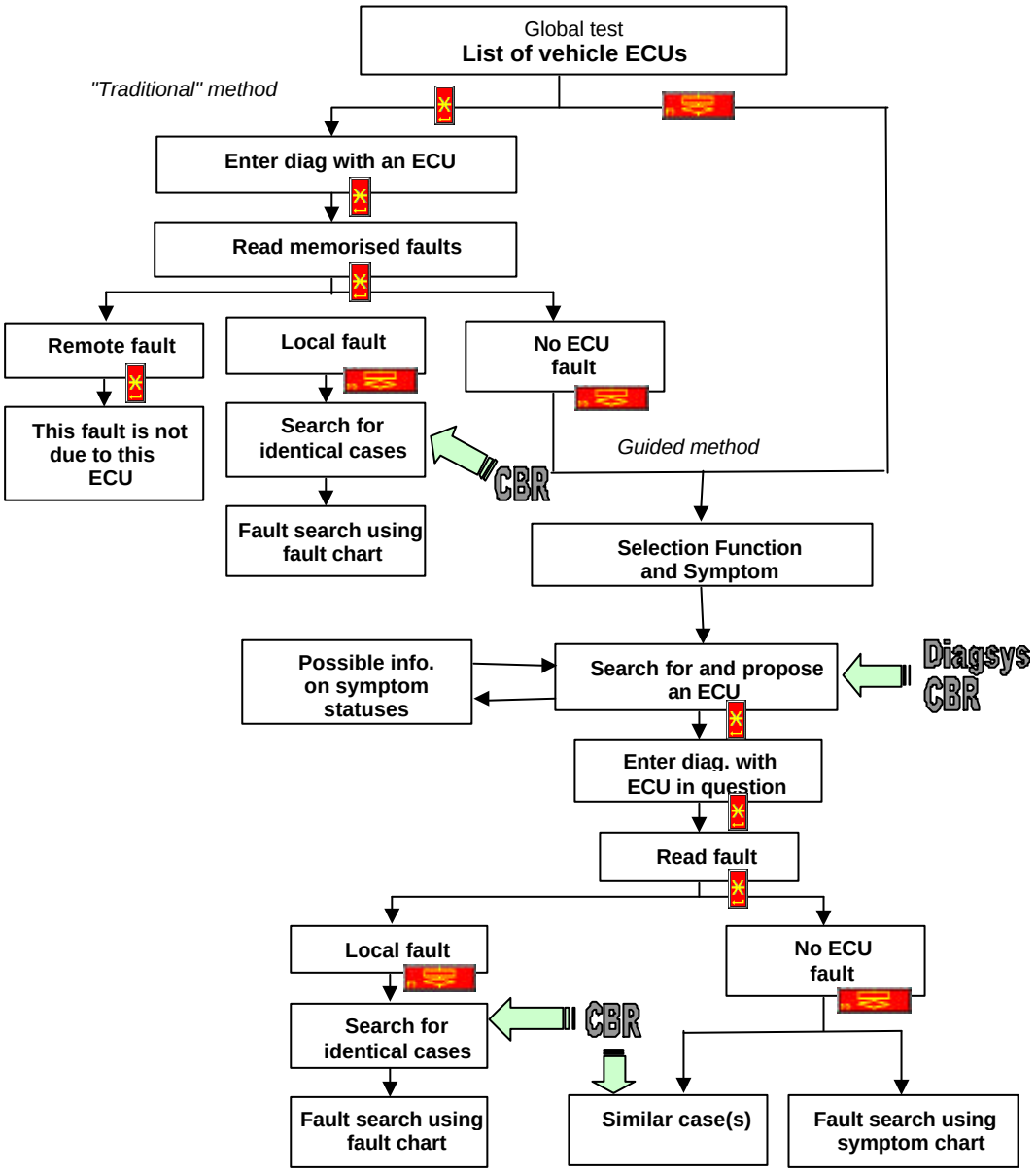
A diagnostic session on a multiplexed vehicle always starts with a global test: the list of ECUs present on the vehicle is automatically prepared by LEXIA. LEXIA then specifies, for each ECU, whether a dialogue with each ECU is possible and if it has any memorised fault codes. After this global test, the user then calls up the guided method. Several steps are required to locate the fault precisely.

- Selection of the faulty *function* from the proposed list of functions, then selection of the *symptom* (or customer complaint). It should be noted that the proposed list of functions only includes multiplexed functions.
- If the information supplied is not sufficient to allow LEXIA (and the DIAGSYS model of the vehicle) to determine the ECU causing the fault directly, LEXIA asks the user to provide additional details. A list of operating checks (called *symptoms* in LEXIA) is proposed to the user: these checks are listed in decreasing order of interest. The user must select a *symptom* and then be guided by the check chart which is then started by LEXIA. The result of the check (correct operation or incorrect operation) is then transmitted automatically by LEXIA to the model, which thus refines its fault finding procedure. The user may be asked to perform a maximum of 2 successive checks. After these two checks, LEXIA displays the result of the fault finding procedure carried out by the model: this result corresponds either to a single faulty ECU or to a list of several likely ECUs (where the model was not able to determine which ECU is actually faulty from the list of ECUs).

- If the result is a list of several ECUs, these are listed in decreasing order of suspicion, i.e. the first ECU given on the list is the one which is most likely to be the origin of the customer complaint. LEXIA then returns to the global test screen, in which the likely ECUs appear in red, with the line corresponding to the most likely ECU being selected.

- The user must then enter a fault finding procedure with the selected ECU (i.e. the one which is the most likely) and then use CBR or the fault finding charts to locate precisely the faulty component causing the customer complaint.

The diagram below shows a summary of the complete sequence of a standard diagnostic session.



III - EXAMPLE OF A COMPLETE DIAGNOSTIC SESSION

When LEXIA is switched on and connected to the vehicle's diagnostic socket, to perform a diagnostic session, the user should select DIAGNOSTIC from the first menu displayed (using keys F1 or F2). The user should then select DIAGNOSTIC again from the second menu, confirming with the * key.

Note*: to switch off the unit, the user must return to this second menu. To do this, he should therefore press the "return to previous menu" key several times or the ↖ key directly, using the EXIT icon then press the on/off button for at least one second when the corresponding shut down authorisation message appears.*

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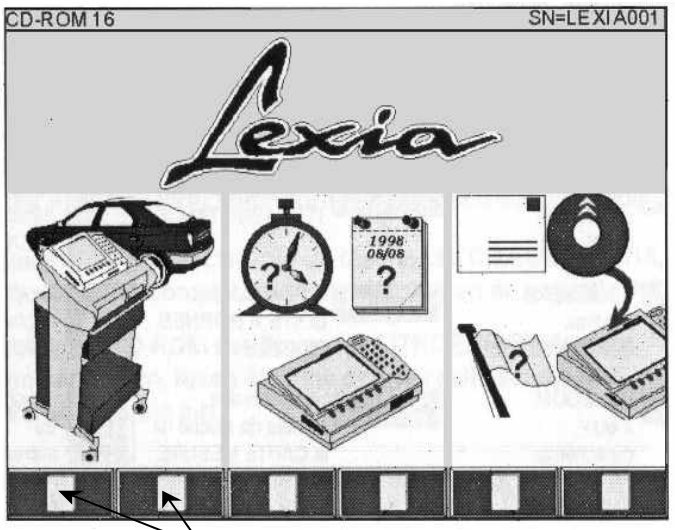

Keys F1 and F2
Access to diagnostic

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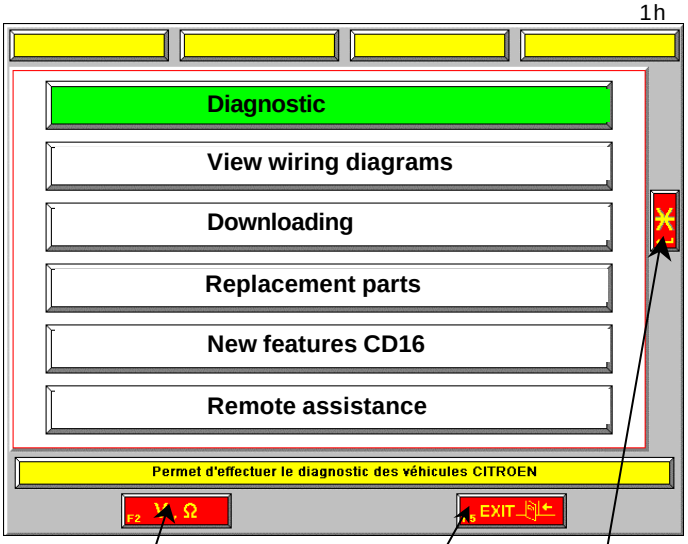

Access to physical measurements

Exit key to switch off the unit

Validation key

Using the arrows, the user should select the type of vehicle to be checked, validate with the * key then enter the vehicle's RPO n°.

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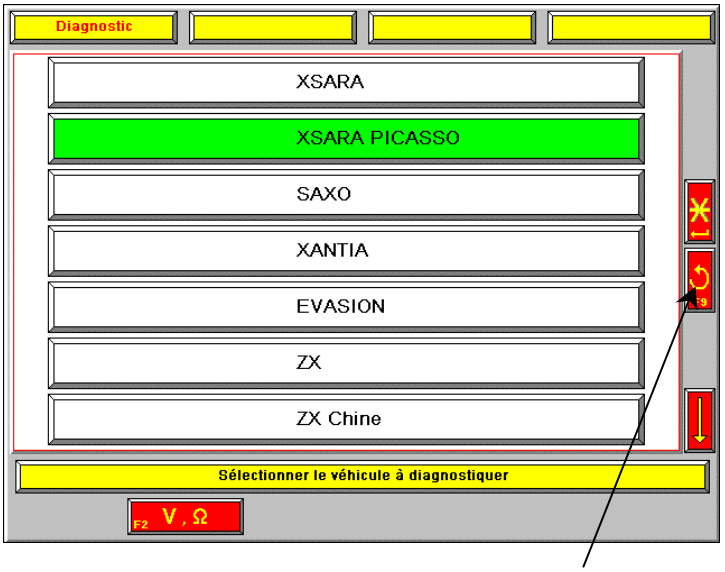

Used to return to the previous menu

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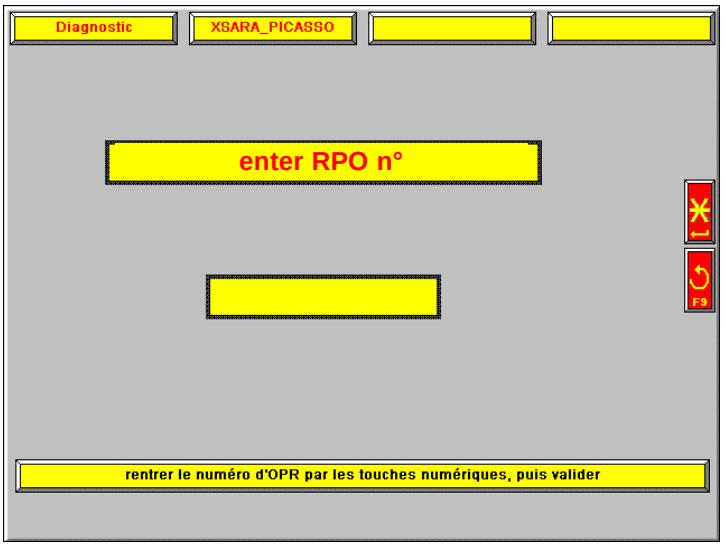
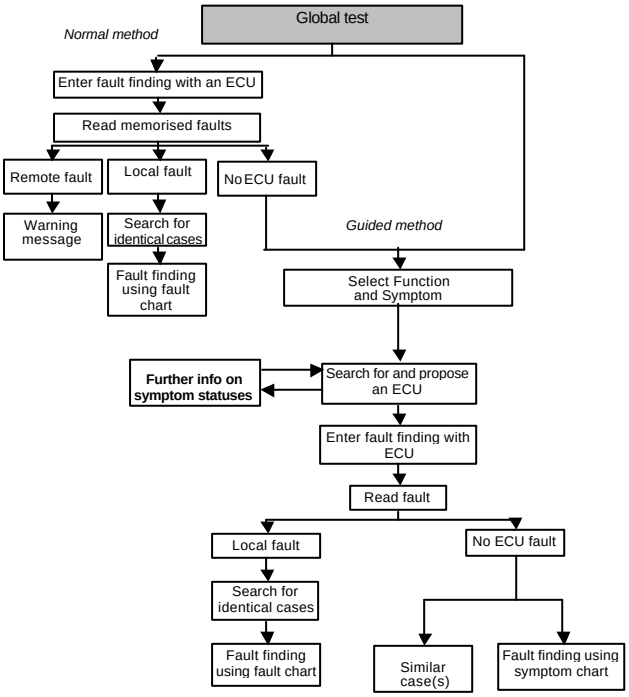
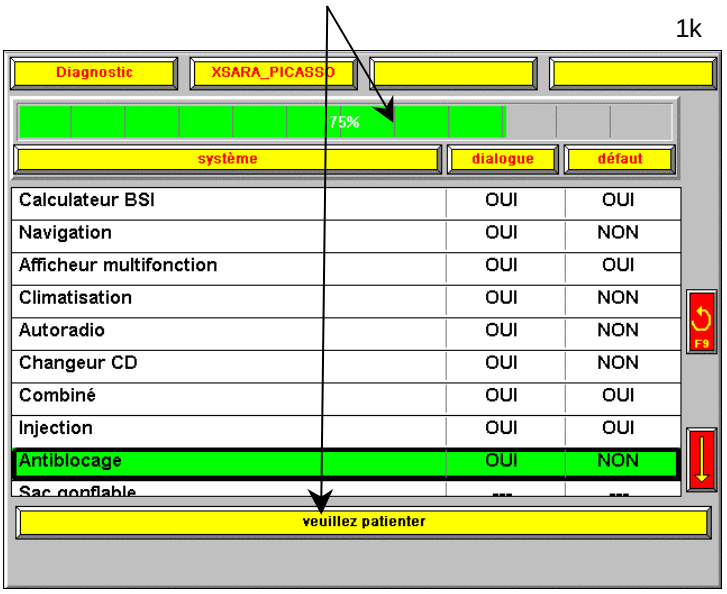


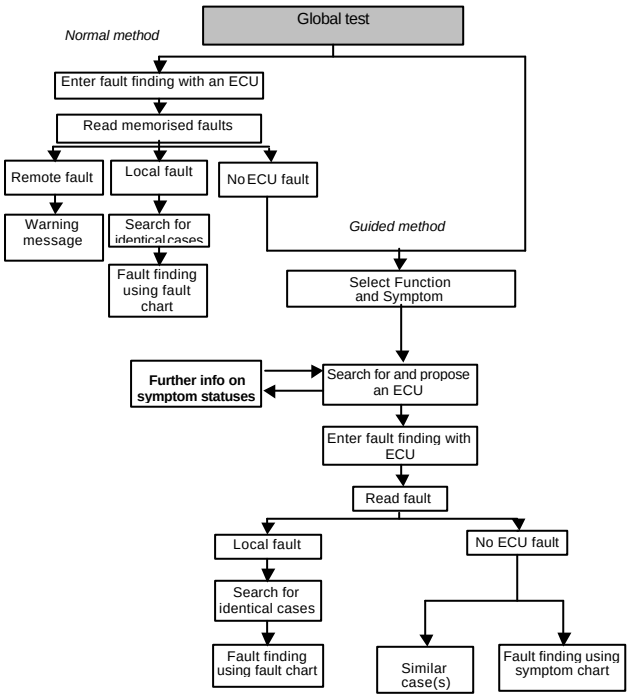
LEXIA then starts a global test: it interrogates in turn all the ECUs fitted on the vehicle being checked. The list of ECUs on the vehicle is displayed on the screen. For each ECU in the list, LEXIA specifies whether a dialogue was possible and whether it contains one or several fault codes in its memory.



Interrogation of ECUs in progress (75 %)



The user should then start the *guided method* by pressing on the "GUIDED METHOD" icon (key F5) in the Global Test screen.



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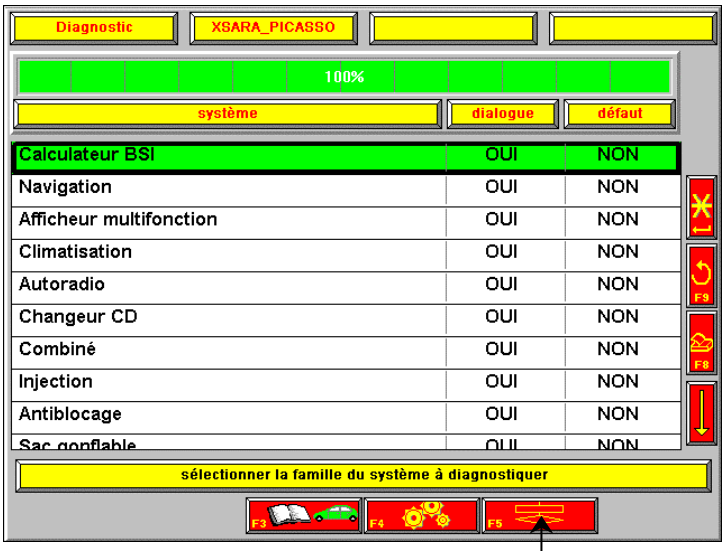
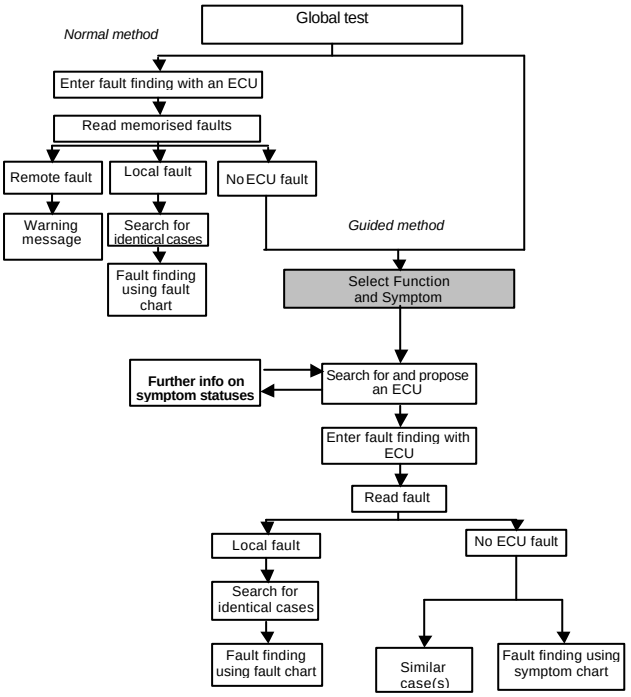


Access to guided method

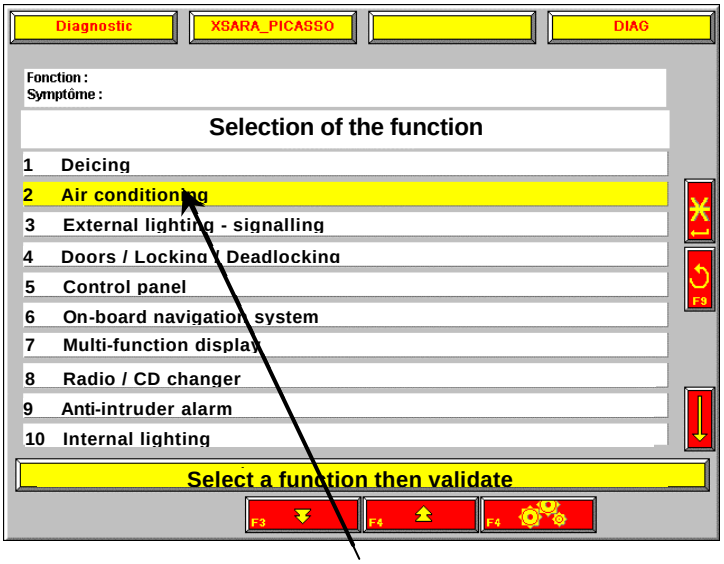
LEXIA then offers the list of all of the vehicle's multiplexed *functions*.

Note: *As these functions only relate to multiplexed ECUs, the functions linked to the ABS, engine management, etc are not shown on the list as these are not multiplexed on the Xsara Picasso.*

The user should select the faulty function then validate.



1m



Selection of the faulty function

The user must then select, from the list displayed, the *symptom* (or customer complaint) affecting the selected function, as well as the exact *status* of this symptom.

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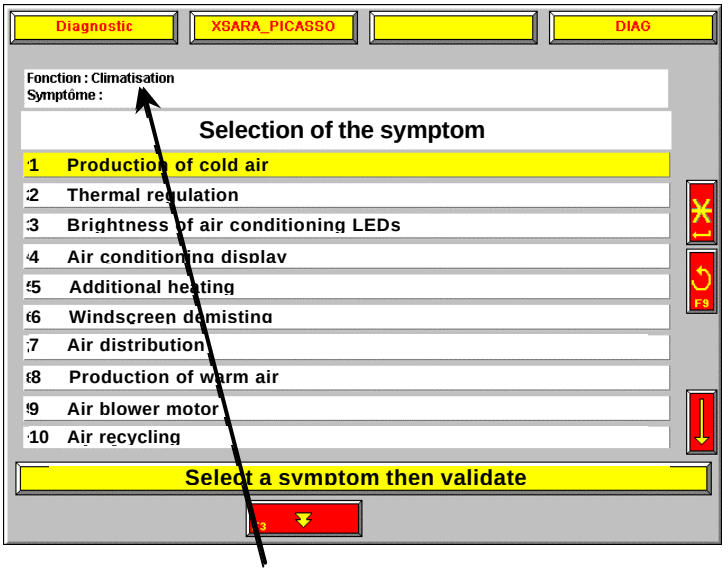

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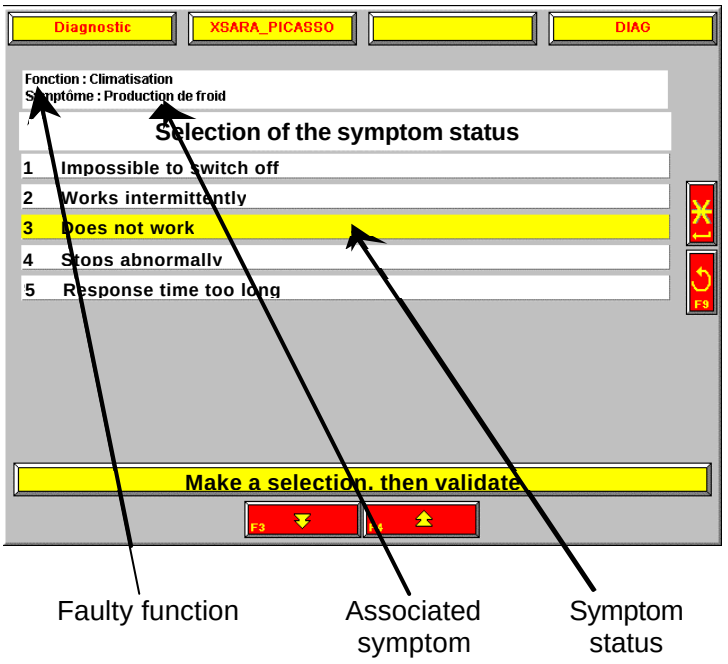


LEXIA transmits this information to the DIAGSYS model, which then performs a search to determine the system (ECU) at the origin of the fault.

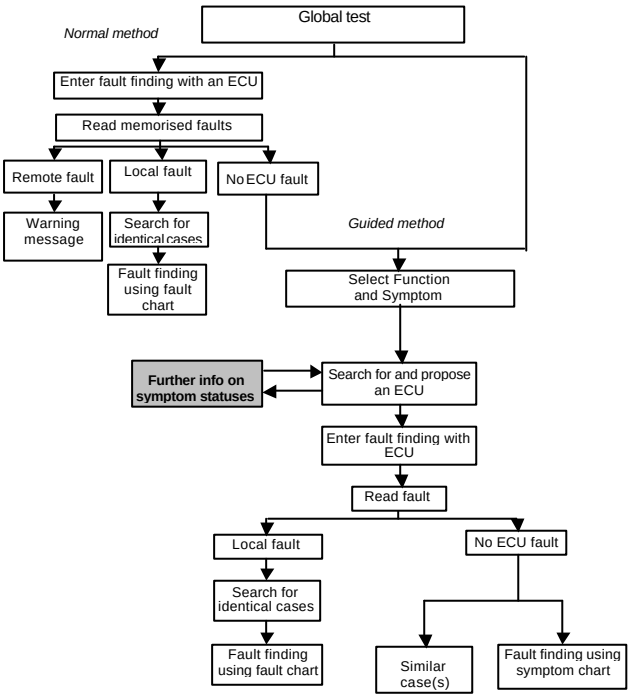
If the information given is not sufficient to identify just one *system*, LEXIA asks the user to supply additional information on the status of the vehicle. LEXIA then proposes a list of additional checks to be carried out on the vehicle.

Note: *In LEXIA, these checks are called* symptoms.

To perform the first check, the user must select the **first** *symptom* on the list. This check (or *symptom*) is effectively of most interest when searching for the current fault.

Note 1: *This* symptom *or check may be totally dissociated from the selected customer complaint. This is not the case in reality and it allows the operating status of a* system *to be checked which is involved in the operation of the function being checked.*

Note 2: *The user can select a* symptom *from the list other than the first one (which may be of interest if components which have already been removed are likely to make this check easier). However, this* symptom *will be of a lesser interest when searching for the current fault, consequently making the search longer.*



Selection of a symptom to be detailed

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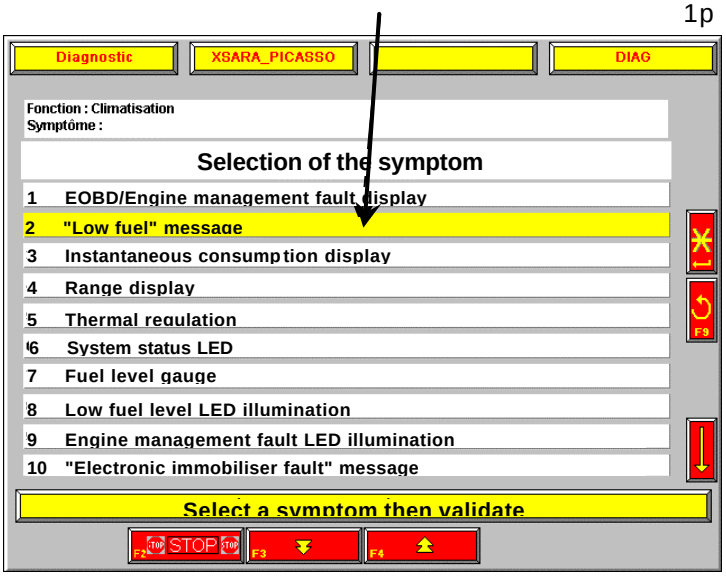
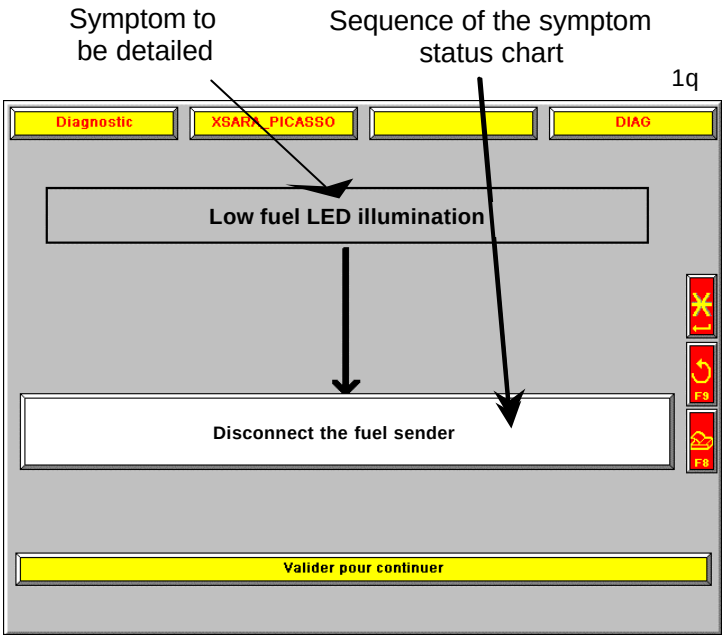
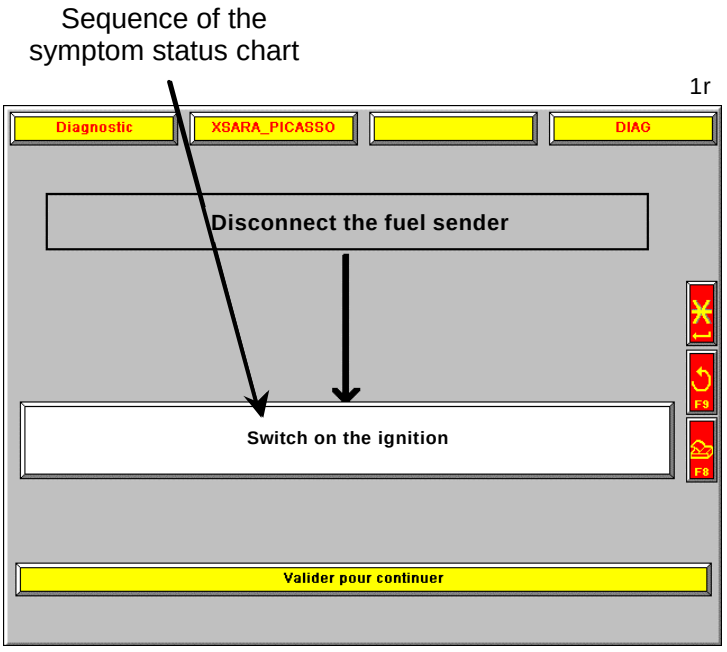
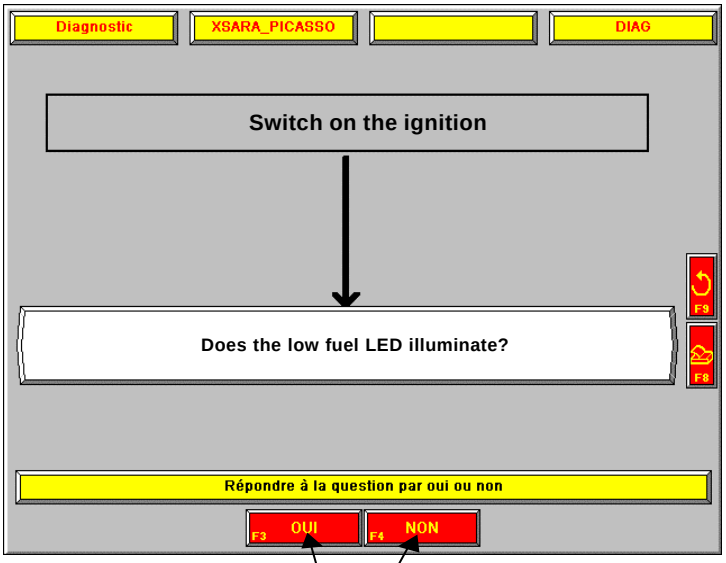


Once the *symptom* has been selected, a *symptom status* chart is called up to show the user the step by step method to be followed to perform the check.





1s



Answers about the symptom status

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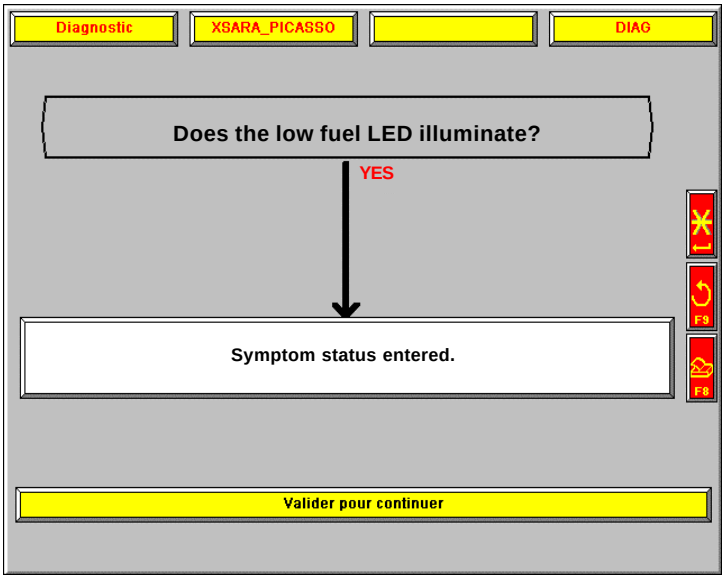
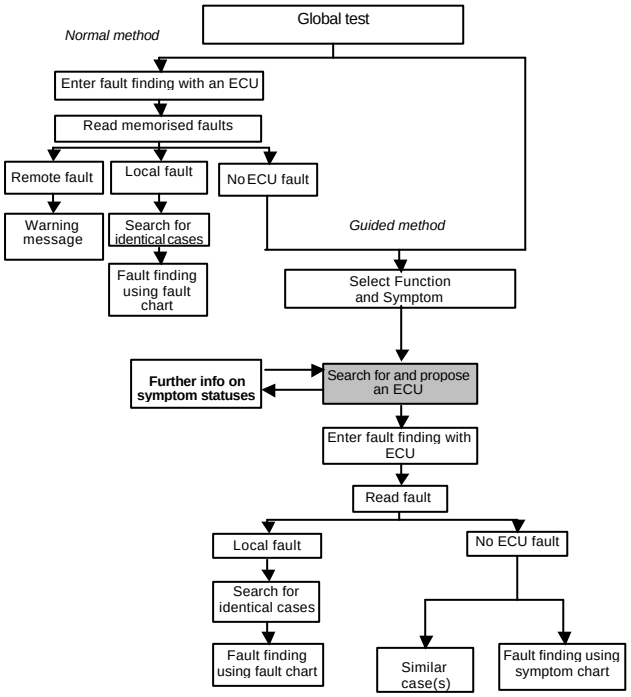


LEXIA transmits the result of the check carried out to the model. The DIAGSYS model refines its fault finding process. Two cases are then possible: either the search has ended and the faulty ECU has been found or LEXIA will ask for an additional check to be carried out.

Once this check has been performed, if the DIAGSYS model has not been able to single out just one ECU, LEXIA presents the user with a list of likely ECUs, which it then classifies in decreasing order of suspicion: the first ECU on the list is the one which is most likely to be the cause of the fault.



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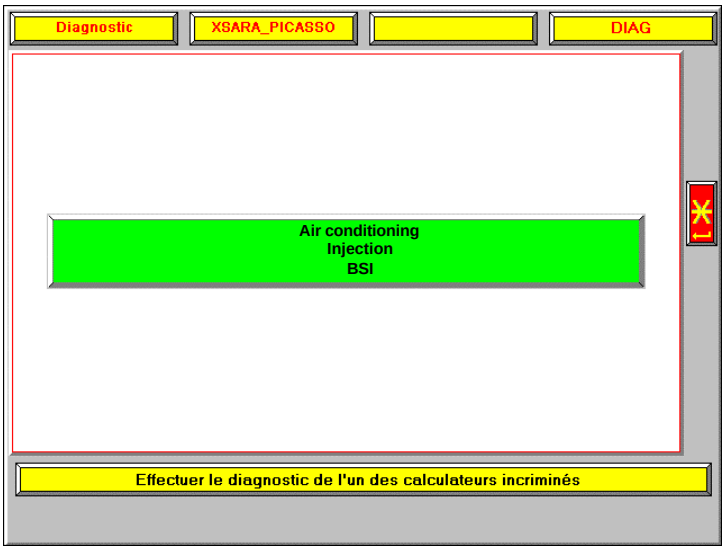
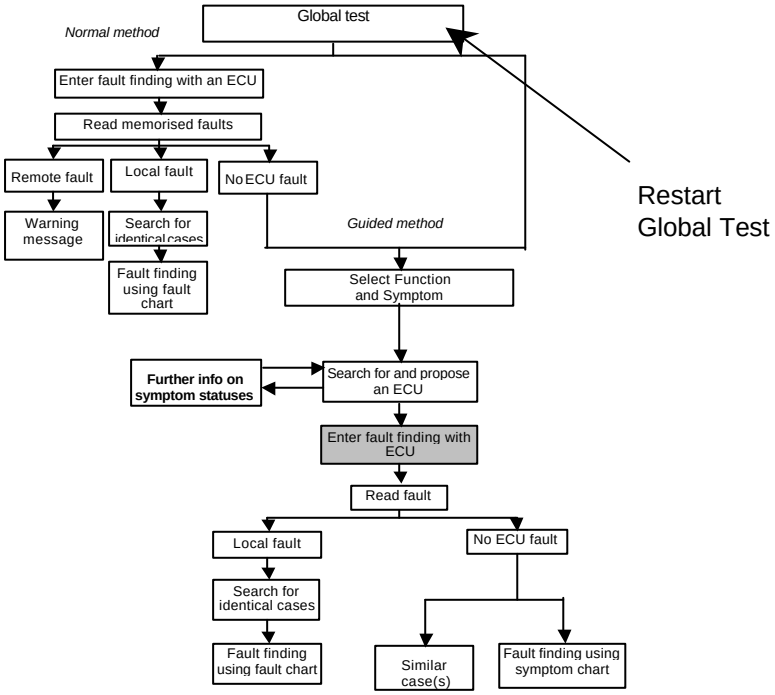
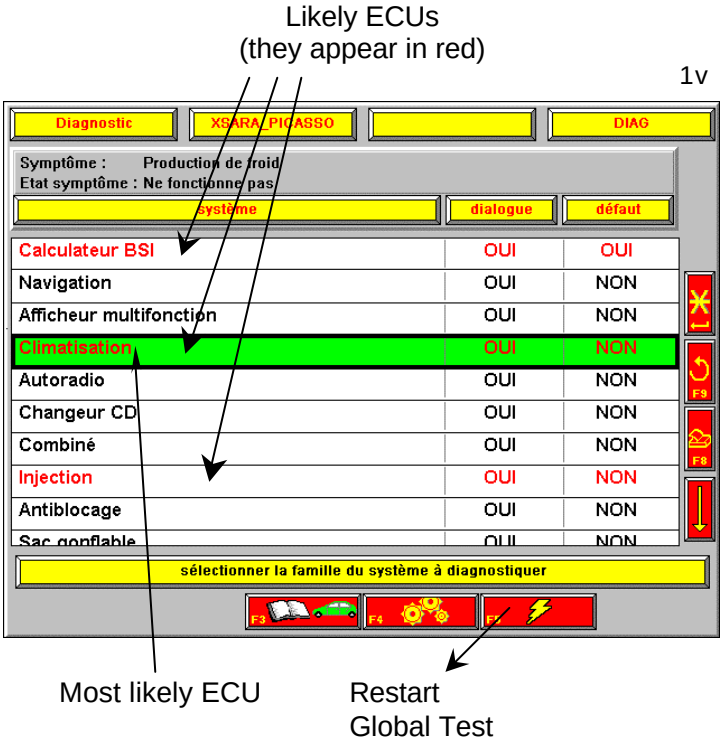
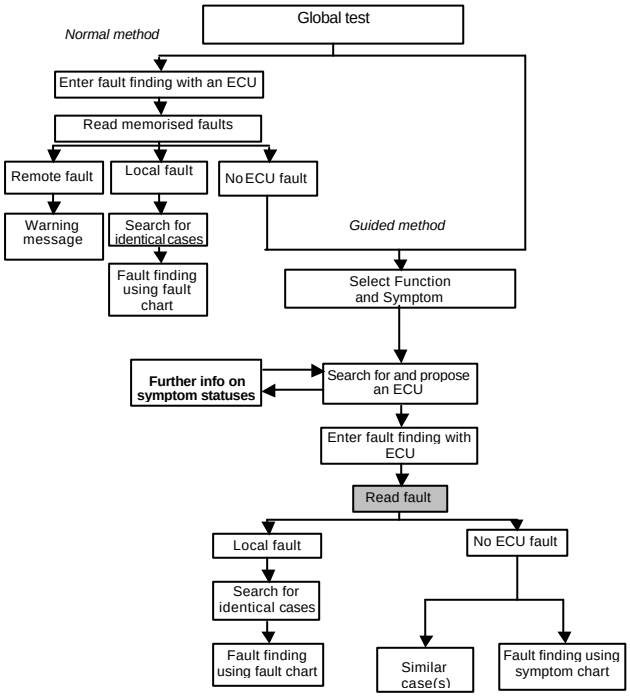


After validating, LEXIA returns to the global test screen and places the cursor on the most likely ECU. If other ECUs are also suspected, they appear in red on the list. The user must validate in order to set up a dialogue with the selected ECU.





The user should then read the faults.



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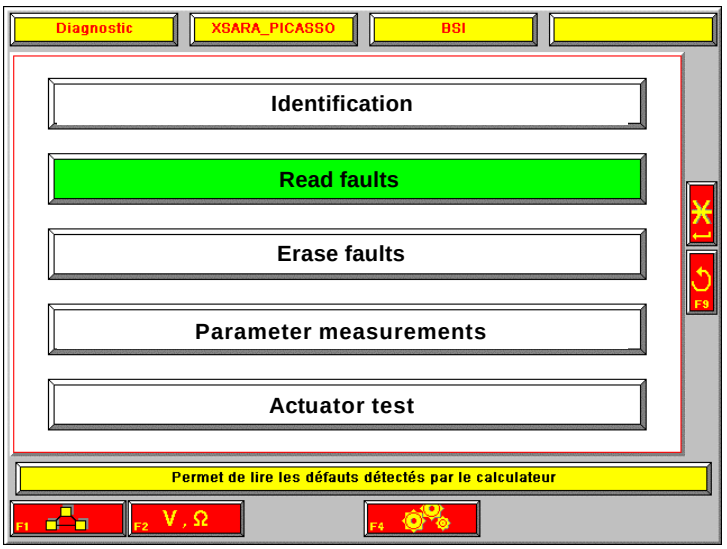
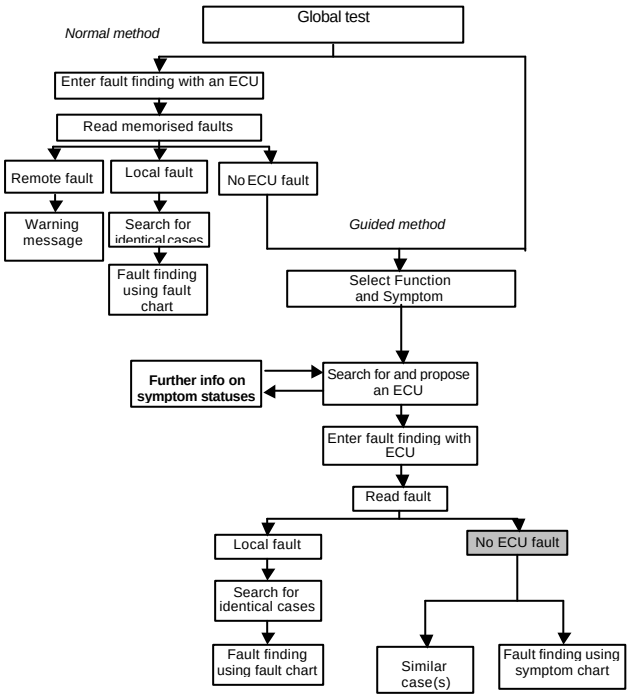


Two cases may then arise:

Case 1: the ECU does not contain a local fault code.

In this case, the user should start to look for similar cases given in the case base (CBR) or use the symptom charts available, with key F5 (guided method).



1x

Starts search for similar cases (CBR) and used to access symptom charts

Warning: *Remote* fault codes which may have been memorised by LEXIA are not displayed. The guided method has effectively incriminated the ECU currently being checked. This ECU is therefore at the origin of the fault. A *remote* fault memorised by this ECU is due to a fault affecting another ECU. The customer complaint, the cause of which is being sought, cannot therefore be due to a *remote* fault on the ECU being checked.

However, even if no faults are shown after reading the faults, the global test may show faults present in the ECU's memory (*remote* faults).

LEXIA then asks for more detailed information to be provided on the faulty function (appearance context, frequency, etc).

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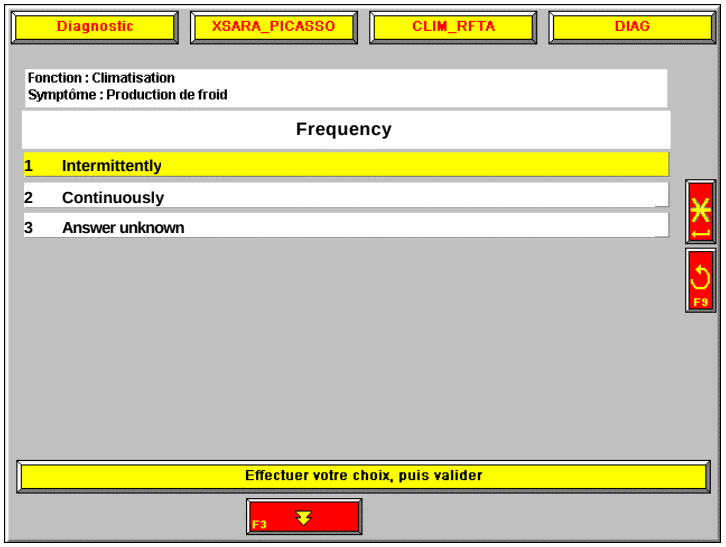

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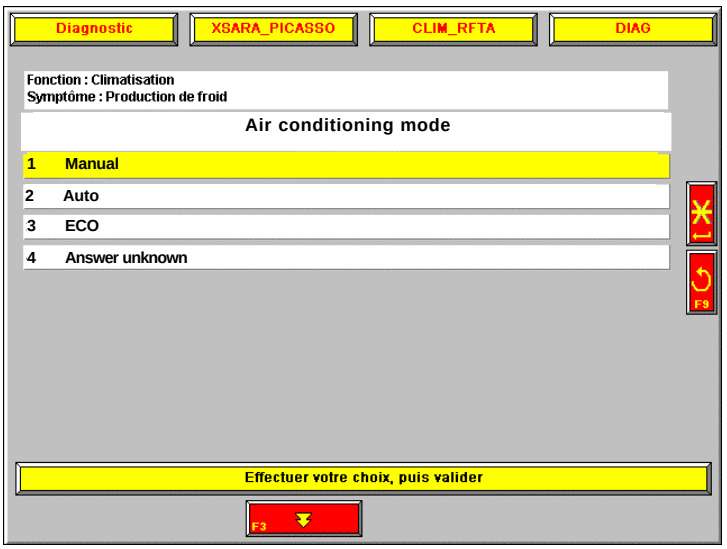
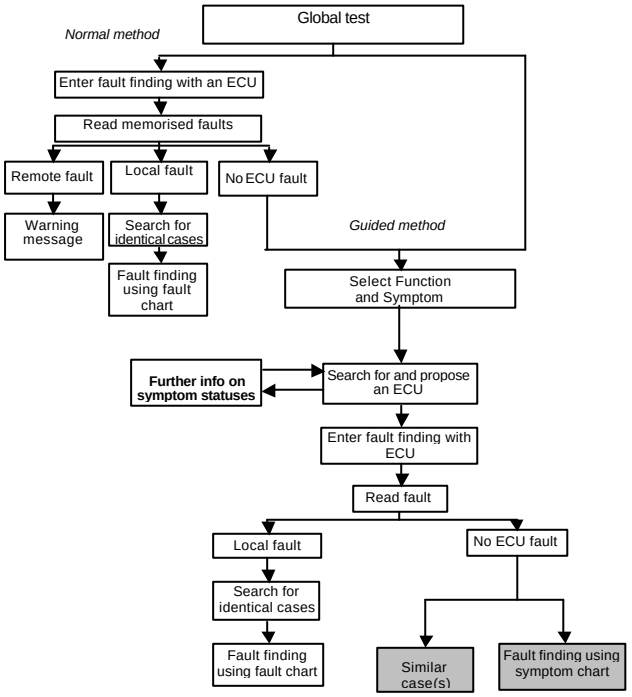


Once all these details have been given, LEXIA starts to search in the case base (CBR) and displays a list for the user of similar cases found (title of the case and similarity rating).



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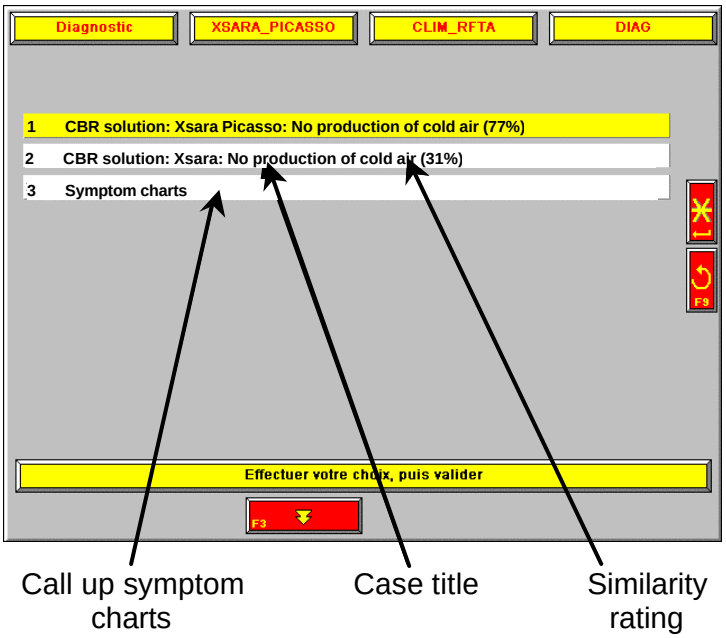
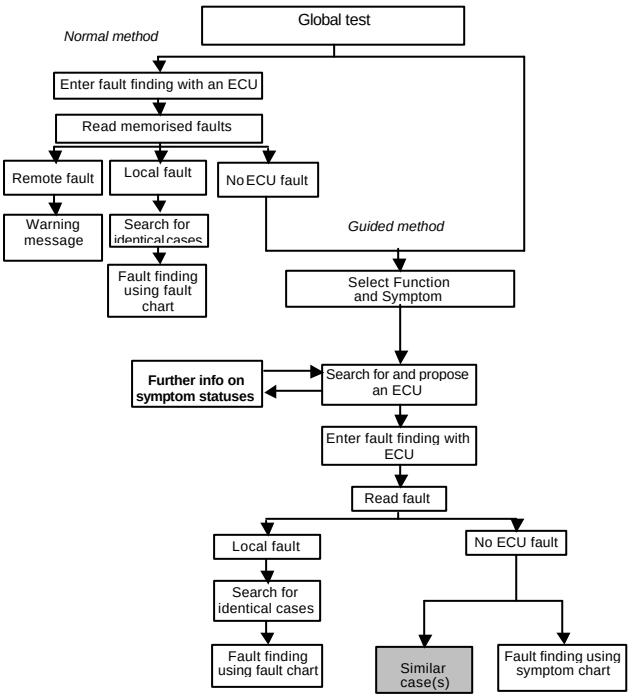


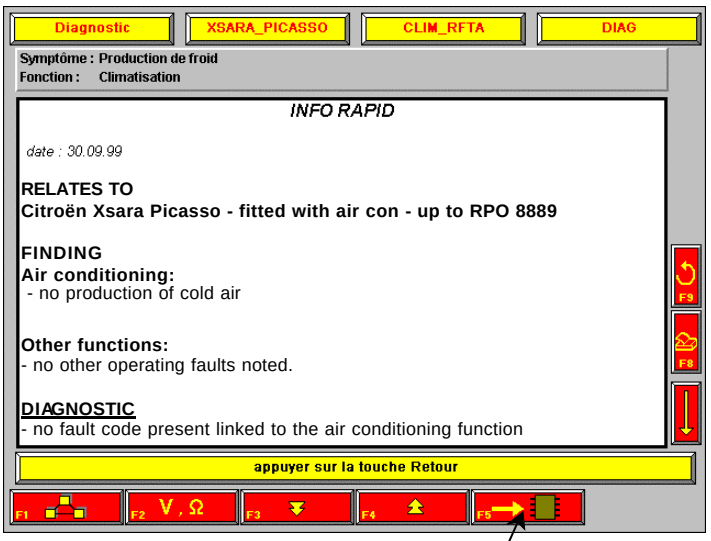
The user can then consult the symptom charts which correspond to faults which do not cause fault codes to appear. For example, for an engine problem, this may involve "the engine does not start" followed by a chart guiding the user, showing him all the points to be checked.

He may also consult the text of each of the similar cases (in the form of "Info Rapid") by selecting and validating it.

Note: *Access to the telecoding / downloading function of the ECU being checked is also possible from this screen.*



2b

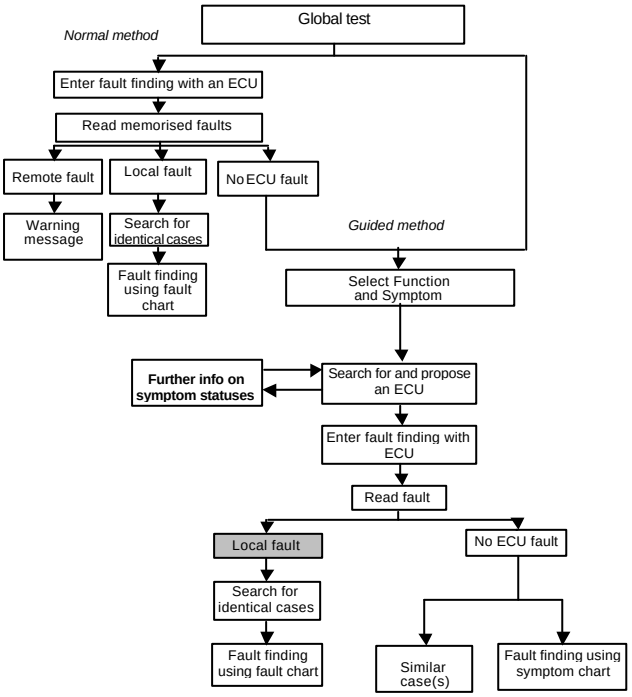


Downloading

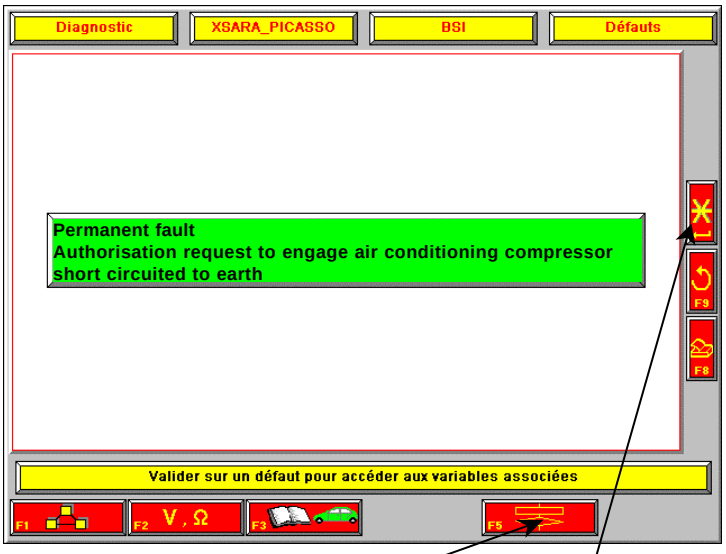
Case 2: the ECU contains at least one local fault.

The user must select the local fault he wants to deal with.

When they are available in the ECU being checked, the user can consult the variables associated to the selected fault code. These variables are used to ascertain the context within which the fault appeared.



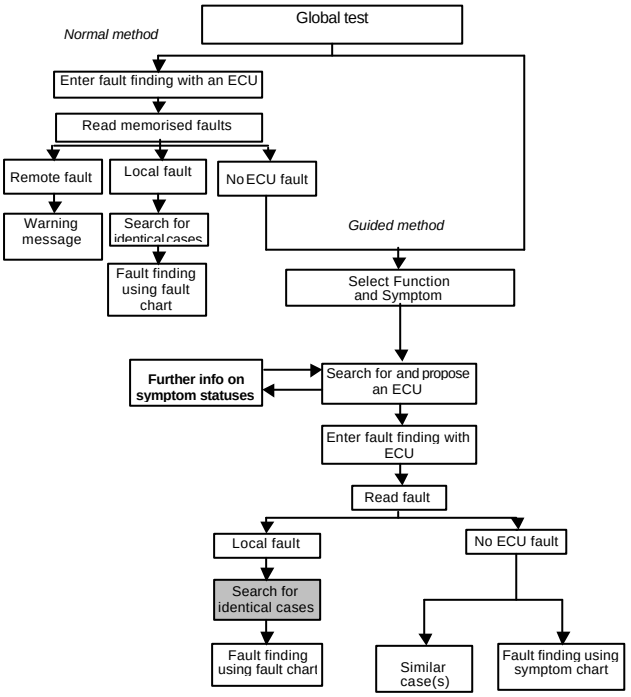
2c



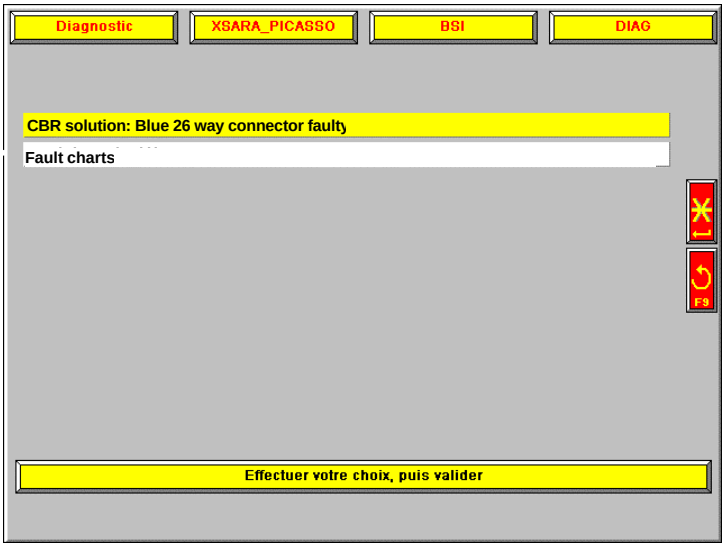
Access to the fault chart associated to the present fault code

Access to associated variables

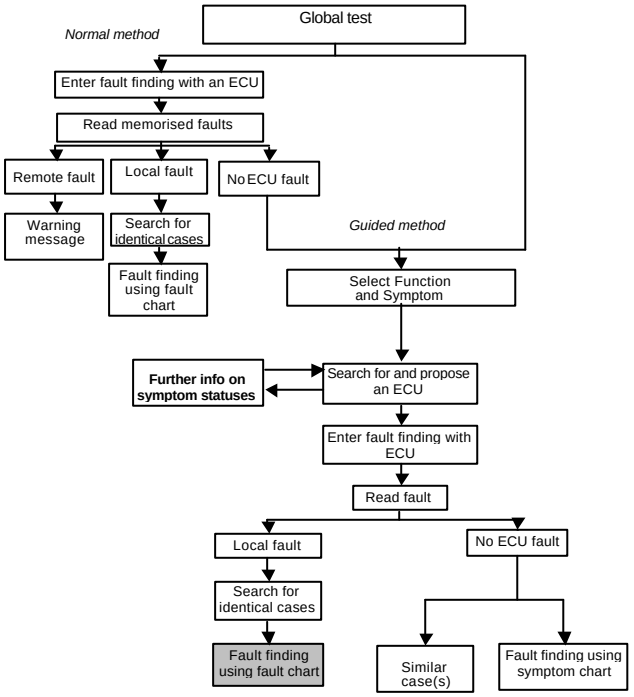
After calling up the guided method (key F5), LEXIA displays the list of identical known cases, if any exist in the case base (CBR). Using these cases means that the reason why the fault code was memorised can be located very quickly ("straight to the point" solution).



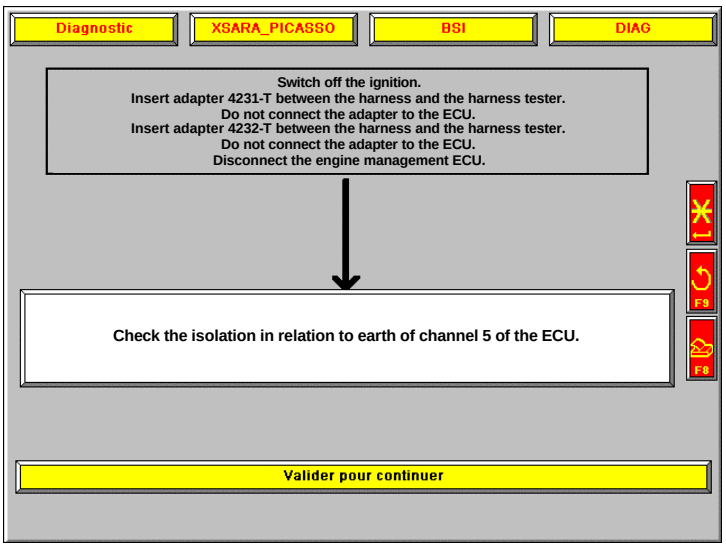
2d



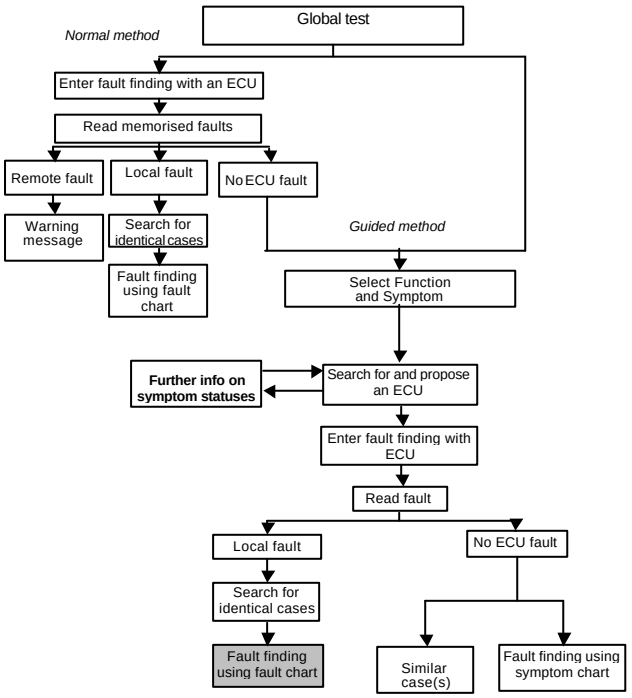
If there are no similar cases in the case base, the user should continue to search for the fault by starting the diagnostic chart, associated to the selected fault code, proposed by LEXIA.



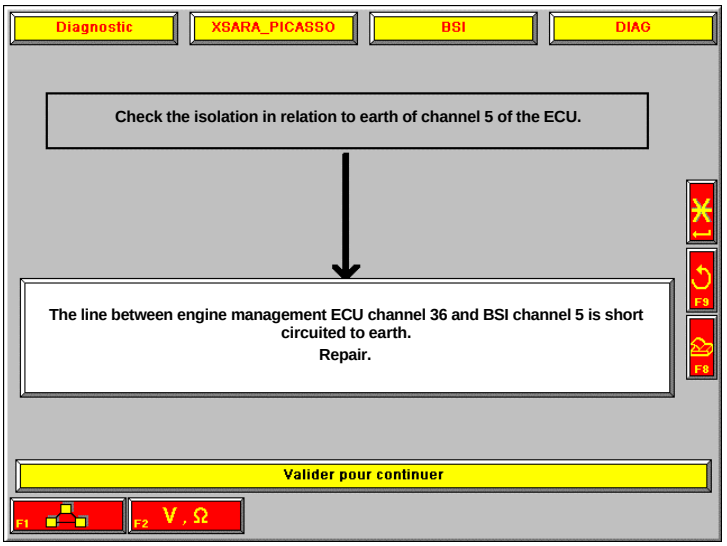
2e



The user should then follow the instructions given by the diagnostic chart step by step and perform the operations proposed. The successive checks performed by following the chart are used to locate the fault and thus determine the faulty component which was the reason why the fault code was memorised.

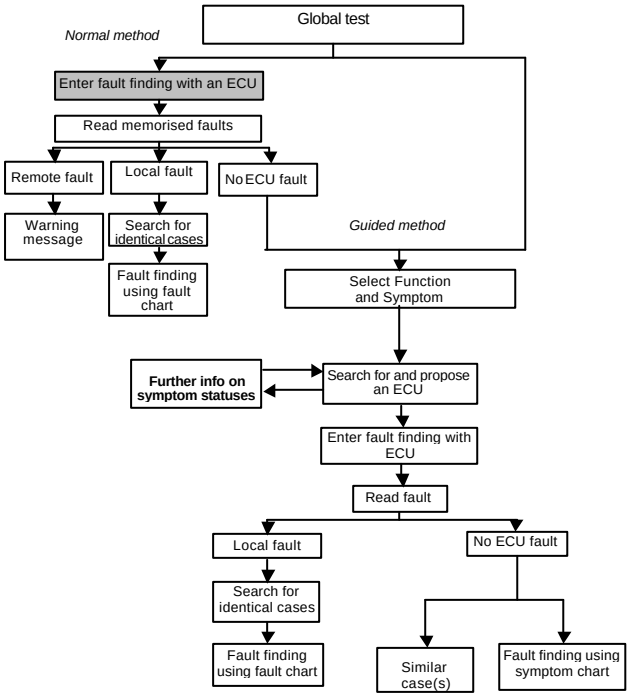


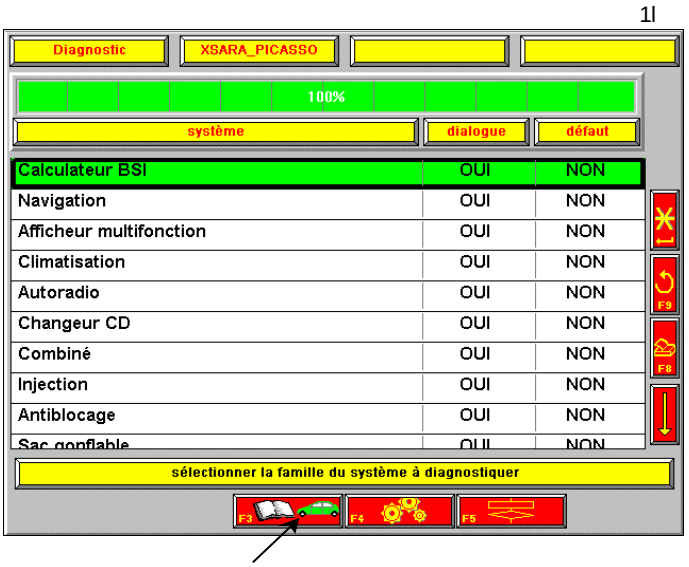
2f



FAULT FINDING WITHOUT USING THE GUIDED METHOD

LEXIA can be used to find a fault on a vehicle without using the guided method. In effect, it is possible to set up communications with an ECU selected by the user without him having to use the guided method beforehand. To do this, the user should select the ECU which he wants to check in the global test screen and then validate.





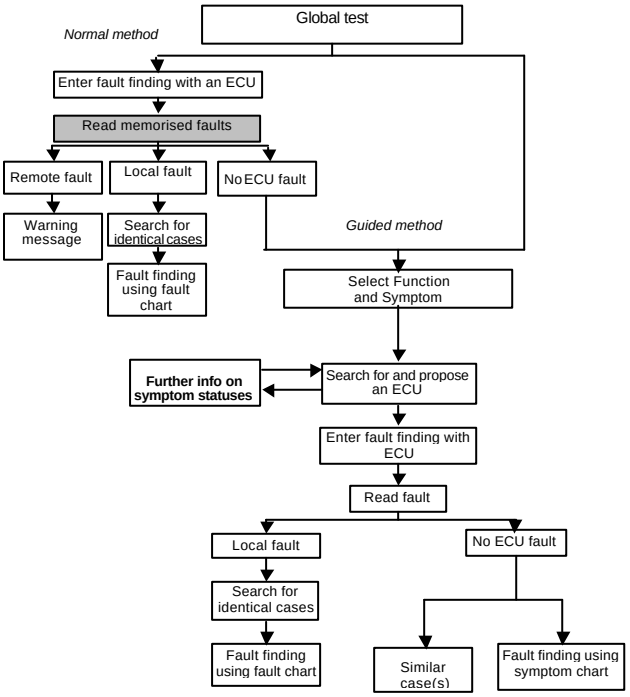
View the trace

The user should then read the faults.

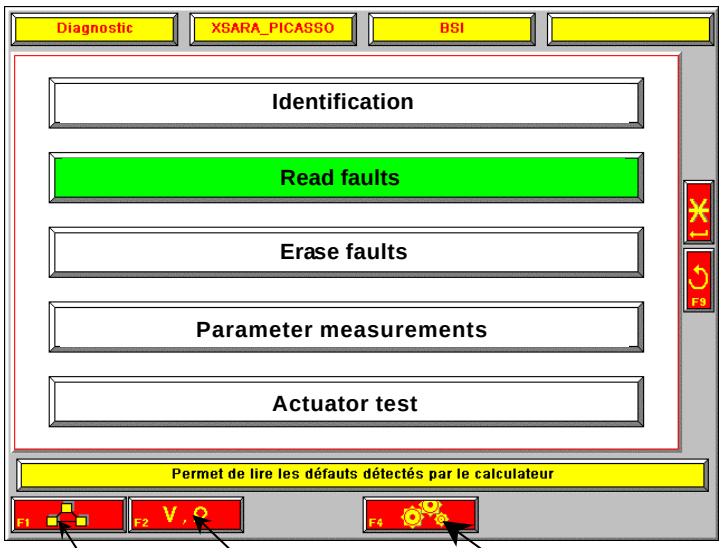
Note: *When icon F1 appears, the user can access the wiring diagrams of the ECU being checked. Then, he can access the layout diagrams by pressing the* 

1c *icon and the location diagrams with the* 

1d *icon.*



1w



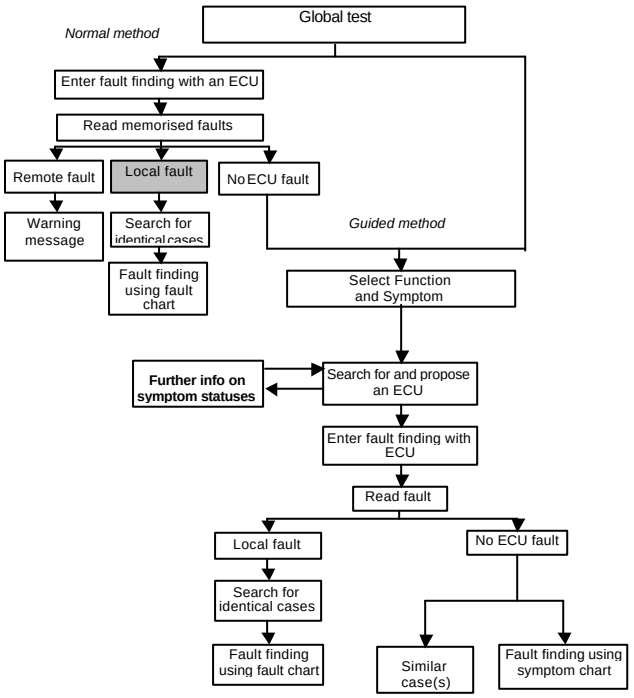
Several cases may then arise and some of the operating features of LEXIA should be detailed.

Case 1: the ECU contains a local fault code

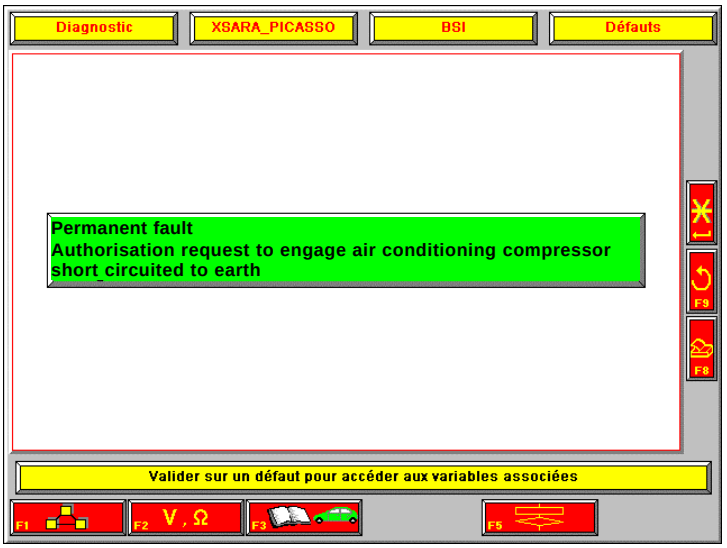
The user selects the *local* fault code which he wants to deal with.

To determine the faulty component causing the fault code to be memorised, fault finding can then be carried out by the user in the "normal" way by using the wiring diagrams and the physical measurement functions (oscilloscope, multimeter).

Note: In this screen, if the user presses the "guided method" icon (key F5), LEXIA starts searching for identical cases in the case base (CBR) and proposes to enter the fault finding chart for the selected fault code (see page 24).

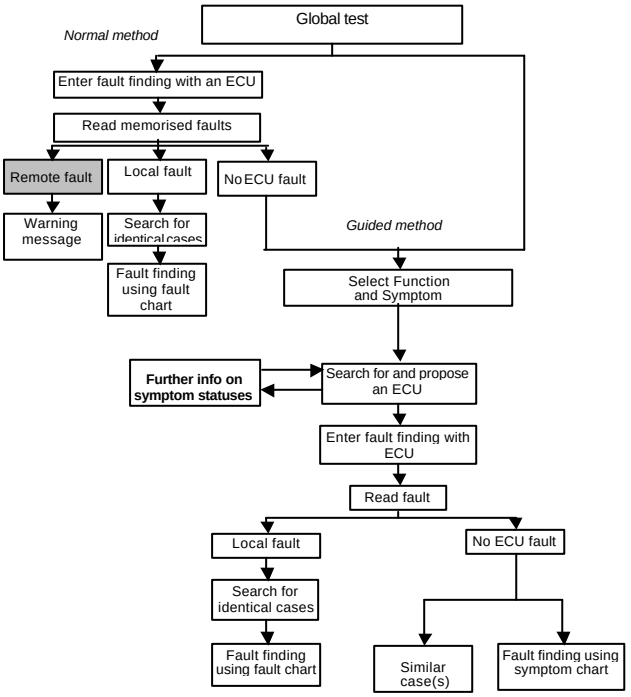

Global test
Normal method
Enter fault finding with an ECU
Read memorised faults
Remote fault
Local fault
No ECU fault
Warning message
Search for identical cases
Fault finding using fault chart
Guided method
Select Function and Symptom
Further info on symptom statuses
Search for and propose an ECU
Enter fault finding with ECU
Read fault
Local fault
No ECU fault
Search for identical cases
Fault finding using fault chart
Similar case(s)
Fault finding using symptom chart

2c

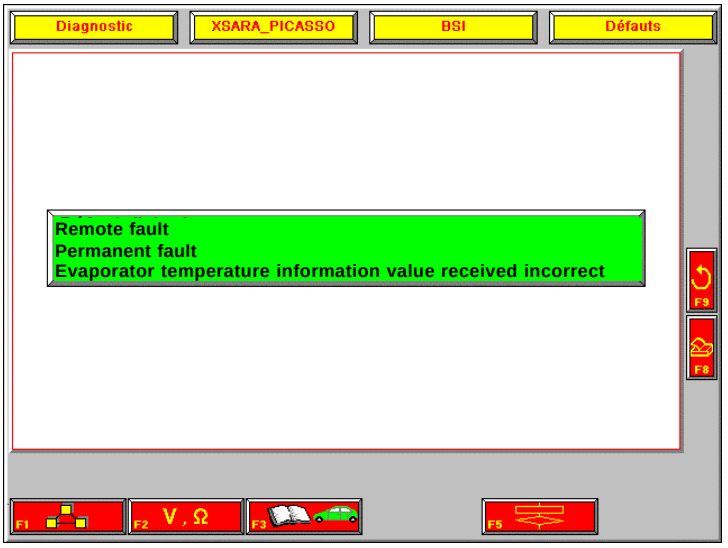

Diagnostic
XSARA_PICASSO
BSI
Défauts
Permanent fault
Authorisation request to engage air conditioning compressor short circuited to earth
F1
F9
F8
Valider sur un défaut pour accéder aux variables associées
F1
F2
V , Ω
F3
F5

Case 2: the ECU contains a remote fault code

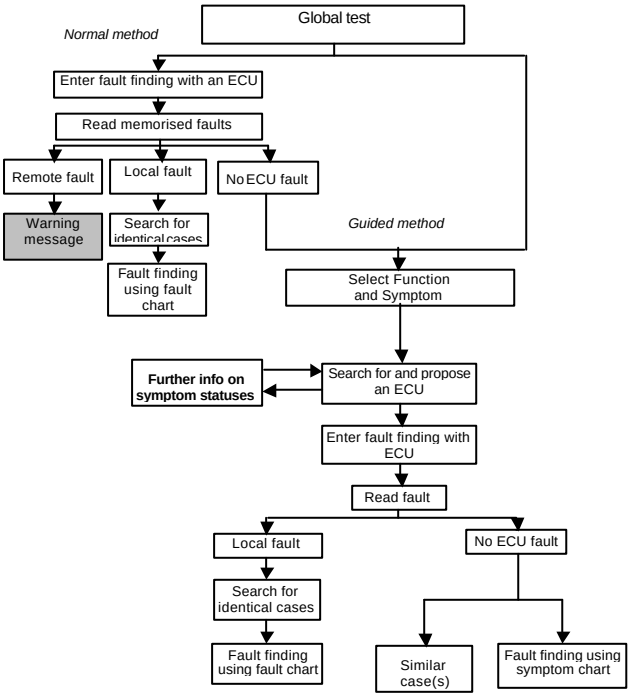
This remote fault code is due to a fault on a component which is not directly linked to the ECU being checked. The user must therefore call up the operating principles, so as to be able to determine which ECUs are functionally linked to the ECU being checked. This is done using key F4 which is accessible after having set up a dialogue with an ECU (see bottom RH diagram on page 17). The user must then set up a diagnostic with these identified ECUs and deal with the *local* fault codes memorised by these ECUs.



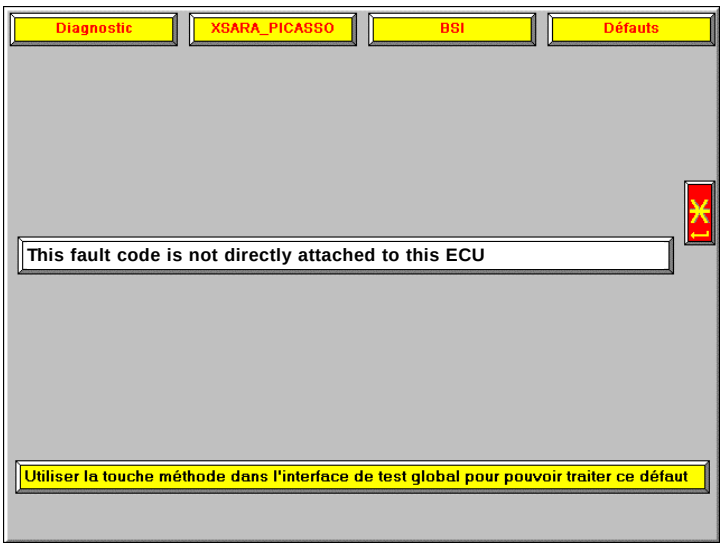
2g



Note: If the user selects the remote fault code and presses, in this screen, the "guided method" icon (key F5), LEXIA displays a warning message.



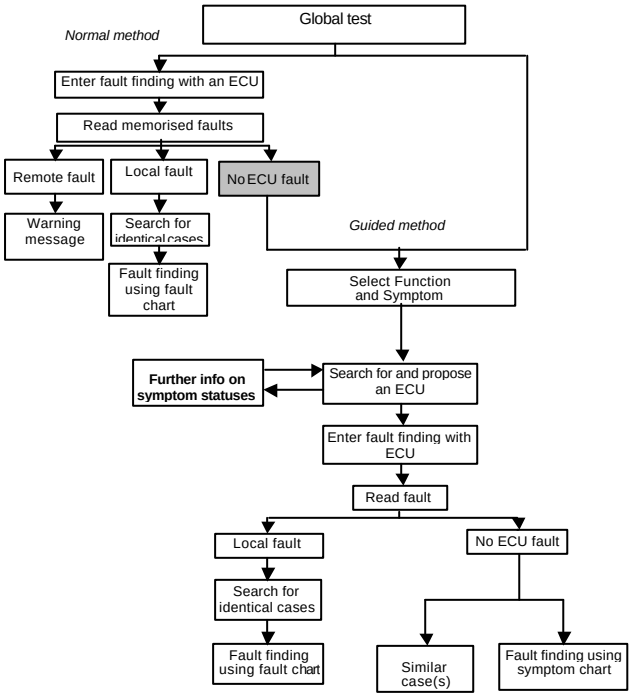
2h



Case 3: the ECU does not contain any fault codes

To determine the faulty component causing the problem being sought (customer complaint), the fault finding procedure can be performed by the user in a "normal" way, by using the wiring diagrams, physical measurement functions (multimeter, oscilloscope) and operating principles (key F4).

Note: In this screen, if the user presses the "guided method" icon (key F5), LEXIA proposes the list of the vehicle's multiplexed functions (see page 13), then calls up the DIAGSYS model.



1x