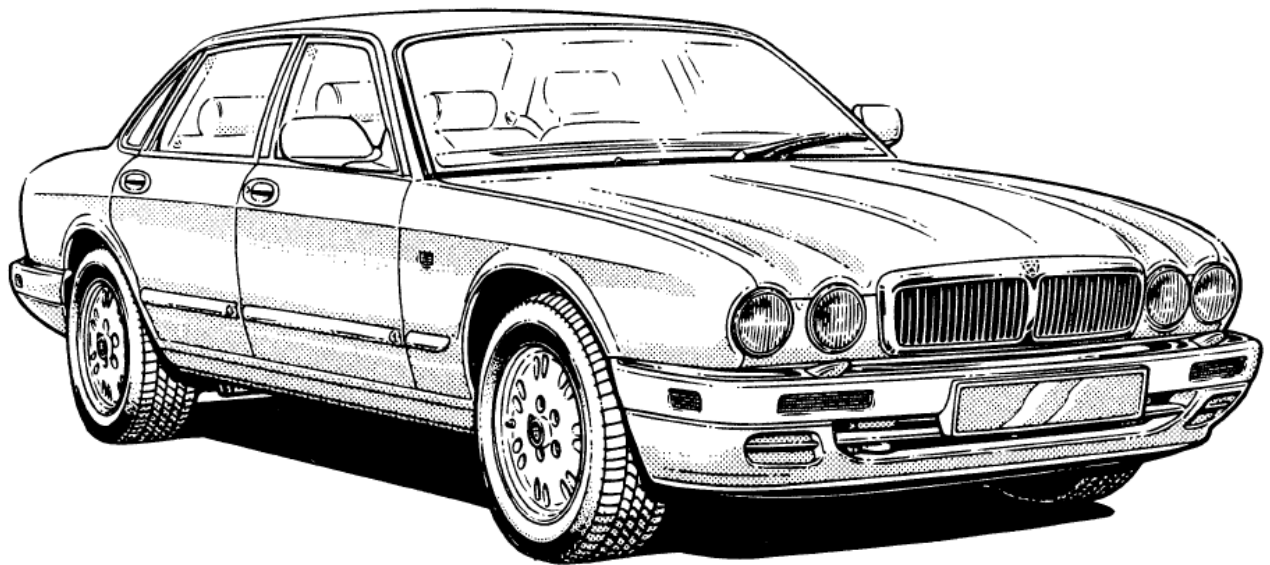


1995 Jaguar X300

Air Bag Diagnostics

FOR
DUMMIES[®]



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Introduction

The Air Bag system in the 1995 X300 is quite basic. It is not integrated with the rest of the cars electronics and fault codes can only be read with dedicated equipment. Not even the Jaguar VCM/IDS system can access the fault codes.

However, using basic tools and a systematic approach, it is reasonably simple to diagnose at least where the majority of issues are coming from. All of the information for diagnosis is available in the Jaguar manual/JTIS which is commonly available. Much of following information is just a rehash of that information in an easier to follow format (hopefully) with some added tips and workarounds.

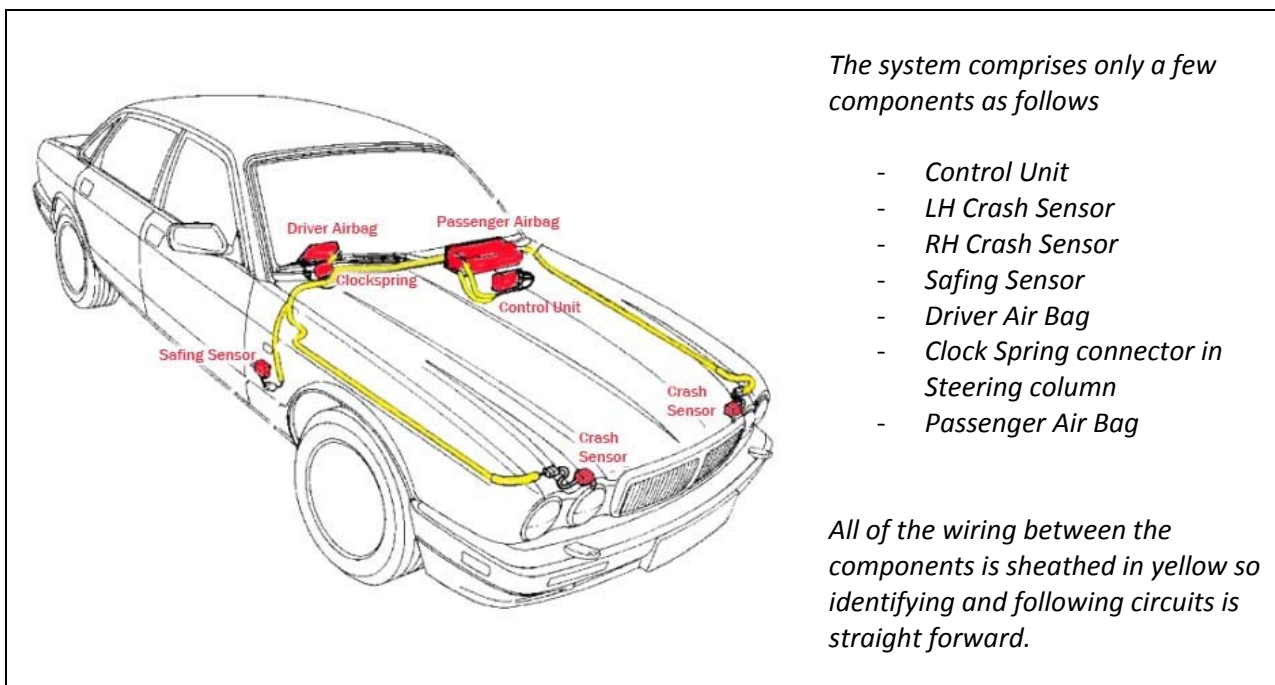
The details here are based on my 1995 Right Hand Drive model, but as far as I'm aware the system was the same in 96 and 97 models also. Left Hand Drive models will differ in layout but operation should be the same.

Limitations

In writing this it is assumed that the reader has a basic understanding of electrical circuits and that you know how to use a Digital Multimeter. Furthermore, the intention here is to help identify which component is causing the Air Bag fault. It does not cover further investigation of the identified fault.

So for example, if the diagnosis suggests that there is a fault on LH Crash Sensor Ground, it is assumed that you can investigate the problem by tracing the circuit from the control unit to the sensor and carry out appropriate tests to specifically identify the root cause.

System Components and Fault Monitoring



For the most part the diagnostic system in the control unit monitors the circuits for the components and will flag an Air Bag warning light for normal electrical circuit issues (open circuit, high resistance etc.). All of these can be measured at the control unit by back-probing the connector with a basic digital multi meter. There are

other conditions that will cause an Air Bag light (such as internal Control module failure) but for these are beyond the scope of this document.

Normal Operation

Before we start any tests, let's just recap on what normal operation of the Air Bag system looks like.

1. When Ignition is switched on, the SRS light in bottom right of dash will illuminate. This should stay illuminated for 6 seconds and then go out – even if there is a fault in the system.
2. If there is a current fault, the light will illuminate again after a second or two and the “AIRBAG” message will be displayed on the dash.
3. If the light does not go out at step one above, that would be because of a fault with the SRS light circuit.
4. If the light does not appear at all, then that would be either a fault on the light circuit or lack of ignition feed to the ABS ECU.
5. If there is a fault with the indicator light circuit, and there is also a fault with the Air Bag system, the Air Bag ECU will emit 5 beeps every 30 minutes while the car is being driven.



The SRS Light and “AIRBAG” words will appear if there is a system fault after the initial extinguishing of the SRS Light when the Ignition is turned on.

Air Bag Warning Light and Message Reset

The SRS Warning Light and the AIRBAG Message warning do not require to be reset. The system carries out a self diagnosis test on each ignition on power up. If a fault exists at the time of the test then the warning light is illuminated and the message displayed.

If faults do not exist at the time of the test, the warning will not be displayed.

TESTING

WARNING BEFORE YOU START

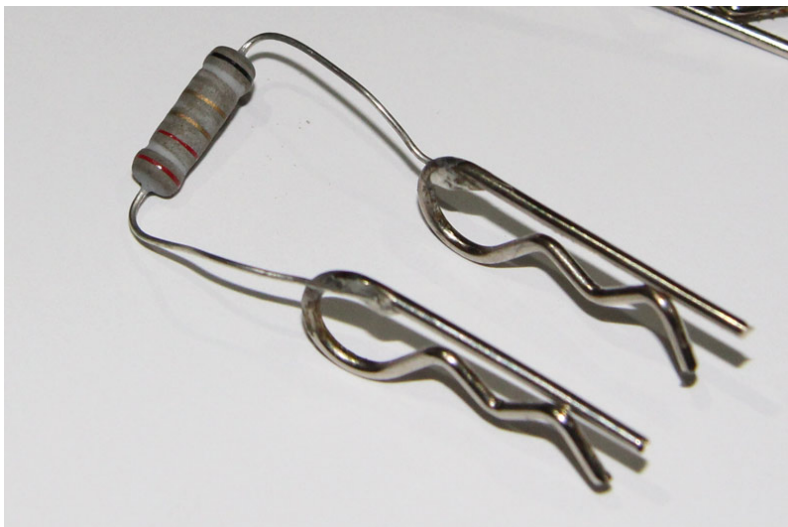
AIR BAGS ARE EXPLOSIVE DEVICES AND MUST BE TREATED WITH RESPECT. DO NOT CARRY OUT ANY TESTS WHILE THE SYSTEM IS ARMED AND THE AIRBAGS ARE IN PLACE.

Tools Required

1. Digital Multi Meter capable of measuring voltage and resistance. It will make life easier if you have needle type probes to enable readings to be taken at the back of the Control Unit connector while the connector is still plugged in to the control unit.



2. Air Bag Simulation Tool – You will need to make your own air bag simulation tool – two of them. This is very simple. For each one you will need a 2.5 ohm resistor (cost pennies from electronics stores like Maplins, or from ebay) and a couple of paper clips or similar to allow connection of the resistor to the air bag connector. Solder the resistor to the clips to make something that looks like this.



Air Bag Simulator


Diagnosis Process

The following is a simple step by step guide. It is the suggested sequence for working through the components in the system to identify which one is causing the problem. The sequence is as follows:

1. Driver Air Bag Test
2. Clock Spring Test
3. Passenger Air Bag Test
4. Control Unit Power and Ground Test
5. Left Hand Crash Sensor Test
6. Right Hand Crash Sensor Test
7. Safing Sensor Test
8. What to do Next


Each test is presented as a separate Section below, and it is assumed that the above sequence is being followed.

1. Driver Air Bag Test


Step 1 – Disarm the System	Disconnect the battery and wait 5 minutes.
Step 2 – Remove the Driver Air Bag	Remove the Driver Air bag from the steering wheel.
Step 3 - Install Simulator	Install one of your Air Bag simulator tools on to the connector in the loom in place of the Driver Air Bag.  b1mcp
Step 4 - Test	Reconnect the battery and turn on ignition. If the air bag light goes out you have diagnosed that the Driver Air Bag is causing the fault.
Step 5	If the light remains on go to the next test


2. Clock Spring Test

Step 1 – Disarm the System	Disconnect the battery and wait 5 minutes.
Step 2 – Remove the Simulator	Remove your Air Bag simulator tool from the connector in the Steering wheel.
Step 3 – Disconnect the Clock Spring	Move down the steering column and disconnect the loom at the connector for the Steering column clock spring. Look for the yellow sheathing and for a similar connector to the one in the steering wheel.
Step 4 – Install Simulator	Connect your Air Bag simulator tool to the loom at this point. This is effectively bypassing the clock spring in the column and connecting the Air Bag (simulator) directly to the Air Bag control unit.

	
Step 5 - Test	Reconnect the battery and turn on ignition. If the air bag light goes out you have diagnosed that the Clock Spring mechanism is causing the fault.
Step 6	If the light remains on go to the next test

3. Passenger Air Bag Test

Step 1 – Disarm the System	Disconnect the battery and wait 5 minutes.
Step 2 – Leave Simulator in place	Leave the simulator connected to the loom at the Clock Spring connector point as in Step 2 above.
Step 2 – Disconnect the Passenger Air Bag	Disconnect the Passenger Air bag . There is no need to remove the Passenger Air bag at this point. The connector location is shown in this picture. (This is after removal of the Knee Bolster or Glovebox depending on what you have) 

<p>Step 3 - Install Simulator</p>	<p>Install the second Air Bag simulator tool on to the connector in the loom in place of the Passenger Air Bag.</p> 
<p>Step 4 - Test</p>	<p>Reconnect the battery and turn on ignition.</p> <p>If the air bag light goes out you have diagnosed that the Passenger Air Bag is causing the fault.</p>
<p>Step 5</p>	<p>If the light remains on, continue as below.</p>

If you still have a warning light at this point then we know that the Air Bags and the Clock Spring are not the fault (or at least they are not the only fault – you may be unlucky and have multiple faults!). We now need to move on to testing the at the Air Bag control unit.

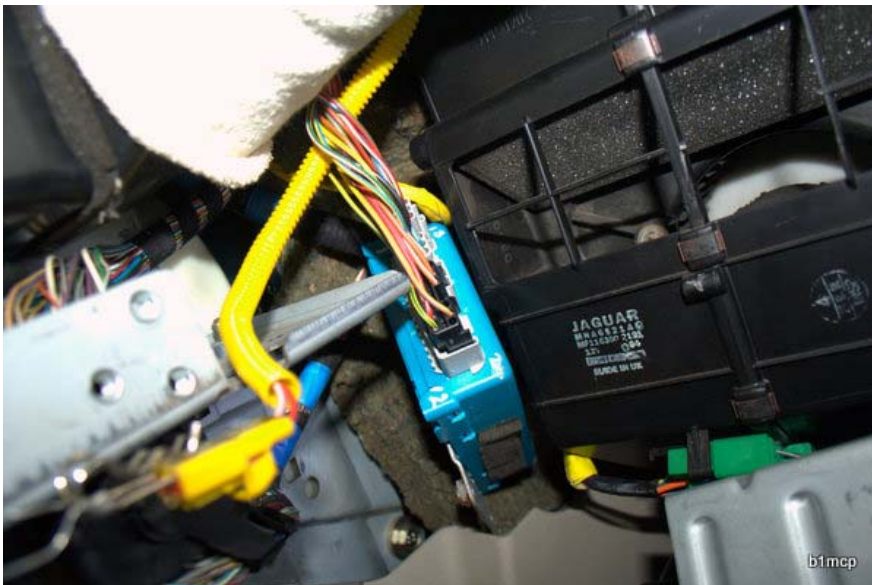
At this point both Air Bags have been removed/disconnected from the system and we have simulators in their place on both sides. So it is safe to leave the battery connected to carry out the remaining tests. If the Air Bags have not been disconnected, go back and complete sections 1, 2 and 3 before continuing.

Aig Bag Control Unit Tests

For the remaining tests we need access to the Air Bag Control Unit. It needs to remain plugged in to the loom and we need to be able to back probe the multi plug connector. You will now need to remove the Passenger Air Bag and enough of the brackets behind it to give easy access to the Air Bag ECU multi plugs.



Location of the Air Bag ECU. This sits directly behind the Passenger Air Bag (which has been removed in this picture)



Remove enough of the brackets to be able to position the ECU for access to the back of the multiplugs while still connected to the ECU.

ECU Pin Numbering Confusion

The JTIS manual provides 3 key references for the the Air Bag unit as follows:

Electrical Diagnostics Manual Section 215-15.1.4 - Provides Pin No.s for the diagnostic tests and a picture of the module showing the pin location. Pins are numbered 1 - 24

Electrical Guide – Control Module Connector Pin Identification and Location – Shows a more detailed picture of the pins and cable colours connected to them. Pins are numbered 1-12 for each of the 2 connectors (Black and Slate) but these appear to be orientated incorrectly.


Electrical Guide Wiring Diagrams – Shows the complete wiring with Plug Pin references for the ECU. This is consistent with Connector Pin Identification numbers above, but shows the LH and RH Crash Sensors reversed with reference to the Electrical Diagnostics Manual

It took me some time to work out the correlation between the above inputs and to verify them with reality on the actual unit. To save you that pain, I have redrawn the key diagram and marked it with the correct numbers in the correct orientation. This is shown at the back of this document.

Additionally, I have included a copy of the Wiring diagram with some annotations that may help. This is also at the end of this document.

To make life easier in remembering which pin is 1 etc. I suggest you print the diagram of the ECU module and stick it to the heater blower for easy reference while you are carrying out the tests.

4. ECU Power and Ground Test


<p>Step 1 – Check that system is not armed</p>	<p>If you have followed the above sequence then both Driver and Passenger Air Bag should have been removed from the car and replaced with Simulators. This is essential before continuing.</p>
<p>Step 2 – Check permanent Power</p>	<p>Confirm Battery Voltage (B+) between Pin 13 and known good ground with Ignition OFF.</p> <p>If not present, check fuse 17 RH Heel Board and associated wiring</p>
<p>Step 3 – Check Ignition Power</p>	<p>Confirm B+ voltage between Pin 1 and known good ground with Ignition ON</p>  <p>If not present, check fuse 16 in Boot and associated wiring</p>
<p>Step 4 – Compare Voltages on Pin 1 and 3</p>	<p>Confirm voltage on Pin 1 and Pin 13 is the same value (a difference indicates a wiring problem In one of the power circuits)</p> <p>If different check for faulty wiring, corroded terminals.</p>
<p>Step 5 – Confirm Ground Pins</p>	<p>Next tests assume B+ voltage found at Pin 1 in Step 1 above</p>


	<p>Pin 3 - Connect meter (set for voltage) between Pin 1 and Pin 3 (Ground). Confirm B+ reading</p> <p>If not present check ground stud LH A Post and associated wiring.</p> <p>Pin 5 - Connect meter (set for voltage) between Pin 1 and Pin 5 (Ground). Confirm B+ reading</p> <p>If not present check ground stud LH A Post and associated wiring.</p>
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The above steps have confirmed basic power and ground to the ECU. If no fault has been found, move on to the tests below for each component.

5. Air Bag Circuit Test

We have previously substituted Air Bag Simulators in place of the actual Air Bags. We need to also confirm the integrity of the circuits to and from the Air Bags.

<p>Step 1 – Check that system is not armed</p>	<p>If you have followed the above sequence then both Driver and Passenger Air Bag should have been removed from the car and replaced with Simulators. This is essential before continuing.</p>
<p>Step 2 – Check Passenger Air Bag Circuit</p>	<p>Ignition Off.</p> <p>Connect meter (set for resistance) between Pin 8 and Pin 9. This reading should be equal to the resistance value of your Air Bag Simulator resistor (2.5 Ohms give or take).</p> 

<p>Step 3 – Check Driver Air Bag Circuit</p>	<p>Ignition Off. Connect meter (set for resistance) between Pin 10 and Pin 11. This reading should be equal to the resistance value of your Air Bag Simulator resistor (2.5 Ohms give or take).</p> 
<p>Allowable Values</p>	<p>The ECU will set a fault code if the resistance measured in Step 2 or Step 3 above is:</p> <p>Lower than 0.7 ohms (Code 34 – Driver, Code 35 – Passenger)</p> <p>Or</p> <p>Higher than 4.0 ohms (Code 32 – Driver, Code 33 –Passenger)</p>

6. RH Crash Sensor Test

<p>Step 1 – Check that system is not armed</p>	<p>If you have followed the above sequence then both Driver and Passenger Air Bag should have been removed from the car and replaced with Simulators. This is essential before continuing.</p>
<p>Step 1 – RH Crash Sensor Feed (Voltage supply)</p>	<p>Ignition Off. Connect meter (set for voltage) between Pin 17 and Pin 3 (Ground). B+ voltage should be seen.</p>

<p>Step 2 – RH Crash Sensor Monitor (Voltage return)</p>	<p>Ignition Off. Connect meter (set for voltage) between Pin 2 and Pin 3 (Ground). B+ voltage should be seen. Less than 5 volts would cause a fault code (14) – likely short to ground in the sensor or the wiring to it.</p> <p>Voltage in Step 1 and Step 2 should be identical – if not there is a resistance in the feed or return wiring.</p> <p>Note that if Fault Code 14 occurs, the unit will blow an internal fuse. This is not replaceable and the whole unit must be replaced. Ensure that the voltage issue is resolved before a replacement unit is connected.</p>
<p>Step 3 – RH Crash Sensor Ground Monitor</p>	<p>Ignition Off. Measure resistance between Pin 3 (Module Ground) and Pin 20 (RH Crash Sensor Ground). Resistance should be less than 2 ohms.</p> <p>The sensor is grounded through its casing. Check for corrosion on mounting surface. Check for short in wiring.</p>

7. LH Crash Sensor Test

<p>Step 1 – Check that system is not armed</p>	<p>If you have followed the above sequence then both Driver and Passenger Air Bag should have been removed from the car and replaced with Simulators. This is essential before continuing.</p>
<p>Step 1 – LH Crash Sensor Feed (Voltage supply)</p>	<p>Ignition Off. Connect meter (set for voltage) between Pin 18 and Pin 3 (Ground). B+ voltage should be seen.</p>
<p>Step 2 – LH Crash Sensor Monitor (Voltage return)</p>	<p>Ignition Off. Connect meter (set for voltage) between Pin 6 and Pin 3 (Ground). B+ voltage should be seen. Less than 5 volts would cause a fault code (14) – likely short to ground in the sensor or the wiring to it.</p> <p>Voltage in Step 1 and Step 2 should be identical – if not there is a resistance in the feed or return wiring.</p> <p>Note that if Fault Code 14 occurs, the unit will blow an internal fuse. This is not replaceable and the whole unit must be replaced. Ensure that the voltage issue is resolved before a replacement unit is connected.</p>
<p>Step 3 – LH Crash Sensor Ground Monitor</p>	<p>Ignition Off. Measure resistance between Pin 3 (Module Ground) and Pin 21 (LH Crash Sensor Ground). Resistance should be less than 2 ohms.</p> <p>The sensor is grounded through its casing. Check for corrosion on mounting surface. Check for short in wiring.</p>

8. Safing Sensor Test

<p>Step 1 – Check that system is not armed</p>	<p>If you have followed the above sequence then both Driver and Passenger Air Bag should have been removed from the car and replaced with Simulators. This is essential before continuing.</p>																		
<p>Step 1 – Safing Sensor Feed (Voltage supply)</p>	<p>Ignition Off. Connect meter (set for voltage) between Pin 15 and Pin 3 (Ground). B+ voltage should be seen.</p>																		
<p>Step 2 – Safing Sensor Monitor (Voltage return)</p>	<p>Ignition Off. Connect meter (set for voltage) between Pin 23 and Pin 3 (Ground). B+ voltage should be seen.</p>																		
<p>Step 3 – Safing Sensor Output Monitor</p>	<p>Ignition On. The Safing Sensor receives a voltage feed from the Airbag input (Pin 11) and this is monitored as a return on Pin 12.</p> <p>Compare the voltage between Pin 11/Ground with the voltage on Pin 12/Ground.</p> <p>These should be identical, and should be roughly 25% of battery voltage. The following table is a representation of expected results.</p> <table border="1" data-bbox="634 1146 1398 1220"> <tr> <td>Batt V</td> <td>10.0</td> <td>10.5</td> <td>11.0</td> <td>11.5</td> <td>12.0</td> <td>12.5</td> <td>13.0</td> <td>13.5</td> </tr> <tr> <td>Pin V</td> <td>2.5</td> <td>2.7</td> <td>2.8</td> <td>3.0</td> <td>3.1</td> <td>3.2</td> <td>3.4</td> <td>3.5</td> </tr> </table>	Batt V	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	Pin V	2.5	2.7	2.8	3.0	3.1	3.2	3.4	3.5
Batt V	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5											
Pin V	2.5	2.7	2.8	3.0	3.1	3.2	3.4	3.5											
<p>Step 3 – Safing Sensor Ground Monitor</p>	<p>Ignition Off. Measure resistance between Pin 3 (Module Ground) and Pin 16 (Safing Sensor Ground). Resistance should be less than 2 ohms.</p> <p>The sensor is grounded through its casing. Check for corrosion on mounting surface. Check for short in wiring.</p>																		

What Next?

We have reached the end of the tests covered by this document. If you have found your problem then congratulations!

If you haven't ... If you have carried out all of the tests documented here and all of them have produced the expected results then there is more than a simple component or wiring problem.

Here are the options

- Within the Jaguar Air Bag/SRS Diagnostic manual there are a few more tests that are complex to explain here without repeating what it says verbatim. You could try those and see.
- Find a Jaguar dealer or Independent that has the necessary equipment to read codes directly from the module (there are very few of these now).
- You could take a flyer and replace the Air Bag ECU. I would normally counsel against replacing a module without proof that it is faulty. We don't have proof here but it is a probability. I would feel justified given that the cost of second hand units is reasonable and you have carried out as much testing as possible.

ECU Fault Code Cross Reference

Fault Code	Fault Description	Test Cross Reference
12	Low Battery Voltage	Section 4
13	Airbag Shorted to Ground	Section 5
14	Front Impact Sensor Circuit Shorted to Ground	Section 6 and 7
21	Safing Impact Sensor Incorrectly Mounted to Vehicle	Section 8
22	Safing Impact Sensor Output Circuit Shorted to Battery Voltage	Section 8
23	Safing Impact Sensor Input Feed / Return Open Circuit	Section 8
24	Safing Impact Sensor Output Feed / Return Open Circuit	Section 8
32	Driver-side Airbag Circuit High Resistance or Open	Section 5
33	Passenger-side Air Bag Circuit High Resistance or Open	Section 5
34	Driver-side Airbag Circuit Low Resistance or Shorted	Section 5
35	Passenger-side Airbag Circuit Low Resistance or Shorted	Section 5
41	Front Right Impact Sensor Feed / Return Open Circuit	Section 6
42	Front Left Impact Sensor Feed / Return Open Circuit	Section 7
44	Front Right Impact Sensor Incorrectly Mounted to Vehicle	Section 6
45	Front Left Impact Sensor Incorrectly Mounted to Vehicle	Section 7
51	Diagnostic Monitor Internal Thermal Fuse - Intermittent Short to Ground	None
52	Back-up Power Supply - Voltage Boost Fault	None
53	Front Impact Sensor Circuits Resistance to Ground or Internal Diagnostic Monitor Failure	Part Section 6 and 7
None	Rapid Continuous Mil Lamp Flashing	None
None	No Airbag Mil Lamp	None
None	Continuous Airbag Mil Lamp Illumination	None

ECU Pin / Plug Pin / Colour / Function Cross Reference

	Pin	Plug	Colour	Circuit	Pin	Plug	Colour	Circuit
Slate Plug	1	AB1-1	LGS	Battery Volts - Ignition Switched	13	AB1-7	RW	Battery Volts – Permanent
	2	AB1-2	ON	RH Impact Sensor Monitor (Return)	14	AB1-8		--
	3	AB1-3	B	Ground	15	AB1-9	RN	Safing Sensor Feed
	4	AB1-4	YW	Instrument Pack Interface - MIL Lamp	16	AB1-10	RG	Safing Sensor Ground Monitor
	5	AB1-5	B	Ground	17	AB1-11	KU	RH Impact Sensor Feed
	6	AB1-6	YU	LH Impact Sensor Monitor (Return)	18	AB1-12	KG	LH Impact Sensor Feed
Black Plug	7	AB2-1		--	19	AB2-7		--
	8	AB2-2	RP	Passenger Airbag Feed	20	AB2-8	OP	RH Impact Sensor Ground Monitor
	9	AB2-3	KP	Passenger Airbag Return	21	AB2-9	OW	LH Impact Sensor Ground Monitor
	10	AB2-4	KN	Driver Airbag Return	22	AB2-10		--
	11	AB2-5	RP	Driver Airbag Feed	23	AB2-11	YP	Safing Sensor Monitor (Return)
	12	AB2-6	YG	Safing Sensor Monitor (Output)	24	AB2-12		--

Air Bag ECU Pin Out

The diagram represents the view of the multi plugs when connected to the Air Bag Control Unit.

The numbers indicated on the Grey and Black plugs are the pin numbers and cable colours of the plugs that are used in the JTIS wiring diagram.

The numbers in the blue box are the sequential numbers 1-24 used in the JTIS Electrical Diagnosis manual for the Air Bag system.

The diagram is an amended copy of the JTIS modules page. The original page shows this picture inside out and upside down or something like that

Colour Key	
B	Black
G	Green
K	Pink
LG	Light Green
N	Brown
O	Orange
P	Purple
R	Red
S	Slate
U	Blue
W	White
Y	Yellow



