WABCO SLABS - System Overview

This ECU is a very interesting and unusual combination of ABS and Air suspension control within one ECU unit. It would not be so interesting if Wabco did not also produce a range of ECU's which were visually identical other than being only 2 thirds of the width of this ECU and having only 3 out of the five connectors on them. This ECU is fitted to all Discovery series 2 vehicles regardless of weather they are Air or Coil sprung, and as such the Air suspension can be disabled. The software running inside the system seems to be created using any number of software module components picked to suit each application which may explain why so many visually similar family members have such differing diagnostic communications and features. The ECU has been the subject of several replacement campaigns. The ECU also loses communication once a certain speed is reached (8km/h). This is a manufacturing design and cannot be overridden.

WABCO SLABS - Known Fitments

Vehicle makes models and variants known or believed to be using this vehicle system, required diagnostic lead and degree of known compatibility.

Vehicle Make	Vehicle Model	Vehicle Variant	Diagnostic Lead	Compatibility Level
Land Rover	Discovery II	All	Blue OBD Lead	Verified
Land Rover	Discovery II	All	Green OBD Lead	Verified

WABCO SLABS - Diagnostic Capabilities Read Fault Codes/Clear Fault Codes

This reads the Self Leveling Anti-lock Braking System (SLABS) ECUs fault code memory and displays the meanings of any faults that it finds there. Faults are listed as Current or

Intermittent, together with the number of times the system has detected the fault. The system can detect up too 47 different faults. You can also clear the faults in this function.

WABCO SLABS - Diagnostic Capabilities (Settings)

- Test status: This is an internal status which is used to notify the ECU that the SLABS system has been successfully tested or not in the vehicle. Disabled means that the system has not been tested yet and enabled indicates that the system has been checked for correct and safe operation and has passed. This flag must be set by the operator before it is possible to change an ECU's status from NEW to USED. Tests should include verifying that all possible inputs and outputs perform correctly.
- ECU Calibrated: This is an internal status in the SLABS ECU, which is used to note if the stored height settings for the height sensors have been set. On a new-born ECU the value will be NO and the ECU knows that the values in the stored height settings are not the correct one. Having used the Store current height function to calibrate the sensors on a new-born ECU, this flag needs to be set to YES to let the ECU know that the calibration has been done.
- Transport mode: This is a lock mode for transportation of a vehicle or for work to be carried out.
- Suspension type: This allows the same ECU to be used for air sprung or coil sprung vehicles. It disables all Air suspension module activity within the ECU and reports no faults to the diagnostic module, even though all air suspension related sensors and valves are missing, effectively transforming the SLABS ECU into a non air suspension ABS ECU. The wiring diagram shows sections for each type of ECU (SLABS & ABS) and the status of this value is the only difference between the two ECU's.
- Left/Right current height: These are the current heights of the vehicle. In order for the SLABS ECU to know how high a corner of the vehicle is at any given time, it uses a variable resistor which is attached between the vehicle body and hub assembly. The varying value is then put through an analogue to digital converter. This results in a numeric value between 0 and 255 being obtained by the SLABS ECU which represents the relative height of the corner. In real terms, each number is worth approximately 1.4mm of motion. There are, however, certain tolerances in the mounting and design of the suspension and the resistor. This means that on one corner of the vehicle a specific arch height may equate to a different number than the one derived from the same arch height on the opposite corner.
- Left/Right TARGET heights: It is not possible to read the stored heights. When you read the settings these fields will be filled with N/A. In the fields above you can read the current heights. If you want to change the stored heights, replace N/A with the value you want to change it to. Click on Store Target Heights to store the values. Reread settings to see the new current heights.

Diagnostic Capabilities (Inputs)

Real time live display of the information the electronic control unit of the selected vehicle system is currently deriving from its input sensors. This is split into 3 sections. INPUT ABS, INPUT SLS and INPUT SWITCH

INPUT ABS

- Sensor - Front Right, Front Left, Rear Right, Rear Left: This shows the DC Voltage for the wheel speed sensor. Expected values are between 2.0 to 2.4 Volts. The wheel speed sensors are different to the conventional wheel speed sensors used on other Land Rover products. Conventionally, wheel speed sensors have an interference fit with the hub or back plate. This positions the sensor close to a reluctor ring. The sensors used on New Discovery series II are incorporated into the inboard wheel bearing, on both front and rear hubs. This bearing assembly is a sealed unit and has no replaceable parts. Also different is the wire from the wheel speed sensor. Land Rover has, historically used a wheel speed sensor employing a signal wire inside a shielded earth wire. The New Discovery series II wheel speed sensors have a twisted pair of wires. This offers some electrical advantages over two straight wires. Such as the signal being less susceptible to electrical noise or interference and it generates less electrical noise, the wires can also be balanced together (similar electrical properties) to ensure voltage losses are minimized. Like a conventional wheel speed sensor, the signal created is an AC sine wave. This wave is generated in the inductive sensor by a sixty-tooth reluctor, machined into the wheel bearing inner race. The frequency of this signal supplies the SLABS ECU with the information it needs to determine the speed of the individual wheels and is used in the calculation of vehicle speed or vehicle reference speed.
- Wheel Speed (mph) - Front Right, Front Left, Rear Right, Rear left: The wheel speed in Km/h. The SLABS ECU cannot detect wheel speeds less than 1.8 KPH. The wheel speed sensors are different to the conventional wheel speed sensors used on other Land Rover products. Conventionally, wheel speed sensors have an interference fit with the hub or back plate. This positions the sensor close to a reluctor ring. The sensors used on New Discovery series II are incorporated into the inboard wheel bearing, on both front and rear hubs. This bearing assembly is a sealed unit and has no replaceable parts. Also different is the wire from the wheel speed sensor. Land Rover has, historically used a wheel speed sensor employing a signal wire inside a shielded earth wire. The New Discovery series II wheel speed sensors have a twisted pair of wires. This offers some electrical advantages over two straight wires. Such as the signal being less susceptible to electrical noise or interference and it generates less electrical noise, the wires can also be balanced together (similar electrical properties) to ensure voltage losses are minimized. Like a conventional wheel speed sensor, the signal created is an AC sine wave. This wave is generated in the inductive sensor by a sixty-tooth reluctor, machined

into the wheel bearing inner race. The frequency of this signal supplies the SLABS ECU with the information it needs to determine the speed of the individual wheels and is used in the calculation of vehicle speed or vehicle reference speed.

- Inlet valve: This shows the voltage being applied to this valve by the SLABS ECU. When driven, the voltage should be around 2.8 to 3.6 Volts and when not being driven, should be around 0 to 0.5 Volts.
- Outlet valve - Front Right, Front Left, Rear Right, Rear left: This shows the voltage being applied to this valve by the SLABS ECU. When driven, the voltage should be around 2.8 to 3.6 Volts and when not being driven, should be around 0 to 0.5 Volts.
- Pump monitor: This shows the voltage being measured at the ABS pump relay by the SLABS ECU. When driven, the voltage at the pump should be around 2.9 to 3.8 Volts and when not being driven, it should be around 0 to 0.2 Volts.
- Pump relay: This shows the voltage being applied to the ABS pump relay by the SLABS ECU. When driven, the voltage should be around 2.8 to 3.6 Volts and when not being driven, should be around 0 to 0.5 Volts.
- Battery V: This is the current battery voltage being supplied to the SLABS ECU.
- Internal ECU supply V: This shows the SLABS ECUs internal supply voltage.
- Ground reference V: This shows the DC value for the reference ground. Expected values are between -0.5 to +1 Volt.
- Engine Speed (RPM): This shows the engine current number of Revolutions per Minute. The SLABS ECU cannot detect engine RPMs of less than 300. This means that any value below 300 RPM should be read as 0.
- Engine torque (Nm): This shows the current engine torque in Newton meters.
- Throttle Position (%): This is the deflection of the throttle pedal measured in degrees.
- HDC brake: This shows the voltage being applied to the Hill Descent Control (HDC) Brake control Relay by the SLABS ECU. When driven the voltage should be around 2.8 to 3.6 Volts and when not being driven should be around 0 to 0.5 Volts.
- Shuttle switch: The modulator houses two shuttle valves, which are moved when brake pressure is supplied via the brake master cylinder's dual channels. The shuttle valves have a switch attached to them, along with a set of resistors located between them. The resistance of the circuit controlled by these shuttle valve switches will change depending upon the position of the shuttle valve. With no brake pressure supplied, the current flows through the three resistors. With one switch open, the current flows through two of the resistors, and when both are open it will flow through only one. The switches can switch at slightly different times because of the internal workings of the master cylinder. The signal from the shuttle valve is used by the SLABS ECU to detect the correct operation of the brake master cylinder and the integrity of the braking circuit, and is used to supply a brake on(tm) signal. The vehicle still has a brake light switch. This switch is used to control the brake lamp operation and the cruise control inhibitor. This shows the state of the shuttle switches input on the SLABS ECU. Valid states are:
  - **OPEN CIRCUIT: This means that either the wiring harness or the switches are faulty.**
  - **BOTH OPEN: Means that the brake pedal is released and the hydraulics are under HDC/ETC control.**

- **ONE CLOSED: Can possibly be shown during transition states or under light braking conditions.**
- **BOTH CLOSED: Indicates that the Brake pedal is depressed and the hydraulics is under ABS control.**
- **SHORT TO GROUND: Indicates that either the harness or the switches are faulty.**

INPUT SLS - The inputs will change if the vehicle is moving. Open the inputs page and then start the engine. Drive the vehicle at a low speed. Once the speed of 8km/h has been reached for all four wheels, the communication will stop.

- Left sensor value: This shows the current height value of the rear left air suspension height sensor. A value of 1 is equal to approximately 1.4 mm between the wheel arch and ground.
- Right sensor value: This shows the current height value of the rear right air suspension height sensor. A value of 1 is equal to approximately 1.4 mm between the wheel arch and ground.
- Left sensor supply: This shows the voltage of the left rear height sensor supply. Expected values are 4.7 to 5.6 Volts.
- Right sensor supply: This shows the voltage of the right rear height sensor supply. Expected values are 4.7 to 5.6 Volts.
- Left valve voltage: This is the voltage measured at the left rear air suspension valve.
- Right valve voltage: This is the voltage measured at the right rear air suspension valve.
- Exhaust valve: This is the voltage measured at the air suspension's exhaust valve.
- Compressor relay: This is the voltage measured at the air suspension compressor / control.

INPUT SWITCH - The inputs will change if the vehicle is moving. Open the inputs page and then start the engine. Drive the vehicle at a low speed. Once the speed of 8km/h has been reached for all four wheels, the communication will stop.
Neutral switch: The state of the neutral / transmission switch input of the SLABS ECU. This input should never indicate GND on a manual gearbox equipped vehicle.
Low range switch: Shows the state of the Low Range switch input line to the SLABS ECU. To change from low to high range you must ensure that the brake pedal is depressed, and neutral gear is selected.
Diff lock switch: This shows the state of the Differential Lock input on the SLABS ECU. Manual engagement of the Differential Lock can only be done from under the vehicle. ABS is disabled, and the ABS warning light remains on, while the Differential Lock is engaged.
Reverse Switch: The state of the Reverse Gear switch input of the SLABS ECU.
HDC switch: The state of the Hill Descent Control switch input on the SLABS ECU.
Any door switch: This shows the current status of the door switch input of the SLABS ECU. The ECU inhibits motion of the vehicle if any door is detected as being open.
Plip signal: This shows the current status of the plip input line to the SLABS ECU from the BCU. The states are:

- GROUND: the signal line has been detected as being shorted to ground which is a fault.
- LOWER: this means that the BCU is currently sending a request to lower the vehicle.

- NEUTRAL: this means that the signal line is normal with no height change requests being made.
- RAISE: this means that the BCU is currently sending a request to raise the vehicle.
- OPEN CIRCUIT: The signal line is detected as being open circuit and is therefore faulty. If the signal line is shorted to battery supply voltage this will also be shown as open circuit.

WABCO SLABS - Diagnostic Capabilities (Outputs)

This is a choice of outputs that can be tested. Each output has an ON and OFF choice. Click on the ON link to start the test and on OFF to end.

- Front Right Inlet Valve:
- Front Right Outlet Valve:
- Front Left Inlet Valve:
- Front Left Outlet Valve:
- Rear Right Inlet Valve:
- Rear Right Outlet Valve:
- Rear Left Inlet Valve:
- Rear Left Outlet Valve:
- SLS Left Valve:
- SLS Right Valve:
- SLS Exhaust Valve:
- ABS Pump Relay:
- Speedometer:
- SLS Compressor:
- SLS Buzzer:
- T.C Lamp:
- ABS Warning Lamp:
- HDC Warning Lamp:
- Brake Warning lamp:
- SLS Lamp:
- Off road Lamp:
- HDC Fault Lamp:
- HDC Brake Lamp:

WABCO SLABS - Diagnostic Capabilities (UTILITY)

Choice of functions that can be performed

ABS BLEEDING

- **Power bleed: This function opens all of the ABS valves and powers the pump causing fluid to circulate around the system, thus removing any trapped air bubbles.**
- **Modulator bleed: This function opens the abs modulator valve and powers the pump causing fluid to circulate around the modulator system, thus removing any trapped air bubbles.**
- **Front Right Test:**
- **Front Left Test:**
- **Rear Right Test:**
- **Rear Left Test:**

SLS HEIGHT CALIBRATION

- **Raise left: This function causes the SLABS ECU to energize the rear left corner valve and the inlet valve. If there is pressure in the system the rear left hand corner will raise.**
- **Lower left: This function causes the SLABS ECU to energize the rear left corner valve and the exhaust valve. This will cause the rear left hand corner to lower.**
- **Raise right: This function causes the SLABS ECU to energize the rear right corner valve and the inlet valve. If there is pressure in the system the rear right hand corner will raise.**
- **Lower right: This function causes the SLABS ECU to energize the rear right corner valve and the exhaust valve. This will cause the rear right hand corner to lower.**
- **Store heights: This function sends a command to the SLABS ECU to store the actual heights.**