LUCAS EAS (P38 NRR) - System Overview

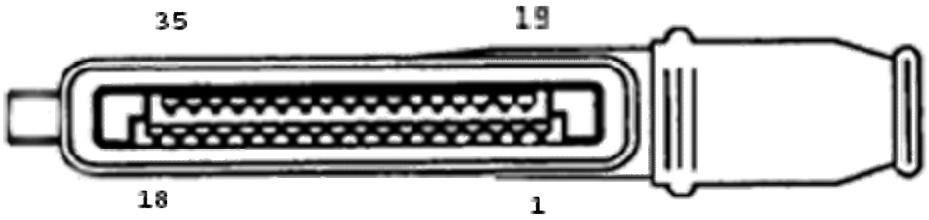
The EAS (Electronic Air Suspension) system is manufactured by Lucas. This is a variation of the Classic Air suspension system with some changes and additional features specifically to suit the P38 Range Rover (1995 to 2002). When working correctly, the system gives the vehicle a level of ride comfort and adjustability that sets it apart, but sadly the system is very prone to problems especially as it ages and large bills at dealerships are not uncommon.

LUCAS EAS (P38 NRR) - 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	Range Rover MKII P38	All	Green OBD lead	Verified

LUCAS EAS (P38 NRR) - Pin Outs

	
1	12 Volt Power from EAS Timer Relay
2	5 Volt supply for Left Rear Height Sensor
3	5 Volt supply for Left Front Height Sensor
4	Returning Voltage from Left Rear Height Sensor
5	Returning Voltage from Left Front Height Sensor
6	EAS Warning Lamp Relay Control (Ground for lamp off)
7	EAS Down Lamp (Ground for on)
8	Output to Compressor Relay
9	Output to Exhaust Valve (12 Volts to open Valve)
10	Output to Front Left Valve (12 Volts to open Valve)
11	Output to Rear Left Valve (12 Volts to open Valve)
12	Engine speed input (Taken from Alternator Phase Tapping)
13	Pressure Switch Input (12 Volts when switch closed)
14	Hand Brake Switch Input (Ground when Brake is On)
15	EAS system Inhibit Switch Input (Connects to pin 29 when inhibited)
16	Thermal Switch input (Open Circuit when too hot)
17	Receive Diagnostic Data
18	Ground
19	12 Volt Supply to Warning Lamp Relay (12 volts when Lamp Off)
20	5 Volt supply for Right Rear Height Sensor
21	5 Volt supply for Right Front Height Sensor
22	Returning Voltage from Right Rear Height Sensor
23	Returning Voltage from Right Front Height Sensor
24	Ground for all height sensors
25	EAS Up Lamp (Ground for on)
26	Output to Inlet Valve (12 Volts to open Valve)
27	Output to Front Right Valve (12 Volts to open Valve)
28	Output to Rear Right Valve (12 Volts to open Valve)
29	Height Switch Common
30	Road Speed Input (12 Volts)
31	Brake Switch Input (12 Volts)
32	Up Switch Input
33	Down Switch Input
34	Door Input
35	Serial Communication Transmission

LUCAS EAS (P38 NRR) - Diagnostic Capabilities - Read Fault Codes/Clear Faults

The Air suspension systems can self detect up to 31 faults, ranging from those causing a full system shutdown, to those simply logging slightly abnormal events in the normal course of vehicle usage that don't even create a warning. The most popular of these is that a height sensor has been out of range, usually caused by excessive articulation of a wheel (in a pothole or up a curb). A momentary disconnection of a poor connector could have also caused it. Sometimes multiple faults may be logged which may have been caused by the same fault all pointing to the same guilty party: height sensor out of range, height sensor open circuit. In this instance, replacing the specified sensor will correct the problem, but a recalibration of the system can be tried first as this will sometimes be sufficient to overcome the problem without having to replace any parts. A good road-test is always essential with any air suspension problems including both rough terrain that makes the system operate at the limits of articulation and also some motorway (or similar) driving in order to check the correct responses to specific speeds over the defined timing periods. Also within this section is a Clear Faults button. Failure to clear the fault memory successfully is usually due to the system re-logging the fault the moment the fault memory is clear. This indicates that the fault has not been rectified properly and as far as the system is concerned still exists. The re-check for successful clearing of the fault code memory may pass but then the system may re-log the fault shortly after.

LUCAS EAS (P38 NRR) - Diagnostic Capabilities (Settings)

Values, configuration settings, and other stored information which can be read from the ECU, edited and then rewritten back. Read settings can also be stored as a standard HTML page for reference. These pages can then later be re loaded and re written back to the ECU. Please note that some values may be read only due to the fact that they are supplied from the ECU's ROM or are internally calculated.

High profile, Standard height, Low profile, Access height : This is where the stored value read from the vehicle or the default setting value appears. Values can theoretically be in the range of 0 to 255 but realistically 40 to 220 can be expected. These figures can be made up by manually entering new figures but trying to put in incorrect figures can cause the ECU to record invalid data faults and prevent the system working at all. If you wish to manually edit the figures use a pen, paper, the relevant manual and a tape measure, adding a few numbers at a time to a given corner and noting the resultant change in height. You may need to re-select the height you are calibrating to see the change. Arch heights can be found in the relevant manuals, from which every other height is derived

LUCAS EAS (P38 NRR) - Diagnostic Capabilities (Inputs)

- Target height: This is the value for the numeric height that the ECU is being instructed to target. If a new user height setting is selected, the target height will change to show the height stored for this corner of the vehicle. When the system goes into self leveling mode it may decide to adjust these heights to compensate and will adjust the actual heights to suit.
- Actual height: This is the value currently being obtained from this corner's height sensor. If it is too far away from the target height the system should open the required valves and the vehicle will raise or lower until this figure is closer to the target height.
- Valve status: Shows the state that the ECU is applying to this valve. Assuming that the valve is not faulty or sticking it would be in this state.
- Compressor: Shows the present status of the compressor requirement from the ECU. It should be noted that although the compressor may be required to top up air reserves, the ECU uses many other factors in deciding if the output to the compressor should actually be turned on. One such factor is the duty cycle of the compressor, i.e. the ECU will not allow the compressor to run for extended periods of time. This value is therefore not a true match as to when the compressor is running. Correct operation of the compressor may be best ascertained by forcing the output on and listening for the distinctive noise that the compressor makes.
- Exhaust valve: Shows the present status that the ECU is applying to this valve.
- Inhibit switch: This shows the current state of the input which is used for the users dashboard mounted air suspension inhibit ride height-changing latching switch. This should be high for normal released operation and then go low when the switch is depressed into its latched low position.
- Park/handbrake: This shows the current status of the input C331 pin 14 which is now wired either directly to the handbrake switch for manual, or on an automatic, to a circuit incorporating a pull down resistor which normally pulls this line low. This is only overridden when the automatic box's selector lever is not in park, making this line high.
- Footbrake switch: This shows the current state of the input that is used for the Brake or Stop lamp switch. With the foot brake depressed this should be high.
- Door/disable: In the case of the Classic C331, pin 34 is used for both the MFU to indicate that a door is open and for the Disable switch.
- Inlet valve: Shows the present status that the ECU is applying to this valve.
- Thermal switch:
- Pressure switch:
- Lower switch:
- Raise switch: Shows the present status that the ECU is applying to this valve.
- Battery volts: Gives an indication of the current battery status at the ECU, but this is obviously subject to losses which change according to load.
- Road speed (MPH): This value is derived in the case of the Classic Range Rover from a signal given to the Air Suspension ECU (C331 pin 30) by the speed transducer, via the speed buffer. (This also supplies the 14CUX engine ECU and the cruise-control ECU as well as the speedometer head).

- Road speed (Km/h): This value is derived in the case of the Classic Range Rover from a signal given to the Air suspension ECU (C331 pin 30) by the speed transducer, via the speed buffer. (This also supplies the 14CUX engine ECU and the cruise-control ECU as well as the speedometer head).
- Engine Speed: This value is derived in the case of the Classic Range Rover from a signal taken from the alternator, which is then passed through an 820-ohm phase tap resistor, ending up at the Air suspension ECU on C331 pin 12 (also to the rev counter).
- Ride state: This shows the current ride state that the air suspension ECU has engaged.

Options are:

  - Extended
  - High profile
  - Standard
  - Low profile
  - Access
  - Leveling
  - ECU wake-up
  - Dormant

LUCAS EAS (P38 NRR) - Diagnostic Capabilities (Outputs)

This is a choice of outputs that can be tested.
Note: more than one valve can be opened at any one time so that any combination of air springs can be inflated or deflated.

- Open Front left: This opens the left hand front valve allowing airflow to or from the left hand front air suspension spring.
- Open front right: This opens the right hand front valve allowing airflow to or from the right hand front air suspension spring.
- Open rear left: This opens the left hand rear valve allowing airflow to or from the left hand rear air suspension spring.
- Open rear right: This opens the right hand rear valve allowing airflow to or from the right hand rear air suspension spring.
- CLOSE ALL: This closes any valves which are open.
- Open Inlet: This opens the inlet valve allowing airflow to or from the reservoir tank to any air spring with an open valve.
- Open Exhaust: This opens the exhaust valve which allows airflow from any open spring to the atmosphere.
- CLOSE ALL: This closes any valves which are open.
- AIR PUMP ON: This function turns on the system compressor that only operates in certain conditions during normal running. It not only allows you to test the compressor but also to manually put air into an otherwise empty reservoir so that other tests may be performed.
- AIR PUMP OFF: Turns off the Air Pump

LUCAS EAS (P38 NRR) - Diagnostic Capabilities (Utility)

- Send to access: This simulates the selection of the access height setting via the buttons on the dashboard. All doors require to be closed for this to work; the vehicle will return to its previous height once the test is finished. The vehicle will not rise if there is no pressure in the system.
- Send to standard: This simulates the selection of the standard height setting via the buttons on the dashboard. All doors require to be closed for this to work and the vehicle will return to its previous height once the test is finished. The vehicle will not rise if there is no pressure in the system.
- Send to high: This simulates the selection of the high setting via the buttons on the dashboard. All doors require to be closed for this to work and the vehicle will return to its previous height once the test is finished. The vehicle will not rise if there is no pressure in the system.
- Deflate entire system: It fully opens the two front corner valves, both inlet and exhaust valves, and disables the compressor for one minute; it then does the same but with the rear two corner valves. This function causes air to be expelled from the system and from each axle and may need to be used repeatedly depending on initial system reserves and suspension heights. No checks for the remaining pressure are performed. It is up to the users to satisfy themselves that no air remains trapped in the system as the result of, for instance, a faulty corner valve that does not open diagnostically, mechanically or for any other reason.
- ATTENTION: Before any disassembly work commences on any part of the air suspension system it is critically important to ensure that the high pressure that normally fills the system is completely removed. This function enables this to be carried out. Failure to ensure that the system has fully de-pressurized can result in serious personal injury.
- Read/Set lock modes: This function allows checking of current lock mode status and the ability to lock or unlock both Transport and High Lock Modes.