DESIGNERS AND MANUFACTURERS OF CUTTING EDGE AUTOMOTIVE DIAGNOSTIC EQUIPMENT.

FUNCTIONS DESCRIPTION MANUAL

Coverage	**Nanocom EVOLUTION**
ECU:	o **ABS (Wabco C,D)** o **SRS Airbag (mps1,sps1,sps2)** o **Auto Gearbox (2.38,8.87)** o **HEVAC** o **HELLA Cruise Control**

DIAGNOSTIC FUNCTIONS OF THE P38 WABCO C ABS ECU

IMPORTANT NOTICE. After diagnostic connection to the ABS system the ignition must be recycled before further diagnostics can take place.

FAULTS:

Reads the fault code memory. The ECU can self detect up to 84 different problems with itself, its wiring and its associated sensors, storing the respective code if it detects any malfunction or reading outside of pre defined acceptable limits. Not all stored faults may cause the fault warning lamp to illuminate.
Clear faults:
This function clears the fault code memory. 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. A re-check for successful clearing of the fault code memory may be successful but then the system may re-log the fault shortly after.

SETTINGS:

ECU manufacturer: The manufacturer of the ABS /ETC ECU.
ECU serial number: This function obtains the electronic identity of ECU's for record keeping purposes. This number is also printed on a label on the top of the ECU.
ETC: This shows if Electronic Traction Control is fitted or not fitted to the ABS system.

INPUTS:

Realtime live display of the information the electronic control unit of the selected vehicle system is currently deriving from its input sensors. The ECU will stop communicating at a speed over 1.6mph (2km/h).
Wheel speed sensor: This value allows you to monitor wheel speed, which is determined by the ABS ECU measuring the wheel rotation sensor's output. Since the basic principle of ABS relies on comparison between the rotations of all the vehicle's wheels, it is important to be able to see what the system is detecting from the wheels. Jacking up a wheel and rotating it by hand whilst someone prods and moves the associated sensors, connectors and cabling will soon show if a sensor is not working or is intermittent.
ABS option code: This value is obtained depending on which valves are fitted to the ECU. It will change if a normal valve is absent or if ETC function valves have been omitted. It can be used to help determine if a vehicle has Traction Control or not.
Pressure valve: This value, whilst no direct comparison to known pressure units, is however, derived from the pressure in the ABS systems fluid reservoir.
Brake switch 1: This shows the state of the upper-most of the two switches that are actuated by motion of the brake pedal. Normally it should indicate low, changing to high as soon as motion is applied through depressing the brake pedal.
Brake switch 2: This shows the state of the lower-most of the two switches that are actuated by motion of the brake pedal. Normally it should indicate high, changing to low towards the bottom of the brake pedal's travel.

OUTPUTS:

Choice of outputs that can be tested.

- **Valves**: Direct control over the inlet and outlet valves which control the fluid flow to and from all wheels, the ETC, the de-manual valve and the isolation valves.
- **Front/rear left/right inlet valve**: This test engages the inlet solenoid control valve for this wheel, allowing fluid pressure from the accumulator to flow into the calliper, thus applying the brake. If the wheel is rotated by hand before and during the test it should become braked and then freed.
- **Front/rear left/right outlet valve**: This test engages the outlet solenoid control valve for this wheel, allowing fluid pressure from the calliper to release and flow back to the reservoir, thus releasing an applied brake. To test correct operation of the valve, jack the corner of the vehicle until the wheel is free, and check that it does not rotate when the brake is applied; whilst continuing to apply the brake, run the test. The brake should release and the wheel should become free to rotate by hand.

UTILITY:

Choice of functions that can be performed.

- **De-manual valve**: This test works only when performed on vehicles fitted with Electronic Traction Control (ETC). The test is engaging the de-manual valve which blocks from the rest of the system any pressure generated from depressing the brake pedal, effectively blocking the manual braking element from the system prior to engaging the computer controlled element. If pressure is applied on the pedal during the test it should be possible to feel the action of the valve feed back on pedal pressure.
- **Isolate ABS inlet/outlet**: This test engages the outlet-isolating valve, in conjunction with the inlet isolating valve and controls flow between the master cylinder, the servo cylinders and the reservoir return. If pressure is applied to the brake pedal during the test the pedal should be felt dropping in stages.
- **Speedo**: This drives the speedometer output to simulate 100 Miles per hour.

DIAGNOSTIC FUNCTIONS OF THE P38 WABCO D ABS ECU

IMPORTANT NOTICE. After diagnostic connection to the ABS system the ignition must be recycled before further diagnostics can take place.

FAULTS:

Reads the fault code memory. The ECU can self detect up to 84 different problems with itself, its wiring and its associated sensors, storing the respective code if it detects any malfunction or reading outside of pre defined acceptable limits. Not all stored faults may cause the fault warning lamp to illuminate.
Clear faults:
This function clears the fault code memory. 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. A re-check for successful clearing of the fault code memory may be successful but then the system may re-log the fault shortly after.

SETTINGS:

Values, configuration settings, and other stored information which can be read from the ECU, edited and then rewritten back.
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.

Product number: This is a Wabco assigned number which tells them which variation of the same family this ECU is.
Product date: This code is used to identify how far into production of this particular variant of this ECU type it was when this individual ECU was built. This would help if a build error was detected and a recall was required.
Bar code: This is the bar code by which stocks of this ECU can be electronically controlled. The bar code itself and the number it represents can also be found on the outer case of the ECU.
Factory code: This is a Wabco number by which they can identify the production line which built this ECU.
ABS module: The ABS ECU is a multi function ECU which can manage the functions of Anti-lock Braking (ABS), Electronic Brake Distribution (EBD), Electronic Traction Control (ETC) and Hill Descent Control (HDC). These different functions all share the same measurements taken from the connected sensors and often control the same valves in conjunction with one another. They also communicate diagnostically as one unit through the same shared connection. This means that each function is treated as a separate module within the ECU and it is possible for any module to be modified independently of the others. For this reason each module has its own reference code by which changes can be traced if required. This is the code for the ABS module.
Diagnostic module: This is the code for the Diagnostic module if fitted (see ABS module for details).
Measurement module: This is the code for the Measurement module if fitted (see ABS module for details).
Traction control: This is the code for the ETC module if fitted (see ABS module for details).
EBD module: This is the code for the EBD module if fitted (see ABS module for details).
HDC module: This is the code for the HDC module if fitted (see ABS module for details).
VIN: This is the vehicle's unique VIN number.
ECU condition: Status of ECU (used or new)

INPUTS:

Realtime live display of the information the electronic control unit of the selected vehicle system is currently deriving from its input sensors.

Wheel speed sensor voltage: This shows the DC Voltage for the right front 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 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 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 ABS 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.

Outlet valve: This shows the voltage being applied to this valve by the ABS 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.
Inlet valve: This shows the voltage being applied to this valve by the ABS 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.

Wheel speed: The wheel speed in KPH. The ABS 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 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 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 ABS 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.

Brake switch 1: This shows the status of the brake switch no 1.
Brake switch 2: This shows the status of the brake switch no 2.
Pressure switch 1: This shows the status of the pressure switch no 1.
Pressure switch 2: This shows the state of the pressure switch no 2.
T.C. control N/close: Status for Traction Control
T.C. control N/open: Status for Traction Control
Pump Monitor (V): This shows the voltage for the pump monitor.
Ignition Supply (V): This shows the voltage for the ignition.
Valve Supply (V): This shows the voltage for the valve supply.
Isolation inlet/outlet: Status for isolation valves.
Ground reference %: Status for ground reference.

OUTPUTS:

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.

Valves: This turns on the output to the ABS valves (front/rear left/right inlet/outlet).
Pump relay: This turns on and off the ABS pump relay output.
Valve relay: This turns on and off the ABS valve relay output.
Brake warning LED: This turns on the brake warning lamp for 20 seconds. The brake or EBD lamp is a combined warning lamp with the low brake fluid warning and the handbrake warning lamp. The lamp is a red light with an exclamation mark inside a brake symbol. The ABS ECU will illuminate this light if it senses a fault that will affect its ability to control the braking balance of the vehicle. This lamp will be illuminated for 3 seconds when the ignition is switched on, as a bulb check function. It will then extinguish as long as no fault currently exists that may effect the operation of the EBD. The EBD warning lamp will remain illuminated if the ABS ECU is in "new-born" mode. Unlike the ABS warning lamp, the ABS ECU supplies a voltage to illuminate the light, not to turn it off. Modes of operation:

- No lamp and no audible warning indicate that the ABS/EBD/TC and HDC systems are OK.
- The lamp being on could indicate that the ignition has just been turned on (Bulb check for 3 seconds), the handbrake is on, there is a low brake fluid level, the ABS ECU supplied voltage is much too high or much too low there is a new-born ABS ECU fitted, the ABS has a sensor/pump or valve fault logged for this journey.
- Both lamp on and the audible warning indicates that the ABS has detected a sensor/pump or valve fault.

ABS warning LED: The ABS warning lamp is an amber light with the letters ABS inside a circle. If there is a fault the ABS warning lamp will remain illuminated until the ignition is switched off.
Traction control lamp: The ETC system employs one amber lamp, which has the letters TC in a dotted circle. The lamp will illuminate during the ignition on lamp check. The system will indicate TC operation by illuminating the amber TC lamp for a minimum of 2 seconds.
Speedometer: This drives the speedometer output to simulate 100 Miles per hour.
T.C. Lamp: T.C. lamp control
T.C. Normally open/closed: Control T.C.
Isolation valve inlet/outlet: Control isolation valves
Rough Road: This turns on and off the rough road feature.

UTILITY:

Choice of functions that can be performed.

ABS power bleed: This causes the ABS system to bleed the main hydraulic circuit and may need to be repeated if there is a substantial amount of air in the circuit.
ABS modulator bleed: This causes the ABS system to bleed the secondary hydraulic circuit and may need to be repeated if there is a substantial amount of air in the circuit.
Front and Rear bleed TESTS.

DIAGNOSTIC FUNCTIONS OF THE P38 SRS AIRBAG ECU

MPS1

FAULTS:

The MPS airbag system can self detect up to 24 faults. Most of these are major or safety related faults causing full system shutdown with only a few being minor caused by, for instance, a flat battery. The systems perform a self-diagnostic test that takes about 15 seconds whenever the ignition is switched on, logging any faults that are found, then at regular intervals thereafter. Resistors are placed at strategic points in the airbag wiring harness / loom giving the systems the ability to self detect open or short circuits. Main loom loops are from the ECU up the column through the spiral cassette through the airbag and back through the spiral cassette to the ECU; from the ECU through the passenger airbag and back again; on MPS systems, one through each of the two crash sensors mounted behind the head lamps at the front and then returning to the ECU, then two loops each going to the instrument cluster, through a bulb each and back again. In accordance with the manuals, no repairs must be carried out on the loom at all; hence, no wiring diagram is supplied in the manufacturer's manuals. All problems involving the airbags, spiral cassette, crash sensors, or loom must be done in strict accordance with the relevant manufacturer's workshop manual instructions. There is a deep memory within the airbag ECU that keeps a long-term record of resets to detected faults. This means that if a particular connection was poor and went open circuit - even just once - the fault would be logged by the system as "a sensor is open circuit" and the airbag warning light would come on. If the fault was not found and the fault code memory was cleared it would be very likely to reappear. This would be logged as an intermittent fault within the system.
Clear faults:
This function clears the fault code memory. 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. A re-check for successful clearing of the fault code memory may be successful but then the system may re-log the fault shortly after.

SPS1

FAULTS:

The SPS1 airbag system can self detect up to 24 faults. Most of these are major or safety related faults causing full system shutdown with only a few being minor caused by, for instance, a flat battery. The systems perform a self-diagnostic test that takes about 15 seconds whenever the ignition is switched on, logging any faults that are found, then at regular intervals thereafter. Resistors are placed at strategic points in the airbag wiring harness / loom giving the systems the ability to self detect open or short circuits. Main loom loops are from the ECU up the column through the spiral cassette through the airbag and back through the spiral cassette to the ECU; from the ECU through the passenger airbag and back again; on SPS1 systems, one through each of the two crash sensors mounted behind the head lamps at the front and then returning to the ECU, then two loops each going to the instrument cluster, through a bulb each and back again. In accordance with the manuals, no repairs must be carried out on the loom at all; hence, no wiring diagram is supplied in the manufacturer's manuals. All problems involving the airbags, spiral cassette, crash sensors, or loom must be done in strict accordance with the relevant manufacturer's workshop manual

instructions. There is a deep memory within the airbag ECU that keeps a long-term record of resets to detected faults. This means that if a particular connection was poor and went open circuit - even just once - the fault would be logged by the system as "a sensor is open circuit" and the airbag warning light would come on. If the fault was not found and the fault code memory was cleared it would be very likely to reappear. This would be logged as an intermittent fault within the system.
Clear faults:
This function clears the fault code memory. 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. A re-check for successful clearing of the fault code memory may be successful but then the system may re-log the fault shortly after.

SPS2

FAULTS:

This airbag system can self detect up to 37 faults. Most of these are major or safety related faults causing full system shutdown with only a few being minor caused by, for instance a flat battery. The systems perform a self-diagnostic test that takes about 15 seconds whenever the ignition is switched on, logging any faults that are found, and then at regular intervals thereafter. Resistors are placed at strategic points in the airbag wiring harness / loom giving the systems the ability to self detect open or short circuits. Main loom loops are from the ECU up the column through the spiral cassette through the airbag and back through the spiral cassette to the ECU; from the ECU through the passenger airbag and back again; on SPS2 systems, one through each of the two crash sensors mounted behind the head lamps at the front and then returning to the ECU, and then two loops each going to the instrument cluster, through a bulb each and back again. In accordance with the manuals no repairs must be carried out on the loom at all, hence no wiring diagram is supplied in the manufacturer's manuals. All problems involving the airbags, spiral cassette, crash sensors, or loom must be done in strict accordance with the relevant manufacturer's workshop manual instructions. There is a deep memory within the airbag ECU that keeps a long-term record of resets to detected faults. This means that if a particular connection was poor and went open circuit - even just once - the fault would be logged by the system as - a sensor is open circuit - and the airbag warning light would come on. If the fault was not found and the fault code memory was cleared it would be very likely to reappear. This would be logged as an intermittent fault within the system.
Clear faults:
This function clears the fault code memory. 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. A re-check for successful clearing of the fault code memory may be successful but then the system may re-log the fault shortly after.

SETTINGS:

Values, configuration settings, and other stored information which can be read from the ECU, edited and then rewritten back. 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.

The SRS airbag has only one programmable option:
VIN: The electronically stored Vehicle Identification Number (VIN) in this airbag ECU. This number should be changed if the ECU is fitted in another vehicle. It should also be entered on new airbag ECU's. The number can be found on the VIN plate under the bonnet or on the visible VIN tag at the bottom of the windscreen.
Other information that can be read from the airbag ECU:
Manufacturer: Gives the manufacturer's name for the airbag ECU.
Model: Gives the manufacturer's model code allocated to this airbag ECU. Not all ECU types feature this information diagnostically.

Software version: Gives the software version number for this airbag ECU. Not all ECU types feature this information diagnostically.
Hardware version: Gives the hardware version number for this airbag ECU. Not all ECU types feature this information diagnostically.
Serial number: The electronically stored serial number for this airbag ECU, and can be found printed on a label affixed to the top or side of the ECU.
Date of build: Gives the electronically stored date of build for this airbag ECU. Not all ECU types feature this information diagnostically.
Part number: Gives the vehicle part number for this airbag ECU. Not all ECU types feature this information diagnostically.
Part reference: Gives the part reference which identifies the family variant of this airbag ECU. Not all ECU types feature this information diagnostically.
Driver's airbag/ Passenger's airbag: This denotes fitment or omission of the driver's/passenger's airbag. Not all ECU types feature this information diagnostically.
Right hand pretensioner/ Left hand pretensioner: This denotes fitment or omission of the right hand/left hand seat belt pretensioner. Not all ECU types feature this information diagnostically.
Driver's side airbag / Passenger's side airbag: This denotes fitment or omission of the driver's/passenger's side airbag. Not all ECU types feature this information diagnostically.
System type: Some airbag ECU's / DCU's are fitted in different vehicle models. Where this is the case this value shows which system has been detected. Where the ECU / DCU type is unique to a vehicle model, this value then indicates the vehicle model.
Rolamites: Status for Rolamites

DIAGNOSTIC FUNCTIONS OF THE P38 AUTO GEARBOX ECU

GS2.38

FAULTS:

Read and clear the fault code memory. The ECU can self detect up to 44 different problems with itself, its wiring and its associated sensors, storing the respective code if it detects any malfunction or reading outside of pre defined acceptable limits. Not all stored faults may cause the fault warning lamp to illuminate.

SETTINGS:

Values, configuration settings, and other stored information which can be read from the ECU:

Manufacturer: This is the name of the manufacturer of the ECU.
ZF Part Number: This is the ZF part number that can be read on the cover of the ECU.
Hardware version: This is the hardware version which denotes the processor and circuit board type.
Land Rover Part Number: This is Land Rover's part number for this ECU.
Manufacturer's Part Number: This is the manufacturer's part number.
Steptronic gear change: Shows if steptronic is fitted or not.

INPUTS:

Realtime live display of the information the electronic control unit of the selected vehicle system is currently deriving from it's input sensors.

Vehicle Speed: This is the speed of the vehicle in both, km/h and mph.
Output Shaft Speed: This is the output shaft speed in both, km/h and mph of the automatic gearbox
Engine Speed: This is the current engine speed in rpm.

Throttle Position: This is the status of the throttle.
Engine Power: This is the power of the engine read from the gearbox ECU.
Battery Voltage: This shows the battery voltage of the automatic gearbox ECU input.
Current Gear: This shows if the gear selection is in Park, Neutral, Drive or Reverse.
H/Low Range: Shows status of high or low range selection
Mode: Shows status for ECONOMY or SPORT mode selection
Throttle position%: Shows live throttle position.

GS8.87

FAULTS:

Read and clear the fault code memory. The ECU can self detect up to 39 different problems with itself, its wiring and its associated sensors, storing the respective code if it detects any malfunction or reading outside of pre defined acceptable limits. Not all stored faults may cause the fault warning lamp to illuminate.

SETINGS:

Values, configuration settings, and other stored information which can be read from 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.

Manufacturer: Gives the manufacturer of the gearbox.
Software Level: Gives the level of software currently being used on the gearbox ECU.
Coding Index: Gives the current standard of coding index used on the gearbox ECU.
Vin: Gives the Vehicles VIN number that can be altered in some supported ECU`s.
CAN Software Level: Gives the current level of CAN software being used.
Land Rover Part Number: Gives the Land Rover assigned part number.
Manufacturers Part Number: Gives the manufacturer assigned part number.
Software Version1,2: Gives the software version currently being used.

INPUTS:

Realtime live display of the information the electronic control unit of the selected vehicle system is currently deriving from its input sensors.

GENERAL

Throttle position %: This shows the current percentage opening of the throttle position sensor as transmitted to the gearbox ECU from the engine management ECU using the CAN link. This percentage varies with the position of the throttle pedal between zero with the throttle closed to about 80% at fully open.

Engine torque %: This is the current torque output of the engine relative to the maximum torque available. The value is transmitted to the gearbox ECU from the engine management ECU using the CAN link.

Torque requested %: This reading shows the amount of torque (as a percentage of nominal torque) being requested from the engine management ECU. Torque will be reduced during gear shifts. This value is transmitted to the gearbox ECU from the engine management ECU using the CAN link.

Reduced torque %: This display shows the current engine torque output corrected for the amount by which the torque is being reduced. The value is given as a percentage of the maximum torque available from the engine. The value is transmitted to the gearbox ECU from the engine management ECU using the CAN link.

Friction torque %: This display shows the current amount of engine torque which is being used to overcome engine frictional losses. The value is given as a percentage of the maximum torque available

from the engine. The value is transmitted to the gearbox ECU from the engine management ECU using the CAN link.

Torque reference Nm: This shows the reference value for maximum torque in Newton metres. The value is transmitted to the gearbox ECU from the engine management ECU using the CAN link.

Gear switch W: This reading shows the gear state that the ECU is reading from selector line W.

Gear switch X: This reading shows the gear state that the ECU is reading from selector line X.

Gear switch Y: This reading shows the gear state that the ECU is reading from selector line Y.

Gear switch Z: This reading shows the gear state that the ECU is reading from selector line Z.

Program switch: This reading shows whether the ECU is reading the state of the program selector switch as open or closed.

High/Low range switch: This reading shows whether the ECU is reading the state of the high/low range switch as being high range or low range.

Kick down: This reading shows whether kick down is currently active or inactive.

Shift type: If a gear shift is taking place this reading shows the type of the shift.

Engine speed (RPM): This is the engine speed measured by the gearbox ECU.

Turbine speed (RPM): This is the turbine speed in revolutions per minute.

Output speed (RPM): This is the gearbox output speed in revolutions per minute.

Battery volts: This reading shows the vehicle battery voltage measured directly by the gearbox ECU.

Solenoid valve 1: This reading shows whether solenoid valve 1 is currently being driven on. The solenoid valves 1 and 2 control the gear selection as following:

1. First gear: Solenoid 1 OFF, Solenoid 2 ON
2. Second gear: Solenoid 1 ON, Solenoid 2 ON
3. Third gear: Solenoid 1 ON, Solenoid 2 OFF
4. Forth gear: Solenoid 1 OFF, Solenoid 2 OFF

Solenoid valve 2: This reading shows whether solenoid valve 2 is currently being driven on.The solenoid valves 1 and 2 control the gear selection as following:

5. First gear: Solenoid 1 OFF, Solenoid 2 ON
6. Second gear: Solenoid 1 ON, Solenoid 2 ON
7. Third gear: Solenoid 1 ON, Solenoid 2 OFF
8. Forth gear: Solenoid 1 OFF, Solenoid 2 OFF

Solenoid valve 3: This reading shows the current state of the solenoid valve 3 drive. This valve controls the torque converter lock up.

Modulator pressure: This value shows the modulation pressure.

Adaptive program 1: This reading shows whether the adaptive shift program A1 is currently active.

Adaptive program 2: This reading shows whether the adaptive shift program A2 is currently active.

Adaptive program 3: This reading shows whether the adaptive shift program A3 is currently active.

Engine temperature °C: This shows the current temperature of the engine.

PRESSURES

Upshift 1-2 speed range 1: This reading shows the adaptive pressure value that the ECU has learned for upshifts 1 and 2 in speed range 1.

Upshift 1-2 speed range 2: This reading shows the adaptive pressure value that the ECM has learned for upshifts 1 and 2 in speed range 2.

Upshift 1-2 speed range 3: This reading shows the adaptive pressure value that the ECM has learned for upshifts 1 and 2 in speed range 3.

Upshift 2-3 speed range 1: This reading shows the adaptive pressure value that the ECU has learned for upshifts 2 and 3 in speed range 1.

Upshift 2-3 speed range 2: This reading shows the adaptive pressure value that the ECU has learned for upshifts 2 and 3 in speed range 2.

Upshift 2-3 speed range 3: This reading shows the adaptive pressure value that the ECU has learned for upshifts 2 and 3 in speed range 3.

Upshift 3-4 speed range 1: This reading shows the adaptive pressure value that the ECU has learned for upshifts 3 and 4 in speed range 1.

Upshift 3-4 speed range 2: This reading shows the adaptive pressure value that the ECU has learned for upshifts 3 and 4 in speed range 2.
Upshift 3-4 speed range 3: This reading shows the adaptive pressure value that the ECU has learned for upshifts 3 and 4 in speed range 3.
1-2 speed range 1 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 1 and 2 in speed range 1.
1-2 speed range 2 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 1 and 2 in speed range 1.
1-2 speed range 3 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 1 and 2 in speed range 1.
2-3 speed range 1 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 2 and 3 in speed range 2.
2-3 speed range 2 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 2 and 3 in speed range 2.
2-3 speed range 3 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 2 and 3 in speed range 2.
3-4 speed range 1 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 3 and 4 in speed range 3.
3-4 speed range 2 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 3 and 4 in speed range 3.
3-4 speed range 3 correction: This reading shows the adaptive pressure value that the ECU has learned for upshifts 3 and 4 in speed range 3.

UTILITY:

Reset adaptive values: This causes the GS887X ECU to reset all adaptive values that the ECU has learned from the vehicle. The adaptions should be reset if the gearbox mechanical components or gearbox ECU have been renewed or rectified.

DIAGNOSTIC FUNCTIONS OF THE P38 HEVAC ECU

Custom Manufactured by Valeo for the P38 Range Rover as an Air condition control module option on everything except the very base model, which has only 3 rotary controls on its facia instead of this quite large LCD panel. Sadly the system seems a source of endless problems on this vehicle with Blend flaps and distribution flaps jamming sometimes burning out the motors if left too long before being repaired. This is especially common in hot countries where the dash has been subject to high temperatures and the Heater box warps slightly causing the flaps to jam. Often these can be easily freed up and the system re calibrated.

Attention: If the BECM is unlocked, the vehicle server might not be able to communicate with this ECU. In order to bypass this, unplug the white connector (the one nearest to the front) located under the driver seat (RHD) under a removable panel in the fuse box.

FAULTS:

The Hevac Self diagnostic system can self-detect approximately 54 faults which it places in one of two banks of memory depending whether the fault is permanent or intermittent. Most of these are minor faults, not even causing the book symbol to illuminate on the LCD display panel. Very few faults cause full system shutdown and these will prompt the display of the book symbol. Both parts of the memory are read explaining which part each fault was in. Often there are multiple faults stored in memory caused as a result of nothing more than battery failure or occasional glitches in the system. The faults once occurred are storing a code in the fault code log. However, besides the fault code log, the ECU is reporting all the current

faults that can be detected in the system. If there are faults that look more serious, it can be useful to clear the memory and see which of the faults becomes re-logged.
Clear faults:
This function checks the fault code memory for resident faults and then clears the memory if the fault has been rectified. Having deleted the faults the system re-checks the fault memory to ensure that it is clear. Failure to clear the fault memory successfully is usually due to the system re-logging the fault the moment the fault memory is clear, meaning that the fault has not been rectified properly and, as far as the system is concerned, still exists. The system may also carry out a re-check of the fault code memory but then the system may re-log the fault shortly after.

SETTINGS:

Values, configuration settings, and other stored information which can be read from 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.

Manufacturer: **Gives the manufacturer's name for the HEVAC ECU.**
Vehicle: Gives the vehicle model where the ECU is fitted.
ECU version: Gives the ECU version number.

INPUTS:

Realtime live display of the information the electronic control unit of the selected vehicle system is currently deriving from its input sensors.

SWITCHES

Left heat down: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Left heat up: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Right heat down: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Right heat up: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Demist program: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Front screen: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Rear screen: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Left heated seat: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Right heated seat: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Face: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Face and feet: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Feet: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Feet and screen: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Screen: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Recirculation: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Air con off: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.
Automatic: This gives the current status of the user's button mounted on the face of the Hevac ECU, allowing its correct operation to be tested.

Fan speed: This gives the numeric value for the currently selected fan speed which should change in even steps from 1 to 10 when the speed adjuster is rotated from one extreme to the other.

VALUES

Ambient temperature: This reading gives the external air temperature or air entering the ventilation system.
Aspirator temperature: This reading gives internal cabin temperature.
Evaporator temperature: This reading gives the evaporator unit's temperature.
Heater core temperature: This reading gives the engine coolant temperature where the coolant enters the heating system.
Road speed: This value is generated by the ABS ECU using information from its wheel rotation sensors.
Solar sensor (w/sqm): This reading gives the effective strength of the sun as detected by the Solar Sensor mounted beside the Alarm LED on the top of the dashboard.
Distribution motors: This gives the current feedback position of the motor that drives the flap controlling air distribution inside the vehicle. As the distribution buttons are pressed the flap should move to the position which gives air flow to the selected direction (feet, face, screen etc.).
Left blend motor: This gives the current feedback position of the motor which drives the flap controlling amounts of hot and cold air to be blended together (effectively the temperature of the air coming out of the vents). As the requested temperature is changed by the user the flap should move.
Right blend motors: This gives the current feedback position of the motor which drives the flap controlling amounts of hot and cold air to be blended together (effectively the temperature of the air coming out of the vents). As the requested temperature is changed by the user the flap should move.
Left blower return: This is the feedback value returned back to the Hevac ECU from the left blower motor, used by the ECU to determine the actual voltage at the motor. This reading value also allows the Hevac ECU to detect Blower motor faults.
Right blower return: This is the feedback value returned back to the Hevac ECU from the right blower motor, used by the ECU to determine the actual voltage at the motor reading. This value also allows the Hevac ECU to detect Blower motor faults.
Air conditioning grant: When the A/C button is pressed an active low signal is output to the engine management ECU (The Request). This then looks at factors like engine temperature, load, current acceleration etc. and according to when these conditions allow, grant Air conditioning. This involves it engaging the clutch to drive the Air Conditioning pump, altering its internal fuelling to compensate for the load imposed by the pump, managing along with the Hevac the Condenser fans, and also telling the Hevac that Air Conditioning has been granted.

OUTPUTS:

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.

Button pressed lights: This test illuminates all of the individual buttons pressed, or selected tell-tale lights on the Hevac control panel, allowing quick detection of lamp failure.
LCD backlight test: This turns the back illumination to the Hevac control panels LCD display allowing the condition of the bulbs to be checked.
LCD test pattern: This test first turns on the back illumination to the Hevac control panels LCD display, allowing the display to be seen, then turns on a special test pattern that illuminates every possible segment on the display. Failing displays with faulty segments can then be more easily seen.
Front heated screen: This will turn on the heated front windscreen for one minute, which is just long enough to detect a raise in temperature of the screen. However, in cold or chilly conditions the test may have to be repeated consecutively before the change can be felt. This test does impose quite a heavy drain on the vehicle's battery and a stationary vehicle with a poor battery and no supplementary supply may not stand the test.

UTILITY:

Choice of functions that can be performed.

Calibrate blend flaps: This function gets the ECU to automatically tune the blend flaps and distribution door servo motors to allow the correct range of operation. This operation is required after either blend flap motor or ECU replacement.
Force blower modules: This allows the blowers to be turned on and off and to test them to different values.
Force left/right blend motor: This allows the hot / cold blend flap motor to be driven to any position between 1 and 100, which represents its percentage of travel of the attached hot / cold blend flap. When the test sends the flap to the requested position it waits a short while to give the flap time to move and then reads back and gives the flap's current position to allow verification of the position before allowing the Hevac ECU to regain control of the flap's position. It is quite normal for the flap to move to a position a few percent away from the requested one even travelling beyond 100 percent or below 1 percent. This is because the returned value is not subject to the calibration values that the ECU stores during a self-calibrate function. If however the position reached by the flap is nowhere near the requested value and re-calibration does not correct the problem, the motor is probably faulty and will require replacing. As a late addition to this function we have added a return value during the output to confirm the flap / motor position.
Force distribution motor: This allows the airflow distribution flap motor to be driven to any position between 1 and 100, which represents its percentage of travel of the attached flap. When the test sends the flap to the requested position it waits a short while to give the flap time to move and then reads back and gives the flap's current position to allow verification of the position before allowing Hevac ECU to regain control of the flap's position. It is quite normal for the flap to move to a position a few percent away from the requested one even travelling beyond 100 percent or below 1 percent. This is because the returned value is not subject to the calibration values that the ECU stores during a self-calibrate function. If however the position reached by the flap is nowhere near the requested value and re-calibration does not correct the problem the motor is probably faulty and will require replacing. As a late addition to this function we have added a return value during the output to confirm the flap / motor position.
Force recirculation motor: This test causes the air recirculation flap motor to close the recirculation flap and then to re-open it.

DIAGNOSTIC FUNCTIONS OF THE P38 HELLA CRUISE CONTROL ECU

(Only found on 1999 onward Motronic engine P38)

IMPORTANT NOTICE

In Order to communicate with the Cruise Control the ignition must be on stage 2 and the button on the Cruise Control depressed until it lights up.

FAULTS:

Reads and clears the fault code memory. The ECU can self detect up to 41 different problems with itself, its wiring and its associated sensors, storing the respective code if it detects any malfunction or reading outside of pre defined acceptable limits. Not all stored faults may cause the fault warning lamp to illuminate.

SETTINGS:

Values, configuration settings, and other stored information which can be read from the ECU, edited and then rewritten back. 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.
Part Number: This is the manufacturer's part number for the ECU.

Software Name: This is a number which relates to the software programmed in the processor of the ECU.
Manufacturer: This is the manufacturer of the ECU.
Coding index: This is a number which denotes the layout of the options within the EPROM of the ECU and denotes which coding map should be used to program the ECU with.
Diagnostic index: This is a number that indicates the diagnostic capabilities support level.
Date of Manufacture: This is the date the ECU was manufactured in YY/MM/DD format.
P Amplification: This is part of the vehicle tune information and affects the way the cruise control operates relevant to the vehicle type. Based on the tune read from the ECU, the data is disassembled and displayed in the settings page. The value cannot be changed manually, it will change when an other tune is selected. The values should be:

- 44 for ECU default
- 25 for Range Rover 4.0
- 34 for Range Rover 4.6
- 25 for Discovery 4.6
- 17 for Discovery 4.0

D Amplification: This is part of the vehicle tune information and affects the way the cruise control operates relevant to the vehicle type. Based on the tune read from the ECU, the data is disassembled and displayed in the settings page. The value cannot be changed manually, it will change when an other tune is selected. The values should be:

- 32 for ECU default
- 31 for Range Rover 4.0
- 40 for Range Rover 4.6
- 31 for Discovery 4.6
- 25 for Discovery 4.0

Hysteresis Pump: This is part of the vehicle tune information and affects the way the cruise control operates relevant to the vehicle type. Based on the tune read from the ECU, the data is disassembled and displayed in the settings page. The value cannot be changed manually, it will change when an other tune is selected. The values should be:

- 30 for ECU default
- 57 for Range Rover 4.0
- 64 for Range Rover 4.6
- 57 for Discovery 4.6
- 10 for Discovery 4.0

Hysteresis Value: This is part of the vehicle tune information and affects the way the cruise control operates relevant to the vehicle type. Based on the tune read from the ECU, the data is disassembled and displayed in the settings page. The value cannot be changed manually, it will change when an other tune is selected. The values should be:

- 10 for ECU default
- 47 for Range Rover 4.0
- 64 for Range Rover 4.6
- 47 for Discovery 4.6
- 12 for Discovery 4.0

Set Pulse Offset: This is part of the vehicle tune information and affects the way the cruise control operates relevant to the vehicle type. Based on the tune read from the ECU, the data is disassembled and displayed in the settings page. The value cannot be changed manually, it will change when an other tune is selected. The values should be:

- 96 for ECU default
- 85 for Range Rover 4.0
- 85 for Range Rover 4.6
- 85 for Discovery 4.6
- 75 for Discovery 4.0

Set Pulse Gradient: This is part of the vehicle tune information and affects the way the cruise control operates relevant to the vehicle type. Based on the tune read from the ECU, the data is disassembled and displayed in the settings page. The value cannot be changed manually, it will change when an other tune is selected. The values should be:

- 80 for ECU default
- 80 for Range Rover 4.0
- 80 for Range Rover 4.6
- 80 for Discovery 4.6
- 80 for Discovery 4.0

Initial Acceleration: This is part of the vehicle tune information and affects the way the cruise control operates relevant to the vehicle type. Based on the tune read from the ECU, the data is disassembled and displayed in the settings page. The value cannot be changed manually, it will change when an other tune is selected. The values should be:

- 15 for ECU default
- 17 for Range Rover 4.0
- 17 for Range Rover 4.6
- 17 for Discovery 4.6
- 15 for Discovery 4.0

Initial Acceleration Gradient: This is part of the vehicle tune information and affects the way the cruise control operates relevant to the vehicle type. Based on the tune read from the ECU, the data is disassembled and displayed in the settings page. The value cannot be changed manually, it will change when an other tune is selected. The values should be:

- 32 for ECU default
- 60 for Range Rover 4.0
- 60 for Range Rover 4.6
- 60 for Discovery 4.6
- 60 for Discovery 4.0

Vehicle Tune: This is the tune selected for the cruise control. The tune is disassembled into the 8 parts and displayed in the settings page. The values for a tune cannot be changed separate. Unknown will be displayed if the tune read from the ECU does not match one of the 5 (ECU default, Range Rover 4.0/4.6, Discovery 4.0/4.6). And "UNKNOWN" map cannot be written into the ECU.

INPUTS:

Realtime live display of the information the electronic control unit of the selected vehicle system is currently deriving from it's input sensors.

Cruise Control Status: The status of the cruise control, either enabled or disabled.
Brake/Clutch Switch: The status of the brake/clutch switch, either on or off.
Brake Light: The status of the brake lights.
Set Switch: The status of the set switch.
Resume Switch: The status of the resume switch.
Speed Signal Input Status: This shows if a speed signal was detected or not.
Min Speed Threshold: Displays if the minimum speed threshold was reached or not.
Road Speed: The road speed in both, km/h and mph.
Cruise Target Speed: The current speed stored by the cruise control ECU in both, km/h and mph

UTILITY:

Last Triggered Memory: This function will display the last reason the cruise control was deactivated.