

## VALEO BCU (DISCO II) - System Overview

The heart of the Discovery series 2 The Valeo BCU has been custom produced for this application and takes care of nearly everything not catered for by independent systems. There are actually different versions with slightly different capabilities and functionality, however this is handled totally transparently and cleverly with capability that has been built in that allows settings to be crossed from one ECU version to another.



## VALEO BCU (DISCO II) - 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

## VALEO BCU (DISCO II) - Diagnostic Capabilities (Read Inputs)

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

### **BODY 1**

#### **LIGHTS**

- **Sidelights:** The sidelights input are used by the BCU to give, amongst other things a lights left on warning sound.

- **Main beam:** When the lighting switch is moved to the flash or main position, the feed from fusible link 10 in the engine compartment fuse box passes through the switch contacts. The feed is connected to the passenger compartment fuse box, where it passes through fuses 3 and 22. The IDM senses the headlamp main beam request and through internal circuitry, provides a feed to the main beam warning lamp in the instrument pack.
- **Dipped:** When the lighting switch is moved to the headlamp position, the feed from fusible link 10 in the engine compartment fuse box passes through the switch contacts. The feed is to the passenger compartment fuse box, where it passes through fuses 9 and 10.
- **Front fog light:** When the front fog lamp switch is operated, an earth path is completed from the BCU to the switch. The completion of the earth path signals the BCU to provide an earth path from the coil of the front fog lamp relay in the engine compartment fuse box to the BCU. The energized coil closes the contacts in the front fog lamp relay.
- **Rear fog light:** When the front fog lamp switch is operated, an earth path is completed from the BCU to the switch. The completion of the earth path signals the BCU to provide an earth path from the coil of the front fog lamp relay in the engine compartment fuse box to the BCU. The energized coil closes the contacts in the front fog lamp relay.
- **Left/right hand indicator:** The BCU supplies a reference voltage from for the LH flasher and for the RH flasher. When the flasher switch is moved to the LH or RH hand flasher position an earth path is completed. The completion of the earth, signals the BCU that a request for LH or RH flasher operation has been made. The BCU then sends a signal to the IDM in the passenger compartment fuse box. The signal is received by the IDM and interpreted as a request for LH or RH flasher operation. The IDM grants an earth path for the coil of the LH or RH direction indicator relay. The IDM controls the flasher operation by momentarily removing and restoring the earth for the relay coil, which opens and closes the contacts causing the indicator bulbs to flash on and off. The resistor is used by the IDM to monitor the current drawn through the resistor by the direction indicator bulbs. If an indicator bulb fails, the IDM detects the drop in current draw across the resistor and operates the flasher relay at a faster speed. The faster flash is also transmitted to the instrument pack to inform the driver of the bulb failure.
- **Hazards:** The BCU supplies a reference voltage to the hazard warning switch. When the hazard warning switch is operated an earth path is completed from the switch. The completion of the earth signals the BCU that a request for hazard warning lamp operation has been made. The BCU then sends a signal to the IDM in the passenger compartment fuse box. The signal is received by the IDM and interpreted as a request for hazard warning lamp operation. The IDM grants an earth path for the coils of the LH and RH direction indicator relays. The IDM controls the flasher operation by momentarily removing and restoring the earth for the relay coils, which opens and closes the contacts causing the indicator bulbs to flash on and off. The resistor is used by the IDM to monitor the current drawn through the resistor by the direction indicator bulbs. If an indicator bulb fails, the IDM detects the drop in current draw across the resistor and operates the flasher relay at a faster speed. The faster flash is also transmitted to the instrument pack to inform the driver of the bulb failure.
- **Daytime run light:** The feed from fuse 13 in the engine compartment fuse box is connected to the coil of the daylight running relay and the IDM integral with the passenger compartment fuse box. When the engine is started, the IDM senses, through

internal circuitry, that the engine is running and provides an earth for the daylight running relay coil. The energized coil closes the contacts of the daylight running relay allowing the feed from fuse 5 in the passenger compartment fuse box to pass through the relay contacts.

## DOORS

- **Passenger/Driver door switch:** When a door is opened the BCU provides earth paths from the interior lamps, the load space lamp and the ignition switch illumination through the BCU.
- **Bonnet:**
- **Key lock/unlock:** The BCU uses the driver's door key lock and unlock switches to activate and deactivate the security system. The driver's door lock is also used for entering the EKA code. Two separate switches are incorporated into the key lock assembly of the driver's door. The switches are normally open and the BCU provides a separate power supply to each. The BCU is signaled when a circuit is earthed enabling it to determine the direction in which the lock has been turned.
- **CDL lock/unlock:** The CDL switch is connected on a KR wire to BCU. This connection provides an earth input to the BCU to signal that the lock has been requested from the CDL switch. A second connection from the CDL switch on a YK wire to BCU provides an earth input to the BCU to signal that unlock has been requested from the CDL switch.
- **Inertia:** The permanent battery feed is connected from fuse 13 in the engine compartment fuse box to the inertia switch. From the inertia switch the feed is connected back to the engine compartment fuse box. From the fuse box the feed is connected to the passenger compartment fuse box where it is then connected to the IDM. From the IDM the feed is connected on the BCU. When the inertia switch is operated, the battery feed to the IDM is removed. This is sensed by the BCU, which automatically unlocks the doors, only if the ignition is in position II and the alarm is disarmed.
- **Ignition Key inserted:** The status of the ignition key in ignition barrel switch.
- **Transfer box neutral:** This is the supply voltage as measured by the BCU at its transistor switching circuit stages located within the BCU itself.
- **Park/neutral:**

## BODY 2

## TRANSMISSION

- **Reverse idle:** The status of the reverse switch input. When reverse gear is selected, a feed from fuse 25 in the passenger compartment fuse box is connected on a GY wire to the reverse lamp switch (manual transmission) or the starter inhibitor/reverse lamp switch (automatic transmission).
- **Transfer neutral switch:**
- **Autobox W switch:** The status of the Automatic gearbox currently selected gear W switch.

- **Autobox X switch:** The status of the Automatic gearbox currently selected gear X switch.
- **Autobox Y switch:** The status of the Automatic gearbox currently selected gear Y switch.
- **Autobox Z switch:** The status of the Automatic gearbox currently selected gear Z switch.
- **Park neutral switch:** This displays whether the Autobox is in Park or Neutral

## WINDOWS

- **Front Left/right hand window up:** The window switch up contact is connected to the BCU by a BS wire. When the switch is set to the up position an internal supply from the BCU flows along the BS wire through the contacts of the switch and to earth via earth header. The motor is energized and drives the window mechanism towards the up position.
- **Front Left/right hand window down:** The window switch down contact is connected to the BCU by a BR wire. When the switch is set to the down position an internal supply from the BCU flows along the BU wire through the contacts of the switch and to earth via earth header. The motor is energized and drives the window mechanism towards the down position.

## WASH WIPE

- **Front intermit:** Operation of the front screen wash/wipe switch to the intermittent position allows a feed from fuse 19 to pass to the wash/wipe switch. The BCU interprets the signal as an intermittent wiper request and signals the IDM via the serial data bus.
- **Front wash:** When the switch stalk is pulled, a feed passes through the washer switch contacts and is connected, from the switch, to the washer pump and the BCU. If the washer switch is held for longer than 0.4 seconds the BCU signals the IDM through the serial data bus to energize the front wiper relay. The IDM energizes the front wiper relay for 4 seconds allowing the screen to be cleared. After 4 seconds the IDM removes the earth path for the relay coil, causing the wipers to return to the park position.
- **Front wiper parked:** The status of the front wiper as determined by the IDM.
- **Front wiper speed:**
- **Rear wiper:** When the rear wiper switch is operated an earth path is completed through the switch contacts and header, to earth. The completed earth path provides a signal to the BCU that rear wiper operation has been requested. The BCU sends a signal through the serial data bus to the IDM to commence wiper operation. The IDM provides a power supply and earth for the coil of the rear wiper relay in the passenger compartment fuse box, which energizes closing the relay contacts.
- **Rear wash:** When the rear screen washer switch is operated, a feed from fuse 30 in the passenger compartment fuse box is connected to the switch. The pump operates for as long as the switch is pushed. The connection to the BCU signals that rear washer operation has been requested. The BCU signals the IDM to energize the rear wiper relay to operate the rear wiper 0.5 seconds after the request has been made.

## HEATED SCREEN

- **Heated screen switch:** The HRW is operated from a non-latching switch located to the left of the instrument pack. The switch has an indicator light to show when the HRW is operating. The HRW element comprises fourteen metallic strips bonded to the inside surface of the rear window. The HRW will only function when the engine is running due to the high current draw and subsequent load on the battery. The HRW can also be operated by the air temperature control ECU on vehicles fitted with air conditioning. When the HRW is selected on, heater elements in the door mirror glass also operate.
- **Ignition 2:** The status of the ignition stage 2 input.
- **Engine speed signal:** This is an internal status within the BCU.

## INSTRUMENT

- **Left/right hand DI:**
- **Left trailer indicator:** The feed for the trailer connection is taken from header C0289, via header C0295, on a GR wire to the trailer pick-up. The trailer pick-up is connected on a B wire to earth eyelet connector C0808-1.
- **Right trailer indicator:** The feed for the trailer connection is taken from header C0289, via header C0723, on a GW wire to the trailer pick-up. The trailer pick-up is connected on a B wire to earth eyelet connector C0808-1.
- **Seat belt:** The seat belt switch is connected to the BCU on a RW wire. The seat belt switch is earthed on a B wire.
- **Diff lock:** When the differential lock unit switch is operated, an earth path is completed from the SLABS ECU to the differential lock unit switch.
- **Transfer neutral:** The status of the Transfer in neutral input to the BCU. The transmission neutral sensor provides an earth signal to the BCU when the transfer box is in neutral. The earth signal causes the BCU to operate an audible warning to warn of the transfer box in neutral when the ignition is on.
- **Autobox manual:** The manual warning lamp is connected to the EAT ECU.
- **Autobox sport:** The sport warning lamp is connected to the Electronic Automatic Transmission (EAT) ECU.
- **Off road level:** The off road warning lamp is connected to the instrument pack to the off road mode switch.
- **ABS:** The ABS warning lamp is connected from the instrument pack to the SLABS ECU.
- **Traction control:** The traction control warning lamp is connected from the instrument pack to the SLABS ECU.

- **SRS:** The SRS warning lamp is connected from the instrument pack, to fuse 35 in the passenger compartment fuse box. Another connection to the SRS warning lamp is connected from the instrument pack to the airbag ECU.
- **HDC select:** The HDC active warning lamp is connected from the instrument pack to the SLABS ECU.
- **Glow plug:** The glow plug warning lamp is connected on the instrument pack to the ECM on a BY wire.
- **Brake:** The handbrake and low brake fluid level warning lamps are connected to the instrument pack to the handbrake switch, the handbrake switch is locally earthed. A second connection connected to the brake fluid level switch on a KO wire. If either of the switches closes, an earth circuit via the closed switch contacts is completed and the handbrake/low fluid level warning lamp will be illuminated.
- **Oil pressure:** The oil pressure warning lamp is connected to the instrument pack to the oil pressure warning switch, the oil pressure warning switch is locally earthed. If the oil pressure switch closes, an earth circuit via the closed switch contacts is completed and the oil pressure warning lamp will be illuminated.
- **Alternator:**
- **Check engine:**
- **Fuel filter:** Fuel filter warning lamp (TD5 models only). A water sensor is installed in the fuel system, the power supply for the sensor is from fuse 10 in the engine compartment fuse box and the closed contacts of the fuel pump relay on a WP wire. The operation of the fuel pump relay coil is controlled by the Engine Control Module (ECM). When the water in the filter becomes too great, the instrument pack illuminates the warning lamp when the voltage reaches a predetermined level.
- **Transmission temp.:** This shows the state of the transmission oil temperature overheat input. The sensors are located in the gearbox oil cooler and the rear of the transfer gearbox.
- **Check ACE:** The ACE warning lamp is connected from the instrument pack to the ACE ECU.
- **Check HDC:** The hill descent 'fail' warning lamp is connected from the instrument pack to the SLABS ECU.
- **Check SLS:** The SLS warning lamp is connected from the instrument pack to the SLABS ECU. The drivers door closed input is enabled by the SLABS ECU to illuminate the SLS warning lamp in some remote control operating modes.
- **Instr. mileage (km):** This is an input which is internal to the instrument pack.
- **BCU mileage (km):** This is an input which is internal to the instrument pack.
- **IP Trip switch:** This is an input which is internal to the instrument pack.

## **POWER DISTRIBUTION**

- **BCU Ignition pos.1:** The status of the ignition stage 1 input.
- **BCU Ignition pos.2:** The status of the ignition stage 2 input.
- **BCU Ignition pos.3:** The status of the ignition stage 3 input. Whilst measuring this input you may require external power or to disconnect the starter motor.
- **IP Ignition pos.2:**

- **IDM ignition pos.2:** The ignition stage 2 status at the Intelligent Drivers Module located within the passenger compartment fuse box.
- **IDM battery (V):** This is the supply voltage as measured by the Intelligent Drivers Module located within the Dash mounted fuse box.
- **BCU switch power:** This is the supply voltage as measured by the BCU at its transistor switching circuit stages located within the BCU itself.
- **BCU relay power:** This is the supply voltage as measured by the BCU at the internal relays located within the BCU itself.

#### BCU (Discovery II) - 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.

### LIGHTS WINDOWS - SEATS

- **Front fog lamp:** The options are:
  - The vehicle is not fitted with front fog lamps (NONE).
  - The front fog lamps operate when the headlamps are dipped or are on main beam (MAIN).
  - The front fog lamps will not operate if the headlamps are on main beam (NO MAIN).
- **Daytime run lights:** Legislation in some markets requires that the headlamps illuminate whilst the vehicle is moving, or the ignition is switched on. This function is referred to as "daylight running lamps". Therefore, the BCU, which controls illumination of the headlamps, must also be programmed to accommodate the legislative requirements of individual markets, with regard to daylight running lamps. The options are:
  - The vehicle does not require the daylight running lamp feature to operate in any circumstance (NONE).
  - The daylight running lamps will be on if the main beam head lamps are off (NO MAIN).
  - The daylight running lamps will be on whenever the main or dipped beam head lamps are switched ' off' and the gear selector lever is in any position other than ' park' (NO HEADS).
- **Courtesy headlamps:** The BCU can be programmed to turn on the vehicle headlamps when the driver presses the remote transmitter. The BCU switches both headlamps on by signaling to IDM to switch the headlamp relay ON.
- **Headlamp power wash:** This option is used if headlamp power washers are fitted to the vehicle.
- **Electric Front window:** The BCU can be programmed to disable operation of the front windows to conform to differing market legislative requirements. Available options are:

- The front windows will be disabled 44 seconds after the driver door is opened (DRIVER CANCEL).
  - The front windows will not be disabled (NO CANCEL).
  - The front windows will be disabled when the ignition is turned off (ALL CANCEL).
- **Rear windows sunroof:** Although the rear windows and sunroof are controlled by a hard-wired circuit, the rear windows and sunroof ECU are enabled by the BCU. This allows programming of the BCU to disable these outputs to conform to differing market legislative requirements. Available options are:
  - The rear windows and sunroof will be disabled 44 seconds after the driver door is opened (DRIVER).
  - The rear windows and sunroof will be disabled 44 seconds after any door is opened (NO CANCEL).
  - The rear windows and sunroof will be disabled when the ignition is turned off (ALL CANCEL).
- **Heated front screen:** Sets whether the Heated Front screen is Fitted or Not Fitted
- **Electric front seats:** This setting is used to configure the operation of the electric front seats available options are:
  - The vehicle is not fitted with electric front seats (NOT FITTED).
  - The electric seats are available if the ignition is on or the driver door is opened for a short time (FITTED).
  - The electric seats are available if the ignition is on (IGNITION II).
- **Programmed wash wipe:** The front wash switch is located on the wiper stalk, the rear wash switch is located in the instrument pack surround. They are both momentary switches (do not stay in when released). The way the vehicle reacts to the driver pressing the front or rear windscreen wash switch depends upon this setting programmed within the BCU. There are two options:
  - No wiper operation when the wash switch is pressed (NO WIPE).
  - Wiper action after an initial delay of 400mS (WIPE).
- **Seat belt warning:** This setting controls operation of the seat belt warning lamp to suit legislative market requirements. Available options are:
  - Timed - The warning lamp is on for 6 seconds after ignition warning lamp is turned on
  - Buckle -
  - Ignition II -
  - Disabled - The warning lamp is not used
  - Driver Door -
  - Ignition or Crank - If the buckle is unfastened when the ignition is turned on then the lamp is on for 6 seconds



- Fastened - The warning lamp is on for 6 seconds after ignition is turned on or until the buckle is fastened
- **Seat belt warning sound:** This setting controls operation of the seat belt warning sounder to suit legislative market requirements. Available options are:
  - Timed -
  - Buckle -
  - Ignition II -
  - Disabled - The warning sound is not used
  - Driver Door -
  - Ignition or Crank -
  - Fastened -
- **Autographics:** The BCU can be programmed to change the situations in which the automatic gearbox selector lever illumination (AUTOGRAPHICS) is enabled. The automatic gearbox selector illumination can be on whenever the ignition is on (ALWAYS option) or it can be on when the ignition is on and the sidelights are on (SIDELIGHTS option).

## TRANSM-LOCK-WARN

- **Transmission:** Configure the BCU for either Automatic or Manual.
- **Shift interlock:** Certain market legislations require that an vehicle must be in neutral or park before removal of the ignition key is allowed, the BCU therefore, is able to be programmed to control solenoids for this purpose. Available options are:
  - The vehicle is not fitted with a shift interlock solenoid (NONE).
  - The vehicle is fitted with both shift interlock and transfer box interlock solenoids (SHIFT).
  - The vehicle is fitted with a shift interlock but no transfer box interlock solenoid (NO TRANSF).
- **HDC:** Fitted or Not Fitted.
- **Super lock:** Super locking prevents the use of the interior door handles to unlock and open the vehicle doors. This prevents an intruder gaining access to the vehicle by smashing a window to open a door. Pressing the remote transmitter or turning the key in the door lock activates super locking. The market specification and customer configuration options will determine if super locking will activate and how it can be set. There are four options:
  - No super locking (DISABLE).
  - Pressing the lock button on the remote transmitter once (NO KEY).
  - Pressing the lock button on the remote transmitter, or turning the key once (SINGLE).
  - Pressing the lock button on the remote transmitter, or turning the key twice within 1 second (DOUBLE).

The vehicle needs to be in the correct 'state' before super locking will activate. These conditions are:

- All doors closed.
  - Ignition key not inserted in ignition switch.
  - Inertia switch not tripped.
  -
- **Single point entry:** Single point entry is a function that allows the driver to unlock just the driver's door, thus leaving all the other doors in a locked state. It is an option that can be enabled using this setting. To use single point entry, press the "unlock" button on the remote transmitter once. Depressing the unlock button a second time in the space of one minute unlocks the remaining doors. Single point entry is also possible by turning the key in the driver's door lock to the "unlock" position, once. Turning the key to the "unlock" position again within one minute unlocks the remaining doors. It is also possible to use a combination of key and remote transmitters unlock signals to unlock all of the doors.
  - **Speed lock option:** This setting allows you to enable or disable the speed related locking. This feature, when enabled locks all the doors automatically when the vehicle speed exceeds 7 km/h (4 mph). The vehicle will unlock automatically when the ignition is switched off; providing the vehicle has been locked by the speed related locking function. Speed related locking only locks the vehicle once every journey/ignition cycle. If the doors are unlocked after the vehicle speed has exceeded 7 Km/h (4 mph), the vehicle will not lock under speed related locking until the ignition has been switched 'off' and then back 'on' again. If the unlock button on the fascia (CDL switch) is pressed it will disable the operation of speed related locking for the duration of the journey.
  - **Mislock option:** The Mislock sound alerts the driver to a failed attempt to lock the vehicle. This may be because one or more of the doors, bonnet or tail door is not correctly closed or the key is inserted into the ignition (any position). A Mislock condition will enable security functions only on the parts of the system that the BCU can verify as being reliable partially armed. The audible warning of a Mislock condition depends on the hardware fitted to the vehicle and on the current setting of the alarm sounder option setting. If a Mislock condition is detected and the Mislock sound is enabled in this setting, the programmed sounder will sound for 50 ms. Furthermore the BCU will not flash the hazard lights or operate the LED in a rapid flashing state when it detects the Mislock condition.
  - **Bathrobe lock option:** When bathrobe locking is enabled, the engine can then be started and then the vehicle locked with a spare key. This allows the vehicle interior to reach the desired temperature without the driver needing to be present. It should be noted that the vehicle security system is not set during this procedure; only the central door locking is activated. This feature is very desirable in cold countries.
  - **Odometer Error warning:** The BCU can be programmed to show an error if there is a difference between the odometer values stored in the BCU and the Instrument pack. Available options are:
    - The odometer will not flash if there is an odometer error (DISABLED).
    - The odometer will flash if there is an odometer error (ENABLED).

- **Key warning:** If the key is left in the ignition and the driver door is open, a warning sound is generated. This can be disabled or enabled.
- **Low battery warning:** If this setting is set to enabled, the BCU will alert the driver of the vehicle if the remote transmitter battery requires replacing. The remote transmitter measures its battery voltage and when the voltage goes below a threshold it will transmit a special code to the BCU to request that it informs the driver by flashing the LED on-off-on short flashes of 50mS and "off" for 2000mS. This is conditional upon the driver's door being open and the ignition in an "off" position, or the key removed from the ignition barrel.
- **Bulb failure:** The BCU can be programmed to detect failure of one of the direction indicator bulbs, this setting allows the function to be enabled or disabled.

## **INSTRUMENT PACK**

- **Transmission:** This configures the instrument pack for either Automatic or Manual vehicles, and then on the second choice, configure the BCU for either Automatic or Manual.
- **Engine:** This sets the instrument pack for a Diesel or Petrol vehicle.
- **ACE:** This configures the instrument pack to indicate the ACE lamp during initial bulb checking and during usage.
- **SLS:** This configures the instrument pack to indicate the SLS lamp during initial bulb checking and during usage.
- **Gulf:** This setting is used to configure the instrument pack for Gulf operation. Its operation on non Gulf specification instrument packs is unknown.
- **Police:** This setting is used to configure the instrument pack for Police force vehicles. Its operation on non Police specification instrument packs is unknown.
- **HDC:** This configures the instrument pack to indicate the HDC lamps during initial bulb checking and during usage.
- **TRC:** This configures the instrument pack to indicate the electronic traction control lamp during initial bulb checking and during usage.

## **ALARM-OTHER**

- **Alarm:** This setting allows for FITTED or NOT FITTED.
- **Alarm option:** This setting allows the BCU's built in alarm to be turned off as if there were no alarm fitted.
- **Alarm disarm:** This setting programs the effect that usage of the vehicles key has on disarming the alarm system. Options:
  - Operation of the key in the drivers door can always disarms the vehicle (ALWAYS).
  - Key only Operation of the key in the drivers door only disarms the vehicle if it was locked with the key (KEY ONLY).
  - The security system is not disarmed by the key (except via an EKA) (KEY NEVER).

- **Alarm sounder:** Depending upon the build specification of a vehicle it may have one of a small choice of sounders available for audible notification of events by the alarm. This setting allows the alarm sounder option to be configured to accommodate any of the fitted options either on their own or in conjunction with any other fitted sounder. The sounders which can be used are:
  - Battery backed sounder (BBS), located inside the exterior body panel near the fuel release solenoid, is a warning device for cases where the alarm is activated or the battery is disconnected. It has a self-contained power source, allowing it to operate when the vehicle battery is disconnected, or the unit is unplugged. The BBS will not sound if the battery is disconnected and the security system is not active.
  - Vehicle horn can either sound independently or using this setting can be programmed to work in conjunction with an alarm horn (if fitted) using the (BOTH) option. If the alarm is triggered, the vehicle horn operates at 250ms intervals, in phase with the hazard lamps.
- **Alarm Tamper:** This setting is used to configure the alarm tamper detection notification via the security system LED. Available options are:
  - The security system LED does not flash when option the security system has been tampered with (DISABLED).
  - The security system LED flashes when the security system has been tampered with (ENABLED).
- **Engine immobile:** The engine immobilization status can be determined by the flashing status of the Security system LED. This LED has four different flash rates. These flash rates signal to the driver the different modes of operation or other system information. The four flash rates are:
  - Flash for 10 seconds at a rate of 10 Hz (50ms 'on', 50ms 'off').
  - Flash at a rate of 10 Hz (50ms 'on', 50ms 'off').
  - Flash until the system changes state at a rate of 50ms 'on', 2000ms 'off'.
  - Flash 'on' for 50ms, 'off' for 50ms, 'on' for 50ms and 'off' for 2000ms.

When the driver first locks the vehicle with either the key or the remote transmitter (assuming the vehicle does not Mislock), the LED will follow flash rate 1 (indicating the correct setting of the security system). After 10 seconds the system will follow flash rate 3 (indication of security system being set). If the engine is immobilized but the alarm system is not set, the LED will signal the driver by following flash rate 3 (indicating the security system is set. If the vehicle is immobilized and the ignition is switch to position II, the LED will illuminate (to indicate that the engine will not start). It will extinguish only when the BCU receives a valid remobilize signal, or the ignition is switched to position 0 or I. If the alarm has triggered since the BCU received a valid 'arm' signal, the LED will follow flash rate 2. When the BCU receives an unlock signal (this indicates that the security system has been activated), the LED will follow flash rate 2 until the ignition

is next turned to position II. The LED will flash one longer period if the EKA code sequence is started.

- **Passive immobile:** When enabled with this setting, passive immobilization prevents the vehicle from being started unless a correctly programmed remote transmitter key is used to start the vehicle. This system works whether or not the driver sets the security system into an active state. The BCU immobilizes the engine 5 minutes after the ignition has been switched off, providing the driver's door is not opened. The BCU will immobilize the engine 30 seconds after it detects the driver's door opening. Immobilization is achieved by the BCU not transmitting the code to the EMS ECU. This code is needed to allow the engine to continue to run after the initial start-up sequence. If the BCU or ECM is replaced, this code will require synchronization with the new unit.
- **Inertia switch:** The inertia switch is located on the bulkhead under-bonnet. It is wired in series with the main relay. Whenever the inertia switch is tripped by a sudden deceleration of the vehicle (over and above the capacity of the braking system), the main power feed to the ECM will be interrupted. This action will stop the fuel pump and the engine by means of the ECM no longer operating the injectors. The vehicle will not restart until the inertia switch has been reset. When the inertia switch has been operated, this setting will affect if the hazards are turned on. Available options are:
  - Operation of the inertia switch does not operate the hazard indicators (NO HAZARDS).
  - Operation of the inertia switch does operate the (Hazards).
- **Hazard option:** This setting configures the usage of the hazard lights by the BCU in respect of alarm usage. Available options are:
  - The hazards do not flash on security system arm disarm or trigger (DISABLED).
  - The hazards flash on security system trigger only (FITTED).
  - The hazards flash on security system arm, disarm and trigger (ALL).
- **Volumetric sensor:** This option allows the volumetric protection system (detailed below) to be enabled or disabled and the BCU to be programmed to suit vehicles which do not have ultrasonic sensors fitted.

Volumetric protection is a function that the vehicle's security system employs to detect movement within the vehicle's interior. It enhances the perimetric function by detecting situations where personal belongings are threatened by an intruder smashing a window. Volumetric protects by using two ultrasonic sensors to produce a sound 'pressure' inside the vehicle. The sensors monitor the 'tone' of the sound being reflected from interior trim panels and seats etc. If the sensor notes a change in 'tone', it indicates that something is moving within the interior of the vehicle.

The BCU does not operate both volumetric sensors at the same time. If it did, the sensors would give unreliable detection. As a result, the two sensors within the vehicle interior communicate with each other. Both sensors use the wire used to inform the BCU that it has detected unauthorized movement within the vehicle, as a communication bus, sending a signal to tell the other sensor that it is currently active. When the BCU provides power to both sensors, the first to operate sends a 5mS pulse along the signal wire to

indicate that it has activated. After a period of 458mS the first sensor will switch off. The other sensor will, after a delay of 42mS, start to detect movement within the vehicle and also send the 5mS signal to declare that it is active along the signal wire. If one of the sensors detects movement when it is activated, it will provide a path to ground for the signal wire for a period of approximately 500mS. The BCU will interpret this lack of signal and activate the alarm components. The sensors continue to transfer operation between each other until the BCU removes their power. The two ultrasonic sensors become active after an initial delay of fifteen seconds, providing the vehicle's security system has been set to activate volumetric sensing. This delay is incorporated into the BCU software to prevent spurious triggering events caused by air moving inside the vehicle interior. It is also possible to lock the vehicle without arming the volumetric alarm by using the key and Instructions to do this are held in the pages of the vehicles user manual.

The same three conditions apply when trying to arm the vehicle in volumetric mode. These are:

- The ignition must not be "on", and the key must be removed from the ignition lock.
  - The inertia switch must not be active.
  - All of the doors must be closed, as well as both the front windows.
  - To unlock the vehicle and disable the security system, the "unlock" button on the remote transmitter must be pressed. If certain market configurations are set inside the BCU, it may not be possible to disengage the volumetric protection with the key.
- **Market:** This code is used to identify the exact country for which the BCU is programmed. Every country has its own number and below is a list of the most common ones. If fitting a new BCU you should use the same code that was in the old one.
  - Australia - 21
  - Denmark - 89
  - Finland - 139
  - Netherlands - 350
  - Norway - 353
  - Sweden - 473
  - Italy - 228
  - Unknown
  - UK - 158
  - USA - 539
- **EKA option:** This setting allows configuration of the EKA facility and how its usage effects the central locking. Available options are:
  - EKA (emergency key access) is DISABLED.

- EKA (emergency key access) is enabled and the door locks operate electrically (ENABLED).
  - EKA (emergency key access) is enabled, but the door locks do not operate electrically (NO UNLOCK).
- **Cruise control:** This option is used if Cruise Control is fitted to the vehicle.
- **Air conditioning:** This option is used if air conditioning is fitted to the vehicle.
- **Fuel burning heater:** This option is used if a Fuel Burning Heater is fitted to the vehicle.
- **Passive coil:** The Passive coil (where fitted) forms part of the passive engine immobilization and Passive engine remobilization system. Having been automatically immobilized after a time delay the BCU requires to see a code transmitted from the vehicles key fob before remobilizing the engine. If the driver has opened the door using the key, no code will have been transmitted, therefore whenever the ignition is first switched 'on', and the vehicle is in an immobilized state, the BCU powers the passive coil located around the ignition barrel. The passive coil produces a magnetic field, which excites the circuitry inside the remote transmitter. The transmitter then sends a remobilization signal to the BCU. If this system fails and the BCU does not receive a valid signal it will stop energizing the coil after one minute of operation. The driver of the vehicle will then need to either press the unlock button on the remote transmitter or enter the EKA code to remobilize the engine. Both engine immobilization and remobilization are totally transparent to the driver of the vehicle providing the system is operating correctly.
- **Transit mode:** To prevent excessive battery drain during transportation of the vehicle after leaving the factory, a transit mode function has been built into the BCU. Enabling this mode disables the following functions/systems:
  - Volumetric sensors.
  - Passive immobilization will remobilize the engine on a valid unlock signal from the driver's door lock, regardless of the programmed market.
  - Immobilization of the vehicle by use of the door locks inputs.
  - Ignition key interlock.
  - Electric seat enable time-out with driver's door open.
  - Besides being able to enable or disable transit mode with this setting, the vehicle can also be removed from transit mode by simultaneously holding down the heated rear window and the rear fog lamp switches and turning the ignition switch from position 0 to position III for 2 seconds.

## **INFO**

- **Serial No:** This shows the serial number allocated to BCU.
- **Date:** This shows the date of the BCU.
- **Hardware No:** This shows the hardware number of the BCU.
- **Software No:** This shows the software number of the BCU.

- **Alarm Type:** This shows the version number allocated to the alarm specification of the BCU. The value is usually 10 but may be different in some countries, altering this number does not change the functionality of the alarm.
- **VIN:** The vehicles VIN number, the first 3 digits are hard coded.

### VALEO BCU (DISCO II) - Diagnostic Capabilities (Outputs)

This is a selection of functions and outputs that can be tested. Each output has the option ON and OFF in order to start and stop testing. The outputs for diesel engine (glow plug, etc.) can be tested only a diesel model. Also see if in the settings the output was disabled. BCU has control over the following features:

## **OUTPUTS - BODY**

### **LIGHTS**

- Front Fog Lights
- Rear Fog Lights
- Daytime Running lights
- LH indicator enable
- RH indicator enable

### **WINDOWS**

- Front left window up
- Front left window down
- Front right window up
- Front right window down
- Rear windows enable
- Sunroof enable

### **WASH WIPE**

- Front wiper enable
- Tail wiper enable



- Head lamp power wash

### **HEATED SCREEN**

- Heated screen
- Heat. Rear screen lamp

### **CHECK ENGINE**

- Check engine lamp

## **OUTPUTS - SECURITY**

### **Security**

- Horn
- BBUS ALL
- BBUS ST
- Fuel flap
- Alarm LED
- Ignition interlock
- Crank Enable
- Volumetric power
- Robust immo.
- Transponder Power

### **LOCKING**

- Lock
- Unlock
- Superlock
- Single point entry

### **VALEO BCU (DISCO II) - Diagnostic Capabilities (KEY PROGRAMMING)**

**There are 2 methods of Key programming. Please select the one relevant to the type of Nanocom unit you have.**

**KEY PROGRAM 6 DIGIT INNER CODE (Used on the Nanocom Evolution Mk 2)**

This function allows you to program one or more keys on the 4 slots available (the suspension plip is not used) by means of the 6 digit code printed on the label of the circuit inside the fob. The code must be written in the desired slot and confirmed with the corresponding button. We suggest using the first slot available. Once the code is inserted and confirmed the SYNC KEY function is required to synchronize the fob's rolling code.

#### **KEY PROGRAM COMPLETE BAR CODE (not available on Nanocom Evolution Mk 2)**

This function allows you to program one or more keys on the 4 slots available (the suspension plip is not used) by means of the 18 digit bar code attached to the new keys. The code must be inserted without the first 2 and the last 2 digits that normally are "\*" or "?" and confirmed with the Set button. We suggest using the first slot available. Once the code is inserted and confirmed we suggest that you perform the SYNC KEY function to synchronize the fob's rolling code.

#### **SUSPENSION FOB**

Besides standard fobs the BCU can accept inputs from an accessories and optional extras fob which can be used to raise and lower the air suspension from outside the vehicle, this fob is designated as a SLABS fob and its bar code must be placed in the Suspension plip BAR CODE box only.

### **BCU (Discovery II) - Diagnostic Capabilities (UTILITY)**

This is a choice of functions that can be performed.

#### **RESET THE NEW FLAG**

#### **RF TEST**

#### **SYNC ODOMETER TO BCU**

#### **SYNC BCU TO ODOMETER**

The stored odometer value can only be incremented and is displayed, as it is stored in kilometers. Typing in too high a value is non reversible. If the odometer error setting is enabled in the settings section the display will also flash when the BCU odometer value is different to the IP (instrument pack) odometer value. To convert the value to miles simply multiply the kilometer value by 0.6214. When changing this value the BCU will also increment to this value.

#### **EKA CODE - READ - SET**

This is a four digit code, each digit of the EKA code can be between 1 and 16.