



RANGE ROVER

BODY ELECTRICAL CONTROL MODULE (BeCM)

APPLICABILITY	RANGE ROVER
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Description of Functionality

General

The Body electrical Control Module (BeCM) controls, monitors and provides power supply to many of the vehicle's electrical systems. This document identifies which system the BeCM interfaces with and describes the functionality and operation of systems that are not covered within other documents. This document also provides a complete list of BeCM inputs and outputs. This document is not intended as a complete diagnostic guide. The ETM should be referred to where further details of the connector pinouts and wire colours are required. Testbook should be used for diagnosis of the observed failures. The diagram on page 8 identifies the systems that the BeCM interfaces with.

BeCM activation and Sleep modes

The BeCM has two modes of operation, normal operation mode or "activation mode", and a low quiescent current state or "sleep mode". The sleep mode is required to enable the vehicle to be left for extended periods of time without the vehicle's battery being discharged.

Transitions between the two states are controlled by the status of the BeCM activation inputs (see activation input table).

Sleep mode will be entered when all timers have timed out (i.e. courtesy lights are off) and all activation inputs have been inactive for two minutes.

Activation mode will be entered when any of the activation inputs changes state. The quiescent current during sleep mode is approximately 30mA when the vehicle is unlocked and approximately 40mA when the vehicle alarm is armed.

If the BeCM is kept awake for more than two days without the vehicle being started, then this will cause the battery to discharge to a level where starting the engine may be difficult.

See sleep mode detection section for diagnosing BeCM sleep mode problems.

Load inhibition during cranking.

In order to maximise battery voltage during cranking, the majority of BeCM outputs will be inhibited when the engine is being cranked (ignition turned to position III). The exceptions to this strategy are:

- Hazards/turn signals
- Side lamps
- Handbrake/Park signal to air suspension
- Door open to air suspension
- Alarm audio-visual functions.

Engine running detection

The BeCM has two methods of detecting engine running, namely tacho pulse monitoring and alternator charge input status.

Tacho pulse detection is used for safety related functions (e.g. memory seat one-touch inhibition) and alternator charge status for electrical load control functions (e.g. heated mirrors).

Horn

The vehicle system has two horns, left and right, these are operated simultaneously when the horn switch is depressed, irrespective of the ignition position.

Cigar Lighter.

The vehicle has one cigar lighter in the front of the vehicle. The cigar lighter can be operated provided that the auxiliary feed has been switched on and the inertia switch is not tripped.

Fuel Level to Engine Management System (GEMS).

The fuel level to the EMS is simply a link from the fuel level input via a series resistor. This signal is used by the EMS for diagnostics.

Auto Transmission Interlock (Shift Interlock).

The gear select lever may only be moved out of the park position when the ignition is on and the brake pedal is depressed. The shift interlock solenoid will be energised continuously whilst the ignition is on and the gear selector lever is in a position other than park.

Key inhibit solenoid.

The key inhibit solenoid will be energised to prevent the removal of the key from the ignition switch at all times when the key is in the ignition unless the gear select lever is in the park position.

Inertia Switch.

Activation of the inertia switch will only be effective when the ignition is on and will have the following effects:

1. All doors including tailgate will be unlocked.
2. The hazard warning lamps will be activated.
3. The "Inertia switch"/"Refer handbook" message sequence will be activated on the instrument pack display.
4. All external bulb failure warning messages will be inhibited.
5. Auxiliary controlled outputs will be inhibited to prevent operation of HEVAC blowers.
6. The power supply to the fuel pump is inhibited. (Included for information only, the pump is not controlled by the BeCM).



"Limp Home" modes.

The BeCM has a limited ability for self diagnosis in the event of an internal failure. In the event of such a failure the BeCM may continue to function with a reduced level of functionality. The precise functionality available will be dependent upon the nature of the failure, however if one of the two main processors inside the BeCM stops working then the functionality will be as follows:

1. Side, tail and dipped beam lamps default to the on state.
2. Fully functional external turn signals and hazard lamps - excluding bulb failure warning and hazard tell tale lamp.
3. Front wiper slow - no automatic wiper arm park facility.
4. Front screen wash - No program wash/wipe facility.
5. Horn will operate when the horn switch is pressed.
6. Crank will operate normally.
7. Shift interlock solenoid activated with brake pedal.
8. Ignition and auxiliary feeds.
9. Stop lamps when brake pedal is depressed.
10. Fuel filler flap release.

All other outputs shall revert to the off state.

A failure of a BeCM is extremely unlikely to result in an engine misfire or the engine cutting out. The ignition signal from the ignition switch is fed through the BeCM and to the underbonnet fuse box then to the Engine ECU. The BeCM monitors the ignition switch signal but does not control it electronically. Even if the power supply (via the 3 maxi fuses) is lost with the engine running the engine will continue to run.

Service Engine Reminder

The "Service Engine" warning lamp will be illuminated as an emission maintenance reminder after the vehicle has covered 50,000 miles or 80,000km (dependent upon selected distance units) whenever the ignition is on. This lamp will have a 3 second bulb check initiated at ignition on. For 95% MY (VIN: TA331365) onwards the mileage is changed to 82 500 miles or 132 000km,



History of Software Changes within the BeCM

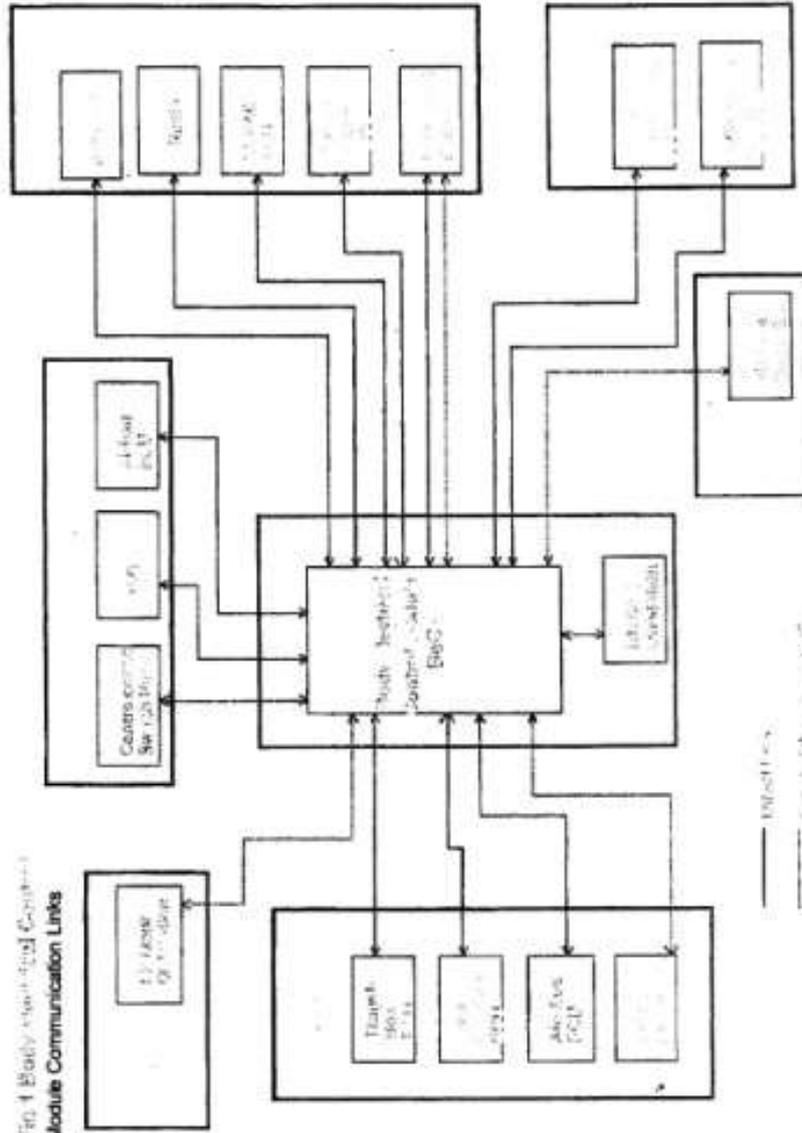
<u>Part No</u>	<u>Micro/PAM</u>	<u>Date</u>	<u>Description</u>
AMR 4918	M23	10-94	Diagnostic mode 3 address, R/W and READY flags are swapped.
AMR 4918	M25	12-94	Cranking now only possible on automatic vehicles when park or neutral is selected.
AMR 5406	M27	2-95	Now permits air suspension fault mode messages ayed in kph.
AMR 5406	M30	3-95	Code replaced that was deleted from the service engine block code.
AMR 4916	P28	2-95	Passive immobilisation functionality. Pwake continuously monitored. Passive key coil switched off when vehicle is about to go to sleep. Auto-relock only triggered by an unlock when vehicle was in an armed state. Remote superlock state made accessible using double key superlock (Part of passive immobilisation functionality. Provision for mislocks using battery backed Klaxon. Number plate lamps now turned on with daylight running.
AMR 4916	P30		NAS functionality introduced, affecting operation of foglamps, mainbeam and main auxiliary driving lamps. Police functionality introduced. Alarm inhibited when unlock request is generated. Horn switch input inhibited to stop sounding during crank. S/W mechanism inserted to cancel any alarm audio-visuals when in a disarmed state and during disarming.
AMR 4916	M31	4-95	Sense of fog bulb failure toggled. Gearbox fail message re-displays on each occurrence. Mainbeam failure displayed on ignition off even if beams are not active. Mislock on lazy locking due to open window results in window open message. Traction failure beeps on first occurrence only. Service indicator software change.
AMR 4916	M32	4-95	Gearbox fault inhibited for 1 second on crank. TRACTION FAILURE results in LH turn signal tell-tale to illuminate. This has been rectified.



<u>Part No</u>	<u>Micro/PAM</u>	<u>Date</u>	<u>Description</u>
AMR 4916	M33	4-95	Spurious triple audible warning on repeated cranking inhibited. Slow 55 kph audible warning now sounds on every occurrence.
AMR 4916	M34	9-95	Service indicator extended to 82,500 miles. Park lamp warning messages re-activated after driver's door has been closed following a "lights on" warning. Two timers added to overcome accidental driver lock-out due to dropping sill buttons.
AMR 5145	M35	4-96	Friendly synchronisation implemented. Sunroof anti-boom. Faster power-on-reset, 200mS.
AMR 5628	P31		Passive immobilisation - on re-mobilisation rear doors only unlock if vehicle was in an armed state.
AMR 5630	P32		Accidental sill lock prevented with software. Slam lock now prevented (i.e. function deleted, vehicle now unlocks).
AMR 5999	P34		Wiper s/w diagnostics problem solved. Sill drop timer now implemented by PAM to free up code space in micro. Slamlock to continue functioning in limp-home. Sleep mod. allowing sleep when ultrasonics active. Vital functions of moving vehicle enhanced to reduce recovery time. Diagnostics reset between mode changes and log out modified to support fast reset. A s/w crash forces micro to limp home and power on reset. Implementation of daylight running mod for NAS/Canada (turn off DRL in PARK). Modification of NAS key inhibit functionality to prevent "sticking" key. Removal of cancellation of auto-relock via a second remote unlock request.



FIG 1 Body Electrical Control
Module Communication Links



Description of System Operation

BeCM sleep mode detection

The BeCM will wake up or remain awake (vehicle quiescent current drain approx. 1A) if any of the activation input are active. When all timers have timed out and the activation inputs are not active (see activation input table), the BeCM quiescent current will drop to approx. 30mA after approximately 2 minutes.

There are two ways to check if the BeCM is asleep or not

1. Follow the Quiescent current (Iq) drain test (page 14) with an ammeter. If the vehicle passes, then the BeCM is allowed to go into sleep mode. If the vehicle does not pass the Iq test then some vehicle component is keeping the BeCM awake with an activation input (see Table 1). This can be done by either an inductive ammeter or by putting an ammeter/voltmeter in series between the disconnected negative battery cable and the negative post on the battery.
2. If an ammeter is not available, then making sure that all doors are closed, wait until 2 minutes and see whether or not the interior lamps extinguish and if the Gearbox H-gate selector dot extinguishes. The selector dot will remain lit at a low intensity if the BeCM is kept awake or completely extinguish after two minutes if the BeCM does not receive any more activation inputs. This may be difficult to observe in highly lighted areas (i.e. you may need to cup your hands around the dot to determine whether or not the dot is still illuminated during lower Iq drains).

Number 1 is the preferred sleep mode detection procedure, use number 2 only as a last resort if any means of current monitoring can not be found.

Table 1 shows the activation inputs.

The BeCM will recognise an input Low (GND) as anything < 3v and an input High as >5v.

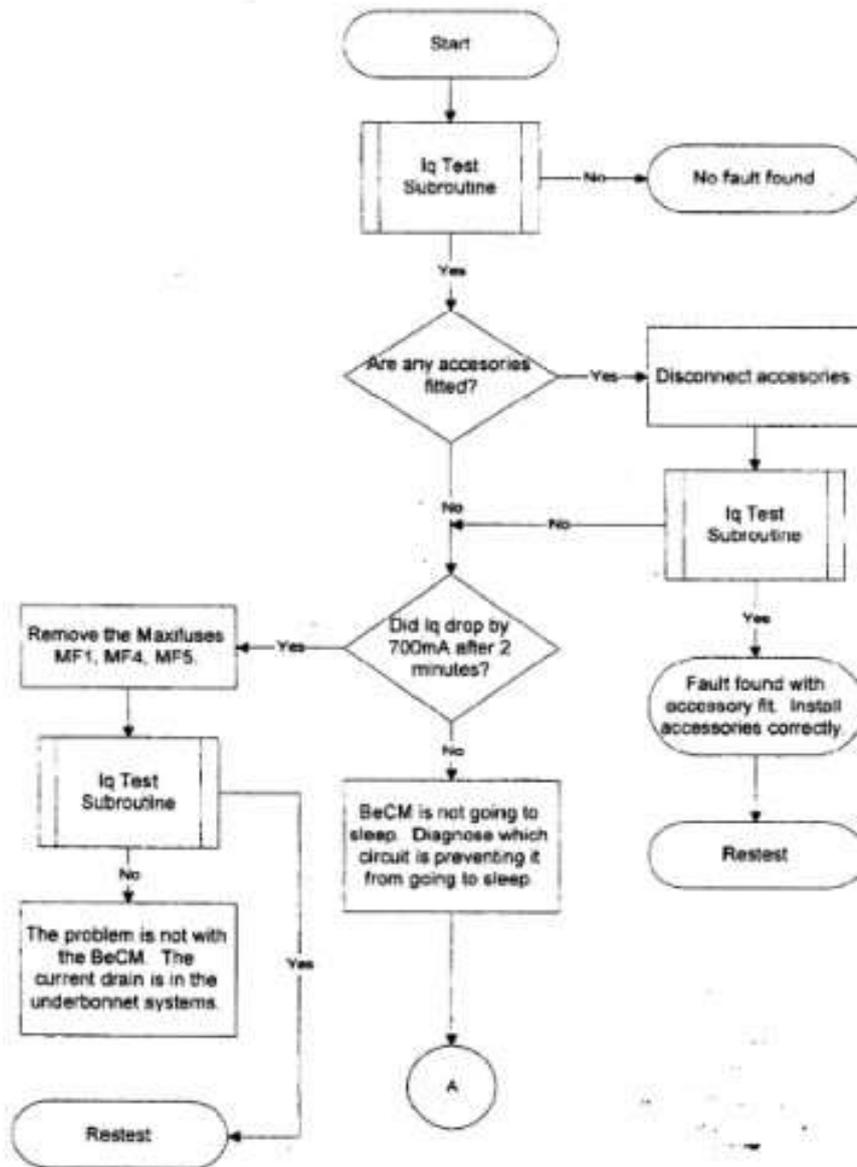
Table 1. ACTIVATION INPUTS TO THE BeCM.

Input (BeCM)	Connector	Pin	Wire Col.	Signal
Bonnet Open Switch	C114 GREEN 20WAY	14	PW	When bonnet is open – I/P to BeCM is GND (edge triggered)
Diagnostic line "K"	C255 WHITE 20WAY	8	KR	Input Short to ground will wake up BeCM
Hazard Switch	C255 WHITE 20WAY	13	PG	When hazards are on – I/P to BeCM is GND
Diagnostic line "L"	C255 WHITE 20WAY	17	LGR	Input Short to ground will wake up BeCM
IGN position I	C256 WHITE 16WAY	13	WK	Ignition 1 on – I/P to BeCM is GND
H/Lamp Flash Switch	C257YELLOW 20WAY	8	US	Switch Closed – I/P to BeCM is GND (non latching)
Sidelight Switch	C257 YELLOW 20WAY	9	OR	If sidelights are on – I/P to BeCM is GND
Horn Switch	C257 YELLOW 20WAY	17	PB	If switch is closed – I/P to BeCM is GND (non latching)
Fuel Flap Release Switch	C257 YELLOW 20WAY	18	LGS	If switch is closed – I/P to BeCM is GND (non latching)
IGN position II	C258 WHITE 10 WAY	8	W	IGN. 2 on – I/P to BeCM is GND
Courtesy Lamp Switch	C326 BLUE 20WAY	2	BP	Switch Closed – I/P to BeCM is GND (non latching)
Tailgate Open Switch	C326 BLUE 20WAY	3	PY	When tailgate is open – I/P to BeCM is GND (edge triggered)
Radio remote I/P	C326 BLUE 20WAY	6	OR	BeCM wakes up when 433MHz / 315MHz received * * An intermittent contact does not activate BeCM
Rear L Door open Switch	C362 BLACK 16WAY	4	PW	If door is open – I/P to BeCM is GND (edge triggered)
Security - Ultrasonic I/P	C362 BLACK 16WAY	6	YK	If active – I/P to BeCM is GND
Diagnostic line "K" (Gearbox ECU)	C626 BLACK 20WAY	12	K	Input Short to ground will wake up BeCM

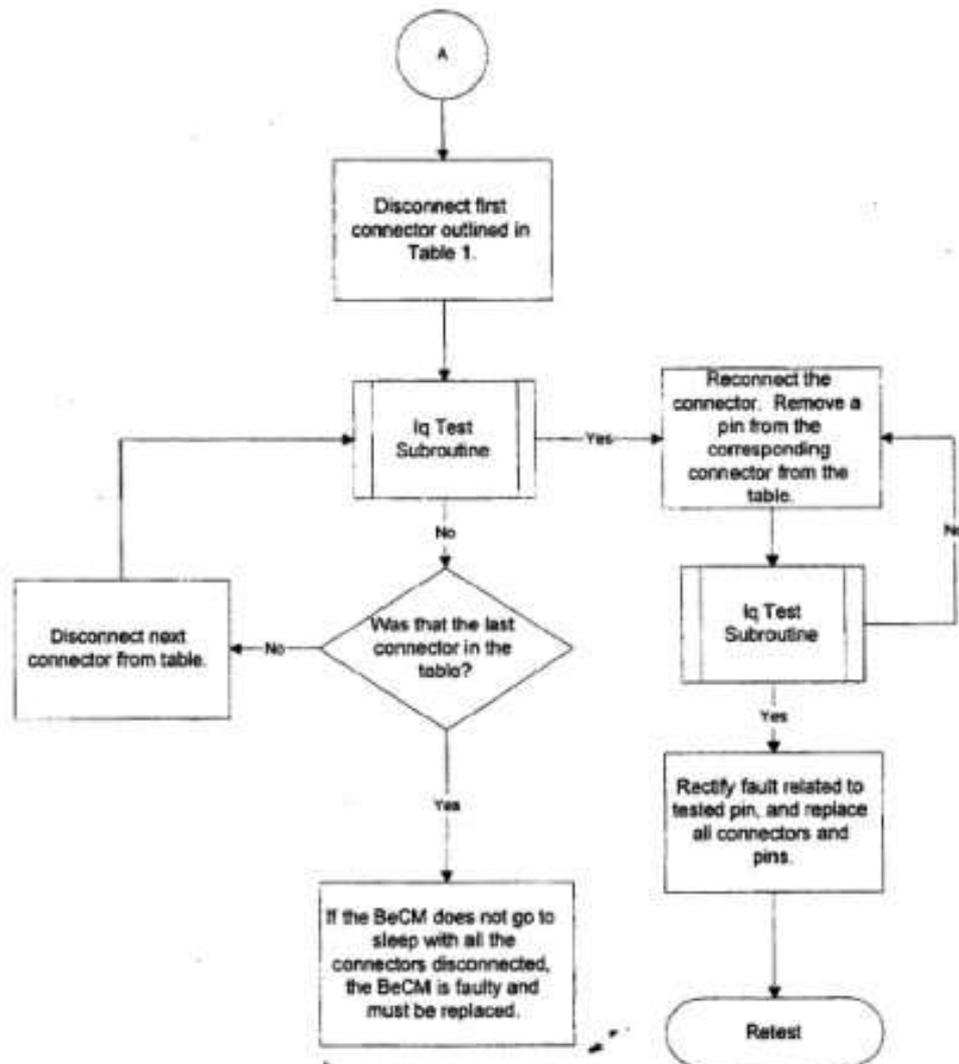
Input (Door Outstation)	Connector	Pin	Wire Col.	Signal
FLH Door Open Switch	C758L 20WAY BLACK	7	PW	If door open – I/P to Door Outstation is GND (edge triggered)
FLH CDL Switch	C758L 20WAY BLACK	5	WP	Switch Closed – I/P to Door Outstation is GND (edge triggered)
FLH Key Switch	C758L 20WAY BLACK	6	UR	Switch Closed – I/P to Door Outstation is GND (edge triggered)
FRH Door Open Switch	C758R 20WAY BLACK	7	PW	Door open – I/P to Door Outstation is GND (edge triggered)
FRH CDL Switch	C758R 20WAY BLACK	5	WP	Switch Closed – I/P to Door Outstation is GND (edge triggered)
FRH Key Switch	C758R 20WAY BLACK	6	UR	Switch Closed – I/P to Door Outstation is GND (edge triggered)

Should a BeCM fail to go to sleep then the diagnostic flowchart on pages 11 -15 should be followed.

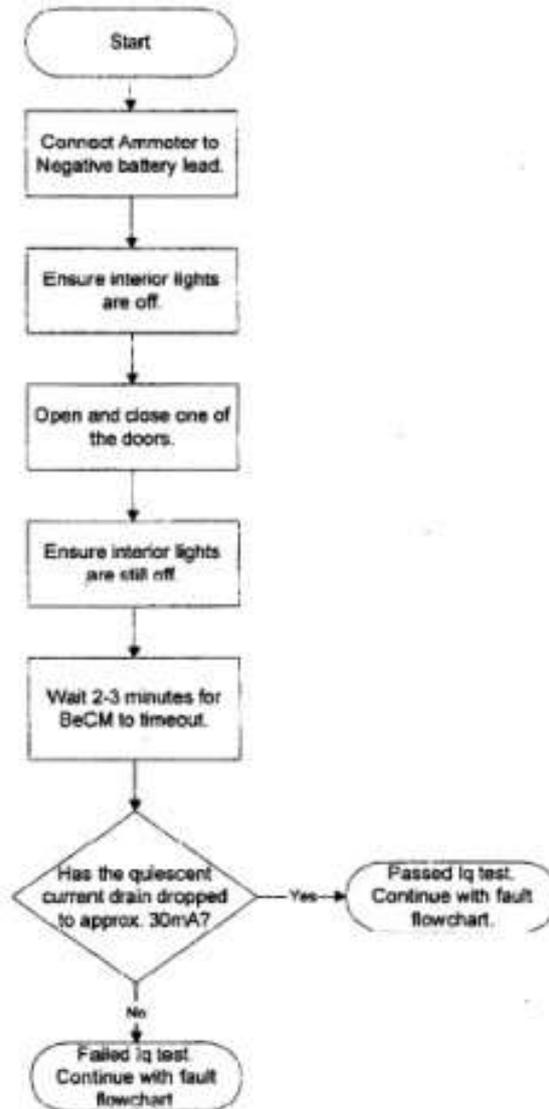
Quiescent current drain (Iq) fault location flowchart



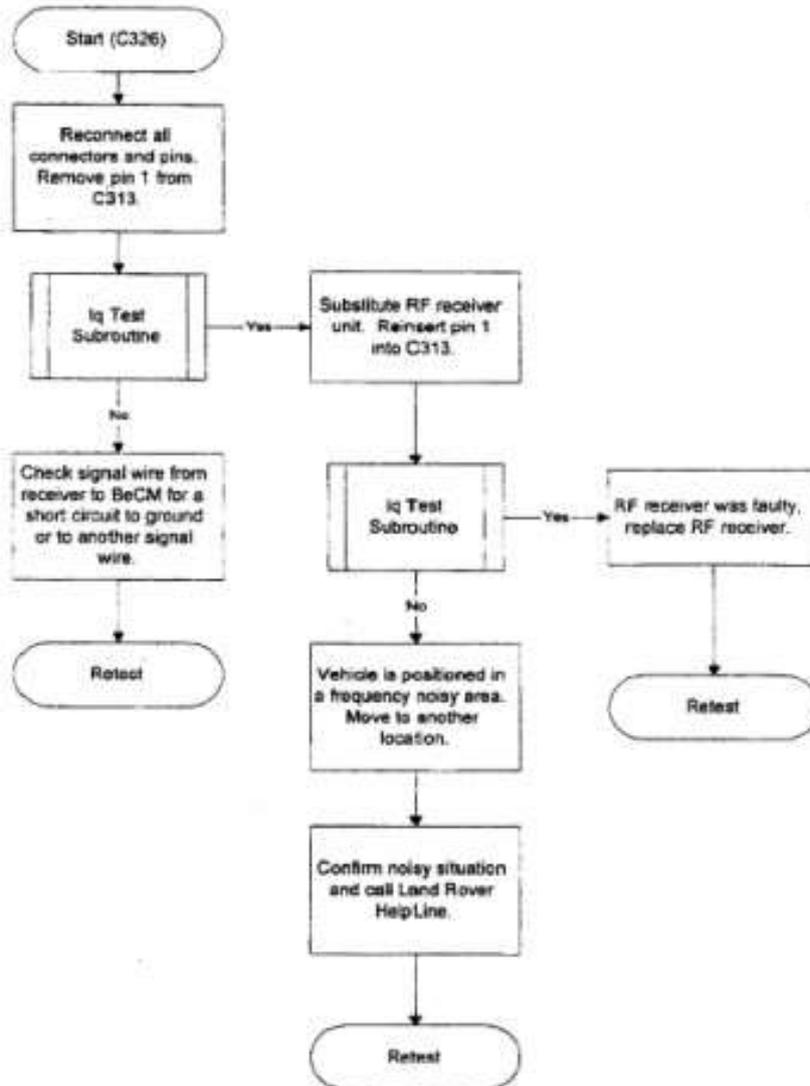
Quiescent current drain (Iq) fault location flowchart, continued



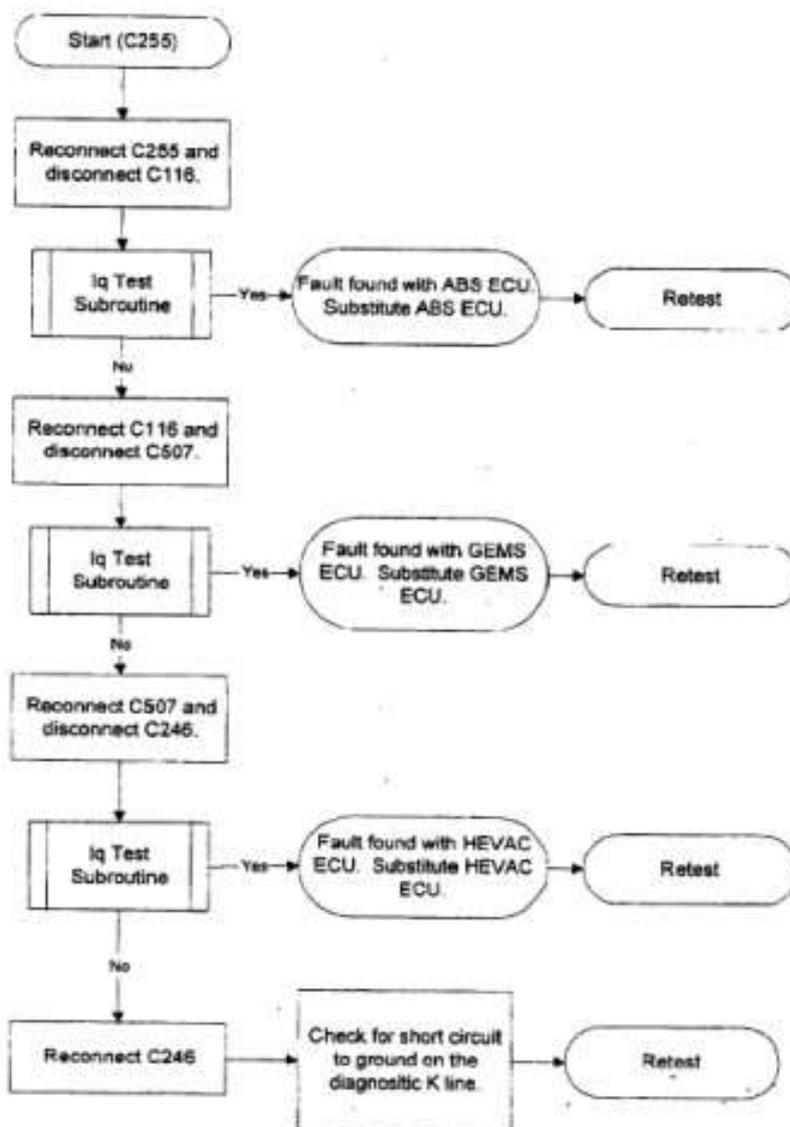
Quiescent current drain (Iq) subroutine test



If pin 6 in C326 is found to be the cause for keeping the BeCM awake, follow the flowchart below.



If pin 8 in C255 is found to be the cause for keeping the BeCM awake, follow the flowchart below.





Engine running signals

The tacho signal is generated by the GEMs ECU, this signal is in the form of a pulse train. The engine rpm thresholds for tacho pulse monitoring will be:

Petrol 180rpm

Horn Signals

The vehicle horns are driven when the horn switch on the steering wheel is pressed. The BeCM sees the horn switch activated when the switch is grounded(0v). The BeCM will output a low (0v) signal to the coil of the horn relay (in the engine compartment fuse box), causing the relay to energise, closing the relay contacts allowing Vbat(12v) to pass through and activate the two horns simultaneously. When the switch is released the input will be high (Vbat), causing the output to be high(Vbat) which in turn de-energises the relay, causing the horns to stop sounding.

Warning Messages

There are a number of components which supply input signals to the BeCM, but are only used for warning messages on the instrument pack. The BeCM may only act as a direct link, passing the information from sensors to the instrument pack. The BeCM is responsible for generating the messages that are then sent to the instrument pack through the serial link for display. The messages are generated when the correct conditions are met.

Flat Battery

If a flat battery is found check for a battery drain of less than 30mA when the BeCM is asleep. If the BeCM is awake it will be approximately 0.8 Amps and the battery will last only 2 to 3 days with this amount of drain. Determine if the problem is underbonnet or BeCM related, by removing the 3 large 60 Amp MaxiFuses from the underbonnet fuse box. If the drain does not reduce to 30mA, then the problem is underbonnet. The alternator has been found to cause a drain of 4 to 10 Amps and the two fuse boxes have a combined drain of 1 Amp.

BeCM and ECU Interconnections

Power Distribution

BeCM Multiplexed communications to other ECUs

The multiplexed communication is a method of electronic communication that enables the BeCM to 'talk' to several other Outstations by passing electrical instructions through the same wires (the serial link).

Each serial link comprises the following:

- Feed wire Supplies battery voltage
- Earth wire Provides vehicle earth
- Clock wire Provides reference signal
- Signal wire Carries instructions between electronic control units
- Direction wire Identifies the direction of instruction

The instructions are communicated through the serial link to the relevant outstations, which then processes the signal, to determine the meaning, before carrying out the instruction.

All the voltages relating to the serial link are either Ground(0v) for logic 0, or Vbat(12v) for logic 1. The electronic instructions can not be seen using a multimeter.

Refer to Fig. 1 for serial link ECU connections.

Message generation

The audible sounder is operated by a moving coil transducer mounted in the instrument pack, controlled by the BeCM output. The tone outputs will be in the form of equally spaced pulses. The tone of the 'beep' is determined by the frequency and volume is determined by the voltage of the pulse. Maximum volume is 7volts.

Odometer logging

The BeCM monitors the odometer value received from the instrument pack through the serial link. When the ignition is turned on, the BeCM stored value will be automatically be updated by the distance value held by the instrument pack. A distance unit is defined as either a mile or a kilometer, as applicable to the vehicle configuration. If the BeCM receives five consecutive numbers from the instrument pack that are less than the number already stored in the BeCM memory, then an odometer error condition will be displayed on the instrument pack. This will only occur if a BeCM with a higher stored odometer value has been put into a vehicle with a lower odometer value in the instrument pack, or an instrument pack with a lower odometer value is fitted (i.e. new instrument pack). The error message can be reset through the use of TestBook, by carrying out an odo update. (In TestBook: instrument pack\Toolbox\Odo Update).



WARNING: IF AN ODO UPDATE IS CARRIED OUT THE ODOMETER WILL TAKE UP A HIGHER VALUE THAN IT CURRENTLY HAS, THEREFORE PLEASE MAKE SURE EVERYTHING IS CORRECT BEFORE CARRYING OUT AN ODO UPDATE.

If the odometer value is greater than the value stored by the BeCM, then the BeCM will automatically update the stored value.

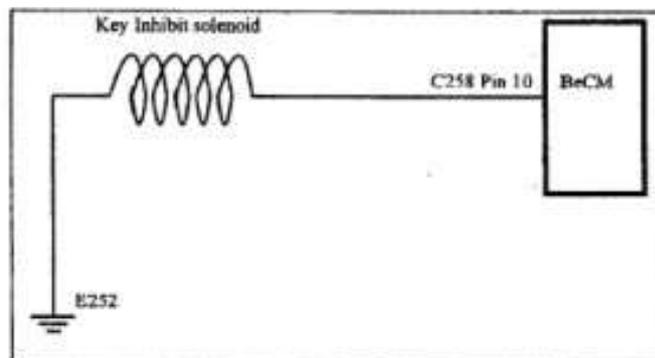
WARNING: PLEASE NOTE THAT IF A BeCM WITH A LOWER STORED VALUE IS PUT INTO A VEHICLE WITH A HIGHER ODOMETER VALUE, THE BeCM WILL STORE THE CURRENT ODO VALUE. THEREFORE DO NOT EXCHANGE OR SUBSTITUTE BeCMs TO ELIMINATE FAULTS BETWEEN VEHICLES. IF A BeCM HAS TO BE SUBSTITUTED, THEN DISCONNECT ALL THE INSTRUMENT PACK CONNECTORS, BEFORE CONNECTING POWER TO THE VEHICLE.

LRNA Technical Support

If a fault free BeCM is locked to a vehicle accidentally, LRNA has the ability to unlock the BeCM from that particular vehicle. LRNA can reset the new fault free BeCM and allow it to be installed into another vehicle as if it were directly from parts stock. It is important that if a BeCM is sent to LRNA to be unlocked that it be fault free. LRNA Service Department will unlock the BeCM and return it for a small fee. If this procedure is needed contact the Technical HelpLine at 1800-562-5824 and inform them of the situation.

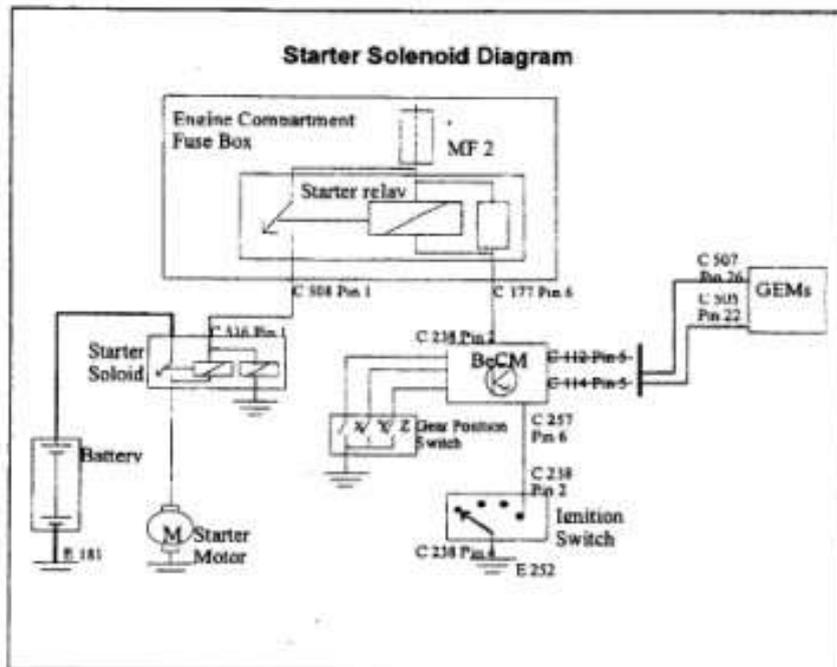
Key inhibit solenoid

When the gear selector lever is not in park or the ignition is not in the off position, the BeCM will output Vbat(12v) - Connector C258 Pin 10 - to energize the solenoid and prevent the key being removed from the ignition barrel. Once the ignition switch is turned to the off position and the gear lever is moved to the park position, the BeCM output will be GND(0v), the solenoid will be de-energized, allowing the key to be removed. Difficulties may be experienced if the driver attempts a rapid key removal, this is due to the solenoid not being able to respond quickly enough. To cure this, for 97MY onwards, the solenoid will energize when the gear lever is out of the park position (BeCM output = Vbat(12v)), and the BeCM output will be GND(0v) to de-energise the solenoid, when the gear lever is in the park position, regardless of the position of the ignition switch.



Starter Solenoid

The starter solenoid is controlled by the BeCM through a starter relay in the engine compartment fuse box. Providing the vehicle is disarmed correctly (e.g. MIL/Check Engine lamp is on, when the ignition is on), gear lever in neutral or park, when the key is turned to ignition position 3, the BeCM input (C238 pin 2) will be grounded(0v). The BeCM will output a low(GND) signal to energise the starter relay. The relay contacts will supply the starter solenoid relay with Vbat(12v) through a 30A Maxifuse (MF 2). This in turn will close the starter solenoid relay contacts to allow a direct feed from the battery positive terminal to the starter motor. If the MIL/ Check Engine lamp does not come on the engine is immobilised.





BeCM Replacement and Reprogramming using TestBook.

This is to be used as a guide when replacing a BeCM. It is a step by step guide of how the BeCM programming works. It should be used if the TestBook operator is unsure of how the procedure works.

It is assumed the new BeCM has just been fitted and is awaiting programming.

Please use the latest disk to program the BeCM.

1. Connect TestBook to vehicle.
2. Power up TestBook and await Welcome Screen.
3. Choose DIAGNOSTIC SYSTEM.
4. On the Next Screen Select Vehicle Type, Model Year etc. then CONTINUE
5. Now Enter the full VIN of the vehicle. Check it before pressing CONTINUE.
(If an invalid VIN has been entered, re entering it will be necessary)
6. The next screen confirms the selections that have been made. If they are correct then CONTINUE.
7. Next, under SYSTEM SELECTION choose BeCM PROGRAM.
There may be THREE or FOUR choices and EXIT on the BeCM Reprogramming MENU, depending the disk being used.
8. Choose NEW BeCM.
Ensure that you are using the blue Diagnostic cable or the Switchable Diagnostic cable is in Position A then CONTINUE.
The next screen will ask whether the necessary vehicle information is available, this is VIN, Lockset Barcode, Build Date.
9. If all the information is available choose YES.
Here, the VIN that was entered earlier will be confirmed. If it is not correct, then press NO and retype the VIN. If it is correct then press YES.
10. The next screen will ask for the Lockset Barcode. It is necessary to type in all 14 characters of the Lockset Barcode. The Lockset Barcode must be the correct one for the HANDSETS. Then press CONTINUE.



11. Next, the Build Date will be asked for. It must be entered in this format: DD/MM/YY (Day, Month and Year) .

If it is in any other format, it is incorrect and will have to be re entered. Press CONTINUE.

The next selection of icons is the Market Selection. Here TestBook will determine whether the vehicle should have an EKA code or not. It will not actually program the market, that will be done later.
12. Choose the correct market for the vehicle.
13. The next screen is SELECT VEHICLE TYPE. Press the required tick boxes that conform to the vehicle specification. Press CONTINUE after the correct Vehicle type has been entered.
14. Finally, all the data that has been inputted will now be displayed. The operator of TestBook must ensure that all this information is correct at this point. If it is not correct, press NO and the diagnostic will return to the VIN check screen. The vehicle information will have to be re entered. If all of the information is correct press YES.

WARNING : ENTERING INCORRECT INFORMATION WILL IMMOBILISE THE VEHICLE AND THE BeCM WILL HAVE TO BE REPLACED AGAIN. ENSURE THIS DOESN'T HAPPEN !

15. The next screen is the last chance to change any vehicle information before it is locked into the BeCM. After this point the information can never be changed. If the information is definitely correct then press YES otherwise press NO.
16. The following screen is the MODEL YEAR selection. Look at the VIN and select the 10 character from the left. M, S, T or V. Conformation of the Market that was selected earlier will be given.
17. The following screen is CUSTOMER OPTIONS PROGRAMMING. Press CONTINUE to change customer options.

Front fogs, Sunroof and Trip computer should be enabled.
18. Select the options that are required by pressing the check boxes. Press CONTINUE when the correct options have been programmed. Conformation of these options will be given followed by conformation that the options have been programmed into the BeCM.

THE BeCM IS NOW PROGRAMMED. IF NEW REMOTE HANDSETS HAVE BEEN SUPPLIED, THE LOCKSET BAR CODE WILL BE DIFFERENT TO THE PREVIOUS ONE AND IT WILL BE NECESSARY TO PUT GEMs INTO LEARN MODE (THROUGH GEMs DIAGNOSTIC).

- RESYNCHRONISE THE HANDSETS AND CRANK THE VEHICLE.
- SET ALL THE WINDOWS AND SUNROOF.
- ENTER THE RADIO CODE



BeCM Substitution Process

There is no customer or dealer accessible facility for altering the stored BeCM or instrument pack odometer value either within the vehicle or via TestBook. However if you need to substitute a BeCM into a vehicle for fault diagnosis then follow the procedure below to avoid locking the new BeCM with vehicle information.

1. Substitute the BeCM in the problem vehicle.
2. Connect all the wire connectors to the BeCM.
3. Remove driver's side access panel and Instrument pack surround as per Workshop Manual and disconnect the Instrument pack connector (C242). This will allow access to vehicle diagnosis without transferring odometer mileage information from the instrument pack to the BeCM.
4. Re-connect vehicle battery after ensuring instrument pack connector (C242) is disconnected
5. Start the BeCM replacement procedure through TestBook as if the BeCM was being replaced with a new unit.
6. Enter in all vehicle information (i.e. VIN, Lockset Barcode, Build Date, etc.)
7. When the confirmation step is reached, TestBook will ask to confirm the information and warn that if continued the displayed information will be locked into the BeCM. **At this time you must ABORT the installation process.**

The abortion of the new BeCM installation process will allow use of the vehicle without locking the BeCM to that particular vehicle.

NOTE: When reconnecting C242 support the instrument pack behind connector to ensure that the connection is complete and to avoid damage to the PC board in the instrument pack. C242 **MUST NOT** be inserted while the substitute BeCM is in place; only when the BeCM that will remain in the vehicle is in situ, can the connector be re-fitted.

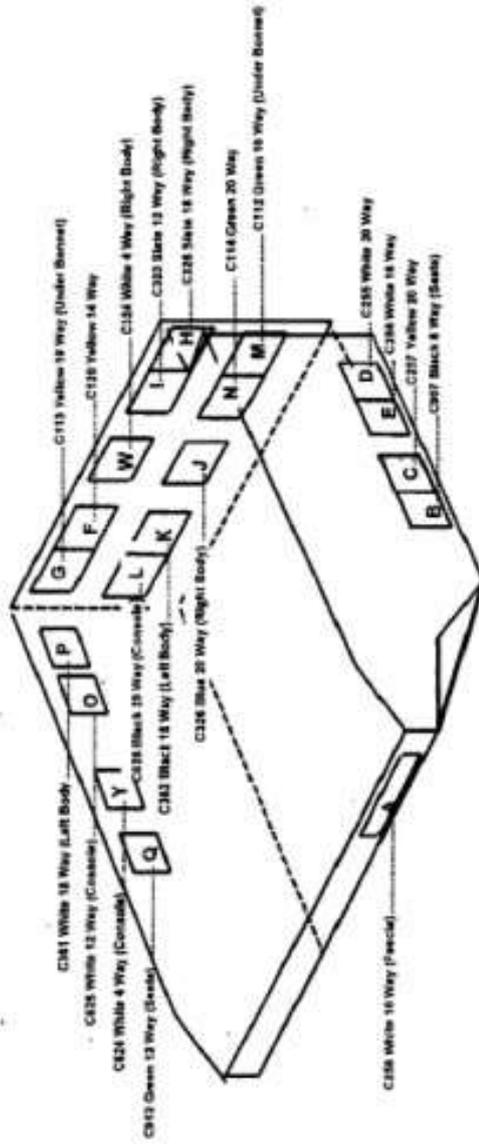
In completing this process, diagnosis is inhibited in the areas related to any Instrument pack functions (speedometer, tachometer, fuel gauge, etc.). **The vehicle will run but is not road worthy, DO NOT drive vehicle on public roads.** If required, only drive vehicle around dealership.

If it is decided to replace the BeCM with the substituted unit the New BeCM installation process needs to be carried out again completely with out aborting. Failure to reprogram and lock the BeCM will compromise vehicle security.



BeCM System Information Document – Edition 2

BeCM Connector Identification





BeCM System Information Document – Edition 2

Connector Pinouts

BeCM

Connector C112 16 WAY AMP D40 FEMALE PLUG (GREEN)				Station	Comments
Cavity	Wire Col.	I/O	Fuse No.	Function	
1					
2	BK	O		Park handbrake on signal to air sus. ECU	GND when park or handbrake selected, otherwise battery, vobts
3	PQ	O		Door / tailgate open signal to air sus. ECU	GND when door or tailgate open, otherwise battery, vobts
4	BP	I		Auto gearbox oil temp. input.	GND when temperature OK otherwise battery, vobts
5	B	O		Security code to Engine control module.	Security code sent to ECM when ignition 2 selected & vehicle not immobilised. A single burst of 5v pulses.
6					
7					
8	WLG	O		Tells alternator/low bat. ION. I sensor	GND when ignition key in either position 1 (park) or position 2, otherwise battery, vobts
9	S	I		Engine speed input from Engine control mod	Square wave input from ECM 0v - 12v.
10	BS	I		ABS warning light & message input.	Modulated 0 to battery, vobts signal depending on message
11	BW	I		Brake pressure input from ABS pump	This input will be GND when ABS pump pressure is low, otherwise battery, vobts
12					
13	Y	O		Road speed output to air sus. & engine ECU's	Signal originates from ABS ECU and filtered by the BeCM. A signal can be seen with a good quality oscilloscope. The motor will give an average value.
14	BY	I		Catalyst overheat (Japan).	GND when warning activated otherwise Vbat.
15					
16	GB	O		Fuel level signal to ECM.	GND when fuel level low, otherwise Vbat.



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Connector C113 10 WAY AMP 070 FEMALE PLUG (YELLOW)					
Cavity	Wire col.	I/O	Fuse No.	Function	Status
1	UB	O	F.E.T.	R.H. Main beam 1 output (own element).	Vbat when main beam selected, otherwise ground.
2	WR	O		Starter motor signal to U/Burnet fuse box.	GND when starter motor request made, otherwise Vbat.
3	LIO	O	F.E.T.	R.H. Dipped beam output.	Vbat when dipped beam selected, otherwise ground.
4	GW	O	F.E.T.	R.H. Front direction indicator lamp.	Pulse from Dv to Vbat when R.H. direction indicator selected otherwise GND.
5	UP	O	F.E.T.	R.H. Main beam 2 output (inner lamp).	Vbat when main beam selected, otherwise ground.
6	LGR	O		Headlamp wash wipe signal to U/B fuse box.	GND when headlamp wash/wipe request made, otherwise Vbat.
7	NLG	O		Front wipers fast output signal to U/B fuse box relay.	GND when front wiper fast speed request made, otherwise Vbat.
8	KLK	O		Front wipers slow output signal to U/B fuse box relay.	GND when front wiper slow speed request made, otherwise Vbat.
9	RW	O	F.E.T.	R.H. Front side light.	Vbat when side lights selected, otherwise ground.
10	RY	O	F.E.T.	R.H. Front fog light.	Vbat when fog light selected, otherwise ground.
					Signal will remain on when fast speed is selected.
					Headlamp wash wipe is normally operated every other front screen wash cycle. There will be no headlamp wash wipe when the washer fluid level is low.
					Signal will remain on when fast speed is selected.
					Side or head lamps will need to be on for fog lights.



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Connector C114 20 WAY AMP 040 FEMALE PLUG (GREEN)			Status	Comments
Cavity	Wire col.	Fuse No.	Func.9001	
1	YB	1	Low screen wash fluid signal input.	GND with low screen washer fluid level, otherwise Vbat.
2	WP	1	Inertia switch tripped signal input.	GND when inertia switch tripped otherwise Vbat.
3	NLG	1	Front wiper park switch	GND when wipers are parked, otherwise Vbat.
4				
5	BY	1	Patrol check engine warning lamp input.	GND when warning lamp activated, otherwise Vbat.
5	WU	1	Diesel check engine warning lamp input.	GND when warning lamp activated, otherwise Vbat.
6				
7	WN	1	OK pressure switch input.	GND with low oil pressure, otherwise Vbat.
8	PB	1	Air sus. valve warning lamp input.	GND when vehicle is made height or for both check.
9	UK	1	Air sus. message input 1.	Air sus. message line control air sus. messages on instrument pack & Ride height status illumination.
10	GB	1	Fuel level sensor input	Variable voltage depending on volume of fuel. 4v - 5v.
11	YG	1	Road speed from ABS ECU.	This is a 0 to V.Batt. square wave with 8000 pulses per mile.
12	WK	1	Signal for traction control messages & ETC bulb.	0 to Vbat Modulated signal depending upon message.
13				
14	PW	1	Bumper open switch input.	GND when bumper open, otherwise Vbat.
15	NY	1	Alternator charge input.	Vbat when charging, otherwise GND
16	BP	1	Brake fluid level input.	Brake fluid level switch closed to ground via ABS pressure switch when level OK.
17				
18	UW	1	Air sus. message input 2.	Air sus. message line control air sus. messages on instrument pack & Ride height status illumination.
19	G	1	Engine Coolant Temperature input.	Variable voltage depending on coolant temperature.
20	S	O	Engine speed out put to Air sus. ECU.	Square wave output 4v - 12v.

TABLE 2

Input 1	Input 2
Air sus. messages	Input 2
Slow: 20mph max./slow: 40kph max.	GND
EAS Manual	Vbat
EAS Fault	GND
Slow: 35mph max./Slow: 55kph max.	Vbat.

The Ride height status lamps are controlled via a serial link and correct signal functionality cannot be checked by measuring the voltage.



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Connector C120 14 WAY AMP 070 FEMALE PLUG (YELLOW)		Function	Status	Comments
Cavity	Wire col. I/O	Fuses No.	Function	Status
1	GS O	7	Air bag ignition feed. (Secondary feed)	Start, volts with ignition on.
2	PY O		Alarm klaxon.	Output to Vbat. pulse signal. Otherwise GND
3	RY O	F.E.T.	L.H. Front fog light	Vbat. when fog lights selected. otherwise ground.
4	BLG O		Rear Screen Wash pump motor.	Vbat. when activated. Otherwise GND
5	RB O	F.E.T.	L.H. Front side light.	Vbat. when side lights selected. otherwise ground.
6	RG O	F.E.T.	L.H. side repeater.	Fuses from 3y to Vbat. when L.H.D.L. selected. Output will be GND if circuit is short/open circuited otherwise ground.
7	PN O		Horn output to fusibox relay.	GND when horn selected. otherwise Vbat.
8	UG O	F.E.T.	L.H. Main beam 2 output (rear lamp).	Vbat. when main beam selected. otherwise ground.
9	W O		Ignition signal to underhood fuse box.	GND when ignition switched on otherwise Vbat.
10	US O	F.E.T.	L.H. Main beam 2 output (horn element).	Vbat. when main beam selected. otherwise ground.
11	UK O	F.E.T.	L.H. Dipper beam output.	Vbat. when dipped beam selected. otherwise ground.
12	GR O	F.E.T.	L.H. Front direction indicator lamp.	Vbat. (oscillating) when L.H. direction indicator selected. otherwise GND
13	LGB O		Front Screen Wash pump motor.	Vbat. when activated.
14	WG O	F.E.T.	RH. side repeater.	Fuses from 4y to Vbat. when R.H.D.L. selected. Output will be GND if circuit is short/open circuited otherwise ground.

Note: F.E.T is Field Effect Transistor, used to drive the outputs instead of the conventional relays.



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Connector C155 20 WAY AMP 640 FEMALE PLUG (WHITE)					Comments
Cavity	Wire Col.	I/O	Fuse No.	Function	Status
1	RN	I		Rear fog light switch input.	GND when switch pressed, otherwise Vbat.
2					
3	NW	I		Key in switch (ignition key) input	GND when key in ignition barrel, otherwise Vbat.
4	YG	I		Clutch switch input (manual).	GND when pedal not depressed, otherwise Vbat.
5					
6	BR	I		R.H. Seat heater request input.	GND when switch pressed, otherwise Vbat.
7	GLG	O		Hazard switch output.	Vbat when hazards selected, otherwise GND
8	KR	I/O		Test boot diagnostic line "K"	Normally Vbat, unless data being transmitted.
9	NY	O		Alternator charging signal to HEVAC.	GND when alternator charging.
10	Y	O		Road speed signal to HEVAC.	Square wave output, switching between GND & Vbat @ 800 pulses per mile.
11	WB	I		Rear screen heater request signal.	GND when heated rear screen selected, otherwise Vbat.
12	R	O		Passive immobilisation coil feed.	When key inserted into ignition & vehicle immobilisation. This line will pulse to Vbat in the handoff. Otherwise its output is at GND.
13	PG	I		Reverse switch input.	GND when hazards selected otherwise at Vbat.
14	WY	I		Cruise enable switch.	GND when cruise switch selected otherwise at Vbat.
15	BP	I		L.H. Seat heater request input.	GND when switch pressed, otherwise Vbat.
16					
17	LGR	I/O		Test boot diagnostic line "L"	Normally Vbat, unless data being transmitted.
18	OW	O		Cruise ECU, switch enable & inverter power	Vbat, when Lancia cruise enable switch is selected, otherwise GND.
19					
20	Y	O		Road speed signal to Cruise ECU	Square wave output, switching between GND & Vbat @ 800 pulses per mile. Typically 2.5v when vehicle is in motion.



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Connector C266 16 WAY AMP 040 FEMALE PLUG (WHITE)				Status	Comments
Cavity	Wire col.	I/O	Fuse No.	Function	
1	OG	O		Instrument pack serial link - direction	Typical average value is 6volts
2	RG	O		Instrument pack serial link - clock	Typical average value is 6volts
3	LG	I/O		Instrument pack serial link - data (duplicate)	Typical average value is 6volts This wire is a duplicate of pin 11
4	RLG	I		Input from panel lamps dimmer switch	GND when dimmer switch moved to "increase" position
5	BG	O		Instrument pack serial link - signal GND(stap)	GND Outputs
6	RU	O		Fog lamp rear switch left/able illumination	Short when rear fog lamps illuminated
7	SR	O		Security LED	Pulse signal when LED flashing. 0v - 12v
8	S	O		Tachometer signal to Instrument Pack	Squares wave signal. 0v - 12v
9	OG	O		Instrument pack serial link - direction (duplicate)	Typical average value is 6volts
10	RG	O		Instrument pack serial link - clock (duplicate)	Typical average value is 6volts
11	LG	I/O		Instrument pack serial link - data	Typical average value is 6volts
12	RB	I		Input from panel lamps dimmer switch	GND when dimmer switch moved to "decrease" position
13	WK	I		Ignition 1 input from ignition barrel	GND when ignition key in position 1 or 8
14	BG	O		Instrument pack serial link - signal GND	GND at all times
15	BK	O		Instrument pack module warning	Pulses of 0v - 7v, otherwise GND
16	Y	O		Speedometer signal to Instrument Pack	Squares wave output, switching between GND & Volt. Typically 2.5v when vehicle is in motion. 4000 pulses per mile

All instrument pack serial links are pulsed signals, hence, using a multimeter will only give an average value. Although the meter may display a value, this does not necessarily mean the serial link is functioning correctly.



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Connector C257 20 WAY AMP 940 FEMALE PLUG (YELLOW)

Cavity	Wire Col.	I/O	Fuse No.	Function	Status	Comments
1	LGB	I		Rear screen wash switch	GND when selected, otherwise Vbat.	
2	GW	I		Right D.L. switch input.	GND when Right D.L. switch selected, otherwise Vbat.	
3	U	I		Headlamp dip beam switch input.	GND when headlamp switch selected, otherwise Vbat.	
4	LGO	I		Front screen wash switch.	GND when selected, otherwise Vbat.	
5	RLG	I		Front wiper switch 2.	Input goes to GND when wiper switch moved to fr. or else position.	
6	WR	I		Ignition position 3 input.	GND when selected, otherwise Vbat.	
7	GR	I		Left D.L. switch input.	GND when Left D.L. switch selected, otherwise Vbat.	
8	US	I		Headlamp flash input	There is a momentary GND input when selected, then returns to Vbat.	May Keep BeCM awake (see Table 1)
8	OR	I		Sidelight switch input.	GND when side lights switch selected, otherwise Vbat.	May Keep BeCM awake (see Table 1)
10	YR	I		Front fog lamp switch left side.	Vbat. when front fog lamps activated, otherwise GND	
11	OP	I		Wiper intermittent delay potentiometer	Resistance to GND typically 2k to 5k ohms, depending on position selected.	If measuring resistance remove C257 from BeCM.
12	UW	I		Headlamp main beam switch.	There is a momentary GND input when selected, then returns to Vbat.	
13	OB	I		Rear wiper switch.	GND when selected, otherwise Vbat.	
14	RY	I		Front fog lamp switch input.	This signal is switched to GND when fog lamps selected otherwise Vbat.	
15	ULG	I		Front wiper switch 3.	Input goes to GND when wiper switch moved to last of three positions.	
16	WG	I		Front wiper switch 1.	Input goes to GND when wiper switch moved to first position, otherwise Vbat.	
17	PB	I		Horn switch input.	GND when selected, otherwise Vbat.	May Keep BeCM awake (see Table 1)
18	LGS	I		Fuel Flap release button input.	There is a momentary GND input when selected, then returns to Vbat.	May Keep BeCM awake (see Table 1)
19				Spare		
20				Spare		



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Connector C258 10 WAY AMP 070 FEMALE PLUG (WHITE)				Status	Comments
Cavity	Wire Col.	I/O	Fuse No.	Function	
1	ON	O		Cruise Pump Supply	Vbat. supply to cruise pump. (See Table 3)
2	RW	O		Check/Brake SW/Hesitation/ Front Footwell + ESM Key Illumination	Vbat. when Solenoid Switch Operated, otherwise GND
3	PR	O		Brake Switch	Vbat. any time when courtesy light is on, otherwise GND
4	GP	I		Stowbox Lamp	Vbat. when Brake applied, otherwise GND
5	R	O		Radio / HEVAC Auxiliary.	Vbat. when stowbox switch operated, otherwise GND
6	WK	O	17	Check / Radio / Int. Puck battery lead	Vbat. when auxiliary supply is on (Ignition 1).
7	P	O	1	Ignition 2 Switch	Permanent battery lead.
8	W	I		Brake Feed Switch/RAS/AR Sys. Switches A/ HEVAC Signal	GND when Ignition 2 selected, Vbat. otherwise.
9	W	O		Key Inhibit	Vbat. when Ignition selected otherwise GND
10	UK	O	13	Automatic Vehicle Charge Available	Vbat. when Ignition 1 and transmission is not in Park (P) or neutral - Transmission is not in park, regardless of Ignition switch.

TABLE 3

IGM on, Cruise Enable Switch on, Transfer Box in High (Pto 1 output = 12v Mode, Gear = D321



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Connector C323 12 WAY AMP 070 FEMALE PLUG (GREY)

Card No.	Wire Col.	ILQ	Wire No.	Function	Status	Comments
1	WP	0	9	Rear View Mirror Dip - Ignition	Voltage when Ignition on.	
2	PU	0	9	Right Front Door Outstation	Permanent Battery Feed	Including ICE amplifier
3	RB	0		Left Trailer Tail Lamp	Voltage when Lamp On, otherwise GND	
4	P	0	15	Rear Right Ice Amp	Permanent Battery Feed	
5	SO	0	2	Rear Right Window Down	Voltage when Motor being Driven, Otherwise GND	
6	RP	0		Floor Right Puddle / Marker Lamps	Voltage when Lamps On, otherwise GND	
7	OB	0	14	Fuel Filter Flap Unlock	Safety Controlled Load Voltage for 1sec when button pressed.	
8	YR	0		Rear Right Anti Trap Feed	Control Feed Voltage	
9	WR	0		Sun Roof Anti Trap Feed	Control Feed Voltage	
10	S	0	2	Rear Right Window Up	Voltage when Motor being Driven, Otherwise GND	
11	RN	0		Rear Right Door Switch Illumination	Sideline Controlled Illumination. Variable pulse width. Motor will display 12v. On to Voltage when Sideline is selected.	
12	PB	0	22	Right Front Door Outstation (Window)	Permanent Battery Feed	

Connector 324 4 WAY POWER CONNECTOR (SUMITOMO) (CLEAR)

Card No.	Wire Col.	ILQ	Wire No.	Function	Status	Comments
1	YO	0	13	Sunroof Backward	Voltage when Sunroof back Switch Pressed. Otherwise GND	
2	PLG	0	12	Rear Screen Heater	Voltage when Rear Screen Heater selected. Otherwise GND	
3	YK	0	13	Sunroof Forward	Voltage when Sunroof forward switch Pressed. Otherwise GND	
4	G	0	6	Sun View Illumination - IGN	Voltage when Ignition on.	



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Connector G126 18 WAY AMP 070 FEMALE PLUG (GREY)		Status	Comments
Wiring	U/I/O	Event No.	Function
1	RY	0	Rear Left Fog Lamp Vbat, when Rear Fog lamps selected
2	GN	0	Left Reverse Lamp Vbat, when reverse selected
3	RY	0	Rear Right Fog Lamp and Trailer Fog Lamp Vbat, when Rear Fog lamps selected
4	GW	0	Rear Right Directional Indicator Pulsed square wave between 0v - 12v when RH turn signal is selected Also true when the Hazard switch is selected
5	WO	0	Aerial Amplifier auxiliary Steady feed when ignition is on.
6	OK	0	Rear Right Door Superlock Vbat, when driving motor.
7	OB	0	Rear Wiper Vbat, when driving motor.
8	0	0	14 Rear Right Door Lock
9	GN	0	Right Reverse Lamp Vbat, when reverse selected.
10	RW	0	Right Tail Lamp + Right Trailer Tail Lamp Vbat, when sidelights / mainbeam selected otherwise GND Also activates Trailer Tail lamps if fitted
11	PR	0	Rear right + Front Courtesy Lamp + Loadspace GND to illuminate the lamps.
12	GP	0	RH Stop Lamp + Trailer Stop Lamp Vbat, when Brake applied
13	GV	0	High Mounted Stop Lamp Vbat, when Brake applied
14	GR	0	Left Trailer Directional Indicator Pulse from 0v to Vbat when L.H.D.J selected otherwise GND
15	GY	0	Right Trailer Directional Indicator Pulse from 0v to Vbat when R.H.D.J selected otherwise GND
16	RU	0	Number Plate Lamps Vbat when sidelights selected otherwise GND
17	P	0	15 Front + Right Courtesy Lamps, Tailgate CDL Alarm BZ + Loadspace Lamp Supply
18	K	0	Rear Right Door Unlock Vbat, when driving motor. Internally connected in BeCM to glow box lamp Typically 800ms duration.



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Connector C326 - 20 WAY AMP 040 FEMALE PLUG (BLUE)

Pin No.	Wire Size	U/I/O	Pass No.	Function	Status	Comments
1	OP	I		Rear Wiper Park	When Rear Wiper is Parked, Input is GND Otherwise Vbat.	
2	BP	I		Courtesy Lamp Main Switch	Input is GND when operated Otherwise Vbat.	May Keep BeCM awake (see Table 1)
3	PV	I		Tailgate Open Switch	Input is GND when Tailgate is Open.	May Keep BeCM awake (see Table 1)
4	RY	I		Sunroof Ant Trap 1	Pulse Signal when Motor operated.	0v to 12v Pulses
5	BG	I		Rear Right Ant Trap 1	Pulse Signal when Motor operated.	0v to 12v Pulses
6	OR	I		Radio Remote Input	When IR detected, approx. 10v, otherwise Approximately 2 volts	May Keep BeCM awake (see Table 1)
7	Y	I		Front Right Ant Trap 1	Pulse Signal when Motor operated.	0v to 12v Pulses
8	BO	I		Rear Right Window Down Switch	GND when switch is operated, Otherwise Vbat.	
9	R	O		Right Front Door Serial Link Clock	Signal Logic : 0 = V(Low) = GND, 1 = V(High) = Vbat	Motor will display average value
10	OG	O		Right Front Door Serial Link Direction	Signal Logic : 0 when transmitting, 1 when receiving	Motor will display average value
11	YG	I		Sunroof Closed Input	Input is GND when Sunroof Closed, otherwise V. battery.	
12	PO	I		Right Front Door Awakening Output	Voltage dependent on position of Mirror Potentiometers. 0v - 5v	
13	PW	I		Rear Right Door Open Switch	Input is GND when Door is Open, otherwise V. battery.	May Keep BeCM awake (see Table 1).
14	YP	I		Sunroof Ant Trap 2	Pulse Signal when Motor operated. (Pulse Inpt Ant Trap 1 signal by 90°).	0v - 12v Pulses
15	YB	I		Rear Right Ant Trap 2	Pulse Signal when Motor operated. (Pulse Inpt Ant Trap 1 signal by 90°).	0v - 12v Pulses
16	YU	I		Front Right Ant Trap 2	Pulse Signal when Motor operated. (Pulse Inpt Ant Trap 1 signal by 90°).	0v - 12v Pulses
17	BK	I		Rear Right Window UP Switch	GND when switch is operated, Otherwise Vbat.	
18						
19	LG	O		Right Front Door Serial Link Data	Trans: 1=Vbat, 0= GND	Motor will display average value
20	NU	O		Reverse Signal (Rear View Mirror)	When reverse selected, output voltage = GND Otherwise Vbat	



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Connector	Wiring Code	I/O	Fuse No.	Function	Status	Comments
Connector C361 18 WAY AMP 970 FEMALE PLUG (WHITE)						
1	WO	0	8	Telephone Auxiliary	Visual when Ignition 1 selected	
2	S	0	12	Rear Left Window Up	Visual when Motor being Driven, Otherwise GND	
3	RP	0		Rear Left Puddle / Marker Lamps	Visual when Lamps On, Otherwise GND	
4	KO	0	14	Trailer Battery Supply	Battery Supply for Trailer	
5	GN	0		Trailer Reverse Lamp	Visual after 0.5 seconds when Reverse selected	
6	P	0	15	JH Rear C Lamp, LH Spare Lamp & Sub-Wooler Asp & LH Rear for Atrg Boat Feed	Battery Supply to these areas	
7	PU	0	22	Front Left Door Outstation (Window)	Permanent Visual	
8	PE	0	9	Front Left Door Outstation	Permanent Visual	
9	PR	0		Rear Left Courtesy Lamp	GND when Courtesy Lamp is activated, otherwise Visual	
10	SO	0	12	Rear Left Window Down	Visual when Motor being Driven, Otherwise GND	
11						
12	RE	0		Left Tail Lamp	Visual When Side-light Selected	
13	K	0	14	Rear Left Door Unlock	Visual when lock motor being driven	
14	GR	0		Rear Left turn signal	Pulse from Sv to Visual when L.H.D. selected otherwise GND	
15	OK	0		Rear Left Door Superlock	Visual when Superlock initiated	C.D. Motor also activated
16	RN	0		Rear Left Door Switch Illumination	Variable pulse with turn Sv to Visual when Side-lamp/headlamps are selected, Otherwise GND	Motor will display 12v
17	GP	0	17	Left Stop Lamp	Visual when Brake applied, Otherwise GND	
18	O	0	14	Rear Left Door Lock	Visual when lock motor being driven	



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Connector C392 - 16 WAY AMP 940 FEMALE PLUG (BLACK)		Pin No.	Function	Signal	Comments
1	LG	O	Front Left Door Serial Link Data	Trase: 1 = Vbat, 0 = GND	Typically 5v
2	YB	I	Rear Left Anti Trap 2	Pulse Signal when Motor operated. (Pulse lags Anti Trap 1 signal by 80°).	0v - 12v Pulses
3	YU	I	Front Left Anti Trap 2	Pulse Signal when Motor operated. (Pulse lags Anti Trap 1 signal by 80°).	0v - 12v Pulses
4	PW	I	Rear Left Door Open Switch	Input is GND when Door Open	May Keep BeCM awake (see Table 1)
5	BG	I	Rear Left Anti Trap 1	Pulse Signal when Motor operated. 0v - 12v	May Keep BeCM awake (see Table 1)
6	YK	I	Security – Ultrasonic Input	Pulse Train when Ultrasonic Detects movement.	
7	BC	I	Rear Left Window Down Switch	GND when switch is operated. Otherwise Vbat.	
8	PO	I	Front Left Aerial Output	Voltage dependent on position of Mirror Potentiometers 0v - 5v.	
9	OG	O	Front Left Door Serial Link Direction	Signal Logic : 0 when transmitting, 1 when receiving.	Typically 0v
10	R	O	Front Left Door Serial Link Clock	Signal Logic : 0 = V(Low) = GND , 1 = V(High) = Vbat	Typically 0v
11	Y	I	Front Left Anti Trap 1	Pulse Signal when Motor operated 0v - 12v	
12					
13					
14	BK	I	Rear Left Window Up Switch	GND when switch is operated. Otherwise Vbat.	
15	RY	O	Security Ultrasonic lead	Control Feed: Vbat when Ultrasonic activated	
16	YR	O	Rear Left Anti Trap Feed	Control Feed: Vbat.	

Connector 624 - 4 WAY POWER CONNECTOR (SUMITOMO) (CLEAR)		Pin No.	Function	Signal	Comments
1					
2					
3	P	O	Transfer Box Battery Feed	Vbat always	
4					



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Connector CB25 12 WAY AMP 070 FEMALE PLUG (WHITE)				Status	Comments
Pin No.	Wiring Code	ILD Fuse No.	Extension		
1	WY	0	Transfer Box ECU - Ignition feed	Vault, feed to Transfer Box ECU when Ignition on	
2	W	0	H-Gate - Ignition feed	Vault, feed to H-Gate when Ignition is on	
3	W	0	Auto Gearbox ECU - Ignition feed	Vault, feed to Auto Gearbox ECU when Ignition on	
4	GR	0	Transfer Box Neutral Tow Lock	If fuse 11 is inserted, vehicle is in low mode, transfer box will remain in neutral.	
5	G	0	Front Cigar Lighter - AUX	Vault, feed to Cigar Lighter when IGM 1 selected / Auxiliary	
6	PR	0	Shift Interlock Solenoid	Vault, when energised	Solenoid is energised when Ignition is on and gear selected is not in park.
7	PV	0	Auto Gearbox ECU parking feed	Permanent battery feed to Auto Gearbox ECU	
8	PU	0	Centre Console switch pack battery feed	Permanent battery feed to the centre console switch pack	
9					
10					
11	RU	0	Centre Console Illumination : Switches, Gen select, cigar lighter.	Variable pulse width from 0v to Vault when solenoid/neutraling selected	Meter will display 12V
12	PW	0	Rear Footwell Lamps	Vault, with tailgate or any door opened for greater than 0.5 seconds	



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Connector C678 20 WAY AMP 040 FEMALE PLUG (BLACK)			States	Comments
Cavity	Wire Col	I/O Fuse No.	Function	
1	LG	0	Gearbox ECU (C09141) P1s	Pulse Train (Meter will display average value) Typical value 5v Signal Logic : 0 when transmitting, 1 when receiving Typically 5v MES Status inputs
2	OG	0	Centre Console Serial Link Direction	
3	NY	1	Transfer Box - H	If High Range Selected then voltage = < 1.5v, Otherwise 12v MES 1 MES 2 MODE
4	NW	1	Transfer Box - N	If Neutral Selected then voltage = < 1.5v, Otherwise 12v
5	YR	1	Manual/Economy/Sport Status 2 from gearbox ECU	See Table 4
6	GB	1	Transfer Box Over Temp	Inputs GND when Transfer Box is over temperature
7	NR	1	Transfer Box - L	If Low Range Selected then voltage = < 1.5v, Otherwise 12v
8	UB	1	Gear Status X. From gearbox switches.	See Table 5
9	UP	1	Gear Status Y. From gearbox switches.	See Table 5
10	UN	1	Gear Status Z	Not Used
11	S	0	Engine Speed to Auto Gearbox	Pulse Train (V _{Low} = < 1.5v, V _{High} = > 5v) Typically 5v
12	K	0	Gearbox ECU 9141 K Pin	Pulse Train, Typically 5v
13	R	0	Centre Console Serial Link Clock	Signal Logic : 0 = V _{Low} = GND, 1 = V _{High} = V _{bat} Typically 5v
14	LG	0	Centre Console Serial Link Data	Trans. 1 = V _{bat} , 0 = GND Typically 5v
15				X Y Z P 1 0 0 R 1 1 0
16	YG	1	Manual/Economy/Sport status 1. From gearbox ECU	See Table 4
17	BK	1	Handbrake Switch	Input is GND when Handbrake applied
18	UG	1	Gear Status Z. From gearbox switches.	Auto - See Table 5. Manual - Neutral when GND
19	WB	1	Seat Belt Switch	Input is GND when Seatbelt latched
20	UN	0	Clutch Switch / Neutral Park to Transfer Box Default EMS	Input is GND when selected.
				Z 0 0 0 Fault Condition 1 = switch SC to GND) 0 = O/C

Connector C807 8 WAY AMP 040 FEMALE PLUG (BLUE)			States	Comments
Cavity	Wire Col	I/O Fuse No.	Function	



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1	R	O	RH Seat Serial Link Clock	Signal Logic: 0 = V(Low) = GND, 1 = V(High) = Vbat	Meter will display average value Typically 6v.
2	OW	O	LH Seat Serial Link Direction	Signal Logic: 0 when transmitting, 1 when receiving	Meter will display average value Typically 6v.
3	LGW	O	JH Seat Serial Link Data	Trans: 1 = Vbat, 0 = GND	Meter will display average value Typically 6v.
4	PW	I	LH Seat Serial Link Analog Signal	Feedback Voltage increases when Front Cushion goes Down, Rear Cushion goes down, Backrest goes up or Headrest goes up. 0v to 5v.	
5	O	O	RH Seat Serial Link Direction	Signal Logic: 0 when transmitting, 1 when receiving	Meter will display average value Typically 6v.
6	LG	O	RH Seat Serial Link Data	Trans: 1 = Vbat, 0 = GND	Meter will display average value Typically 6v.
7	RW	O	LH Seat Serial Link Clock	Signal Logic: 0 = V(Low) = Vbat, 1 = V(High) = GND	Meter will display average value Typically 6v.
8	P	I	RH Seat Serial Link Analog Signal	Feedback Voltage increases when Front Cushion goes Down, Rear Cushion goes down, Backrest goes up or Headrest goes up. 0v to 5v.	

Connector	Wire col.	I/O	Fuse No.	Fusible	Status	Comments
Connector C912 12 WAY AMP 040 FEMALE PLUG (GREEN)						
1	NU	O	2	RH Seat Heater	Output is Vbat when RH Seat Heater selected. Otherwise GND	This is irrespective of Thermal Switch (located in seat)
2	NR	O	2	LH Seat Heater	Output is Vbat when LH Seat Heater selected. Otherwise GND	This is irrespective of Thermal Switch (located in seat)
3	BY	O		Seat Enable 2	Output is Vbat if Vehicle does not have Memory Seats. Otherwise GND	
4	BW	O		LH Seat Signal GND	GND always	
5	VLG	O	10	RH Seat Lumber	Battery Feed to RH Seat Lumber	
6	WU	O	20	LH Seat Lumber	Battery Feed to LH Seat Lumber	
7	WV	O	20	LH Seat Battery 2	Battery Feed to LH Seat (Fuse Rated 30A)	
8	W	O	20	LH Seat Battery 1	Battery Feed to LH Seat (Fuse Rated 30A)	
9	BY	O		Seat Enable 1	Output is Vbat if Vehicle does not have Memory Seats. Otherwise GND	
10	BO	O		RH Seat signal GND	GND always	
11	WO	O	10	RH Seat Battery 1	Battery Feed to RH Seat (Fuse Rated 30A)	
12	WR	O	10	RH Seat Battery 2	Battery Feed to RH Seat (Fuse Rated 30A)	

Note: The harness connector views can be found in the ETM - section Z6. UNLESS STATED OTHERWISE, THE INPUT AND OUTPUT CAN BE MEASURED WITH A VOLTMETER. When measuring the pulse train outputs, the meter may not display the full voltage, but the average voltage.



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Instrument Pack

Connector C242 20 WAY AMP D40 FEMALE PLUG (BLACK)				
Pin No.	Wiring	Function	Comments	
1	SU	1	Tri computer switch Switch grounded to zero volts when switch pressed, 6V otherwise.	Average value seen on meter when link active.
2	RG	1	Serial Link - clock Square wave signal. Typically 6V average.	Average value seen on meter when link active.
3	OG	1	Serial Link - direction Square wave signal. Typically 6V average.	Average value seen on meter when link active.
4	P	1	Battery supply V batt	Average value seen on meter when link active.
5	LG	1	Serial Link - data Square wave signal. Typically 6V average.	Average value seen on meter when link active.
6	RW	0	Dimmer (Controls illumination levels of pack when lighting is on) Square wave signal (when switch modulated) Average value will vary depending on illumination level.	
7	B	0	Power GND GND 0 volts	
8	BG	0	Serial Link GND GND 0 volts	
9	Y	1	Speedometer signal Square wave signal 0-12 volts	
10	BK	1	Sounder (Driven from BeCM) Pulses between 0 - 7 volts otherwise ground	
11	SP	1	Over-speed warning switch Switch grounded to zero volts when switch pressed, 6V otherwise.	
12	RG	1	Serial Link - clock (dup) Square wave signal. Typically 6V average.	Average value seen on meter when link active.
13	OG	1	Serial Link - direction (dup) Square wave signal. Typically 6V average.	Average value seen on meter when link active.
14	P	1	Battery supply V batt	Average value seen on meter when link active.
15	LG	1	Serial Link - data (dup) Square wave signal. Typically 6V average.	Average value seen on meter when link active.
16	S	1	Tachometer signal Square wave signal 0 - 12 volts	
17	B	0	Power GND GND 0 volts	
18	BG	0	Serial Link - signal GND GND 0 volts	GND at all times
19	GU	1	Fuel pulsing signal Square wave pulsed signal	
20	O	0	External LCD dimmer (supplies control of illumination to HEVAC display panel) Square wave signal	

NOTE: Square wave signals cannot be measured directly with a voltmeter. The voltmeter will give an average value that may fluctuate depending on the meter used. This signifies the fact that there is not a short circuit to ground or V batt. In this case the part of the serial link tested is probably working, but there is still the possibility of a fault.



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Center Console Outstation

Connector C614 8 WAY AMP 940 FEMALE PLUG (BLUE)

Pin No.	Wire Color	LD	Func. No.	Function	Status	Comments
1	PU	1	1	Battery supply	V batt permanent battery feed	Mirror, windows and sunroof will not work without battery feed.
2	LG	1/0		Serial link - data	Typically 8 volts, during transmitting = 11vatt, all other times = GND, (receives wire)	Not active when BeCM goes to sleep.
3	OG	1		Serial link - direction	Typically 8 volts, during transmitting = GND, when receiving = 11vatt, (receives wire)	Not active when BeCM goes to sleep.
4	R	1		Serial link - clock	Squams wire, typically 6V.	Not active when BeCM goes to sleep.
5	RU	1		Murmurecon	Variable pulse width modulated from 0-11vatt when idle/stop/standings are selected.	12 volts is displayed on the voltmeter
6	B	0		GND	GND 0 volts	
7						
8						

Door Outstations

Connector C765 16 WAY AMP 070 FEMALE PLUG (BLACK)

Pin No.	Wire Color	LD	Func. No.	Function	Status	Comments
1	BO	0		Anti-trap GND	GND 0 volts	Provides the ground for the Hall Effect Sensors in the window motor for one-touch operation and anti-trap.
2	PR	0		Puddle / Marker Lamp Feed	12vatts while courtesy lamps are on, otherwise floating voltage.	
3	PO	0		Awning	Varying voltage, dependent upon seat position, 0-5volts	
4	YR	0		Anti-trap Feed	V batt permanent battery feed	Provides power for the Hall Effect Sensors in the window motor for one-touch operation and anti-trap.
5		0			V batt permanent battery feed	Provides power for lock and window operation.
6	PU	0	22	Power Feed (Window, Locking)	GND 0 volts	
7	B	0		Power GND	12vatt output when window 'down' is selected, GND when window not operating or when window 'up' is selected.	
8	SG	0		Window Down	GND 0 volts	
9	B	0		Power GND	V batt permanent battery feed	Provides power for door locks and windows.
10	PB	0	9	Power Feed	GND 0 volts	
11	B	0		Puddle / Marker Lamp Ground	V batt permanent battery feed	Provides power for sound system door amplifier
12	P	0	9	16a Power Amp Feed	Typical average value is 8 volts	
13	LG	1/0		Serial Link - data	Typical average value is 0 volts	
14	R	1		Serial Link - clock	Typical average value is 6 volts	
15	OG	1		Serial Link - direction	12vatt output when window 'up' is selected, GND when window not operating or when window 'down' is selected.	
16	SW	0		Window Up		



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Connector C764 12 WAY AMP 040 FEMALE PLUG (BLACK)

Pin No.	Wire Col.	LED	Exam No.	Function	Notes	Comments
1	Y	0		Mirror left		12volt output when mirror 'left' is selected, GND when mirror not operating or when mirror 'right' is selected.
2	R	0		Mirror right		12volt output when mirror 'right' is selected, GND when mirror not operating or when mirror 'left' is selected.
3	G	0		Mirror heater		12volt output when engine is running or mirror is operated.
4						
5	BR	0		Mirror position sensor GND		GND 0 volts
6	O	1		Mirror vertical position		
7	S	0		Mirror up		12volt output when mirror 'up' is selected, GND when mirror not operating or when mirror 'down' is selected.
8	U	0		Mirror down		12volt output when mirror 'down' is selected, GND when mirror not operating or when mirror 'up' is selected.
9						
10	W	0		Mirror potentiometer power feed		5volt feed for the mirror potentiometer.
11	P	1		Mirror horizontal position		Varying voltage, depending upon mirror position.
12	B	0		Heater GND		GND 0 volts



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Connector C150 20 WAY AMP 040 FEMALE PLUG (BLACK)

Pin No.	Wire Col.	LCB	Fuse No.	Function	Status	Comments
1	OB	O		Door Lock	12volt output when lock is operated, GND when lock not operating or when unlock is operated.	
2	KB	O		Door Unlock	12volt output when 'unlock' is operated, GND when lock not operating or when 'lock' is operated.	
3						
4						
5	GR	I		CDL Switch	Switch when switch is open, GND when operated.	
6	UR	I		Key Switch	Switch when switch is open, GND when operated.	
7	PN	I		Door Open Switch	3volts when switch is open, GND when closed.	Only fitted to driver's side door.
8	OK	O		Door Superlock	12volts when latch is driven into superlock, otherwise floating voltage.	
9						
10						
11	B	O		Door Lock Switch GND	GND 6 volts	Ground for all switches in door latch.
12						
13						
14						
15						
16						
17						
18						
19						
20						



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Seat Outstations

Connector C901(LHVC902 (RH) 12 WAY AMP 070 FEMALE PLUG (SLATE)				Signal	Comments
Pin No.	Wire No.	Function	Signal	Comments	
1	P	0	Varying voltage, deactivates upon seat position, 0-5volts	Seat memory will not function without this output	
2	R	1	Square wave, typically 5V		
3	WO	1	Permanent 12 volt supply for seat motors.		
4	WR	1	Permanent 12 volt supply for seat motors.		
5	BO	0	GND 0 volts		
6	WLG	1	Permanent 12 volt supply for seat lumbar pump.		
7	O	1	Square wave, typically 5V		
8					
9	B	0	GND 0 volts		
10	B	0	GND 0 volts		
11					
12	LG	1/0	Square wave, typically 5V		

Connector C977 8 WAY AMP 040 FEMALE PLUG (BLACK)

Connector C977 8 WAY AMP 040 FEMALE PLUG (BLACK)				Signal	Comments
Pin No.	Wire No.	Function	Signal	Comments	
1	KR	1	Switch when switch open, GND when switch is selected.		
2	LG	1	Switch when switch open, GND when switch is selected.		
3					
4	B	0	GND 0 volts		
5	KY	1	Switch when switch open, GND when switch is selected.	Ability to store memory positions for seat	
6					
7					
8					



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Connector C362 12 WAY AMP 670 FEMALE PLUG (GREEN)					Signal	Comments
Pin No.	Wire Col.	ILQ	Term No.	Function	Signal	Comments
1	UG	0		Headrest down	12volt output when headrest 'down' is selected. GND when motor not operating or when headrest 'up' is selected.	If seat is not operating in a certain direction, check to see if proper voltage/GND condition exists.
2	G	0		Headrest up	12volt output when headrest 'up' is selected. GND when motor not operating or when headrest 'down' is selected.	If seat is not operating in a certain direction, check to see if proper voltage/GND condition exists.
3	YR	1		Backrest retractor potentiometer	Varying voltage, depending upon position of backrest. 0-5volts	
4	UY	1		Headrest retractor potentiometer	Varying voltage, depending upon position of headrest. 0-5volts	
5	YB	0		Backrest down	12volt output when backrest 'down' is selected. GND when motor not operating or when headrest 'up' is selected.	If seat is not operating in a certain direction, check to see if proper voltage/GND condition exists.
6	Y	0		Backrest up	12volt output when headrest 'down' is selected. GND when motor not operating or when headrest 'up' is selected.	If seat is not operating in a certain direction, check to see if proper voltage/GND condition exists.
7	RS	0		Backrest/headrest retractor potentiometer	12-volt feed for the backrest and headrest potentiometers.	
8	WLG	0	left 20, right 10	Lumbar feed	12-volt feed for the lumbar pump motor.	Lumbar pump may not operate without this output.
9	N	0		Backrest/headrest retractor potentiometer	GND 0 volts	
10		0		GND		
11	BS	0		Lumbar pump down	GND when lumbar 'down' is selected. Floating when not selected.	Lumbar pump may not deflate without this output.
12	PP	0		Lumbar pump up	GND when lumbar 'up' is selected. Floating when not selected.	Lumbar pump may not inflate without this output.



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Connector	Wiring code	U/I/O	Event No.	Function	Signal	Comments
1	NV	O		Lumbar switch GND	GND 0 volts	
2	K	O		Backrest switch GND	GND 0 volts	
3	N			Spare pin		
4	GN			Spare pin		
5	GY/Y	I		Rear cushion raise switch	5volts when switch open, GND when switch is selected.	
6	PW/B	I		Rear cushion lower switch	5volts when switch open, GND when switch is selected.	
7	BY/US	I		Backrest raise switch	5volts when switch open, GND when switch is selected.	
8	S/G	I		Seat forward switch	5volts when switch open, GND when switch is selected.	
9	R	O		Cushion switch GND	GND 0 volts	No cushion operation without this ground.
10	PI/P	I		Lumbar pump up switch	Floating voltage when switch is open, GND when switch is selected.	
11						
12	UP/P	I		Lumbar pump down switch	Floating voltage when switch is open, GND when switch is selected.	
13	U/W	I		Headrest up switch	5volts when switch open, GND when switch is selected.	
14	W/U	I		Headrest down switch	5volts when switch open, GND when switch is selected.	
15	B/PW	I		Front cushion lower switch	5volts when switch open, GND when switch is selected.	
16	Y/GY	I		Front cushion raise switch	5volts when switch open, GND when switch is selected.	
17	O/Y/S	I		Backrest lower switch	5volts when switch open, GND when switch is selected.	
18	G/S	I		Seat back switch	5volts when switch open, GND when switch is selected.	



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Connector C971 18 WAY AMP 070 FEMALE PLUG (WHITE)

Pin No.	Wire Col.	LLG	Exns No.	Function	Signal	Comments
1	WG	0		Front cushion up	12volts when switch is selected, otherwise GND with switch open.	
2	BG	0		Front cushion down	12volts when switch is selected, otherwise GND with switch open.	
3	UV	1		Front cushion raise/lower potentiometer	Varying voltage, dependent upon seat position. 0-5volts	
4	W	1		Forward/back potentiometer	Varying voltage, dependent upon seat position. 0-5volts	
5						
6	BY	0		Rear cushion down	12volts when switch is selected, otherwise GND with switch open.	
7						
8	WB	0		Seat forward motor	12volts when switch is selected, otherwise GND with switch open.	
9	U	0		Forward/back potentiometer GND	Permanent ground, 0 volts	
10	RB	0		Front cushion raise/lower potentiometer GND	Permanent ground, 0 volts	
11	RB	0		Rear cushion raise/lower potentiometer GND	Permanent ground, 0 volts	
12	LUR	1		Rear cushion raise/lower potentiometer	Varying voltage, dependent upon seat position. 0-5volts	
13	RG	0		Forward/back potentiometer feed	12volt feed for the backrest and cushion forward/back potentiometers.	
14	RG	0		Front cushion raise/lower potentiometer feed	12volt feed for the backrest and front cushion raise/lower potentiometer.	
15	RG	0		Rear cushion raise/lower potentiometer feed	12volt feed for the backrest and rear cushion raise/lower potentiometer.	
16		0				
17	WY	0		Rear cushion up	12volts when switch is selected, otherwise GND with switch open.	
18	BW	0		Seat back motor	12volts when switch is selected, otherwise GND with switch open.	



Appendix A

Glossary

BeCM

Body electrical Control Module. This unit controls, monitors and provides power supply to many other vehicle's electrical systems.

Sleep Mode

When all timers time out and activation inputs are inactive for two minutes. Current drain should be approx. 30mA.

Tacho pulse monitoring

Square wave pulses from the engine when it is running.

Key inhibit solenoid

This solenoid is energized to prevent the gear lever being move out of the park position.

Inertia switch

A switch that is used to switch off the engine fuelling and unlock the doors should the vehicle be involved in an impact.

Limp Home Mode

This is when the BeCM has an internal failure and default to safety critical operations only.

Quiescent Drain

This is the current taken by the vehicle when all timers have timed out and activation inputs are inactive.

Level switched

The BeCM will recognise this activation input as a high or a low value.

Edge triggered

The BeCM will only recognise this input as an activation input when the input voltage is changing between high and low or vice versa.

Diagnostic 'K' & 'L' lines

These are communication lines used by the BeCM to 'talk' to Testbook.

Serial Link

This is a method of electron communication that enables the BeCM to 'talk' to several other outstations using the same wires.

Data - This line carries the information between the BeCM and the outstation. It is a bi-directional line and information can travel either way.

Clock - This signal is controlled by the BeCM to ensure that both microchips between the BeCM and outstation are synchronized with each other.

Direction - This signal is controlled by the BeCM to ensure both microchips, either in the BeCM or outstation, are not trying to communicate at the same time. This signal determines which component is sending data and which component is receiving the data.

Odometer Logging

The BeCM and the instrument pack both store the mileage the vehicle has done. The instrument pack updates the BeCM with the latest mileage.

**Appendix B****Battery Feed 1**

Wire colour - NLG

Supply fuse = Maxifuse 1

Feeds F1, F2, F3, F4 and FETs

Connector C171

Components supply by this battery feed	Fuse
Left tail lamp	
Rear left puddle lamp	
Rear left direction indicator	
Left seat heater	F2
Right heater	F2
Left sidelight	
Front left direction indicator	
Left direction indicator repeater	
Left dipped beam	
Front left fog lamp	
Left main beam 1	
Left main beam 2	
Left trailer tail lamp	
Left trailer direction indicator	
Rear left fog lamp	
Left reverse lamp	F2
Rear right window up	F2
Rear right window down	F2
Centre console battery	F1
Clock/Radio/Instrument pack	F1
Auto gearbox ECU	F3
Transfer box ECU	F4

**Battery Feed 2**

Wire color - N

Supply fuse = Maxifuse 4

Feeds F6, F7, F12, F13, F14, F15, F17 and FETs

Connector C170

Components supply by this battery feed	Fuse
Rear left door lock	F14
Rear left door unlock	F14
Trailer reverse lamp	
Left rear courtesy lamp, sub-woofer amp & left rear ice amp	
Rear left window up	F12
Rear left window down	F12
Trailer battery	F14
Right sidelight	
Alarm Klaxon	
Front right direction indicator	
Right side direction indicator repeater	
Right dipped beam	
Front right fog lamp	
Right main beam 1	
Right main beam 2	
Air bag ignition feed	F7
Rear right puddle lamps	
Number plate lamps	
Glovebox lamps	
Right tail lamp & trailer tail lamp	
Rear right direction indicator	
Rear view mirror dip (IGN)	F8
Front & Right courtesy lamps, loadspace lamp, alarm RF & Tailgate CDL	F15
Rear right ice amp	F15
Rear right fog lamp	
Trailer fog lamp	
Right reverse lamp	
Sun-visor illumination	F6
Rear right door lock	F14
Rear right door unlock	F14
Rear wiper	F15
Sunroof back	F13
Sunroof forward	F13
Rear screen heater	F12
Fuel flap release	F14
Spare IGN	F6
Shift interlock solenoid	F13
Auto gearbox IGN	F8
Key inhibit solenoid	F13
Break switch feed	F17
HEVAC IGN feed & Air suspension ECU	F17
Transfer box ECU IGN	F8



Battery Feed 3

Wire color - NK

Supply fuse = Maxifuse 5

Feeds F8, F9, F10, F20, F22 and FETs

Connector C169

Components supply by this battery feed	Fuse
Front left & right battery 1 (window & locking)	F22
Front left & right battery 2 (inc. LH & RH front ICE amp)	F9
Rear left door switch illumination	
Rear left door superlock	
Car phone Aux	F8
Left seat battery 1	F20
Left seat battery 2	F20
Right seat battery 1	F10
Right seat battery 2	F10
Left seat lumbar	F20
Right seat lumbar	F10
Front screen wash	
Aerial amplifier (Aux)	F8
Rear right door superlock	
Rear right door illumination	
Audible warning (instrument pack)	
Cruise Pump	
Spare (S1)	
Spare (S3)	
Spare (Y4)	F 5P2
Front cigar lighter	F8
Radio	F8
HEVAC	F8
Fascia controls/ Inst. pack/ radio/ HEVAC/ Clock	