

**372: Central electronic module (CEM)**

S40 (04-), 2005, B5254T3, L.H.D

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**PRINT**

**372: Central electronic module (CEM)**

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## **Function**

### **Alarm**

See Design and Function, Alarm.

### **Locks**

See Design and Function, Central locking.

### **Immobilizer**

See Design and Function, Immobilizer/start inhibition.

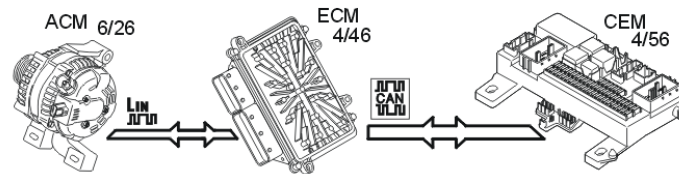
### **Alcolock (option 2009-)**

See Design and Function, Alcohol Analysing Start Inhibitor.

### **Automatic start/stop of engine (2010-)**

See Design and Function, Automatic start/stop of engine (2010-, only on vehicles with the function automatic start/stop of engine)

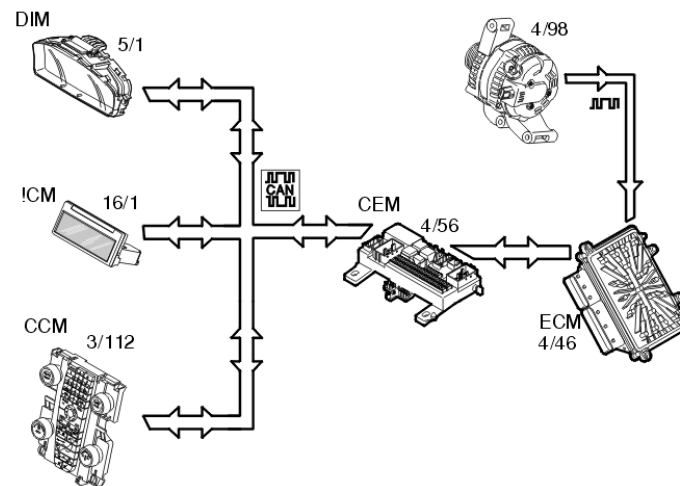
### **Alternator**



See Design and Function, Generator (GEN) and Design and Function, Engine control module (ECM).

See also Design and Function, Regenerating brake energy (2010-).

### Current limiting



Central electronic module (CEM) (4/56) communicates with the engine control module (ECM) (4/46) on the controller area network (CAN). The engine control

module (ECM) communicates with alternator control module (ACM) (4/98). In this way the central electronic module (CEM) receives information about how much current the generator produces and how much current can be used for the various loads in the vehicle. Under certain conditions the generator cannot produce enough current for those loads which are connected. The central electronic module (CEM) communicate with the with climate control module (CCM) (3/112) which then completely or partially switches off the following loads.

- electrical additional heater
- rear demist
- electrically heated seats
- heated door mirrors.

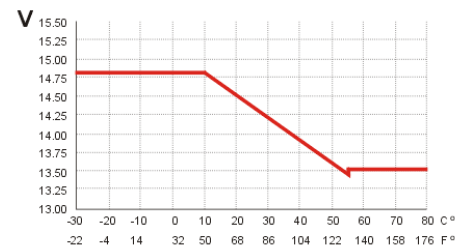
The central electronic module (CEM) also transmits a request via the Control area network (CAN) to the engine control module (ECM) to increase the engine idle speed.

When the engine is not running all current is taken from the battery. There are a number of different loads which can be activated when the engine is not running. For example the infotainment system. The central electronic module (CEM) continuously monitors the voltage level of the battery. When the voltage level is too low the central electronic module (CEM) transmits information to the infotainment control module (ICM) (16/1) which then shuts off the infotainment system. In the event of a fault, the central electronic module (CEM) transmits data via the Control area network (CAN) to the driver information module (DIM) (5/1) which displays a text message to the user.

If the infotainment system used in key position II, when the engine is not running, the information is sent to the driver information module (DIM). A message is displayed if the infotainment system is switched off for 2 minutes.

See also Design and Function, Activating automatic start/stop of engine (2010-, only on vehicles with the function automatic start/stop of engine)

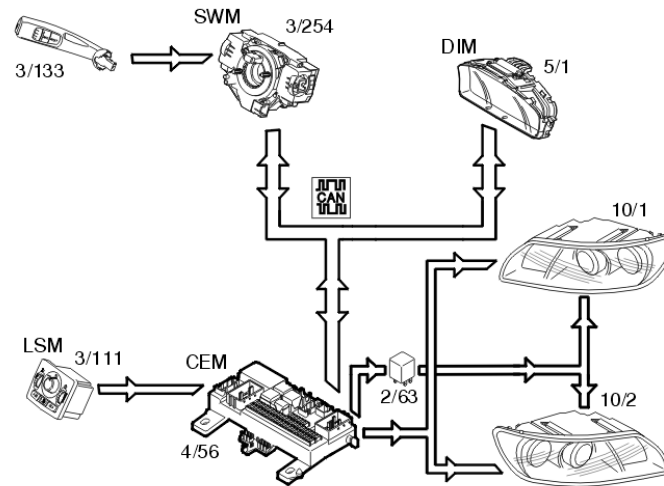
### Charge voltage



To charge the battery optimally the central electronic module (CEM) calculates the output voltage from the generator (GEN) using the temperature of the battery. The alternator control module (ACM) controls the output voltage, depending on the control from the central electronic module (CEM). See the illustration above. In some driving conditions for example, the engine control module (ECM) is able to affect generator (GEN) control, whereby the output voltage will deviate from the above.

See also Design and Function, Regenerating brake energy (2010-).

### Headlamps



Depending on the position of the knob in the light switch module (LSM) (3/111), the module transmits a request to the central electronic module (CEM) to switch on low beam. Central electronic module (CEM) (4/56) supplies power to the low beam directly via an output. The level of the supply voltage to the low beam is controlled using pulse width modulation of the central electronic module (CEM). This means that the average value of the voltage level to the low beam does not exceed 13.2 V, despite the fact that the supply voltage may be higher.

To change to high beam, the left-hand control stalk (3/133) is pulled towards the steering wheel. The control area network (CAN) signal from the steering wheel module (SWM) (3/254) is transmitted to the central electronic module (CEM) which activates the high beam relay (2/63) and supplies power to the high beam. For Bi-Xenon lamps, the position of the reflector is also changed so that the Xenon lamp is on at high beam.

The central electronic module (CEM) also transmits a CAN signal to the driver information module (DIM) (5/1) to light the indicator lamp for high beam.

There is a Limp Home function which ensures that low beam still works if there is a fault in the control area network (CAN). For Bi-Xenon lamps the beam is then set to the shortest range.

For more information about Bi-Xenon lights, see Design and Function, GDL-lights/Design and Function, Headlamp Control Module (HCM) (S40/V50 2008-).

**For more information on Bi-Xenon lights:**

**S40/V50:**

See: Design and Function - GDL-lights (-200719).

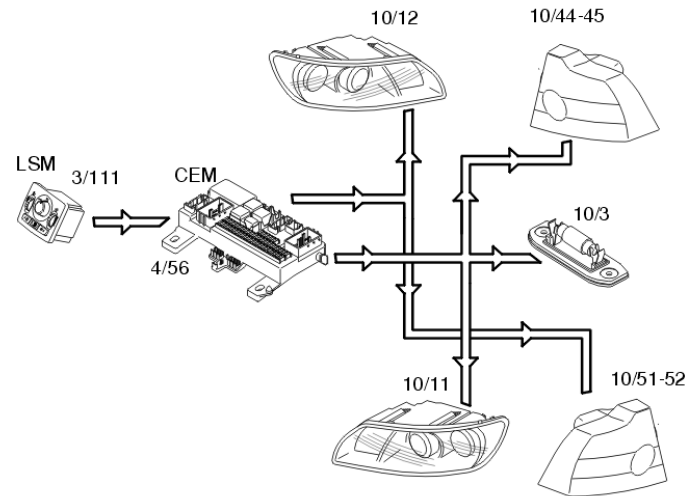
See: Design and Function, Headlamp Control Module (HCM) (200720-).

**C30/C70:**

See: Design and Function, GDL-lights (-200945).

See: Design and Function, Headlamp Control Module (HCM) (200946-).

**Parking lights / number plate lighting**



The parking lamps (10/11-12, 10/44-45 and 10/51-52) and license plate lighting (10/3) lights when:

- the knob in the light switch module (LSM) (3/111) is in the low beam position
- the knob in the light switch module (LSM) is in the parking lamp position
- low beam is lit via the low beam automatic function (market dependent).

The central electronic module (CEM) (4/56) receives information from the light switch module (LSM) which is directly connected to activate the lamps.

The lamps are powered directly via two outputs on the central electronic module (CEM). The license plate lighting, front parking lamp on the left-hand side and the rear parking lamp on the right hand side are supplied with power from one output. The front parking lamp on the right-hand side and the rear

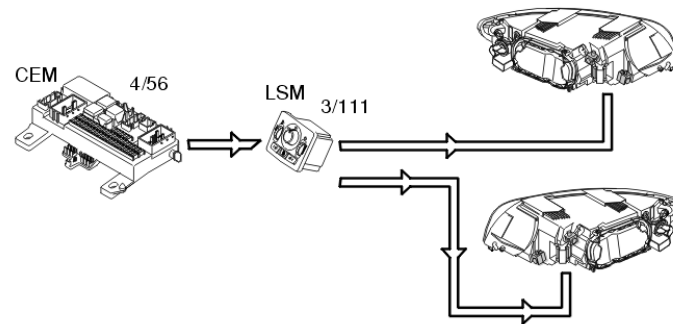


parking lamp on the left hand side are supplied with power from the other output in the Central Electronic Module (CEM).

To detect problems with the lamp faults, the central electronic module (CEM) reads the power consumption of each output.

The parking lamps have a limp Home function and will work even if there is a fault in the control area network (CAN) or an open-circuit in the serial communication between the light switch module (LSM) and the central electronic module (CEM). The parking lamps will function when the ignition key is in position II.

### Headlamp range adjustment



Headlamp range adjustment is controlled by the light switch module (LSM) (3/111) which is directly connected to the actuator motors.

If the thumb wheel in the lamp switch module is turned, information about the position of the wheel is

transmitted to the actuator motors. The actuator motors change the angle of the reflectors in the headlamps. The headlamp range can be adjusted in 16 stages.

### Automatic range adjustment (Bi-Xenon)

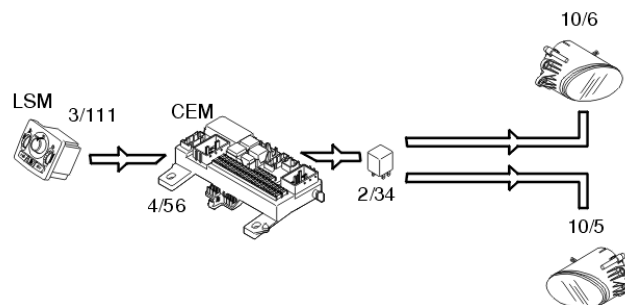
#### **S40/V50:**

See: Design and Function - GDL-lights (-200719).  
See: Design and Function, Headlamp Control Module (HCM) (200720-).

#### **C30/C70:**

See: Design and Function, GDL-lights (-200945).  
See: Design and Function, Headlamp Control Module (HCM) (200946-).

### Front fog lamps (certain lamps)

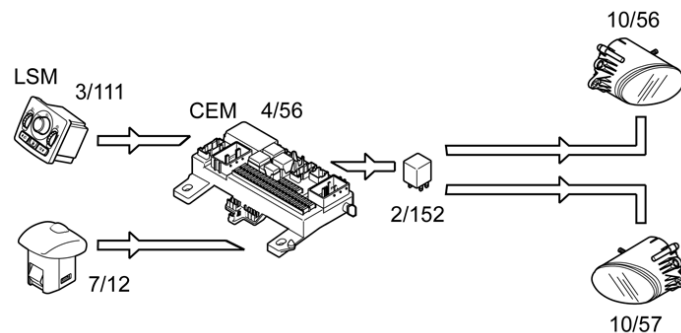


The front fog lamps (10/5-6) are activated by pressing the button for the front fog lamps in the light switch module (LSM) (3/111). The light switch module (LSM) is directly connected to the central electronic module (CEM) (4/56).

The power supply for the lamps is via a directly connected relay (2/34) on the central electronic module

(CEM).

**Daytime running lights (from structure week 201044, option)**



Daytime running lights (10/56-57) are activated via an extra "auto-position" in Light switch module (LSM) (3/111). Daytime running lights can also, on certain markets, be activated via position 0 and P (parking lights).

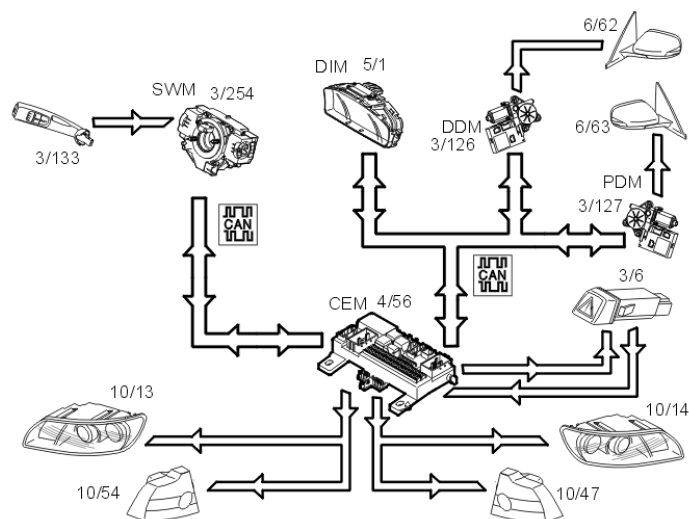
When "auto-position" is selected in Light switch module (LSM) the Central electronic module (CEM) (4/56) uses information from the vehicle's twilight sensor (7/12) for automatic switching between low beams and daytime running lights. In case of missing or incorrect signal from the twilight sensor the low beams are used as usual.

Daytime running lights are never active together with running lights. On vehicles equipped with ABL-lights, there is a diode by the "auto-position". This diode pertains to the ABL-lights' function and not the daytime running lights.

For certain markets, when Light switch module (LSM) is in "position P", the daytime running lights are deactivated automatically and the parking lights are turned on when the automatic transmission's gear selector changes to P- or N-position, or when the parking brake is activated.

The light switch module (LSM) is directly connected to the central electronic module (CEM). Power is supplied to the daytime running lights, via a directly connected relay (2/152), from the central electronic module (CEM).

### Turn signal lamps / Hazard warning signal flashers



This function is controlled by the left control stalk (3/133). The steering wheel module (SWM) (3/254) sends signals via the control area network (CAN) to the central electronic module (CEM) (4/56) to activate the

turn signal lamps (10/13-14 and 10/47-54).

To activate the indicator for the turn signal lamp and to supply the turn signal lamp with voltage directly via one output, the central electronic module (CEM) transmits information to:

- driver information module (DIM) (5/1)
- driver door module (DDM) (3/126)
- passenger door module (PDM) (3/127)
- trailer module (TRM).

The turn signal lamps in the door mirrors are supplied with voltage via the driver door module (DDM) or the passenger door module (PDM).

If a trailer or similar is connected the symbol for a trailer in the driver information module (DIM) will be activated in time with the indicator light for the turn signal lamp.

The power supply is pulsed and the turn signal lamps are activated 90 times per minute.

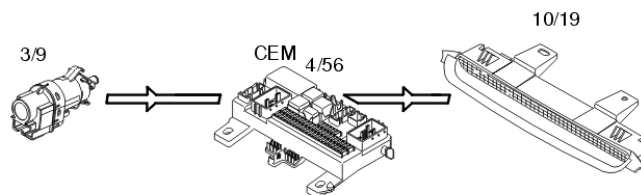
The hazard warning signal flasher is activated by closing the switch (3/6) and transmits a signal to the central electronic module (CEM) to start the function. The central electronic module (CEM) transmits a signal in the same way as when activating the turn signal lamp, but to both sides. The central electronic module (CEM) also transmits a signal to the bulb in the switch to indicate that the hazard warning signal flashers are on.

If the ignition key is in position I or II, there is a clicking

sound from the driver information module (DIM). If the ignition is switched off, there is no sound, but the hazard warning signal flashers continue to flash.

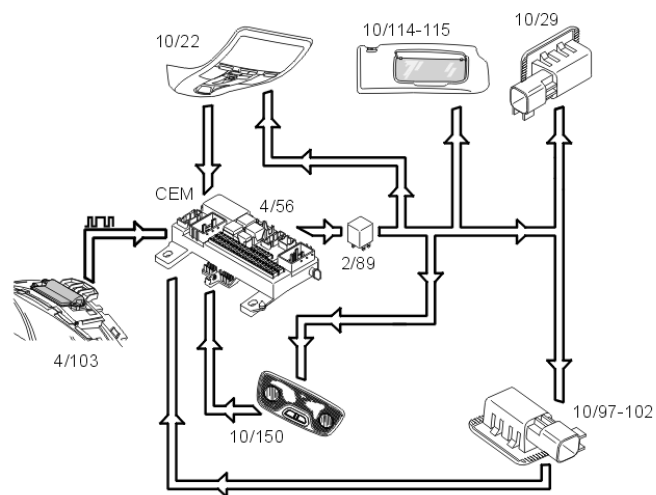
If a fault occurs with a lamp, the central electronic module (CEM) detects the reduction in power consumption and the frequency is doubled on the side where the fault occurred. The display in the driver information module (DIM) will occur at twice the frequency.

### High level stop lamp



When the stop lamp switch (3/9) is closed, a signal is transmitted to the central electronic module (CEM) (4/56). The high mounted stop brake lamp (10/19) is supplied with power directly from the central electronic module (CEM). The stop lamp is supplied with power for as long as the stop lamp switch is closed.

### Courtesy lighting/sun visor/glove compartment lighting



The interior roof lighting front (10/22) and rear (10/150) a total of four lamps is activated by the relevant switch.

The inner roof lighting and courtesy lighting (10/97-102) is automatically activated when a door is opened, when unlocking using the remote control or when activating the approach lighting.

In order for the automatic activation to function the light switch in the roof console must be in the auto position. This only applies to roof lighting. The courtesy lighting is activated regardless of the position of the light switch.

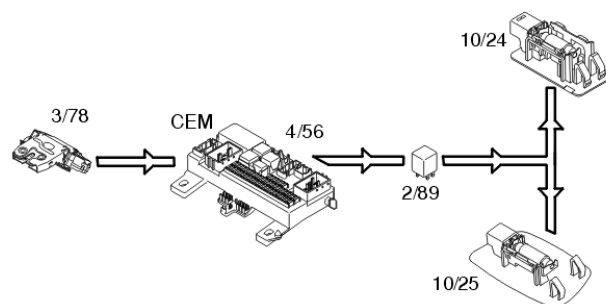
The interior roof lighting and the courtesy lighting is powered by the central electronic module (CEM) via the relay for courtesy lighting (2/89). The interior roof lighting and the courtesy lighting can be dimmed when the central electronic module (CEM) activates/deactivates general lighting. This is because the return cable from the interior roof lighting to the Central Electronic Module (CEM) can be controlled.

Courtesy lighting activated:

- when the request for courtesy and roof lighting is transmitted from the remote receiver to the central electronic module (CEM) using serial communication
- when the remote control receiver has received a command to unlock from one of the remote controls
- when one of the doors is opened.

The lighting in the sun visors (10/114-115) and the lighting in the glove compartment (10/29) is powered by the central electronic module (CEM) via the relay for courtesy lighting (2/89). The lighting in the sun visor is activated when the cover for the vanity mirror is opened. The lighting in the glove compartment is activated when the cover for the glove compartment is opened.

### Cargo compartment lighting

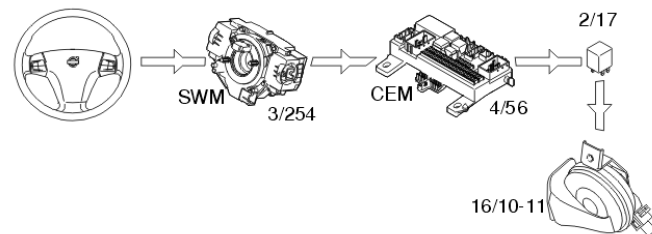


The cargo compartment lighting is activated when the trunk lid is opened. When the trunk lid opens the switch in the trunk lid lock unit (3/78) is activated. The lighting (4 door 10/24, 5 door 10/25) is powered by the central electronic module (CEM) (4/56) via the relay



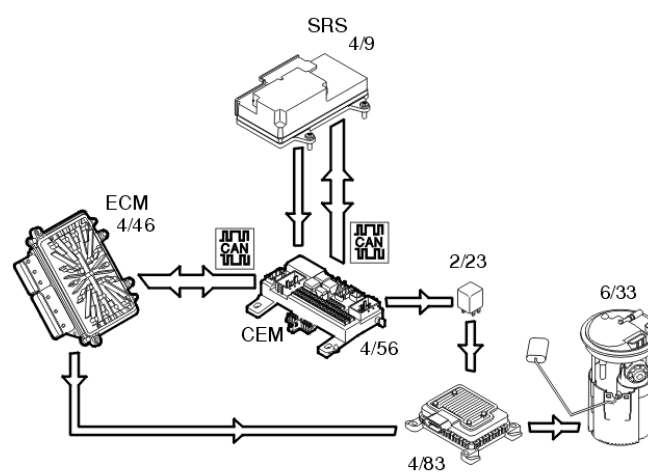
for courtesy lighting (2/89).

### Horn



The horn (16/10-11) is operated when the steering wheel module (SWM) (3/254) receives a signal from the switches in the steering wheel. The steering wheel module (SWM) transmits information via a directly connected cable to the central electronic module (CEM) (4/56) indicating that the switch is closed. The central electronic module (CEM) activates the relay (2/17) for power supply to the horn.

### Fuel pump



The central electronic module (CEM) (4/56) receives a request from the engine control module (ECM) (4/46) via the control area network (CAN) to start the fuel pump (FP). The central electronic module (CEM) then activates the relay (2/23) which supplies the fuel pump unit (4/83) with power, which in turn powers the fuel pump (FP) (6/33).

If the controller area network (CAN) does not function the relay for the power supply to the fuel pump control module will not be activated.

In the event of a collision in which the airbags are deployed, a signal is transmitted from the supplemental restraint system (SRS) module (4/9) via the control area network (CAN) to the central electronic module (CEM). The central electronic module (CEM) deactivates the relay for the fuel pump unit.



information about intermittent wiping from the steering wheel module (SWM). The information is transmitted from the steering wheel module (SWM) via the central electronic module (CEM) on the controller area network (CAN).

The Wiper motor module (WMM) has an integrated function to protect the wiper motor from overheating and unnecessary wear.

The load on the motor is monitored and in the event of too great a load or high motor temperature, the wiper speed can be reduced gradually or temporarily switched off to protect the motor.

The wiper speed is reset automatically after the load or temperature has reached a safe level.

The windshield and headlamps are washed when the right-hand control stalk is moved towards the steering wheel. The steering wheel module (SWM) transmits information to the central electronic module (CEM) via the Control area network (CAN) to activate washing. The central electronic module (CEM) activates the relay (2/182) for power supply to the pump motor (6/104) for the headlamps. When washing the windshield the central electronic module (CEM) activates the relay (2/92) for power supply to the pump motor (6/2).

The central electronic module (CEM) receives a signal from the level sensor in the windshield washer reservoir so that it can check the windshield washer reservoir level. The switch in the level sensor closes if the level falls below 0.7 liters. The central electronic module (CEM) sends the signal to Driver information module (DIM) (5/1) via the controller area network (CAN). The driver information module (DIM) displays a text message indicating that the windshield washer fluid

needs to be topped up. The symbol for low windshield washer reservoir level lights.

The tailgate wiper (6/32) (C30/V50) is controlled directly by the central electronic module (CEM). The central electronic module (CEM) receives a signal from the steering wheel module (SWM) via the controller area network (CAN). The central electronic module (CEM) then activates relay (2/16) to start the tailgate wiper. The tailgate wiper is powered via relay (2/193).

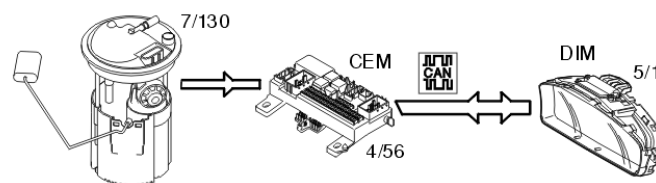
The tailgate wiper can be programmed so that it is activated if the windshield wipers are on and back-up (reverse) gear is selected.

Rear windshield cleaning is activated when the right-hand control stalk is pushed away from the steering wheel. The steering wheel module (SWM) transmits information to the central electronic module (CEM) via the Control area network (CAN) to activate rear windshield washing. The central electronic module (CEM) activates relay (2/93) to power the pump motor (6/2). The central electronic module (CEM) activates the tailgate wiper at the same time.

The wipers only operate at low speed if there is a fault in the control area network (CAN).

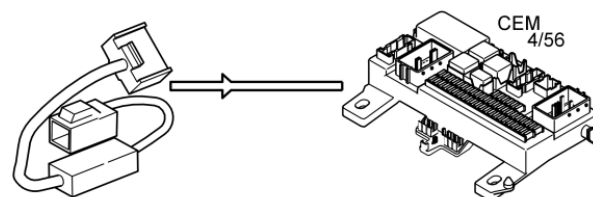
There is no Limp Home function for the rear windshield washer and wiper.

### **Fuel level (Gasoline/Diesel)**



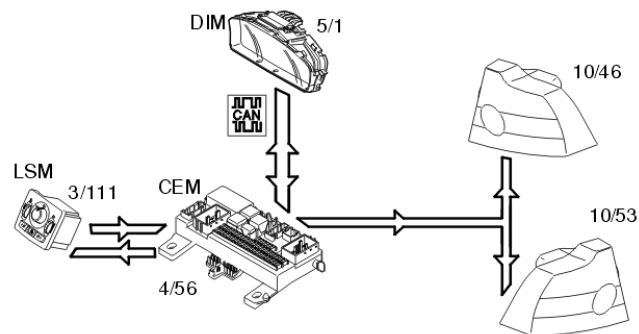
The fuel level is gauged by the fuel level sensor (7/130). The signal from the sensor is transmitted to the central electronic module (CEM) (4/56). The central electronic module (CEM) calculates the remaining quantity of fuel by comparing the signals with a tank table. Information about the quantity of fuel is transmitted via the Control area network (CAN) to the driver information module (DIM) (5/1) where the fuel level is displayed on the fuel gauge.

#### Corrosion inhibitor fuel tank (only B4184S8)



The Central electronic module (CEM) (4/56) inhibits ethanol corrosion in the fuel tank. This is controlled by a DC/AC converter that is directly connected to the Central electronic module (CEM). The DC/AC converter produces alternating current on the inside of the fuel tank, which inhibits corrosion.

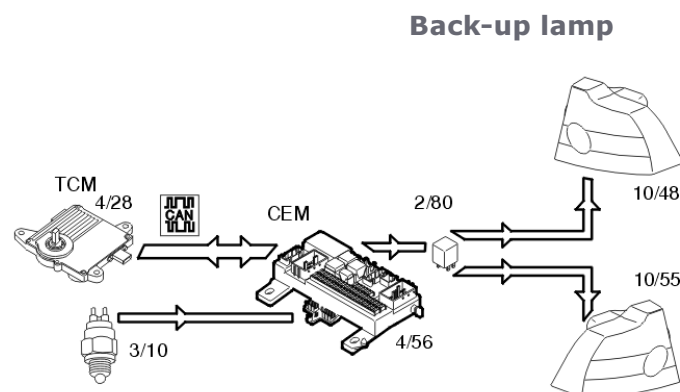
#### Rear fog lamp



The rear fog lamps (10/46, 10/53) are activated by pressing the button for the rear fog lamps in the lamp switch module (3/111). The light switch module (LSM) is directly connected to the central electronic module (CEM) (4/56). The central electronic module (CEM) directly powers the lamps via an output.

The central electronic module (CEM) transmits information via the Controller area network (CAN) to the driver information module (DIM) (5/1) to light the indicator lamp for the rear fog lamps. The central electronic module (CEM) also lights an LED in the button on the light switch module (LSM) which indicates that the rear fog lamps are activated.

The central electronic module (CEM) measures the power consumption on the output which powers the rear fog lamps. In this way information about lamp status can be obtained. In the event of a fault, the central electronic module (CEM) transmits information via the Control area network (CAN) to the driver information module (DIM) which displays a text message.



### Manual transmissions

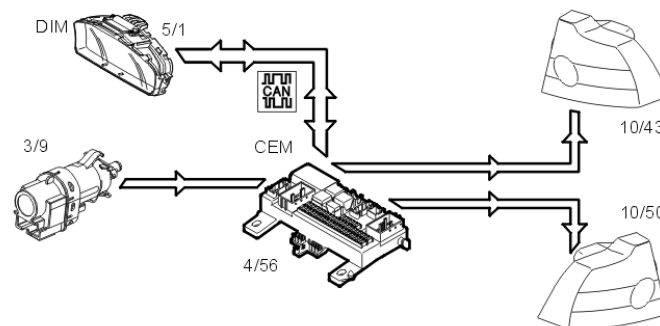
The back-up lamps (10/48, 10/55) are activated when back-up gear is selected. The switch (3/10) on the transmission is then closed. A directly connected signal is transmitted to the central electronic module (CEM) (4/56) indicating that back-up (reverse) gear is selected. The central electronic module (CEM) activates the relay (2/80) and the back-up (reversing) lamps are supplied with power via the relay.

### Automatic transmission

The back-up lamps (10/48, 10/55) are activated when back-up gear is selected. The transmission control module (TCM) (4/28) transmits information via the Control area network (CAN) to the central electronic module (CEM) (4/56) indicating that back-up (reverse) gear is selected. The central electronic module (CEM) activates the relay (2/80) and the back-up (reversing) lamps are supplied with power via the relay.

### Brake light



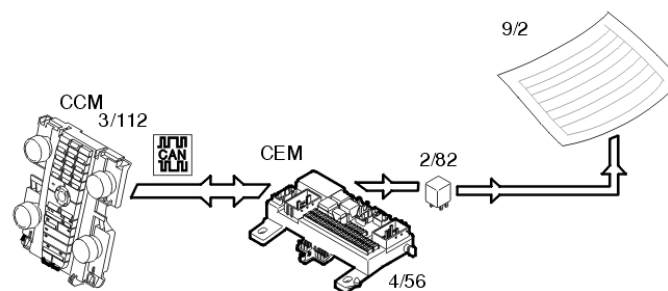


The stop lamps (10/43, 10/50) are activated when the brake switch is (3/9) closed. A directly connected signal is transmitted to the central electronic module (CEM) (4/56) indicating that the brake is activated.

The lamps are powered directly via two outputs on the central electronic module (CEM). Information about the lamp circuit is extracted via the power supply function in the central electronic module (CEM).

In the event of a fault, the central electronic module (CEM) transmits data via the Control area network (CAN) to the driver information module (DIM) (5/1) which displays a text message.

### Rear demist



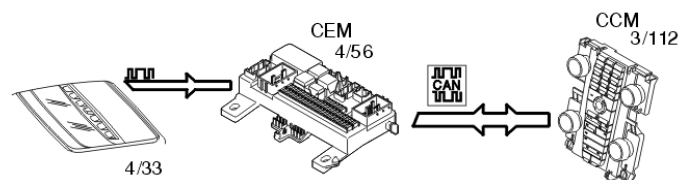
Rear demist (9/2) is activated by pressing the switch on the climate control module (CCM) (3/112). The climate control module (CCM) transmits the data via the Control area network (CAN) to the central electronic module (CEM) (4/56).

The central electronic module (CEM) checks that the conditions to start the demist have been met. If the conditions are met the central electronic module (CEM) activates the relay (2/82) and the heating is supplied with power via the relay.

The central electronic module (CEM) also transmits a request via the Control area network (CAN) back to the climate control module (CCM) to light the LED in the switch.

When the roof is opened on the C70, the rear demist on the rear windshield switches off automatically.

### Sunroof operation

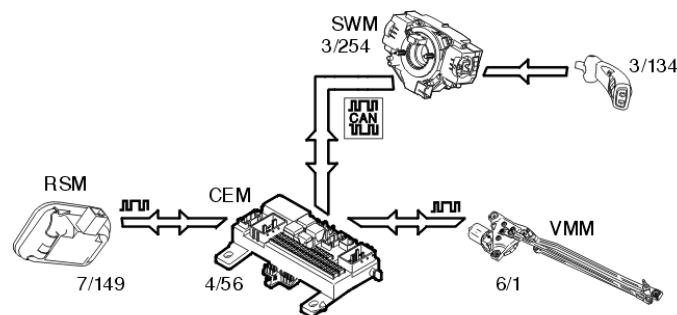


The sun roof communicates with the central electronic module (CEM) (4/56) via serial communication. The sun roof has a sun roof module (SRM) (4/33) which manages this communication.

Information about the sun roof position and information to be used for diagnosis is sent from the sun roof to the central electronic module (CEM). The information about the position is transmitted on to other control modules, such as the climate control module (CCM) (3/112) (via central electronic module (CEM)).

The communication between the central electronic module (CEM) and the sun roof mainly consists of diagnostic information.

### **Rain sensor module (RSM)**



The rain sensor module (RSM) (7/149) senses water on the windshield. The rain sensor (RSM) assesses the information based on volume of water on the windscreen and the prevailing exterior light conditions. This information is transmitted via the central electronic module (CEM) (4/56) transmits on to the wiper motor module (WMM) (6/1) using serial communication. The wiper motor module (WMM) in turn ensures that the windscreen wipers are set to the correct speed.

The rain sensor module (RSM) senses if the windscreen is dirty or covered with traffic film and automatically compensates accordingly. The rain sensor module (RSM) also senses heavier splashes on the windscreen. The windscreen wipers are then operated at top speed.

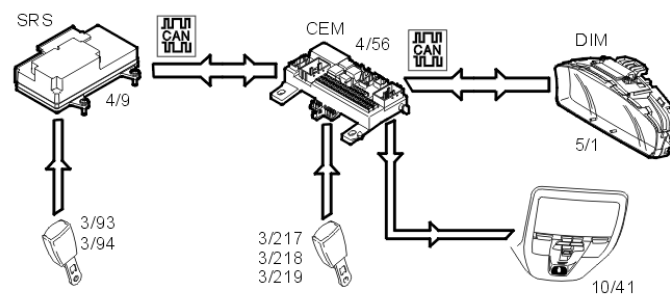
The rain sensor module (RSM) communicate with the central electronic module (CEM) using serial communication. The power supply is from the relay for extended power supply. The relay is checked by the central electronic module (CEM) and is activated when the ignition key is in position I or II. The rain sensor module (RSM) is powered for 3 seconds after the ignition has been switched off.

The steering wheel module (SWM) (3/254) transmits the signal via the control area network (CAN) to the central electronic module (CEM) indicating the position of the windshield wiper stalk and the status of the rain sensor switch. If the rain sensor switch is activated on the wiper stalk (3/134), the central electronic module (CEM) transmits the information to the rain sensor module (RSM) which is activated.

The rain sensor module (RSM) transmits information to the wiper motor module (WMM) via the central electronic module (CEM). The sensitivity can be adjusted using the collar on the wiper stalk.

If a fault occurs in the rain sensor module (RSM), the central electronic module (CEM) transmits an error message to the wiper motor module (WMM). If there is a fault message when the rain sensor module (RSM) is active, the wiper motor module (WMM) selects top speed for the windscreen wipers until the rain sensor is deactivated. If the fault recurs, wiping will only be activated when the wiper stalk is next moved to the single sweep or slow speed position.

### **Seat belt reminder**

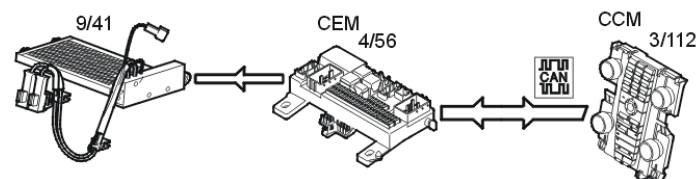


The seat belt reminder (10/41) is activated when the central electronic module (4/56) receives a signal from the supplemental restraint system module (SRS) (4/9), via the control area network (CAN), which indicates that the seat belt is not fastened despite someone sitting in the front seat. The three seat belt buckles in the rear seat (3/217-219) have sensors which are directly connected to the central electronic module (CEM). If a belted passenger opens the seat belt while the vehicle is in motion, the central electronic module (CEM) will activate the seatbelt not fastened indicator.

Data is also transmitted to the driver information module (DIM) (5/1) which indicates to the driver that the seat belt is not being used in one of the front seats.

See also Design and Function, Activating automatic start/stop of engine (2010-, only on vehicles with the function automatic start/stop of engine)

#### **Electrical additional heater (certain markets)**



Climate control module (CCM) (3/112) checks the function of the electrical additional heater.

The central electronic module (CEM) transmits information regularly to the climate control module (CCM), for example, about the permitted size of the output voltage.

The climate control module (CCM) uses this information to prioritize between its loads. The climate control module (CCM) also uses the information to calculate how much output must be used to activate the electrical additional heater (9/41).

The central electronic module (CEM) (4/56) receives information via the CAN network from the climate control module (CCM).

The central electronic module (CEM) checks that the output voltage is not too great. See: Function:Current limiting

The power consumption of the electrical additional heater is regulated via a pulse-width modulated signal from the central electronic module (CEM).

### **Tire pressure warning (TPMS)**

For more information, see Design and Function, System for Tire pressure monitoring (TPMS).

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