372: Central electronic module (CEM)

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372: Central electronic module (CEM)

Alarm
Alcolock (option 2009-)
Automatic range adjustment (Bi-Xenon)
Automatic start/stop of engine (2010-)
Back-up lamp
Battery temperature sensor (replaced by software starting from structure week 200605)
Brake light
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Generator (GEN) (Alternator control module (ACM))
Headlamp range adjustment (certain markets)
Headlamp range adjustment position sensors (Bi-Xenon)
Headlamps
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Horn
Humidity sensor (option, only ECC 2008-)
Immobilizer

Interior roof lighting
LEDs in doors for lock indication (only C70)
Locks
Mass movement sensor module (MMS)
Parking lights / number plate lighting
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Rear demist
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Secondary battery (2010-, only on vehicles with the function automatic start/stop of engine).
Siren
Sun roof
Sun sensor (electronic climate control only)
Switch clutch pedal (4-cylinder)
The battery monitor sensor (BMS) (only vehicles with the function for brake energy regeneration 201020-)
The DC/AC converter fuel tank (only B4184S8)
Tire pressure monitoring system (TPMS)
Tire pressure sensor
Turn signal lamps / Hazard warning signal flashers
Twilight sensor (ECC only)
Ultrasonic sensor module (IMS)
Wiper/washers for the windshield/rear window/ headlights

Design

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-)

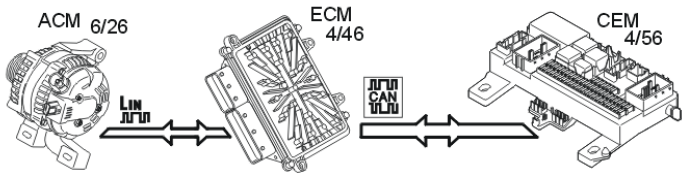
See Design and Function, Automatic start/stop of engine (2010-, only on vehicles with the function automatic start/stop of engine)

Current limiting

The central electronic module (CEM) checks and sometimes limits the current from the battery and generator. The central electronic module (CEM) can prioritize between different loads in the prevailing conditions.

If there is a fault with current limitation, the general warning lamp will light in the driver information module (DIM) and a text message will be displayed.

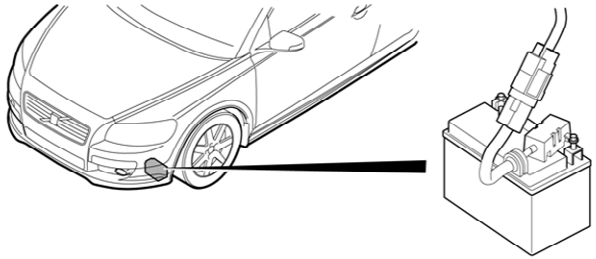
Generator (GEN) (Alternator control module (ACM))



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

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

Secondary battery (2010-, only on vehicles with the function automatic start/stop of engine).



The secondary battery is used in the function automatic start/stop of engine, see Design and Function, Automatic start/stop of engine.

The secondary battery is only connected to the vehicle's electrical system when the engine is restarted after autostop and when the secondary battery needs to be charged. Connecting the secondary battery to the vehicle's electrical system is controlled by Engine

control module (ECM) via a relay.

Central electronic module (CEM) is monitors the secondary battery's voltage and controls the secondary battery's charging.
When the secondary battery needs charging the Central electronic module (CEM) sends a request to Engine control module (ECM) to connect the secondary battery to the vehicle's electrical system. When the alternator is charging and secondary battery is connected, the battery is charged.

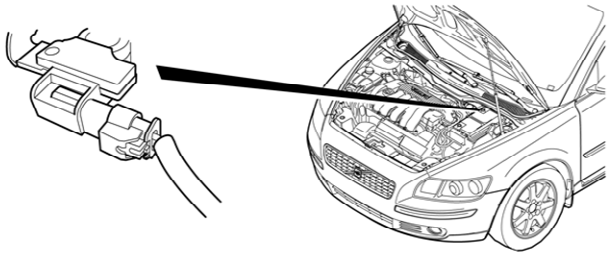
Note! When restarting the engine, it is only Engine control module (ECM) that controls connection of the secondary battery.

When the engine is on (alternator charging) and the secondary battery is connected to the vehicle's electrical system, the secondary battery's voltage will be the same as the rest of the electrical system's voltage. If the secondary battery is disconnected, the voltage will be lower.

See also Design and Function, Automatic start/stop of engine.

The secondary battery's voltage can be diagnosed.

The battery monitor sensor (BMS) (only vehicles with the function for brake energy regeneration 201020-)

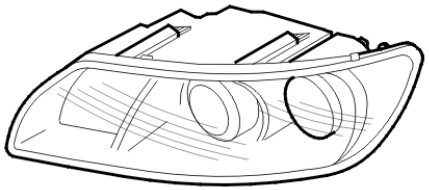


Note! From structure week 201020- the battery monitoring sensor (BMS) is LIN-connected to Central electronic module (CEM) instead of to Engine control module (ECM) as before. (For D4164T the battery monitoring sensor is still connected to Engine control module (ECM).)

The battery monitoring module is fitted on the battery's negative terminal and its main function is to monitor battery status.

For more information about battery monitoring sensor (BMS) function, see: Design and Function, Brake energy regeneration.

Headlamps



Warning! The ballast, which is located in the wheel arch liner, and the wiring for the Bi-Xenon

lamps are high voltage. For S40/V50 (200720-), C30/C70 (200946-), the ballast is integrated in the headlight.

The headlamps are operated via the light switch module (LSM). This is on the dashboard at the side of the steering wheel. The light switch module (LSM) is directly connected to the central electronic module (CEM). Low and high beam are operated by moving the left-hand control stalk towards the steering wheel.

Low beam is powered directly by the central electronic module (CEM). High beam is powered via a directly connected relay on the central electronic module (CEM). The level of the supply voltage to the low beam is regulated by the central electronic module (CEM). When the supply voltage is sufficient (in excess of 13 V), pulse width modulation is used to maintain the voltage level at 13.0 V +/- 0.2 V. This does not apply to cars with Bi-Xenon lamps.

Cars with Bi-Xenon lamps are powered directly via the central electronic module (CEM) without pulse width modulation.

Warning! The ballast, which is located in the wheel arch liner, and the wiring for the Bi-Xenon lamps are high voltage. For S40/V50 (200720-), C30/C70 (200946-), the ballast is integrated in the headlight.

In Bi-Xenon lamps, the reflector in the lamp housing is moved by an actuator motor when changing between high and low beam. The actuator motor is integrated in the lamp housing.

To detect problems with the low beam, the central electronic module (CEM) reads the power consumption of the circuit. If this falls below a certain threshold value a fault will be indicated. The general warning lamp lights in the driver information module (DIM) and a text message is displayed.

There are diagnostics for the high beam relay.
There are also diagnostics for the high and low beam function (actuator motor) for Bi-Xenon lamps.

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-).

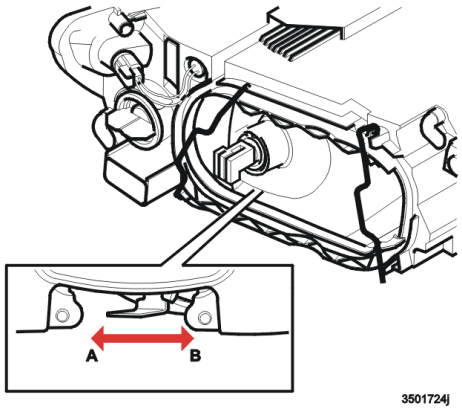
C30/C70:
See: Design and Function, GDL-lights (-200945).
See: Design and Function, Headlamp Control Module (HCM) (200946-).

Right and left-hand asymmetric lamps

The right and left-hand asymmetric lamps are adjusted mechanically using a simple operation. A lever is accessible when the rear cover on the headlamp housing is opened.

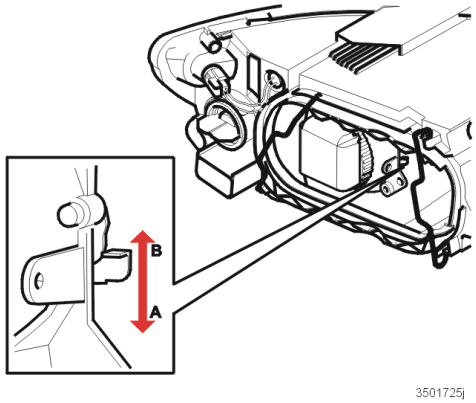
Halogen

A = left-hand asymmetric



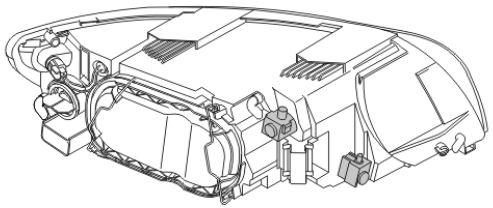
B = right-hand asymmetric

Bi-Xenon



A = left-hand asymmetric
B = right-hand asymmetric

Headlamp range adjustment (certain markets)



There are two motors which angle the headlamps

upwards or downwards to control the range of the beam. The motors are integrated in the headlamps.

The motors are controlled by a thumb wheel which is located in the light switch module (LSM) on the dashboard by the side of the steering wheel.
If the thumb wheel is turned, information is transmitted to the motors which adjust the headlamps accordingly.

Automatic range adjustment (Bi-Xenon)

S40/V50:
See: Design and Function - GDL-lights (-200719).
See: Design and Function, Headlamp Control Module (HCM) (200720-).

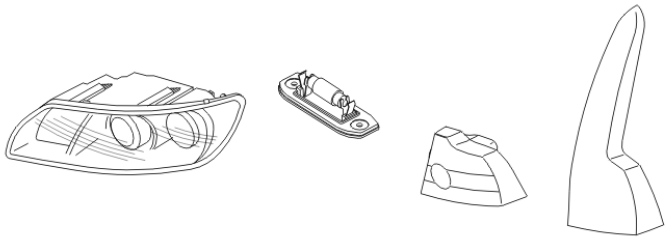
C30/C70:
See Design and Function, GDL-lights (-200945).
See: Design and Function, Headlamp Control Module (HCM) (200946-).

Headlamp range adjustment position sensors (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-).

Parking lights / number plate lighting



There are a number of lamps positioned around the car to mark its position. These are in the headlamps, tail lamps and on the front fenders (US model). The lamps light together with the number plate lighting when the light switch module (LSM) is in parking lamp mode or low beam is on.
The lamps are powered directly via two outputs on the central electronic module (CEM). One of the outputs powers:

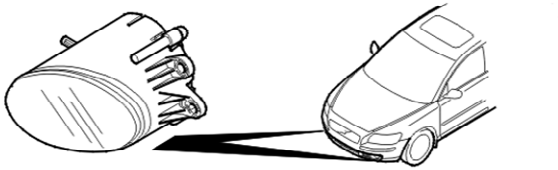
- the front left-hand parking lamp
- the left-hand parking lamps
- the license plate lighting
- the rear right-hand parking lamp.

The other output powers:

- the front right-hand parking lamp
- the right-hand side parking lamps
- the rear left-hand parking lamp.

There are diagnostics for the light switch module (LSM) and the lamps.

Front fog lamps

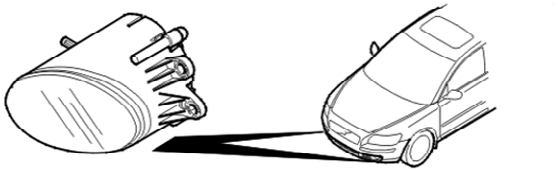


If the car is equipped with front fog lights, these are in the bumper casing below the headlights.

The fog lamps are operated via a button in the light switch module (LSM). An LED in the button lights when the fog lamps are activated. The light switch module (LSM) is directly connected to the central electronic module (CEM). The lamps are powered via a directly connected relay on the central electronic module (CEM).

There are diagnostics for the fog lamp relay (front).

Daytime running lights (from structure week 201044, option)



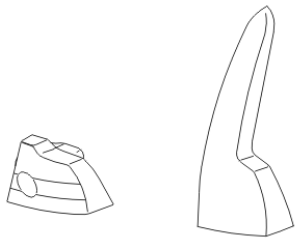
If the vehicle is equipped with daytime running lights, these are located in the bumper casing below the headlights where the front fog lights otherwise would be

installed.

Light switch module (LSM) is directly connected to Central electronic module (CEM). The lights are supplied with voltage via a directly connected relay from Central electronic module (CEM), the same relay that normally supplies voltage to the front fog lights.

The relay for daytime running lights/front fog lights can be diagnosed.

Rear fog lamp



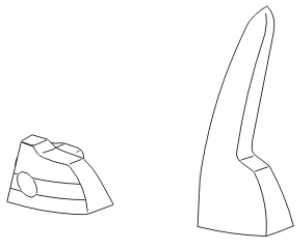
The rear fog lamp are in the tail lamps. The fog lamps are operated via a button in the light switch module (LSM). An LED in the button lights when the fog lamps are activated. The rear fog lamp can only be activated when low beam is on (market dependent). The light switch module (LSM) is directly connected to the central electronic module (CEM). The lamps are powered directly via an output on the central electronic module (CEM).

When reactivating key position II, the function is set to de-activated mode.

To detect faults in the rear fog lamps, the central electronic module (CEM) reads the power consumption of the circuit. If the power consumption falls below a certain limit, a fault is indicated and a text message is displayed in the driver information module.

There are diagnostics for the rear fog lamps.

Back-up lamp



There are two back-up (reversing) lamps. These are in the tail lamps. The back-up (reversing) lamp lights when back-up (reverse) gear is selected. The back-up (reversing) lamps are connected to the central electronic module (CEM) via a directly connected relay. The lamps are powered via the relay.

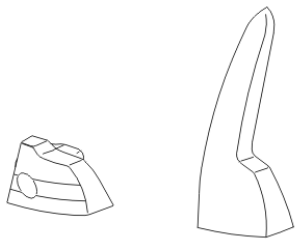
Cars with manual transmissions
Cars with manual transmissions have a back-up (reverse) switch on the transmission. The switch closes and transmits a directly connected signal to the central electronic module (CEM) when back-up (reverse) gear is selected.

Cars with automatic transmissions

In cars with automatic transmissions, a signal is transmitted from the transmission control module (TCM) on the controller area network (CAN) to the central electronic module (CEM) indicating that back-up (reverse) gear is selected.

There are diagnostics for the back-up (reversing) lamp relay.

Brake light



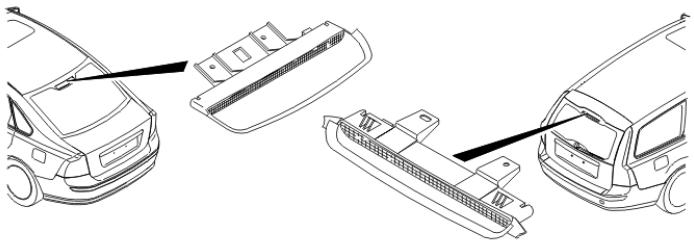
The stop lamps are in the tail lamps. The lamps light when the stop lamp switch on the brake pedal is closed. The stop lamp switch is connected to the central electronic module (CEM). The lamps are powered directly via an output on the central electronic module (CEM).

The stop lamps function even when the ignition is not on. When the ignition is not on, the central electronic module (CEM) is still powered. However the module is in a current saving mode. If the stop lamp switch is activated, the central electronic module (CEM) will also be activated and the stop lamps will come on.

To detect faults in the stop lamps, the central electronic

module (CEM) reads the power consumption of the lamp circuit. If the power consumption falls below a certain limit, a fault is indicated and a text message is displayed in the driver information module.

High level stop lamp

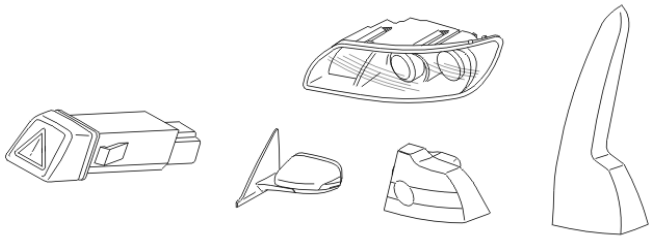


There is a high level stop lamp at the top of the rear windshield. This lamp lights during braking together with the standard stop lamps. It is activated when the switch on the brake pedal is closed.

The high level stop lamp is powered directly from the central electronic module (CEM). The lamp consists of a number of LEDs.

There are diagnostics for the high level stop lamp.

Turn signal lamps / Hazard warning signal flashers



There are six lamps around the car to indicate direction changes. These are in the headlamps, tail lamps and in the door mirrors.

The turn signal lamps are operated using the left-hand control stalk.

To cancel the hazard warning signal flashers, where all the turn signal lights flash, press in the button for the hazard warning signal flasher. This is positioned in the middle of the dashboard by the center air vents.

The front and rear lamps are powered directly from the central electronic module (CEM). The lamps in the door mirrors are powered directly from the control module in each door, the driver door module (DDM) or the passenger door module (PDM).

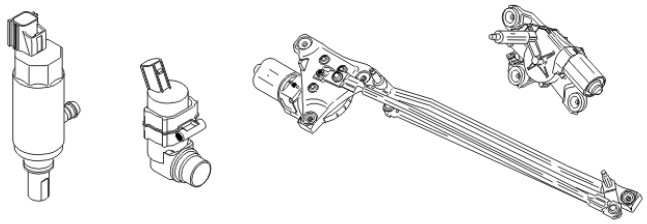
A signal is also sent to the bulb in the hazard warning signal flasher switch when this function is activated.

The central electronic module (CEM) monitors the power consumption on each side to check for bulb faults. If the

power consumption falls below a certain threshold value, a fault is indicated and the frequency of the signal to the bulbs is doubled on the side of the blown lamp.

There are diagnostics for the front and rear turn signal lamps.

Wiper/washers for the windshield/rear window/ headlights



Note! Rear window wiper and washer are only available on C30 and V50.

The windshield wipers are powered by a motor positioned under the cowl panel cover. There are also washer nozzles on the hood and bumper cover for cleaning the windshield and headlamps. For cars with five doors, there is also a wiper and washer nozzle for the rear windshield. The washer nozzles are connected to two different pump motors on the windshield washer reservoir at the front right of the engine compartment. One pump motor is for high-pressure cleaning of the headlamps. The other pump is for washing the front and rear windshields (5 door).

The windshield wipers are operated using the right-hand

control stalk. There are three positions:

- intermittent
- low speed
- high speed.

The time between strokes for intermittent wiping is adjusted using a ring on the control stalk.

Pull the control stalk towards the steering wheel to clean the windshield. The washers for the headlamps are activated simultaneously.
The washers for the headlamps are activated in two short intervals. Then the washer for the windshield must be activated 5 times before a further two short headlamp washes take place. Alternatively the interval is 10 minutes. The headlamp washers are not activated if the level in the windshield washer reservoir is below 0.7 liters.

Push the control stalk away from the steering wheel to clean the rear windshield. There is a button at the end of the control stalk to control the rear wiper.

Information about the position of the control stalk is transmitted to the central electronic module (CEM) on the controller area network (CAN). The central electronic module (CEM) also receives a signal from the wiper motor if the wipers are in the park position.

The central electronic module (CEM) also monitors the windshield washer reservoir level via a level sensor in the reservoir. The switch in the level sensor closes if the

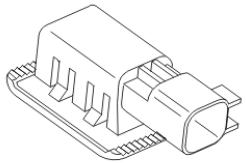
level falls below 0.7 liters. A text message indicating that the windshield washer fluid needs to be topped up then lights in the driver information module (DIM).

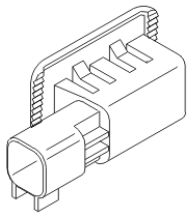
The wiper motor module (WMM) is powered directly via a 30-supply.

The washer motor for the front and rear windshields is powered via directly connected relays which are on the central electronic module (CEM). The headlamp washers are supplied via a relay in the combined relay and fusebox in the engine compartment.

There are diagnostics for the wiper motor module (WMM) and the relays for the washer pump motors.

Courtesy lighting/glove compartment lighting



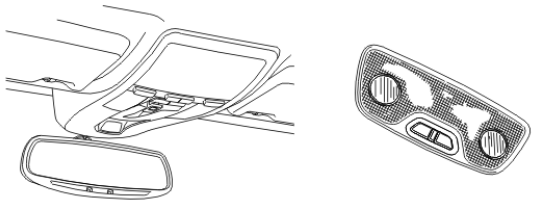


There are various lamps inside the passenger compartment, such as the courtesy lighting and glove compartment lighting for example.

The lamps for courtesy lighting are in the soundproofing panel on the driver and passenger sides. The lamp for

the glove compartment is at the top of the glove compartment.

Interior roof lighting



Inside there are a number of lamps with different purposes. There are up to four lamps which light when the general lighting is on.

Two of the reading lamps, (front left and front right) are in a unit in the roof immediately above the rear view mirror. The two rear reading lamps (option, market dependent) are in the roof above the rear seat.

The lighting time from when the door is unlocked or closed or from when the engine is switched off is 30 seconds.

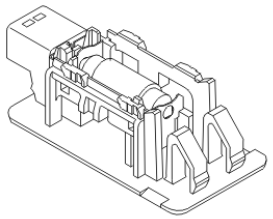
The lighting time from the door being left open or from a lamp being activated with a button until the interior lighting goes out is 5 minutes.

For the inner roof lighting to work, the relay for interior lighting must be activated. The central electronic

module (CEM) activates the relay via an output.

There are diagnostics for the relay for interior lighting.

Cargo compartment lighting

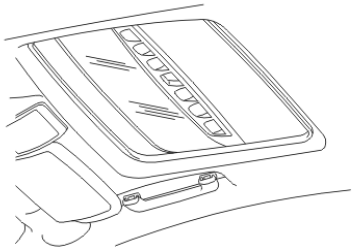


There is a lamp for cargo compartment lighting in the cargo compartment.
The lamp is located in the cargo compartment panel's roof (S40/C70), respectively in the cargo compartment's ceiling (C30/V50).

For the cargo compartment lighting to work, the relay for interior lighting must be activated.

There are diagnostics for the relay for interior lighting.

Sun roof

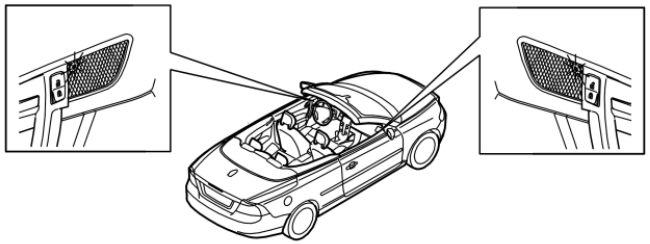


The sun roof is operated using a switch in the same unit in the roof as for the front reading lamps. The sun roof can be opened and closed as well as angled up slightly at the rear edge.

The sun roof is driven by a motor which is in the roof, in front of the sun roof. The position of the sun roof is determined by two sensors.
The sun roof has a sun roof module (SRM). The sun roof module (SRM) communicates with the central electronic module (CEM) using serial communication.

There are diagnostics for the sun roof.

LEDs in doors for lock indication (only C70)

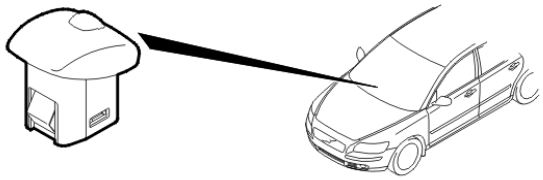


Usually there are locking buttons in the doors, but the C70 does not have these. The vehicle is equipped with

LEDs instead that indicate whether the vehicle is locked or not. The LEDs light for approximately 5 minutes after locking the vehicle. The LEDs are on each door and are directly connected to the Central electronic module (CEM).

There are diagnostics for the LEDs.

Twilight sensor (ECC only)



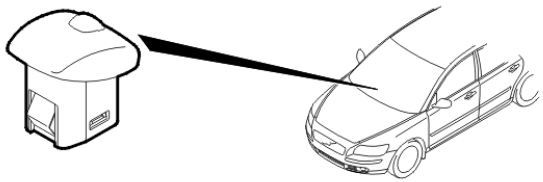
The twilight sensor consists of a photo diode powered from the central electronic module (CEM). The conductivity of the diode depends on the amount of light to which it is exposed.
The diode is under a diffusing lens which reduces the sensitivity of the photo diode to the angle of the light hitting it. Increased light intensity reduces the voltage over the photo diode.

The control module measures the voltage across the photo diode and converts the voltage to information which is then transmitted to other control modules via the controller area network (CAN).

The twilight sensor is located in the same holder as the sun sensor and alarm diode.

There are diagnostics for the twilight sensor.

Sun sensor (electronic climate control only)



The sun sensor consists of a photo diode powered from the central electronic module (CEM). The conductivity of the diode depends on the amount of light to which it is exposed.
The diode is located under a diffusing lens which reduces the sensitivity of the photo diode to the angle of the light hitting it. Increased sun intensity reduces the voltage over the photodiode.

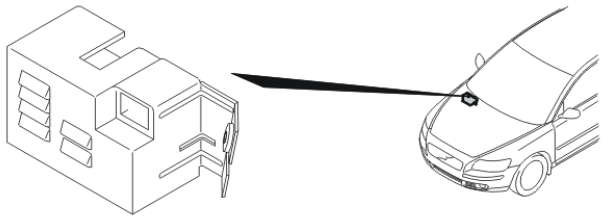
The control module measures the voltage across the photo diode and converts the voltage to information which is then transmitted to the climate control module (CCM) via the controller area network (CAN).

The sun sensor and its housing are located in the center of the dashboard at the windshield together with the twilight sensor and alarm diode.
From and including structure week 200746, the sun sensor is replaced by twin sun sensors.

For further information, see Design and Function, climate control module (CCM).

There are diagnostics for the sun sensor.

Siren



Information from the siren control module (SCM) to the central electronic module (CEM) contains configuration and status data. This information is transmitted using serial communication.

When the alarm is activated, the siren control module (SCM) transmits continuous status signals to the central electronic module (CEM).

The siren has a battery and a built in battery charger so that it is independent of the power supply in the car. The battery charger maintains battery voltage in the integrated battery. When the alarm is activated, the power to the siren and the serial communication between the siren control module (SCM) and the central electronic module (CEM) is monitored. If the power supply for the car to the siren is broken, or the communication between the central electronic module

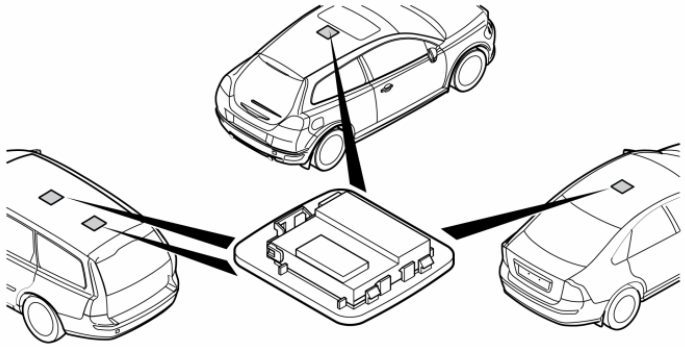
(CEM) and siren control module fails, the siren starts to sound. The battery and battery charger in the siren cannot be replaced separately. The entire siren must be replaced in the event of a fault.

The siren is below the plenum chamber on the passenger side. After replacement, a new siren control module (SCM) must be configured. This is done using VIDA.

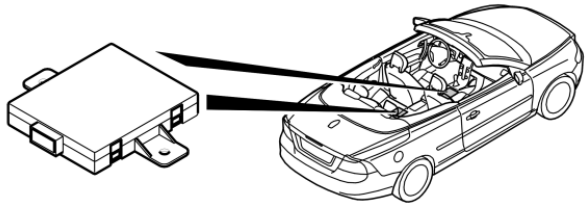
There are diagnostics for the siren.

Mass movement sensor module (MMS)

C30/S40/V50 (MY –2011)



C70



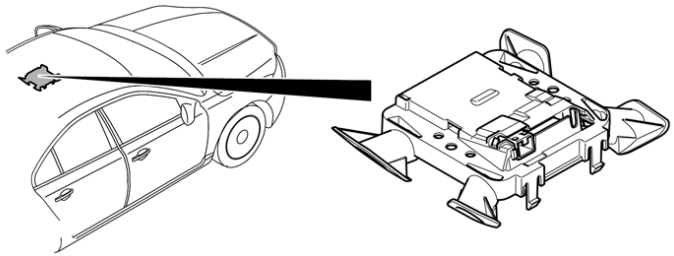
The mass movement sensor module (MMS) detects movements inside the passenger compartment using high frequency radio waves of 2.45 GHz. The Doppler effect principle is used to determine whether the frequency of the received microwave is different from the transmitted microwave. If the frequency has changed, this is interpreted as a movement in the vehicle. If a movement is detected, a trigger signal is transmitted to the central electronic module (CEM) which activates the alarm.

The mass movement sensor (MMS) is in the headlining in the center of the vehicle. This ensures optimum coverage of the interior of the vehicle. There are two sensors in five door cars. One is positioned in the center of the roof and the other in the roof above the cargo compartment.

There are diagnostics for the mass movement sensor module (MMS).

Ultrasonic sensor module (IMS)

C30/S40/V50 (MY 2012–)



The ultrasonic sensor module (IMS) is located in a cover on the ceiling. The ultrasound sensor (IMS) is used to detect movement inside the passenger compartment

when the alarm is activated. The aim is to detect, for example, anybody attempting to reach into the vehicle to steal a bag or similar. When the sensor is activated it performs an internal self-test and reports the result to the CEM, if the test failed the CEM sets a DTC. The sensors communicate serially and are powered via the central electronic module (CEM). When the sensor is activated, it emits ultrasound in the passenger compartment. The sound waves are reflected back to the sensor and if the sensor detects changes in reflectivity or movements inside the passenger compartment, the alarm is triggered.

Note! The sensor performance is affected by air turbulence and therefore all windows and any roof hatches must be closed for the sensor to operate most effectively.

Rain sensor module (RSM)

The rain sensor module (RSM) uses optical measurement to detect water on the windshield. An infrared beam of a fixed intensity lights part of the windshield. The intensity of the reflected beam is measured and compared to the intensity of the transmitted beam. If there is water on the surface of the windshield, the beam will be distorted and some of its intensity lost. If the beam is not fully reflected, this is interpreted as water on the windshield and the windshield wipers start.

The rain sensor module (RSM) transmits signals to the central electronic module (CEM) using serial communication. The signals contain information about:

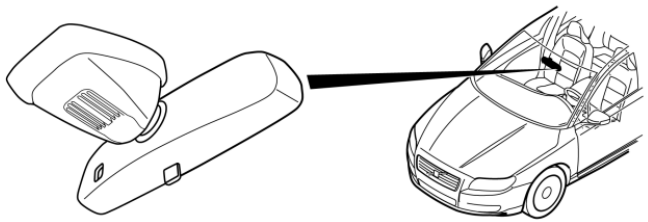
- how much rain is hitting the windshield
- a sudden splash on the windshield
- the outside light conditions.

The central electronic module (CEM) requests a certain windshield wiper speed based on this information.

The rain sensor module (RSM) is in front of the rear view mirror on the inside of the windshield. Cars with rain sensor modules (RSM) have a special windshield.

There are diagnostics for the rain sensor module (RSM).

Humidity sensor (option, only ECC 2008-)



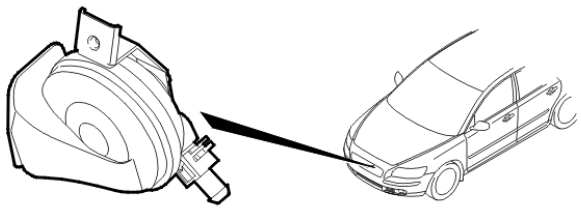
The task of the humidity sensor (HUS) is to transmit information about the passenger compartment's humidity to the Climate control module (CCM).
The sensor is part of the optional system for air quality together with the Air quality sensor (AQS) and a particle

filter.
The humidity sensor is via serial communication to the Central electronic module (CEM), which transmits the information to the Climate control module (CCM) on the CAN network.
All information processing then occurs in the Climate control module (CCM).

The sensor is in the holder for the rear view mirror and is powered and diagnosed by the Central electronic module (CEM).

For further information, also see Design and Function, climate control module (CCM):

Horn

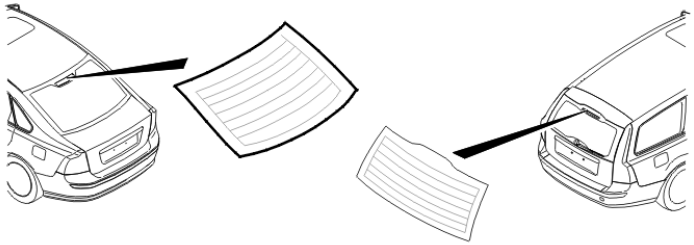


There are two horns in front of the radiator. There are four switches in the steering wheel. The horn is activated when one of these is closed.
The signal continues for as long as the switch is closed.
The horn is also activated when the panic alarm button on the remote control is pressed (certain markets).

The power supply to the horns is via a relay in the relay box in the engine compartment.

There are diagnostics for the relay for the horn.

Rear demist



There are heating loops in the glass for demisting and to prevent ice from forming. The loops heat up when they are supplied with power. The power supply is via a relay in the central electronic module (CEM).

Rear demist is controlled using a switch on the right-hand side of the climate control module (CCM).

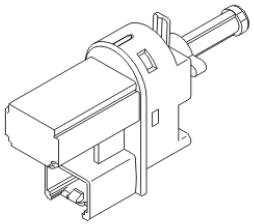
Press the button again to switch off the function. Demisting is switched off automatically after the maximum time of 12 minutes.

On vehicles with certain diesel engines the rear demist can start without manual activation. This means that the engine sometimes needs to reach a much greater working temperature to burn soot particles that are trapped in the particle filter.
By starting the rear demist, together with other actions, the vehicle's alternator is loaded and the engine coolant

temperature rises.
Read more detailed information about this function in Design and Function, Engine control module (ECM).

There are diagnostics for the relay and switch.

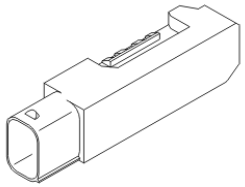
Switch clutch pedal (4-cylinder)



The clutch pedal switch is positioned together with the clutch pedal. In resting position the switch is open. It closes when the clutch pedal is pressed down by more than 90% of its entire stroke length. When the switch is activated, a signal is transmitted to the central electronic module (CEM).

For further information about the immobilizer, see Design and Function, Immobilizer.

Clutch pedal sensor (5-cylinder)



Cars with 5-cylinder gasoline engines have a position sensor for the clutch pedal. The sensor is affected when the clutch pedal is pressed. The sensor then sends a signal (voltage level) which is proportional to the degree to which the clutch pedal has been pressed.

The position sensor is directly connected to the central electronic module (CEM). The control module receives and processes the signal. The information is used in difference ways depending on the equipment level of the car.
The signal is used as part of the conditions for the immobilizer.

For further information about the immobilizer, see Design and Function, Immobilizer.

Power windows

All side windows are operated by motors in the doors. The switches for operating the windows are in each door panel. All windows can be operated from the control panel in the driver's door.
For further information, see Design and Function, Door control modules.

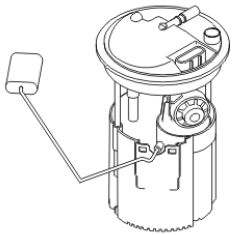
For greater comfort, all windows including the sun roof can be opened. This is done by holding in the unlock button on the remote control for 1.5 seconds. In the same way, all windows including the sun roof can be closed at the same time. This is done by holding in the lock button on the remote control for 1.5 seconds.

This function can also be activated from inside the passenger compartment. If the lock or unlock button is held in on either of the front door panels the same function will be obtained.

Fuel pump

See Design and function, engine control module (ECM).

Fuel level (Gasoline/Diesel)



The fuel level in the tank is measured by a sensor. The sensor is on the pump side of the fuel tank. The sensor is directly connected to the central electronic module (CEM) on the same side as the DC/AC converter (only applies to B4184S8).

There are different tables for different fuel tank sizes. The tables are stored in the central electronic module

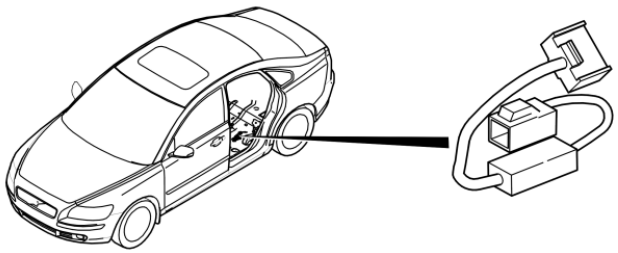
(CEM) and indicate which sensor values correspond to the remaining fuel in the tank. The central electronic module (CEM) determines which tank is in the car by reading a parameter.

The resistance of the sensor increases as the fuel volume in the tank decreases. The signal from the sensor is compared with the values in the fuel tank table to obtain a value for the remaining fuel volume. This data is displayed by the fuel gauge in the driver information module (DIM).

If the fuel level sensor is faulty, the fuel gauge will show 0.

There are diagnostics for the fuel level sensor. In the event of a fault on the DC/AC converter (only applies to B4184S8) any fuel level measurement functions are affected.

The DC/AC converter fuel tank (only B4184S8)

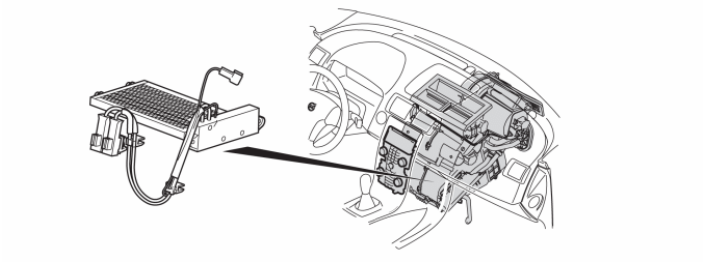


The DC/AC converter functions as a corrosion preventative by producing alternating current on the inside of the fuel tank. The converter is directly connected to the Central electronic module (CEM) on

the same terminal as the fuel level gauge. The converter is located on the left-hand side under the rear of the seat cushion.

There are diagnostics for the DC/AC converter. In the event of a fault with the fuel level gauge, the converter function will be affected.

Electrical additional heater (certain markets)

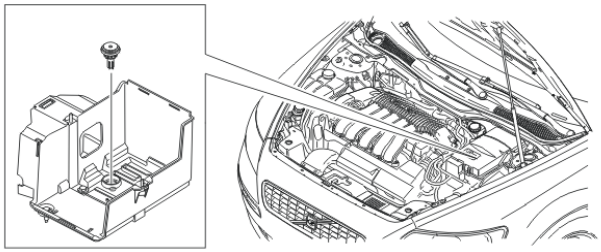


Vehicles with diesel engines have an electrical additional heater (PTC element) on certain markets.

This comprises a heater element with ceramic resistors located in the heater housing. The air that flows into the passenger compartment is heated directly.

For further information, see Design and Function, climate control module (CCM).

Battery temperature sensor (replaced by software starting from structure week 200605)



The battery temperature sensor checks the temperature of the battery. 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 sensor is a negative temperature coefficient (NTC) type which is supplied with power from the control module (signal) and is grounded in the control module.

The resistance of the sensor changes with the temperature of the battery. This alters the signal to the central electronic module (CEM). At:

- +20 °C the resistance is approximately 3.5 kΩ
- 0 °C the resistance is approximately 9.4 kΩ
- -20 °C the resistance is approximately 28.6 kΩ.

The lower the temperature the higher the resistance (high voltage). A high temperature results in low resistance (low voltage).

The battery temperature sensor is in the bottom of the battery box. The sensor is directly connected to the central electronic module (CEM).

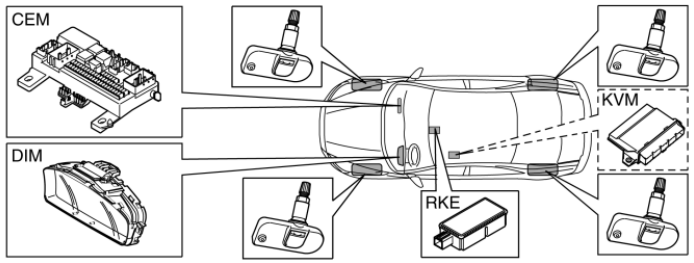
The central electronic module (CEM) has diagnostics for the battery temperature sensor. The temperature can be read off using VIDA.

From structure week 200605, the battery temperature sensor has been replaced by software. Battery temperature is then calculated from four input signals: outside temperature, engine temperature, vehicle speed and power supply status. The function is diagnosed by the central electronic module (CEM). Temperature can be read off using VIDA.

If the central electronic module (CEM) detects a fault in the sensor or the calculation function, a substitute value of +55 °C is used. This generates a fixed generator output voltage of 13.5 V.

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

Tire pressure monitoring system (TPMS)



The purpose of the tire pressure monitoring system,

TPMS, is to enable the driver to have optimum tire pressure by giving a warning when the pressure in any of the tires becomes too low. Correct tire pressure is important for:

- achieving good fuel economy
- achieving optimum comfort and good driving characteristics
- preventing flat tires due to too low tire pressure.

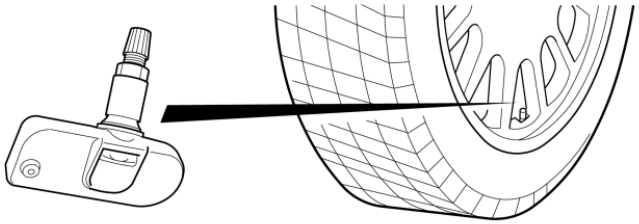
The function is integrated in the central electronic module (CEM). Sensors are installed together with the air valve on each wheel to measure the air pressure in the tires.

Note! The system must be regarded as a driver aid to maintain the correct tire pressure. The system must NOT be regarded as a warning system that indicates that there is a serious problem with the vehicle. No tire is completely sealed - there is always slight leakage as the tire can never be completely sealed to the rim. When inflating the tire with air, you must, as much as possible, ensure that the tires are at same temperature as the outside temperature. Furthermore, "Comfort pressure" should not be applied as this gives a tire pressure that is too close to the parameter for the monitoring system, which means that even small changes in temperature or load can cause the pressure in the tires to be too low for the system to consider acceptable. When inflating with air, the tires must be filled to the pressure stated on the decal located on the car body. The pressure is calculated with regard to fuel economy, comfort and safety. Therefore, these pressures MUST be followed. If the decal is missing or damaged, a new one must be ordered and applied. This is especially important on

vehicles with TPMS.

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

Tire pressure sensor



The tire pressure sensors are installed together with the air valve on the rim. The sensor consists of a pressure sensor, a communication circuit, an acceleration sensor and a battery.

Note! Special procedures are required for removing the tire from the rim depending on vehicle model and tire type. This is to prevent damaging the sensor. See the specific mechanical information instruction under Repairing/Removal, replacement and installation.

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

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