PRINT

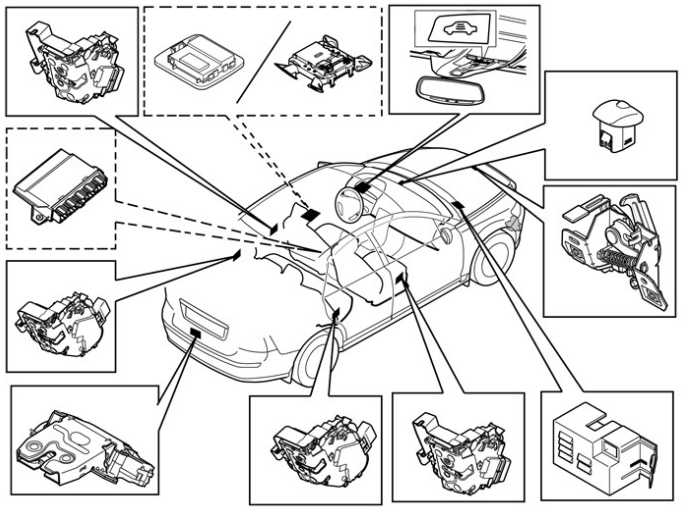
09: Alarm

General
Signals

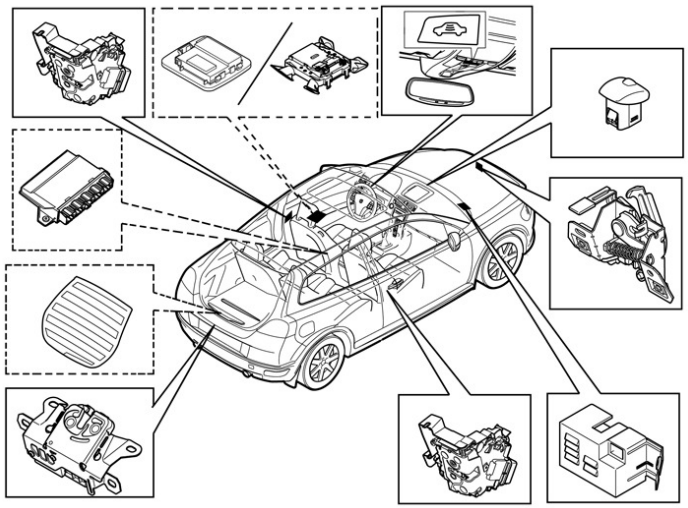
System overview

General

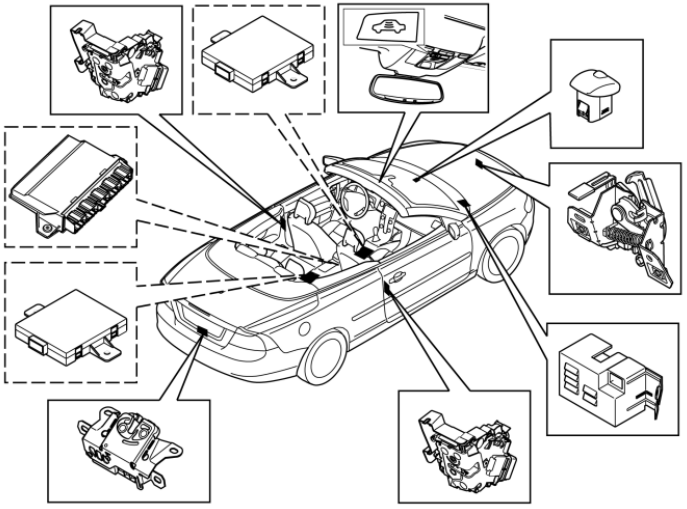
S40/V50



C30



C70



The alarm is an entry protection for the vehicle. The aim is prevent anyone getting into the vehicle or manipulating the vehicle in any way without being detected.

The alarm is available in various configurations:

- Perimeter guard. This configuration includes door open sensors in the lock motors, alarm LED and siren control module (SCM) but no vehicle tilt sensor. The C30 and C70 do not have any rear door open sensors as the models do not have any rear side doors.
- Perimeter guard with Mass movement sensor module (MMS) or ultrasonic sensor module (IMS), (Ultrasonic sensor module (IMS) replaces one or two Mass movement sensor modules (MMS) from and including model year 2012 for the for S40, V50 and C30). The Mass movement sensor module (MMS) alternatively ultrasonic sensor module (IMS) is used to detect movement inside the vehicle. In this configuration the C30 also has a glass breakage loop in the rear windscreen. Siren control module (SCM) without vehicle tilt sensor.
- Perimeter guard with Mass movement sensor module (MMS) or ultrasonic sensor module (IMS), (Ultrasonic sensor module (IMS) replaces one or two Mass movement sensor modules (MMS) from and including model year 2012 for the for S40, V50 and C30). The Siren control module (SCM) with vehicle tilt sensor. The vehicle tilt sensor is used to detect changes in the vehicle's position. In this configuration the C30 also has a glass breakage loop in the rear window.

Definitions:

- **Deactivated:**The alarm is not activated and is not protecting the vehicle
- **Activated:** The alarm is protecting the vehicle and will be triggered if there is an input signal from one of the sensors
- **Triggered:** An alarm cycle has started. The siren sounds for 25 seconds and the turn signal lamps flash for approximately 5 minutes
- **Reactivated:** The alarm has been triggered and an alarm cycle has been completed. If a check of

the sensors in the vehicle shows that they are OK the alarm will be reactivated.

Signals

The tables below summarize the input and output signals to the units in the system for the alarm. The signal types are divided into directly connected signals, serial communication and controller area network (CAN) communication.

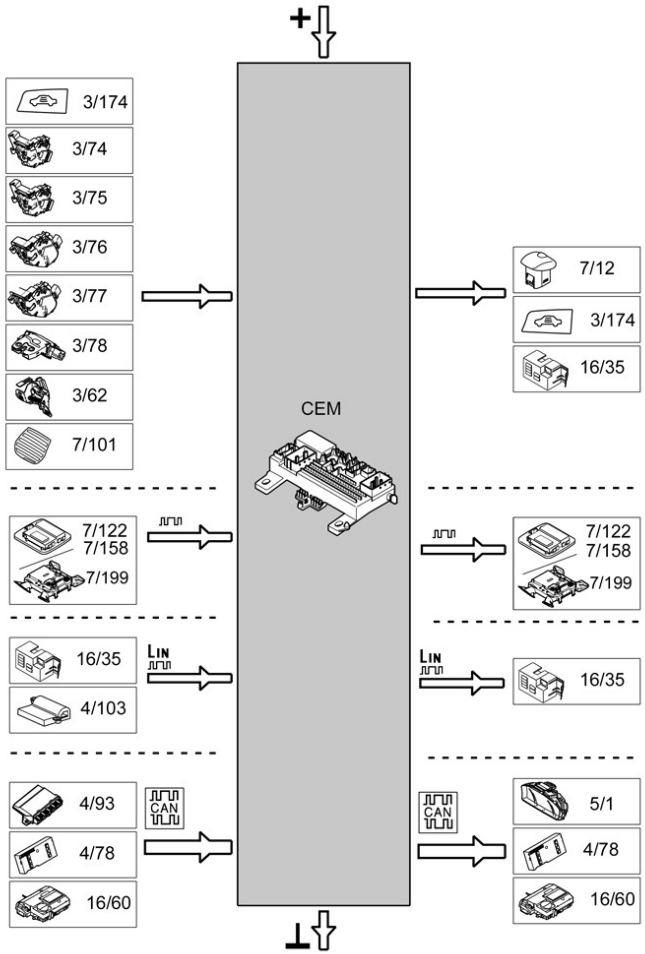
Central electronic module (CEM) (4/56):

Input signals	Output signals
Directly connected: ■ Reduced alarm switch (3/174) for disconnecting the vehicle tilt sensor, Mass movement sensor module (MMS) (7/122, 7/158), alternatively ultrasonic sensor module (IMS) (7/199) and deadlock mode. ■ Driver's door open sensor to indicate when the door is open (3/74) ■ Passenger door open sensor to indicate when the door is open (3/75) ■ Right rear door open sensor to indicate when the door is open (3/76) (only S40/V50). ■ Left rear door open sensor to indicate when the door is open (3/77) (only S40/V50). ■ Tailgate/trunk lid open sensor to indicate when the tailgate/trunk is open (3/78) ■ Hood open sensor to indicate when the hood is open (3/62). ■ Glass breakage loop in rear window (7/101) (only C30 with Mass movement sensor module (MMS) (7/122), 7/158), alternatively ultrasonic sensor module (IMS) (7/199)) ■ Manipulation guard (only C30 with Mass movement sensor module (MMS) (7/122, 7/158), alternatively ultrasonic sensor module (IMS) (7/199))	**Directly connected:** ■ Alarm indicator to display the alarm status (7/12) ■ Voltage supply to Mass movement sensor module (MMS) (7/122, 7/158) alternatively ultrasonic sensor module (IMS) (7/199). ■ Ground connection to Mass movement sensor module (MMS) (7/122, 7/158) alternatively ultrasonic sensor module (IMS) (7/199). ■ Power supply to LED (3/174), to indicate the reduced alarm function ■ Power supply to the siren control module (SCM) (16/35).
Via serial communication: ■ Communication with Mass movement sensor module (MMS) (7/122, 7/158) alternatively ultrasonic sensor	**Via serial communication:** ■ Communication with Mass movement sensor module (MMS) (7/122, 7/158) alternatively ultrasonic sensor

module (IMS) (7/199) (only the V50/C70 has rear Mass movement sensor module (MMS)).	module (IMS) (7/199) (only V50/C70 has rear Mass movement sensor module (MMS)) (Ultrasonic sensor module (IMS) replaces one or several Mass movement sensor modules (MMS) from and including 2012 for the S40, V50 and C30).
Via serial communication (LIN): ■ Siren control module (SCM) (16/35) for information regarding siren status ■ Remote receiver module (RRX) (4/103) with unlock commands (does not apply to vehicles with the keyless entry system).	**Via serial communication (LIN):** ■ Siren control module (SCM) (16/35) for alarm function trigger commands.
Via Controller Area Network (CAN) communication: ■ Keyless vehicle module (KVM) (4/93) with information about the key check (only vehicles with the keyless entry system) ■ Accessory electronic module (AEM) (4/78) (only for the Israeli market) ■ Phone Module (PHM) (16/60) when using Volvo On Call services.	**Via Controller Area Network (CAN) communication:** ■ The driver information module (DIM) (5/1) receives information about which message is to be displayed ■ Accessory electronic module (AEM) (4/78) (only for the Israeli market) ■ Phone Module (PHM) (16/60) when using Volvo On Call services.

Keyless vehicle module (KVM) (4/93) (only vehicles with the keyless entry system)

Input signals	Output signals
Via serial communication: ■ Remote keyless entry (RKE) receiver (4/103), using signals from the remote control.	**Via serial communication:** ■ Remote keyless entry (RKE) receiver (4/103) for configuration.
Via Controller Area Network (CAN) communication: ■ Central electronic module (CEM) (4/56) with the request for a key check.	**Via Controller Area Network (CAN) communication:** ■ Central electronic module (CEM) (4/56) with the result of a key check.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CEM
7/12
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7/122
7/158
7/199
7/122
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LIN
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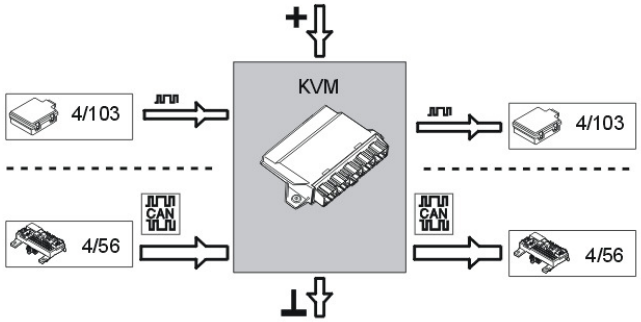
⊥



8/10/2017 PRINT

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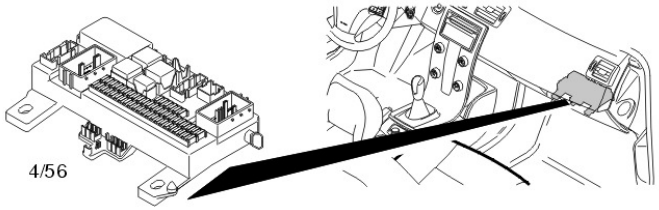
09: Alarm

Alarm LED
Central electronic module (CEM)
Door open sensor
Glass breakage loop (only C30)
Mass Movement Sensor Module (MMS) (C30/S40/V50 MY -2011, all C70)
Siren control module (SCM)
Switch for reduced alarm
Ultrasonic sensor module (IMS) (C30/S40/V50 MY 2012-)

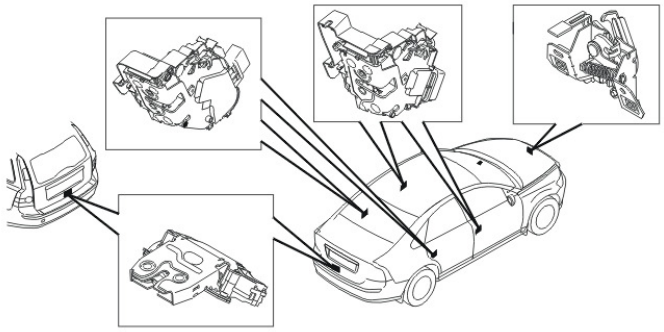
Design

Central electronic module (CEM)



The central electronic module (CEM) (4/56) is the master unit for the alarm.
The control module communicates with directly connected units, via the LIN and the controller area network (CAN). The control module has a number of sensors connected to it and determines what actions should be taken.

Door open sensor

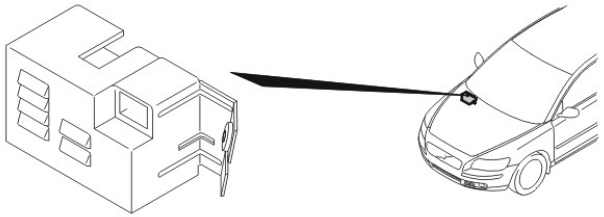


The door open sensor is a switch mounted in the lock units of the side doors and the tailgate/trunk lid. On vehicles with an alarm there is a single switch on the hood. The switches are closed when the door or tailgate/trunk lid is shut.
The C30 and C70 do not have door open sensors for the rear side doors as they do not have any rear doors.

When the alarm is activated, the central electronic module (CEM) checks every 3 times / second that the switches are closed. If the central electronic module (CEM) detects that a switch is open the alarm is triggered.

If the central electronic module (CEM) detects that a switch is not closed when the central locking and alarm activation command is received, the vehicle tilt sensor and mass movement sensor module (MMS) alternatively ultrasonic sensor module (IMS) will not be activated. Similarly, no attention will be paid to signals from a door open sensor not closed on activation.

Siren control module (SCM)



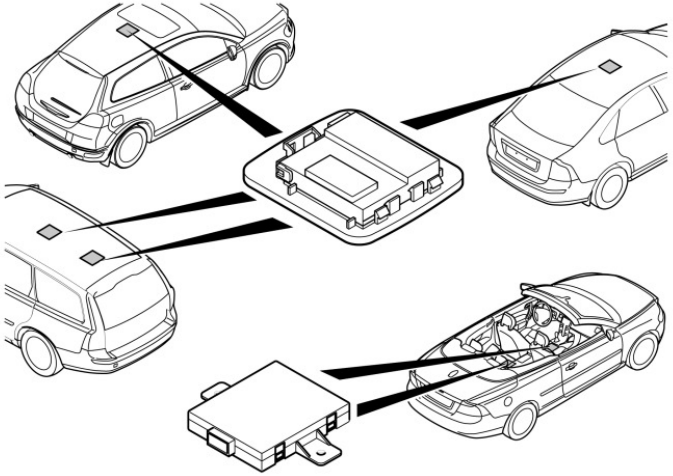
The siren is used as a sound source for the alarm function. The siren is mounted under the plenum on the passenger side. The siren is available in left-hand and right-hand drive versions, with or without an internal vehicle tilt sensor. The type of siren mounted in the vehicle is market and customer dependant.

The siren sounds if the power supply is cut or if communication with the central electronic module (CEM) fails while the alarm is activated. The siren contains an internal battery which is charged when the ignition is on. This battery has a capacity for 10 alarm cycles. The battery service life is limited and depends on the local climate. The siren must be replaced regularly. The battery cannot be replaced by itself. The alarm cause can be read from VADIS. This states what caused the alarm.

If the vehicle is equipped with a siren with a vehicle tilt sensor, the sensor is integrated into the siren. The vehicle tilt sensor reacts to changes in the angle of lean of the vehicle and transmits a signal to the central electronic module (CEM). The aim is for the alarm to be triggered if somebody attempts to steal a wheel for example.
While the vehicle tilt sensor is mounted in the siren it is counted as a separate unit. If the vehicle tilt sensor indicates that the vehicle is about to be raised, the vehicle tilt sensor sends a signal to the Central electronic module (CEM), which in turn, transmits an activation signal to the Siren control module (SCM). The Siren control module (SCM) cannot trigger an alarm by itself.

The siren is powered via a fuse from the central electronic module (CEM) The siren is grounded in the engine compartment.

Mass Movement Sensor Module (MMS) (C30/S40/V50 MY -2011, all C70)



Note! For S40, V50 and C30 MY 2012- the mass movement sensor module (MMS) has been replaced by the ultrasonic sensor module (IMS).

The mass movement sensor module (MMS) is located in the roof under its own panels on the S40/V50 and C30.
There is a Mass movement sensor module (MMS) in the S40/C30. The sensor is located in the middle of the roof.
There are two sensors in the V50. On is centrally located on the roof and the other in the roof above the cargo compartment.
There are two Mass movement sensor modules (MMS) in the C70. One is located under the cup holder in the center console and the other under the central rear seat.
The mass movement sensor module (MMS) is used to detect movement in the passenger compartment when

the alarm is activated. The aim is to detect if somebody attempts to reach inside the vehicle to steal bag or similar.

When the alarm is activated, the central electronic module (CEM) checks the sensors.
The sensors communicate serially with the central electronic module (CEM). If two sensors are installed they are connected in parallel to the central electronic module (CEM).
The sensor that triggered the alarm can be detected by the Central electronic module (CEM) by differences in the data messages that are received from each Mass movement sensor module (MMS).

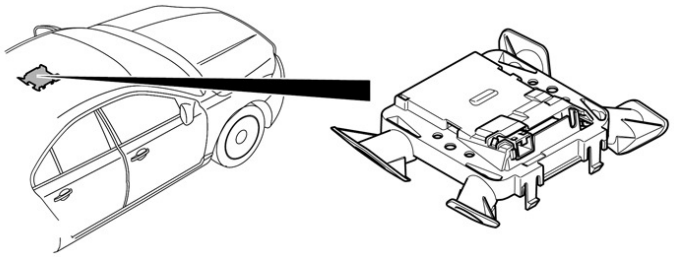
When the sensors are activated they transmit microwaves into the vehicle. The microwaves bounce back from the interior of the vehicle and the sensors react to changes in these reflected waves.

The Mass movement sensor module (MMS) functions a slightly different way in the C70. The sensors work as well with the roof open or closed.
If the roof is open, there is no surface that the microwaves can directly bounce off. However, the waves spread in the air and eventually bounce back to the object that is further away, for example, the roof of a car park or a tree that the vehicle is parked under.
To reduce he risk of a false alarm in this mode, the sensor measures the time from when it sent a pulse until it receives the same pulse back. If the reflection time is too long, i.e. the pulse has bounced on something further away than 1.5 meters, (4.92 feet) upwards from the sensor, the sensor will refer to the pulse changes.
On the other hand, if the time is within specified values, the pulse changes are interpreted as a movement in the vehicle and the alarm will be triggered.

Using microwaves makes the system more robust and avoids false alarms. Microwaves cannot be changed by different temperatures in the layers of air in a vehicle left in the sun for example.

The sensors are powered and grounded via the central electronic module (CEM).

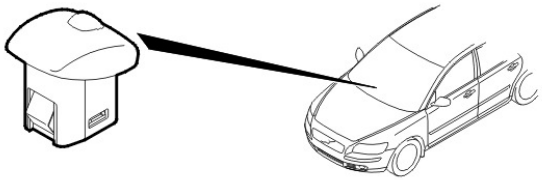
Ultrasonic sensor module (IMS) (C30/S40/V50 MY 2012-)



The ultrasonic sensor module (IMS) is located in a cover in the ceiling. The ultrasonic sensor module (IMS) is used to detect movements inside the passenger compartment when the alarm has been activated. The aim is to detect anyone trying to reach in and steal a bag or similar, for example. When the sensor is activated, an internal self test is performed and informs the Central electronic module (CEM) of the result. If the test failed the Central electronic module (CEM) stores a DTC. The sensors communicate serially and are powered via the Central electronic module (CEM). When the sensor is activated it transmits ultrasound inside the passenger compartment. The sound waves reflect back to the sensor and if the sensor detects a change in reflections or movements in the passenger compartment, the alarm is tripped.

Note! The sensor's performance is affected by air turbulence and therefore all windows and any roof hatches must be closed for the sensor to work optimally.

Alarm LED

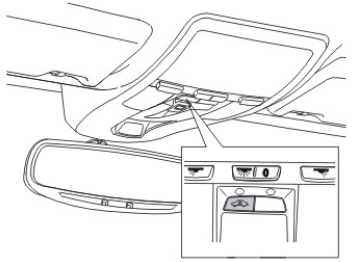


The alarm LED is located on top of the dashboard. The LED is in the same housing as the sun sensor and twilight sensor. The LED is directly connected to the central electronic module (CEM). It is used to indicate alarm status.

When the alarm is activated, the central electronic module (CEM) checks all units and sensors. If everything is OK the LED starts to flash once a second.

If the alarm is triggered the LED starts to flash quickly, approximately 6 times a second. When the vehicle is unlocked, the LED continues to flash until the ignition key is inserted into the ignition switch.

Switch for reduced alarm

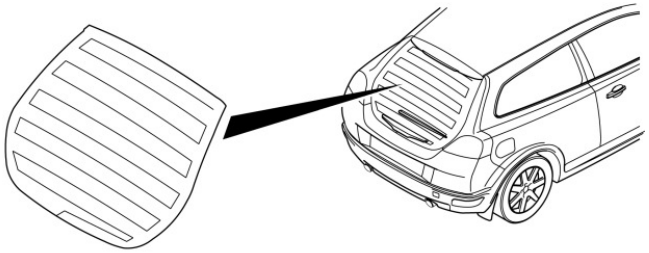


The switch for reduced alarm is in the front lighting panel in the roof. The switch is only found in vehicles with deadlocks for central locking and/or an alarm system that consists of sensors (i.e. level above perimeter guard).
The switch is used to temporarily deactivate the vehicle tilt sensor and Mass movement sensor module (MMS) alternatively ultrasonic sensor module (IMS) functions.

When the function is activated the doors are not deadlocked when the vehicle is locked. The function can only be activated when the ignition has been switched off and up to a minute after the ignition key has been taken out of the ignition switch. If a longer time has passed the ignition must be turned to position II and back to 0 before the function can be activated.

The switch has an integrated LED to indicate when the function is activated. A message is displayed in the display in the driver information module (DIM).

Glass breakage loop (only C30)



On the C30 there is a glass breakage loop installed in the rear window if the vehicle is equipped with a Mass movement sensor module (MMS) alternatively ultrasonic sensor module (IMS). In the cable harness for the tailgate there is also a cable that is designed as manipulation protection for the glass breakage loop. Both wires are directly connected to the Central electronic module (CEM) and are monitored when the alarm is activated.
The glass breakage loop is grounded to the body. When the alarm is activated, the central electronic module (CEM) checks that the glass wires are still intact at regular intervals. If the control module detects a break in the wire, the control module will trigger the alarm.
The manipulation wires are used to make grounding the cables in the cable harness for the tailgate more difficult, thus attempting to by-pass the glass breakage loop in the rear window.
The wires are not supplied with voltage and are only

connected to the Central electronic module (CEM) at one end. The Central electronic module (CEM) monitors the cable when the alarm is activated and detects if the cable is to be grounded to trigger the alarm.

8/10/2017 PRINT

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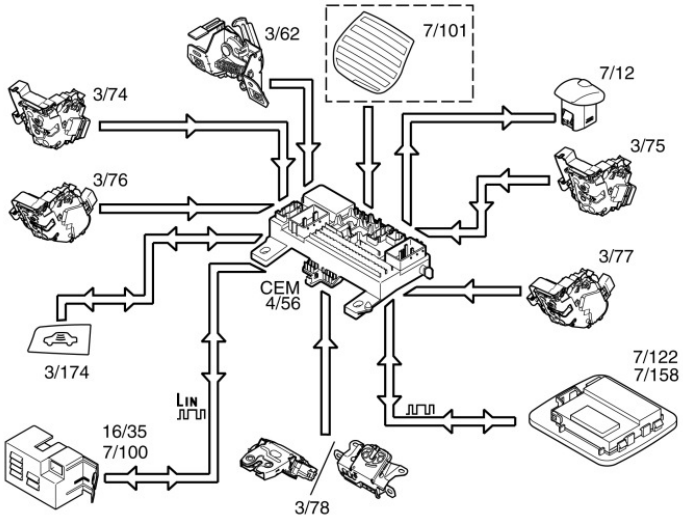
09: Alarm

Activation
Deactivation
Market adaptations
Reduced alarm function
Resetting the alarm
Triggering the alarm

Function

Activation



When the central electronic module (CEM) receives a lock command, it first locks the central locking system and then activates the alarm. On cars with the keyless entry system, the lock command is transmitted from the keyless vehicle module (KVM) to the central electronic

module (CEM). The alarm LED starts to flash as soon as the system has been activated. However, the central electronic module (CEM) will not refer to these signals until after approximately 26 seconds, or until the deadlocks are activated as part of central locking, which happens after approximately 25 seconds.

Triggering the alarm

If the alarm is in activated mode and the central electronic module (CEM) receives an indication from a sensor, an alarm cycle is started. An alarm cycle means that the siren starts sounding and the turn signal indicators start flashing. The siren sounds for approximately 25 seconds and then stops. However, the turn signal lamps continue to flash for approximately a further 5 minutes.
When the siren has fallen silent the central electronic module (CEM) checks the sensors that should be active in the vehicle. If the sensors are OK the alarm will be reactivated. If there is a fault in one of the sensors this will be "discounted" by the central electronic module (CEM) on reactivation. The exception is cars for the British market. See the section on Market adaptation. After this the alarm can be triggered again when necessary.

Deactivation

The alarm is deactivated if the vehicle is unlocked using the remote control or using the keyless system. When the central electronic module (CEM) receives an unlock command, it deactivates the alarm and releases the central locking. On vehicles with the keyless entry system, the unlock command is transmitted from the keyless vehicle module (KVM) to the central electronic module (CEM).

Note! This means that if the vehicle is locked and alarmed but then unlocked using the key blade instead of the remote control the alarm will be triggered if a door is opened.

The alarm functions can also be deactivated locally if

the button for unlocking the tailgate/trunk lid is pressed on the remote control. In that case the central electronic module (CEM) takes no account of signals from the door open sensor in the tailgate/trunk lid lock unit. The vehicle tilt sensor and mass movement sensor module (MMS) alternatively ultrasonic sensor module (IMS) will also be deactivated temporarily. To regain full protection for the vehicle the locking button on the remote control must be pressed.

Full protection can also be regained by activating the relock function. This automatically locks the vehicle and alarms it after approximately 2 minutes. However, it is still possible to open the tailgate/trunk lid during those two minutes.

Resetting the alarm

If the alarm has been triggered it can be reset in three ways.

- by pressing the unlock button on the remote control
- by inserting the ignition key in the ignition switch
- by pressing the starter button (vehicles with the keyless system where there is a valid key inside the vehicle).

Reduced alarm function

The switch for reduced alarm is in the front lighting panel in the roof. The switch is used to temporarily deactivate the vehicle tilt sensor, mass movement sensor module (MMS) alternatively ultrasonic sensor module (IMS), deadlock function and glass breakage loop (only C30) when the vehicle is locked. The switch has an integrated LED to indicate when the function is activated.

The function is activated during a lock cycle - from when the button is pressed and the vehicle locked until the vehicle is unlocked again. When the ignition is turned to position II a message is displayed in the driver information module (DIM) that full protection is activated.

An example would be when a person or pet was being left in a locked vehicle. This may also be required if the car is being transported by ferry to prevent the vehicle tilt sensor triggering the alarm.

Market adaptations

In the following markets there are certain differences in alarm function. These differences depend on the market for which the vehicle is adapted. The differences are primarily due to different requirements from insurance companies and authorities.

- **British market.** If the alarm is triggered the central electronic module (CEM) carries out an alarm cycle. If the cause of the alarm persists, for example an open door that triggered the alarm is still open, a further alarm cycle is carried out. This is repeated up to ten times. This operation is regulated in the vehicle's configuration file
- **USA/Canada.** In this market there is a "slam-lock arming" function. This means that the vehicle can be locked with the central locking button on either of the front doors even though the door on which the button is pressed is still open. Doors, the hood, trunk lid or tailgate will be locked. The alarm is activated as soon as the last front door is closed.
- **Israel/Belgium.** In this market there is an automatic alarm activation function. If the vehicle has been driven, the engine turned off, the ignition key is in position I, 0 or out of the ignition switch and the vehicle has not been locked, the alarm will automatically be activated after 90 seconds. For the alarm to activate all doors etc. with sensors must be closed and the driver’s door must have been opened and closed at least once. When the alarm has been activated, this is indicated by the turn signal lamps flashing.

  Note! Due to a new environmental regulatory requirement in Israel that forbids alarm

sirens on cars, the alarm will be withdrawn on the Israeli market as of structure week 201130.

8/10/2017 **PRINT**