
Table of Contents

F01 Anti-theft System

Subject	Page
Introduction	3
Anti-theft System	3
System Overview	4
Anti-theft System Circuit Diagram	4
Functions	6
Overview	6
Activating the Anti-theft System	6
Deactivating tilt sensor and ultrasonic interior movement detector	6
Deactivating the anti-theft system	7
Unlocking the trunk	7
No crosswise operation	7
Feedback from the Anti-theft System	8
Feedback via DWA LED	8
Confirmation from turn signal indicators	8
Confirmation via the emergency power siren	9
Comfort Access	9
Alarm Trigger	10
Door contacts	10
Trunk lid switch	10
Hood	10
Ultrasonic interior movement detector	11
Tilt alarm sensor	12
Self-monitoring of emergency current siren	12
Line monitoring - DWA bus	12
Alarm Output	13
Audible alarm	13
Visual alarm	13
Autarkic alarm	13
Panic mode	14
Alarm termination	14
Diagnosis	15
Ultrasonic interior movement detector alarm memory	15

Anti-theft System

Model: F01/F02

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Understand the anti-theft system used in the F01/F02

Introduction

Anti-theft System

The anti-theft system is available as an option. The task of the anti-theft system is to indicate unauthorized access to the vehicle by emitting an alarm. The alarm can be triggered both audibly and visually. To do this, however, the anti-theft system must be activated. When activated, the alarm monitors the whole of the vehicle interior.

In addition the anti-theft system monitors the engine compartment and the vehicle's rest position. In order that nothing can be stolen from the trunk, the anti-theft system monitors opening of the trunk lid.

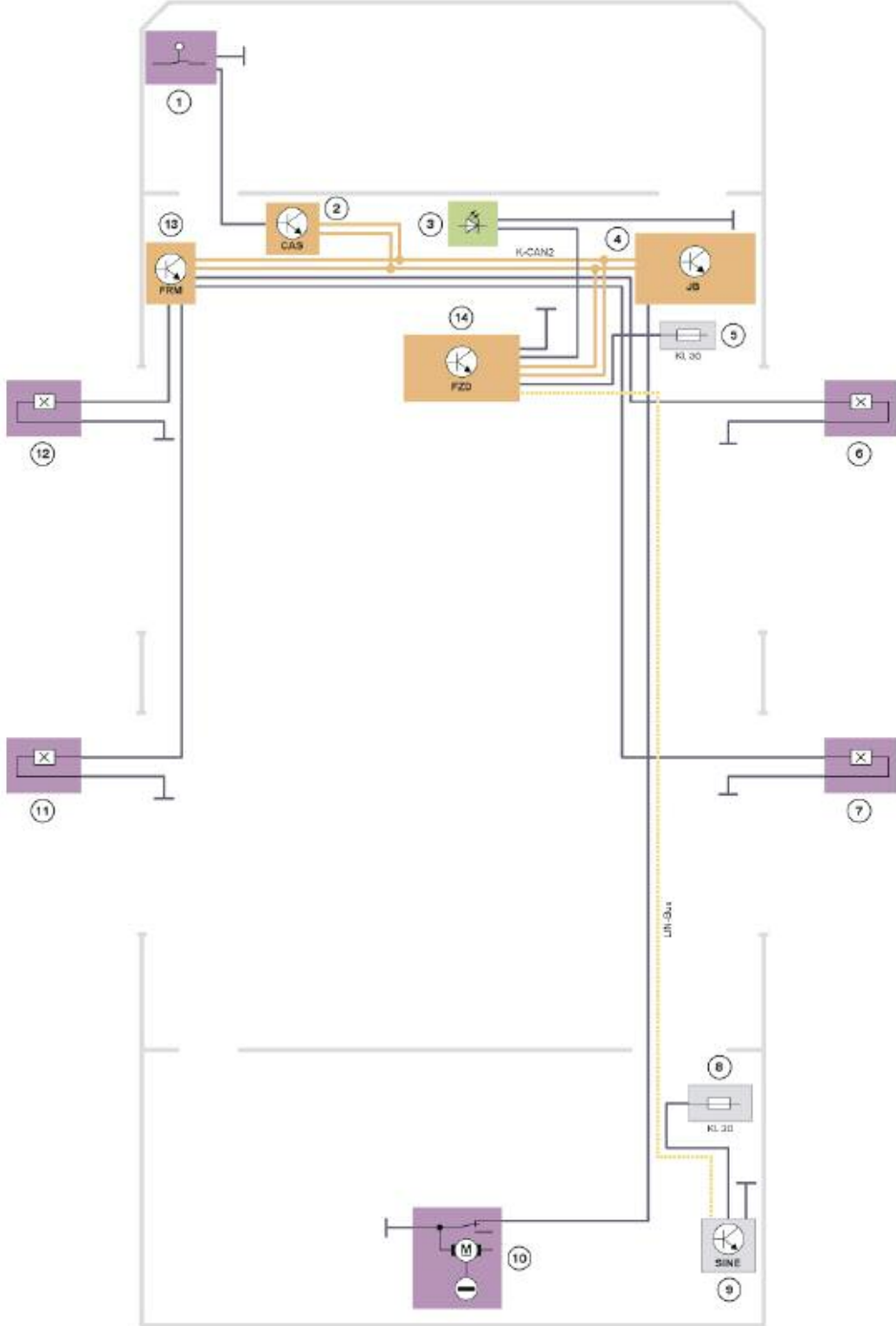
The alarm also signals an attempt to tamper with the vehicle, e.g. cutting of the supply line to the emergency power siren.

The anti-theft system's ultrasonic interior movement detector is entirely integrated in the roof function center.

The ultrasonic signal passes into the inside of vehicle through apertures in the grille of the roof function center. The emergency power siren and combined tilt sensor is located near the rear wheel arch.

System Overview

Anti-theft System Circuit Diagram



Index	Explanation	Index	Explanation
1	Hood switch	10	Trunk lock with trunk-lid switch
2	Car Access System 4 (CAS4)	11	Door contact, rear driver's side
3	Anti-theft system (DWA) LED	12	Door contact, driver's door
4	Junction Box electronics (JB)	13	Footwell module (FRM)
5	Front power distribution box	14	Roof function center (FZD) with ultrasonic interior movement detector USIS
6	Door contact, passenger's door	LIN-Bus	Local Interconnect Network bus
7	Door contact, rear passenger's side	K-CAN2	Body CAN2
8	Rear power distribution box	Kl. 30	Terminal 30
9	Emergency power siren with integrated tilt alarm sensor (SINE)		

The anti-theft system on the F01/F02 is equipped with an ultrasonic interior movement detector for monitoring the vehicle interior. The ultrasonic interior movement detector USIS is fully integrated in the FZD.

The anti-theft system is equipped with an ultrasonic interior movement detector. The ultrasonic interior movement detector has been fully integrated into the FZD.

The door switches (6, 7, 11, 12, Hall-effect sensors) are monitored by the footwell module (13). As soon as the status of a Hall-effect sensor changes, the ultrasonic interior movement detector (14) receives that information via the K-CAN2. If the anti-theft system is activated, an alarm is triggered.

The hood switch (1) is monitored by the Car Access System 4 (2). If the status changes, an alarm is triggered in the same way.

Opening of the trunk lid is monitored by the Junction Box electronics (4). If the status of the trunk-lid switch (10) changes, it triggers an alarm.

Functions

Overview

When activated, the anti-theft system on the F01/F02 monitors the entire vehicle. The doors and hood/trunk lid, emergency current siren, the vehicle interior and the DWA bus in particular are monitored. The anti-theft system can be activated or deactivated at terminal 30. It is not possible to activate the anti-theft system when the Terminal R or Terminal 15 signal is present.

Activating the Anti-theft System

The anti-theft system is activated when the vehicle is centrally locked. Activation can be triggered by the following components:

- Driver's door lock barrel
- ID transmitter
- Outside door handle with Comfort Access (sensitive surface)

After the vehicle has been centrally locked, the emergency power siren is first activated together with the tilt alarm sensor. Then the signals from all door switches, the hood switch and the trunk-lid switch are checked for plausibility. Once the contacts are set, they are then linked to the vehicle monitoring system by the anti-theft system.

The tilt sensor and the ultrasonic interior movement detector must be adjusted to the vehicle's situation each time the vehicle is centrally double-locked. This is called initializing. The tilt alarm sensor delivers information on the vehicle's rest position. If this value is plausible, the tilt alarm sensor is included in the vehicle monitoring process.

The anti-theft system's ultrasonic interior movement detector monitors the passenger compartment. It therefore takes a little time before the ultrasonic interior movement detector can actively be used for the anti-theft system. The ultrasonic interior movement detector is switched to 'activated' approximately 30 seconds after the contacts have been linked to the anti-theft system.

Note: You should wait approximately one minute before testing the interior motion detector.

■ Deactivating tilt sensor and ultrasonic interior movement detector

It is advisable to deactivate the tilt sensor and ultrasonic interior movement detector in the following situations:

- Vehicle in tilt-type duplex garage
- Vehicle on ship transport
- Vehicle on car transporter
- Persons or animals in vehicle

Deactivation is performed by centrally double-locking or auto-remote closing the vehicle a second time within 10 seconds of doing so the first time. To acknowledge, the anti-theft system LED is lit for 2 seconds.

Note: The tilt sensor/ultrasonic interior movement detector can be permanently deactivated by coding.

■ **Deactivating the anti-theft system**

The anti-theft system is deactivated by the “unlock” or “selective unlock” central locking functions. An audible and/or visual signal can be output in connection with deactivating corresponding to the country-specific version.

If an alarm was triggered during the time when the anti-theft system was activated, the anti-theft system LED flashes for 5 minutes. If a terminal status changes, e.g. if the central locking is unlocked, while the LED is flashing then the LED stops flashing. If the alarm is deactivated while the alarm is active, the deactivate instruction is not acknowledged and the alarm signal is completed.

■ **Unlocking the trunk**

The tilt alarm sensor and ultrasonic interior movement detector are blanked out if the luggage compartment is unlocked and opened on an armed vehicle. Loading the vehicle might result in a new vehicle resting position. Initialization of the ultrasonic interior movement detector and the tilt sensor starts 6 seconds after the trunk is closed again.

Note: When the trunk is closed, the visual confirmation signal is repeated to indicate to the driver that the trunk is properly closed.

■ **No crosswise operation**

If crosswise operation is not implemented, an alarm is triggered when the anti-theft system is deactivated.

This only applies to activating with the ID transmitter and deactivating via the driver's door lock. The footwell module detects that the vehicle has been unlocked via the driver's door lock and broadcasts that information via the K-CAN2.

The Car Access System detects that the driver's door lock has been unlocked but does not unlock the vehicle. The anti-theft system remains activated and triggers the alarm when the driver's door is opened.

This function is coded on the Car Access System.

Feedback from the Anti-theft System

When the alarm is activated, the system does not signal confirmation until all doors, the hood and the trunk have been closed. That confirmation may be in the form of a visual or audible signal. If confirmation is by a visual signal, the alarm LED or the hazard warning lights may flash, for example. If the confirmation signal is audible, it is produced by sounding the emergency power siren, for example.

■ Feedback via DWA LED

The DWA LED serves as an indicator showing the status of the anti-theft system. The roof functions center supplies the DWA LED with signals from the ultrasonic interior movement detector.

DWA Status	DWA LED
Deactivated	OFF
Activated	ON
Armed, but not all contacts closed	Blinks for 10 seconds, then continues flashing
Ultrasonic interior motion/tilt sensor OFF	Lights up for 2 seconds and then remains on
Alarm triggered	Flashes for 5 minutes, then continues flashing in bursts
Deactivating	Goes out
Deactivating after alarm	Flashes for 5 minutes or stops if a terminal status changes (central locking unlocked)

When blinking, the DWA LED is driven at a frequency of 0.5 Hz. The switch-on time is 60 milliseconds. When the DWA LED flashes, it is activated at a frequency of 2 Hz.

■ Confirmation from turn signal indicators

Visual confirmation by the turn signal indicators of anti-theft system activation and deactivation serves as an indication for the vehicle user.

The feedback is coded specifically to the country and/or vehicle.

DWA Status	Signal of hazard warning lights
Activation	Hazard warning lights flash once
Deactivation	Hazard warning lights flash twice
Activation after "Easy Access" to trunk	Hazard warning lights flash once after trunk is closed
Deactivating after alarm	Hazard warning lights flash four times at double frequency

■ Confirmation via the emergency power siren

The audible confirmation signal to the vehicle user when activating and deactivating the alarm is individually coded for the country of purchase.

DWA Status	Signal from siren
Activation	Signal tone sounds once
Deactivation	Signal tone sounds twice
Activation with doors open or trunk lid open	No signal tone, sounds only after closing last door or trunk lid

■ Comfort Access

If the vehicle is locked but the trunk is open, it is possible for the ID transmitter to be inadvertently left in the trunk. If the trunk lid is closed in such circumstances, it is automatically opened again to prevent the ID transmitter from being locked in.

In addition to automatically opening the trunk lid, the anti-theft system emits an audible warning. The warning consists of the emergency power siren sounding a two-tone signal three times. The footwell module also activates the visual signal by the hazard warning lights.

Alarm Trigger

The anti-theft system can be triggered by the following components:

- Door contacts
- Trunk lid switch
- Hood switch
- Ultrasonic interior movement detector
- Emergency power siren with integral tilt sensor.

■ Door contacts

The status of the door contacts is evaluated by the footwell module and signalled to the ultrasonic interior movement detector. The status of the individual door contacts is included in the vehicle monitoring system 6 seconds after the status signal “door closed” is issued. This means that an alarm can be triggered via a door that is already closed even if another door contact is still open.

■ Trunk lid switch

The status of the trunk lid switch is analysed by the Junction Box electronics and signalled to the ultrasonic interior movement detector. When the trunk lid is closed, the Junction Box electronics receives a low signal (approximately 0 V). If the trunk lid is unlocked when the anti-theft system is activated, the signals from the trunk lid switch, ultrasonic interior movement detector and tilt sensor are initially suppressed.

The signals are also suppressed if the trunk lid is unlocked using the ID transmitter when the anti-theft system is activated. The trunk lid switch is reinstated as part of the vehicle monitoring system 6 seconds after the lid is closed. Once there are no other doors open and the trunk lid is closed, the initialization procedure for the ultrasonic interior movement detector and the tilt sensor starts.

Because of the manipulation prevention system, unlocking the luggage compartment with the aid of the mechanical key when the DWA is activated will cause an alarm to be triggered.

■ Hood

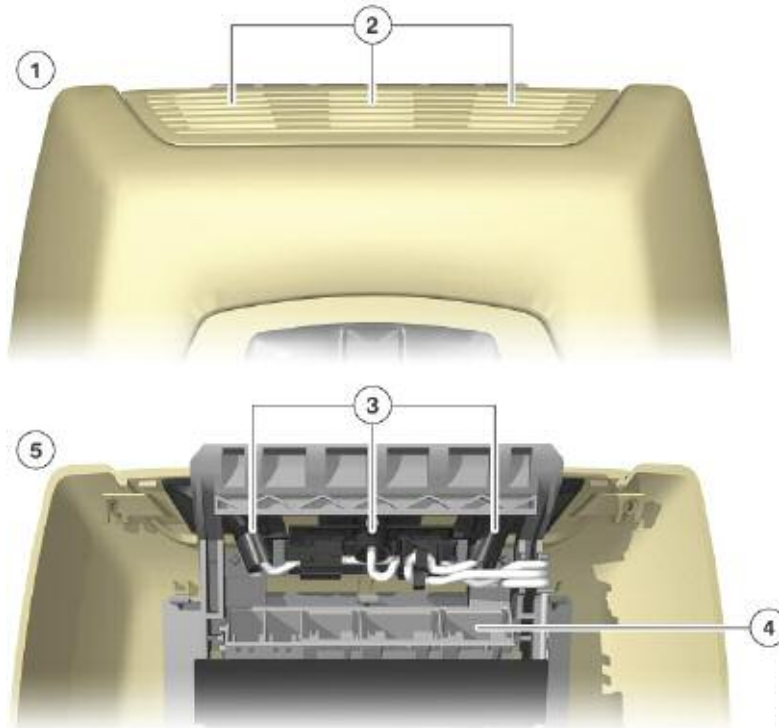
The status of the hood switch is analysed by the Car Access System and signalled to the ultrasonic interior movement detector. The status of the hood switch is included in the vehicle monitoring system 6 seconds after the status “hood closed” is signalled.

The Car Access System interprets a hood switch that is not connected as closed. When the hood is closed, the Car Access System receives a low signal (approximately 0 V).

■ Ultrasonic interior movement detector

The ultrasonic interior movement detector captures and evaluates movements in the vehicle interior. Initialization of the ultrasonic interior movement detector is started 6 seconds after the hood, trunk lid and the last door have been closed.

The ultrasonic interior movement detector is operational 30 seconds after the start of initialization and is included in the vehicle monitoring system. The ultrasonic interior movement detector has been integrated into the roof function center. The FZD is connected to the K-CAN2 and DWA bus.



Index	Explanation	Index	Explanation
1	Front of roof function center	4	Roof function center connector
2	Sensor ultrasound emission grille	5	Rear of roof function center
3	Funnels for the ultrasonic sensors		

Note: For the ultrasonic interior movement detector to function properly, it is very important that the grille (2) is fitted correctly. The funnels must be touching the grille to prevent/reduce interference between the ultrasonic sensors. The grille must be engaged at the sides and fully located in position in the center.

■ Tilt alarm sensor

The tilt alarm sensor registers the vehicle rest position when it is activated and detects changes in the position, e.g. jacking up the vehicle. The tilt alarm sensor is integrated in the emergency current siren.

Initialization of the tilt sensor is started 6 seconds after all doors, the trunk lid and the hood are closed. The tilt sensor is ready for operation 60 seconds from the start of initialization and is then included in the vehicle monitoring system.

If the tilt alarm sensor detects vehicle movement, a corresponding signal is sent to the ultrasonic interior movement detector. The anti-theft system decides whether the movement is sufficient to trigger an alarm.

To ensure a false alarm is not triggered as the result of the vehicle rocking, the angle values for the longitudinal and transverse axis are determined every 90 ms. An alarm is triggered only if the vehicle remains in an inclined position for longer than approximately 1.5 seconds.

Note: Testing the tilt sensor:

Activate the anti-theft system then wait for one and a half minutes. Then raise the vehicle with a jack at one of the wheels. The alarm should be triggered before the wheel has been raised completely off the ground.

■ Self-monitoring of emergency current siren

A self-monitoring facility that is activated immediately after the anti-theft system has been activated is implemented in the emergency current siren. The emergency current siren monitors its own power supply and detects overvoltage, undervoltage and line break (open-circuit).

If anyone attempts to manually interfere with the emergency power siren or its supply leads, the emergency power siren will trigger an alarm. At the same time, it reports this alarm to the ultrasonic interior movement detector regardless of whether the DWA bus has been affected.

■ Line monitoring - DWA bus

The ultrasonic interior movement detector and the emergency current siren are connected via the DWA bus. As soon as the anti-theft system has been activated, the DWA bus is monitored cyclically every 2 seconds.

If the anti-theft system does not register with the SINE within 3.2 s, an alarm is initiated.

The anti-theft system sends a line monitoring request on the DWA bus to the emergency current siren. The emergency power siren must respond within 100 ms. If no response is received, the anti-theft system triggers an alarm. The line monitoring facility is also active while the alarm is triggered.

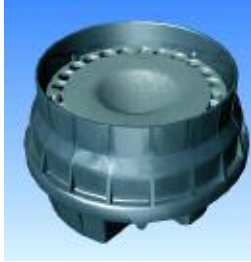
The anti-theft system in the roof function center measures the system voltage. The line monitoring facility is switched off at a system voltage below 9 V. This avoids false alarms.

Alarm Output

If an alarm criterion is fulfilled with the anti-theft system activated, the alarm is output (triggered) audibly and/or visually corresponding to the country-specific coding.

■ Audible alarm

The emergency power siren receives a signal via the DWA bus when the ultrasonic interior movement detector triggers an alarm. It is fitted in the rear right wheel arch. The emergency current siren confirms receipt of the alarm request and triggers the audible alarm.



Emergency power siren on F01/F02

If the alarm request is not acknowledged, the anti-theft system will repeat the alarm request up to eight times.

Depending on the country-specific coding of the emergency current siren, an intermittent or interval tone is generated. If the anti-theft system is deactivated, the audible alarm is stopped immediately and without response.

■ Visual alarm

Depending on the country-specific version, the following components of the exterior lighting can be activated for the visual alarm:

- Turn signal indicators
- Dipped-beam headlights
- High-beam headlights.

When the anti-theft system triggers an audible alarm, a visual alarm is simultaneously triggered for 5 minutes. The anti-theft system sends the request for flashing lights to the footwell module via the K-CAN2. In turn, the footwell module activates the components of the exterior lighting system.

The visual alarm cannot be extended by repeated alarm triggering.

If the anti-theft system is deactivated, the visible alarm is stopped immediately and without response.

■ Autarkic alarm

If the emergency power siren's wires are tampered with, it initiates the autonomous alarm. If the DWA bus is also cut through, the ultrasonic passenger-compartment sensor detects this situation by the absence of the reply from the emergency current siren. In turn, the ultrasonic interior movement detector triggers the visual alarm.

■ **Panic mode**

Panic mode is a means of attracting attention by triggering an alarm when under threat from the outside or in the event of an accident, for example.

Panic mode is initiated by pressing the trunk lid button on the ID transmitter. The button must be pressed for longer than 2.5 seconds irrespective of whether the anti-theft system is activated or not.

The alarm is stopped by pressing any button on the ID transmitter. Panic mode is not stored. On completion of panic mode, the anti-theft system assumes the setting that was selected prior to panic mode.

Panic mode is at present only coded in US vehicles.

■ **Alarm termination**

An alarm initiated for testing purposes or by accident can be stopped by deactivating the anti-theft system.

Diagnosis

All information is stored in the non-volatile alarm memory.

Ultrasonic interior movement detector alarm memory

The alarm memory of the ultrasonic interior movement detector stores all alarms apart from the autonomous alarm. The alarm memory contains the following information:

- Cause of alarm trigger
- Subsequent alarm triggers
- Date
- Time
- Ambient conditions
 - Outside temperature
 - Window position
 - Sunroof position
 - Heating.

An alarm history is formed from the beginning to the end of the alarm. The manner in which the alarm is ended is also defined. The alarm can be terminated by deactivating it or by allowing it to run its course. The last 10 alarms are stored in the alarm memory.

Autonomous alarms are stored by the roof function center if the connection between the roof function center and the emergency power siren is in functional order.