
Table of Contents

E88 Complete Vehicle

Subject	Page
Introduction	5
Body	7
Body Dimensions	7
Dimensional Variations Between the E88 and E93	8
Dimensional Variations Between the E88 and E46/C	8
Bodyshell	9
Exterior Sill/Rocker Structure	13
Partition Wall Module	14
Strut Brace Concept	15
Front Section Body work	16
Interior Features	17
Doors and Side Panels	17
Shared Door Design for the E88/E82	17
Dashboard Module	18
Luggage Compartment	19
Volume/loading	19
Convertible Top	20
Top Opening and Closing Procedure	22
Layout of the Hydraulic Control Unit	23
Top Storage Compartment Cover	24
System Components	25
Convertible Top	25
Position Sensors and Microswitches	25
Convertible Top Module (CVM)	32
Controls for Operation	33
Convertible Top Hydraulic Circuit Components	34
Electrical Hydraulic Control Unit	35
Windshield Cowl Locking System	37
System Functions	41
Prerequisites for Opening and Closing the Top	41
Top Opening Sequence	42
Comfort Operation	42
Check Control Messages	43

Subject	Page
Service Information	45
Service Notes	45
Diagnostic Notes	45
Encoding/Programming Notes	46
Window Adjustments	46
Positions for the Convertible Top Diagnosis	46
Emergency Operation	53
Rollover Protection System	61
Bus System Overview	63
Vehicle Systems Network	63
General Vehicle Electrical System	67
Central Locking System	67
Anti-theft Alarm System	67
Audio and Communication Systems	71
USB/audio Interface	71
Antenna Systems	71
AM/FM Antennas	72
Antennas for Digital Receivers	73
Antennas for Telephone and Telematics	74
Telematics Antenna	74
SOS Antenna	75
Bluetooth Antenna	75
GPS Antenna	75
E88 Antenna Circuit Diagram	76
Passive Safety Systems	79
Advanced Crash and Safety Management	79
E88 Passive Safety System Circuit Diagram	80
Front Seats Air Bags	82
Seat Position Sensors	82
Retraction Tensioner and Adaptive Belt-load Limiter	84
Component Location	87

**BLANK
PAGE**

Complete Vehicle

Model: E88

Production: 3/2008

OBJECTIVES

After completion of this module you will be able to:

- Identify the different features of the E88 BMW 1 Series
- Diagnose and service the E88 Convertible Top
- Identify the components that make up the E88 Convertible Top
- Explain the operation of the E88 Convertible Top

Introduction

Inspired by past 2002 models of the sixties and seventies BMW has designed a vehicle combining rear-wheel-drive, excellent handling and powerful engines with the stiffest and lightest bodyshell possible along with accommodations for four. The 1 Series Coupe picks up where the 2002 left off.

Similar to the legendary BMW 2002, the 1 Series inspires feelings of nostalgia. With the innovations in automotive technology and safety along with the experience gathered over the many years of vehicle development, one can only imagine the car that BMW would build today in honor of such automotive legacy.



With the 1 Series convertible, BMW succeeded in taking the typical sports coupe to the next level. To the already fun inspiring and performance oriented theme of the E82, designers added the free spirited look and feel that all past BMW convertibles models share. Both the E88 and E82 vehicles will be available as 128i and 135i.



The E88's design was influenced by the E93, both cars share similar features and systems. Although they are both convertibles, the difference between the E93 and E88 is mainly that the E93 is considered a retractable hardtop convertible and the E88 is a soft top design. There are also noticeable differences in the exterior, interior and in the luggage compartment. The front bodywork, rear section, doors and bumpers have been adapted from the E82.

Note: Dependent on the market/state, the 128i is available with the N51B30M0 SULEV engine on both the E82 and E88 versions.



The 1 Series Convertible is a four-seater vehicle with a fully automatic fabric convertible top

The 128i is powered by the N51B30M0 SULEV engine or the N52B30O1, 230 horsepower inline 6-cylinder 3.0-liter engine that generates 200 lb-ft of torque; the 128i will feature Valvetronic, VANOS and aluminum/magnesium block construction. The 128i can be visually identified by the two oval tail pipes with chrome tips at the lower left of the rear bumper.

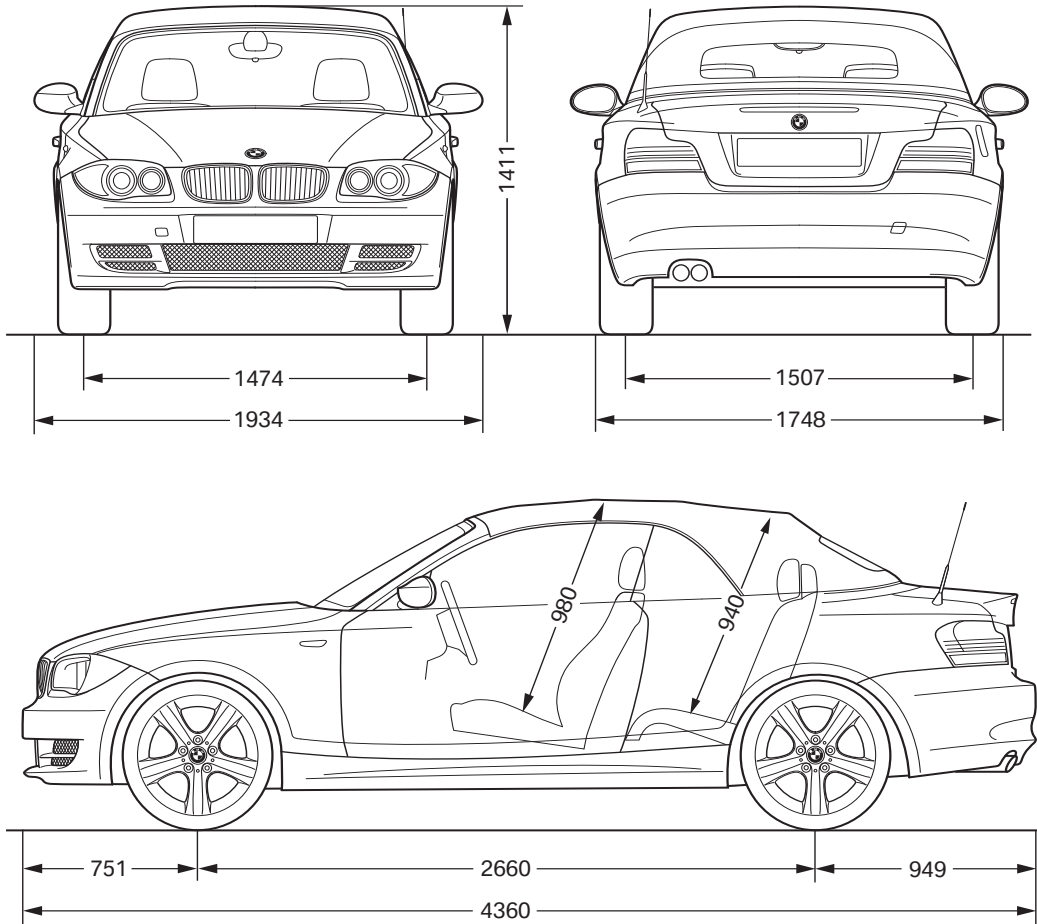
The 135i features the N54B30U0 twin-turbocharged direct injection 3.0-liter inline six-cylinder engine that produces 300 horsepower and 300 lb-ft of torque from as low as 1,400 rpm. The 135i can be visually identified by the two 80 mm diameter tail pipes with chrome tips as standard equipment along with the M aerodynamic package.

Conforming to BMW's Efficient Dynamics, these vehicles will include the following:

- Light weight but rigid bodyshell.
- Lightweight suspension components:
example: hollow anti-roll bars and aluminum front axle.
- Run Flat Tires as standard equipment.

Body

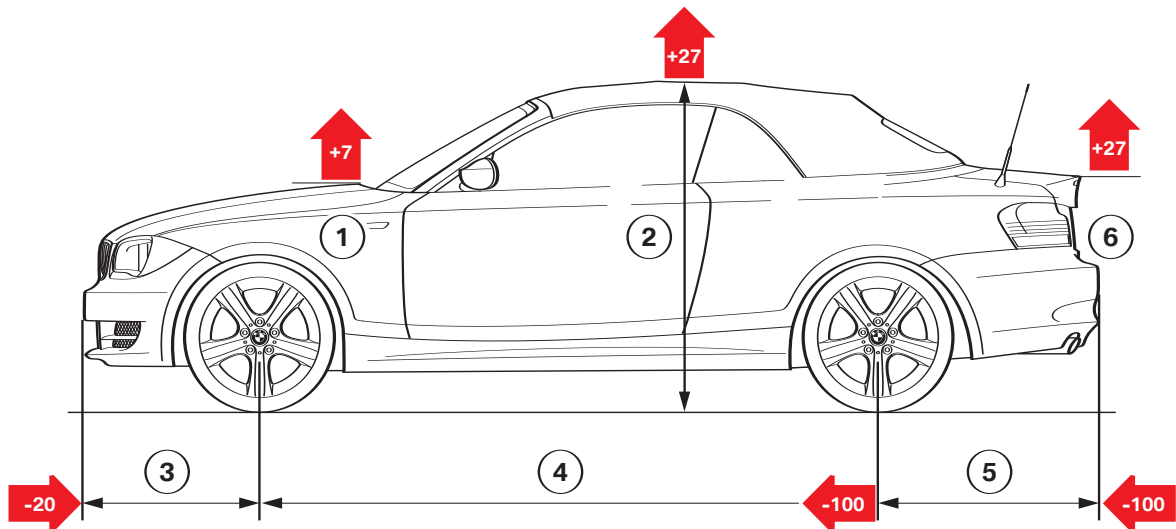
Body Dimensions



Comparison of the E88 with the current E93 and E46/C:

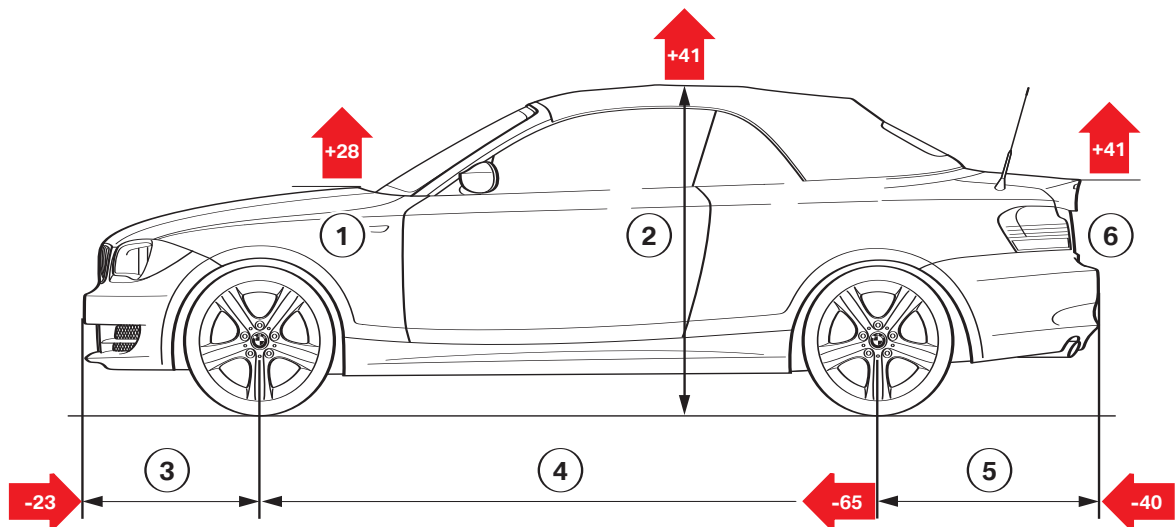
External dimensions (mm)	E88	E93	E46/C
Vehicle length	4360	4580	4,488
Overall vehicle width	1748	1782	1,757
Vehicle height, unladen	1411	1384	1,370
Wheelbase	2660	2760	2,725
Overhang front	751	771	774
Overhang rear	949	1049	989
Track width front	1481	1500	1,471
Track width rear	1517	1513	1,483
Wheels/tires	195/55 R16	225/45 R17	205/55 R16

Dimensional Variations Between the E88 and E93



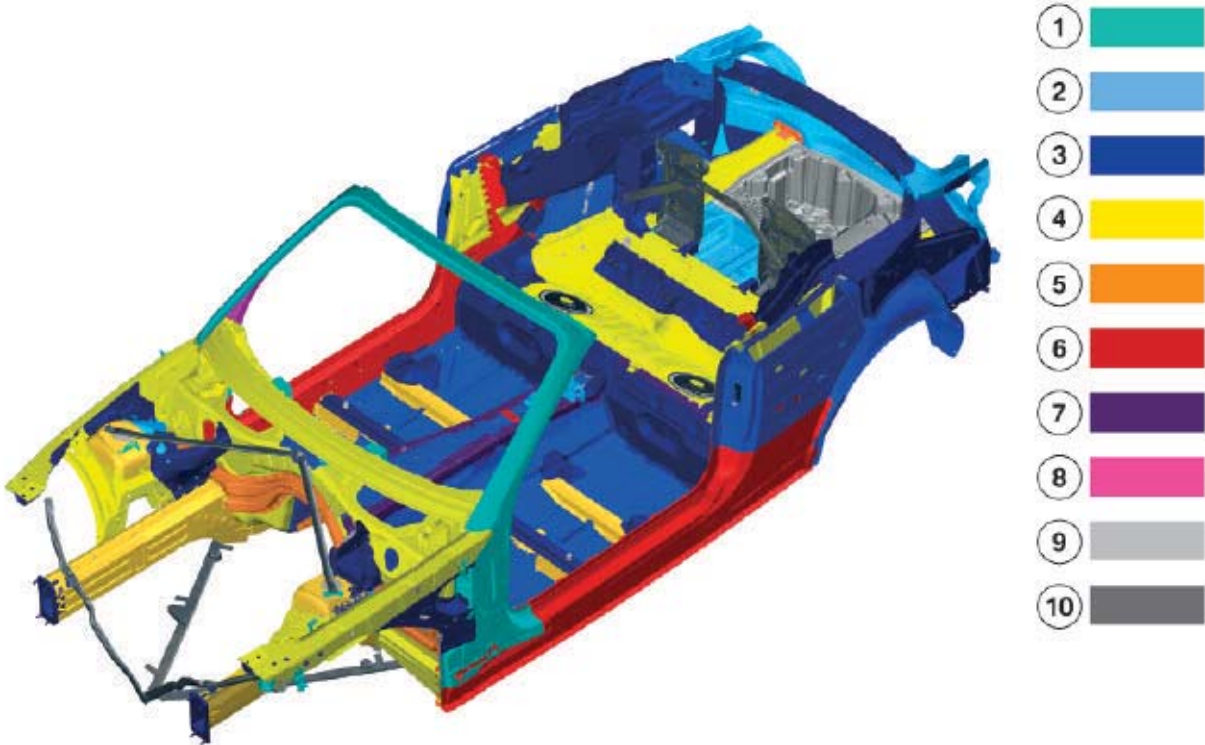
Index	Explanation	Index	Explanation
1	+7 mm @ Rear edge of the hood	4	-100 mm Wheelbase
2	+27 mm @ Vehicle height unladen	5	-100 mm Rear overhang
3	-20 mm Front overhang	6	+27 mm @ Rear edge of the trunk

Dimensional Variations Between the E88 and E46/C

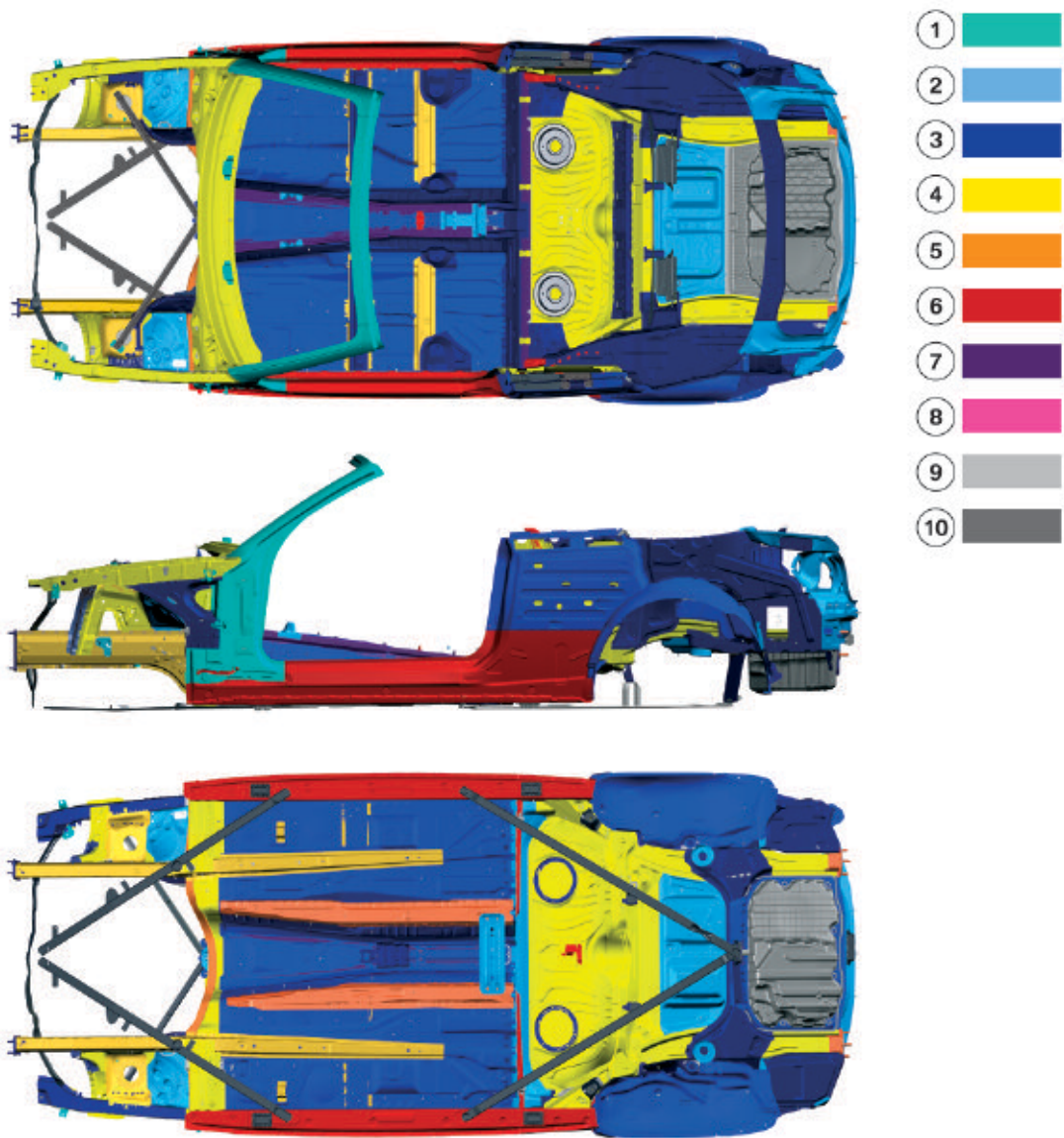


Index	Explanation	Index	Explanation
1	+28 mm @ Rear edge of the hood	4	-65 mm Wheelbase
2	+41 mm @ Vehicle height unladen	5	-40 mm Rear overhang
3	-23 mm Front overhang	6	+41 mm @ Rear edge of the trunk

Bodyshell



Index	Explanation	Index	Explanation
1	DC04, DX54	6	HC420LAD
2	HC180BD, HC180YD	7	HC600C
3	HC220BD, HC260LAD	8	22MnB5
4	HC300BD	9	Plastics
5	HC340LAD, HC380LA	10	Other metal materials



Index	Explanation	Index	Explanation
1	DC04, DX54	6	HC420LAD
2	HC180BD, HC180YD	7	HC600C
3	HC220BD, HC260LAD	8	22MnB5
4	HC300BD	9	Plastics
5	HC340LAD, HC380LA	10	Other metal materials

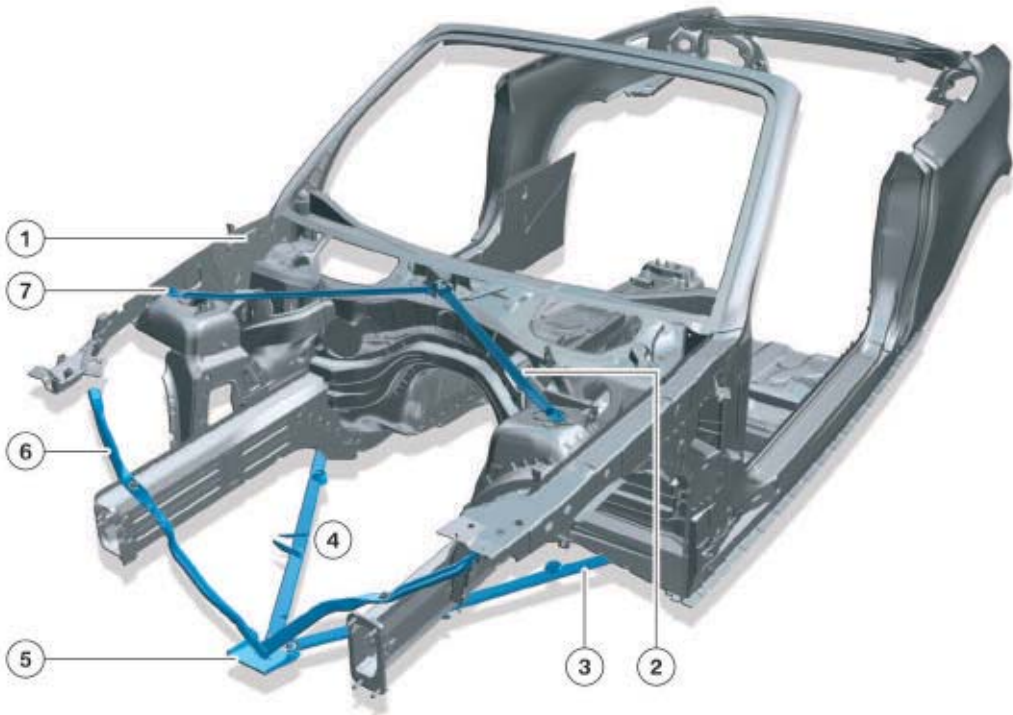
The bodyshell is fully galvanized and composed of a variety of steel grades. High-tensile steels and specially designed bracing concepts ensure the bodyshell is extremely rigid and stable.

Rigidity is increased with the use of a convertible-specific bracing package that reinforces the front section and trunk area in combination with a specially design sill/rocker beam component.

The front section bracing system links are connected using 4 special brackets incorporated into the bodyshell and a mounting fixture on the front axle carrier.

The front axle carrier and front section components are bridged providing additional rigidity to the frame rails. Three pairs of brace struts are combined to create a spatial framework which provides optimum bracing for the front section, while adding minimum weight to the vehicle.

Front section bracing/reinforcement configuration



Index	Explanation	Index	Explanation
1	Support beam	5	Main brace mounting
2	Shock tower brace	6	Front section brace
3	Left front axle brace	7	Shock tower brace threaded connection
4	Right front axle brace		

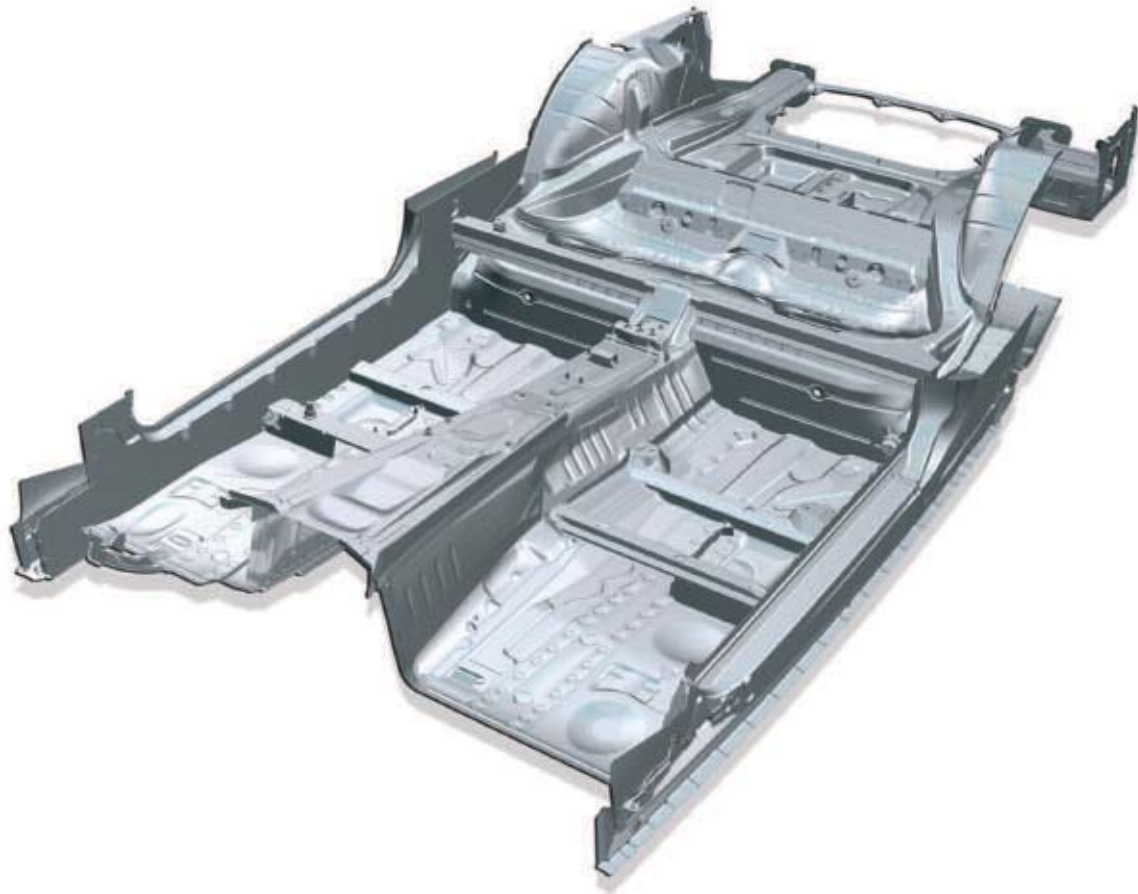
Top view of front shock tower bracing (hood removed)



Exterior Sill/Rocker Structure

The sill/rocker structure represents the principle load path from the front section to the rear. To provide rigidity against bending and torsion forces, a horizontal flange has been added between the inner and outer sill/rocker beam shell. The sill/rocker structure is additionally reinforced with the incorporation of transverse reinforcing components.

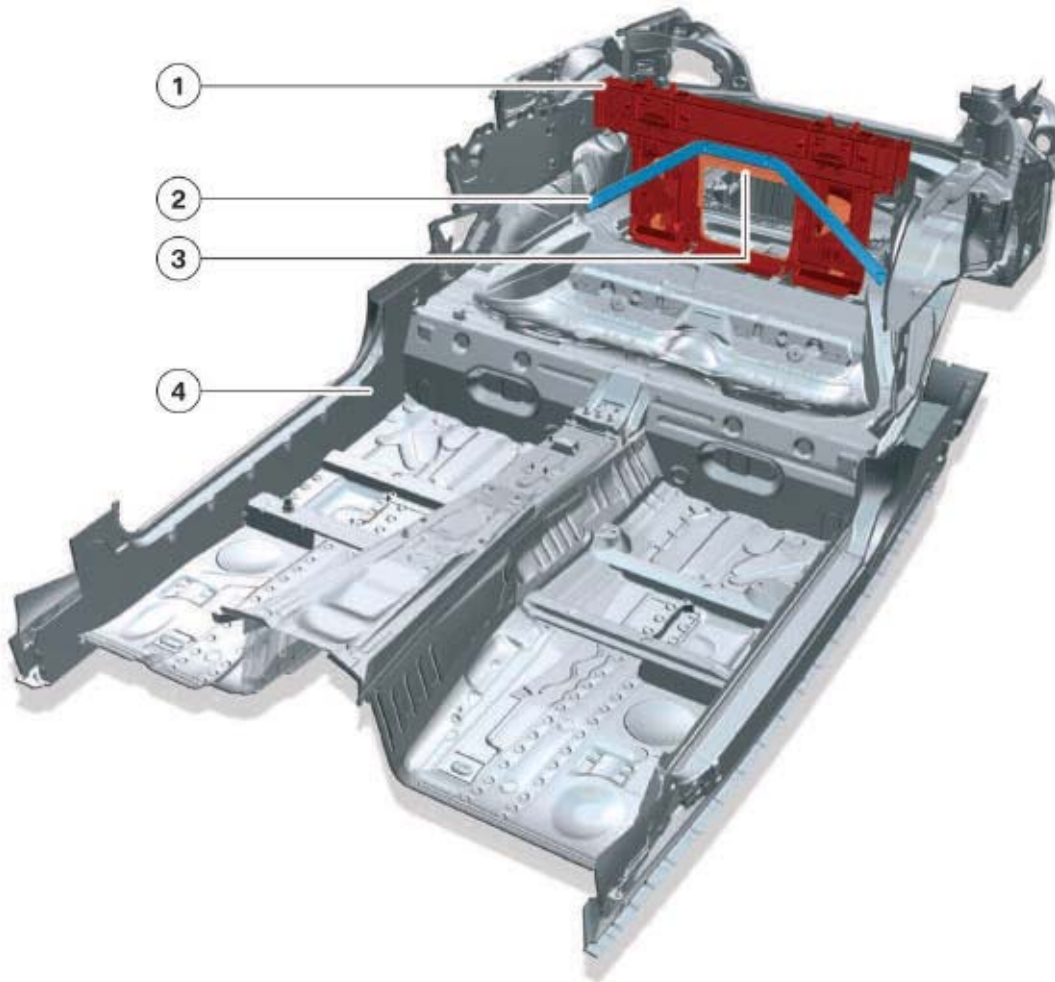
Top view of floor pan, sill/rocker structure and transverse reinforcing components.



Partition Wall Module

Additional bracing has been incorporated into the rear section, as in previous convertibles. The partition wall is designed as an assembly module which provides structure with only minimal vehicle weight gain. The main support is also transmitted through the partition wall reinforcement struts, offering a weight bearing advantage.

Cut away view of the body floor pan

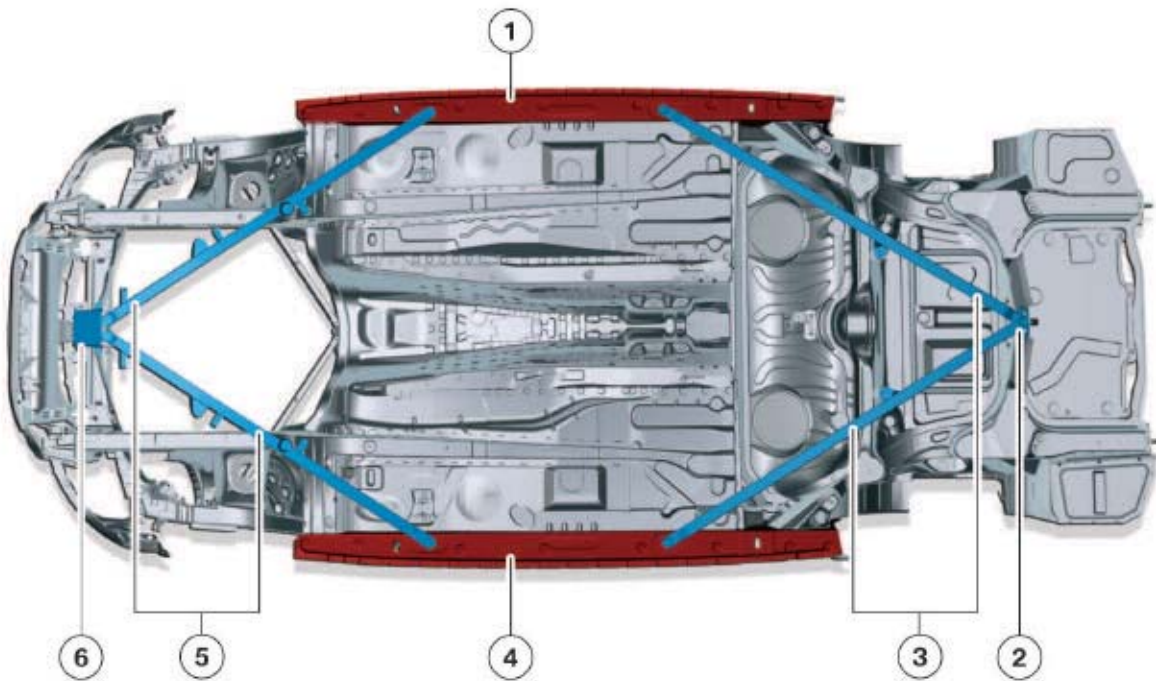


Index	Explanation	Index	Explanation
1	Partition wall module	3	Rollover protection mounting
2	Partition wall reinforcement	4	Sill/rocker structure

Strut Brace Concept

The underbody strut braces along with the sill/rocker beam structure secure the front and rear sections of the under body while reinforcing the lower rocker assemblies. The entire concept is designed to work together with the modular partition wall and the front strut bracing assembly to meet the E88's requirements for structure rigidity and crash safety standards.

Strut brace and sill/rocker beam design (underside view of bodyshell)



Index	Explanation	Index	Explanation
1	Left sill/rocker beam	4	Right sill/rocker beam
2	Mounting for rear brace	5	Front axle braces
3	Rear braces	6	Mounting for front axle braces

Front Section Body work

The the design of the E88 front body work meets the requirements for the US market while accommodating the current top of the line N54B30 engine (in the 135is) within the established dimensions of the 1-Series body.

The design front section features:

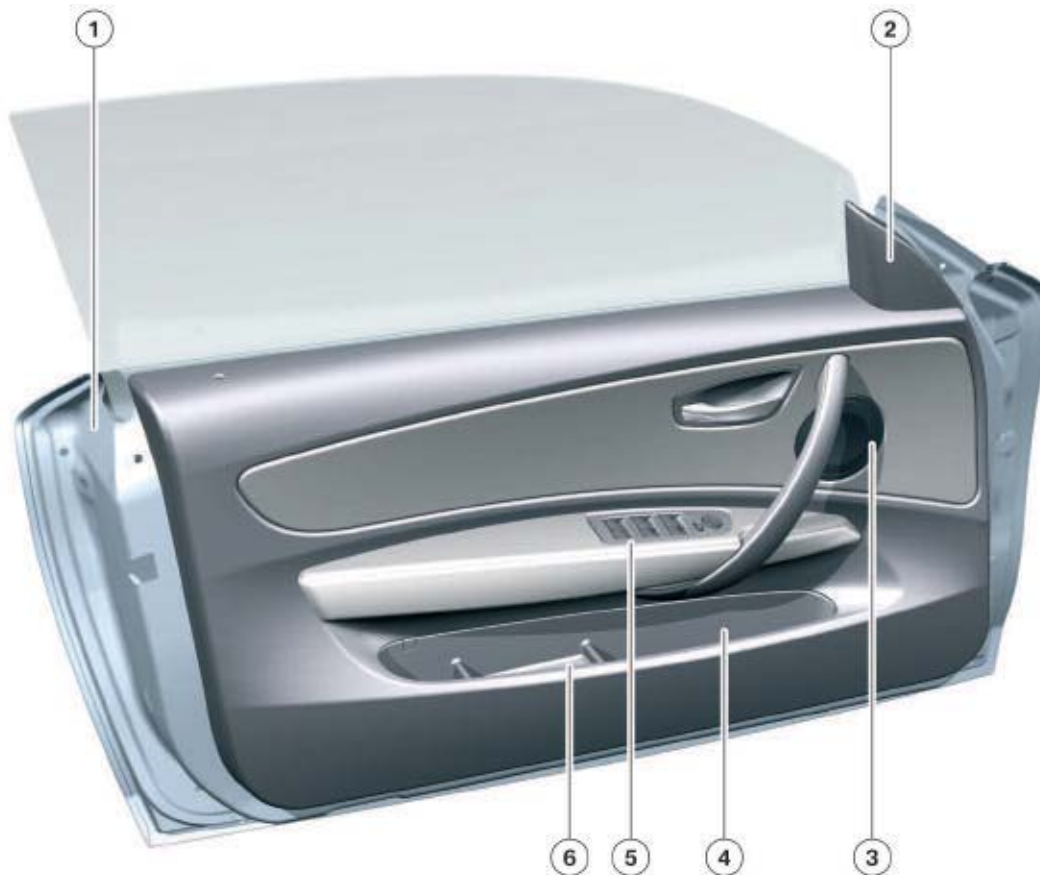
- Slightly different bumper trim from the E82.
- Extends the range of engines available between the N54B30U0, N51B30M0 and N52B30O1.
- Integration of front strut braces (inspired by E93) to increase the rigidity of the front section of the body.
- Accommodates the front section components, front axle components, front bumper cover, radiator support and cooling module (including an additional cooler for the top of the line N54B30 engine).

Exploded view of the front section components



Interior Features

Doors and Side Panels



Index	Explanation	Index	Explanation
1	Frameless door	4	Open storage compartment
2	Tweeter	5	Switch cluster
3	Mid-range speaker	6	Rubber inlay mat

Shared Door Design for the E88/E82

The doors were adopted from the E82 Coupe. The inner door panels are designed with integrated storage areas and new door opening handle.

Note: A special procedure is necessary to adjust the windows to the convertible top on the E88. (See the repair instructions for details)

Dashboard Module



Dashboard module features:

- 2-piece driver's footrest
- The design and arrangement of the dashboard components (start/stop, light switch cluster, etc.)
- Electric steering column lock (not on manual gearshift vehicles)
- Steering column adjustment lever located to the side (out of the range of knee impact).

Note: The vehicle also incorporates active knee protection airbags for both the driver and passenger.

Luggage Compartment

The luggage compartment offers the customer versatility, while providing for convenient location and logical arrangement of the control modules.

Volume/loading

In order to provide the customer with the largest cargo room possible, a variable roof storage compartment has been incorporated, as on the E46/C. When the convertible roof is stowed the available cargo room is 260 liters, with the convertible top up the cargo room increases by 40 liters to a maximum of 300 liters; this is the same as the maximum cargo capacity of the E46/C.

The total volume of the trunk is not only impressive in numbers, but also very practical in function. With the convertible top open, the vehicle can be loaded with two 46" golf bags. This can also equate to one large and one small suitcase.

The use of the modular partition wall created a larger through-loading opening (option) compared to the E46/C. Two snowboards or at least three pairs of skis can be loaded through this opening.

Luggage compartment view of ski bag through-loading feature.



Index	E46/C	E88
1	215 mm	230 mm
2	240 mm	300 mm

Convertible Top

The convertible top is 20 mm shorter and the top storage compartment is 20% smaller than on the E46/C.

The use of a sound-absorbing material for the convertible top makes it possible to reduce noise levels in the vehicle and also compensates for aerodynamic disadvantages caused by the rounded shape of the top.

The thickness of the rear window is now 3.8 mm instead of 3.25 mm. This allows levels of low-frequency noise to be reduced considerably.

Significant improvement of the "top down" sensation has been achieved by locating the windshield frame and sun shades forward when compared to the E46/C. The sun shades are 1.92" further forward than on the E46/C.

View of convertible top fabric and hydraulics (closed position)



- A classic fabric convertible top with storage compartment cover /lid.
- First time that "anthracite" color has been used on production vehicles (silver effect).
- Top lining is similar as the top on the E46/C.
- Fully functional while the vehicle is in motion, top operation starts at speeds up to approximately 30 km/h (19 mph) and continues up to 40 km/h (25 mph).
- The frameless rear window is bonded in with adhesive to the top material. It cannot be replaced separately.
- Variable top storage compartment to increase the loading volume when the top is closed.

**Trunk Partition, raised
(Left side view)**



**Trunk Partition, lowered
(Left side view)**



Trunk Partition, lowered
(View from luggage compartment)



Top Opening and Closing Procedure

Fully automatic opening and closing of the top takes 22 seconds (not counting windows operation time).

Once the convertible top is fully closed, the side windows are actuated.

Opening/closing – from inside the vehicle:

- Using the switch on the center console (also actuates the windows)

Opening/closing – from outside the vehicle:

- Using the door lock (also actuates the windows)
- Up to 4 m/13 ft remote control radius, in conjunction with Comfort Access (also actuates the windows)
- At a distance greater than 4m/13ft, only opens via remote control. (also actuates the windows).

Layout of the Hydraulic Control Unit

The hydraulic pump is located in the right side section of the trunk.

The benefits of this location are:

- Maximum distance between the pump and the driver for noise suppression.
- Hydraulic lines are easily concealed by the luggage compartment trim.
- Ease of accessibility for service and repair.

Cut away view of luggage compartment from the rear



Index	Explanation	Index	Explanation
1	Hydraulic control unit	2	Trunk divider

Top Storage Compartment Cover

Notable features of the top storage compartment lid/cover are:

- The top storage compartment lid is made from sheet metal.
- There is a concealed trim panel on the top storage compartment lid.
- The side trim panel overlaps with the metal panel to provide anti-trap function.
- Seam width from the top storage compartment to the side panel is reduced to 3.5 mm.



**Top Storage Compartment Lid/Cover
(right side view)**

System Components

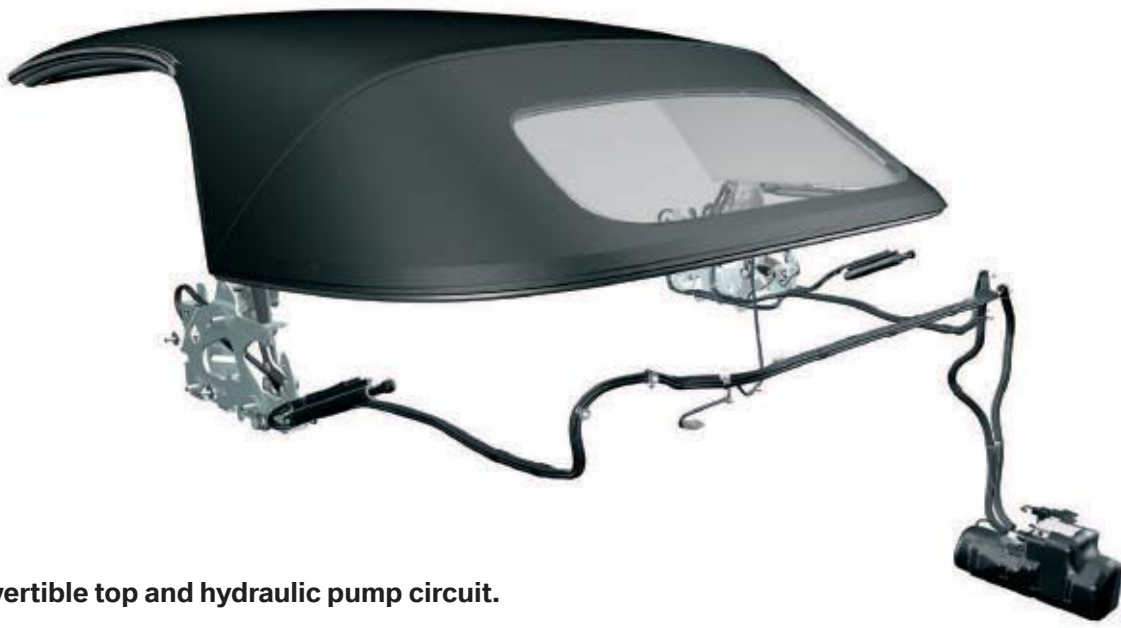
Convertible Top

The electrohydraulic convertible top can be opened and closed fully automatically.

Opening or closing the convertible top takes approximately 22 seconds. If necessary it may also be activated when moving at low speeds (up to 40 km/h or 25mph).

This involves moving the convertible top by means of a hydraulic cylinders. An electric motor unlocks the convertible top from and locks it to the windshield cowl.

After it has opened, the convertible top is stored in the top storage compartment. The top storage compartment lid then closes automatically. The convertible top can be operated via 2 buttons in the center console switch cluster.



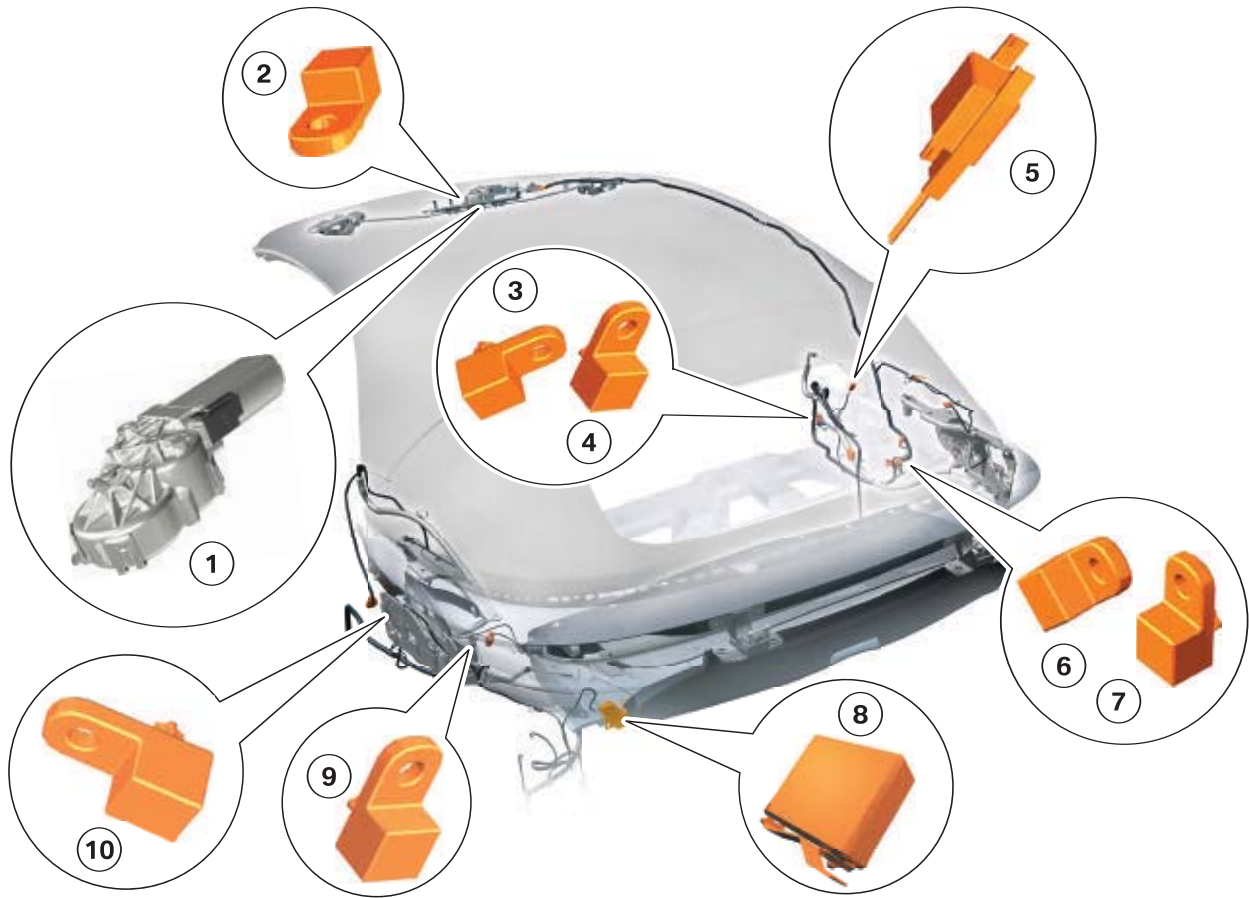
Convertible top and hydraulic pump circuit.

Position Sensors and Microswitches

The sensors for the convertible top module (CVM) are composed of:

- 8 Hall sensors supply signals to the convertible top module (CVM). The CVM monitors these sensors and determines the position of the convertible top.
- 1 microswitch to determine trunk partition position.
- 1 incremental sensor is a magneto resistive sensor mounted on the locking motor and monitors the locking mechanisms position.

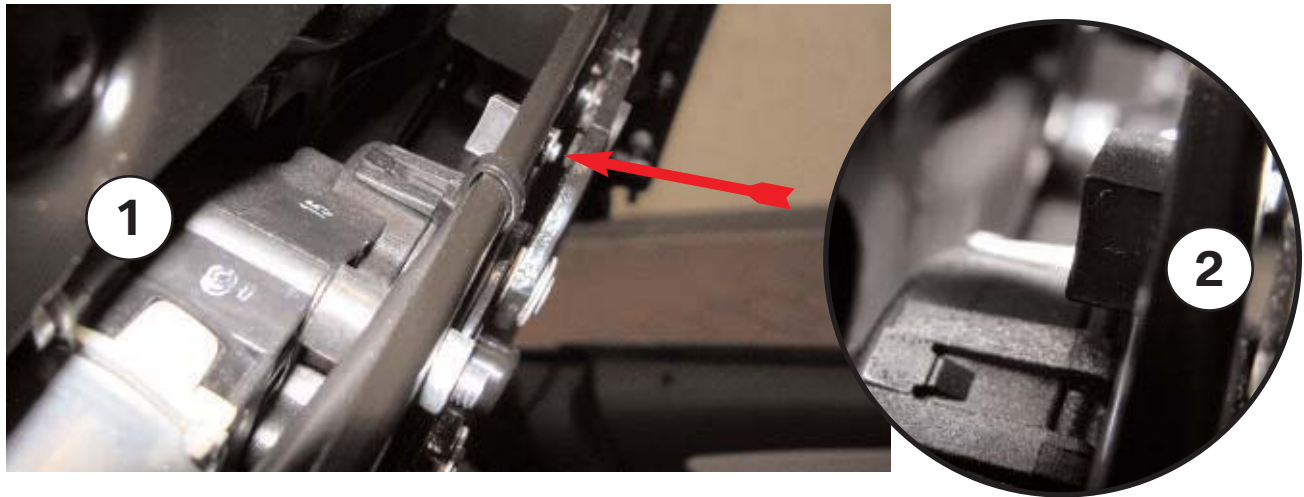
Convertible top position sensor component location



Index	Explanation	Index	Explanation
1	Incremental sensor in the drive unit for the windshield cowl locking system	6	Hall sensor, main pillar raised
2	Hall sensor, windshield cow panel locked	7	Hall sensor, main pillar stowed
3	Hall sensor, roll bar stowed	8	Switch for the trunk partition
4	Hall sensor, roll bar raised or "Clamping bar positioned"	9	Hall sensor, Top storage compartment lid opened
5	Hall sensor, roll bar unclamped	10	Hall sensor, top storage compartment lid locked

■ **Incremental Sensor**

The incremental sensor #1 is integrated into the drive unit for the convertible top locking mechanism. The incremental sensor monitors the revolutions of the drive unit by monitoring motor position and the locking system linkage and the different states are identified, closed, intermediate and open positions.

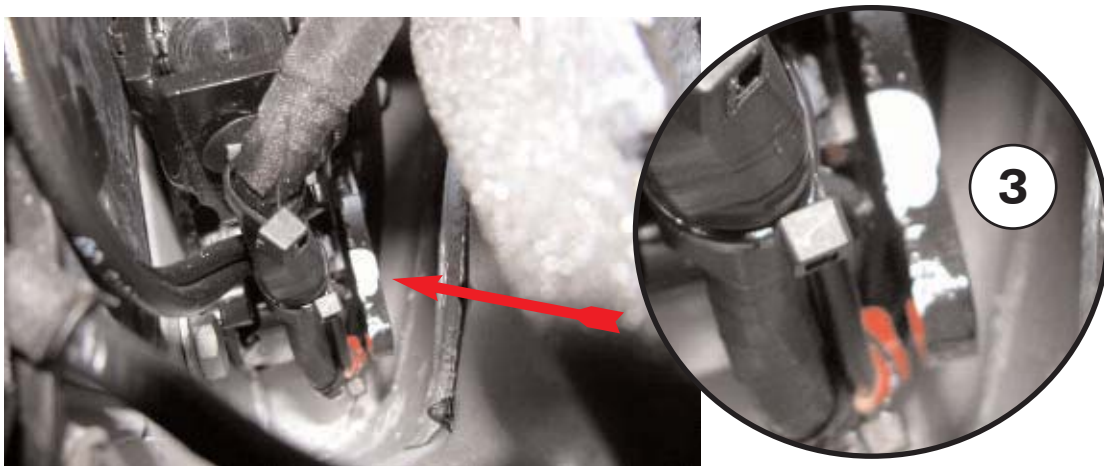


■ **Hall Sensor #2**

Indicates when the windshield cowl is locked, located next to cowl locking motor.

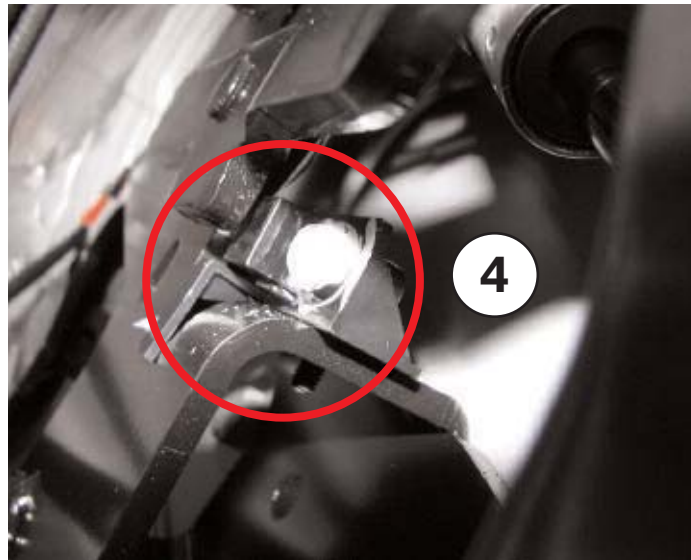
■ **Hall Sensor #3**

Signals the position of the “Main Pillar Stowed” and is located on the lower right side bracket of top linkage/mechanism.



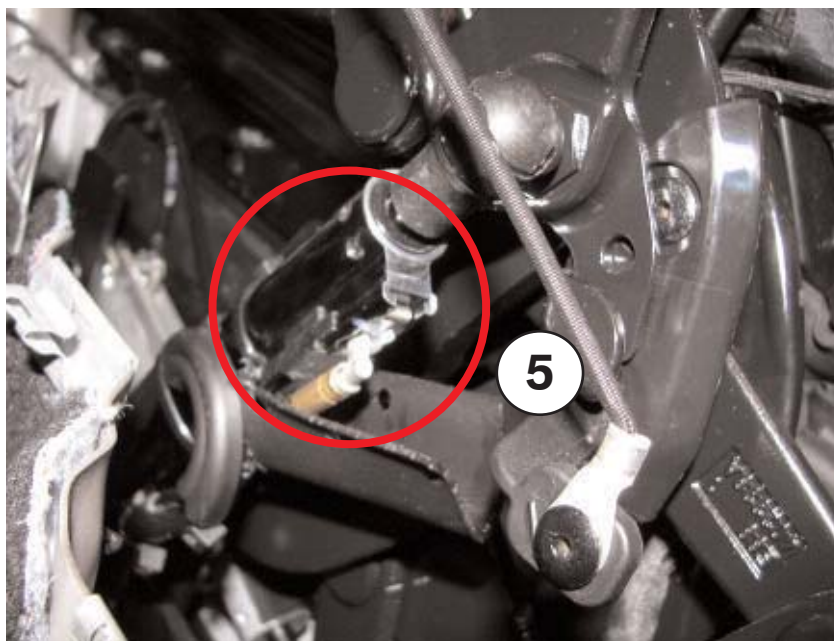
■ **Hall Sensor #4**

Measures the Roll Bar in its most vertical position referred to as “Clamping Bar Positioned” in the current diagnostic equipment software version. It is located right side bracket of top linkage/mechanism (mid bracket).



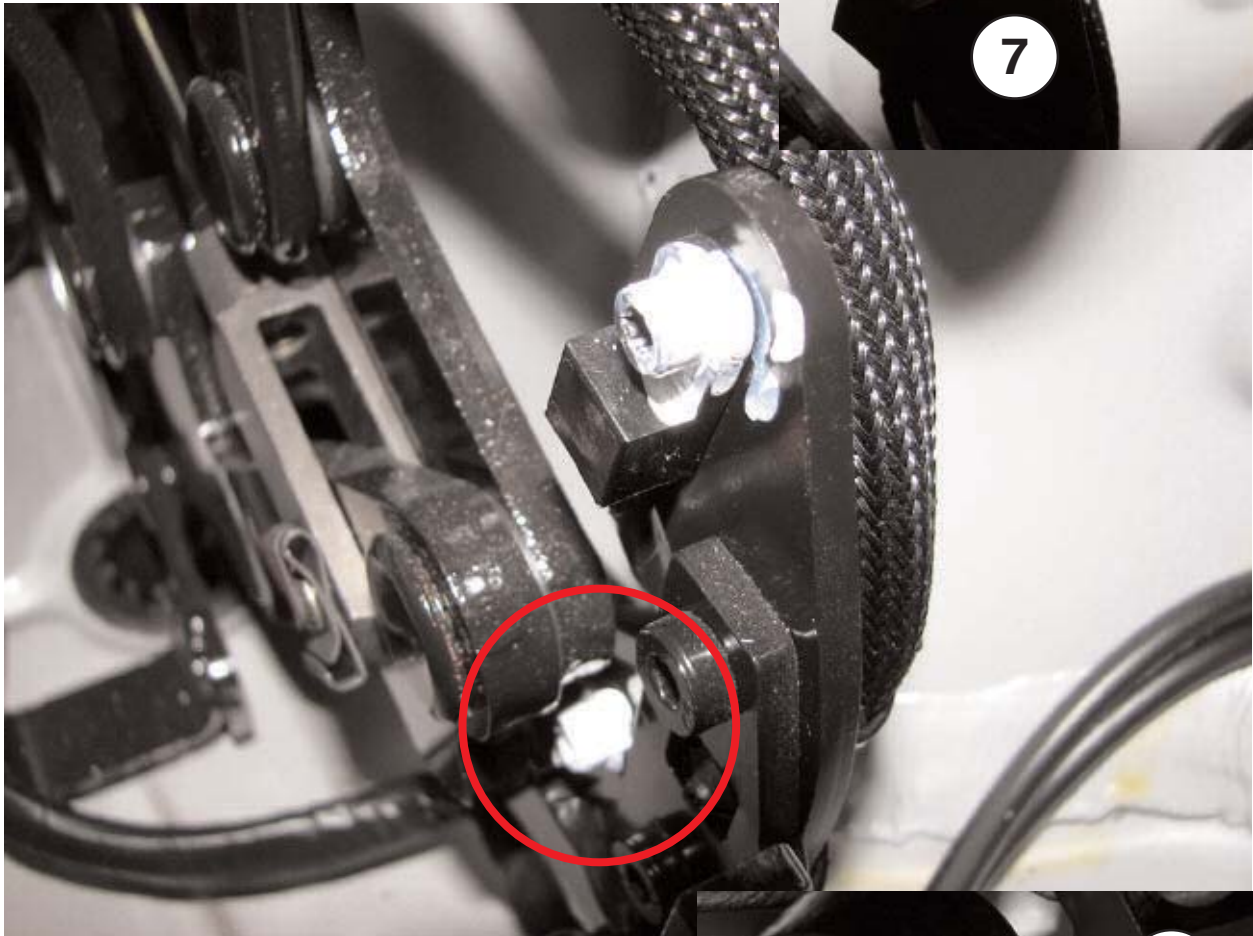
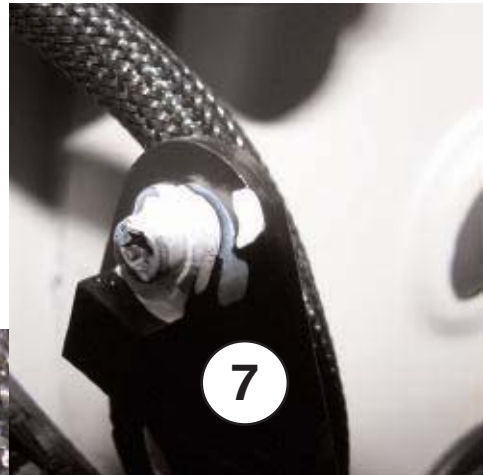
■ **Hall Sensor #5**

Measures the position of the top extending piston actuator which is labeled as “Roll Bar Unclamped” in the diagnostic equipment. Located on the right side top unfolding piston actuator under a plastic cover.



■ **Hall Sensor #7**

Signals “Main Pillar Stowed” and is located on the rear of the right side bracket of top linkage/mechanism (upper most sensor).



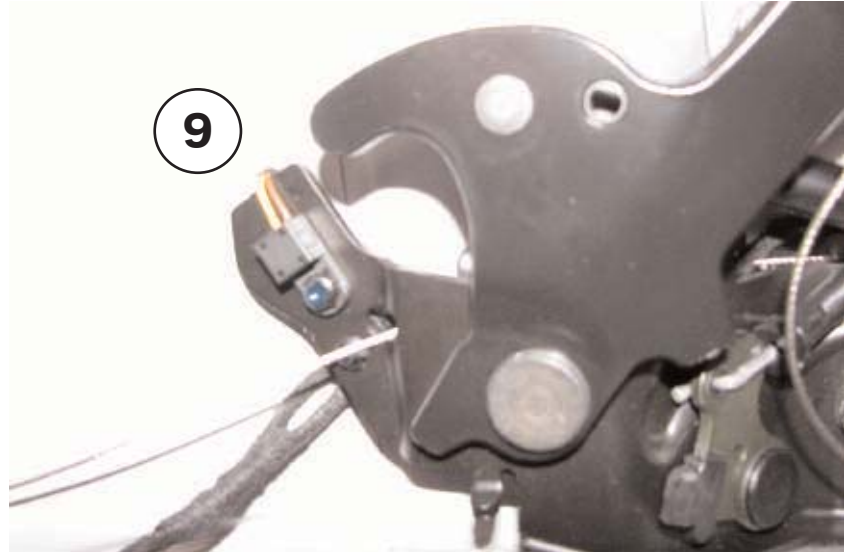
■ **Hall Sensor #6**

Signals “Main Pillar Position” and is located on the rear of the right side bracket of top linkage/mechanism (lower most sensor).



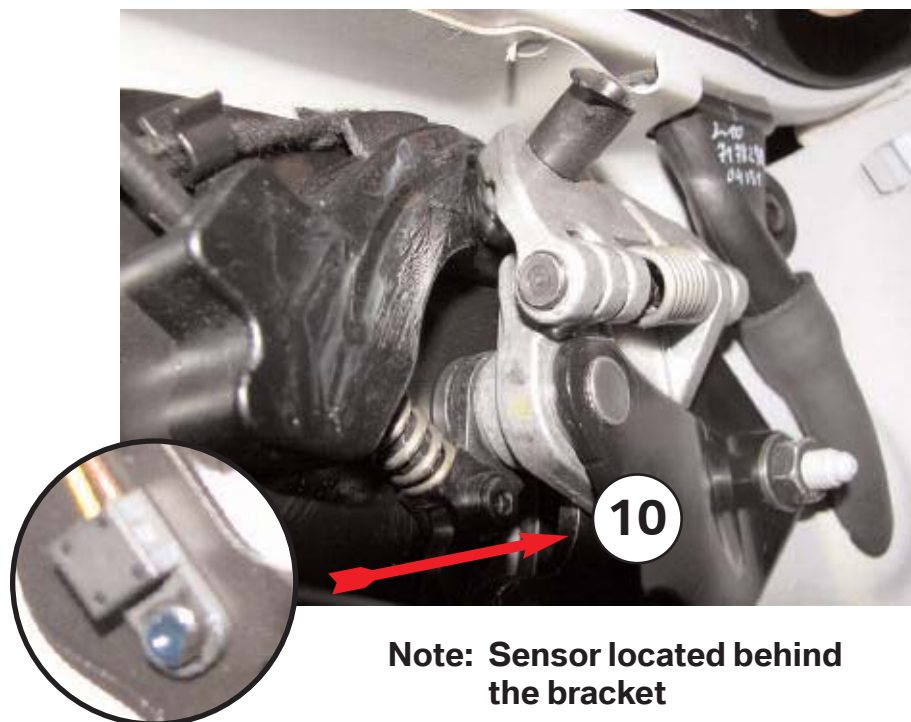
■ **Hall Sensor #9**

Signals “Convertible Top Compartment Lid Opened” and is located on the rear of the left top lid hinge bracket shown here.



■ **Hall Sensor #10**

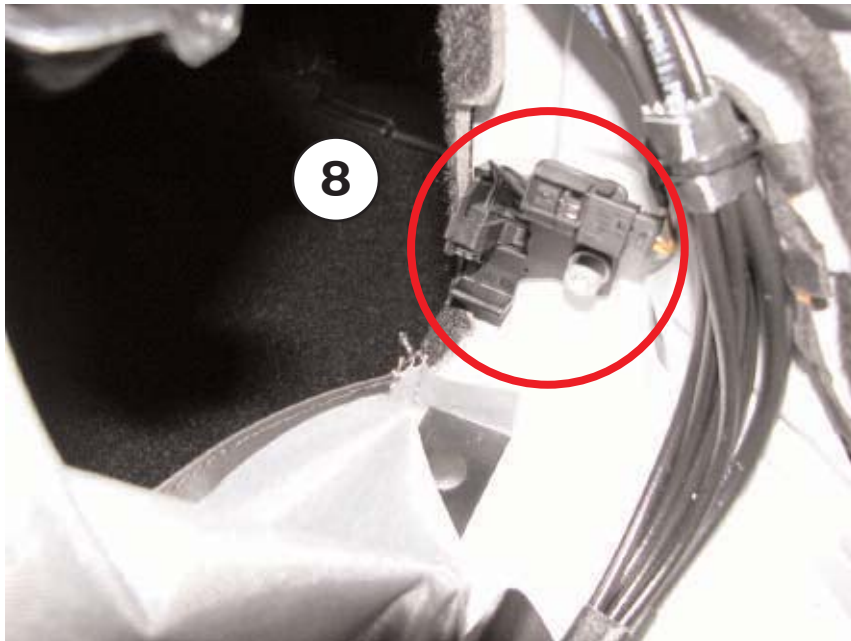
Signals when the “Convertible Top Compartment Lid Locked” and is located on the front of the left hinge behind the top lid locking mechanism.



Note: Sensor located behind the bracket

■ Trunk Partition Microswitch #8

This microswitch #8 ensures that the trunk partition has been lowered. With the trunk partition lowered, the microswitch is connected to ground. If this condition is not fulfilled, the convertible top does not open (disabling condition). Located on the left side trunk partition catch.



Note: No short circuit recognition.

The convertible top module (CVM) will not recognize a short circuit of the wire to the microswitch for the detection of the trunk partition.

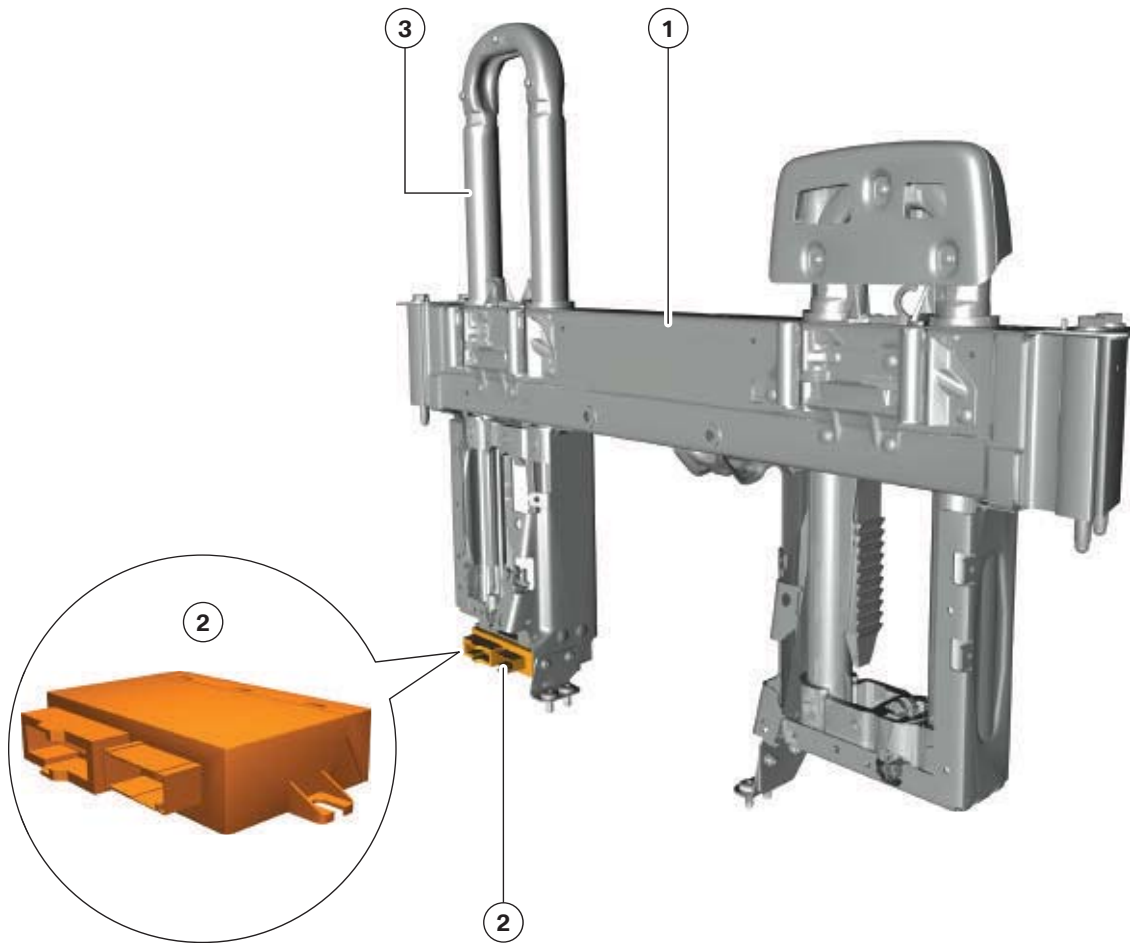
Note: When diagnosing and servicing the convertible top, please be aware that the terminology may vary between the training material, repair instructions and diagnostic software version used.

Convertible Top Module (CVM)

The convertible top module (CVM) controls all the electrical and hydraulic functions of the convertible top. The convertible top module is connected to the K-CAN.

The convertible top module is fitted to the partition wall module. Under certain inhibition conditions, the CVM will not activate the convertible top (see system functions, prerequisites for opening and closing the top).

Installation location for the convertible top module



Index	Explanation	Index	Explanation
1	Rollover protection system	3	Roll bar (extended)
2	Convertible top module (CVM)		

Controls for Operation

The center console switch cluster has 2 buttons for operating the convertible top (Open convertible top and Close convertible top). The center console switch cluster (SZM) is connected to the heating/air conditioning controls module.

Above the two buttons there are a red and a green function LEDs. These LEDs are controlled by the convertible top module (CVM) via the K-CAN. The green LED lights up while the convertible top is moving. The red LED starts to flash if the convertible top or the top storage compartment lid is not located securely in their end position when the button is released.

The flashing red LED does not denote a fault. The flashing LED is intended to draw attention to the fact that the vehicle should not be driven in this state.

When the convertible top is opened by pressing the button, and there is a disabling condition (like, the trunk partition not lowered) the red LED lights up to signal the fault.

The two control buttons are each equipped with 2 double contacts (normally open contact against ground). A wire leads directly to the CVM and reports a general operation request. The second wire reports the direction to the control unit for the heating/air conditioning system (IHKA). The signal is then transmitted to the CVM via the K-CAN.

The execution of an operation request takes place after a time delay. If the button is released during the operation, the convertible top or side window movement stops immediately.

Location of the control buttons for the convertible top

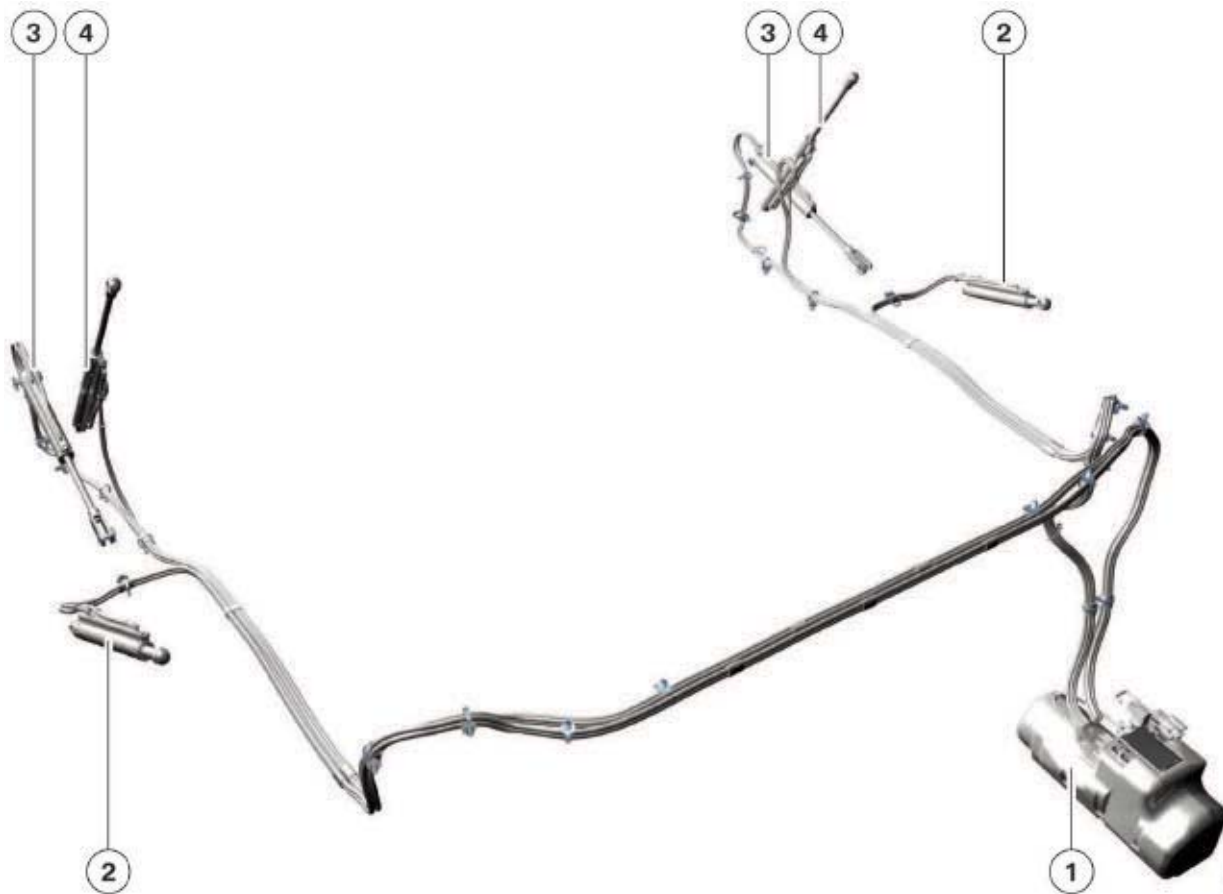


Convertible Top Hydraulic Circuit Components

The convertible top hydraulic control unit consists of the electric motor with hydraulic pump, fluid reservoir, valve block and relays. The hydraulic control unit powers all the movements of the convertible top using 3 cylinder pairs.

Each cylinder pair controls either:

- the convertible top main pillars
- the convertible top roll bar
- the top storage compartment cover or (lid).



Index	Explanation	Index	Explanation
1	Hydraulic control unit	3	Cylinder pair for the top storage compartment lid
2	Cylinder pair for the main pillars	4	Cylinder pair for the roll bar

■ Electrical Hydraulic Control Unit

The direction of movement of the convertible top (OPEN or CLOSE) is controlled by 2 relays.

The cylinders are supplied with oil by a hydraulic pump with 3 valves and with 2 directions of flow. A change in direction by the hydraulic pump determines the direction of movement of the pistons/rams.

The hydraulic pump with a maximum of 200 bar is integrated into the hydraulic control unit. The two relays and the 3 hydraulic valves for hydraulic control are also integrated into the hydraulic control unit.

The hydraulic control unit circuit is safeguarded with a slow-acting fuse rated at 50 amp. fuse. To protect the hydraulic control unit, a "pump protection feature" is resident in convertible top module (CVM).



Hydraulic Control Unit



The hydraulic pump is only operational while the convertible top is in motion. Should the pump fail, emergency operation will be necessary.

The hydraulic control unit is installed in the right side of the luggage compartment. It has been placed in the furthest point possible from the driver in order to minimize the sound being transmitted into the passenger compartment by the pump during operation.

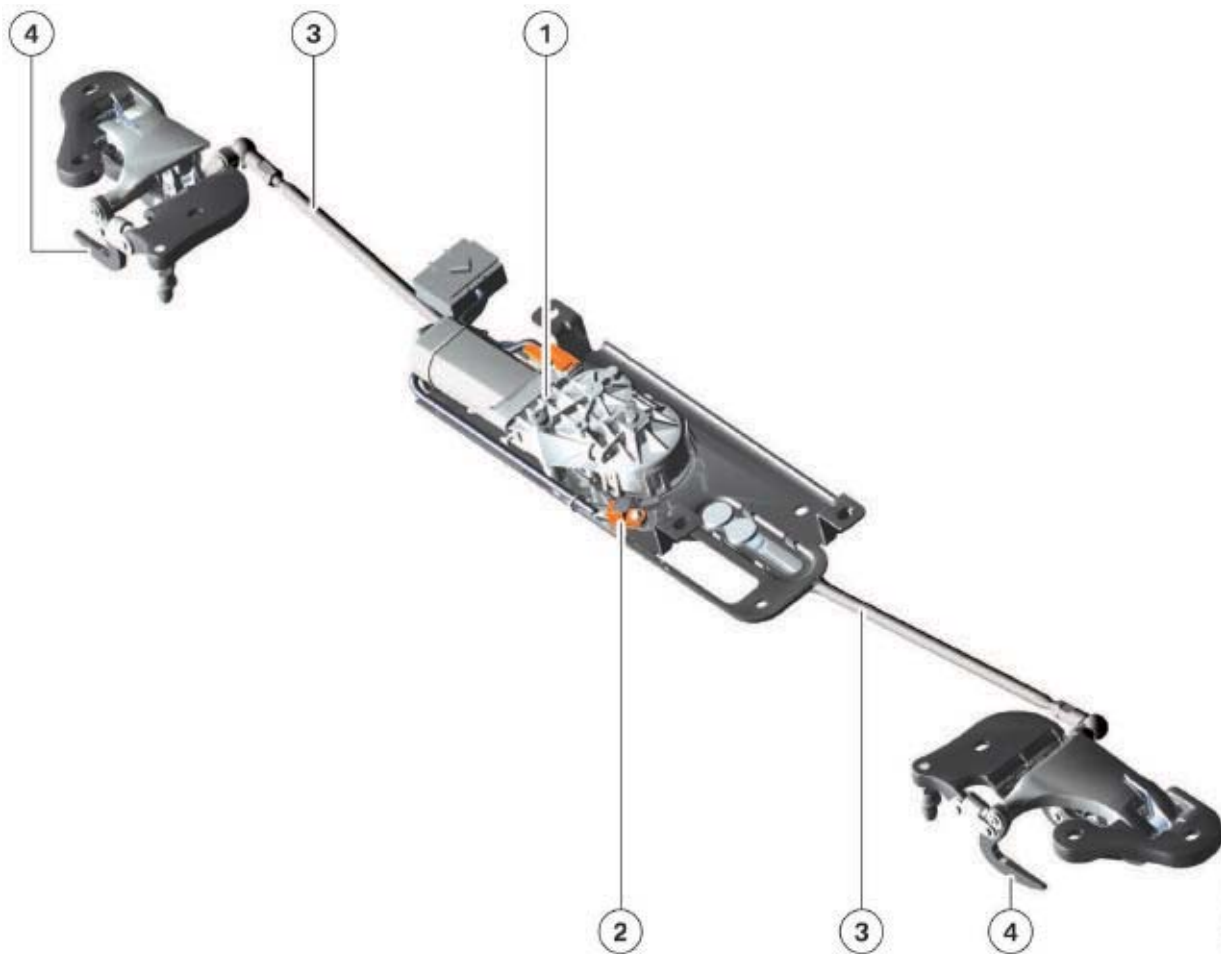


Index	Explanation	Index	Explanation
1	Trunk side member	2	Hydraulic control unit

Windshield Cowl Locking System

A geared electric motor locks and unlocks the convertible top to and from the windshield cowl on the top of the windshield frame. The convertible top module (CVM) actuates the drive unit.

The drive unit is located in the center of the cowl locking system. The right and left side catches are moved via a disc and 2 thrust rods. The Hall sensor for the (windshield cowl locked) monitors the locking system.



Index	Explanation	Index	Explanation
1	Drive unit for windshield cowl locking system	3	Thrust rods
2	Hall sensor, for windshield cowl locked	4	Catches

The following control modules also contribute to the operation of the convertible top:

- **Instrument cluster (KOMBI)**

The instrument cluster supplies an outside temperature reading (bus signal) and indicates the Check Control messages regarding the convertible top using Check Control symbols.

- **Footwell module (FRM)**

The footwell module (FRM) controls the front power windows. To open the convertible top, the side windows must be opened (bus signal from the CVM).

- **Junction box electronics (JBE)**

The junction box electronics (JBE) control the rear power windows. To open the convertible top, the side windows must be opened (bus signal from the CVM).

The junction box electronics supply a signal to indicate whether the trunk lid is closed (bus signal).

The distribution box in the junction box supplies the convertible top module (CVM) via terminal 30g.

The CVM is supplied via terminal 15 of the Car Access System (CAS). If, for example, the junction box power supply is interrupted, sufficient communication is still possible with the BMW diagnostic system.

- **Car Access System (CAS)**

The CAS stores the power window position or status and makes that information available to the CVM control module.

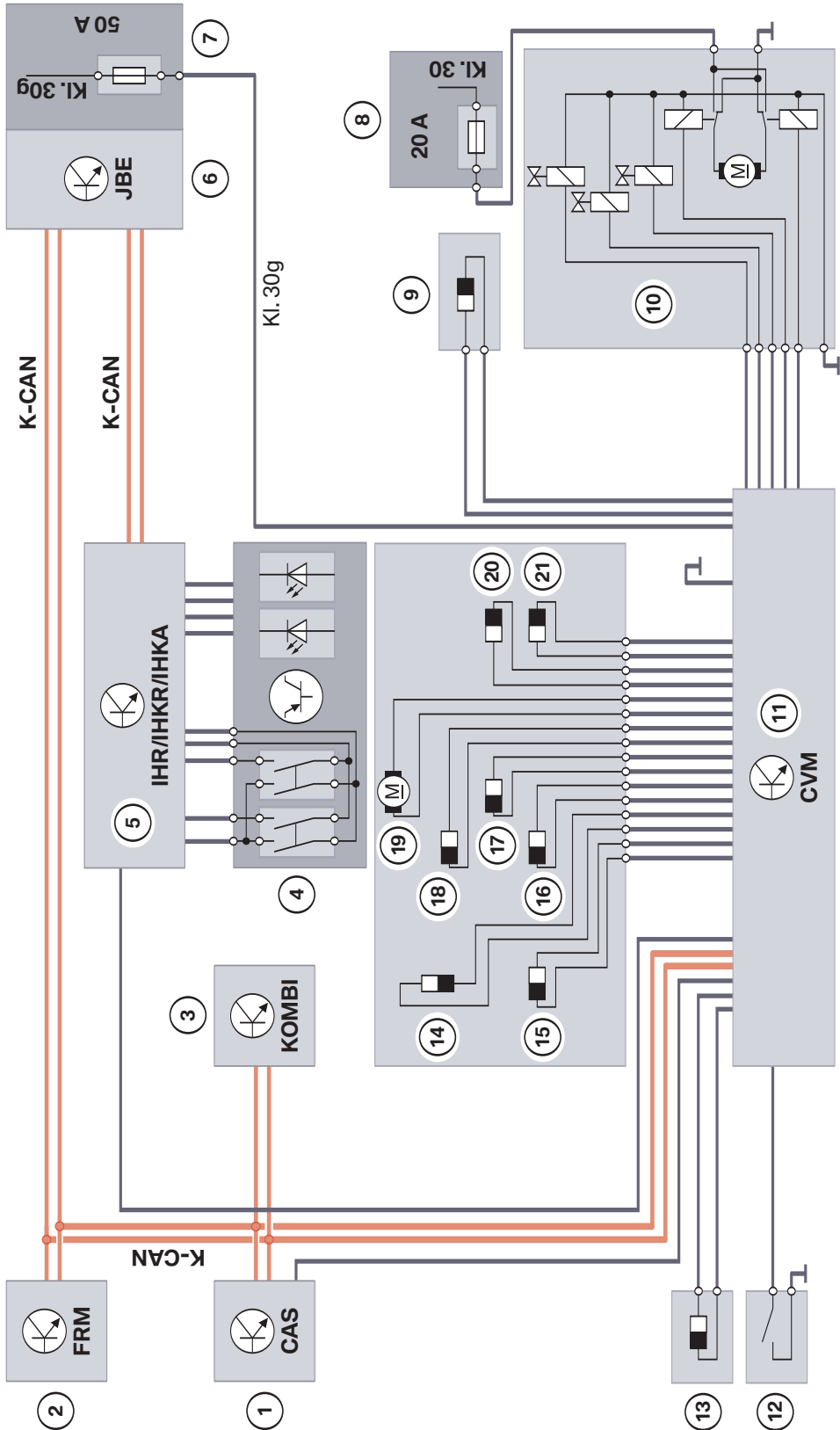
Following a request from the CVM, the CAS controls the opening and closing of the side windows. The CAS prevents the trunk lid from opening and any movement of the power windows when the convertible top is in an intermediate position.

The Car Access System (CAS) controls comfort opening of the convertible top.

The signals from the remote control are received by the FBD receiver and passed on to the CAS.

Comfort opening and comfort closing are controlled via the lock and key in the driver's door: The CAS receives this signal from the footwell module (FRM).

Convertible top system circuit diagram



Convertible top system circuit diagram legend

Index	Explanation	Index	Explanation
1	Car Access System (CAS)	12	Switch for the trunk partition
2	Footwell module (FRM)	13	Hall sensor, convertible top storage compartment lid open
3	Instrument cluster (KOMBI)	14	Hall sensor, windshield cowl locked
4	Center console switch cluster (SZM)	15	Hall sensor, roll bar unclamped
5	IHKA control module	16	Hall sensor, roll bar positioned/raised
6	Junction box electronics (JBE)	17	Hall sensor, roll bar stowed
7	Power distribution box in junction box	18	Incremental sensor
8	Rear distribution box	19	Drive unit for the windshield cowl locking system
9	Hall sensor, convertible top storage compartment lid locked	20	Hall sensor, main pillar raised
10	Hydraulic control unit	21	Hall sensor, main pillar stowed
11	Convertible top module (CVM)		

System Functions

The system functions for the automatic convertible top are:

- Opening and closing the convertible top
- Comfort operation
- Check Control messages

Prerequisites for Opening and Closing the Top

In order to open and close the convertible top, the following conditions must be fulfilled:

- Terminal R ON
- Outside temperature above -12°C
- Trunk lid closed
- Speed lower than 40 km/h, (25mph)
 - Speed lower than 50 km/h (31mph)
 - The convertible top is allowed to finish opening or closing until it reaches its end position.
 - Speed above 50 km/h (31mph)
 - The convertible top does not move.
 - Speed above 70 km/h (44mph)
 - Fault code memory entry A69A (Speed not permissible in current convertible top position).
- Trunk partition lowered
- Battery voltage greater than 11.5 Volts
- Less than 5 opening and closing actions in succession (pump protection feature)
- The CAS must allow top operation. (*example: window status, terminal status*)

Top Opening Sequence

Automatic top opening proceeds as follows:

- Side windows are opened (if closed or in an intermediate position)
- Convertible top is unlocked from the windshield cowl
- Rear-window heater is switched off (via the junction box electronics)
- Top storage compartment lid is unlocked and opened
- Convertible top is stored in the top storage compartment
- Catches on the windshield cowl are locked
- Top storage compartment lid is closed and locked
- Side windows are returned to their initial position.

Note: Automatic closing of the convertible top occurs in the reverse sequence.

Comfort Operation

The convertible top can be operated using the remote control and via the mechanical key and the door lock. (Windows also operate)

On vehicles with the "Comfort Access" option, the convertible top can be opened and closed using the ID transmitter. (Windows also operate)

In the US the conditions for operation using the remote control or ID transmitter.

The Comfort Access conditions are:

- Top OPEN: only if the ID transmitters less than 4 m away
- Top CLOSE: only if the ID transmitter is less than 4 m away

Check Control Messages

Under certain circumstances it may not be possible to open or close the convertible top. The appropriate Check Control messages will be displayed in the instrument cluster.

On vehicles with a Central Information Display (CID), a text-based message and accompanying instructions are displayed.

The Check Control messages provide a more detailed explanation of the red LED on the button, which lights up in the case of a fault.

Once a Check Control message is activated, it is displayed every 5 seconds.



Index	Color	Check Control message	Accompanying information
1	Yellow	Trunk open	
2	Yellow	Trunk partition	<ul style="list-style-type: none"> - Trunk partition - Movement of the convertible top is not possible. - Move the trunk partition into the required position; see the Owner's Manual.
		Convertible top! Slow down!	<ul style="list-style-type: none"> - Convertible top - Speed for convertible top operation exceeded. - Reduce speed and proceed with top operation.
		Convertible top! Emergency operation	<ul style="list-style-type: none"> - Convertible top - Convertible top control failure. - For information on convertible top emergency operation, see Owner's Manual.
		Convertible top drive unit overheated	<ul style="list-style-type: none"> - Convertible top operation - Convertible top drive unit overheated
		Convertible top operation not possible	<ul style="list-style-type: none"> - Convertible top operation - Convertible top temporarily out of action. See Owner's Manual for possible causes.

Index	Color	Check Control Message	Accompanying Information
3	Red	Convertible top not locked	<ul style="list-style-type: none"> - Convertible top - Automatic locking interrupted. See the Owner's Manual for how to lock the convertible top. - Have the problem checked by your BMW Service.
		Convertible top control failure	<ul style="list-style-type: none"> - Convertible top control failure - Convertible top position and locking status cannot be detected. - If the convertible top locks securely in place, you may continue driving. - For information on inspecting the locking system, see the Owner's Manual.
		Convertible top not locked	<ul style="list-style-type: none"> - Convertible top - Convertible top not locked First open or close the convertible then continue your journey.

Note: The terminology may differ from what you see here and the wordage used in the diagnostic equipment and or repair instructions.

Service Information

Service Notes

Consider the following helpful hints when servicing the E88 top:

- The rear power windows do not have an anti-trap mechanism. There is no one-touch control function for closing the rear windows.
- No comfort closing from the outside door handle electronics.

On vehicles with Comfort Access, comfort closing cannot be activated from the outside door handle electronics. Comfort closing is performed by the driver's door lock and key.
- Maintenance-free hydraulic fluid.

Changing the hydraulic fluid is not necessary. If hydraulic fluid needs to be added to the system due to leaks, only the approved hydraulic fluid may be used. (See operating fluids in TIS). The hydraulic fluid must be filled up only to the mark on the fluid reservoir.
- The hydraulic system is self-bleeding.
- The convertible top Hydraulic unit and its mechanism are replaced as a complete assembly.

Diagnostic Notes

Consider the following helpful hints when diagnosing the E88 top:

- When working on the rollover protection system, if rollover protection is to be triggered by the diagnostic system or manually by the technician, **the convertible top must first be opened**. Otherwise the convertible top will be damaged. This also applies to mechanical activation of the roll over system.
- Particular characteristics of the open and close convertible top buttons.
 - Terminal R ON while the button is being pressed.
 - After top operation is complete, press and hold the button for longer than 20 seconds.

A fault code memory entry may occur due to operator error: example: if the front passenger presses to open convertible top and the driver switches Terminal R ON. In this case, the fault code is saved as "not present".

In the event that the "convertible top is temporarily out of action" message is displayed, the system will reset after the top has been opened or closed using the button. The top will then again be functional.

Encoding/Programming Notes

After replacement, the convertible top module (CVM) must be re-encoded.

Window Adjustments

The windows on the E88 don't have to be initialized, but they do need to be adjusted to the body to prevent rattles, wind noises and vibrations as well as water leaks.

Note: Special tools are needed to perform the window adjustment procedure. Please refer to the repair instructions in TIS for the most up to date window adjustment information and a list of special tools needed to perform the procedure.

Positions for the Convertible Top Diagnosis

The automatic convertible top has 10 sensors in all:

- 8 Hall sensors
- 1 microswitch
- 1 incremental sensor

These sensors detect the different positions of the convertible top as it is opening and closing. In order to pinpoint faults, the system must be aware of which intermediate position the convertible top is in. This helps in diagnosing the system by pinpointing the faulty component or verifying the fault code present.

Note: The following pages show the diagnostic equipment in Control Module Functions, to monitor sensor position and activity of the convertible top as it is operated and stopped in pre-determined positions. Pay close attention to the terminology and the proper position of the top as you perform diagnosis.

Convertible top open and stored in the luggage compartment



Sensor	State
Hall sensor, main pillar positioned	no
Hall sensor, main pillar stowed	yes
Hall sensor, roll bar unclamped	no
Hall sensor, clamping bar in position (roll bar raised)	no
Hall sensor, roll bar stowed	no
Hall sensor, windnield cowl panel closed	no
Incremental sensor, windnield cowl locking system motor position	Lock opened
Hall sensor, convertible top storage compartment lid locked	yes
Hall sensor, convertible top storage compartment lid open	no
Microswitch, Trunk partition down position	yes

Roof storage compartment lid open



Sensor	State
Hall sensor, main pillar positioned	no
Hall sensor, main pillar stowed	yes
Hall sensor, roll bar unclamped	no
Hall sensor, clamping bar in position (roll bar raised)	no
Hall sensor, roll bar stowed	no
Hall sensor, windnield cowl panel closed	no
Incremental sensor, windnield cowl locking system motor position	Lock opened
Hall sensor, convertible top storage compartment lid locked	no
Hall sensor, convertible top storage compartment lid open	yes
Microswitch, Trunk partition down position	yes

Convertible top intermediate position and top storage compartment lid open



Sensor	State
Hall sensor, main pillar positioned	yes
Hall sensor, main pillar stowed	no
Hall sensor, roll bar unclamped	no
Hall sensor, clamping bar in position (roll bar raised)	yes
Hall sensor, roll bar stowed	no
Hall sensor, windnield cowl panel closed	no
Incremental sensor, windnield cowl locking system motor position	Lock opened
Hall sensor, convertible top storage compartment lid locked	no
Hall sensor, convertible top storage compartment lid open	yes
Microswitch, Trunk partition down position	yes

Convertible roof intermediate position and roof storage compartment lid closed



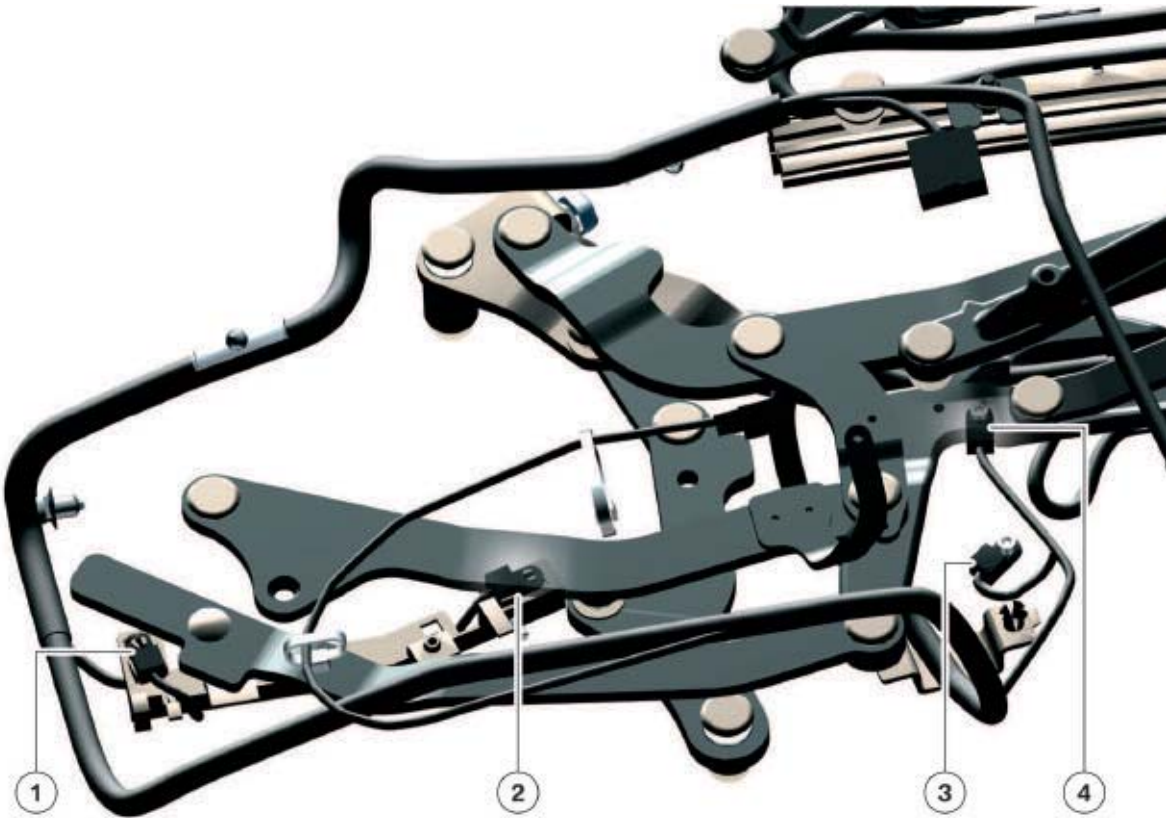
Sensor	State
Hall sensor, main pillar positioned	yes
Hall sensor, main pillar stowed	no
Hall sensor, roll bar unclamped	no
Hall sensor, clamping bar in position (roll bar raised)	yes
Hall sensor, roll bar stowed	no
Hall sensor, windnield cowl panel closed	no
Incremental sensor, windnield cowl locking system motor position	Lock opened
Hall sensor, convertible top storage compartment lid locked	yes
Hall sensor, convertible top storage compartment lid open	no
Microswitch, Trunk partition down position	yes

Convertible roof closed



Sensor	State
Hall sensor, main pillar positioned	yes
Hall sensor, main pillar stowed	no
Hall sensor, roll bar unclamped	yes
Hall sensor, clamping bar in position (roll bar raised)	no
Hall sensor, roll bar stowed	yes
Hall sensor, windnield cowl panel closed	yes
Incremental sensor, windnield cowl locking system motor position	Lock closed
Hall sensor, convertible top storage compartment lid locked	yes
Hall sensor, convertible top storage compartment lid open	no
Microswitch, Trunk partition down position	yes

Hall sensor installation locations



Index	Explanation	Index	Explanation
1	Hall sensors roll bar stowed	3	Hall sensors main pillar positioned (raised)
2	Hall sensors roll bar positioned (raised)	4	Hall sensors main pillar stowed

Emergency Operation

To activate the convertible top in an emergency, the following tools are required:

- Allen key
- Thin slotted screwdriver

These tools can be found in the tool kit located in the luggage compartment of the vehicle.

CAUTION!!! Closing the top in an emergency must be performed by two people.

Note: The vehicle must be in KL0 to perform the emergency operation and you must first lower all the side windows.

First step is to release the convertible top storage compartment lid:

1. Open the trunk lid.
2. To release the top storage compartment lid, detach the pull knobs for the Bowden cables from the luggage compartment lining, on the right and left side.



3. Pull the pull left and right knobs towards the rear of the vehicle until resistance is detected (as illustrated to the left).

Note: The convertible top storage compartment lid is fully unlocked and it can now be manually lifted.

4. Close the trunk lid.



Proceed to open the convertible top storage compartment lid:

5. Push the sliding trim cover (1) forward.
6. Reach underneath the top storage compartment lid in the area (2) indicated and lift it open slowly and smoothly.



CAUTION!!!

Once opened, the convertible top storage compartment lid must be held at all times, as it could otherwise close on its own and may cause injury.

CAUTION!!!

Before lifting the convertible top, make a visual inspection to ensure that the locking pin is not incorrectly positioned, either on the left or right-hand side.

(Only the left side locking pin is visible in the image)



If one or both locking pins are incorrectly positioned, proceed as follows:

1. Close the top storage compartment lid again until you hear the locking pin(s) fold back (approximately to the position illustrated).

CAUTION!!!

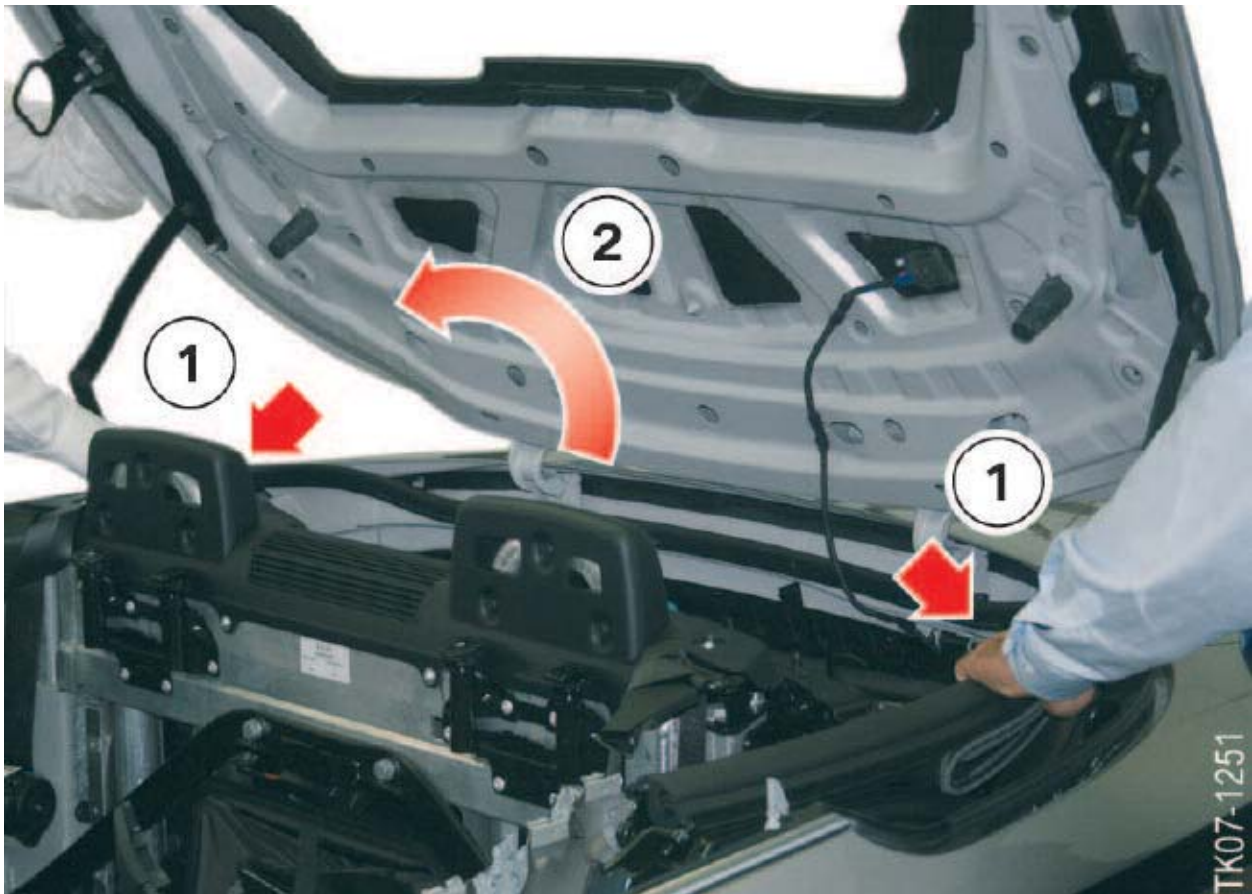
Do not fully close the top storage compartment lid.

2. Fully open the top storage compartment lid again and make another visual inspection of the locking pins.



To manually close the convertible top:

1. With the help of a second person, reach under the top edge in the area indicated (on the left and right-hand side).
2. Lift the convertible top up and out of the top storage compartment.



3. Open the convertible top as far as the position illustrated.

4. Lift the roll bar into an upright position.

CAUTION!!!

Once raised, the roll bar must be held at all times, as it could otherwise fall on its own and may cause injury.



1. Close the top storage compartment lid (be careful not to get trapped underneath).
2. Lay the roll bar down on the top storage compartment lid.

CAUTION!!!

After emergency operation of the convertible top, the top storage compartment lid is no longer locked. Seek the assistance of a BMW Center as soon as possible.



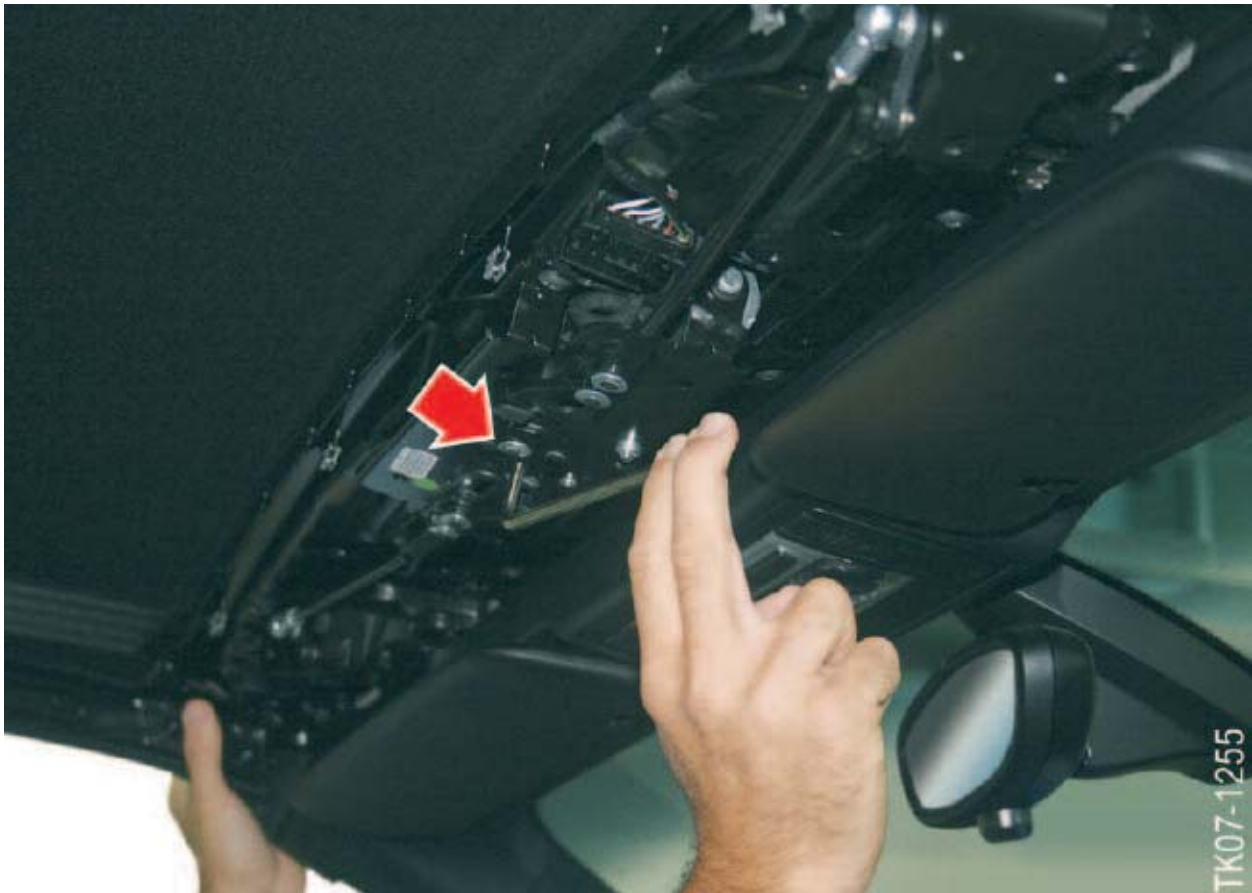
3. Press the edge of the top onto the fastener until it is lying flush. This automatically pulls the roll bar onto the top storage compartment lid.

To lock the convertible top to the edge of the windshield cowl:

1. Sit in one of the two front seats.
2. Pry the access cover flap for the locking screw out of the top edge trim using the small flat screwdriver.
3. Insert the Allen key from the on board tool kit into the bolt located underneath the access cover.



-
4. Turn the Allen bolt counterclockwise. This pulls the convertible top downward and locks it in place. If necessary, pull the convertible top downward while gently supporting it as to guide the locking mechanisms in place.
 5. Snap the plastic access cover back into place.
 6. Close all side windows.



The convertible top emergency closing procedure is complete.

Rollover Protection System

The design and function of the Rollover Protection System (ROC) is similar to the E93.

The ROC used in the 1 Series has been enhanced with the following features:

- Ski bag option with 380 mm through loading opening will accommodate 2 snowboards or 2 golf bags
- 8 kg lighter compared to the E46/C
- The use of function-inverted mechanisms is much more cost effective.

In the event of an impact, in which the vehicle rolls over, the roll bars extend in milliseconds and, together with the top frame, form a well protected area for the occupants.

Rollover protection system - front and rear view



Index	Explanation	Index	Explanation
1	Front view	2	Rear view

Partition wall module



Note: The mechanism of the rollover protection system may only be removed and fitted as a complete unit, as its part of the partition wall module. Individual mechanical components of the system may not be replaced separately.

Bus System Overview

Vehicle Systems Network

The vehicle electrical system on the E88 is very similar to that on the E93.

The E93/E88 vehicle electrical systems differ only slightly by the omission or addition of some control modules.

Changes to the K-CAN

The convertible Top module (CVM) controls the convertible Top operation.

The High-Beam Assistant is not offered on the E88, so the control unit for the High-Beam Assistant (FLA) has been omitted.

Changes to the MOST

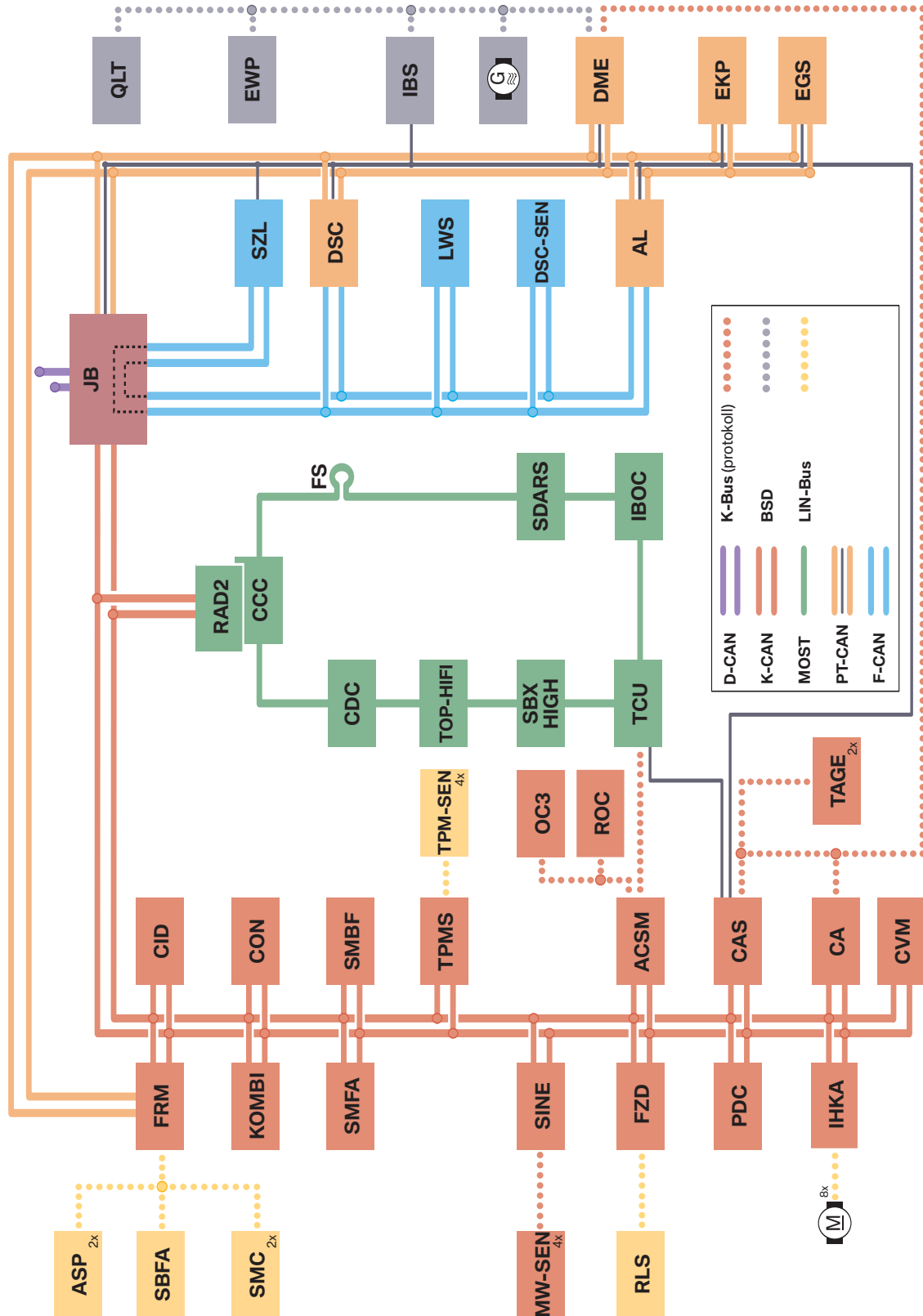
SBX High is offered along with the Telematics Control Unit (TCU). SBX High permits the connection of external devices such as mobile phones from various manufacturers and USB devices (MP3 players, USB sticks or iPods).

Changes to PT-CAN

The longitudinal dynamics management (LDM) and Active Cruise Control (ACC) functions are not offered in the E88.

Note: As on all current new BMW models D-CAN is incorporated to the bus system instead of D-bus to enhance communication on this line and comply with OBD regulations.

E88 Bus System Overview

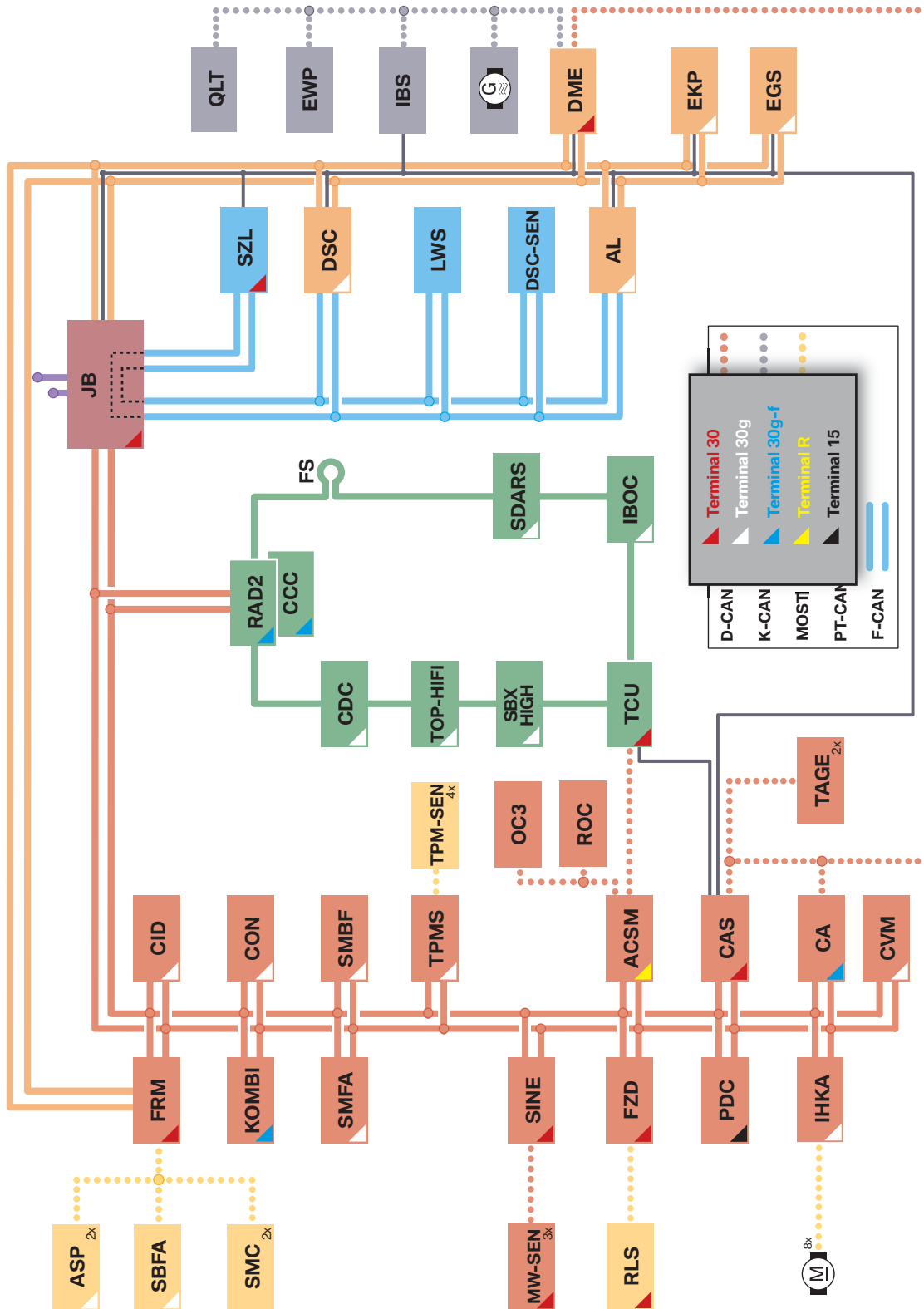


Index	Explanation	Index	Explanation
AL	Active steering system	KOMBI	Instrument cluster
ASP	Outside mirror	LWS	Steering angle sensor
CA	Comfort access	ACSM	Advanced crash and safety management
CAS	Car access system	OC3	Seat occupancy detection mat
CCC	Car communication computer	PDC	Park distance control
CDC	CD changer	QLT	Quality, level,temp, oil sensor
CID	Central information display	RAD	Radio 2
CON	Controller	RLS	Rain/driving light sensor
DME	Digital motor electronics	SBFA	Driver's door switch cluster
DSC	Dynamic stability control	SDARS	Satellite tuner
DSC-Sen	DSC sensor	SINE	Emergency current siren w/ tilt alarm sensor
EGS	Electronic transmission control unit	SMBF	Passenger's seat module
EKP	Electric fuel pump control unit	SMC	Stepper motor controller
EWP	Electric water pump	SMFA	Driver's seat module
FRM	Footwell module	Top-HiFi	Top-HiFi amplifier
FS	Most direct access	TPMS	Tire pressure monitoring system
FZD	Roof function center	TPM-sen	TPMS sensors X4
IBOC	In band on channel (digital radio)	SBX -H	Interface box
IBS	Intelligent battery sensor	MW-SEN	Micro wave sensors
IHKA	Automatic climate control	SZL	Steering column switch cluster
TCU	Telematics control unit	TAGE	Electric outer door handle module
JB	Junction box	CVM	Convertible roof module

The instrument cluster is supplied with power by terminal 30g_f.

The legends on the Bus overview also apply to the Bus overview with terminal status on the next page.

Terminal Status of the E88 (US variant)



General Vehicle Electrical System

Because the vehicle systems network in the E88 is the same as that in the E93, only new features and differences will be described here. For detailed information on the vehicles systems network , refer to ST701 training material.

Central Locking System

In contrast to the E93, in the E88 the glove compartment and the storage compartment in the center console are not locked/unlocked automatically.

Anti-theft Alarm System

The anti-theft alarm system in the E88 is similar to that in the E93 in terms of its basic functions and operation. There are some differences when it comes to interior monitoring.

Three microwave sensors are used on the E88 for the purpose of monitoring the interior. The microwave sensors are connected via the DWA bus to the SINE (siren with tilt alarm sensor). The DWA bus is a sub-bus based on the K-bus. SINE is the master control module and is connected directly to the K-CAN.

The microwave sensors facilitate monitoring of the vehicle interior also when the convertible top is down. The microwave sensors have a semicircular radiation range characteristic. By strategic placement in the vehicle, the entire interior can be monitored.

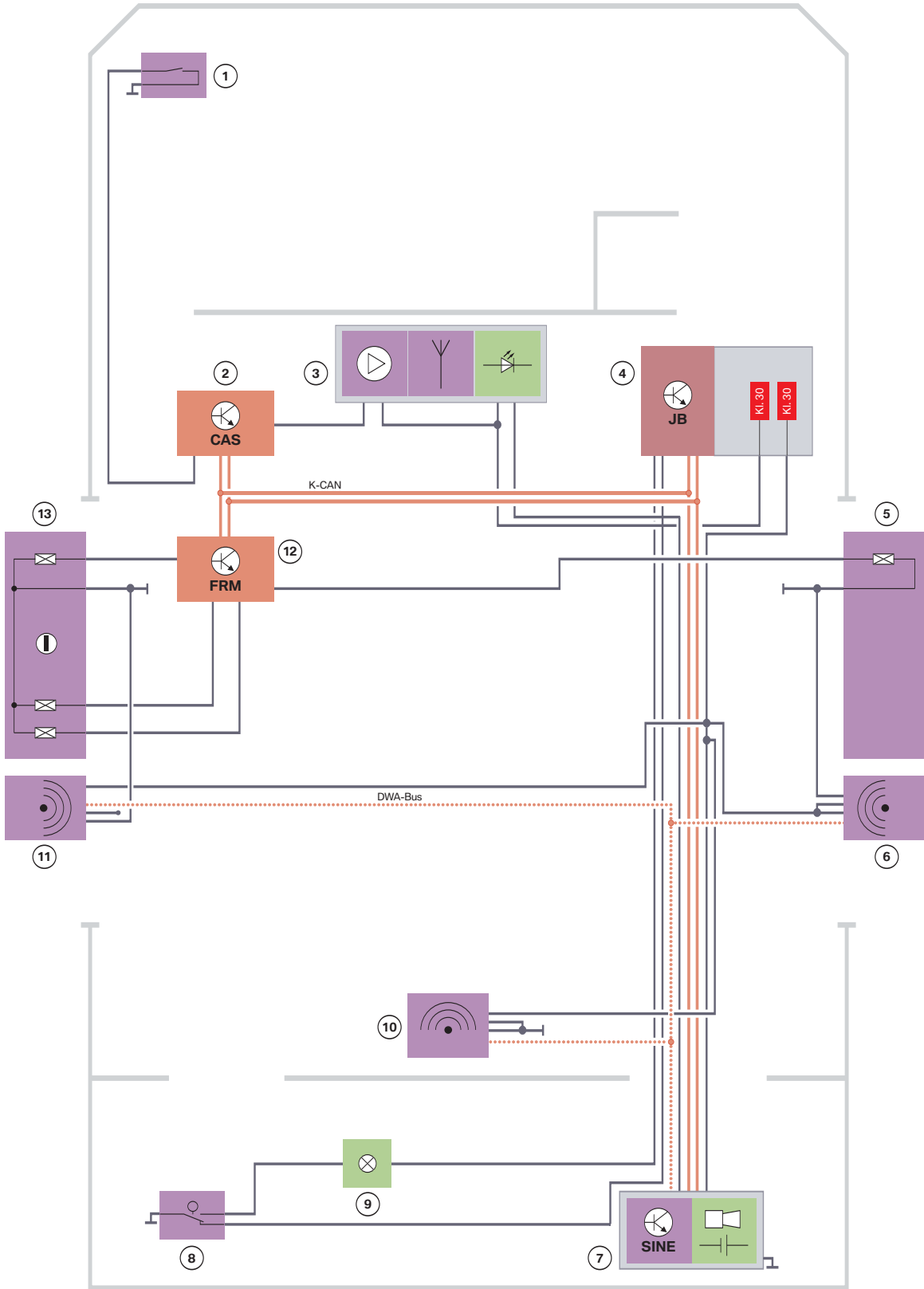
Interior monitoring with microwave sensors



Microwave Sensor



E88 Convertible anti-theft alarm system



Index	Explanation	Index	Explanation
1	Hood contact switch	8	trunk-lid contact switch
2	Car Access System	9	Luggage compartment light
3	Interior rear-view mirror with remote control receiver and DWA LED	10	Rear microwave sensor
4	Junction box	11	Microwave sensor, front left
5	Passenger's door contact	12	Footwell module
6	Microwave sensor, front right	13	Driver's door contact
7	Siren with tilt alarm sensor		

NOTES

PAGE

Audio and Communication Systems

USB/audio Interface

The USB/audio interface is available as an option. This interface can be used to connect external audio devices and storage media into the vehicle entertainment system via a USB interface.

If the vehicle is equipped with a center armrest, the external player can be stored in a special pocket on the underside of the armrest, where it is protected from damage.



USB/audio interface in the E88

Note: For more detailed information on the USB interface refer to the E82 reference material.

Antenna Systems

Since the standard locations for antennas on the roof of the vehicle or in the fixed rear window are not possible on the E88, the various antenna systems are integrated in various places around the vehicle.

Antennas are required for the following systems:

- Radio
- Digital receivers
- Navigation
- Telephone and telematics
- Remote control

AM/FM Antennas

Three FM antennas (FM1, FM2, FM3) and one AM antenna are switched via an FM diversity module and are used for radio reception in the E88.

The AM and FM1 antennas are integrated into the mast antenna. The FM2 and FM3 antennas are located under the rear bumper trim. The antenna amplifier for the FM2 and FM3 antennas are located in the diversity antenna module at the rear left of the luggage compartment.



Index	Explanation
1	Mast antenna (AM, FM1 and telephone antenna)

Index	Explanation
1	FM3 antenna for VHF reception
2	Telematics antenna
3	FM2 antenna for VHF reception



Antennas for Digital Receivers



Satellite Digital Audio Radio Services (SDARS) antenna on trunk lid
(View from the rear of the vehicle)



View from under
trunk lid.

Index	Explanation
1	SDARS antenna

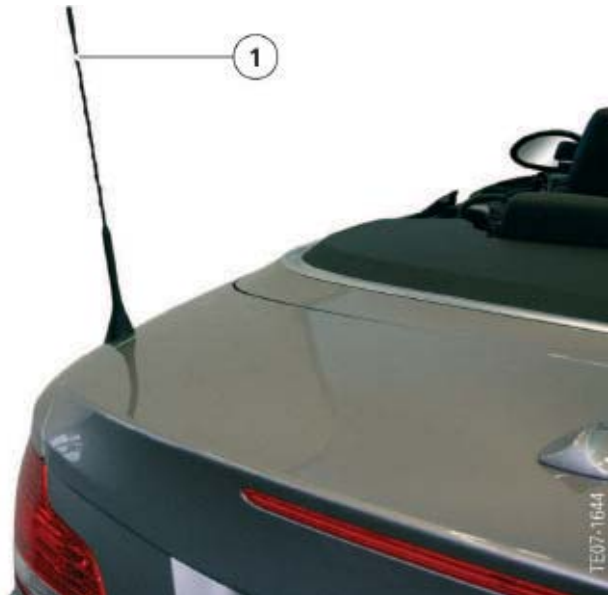
Note: The terrestrial In Band On Channel (IBOC) uses the FM antennas for digital reception.

Antennas for Telephone and Telematics

The following antennas are required for telephone and telematics functions:

- Telephone antenna
- Telematics antenna
- SOS antenna
- GPS antenna
- Bluetooth antenna for internal communication

The telephone antenna is located in the mast antenna.



The telephone antenna is integrated into the mast antenna

Telematics Antenna

The telematics antenna is located on the rear bumper under the left tail light. On vehicles equipped with the BMW Assist option, the telematics antenna is connected directly to the telematics control unit TCU and is used solely for data transmission relating to telematics functions.

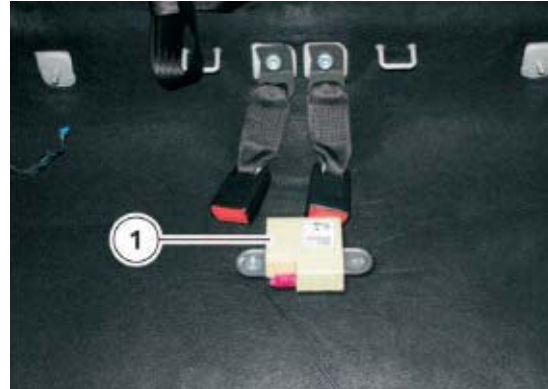
Index	Explanation
1	FM3 antenna for VHF reception
2	Telematics antenna
3	FM2 antenna for VHF reception



FM antenna behind the bumper trim (Left rear bumper view)

SOS Antenna

The SOS antenna is activated if the emergency call function is no longer possible via the telematics antenna after an accident. The emergency antenna is installed under the back seat.



1- Emergency antenna (under back seat)

Bluetooth Antenna

The Bluetooth antenna is used for internal data transmission between the mobile phone and vehicle. The Bluetooth antenna is located in the left footwell trim panel.



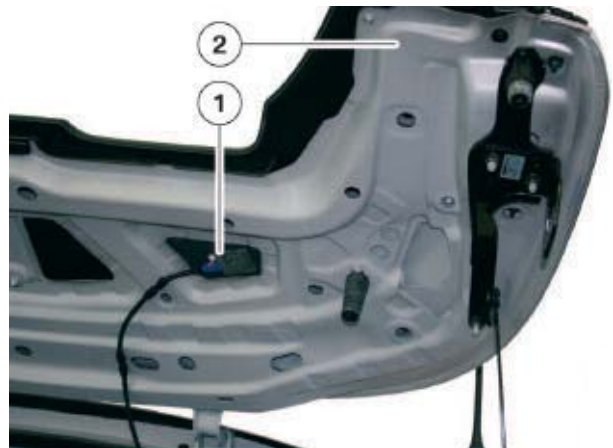
1- Bluetooth antenna (under left footwell trim panel)

GPS Antenna

A GPS antenna is necessary for the telematics function "Automatic emergency call with current location". On vehicles with CCC navigation system, the GPS antenna is routed directly to the navigation computer.

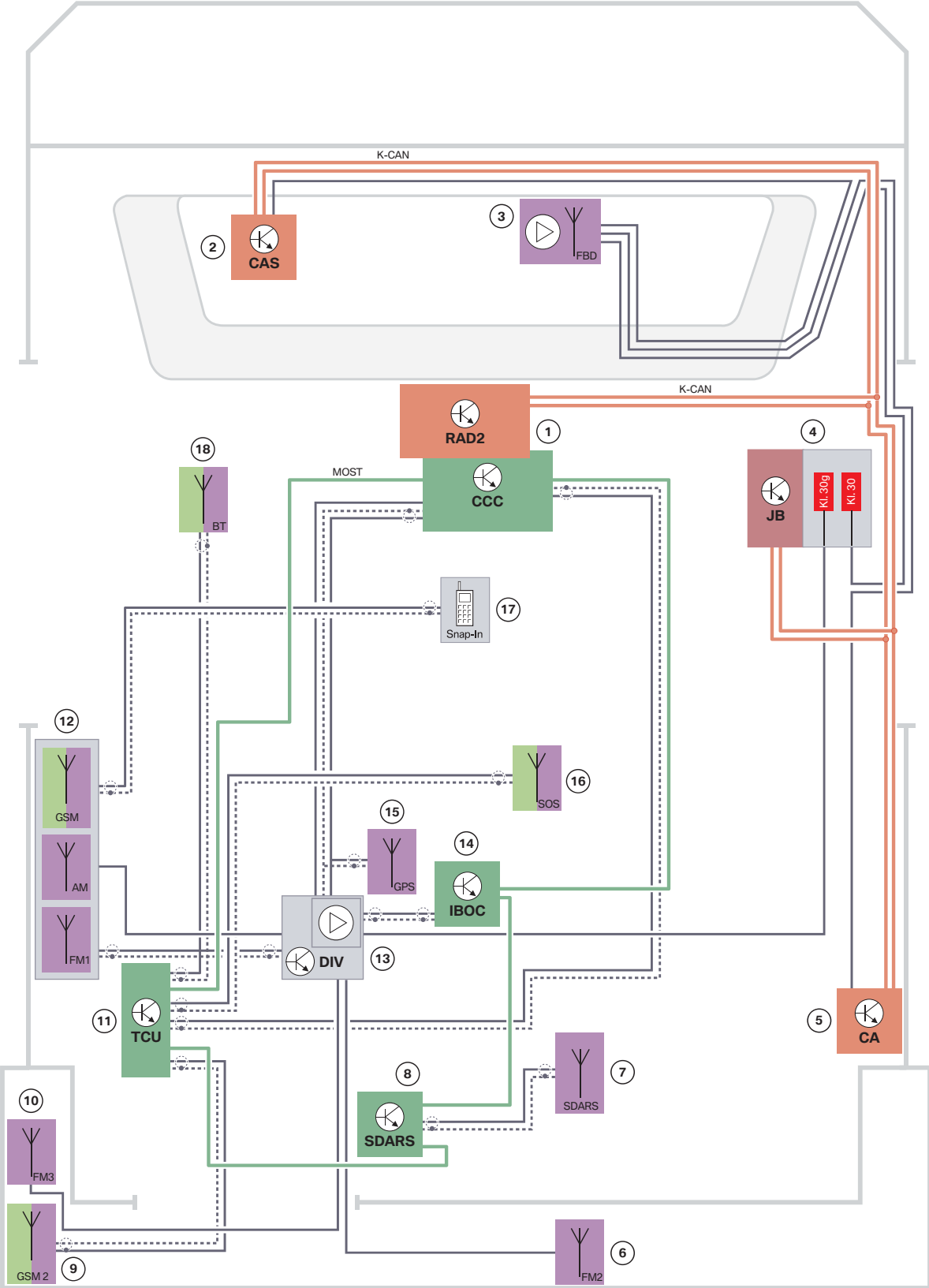
The TCU receives the position data via the MOST.

The GPS antenna is connected directly to the TCU on vehicles with no navigation system but with BMW radio 2 and telematics functions. In this case, the TCU determines the location. The GPS antenna is located on the left-hand side under the roof storage compartment lid.



Index	Explanation
1	GPS antenna
2	Under side of top storage compartment lid

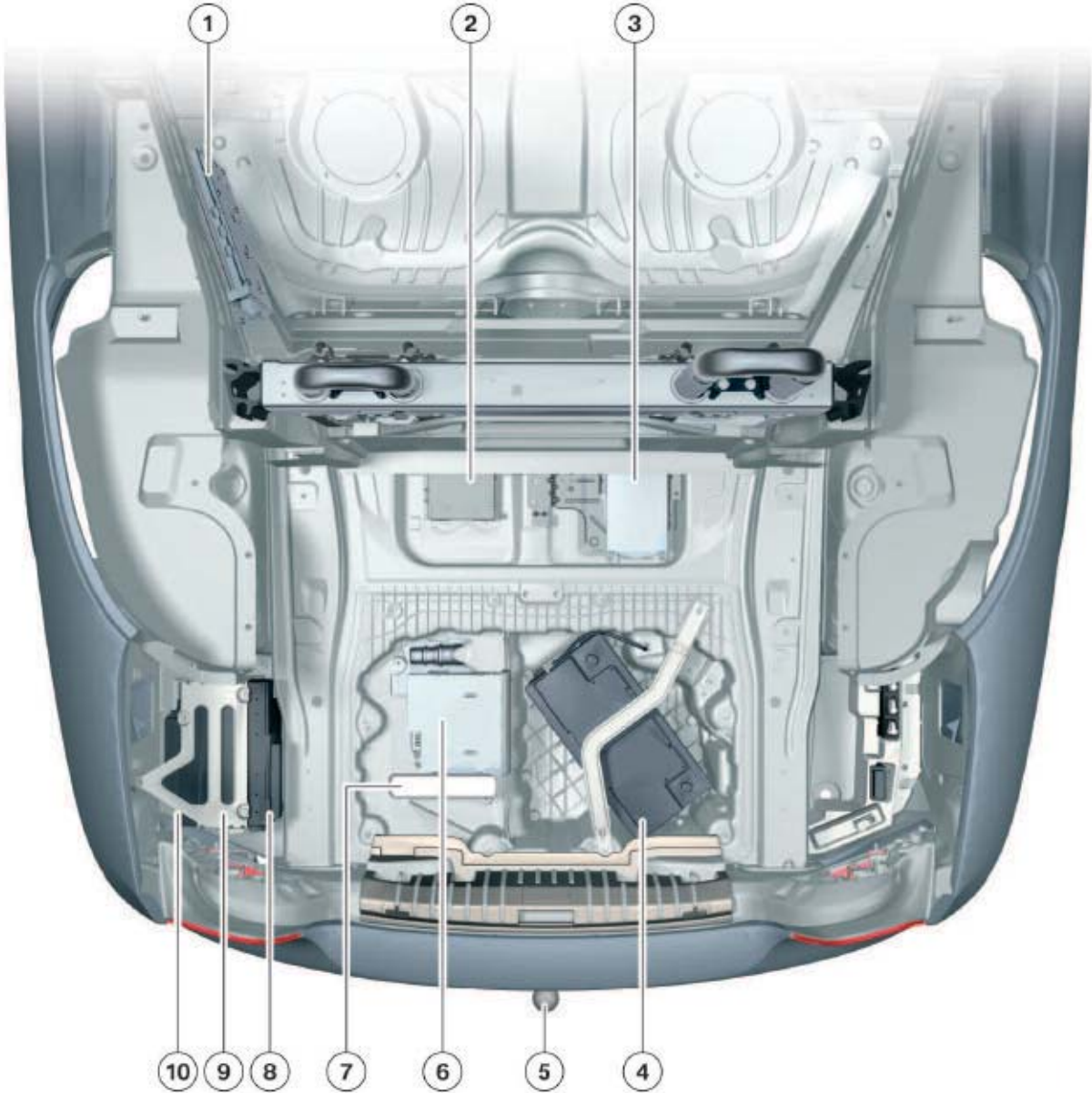
E88 Antenna Circuit Diagram



E88 Antenna Circuit Diagram Legend

Index	Explanation	Index	Explanation
1	Head unit (RAD2, CCC)	10	FM3 antenna
2	Car Access System	11	Telematic Control Unit (TCU)
3	Remote control receiver in rear-view mirror	12	Mast antenna (telephone antenna, AM antenna and FM1 antenna)
4	Junction box	13	FM antenna diversity module
5	Comfort access	14	IBOC receiver (digital radio tuner)
6	FM2 antenna	15	GPS antenna (on vehicles without the navigation system, the GPS antenna is connected directly into the TCU)
7	SDARS antenna	16	SOS antenna
8	SDARS receiver (satellite tuner)	17	Eject box with snap-in adapter
9	Telematics antenna	18	Bluetooth antenna

IKT Module Location



Top cut away view of components located in the luggage compartment

Index	Explanation	Index	Explanation
1	Top-HiFi amplifier	6	Japan navigation system
2	SDARS	7	On-board tool kit
3	Telematics control unit TCU with BMW Assist	8	CD changer
4	Battery	9	Hi-Fi amplifier
5	Removable towing hitch (Not for US)	10	IBOC

Passive Safety Systems

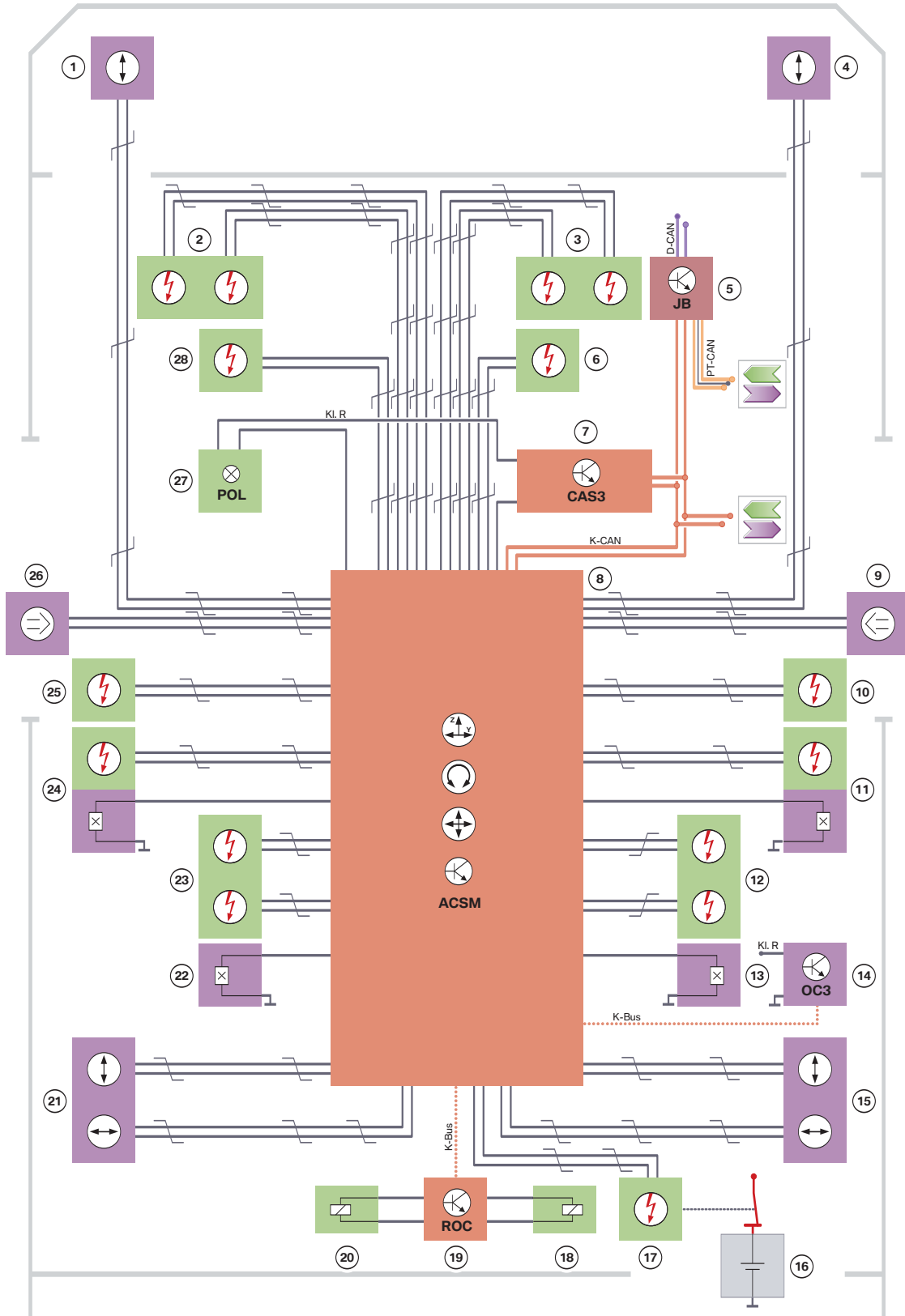
Advanced Crash and Safety Management

The E88 is equipped with the second generation advanced crash and safety management system (ACSM2) as featured in the E93.

The system is enhanced with the following components:

- Seat position sensor, driver seat and front passenger seat
- Left and right side retraction tensioner
- Left and right side adaptive belt-load limiter

E88 Passive Safety System Circuit Diagram



E88 Passive Safety System Circuit Diagram Legend

Index	Explanation	Index	Explanation
1	Up-front sensor, left	15	B-pillar satellite, right
2	Driver airbag	16	Battery
3	Front passenger airbag	17	Safety battery terminal
4	Up-front sensor, right	18	Right-hand roll bar actuator
5	Junction box	19	Rollover protection controller
6	Knee airbag, passenger's side	20	Left-hand roll bar actuator
7	Car access system 3	21	B-pillar satellite, left
8	Crash safety module ACSM	22	Seat position sensor, driver's seat
9	Door pressure sensor, passenger's side	23	Right side retraction tensioner and adaptive belt-load limiter
10	Side airbag, passenger's side	24	Side airbag, driver's side
11	Seat belt pretensioner and seat belt buckle switch, passenger's side	25	Door pressure sensor, driver's side
12	Left side retraction tensioner and adaptive belt-load limiter	26	Passenger Airbag OFF lamp
13	Seat position sensor, front passenger's seat	27	Knee airbag, driver's side
14	OC3 mat	28	Seat belt pretensioner and seat belt buckle switch, driver's side

Signals on the PT-CAN

In/out	Information	Source/sink	Function
OUT	Crash telegram	ACSM2>JB>EKP module	Shut down fuel pump
OUT	Crash Telegram	ACSM2>JB>DME	Shut down alternator

Signals on the K-CAN

In/out	Information	Source/sink	Function
OUT	Crash Telegram	ACSM2> CAS3	Open central locking
OUT	Crash Telegram	ACSM2>FRM	Activate hazard warning lights
OUT	Crash Telegram	ACSM2>FRM	Switch on interior lights

Front Seats Air Bags

The front seats in the E88 do not have an integrated seat belt system. The automatic seat belt tensioner is secured to the bodyshell. The front seats each house a side head-level airbag. These seat airbags when deployed are much taller and are used in the convertible because of the absence of curtain airbags.



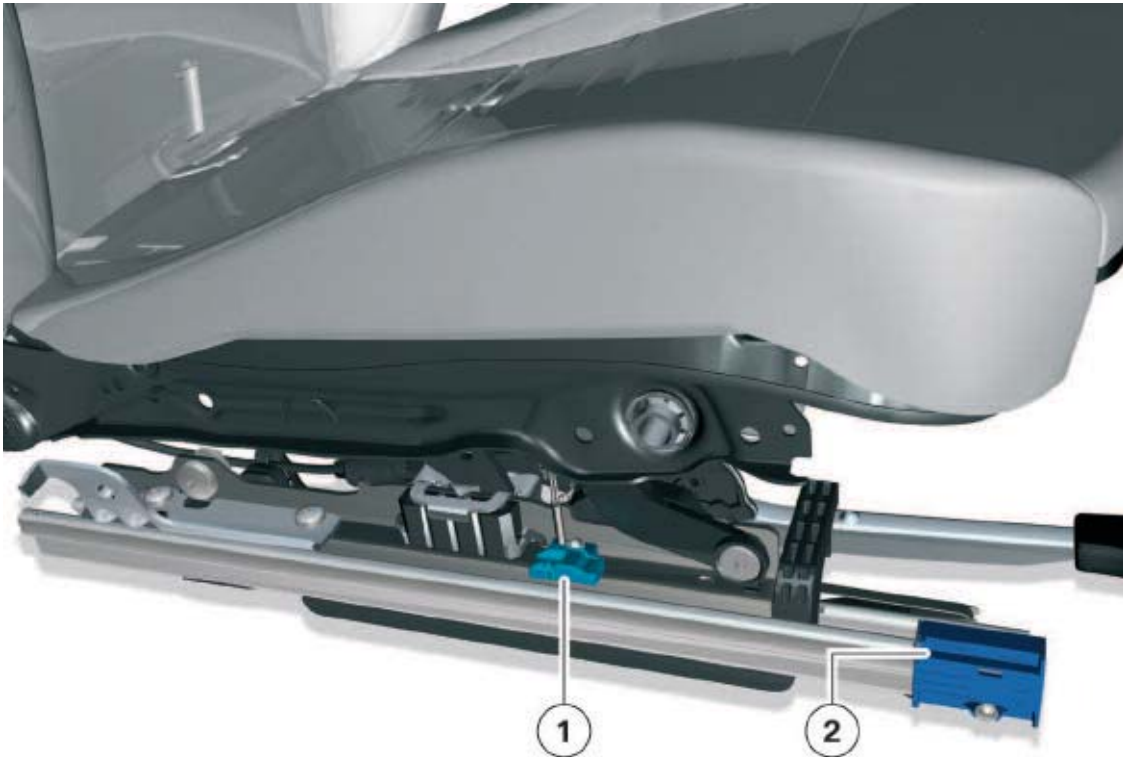
Picture of an E93 seat air bag

Seat Position Sensors

Adaptive restraint systems were developed in order to optimize the protective effect of the restraint system under changing conditions. The severity of the accident, the seat position and the posture of the occupant are important factors when calculating the triggering sequence.

The seat position sensors in the E88 make it possible to differentiate between people of different sizes. Within the seat's longitudinal adjustment range, the seat position detection system can differentiate between a small person and a larger size occupant. This detection system is another technical feature designed to increase the safety.

Seat position sensor in the driver's seat



Index	Explanation	Index	Explanation
1	Seat position sensor	2	Permanent magnet

The system adapts the triggering of the two airbags to the driver's and front passenger's seat position.

Due to US legal requirements, the driver's seat and front passenger seat must be able to detect the size of the occupant. Size is detected by the extent of back and forward seat adjustment. In the E88, the exact position is determined by the seat position sensors in the driver's and front passenger's seats.

The seat position detection system is designed with a dual-wire Hall sensor and is supplied with power by the ACSM control unit.

The strength of the current in the seat position sensor changes depending on the seat position and the distance of the seat position sensor from the permanent magnet.

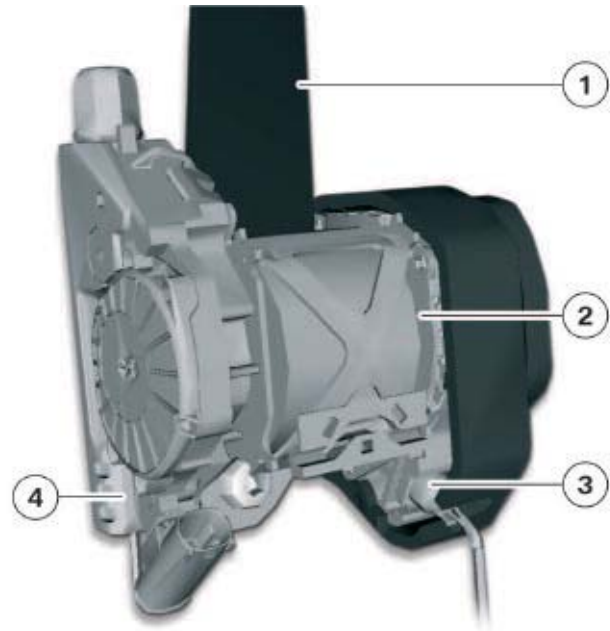
Retraction Tensioner and Adaptive Belt-load Limiter

The automatic seat belt tensioner is enhanced with the addition of two extra functions:

- Retraction tensioner
- Adaptive belt-load limiter.

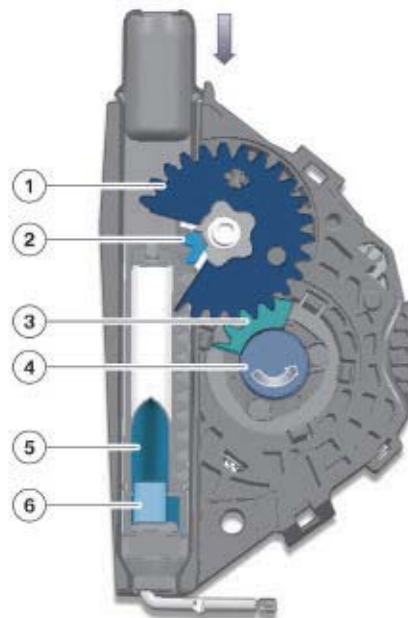
Index	Explanation
1	Seat belt
2	Automatic seat belt tensioner
3	Pyrotechnic actuator for the adaptive belt-load limiter
4	Pyrotechnic actuator for the retraction tensioner

Automatic seat belt tensioner



Cutaway view of the retraction tensioner

Index	Explanation
1	Gearwheel
2	Drive pinion
3	Disc
4	Seat belt retractor
5	Piston
6	Gas generator



Note: The two functions are deployed using pyrotechnic elements.

Retraction Tensioner

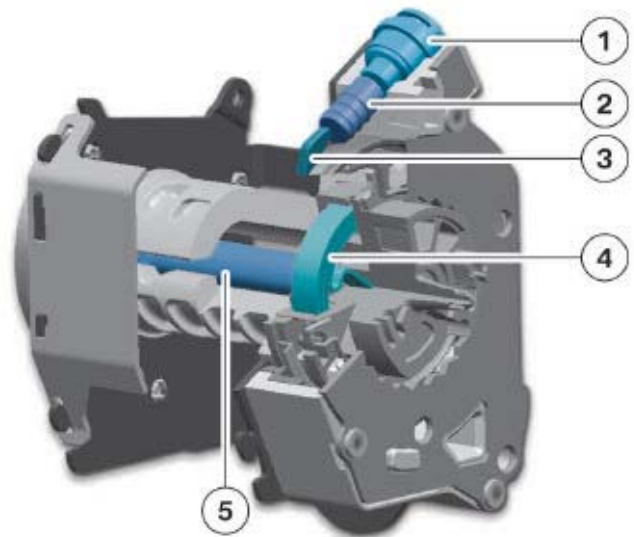
As with the seat belt tensioner, the role of the pyrotechnic retraction tensioner is to minimize any looseness of the belt in the pelvis and shoulder areas in the event of impact.

The pyrotechnic retraction tensioner is located in the driver and front passenger automatic seat belt tensioner. In the event of an impact of the appropriate accident severity, the gas generator (6) is ignited and the piston (5) moves upwards. This moves the drive pinion (2) which is connected to the gearwheel (1). The rotation of the gearwheel (1) turns the disc (3) and the Seat belt retractor. This pulls the belt into the automatic seat belt tensioner.

Adaptive Belt-load Limiter

The adaptive belt-load limiter in the automatic seat belt tensioner reduces the load on the chest of the occupant. The seat belt tensioner, retraction tensioner and belt-load limiter all work together.

Index	Explanation
1	Gas generator
2	Piston
3	Slider
4	Leaf spring
5	Torsion shaft



Adaptive load limiting works in two stages. The kinetic energy is first dissipated by the leaf spring (4) and the torsion shaft (5) in the automatic seat belt tensioners. Then the gas generator (1) is ignited, which moves the piston (2).

The piston (2) then presses on the slider (3) which is shifted out of position and rotated in a predefined movement. This pushes away a retaining ring and disconnects the leaf spring (4).

In addition, the slider (3) wedges itself into the automatic seat belt tensioner housing and the kinetic energy is dissipated via the torsion shaft (5) as the process continues. Thanks to the optimum coordination of the airbag, the kinetic energy from the passenger is dissipated more evenly over the duration of the impact. This results in low stress forces on the passengers.

NOTES

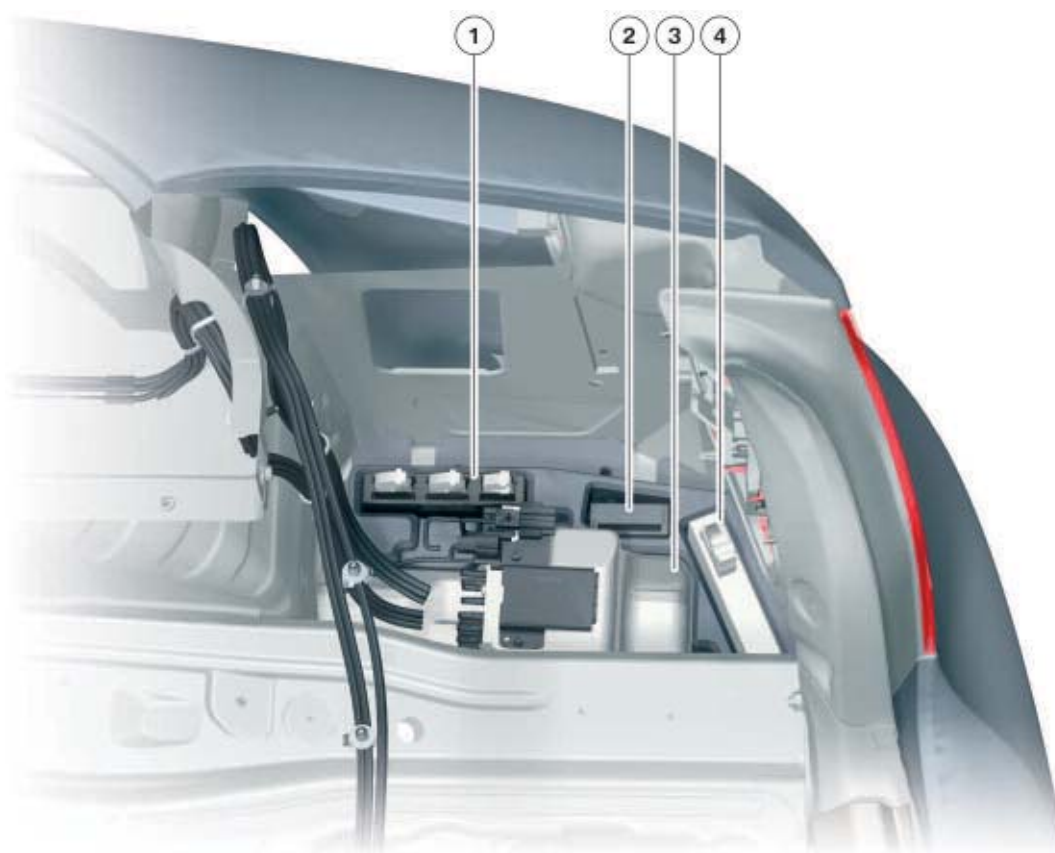
PAGE

Component Location

The control modules in the luggage compartment are located so as to avoid the need for different luggage compartment trim, wherever possible.

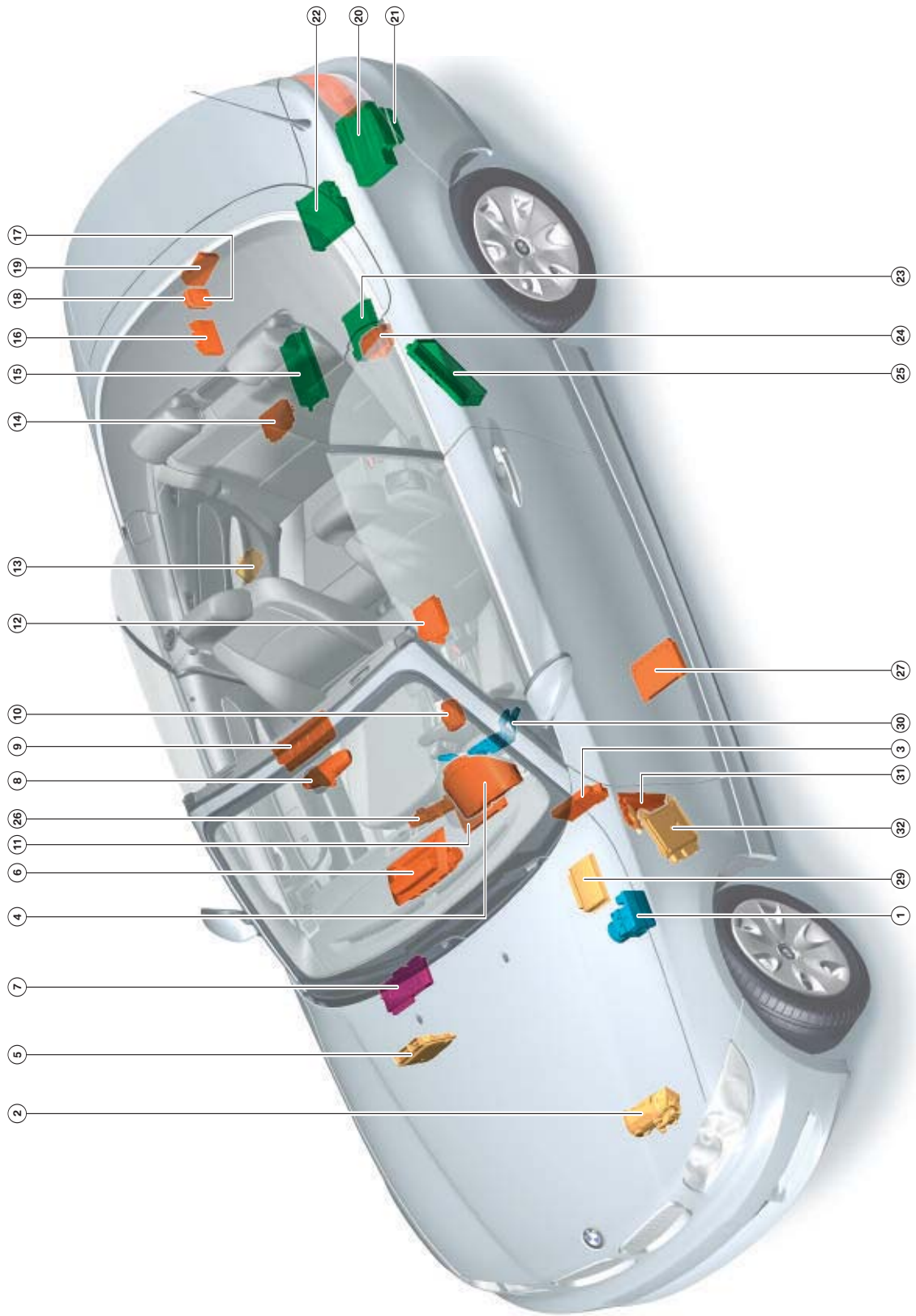
The hydraulic control unit is located in the right side panel of the luggage compartment floor. This reduces the loss of useable cargo room and minimizes noise inside the vehicle.

Cut away view of components in the right luggage compartment



Index	Explanation	Index	Explanation
1	Park Distance Control (PDC) control module	3	Hydraulic pump
2	Towing hitch control module (Not for US)	4	Comfort Access module

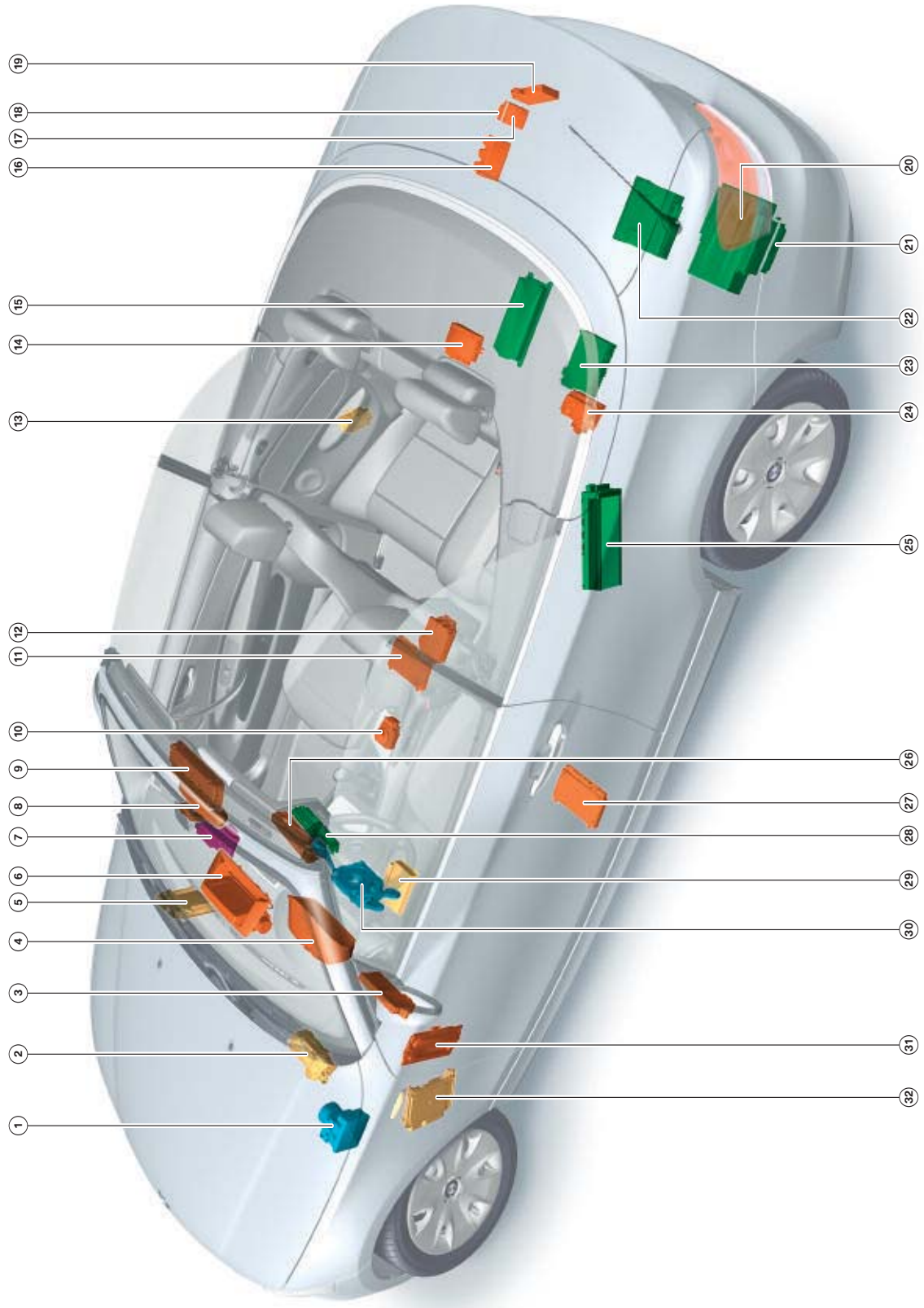
Component Location Overview (Front View)



Component Location Legend

Index	Explanation	Index	Explanation	Index	Explanation
1	DSC - Dynamic Stability Control	12	ACSM - Crash safety module	23	SDARS - Satellite Digital Audio Radio Service
2	EPS - Electromechanical Power(Not for US)	13	EKP Module	24	ROC - Rollover protection controller
3	CAS3 - Car Access System	14	CVM - Convertible roof module	25	TOP HiFi - Hifi system
4	Instrument cluster	15	TCU - Telematic Control Unit	26	IHKA - Integrated heating and air-conditioning system
5	DDE - Digital Diesel Electronics (Not for US)	16	PDC - Park Distance Control	27	SMFA - Driver's seat module
6	CID - Central Information Display	17	TPMS - Tire-pressure monitoring	28	CCC - Car Communication Computer
7	JB - Junction box	18	AHM - Trailer module Steering (Not for US)	29	EGS - Electronic transmission control unit
8	FLA - High-Beam Assistant (Not for US)	19	Comfort Access	30	SZL - Steering column switch cluster
9	FZD - Roof function center	20	CDC CD charger	31	FRM - Footwell module
10	Controller	21	IBOC tuner DME - Digital engine Electronics	32	AL - Active Steering
11	SMBF - Passenger's seat module	22	NAVI - Navigation system		

Component Location Overview (Rear View)



Component Location Legend

Index	Explanation	Index	Explanation	Index	Explanation
1	DSC - Dynamic Stability Control	12	ACSM - Crash safety module	23	SDARS - Satellite Digital Audio Radio Service
2	EPS - Electromechanical Power(Not for US)	13	EKP Module	24	ROC - Rollover protection controller
3	CAS3 - Car Access System	14	CVM - Convertible roof module	25	TOP HiFi - Hifi system
4	Instrument cluster	15	TCU - Telematic Control Unit	26	IHKA - Integrated heating and air-conditioning system
5	DDE - Digital Diesel Electronics (Not for US)	16	PDC - Park Distance Control	27	SMFA - Driver's seat module
6	CID - Central Information Display	17	TPMS - Tire-pressure monitoring	28	CCC - Car Communication Computer
7	JB - Junction box	18	AHM - Trailer module Steering (Not for US)	29	EGS - Electronic transmission control unit
8	FLA - High-Beam Assistant (Not for US)	19	Comfort Access	30	SZL - Steering column switch cluster
9	FZD - Roof function center	20	CDC CD charger	31	FRM - Footwell module
10	Controller	21	IBOC tuner DME - Digital engine Electronics	32	AL - Active Steering
11	SMBF - Passenger's seat module	22	NAVI - Navigation system		