# Reference Manual

# E63 / E64 COMPLETE VEHICLE


## Technical Training

# Table of Contents

## E63/E64 Complete Vehicle

# Complete Vehicle

## Model: E63/E64

## Production: Start of Production MY 2004

# OBJECTIVES

After completion of this module you will be able to:

- Relate the significant innovations of the E63/64
- Explain special construction materials of the E63/E64
- Explain the chassis changes of the E64

# E63 Complete Vehicle

## History of BMW Coupes

The Coupe bodystyle has always been associated with words such as style, elegance, sportiness and exclusivity. This was the case when in 1909 Henry Ford introduced his celebrated "Tin Lizzy," the Coupe version of the Model T. And this was also the case when in 1931 BMW launched its first - small - white/blue Coupe called the DA4.

Ever since then, the Coupe has played a vital role in BMW's success and image. Even in difficult times for BMW, this "beautiful sister of the Saloon" has heightened the profile of the BMW marque amidst the mass of car manufacturers. Today as ever the combination of sportiness and elegance arouses the passions of the public.

This is especially true of high-performance luxury-class Coupes. It is these models in particular which are the focus of the general public's interest, attracting huge crowds around them at motor shows and thereby highlighting the marque image. BMW has always taken the bull by the horns and thus the new BMW Coupe is continuing a proud tradition.

### 501 502 and 503


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1951 saw the launch of the BMW 501, known in popular parlance as the "baroque angel." The 502 with V8 engine arrived in 1954. In the same year, the 501 and 502 Coupes were fashioned from these Saloons. The intention was to offer particularly discerning customers something quite unique for a price of 20,000 deutschmarks - at the time, however, you could buy your own house for that amount of money. Barely 50 of these Coupes were sold in the first year.

In 1955 BMW made its debut on the international stage in Frankfurt with the 503 Coupe. A V8 engine and every conceivable luxury available at the time such as leather upholstery and power windows established it as a luxury toy for the super-rich. 276 of these 503 Coupes costing roughly 30,000 marks each had been built by 1959.

### 3200 CS


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In 1961 the famous Italian body stylist Nuccio Bertone was commissioned to design a new BMW V8 Coupe. Clear, smooth lines exuded elegant dynamics. By 1965 Bertone had delivered 603 bodies to BMW, where they were completed - in accordance with individual customer requirements - to create the 3200 CS.

## 2000 CS to 3.0 CSi

In mid-1965 BMW presented a new, not quite so selectively targeted Coupe based on the successful new 4-cylinder Saloons. The BMW designers had discovered a new BMW line: compact, sportily elegant and above all distinctive.


## E9


Three years later this 2000 CS Coupe was completely redesigned and equipped with a 6-cylinder engine. The range now stretched from the 2800 CS through to the 3.0 CSi Coupe. The E9 Coupe utilized the technology and engineering of the new top-class 2500 and 2800 Saloons but was closely allied to the 2000 CS in terms of form and shape.

This Coupe with a 2.5 to 3-liter engine created a stir not only on the boulevards but also on the racetrack. In the guise of the 3.0 CSL lightweight Coupe, these racers with up to 900 bhp under the bonnet and Hans-Joachim Stuck, Brian Redman or Ronnie Petersson behind the wheel ran the competition of Porsche and Ford into the ground.

A total of 44,237 of the 2000 CS and E9 were built in a period of 11 years.

## E24

The first BMW Coupe to be called a 6 Series came onto the market in 1976. The oil crisis and burgeoning environmental awareness brought a halt to the rushed explosion of power. But even with an engine developing from 185 to 286 bhp (M version), this Coupe was in no way underpowered.


Comfort and engine and chassis electronics made the 6 Series a huge international success. By the time production was terminated in 1989, a total of 86,199 had been sold in a period of 14 years: Never before had a BMW Coupe been so successful.

## E31

BMW ensured its place in automobile history with the introduction in 1989 of the 8 Series Coupe. Two years after the market launch of the first German 12-cylinder engine since the 1930s in the 750i, this power plant was transplanted into an absolute luxury-class Coupe. The latest in engineering, technology and design which BMW was able to offer was just what was needed.

With an 8-cylinder version also introduced later, it was always possible to reach 250 km/h effortlessly (cut-off) whenever one wanted. But what this car also uniquely offered was the sheer pleasure of smooth driving with the reassurance of optimum safety. A total of 31,283 E31 models were built over a period of 10 years.

## E63 Introduction

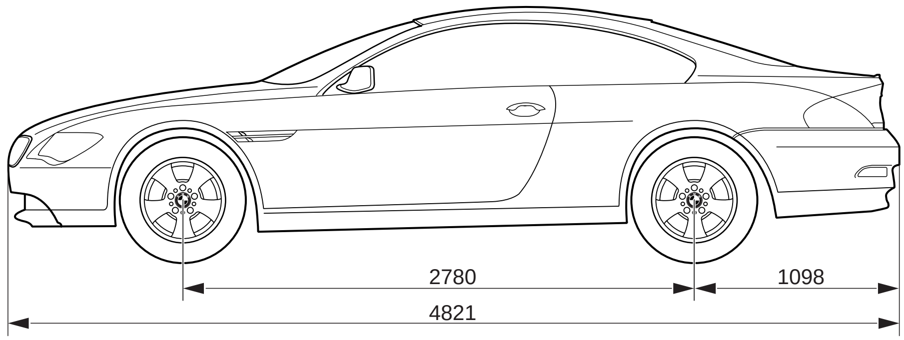
All the significant innovations of the E65 or E60 are also offered in the 6 Series Coupe. However the E63 also offers new features of its own. The most important of these new features are:

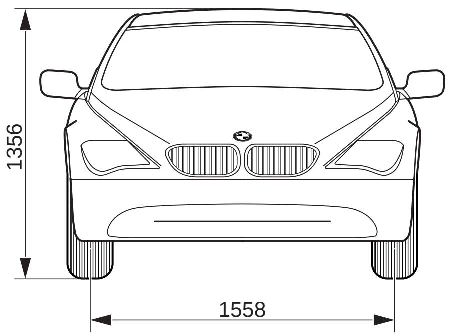
- Body of composite construction. Doors made of aluminum, hood made of bonded aluminum, side panels made of thermoplastic and trunk lid made of SMC plastic extend far beyond the GRAV (reduced weight aluminum front end) of steel and aluminum already established in the E60.
- "Panorama" glass sunroof with a comparatively huge surface, whose floating roofliner comes in two parts so that when opened it can be accommodated under the remaining area of the steel roof in front of the rear window.

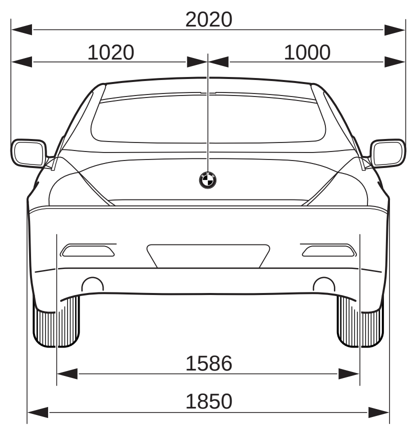
Additional new features introduced on the E63 will migrate to other models.

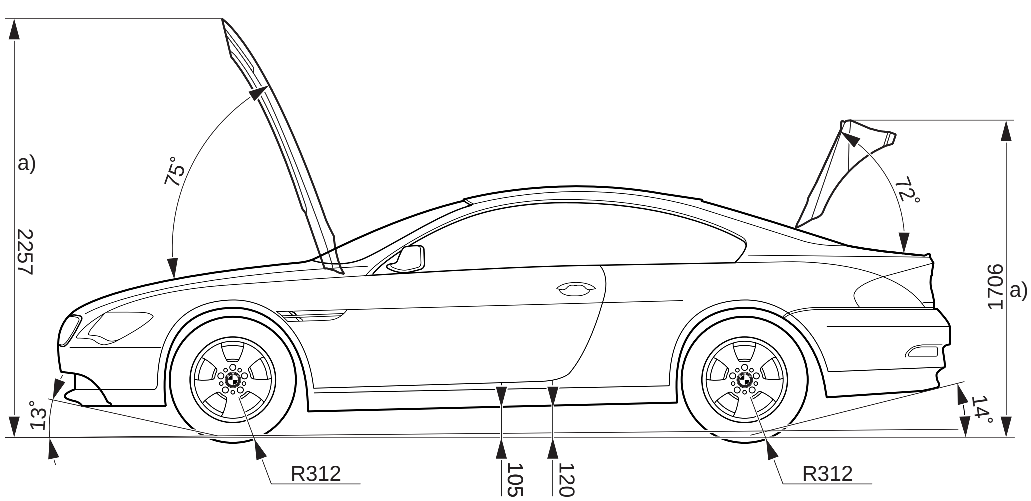
- “CCC” Car Communication Computer is the central control unit for all Information/communication systems in the E63
- “HUD” Head up Display
- New DWA with improved sensor capability
- Knee air bags

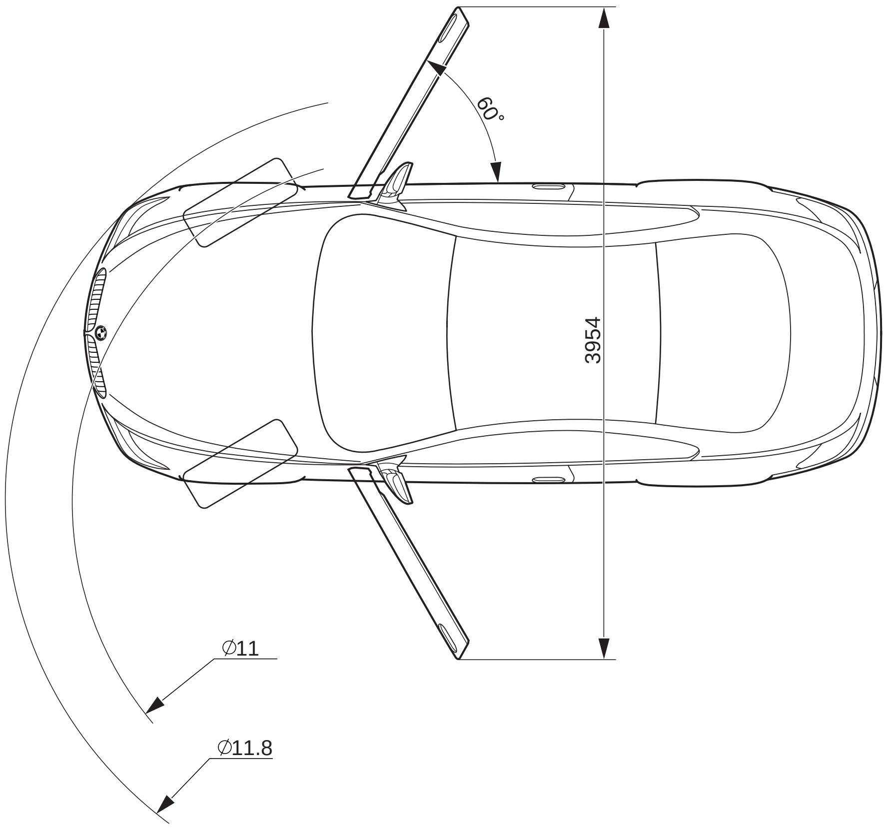
# Technical Data






### Dimension Comparison

| | E63 | E60 | | E24 | | E31 | |
|---|---|---|---|---|---|---|---|
| **Length (mm)** | 4820 | 4841 | + 21 | 4755 | - 65 | 4780 | - 40 |
| **Width (mm)** | 1855 | 1846 | - 9 | 1725 | - 130 | 1855 | 0 |
| **Height (mm)** | 1373 | 1469 | + 96 | 1353 | -20 | 1340 | + 33 |
| **Unloaded weight (kg)** | 1690 | 1695 | + 5 | 1505 | - 185 | 1855 | + 165 |
| **Additional load (kg)** | 450 | 560 | + 110 | 345 | - 105 | 345 | - 105 |
| **Trunk volume (l)** | 450 | 520 | + 70 | 360 | - 90 | 320 | - 130 |

# Body

## Aluminum Doors

The E63 has aluminum doors. This feature reduces the weight of the car by 10 kg.

The E63's aluminum doors exceed all internal BMW rigidity and safety requirements. Each door has two reinforcement members with door  hooks arranged in a V-shape.

## Hood

As in the E60, the E63's hood is made of aluminum.

However, a new manufacturing  process is used.   For the first time in a BMW vehicle, the inner and outer skin panels of the bonnet are joined with a 2-component adhesive as an underlining. This turns the two skin panels into a single structural unit.

This manufacturing procedure helps to keep both aluminum skin panels thin, a factor which reduces the bonnet weight by 12 kg. Even the acoustic behavior is improved. The increased rigidity prevents the bonnet from vibrating almost completely at high speeds. This vibration is normally absorbed without being noticed and can disturb the driver's concentration while driving.

The hood of the E63 can be moved into a service position. A special tool is needed for this purpose.

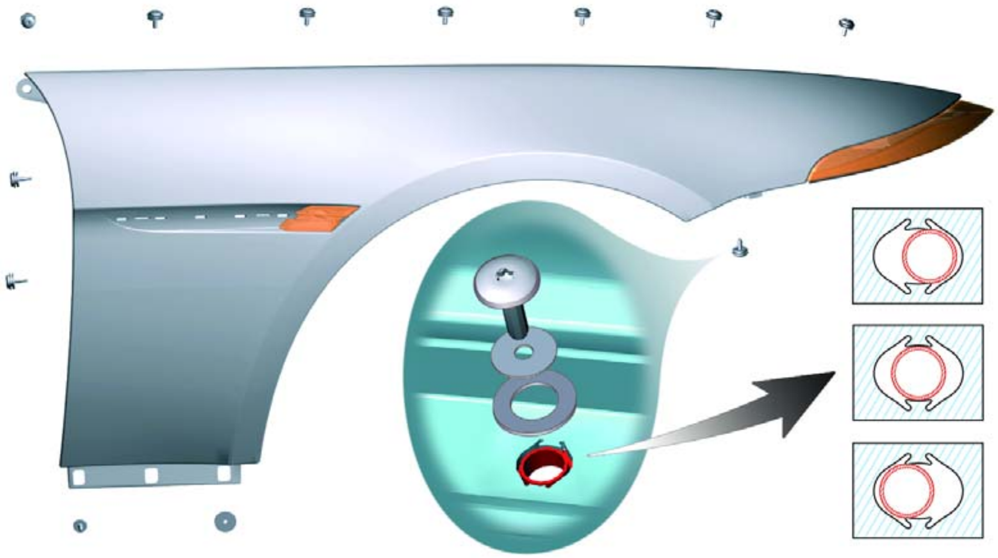
The gap dimensions to the side panel and to the bumper are adjusted via elongated holes. These elongated holes are situated on the hinges and on the bonnet lock.

## Front Fenders

For the first time in a vehicle built by the BMW Group, a thermoplastic (in this instance "Noryl GTX" from GE Plastics) has been used for the large-scale manufacture of a side panel.

The decision to use a thermoplastic was made for 3 primary reasons:

- The E63 as a luxury-class car should be distinct in terms of design from the E60 mass-produced model. However, the level of remodeling required for this purpose cannot be accomplished in steel or aluminum and the same argument applies to integrating the direction indicator and the chrome trim bar in the side panel.



- The weight-reducing potential of thermoplastic is 50% compared with a side panel made of sheet steel; in this particular case 2 kg per side panel of thermoplastic as against 4 kg per side panel of sheet steel.
- Increased buckling resistance as the primary customer benefit for reducing minor damage and the corrosion-resistant properties of the material.

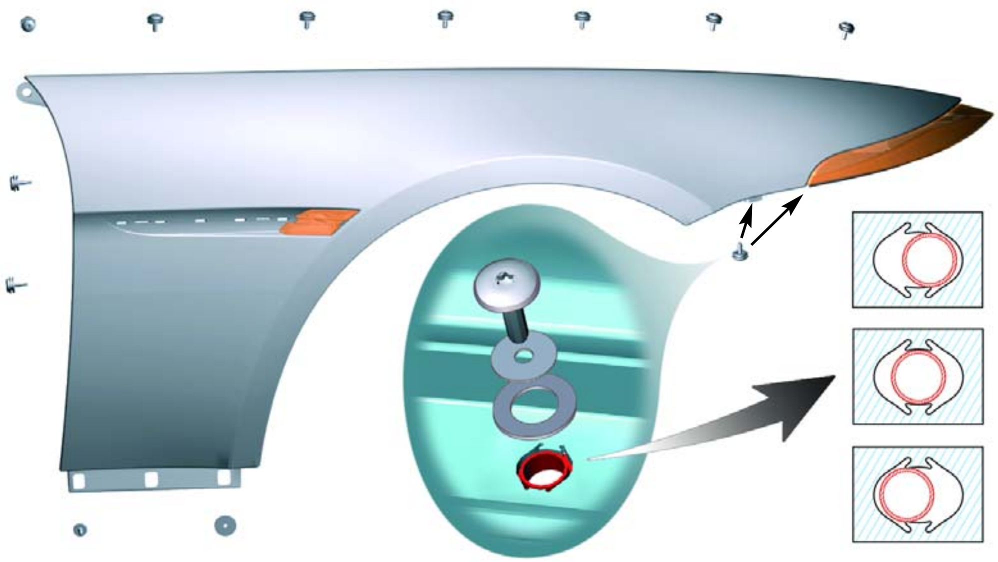
Because plastic expands or contracts in direct response to the outside temperature, the side panel is mounted in a "floating" manner. This means that the the front side panels are attached in such a way as to allow the material to expand or contract without incurring damage.

The connection to the body is established by means of 3 screw connections on the A-pillar, 2 screwing points in the sill area and 8 screwing points on the reduced-weight aluminum front end (GRAV).

To allow linear expansion as a function of the climatic conditions, the screwing points on the GRAV are designed to be "floating." A maximum linear expansion of 2.5 mm is possible in the vehicle longitudinal direction; in the event of further expansion, the side panel assumes a block setting.

## Workshop Exercise (optional) - Front Fender Removal/Install

1. *Before removing front fender, you must first remove the rocker panel cover.*
2. *Remove the 2 screws from the front of the inner fender liner and fold in (where it joins the front bumper cover).*
3. *The upper light housing (above headlamps) will be removed with the fender.*
4. *Remove the bolts (Torx T30) and 2 nuts at the rear fender base as shown below:*



5. *Note which bolts are different* ______________________
6. *Consult Repair Instructions, are there any special tools required for adjusting/ installing the fender assembly? (if so, what is the tool number and what is it for)*

______________________

______________________

7. *Before installing a fender, allow time for it to "climatize" in the same area as the vehicle (temperature, humidity, moisture, etc) for expansion/contraction.*

**Notes:**

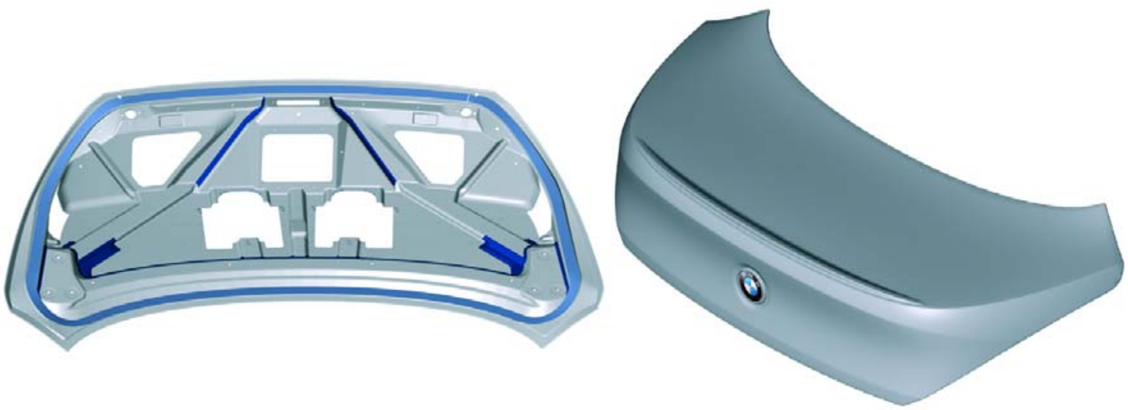
## Trunk Lid

This trunk lid made of SMC (Sheet Moulding Compound) saves approx. 25% weight compared with a corresponding component made of steel.

The trunk lid of the E63 incorporates the aerials for the telephone and the navigation system. This is also an E63 innovation.

Like the thermoplastic front side panels, the SMC trunk lid can also expand slightly under the effects of heat. It is therefore extremely important for the lid to be correctly adjusted.

Surface damage in the form of scratches can be repaired with the BMW repair spatula kit. In the event of fractures or cracks, the complete component must be replaced.



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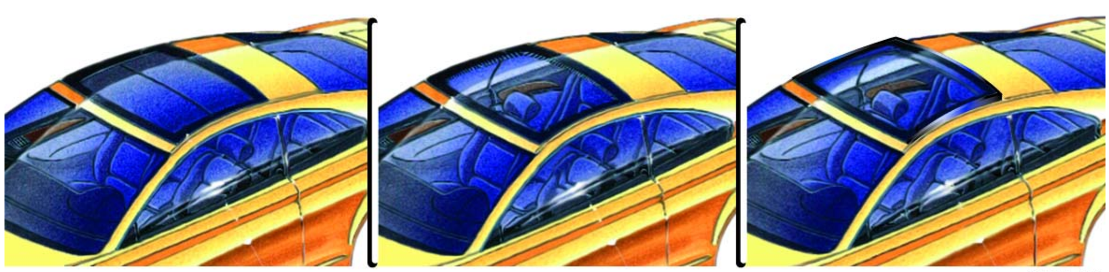
## Panorama Sunroof

The panorama glass sunroof comprises a glass roof, a two-part floating roofliner, two electric motors and the casing housing the mechanism.

The system is controlled by means of a switch and a control unit which is mounted behind the glovebox. The front electric motor moves the glass roof. The glass roof can only be tilted and cannot be opened fully. The rear electric motor moves the two-part floating roofliner. The roofliner in the E63 is in two parts as there would not be enough space between the rear edge of the sunroof and the front edge of the rear window for a single undivided component.

Both the glass roof and the roofliner have anti-trapping protection.



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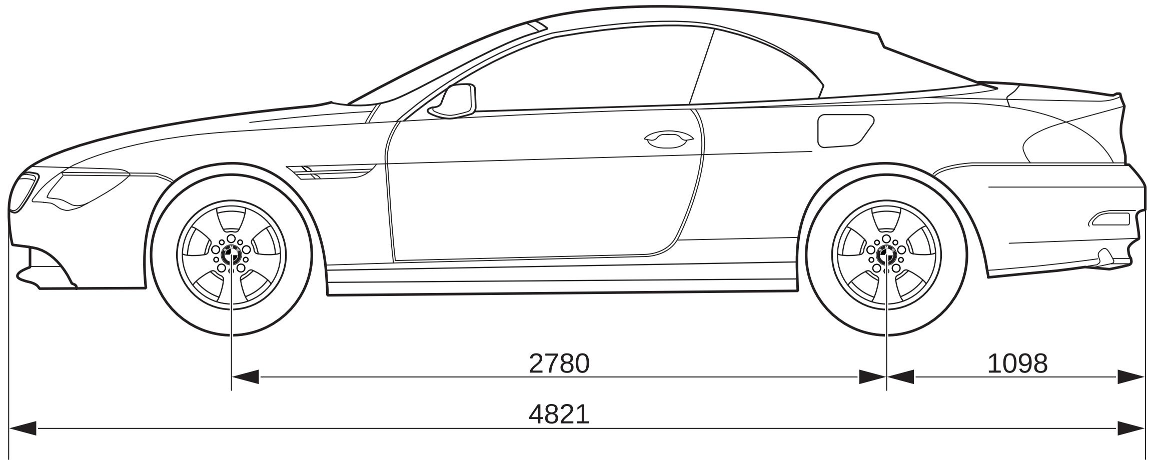
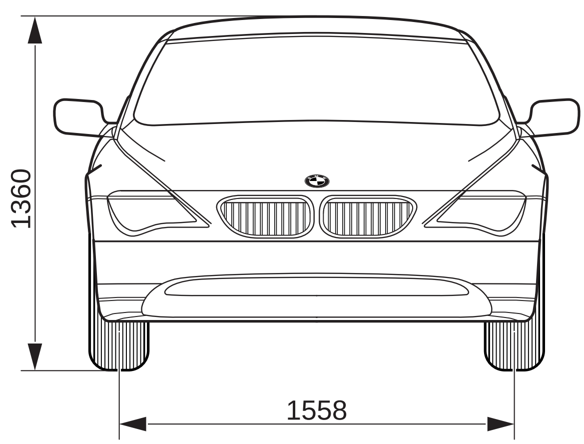
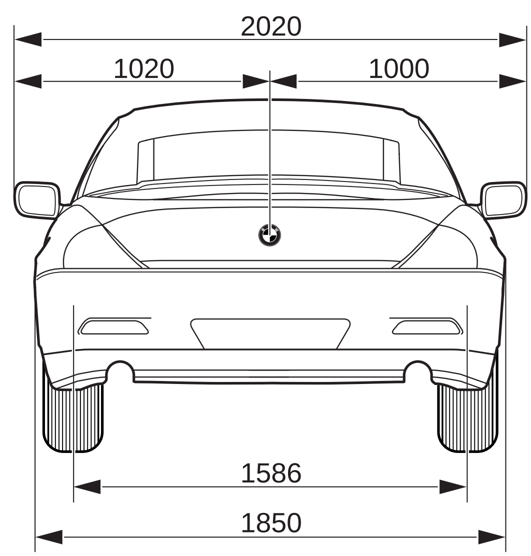
## E64 Complete Vehicle




The 6 Series E64 Convertible is based on the E63 Coupe.  External dimensions for the Convertible are the same as the Coupe. Trunk volume is reduced from 450 L to 350 L (with the top up) and 300 L (with the top down).

Empty weight is increased by 2 00kg, to 1815kg.

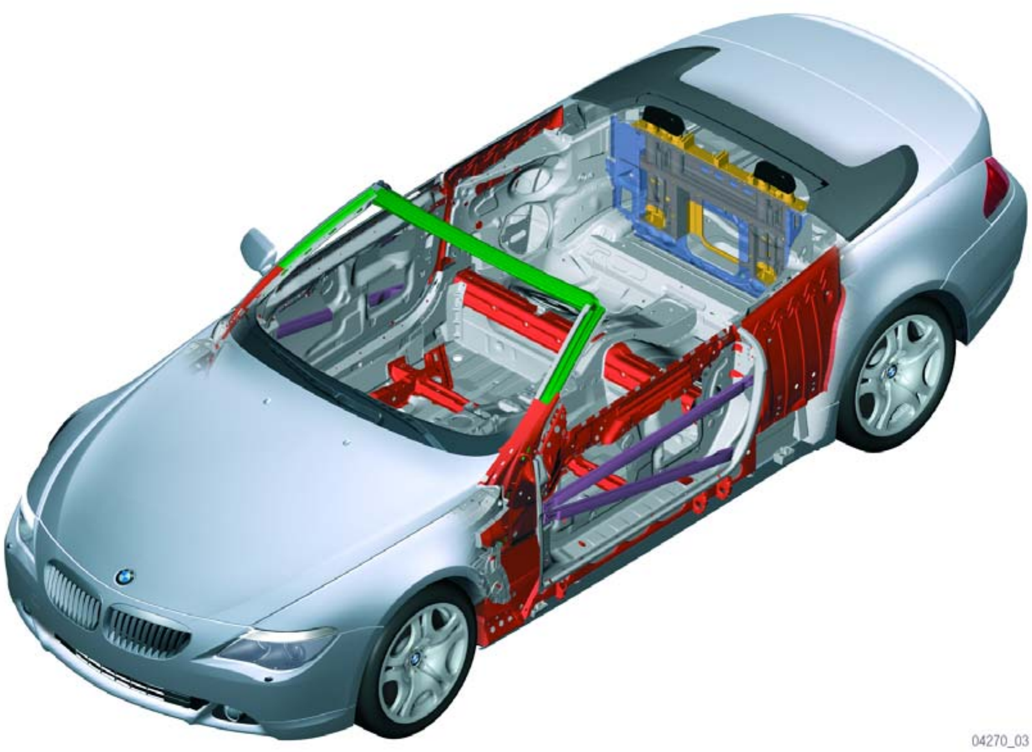


## Convertible Body

The E64 body has been reinforced in the following areas:

- The A pillar has increased support at the base.
- The windshield frame is made from high-strength steel.
- Additional aluminum extruded bracing is added to the doors.
- The sill rail and crashbox are made from high-strength steel.
- The seat cross member was strengthened;  additional bracing has been added for side impact protection.
- The crossmember in the back seat floor area is  strengthened.
- The rear seat back area was strengthen and braced for the additional roll over protection.




- The rear decklid construction is the same as the E63, however the shape and overall size of the decklid is smaller.
- The soft top boot is also constructed with SMC.
- Roll down rear quarter windows have been added.
- E46 Style Convertible seats with integral seat belts are used.

# Table of Contents

## E63/64 Body Electrical



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# Body Electrical

## Model: E63/64

## Production: Start of Production MY 2004

# OBJECTIVES

After completion of this module you will be able to:

- Understand the electrical changes in t he E63/64
- Explain the operation of the sunroof
- Relate ASE changes to E63/E64
- Recognize SGS seat in the E64

## Voltage Supply and Bus System

The vehicle electrical system of the E63/64 is essentially based on the electrical system of the E60. This documentation describes the differences in the power supply, bus systems and in the general vehicle electrical system compared to the E60.

In the E60/E63, an energy management function is responsible for the power requirements of the vehicle both while driving as well as when stationary.

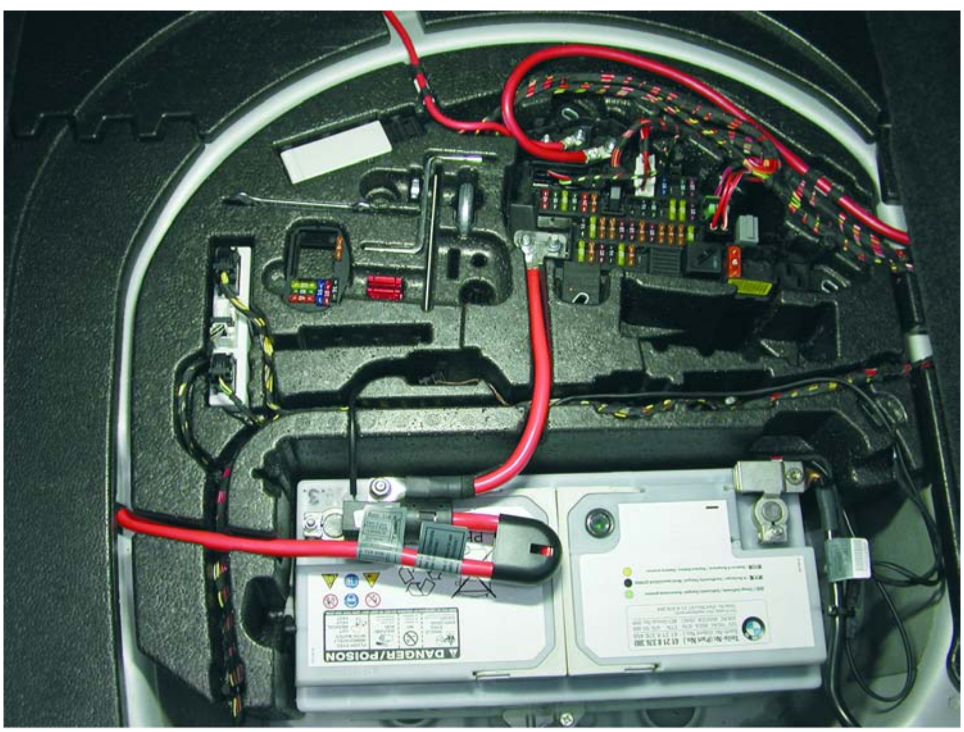
The most important integral parts of the energy management system are:

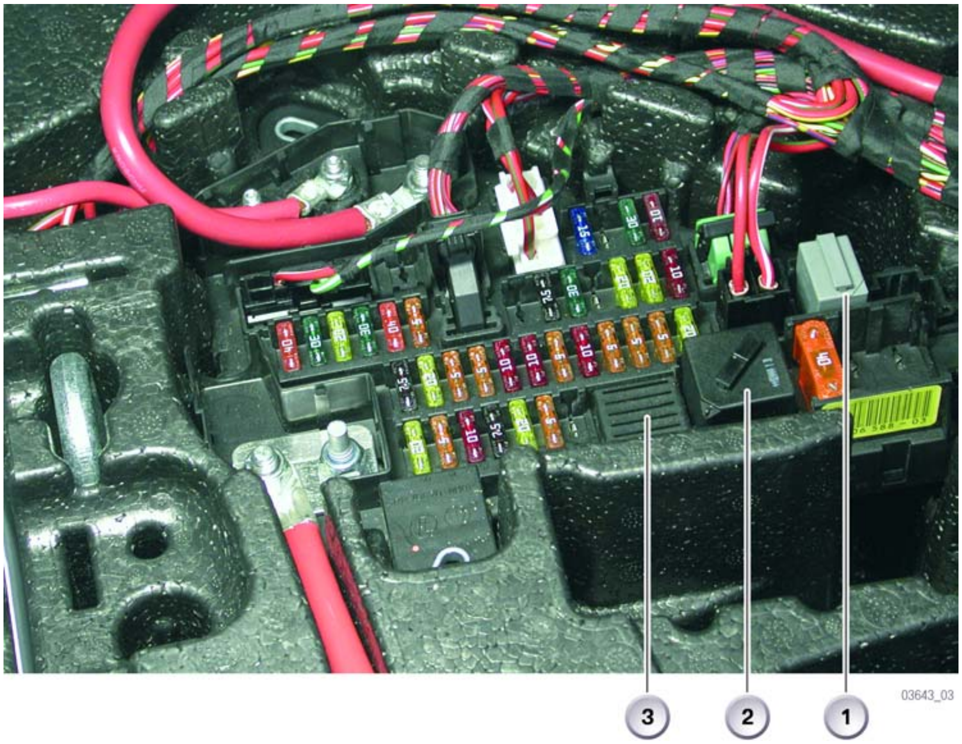
- Intelligent battery sensor IBS
- Power management software in the digital motor electronics DME or digital diesel electronics DDE and in the IBS.

  The power management controls the electric currents in the vehicle
- Terminal 30g relay actuated by the car access system

### Power Supply

**Changes Compared to the E60**
The battery is installed in the luggage compartment recess. The power distribution box in the luggage compartment was repositioned from the side panel to the recess in the luggage compartment. The vehicle electrical system is extended with the integrated power supply module IVM if an 8-cylinder engine is installed.

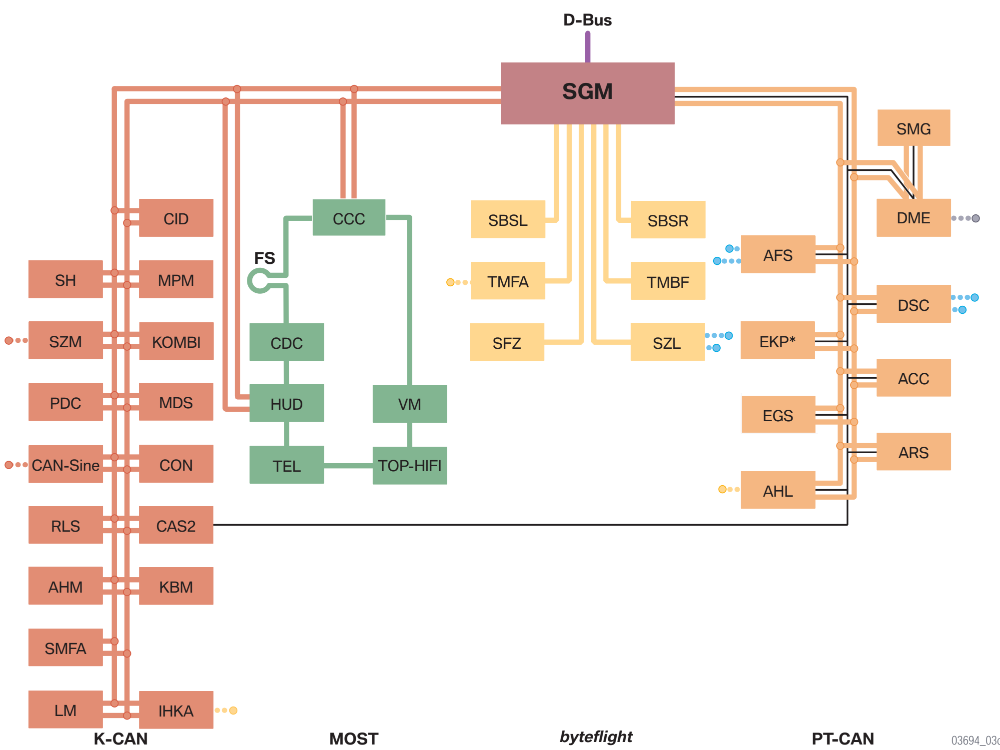





1. Rear window relay
2. Terminal 30g relay
3. Terminal 15 relay, soldered

## Bus System Changes

Instead of the control unit for the slide/tilt sunroof SHD the control unit for the glass roof MDS is installed in the E63. There is no passenger's seat module SMBF in the E63.



## General Vehicle Electrical System

### Power Windows

#### Changes Compared to the E60

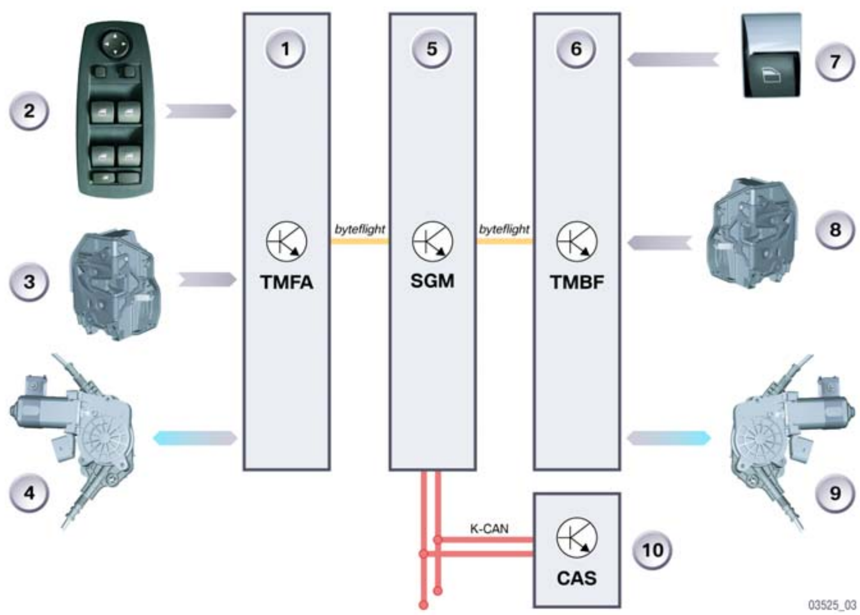
The function of the power windows correspond to those of the E60. The rear windows are fixed. The pins of the KBM for the rear windows are not used.

The following components are not installed in the E63:

- Switches, rear driver's door, rear passenger's door
- Power window motors with incremental sensor, rear driver's and passenger's side

1. Driver's door module (TMFA)
2. Switch block on driver's door
3. Door contact, driver's door, front
4. Power window regulator, driver's door, front
5. Safety and gateway module (SGM)
6. Passenger's door module (TMBF)
7. Power-window switch, passenger, front
8. Door contact, passenger door, front
9. Power window regulator passenger door, front
10. Car access system (CAS)
11. Basic body module (KBM)
12. Power-window switch, driver, rear

| | |
|---|---|
| K-CAN | Bodyshell CAN |
| byteflight | byteflight |




### E63 Glass Tilt Sunroof

#### Changes Compared to the E60

Instead of the slide/tilt sunroof, the E63 features a glass tilt sunroof. The sunroof visor is two-piece. Two motors are installed for operating the glass tilt sunroof.

#### System Components

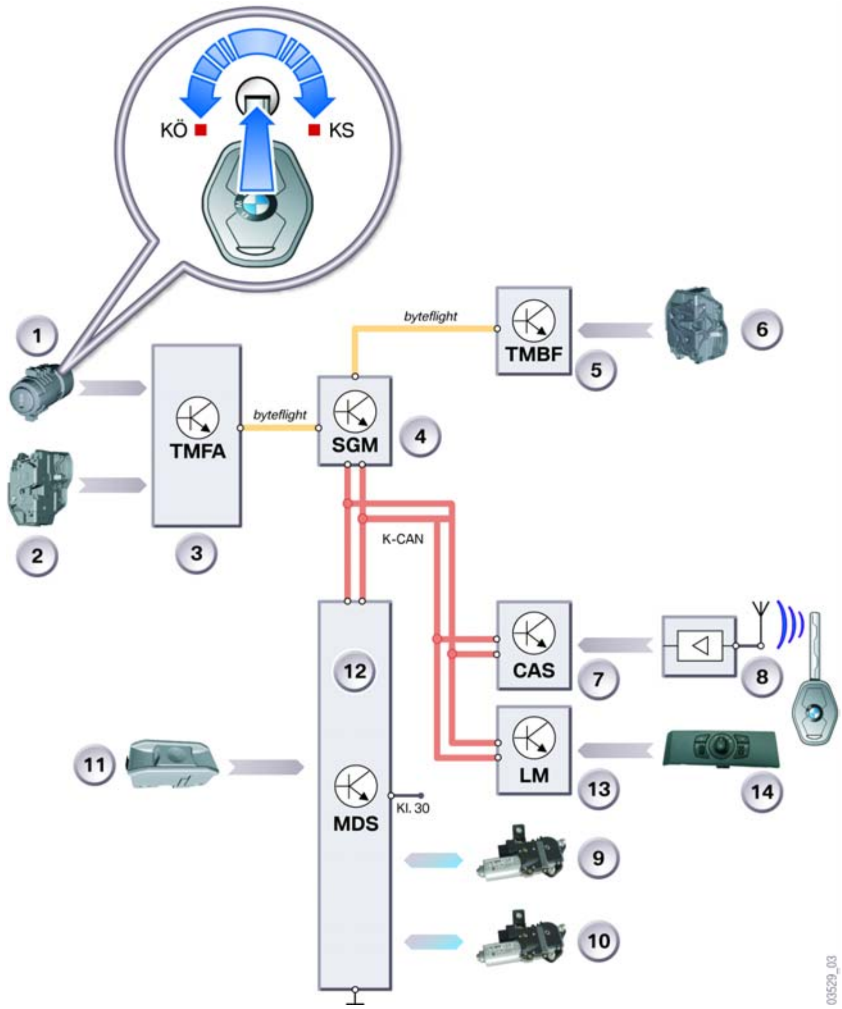
The following components relating to the glass tilt sunroof are fitted in the vehicle:

- Control button for glass tilt sunroof
- Control unit, multi-drive sunroof MDS, for glass tilt sunroof

- Motor for glass tilt sunroof
- Motor for sunroof visor

Communication with other users in the vehicle, such as the car access system CAS takes place via the K-CAN.

**Control Unit MDS**
The MDS is installed in the carrier in the glove compartment.




1. Lock cylinder, driver's door
2. Door contact, driver's door
3. Driver's door module (TMFA)
4. Safety and gateway module (SGM)
5. Passenger door module (TMBF) sunroof (MDS)
6. Door contact, passenger's door
7. Car access system (CAS)
8. Remote control
9. Motor for glass tilt sunroof
10. Motor, sunroof visor
11. Glass roof control button
12. Control unit for glass tilt (MDS)
13. Light module
14. Light module control switch

## Functions

**Control Button**
The button functions are described in the Owner's Handbook.

**Glass Tilt Sunroof**
The functions of the glass tilt sunroof are based on the tilt functions of the E60 slide/tilt sunroof.

### Sunroof Visor
The functions of the sunroof visor are based on the functions of the sunroof visor for the panoramic glass sunroof.

### Service Information

### Initialization
Initialization of the glass tilt sunroof is based on that of the E60. The glass tilt sunroof can be initialized either via the control button or the tester.

Only full initialization will ensure complete operability of the glass roof.

### Manual Initialization with Control Button
The characteristic curve is relearned during every new or reinitialization of the glass tilt sunroof.

### Preconditions
The glass sunroof must be clean and be at room temperature. Terminal 15 ON must be applied. When the glass tilt sunroof is subsequently initialized using the control button, this button must remain pressed until the initialization procedure is concluded.

The control button is pressed and held in the lift sunroof direction. The initialization run starts up approx.15 seconds after pressing the control button.

### Glass Tilt Sunroof

The glass tilt sunroof can be replaced only together with the sunroof visor.

The motors and the control unit can be replaced individually. The glass tilt sunroof must be encoded and initialized after replacing the control unit.

## Alarm System

The alarm system detects and warns of any attempts to break in or tamper with the vehicle. The system is installed in various types of vehicles in different country-specific versions.

The anti-theft alarm system, integrated in the CAN-Sine, communicates with the components via the K-CAN or via the DWA bus. The DWA of the E63 is equipped with multiplex microwave sensors, the CAN-Sine and the DWA LED.

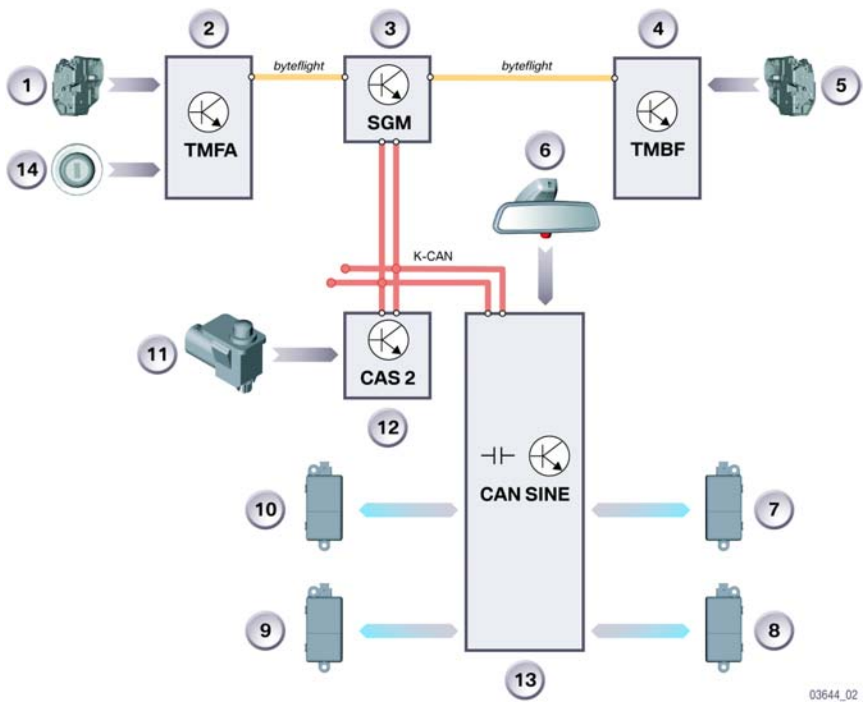
For the first time at BMW, MuW (multiplex microwave sensors) sensors are fitted in the E63.

The advantages of these MuW sensors are:

- Interior protection
- Effective MuW sensor detection during interior monitoring
- No false alarms triggered by MuW sensors during interior monitoring

The processor in the CAN-Sine features diagnostic capabilities and can be encoded. The MuW sensors assume the secondary functions and the CAN-Sine the main control unit function.

The E63 is not equipped with the Ultrasonic interior movement detector USIS. The DWA logic and the emergency current siren with integrated tilt alarm sensor have been combined to form one unit, i.e. the CAN-Sine.




1. Hall sensor, driver's door
2. Driver's door module (TMFA)
3. Safety and gateway module (SGM)
4. Passenger door module (TMBF)
5. Hall sensor, passenger's door
6. DWA LED
7. Multiplex microwave sensor, passenger's door
8. Multiplex microwave sensor, rear passenger's side door
9. Multiplex microwave sensor, rear driver's side door
10. Multiplex microwave sensor, driver's door
11. Bonnet contact
12. CAN-Sine tilt alarm sensor with integrated emergency current siren
13. Car access system 2 (CAS 2)
14. Lock, driver's door

## Exterior Lights

### Changes Compared to the E60

The E63/64 features 2 lamp bulbs in each directional indicator for the front direction indicator function.

The marker light of the E63 is fed from below into the light guide. The hotspot is located at the feed point of the light guide.

The front side markers are equipped with lamp bulbs. LEDs are used for the tail lights/brake lights.




## Brake Force Display

The BFD can currently be used only in the US country-specific version. The upper LEDs of the rail light are used as the BFD as of a deceleration of 6 m/s2.

# E63 Seats

The seats in the E63 have been adapted from the E46/2.

All seats feature a manual head restraint adjustment facility in up and down direction. The sports seat additionally features a seat depth adjustment.

The seat functions have been adopted from the E46/2.

## Steering Column Memory

The memory positions for the steering column are stored and managed in the center console switch center.

## Seat Heating

The seat heating is activated and controlled from the SZM. The seat heating is supplied with a clocked voltage. The heating output control that is required in order to regulate the temperature is achieved by pulse width modulation of the heating current. The clocking frequency is 25 Hz.

## E63 Advanced Safety Electronics

The advanced safety electronics ASE is the electronic safety system for the 6 Series Coupe. In principle the ASE is the same as the system in the E60. The ASE has been correspondingly adapted for the E63

The changes to the ASE system on the E63 have been made in the following areas:

- B-pillar satellites
- AITS I (head airbag)
- Active knee protector (US)

**Note:**
**This Workshop Manual is only a supplement to the E60 Training Reference manual. Only the changes compared to the E60 are described.**

### B-Pillar Satellites

The following changes have been made on the E63 to the B-pillar satellites:

- No ignition circuits for the active head restraints
- No ignition circuits for the rear side airbags
- No ignition circuits for the rear seat belt tensioners

The SBSL still controls and monitors the following trigger circuits:

- Head airbag (AITS I) left
- Seat belt tensioner, left

The SBSR still controls and monitors the following trigger circuits:

- Front airbag, passenger
- Head airbag (AITS I) right
- Seat belt tensioner, right

### AITS I (Head Airbag)

The advanced inflatable tubular structure (AITS I) is used on the E63. The difference compared to the AITS II of the E60 is the length adaptation to the body of the 6 Series Coupe. The AITS I is the head airbag for the driver and passenger side. The AITS I extends from the A-pillar back to the B-pillar and covers the entire side area of the driver/passenger.

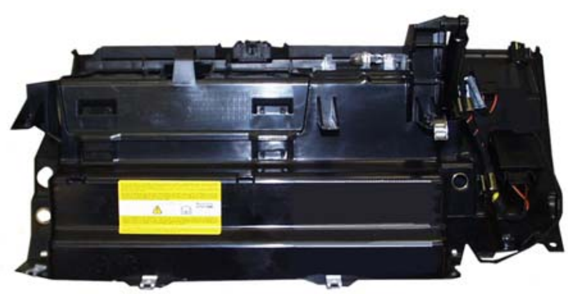
## Active Knee Protection

The E63 US features knee airbags on the driver's side and passenger's side.

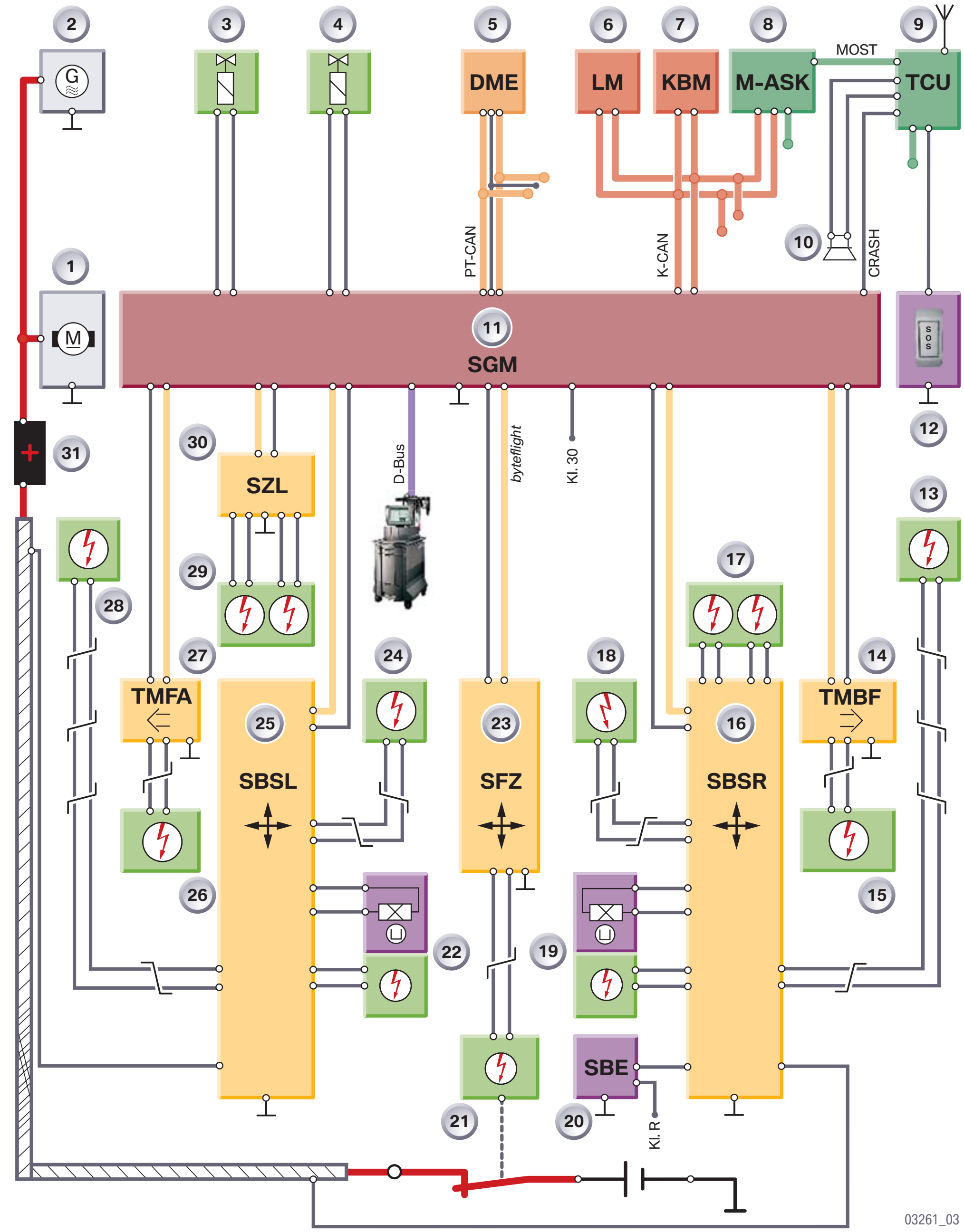
In the event of a crash, the knee airbag adds additional support for the knees. This initiates a controlled forward shift of the upper body, which is cushioned by the relevant airbag.

The knee airbag on the driver's side is located behind a cover under the steering column.

The knee airbag on the passenger's side is located behind a cover in the flap of the glove compartment.



## E63 ASE Schematic




1. Starter
2. Generator
3. ECO valve (AFS Only)
4. Servotronic Valve (optional)
5. DME
6. Light Module
7. KBM
8. MASK
9. TCU
10. Emergency speaker
11. SGM
12. Emergency Call Button
13. Head Airbag AITS II, R/S
14. Door Module Passenger Door
15. Side Airbag, Passenger Door
16. B-pillar satellite, R/S
17. Front Airbag, Passenger
18. Knee Airbag, Passenger
19. Seat Belt switch/tensioner, Pass
20. OC3
21. BST
22. Seat Belt switch/tensioner, Driver
23. Vehicle Center Satellite
24. Knee Airbag, Driver
25. B-Pillar Satellite L/S
26. Side Airbag Driver
27. Door Module Driver Door
28. Head Airbag AITS II, L/S
29. Front Airbag, Driver
30. Steering column switch cluster
31. Main adapter point, eng. com.

## E64 Advance Safety Electronics

E64 Advance Safety Electronics are based on the systems of the E60/E63.

### Changes to E64 ASE

The following charges have been made to the E64 ASE compared to the E60/E63:

- AITS head protection is eliminated
- New rollover protection system URSS added
- Seat-integrated belt system SGS
- New vehicle center satellite, SFZ-R, with Rollover and acceleration sensors
- Updated SGM to include actuators for Rollover protection system

### Rollover Protection System

The Rollover protection system for the E64 consists of the following:

- ***byteflight,*** the optical bus system
- SGM
- SBSL with acceleration sensors
- SBSR with acceleration sensors
- TMFA with door pressure sensor
- TMBF with door pressure sensor
- SFZ-R with Rollover sensor and Acceleration Sensors
- satellite switching center steering column SZL
- URSS unit

### SFZ-R

The SFZ-R of the E64 includes the additional sensors for rollover protection system activation. Sensor data is sent via ***byteflight*** to the SGM. The SFZ-R is mounted on the transmission tunnel.

### SFZ-R Sensors

Included in SFZ-R are the following sensors:

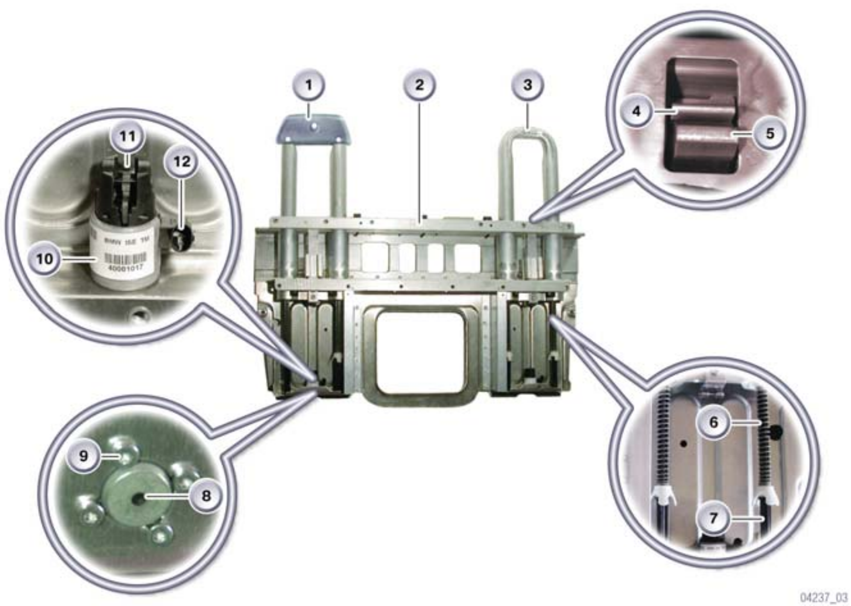
- Longitudinal acceleration sensor (x axis)
- Transverse acceleration sensor (y axis)
- Low g sensor (Rollover sensor) (Z-axis)
- Turning rate sensor (turn in the x axis)

### Function Mode

The SFZ-R contains two processors, the main processor and the auxiliary processor. The main processor computes an estimated angle of the vehicle based on data received from the ASE system sensors and information from the Rollover sensor and the turning rate sensor. The auxiliary processor computes estimated vehicle angle based on data received for the transverse acceleration sensors, the Rollover sensor and the turning rate sensor.

Information from both the main and auxiliary processors is constantly compared. If the processors determine the angle of the vehicle exceeds a fixed threshold the following sequence is initiated:

- The main processor advises the SGM the vehicle has exceeded threshold limits vi the ***byteflight***
- The auxiliary processor activates the arming line (New to the E64) to the SGM
- The SGM evaluated information received from both processors
- The SGM activates both Rollover protection devices and they are driven up by spring pressure




1. Cover Rollover Bar
2. Rollover protection carrier
3. Rollover bar
4. Pawl
5. Locking Lever
6. Activation Spring
7. Guide Rod
8. Opening for emergency release
9. Attaching bolts for actuator
10. Actuator
11. Holding device
12. Electrical Connection

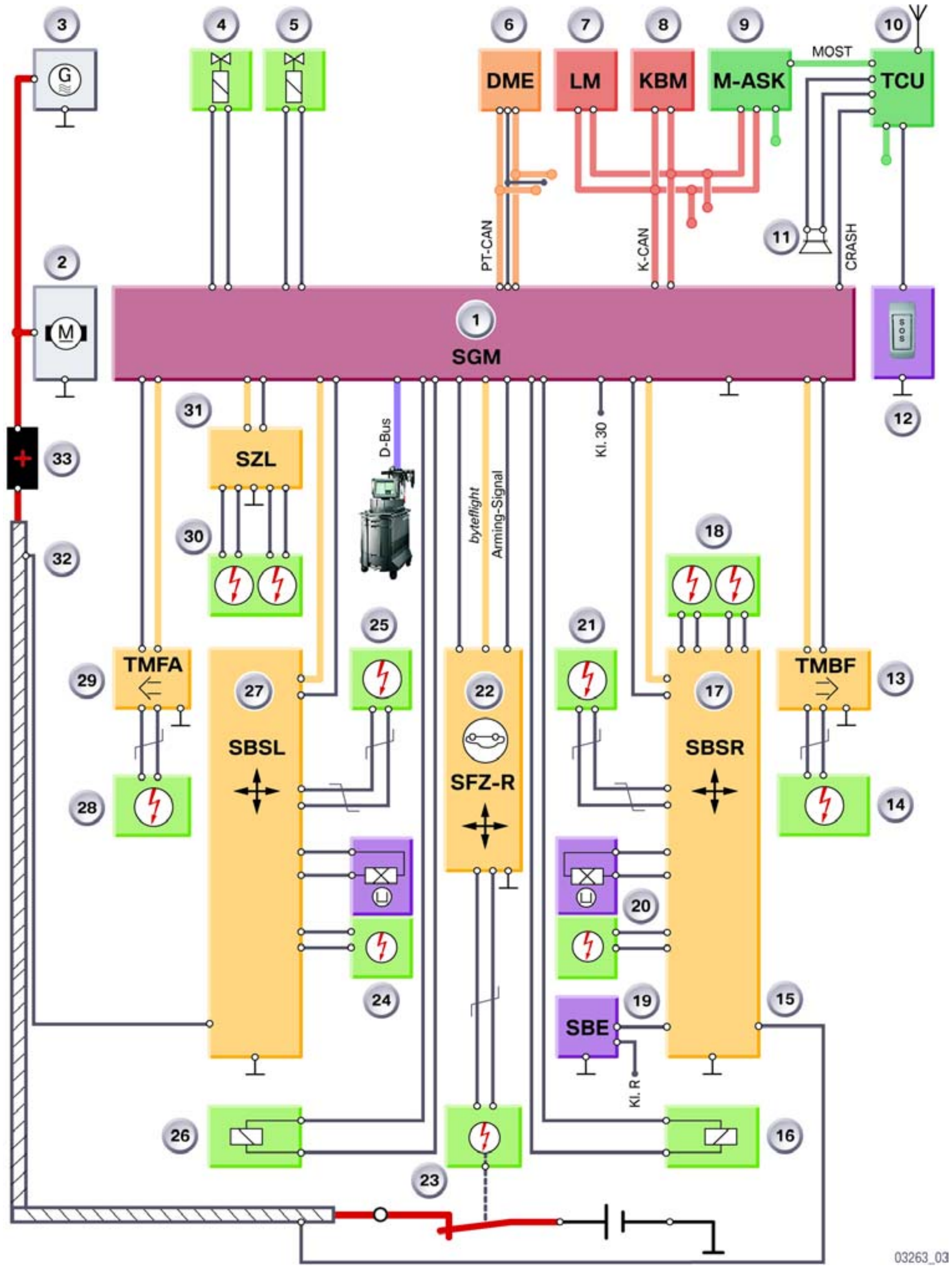
### SBSL

Since there are no Head Airbag AITS devices in the E64, the SBSL is only responsible for the activation of the driver side knee airbag and seat belt tensioner.

### SBSR

The SBSR is responsible for the activation of the passenger front airbag, knee airbag and seat belt tensioner.

## Rollover System Schematic




1. SGM
2. Starter
3. Generator
4. ECO valve (AFS Only)
5. Servotronic
6. DME
7. Light Module
8. KBM
9. MASK
10. TCU
11. Emergency speaker
12. Emergency Call Button
13. Door Module Passenger Door
14. Side Airbag, Passenger
15. Not Used
16. Rollover protection system R/S
17. B-Pillar Satellite, R/S
18. Front Airbag, Passenger
19. OC3
20. Seat Belt switch/tensioner, Pass
21. Knee Airbag Passenger
22. Vehicle Center Satellite
23. BST
24. Seat Belt switch/tensioner, Driver
25. Knee Airbag, Driver
26. Rollover Protection L/S
27. B-Pillar Satellite L/S
28. Side Airbag, Driver
29. Door Module Driver Door
30. Front Airbag, Driver
31. Steering Column Switch cluster
32. Battery Cable Monitor
33. Main adapter point, eng. com

### URSS Service Information

Activation of the rollover protection devices is possible through a Test Plan of the DISplus or GT1.

During Test plan activation observe the following safety precautions:

- The convertible top MUST be in the down position (Top Open)
- DO NOT stand over or near the rollover protection devices prior to or during deployment

### Mechanical Deployment (For Service)

Prior to servicing, repairing or removing the URSS the rollbars must be deployed. If it is not possible to activate the system with the DISplus or GT1, the emergency mechanical release should be used.

1. Open the Convertible top
2. Trunk open
3. Remove the baggage compartment floor mat and bulkhead cover
4. Insert a hook device into the opening of the crossmember until you reach the actuator
5. Insert the hook into the hole in the actuator and pull the release lever

## E64 Seat Belts SGS

The seat and SGS system of the E64 are identical to those of the E46 Convertible.

## Workshop Exercise - URSS Deployment

### Mechanical Deployment

*Prior to servicing, repairing or removing the URSS the rollbars, they must be deployed. If it is not possible to activate the system with the DISplus or GT1, the emergency mechanical release should be used.*

*With the Instructor's assistance:*

1. *Open the Convertible Top.*
2. *Trunk open.*
3. *Remove the luggage compartment floor mat and bulkhead cover.*
4. *Insert an "L" shaped device (allen key) into the opening of the bulkhead cross member until you reach the actuator.*

**Note: DO NOT stand over or near the rollover protection devices prior to or during deployment.**

5. *Insert the tool into the base of the actuator (hole) and push up.*

*To Reset:*

6. *Slide the release latch (under the deployed bar) and slowly compress the bar (approximately half way) remove your hand and fully down seat the bar until it latches.*

### DISplus/GT1 Deployment

*Activation of the rollover protection devices is possible through Service Functions > Test Plan in the DISplus or GT1.*

*During Test plan activation observe the following safety precautions:*

1. *The convertible top MUST be in the down position (Top Open).*

**Note: DO NOT stand over or near the rollover protection devices prior to or during deployment.**

2. *Slide the release latch (under the deployed bar) and slowly compress the bar (approximately half way) remove your hand and fully down seat the bar until it latches.*

# Table of Contents

## E63/64 Car Communication Computer




Initial Print Date: 02/04 Revision Date:

# Car Communication Computer (CCC)

## Model: E63/64

## Production:  Start of Production MY 2004

# OBJECTIVES

After completion of this module you will be able to:

- Recognize the CCC
- Identify the main CCC components
- Disassemble and repair the CCC
- Understand the operation of the CCC

## Car Communication Computer

In principle, the structure of the car communication computer corresponds to that of a personal computer. In the same way as a personal computer, the car communication computer contains a processor as well as RAM modules and other peripheral components. Certain functions such as the voice input control system are integrated in the form of software in the car communication computer.

The car communication computer is the central control module for all applications. It is always coupled with the 8.8" split-screen central information display. The car communication computer also features the high variant of the controller with haptic feedback.

The car communication computer is based on a modular design, i.e. the main systems of the communication network are integrated in the form of modules in the car communication computer. It can be configured and expanded corresponding to requirements. At the time of market launch, the following modules/functions will be integrated in the car communication computer:

- Radio double tuner
- DVD navigation system, Professional (map presentation)
- Voice control system
- ASK functions
- MOST-CAN gateway functions


The following advantages are achieved by combining several control units in one module:

- Increased functionality by combining several systems
- Easy to expand/upgrade by means of software with corresponding interfaces
- Fewer plug connections therefore fewer potential fault sources
- Reduced package space for control units

## Components

The car communication computer consists of several components:

Housing

CD-ROM drive

DVD drive

HIP-module (host independence positioning module)

Gyro sensor

Tuner module

Main board

Power board

Audio board

Memory module

Front panel

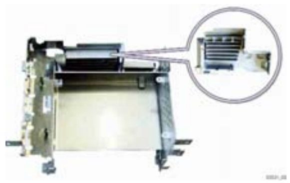
Front panel with Bluetooth module (not at SOP)

PMC-card 1 for rear compartment entertainment (not at SOP)

PMC-card 2 open

PCMCIA-card for memory expansion (not at SOP)

Electric fan



The car communication computer is accommodated in an aluminium casing. The size of the car communication computer corresponds to two radio DIN casings.

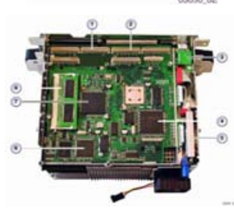
The following types of CD can be played on the CD-ROM drive:

- Audio CD
- Audio CD-ROM with MP3 files

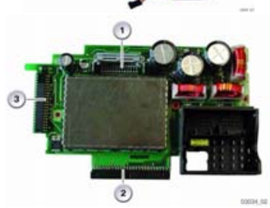
When the navigation system is not in use, the DVD drive can also be used to play audio CDs or audio CD-ROMs with MP3 files.

The HIP module contains the GPS receiver that has the task of converting and decoding the signals received from the GPS aerial.:

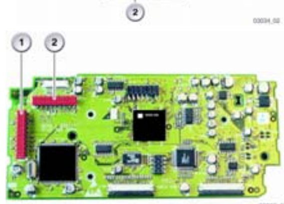
The gyro sensor is a separate module that is connected via plug contacts to the main board and is secured by a screw.



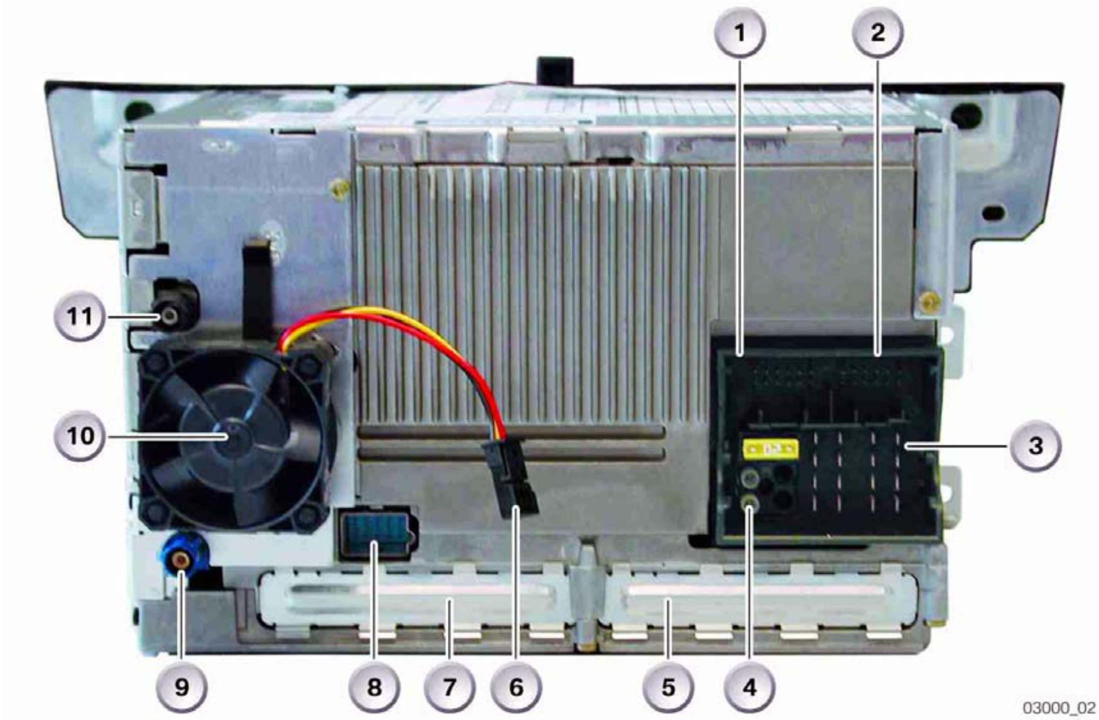
In addition to the CPU (Central Processing Unit) further processors and main memories are mounted on the main board. The main board also contains plug-in slots for expansion boards.



The power board is located at the rear of the car communication computer. The FAKRA main connector for the power supply and the MOST connector are secured on the power board. The main connector provides the interface to the vehicle electrical system.

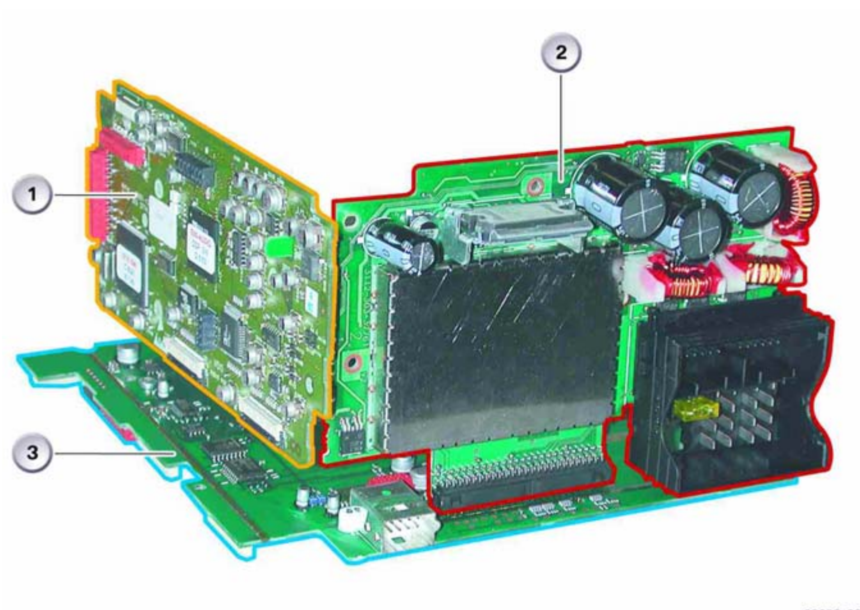


The ASK functions are located on the audio board. Two digital sound processors facilitate simultaneous conditioning of the audio signals and operation of the voice control system.




**Rear view of car communication computer**

1. 12-pin connector, left
2. 12-pin connector, right
3. 16-pin connector
4. MOST connector
5 . Cover for expansion card
6. Connection for fan motor
7. Cover for expansion card
8. LVDS connector
9. GPS aerial connector
10. Fan motor
11. Radio aerial connector




1. Audio Board
2. Power Board
3. Main Board

## Service Concept for the Car Communication Computer

The service concept is such that individual modules and parts of the car communication computer can be replaced in the event of malfunction, thus serving to reduce repair costs. A differentiation is made between electronic and mechanical parts.

### Electronic Parts

Replacement of the following electronic parts is planned:

| | | | |
|---|---|---|---|
| CD drive | DVD drive | Tuner module | HIP module |
| Gyro | Front panel | Audio board | Memory module |
| PMC cards | Electric fan | | |

### Mechanical Parts

Following mechanical parts are available:

| | | |
|---|---|---|
| Top cover | Bottom cover | DVD drive retaining fixture |
| CD retaining fixture | DVD drive holder | CD drive holder |
| Cover PMC slot | Cover PCMCIA slo | Rubber mount for electric fan |

Particular attention must be paid to electrostatic discharge ESD when working on the car communication computer. Disregard of the safety requirements may result in damage to the electronic components in the car communication computer.

### Working on Electronic Components

#### Preparatory Work

The following points must be observed when working on electronic components of the car communication computer corresponding to the service concept.

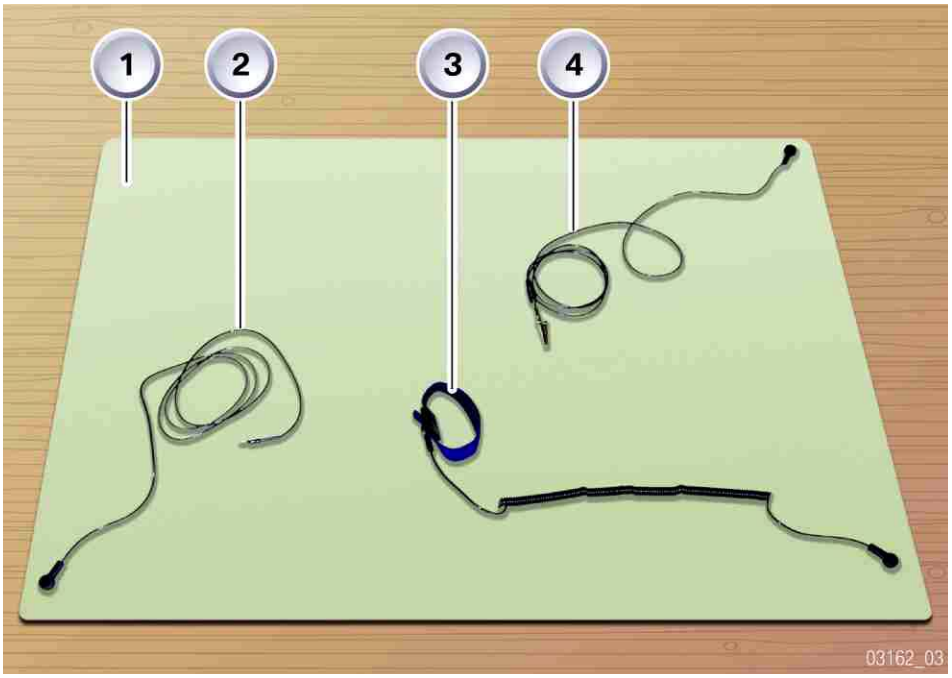
All work must be carried out on a conductive and earthed workbench.

The special tool 12 7 192 is additionally used for this purpose.

The earthing cable must be connected to a secure and reliable earthing point (water pipe, heating pipe, socket outlet earth). Before taking the parts out of their packaging, the person working on the components must first put on the wrist cuff in order to discharge himself. The electronic components are placed on the antistatic mat and also connected with the earthing cable.

### Replacement

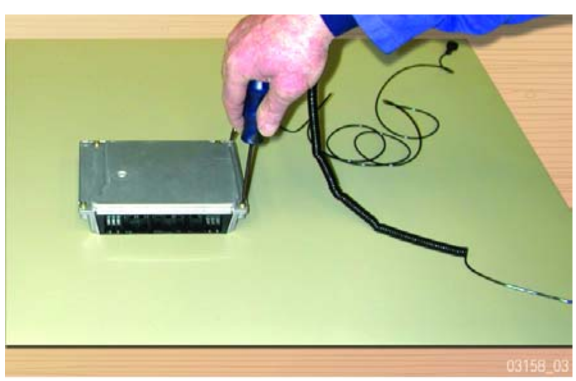
The electronic components must be replaced as described in the repair instructions and following the procedure described on SIP Electrostatic Fundamentals, while observing ESD safety measures.




1. Antistatic Mat
2. Ground Strap Antistatic Mat
3. Wrist Strap
4. Ground Strap Component

**Note: The Antistatic Mat at your Center may look different than the one shown here or at the training center. Remember the following when using the Antistatic Mat:**

- **Ground the Antistatic Mat to the workbench using the attached lead**
- **Attach the Grounding strap to the component being serviced**
- **Always wear the wrist cuff.**



## System Functions

The car communication computer comprises the following functions:

- Radio
- DVD navigation, Professional (map presentation)
- Voice control system
- Online platform
- Audio management
- ASK functions
- Driver for central information display
- MOST CAN gateway

### Voice Control System

A voice control system High is integrated in the car communication computer. With this system, all functions shown in the CID can be controlled by voice commands. This system has the advantage that the hands need not be taken off the steering wheel while driving in order to change settings.

The SES can be used to control the following systems:

- Entertainment
- Communication
- Navigation
- Climate
- "5th Menu" setting

The voice control system makes use of specific voice commands. The voice control system sets up a dialogue with the user. Repeat requests are issued if the system did not understand a command.

### System Integration

The voice control system is loaded as pure software in the car communication computer. The voice control system makes use of the memories and processors in the car communication computers as well as the hardware of other systems (e.g. microphones).

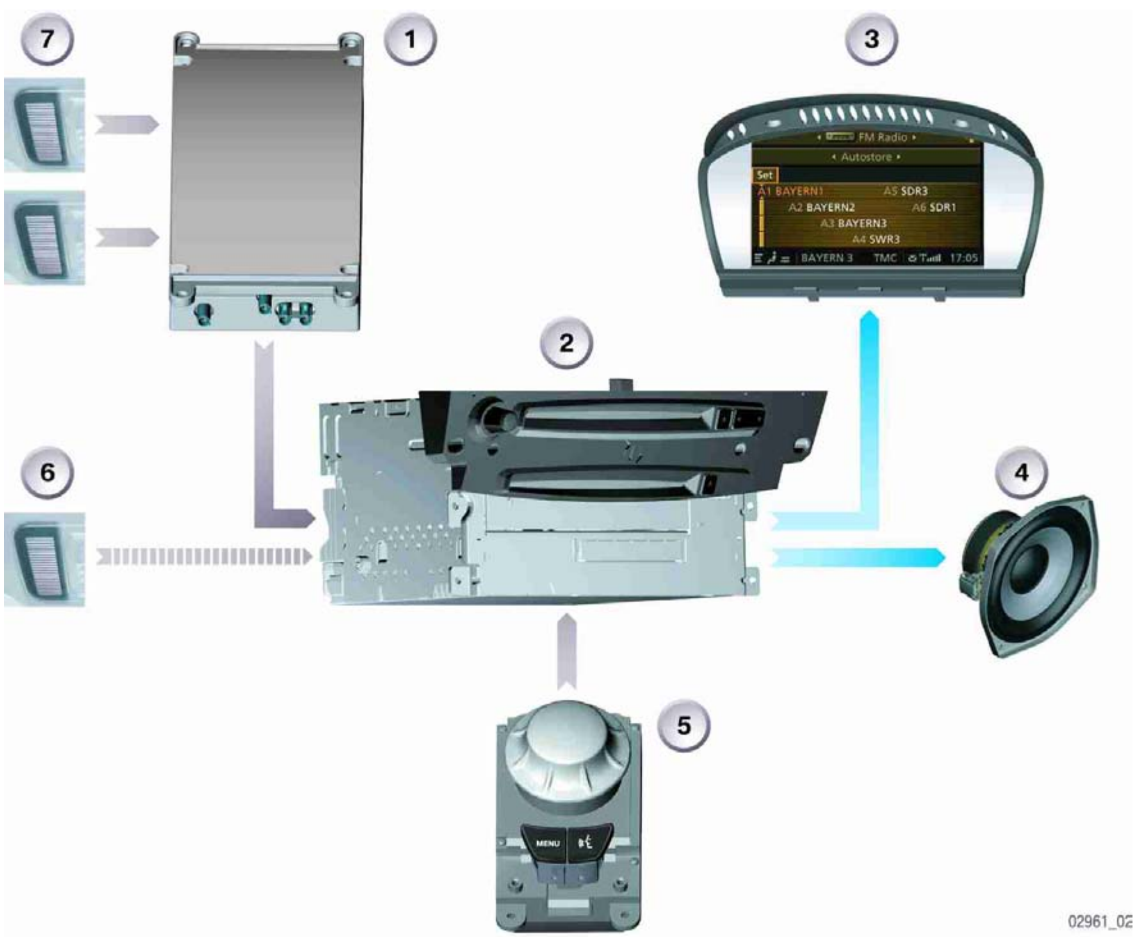
The two hands-free microphones in the front roof console are used in connection with the voice control system. The hands-free microphones are connected directly to the telematics control unit (TCU). The TCU sends the microphone signals via MOST to the car communication computer where they are processed in the DSP in order to execute the required functions.

## Functional Principle of Voice Control System

### System Start/End

The voice control system is activated/deactivated via the push-to-talk button (PTT) on the multifunction steering wheel or on the controller. For the first time, the PTT button on the controller makes it possible for the passenger to use the voice control system (SES). The SES is activated for the driver by briefly pressing the button and for the passenger by pressing and holding the button longer.

The SES is deactivated by again pressing one of the PTT buttons. Activation of the SES is indicated by a graphic display (PTT logo) in the status line of the CID. The system is active for about 5 seconds. If no input takes place during this period of time, the user is informed that no voice input was detected and the request for voice input is repeated. The voice control system is deactivated if again no input is made within 5 seconds.



## Workshop Exercise - CCC Disassembly

*With the Instructor's assistance, remove and disassemble the CCC mockup using the Antistatic Mat.*

1. *Remove CCC face plate*
2. *Remove housing top plate and Tuner Module (on RH side)*

3. *Remove CD -ROM drive and disconnect harness (shown on the right)*

4. *Turn CCC upside down and remove bottom cover plate*

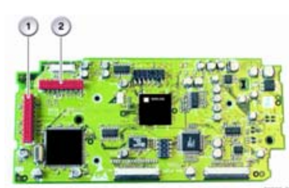
5. *Remove HIP module - slide upwards and disconnect harness (shown on the right)*

6. *Release single screw and remove the gyro sensor (shown on the right)*

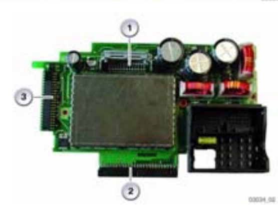
7. *Remove the Main Board surface screws*
   - *disconnect top ribbon cables (3)*
   - *disconnect bottom ribbon cables (2)*
   - *release fiber optic connector from rear main plug block (in housing)*
   - *remove main board (shown on the right)*

8. *Remove DVD drive from the front (shown on the right)*

9. *Remove Audio Board (shown on the right)*



10. *Remove the power board by sliding it out of the housing (shown on the right)*



# Table of Contents

## E63/64 Head-Up Display (HUD)

**Subject** **Page**



Initial Print Date: 02/04 Revision Date:

# Head-Up Display

## Model: E63/64

## Production: Start of Production MY 2004

# OBJECTIVES

After completion of this module you will be able to:

- List the advantages of the HUD
- Name the components of the HUD
- Explain HUD operation
- Perform HUD self test
- Align HUD with special tools

# Head-Up Display

The HUD projects a virtual image into the driver's field of vision.

Depending on the equipment installed in the vehicle, this virtual image contains information that is of relevance to the driver, such as e.g.: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- Cruise control FGR
- Active Cruise Control ACC
- Navigation
- Check Control messages
- Road speed

The size of the virtual image is approx. 200 mm x 100 mm.

### Advantages of the Head-Up Display

The virtual image in the driver's field of vision allows the driver to concentrate more on the road ahead than previously. Driving is thus rendered less fatiguing. The driver switches his vision between e.g. the instrument cluster and road traffic less frequently.

### Components

The HUD is made up of the following components:

- Cover glass
- Mirror
- LED power supply
- LED array
- Light well
- TFT projection display
- Shutter
- Main board
- Secondary board
- Housing

Additionally required components:

- Windscreen
- Light Module
- Rain/light sensor
- Safety and information module

## Control Elements

- HUDs control buttons and light switch
- Instrument-lighting dimmer
- Controller

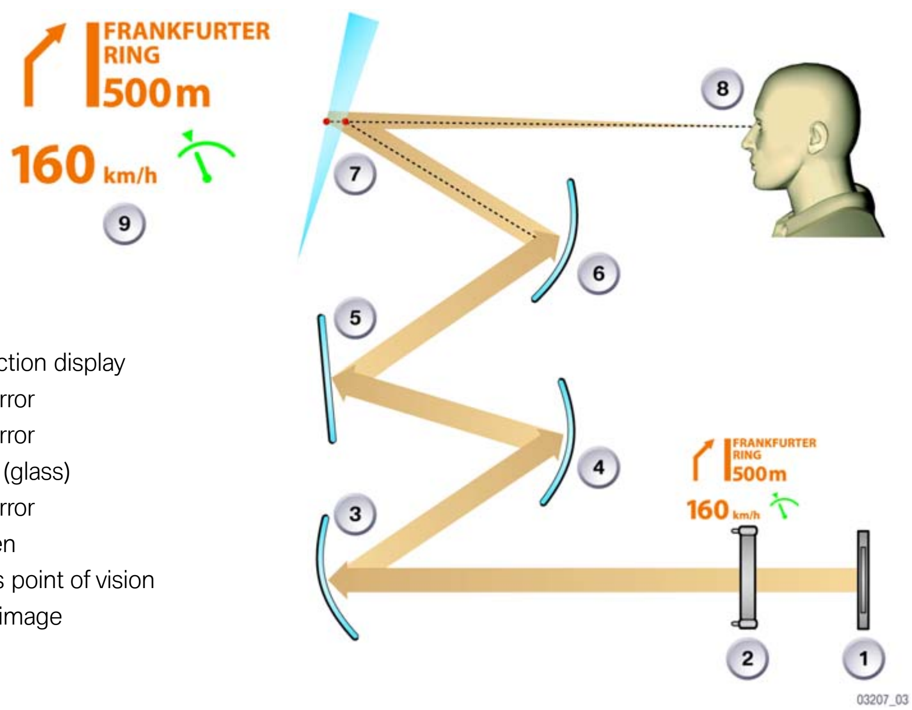
## Image Sources

The following control units supply the necessary signals for the displays:

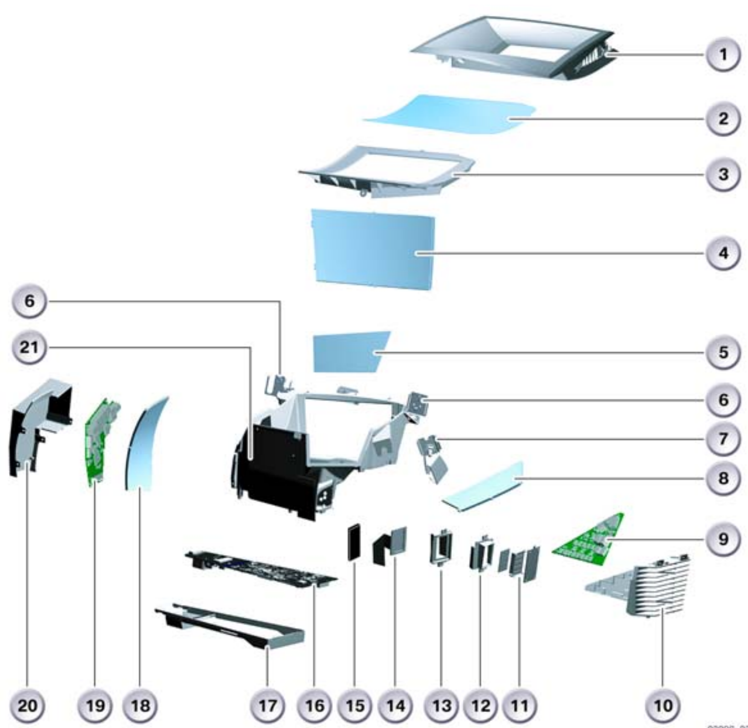
- Active cruise control ACC
- Car Communication Computer CCC
- Instrument cluster KOMBI
- Steering column switch cluster SZL
- Digital motor electronics DME

## Functional Description

The HUD can be compared to a projection device. An LED field is required as the light source for the purpose of projecting the HUD information. The image content is created by the TFT projection display. The TFT projection display can be compared to a filter which admits or blocks light. An optical imaging element determines the shape and size of the HUD images. The image is projected onto the windscreen and appears freely suspended over the road surface.




1. LED array
2. TFT projection display
3. Curved mirror
4. Curved mirror
5. Flat mirror (glass)
6. Curved mirror
7. Windscreen
8. Observer's point of vision
9. Projected image




1. HUD finisher
2. Cover glass
3. Housing frame
4. Curved mirror
5. Flat mirror (glass)
6. Mounting points, front bulkhead
7. Adjusting device
8. Curved mirror
9. LED power supply
10. Heat sink
11. LED array
12. Light well
13. Fixture, TFT projection display
14. TFT projection display
15. Shutter
16. Main board, activation of LEDs
17. Housing frame
18. Curved mirror
19. Secondary board, activation of shutter
20. Housing section
21. Housing

**Mirror**

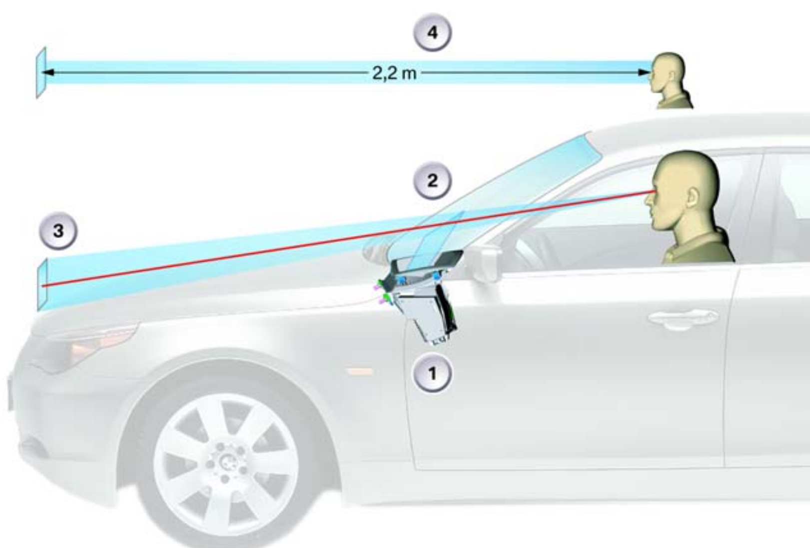
The HUD incorporates four mirrors. These mirrors reflect the display content onto the windscreen. Three of the mirrors are curved. These mirrors adapt the display content to the screen.

This mirror determines the size and distance of the HUD projection. The curved mirrors are made of plastic while the plane mirror is made of glass.

The course of projection is shown in the following illustration.

The projected HUD image content appears at a distance of approx. 2.2 m from the eye.

1. Head-Up Display
2. Windscreen
3. Projected image
4. Projection distance



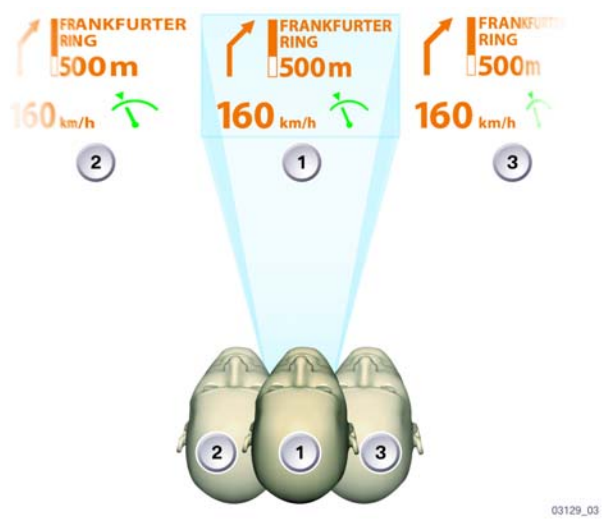
## Eyebox

The eyebox is the movement space in which the driver can move without his view of the image in the HUD being impaired.

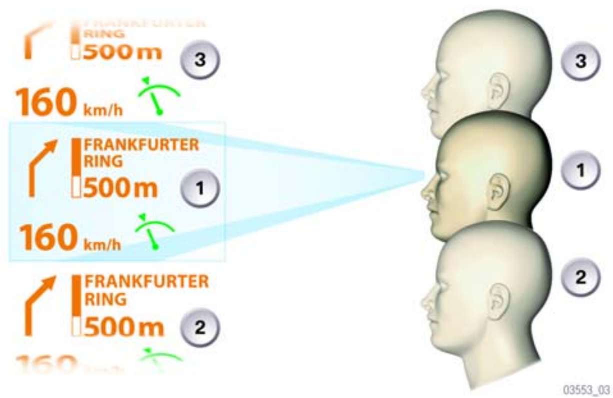
The freedom of movement within the eyebox is roughly:

- 130 mm horizontally
- 90 mm vertically

Outside the eyebox limits the image in the HUD is no longer clearly visible.




1. Point of vision inside the eyebox HUD image OK
2. Point of vision displaced to the left HUD image distorted to the left
3. Point of vision displaced to the right HUD image distorted to the right



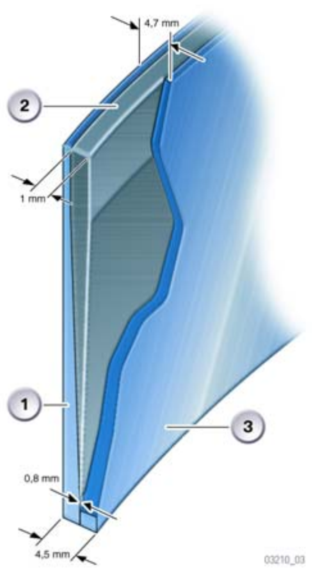

1. Point of vision inside the eyebox HUD image OK
2. Point of vision displaced downward HUD image distorted downward
3. Point of vision displaced upwards HUD image distorted upwards

## Windshield

The windshield is a "special" windshield and is an integral component vital to projecting the displays. The outer and inner glass panes are connected to a plastic film, which is wedge-shaped over the entire length of the windshield.

The wedge-shape prevents double displays (ghosts) of the HUD by positioning both images one above the other. The wedge tip points downward and starts at a distance of approx.10 cm to the bottom edge of the windshield.

The end of the wedge is located at approx. 2/3 windshield height. In the top third of the windshield, the plastic film runs parallel to the outer and inner glass panes. The thickness of the wedge tip is 0.8 mm. The thickness of the end of the wedge is 1 mm.




1. Outer glass pane
2. Plastic film
3. Inner glass pane
   mm Unit of measurement in mm


**HUD "double display"**

If a non-specified (normal) windshield is used, the image is reflected on both the outer and inner glass panes. Overlapping causes the image to be displayed twice. The plastic wedge in the windshield places the images of the outer and inner pane over each other thus preventing double displays (ghosts).

### Color Selection

The HUD background color is transparent.

Symbols (such as e.g. warning symbols) are specified by the individual control units. This color specification is adopted for the display in the HUD.

2D symbols are used for optimum visibility and legibility.

The colors are:

- Orange as the standard color
- Red or yellow for warning messages
- Green for the setting speed

### Light Switch with Operating Unit

The HUD button is located in the operating unit. The control button is resistance-coded and routed directly to the HUD. The HUD can identify the button signals or a button fault using the resistance coding.

### Instrument-Lighting Dimmer

The dimmer setting is also used for the HUD with active headlights. The dimmer signal is emitted by the light module.

### Adjusting HUD Brightness
The brightness of the HUD can be individually adjusted. The CID is the display instrument and the controller the control element for brightness adjustment.

The brightness offset is adjusted from the main menu as follows:

The main menu is activated as soon as terminal 15 is on.

- Press the controller, the "Settings" menu will appear.
- Select "Display settings" and confirm
- Select "Brightness of head-up display" and confirm
- Set brightness and confirm the entry by pressing the controller.

## Service Information

### Operating-Hours Counters

The HUD incorporates operating-hours counters for both the HUD and the LED array. When the HUD is replaced, the operating-hours counter must be initialized at 0.

### Windshield

Bear in mind when replacing the E60 or E63 windshield that the HUD requires a special windshield.

### Replacing Head-Up Display

A faulty HUD must be completely replaced. A new HUD must be adjusted once it has been installed. The CID must be removed for this adjustment work.

This adjustment is performed at a screw on the supporting tube. This screw incorporates an eccentric which serves to adjust the angle of the HUD in relation to the windshield.

A special tool is required for adjustment.

### Test Functions

Different functions can be selected in service without the Service Tester.

Press the HUD button for 30 s to call up the test functions. As soon as the first test function is displayed, further test functions can be called up by briefly pressing the HUD button.  Press the HUD button for more than 2 s to terminate the function.

Function selection:

- Identification
- System test
- Unlocking

- Rain/light sensor
- Road speed
- Operating voltage
- Language
- Unit
- Car & key memory
- Reset.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03106_03


03103_03

**Image Defects**

Incorrect installation of the HUD or of the windshield may result in faulty HUD projections.

The incidence of light onto the windshield or into the HUD in an inconvenient situation causes the image to fade. Excessive heat in the HUD will also cause the image to fade.


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## Workshop Exercise - HUD Adjustment

*With the Instructor's assistance:*

1. *Access the HUD test functions (with KL 15 on, depress HUD button for 30 sec). Activate the System Test as an example. To unlock the HUD (test 19) for additional tests, add the last 5 numbers of the VIN.*
2. *Verify the vehicle is equipped with the correct windshield. Fold back the weather strip at the lower A pillar corner (base of windshield) on the passenger's side.*

   *Look for HUD identification label.*
3. *Lower steering wheel, unclip sun visors and swivel to the side. Place a large covering over the driver's side windshield (sheet of paper). Remove the on-board monitor, position special tools (62 1 121 & 62 1 122) in place.*
4. *Using the DISplus/GT1, perform a short test on the HUD.*

   *Select >Control Module Functions>Component Activation>Test Picture for Height>Activate.*

**Note: Do not activate longer than 30 minutes to avoid overheating of the HUD!**

5. *The height adjustment is measured at the upper limit test image only. The upper limit test image must be at 215 mm +/- 5 mm. If not, use special tool*

   *62 1 122 to release the lock nut and turn the eccentric screw until the upper limit is at the correct height. Tighten the lock nut. Deactivate Test Picture as soon as the adjustment is complete.*

# Table of Contents

## E64 Convertible Top

**Subject** **Page**




Initial Print Date: 02/04 Revision Date:

# Convertible Top

## Model: E64

## Production:  Start of Production MY 2004

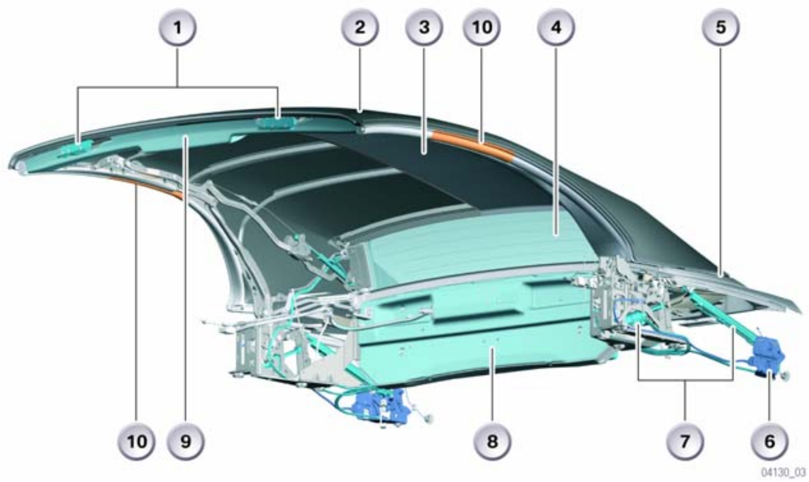
# OBJECTIVES

After completion of this module you will be able to:

- Identify the components of the Electrohydraulic convertible top.
- Remove the rear window module.
- Relate the convertible top opening/closing sequence.
- Perform convertible top emergency operation

# Convertible Top

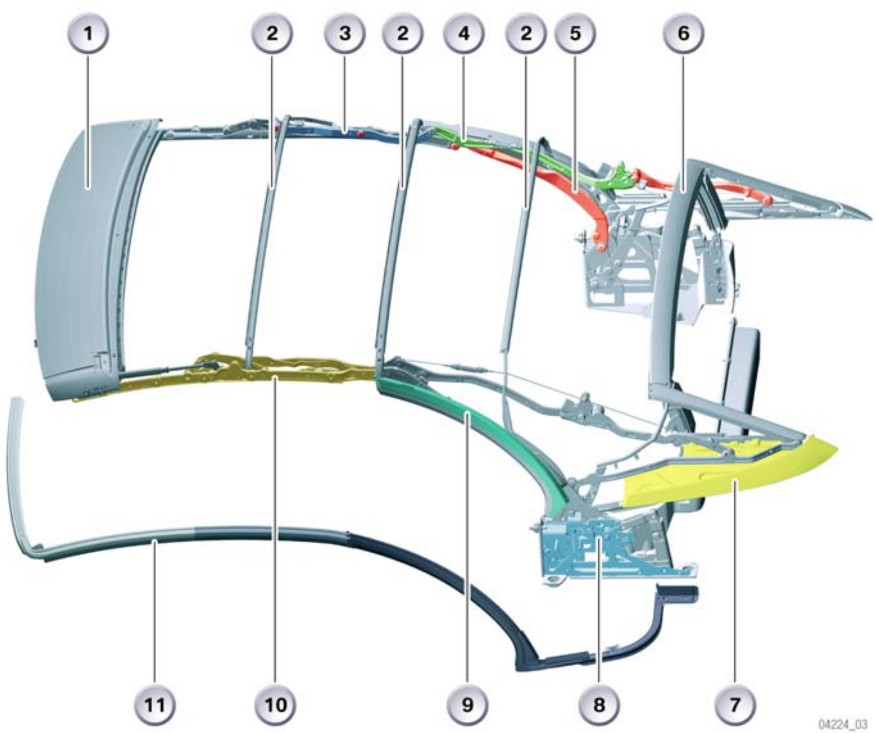
A technical highlight of the E64 is the fully automatic, electrohydraulic convertible top.




1. Convertible top latch (driven by electric motor)
2. Convertible top cover
3. Headliner
4. Fixed, heated rear window
5. Fin
6. Kinetics box
7. Convertible top hydraulic system
8. Rear window module
9. Front brace
10. Window seal

The electrohydraulic convertible top consists of mechanical, electrical and hydraulic components.

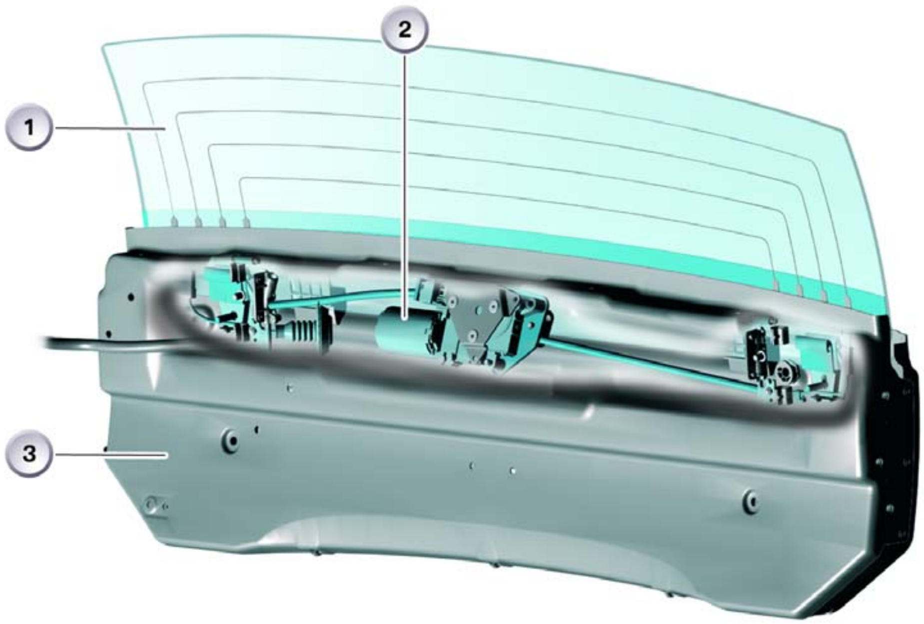
## Mechanical Components




1. Front brace
2. Brace
3. Control arm
4. Tensioning bar
5. Main control arm
6. Corner brace
7. Fin
8. Main bearing
9. Main pillar
10. Roof control arm
11. Seal

In addition to the convertible top frame, other important mechanical components of the convertible top include the headliner and the convertible top cover with their mounting elements.

## Rear Window Module




1. Rear window
2. Electric motor for rear window drive
3. Cover for rear window module

The rear window module, however, represents a completely new mechanical element in the convertible top of the E64.

The rear window module can be removed as a complete unit. This is recommended if major repairs need to be performed.

## Removal Procedure

- Unplug cables (remove rear side trim, rear seat and rear seat backrest)
- Remove cover for rollover protection system
- Unclip cover on rear window module
- Unscrew retaining bracket under cover
- Remove hydraulic unit (four screws)
- Loosen six side screws at rear window module (if necessary, mark position beforehand)
- Unscrew cover for rear window module (nine screws, partly under module)

The complete rear window module can now be removed.

**Note:**
**It is sufficient to detach the cover of the rear window module if only the rear window is to be replaced.**

Continue as follows:

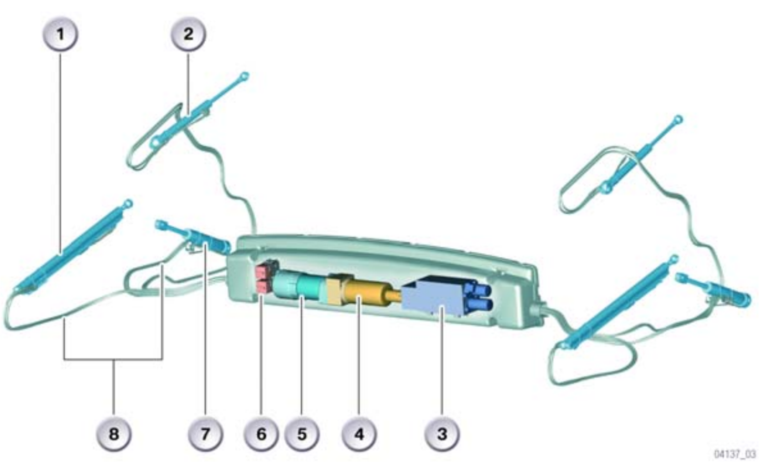
- Screw on clamps
- Disconnect two cables for rear window defogger
- Lift out rear window

When installing, the rear window must first be placed on the bottom slide and centered. The rear window is then firmly clamped.

The rear window must also be removed beforehand if the electric motor for the rear window drive is to be replaced (refer to repair instructions for details).

Any leaks in the area of the rear window can be rectified by releasing the upper mounting screws of the rear window module and tilting the seal or changing the seal pressure. If this measure is not successful, the rear window must be shifted correspondingly in its clamp mounting.

### Hydraulic Components




1. Cylinder for convertible top compartment lid
2. Cylinder for tensioning rod
3. Valve block
4. Hydraulic pump
5. Electric motor for hydraulic pump
6. Hydraulic pump relay
7. Main pillar cylinder
8. Hydraulic lines

A pair of cylinders each acts on the main pillars, convertible top compartment lid and tensioning rods. The cylinders are double-acting, i.e. operated both from the piston as well as from the rod end.

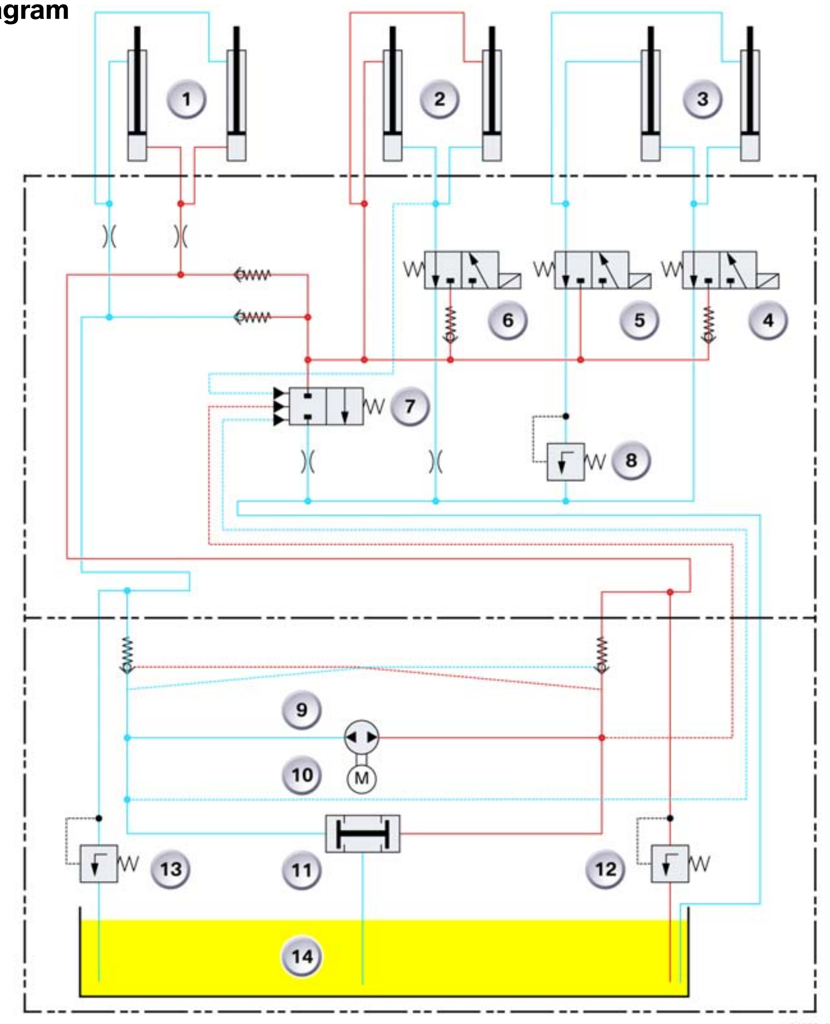
The operating direction of the main pillar cylinders depends on the direction of rotation of the hydraulic pump.

The convertible top compartment lid is extended by corresponding actuation of the changeover valve 6. The cylinders for the convertible top compartment lid are designed such that the pressure on the piston rod end is always prevalent. The tensioning rods are extended and retracted by correspondingly switching the changeover valves 4 and 5.

Changeover valve 7 is responsible for depressurizing the hydraulic system. Changeover valve 7 is activated for as long as the hydraulic pump is operating and/or pressure is applied to the piston end of the cylinders for the convertible top compartment lid so as to maintain pressure in the hydraulic system. Changeover valve 7 is no longer actuated when no pressure is applied to the piston end of the cylinders for the convertible top compartment lid and the hydraulic pump is stationary. The pressure is then reduced via changeover valve 7, thus depressurizing the hydraulic system.

The pressure relief valves open at a system pressure of approx. 190 bar.

**Hydraulic Diagram**




1. Main pillar cylinder
2. Convertible top compartment lid cylinder
3. Tensioning Rod cylinder
4. Changeover valve, extended tensioning rod
5. Changeover valve, retract tensioning rod
6. Changeover valve, extended top compartment lid
7. Changeover valve, depressurize system
8. Pressure relief valve
9. Hydraulic pump
10. Electric motor for hydraulic pump
11. Silencer
12. Pressure relief valve
13. Pressure relief valve
14. Oil reservoir

The hydraulic oil need not be changed (lifetime filling). If it is necessary to top up the hydraulic oil due to leaks, particular care must be taken to ensure that only approved hydraulic oil is used for this purpose (see electronic parts catalogue). Top up hydraulic oil only up to the mark on the oil reservoir.

If the noise level is excessively high during operation of the convertible top, open and close the convertible top several times in succession in order to bleed the system.

The hydraulic system is bled automatically in the oil reservoir.

A temperature sensor measures the temperature of the electric motor in the hydraulic unit. The convertible top can only be closed once automatically as from a temperature of 90ºC and can then no longer be opened.

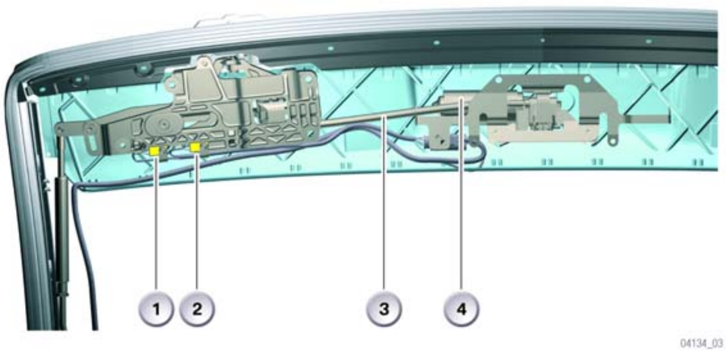
### Electrical Components

The following electrical components are mounted on the electrohydraulic convertible top of the E64:

- Electric motor for releasing and locking the catch hooks at the cowl panel
- Two Hall sensors for detecting the release/lock status of the catch hooks
- Two angle rotation sensors for detecting the position of the convertible top frame
- Two Hall sensors in the main bearings for detecting the lock status of the convertible top compartment lid
- One Hall sensor on the top left cylinder for the convertible top compartment lid for detecting the upper position of the lid
- One Hall sensor on the left-hand kinematics box for detecting the bottom position of the convertible top compartment lid. This Hall sensor additionally checks the lock status of the convertible top compartment lid.
- One microswitch for the convertible top compartment for detecting the position of the floor of the convertible top compartment.

Further electrical components include:

- Driver's switch block with Convertible-specific switch for opening/closing all 5 windows and separately opening/closing the rear window
- Switch cluster in the center console for opening/closing the convertible top
- Convertible top module 5 CVM 5 control unit for the electrohydraulic convertible top. This control unit is mounted behind the rear left side panel.

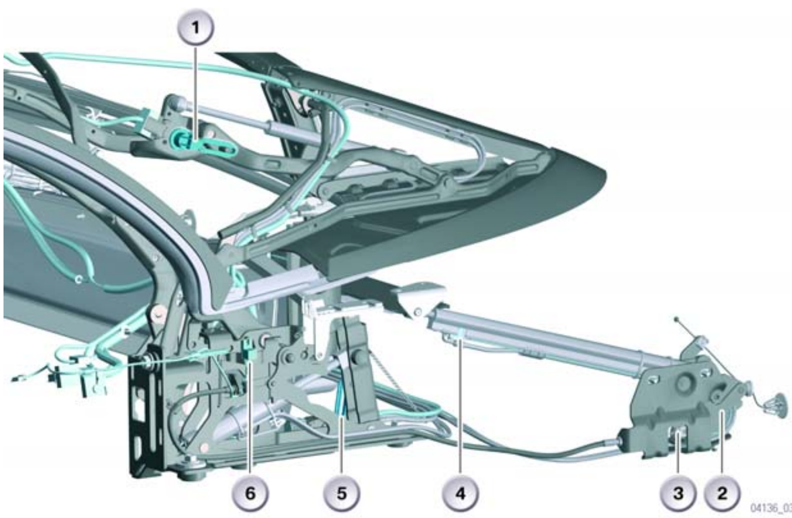



1. Hall sensor, catch hooks closed
2. Hall sensor, catch hooks open
3. Drive shaft
4. Electric motor

**Convertible Top Lock**

The catch hooks for the convertible top lock at the cowl panel are driven by an electric motor.

The Hall sensors are installed on the left-hand side of the front brace. They signal the "Convertible top locked at cowl panel" and "Convertible top released at cowl panel" statuses.




1. Angle of rotation sensor, tensioning rod
2. Kinematics box
3. Hall sensor, convertible top compartment lid down and locked
4. Hall sensor, convertible top compartment lid up
5. Angle of rotation sensor, main pillar
6. Hall sensor, convertible top compartment lid locked, left

**Sensors**

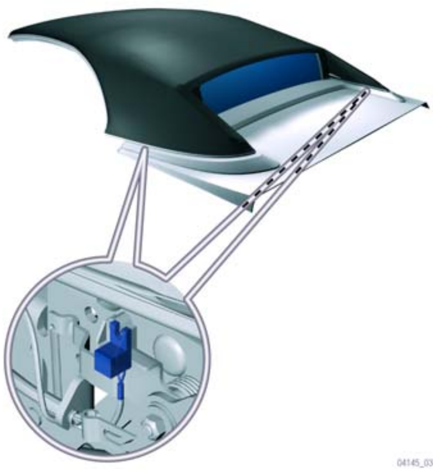
**Tensioning Rod**

The angle of rotation sensor is designed as a potentiometer and is installed on the left-hand tensioning rod. The output voltage changes at the wiper contact of the potentiometer during convertible top operation.

The CVM 5 converts the voltage values to angle values. The CVM 5 uses the angle value to recognize the main pillar angle of 1070 for instance. The convertible top lid is not release and opened before this angle is reached.


**Main Pillar**
The angle of rotation sensor is designed as a potentiometer and is installed on the left-hand main pillar. The output voltage changes at the wiper contact of the potentiometer during convertible top operation.

The CVM 5 converts the voltage values to angle values.



**Convertible Top - Compartment Locked**
One Hall sensor is fitted on the left-hand main bearing and the other on the right-hand main bearing of the electrohydraulic convertible top.

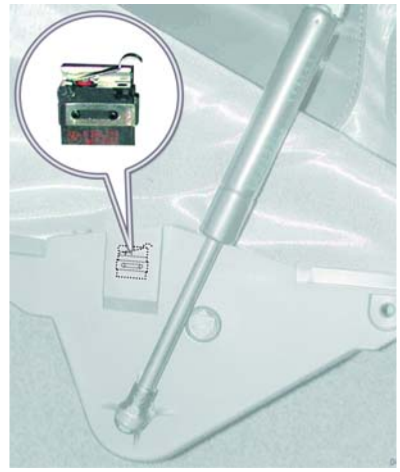
The two Hall sensors signal the "Convertible top compartment lid locked at main bearing" status to the CVM 5.

**Convertible Top - Compartment Up**
The Hall sensor for "Convertible top compartment up" is installed at the top end of the left-hand cylinder for the convertible top compartment lid.

**Kinematics Box**
The cylinders press the convertible top compartment lid into the down position such as to operate the cable assemblies that in turn engage the catch hooks. The cable assembly runs from the kinematics box to the main bearing of the convertible top. After the cable assembly has been operated, the Hall sensor signals the "Convertible top compartment lid down and locked" status to the kinematics box.

**Note: The convertible top compartment lid can no longer be locked after opening the electrohydraulic convertible top using the emergency facility. Consequently, the driving wind can rip the convertible top compartment lid out of its hinge.**

### Microswitch - Convertible Top Compartment
The microswitch is installed on the right-hand side on the convertible top compartment. The CVM 5 evaluates the signal from the microswitch. The CVM 5 receives a low signal when the convertible top compartment is in the down position.

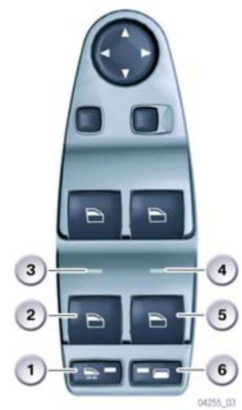


### Convertible-Specific SBFA Buttons

In the SBFA, the buttons for the rear power window additionally feature Convertible-specific functions. These functions are:

- Raise or lower all 5 windows simultaneously
- Raise or lower the rear window

The functions are controlled with the buttons for the rear window defogger. Two additional buttons in the SBFA activate the corresponding function. A green LED in the corresponding button indicates when a function is active.




1. Button for all 5 windows
2. Power window button, rear driver's side
3. LED button, all 5 windows activated and at standby
4. LED button, rear window activated and at standby
5. Power window button, rear passenger's side
6. Button, rear window

### Door Module

Convertible-specific power window functions When one of the doors is opened, the TMFA or TMBF recognizes this status via the respective door contact.The side windows are then lowered by approx. 2 cm in order to protect the seal. The side windows are lowered by approx. 10 cm when opening or closing the convertible top. The CVM 5 sends the request to lower the power windows via the K-CAN to the CAS 2.

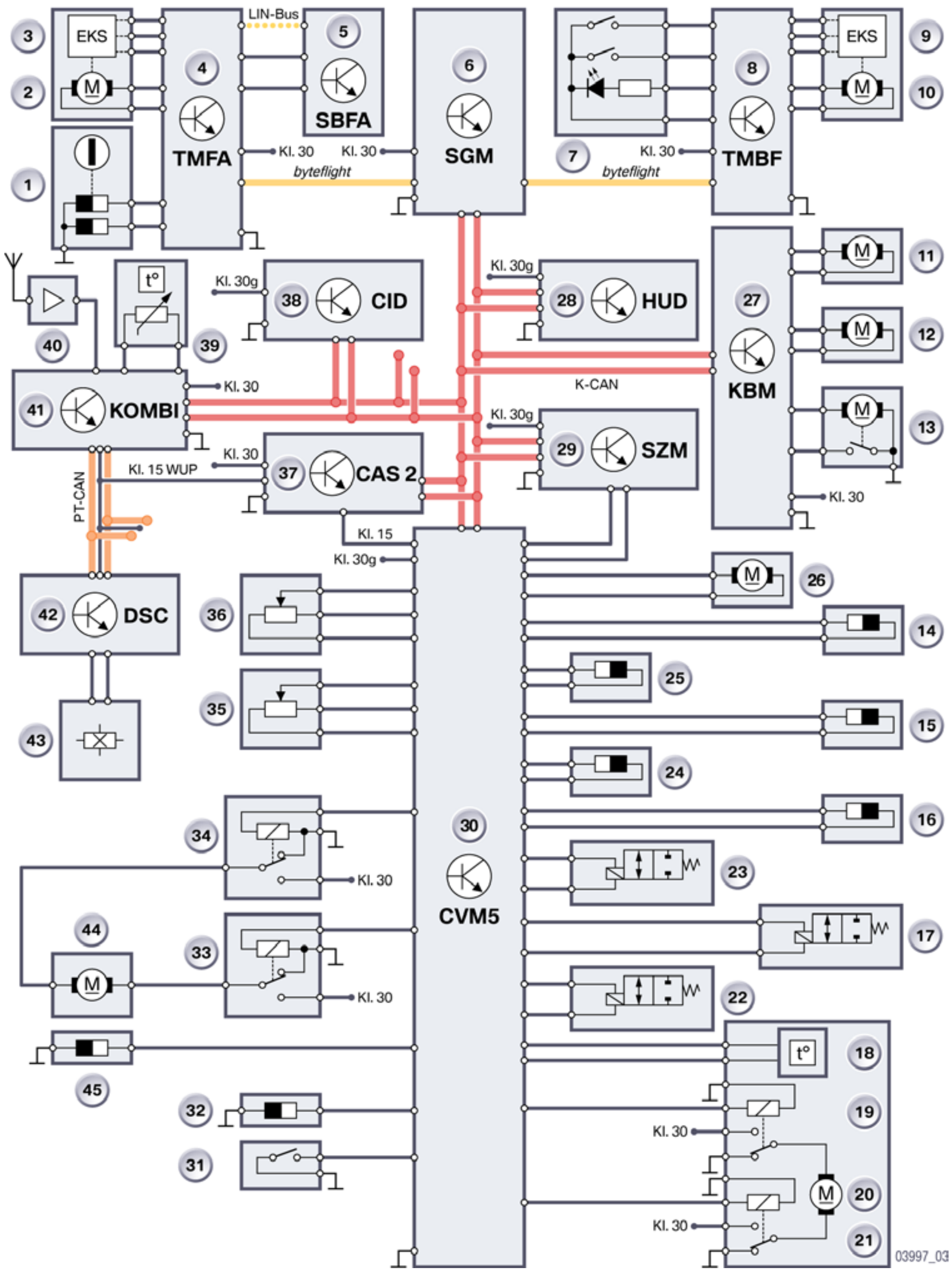
### Basic Body Module KBM

Convertible-specific power window functions Since the rear power windows feature no anti-trapping circuit, the KBM evaluates and forwards the following statuses:

- Power window in Open position
- Power window between Open/Close or Close/Open position
- Power window in Closed position

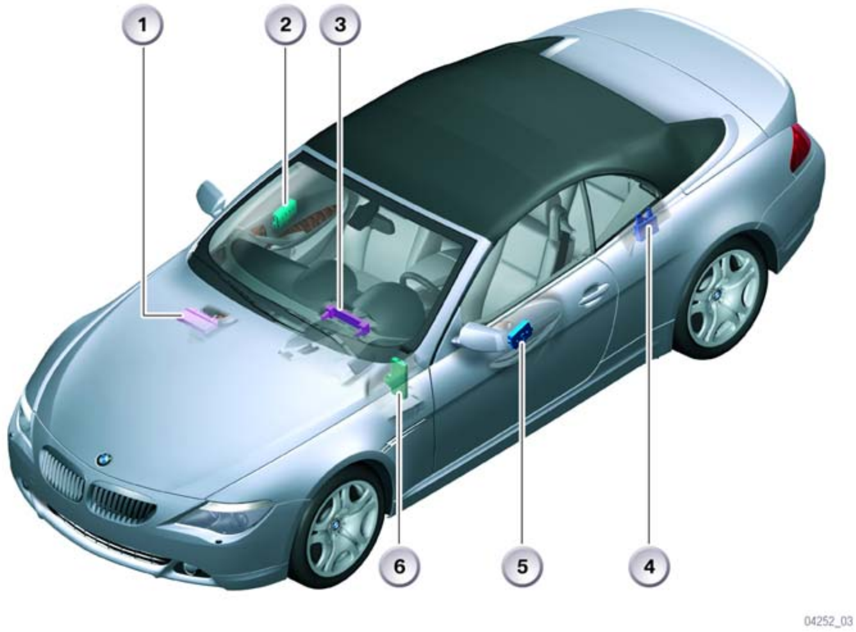
The power window Open or Closed positions are detected based on the blocking current of the power window motors.

## Convertible Top Schematic




1. Driver's Door Lock
2. Window Motor L/F
3. Anti-trap L/F
4. Door Module L/F
5. Switch Block
6. SGM
7. Window Switch R/F
8. Door Module R/F
9. Anti-trap R/F
10. Window Motor R/F
11. Window Motor L/R
12. Window Motor R/R
13. Trunk Lock
14. Sensor Top Cowl Open
15. Sensor Top Cowl Clsd
16. Sensor Top Lid L/S
17. Valve Tension rod
18. Hydraulic Temp Sensor
19. Pump Relay closed
20. Hydraulic pump motor
21. Pump Relay open
22. Valve Tension rod
23. Valve top lid
24. Sensor lid open
25. Sensor lid locked r/s
26. Motor top lock
27. KBM
28. HUD
29. SZM
30. CVM5
31. Switch top lid down
32. Sensor lid bottom left
33. Relay r. window down
34. Relay r. window up
35. Sensor Main Pillar
36. Sensor tension rod
37. CAS2
38. CID
39. Outside temp sensor
40. Remote
41. KOMBI
42. DSC
43. Sensor wheel speed
44. Motor rear window
45. Sensor r. window down

## CVM5




1. Basic body module
2. Door module, passenger's side
3. Centre console switch cluster
4. Convertible top module 5
5. Door module, driver's side
6. CAS2

### Signal Sequence

The center console switch cluster SZM recognizes the switch position "Open convertible top" and this information is sent via the K-CAN to the CVM 5. Following a safety enquiry performed by the CAS2, the CVM 5 activates the power window motors via the front door modules and KBM. The motors lower the 4 side windows a little. The rear window motor completely lowers the rear window (activated by CVM 5).

The CVM 5 then drives the electric motor in the front brace. This motor releases the catch hooks at the cowl panel and slightly raises the front brace.

The CVM 5 now activates the hydraulic module. First, the fins and front brace are raised. The convertible top compartment lid is then released and opened. When the Hall sensor on the cylinder for the convertible top compartment lid signals the "Convertible top compartment lid up" status, the CVM 5 switches over the pump in the hydraulic module (hydraulic pump turns in other direction) and the convertible top is folded by means of the main pillar cylinders into the convertible top compartment.

When the angle of rotation sensors on the convertible top frame signal to the CVM 5 that the convertible top is positioned in the convertible top compartment, the changeover valve for driving the cylinders of the convertible top compartment lid is switched off and the convertible top compartment lid is closed by means of the cylinders. The convertible top compartment lid is locked by means of a cable assembly from the kinematics box to the main bearing. The Hall sensor on the left-hand kinematics box signals to the CVM 5 that the convertible top compartment lid is closed and locked. The CVM 5 and KBM send a signal indicating that all 5 windows are now closed.

## Top Operation

### Normal Operation

In addition to the correct position of the base of the convertible top compartment, further conditions must be met before the convertible top can be operated:

- Boot lid must be closed
- Vehicle speed must be less than 30 km/h
- Outside temperature must not be below -10°C
- Key in ignition lock turned to at least position R

Once these conditions have been met, the following operating procedure is initiated by pressing and holding the button to open the convertible top:

- Side windows are lowered slightly
- Rear window is lowered completely
- Front brace of convertible top is released at cowl panel
- Fins are raised
- Convertible top lid is released and raised
- Convertible top is folded into convertible top compartment
- Convertible top compartment lid is closed and locked
- Side windows and rear window are raised

The convertible top can also be opened with the key. The key must be held in open direction in the driver's door during the entire convertible top opening procedure.

Auto-remote opening with remote control is also possible. An auto-remote closing feature is not provided for safety reasons.

### Emergency Operation

The convertible top can also be operated manually in the event of electrohydraulic system failing.

Emergency closing of convertible top:

1. Slightly lower side windows and completely lower rear window.
2. Release emergency top compartment lid from the luggage compartment using the emergency release facility (left and right) and open.
3. With the aid of a second person, lift the convertible top out of the convertible top compartment and raise the fins.

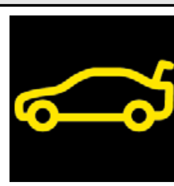
4. Close convertible top compartment lid.
5. Lower the fins onto the convertible top compartment lid.
6. Remove cover at middle of front brace.
7. Using the cranked socket head wrench from the vehicle tool box, lock the convertible top at the front brace. The cranked hexagon socket head wrench engages in the gear unit of the electric motor and locks the catch hooks at the cowl panel.

### Rear Window Emergency Operation

### Emergency Closing

- Remove cover between the rear headrests
- Fit the cranked hexagon socket head wrench from the vehicle tool box on the screw and turn in counter clockwise direction until the rear window is closed.

**Check-Control Messages**

| CC-Message | CC-Indicator | Message in CID |
|---|---|---|
| Rear window Emerg. operation |  | Rear window Malfunction:<br>Operation of soft top only possible after emergency operation of rear window.<br>For emergency operation of rear window, see Owner's Handbook.<br>Have the problem checked as soon as possible by BMW Service. |
| Lower soft-top compartment base |  | Soft-top comp. base<br>Base not lowered, soft top cannot be operated.<br>Lower soft-top compartment base and open soft top. |
| Soft top not engaged |  | Soft top<br>Automatic locking faulty.<br>Lock soft top manually, see Owner's Handbook.<br>Have the problem checked by BMW Service. |
| Soft top max. 30 km/h |  | Soft top<br>Automatic soft top may only be opened or closed at speeds of up to 30 km/h.<br>Reduce speed and resume operation of soft top. |
| Soft top Emergency operation |  | Soft top<br>Control electronics failed.<br>For emergency operation of soft top, see Owner's Handbook. |
| End of convertible top movement |  | End of convertible top movement. |
| Roll-over protection fault |  | Roll-over protection Malfunction:<br>Have the problem checked by the nearest BMW Service. |
| Boot open |  | Please close boot lid. |

# Workshop Exercise - Convertible Top Assembly

## Rear Window Module Removal

*With the Instructor's assistance:*

1. *Remove the RR interior trim panel (armrest and speaker panel).*
2. *Remove rear seat (upper and lower), rear headrests, upper seat and URSS trim panels.*
3. *Remove rear window base seal.*
4. *Unscrew hydraulic unit (4 screws) and slide rearward.*
5. *Remove retaining bracket screws (2). Loosen the side screws (3 per side) on the rear window module.*
6. *Unplug the rear window motor wiring harness (at the body).*
7. *Manually lower the rear window (if up), slide the rear window module out of the retaining bracket and remove for bench top service.*
8. *With the module on the bench, remove the remaining cover screws to expose the electric motor and window drive.*
9. *Reassemble and install in vehicle.*

## Convertible Top Emergency Operation

1. *With top open, open trunk, access and pull the release cables (Left and Right).*
2. *Switch ignition off, wait a few seconds for the hydraulics to bleed down.*
3. *With 2 people, lift the top storage cover and fold the top up and out. Close the storage cover lid and unfold the top into the closed position.*
4. *The crank handle (in tool kit) is required to lock the top at the front brace (windshield frame). Using the same tool, remove the access panel between the rear headrests and crank the rear window up.*