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**Model: E85**

**Production: Start of Production MY 2003**

**Objectives:**

After completion of this module you should be able to:

- Understand the Lay-out of the Central Body Electronics System.
- Locate the components of the major systems of ZKE.
- Know the operation of the Soft-Top.

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## Central Body Electronics

### Introduction

The central body electronics of the E85 are based to a large degree on the central body electronics of the E46.

### General Module V (GM V)

New features of the GM V include:

- A more powerful processor
- 2 outputs for switching off electrical equipment (VA1 and VA2)
- Pulse-width modulated output for the interior lighting

### Central locking system

- The glove compartment is not integrated in the central locking system
- The storage compartment is integrated in the central locking system
- The Low lock is fitted on the driver's side
- The contact for the hotel setting (trunk lock barrel) is not fitted

### Seat adjustment/memory functions

- The memory functions are only available for the driver's seat

### Soft-top module (CVM) 4

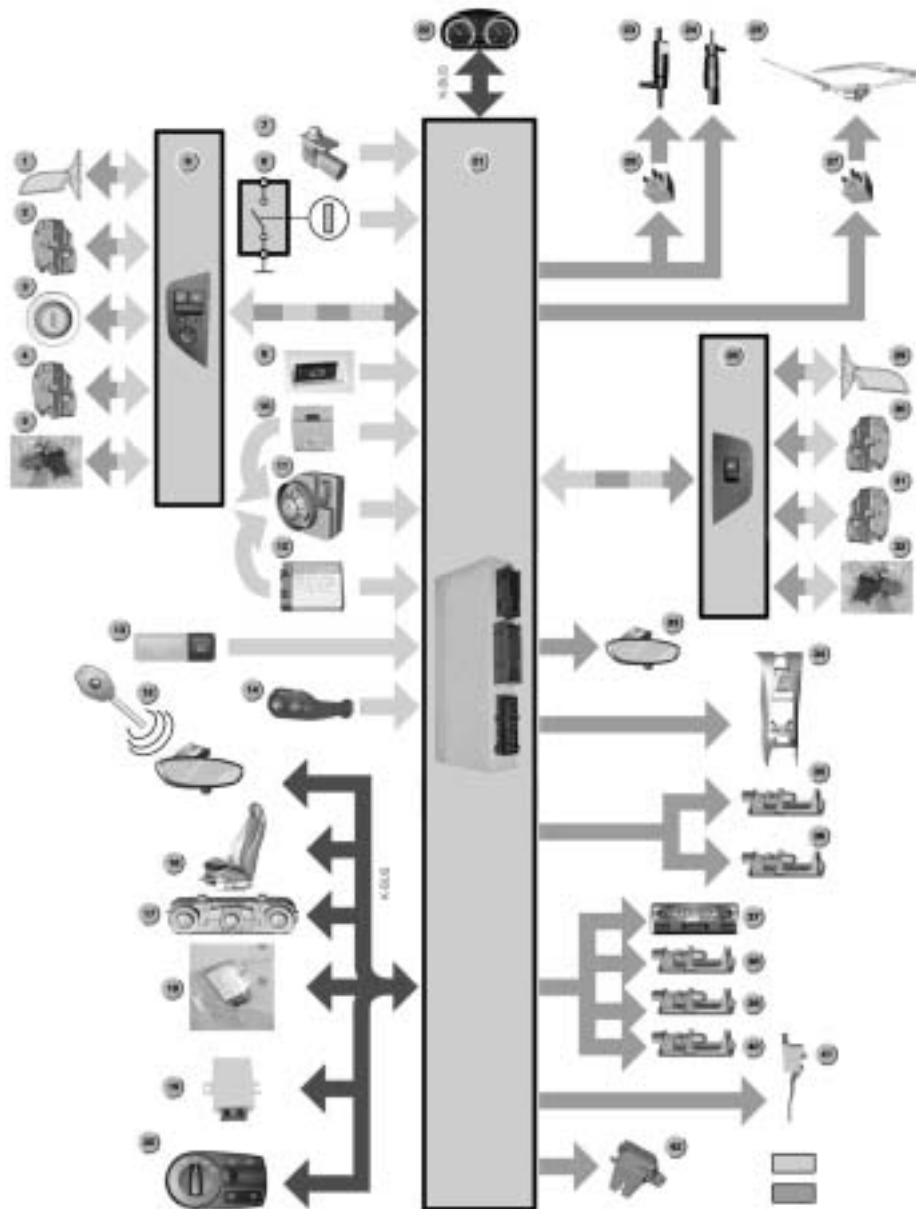
- The enable signal for relay 2 for activating the rear window heater is generated by the Soft-top module 4.
- The soft-top position is only detected at the limits of movement in either direction.

### Antitheft alarm system

- Operation of the trunk emergency release sets off the alarm if the anti-theft alarm system is armed.

### Temperature switch

- The temperature switch is located at the front on the left under the cover on the vehicle underbody.



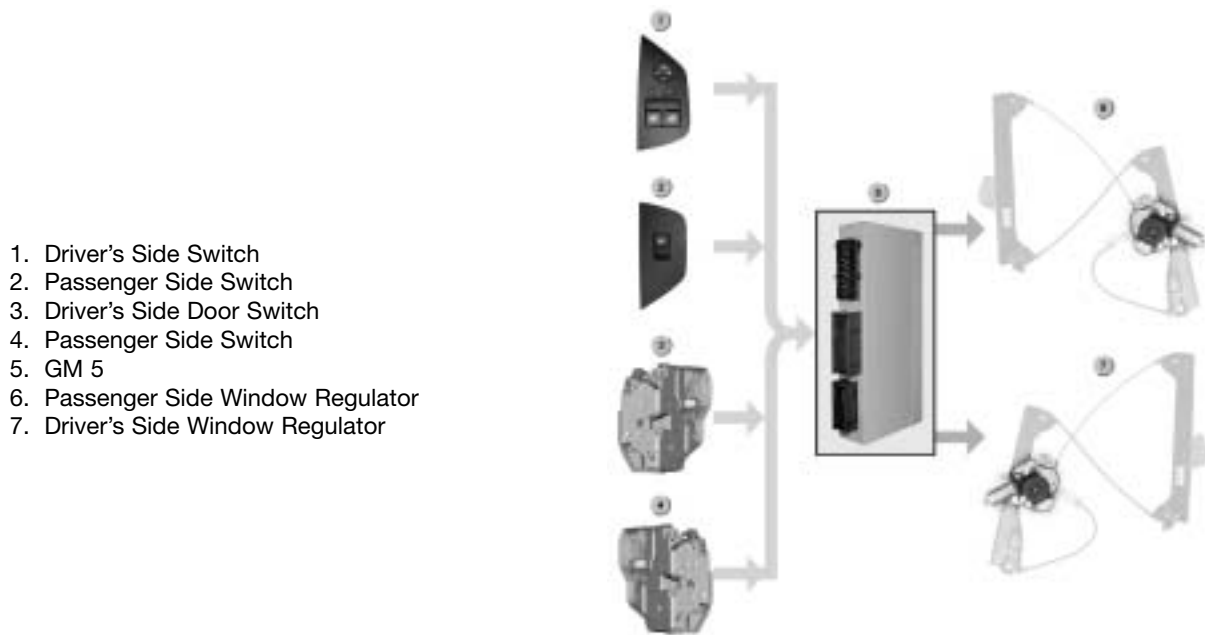
1. Drivers Door Mirror	15. Remote Control	29. Passenger Door Mirror
2. Drivers Central Lock Servo	16. Seat Module	30. Passenger Central Lock Servo
3. Lock Assembly Drivers Side	17. Air Conditioning	31. Passenger Door Switch
4. Drivers Door Switch	18. Soft Top Module CVM4	32. Passenger Window Regulator
5. Drivers Window Regulator	19. EWS	33. Alarm LED
6. Drivers Window Switch Assy.	20. LSZ	34. Storage Compartment Servo
7. Hood Contact	21. GM V	35. Footwell Light
8. Alarm Switch	22. Instrument Cluster	36. Footwell Light
9. Trunk Release Button	23. Windshield Washer Pump	37. Interior Light Assembly
10. Tilt Sensor	24. Headlight Washer Pump	38. Storage Compartment Light
11. Siren	25. Wash-Wipe System	39. Storage Compartment Light
12. SDR (Not Used in USA)	26. Washer Relay	40. Trunk Light
13. Central Lock Button	27. Twin Wiper Relay Module	41. Fuel Filler Cap Servo
14. Steering Column Switch	28. Passenger Window Switch	42. Trunk Lock Servo

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## Power Windows

### Purpose of the System

The function of the power windows is based on the function of those fitted on the E46 convertible.



### Components

The system consists of the following components:

- Door locks with Hall-effect sensors
- General module 5
- Power window switches
- Window regulator motors

### Door Locks with Hall-Effect Sensors

The door locks each contain a Hall-effect sensor for detecting the door position. In addition, there are two Hall-effect sensors in the driver's door which monitor the position of the lock barrel.

The Hall-effect sensors signal to the general module 5 that one of the doors is being opened, for example. The general module 5 briefly lowers the window in the door concerned. The window has to be lowered in order that the door can be opened.

### General Module 5

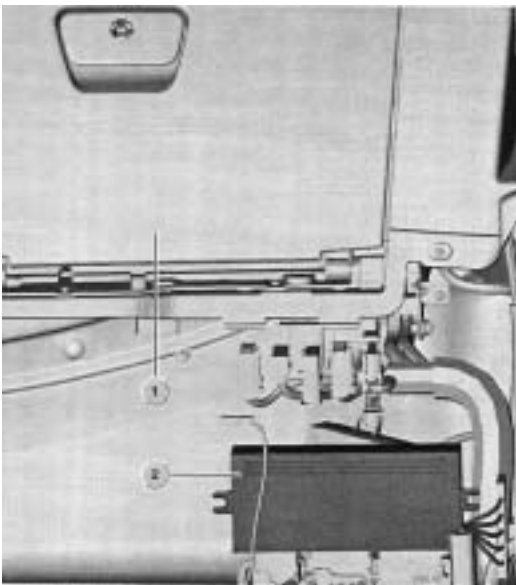
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The General Module is attached to the lower trim behind the glove compartment. The general module controls the powerwindow functions. It receives the input signals from the door locks and the switch units, and monitors the power consumption of the electric motors that drive the window regulator mechanisms.

The E85 has no anti-trap function available. Consequently, one-touch closing on the passenger side is not allowed. One-touch closing on the driver's side is possible at key positions starting from terminal 15.

One-touch opening is possible at key positions starting from terminal 15 on the driver's and passenger sides.

### Power-Window Switches



The power-window switches are integrated in the arm rests of the door trim panels. The driver's-side power-window switch unit also incorporates a switch for the passenger-side window, the buttons for the door mirrors and the mirror folding button.

Each power-window switch has four positions. Those positions trigger different functions depending on country-specific variations and the programming of the general module. The passenger-side power-window switch also has four positions.

### Window Regulator

The window regulator mechanisms are cable operated. The drive motor is not monitored by Hall-effect sensors.

## Central Locking System

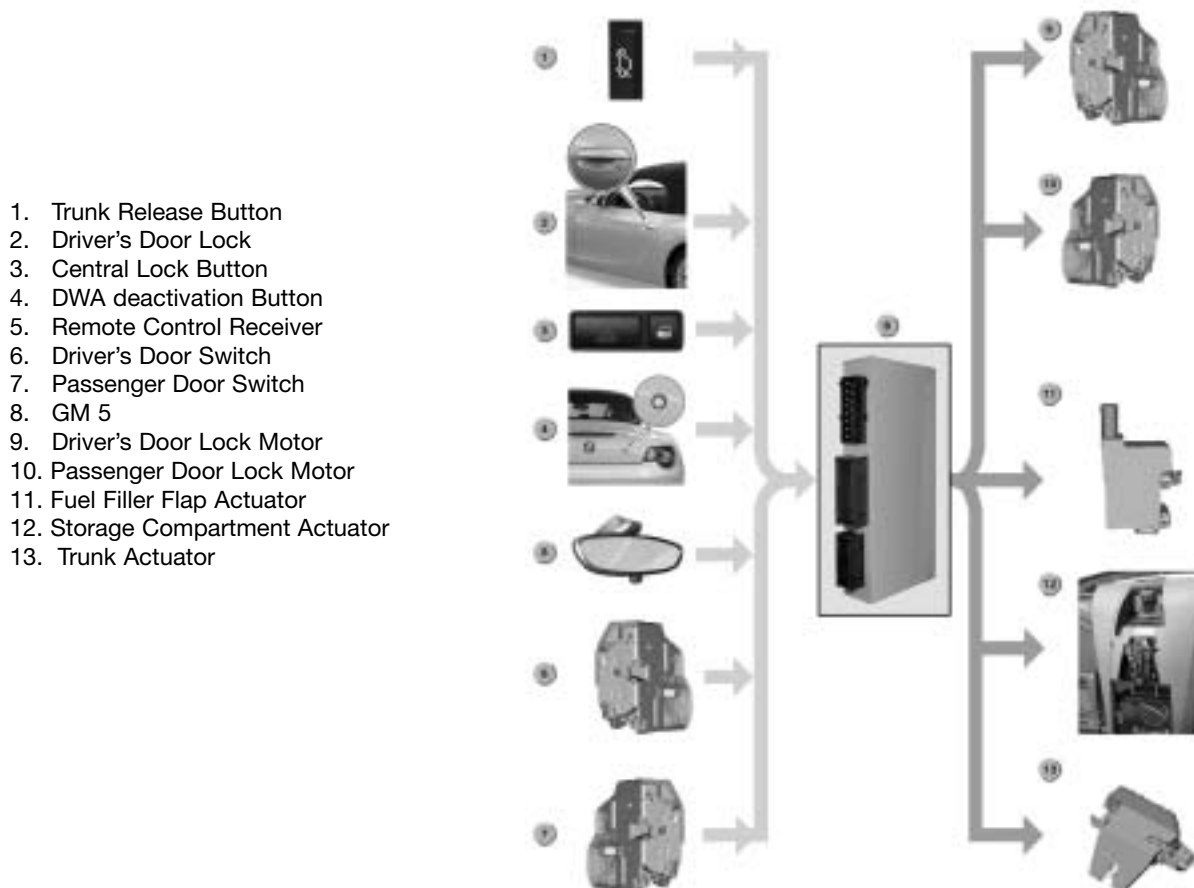


## Purpose of the System

The central locking system function is based to a large extent on the function of the system on the E46.

## New System Features

- The storage compartment is integrated in the central locking system function.
- The glove compartment is not operated by the central locking system.
- The trunk lock does not have a hotel setting switch that operates in conjunction with the lock barrel. It is locked by means of a cable mechanism.
- The driver's door lock is the Low lock from the E65.
- The Easy Open/Close function cannot be activated with the remote control.

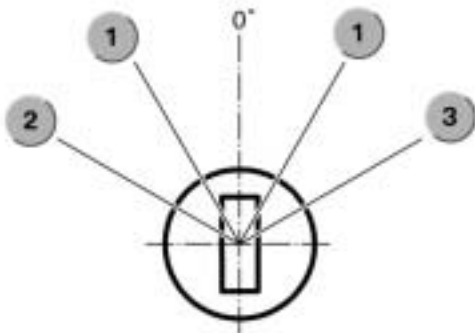


## Components

The system consists of the following components:

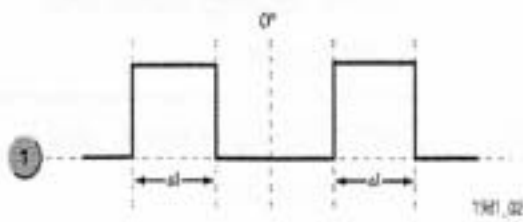
- General module 5
- Driver's door lock
- Central locking servo unit, driver's side
- Central locking servo unit, passenger side
- Central locking servo unit, storage compartment
- Central locking servo unit, fuel filler
- Central locking servo unit, trunk
- Trunk lock switch for "deactivating" the anti-theft alarm system
- Trunk release button in passenger compartment
- Centerlock button
- Remote control receiver in rear-view mirror base

### General Module



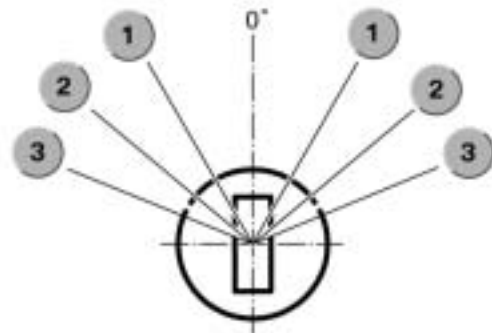
E46 lock: E46 Driver's door lock barrel

- 0: Center position
- 1: Hall effect sensor 1 (SNU 1)
- 3: Mechanical lock/unlock



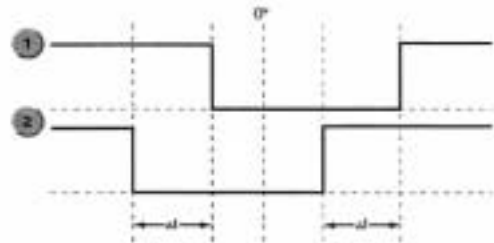
E46 Signal

- 1: Hall-effect sensor 1 (SNU 1)
- 50 ms



E85 lock (Low lock)

- 0: Center position
- 1: Hall-effect sensor 1 (SNU 1)
- 2: Hall-effect sensor 2 (SNU 2)
- 3: Mechanical lock/unlock



- 1: Hall-effect sensor 1 (SNU 1)
- 2: Hall-effect sensor 2 (SNU 2)
- 2 to 1000ms

---

The General Module controls the central locking functions on the E85.

### **Driver's-Door Lock**

The driver's door lock on the E85 is an Low lock. The same lock was previously fitted as a Low lock on the E66. Compared with the lock used on the E46, this unit incorporates two Hall-effect sensors. The general module analysis the signals from those sensors and locks/thief-proofs or unlocks the vehicle accordingly.

The order of the signals determines how they are interpreted, i.e. as lock/thiefproof or unlock. By the use of two Hall-effect sensors and the intelligent analysis of their signals, errors when locking/thiefproofing or unlocking the vehicle are prevented.

Detection of a rising edge starts a counter which is stopped again as soon as both signals (SNU 1 and SNU 2) are present. Within a valid time window, the request to lock/thiefproof or unlock is set. As long as the key is held in the turned position, the request to lock/thiefproof or unlock remains valid. If either of the two signals (SNU 1 or SNU 2) is lost, the request is reset again.

### **Central Locking Servo Units**

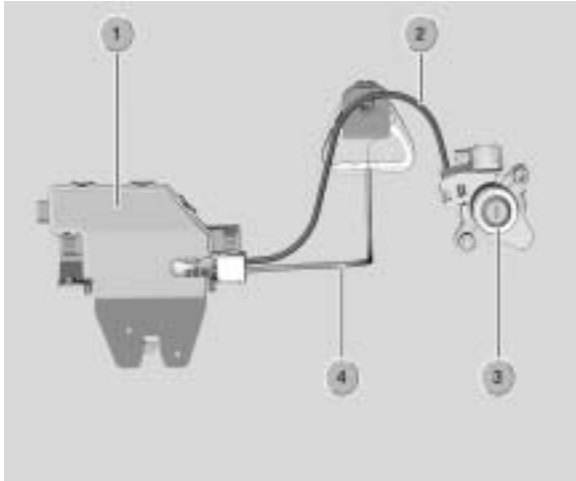
The door lock is a single unit. That unit incorporates the servo motor, the door lock mechanism and the Hall-effect sensors.



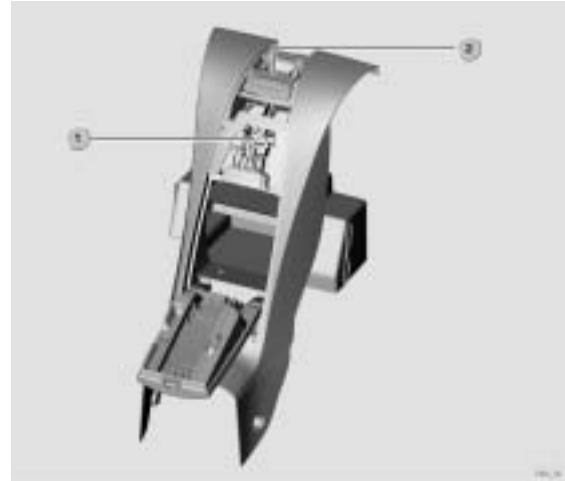
### **Storage Compartment**

The storage compartment is integrated in the central locking system and can be locked/unlocked using the remote control, the driver's-door lock or the Centerlock button. Inside the trunk on the bulkhead there is an emergency release.

The storage compartment is between the passenger seat and the driver's seat in the bulkhead trim.



- 1. Trunk Lock
- 2. Cable
- 3. Trunk Lock Barrel
- 4. Emergency Release Handle
- 5. Cable for Emergency Trunk Release



- 1. Storage Compartment Locking Servo
- 2. Storage Compartment Retainer

## Fuel Filler Flap

The fuel filler flap is incorporated in the central locking system. There is an emergency release for the fuel filler flap inside the trunk on the right side under the trunk lining.

## Trunk Lock

The trunk lock and lock barrel are identical with those on the E46. The difference between the E85 and the E46 is the linkage between the lock and the lock barrel. Instead of a rod linkage, a cable is used. The lock is released (manually) by a cable mechanism operated by the key. The switch for the anti-theft alarm system is incorporated in the lock barrel.

The trunk lock can be operated manually or electrically. The Basic module 5 controls the motor in the trunk lock by means of the "Trunk lock, motor unlock" signal. The locking pawl is moved to the release position by the drive pin. The locking pawl releases the latch which can then rotate into the disengaged position by the action of the tension spring. The trunk can then be opened. The locking pawl releases the microswitch button from the depressed position. The microswitch switches the trunk light on.

The trunk can be unlocked from the lock barrel. The trunk lock can be unlocked by means of a cable operated by the lock barrel.

The locking pawl is pulled to the release position by the cable. The locking pawl releases the latch which can then rotate into the disengaged position by the action of the tension spring. The trunk can then be opened.

## Emergency Trunk Release

The emergency trunk release operates in a similar manner to the mechanical method using the key. The only difference is the actuating device.

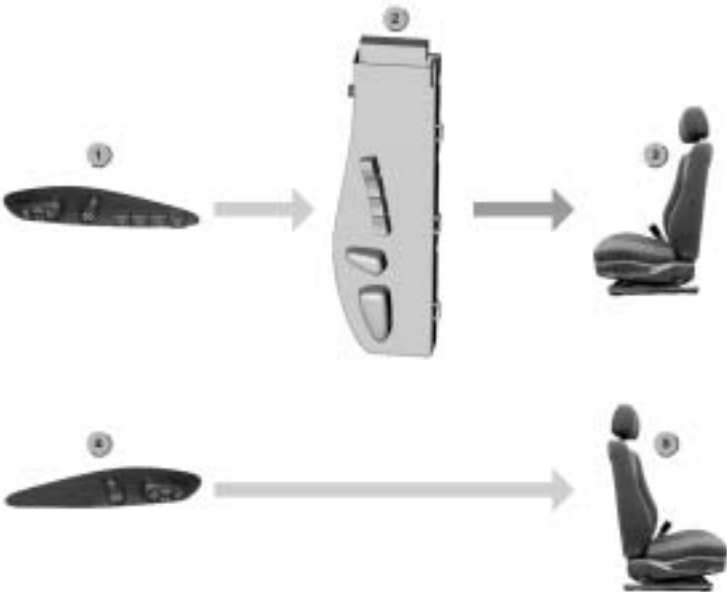
A person locked inside the trunk can pull the release handle on the inside of the trunk (see illustration KT-10297). The handle is connected to a release cable. Pulling the release handle releases the trunk lock in a similar manner to the preceding description (mechanical method) so that the trunk can be opened.

**Power Seat**

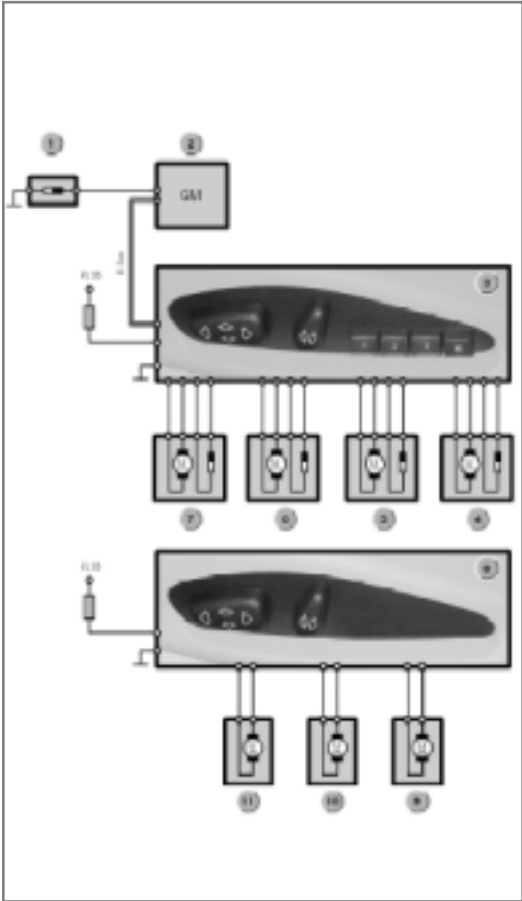
**Purpose of the System**

The seat adjustment and memory functions are based to a large degree on those on the E46. The memory functions are only available for the driver's seat.

**System Overview Seat adjustment**



- 1. Driver's Seat Adjustment Controls
- 2. Driver's Seat Module
- 3. Driver's Seat Adjustment
- 4. Passenger Seat Adjustment Controls
- 5. Passenger Seat Adjustment

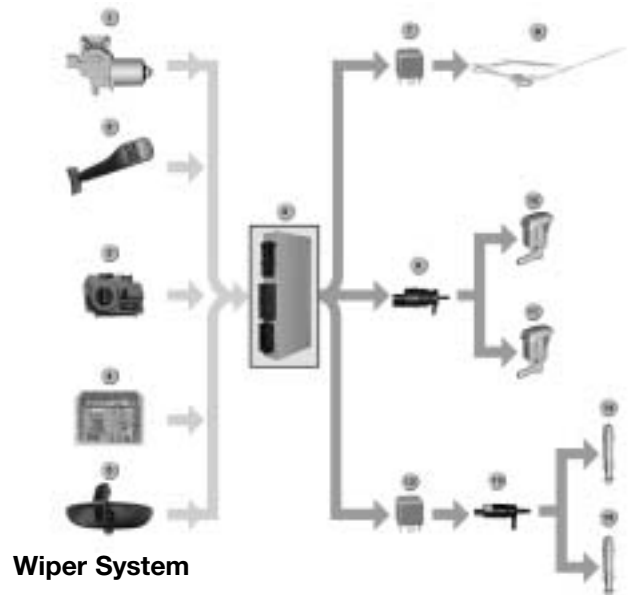


**Seat Heating**

The seat heating functions are based on those on the E46. The seat heater is activated and controlled by means of the seat heater button integrated in the centre console.



1. Fuse Box
2. Passenger Seat Heating Switch
3. Passenger Seat Backrest Heater
4. Passenger Seat Heater
5. Driver Seat Heating Switch
6. Driver's Seat Backrest Heater
7. Driver's Seat Heater



1. Wiper Motor
2. Wiper Switch
3. Light Switch Center
4. DSC
5. RLS
6. GM5
7. Wiper Twin-Relay Module
8. Wipe-wash system
9. Windshield Washer Relay
10. Windshield Washer Pump
11. Left Washer Jet
12. Right Washer Jet
13. Headlight Washer Relay
14. Headlight Washing Pump
15. Left Headlight Washer
16. Right Headlight Washer

## Wiper System

### Purpose of the System

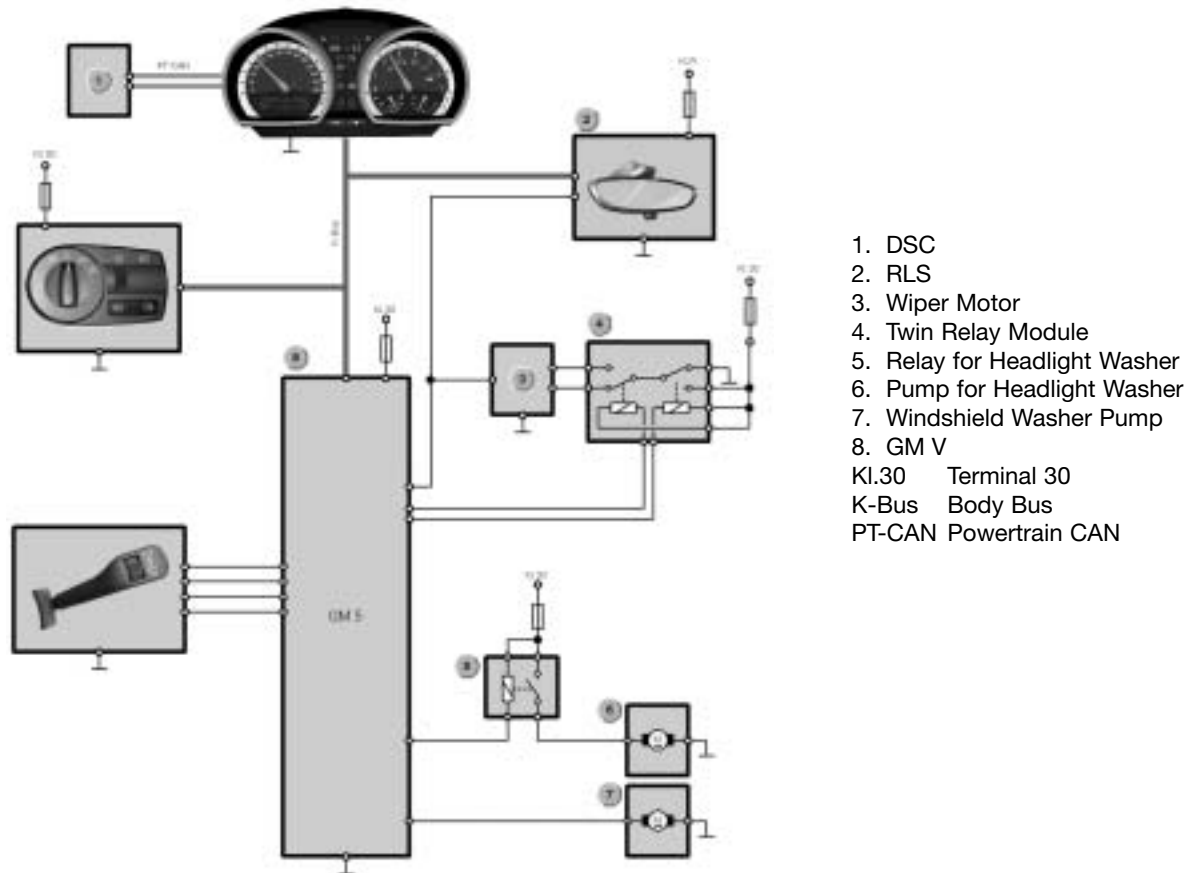
The function of the wash-wipe system is based on that of the E46 wash-wipe system.

### Components

The Wiper system consists of the following components:

- Windscreen washer system
- Steering-column switch
- Rain/light sensor
- Headlight washer system

### Rain/Light Sensor



A rain/light sensor is available as an option on the E85. The headlights are switched on/off automatically by the rain/light sensor according to the ambient light conditions. The rain/light sensor detects the presence of water on the windscreen and switches the windscreen wiper on and off accordingly.

The rain/light sensor is fitted in the base of the rear-view mirror and it consists of optical sensors. The RLS has 2 optical sensors integrated in the casing of the automatic interval control module. The 2 new sensors supplement the otherwise unchanged wiper interval control function of the automatic interval control module as follows:

- An ambient-light sensor detects the light intensity above the vehicle within a wide

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scanning angle.

- A forward light sensor detects the light intensity within a narrow scanning angle directly ahead of the vehicle.

An internal processor calculates from the readings taken by the ambient and forward light sensors whether the preconditions for switching on the lights are present.

The RLS checks the following preconditions for switching on the headlights:

- Twilight
- Complete darkness
- Entry in underground car park
- Entry in tunnel

If any of the above conditions is met, the rain/light sensor on the E85 sends the information via the K-bus to the light switch centre. In order to be able to control the headlights automatically, the rain/light sensor must be activated by a separate light switch setting on the light switch centre.

If the light switch on the light switch centre has been set to the position for automatic control of the headlights, the exterior/instrument panel lights are switched on by the light switch centre. The preconditions for switching on the lights are as follows:

- One of the rain/light sensor conditions listed above is met.
- The fog lamps are switched on.

**Note:**

***If the above conditions exist, the lights can only be switched off by switching off the fog lamps. In addition, the lights are switched on if any of the following faults occur:***

- ***The rain/light sensor detects a sensor fault.***
- ***There is a fault in communication between the rain/light sensor and the light switch centre.***

The following lights are controlled by the light switch centre:

- If terminal R is "ON," the side lights, the number-plate light and the instrument panel lights are switched on.
- If terminal 15 is "ON," the dipped-beam headlights are also switched on. If only the side lights are required at that setting, the switch on the light switch centre must be manually set to Side lights "ON."
- When the ignition switch is at position "0," the exterior/instrument panel lights are switched off.

The switching thresholds of the rain/light sensor can be set to 2 different levels using the Car Memory function.

**Safety note:**



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Automatic control of the headlights is not a substitute for individual assessment of the light/visibility conditions (e.g. fog) by the driver. In order to avoid safety risks in such situations, the lights must be switched on manually by the driver.

The rain sensor controls the windscreen wiper interval in rain or snow.

**Note:**

***If the wiper switch is set to intermittent wipe, the activation condition is detected above a certain wiper frequency. When the vehicle leaves the factory, that wiper frequency is set to 15 wiper cycles per minute. The sensitivity of the rain sensor can be set to four different levels using the knurled adjuster on the wiper switch.***

## Fully Automatic Soft-Top

### CVM4

#### Purpose of the System

The E85 will be available with a manual or an electro-hydraulic soft-top. On vehicles with the electro-hydraulic soft-top, the Soft-top module IV will be fitted. There will also be a hard-top for the E85.

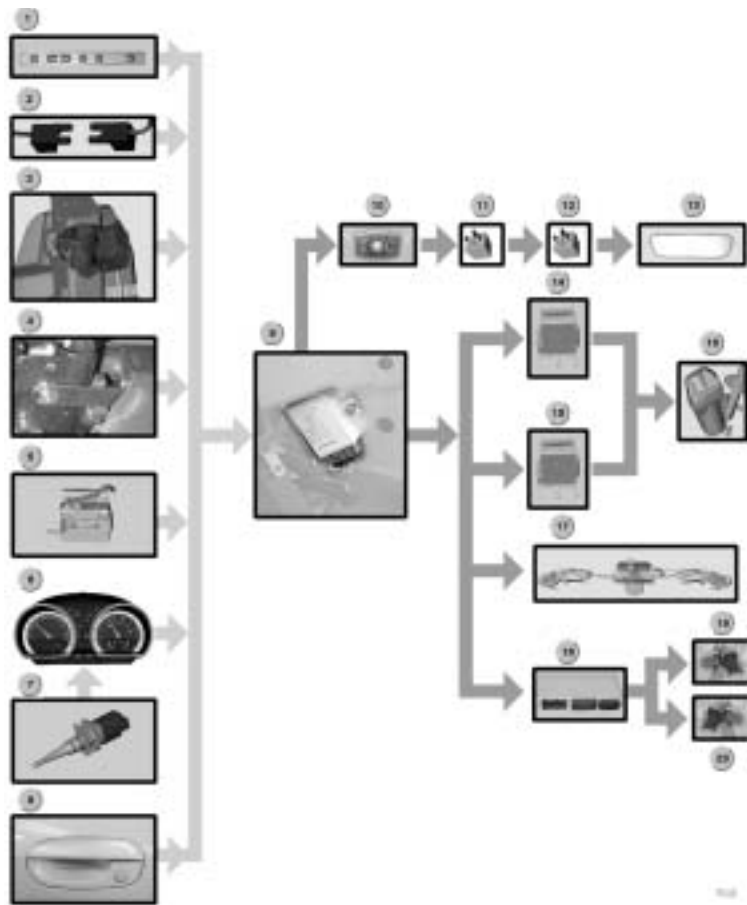
The system has the following predecessor systems:

Predecessor Systems	Series	Model	Dates
Soft-top Module 1	E36	Convertible	1995-3/2000
Soft-top Module 2	E46C	Convertible	03/2000 to present
Soft-top Module 3	E52	Z8	03/2000 to present

#### Fully Automatic Soft-Top Components

The system consists of the following components:

- Fully automatic soft-top
- Soft-top module 4 (CVM4)
- Hall-effect sensors (2) for Soft-top position
- Hall-effect sensors (2) for Windshield Rail lock position
- Locking servo unit, front
- Hydraulic pump
- Hydraulic pump relays (2)
- Left (hardtop detection) and right hardtop locating socket contacts
- Microswitch for variable-size soft-top stowage compartment
- General module 5
- Instrument cluster
- Heater control panel



1. Soft-Top Control Panel
2. Windshield Rail Hall-Effect Sensors
3. Hardtop Detectors
4. Soft-Top Position Sensors
5. Storage Compartment Microswitch
6. Instrument Cluster
7. Temperature Sensor
8. Drivers Door Lock
9. CVM 4
10. Heater Control Panel
11. Relay 1 For Heated Rear Window
12. Relay 2 For Heated Rear Window
13. Rear Window Heater
14. Down Relay for Soft-Top Pump
15. Up Relay for Soft-Top Pump
16. Hydraulic Pump
17. Windshield Rail Lock
18. GM V
19. Drivers Window Regulator
20. Passenger Window Regulator

- Relay 1 for rear window heater
- Relay 2 for rear window heater
- Rear window heater
- Soft-top control button with LED (for soft-top DOWN)
- Soft-top control button with LED (for soft-top UP)

### CVM 4

The Soft-top module controls and monitors the hydraulic and electrical positioning and locking systems of the soft-top. In addition, it registers the position of the soft-top and records any faults that occur.

The Soft-top module IV is located behind the driver's seat and underneath the top part of the side trim panel.



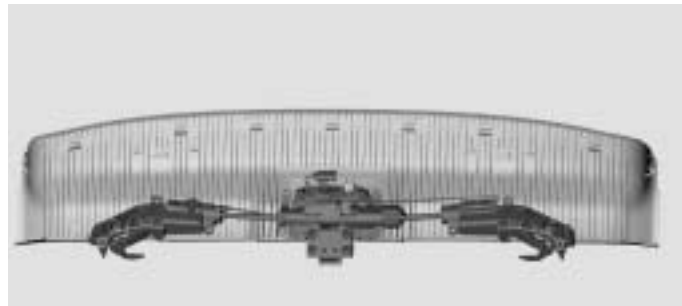
### Soft-top Position Sensors

The Hall-effect sensors detect the soft-top position when it is fully raised or fully lowered into the stowage compartment. The two sensors are fitted to the left-hand main pillar. Hall-effect sensor 1 signals to the Soft-top module 4 that the fully automatic soft-top is in the fully raised position. Hall-effect sensor 2 signals to the Soft-top module 4 that the fully automatic soft-top is in the fully lowered position in the stowage compartment.



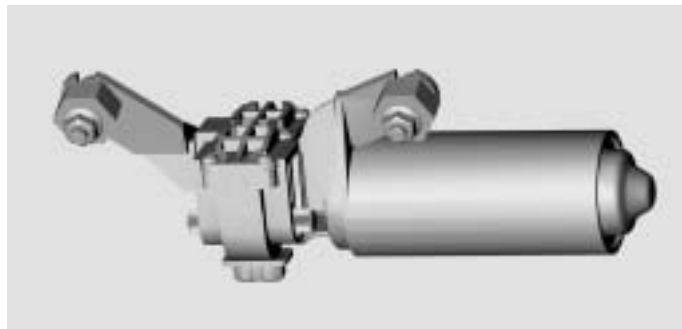
### Windshield Top-Rail Lock

The Hall-effect sensors (2) on the windscreen top-rail locking mechanism signal the position of the locking latches. They are located on the left-hand locking mechanism on the front roof bow of the fully automatic soft-top.



### Lock Servo Unit

The lock servo unit locks and unlocks the windscreen top-rail lock. The lock servo unit is positioned centrally on the front roof bow of the fully automatic soft-top.



### Hydraulic Pump

The hydraulic pump generates the necessary pressure for the hydraulic piston to move the soft-top. The hydraulic pump is part of the hydraulic servo unit on the left main bearing of the fully automatic soft-top.



### Soft-Top Relays

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The relays control the hydraulic pump for raising/lowering the soft-top. The relays are fitted behind the passenger airbag. The relays (colour: pink) for the hydraulic pump are plugged into a relay panel on the K-bus junction box. The junction box is located behind the glove compartment and the passenger airbag.

### **Stowage Compartment Switch**

The microswitch signals to the Soft-top module 4 that the stowage compartment base is at its lowest position. That signal is one of the preconditions for lowering the soft-top. The microswitch is located inside the trunk. The microswitch is fitted inside the trunk on the positioning mechanism (in the centre of the trunk bulkhead) for the stowage compartment base.

### **General Module V**

The GM V controls the function of the window regulators when the fully automatic soft-top is being raised or lowered.

### **Instrument Cluster**

The instrument cluster calculates the vehicle road speed and the outside temperature from the information supplied by the sensors (wheel-speed and outside-temperature sensors). The vehicle road speed and the outside temperature are placed on the K-bus where they can be read by the Soft-top module 4. The vehicle road speed and the outside temperature are among the preconditions for enabling raising/lowering of the soft-top.

### **Heater Control Panel**

The heater control panel receives the enable signal for the rear window heater and switches the rear window heater on. The button for the rear window heater is integrated in the heater control panel. The heater control panel receives the enable signal for relay 2 for the rear window heater. For details of the operation of the rear window heater, refer to the section "System functions" in this document.

### **Rear Window Heater**

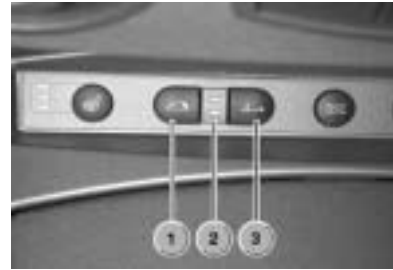
The rear window heater is supplied with power via relay 1 and relay 2 and is switched on by the rear window heater button. Relays 1 and 2 for the rear window heater pick up, thereby connecting the rear window heater to terminal 30. Relay 2 must have been enabled.

### **Soft-Top Control Buttons**

---

The soft-top control buttons are fitted in the center console.

The soft-top control buttons are make-switches that connect to ground. The Soft-top module 4 controls the soft-top UP or DOWN movement.



## Principle of Operation

The Soft-top module IV controls the raising and lowering of the electro-hydraulic soft-top in response to the commands from the soft-top control buttons.

Preconditions for raising/lowering that are detected directly by the Soft-top module IV:

- Hall-effect sensor 1 for the windscreen top-rail lock signals that the windscreen top-rail lock is disengaged (soft-top unlocked)
- Hall-effect sensor 2 for the windscreen top-rail lock signals that the windscreen top-rail lock is engaged (soft-top locked),
- The Hall-effect sensor (for soft-top raised) on the hinge of the main pillar signals that the soft-top is raised, or
- The Hall-effect sensor (for soft-top lowered) on the hinge of the main pillar signals that the soft-top is stowed in the stowage compartment
- The hardtop detector signals that no hardtop is fitted
- The microswitch of the variable-size stowage compartment indicates that the stowage compartment base is at its lowest position
- The Soft-top module IV has not detected any faults on the system as a whole during its internal system test

Other conditions that are detected indirectly by the Soft-top module IV:

- Ignition key at position R at least
- Window not closed
- Vehicle stationary (road speed < 4 km/h)
- No short circuit and no circuit break present
- Outside temperature is not below the limit of approx. -20 °C
- Soft-top button pressed

The Soft-top module IV exchanges information via the K-bus. The Soft-top module IV monitors the Hall-effect sensors for plausibility of the signals and correct function. There are 2 Hall-effect sensors fitted to the hinge of the main pillar. There are 2 Hall-effect sensors on the front roof bow of the electrohydraulic soft-top.

## Response to high/low voltage

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The voltage range of the Soft-top module IV is 9 V to 16 V.

### **Method of operation of soft-top stowage compartment lock**

The soft-top stowage compartment lock holds the soft-top in place when it is fully stowed in the compartment. When the softtop is raised, it locks onto the windscreen top rail.

### **Operation of soft-top stowage compartment lock when lowering soft-top**

When the electro-hydraulic soft-top is fully lowered into the stowage compartment it is automatically locked in position. This is effected by the electro-hydraulic soft-top being lowered to a position in the stowage compartment where the mechanical locking mechanism engages.

The Hall-effect sensor on the hinge of the right-hand main pillar signals to the Soft-top module IV that the electrohydraulic soft-top is in the fully lowered (stowed) position. The locking latches on the electro-hydraulic soft-top are then also engaged. The locking latches are controlled by the Soft-top module IV.

When the electro-hydraulic soft-top is in the fully lowered (stowed) position, the Soft-top module IV switches the hydraulic pump off. The relay is switched off by virtue of the fact that it is no longer enabled by the Soft-top module IV.

The electro-hydraulic soft-top is now fully lowered into the stowage compartment.

### **Operation of soft-top stowage compartment lock when raising soft-top**

When the electro-hydraulic soft-top is raised, the stowage compartment catch is released, the locking latches disengaged and the soft-top raised out of the stowage compartment. On the windscreen top-rail, the locking latches engage and lock the electro-hydraulic soft-top in position.

### **Operation of soft-top stowage compartment lock**

The soft-top stowage compartment lock mechanism engages the latches of the fully automatic soft-top when it is fully lowered into the stowage compartment. When the fully automatic soft-top is raised, the latches are engaged in the windscreen top rail.

The fully automatic soft-top is now fully lowered into the stowage

### **Operation of soft-top control buttons**

The soft-top control buttons for controlling the soft-top UP and DOWN actions are switches that connect to ground. Closing the connection to ground signals to the Soft-top module 4 that raising or lowering of the fully automatic soft-top has been requested.

### **Operation of Hall-effect sensors**

The Hall-effect sensors signal the position (LOCKED or UNLOCKED) of the locking latches to the Soft-top module 4.

### **Operation of soft-top Relays**

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The Soft-top module 4 controls the relays. The 2 relays for the hydraulic pump are controlled as required (for raising or lowering soft-top) by the Soft-top module 4.

The relays are wired in such a way that the hydraulic pump action is reversible. The relays are controlled by the Soft-top module 4 via Highside switches. On a High-side switch, the transistor connects positive through.

### **Soft-top latch for locking to windscreen top rail**

The locking latches are closed when they locate in the windscreen top rail. The left and right locking latches are closed when they locate in the windscreen top rail. The rotation of the DC motor is transmitted to spindles. The spindles drive linkages. The action of the linkages is transmitted to the locking latches. The locking latches lock/unlock the fully automatic soft-top to/from the windscreen top rail.

The position of the locking latches is detected by Hall-effect sensors 1 and 2

### **Microswitch for variable-size soft-top stowage compartment**

The microswitch signals to the Soft-top module 4 that the stowage compartment base is at its lowest position. The Soft-top module 4 is informed by the microswitch that the movable stowage compartment base is at its lowest position. The microswitch is a make-switch that connects to earth.

### **GM5**

The general module 5 opens or closes the windows on instruction from the Soft-top module 4. The general module 5 stores the current status of trunk and window position. The general module 5 places the following information on the K-bus when it starts up:

- Current status of trunk and windows
- Changes to current status of trunk and windows

Examples of current status information are:

- Window closed; window open,
- Trunk closed; trunk open.

(The signal for the trunk status is present but is not required by the Soft-top module 4)

The general module 5 receives the control commands for raising and lowering the windows from the Soft-top module 4. The Soft-top module 4 sends the control commands via the body electronics bus before and after raising/lowering the soft-top. The precondition for lowering the windows is that at least one window is closed.

If the windows are already open before the soft-top is raised/lowered, and if one of the two soft-top control buttons remains pressed (2 s) after the soft-top has been fully raised/lowered, the windows are closed. Closing of the windows is stopped as soon as either of the softtop control buttons is released or the window mechanism detects that the window is closed (at limit of movement).

### **Soft-top stowage compartment lock**

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The locking latches are closed when the soft-top is stowed in the stowage compartment and the soft-top locked in position. As soon as the fully automatic soft-top is stowed in the stowage compartment, the locking latches close.

## **Note for Service**

### **Soft-top module IV time-out function**

If the soft-top control button remains pressed after the soft-top has stopped moving, the Soft-top module IV detects a fault. The fault is interpreted as "Short to ground on soft-top button or one of the leads" and the fault is recorded in the Soft-top module fault memory. However, the electro-hydraulic soft-top can still be moved to a safe parked position using the other soft-top control button/ lead, which is still functioning. If the button is released while the soft-top is still in motion, the soft-top is stopped (safety function). Once the fault has been rectified and terminal R switch off and on again, the electro-hydraulic soft-top can be controlled by the soft-top button again.

## **Diagnosis**

The diagnostic functions of the Soft-top module IV are to a large degree identical with those on the E46. However, fewer signals are analyzed on the E85 than on the E46 because there are fewer components on the E85.

### **Soft-top module 4 internal check**

The internal functions of the Soft-top module 4 are checked under the following circumstances:

- When the power is switched on
- When terminal R is ON
- Before the soft-top is raised/lowered

If a system fault is detected, movement of the soft-top is stopped immediately. The fault detected is recorded in the fault memory of the Soft-top module 4. If the nature of the fault allows, the soft-top can be moved to the nearest safe parked position using one of the soft-top control buttons.

### **Control button for raising soft-top**

A short circuit on the control button for raising the soft-top would raise the soft-top. The soft-top can still be moved to a safe parked position using the functioning control button for lowering the soft-top.

### **Control button for lowering soft-top**

A short circuit on the control button for lowering the soft-top would lower the soft-top. To prevent the soft-top lowering, the functioning control button for raising the soft-top can be used to move the soft-top to a safe parked position.

## **Electric locking system**



The electric locking system is fitted with an overload protection circuit. The overload protection circuit has a time-out function as well as the hardware systems. In the event of misuse, e.g. while the soft-top is in motion, the time-out function disables the fully automatic soft-top function. After a certain time (when time-out has elapsed) the fully automatic soft-top function is restored.

## Faults on peripheral systems

During the internal check and while the soft-top is being raised/lowered, the signals from peripheral systems are checked for plausibility. Those signals must be within the defined valid operating ranges.

Examples of peripheral system signals are:

- Outside temperature
- Vehicle stationary signal
- Signals from the fully automatic soft-top, etc.

## Storage of faults

Faults are stored in the order in which they occur. The Soft-top module 4 has up to 16 "fault storage locations" available in its fault memory. Each fault storage location has a fre

## Status signals from Soft-top module 4

The Soft-top module 4 supplies the general module 5 and all other bus nodes with the current status signals. The Soft-top module 4 provides the following status signals:

- Reset
- Status request
- Ready after reset

## General module 5 window regulator safety function

The general module 5 stops the windows being closed immediately with the loss of the Close windows signal.

## Manual Soft-Top

### Components of Manual Soft-Top



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The system consists of the following components:

- Manual soft-top
- General module 5
- Heater control
- Left and right hardtop locating socket contacts
- Relay 1 for rear window heater
- Relay 2 for rear window heater
- Rear window heater
- Hall-effect sensor for detecting when soft-top is raised and locked to the windscreen top rail (enable signal for relay 2)
- Button lock for manual soft-top

## **Manual Soft-Top System Functions**

### **Rear Window Heater**

The rear window heater cannot be switched on until the relay is enabled according to the enabling conditions.

As with the hardtop, the rear window heater is switched on by the rear window heater button. Relays 1 and 2 for the rear window heater pick up, thereby connecting the rear window heater to terminal 30. Relay 2 must have been enabled.

Relay enabling

Relay 2 is enabled by the Basic module 5 which sends a message via the K-bus to the heater control panel. The general module 5 does not send that message unless the following preconditions are satisfied:

- The Hall-effect sensor on the manual soft-top signals that the soft-top is raised and locked to the windscreen top rail.

### **Hardtop Detection**

Hardtop detection prevents the soft-top being raised when the hardtop is fitted.

When a hardtop is fitted, the right-hand hardtop locating socket contact is used to detect the presence of the hardtop. The hardtop's rear window heater is supplied with power via the left-hand hardtop locating socket contacts (right and left).

### **Button Lock for Manual Soft-Top**

The button lock is integrated in the central locking system.

When stowed in the stowage compartment, the soft-top is locked in place by a catch. That catch has to be released in order to raise the manual soft-top. The button at the top of the bulkhead trim is for releasing the catch.

## **Hardtop**

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## Hardtop Components

The system consists of the following components:

- Hardtop
- Heater control
- Left and right hardtop locating socket contacts
- Relay 1 for rear window heater
- Rear window heater

## Hardtop System Functions

### Rear Window Heater

The rear window heater is switched on by the rear window heater button. The button is fitted in the heater control panel (centre console). The button is a make-switch that connects to earth; the LED lights up when the switch is on.

Relay 1 for the rear window heater picks up, thereby connecting the right-hand hardtop locating socket contacts to terminal 30. When the hardtop is fitted, the left-hand hardtop locating socket contact is the input (terminal 30) of the rear window heater. The righthand hardtop locating socket contact is connected to earth.

### Note (Rear Window Heater Button):

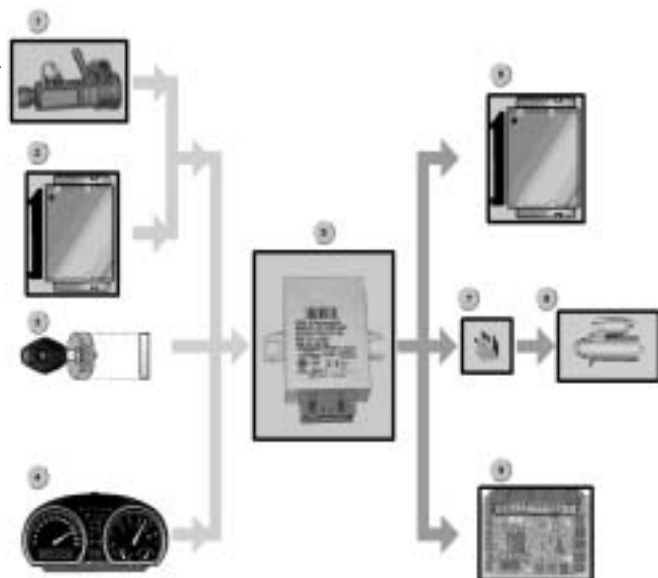
**When the button is pressed in, the LED is always on, regardless of whether the rear window heater can actually be operated or not.**

## Electronic vehicle immobilizer

### Purpose of the System

The familiar version 3.3 electronic immobilizer is fitted on the E85.

1. Clutch Switch Module
2. DME
3. Ignition Lock
4. Instrument Cluster
5. EWS Module
6. DME
7. Starter Motor Relay
8. Starter Motor
9. Transmission control Module



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## Antitheft alarm system

### Purpose of the System

The anti-theft alarm system on the E85 is based on the system used on the E46.

### New System Features

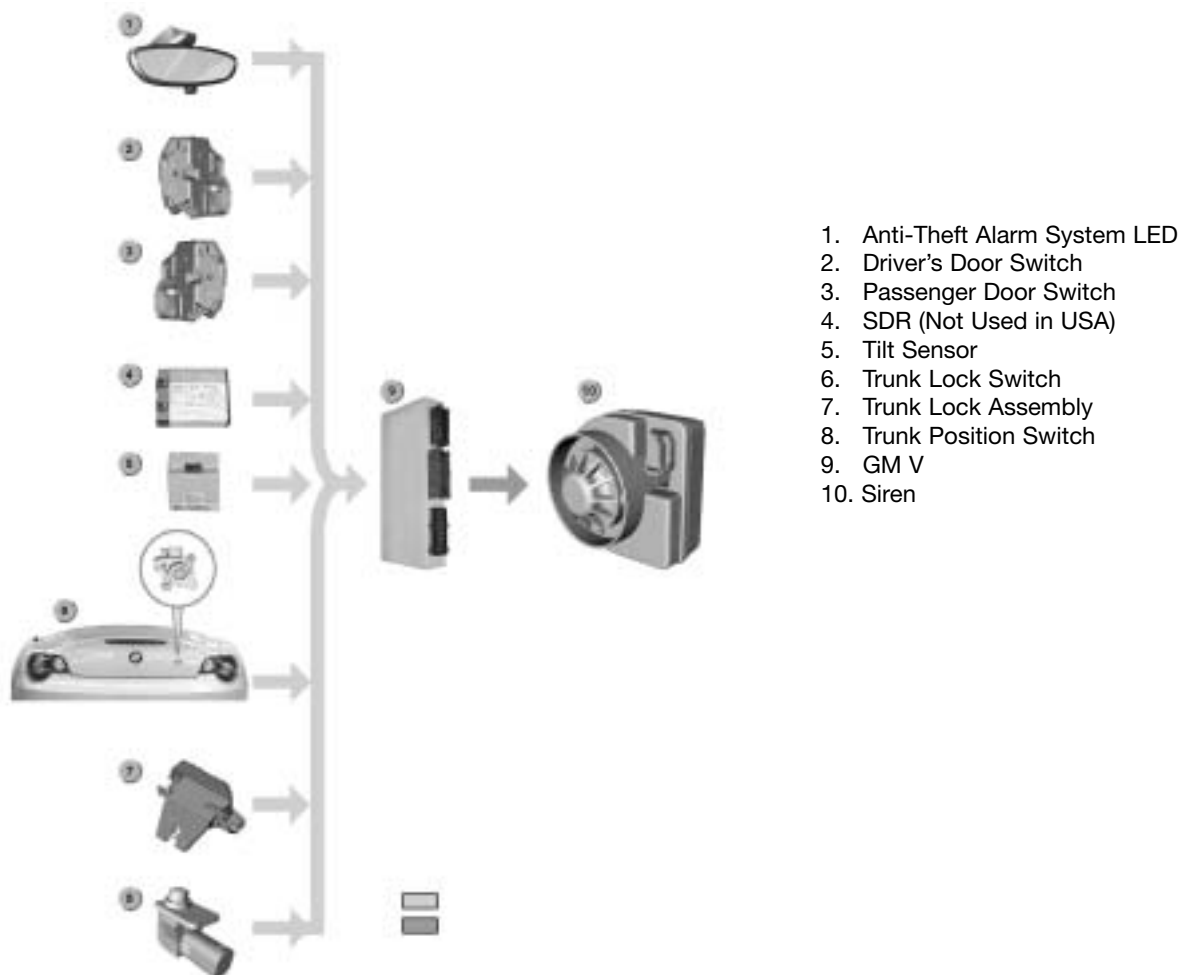
#### Disabling Tilt Sensor

The tilt sensor are temporarily disabled under certain circumstances.

#### Trunk Emergency Release

If the trunk emergency release is operated from inside, the alarm is set off if the anti-theft alarm system is armed.

### System Overview



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## System Functions

### Disabling Tilt Sensor

The the tilt sensor are temporarily disabled under the following circumstances:

- For the first 30 seconds after the anti-theft alarm system is armed
- Once the anti/theft alarm system has been armed, while either of the doors or the trunk is open (30-second inhibition period does not start until they are all closed)

### Emergency Trunk Release

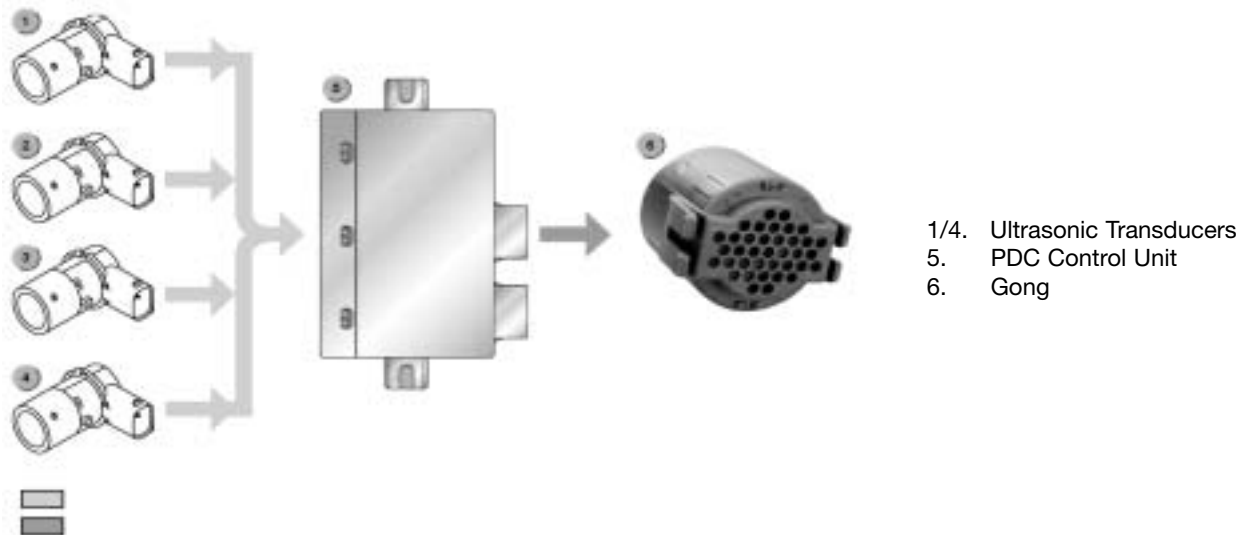
The trunk can be released from inside the trunk in an emergency. Operation of the trunk emergency release sets off the alarm if the anti-theft alarm system is armed.

## Park Distance Control

### Introduction

The Park Distance Control system is familiar. On the E85, it is a 4-channel system.

### System Overview



## Central Body Electrical System

### Introduction

This chapter describes the alterations to the central body electrical system (ZKE), "electrical consumer unit shutdown" (VA) and "sleep mode" as compared to the E46 electrical system.

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## Changes compared to E46

### Consumer unit shut-down

There are 2 outputs for consumer unit shut-down.

### Sleep mode

New conditions

### K-bus messages

New messages

## System Functions

### Consumer Shut-Down

The outputs VA1 and VA2 are available for consumer unit shut-down. The general module 5 has been expanded. There is now a second output available for consumer unit shut-down (VA). The consumer unit shut-down function switches consumer units to Sleep mode after 16 min.

### Consumer unit shut-down 1 (VA1)

Consumer unit shut-down output 1 is factory-configured as a pulse-width modulated output. The consumer units connected to consumer unit shut-down output 1 are the following:

- Storage compartment light
- Trunk light
- Reading lights

In the event of an overload or short circuit, consumer unit shut-down output 1 is switched off by the general module 5 unless there is no load connected to the output (open load). Once switched off, the output is switched on again by terminal R "OFF/ ON" provided the fault (overload or short circuit) is no longer present.

### Consumer unit shut-down 2 (VA2)

Consumer unit shut-down output 2 is available as a permanent general module 5 output. Consumer unit shut-down output 2 is overload and short-circuit proof. The consumer units connected to consumer unit shut-down output 2 are the following:

- Illuminated shifting gate on centre console (USA version)
- Sequential Manual Transmission control unit

The permanent consumer unit shut-down output 2 is intended for electronic control units. The electrical control units require a permanent output as otherwise they would not be able to function.

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## **Sleep Mode**

The preconditions for Sleep mode are the following:

- Window regulators deactivated for 1 s
- Consumer unit shut-down and interior lighting passive
- Diagnostic mode not active
- K-bus in Sleep mode
- On "Goto Sleep Mode" signal after 1 s or within 30 s of the anti-theft alarm system being armed

## **K-Bus Messages**

The K-Bus now contains messages that may be addressed to all or multiple control units.

## **Diagnosis**

### **Consumer unit shut-down**

The diagnostic capabilities of the general module 5 have been extended. The general module 5 can distinguish between the following load conditions at the consumer unit shut-down outputs:

- Overload
- Short circuit
- No load connected (open load)

The various faults can be diagnosed.

Consumer unit shut-down output 2 (VA2) is overload and short-circuit proof. An overload is detected by the general module 5.

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## Door mirrors

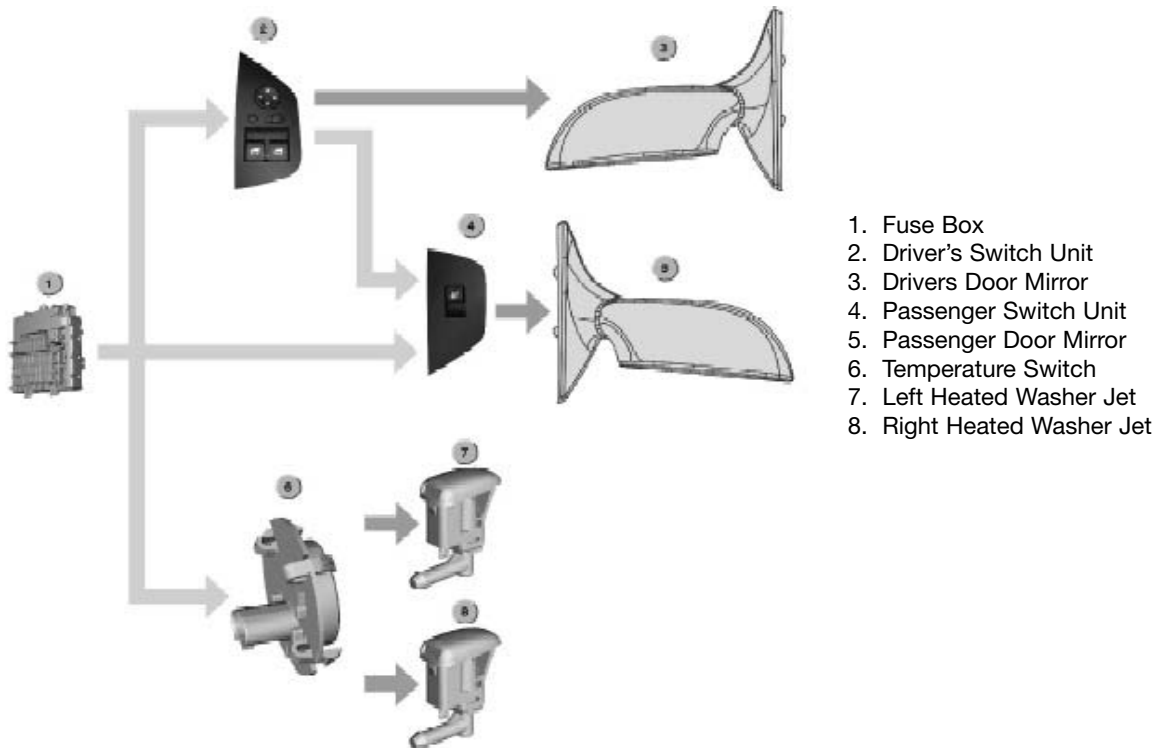
### Introduction

The functions of the door mirrors on the E85 are largely the same as on the E46. Options offered on the E85 are electrochromatic mirrors, the mirror folding function and the winter package.

### New system features

The temperature switch for the heated washer jets is at the front on the left under the cover on the vehicle underbody.

### System overview



### Components

The system consists of the following components:

- Door mirrors on driver's side and passenger side
- Mirror adjuster button, driver's side
- Rear-view mirror (if electrochromatic option fitted)
- Mirror folding module (Located at the base of the A pillar)
- Mirror heater
- Temperature switch
- Heated washer jets
- Temperature switch (switches on the heaters for the heated washer jets)



# Lights

## Headlights

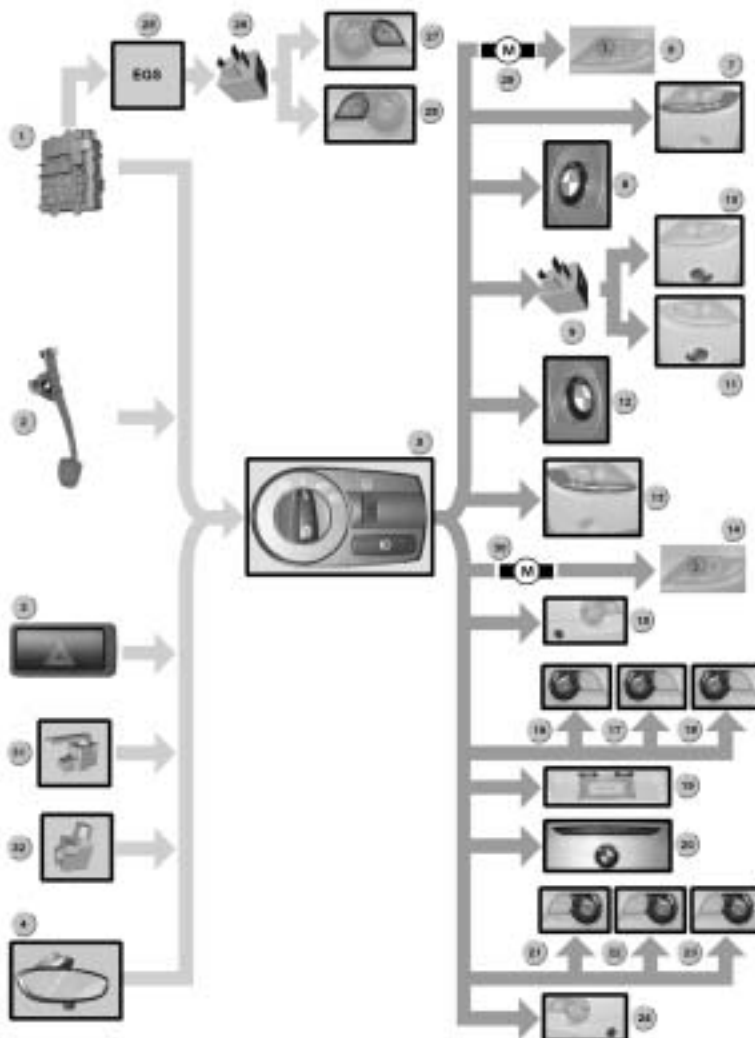
The E85 headlights are fitted with halogen bulbs as standard for both the low and high beams.

Bi-xenon bulbs are available as an option. If the bi-xenon option is fitted, a dynamic beam-height adjustment system is also fitted. Lighting configurations for the E 85 are as follows:

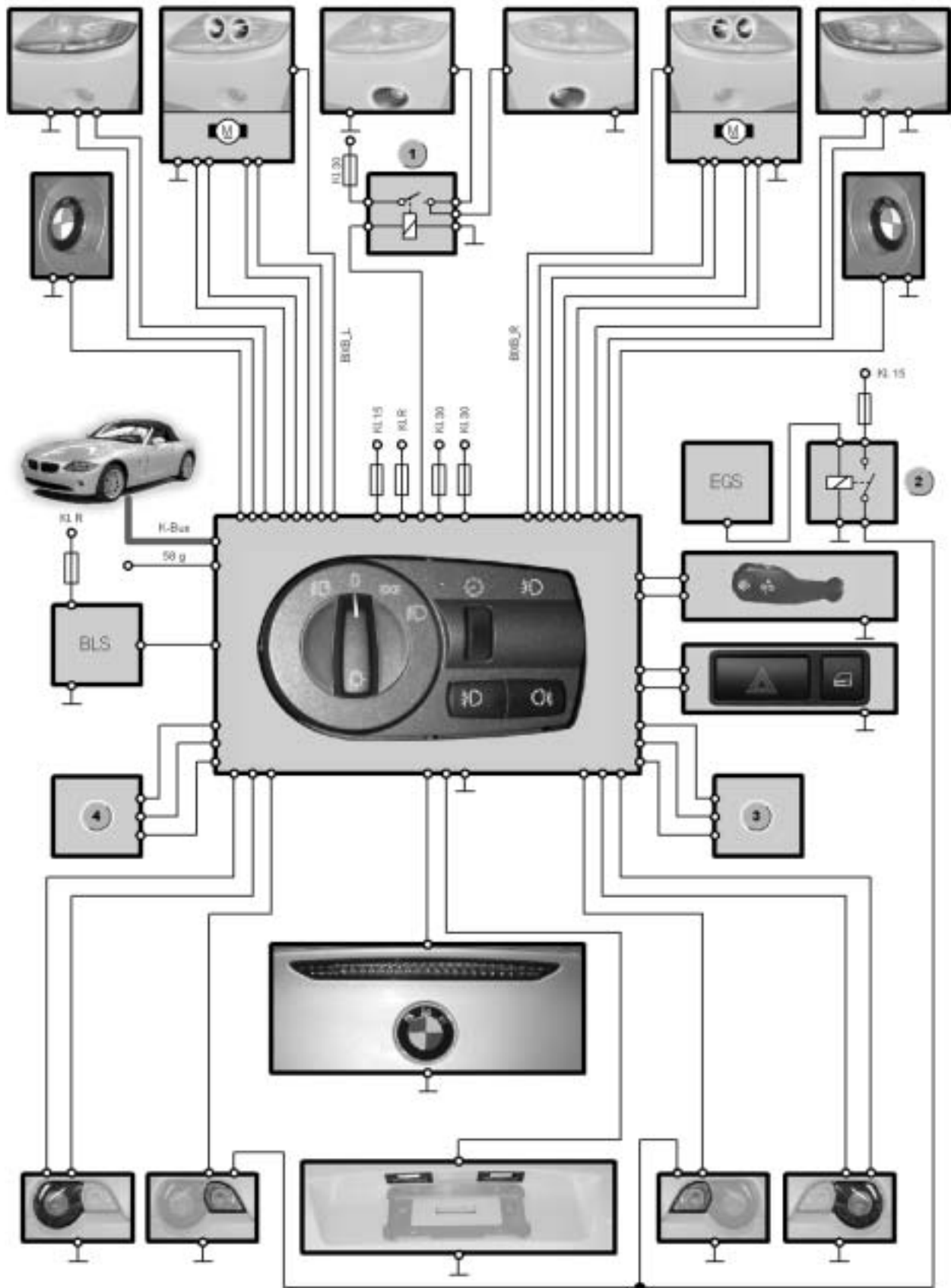
- US version with halogen headlights without manual beam height adjustment
- US version with dynamic beam-height adjustment and bi-xenon headlights

The US versions also have two sidemarker LEDs. They are integrated in the left and right side sections of the rear bumper.

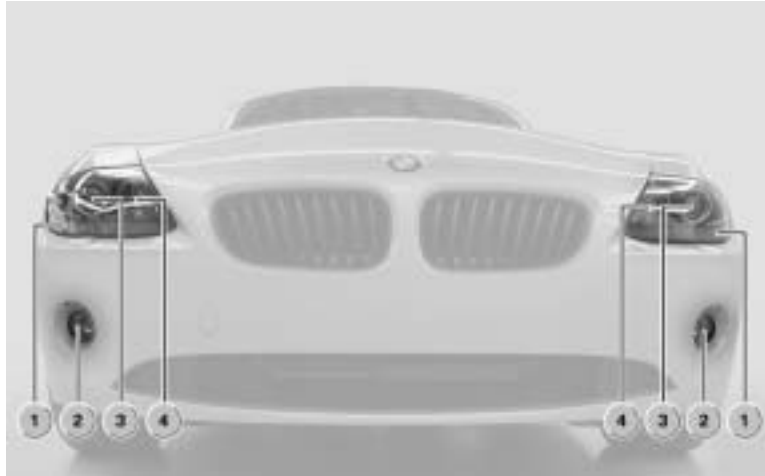
## System overview



1. Fuse Box
2. Brake Light Switch
3. Hazard Warning Switch
4. RLS
5. LSZ
6. Bi-xenon Headlight
7. Front Turn Signal
8. Side Repeater
9. Fog Light Relay
10. Fog Light
11. Fog Light
12. Side Repeater
13. Front Turn Signal
14. Bi-xenon Headlight
15. Rear Sidemarker
16. Rear/Brake Light (Compartment 1)
17. Rear/Brake Light (Compartment 2)
18. Rear Turn Signal
19. License Plate Lights
20. 3rd Brake Light
21. Rear/Brake Light (Compartment 1)
22. Rear/Brake Light (Compartment 2)
23. Rear Turn Signal
24. Rear Sidemarker
25. Transmission Control Module
26. Back-up Light Relay
27. Back-up Light
28. Back-up Light
29. Bi-xenon adjusting motor
30. Bi-xenon adjusting motor
31. Height sensor, front
32. Height sensor, rear

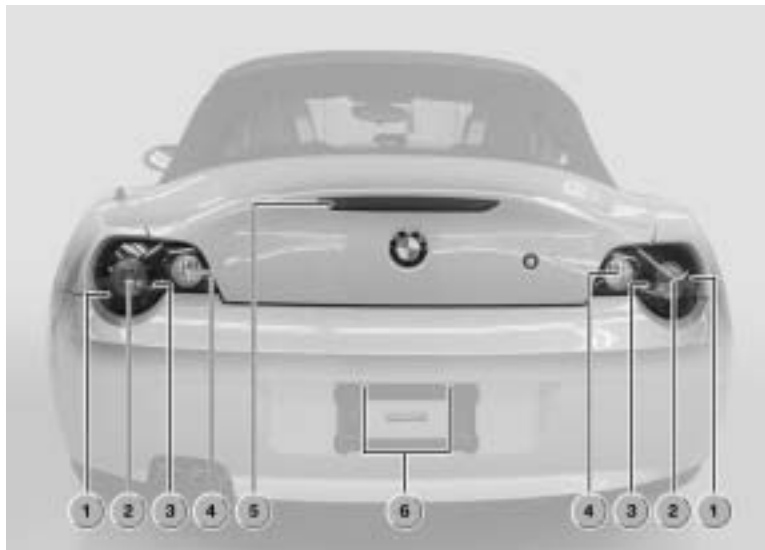


## Front Light Clusters



1. Turn Signal Indicators
2. Fog Lamps
3. Low Beam Lights
4. High Beam Lights

## Rear light clusters



1. Rear/Brake Lights
2. Turn Signal Lights
3. Brake Force Display Lights
4. Back-up Lights
5. 3rd Brake Light
6. License Plate Lights

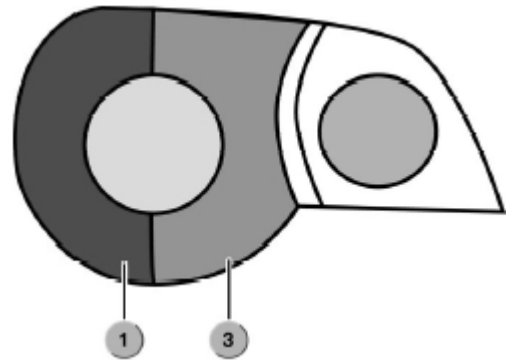
## Rear/brake light

The rear-light and brake-light bulbs are in separate compartments in the left and right light clusters. When the headlights are switched on, all bulbs in compartments 1 and 3 are switched on. Those bulbs have a power rating of 21 Watts. For the rear light function, all four bulbs are controlled by pulse-width modulation. This dims all four bulbs to 5 Watts.

During braking, the light switch centre receives a signal from the brake light switch. The light switch centre then applies 21 Watts to the bulbs in compartment 1. In that way, the brake light function is performed.

## Brake Force Display

In order to improve the reaction of other drivers to an emergency stop, the E85 has a Brake Force Display system. Its purpose is to reduce the likelihood of being driven into by the vehicle behind. The Brake Force Display function will only be available on the US version at series launch. If a deceleration of more than 5m/s<sup>2</sup> or an ABS signal is detected, the bulbs in compartment 3 are activated by the light switch centre. They too then receive the full 21 Watts of power. In this way, the brake light plus Brake Force Display function is performed.



1. Normal Brake Light
2. Rear Tail Light plus Brake Force Display

## Sidemarker Lights

The US version has two sidemarker lights in the rear plastic bumper panel. They are LED light units.

## Bi-xenon Headlights

The optional bi-xenon headlights represent a major advance in road illumination and headlamp range. Their function is identical to the bi-xenon headlights on the E46. When the headlights are switched on using the steering column stalk, an electromagnet controls a movable beam-pattern screen in the ellipsoid module of the dipped-beam headlight. That screen then uncovers the high part of the headlight beam.

### **Note:**

***If the headlight flasher function is required, the bi-xenon beam-pattern screen is not activated. Only the high-beam headlight (H7) is activated. The bi-xenon light reacts too slowly to that signal.***

## Light switch center

The light switch centre controls the entire exterior lighting system. The following components are integrated in the light switch centre, depending on equipment level.

- Light switch
- Switch for fog lamps
- Dimmer control for dashboard, instrument cluster and locator lighting (terminal 58)
- Photocell for detecting ambient light conditions

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The light switch centre has the capability of adjusting the effective voltage at all outputs by means of pulse-width modulation. With the exception of those for the bi-xenon headlights and their beam-pattern screens, all output voltages are pulse-width modulated.

Control of the effective voltage levels by pulse-width modulation allows brightness fluctuations due to variations in the load on the vehicle's electrical system to be evened out. The electrical system voltage has to be higher than the desired effective voltage.



## Rain/light sensor (RLS)

The E85 is available with a rain/light sensor (RLS) as an option. The headlights are switched on/off automatically by the rain/light sensor according to the ambient light conditions.

There are two additional optical sensors for the RLS integrated in the casing of the automatic interval control (AIC) module. The two new sensors supplement the otherwise unchanged wiper interval control function as follows:

- An ambient-light sensor detects the light intensity above the vehicle within a wide scanning angle.
- A forward light sensor detects the light intensity within a narrow scanning angle directly ahead of the vehicle.

An internal processor calculates from the readings taken by the sensors whether the preconditions for switching on the lights are present.

The following conditions are checked for:

- Twilight
- Complete darkness
- Entry in underground car park
- Entry in tunnel
- Precipitation such as rain or snow

### Note:

If the wiper switch is set to intermittent wipe, the precondition for switching on the lights is detected once the wiper frequency exceeds a pre-defined level (factory setting is 15 wiper cycles per minute). If the wiper switch is set to Speed I or II, the precondition for switching on the lights is constantly satisfied.

If any of the above conditions is met, the RLS on the E85 sends the information to the light switch centre.

In order to be able to control the headlights automatically, the RLS must be activated by a separate light switch setting on the light switch centre.

In addition, the lights are switched on if any of the following faults occur:

- The RLS detects a sensor fault.
- There is a fault in communication between the RLS and the light switch centre.

The following lights are controlled by the light switch centre:

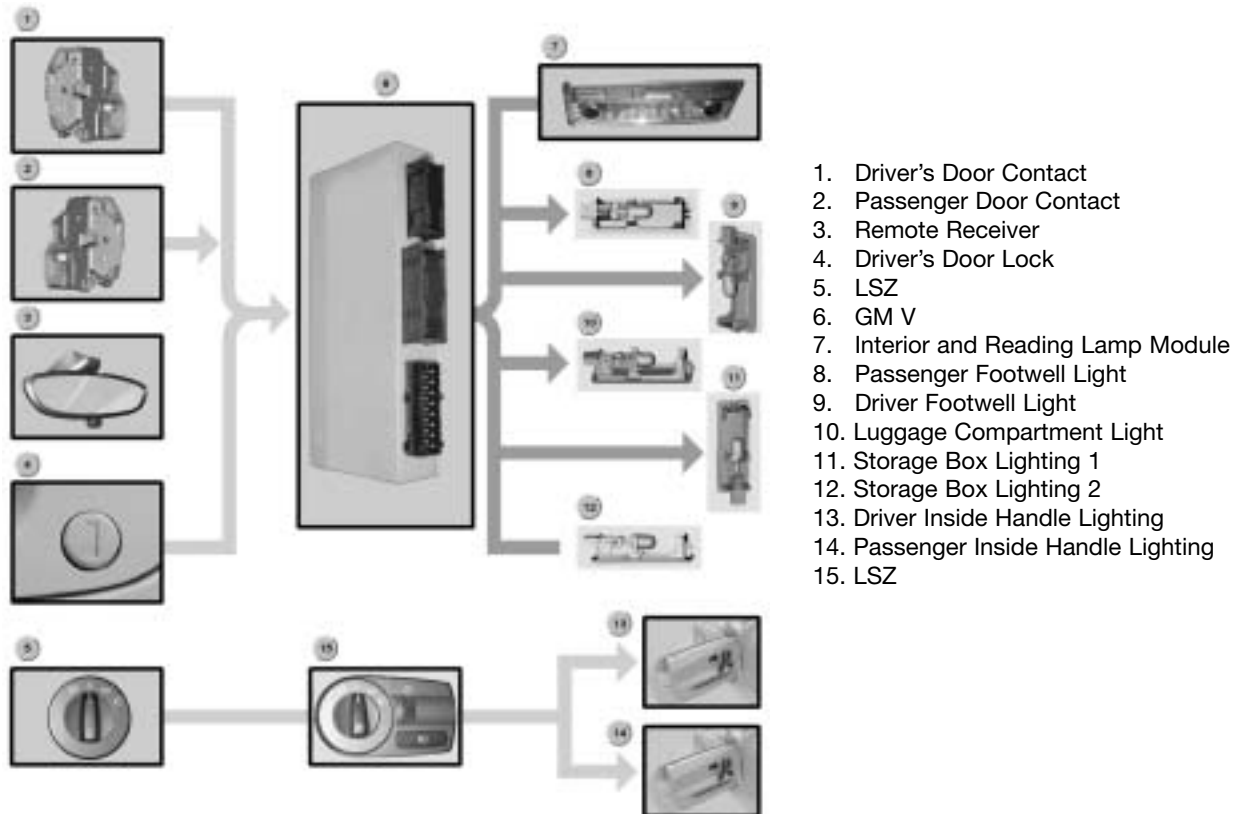
- If terminal R is "ON," the side lights, the number-plate light and the instrument panel lights are switched on.
- If terminal 15 is "ON," the side lights, the dipped headlights, the number-plate light and the instrument panel lights are switched on. If only the side lights are required at that setting, the switch on the light switch centre must be manually set to Side lights "ON."
- When the ignition switch is at position "0," the exterior/instrument panel lights are switched off.

The sensitivity of the RLS can be set by means of the Car Memory function.

**Safety note:**

**Automatic control of the headlights is not a substitute for individual assessment of the light/visibility conditions (e.g. fog) by the driver. In order to avoid safety risks in such situations, the lights must be switched on manually by the driver.**

**Interior lights**

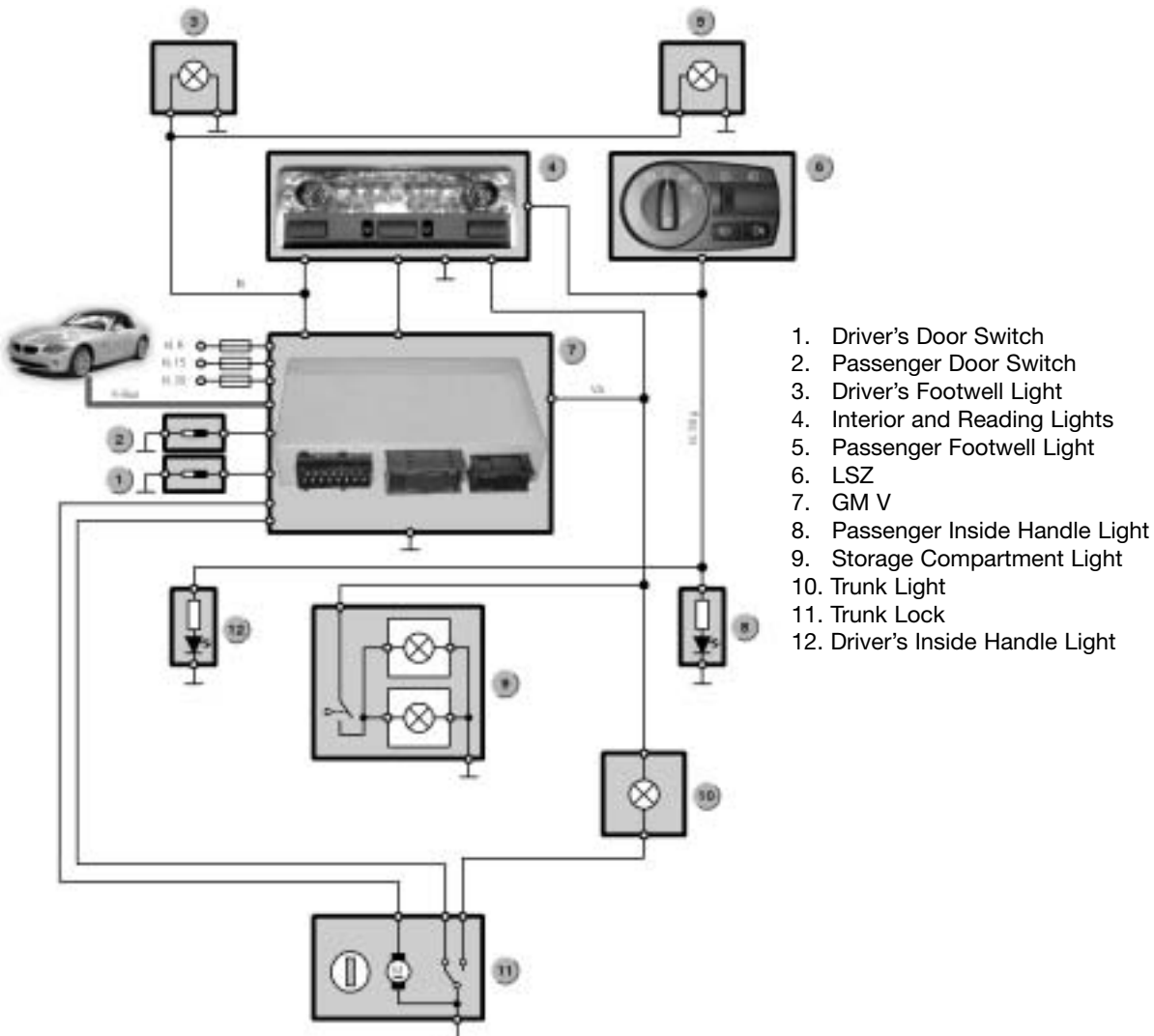


## Changes Compared to E46

The interior lighting is controlled by the general module V. In order to even out the light power fluctuations that are made more likely by the use of the NG engines (probability of high power draw by Valvetronic electric motors), the voltage for the vehicle lights is provided by means of a pulse-width modulated signal with a fixed frequency of 100 Hz. By varying the pulse width, and thereby the voltage, applied to the light bulbs, the fluctuations referred to above can be compensated for.

The general module V has a fault feedback function. If the power driver in the general module V detects the failure of a bulb, the output on the general module V is shut down. That means that no power is available at that output any longer. If the defective bulb is replaced and terminal R switched OFF/ON, power is available at the general module output again. The interior door handle lights and centre console lights as well as the ambience lights in the interior light unit are controlled by the light switch center.

The storage compartment also has a light. That light has a microswitch and two bulbs.



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## Review Questions

1. Why is One-Touch closing not allowed on the passenger side window?  
\_\_\_\_\_
2. How does the GM V determine if a lock or unlock signal is received from the Drivers Door Latch assembly? \_\_\_\_\_  
\_\_\_\_\_
3. How many Hall-Effect Sensors are used to determine Soft-Top Positions ? And what are their locations? \_\_\_\_\_  
\_\_\_\_\_
4. What are the preconditions for raising and lowering of the Soft-Top (Fully Automatic)?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
5. When are the internal functions of the CVM 4 checked? \_\_\_\_\_  
\_\_\_\_\_
6. What changes have been made to the K-Bus messaging? \_\_\_\_\_  
\_\_\_\_\_
7. Under what conditions is the Brake Force Display active? \_\_\_\_\_  
\_\_\_\_\_
8. Where is the GM V located? \_\_\_\_\_  
\_\_\_\_\_
9. Where is the CVM 4 located? \_\_\_\_\_
10. How is the Heated Rear Window controlled? \_\_\_\_\_  
\_\_\_\_\_
11. Why is the voltage supplied to the interior lights a PWM signal? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_