Reference Manual

E83
COMPLETE VEHICLE

Technical Training

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E83 Complete Vehicle

Subject **Page**

Initial Print Date: 10/03 Revision Date: 11/03

Complete Vehicle

Model: E83

Production: Start of Production MY 2004

OBJECTIVES

After completion of this module you will be able to:

- Recognize the X3
- Relate the differences between the X3, the X5 and E46 sportwagon
- Remove and reinstall X3 door handles and exterior mirrors
- Understand and Relate Panorama Sunroof Operation

E83 Complete Vehicle

Introduction

The E83, X3, conceived and engineered by BMW will be an addition to the X Family of SAV's. Based on the 3 Series Touring (Sportwagon), its size, weight and capabilities more closer match those of the X5.

The chassis and many parts are taken either directly or in modified form from the E46/3-16 or the X5. Almost 35% of the parts were designed specifically for the X3.

By extending the X family, BMW is strengthening its leading position in the field of on-road-orientated four-wheel drive SAV's geared towards outstanding driving performance.

Production

Due to the outstanding success of all models none of the present-day BMW plants currently have sufficient capacity to produce the X3 in the intended quantities.

The BMW Group has therefore entrusted Magna Steyr with the development and production of the E83. The vehicle concept has been devised by BMW engineers in Munich while production-vehicle development and production take place in Graz/Austria.

Magna Steyr has already established a sound reputation with complete-vehicle developments as well as with body work or drive train developments.

It is above all in the 4WD sector that the Austrian's demonstrate an exceptional level of technical skill and competence.

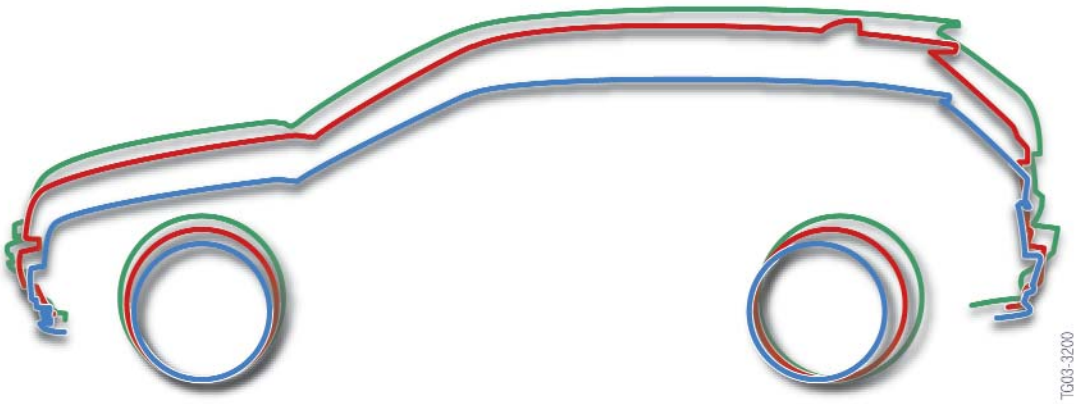
Even mass production is nothing new to Magna Steyr. All 4WD variants of the Mercedes E-Class, the Mercedes G-Model, the Chrysler Jeep Grand Cherokee and the Chrysler Voyager have been rolling off the production lines in Graz to some extent for years. Magna Steyr has regularly received the best marks in quality inspections and tests, carried out by among others J. D. Power.

Models

The X3 is available with the 3.0 M54 engine and two versions of the 2.5 liter engine, the M54. A six speed manual transmission is standard on all X3's with a 5-speed automatic optional.

Technical Highlights

- New four-wheel drive system with variable power distribution (xDrive)
- Multifunctional panorama glass sunroof
- Best-in-class ratio of power output and fuel efficiency



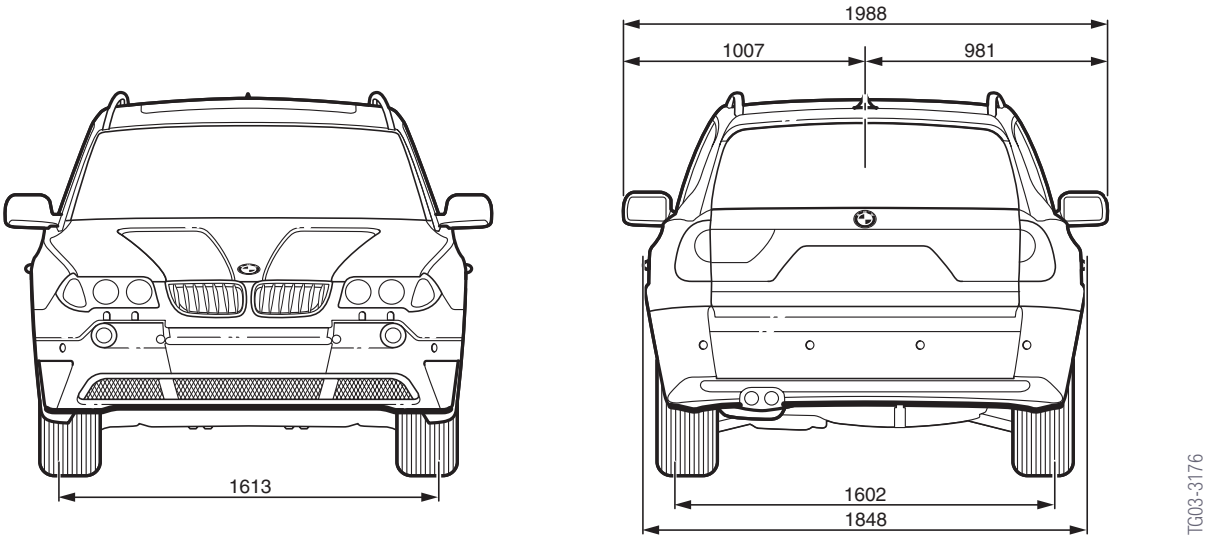
The X3 (Red) is significantly larger than the 3 Series Sportwagon(Blue), but only slightly smaller than the X5 (Green).

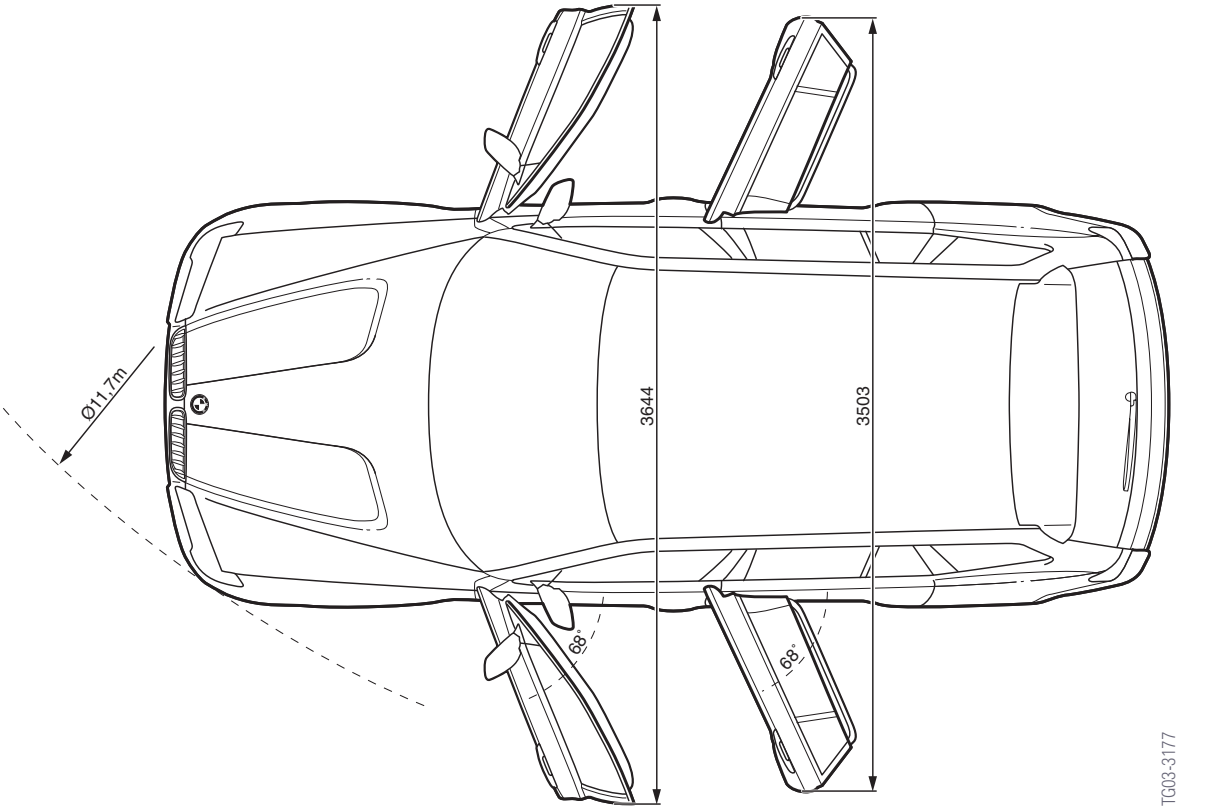
	E46/3 330XI Sportwagon	E83 X3 3.0i	E53 X5 3.0i
Length (mm)	4478	4563	4667
Width (mm)	1739	1848	1872
Height (mm)	1429	1631	1715
Empty Weight (kg)	1670	1730	2056
Payload	425	500	544
Luggage Compartment Capacity (L)	435-1345	480-1560	465-1550

Vehicle Technical Data

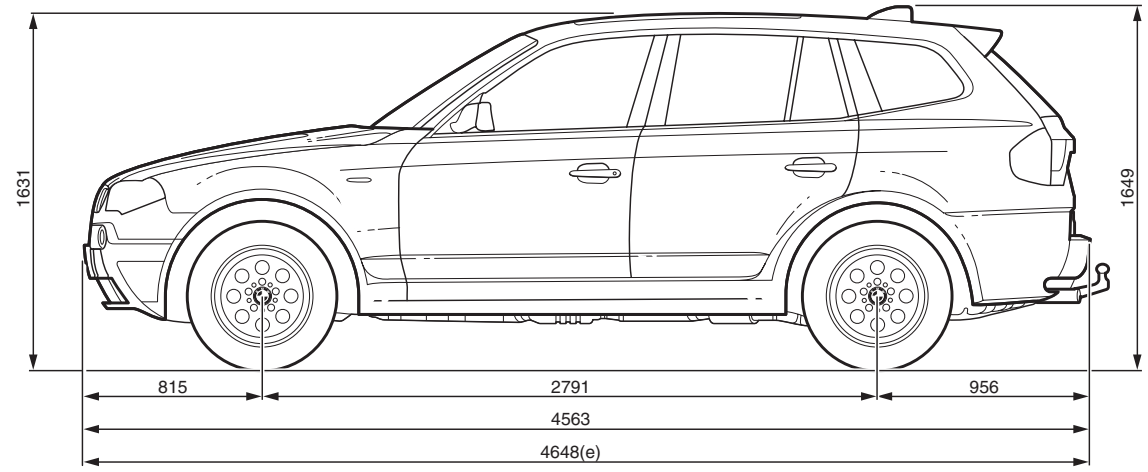
	X3 2.5 M54	X3 3.0 M54
Engine	M54B25	M54B30
Cylinders/Valves	6/4	6/4
Capacity (cc)	2494	2979
Stroke/Bore (mm)	75/84	89.6/84
Output (kw) At Speed (RPM)	141@6000	170@5900
Maximum Torque (Nm) At Speed (RPM)	245@3500	300@3500
Compression	10.5:1	10.2:1
Motor Electronics	MS45	MS45 MS45.1 w/auto
Fuel Type	Unleaded RON98	Unleaded RON98
Maximum Engine Speed (RPM)	6500	6500
Manual Transmission	ZF GS6X37BZ	ZF GS6X37BZ
Automatic Transmission	GM GA5R390R	GM GA5R390R
Empty Weight (kg)	1707	1730
Maximum Load (kg)	500	500
Wheels	7J17 Cast Al. ET39 Styling 110	8J17 Cast Al. ET46 Styling 112
Tires	215/60R17 96H M+S	235/55R17 99H M+S
0-100km/h (Manual/Auto)	-/10.0	7.9/8.3

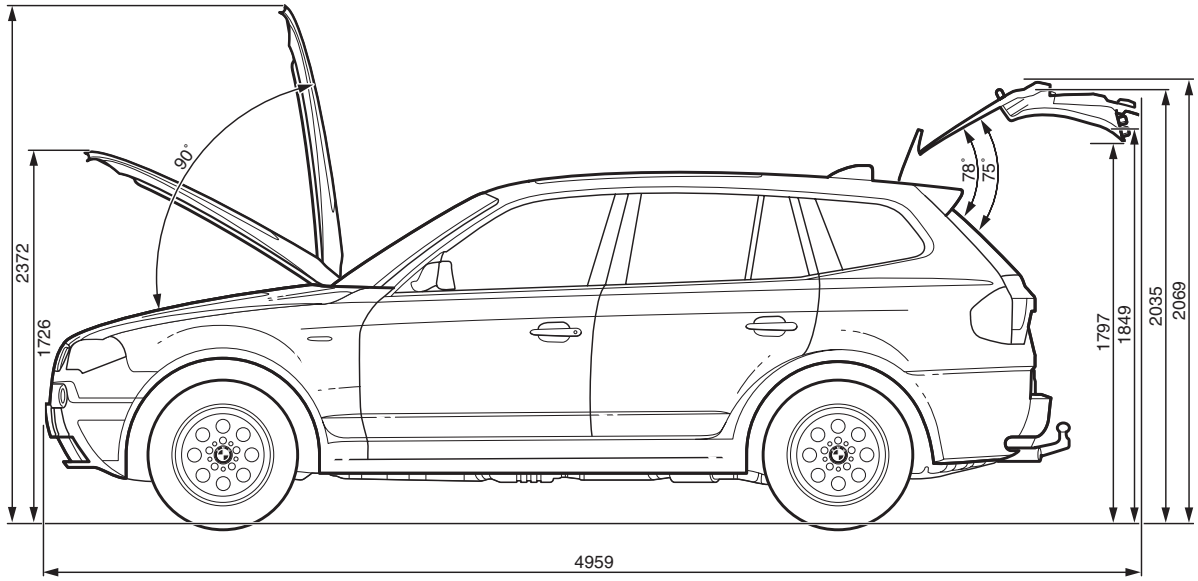
Vehicle Data Views

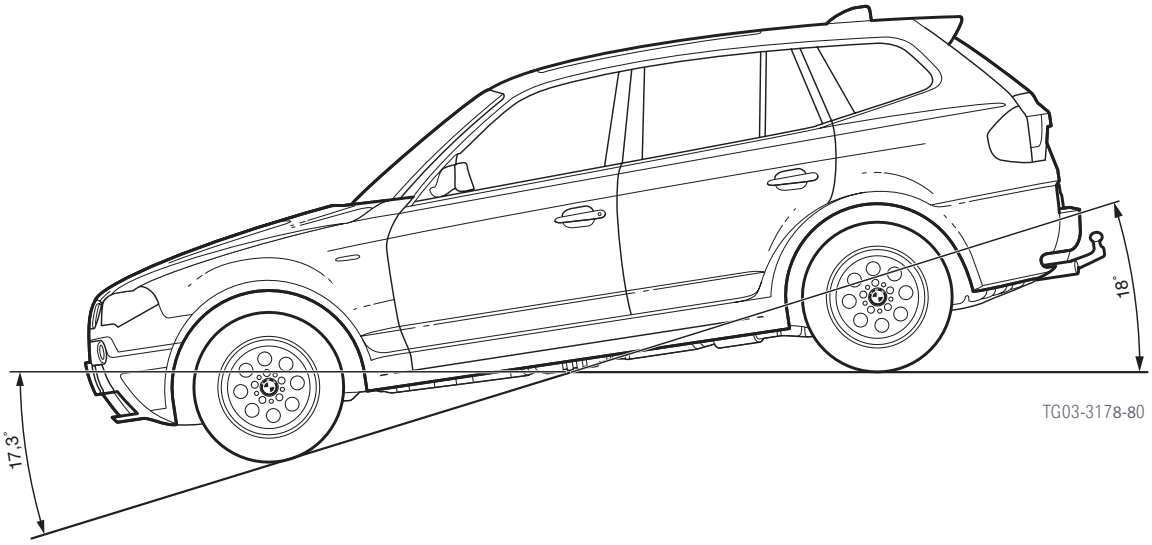




Vehicle Data Views







Body

The X3 is derived from the E46 sharing many identical parts but is much heavier. Various reinforcement measures were necessary to guarantee the required level of rigidity - even in the event of a crash.

Thus the front axle (2-joint spring strut as in the X5) is bolted at 8 points, the front end is stabilized with a suspension cross-brace (load factor higher than for the M3), seat cross-members and reinforcement plates in the B-pillars provide additional protection in the event of a side impact and the rear engine brackets are made of high-tensile but light "Trip 700" steel.

The engine in the E83 is lower than in the E46. To ensure sufficient clearance for the manifold heat shield, the left engine bracket is shorter than the right.

The hood has a side support to prevent it from moving in the event of a crash. Held in place in this way, the hood cannot jump out of its anchoring to damage the windshield.

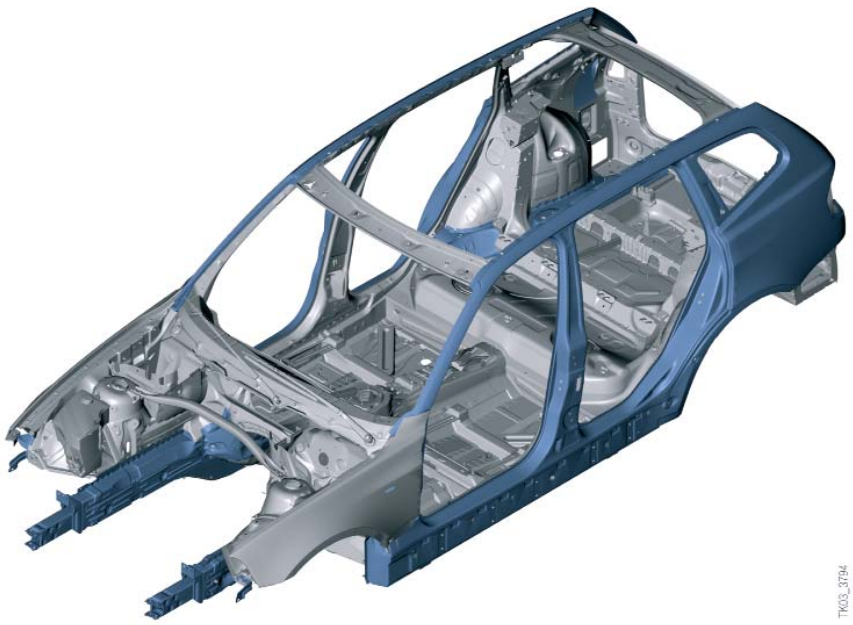
Body Shell

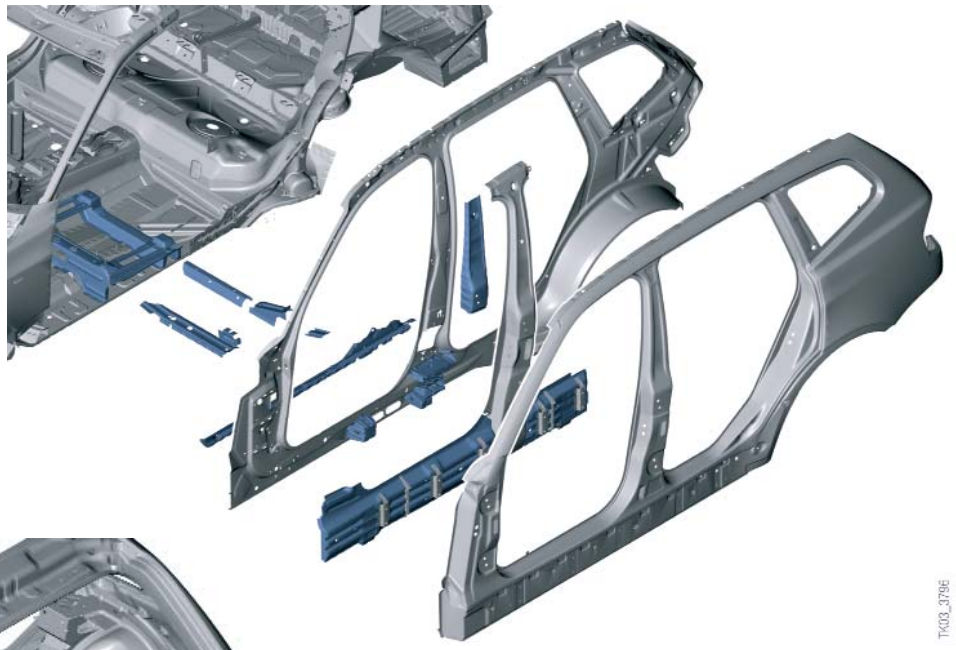
The Bodyshell panels are stamped and assembled at Magna Steyr.

Since the bodyshell is made completely of steel, there are few new procedures to observe with regards to repair and replacing parts of the body.

To reduce weight, the front bulkhead (radiator support) of the X3 is made of a hybrid steel injection-molded with plastic. The air ducts are cast on. In the case of an accident this bulkhead must be replaced rather than repaired.

The static rigidity of the X3 body is 20,000Nm/degree.





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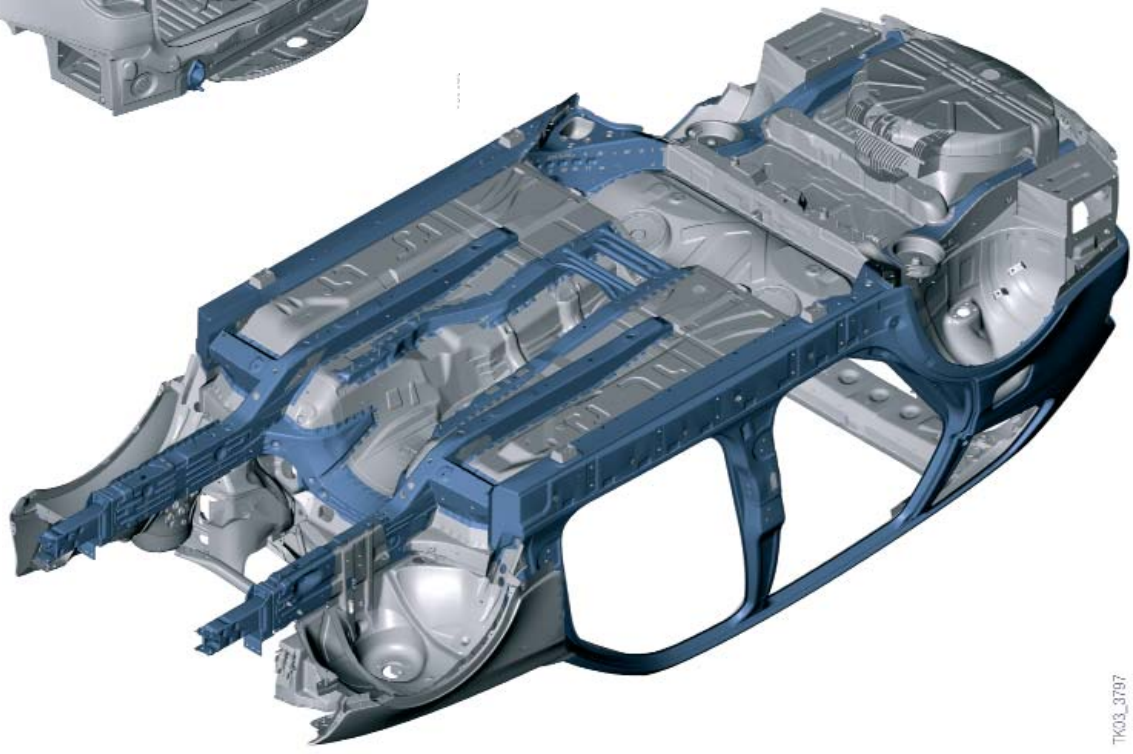


TK03_3797

Front Bumper

The front bumper assembly consists of a 2 part panel, the support member and the deforming elements.

The two panels are made of plastic and clipped and bolted together. The panels must be removed from the X3 individually with the outer panel being removed first.

Attached to the chassis is the aluminum support member and deforming elements.

Front Bumper Assembly

Headlights

Front Lights

Halogen headlights are standard, bi-xenon with AHL optional. The headlights are mounted to the forward bulkhead with 4 screws.

The fog lights are installed in the bumper trim and have adjustment screws accessible from the outside (front).

Doors

The door panels are attached with 5 screws. The trim on the pull handle must be removed to access the screws.

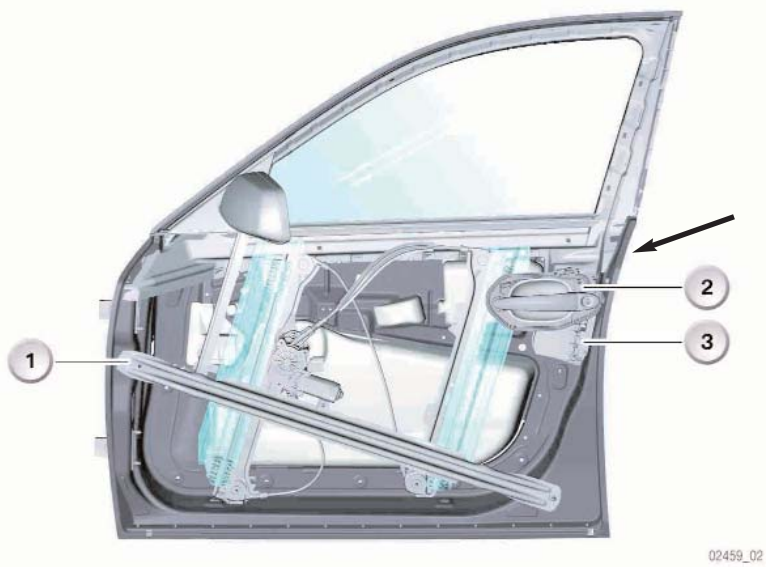
The outside mirror is held to the door by 3 screws, the cover and mirror are clipped to the mirror assembly.

Outside Mirrors

Exterior Door Handles

The exterior door handle is a three-piece assembly. It consists of a mounting plate fitted from the inside, a handle recess plate fitted from the outside and the handle fitted and screwed onto the recess plate from the outside (access screw from outside - arrow).

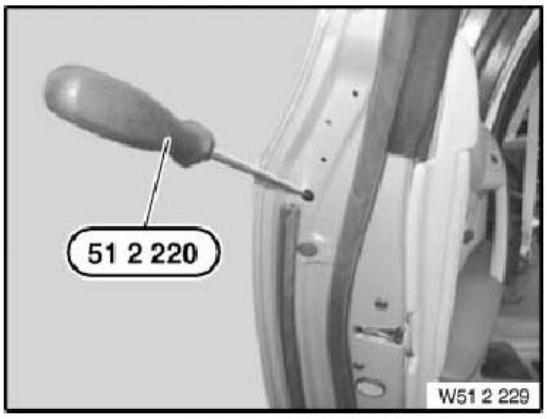
1. Diagonally mounted side-impact bar
2. Exterior door handle mounting plate with door handle and recess plate
3. Lock



Workshop Exercise - Exterior Door Handle Removal

The Instructor will demonstrate the proper door handle release and attachment procedure using mockup parts and special tool. This will familiarize you before attempting "on vehicle" removal. After the demonstration is completed, proceed to "on vehicle" removal and installation.

Caution: Lift handle until access hole (to screw) is exposed and insert tool to engage in screw, do not overtighten securing screw in either direction!



1. *To remove door handle, turn screw counterclockwise against stop. Pull rear of handle up, pivot and pull handle off of front pin.*

2. *To install handle, position on front pin and swivel into place. Push rear of handle into socket (lightly) until it snaps in (slight resistance). Turn screw clockwise until it seats.*

Remove tool, release door handle.

Workshop Exercise - Replace Painted Mirror Cover

The customer complains that the mirror cover is scratched. The correct color cover has been ordered and received and now must be installed.

1. *Is it possible to remove the painted cover without removing the mirror glass?*

   _____

2. *What is the proper procedure to remove the mirror glass?*

   _____

3. *What is the final step in removing the painted mirror cover?*

   _____

Interior

The use of forms on the outside is continued on the inside. The X3 is characterized by modern styling down to the last detail (e.g. inwardly turning surfaces on the door handle) and a strong lifestyle direction. The two-tone color scheme and horizontal shapes convey lightness of touch, power and dynamics. Thanks to the use of diverse materials ranging from sporty aluminum to elegant leather or wood, ample freedom is given a high level of individualization.

The interior concept has taken into account the specific demands made of an SAV. A rear bench seat for three rear passengers ensures that up to five persons can sit comfortably in their seats in the X3. Knee room of 61 cm provides particular comfort on top of the fold-out rear center armrest.

The wide range of practical storage options, stowage compartments and mounting options in the passenger and luggage compartments can be extended still further with the option "storage package."

The X3 is fitted as standard with 4 cup holders, map pockets with nets in the front doors and a 4.5-liter glovebox. The storage package features among others additional nets for the front and the luggage compartment, mounting rails with variable lashing points and a nonslip revolving floor for the luggage compartment.

The luggage compartment capacity up to the height of the removable interior lid is 480 liters and with the rear bench seat folded down up to the height of the window edge is 930 liters. When the vehicle is loaded up to the height of the roofliner, a volume of 1560 liters becomes available. The single-part tailgate opens upwards, the loading sill is low and the rear bench seat can be folded in a ratio of 60 : 40.

For carrying sports or leisure equipment, the list of options includes a ski bag, a holder for mountain bikes (up to two can be stowed inside the vehicle) and a roof rack.

Heating/Air Conditioning System

The heating and air conditioning systems are derived from the E46 and are adapted geometrically to the body of the E83.

Communications/Entertainment

All the technical highlights familiar to BMW can also be ordered for the X3. Park Distance Control, cut-off ultrasonic interior movement detector, bi-xenon headlights and the recently introduced adaptive headlight are featured in the list of optional extras.

Hi-Fi and navigation systems (with pop-up monitor and DVD) and the telecommunications system (Bluetooth interface) represent cutting edge technology. The CD changer - for the first time in a BMW - is integrated in the center console for particular ease of use.

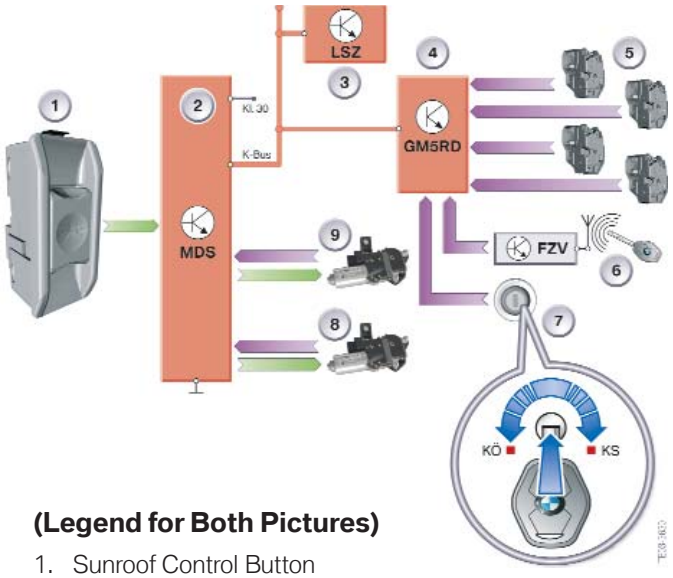
Panorama Glass Sunroof

One of the highlights of the X3 is a fully automatic, two-part panorama glass sunroof with an area of almost one square metre. Its front window section can be fully opened while both window sections can also be tilted rearward. The panorama glass sunroof affords an outstanding view for the rear occupants and, when fully opened, lends the vehicle the impression of being almost a Convertible.

System Components

The panorama glass sunroof assembly consists of the following components:

- Panorama Glass Sunroof control unit, MDS
- 2 Drive Motors
- 2 Part floating headliner
- 2 Glass covers
- Power Supply
- K-Bus Interface
- Wind deflector



(Legend for Both Pictures)

1. Sunroof Control Button
2. MDS
3. LSZ
4. GM5RD
5. Door Contacts
6. FZV
7. Driver's Door Lock
8. Motor
9. Motor

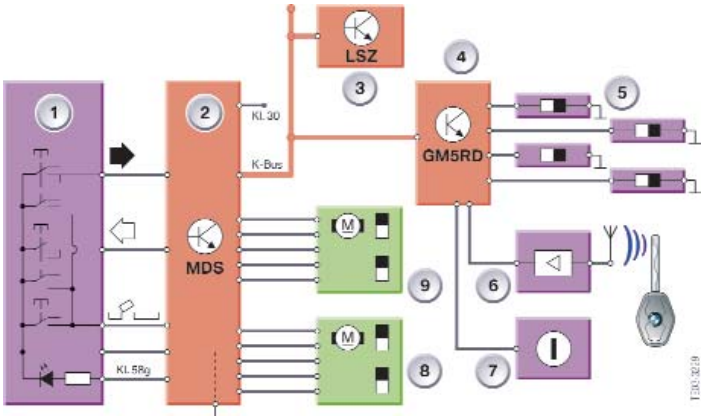
MDS

The MDS is a further development of the slide/tilt sunroof module fitted to the E 65.

The MDS contains the following components:

- Control Electronics
- K-Bus Interface
- Drive motor Relay
- Hall Sensor Power Supply

The drive motors are connected to the MDS by a 10 pin connector. The remaining components are connected via a 16 pin connector.



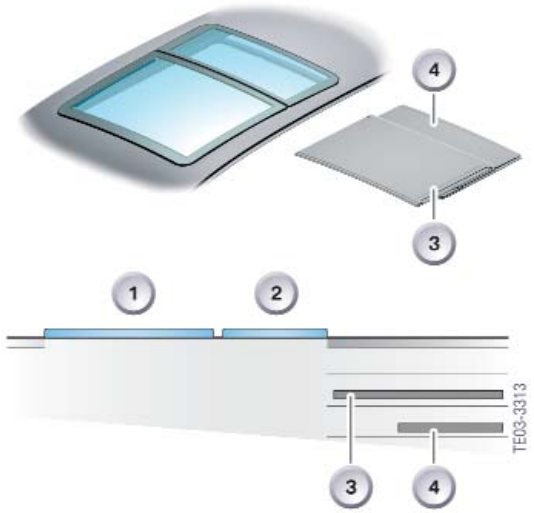
Drive Motors

The motor is a DC motor. The hall sensors are integrated in the motors to detect motor revolutions. These signals are forwarded to the MDS for analysis.

Floating Headliner

The floating headliner consists of two parts controlled by a Bowden Cable.

The headliner is interlocked to the function of the glass roofs. The headliner must be opened before the glass sunroof will open. On closing the glass sunroof must be closed before the headliner can be closed.



1. Front glass sunroof
2. Rear glass sunroof
3. Front Floating Headliner
4. Rear Floating Headliner

Glass Covers

Two glass covers are installed in the panorama sunroof. Six. bolts secure the front glass to the frame and four bolts secure the rear glass.

Power Supply and K-Bus Interface

The MDS acts as the power supply module for both the sunroof motor and the headliner motor. Communication with the rest of the car is through the K-Bus. The MDS receives and transmits K-Bus messages.

Wind Deflector

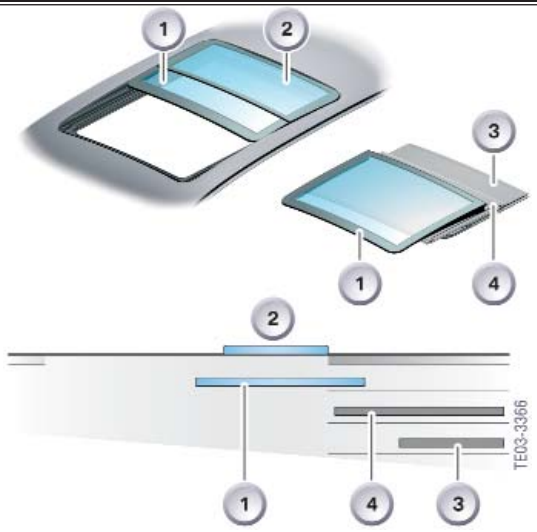
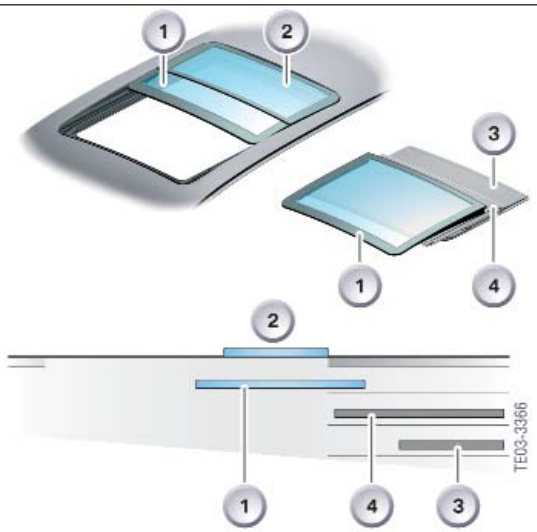
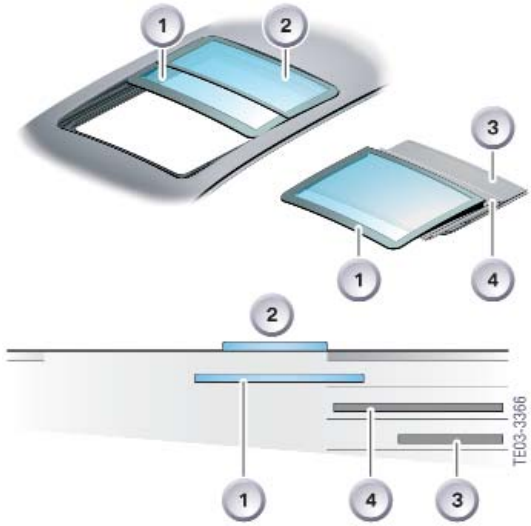
The wind deflector is cable operated by the rear (headliner) motor.

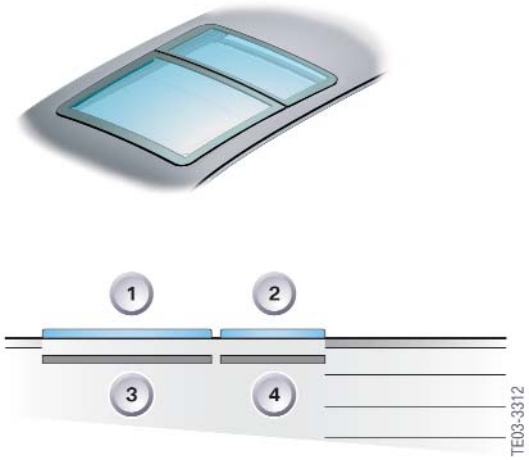
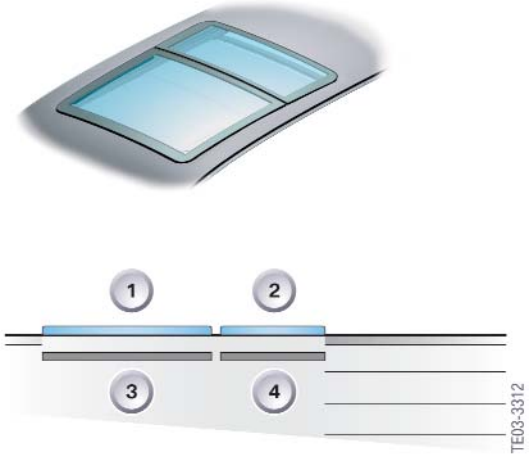
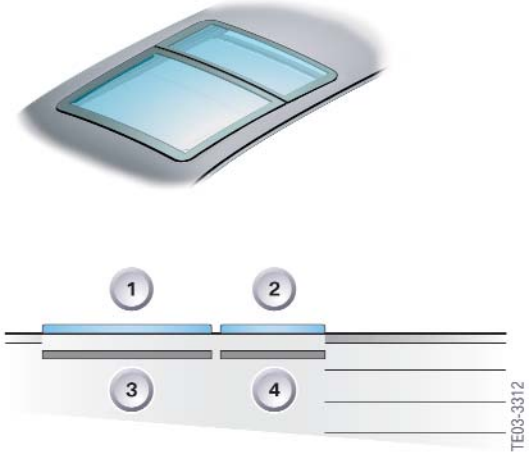
System Operation

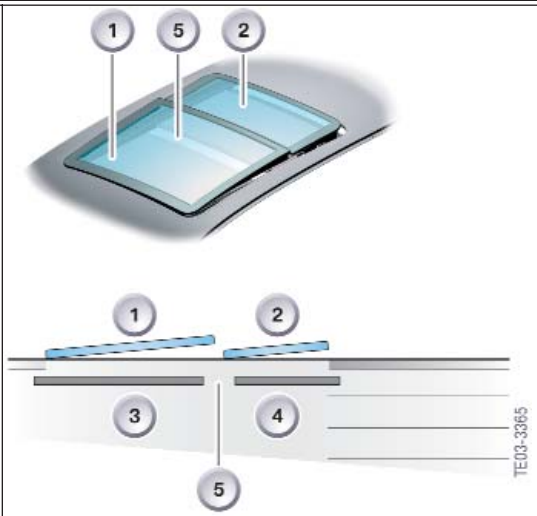
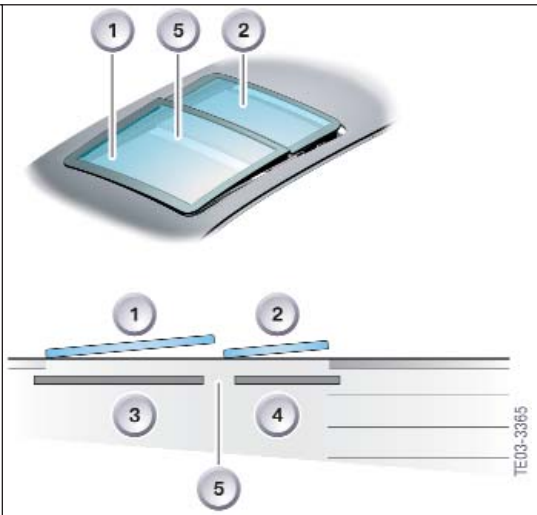
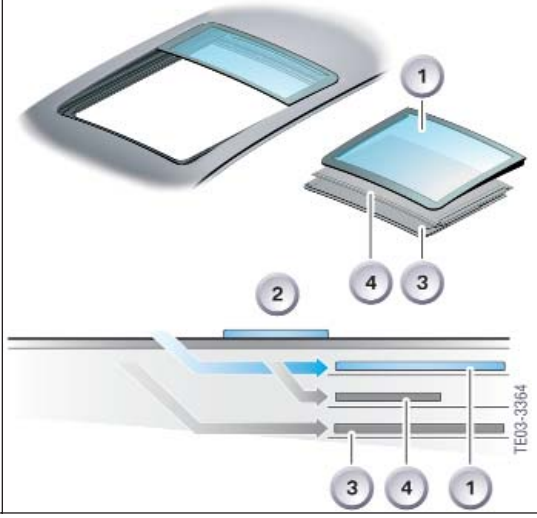
Operation of the panorama sunroof is similar to the conventional slide/tilt sunroof. It functions both as a tilting sunroof and a slide/tilt sunroof. The rear glass only tilts, the front glass slides and tilts. Rear tilt is possible only when the front glass is also tilted.The GM5RD signals the MDS for convenience opening and closing of the panorama glass sunroof.

The panorama glass sunroof is operated as follows:

- Headliner and glass sunroof Closed.
- Headliner closed, front and rear glass in tilt position (Headliner goes to vent position).
- Headliner open, sunroof closed.
- Headliner open, sunroof opened manually.
- Headliner open, sunroof opened to comfort position (Via one touch opening).
- Headliner open, sunroof opened fully (Beyond comfort position).

Control Button	Movement	Panorama Glass Sunroof Positions
 Manual opening of panorama glass sunroof by sliding button to first detente position	Floating headliner of glass tilt sunroof and slide/tilt sunroof are opened until the control button is released.	
 Automatic opening of panorama glass sunroof by sliding the button beyond the pressure point to the second detente position	Panorama glass sunroof is automatically opened to the comfort position.	
 Double-click function Automatic opening of panorama glass sunroof by sliding the button twice beyond the pressure point to the second detente position	Panorama glass sunroof is automatically opened to the comfort position.	

Control Button	Movement	Panorama Glass Sunroof Positions
 Manual closing of panorama glass sunroof by sliding control button in first detente position	Floating headliner or glass tilt and slide/tilt sunroofs are closed until the control button is released	
 Automatic closing of panorama glass sunroof by sliding the button beyond the pressure point to the second detente position	Floating headliner or glass tilt sunroof or slide/tilt sunroof are fully closed	
 Double-click function Automatic closing of panorama glass sunroof by sliding the button twice beyond the pressure point to the second detente position	Floating headliner and glass tilt sunroof or slide/tilt sunroof are fully closed	

Control Button	Movement	Panorama Glass Sunroof Positions
 Manual opening of panorama glass sunroof by pressing control button to first detente position	Panorama glass sunroof is opened to raised position until the control button is released	
 Double-click function Automatic opening of panorama glass sunroof by pressing the button beyond the pressure point to the second detente position	Panorama glass sunroof is fully opened to raised position and the floating headliner is moved to the vent position.	
 After opening panorama glass sunroof via one touch, the sunroof may be opened fully (rather than the comfort position) by sliding the control button to the first detente and holding.	Front glass of panorama sunroof will move from comfort position to fully open position.	

Floating Headliner

Opening

On opening the front part of the headliner moves over the rear part of the floating headliner. The special feature of the floating headliner is that it can be opened fully without the sunroof being open or tilted.

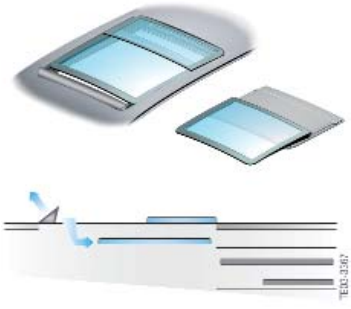
Vent Mode

When the panorama glass sunroof is moved into the tilt position, the floating headliner is moved into the vent position.

The vent position reduces the suction effect at high road speeds.

Wind Deflector

The wind deflector is regulated according to road speed. When the sunroof is opened the wind deflector remains in the down position until road speed is seen by the MDS. Then the wind deflector is placed in the extended position. At roads speeds greater than 140km/h (84mph) it is retracted to an intermediate position. If the road speed drops below 100km/h, the wind deflector is again raised.



Initialization

Initialization must be performed on the panorama glass sunroof anytime the MDS looses positioning of the glass panels or the headliner or if the any component of the sunroof assembly is replaced.

The control button is pressed and held in the position to tilt the sunroof. Initialization begins approximately 15 seconds after pressing the button. The initialization process may take over 2 minutes to perform.

Note:
The control button MUST be held in the tilt position during the entire initialization process. Failure to hold the button will result in the initialization procedure to be cancelled.

During initialization the panorama sunroof will operate as follows:

- Both sunroof panels enter tilt position(Headliners enter Vent Mode)
- Both Headliners open
- Both sunroof panels lower
- The front sunroof panel opens then closes
- Both Headliners close

Anti-Trapping Protection

Both the covers and the floating headliners are fitted with anti-trap protection. If the MDS detects something in the path, the appropriate motor is stopped and activated in the reverse direction.

Service Notes

The motors may be replaced individually. An initialization procedure is required after replacing one or both of the motors

The MDS control unit my be replaced separately. The panorama glass sunroof must be recoded and initialized after MDS replacement.

Workshop Exercise - Panorama Glass Sunroof

The customer has complained of a stained rear sunroof headliner. The sunroof headliner has been received, and now must be replaced. However when the vehicle arrives in the shop, the headliner will not operate.

1. *Check fault memory and list any faults.* _____

   _____

2. *Is there a Test Plan for this situation?* _____
3. *Perform the Test Plan.* _____
4. *Which section of the Test Plan best fits this situation?*

   _____

5. *From where does the headliner motor receive its power?*

   _____

6. *What is the easiest place to check the power supply to the headliner motor?* _____

   Check power for visor motor at MDS. _____

7. *Is B+ available at the headliner motor?* _____
8. *Repair the fault.* _____
9. *List the steps necessary to remove the rear headliner.*

   _____

   _____

   _____

   _____

10. *List the movement of the sunroof and headliner during initialization.*

    _____

    _____

    _____

    _____

    _____

    _____

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E83 Body Electrical

Subject **Page**

Initial Print Date: 10/03 Revision Date: 11/03

Subject **Page**

Body Electrical

Model: E83

Production: Start of Production MY 2004

OBJECTIVES

After completion of this module you will be able to:

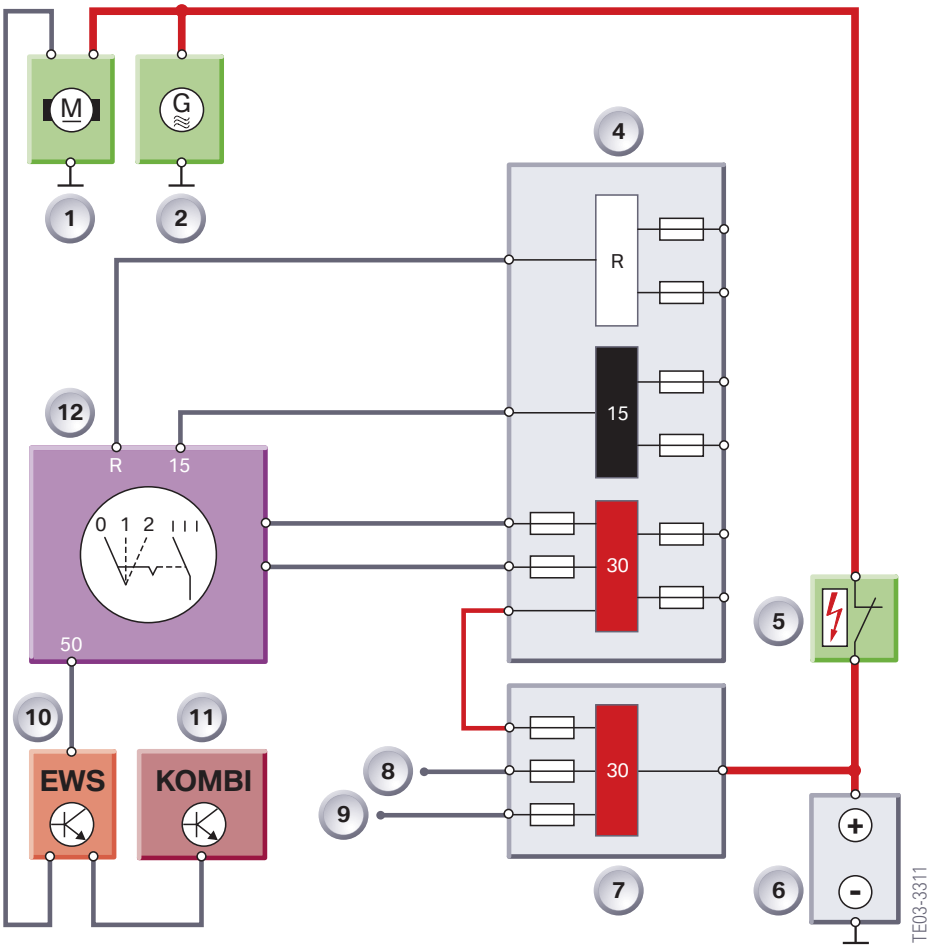
- Identify locations of major electrical components
- Know the differences in the audio systems
- Relate Bus Systems Layout

Voltage Supply and Bus Systems

The E83 electrical system is on the E46 electrical system and E85 system components. The systems have been adapted to the vehicle and their functions improved and extended.

The bus systems K-bus, PT-CAN, LIN bus and the diagnosis bus are used. The instrument cluster is the central gateway module. The luggage compartment houses the vehicle battery and the luggage compartment fuse holder. The luggage compartment fuse holder supplies the glovebox fuse holder.

Voltage Supply Schematic



1. Starter
2. Alternator
3. Not used for U.S.
4. Glovebox fuse holder
5. Safety battery terminal
6. Vehicle battery
7. Luggage compartment fuse holder
8. Valvetronic or common rail
9. Top HiFi amplifier
10. Electronic immobilizer
11. Instrument cluster
12. Ignition/starter switch

Power Supply

Battery
Different vehicle batteries with different capacities are used depending on the engine and equipment specification. The battery is located in the luggage compartment in the spare-wheel recess.

Battery Lead
The E83 has different battery leads depending on the engine variant. The B+battery cable is routed through the interior of the X3, along the floor on the passenger side. The B+ cable is made of aluminum and has a diameter of 80mm^2.

Fuses
The E83 is equipped with two fuse holders. The luggage compartment fuse holder with the fuse of the front fuse holder is located next to the vehicle battery in the spare wheel recess.

E83 Luggage Compartment Fuse Box w/ Top HiFi Fuse.

E83 fuse Panel behind Glove Box

The glovebox fuse holder carries the majority of the fuses. The main fuses for the DME and the ignition/starter switch are located on the rear side of the glovebox fuse holder.

Bus Systems

The Bus system of the E83 is based on the E46 with minor upgrades.

The following Bus Systems are used on the E83:

- K-Bus
- PT-CAN
- Diagnosis Bus
- Sub-Bus Systems (BSD, LIN, M, Data Interface)

K-Bus

The K-bus links the components of the general vehicle electrical system, the information and communications systems and the safety system. The majority of the systems and components has been taken from other models and adapted to the E83.

A new feature is the control system for the new panorama sunroof (MDS) and the safety system (MRS4RD).

The satellite radio (SDARS) has been adapted to the connection to the K-bus.

The data transfer rate is 9.6 kbit.

PT-CAN

The PT-CAN links the components of the control units for the drive and chassis systems.

Newly incorporated is the VG-SG control unit for the transfer case.

The data transfer rate is 500 kbit.

Diagnosis Bus

The diagnosis bus is connected with two leads to the overall bus system. The PIN 7 diagnostic connector lead is directed to the DME and transfers all the emissions-related data from the engine management system and from the automatic gearbox.

The PIN 8 diagnostic connector is connected to the remaining control units either directly or via the instrument cluster as gateway.

The data transfer rate is 9.6 kbit. The rate of transfer of emissions related data KWP2000* (E-OBD and OBD) is 10.4 kbit.

Sub-Bus Systems

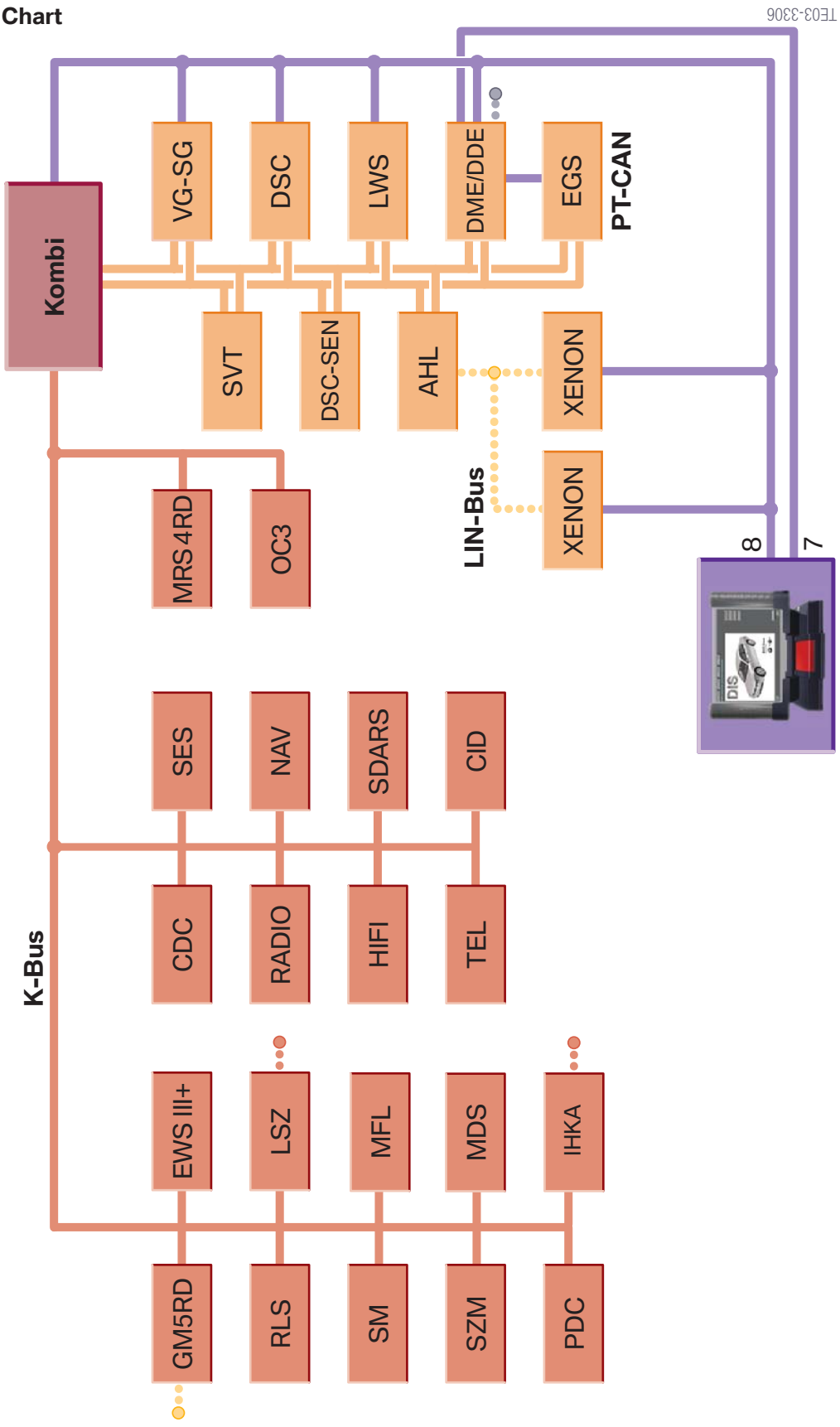
The following sub-buses are used in the E83:

- BSD Bit-serial data interface - connection of electronic engine management and alternator
- LIN Local Interconnected Network - connection of AHL and bi-xenon headlights, connection of GM5 and driver's or door mirror switch block
- M-bus - connection of IHKA/IHKR and stepping motors

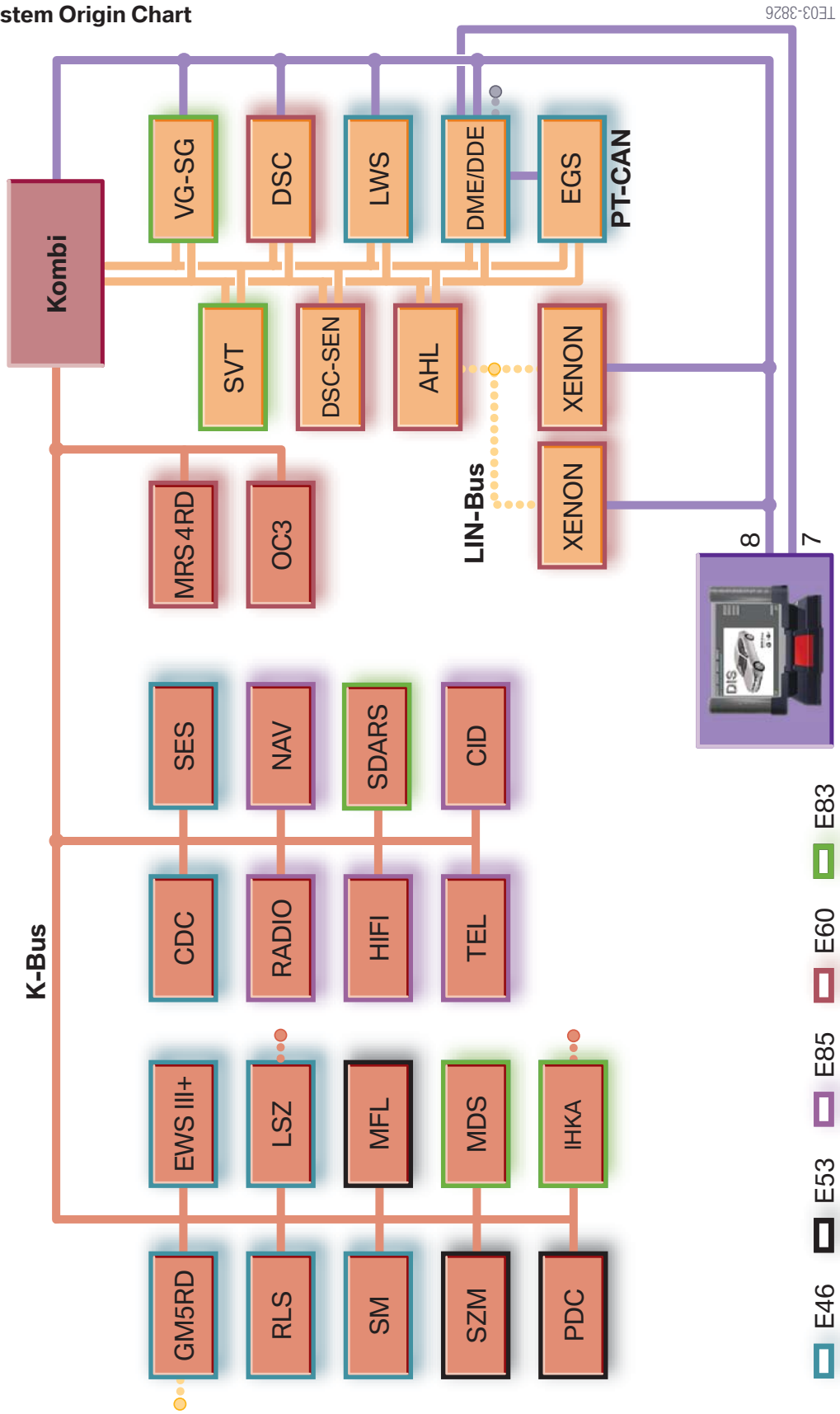
Energy Management

Energy management for the E83 is taken from the E46. The software for regulating the charging voltage is in the DME. In the event of an increased current consumption in the vehicle electrical system, the charging voltage specification can be increased. The charging voltage specification is issued by the DME via the bit-serial data interface to the alternator.

E83 Bus Chart



E83 System Origin Chart



The charging voltage can be regulated as a function of the outside temperature. Thus the battery can be charged to optimum effect. At low temperatures, the charging voltage can be increased to obtain a higher capacity. At high temperatures, the charging voltage is reduced to avoid excessive gassing. The maximum charging voltage is 14.8 V.

A battery change does not have to be communicated to the DME control unit.

Energy management also features the option of load/consumer shutdown. In the event of excessive current consumption in the vehicle, the power output of the heated rear window can be reduced.

Starter Control

EWS III plus is used in the E83. The basic function of starter control and enabling of DME and EGS has remained the same. With EWS III plus the terminal 50 information is forwarded not from the starter motor but rather directly from the EWS control unit to the instrument cluster. A circuit is hardwired from the output of the starter relay in the EWS III plus control unit directly to the instrument cluster. In order to avoid erroneous measurements, no sensor values are stored during the starting process.

General Vehicle Electrical

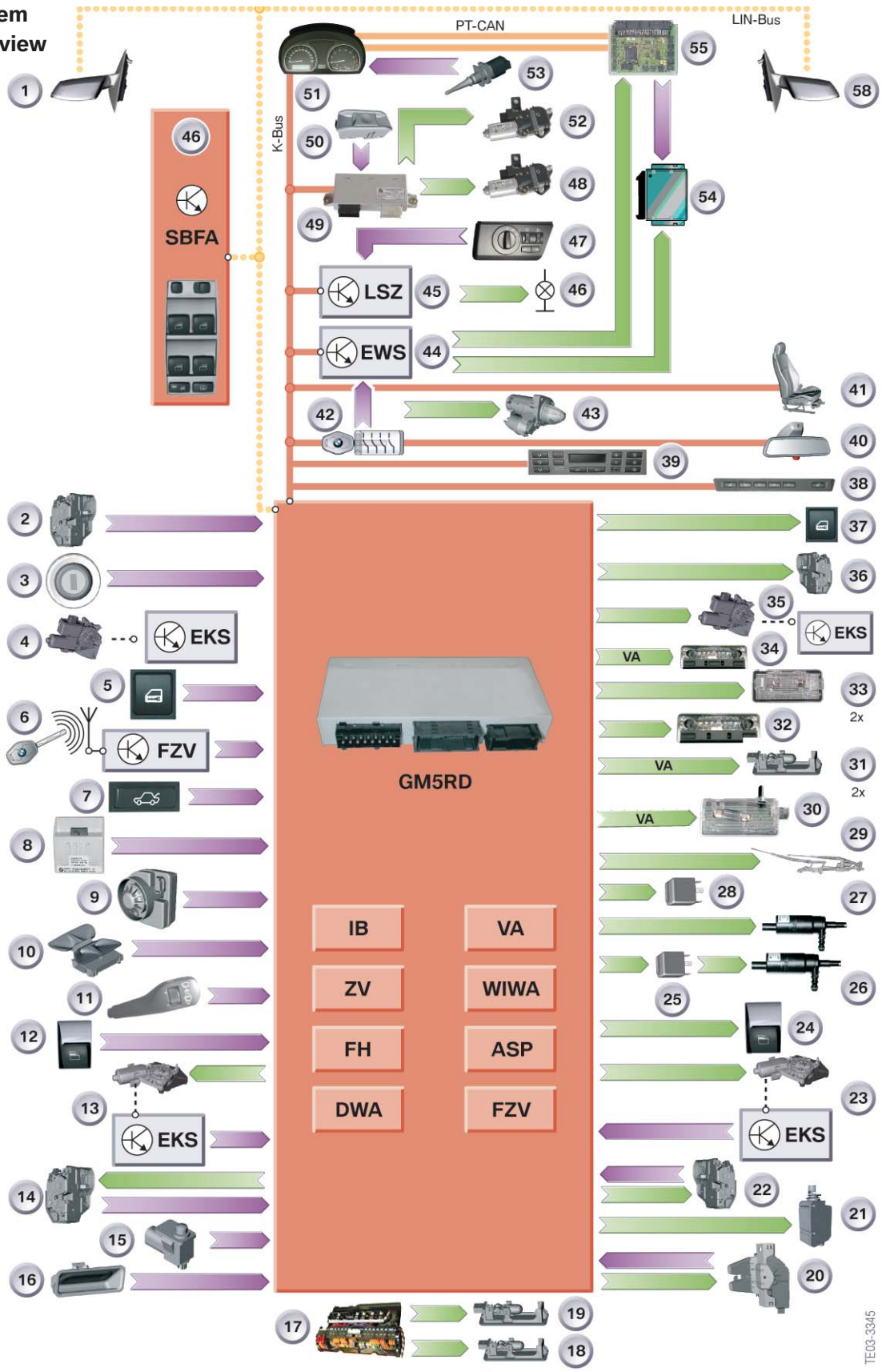
Introduction

The general vehicle electrical system of the E83 is for the most part based on the central body electronics 5 ZKE 5 of the E46.

The functions of the general vehicle electrical system are comparable to those of the general vehicle electrical system on the E46:

- Central locking
- Power windows, different to the E46
- Wipe/wash system
- Anti-theft alarm system
- Interior Lights
- Consumer shutdown
- Remote control operation
- Door mirror control
- Car and Key Memory

System Overview



1 Door mirror, left-hand side	33 Footwell lights
2 Central locking, driver's side	34 Ambient lights
3 Lock cylinder, driver's door	35 Power-window motor passenger side front with antitrap
4 Power window, driver's side with anti-trap protection	36 Central locking, passenger side, front
5 Center-lock button	37 Power-window switch, passenger side, front
6 Central locking system remote control	38 Center console switch center
7 Interior tailgate opening button	39 Integrated automatic heating and air conditioning
8 Tilt sensor	40 Rear-view mirror with rain/light sensor
9 Siren	41 Seat adjustment
10 Ultrasonic interior movement detector	42 Ignition/starter switch
11 Wiper switch	43 Digital motor electronics
12 Power-window switch, driver's side, rear	44 Electronic immobilizer
13 Power-window motor, driver's side rear with anti-trap	45 Light switch cluster
14 Central locking, driver's side,rear	46 Exterior lighting WIWA Wipe/wash system
15 Bonnet contact switch	47 Lights operating unit FH Power windows
16 Exterior tailgate opening button	48 Panorama glass sunroof drivemotor
17 Power distributor, front	49 Panorama glass sunroof control unit
18 Vanity mirror light	50 Panorama glass sunroof switch IB Interior Lights
19 Vanity-mirror light	51 Instrument cluster VA Consumer shutdown
20 Central locking, boot lid	52 Panorama glass sunroof drive motor
21 Fuel filler flap central locking	53 Outside temperature sensor
22 Central locking, passenger side,rear	54 EGS
23 Power-window motor,passenger side rear with antitrap	55 Engine management
24 Power-window switch, passenger side, rear	58 Door mirror, right
25 Headlight cleaning system relay	K-BUS Body bus
26 Headlight cleaning system pump	LIN-Bus Local Interconnected Network bus
27 Washer fluid pump	PT-CAN Powertrain CAN
28 Relay, wipe/wash system	ZV Central locking
29 Wipe/wash system	DWA Anti-theft alarm system
30 Glovebox light	FZV Central locking system remote control
31 Luggage-compartment light	CKM Car and Key Memory
32 Interior/reading lights, front	

The GM5RD communicates with the following components on the LIN bus:

- Door mirror, driver
- Door mirror, passenger side
- Switch block, driver

The stored positions of the door mirrors are lost if the GM5RD is replaced.

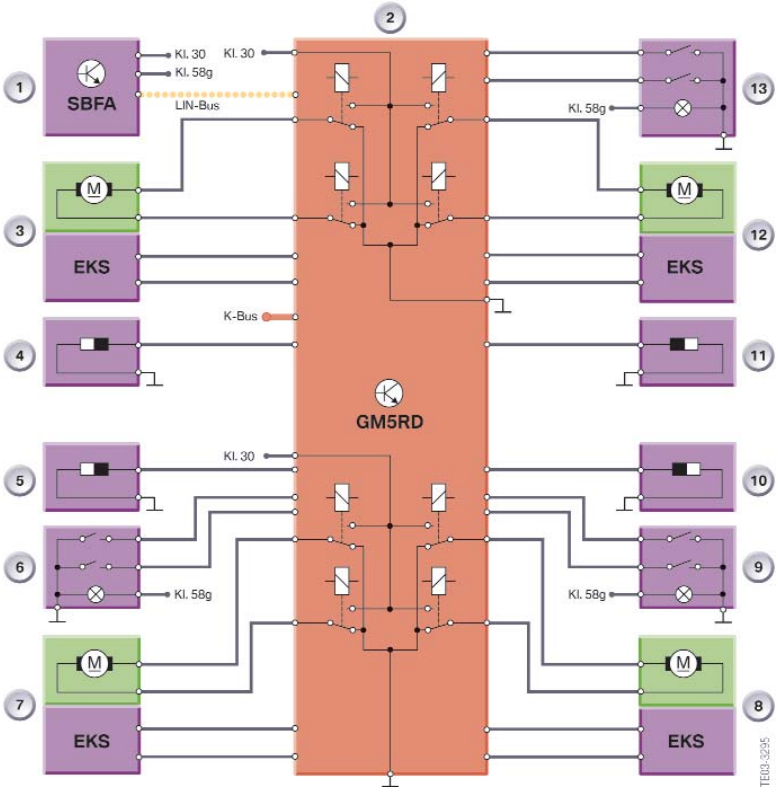
GM5 Redesign

The General Module 5 Redesign (GM5RD) is the heart of the general vehicle electrical system. The GM5RD, which was used on the E85, has been further developed for the E83 with a combined K-/LIN bus module. The K-/LIN bus module is integrated in the GM5RD for operation of the door mirrors.

Power Windows

The power windows of the E83 are controlled by the GM5RD similar to the operation in the E46. The anti-trapping feature has been modified and the anti-trap strip is not used in the E83. Anti-trapping is provided by the EKS electronics included in the individual window motors.

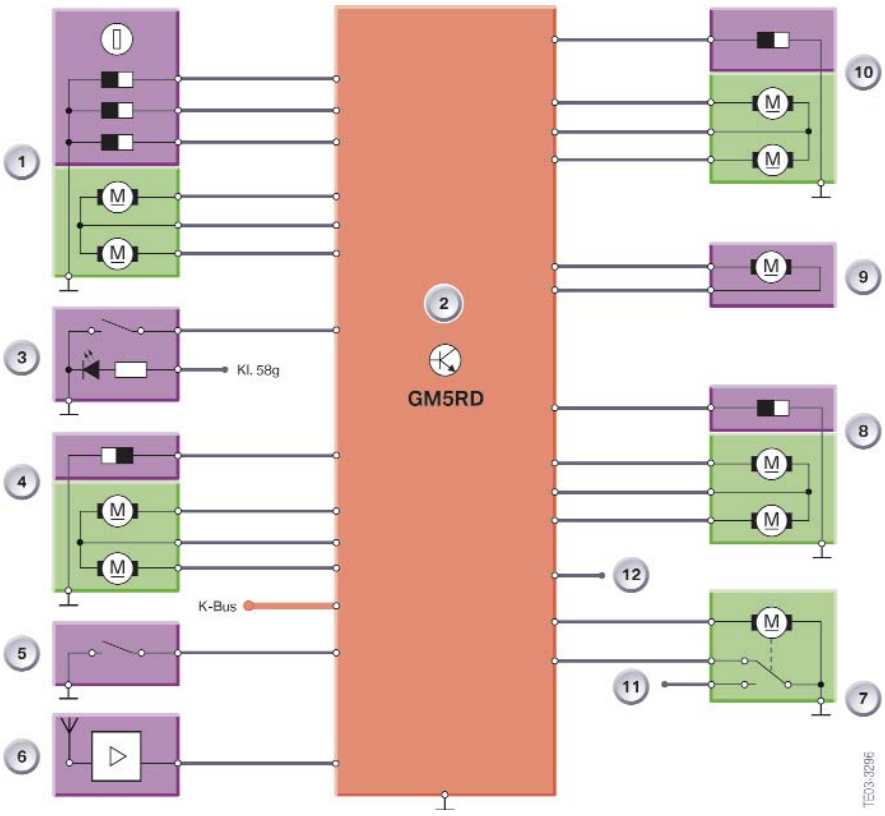
The SBFA (drivers door switch block assembly) is connected to the GM5RD via the LIN Bus. The passenger door switch and both rear door switch assemblies are connected directly via hardwire to the GM5RD.



1. SBFA
2. GM5RD
3. Driver's power window motor
4. Driver's door contact
5. Driver's side rear door contact
6. Driver's side rear window switch
7. Driver's side rear power window motor
8. Passenger rear door power window motor
9. Passenger rear window switch
10. Passenger door rear contact switch
11. Passenger door front contact switch
12. Passenger front power window motor
13. Passenger front window switch

Central Locking

The functions of the Central Locking system is the same as those on the E46. The GM5RD is the master control unit for the central locking system, and all requests are processed through the GM5RD.



1. Central Locking, drivers door w/Hall sensors
2. GM5RD
3. Tailgate Release Button
4. Central Locking, driver's side rear door w/Hall sensor
5. Centerlock Button
6. Remote control antenna
7. Tailgate Lock Assembly
8. Passenger door rear, w/Hall sensor
9. Fuel Filler Flap Locking
10. Passenger door front,, w/Hall sensor
11. Luggage Compartment Light

Wipers

The wiper system has been modified for use in the E83. The GM5RD controls front wiper and washer operation as well as headlight washer operation. The rear wiper and rear washer are controlled by a wiper module with operation requested directly by the wiper switch.

Wiper Relay

The dual relay is located in the E-Box.

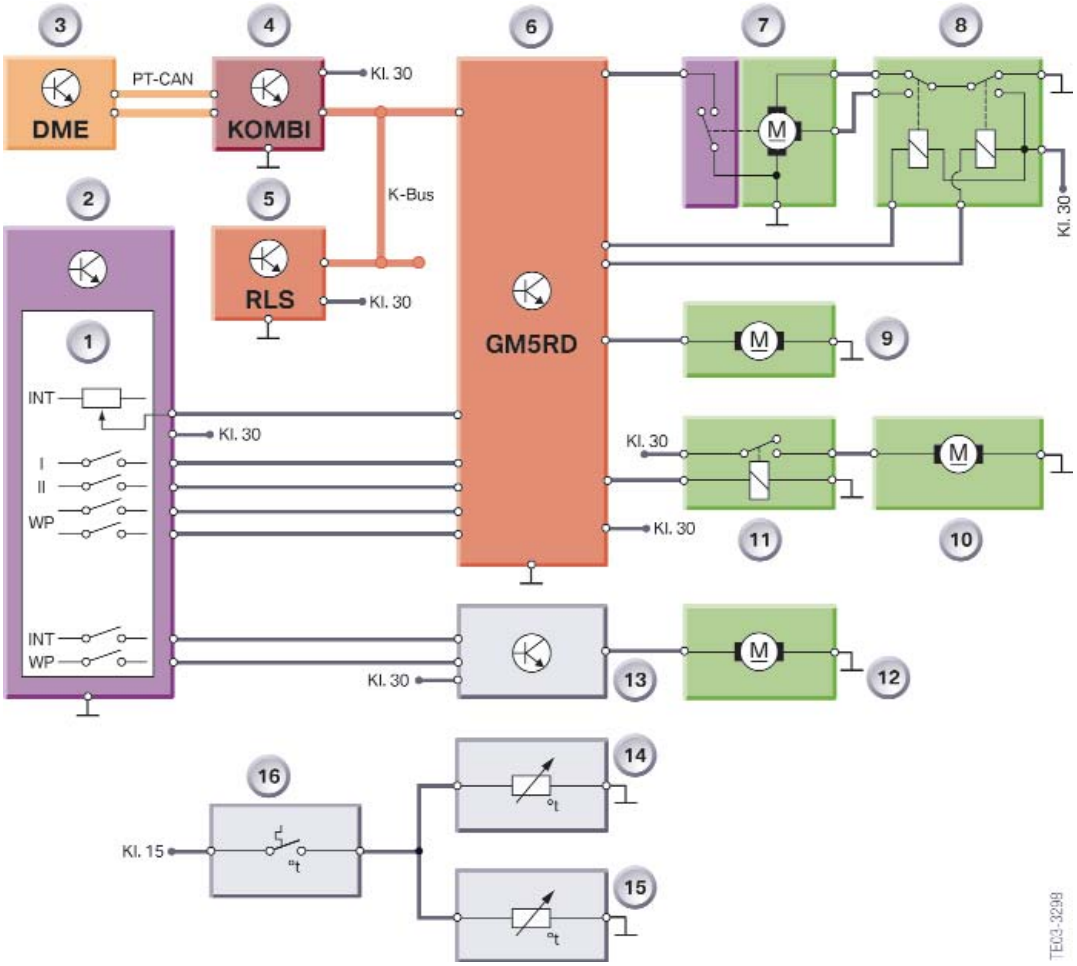
SRA Relay

The SRA (headlight washing system) relay is located in the glove box fuse carrier.

Heated Wiper Nozzles

The heating element of the front washer nozzles are switched by an inline ambient temperature sensor via terminal 15. The current draw of the heating elements is controlled by a PTC resistor as a function of temperature.

Wipe and Wash Circuit Diagram



1. Wiper Switch
2. Wiper Switch Electronics
3. DME
4. Instrument Cluster
5. RLS
6. GM5RD
7. Wiper Motor Reset Contact
8. Dual Mode Relay
9. W/S Washer Pump
10. Headlight Washer Pump
11. SRA Relay
12. Tailgate Washer Pump
13. Tailgate Wiper Electronics
14. Drivers Heated Washer
15. Passenger Heated Washer
16. Ambient Temperature Switch

Headlight Washer System

The headlight washer system is switched on and off using the windshield washer switch.

The GM5RD switches the headlight washer pump on if terminal 58g is active, every fifth time the windshield is washed.

Rear Window Wiper

The rear window wiper is controlled by the rear wiper module. The rear wiper module is the same as used on the E46 sportwagon.

Door Mirrors

There are two door mirror versions fitted to the E83. The low version(standard) door mirrors have the following functions:

- Electric mirror adjustment
- Mirror heating

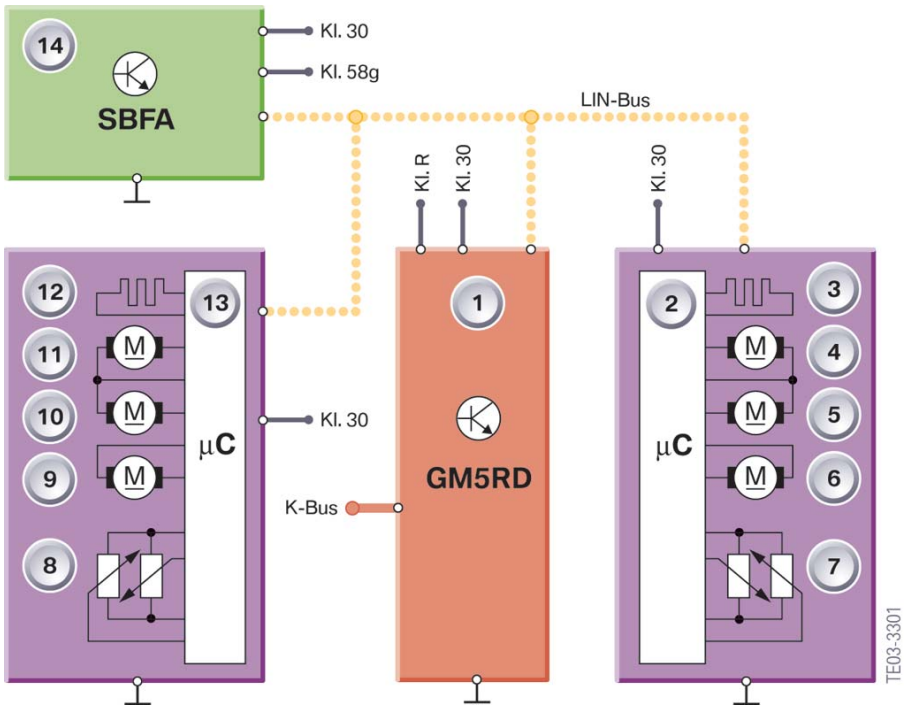
The high version (optional) door mirrors have the following functions:

- Electric mirror adjustment
- Mirror heating
- Mirror folding

All mirror functions for both exterior mirrors are controlled by the GM5RD. The GM5RD makes all decisions concerning mirror movement and passes instructions to the mirror electronics (contained in the mirrors) via the LIN bus.

Potentiometers in the mirror electronics monitor position. Current position is sent to the GM5RD on a cyclical basis, and last mirror position is stored in the GM5RD.

The mirror switch in the SBFA communicates with the GM5RD via the LIN bus.



1. GM5RD
2. Mirror electrics, right
3. Mirror heating, right
4. Mirror vertical motor, right
5. Mirror horizontal motor, right
6. Mirror fold motor, right
7. Mirror Pot, right
8. Mirror Pot, right
9. Mirror Fold motor, left
10. Mirror horizontal motor, left
11. Mirror vertical motor, left
12. Mirror heating, left
13. Mirror electrics, left
14. SBFA

Anti-Theft Alarm System

The DWA anti-theft alarm system is the same as used on the E46. The DWA has been modified for use on the E83. The alarm is not standard, but a dealer installed option.

Park Distance Control

The PDC Park Distance Control has been taken from the E53. The PDC has been modified for use on the E83.

Tire Pressure Control System

The E83 is equipped with the RPA tire defect (RDW) indicator as standard.

Exterior Lighting

The exterior lighting function has been taken from the E46. The control unit is the light switch cluster. The lamps have been modified to the design of the E83. RLS is standard on all E83's. Bi-xenon lights with AHL are optional.

Seats

The seat functions have been taken from the E46. The design has been modified for the E83. The following seat variants are fitted on the E83:

- Mechanical adjustment seats standard on some models
- Electric seat with memory
- Electric sports seat with memory

The memory function can only be used for the driver's seat. Seat heating with lumbar support is also optional.

Center Console Switch Center (SZM)

The SZM is used from the E53. Opening of the tailgate from the SZM is not possible. There are two variants:

- SZM Low with DSC, HDC and PDC
- SZM High with DSC, HDC, PDC and SHZ

The High variant may used as a replacement for the Low version.

Displays and Controls

Displays and Controls includes the following individual sections:

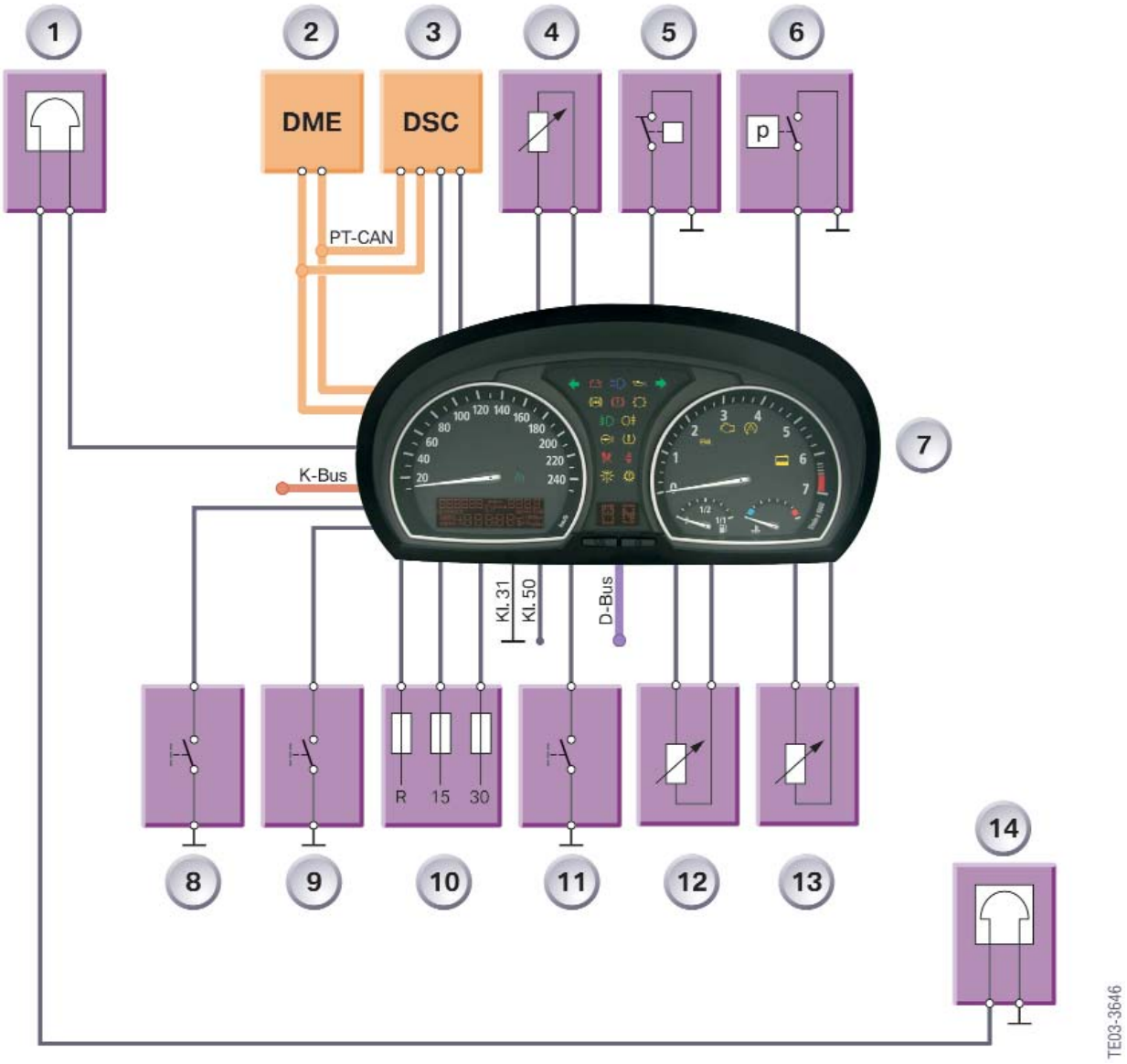
- Instrument cluster
- Central Information Display
- Service Interval Indicator

Instrument Cluster

The instrument cluster in the E83 is similar to that of the E85. The following changes have been made to the E83 cluster:

- The end scale value (maximum speed reading) has been reduced to 250 km/h
- There are no indicator lamps for the EPS or DTC
- A wiper fluid indicator lamp has been added.

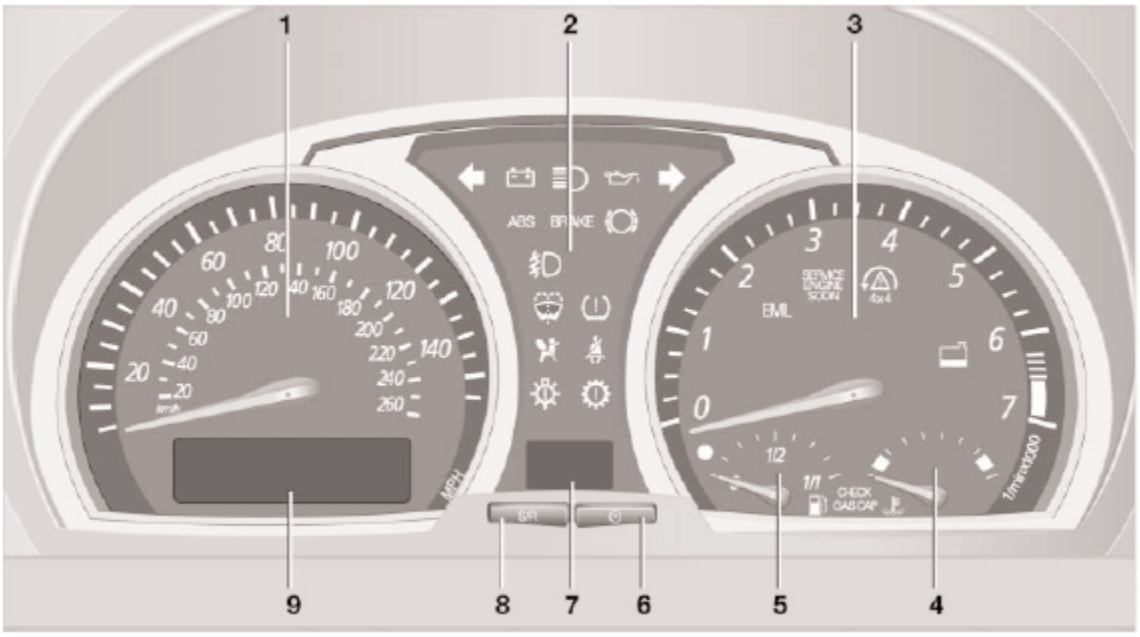
Instrument Cluster Circuit Diagram



1. Brake lining wear sensor, LF
2. DME
3. DSC
4. Outside Temperature Sensor
5. Coolant Level Switch
6. Not used in the USA
7. Instrument Cluster
8. On-Board Computer button in turn signal stalk
9. Reverse Light Switch, Manual Trans only
10. Fuse Box
11. Parking brake switch
12. Fuel level sensor 1
13. Fuel level sensor 2
14. Brake lining wear sensor, RR

Indicator and Warning Lamps

The indicator and warning lamps are activated by the processor in the instrument cluster. Important indicator and warning lamps are activated in the Predrive Check with terminal 15 "ON". The indicator lamps and warning symbols are illuminated by permanently wired-in LEDs (replacement of LEDs not possible).



1. Speedometer
2. Indicator Warning Lamps
3. Tachometer
4. Coolant Temperature Guage
5. Fuel Guage
6. Button for display of Time and Service Interval
7. Display for Selector lever and program display
8. Button for reset of Trip Odometer and Time
9. Display for Time, Service Interval, OBC

Predrive Check

The Predrive Check is a test of important indicator and warning lamps. In the Predrive Check, these indicator and warning lamps are activated for 2 seconds with terminal 15 "ON". All the indicator and warning lamps are deactivated at the end of the Predrive Check.

The following indicator and warning lamps are activated in the Predrive Check:

- Fuel reserve
- Coolant overtemperature
- Fasten seat belt (country-specific)
- Brake-lining wear
- General brake warning light (1 second yellow, 1 second red)
- RDW (1 second yellow, 1 second red)

- Oil pressure/oil level (1 second yellow, 1 second red)
- Gearbox limp-home program
- Washer fluid
- Lamp fault (Check Control)
- Battery charge

LC Display
The LC display is integrated in the speedometer. The LC display indicates the kilometer reading/mileage and time as well as the on-board computer functions. The service interval indicator is also shown in the LC display.

A tampering dot indicates if there are different vehicle identification numbers in the light switch cluster and in the instrument cluster.

The LC display is made up of orange-colored segment characters(similar to a dot matrix). The brightness of the display is determined by the light switch cluster.

The LC display is activated with terminal R "ON".

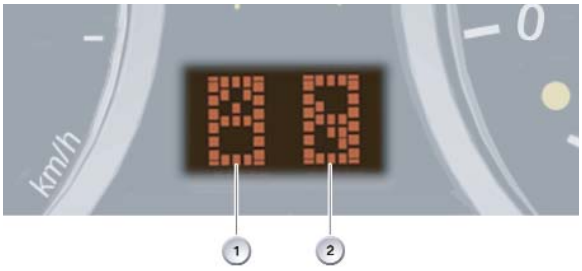
Program and Gear Display
On vehicles fitted with an automatic gearbox, the program and gear display is featured in a separate LC display. The LC display is located between the speedometer and the rev counter. The program and gear display is activated with terminal 15 "ON".

The LC display for the program and gear display is made up of orange colored segments (dot matrix). The brightness of the display is determined by the light switch cluster .

The information between the control units for the automatic gearbox and the instrument cluster is exchanged on the PT-CAN bus. A separate indicator lamp (see warning and indicator lamps) indicates the gearbox limp-home program in the event of a fault in the electronic transmission control.

The program and gear display shows letters and numbers. The program mode is displayed on the left and the drive position on the right.

1. Program Mode 2. Drive Position



Control Buttons

Two control buttons are located between the 2 large needle instruments. The left button (S/R for Set/Reset) is used to reset the trip-odometer reading, to call up the test functions and to call up the reset menu for the service interval indicator.

The right button (clock symbol) is used to set the time and to switch the service interval indicator (remaining distance/service date or vice versa).

1. Set/Reset 2. Clock Symbol

On-Board Computer

The on-board computer functions are indicated in the bottom line of the LC display. The software used in the instrument cluster of the E83 is the same as that used in the E85. All the functions are identical and are described in the vehicle documentation for the E85.

The displays of the on-board computer can be displayed and scrolled through in the instrument cluster using the button in the turn indicator and High beam switch.

Test Functions

The test functions are used by service mechanics to check the coding. The test functions are also tools for fault finding without a diagnostic tester. The test functions are only shown in the LC display of the instrument cluster. The test functions are activated by pressing the left control button in the instrument cluster (S/R, 5 seconds) with terminal R or terminal 15 "ON".

In addition, the test functions can still be called up by pressing the left control button S/R for Set/Reset) in the instrument cluster with simultaneous activation of terminal R.

Locking and Unlocking Test Functions

Only the first two test functions are freely accessible. All test functions after the third test function are locked. Unlocking can only be carried out removed by means of test function 19. In test function 19, the display switches in intervals of 1 second from L_on to L_off (Lock on and Lock off). The test functions are unlocked or locked by pressing the left control button (S/R for Set/Reset).

If the left control button (S/R for Set/Reset) in the instrument cluster is pressed while L_off is displayed, the test functions remain unlocked or are unlocked. The display jumps to test function 0.

If the left control button (S/R for Set/Reset) in the instrument cluster is pressed while L_on is displayed, the test functions remain locked or are locked. The test functions can be locked by means of test function 19.

Diagnosis

There are three possible combinations for replacing the instrument cluster/light switch cluster:

- Instrument cluster faulty, light switch cluster OK
- Light switch cluster faulty, instrument cluster OK
- Light switch cluster and instrument cluster must be replaced

Simultaneous replacement of the light switch cluster and the instrument cluster must be avoided. The odometer reading will be lost. In principle it is also possible to carry out a trial replacement of the instrument cluster/light switch cluster.

CID

The Central Information Display on the E83 is located in the center of the instrument panel immediately above the ventilation grille. The Central Information Display is identical in design to the CID fitted in the E85.

The software used in the Central Information Display in the E83 is the same as that used in the E85. All the functions are identical and are described in the vehicle documentation for the E85.

SIA IV Service Interval Indicator

The BMW maintenance system SIA IV (service interval indicator) is used in the E83. The service interval indicator is a system subject to constant development which in its development stages has been integrated in various model series such as the E85 and E46.

The service interval indicator appears in the LC display in the instrument cluster's speedometer. The indicator is shown for five seconds in the LC display after terminal R "ON".

Resetting Service Interval Indicator

Resetting the service interval indicator for the oil service and inspection can only be performed by pressing the left button in the instrument cluster.

Information and Communication

The BMW X3 is a premium vehicle in the SAV (Sports Activity Vehicle) range. The X3 information and communication systems also offer current technology which meets the highest standards. For example, DVD navigation with color screen, Bluetooth telephone technology (not at SOP) and audio systems with digital sound improvement are all offered in the X3.

Radio and CD Changer

The radios in the E83 are identical to those in the E85 except for the color of the front finisher panel. The controls and functional efficiency also correspond to those of the E85 radio systems.

The E83 does come with a BMW Business Radio w/CD as Standard.

Additionally available is the BMW Central Information Display CID radio w/ navigation.

All radios are new generation radios (NG radios). The radios feature a K-bus connection via which they communicate with other control units. Radios with a cassette deck are no longer available.

A 6-CD changer is also available for the E83. The CD changer audio signals have a level of 2.0 V (increased interference voltage distance). New generation radios detect whether they are communicating with a 0.5 V CD changer (old) or a 2.0 V CD changer (new) and switch over the input accordingly.

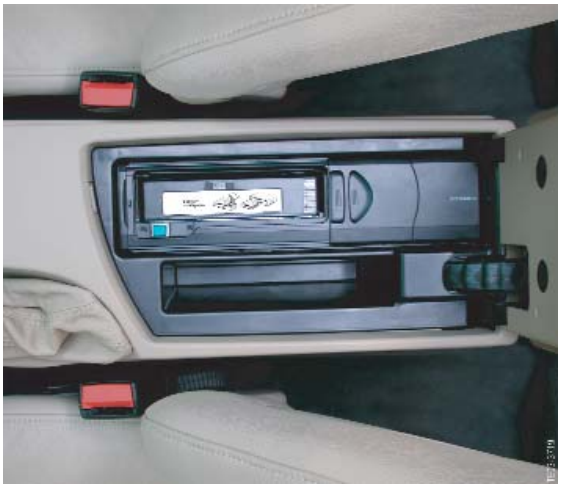
BMW CD Business w/CD

BMW CID Radio w/ Navigation

Model	HiFi Audio System	Top HiFi Audio System	CDC
Business Radio w/CD	Standard	Optional	Optional
CID Radio w/Nav	Standard	Optional	Optional

CD Changer

The CD changer is a standard 6 disc CD changer as fitted on the E46. The CD changer is suitable for the new generation radios (2.0 V audio output).



CDC Location

For the first time in a BMW model, the CD changer is located in a user friendly position between the driver's seat and front passenger's seat in the front armrest (forced connection with option 473). The snap-in adapter for the mobile phone is housed in a flap above the CD changer.

Aerial System

The E83 has up to 6 aerial systems depending on the options installed, not including the aerial for the remote control services (FBD).

The E83 features the following aerial systems:

- FM 1 - 3 window aerials in the rear window
- FM aerial 4 in the rear spoiler
- AM aerial in the rear spoiler
- Telephone aerial (roof-mounted aerial)
- GPS aerial for the navigation system (roof-mounted aerial)
- SDARS aerial for the digital radio in the USA (roof-mounted aerial)

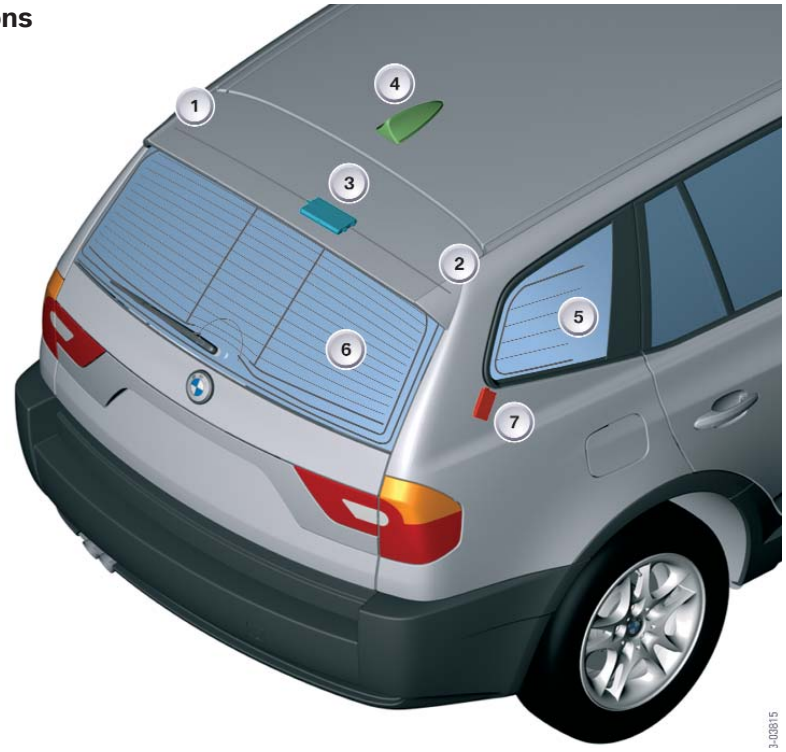
AM and FM Aerials

The aerial structures for the FM aerials 1 - 3 are integrated in the rear window. The rear window is made of toughened safety glass (ESG) and is approximately 3.1 mm thick.

The AM aerial is in the rear spoiler. To avoid disturbances in AM reception through the third brake light in the rear spoiler, there is a suppressor filter in the feed line to the third brake light.

The power supply to the AM and FM aerial amplifier comes from the radio via terminal Rad_on.

Aerial Systems Installation Locations



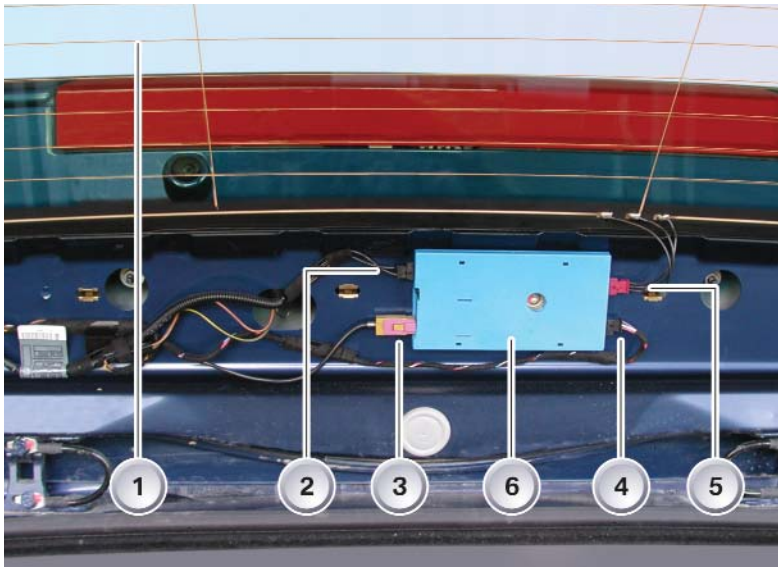
1. AM Aerial
2. FM Aerial 4
3. Amplifier with Diversity Module
4. Roof-mounted Shark Fin, with aerial for Telephone, Nav and SDARS
5. Not used in USA
6. Heated rear window with FM 1-3
7. Not used in USA

Aerial Amplifier

The aerial amplifier for AM, FM and (FBD) as well as the aerial diversity module are built into a housing. The module is fitted on the inside of the tailgate.

FM Aerial Diversity

The tuner is connected to the aerial diversity module via an aerial connector (Fakra) and a coaxial cable. The antenna diversity switches to the next aerial as soon as the signal quality of the active FM aerial exceeds a defined threshold value. No interruption can be heard when the diversity module switches over. Evaluation of the signal quality and the switch over only occur in the aerial diversity module.



1. Heated rear window heating wires with built in FM Aerials
2. Input: Term 30, Radio On, FBD Output
3. Input/Output: Coaxial Cable
4. Input: FM 4 Aerial, FBD input, AM
5. Input: FM Aerial 1-3
6. Aerial Amplifier with Diversity

Service Mode

BMW Business CD

The following procedure applies to BMW CD radio and Business CD:

- Switch on the radio
- Press the "m" button within 8 seconds and hold for at least 8 seconds
- The functions listed in the following table are now possible via the service menu
- Switch off the radio to exit service mode

CID Radio

The following procedure applies to BMW CID Radio:

- Switch on the radio
- Press the "SEL" button within 8 seconds and hold for at least 8 seconds
- Switch off the radio to exit service mode

Car and Key Memory

The following functions are stored in car and key memory:

- Sound settings
- Audio source
- The last station accessed is stored

Audio Systems

The various audio systems of the E83 are described in this technical documentation. The radio systems originate from the E85. The loudspeaker systems are new developments and are adapted to the acoustic and technical dimension requirements of the E83.

The following audio systems are available for the E83:

- HiFi audio system (Standard)
- Top HiFi audio system

The BMW audio standards which have been applied since the E85 are also being applied to the E83. They apply to the HiFi and Top HiFi systems with regard to symmetry of the sound field, sound pressure and linearity of the frequency response.

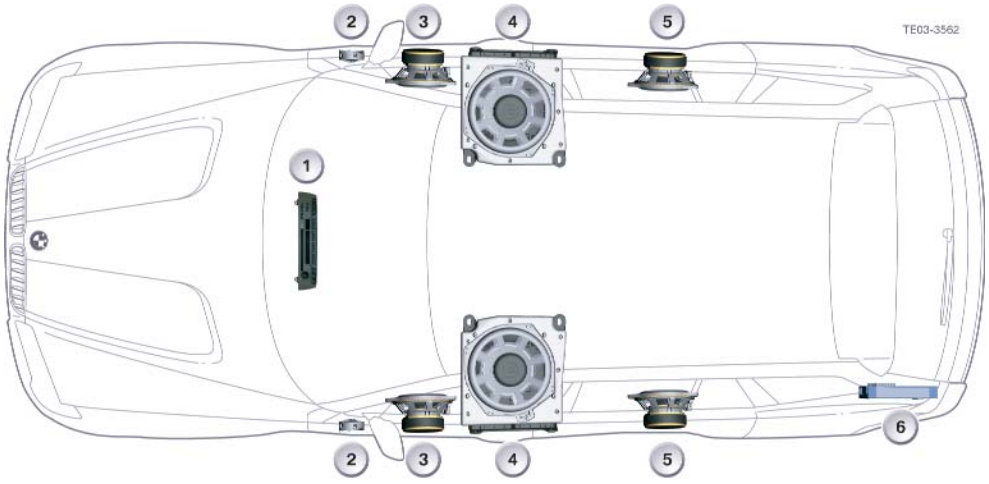
New Features

New features by comparison with the E85:

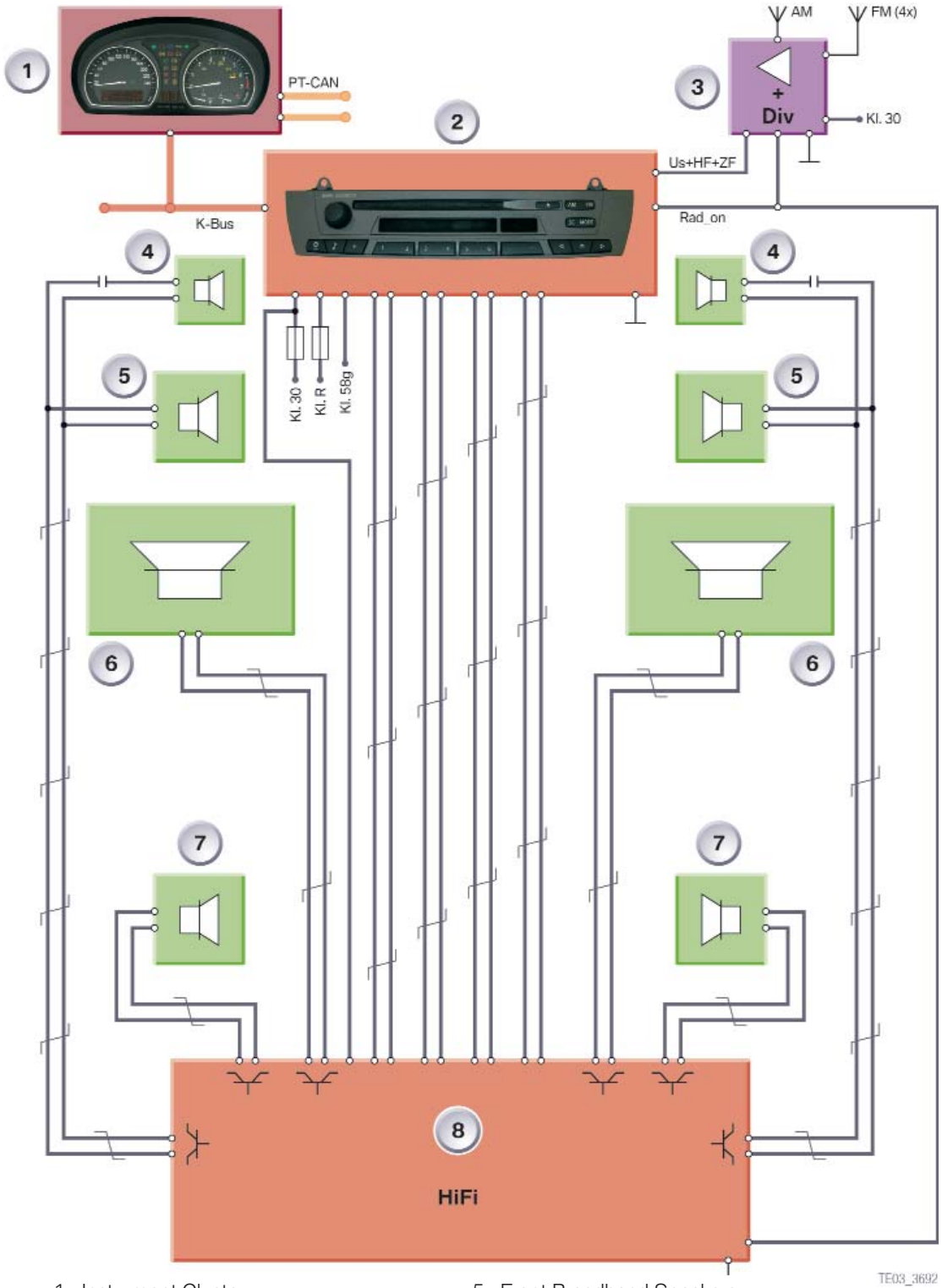
- Central woofers for the HiFi and Top HiFi audio systems are fitted. The central bass principle applies to the systems in the E65/E60.
- The HiFi amplifier in the E83 luggage compartment is a modified version of the HiFi amplifier from the E85/E46. A 6 channel amplifier is adapted from the 10 channel hifi amplifier via internal switch changes.
- A fuse is added to the Carver Top HiFi amplifier from the E85 but is otherwise installed in the E83 without further modifications.

HiFi System

1. Business Radio
2. Front Tweeters
3. Front Broadband Speakers
4. Central Woofers
5. Rear Broadband Speakers
6. HiFi Amplifier



HiFi Schematic



1. Instrument Cluster
2. Business CD Radio
3. Aerials for AM/FM and diversity module
4. Front Tweeters
5. Front Broadband Speakers
6. Central Woofers
7. Rear Broadband Speakers
8. HiFi Amplifier, 6 channel

The HiFi audio system features a 6 channel analogue amplifier that is connected directly to the 4 speaker outputs of the radio. The loudspeakers are connected to the 6 HiFi amplifier out channels. The tweeters are protected from overload by capacitors in the supply lead and connected in parallel to the broadband speakers.

All sound controlling functions such as volume, bass, treble, fader, and GAL are performed in the radio.

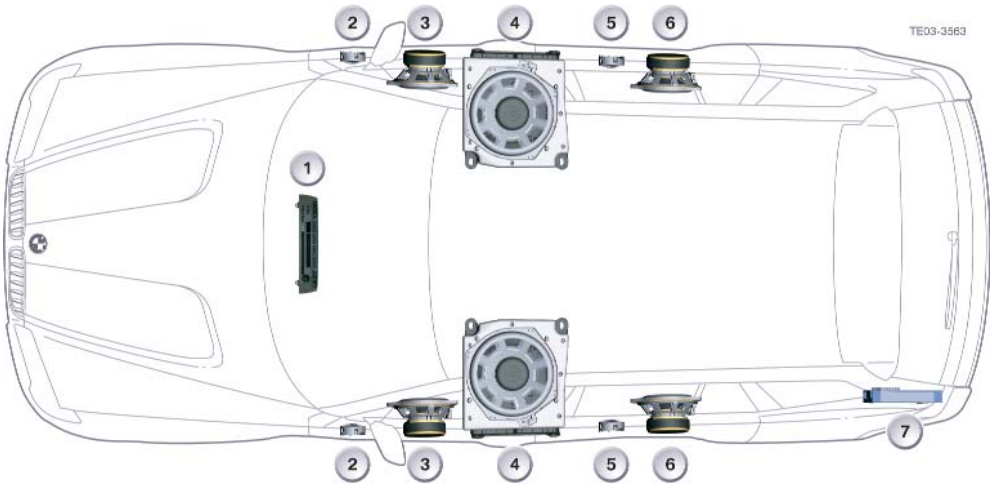
HiFi Amplifier

The 6 channel HiFi amplifier in the luggage compartment of the E83 is a modified version of the 10 channel HiFi amplifier from the E85/E46. Four channels are for the door loudspeakers (broad-band loudspeaker or broad-band speaker with additional tweeter) and 2 channels are for the central woofers.

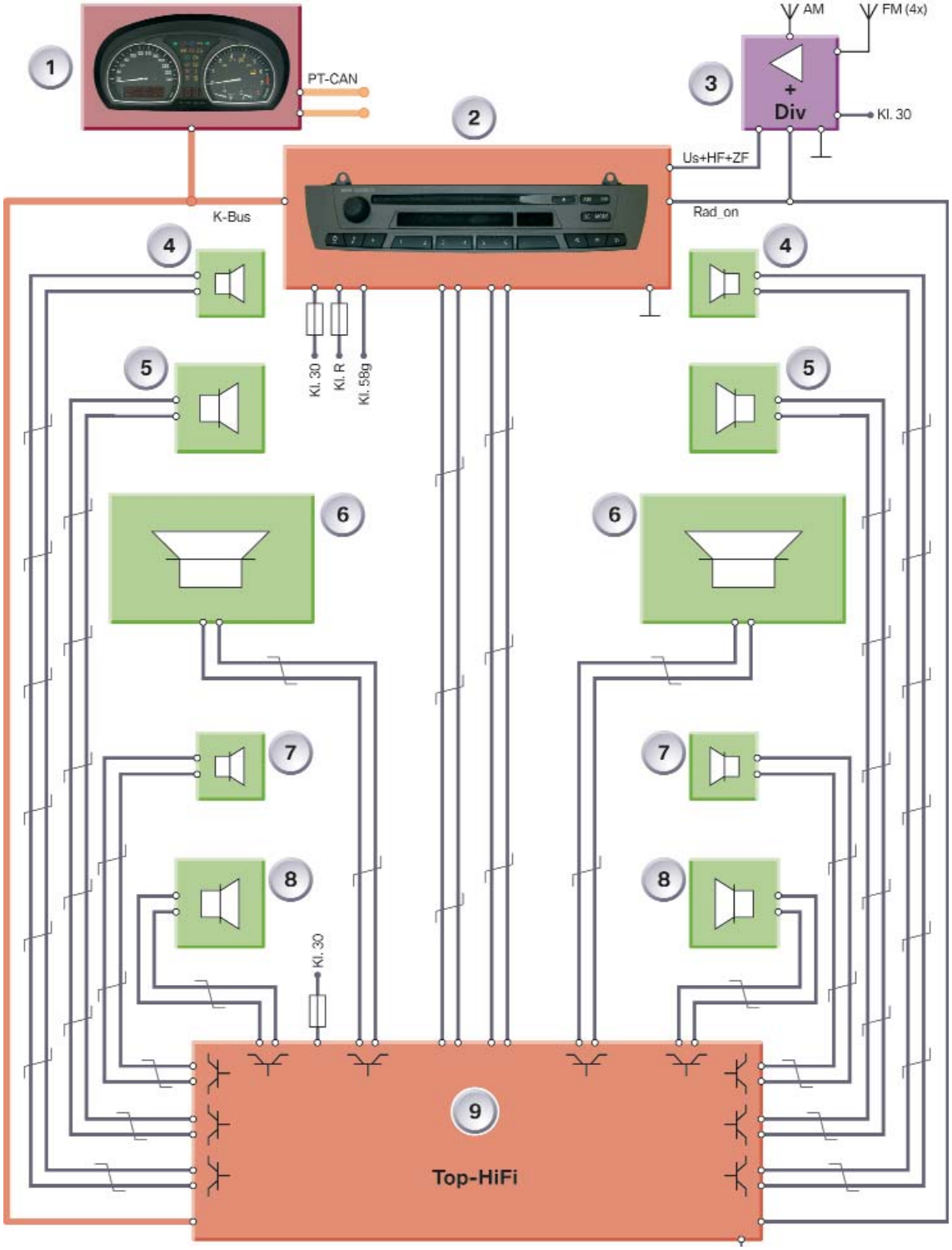
The housing is constructed in the same way as the 10 channel HiFi amplifier in the E85/E46. The HiFi amplifier has on output of 4 x 25 watts for the mid-range and high-ranges and 2 x 40 watts for the low frequency.

Top HiFi System

1. Business Radio
2. Front Tweeters
3. Front Broadband Speakers
4. Central Woofers
5. Rear Tweeters
6. Rear Broadband Speakers
7. Carver Top HiFi Amplifier



Top HiFi Schematic



1. Instrument Cluster
2. BMW Business CD Radio
3. Aerials AM/FM and diversity module
4. Front Tweeters
5. Front Broadband speakers
6. Central Woofers
7. Rear Tweeters
8. Rear Broadband Speakers
9. Carver Top HiFi Amplifier

Top HiFi Audio System

The Top HiFi audio system features a 10 channel amplifier with digital signal processor technology for sound control. The Top HiFi amplifier is controlled via the two radio analogue audio signals.

The Top HiFi amplifier features a digital input for the CD changer. The digital input is only used for the BMW Business CD radio and CD changer combination. The 10 loudspeakers are directly connected to the 10 output channels of the Top HiFi amplifier. The active frequency gates for adaptation of the loudspeakers are built into the amplifier.

Depending on the radio, various functions can be called up. Sound control functions such as volume, bass, treble, fader, GAL, spatial sound simulation etc. are formed in the Top HiFi amplifier. The 7 band graphic equalizer can only be used in connection with the CID radio.

Top HiFi Amplifier

A fuse is added to the familiar Carver Top HiFi amplifier from the E85 but is otherwise installed in the E83 without further modifications.

However, special Carver woofers with increased cone excursion are used in the E83 that are used in the the E85. The space available in the E83 and the resonance volume in the side sill enables the use of the central bass principle.

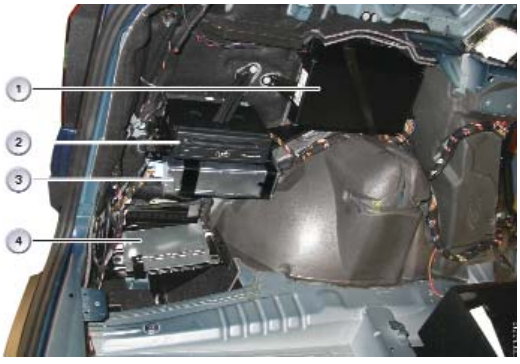
1. 46-pin connector
2. Digital input for CDC
3. Fuse

The central woofers in the Top HiFi audio system are simply adapted to the increased voltage level of the bass end levels (8 . impedance). The amplifier delivers 6 x 20 watts,
2 x 40 watts and 2 x 100 watts.

SPDIF

The digital connection between the Top HiFi amplifier and the CD changer is an SPDIF connection. SPDIF stands for Sony Philips Digital Interface and is a data transfer standard for digital audio data. The data can be transferred optically via fibre-optic cables or via coaxial cables depending on the unit.

Advantage: the digital data is read by the CD and transferred between the units with the highest possible quality, as no digital/analogue conversion is necessary. The Top HiFi amplifier also no longer has to carry out analogue/digital conversion. The digital data can therefore be processed directly from the DSP (Digital Sound Processor).



1. Top HiFi Amplifier (HiFi Amplifier also)
2. Navigation
3. Not used in USA
4. SDARS

Telephone System

The Everest platform for the telephone and telematics functions are used in the US version of the E83. For the American market, three different versions are offered:

- TCU only with telematics function emergency call (E-Call) and breakdown call (B-Call). (Optional w/Premium Package
- TCU with telematic function emergency call and enabling by provider.
- TCU with telematics and telephone functions via hands-free unit or mobile phone (after retrofitting a telephone).

Telematic Control Unit TCU

The Telematic Control Unit TCU is optional equipment in US vehicles. This means that an emergency call can always be made(if the car is equipped with the TCU), also if the customer has not (yet) retrofitted a telephone.

The range of functions of the US version is as follows:

- TCU is always fitted in order to ensure the emergency call can be made even if no telephone is present
- Dual-band 800 MHz and 1900 MHz
- Combined transmit/receive module NAD (Network Access Device) for analog AMPS (American Mobile Phone Standard) for telephone calls and digital CDMA (Code Division Multiplex Algorithm) for telematics functions
- Eject box with charging unit for Motorola Phoenix V60
- Telematics functions (E/B call)
- GPS receiver for localization

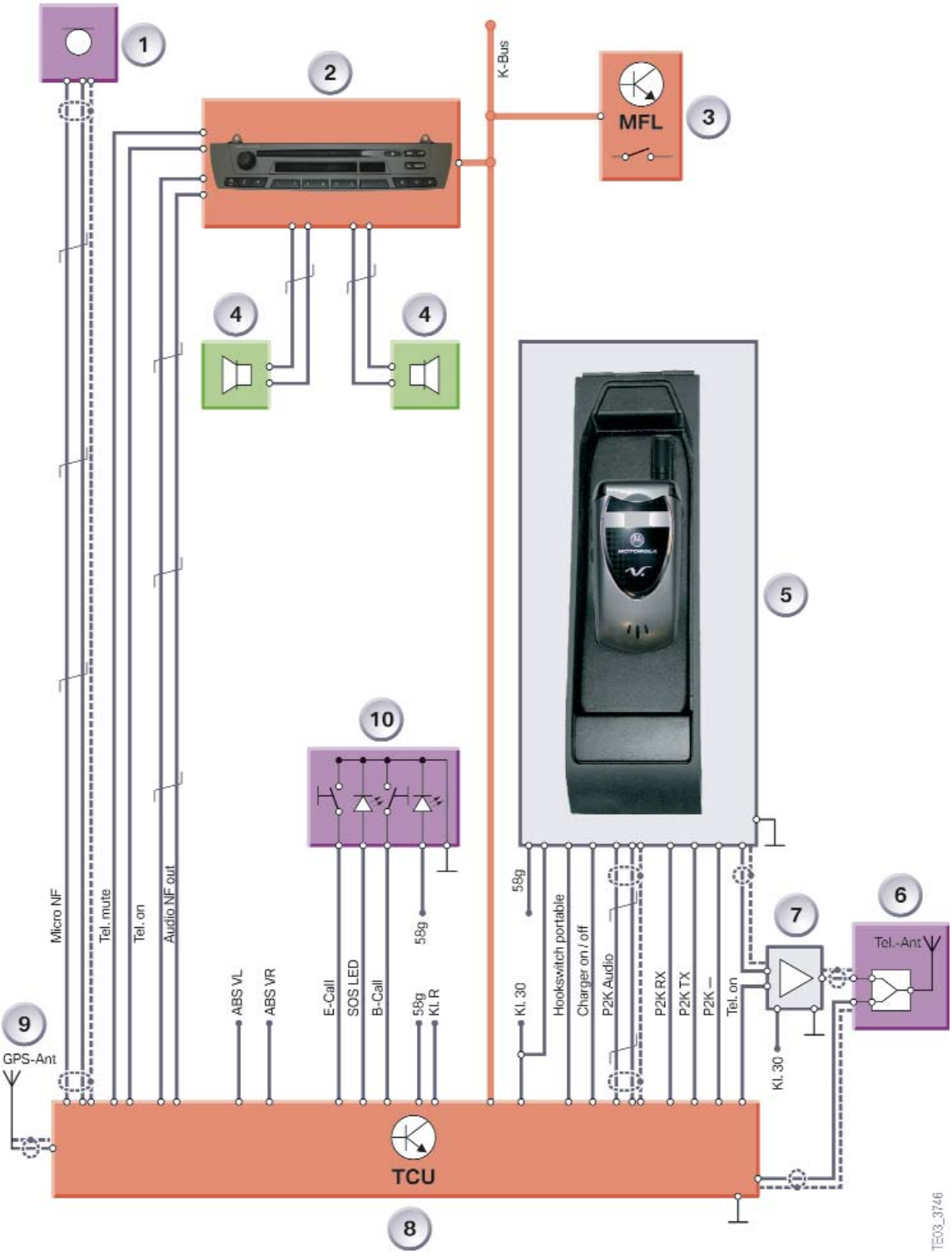
Principle of Operation

In the US version, the Telematic Control Unit has an NAD (Network Access Device) that works in the AMPS/CDMA standard with the frequencies 800/1900 MHz. The TCU features a hands-free system with full-duplex transmission. This makes it possible to speak and listen simultaneously. The position of the vehicle is determined by the TCU by means of a built-in GPS receiver. In the event of a crash, the TCU sends an SMS with this location data to the provider. Furthermore, the TCU has an interface for the connection of an emergency call button (E/B Call). The emergency call button is a dual function switch with two keys: one for the emergency call and one for the breakdown call. The emergency call button is standard equipment.

Telephone Overview

1. MFL w/ Telephone Button
2. CID
3. Speaker
4. Motorola Mobile Phone
5. Compensator
6. Phone Aerial
7. GPS Aerial
8. Hands-free Microphone
9. Emergency Call and Assistance Buttons
10. CID control panel (Radio)
11. TCU

Telephone Circuit Diagram



1. Hands-free Microphone
2. BMW Business CD Radio
3. MFL w/Telephone Button
4. Speaker
5. Eject Box w/Mobile Phone
6. Phone Aerial
7. Compensator
8. TCU
9. GPS Aerial
10. Call Buttons

Compensator

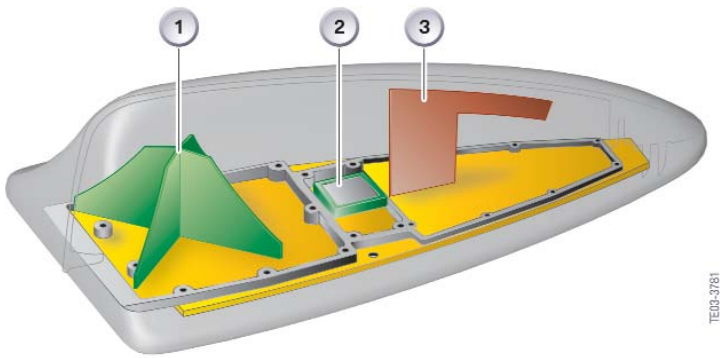
The compensator is connected in the aerial cable between the telephone and the roof aerial. It balances out the losses of the aerial cable. The compensator is fitted in the luggage compartment on the separating wall to the left of the TCU.

GPS Aerial

The GPS aerial permanently receives data regarding the current latitude and longitude from the satellites of the Global Positioning System, GPS. This data is transferred to the GPS receiver in the TCU, which uses it to determine each position of the vehicle. The GPS aerial is integrated in the roof aerial.

Telephone Aerial

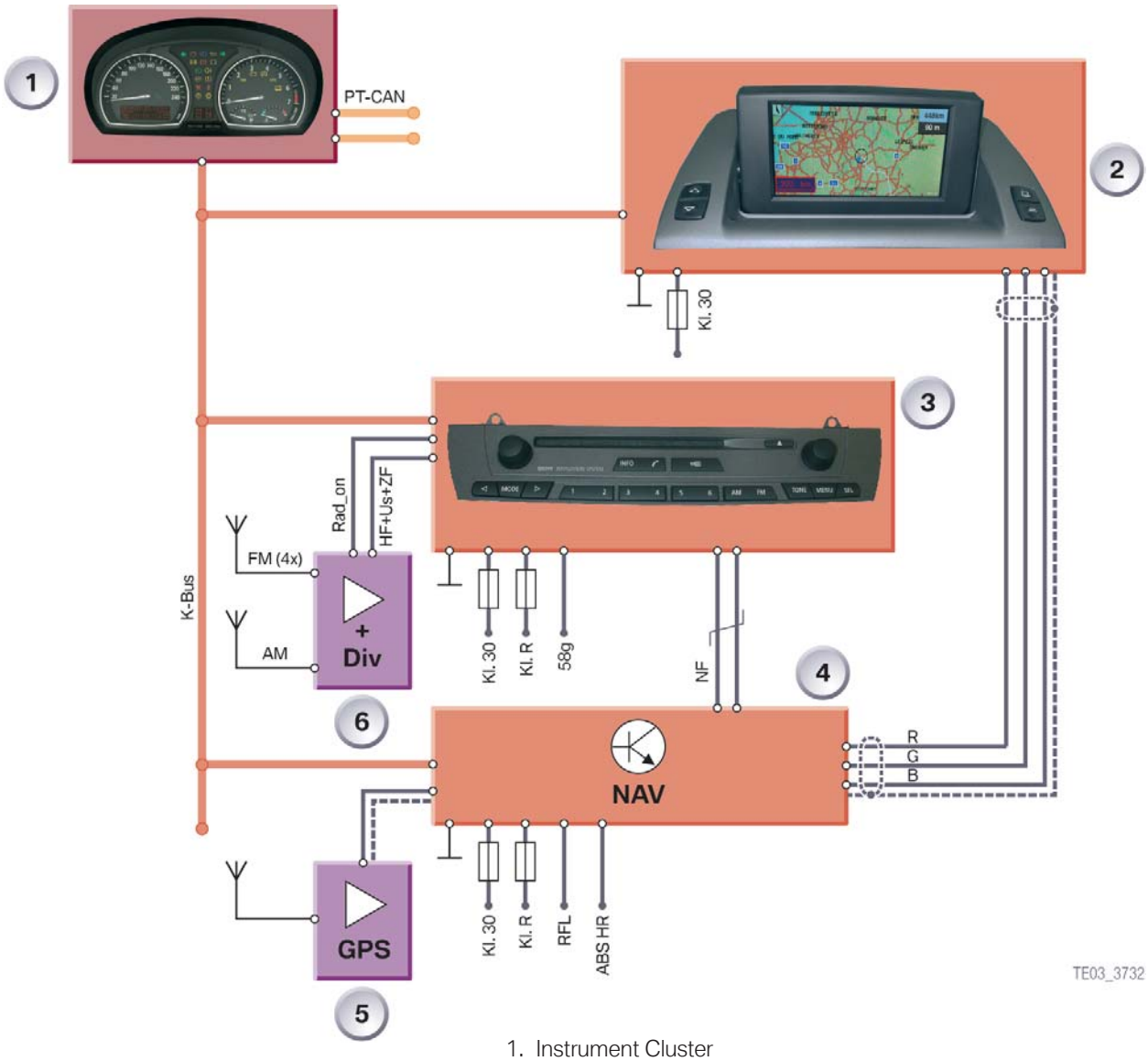
The telephone aerial is part of the shark fin antenna.



1. SDARS
2. GPS
3. Telephone

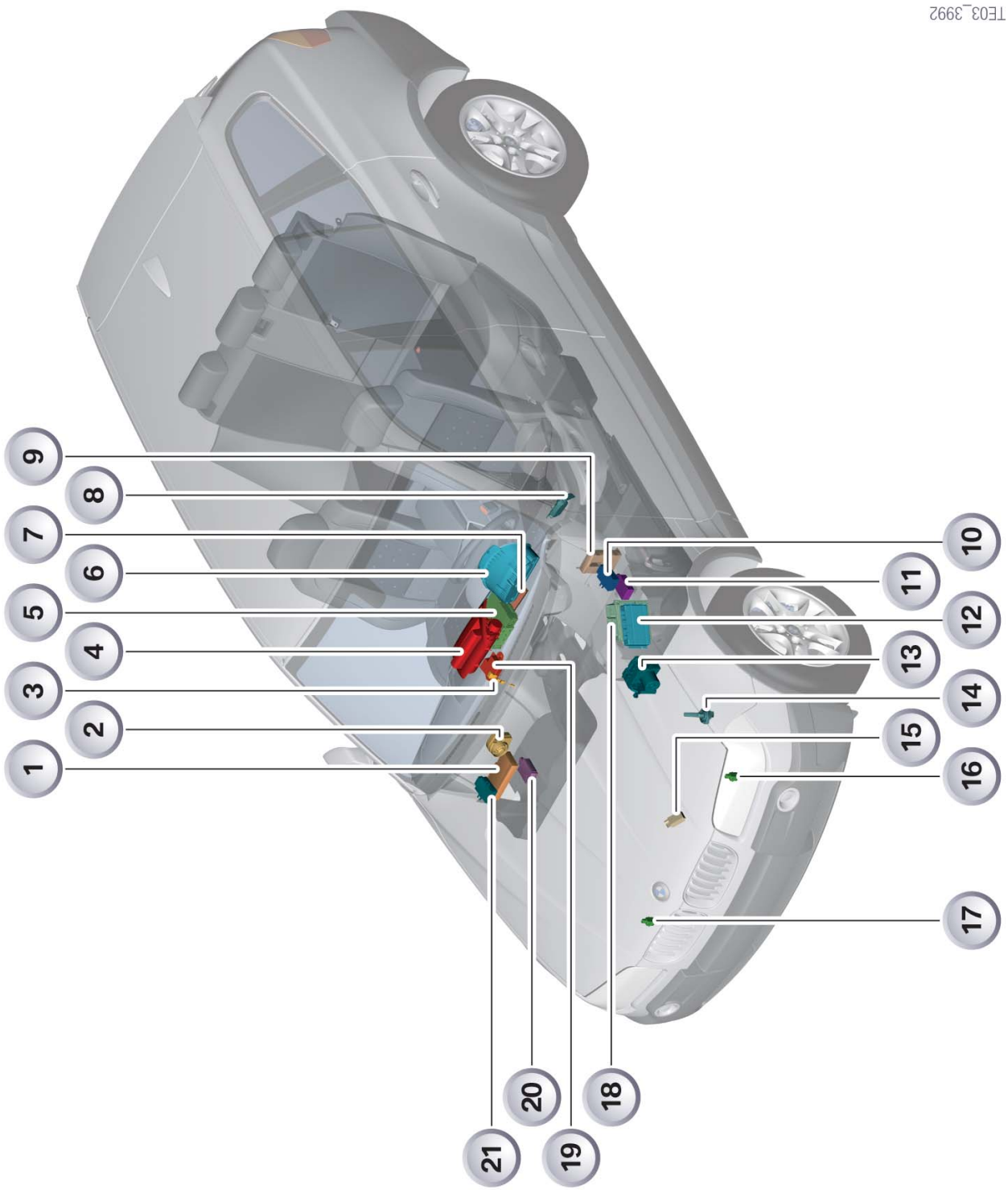
Navigation

One navigation system is available optionally in the E83. The Professional Navigation with CID and Business Radio with CD(MK-3 Nav with widescreen monitor), is the only system available.



1. Instrument Cluster
2. CID
3. CID Control Panel (Radio)
4. DVD Navigation Computer
5. GPS Aerial
6. AM/FM Aerials with amplifier and diversity

Workshop Exercise - E83 Component Location



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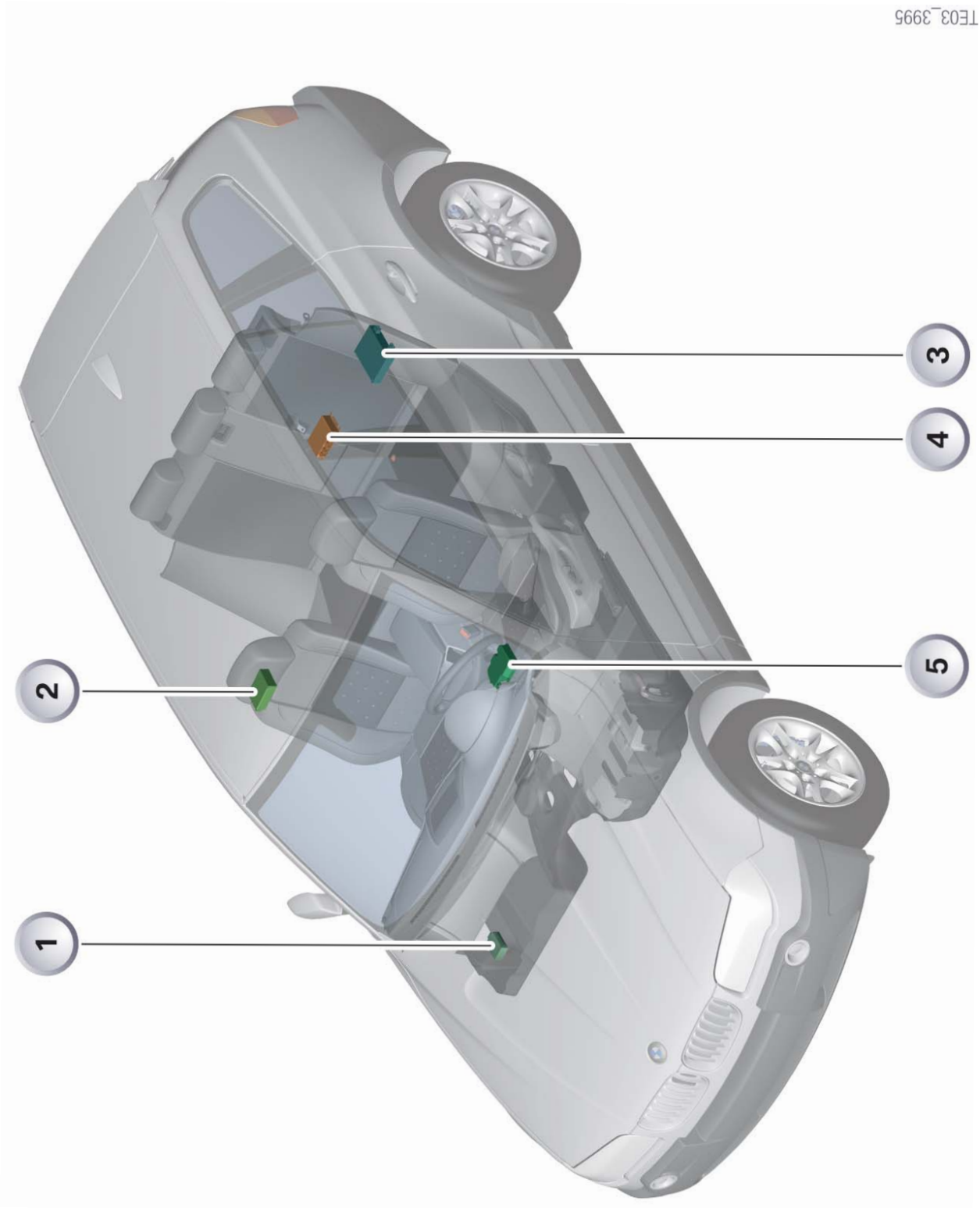
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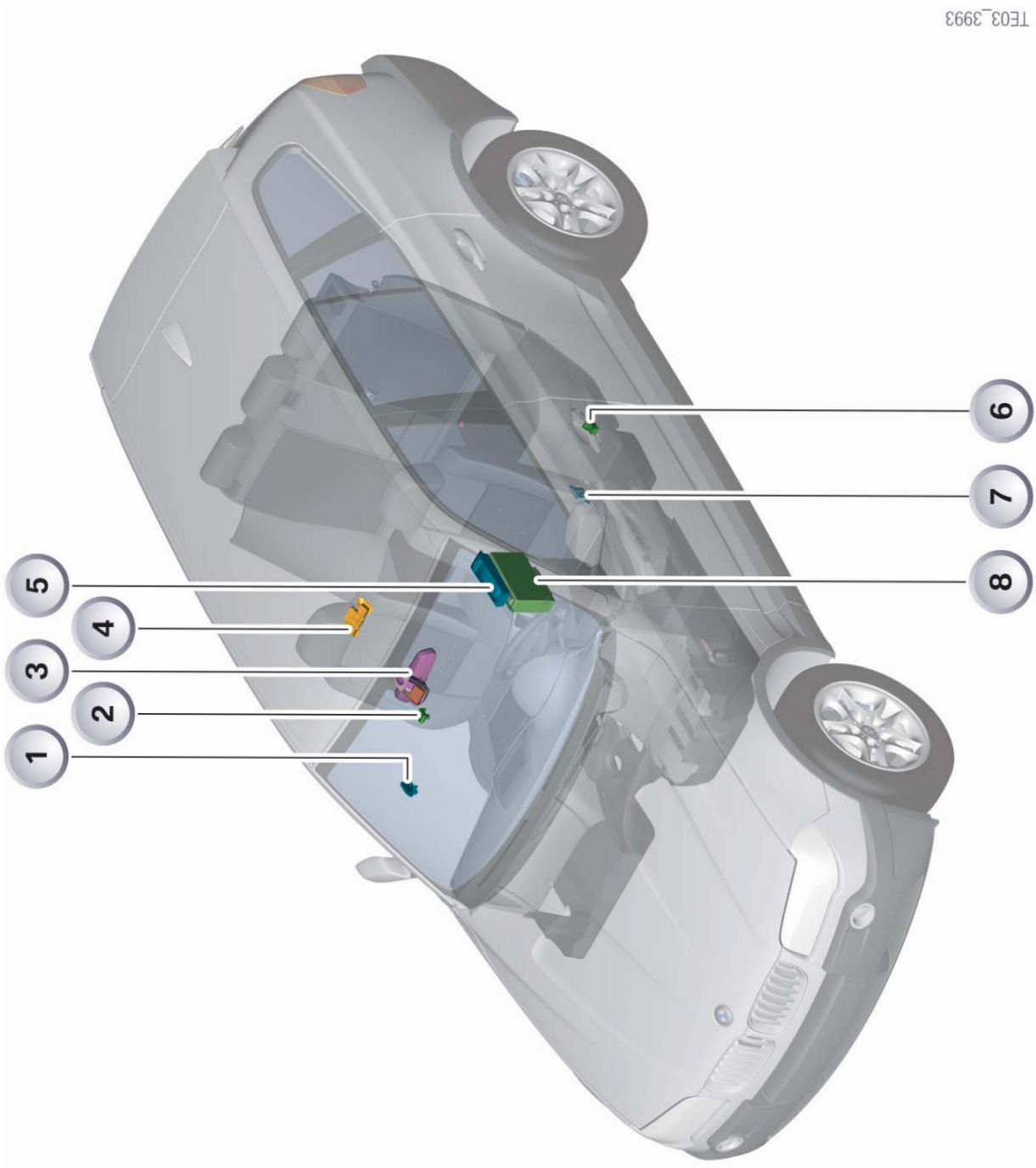
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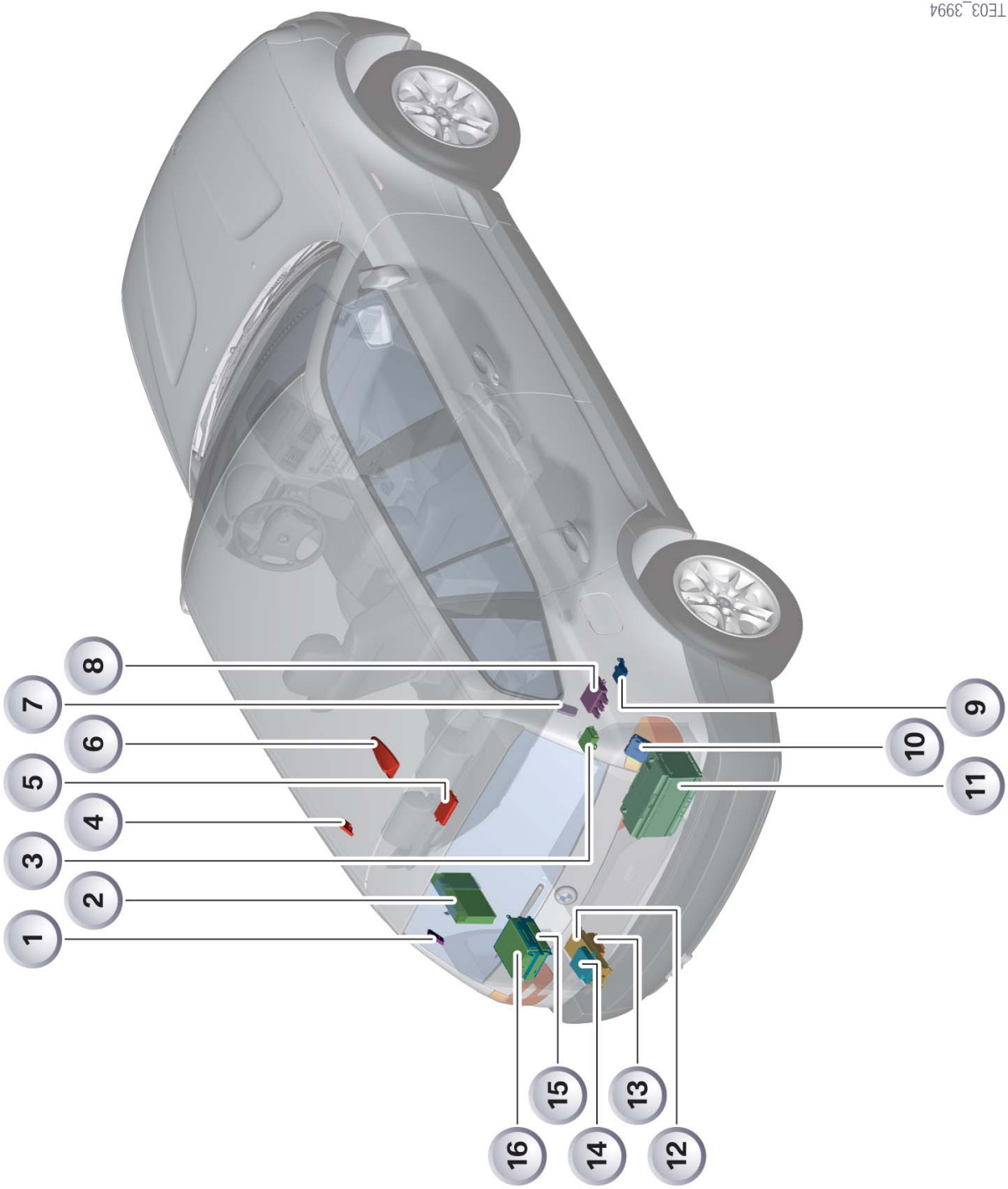
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Item	Component Name	Acronym	Location
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AHL	Active Headlight Control Unit
	Antenna Amplifier and Diversity
AUC	Auto Recirc Air Control Sensor
	Battery
	Bluetooth Antenna
CDC	Compact Disc Changer
CID	Central Information Display
DME	Digital Motor Electronics
	Door Pressure Sensor Right
	Door Pressure Sensor Left
DSC	Dynamic Stability Control
DVD	Navigation Computer
DXC	Dynamic X Drive Control
EGS	Electronic Transmission Control
	Eject Box
EWS	Electronic Vehicle Immobilization
GM5RD	General Module
GPS	GPS Antenna, also Telephone and SDARS
HiFi	HiFi Amplifier, also Top HiFi Amplifier
KOMBI	Instrument Cluster
LSZ	Light Switch Cluster

	Light Switch Panel
	Main Fuse and Power Distribution Box
MDS	Multi Drive Sunroof Control Unit
MRS	Multiple Restraint System
NG	Tilt Sensor
	Oil Level Sensor
PDC	Park Distance Control
	Radio
RLS	Rain Light Sensor
SBSL	Satellite Crash Sensor B-Pillar Left
SBSR	Satellite Crash Sensor B-Pillar Right
SDARS	Satellite Radio Receiver
SES	Voice Recognition
SINE	Emergency Power Sensor
	Solar Sensor
SVT	Servotronic Control Unit
TCU	Telematics Control Unit
	Up Front Sensor
	Up Front Sensor
USIS	Ultrasonic Car Alarm

E83 Workshop Exercise A/C

Customer has just picked up their new X3. Almost immediately they return with a complaint of no fan in the car.

1. *Perform Short Test.*
2. *List the pertinent faults for this complaint.*
3. *From what source does the affected control module receive its B+?*
4. *Are those fuses good?*
5. *Explain the operation of K19 and how it affects the power supply.*
6. *Check for power at the affected control module.*
   What is the voltage on the pin(s) that supply B+?
7. *What is the next most likely source of the problem?*
8. *Where is K19?*
9. *Could you substitute K6304 for K19?*
10. *List the other components similar to K19 and their location.*
11. *What is the results of Test Function 7.2 of the Instrument Cluster?*

Table of Contents

E83 Safety Systems

Initial Print Date: 10/03 Revision Date:

Safety Systems

Model: E83

Production: Start of Production MY 2004

OBJECTIVES

After completion of this module you will:

- Know the differences in the MRS Systems
- Understand the operation of MRS4RD
- Be able to locate all the components of MRS4RD
- Understand OC3 mat operation

History of Multiple Restraint Systems

Multiple restraint systems have a long history at BMW. The first multiple restraint system, the MRS1, was introduced as long ago as 1996.

MRS 1

With the introduction of the side airbags in March 1996, the MRS1 replaced the ZAE/BAE control unit used until then on the E38/E39. When the side airbags were introduced, two MRSA external sensors were also added for improved side-impact detection. Because of the required number of inputs/outputs, the number of pins had to be increased from 30 to 50.

MRS 2

The addition of the ITS head airbag and rear side airbags on the E38 in May 1997 saw the introduction of the MRS2. On the E39, the MRS2 was first used when the ITS head airbag was fitted in September 1997. September 1998 saw the introduction of the 2-stage front-passenger airbag (SMART airbag).

MRS 3

The MRS3 system was launched with the arrival of the 2-stage driver's airbag in March 1999. Another innovation on the MRS3 was its connection with the K-bus. The previous MRS systems had been hooked up to the diagnostic bus. The exception in that regard was the E36/7 (Z3). Since the Z3 has no K-bus, the MRS3 on the Z3 remained connected to the diagnostic bus.

MRS 4

The changes on the MRS4 as compared with the MRS3 consisted of a modified processor and new software for calculating the restraint system triggering algorithm. The MRS4 was first used in April 2001 with the launch of the MINI as well as on the E46 and E53. The E38 and E39 models were fitted with the MRS4 for the first time in August 2001.

MRS4RD

The multiple restraint system 4 redesign MRS4RD is a development of the MRS4 on the E46. The MRS4RD has had its interfaces expanded to 75 pins.

The job of the MRS4RD is to detect accident scenarios that are critical for the vehicle occupants and to selectively activate the necessary restraint systems according to the severity of the crash.

The MRS4RD has been further optimized and equipped with the following sensors:

- Up-front sensors
- Door-compression sensors
- B-pillar satellites

The job of the up-front sensors is to detect frontal impacts. This allows the restraint systems such as seatbelt tensioners and airbags to be activated.

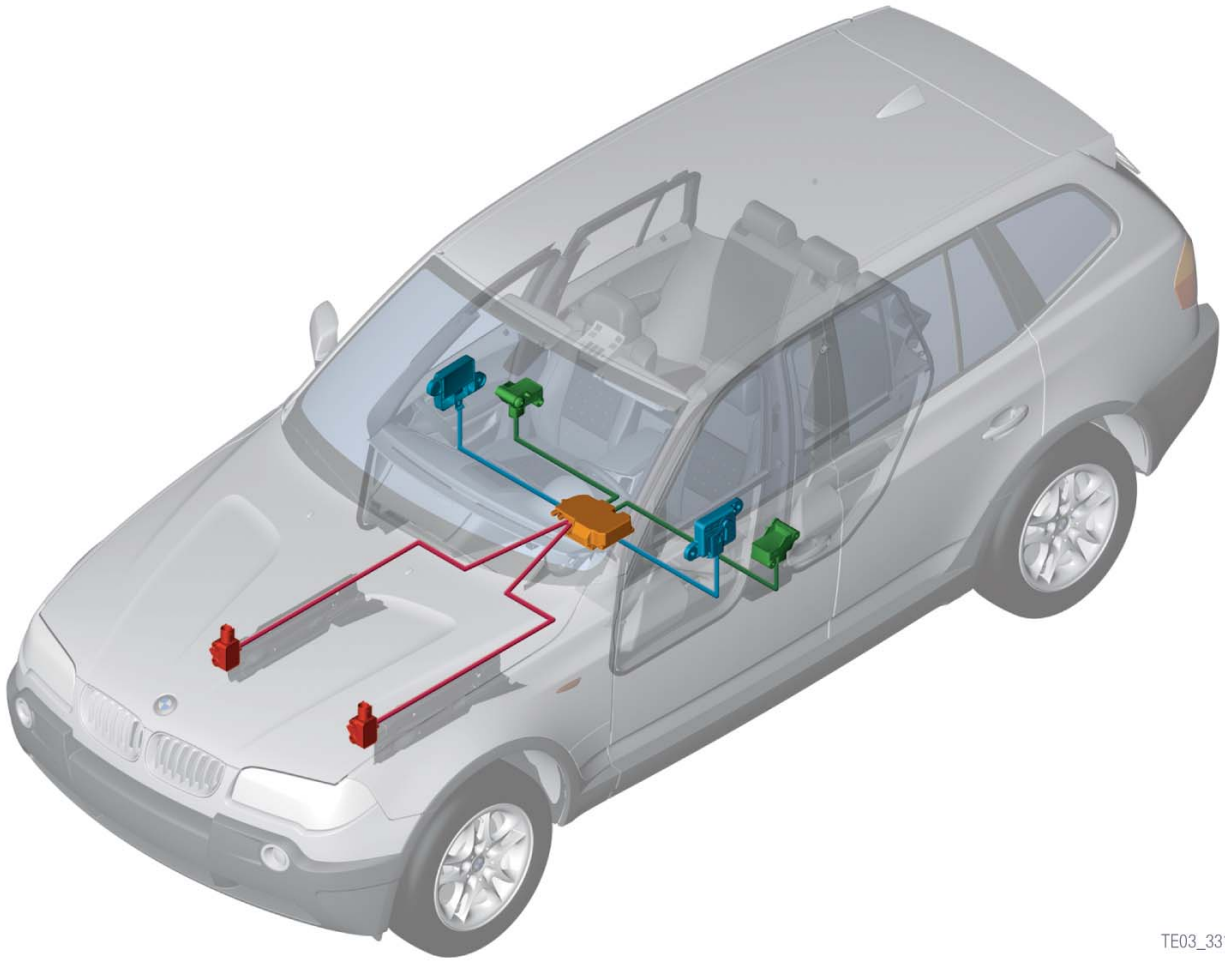
The job of the door-compression sensors is to detect side impacts The MRS4 satellites (MRSA) under the front seats have been moved to the B-pillars. The B-pillar satellites contain acceleration sensors for linear and lateral acceleration.

The MRS4RD performs a self-diagnosis and monitors all input and output signals. Any faults detected are stored in a non-volatile memory and indicated to the driver by the airbag warning lamp (AWL).

Communication with other control units in the vehicle's network of systems takes place via the K-bus.

The MRS4RD can be programmed/encoded via the K-bus.

MRS4RD Equipped E83



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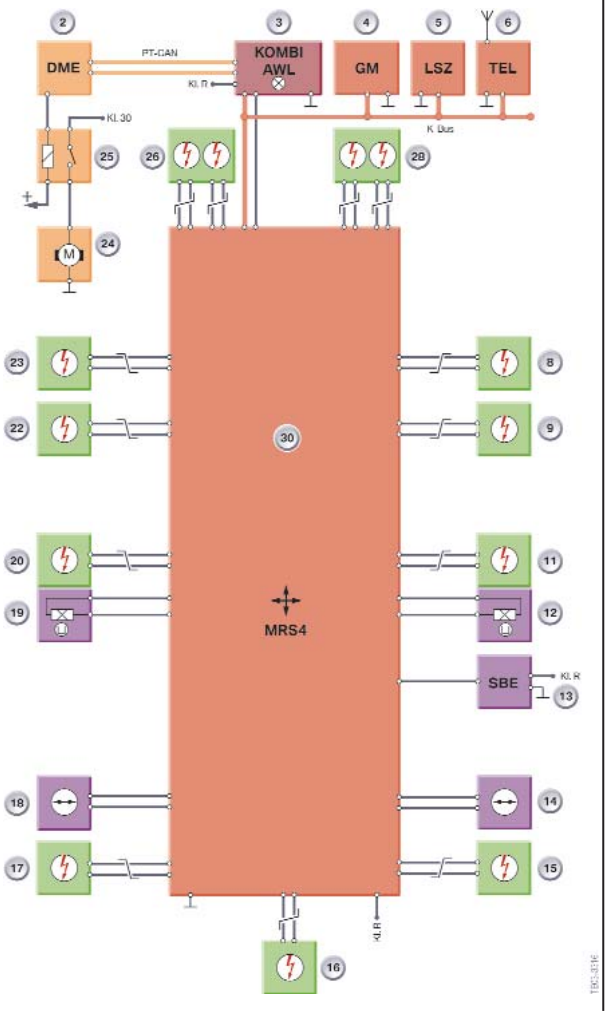
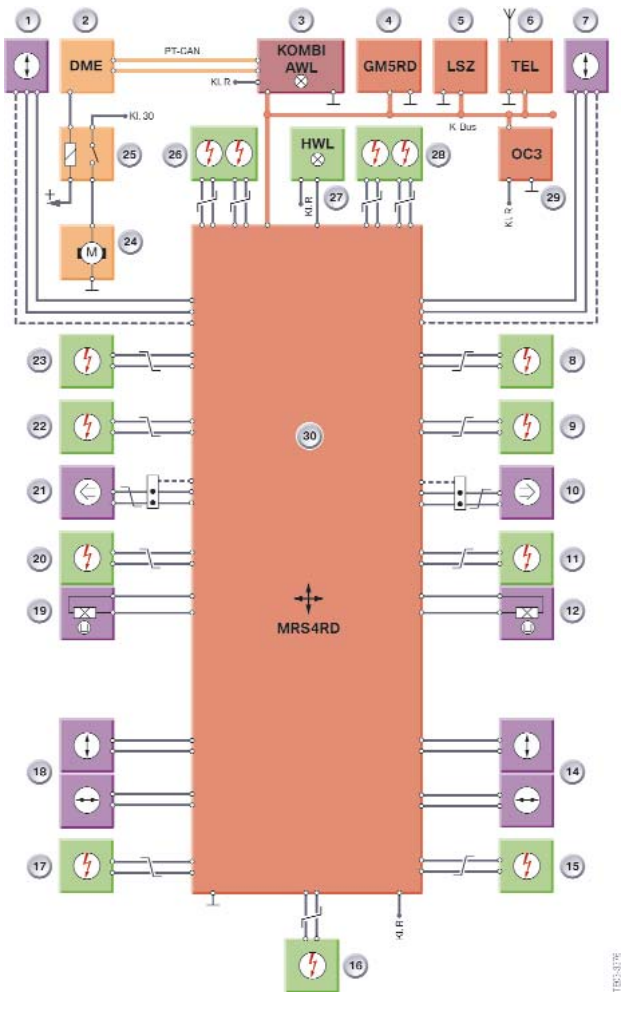
Comparison E46/E53 MRS w/ E83 MRS4RD

E46/E53



E83



1. Up-front Sensor, Left (E83)	11. Seat-belt tensioner, Right	21. Door Pressure Sensor, L (E83)
2. DME	12. Seat Belt Switch, Right	22. Side Airbag, LF
3. Instrument Cluster	13. Seat Occupation Sensor	23. ITS, Left (E83 Curtain Airbag)
4. GM5 (E83 GM5RD)	14. B-Pillar Satellite, Right (E83)	24. Electric Fuel Pump
5. LSZ	15. Side Airbag, RR	25. Fuel Pump Relay
6. Telephone	16. BST	26. Driver Airbag
7. Up-front Sensor, Right (E83)	17. Side Airbag, LR	27. Airbag Indicator Lamp (E83)
8. ITS, Right (E83 Curtain Airbag)	18. B-Pillar Satellite, Left (E83)	28. Passenger Airbag
9. Side Airbag, RF	19. Seat Belt Switch, Left	29. OC3 Mat (E83)
10. Door Pressure Sensor, R (E83)	20. Seat-belt Tensioner, Left	30. MRS Control Unit

Grayed Items X3 Only

System Components

The MRS4RD multiple restraint system consists of the following components:

- MRS4RD control unit
- Sensors and switches
- Actuators

MRS4RD Control Unit

The number of pins on the MRS4RD control unit has been increased from 50 (MRS4) to 75 because of the greater number of interfaces.

The MRS4RD control unit is located centrally in the vehicle on the transmission tunnel. Integrated in the MRS4RD control unit are two acceleration sensors set right-angles to one another. The linear acceleration sensor (X-axis) is positioned at 0 degrees to the vehicle's longitudinal axis, and the lateral acceleration sensor (Y-axis) at 90 degrees to that axis.

All acceleration sensors sense acceleration in two directions, i.e. they register both positive and negative acceleration. The polarity of the acceleration signals depends on the direction of impact. That means it is possible to distinguish between a front or rear impact and between a left or right side impact.

Sensors

The MRS4RD multiple restraint system has more sensors than its predecessor system. They include the following sensors:

- Up-front sensors
- Door-compression sensors
- B-pillar satellites with lateral and linear acceleration sensors

Up-Front Sensors

The job of the up-front sensors is to detect frontal impacts. The up-front sensors are located in the front end above the longitudinal subframe members. The up-front sensors provide the MRS control unit with the initial information on the progression and severity of the impact.

An up-front sensor consists of an acceleration sensor for detecting deceleration, a signal converter and a microprocessor for data transmission.

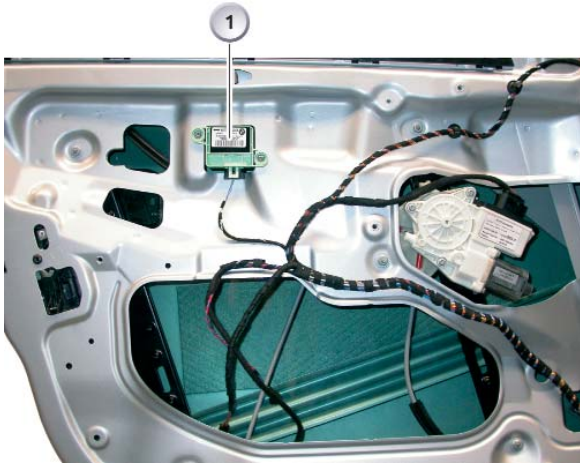
The up-front sensors are supplied with power via a current-signal interface. The up-front sensors are supplied with a current of 5 - 10 mA. When a data message is transmitted, the level jumps vertically by 20 mA.

The advantage of the current-signal interface is its constant supply of current which prevents corruption of the signal. A change of resistance in the lead does not affect the signal.

A power supply with a voltage signal would be corrupted by changes in resistance in the lead. The signal could equally be corrupted by EMC interference from other leads.

Door Pressure Sensors

The function of the door pressure sensors (1) is to provide supplementary detection of side impacts in addition to the information supplied by the lateral acceleration sensors in the B-pillar satellites and the MRS4RD control unit. The door pressure sensors are located on the inner door panel and measure the pressure inside the door.



In the event of a side impact, the outer door panel may be pushed inwards, thus compressing the space inside the door and increasing the pressure. That pressure increase is detected by the door pressure sensors. At the same time, the side impact is detected by the acceleration sensors in the B-pillar satellite. The B-pillar satellite then also transmits a data message. The MRS4RD control unit in the center of the vehicle processes the two signals and is able to trigger the restraint systems on the basis of the information provided.

B-Pillar Satellites

The two MRSA modules (multiple restraint system external satellites) which were previously positioned under the seats, have been replaced by B-pillar satellites. Each B-pillar satellite consists of a lateral acceleration sensor and a linear acceleration sensor.

As with the up-front sensors, signal transmission is cyclic. The B-pillar satellites detect side, front and rear impacts.

The left and right B-pillar satellites are identical.

Seat Occupancy Detector (OC-3 Mat)

Because of the legal situation in the USA, the presence of a child seat for a child up to one year old must be automatically detected and the passenger airbags then deactivated. The OC3 mat detects a child seat that conforms to the relevant standard (NHTSA FMVSS 208) by virtue of the pattern of the impression it makes on the seat and deactivates the passenger airbags.

A straightforward seat occupancy detector recognizes a certain weight as proof that the seat is occupied. In order to meet legislative requirements, the seat occupancy detector (SBE) has been developed into an intelligent occupant classifier (OC). This was achieved by means of the following measures:

- By a larger number of sensor elements
- By sensing a larger area of the seat
- By an intelligent electronic analyzer

OC3 Mat

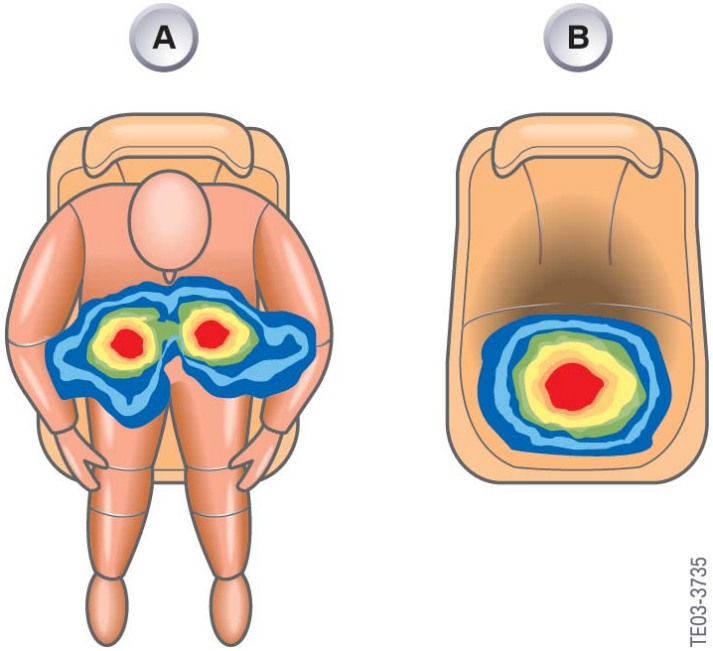
Convention Seat Occupancy Detector

The OC-3 mat is capable of distinguishing between a one-year-old child in a child's seat and a light person.

The OC-3 mat is integrated into the seat area of the passenger seat. The OC-3 mat consists of conductors with pressure-dependent resistor elements (FSR, or Force Sensitive Resistance elements). The conductors are connected to the electronic analyzer.

The FSR elements are wired in such a way that they can be sampled individually. When the mechanical load on a sensor element increases electrical resistance decreases and the measurement current changes accordingly.

By analyzing the signals from the individual sensors, the analyzer maps the occupancy of the seat surface and can identify the local concentrations of weight. The distances between the areas where pressure is applied and the concentrations of pressure reveal whether the seat is occupied by a person (A) or a child seat (B).



The analyzer of the OC3 mat sends a message to the MRS4RD control unit via the K-bus. If the system detects that the seat is unoccupied or that a child seat for a child up to one year old is fitted, the airbags on the passenger side are deactivated. The MRS4RD control unit switches on the airbag warning light. The airbag warning light indicates that the airbags on the passenger side are deactivated.

Note:
The airbag warning light is switched on if the seat is unoccupied.

Belt Buckle Switch

The belt buckle switch is used to detect whether the seatbelt has been fastened or not. The detection signal is sent to the MRS4RD control unit. The signal is used as a criterion for selective triggering of the actuators in the event of a crash. The belt buckle switch is located in the seatbelt buckle on the driver and passenger seat.

The belt buckle switch is a two-wire Hall switch. The Hall switch is supplied by the MRS4RD control unit via a current-signal interface. The current draw of the switch is the signal for the switch position. The belt buckle switch is permanently diagnosed and monitored in all electrical system statuses from Terminal R "ON" onwards.

Actuators

The Multiple Restraint System 4 Redesign is responsible for activation of the following actuators:

- Front airbag, 2-stage, driver's side
- Front airbag, 2-stage, passenger side
- Head air bag (curtain airbag), left and right
- Side airbag, front door, left and right
- Side airbag, rear door, left and right
- Seatbelt tensioner, front, left and right
- Safety battery terminal
- Airbag warning lamp

Driver's Airbag

The purpose of the driver's front airbag in conjunction with the seatbelt is to reduce the risk of serious or fatal injury to the driver in the event of a head-on collision. The front airbag for the driver's side is located in the impact pad of the steering wheel. The front airbag for the driver is equipped with a 2-stage gas generator.

Depending on the crash severity, the two stages of the airbag are ignited with a delay. The two stages of the gas generator permit the airbag to perform its restraining function in a manner appropriate to the severity of the collision, thus avoiding additional trauma to the driver during the deployment stage. The gas flowing into the airbag inflates it, and in combination with the seat belt this reduces the risk of injury in an accident.

Passenger Airbag

The purpose of the passenger front airbag in conjunction with the seatbelt is to reduce the risk of serious or fatal injury to the front passenger in the event of a head-on collision. The 2-stage passenger front airbag is located underneath the dashboard.

In a crash and depending on crash severity, the two stages of the airbag are triggered with a delay. In this way the restraining effect is matched to the severity of the crash situation. Another effect is to reduce the strain on the occupant during the airbag-deployment phase.

When the passenger airbag inflates, a hinged flap that is attached to the dashboard opens. The passenger airbag inflates towards the windscreen. The front passenger's airbag emerges upwards and supports itself on the windscreen glass and the dashboard.

Head Airbag (Curtain Airbag)

On the E83, a new head protection system, the curtain airbag, is introduced as standard equipment for the first time. It differs from the head-protection system used on the E46/E53 as follows:

- Continuous head airbag extending all the way from the A-pillar to the C-pillar

The curtain airbag extends all the way from the A-pillar to the C-pillar, covering the entire side-window area. The curtain airbag inflates between the vehicle occupants and the side windows and pillar trims. In conjunction with the side airbags in the front and rear doors, it provides optimum protection for all passengers in the event of a side on impact.

The curtain airbag reduces the risk of occupants' heads or other extremities protruding through the windows in a sideways collision. This leads to less severe neck backlash forces and less severe head injuries.

Advantages of the system:

- Extended covered area for side windows front and rear.
- Protection against glass splinters and penetrating objects.
- Optimized protective area offering protection for occupants of differing sizes.

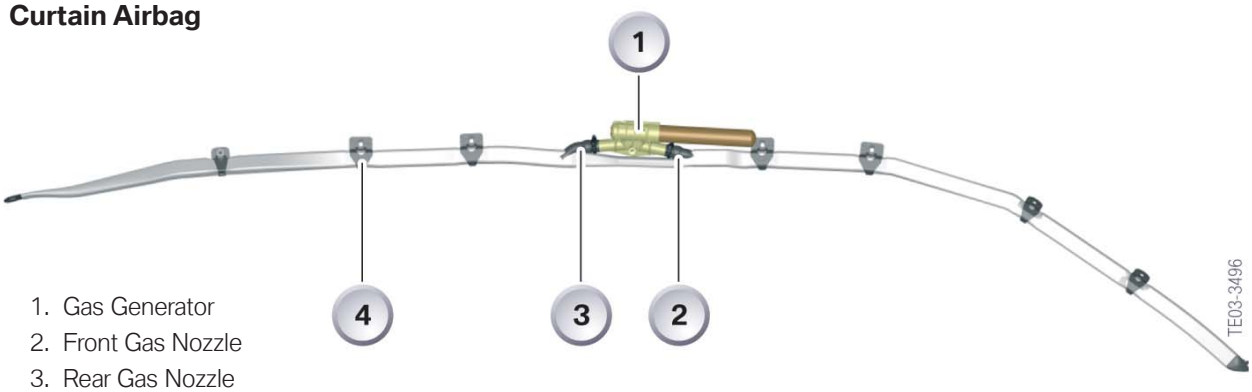
The curtain airbag is positioned along the line of roof side member, folded up. It consists of a gas generator, the two gas lances and the curtain.

In the event of a side-on collision, the generator is detonated and the gas flows through the two gas lances into the curtain. Simultaneous inflation of the curtain at the front and back achieves more even deployment.

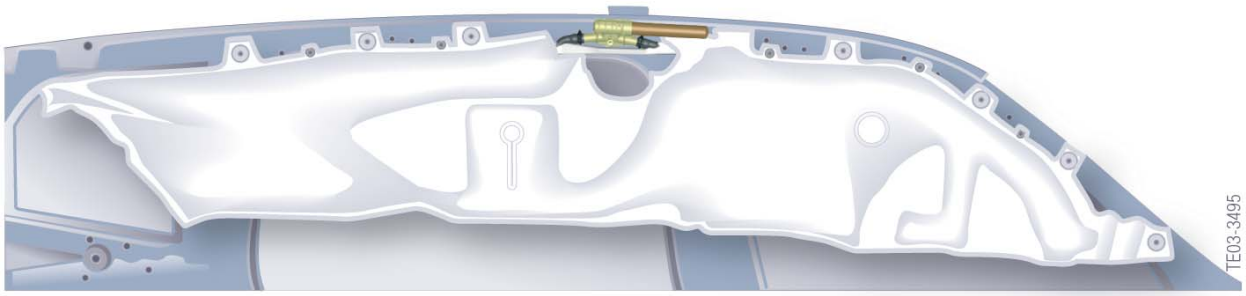
The attachment of the curtain airbag to the A-pillar and the C-pillar pulls it into position. The curtain airbag inflates between the vehicle occupants and the side windows and pillar trims.

Being a sealed system, the curtain airbag retains its shape and strength for several seconds.

Curtain Airbag



1. Gas Generator
2. Front Gas Nozzle
3. Rear Gas Nozzle
4. Airbag Retaining Clips



Side Airbag

The side airbags in the front and rear doors reduce the risk of occupant injury in the torso region of the body in the event of a side-on impact.

The side airbags are folded up inside an aluminum casing with a plastic cover behind the door trim panels. In the area of the side airbag in the door trim is a tear seam. The side airbags are fixed to the door trims as well as by a single screw to the inner door panel.

The plastic cover has defined breaking points. In a side impact of sufficient severity, the side airbag is triggered. The side airbag exits through the split line and deploys between the door and the sear occupants.

Seatbelt Tensioner

The pyrotechnic seatbelt tensioner has the task in the event of a crash to minimize any belt slack in the pelvic and shoulder region.

The seatbelt tensioner is located on the driver's and/or passenger seat. In combination with the mechanical force limiter in the inertia reel, this reduces the chest load for the seat occupants.

BST

If the MRS detects an impact of sufficient severity, the safety battery terminal is deployed. When this happens, the starter/alternator cable is electrically and mechanically disconnected. The alternator is deenergized. The safety battery terminal is located directly at the positive terminal of the battery.

System Functions

The MRS4RD control unit has to perform the following functions:

- Crash detection and calculation of deployment timing
- Activation of deployment output stages
- Documentation of time sequence of actuator deployment
- Pre-drive check
- Cyclic monitoring
- Indication of system readiness
- Indication and storage of faults
- Output of fault data (diagnosis)
- Output of crash signal for other members of the communication network
- Activation of the warning lamp if the passenger airbag is deactivated

Deployment

For the deployment output stages to be activated, the appropriate signals must be received from two different sensors, i.e. the B-pillar satellite and the MRS control-unit sensor.

In electrical-system statuses from Terminal R "ON" onwards, the MRS4RD control unit is supplied with power and is ready for operation on completion of the pre-drive check. The deployment capacitor, which acts as a power reserve, is charged to approx. 26 V via a switching regulator . The deployment capacitor provides the back-up power supply in the event of a crash in which the battery power supply is cut off.

The deployment capacitor, which provides the deployment power for the deployment output stages is controlled by a safety switch (trigger switch). The safety switch is operated by the microprocessor.

The deployment output stages consist of a high-side and a low-side power switch. The high-side power switch switches the deployment current and the low-side power switch switches the earth current. The high-side and low-side power switches are also used to check the deployment circuits as part of the pre-drive check.

The incoming sensor signals are analyzed by the analyzer module and passed on to the microprocessor. The microprocessor performs the deployment-algorithm calculations. The calculation results are compared with the event/deployment matrix and a decision reached as to the deployment of the various detonator pellets.

Pre-Drive Check

As of system status Terminal R "ON," the MRS4RD performs a pre-drive check (system test). While the pre-drive check is in progress, the airbag warning lamp is switched on for 3 - 5 seconds. Once the pre-drive check has been completed, and assuming no faults have been detected, the airbag warning lamp is switched off and the system is ready for operation.

The following tests are performed as part of the pre-drive check:

- Comparison of programmed equipment with actual equipment fitted
- Testing of deployment circuits
- Testing of resistance of deployment circuits
- Testing of internal components
- Testing of external components
- Checksum calculation for algorithm parameters

Cyclic Check

Once the pre-drive check has been successfully completed and the system is ready for operation, a cyclic check for the purposes of fault monitoring is performed. The cyclic check continues to be carried out as long as the system status is Terminal R "ON."

The following tests are performed as part of the cyclic check:

- Monitoring of resistance of deployment circuits
- Communication capability and status of components
- Power supply

System Readiness

The MRS4RD indicates that the system is ready for operation by extinguishing the airbag warning lamp (AWL).

Fault Storage

If there is a fault in the system, it is indicated by the airbag warning lamp.

If a fault occurs on the MRS4RD, it must be stored in a non-volatile memory (EEPROM). When faults are recorded, a distinction is made between internal and external faults.

If an internal fault has been detected, the record of the fault cannot be deleted, i.e. the control unit has to be replaced. The only exception in that regard is incorrect programming data.

External faults on system components are also recorded in the fault memory. Once such faults have been rectified, the record can be removed from the fault memory.

Crash Signal

In the event of a crash involving deployment of the restraint systems, the MRS4RD control unit sends a crash signal to the members of the bus network.

On receipt of that signal, the control units concerned perform the following functions according to the severity of the crash:

- Switch off electric fuel pump
- Switch off alternator
- Unlock central locking system
- Switch on hazard warning flashers
- Make emergency call (only if Professional phone option fitted)

Emergency Call (If equipped w/Telematics)

The E83 offers the customer a number of emergency call functions and a breakdown call function if the vehicle is equipped w/Telematics. The emergency call functions include a manual emergency call as well as the automatic emergency call activated as a result of a crash of appropriate severity.

Even if the vehicle is not equipped with the Motorola Everest telephone, every vehicle has a Telematic Control Unit TCU(if equipped w/Telematics), a telephone aerial, a hands-free unit as well as a GPS aerial for localization.

Manual Emergency Call

The emergency call switch (4) is connected directly to the telephone. Pressing the emergency call switch sets up a voice connection with the provider "Cross Country." The voice connection is indicated by a flashing LED in the switch.

Breakdown Call

The Breakdown call button in the Central Information Display can be activated by means of the controller. If the breakdown call button is activated, a connection to the BMW Emergency Service of the relevant country is set up.

Automatic Emergency Call

In the event of a crash of the appropriate severity, the MRS4RD control unit transmits a crash telegram to the TCU. The TCU places an emergency call, which at the same time contains the location of the vehicle.

If a navigation system is installed, the location of the vehicle is notified to the TCU. If no navigation system is installed, the location of the vehicle is determined by the internal GPS receiver of the TCU.

A voice connection is set up with the provider "Cross Country" to obtain more information on the accident (severity of the accident, number of injured) so that rescue operations can be initiated.

Workshop Exercise - Safety Systems

Vehicle is brought into shop with airbag light on.

1. *Confirm Complaint* _____
2. *Perform Short Test* _____
3. *List the Faults which pertain to the Safety System.* _____

   _____
4. *What is the next step in the diagnostics of the problem?* _____

   _____
5. *Is there a Test Plan available for this situation?* _____
6. *Does the DISplus offer any alternate diagnostic suggestions?* _____

   _____
7. *What is the result of the test suggested at the door pressure sensor?*

   _____
8. *What is the location of the MRS control module?* _____
9. *Is there an adapter that is used when testing the inputs and outputs of the MRS?* _____
10. *Perform a resistance test on the wires from the MRS to the door pressure sensor.* _____

    _____
11. *Is there an alternate connector to check this wiring?* _____

    _____
12. *Test at the alternate connector.* _____

    _____

    _____

    _____

    _____

    _____

Table of Contents

xDrive / DSC

Subject **Page**

Initial Print Date: 10/03 Revision Date:

xDrive/DSC

Model: E83/ E53 MU (Model Update)

Production: E83 - Start of Production MY 2004
E53 MU - 9/03

OBJECTIVES

After completion of this module you will be able to:

- Explain the xDrive mechanical operation
- Describe the xDrive power flow
- Identify the coding resistor and understand its purpose
- Diagnose the VGSG control of the multi-disc clutch
- Perform an “on vehicle” test to verify xDrive function
- Explain the Oil change procedure found in Service Functions

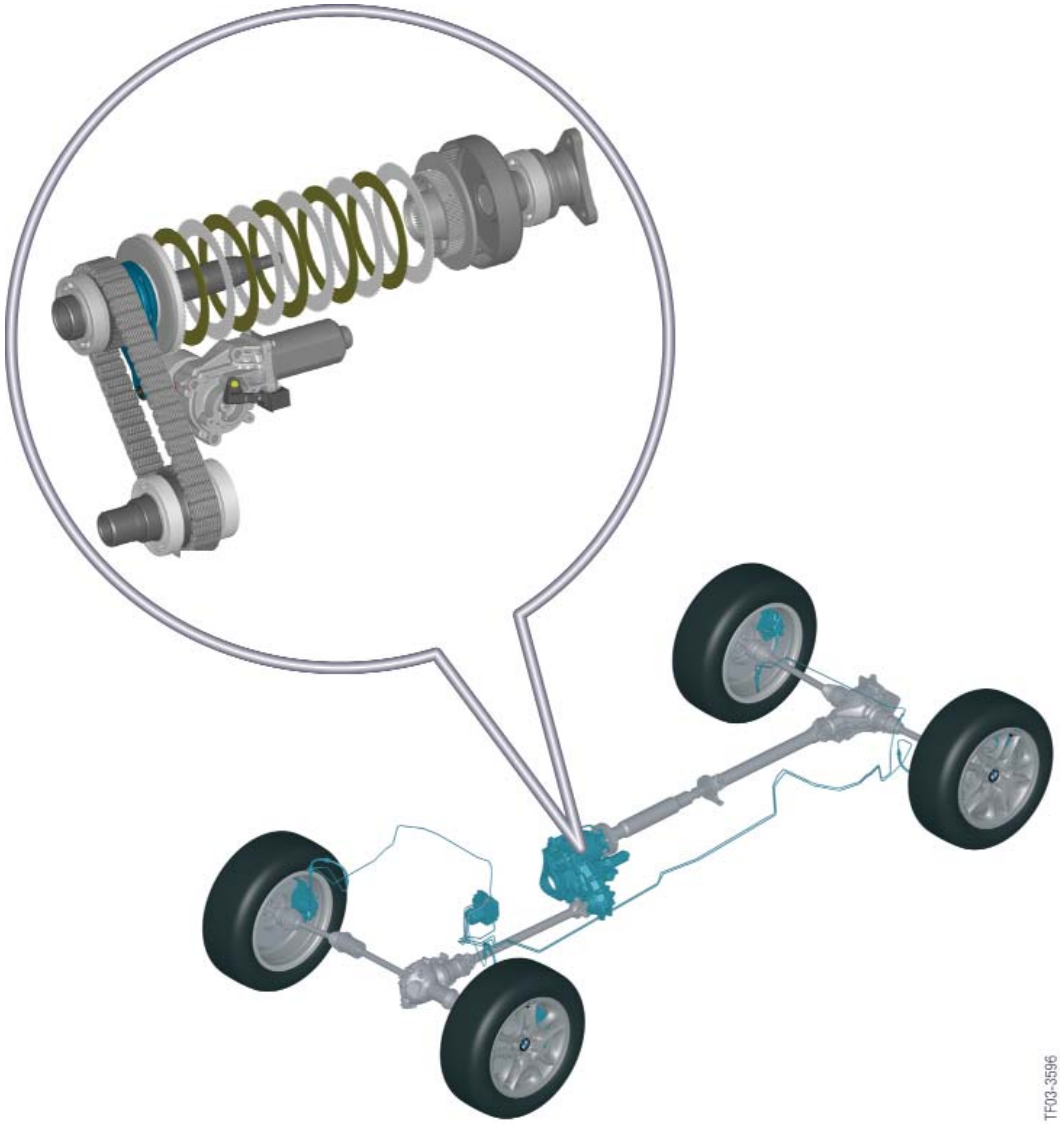
Purpose of the System

xDrive

The innovative xDrive four-wheel drive is a system that controls and regulates the distribution of driving torque to the front and rear axles. The measured variables of DSC are used by xDrive but are also influenced by modified handling performance.

The multi-disc clutch is the heart of the xDrive. By using the controlled multi-disc clutch, it is possible to resolve the conflict between traction and handling performance.

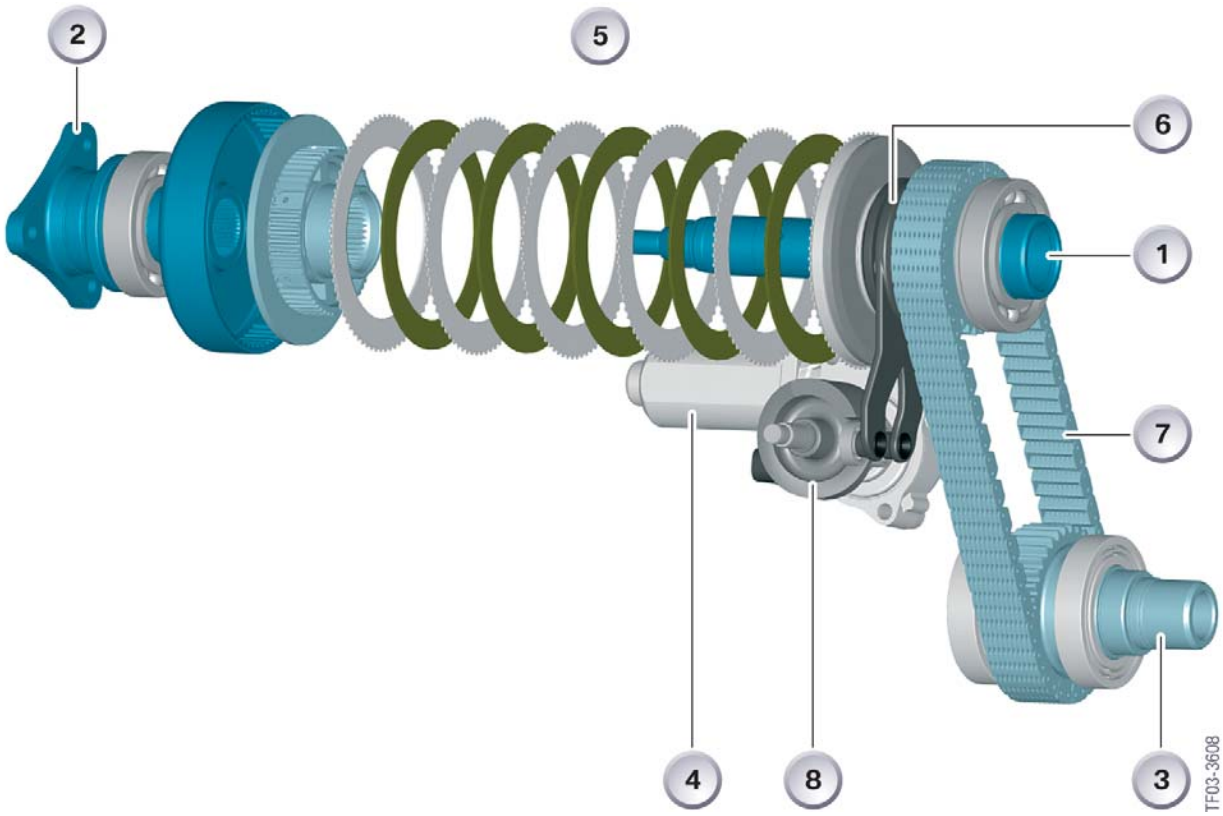
This is achieved through the fact that torque distribution is not determined by a fixed gear ratio in the xDrive as was the case in the previous systems. Instead, the distribution of driving torque is dependent on the locking torque of the controlled multi-disc clutch in the transfer case and on the transferable torque to the front and rear axles.



xDrive - System Components

ATC 400 / ATC 500 Transfer Case

The ATC 400 is installed in the E83 and the ATC 500 in the E53 MU. They differ in that the ATC 500 is splined to the front propeller shaft and the ATC 400 uses a four bolt flange. In addition, there is one more disc in the multi-disc clutch of the ATC 500 and the distance between the input shaft and the output shaft to the front axle is 19 mm greater than in the ATC 400.



1. Input from manual / automatic transmission
2. Output to rear axle prop. shaft
3. Output to front axle prop. shaft
4. Servomotor
5. Clutch discs
6. Adjusting levers with ball ramp
7. Chain
8. Disc cam

The flange illustration of the ATC transfer case is the same for automatic and manual transmissions.

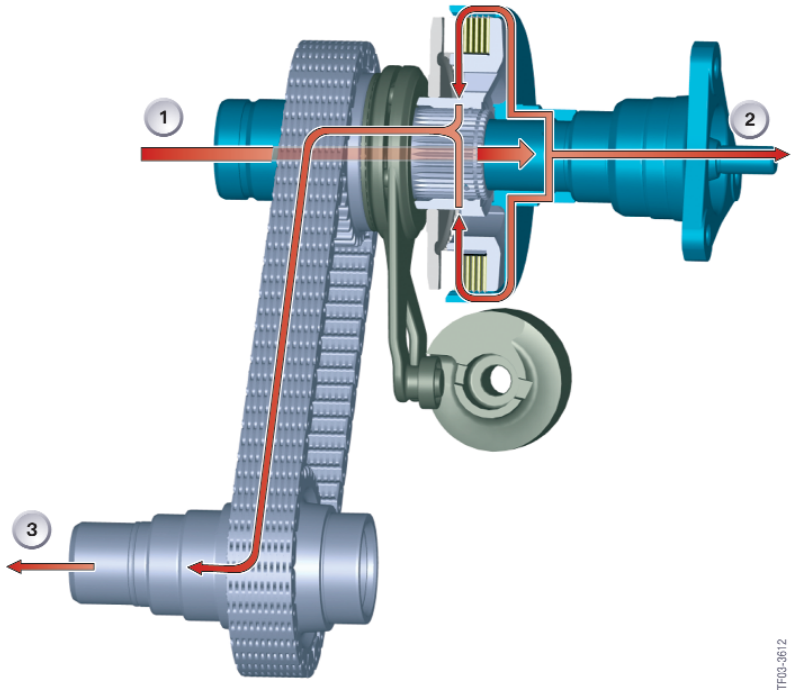
Power Flow

When the multi-disc clutch in the transfer case is disengaged, no driving torque is transmitted to the front axle. All of the driving torque is then distributed to the rear axle. This is because the input shaft (1) is splined providing a permanent connection to the rear axle propeller shaft output flange (2). The multi-disc clutch couples the rear axle propeller shaft output flange to the front propeller shaft output (3).

The driving torque on the front axle is increased or decreased by regulating the locking pressure of the multi-disc clutch, providing a stepless coupling of the front axle to the drivetrain. This depends on driving situations and road conditions. When the multi-disc clutch is fully engaged, the front and rear axles turn at the same speed.

Driving torque distribution (front/rear) is based on available traction at each axle. For example, when traction is identical on the front and rear axles and a driver accelerates from a stop in first gear at full throttle, the rear axle is capable of sustaining greater driving torque as the vehicle weight shifts from the front to the rear.

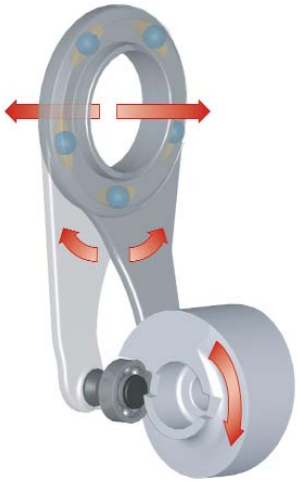
Another example is when the front axle is on a high traction surface and the rear axle is on ice. In this case, virtually 100% of the available driving torque is transmitted to the front axle. Based on available traction, virtually no driving torque can be supported by the rear axle . Obviously, when more driving torque is transmitted to the front axle, driving torque on the rear axle is proportionally reduced due to lack of traction.



1. Input from transmission
2. Rear propeller shaft output
3. Front propeller shaft output

Note:
On a vehicle equipped with an automatic transmission, when driving onto brake analyzers, move the selector lever to the "N" position . On a vehicle equipped with a manual transmission, do not press the accelerator pedal once on the brake analyzer. This keeps the transfer case clutch open and the vehicle cannot be pulled off the analyzer.

Adjusting Levers



When the disc cam is rotated, it forces the adjusting levers apart.

The ball ramps create a precision axial movement which compresses and increases pressure on the multi-disc clutch.

This is completely variable up to a full lock.

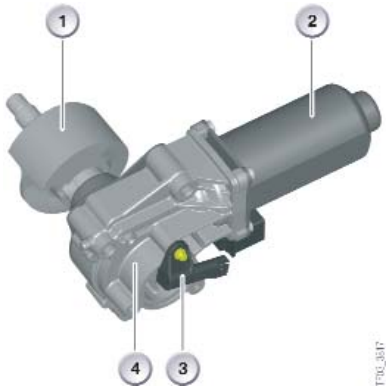
Servomotor with Motor Position Sensor

The servomotor with worm gear are powered to rotate the disc cam.

The servomotor is a permanent magnet (1) DC motor which contains a Hall sensor (2) to detect the position and the adjusting speed of the motor shaft.

This is proportional to the degree of multi-disc clutch engagement.

Coding Resistor



1. Disc cam
2. Electric motor
3. Coding resistor
4. Worm gear

Because of mechanical tolerances in production, the characteristic curve of the multi-disc clutch locking torque varies slightly.

Once the actual locking torque has been measured on the clutch test bench, a resistor is attached to the servomotor; the resistor's value is a reference to the locking torque characteristic.

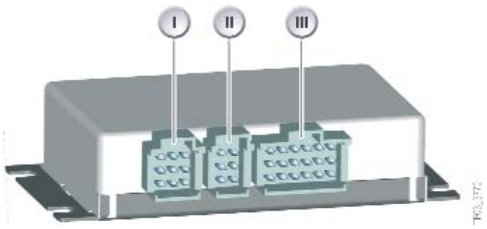
Each time the engine is started, the transfer case control unit measures the resistance value once and the optimum program map for the transfer case fitted is selected.

Transfer Case Electronic Control Unit

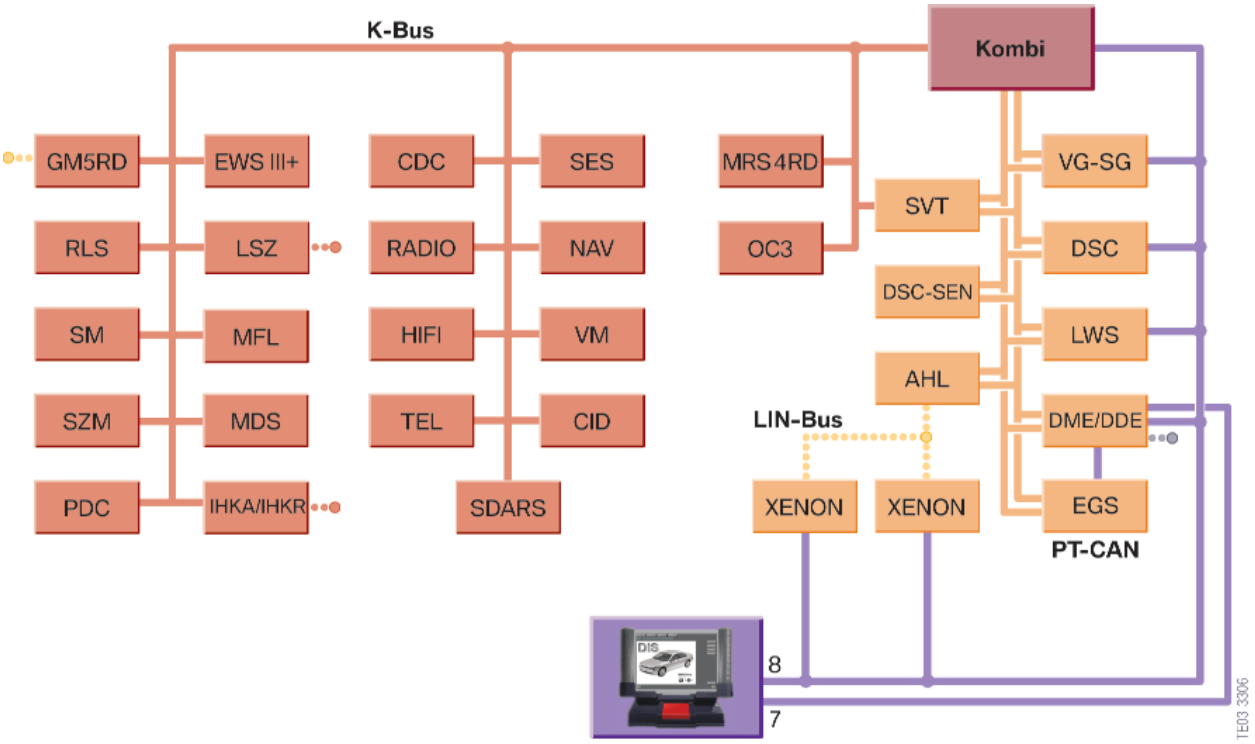
The transfer case control unit (VGSG) is installed in the E83 on the rear floor panel under the luggage compartment trim.

In E53 MU, it is located underneath the rear bench seat on the left.

I. 9-pin ELO connector (not used)
II. 6-pin ELO connector
III. 18-pin ELO connector

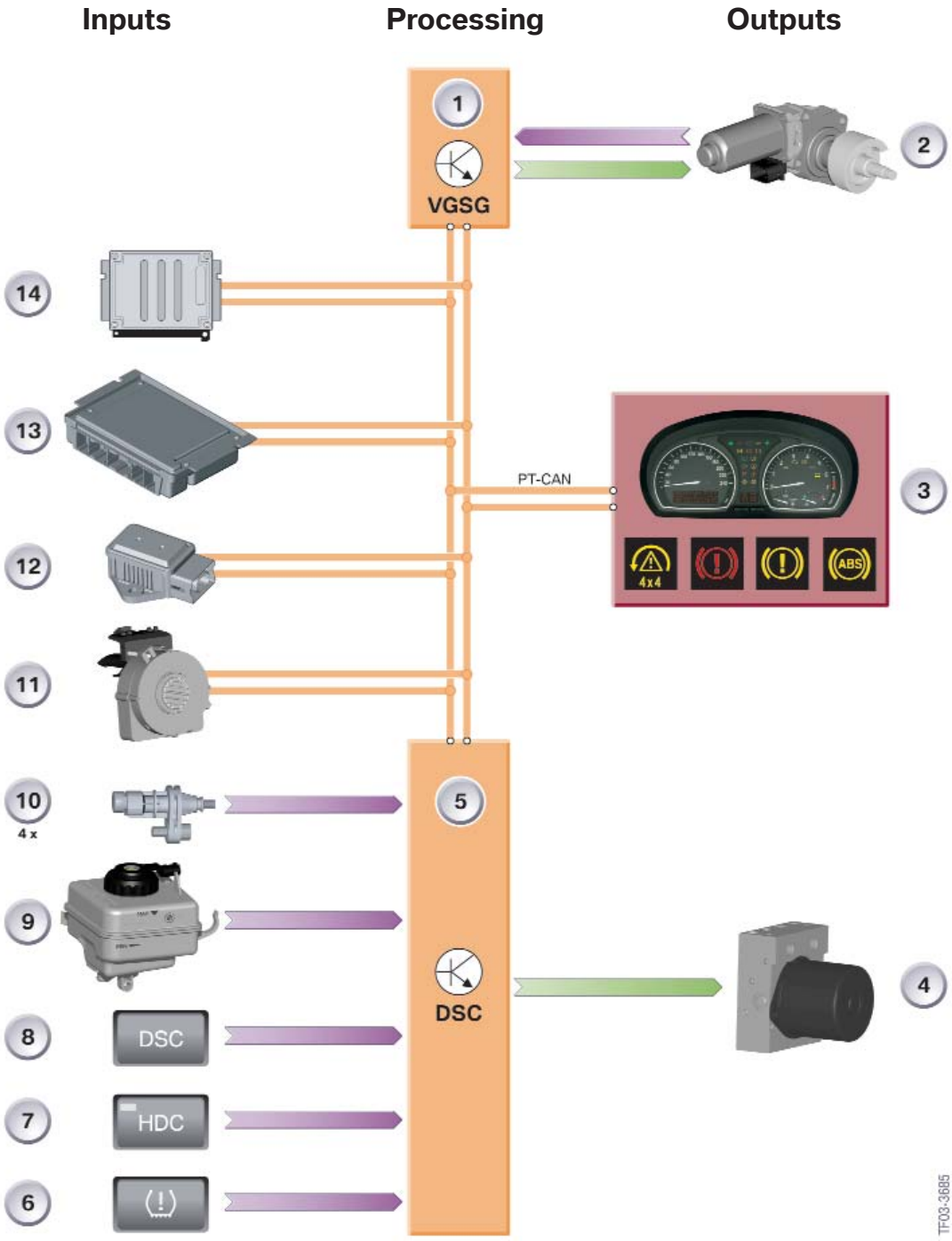


Bus Overview



The transfer case control unit (VGSG) is on the PT-CAN Bus. VGSG shares information with DSC for overall xDrive control and has diagnostic communication via the OBD connector .

Notes:



1. Transfer case control unit
2. Transfer case clutch servomotor
3. Instrument cluster
4. DSC hydraulic modulator
5. DSC control unit
6. RDW button
7. HDC button
8. DSC button
9. Brake fluid level
10. Wheel speed sensor
11. Steering angle sensor
12. Yaw/transverse acceleration sensors
13. EGS
14. ECM (DME)

xDrive - Principle of Operation

xDrive

The transfer case control unit (VGSG) regulates the locking pressure of the multi-disc clutch in the transfer case. The transfer case control unit receives information on the required clutch locking pressure from the DSC control unit. The processing, control and electronics required for this are integrated in the transfer case control unit. This information is converted and output as a corresponding rotary motion of the servomotor.

In order to position the servomotor and compensate for wear, a reference run is carried out each time the ignition is switched off. The servomotor position is determined by a Hall sensor integrated in the servomotor. During the reference run, the clutch is engaged and disengaged completely (once). While the clutch is actuated, the current consumption is measured for the servomotor position. This allows the VGSG to determine the beginning and end of the clutch actuating procedure.

A clutch and oil wear calculation is also processed and stored in the VGSG. It increases the locking pressure as necessary in order to reduce friction.

In the event of DSC failure, the VGSG incorporates a fallback level (strategy) for activating the transfer case clutch in order to maintain the four-wheel drive function.

TCC

Regulation of the transfer case clutch (TCC) locking pressure allows stepless coupling of the front axle to the drivetrain. The driving torque on the front axle can be increased or decreased depending on the driving situation and road conditions. Obviously, when more driving torque is transmitted to the front axle, driving torque on the rear axle is proportionally reduced due to lack of traction.

The advantages of variable distribution of driving torque to the front and rear axles are:

- Optimum utilization of the cornering and longitudinal wheel forces on the front and rear axles.
- DSC brake interventions only become necessary at a significantly later stage, an increase in comfort refinement.
- Compared with an “open” differential transfer case and DSC, xDrive significantly improves driving torque distribution when traction on the front and rear axles is notably different.

The DSC control unit influences control of the transfer case clutch. Even when DSC is deactivated, TCC remains active for the purpose of maximum traction and driving dynamics.

Permanent four-wheel drive is only completely deactivated in three control situations:

- During very tight cornering with low engine torque to allow speed compensation between the front and rear axles (e.g. parking)
- At speeds > 180 km/h
- When the vehicle dramatically understeers

The transfer case clutch control logic is described in three main modules:

- Pre-control
- Traction control / driving dynamics control
- Tire tolerance logic

Pre-control
The pre-control logic (shared from DSC) reflects the driver's command and is calculated based on:

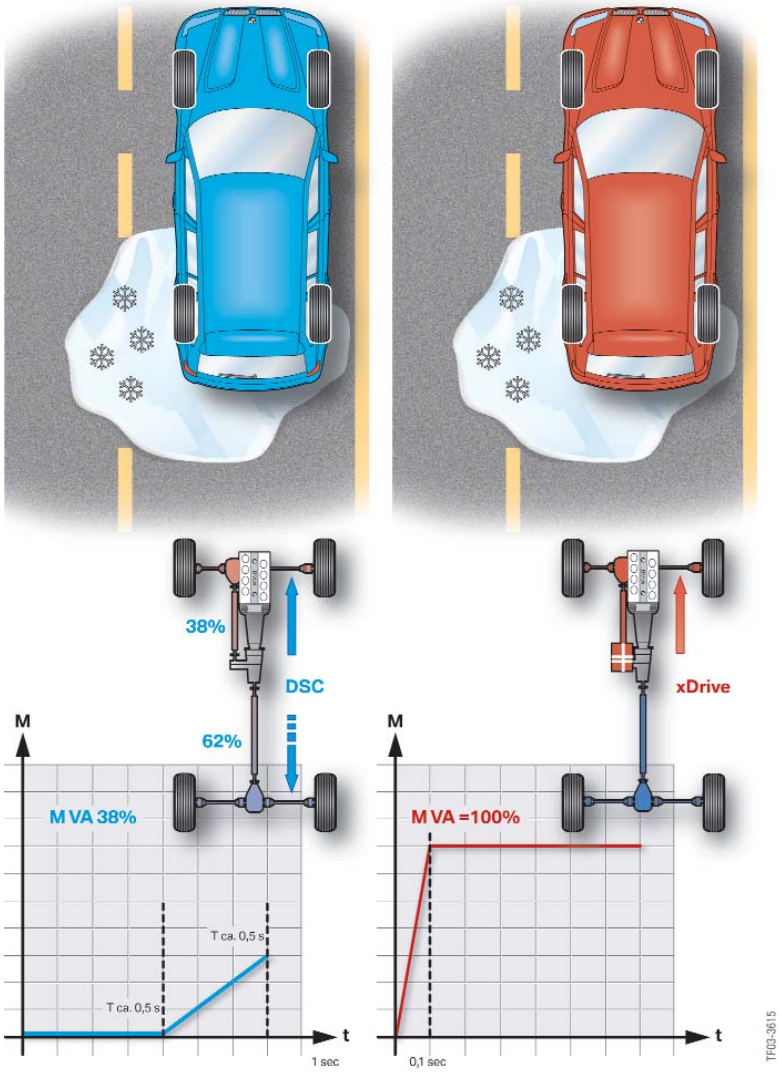
- Accelerator pedal value
- Engine torque
- Engine rpm
- Vehicle speed
- Gear
- Steering angle

In normal driving, the clutch is operated with minimum slip so that permanent four-wheel drive with a driving torque distribution of 40% on the front axle and 60% on the rear axle is available.

Even when the traction for the front and rear axles is dramatically different, the pre-control ensures that the system responds very quickly, as can be seen in graphic on the following page.

Notes:

“Open” Transfer Case vs xDrive



M = Driving torque M VA = Driving torque on front axle t = Time

In the case of the open transfer case, the brake is applied after slip is detected on the rear axle. This takes approximately one half of a second in reaction time. 62% of the driving torque is supported on the two rear brake discs and only 38% of the driving torque can be transferred to the front axle. In other words, wheel slip must be sensed first before driving torque is transferred through the transfer case by applying the rear wheel brakes.

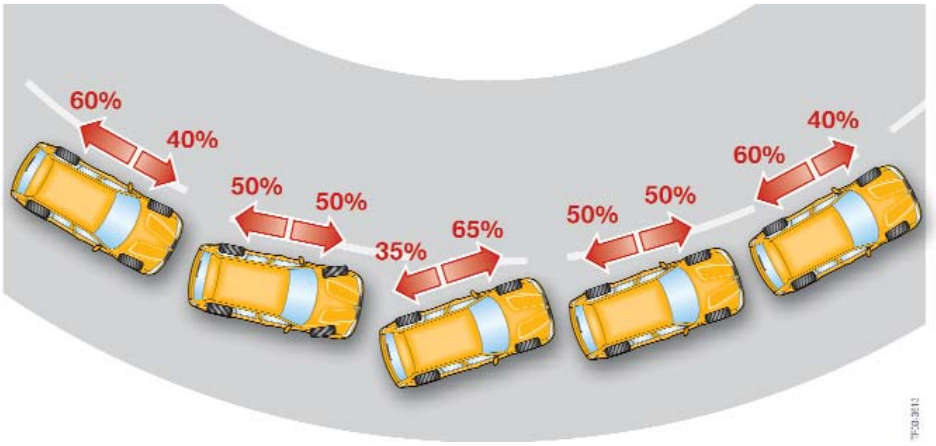
In contrast to an “open” transfer case (differential), the xDrive does not require brake intervention on the rear axle because no slip can occur (permanent through connection). The transfer case clutch is engaging the front axle as the vehicle is accelerating. This takes significantly less time (approx. one/tenth of a second).

Traction Control / Driving Dynamics Control

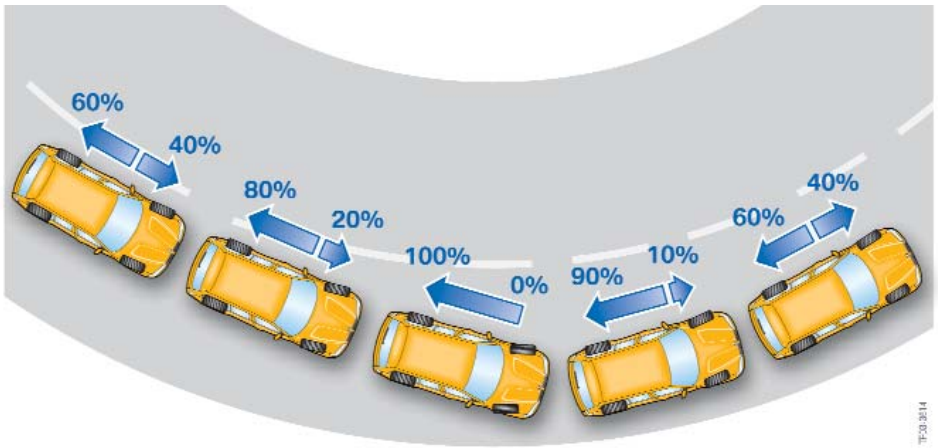
Traction control monitors the slip conditions on the front and rear axles. The wheel speeds, yaw rate and transversal acceleration serve as the input signals.

The function of traction control/driving dynamics control is to achieve optimum traction and to keep the vehicle stable.

As seen in the following graphic, in the event of an oversteer tendency, the transfer case clutch is completely engaged and the maximum supportable driving torque on the front axle is transmitted. This helps to “pull’ the front of the vehicle until stability is achieved.



In the event of an understeer tendency, the clutch can be fully disengaged if necessary. In this example, the front axle is separated from the drivetrain and the driving torque can only be transmitted to the rear axle. This helps to “push” the rear of the vehicle until stability is achieved.



Tire Tolerance Logic

The tire tolerance logic detects different tread circumferences on the front and rear axles. This occurs when:

- Mixed tires are used
- Space saving spare tire is installed
- Tires are used that have been worn down to different levels

Normally, tire circumference deviations result in drivetrain torque bias (unwanted variations).

The tire circumference can fluctuate up to 1% or more as a result of mixed tires or wear. The tire tolerance logic decides depending on the driver's command and driving situation whether the slip is to occur in the transfer case clutch or at the contact area between tire and road.

If the slip is permitted in the transfer case clutch, the locking pressure set by the pre-control is reduced in order to keep the work loss low. In the driving dynamic control situation, the clutch is locked slightly more than normal, the four wheel drive is always guaranteed when required.

For maximum xDrive performance, tires (and wheels) of the same diameter should be installed on the vehicle.

Notes:

Workshop Exercise - xDrive Transfer Case

With the Instructor's assistance, perform the following:

1. *Disassemble xDrive transfer case. Familiarize yourself with the mechanical operation.* _____

2. *What are the differences between the ATC 400 and the ATC 500?*

   _____

   _____

   _____

3. *The multi-disc clutch (when engaged) locks what two components together?*

   _____

   _____

4. *What is the purpose of the adjusting levers and the cam disc?* _____

   _____

   _____

5. *Visually identify the coding resistor, why is it necessary?* _____

   _____

6. *When the E83 is placed on a brake analyzer (or dyno), what procedure must be followed for:*

   Manual Transmission _____

   Automatic Transmission _____

7. *The VGSG regulates the* _____

   and receives information on the required locking pressure from the _____

8. *When the multi-disc clutch is not engaged, the E83 will always be driven by* _____

   _____

   Why? _____

   _____

Workshop Exercise - xDrive on Vehicle

With the Instructor's assistance, perform the following:

1. *With the E83 placed securely on a vehicle lift and all 4 wheels off of the ground, start the engine and place the vehicle in a forward gear.*

   Manual Transmission: release clutch pedal and observe which wheels are being driven_____. Now press down on the accelerator pedal (slightly), what do you observe or feel? _____

   _____

   Automatic Transmission: release brake pedal and observe which wheels are being driven_____. Now press down on the accelerator pedal (slightly), what do you observe or feel? _____

   _____

   Based on your observations, explain why this occurs: _____

   _____

   _____

2. *Apply the parking brake (completely). Start the engine and place the vehicle in a forward gear.*

   *Manual Transmission: release clutch pedal, what do you observe?*_____

   _____

   *Automatic Transmission: release brake pedal and press down on the accelerator pedal (slightly), what do you observe?*_____

   _____

   Based on your observations, explain why this occurs: _____

   _____

   _____

3. *Is DSC braking application required to transfer drive torque from the rear output to the front output?*_____

4. *DSC braking application takes place to provide:* _____

   _____

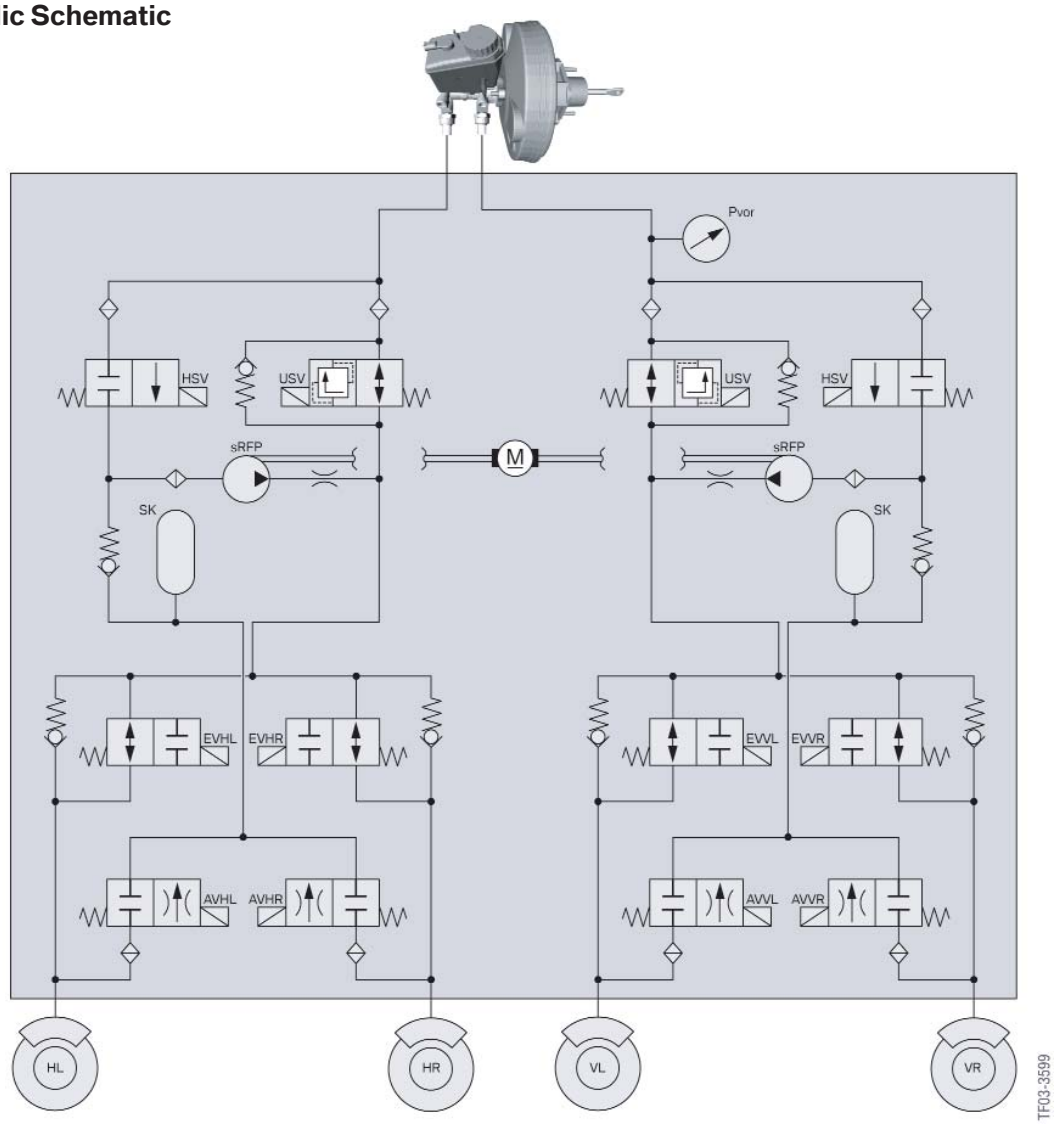
   _____

xDrive / DSC - System Components

The xDrive / DSC system consists essentially of those components from the familiar DSC8. The controllable multi-disc clutch in the transfer case is a new feature.

- DSC8 module
- Transfer case electronic control unit (VGSG)
- Yaw and transversal acceleration sensors
- Wheel speed sensors
- Pressure sensor
- Steering angle sensor
- Brake fluid warning switch
- Brake light switch
- DSC button
- Transfer case motor position sensor
- Coding resistor
- Transfer case servomotor

Hydraulic Schematic



DSC Module

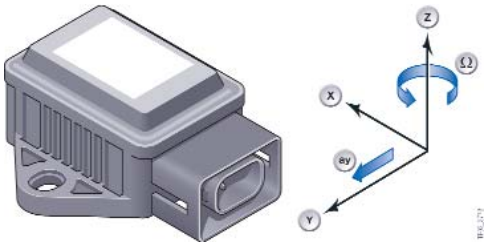
The DSC module located in the engine compartment consists primarily of the following three components:

- Surface mounted control unit
- Valve block with integrated pressure sensor
- Pump motor

It is the same design as the DSC8 module which was introduced at BMW with the E60.

Yaw and Transversal Acceleration Sensors

The sensor (assembly) in the E83 and the E53 MU is located on the transmission tunnel at the rear.



X Longitudinal vehicle axis
Y Transversal vehicle axis
Z Vertical vehicle axis
ay Transversal acceleration
Ω Yaw

Wheel Speed Sensors

The active wheel speed sensors require a supply voltage for operation and output a signal of non speed dependent constant amplitude.

1. Sensor ring (ferromagnetic wheel bearing seal carrier)
2. Sensor IC with Hall elements
3. Sensor housing

The xDrive uses wheel speed sensors with an integrated evaluation circuit. The output signal is transmitted with the pulse width modulation (PWM).

The rising signal edge is used to determine road speed; the pulse width contains additional information on the direction of rotation, standstill detection, installation position detection and air gap reserve to the sensor ring. Direction of rotation detection is by the internal Hall sensor signals (like E65).

xDrive / DSC System - Principle of Operation

As featured in earlier DSC modules, the DSC8 mounted control unit also features two microprocessors. The surface mounted control unit also incorporates two semiconductor relays:

- One for the pump motor
- One for the solenoid valves

When a speed of 6 km/h (4mph) is exceeded, an electronic self-test is started which the pump motor and all the solenoid valves are briefly activated. When the brake light switch is activated simultaneously at that speed (for example: two footed drivers), the self-test is carried out at 15 km/h. Checking of the wheel speed signals is started at 2.75 km/h.

In the xDrive, the DSC also assumes the function of calculating the locking pressure for the multi-disc clutch in the transfer case. The locking pressure is set based on the driver's command and regulated as required depending on the driving situation.

The locking pressure produces the distribution of driving torque to the front and rear axles. The DSC sends the required locking pressure request to the VGSG via the PT-CAN Bus.

In turn, the VGSG signals the locking pressure actually set depending on:

- Transfer case fluid temperature (calculation based on locking pressures)
- Electric motor loads
- Multi-disc clutch loads

System Functions

The xDrive / DSC system comprises the following functions (same as E60 or E53 except for *):

DSC:

- ABS Antilock Braking System
- ASC-X Automatic Stability Control X *
- DSC Dynamic Stability Control
- EBV Electronic brake-force distribution
- DBC Dynamic Brake Control
- CBC Cornering Brake Control
- MSR Engine drag-torque control
- HDC Hill Descent Control
- ADB-X Automatic Differential Brake *

xDrive:

- TCC Transfer Case Control (previously covered)

ASC-X / ADB-X

Unlike regular road vehicles, SAVs are also meant to demonstrate satisfactory handling characteristics and appropriate traction on unconventional roads. In order to provide optimum propulsion with sufficient cornering stability on both normal roads and other road surfaces, Automatic Stability Control X (ASC-X) contains a detection function to distinguish between them.

When off-road terrain is detected, wheel slip threshold is increased to provide sufficient traction force with the increased levels of traction loss.

ASC-X is supplemented by the Automatic Differential Brake (ADB-X) function, which applies the brakes to the wheels per axle, for side to side torque transfer. For example, when a wheel is spinning on one side (up to the slip setpoint), the brakes are applied to that wheel and the driving torque is transferred through the axle differential to the wheel with the higher traction. This provides superb capabilities when there are diagonal traction losses (ie. left front/right rear).

ADB-X remains active when DSC is deactivated. Furthermore, ADB-X can develop full capability because the engine power is not reduced, even during extreme four wheel drive operation. Only that wheel which has a low traction receives the brake application.

The brake disc can overheat with excessive ADB-X intervention with DSC deactivated. In this situation, the operation is discontinued at a disc temperature of approx. 700 °C and is resumed when this temperature drops below approx. 400 °C. This is a calculation performed by the DSC control unit based on brake application time, pressure, wheel speed, etc.

Limp Home Operation

In order to maintain the four wheel drive function for as long as possible even in the event of important sensor signal failures or failure of the DSC control unit, a limp home control is integrated in the transfer case control unit. This control operates in redundancy to the transfer case clutch control in the DSC control unit. The limp home control contains only two control functions, precontrol and traction-slip control.

The wheel speed signals are very important to traction/slip control. Engine signals, steering angle and yaw are used predominantly for precontrol. If individual sensor signals fail, substitute values are calculated and the relevant functions operated with extended control thresholds.

This strategy is continued until useful four wheel drive control is no longer possible. In this event, the driver is alerted by the DSC/xDrive lamp coming on in the instrument cluster and also by an acoustic warning signal (gong).

Faulted wheel speed signals on the rear axle are calculated by driving or engine speed (remember, the rear wheels are always driven). If the front wheel speed signals fail, the values of the rear axle are adopted. Wheel speeds also substitute for a faulty steering angle signal.

Warning Indicator Lamps

The warning indicator lamps for the xDrive / DSC are found in the instrument cluster as shown on the right.

The warning indicator lamps and acoustic signals (gong) are assigned to the xDrive / DSC system states of malfunction described below.

DSC deactivated	no gong	
DSC faulty (ABS only) or VGSG faulty	with gong	
Complete DSC failure or Complete DSC failure and VGSG failure	with gong	

Workshop Hints

CAUTION!!!

On a vehicle equipped with an automatic transmission, when driving onto brake analyzers, move the selector lever to the "N" position . On a vehicle equipped with a manual transmission, do not press the accelerator pedal once on the brake analyzer. This keeps the transfer case clutch open and the vehicle cannot be pulled off the analyzer.

Towing: Use only a flatbed carrier!

Transfer Case Oil and Monitoring

Please refer to BMW Operating Fluids for the required transfer case oil and specifications for the correct amount.

Oil Monitoring is performed by the VTG control module to determine when a service (change) is due. The VTG calculates transfer case and clutch wear based on the amount of slip, engagement pressure (torque), speed and mileage.

This calculation accounts for normal "dry" road driving, "adverse" road driving and "other" road extreme driving. Depending on individual vehicle use - driving styles and driving conditions, the transfer case oil service interval will vary.

When a service is due, this will be indicated by a Fault Code and additional details are available using the DISplus/ GT1. Service functions provide directions on changing the transfer case oil and updating the VTG control module with the necessary reset and adaption procedure. This is extremely important for CBS.

Diagnosis

Diagnosis is available for fault repairs and service procedures using the DSIplus/GT1. When the tire tolerance logic is active, it can be read out in the fault memory.

Programming (flashing)

Both the transfer case control unit (VTG) and the DSC control unit are programmable and the new control unit(s) must be programmed when replaced. The wear values stored in the VTG control module (to be replaced) must be transferred to the replacement VTG.

Workshop Exercise - VTG Inputs/Signals

1. *Using the DISplus/GT1, perform an automatic vehicle determination and locate the transfer case (transmission) control.*
2. *For the vehicle you are using, list the power supply sources and locations (power distribution, fuse box, etc.):* _____

   _____

   _____

3. *What are the connector and pin numbers for the Coding (classification) Resistor? Connector:* _____ *Pins:* _____
4. *Disconnect the harness connector at the VTG and perform a resistance measurement of the Coding Resistor. What is the value?* _____
5. *With the DISplus/GT1, access VTG - "Diagnosis Control unit functions". Select Diagnosis requests, Control module - Battery voltage to transfer case and Coding status. What values are displayed?* _____ _____

Additional Information:

6. *With the DISplus/GT1, access VTG - "Diagnosis Control unit functions". Select Diagnosis requests, Transmission, Transmission integrator 1 and Transmission integrator 2. Select Display.*

   These are kW hours of wear on the transfer case calculated by the VTG control module (based on wear factors, refer to page 22).

   Now select Clutch, Plate integrator 1, 2 and 3. Select Display.

   These are kW hours of wear on the multi-disc clutch calculated by the VTG control module (based on wear factors, refer to page 22). These are deleted during a control module reset (oil service procedure).

Notes:

Workshop Exercise - VTG Outputs/Signals

1. *Using the DISplus/GT1, locate the wiring diagram for the transfer case control.*
2. *What are the connector and pin numbers for the servomotor (actuator)?*

   Connector: _____ *Pins:* _____
3. *Disconnect the harness connector at the VTG and perform a resistance measurement of the servomotor "drive motor" (inside the actuator). What is the value?* _____
4. *Reconnect the harness, and measure the voltage applied to the drive motor:*

   With key on (KL15) _____

   Engine started _____

   Raise vehicle on lift, place in a forward gear and accelerate slightly. _____

   Set up a scope pattern and repeat the step above, what do you observe?

   _____

   Record the duty cycle (%) while repeating the step above _____
5. *With the DISplus/GT1, access VTG - "Diagnosis Control unit functions". Select Diagnosis requests, Servomotor, Current consumption, Angle of rotation actual value and Display.*

   Start engine and record readings _____ _____

   Place vehicle in a forward gear and accelerate slightly _____ _____

   Now select Diagnosis requests, Clutch, Nominal clutch torque, Actual clutch torque and Display.

   Start engine and record readings _____ _____

   Place vehicle in a forward gear and accelerate slightly _____ _____
6. *With the Diagnostic head connected, ignition "on" (KL15), parking brake "released" and transmission in "neutral", raise the vehicle on the lift.*

   With the DISplus/GT1, access VTG - "Diagnosis Control unit functions". Select Component activation, Servomotor and clutch.

   Turn one front wheel by hand (slowly) and have a colleague select "Activate" while continuing to turn the front wheel steadily. What did you observe?

   _____

   _____

Workshop Exercise - VTG Service/Repairs

1. *Using the DISplus/GT1, locate Service functions for the transfer case (transmission control) VTG.*
2. *What procedures appear in the Components column?* _____

   _____

3. *Select the Oil change service path, what component is "adapted" during this procedure?* _____
4. *Select the Repair service path, what "selections" are available?*

   _____ _____ _____

   _____ _____ _____

5. *When you select [3] Replace transfer case, does "Adaption" occur during this procedure?* _____
6. *When you select [4] Replace VTG control, what values are read out during this procedure?* _____

   What procedure must be performed with the values? _____

   _____

7. *When you select [5] Enter wear values in new VTG control, what does this procedure prompt you to do?* _____

   What is provided on screen for you to accomplish this? _____
8. *Return to the main component selection column and select Complete vehicle, Drive, Transmission control VTG, Transmission oil and Test plan.*

   Does "Adaption" occur during this procedure? _____

   Is there an on screen indication about the condition of the transfer case oil? _____

   If yes, what is displayed? _____

   _____

   _____

Table of Contents

E83 Drive

Subject **Page**

Initial Print Date: 10/03 Revision Date:

Drive

Model: E83/ E53 MU (Model Update)

Production: E83 - Start of Production MY 2004
E53 MU - 9/03

OBJECTIVES

After completion of this module you will be able to:

- Describe the drive train modifications in the E83
- Locate and access the fuel system serviceable items
- Diagnose the fuel delivery and evaporative containment systems
- Visually identify the rear driveshaft variants
- Explain the difference between the left and right rear output shafts

Purpose of the System

Drive

The E83 is available with the following engine and transmission variants in the US market:

Engine	Manual Transmission	Automatic Transmission	Transfercase	Final Drive
M54B25 M54B30	GS6X37BZ	GA5R390R	ATC400	188K i = 3.64 (man. and auto.)

The vehicles are all fitted with the VAG 174 front axle drive.

Drive Modifications

Please reference to ST045 E85 and ST046 E60 Training Handouts for additional details on the M54 engine and MS45.0/MS45.1 Engine Management systems.

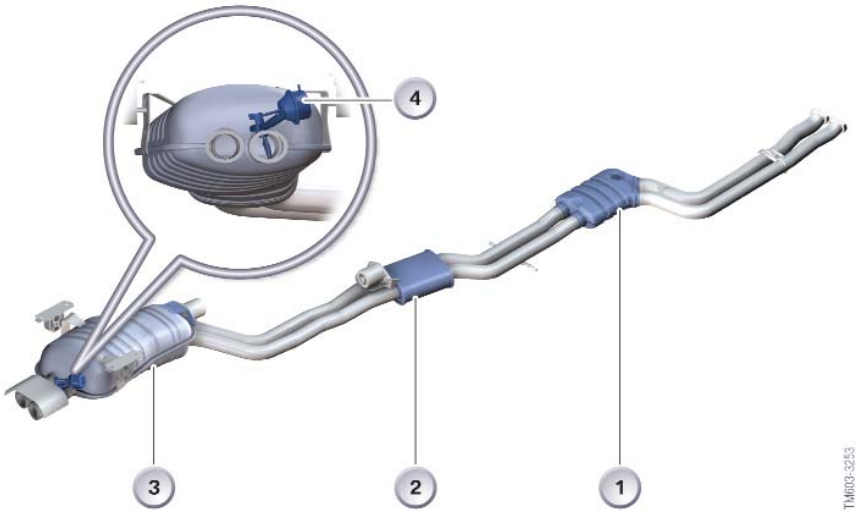
The following modifications have been made to the engine for use in the E83:

- Modified Belt Drive - the position of the deflection pulley on the alternator (150 A Bosch/Valeo) has been modified slightly.
- M54B25 manual and automatic transmission and M54B30 manual transmission equipped vehicles use Siemens MS45.0 engine management system. This system is LEV emission compliant.
- M54B30 automatic transmission equipped vehicles use Siemens MS45.1 engine management system. This system is ULEV II emission compliant.

Exhaust System

The following exhaust system is used at the start of E83 series production:

1. Front silencer
2. Center silencer
3. Rear silencer
4. Diaphragm chamber to operate the exhaust flap



The E83 exhaust system is made of stainless steel. The exhaust system connected to the M54 engine is one piece from the exhaust manifolds to the rear silencer (muffler). However, the system is available in sections for service replacement.

As on current BMW M54 engines, each exhaust manifold is equipped with metal base catalytic converters, 2 pre-catalyst and 2 post catalyst oxygen sensors.

The rear silencer is equipped with an exhaust flap (similar to the E46). It reduces noise in the lower engine rpm range. The exhaust flap is operated by a Diaphragm (4). It is controlled by a solenoid valve, which is controlled in turn by the ECM (DME). The rear silencer has an 18.5 liter volume.

Cooling System

This section describes the cooling module installed in the E83 in conjunction with the M54B25 and M54B30. The following components of the cooling module were adopted from the E46 and E85:

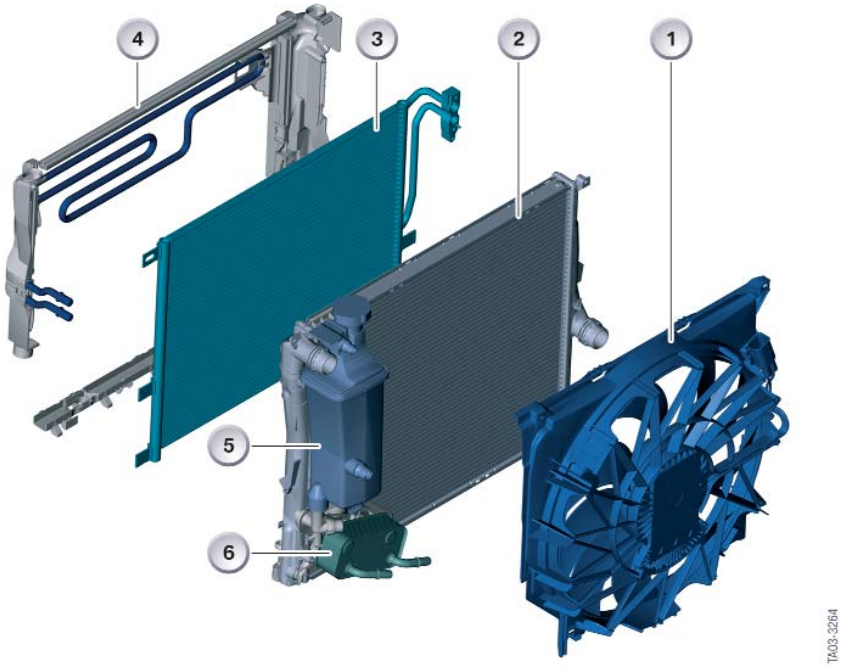
- Module carrier
- Fan
- Transmission oil cooler (oil-water heat exchanger)
- Expansion tank

The following components were physically modified for use in the E83:

- Radiator - performance increased
- Fan shroud
- A/C condenser - performance increased
- PS cooler - performance increased

Cooling Module Components

1. Electric fan (600 W) and shroud
2. Radiator
3. A/C condenser
4. P/S cooler (hose loop)
5. Expansion tank
6. Automatic transmission cooler (heat exchanger)



E83 Fuel System Modifications

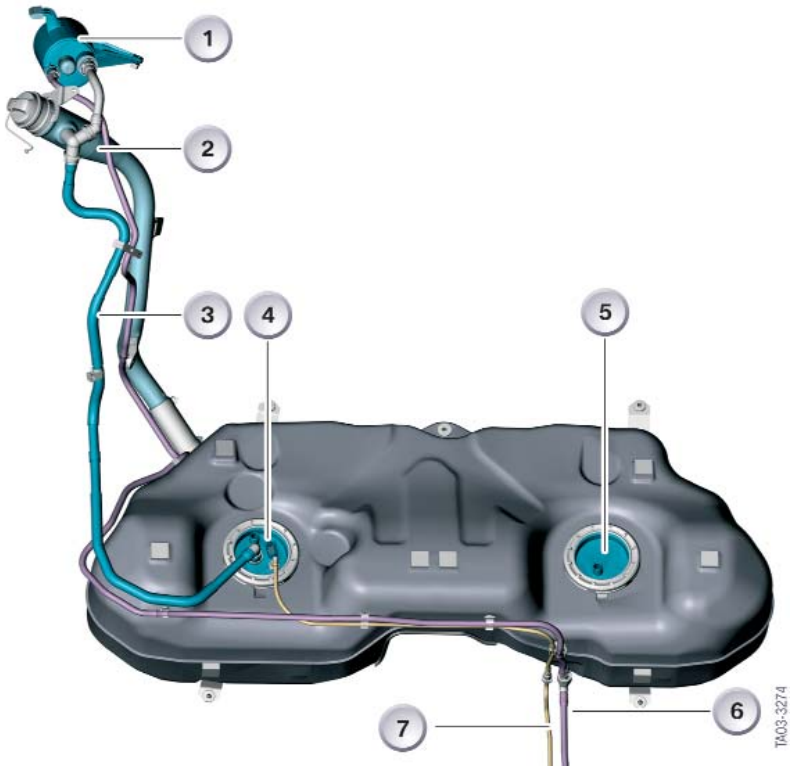
To comply with ever increasing emissions laws, the E83 fuel system has a further decrease in the number of openings and ports over previous series production. On the E83, the filler valves and service breather valves are completely encapsulated by the fuel tank.

The only ports/openings except the fuel filler neck are located in the two service access cover plates.

Components

The fuel tank is located above the drive shaft in front of the rear axle (similar to E46) and is secured by two tensioning straps. The fuel tank capacity is 67 liters, including 8 liters of reserve fuel. It is made of plastic (multi-layer HDPE) with an intermediate layer (barrier layer).

Access to the fuel filter, pressure regulator, the two fuel level sensors and the electric fuel pump are through the two service access covers. The fuel filler neck is secured to the right hand side of the fuel tank with hose clamps.



1. Activated charcoal filter with DM TL
2. Filler pipe
3. Vent line
4. Right service access cover
5. Left service access cover
6. Evaporative purge line
7. Fuel delivery line

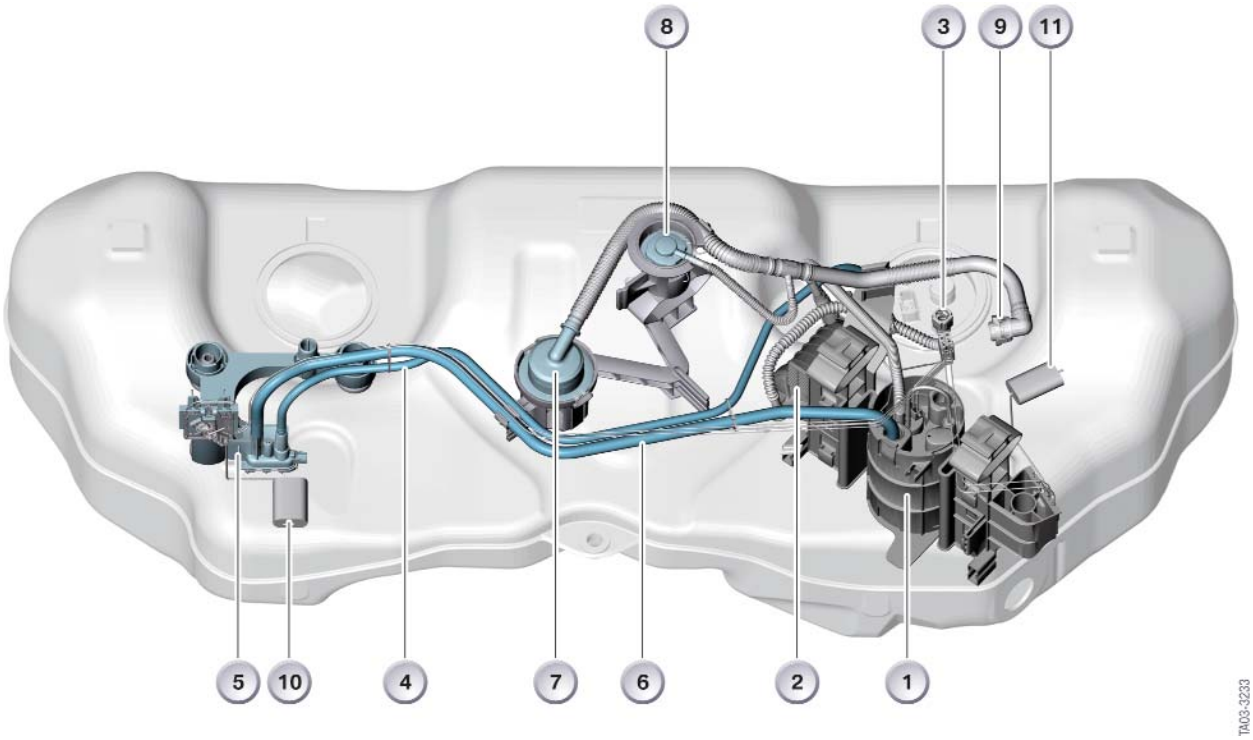
The fuel delivery unit comprises the following components in the right hand side of the fuel tank:

- Fuel baffle with electric fuel pump and right hand suction-jet pump
- Right hand fuel level sensor
- Fuel filter with pressure regulator.

In the left hand side of the fuel tank:

- Left hand fuel level sensor
- Left hand suction-jet pump

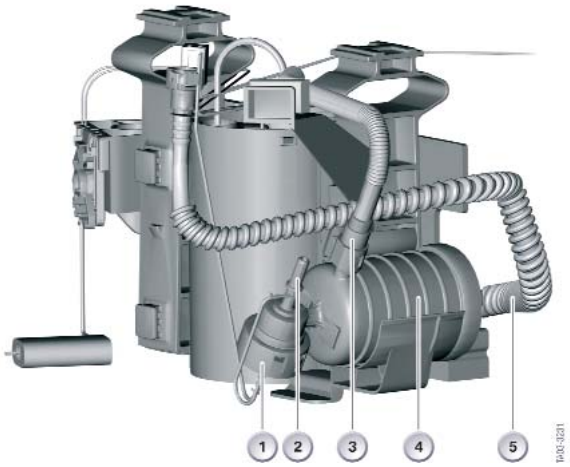
The components are accessible through the two service access covers.



1. Fuel baffle chamber with electric fuel pump (EKP)
2. Fuel filter with pressure regulator (3.5 bar)
3. Fuel feed (port in the service access cover)
4. Return flow from the pressure regulator for the left hand suction-jet pump
5. Left hand suction-jet pump
6. Return flow from the left hand suction-jet pump into the fuel baffle chamber
7. Filler breather valve
8. Service breather valve
9. Vent line (port in the service access cover)
10. Left hand fuel level sensor
11. Right hand fuel level sensor

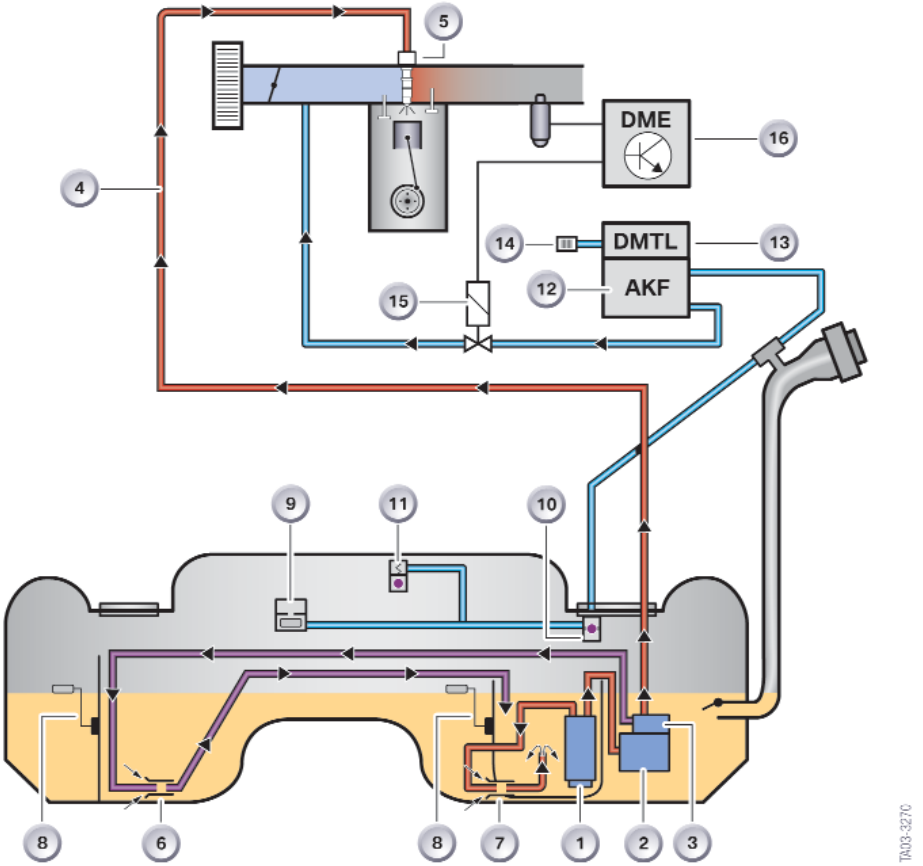
The fuel filter and the pressure regulator form one component, the pressure regulator for the M54 engines are 3.5 bar.

The fuel filter is replaced together with the pressure regulator for service repairs.



1. Pressure regulator
2. Port for return line
3. Supply from the electric fuel pump (EKP)
4. Fuel filter
5. Supply to fuel rail

Fuel System Overview



1. Electric fuel pump (EKP)
2. Fuel filter
3. Pressure regulator **(3.5 bar)**
4. Delivery line
5. Fuel injector
6. Left hand suction-jet pump
7. Right hand suction-jet pump
8. Fuel level sensor
9. Filler breather valve
10. Roll over valve
11. Service breather valve
12. Activated charcoal filter (AKF)
13. Diagnostic module for tank leakage (DMTL)
14. Dust filter
15. Tank ventilation valve (TEV)
16. ECM (DME)

Fuel Delivery

The fuel is supplied to the engine from the fuel tank as follows:

- From the right hand half of the fuel tank
- Through the non-return valve inside the fuel baffle chamber (only for initial filling of the fuel baffle)
- Into the fuel baffle chamber
- Pumped out by the electric fuel pump (EKP)
- Into the fuel filter
- Through the line in the right hand service access cover to the engine
- Pumped out by the electric fuel pump in parallel through a separate fuel line to the right hand suction-jet pump, then from the right hand half into the fuel baffle (level increase)

Fuel Pressure Regulation

With pressure regulation, fuel is fed through the fuel tank as follows:

- Fuel pressure controlled by the pressure regulator (3.5 bar)
- To the suction-jet pump in the left hand half of the fuel tank
- Into the fuel baffle chamber

At the same time, the suction-jet pumps draw the fuel from the right and left hand sides of the fuel tank. This ensures that the fuel baffle and the electric fuel pump are supplied with fuel at all times.

Filler Venting

To provide filler venting, there is a breather unit in the fuel tank consisting of a service breather valve (11) and filler breather valve (9). There is also a roll over valve (10) on the right hand service access cover. The filler breather valve allows air and fuel vapors to escape from the fuel tank when the vehicle is refuelled (venting).

When the vehicle is refuelled, the air and fuel vapors vent via:

- The filler breather valve
- Through the vent line
- To the roll over valve
- Through the T-fitting on the fuel filler neck
- Into the activated charcoal filter

When the maximum capacity is reached, the filler breather valve is closed by the fuel lifting the internal float valve. The fuel level rises in the fuel filler neck and trips the fuel pump nozzle. A vapor barrier (approximately 15 liters) remains in the tank above the filler breather valve after the tank has been filled. This provides internal liquid/vapor separation.

Service Breather Valve
The fuel vapors produced are vented:

- Through the filler breather valve
- Through the service breather valve if the filler breather valve is closed
- To the roll over valve
- Through the vent line
- Through the T-fitting on the fuel filler neck
- Into the activated charcoal filter (AKF)
- Through the evaporative purge line
- Through the evaporative purge valve (TEV)
- To the engine intake manifold

The service breather valve only opens if the filler breather valve is closed (fuel tank full to capacity). The service breather valve location is higher in the tank than the filler breather valve and opens at a pressure of 50 mbar. When the fuel tank is not full, vapors are vented through the filler breather valve.

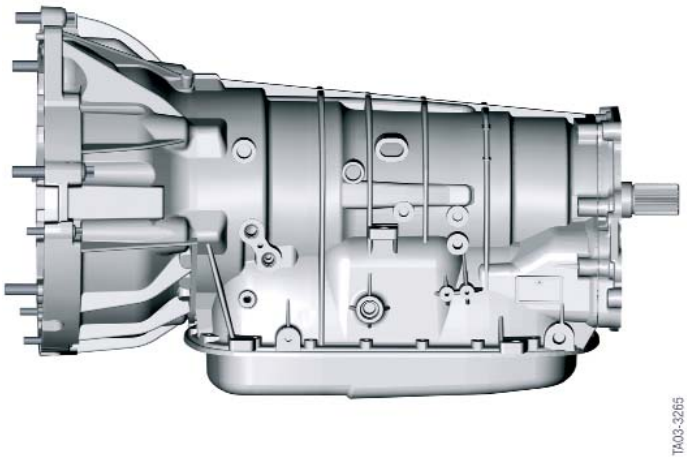
Notes:

Automatic Transmission

The previously used 5-speed GM5 automatic transmission is used in the E83 and E53 MU.

The transmission designation is GA5R390R.

Modifications have been made to the output shaft and tail housing to accommodate the ATC 400/500 transfer case.



Technical Data

Index	Explanation
Type	Automatic gearbox with five forward gears. 5th gear is designed as an overdrive gear.
Power transmission	The maximum torque is 390Nm in 1st/2nd/3rd and 5th gear and 410Nm in 4th gear with the converter clutch closed.
Torque converter	With M54B30 = W245 with controlled converter clutch
Gear ratios	1st gear 3.24 2nd gear 2.22 3rd gear 1.60 4th gear 1.00 5th gear 0.75 Reverse gear 3.03
Selector positions	P-R-N-D and Steptronic
Control	Electrohydraulic with adaptive shift characteristic control
Weight with oil*	77 to 78 kg depending on the version

*** Lifetime oil fill**

Transmission control

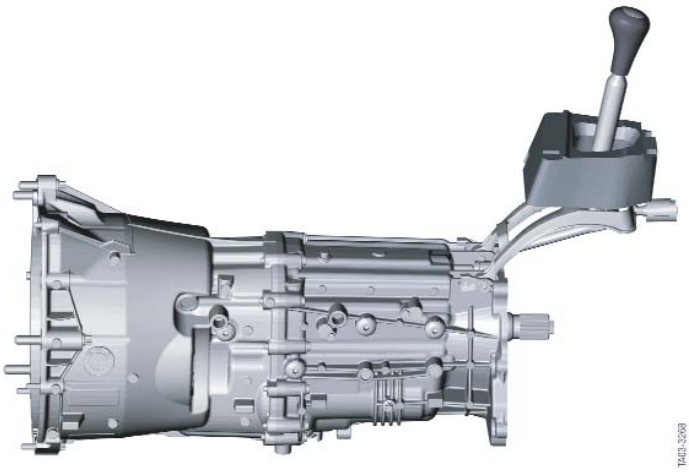
The transmission control has been adopted from the E46. The transmission control unit (GS20 as on E46) is located in the electronics box in the engine compartment and is on the PT-CAN.

Manual Transmission

The 6 speed manual transmission in the E83 and E53 MU was previously used in series production.

The transmission designation is GS6X37BZ (H-gearbox) with the M54 engine.

Modifications have been made to the external gearshift mechanism as well as the output shaft and tail housing to accommodate the ATC 400/500 transfer case.



Technical Data

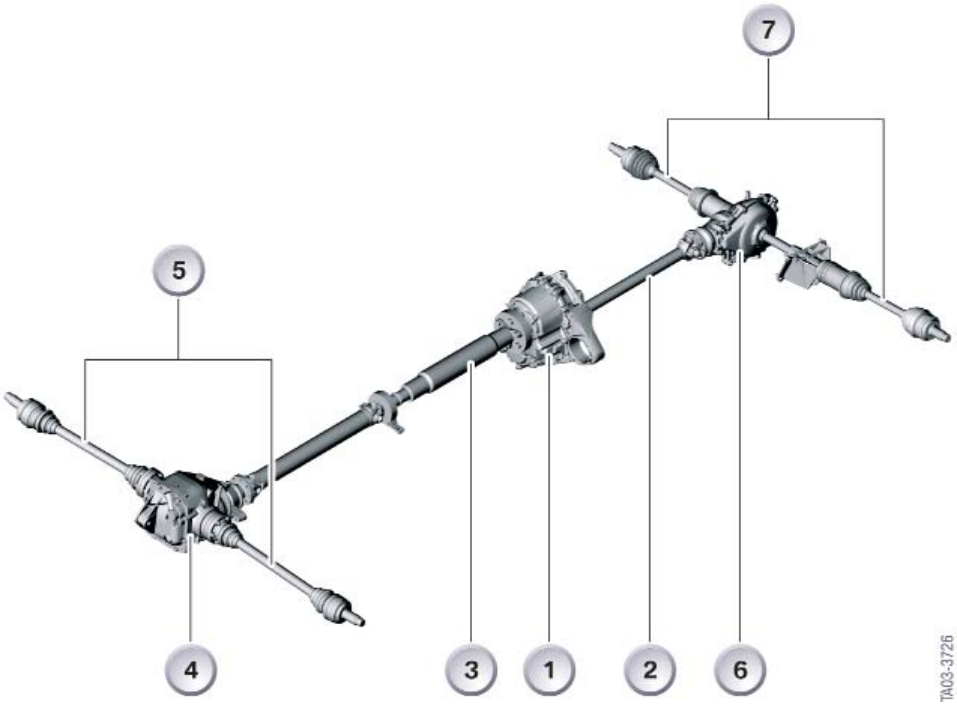
Gear	Gear ratio GS6-37BZ (H-gearbox)
1	4.35
2	2.50
3	1.67
4	1.23
5	1.00 (direct drive)
6	0.85 (overdrive)
R	3.93

*** Lifetime oil fill**

Notes:

Drive Train

The E83 drive train has been largely adopted from the E46/3-16 (3 Series, Touring, all wheel drive).



Components

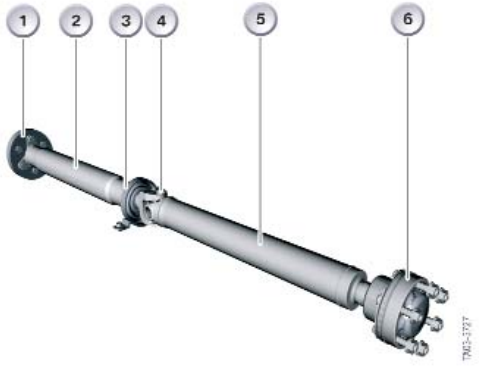
1. Transfer case
2. Front drive shaft
3. Rear drive shaft
4. Final drive
5. Rear output shafts
6. Front axle drive
7. Front output shafts

Rear Driveshaft

The rear drive shaft in the E83 with the M54 engine is a steel universal joint shaft (arrow on the right).

To minimize noise, a constant velocity joint shaft is used in the E53 MU.

1. Flexible coupling
2. Front section of drive shaft (collapsing tube)
3. Center bearing
4. Universal joint
5. Rear section of drive shaft
6. Constant velocity joint

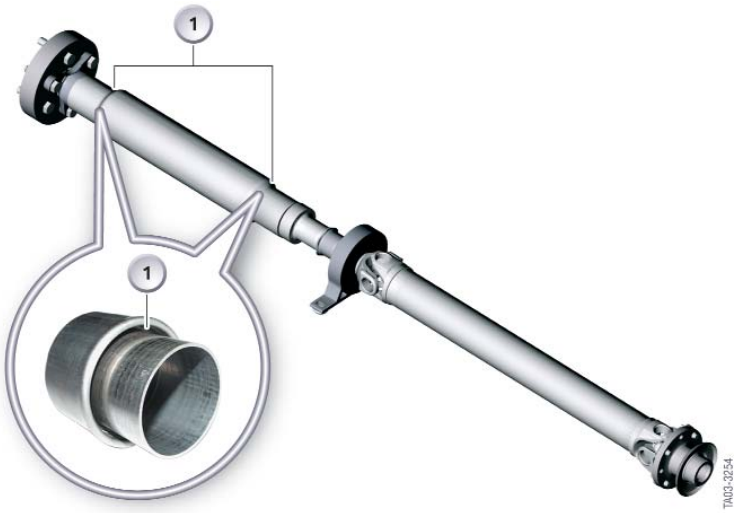


Both style rear drive shafts are equipped with a deforming element.

The front section of the drive shaft is designed as a collapsing tube (1).

When the drive shaft is compressed (collapsed) it absorbs a defined force.

After collision or accident repairs, the drive shafts must always be checked for compression of the collapsing tube (refer to Repair Instructions for additional details).



Note: When the collapsing tube is deformed, the drive shaft must be replaced.

Front Drive Shaft
The front drive shaft connects the transfer case to the front axle drive. It is designed as a one piece section without a center bearing and has two universal joints.

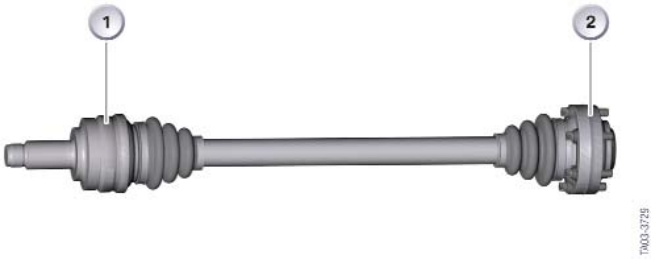
Rear Axle Final Drive
The 188 K (ring gear size) final drive is known from the previous model series productions. The final drive ratio varies depending on the engine/gearbox combination. For the US with M54 engines, the ratio is 3.64:1 for both automatic and standard transmissions.

Front Axle Drive
The vehicles are equipped with the familiar VAG 174 front axle drive, regardless of the engine and transmission variant. The front axle ratio is always identical to the final drive ratio (3.64:1 for US with M54 engines).

*** Lifetime oil fill on both axles**

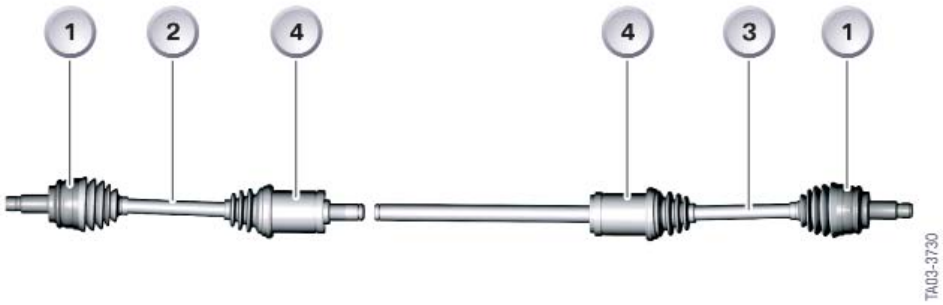
Rear Output Shafts
The rear output shafts have sliding joints for length compensation on both wheel side (1) and axle side (2).

Note: There is a difference in shaft tube length of approximately 54 mm between the right and left output shaft.



Front Output Shafts

The locking angle of wheel side fixed joint (1) is 50°. The axle side joint (4) slides to compensate for differences in length caused by suspension/axle movements.



1. Constant velocity joint (fixed joint), wheel side
2. Front left output shaft
3. Front right output shaft
4. Triple roller joint (sliding joint), axle side

Notes:

Table of Contents

E83 Chassis Dynamics

Initial Print Date: 10/03 Revision Date:

Chassis Dynamics

Model: E83

Production: Start of Production MY 2004

OBJECTIVES

After completion of this module you will be able to:

- Visually identify the suspension components that are unique to the E83
- Describe the steering system mechanical/hydraulic components
- Demonstrate how to access, remove and install the spare wheel
- Explain how to initialize RDW

Purpose of the System

E83 Chassis Dynamics

As with all BMW vehicles, the X3 chassis and suspension was designed with particular emphasis on driving pleasure, dynamics and favorable handling.

The main aim in the full development of the X3 was to achieve:

- Agility on the road
- Driving dynamics
- Stability
- Traction

The front axle is a double joint spring strut axle with tension arms and a rack and pinion steering system with hydraulic power assist. Conventional rack and pinion power steering is installed to the E83 as standard. Servotronic is available as an option. Spring struts with coil springs and twin tube gas-pressure dampers are used on the front axle. It is similar the front axle of the E53.

The rear axle design is based on the E46/16 with barrel springs and separate twin tube gas-pressure dampers.

The brake system is a hydraulic dual-circuit brake system with "front/rear split" vacuum boost power assist and EBV. The parking brake actuating unit is located in the center console and is equipped with an automatic cable adjuster (ASZE) and a compensating element.

Several different wheel and tire combinations are available for the E83. The spare wheel (steel) is located in a special bracket under the luggage compartment floor in the rear. The tire deflation warning (RDW) is a standard feature on the E83.

System Components

Front Axle

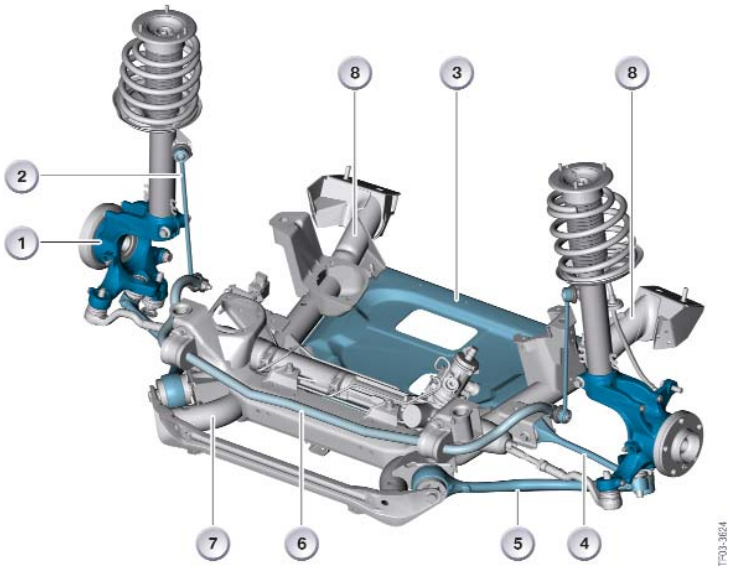
Specific components in the E83 (subject to additional load) are designed as forged steel parts.

- Control arms: forged steel with rubber mount
- Tension arms: forged steel with hydraulic bushing
- Swivel bearing: forged steel, track arm forged on

A reinforcement plate (thrust panel) is bolted to the front axle carrier. This makes a contribution to the rigidity of the front structure and suspension. There are two recesses in this thrust zone for accessibility to the engine oil drain plug (rectangular recess on 6 cylinder engines).

Mechanical Components

1. Swivel bearing
2. Anti-roll bar link (attached to strut tube)
3. Thrust panel
4. Control arm
5. Tension arm
6. Anti-roll bar
7. Front axle carrier
8. Axle carrier rear mounts



Technical Data

Wheels	7Jx17	8Jx17	8Jx18
Tires	215/60	235/55	235/50
Rim offset (mm)	39	46	46
Track width (mm)	1,537.7	1,523.7	1,523.7
Total toe-in	6° ± 10'	6° ± 10'	6° ± 10'
Min. camber	-20' ± 20'	-20' ± 20'	-20' ± 20'
Camber differential angle	max. 30' left to right	max. 30' left to right	max. 30' left to right
Caster offset (mm)	25.79	25.79	25.79
Kingpin offset (mm)	-0.88	-7.88	-8.53
Toe difference angle	2° 16' ± 30'	2° 16' ± 30'	2° 16' ± 30'
Steering axis inclination angle	12° 41' ± 30'	12° 41' ± 30'	12° 41' ± 30'
Caster angle	5° 47' ± 30'	5° 47' ± 30'	5° 47' ± 30'
Caster angle differential	max. 30' left to right	max. 30' left to right	max. 30' left to right
Maximum steering angle	internal 38° external 31°	internal 38° external 31°	internal 38° external 31°

Workshop Hints

Alignment and Camber Adjustment
Toe-in adjustment is performed at the tie rods. If necessary, the camber is corrected by driving out the pin on the strut tower (spring cup).

Strut Replacement
When replacing the strut, the mounting on the swivel bearing must be expanded with a special tool.

Spring Replacement
There are new spring tensioners to be used during spring replacement. Refer to Repair Instructions for detailed information about special tools.

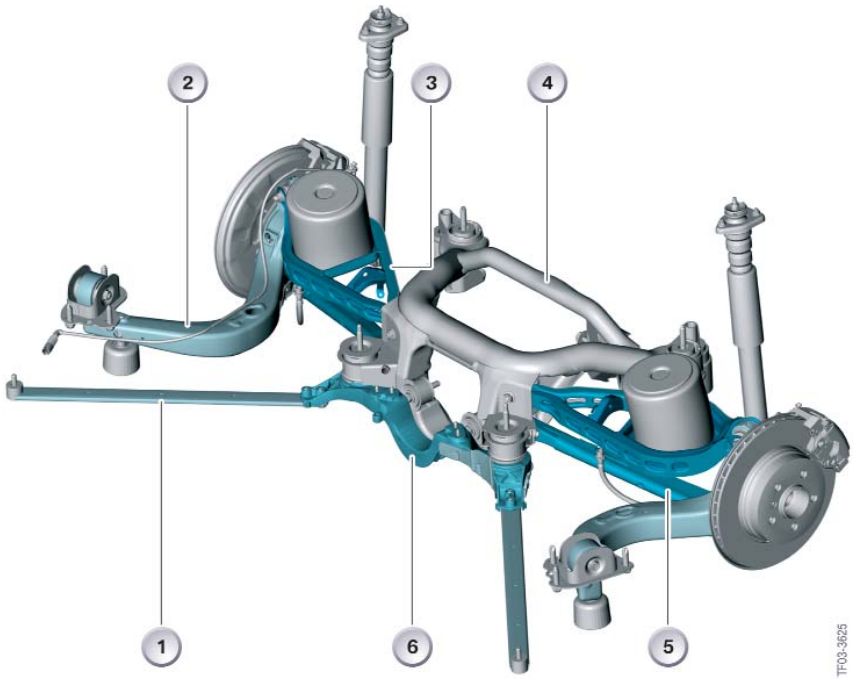
Reinforcement Plate
The vehicle must not be driven without the reinforcement plate in place. The reinforcement plate ensures the transversal rigidity and contributes to the strength of the front axle.

Rear Axle

The E83 is fitted with a central rear axle and subframe. The design of the rear axle is similar to the E46/16. Two tension arms have been added to the rear axle of the E83 and are secured to the bodyshell.

Mechanical Components

1. Tension arm
2. Trailing arm
3. Upper control arm
4. Rear axle bracket
5. Lower control arm with plastic cover
6. Thrust brace



Modifications to the E46/16 rear axle to adapt it to the E83:

- Anti-roll bar secured to the rear axle carrier by clamps.
- Front of rear axle carrier suspension converted to special bolts with additional thrust washer.
- Thrust brace and tension arms.
- Surface of control arms are galvanized steel plates.
- Anti-roll bar link with ball joint attached directly to the control arm.
- Dampers with three point flange (bolt) plate.

Technical Data

Wheels	7Jx17	8Jx17	9Jx18
Tires	215/60 R17	235/55 R17	255/45 R18
Rim offset (mm)	39	46	51
Total track width (mm)	1,611	1,611	1,611
Total toe-in	6° ± 8'	6° ± 8'	6° ± 8'
Camber	-2° ± 15'	-2° ± 15'	-2° ± 15'
Thrust angle	0° ± 4'	0° ± 4'	0° ± 4'

Workshop Hints

Adjustment of Rear Wheel Alignment

Rear wheel alignment is adjusted by a special tool on the lower trailing arm (refer to Repair Information for additional details. The camber is adjusted by an eccentric element on the lower control arm at the axle carrier connection.

Lowering (removing) the Rear Axle

The handbrake cables (routed through the rear axle carrier and the body console) must be disengaged before the rear axle is lowered. This is to prevent shearing of the hand-brake cables.

Brakes

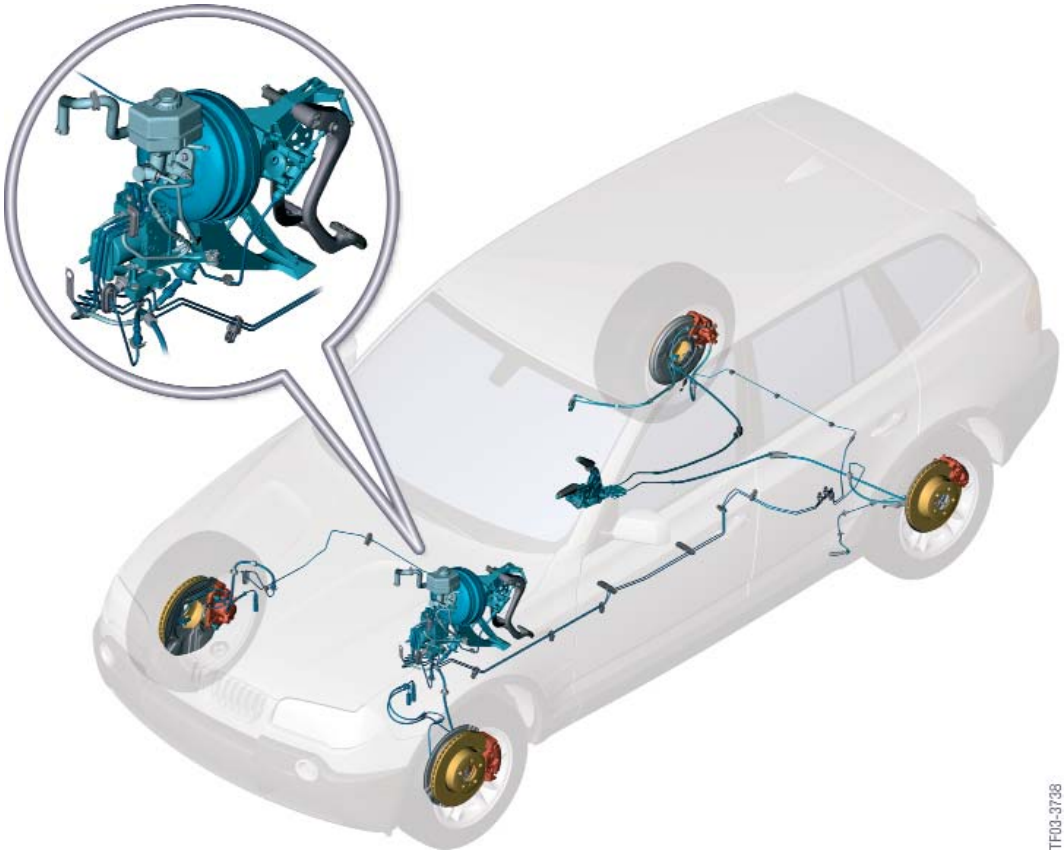
The brake system is a hydraulic dual-circuit brake system with "front/rear split", vacuum boost power assist and EBV. One brake circuit each for the front and rear axles. The parking brake actuating unit is located in the center console and is equipped with an automatic cable adjuster (ASZE) and a compensating element.

The advantages of the parking brake with automatic cable adjuster are:

- The 2 cables no longer have to be adjusted during installation.
- Cable extensions (cable conduit) contractions over the operating time are automatically compensated so that the parking brake lever travel is consistent.
- Prestretching of the cables is no longer necessary.
- The parking brake does not have to be adjusted at the end of the assembly line and in the service department.
- Note: color coded handbrake cables (left/right different part numbers).

Mechanical Components

The brake system consists of the following components:



Four Wheel Hydraulic Disc Brakes

The front brakes are constructed of ventilated brake discs 325mm diameter x 25mm thick (Geomet coating) with FN57/25 single piston floating calipers.

The rear brake brakes are constructed of ventilated brake discs 320mm diameter x 22mm thick (Geomet coating) with FN42/22 single piston floating calipers.

Hydraulic Unit with Vacuum Brake Booster and DSC Hydraulic Module

The hydraulic unit is located at the front on the left hand side under the main brake cylinder. The electric precharging pump is no longer required. All vehicles are equipped with an 8"/9" tandem brake booster and have a tandem brake master cylinder. The DSC hydraulic module is a DSC8 system.

Foot Controls with Brake and Clutch Pedals

The essential components of the foot controls are:

- Pedal mounting block
- Brake pedal
- Clutch pedal
- Clutch master cylinder

The pedal mounting block is made of aluminum and is bolted to the bulkhead. The vehicle has a wide steel brake pedal. The clutch pedal is made of plastic.

Parking Handbrake Lever, ASZE, Cables and Duo-Servo Brakes.

The duo-servo brakes are similar to the duo-servo brakes on the E65 and E53 (185mm diameter x 30mm wide).

The handbrake lever is bolted to the floor pan and is equipped with an automatic cable adjuster (ASZE) and a compensating element. Refer to ST045 E85 or ST047 E60 Technical Training handouts for additional details on deactivating and activating this unit.

Workshop Hints

Changing Cables

If there is a broken cable, the automatic cable adjuster is in the untensioned position. To replace the cables, it is necessary to remove the center console and the rear compartment ventilation ducts. For the cables to be removed or parking break shoe replacement, the parking-brake lever **must** be in the released position and the ASZE unit must be deactivated. Refer to the Repair Instructions or ST045 E85, ST047 E60 Technical Training handouts for additional details.

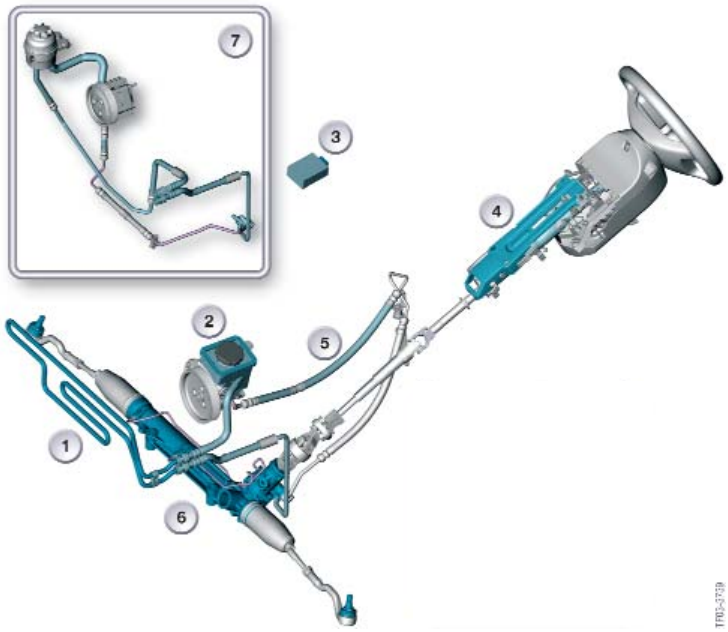
Steering

Conventional rack and pinion power steering is used in the E83 and Servotronic is available as an option. The design and functioning principle of the Servotronic option are nothing new but have been modified as described in this chapter.

The servotronic steering system controls the amount of power assistance based on the current road speed. The hydraulic pressure is electronically adapted to the current road speed, with greater power assistance available at lower road speeds and less power assistance available at greater road speeds.

Mechanical/Hydraulic Components

1. Power-steering cooler
2. Hydraulic pump with supply reservoir (M57TU, diesel)
3. Servotronic control unit
4. Upper steering column assembly
5. Flexible hoses
6. Steering gear
7. Hydraulic pump with separate supply reservoir (M54B25 and M54B30)



The E83 is equipped with hydraulic assisted rack and pinion steering. The total ratio of the steering is: 18.9 : 1. The total rack stroke is 81.0 mm (1.7 turns of the steering wheel). The hydraulic ports on the steering gear have quick release couplings. The hydraulic pump maximum pressure is limited to 127 bar.

E83 vehicles are equipped with “W” shaped cooling loops (hoses) to assist in cooling.

CAUTION!!!

The hydraulic pump does not have a pump end shutdown feature. The hydraulic pump could be damaged after approximately 1 minute if the steering is kept on full lock (end stop) for a long period.

Wheels and Tires

Several different wheel stylings are available. Different 17" wheel stylings are standard equipment. Other 17" and 18" wheels are available as options, depending on the type of engine.

A compact wheel (spare/emergency wheel) is standard, regardless of the vehicle version.

The tire deflation warning (RDW) is a standard feature. The RDW function is integrated in the DSC control unit.

The following wheel/tire combinations are available for US models:

2.5Liter Engine (optional for 3.0 Liter)

- 8.0Jx17 EH2 IS46* (shown to the right)
- 235/55 R17 LI 99** tires
- A/S
- H-rated tires, M+S

3.0 Liter Engine (optional for 2.5 Liter)

- 8.0Jx17 EH2 IS46* (shown to the right)
- 235/55 R17 LI 99** tires
- A/S
- H-rated tires, M+S

Optional (for 2.5 and 3.0)

- 8.0Jx18 EH2 IS46* (shown to the right)
- 235/50 R18 LI 97** tires
- A/S
- H-rated tires, M+S

Optional (for 2.5 and 3.0)

- 8.0Jx18 EH2 IS46* (shown to the right)
- 235/50 R18 LI 97** tires
- A/S
- H-rated tires, M+S

* IS = insert size
** LI = load index
A = all season tires
S = summer tires

The spare/emergency wheel (compact wheel) is standard equipment. The E83 has a special bracket for the compact wheel which is located in the vehicle floor under the luggage compartment and is operated from inside the vehicle.

The release knob is located under the luggage compartment floor covering next to the tool kit.

The compact wheel is a 4Bx17 IS18 steel wheel with T135/90 R17 104 M tire.

The compact wheel bracket has a special service access cap (1) to check the tire pressure without having to lower the bracket/wheel.

Tire Deflation Warning (RDW)

The RDW function is integrated (and diagnosed) in the DSC control unit. The system uses the rotation speed of the diagonally opposite wheels to compare the dynamic circumferences of all four wheels.

The RDW system does not monitor uniform air pressure loss over all 4 tires. If the pressure loss is the same in all four tires, the wheel speeds change equally and pressure loss cannot be detected. The customer must continue to check inflation pressures on a regular basis.

The system must be reinitialized if tire inflation pressures are modified or if the tires/wheels are replaced. Initializing RDW:

1. Start the engine but do not drive away.
2. Press and hold the RDW button in the center console until the indicator light in the instrument cluster illuminates in yellow for several seconds.
3. Drive away.

After a certain distance, the system stores the new wheel speeds as reference values and is then able to display a detected deviation. RDW has an indicator light in the instrument cluster that may illuminate in yellow or red.

Indicator illuminates in red:

- Indicates a loss of more than 30% of inflation pressure in one of the tires
- Accompanied by a “gong” sound

Indicator illuminates in yellow :

- Possible faults in the system
- Initialization

Table of Contents

X5 Face Lift

Initial Print Date: 10/03 Revision Date:

X5 Face Lift

Model: E53

Production: Start of Production MY 2004

OBJECTIVES

After completion of this module you will be able to:

- Recognize the external changes to the X5
- Understand operation of the X-Drive
- Explain mechanical and electrical changes to the X5

X5 Updates

The X5 Face Lift includes both seen and unseen changes. A partial list of the X5 updates is as follows:

- N62 Engine available
- New Engine wiring harness
- New Driveshaft
- Updated emissions for the M54
- 150 Amp generator for the M54
- New wheel designs
- DXC
- New wheel speed sensors
- X Drive transfer case
- RPA
- New Steering Wheel
- New Transmissions
- Bi-Xenon Lights
- Redesigned Tail Lights
- New LCM
- Revised PDC
- New AC compressor
- New Telephone prep
- Redesigned Front End
- Panoramic Sunroof (after 04/04)
- New Colors
- New Interior Trim

Lights

New lighting features for the X5 FL include the following:

- Revised Front Headlights
- Redesigned Taillights

Front Headlights

The front headlights are all new. Both the High and Low beams are now free-form reflectors and no longer use glass lenses. The turn signal now has a clear lens housing, and the parking light uses the optical wave guide technology. Clear rings surround the High and Low beam reflectors.

Out put voltage for the light source module comes from the parking lamp final stage of the LCM IV.

Bi-Xenon

Bi-Xenon lights are optional in the X5 3.0l and standard in the 4.4l Operation is the same as E46.

Taillights

The revised taillights include brake lights, running lights, rear fog lights, reverse and turn signal lights. Similar to the headlights, the lenses have been replaced with a clear lens. Taillight dimensions remain unchanged.

Tail light up to October 2003

Tail light X5 FL

LCM IV

Due to improvements in the LCM, the same LCM unit (IV) may be used for both the halogen and bi-xenon lights.

Check Control Messages

A modified CC message, Check Gas Cap, replaces the old Check Filler Cap.

PDC

Placement of the sensors has changed due to revisions of the front bumpers.

GM3RD

The GM3RD has been Redesigned to accommodate new functions in the X5 FL. While some pin assignments have changed, operation and diagnostics remain the same. New features of the GM3RD include:

- Revised software and hardware
- Adaptation of HW for Interior Lighting (IB) changes
- Additional Load Deactivation (VA2) to support peripheral control units
- Integration of Soft Close Actuator (SCA)

The primary reason for the redesign of the GM3 was to integrate a new microprocessor. Additionally, other hardware changes were also implemented requiring a new printed circuit board.

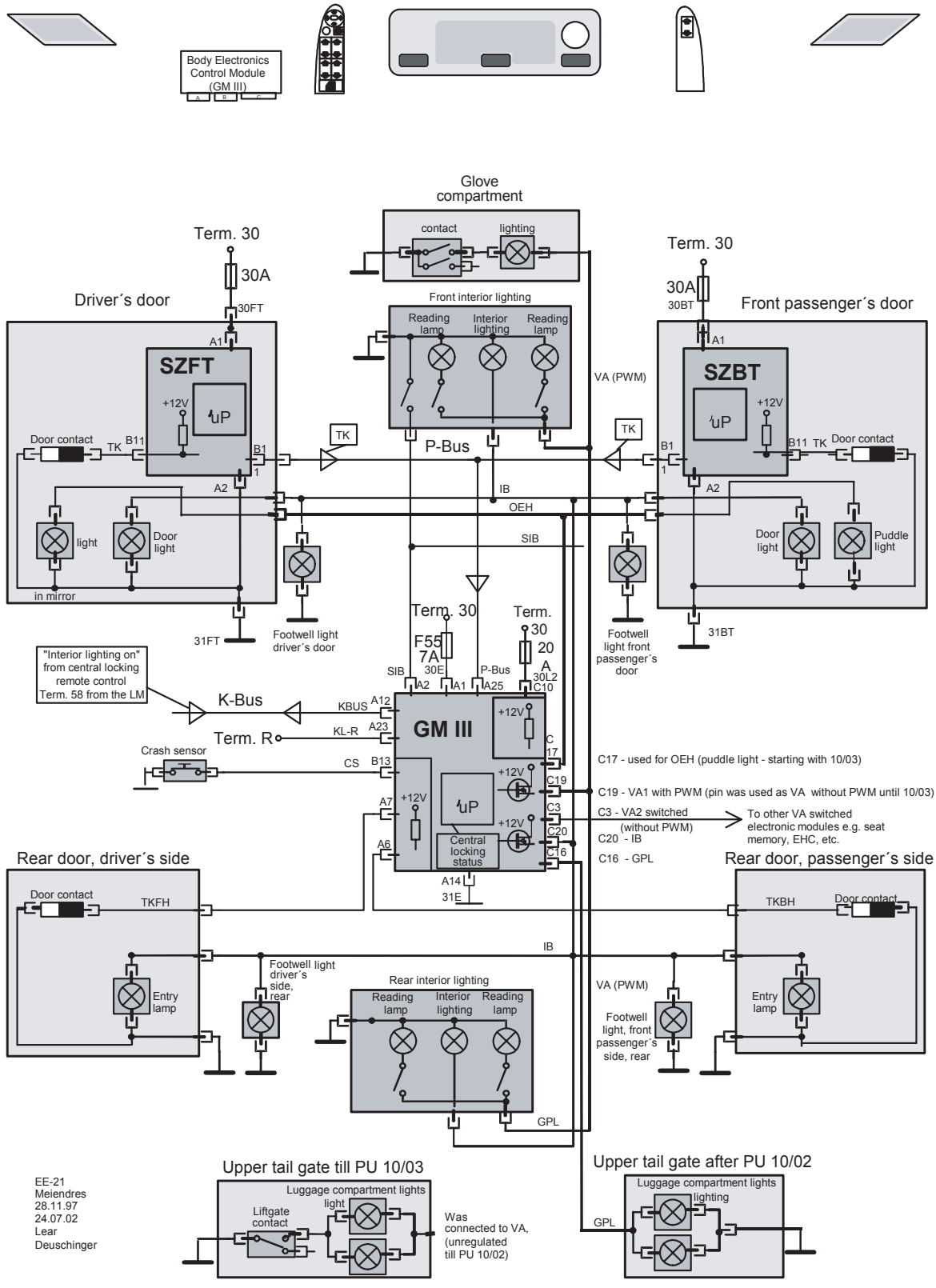
- Semiconductor control of lock activations (not relay)
- Integrated Optical Entry Assist (OEH)
- SCA
- Elimination of heat sink
- Pulse width modulated (PWM) signal for the interior lighting (IB), and reading lights supply line (VA)

Load Deactivation

Load Deactivation remains the same.

There are now two VA outputs from the GM3RD. VA1 is a PWM signal and VA2 is not PWM.

Interior Lighting Schematic



Softclose Actuator (SCA)

The softclose actuator system for the rear upper hatch is new for the E53 Facelift package. The purpose of the SCA system is to automatically pull the upper lift-gate fully closed once the customer lowers the hatch, and to automatically release the hatch once the opening process is initiated. The controlling function for the SCA is integrated into the GM3.

System Components

- SCA Assembly
  - Locking Pawls
  - Mechanical Components (Gears, springs, etc.)
  - Load Protection Device
  - Motor
  - Hall Sensor system
- Pushbutton Switches
- Relay SCA Open
- Relay SCA Close

SCA Assembly

Prior to this change, a micro-switch located in the upper lift-gate was used to provide the status of the lift-gate to the GM3 body electronics control module. For the 10/03 facelift, the micro-switch has been replaced with Hall Sensors for greater reliability. The hall sensors report the status of the lift-gate to the GM3. The GM3 responds to the status signals and provides the outputs to the relays that control the SCA motor. The GM3 also uses these input signals to control the upper hatch luggage compartment lights and to trigger the DWA anti-theft alarm.

Pushbutton Switches

The upper and lower lift-gates can be opened electrically in the same manner as before by using the respective switches in the upper and lower lift-gate. Additionally, the upper lift-gate can be opened using the center console switch, or the remote key.

The pushbutton switches for the upper lift-gate must be pressed for at least 200 ms in order for an electrical opening of the upper hatch to be initiated.

The SCA motor is not activated if the battery voltage is lower than 9 volts. In a crash situation (crash telegram generated), the lift-gate opening function is blocked for 10 seconds for additional safety.

Relay SCA Open

The GM3 controls the SCA Open relay K112 by applying a ground signal to the relay coil, which switches KL30 voltage to the motor.

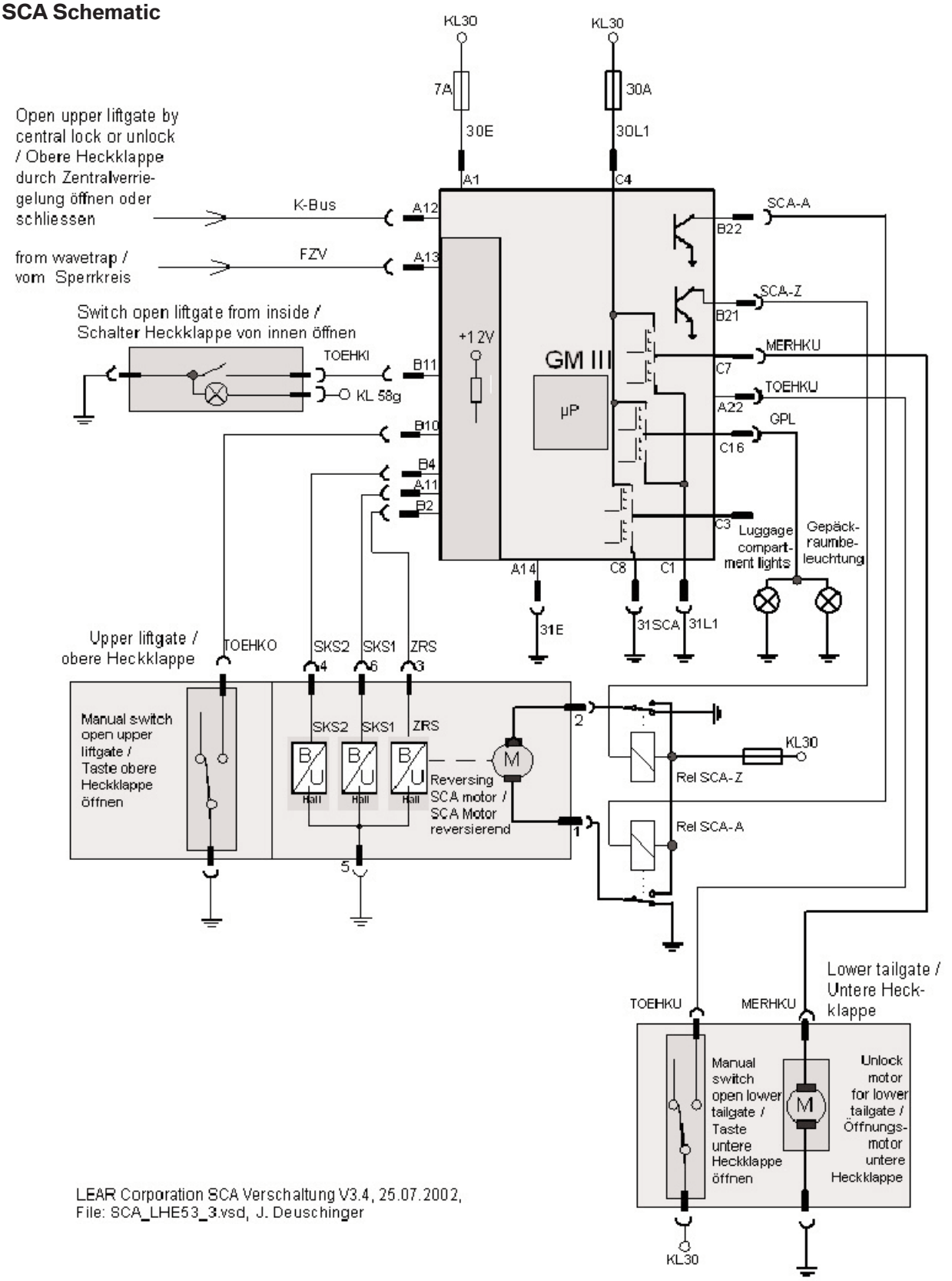
Relay SCA Close

The GM3 controls the SCA Close relay K70 by applying a ground signal to the relay coil,which switches KL30 voltage to the motor pulling the liftgate closed.

SCA Functions

- Disabling of liftgate operation while vehicle is moving
- Disabling of liftgate for 10s following a crash
- Opening of the upper liftgate from the outside/inside electrically via a pushbutton (minimum actuation duration 200 ms) and remote control.
- Opening the lower liftgate via pushbutton on the lower liftgate.
- Dimmed activation and deactivation of the interior lighting and luggage compartment lighting via the body electronics control module.
- The Pawl Sensor is an anti-theft alarm system trigger.
- Activation of the SCA motor in order to automatically close the SCA latch into the primary position after engagement in the secondary position by means of the “pull-closed” function.
- Activation of the SCA motor must occur in order to open the SCA latch when the vehicle is at a standstill.
- Activation of the SCA motor via two relays, activation of the lower liftgate motor and the luggage compartment light directly via the GM3RD

SCA Schematic

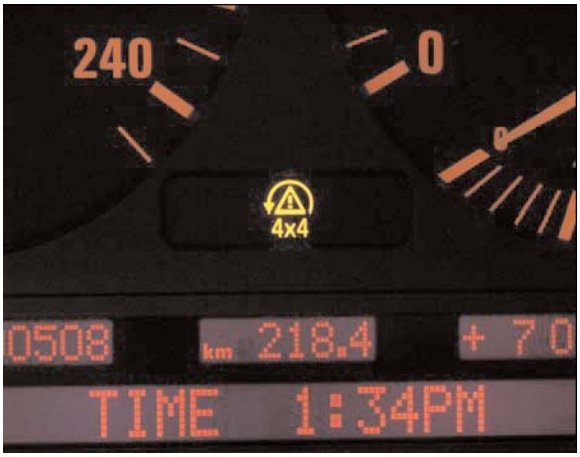


LEAR Corporation SCA Verschaltung V3.4, 25.07.2002,
File: SCA_LHE53_3.vsd, J. Deuschinger

Instrument Cluster

Soft ware and hardware have been updated.

The “Check Gas Cap” CC message and the DCX icon have been added.



MFL

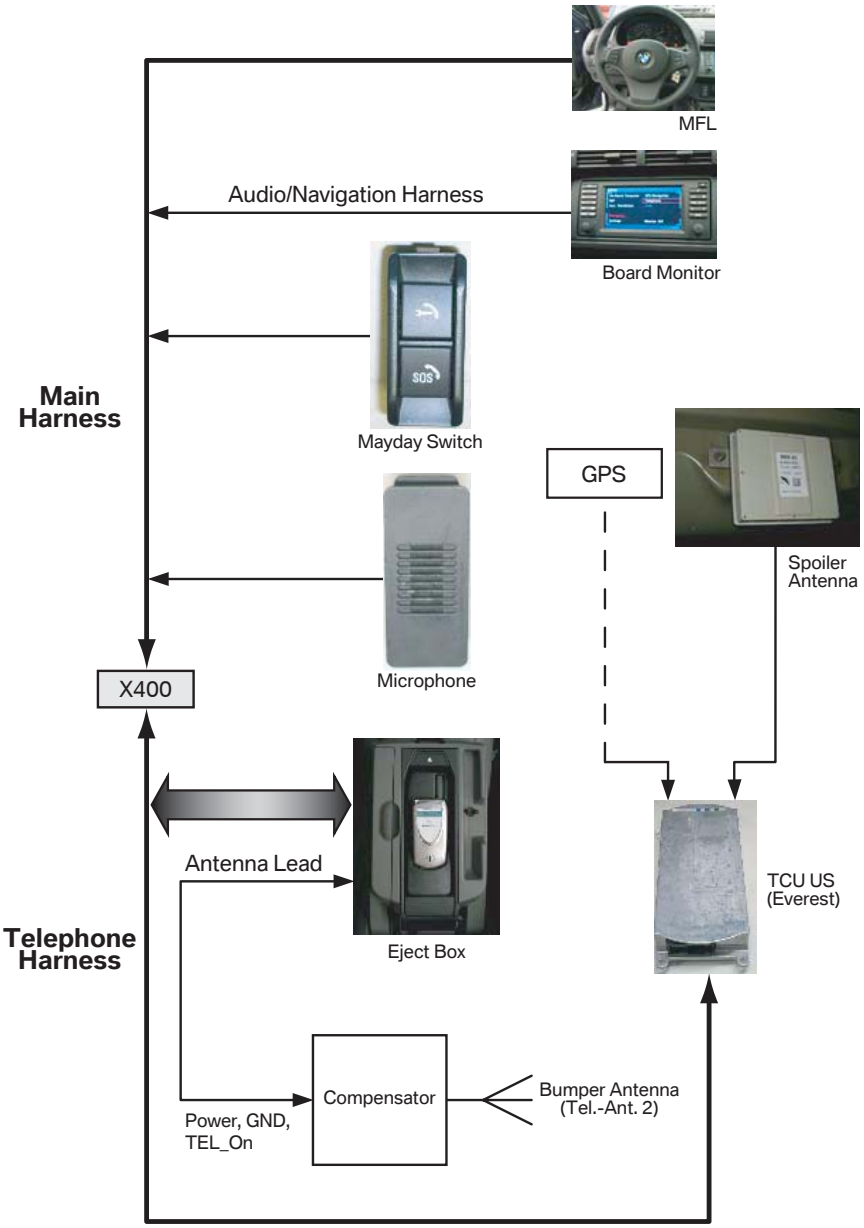
Communication Systems

The Navigation System, Business Radio and DSP Amplifier all have revised software and hardware. While the changes internally may be dramatic, there will no apparent change to the customer.

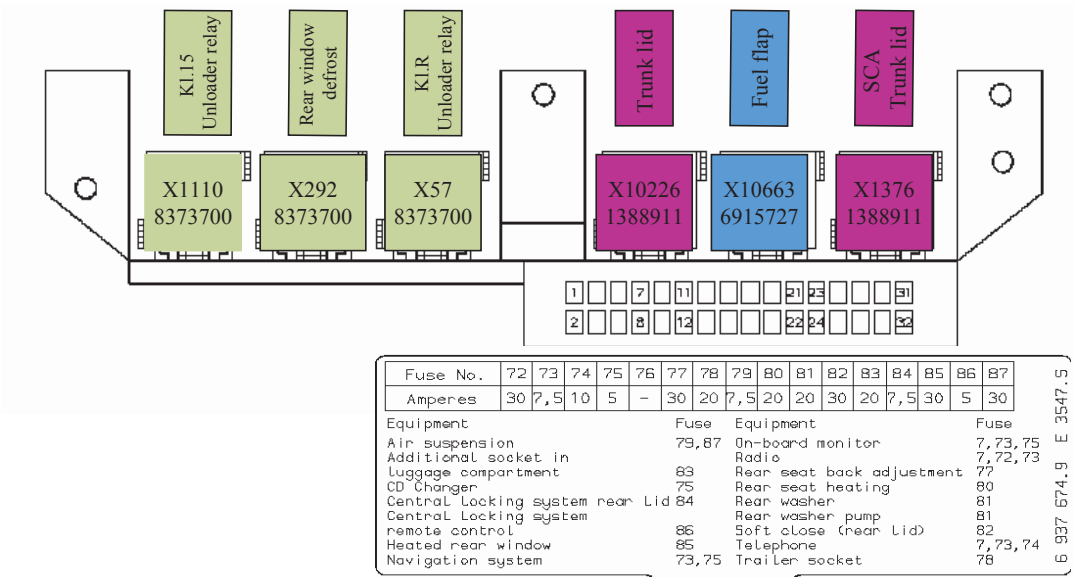
Telephone System

The X5 FL now include a TCU as standard equipment. Operation of the system is the same as E65/E60 equipped with the Everest Platform.

Installation of the eject box, cell phone antenna and compensator will be performed at the dealership.



Fuse and Relay Carrier Layout



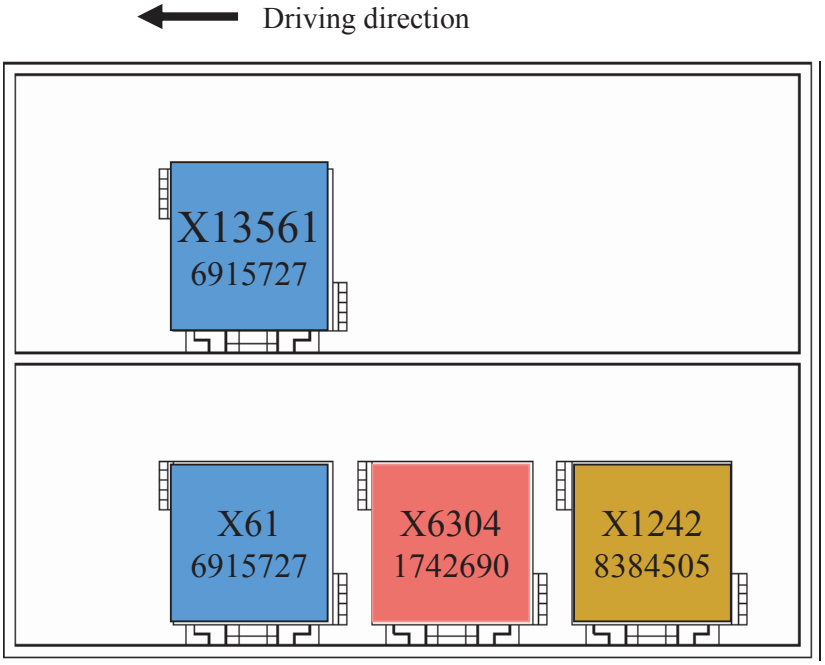
Fuse No.	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Amperes	30	7,5	10	5	-	30	20	7,5	20	20	30	20	7,5	30	5	30

Equipment	Fuse	Equipment	Fuse
Air suspension	79,87	On-board monitor	7,73,75
Additional socket in luggage compartment	83	Radio Rear seat back adjustment	7,72,73 77
CD Changer	75	Rear seat heating	80
Central Locking system rear Lid	84	Rear washer	81
Central Locking system remote control	86	Rear washer pump Soft close (rear Lid)	81 82
Heated rear window	85	Telephone	7,73,74
Navigation system	73,75	Trailer socket	78

6 937 674.9 E 3547.5

Relay Schematic E Box

X 61 High pressure headlight cleaning
X66 KL.50
X1242 wiper module
X6304 secondary air pump



Control Module and Relay Carrier

GM III # 6935890-01
HW 2.5 SW 3.1

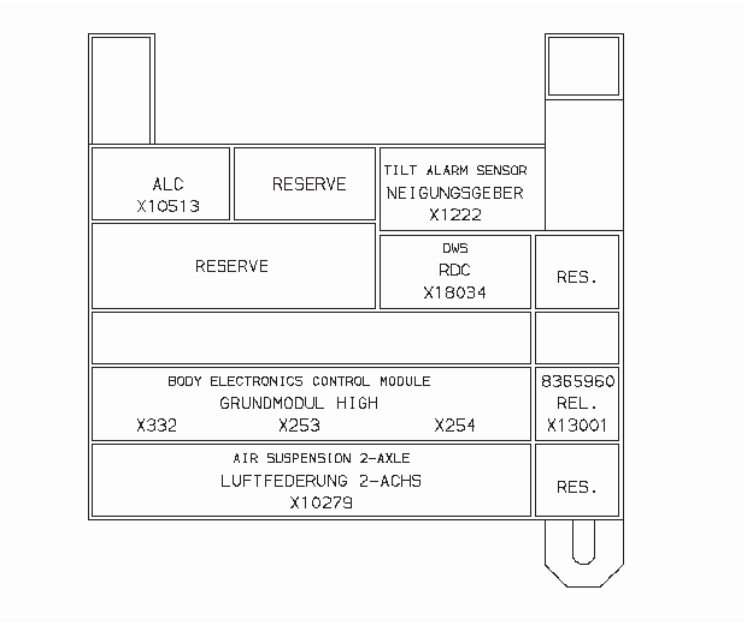
RDC # 6759023-01
HW 2 SW 10
CI 1 DI 2 BI 8

2-axle air suspension # 6758452-01
HW 20 SW 30

DWA tilt alarm sensor # 6923209-0
HW 04 SW16

Sleep current relay # 8365960-01

ALC
Part of the 04_2004 package



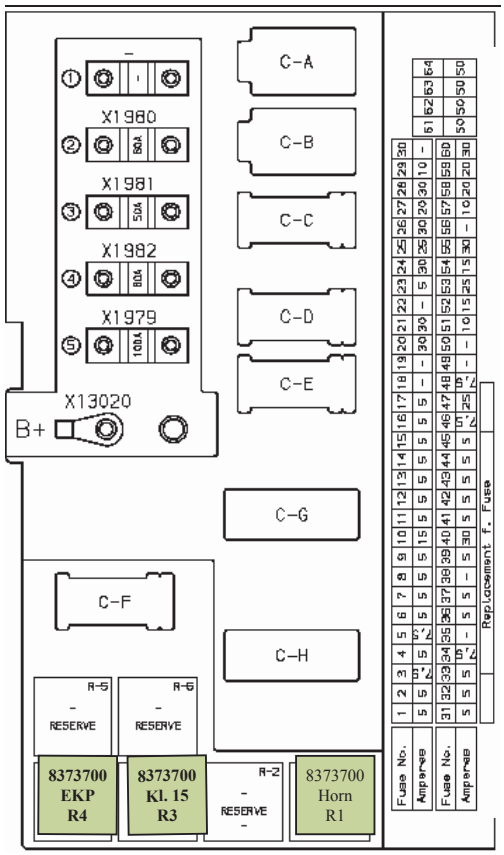
Power Distribution and Relay Carrier

R1
Relay Horn
 # 8373700

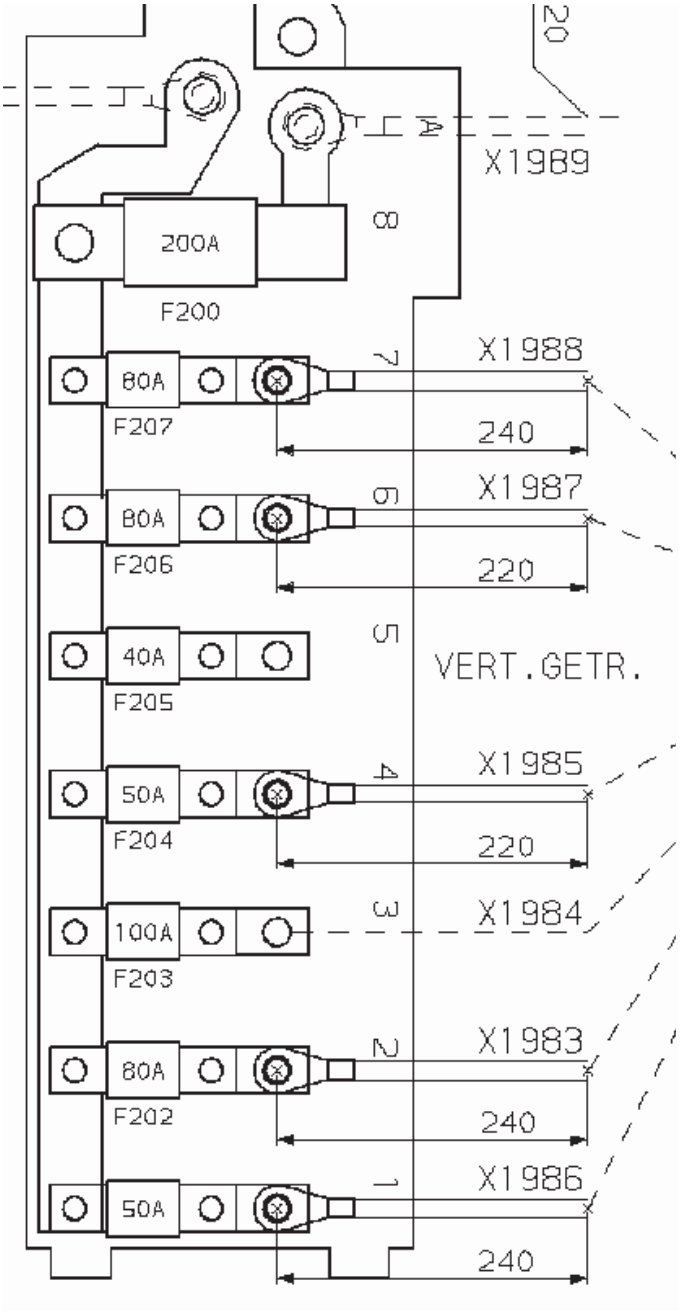
R 2
Reserve

R3
Relay Kl.15
 # 8373700

R 4
Relay fuel
Pump
 # 8373700



Power Distribution in Relay Box



F 200 >

F 207 >
F 206 >
F 205 > VGSG (Transfer case control) unit

F 204 > relay 2-axle air susp

F 203 >

> F 202 >

> F 201 > trailer module

Components for US Telephone

Oddiments Tray

Spoiler Antenna

TCU

Emergency Call Button

Voice Recognition Jumper